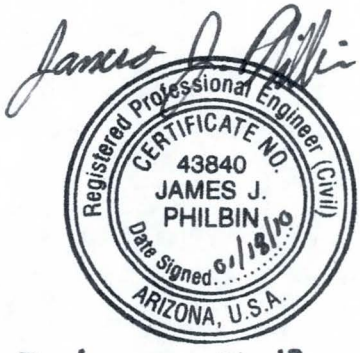
2008PD067

Final Drainage Report

Riggs Road
Val Vista Drive to Recker Road
ST100

GILBERT
ARIZONA



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January 2010

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1 INTRODUCTION

1.1 Background and Scope

The Riggs Road project is part of the Town of Gilbert (TOG) roadway improvements. The project limits extend from Val Vista Drive to Recker Road, including a quarter mile section of Higley Road south of Riggs Road. The roadway will be built to ultimate configuration which includes multiple lanes, raised medians, bike paths, sidewalk, curb and gutter and drainage.

The purpose of this report is to document the engineering analyses used in the design of drainage infrastructure for Riggs Road and Higley Road. Figure 1 shows the project location.

All plans and reports for this project are in English Units.

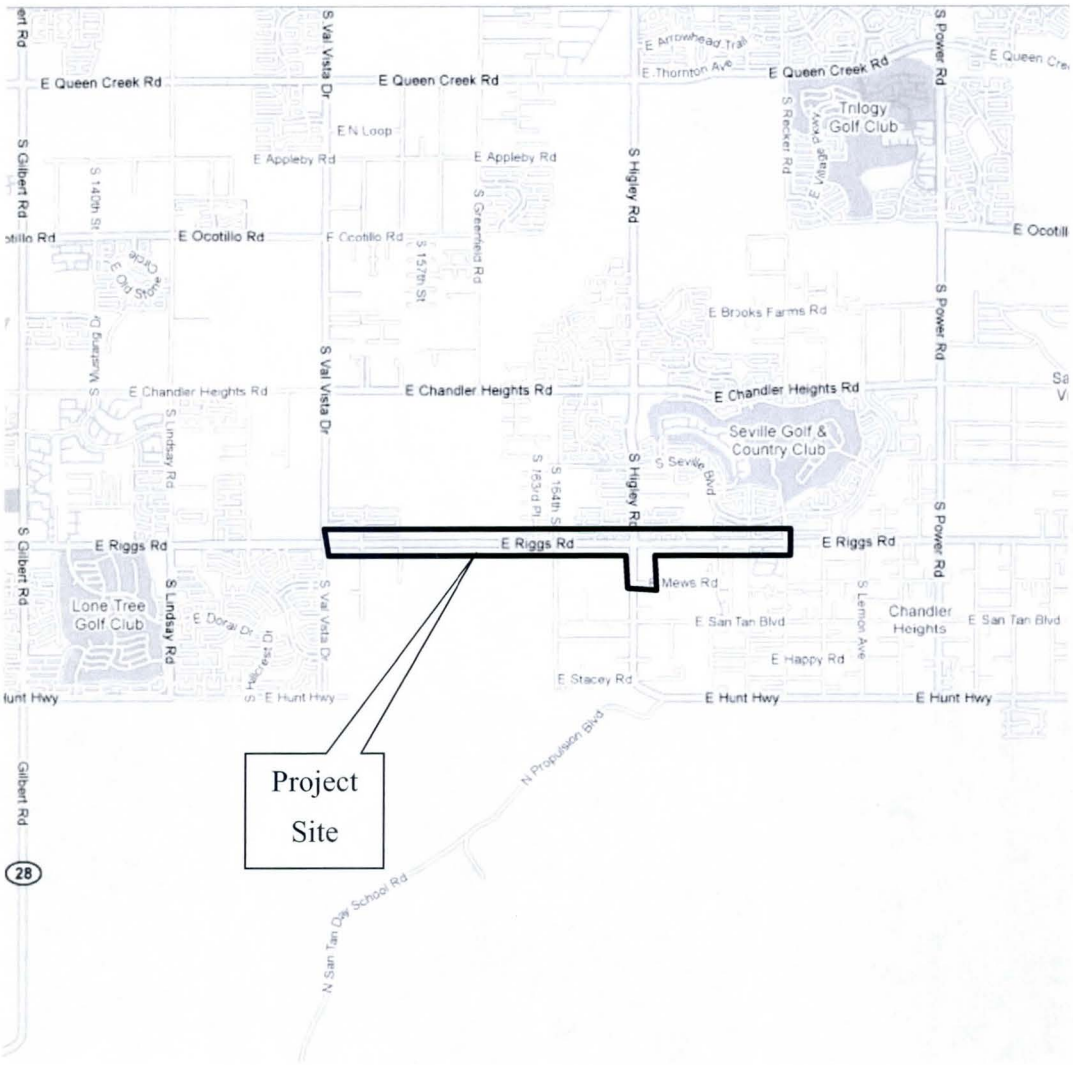


Figure 1: Project Location Map

1.2 Previous Studies

1.2.1 Sonoqui Wash Floodplain Delineation Study

Entellus, Inc. under contract with the Flood Control District of Maricopa County (FCDMC), completed the analysis of the *Sonoqui Wash Floodplain Delineation Study, March 2004.* This project evaluated the 100-yr, 6-hr storm and the 100-yr, 24-hr storm for approximately 7 river miles of floodplain delineation for Sonoqui Wash from Ellsworth Road to Higley Road, in eastern Maricopa County.

1.2.2 Queen Creek/Sonoqui Wash Hydraulic Master Plan & East Maricopa Floodway Capacity Mitigation Study

Huitt-Zollars (H-Z), under contract with the Flood Control District of Maricopa County (FCDMC), completed a hydraulic/analysis entitled *Queen Creek/Sonoqui Wash Hydraulic Master Plan & East Maricopa Floodway Capacity Mitigation Study, December 1999.* This project is was used to evaluate flows in the East Maricopa Floodway (EMF) for the 100-yr, 24-hr storm.

1.2.3 Chandler/Gilbert Floodplain Delineation Study Phase I– South, Eastern Canal Watershed

David Evans & Associates (DEA), under contract with the Flood Control District of Maricopa County (FCDMC), recently completed the analysis of the *Chandler/Gilbert Floodplain Delineation Study Phase I –South, Eastern Canal Watershed, June 2007.* This project provided the flood plain limits along the Eastern canal.

1.2.4 Master Offsite Drainage report for Seville-Higley Road &Chandler Heights Road

CMX Group Inc. (CMX), under contract for Shea Homes Inc. completed the drainage report *Master Offsite drainage report for Seville-Higley Road and Chandler Heights Road, August 1, 2000.* The analysis was used to evaluate and document the impact that the Seville development had on the existing drainage.

1.2.5 Offsite Drainage report for Riggs Pavilion

CMX Group Inc. (CMX), under contract for Marathon Commercial Development completed the drainage report *Offsite Drainage Report for Riggs Pavilion, southeast corner of Higley Road and Riggs Road Gilbert, AZ, July 16, 2008.* This analysis was used to evaluate and document the impact that Riggs Pavilion will have on the existing drainage condition.

1.2.6 Chandler Junior High School Preliminary Drainage study

Erie & Associate, Inc. (Erie), under contract for Hess-Roundtree Engineering and Chandler School District completed a drainage report Chandler Junior High School Preliminary Drainage study, April 14, 2004. The analysis was used evaluate the impact that the development will have on the existing drainage condition. Note: team members were unable to obtain the final drainage report.

1.2.7 Drainage Report for Mountainwood Development

Stantec Consulting Inc. (Stantec), under contract for Vanderbilt Farms L.L.C. completed the drainage report *Final Drainage Report for Mountainwood, June 2006*. This analysis was used to evaluate and document the drainage improvements for the development.

1.2.8 FEMA Studies

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panels 04013C3075H & 04013C3035H, dated September 30, 2005, show the project area to lie within Flood Hazard Zone X (shallow flooding), with the exception of the EMF which has a Flood Hazard Zone A (100-year flood, no base flood elevations determined). The 100 year flood for the EMF is contained within the Right of Way (ROW) of the EMF.

2 SITE DESCRIPTION

2.1 Topography

The terrain in the project area east of the EMF gently slopes towards the northwest at a grade of approximately 0.5 percent. Elevations range from 1282 feet at Val Vista Drive to 1366 feet near Recker Road. West of the EMF, the slope of the terrain is generally in a northwesterly or westerly direction.

Figure 2 shows the topography in the project area.

2.2 Land Use and Soil Types

Existing land use along the project corridor consists of vacant desert as well as commercial and residential land use. Several residential and commercial developments are planned along the Riggs Road corridor. Due to the recent economic downturn, development of these parcels has been placed on hold. It is likely that these parcels will not be developed for several years.

Soils within the project area consist of sandy loam, sandy clay and clayey sand, silty sand and clayey to silty sand with various amounts of gravel and medium to high plasticity. These fined grained soils are easily transported by storm water.

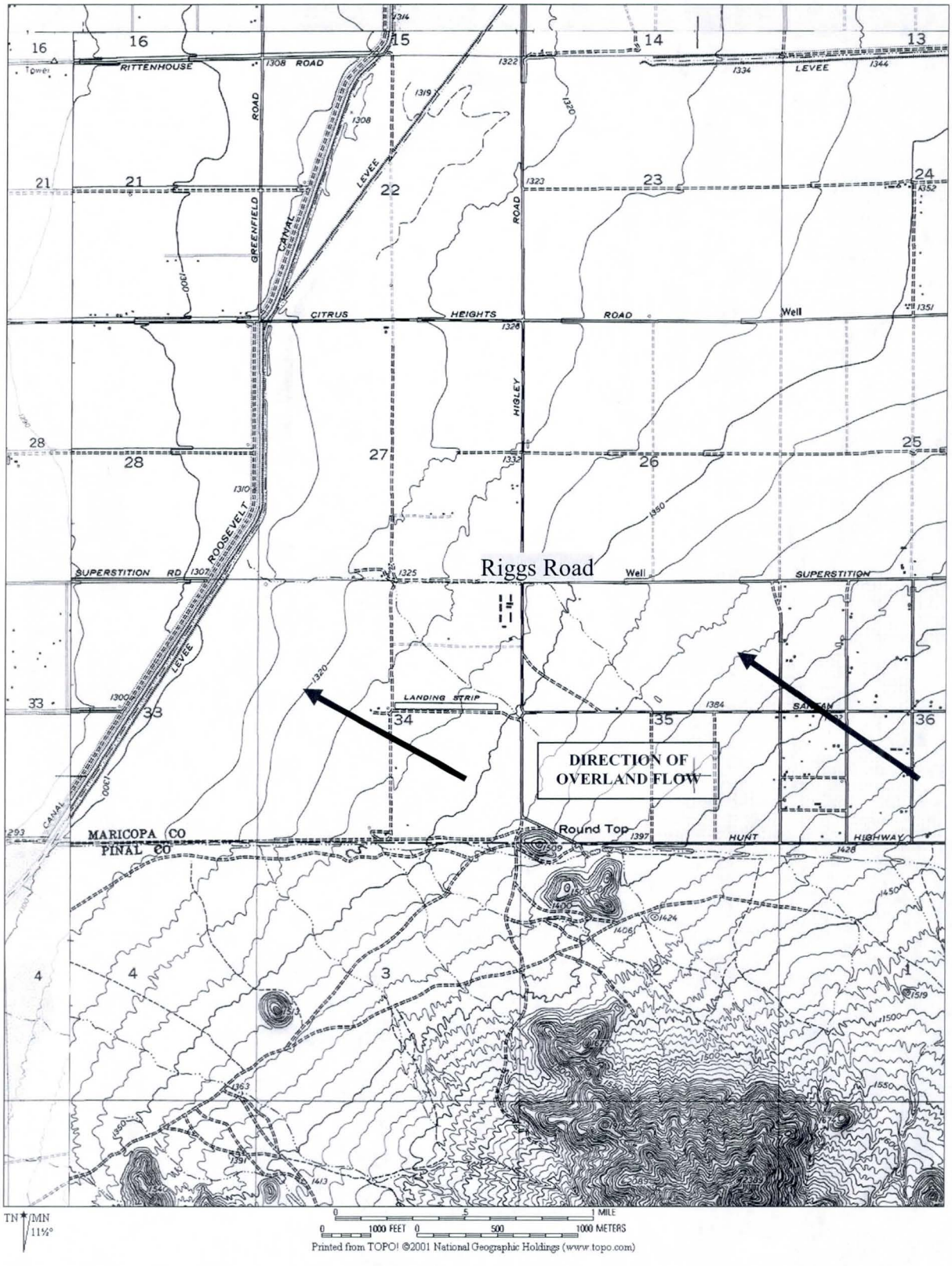


Figure 2: Topographic Map of Project Area

3 HYDROLOGY

Entellus, Inc. performed the hydrologic analysis for FCDMC for the *Sonoqui Wash Floodplain Delineation Study, March 2004.* The 100-yr, 6-hr storm was used due to the higher peak flows. CMX Group Inc. (CMX), under contract for Shea Homes Inc. completed the drainage report *Master Offsite Drainage Report for Seville-Higley Road and Chandler Heights Road, August 1, 2000.* In the report CMX updated the FCDMC HEC-1 model to document the impact of the Seville development on offsite flows. This updated HEC-1 model will be utilized for this project. Excerpts of the report can be found in Appendix B.

As can be seen on Figure 2, offsite flows west of the EMF have a minimal impact on Riggs Road because the direction of runoff is parallel to Riggs Road. East of the EMF, offsite runoff flows northwesterly towards Riggs Road. These flows are intercepted by two independent drainage systems. The first is an existing gabion trapezoidal channel, which originates east of Higley Road and extends along the south side of Riggs Road to the EMF. The second channel is the Seville channel located along the north side of Riggs Road. This channel originates at Power Road and extends along the north side of Riggs Road to 172st, then routes storm water north to Chandler Heights Road. The FCDMC HEC-1 existing condition models will be utilized for the analysis of the Riggs Road channel. Team members reviewed/refined the model to identify peak discharge values at key locations. They only modified basins directly impacting the project limits (i.e., they did not review/refine the entire hydrologic model).

The onsite hydrologic analysis was completed using the Rational Method. The Rational Method is described in the sections below. Each onsite inlet was sized for the 10-year 1-hour storm event, as specified by the Town of Gilbert *Roadway Design Guidelines*.

3.1 Onsite Retention Volumes

The Modified Rational Equation was used to determine the storage volume required for the 50-year, 24-hour storm event. The Modified Rational Equation is:

$$V = \overline{C}(D/12)A$$

Where
V = storage volume, acre-feet
$\overline{C}$ = weighted runoff coefficient
D = 50-year, 24-hour rainfall depth (3.0 inches Per TOG Guidelines)
A = contributing drainage area, acres

3.2 Precipitation

Rainfall data for the project site was determined using equations and procedures described in the Flood Control District of Maricopa County *Drainage Design Manual, Volume 1, Hydrology.* Precipitation calculations can be found in Appendix C.

3.3 Rational Method

The Rational Method calculates the peak discharge using the following equation:

$$Q = CiA$$

Where
Q = peak discharge, cfs
C = runoff coefficient
i = average rainfall intensity, inches/hour
A = contributing drainage area, acres

Each of the Rational Method parameters is discussed below.

3.3.1 Rational Runoff Coefficient: C

The Rational Method runoff coefficient (C) depends on the one-hour precipitation depth, vegetation cover, percent of effective impervious area, and the hydrologic soil group (HSG).

For this project, a pavement runoff coefficient of 0.95 was used for onsite drainage areas and for landscaped areas a runoff coefficient of 0.70 was used.

For undeveloped desert a runoff coefficient of 0.40 was used.

3.3.2 Rainfall Intensity: i

The rainfall intensity (i) in the Rational Method equation is the average rainfall intensity for the selected return period with rainfall duration equal to the time of concentration. The time of concentration is the time for a flood wave to travel from the hydraulically most distant point in the watershed to the point of concentration.

For pavement drainage calculations, a time of concentration of 60 minutes was used at each inlet per Town of Gilbert policy.

3.3.3 Sub-Basin Areas: A

Pavement drainage areas were delineated for each pavement inlet. See Figure 3 for onsite drainage areas.

3.4 Retention Volume Summary

Two onsite retention basins and five underground storage pipes west of the EMF are required for this project because there are no outfalls available. A 96" corrugated metal pipe (CMP) pipe was recommended to minimize the impact on existing county properties. In addition, three temporary offsite retention basins are required for this project to protect the roadway until the land is fully developed. Currently the land is undeveloped desert. The basins will capture 50-year 24-hour storm using desert conditions with the exception of the basin at the southeast corner of Riggs/Recker Road. Team members meet with the developer to identify the size and shape of the basin. For retention calculations see excerpts from SVK Engineering drainage report in Appendix B. Refer to Figure 3 for general retention basin locations. Also refer to Tables 1 and 2 for retention basin and underground storage sizes respectively.

Initial geotechnical data shows favorable infiltration rates of 2 in/hr to 8 in/hr, which will allow the retention basins to drain within 36 hours. However, during construction of the basins site specific percolation tests will still need to be performed to determine if a basin needs a drywell or not.

The underground storage pipe will utilize drywells to drain the pipe within 36 hours.

Table 1 Required Retention Basin Summary

Basin approx. Sta	Roadway	Pavement area acres	Runoff coeff. Pavement C	Desert/ Landscape area acres	Runoff coeff. C	D ft	Volume of storage required ac-ft
47+00	Riggs	3.34	0.95	2.74	0.7	0.25	1.28[A]
55+00	Riggs	1.38	0.95	1.94	0.7	0.25	0.67
143+43	Riggs	1.48	0.95	2.20	0.4	0.25	0.57
153+25	Riggs	0.49	0.95	0.00	0.4	0.25	0.12
180+00	Riggs/Recker	-	-	-	-	-	0.70[B]

Notes:

A) Storage includes 1/2 street drainage for south side of Riggs Road

B) 0.73 ac-ft of storage provided. See excerpts from SVK Engineering drainage Report in Appendix B for retention basin calculations.

Table 2 Underground Storage Summary

Basin approx. Sta	Roadway	C Pavement	Pavement Area acres	C Desert/ Landscape	Desert landscape Area acres	D ft	Volume ft^3	Storage Volume ac-ft	96" storage Pipe (ft)
40+28	Riggs	0.95	0.84	0.70	0.18	0.25	10097	0.23	210
33+93	Riggs	0.95	0.78	0.70	0.17	0.25	9346	0.21	190
27+05	Riggs	0.95	0.84	0.70	0.18	0.25	10127	0.23	210
20+95	Riggs	0.95	0.76	0.70	0.16	0.25	9052	0.21	185
17+00	Val Vista	0.95	0.44	0.70	0.09	0.25	5297	0.12	105

3.5 Onsite Hydrologic Results

Pavement runoff calculations and retention basin volumes and underground storage are provided in Appendix D. See Table 3 for summary of onsite flows.

Table 3 Onsite Summary

Station	Roadway	Area ID	i, in/hr	A, acres	Q, cfs
166+75	Riggs	ES1	1.5	1.75	2.5
157+33	Riggs	22S	1.5	1.56	2.2
155+45	Riggs	21S	1.5	0.27	0.4
151+15	Riggs	20M	1.5	0.56	0.8
146+62	Riggs	19M	1.5	0.51	0.7
143+43	Riggs	18S	1.5	0.50	0.7
136+77	Riggs	17S	1.5	1.11	1.6
127+94	Riggs	16S	1.5	1.47	2.9
019+03	Higley	H1W	1.5	2.00	2.9
018+75	Higley	H2E	1.5	0.89	1.3
012+85	Higley	H1E	1.5	0.99	1.4
123+71	Riggs	14S	1.5	0.72	1.0
118+63	Riggs	13S	1.5	1.16	1.7
111+50	Riggs	12S	1.5	1.64	2.3
107+74	Riggs	11S	1.5	0.87	1.2
093+85	Riggs	10S	1.5	0.71	1.0
093+85	Riggs	10N	1.5	0.78	1.1
086+00	Riggs	9S	1.5	0.86	1.2
086+00	Riggs	9N	1.5	1.03	1.5
072+73	Riggs	8S	1.5	2.22	3.2
072+69	Riggs	8N	1.5	2.37	3.4
055+00	Riggs	7N	1.5	1.43	2.0
047+14	Riggs	6N	1.5	0.99	1.4
047+14	Riggs	6S	1.5	2.55	3.6
040+28	Riggs	5S	1.5	1.02	1.5
033+93	Riggs	4S	1.5	0.94	1.3
027+05	Riggs	3S	1.5	1.02	1.4
020+95	Riggs	2S	1.5	0.86	1.2
017+00	Val Vista	1S	1.5	0.51	0.7

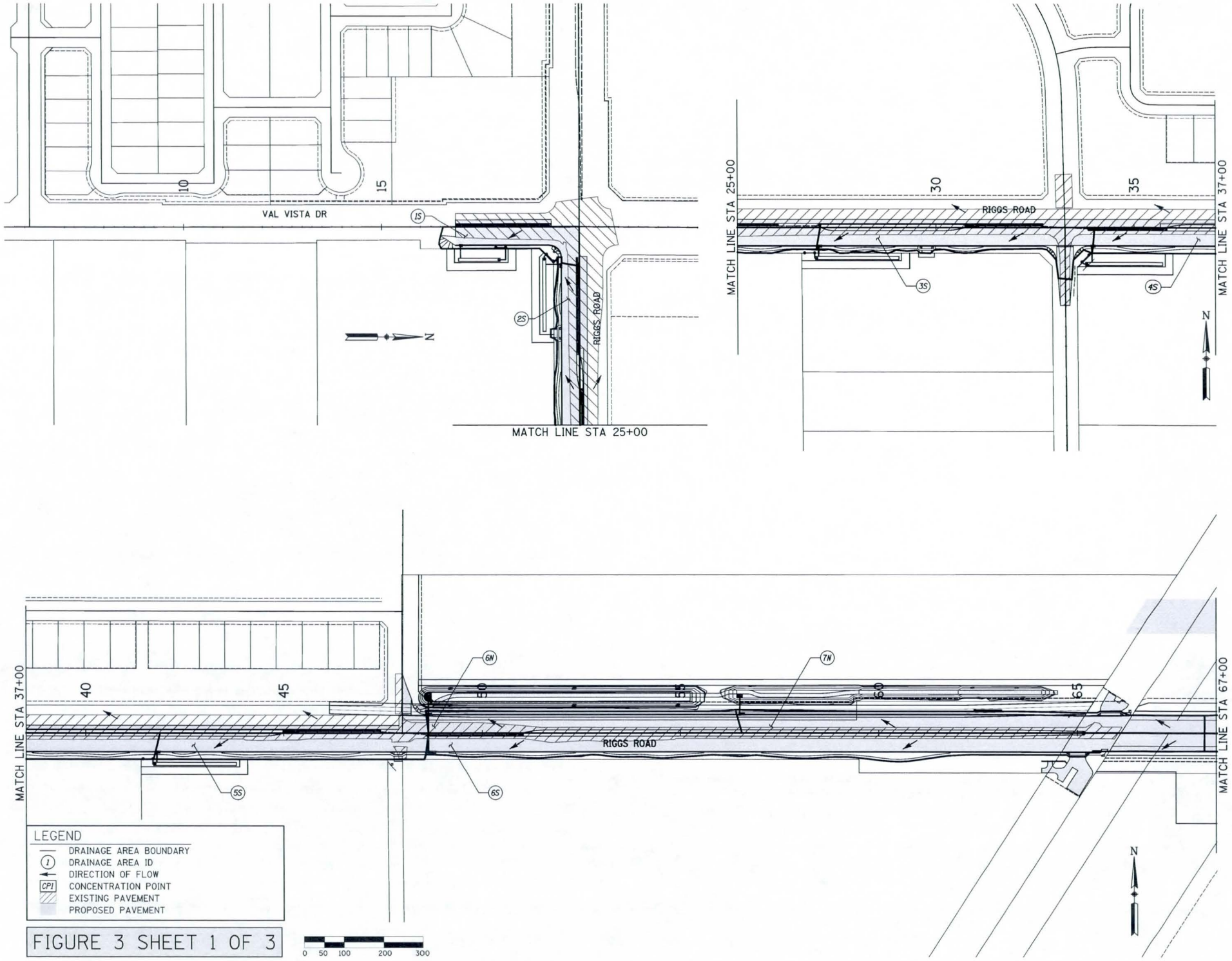


FIGURE 3 SHEET 1 OF 3

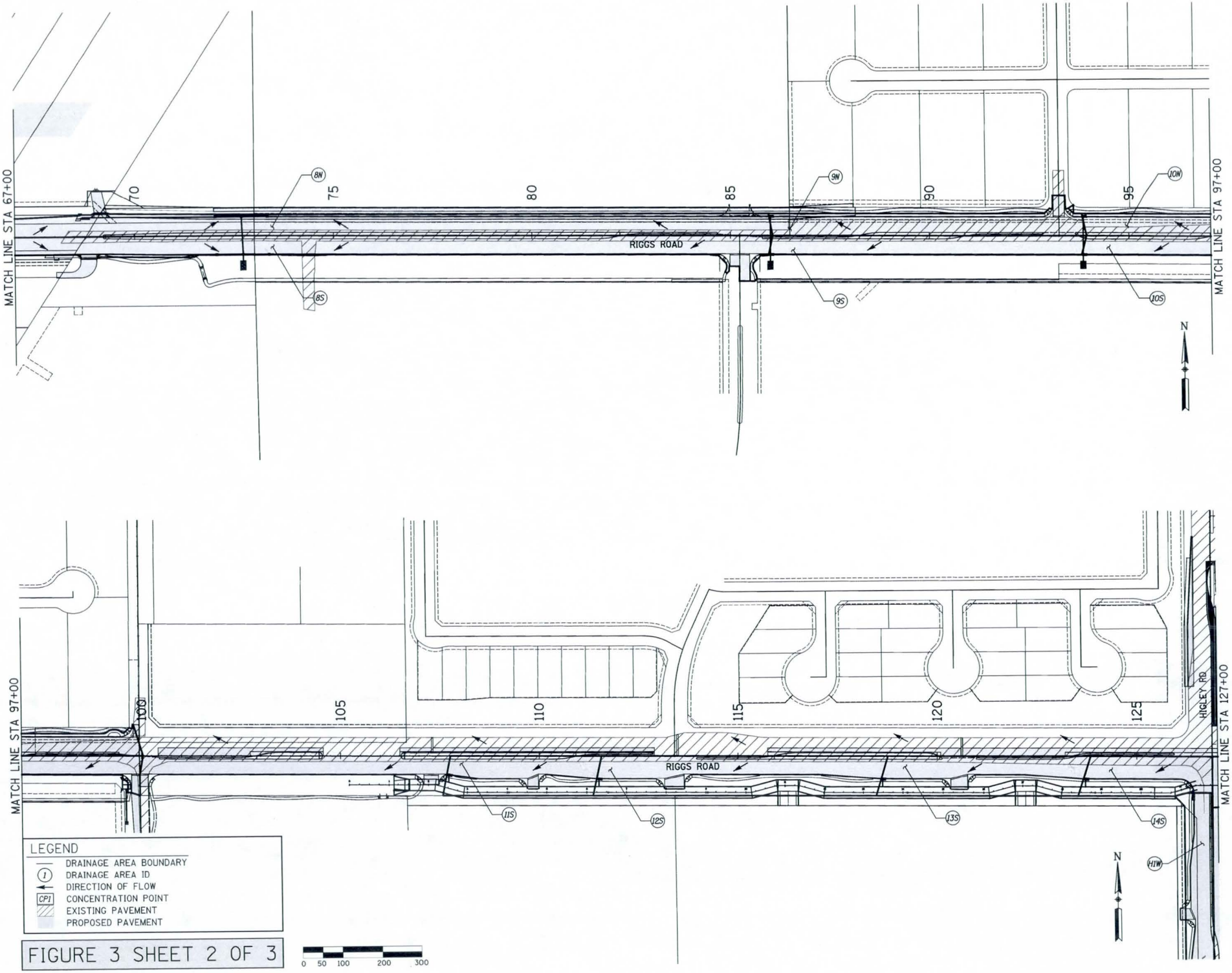


FIGURE 3 SHEET 2 OF 3

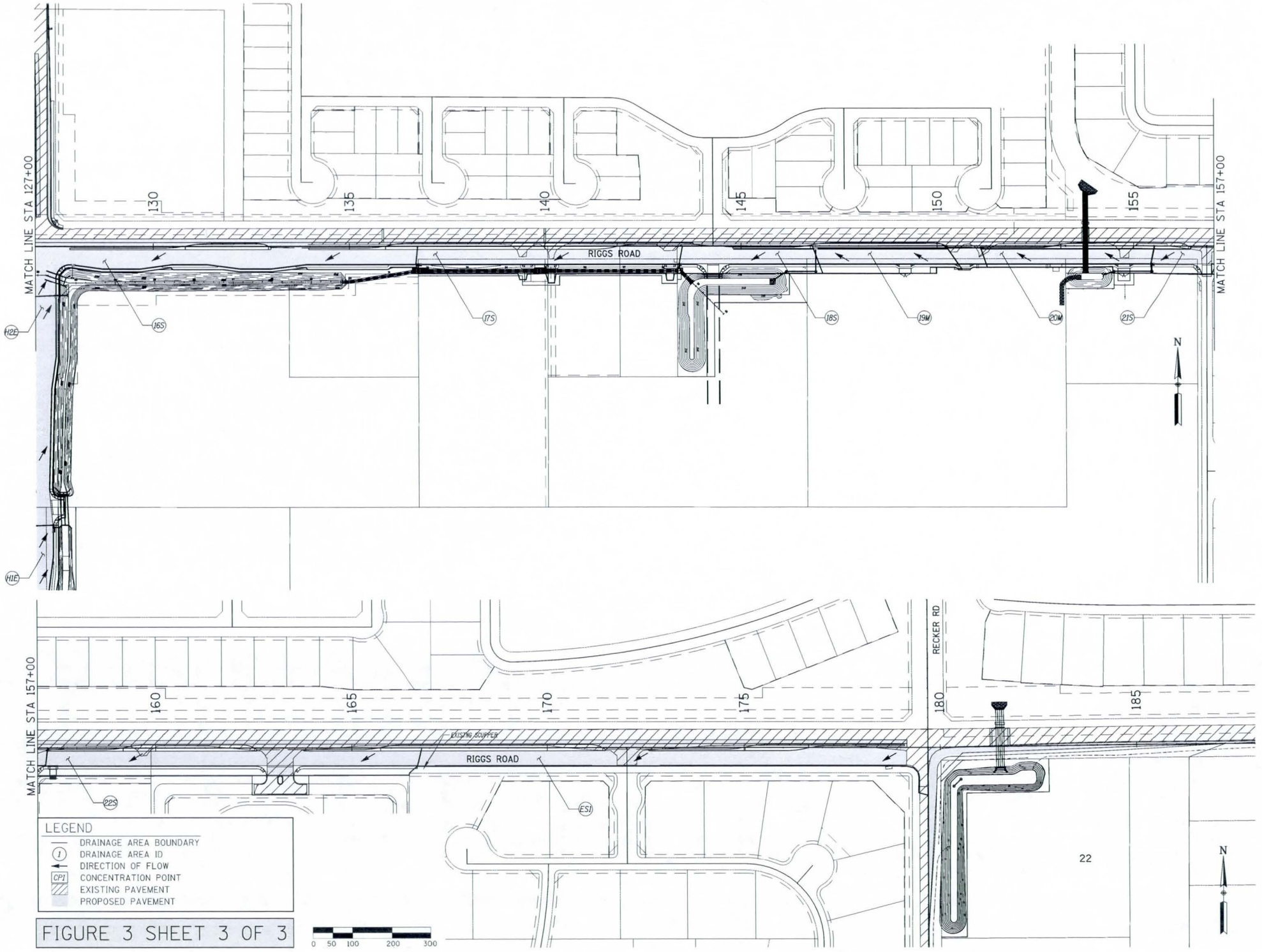


FIGURE 3 SHEET 3 OF 3

3.6 Runoff Analysis Existing/Proposed Conditions

Due to the Riggs Road improvements, i.e. increased runoff coefficient the rational method was used to analysis peak flows impacting the gabion trapezoidal channel (along the south side of Riggs Road) which, ultimately drains to the EMF. Both the existing and proposed conditions were analyzed. The analysis was broken into three segments or concentration points. The three segments are as follows: just upstream of the EMF, 164th Street and Higley Road. Drainage areas were delineated within the right of way and the limits of roadway construction. Refer to Figure 4.

For this analysis, a pavement runoff coefficient of 0.95 was used for onsite drainage areas and for landscaped areas a runoff coefficient of 0.70 was used.

The results of the analysis show that there is no significant impact on the peak flows therefore the hydraulics of the channel have not changed. Refer to table 4 & 5 for summary of flows and to Appendix D for runoff calculations.

Table 4 Existing Conditions Summary

Concentration Point	Area, Pavement (ac)	Area, Landscape (ac)	2-Year (cfs)	5-Year (cfs)	10-Year (cfs)	25-Year (cfs)	50-Year (cfs)	100-Year (cfs)	Comments
1	3.3	11.48	18	27	34	46	57	68	EMF
2	1.7	7.58	12	18	23	31	39	46	164th Street
3	0.55	6.17	8	13	16	21	27	32	Higley Road

Table 5 Proposed Conditions Summary

Concentration Point	Area, Pavement (ac)	Area, Landscape (ac)	2-Year (cfs)	5-Year (cfs)	10-Year (cfs)	25-Year (cfs)	50-Year (cfs)	100-Year (cfs)	Comments
1	8.44	6.34	18	29	36	47	57	67	EMF
2	5.64	3.63	13	20	25	33	39	46	164th Street
3	5.26	1.46	10	15	19	24	29	33	Higley Road

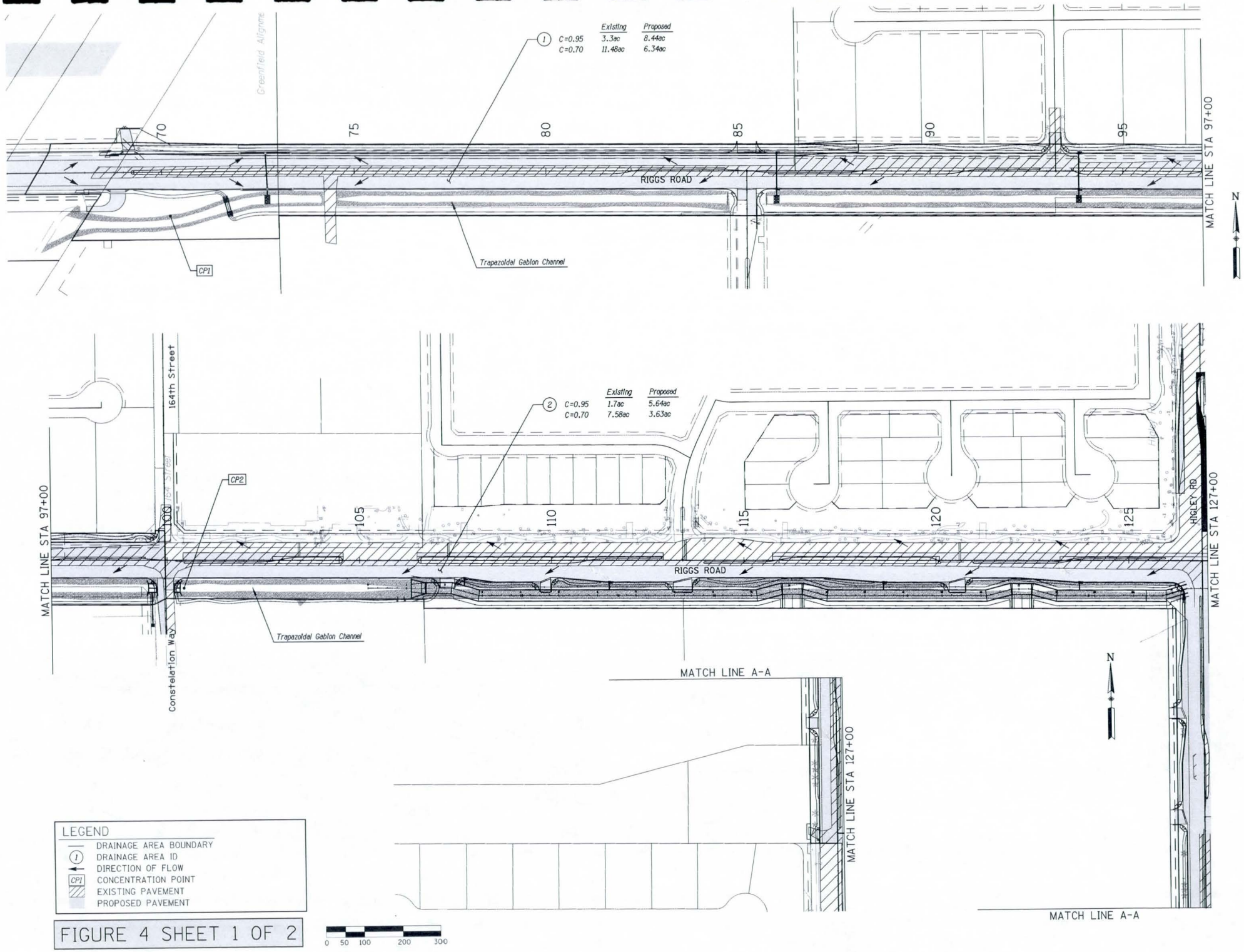
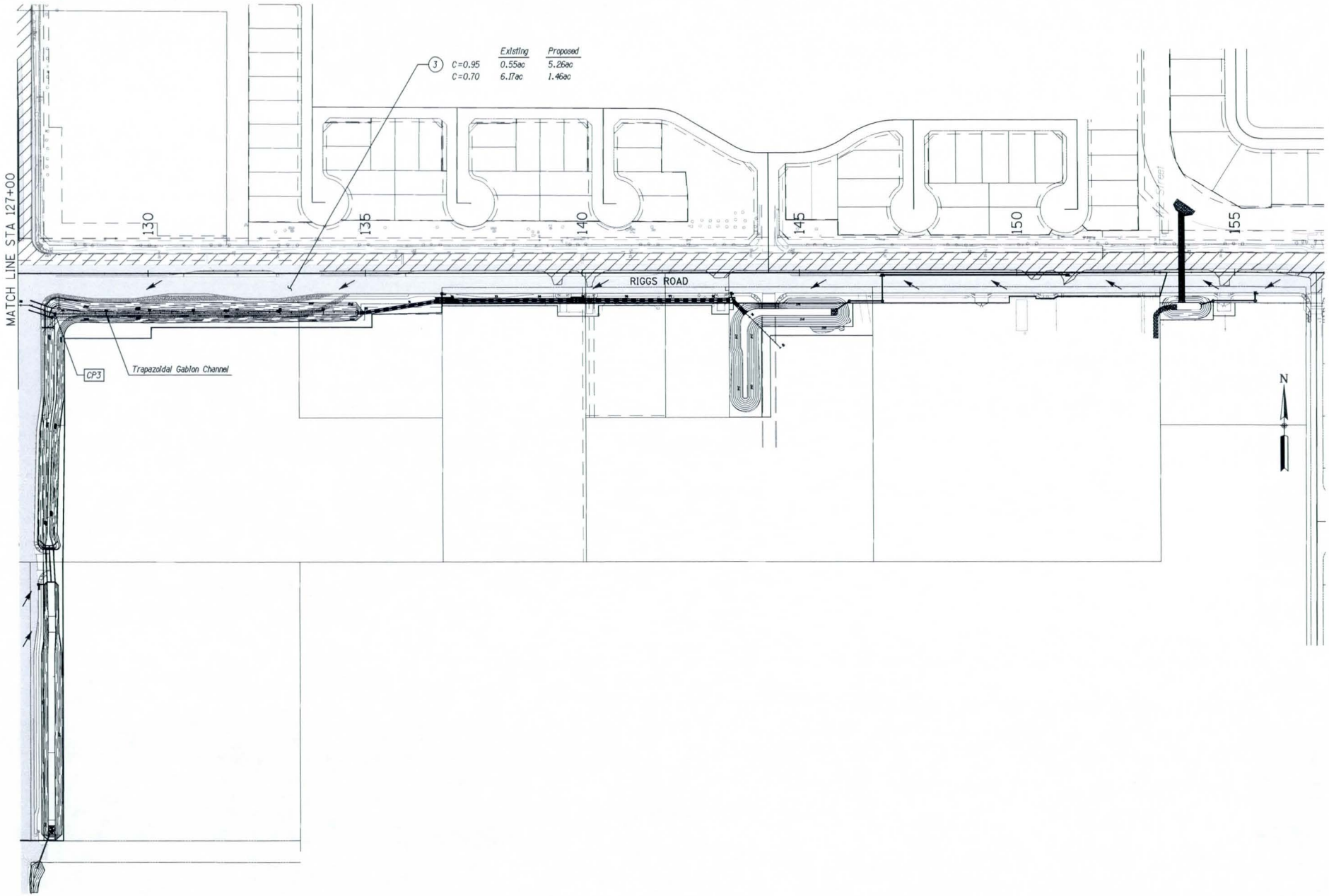


FIGURE 4 SHEET 1 OF 2



LEGEND

- DRAINAGE AREA BOUNDARY
- (1) DRAINAGE AREA ID
- DIRECTION OF FLOW
- CP1 CONCENTRATION POINT
- EXISTING PAVEMENT
- PROPOSED PAVEMENT

FIGURE 4 SHEET 2 OF 2

0 50 100 200 300

3.7 HEC-1 Results

As mentioned previously, the modified Entellus HEC-1 100-yr, 6-hr model is used as the base model. Team members incorporated the CMX modified HEC-1 model and simplified/refined this model for this project. Most notably, only the basins that impact the project will be analyzed. Refer to appendix G for the HEC-1 model schematic diagram.

The offsite flows can be broken down into two major segments. The first segment is the gabion lined trapezoidal channel. The channel intercepts offsite flows along the south side of Riggs Road. Flows are conveyed from approximately 172nd Street, west to the EMF. Note that the existing channel does not have the capacity to contain the 100yr-6hr storm event. The channel is a 3.5 foot-deep gabion lined trapezoidal channel with a 20 foot bottom width and 3 to 1 side slopes. A normal depth analysis of the channel shows the channel capacity is approximately 538 cfs. However due to the culvert crossing at 164th Street and Higely Road (2-10'x3'RCBC) the channel capacity is reduced to 330 cfs with a headwater depth of 3.5 ft. Any headwater depth greater than 3.5 feet will overtop the channel banks and enter the roadway. Flows will continue west along the overbanks and Riggs Road and ultimately to the EMF.

The second segment is from 172nd Street east to Lemon Avenue. These flows will be passed through two culvert crossings and will overtop Riggs Road and will enter into the Seville development channel along the north side of Riggs Road. See Seville paragraph for further discussion.

Two HEC-1 models were developed: SNQ6alt1.dat and SNQ6alt2.dat. In the first model, flows from basin W13A are routed to the southeast corner of Higley Road/Riggs Road as it currently does. The second model reflects the potential of future development to redirect flows from Basin W13A and route flows directly north to the SE corner of 172nd Street/Riggs Road via the SRP easement. Basin W13A will be discussed in the later paragraphs. Each basin is discussed below and is reflected in the SNQ6alt1.dat as these are the current conditions. Refer to Figure 4 for location of the basins, concentration points and drainage features. Also refer to Table 4 for summary of flows at concentration points.

Note: discussion will be from Upstream to downstream.

172 Street/Riggs Road - Seville Development (contributing basins W9, W10 &W14A)

Offsite flows impacting Riggs Road and the Seville development include basins W9, W10 and W14A, from 172nd Street to Lemon Avenue. The Seville channel that runs along the north side of Riggs Road will convey the offsite flows around the development to the SE corner of Chandler Heights Road/Higley Road and ultimately be conveyed west to the EMF. Currently there are no structures to convey the offsite flows to the north, thus flows overtop Riggs Road. The Riggs Road project will incorporate two drainage crossings. The first culvert crossing is a 4 barrel 4'x2' Reinforced Concrete Box Culvert (RCBC), located at the SE corner of Recker Road/Riggs Road (basinW10 concentration point). Approximately 192 cfs via the RCBC will be conveyed north to the Seville channel. The second crossing will be 4-24" Reinforced Concrete Pipe (RCP), located just east of 172nd Street (basin W14A concentration point). Approximately 75cfs will be conveyed north to the Seville channel.

Basin W14A concentration point is SE corner of Riggs Road/172nd Street. Currently the development SanTan Lakes Estates does not contain the north half of its onsite drainage. Flow will pond behind their wall and eventually overtop the driveway and drain out onto Riggs Road.

San Tan Blvd. (Higley to Recker) this includes Basins W13A and the Jr. HS basins SA01 to SA07. See discussion below.

Basin W13A concentration point is southeast corner of San Tan Blvd and 172nd Street. Flows are conveyed northwesterly via 2-24" CMP and roadway overtopping to the northwest corner. These culverts are undersized and the flows overtop San Tan Blvd. A portion of this flow will head west towards the Jr. High School. A majority of the flow heads in a NW direction overland. Mews Road will tend to push these flows west to Higley Road. From there flows will continue north to the southeast corner to Riggs Road/Higley Road. Note: depending on future development there is potential to divert this flow directly north to Riggs Road along the SRP easement (172nd Street). Most likely the flows will be directed to Riggs Road/Higley Road.

Basin SA01 to SA07 (Payne Jr. HS) concentration point is southeast corner of San Tan Blvd/Higley Road. Flows are conveyed northwesterly via 3-36" cmp and roadway overtopping to the northwest corner. Flows are then conveyed via a concrete trap channel to the west and ultimately to the southeast corner of Riggs Road/164th Street. A portion of the overtopping flow will head north, along the east side of Higley Road.

Higley Road/Riggs Road intersection SE corner. (Beginning offsite channel) A proposed development Riggs Pavilion will be built at this corner after the Riggs Road project. Therefore as part of this project, portions of the Riggs Pavilion drainage system will be built. This includes extending the existing 2-10'x3 RCBC under Higley Road, adding 2-8'x3' RCBC under driveway, extending an earthen trapezoidal to the existing RCBC along the north and west boundary of the development. Also extend the 2-36" RCP to proposed driveway and add a modified junction structure/catch basin. Refer to the drainage plans in Appendix A. HEC-1 basins contributing to this site are W13A, W13B, W14 and flows from the Jr. High school.

Mountainwood development is located on the south side of Riggs Road and is bounded by the EMF to the west and 164th Street on the East. Per the Mountainwood drainage report (Stantec) northwesterly and southwesterly offsite flows will be redirected north along the east side of 164th Street, by raising 164th Street. See excerpts of the drainage report in Appendix B. This affects the offsite drainage for basins W21 and W22 see discussion below.

Basin W22 concentration point is the SE corner of San Tan Blvd/164th Street. This basin is predominately very low density residential. Before the Mountainwood area development grading was completed, approximately ½ the property flowed west across 164th Street and ultimately south. Due to the raising of 164th Street, flows are contained along the east side of the road and are diverted north to Riggs Road, thus increasing offsite flows to the gabion channel and properties along the east side of 164th Street.

Basin W21 concentration point is the southeast corner of Riggs Road/164th Street Just over ¼ of this basin has been developed. Flows contributing to this basin from the Jr. High School are diverted along the north side of San Tan Blvd via a shallow concrete trapezoidal ditch. Flows continue along the south side of Acacia development at the northwest corner of Higley Road/San Tan Blvd. Along the south side of the development a concrete trapezoidal channel will convey flows from the Jr. High School to the west where the flows will outlet onto the adjacent property and sheet flow to 164th Street. Flows will concentrate along the east side of 164th Street and will be conveyed to the church property were flows will be conveyed north via 3-48" RCP's. There are also several planned developments to be constructed in the near future. Offsite flows will be diverted via the trapezoidal channel to the EMF.

Table 6 Summary of 100-year, 6-hour Peak Flows

HEC-1 ID	Description of Concentration Point Location	Peak Flow (cfs)
W9	SE Corner of Lemon Ave/Riggs Rd	533
W10	SE Corner of Recker Rd/Riggs Rd	547
HCW14A	Just East of 172nd St, south side of Riggs Road. Note: All flows are routed north to Seville development channel.	881
W14B	Flows from the east contributing to SE corner of Higley Rd/Riggs Rd	138
W13A	SE Corner of 172nd St/San Tan Blvd	212
CP13B	Flows from the south contributing to SE corner of Higley Rd/Riggs Rd	230
CPW14B	Combined flows contributing to SE corner of Higley Rd/Riggs Rd	320
SA06	SE Corner of Higley Rd/San Tan Blvd. Contributing flows from Jr. High School	248
W22	SE corner of 164th St/San Tan Blvd	274
CPW21	SE corner of 164th St/Riggs Road	570

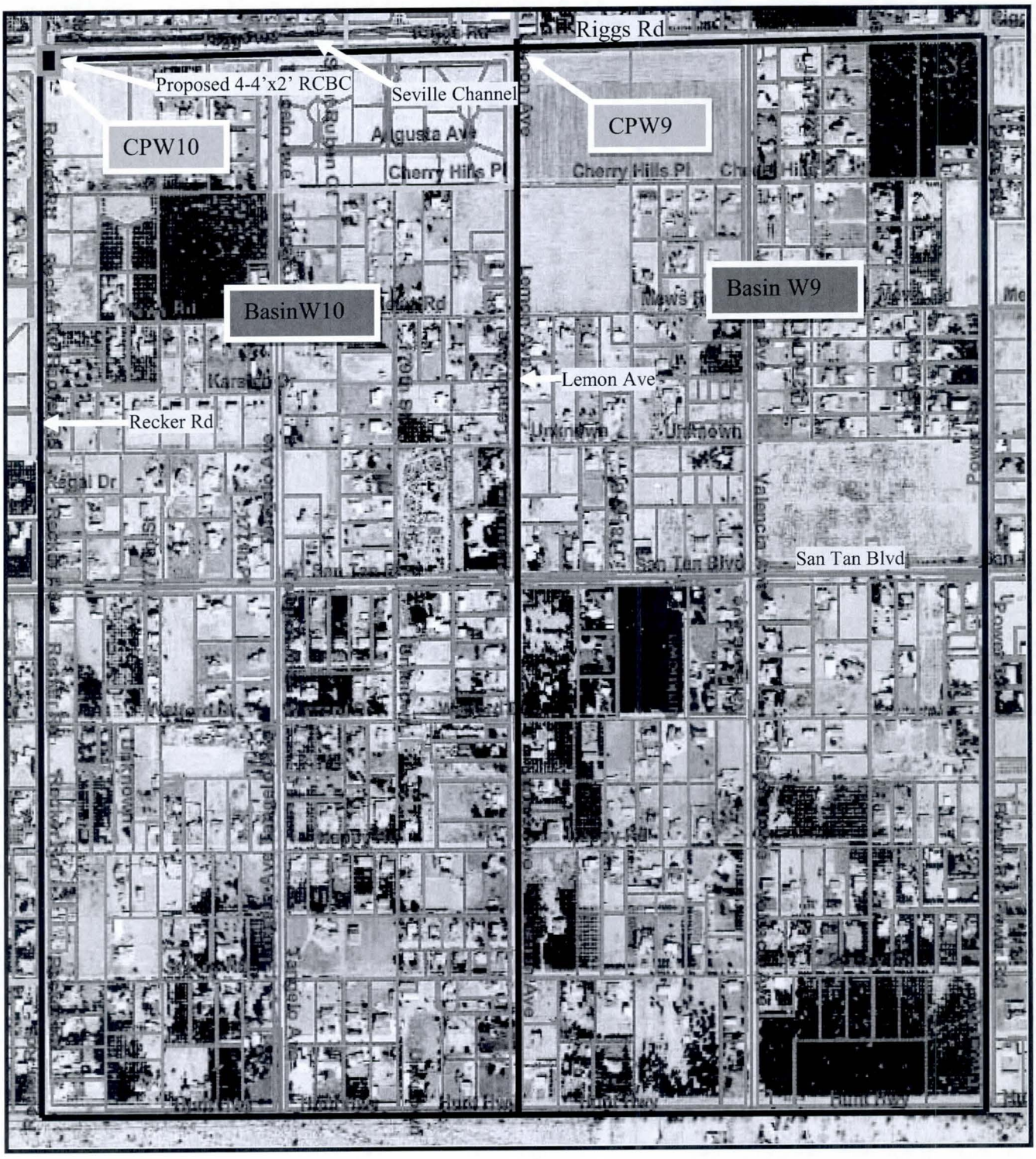


Figure 4 (sheet 1 of 3): Basin Map of Project Area

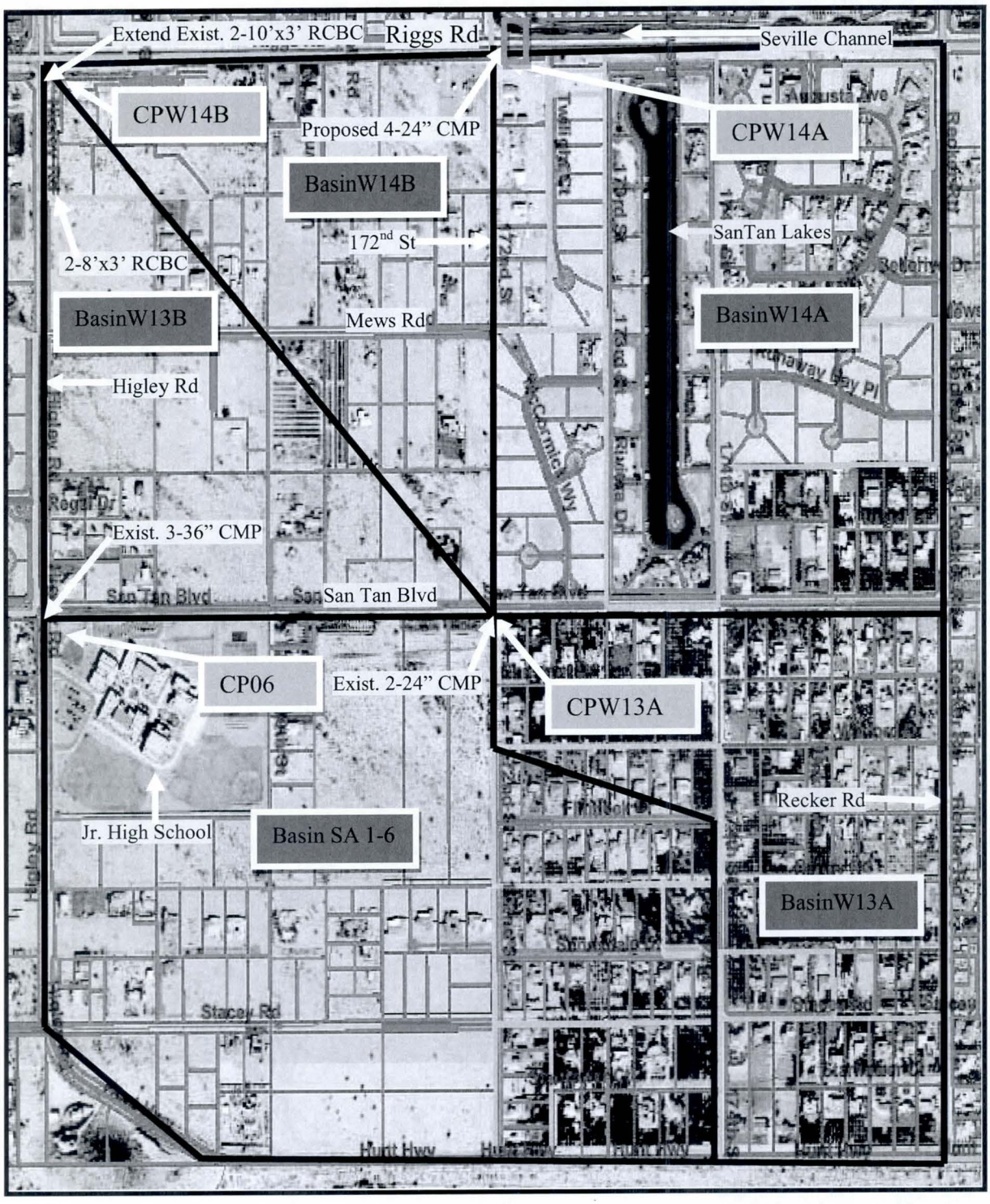


Figure 4 (sheet 2 of 3): Basin Map of Project Area

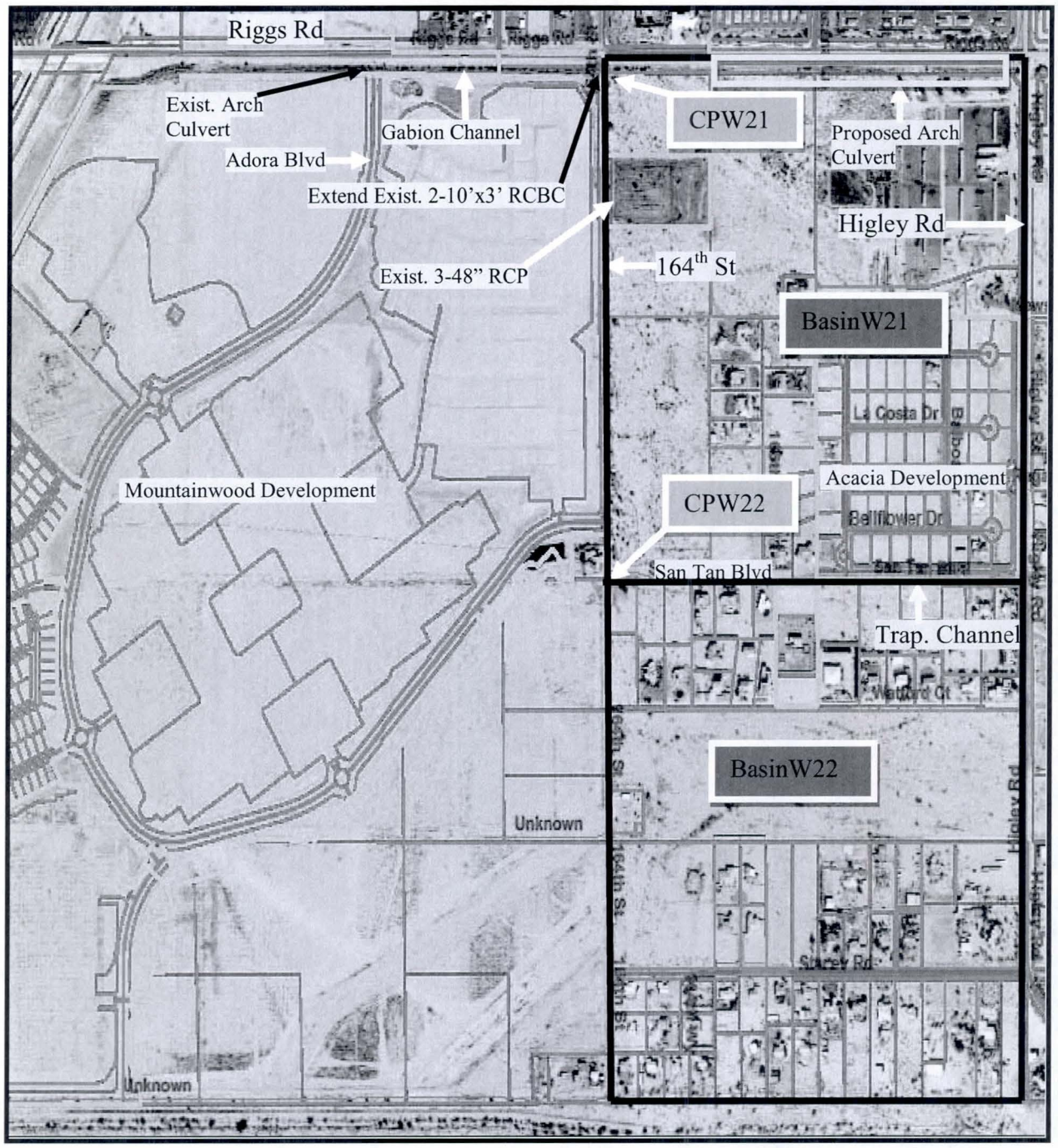


Figure 4 (sheet 3 of 3): Basin Map of Project Area

4 HYDRAULIC ANALYSIS

Hydraulic analyses were performed for onsite pavement inlets and storm drain systems

4.1 Inlet Design

The Riggs Road typical section will include MAG 220 Type A curb and gutter throughout the project limits. Scuppers, catch basins and storm drain pipe are used to capture and convey flows to the basins or the Riggs Road channel.

Roadway geometry, including profile grades and superelevation data were provided by Nfra, Inc. and were used for determining inlet placement and spread calculations.

The following design standards were used for inlet placement and design:

- Allowable Spread: According to the Town of Gilbert *Design Guidelines*, water may inundate up to one traveled lane in each direction during the 10–year 1-hour storm event. Therefore, a spread limit of 16.5 feet is allowed for the majority of the project limits. Riggs Road has a normal crown section throughout the project, so most of the pavement runoff is collected along the outside curb and gutter. The exception is along the SRP property (Begin Riggs Road Sta. 144+00 to Sta156+43.53) where Riggs Road will transition from normal crown to reverse crown back to normal crown. The pavement runoff is collected along the median curb and gutter.
- MAG 533 combination inlets are used for on-grade inlets and at sump locations.
- MAG 532 "Type C" curb opening inlets are used along the median.
- MAG concrete scuppers are used for on-grade inlets where the RWCD irrigation line is shallow or where existing drainage features are being matched.
- A clogging factor of 0.80 will be used for curb openings and 0.50 will be used for grate inlets.
- The minimum storm drain pipe size used is 15 inches per Town of Gilbert requirements.
- The desirable "self cleaning" velocity is 3 feet per second (fps), based on a pipe flowing full, in the design of storm drains. The minimum "self-cleaning" velocity based on a pipe flowing full is 2 fps.

The onsite inlets were analyzed using Haestad Methods' *FlowMaster* software. The inlet design calculations are provided in Appendix E.

4.2 Storm Drain Systems

Several storm drain lateral systems are needed to drain the Riggs Road pavement. Each system collects gutter flow and carries it to a retention basin or the Riggs Road Channel.

Each of these systems is designed to collect and convey the 10-year 1-hour storm event. The systems were sized assuming each inlet captures all of the flow arriving at the inlet. The storm drain hydraulic performance was calculated using Bentley *StormCad* software. The results of the analyses are included in Appendix F.

4.3 Riggs Road Channel

The existing Riggs Road Channel has a trapezoidal configuration, with a 20 foot bottom width and 3:1 side slopes. The bank protection is composed of gabion mattresses. The channel depth is 3.5 feet. Where the channel crosses roadways, concrete box culverts (CBCs) were utilized. Typical culvert sizes are two cell 10'x3' CBCs or equivalent flow area. The exception is a 28' x 6' arch culvert for South Mountainwood Blvd. Refer to Figure 4 for location. The channel collects off-site flows south of Riggs Road and directs the water west and ultimately discharges to the EMF. Per the HEC-1 model at the concentration point CPW21 (southeast corner of 164th Street and Riggs Road) the channel intercepts and routes 570 cfs to the EMF. From culvert analysis the culvert capacity is approximately 330 cfs with a headwater depth of 3.5 feet. Therefore flows will overtop 164th Street and continue west.

As future development occurs and due to TOG guidelines to capture the 50-year 24-hour storm event, this will reduce the amount of flow reaching the channel. Also there are several development projects that will coincide with the Riggs Road project.

There is one proposed channel modification in the 100% plans. That modification is replacing the channel with an enclosed conduit per discussions with the TOG and the developer Vestar. The enclosed system limits are from 1/8 mile east of 164th Street and would tie into the existing culvert at Higley Road. The closed conduit will be a 28'x6' arch culvert with an open bottom. The arch culvert would be approximately 1,882 feet long and have two maintenance access points. Approximately 320cfs will be conveyed via the culvert. Field visits reveal that the channel has a tendency for siltation, which adds complexity to maintaining a closed conduit system. Refer to Appendix H for the HEC-RAS model.

5 WATER QUALITY ISSUES

5.1 BMP Measures for Drainage into the EMF

The Town of Gilbert and the Flood Control District of Maricopa County are requiring that Best Management Practice (BMP) measures be implemented to reduce the concentration of pollutants discharged into the EMF during runoff events. When right-of-way is available, the Town of Gilbert's typical approach is to direct pavement runoff to roadside basins or underground storage that are designed to retain the "first flush" (defined by the FCDMC as the first 0.5 inches of runoff). This water quality concept was implemented for the majority of this project. However, due to limited right-of-way, the channel section from Higley Road to the EMF, the construction of first flush basins is not feasible.

Initially the TOG and FCDMC agreed that street sweeping would be an adequate BMP for this section of the project. Later, the FCDMC requested that in addition to street sweeping, "first flush" check structures will be implemented as the BMP for the Higley to EMF section of the project. "First flush" check structures will be installed along each storm drain system just downstream of the discharge point within the gabion lined channel. The check structures will operate as "first flush' basins within the channel for small storm events. This will require a long-term maintenance plan to maintain the check structures. The required frequency will be dependent upon the number and size of storm events and sediment buildup upstream of the check structures. Refer to Appendix I for TOG memo regarding the BMP's.

6 SUMMARY

6.1 Summary

West of the EMF onsite flows are captured via catch basins and are stored in retention basins or underground storage pipe. East of the EMF to 172nd Street onsite flows are captured and drained to the existing Riggs Road Channel, which discharges into the EMF. East of 172nd Street offsite flows are captured and drained to the Seville channel located on the north side of Riggs Road. In areas where offsite flows impact the roadway, temporary basins will be installed until the land is developed.

Channel modifications to the Riggs Road Channel are presented in the 100% plans (Appendix A) and discussed in Section 4.3.

7 REFERENCES

Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology,* January 1, 1995.

Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics,* January 28, 1996.

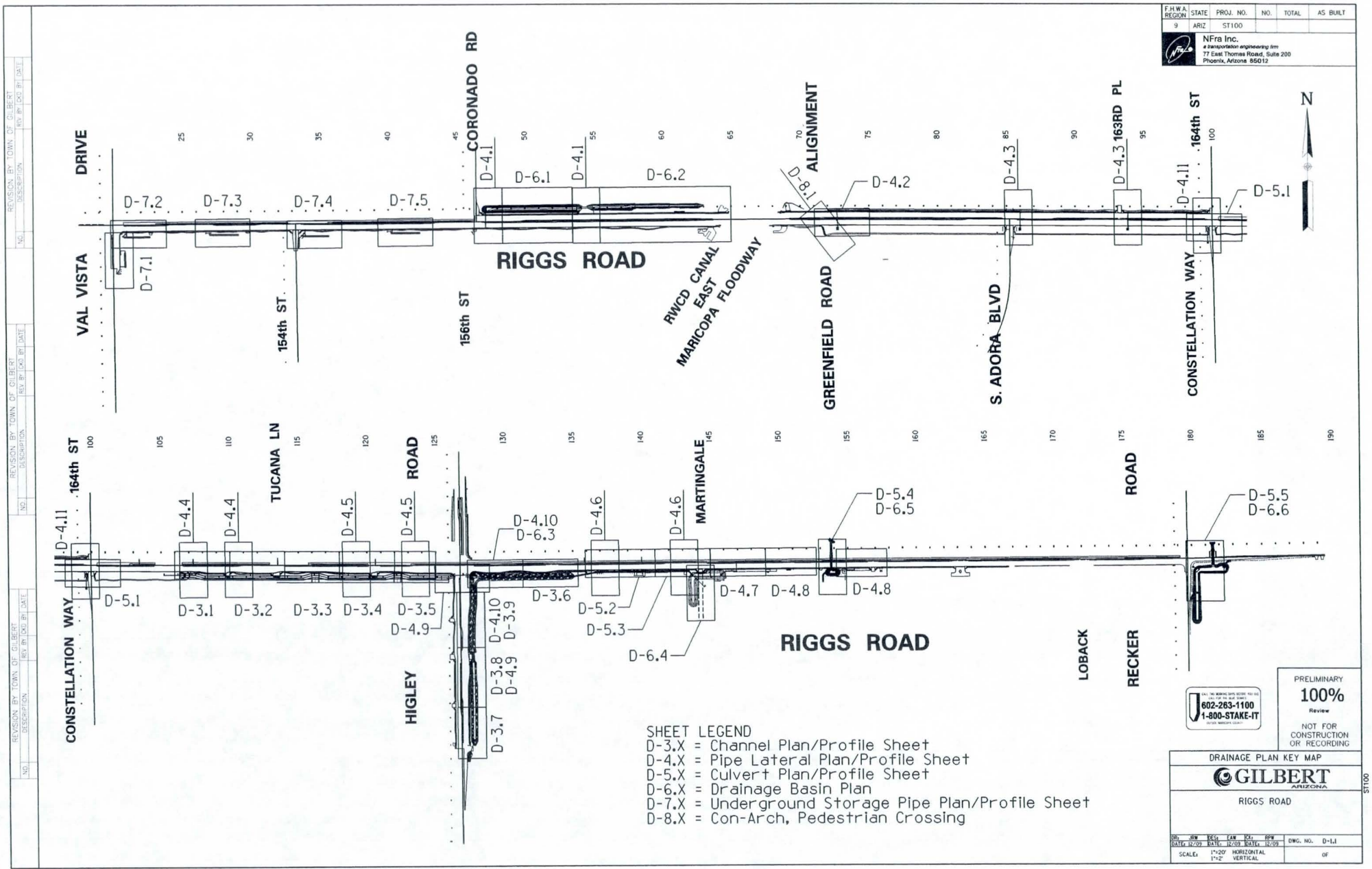
Town of Gilbert. *Public Works and Engineering Standards & Details*. March 2005.

Urban Drainage Design Manual (HEC-22), U.S. Department of Transportation, Federal Highway Administration, November 1996.

Hydraulic Design of Highway Culverts (HDS 5), U.S. Department of Transportation, Federal Highways Administration, September 1985.

APPENDIX A

100% Drainage Plans



SHEET LEGEND
D-3.X = Channel Plan/Profile Sheet
D-4.X = Pipe Lateral Plan/Profile Sheet
D-5.X = Culvert Plan/Profile Sheet
D-6.X = Drainage Basin Plan
D-7.X = Underground Storage Pipe Plan/Profile Sheet
D-8.X = Con-Arch, Pedestrian Crossing

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

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DRAINAGE PLAN KEY MAP

GILBERT ARIZONA

RIGGS ROAD

ST100

DR: JKW	DES:	LAN	CK:	RPW
DATE: 12/09	DATE: 12/09	DATE: 12/09	DATE: 12/09	

DWG. NO. D-1.1

SCALE: 1"=20' HORIZONTAL, 1"=2' VERTICAL

OF

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F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

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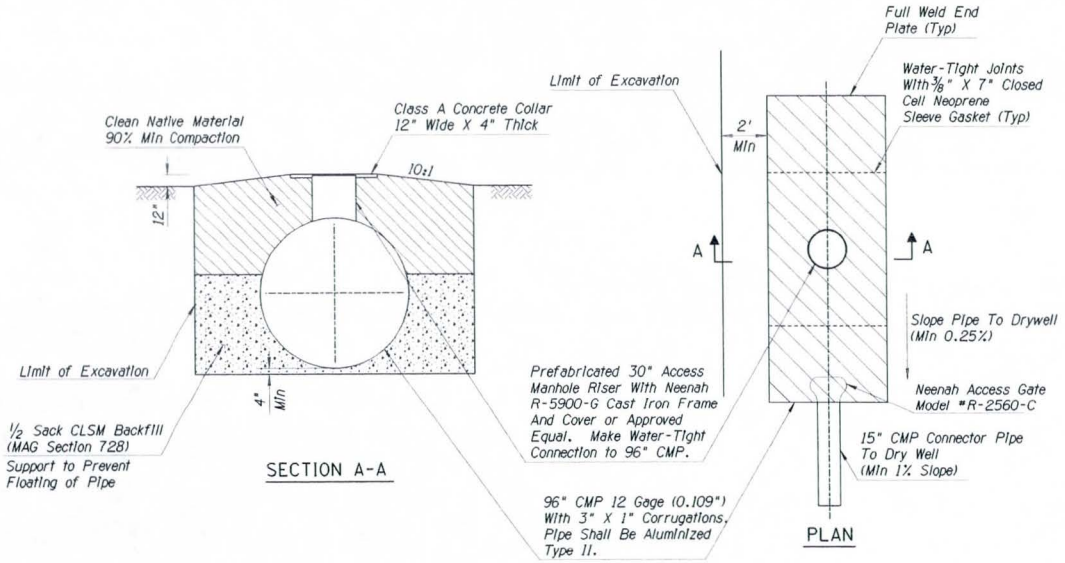
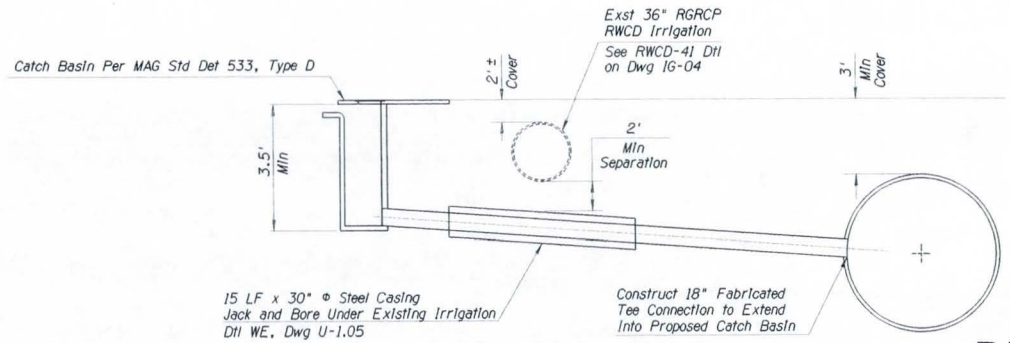


NOTE:
Detail shown with CMP. CIPCP is an acceptable alternative. If CIPCP is used, laterals from Catch Basin to 96" Storage Pipe shall be RCP.



TYPICAL CONNECTION TO ATTACHED CATCH BASIN

DETAIL D1

Sheet 1 of 2

Underground Storage

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UNDERGROUND STORAGE TANK

GILBERT ARIZONA

RIGGS ROAD

DRN	LDT	DES	AB	CK	RPB	DWG. NO. D-2.1
DATE 12/09		DATE 12/09		DATE 12/09		
SCALE:	1"=20' HORIZONTAL 1"=2' VERTICAL					OF

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REVISION BY TOWN OF GILBERT
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F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
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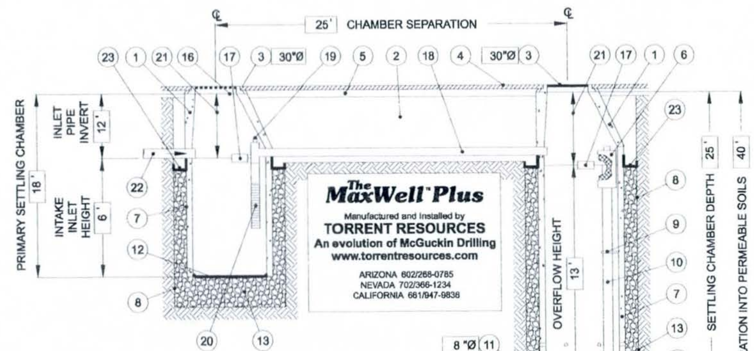
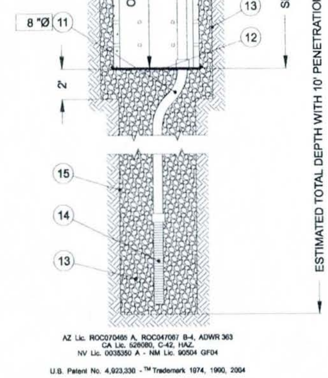
The MaxWell™ Plus Drainage System Detail And Specifications





ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **STABILIZED BACKFILL** - COMPACTED NATIVE IN LANDSCAPED AREAS, 1 SACK SLURRY IN PAVEMENT.
3. **BOLTED RING & GRATE/COVER** - DIAMETER AS SHOWN. CLEAN CAST IRON WITH WORDING "STORM WATER ONLY" IN RAISED LETTERS. BOLTED IN 2 LOCATIONS AND SECURED TO CONE WITH MORTAR. RIM ELEVATION ±0.02' OF PLANS.
4. **GRADED BASIN OR PAVING** (BY OTHERS).
5. **COMPACTED BASE MATERIAL** (BY OTHERS).
6. **PUREFLO™ DEBRIS SHIELD** - ROLLED 16 GA. STEEL X 24" LENGTH WITH VENTED ANTI-SIPHON AND INTERNAL .265" MAX. SWO FLATTENED EXPANDED STEEL SCREEN X 12" LENGTH. **FUSION BONDED EPOXY COATED.**
7. **PRE-CAST LINER** - 4000 PSI CONCRETE 48" ID. X 54" OD. **CENTER IN HOLE** AND ALIGN SECTIONS TO **MAXIMIZE BEARING SURFACE.**
8. **MIN. 6' Ø DRILLED SHAFT.**
9. **SUPPORT BRACKET** - FORMED 12 GA. STEEL. **FUSION BONDED EPOXY COATED.**
10. **OVERFLOW PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
11. **DRAINAGE PIPE** - ADS HIGHWAY GRADE WITH TRI-A COUPLER. **SUSPEND PIPE** DURING BACKFILL OPERATIONS TO PREVENT BUCKLING OR BREAKAGE. DIAMETER AS NOTED.
12. **BASE SEAL** - GEOTEXTILE, POLY LINER OR CONCRETE SLURRY.
13. **ROCK** - CLEAN AND WASHED, SIZED BETWEEN 3/8" AND 1-1/2" TO **BEST COMPLEMENT SOIL CONDITIONS.**
14. **FLOFAST™ DRAINAGE SCREEN** - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. DIAMETER VARIES 96" OVERALL LENGTH WITH TRI-B COUPLER.
15. **MIN. 4' Ø SHAFT** - DRILLED TO **MAINTAIN PERMEABILITY** OF DRAINAGE SOILS.
16. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER** AT PROJECT COMPLETION.
17. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY.
18. **CONNECTOR PIPE** - 4" Ø SCH. 40 PVC .
19. **VENTED ANTI-SIPHON** INTAKE WITH FLOW REGULATOR.
20. **INTAKE SCREEN** - SCH. 40 PVC 0.120" MODIFIED SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. 48" OVERALL LENGTH WITH TRI-C END CAP.
21. **FREEBOARD DEPTH VARIES** WITH INLET PIPE ELEVATION. INCREASE PRIMARY/SECONDARY SETTLING CHAMBER DEPTHS AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE CONNECTOR PIPE OVERFLOW.
22. **OPTIONAL INLET PIPE** (BY OTHERS).
23. **MOISTURE MEMBRANE** - 6 MIL. PLASTIC. PLACE SECURELY AGAINST ECCENTRIC CONE AND HOLE SIDEWALL. USED IN LIEU OF SLURRY IN LANDSCAPED AREAS.

NOTE:
Total depth of drywell is an estimate based on past history in this area.

DETAIL D1

Sheet 2 of 2

Underground Storage

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THE MAXWELL PLUS
GILBERT
ARIZONA
RIGGS ROAD
ST100

DR: LMR	DES: LAK	CK: RPW	DWG. NO. D-2.2
DATE: 12/09	DATE: 12/09	DATE: 12/09	
SCALE: 1"=20' HORIZONTAL 1"=2' VERTICAL			OF

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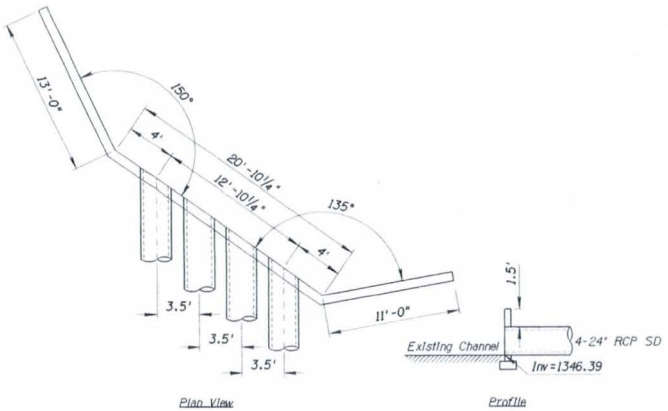
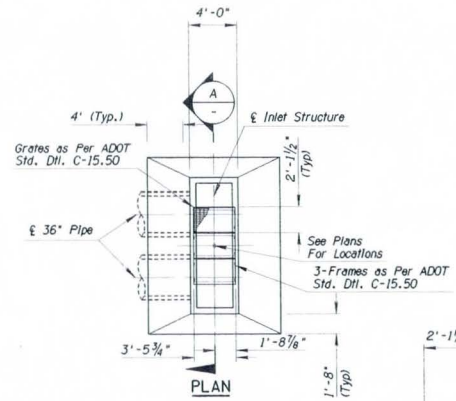
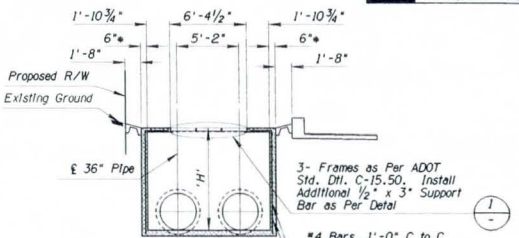
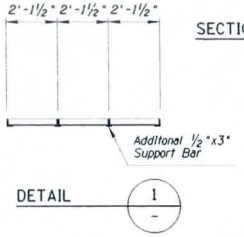


DETAIL D3

OUTLET DETAIL
MODIFIED MAG DET 501-1 & 501-2



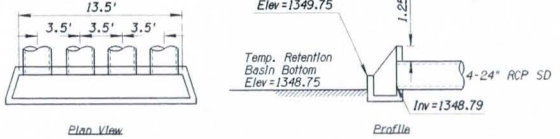




Notes:
1. "H" Indicated on sheets D-5.2 & D-5.3.
2. See plan sheets for grading.
3. Refer to ADOT Std. Dtl. C-15.80 for additional information.
4. All Concrete To Be Class 'A' Per MAG Section 725 & 505.
5. Reinforcing Steel Shall Comply With MAG Section 727.
6. All exposed steel shall be galvanized or painted with one coat #1 paint and two field coats of #10 paint.

DETAIL D4

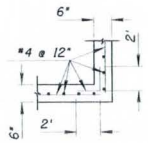
INLET STRUCTURE DETAIL

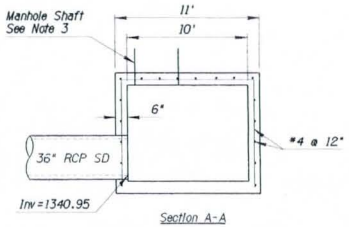


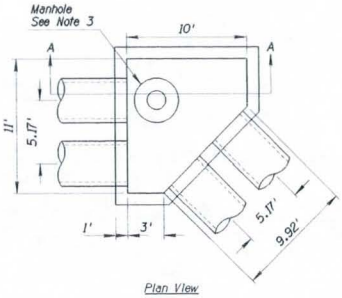
Pipe ID	Dimensions					
	A	B	E	F	J	K
24"	3'-6"	1'-7½"	1'-1½"	1'-11⅜"	11"	2'-3"

DETAIL D2

DROP INLET HEADWALL DETAIL
MODIFIED MAG DET 501-5







Notes
1. All Concrete To Be Class 'A' Per MAG Section 725 & 505.
2. Reinforcing Steel Shall Comply With MAG Section 727.
3. Manhole Shaft Shall Be Per MAG Std Dtls 520 & 522.

DETAIL D5

FIVE SIDED MANHOLE DETAIL

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9	ARIZ	ST100			

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DRAINAGE DETAILS
GILBERT ARIZONA
RIGGS ROAD

DR: JRW	DES: RAB	CK: RPW
DATE: 12/09	DATE: 12/09	DATE: 12/09

DWG. NO. D-2.3
SCALE: 1"=20' HORIZONTAL, 1"=2' VERTICAL
OF
ST100

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NO.	DESCRIPTION	REV. BY	CKD. BY	DATE

REVISION BY TOWN OF GILBERT				
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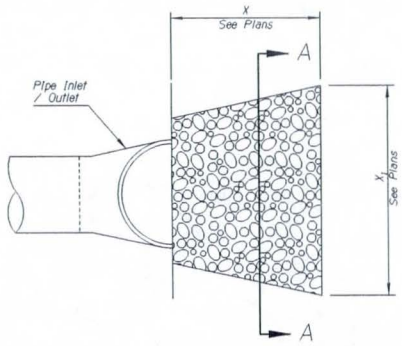

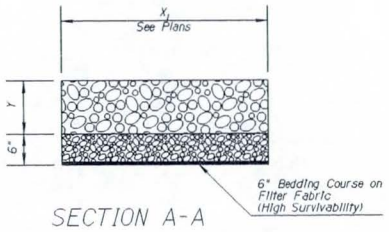

SECTION A-A

Note:
1) The 6" Bedding Course and Filter Fabric are incidental to the unit cost of Riprap.

Dumped Riprap Gradation Table			
% Passing	D_{50} = 6"	D_{50} = 12"	D_{50} = 18"
100-90	12"	24"	30"
85-70	9"	18"	24"
50-30	6"	12"	18"
15-5	4"	8"	12"
5-0	2"	4"	6"
Y	12"	24"	36"

DETAIL D6

DUMPED RIPRAP

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

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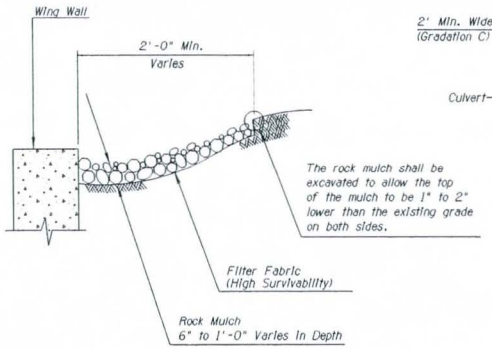
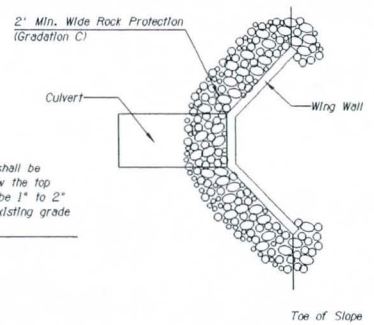
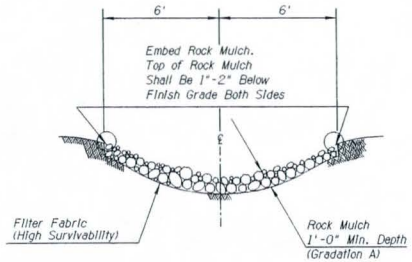
Phoenix, Arizona 85012



ROCK MULCH FOR HEADWALL TRANSITION



HEADWALL (NTS)



ROCK MULCH DITCH LINING

Gradation A	
Sieve Size	% Passing
6"	90-100
4.24"	70-85
3"	30-50
2"	5-15
1"	0-5
Gradation C	
Sieve Size	% Passing
3"	100
2"	50-75
1"	10-20

Note:
1) Within traffic recovery area/clear zone, any rock size 4 inches or greater shall be imbedded into the finished grade so that any portion of the rock above the grade will be less than 4 inches in height.

2) Filter fabric may be either woven or non-woven, see special provisions.

DETAIL D7

ROCK MULCH

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RIPRAP/ROCK MULCH DETAILS D6 & D7

GILBERT
ARIZONA

RIGGS ROAD

ST100

DR: JRW	DES:	RAB	CK:	RPM	DWG. NO. D-2.4
DATE: 12/09	DATE:	12/09	DATE:	12/09	
SCALE:	1"=20' HORIZONTAL 1"=2' VERTICAL				OF

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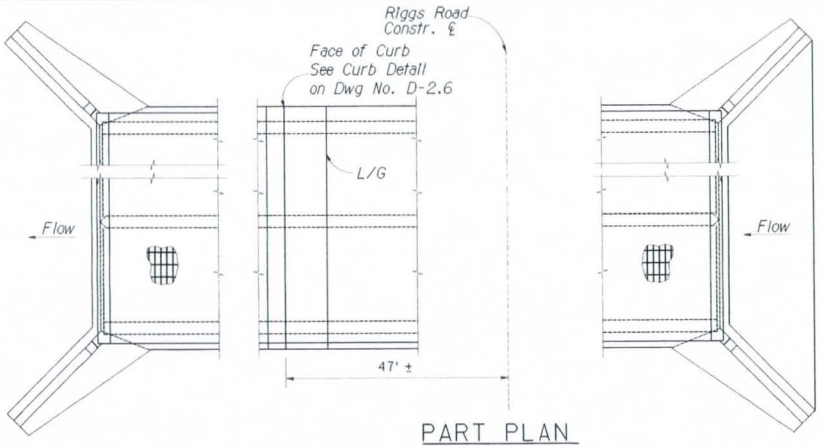
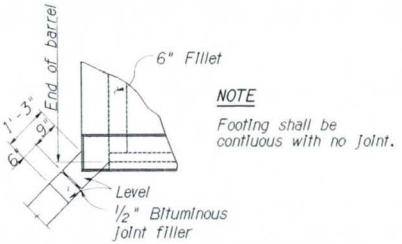
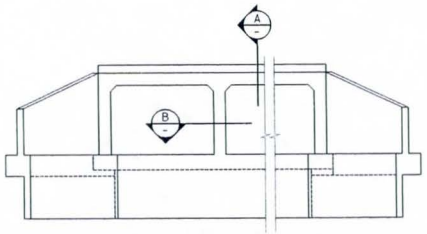


PART PLAN
Showing Inlet & Outlet Details

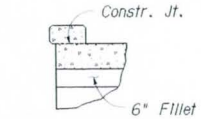


WINGWALL JOINT DETAIL

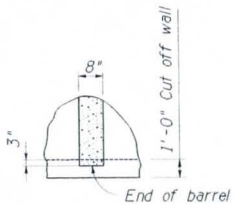
NOTE
Footing shall be continuous with no joint.



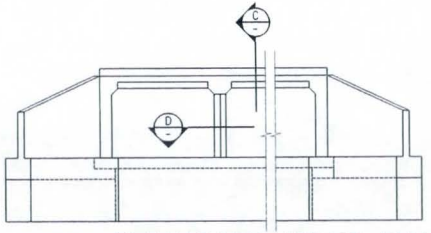
ELEVATION-OUTLET END



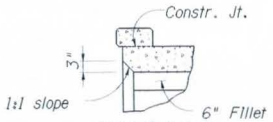
A SECTION



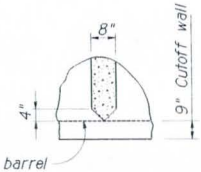
B SECTION



ELEVATION- INLET END



C SECTION



D SECTION

JOINT NOTE:

All structures shall have formed Constr. Joints in top slab and walls (optional in floor slab) spaced not more than 38'-6" apart or as shown. Reinforcing steel shall project 1'-6" thru the joint. The joint shall be made with ¼" plywood bulkhead which shall be left in place. Joints shall be perpendicular to the centerline of the box.

QUANTITIES				
	Concrete C.Y.	Reinf lbs	Structural Excavation C.Y.	Structural Backfill C.Y.
Box Culvert	206.30	31,287		
Inlet	16.10	1,373		
Outlet	9.80	891		
Curb	0.30	40		
Total	231.10	33,591	486	295

GENERAL NOTES:

Construction Specification - Arizona Department of Transportation Standard Specifications for Road and Bridge Construction, latest Edition.

Design Specifications - AASHTO Standard Specifications for Highway Bridges, 17th Edition

Loading Class - HS25-44 and/or Interstate Alternate Loading.

All concrete shall be Class "S" unless noted otherwise.

Reinforcing steel shall conform to ASTM Specification A615. Bar sizes #6 and smaller shall be designed as Grade 40 but may be furnished as Grade 40 or Grade 60. Bar sizes #7 and larger shall be designed and furnished as Grade 60.

All bend dimensions for reinforcing steel shall be out-to-out of bars. All placement dimensions for reinforcing steel shall be to center of bars unless noted otherwise.

All reinforcing steel shall have 2 inch clear cover unless noted otherwise.

Stresses:
Concrete ..... f'c = 3000 psi
Grade 40 reinforcing steel ..... fs = 20000 psi
Grade 60 reinforcing steel ..... fs = 24000 psi

Chamfer all exposed corners ¾" as per Standard B-19.10 unless noted otherwise.

Dimensions shall not be scaled from drawings.

QUANTITY NOTE:

Total Box Culvert Quantities include Barrel Quantities and Inlet/Outlet Quantities.
Inlet quantities include wings, curb, cut-off wall, and apron.
Barrel Quantities are obtained by multiplying length of box by quantities per linear foot of box.
Outlet Quantities include wing, curb, and cut-off wall.

DETAIL D8

Sheet 1 of 4

Concrete Box Culvert

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

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BOX CULVERT MISC. DETAILS
GILBERT ARIZONA
RIGGS ROAD
ST100

DR: HM	DES: ML	CK: SG	DWG. NO. D-2.5
DATE: 12/09	DATE: 12/09	DATE: 12/09	
SCALE:	1"=20' HORIZONTAL 1"=2' VERTICAL		OF

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD BY | DATE

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD BY | DATE

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD BY | DATE

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

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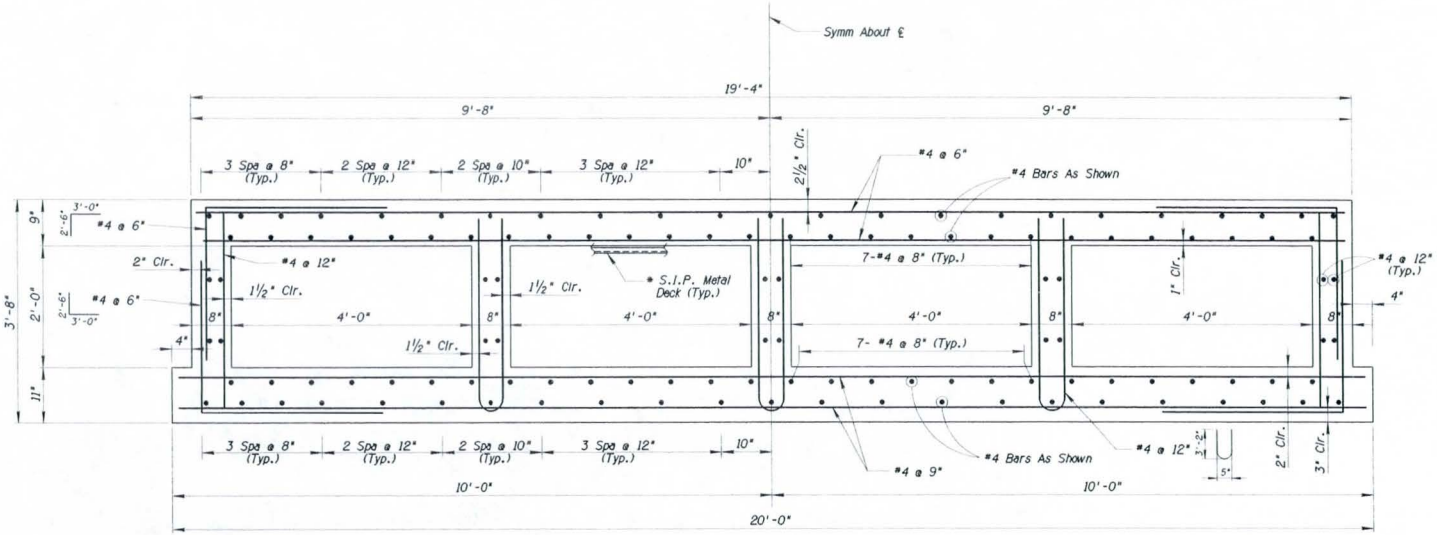
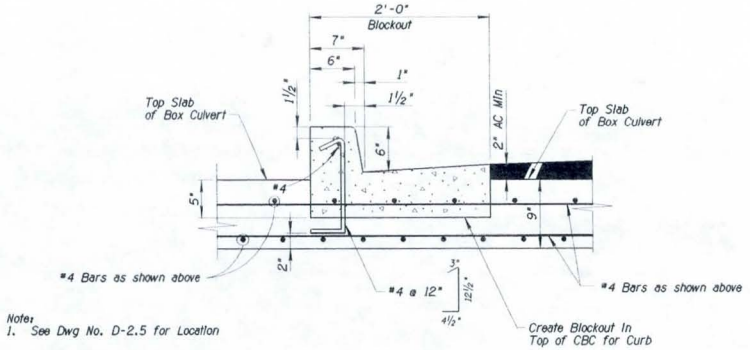


NOTE:

Lap Splice Length for #4 bar is 1'-8".

* S.I.P. metal deck forms maybe used to shore top slab concrete. Contractor shall sumbit metal deck to wall connection details to Engineer for approval.

TYPICAL BOX CULVERT SECTION
Scale = 1"= 1'-0"



Note:
1. See Dwg No. D-2.5 for Location

CURB DETAIL
Scale = 1½" = 1'-0"

DETAIL D8

Sheet 2 of 4

Concrete Box Culvert

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BOX CULVERT PLAN & END SECTION

GILBERT ARIZONA

RIGGS ROAD

DR: HM	DES: ML	CK: SG
DATE: 12/09	DATE: 12/09	DATE: 12/09

SCALE: 1"=20' HORIZONTAL, 1"=2' VERTICAL

DWG. NO. D-2.6

OF

ST100

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NO. | DESCRIPTION | REV. BY | CKD. BY | DATE

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD. BY | DATE

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F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
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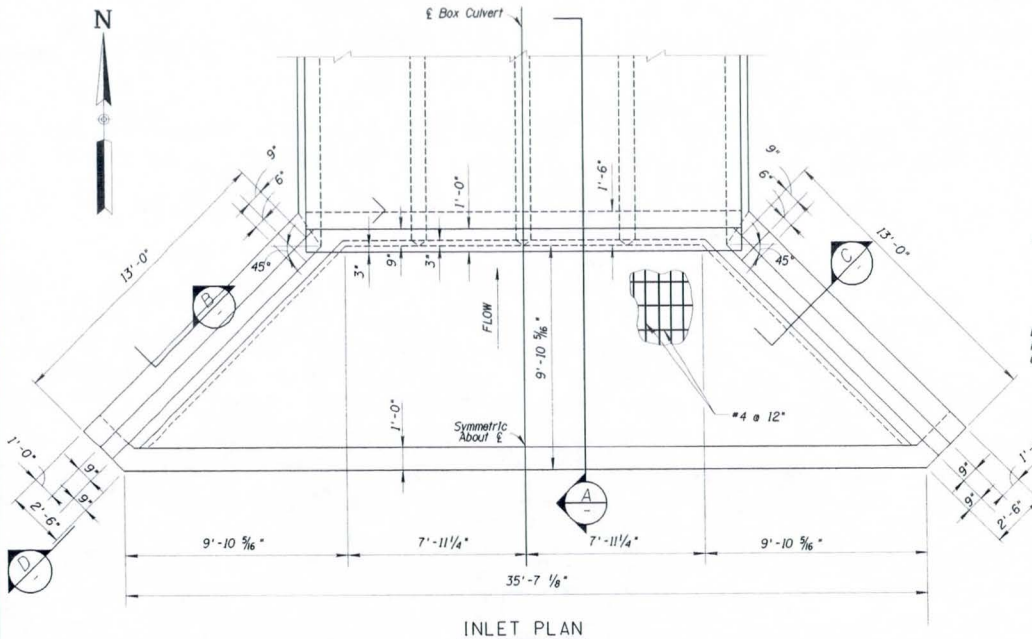
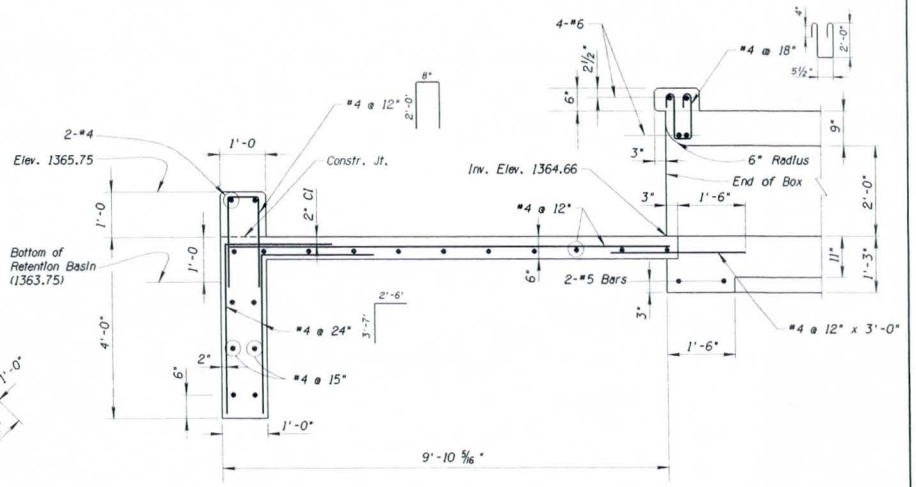
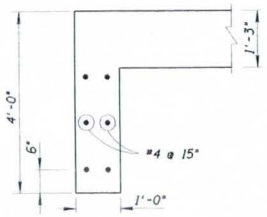


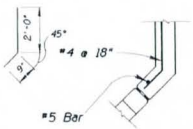
INLET PLAN
Scale=3/8"=1'-0"



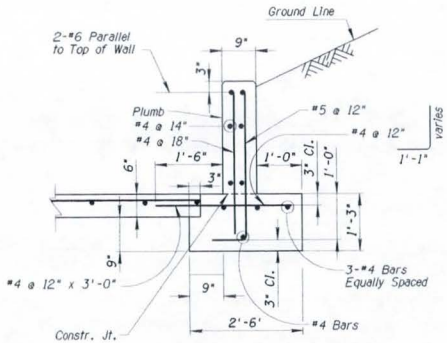
A SECTION
Scale=3/4"=1'-0"



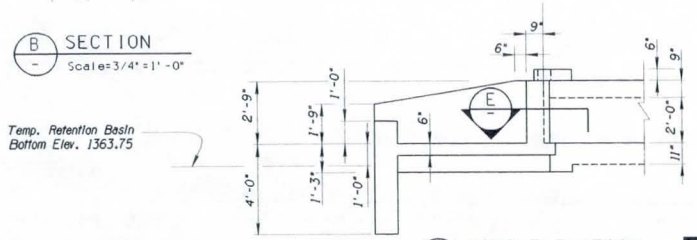
B SECTION
Scale=3/4"=1'-0"



E SECTION
Not To Scale



C SECTION
Scale=3/4"=1'-0"



D WING ELEVATION
Scale=3/8"=1'-0"

NOTE :
For General Notes and Miscellaneous Details see Sheet D-2.5

DETAIL D8

Sheet 3 of 4

Concrete Box Culvert

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BOX CULVERT INLET DETAILS

GILBERT ARIZONA

RIGGS ROAD

ST100

DR: HM DATE: 12/09	DES: MR DATE: 12/09	CK: SG DATE: 12/09	DWG. NO. D-2.7
SCALE:	1"=20' HORIZONTAL 1"=2' VERTICAL		OF

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD. BY | DATE

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F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

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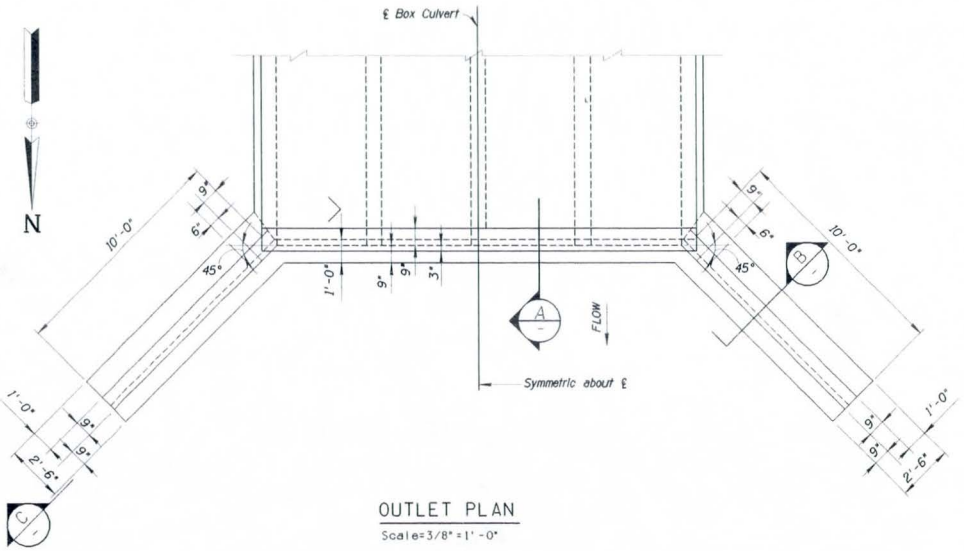
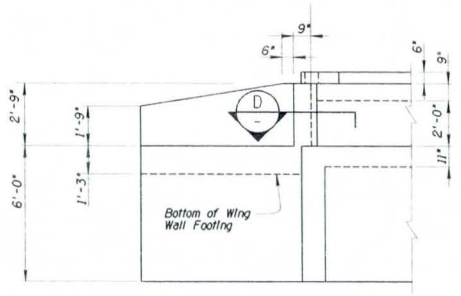
Phoenix, Arizona 85012

REVISION BY TOWN OF GILBERT

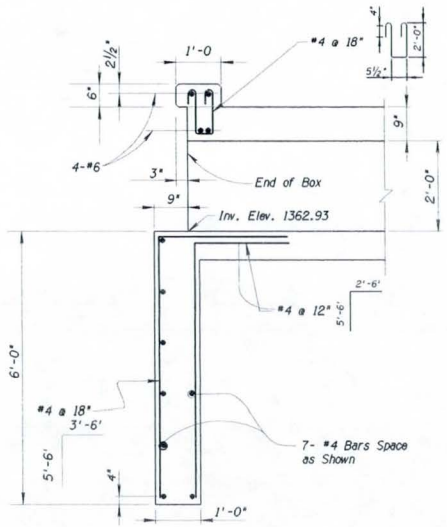
NO.	DESCRIPTION	REV. BY	CKD. BY	DATE



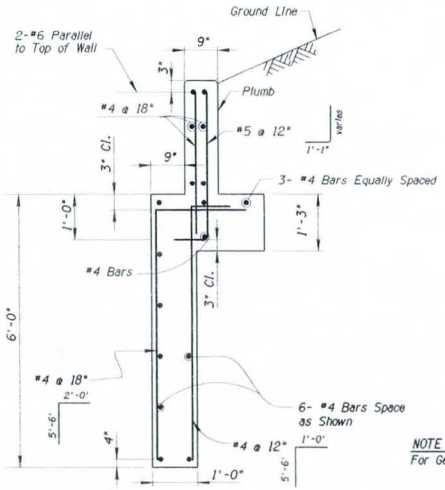
OUTLET PLAN
Scale=3/8"=1'-0"



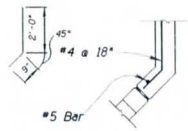
C WING ELEVATION
Scale=3/8"=1'-0"



A SECTION
Scale=3/4"=1'-0"



B SECTION
Scale=3/4"=1'-0"



D SECTION
Not to Scale

NOTE :
For General Notes and Miscellaneous Details See Sheet D-2.5.

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DETAIL D8

Sheet 4 of 4

Concrete Box Culvert

BOX CULVERT OUTLET DETAILS

GILBERT ARIZONA

RIGGS ROAD

ST100

DR: HM	DES: ML	CK: SG
DATE: 12/09	DATE: 12/09	DATE: 12/09

DWG. NO. D-2.8

SCALE: 1"=20' HORIZONTAL
1"=2' VERTICAL

OF

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

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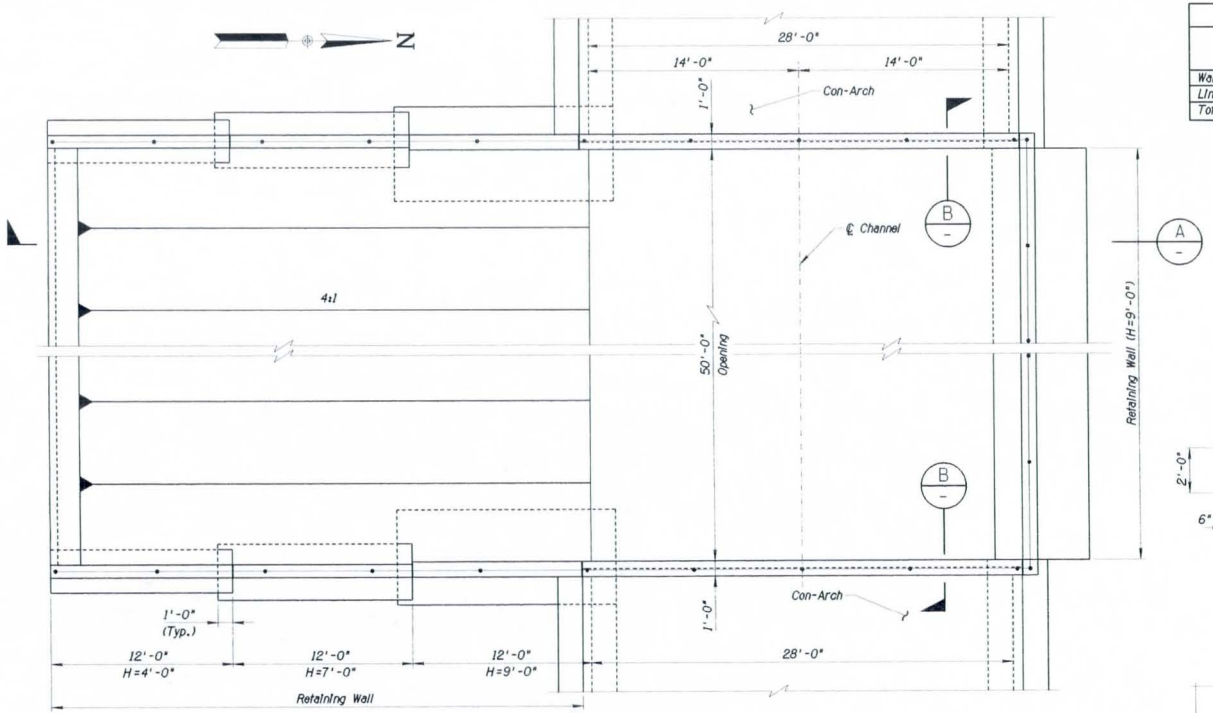
Phoenix, Arizona 85012

QUANTITIES

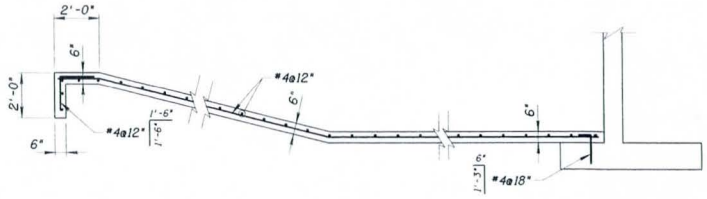
	Concrete C.Y	Reinforcing lbs	Structural Excavation C.Y.	Structural Backfill C.Y.	Safety Rail Lin Ft
Walls	69	4,810	234	411	180
Lining	68	5,255	-	-	-
Total	137	10,066	234	411	180

NOTES:

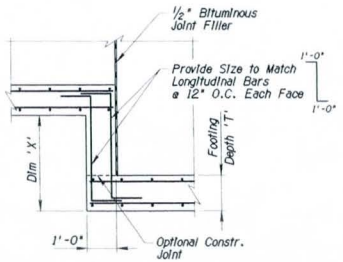
1. See ADOT Std. B-18.10 and B-18.20 (Case II) for General Notes and Details.
2. Wall cross-section, dimensions and reinforcing shall be per "H" shown in this sheet.
3. See ADOT Std. B-19.30 and B-19.40 for payment limits for structural excavation and structure backfill.
4. Safety rail shall be per MAG Detail No. 145. Anchor plate detail shall be Type 1.
5. CON-ARCH shall be designed based on AASHTO LRFD Bridge Design Specifications, 4th Edition, 2007.

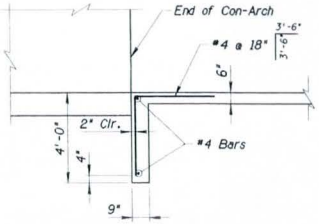


PLAN — Scale: 1/4"=1'-0" (1)



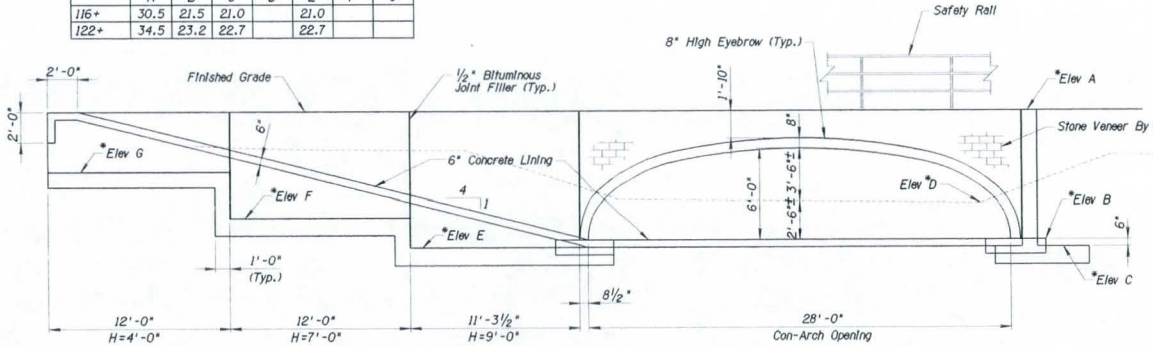
SECTION A — Scale: 3/8"=1'-0"





SECTION B — Scale: 3/8"=1'-0"

Locations	Elevations (13xx.xx)						
	A	B	C	D	E	F	G
116+	30.5	21.5	21.0		21.0		
122+	34.5	23.2	22.7		22.7		



ELEVATION — Scale: 1/4"=1'-0" (2)

Note: See Elevation, this sheet for location of footing steps and Dim 'X'.

