Final Design Report

Lafayette Interceptor Drain and Outlet Design

FCD Project No. 2010 C030
COP Project No. ST83110068

Prepared for:
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009
Project No. 2006C027

Prepared in Cooperation with:
The City of Phoenix
Street Transportation Department
200 W. Washington
Phoenix, AZ 85003

Prepared by:

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7250 North 16th Street
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Registered Professional Engineer (Civil) CERTIFICATE NO. 37849 DUC V. DAO Date Signed 8/6/12 ARIZONA, U.S.A. Expires 09/30/2014

Registered Professional Engineer (Civil) CERTIFICATE NO. 49123 GAJENDRA M. SHRESTHA Date Signed 8/6/12 ARIZONA, U.S.A. EXPIRES 3/31/2015

March 2012
Revised June 2012
Revised August 2012

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Executive Summary

The Arcadia Area Drainage Project is a flood control project by the Flood Control District of Maricopa County, in partnership with the City of Phoenix, to mitigate flooding to homes and structures upstream of the Arizona Canal within the Arcadia area watershed. A drainage study was performed in 1995 to evaluate drainage improvement alternatives, and the *Arcadia Area Drainage Report Final Recommendations Report* was prepared in 1997.

This report selected Alternative 2 (Figure 1.3) as the preferred alternative which proposed a 10-year storm drain system along Arcadia Drive, Lafayette Boulevard, Camelback Road, and 44th Street. The total design flow for the 10 year event for this option was 681 cfs and crosses the Arizona Canal at Arcadia Drive and flows south through the recently improved Old Cross Cut Canal.

The Old Cross Cut Canal (OCCC) Project was designed in 2010 and the construction was completed in April 2011. During the design phase of the OCCC project the storm drain crossing under the canal was increased from 96" as proposed in the pre-design plan to 102". This, along with final hydraulics, increased the capacity of the pipe at the canal crossing from 681 cfs to 990 cfs.

Project Hydrology:

Trunkline Hydrology

The original predesign hydrology was based on the 10-year event, and is shown on Figure 1.3. This was developed in HEC-1 and results in a flow across the Arizona Canal of 681 cfs.

The project hydrology has been based on the capacity of the downstream outfall of 990 cfs and is shown on Figure 2.4. This hydrology is referred to as the 10-year plus event. No HEC-1 model has been developed for this, and the 10-year flows were simply increased a uniform percentage.

Collection Hydrology

Collection hydrology was developed using the 10-year HEC-1 model, and designating splits and flow paths based on field investigation. This is shown on Plate 1.

Flow to the catch basins, east of 46th Street, will be reduced once the ultimate storm drain system is constructed upstream, as shown in Figure 2.1. Therefore, these catch basins are considered

sufficient since they will be oversized in the ultimate condition. The design flows for the catch basins west of 46th Street were upsized to accommodate a 10-year plus design event as shown in Figure 4.1.

Project Hydraulics:

Trunk Line Hydraulics

The Trunk Line Hydraulics were designed using Bentley's StormCAD computer program. The hydraulic grade line from Old Cross Cut Canal project was used as the tailwater for the model, and hydraulic losses for bends and junctions were calculated based on the methodology from Flood Control District of Maricopa County's (FCDMC) Hydraulics Drainage Design Manual. This table is included in Section E-2 of Appendix E.

Inlet Hydraulics

Designing inlets to capture offsite flows is fundamentally different than collecting onsite flows as a part of roadway design because the much higher offsite Q are not contained within the roadway cross section. Catch basins have been placed based on engineering judgement, and each catch basin's capture has been calculated based on a flow depth to the top of curb. Total catch basin capacity is more than required at each location to account for uncertainties. These calculations are included in Section E-3 of Appendix E.

1.0 INTRODUCTION

1.1 Purpose

The purpose of this Design Report is to document the design decisions and future construction of the Arcadia Area Drainage Project regional storm drain system to mitigate flooding for the area north of the Arizona Canal within the Arcadia area watershed

1.2 Project Location

The Arcadia area watershed is located within the metropolitan Phoenix area, and encompasses Sections 16 through 21 of Township 2N, Range 4E of the Gila and Salt River Base Line and Meridian, Maricopa County. Figure 1.1 shows the Project Vicinity Map and Figure 1.2 is a Proposed Project Location Map showing the overall Arcadia drainage project area.

1.3 Project Background

The Arcadia Area Drainage Project is a flood control project by the Flood Control District of Maricopa County, in partnership with the City of Phoenix, to mitigate flooding to homes and structures upstream of the Arizona Canal within the Arcadia area watershed.

A drainage study was performed in 1995 to evaluate drainage improvement alternatives, and the *Arcadia Area Drainage Report Final Recommendations Report* was prepared in 1997. This report evaluated five final alternatives to provide flood protection to homes and structures north of the Arizona Canal within the Arcadia area watershed. The first three alternatives provided for a 10-year level of flood protection, while the fourth and fifth alternatives provided for a 100-year level of flood protection. The opinion of probable construction cost in the report estimated the 10-year systems from $2.7M to $10.3M, while the 100-year systems were estimated between $36M and $45M. Consequently, Alternative 2 with an estimated cost of $10M was selected as the preferred alternative.

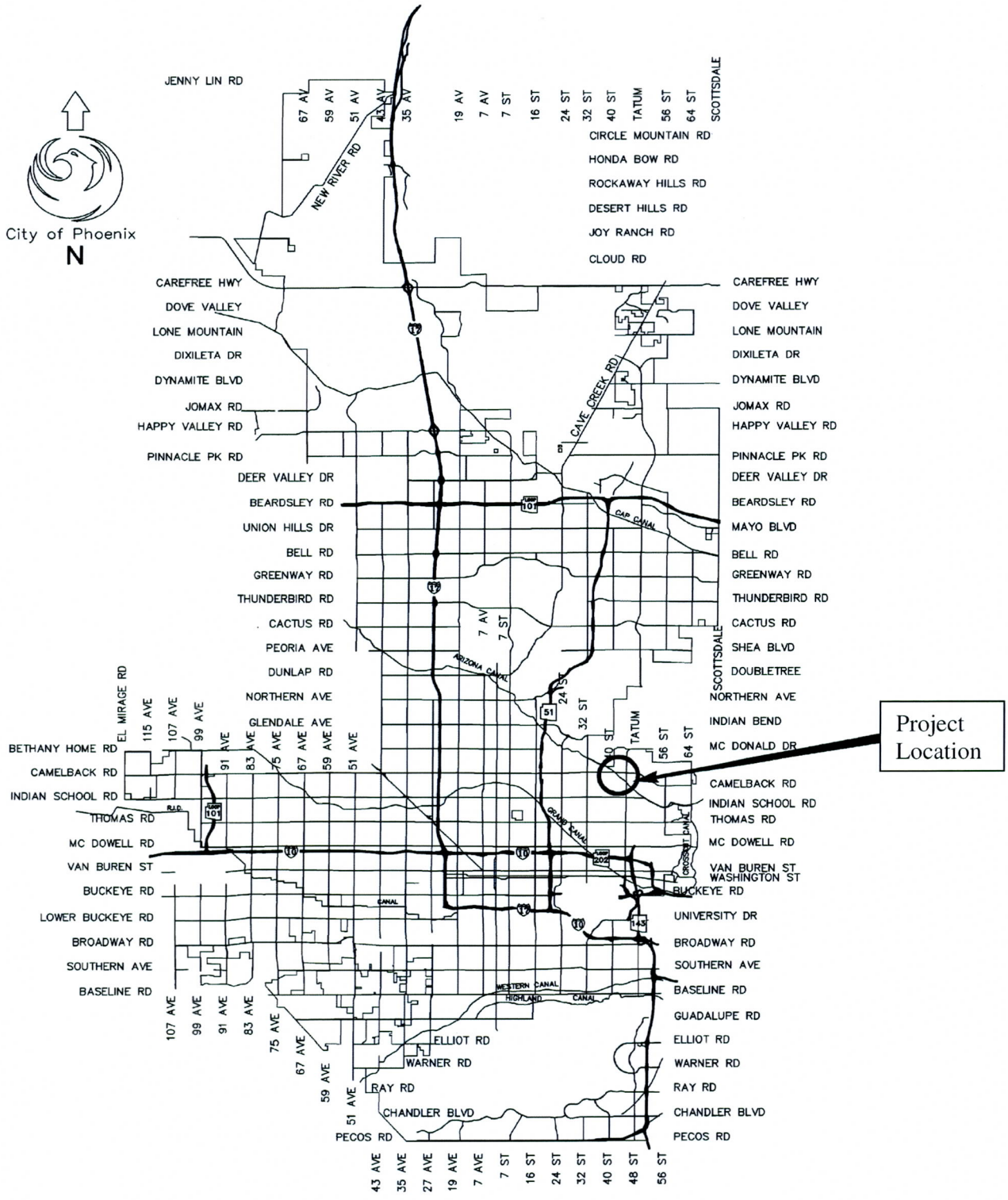


Figure 1.1: Project Vicinity Map

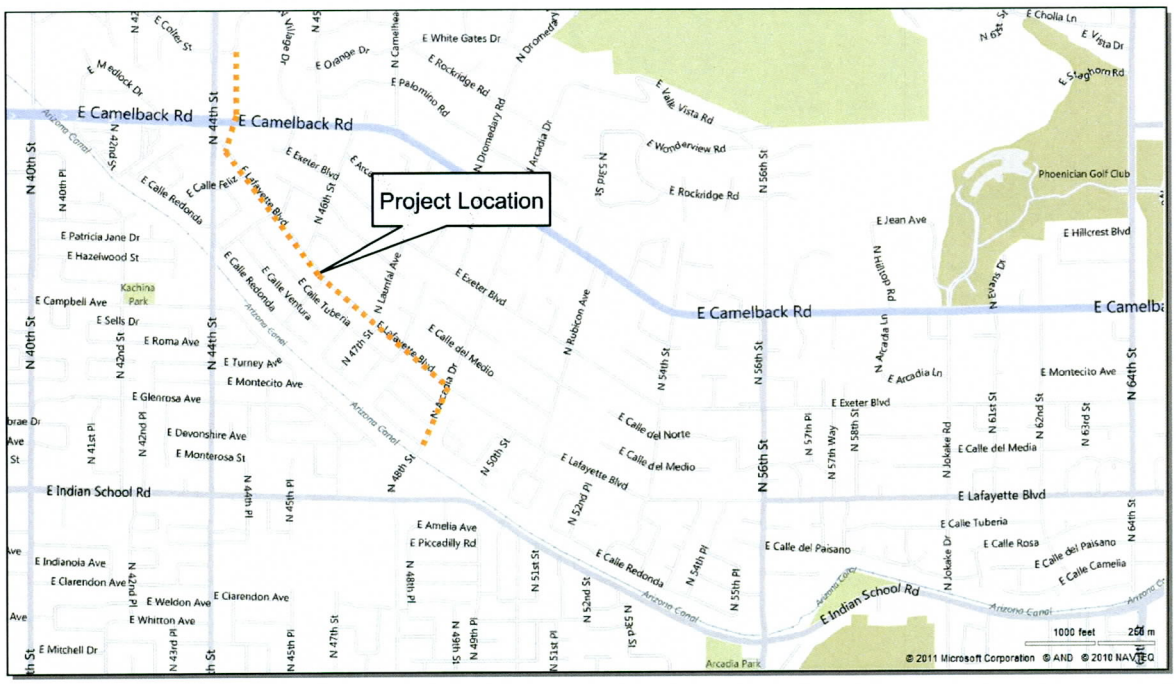


Figure 1.2: Proposed Project Location Map

The preferred alternative proposed a 10-year storm drain system along Arcadia Drive, Lafayette Boulevard, Camelback Road, and 44th Street. The layout of the preferred Alternative 2 is shown in Figure 1.3. This figure shows that a total of 681 cfs for the 10-year event is collected at the concentration point at Arcadia Drive north of the Arizona Canal. This flow would be conveyed under the Arizona Canal in a 96" pipe and outlet into the Old Cross Cut drainage system north of Indian School Road.

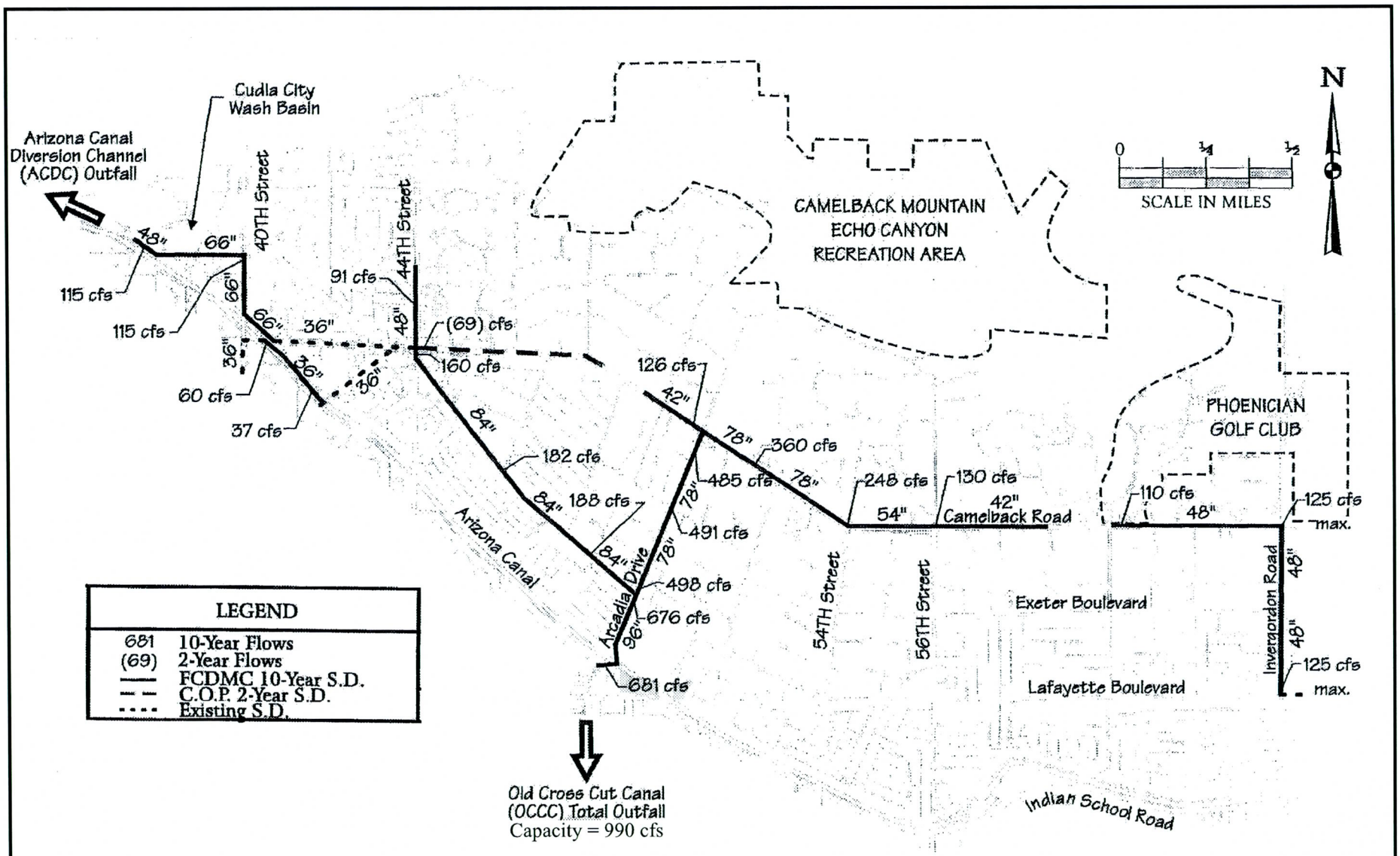
The Old Cross Cut Canal Improvements Project was designed in 2010 as the first phase of the regional flood control project to replace the Old Cross Cut earthen ditch and to install the storm drain segment from Indian School Road to the Arizona Canal. Construction of this project was completed in April 2011. The earthen ditch was replaced with a 120" cast-in-place pipe to accommodate irrigation water discharge from the Arizona Canal up to 1,000 cfs. The size of the pipe crossing under the canal was increased from 96" as proposed in the pre-design plan to 102". It was determined that upsizing this pipe would be cost effective and constructible. This increased the capacity of the pipe at the canal

crossing from 681 cfs to 990 cfs. The opportunities to use this additional capacity will be discussed in Section 4.0 of this report.

1.4 Existing Conditions

Stormwater from the Arcadia area drainage watershed sheet flows in a predominantly southerly and southwesterly direction, originating from the Camelback Mountains and continuing south until it reaches the Arizona Canal. There is little drainage infrastructure within the watershed and as stormwater flows to the south, it creates ponding and localized flooding even during annual events. Additionally, the canal, being elevated several feet above existing ground, ponds water against the upstream bank, and flooding to homes and structures occurs within the ponded areas upstream of the canal during large storm events.

Properties inside this flood area are within FEMA's Zone "A" floodplain designation, which corresponds to the 100-year floodplains that are determined by approximate methods with no base flood elevations or depths. Approximately 280 homes are located inside this Zone "A" floodplain. Areas north of the Zone "A" designation are designated shaded Zone "X", which corresponds to areas outside the 100-year floodplains or areas of 100-year sheet flow flooding where average depths are less than 1 foot. A FIRM map showing the existing floodplain of the project area is provided in Figure 1.4.



Reference: *Arcadia Area Drainage Project Final Recommendations Report,* Huitt-Zollars, for Flood Control District of Maricopa County, FCD No. 94-21, March 1997

LAFAYETTE INTERCEPTOR DRAIN AND OUTLET

COP ST 83110068
FCD PROJ. NO. 2010C030

PROPOSED PRE-DESIGN ALTERNATIVE 2 IMPROVEMENTS

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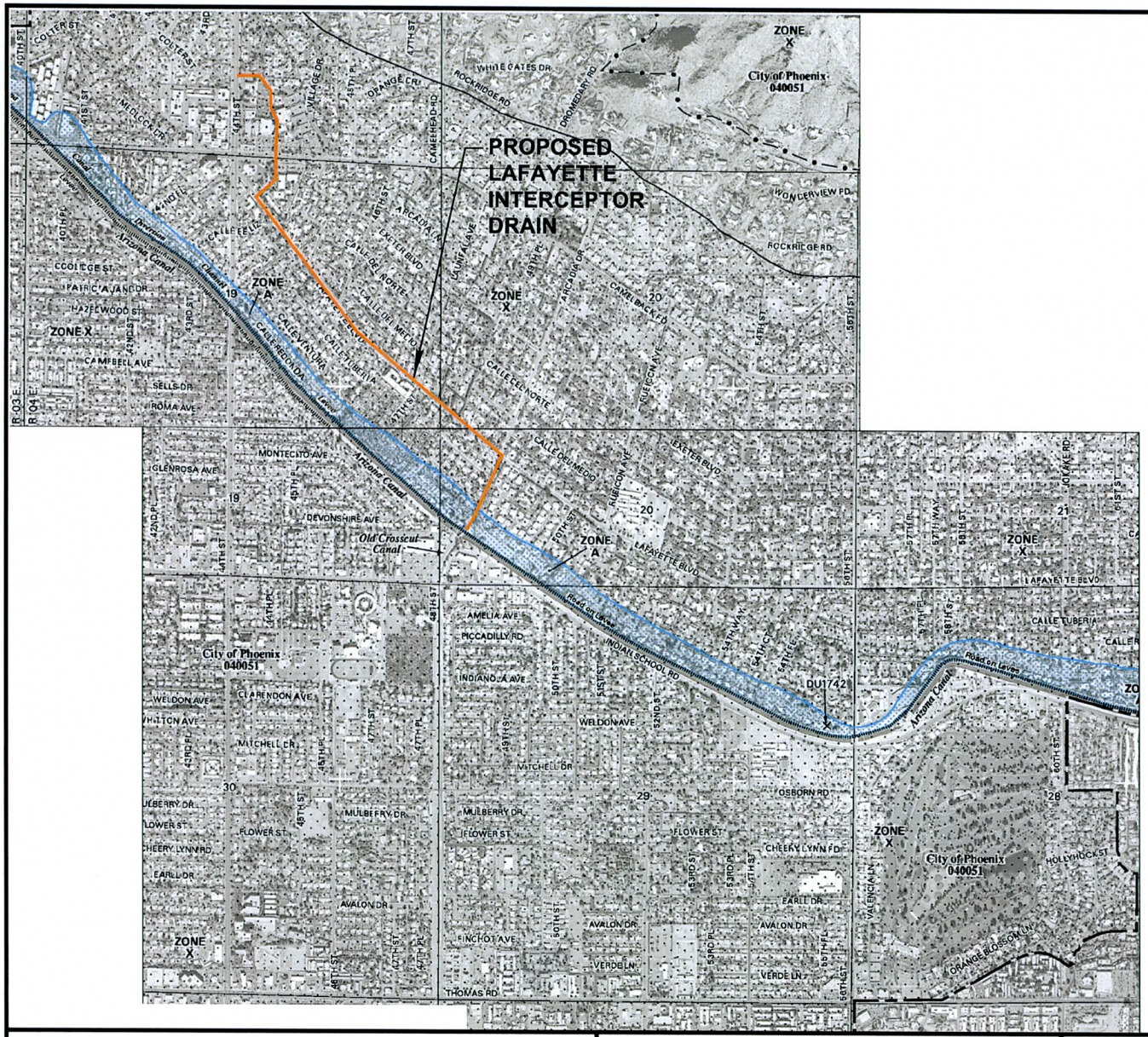
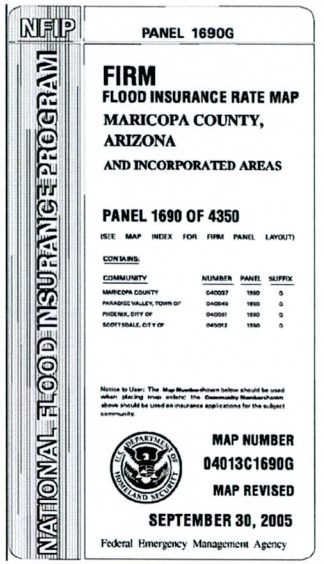
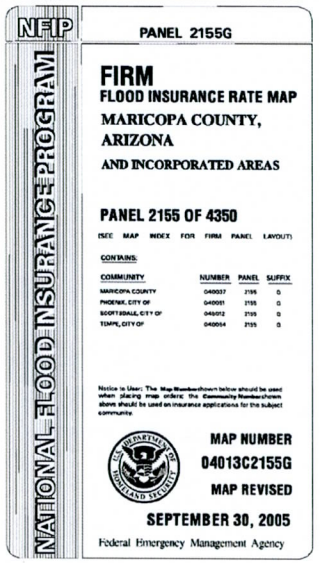
FIGURE 1.3







LAFAYETTE INTERCEPTOR DRAIN
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FIRM MAP

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FIGURE
1.4

1.5 Design Criteria

The basis of design for this project is the *Arcadia Area Drainage Project, Final Recommendations Report* (Huitt-Zollars, 1997) and the *Final Design Report Old Cross Cut Canal Improvements Arizona Canal to Indian School Road* (Olsson Associates, 2010). The *Final Recommendations Report* specified a 10-year design flow of 681 through a 96" pipe across the Arizona Canal. The *Old Cross Cut Canal Improvements Final Design Report* provided for a 102" pipe across the canal with a design capacity of 990 cfs.