FOOTING STEP SECTION — Scale: 1/2"=1'-0" (3)

DETAIL D9

CON-ARCH MAINTENANCE OPENING

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CON-ARCH DETAILS

GILBERT ARIZONA

RIGGS ROAD

ST100

DR: JRW	DES:	CK: RPW	DWG. NO. D-2.9
DATE: 12/09	DATE: 12/09	DATE: 12/09	
SCALE:			OF

REVISION BY TOWN OF GILBERT — NO. | DESCRIPTION | REV. BY | CKD. BY | DATE

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F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

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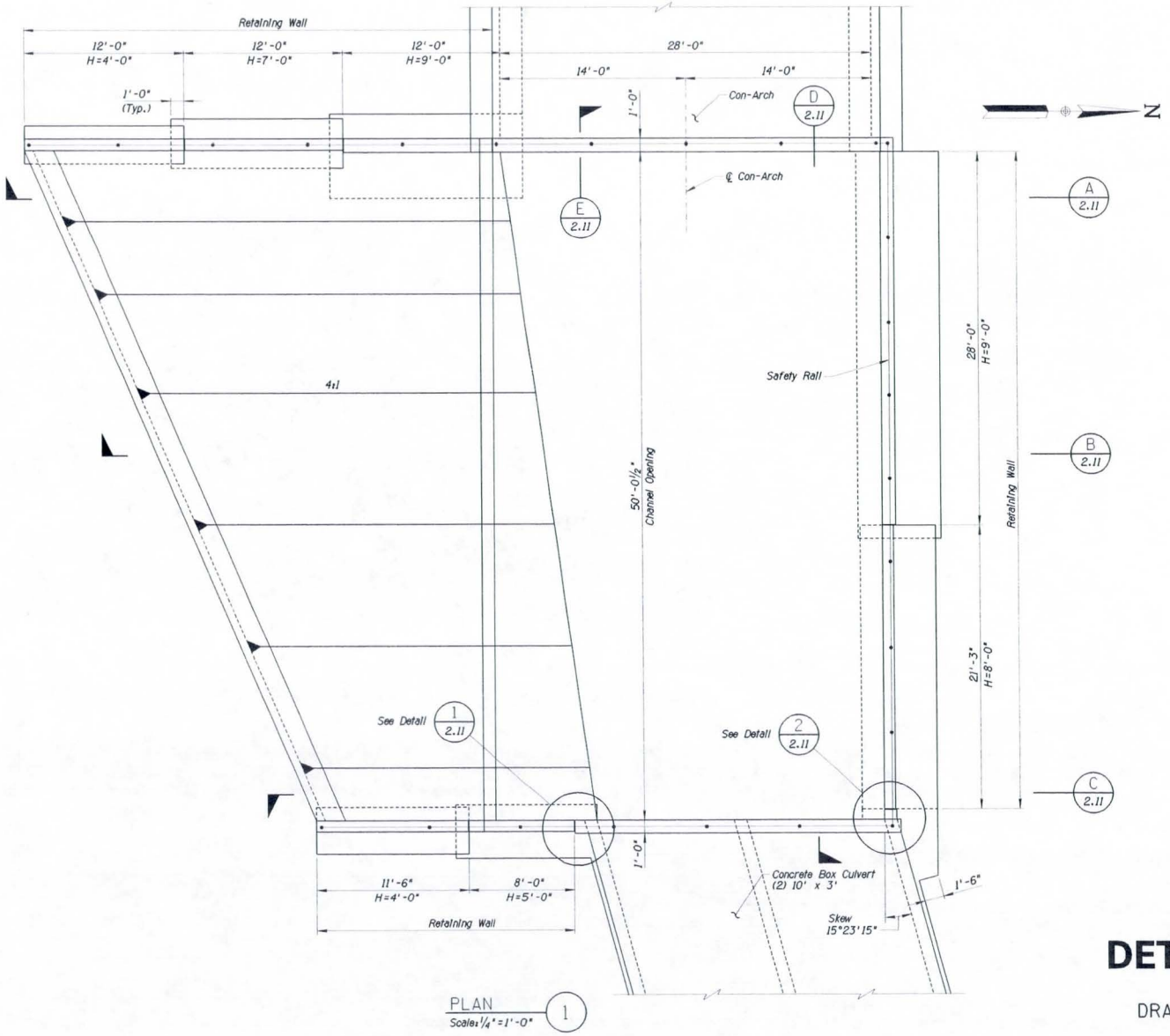

PLAN
Scale: 1/4"=1'-0" 1

QUANTITIES

	Concrete C.Y	Reinforcing lbs	Structural Excavation C.Y.	Structural Backfill C.Y.	Safety Rail Lin Ft
Walls	56	4,372	199	334	169
Lining	58	5,085	-	-	-
Total	114	9,457	199	334	169

NOTES:

1. See ADOT Std. B-18.10 and B-18.20 (Case II) for General Notes and Details.
2. Wall cross-section, dimensions and reinforcing shall be per "H" shown on sheet D-2.11.
3. See ADOT Std. B-19.30 and B-19.40 for payment limits for structural excavation and structure backfill.
4. Safety rail shall be per MAG Detail No. 145. Anchor plate detail shall be Type 1.
5. CON-ARCH shall be designed based on AASHTO LRFD Bridge Design Specifications, 4th Edition, 2007.

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DETAIL D10

Sheet 1 of 2

DRAINAGE DETAILS

DRAINAGE DETAILS
GILBERT ARIZONA
RIGGS ROAD
ST100

DR: JRW	DES:	CK: RPW
DATE: 12/09	DATE: 12/09	DATE: 12/09

DWG. NO. D-2.10
SCALE:
OF

REVISION BY TOWN OF GILBERT
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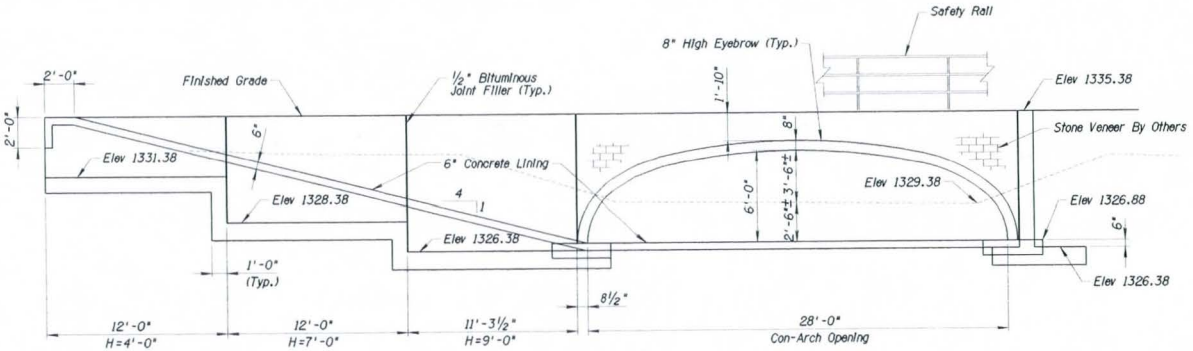
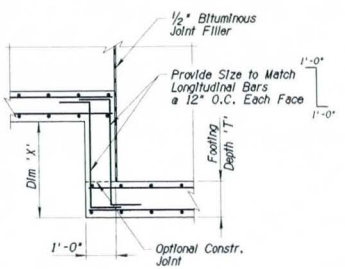
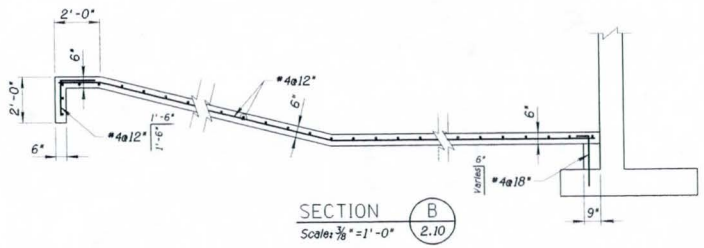


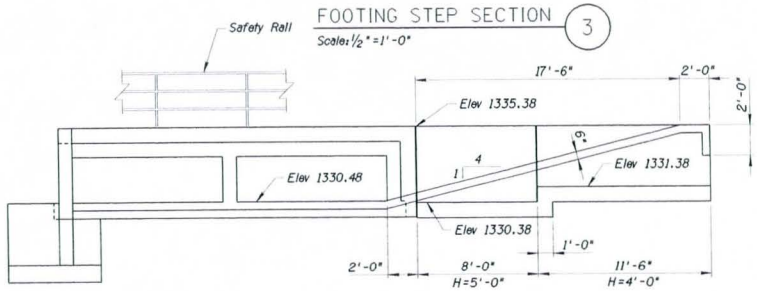
SECTION A 2.10
Scale: 1/4" = 1'-0"



Note:
See Elevation, this sheet for location of footing steps and Dim 'X'.

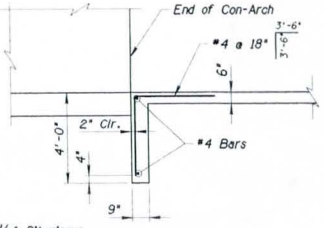


SECTION B 2.10
Scale: 3/8" = 1'-0"

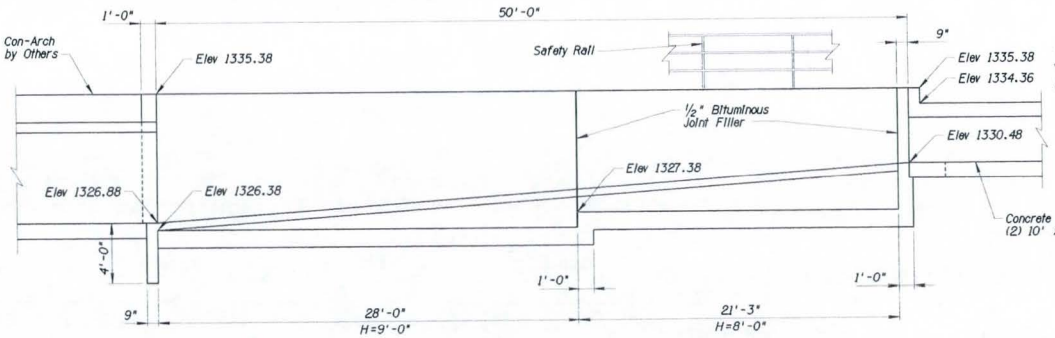


FOOTING STEP SECTION 3
Scale: ½" = 1'-0"

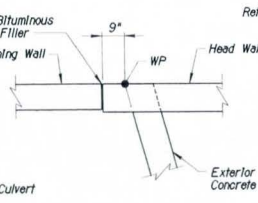
SECTION C 2.10
Scale: 1/4" = 1'-0"



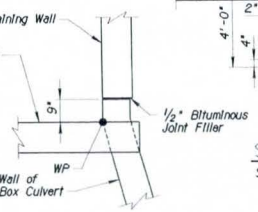
SECTION E 2.10
Scale: 3/8" = 1'-0"



SECTION D 2.10
Scale: 1/4" = 1'-0"



DETAIL 1
Scale: ½" = 1'-0"



DETAIL 2
Scale: ½" = 1'-0"

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DETAIL D10

Sheet 2 of 2

DRAINAGE DETAILS

F.H.W.A. REGION	STATE	PROJ. NO.	INC.	TOTAL	AS BUILT
9	ARIZ	ST100			

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Phoenix, Arizona 85012

DRAINAGE DETAILS
GILBERT ARIZONA
RIGGS ROAD
ST100

DES.	DRN.	CK'r.	APP'r.	DWG. NO. D-2.11
DATE: 12/09	DATE: 12/09	DATE: 12/09	DATE: 12/09	
SCALE:				OF

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD. BY | DATE

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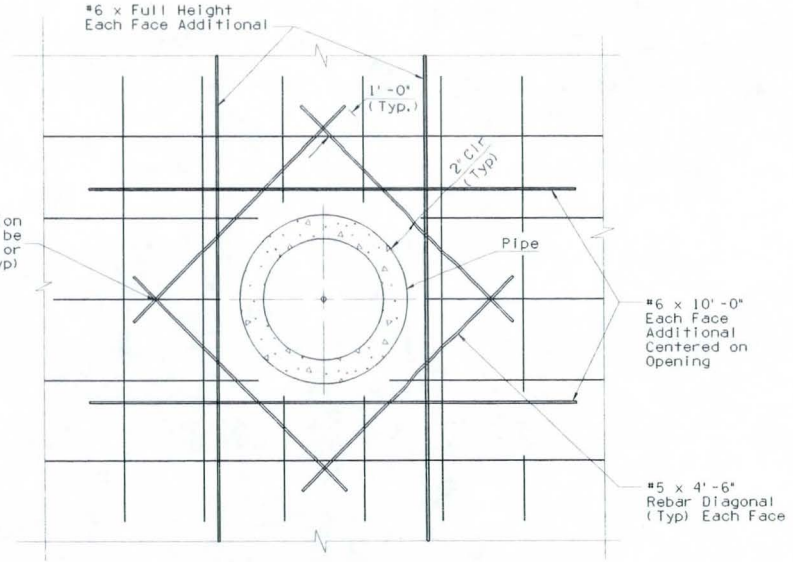
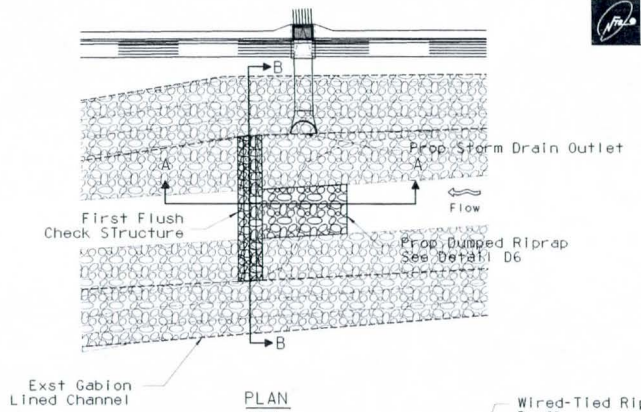


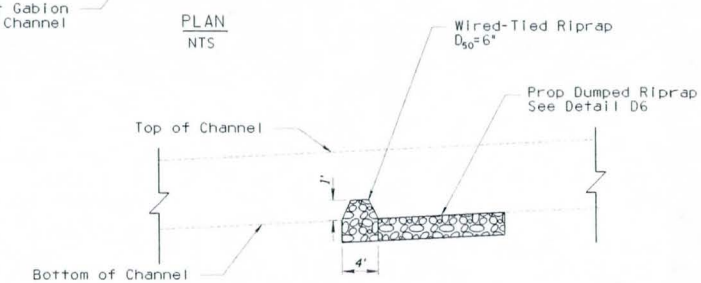
PIPE PENETRATION AT CONCRETE BOX CULVERT
NTS

DETAIL D11

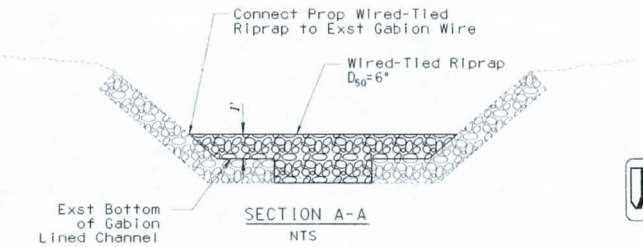
PIPE PENETRATION AT CONCRETE BOX CULVERT



PLAN
NTS



SECTION A-A
NTS



SECTION A-A
NTS

DETAIL D14

FIRST FLUSH CHECK STRUCTURE

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

DRAINAGE DETAILS

GILBERT
ARIZONA

RIGGS ROAD

ST100

DRN: JRW	DES:	DAW	CK:	RPW
DATE: 12/09	DATE:	12/09	DATE:	12/09
SCALE:	1"=20' HORIZONTAL 1"=2' VERTICAL			

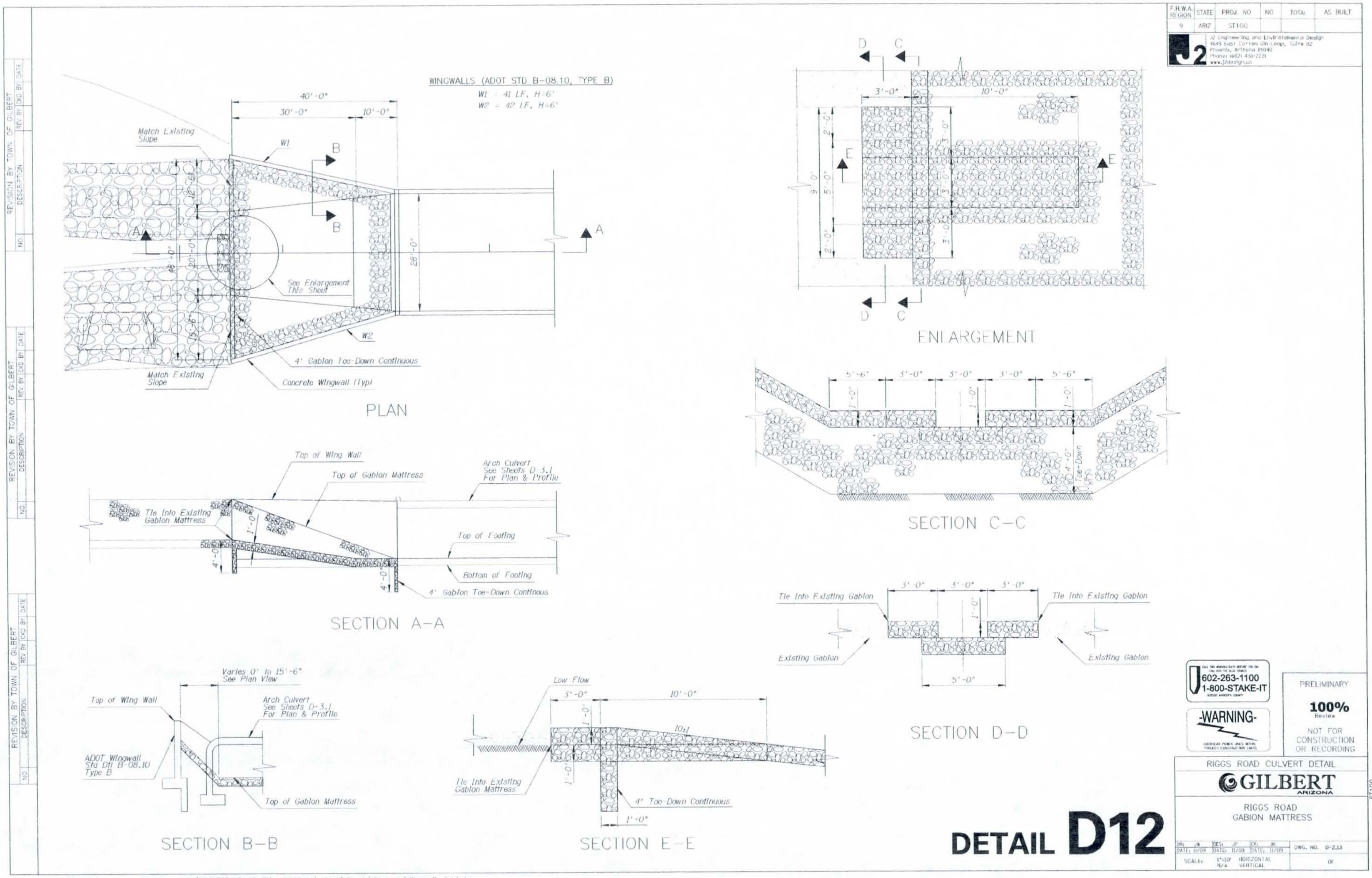
DWG. NO. D-2.12

OF

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD. BY | DATE

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD. BY | DATE

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD. BY | DATE


WINGWALLS (ADOT STD B-08.10, TYPE B)
W1 = 41 LF, H=6'
W2 = 42 LF, H=6'
40'-0"
30'-0"
10'-0"
Match Existing Slope
W1
W2
28'-0"
See Enlargement This Sheet
4' Gabion Toe-Down Continuous
Concrete Wingwall (Typ)
PLAN
ENLARGEMENT
SECTION C-C
Top of Wing Wall
Top of Gabion Mattress
Arch Culvert See Sheets D-3.1 For Plan & Profile
Tie Into Existing Gabion Mattress
Top of Footing
Bottom of Footing
4' Gabion Toe-Down Continous
SECTION A-A
Tie Into Existing Gabion
Existing Gabion
SECTION D-D
Varies 0' to 15'-6" See Plan View
ADOT Wingwall Std Dtl B-08.10 Type B
SECTION B-B
Low Flow
10:1
4' Toe-Down Continuous
SECTION E-E
602-263-1100
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-WARNING-
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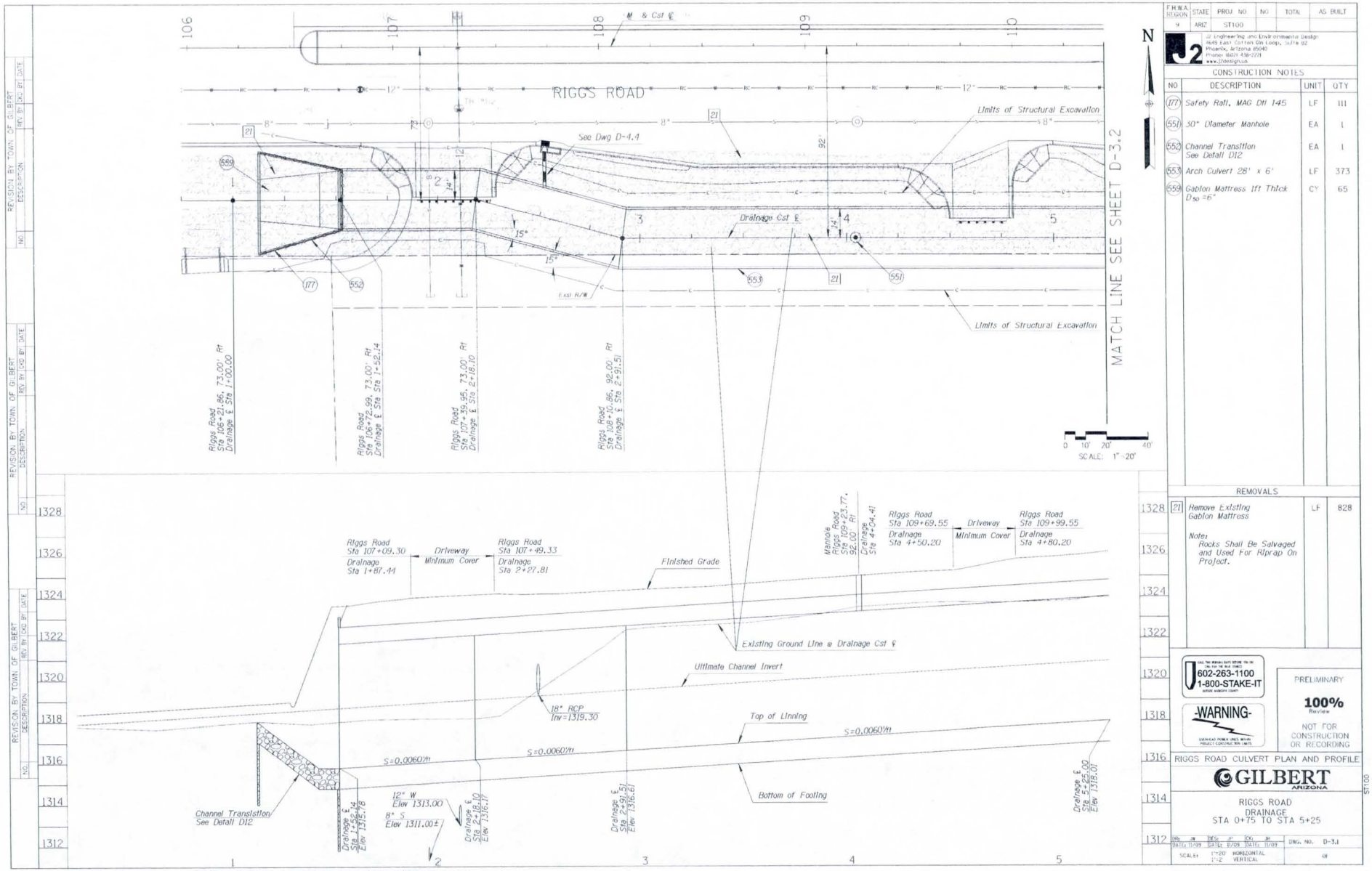
RIGGS ROAD CULVERT DETAIL
GILBERT ARIZONA
RIGGS ROAD
GABION MATTRESS
DETAIL D12
REVISION BY TOWN OF GILBERT

Plotted By: mross-touchin 11/19/2009 1:04:49 PM p:\080217\J2Cad\Sheets\Drainage\Riggs-D-2.11.dgn



F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite 92
Phoenix, Arizona 85040
Phone: (602) 438-2278
www.J2designs.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
(177)	Safety Rail, MAG Dtl 145	LF	111
(551)	30" Diameter Manhole	EA	1
(552)	Channel Transition See Detail D12	EA	1
(553)	Arch Culvert 28' x 6'	LF	373
(559)	Gabion Mattress 1ft Thick D_{50} =6"	CY	65

REMOVALS

[21]	Remove Existing Gabion Mattress	LF	828

Note: Rocks Shall Be Salvaged and Used for Riprap On Project.

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
ARIZONA BLUE STAKE, INC.

-WARNING-
OVERHEAD POWER LINES MAY BE PRESENT CONTACT POWER CO. BEFORE DIGGING

PRELIMINARY
100% Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD CULVERT PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
DRAINAGE
STA 0+75 TO STA 5+25

DES. JR	DET. JR	CK. JR
DATE: 11/09	DATE: 11/09	DATE: 11/09

DWG. NO. D-3.1

SCALE: 1"=20' HORIZONTAL, 1"=2' VERTICAL

ST100

REVISION BY TOWN OF GILBERT
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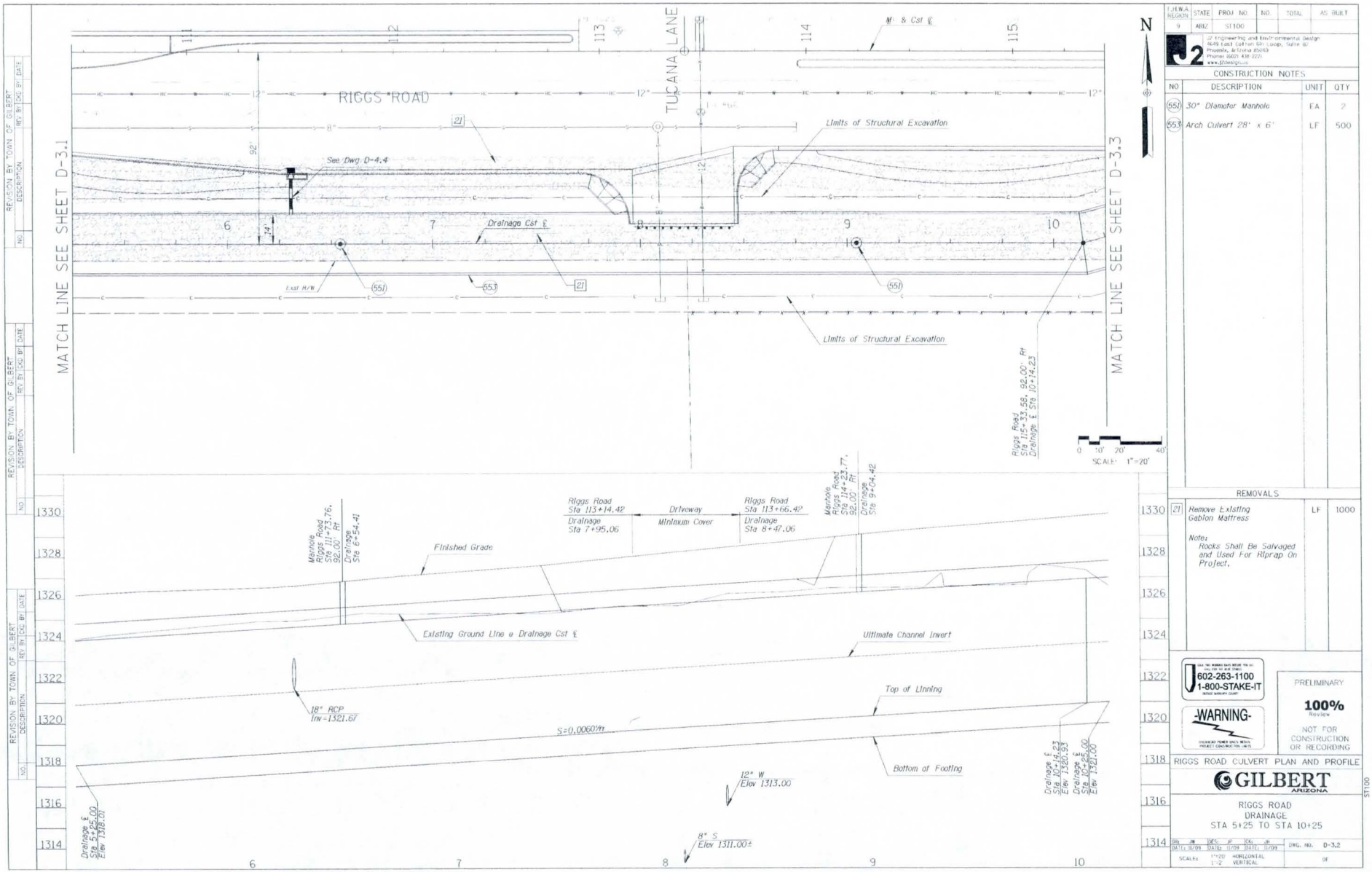

T.I.E.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite 10
Phoenix, Arizona 85040
Phone: (602) 438-2221
www.j2design.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
(551)	30" Diameter Manhole	EA	2
(553)	Arch Culvert 28' x 6'	LF	500

REMOVALS

21	Remove Existing Gabion Mattress Note: Rocks Shall Be Salvaged and Used For Riprap On Project.	LF	1000

602-263-1100
1-800-STAKE-IT

-WARNING-

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RIGGS ROAD CULVERT PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
DRAINAGE
STA 5+25 TO STA 10+25

DRN. JW	DES. JP	CHK. JH	DWG. NO. D-3.2
DATE: 11/09	DATE: 11/09	DATE: 11/09	
SCALE: 1"=20' HORIZONTAL 1"=2 VERTICAL			SHT. OF

ST100

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CHK. BY | DATE

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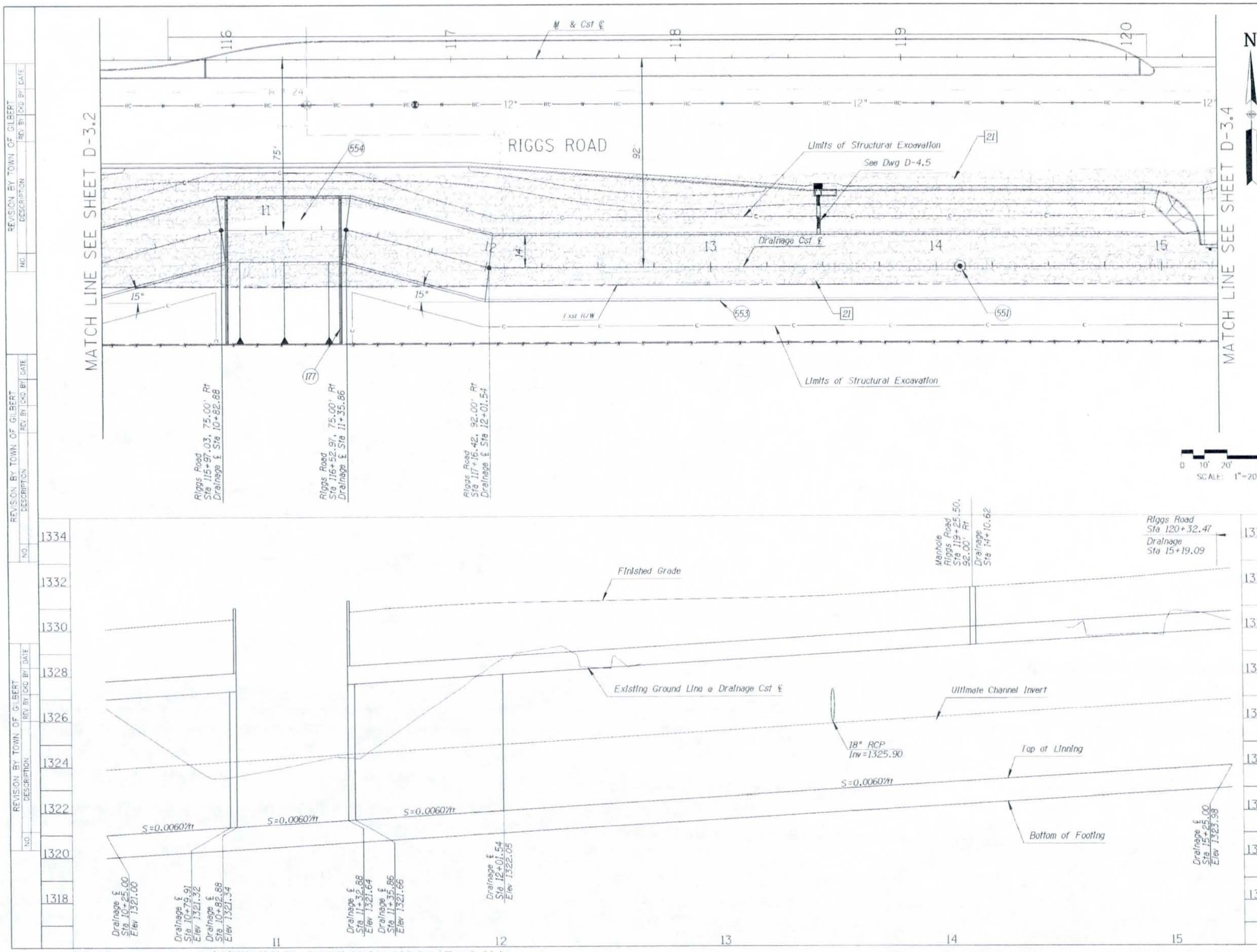

F.H.W.A REGION	STATE	PROJ. NO.	NO	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Ctr Loop, Suite B2
Phoenix, Arizona 85040
Phone: (602) 438-2221
www.j2design.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
551	30" Diameter Manhole	EA	1
553	Arch Culvert 28' x 6'	LF	450
554	Transition Structure See Detail D9	EA	1
177	Safety Rail, MAG Dtl 145	LF	178

REMOVALS

NO	DESCRIPTION	UNIT	QTY
21	Remove Existing Gabion Mattress	LF	1000

Note:
Rocks Shall Be Salvaged and Used For Riprap On Project.

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD CULVERT PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
DRAINAGE
STA 10+25 TO STA 15+25

DRN JW DES JP CK JR DATE 11/09 DATE 11/09 DATE 11/09
DWG. NO. D-3.3
SCALE: 1"=20' HORIZONTAL 1"=2' VERTICAL

ST100

REVISION BY TOWN OF GILBERT

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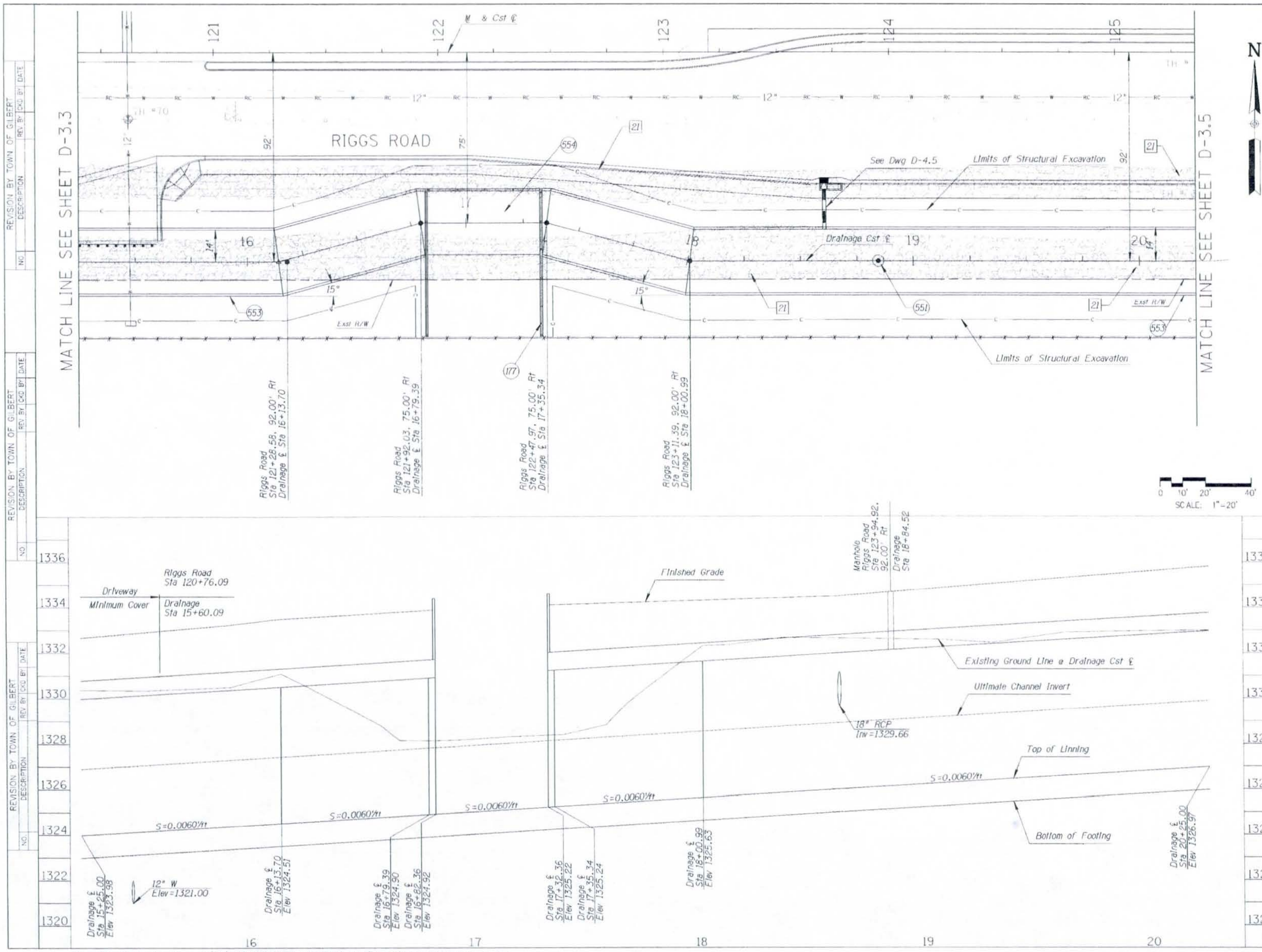

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite B2
Phoenix, Arizona 85040
Phone: (602) 438-2221
www.j2design.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
551	30" Diameter Manhole	EA	1
553	Arch Culvert 28' x 6'	LF	450
554	Arch Culvert Opening See Detail D9	EA	1
177	Safety Rail, MAG Dtl 145	LF	178

REMOVALS

NO	DESCRIPTION	UNIT	QTY
21	Remove Existing Gabion Mattress	LF	1000

Note:
Rocks Shall Be Salvaged and Used For Riprap On Project.

SCALE: 1"=20'

602-263-1100
1-800-STAKE-IT

-WARNING-
OVERHEAD POWER LINES WITHIN PROJECT CONSTRUCTION LIMITS

PRELIMINARY
100% Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD CULVERT PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
DRAINAGE
STA 15+25 TO STA 20+25

DR: JW	DES: JP	CK: JH	DWG. NO. D-3.4
DATE: 11/09	DATE: 11/09	DATE: 11/09	
SCALE: 1"=20' HORIZONTAL, 1"=2' VERTICAL			OF

ST100

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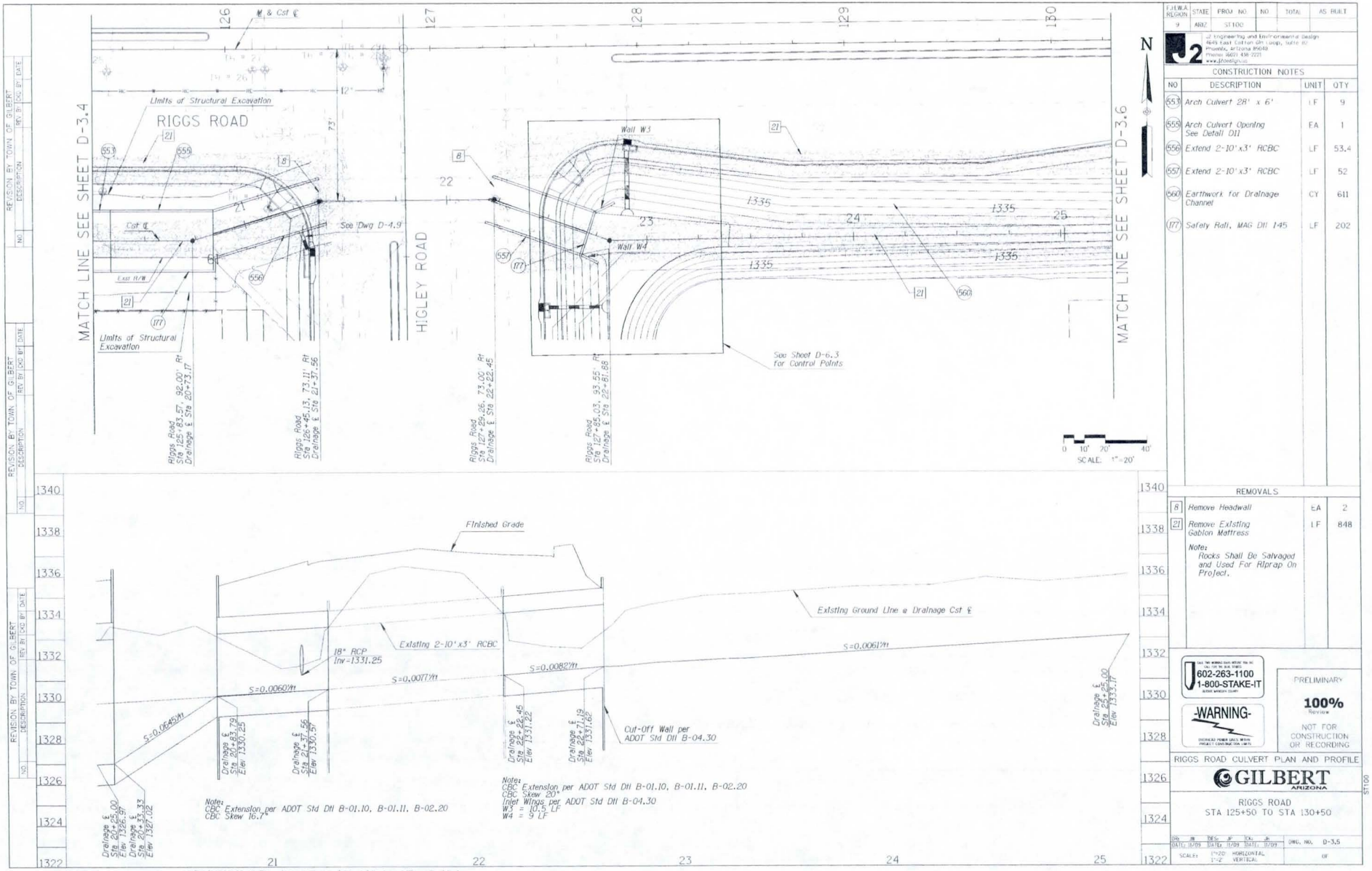

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
8645 East Cotton Gin Loop, Suite 10
Phoenix, Arizona 85040
Phone: (602) 438-7221
www.j2design.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
553	Arch Culvert 28' x 6'	LF	9
555	Arch Culvert Opening See Detail Dtl	EA	1
556	Extend 2-10'x3' RCBC	LF	53.4
557	Extend 2-10'x3' RCBC	LF	52
560	Earthwork for Drainage Channel	CY	611
177	Safety Rail, MAG Dtl 145	LF	202

REMOVALS

8	Remove Headwall	EA	2
21	Remove Existing Gabion Mattress	LF	848

Note: Rocks Shall Be Salvaged and Used For Riprap On Project.

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
ARIZONA BLUE STAKE, INC.

-WARNING-
OVERHEAD POWER LINES WITHIN PROJECT CONSTRUCTION LIMITS

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD CULVERT PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 125+50 TO STA 130+50

DES.	JP	CK.	JP	DWG. NO.	D-3.5
DATE: 11/09	DATE: 11/09	DATE: 11/09			
SCALE:	1"=20' HORIZONTAL 1"=2' VERTICAL			SHT. NO.	OF

ST100

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD. BY | DATE

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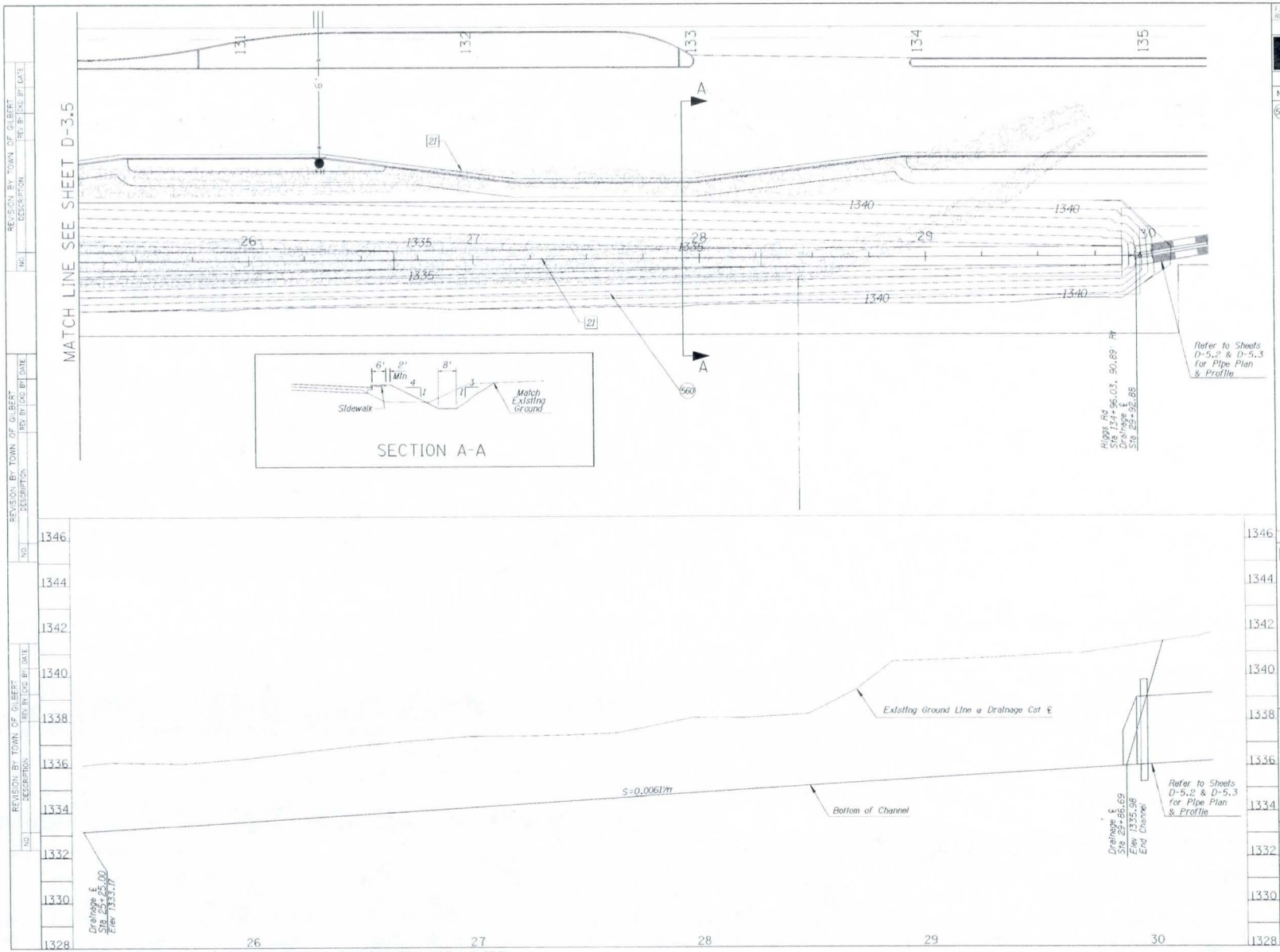

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite 102
Phoenix, Arizona 85040
Phone: (602) 438-2221
www.j2eed.com

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
660	Earthwork for Drainage Channel	CY	1824
	REMOVALS		
21	Remove Existing Gabion Mattress Note: Rocks Shall Be Salvaged and Used For Riprap On Project.	LF	888

REVISION BY TOWN OF GILBERT

NO	DESCRIPTION	REV. BY	CKD. BY	DATE

602-263-1100
1-800-STAKE-IT
(ALSO ARIZONA ONE CALL)

-WARNING-
OVERHEAD POWER LINES MAY BE PRESENT DURING CONSTRUCTION. LIMITS.

PRELIMINARY
100%
REVIEW
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD CULVERT PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 130+00 TO STA 135+50

DSN. JR	DES. JP	CK. JP	DWG. NO. D-3.6
DATE: 11/09	DATE: 11/09	DATE: 11/09	
SCALE:	1"=20' HORIZONTAL 1"=2' VERTICAL		OF

ST100

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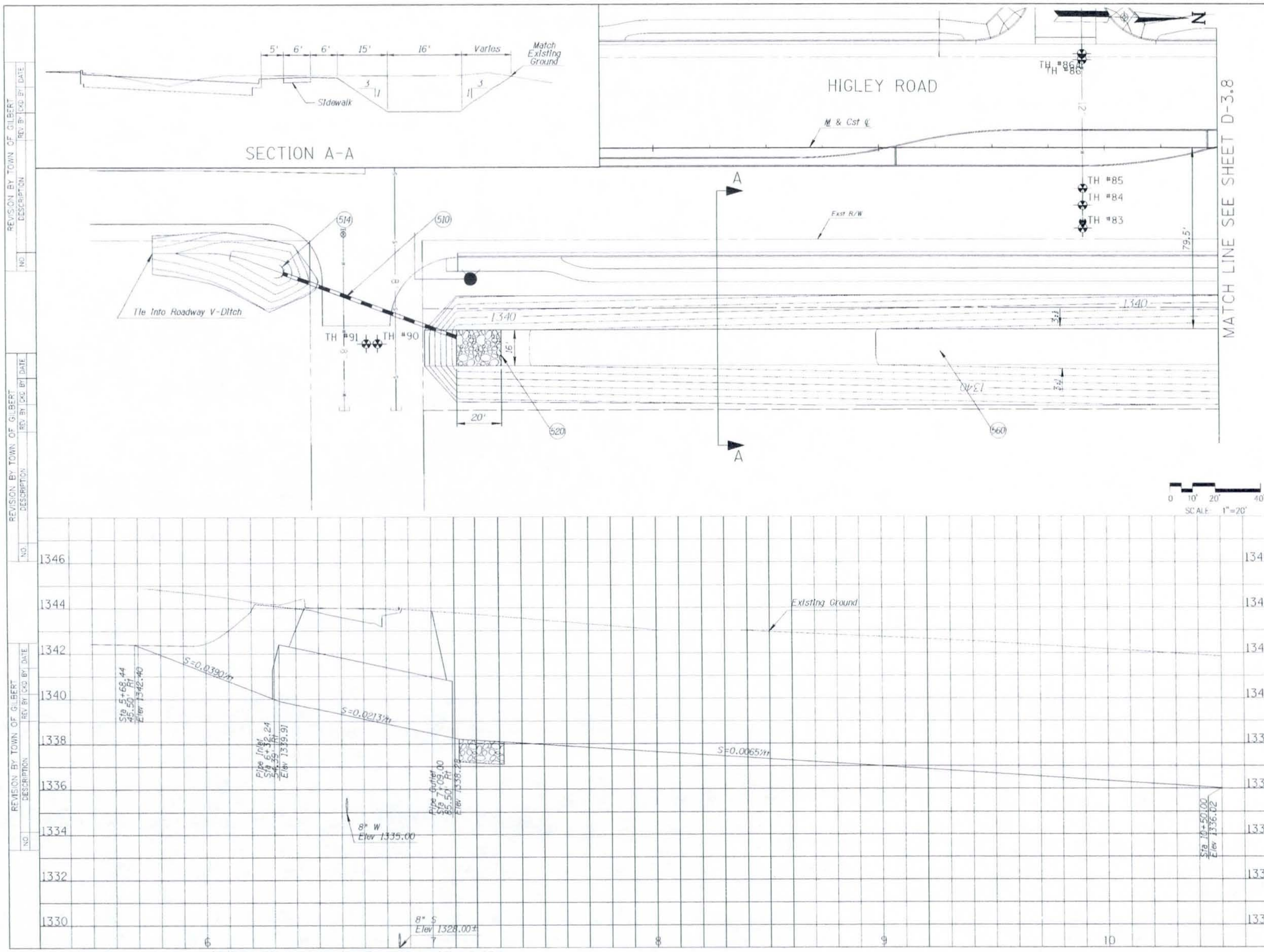

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite B2
Phoenix, Arizona 85040
Phone: (602) 438-2221
www.j2design.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
560	Earthwork for Drainage Channel	CY	2501
520	Dumped RipRap D_{50}=6" See Detail D6	CY	12
510	30" CMP	LF	84
514	Headwall MAG Dtl 501-1	EA	1

REMOVALS

602-263-1100
1-800-STAKE-IT

-WARNING-
OVERHEAD POWER LINES WITHIN PROJECT CONSTRUCTION LIMITS

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

HIGLEY ROAD CHANNEL PLAN AND PROFILE

GILBERT ARIZONA

HIGLEY ROAD
STA 5+50 TO STA 10+50

DR: JW	DES: JP	CK: JH	DWG. NO. D-3.7
DATE: 11/09	DATE: 11/09	DATE: 11/09	
SCALE: 1"=20' HORIZONTAL, 1"=2' VERTICAL			OF

ST100

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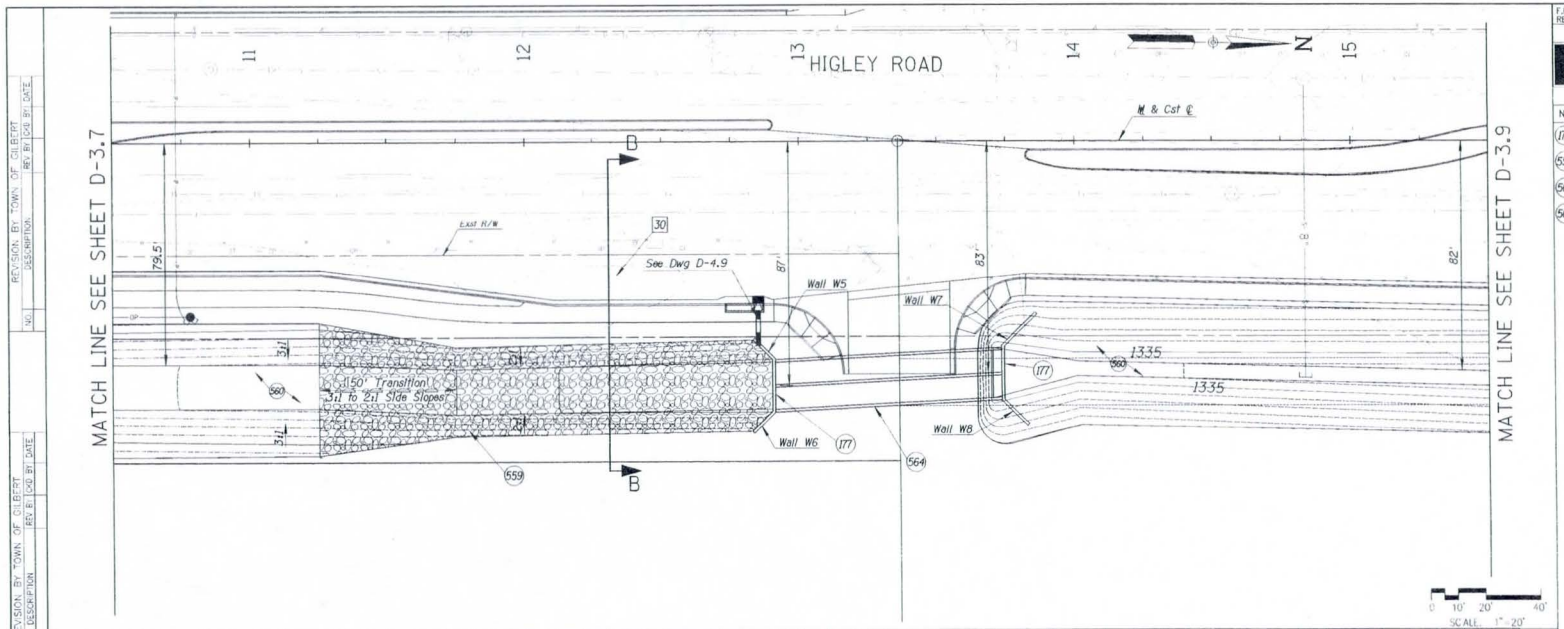

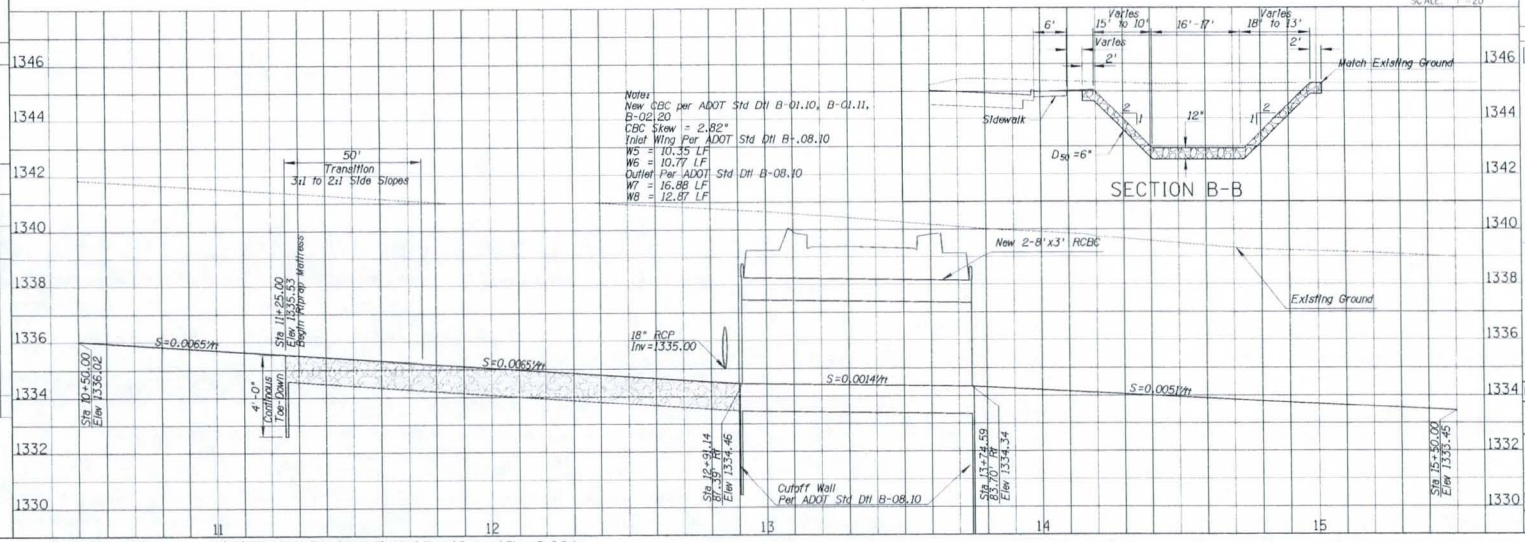

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	S1100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite B2
Phoenix, Arizona 85040
Phone (602) 438-2221
www.j2design.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
177	Safety Rail, MAG Dtl 145	LF	90
559	Gabion Mattress 1ft Thick D_{50} =6"	CY	299
560	Earthwork for Drainage Channel	CY	2261
564	2-8'x3' RCBC	LF	82

REMOVALS

30	Remove Existing Riprap	SY	592

Note:
Rocks Shall Be Salvaged and Used For Riprap On Project.

602-283-1100
1-800-STAKE-IT

PRELIMINARY
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HIGLEY ROAD CHANNEL PLAN AND PROFILE

GILBERT ARIZONA

HIGLEY ROAD
STA 10+50 TO STA 15+50

DES: JW	DRN: JP	CK: JH	DWG. NO. D-3.8
DATE: 11/09	DATE: 11/09	DATE: 11/09	
SCALE:	1"=20' HORIZONTAL		
	1"=2' VERTICAL		

ST100

REVISION BY TOWN OF GILBERT
NO. DESCRIPTION REV BY DATE CKD BY DATE

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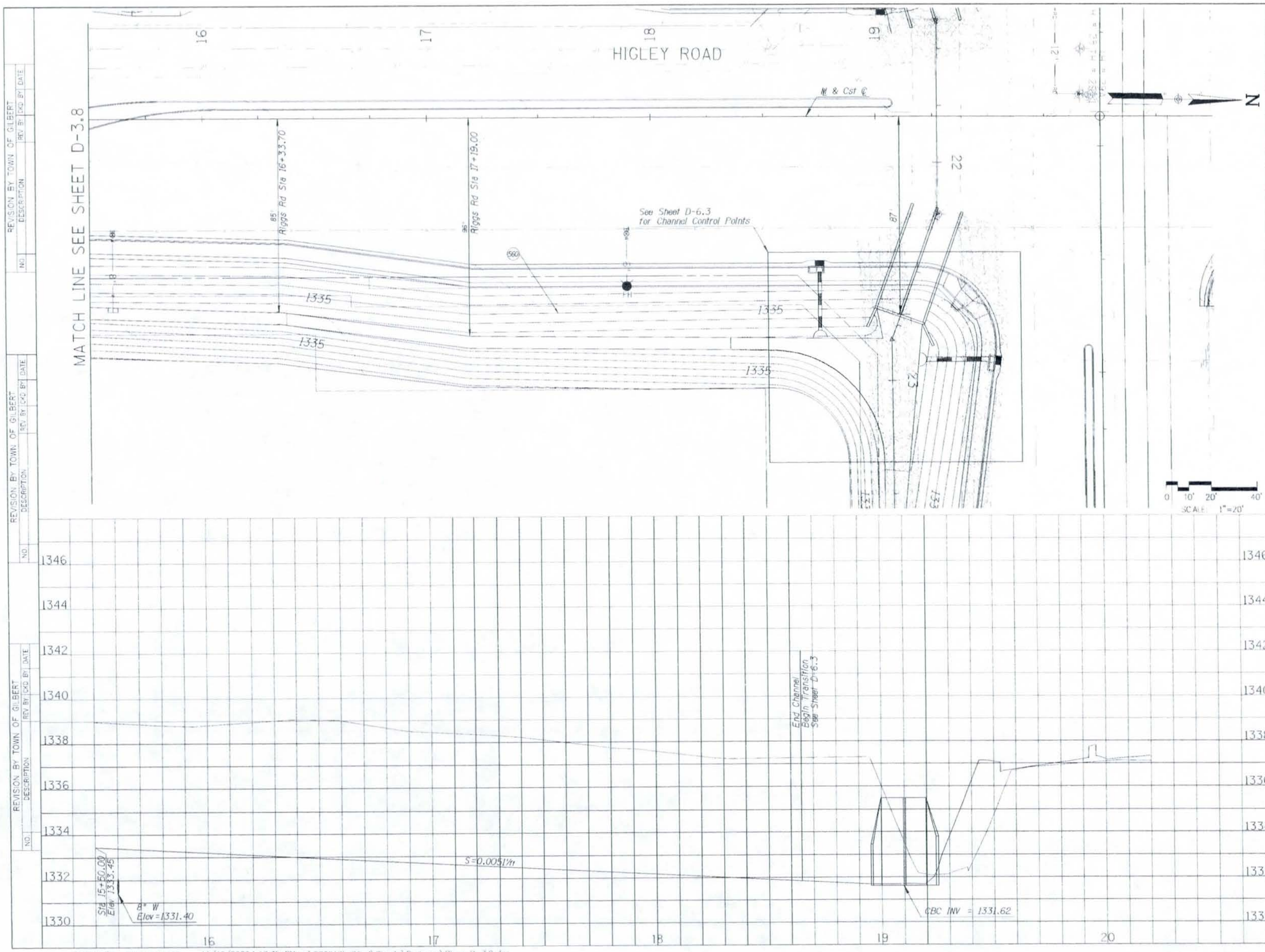


F.H.W.A REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite B2
Phoenix, Arizona 85040
Phone: (602) 438-2221
www.j2design.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
560	Earthwork for Drainage Channel	CY	1166

REMOVALS

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

HIGLEY ROAD CHANNEL PLAN AND PROFILE

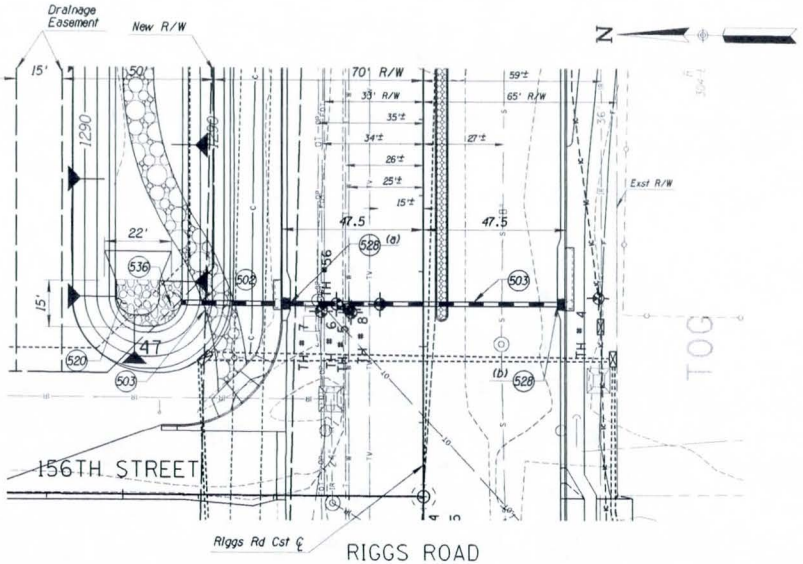
GILBERT
ARIZONA

HIGLEY ROAD
STA 15+50 TO STA 20+00

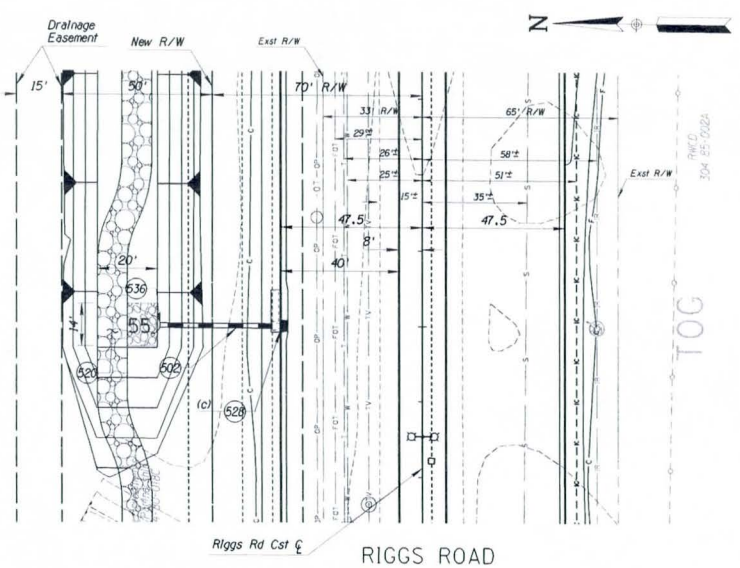
DR: JB	DES: JP	CK: JH	DWG. NO. D-3.9
DATE: 11/09	DATE: 11/09	DATE: 11/09	
SCALE: 1"=20' HORIZONTAL, 1"=2' VERTICAL			OF

ST100

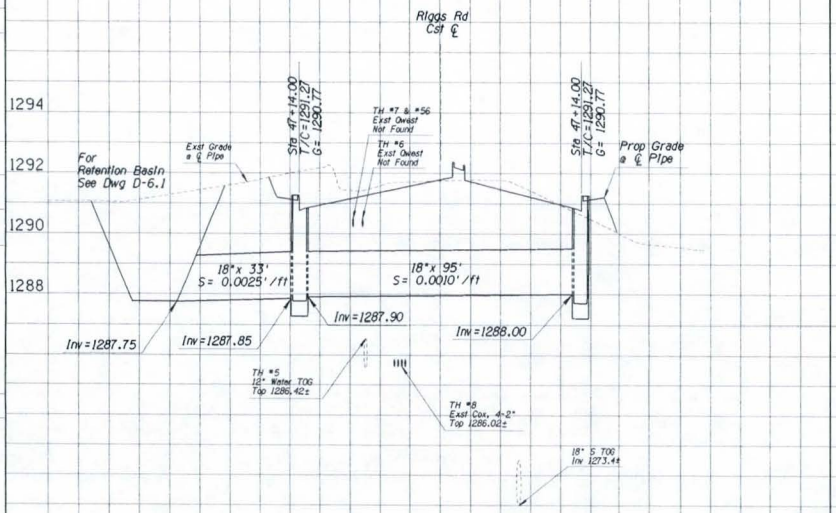
Plotted By: mross-touchin 11/19/2009 1:13:35 PM p:\080217\J2Cad\Sheets\Drainage\Riggs-D-3.9.dgn

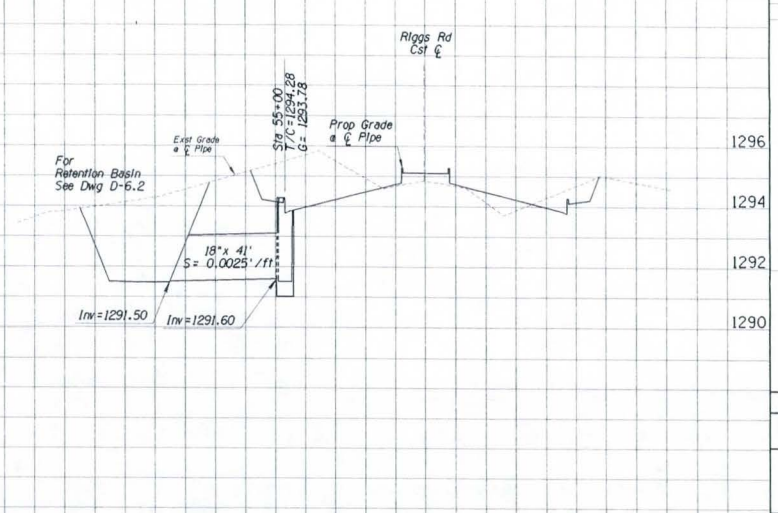


RIGGS ROAD
STA 47+14.00



RIGGS ROAD
STA 55+00.00





F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
502	18" RGRCP Class III	LF	74
503	18" RGRCP Class IV	LF	95
520	Dumped Riprap, D_{50}=6" See Dtl D6	CY	16
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L=6', V=3.4' (a) L=17', V=3.3' (b) L=10', V=2.7' (c)	Ea	3
536	Concrete Pipe End Section MAG Dtl 545	Ea	2

NOTE: All Dimensions to Face of Curb

REMOVALS

602-263-1100
1-800-STAKE-IT

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PIPE LATERAL PLAN AND PROFILE

GILBERT
ARIZONA

RIGGS ROAD
STA 47+14.00 AND STA 55+00.00

DR:	DES:	CK:	RPW
DATE: 12/09	DATE: 12/09	DATE: 12/09	

DWG. NO. D-4.1

SCALE: 1"=20' HORIZONTAL
1"=2' VERTICAL

SHEET OF

ST100

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD. BY | DATE

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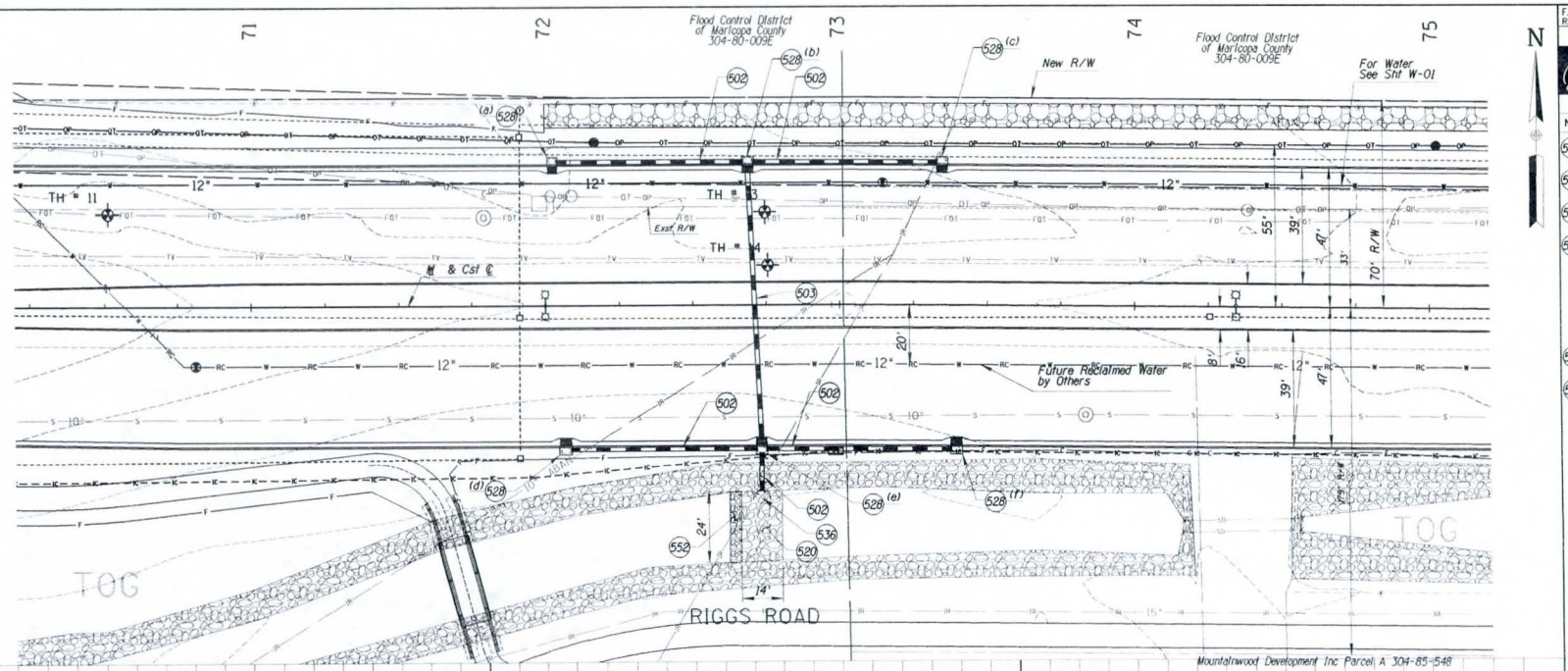

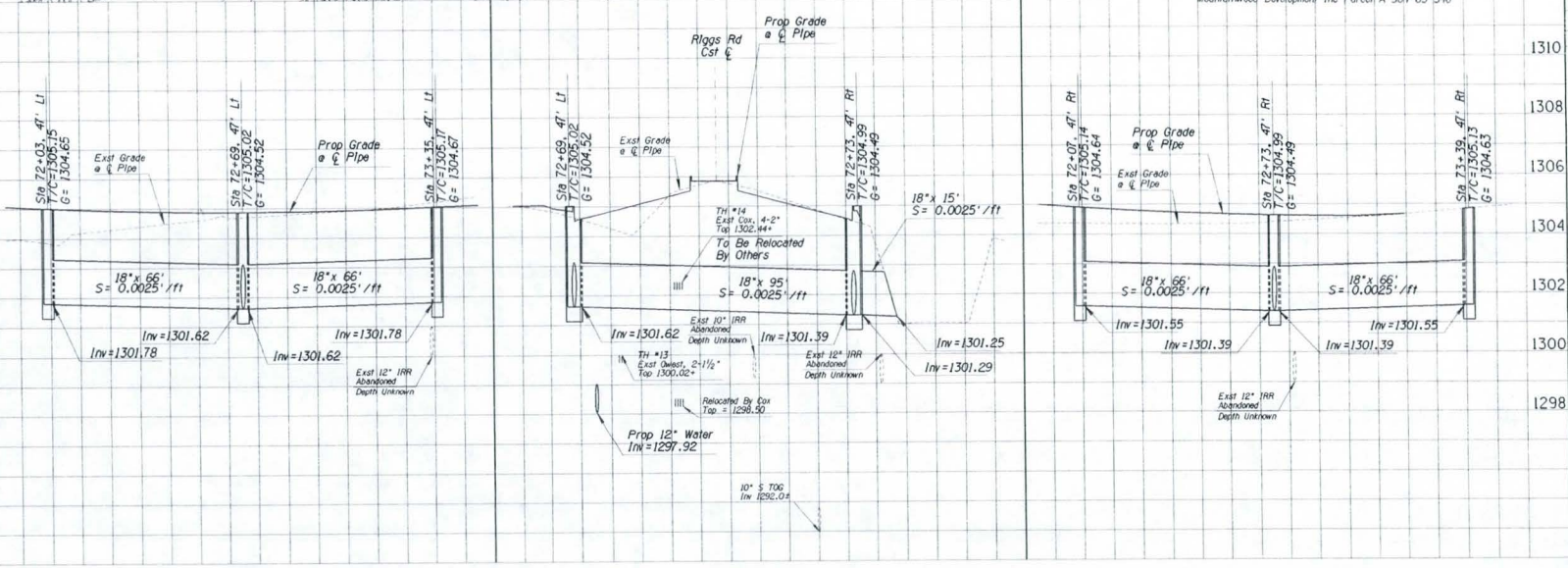

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
502	18" RGRCP Class III	LF	279
503	18" RGRCP Class IV	LF	95
520	Dumped Riprap, D_{50}=6" See Dtl D6	CY	12
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L=0', V=3.4' (a) L=0', V=3.4' (b) L=0', V=3.4' (c) L=0', V=3.6' (d) L=0', V=3.6' (e) L=0', V=3.6' (f)	Ea	6
536	Concrete Pipe End Section MAG Dtl 545	Ea	1
552	First Flush Check Structure See Dtl D14	Ea	1

NOTE: All Dimensions to Face of Curb

REMOVALS

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

PIPE LATERAL PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 72+03 to STA 73+39

DR: JRW	DES: RAB	CK: RPW
DATE: 12/09	DATE: 12/09	DATE: 12/09

DWG. NO. D-4.2

SCALE: 1"=20' HORIZONTAL, 1"=2' VERTICAL

SHT OF

ST100

REVISION BY TOWN OF GILBERT
NO | DESCRIPTION | REV. BY | CKD. BY | DATE

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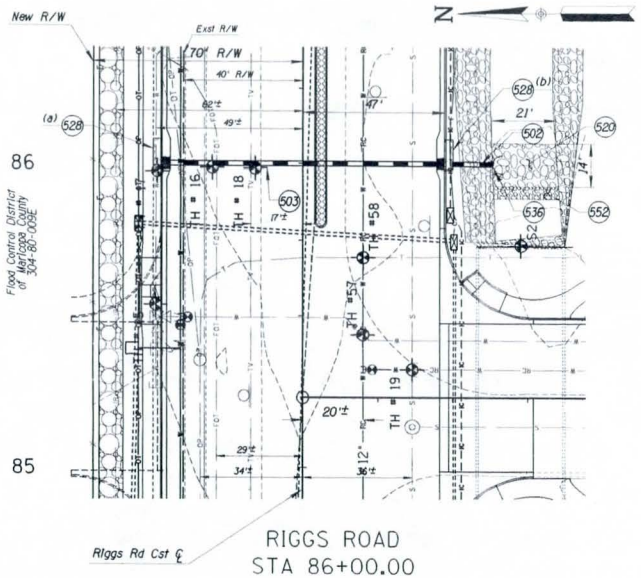
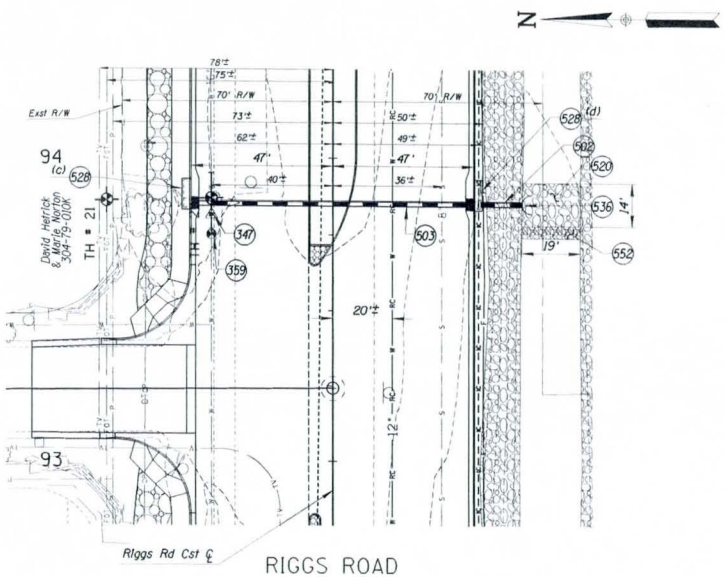
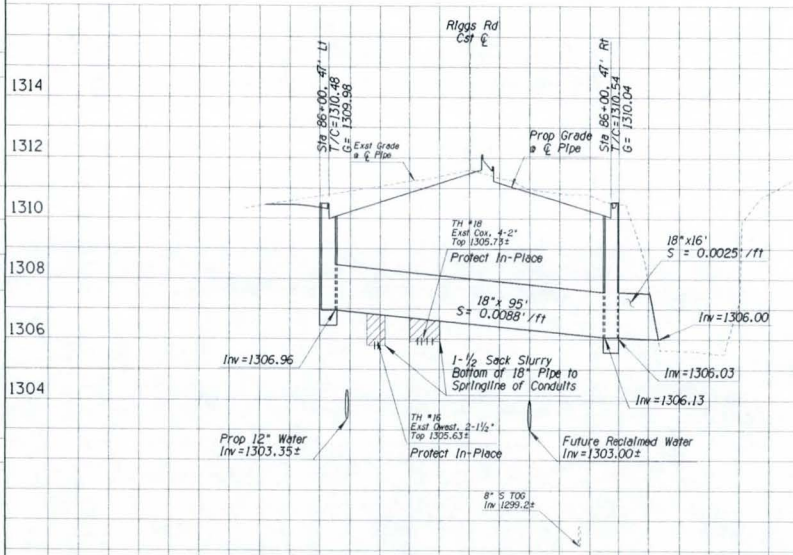
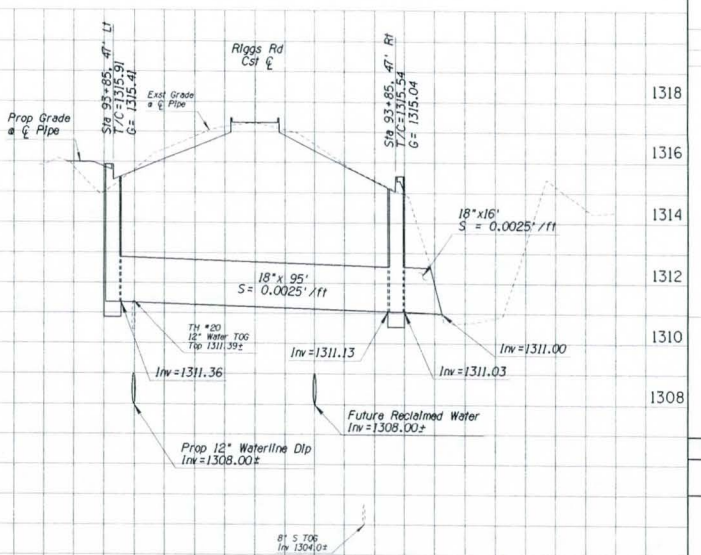


RIGGS ROAD
STA 86+00.00



RIGGS ROAD
STA 93+85.00





F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
502	18" RGRCP Class III	LF	32
503	18" RGRCP Class IV	LF	190
520	Dumped Riprap, D_{50}=6" See Dtl D6	CY	21
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L= 6', V= 3.5' (a) L= 6', V= 4.5' (b) L= 6', V= 4.6' (c) L= 6', V= 4.5' (d)	Ea	4
536	Concrete Pipe End Section MAG Dtl 545	Ea	2
347	Vertical Realignment of 12" DIP Water Main per MAG Dtl 370	LF	20
359	Relocate Water Valve	Ea	1
552	First Flush Check Structure See Dtl D14	Ea	2

NOTE: All Dimensions to Face of Curb

REMOVALS

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

PIPE LATERAL PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 86+00 AND STA 93+85

ST100

DR:	IM	DES:	AW	CK:	RPW	DWG. NO.	D-4.3
DATE:	12/09	DATE:	12/09	DATE:	12/09		
SCALE:	1"=20' HORIZONTAL 1"=2' VERTICAL					OF	

REVISION BY TOWN OF GILBERT
NO. DESCRIPTION REV. BY CKD. BY DATE

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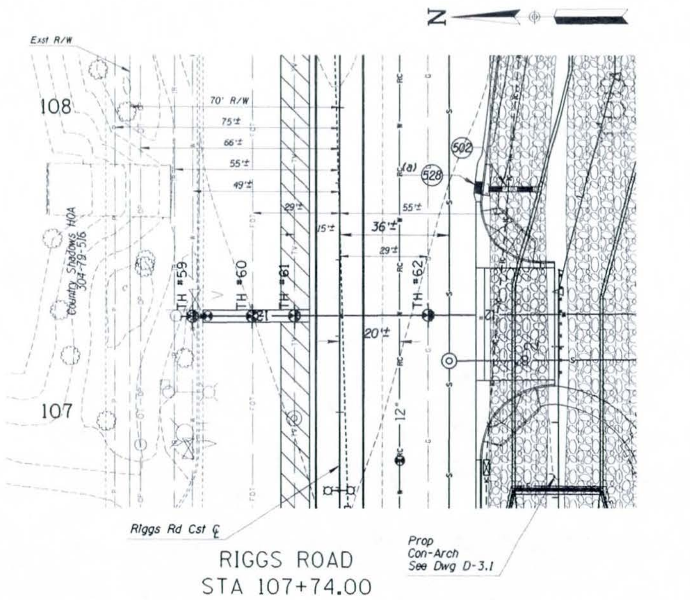
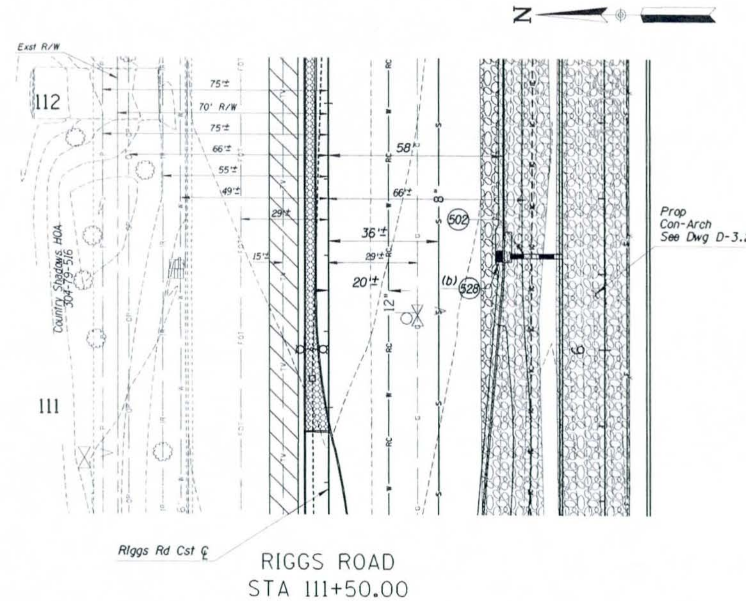
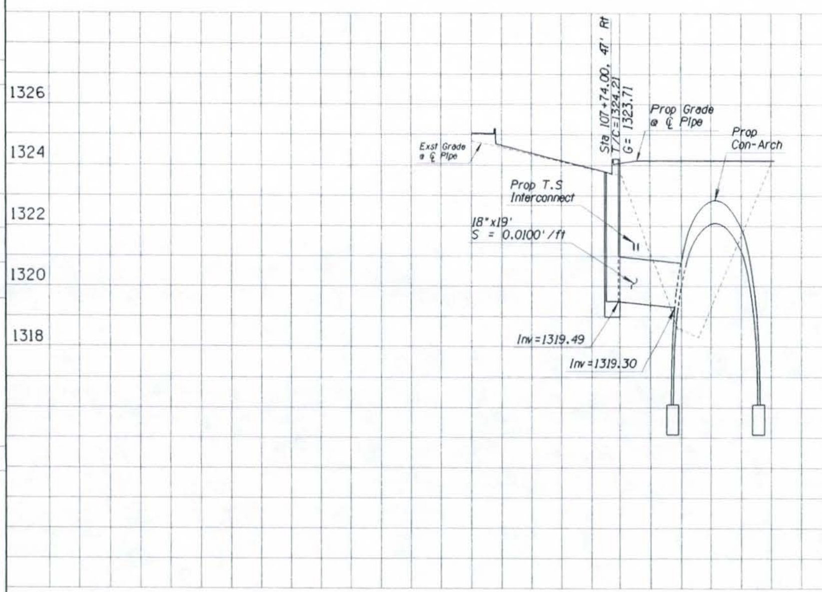
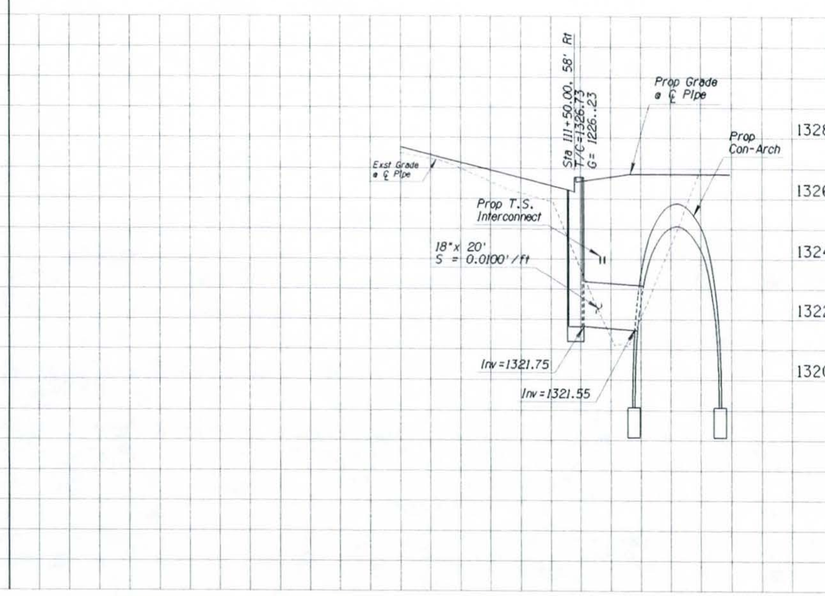
F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012









CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
502	18" RGRCP Class III	LF	39
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L= 6', V=4.7' (a) L= 6', V=5.0' (b)	Ea	2

NOTE: All Dimensions to Face of Curb

REMOVALS

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review

NOT FOR CONSTRUCTION OR RECORDING

PIPE LATERAL PLAN AND PROFILE

GILBERT
ARIZONA

RIGGS ROAD
STA 107+74.00 AND STA 111+50.00

DR: HU	DES: LAR	CK: RPW	DWG. NO. D-4.4
DATE: 12/09	DATE: 12/09	DATE: 12/09	
SCALE: 1"=20' HORIZONTAL 1"=2' VERTICAL			OF

ST100

NO	DESCRIPTION	REV BY	CKD BY	DATE
REVISION BY TOWN OF GILBERT				

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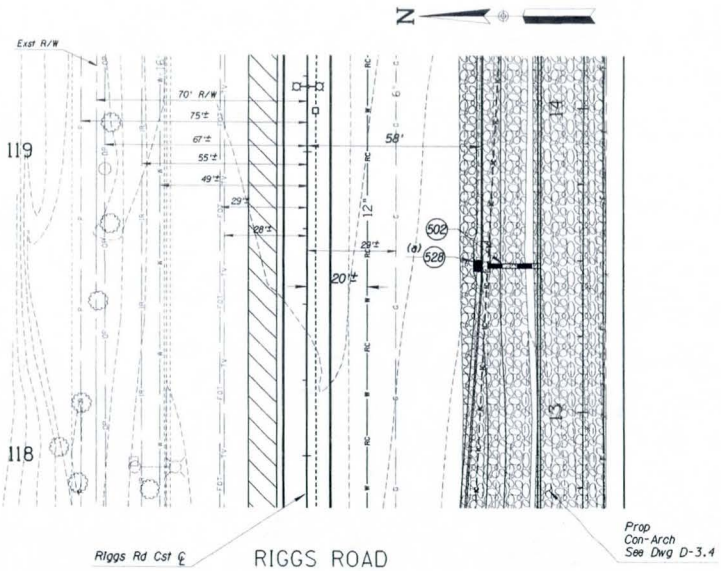
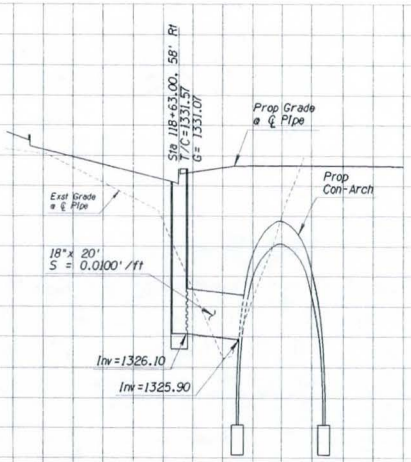
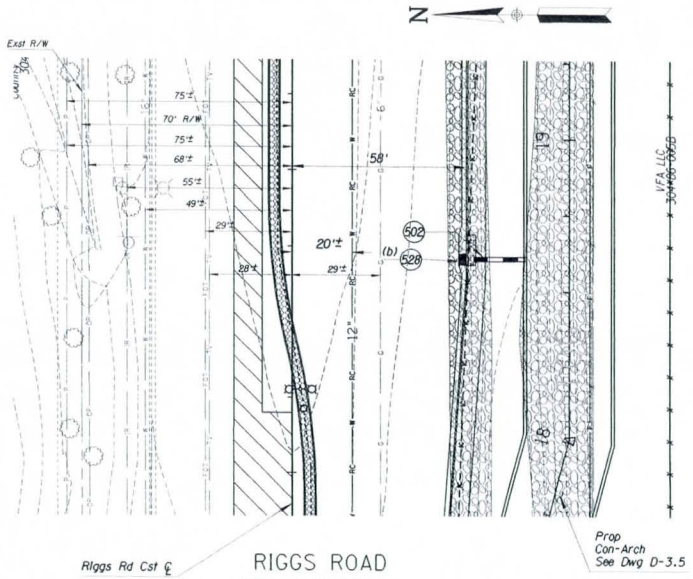
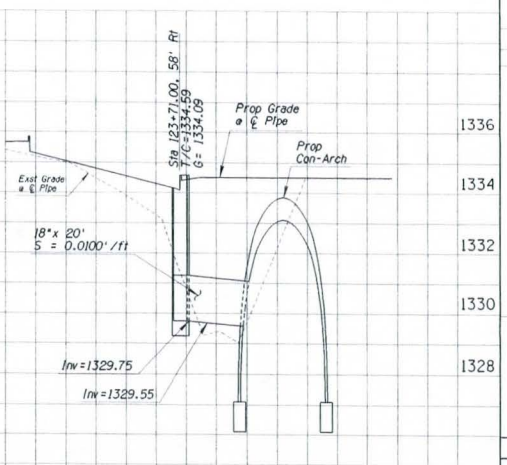


RIGGS ROAD
STA 118+63.00





RIGGS ROAD
STA 123+71.00



F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
502	18" RGRCP Class III	LF	40
528	SIngle Grate Catch Basin Type "D" MAG Dtl 533. L= 6', V= 5.5' (a) L= 6', V= 4.8' (b)	Ea	2

NOTE: All Dimensions to Face of Curb

REMOVALS

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

PIPE LATERAL PLAN AND PROFILE

GILBERT
ARIZONA

RIGGS ROAD
STA 118+63.00 AND STA 123+71.00

DR: JRW	DES: RAB	CK: RPW	DWG. NO. D-4.5
DATE: 12/09	DATE: 12/09	DATE: 12/09	
SCALE: 1"=20' HORIZONTAL 1"=2' VERTICAL			OF

ST100

REVISION BY TOWN OF GILBERT
NO. DESCRIPTION REV. BY CKD. BY DATE

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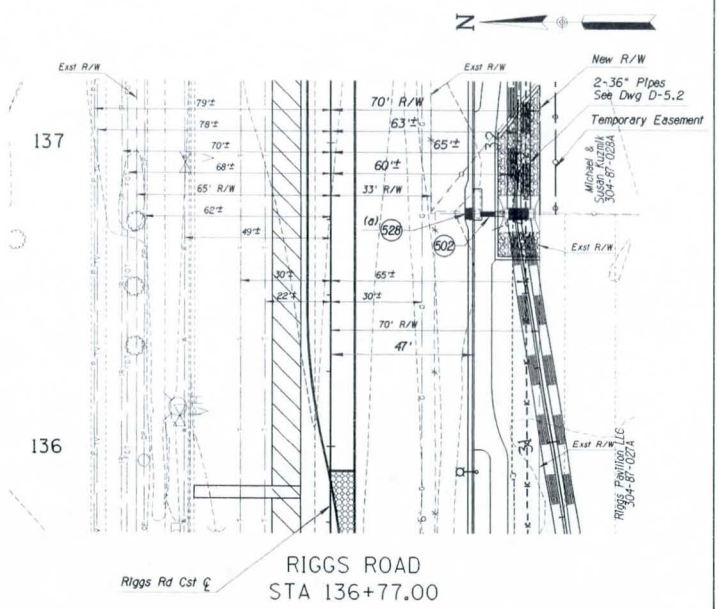

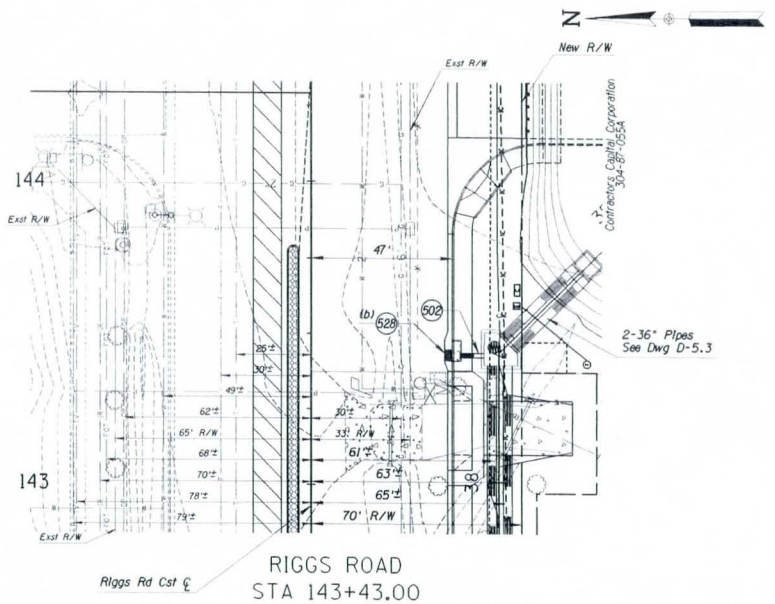

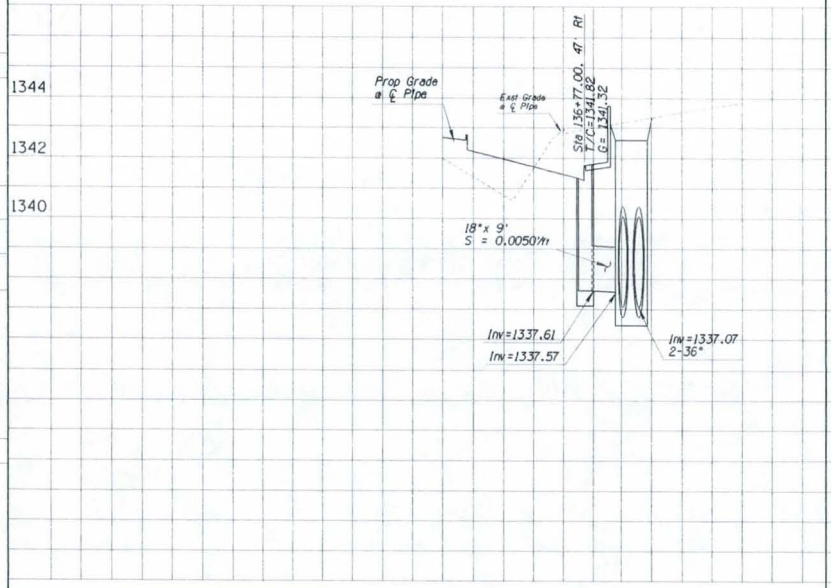

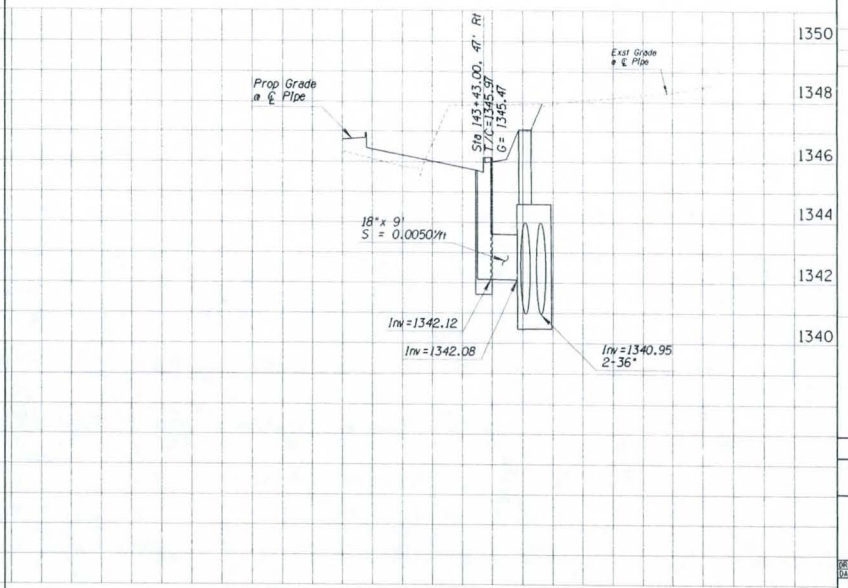

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
502	18" RGRCP Class III	LF	18
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L= 6', V= 4.2' (a) L= 3', V= 3.9' (b)	Ea	2

NOTE: All Dimensions to Face of Curb

REMOVALS

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

PIPE LATERAL PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 136+77.00 AND STA 143+43.00

DES.	DRN.	CK'D	APP'D
DATE: 12/09	DATE: 12/09	DATE: 12/09	DATE: 12/09

DWG. NO. D-4.6

SCALE: 1"=20' HORIZONTAL
1"=2' VERTICAL

SHEET OF

ST100

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CKD. BY	DATE

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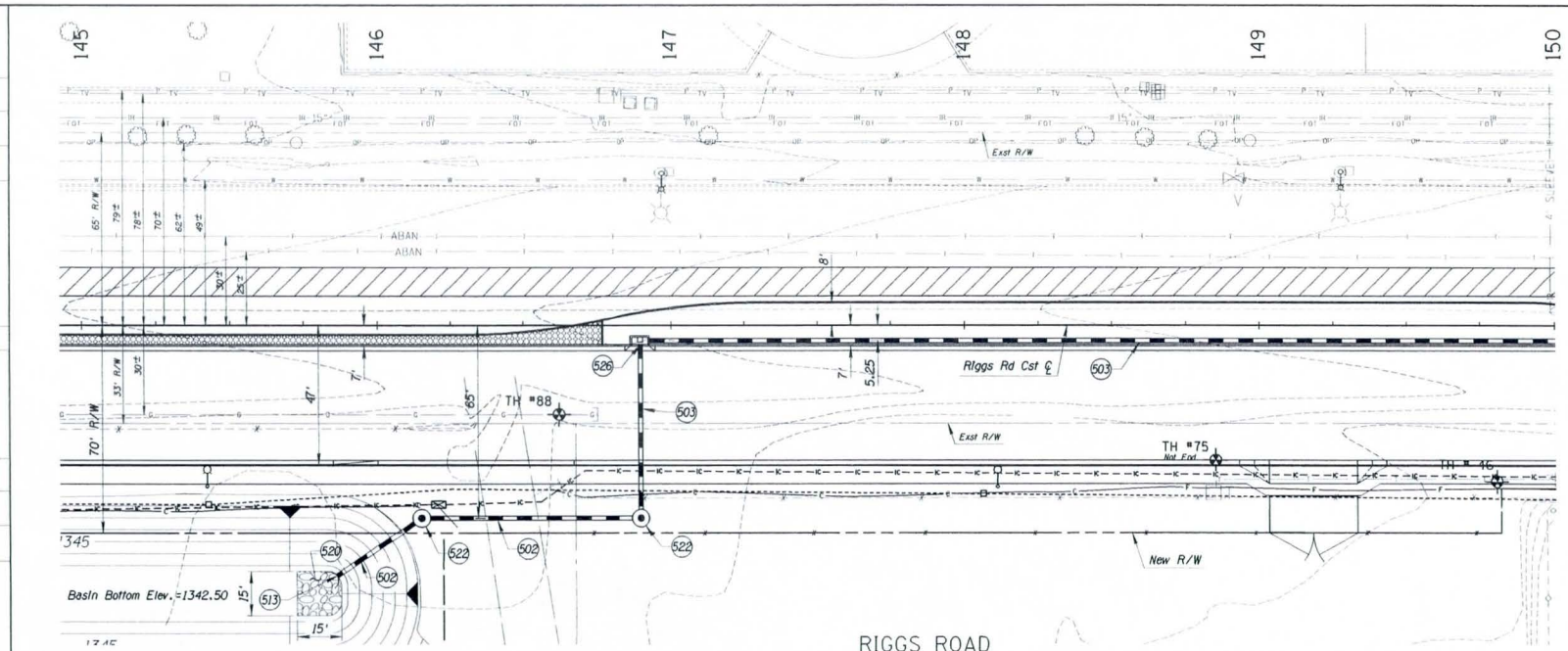
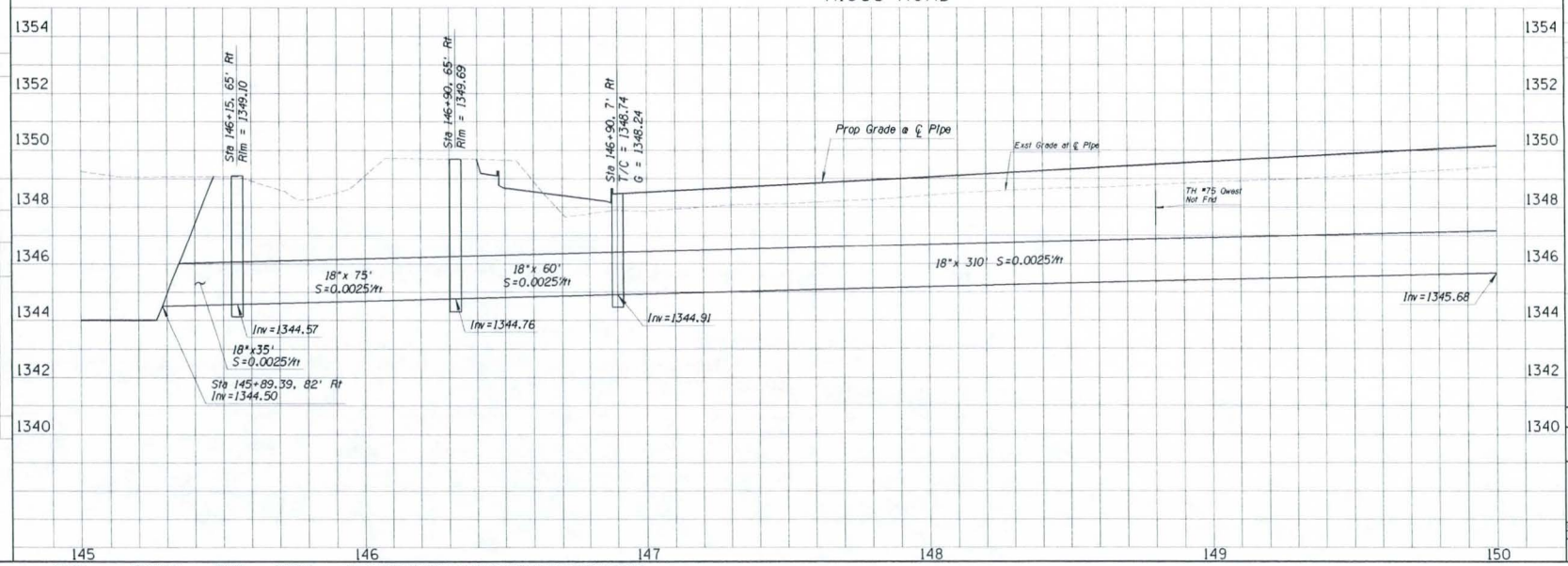


RIGGS ROAD



F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
502	18" RGRCP Class III	LF	110
503	18" RGRCP Class IV	LF	370
513	RCP End Section MAG Dtl 545	Ea	1
520	Dumped Riprap, D_{50}=6" See Dtl D6	CY	8
522	Storm Drain Manhole MAG Dtl 520, 522	Ea	2
526	Curb Opening Catch Basin Type "C" MAG Dtl 532 V=4.9'	Ea	1

NOTE: All Dimensions to Face of Curb

REMOVALS

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

PIPE LATERAL PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 145+87.00 TO STA 150+00.00

DR:	DES:	CK:	RPW
DATE: 12/09	DATE: 12/09	DATE: 12/09	

DWG. NO. D-4.7

SCALE: 1"=20' HORIZONTAL
1"=2' VERTICAL

SHEET OF

ST100

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV BY | CKD BY | DATE

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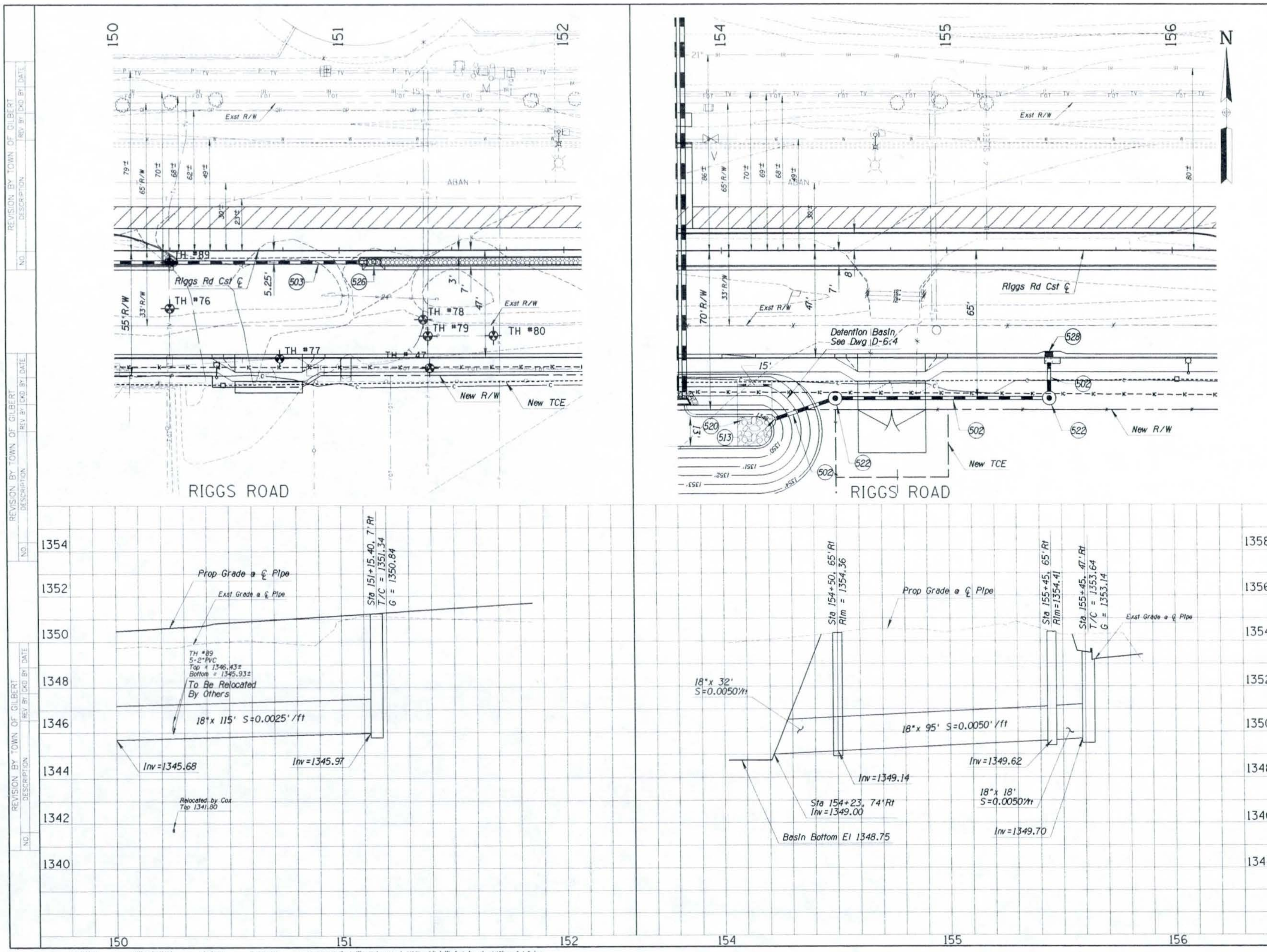