The drainage facilities and improvements proposed for this project is located within the City of Phoenix and will be designed to meet the standards and guidelines set forth in the City of Phoenix's *Storm Water Policies and Standards*, unless otherwise noted. These criteria are supplemented with design standards and procedures established in the FCDMC's *Drainage Design Manual, Volume 1 (Hydrology)*, and *Volume 2 (Hydraulics)*. The following summarizes the design criteria for the project:

- The storm drain north of the Arizona Canal will be designed for the 10-year flow. However, the storm drain system has been design to also accommodate a 10-year plus storm. The upsizing is discussed in Section 4.0.
- Surface improvements required for the collection of runoff will be designed in accordance with the City of Phoenix roadway design standards, including ADA design requirements. This evaluation is discussed in Section 3.0.
- The minimum velocity in the storm drain pipe will be 5 ft/sec and the maximum velocity will be 15 ft/sec. Please note that the 102" pipe will have a velocity of 17.45 ft/s at the design discharge of 990 cfs. For the 10-year or less event, the pipe velocity will be less than 15 ft/s. The District has indicated that this condition is acceptable. Please refer Appendix B for supporting documents.

1.5.1 Basis of Hydrology

The basis of hydrology for this project is the hydrology analysis that was performed for the selected Alternative 2 proposed improvements as documented in the *Final Recommendations Report*. This hydrology will be reviewed and updated as part of the pre-design evaluation. This hydrology evaluation is detailed in Section 2.0.

2.0 HYDROLOGY AND HYDRAULICS

2.1 Trunk Line Hydrology

The HEC-1 model for the selected Alternative 2 improvements from the *Final Recommendations Report* was used as the basis for the trunk line hydrology (file ALT2.DAT). This model determined the 10-year peak discharges for the sub-basins that contribute runoff within the Arcadia area watershed, and routed flows to be collected into the proposed Alternative 2 improvements to determine the size of the trunk line. This model showed a total of 681 cfs in the storm drain at the location north of the Arizona Canal (see Figure 3 for the proposed Alternative 2 improvements with 10-year flows).

The Alternative 2 HEC-1 model was reviewed to verify the parameters used in the model. A modification was made to sub-basin 38. The original model shows most of the runoff flowing to the south, with 16 cfs breaking to the west. Based on topographic data and field observations, sub-basin 38 was divided into 2 sub-basins, 38A and 38B, with runoff in sub-basin 38A flowing south and runoff in sub-basin 38B flowing west.

A new 10-year base model called LID10a.dat was created with this revision. The revised HEC-1 schematic is shown in Figure 2.1. This model reduces the flow going into the storm drain on Camelback Road and increases the flow going into the storm drain on Lafayette Boulevard. This revision did not change the proposed pipe size on Lafayette Boulevard, since the pre-design plan shows the 84" pipe not flowing full. The originally proposed 42" pipe on Camelback Road was able to be reduced to 36". The total flow at the Arizona Canal increases negligibly from 681 cfs to 686 cfs. Table 2.1 provides a summary of the hydrology results, and output from the revised 10-year base HEC-1 model is included in Appendix C. Figure 2.2 shows the revised 10-year base model system.

A technical memorandum summarizing the trunk line hydrology evaluation was submitted to the District on January 13, 2011, and was subsequently approved. A copy of the technical memorandum is provided in Appendix B.

Table 2.1
Peak 10-year Discharge Summary

Sub-Basin	10-yr Peak Flow	
	Pre-Design Report*	LID10a Updated Base Model
1	31	31
2	22	22
3	18	18
4	25	25
5	15	15
6	81	81
7	61	61
8	14	14
9	21	21
10	31	31
11	64	64
12	77	77
13	89	89
14	39	39
15	45	45
16	100	100
17	25	25
18	18	18
19	21	21
20	45	45
21	101	101
22	23	23
23	18	18
24	20	20
25	19	19
26	12	12
27	17	17
28	21	21
29	14	14
30	18	18
31	13	13
32	16	16
33	22	22
34	41	41
35	67	67
36	37	37
37	13	13
38	127	NA
38A	NA	64
38B	NA	74
39	61	61
40	46	46
41	55	55
42	125	125
TOTAL	**1,728**	**1,739**

*Ref. 6

Reference: *Arcadia Area Drainage Project Final Recommendations Report,*
Hultt-Zollars, for Flood Control District of Maricopa County, FCD No. 94-21, March 1997

NO.	REVISION	BY	DATE
3			
2			
1			

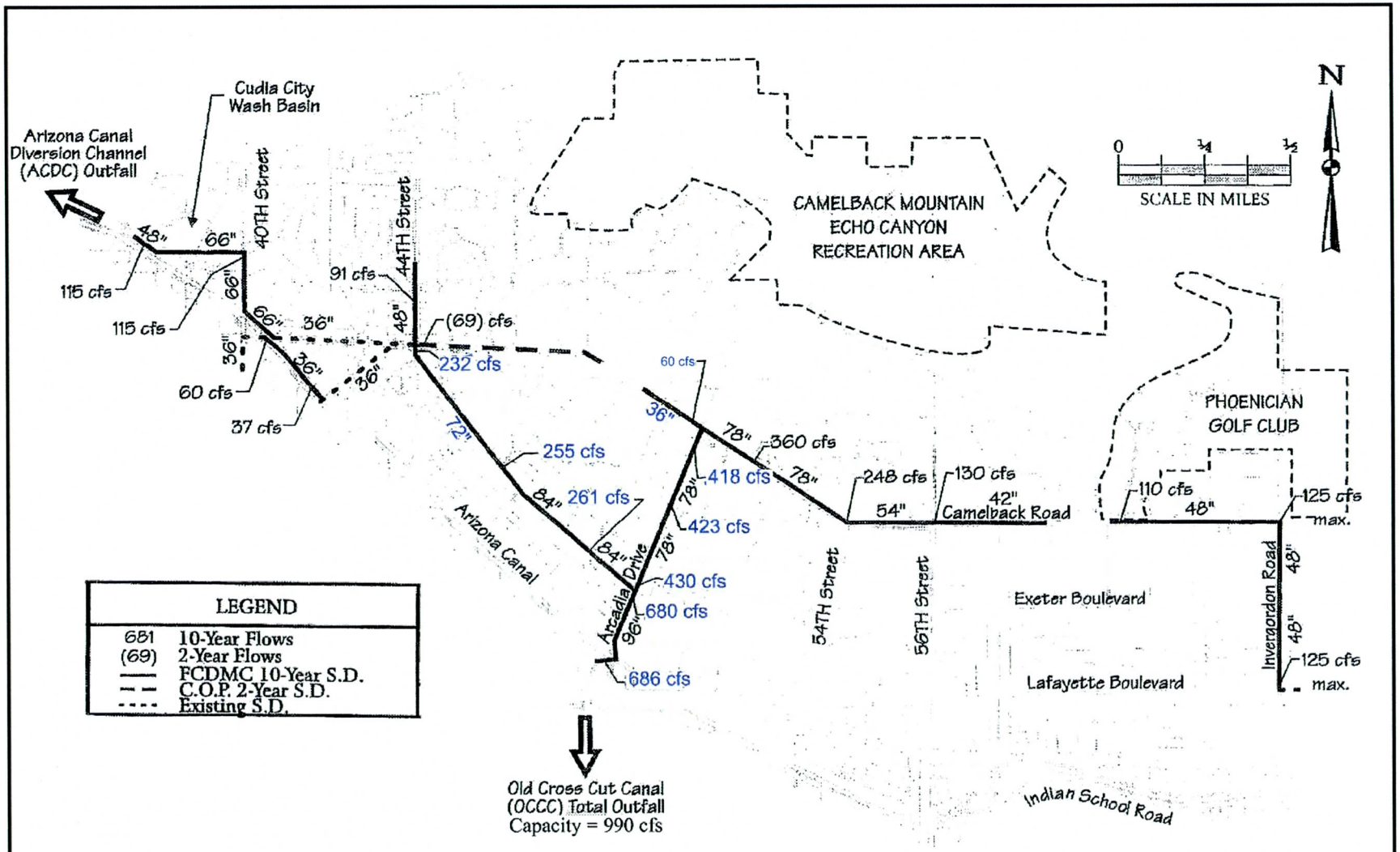
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

LAFAYETTE INTERCEPTOR DRAIN
AND OUTLET DESIGN
PCN 625.02.30

	BY	DATE
DESIGNED	DVD	2/6/2012
DRAWN	HM	2/6/2012
CHECKED	JCF	2/6/2012

OLSSON ASSOCIATES

FIGURE 2.1 — REVISED HEC-1 SCHEMATIC — SHEET OF



Reference: *Arcadia Area Drainage Project Final Recommendations Report,* Huitt-Zollars, for Flood Control District of Maricopa County, FCD No. 94-21, March 1997

LAFAYETTE INTERCEPTOR DRAIN AND OUTLET

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UPDATED
10-YEAR BASE MODEL

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FIGURE
2.2

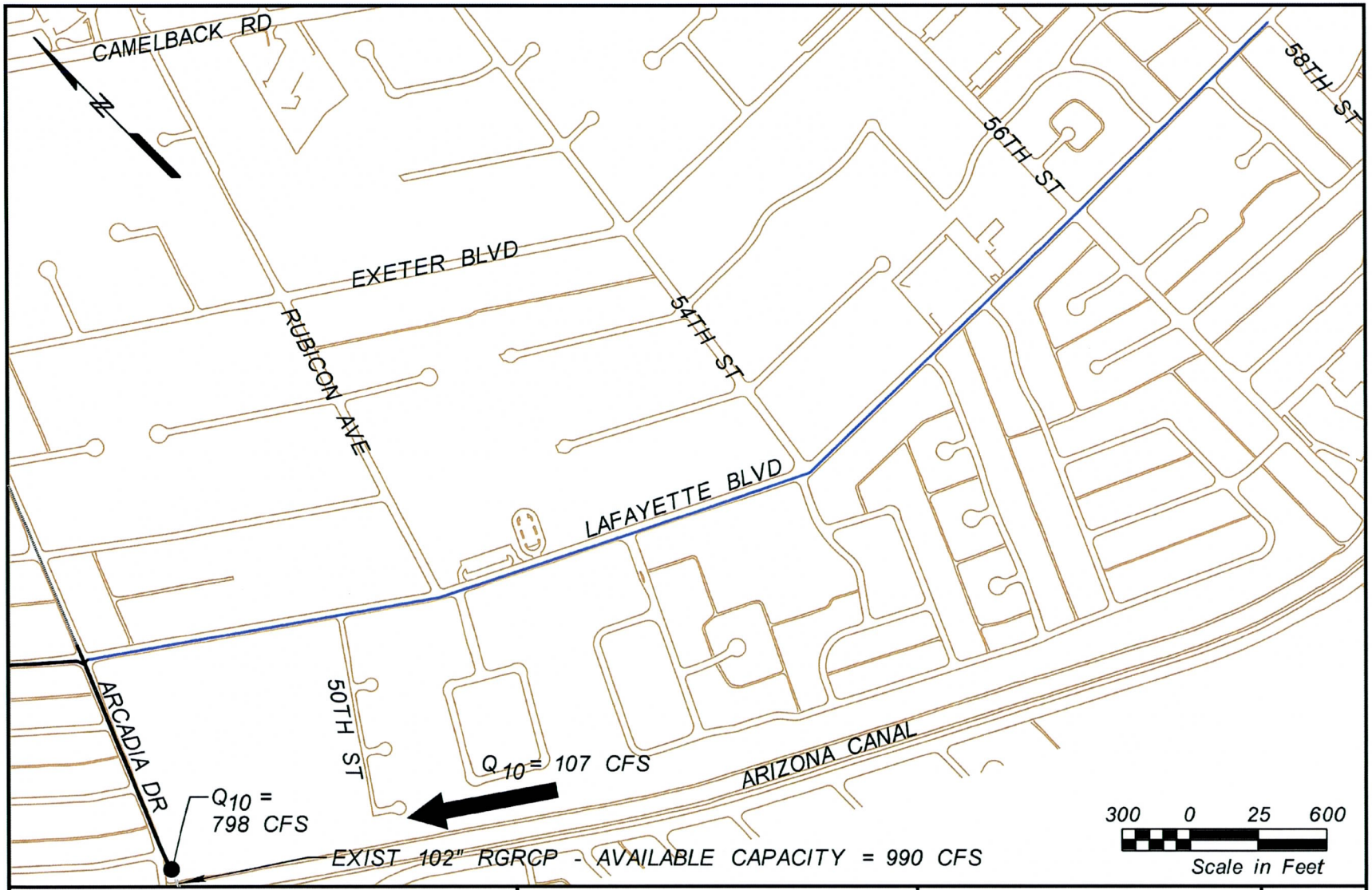
2.2 Proposed East Lafayette Collector System

The original Alternative 2 improvements do not collect stormwater runoff in the area south of Camelback Road and east of Arcadia Drive, even with the East Camelback System in place. An opportunity to provide flood protection to homes and structures in this area was evaluated. The result of this evaluation is a future 10-year system called the East Lafayette Collector System.

The alignment of the East Lafayette Collector System begins on Lafayette Boulevard near 58th Street and continues west to connect at the junction structure at Lafayette Boulevard and Arcadia Drive. An alignment variation of this option would be to turn south at 50th Street, then west under the existing detention basin and connecting to the junction structure at Arcadia Drive north of the Arizona Canal. With the understanding that Arcadia Drive cannot remain open during construction, the continuous route with connection at Lafayette Boulevard and Arcadia Drive is the preferred alignment to minimize impacts to residence along 50th Street. The layout of the proposed East Lafayette Collector System is shown in Figure 2.3.

The base HEC-1 model was modified to add the proposed East Lafayette Collector System in the file called LID10b.dat. The 10-year peak discharge from sub-basins 13, 14, 18, 19, 23, 24, 27, 28, and 29 were diverted into the proposed East Lafayette Collector System and routed into the 102" pipe north of the Arizona Canal. The HEC-1 model indicates the East Lafayette Collector System will collect a total of 112 cfs. This increases the total flow at the concentration point north of the Arizona canal from 686 cfs to 798 cfs. Figure 2.4 shows the hydrology results with the East Lafayette Collector System in place.

A preliminary cost estimate was prepared for the East Lafayette Collector System. Construction of this system is estimated to be $2.6 to $2.7 million. Design cost is estimated to be $275,000, which brings the total cost of this future project to be approximately $3.0 million.



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PROPOSED FUTURE EAST LAFAYETTE COLLECTOR SYSTEM

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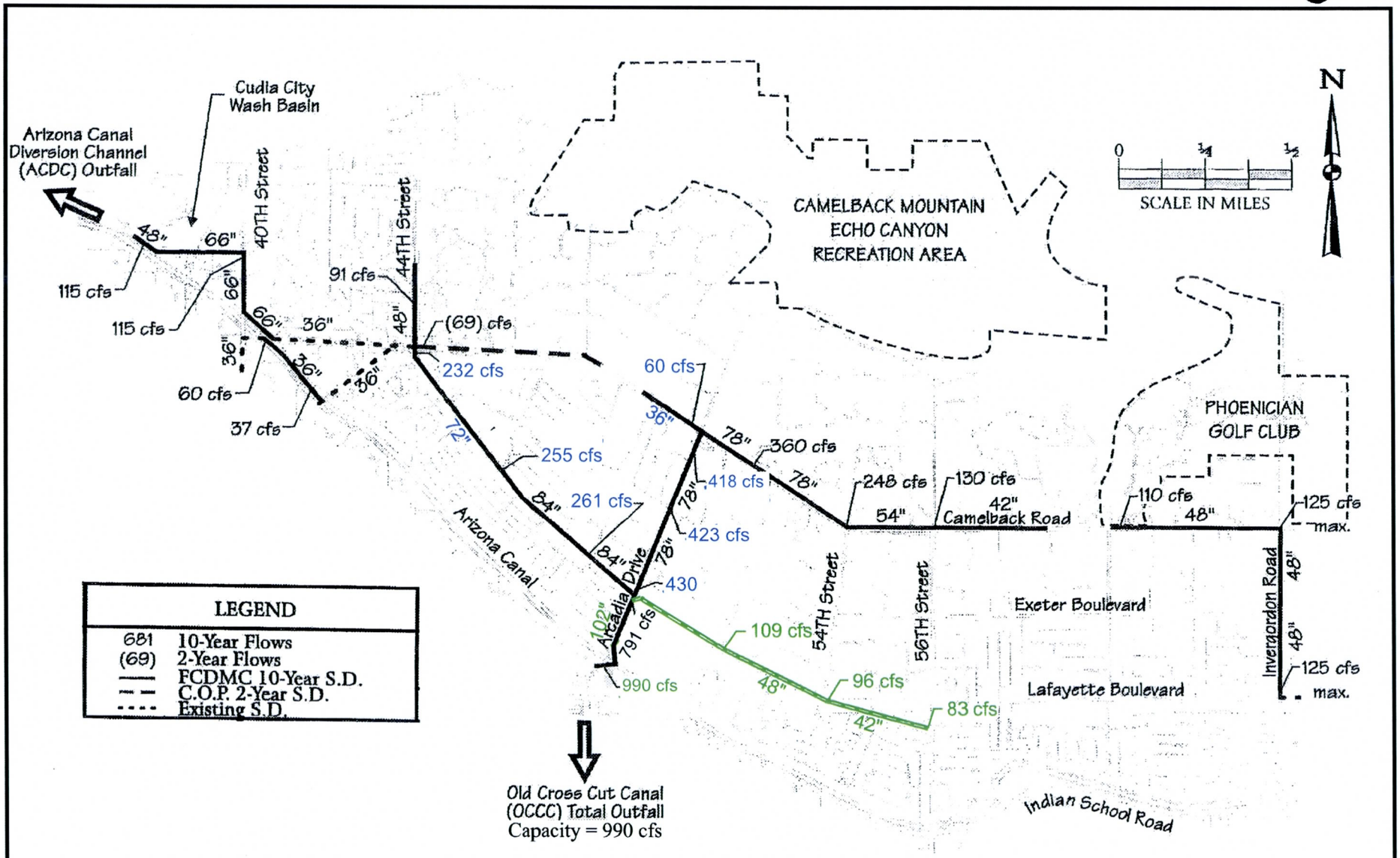
FIGURE
2.3



Reference: *Arcadia Area Drainage Project Final Recommendations Report,*
Huitt-Zollars, for Flood Control District of Maricopa County, FCD No. 94-21, March 1997

LAFAYETTE INTERCEPTOR DRAIN
AND OUTLET
90% PRE-DESIGN
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HYDROLOGY SUMMARY WITH PROPOSED FUTURE EAST LAFAYETTE COLLECTOR SYSTEM

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FIGURE
2.4

While the East Lafayette Collector System is a future storm drain project that can be designed and constructed in the future as funding becomes available, a stubout for the future connection will be designed and constructed as part of this project.

2.3 Collection System Hydrology

The collection system hydrology was performed to determine the specific locations where flows can be collected and the peak discharge at each collection point. Typically the regional hydrology is refined into smaller sub-drainage areas, and the peak discharge is computed using the Rational Method. The times of concentration from the Rational Method is usually shorter than the time from the HEC-1 method, resulting in a higher rainfall intensity and, consequently, a higher peak discharge than the HEC-1 method. On average, the peak discharge from the Rational Method is about 1.3 times the HEC-1 value.

A limitation of the Rational Method is that it cannot perform flow diversions that are available in the HEC-1 program. For example, in the HEC-1 model, flow was diverted from each sub-basin that had irrigated lots. This operation cannot be performed with the Rational Method. The runoff coefficient would have to be adjusted, using best engineering judgment. As an example, a few sample Rational calculations were performed for sub-basins 37, 38A, 38B, 39, 40, and 41 using the DDMS software. These were delineated as sub-basins K through R. The total peak discharge for these sub-basins using HEC-1 is 313 cfs, while the Rational Method (without 'C' value adjustment) is over 3 times higher at 979 cfs. Using the Rational Method for the collection system hydrology would result in the collection system being overdesigned. In lieu of the Rational Method, the following procedures were developed to perform the collection system hydrology.

The peak discharge without diversion of each sub-basin from the HEC-1 results was used as the starting point. Next, the sub-basins were divided into smaller drainage areas, typically for flow splits that occur where two streets intersect. This was performed using ground survey data, GIS topo, and field observations. Flow splits were determined by cutting cross sections and computing the capacity of the section. If no defined sections are present at the split location, the flow distribution was determined by the magnitude of the slope in each direction. For example, if the slope to the south is 1.5% and the slope the

west is 0.5%, then the flow distribution would be 75% to the south and 25% to the west. Plate 1 shows the result of the collection system hydrology including the collection location and discharge value

A technical memorandum summarizing the collection system hydrology evaluation was submitted to the District on March 1, 2011, and was subsequently approved. A copy of the technical memorandum is provided in Appendix B.

2.4 Storm Drain Hydraulics

The inlet hydraulics were designed according to the standards and requirements specified in the FCDMC's Hydraulics Drainage Design Manual and the City of Phoenix's Storm Water Policies and Standards manual. The major design criteria used for the storm drain design include the following:

- The minimum velocity in the storm drain pipe will be 5 ft/sec and the maximum velocity will be 15 ft/sec for the design event. A discussion on maximum allowable pipe velocities will be provided as a separate memo.
- The hydraulic grade line (HGL) will be at least 1 foot below the ground or rim elevation for any catch basins and manholes for the 10-yr event.
- The dry lane and spread criteria are not applicable and will not be met because these criteria are for the 2-year event and the proposed system will be designed for the 10-year event.

2.4.1 Trunk Line Hydraulics

The base 10-year flow for the trunk line is 686 cfs, as discussed in Section 2.1 of this report. However, because the pipe size at the Arizona Canal crossing was increased from 96" to 102", the capacity of the storm drain system increased from 686 cfs to 990 cfs at this location. The Project Team discussed options to utilize this additional capacity (see Section 4.0 for a detailed discussion of the additional capacity evaluation). Consequently, the trunk line hydrology was increased by 10% and the trunk line was designed for the increased flows. This design for the additional 10% capacity is called the "10 plus system". Table 2.2 provides a summary of the flows used in the trunk line design.

The trunk line hydraulics were designed using the Bentley's StormCAD computer program. The hydraulic grade line elevation of 1240.30 was used from the Old Cross Cut Canal project as the tailwater for the model, and hydraulic losses for bends and junctions

were calculated based on the methodology from the Hydraulics Drainage Design Manual. Models were created for the interim and ultimate build-out conditions. The StormCAD outputs and the headloss calculation table are provided in Section E-2 Trunk Line Hydraulics of Appendix E.

2.4.2 Inlet Design

Curb opening catch basins based on the City of Phoenix Standard Detail P-1569 are proposed to capture the offsite flows at the collection locations discussed in the collection system hydrology section. A clogging factor of 20% was used for the curb opening inlets on grade and in sump conditions. For the catch basins on North Village Drive north of Camelback Road, the clogging factor was increased to 40% to account for street parking. A clogging factor of 50% was used for the grated area drain proposed at the drainage swale. A special catch basin will be designed for the bermed areas along the north side of Lafayette Boulevard between Launfal Avenue and 45th Street.