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
502	18" RGRCP Class III	LF	145
503	18" RGRCP Class IV	LF	115
513	RCP End Section MAG Dtl 545	Ea	1
520	Dumped Riprap, D_{50} =6" See Dtl D6	CY	7
522	Storm Drain Manhole MAG Dtl 520, 522	Ea	2
526	Curb Opening Catch Basin Type "C" MAG Dtl 532 V=5.4'	Ea	1
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L= 3', V= 3.9'	Ea	1

NOTE: All Dimensions to Face of Curb

REMOVALS

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review

NOT FOR CONSTRUCTION OR RECORDING

PIPE LATERAL PLAN AND PROFILE

GILBERT
ARIZONA

RIGGS ROAD
STA 150+00.00 TO STA 155+45.00

DR: LMR DATE: 12/09 | DES: EAW DATE: 12/09 | CK: RPW DATE: 12/09 | DWG. NO. D-4.8

SCALE: 1"=20' HORIZONTAL, VERTICAL | OF

ST100

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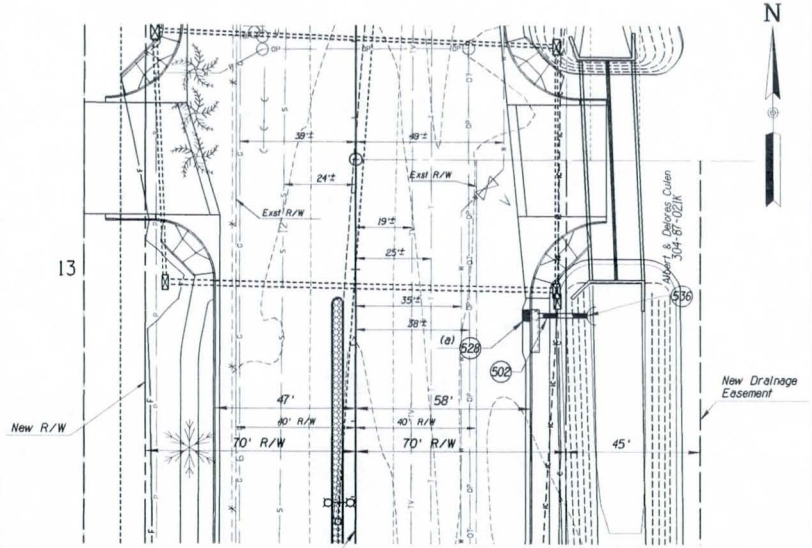

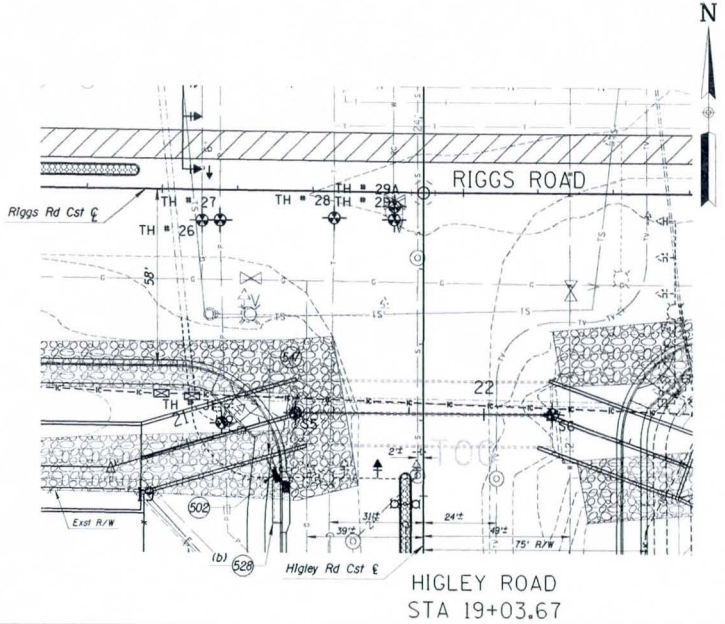

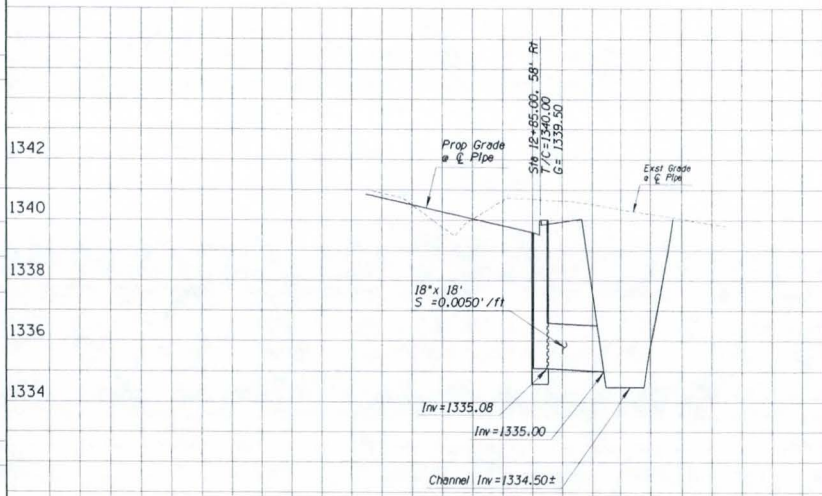

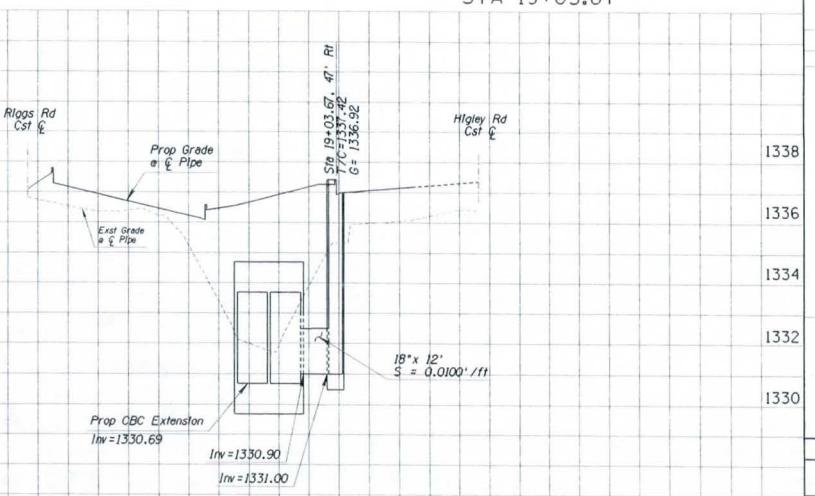

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
502	18" RGRCP Class III	LF	30
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L= 10', V= 4.9' (a) L= 10', V= 6.4' (b)	Ea	2
536	Concrete Pipe End Section MAG Dtl 545	Ea	1
547	Pipe Penetration to CBC See Dtl D11	NPI	

NOTE: All Dimensions to Face of Curb

REMOVALS

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

PIPE LATERAL PLAN AND PROFILE

GILBERT ARIZONA

HIGLEY ROAD
STA 12+85.00 & STA 19+03.67

DR: TJM DATE: 12/09	DES: LAB DATE: 12/09	CK: RPW DATE: 12/09	DWG. NO. D-4.9
SCALE: 1"=20' HORIZONTAL 1"=2' VERTICAL			OF

ST100

REVISION BY TOWN OF GILBERT
NO | DESCRIPTION | REV. BY | CKD. BY | DATE

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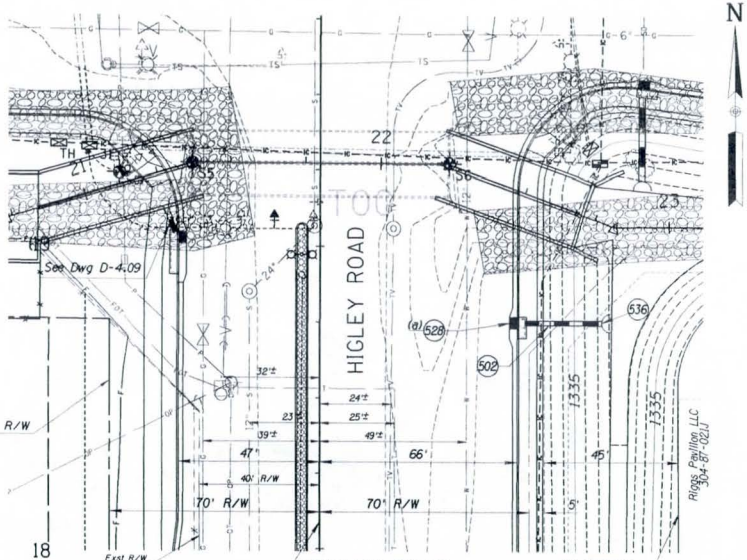
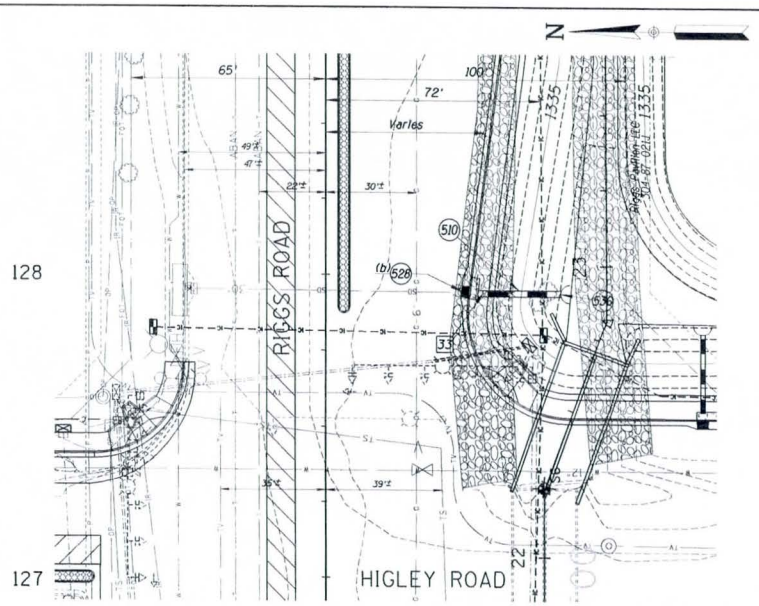
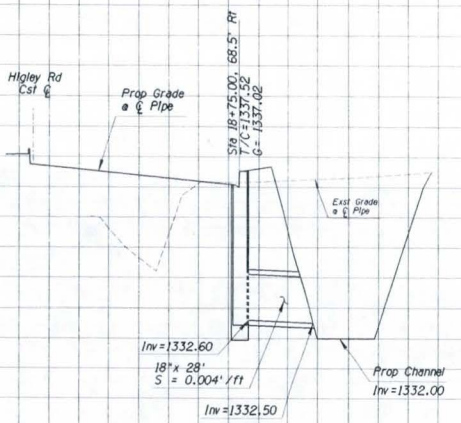
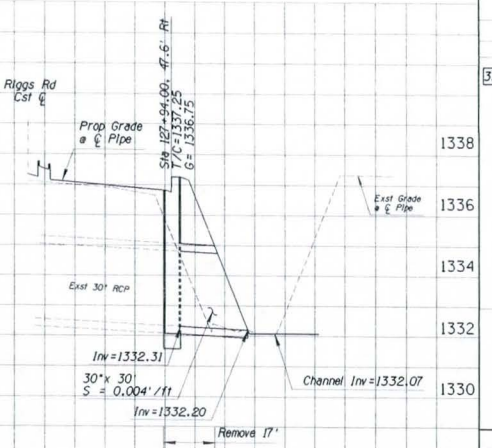


HIGLEY ROAD
STA 18+75.00



RIGGS ROAD
STA 127+94.00





F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
502	18" RGRCP Class III	LF	28
510	30" RGRCP Class III	LF	30
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L= 3', V= 4.9' (a) L= 3', V= 4.9' (b)	Ea	2
536	Concrete Pipe End Section MAG Dtl 545	Ea	2

NOTE: All Dimensions to Face of Curb

REMOVALS

33	Remove 30" RCP	LF	17

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

PIPE LATERAL PLAN AND PROFILE

GILBERT ARIZONA

HIGLEY ROAD
Higley Road Sta 18+75.00 &
Riggs Road Sta 127+94.00

DR: HM	DES: TAW	CK: RPW	DWG. NO. D-4.10
DATE: 12/09	DATE: 12/09	DATE: 12/09	
SCALE: 1"=20' HORIZONTAL 1"=2' VERTICAL			OF

ST100

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD. BY | DATE

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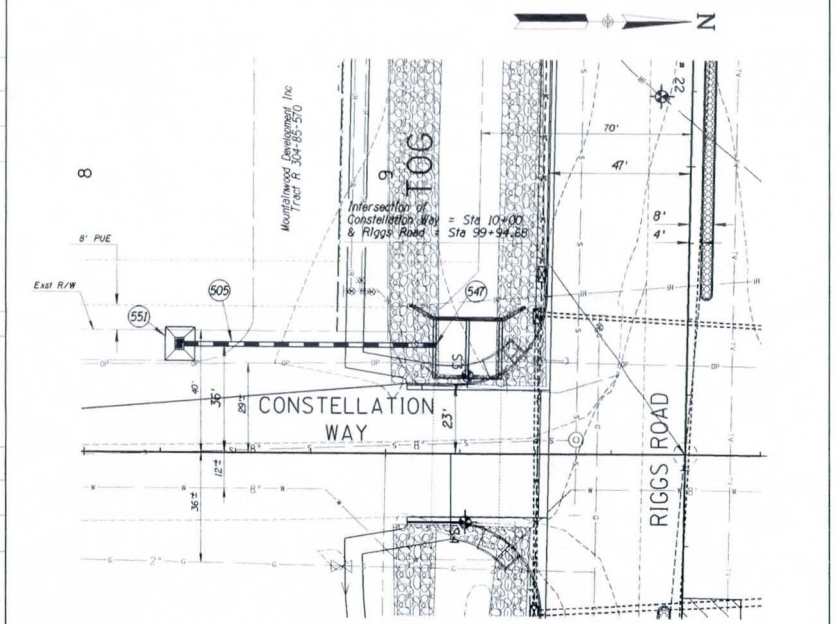

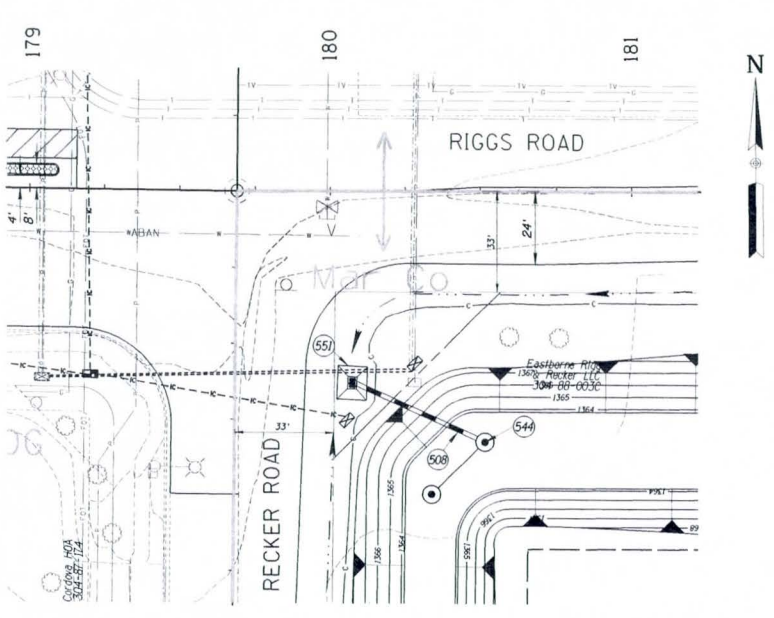

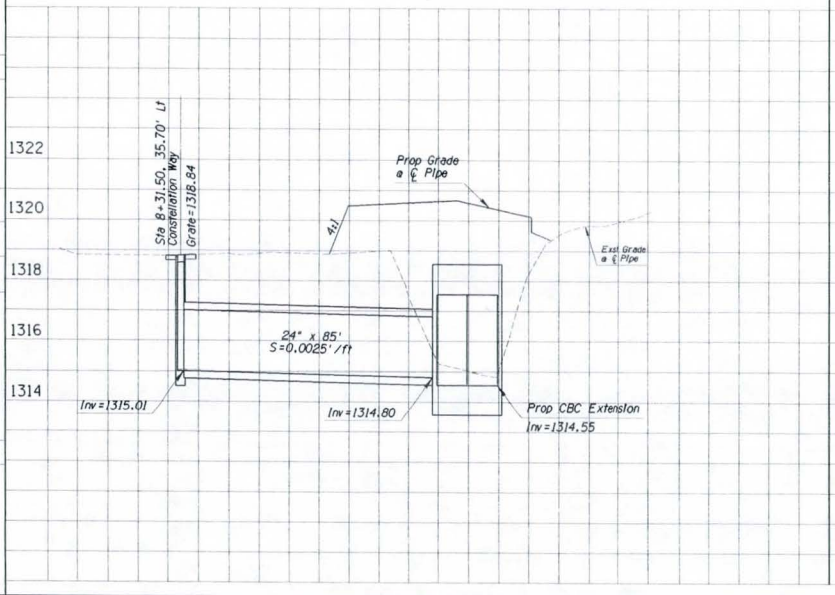

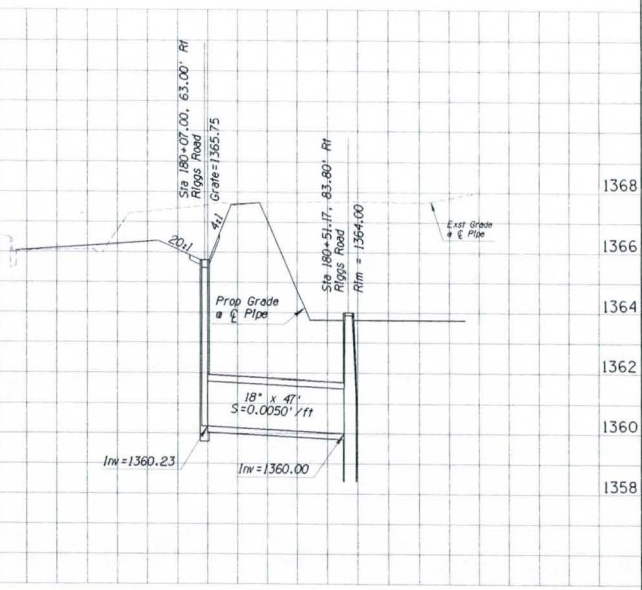

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
505	24" RGRCP CLASS III	LF	85
508	18" RGRCP CLASS III	LF	47
544	Dry Well Per Dtl U1, Dwg D-7.2	Ea	1
547	Pipe Penetration to CBC See Dtl D11	NPI	
551	Catch Basin with Apron per ADOT Std C-15.80	Ea	2

NOTE: All Dimensions to Face of Curb

REMOVALS

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

PIPE LATERAL PLAN AND PROFILE

GILBERT ARIZONA

CONSTELLATION WAY
STA 8+31.50
RIGGS ROAD
STA 180+07.00

DR: HM	DES:	CH:	CK: RPW	DWG. NO. D-4.11
DATE: 12/09	DATE: 12/09	DATE: 12/09	DATE: 12/09	
SCALE: 1"=20' HORIZONTAL 1"=2' VERTICAL				OF

ST100

REVISION BY TOWN OF GILBERT
NO. DESCRIPTION REV. BY CKD. BY DATE

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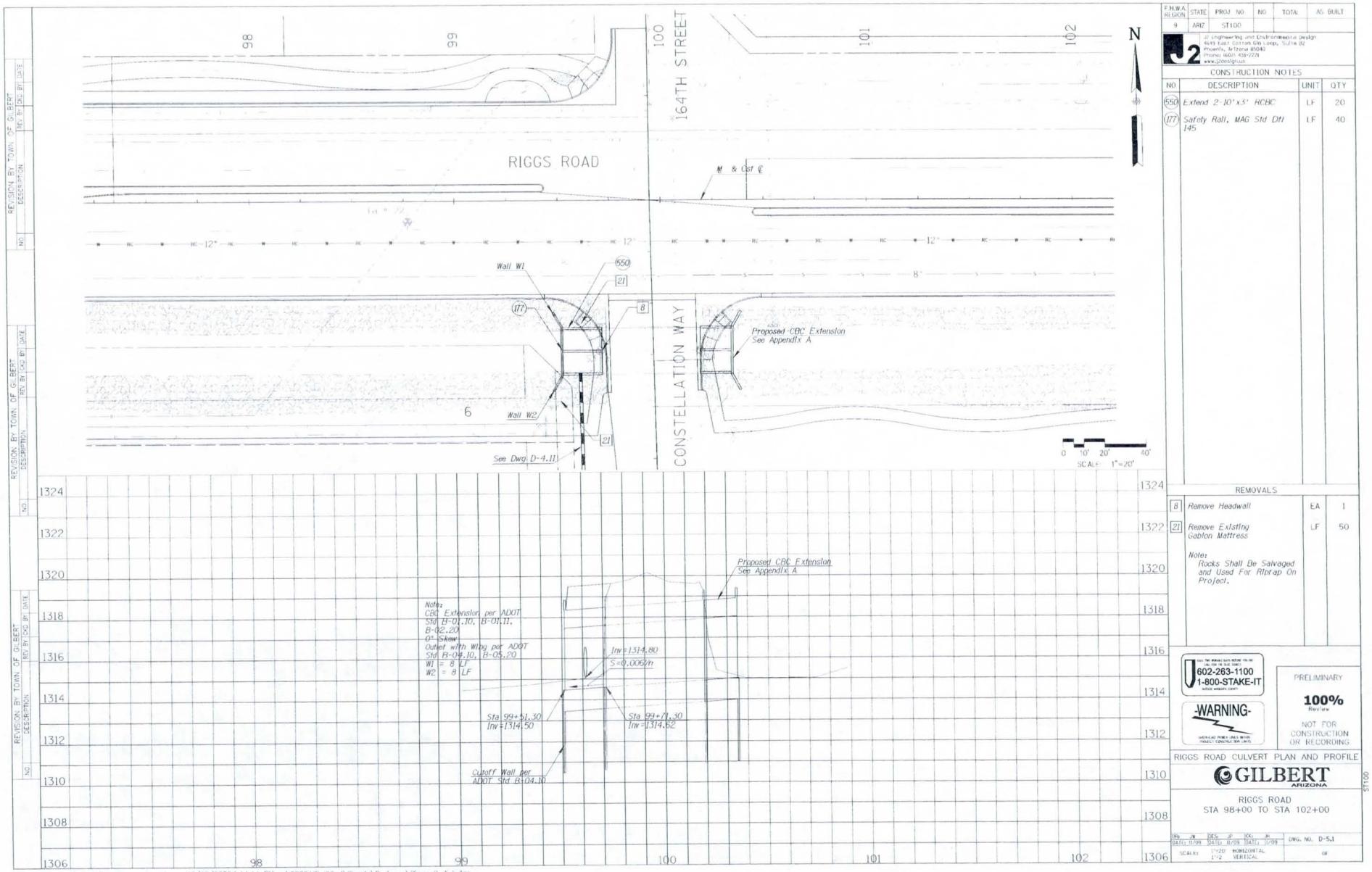

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite 32
Phoenix, Arizona 85040
Phone: (602) 438-2221
www.j2design.us

CONSTRUCTION NOTES

NO.	DESCRIPTION	UNIT	QTY
(550)	Extend 2-10'x5' RCBC	LF	20
(177)	Safety Rail, MAG Std Dtl 145	LF	40

REMOVALS

8	Remove Headwall	EA	1
21	Remove Existing Gabion Mattress	LF	50

Note:
Rocks Shall Be Salvaged and Used For Riprap On Project.

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CKD. BY	DATE

602-263-1100
1-800-STAKE-IT

-WARNING-

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD CULVERT PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 98+00 TO STA 102+00

DR: JR	DES: JF	QC: JH
DATE: 11/09	DATE: 11/09	DATE: 11/09

DWG. NO. D-5.1

SCALES: 1"=20' HORIZONTAL
1"=2 VERTICAL

OF

ST100

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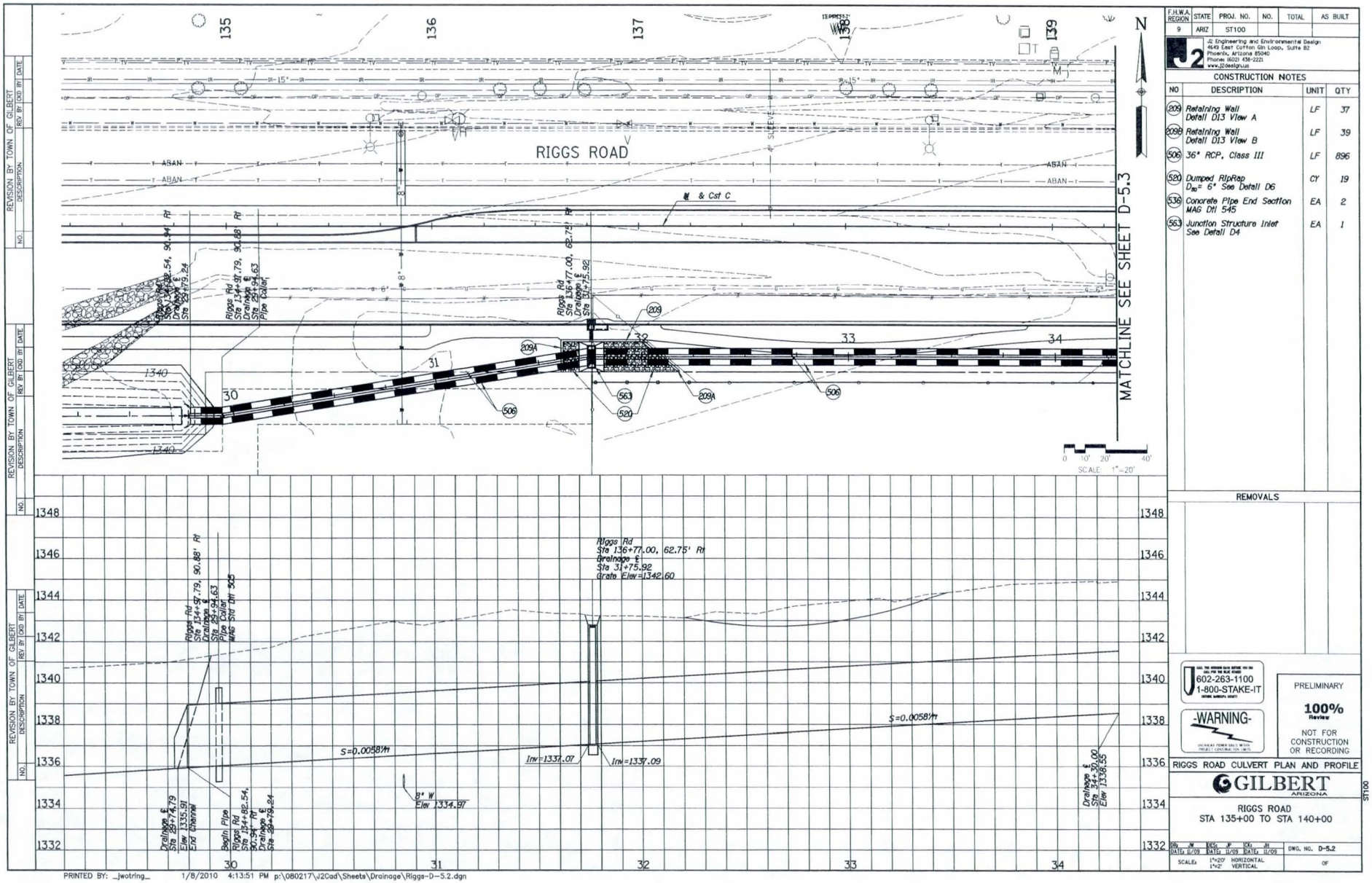

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite B2
Phoenix, Arizona 85040
Phone: (602) 438-2221
www.j2design.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
209	Retaining Wall Detail D13 View A	LF	37
209B	Retaining Wall Detail D13 View B	LF	39
506	36" RCP, Class III	LF	896
520	Dumped RipRap D_{50}= 6" See Detail D6	CY	19
538	Concrete Pipe End Section MAG Dtl 545	EA	2
563	Junction Structure Inlet See Detail D4	EA	1

REMOVALS

602-263-1100
1-800-STAKE-IT

-WARNING-

PRELIMINARY
100% Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD CULVERT PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 135+00 TO STA 140+00

DR. JM	DES. JP	CK. JH
DATE 11/09	DATE 11/09	DATE 11/09

SCALE: 1"=20' HORIZONTAL, 1"=2' VERTICAL

DWG. NO. D-5.2

OF

ST100

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CKD. BY	DATE

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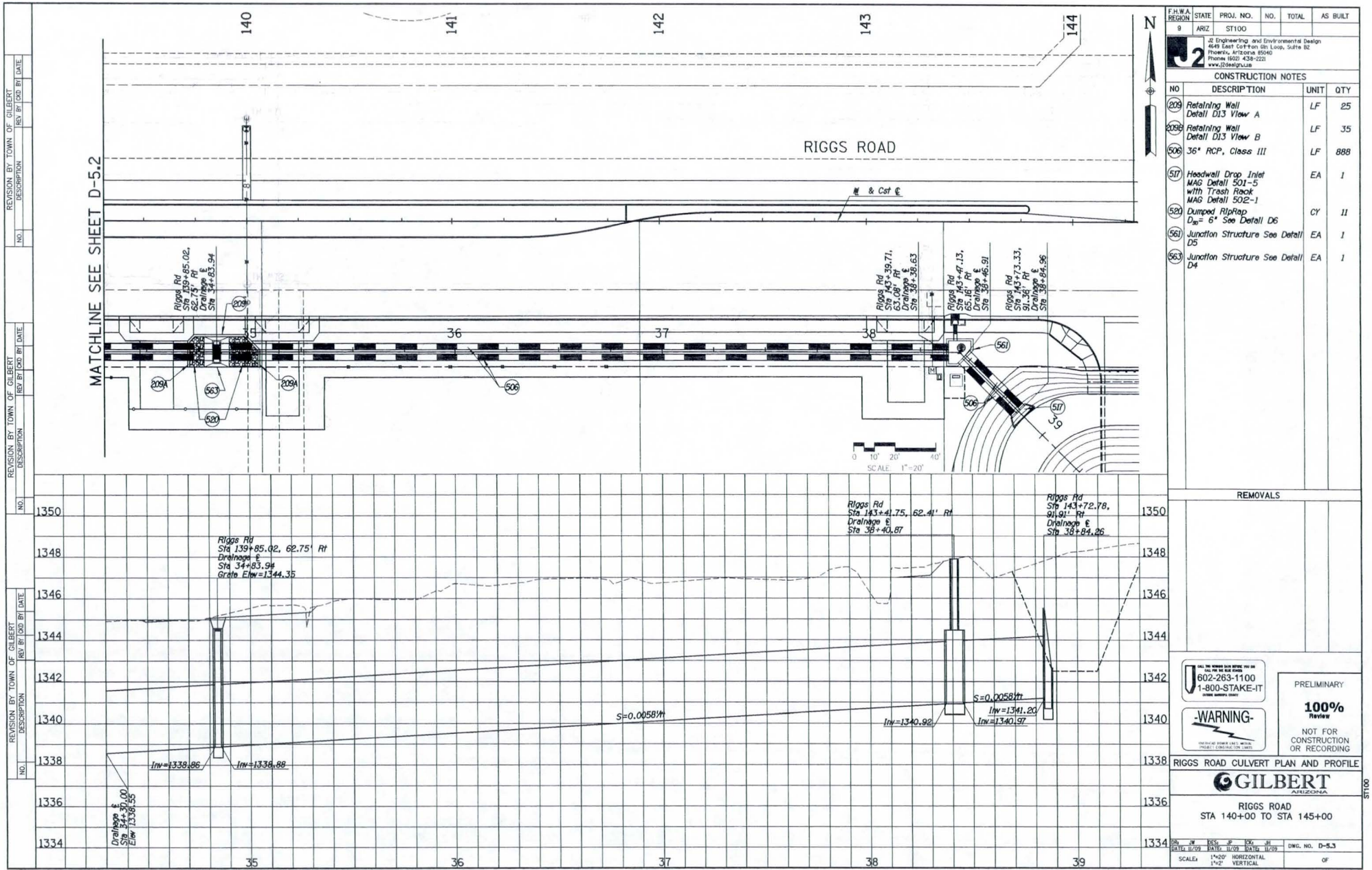

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite B2
Phoenix, Arizona 85040
Phone (602) 438-2221
www.j2design.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
209	Retaining Wall Detail D13 View A	LF	25
209B	Retaining Wall Detail D13 View B	LF	35
506	36" RCP, Class III	LF	888
517	Headwall Drop Inlet MAG Detail 501-5 with Trash Rack MAG Detail 502-1	EA	1
520	Dumped RipRap D_{50}= 6" See Detail D6	CY	11
561	Junction Structure See Detail D5	EA	1
563	Junction Structure See Detail D4	EA	1

REMOVALS

CALL TWO WORKING DAYS BEFORE YOU DIG
CALL OR BE ELSE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

-WARNING-
OVERHEAD POWER LINES WITHIN PROJECT CONSTRUCTION LIMITS

PRELIMINARY
100% Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD CULVERT PLAN AND PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 140+00 TO STA 145+00

DN: JW	CK'D: JP	CK'd: JH	DWG. NO. D-5.3
DATE: 11/09	DATE: 11/09	DATE: 11/09	
SCALE: 1"=20' HORIZONTAL 1"=2' VERTICAL			OF

ST100

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CK'D BY	DATE

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CK'D BY	DATE

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CK'D BY	DATE

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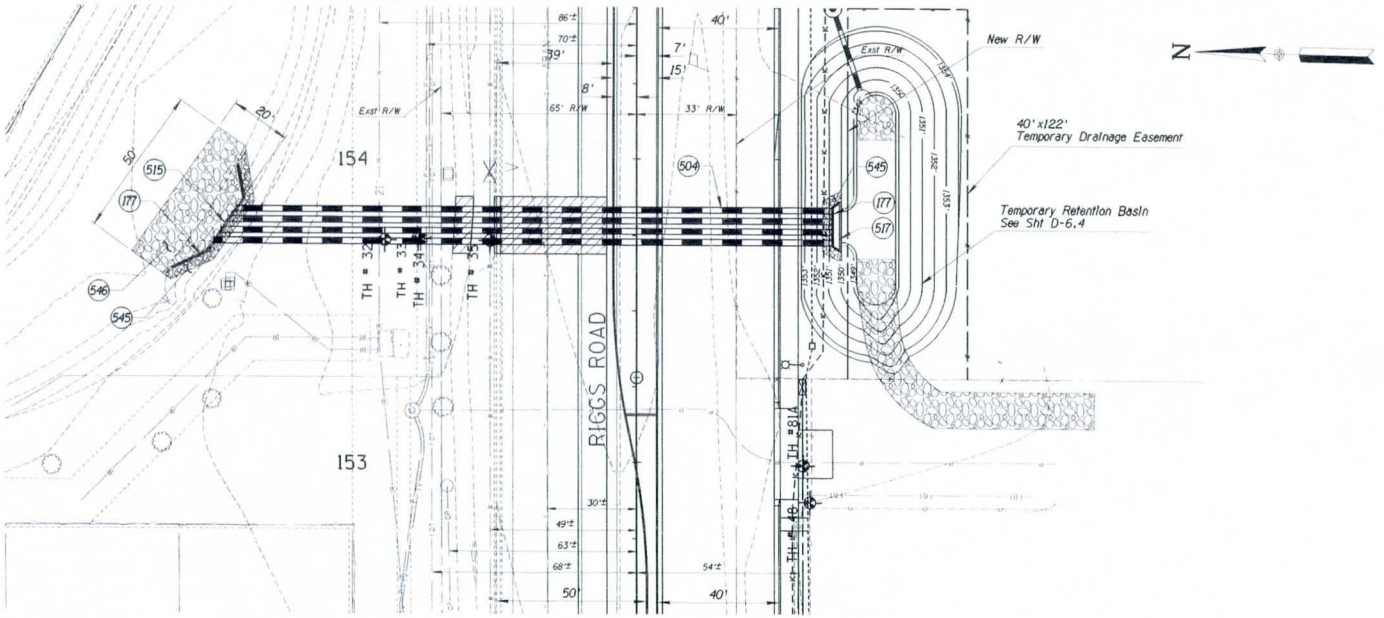
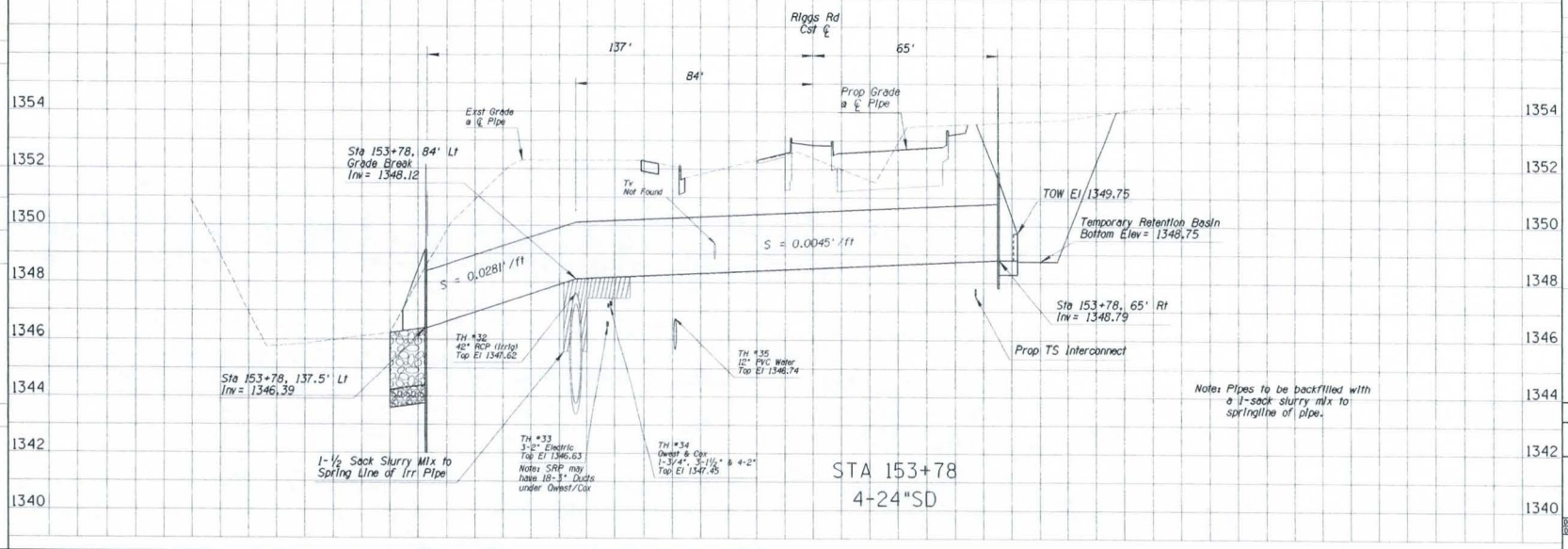




F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
(177)	Safety Rail MAG Dtl 145	LF	63
(504)	24" RGRCP Class V	LF	812
(515)	Headwall Per Dtl D3	Ea	1
(517)	Headwall Per Dtl D2	Ea	1
(545)	Rock Mulch, Gradation C See Dtl D7	CY	9
(546)	Dumped Riprap, D_{50} =12" See Dtl D6	CY	64

NOTE: All Dimensions to Face of Curb

REMOVALS

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD 4-24" PIPES PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 153+78

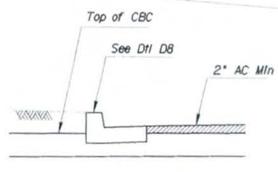
DR: JRW	DES: RAB	CK: RPW	DWG. NO. D-5.4
DATE: 12/09	DATE: 12/09	DATE: 12/09	
SCALE: 1"=20' HORIZONTAL 1"=2' VERTICAL			OF

ST100

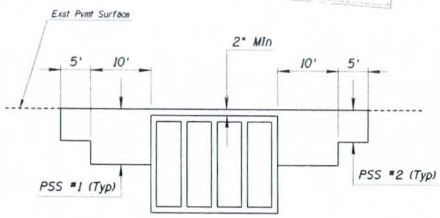
REVISION BY TOWN OF GILBERT
NO. DESCRIPTION REV BY (OK) BY DATE

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

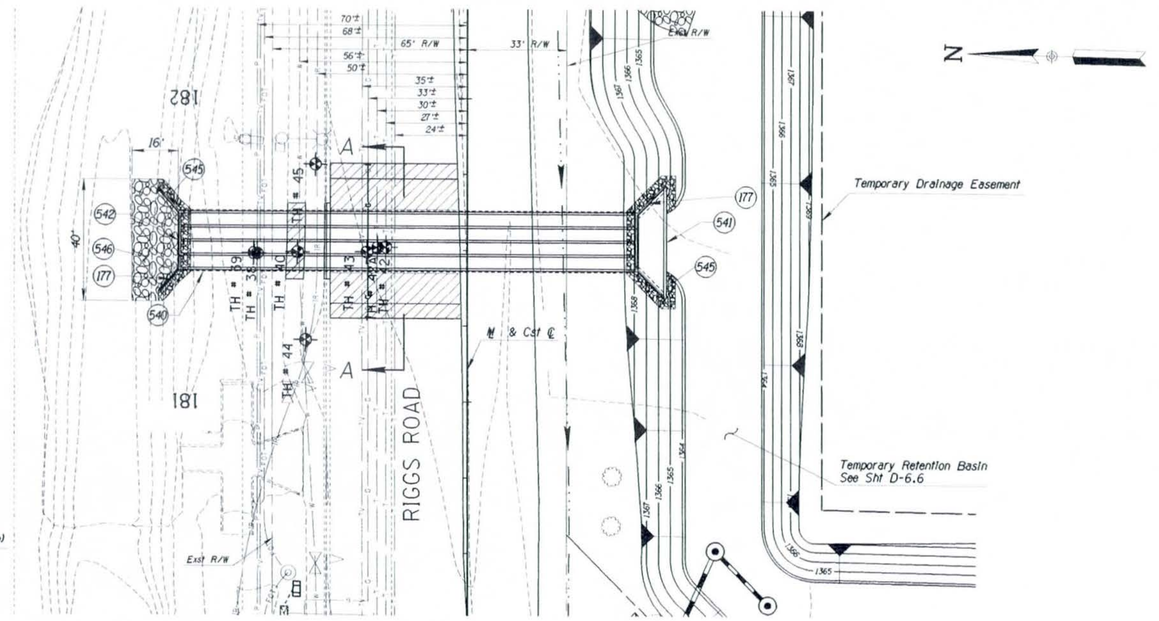
NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

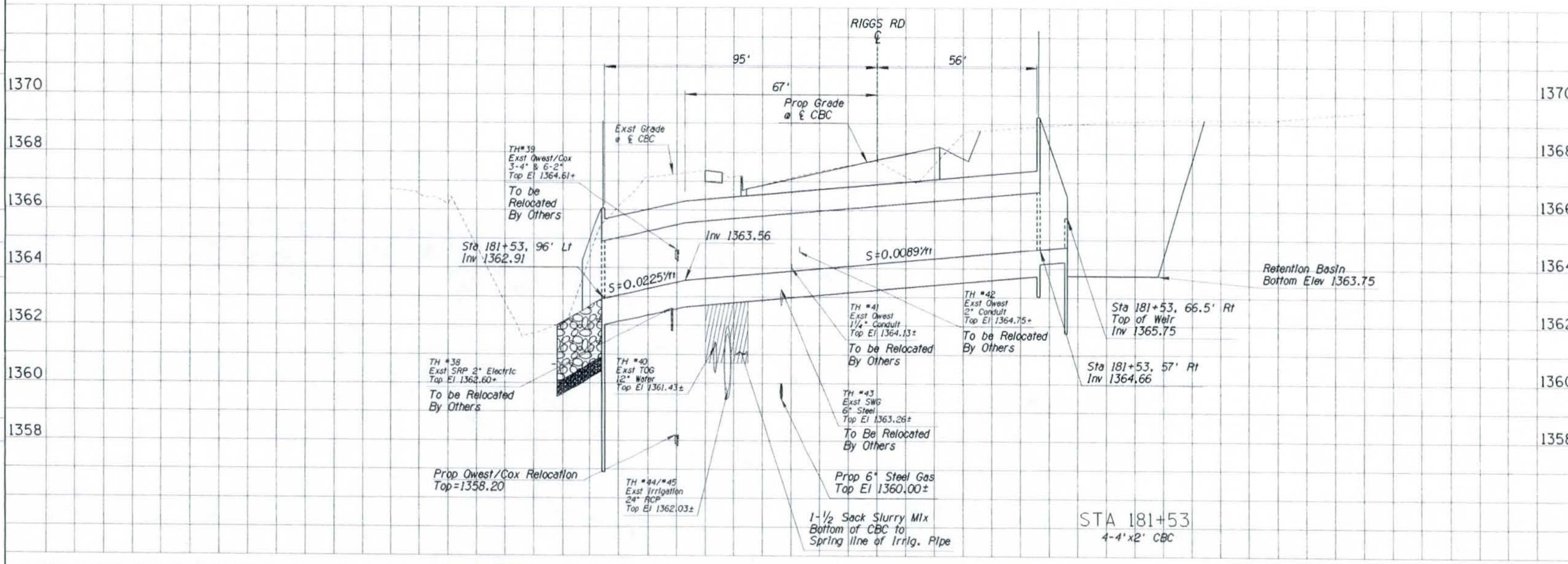


CURB DETAIL
NTS



SECTON A-A
NTS





STA 181+53
4-4'x2' CBC

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
177	Safety Rail MAG Dtl 145	LF	85
540	4-4'x2' Concrete Box Culvert. See Dtl D8	LF	153
541	Drop Inlet Structure See Dtl D8	Ea	1
542	Outlet Structure See Dtl D8	Ea	1
545	Rock Mulch, Gradation C See Dtl D7	CY	14
546	Dumped Riprap, D_{50}=12" See Dtl D6	CY	40

NOTE: All Dimensions to Face of Curb

REMOVALS

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD CBC PROFILE

GILBERT
ARIZONA

RIGGS ROAD
STA 181+53

DR: JRW	DES: RAB	CK: BPW	DWG. NO. D-5.5
DATE: 12/09	DATE: 12/09	DATE: 12/09	

SCALE: 1"=20' HORIZONTAL, 1"=2' VERTICAL

ST100

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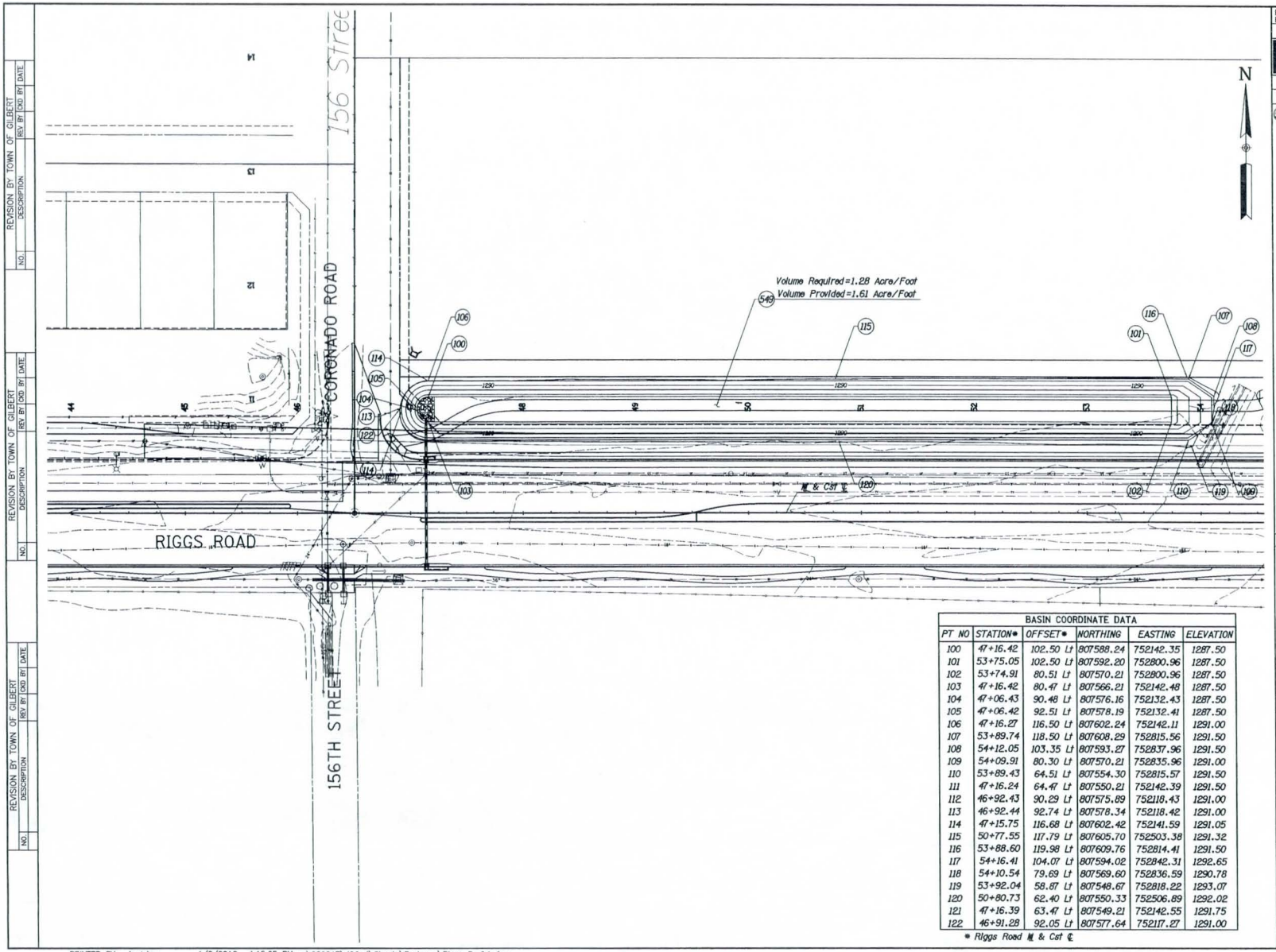

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CKD. BY	DATE

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CKD. BY	DATE

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CKD. BY	DATE

BASIN COORDINATE DATA

PT NO	STATION*	OFFSET*	NORTHING	EASTING	ELEVATION
100	47+16.42	102.50 Lt	807588.24	752142.35	1287.50
101	53+75.05	102.50 Lt	807592.20	752800.96	1287.50
102	53+74.91	80.51 Lt	807570.21	752800.96	1287.50
103	47+16.42	80.47 Lt	807566.21	752142.48	1287.50
104	47+06.43	90.48 Lt	807576.16	752132.43	1287.50
105	47+06.42	92.51 Lt	807578.19	752132.41	1287.50
106	47+16.27	116.50 Lt	807602.24	752142.11	1291.00
107	53+89.74	118.50 Lt	807608.29	752815.56	1291.50
108	54+12.05	103.35 Lt	807593.27	752837.96	1291.50
109	54+09.91	80.30 Lt	807570.21	752835.96	1291.00
110	53+89.43	64.51 Lt	807554.30	752815.57	1291.50
111	47+16.24	64.47 Lt	807550.21	752142.39	1291.50
112	46+92.43	90.29 Lt	807575.89	752118.43	1291.00
113	46+92.44	92.74 Lt	807578.34	752118.42	1291.00
114	47+15.75	116.68 Lt	807602.42	752141.59	1291.05
115	50+77.55	117.79 Lt	807605.70	752503.38	1291.32
116	53+88.60	119.98 Lt	807609.76	752814.41	1291.50
117	54+16.41	104.07 Lt	807594.02	752842.31	1292.65
118	54+10.54	79.69 Lt	807569.60	752836.59	1290.78
119	53+92.04	58.87 Lt	807548.67	752818.22	1293.07
120	50+80.73	62.40 Lt	807550.33	752506.89	1292.02
121	47+16.39	63.47 Lt	807549.21	752142.55	1291.75
122	46+91.28	92.05 Lt	807577.64	752117.27	1291.00

* Riggs Road ℄ & Csf ℄

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite 82
Phoenix, Arizona 85040
Phone: (602) 438-2221
www.j2design.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
549	Earthwork For Retention Basins	CY	2603

REMOVALS

602-263-1100
1-800-STAKE-IT

-WARNING-

PRELIMINARY
100% Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD BASIN PLAN

GILBERT ARIZONA

RIGGS ROAD
BASIN GEOMETRY & PLAN LAYOUT

ST100

DES. JW DATE: 11/09	DRN. JP DATE: 11/09	CK'D. AH DATE: 11/09	DWG. NO. D-6.1
SCALE: 1"=40' HORIZONTAL N/A VERTICAL			OF

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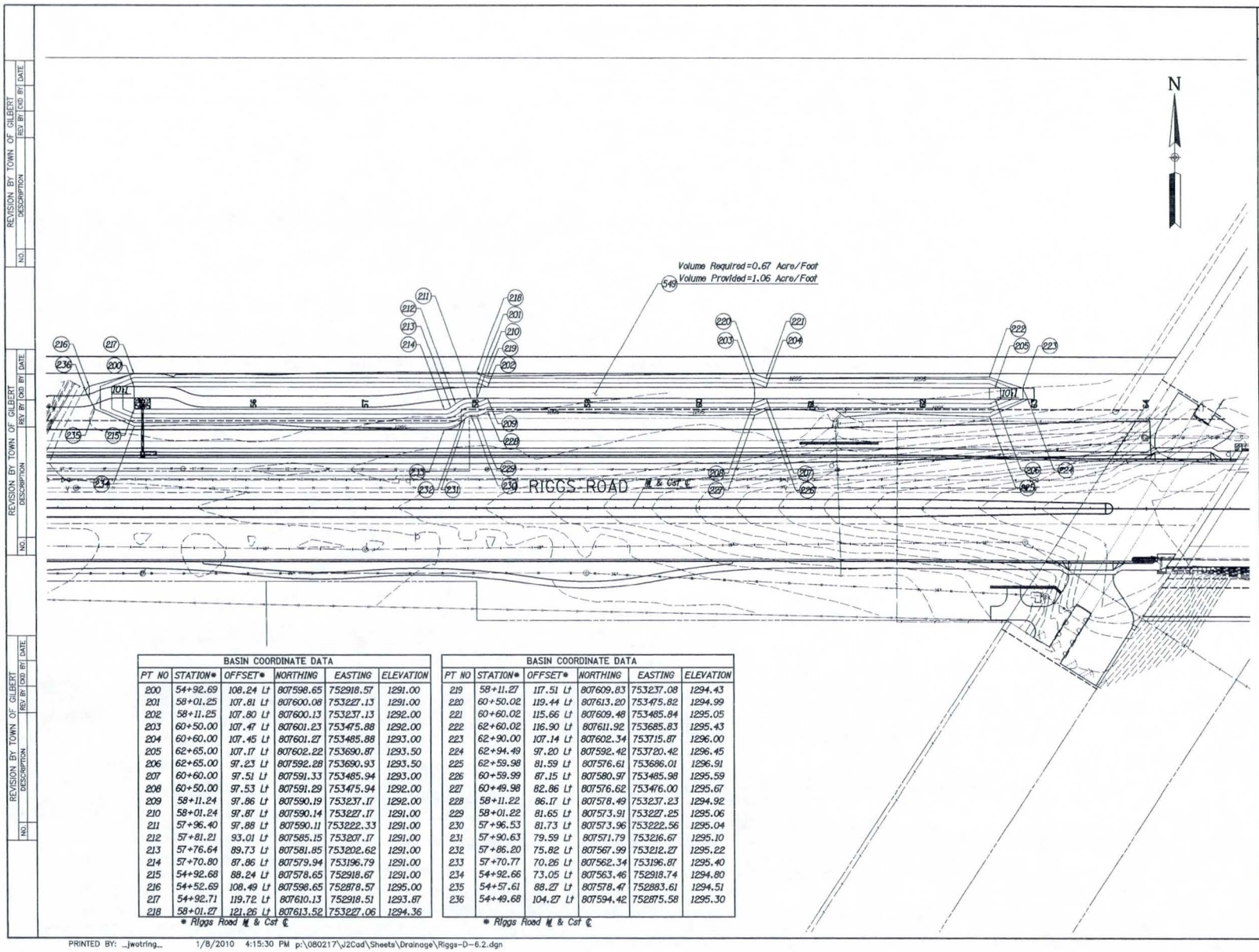

BASIN COORDINATE DATA					
PT NO	STATION*	OFFSET*	NORTHING	EASTING	ELEVATION
200	54+92.69	108.24 Lt	807598.65	752918.57	1291.00
201	58+01.25	107.81 Lt	807600.08	753227.13	1291.00
202	58+11.25	107.80 Lt	807600.13	753237.13	1292.00
203	60+50.00	107.47 Lt	807601.23	753475.88	1292.00
204	60+60.00	107.45 Lt	807601.27	753485.88	1293.00
205	62+65.00	107.17 Lt	807602.22	753690.87	1293.50
206	62+65.00	97.23 Lt	807592.28	753690.93	1293.50
207	60+60.00	97.51 Lt	807591.33	753485.94	1293.00
208	60+50.00	97.53 Lt	807591.29	753475.94	1292.00
209	58+11.24	97.86 Lt	807590.19	753237.17	1292.00
210	58+01.24	97.87 Lt	807590.14	753227.17	1291.00
211	57+96.40	97.88 Lt	807590.11	753222.33	1291.00
212	57+81.21	93.01 Lt	807585.15	753207.17	1291.00
213	57+76.64	89.73 Lt	807581.85	753202.62	1291.00
214	57+70.80	87.86 Lt	807579.94	753196.79	1291.00
215	54+92.68	88.24 Lt	807578.65	752918.67	1291.00
216	54+52.69	108.49 Lt	807598.65	752878.57	1295.00
217	54+92.71	119.72 Lt	807610.13	752918.51	1293.87
218	58+01.27	121.26 Lt	807613.52	753227.06	1294.36

* Riggs Road ℄ & Csf ℄

BASIN COORDINATE DATA					
PT NO	STATION*	OFFSET*	NORTHING	EASTING	ELEVATION
219	58+11.27	117.51 Lt	807609.83	753237.08	1294.43
220	60+50.02	119.44 Lt	807613.20	753475.82	1294.99
221	60+60.02	115.66 Lt	807609.48	753485.84	1295.05
222	62+60.02	116.90 Lt	807611.92	753685.83	1295.43
223	62+90.00	107.14 Lt	807602.34	753715.87	1296.00
224	62+94.49	97.20 Lt	807592.42	753720.42	1296.45
225	62+59.98	81.59 Lt	807576.61	753686.01	1296.91
226	60+59.99	87.15 Lt	807580.97	753485.98	1295.59
227	60+49.98	82.86 Lt	807576.62	753476.00	1295.67
228	58+11.22	86.17 Lt	807578.49	753237.23	1294.92
229	58+01.22	81.65 Lt	807573.91	753227.25	1295.06
230	57+96.53	81.73 Lt	807573.96	753222.56	1295.04
231	57+90.63	79.59 Lt	807571.79	753216.67	1295.10
232	57+86.20	75.82 Lt	807567.99	753212.27	1295.22
233	57+70.77	70.26 Lt	807562.34	753196.87	1295.40
234	54+92.66	73.05 Lt	807563.46	752918.74	1294.80
235	54+57.61	88.27 Lt	807578.47	752883.61	1294.51
236	54+49.68	104.27 Lt	807594.42	752875.58	1295.30

* Riggs Road ℄ & Csf ℄

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite B2
Phoenix, Arizona 85040
Phones (602) 438-2221
www.j2design.us

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
549	Earthwork For Retention Basins	CY	1715

REMOVALS

SCALE: 1"=40'

PRELIMINARY

100% Review

NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD BASIN PLAN

GILBERT ARIZONA

RIGGS ROAD
BASIN GEOMETRY & PLAN LAYOUT

DES. JP	DRN. JP	CHK. JP	DWG. NO. D-6.2
DATE: 11/09	DATE: 11/09	DATE: 11/09	
SCALE:	1"=40' HORIZONTAL		SHT. OF
	N/A VERTICAL		

ST100

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CKD. BY	DATE

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CKD. BY	DATE

REVISION BY TOWN OF GILBERT

NO.	DESCRIPTION	REV. BY	CKD. BY	DATE

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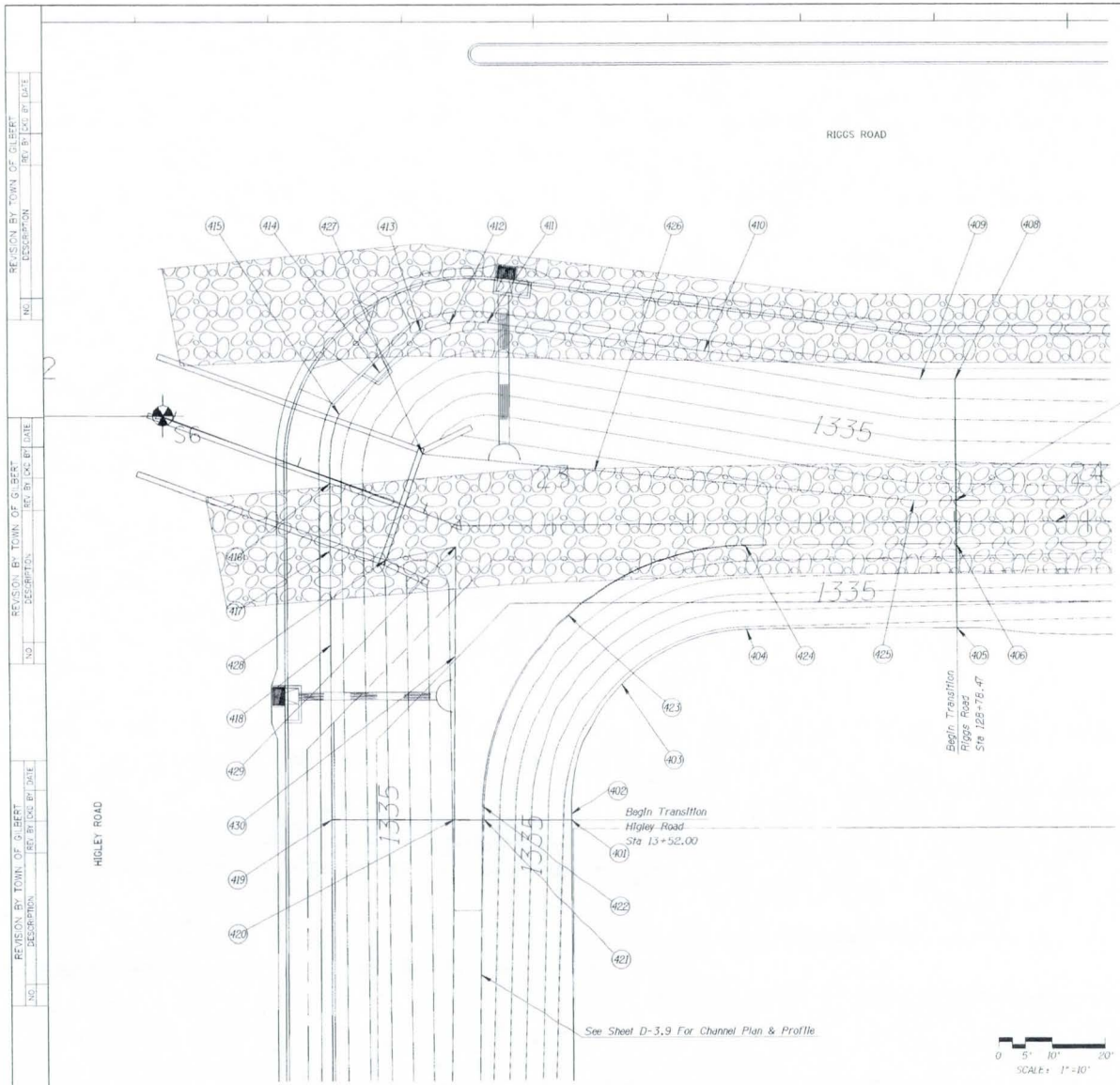


BASIN CORDINATE DATA					
PT NO	STATION*	OFFSET*	NORTHING	EASTING	ELEVATION
401	128+06.09	148.35	807330.43	760233.41	1337.467
402	128+06.09	147.25	807331.53	760233.40	1337.456
403	128+15.57	123.04	807355.79	760242.74	1337.241
404	128+39.03	113.01	807365.96	760266.13	1337.152
405	128+78.46	112.84	807366.37	760305.57	1337.384
406	128+78.41	97.20	807382.01	760305.42	1332.222
407	128+78.42	89.20	807390.01	760305.39	1332.222
408	128+78.47	66.47	807412.74	760305.30	1337.904
409	128+71.94	66.47	807412.70	760298.77	1337.87
410	128+31.42	61.08	807417.84	760258.22	1337.527
411	127+90.89	55.70	807422.99	760217.66	1337.183
412	127+83.73	55.85	807422.80	760210.50	1337.075
413	127+78.31	57.25	807421.37	760205.09	1337.01
414	127+70.58	64.96	807413.61	760197.41	1337.109
415	127+62.86	72.67	807405.86	760189.73	1337.208
416	127+61.05	85.65	807392.87	760188.00	1337.516
417	127+61.03	98.15	807380.37	760188.05	1337.547
418	127+60.99	115.65	807362.87	760188.12	1337.59
419	127+60.93	148.15	807330.37	760188.24	1337.671
420	127+83.96	148.20	807330.46	760211.27	1331.914
421	127+89.27	148.14	807330.54	760216.58	1331.913
422	127+89.30	145.67	807333.01	760216.59	1331.901
423	128+05.73	110.26	807368.52	760232.82	1331.943
424	128+38.85	97.34	807381.63	760265.86	1331.978
425	128+70.92	89.22	807389.94	760297.88	1332.175
426	128+10.79	83.39	807395.42	760237.72	1331.81
427	127+78.46	80.22	807398.40	760205.38	1331.62
428	127+71.36	99.98	807378.59	760198.39	1331.62
429	127+84.59	97.45	807381.20	760211.61	1331.657
430	127+84.34	117.82	807360.83	760211.47	1331.76

* Riggs Road ℳ & Csf ℄

FHWA REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite 101
Phoenix, Arizona 85040
Phone: (602) 438-2221
www.j2eadgroup.com

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
549	Earthwork For Retention Basins	CY	678

REMOVALS

602-263-1100
1-800-STAKE-IT

-WARNING-

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD BASIN PLAN

GILBERT
ARIZONA

RIGGS ROAD
TRANSITION GEOMETRY & PLAN LAYOUT

DN: JM	DES.: JP	DR.: JM	DWG. NO. D-6.3
DATE: 11/09	DATE: 11/09	DATE: 11/09	
SCALE: 1"=20' HORIZONTAL N/A VERTICAL			08

ST100

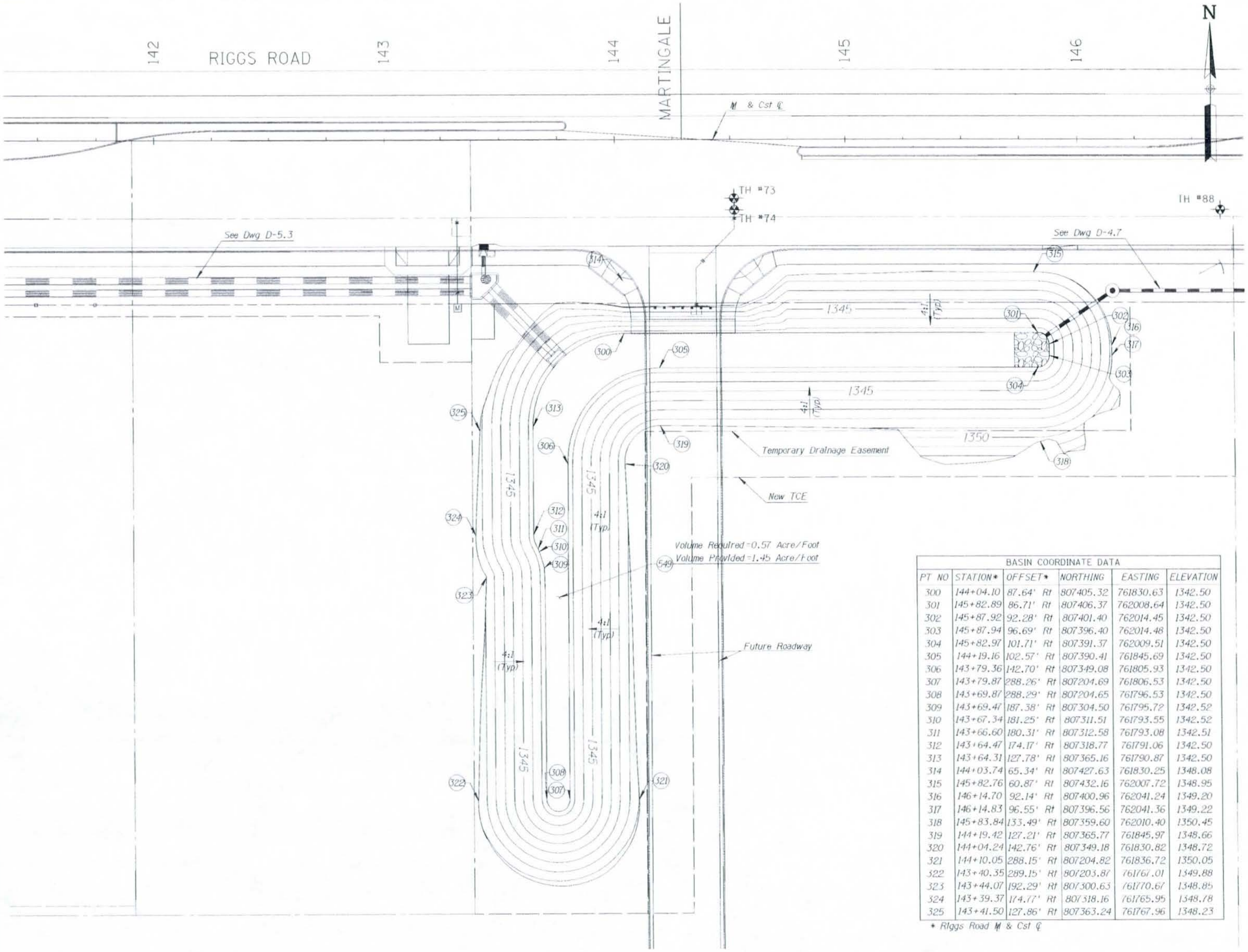
REVISION BY TOWN OF GILBERT

NO	DESCRIPTION	REV. BY	CKD. BY	DATE

Plotted By: mross-touchin 11/19/2009 1:16:33 PM p:\080217\j2Cad\Sheets\Drainage\Riggs-D-6.3.dgn

F.H.W.A. REGION	STATE	PROJ NO.	NO	TOTAL	AS BUILT
9	ARIZ	ST100			

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite B2
Phoenix, Arizona 85040
Phone: (602) 438-2221
www.j2design.us



BASIN COORDINATE DATA					
PT NO	STATION*	OFFSET*	NORTHING	EASTING	ELEVATION
300	144+04.10	87.64' Rt	807405.32	761830.63	1342.50
301	145+82.89	86.71' Rt	807406.37	762008.64	1342.50
302	145+87.92	92.28' Rt	807401.40	762014.45	1342.50
303	145+87.94	96.69' Rt	807396.40	762014.48	1342.50
304	145+82.97	101.71' Rt	807391.37	762009.51	1342.50
305	144+19.16	102.57' Rt	807390.41	761845.69	1342.50
306	143+79.36	142.70' Rt	807349.08	761805.93	1342.50
307	143+79.87	288.26' Rt	807204.69	761806.53	1342.50
308	143+69.87	288.29' Rt	807204.65	761796.53	1342.50
309	143+69.47	187.38' Rt	807304.50	761795.72	1342.52
310	143+67.34	181.25' Rt	807311.51	761793.55	1342.52
311	143+66.60	180.31' Rt	807312.58	761793.08	1342.51
312	143+64.47	174.17' Rt	807318.77	761791.06	1342.50
313	143+64.31	127.78' Rt	807365.16	761790.87	1342.50
314	144+03.74	65.34' Rt	807427.63	761830.25	1348.08
315	145+82.76	60.87' Rt	807432.16	762007.72	1348.95
316	146+14.70	92.14' Rt	807400.96	762041.24	1349.20
317	146+14.83	96.55' Rt	807396.56	762041.36	1349.22
318	145+83.84	133.49' Rt	807359.60	762010.40	1350.45
319	144+19.42	127.21' Rt	807365.77	761845.97	1348.66
320	144+04.24	142.76' Rt	807349.18	761830.82	1348.72
321	144+10.05	288.15' Rt	807204.82	761836.72	1350.05
322	143+40.35	289.15' Rt	807203.87	761767.01	1349.88
323	143+44.07	192.29' Rt	807300.63	761770.67	1348.85
324	143+39.37	174.77' Rt	807318.16	761765.95	1348.78
325	143+41.50	127.86' Rt	807363.24	761767.96	1348.23

* Riggs Road ℞ & Cst ℄

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
549	Earthwork For Retention Basins	CY	4215

REMOVALS

0 10' 20' 40'
SCALE: 1"=20'

602-263-1100
1-800-STAKE-IT

-WARNING-

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD BASIN PLAN

GILBERT ARIZONA

RIGGS ROAD
BASIN GEOMETRY & PLAN LAYOUT

DR: JW	DES: JP	CK: JH	DWG. NO. D-6.4
DATE: 11/09	DATE: 11/09	DATE: 11/09	
SCALE:	1"=20' HORIZONTAL	N/A VERTICAL	OF

ST100

REVISION BY TOWN OF GILBERT — NO | DESCRIPTION | REV BY | CKD BY | DATE

REVISION BY TOWN OF GILBERT — NO | DESCRIPTION | REV BY | CKD BY | DATE

REVISION BY TOWN OF GILBERT — NO | DESCRIPTION | REV BY | CKD BY | DATE

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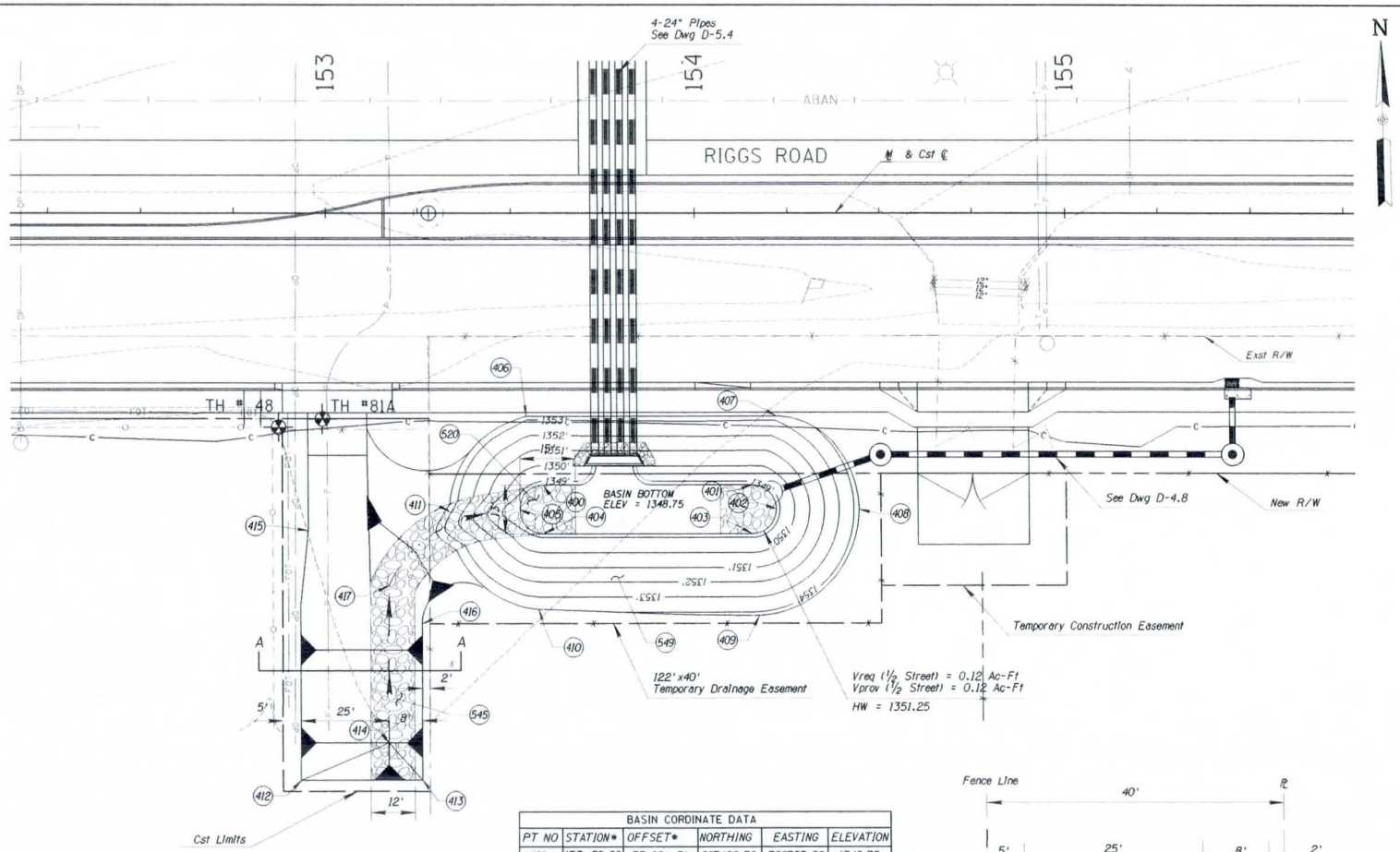

BASIN CORDINATE DATA

PT NO	STATION*	OFFSET*	NORTHING	EASTING	ELEVATION
400	153+59.00	73.00' Rt	807420.76	762785.82	1348.75
401	154+15.21	73.00' Rt	807421.08	762842.03	1348.75
402	154+21.71	79.50' Rt	807414.62	762848.56	1348.75
403	154+15.21	86.00' Rt	807408.08	762842.10	1348.75
404	153+59.00	86.00' Rt	807407.76	762785.89	1348.75
405	153+52.50	79.50' Rt	807414.22	762779.36	1348.75
406	153+54.59	54.50' Rt	807439.23	762781.21	1353.24
407	154+21.83	54.50' Rt	807439.62	762848.54	1353.28
408	154+44.10	79.00' Rt	807415.25	762870.95	1354.35
409	154+15.70	107.95' Rt	807386.13	762842.72	1354.24
410	153+59.00	106.28' Rt	807387.48	762786.01	1353.82
411	153+35.55	82.46' Rt	807411.17	762762.42	1353.00
412	152+92.74	152.00' Rt	807341.38	762720.03	1355.00±
413	153+25.66	152.00' Rt	807341.57	762752.95	1355.00±
414	153+16.68	142.00' Rt	807351.52	762743.91	1354.00
415	152+95.00	85.00' Rt	807408.39	762721.90	1353.99
416	153+25.76	110.00' Rt	807383.57	762752.80	1353.79
417	153+16.78	100.00' Rt	807393.54	762743.76	1353.25

* Riggs Road ℄ & Cst ℄

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
520	Dumped Riprap, D_{50}=6" See Dtl D6	CY	8
545	Rock Mulch, Gradation C See Dtl D7	CY	45
549	Earthwork For Retention Basins	CY	540

NOTE: All Dimensions to Face of Curb

REMOVALS

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(ARIZONA BLUE STAKE, INC.)

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100%
Review
NOT FOR CONSTRUCTION OR RECORDING

RIGGS ROAD BASIN PLAN

GILBERT ARIZONA

RIGGS ROAD
BASIN GEOMETRY & PLAN LAYOUT

DR: HM	DES:	CK: RPW
DATE: 12/09	DATE: 12/09	DATE: 12/09

DWG. NO. D-6.5

SCALE: 1"=15' HORIZONTAL
N/A VERTICAL

OF

ST100

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV BY | CKD BY | DATE

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV BY | CKD BY | DATE

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV BY | CKD BY | DATE

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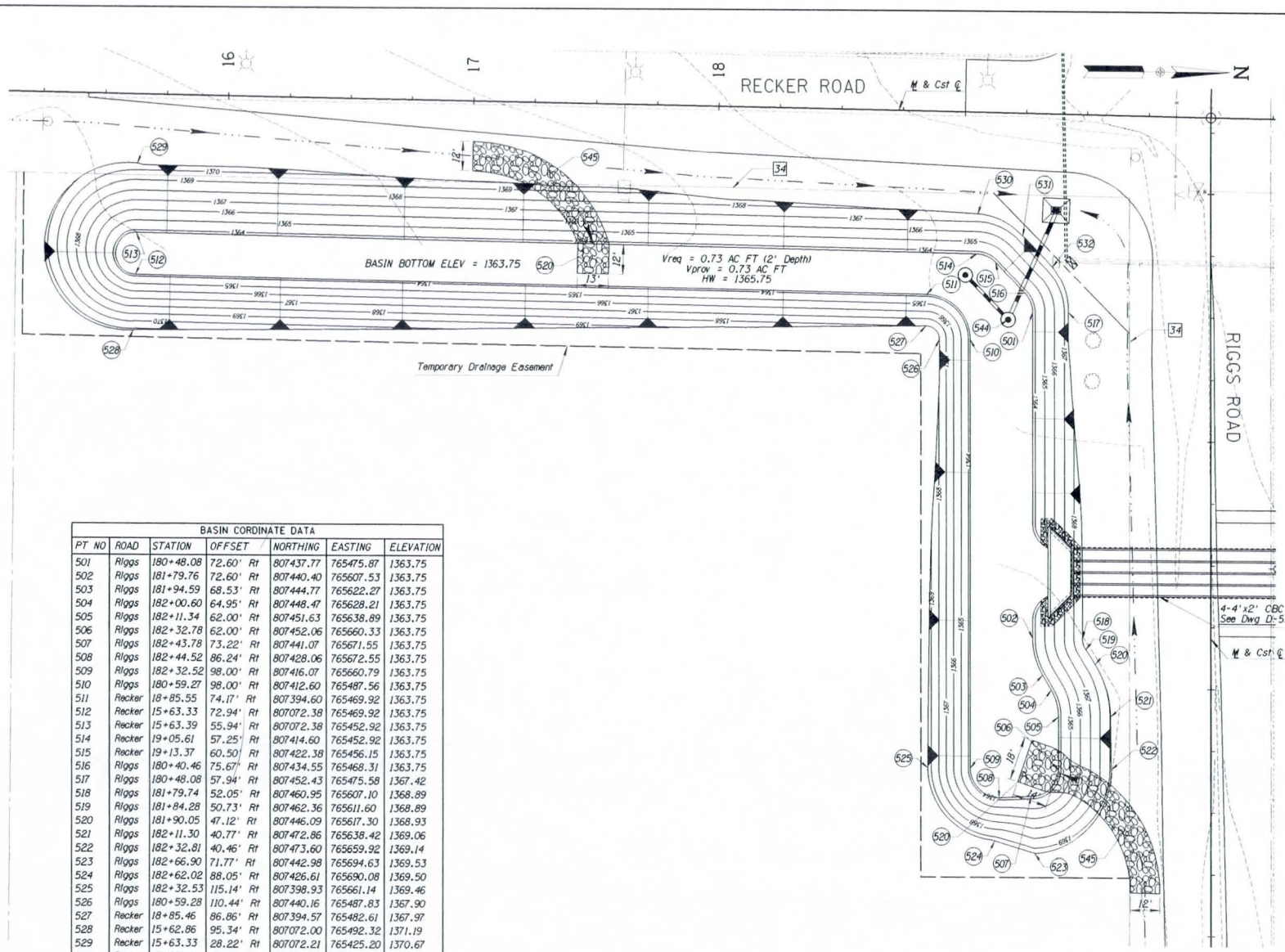

BASIN CORDINATE DATA

PT NO	ROAD	STATION	OFFSET	NORTHING	EASTING	ELEVATION
501	Riggs	180+48.08	72.60' Rt	807437.77	765475.87	1363.75
502	Riggs	181+79.76	72.60' Rt	807440.40	765607.53	1363.75
503	Riggs	181+94.59	68.53' Rt	807444.77	765622.27	1363.75
504	Riggs	182+00.60	64.95' Rt	807448.47	765628.21	1363.75
505	Riggs	182+11.34	62.00' Rt	807451.63	765638.89	1363.75
506	Riggs	182+32.78	62.00' Rt	807452.06	765660.33	1363.75
507	Riggs	182+43.78	73.22' Rt	807441.07	765671.55	1363.75
508	Riggs	182+44.52	86.24' Rt	807428.06	765672.55	1363.75
509	Riggs	182+32.52	98.00' Rt	807416.07	765660.79	1363.75
510	Riggs	180+59.27	98.00' Rt	807412.60	765487.56	1363.75
511	Recker	18+85.55	74.17' Rt	807394.60	765469.92	1363.75
512	Recker	15+63.33	72.94' Rt	807072.38	765469.92	1363.75
513	Recker	15+63.39	55.94' Rt	807072.38	765452.92	1363.75
514	Recker	19+05.61	57.25' Rt	807414.60	765452.92	1363.75
515	Recker	19+13.37	60.50' Rt	807422.38	765456.15	1363.75
516	Riggs	180+40.46	75.67' Rt	807434.55	765468.31	1363.75
517	Riggs	180+48.08	57.94' Rt	807452.43	765475.58	1367.42
518	Riggs	181+79.74	52.05' Rt	807460.95	765607.10	1368.89
519	Riggs	181+84.28	50.73' Rt	807462.36	765611.60	1368.89
520	Riggs	181+90.05	47.12' Rt	807446.09	765617.30	1368.93
521	Riggs	182+11.30	40.77' Rt	807472.86	765638.42	1369.06
522	Riggs	182+32.81	40.46' Rt	807473.60	765659.92	1369.14
523	Riggs	182+66.90	71.77' Rt	807442.98	765694.63	1369.53
524	Riggs	182+62.02	88.05' Rt	807426.61	765690.08	1369.50
525	Riggs	182+32.53	115.14' Rt	807398.93	765661.14	1369.46
526	Riggs	180+59.28	110.44' Rt	807440.16	765487.83	1367.90
527	Recker	18+85.46	86.86' Rt	807394.57	765482.61	1367.97
528	Recker	15+62.86	95.34' Rt	807072.00	765492.32	1371.19
529	Recker	15+63.33	28.22' Rt	807072.21	765425.20	1370.67
530	Recker	19+05.70	41.15' Rt	807414.63	765436.83	1367.77
531	Recker	19+24.29	49.66' Rt	807433.25	765445.26	1367.59
532	Riggs	180+29.81	64.47' Rt	807445.53	765457.44	1367.61

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
520	Dumped Riprap. D_{50}=6" See Dtl D6	CY	15
544	Dry Well Per Dtl U1. Dwg D-2.2	Ea	1
545	Rock Mulch, Gradation C See Dtl D7	CY	58
549	Earthwork For Retention Basins	CY	4,784

NOTE: All Dimensions to Face of Curb

REMOVALS

34	Remove & Salvage & Reconstruct 6' High Temporary ChainLink Fence on R/W Line	LF	725

602-263-1100
1-800-STAKE-IT

PRELIMINARY
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GILBERT
ARIZONA

RIGGS ROAD
BASIN GEOMETRY & PLAN LAYOUT

DR: JRW	DES: RAB	CK: RPW	
DATE: 12/09	DATE: 12/09	DATE: 12/09	DWG. NO. D-6.6
SCALE: 1"=20' HORIZONTAL 1"=2' VERTICAL			SF

ST100

REVISION BY TOWN OF GILBERT

NO	DESCRIPTION	REV BY	CKD BY	DATE

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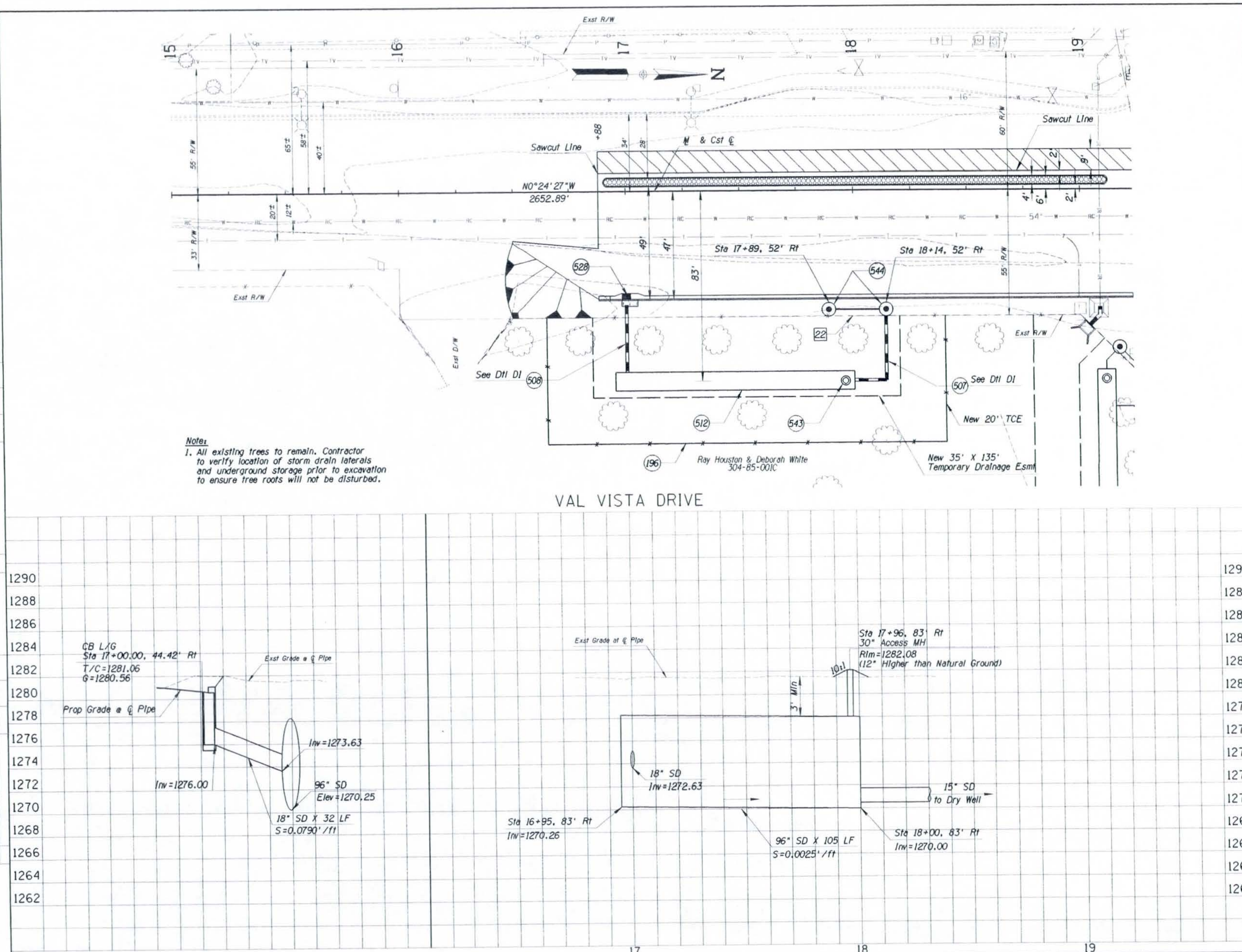

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
196	Temporary 6' High Chain Link Fence, Dwg G-9.1	LF	285
507	15" SD	LF	45
508	18" SD	LF	32
512	96" SD Underground Storage Per Dtl D1, Dwg D-2.1	LF	105
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L=3', V=5.1'	Ea	1
543	30" Access Manhole Riser with Neenah R-5900-G Cast Iron Frame and Cover	Ea	1
544	Dry Well Per Dtl D1, Dwg D-2.2	Ea	1

NOTE: All Dimensions to Face of Curb

REMOVALS

NO	DESCRIPTION	UNIT	QTY
22	Remove & Replace Fence to Construct Drywell & For Access, Dwg G-9.1	LF	40

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review

NOT FOR CONSTRUCTION OR RECORDING

UNDERGROUND STORAGE PLAN & PROFILE

GILBERT ARIZONA

VAL VISTA DRIVE
STA 15+00 TO STA 19+23

ST100

DR: LMR DATE: 12/09 DES: LAN DATE: 12/09 CK: RPW DATE: 12/09

DWG. NO. D-7.1

OF

SCALE: 1"=20' HORIZONTAL, VERTICAL

REVISION BY TOWN OF GILBERT — NO. | DESCRIPTION | REV BY | CKD BY | DATE

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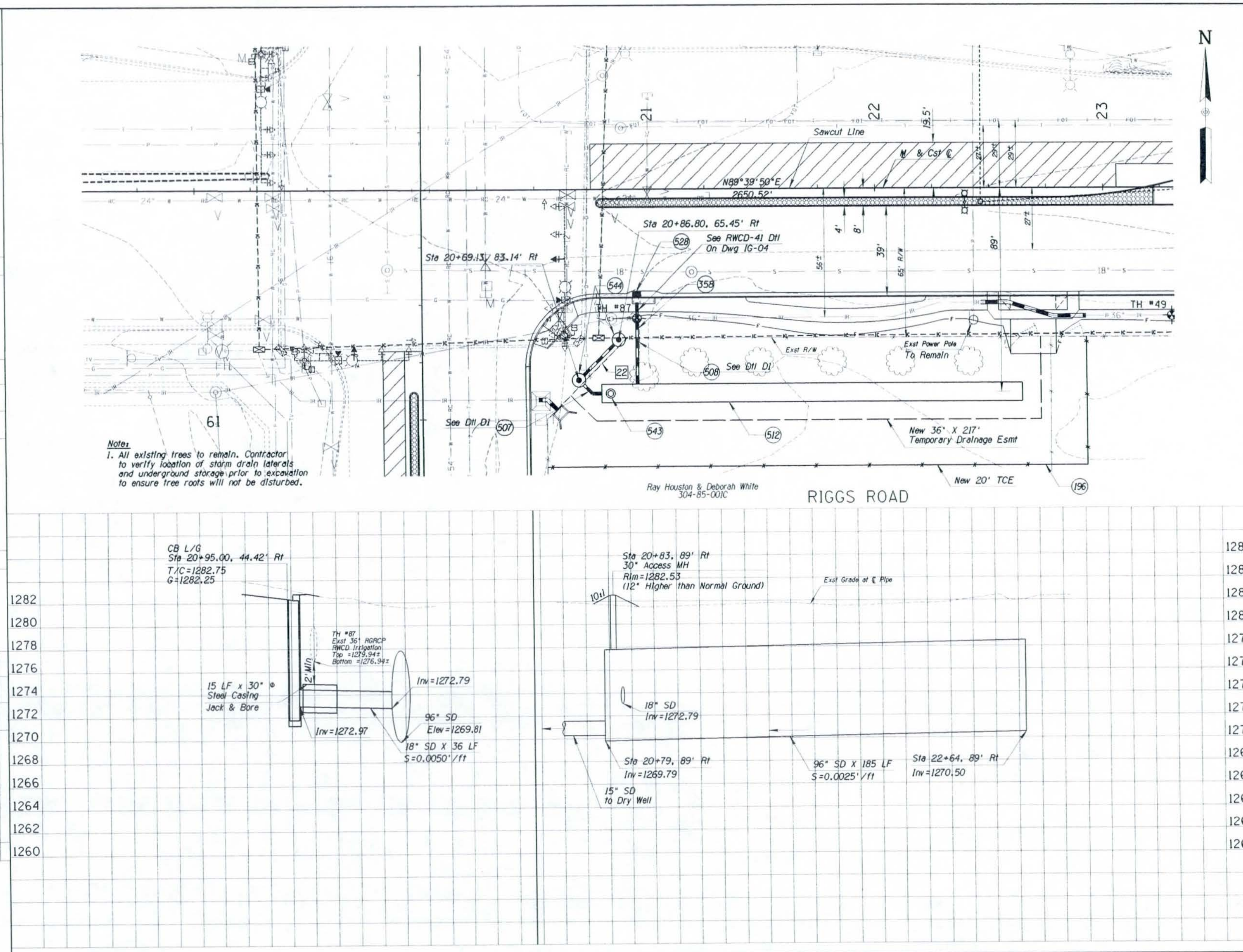

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
196	Temporary 6' High Chain Link Fence, Dwg G-9.1	LF	293
358	30" Steel Casing per Detail WE on Dwg U-1.05 (Jack & Bore)	LF	15
507	15" SD	LF	13
508	18" SD	LF	38
512	96" SD Underground Storage Per Dtl DI, Dwg D-2.1	LF	185
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L=6', V=9.8'	Ea	1
543	30" Access Manhole Riser with Neenah R-5900-G Cast Iron Frame and Cover	Ea	1
544	Dry Well Per Dtl DI, Dwg D-2.2	Ea	1

NOTE: All Dimensions to Face of Curb

REMOVALS

22	Remove & Replace Fence to Construct Drywell & For Access, Dwg G-9.1	LF	40

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

UNDERGROUND STORAGE PLAN & PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 20+70 TO STA 25+50

ST100

DR: LMR	DES: TAR	CK: RPW	DWG. NO. D-7.2
DATE: 12/09	DATE: 12/09	DATE: 12/09	

SCALE: 1"=20' HORIZONTAL, VERTICAL — OF

REVISION BY TOWN OF GILBERT — NO. | DESCRIPTION | REV BY | CKD BY | DATE

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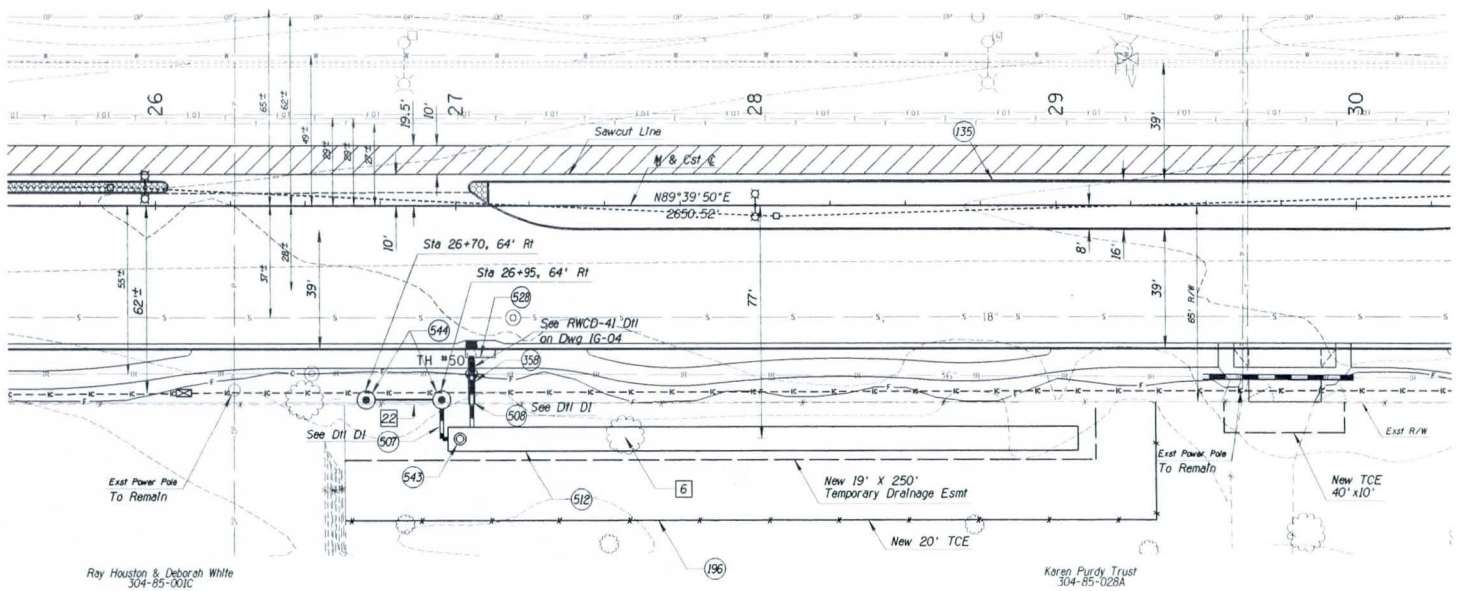
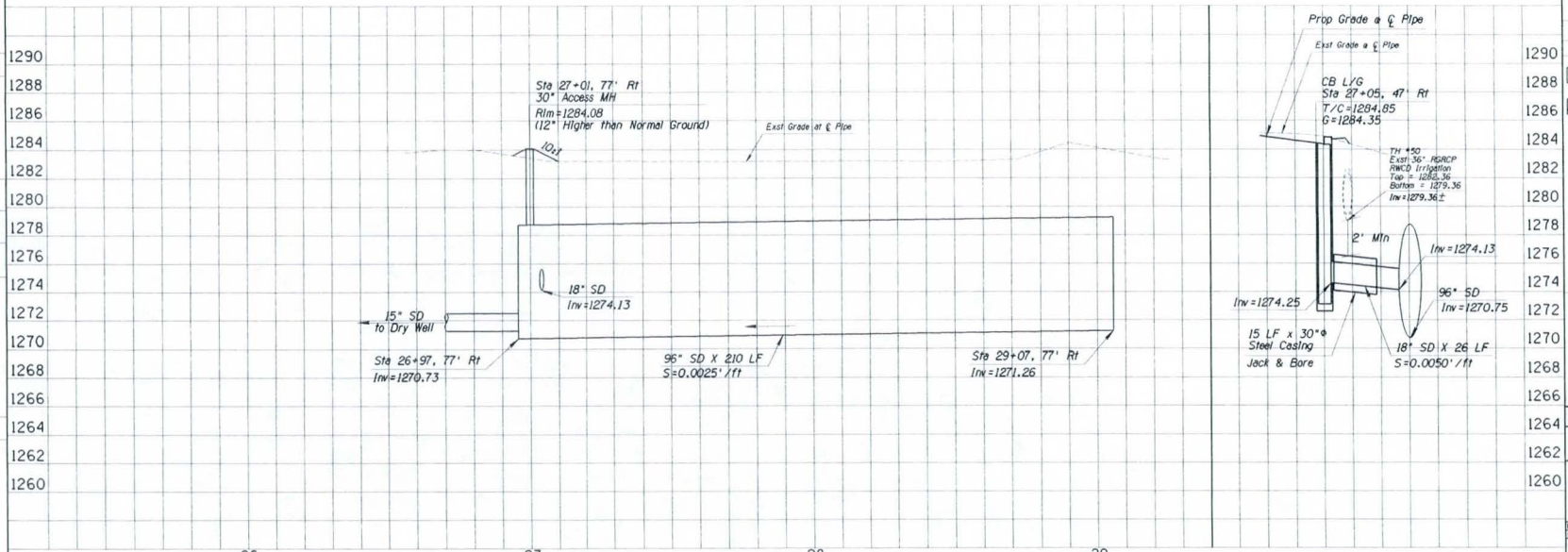


RIGGS ROAD



F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
196	Temporary 6' High Chain Link Fence, Dwg G-9.1	LF	309
358	30" Steel Casing per Detail WE on Dwg U-1.05 (Jack & Bore)	LF	15
507	15" SD	LF	15
508	18" SD	LF	26
512	96" SD Underground Storage Per Dtl D1, Dwg D-2.1	LF	210
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L=6', V=10.6'	Ea	1
543	30" Access Manhole Riser with Neenah R-5900-G Cast Iron Frame and Cover	Ea	1
544	Dry Well Per Dtl D1, Dwg D-2.2	Ea	1

NOTE: All Dimensions to Face of Curb

REMOVALS

6	Remove Tree	Ea	1
22	Remove & Replace Fence to Construct Drywell & For Access, Dwg G-9.1	LF	40

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

UNDERGROUND STORAGE PLAN & PROFILE

GILBERT
ARIZONA

RIGGS ROAD
STA 25+50 TO STA 30+30

ST100

DR:	DES:	CK:	RPW
DATE: 12/09	DATE: 12/09	DATE: 12/09	

DWG. NO. D-7.3

SCALE: 1"=20' HORIZONTAL, 1"=4' VERTICAL

SHT. OF

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV BY | CKD BY | DATE

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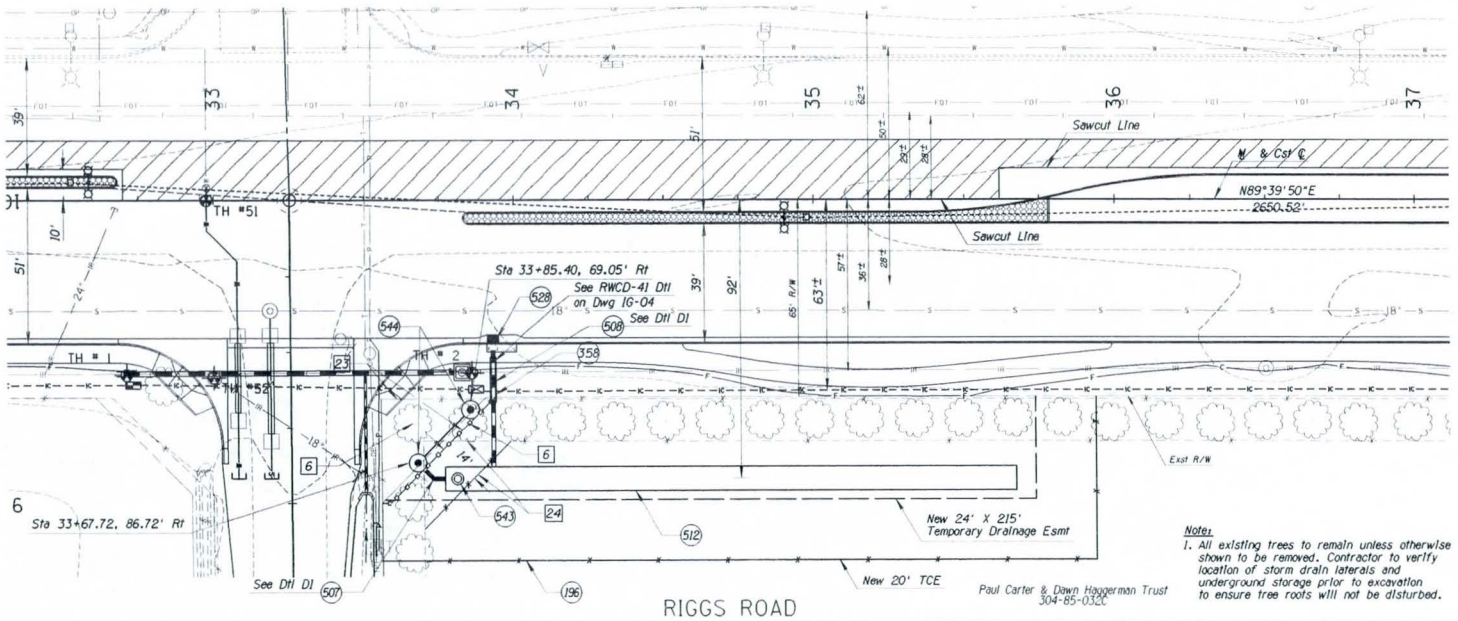
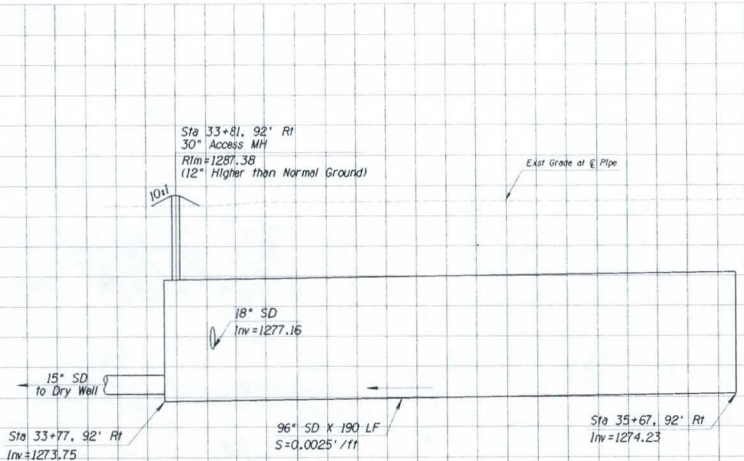
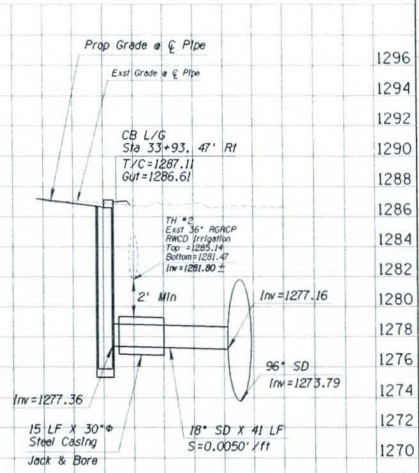


RIGGS ROAD





Note:
1. All existing trees to remain unless otherwise shown to be removed. Contractor to verify location of storm drain laterals and underground storage prior to excavation to ensure tree roots will not be disturbed.

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
196	Temporary 6' High Chain Link Fence, Dwg G-9.1	LF	292
358	30" Steel Casing per Detail WE on Dwg U-1.05 (Jack & Bore)	LF	15
507	15" SD	LF	11
508	18" SD	LF	41
512	96" SD Underground Storage Per Dtl D1, Dwg D-2.1	LF	190
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L=6, V=9.8'	Ea	1
543	30" Access Manhole Riser with Neenah R-5900-G Cast Iron Frame and Cover	Ea	1
544	Dry Well Per Dtl D1, Dwg D-2.2	Ea	1

NOTE: All Dimensions to Face of Curb

REMOVALS

6	Remove Tree	Ea	2
23	Remove 71' & Relocate 53' Steel Tube Fence at Exst R/W, Dwg G-9.1	LF	53
24	Remove 58' & Relocate 41' 3-Strand Electric Fence at Exst R/W, Dwg G-9.1	LF	41

CALL TWO WORKING DAYS BEFORE YOU DIG CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

UNDERGROUND STORAGE PLAN & PROFILE

GILBERT ARIZONA

RIGGS ROAD
STA 32+30 TO STA 37+10

ST100

DR: TMR	DES: TAW	CK: RPM
DATE: 12/09	DATE: 12/09	DATE: 12/09

DWG. NO. D-7.4

SCALE: 1"=20' HORIZONTAL, 1"=5' VERTICAL

SHT. OF

REVISION BY TOWN OF GILBERT
NO. | DESCRIPTION | REV. BY | CKD. BY | DATE

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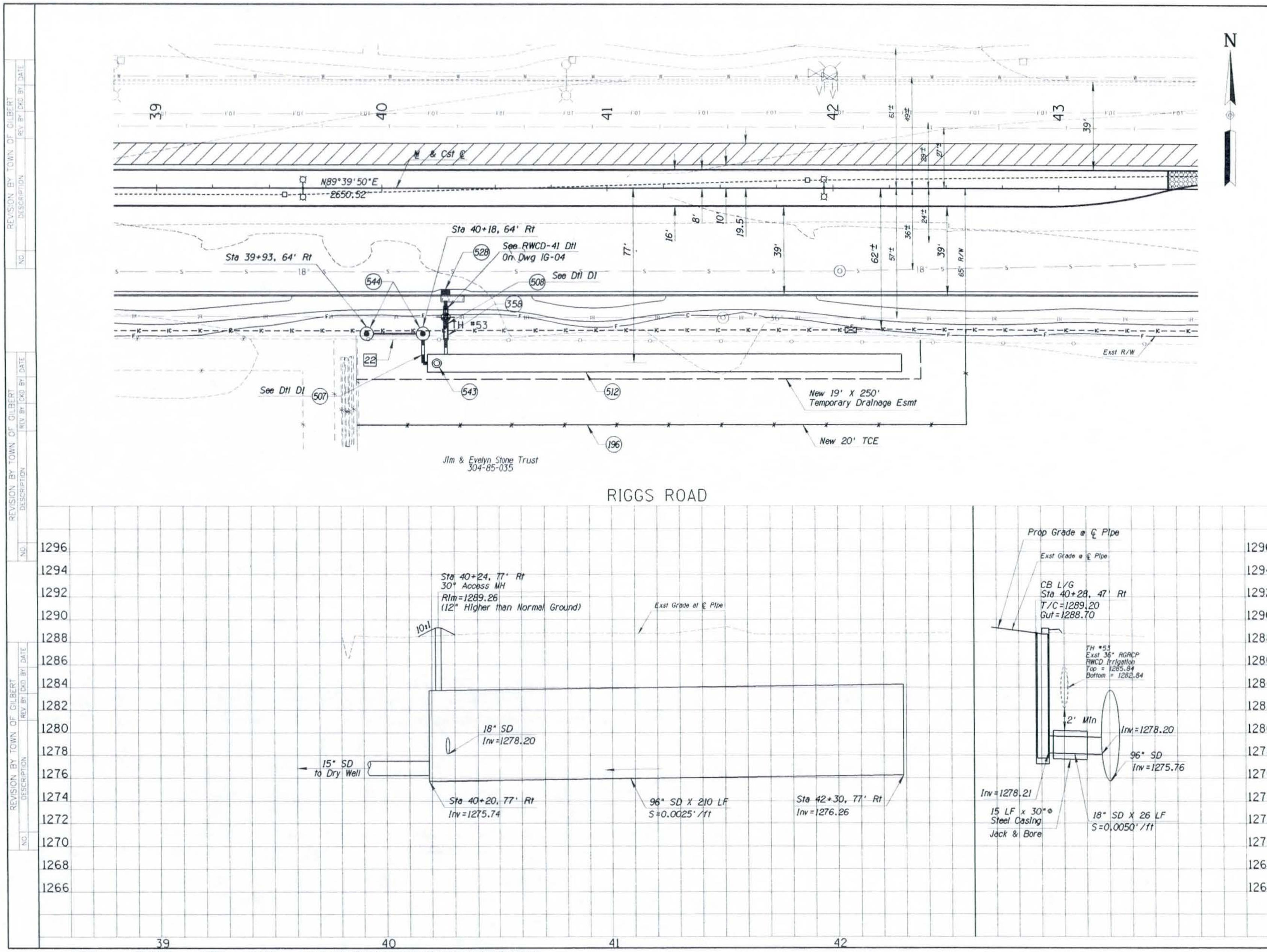


F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
196	Temporary 6' High Chain Link Fence, Dwg G-9.1	LF	309
358	30" Steel Casing per Detail (Jack & Bore)	LF	15
507	15" SD	LF	15
508	18" SD	LF	26
512	96" SD Underground Storage Per Dtl DI, Dwg D-2.1	LF	210
528	Single Grate Catch Basin Type "D" MAG Dtl 533, L=6', V=10.0'	Ea	1
543	30" Access Manhole Riser with Neenah R-5900-G Cast Iron Frame and Cover	Ea	1
544	Dry Well Per Dtl DI, Dwg D-2.2	Ea	1

NOTE: All Dimensions to Face of Curb

REMOVALS

NO	DESCRIPTION	UNIT	QTY
22	Remove & Replace Fence to Construct Drywell & For Access, Dwg G-9.1	LF	40

602-263-1100
1-800-STAKE-IT

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

UNDERGROUND STORAGE PLAN & PROFILE

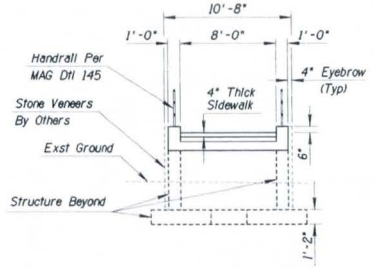
GILBERT ARIZONA

RIGGS ROAD
STA 38+80 TO STA 43+60

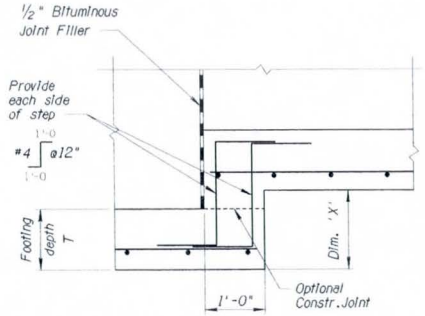
DRN: MR DATE: 12/09 DES: LAW DATE: 12/09 CKD: RPW DATE: 12/09
DWG. NO. D-7.5
SCALE: 1"=20' HORIZONTAL 1"=4' VERTICAL
OF

ST100

ewatkins gilberthalf.tbl 1/13/2010 5:14:05 PM w:\transportation\gilbert\riggs road st100\cadd\civil\nfra\plan sheets\Riggs_D-7.5.dgn

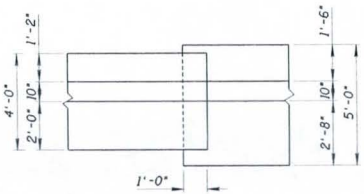


SECTION A-A
MID-SPAN

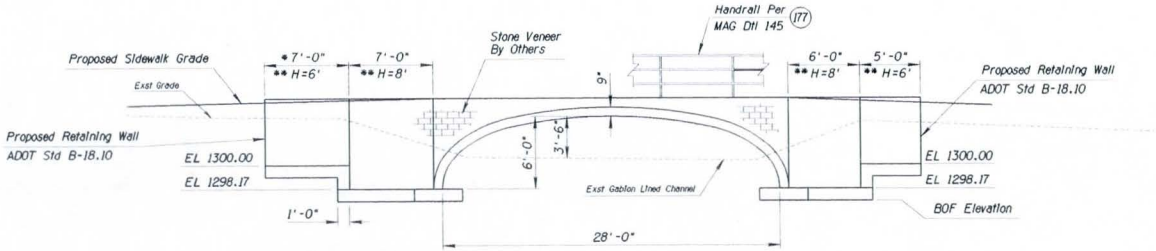


NOTE:
See Elevation below for location of footing steps and Dim. 'X'.

FOOTING STEP SECTION

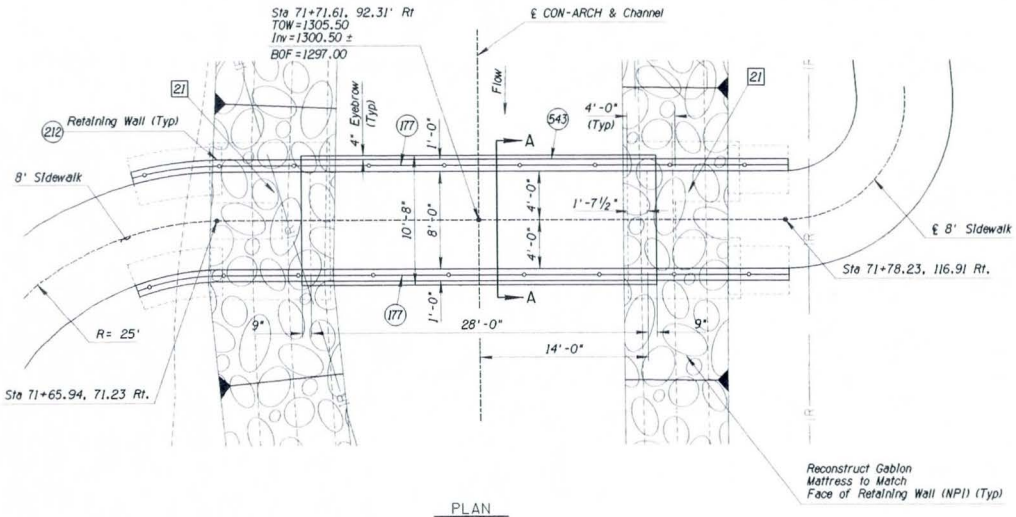


FOOTING STEP DETAIL



* Measured along outside face of wall.
** Use H shown for structural dimensions and reinforcement, actual height shall be based on TOW and BOF elevations.

ELEVATION
Scale: 1"=5'



PLAN
Scale: 1"=5'

CON-ARCH 28' X 6' CULVERT
PEDESTRIAN OVERPASS AT
STA 71+71.61, 92.31' RT

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ	ST100			

NFra Inc.
a transportation engineering firm
77 East Thomas Road, Suite 200
Phoenix, Arizona 85012

CONSTRUCTION NOTES

NO	DESCRIPTION	UNIT	QTY
177	Safety Rail MAG Dtl 145	LF	110
212	Retaining Wall See Detail	SF	338
543	Con-Arch	LF	10

NOTE: All Dimensions to Face of Curb

REMOVALS

21	Remove Existing Gabion Mattress	LF	30

NOTES:

1. See ADOT Std. B-18.10 & B-18.20 (Case I) for General Notes and Details.
2. Wall cross-section, dimensions and reinforcing shall be per "H" shown in this sheet.
3. See ADOT Std. B-19.30 & B-19.40 for payment limits for structural excavation and structure backfill.
4. Safety rail shall be per MAG Detail Number 145. Anchor plate detail shall be Type 1.
5. CON-ARCH shall be designed based on AASHTO LRFD Bridge Design Specifications, 4th Edition, 2007.

PRELIMINARY
100%
Review
NOT FOR CONSTRUCTION OR RECORDING

CON-ARCH PEDESTRIAN CROSSING

GILBERT
ARIZONA

RIGGS ROAD

ST100

DR: JCW DATE: 12/09	DES: DATE: 12/09	CK: DATE: 12/09	RPW

DWG. NO. D-8.1
SCALE: NONE
OF

APPENDIX B

Excerpts From Various Drainage Reports

SVK ENGINEERING
6033 S. Mack Avenue
Gilbert, Arizona 85298
(480) 363-6260

FINAL DRAINAGE REPORT

RIGGS & RECKER SELF STORAGE
Maricopa County, Arizona

Submitted to:

Maricopa County
501 N. 44th Street
Phoenix, AZ 85008

Prepared For:

RDK Capital
44566 W. Venture Lane
Maricopa, AZ 85239

Prepared By:

SVK Engineering
6033 S. Mack Avenue
Gilbert, Arizona 85298

Dated: March 18, 2009

FINAL DRAINAGE REPORT
RIGGS & RECKER SELF STORAGE

(as taken from UEG's Conceptual Drainage Report dated March 27, 2008; modified & expanded by SVK Engineering)

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Site Description

1.1.1 Location

Riggs & Recker Self Storage is located on the southeast corner of Recker and Riggs Road in Maricopa County, Arizona. Legally, it is part of Section 36, Township 2 South, Range 6 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. See Figure 1.1, Vicinity Map.

1.1.2 Existing Features

The entire property consists of 10.40 gross acres of undeveloped desert land, including adjacent right of way which has been dedicated previously. The site being developed consists of 4.24 gross acres comprising a portion of the south and east sides of the larger site. The only proposed onsite improvements for the "hard corner" of the site are a retention basin and minor drainage swale to convey onsite flows to the basin. The entire property has a higher elevation toward the southeast of the lot and gently slopes towards the northwest.

1.1.3 Proposed Conditions

A new commercial mini-storage development is proposed on a portion of the property.

The total retention provided on site will be sized to retain the volume generated by the 100-year, 2-hour storm event.

1.2 Purpose of Report

The purpose of this report is to substantiate the drainage design for the subject parcel and to demonstrate conformance with Maricopa County design standards and policies.

This report and related design have been developed in accordance with Maricopa County Regulations, standards and policies.

1.3 FEMA Information

The Flood Insurance Rate Map (Panel 3075H, Revision date September 30, 2005) for this subject property shows that the site is located within "Zone X shaded." Zone X denotes areas of the 500-yr flood; areas of 100-

3.2 Onsite

Retention volumes for the site were determined based on the 100-year, 2-hour storm event. The rainfall depth in this event is 2.6 inches for this site and a C-coefficient of 0.95 was used for the improved site. A C-coefficient of 0.50 was used for the bare-ground, unimproved portion of the site. Retention volumes are calculated using the equation:

$V_R = {}^{D}/_{12}\, AC$

Where:

V_R = Retention volume required, cubic feet
D = 100-year, 2-hour depth of rainfall, inches (2.6 inches)
A = Gross Area of the subject drainage field (sq.ft.)
C = Runoff coefficient of 0.95 per MCFCD Manual

The lot is divided into three drainage areas as shown in Figure 3.2, Conceptual Drainage Exhibit. The areas were approximately 36,853 square feet for Area DA1, 41,438 square feet for Area DA2, and 65,631 square feet for Area DA3. Table A-1, Retention Volume & Drywell Calculations, in Appendix A shows the calculated retention volume required for each drainage area and compares the retention required with the retention provided as well as showing the number of drywells needed to drain these facilities. This table shows that 29,798 cubic feet of retention is provided to retain 29,624 cubic feet of runoff from the 100-year, 2-hour event. Area DA1 includes an 8 foot diameter underground retention system totaling a length of 152 feet. Area DA2 includes an 8 foot diameter underground retention system totaling 171 feet. Area DA3 includes an 8 foot diameter underground retention system totaling a length of 270 feet.

DA4 consists of the undeveloped portion of the site. DA4 is 268,330 square feet in size. A weighted C value was used to account for the adjacent street improvements. Retention of this area is provided within a one-foot deep retention basin located at the northwest corner of the property. 30,492 cubic feet is provided where 30,232 cubic feet is required. Due to the shallow nature of this basin, no drywells are required.

A total of 4 drywells are being proposed for this site. Drywells will be exclusively used to drain the underground retention basins. A minimum surface percolation rate of 0.33 inches per hour must be observed in Basin C (Drainage Area 4) in order to drain this basin within 36 hours, based on the basin depth of 12 inches. If this basin does not completely drain within 36 hours, drywells will need to be installed by separate

permit at the low corner of this basin to ensure drainage within 36 hours. The number of drywells required will depend on the observed percolation rate.

Dyrwells shall be constructed as needed, and field verified, to drain the underground storage volume within 36 hours. See Appendix A, Table A-1, for retention calculations. Based on the minimum standard for design mentioned in the Maricopa County Design Standards, a single drywell will be required for each drainage area DA1 and DA2. Two drywells are required for drainage area DA3. More drywells must be added if they do not sufficiently drain the entire volume of the underground storage within 36 hours. The accepted percolation rate of the design drywells is 0.10 cfs.

Eight-foot diameter corrugated metal pipe is proposed for the underground storage. RAMM has conducted field exploration, laboratory testing, engineering analysis, and provided evaluation and recommendations regarding the use of underground storm water retention tanks. Their results have been submitted separately, and are also included here in Appendix E. Based on RAMM field tests, the existing site soil is suitable for use as backfill material. Also, based on field tests, and manufacturer data supplied in Appendix D, the proposed underground storage tanks will have a life span of a minimum of 75 years. The underground storage system has a lifespan at initial installation that exceeds the length of time the special use permit will be in place. Before the special use permit can be extended, it must be certified that the underground storage system will continue to be sound for the length of such extension before such extension will be granted. Warranty and maintenance requirements for the underground storage are required to be followed. These requirements vary from manufacturer to manufacturer and from product to product. However, in no case shall a maintenance schedule be observed that is less rigorous than the following. The maintenance schedule shall be written into the CC&R's for the project prior to construction of the underground system.

An annual inspection with photo documentation shall be performed beginning in the 1st year of service as indicated below. Results of the following shall be provided to Maricopa County after each inspection:

1) The condition of the pavement and valley gutters above the underground storage shall be noted. Any deviation from the original design shall be repaired in an appropriate manner. Pavement shall not be allowed to degrade in such a manner that

will allow water or drainage to absorb into the soil above the underground storage.

2) The condition of the pipe material shall be observed by visual inspection by entering the underground system. If corrosive or wearing effects exceed those expected for the lifetime of the product, or 50-years, whichever is greater, than a mitigation plan shall be formed. If mitigation cannot be accomplished, then the product shall be replaced in kind.
3) Welds shall be visually inspected. Corrosion of, or the formation of holes with welds shall be repaired. New material shall be placed around welds as needed if damage occurs.
4) Access hatches and auxiliary equipment shall be maintained to a like-new standard and to all applicable safety standards.
5) All connecting pipes and drywells shall be observed for degradation. If significant degradation has occurred, these items shall be replaced in kind.

Drywell and underground storage structures shall be emptied of debris on a minimum of an annual basis, or after any significant storm event. If the buildup of silt and other materials exceeds 10% of the volume of the drywell or underground structures, this material shall be removed in its entirety.

The "hard corner" portion that is not proposed for full development at this time will remain unchanged except for the minor grading. A retention basin is proposed to capture the existing onsite runoff from the "hard corner" in order to include this property in the SUP application. The manner in which the drainage patterns were determined and calculated was previously discussed in this section. All C-coefficients were based on the 100-year event.

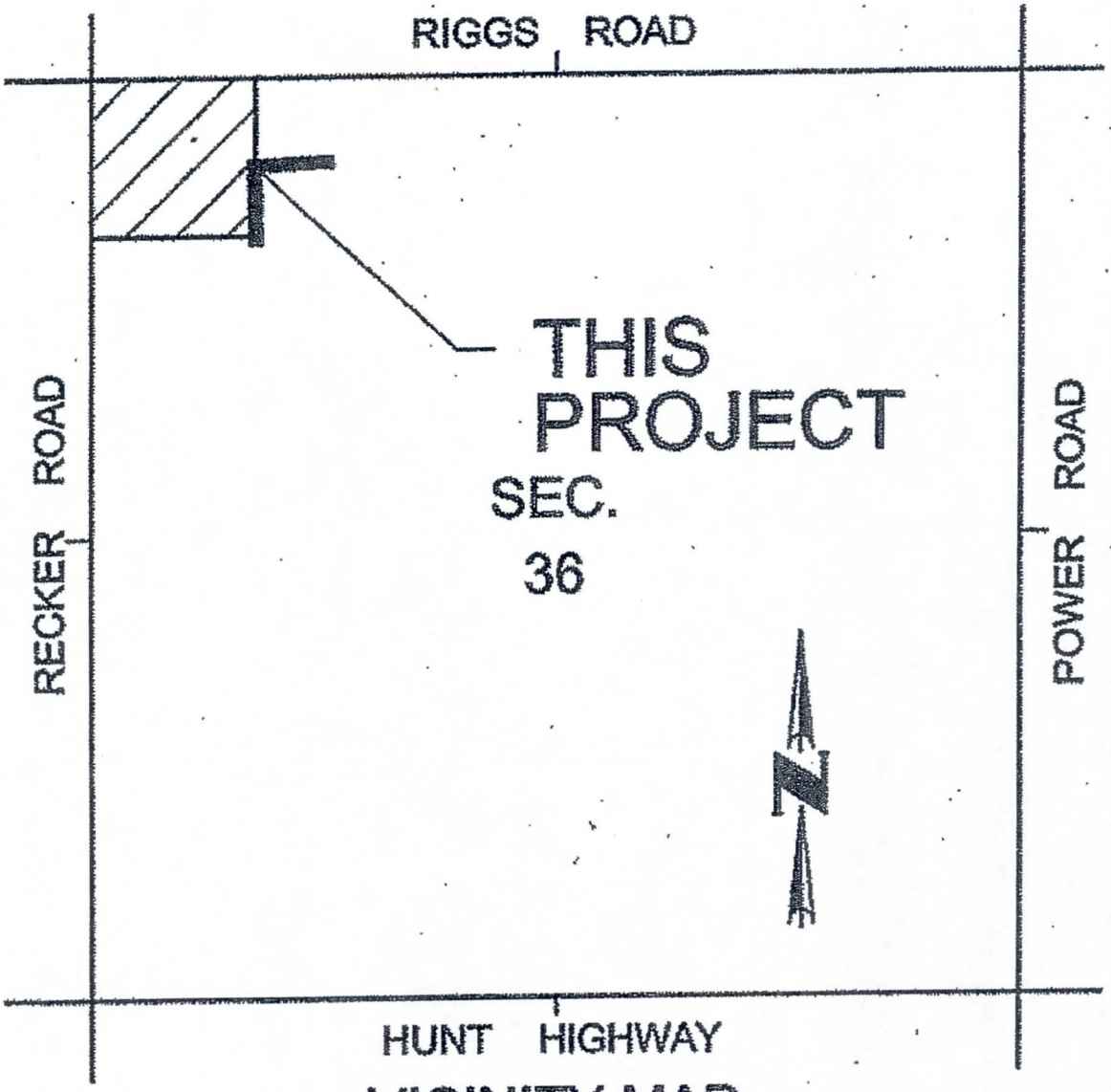
In an event exceeding the 100-year, 2-hour storm, water will fill the underground retention and continue to flow to low spots at the north and west ends of the site where it will pond to a depth of less than 6 inches before overtopping the high points at the entrances and flowing onto the adjacent rights-of-way near the undeveloped outfall location. Overflow will then continue westerly along its historical route.

All retention areas will drain within 36 hours as per Maricopa County Regulations.

4.0 HYDRAULIC CONDITIONS

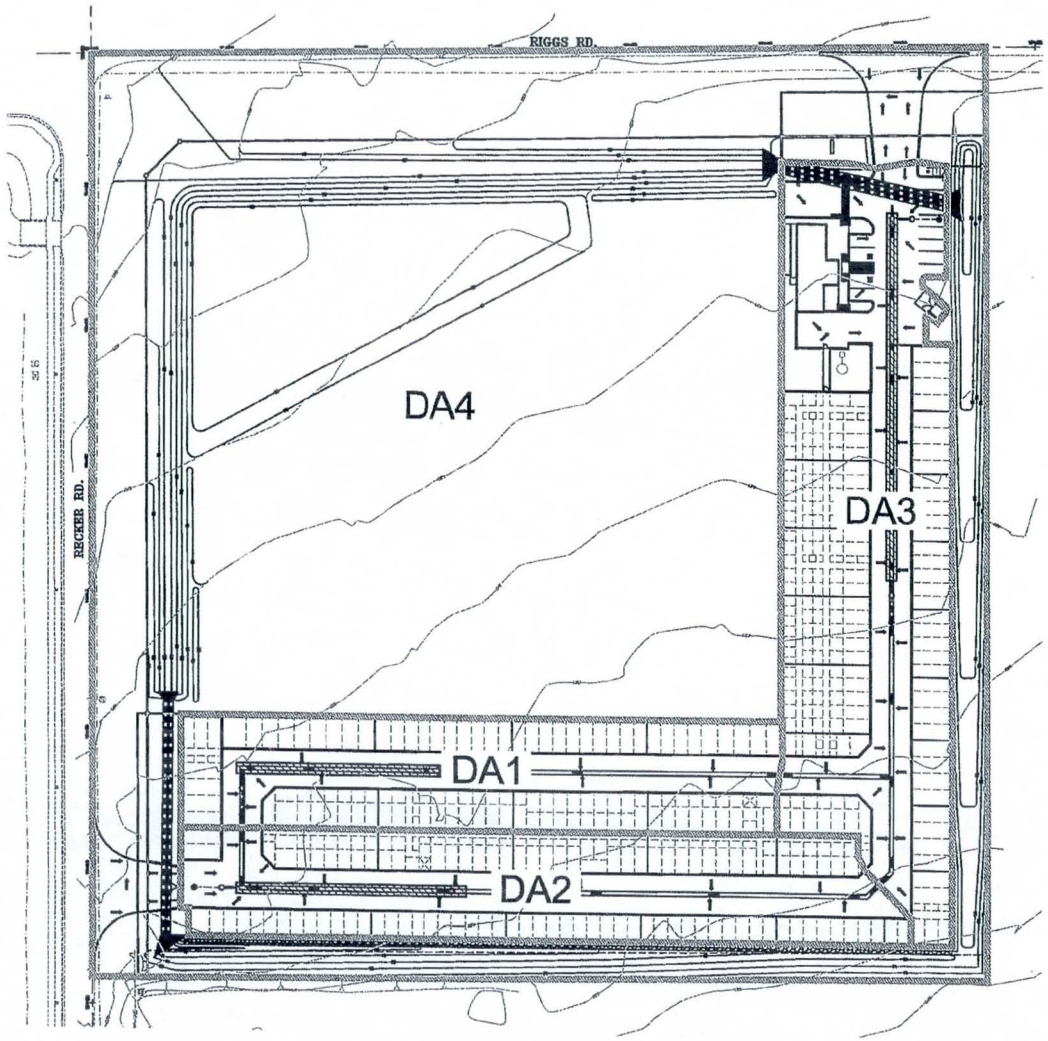
4.1 Existing Conditions

As mentioned above, the site has relatively uniform slope and no notable



VICINITY MAP

(NOT TO SCALE)



GRAPHIC SCALE
40 20 0 40 80
SCALE FEET

SK Engineering
6636 E. BASELINE ROAD, SUITE 101
MESA, ARIZONA 85206
PHONE: 480.294.6760
FAX: 480.294.6770
EMAIL: info@skengineering.com

602-263-1100
1-800-STAKE-IT

REVISIONS:

RIGGS AND RECKER SELF STORAGE
MARICOPA COUNTY, ARIZONA

DRAINAGE EXHIBIT

Job No.:	08140
Drawn By:	b.r.s.
Checked:	s.m.k.
1st Submittal:	11/05/08
2nd Submittal:	
3rd Submittal:	

Sheet
of

T:\Engr\08140 - Riggs & Recker Self Storage\Dwg\Exhibits\08140 - Drainage Exhibit.dwg Apr 15, 2009 - 12:02pm shanek

APPENDIX A

HYDROLOGIC CALCULATIONS

Table A-1: Retention Basin Volume Calculations

Required Volume				**Provided Volume**				**Drywell**	
	C =	0.95	Runoff Coefficient						
	P =	2.6	100-year, 2-hour Precipitation						
	A =		Area (sf)						
	V =	CPA/12	Volume (cf)						
					Calculated	Designed	Length	Time to Drain (days)	# of Drywells
(DA1) Drainage Area 1	A =	36,853	sf	Aboveground	0	0			
				Underground	7,586	7,638.00	152		
Total Required	V =	**7,586**	cf	Total Provided		**7,638.00**	cf	0.59	1
(DA2) Drainage Area 2	A =	41,438	sf	Aboveground	0	0			
				Underground	8,529	8,592.75	171		
Total Required	V =	**8,529**	cf	Total Provided		**8,592.75**	cf	0.66	1
(DA3) Drainage Area 3	A =	65,631	sf	Aboveground	0	0			
				Underground	13,509	13,567.50	270		
Total Required	V =	**13,509**	cf	Total Provided		**13,567.50**	cf	1.05	2*
(DA4) Drainage Area 4	A =	268,330	sf	Aboveground	30,232	30,492.00			
note: C = 0.52 for vacant hard corner				Underground	-	0			
Total Required	V =	**30,232**	cf	Total Provided		**30,492.00**	cf	no drywells - 1' deep retention	

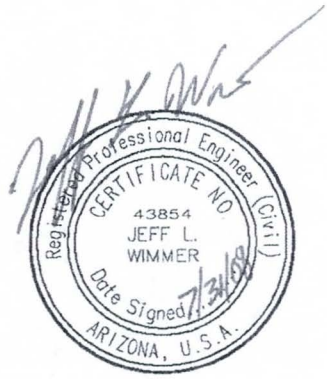
Note: A total of 4 drywells are required based on a design rate of 0.1 cfs. Testing will be required upon installation of drywells.

***DA3 Underground Retention** requires 2 drywells to drain within 36 hours. Inverts to drain into drywells are at different elevations, so calcs are required: Drywell inverts are within 3' of each other in elevation, meaning that more than 50% of the underground storage will drain evenly into both drywells before the drywell on the north end (downhill side) begins taking the remaining water. Within the first 50% drainage, the second drywell received approximately 50% of the water, or 3,377 c.f.. 13,567.50 - 3,377.25 = 10,190.25 c.f < total capacity of single drywell.

OFFSITE DRAINAGE REPORT
FOR
RIGGS PAVILION
SOUTHEAST CORNER OF HIGLEY ROAD AND RIGGS ROAD
GILBERT, ARIZONA

Prepared for:
MARATHON COMMERCIAL DEVELOPMENT
8978 Spanish Ridge Avenue, Suite. 100
Las Vegas, Nevada 89148
702-990-3003

Prepared by:
CMX, L.L.C.
4135 South Power Road, Suite 103
Mesa, Arizona 85212
480-656-5500



Expires 3-31-2009

July 16, 2008
CMX Project No. 7440

OFFSITE DRAINAGE REPORT
FOR
RIGGS PAVILION

TABLE OF CONTENTS

Expires 3-31-2009

I. INTRODUCTION

Riggs Pavilion is a proposed commercial development located at the southeast corner of Higley Road and Riggs Road in Gilbert, Arizona. The development is located within a portion of Section 35, Township 2 South, Range 6 East. The site is bound by Riggs Road and an undeveloped commercial property to the north, an undeveloped commercial property and existing low density residential to the south, existing low density residential to the east and then Higley Road and a dairy farm to the west (see Vicinity Map, Figure 1). Riggs Pavilion is comprised of approximately 15.04 gross acres.

The existing land is currently undeveloped and slopes to the northwest at a slope of approximately 0.95%. The site will be developed for commercial use.

Riggs Pavilion is within the jurisdiction of the Town of Gilbert, and is being designed to comply with the Town of Gilbert drainage policies.

II. FLOOD PLAIN DESIGNATION

The site is located within Zone X as shown on the FEMA Flood Insurance Rate Map 04013C3075H dated September 30, 2005. Flood Zone X is defined as:

> Zones B, C, and X are the flood insurance rate zones that correspond to the areas outside the 100-year floodplains, areas of 100-year sheet flow flooding where average depths are less than 1 foot, areas of 100-year stream flooding where the contributing drainage areas is less than 1 square mile, or areas protected from the 100-year flood by levees. No BFE's or depths are shown within this zone.

III. OFFSITE DRAINAGE

The project site is located within the watershed of a regional drainage study called "Sonoqui Wash Floodplain Delineation Study (FDS)", prepared in May 2004.

A recent development called Seville to the north of the site addresses the offsite flows in the area, which may impact the proposed site. CMX was the design engineer for the development of Seville. In the process, CMX prepared a drainage report titled "Master Offsite Drainage Report for Seville, Higley Road and Chandler Heights Road, August 1, 2000" (see excerpts in Appendix G). This report was based on the Queen Creek/Sanokai (Sonoqui) Wash FDS. As can be concluded from this report, the offsite flow (100-yr, 6-hr) impacting Riggs Pavilion is 145 cfs from the east, along Riggs Road, and 644 cfs from the south, along Higley Road.

In July 2007, CMX worked on the design of a drainage swale that conveys storm water runoff out of the Seville Development to a collection point downstream. In the process, CMX prepared a drainage report titled "Hydrologic Study for Seville Off-Site Channel, Chandler Heights Road and 162nd Street, Gilbert, Arizona". This report estimated that an additional flow of approximately 23 cfs also impacts

the Riggs Pavilion site from the east. This will revise the flow that from the east to 168 cfs which may impact the Riggs Pavilion site.

In 2004, the consulting engineer Erie and Associates, Inc. prepared a drainage report titled "Chandler Junior High School, Preliminary Drainage Study" for the improvements of the subject school (see excerpts in Appendix G). In this report, Erie and associates documented the existence of 3-36" pipes under Higley Road, at the intersection with San Tan Blvd, and estimated that approximately 212 cfs of offsite flow is conveyed westerly across Higley Road, through the existing culvert and through road overtopping. Erie and Associates maintained a similar flow pattern in the post development conditions of the school site. The offsite drainage area contributing to the school site is a portion of the offsite drainage area contributing to the Riggs Pavilion site and thus this flow diversion to the west would reduce the offsite flow effecting Riggs Pavilion from the south. A site visit was conducted to observe current condition, including the location of the 3-36" at the school site. Erie and Associates indicated that the pipes were severely silted and the capacity reduced to only 18 cfs through the pipes with the rest overtopping the road to the west. As it would be expected, the pipes would undergo routine maintenance and be cleaned up. This would increase the capacity of the pipes to approximately 177 cfs. The post development flow from the school site was estimated in the corresponding drainage report to be 185 cfs. It can be concluded from these numbers that it is reasonable to consider the flow diversion at the school in re-evaluating the offsite flow that impact Riggs Pavilion from the south.

The HEC-1 model in the master drainage report prepared by CMX for Seville was used as a base model for this task (see Appendix E). The model output indicated the offsite flow impacting Riggs Pavilion from the south is reduced from 644 cfs to 310 cfs, and the combined flow at the intersection of Riggs and Higley is reduced from 730 cfs to 440 cfs (463 when adding the 23 cfs from the east).

An existing drainage swale exists along the western 650 feet or so of the adjacent Riggs Road frontage and is lined with riprap from side to side for this distance. The swale slopes from east to west and is lined on its sides for 650 feet with riprap baskets. It is our understanding that this swale is not under 404 jurisdiction. A letter of non-delineation & documentation were sent to the Army Corps of engineers for their review. The swale flows come from sheet flow produced by runoff from areas east and south of the site and then cross under Higley Road via an existing box culvert. The flows then continue westerly along Riggs Road approximately 1 mile to the Roosevelt Water Conservation District Canal (RWCD Canal).

The north half of Riggs Road is fully improved and it's runoff drains toward Higley Road where the runoff enters a catch basin in sump condition and storm drain system east of Higley, then drains to the existing drainage swale along the south side of Riggs Road then continue westerly to the RWCD Canal. Runoff from the proposed improvements to the south half of Riggs Road will continue to drain to the existing swale that will be re-graded with the offsite improvements and then westerly in their historical drainage pattern. There are two proposed catch basins on the south side of Riggs to collect the south half runoff. Catch Basin #1

will receive 3.95 cfs and Catch Basin #2 will receive 3.24 cfs, see Offsite Drainage Map in Appendix A.

The runoff from the adjacent portions of Higley Road, currently and with improvements will drain northerly along the site and to the above mentioned box culvert and then flow westerly in their historical drainage pattern to the RWCD Canal. There is one proposed catch basin on the east side of Higley Road to collect the east half street improvements. Catch Basin #3 will receive 3.17 cfs (see Offsite Drainage Map in Appendix A). Street Flow calculations are based on the rational method as specified by Maricopa County Flood Control District. (Drainage Design Manual for Maricopa County, November, 2003) per Town of Gilbert requirements. See attached calculations for further details.

Offsite storm water will be channeled by the proposed drainage swales along Riggs Road and Higley Road, under Higley Rd. via the box culvert and then westerly away from the site in the historical drainage pattern. The existing box culvert running under Higley Rd. is not sized for the 50-year, 24-hour storm and flows currently overtop and run across Higley Rd. during the 50-year, 24-hour storm event. Since this existing box culvert is undersized an additional cell will be added so the box culvert will contain the 50-year, 24-hour storm. The existing swales provide short-term half-street storm water runoff capacity from these two adjacent roadways for the 50-year, 24-hour design storm. The proposed swales and additional box culvert section are designed to contain the 50-year, 24-hour storm event. To protect the swales from scouring riprap has been designed at the swale drops into the site as well at the box culvert outlets (see Appendix F).

IV. ONSITE DRAINAGE

The onsite storm water retention for Area "B" (see Offsite Drainage Map) will be designed to retain the 10-year storm, any excess will overtop into the adjacent offsite drainage swales. Area "B" will retain the first 2.2 inches of rainfall from the 10-year storm, but not the full 3 inches typical for the 50-year storm. The storm water runoff for Area "B" above and beyond the 10-year storm, combined with the 50-year runoff from the offsite improvements, is less than the storm water runoff that currently leaves the existing undeveloped site. The portion of storm water not retained will be less than what currently leaves the site in the historical pattern and will not cause additional runoff to down stream sites, but will decrease runoff volume allowed to leave this site. This will be further detailed in the Onsite Drainage Report for this project.

V. CONCLUSIONS

- The proposed development is in compliance with Town of Gilbert design criteria and other required drainage standards.
- Riggs Road and Higley Road have been designed to adequately convey the 10-year peak flow between curbs without overtopping and the 50-year

peak flow within street right of way in order to meet the Town's design standards.

- Onsite retention for the onsite Drainage Area "B" will be provided by surface retention and underground storage that will total the volume equal to the 10-year, 24-hour storm event, not the 50-year event. The difference in runoff will continue to flow westerly away from the site in its historical drainage pattern.

- The Hydraulic Grade Line for the storm drainpipes will remain at least 6 inches below the gutter elevation for the 10-year rainfall event (see Appendix D).

- No additional offsite storm water is anticipated to impact the site.

VI. REFERENCES

1. Town of Gilbert, Unified Land Development Code, Improvement Details, Article XII Drainage Engineering, May 13, 2003

2. Town of Gilbert, Public Works and Engineering Standard Details, Article 2, Drainage Engineering, March 2005

3. Flood Control District of Maricopa County, 2003. Drainage Design Manual for Maricopa County, Arizona, Hydrology & Hydraulics Volumes. Phoenix, Arizona.

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*       VERSION 4.1                     *
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*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*      609 SECOND STREET                *
*      DAVIS, CALIFORNIA 95616          *
*        (916) 756-1104                 *
*                                       *
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X     X  XXXXXXX   XXXXX          XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
   1          ID  ********************************************************************************
   2          ID  **
   3          ID     RIGGS PAVILION MODEL
   4          ID     SEVILLE DEVELOPMENT MODEL REVISED TO ADDRESS CHANGES DUE TO DEVELOPEMENT***
   5          ID     EAST AND SOUTH OF RIGGS PAVILION PROJECT SITE 09-28-2007
   6          ID     (FILE I.D. RP-100-6Prel.DAT)
   7          ID
   8          ID  ********************************************************************************
   9          ID     ENTELLUS MODEL REVISED FOR RE-ROUTED FLOWS DUE TO DEVELOPMENT OF SEVILE
  10          ID     @ HIGLEY & CHANDLER HEIGHTS ROADS. REVISIONS WERE CONFINED TO RUNOFF
  11          ID     FROM DRAINAGE BASIN W ONLY WHERE THESE FLOWS IMPINGE UPON THE SEVILLE
  12          ID     DEVELOPMENT. CMX GROUP INC., 5-30-2000 (FILE I.D. SNQ6REV2.DAT)
  13          ID  **
  14          ID  ** THIS IS A MODEL FOR 100-YR 6-HR PROPOSED CONDITIONS WITH SEVILLE
  15          ID  ** REVISED 1-20-2000 TO INCLUDE SITE AREA BETWEEN 164Th ST. & HIGLEY RD
  16          ID  ** REVISED 5-11-2000 TO MODIFY THE DRAINAGE AREA FOR W11 & W12
  17          ID  ** REVISED 5-11-2000 TO INCLUDE OFFSITE AREAS W11A, W11B, W11C, W11D & W12A
  18          ID     WITH CHANNEL ROUTINGS
  19          ID  ** REVISED 5-22-2000 TO INCLUED AREAS W15 & W20 AND W14, W13 & W21 AS OFF-
  20          ID     SITE AREAS NEAR SW CORNER OF SITE FOR FLOWS ALONG SOUTHERN BOUNDARY OF
  21          ID     PARCELS 38A & 38B, PLUS FLOWS IN EXISTING CHANNEL SOUTH OF, AND PARALLEL
  22          ID     TO RIGGS RD.
  23          ID  ** REVISED RTIMP FOR W11, W12, W16, W17, W18, W19 TO 30% FROM 0%
  24          ID  ** REVISED RET. VOLUMES FOR W11, W12, W16, W17, W18 & W19 (USE VOL "PROVIDED"
  25          ID     PER THE ONSITE DRAINAGE REPORT BY CMX)
  26          ID  ** CHANNEL DESIGN FOR CHANDLER HEIGHTS BETWEEN POWER RD AND RECKER ROAD WILL
  27          ID     SIMULATE EXISTING FLOW OVERTOPPING CONDITIONS
  28          ID  ** CHANNEL DESIGN FOR CHANDLER HTS BETWEEN RECKER RD TO HIGLEY RD WILL BE
  29          ID     DESIGNED WITHOUT OVERTOPPING FLOWS
  30          ID  ** CHANNEL DESIGN FOR CHANDLER HTS BET HIGLEY RD & 164TH ST WILL BE DESIGNED
  31          ID     TO SIMULATE FLOW OVERTOPPING CONDITIONS
              *
  32          ID  ********************************************************************************
  33          ID  ********************************************************************************
  34          ID  **    SONOKAI WASH FLOODPLAIN DELINEATION STUDY                                 **
  35          ID  **    100-Year 6-hour Storm                                                     **
  36          ID  **    First Run Date  February 10-1998                                          **
  37          ID  **    Run Date  May 20-1998                                                     **
  38          ID  **    Entellus, Inc.                                        File SNQ1.DAT       **
  39          ID  ********************************************************************************
  40          ID  ********************************************************************************
  41          ID
  42          ID  DDM MCUHP1 Sonokai Wash Floodplain Delineation Study
              *
  43          IT       5                    300
  44          IO       5
              *
              *DIAGRAM
              * ////////////////////////////////////////////////////////////////////////////////
              * ////////////////////////////  Rainfall Distributio  ////////////////////////////////
              * ////////////////////////////////////////////////////////////////////////////////
  45          IN     15
  46          JD   3.04    0.01
  47          PC    .000    .008    .016    .025    .033    .041    .050    .058    .066    .074
  48          PC    .087    .099    .118    .138    .216    .377    .834    .911    .931    .950
```

1 HEC-1 INPUT PAGE 2

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
  49          PC    .962    .972    .983    .991   1.000
  50          JD   3.02    0.50
  51          JD   2.98    2.80
  52          PC    .000    .009    .016    .025    .034    .042    .051    .059    .067    .076
  53          PC    .087    .100    .120    .163    .252    .451    .694    .837    .900    .938
  54          PC    .950    .963    .975    .988   1.000
  55          JD   2.80   16.0
  56          PC    .000    .015    .020    .030    .048    .063    .076    .090    .105    .119
  57          PC    .135    .152    .175    .222    .304    .472    .670    .796    .868    .912
```

```
PC     .946     .960     .973     .987    1.000
JD     2.46     90.0
PC     .000     .021     .035     .051     .071     .087     .105     .125     .143     .160
PC     .179     .201     .232     .281     .364     .500     .658     .773     .841     .888
PC     .927     .945     .964     .982    1.000
JD     1.73    500.0
PC     .000     .024     .043     .059     .078     .098     .119     .141     .162     .186
PC     .212     .239     .271     .321     .408     .515     .627     .735     .814     .864
PC     .907     .930     .954     .977    1.000
* ///////////////////////////////////////////////////////////////////////////
* ///////////////////////////// End Distribution ////////////////////////////
* ///////////////////////////////////////////////////////////////////////////
*
* ***************************************************************************
* **********************   Basin S9     *************************************
* ***************************************************************************
* DDM   ***** Updated *****

KK      S9
KM    SUB-BASIN S9
KM    6-HOUR RAINFALL, PATTERN NO. 2.11 WAS USED TO FIND TC & R FOR THIS BASIN
KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .971
KM      L = 4.51  Kb = .052  Adj. Slope =  195.0
BA    3.403
LG     .240     .350   4.450     .360  27.000
UC     .921     .561
UA        0        3       5        8       12       20       43       75       90       96
UA      100
*
*
* ///////////////////////////////////////////////////////////////////////////
* ////////////////////// Diversion *DS9   ///////////////////////////////////
* ///    1 Main Dip section - 2 Small Dip to Empire Channel              ////
* ///    At the crossing of Hunt Hwy between Ellsworth and Crismon Rds.  ////
* ///////////////////////////////////////////////////////////////////////////
* DDM   ***** Preserved *****

KK     *DS9
KM     DIVERSION FLOW FROM CP-S9
DT     DDS9
DI        0      250     500      750     1000     1250     1500     1750     2000     2500
DQ        0       50     100      150      200      250      300      350      400      500
*
*
* ***************************************************************************
* **********************   Basin S10    *************************************
* ***************************************************************************
* DDM   ***** Updated *****
```

1   HEC-1 INPUT   PAGE 3

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

KK      S10
KM    SUB-BASIN S10
KM    6-HOUR RAINFALL, PATTERN NO. 1.20 WAS USED TO FIND TC & R FOR THIS BASIN
KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .991
KM      L = 1.45  Kb = .067  Adj. Slope =  283.2
BA     .711
LG     .230     .350   3.950     .470  27.000
UC     .379     .206
UA        0        3       5        8       12       20       43       75       90       96
UA      100
*
*
* +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
* +++++++++++++++++++++ Conc. Point CP-S10     ++++++++++++++++++++++++++++++
* +++  Combines basins S9 & S10                                           +++
* +++  Hunt Hwy near Ellsworth Rd.                                        +++
* +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
* DDM   ***** Preserved *****

KK  CP-S10
HC       2
*
*
* rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* rrrrrrrrrrrrrrrrrrrr   Routing R-S10         rrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* rrr  Route CP-S10 to CP-E8 Through Basin E8                             rrr
* rrr  Mountain typical cross section - natural channel                   rrr
* rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* DDM   ***** Preserved *****

KK     RS10
RS        3     FLOW
RC      .07      .06     .07     1859    .0102
RX        0      400     800     1200     1600     2000     2400     2800
RY        3        1      .5        0        0       .5        1        3
*
*
* ***************************************************************************
* **********************   Basin E8     *************************************
* ***************************************************************************
* DDM   ***** Updated *****

KK      E8
KM    SUB-BASIN E8
KM    6-HOUR RAINFALL, PATTERN NO. 1.00 WAS USED TO FIND TC & R FOR THIS BASIN
KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .995
KM      L = 1.19  Kb = .090  Adj. Slope =   42.0
BA     .389
LG     .500     .000   4.300     .620     .000
UC     .875     .628
UA        0        3       5        8       12       20       43       75       90       96
UA      100
*
```

```
KM     SUB-BASIN 9
KM     L=1.49 Kb=.038 Adj. SLOPE = 45
BA     .516
LG     .580     .050    3.950     .680    1.000
UC     .567     .395
UA        0        3        5        8       12       20       43       75       90       96
UA      100
*

KK      RW9
KM      RE-ROUTE W9 RUNOFF IN RIGGS RD. PLUS TRAP. CHN. TO CP-W10
RS        1     FLOW
RC     .015     .025     .015     2640  .005906
RX        0        0       66       82       98      114      116      116
RY        6        4        4        0        0        4        4        6
*
```



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

KK      W10
KM      SUB-BASIN 10
BA     .513
LG     .430     .090    3.950     .650    2.000
UC     .658     .378
UA        0        3        5        8       12       20       43       75       90       96
UA      100
*

KK    CPW10
KM     COMBINE RUNOFF FROM SUB-BASINS W9 & W10
HC        2
*

KK     RW14
KM      RE-ROUTE W9 & W10 RUNOFF IN RIGGS RD. PLUS TRAP. CHN. TO CP-W14A
RS        1     FLOW
RC     .015     .025     .015     2640  .005906
RX        0        0       66       82       98      114      116      116
RY        6        4        4        0        0        4        4        6

KK     W14A
KM     OFFSITE AREA SOUTH OF RIGGS RD. & EAST OF HIGLEY RD.
BA     .250
LG      .35      .35      4.3     .400     .000
UC     .488     .273
UA        0        3        5        8       12       20       43       75       90       96
UA      100

KK   CPW14A
KM     COMBINE RUNOFF FROM SUB-BASINS W9,W10 & W14A
HC        2

KK     RW10
KM     RE-ROUTE COMBINED HYDROGRAPH IN "LOOP RD." PLUS TRAP CHN TO  HIGLEY RD.
KM     THEN IN HIGLEY RD. PLUS TRAP CHN. TO INTERSECTION OF CHANDLER HGTS. RD.
RS        1     FLOW
RC     .015     .025     .015     7920  .004776
RX        0        0       66       82       98      114      116      116
RY        6        4        4        0        0        4        4        6
* +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
* ++++++++++++++++++++++ Conc. Point CP-W17      +++++++++++++++++++++++++++++++
* +++  Combines Basins W17,Flows From W9 & W10, Divr. flow CP-W16 & CP-W16
* +++  Higley Rd and Chandler Heights                                         +++
* +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
* DDM    ***** Preserved *****

KK   CP-W17
HC        4
*
*
* ///////////////////////////////////////////////////////////////////////////////
* /////////////////////  Diversion *DW17   /////////////////////////////////////
* ///   1 North along Higley to C14 - 2 West Out of Watershed                ////
* ///   Higley Rd between Chandler Heights and Brooks Farm Rds.              ////
* ///////////////////////////////////////////////////////////////////////////////
* DDM    ***** Preserved *****
```



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

KK    *DW17
KM     DIVERSION FLOW FROM CP-W17
DT   DDW170
DI        0      200      400      600      800     1000     1200     1400     1596
DQ        0      200      400      417      417      417      417      417      417
*
*
* rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* rrrrrrrrrrrrrrrrrrrrrr   Routing RW17       rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* rrr Flow from CP-W17 to CP-C14 along Higley Rd.                            rrr
* rrr Street typical section  --  flow along Higley Rd.                      rrr
* rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* DDM    ***** Preserved *****

KK     RW17
RS       94     FLOW
RC      .08      .02      .08     2700    .0001
RX        0     1000     2470     2488     2512     2515     2520     5000
RY      4.5      3.5      1.5        1       .5        0       .5      4.5
*
*
* *******************************************************************************
* **********************   Basin C14      ***************************************
```

```
     * ***************************************************************************
     * DDM    ***** Updated *****
1565 KK     C14
1566 KM   SUB-BASIN C14
1567 KM   6-HOUR RAINFALL, PATTERN NO. 1.01 WAS USED TO FIND TC & R FOR THIS BASIN
1568 KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .993
1569 KM     L = 1.38  Kb = .044  Adj. Slope =    11.0
1570 BA    .512
1571 LG    .550     .060   4.800    .440   4.000
1572 UC   1.112     .789
1573 UA       0        5      16      30      65      77      84      90      94      97
1574 UA     100
     *
     *
     * ///////////////////////////////////////////////////////////////////////////
     * /////////////////////  Diversion Recover DC12   ////////////////////////////
     * ///   From east                                                         ////
     * ///////////////////////////////////////////////////////////////////////////
     * DDM    ***** Preserved *****
1575 KK    DC12
1576 KM    DIVERSION FLOW FROM CP-C12
1577 DR   DDC12
     *
     *
     * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
     * rrrrrrrrrrrrrrrrrrrrr    Routing RC12w        rrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
     * rrr Diversion Flow from CP-C12 to CP-C14                                 rrr
     * rrr Street typical section  -                                            rrr
     * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
     * DDM    ***** Preserved *****
```



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

1578 KK   RC12w
1579 RS      30     FLOW
1580 RC     .08      .02     .08    5300   .0029
1581 RX       0     1000    2470    2488    2512    2515    2520    5000
1582 RY     4.5      3.5     1.5       1      .5       0      .5     4.5
     *
     *
     * +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
     * ++++++++++++++++++++++ Conc. Point CP-C14     ++++++++++++++++++++++++++++++
     * +++  Combines Basins C14 & Conc. Point CP-C12, & CP-E17      +++
     * +++  Higley Rd and Brooks Farm Rd.                                       +++
     * +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
     * DDM    ***** Preserved *****
1583 KK  CP-C14
1584 HC       3
     *
     *
     * ///////////////////////////////////////////////////////////////////////////
     * /////////////////////  Diversion *DC14   ///////////////////////////////////
     * ///   1 North along Higley - 2 Off-site west                             ///
     * ///   Higley Rd. north of Brooks Farm Rd.                                ///
     * ///////////////////////////////////////////////////////////////////////////
     * DDM    ***** Preserved *****
1585 KK    *DC14
1586 KM    DIVERSION FLOW OFFSITE
1587 DT  DDC140
1588 DI       0       60     180     300     420     600
1589 DQ       0       40     147   244.4     342     489
     *
     *
     * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
     * rrrrrrrrrrrrrrrrrrrrr    Routing R-C14N      rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
     * rrr  Route CP-C14 to CP-C15 Through Basin C15 (Hingley Rd.)              rrr
     * rrr Street typical section  -                                            rrr
     * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
     * DDM    ***** Preserved *****
1590 KK   RC14N
1591 RS      13     FLOW
1592 RC     .08     .035     .08    1775    .001
1593 RX       0     1000    2470    2488    2512    2515    2520    5000
1594 RY     4.5      3.5     1.5       1      .5       0      .5     4.5
     *
     *
     * ***************************************************************************
     * **********************      Basin C15     *********************************
     * ***************************************************************************
     * DDM    ***** Updated *****
```



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

1595 KK     C15
1596 KM   SUB-BASIN C15
1597 KM   6-HOUR RAINFALL, PATTERN NO. 1.01 WAS USED TO FIND TC & R FOR THIS BASIN
1598 KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .993
1599 KM     L = 1.26  Kb = .074  Adj. Slope =    13.0
1600 BA    .511
1601 LG    .440     .080   4.800    .430   5.000
1602 UC   1.454     .989
1603 UA       0        5      16      30      65      77      84      90      94      97
1604 UA     100
     *
     *
     * +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
     * ++++++++++++++++++++++ Conc. Point CP-C15     ++++++++++++++++++++++++++++++
```

```
* +++  Combines Basins C15 & Conc. Point CP-C14                                  +++
* +++  Higley Rd. between Brook Farm and Ocotillo Rds.                           +++
* ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
* DDM    ***** Preserved *****

KK  CP-C15
HC       2
*
* ////////////////////////////////////////////////////////////////////////////////
* ////////////////////  Diversion *DC15  //////////////////////////////////////////
* ///    1 Hingley Rd. To Sonokay - 2 Off-site                                  ////
* ///    Higley Rd. South of Ocotillo Rd.                                       ////
* ////////////////////////////////////////////////////////////////////////////////
* DDM    ***** Preserved *****

KK   *DC15
KM    DIVERSION FLOW OFFSITE
DT  DDC150
DI       0      42     126     210     294     336     420
DQ       0      28      69     115     161     184     230
*
* rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* rrrrrrrrrrrrrrrrrrrrrrr   Routing R-C15N          rrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* rrr  Route CP-C15 to CP-N6 Through Basin N6 (Higley Rd.)                      rrr
* rrr Street typical section  -                                                 rrr
* rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* DDM    ***** Preserved *****

KK   RC15N
RS       6    FLOW
RC     .08     .02     .08     825   .0018
RX       0    1000    2470    2488    2512    2515    2520    5000
RY     4.5     3.5     1.5       1      .5       0      .5     4.5
*
* ////////////////////////////////////////////////////////////////////////////////
* ////////////////////  Diversion Recover DC11  //////////////////////////////////
* ///    Field towars Recker                                                    ////
* ////////////////////////////////////////////////////////////////////////////////
* DDM    ***** Preserved *****
```



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

KK    DC11
KM    DIVERSION FLOW FROM CP-C11
DR   DDC11
*
* rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* rrrrrrrrrrrrrrrrrrrrrr   Routing RC11N        rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* rrr  Diversion Flow from CP-C11 to CP-01 Through Basin C13                    rrr
* rrr  Field typical section  -  sheet flow across fields                       rrr
* rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
* DDM    ***** Preserved *****

KK   RC11N
KO       5                          21
RS      26    FLOW
RC     .08     .08     .08    3550   .0030
RX       0    1000    2480  2497.5    2500  2502.5    4000    5000
RY       5     3.5       3       2       0       2       3       5
*
*
* ********************************************************************************
* **********************   Basin C13     ***************************************
* ********************************************************************************
* DDM    ***** Updated *****

KK     C13
KM    SUB-BASIN C13
KM    6-HOUR RAINFALL, PATTERN NO. 1.01 WAS USED TO FIND TC & R FOR THIS BASIN
KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .993
KM      L = 1.14  Kb = .050  Adj. Slope =   21.0
BA    .509
LG    .560    .050   4.700    .460   3.000
UC    .771    .452
UA       0       5      16      30      65      77      84      90      94      97
UA     100
*
*
* ********************************************************************************
* **********************   Basin N5      ***************************************
* ********************************************************************************
* DDM    ***** Updated *****

KK      N5
KM    SUB-BASIN N5
KM    6-HOUR RAINFALL, PATTERN NO. 1.00 WAS USED TO FIND TC & R FOR THIS BASIN
KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .994
KM      L = 1.05  Kb = .068  Adj. Slope =   17.0
BA    .426
LG    .430    .170   4.700    .390    .000
UC   1.100    .696
UA       0       3       5       8      12      20      43      75      90      96
UA     100
*
*
* ////////////////////////////////////////////////////////////////////////////////
* ////////////////////  Diversion Recover DC10  //////////////////////////////////
* ///    Sonokay Wash                                                           ////
* ///    Recovered stored hydrograph for Conc. Point C-10                       ////
* ////////////////////////////////////////////////////////////////////////////////
* DDM    ***** Preserved *****
```



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

```
1646        KK    DC10
1647        KM    ACTUAL FLOW FROM CP-C10
1648        DR    DDC10
            *
            *
            * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
            * rrrrrrrrrrrrrrrrrrrrrr   Routing R-C10W        rrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
            * rrr  Route CP-C10 to CP-N5 Through Basin N5 (Ocotillo Rd.)                rr
            * rrr  Sonokai Wash                                                          rr
            * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
            * DDM   ***** Preserved *****

1649        KK    RC10W
1650        RS       13    FLOW
1651        RC      .08    .045      .08     5410   .0029
1652        RX      232    1550     2850     2900    2920    2925    2930    3600
1653        RY   1343.5  1341.7   1341.5   1338.9    1340  1341.7  1342.8    1343
            *
            *
            * ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
            * +++++++++++++++++++++ Conc. Point CP-N5      +++++++++++++++++++++++++++++++
            * +++  Combines Basins N5 & Conc. Points CP-C10, CP-C11 & CP-13              +++
            * +++  Sonokai Wash at Recker Rd.                                            +++
            * ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
            * DDM   ***** Preserved *****

1654        KK    CP-N5
1655        HC        4   50.60
            *
            *
            * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
            * rrrrrrrrrrrrrrrrrrrrrr   Routing R-N5W         rrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
            * rrr  Route CP-N5 to CP-N6 Through Basin N6 (Sonokai/Ocotillo)             rrr
            * rrr  Sonokai Wash                                                          rr
            * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
            * DDM   ***** Preserved *****

1656        KK    RN5W
1657        RS       12    FLOW
1658        RC      .08    .045      .08     5275   .0035
1659        RX      233    1550     2850     2900    2920    2925    2930    5000
1660        RY   1343.5  1341.7   1341.5   1338.9    1340  1341.7  1342.8  1343.5
            *
            *
            * ******************************************************************************
            * **********************    Basin N6     **************************************
            * ******************************************************************************
            * DDM   ***** Updated *****
```

HEC-1 INPUT PAGE 70

1

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

1661        KK       N6
1662        KM    SUB-BASIN N6
1663        KM    6-HOUR RAINFALL, PATTERN NO. 1.00 WAS USED TO FIND TC & R FOR THIS BASIN
1664        KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .994
1665        KM      L = 1.26  Kb = .072  Adj. Slope =   14.0
1666        BA     .431
1667        LG     .550    .000   4.700    .480    .000
1668        UC    1.267    .935
1669        UA        0       3       5       8      12      20      43      75      90      96
1670        UA      100
            *
            *
            * ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
            * +++++++++++++++++++++ Conc. Point CP-N6      +++++++++++++++++++++++++++++++
            * +++  Combines Basins N6; Conc. Points CP-C13, CP-15; Diversion Flow RC13W  +++
            * +++  Sonokai Wash at Higley Rd.                                            +++
            * ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
            * DDM   ***** Preserved *****

1671        KK    CP-N6
1672        HC        5

1673        KK   DW17aa
1674        KM    RETRIEVE DIVERTED FLOW FROM DW17
1675        DR   DDW17O

1676        KK     RW17
1677        KM    ADD CONVEYANCE BETWEEN 164Th ST. & HIGLEY RD.
1678        KO        2
1679        RS        2    FLOW
1680        RC      .08    .045     .08    2640   .0028
1681        RX        0       5      10      35      55      70      75      80
1682        RY        7       6       5       0       0       5       6       7

1683        KK      W19
1684        KM    ADDED SUBAREA W19 (NE 1/4 SECTION 27)
1685        BA      .25
1686        LG      .25     .25    4.55     .53      30
1687        UC     .400    .229
1688        UA        0       5      16      30      65      77      84      90      94      97
1689        UA      100

1690        KK     W19a
1691        KM    DIVERT W19 RUNOFF THRU RET BASIN WITH 100-YR., 2-HR CAPACITY
1692        KO        2
1693        DT      OUT   31.29
1694        DI        0     500    1000
1695        DQ        0     500    1000
```

HEC-1 INPUT PAGE 71

1

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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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```
1696        KK    CP19
1697        KM   COMBINE OVERFLOW FR. W19 RET.BASIN WITH FLOW FROM RW17
1698        HC       2

1699        KK    DW19
1700        KM   DIVERT CP19 RUNOFF TO THE WEST
1701        DT   *DW19
1702        DI       0     200     500     750    1000    1250    1500    1642
1703        DQ       0     200     422     422     422     422     422     422

1704        KK     W15
1705        KM     OFFSITE AREA BOUNDED BY HIGLEY RD, AND PARCELS 28,27,33,22, & 23
1706        BA    .075
1707        LG    .350    .350   4.300    .400    .000
1708        UC    .338    .245
1709        UA       0       3       5       8      12      20      43      75      90      96
1710        UA     100

1711        KK    RW20
1712        KM     ROUTE W15 RUNOFF WESTERLY TO CONCENTRATION PT. W20
1713        RS       1    FLOW
1714        RC    .030    .035    .030    1300   .0083
1715        RX       0       0      20      20      40      40      60      60
1716        RY       4       2       2       0       0       2       2       4

1717        KK     W20
1718        KM     OFFSITE AREA SOUTH OF SOUTHERN BOUNDARY  OF PARCELS 38A AND 38B
1719        BA    .250
1720        LG    .350    .350     4.3    .400    .000
1721        UC    .525    .300
1722        UA       0       3       5       8      12      20      43      75      90      96
1723        UA     100

1724        KK    CP20
1725        KM     COMBINE FLOW FROM W15 WITH FLOW FROM W20
1726        HC       2

1727        KK    W14B
1728        KM     OFFSITE AREA SOUTH OF RIGGS RD. & EAST OF HIGLEY RD.
1729        BA    .125
1730        LG     .35     .35     4.3    .400    .000
1731        UC    .467    .387
1732        UA       0       3       5       8      12      20      43      75      90      96
1733        UA     100
            * KK   W13
            * KM   OFFSITE AREA SOUTH OF AREA W14B
            * BA   .606
            * LG   .350    .350   4.300    .400    .000
            * UC   .625    .383
            * UA      0       3       5       8      12      20      43      75      90
            * UA    100
            *
```



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

1734        KK    W13A
1735        KM     OFFSITE AREA SOUTH OF AREA W14B
1736        BA    .159
1737        LG    .350    .350   4.300    .400    .000
1738        UC    .488    .273
1739        UA       0       3       5       8      12      20      43      75      90      96
1740        UA     100
            *

1741        KK  13At14
1742        KM
1743        RS       2    FLOW       0
1744        RC    .030     .03     .03    3733   .0067
1745        RX     990     992     994     998    1002    1006    1008    1010
1746        RY       2     1.5     1.8       0       0     1.0    1.50     2.0
            *

1747        KK    W13B
1748        KM     OFFSITE AREA SOUTH OF AREA W14B
1749        BA    .125
1750        LG    .350    .350   4.300    .400    .000
1751        UC    .467    .387
1752        UA       0       3       5       8      12      20      43      75      90      96
1753        UA     100
            *

1754        KK  CPW13B
1755        KM     COMBINE FLOW FROM W13 WITH FLOW FROM W14B
1756        HC       2
            *

1757        KK   CPW14
1758        KM     COMBINE FLOW FROM W13 WITH FLOW FROM W14B
1759        HC       2
            *

1760        KK    RW21
1761        KM   ROUTE COMBINED FLOWS TO CPW21
1762        RS       1    FLOW
1763        RC    .030    .035    .030    2640   .0094
1764        RX       0       0      15      15      45      45      60      60
1765        RY       6       4       4       0       0       4       4       6

1766        KK     W21
1767        KM     OFFSITE AREA SOUTH OF RIGGS RD. & WEST OF HIGLEY DR.
1768        BA    .250
1769        LG     .35     .35     4.3    .400    .000
```

```
1770          UC    .504    .293
1771          UA       0       3       5       8      12      20      43      75      90      96
1772          UA     100
```


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HEC-1 INPUT

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

1773          KK    CP21
1774          KM    COMBINE FLOWS FROM W21 WITH HYDROGRAPH
1775          HC       2
              *

1776          KK    SA03
1777          KM
1778          BA    .058
1779          LG    .35     .35     3.95    .48     0
1780          UC    .342    .348
1781          UA       0       3       5       8      12      20      43      75      90      96
1782          UA     100
              *

1783          KK    SA04
1784          KM
1785          BA    .008
1786          LG    .35     .35     3.95    .48     0
1787          UC    .229    .385
1788          UA       0       3       5       8      12      20      43      75      90      96
1789          UA     100
              *

1790          KK    CP01
1791          KM
1792          HC       2
              *

1793          KK    01to02
1794          KM
1795          RS       1    FLOW       0
1796          RC     .03     .03     .03     875   .0046
1797          RX     988     990     994     998    1002    1003    1005    1006
1798          RY       2     1.6     0.8       0       0     1.0     3.0     4.0
              *

1799          KK    SA01
1800          KM
1801          BA    .013
1802          LG    .35     .35     3.95    .48     0
1803          UC    .296    .423
1804          UA       0       3       5       8      12      20      43      75      90      96
1805          UA     100
              *

1806          KK    CP02
1807          KM
1808          HC       2
              *
```


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HEC-1 INPUT

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

1809          KK    SA05
1810          KM
1811          BA    .050
1812          LG    .35     .35     3.95    .48     0
1813          UC    .329    .341
1814          UA       0       3       5       8      12      20      43      75      90      96
1815          UA     100
              *

1816          KK    03to06
1817          KM
1818          RS       2    FLOW       0
1819          RC    .045     .03     .03    1500   .0087
1820          RX     990     992     994     998    1002    1006    1008    1010
1821          RY       2     1.5     1.8       0       0     1.0    1.50     2.0
              *

1822          KK    SA06
1823          KM
1824          BA    .082
1825          LG    .44     .29     3.95    .62     0
1826          UC    .733    .867
1827          UA       0       3       5       8      12      20      43      75      90      96
1828          UA     100
              *

1829          KK    04to06
1830          KM
1831          RS       2    FLOW       0
1832          RC    .045     .03     .03    1433   .0091
1833          RX     990     992     994     998    1002    1006    1008    1010
1834          RY       2     1.5     1.8       0       0     1.0    1.50     2.0
              *

1835          KK    SA06
1836          KM
1837          BA    .077
1838          LG    .41     .31     3.95    .57     0
1839          UC    .679    .816
1840          UA       0       3       5       8      12      20      43      75      90      96
1841          UA     100
              *

1842          KK    05to06
```

```
1843          KM
1844          RS      1    FLOW       0
1845          RC   .045     .03     .045     1331    .0083
1846          RX   988      990      994      998     1002     1003     1005     1006
1847          RY     2      1.6      0.8        0        0      1.0      3.0      4.0
              *
```


1

HEC-1 INPUT

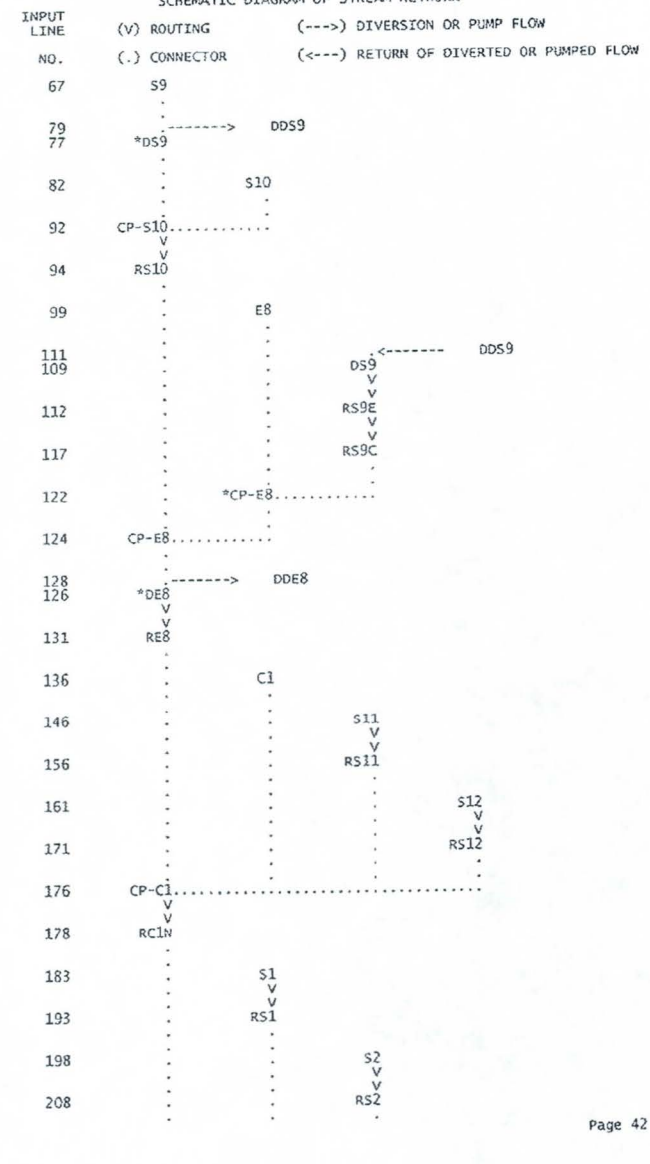
```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

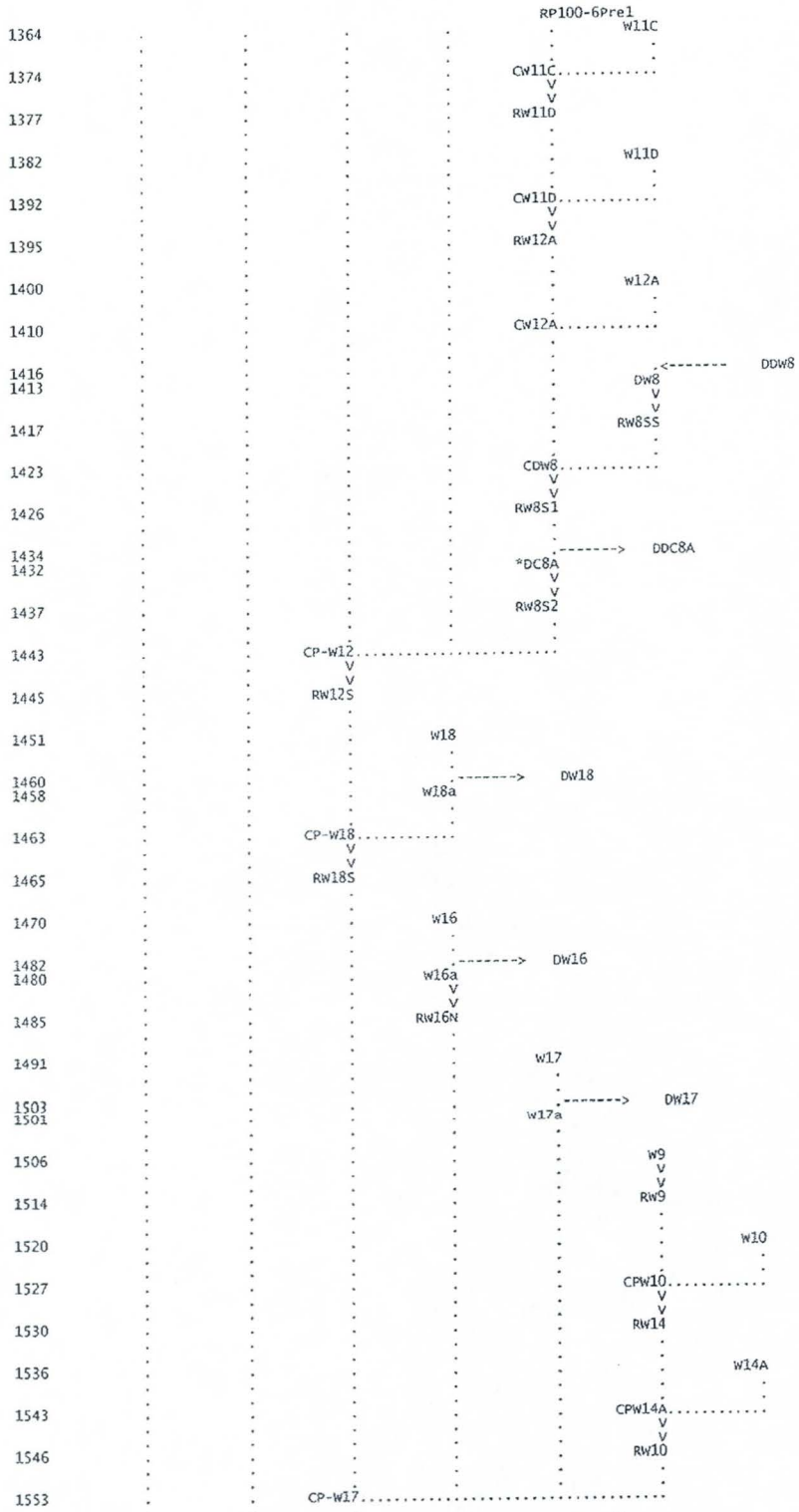
1848          KK    SA02
1849          KM
1850          BA    .034
1851          LG    .35      .35     3.95     .48       0
1852          UC    .258     .239
1853          UA       0        3        5        8       12       20       43       75       90       96
1854          UA     100
              *

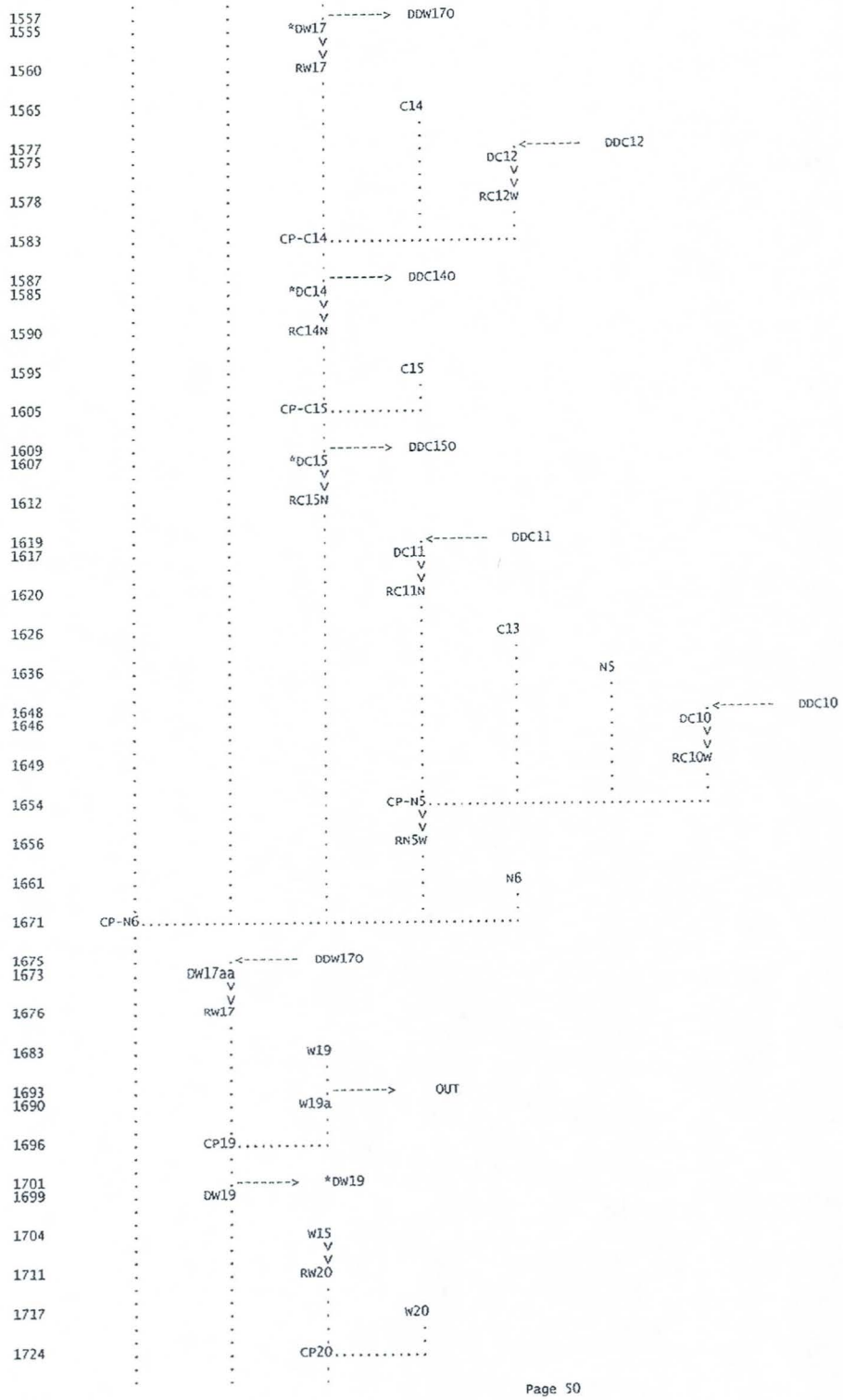
1855          KK    CP06
1856          KM
1857          HC       5
              *
1858          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK




RP100-6Prel
W11C
CW11C
RW11D
W11D
CW11D
RW12A
W12A
CW12A
DDW8
DW8
RW8S5
CDW8
RW8S1
DDC8A
*DC8A
RW8S2
CP-W12
RW12S
W18
DW18
W18a
CP-W18
RW18S
W16
DW16
W16a
RW16N
W17
DW17
W17a
W9
RW9
W10
CPW10
RW14
W14A
CPW14A
RW10
CP-W17


1557
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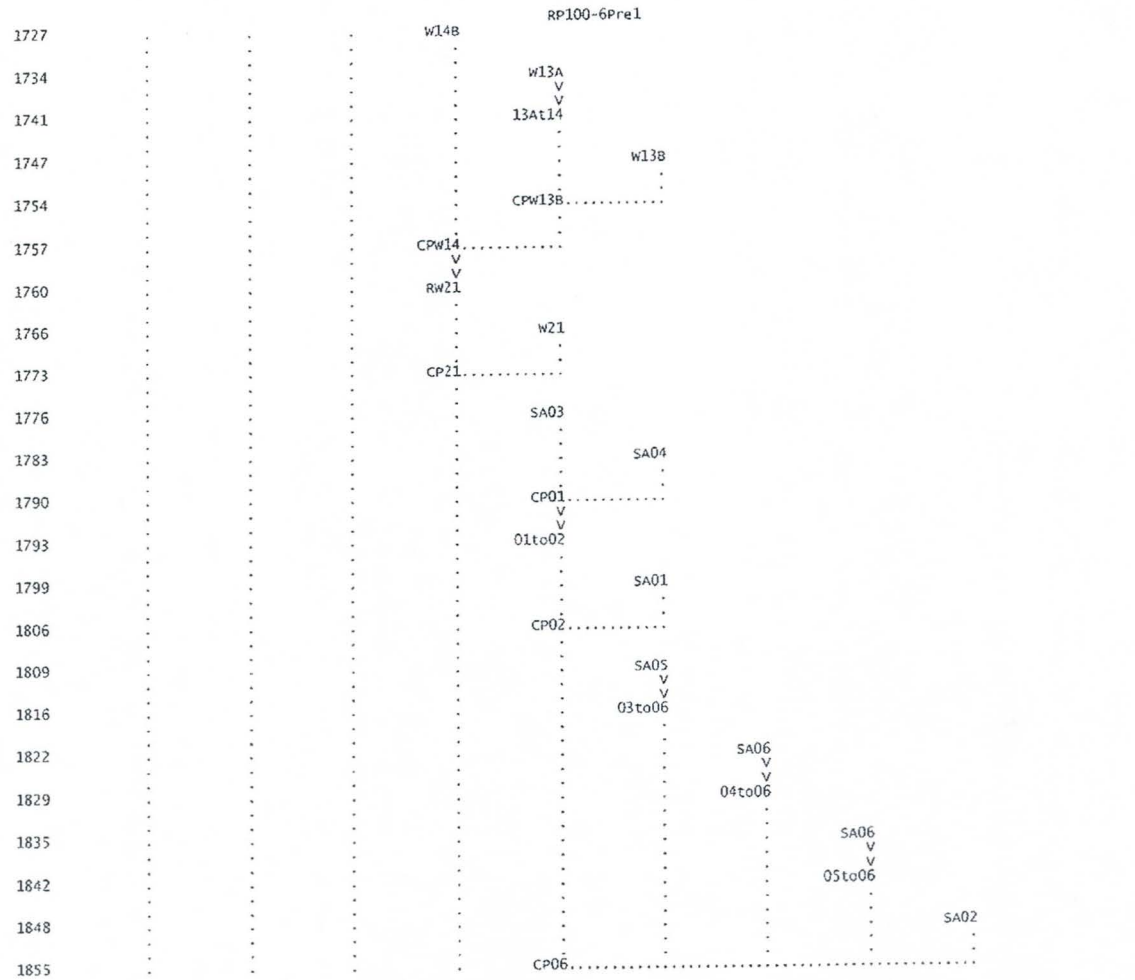
1693
1690
1696
1701
1699
1704
1711
1717
1724
DDW17O
*DW17
RW17
C14
DDC12
DC12
RC12W
CP-C14
DDC14O
*DC14
RC14N
C15
CP-C15
DDC15O
*DC15
RC15N
DDC11
DC11
RC11N
C13
N5
DDC10
DC10
RC10W
CP-N5
RN5W
N6
CP-N6
DDW17O
DW17aa
RW17
W19
OUT
W19a
CP19
*DW19
DW19
W15
RW20
W20
CP20



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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```
*****************************************
*                                       *
*    FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*                JUN  1998              *
*             VERSION 4.1               *
*                                       *
*  RUN DATE   15JUL08  TIME  16:33:23   *
*                                       *
*****************************************
```

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

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**********************************************************************
**
   RIGGS PAVILION MODEL
   SEVILLE DEVELOPMENT MODEL REVISED TO ADDRESS CHANGES DUE TO DEVELOPEMENT***
   EAST AND SOUTH OF RIGGS PAVILION PROJECT SITE 09-28-2007
   (FILE I.D. RP-100-6Pre1.DAT)
**********************************************************************
   ENTELLUS MODEL REVISED FOR RE-ROUTED FLOWS DUE TO DEVELOPMENT OF SEVILE
   @ HIGLEY & CHANDLER HEIGHTS ROADS. REVISIONS WERE CONFINED TO RUNOFF
   FROM DRAINAGE BASIN W ONLY WHERE THESE FLOWS IMPINGE UPON THE SEVILLE
   DEVELOPMENT. CMX GROUP INC., 5-30-2000 (FILE I.D. SNQ6REV2.DAT)
**
** THIS IS A MODEL FOR 100-YR 6-HR PROPOSED CONDITIONS WITH SEVILLE
** REVISED 1-20-2000 TO INCLUDE SITE AREA BETWEEN 164Th ST. & HIGLEY RD
** REVISED 5-11-2000 TO MODIFY THE DRAINAGE AREA FOR W11 & W12
** REVISED 5-11-2000 TO INCLUDE OFFSITE AREAS W11A, W11B, W11C, W11D & W12A
   WITH CHANNEL ROUTINGS
** REVISED 5-22-2000 TO INCLUED AREAS W15 & W20 AND W14, W13 & W21 AS OFF-
   SITE AREAS NEAR SW CORNER OF SITE FOR FLOWS ALONG SOUTHERN BOUNDARY OF
   PARCELS 38A & 38B, PLUS FLOWS IN EXISTING CHANNEL SOUTH OF, AND PARALLEL
   TO RIGGS RD.
** REVISED RTIMP FOR W11, W12, W16, W17, W18, W19 TO 30% FROM 0%
```

+		RW11D	88.	4.42	14.	4.	3.	0.09
+	HYDROGRAPH AT	W11D	153.	4.33	17.	4.	4.	0.10
+	2 COMBINED AT	CW11D	239.	4.33	31.	8.	8.	0.19
+	ROUTED TO	RW12A	202.	4.50	31.	8.	8.	0.19
+	HYDROGRAPH AT	W12A	74.	4.42	14.	3.	3.	0.08
+	2 COMBINED AT	CW12A	274.	4.50	45.	11.	11.	0.26
+	HYDROGRAPH AT	DW8	1065.	8.67	720.	298.	287.	9.19
+	ROUTED TO	RW8SS	1067.	8.75	720.	298.	287.	9.19
+	2 COMBINED AT	CDW8	1063.	8.75	731.	304.	293.	9.45
+	ROUTED TO	RW8S1	1070.	8.92	731.	304.	293.	9.45
+	DIVERSION TO	DDC8A	345.	8.92	77.	19.	18.	9.45
+	HYDROGRAPH AT	*DC8A	725.	8.67	654.	285.	274.	9.45
+	ROUTED TO	RW8S2	727.	8.92	654.	285.	274.	9.45
+	3 COMBINED AT	CP-W12	727.	8.92	650.	282.	271.	10.22
+	ROUTED TO	RW12S	725.	9.17	650.	281.	271.	10.22
+	HYDROGRAPH AT	W18	346.	4.25	47.	12.	11.	0.25
+	DIVERSION TO	DW18	346.	4.25	47.	12.	11.	0.25
+	HYDROGRAPH AT	W18a	0.	0.00	0.	0.	0.	0.25
+	2 COMBINED AT	CP-W18	725.	9.17	650.	281.	271.	10.48
+	ROUTED TO	RW18S	725.	9.67	648.	280.	270.	10.48
+	HYDROGRAPH AT	W16	569.	4.17	52.	13.	12.	0.25
+	DIVERSION TO	DW16	569.	4.17	52.	13.	12.	0.25
+	HYDROGRAPH AT	W16a	0.	0.00	0.	0.	0.	0.25
+	ROUTED TO	RW16N	0.	0.00	0.	0.	0.	0.25
+	HYDROGRAPH AT	W17	621.	4.17	57.	14.	14.	0.26
+	DIVERSION TO	DW17	621.	4.17	57.	14.	14.	0.26
+	HYDROGRAPH AT	W17a	0.	0.00	0.	0.	0.	0.26
+	HYDROGRAPH AT	W9	609.	4.42	74.	18.	18.	0.52
+	ROUTED TO	RW9	572.	4.42	74.	18.	18.	0.52
+	HYDROGRAPH AT	W10	609.	4.42	73.	18.	18.	0.51
+	2 COMBINED AT	CPW10	995.	4.42	133.	33.	32.	1.03
+	ROUTED TO	RW14	953.	4.50	133.	33.	32.	1.03
+	HYDROGRAPH AT	W14A	349.	4.33	32.	8.	8.	0.25
+	2 COMBINED AT	CPW14A	1090.	4.50	156.	39.	38.	1.28
+	ROUTED TO	RW10	860.	4.75	156.	39.	38.	1.28
+	4 COMBINED AT	CP-W17	849.	5.42	680.	299.	288.	12.26

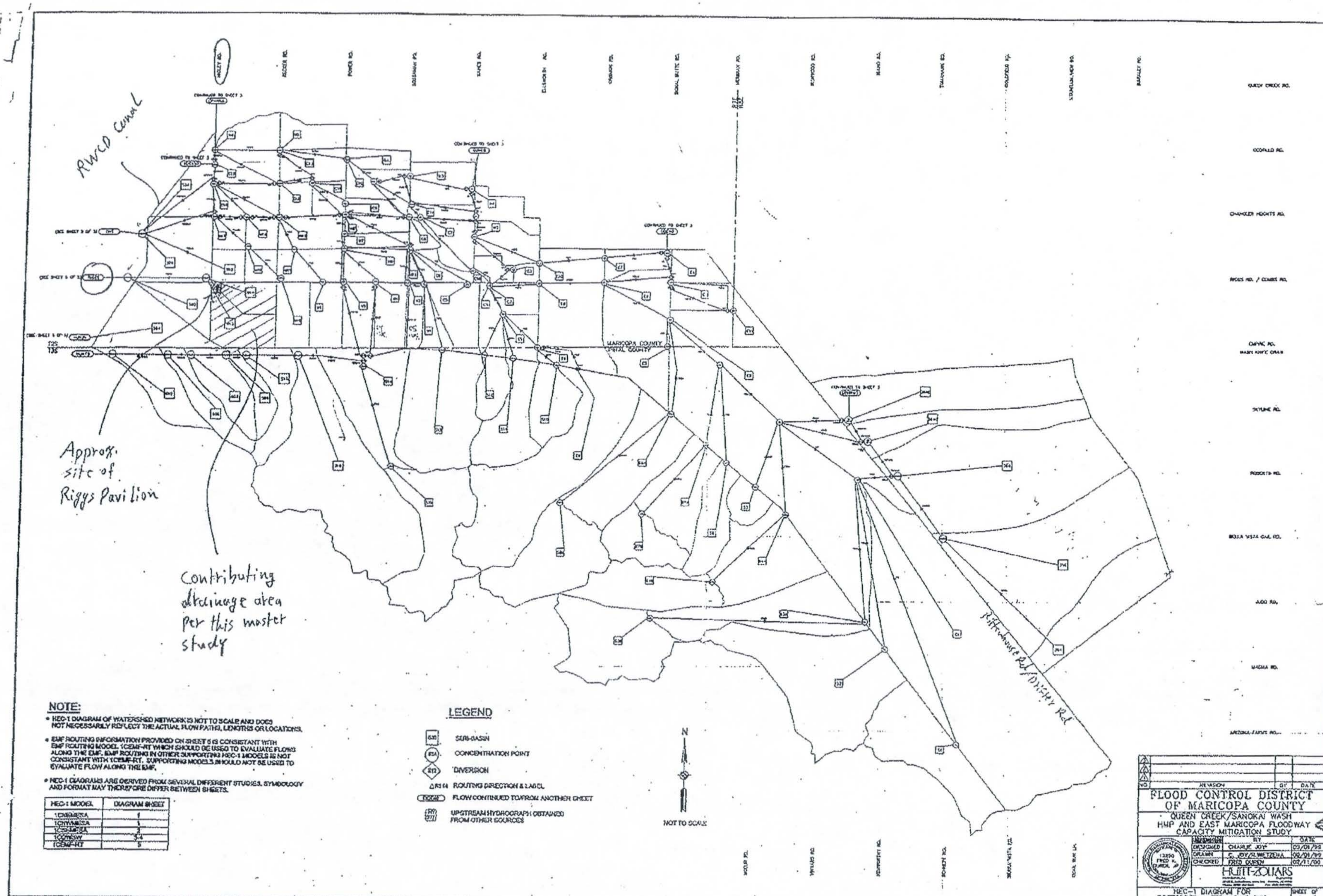
+	DIVERSION TO	DDW17O	417.	5.17	416.	220.	212.	12.26
+	HYDROGRAPH AT	*DW17	432.	5.42	264.	80.	77.	12.26
+	ROUTED TO	RW17	345.	8.92	250.	79.	77.	12.26
+	HYDROGRAPH AT	C14	358.	4.50	85.	21.	21.	0.51
+	HYDROGRAPH AT	DC12	52.	5.25	18.	5.	5.	9.93
+	ROUTED TO	RC12W	38.	7.75	17.	5.	5.	9.93
+	3 COMBINED AT	CP-C14	367.	8.92	258.	98.	94.	12.77
+	DIVERSION TO	DDC14O	299.	8.92	210.	78.	75.	12.77
+	HYDROGRAPH AT	*DC14	68.	8.92	48.	20.	19.	12.77
+	ROUTED TO	RC14N	61.	10.42	47.	20.	19.	12.77
+	HYDROGRAPH AT	C15	290.	4.67	86.	22.	21.	0.51
+	2 COMBINED AT	CP-C15	176.	4.83	72.	34.	33.	13.28
+	DIVERSION TO	DDC15O	97.	4.83	42.	21.	20.	13.28
+	HYDROGRAPH AT	*DC15	80.	4.83	31.	13.	13.	13.28
+	ROUTED TO	RC15N	77.	5.25	30.	13.	13.	13.28
+	HYDROGRAPH AT	DC11	96.	4.33	35.	11.	10.	9.66
+	ROUTED TO	RC11N	64.	6.42	33.	11.	10.	9.66
+	HYDROGRAPH AT	C13	552.	4.33	85.	21.	20.	0.51
+	HYDROGRAPH AT	N5	321.	4.75	63.	16.	15.	0.43
+	HYDROGRAPH AT	DC10	3091.	15.00	2563.	1548.	1491.	49.66
+	ROUTED TO	RC10W	3034.	16.08	2556.	1458.	1404.	49.66
+	4 COMBINED AT	CP-N5	3030.	16.08	2553.	1477.	1423.	50.60
+	ROUTED TO	RN5W	2999.	17.00	2546.	1388.	1337.	50.60
+	HYDROGRAPH AT	N6	328.	4.92	83.	21.	20.	0.43
+	5 COMBINED AT	CP-N6	3254.	17.17	2664.	1417.	1365.	123.89
+	HYDROGRAPH AT	DW17aa	417.	5.17	416.	220.	212.	12.26
+	ROUTED TO	RW17	417.	6.00	416.	219.	211.	12.26
+	HYDROGRAPH AT	W19	429.	4.17	46.	12.	11.	0.25
+	DIVERSION TO	OUT	429.	4.17	46.	12.	11.	0.25
+	HYDROGRAPH AT	W19a	0.	0.00	0.	0.	0.	0.25
+	2 COMBINED AT	CP19	417.	5.75	417.	263.	254.	0.25
+	DIVERSION TO	*DW19	361.	5.50	361.	233.	224.	0.25
+	HYDROGRAPH AT	DW19	56.	5.42	56.	31.	30.	0.25
+	HYDROGRAPH AT	W15	117.	4.17	10.	2.	2.	0.08
+	ROUTED TO	RW20	112.	4.25	10.	2.	2.	0.08

+	HYDROGRAPH AT	W20	332.	4.33	32.	8.	8.	0.25
+	2 COMBINED AT	CP20	434.	4.33	41.	10.	10.	0.32
+	HYDROGRAPH AT	W14B	145.	4.33	16.	4.	4.	0.13
+	HYDROGRAPH AT	W13A	222.	4.33	20.	5.	5.	0.16
+	ROUTED TO	13At14	187.	4.50	20.	5.	5.	0.16
+	HYDROGRAPH AT	W13B	145.	4.33	16.	4.	4.	0.13
+	2 COMBINED AT	CPW13B	310.	4.42	36.	9.	9.	0.28
+	2 COMBINED AT	CPW14	440.	4.33	52.	13.	13.	0.41
+	ROUTED TO	RW21	414.	4.50	52.	13.	13.	0.41
+	HYDROGRAPH AT	W21	339.	4.33	32.	8.	8.	0.25
+	2 COMBINED AT	CP21	661.	4.42	81.	20.	19.	0.66
+	HYDROGRAPH AT	SA03	72.	4.25	7.	2.	2.	0.06
+	HYDROGRAPH AT	SA04	10.	4.17	1.	0.	0.	0.01
+	2 COMBINED AT	CP01	80.	4.25	8.	2.	2.	0.07
+	ROUTED TO	01to02	79.	4.25	8.	2.	2.	0.07
+	HYDROGRAPH AT	SA01	14.	4.17	2.	0.	0.	0.01
+	2 COMBINED AT	CP02	93.	4.25	10.	2.	2.	0.08
+	HYDROGRAPH AT	SA05	63.	4.25	6.	2.	1.	0.05
+	ROUTED TO	03to06	61.	4.25	6.	2.	1.	0.05
+	HYDROGRAPH AT	SA06	45.	4.58	9.	2.	2.	0.08
+	ROUTED TO	04to06	45.	4.58	9.	2.	2.	0.08
+	HYDROGRAPH AT	SA06	47.	4.50	9.	2.	2.	0.08
+	ROUTED TO	05to06	45.	4.58	9.	2.	2.	0.08
+	HYDROGRAPH AT	SA02	54.	4.17	4.	1.	1.	0.03
+	5 COMBINED AT	CP06	217.	4.25	38.	9.	9.	0.32

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

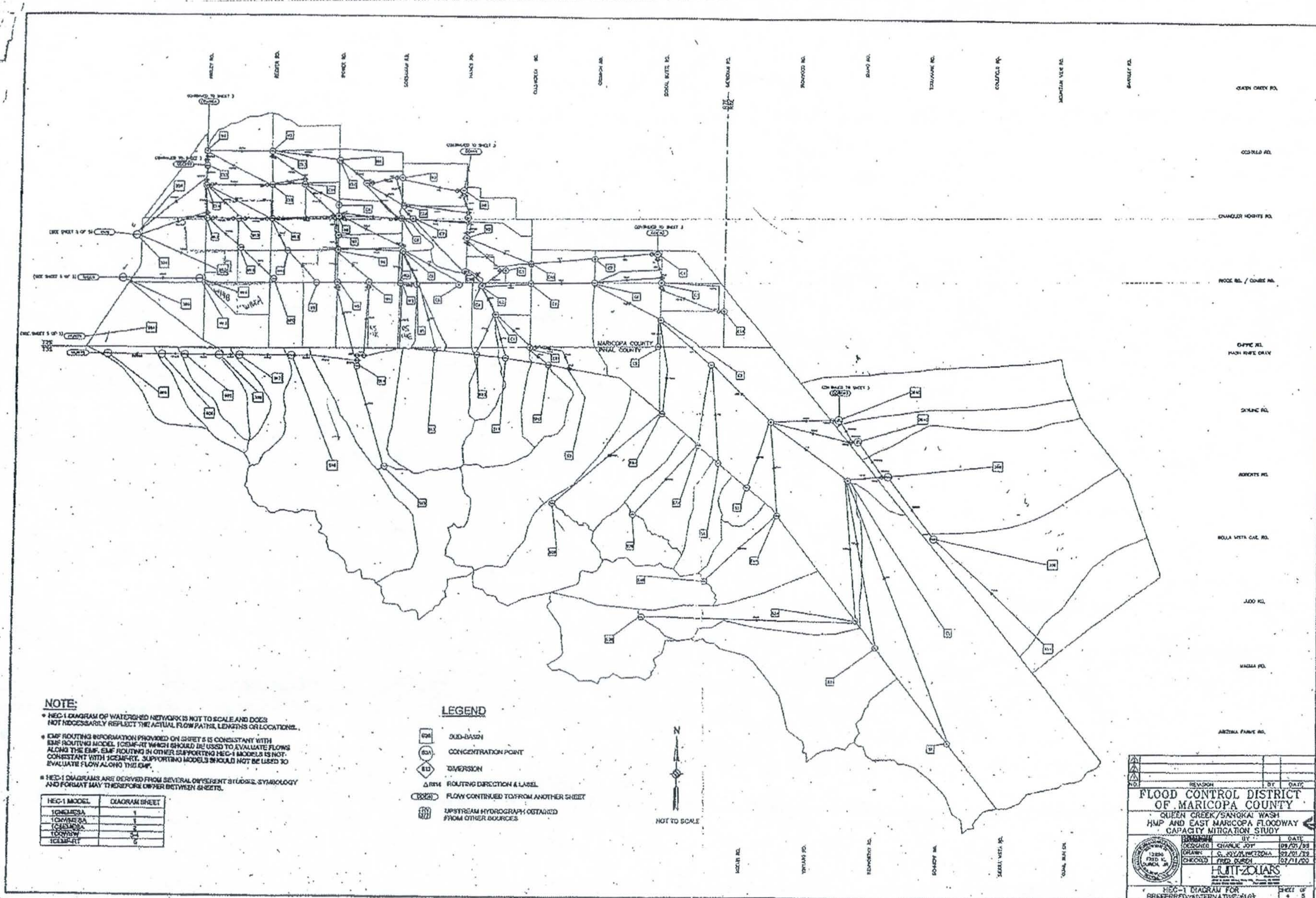
APPENDIX G

SUPPORTIVE MATERIAL



RWCD Canal
Approx. site of Riggs Pavilion
Contributing drainage area per this master study
MARICOPA COUNTY
PINAL COUNTY
T2S
T3S
NOTE:
• HEC-1 DIAGRAM OF WATERSHED NETWORK IS NOT TO SCALE AND DOES NOT NECESSARILY REFLECT THE ACTUAL FLOW PATHS, LENGTHS OR LOCATIONS.
• EMF ROUTING INFORMATION PROVIDED ON SHEET 5 IS CONSISTANT WITH EMF ROUTING MODEL 1CEMF-RT WHICH SHOULD BE USED TO EVALUATE FLOWS ALONG THE EMF. EMF ROUTING IN OTHER SUPPORTING HEC-1 MODELS IS NOT CONSISTANT WITH 1CEMF-RT. SUPPORTING MODELS SHOULD NOT BE USED TO EVALUATE FLOW ALONG THE EMF.
• HEC-1 DIAGRAMS ARE DERIVED FROM SEVERAL DIFFERENT STUDIES. SYMBOLOGY AND FORMAT MAY THEREFORE DIFFER BETWEEN SHEETS.
HEC-1 MODEL | DIAGRAM SHEET
1CNWMESA | 1
1CNYMESA | 1
1CSEMESA | 2
1CQTNSW | 3-4
1CEMF-RT | 5
LEGEND
SUB-BASIN
CONCENTRATION POINT
DIVERSION
ROUTING DIRECTION & LABEL
FLOW CONTINUED TO/FROM ANOTHER SHEET
UPSTREAM HYDROGRAPH OBTAINED FROM OTHER SOURCES
N
NOT TO SCALE
Rittenhouse Rd / Ditty Rd
QUEEN CREEK RD.
OCOTILLO RD.
CHANDLER HEIGHTS RD.
RIGGS RD. / COMBS RD.
ARIZONA FARMS RD.
NO | REVISION | BY | DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
QUEEN CREEK/SANOKAI WASH HMP AND EAST MARICOPA FLOODWAY CAPACITY MITIGATION STUDY
DESIGNED | CHARLIE JOY | 03/01/99
DRAWN | C. JOY/R. WETZEL | 09/01/99
CHECKED | FRED QUIROH | 02/11/00
HUITT-ZOLLARS
HEC-1 DIAGRAM FOR PREFERRED ALTERNATIVE (1C)
SHEET 4 OF 5

4,719.42


NOTE:
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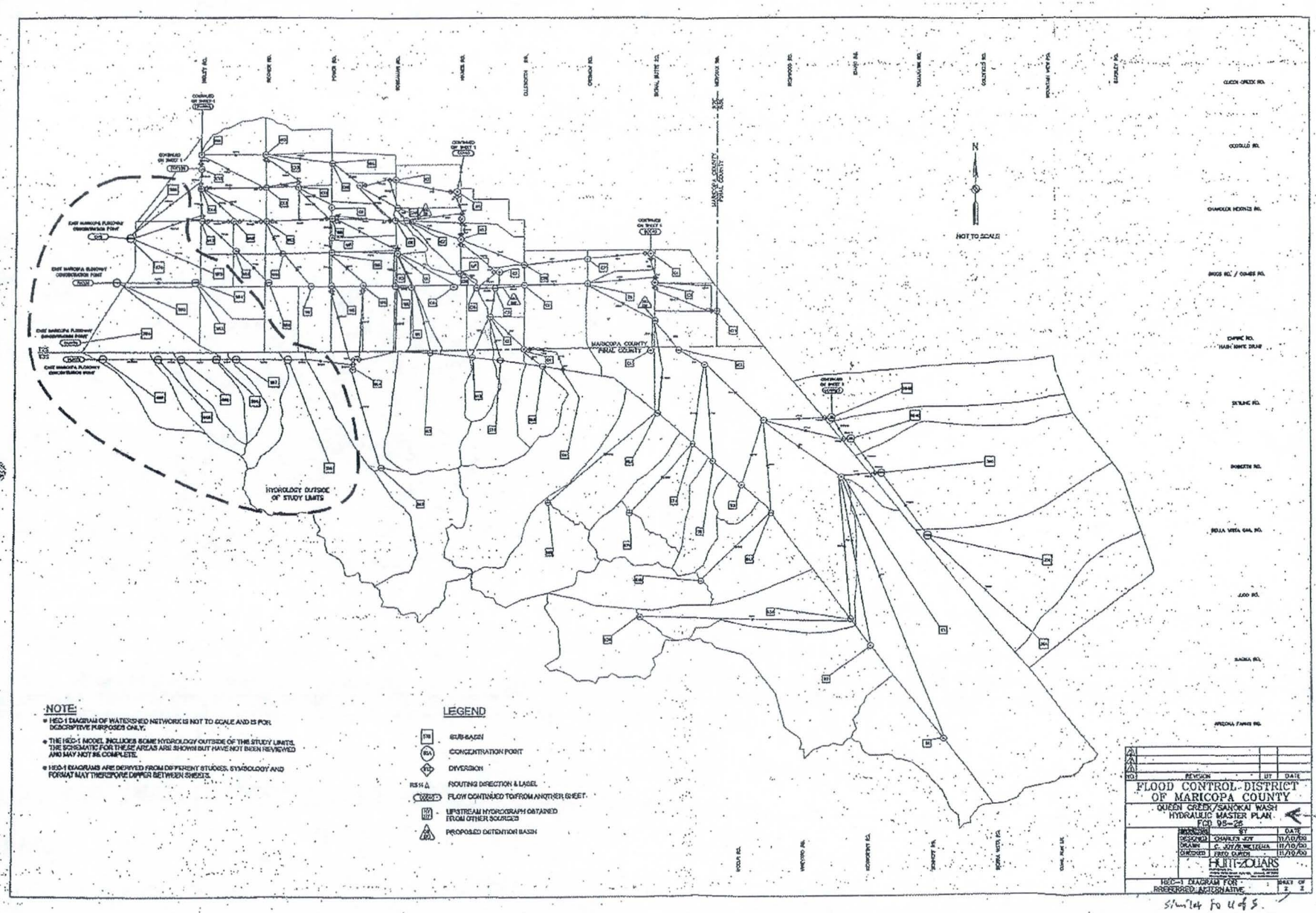
HEC-1 MODEL | DIAGRAM SHEET
1CEMF-RT | 5
LEGEND
SUB-BASIN
CONCENTRATION POINT
DIVERSION
ROUTING DIRECTION & LABEL
FLOW CONTINUED TO/FROM ANOTHER SHEET
UPSTREAM HYDROGRAPH OBTAINED FROM OTHER SOURCES
MARICOPA COUNTY
PINAL COUNTY
N
NOT TO SCALE
NO. | REVISION | BY | DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
QUEEN CREEK/SANOKAI WASH HMP AND EAST MARICOPA FLOODWAY CAPACITY MITIGATION STUDY
BY | DATE
DESIGNED | CHARLIE JOY |
CHECKED | FRED BURCH | 02/11/00
HUITT-ZOLLARS
HEC-1 DIAGRAM FOR PREFERRED ALTERNATIVE
SHEET 4 OF 5

4,719.42


HYDROLOGY OUTSIDE OF STUDY LIMITS
MARICOPA COUNTY / PINAL COUNTY
NOT TO SCALE
N
NOTE:
HEC-1 DIAGRAM OF WATERSHED NETWORK IS NOT TO SCALE AND IS FOR DESCRIPTIVE PURPOSES ONLY.
THE HEC-1 MODEL INCLUDES SOME HYDROLOGY OUTSIDE OF THE STUDY LIMITS. THE SCHEMATIC FOR THESE AREAS ARE SHOWN BUT HAVE NOT BEEN REVIEWED AND MAY NOT BE COMPLETE.
HEC-1 DIAGRAMS ARE DERIVED FROM DIFFERENT STUDIES. SYMBOLOGY AND FORMAT MAY THEREFORE DIFFER BETWEEN SHEETS.
LEGEND
SUB-BASIN
CONCENTRATION POINT
DIVERSION
ROUTING DIRECTION & LABEL
FLOW CONTINUED TO/FROM ANOTHER SHEET
UPSTREAM HYDROGRAPH OBTAINED FROM OTHER SOURCES
PROPOSED DETENTION BASIN
REVISION
BY
DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
QUEEN CREEK/SANOKAI WASH HYDRAULIC MASTER PLAN
FCD 95-26
DESIGNED
CHARLES JOY
11/10/00
DRAWN
C. JOY/E.NICHOLAS
11/10/00
CHECKED
FRED GUTOL
11/10/00
HULT-ZOLLARS
HEC-1 DIAGRAM FOR PREFERRED ALTERNATIVE
SHEET OF
2 2

Sheet 24 of 5.

MASTER OFFSITE DRAINAGE REPORT
FOR
SEVILLE – HIGLEY ROAD &
CHANDLER HEIGHTS ROAD

Prepared By:
CMX GROUP INC.
1515 E. Missouri, Suite 115
Phoenix, Arizona 85014
Phone: (602) 279-8436

Prepared For:
SHEA HOMES INC.
8800 N. Gainey Center
Suite 350
Scottsdale, Arizona 85258
480-348-6000

Revised August 1, 2000
CMX Project No. 5946

PRELIMINARY MASTER OFFSITE DRAINAGE REPORT
FOR
SEVILLE – HIGLEY & CHANDLER HEIGHTS ROAD

Prepared By:
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Prepared For:
SHEA HOMES INC.
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Suite 350
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480-348-6000

Revised May 8, 2000
March, 1999
CMX Project No. 5946

PRELIMINARY MASTER OFFSITE DRAINAGE REPORT
FOR
SEVILLE – HIGLEY & CHANDLER HEIGHTS ROAD

TABLE OF CONTENTS

I. INTRODUCTION

The purpose of this preliminary master offsite drainage report is to evaluate the impact that the Seville development will have on the existing drainage and to outline the hydrologic and hydraulic methods to be used in project design.

The Seville development is located in southeastern Maricopa County within portions of Section 23, 25, 26, and 27 Township 2 South, Range 6 East (See Figure 1). Seville is within a watershed area tributary to the Sonokai Wash. The existing land use is agriculture; primarily flood irrigated citrus. The land slopes to the northwest at a very mild rate.

The Maricopa County, Arizona and incorporated areas Flood Insurance Rate Map (FIRM) Number 04013C3075F dated December 3, 1993 indicates that the project site is within a designated Zone X. A Zone X is defined as an area outside of the 500-year floodplain. See Figure 4.

II. RELATED STUDIES

Previous studies of the Sonokai Wash and Queen Creek included drainage basins directly impacting the Seville project site.

A. Sonokai Wash

Entellus prepared a Sonokai Wash Floodplain Delineation Study (Draft Report) in April, 1998. The Sonokai Wash watershed included 60 square miles with a portion directly impacting the Seville site. Because of a complex scenario of flow splitting, this study included a possible impact on Seville of runoff from areas as far away as 21,000 ft. to the south and southeast.

The 100-year, 6-hour runoff values were calculated with the Corps of Engineers HEC-1 computer program using the Clark unit hydrograph parameters. Precipitation frequency values were calculated using the PREFRE computer program.

It should be noted that a rainfall pattern No. 1 was used for subareas adjacent to the Seville site. This resulted in very high runoff values.

The 100-year, 24-hour runoff values were also determined by Entellus.

B. Queen Creek

A Queen Creek Area Drainage Master Study was prepared by Wood & Associates August 1991. This study included the SandQui (Sonokai) Wash watershed as a tributary to Queen Creek. The SCS Dimensionless Unit

a) Riggs Road major arterial half street plus grass lined trapezoidal channel with Z=4:1 and b=16Ft (where Z = side slopes and b = channel bottom width).
b) Onsite Residential Collector Rd. (Loop Rd.) Z=4:1 and b=16Ft.
c) Higley Road full Major Arterial Street plus grass lined trapezoidal channel with Z=4:1 and b=16Ft.

For HEC-2 input data plus HEC-RAS output see Appendix B.

2. Chandler Heights Road

The conveyance for this channelization includes a minor Arterial Street section (Chandler Heights Rd.) plus a grass lined trapezoidal channel with Z=4:1 and b=32 Ft.

Backwater analysis of this channel begins at the intersection of Higley Road and Chandler Heights Road and extends upstream along Chandler Heights Road easterly to 650± Ft. west of Power Road. See Figure 6.

Starting backwater elevation was determined by a HY-8 culvert analysis computer program. A starting runoff rate of 884 cfs included flows in Chandler Heights Road from the east combined with outflow from the Riggs Road channel.

Historically, once the capacity of the existing earth channel along the south side of Chandler Heights Road is exceeded, flows would overtop the channel and road and sheet flow northerly across the proposed Parcels 1 through 8 of Seville. As the Seville project will not accommodate this sheet flow, flows shall be contained in the Chandler Heights channel until Higley Road, at which point some flow will be directed northerly, to as best as possible match historical conditions. The final drainage report will include a flow split analysis at the intersection of Higley Road and Chandler Heights Road to ensure that the historical flows west of Higley Road in Chandler Heights Road are not exceeded. The pipes west of the site are sized for 500 cfs and the Seville project will not discharge more than this amount westerly. The intersection of Higley and Chandler Heights Roads will be designed to create a broad-crested weir effect to direct the additional flow amounts, which historically sheet flowed northerly across Seville Parcels 1 thorough 8, across the street and into the proposed channel along the east side of Higley Road.

For HY-8 culvert analysis output, HEC-2 input data, and HEC-RAS output see Appendix C.

IV. FLOW OVER CHANDLER HEIGHTS ROAD & RIGGS ROAD

A. Chandler Heights Road

Based on The Entellus report of reference 3, flow will split at four (4) concentration points along Chandler Heights Road. A portion of the flows will be

B. Riggs Road

The Entellus report shows that flows from the South will flow over Riggs Road at concentration points W9 and W10.

Flow across Riggs Road, in this study, was simulated as incremental flows across road segments along the roadway alignment. This simulation was accomplished by:

1. Using The Entellus generated 100-yr., 6-hr. Q's.
2. Developing cross section data of the Riggs Road flow corridor.
3. Using the HEC-2 split-flow option of reference 5 at each cross section along the alignment; the high point elevation on the North side was modeled as the crest elevation of a side-channel weir segment. Flow above crest elevation represented flows crossing Riggs Road. See APPENDIX-D for overflow concept and HEC-2 output. Table 2 is a summary of results.