The catch basins were sized using Bentley's FlowMaster computer program. The longitudinal slope and cross slope design parameters were determined from the ground survey data. Outputs from FlowMaster for each inlet are provided in Section E-3 Collection System Hydraulics of Appendix E.

Table 2.2
Summary of Trunk Line Flows

Node ID*	Location	Station	Design Flow (cfs)
MH 19 (44th Street)	44th St	239+18.68	78
DI (Village Drive)	N Village Dr	515+90.00	100
MH-14	N Village Dr	510+38.04	146
Camelback Road - JS	Camelback Rd	506+40.36	196
DI (Lafayette Blvd)	Lafayette Blvd	59+43.34	257
MH 8 (46th Street)	46th St	72+37.22	285
MH 4 (Dromedary Road)	Dromedary Rd	91+40.38	289
MH 2	Arcadia Dr	22+57.00	473
DS 3 (ARCADIA DR)	Arcadia Dr	19+97.44	762
JS1 (Flow East of Lafayette)	Arcadia Dr	19+73.09	865
DS 1	Arcadia Dr	9+95.77	990

*Node ID from StormCAD model, See Appendix E.2

3.0 SURFACE IMPROVEMENTS

The existing surface conditions along Lafayette Boulevard within the project limits are discontinuous and do not adequately contain stormwater flows within the roadway prism. Due to the scalloped nature of the existing roadway, developing a storm drain collection system that adequately captures the design stormwater flows without providing any surface improvements is not possible. To establish the extent of the improvements necessary to provide an adequate collection system, the existing roadway conditions were researched and cataloged.

3.1 Existing Roadway Conditions

Lafayette Boulevard is a two-lane collector roadway with a posted speed limit of 35 mph. The existing roadway cross section consists of one travel lane and one bike lane in each direction. The roadway width varies from approximately 36 feet to 46 feet. The wider area currently provides some on-street parking.

3.1.1 Existing Roadway Cross Slopes

The existing roadway cross slope along Lafayette Boulevard varies throughout the project limits. From 44th Street to South 46th Street the roadway is normal crown, except for a small portion between 45th Street and North 46th Street where the roadway slopes entirely to the north. From South 46th Street to Launfal Avenue, the roadway transitions from a southerly-draining cross slope to a northerly-draining cross slope, and then ultimately to a normal crown section. From Launfal Avenue to Arcadia Drive, the roadway slopes almost entirely to the south with a few areas being almost completely flat. There is an existing irrigation ditch located along the south side of Lafayette Boulevard from Launfal Road to Dromedary Drive. Throughout this section of Lafayette, the roadway slopes entirely to the south into the existing irrigation ditch. Figure 3.1 provides a graphical representation of the existing pavement slopes throughout the project limits.

3.1.2 Existing Sidewalk and Curb & Gutter Inventory

As a part of this project, a sidewalk and curb & gutter inventory was conducted to determine the limits and conditions of existing improvements throughout the project

limits. All curb & gutter and sidewalks throughout the corriddor were found to be in good condition and do not currently require reconditioning. The following areas were found to have existing sidewalk and have been depicted in Figure 3.1:

- North side of Lafayette Blvd from 44th Street to east of Calle Feliz
- South side of Lafayette Blvd from Ave Del Puente to just west of North 46th Street
- South side of Lafayette Blvd from 46th Place to 47th Street
- West side of Arcadia Drive from Lafayette Boulevard to the Arizona Canal

Various types of curb and gutter were found throughout the project limits including roll curb and vertical curb & gutter. The following areas along Lafayette Boulevard were found to have existing curb and have been depicted in Figure 3.1:

- North side of Lafayette Boulevard from 44th Street to just east of Calle Feliz – vertical C&G, H=6"
- North side of Lafayette Boulevard from east of Calle Feliz to Dromedary – roll curb, H=4"
- South side of Lafayette Boulevard from Ave Del Puente to 46th Place - roll curb, H=4"
- South side of Lafayette Boulevard from 46th Place to 47th Street - vertical C&G, H=6"

From research and discussions with the City of Phoenix management staff, it was identified that the local community has historically been opposed to continuous sidewalks being installed within the Arcadia corridor. However, based on the first public meeting held on March 15th, 2011, there is some new interest to install continuous sidewalks along Lafayette Boulevard. The City is in discussions to form a committee to further investigate the possibility of installing continuous sidewalks in the future.

Figure 3.1: Existing Surface Conditions

3.1.3 Existing Right-of-Way

The existing right-of-way within the project limits varies from 66 feet to 80 feet and is asymmetric about the existing roadway. The various right-of-way widths are as follows:

- From 44th Street to west of Calle Feliz – 66-ft
- From west of Calle Feliz to west of 45th Street – 73-ft
- From west of 45th Street to 45th Street – 80-ft
- From 45th Street to North 46th Street – 73-ft
- From North 46th Street to South 46th Street – 80-ft
- From South 46th Street to 46th Place – 76-ft
- From 46th Place to Launfal Avenue – 73-ft
- From Launfal Avenue to Arcadia Drive – 66-ft
- Arcadia Drive south of Lafayette Boulevard – 73-ft
- Arcadia Drive north of Lafayette Boulevard – 86-ft

In various places throughout the project limits, the existing right-of-way is currently being utilized by homeowners for use as additional parking and/or landscaping. Some improvements within the right-of-way include decorative walls and pilasters, pavers, mailboxes, trees, and landscape irrigation. While conversations with homeowners indicate they realize these improvements are within City right-of-way, any significant impacts in these locations may be undesirable from a public standpoint.

3.2 Surface Improvement

The main purpose of the surface improvements portion of this project is to contain and convey drainage into the proposed storm drain system.

3.2.1 Selected Alternative

To mitigate the storm water flows, a new 6-inch roll curb will be installed per Figure 3.3 and Sheet 2 of 4 in Appendix D. Rolled curb is traversable so City of Phoenix standard driveways are not necessary for property access. Due to the height differential caused by the addition of the curb, the existing driveways adjacent to the curb installation have been re-profiled and will require the purchase of TCE's to complete the construction. A 1-foot bench behind the curb with a 4:1 slope down to existing ground will be constructed to ensure the stability of the curb. Where ever the new rolled curb is installed the adjacent roadway will be removed and replaced to the crown line of the road. In areas where no rolled curb is being installed, the removal limits will be dependent on the needs of the storm drain installation. Where feasible, the existing high points and low points of the existing edge of pavement were retained in the proposed rolled curb profile. In areas where low points were found to be in close proximity to each other, one of the low points was removed and the curb was profiled to one low point to improve the functionality of the collection system.

Due to the addition of roll curb, driveway reconstruction, and fill slopes, some existing appurtenances would need to be removed or relocated as follows:

- 3 existing water valves to be adjusted
- 1 existing water meters to be relocated
- 1 existing telephone pullbox to be relocated

This design integrates well into the existing corridor as much of the existing curb within the project limits is roll curb. Additionally, should the local community decide that they would like to install sidewalk at some point in the future, this could be easily accomplished. Access to properties is relatively unchanged and City of Phoenix standard driveways are not necessary. In addition, impacts to existing private landscaping within the right-of-way are minimized.

Figure 3.2: Roll Curb Locations

3.2.2 American with Disabilities Act

Due to funding constraints associated with this project, surface improvements in the vicinity of radius returns, driveways and intersections have been avoided to eliminate the need for reconstructing existing facilities that would not directly benefit the proposed stormwater collection system. Wherever possible, a 10-foot buffer between the proposed surface improvements and the existing surface improvements has been utilized. This buffer was established based on discussions with and documentation provided by the City of Phoenix. For this reason the surface improvements will be structured to maximize the collection system only. Consideration has not been given to installing ADA improvements consistently throughout the project limits.

3.2.3 Office Complex Parking Lot Regrading

The existing office complex south of Camelback Road along the storm drain trunk line alignment will be substantially impacted by the installation of the storm drain. In result, new catch basin inlets will be installed to capture flows from the office complex. Curb openings to allow drainage to the proposed storm drain inlets and replacement of the parking lot pavement, curbs, walls, landscaping, utilities, and trash enclosure have been provided in the plans.

In addition to the replacement of existing features, consideration was given to the grading of the existing parking lot. The existing parking lot was constructed as an inverted crown along the length of the storm drain installation alignment. Since the storm drain installation will have a substantial impact on the inverted crown section, the reconstruction of the parking lot will remove the entire inverted crown section. The final revised grading of the parking lot will allow storm water flows to drain to the west side of the parking lot then to the south for the majority of the reconstruction area.

4.0 ADDITIONAL CAPACITY EVALUATION

The Old Cross Cut Canal Improvements Project constructed the first phase of the Arcadia area regional flood control project and will provide the outfall for this project. During the design of that phase, the decision was made by the project team to upsize of the pipe crossing the Arizona Canal from a 96" to a 102" because of the minimal additional cost. The bigger pipe size allows approximately 990 cfs to be conveyed under the canal in an extreme event, which is 304 cfs more than the designed 10-year flow of 686 cfs. Utilizing this additional capacity is discussed in the following sections.

Utilizing this capacity can be placed into two distinct groupings:

- Increasing the collection system and trunk line pipe size to collect more stormwater than the 10-year event
- Constructing an inlet structure at the existing basin at the northeast corner of Arcadia Drive and the Arizona Canal to collect water that ponds along the upstream bank of the canal.

4.1 Trunk Line Hydrology

Separate hydrology for the trunk line and for the collection system has been developed and was discussed in detail in Section 2.0 of this report. When the Alternative 2 storm drain system is completely constructed (ultimate condition), the total 10-year flow in the trunk line at the Arizona Canal crossing is 686 cfs. If the East Lafayette Interceptor Drain is added as a project in the future, an additional 112 cfs will be added to the trunk line, which will bring the 10-year flow in the pipe at the canal crossing to 798 cfs.

During the interim condition, with only the Lafayette Interceptor Drain in place, the 10-year flow in the trunk line is 311 cfs for the catchment area directly associated with the Lafayette trunk line. An additional 61 cfs from areas north of Camelback Road (sub-basins 30 and 38A) also get into the Lafayette trunk line during the interim condition. Therefore, the total 10-year flow in the trunk line during the interim condition is 372 cfs.