TABLE 2
RIGGS ROAD
WEIR FLOW SPLIT

SEGMENT		FLOW IN (cfs)	Q ACROSS ROAD (cfs)		FLOW REMAIN (cfs)
FROM	TO		SEGMENT	SUM	
1	2	1218	5.14	1148.93	69.07
2	4	1218	0.00	1143.80	74.20
4	6	1218	0.00	1143.80	74.20
6	8	1218	59.75	1143.79	74.21
8	10	1218	364.90	1084.04	133.96
10	12	1218	89.02	719.14	498.86
12	14	914	77.03	630.13	283.87
14	16	914	167.14	553.09	360.91
16	18	914	168.94	385.96	223.04
18	20	914	81.56	217.02	391.98
20	22	914	0.00	135.45	473.55
22	24	914	0300	135.45	473.55
24	26	609	7.34	135.45	473.35
26	27	609	128.12	128.12	480.88

V. ADDITIONAL OFFSITE DRAINAGE ANALYSIS

There are three areas offsite of the Seville project that are not intercepted by the Riggs and Loop Road channel or the Chandler Heights channel, which need to be analyzed in more detail in the final drainage study for Seville. These areas include: (1) the area southeast of the site, between the Seville project and the intersection of Power and Riggs Roads, (2) the area south of the Cloud Road alignment, and (3) the area south of Riggs Road west of the proposed channel. These areas may require additional channelization, flood protected walls, or berms to control the offsite storm water around the site.

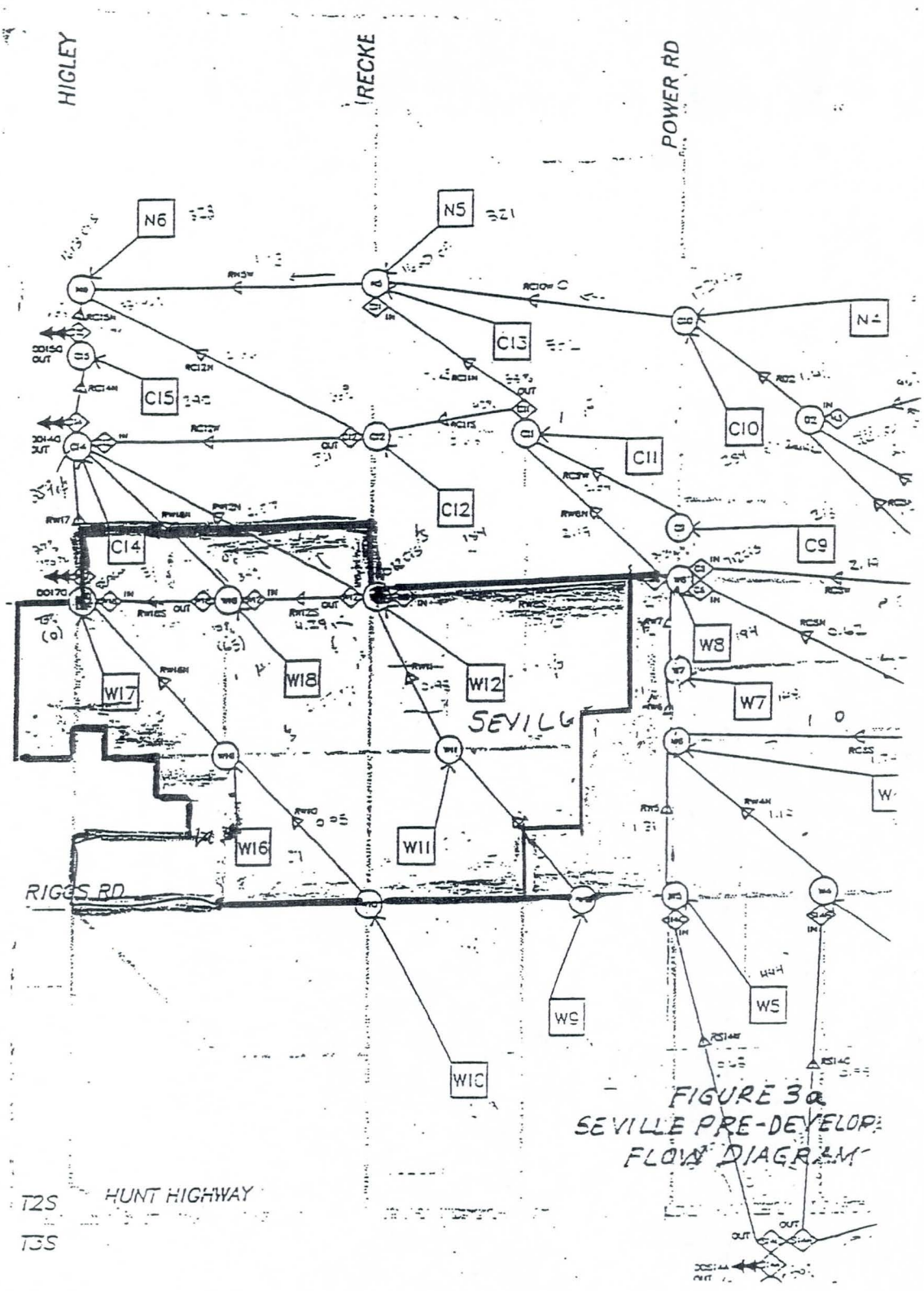


FIGURE 3a
SEVILLE PRE-DEVELOPMENT FLOW DIAGRAM

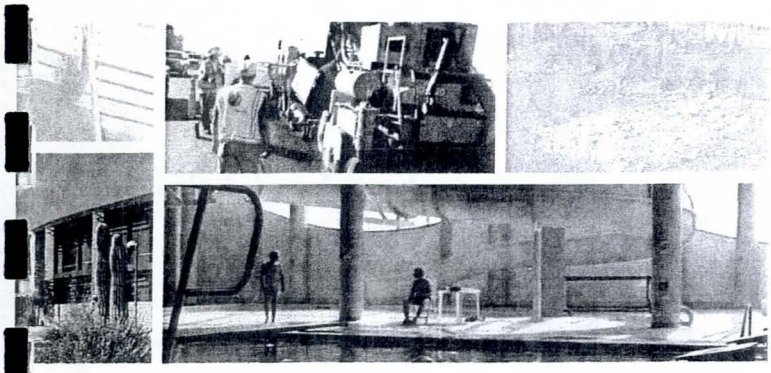
FIGURE 3a

CMX GROUP INC.
1515 E. MISSOURI, #115
PHOENIX, AZ 85014
PH (602)279-8436
FAX (602)265-1191

SEVILLE PRE-DEVELOPMENT FLOW DIAGRAM

SEVILLE
CHANDLER HEIGHTS & HIGLEY
GILBERT, ARIZONA

CMX JOB NO.	5946A
DATE:	03-08-00
SCALE:	NTS
DRAWN BY:	
CHECKED BY:	



FINAL
DRAINAGE REPORT
FOR
MOUNTAINWOOD

Stantec

FINAL
DRAINAGE REPORT
FOR
MOUNTAINWOOD

Prepared for:

Vanderbilt Farms L.L.C.
1121 W. Warner Rd., Suite 109
Tempe, Arizona 85284
(480) 831-2000

Prepared by:

Stantec Consulting Inc.
8211 S. 48th St.
Phoenix, Arizona 85044
(602) 438-2200

June, 2006
181504002

Final Drainage Report For Mountainwood

Table of Contents

1.0 Scope

This report has been prepared under contract from the Vanderbilt Farms, L.L.C., owner and developer of the proposed Mountainwood development. The purpose of this report is to present detailed hydrologic and hydraulic analyses for the proposed improvements to support final plat submittal and application for building permits. This report has been prepared in accordance with the Town of Gilbert Engineering Design Guidelines (Ref.1.) and Drainage Design Manual for Maricopa County (Ref. 2). This study provides drainage evaluations for the proposed development and its impact on downstream and upstream properties. The analysis presented herein focused on preventing flood damages from occurring as the results of storm events of particular duration and frequency up to and including a 100-year event.

2.0 Location

The proposed Mountainwood project is located on the east side of the East Maricopa Floodway (EMF) and between Riggs Road and Hunt Highway within the jurisdiction of Town of Gilbert, Arizona. South of the site is Gila River Indian Community and San Tan Mountain.

The project site is located within the Sections 33 and 34, Township 2 South, Range 6 East, Gila and Salt River Base and Meridian, Maricopa County, Arizona.

The site can also be described by parcel numbers from Maricopa County Assessor's Office:

304-85-003L	304-85-006C	304-85-007L	304-85-014C
304-85-003B	304-85-006B	304-85-007J	
304-85-003R	304-85-006K		304-85-015A
304-85-003K	304-85-006M	304-85-011D	304-85-015B
304-85-003S	304-85-006L		
304-85-003U	304-85-006F	304-85-012A	304-85-016C
304-85-003Q	304-85-006G	304-85-012B	304-85-016D
304-85-003V	304-85-006H		
304-85-003X	304-85-006J	304-85-013B	
304-85-003N		304-85-013C	
304-85-003A			

More geographic information can be found in Figures 1 and 2.

3.0 Site Description

The site consists of approximately 580 acres of irrigated farmland and orchards and slopes northwest towards the intersection of Riggs Road and the EMF. The overall slope is approximately 0.8%. The surrounding area is predominately farmland, with some new single-family subdivisions and scattered rural buildings. The area to the north of the site is currently under development. Green Fields and Country Shadows are both low density residential.

4.0 Flood Hazard Zone Classification

The 'Maricopa County, Arizona and Incorporated Areas Flood Insurance Rate Map' (FIRM) Number 04013C3075G, dated July 19, 2001 (Fig. 3) shows that the project site falls within Flood Hazard Zone "X".

6.0 Offsite Drainage

The watershed has moderate vegetative cover with dense vegetation along wash banks. The watershed drainage is characterized by poorly defined and scattered washes on mild grades. The majority of the offsite area is currently undeveloped natural desert except a portion in the east of 164th Street, which has been used as sites for low density custom or rural homes. The surrounding areas are in transition to suburban development with land uses including median to low density residential except for the south of the site. Lying south of Hunt Highway is the Gila River Indian Community where no existing development identified.

Hydrology of the watershed has been previously studied under the Queen Creek Area Drainage Master Study in 1999 (Ref. 6). This Master Study was an effort by Flood Control District of Maricopa County to develop planning and engineering guidelines for management of the storm water along Queen Creek and Sanokai Wash. This study does not include any hydrologic modeling for offsite runoff originating from the south and east of the property. Instead, this report references the flow quantities resulting from the HEC-1 models in the Queen Creek Area Drainage Master Study.

6.1 Offsite Drainage from South

Per the HEC-1 analysis of the Master Study, the drainage from south of the site flows west and discharges at a 100-year 24-hour rate of 1788 cfs into the EMF south of Hunt Highway via an existing flood channel system. The output of the HEC-1 modeling extracted from the Master Study is included in Appendix C. It was observed during a site visit that there are two (2) earth channels conveying flows from east to west as shown in Figure 6. These two (2) channels run parallel to each other and apart for 50 to 200 feet. The drainage area between the two (2) channels extends approximately 3000 feet east of Constellation Way's alignment, consisting of 20.66 acres of natural desert. It was determined by the rational method that the 100-year runoff generated a peak flow of 29.05 cfs from this area. The calculation results are included in the last line in the Table 4. This localized offsite drainage is concentrated along the north channel and

the regional flow of 1788 cfs is contained by the south channel. In general, the south channel has a larger section than the north channel. The two (2) existing channels are linked at Station 27+20, where the regional runoff from the south break into the north channel. At this junction, turbulence may occur and backwater effect may cause raising water surfaces in the immediately upstream vicinity. It is necessary to set the Hunt Highway profile high enough to account for the potential raise in water surface due to backwater effect. It can be seen that the proposed centerline grade is 1316.21 at the STA 28+00, which is higher than the backwater potential with more than one and a half feet freeboard (1316.21 – 1314.69 = 1.52).

Normal depth calculations for the channels were performed at various locations along Hunt Highway and the results are listed in Table 2. The results of the normal depth analyses demonstrate that the existing channels can contain 100-year offsite flows with the proposed Hunt Highway profile set high enough to prevent offsite flows originating from the south from entering the project.

Table 2 Hydraulic Evaluation for Offsite Drainage from South

LOCATION	FLOW (cfs)	VELOCITY (ft/s)	WSE (ft)	DEPTH (ft)	PROPOSED HUNT HWY PROFILE @CL
Hunt Hwy 10+00	1788	5.49	1303.12	4.12	1304.40
Hunt Hwy 13+00	1788	5.39	1304.80	3.80	1305.96
Hunt Hwy 27+20	1788	6.83	1314.69	3.69	1315.61
Hunt Hwy 28+00	29.05	2.28	1313.52	0.52	1316.21
Hunt Hwy 34+60	29.05	2.55	1316.77	0.77	1321.16
Hunt Hwy 42+17.35	29.05	2.07	1324.45	0.45	1326.84
Hunt Hwy 67+78	1788	6.5	1347.37	4.37	N/A
Hunt Hwy 75+25	1788	7.91	1352.98	2.98	N/A

6.2 Offsite Drainage from East

Per HEC-1 analysis of the Queen Creek Master Study, the drainage from the east of the site flows west through the site and discharges into the EMF. There is an existing gabion channel on the south side of Riggs Road across the site. This channel collects drainage from the east and conveys to the EMF. The construction of the Mountainwood project will redirect the offsite drainage from the south north to Riggs Road and then flow west to the EMF in the gabion channel. This project will improve the west half of Constellation Way and a 6-inch "A" type curb is proposed at the centerline to prevent offsite drainage on the east side from spilling over the street profile and entering the site.

The offsite watershed east of the site has been analyzed in the Queen Creek Master Study. The drainage basin 580 in the Master Study (see drainage map in Appendix C) covers much of the offsite drainage areas impacting the project. The basin 580 has a drainage area of 339 acres and produce a peak flow of 186 cfs for a 100 year and 24 hour event. The offsite watershed impacting the project is limited between Riggs Road and Hunt Highway and between Constellation Way and Higley Road, roughly 320 acres. The peak flow of 186 cfs from the basin 580 is referenced from the Queen Creek Master Study and used in this study for a more conservative purpose.

The offsite flow of 186 cfs will be routed into an existing drainage ditch to the north along the east side of Constellation Way. Normal depth calculations for the earth ditch are performed at various locations along this parameter street and the results are listed in following table:

A portion of the 100-year and 24-hour runoff overflows the existing 164th Street approximately 300 feet south of Riggs Road. At this location, runoff from the east overtops the dirt road and travels through the northeast corner of the site and ends up in the existing gabion channel south of Riggs Road in existing condition. Since the proposed Constellation Way profile has been raised over the existing grades at the location and a 6-inch curb is proposed along the centerline, the 100-year flow will no longer spill over the proposed street.

Table 3 Hydraulic Evaluation for Offsite Drainage from East

LOCATION ALONG CONSTELLATION WAY	FLOW (cfs)	VELOCITY (ft/s)	WSE (ft)	DEPTH (ft)	PROPOSED STREET PROFILE @CL
STA 57+70	186	2.96	1321.23	2.23	1321.29
STA 53+40	186	3.00	1322.75	2.75	1322.80
STA 38+10	186	3.47	1331.48	2.18	1332.80
STA 25+45	186	3.18	1337.91	1.91	1338.80

- The grades at the centerline of the proposed street are the top of the curb elevations.

The landscaped areas at the southeast corner of Constellation Way and Riggs Road have been graded to easily convey the flow to the gabion channel. Buildings in the adjacent areas are protected by raised finish floors and perimeter walls. These grading designs provide additional safety for the project in the interim condition.

A normal depth analysis for the gabion channel indicates that the flow depth in the channel is estimated to be 3.33 feet using a 100-year flow rate of 721 cfs referenced from the Preliminary Drainage Report for this project. The finish floor elevations of the lots adjacent to the channel are listed in following table and comparisons are made in reference to the estimated water surface elevations in the channel. All these lots adjacent to the existing gabion channel have more than 14-inch freeboard and meet Gilbert's criteria. This gabion channel is a permanent flood control facility for the project and upstream properties and should be maintained to standards to guarantee satisfactory hydraulic performance.

Chandler Junior High School
Preliminary Drainage Study

Prepared for:

Hess-Roundtree Engineering

And Chandler School District

For Submittal to:

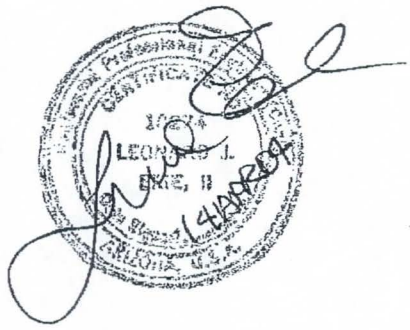
Maricopa County

Prepared by:

Erie & Associates, Inc.

3120 N. 24th St.

Phoenix, AZ 85016



EA# 1843.02

April 14, 2004

Erie & Associates, Inc.
CONSULTING ENGINEERS
3120 N. 24th St. / Phoenix, Arizona 85016 / (602) 954-6399

1. 0 Table of Contents

2.0 List of Plates & Tables

3.0 Project Location/Description

The 30± acre Chandler Junior High School site is located within an unincorporated area of Maricopa County, Arizona. More specifically the site is within Section 35, Township 2 South, Range 6 East, of the Gila and Salt River Base and Meridian. The project is bound on the north by San Tan Boulevard, and on the west by Higley Road. The project site is shown on Plate 1-Location Map.

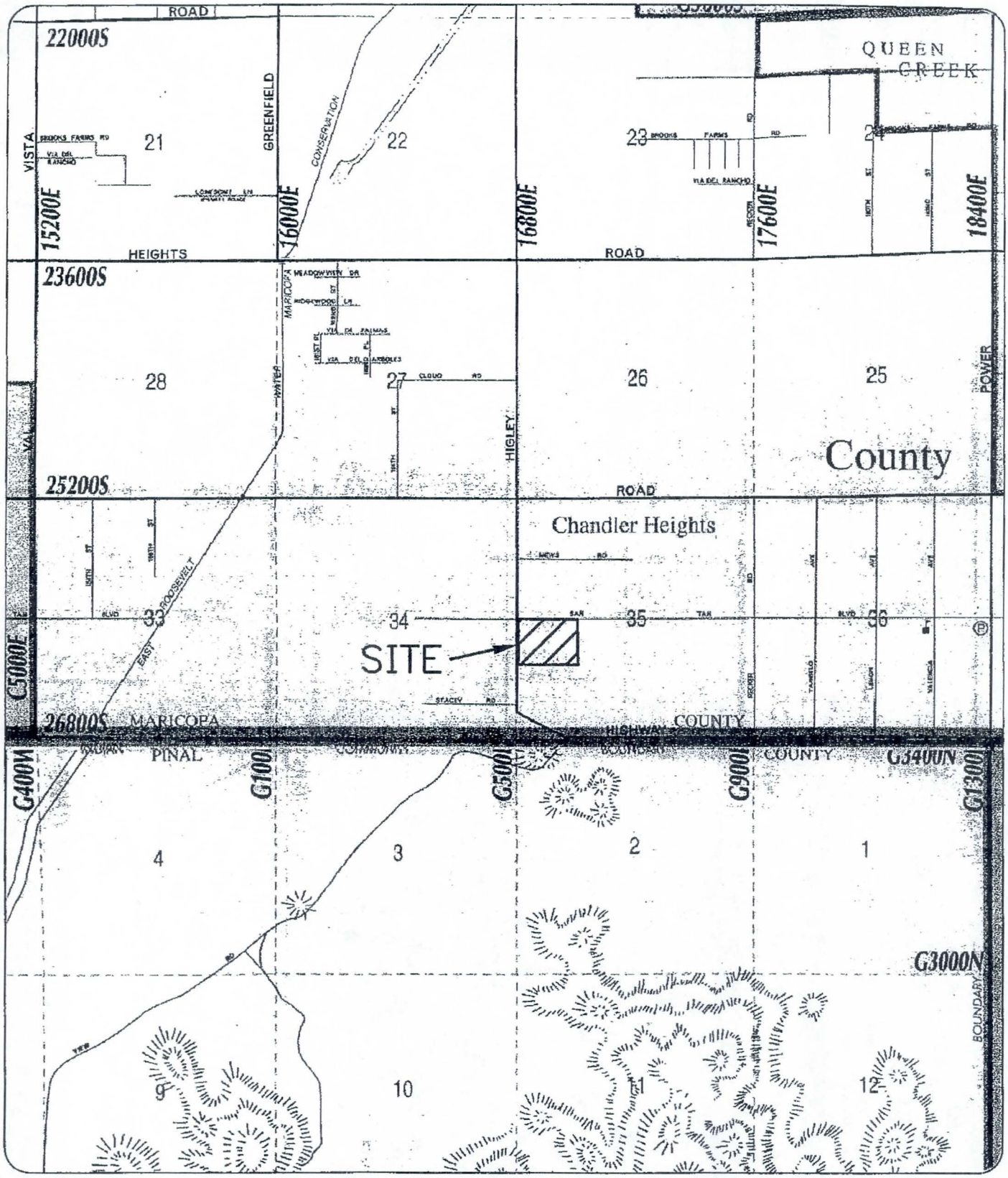
3.1 FEMA Information

The site is located in Zone X as shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map #04013C3075G, Maricopa County, Arizona, effective date: July 19, 2001. The Zone X classification is defined as "areas of 500-year flood; areas of 100- year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees form 100-year flood." The site location on the FEMA map is shown on Plate 2-FEMA Map.

3.2 Drainage Concept

Currently, offsite flow enters the site at several locations on the south and east property line. Offsite flow generally enters the site flowing northwest, except when it is contained along Higley road and San Tan Blvd.

- Flows will enter and depart the site in substantially the same manner as under predevelopment conditions.
- Onsite flows will go thru a first flush basin and "Sonoran Biofilter" before commingling with offsite flows.
- Finish floors are set a minimum of 1' above the 100-year water surface elevations.
- Water overtopping the Higley/San Tan intersection will continue to do so as under predevelopment conditions.



JOB NO. 1843.01 DATE: 04/07/04 SCALE: ------	ERIE AND ASSOCIATES, INC. 3120 N. 24th St. PHOENIX, ARIZONA 85016 PH: (602) 954-6399	CHANDLER JR HIGH SCHOOL PLATE 1 – LOCATION MAP

4.0 Hydrology

The tributary area for the Chandler Junior High School project is generally bounded by Hunt highway to the south and by Higley road on the west. The total contributing drainage area is approximately 206 acres or 0.32 square miles. The drainage area consists of orange groves, undeveloped desert, and residential homes.

Existing onsite flow generally flows northwest across undeveloped desert and small washes. Onsite and offsite flow concentrates at the northwest corner of the site before flowing offsite through existing culverts, and by overtopping Higley road.

The developed drainage model routes offsite flow through pipes along the property lines to the northwest corner of the site. The conveyance pipes have been sized to carry the peak flows generated from the 100-year 6-hr storm conditions. The developed onsite flow is routed through "first flush" basins and retention basins to the northwest corner of the property before flowing offsite.

Onsite retention volume will be provided for the first flush volume, and for the 100-year, 2-hour volume per the Maricopa County Standards. All onsite basins will not exceed 3' in depth. Basins are provided to meet retention requirements as well as to ensure that post development flow is less than pre development flow.

Currently flow leaves the site through three 36" pipes that are silted over allowing a restricted flow under Higley road. The excess flow overtops at the northwest corner and flows over Higley road. A hydraulic analysis has been prepared to ensure the post-development flow levels are less than pre-development conditions.

Existing and Proposed conditions were analyzed using the United States Army Corps of Engineer's HEC-1 flood hydrograph computer program, as implemented by Haestad Methods, Inc. Rainfall losses were generated by the Green and Ampt method, and the Clark Unit Hydrograph method was used for hydrograph routing. Soil information was taken from the Soil Conservation Service's Soil Survey of Eastern Maricopa County and Northern Pinal County, Arizona. Hydrologic calculations are included in Appendix A.

4.1 Existing Conditions Hydrology

The contributing area for the existing condition was delineated using the current U.S. Geological Survey (USGS) 7.5 Minute Series topographic quadrangle maps with contour intervals of 10'. In addition, aerial photographs and a visual inspection were used to delineate the drainage areas. The existing conditions sub areas are included as Plate 3-Existing Conditions Drainage Map.

The existing conditions drainage area consists of seven sub areas. The land is generally desert, orange groves, and residential homes. The existing conditions hydrologic parameters are included as Table 1 following.

Table 1-Existing Hydrologic Parameters

Sub Area	Area (sq mi)	Length (mile)	Slope (ft/mile)	Tc (hr)	R (hr)
SA01	0.013	0.286	38.5	0.296	0.423
SA02	0.034	0.338	59.2	0.258	0.239
SA03	0.058	0.538	59.5	0.342	0.348
SA04	0.008	0.263	68.4	0.229	0.385
SA05	0.050	0.501	59.9	0.329	0.341
SA06	0.082	0.748	53.5	0.733	0.867
SA07	0.077	0.744	49.7	0.679	0.816

The Existing conditions HEC-1 model is included as Appendix B in the back of this report.

4.2 Developed Conditions Hydrology

The developed conditions model was constructed by modifying the existing conditions model for a proposed junior high school built on site. The drainage sub areas were delineated according to the roof drainage and developed drainage concept as prepared by Hess Roundtree Engineers. The developed conditions drainage sub areas are shown on Plate 4-Master Drainage Plan. The developed conditions hydrologic parameters are summarized in Table 2 following.

Table 2-Developed Hydrologic Parameters

Sub Area	Area (sq mi)	Length (mile)	Slope (ft/mile)	Tc (hr)	R (hr)
OS01	0.002	0.126	31.7	0.138	0.276
OS02	0.0022	0.062	113.1	0.138	0.149
OS03	0.0022	0.094	38.5	0.108	0.158
OS04	0.0023	0.084	59.4	0.15	0.206
OS05	0.0012	0.164	42.8	0.15	0.533
OS06	0.0051	0.108	4.6	0.588	0.719
OS07	0.0061	0.141	35.5	0.175	0.205
OS08	0.0041	0.117	59.8	0.138	0.175
OS09	0.0023	0.173	52	0.133	0.331
OS11	0.0093	0.162	40.1	0.254	0.274
OS12	0.0101	0.156	25.6	0.333	0.348

The developed onsite drainage area consists of 11 sub areas consisting of buildings, parking areas, open space, and sports fields. Sub area OS06, which is the soccer and track field, has been developed to retain the 100-year 6-hour volume.

The developed conditions HEC-1 model is included as Appendix B in the back of the report.

The HEC-1 analysis resulted in peak flows entering and leaving the site as shown on Plate 4-Master Drainage Plan. Peak flows at key locations are summarized in Table 3.

Table 3-Peak Flows at Key Locations

HEC-1 ID	Description	Q_{100} (cfs) existing	Q_{100} (cfs) developed
CP01	Developed conditions at the southwest corner of the site	71	139
CP03	Main wash at south boundary offsite wash	61	N/A
CP04	East boundary offsite flow	44	N/A
CP06	Intersection of Higley and San Tan Blvd.	194	168

5.0 Hydraulics

Hydraulic analysis of the overtopping of Higley Road was performed using the U.S. Army Corps of Engineers' HEC-RAS computer program version 3.1.1. The hydraulic analysis for routing of the offsite flows has been analyzed using Manning's Equation.

Offsite flow entering the Chandler junior high school site is proposed to be rerouted using smoothbore pipes around the perimeter of the site to the northwest corner of the property which is the outfall. Analysis and calculations of flow are included in Appendix A.

5.1 Flow over Higley Road

The existing and developed HEC-RAS models include ponding at the northwest corner of the site as flow leaves through culverts that are partially silted up and by overtopping of Higley Road. Because the existing 3-36" cmp are silted up, the capacity is reduced to approximately 18 cfs. Existing flows are in the 200 cfs range on existing conditions. Flow reductions resulting from onsite basins lower the peak flow to 168 cfs and therefore also lower the downstream water surfaces. Analysis of the existing and developed conditions was performed and is summarized in Table 4 following.

Table 4-Water Surface Summary for Higley & San Tan Roads

Station	Water Surface Existing (Q=194 cfs)	Water Surface Developed (Q=168 cfs)
1	51.14	51.08
2	51.98	51.95
3	52.91	52.87
4	53.22	53.12

6.0 Retention/First Flush Basins

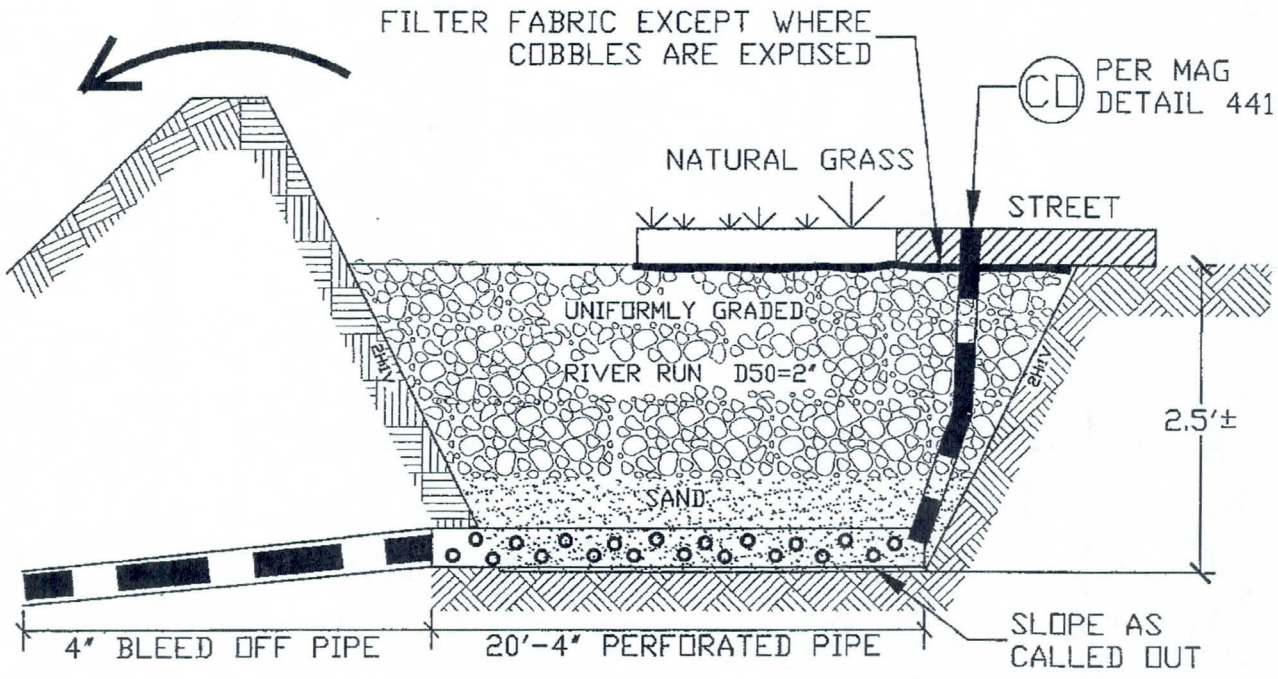
Onsite drainage areas are shown on Plate 4-Master Drainage Plan. The subareas are routed thru 5 onsite basins. The basins are sized to provide the 100-year, 2-hour storm detention and 3 of the basins also serve as first flush basins for the first ½" of runoff.

The first flush basins will drain to the lower basins thru a "Sonoran Biofilter" which is included as Plate 5. Calculations for the basin capacities are included in Appendix A and the basin information is summarized in Table 5 following.

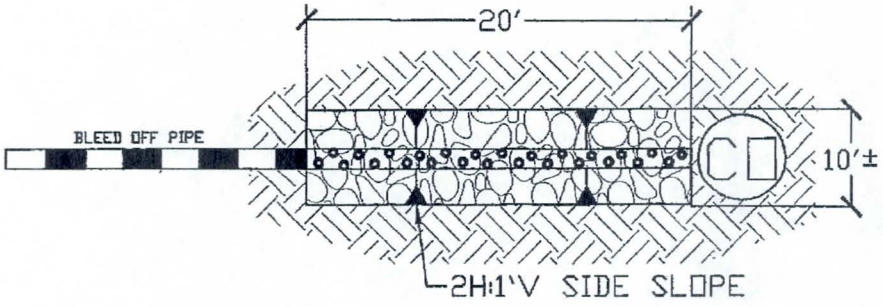
Table 5-Basin Information

Basin ID	Location	Volume (ac.-ft.)	Bottom Elevation	High Water Line
A1	Northwest corner of site (outfall)	0.63	48.5	51.5
A2	Northwest corner of site. First flush basin spills to A1	1.61	50.5	53.5
B1	North central portion of the site drains to A1	1.40	54.5	57.5
B2	North central first flush from campus drains to B1	0.27	57.5	60.0
C	North central first flush from playing fields drains to B1	0.40	58.0	61.0

The track/stadium area (OS06) drainage is self contained and stays in the track area on the 100-year, 6-hour storm.



PROFILE(SEC A-A')



PLAN VIEW

JOB NO. 1843
DATE: 04/06/04
SCALE: ------

ERIE AND ASSOCIATES, INC.
3120 N. 24th St.
PHOENIX, ARIZONA 85016
PH: (602) 954-6399

CHANDLER JR HIGH SCHOOL
PLATE 5 – SONORAN BIOFILTER

HEC1 S/N: 1343000424 HMVersion: 6.33 Data File: 1843DR02.HC1

```
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*             MAY  1991                 *
*          VERSION 4.0.1E               *
*                                       *
*  RUN DATE  04/01/2004  TIME  10:11:04 *
*                                       *
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*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*        609 SECOND STREET              *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
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:::::::::::::::::::::::::::::::::::::::::::
:::                                     :::
:::  Full Microcomputer Implementation  :::
:::                 by                  :::
:::        Haestad Methods, Inc.        :::
:::                                     :::
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```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

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

    1     ID
    2     ID        ERIE AND ASSOCIATES
    3     ID        CHANDLER HIGH SCHOOL SITE- 100yr/6hr Year Storm
    4     ID        100 Year Storm\DEVELOPED CONDITIONS
    5     ID
    6     ID        HEC-1 FILE NAME:  1843DE02.HC1
    7     ID        DATE:             FEBRUARY 24, 2004
    8     ID        CREATED BY:       JOHN PETAISTO, EIT
    9     ID
   10     ID        HEC-1  HYDROLOGY MODEL
          *DIAGRAM
   11     IT      5                   2000
   12     IO      5
   13     IN     15
   14     JD   3.00   0.01
   15     PC  0.000  0.008  0.016  0.025  0.033  0.041  0.050  0.058  0.066  0.074
   16     PC  0.087  0.099  0.118  0.138  0.216  0.377  0.834  0.911  0.931  0.950
   17     PC  0.962  0.972  0.983  0.991  1.000
   18     JD  2.981   0.50
   19     PC  0.000  0.008  0.016  0.025  0.033  0.041  0.050  0.058  0.066  0.074
   20     PC  0.087  0.099  0.118  0.138  0.216  0.377  0.834  0.911  0.931  0.950
   21     PC  0.962  0.972  0.983  0.991  1.000
   22     JD  2.925   2.80
   23     PC  0.000  0.009  0.016  0.025  0.034  0.042  0.051  0.059  0.067  0.076
   24     PC  0.087  0.100  0.120  0.163  0.252  0.451  0.694  0.837  0.900  0.938
   25     PC  0.950  0.963  0.975  0.988  1.000
   26     JD  2.766   16.0
   27     PC  0.000  0.015  0.020  0.030  0.048  0.063  0.076  0.090  0.105  0.119
   28     PC  0.135  0.152  0.175  0.222  0.304  0.472  0.670  0.796  0.868  0.912
   29     PC  0.946  0.960  0.973  0.987  1.000
   30     JD  2.436   90.0
   31     PC  0.000  0.021  0.035  0.051  0.071  0.087  0.105  0.125  0.143  0.160
   32     PC  0.179  0.201  0.232  0.281  0.364  0.500  0.658  0.773  0.841  0.888
   33     PC  0.927  0.945  0.964  0.982  1.000
   34     JD  1.710  500.0
   35     PC  0.000  0.024  0.043  0.059  0.078  0.098  0.119  0.141  0.162  0.186
   36     PC  0.212  0.239  0.271  0.321  0.408  0.515  0.627  0.735  0.814  0.864
   37     PC  0.907  0.930  0.954  0.977  1.000
          *

   38     KK   SA03   BASIN
   39     BA  0.058
   40     LG   0.35   0.35   3.95   0.48      0
   41     UC  0.342  0.348
   42     UA      0    3.0    5.0    8.0   12.0   20.0   43.0   75.0   90.0   96.0
   43     UA    100
          *

   44     KK   SA04   BASIN
   45     BA  0.008
   46     LG   0.35   0.35   3.95   0.48      0
   47     UC  0.229  0.385
   48     UA      0    3.0    5.0    8.0   12.0   20.0   43.0   75.0   90.0   96.0
   49     UA    100
          *
```

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

  50      KK    SA05   BASIN
  51      BA   0.050
  52      LG    0.35    0.35    3.95    0.48       0
  53      UC   0.329   0.341
  54      UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  55      UA     100
          *

  56      KK  03TO01
  57      KM    ROUTE CP03 TO CP01 THROUGH 2-36" SMOOTHBORE PIPES
  58      RS       1    STOR
  59      SV       0    0.02    0.03
  60      SE       0     1.5       3
  61      SQ       0      42      84
          *

  62      KK    CP01 *COMBINES SA03, SA04, & SA05*
  63      HC       3
          *

  64      KK  01TO02
  65      KM    ROUTE CP01 TO CP02 THROUGH 3-36" SMOOTHBORE PIPES
  66      RS       1    STOR
  67      SV       0    0.02    0.03
  68      SE       0     1.5       3
  69      SQ       0      80     160
          *

  70      KK    OS09   BASIN
  71      BA   0.002
  72      LG    0.00    0.25    3.95    0.40      99
  73      UC   0.133   0.331
  74      UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
  75      UA     100
          *

  76      KK    CP02 *COMBINES OS09 & CP01*
  77      HC       2
          *

  78      KK    OS07  *ONSITE DRAINAGE BASIN #7*
  79      BA   0.006
  80      LG    0.04    0.25    3.95    0.47      79
  81      UC   0.175   0.205
  82      UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
  83      UA     100
          * e

  84      KK  08to10       ROUTE OS07 TO CP10
  85      RS       1    FLOW       0
  86      RC     .03     .03     .03      70     .10
  87      RX     990     992     996   999.9  1000.1    1004    1008    1010
  88      RY     2.5     2.0     1.0       0       0     1.0     2.0     2.5
          *
```

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

  89      KK    OS03  *ONSITE DRAINAGE BASIN #3*
  90      BA   0.002
  91      LG    0.00   0.25    3.95    0.40      99
  92      UC   0.108  0.158
  93      UA       0    5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
  94      UA     100
          *

  95      KK  09to10  *ROUTE OS03 TO CP10*
  96      RS       1    FLOW       0
  97      RC     .03     .03     .03      70     .10
  98      RX     990     992     996   999.9  1000.1    1004    1008    1010
  99      RY     2.5     2.0     1.0       0       0     1.0     2.0     2.5
          *

 100      KK    OS11   ONSITE DRAINAGE BASIN #11
 101      BA   0.009
 102      LG    0.14   0.25    3.95    0.65      30
 103      UC   0.254  0.274
 104      UA       0    5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 105      UA     100
          *

 106      KK    OS01   BASIN
 107      BA   0.002
 108      LG    0.00   0.25    3.95    0.40      99
 109      UC   0.171  0.574
 110      UA       0    5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 111      UA     100
          *

 112      KK    OS02   BASIN
 113      BA   0.002
 114      LG    0.20   0.25    3.95    0.76       0
 115      UC   0.138  0.149
 116      UA       0    5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 117      UA     100
          *

 118      KK    CP10  *COMBINES OS01, OS02, OS03, OS07, & OS11*
 119      HC       5
          *

 120      KK  BAS-A2
 121      KM  *FIRST FLUSH BASIN FOR OS02, OS10, OS07 & OS03*
 122      RS       1    STOR
 123      SA    .436    .531    .635    .635
 124      SE       0     1.5       3     3.5
 125      SQ       0       0       0      50
          *
```
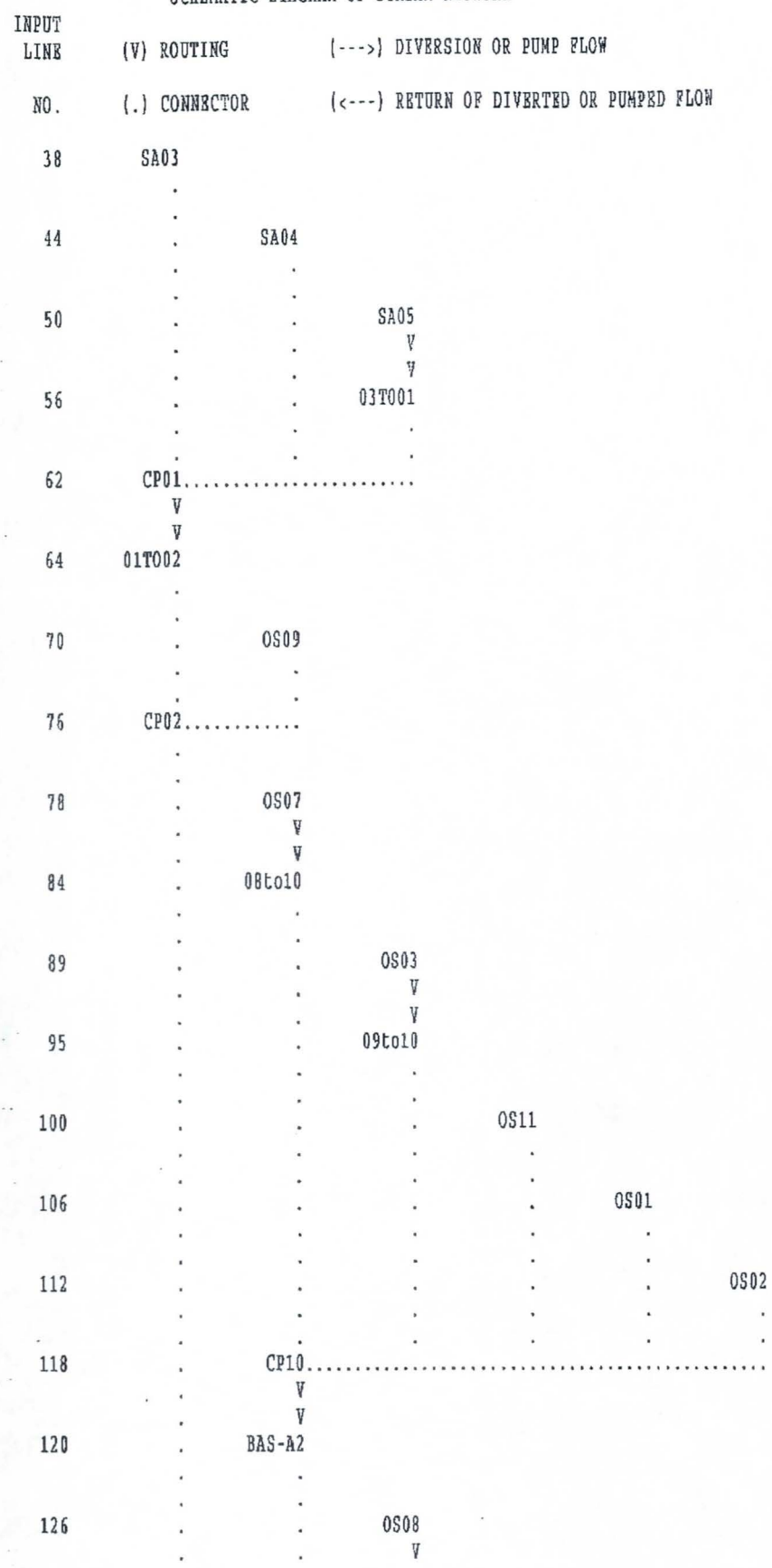
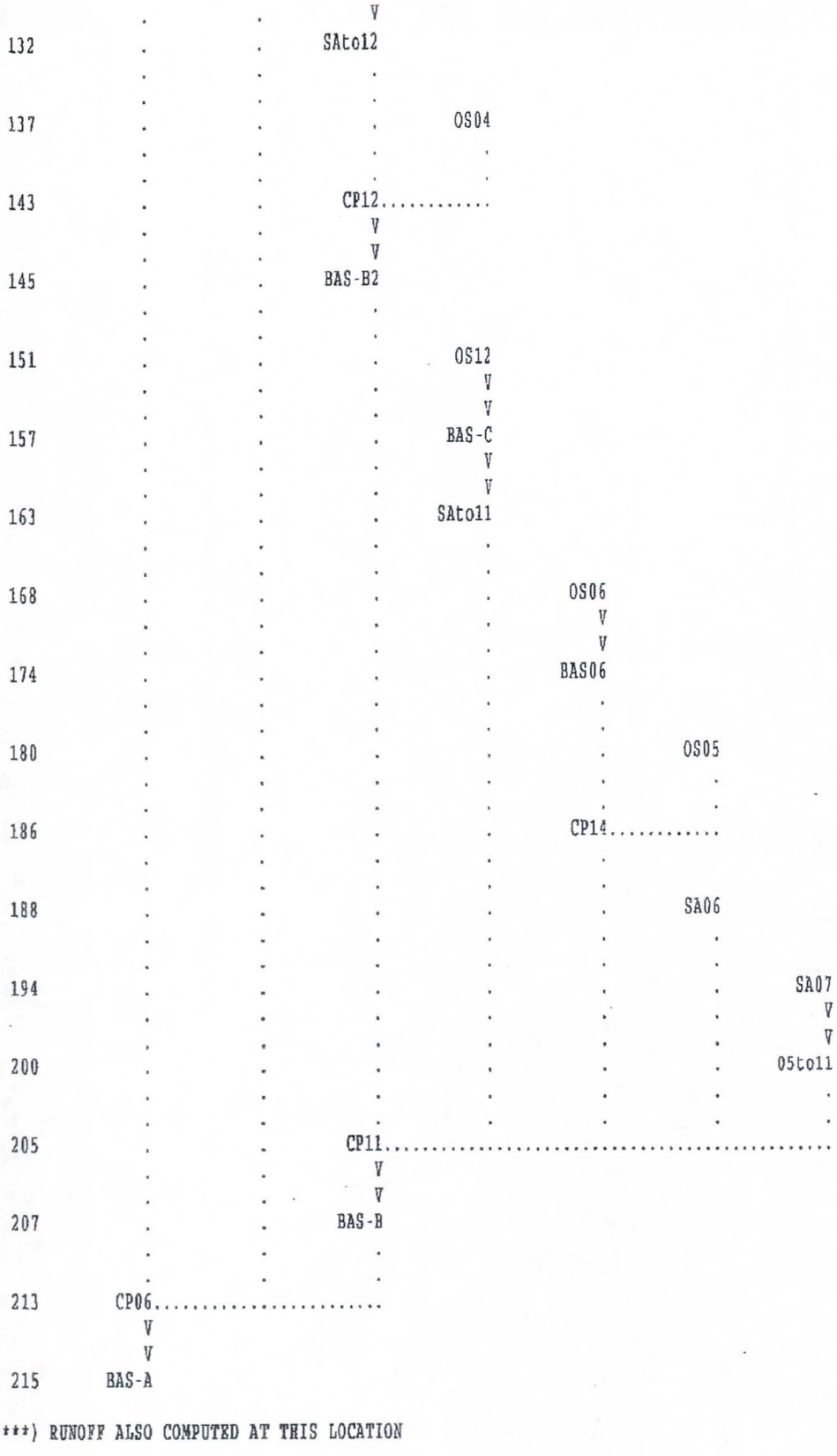

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  126     KK    OS08  *ONSITE DRAINAGE BASIN #8*
  127     BA   0.004
  128     LG    0.04    0.25    3.95    0.47      80
  129     UC   0.138   0.175
  130     UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
  131     UA     100
          *

  132     KK  SAto12  *ROUTE OS08 TO CP12*
  133     RS       1    FLOW       0
  134     RC     .03     .03     .03      70     .10
  135     RX     980     985     990   999.9  1000.1    1010    1015    1020
  136     RY     1.2     0.6       0       0       0       0     0.6     1.2
          *

  137     KK    OS04   BASIN
  138     BA   0.002
  139     LG    0.10    0.25    3.95    0.59      47
  140     UC   0.150   0.206
  141     UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
  142     UA     100
          *

  143     KK    CP12  *COMBINES OS08 & OS04*
  144     HC       2
          *

  145     KK  BAS-B2
  146     KM  *FIRST FLUSH BASIN FOR OS08 & OS04*
  147     RS       1    STOR
  148     SA    .054    .091    .136    .136
  149     SE       0     1.5       3     3.5
  150     SQ       0       0       0      50
          *

  151     KK    OS12   BASIN
  152     BA   0.010
  153     LG    0.16    0.25    3.95    0.69      20
  154     UC   0.333   0.348
  155     UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
  156     UA     100
          *

  157     KK   BAS-C
  158     KM  *FIRST FLUSH BASIN FOR OS12*
  159     RS       1    STOR
  160     SA    .077    .128    .188    .188
  161     SE       0     1.5       3     3.5
  162     SQ       0       0       0      50
          *
```

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

  163     KK  SAto11  *ROUTE OS12 TO CP11*
  164     RS      1    FLOW       0
  165     RC    .03     .03     .03     160    .019
  166     RX    990     992     996   999.9  1000.1    1004    1008    1010
  167     RY    2.5     2.0     1.0       0       0     1.0     2.0     2.5
          *

  168     KK    OS06   BASIN
  169     BA   0.005
  170     LG    0.16    0.25    3.95    0.69      19
  171     UC   0.588   0.719
  172     UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
  173     UA     100
          *

  174     KK   BAS06
  175     KM  *RETENTION BASIN IS ENTIRE AREA OF OS06*
  176     RS       1    STOR
  177     SA     3.3     3.3     3.3
  178     SE       0     0.5     1.0
  179     SQ       0       0      50
          *

  180     KK    OS05   BASIN
  181     BA   0.001
  182     LG    0.10    0.35    3.95    0.40       0
  183     UC   0.150   0.533
  184     UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
  185     UA     100
          *

  186     KK    CP14  *COMBINES OS05 & OS06*
  187     HC       2
          *

  188     KK    SA06   BASIN
  189     BA   0.082
  190     LG    0.44    0.29    3.95    0.62       0
  191     UC   0.733   0.867
  192     UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  193     UA     100
          *

  194     KK    SA07   BASIN
  195     BA   0.077
  196     LG    0.41    0.31    3.95    0.57       0
  197     UC   0.675   0.811
  198     UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  199     UA     100
          *
```

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

  200     KK  05to11       ROUTE CP05 (SA07) TO CP11
  201     RS       1    FLOW       0
  202     RC    .035     .03    .035     595   .0083
  203     RX     990     992     996   999.9  1000.1    1004    1008    1010
  204     RY     2.5     2.0     1.0       0       0     1.0     2.0     2.5
          *

  205     KK    CP11 *COMBINES SA06, SA07, OS12, CP12 & CP14*
  206     HC       5
          *

  207     KK   BAS-B
  208     KM  *RETENTION BASIN FOR SUBAREAS OF CP11 DRAINED BY 2-36" PIPES*
  209     RS       1    STOR
  210     SA     .40     .52     .64
  211     SE       0     1.5       3
  212     SQ       0      65     130
          *

  213     KK    CP06 *COMBINES CP02, CP11, & CP10*
  214     HC       3
          *

  215     KK   BAS-A
  216     KM  *RET BASIN FOR ENTIRE SITE DRAINED BY 3 SILTED 36"PIPES AND BY OVERTOPPING*
  217     RS       1    STOR
  218     SA    .101    .168    .243    .243    .243
  219     SE       0     1.5       3       4       5
  220     SQ       0       0      10      18     250
          *
  221     ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK





(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

HEC1 S/N: 1343000424 HMVersion: 6.33 Data File: 1843DE02.HC1

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE (HEC-1)    *
*             MAY  1991                 *
*          VERSION 4.0.1E               *
*                                       *
*  RUN DATE  04/01/2004  TIME  10:11:04 *
*                                       *
*****************************************
```

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

ERIE AND ASSOCIATES
CHANDLER HIGH SCHOOL SITE- 100yr/6hr Year Storm
100 Year Storm\DEVELOPED CONDITIONS

HEC-1 FILE NAME: 1843DE02.HC1
DATE: FEBRUARY 24, 2004
CREATED BY: JOHN PETAISTO, EIT

HEC-1 HYDROLOGY MODEL

12 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1 0	STARTING DATE
ITIME	0000	STARTING TIME
NQ	2000	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	7 0	ENDING DATE
NDTIME	2235	ENDING TIME
ICENT	19	CENTURY MARK

COMPUTATION INTERVAL 0.08 HOURS
TOTAL TIME BASE 166.58 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

14 JD INDEX STORM NO. 1

STRM	3.00	PRECIPITATION DEPTH
TRDA	0.01	TRANSPOSITION DRAINAGE AREA

15 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

```
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
          0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
          0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00

18 JD     INDEX STORM NO. 2
               STRM       2.98  PRECIPITATION DEPTH
               TRDA       0.50  TRANSPOSITION DRAINAGE AREA

19 PI       PRECIPITATION PATTERN
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
          0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
          0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00

22 JD     INDEX STORM NO. 3
               STRM       2.92  PRECIPITATION DEPTH
               TRDA       2.80  TRANSPOSITION DRAINAGE AREA

23 PI       PRECIPITATION PATTERN
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
          0.03      0.03      0.07      0.07      0.07      0.08      0.08      0.08      0.05      0.05
          0.05      0.02      0.02      0.02      0.01      0.01      0.01      0.00      0.00      0.00
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00

26 JD     INDEX STORM NO. 4
               STRM       2.77  PRECIPITATION DEPTH
               TRDA      16.00  TRANSPOSITION DRAINAGE AREA

27 PI       PRECIPITATION PATTERN
          0.01      0.01      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01
          0.01      0.01      0.00      0.01      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00      0.01      0.00      0.00      0.00      0.00      0.01      0.01      0.01
          0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
          0.03      0.03      0.06      0.06      0.06      0.07      0.07      0.07      0.04      0.04
          0.04      0.02      0.02      0.02      0.01      0.01      0.01      0.01      0.01      0.01
          0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
          0.00      0.00

30 JD     INDEX STORM NO. 5
               STRM       2.44  PRECIPITATION DEPTH
               TRDA      90.00  TRANSPOSITION DRAINAGE AREA

31 PI       PRECIPITATION PATTERN
          0.01      0.01      0.01      0.00      0.00      0.00      0.01      0.01      0.01      0.01
          0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
          0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
          0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
          0.03      0.03      0.05      0.05      0.05      0.05      0.05      0.05      0.04      0.04
```

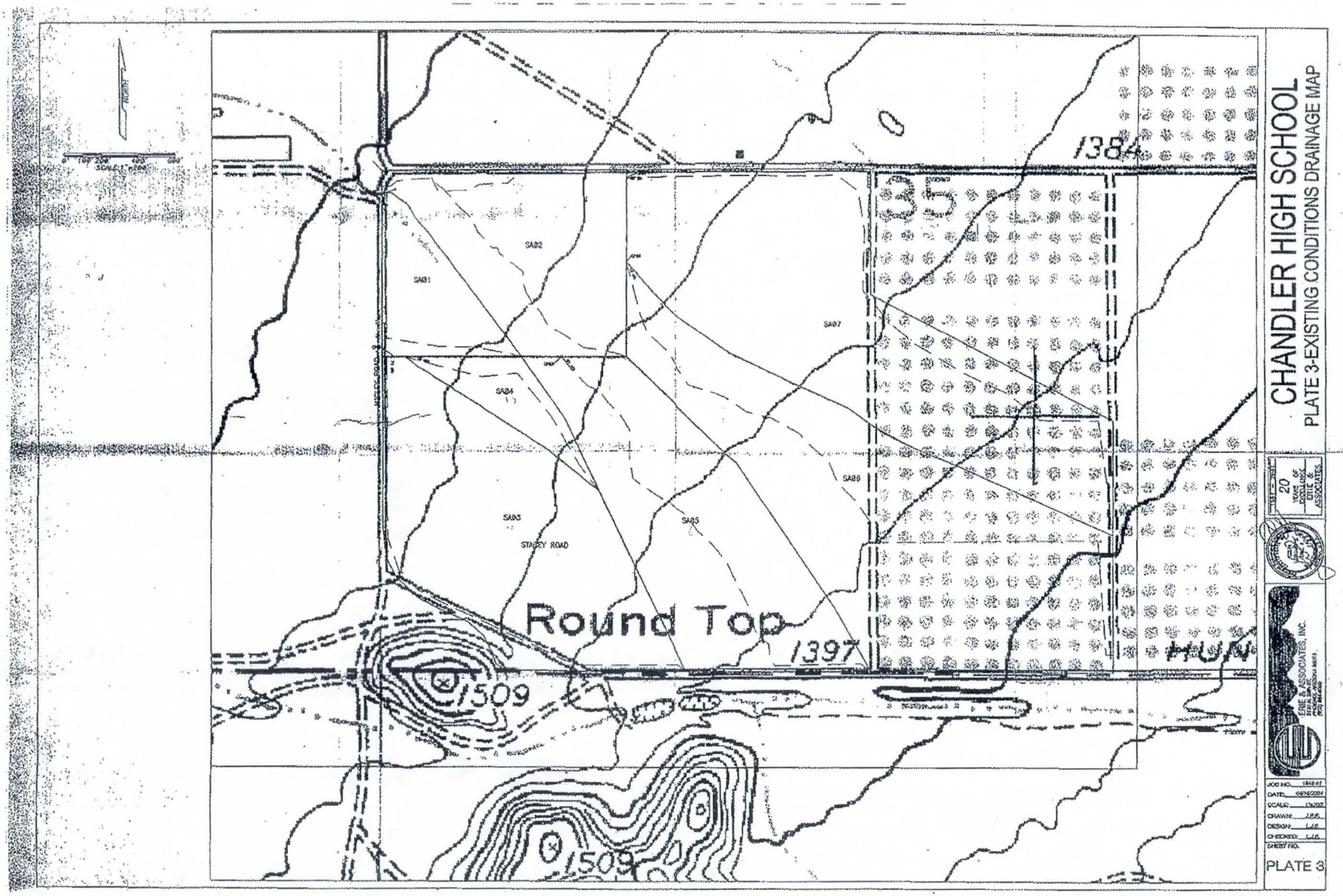
```
      0.04      0.02      0.02      0.02      0.02      0.02      0.02      0.01      0.01      0.01
      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
      0.01      0.01

34 JD       INDEX STORM NO. 6
              STRM        1.71  PRECIPITATION DEPTH
              TRDA      500.00  TRANSPOSITION DRAINAGE AREA

35 PI       PRECIPITATION PATTERN
      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
      0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
      0.03      0.03      0.04      0.04      0.04      0.04      0.04      0.04      0.04      0.04
      0.04      0.03      0.03      0.03      0.02      0.02      0.02      0.01      0.01      0.01
      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
      0.01      0.01
```

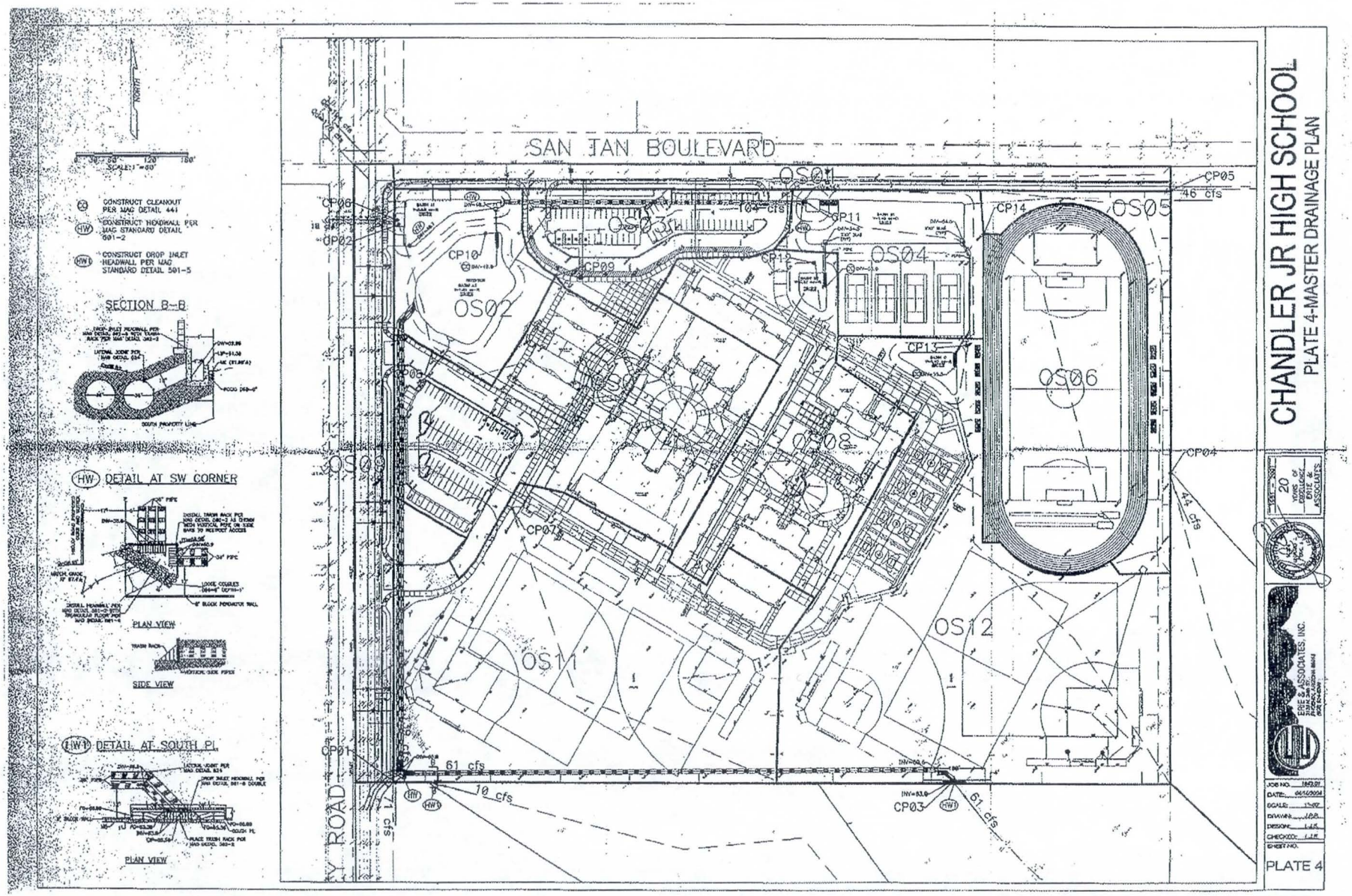
RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

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	SA03	71.	4.25	7.	2.	1.	0.06		
HYDROGRAPH AT	SA04	10.	4.17	1.	0.	0.	0.01		
HYDROGRAPH AT	SA05	61.	4.25	6.	1.	0.	0.05		
ROUTED TO	03TO01	61.	4.25	6.	1.	0.	0.05		
3 COMBINED AT	CP01	140.	4.25	14.	3.	1.	0.12		
ROUTED TO	01TO02	140.	4.25	14.	3.	1.	0.12		
HYDROGRAPH AT	OS09	4.	4.08	1.	0.	0.	0.00		
2 COMBINED AT	CP02	143.	4.25	14.	4.	1.	0.12		
HYDROGRAPH AT	OS07	14.	4.00	2.	0.	0.	0.01		
ROUTED TO	08to10	14.	4.08	2.	0.	0.	0.01		
HYDROGRAPH AT	OS03	6.	4.00	1.	0.	0.	0.00		
ROUTED TO	09to10	6.	4.00	1.	0.	0.	0.00		
HYDROGRAPH AT	OS11	15.	4.08	2.	0.	0.	0.01		
HYDROGRAPH AT	OS01	3.	4.08	1.	0.	0.	0.00		
HYDROGRAPH AT	OS02	4.	4.00	0.	0.	0.	0.00		
5 COMBINED AT	CP10	41.	4.08	5.	1.	0.	0.02		
ROUTED TO	BAS-A2	17.	4.42	2.	0.	0.	0.02		
HYDROGRAPH AT	OS08	10.	4.00	1.	0.	0.	0.00		
ROUTED TO	SAto12	10.	4.00	1.	0.	0.	0.00		
HYDROGRAPH AT	OS04	4.	4.00	0.	0.	0.	0.00		
2 COMBINED AT	CP12	15.	4.00	2.	0.	0.	0.01		
ROUTED TO	BAS-B2	17.	4.00	1.	0.	0.	0.01		
HYDROGRAPH AT	OS12	13.	4.17	2.	0.	0.	0.01		
ROUTED TO	BAS-C	13.	4.33	1.	0.	0.	0.01		
ROUTED TO	SAto11	12.	4.33	1.	0.	0.	0.01		
HYDROGRAPH AT	OS06	4.	4.25	1.	0.	0.	0.00		

ROUTED TO	BAS06	0.	0.08	0.	0.	0.	0.00
HYDROGRAPH AT	OS05	1.	4.08	0.	0.	0.	0.00
2 COMBINED AT	CP14	1.	4.08	0.	0.	0.	0.01
HYDROGRAPH AT	SA06	44.	4.58	9.	2.	1.	0.08
HYDROGRAPH AT	SA07	46.	4.50	9.	2.	1.	0.08
ROUTED TO	05to11	45.	4.50	9.	2.	1.	0.08
5 COMBINED AT	CP11	98.	4.50	19.	5.	2.	0.18
ROUTED TO	BAS-B	88.	4.67	19.	5.	2.	0.18
3 COMBINED AT	CP06	180.	4.33	35.	9.	3.	0.32
ROUTED TO	BAS-A	185.	4.33	35.	9.	3.	0.32

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


CHANDLER HIGH SCHOOL
PLATE 3-EXISTING CONDITIONS DRAINAGE MAP
1384
1397
Round Top
1509
1509
STACEY ROAD
SA01
SA02
SA03
SA04
SA05
SA07
SA08
HUM
ERIE & ASSOCIATES, INC.
PLATE 3


SAN JAN BOULEVARD
OS01
OS02
OS03
OS04
OS05
OS06
OS07
OS08
OS09
OS10
OS11
OS12
CP01
CP02
CP03
CP04
CP05
CP06
CP07
CP08
CP09
CP10
CP11
CP12
CP13
CP14
104 cfs
46 cfs
44 cfs
61 cfs
10 cfs
51 cfs
71 cfs
SCALE: 1"=60'
CONSTRUCT CLEANOUT PER MAG DETAIL 441
CONSTRUCT HEADWALL PER MAG STANDARD DETAIL 501-2
CONSTRUCT DROP INLET HEADWALL PER MAG STANDARD DETAIL 501-5
SECTION B-B
HW DETAIL AT SW CORNER
PLAN VIEW
SIDE VIEW
HW1 DETAIL AT SOUTH PL
PLAN VIEW
CHANDLER JR HIGH SCHOOL
PLATE 4-MASTER DRAINAGE PLAN
EBBE & ASSOCIATES, INC.
PLATE 4

TOWN OF GILBERT
RIGGS ROAD
VAL VISTA - 164TH STREET UTILITIES

GILBERT PROJECT NO.: WW074

GILBERT
ARIZONA

MAYOR
STEVEN M. BERMAN

VICE MAYOR
DAVE CROZIER

TOWN COUNCIL
JOAN KRUEGER
LARRY MORRISON
LES PRESMYK
DON SKOUSEN
STEVE URIE

TOWN CLERK
CATHY TEMPLETON, CMC

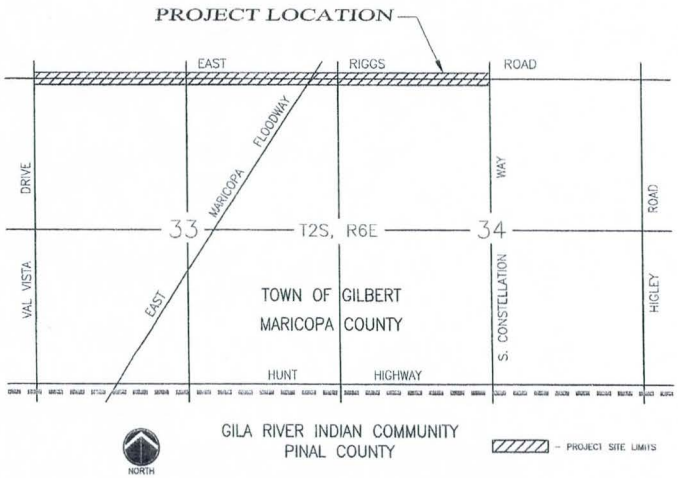
TOWN MANAGER
GEORGE PETTIT

TOWN ENGINEER
RICK ALLRED, P.E.

PUBLIC WORKS DIRECTOR
LONNIE K. FROST

PROJECT BENCH MARKS:

NE COR SECTION 33, T.2S.,R.6E. (3" BCHH)
ELEV=1304.85 1988 NAVD (PROJECT BENCHMARK)
ELEV=1303.24 1929 NGVD
TOWN OF GILBERT DATUM
N 807376.165
E 754610.802



VICINITY MAP
NO SCALE

UTILITIES

SOUTHWEST GAS		
HENGAMEH NAJAFI	09-16-2005	
CONTACT NAME	DATE SUBMITTED	
SRP		
DOLLY FRANCO	09-20-2005	
CONTACT NAME	DATE SUBMITTED	
QWEST		
JAMES CALDWELL	09-16-2005	
CONTACT NAME	DATE SUBMITTED	
COX COMMUNICATIONS		
KEN DEGRAFFENREID	09-20-2005	
CONTACT NAME	DATE SUBMITTED	
WATER	TOWN OF GILBERT	
SEWER	TOWN OF GILBERT	
REFUSE	TOWN OF GILBERT	
FIRE	TOWN OF GILBERT	
POLICE	TOWN OF GILBERT	
SCHOOL DIST.	CHANDLER UNIFIED	

APPROVALS:

TOWN OF GILBERT ENGINEER _____ DATE

MARICOPA COUNTY ENVIRONMENTAL SERVICES DEPARTMENT _____ DATE

ROOSEVELT WATER CONSERVATION DISTRICT

CHECKING IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN. ANY ACTION SHOWN IS SUBJECT TO THE REQUIREMENTS OF THE PLANS AND SPECIFICATIONS. CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE; FABRICATION, PROCESSES AND TECHNIQUES OF CONSTRUCTION; COORDINATION OF HIS WORK WITH THAT OF ALL OTHER TRADES; THE SATISFACTORY PERFORMANCE OF HIS WORK. THE DISTRICT'S REVIEW OF THE PLANS IS A VOLUNTARY AND DISCRETIONARY ACTION WHICH IS NOT MANDATED BY STATE STATUTE. THE DISTRICT'S REVIEW OF THE PLANS IS SOLELY FOR THE DISTRICT'S BENEFIT, CONDUCTED WITH ONLY THE DISTRICT'S INTEREST IN MIND, AND SHOULD NOT BE RELIED UPON BY ANY THIRD PARTY. BY REVIEWING THE PLANS THE DISTRICT DOES NOT ASSUME ANY DUTY TO THIRD PARTIES.

ENGINEER: _____ DATE: 7 Nov 2006
RWCD: _____ DATE: 7 Nov 2006

100% SUBMITTAL	JM	TA	NG	06.07.25
ISSUED FOR PERMIT	JM	TA	NG	06.01.22
File Name: 0660001c.dwg	JM	TA	NG	06.01.04
	Des.	Chkd.	Dsgn.	YY.MM.DD

Seal

NOEL S. GUERCIO 44168 REGISTERED PROFESSIONAL ENGINEER ARIZONA U.S.A.
EXPIRES 6-30-09

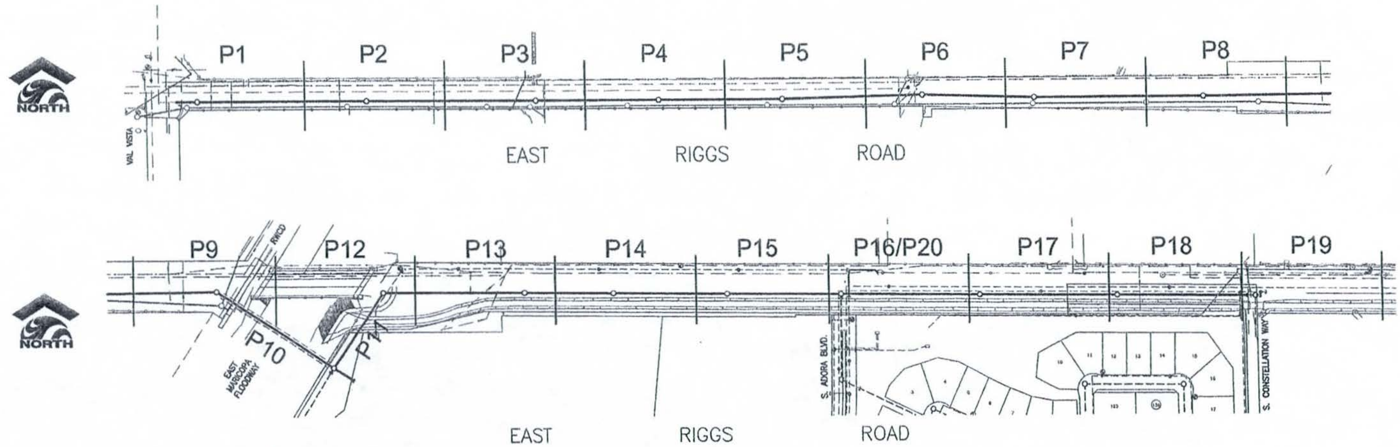
CALL TWO WORKING DAYS BEFORE YOU DIG (602) 263-1100 1-800-STAKE-IT (outside Maricopa county)

Client/Project
RIGGS ROAD

VAL VISTA - 164TH STREET UTILITIES
PW# WW074
GILBERT, ARIZONA

Title
COVER SHEET
AND VICINITY MAP

Project No.	Scale
161400098	NONE
Drawing No.	Sheet
H-0131A G1	1 of 24



KEY MAP

0 200' 400' 600'
SCALE: 1" = 200'

LEGEND AND ABBREVIATIONS:

(symbol)	EXISTING FIRE HYDRANT
(symbol)	PROPOSED WATERLINE W/VALVE
(symbol)	EXISTING WATERLINE W/VALVE
(symbol)	PROPOSED SEWER LINE W/MH
(symbol)	DIRECTION OF FLOW
(symbol)	PROPOSED STREET LIGHT
PIP	PLASTIC IRRIGATION PIPE
S.T.I.D.	SAN TAN IRRIGATION DISTRICT
S.D.	STORM DRAIN
(symbol)	BENCHMARK
(symbol)	PLAN AND PROFILE SHEET MATCH LINE
PUE	PUBLIC UTILITY EASEMENT
ROW	RIGHT OF WAY DIMENSION
B/C	BACK OF CURB
+1300.45	SPOT ELEVATION, PROPOSED
+(1300.45)	SPOT ELEVATION, EXISTING
— 1300 —	EXISTING CONTOUR
———	PARCEL DELINEATION

SHEET INDEX

H-0131A

Stantec

Stantec Consulting Inc.
8211 South 48th Street
Phoenix AZ USA
85044-5355
Tel. 602.438.2200
Fax. 602.431.9562
www.stantec.com

	Dwn.	Chkd.	Dsgn.	YY.MM.DD
100% SUBMITTAL	JM	TA	NG	08.02.25
ISSUED FOR PERMIT	JM	TA	NG	08.01.22
File Name: 098c002g.dwg	JM	TA	NG	08.01.04

Permit/Seal

Registered Professional Engineer (Civil)
44168
NOEL S.
GUERCIO
Date Signed 03/04/08
ARIZONA U.S.A.
EXPIRES 6-30-09

CALL TWO WORKING DAYS BEFORE YOU DIG
(602) 263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

Client/Project

RIGGS ROAD

VAL VISTA - 164TH STREET UTILITIES
PW# WW074

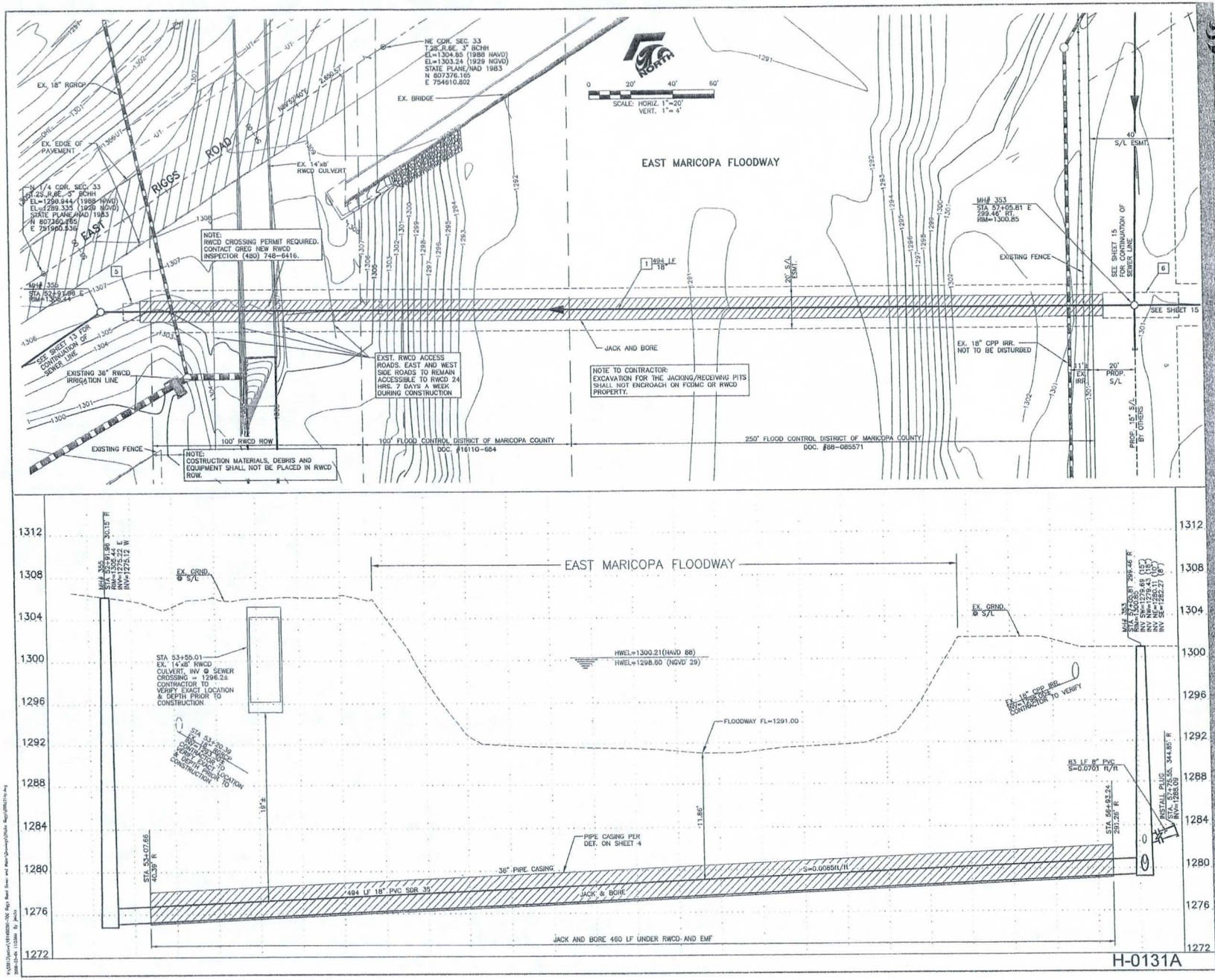
GILBERT, ARIZONA

Title

KEY MAP, SHEET INDEX, LEGEND AND ABBREVIATIONS

Project No.	Scale
181400098	AS NOTED

Drawing No.	Sheet	Revision
G2	2 of 24	



H-0131A

Stantec Consulting Inc.
8211 South 48th Street
Phoenix AZ USA
85044-5365
Tel. 602.438.2200
Fax. 602.431.9562
www.stantec.com

SEWER NOTES

1. PVC SDR 35 SEWER LINE (SIZE AND LENGTH AS SHOWN)
2. 5' DIA MANHOLE PER MAG STD. DET. 420, NOERAH R=1743, 30" COVER, TYPE "D" FRAME AND COVER FRAME AND COVER ADJUSTMENT PER TOC DET. 43
3. HDPE SEWER LINE PER MAG SPECS. 736 & 602 (SIZE AND LENGTH AS SHOWN)
4. STUB OUT AND PLUG PER MAG DET. 427
5. 8'-0" X 8'-0" EXIT PIT
6. 36'-0" X 12'-0" BORE PIT

100% SUBMITTAL	JM	TA	NG	08.02.25
ISSUED FOR PERMIT	JM	TA	NG	08.01.22
File Name: G88c21fp.dwg	JM	TA	NG	08.01.04
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit/Seal

EXPIRES 6-30-09

CALL TWO WORKING DAYS BEFORE YOU DIG (602) 263-1100 1-800-STAKE-IT (ARIZONA BLUE STAKE, INC.)

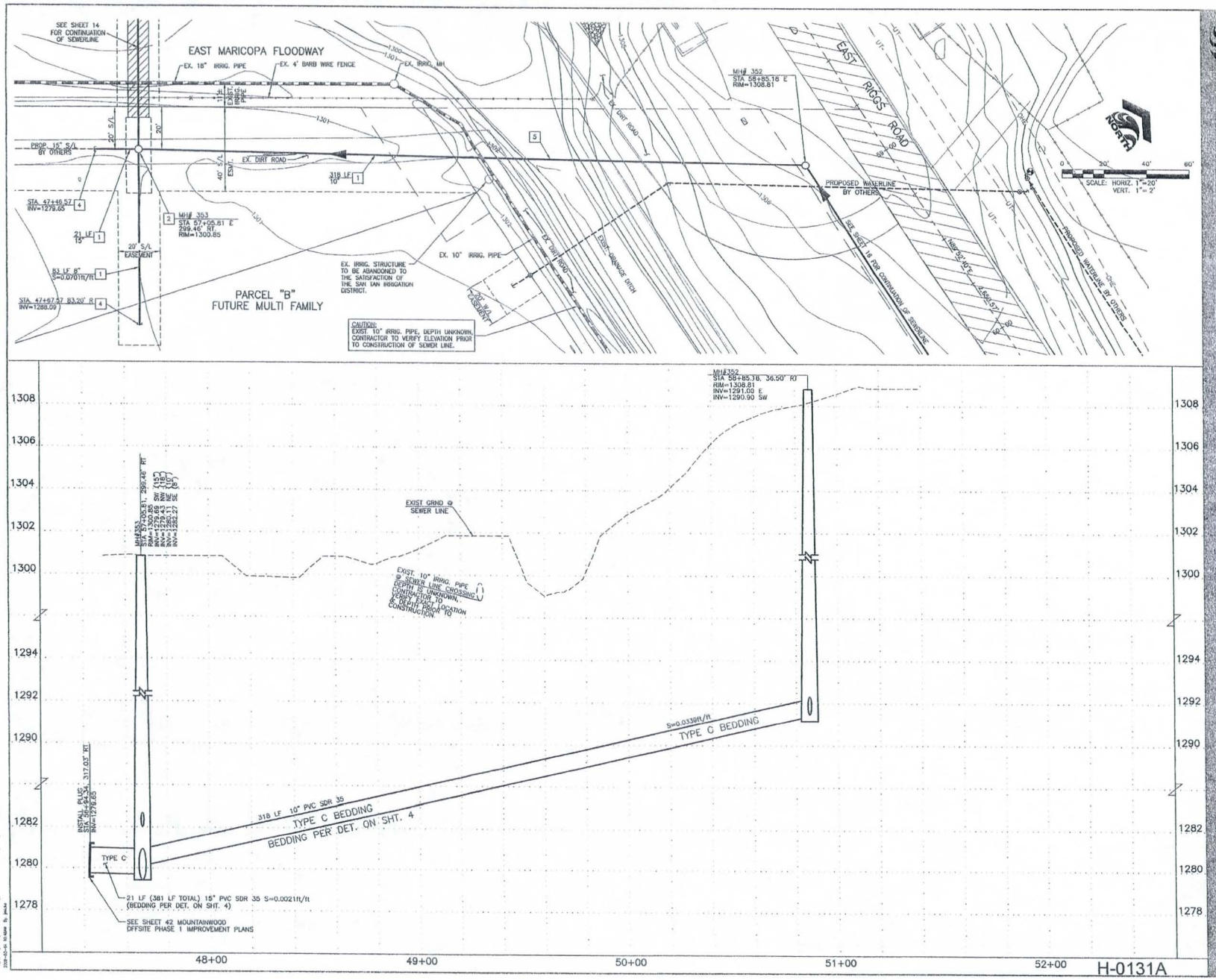
Client/Project
RIGGS ROAD

VAL VISTA - 164TH STREET UTILITIES
PW# WW074

GILBERT, ARIZONA

Title
RIGGS ROAD SEWER
PLAN AND PROFILE
STA 53+01.72 TO 57+05.81, 299.46' RT.

Project No.	Scale	
181400086	AS NOTED	
Drawing No.	Sheet	Revision
P10	14 of 24	



Stantec
Stantec Consulting Inc.
8211 South 48th Street
Phoenix AZ USA
85044-5305
Tel. 602.438.2200
Fax. 602.431.9562
www.stantec.com

SEWER NOTES

1. PVC SDR 35 SEWER LINE (SIZE AND LENGTH AS SHOWN)
2. 5' DIA MANHOLE PER MAG STD DET 420, NEENAH R-1743, 30" COVER, TYPE "B" FRAME AND COVER. FRAME AND COVER ADJUSTMENT PER TOG DET 45.
3. HDPE SEWER LINE PER MAG SPECS 738 & 602. (SIZE AND LENGTH AS SHOWN)
4. STUB OUT AND PLUG PER MAG DET. 427.
5. CONTRACTOR TO REPLACE GROUTED RIPRAP IN KIND TO EXTENTS OF DISTURBANCE.

100% SUBMITTAL	JM	TA	NG	08.02.25
ISSUED FOR PERMIT	JM	TA	NG	08.01.22
File Name: 098c224p.ovg	JM	TA	NG	08.01.04
	Des.	Chkd.	Dsgn.	YY.MM.DD

Permit/Seal

EXPIRES 6-30-09

CALL TWO WORKING DAYS BEFORE YOU DIG (602) 263-1100 1-800-STAKE-IT (OUTSIDE MARICOPA COUNTY)

Client/Project
RIGGS ROAD

VAL VISTA - 164TH STREET UTILITIES
PW# WW074

GILBERT, ARIZONA

Title
RIGGS ROAD SEWER
PLAN AND PROFILE
STA 57+05.81, 299.46' RT. TO 58+85.18

Project No.	Scale	
161400098	AS NOTED	
Drawing No.	Sheet	Revision
P11	15 of 24	

APPENDIX C
PRECIPITATION DATA

Precipitation: FCD Hydrology Manual

Project:	**Riggs Road, Val Vista to Recker**	By:	**JJP**
Location :		Date:	**Sep-08**
Subject :		Project #:	**8.0129**

RAINFALL DEPTH-DURATION-FREQUENCY (D-D-F) WORKSHEET
AND INTENSITY-DURATION-FREQUENCY (I-D-F)CURVES

Determine rainfall depths from the isopluvial maps

2-year, 6-hour	P2,6' =	1.1
2-year, 24-hour	P2,24' =	1.3
100-year, 6-hour	P100,6' =	3
100-year, 24-hour	P100,24' =	3.6
Short Duration Frequency Zone	Zone =	8

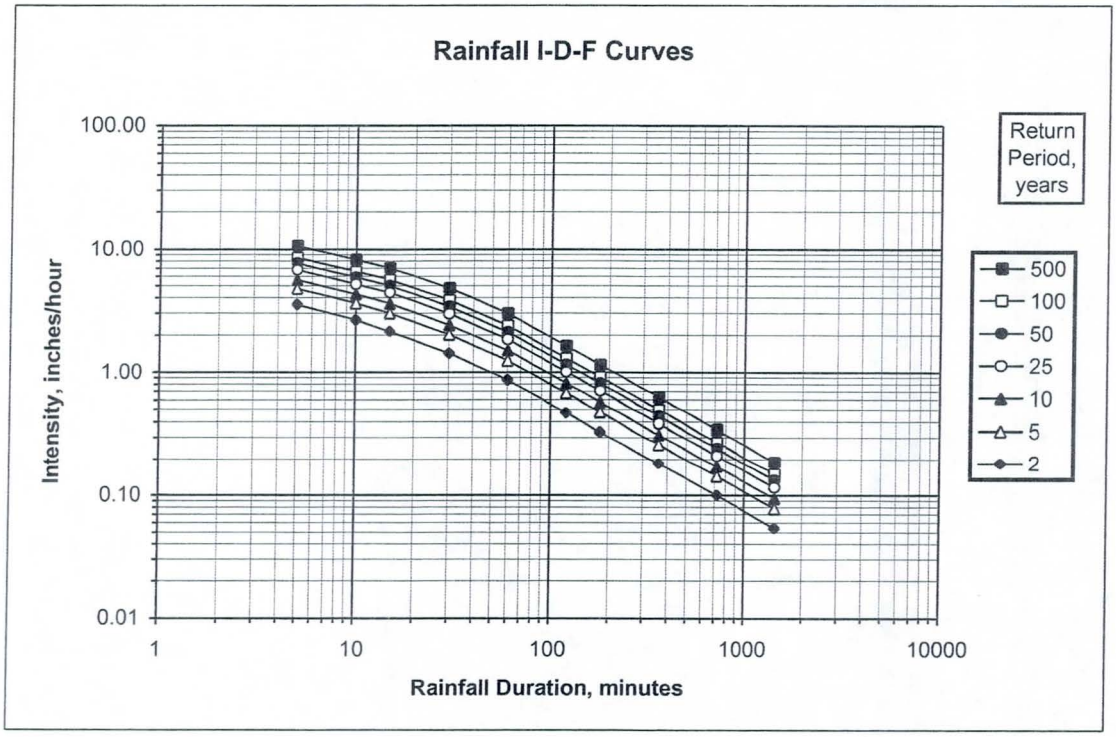
Depth - Duration - Frequency (DDF)

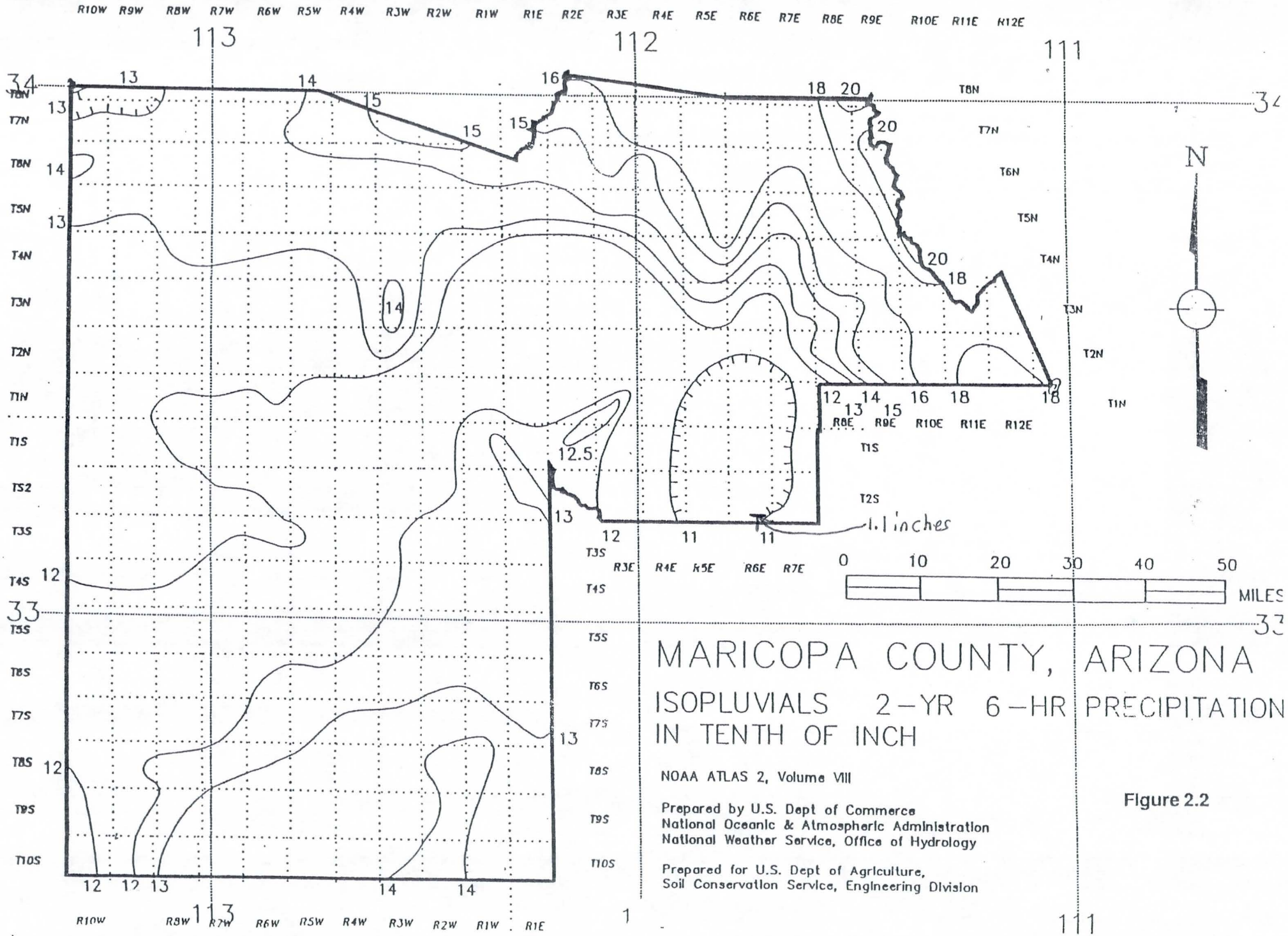
Rainfall Depth, in inches							
	Frequency, in years						
Duration	**2**	**5**	**10**	**25**	**50**	**100**	**500**
5-min	0.29	0.40	0.47	0.56	0.64	0.71	0.89
10-min	0.44	0.60	0.71	0.86	0.98	1.10	1.36
15-min	0.54	0.75	0.90	1.10	1.25	1.41	1.76
30-min	0.71	1.01	1.21	1.48	1.69	1.91	2.39
1-hour	0.87	1.25	1.50	1.85	2.11	2.38	3.00
2-hour	0.95	1.36	1.63	2.01	2.30	2.59	3.26
3-hour	1.00	1.43	1.72	2.12	2.43	2.73	3.44
6-hour	1.10	1.58	1.89	2.33	2.67	3.00	3.77
12-hour	1.20	1.73	2.08	2.56	2.93	3.30	4.15
24-hour	1.30	1.88	2.26	2.79	3.20	3.60	4.53

Project:	**Riggs Road, Val Vista to Recker**	By:	**JJP**
Location :		Date:	**Sep-08**
Subject :		Project #:	**8.0129**

Intensity - Duration - Frequency (IDF)

Rainfall Intensity, in inches per hour								
		Frequency, in years						
Duration	minutes	2	5	10	25	50	100	500
5-min	5	3.53	4.76	5.60	6.77	7.67	8.57	10.65
10-min	10	2.65	3.61	4.27	5.17	5.88	6.57	8.18
15-min	15	2.15	3.01	3.59	4.39	5.01	5.62	7.04
30-min	30	1.42	2.02	2.42	2.97	3.39	3.81	4.78
1-hour	60	0.87	1.25	1.50	1.85	2.11	2.38	3.00
2-hour	120	0.47	0.68	0.82	1.01	1.15	1.30	1.63
3-hour	180	0.33	0.48	0.57	0.71	0.81	0.91	1.15
6-hour	360	0.18	0.26	0.32	0.39	0.44	0.50	0.63
12-hour	720	0.10	0.14	0.17	0.21	0.24	0.28	0.35
24-hour	1440	0.05	0.08	0.09	0.12	0.13	0.15	0.19

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113
112
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33
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T7N
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T5N
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T3S
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T5S
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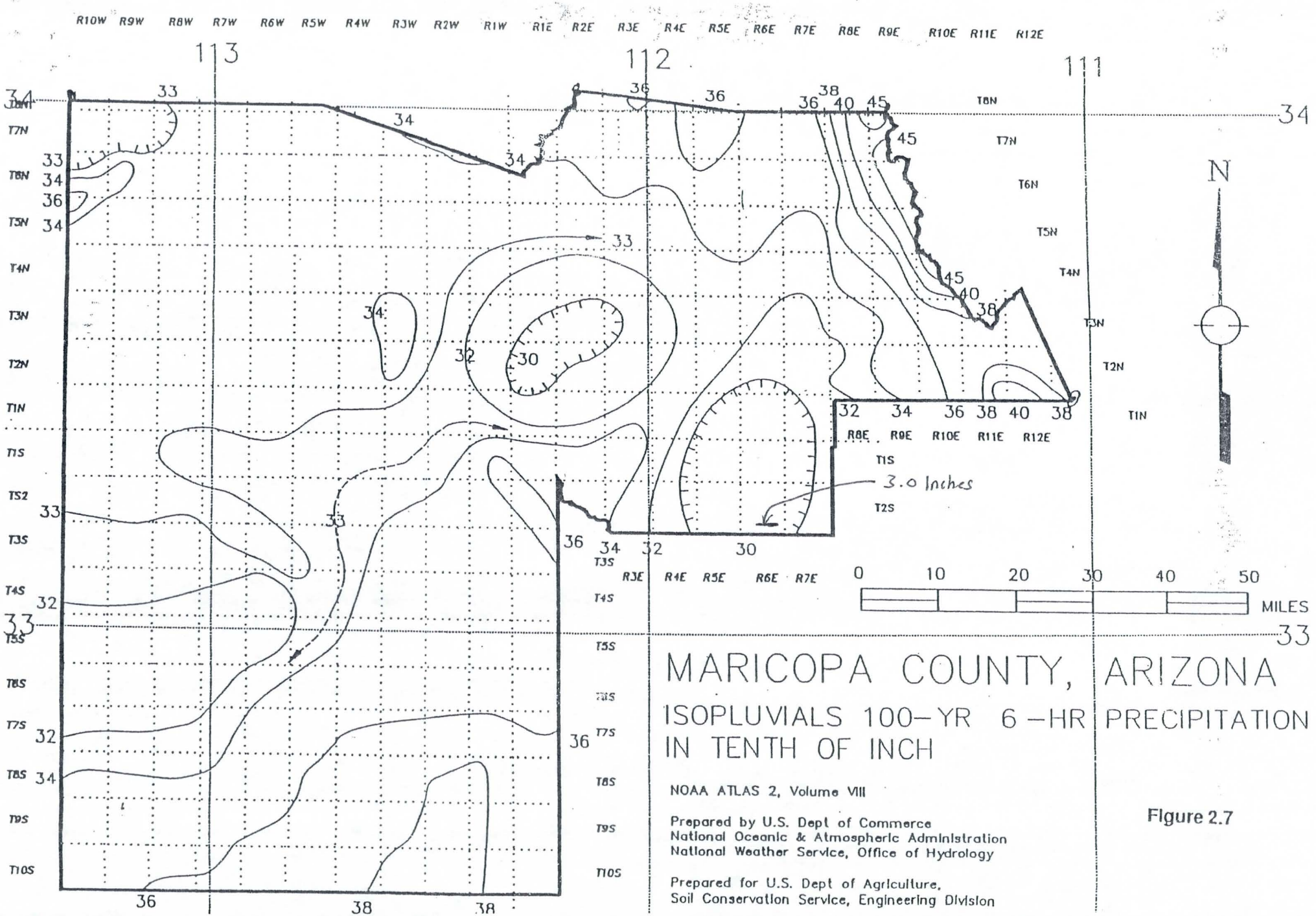
T9S
T10S
N
0 10 20 30 40 50
MILES
1.1 inches
MARICOPA COUNTY, ARIZONA
ISOPLUVIALS 2-YR 6-HR PRECIPITATION
IN TENTH OF INCH
NOAA ATLAS 2, Volume VIII
Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.2



MARICOPA COUNTY, ARIZONA

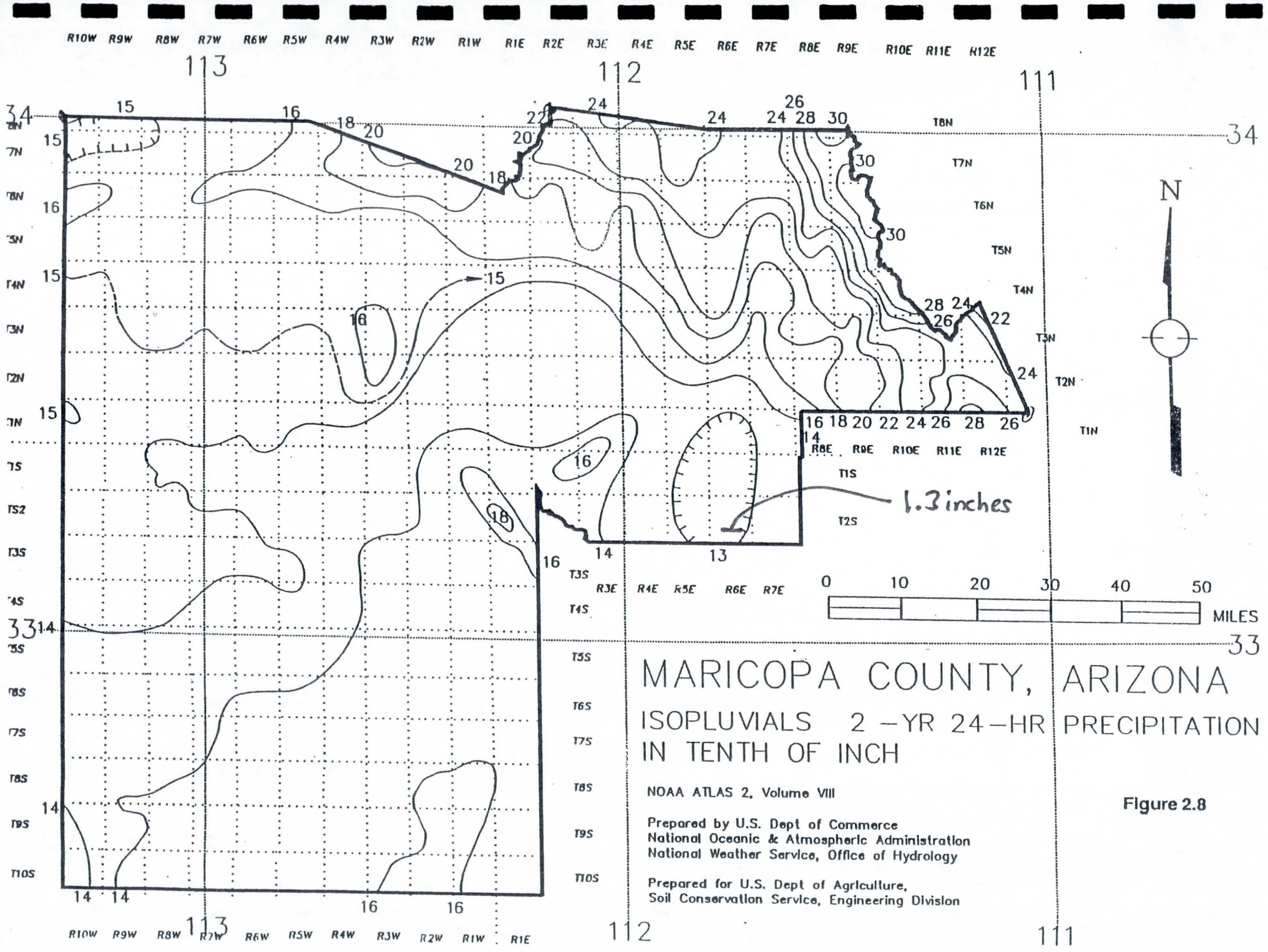
ISOPLUVIALS 100-YR 6-HR PRECIPITATION IN TENTH OF INCH

NOAA ATLAS 2, Volume VIII

Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology

Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.7



MARICOPA COUNTY, ARIZONA

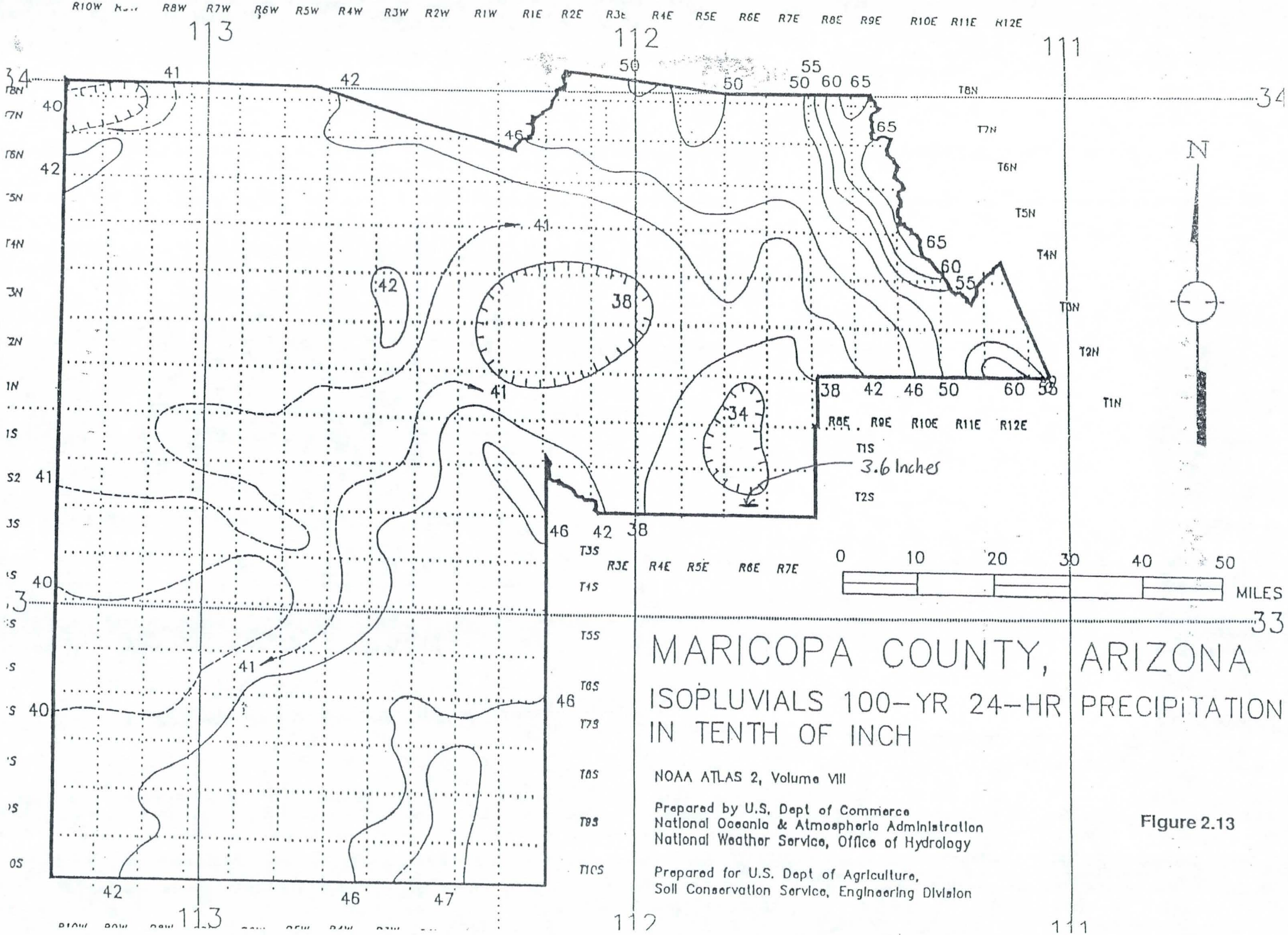
ISOPLUVIALS 2 – YR 24 – HR PRECIPITATION IN TENTH OF INCH

NOAA ATLAS 2, Volume VIII

Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology

Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.8



MARICOPA COUNTY, ARIZONA

ISOPLUVIALS 100–YR 24–HR PRECIPITATION IN TENTH OF INCH

NOAA ATLAS 2, Volume VIII

Prepared by U.S. Dept of Commerce
National Oceanic & Atmospheric Administration
National Weather Service, Office of Hydrology

Prepared for U.S. Dept of Agriculture,
Soil Conservation Service, Engineering Division

Figure 2.13

APPENDIX D
PAVEMENT RUNOFF CALCULATIONS

Riggs Road, Val Vista Dr. to Recker Rd.

Pavement Drainage Areas

Pavement Runoff Calculations for 10-year, 1-hour storm event

Station	Roadway	Area ID	C	i, in/hr	A, SF	A, acres	Q, cfs
166+75	Riggs	ES1	0.95	1.5	76346.00	1.75	2.5
157+33	Riggs	22S	0.95	1.5	67786.00	1.56	2.2
155+45	Riggs	21S	0.95	1.5	11589.00	0.27	0.4
151+15	Riggs	20M	0.95	1.5	24244.00	0.56	0.8
146+90	Riggs	19M	0.95	1.5	23650.00	0.54	0.8
143+43	Riggs	18S	0.95	1.5	24583.00	0.56	0.8
136+77	Riggs	17S	0.95	1.5	48191.00	1.11	1.6
127+94	Riggs	16S	0.95	1.5	63873.40	1.47	2.1
019+03	Higley	H1W	0.95	1.5	87136.00	2.00	2.9
018+75	Higley	H2E	0.95	1.5	38854.00	0.89	1.3
012+85	Higley	H1E	0.95	1.5	42966.00	0.99	1.4
123+71	Riggs	14S	0.95	1.5	31209.00	0.72	1.0
118+63	Riggs	13S	0.95	1.5	50624.00	1.16	1.7
111+50	Riggs	12S	0.95	1.5	71599.00	1.64	2.3
107+74	Riggs	11S	0.95	1.5	37829.00	0.87	1.2
093+85	Riggs	10S	0.95	1.5	30760.00	0.71	1.0
093+85	Riggs	10N	0.95	1.5	33820.00	0.78	1.1
086+00	Riggs	9S	0.95	1.5	37364.00	0.86	1.2
086+00	Riggs	9N	0.95	1.5	44735.00	1.03	1.5
072+73	Riggs	8S	0.95	1.5	96716.00	2.22	3.2
072+69	Riggs	8N	0.95	1.5	103025.00	2.37	3.4
055+00	Riggs	7N	0.95	1.5	62125.00	1.43	2.0
047+14	Riggs	6N	0.95	1.5	43307.00	0.99	1.4
047+14	Riggs	6S	0.95	1.5	110878.00	2.55	3.6
040+28	Riggs	5S	0.95	1.5	44370.00	1.02	1.5
033+93	Riggs	4S	0.95	1.5	41032.00	0.94	1.3
027+05	Riggs	3S	0.95	1.5	44282.00	1.02	1.4
020+95	Riggs	2S	0.95	1.5	37446.54	0.86	1.2
017+00	Val Vista	1S	0.95	1.5	22272.00	0.51	0.7

Note:

1) Pavement width includes 9 foot Desert landscape between back of curb and sidewalk, but didn't reduce "C" value.

RUNOFF ANALYSIS EXISTING/PROPOSED CONDITIONS

Summary Existing/Proposed Conditions

Existing Conditions

Concentration Point	Area, Pavement (ac)	Area, Landscape (ac)	2-Year (cfs)	5-Year (cfs)	10-Year (cfs)	25-Year (cfs)	50-Year (cfs)	100-Year (cfs)	Comments
1	3.3	11.48	18	27	34	46	57	68	EMF
2	1.7	7.58	12	18	23	31	39	46	164th Street
3	0.55	6.17	8	13	16	21	27	32	Higley Road

Proposed Conditions

Concentration Point	Area, Pavement (ac)	Area, Landscape (ac)	2-Year (cfs)	5-Year (cfs)	10-Year (cfs)	25-Year (cfs)	50-Year (cfs)	100-Year (cfs)	Comments
1	8.44	6.34	18	29	36	47	57	67	EMF
2	5.64	3.63	13	20	25	33	39	46	164th Street
3	5.26	1.46	10	15	19	24	29	33	Higley Road

Rational Runoff Method
FCDMC Rational Method

Project:	Riggs Road	By:	JJP
Basin:	Exisitng - EMF to 164th St	Date:	Aug-09
ID		Checked:	
Contrib. A	14.78 Acres	Project No.:	8.0217

Storm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Q =	18	27	34	46	57	68	cfs

Note:

Runoff Coefficient, C and Basin Area, A

Min Tc : 10 min (5 or 10 minutes)

Watershed Classification: urban

	Phx	Specific	
P10-Yr 6-Hour Precipitation:	1.89	1.89	inches

Subarea	Area, A acres	Land Use/ Classification	% Cover	2-Year C	5-Year C	10-Year C	25-Year C	50-Year C	100-Year C
1	11.48	landscape	10%	0.70	0.70	0.70	0.77	0.84	0.88
2	3.3	pavment		0.95	0.95	0.95	0.95	0.95	0.95
3				0.00	0.00		0.00	0.00	0.00
4				0.00	0.00		0.00	0.00	0.00
5				0.00	0.00		0.00	0.00	0.00
6				0.00	0.00		0.00	0.00	0.00
7				0.00	0.00		0.00	0.00	0.00
Total:	14.8								

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Weighted C =	0.76	0.76	0.76	0.81	0.86	0.89

Time of Concentration, Tc / Rainfall intensity, i

Note: Minimum Tc = 10 min

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Rainfall intensity for Tc = 10 minutes =	2.80	3.91	4.51	5.51	6.21	7.01	in/hour

Tc is a function of intensity and vice-versa thus solution is iterative.

1) Longest flowpath length: L, and slope, S

Segment	Length, d, ft	Elevation, ft High Pt.	Low Pt.	Change, H	Slope, ft/ft	(d^3/H)^1/2
1	3264	1320.6	1299.1	21.5	0.007	40198
2				0.0		0
3				0.0		0
4				0.0		0
5				0.0		0
d_T =	3264		Sum =	22		j = 40198

L, miles = d_T/5280 = 0.618 miles

S, ft/mi = 5280(d_T/j)^2 = 34.8 ft/mi 0.0066 ft/ft

Corr. S, ft/mi = 5280(d_T/j)^2 = 34.8 ft/mi (See Figure 5.4)

2) Roughness Coefficient, Kb (Table 3.1)

Landform: Residentail area

Runoff Character: Medium to high

Type A A-D Refer to Table 3.1

m -0.00625

b 0.04

Kb = 0.0327

User Specified Kb = (If a number is used this overrides the calculated value in calculations)

3) Tc / i iteration:

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Assume Tc:	25.40	21.59	19.87	18.14	17.11	16.22	minutes
Try i:	1.58	2.42	3.01	3.83	4.47	5.14	inches/hour
Calc Tc:	0.42	0.36	0.33	0.30	0.29	0.27	hours
Calc Tc:	25.40	21.59	19.87	18.14	17.11	16.22	minutes
Min Tc :	10	10	10	10	10	10	
Final **i** =	**1.58**	**2.42**	**3.01**	**3.83**	**4.47**	**5.14**	inches/hour

Note: ** If Calculated Tc was less than 5 minutes use 5-minute rainfall intensity

Discharge Q

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
C	0.76	0.76	0.76	0.81	0.86	0.89	
i	1.58	2.42	3.01	3.83	4.47	5.14	inches/hour
A	14.8	14.8	14.8	14.8	14.8	14.8	acre
Add. Q							
Q = CiA	**17.6**	**27.0**	**33.6**	**45.8**	**57.1**	**67.7**	cfs
Q/A ratio =	1.2	1.8	2.3	3.1	3.9	4.6	cfs/ac

Rational Runoff Method
FCDMC Rational Method

Project:	Riggs Road	By:	JJP
Basin:	Exisitng - 164th St to Higley	Date:	Aug-09
ID		Checked:	
Contrib. A	9.28 Acres	Project No.:	8.0217

Storm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Q =	12	18	23	31	39	46	cfs

Note:

Runoff Coefficient, C and Basin Area, A

Min Tc : 10 min (5 or 10 minutes)

Watershed Classification: urban

	Phx	Specific	
P10-Yr 6-Hour Precipitation:	1.89	1.89	inches

Subarea	Area, A acres	Land Use/ Classification	% Cover	2-Year C	5-Year C	10-Year C	25-Year C	50-Year C	100-Year C
1	7.58	landscape	10%	0.70	0.70	0.70	0.77	0.84	0.88
2	1.7	pavment		0.95	0.95	0.95	0.95	0.95	0.95
3				0.00	0.00		0.00	0.00	0.00
4				0.00	0.00		0.00	0.00	0.00
5				0.00	0.00		0.00	0.00	0.00
6				0.00	0.00		0.00	0.00	0.00
7				0.00	0.00		0.00	0.00	0.00
Total:	9.3								

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Weighted C =	0.75	0.75	0.75	0.80	0.86	0.89

Time of Concentration, Tc / Rainfall intensity, i

Note: Minimum Tc = 10 min

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Rainfall intensity for Tc = 10 minutes =	2.80	3.91	4.51	5.51	6.21	7.01	in/hour

Tc is a function of intensity and vice-versa thus solution is iterative.

1) Longest flowpath length: L, and slope, S

Segment	Length, d, ft	Elevation, ft			Slope, ft/ft	(d^3/H)^1/2
		High Pt.	Low Pt.	Change, H		
1	2701	1337.2	1315.5	21.7	0.008	30162
2				0.0		0
3				0.0		0
4				0.0		0
5				0.0		0
d_T =	2701		Sum =	22		j = 30162

L, miles = d_T/5280 = 0.512 miles

S, ft/mi = 5280(d_T/j)^2 = 42.3 ft/mi 0.008 ft/ft

Corr. S, ft/mi = 5280(d_T/j)^2 = 42.3 ft/mi (See Figure 5.4)

2) Roughness Coefficient, Kb (Table 3.1)

Landform: Residentail area

Runoff Character: Medium to high

Type A A-D Refer to Table 3.1

m -0.00625

b 0.04

Kb = 0.0340

User Specified Kb = (If a number is used this overrides the calculated value in calculations)

3) Tc / i iteration:

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Assume Tc:	21.28	18.20	16.79	15.35	14.49	13.78	minutes
Try i:	1.76	2.66	3.28	4.15	4.84	5.53	inches/hour
Calc Tc:	0.35	0.30	0.28	0.26	0.24	0.23	hours
Calc Tc:	21.28	18.20	16.79	15.35	14.49	13.78	minutes
Min Tc :	10	10	10	10	10	10	
Final **i** =	**1.76**	**2.66**	**3.28**	**4.15**	**4.84**	**5.53**	inches/hour

Note: ** If Calculated Tc was less than 5 minutes use 5-minute rainfall intensity

Discharge Q

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
C	0.75	0.75	0.75	0.80	0.86	0.89	
i	1.76	2.66	3.28	4.15	4.84	5.53	inches/hour
A	9.3	9.3	9.3	9.3	9.3	9.3	acre
Add. Q							
Q = CiA	**12.2**	**18.4**	**22.7**	**31.0**	**38.6**	**45.6**	cfs
Q/A ratio =	1.3	2.0	2.4	3.3	4.2	4.9	cfs/ac

Rational Runoff Method
FCDMC Rational Method

Project:	Riggs Road	By:	JJP
Basin:	Exisitng - Higley to SRP easement	Date:	Aug-09
ID		Checked:	
Contrib. A	6.72 Acres	Project No.:	8.0217

Storm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Q =	8	13	16	21	27	32	cfs

Note:

Runoff Coefficient, C and Basin Area, A

Min Tc : 10 min (5 or 10 minutes)

Watershed Classification: urban

	Phx	Specific	
P10-Yr 6-Hour Precipitation:	1.89	1.89	inches

Subarea	Area, A acres	Land Use/ Classification	% Cover	2-Year C	5-Year C	10-Year C	25-Year C	50-Year C	100-Year C
1	6.17	landscape	10%	0.70	0.70	0.70	0.77	0.84	0.88
2	0.55	pavment		0.95	0.95	0.95	0.95	0.95	0.95
3				0.00	0.00		0.00	0.00	0.00
4				0.00	0.00		0.00	0.00	0.00
5				0.00	0.00		0.00	0.00	0.00
6				0.00	0.00		0.00	0.00	0.00
7				0.00	0.00		0.00	0.00	0.00
Total:	6.7								

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Weighted C =	0.72	0.72	0.72	0.78	0.85	0.88

Time of Concentration, Tc / Rainfall intensity, i

Note: Minimum Tc = 10 min

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Rainfall intensity for Tc = 10 minutes =	2.80	3.91	4.51	5.51	6.21	7.01	in/hour

Tc is a function of intensity and vice-versa thus solution is iterative.

1) Longest flowpath length: L, and slope, S

Segment	Length, d, ft	Elevation, ft High Pt.	Low Pt.	Change, H	Slope, ft/ft	(d^3/H)^1/2
1	2653	1352.3	1333.0	19.3	0.007	31098
2				0.0		0
3				0.0		0
4				0.0		0
5				0.0		0
d_T =	2653		Sum =	19		j = 31098

L, miles = d_T/5280 = 0.502 miles

S, ft/mi = 5280(d_T/j)^2 = 38.4 ft/mi 0.0073 ft/ft

Corr. S, ft/mi = 5280(d_T/j)^2 = 38.4 ft/mi (See Figure 5.4)

2) Roughness Coefficient, Kb (Table 3.1)

Landform: Residentail area

Runoff Character: Medium to high

Type A A-D Refer to Table 3.1

m -0.00625

b 0.04

Kb = 0.0348

User Specified Kb = (If a number is used this overrides the calculated value in calculations)

3) Tc / i iteration:

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Assume Tc:	22.25	19.00	17.52	16.01	15.11	14.36	minutes
Try i:	1.71	2.60	3.21	4.07	4.75	5.43	inches/hour
Calc Tc:	0.37	0.32	0.29	0.27	0.25	0.24	hours
Calc Tc:	22.25	19.00	17.52	16.01	15.11	14.36	minutes
Min Tc :	10	10	10	10	10	10	
Final i =	**1.71**	**2.60**	**3.21**	**4.07**	**4.75**	**5.43**	inches/hour

Note: ** If Calculated Tc was less than 5 minutes use 5-minute rainfall intensity

Discharge Q

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
C	0.72	0.72	0.72	0.78	0.85	0.88	
i	1.71	2.60	3.21	4.07	4.75	5.43	inches/hour
A	6.7	6.7	6.7	6.7	6.7	6.7	acre
Add. Q							
Q = CiA	**8.3**	**12.6**	**15.6**	**21.5**	**27.1**	**32.1**	cfs
Q/A ratio =	1.2	1.9	2.3	3.2	4.0	4.8	cfs/ac

Rational Runoff Method
FCDMC Rational Method

Project:	Riggs Road	By:	JJP
Basin:	Developed - EMF to 164th St	Date:	Aug-09
ID		Checked:	
Contrib. A	14.78 Acres	Project No.:	8.0217

Storm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Q =	18	29	36	47	57	67	cfs

Note:

Runoff Coefficient, C and Basin Area, A

Min Tc : 10 min (5 or 10 minutes)

Watershed Classification: urban

	Phx	Specific	
P10-Yr 6-Hour Precipitation:	1.89	1.89	inches

Subarea	Area, A acres	Land Use/ Classification	% Cover	2-Year C	5-Year C	10-Year C	25-Year C	50-Year C	100-Year C
1	6.34	landscape	10%	0.70	0.70	0.70	0.77	0.84	0.88
2	8.44	pavment		0.95	0.95	0.95	0.95	0.95	0.95
3				0.00	0.00		0.00	0.00	0.00
4				0.00	0.00		0.00	0.00	0.00
5				0.00	0.00		0.00	0.00	0.00
6				0.00	0.00		0.00	0.00	0.00
7				0.00	0.00		0.00	0.00	0.00
Total:	14.8								

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Weighted C =	0.84	0.84	0.84	0.87	0.90	0.92

Time of Concentration, Tc / Rainfall intensity, i

Note: Minimum Tc = 10 min

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Rainfall intensity for Tc = 10 minutes =	2.80	3.91	4.51	5.51	6.21	7.01	in/hour

Tc is a function of intensity and vice-versa thus solution is iterative.

1) Longest flowpath length: L, and slope, S

Segment	Length, d, ft	Elevation, ft High Pt.	Low Pt.	Change, H	Slope, ft/ft	(d^3/H)^1/2
1	2747	1320.6	1304.5	16.1	0.006	35882
2	631	1301.6	1299.1	2.5	0.004	9985
3				0.0		0
4				0.0		0
5				0.0		0
d_T =	3378		Sum =	19		j = 45867

L, miles = d_T/5280 = 0.640 miles

S, ft/mi = 5280(d_T/j)^2 = 29.1 ft/mi 0.0055 ft/ft

Corr. S, ft/mi = 5280(d_T/j)^2 = 29.1 ft/mi (See Figure 5.4)

2) Roughness Coefficient, Kb (Table 3.1)

Landform: Residentail area

Runoff Character: Medium to high

Type A A-D Refer to Table 3.1

m -0.00625

b 0.04

Kb = 0.0327

User Specified Kb = (If a number is used this overrides the calculated value in calculations)

3) Tc / i iteration:

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Assume Tc:	27.97	23.70	21.78	19.86	18.72	17.73	minutes
Try i:	1.48	2.29	2.86	3.65	4.27	4.92	inches/hour
Calc Tc:	0.47	0.39	0.36	0.33	0.31	0.30	hours
Calc Tc:	27.97	23.70	21.78	19.86	18.72	17.73	minutes
Min Tc :	10	10	10	10	10	10	
Final **i** =	**1.48**	**2.29**	**2.86**	**3.65**	**4.27**	**4.92**	inches/hour

Note: ** If Calculated Tc was less than 5 minutes use 5-minute rainfall intensity

Discharge Q

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
C	0.84	0.84	0.84	0.87	0.90	0.92	
i	1.48	2.29	2.86	3.65	4.27	4.92	inches/hour
A	14.8	14.8	14.8	14.8	14.8	14.8	acre
Add. Q							
Q = CiA	**18.5**	**28.6**	**35.7**	**47.1**	**56.9**	**66.8**	cfs
Q/A ratio =	1.2	1.9	2.4	3.2	3.9	4.5	cfs/ac

Rational Runoff Method
FCDMC Rational Method

Project:	Riggs Road	By:	JJP
Basin:	Developed - 164th St to Higley	Date:	Aug-09
ID		Checked:	
Contrib. A	9.27 Acres	Project No.:	8.0217

Storm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Q =	13	20	25	33	39	46	cfs

Note:

Runoff Coefficient, C and Basin Area, A

Min Tc : 10 min (5 or 10 minutes)
Watershed Classification: urban

	Phx	Specific	
P10-Yr 6-Hour Precipitation:	1.89	1.89	inches

Subarea	Area, A acres	Land Use/ Classification	% Cover	2-Year C	5-Year C	10-Year C	25-Year C	50-Year C	100-Year C
1	3.63	landscape	10%	0.70	0.70	0.70	0.77	0.84	0.88
2	5.64	pavment		0.95	0.95	0.95	0.95	0.95	0.95
3				0.00	0.00		0.00	0.00	0.00
4				0.00	0.00		0.00	0.00	0.00
5				0.00	0.00		0.00	0.00	0.00
6				0.00	0.00		0.00	0.00	0.00
7				0.00	0.00		0.00	0.00	0.00
Total:	9.3								

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Weighted C =	0.85	0.85	0.85	0.88	0.91	0.92

Time of Concentration, Tc / Rainfall intensity, i

Note: Minimum Tc = 10 min

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Rainfall intensity for Tc = 10 minutes =	2.80	3.91	4.51	5.51	6.21	7.01	in/hour

Tc is a function of intensity and vice-versa thus solution is iterative.

1) Longest flowpath length: L, and slope, S

Segment	Length, d, ft	Elevation, ft High Pt.	Low Pt.	Change, H	Slope, ft/ft	(d^3/H)^1/2
1	2664	1337.2	1319.9	17.2	0.006	33116
2				0.0		0
3				0.0		0
4				0.0		0
5				0.0		0
d_T =	2664		Sum =	17		j = 33116

L, miles = d_T/5280 = 0.505 miles
S, ft/mi = 5280(d_T/j)^2 = 34.2 ft/mi 0.0065 ft/ft
Corr. S, ft/mi = 5280(d_T/j)^2 = 34.2 ft/mi (See Figure 5.4)

2) Roughness Coefficient, Kb (Table 3.1)

Landform: Residentail area
Runoff Character: Medium to high

Type A A-D Refer to Table 3.1
m -0.00625
b 0.04
Kb = 0.0340
User Specified Kb = (If a number is used this overrides the calculated value in calculations)

3) Tc / i iteration:

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Assume Tc:	22.99	19.61	18.08	16.52	15.58	14.80	minutes
Try i:	1.68	2.55	3.16	4.01	4.68	5.36	inches/hour
Calc Tc:	0.38	0.33	0.30	0.28	0.26	0.25	hours
Calc Tc:	22.99	19.61	18.08	16.52	15.58	14.80	minutes
Min Tc :	10	10	10	10	10	10	
Final i =	**1.68**	**2.55**	**3.16**	**4.01**	**4.68**	**5.36**	inches/hour

Note: ** If Calculated Tc was less than 5 minutes use 5-minute rainfall intensity

Discharge Q

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
C	0.85	0.85	0.85	0.88	0.91	0.92	
i	1.68	2.55	3.16	4.01	4.68	5.36	inches/hour
A	9.3	9.3	9.3	9.3	9.3	9.3	acre
Add. Q							
Q = CiA	**13.3**	**20.2**	**25.0**	**32.7**	**39.3**	**45.7**	cfs
Q/A ratio =	1.4	2.2	2.7	3.5	4.2	4.9	cfs/ac

Rational Runoff Method
FCDMC Rational Method

Project:	Riggs Road	By:	JJP
Basin:	Developed - Higley to SRP easement	Date:	Aug-09
ID		Checked:	
Contrib. A	6.72 Acres	Project No.:	8.0217

Storm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Q =	10	15	19	24	29	33	cfs

Note:

Runoff Coefficient, C and Basin Area, A

Min Tc : 10 min (5 or 10 minutes)

Watershed Classification: urban

	Phx	Specific	
P10-Yr 6-Hour Precipitation:	1.89	1.89	inches

Subarea	Area, A acres	Land Use/ Classification	% Cover	2-Year C	5-Year C	10-Year C	25-Year C	50-Year C	100-Year C
1	1.46	landscape	10%	0.70	0.70	0.70	0.77	0.84	0.88
2	5.26	pavment		0.95	0.95	0.95	0.95	0.95	0.95
3				0.00	0.00		0.00	0.00	0.00
4				0.00	0.00		0.00	0.00	0.00
5				0.00	0.00		0.00	0.00	0.00
6				0.00	0.00		0.00	0.00	0.00
7				0.00	0.00		0.00	0.00	0.00
Total:	6.7								

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Weighted C =	0.90	0.90	0.90	0.91	0.93	0.93

Time of Concentration, Tc / Rainfall intensity, i

Note:		2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Minimum Tc = 10 min								
Rainfall intensity for Tc = 10 minutes =	2.80	3.91	4.51	5.51	6.21	7.01	in/hour

Tc is a function of intensity and vice-versa thus solution is iterative.

1) Longest flowpath length: L, and slope, S

Segment	Length, d, ft	Elevation, ft			Slope, ft/ft	(d^3/H)^1/2
		High Pt.	Low Pt.	Change, H		
1	2585	1352.3	1336.7	15.6	0.006	33297
2				0.0		0
3				0.0		0
4				0.0		0
5				0.0		0
d_T =	2585		Sum =	16		j = 33297

L, miles = d_T/5280 = 0.490 miles

S, ft/mi = 5280(d_T/j)^2 = 31.8 ft/mi 0.006 ft/ft

Corr. S, ft/mi = 5280(d_T/j)^2 = 31.8 ft/mi (See Figure 5.4)

2) Roughness Coefficient, Kb (Table 3.1)

Landform: Residentail area

Runoff Character: Medium to high

Type A A-D Refer to Table 3.1

m -0.00625

b 0.04

Kb = 0.0348

User Specified Kb = (If a number is used this overrides the calculated value in calculations)

3) Tc / i iteration:

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
Assume Tc:	23.61	20.11	18.53	16.93	15.97	15.16	minutes
Try i:	1.65	2.52	3.12	3.96	4.62	5.30	inches/hour
Calc Tc:	0.39	0.34	0.31	0.28	0.27	0.25	hours
Calc Tc:	23.61	20.11	18.53	16.93	15.97	15.16	minutes
Min Tc :	10	10	10	10	10	10	
Final **i** =	**1.65**	**2.52**	**3.12**	**3.96**	**4.62**	**5.30**	inches/hour

Note: ** If Calculated Tc was less than 5 minutes use 5-minute rainfall intensity

Discharge Q

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	
C	0.90	0.90	0.90	0.91	0.93	0.93	
i	1.65	2.52	3.12	3.96	4.62	5.30	inches/hour
A	6.7	6.7	6.7	6.7	6.7	6.7	acre
Add. Q							
Q = CiA	**9.9**	**15.2**	**18.8**	**24.3**	**28.8**	**33.2**	cfs
Q/A ratio =	1.5	2.3	2.8	3.6	4.3	4.9	cfs/ac

APPENDIX E

INLET, RETENTION BASIN & HYDRAULIC CALCULATIONS

Riggs Road, Val Vista Dr. to Recker Rd.

100% Inlet Calculations

Inlet ID	Station	Roadway	Rational Q, cfs	Q from U/S, cfs	Total Q at Inlet, cfs	Inlet Type	Wing/Scupper Length, ft	Q int, cfs	Q bypass cfs	
ES1	*166+75*	*Riggs*	*2.5*	*0.0*	*2.5*	*MAG 206*	*28*	*2.5*	*0.0*	Existing scupper
22S	157+33	Riggs	2.2	0.0	2.2	MAG 206	16	2.2	0.0	
21S	155+45	Riggs	0.4	0.0	0.4	MAG 533 Type D	3	0.4	0.0	
20M	151+15	Riggs	0.8	0.0	0.8	MAG 532 Type C	0	0.8	0.0	
19M	146+62	Riggs	0.7	0.0	0.7	MAG 532 Type C	0	0.7	0.0	
18S	143+43	Riggs	0.7	0.0	0.7	MAG 533 Type D	3	0.7	0.0	
17S	136+77	Riggs	1.6	0.0	1.6	MAG 533 Type D	6	1.6	0.0	
16S	127+94	Riggs	2.1	0.0	2.1	MAG 533 Type D	3	2.1	0.0	
H1W	19+03	Higley	2.9	0.0	2.9	MAG 533 Type D	10	2.9	0.0	
H2E	18+75	Higley	1.3	0.0	1.3	MAG 533 Type D	3	1.3	0.0	
H1E	12+85	Higley	1.4	0.0	1.4	MAG 533 Type D	6	1.4	0.0	
14S	123+71	Riggs	1.0	0.0	1.0	MAG 533 Type D	6	1.0	0.0	
13S	118+63	Riggs	1.7	0.0	1.7	MAG 533 Type D	6	1.7	0.0	
12S	111+50	Riggs	2.3	0.0	2.3	MAG 533 Type D	6	2.3	0.0	
11S	107+74	Riggs	1.2	0.0	1.2	MAG 533 Type D	6	1.2	0.0	
10S	93+85	Riggs	1.0	0.0	1.0	MAG 533 Type D	6	1.0	0.0	
10N	93+85	Riggs	1.1	0.0	1.1	MAG 533 Type D	6	1.1	0.0	
9S	86+00	Riggs	1.2	0.0	1.2	MAG 533 Type D	6	1.2	0.0	
9N	86+00	Riggs	1.5	0.0	1.5	MAG 533 Type D	6	1.5	0.0	
Flanker, S	*72+07*	*Riggs*	*1.0*	*0.0*	*1.0*	*MAG 533 Type D*	*0*	*0.9*	*0.1*	
8S	72+73	Riggs	3.2	0.0	3.2	MAG 533 Type D	0	3.2	0.0	
Flanker, S	*73+39*	*Riggs*	*2.2*	*0.0*	*2.2*	*MAG 533 Type D*	*0*	*1.5*	*0.7*	
Flanker, N	*72+03*	*Riggs*	*1.1*	*0.0*	*1.1*	*MAG 533 Type D*	*0*	*0.9*	*0.2*	
8N	72+69	Riggs	3.4	0.0	3.4	MAG 533 Type D	0	3.4	0.0	
Flanker, N	*73+35*	*Riggs*	*2.3*	*0.0*	*2.3*	*MAG 533 Type D*	*0*	*1.6*	*0.7*	
7N	55+00	Riggs	2.0	0.0	2.0	MAG 533 Type D	10	2.0	0.0	
6N	47+14	Riggs	1.4	0.0	1.4	MAG 533 Type D	6	1.4	0.0	
6S	47+14	Riggs	3.6	0.0	3.6	MAG 533 Type D	17	3.6	0.0	
5S	40+28	Riggs	1.5	0.0	1.5	MAG 533 Type D	6	1.5	0.0	
4S	33+93	Riggs	1.3	0.0	1.3	MAG 533 Type D	6	1.3	0.0	
3S	27+05	Riggs	1.4	0.0	1.4	MAG 533 Type D	6	1.4	0.0	
2S	20+95	Riggs	1.2	0.0	1.2	MAG 533 Type D	6	1.2	0.0	
1S	17+00	Val Vista	0.7	0.0	0.7	MAG 533 Type D	3	0.7	0.0	

Riggs Road Detention Basin From station 47+00 to Sta 66+70 (crest of EMF Bridge)

North Side of Riggs Road
Scenario Add 50 (drainage Easement) feet plus 15 (easement) feet of width for drainage easement for Zinke Properties on the North Side.

Basin approx. sta	Roadway	Side of Road	U/S Sta	D/S Sta	L	C Pavement	W Pavement, ft	C Desert Landscape	W Desert Landscape, ft	CA	D ft	Volume ft^3	Volume ac-ft
	Riggs	North	6670	6452.34	217.66	0.95	44.00	0.70	0.00	9098.19	0.25	2274.55	0.05
	Riggs	North	6452.34	6175	277.34	0.95	52.00	0.70	93.00	31755.43	0.25	7938.86	0.18
	Riggs	North	6175	5795	380	0.95	53.50	0.70	91.50	43652.50	0.25	10913.13	0.25
55+00	Riggs	North	5795	5500	295	0.95	53.50	0.70	81.50	31823.13	0.25	7955.78	0.18
					1170					116329.24			***0.67***
47+00	Riggs	North	5500	4700	800	0.95	53.50	0.70	81.50	86300.00	0.25	21575.00	0.50
					0	0.95		0.70		0.00	0.25	0.00	0.00
					0	0.95		0.70		0.00	0.25	0.00	0.00
										86300.00			***0.50***

South Side of Riggs Road
RWCD Property

Basin approx. sta	Roadway	Side of Road	U/S Sta	D/S Sta	L	C Pavement	W Pavement, ft	C Desert Landscape	W Desert Landscape, ft	CA	D ft	Volume ft^3	Volume ac-ft
47+00	Riggs	South	6670	6452.34	217.66	0.95	44.00	0.70	0.00	9098.19	0.25	2274.55	0.05
	Riggs	South	6452.34	6175	277.34	0.95	52.00	0.70	48.00	23019.22	0.25	5754.81	0.13
	Riggs	South	6175	5795	380	0.95	53.50	0.70	46.50	31682.50	0.25	7920.63	0.18
	Riggs	South	5795	5500	295	0.95	53.50	0.70	21.50	19433.13	0.25	4858.28	0.11
	Riggs	South	5500	4700	800	0.95	53.50	0.70	21.50	52700.00	0.25	13175.00	0.30
					0	0.95		0.70		0.00	0.25	0.00	0.00
					0	0.95		0.70		0.00	0.25	0.00	0.00
										135933.03			

1/2 Street to R/W, route flows to north side of rigg's road ***0.78***

1/2 Street to R/W, route flows to north side of rigg's road ***1.28***
Plus 1/2 Street to R/W north side of Riggs road

Temporary Basins

Basin approx. sta	Roadway	Side of Road	Area Pavement ft^2	C Pavment	Area Desert ft^2	C Desert	SUM CA	Volume ft^3	Volume ac-ft	
143+43	Riggs	South side	64307	0.95	95832	0.40	99424.45	24856.11	0.57	2.20
153+25	Riggs	South side	21507	0.95	0	0.40	20431.65	5107.91	0.12	0.00
180+00	Riggs/Recker	SE corner	NA	NA	NA	NA	NA	30492.00	0.70	See note 3

Note:
1) Basin just west of SRP property. Basin will be sized for 1/2 street flows plus 2.2 acres contributing property
2) Basin sized for 1/2 street flows only.
3) Basin SE corner of Riggs & Recker Road. Volume Provided 0.73 ac-ft. See excerpts from SVK Enginnering drainage report in Appendix B for retention basin calculations.

Worksheet for 1S Mag 533 In Sag - Sta 17+00 Rt VV

Project Description

Solve For	Spread

Input Data

Discharge	0.70	ft³/s
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	2.40	ft
Opening Height	0.42	ft
Curb Throat Type	Horizontal	
Throat Incline Angle	90.00	degrees

Options

Calculation Option	Use Both

Results

Spread	2.76	ft
Depth	0.14	ft
Gutter Depression	0.06	ft
Total Depression	0.23	ft
Open Grate Area	2.70	ft²
Active Grate Weir Length	5.00	ft

Worksheet for 2S Mag 533 -Sta 20+95 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.20	ft^3/s
Slope	0.00521	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.20	ft^3/s
Bypass Flow	0.00	ft^3/s
Spread	6.99	ft
Depth	0.24	ft
Flow Area	0.68	ft^2
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.77	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.13	
Grate Flow Ratio	0.67	
Equivalent Cross Slope	0.10402	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.92	
Total Interception Length	6.22	ft

Worksheet for 3S Mag 533 -Sta 27+05 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.40	ft³/s
Slope	0.00329	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.40	ft³/s
Bypass Flow	0.00	ft³/s
Spread	8.25	ft
Depth	0.27	ft
Flow Area	0.92	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.53	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.17	
Grate Flow Ratio	0.60	
Equivalent Cross Slope	0.09479	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.93	
Total Interception Length	6.11	ft

Worksheet for 4S Mag 533 -Sta 33+93 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.30	ft³/s
Slope	0.00329	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.30	ft³/s
Bypass Flow	0.00	ft³/s
Spread	7.99	ft
Depth	0.27	ft
Flow Area	0.87	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.50	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.17	
Grate Flow Ratio	0.61	
Equivalent Cross Slope	0.09653	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.97	
Total Interception Length	5.86	ft

Worksheet for 5S Mag 533 -Sta 40+28 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.50	ft³/s
Slope	0.00329	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	8.49	ft
Depth	0.28	ft
Flow Area	0.97	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.55	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.16	
Grate Flow Ratio	0.58	
Equivalent Cross Slope	0.09320	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.90	
Total Interception Length	6.36	ft

Worksheet for 6S Mag 533 -Sta 47+14 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	3.60	ft³/s
Slope	0.00370	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	16.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	3.60	ft³/s
Bypass Flow	0.00	ft³/s
Spread	11.86	ft
Depth	0.36	ft
Flow Area	1.82	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.97	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.11	
Grate Flow Ratio	0.44	
Equivalent Cross Slope	0.07627	ft/ft
Active Grate Length	1.50	ft
Length Factor	1.35	
Total Interception Length	10.72	ft

Worksheet for 6N Mag 533 -Sta 47+14 Lt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.40	ft³/s
Slope	0.00371	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.40	ft³/s
Bypass Flow	0.00	ft³/s
Spread	8.04	ft
Depth	0.27	ft
Flow Area	0.88	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.60	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.15	
Grate Flow Ratio	0.61	
Equivalent Cross Slope	0.09618	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.91	
Total Interception Length	6.28	ft

Worksheet for 7N Mag 533 -Sta 55+00 Lt

Project Description

Solve For	Efficiency

Input Data

Discharge		2.00	ft^3/s
Slope		0.00415	ft/ft
Gutter Width		2.00	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.03	ft/ft
Roughness Coefficient		0.016	
Local Depression		2.00	in
Local Depression Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%
Curb Opening Length		10.40	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	2.00	ft^3/s
Bypass Flow	0.00	ft^3/s
Spread	9.12	ft
Depth	0.30	ft
Flow Area	1.11	ft^2
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.80	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.13	
Grate Flow Ratio	0.55	
Equivalent Cross Slope	0.08933	ft/ft
Active Grate Length	1.50	ft
Length Factor	1.13	
Total Interception Length	7.89	ft

Worksheet for 8N Mag 533 Sta 72+69 Rt Combination Inlet In Sag - 1

Project Description

Solve For	Spread

Input Data

Discharge		3.40	ft³/s
Gutter Width		2.00	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.03	ft/ft
Local Depression		2.00	in
Local Depression Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%
Curb Opening Length		2.40	ft
Opening Height		0.42	ft
Curb Throat Type	Horizontal		
Throat Incline Angle		90.00	degrees

Options

Calculation Option	Use Both

Results

Spread	10.50	ft
Depth	0.33	ft
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Open Grate Area	2.70	ft²
Active Grate Weir Length	5.00	ft

Worksheet for Flanker N-W Mag 533 -Riggs Sta 72+03 Lt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.10	ft³/s
Slope	0.00455	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	2.40	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	84.25	%
Intercepted Flow	0.93	ft³/s
Bypass Flow	0.17	ft³/s
Spread	6.93	ft
Depth	0.24	ft
Flow Area	0.67	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.65	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.15	
Grate Flow Ratio	0.68	
Equivalent Cross Slope	0.10449	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.16	
Total Interception Length	5.74	ft

Worksheet for Flanker N-E Mag 533 -Riggs Sta 73+35 Lt

Project Description

Solve For	Efficiency

Input Data

Discharge	2.30	ft³/s
Slope	0.00454	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	2.40	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	68.90	%
Intercepted Flow	1.58	ft³/s
Bypass Flow	0.72	ft³/s
Spread	9.49	ft
Depth	0.30	ft
Flow Area	1.19	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.93	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.11	
Grate Flow Ratio	0.53	
Equivalent Cross Slope	0.08726	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.10	
Total Interception Length	8.71	ft

Worksheet for 8S Mag 533 Sta 72+73 Rt Combination Inlet In Sag - 1

Project Description

Solve For	Spread

Input Data

Discharge		3.20	ft³/s
Gutter Width		2.00	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.03	ft/ft
Local Depression		2.00	in
Local Depression Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%
Curb Opening Length		2.40	ft
Opening Height		0.42	ft
Curb Throat Type	Horizontal		
Throat Incline Angle		90.00	degrees

Options

Calculation Option	Use Both

Results

Spread	9.98	ft
Depth	0.32	ft
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Open Grate Area	2.70	ft²
Active Grate Weir Length	5.00	ft

Worksheet for Flanker S-W Mag 533 -Riggs Sta 72+07 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.00	ft³/s
Slope	0.00454	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	2.40	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	86.12	%
Intercepted Flow	0.86	ft³/s
Bypass Flow	0.14	ft³/s
Spread	6.64	ft
Depth	0.23	ft
Flow Area	0.62	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.61	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.15	
Grate Flow Ratio	0.70	
Equivalent Cross Slope	0.10686	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.17	
Total Interception Length	5.44	ft

Worksheet for Flanker S-E Mag 533 -Riggs Sta 73+39 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	2.20	ft³/s
Slope	0.00458	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	2.40	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	69.85	%
Intercepted Flow	1.54	ft³/s
Bypass Flow	0.66	ft³/s
Spread	9.30	ft
Depth	0.30	ft
Flow Area	1.15	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.91	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.12	
Grate Flow Ratio	0.54	
Equivalent Cross Slope	0.08831	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.11	
Total Interception Length	8.51	ft

Worksheet for 9N Mag 533 -Sta 86 + 00 Lt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.50	ft³/s
Slope	0.00609	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	7.45	ft
Depth	0.25	ft
Flow Area	0.76	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.97	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.11	
Grate Flow Ratio	0.64	
Equivalent Cross Slope	0.10045	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.78	
Total Interception Length	7.31	ft

Worksheet for 9S Mag 533 -Sta 86 + 00 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.20	ft³/s
Slope	0.00636	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.20	ft³/s
Bypass Flow	0.00	ft³/s
Spread	6.69	ft
Depth	0.23	ft
Flow Area	0.63	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.92	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.12	
Grate Flow Ratio	0.70	
Equivalent Cross Slope	0.10651	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.88	
Total Interception Length	6.51	ft

Worksheet for 10N Mag 533 -Sta 93 + 85 Lt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.10	ft³/s
Slope	0.00253	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.10	ft³/s
Bypass Flow	0.00	ft³/s
Spread	7.87	ft
Depth	0.26	ft
Flow Area	0.84	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.31	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.21	
Grate Flow Ratio	0.62	
Equivalent Cross Slope	0.09737	ft/ft
Active Grate Length	1.50	ft
Length Factor	1.13	
Total Interception Length	5.02	ft

Worksheet for 10S Mag 533 -Sta 93 + 85 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.00	ft^3/s
Slope	0.00636	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.00	ft^3/s
Bypass Flow	0.00	ft^3/s
Spread	6.16	ft
Depth	0.22	ft
Flow Area	0.54	ft^2
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.85	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.12	
Grate Flow Ratio	0.74	
Equivalent Cross Slope	0.11111	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.97	
Total Interception Length	5.88	ft

Worksheet for 11S Mag 533 -Sta 107 + 74 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.24	ft^3/s
Slope	0.00436	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.24	ft^3/s
Bypass Flow	0.00	ft^3/s
Spread	7.37	ft
Depth	0.25	ft
Flow Area	0.75	ft^2
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.66	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.15	
Grate Flow Ratio	0.65	
Equivalent Cross Slope	0.10103	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.94	
Total Interception Length	6.08	ft

Worksheet for 12S Mag 533 -Sta 111 + 50 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge		2.30	ft³/s
Slope		0.00899	ft/ft
Gutter Width		2.00	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.03	ft/ft
Roughness Coefficient		0.016	
Local Depression		2.00	in
Local Depression Width		2.00	ft
Grate Width		2.00	ft
Grate Length		3.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%
Curb Opening Length		7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency		98.09	%
Intercepted Flow		2.26	ft³/s
Bypass Flow		0.04	ft³/s bypass added to basin 11S
Spread		8.23	ft
Depth		0.27	ft
Flow Area		0.91	ft²
Gutter Depression		0.07	ft
Total Depression		0.23	ft
Velocity		2.52	ft/s
Splash Over Velocity		6.99	ft/s
Frontal Flow Factor		1.00	
Side Flow Factor		0.07	
Grate Flow Ratio		0.60	
Equivalent Cross Slope		0.09492	ft/ft
Active Grate Length		1.50	ft
Length Factor		0.56	
Total Interception Length		10.17	ft

Worksheet for 13S Mag 533 -Sta 118 + 63 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.70	ft³/s
Slope	0.00594	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.70	ft³/s
Bypass Flow	0.00	ft³/s
Spread	7.90	ft
Depth	0.27	ft
Flow Area	0.85	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	2.00	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.11	
Grate Flow Ratio	0.62	
Equivalent Cross Slope	0.09715	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.73	
Total Interception Length	7.80	ft

Worksheet for 14S Mag 533 -Sta 123 + 71 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.00	ft³/s
Slope	0.00813	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	5.81	ft
Depth	0.21	ft
Flow Area	0.49	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	2.04	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.11	
Grate Flow Ratio	0.76	
Equivalent Cross Slope	0.11423	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.92	
Total Interception Length	6.22	ft

Worksheet for 16S Mag 533 Sta 127+94 Rt Combination Inlet In Sag - 1

Project Description

Solve For	Spread

Input Data

Discharge	2.10	ft³/s
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	4.80	ft
Opening Height	0.42	ft
Curb Throat Type	Horizontal	
Throat Incline Angle	90.00	degrees

Options

Calculation Option	Use Both

Results

Spread	6.41	ft
Depth	0.23	ft
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Open Grate Area	2.70	ft²
Active Grate Weir Length	5.00	ft

Worksheet for 17S Mag 533 -Sta 136 + 77 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.60	ft³/s
Slope	0.00830	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.60	ft³/s
Bypass Flow	0.00	ft³/s
Spread	7.16	ft
Depth	0.25	ft
Flow Area	0.71	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	2.26	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.09	
Grate Flow Ratio	0.66	
Equivalent Cross Slope	0.10267	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.70	
Total Interception Length	8.13	ft

Worksheet for 18S Mag 533 -Sta 143+43 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	0.70	ft³/s
Slope	0.00583	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	4.80	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	0.70	ft³/s
Bypass Flow	0.00	ft³/s
Spread	5.99	ft
Depth	0.20	ft
Flow Area	0.44	ft²
Gutter Depression	0.08	ft
Total Depression	0.24	ft
Velocity	1.60	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.13	
Grate Flow Ratio	0.78	
Equivalent Cross Slope	0.11481	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.68	
Total Interception Length	4.83	ft

Worksheet for 19M Mag 532 Type C - Sta 146+62 Rt Median

Project Description

Solve For	Efficiency

Input Data

Discharge	0.70	ft^3/s
Slope	0.00520	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	6.40	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	0.70	ft^3/s
Bypass Flow	0.00	ft^3/s
Spread	10.18	ft
Depth	0.17	ft
Flow Area	0.57	ft^2
Gutter Depression	0.07	ft
Total Depression	0.24	ft
Velocity	1.23	ft/s
Equivalent Cross Slope	0.08602	ft/ft
Length Factor	1.15	
Total Interception Length	5.55	ft

Worksheet for 20M Mag 532 Type C - Sta 151+15 Rt median

Project Description

Solve For	Efficiency

Input Data

Discharge	0.80	ft^3/s
Slope	0.00625	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	6.40	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	0.80	ft^3/s
Bypass Flow	0.00	ft^3/s
Spread	5.94	ft
Depth	0.20	ft
Flow Area	0.48	ft^2
Gutter Depression	0.05	ft
Total Depression	0.21	ft
Velocity	1.68	ft/s
Equivalent Cross Slope	0.11403	ft/ft
Length Factor	1.22	
Total Interception Length	5.24	ft

Worksheet for 21S Mag 533 -Sta 155+45 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	0.40	ft³/s
Slope	0.00249	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	4.80	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	0.40	ft³/s
Bypass Flow	0.00	ft³/s
Spread	8.32	ft
Depth	0.18	ft
Flow Area	0.44	ft²
Gutter Depression	0.10	ft
Total Depression	0.26	ft
Velocity	0.90	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.17	
Grate Flow Ratio	0.72	
Equivalent Cross Slope	0.10578	ft/ft
Active Grate Length	1.50	ft
Length Factor	1.06	
Total Interception Length	3.11	ft

Worksheet for 22S Mag 206 - Sta 157+33 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	2.20	ft³/s
Slope	0.00621	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	12.80	ft
Local Depression	1.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.20	ft³/s
Bypass Flow	0.00	ft³/s
Spread	10.30	ft
Depth	0.26	ft
Flow Area	1.10	ft²
Gutter Depression	0.06	ft
Total Depression	0.14	ft
Velocity	2.00	ft/s
Equivalent Cross Slope	0.05696	ft/ft
Length Factor	1.05	
Total Interception Length	12.14	ft

Worksheet for H1W Mag 533 -Sta 19+03 Lt

Project Description

Solve For	Efficiency

Input Data

Discharge	2.90	ft³/s
Slope	0.00542	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	10.40	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	2.90	ft³/s
Bypass Flow	0.00	ft³/s
Spread	10.06	ft
Depth	0.32	ft
Flow Area	1.33	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	2.18	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.09	
Grate Flow Ratio	0.51	
Equivalent Cross Slope	0.08424	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.86	
Total Interception Length	10.35	ft

Worksheet for H1E Mag 533 -Higley Sta 12+85 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.40	ft³/s
Slope	0.00300	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	7.20	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	100.00	%
Intercepted Flow	1.40	ft³/s
Bypass Flow	0.00	ft³/s
Spread	8.41	ft
Depth	0.28	ft
Flow Area	0.95	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.47	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.17	
Grate Flow Ratio	0.59	
Equivalent Cross Slope	0.09371	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.95	
Total Interception Length	5.99	ft

Worksheet for H2E Mag 533 -Higley Sta 18+75 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	1.30	ft³/s
Slope	0.00252	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	2.00	ft
Grate Width	2.00	ft
Grate Length	3.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.00	%
Curb Opening Length	4.80	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	98.94	%
Intercepted Flow	1.29	ft³/s
Bypass Flow	0.01	ft³/s
Spread	8.46	ft
Depth	0.28	ft
Flow Area	0.96	ft²
Gutter Depression	0.07	ft
Total Depression	0.23	ft
Velocity	1.35	ft/s
Splash Over Velocity	6.99	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.20	
Grate Flow Ratio	0.58	
Equivalent Cross Slope	0.09341	ft/ft
Active Grate Length	1.50	ft
Length Factor	0.60	
Total Interception Length	5.52	ft

Worksheet for ES1 Mag 206 - Sta 166+75 Rt

Project Description

Solve For	Efficiency

Input Data

Discharge	2.50	ft³/s
Slope	0.00510	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	22.40	ft
Local Depression	1.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	9.82	ft
Depth	0.29	ft
Flow Area	1.24	ft²
Gutter Depression	0.05	ft
Total Depression	0.13	ft
Velocity	2.02	ft/s
Equivalent Cross Slope	0.06015	ft/ft
Length Factor	1.92	
Total Interception Length	11.68	ft

Normal Depth of Existing RCBC @ 164th Street

ARIZONA DEPARTMENT OF TRANSPORTATION
BRIDGE DRAINAGE SECTION
BOX CULVERT CALCULATIONS-Vers 2.02

04-30-2009

PROJECT NUMBER _____ TRACS NO. _____
PROJECT NAME Riggs Rd DESIGNER _____
HIGHWAY NAME _____ CHECKER _____
LOCATION/STATION _____ PAGE _____

***** INPUT DATA *****

SQUARE EDGE CULVERT: HDS-5 CHART 8(2)
WINGWALL @ 15, 90 Degrees
2 Barrel- 10.0 FT. Wide x 3.0 Ft. High

LENGTH = 50.0 Ft.
SLOPE = 0.0060 Ft./Ft.
Length*Slope = 0.3000 Ft.
TOTAL DISCHARGE: 330 Cfs.
FREQUENCY = 100 Years

Entrance Co-eff. (Ke) = 0.5
Inlet Invert Elev: 100.00 Ft.
Allowable Headwater Elev: 105.00 Ft.
Tailwater Depth = 2.00 Ft.
Calculated Tailwater Elev: 101.70 Ft.

---------- HYDRAULIC ANALYSIS ----------

INLET CONTROL DATA	OUTLET CONTROL DATA	
Hw/D = 1.17	Hw/D = 1.00	H = 0.79 Ft.
Hw = 3.51 Ft.	Hw = 3.01 Ft.	Ho= 2.52 Ft.

** INLET CONTROL GOVERNS **

HEADWATER COMPUTATION

Controling Hw. = 3.51 Ft.
Design Hw/D = 1.2
Design HEADWATER Elev. 103.51 Ft.

Dn = 1.54 Ft.
Dc = 2.04 Ft.
(Dc+D)/2 = 2.52 Ft.

Outlet Velocity 9.71 Fps.
based on depth = 1.70 Ft.
Dc to Dn curve.

Existing Gabion Channel/
Normal Depth Calc.

ARIZONA DEPARTMENT OF TRANSPORTATION
BRIDGE DRAINAGE SECTION
TRAP. CHANNEL CALCULATIONS-Vers. 2.0

05-06-2009

PROJECT NUMBER _____ TRACS NO. _____
PROJECT NAME Riggs Rd DESIGNER _____
HIGHWAY NAME _____ CHECKED BY: _____
LOCATION/STATION _____ PAGE _____

Channel Bottom Width (Ft.) =20.00
Lt. side slope (Horiz. to 1) =3.00
Rt. side slope (Horiz. to 1) =3.00
Channel Slope,(Ft./Ft.) =0.0030
Manning's 'n' =0.030

==> Discharge (CFS) = 538.2

Normal Depth (Ft.) = 3.50
Area of Normal Depth (Sq. Ft.) =106.8
Normal Depth Velocity (Ft./Sec.) = 5.04

Critical Depth (Ft.) = 2.48
Critical Depth Velocity (Ft./Sec.) = 7.93
Critical Slope (Ft./Ft.) =0.0108

Sequent Depth-Ft. = 1.66
Froude Number = 0.55

Dc to Dn Table: Subcritcial flow

I	Y	V	E	Sf	DEL X	X	I
0	2.476	7.925	3.451	0.01079	0.00	0.00	0
1	2.527	7.722	3.453	0.01001	-0.00	-0.00	1
2	2.578	7.526	3.458	0.00930	-0.00	-0.00	2
3	2.630	7.339	3.466	0.00865	-0.00	-0.00	3
4	2.681	7.160	3.477	0.00806	-0.00	-0.01	4
5	2.732	6.987	3.490	0.00752	-0.00	-0.01	5
6	2.783	6.821	3.506	0.00702	-0.00	-0.01	6
7	2.834	6.662	3.524	0.00656	-0.00	-0.02	7
8	2.886	6.509	3.543	0.00614	-0.00	-0.02	8
9	2.937	6.361	3.565	0.00576	-0.01	-0.03	9
10	2.988	6.219	3.589	0.00540	-0.01	-0.03	10
11	3.039	6.082	3.614	0.00507	-0.01	-0.04	11
12	3.090	5.950	3.640	0.00476	-0.01	-0.05	12
13	3.142	5.822	3.668	0.00448	-0.01	-0.05	13
14	3.193	5.699	3.697	0.00422	-0.01	-0.06	14
15	3.244	5.580	3.728	0.00397	-0.01	-0.07	15
16	3.295	5.465	3.759	0.00375	-0.01	-0.08	16
17	3.346	5.354	3.792	0.00353	-0.01	-0.09	17
18	3.398	5.247	3.825	0.00334	-0.01	-0.09	18
19	3.449	5.143	3.859	0.00315	-0.01	-0.10	19
20	3.500	5.042	3.895	0.00298	-0.01	-0.11	20

Culvert Crossing W of 132nd St

ARIZONA DEPARTMENT OF TRANSPORTATION
BRIDGE DRAINAGE SECTION
PIPE CULVERT CALCULATIONS-Vers. 2.1

04-30-2009

PROJECT NUMBER _____ TRACS NO. _____
HIGHWAY NAME _____ DESIGNER _____
PROJECT NAME Riggs Rd CHECKER _____
LOCATION/STATION _____ PAGE _____

***** INPUT DATA *****

Number of Pipes= 4
Diameter = 2.0 Ft.
LENGTH = 149.00 Ft.
SLOPE = 0.0045 Ft./Ft.
Length*Slope = 0.67 Ft.
TOTAL DISCHARGE = 75.0 Cfs.
FREQUENCY = 100 Years

Manning's 'n'= 0.0130
Entrance Co-eff. Ke=0.5
Inlet Invert Elev: 1348.78 Ft.
Allowable Headwater Elev: 1351.78 Ft.
Tailwater depth = 1.78 Ft.
Calculated Tailwater Elev: 1349.89 Ft.

---------- HYDRAULIC ANALYSIS ----------

INLET CONTROL DATA:	OUTLET CONTROL DATA:	
Hw/D = 1.39	Hw/D = 1.51	H = 1.90 Ft.
Hw = 2.77 Ft.	Hw = 3.02 Ft.	Ho= 1.78 FT.

***** OUTLET CONTROL GOVERNS *****

HEADWATER COMPUTATION

Controling Hw = 3.02 Ft.
Design Hw/D = 1.51
DESIGN HEADWATER Elev. 1351.80

Dn = 2.00Ft.
Dc = 1.57 Ft.
(Dc+D)/2 = 1.78 Ft.

Outlet Velocity = 6.43 fps.
based on depth = 1.78 Ft.
Tailwater.

Culvert Crossing @ Rector Rd

ARIZONA DEPARTMENT OF TRANSPORTATION
BRIDGE DRAINAGE SECTION
BOX CULVERT CALCULATIONS-Vers 2.02

04-30-2009

PROJECT NUMBER _____ TRACS NO. _____
PROJECT NAME Riggs Rd DESIGNER _____
HIGHWAY NAME _____ CHECKER _____
LOCATION/STATION _____ PAGE _____

***** INPUT DATA *****

SQUARE EDGE CULVERT: HDS-5 CHART 8(2)
WINGWALL @ 15, 90 Degrees
4 Barrel- 4.0 FT. Wide x 2.0 Ft. High

LENGTH = 139.0 Ft.
SLOPE = 0.0100 Ft./Ft.
Length*Slope = 1.3900 Ft.
TOTAL DISCHARGE: 192 Cfs.
FREQUENCY = 100 Years

Entrance Co-eff. (Ke) = 0.5
Inlet Invert Elev: 1365.62 Ft.
Allowable Headwater Elev: 1368.62 Ft.
Tailwater Depth = 2.00 Ft.
Calculated Tailwater Elev: 1366.23 Ft.

---------- HYDRAULIC ANALYSIS ----------

INLET CONTROL DATA	OUTLET CONTROL DATA	
Hw/D = 1.50	Hw/D = 1.00	H = 1.40 Ft.
Hw = 3.01 Ft.	Hw = 2.01 Ft.	Ho= 2.00 Ft.

** INLET CONTROL GOVERNS **

HEADWATER COMPUTATION

Controling Hw. = 3.01 Ft.
Design Hw/D = 1.5
Design HEADWATER Elev. 1368.63 Ft.

Dn = 1.18 Ft.
Dc = 1.65 Ft.
(Dc+D)/2 = 1.82 Ft.

Outlet Velocity 9.97 Fps.
based on depth = 1.20 Ft.
Dc to Dn curve.

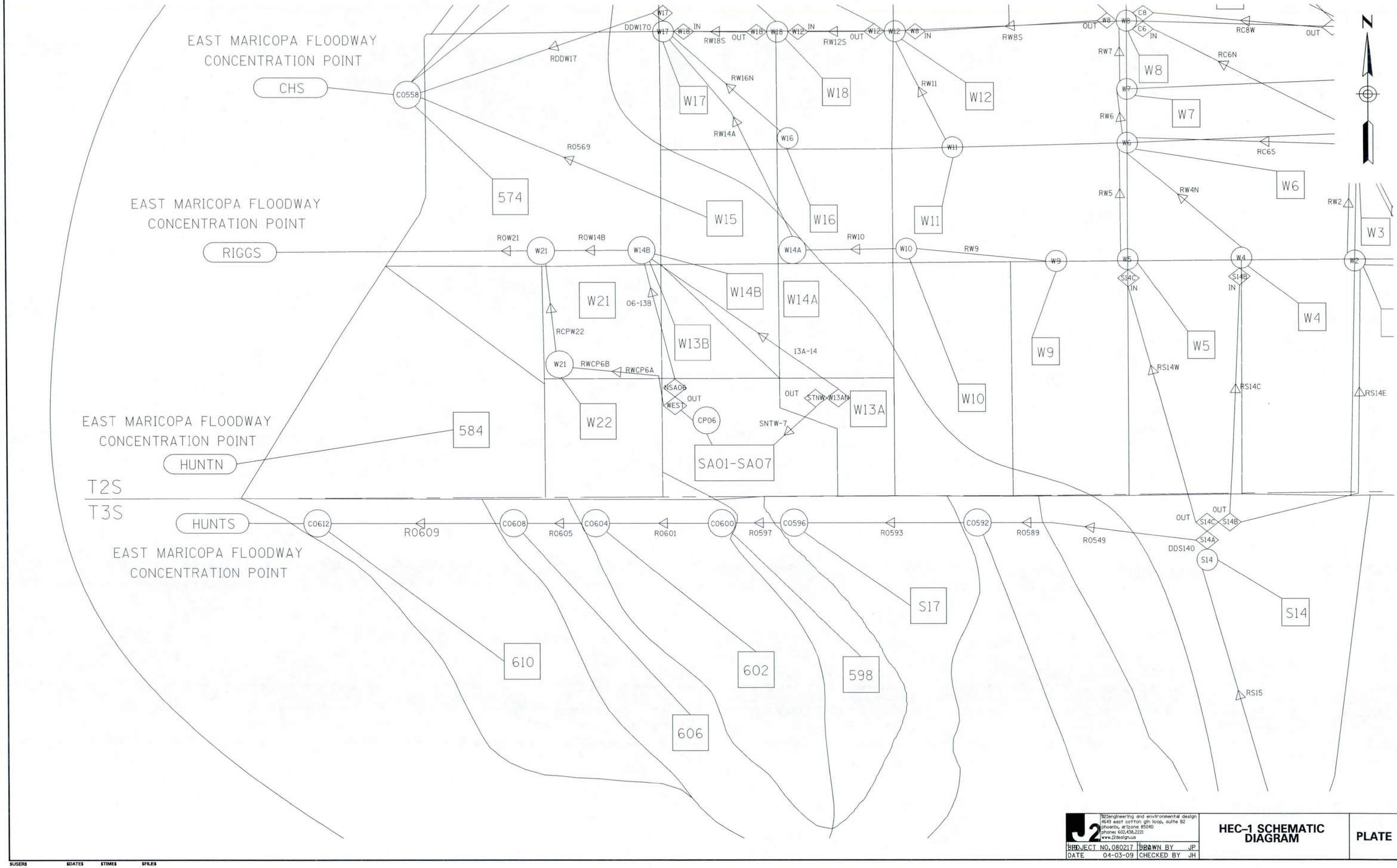
APPENDIX F
STORM DRAIN CALCULATIONS

Riggs Road: Val Vista Drive to Recker Road
95% Storm Drain Calculations

Pipe	Upstream Node	Downstream Node	Length (ft)	Section Size	Constructed Slope (ft/ft)	Total Flow (cfs)	Upstream Ground Elevation (ft)	Upstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Downstream Ground Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line Out (ft)	Average Velocity (ft/s)
P-1	CB 6S	CB 6N	94	18 inch	0.001064	3.6	1,290.77	1,288.00	1,289.70	1,290.77	1,287.90	1,289.59	2.04
P-2	CB 6N	O-1	40	18 inch	0.0025	5	1,290.77	1,287.85	1,289.59	1,291.00	1,287.75	1,289.50	2.83
P-3	CB 72+03, Lt	CB 8N	63	18 inch	0.00254	1.1	1,304.65	1,301.78	1,304.25	1,304.52	1,301.62	1,304.25	0.62
P-4	CB 8N	CB 8S	94	18 inch	0.002447	6.8	1,304.52	1,301.62	1,304.25	1,304.49	1,301.39	1,303.85	3.85
P-5	CB 8S	O-2	15	24 inch	0.002667	13.2	1,304.49	1,301.29	1,303.85	1,304.50	1,301.25	1,303.80	4.2
P-6	CB 72+07, Rt	CB 8S	63	18 inch	0.00254	1	1,304.64	1,301.55	1,303.86	1,304.49	1,301.39	1,303.85	0.57
P-7	CB 73+35, Lt	CB 8N	63	18 inch	0.00254	2.3	1,304.67	1,301.78	1,304.28	1,304.52	1,301.62	1,304.25	1.3
P-8	CB 73+39.Rt	CB 8S	63	18 inch	0.00254	2.2	1,304.63	1,301.55	1,303.88	1,304.49	1,301.39	1,303.85	1.24
P-9	CB 9N	CB 9S	94	18 inch	0.00883	1.5	1,309.98	1,306.96	1,308.02	1,310.04	1,306.13	1,308.01	4.03
P-10	CB 9S	O-3	13	18 inch	0.002308	2.7	1,310.04	1,306.03	1,308.01	1,310.00	1,306.00	1,308.00	1.53
P-11	CB 10N	CB 10S	94	18 inch	0.002447	1.1	1,315.41	1,311.36	1,313.68	1,315.04	1,311.13	1,313.67	0.62
P-12	CB 10S	O-4	13	18 inch	0.002308	2.1	1,315.04	1,311.03	1,313.67	1,315.00	1,311.00	1,313.66	1.19
P-13	CB 11S	J 107+74	19	18 inch	0.01	1.2	1,323.71	1,319.00	1,321.00	1,324.00	1,318.81	1,321.00	0.68
P-14	J 107+74	Oulet 106+75	98	7 x 3 ft	0.00602	9.1	1,324.00	1,316.37	1,321.00	1,323.70	1,315.78	1,321.00	0.11
P-15	CB 12S	J 111+50	21	18 inch	0.009524	2.3	1,326.23	1,321.75	1,322.32	1,326.50	1,321.55	1,322.04	4.68
P-16	J 111+50	J 107+74	377	7 x 3 ft	0.005995	7.9	1,326.50	1,318.63	1,321.00	1,324.00	1,316.37	1,321.00	2.2
P-17	CB 13S	J 118+61.50	20	18 inch	0.01	1.7	1,331.07	1,325.75	1,326.24	1,331.50	1,325.55	1,325.96	4.37
P-18	J 118+61.50	J 111+50	713	10 x 4 ft	0.005989	5.6	1,331.50	1,322.90	1,323.11	1,326.50	1,318.63	1,321.00	2.89
P-19	CB 14S	J123+69.50	20	18 inch	0.01	1	1,334.09	1,329.75	1,330.12	1,334.50	1,329.55	1,329.86	3.75
P-20	J123+69.50	J 118+61.50	508	7 x 3 ft	0.006024	3.9	1,334.50	1,325.96	1,326.04	1,331.50	1,322.90	1,323.11	1.67
P-21	CB H1W	J126+36	10	18 inch	0.01	2.9	1,336.92	1,331.00	1,331.65	1,335.00	1,330.90	1,331.46	5.08
P-35	J126+36	J-12	54	5 x 3 ft	0.005556	2.9	1,335.00	1,330.57	1,330.71	1,336.00	1,330.27	1,330.40	2.16
P-42	J-12	J-13	50	7 x 3 ft	0.065	2.9	1,336.00	1,330.27	1,330.34	1,336.00	1,327.02	1,327.05	3.04
P-43	J-13	J123+69.50	173	7 x 3 ft	0.006127	2.9	1,336.00	1,327.02	1,327.09	1,334.50	1,325.96	1,326.04	1.49
P-31	CB 17S	O-10	8	18 inch	0.01375	1.6	1,341.32	1,337.61	1,338.09	1,341.82	1,337.50	1,337.89	4.81
P-28	AD 143+56	MH 143+33	44	36 inch	0.038864	0	1,346.24	1,342.70	1,342.70	1,347.70	1,340.99	1,341.13	0
P-29	MH 143+33	J 140+00	346	36 inch	0.005751	0.7	1,347.70	1,340.95	1,341.13	1,344.50	1,338.96	1,339.14	2.05
P-30	J 140+00	J 137+40	243	36 inch	0.00572	0.7	1,344.50	1,338.93	1,339.11	1,343.70	1,337.54	1,338.88	2.05
P-32	J 137+40	O-11	65	36 inch	0.023846	0.7	1,343.70	1,338.70	1,338.88	1,342.00	1,337.15	1,337.28	3.37
P-41	CB 18S	MH 143+33	9.5	18 inch	0.123158	0.7	1,345.47	1,342.12	1,342.43	1,347.70	1,340.95	1,341.10	8.13
P-33	CB 21S	MH 155+45	16	18 inch	0.005	0.4	1,353.14	1,349.70	1,349.94	1,354.41	1,349.62	1,349.86	2.24
P-34	MH 155+45	MH 154+50	95	18 inch	0.005053	0.4	1,354.41	1,349.62	1,349.86	1,354.36	1,349.14	1,349.38	2.25
P-36	MH 154+50	O-12	28	18 inch	0.005	0.4	1,354.36	1,349.14	1,349.38	1,354.20	1,349.00	1,349.23	2.24
P-37	CB 20M	CB 19M	453	18 inch	0.005011	0.8	1,350.84	1,345.97	1,346.30	1,348.08	1,343.70	1,344.16	2.75
P-38	CB 19M	MH 146+62	60	18 inch	0.005	1.5	1,348.08	1,343.70	1,344.16	1,349.31	1,343.40	1,343.86	3.29
P-39	MH 146+62	MH 146+15	47	18 inch	0.004894	1.5	1,349.31	1,343.40	1,343.86	1,349.10	1,343.17	1,343.63	3.27
P-40	MH 146+15	O-13	33	18 inch	0.005152	1.5	1,349.10	1,343.17	1,343.63	1,349.00	1,343.00	1,343.45	3.33
P-44	CB 7N	O-14	40	18 inch	0.0025	2	1,293.78	1,291.60	1,292.23	1,294.50	1,291.50	1,292.03	2.77
P-45	CB 5S	O-15	24	18 inch	0.005	1.5	1,288.70	1,279.25	1,279.71	1,288.50	1,279.13	1,279.59	3.29
P-46	CB 4S	O-16	39	18 inch	0.005128	1.3	1,286.61	1,277.36	1,277.79	1,286.50	1,277.16	1,277.58	3.19
P-47	CB 3S	O-17	24	18 inch	0.005	1.4	1,284.35	1,274.25	1,274.69	1,283.00	1,274.13	1,274.57	3.23
P-48	CB 2S	O-18	36	18 inch	0.005	1.2	1,282.25	1,273.24	1,273.65	1,280.00	1,273.06	1,273.47	3.09
P-49	CB 1S	O-19	30	18 inch	0.079	0.7	1,280.56	1,276.00	1,276.31	1,281.00	1,273.63	1,273.79	6.96
P-50	CB H1E	O-20	16	18 inch	0.005	1.4	1,339.50	1,335.08	1,335.52	1,340.00	1,335.00	1,335.44	3.23

APPENDIX G

100-year, 6-hour HEC-1 Model



J2 engineering and environmental design 4649 east cotton gin loop, suite 82 phoenix, arizona 85040 phone: 602.438.2221 www.j2design.us		**HEC-1 SCHEMATIC DIAGRAM**	**PLATE 1**
PROJECT NO. 080217	DRAWN BY JP		
DATE 04-03-09	CHECKED BY JH		

$USER$ $DATE$ $TIME$ $FILE$

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   07MAY09  TIME  13:46:03   *
*                                       *
*****************************************
```

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

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

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

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


```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
   1          ID   ********************************************************************************
   2          ID      RIGGS ROAD WIDENING PROJECT, VAL VISTA DRIVE TO RECKER ROAD. PLUS 1/4 MILE
   3          ID      SECTION OF HIGLEY ROAD TO THE SOUTH OF RIGGS ROAD.
   4          ID      FILENAME SNQ6ALT1.DAT
   5          ID      J2 PROJECT ID 08.0217
   6          ID      100-YEAR, 6-HOUR STORM (FCDMC - METHODOLOGY)
   7          ID   **
   8          ID   ** REVISED 05-01-2009
   9          ID      -SIMPLIFIED MODEL, INCLUDED ONLY RELEVANT BASINS THAT IMPACT THE PROJECT
  10          ID      -UPDATED BASIN W9 & W10 LG AND UC CARD TO CURRENT CONDITIONS
  11          ID      -ADDED BASIN 22
  12          ID      -ADDED FLOW SPLITS FOR BASINS W13A & SAO6
  13          ID   **
  14          ID   ********************************************************************************
  15          ID   **
  16          ID      RIGGS PAVILION MODEL
  17          ID      SEVILLE DEVELOPMENT MODEL REVISED TO ADDRESS CHANGES DUT TO DEVELOPMENT***
  18          ID      EAST AND SOUTH OF RIGGS PAVILION PROJECT SITE 09-28-2007
  19          ID      (FILE i.d. RP-100-6Pre1.DAT
  20          ID
  21          ID   ********************************************************************************
  22          ID      ENTELLUS MODEL REVISED FOR RE-ROUTED FLOWS DUE TO DEVELOPMENT OF SEVILE
  23          ID      @ HIGLEY & CHANDLER HEIGHTS ROADS. REVISIONS WERE CONFINED TO RUNOFF
  24          ID      FROM DRAINAGE BASIN W ONLY WHERE THESE FLOWS IMPINGE UPON THE SEVILLE
  25          ID      DEVELOPMENT. CMX GROUP INC., 5-30-2000 (FILE I.D. SNQ6REV2.DAT)
  26          ID   **
  27          ID   ** THIS IS A MODEL FOR 100-YR 6-HR PROPOSED CONDITINOS WITH SEVILLE
  28          ID   ** REVISED 1-20-2000 TO INCLUDE SITE AREA BETWEEN 164TH ST. & HIGLEY RD
  29          ID   ** REVISED 5-11-2000 TO MODIFY THE DRAIANGE AREAS W11A, W11B, W11C, W11D & WA
  30          ID      WITH CHANNEL ROUTINGS
  31          ID   ** REVISED 5-22-2000 TO INCLUDED AREAS W15 & W20 AND W14, W13 & W21 AS OFF-
  32          ID      SITE AREAS NEAR SW CORNER OF SITE FOR FLOWS ALONG SOUTHERN BOUNDARY OF
  33          ID      PARCELS 38A & 38B, PLUS FLOWS IN EXISTING CHANNEL SOUTH OF, AND PARALLEL
  34          ID      TO RIGGS RD.
  35          ID   ** REVISED RTIMP FOR W11, W12, W16, W17, W18, W19 TO 30% FROM 0%
  36          ID   ** REVISED RET. VOLUMES FOR W11, W12, W16, W17, W18 & W19 (USE VOL "PROVIDED"
  37          ID      PER THE ONSITE DRAINGE REPORT BY CMX)
  38          ID   ** CHANNEL DESIGN FOR CHANDLER HEIGHTS BETWEEN POWER RD AND RECKER ROAD WILL
  39          ID      STIMULATE EXISTING FLOW OVERTOPPING CONDITIONS
  40          ID   ** CHANNEL DESIGN FOR CHANDLER HTS BETWEEN RECKER RD TO HIGLEY RD WILL BE
  41          ID      DESIGNED FOR CHANDLER HTS BETWEEN RECKER RD TO HIGLEY RD WILL BE
  42          ID      DESIGNED WITHOUT OVERTOPPING FLOWS
  43          ID   ** CHANNEL DEIGN FOR CHANDLER HTS BET HIGLEY RD & 164TH ST WILL BE DESIGNED
  44          ID      TO SIMULATE FLOW OVERTOPPING CONDTIONS
              *
  45          ID   ********************************************************************************
  46          ID   ********************************************************************************
  47          ID   **    SONOQUI WASH FLOODPLAIN DELINEATION STUDY                                 **
  48          ID   **    100-Year 6-hour Storm                                                     **
  49          ID   **    First Run Date  February 10-1998                                          **
  50          ID   **    Run Date            May 20-1998                                           **
  51          ID   **    REVISED:          March 10-2004                                           **
  52          ID   **    REVISION CHANGES:                                                         **
  53          ID   **                      Basins E1 and E2 changed from Clark UH to S-graphs      **
  54          ID   **                      Changed method of Railroad Culvert flow calculations**
```



```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
  55          ID   **                          Applies to structures RRW1, RRW2 and RRW3       **
  56          ID   **                          See note prior to structure RRW1                **
  57          ID   **                      Extended X-Section for structure RRW3               **
  58          ID   **    Entellus, Inc.                                        File SNQ6.DAT     **
  59          ID   ********************************************************************************
  60          ID   ********************************************************************************
  61          ID
  62          ID   DDM MCUHP1 Sonoqui Wash floodplain Delineation Study
              *
```

```
                 *
     63          IT       5 01APR97            600
     64          IO       5
                 *
                 *DIAGRAM
                 * ///////////////////////////////////////////////////////////////////////////
                 * ////////////////////////// Rainfall Distribution///////////////////////////
                 * ///////////////////////////////////////////////////////////////////////////
     65          IN      15
     66          JD    3.04     0.01
     67          PC    .000     .008     .016     .025     .033     .041     .050     .058     .066     .074
     68          PC    .087     .099     .118     .138     .216     .377     .834     .911     .931     .950
     69          PC    .962     .972     .983     .991    1.000
     70          JD    3.02     0.50
     71          JD    2.98     2.80
     72          PC    .000     .009     .016     .025     .034     .042     .051     .059     .067     .076
     73          PC    .087     .100     .120     .163     .252     .451     .694     .837     .900     .938
     74          PC    .950     .963     .975     .988    1.000
     75          JD    2.80     16.0
     76          PC    .000     .015     .020     .030     .048     .063     .076     .090     .105     .119
     77          PC    .135     .152     .175     .222     .304     .472     .670     .796     .868     .912
     78          PC    .946     .960     .973     .987    1.000
     79          JD    2.46     90.0
     80          PC    .000     .021     .035     .051     .071     .087     .105     .125     .143     .160
     81          PC    .179     .201     .232     .281     .364     .500     .658     .773     .841     .888
     82          PC    .927     .945     .964     .982    1.000
     83          JD    1.73    500.0
     84          PC    .000     .024     .043     .059     .078     .098     .119     .141     .162     .186
     85          PC    .212     .239     .271     .321     .408     .515     .627     .735     .814     .864
     86          PC    .907     .930     .954     .977    1.000
                 * ///////////////////////////////////////////////////////////////////////////
                 * ////////////////////////// End Distribution ///////////////////////////////
                 * ///////////////////////////////////////////////////////////////////////////
                 *
                 * ***************************************************************************
                 * **********************      Basin W9       ********************************
                 * ***************************************************************************
                 * DDM    ***** Updated *****

     87          KK      W9
     88          KM    SUB-BASIN W9
     89          KM    6-HOUR RAINFALL, PATTERN NO. 1.02 WAS USED TO FIND TC & R FOR THIS BASIN
     90          KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF   .993
     91          KM       L = 1.49  Kb = .038  Adj. Slope =    45.0
     92          KM    UPDATED GREEN AMPT PARAMETERS TO VERY LOW DENSITY RESIDENTIAL
     93          BA    .516
1                                         HEC-1 INPUT                                                PAGE  3

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

     94          LG     .30      .25     4.30      .40    5.000
     95          UC    .646     .457
     96          UA       0        5       16       30       65       77       84       90       94       97
     97          UA     100
                 *
                 *
                 * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
                 * RRrrrrrrrrrrrrrrrrrrrrr   Routing R-W9       rrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
                 * rrr  Route W9 to W10
                 * rrr  Field typical section - sheet flow across field                   rrr
                 * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
                 * DDM    ***** Preserved *****

     98          KK     RW9
     99          RS       1     FLOW
    100          RC   0.015    0.025    0.015     2640  .005906
    101          RX       0        0       66       82       98      114      116      116
    102          RY       6        4        4        0        0        4        4        6
                 *
                 *
                 * ***************************************************************************
                 * **********************      Basin W10      ********************************
                 * ***************************************************************************
                 * DDM    ***** Updated *****

    103          KK     W10
    104          KM    SUB-BASIN W10
    105          KM    6-HOUR RAINFALL, PATTERN NO. 1.01 WAS USED TO FIND TC & R FOR THIS BASIN
    106          KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF   .993
    107          KM       L = 1.14  Kb = .071  Adj. Slope =    62.0
    108          KM    UPDATED GREEN AMPT PARAMETERS TO VERY LOW DENSITY RESIDENTIAL
    109          BA    .513
    110          LG     .30      .25      4.3       .4    5.000
    111          UC    .708     .409
    112          UA       0        5       16       30       65       77       84       90       94       97
    113          UA     100
                 *
                 *

    114          KK  RETAIN
    115          KM   50YR-24HR RETENTION VOLUME FOR SUBBASIN LOCATED IN TOWN OF GILBERT
    116          KM   USED AN AVERAGE C = 0.60 FOR 16.7AC DEVELOPED LAND
    117          DT  RETDIV     2.5
    118          DI       0    10000
    119          DQ       0    10000
                 *

    120          KK  HC9-10
    121          KM   COMBINE BASIN 9 & 10
    122          HC       2
                 *
                 * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
                 * rrrrrrrrrrrrrrrrrrrrrr   Routing RW10        rrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
                 * rrr Route Flow from HC9-10 to BASIN 14A           rrr
                 * rrr Field typical section -- sheet flow across field                   rrr
                 * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
```

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          * DDM    ***** Preserved *****
1                                        HEC-1 INPUT                                          PAGE  4

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


 123           KK     RW10
 124           KO                                       21
 125           RS        1    FLOW
 126           RC    0.015   0.025   0.015    2640 .005906
 127           RX        0       0      66      82      98     114     116     116
 128           RY        6       4       4       0       0       4       4       6
               *

 129           KK     W14A
 130           KM     OFFSITE AREA SOUTH OF RIGGS RD. & EAST OF HIGLEY RD.
 131           BA     .250
 132           LG      .35     .35     4.3    .400    .000
 133           UC     .488    .273
 134           UA        0       5      16      30      65      77      84      90      94      97
 135           UA      100
               *

 136           KK   RETAIN
 137           KM    50YR-24HR RETENTION VOLUME FOR SUBBASIN LOCATED IN TOWN OF GILBERT
 138           KM    C=0.60 FOR 130AC DEVELOPED     19.5 ac-ft
 139           DT   RETDIV    19.5
 140           DI        0   10000
 141           DQ        0   10000
               *
               *

 142           KK   HCW14A
 143           KM    COMBINE BASIN W9, W10 & 14A
 144           HC        2
               *

 145           KK    RW14A
 146           KM    RE-ROUTE COMBINED HYDROGRAPH IN "LOOP RD." PLUS TRAP CHN TO HIGLEY RD.
 147           KM    THEN IN HIGLEY RD. PLUS TRAP CHN. TO INTERSECTION OF CHANDLER HGTS.RD.
 148           KO                                       21
 149           RS        1    FLOW
 150           RC    0.015   0.025   0.015    7920 .004776
 151           RX        0       0      66      82      98     114     116     116
 152           RY        6       4       4       0       0       4       4       6
               *

 153           KK     W13A
 154           KM     OFFSITE AREA SOUTH OF AREA W14B
 155           BA     .159
 156           LG      .35     .35     4.3    .400    .000
 157           UC     .488    .273
 158           UA        0       5      16      30      65      77      84      90      94      97
 159           UA      100
               *
1                                        HEC-1 INPUT                                          PAGE  5

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


 160           KK    W13AN
 161           KM    DIVERT FLOW
 162           KM    47 CFS VIA 2-24" RCP
 163           KM    47 MINUS BASIN W13A Q x 50% FLOW SPLIT = 39% FLOW TO THE WEST
 164           DT     SNTW
 165           DI        0     100    1000
 166           DQ        0      39     390
               *

 167           KK   13A-14
 168           KM    ROUTE FLOW NORTH WEST TO MEWS RD, THEN WEST ALONG MEWS TO HIGLEY THEN
 169           KM    NORTH TO RIGGS ROAD
 170           KO                                       21
 171           RS        3    FLOW
 172           RC     0.03    0.03    0.03    4506  0.0039
 173           RX      100     102     106     110     120     124     128     130
 174           RY      2.5       2       1       0       0       1       2     2.5
               *
               * ***************************************************************************
               *   Basins SA01 to SA06 Taken from HEC-1 model found in the draiange report
               *   titled "Chandler Junior High School Prelimianry Draiange Study"
               *   This portion of the HEC-1 model was developed by Eire & Associates
               *   Inc. Perpared for Hess-Roundtree Engineering and Chandler School distric
               *   ***************************************************************************
               *

 175           KK     SA03
 176           KM     OFFSITE AREA
 177           BA     .058
 178           LG      .35     .35    3.95     .48       0
 179           UC     .342    .348
 180           UA        0       3       5       8      12      20      43      75      90      96
 181           UA      100
               *
               *

 182           KK     SA04
 183           KM     OFFSITE AREA
 184           BA     .008
 185           LG      .35     .35    3.95     .48       0
 186           UC     .229    .385
 187           UA        0       3       5       8      12      20      43      75      90      96
 188           UA      100
               *

 189           KK     SA05
```

```
190          KM    OFFSITE AREA
191          BA    .050
192          LG     .35     .35    3.95     .48       0
193          UC    .329    .341
194          UA       0       3       5       8      12      20      43      75      90      96
195          UA     100
             *
```



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

196          KK  03to01
197          KM        ROUTE CP03 TO CP01 THROUGH 2-36" SMOOTHBORE PIPES
198          RS       1    STOR
199          SV       0    0.02    0.03
200          SE       0     1.5       3
201          SQ       0      42      84
             *

202          KK    CP01 *COMBINES SA03, SA04, &SA05*
203          KM
204          HC       3
             *

205          KK  01to02
206          KM        ROUTE CP01 TO CP02 THROUGH 3-36" SMOOTHBORE PIPES
207          RS       1    STOR
208          SV       0    0.02    0.03
209          SE       0     1.5       3
210          SQ       0      80     160
             *

211          KK    OS09  BASIN
212          BA   0.002
213          LG    0.00    0.25    3.95    0.40      99
214          UC   0.133   0.331
215          UA       0       5      16      30      65      77      84      90      94      97
216          UA     100
             *

217          KK    CP02 *COMBINES OS09 & CP01*
218          HC       2
             *

219          KK    OS07  *ONSITE DRAINAGE BASIN #7*
220          BA   0.006
221          LG    0.04    0.25    3.95    0.47      79
222          UC   0.175   0.205
223          UA       0       5      16      30      65      77      84      90      94      97
224          UA     100
             *

225          KK  08to10
226          RS       1    FLOW       0
227          RC     .03     .03     .03      70      .1
228          RX     990     992     996   999.9  1000.1    1004    1008    1010
229          RY     2.5     2.0     1.0       0       0     1.0     2.0     2.5
             *

230          KK    OS03  *ONSITE DRAINAGE BASIN #3*
231          BA   0.002
232          LG    0.00    0.25    3.95    0.40      99
233          UC   0.108   0.158
234          UA       0       5      16      30      65      77      84      90      94      97
235          UA     100
             *
```



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

236          KK  09to10
237          RS       1    FLOW       0
238          RC     .03     .03     .03      70      .1
239          RX     990     992     996   999.9  1000.1    1004    1008    1010
240          RY     2.5     2.0     1.0       0       0     1.0     2.0     2.5
             *

241          KK    OS11  *ONSITE DRAINAGE BASIN #11*
242          BA   0.009
243          LG    0.14    0.25    3.95    0.65      30
244          UC   0.254   0.274
245          UA       0       5      16      30      65      77      84      90      94      97
246          UA     100
             *

247          KK    OS01  BASIN
248          BA   0.002
249          LG    0.00    0.25    3.95    0.40      99
250          UC   0.171   0.574
251          UA       0       5      16      30      65      77      84      90      94      97
252          UA     100
             *
             *

253          KK    OS02  BASIN
254          BA   0.002
255          LG    0.20    0.25    3.95    0.76       0
256          UC   0.138   0.149
257          UA       0       5      16      30      65      77      84      90      94      97
258          UA     100
             *

259          KK    CP10  *COMBINES OS01, OS03, OS07, & OS11*
260          HC       5
```

```
                      *

 261                  KK   BAS-A2
 262                  KM    *FIRST FLUSH BASIN FOR OS02, OS10, OS07 & OS03*
 263                  RS        1     STOR
 264                  SA     .436     .531     .635     .635
 265                  SE        0      1.5        3      3.5
 266                  SQ        0        0        0       50
                      *

 267                  KK     OS08    *ONSITE DRAINAGE BASIN #8*
 268                  BA    0.004
 269                  LG     0.04     0.25     3.95     0.47       80
 270                  UC    0.138    0.175
 271                  UA        0        5       16       30       65       77       84       90       94       97
 272                  UA      100
                      *
1                                                    HEC-1 INPUT                                               PAGE  8

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

 273                  KK   SAto12    *ROUTE OS08 TO CP12*
 274                  RS        1     FLOW        0
 275                  RC      .03      .03      .03       70       .1
 276                  RX      980      985      990    999.9   1000.1     1010     1015     1020
 277                  RY      1.2      0.6        0        0        0        0      0.6      1.2
                      *

 278                  KK     OS04    BASIN
 279                  BA    0.002
 280                  LG     0.10     0.25     3.95     0.59       47
 281                  UC    0.150    0.206
 282                  UA        0        5       16       30       65       77       84       90       94       97
 283                  UA      100
                      *

 284                  KK     CP12    *COMBINES OS08 & OS04*
 285                  HC        2
                      *

 286                  KK   BAS-B2
 287                  KM    *FIRST FLUSH BASIN FOR OS08 & OS04*
 288                  RS        1     STOR
 289                  SA     .054     .091     .136     .136
 290                  SE        0      1.5        3      3.5
 291                  SQ        0        0        0       50
                      *

 292                  KK     OS12    BASIN
 293                  BA    0.010
 294                  LG     0.16     0.25     3.95     0.69       20
 295                  UC    0.333    0.348
 296                  UA        0        5       16       30       65       77       84       90       94       97
 297                  UA      100
                      *

 298                  KK    BAS-C
 299                  KM    *FIRST FLUSH BASIN FOR OS12*
 300                  RS        1     STOR
 301                  SA     .077     .128     .188     .188
 302                  SE        0      1.5        3      3.5
 303                  SQ        0        0        0       50
                      *

 304                  KK   SAto11  *ROUTE OS12 TO CP11*
 305                  RS        1     FLOW        0
 306                  RC      .03      .03      .03      160     .019
 307                  RX      990      992      996    999.9   1000.1     1004     1008     1010
 308                  RY      2.5      2.0      1.0        0        0      1.0      2.0      2.5
                      *
1                                                    HEC-1 INPUT                                               PAGE  9

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

 309                  KK    DUMMY
 310                  KM    DUMMY DUMMY HC
 311                  HC        2
                      *

 312                  KK     OS06    BASIN
 313                  BA    0.005
 314                  LG     0.16     0.25     3.95     0.69       19
 315                  UC    0.588    0.719
 316                  UA        0        5       16       30       65       77       84       90       94       97
 317                  UA      100
                      *

 318                  KK    BAS06
 319                  KM    *RETNETION BASIN IS ENTIRE AREA OF OS06*
 320                  RS        1     STOR
 321                  SA      3.3      3.3      3.3
 322                  SE        0      0.5      1.0
 323                  SQ        0        0       50
                      *

 324                  KK     OS05    BASIN
 325                  BA    0.001
 326                  LG     0.10     0.35     3.95     0.40        0
 327                  UC    0.150    0.533
 328                  UA        0        5       16       30       65       77       84       90       94       97
 329                  UA      100
                      *

 330                  KK     CP14    *COMBINES OS05 &OS06*
```

```
331          HC       2
             *
332          KK    SA06
333          KM    OFFSITE AREA
334          BA    .082
335          LG     .44     .29    3.95     .62       0
336          UC    .733    .867
337          UA       0       3       5       8      12      20      43      75      90      96
338          UA     100
             *
             *
339          KK   RCSTW
340          KM   RECALL WEST FLOW SPLIT FROM INTERSECTION OF 172 ST & SANTAN BLVD.
341          DR    SNTW
             *
             *
```



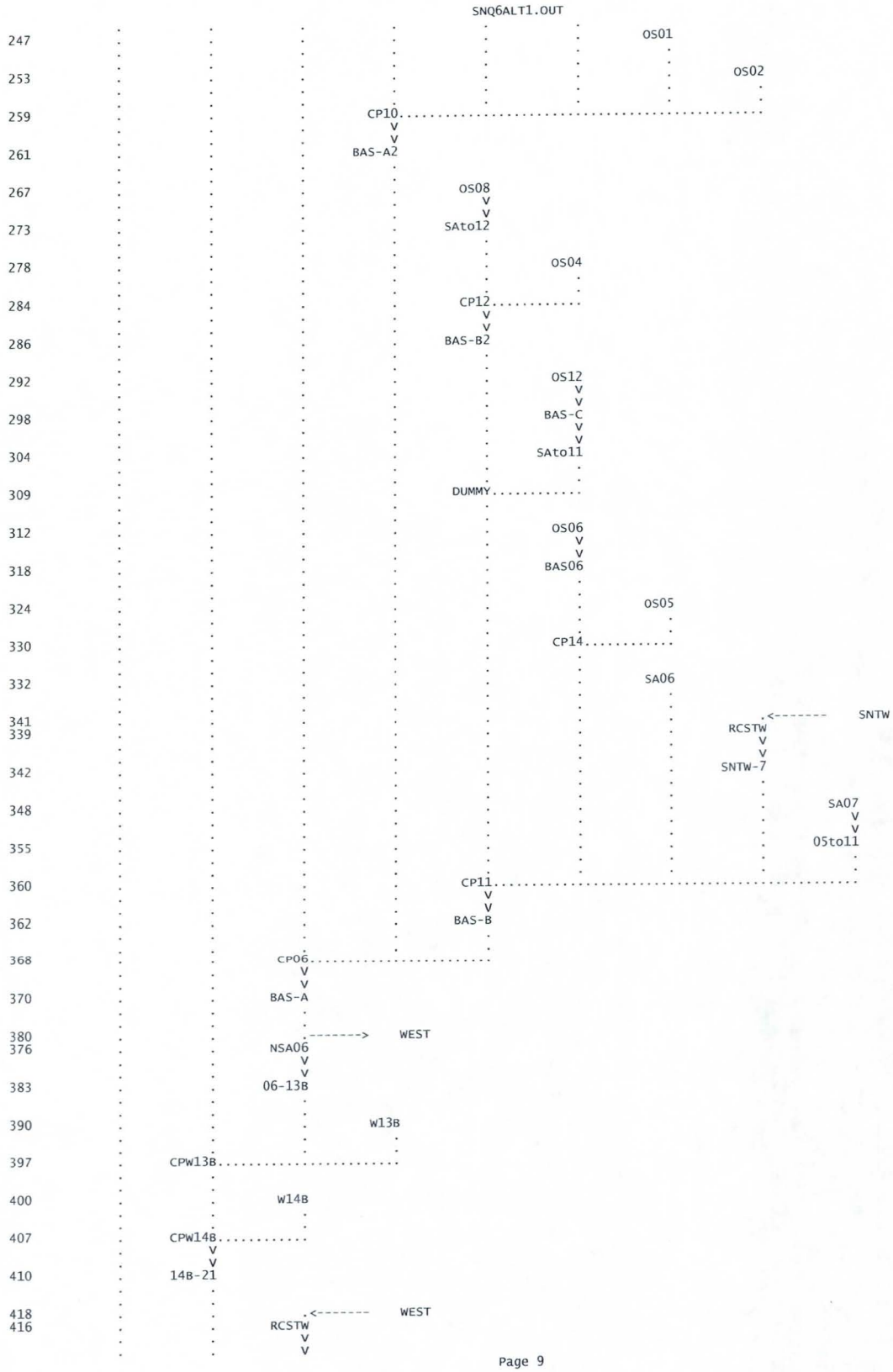
```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

342          KK  SNTW-7
343          KM
344          RS       2    FLOW       0
345          RC    .045     .03     .03    1056   .0091
346          RX     988     990     994     998    1002    1006    1008    1010
347          RY       2     1.5     1.8       0       0     1.0     3.5     2.0
             *
             *
348          KK    SA07
349          KM    OFFSITE AREA
350          BA    .077
351          LG     .41     .31    3.95     .57       0
352          UC    .675    .811
353          UA       0       3       5       8      12      20      43      75      90      96
354          UA     100
             *
             *
355          KK  05to11 *ROUTE CP05 (SA07) TO CP11
356          RS       1    FLOW       0
357          RC     .03     .03     .03     595   .0083
358          RX     990     992     996   999.9  1000.1    1004    1008    1010
359          RY     2.5     2.0     1.0       0       0     1.0     2.0     2.5
             *
360          KK    CP11  *COMBINES SA06, SA07, OS12, CP12 & CP14*
361          HC       5
             *
362          KK   BAS-B
363          KM   *RETNETION BASIN FOR SUBAREAS OF CP11 DRAINED BY 2-36" PIPES*
364          RS       1    STOR
365          SA     .40     .52     .64
366          SE       0     1.5       3
367          SQ       0      65     130
             *
368          KK    CP06  *COMBINES CP02, CP1, CP10*
369          HC       3
             *
370          KK   BAS-A
371          KM   *RETNETION BASIN FOR SITE DRAINED BY 3 SILTED 36"PIPES AND BY OVERTOPPING*
372          RS       1    STOR
373          SA    .101    .168    .243    .243    .243
374          SE       0     1.5       3       4       5
375          SQ       0       0      10      18     250
             *
             *  ********************************************************************
             *
```



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

376          KK   NSA06
377          KM   DIVERT FLOW
378          KM   160CFS VIA 3-36" PIPES UNDER HIGLEY ROAD
379          KM   160CFS MINUS BASIN CP06 Q x 50% FLOW SPLIT = 82% FLOW TO THE WEST
380          DT    WEST
381          DI       0     100    1000
382          DQ       0      82     820
             *
             *
383          KK  06-13B
384          KM   ROUTE FLOWS NORTH TO HIGLEY ROAD
385          KO                                  21
386          RS       3    FLOW       0
387          RC    0.03    0.03    0.03    2640  0.0067
388          RX     100     102     104     108     118     122     124     126
389          RY       2     1.5       1       0       0       1     1.5     2.0
             *
             *
390          KK    W13B
391          KM    OFFSITE AREA SOUTH OF RIGGS RD. & EAST OF HIGLEY RD.
392          BA    .125
393          LG     .35     .35     4.3    .400    .000
394          UC    .467    .387
395          UA       0       5      16      30      65      77      84      90      94      97
396          UA     100
```

```
                  *
                  *
 397              KK  CPW13B
 398              KM   COMBINE W13B FLOWS WITH ROUTED FLOWS FROM BASIN W13A & SA06
 399              HC        3
                  *

 400              KK    W14B
 401              KM    OFFSITE AREA SOUTH OF RIGGS RD. & EAST OF HIGLEY RD.
 402              BA    .125
 403              LG     .35      .35      4.3     .400     .000
 404              UC    .467     .387
 405              UA       0        5       16       30       65       77       84       90       94       97
 406              UA     100
                  *
                  *

 407              KK  CPW14B
 408              KM   COMBINE FLOW FROM W13 WITH FLOW FROM 14B
 409              HC        2
                  *
1                                         HEC-1 INPUT                                                    PAGE 12

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

 410              KK  14B-21
 411              KO                                           21
 412              RS        1     FLOW
 413              RC    0.035    0.035    0.035     2640    .0094
 414              RX        0        0       15       15       45       45       60       60
 415              RY        6        4        4        0        0        4        4        6
                  *
                  *  HIGLEY/SAN TAN BLVD
                  *  BASIN SA01 THRU SA06 INCLUDE LANDS SOUTH OF SAN TAN BLVD AND EAST OF HIGLEY
                  *  THIS INCLUDES THE JR. HIGH SCHOOL.
                  *  FLOWS ARE NOW ROUTED ACROSS HIGLEY (AT SAN TAN BLVD) FROM THE SE QUAD. TO
                  *  THE NE QUAD.  NEW DEVELOPEMENT ROUTES THIS FLOW WEST ALONG THE N SIDE OF
                  *  SAN TAN BLVD. VIA A TRAP DITCH.
                  *
                  *

 416              KK   RCSTW
 417              KM   RECALL WEST FLOW SPLIT FROM INTERSECTION OF SANTAN BLVD & HIGLEY
 418              DR    WEST
                  *

 419              KK  RWCP6A
 420              KM   ROUTE FLOW VIA CONCRETE LINED DITCH ALONG SOUTH SIDE OF ACACIA DEVELOPMENT
 421              KO                                           21
 422              RS        2     FLOW
 423              RC    0.035    0.016    0.035     1320    .0093
 424              RX        0       10       20       26       46       52       60       70
 425              RY        4        3        3        0        0        3        3        4
                  *

 426              KK  RWCP6B
 427              KM   ROUTE FLOW VIA SHEET FLOW DOWN STREAM OF ACACIA DEVELOPMENT
 428              KO                                           21
 429              RS        2     FLOW
 430              RC    0.035    0.035    0.035     1320    .0093
 431              RX       30       40       45       50       70       75       80       90
 432              RY        2        1       .5        0        0       .5        1        2
                  *

 433              KK     W22
 434              KM    OFFSITE AREA SOUTH OF SAN TAN BLVD. & WEST OF HIGLEY RD. E. OF 164TH ST.
 435              KM    6-HOUR RAINFALL, PATTERN NO. 2.05 WAS USED TO FIND TC & R FOR THIS BASIN
 436              KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .973
 437              KM      L =  .78  Kb = .050  Adj. Slope =   48.9
 438              BA    .250
 439              LG      .3      .35      4.3     .400        5
 440              UC    .610     .386
 441              UA       0        5       16       30       65       77       84       90       94       97
 442              UA     100
                  *
                  *
1                                         HEC-1 INPUT                                                    PAGE 13

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

 443              KK   CPW22
 444              KM
 445              HC        2
                  *
                  *

 446              KK  RCPW22
 447              KO                                           21
 448              RS        1     FLOW
 449              RC    0.035    0.035    0.035     2640    .0053
 450              RX      140      147      151      160      165      183      219      255
 451              RY     32.8       32       30     29.3       30       31     31.5       32
                  *
                  *

 452              KK     W21
 453              KM    OFFSITE AREA SOUTH OF RIGGS RD. & WEST OF HIGLEY RD.
 454              BA    .250
 455              LG     .35      .35      4.3     .400     .000
 456              UC    .504     .293
 457              UA       0        5       16       30       65       77       84       90       94       97
 458              UA     100
                  *
```

```
                *
459             KK  RETAIN
460             KM   50YR-24HR RETENTION VOLUME FOR SUBBASIN LOCATED IN TOWN OF GILBERT
461             KM   APPROXIMATELY 3/4 OF THE BASIN HAS BEEN DEVELOPED OR WILL BE DEVELOPED
462             KM   IN THE NEAR FUTURE.
463             KM   USED AN AVERAGE C = 0.63 FOR 120 AC DEVELOPED LAND
464             DT  RETDIV    18.9
465             DI        0   10000
466             DQ        0   10000
                *
                *
467             KK   CPW21
468             KM
469             HC        3
                *
                *
470             ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   87          W9
               V
               V
   98         RW9
               .
               .
  103          .         W10
               .          .
               .          .
  117          .          .-------->  RETDIV
  114          .      RETAIN
               .          .
               .          .
  120      HC9-10.............
               V
               V
  123        RW10
               .
               .
  129          .        W14A
               .          .
               .          .
  139          .          .-------->  RETDIV
  136          .      RETAIN
               .          .
               .          .
  142      HCW14A.............
               V
               V
  145       RW14A
               .
               .
  153          .        W13A
               .          .
               .          .
  164          .          .-------->    SNTW
  160          .       W13AN
               .          V
               .          V
  167          .      13A-14
               .          .
               .          .
  175          .          .        SA03
               .          .          .
               .          .          .
  182          .          .          .        SA04
               .          .          .          .
               .          .          .          .
  189          .          .          .          .        SA05
               .          .          .          .          V
               .          .          .          .          V
  196          .          .          .          .      03to01
               .          .          .          .          .
               .          .          .          .          .
  202          .          .        CP01.........................
               .          .          V
               .          .          V
  205          .          .      01to02
               .          .          .
               .          .          .
  211          .          .          .        OS09
               .          .          .          .
               .          .          .          .
  217          .          .        CP02.............
               .          .          .
               .          .          .
  219          .          .          .        OS07
               .          .          .          V
               .          .          .          V
  225          .          .          .      08to10
               .          .          .          .
               .          .          .          .
  230          .          .          .          .        OS03
               .          .          .          .          V
               .          .          .          .          V
  236          .          .          .          .      09to10
               .          .          .          .          .
               .          .          .          .          .
  241          .          .          .          .          .        OS11
               .          .          .          .          .          .
```


SNQ6ALT1.OUT
247
OS01
253
OS02
259
CP10
261
BAS-A2
267
OS08
273
SAto12
278
OS04
284
CP12
286
BAS-B2
292
OS12
298
BAS-C
304
SAto11
309
DUMMY
312
OS06
318
BAS06
324
OS05
330
CP14
332
SA06
341
339
<------- SNTW
RCSTW
342
SNTW-7
348
SA07
355
05to11
360
CP11
362
BAS-B
368
CP06
370
BAS-A
380
376
-------> WEST
NSA06
383
06-13B
390
W13B
397
CPW13B
400
W14B
407
CPW14B
410
14B-21
418
416
<------- WEST
RCSTW

```
419          .          .      RWCP6A
             .          .          V
             .          .          V
426          .          .      RWCP6B
             .          .          .
             .          .          .
433          .          .          .        W22
             .          .          .          .
             .          .          .          .
443          .          .       CPW22.........
             .          .          V
             .          .          V
446          .          .      RCPW22
             .          .          .
             .          .          .
452          .          .          .        W21
             .          .          .          .
             .          .          .          .
464          .          .          .          .-------->  RETDIV
459          .          .          .      RETAIN
             .          .          .          .
             .          .          .          .
467          .      CPW21.......................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   07MAY09  TIME  13:46:03   *
*                                       *
*****************************************
```

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

```
*******************************************************************************
   RIGGS ROAD WIDENING PROJECT, VAL VISTA DRIVE TO RECKER ROAD. PLUS 1/4 MILE
   SECTION OF HIGLEY ROAD TO THE SOUTH OF RIGGS ROAD.
   FILENAME SNQ6ALT1.DAT
   J2 PROJECT ID 08.0217
   100-YEAR, 6-HOUR STORM (FCDMC - METHODOLOGY)
**
** REVISED 05-01-2009
   -SIMPLIFIED MODEL, INCLUDED ONLY RELEVANT BASINS THAT IMPACT THE PROJECT
   -UPDATED BASIN W9 & W10 LG AND UC CARD TO CURRENT CONDITIONS
   -ADDED BASIN 22
   -ADDED FLOW SPLITS FOR BASINS W13A & SAO6
**
*******************************************************************************
**
   RIGGS PAVILION MODEL
   SEVILLE DEVELOPMENT MODEL REVISED TO ADDRESS CHANGES DUT TO DEVELOPMENT***
   EAST AND SOUTH OF RIGGS PAVILION PROJECT SITE 09-28-2007
   (FILE i.d. RP-100-6Pre1.DAT

*******************************************************************************
   ENTELLUS MODEL REVISED FOR RE-ROUTED FLOWS DUE TO DEVELOPMENT OF SEVILE
   @ HIGLEY & CHANDLER HEIGHTS ROADS. REVISIONS WERE CONFINED TO RUNOFF
   FROM DRAINAGE BASIN W ONLY WHERE THESE FLOWS IMPINGE UPON THE SEVILLE
   DEVELOPMENT. CMX GROUP INC., 5-30-2000 (FILE I.D. SNQ6REV2.DAT)
**
** THIS IS A MODEL FOR 100-YR 6-HR PROPOSED CONDITINOS WITH SEVILLE
** REVISED 1-20-2000 TO INCLUDE SITE AREA BETWEEN 164TH ST. & HIGLEY RD
** REVISED 5-11-2000 TO MODIFY THE DRAIANGE AREAS W11A, W11B, W11C, W11D & WA
   WITH CHANNEL ROUTINGS
** REVISED 5-22-2000 TO INCLUDED AREAS W15 & W20 AND W14, W13 & W21 AS OFF-
   SITE AREAS NEAR SW CORNER OF SITE FOR FLOWS ALONG SOUTHERN BOUNDARY OF
   PARCELS 38A & 38B, PLUS FLOWS IN EXISTING CHANNEL SOUTH OF, AND PARALLEL
   TO RIGGS RD.
** REVISED RTIMP FOR W11, W12, W16, W17, W18, W19 TO 30% FROM 0%
** REVISED RET. VOLUMES FOR W11, W12, W16, W17, W18 & W19 (USE VOL "PROVIDED"
   PER THE ONSITE DRAINGE REPORT BY CMX)
** CHANNEL DESIGN FOR CHANDLER HEIGHTS BETWEEN POWER RD AND RECKER ROAD WILL
   STIMULATE EXISTING FLOW OVERTOPPING CONDITIONS
** CHANNEL DESIGN FOR CHANDLER HTS BETWEEN RECKER RD TO HIGLEY RD WILL BE
   DESIGNED FOR CHANDLER HTS BETWEEN RECKER RD TO HIGLEY RD WILL BE
   DESIGNED WITHOUT OVERTOPPING FLOWS
** CHANNEL DEIGN FOR CHANDLER HTS BET HIGLEY RD & 164TH ST WILL BE DESIGNED
   TO SIMULATE FLOW OVERTOPPING CONDTIONS
*******************************************************************************
*******************************************************************************
**    SONOQUI WASH FLOODPLAIN DELINEATION STUDY                                **
**    100-Year 6-hour Storm                                                    **
**    First Run Date  February 10-1998                                         **
**    Run Date            May 20-1998                                          **
**    REVISED:          March 10-2004                                          **
**    REVISION CHANGES:                                                        **
**                      Basins E1 and E2 changed from Clark UH to S-graphs     **
**                      Changed method of Railroad Culvert flow calculations   **
**                           Applies to structures RRW1, RRW2 and RRW3          **
**                           See note prior to structure RRW1                   **
**                      Extended X-Section for structure RRW3                  **
**    Entellus, Inc.                                        File SNQ6.DAT      **
*******************************************************************************
*******************************************************************************

   DDM MCUHP1 Sonoqui Wash floodplain Delineation Study

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

```
 IT          HYDROGRAPH TIME DATA
                  NMIN          5  MINUTES IN COMPUTATION INTERVAL
                 IDATE     1APR97  STARTING DATE
                 ITIME       0000  STARTING TIME
                    NQ        600  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE     3APR97  ENDING DATE
                NDTIME       0155  ENDING TIME
                 ICENT         19  CENTURY MARK

               COMPUTATION INTERVAL      .08 HOURS
                   TOTAL TIME BASE    49.92 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

66 JD       INDEX STORM NO. 1
                  STRM        3.04  PRECIPITATION DEPTH
                  TRDA         .01  TRANSPOSITION DRAINAGE AREA

67 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   .01   .01   .01   .01   .01   .01   .03
               .03   .03   .05   .05   .05   .15   .15   .15   .03   .03
               .03   .01   .01   .01   .01   .01   .01   .00   .00   .00
               .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
               .00   .00

70 JD       INDEX STORM NO. 2
                  STRM        3.02  PRECIPITATION DEPTH
                  TRDA         .50  TRANSPOSITION DRAINAGE AREA

 0 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   .01   .01   .01   .01   .01   .01   .03
               .03   .03   .05   .05   .05   .15   .15   .15   .03   .03
               .03   .01   .01   .01   .01   .01   .01   .00   .00   .00
               .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
               .00   .00

71 JD       INDEX STORM NO. 3
                  STRM        2.98  PRECIPITATION DEPTH
                  TRDA        2.80  TRANSPOSITION DRAINAGE AREA

72 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   .01   .01   .01   .01   .01   .01   .03
               .03   .03   .07   .07   .07   .08   .08   .08   .05   .05
               .05   .02   .02   .02   .01   .01   .01   .00   .00   .00
               .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
               .00   .00

75 JD       INDEX STORM NO. 4
                  STRM        2.80  PRECIPITATION DEPTH
                  TRDA       16.00  TRANSPOSITION DRAINAGE AREA

76 PI         PRECIPITATION PATTERN
               .01   .01   .00   .00   .00   .00   .00   .00   .00   .01
               .01   .01   .00   .01   .00   .00   .00   .00   .00   .00
               .00   .00   .01   .00   .00   .00   .00   .01   .01   .01
               .01   .01   .01   .01   .01   .01   .02   .02   .02   .03
               .03   .03   .06   .06   .06   .07   .07   .07   .04   .04
               .04   .02   .02   .02   .01   .01   .01   .01   .01   .01
               .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
               .00   .00

79 JD       INDEX STORM NO. 5
                  STRM        2.46  PRECIPITATION DEPTH
                  TRDA       90.00  TRANSPOSITION DRAINAGE AREA

80 PI         PRECIPITATION PATTERN
               .01   .01   .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   .01   .02   .02   .02   .03
               .03   .03   .05   .05   .05   .05   .05   .05   .04   .04
               .04   .02   .02   .02   .02   .02   .02   .01   .01   .01
               .01   .01   .01   .01   .01   .01   .01   .01   .01   .01
               .01   .01

83 JD       INDEX STORM NO. 6
                  STRM        1.73  PRECIPITATION DEPTH
                  TRDA      500.00  TRANSPOSITION DRAINAGE AREA

84 PI         PRECIPITATION PATTERN
               .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
               .01   .01   .01   .01   .01   .01   .02   .02   .02   .03
               .03   .03   .04   .04   .04   .04   .04   .04   .04   .04
               .04   .03   .03   .03   .02   .02   .02   .01   .01   .01
               .01   .01   .01   .01   .01   .01   .01   .01   .01   .01
               .01   .01
```

*** ***

```
          ***************
          *             *
123 KK    *      RW10   *
          *             *
          ***************
```

```
124 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                      IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2         600  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT        .083  TIME INTERVAL IN HOURS
```

*** ***

```
          ***************
          *             *
145 KK    *     RW14A   *
          *             *
          ***************
```

```
148 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                      IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2         600  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT        .083  TIME INTERVAL IN HOURS
```

*** ***

```
          ***************
          *             *
167 KK    *    13A-14   *
          *             *
          ***************
```

```
170 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                      IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2         600  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT        .083  TIME INTERVAL IN HOURS

WARNING --- ROUTED OUTFLOW (    137.) IS GREATER THAN MAXIMUM OUTFLOW (    130.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (    138.) IS GREATER THAN MAXIMUM OUTFLOW (    130.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (    133.) IS GREATER THAN MAXIMUM OUTFLOW (    130.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (    135.) IS GREATER THAN MAXIMUM OUTFLOW (    130.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (    137.) IS GREATER THAN MAXIMUM OUTFLOW (    130.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (    132.) IS GREATER THAN MAXIMUM OUTFLOW (    130.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (    254.) IS GREATER THAN MAXIMUM OUTFLOW (    250.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (    250.) IS GREATER THAN MAXIMUM OUTFLOW (    250.) IN STORAGE-OUTFLOW TABLE
```

*** ***

```
          ***************
          *             *
383 KK    *    06-13B   *
          *             *
          ***************
```

```
385 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                     IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                      IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2         600  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT        .083  TIME INTERVAL IN HOURS
```

*** ***

```
           **************
           *            *
410 KK     *   14B-21   *
           *            *
           **************

411 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        600  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       .083  TIME INTERVAL IN HOURS
```

*** ***

```
           **************
           *            *
419 KK     *   RWCP6A   *
           *            *
           **************

421 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        600  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       .083  TIME INTERVAL IN HOURS
```

*** ***

```
           **************
           *            *
426 KK     *   RWCP6B   *
           *            *
           **************

428 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        600  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       .083  TIME INTERVAL IN HOURS
```

*** ***

```
           **************
           *            *
446 KK     *   RCPW22   *
           *            *
           **************

447 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                     IPNCH          0  PUNCH COMPUTED HYDROGRAPH
                      IOUT         21  SAVE HYDROGRAPH ON THIS UNIT
                     ISAV1          1  FIRST ORDINATE PUNCHED OR SAVED
                     ISAV2        600  LAST ORDINATE PUNCHED OR SAVED
                    TIMINT       .083  TIME INTERVAL IN HOURS
```

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	W9	533.	4.25	78.	20.	9.	.52		
+	ROUTED TO	RW9	507.	4.33	78.	20.	9.	.52		
+	HYDROGRAPH AT	W10	547.	4.25	78.	20.	9.	.51		
+	DIVERSION TO	RETDIV	117.	3.92	5.	1.	1.	.51		

+ HYDROGRAPH AT	RETAIN	547.	4.25	73.	18.	9.	.51
+ 2 COMBINED AT	HC9-10	907.	4.33	138.	35.	17.	1.03
+ ROUTED TO	RW10	881.	4.42	138.	35.	17.	1.03
+ HYDROGRAPH AT	W14A	332.	4.17	32.	8.	4.	.25
+ DIVERSION TO	RETDIV	332.	4.17	32.	8.	4.	.25
+ HYDROGRAPH AT	RETAIN	0.	.00	0.	0.	0.	.25
+ 2 COMBINED AT	HCW14A	881.	4.42	138.	35.	17.	1.28
+ ROUTED TO	RW14A	670.	4.67	134.	34.	16.	1.28
+ HYDROGRAPH AT	W13A	212.	4.17	20.	5.	2.	.16
+ DIVERSION TO	SNTW	82.	4.17	8.	2.	1.	.16
+ HYDROGRAPH AT	W13AN	129.	4.17	12.	3.	1.	.16
+ ROUTED TO	13A-14	102.	4.42	12.	3.	1.	.16
+ HYDROGRAPH AT	SA03	72.	4.25	7.	2.	1.	.06
+ HYDROGRAPH AT	SA04	10.	4.17	1.	0.	0.	.01
+ HYDROGRAPH AT	SA05	63.	4.25	6.	2.	1.	.05
+ ROUTED TO	03to01	63.	4.25	6.	2.	1.	.05
+ 3 COMBINED AT	CP01	143.	4.25	14.	4.	2.	.12
+ ROUTED TO	01to02	143.	4.25	14.	4.	2.	.12
+ HYDROGRAPH AT	OS09	4.	4.08	1.	0.	0.	.00
+ 2 COMBINED AT	CP02	146.	4.25	15.	4.	2.	.12
+ HYDROGRAPH AT	OS07	14.	4.00	2.	0.	0.	.01
+ ROUTED TO	08to10	14.	4.08	2.	0.	0.	.01
+ HYDROGRAPH AT	OS03	6.	4.00	1.	0.	0.	.00
+ ROUTED TO	09to10	6.	4.00	1.	0.	0.	.00
+ HYDROGRAPH AT	OS11	15.	4.08	2.	0.	0.	.01
+ HYDROGRAPH AT	OS01	3.	4.08	1.	0.	0.	.00
+ HYDROGRAPH AT	OS02	4.	4.00	0.	0.	0.	.00
+ 5 COMBINED AT	CP10	42.	4.08	5.	1.	1.	.02
+ ROUTED TO	BAS-A2	18.	4.33	2.	0.	0.	.02
+ HYDROGRAPH AT	OS08	11.	4.00	1.	0.	0.	.00
+ ROUTED TO	SAto12	10.	4.00	1.	0.	0.	.00
+ HYDROGRAPH AT	OS04	4.	4.00	0.	0.	0.	.00
+ 2 COMBINED AT	CP12	15.	4.00	2.	0.	0.	.01
+ ROUTED TO	BAS-B2	19.	4.00	1.	0.	0.	.01
+ HYDROGRAPH AT	OS12	14.	4.17	2.	0.	0.	.01
ROUTED TO							

+		BAS-C	12.	4.33	1.	0.	0.	.01
+	ROUTED TO	SAto11	12.	4.33	1.	0.	0.	.01
+	2 COMBINED AT	DUMMY	19.	4.00	2.	0.	0.	.02
+	HYDROGRAPH AT	OS06	4.	4.25	1.	0.	0.	.00
+	ROUTED TO	BAS06	0.	.00	0.	0.	0.	.00
+	HYDROGRAPH AT	OS05	1.	4.08	0.	0.	0.	.00
+	2 COMBINED AT	CP14	1.	4.08	0.	0.	0.	.01
+	HYDROGRAPH AT	SA06	45.	4.58	9.	2.	1.	.08
+	HYDROGRAPH AT	RCSTW	82.	4.17	8.	2.	1.	.16
+	ROUTED TO	SNTW-7	81.	4.25	8.	2.	1.	.16
+	HYDROGRAPH AT	SA07	47.	4.50	9.	2.	1.	.08
+	ROUTED TO	05to11	46.	4.50	9.	2.	1.	.08
+	5 COMBINED AT	CP11	152.	4.42	28.	7.	3.	.18
+	ROUTED TO	BAS-B	137.	4.58	28.	7.	3.	.18
+	3 COMBINED AT	CP06	248.	4.33	44.	11.	5.	.32
+	ROUTED TO	BAS-A	251.	4.33	44.	11.	5.	.32
+	DIVERSION TO	WEST	205.	4.33	36.	9.	4.	.32
+	HYDROGRAPH AT	NSA06	45.	4.33	8.	2.	1.	.32
+	ROUTED TO	06-13B	42.	4.50	8.	2.	1.	.32
+	HYDROGRAPH AT	W13B	138.	4.17	16.	4.	2.	.13
+	3 COMBINED AT	CPW13B	230.	4.42	35.	9.	4.	.60
+	HYDROGRAPH AT	W14B	138.	4.17	16.	4.	2.	.13
+	2 COMBINED AT	CPW14B	320.	4.33	49.	12.	6.	.73
+	ROUTED TO	14B-21	308.	4.42	49.	12.	6.	.73
+	HYDROGRAPH AT	RCSTW	205.	4.33	36.	9.	4.	.32
+	ROUTED TO	RWCP6A	204.	4.42	36.	9.	4.	.32
+	ROUTED TO	RWCP6B	199.	4.42	36.	9.	4.	.32
+	HYDROGRAPH AT	W22	274.	4.25	35.	9.	4.	.25
+	2 COMBINED AT	CPW22	452.	4.33	70.	18.	9.	.25
+	ROUTED TO	RCPW22	374.	4.50	70.	18.	9.	.25
+	HYDROGRAPH AT	W21	316.	4.17	32.	8.	4.	.25
+	DIVERSION TO	RETDIV	316.	4.17	32.	8.	4.	.25
+	HYDROGRAPH AT	RETAIN	0.	.00	0.	0.	0.	.25
+	3 COMBINED AT	CPW21	570.	4.50	105.	26.	13.	1.23

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

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   07MAY09  TIME  13:44:23   *
*                                       *
*****************************************
```