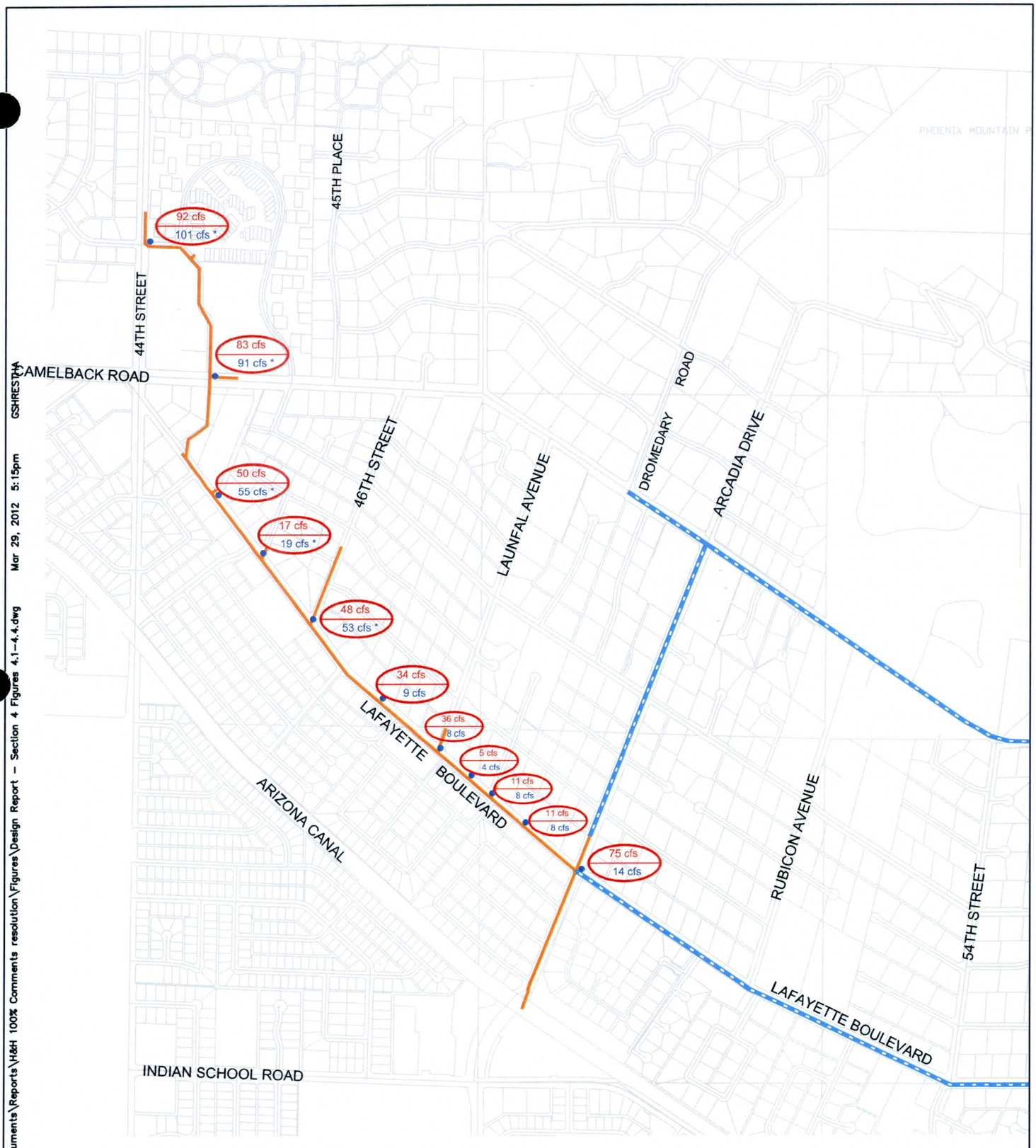
4.2 Collection System Sizing

The collection system hydrology is typically about 1.3 times the trunk line hydrology due to differences in the time of concentrations. The collection system has been sized to collect the flows as shown in Figure 4.1. The total flow collected is approximately 462 cfs. This provides for a 10-year collection system for the interim condition including the areas north of Camelback Road. However, when the storm drains along Camelback Road and Arcadia Drive north of Lafayette Boulevard are constructed in the future (ultimate condition), these systems will cut off approximately 122 cfs that was intercepted by the Lafayette Interceptor Drain east of 46th Street during the interim condition. This scenario is illustrated in Figure 4.2, which shows the 10-year collection hydrology for the Lafayette Interceptor Drain in the ultimate condition.

Figure 4.2 shows that in the ultimate condition, the 10-year collection hydrology for the Lafayette Interceptor Drain is less than the interim condition collection hydrology, 340 cfs in the ultimate condition vs. 462 cfs in the interim condition. The collection system for the Lafayette Interceptor Drain east of 46th Street has 122 cfs of extra capacity in the ultimate condition. Therefore, the Lafayette Interceptor Drain collection facilities east of 46th Street do not need to be upsized to create a 10-year plus system in the ultimate condition.

Additionally, at 46th Street, while the 10-year hydrology indicates that 48 cfs will concentrate at 46th Street, the collection system has been sized for 56 cfs. This is due to the physical constraints including a breakout to the west and the existing speed hump. Therefore, the collection system along 46th will not need to be upsized to create a 10-year plus system in the ultimate condition.

For the collection system west of 46th Street, there are no planned improvements upstream of the Lafayette collection system that will cut off flows in the future. Therefore, the collection system west of 46th Street could be upsized to allow an additional 10% capture, creating an ultimate collection system for this entire project that will accommodate the 10-plus year event. Upsizing this portion of the system will provide benefit since flooding



11 cfs / 8 cfs — INTERIM CONDITIONS FLOW

11 cfs / 8 cfs — ULTIMATE CONDITIONS FLOW

11 cfs / 8 cfs * — ULTIMATE CONDITION FLOW INCREASED BY 10%

STORM DRAIN TO BE CONSTRUCTED BY THIS PROJECT

FUTURE STORM DRAIN

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PROJECT NO: 010-2312 DRAWN BY: TGB DATE: 03/29/2012	Interim /Ultimate Conditions 10-Year Collection System LAFAYETTE INTERCEPTOR STORM DRAIN SYSTEM	OLSSON ASSOCIATES 7250 North 16th Street Suite 210 Phoenix, AZ 85020-5282 TEL 602.748.1000 FAX 602.748.1001	FIGURE 4.1

10 cfs — 10–Year Plus Design Discharge

STORM DRAIN TO BE CONSTRUCTED BY THIS PROJECT

FUTURE STORM DRAIN

NOTE: Refer to Appendix E, Section E–3 for Collection System Capacity Calculations

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PROJECT NO: 010-2312	Collection System Design Discharge	OLSSON ASSOCIATES	7250 North 16th Street Suite 210 Phoenix, AZ 85020-5282 TEL 602.748.1000 FAX 602.748.1001	FIGURE
DRAWN BY: TGB	LAFAYETTE INTERCEPTOR STORM DRAIN SYSTEM			4.2
DATE: 03/29/2012				

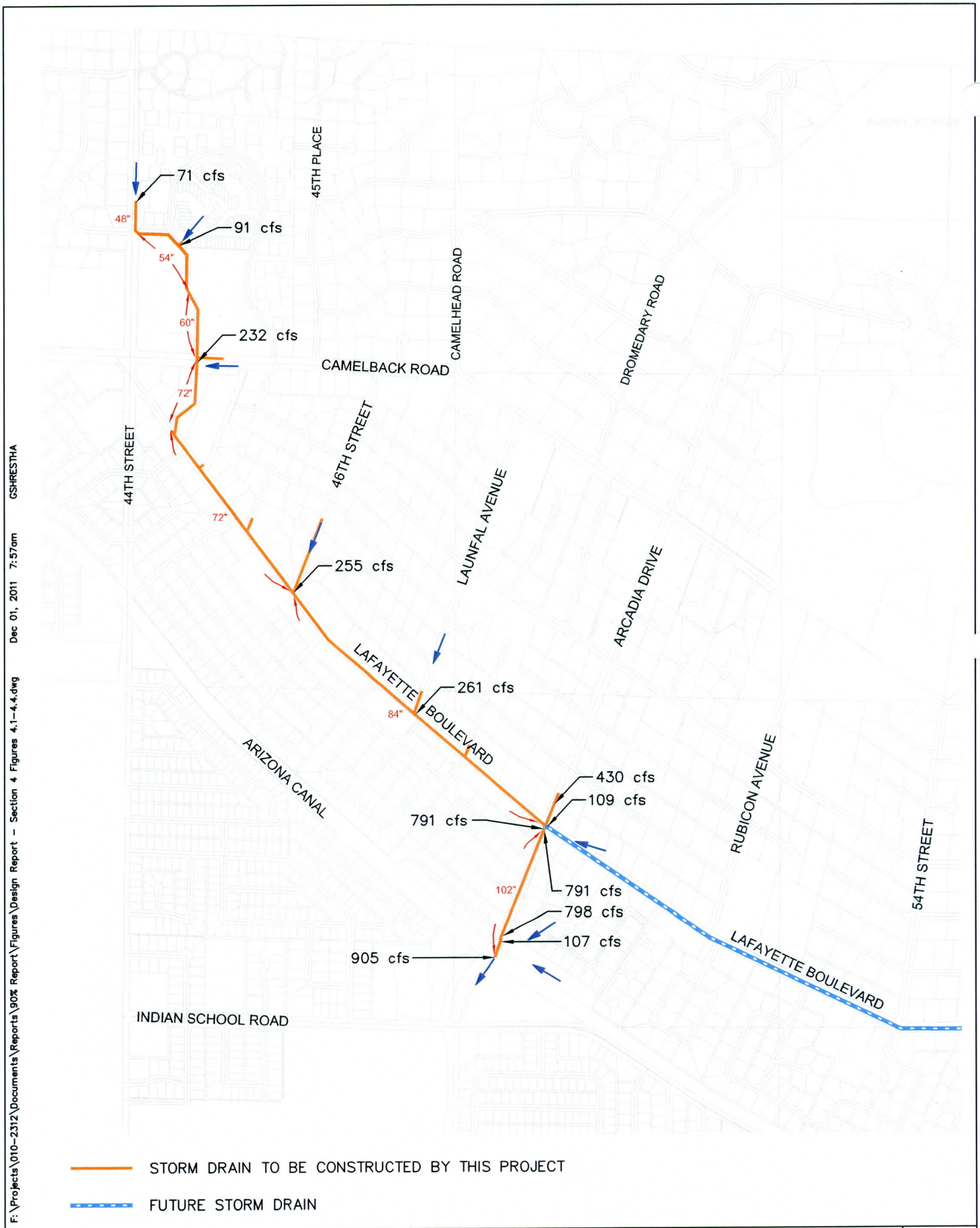
west of 44th Street is one of the main drivers of this project. This additional capture will provide additional benefit to that area. Figure 4.2 shows the collection system hydrology in the ultimate condition with the collection system west of 46th Street upsized by 10%.

4.3 Trunk Line Sizing

The trunk line has been evaluated to determine what would be required to provide the additional 10% increase in capacity within the trunk line. The base 10-yr trunk line flows are shown in Figure 4.3. The upsized system design flows are shown in Figure 4.4. The result of the Trunkline analysis shows hydraulic grade line (HGL) at least 1-foot below the gutter and rim elevation at any catch basin and manhole location respectively. While all criteria will be met for the 10-year design storm, the system is also designed to function for the 10-year plus system. Please refer to Section E-2 Trunk Line Hydraulics of Appendix E for outputs from StormCAD model.

4.4 Summary of Collection System and Trunk Line Upsizing

The base 10-year system from Arcadia to the west will cost approximately $23,000/cfs. Upsizing this storm drain system will cost approximately $10,000/cfs. Additionally, this increased capacity will primarily cut off flows concentrating at the intersection of Camelback Road and 44th Street. This will primarily provide benefit to the area west of 44th Street where significant flooding currently occurs.