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

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

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

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


```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
   1          ID   ********************************************************************************
   2          ID      RIGGS ROAD WIDENING PROJECT, VAL VISTA DRIVE TO RECKER ROAD. PLUS 1/4 MILE
   3          ID      SECTION OF HIGLEY ROAD TO THE SOUTH OF RIGGS ROAD.
   4          ID      FILENAME SNQ6ALT1.DAT
   5          ID      J2 PROJECT ID 08.0217
   6          ID      100-YEAR, 6-HOUR STORM (FCDMC - METHODOLOGY)
   7          ID   **
   8          ID   ** REVISED 05-01-2009
   9          ID      -SIMPLIFIED MODEL, INCLUDED ONLY RELEVANT BASINS THAT IMPACT THE PROJECT
  10          ID      -UPDATED BASIN W9 & W10 LG AND UC CARD TO CURRENT CONDITIONS
  11          ID      -ADDED BASIN 22
  12          ID      -ADDED FLOW SPLITS FOR BASINS W13A & SAO6
  13          ID
  14          ID      -BASIN W13A ROUTED FLOWS NORTH TO RIGGS ROAD VIA SRP EASEMENT (172ST)
  15          ID       DUE TO FUTURE DEVELOPMENT.
  16          ID   **
  17          ID   ********************************************************************************
  18          ID   **
  19          ID      RIGGS PAVILION MODEL
  20          ID      SEVILLE DEVELOPMENT MODEL REVISED TO ADDRESS CHANGES DUT TO DEVELOPMENT***
  21          ID      EAST AND SOUTH OF RIGGS PAVILION PROJECT SITE 09-28-2007
  22          ID      (FILE i.d. RP-100-6Pre1.DAT
  23          ID
  24          ID   ********************************************************************************
  25          ID      ENTELLUS MODEL REVISED FOR RE-ROUTED FLOWS DUE TO DEVELOPMENT OF SEVILE
  26          ID      @ HIGLEY & CHANDLER HEIGHTS ROADS. REVISIONS WERE CONFINED TO RUNOFF
  27          ID      FROM DRAINAGE BASIN W ONLY WHERE THESE FLOWS IMPINGE UPON THE SEVILLE
  28          ID      DEVELOPMENT. CMX GROUP INC., 5-30-2000 (FILE I.D. SNQ6REV2.DAT)
  29          ID   **
  30          ID   ** THIS IS A MODEL FOR 100-YR 6-HR PROPOSED CONDITINOS WITH SEVILLE
  31          ID   ** REVISED 1-20-2000 TO INCLUDE SITE AREA BETWEEN 164TH ST. & HIGLEY RD
  32          ID   ** REVISED 5-11-2000 TO MODIFY THE DRAIANGE AREAS W11A, W11B, W11C, W11D & WA
  33          ID      WITH CHANNEL ROUTINGS
  34          ID   ** REVISED 5-22-2000 TO INCLUDED AREAS W15 & W20 AND W14, W13 & W21 AS OFF-
  35          ID      SITE AREAS NEAR SW CORNER OF SITE FOR FLOWS ALONG SOUTHERN BOUNDARY OF
  36          ID      PARCELS 38A & 38B, PLUS FLOWS IN EXISTING CHANNEL SOUTH OF, AND PARALLEL
  37          ID      TO RIGGS RD.
  38          ID   ** REVISED RTIMP FOR W11, W12, W16, W17, W18, W19 TO 30% FROM 0%
  39          ID   ** REVISED RET. VOLUMES FOR W11, W12, W16, W17, W18 & W19 (USE VOL "PROVIDED"
  40          ID      PER THE ONSITE DRAINGE REPORT BY CMX)
  41          ID   ** CHANNEL DESIGN FOR CHANDLER HEIGHTS BETWEEN POWER RD AND RECKER ROAD WILL
  42          ID      STIMULATE EXISTING FLOW OVERTOPPING CONDITIONS
  43          ID   ** CHANNEL DESIGN FOR CHANDLER HTS BETWEEN RECKER RD TO HIGLEY RD WILL BE
  44          ID      DESIGNED FOR CHANDLER HTS BETWEEN RECKER RD TO HIGLEY RD WILL BE
  45          ID      DESIGNED WITHOUT OVERTOPPING FLOWS
  46          ID   ** CHANNEL DEIGN FOR CHANDLER HTS BET HIGLEY RD & 164TH ST WILL BE DESIGNED
  47          ID      TO SIMULATE FLOW OVERTOPPING CONDTIONS
              ID   *
  48          ID   ********************************************************************************
  49          ID   ********************************************************************************
  50          ID   **    SONOQUI WASH FLOODPLAIN DELINEATION STUDY                                **
  51          ID   **    100-Year 6-hour Storm                                                    **
  52          ID   **    First Run Date  February 10-1998                                         **
  53          ID   **    Run Date            May 20-1998                                          **
  54          ID   **    REVISED:          March 10-2004                                          **
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
  55          ID   **    REVISION CHANGES:                                                        **
  56          ID   **                    Basins E1 and E2 changed from Clark UH to S-graphs      **
  57          ID   **                    Changed method of Railroad Culvert flow calculations**
  58          ID   **                        Applies to structures RRW1, RRW2 and RRW3           **
  59          ID   **                        See note prior to structure RRW1                    **
  60          ID   **                    Extended X-Section for structure RRW3                   **
  61          ID   **    Entellus, Inc.                                        File SNQ6.DAT      **
  62          ID   ********************************************************************************
  63          ID   ********************************************************************************
```

```
64          ID
65          ID   DDM MCUHP1 Sonoqui Wash floodplain Delineation Study
            *
            *
66          IT       5 01APR97             600
67          IO       5
            *
            *DIAGRAM
            * ////////////////////////////////////////////////////////////////////////////
            * ////////////////////////// Rainfall Distribution//////////////////////////////
            * ////////////////////////////////////////////////////////////////////////////
68          IN      15
69          JD    3.04    0.01
70          PC    .000    .008    .016    .025    .033    .041    .050    .058    .066    .074
71          PC    .087    .099    .118    .138    .216    .377    .834    .911    .931    .950
72          PC    .962    .972    .983    .991   1.000
73          JD    3.02    0.50
74          JD    2.98    2.80
75          PC    .000    .009    .016    .025    .034    .042    .051    .059    .067    .076
76          PC    .087    .100    .120    .163    .252    .451    .694    .837    .900    .938
77          PC    .950    .963    .975    .988   1.000
78          JD    2.80   16.0
79          PC    .000    .015    .020    .030    .048    .063    .076    .090    .105    .119
80          PC    .135    .152    .175    .222    .304    .472    .670    .796    .868    .912
81          PC    .946    .960    .973    .987   1.000
82          JD    2.46   90.0
83          PC    .000    .021    .035    .051    .071    .087    .105    .125    .143    .160
84          PC    .179    .201    .232    .281    .364    .500    .658    .773    .841    .888
85          PC    .927    .945    .964    .982   1.000
86          JD    1.73   500.0
87          PC    .000    .024    .043    .059    .078    .098    .119    .141    .162    .186
88          PC    .212    .239    .271    .321    .408    .515    .627    .735    .814    .864
89          PC    .907    .930    .954    .977   1.000
            * ////////////////////////////////////////////////////////////////////////////
            * ////////////////////////// End Distribution //////////////////////////////////
            * ////////////////////////////////////////////////////////////////////////////
            *
            * ***************************************************************************
            * **********************    Basin W9     ************************************
            * ***************************************************************************
            * DDM    ***** Updated *****
```

1 HEC-1 INPUT PAGE 3

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

90          KK      W9
91          KM    SUB-BASIN W9
92          KM    6-HOUR RAINFALL, PATTERN NO. 1.02 WAS USED TO FIND TC & R FOR THIS BASIN
93          KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .993
94          KM      L = 1.49  Kb = .038  Adj. Slope =   45.0
95          KM    UPDATED GREEN AMPT PARAMETERS TO VERY LOW DENSITY RESIDENTIAL
96          BA     .516
97          LG      .30     .25    4.30     .40    5.000
98          UC     .646    .457
99          UA        0       5      16      30      65      77      84      90      94      97
100         UA      100
            *
            *
            * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
            * RRrrrrrrrrrrrrrrrrrrrrrr    Routing R-W9        rrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
            * rrr  Route W9 to W10                                                          rrr
            * rrr  Field typical section - sheet flow across field                         rrr
            * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
            * DDM    ***** Preserved *****

101         KK      RW9
102         RS        1     FLOW
103         RC    0.015   0.025   0.015    2640 .005906
104         RX        0       0      66      82      98     114     116     116
105         RY        6       4       4       0       0       4       4       6
            *
            *
            * ***************************************************************************
            * **********************    Basin W10    ************************************
            * ***************************************************************************
            * DDM    ***** Updated *****

106         KK      W10
107         KM    SUB-BASIN W10
108         KM    6-HOUR RAINFALL, PATTERN NO. 1.01 WAS USED TO FIND TC & R FOR THIS BASIN
109         KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .993
110         KM      L = 1.14  Kb = .071  Adj. Slope =   62.0
111         KM    UPDATED GREEN AMPT PARAMETERS TO VERY LOW DENSITY RESIDENTIAL
112         BA     .513
113         LG      .30     .25     4.3      .4    5.000
114         UC     .708    .409
115         UA        0       5      16      30      65      77      84      90      94      97
116         UA      100
            *
            *

117         KK  RETAIN
118         KM    50YR-24HR RETENTION VOLUME FOR SUBBASIN LOCATED IN TOWN OF GILBERT
119         KM    USED AN AVERAGE C = 0.60 FOR 16.7AC DEVELOPED LAND
120         DT  RETDIV      2.5
121         DI        0   10000
122         DQ        0   10000
            *
```

1 HEC-1 INPUT PAGE 4

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

123         KK  HC9-10
124         KM    COMBINE BASIN 9 & 10
```

```
125       HC        2
          *
          * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
          * rrrrrrrrrrrrrrrrrrrrr   Routing RW10        rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
          * rrr Route Flow from HC9-10 to BASIN 14A              rrr
          * rrr Field typical section  -- sheet flow across field                    rrr
          * rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
          * DDM    ***** Preserved *****

126       KK      RW10
127       KO                                     21
128       RS         1    FLOW
129       RC     0.015   0.025   0.015    2640 .005906
130       RX         0       0      66      82      98     114     116     116
131       RY         6       4       4       0       0       4       4       6
          *

132       KK      W14A
133       KM      OFFSITE AREA SOUTH OF RIGGS RD. & EAST OF HIGLEY RD.
134       BA      .250
135       LG       .35     .35     4.3    .400    .000
136       UC      .488    .273
137       UA         0       5      16      30      65      77      84      90      94      97
138       UA       100
          *

139       KK    RETAIN
140       KM     50YR-24HR RETENTION VOLUME FOR SUBBASIN LOCATED IN TOWN OF GILBERT
141       KM     C=0.60 FOR 130AC DEVELOPED     19.5 ac-ft
142       DT    RETDIV    19.5
143       DI         0   10000
144       DQ         0   10000
          *
          *

145       KK      W13A
146       KM      OFFSITE AREA SOUTH OF AREA W14B
147       BA      .159
148       LG       .35     .35     4.3    .400    .000
149       UC      .488    .273
150       UA         0       5      16      30      65      77      84      90      94      97
151       UA       100
          *

152       KK     W13AN
153       KM     DIVERT FLOW
154       KM     47 CFS VIA 2-24" RCP
155       KM     47 MINUS BASIN W13A Q x 50% FLOW SPLIT = 39% FLOW TO THE WEST
156       DT      SNTW
157       DI         0     100    1000
158       DQ         0      39     390
          *
```

1 HEC-1 INPUT PAGE 5

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

159       KK     13A-14
160       KM     ROUTE FLOW NORTH TO RIGGS RD ALONG SRP EASTMENT (172ND ST)
161       KO                                     21
162       RS         3    FLOW
163       RC      0.03    0.03    0.03    2640  0.0067
164       RX       100     102     106     110     120     124     128     130
165       RY       2.5       2       1       0       0       1       2     2.5
          *
          *

166       KK     HCW14A
167       KM     COMBINE BASIN W9, W10 & 14A
168       HC         3
          *

169       KK     RW14A
170       KM     RE-ROUTE COMBINED HYDROGRAPH IN "LOOP RD." PLUS TRAP CHN TO HIGLEY RD.
171       KM     THEN IN HIGLEY RD. PLUS TRAP CHN. TO INTERSECTION OF CHANDLER HGTS.RD.
172       KO                                     21
173       RS         1    FLOW
174       RC     0.015   0.025   0.015    7920 .004776
175       RX         0       0      66      82      98     114     116     116
176       RY         6       4       4       0       0       4       4       6
          *
          *
          * ****************************************************************************
          *   Basins SA01 to SA06 Taken from HEC-1 model found in the draiange report
          *   titled "Chandler Junior High School Prelimianry Draiange Study"
          *   This portion of the HEC-1 model was developed by Eire & Associates
          *   Inc. Perpared for Hess-Roundtree Engineering and Chandler School distric
          *   **************************************************************************
          *

177       KK      SA03
178       KM      OFFSITE AREA
179       BA      .058
180       LG       .35     .35    3.95     .48       0
181       UC      .342    .348
182       UA         0       3       5       8      12      20      43      75      90      96
183       UA       100
          *
          *

184       KK      SA04
185       KM      OFFSITE AREA
186       BA      .008
187       LG       .35     .35    3.95     .48       0
188       UC      .229    .385
189       UA         0       3       5       8      12      20      43      75      90      96
```

```
 190          UA     100
              *
```



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

 191          KK    SA05
 192          KM    OFFSITE AREA
 193          BA    .050
 194          LG     .35     .35    3.95     .48       0
 195          UC    .329    .341
 196          UA       0       3       5       8      12      20      43      75      90      96
 197          UA     100
              *

 198          KK  03to01
 199          KM        ROUTE CP03 TO CP01 THROUGH 2-36" SMOOTHBORE PIPES
 200          RS        1    STOR
 201          SV        0    0.02    0.03
 202          SE        0     1.5       3
 203          SQ        0      42      84
              *

 204          KK    CP01 *COMBINES SA03, SA04, &SA05*
 205          KM
 206          HC        3
              *

 207          KK  01to02
 208          KM        ROUTE CP01 TO CP02 THROUGH 3-36" SMOOTHBORE PIPES
 209          RS        1    STOR
 210          SV        0    0.02    0.03
 211          SE        0     1.5       3
 212          SQ        0      80     160
              *

 213          KK    OS09  BASIN
 214          BA   0.002
 215          LG    0.00    0.25    3.95    0.40      99
 216          UC   0.133   0.331
 217          UA       0       5      16      30      65      77      84      90      94      97
 218          UA     100
              *

 219          KK    CP02 *COMBINES OS09 & CP01*
 220          HC       2
              *

 221          KK    OS07  *ONSITE DRAINAGE BASIN #7*
 222          BA   0.006
 223          LG    0.04    0.25    3.95    0.47      79
 224          UC   0.175   0.205
 225          UA       0       5      16      30      65      77      84      90      94      97
 226          UA     100
              *
```



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

 227          KK  08to10
 228          RS        1    FLOW       0
 229          RC      .03     .03     .03      70      .1
 230          RX      990     992     996   999.9  1000.1    1004    1008    1010
 231          RY      2.5     2.0     1.0       0       0     1.0     2.0     2.5
              *

 232          KK    OS03  *ONSITE DRAINAGE BASIN #3*
 233          BA   0.002
 234          LG    0.00    0.25    3.95    0.40      99
 235          UC   0.108   0.158
 236          UA       0       5      16      30      65      77      84      90      94      97
 237          UA     100
              *

 238          KK  09to10
 239          RS        1    FLOW       0
 240          RC      .03     .03     .03      70      .1
 241          RX      990     992     996   999.9  1000.1    1004    1008    1010
 242          RY      2.5     2.0     1.0       0       0     1.0     2.0     2.5
              *

 243          KK    OS11  *ONSITE DRAINAGE BASIN #11*
 244          BA   0.009
 245          LG    0.14    0.25    3.95    0.65      30
 246          UC   0.254   0.274
 247          UA       0       5      16      30      65      77      84      90      94      97
 248          UA     100
              *

 249          KK    OS01  BASIN
 250          BA   0.002
 251          LG    0.00    0.25    3.95    0.40      99
 252          UC   0.171   0.574
 253          UA       0       5      16      30      65      77      84      90      94      97
 254          UA     100
              *
              *

 255          KK    OS02  BASIN
 256          BA   0.002
 257          LG    0.20    0.25    3.95    0.76       0
 258          UC   0.138   0.149
 259          UA       0       5      16      30      65      77      84      90      94      97
 260          UA     100
```

```
                 *
  261            KK    CP10  *COMBINES OS01, OS03, OS07, & OS11*
  262            HC       5
                 *
1                                    HEC-1 INPUT                                          PAGE  8

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


  263            KK  BAS-A2
  264            KM   *FIRST FLUSH BASIN FOR OS02, OS10, OS07 & OS03*
  265            RS       1    STOR
  266            SA    .436    .531    .635    .635
  267            SE       0     1.5       3     3.5
  268            SQ       0       0       0      50
                 *

  269            KK    OS08  *ONSITE DRAINAGE BASIN #8*
  270            BA   0.004
  271            LG    0.04    0.25    3.95    0.47      80
  272            UC   0.138   0.175
  273            UA       0       5      16      30      65      77      84      90      94      97
  274            UA     100
                 *

  275            KK  SAto12  *ROUTE OS08 TO CP12*
  276            RS       1    FLOW       0
  277            RC     .03     .03     .03      70      .1
  278            RX     980     985     990   999.9  1000.1    1010    1015    1020
  279            RY     1.2     0.6       0       0       0       0     0.6     1.2
                 *

  280            KK    OS04   BASIN
  281            BA   0.002
  282            LG    0.10    0.25    3.95    0.59      47
  283            UC   0.150   0.206
  284            UA       0       5      16      30      65      77      84      90      94      97
  285            UA     100
                 *

  286            KK    CP12  *COMBINES OS08 & OS04*
  287            HC       2
                 *

  288            KK  BAS-B2
  289            KM   *FIRST FLUSH BASIN FOR OS08 & OS04*
  290            RS       1    STOR
  291            SA    .054    .091    .136    .136
  292            SE       0     1.5       3     3.5
  293            SQ       0       0       0      50
                 *

  294            KK    OS12   BASIN
  295            BA   0.010
  296            LG    0.16    0.25    3.95    0.69      20
  297            UC   0.333   0.348
  298            UA       0       5      16      30      65      77      84      90      94      97
  299            UA     100
                 *
1                                    HEC-1 INPUT                                          PAGE  9

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


  300            KK   BAS-C
  301            KM   *FIRST FLUSH BASIN FOR OS12*
  302            RS       1    STOR
  303            SA    .077    .128    .188    .188
  304            SE       0     1.5       3     3.5
  305            SQ       0       0       0      50
                 *

  306            KK  SAto11 *ROUTE OS12 TO CP11*
  307            RS       1    FLOW       0
  308            RC     .03     .03     .03     160    .019
  309            RX     990     992     996   999.9  1000.1    1004    1008    1010
  310            RY     2.5     2.0     1.0       0       0     1.0     2.0     2.5
                 *

  311            KK   DUMMY
  312            KM   DUMMY DUMMY HC
  313            HC       2
                 *

  314            KK    OS06   BASIN
  315            BA   0.005
  316            LG    0.16    0.25    3.95    0.69      19
  317            UC   0.588   0.719
  318            UA       0       5      16      30      65      77      84      90      94      97
  319            UA     100
                 *

  320            KK   BAS06
  321            KM   *RETNETION BASIN IS ENTIRE AREA OF OS06*
  322            RS       1    STOR
  323            SA     3.3     3.3     3.3
  324            SE       0     0.5     1.0
  325            SQ       0       0      50
                 *

  326            KK    OS05   BASIN
  327            BA   0.001
  328            LG    0.10    0.35    3.95    0.40       0
  329            UC   0.150   0.533
  330            UA       0       5      16      30      65      77      84      90      94      97
```

```
331          UA     100
             *
332          KK    CP14  *COMBINES OS05 &OS06*
333          HC      2
             *
334          KK    SA06
335          KM    OFFSITE AREA
336          BA    .082
337          LG     .44     .29    3.95     .62       0
338          UC    .733    .867
339          UA       0       3       5       8      12      20      43      75      90      96
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
340          UA     100
             *
             *
341          KK   RCSTW
342          KM   RECALL WEST FLOW SPLIT FROM INTERSECTION OF 172 ST & SANTAN BLVD.
343          DR    SNTW
             *
             *
344          KK  SNTW-7
345          KM
346          RS       2    FLOW       0
347          RC    .045     .03     .03    1056   .0091
348          RX     988     990     994     998    1002    1006    1008    1010
349          RY       2     1.5     1.8       0       0     1.0     3.5     2.0
             *
             *
350          KK    SA07
351          KM    OFFSITE AREA
352          BA    .077
353          LG     .41     .31    3.95     .57       0
354          UC    .675    .811
355          UA       0       3       5       8      12      20      43      75      90      96
356          UA     100
             *
             *
357          KK  05to11 *ROUTE CP05 (SA07) TO CP11
358          RS       1    FLOW       0
359          RC     .03     .03     .03     595   .0083
360          RX     990     992     996   999.9  1000.1    1004    1008    1010
361          RY     2.5     2.0     1.0       0       0     1.0     2.0     2.5
             *
362          KK    CP11  *COMBINES SA06, SA07, OS12, CP12 & CP14*
363          HC       5
             *
364          KK   BAS-B
365          KM   *RETNETION BASIN FOR SUBAREAS OF CP11 DRAINED BY 2-36" PIPES*
366          RS       1    STOR
367          SA     .40     .52     .64
368          SE       0     1.5       3
369          SQ       0      65     130
             *
370          KK    CP06  *COMBINES CP02, CP1, CP10*
371          HC       3
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
372          KK   BAS-A
373          KM   *RETNETION BASIN FOR SITE DRAINED BY 3 SILTED 36"PIPES AND BY OVERTOPPING*
374          RS       1    STOR
375          SA    .101    .168    .243    .243    .243
376          SE       0     1.5       3       4       5
377          SQ       0       0      10      18     250
             *
             *  ********************************************************************
             *
378          KK   NSA06
379          KM   DIVERT FLOW
380          KM   160CFS VIA 3-36" PIPES UNDER HIGLEY ROAD
381          KM   160CFS MINUS BASIN CP06 Q x 50% FLOW SPLIT = 82% FLOW TO THE WEST
382          DT    WEST
383          DI       0     100    1000
384          DQ       0      82     820
             *
             *
385          KK  06-13B
386          KM   ROUTE FLOWS NORTH TO HIGLEY ROAD
387          KO                      21
388          RS       3    FLOW       0
389          RC    0.03    0.03    0.03    2640  0.0067
390          RX     100     102     104     108     118     122     124     126
391          RY       2     1.5       1       0       0       1     1.5     2.0
             *
             *
392          KK    W13B
393          KM    OFFSITE AREA SOUTH OF RIGGS RD. & EAST OF HIGLEY RD.
394          BA    .125
```

```
395          LG     .35     .35     4.3     .400    .000
396          UC    .467    .387
397          UA       0       5      16       30      65      77      84      90      94      97
398          UA     100
             *
             *

399          KK  CPW13B
400          KM   COMBINE W13B FLOWS WITH ROUTED FLOWS FROM BASIN W13A & SA06
401          HC       2
             *

402          KK    W14B
403          KM    OFFSITE AREA SOUTH OF RIGGS RD. & EAST OF HIGLEY RD.
404          BA    .125
405          LG     .35     .35     4.3     .400    .000
406          UC    .467    .387
407          UA       0       5      16       30      65      77      84      90      94      97
408          UA     100
             *
             *
```



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

409          KK  CPW14B
410          KM   COMBINE FLOW FROM W13 WITH FLOW FROM 14B
411          HC       2
             *

412          KK  14B-21
413          KO                                      21
414          RS       1    FLOW
415          RC   0.035   0.035   0.035    2640   .0094
416          RX       0       0      15      15      45      45      60      60
417          RY       6       4       4       0       0       4       4       6
             *
             *  HIGLEY/SAN TAN BLVD
             *  BASIN SA01 THRU SA06 INCLUDE LANDS SOUTH OF SAN TAN BLVD AND EAST OF HIGLEY
             *  THIS INCLUDES THE JR. HIGH SCHOOL.
             *  FLOWS ARE NOW ROUTED ACROSS HIGLEY (AT SAN TAN BLVD) FROM THE SE QUAD. TO
             *  THE NE QUAD.  NEW DEVELOPEMENT ROUTES THIS FLOW WEST ALONG THE N SIDE OF
             *  SAN TAN BLVD. VIA A TRAP DITCH.
             *
             *

418          KK   RCSTW
419          KM   RECALL WEST FLOW SPLIT FROM INTERSECTION OF SANTAN BLVD & HIGLEY
420          DR    WEST
             *

421          KK  RWCP6A
422          KM   ROUTE FLOW VIA CONCRETE LINED DITCH ALONG SOUTH SIDE OF ACACIA DEVELOPMENT
423          KO                                      21
424          RS       2    FLOW
425          RC   0.035   0.016   0.035    1320   .0093
426          RX       0      10      20      26      46      52      60      70
427          RY       4       3       3       0       0       3       3       4
             *

428          KK  RWCP6B
429          KM   ROUTE FLOW VIA SHEET FLOW DOWN STREAM OF ACACIA DEVELOPMENT
430          KO                                      21
431          RS       2    FLOW
432          RC   0.035   0.035   0.035    1320   .0093
433          RX      30      40      45      50      70      75      80      90
434          RY       2       1      .5       0       0      .5       1       2
             *

435          KK    W22
436          KM    OFFSITE AREA SOUTH OF SAN TAN BLVD. & WEST OF HIGLEY RD. E. OF 164TH ST.
437          KM   6-HOUR RAINFALL, PATTERN NO. 2.05 WAS USED TO FIND TC & R FOR THIS BASIN
438          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .973
439          KM     L =   .78  Kb = .050  Adj. Slope =   48.9
440          BA    .250
441          LG      .3     .35     4.3     .400       5
442          UC    .610    .386
443          UA       0       5      16       30      65      77      84      90      94      97
444          UA     100
             *
             *
```



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

445          KK   CPW22
446          KM
447          HC       2
             *
             *

448          KK  RCPW22
449          KO                                      21
450          RS       1    FLOW
451          RC   0.035   0.035   0.035    2640   .0053
452          RX     140     147     151     160     165     183     219     255
453          RY    32.8      32      30    29.3      30      31    31.5      32
             *
             *

454          KK    W21
455          KM    OFFSITE AREA SOUTH OF RIGGS RD. & WEST OF HIGLEY RD.
456          BA    .250
457          LG     .35     .35     4.3     .400    .000
```

```
458           UC    .504    .293
459           UA       0       5      16      30      65      77      84      90      94      97
460           UA     100
              *
              *

461           KK  RETAIN
462           KM   50YR-24HR RETENTION VOLUME FOR SUBBASIN LOCATED IN TOWN OF GILBERT
463           KM   APPROXIMATELY 3/4 OF THE BASIN HAS BEEN DEVELOPED OR WILL BE DEVELOPED
464           KM   IN THE NEAR FUTURE.
465           KM   USED AN AVERAGE C = 0.63 FOR 120 AC DEVELOPED LAND
466           DT  RETDIV    18.9
467           DI       0   10000
468           DQ       0   10000
              *
              *

469           KK   CPW21
470           KM
471           HC       3
              *
              *
472           ZZ
```

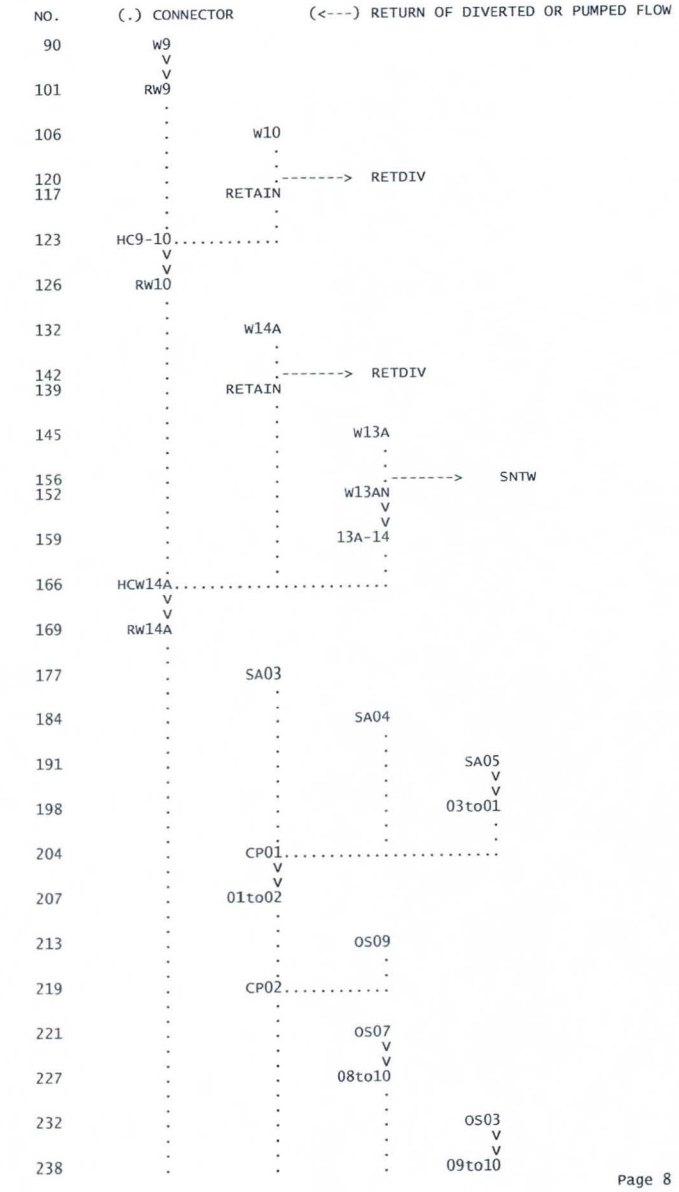
1

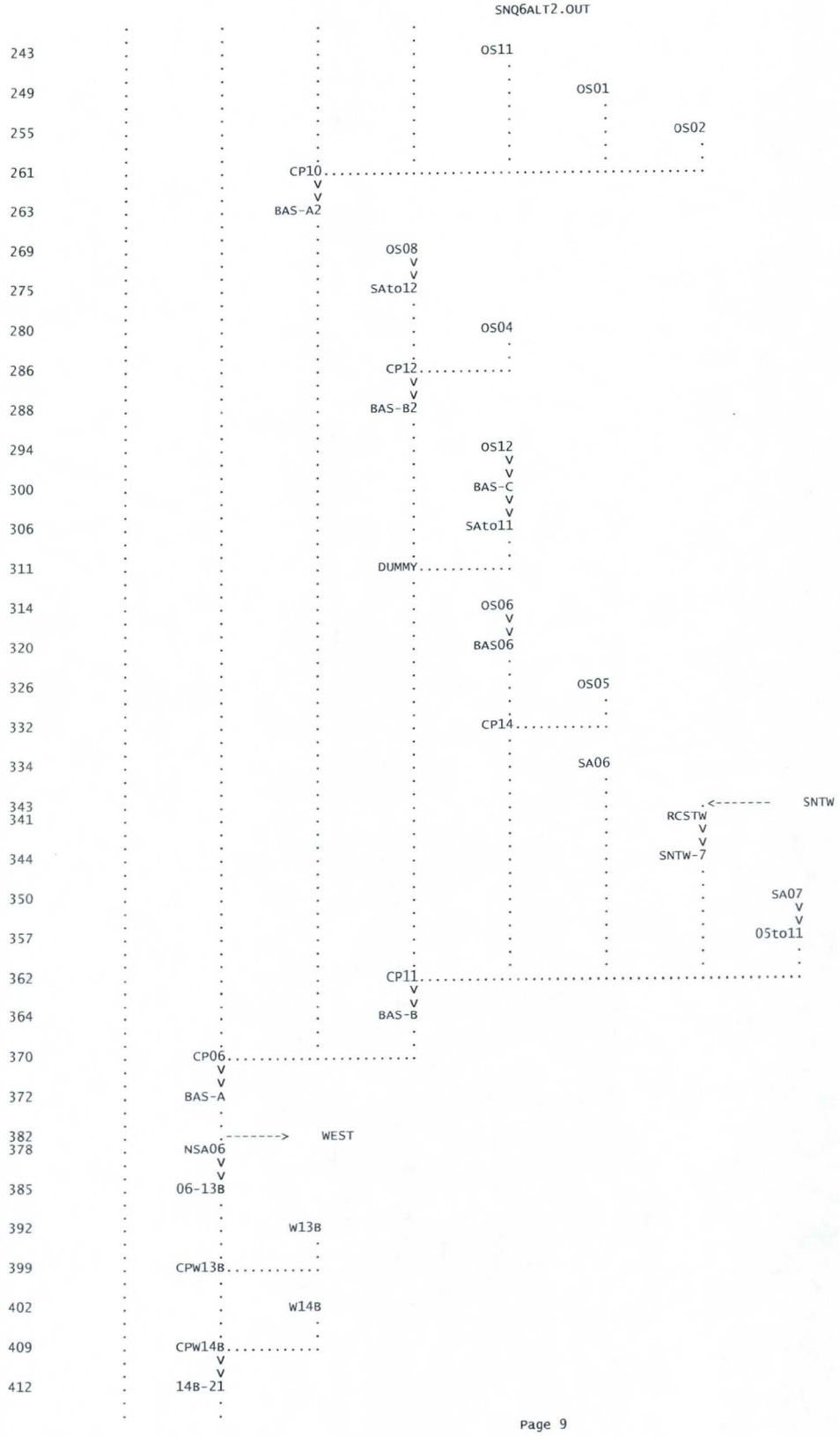
SCHEMATIC DIAGRAM OF STREAM NETWORK

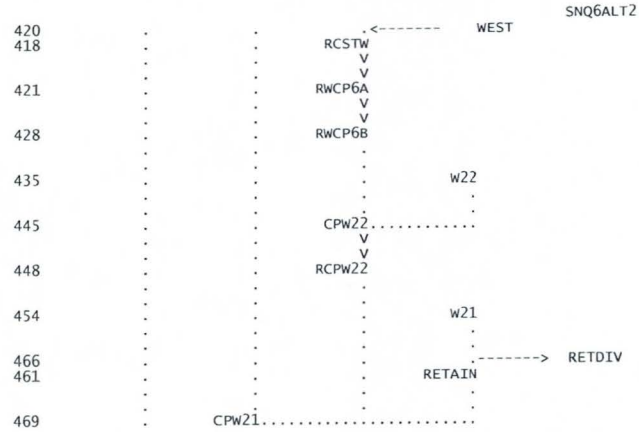
INPUT LINE NO.

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

(.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW




243
OS11
249
OS01
255
OS02
261
CP10
263
BAS-A2
269
OS08
275
SAto12
280
OS04
286
CP12
288
BAS-B2
294
OS12
300
BAS-C
306
SAto11
311
DUMMY
314
OS06
320
BAS06
326
OS05
332
CP14
334
SA06
343
341
SNTW
RCSTW
344
SNTW-7
350
SA07
357
05to11
362
CP11
364
BAS-B
370
CP06
372
BAS-A
382
378
WEST
NSA06
385
06-13B
392
W13B
399
CPW13B
402
W14B
409
CPW14B
412
14B-21



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*          VERSION 4.1                  *
*                                       *
*  RUN DATE   07MAY09  TIME  13:44:23   *
*                                       *
*****************************************
```

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

```
*******************************************************************************
   RIGGS ROAD WIDENING PROJECT, VAL VISTA DRIVE TO RECKER ROAD. PLUS 1/4 MILE
   SECTION OF HIGLEY ROAD TO THE SOUTH OF RIGGS ROAD.
   FILENAME SNQ6ALT1.DAT
   J2 PROJECT ID 08.0217
   100-YEAR, 6-HOUR STORM (FCDMC - METHODOLOGY)
**
** REVISED 05-01-2009
   -SIMPLIFIED MODEL, INCLUDED ONLY RELEVANT BASINS THAT IMPACT THE PROJECT
   -UPDATED BASIN W9 & W10 LG AND UC CARD TO CURRENT CONDITIONS
   -ADDED BASIN 22
   -ADDED FLOW SPLITS FOR BASINS W13A & SAO6

   -BASIN W13A ROUTED FLOWS NORTH TO RIGGS ROAD VIA SRP EASEMENT (172ST)
    DUE TO FUTURE DEVELOPMENT.
**
*******************************************************************************
**
   RIGGS PAVILION MODEL
   SEVILLE DEVELOPMENT MODEL REVISED TO ADDRESS CHANGES DUT TO DEVELOPMENT***
   EAST AND SOUTH OF RIGGS PAVILION PROJECT SITE 09-28-2007
   (FILE i.d. RP-100-6Pre1.DAT

*******************************************************************************
   ENTELLUS MODEL REVISED FOR RE-ROUTED FLOWS DUE TO DEVELOPMENT OF SEVILE
   @ HIGLEY & CHANDLER HEIGHTS ROADS. REVISIONS WERE CONFINED TO RUNOFF
   FROM DRAINAGE BASIN W ONLY WHERE THESE FLOWS IMPINGE UPON THE SEVILLE
   DEVELOPMENT. CMX GROUP INC., 5-30-2000 (FILE I.D. SNQ6REV2.DAT)
**
** THIS IS A MODEL FOR 100-YR 6-HR PROPOSED CONDITINOS WITH SEVILLE
** REVISED 1-20-2000 TO INCLUDE SITE AREA BETWEEN 164TH ST. & HIGLEY RD
** REVISED 5-11-2000 TO MODIFY THE DRAIANGE AREAS W11A, W11B, W11C, W11D & WA
   WITH CHANNEL ROUTINGS
** REVISED 5-22-2000 TO INCLUDED AREAS W15 & W20 AND W14, W13 & W21 AS OFF-
   SITE AREAS NEAR SW CORNER OF SITE FOR FLOWS ALONG SOUTHERN BOUNDARY OF
   PARCELS 38A & 38B, PLUS FLOWS IN EXISTING CHANNEL SOUTH OF, AND PARALLEL
   TO RIGGS RD.
** REVISED RTIMP FOR W11, W12, W16, W17, W18, W19 TO 30% FROM 0%
** REVISED RET. VOLUMES FOR W11, W12, W16, W17, W18 & W19 (USE VOL "PROVIDED"
   PER THE ONSITE DRAINGE REPORT BY CMX)
** CHANNEL DESIGN FOR CHANDLER HEIGHTS BETWEEN POWER RD AND RECKER ROAD WILL
   STIMULATE EXISTING FLOW OVERTOPPING CONDITIONS
** CHANNEL DESIGN FOR CHANDLER HTS BETWEEN RECKER RD TO HIGLEY RD WILL BE
   DESIGNED FOR CHANDLER HTS BETWEEN RECKER RD TO HIGLEY RD WILL BE
   DESIGNED WITHOUT OVERTOPPING FLOWS
** CHANNEL DEIGN FOR CHANDLER HTS BET HIGLEY RD & 164TH ST WILL BE DESIGNED
   TO SIMULATE FLOW OVERTOPPING CONDTIONS
*******************************************************************************
*******************************************************************************
**    SONOQUI WASH FLOODPLAIN DELINEATION STUDY                              **
**    100-Year 6-hour Storm                                                  **
**    First Run Date  February 10-1998                                       **
**    Run Date            May 20-1998                                        **
**    REVISED:          March 10-2004                                        **
**    REVISION CHANGES:                                                      **
**                      Basins E1 and E2 changed from Clark UH to S-graphs   **
**                      Changed method of Railroad Culvert flow calculations**
**                           Applies to structures RRW1, RRW2 and RRW3       **
**                           See note prior to structure RRW1                **
**                      Extended X-Section for structure RRW3                **
**    Entellus, Inc.                                        File SNQ6.DAT    **
*******************************************************************************
*******************************************************************************
```

DDM MCUHP1 Sonoqui Wash floodplain Delineation Study

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

   IT          HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1APR97  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        600  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     3APR97  ENDING DATE
                   NDTIME       0155  ENDING TIME
                    ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL      .08 HOURS
                    TOTAL TIME BASE    49.92 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

69 JD          INDEX STORM NO. 1
                    STRM       3.04  PRECIPITATION DEPTH
                    TRDA        .01  TRANSPOSITION DRAINAGE AREA

70 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   .01   .01   .01   .01   .01   .01   .03
                  .03   .03   .05   .05   .05   .15   .15   .15   .03   .03
                  .03   .01   .01   .01   .01   .01   .01   .00   .00   .00
                  .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                  .00   .00

73 JD          INDEX STORM NO. 2
                    STRM       3.02  PRECIPITATION DEPTH
                    TRDA        .50  TRANSPOSITION DRAINAGE AREA

 0 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   .01   .01   .01   .01   .01   .01   .03
                  .03   .03   .05   .05   .05   .15   .15   .15   .03   .03
                  .03   .01   .01   .01   .01   .01   .01   .00   .00   .00
                  .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                  .00   .00

74 JD          INDEX STORM NO. 3
                    STRM       2.98  PRECIPITATION DEPTH
                    TRDA       2.80  TRANSPOSITION DRAINAGE AREA

75 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   .01   .01   .01   .01   .01   .01   .03
                  .03   .03   .07   .07   .07   .08   .08   .08   .05   .05
                  .05   .02   .02   .02   .01   .01   .01   .00   .00   .00
                  .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                  .00   .00

78 JD          INDEX STORM NO. 4
                    STRM       2.80  PRECIPITATION DEPTH
                    TRDA      16.00  TRANSPOSITION DRAINAGE AREA

79 PI            PRECIPITATION PATTERN
                  .01   .01   .00   .00   .00   .00   .00   .00   .00   .01
                  .01   .01   .00   .01   .00   .00   .00   .00   .00   .00
                  .00   .00   .01   .00   .00   .00   .00   .01   .01   .01
                  .01   .01   .01   .01   .01   .01   .02   .02   .02   .03
                  .03   .03   .06   .06   .06   .07   .07   .07   .04   .04
                  .04   .02   .02   .02   .01   .01   .01   .01   .01   .01
                  .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
                  .00   .00

82 JD          INDEX STORM NO. 5
                    STRM       2.46  PRECIPITATION DEPTH
                    TRDA      90.00  TRANSPOSITION DRAINAGE AREA

83 PI            PRECIPITATION PATTERN
                  .01   .01   .01   .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   .03
                  .03   .03   .05   .05   .05   .05   .05   .05   .04   .04
                  .04   .02   .02   .02   .02   .02   .02   .01   .01   .01
                  .01   .01   .01   .01   .01   .01   .01   .01   .01   .01
                  .01   .01

86 JD          INDEX STORM NO. 6
                    STRM       1.73  PRECIPITATION DEPTH
                    TRDA     500.00  TRANSPOSITION DRAINAGE AREA

87 PI            PRECIPITATION PATTERN
                  .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
       .01       .01       .01       .01       .01       .01       .02       .02       .02       .03
       .03       .03       .04       .04       .04       .04       .04       .04       .04       .04
       .04       .03       .03       .03       .02       .02       .02       .01       .01       .01
       .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
       .01       .01

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

              **************
              *            *
126 KK        *    RW10    *
              *            *
              **************

127 KO             OUTPUT CONTROL VARIABLES
                          IPRNT           5  PRINT CONTROL
                          IPLOT           0  PLOT CONTROL
                          QSCAL          0.  HYDROGRAPH PLOT SCALE
                          IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                           IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                          ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                          ISAV2         600  LAST ORDINATE PUNCHED OR SAVED
                         TIMINT        .083  TIME INTERVAL IN HOURS

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

              **************
              *            *
159 KK        *   13A-14   *
              *            *
              **************

161 KO             OUTPUT CONTROL VARIABLES
                          IPRNT           5  PRINT CONTROL
                          IPLOT           0  PLOT CONTROL
                          QSCAL          0.  HYDROGRAPH PLOT SCALE
                          IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                           IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                          ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                          ISAV2         600  LAST ORDINATE PUNCHED OR SAVED
                         TIMINT        .083  TIME INTERVAL IN HOURS

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

              **************
              *            *
169 KK        *    RW14A   *
              *            *
              **************

172 KO             OUTPUT CONTROL VARIABLES
                          IPRNT           5  PRINT CONTROL
                          IPLOT           0  PLOT CONTROL
                          QSCAL          0.  HYDROGRAPH PLOT SCALE
                          IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                           IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                          ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                          ISAV2         600  LAST ORDINATE PUNCHED OR SAVED
                         TIMINT        .083  TIME INTERVAL IN HOURS

WARNING --- ROUTED OUTFLOW (      137.) IS GREATER THAN MAXIMUM OUTFLOW (      130.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (      138.) IS GREATER THAN MAXIMUM OUTFLOW (      130.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (      133.) IS GREATER THAN MAXIMUM OUTFLOW (      130.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (      135.) IS GREATER THAN MAXIMUM OUTFLOW (      130.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (      137.) IS GREATER THAN MAXIMUM OUTFLOW (      130.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (      132.) IS GREATER THAN MAXIMUM OUTFLOW (      130.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (      254.) IS GREATER THAN MAXIMUM OUTFLOW (      250.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (      250.) IS GREATER THAN MAXIMUM OUTFLOW (      250.) IN STORAGE-OUTFLOW TABLE

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

              **************
              *            *
385 KK        *   06-13B   *
              *            *
              **************

387 KO             OUTPUT CONTROL VARIABLES
                          IPRNT           5  PRINT CONTROL
                          IPLOT           0  PLOT CONTROL
                          QSCAL          0.  HYDROGRAPH PLOT SCALE
                          IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                           IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
```

```
                ISAV1         1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2       600  LAST ORDINATE PUNCHED OR SAVED
               TIMINT      .083  TIME INTERVAL IN HOURS


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

          **************
          *            *
412 KK    *   14B-21   *
          *            *
          **************

413 KO         OUTPUT CONTROL VARIABLES
                IPRNT         5  PRINT CONTROL
                IPLOT         0  PLOT CONTROL
                QSCAL        0.  HYDROGRAPH PLOT SCALE
                IPNCH         0  PUNCH COMPUTED HYDROGRAPH
                 IOUT        21  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1         1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2       600  LAST ORDINATE PUNCHED OR SAVED
               TIMINT      .083  TIME INTERVAL IN HOURS


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

          **************
          *            *
421 KK    *   RWCP6A   *
          *            *
          **************

423 KO         OUTPUT CONTROL VARIABLES
                IPRNT         5  PRINT CONTROL
                IPLOT         0  PLOT CONTROL
                QSCAL        0.  HYDROGRAPH PLOT SCALE
                IPNCH         0  PUNCH COMPUTED HYDROGRAPH
                 IOUT        21  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1         1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2       600  LAST ORDINATE PUNCHED OR SAVED
               TIMINT      .083  TIME INTERVAL IN HOURS


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

          **************
          *            *
428 KK    *   RWCP6B   *
          *            *
          **************

430 KO         OUTPUT CONTROL VARIABLES
                IPRNT         5  PRINT CONTROL
                IPLOT         0  PLOT CONTROL
                QSCAL        0.  HYDROGRAPH PLOT SCALE
                IPNCH         0  PUNCH COMPUTED HYDROGRAPH
                 IOUT        21  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1         1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2       600  LAST ORDINATE PUNCHED OR SAVED
               TIMINT      .083  TIME INTERVAL IN HOURS


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

          **************
          *            *
448 KK    *   RCPW22   *
          *            *
          **************

449 KO         OUTPUT CONTROL VARIABLES
                IPRNT         5  PRINT CONTROL
                IPLOT         0  PLOT CONTROL
                QSCAL        0.  HYDROGRAPH PLOT SCALE
                IPNCH         0  PUNCH COMPUTED HYDROGRAPH
                 IOUT        21  SAVE HYDROGRAPH ON THIS UNIT
                ISAV1         1  FIRST ORDINATE PUNCHED OR SAVED
                ISAV2       600  LAST ORDINATE PUNCHED OR SAVED
               TIMINT      .083  TIME INTERVAL IN HOURS
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	W9	533.	4.25	78.	20.	9.	.52		
+	ROUTED TO	RW9	507.	4.33	78.	20.	9.	.52		

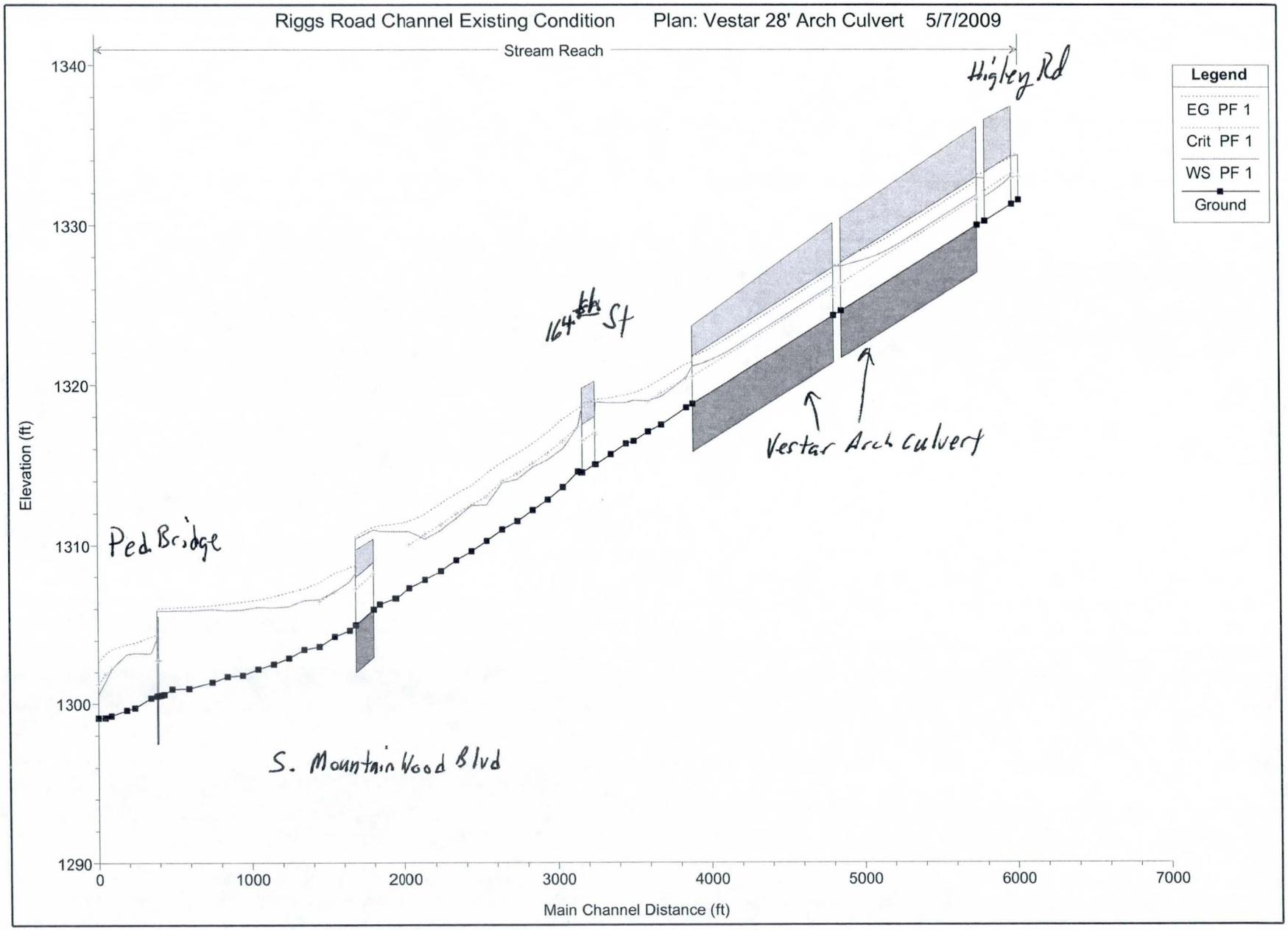
+	HYDROGRAPH AT	W10	547.	4.25	78.	20.	9.	.51
+	DIVERSION TO	RETDIV	117.	3.92	5.	1.	1.	.51
+	HYDROGRAPH AT	RETAIN	547.	4.25	73.	18.	9.	.51
+	2 COMBINED AT	HC9-10	907.	4.33	138.	35.	17.	1.03
+	ROUTED TO	RW10	881.	4.42	138.	35.	17.	1.03
+	HYDROGRAPH AT	W14A	332.	4.17	32.	8.	4.	.25
+	DIVERSION TO	RETDIV	332.	4.17	32.	8.	4.	.25
+	HYDROGRAPH AT	RETAIN	0.	.00	0.	0.	0.	.25
+	HYDROGRAPH AT	W13A	212.	4.17	20.	5.	2.	.16
+	DIVERSION TO	SNTW	82.	4.17	8.	2.	1.	.16
+	HYDROGRAPH AT	W13AN	129.	4.17	12.	3.	1.	.16
+	ROUTED TO	13A-14	122.	4.33	12.	3.	1.	.16
+	3 COMBINED AT	HCW14A	901.	4.42	142.	36.	17.	1.44
+	ROUTED TO	RW14A	721.	4.67	142.	36.	17.	1.44
+	HYDROGRAPH AT	SA03	72.	4.25	7.	2.	1.	.06
+	HYDROGRAPH AT	SA04	10.	4.17	1.	0.	0.	.01
+	HYDROGRAPH AT	SA05	63.	4.25	6.	2.	1.	.05
+	ROUTED TO	03to01	63.	4.25	6.	2.	1.	.05
+	3 COMBINED AT	CP01	143.	4.25	14.	4.	2.	.12
+	ROUTED TO	01to02	143.	4.25	14.	4.	2.	.12
+	HYDROGRAPH AT	OS09	4.	4.08	1.	0.	0.	.00
+	2 COMBINED AT	CP02	146.	4.25	15.	4.	2.	.12
+	HYDROGRAPH AT	OS07	14.	4.00	2.	0.	0.	.01
+	ROUTED TO	08to10	14.	4.08	2.	0.	0.	.01
+	HYDROGRAPH AT	OS03	6.	4.00	1.	0.	0.	.00
+	ROUTED TO	09to10	6.	4.00	1.	0.	0.	.00
+	HYDROGRAPH AT	OS11	15.	4.08	2.	0.	0.	.01
+	HYDROGRAPH AT	OS01	3.	4.08	1.	0.	0.	.00
+	HYDROGRAPH AT	OS02	4.	4.00	0.	0.	0.	.00
+	5 COMBINED AT	CP10	42.	4.08	5.	1.	1.	.02
+	ROUTED TO	BAS-A2	18.	4.33	2.	0.	0.	.02
+	HYDROGRAPH AT	OS08	11.	4.00	1.	0.	0.	.00
+	ROUTED TO	SAto12	10.	4.00	1.	0.	0.	.00
+	HYDROGRAPH AT	OS04	4.	4.00	0.	0.	0.	.00
+	2 COMBINED AT	CP12	15.	4.00	2.	0.	0.	.01

+	ROUTED TO	BAS-B2	19.	4.00	1.	0.	0.	.01
+	HYDROGRAPH AT	OS12	14.	4.17	2.	0.	0.	.01
+	ROUTED TO	BAS-C	12.	4.33	1.	0.	0.	.01
+	ROUTED TO	SAto11	12.	4.33	1.	0.	0.	.01
+	2 COMBINED AT	DUMMY	19.	4.00	2.	0.	0.	.02
+	HYDROGRAPH AT	OS06	4.	4.25	1.	0.	0.	.00
+	ROUTED TO	BAS06	0.	.00	0.	0.	0.	.00
+	HYDROGRAPH AT	OS05	1.	4.08	0.	0.	0.	.00
+	2 COMBINED AT	CP14	1.	4.08	0.	0.	0.	.01
+	HYDROGRAPH AT	SA06	45.	4.58	9.	2.	1.	.08
+	HYDROGRAPH AT	RCSTW	82.	4.17	8.	2.	1.	.16
+	ROUTED TO	SNTW-7	81.	4.25	8.	2.	1.	.16
+	HYDROGRAPH AT	SA07	47.	4.50	9.	2.	1.	.08
+	ROUTED TO	05to11	46.	4.50	9.	2.	1.	.08
+	5 COMBINED AT	CP11	152.	4.42	28.	7.	3.	.18
+	ROUTED TO	BAS-B	137.	4.58	28.	7.	3.	.18
+	3 COMBINED AT	CP06	248.	4.33	44.	11.	5.	.32
+	ROUTED TO	BAS-A	251.	4.33	44.	11.	5.	.32
+	DIVERSION TO	WEST	205.	4.33	36.	9.	4.	.32
+	HYDROGRAPH AT	NSA06	45.	4.33	8.	2.	1.	.32
+	ROUTED TO	06-13B	42.	4.50	8.	2.	1.	.32
+	HYDROGRAPH AT	W13B	138.	4.17	16.	4.	2.	.13
+	2 COMBINED AT	CPW13B	145.	4.33	24.	6.	3.	.44
+	HYDROGRAPH AT	W14B	138.	4.17	16.	4.	2.	.13
+	2 COMBINED AT	CPW14B	270.	4.25	39.	10.	5.	.57
+	ROUTED TO	14B-21	254.	4.33	39.	10.	5.	.57
+	HYDROGRAPH AT	RCSTW	205.	4.33	36.	9.	4.	.32
+	ROUTED TO	RWCP6A	204.	4.42	36.	9.	4.	.32
+	ROUTED TO	RWCP6B	199.	4.42	36.	9.	4.	.32
+	HYDROGRAPH AT	W22	274.	4.25	35.	9.	4.	.25
+	2 COMBINED AT	CPW22	452.	4.33	70.	18.	9.	.25
+	ROUTED TO	RCPW22	374.	4.50	70.	18.	9.	.25
+	HYDROGRAPH AT	W21	316.	4.17	32.	8.	4.	.25
+	DIVERSION TO	RETDIV	316.	4.17	32.	8.	4.	.25
+	HYDROGRAPH AT	RETAIN	0.	.00	0.	0.	0.	.25
	3 COMBINED AT							

+ CPW21	514.	4.50	97.	24.	12.	1.07

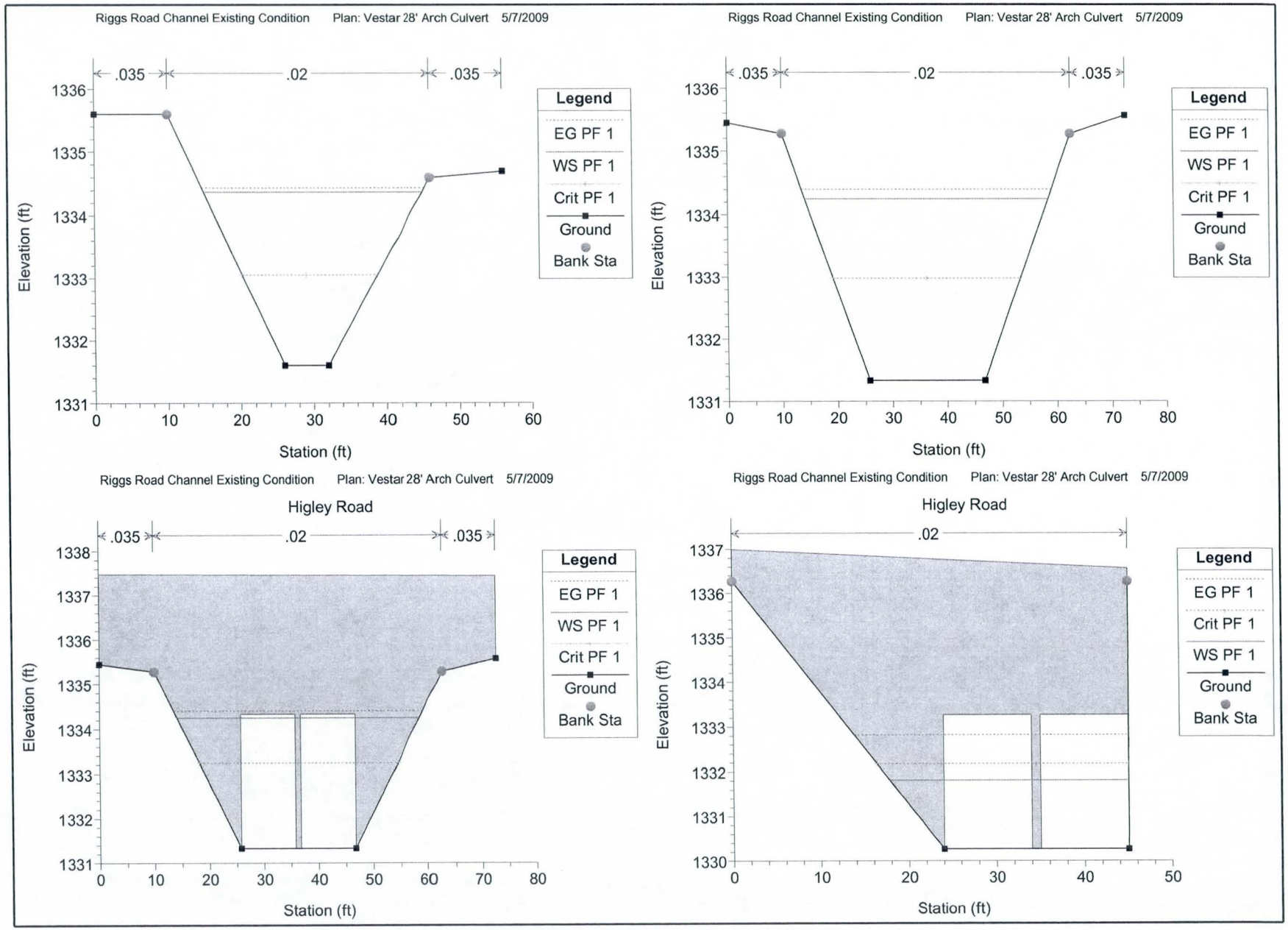
*** NORMAL END OF HEC-1 ***

APPENDIX H
HEC-RAS Model


Riggs Road Channel Existing Condition
Plan: Vestar 28' Arch Culvert 5/7/2009
Stream Reach
Higley Rd
164th St
Vestar Arch Culvert
Ped. Bridge
S. Mountain Wood Blvd
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Elevation (ft)
1340
1330
1320
1310
1300
1290
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)

HEC-RAS Plan: Vestar 28' River: Stream Reach: Reach Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach	6150.000	PF 1	100.00	1331.60	1334.38	1333.06	1334.44	0.000375	1.99	50.15	30.09	0.27
Reach	6105.	PF 1	300.00	1331.33	1334.25	1332.98	1334.41	0.000656	3.14	95.58	44.39	0.38
Reach	6034.5		Culvert									
Reach	5919	PF 1	320.00	1330.27	1332.93		1333.25	0.001476	4.57	70.07	31.68	0.54
Reach	5869	PF 1	320.00	1330.02	1332.99	1331.58	1333.17	0.000541	3.57	101.99	40.78	0.37
Reach	5422.5		Culvert									
Reach	4976.	PF 1	320.00	1324.64	1327.43		1327.53	0.000311	2.59	126.95	51.20	0.27
Reach	4926	PF 1	320.00	1324.34	1327.43	1325.57	1327.51	0.000243	2.25	142.55	52.39	0.24
Reach	4663		Culvert									
Reach	4000	PF 1	320.00	1318.78	1321.13		1321.42	0.001164	4.48	82.26	42.09	0.51
Reach	3960	PF 1	320.00	1318.54	1320.44	1320.44	1321.28	0.004565	7.69	48.66	31.37	0.98
Reach	3790.	PF 1	320.00	1317.48	1319.24	1319.45	1320.34	0.006926	8.75	42.59	30.76	1.19
Reach	3710.	PF 1	320.00	1317.04	1318.97	1318.94	1319.83	0.004316	7.57	46.34	27.79	0.96
Reach	3615.	PF 1	320.00	1316.47	1319.00		1319.46	0.001726	5.72	67.33	34.95	0.63
Reach	3565.	PF 1	320.00	1316.30	1318.85		1319.36	0.002075	6.13	66.75	36.53	0.69
Reach	3465.	PF 1	320.00	1315.63	1318.85		1319.16	0.000978	4.81	86.00	39.40	0.49
Reach	3365.	PF 1	320.00	1315.00	1318.90	1316.87	1319.06	0.000353	3.46	116.06	41.00	0.31
Reach	3327		Culvert									
Reach	3270	PF 1	320.00	1314.50	1318.39		1318.58	0.000395	3.65	108.29	45.38	0.33
Reach	3250.	PF 1	570.00	1314.56	1317.35	1317.35	1318.46	0.004032	9.08	79.89	39.82	0.98
Reach	3150.	PF 1	570.00	1313.59	1316.00	1316.48	1317.83	0.008118	11.40	60.01	34.02	1.35
Reach	3050.	PF 1	570.00	1312.83	1315.31	1315.73	1317.02	0.007370	10.98	62.01	34.48	1.29
Reach	2950.	PF 1	570.00	1312.18	1314.84	1315.09	1316.31	0.005603	10.33	68.49	35.21	1.14
Reach	2850.	PF 1	570.00	1311.50	1314.09	1314.44	1315.69	0.006664	10.81	65.59	35.45	1.23
Reach	2750.	PF 1	570.00	1310.99	1313.88	1313.97	1315.15	0.004565	9.69	74.22	36.19	1.04
Reach	2650.	PF 1	570.00	1310.27	1312.51	1313.05	1314.47	0.008751	11.71	57.24	32.50	1.40
Reach	2550.	PF 1	570.00	1309.63	1312.49	1312.51	1313.70	0.004098	9.40	75.50	35.86	0.99
Reach	2450.	PF 1	570.00	1309.06	1311.70	1311.96	1313.20	0.005528	10.43	68.02	34.24	1.14
Reach	2350.	PF 1	570.00	1308.36	1310.96	1311.31	1312.60	0.006351	11.00	65.78	34.40	1.22
Reach	2250.	PF 1	570.00	1307.80	1310.40	1310.70	1311.95	0.005867	10.48	65.34	33.61	1.17
Reach	2150.	PF 1	570.00	1307.29	1310.88	1310.05	1311.51	0.001549	6.74	106.17	40.43	0.63
Reach	2050.	PF 1	570.00	1306.64	1310.87		1311.34	0.000984	5.86	129.92	53.78	0.52
Reach	1950.	PF 1	570.00	1306.28	1310.89		1311.22	0.000603	5.01	169.61	73.86	0.41
Reach	1910	PF 1	570.00	1305.95	1310.98	1308.22	1311.16	0.000268	3.57	217.33	79.99	0.28
Reach	1849		Culvert									
Reach	1790	PF 1	570.00	1304.97	1308.21		1308.72	0.001309	5.89	109.77	40.77	0.58
Reach	1750.	PF 1	570.00	1304.64	1307.70		1308.61	0.002999	8.17	87.45	39.70	0.85
Reach	1650.	PF 1	570.00	1304.25	1307.07	1307.07	1308.24	0.004012	9.25	77.74	37.13	0.98
Reach	1550.	PF 1	570.00	1303.61	1306.59	1306.45	1307.64	0.003397	8.82	82.42	37.27	0.91
Reach	1450.	PF 1	570.00	1303.43	1306.53		1307.27	0.002216	7.39	98.42	42.88	0.74
Reach	1350.	PF 1	570.00	1302.88	1306.16		1307.03	0.002430	8.00	90.88	38.06	0.78
Reach	1250.	PF 1	570.00	1302.50	1306.08		1306.77	0.001693	7.11	108.93	57.22	0.67
Reach	1150.	PF 1	570.00	1302.19	1306.12		1306.56	0.001070	6.03	140.95	57.98	0.54
Reach	1050.	PF 1	570.00	1301.79	1305.95		1306.45	0.001102	6.33	140.26	66.05	0.55
Reach	950.	PF 1	570.00	1301.71	1305.90		1306.32	0.000917	5.83	150.31	66.65	0.50
Reach	850.	PF 1	570.00	1301.34	1305.99		1306.20	0.000452	4.36	207.87	74.68	0.36
Reach	700.	PF 1	570.00	1300.95	1305.89		1306.12	0.000456	4.51	205.44	80.00	0.36
Reach	592.	PF 1	570.00	1300.92	1305.89		1306.07	0.000309	3.79	215.50	62.53	0.30
Reach	539.	PF 1	570.00	1300.58	1305.88		1306.05	0.000268	3.66	224.52	61.55	0.28
Reach	520.0000	PF 1	570.00	1300.53	1305.88		1306.04	0.000254	3.57	231.66	63.38	0.27
Reach	505.0000	PF 1	570.00	1300.50	1305.90	1302.74	1306.03	0.000187	3.13	238.13	58.00	0.24
Reach	497.5		Culvert									
Reach	490.0000	PF 1	570.00	1300.47	1304.09		1304.38	0.000801	4.44	140.46	49.69	0.44
Reach	450.0000	PF 1	570.00	1300.35	1303.20		1304.24	0.003409	8.71	81.28	37.09	0.91
Reach	345.0000	PF 1	570.00	1299.73	1303.23		1303.86	0.001824	7.16	113.20	47.80	0.69
Reach	290.0000	PF 1	570.00	1299.58	1303.15		1303.76	0.001761	7.09	116.27	49.53	0.67
Reach	190.0000	PF 1	570.00	1299.23	1302.19	1302.19	1303.44	0.003940	9.51	74.24	33.03	0.98
Reach	150.0000	PF 1	570.00	1299.11	1301.40	1301.87	1303.17	0.008357	11.41	62.18	36.28	1.36
Reach	105.0000	PF 1	570.00	1299.10	1300.58	1301.21	1302.63	0.016845	11.87	54.69	48.01	1.79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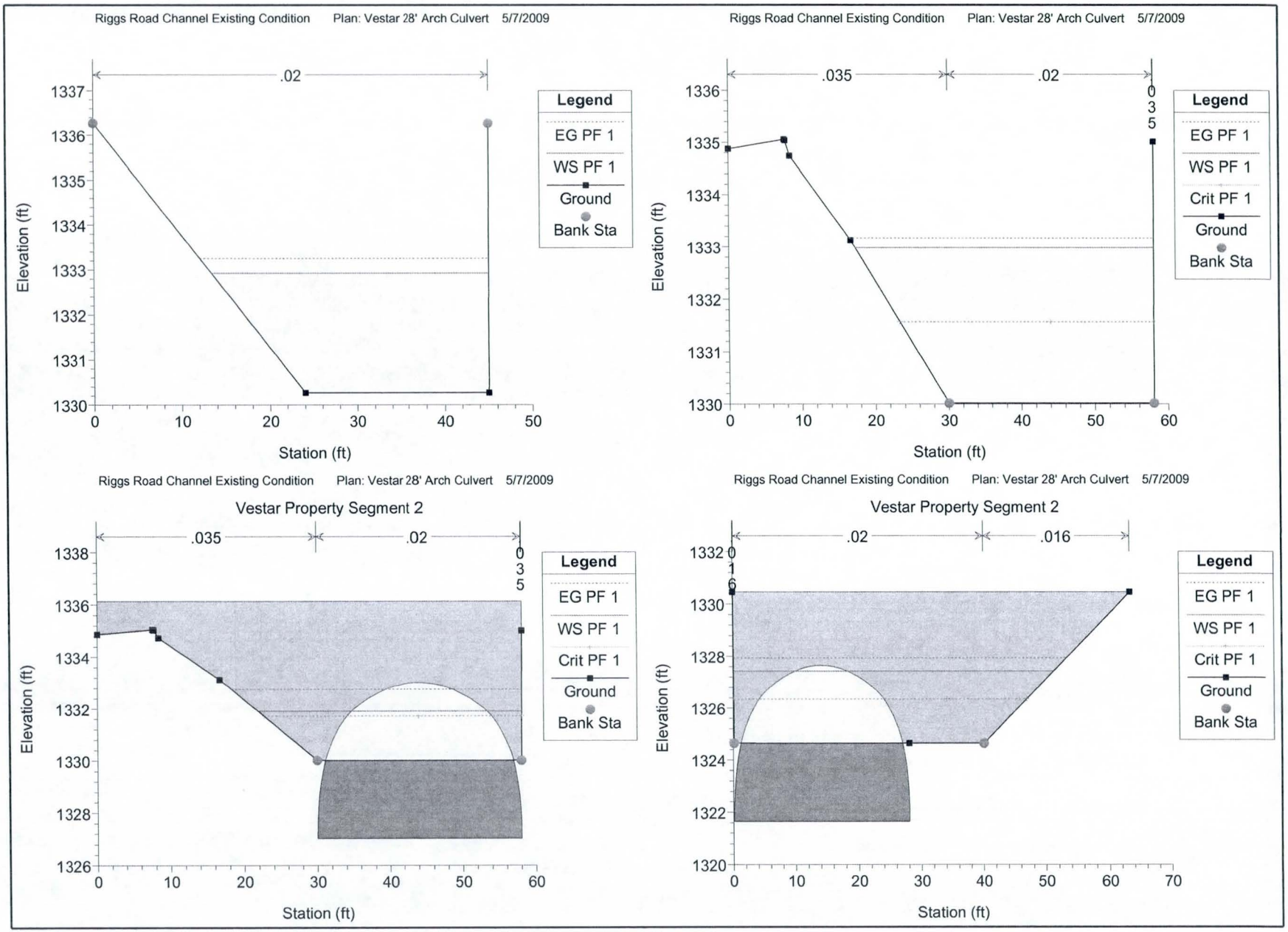
.035
.02
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
Higley Road
.035
.02
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
Higley Road
.02
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta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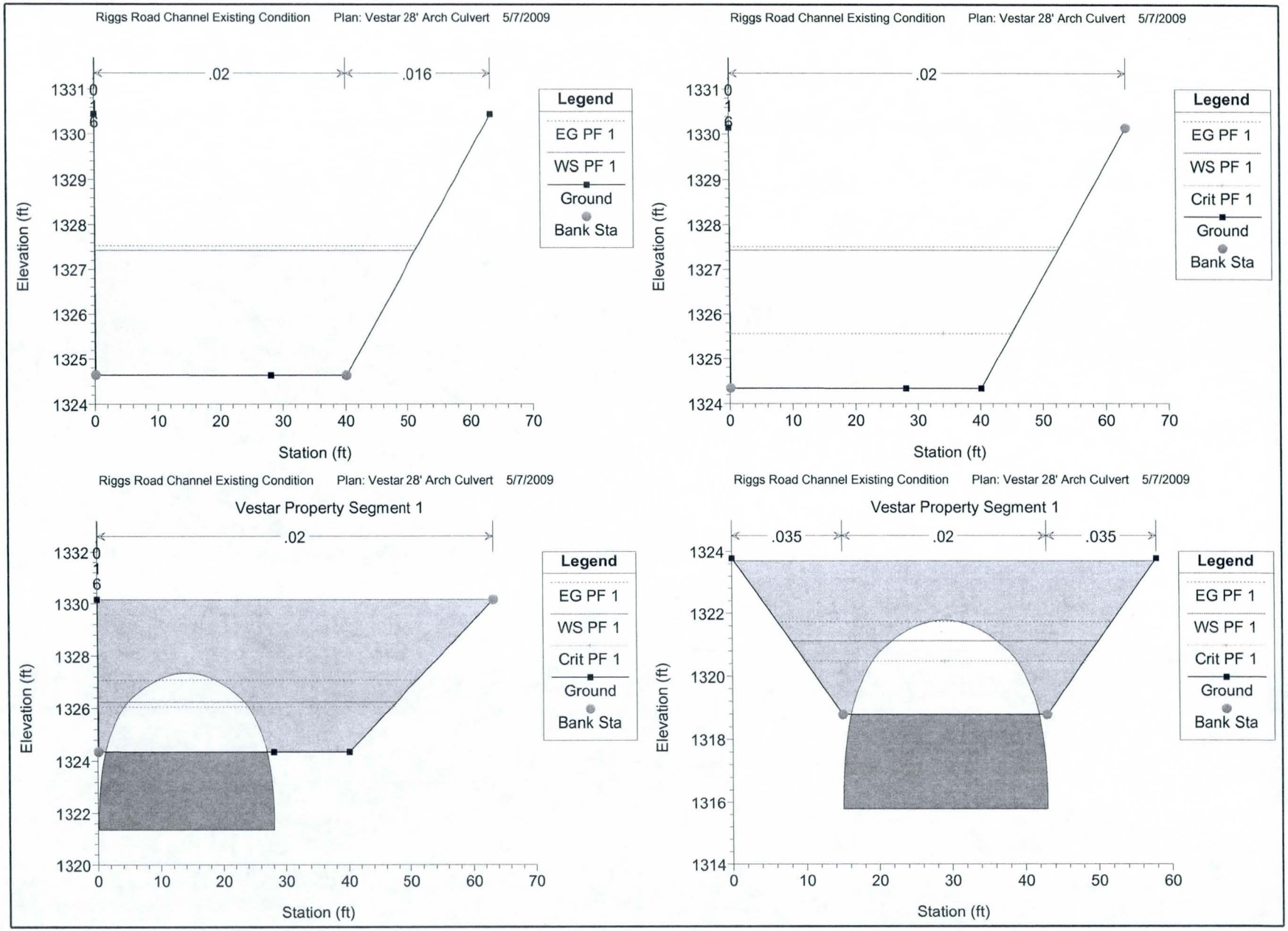
.02
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
Vestar Property Segment 2
.035
.02
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
Vestar Property Segment 2
.02
.016
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta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.02
.016
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.02
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
Vestar Property Segment 1
.02
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
Vestar Property Segment 1
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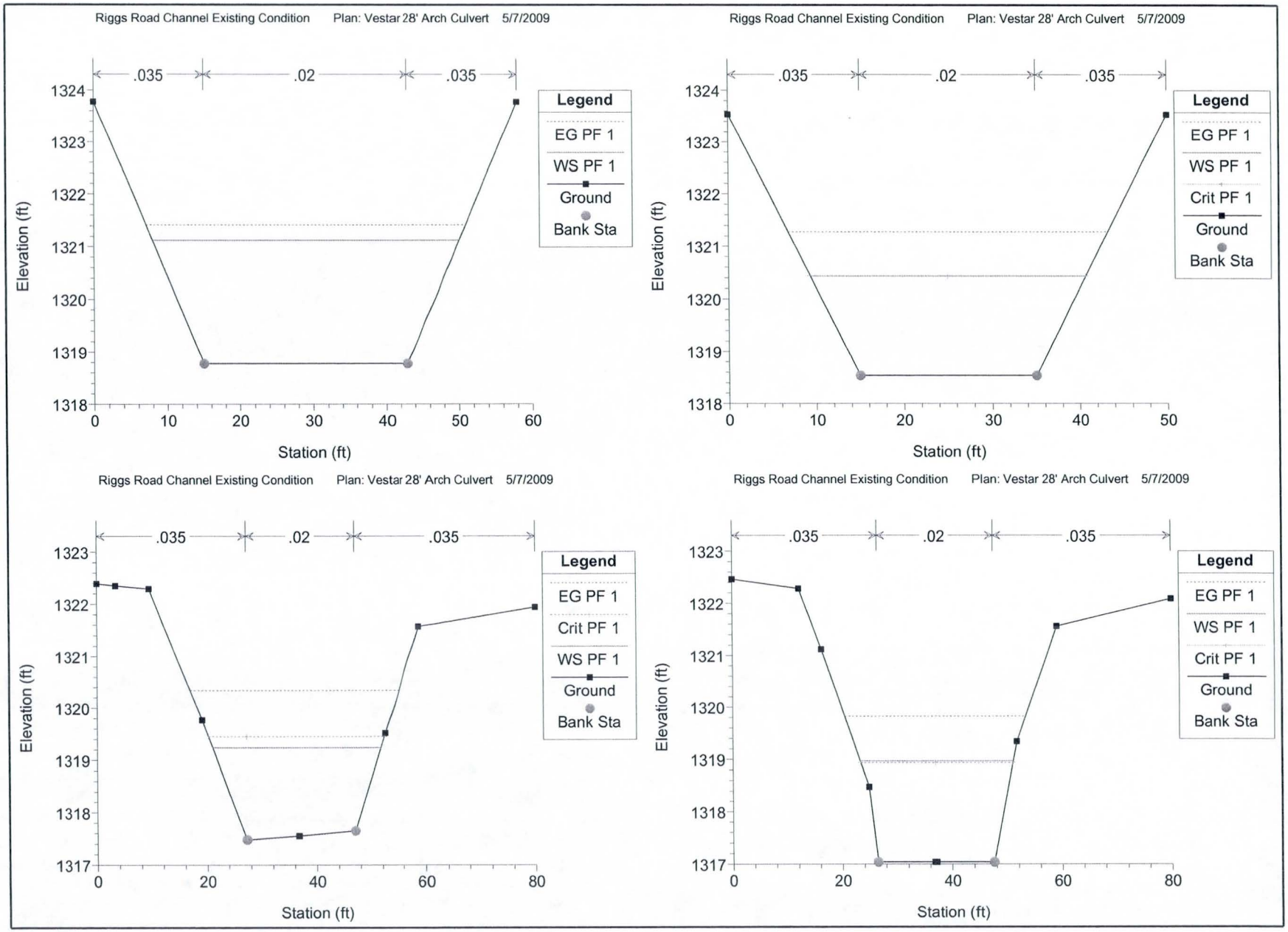
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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.035
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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1324
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Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
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Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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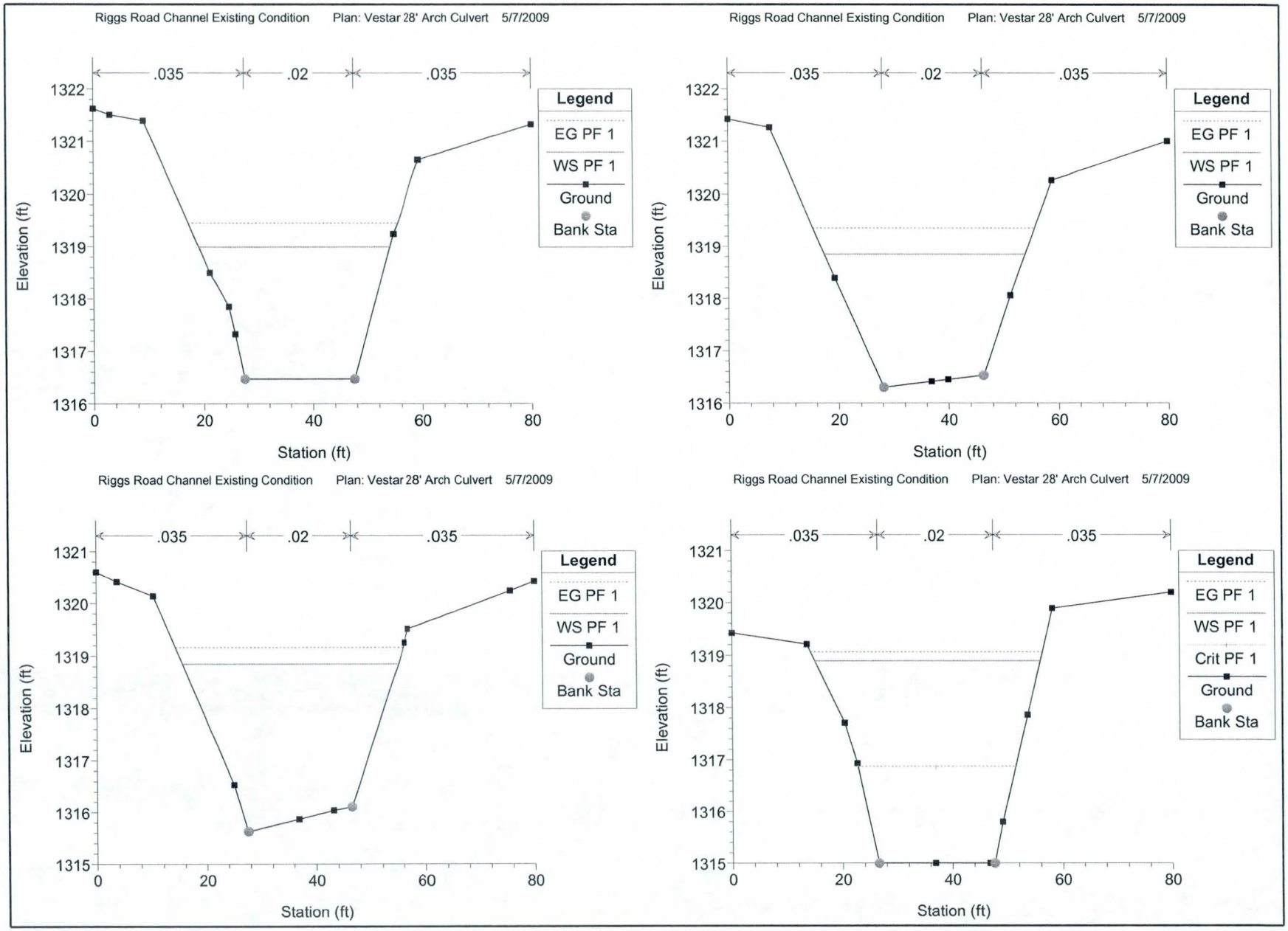
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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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80

Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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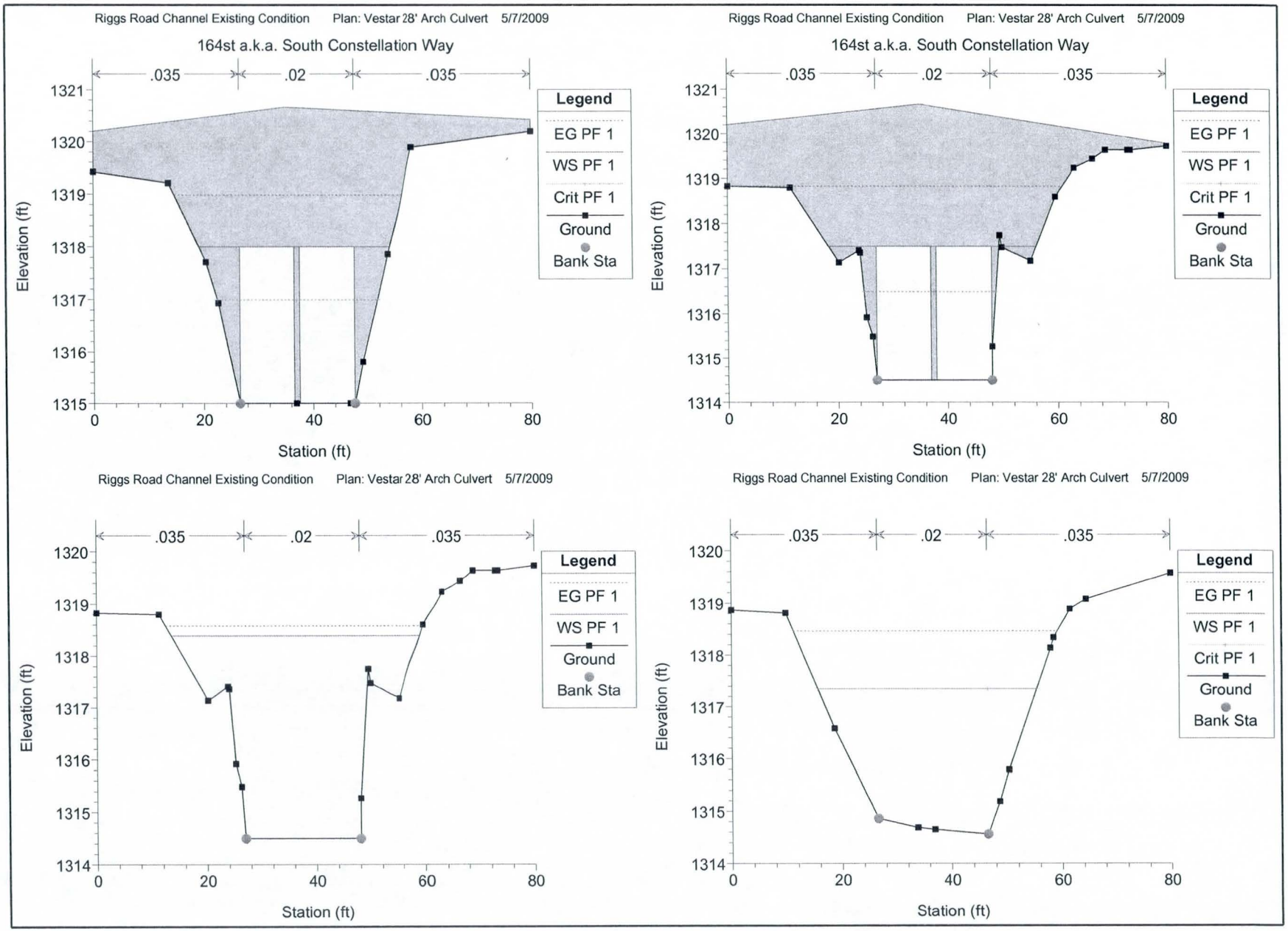
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164st a.k.a. South Constellation Way
.035
.02
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
164st a.k.a. South Constellation Way
.035
.02
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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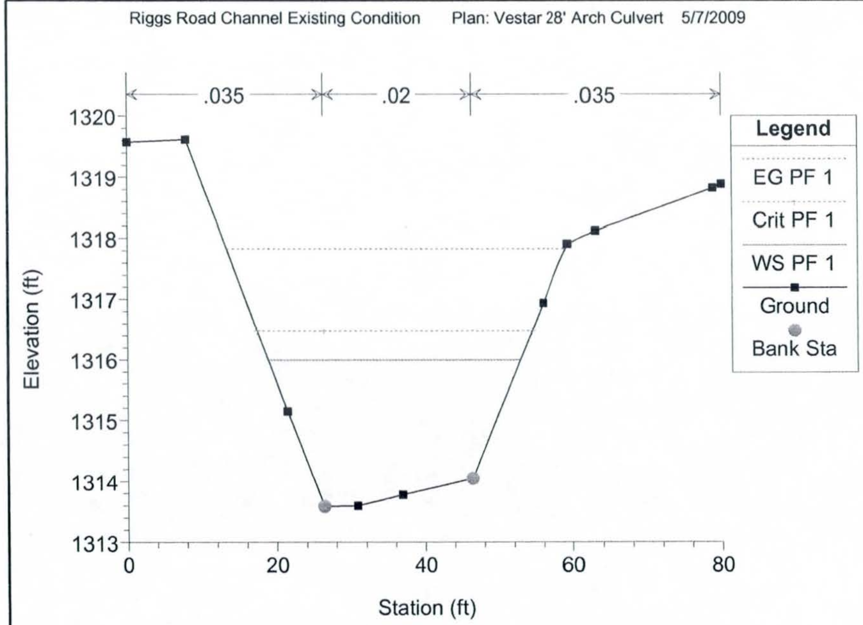
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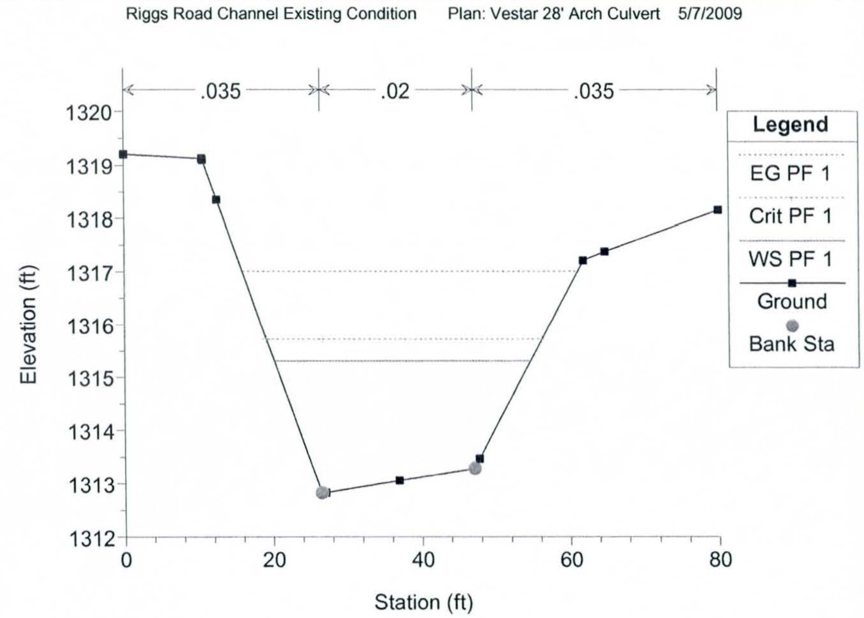
Bank Sta
Elevation (ft)
Station (ft)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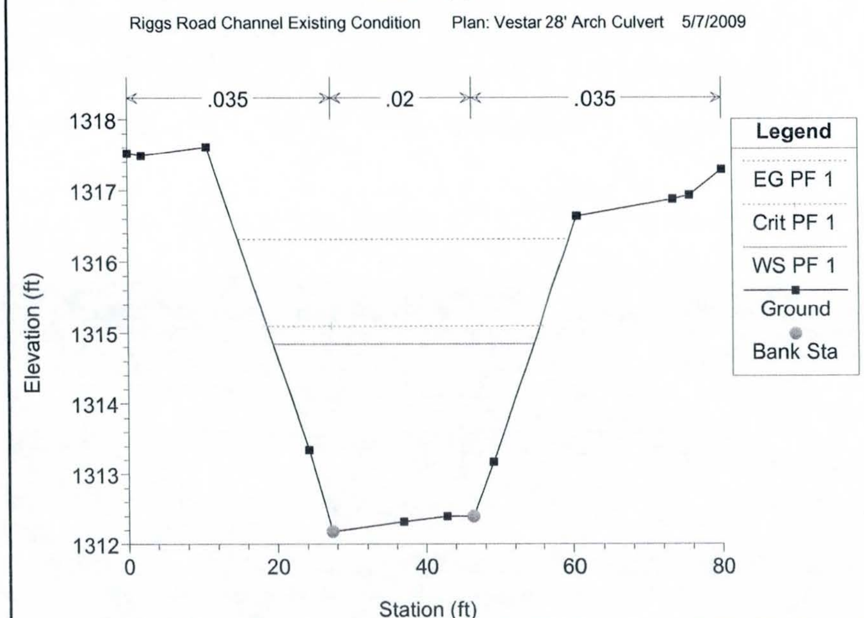
Bank Sta
Elevation (ft)
Station (ft)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WS PF 1
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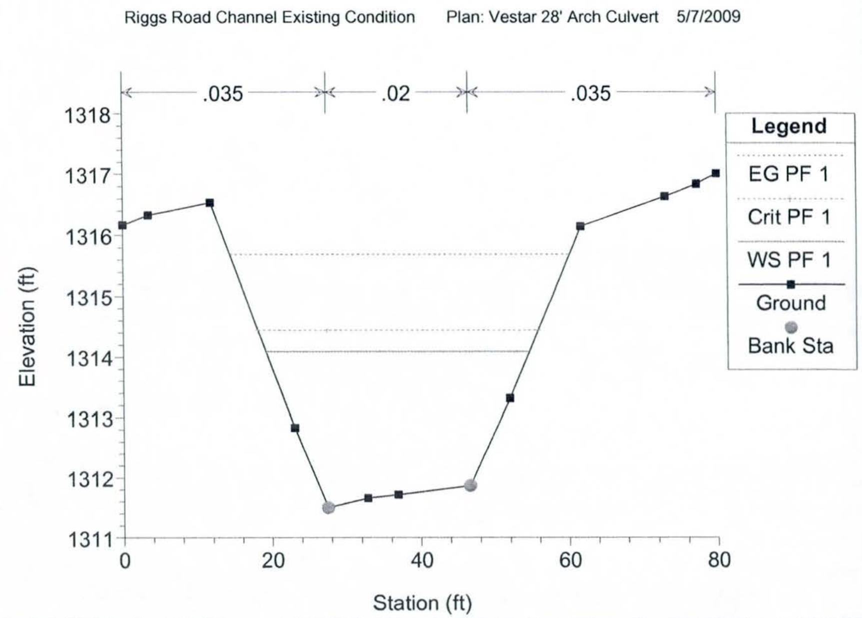
Bank Sta
Elevation (ft)
Station (ft)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Legend
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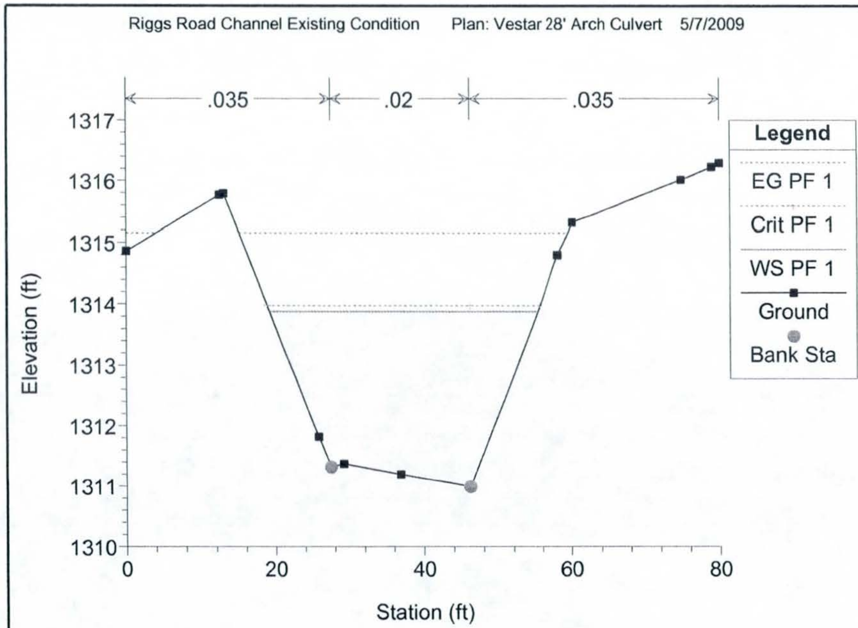
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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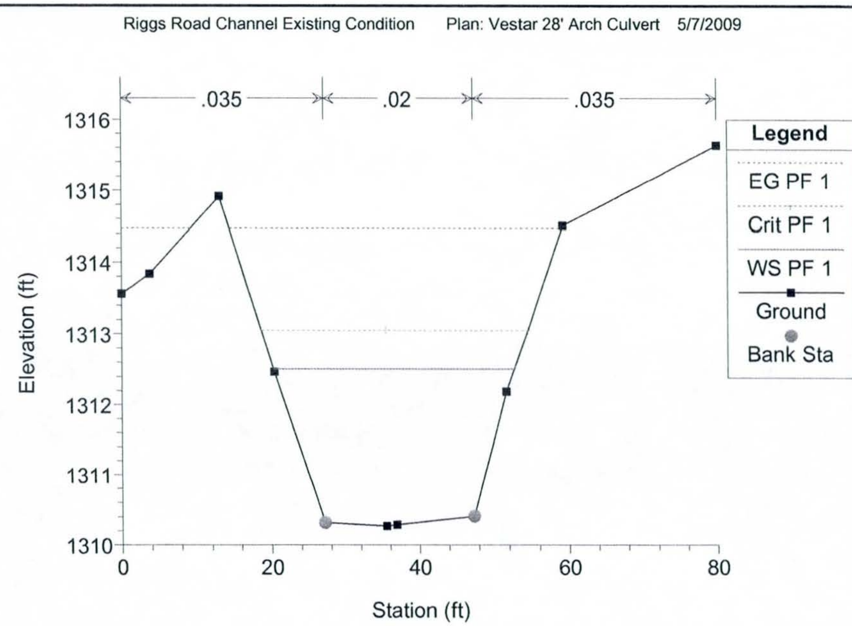
.035
.02
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta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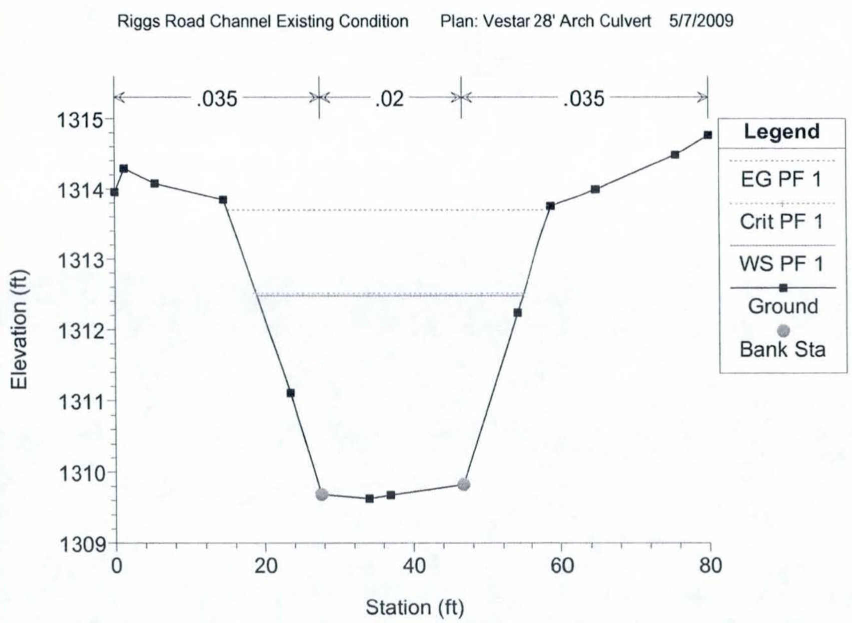
.02
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta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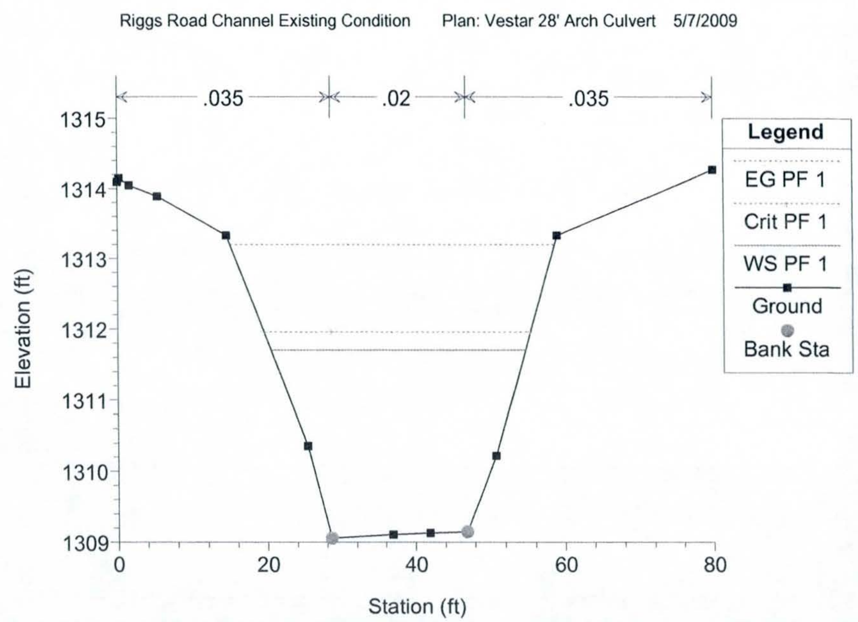
.035
.02
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta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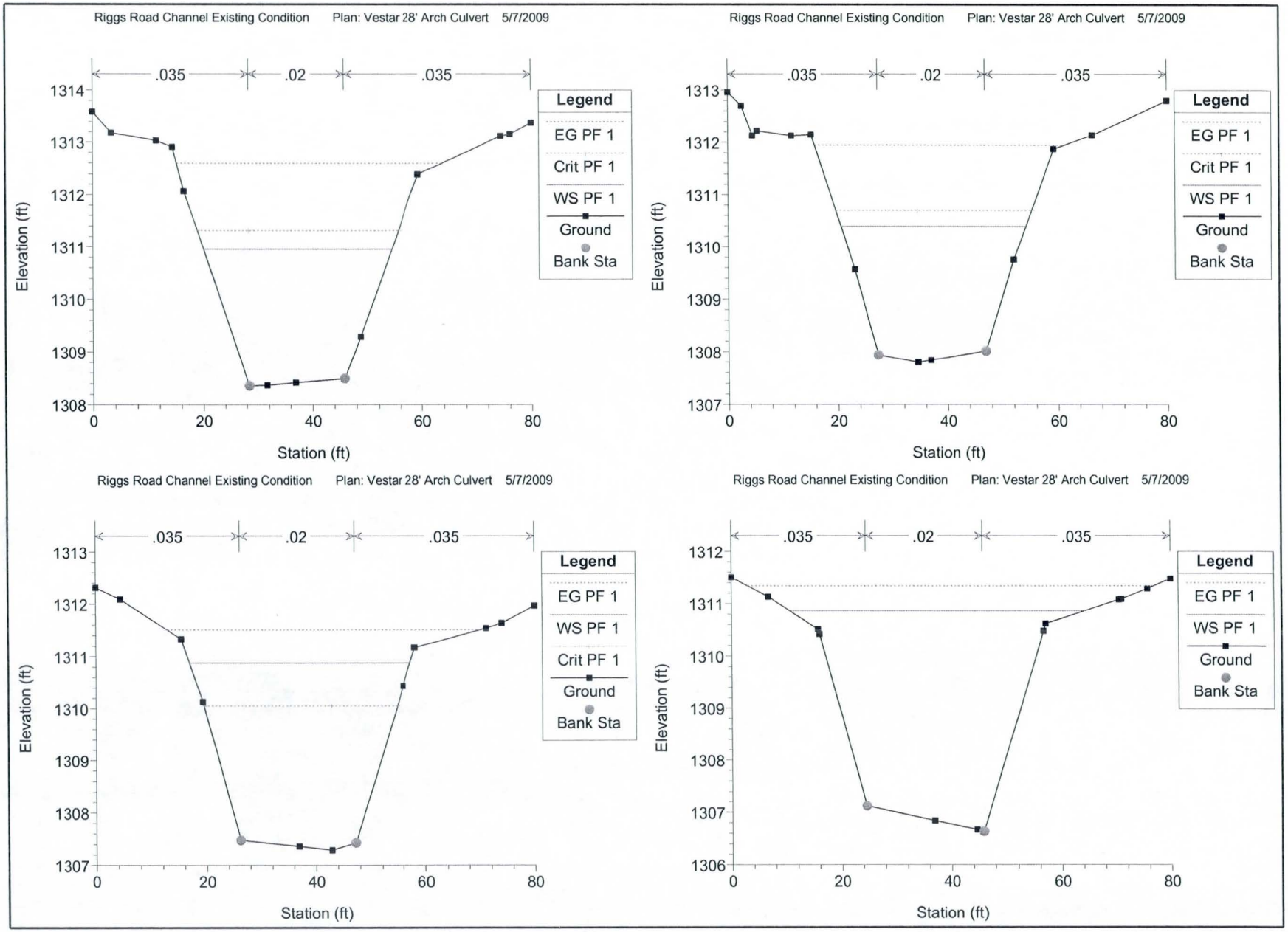
.035
.02
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta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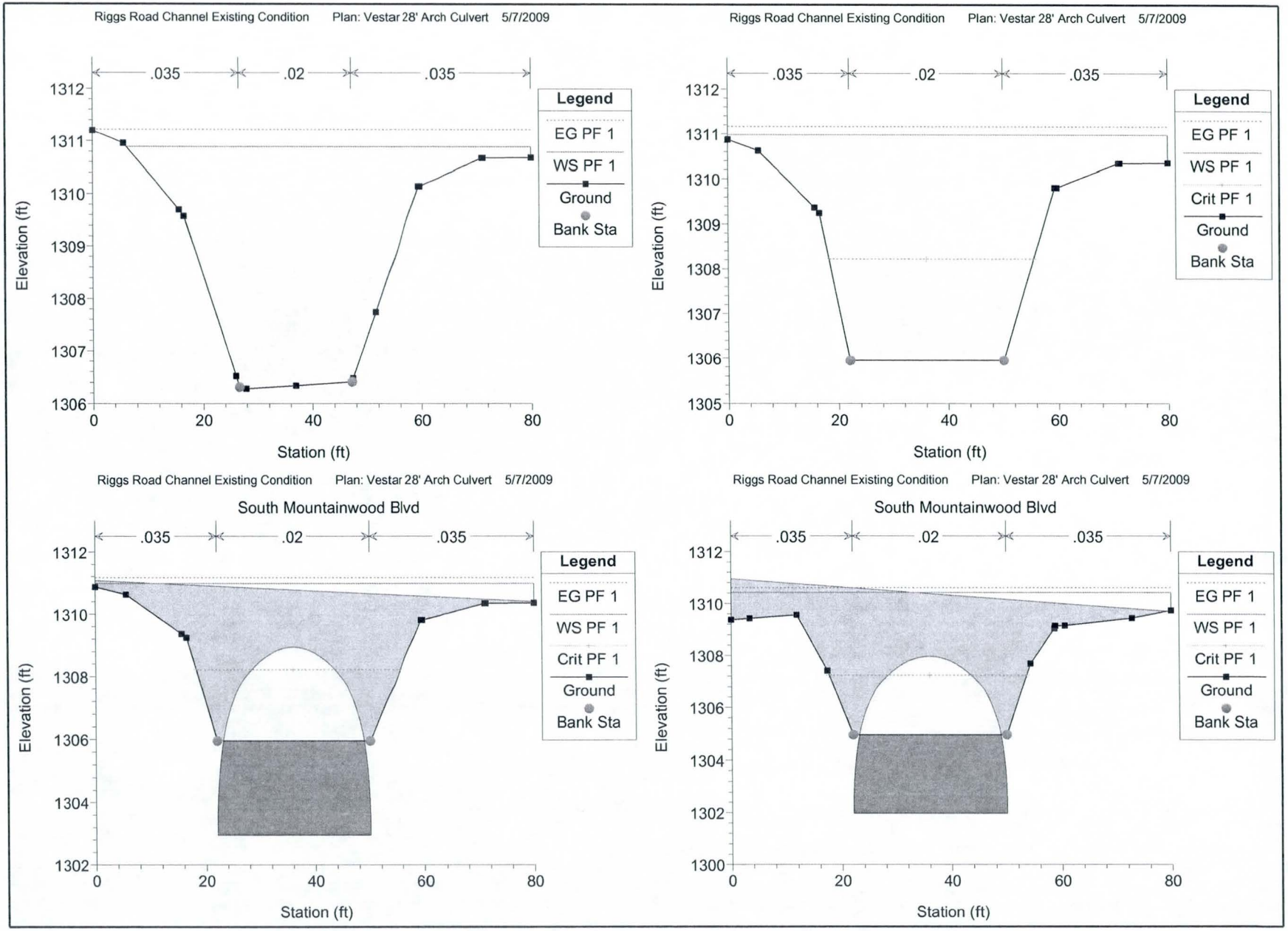
.035
.02
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1312
1311
1310
1309
1308
1307
1306
0
20
40
60
80
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1312
1311
1310
1309
1308
1307
1306
1305
0
20
40
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80
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
South Mountainwood Blvd
.035
.02
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1312
1310
1308
1306
1304
1302
0
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40
60
80
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
South Mountainwood Blvd
.035
.02
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1312
1310
1308
1306
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1302
1300
0
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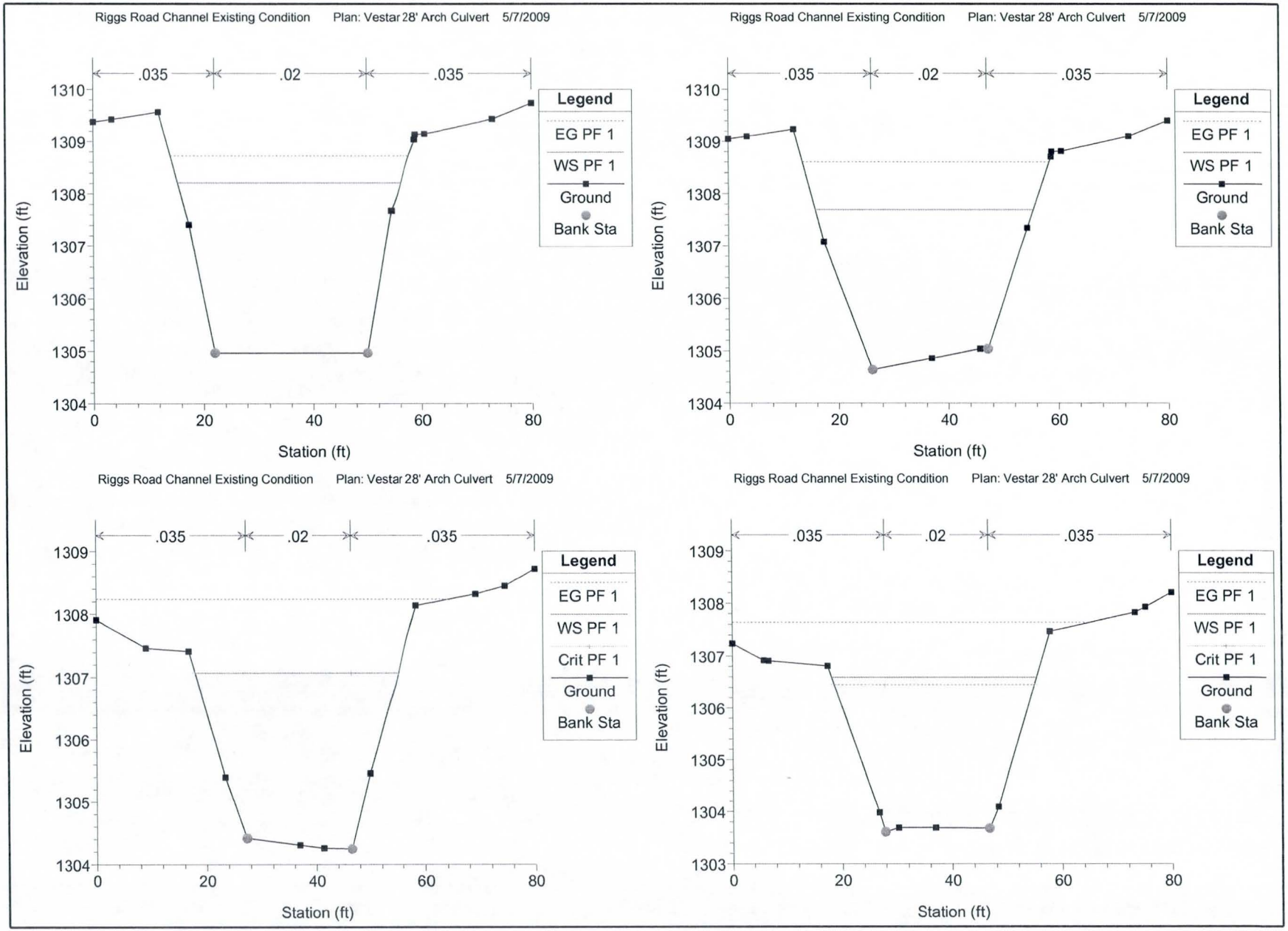
60
80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.035
.02
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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0
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80
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1309
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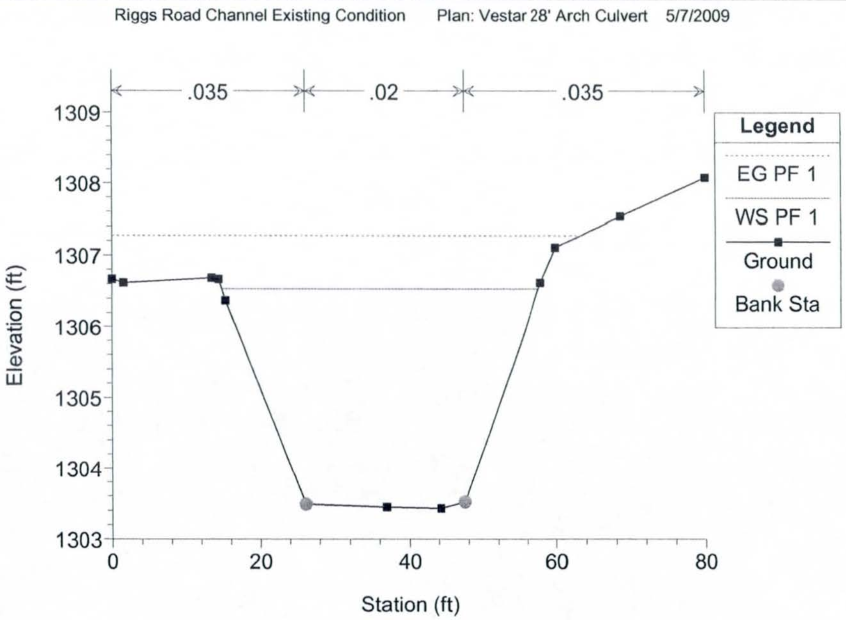
1306
1305
1304
1303
0
20
40
60
80