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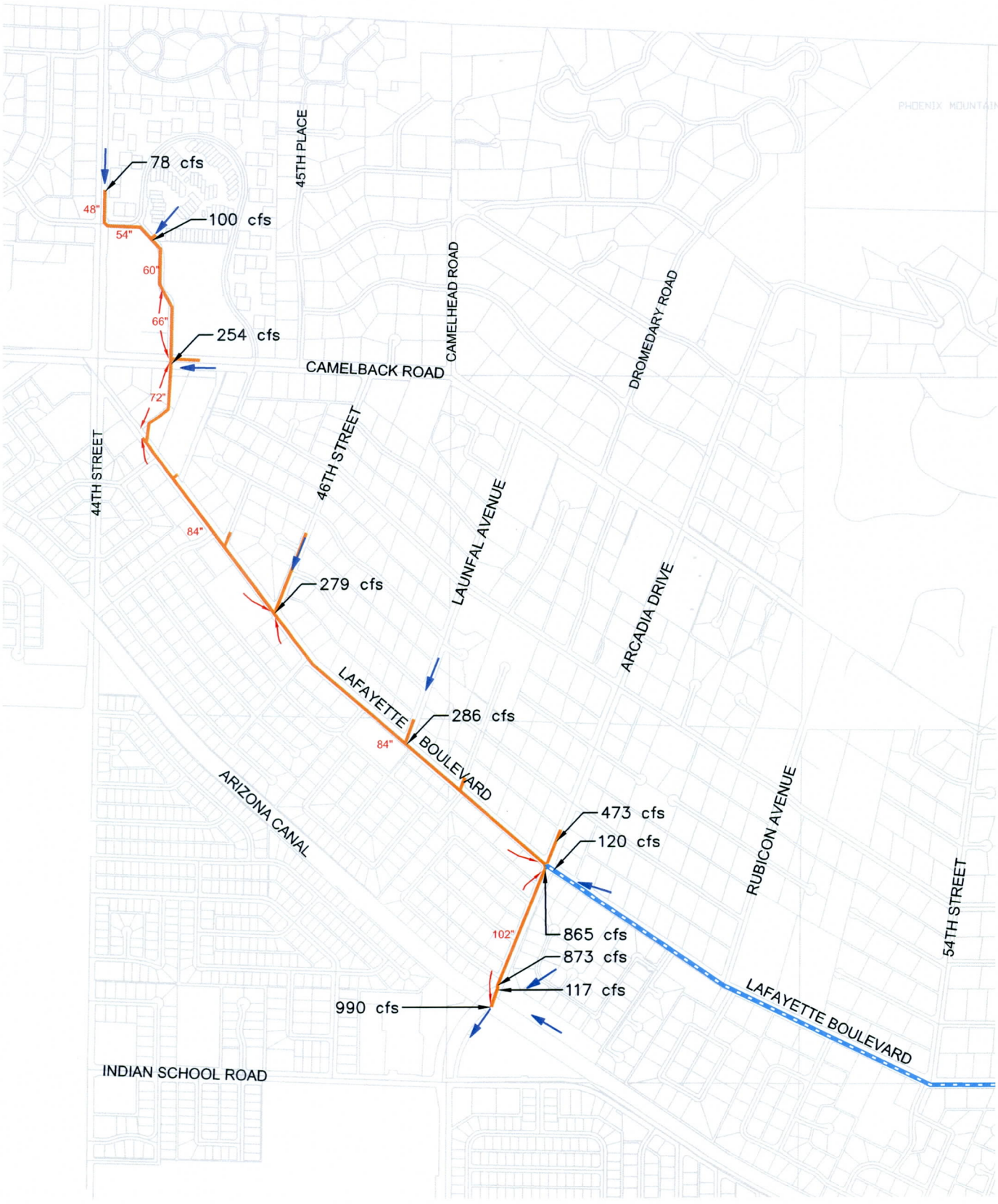
PROJECT NO: 010-2312	Interim Condition 10-Year Trunkline System	OLSSON ASSOCIATES	FIGURE
DRAWN BY: TGB	LAFAYETTE INTERCEPTOR STORM DRAIN SYSTEM	7250 North 16th Street Suite 210 Phoenix, AZ 85020-5282 TEL 602.748.1000 FAX 602.748.1001	4.3
DATE: 12/01/2011			



STORM DRAIN TO BE CONSTRUCTED BY THIS PROJECT

FUTURE STORM DRAIN

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PROJECT NO: 010-2312	Ultimate Condition 10-Year Plus Trunkline System	OLSSON ASSOCIATES	FIGURE
DRAWN BY: TGB	LAFAYETTE INTERCEPTOR STORM DRAIN SYSTEM	7250 North 16th Street Suite 210 Phoenix, AZ 85020-5282 TEL 602.748.1000 FAX 602.748.1001	4.4
DATE: 12/01/2011			

4.5 Inlet Structure at the Existing Basin

A very cost effective way to ensure that as much of the storm drain capacity is utilized is to collect water at the existing basin at the northeast corner of the Arcadia Drive and the Arizona Canal.

The basin is owned and maintained by the Arcadia Estates Homeowner's Association, and designed to function as a detention basin for runoff from the development. However, water from upstream areas to the north and east of the development also finds its way into the basin. Water from the watershed originates from Camelback Mountain, then flows from north to south due to the topography. Water is conveyed within the north-south roadways to the Arizona Canal, where it ponds against the upstream side of the elevated north bank. While the topography in the east-west direction is very flat, the runoff tends to move from east to west along the upstream side of the canal during events that do not overtop the canal.

The HEC-1 model indicates a peak flow of 205 cfs for the 10-year event at the existing basin location. This value assumes the East Camelback System is in place for the ultimate condition. During the interim condition with just the Lafayette Interceptor Drain in place, the HEC-1 model indicates a 10-year flow of 528 cfs concentrates at the basin location.

A drop inlet structure is proposed at the basin location to collect the water that currently concentrates there and convey it into the OCCC system. The inlet structure will be designed for 304 cfs, additional capacity due to upsize of the trunk line at the Arizona Canal crossing. Please refer to *Section 4.0 Additional Capacity Evaluation* for increased capacity of the trunk line system. A 66-inch concrete pipe is design to convey 304 cfs from the drop inlet structure into the OCCC system. Please refer to sheet 71 for detail of drop inlet structure and conveyance pipe.

4.5.1 Design Procedure

The design of the drop inlet structure was done in a way to ensure that flow through the inlet structure does not surcharge the storm drain system, reducing its capacity. This was

necessary because the downstream trunk line only has an additional capacity of 304 cfs after storm drain flows are considered.

The flow breakout location and elevation of the retention basin was determined. Flow from the basin breaks out at an elevation of 1253.80 ft from the southwest corner of the basin.

A rating curve for the downstream storm drain (OCCC-Phase 1) was developed and is included in Table 4.1 below.

Table 4.1

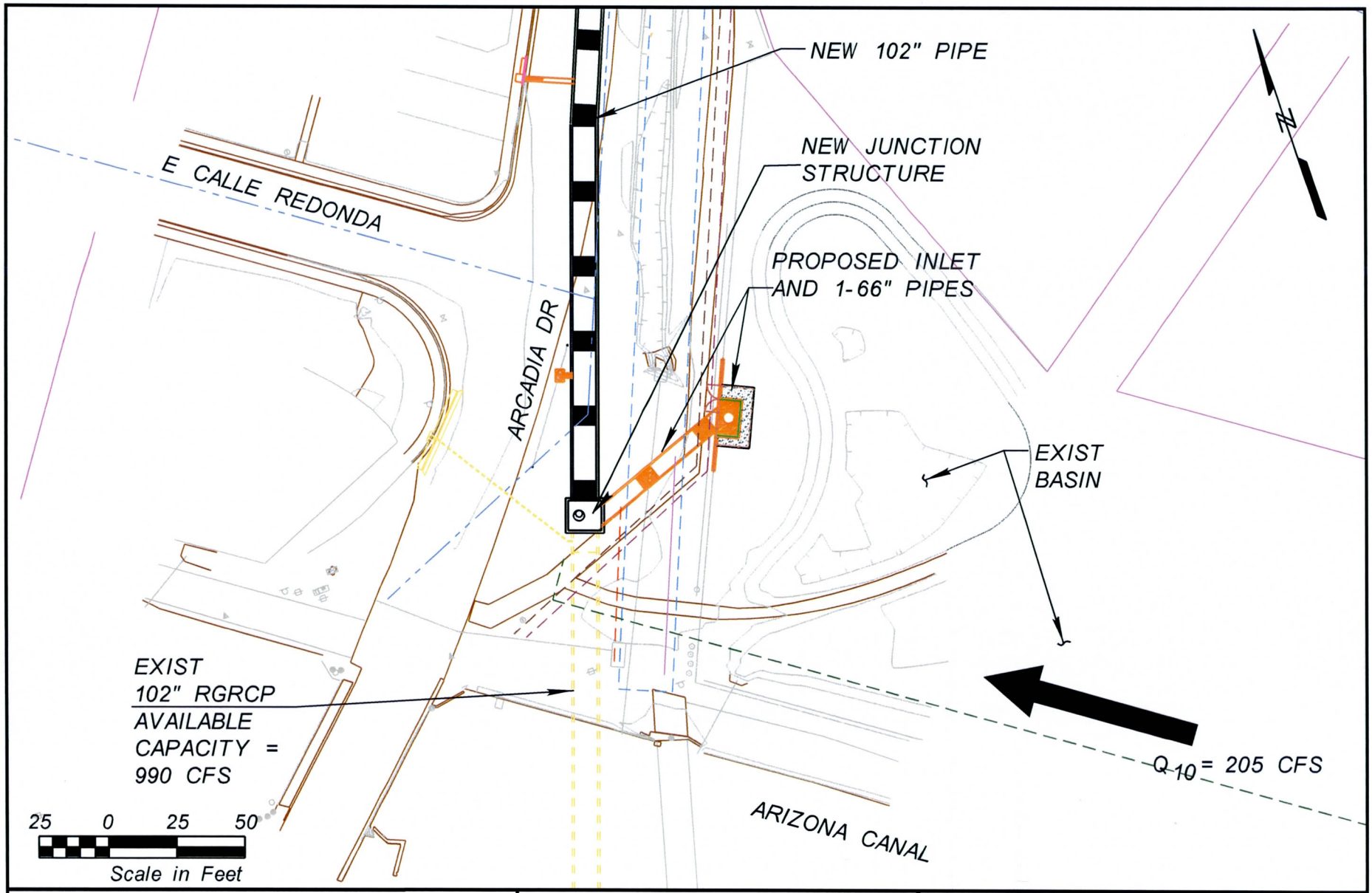
Flow vs. Water Surface Elevation Rating Table for OCCC-Phase 1 Storm Drain

Discharge (cfs)	Water Surface Elevation (ft)
700	1234.99
800	1236.84
900	1238.65
990	1240.30
1100	1242.63
1200	1244.94
1300	1247.42

The starting water surface elevation within the storm drain is 1240.30. Design criteria is to pass no more than 304 cfs at breakout, which will result in a water surface elevation on the drop inlet of 1253.80.

A 4.3-ft diameter orifice is designed at the drop inlet structure to limit the amount of flow from the basin. The elevation of the orifice is set such that it can convey maximum 304 cfs at the flow breakout elevation (1253.80) and does not influence the headwater (1244.00) of the 66-inch conveyance pipe that drains 304 cfs from the drop inlet into the

OCCC system. The headwater for the 66-inch conveyance pipe was determined based on back water calculations from the trunk line to the drop inlet structure. The calculation considers the tailwater elevation at 1240.30 ft (from OCCC-Phase 1 model) and head losses at the junction, bend, pipe, and inlet. Please refer Figure 4.5 for the drop inlet location in Arcadia Drive, and Section E-4 and Section E-5 in Appendix E for the hydraulic calculations and structural analysis of drop inlet structures respectively.