Riggs Road Channel Existing Condition
Plan: Vestar 28' Arch Culvert
5/7/2009
.035
.02
.035
Elevation (ft)
1303
1304
1305
1306
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1309
Station (ft)
0
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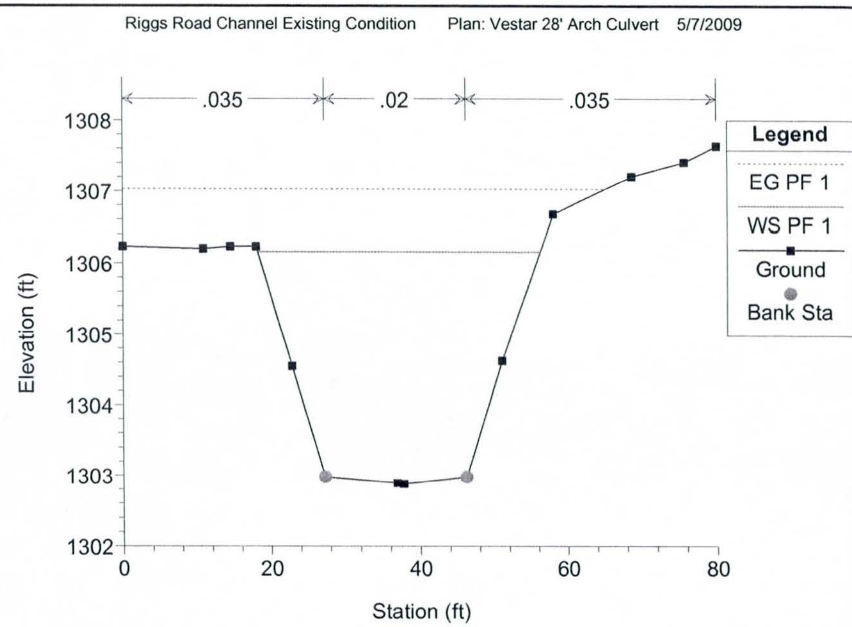
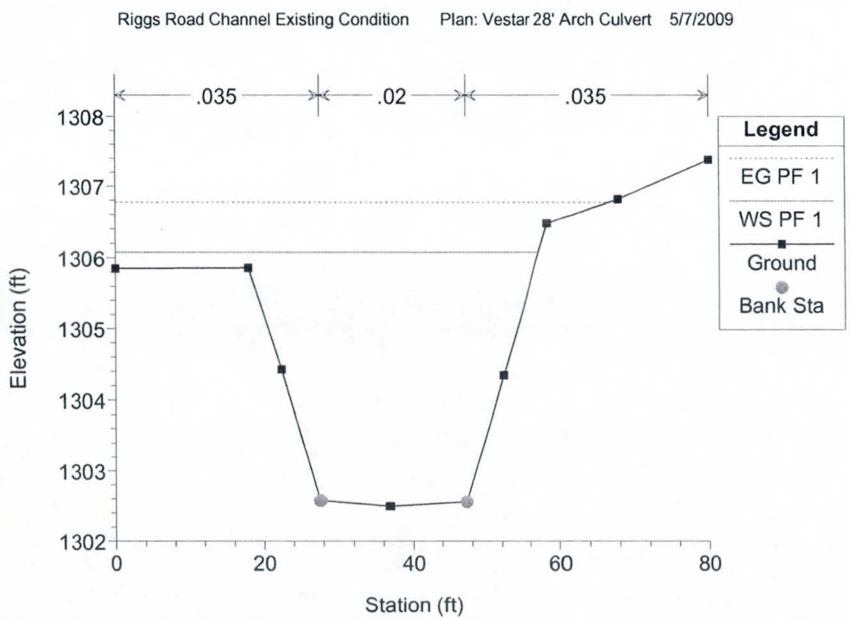
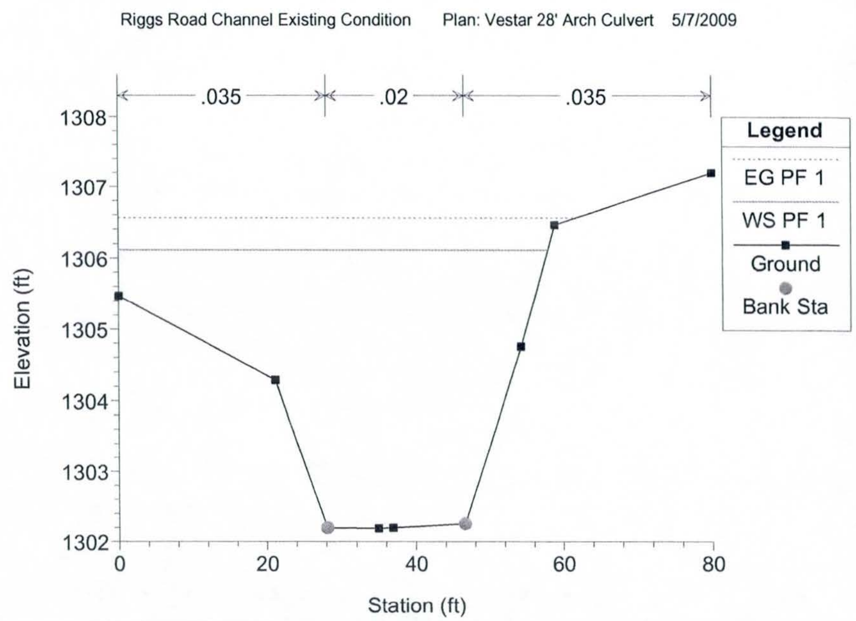
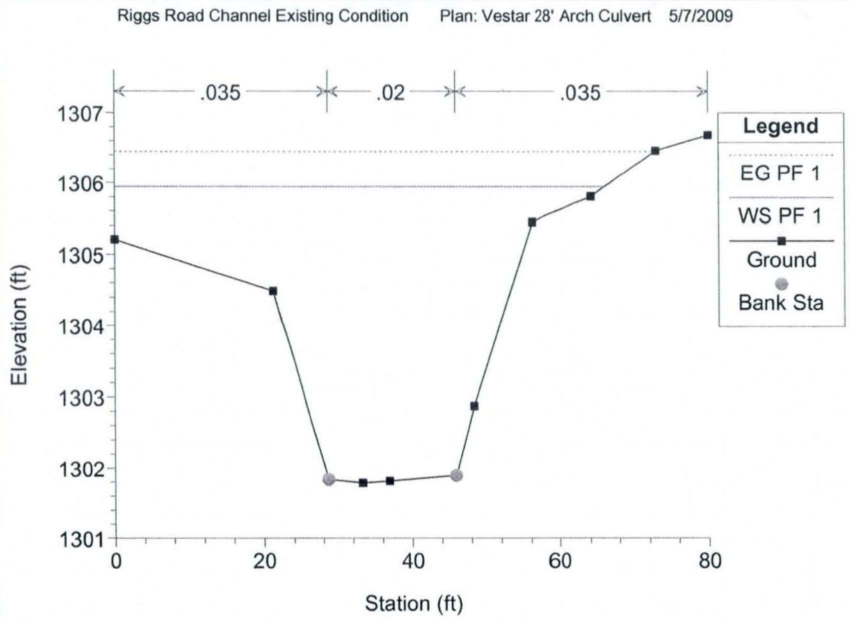
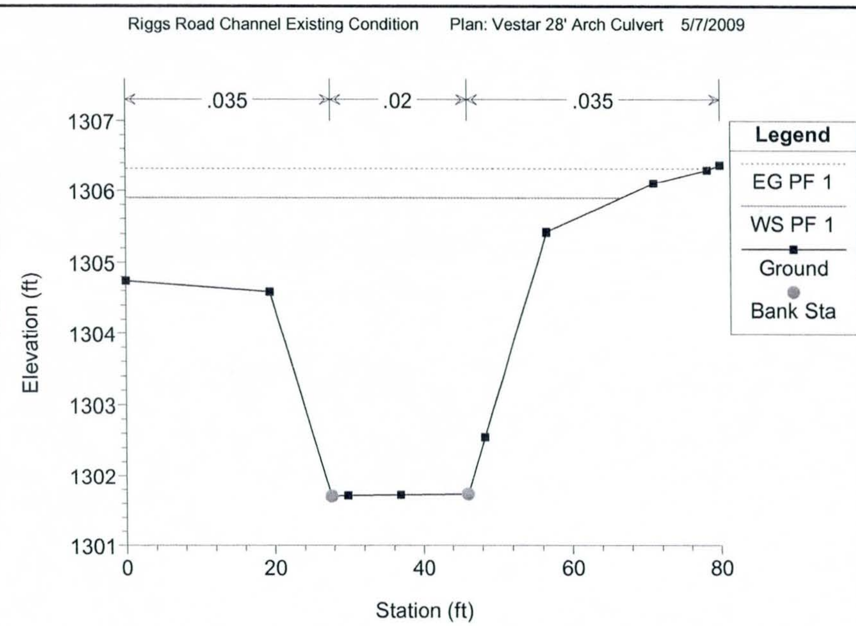
60
80
Legend
EG PF 1
WS PF 1
Ground
Bank Sta

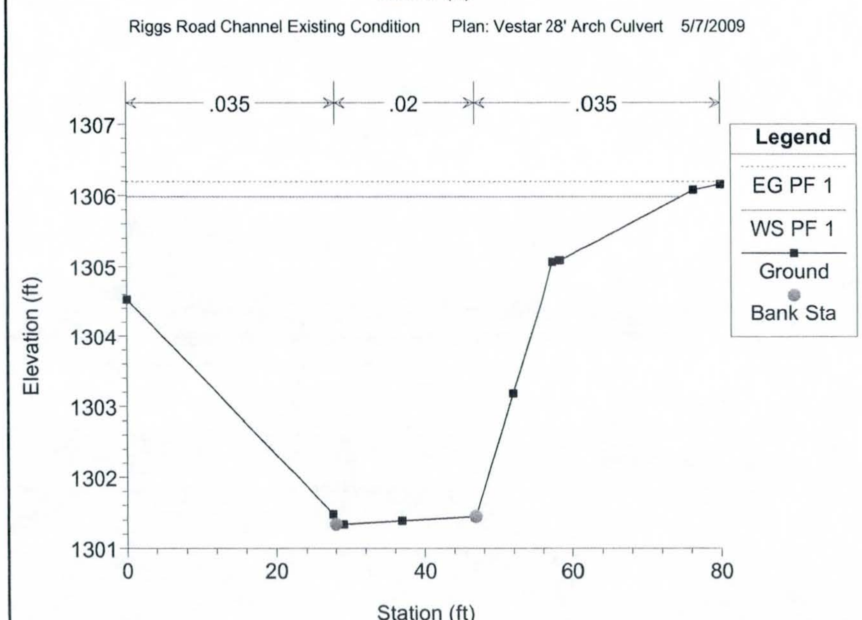

Riggs Road Channel Existing Condition
Plan: Vestar 28' Arch Culvert
5/7/2009
.035
.02
.035
Elevation (ft)
1302
1303
1304
1305
1306
1307
1308
Station (ft)
0
20
40
60
80
Legend
EG PF 1
WS PF 1
Ground
Bank Sta

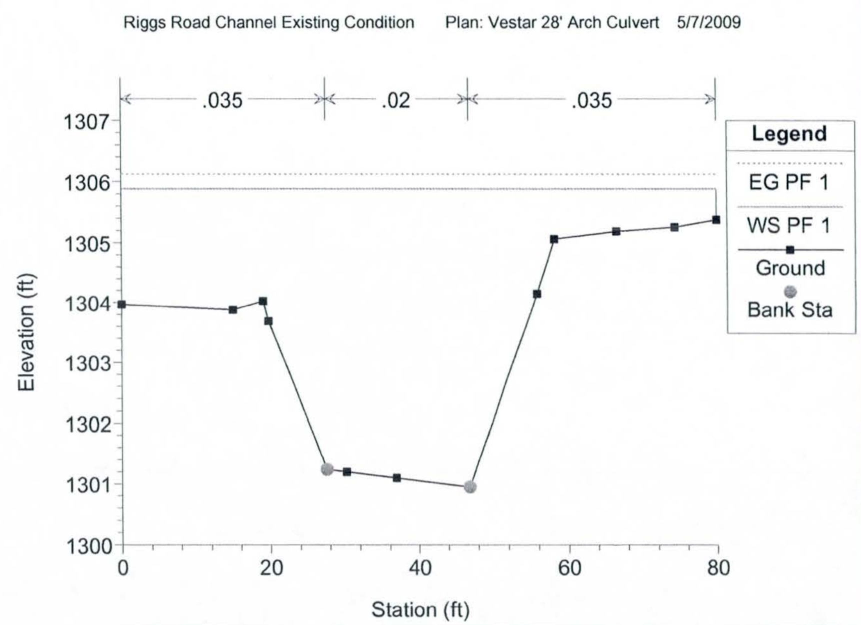

Riggs Road Channel Existing Condition
Plan: Vestar 28' Arch Culvert
5/7/2009
.035
.02
.035
Elevation (ft)
1302
1303
1304
1305
1306
1307
1308
Station (ft)
0
20
40
60
80
Legend
EG PF 1
WS PF 1
Ground
Bank Sta

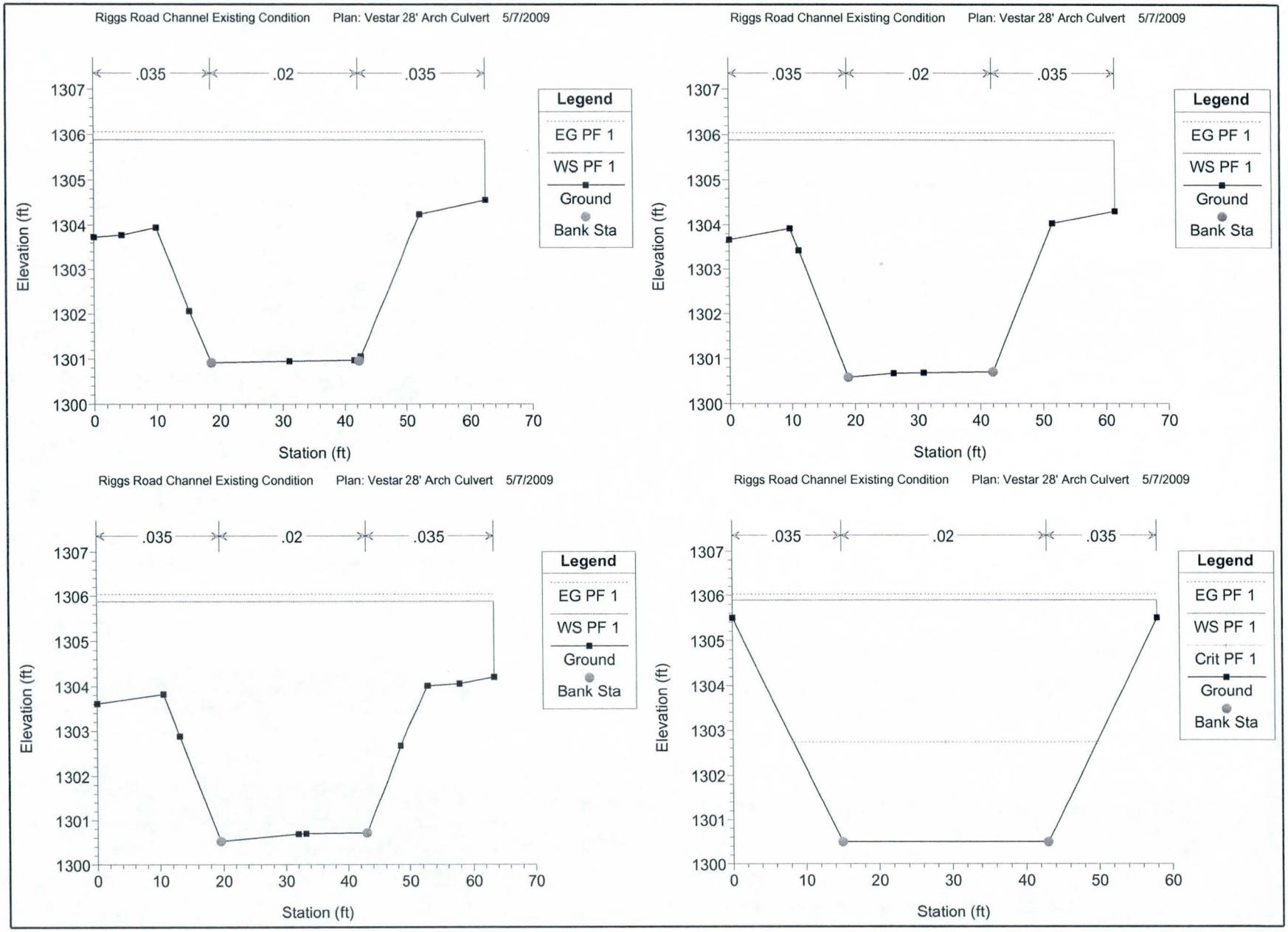

Riggs Road Channel Existing Condition
Plan: Vestar 28' Arch Culvert
5/7/2009
.035
.02
.035
Elevation (ft)
1302
1303
1304
1305
1306
1307
1308
Station (ft)
0
20
40
60
80
Legend
EG PF 1
WS PF 1
Ground
Bank Sta

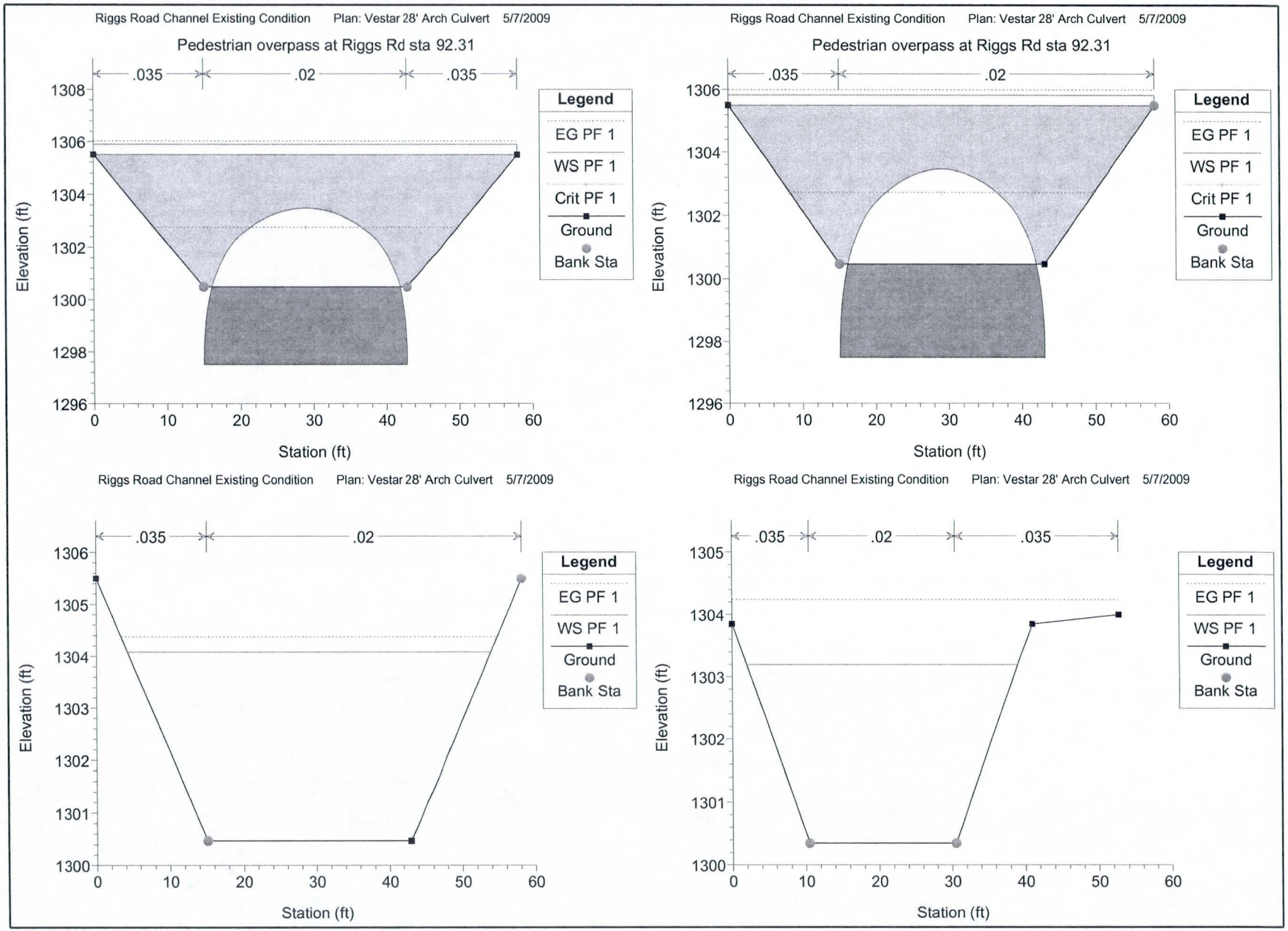

Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1301
1302
1303
1304
1305
1306
1307
0
20
40
60
80

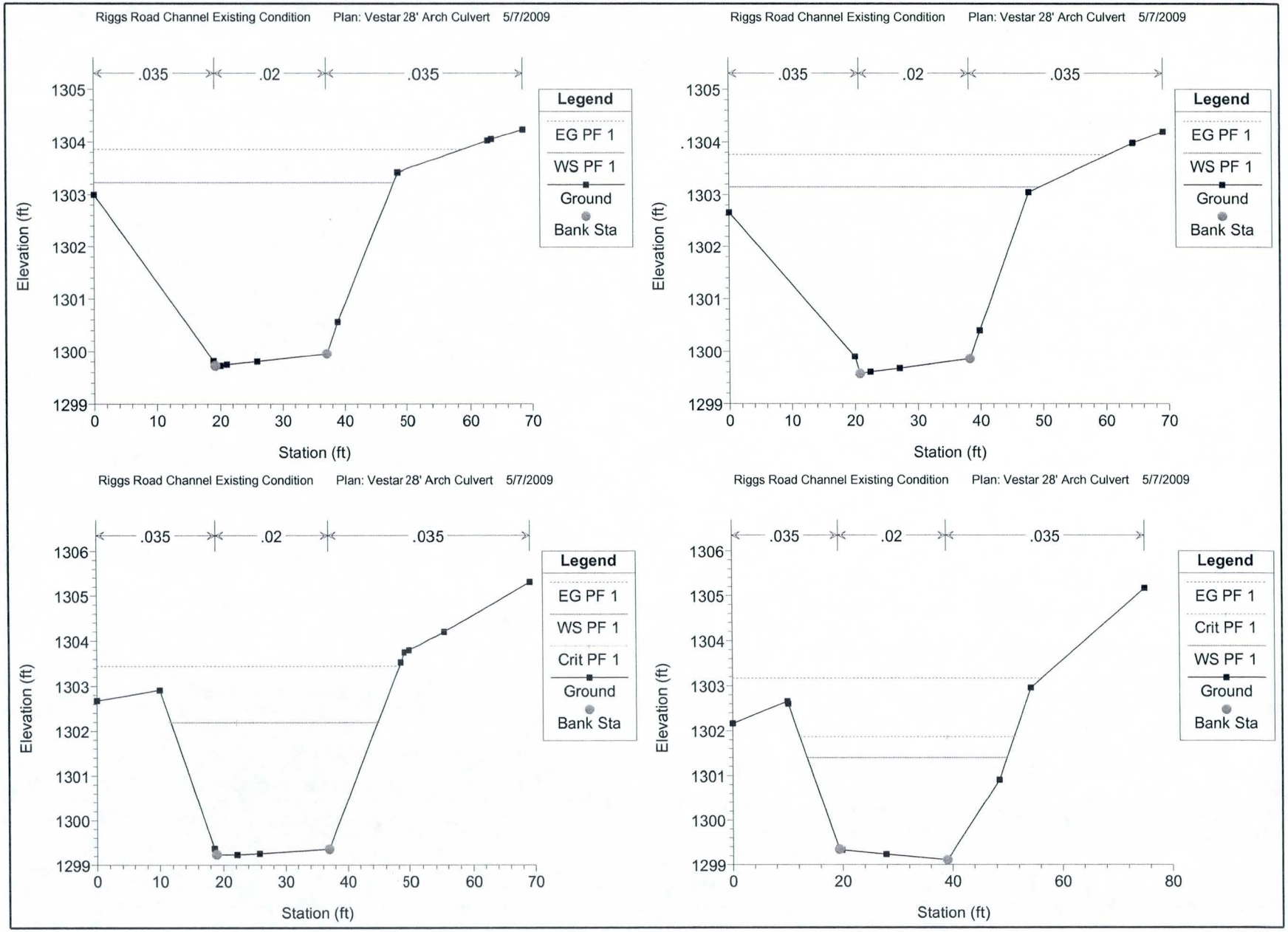

Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1301
1302
1303
1304
1305
1306
1307
0
20
40
60
80

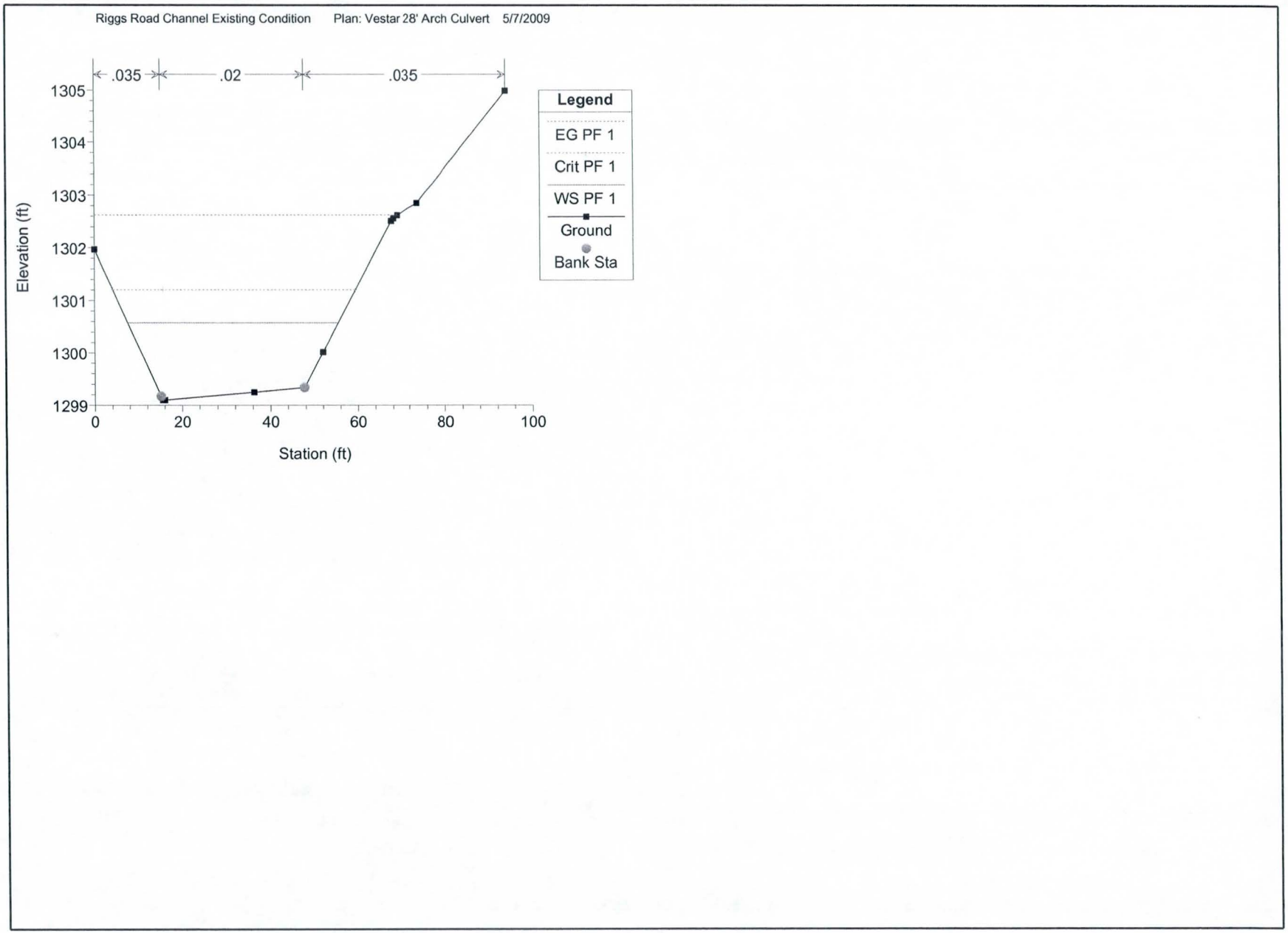

Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1301
1302
1303
1304
1305
1306
1307
0
20
40
60
80

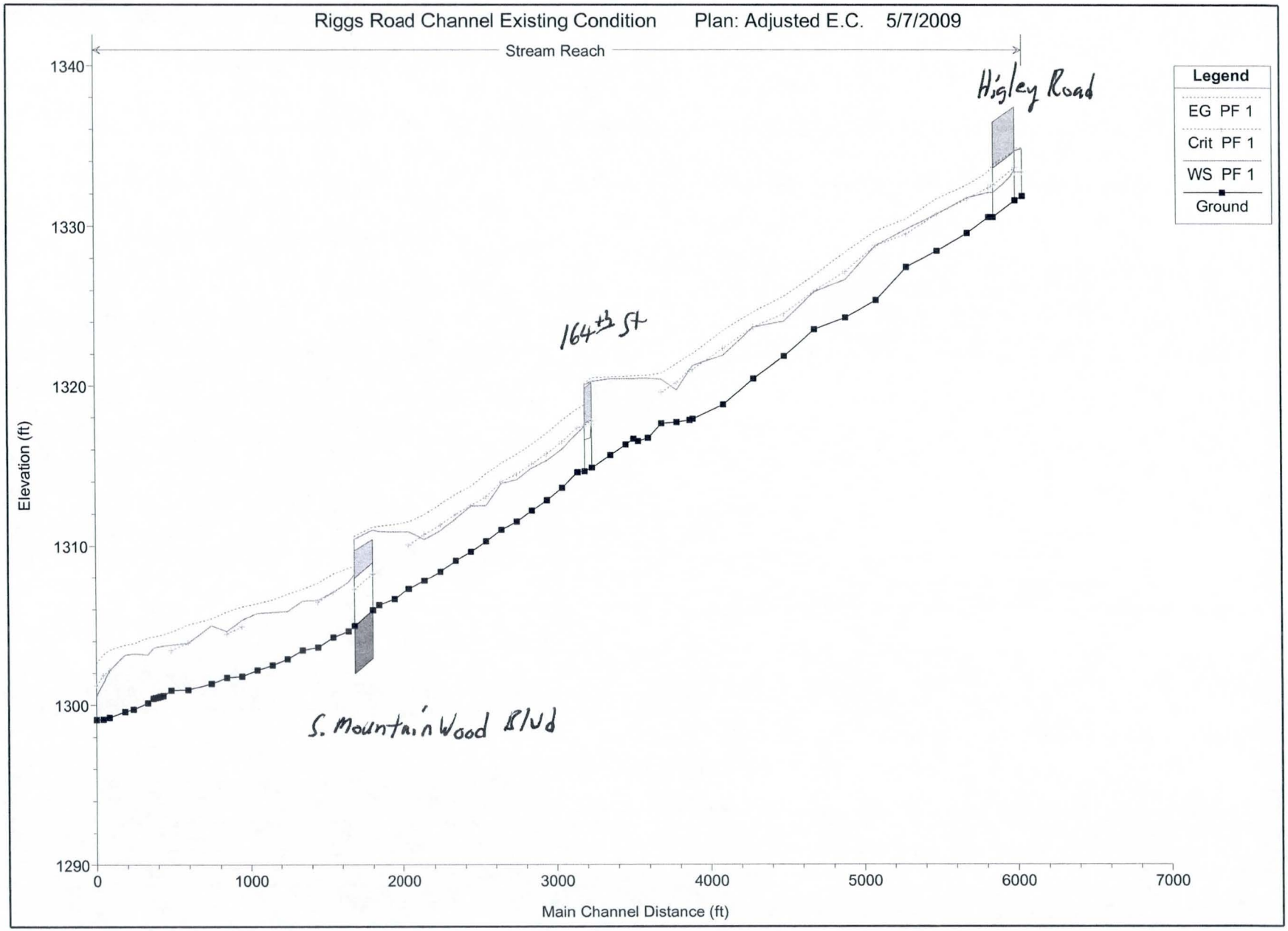

Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1300
1301
1302
1303
1304
1305
1306
1307
0
20
40
60
80


Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
Pedestrian overpass at Riggs Rd sta 92.31
.035
.02
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1308
1306
1304
1302
1300
1298
1296
0
10
20
30
40
50
60
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
Pedestrian overpass at Riggs Rd sta 92.31
.035
.02
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1306
1304
1302
1300
1298
1296
0
10
20
30
40
50
60
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1306
1305
1304
1303
1302
1301
1300
0
10
20
30
40
50
60
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1305
1304
1303
1302
1301
1300
0
10
20
30
40
50
60


Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Riggs Road Channel Existing Condition Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Riggs Road Channel Existing Condition
Plan: Vestar 28' Arch Culvert 5/7/2009
.035
.02
.035
1305
1304
1303
1302
1301
1300
1299
Elevation (ft)
0
20
40
60
80
100
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta


Riggs Road Channel Existing Condition
Plan: Adjusted E.C. 5/7/2009
Stream Reach
Higley Road
164th St
S. Mountain Wood Blvd
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Elevation (ft)
1340
1330
1320
1310
1300
1290
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)

HEC-RAS Plan: Adjusted EC River: Stream Reach: Reach Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach	6150.000	PF 1	100.00	1331.89	1334.82	1333.34	1334.87	0.000297	1.83	54.69	31.37	0.24
Reach	6105.	PF 1	320.00	1331.62	1334.68	1333.34	1334.84	0.000625	3.14	101.82	45.50	0.37
Reach	6034.5		Culvert									
Reach	5935.	PF 1	320.00	1330.57	1332.10	1332.41	1333.35	0.008755	9.24	39.23	30.19	0.37
Reach	5795.	PF 1	320.00	1329.57	1331.79	1331.73	1332.57	0.003974	7.57	53.46	34.67	0.93
Reach	5595.	PF 1	320.00	1328.46	1330.76	1330.76	1331.71	0.004422	8.30	47.48	28.62	0.99
Reach	5395.	PF 1	320.00	1327.45	1329.81	1329.51	1330.44	0.002737	6.80	58.72	33.26	0.79
Reach	5195.	PF 1	320.00	1325.38	1328.80	1328.80	1329.71	0.004764	11.53	60.21	32.68	1.10
Reach	4995.	PF 1	320.00	1324.28	1326.69	1327.18	1328.37	0.008676	11.87	39.84	26.55	1.40
Reach	4795.	PF 1	320.00	1323.54	1325.91	1325.96	1326.93	0.004665	8.89	48.71	29.51	1.03
Reach	4595.	PF 1	320.00	1321.85	1324.07	1324.52	1325.62	0.008920	11.26	40.54	28.46	1.39
Reach	4395.	PF 1	320.00	1320.43	1323.69	1323.69	1324.65	0.004074	10.32	58.28	31.20	1.02
Reach	4195.	PF 1	320.00	1318.80	1321.93	1322.37	1323.47	0.008111	13.89	46.77	28.27	1.41
Reach	3995.	PF 1	320.00	1317.91	1321.27	1321.01	1322.02	0.002904	8.91	65.43	33.29	0.86
Reach	3975.	PF 1	320.00	1317.83	1320.98	1320.98	1321.93	0.004066	9.96	57.72	31.87	1.00
Reach	3890.	PF 1	320.00	1317.70	1319.74	1320.21	1321.37	0.008946	11.03	37.56	26.17	1.39
Reach	3790.	PF 1	320.00	1317.62	1320.40	1319.59	1320.77	0.001286	5.17	77.45	37.60	0.55
Reach	3710.	PF 1	320.00	1316.72	1320.47		1320.66	0.000420	3.67	106.82	39.21	0.33
Reach	3645.	PF 1	320.00	1316.51	1320.46		1320.63	0.000346	3.45	116.17	42.68	0.31
Reach	3615.	PF 1	320.00	1316.66	1320.43		1320.61	0.000437	3.73	117.12	45.56	0.34
Reach	3565.	PF 1	320.00	1316.30	1320.44		1320.59	0.000333	3.43	134.51	52.69	0.30
Reach	3465.	PF 1	320.00	1315.63	1320.44		1320.55	0.000210	2.96	167.96	76.78	0.24
Reach	3345	PF 1	570.00	1314.85	1320.28	1317.55	1320.50	0.000329	4.16	206.50	80.00	0.31
Reach	3320		Culvert									
Reach	3295.	PF 1	570.00	1314.62	1317.44	1317.44	1318.78	0.004031	9.41	65.10	31.27	0.99
Reach	3250.	PF 1	570.00	1314.56	1317.04	1317.35	1318.54	0.006341	10.48	67.74	37.57	1.20
Reach	3150.	PF 1	570.00	1313.59	1316.02	1316.48	1317.81	0.007844	11.28	60.75	34.16	1.33
Reach	3050.	PF 1	570.00	1312.83	1315.32	1315.73	1317.01	0.007329	10.96	62.13	34.50	1.28
Reach	2950.	PF 1	570.00	1312.18	1314.84	1315.09	1316.31	0.005609	10.33	68.46	35.20	1.14
Reach	2850.	PF 1	570.00	1311.50	1314.09	1314.44	1315.69	0.006664	10.81	65.59	35.45	1.23
Reach	2750.	PF 1	570.00	1310.99	1313.88	1313.97	1315.15	0.004565	9.69	74.22	36.19	1.04
Reach	2650.	PF 1	570.00	1310.27	1312.51	1313.05	1314.47	0.008751	11.71	57.24	32.50	1.40
Reach	2550.	PF 1	570.00	1309.63	1312.49	1312.51	1313.70	0.004098	9.40	75.50	35.86	0.99
Reach	2450.	PF 1	570.00	1309.06	1311.70	1311.96	1313.20	0.005528	10.43	68.02	34.24	1.14
Reach	2350.	PF 1	570.00	1308.36	1310.96	1311.31	1312.60	0.006351	11.00	65.78	34.40	1.22
Reach	2250.	PF 1	570.00	1307.80	1310.40	1310.70	1311.95	0.005867	10.48	65.34	33.61	1.17
Reach	2150.	PF 1	570.00	1307.29	1310.88	1310.05	1311.51	0.001549	6.74	106.19	40.43	0.63
Reach	2050.	PF 1	570.00	1306.64	1310.87		1311.34	0.000983	5.86	129.95	53.80	0.52

HEC-RAS Plan: Adjusted EC River: Stream Reach: Reach Profile: PF 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach	1950.	PF 1	570.00	1306.28	1310.89		1311.22	0.000603	5.01	169.65	73.87	0.41
Reach	1910	PF 1	570.00	1305.95	1310.98	1308.22	1311.16	0.000268	3.57	217.37	79.99	0.28
Reach	1849		Culvert									
Reach	1790	PF 1	570.00	1304.97	1308.21		1308.72	0.001309	5.89	109.76	40.77	0.58
Reach	1750.	PF 1	570.00	1304.64	1307.70		1308.61	0.002999	8.17	87.45	39.70	0.85
Reach	1650.	PF 1	570.00	1304.25	1307.07	1307.07	1308.24	0.004010	9.25	77.75	37.14	0.98
Reach	1550.	PF 1	570.00	1303.61	1306.58	1306.45	1307.64	0.003430	8.85	82.14	37.22	0.92
Reach	1450.	PF 1	570.00	1303.43	1306.52		1307.27	0.002247	7.43	97.91	42.80	0.75
Reach	1350.	PF 1	570.00	1302.88	1305.88		1306.96	0.003358	8.86	80.63	36.33	0.91
Reach	1250.	PF 1	570.00	1302.50	1305.82		1306.61	0.002165	7.63	94.49	38.40	0.74
Reach	1150.	PF 1	570.00	1302.19	1305.77		1306.37	0.001592	6.90	120.65	57.02	0.65
Reach	1050.	PF 1	570.00	1301.79	1305.34	1304.92	1306.17	0.002131	7.91	103.40	55.93	0.74
Reach	950.	PF 1	570.00	1301.71	1304.63	1304.48	1305.85	0.003851	9.38	77.74	40.24	0.97
Reach	850.	PF 1	570.00	1301.34	1305.01		1305.41	0.001147	5.92	143.40	57.31	0.55
Reach	700.	PF 1	570.00	1300.95	1303.89	1303.89	1305.05	0.003884	9.19	77.21	37.79	0.97
Reach	592.	PF 1	570.00	1300.92	1303.78	1303.42	1304.58	0.002584	7.56	91.01	44.79	0.79
Reach	539.	PF 1	570.00	1300.58	1303.71		1304.43	0.002117	7.18	96.63	41.83	0.73
Reach	520.0000	PF 1	570.00	1300.53	1303.67		1304.39	0.002150	7.18	96.40	43.50	0.73
Reach	505.0000	PF 1	570.00	1300.49	1303.65		1304.34	0.002062	7.04	98.47	46.67	0.71
Reach	490.0000	PF 1	570.00	1300.45	1303.63		1304.30	0.001999	6.97	100.85	50.88	0.70
Reach	475.	PF 1	570.00	1300.41	1303.56		1304.30	0.002203	7.30	96.39	49.63	0.74
Reach	440.0000	PF 1	570.00	1300.13	1303.16		1304.21	0.003315	8.75	81.03	35.99	0.90
Reach	345.0000	PF 1	570.00	1299.73	1303.23		1303.86	0.001824	7.16	113.20	47.80	0.69
Reach	290.0000	PF 1	570.00	1299.58	1303.15		1303.76	0.001761	7.09	116.27	49.53	0.67
Reach	190.0000	PF 1	570.00	1299.23	1302.19	1302.19	1303.44	0.003940	9.51	74.24	33.03	0.98
Reach	150.0000	PF 1	570.00	1299.11	1301.40	1301.87	1303.17	0.008357	11.41	62.18	36.28	1.36
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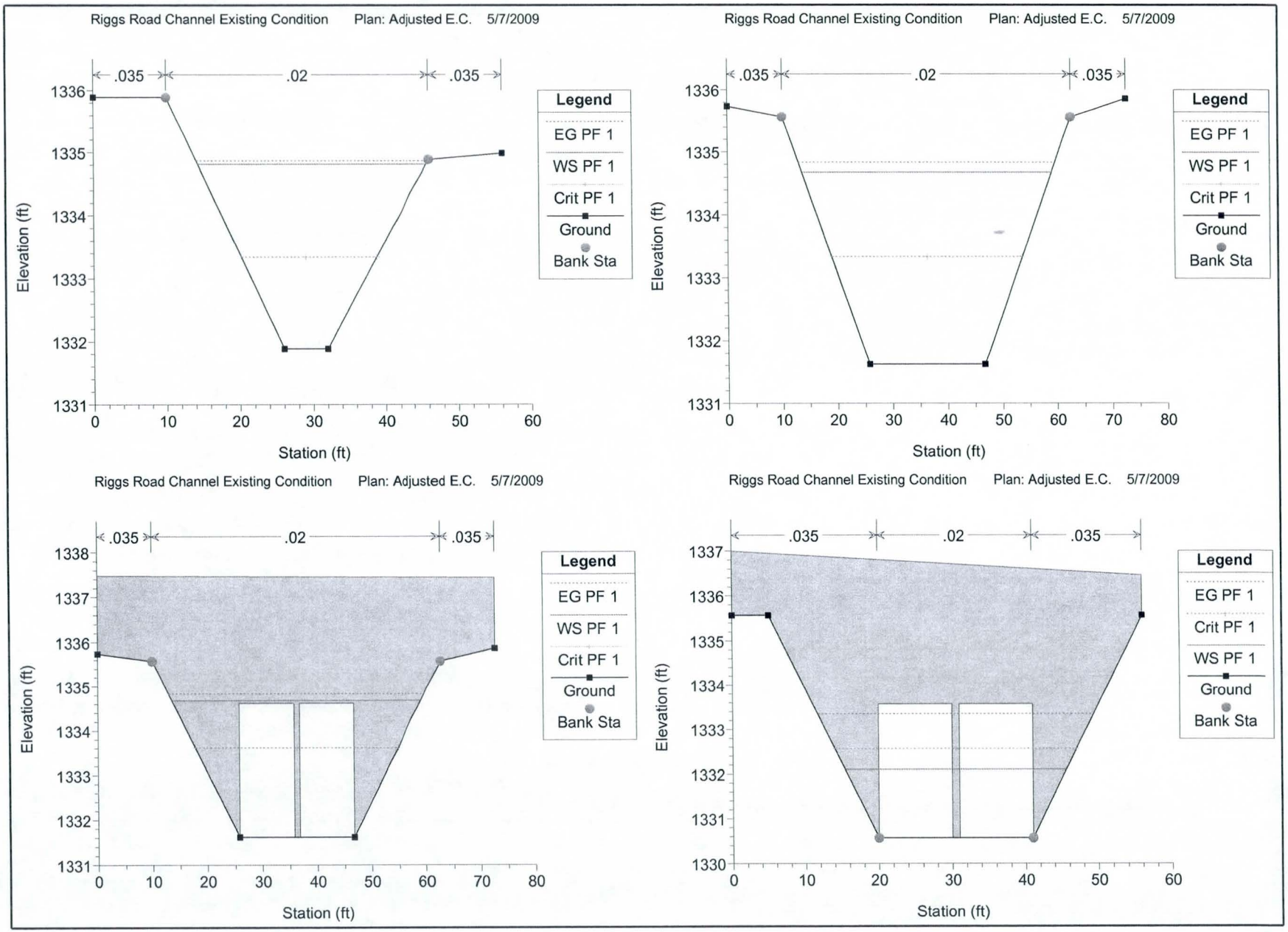
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Elevation (ft)
Station (ft)
Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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Elevation (ft)
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Crit PF 1
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Bank Sta
Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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Elevation (ft)
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Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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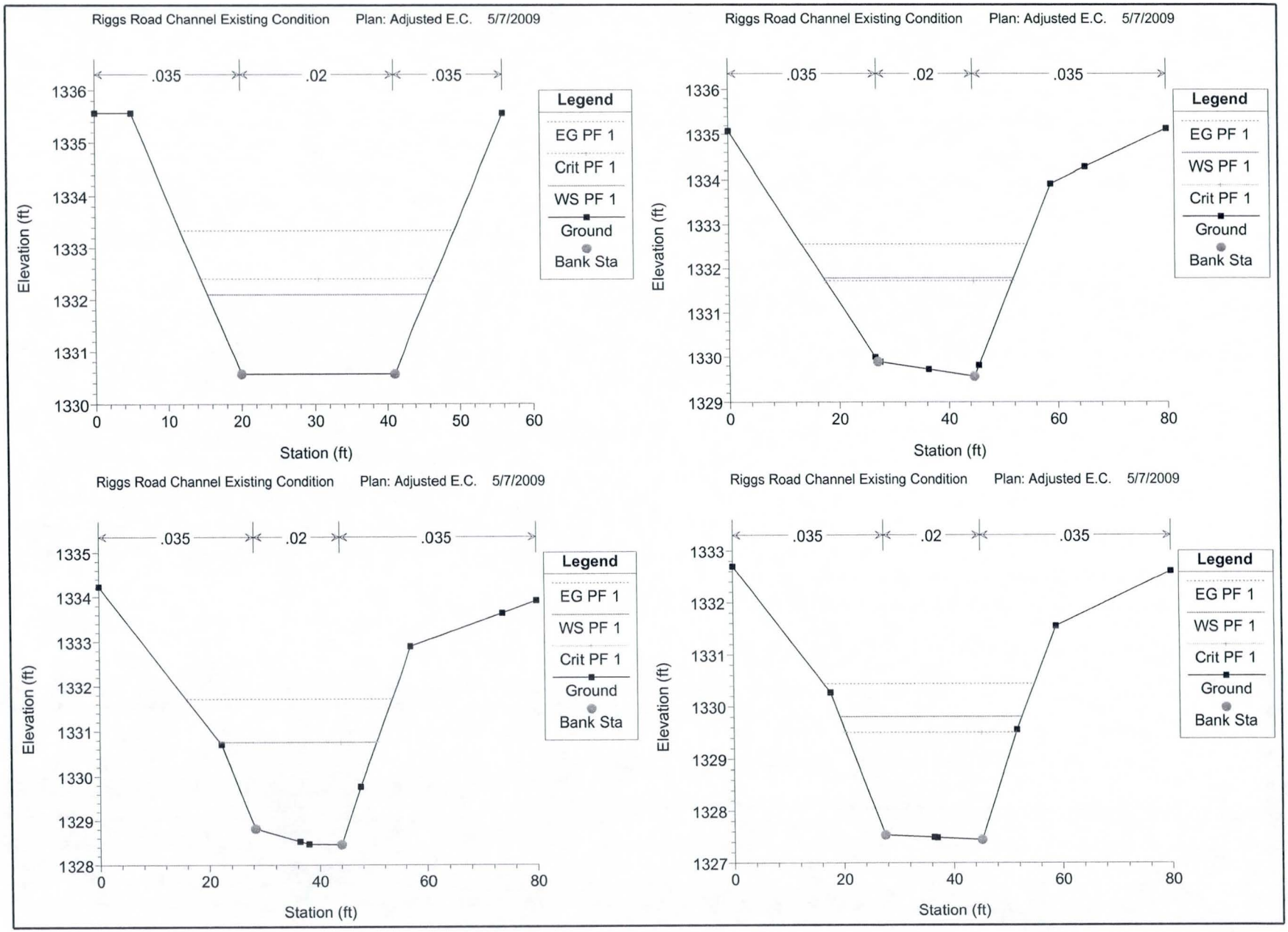
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Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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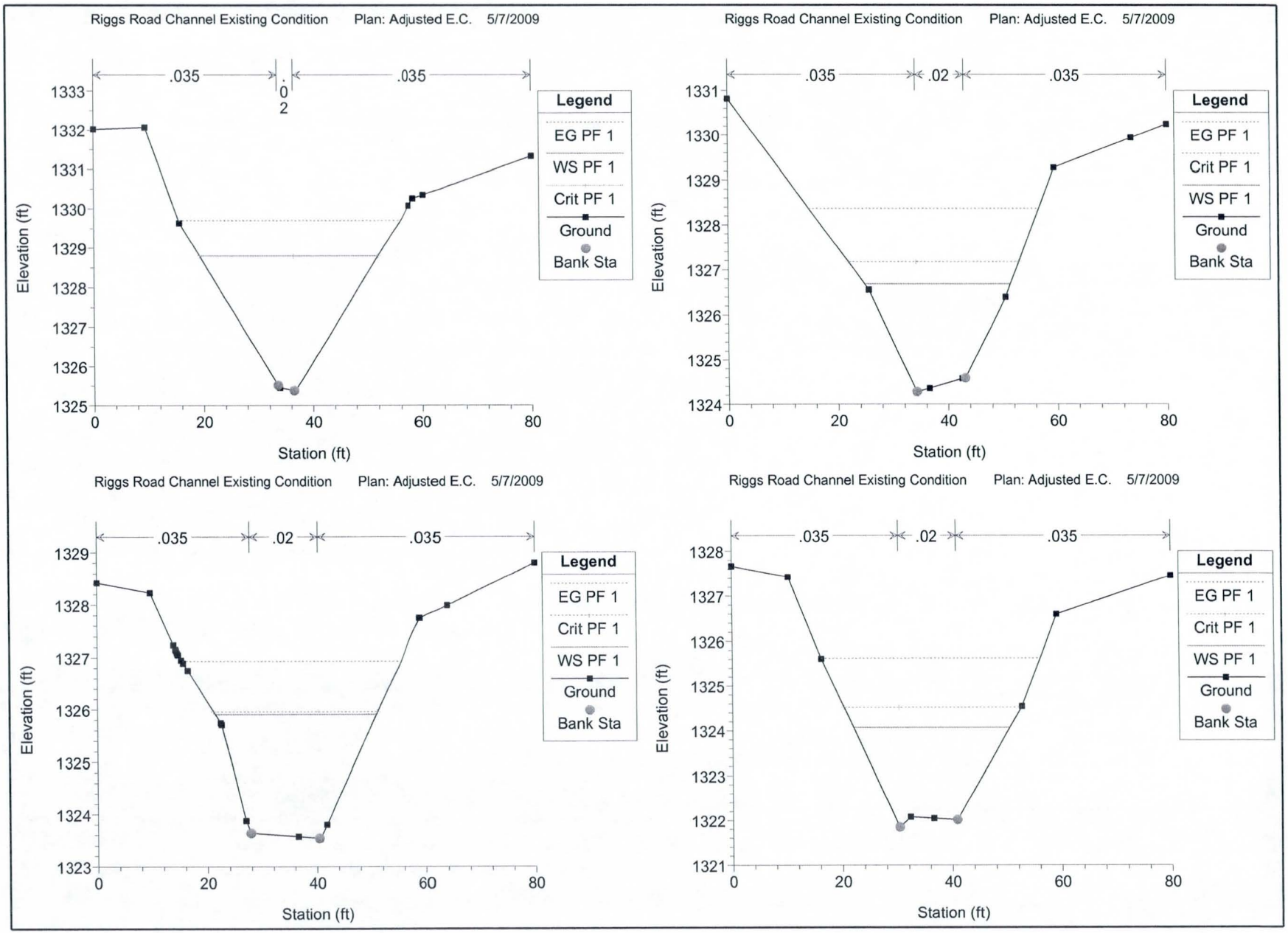
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Elevation (ft)
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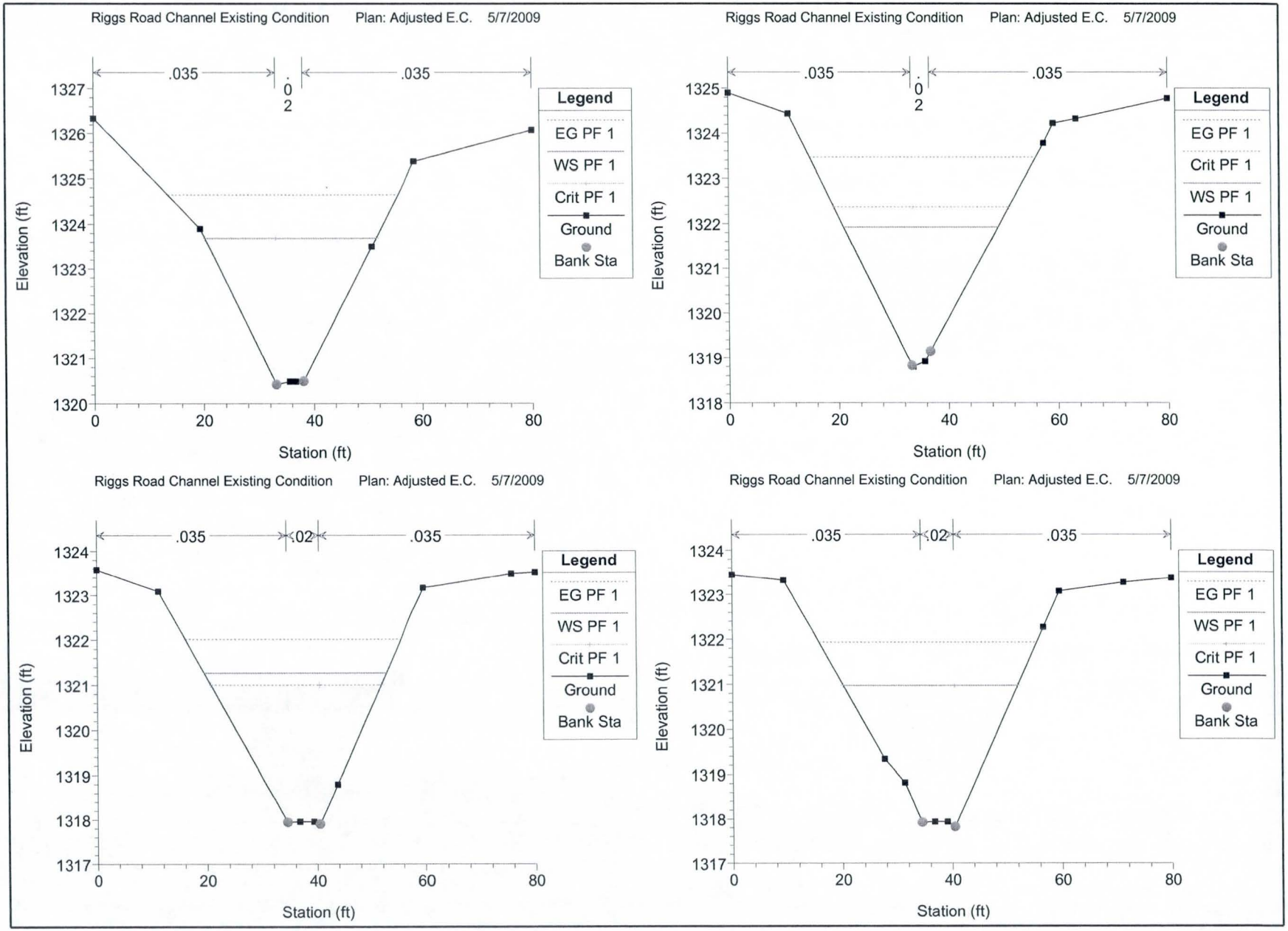
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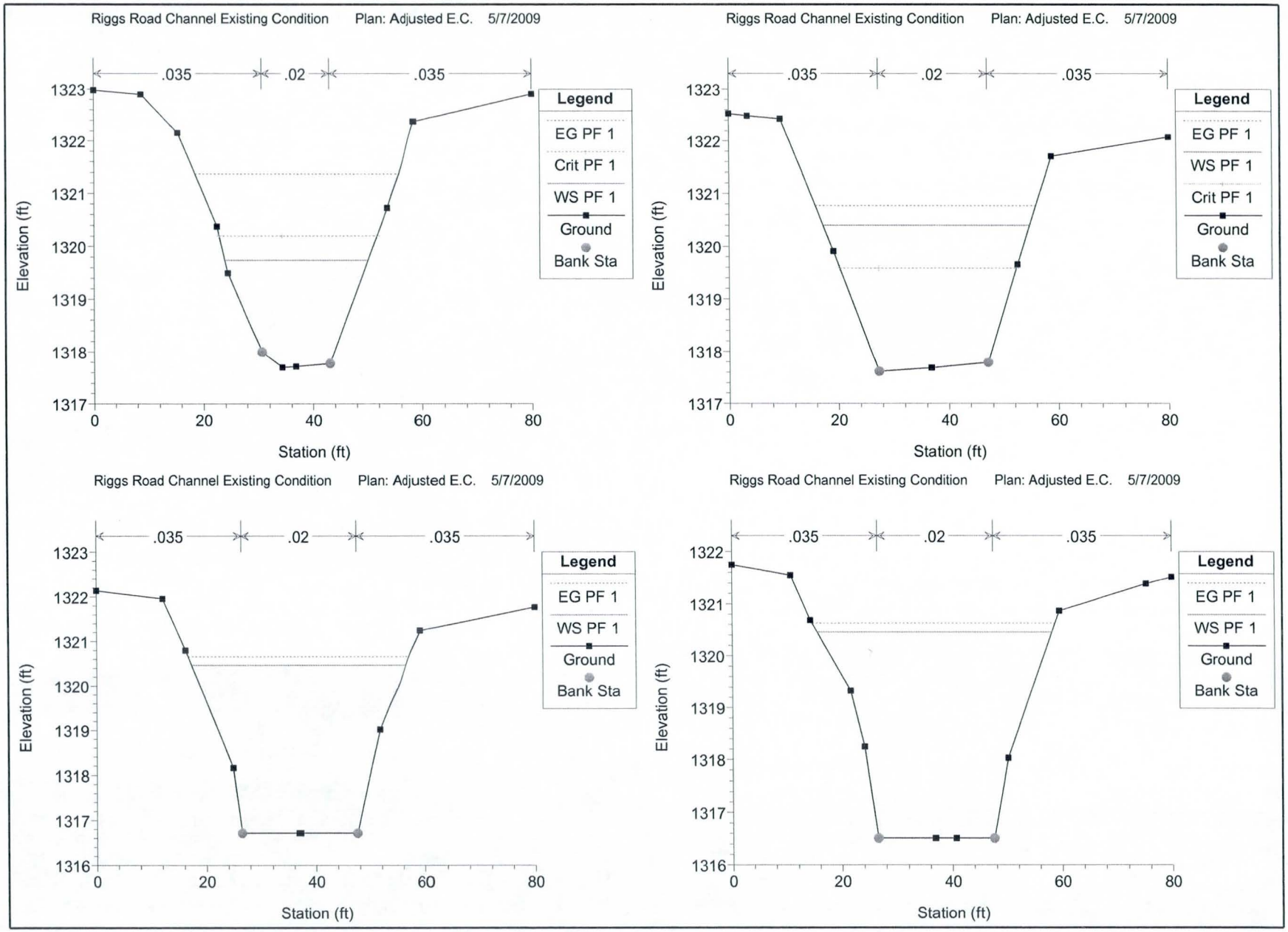
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Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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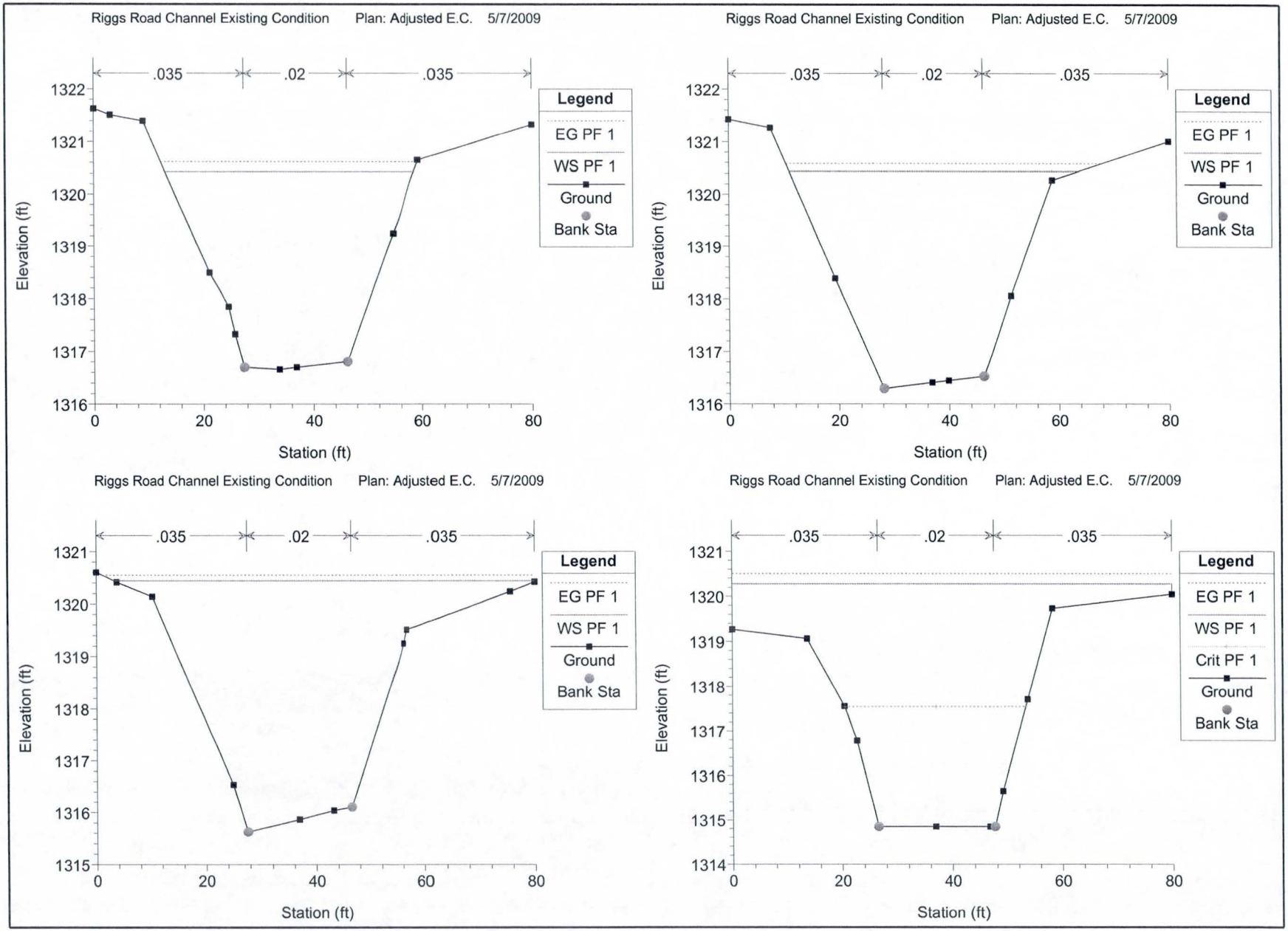
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Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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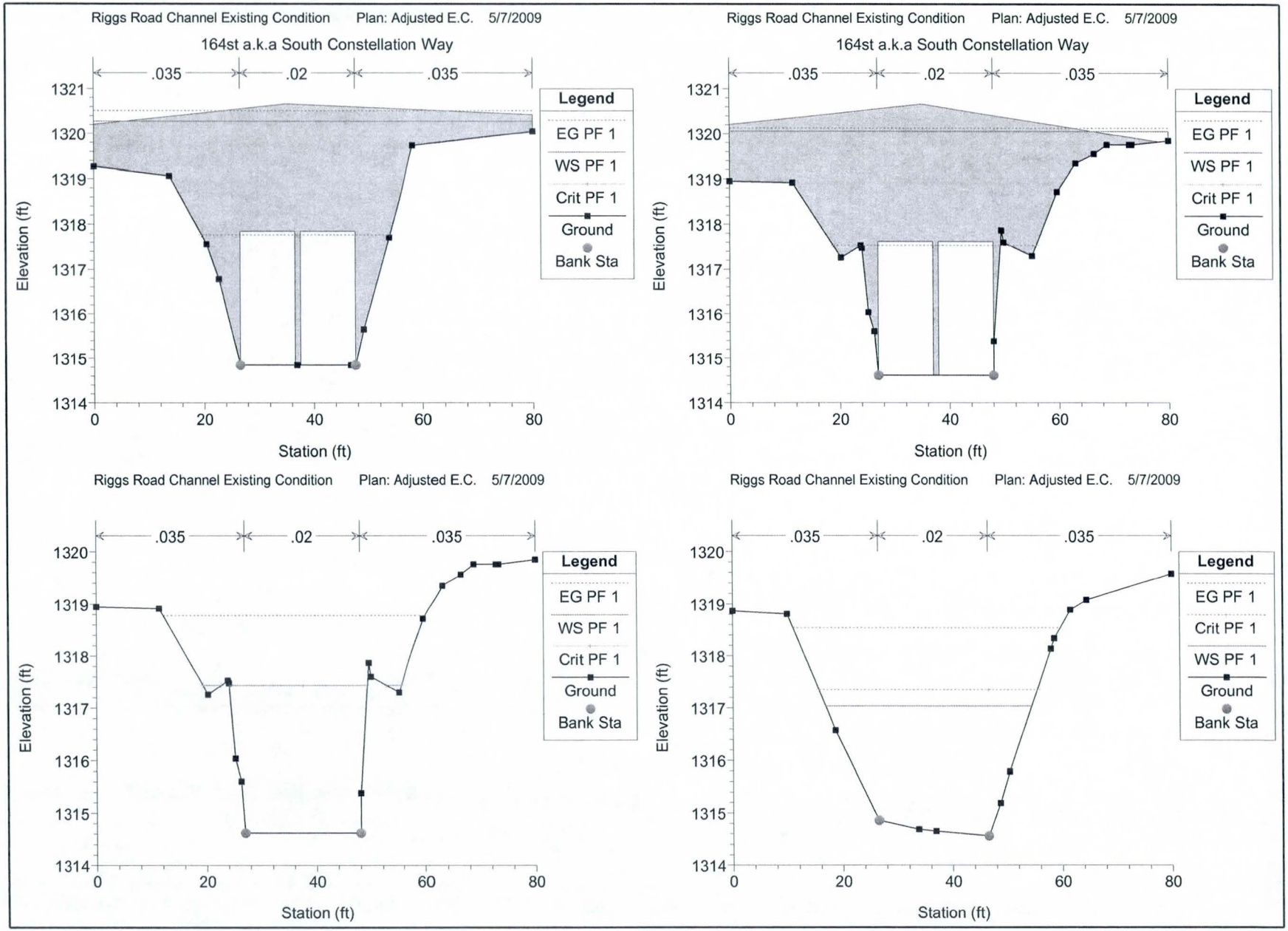
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164st a.k.a South Constellation Way
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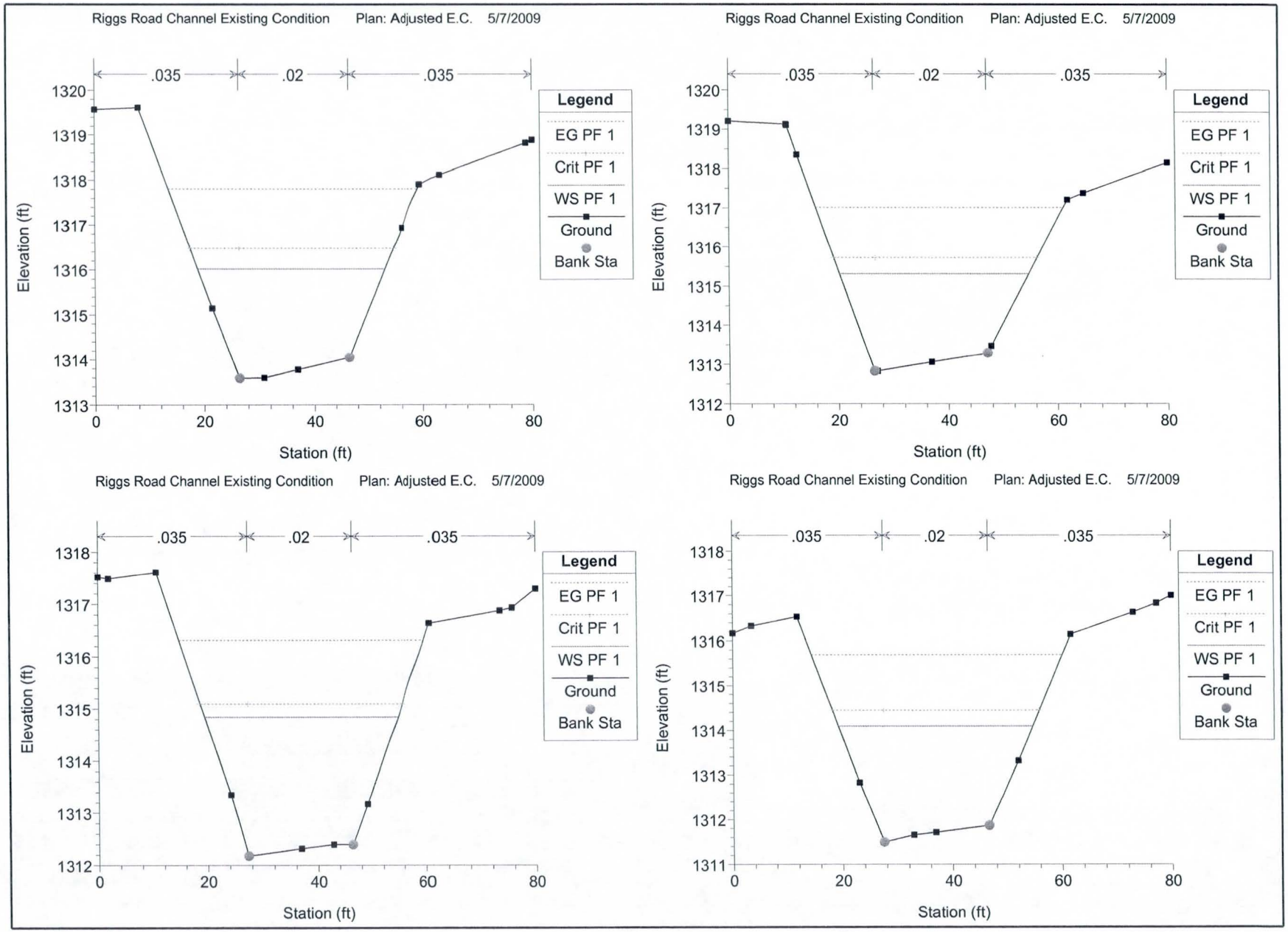
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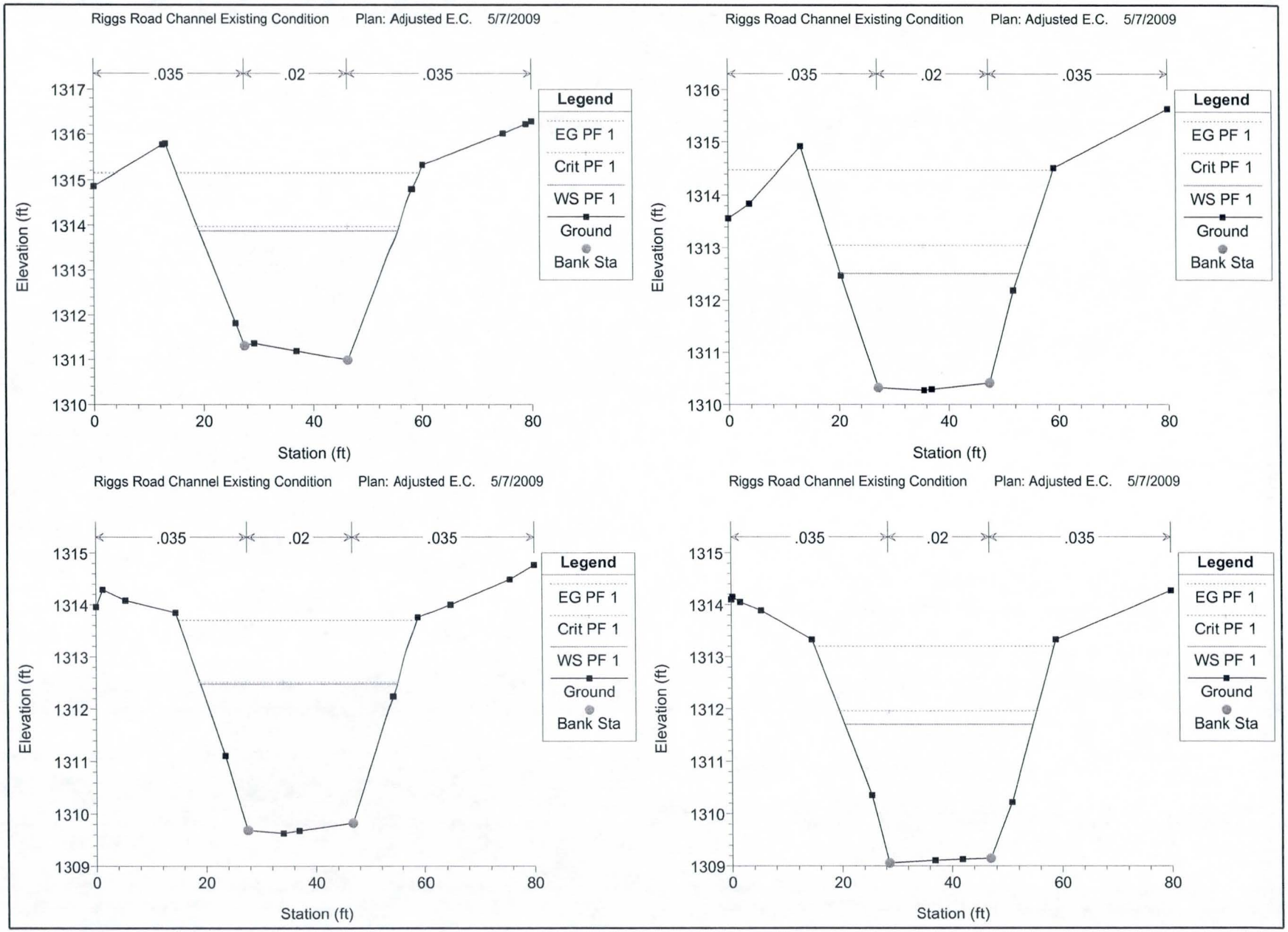
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Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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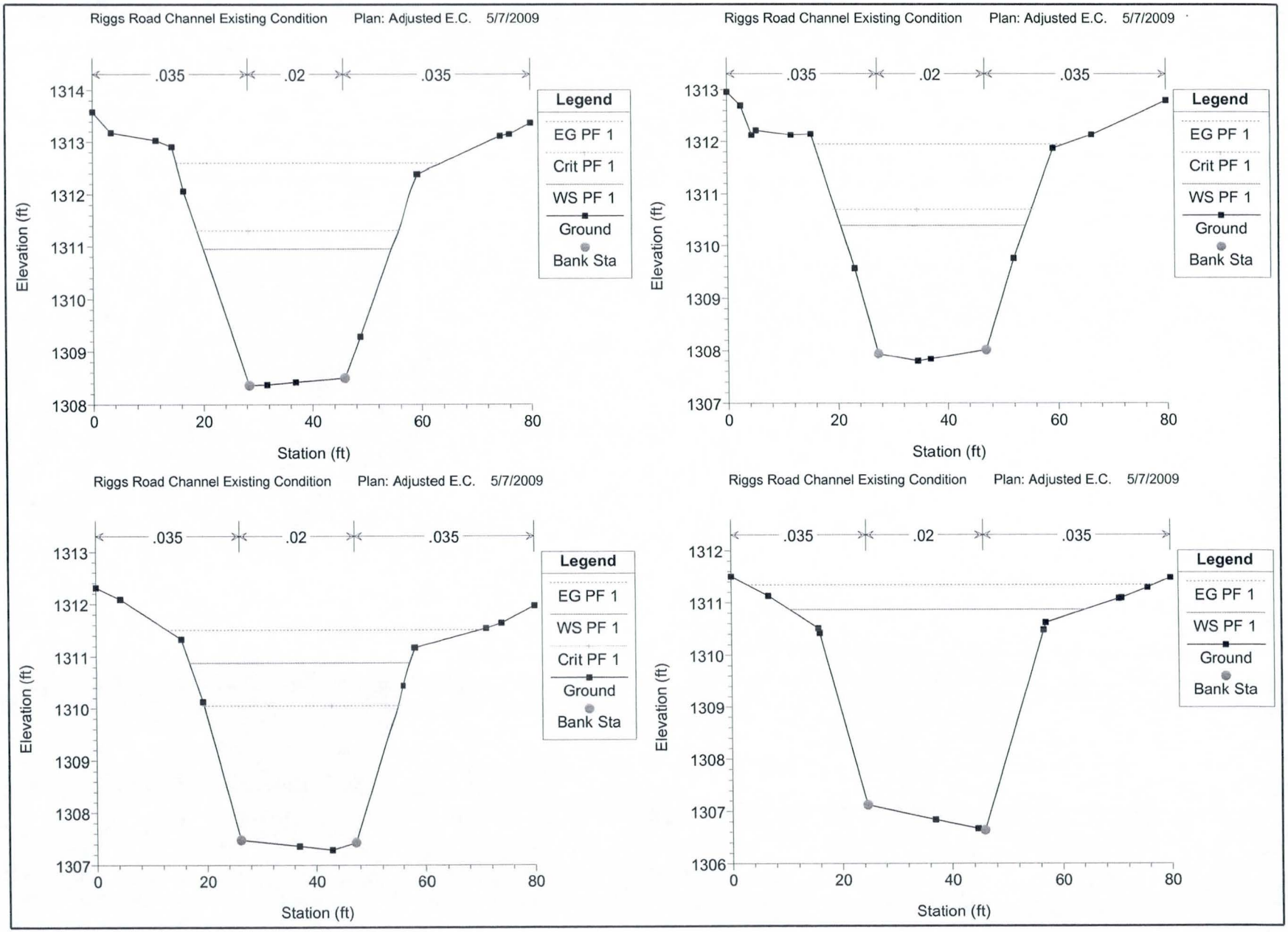
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Elevation (ft)
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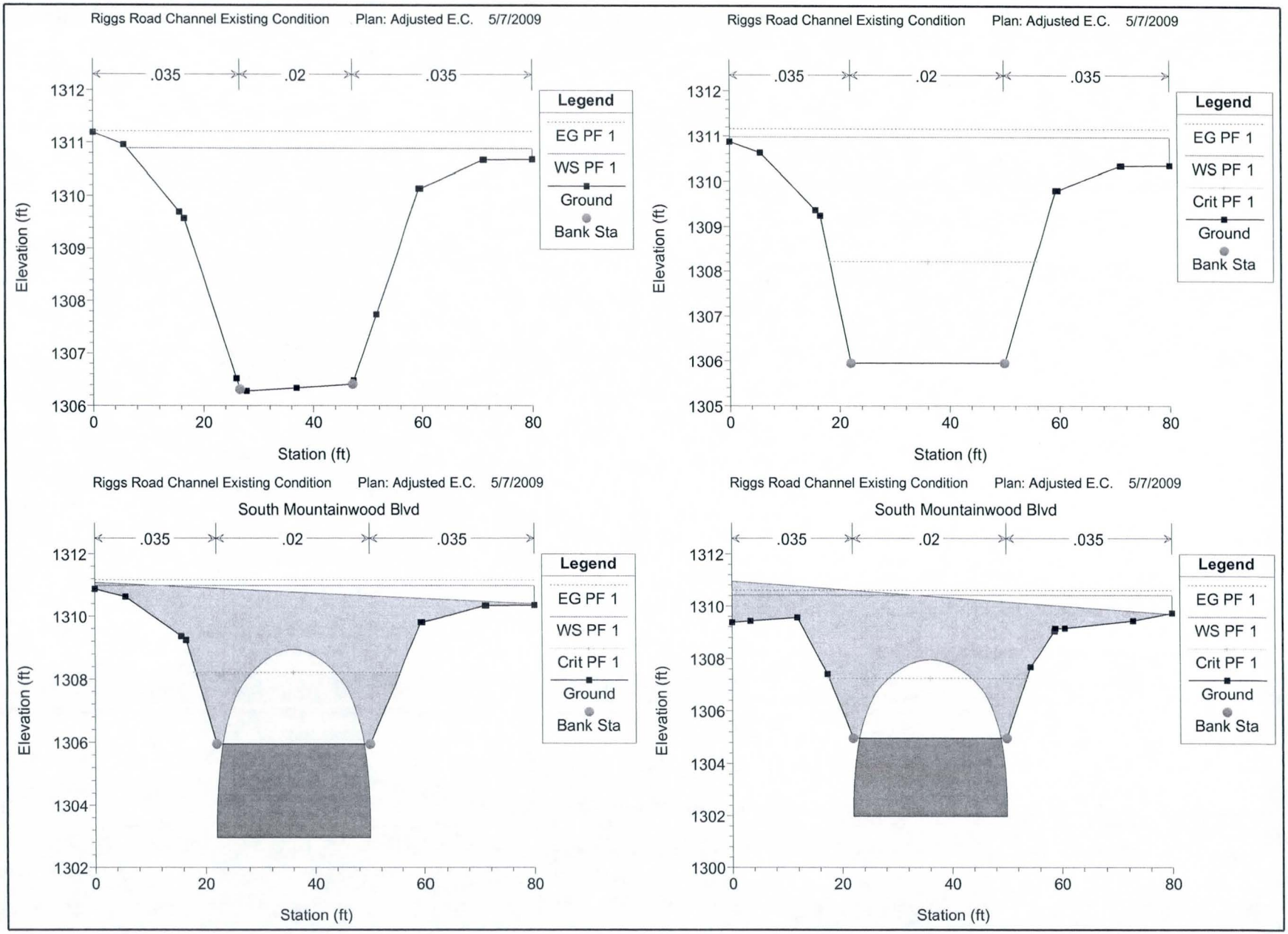
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Station (ft)
Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
South Mountainwood Blvd
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South Mountainwood Blvd
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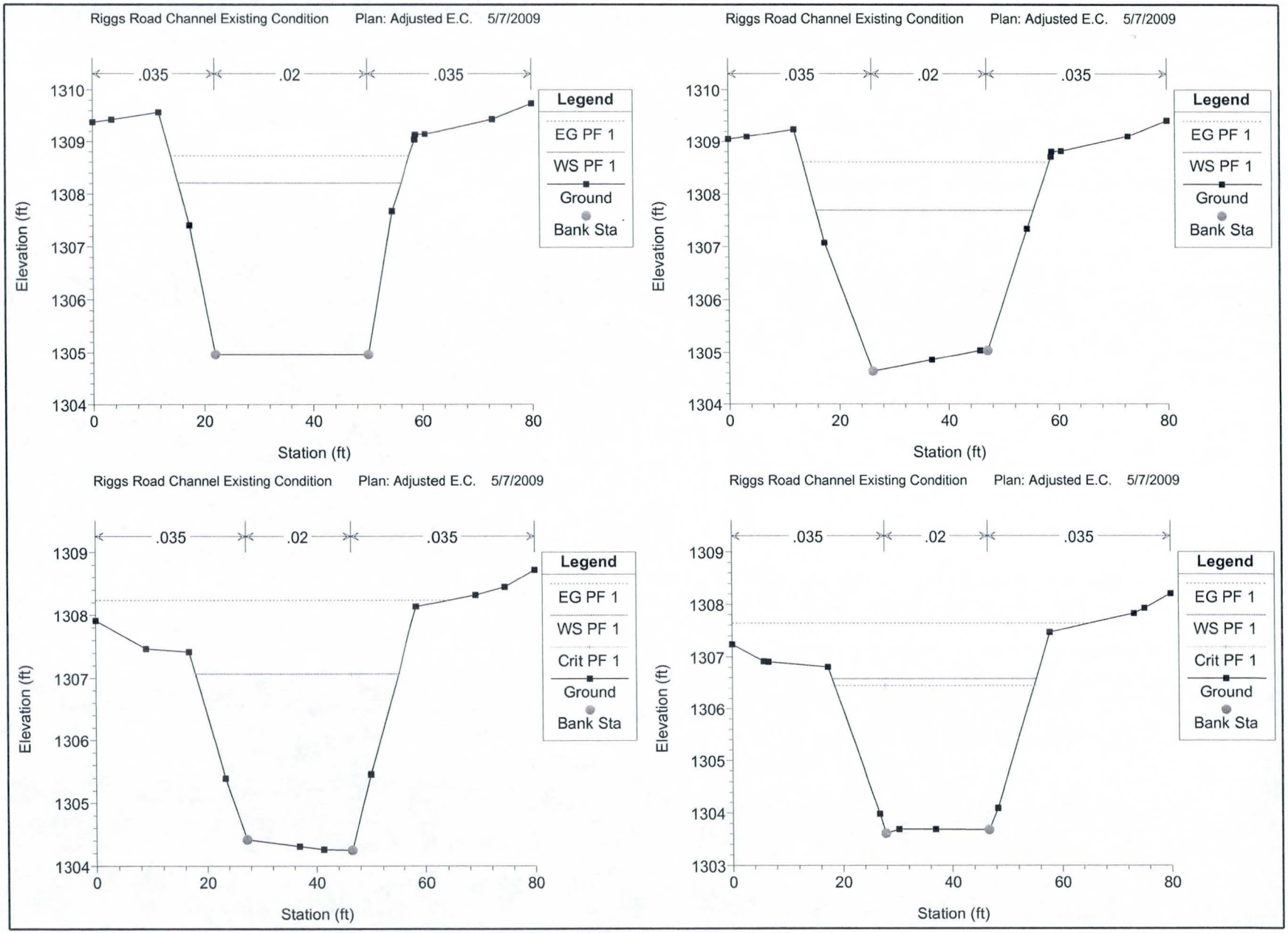
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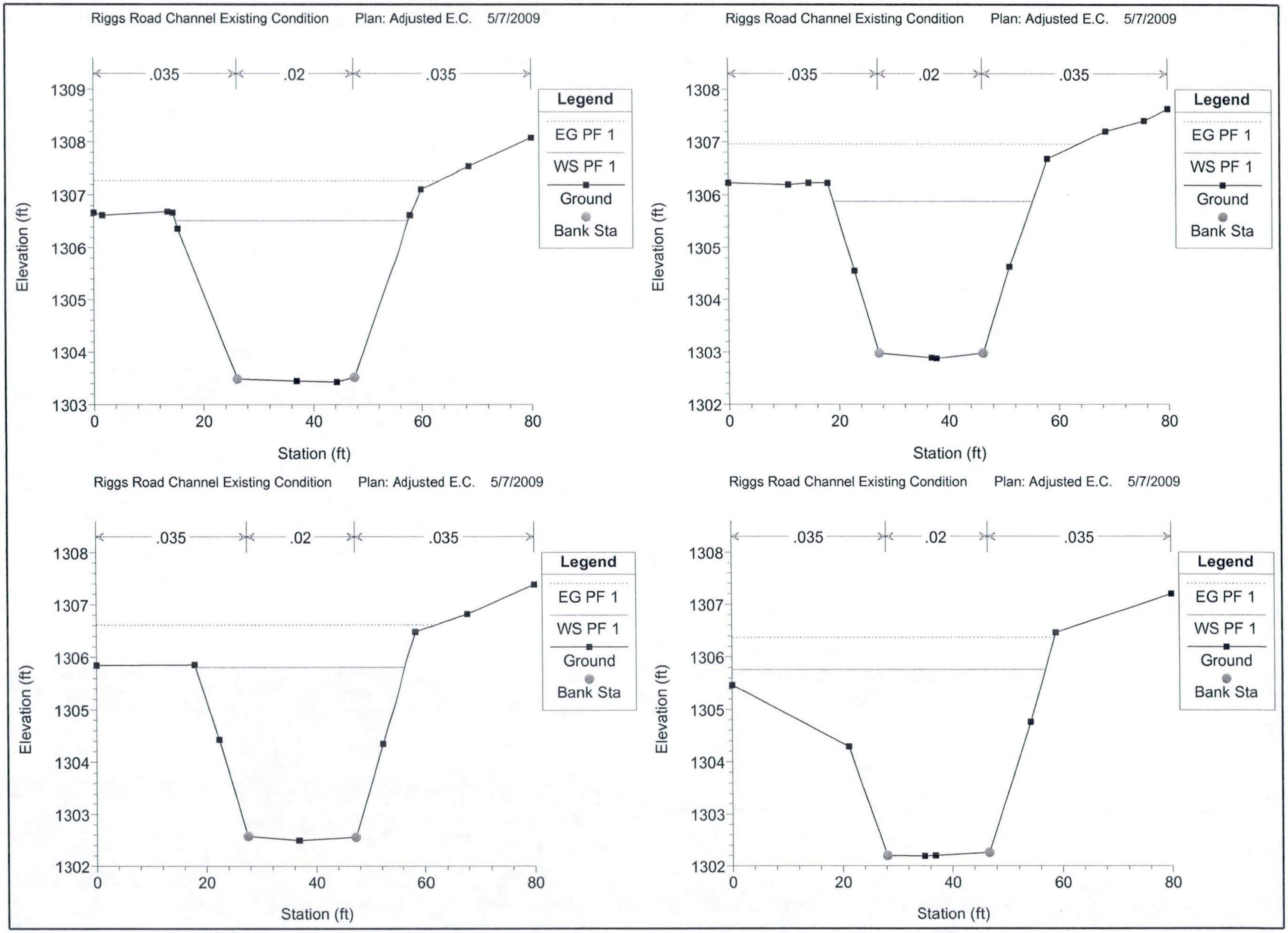
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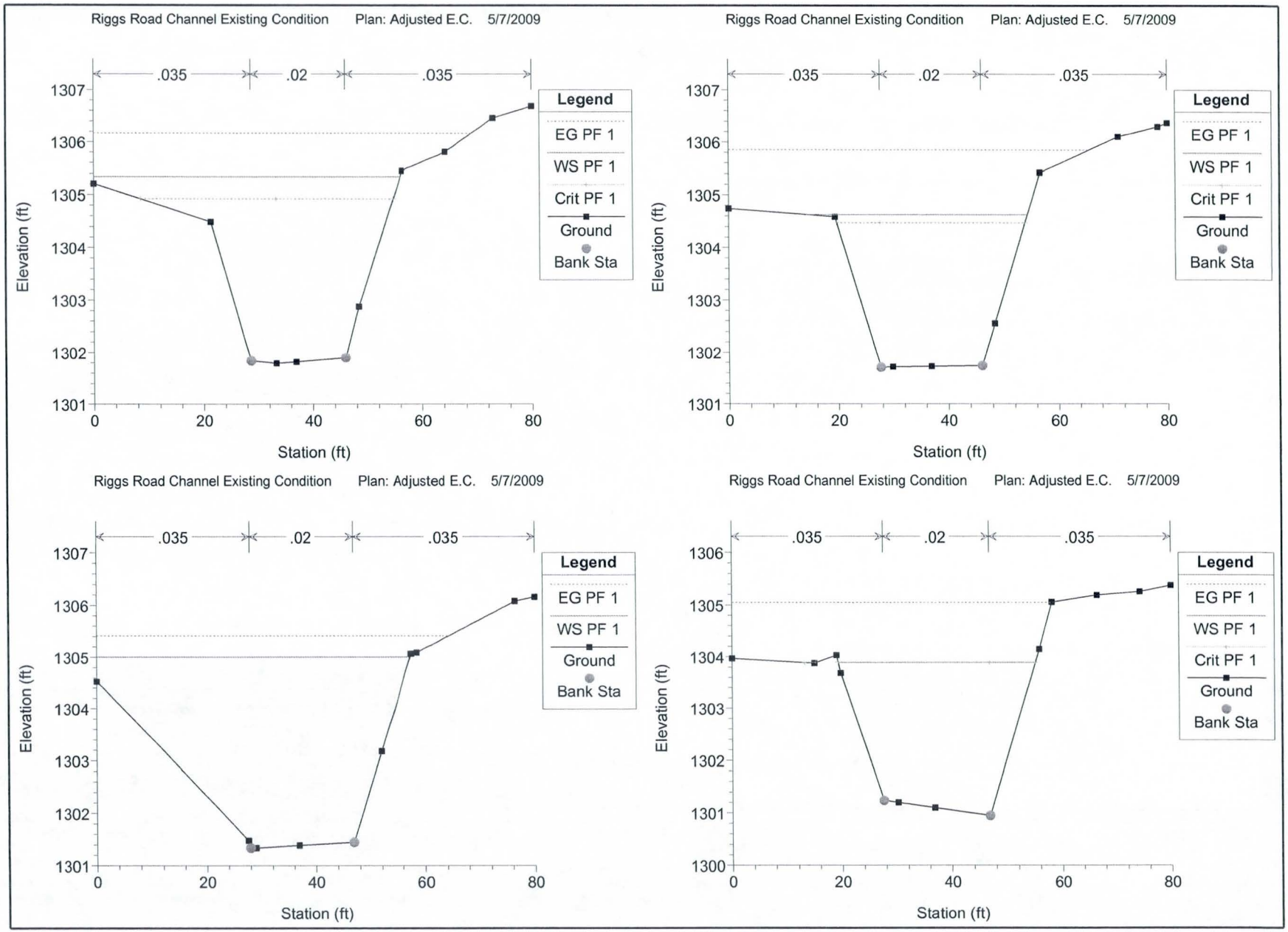
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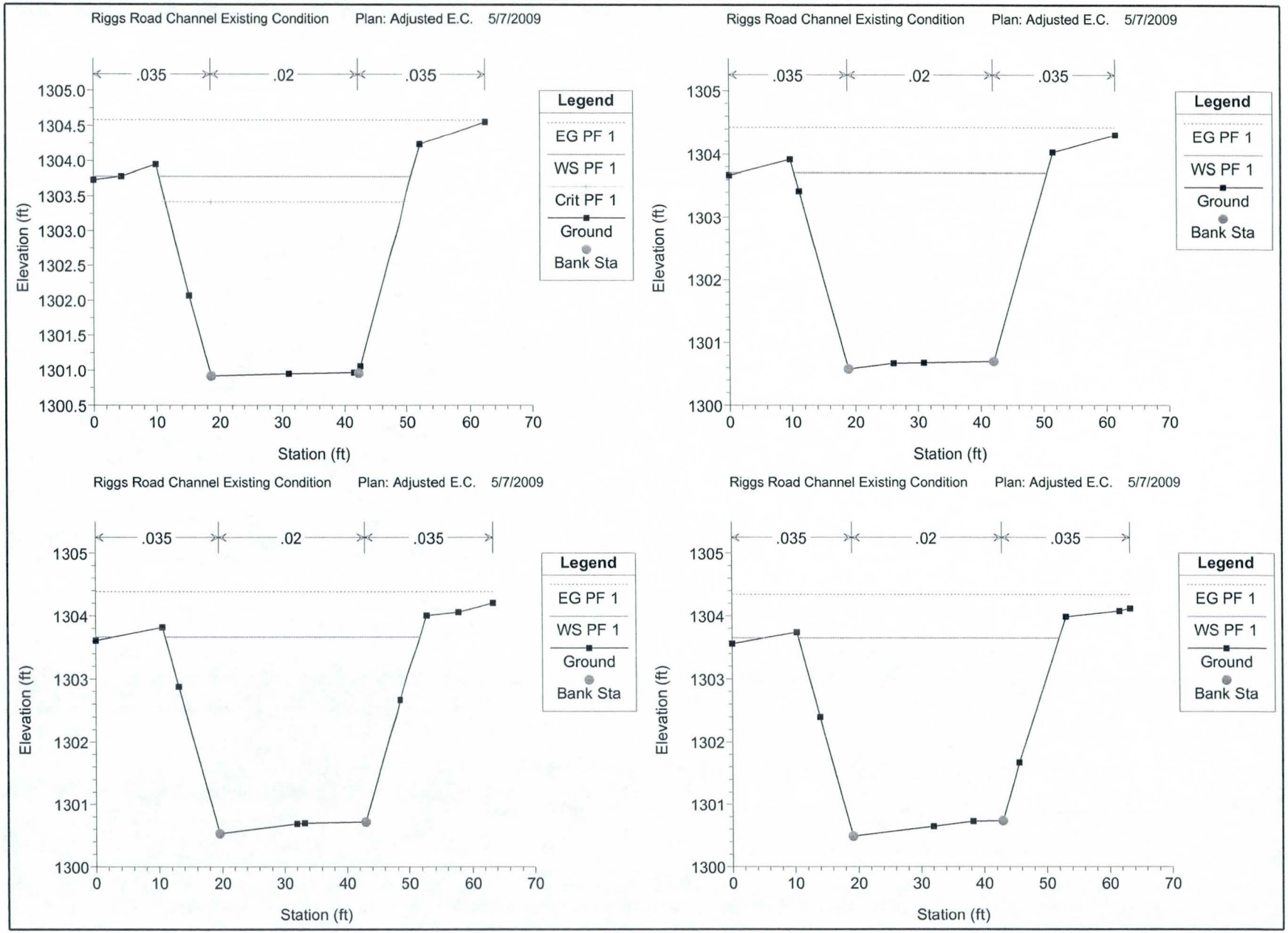
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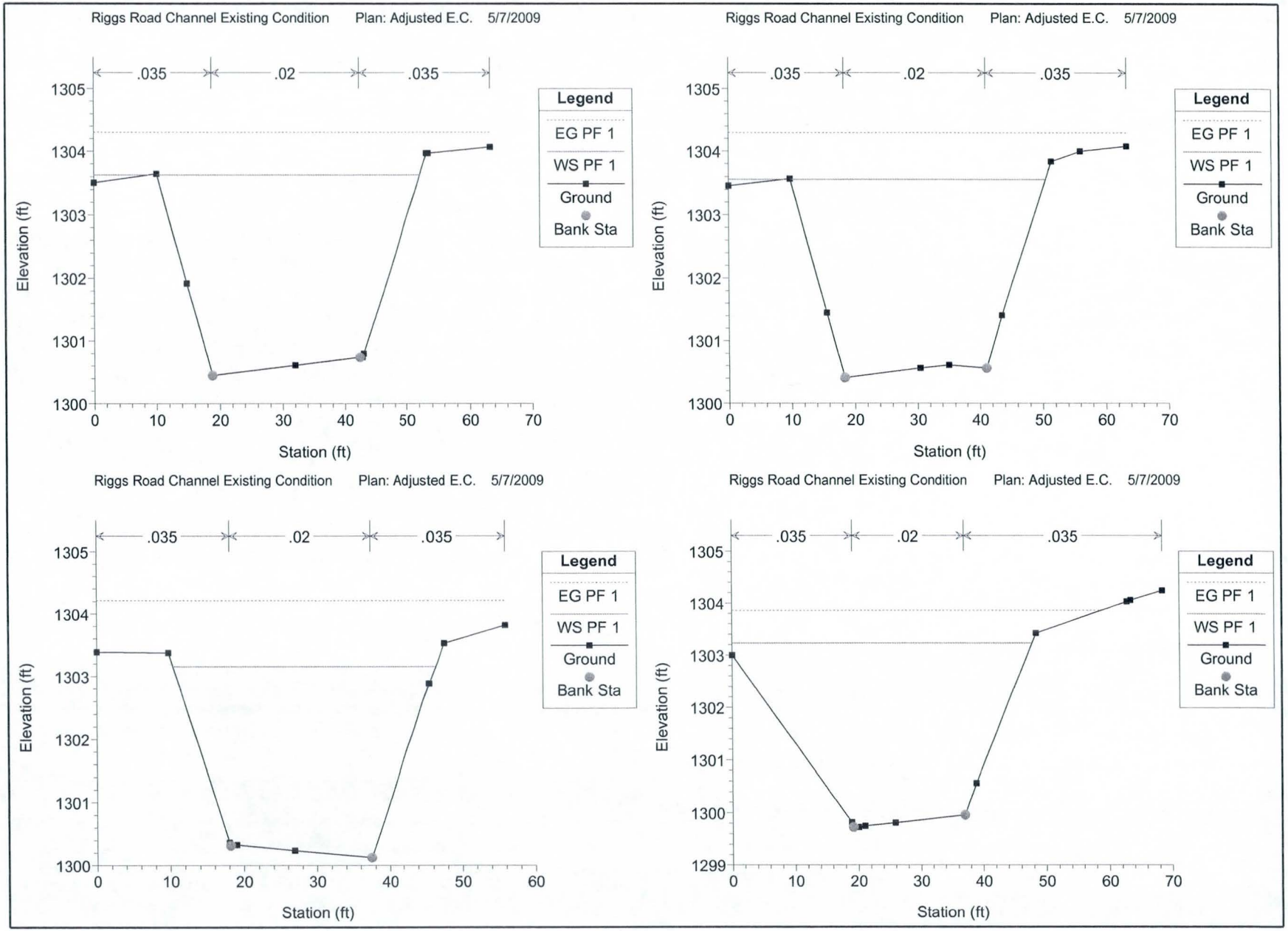
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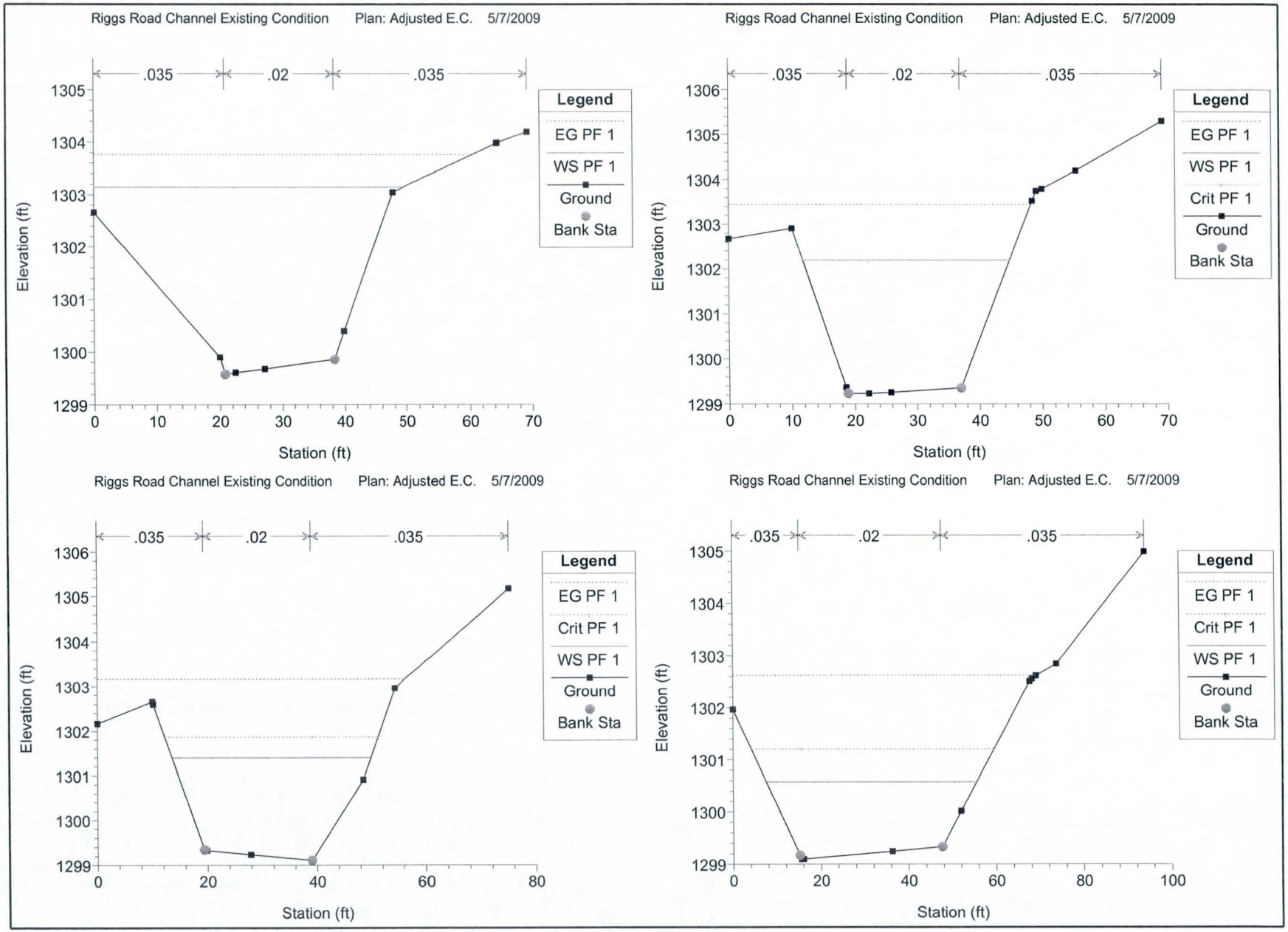
Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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Riggs Road Channel Existing Condition Plan: Adjusted E.C. 5/7/2009
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APPENDIX I
BMP MEMO

GILBERT
ARIZONA

January 14, 2010

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Attention: Shelby Brown

RE: Design of Riggs Road Drainage Channel

Dear Ms. Brown,

I am responding to MCFCD's request in regards to the above noted drainage channel design. This project is located at Riggs Road east of the East Maricopa Floodway. This drainage way was constructed by Maricopa County DOT and due to annexation the Town of Gilbert has assumed ownership and maintenance of the channel. The channel flows into the Flood Control District's Right-of-Way.

This project was designed to provide best management practices to handle first flush drainage issues prior to water flowing into the EMF.

The Town of Gilbert will be providing PM-10 street sweeping activities on a regular basis upon completion of roadway construction. The Town is also proposing to add first flush check structures in the existing channel from the outlet of the proposed con-arch system located east of Mountainwood Blvd. to the EMF to provide first flush settlement buildup and reduce the concentration of pollutants discharged into the floodway.

Should you have any further questions, please don't hesitate in contacting me.

Sincerely,

Richard Allred

Richard Allred, P.E.
Town Engineer

Town of Gilbert | Development Services Department
90 E. Civic Center Drive, Gilbert, AZ 85296 Phone: 480.503.6700 Fax: 480.503.6770 www.gilbertaz.gov