LAFAYETTE INTERCEPTOR DRAIN AND OUTLET

COP ST 83110068
FCD PROJ. NO. 2010C030

PROPOSED INLET STRUCTURE AT EXISTING BASIN

OLSSON ASSOCIATES
7250 North 16th Street
Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001

FIGURE 4.5

5.0 FLOODPLAIN ANALYSIS

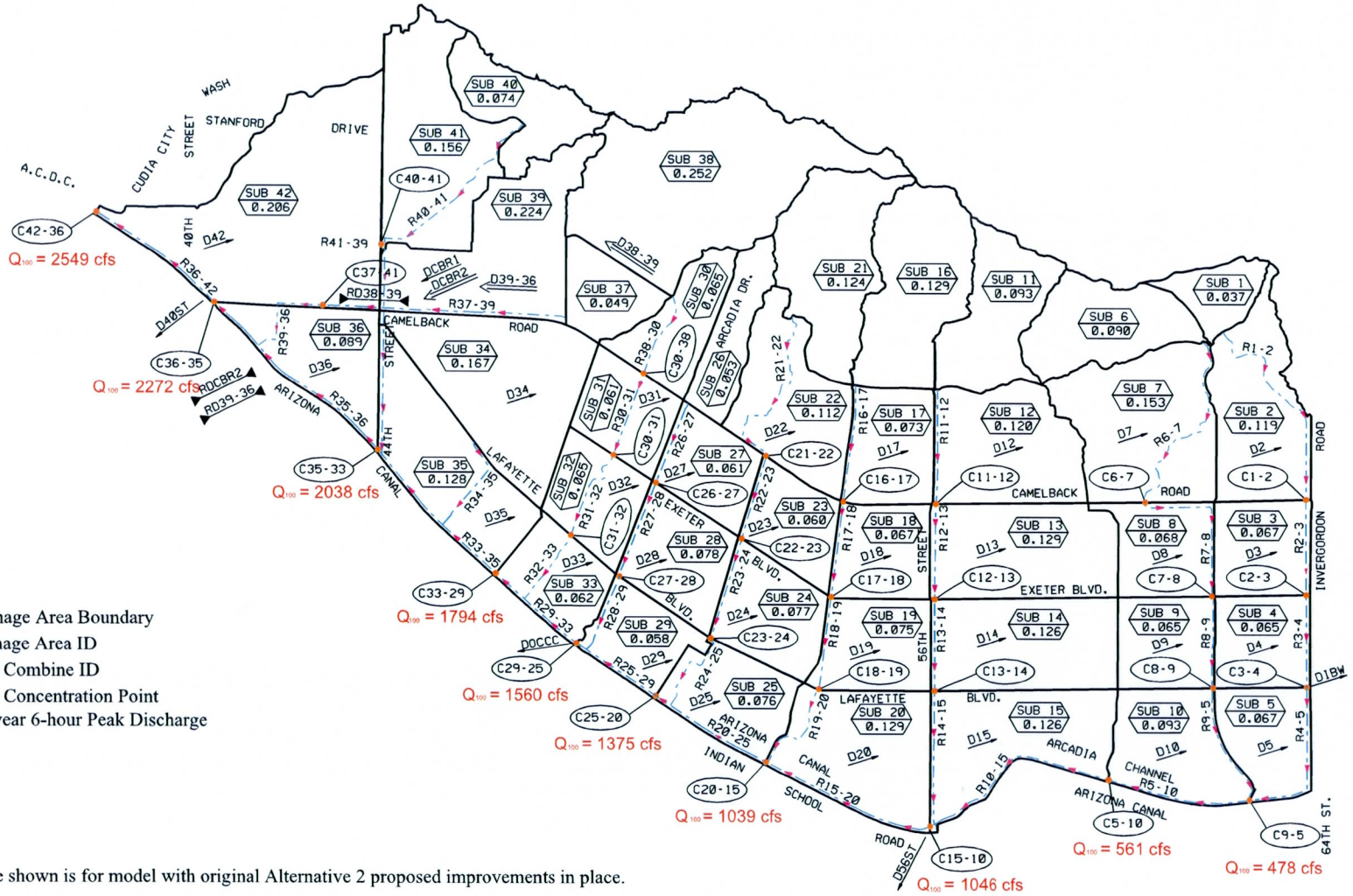
The Flood Insurance Rate Map (FIRM) shown in Figure 1.4 indicates that a 100-year floodplain designated as Zone "A" exists along the north side of the Arizona Canal within the Arcadia area watershed. The floodplain results from water ponding against the elevated north canal banks with drainage system to drain stormwater during the 100-year events.

The scope of the Lafayette Interceptor Drain and Outlet Design project includes revising the existing 100-year regional hydrology (HEC-1 model) for the Arcadia area to determine if the proposed regional drainage system (Alternative 2 from the *Arcadia Area Drainage Project Final Recommendations Report*) would reduce the floodplain along the north side of the Arizona Canal enough to warrant a FEMA standard Letter of Map Revision (LOMR) process for flood map.

5.1 100-Year Regional Hydrology

The initial approach to perform the LOMR evaluation was to use the 100-year regional hydrology from the Phoenix Metro Area ADMP and divert out the flow from the proposed drainage system to model the 100-year peak discharge with project-in-place. A review of that report indicates that the Phoenix Metro Area ADMP does not cover the area north of the Arizona Canal.

A 100-year model with project-in-place was created from the updated Alternative 2 base model by replacing the precipitation data with the 100-year, 6-hour rainfall depth. No changes were made to the sub-basin, diversion, or routing parameters. While it is understood that this does not provide a true 100-year model, it is assumed that the model will provide a reasonable approximation of the 100-year peak discharge. The 100-year HEC-1 model is provided in Appendix C. Figure 5.1 shows the Hydrology Map with 100-year, 6-hour peak discharges that concentrate along the Arizona Canal.



LEGEND

- Drainage Area Boundary
- SUB 34 0.137 — Drainage Area ID
- C33-29 — Flow Combine ID
- Flow Concentration Point
- Q_{100} = 1560 cfs — 100-year 6-hour Peak Discharge

Note: Discharge shown is for model with original Alternative 2 proposed improvements in place.

Reference: *Arcadia Area Drainage Project Final Recommendations Report,* Huitt-Zollars, for Flood Control District of Maricopa County, FCD No. 94-21, March 1997

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, FCD PROJ. NO. 2010C036	100-YEAR HYDROLOGY MAP LAFAYETTE DRAIN INTERCEPTOR AND OUTLET DESIGN	FIGURE 5.1

5.2 HEC-RAS Model along the Arizona Canal

A HEC-2 model was prepared as part of the Arcadia Area Drainage Project to determine the storage-discharge relationship of the north canal bank area. This model (OCCC.DAT) was imported into HEC-RAS and the flow data of the model was updated with the 100-year, 6-hour peak discharges that were determined from the 100-year model with project-in-place that was created as discussed in Section 5.1. No changes were made to the manning's roughness, contraction and expansion coefficient, ineffective flow area, or channel reach length parameters. The output from the HEC-RAS model is provided in Section E-1 of Appendix E.

The modeling reach extends from 64th street to 37th Place and covers a sufficient area north of the Arizona Canal to evaluate the storage capacity at the 100-year peak discharge. Outputs from the HEC-RAS model show that the area north of the Arizona Canal between east of 56th Street to 64th Street has the capacity to contain the 100-year, 6-hour peak discharge. However, the area north of the Arizona Canal between west of 56th Street to 37th Place does not have the capacity to contain the 100-year peak discharge and flow overtops the canal. This is shown in the HEC-RAS model between river station 99327 to river station 84000. The overtopping occurs because the 100-year peak discharge increases as ponded water along the north canal bank slowly migrates westerly and combines with runoff from the north.

The overtopping with project-in-place indicates that ponding still occurs to the top of canal bank elevation on the north side of the Arizona Canal. Since the top of canal bank elevation does not change, the existing floodplain on the north side of the Arizona Canal remains the same. The proposed storm drain system will only reduce the amount of overtopping that occurs over the canal. It does not reduce the amount of ponding on the upstream side of the canal. Therefore, the floodplain is not reduced

5.3 Summary

The proposed regional drainage system as presented in the *Arcadia Area Drainage Project Final Recommendations Report* is a 10-year storm drain system. While this system will reduce the amount of flooding for the more frequent storms up to 10-year event, it will not

reduce the 100-year floodplain limit of the existing Special Flood Hazard Area (SFHA) on the north side of the Arizona Canal. Therefore, a FEMA Letter of Map Revision (LOMR) is not warranted.

6.0 Survey

6.1 Topographic Mapping

The source of topographic mapping for the project is based on several 1-ft and 2-ft contour provided by the Flood Control District of Maricopa County (FCDMC) in conjunction with the aerial map. Table below summarizes the topographic mapping information.

Table 6.1 – Topographic Mapping Information

Project ID	FCD Contract #	Project Name	Flight Date	Contour Interval	Vertical Datum	Horizontal Datum
6600	FCD 94-21	Arcadia Area DIS	11-13-94	2-ft	NGVD 29	NAD 27
6601	FCD 94-21	Arcadia Area DIS	11-13-94	1-ft	NGVD 29	NAD 27
1024	FCD 95-46	Papago Regional Flood Control Project	11-08-96	2-ft	NAVD 88	NAD 83
1071	N/A	Scottsdale Mapping	09-01-93	1-ft	NAVD 88	NAD 83
1062	FCD 97-14	Metro ADMS	05-15-98	2-ft	NGVD 29	NAD83
8000	FCD 90-19	Arizona Canal Diversion ADMS	08-23-91	2-ft	NGVD 29	NAD 27

This project will use this mapping as the base for offsite areas adjacent to the project, and will use supplement survey to update the project corridor along, Lafayette Boulevard, Arcadia Drive, North Village Drive, Camelback Road, and 44th Street. Additional ground survey for storm drain laterals was performed as a part of this project at several major and minor arterial streets north of Lafayette Boulevard. The survey scope of work includes verification of the right-of-way limits with finished floor elevations for the first row of building along Lafayette Boulevard.

6.2 Datum

The Horizontal Data for this survey is tied into the Maricopa County Department of Transportation Geodetic Densification and Cadastral Survey (GDACS) network control. This system is based on the NAD 1983 Horizontal Datum. The Horizontal Data is provided in the Arizona State Plane Coordinates (Central Zone) and converted to ground using a factor of 1.00016.

To be consistent with the design from the Old Cross Cut Canal Improvement Project, the design for this project use the vertical data tied into the City of Phoenix Datum. This system is based on the National Geodetic Vertical Datum of 1929 (NGVD 29).

Survey data are provided in Appendix H.

7.0 UTILITIES

This section discusses the existing utilities within the project area and the design constraints that impact the design of the proposed storm drain.

Initial identification of utilities within the project area was provided by Bluestake through a design request. The utilities identified within the project area include: water, sewer, storm drain, traffic signals, irrigation, cable TV, telephone, fiber optics, gas, and underground and overhead power. The name and contact for each utility are provided in Table 6.1 below.

Table 7.1 – Utility Contact Information

Company	Utility	Number	Contact
Arcadia Water Company	Irrigation	480.945.4621	John Richardson
AT&T (TCG)	Fiber Optic	480.844.5806	Zack Freeman
CBS Outdoor	Underground Power	602.477.3094	Colleen McCarthy
City of Phoenix Traffic Signals	Traffic Signals, Junction Boxes, Fiber	602.256.3409	Zeke Rios
City of Phoenix Water Services Department	Water, Sewer, Reclaimed Water	602.261.8229	Jami Erickson
Cox Communications	Cable TV, Fiber	623.328.4349	John Rowe
Qwest Local	Coaxial, Fiber	602.630.5474	Eric Hitchcock
SRP	Irrigation & Construction License	602.236.5227	Bob Gooch
	Power Distribution	602. 236.0886	Jason Hughes
	Power Transmission	602.236.4882	Wayne Darby
Southwest Gas	Gas	480.730.3843	Howard Warren
	High Pressure	480.730.3672	Saul Carrasco
Verizon (MCI/MFS)	Fiber	909.421.3316	Dan Garden

An initial utility base map was created using as-built maps, quarter section maps, facility maps obtained from the City of Phoenix and utility companies, Blue Stake markings, and field verification. Table 6.2 summarizes the sources used for the utility mapping.

Table 7.2 – Utility Mapping Sources

Utility Owner	Utility	Source				
		Facility Maps	Quarter Section Maps	As-Built Maps	Blue Stake Markings	Survey/ Field Verif.
City of Phoenix	Water		X	X	X	X
	Sewer		X		X	X
	Storm Drain		X			X
	Traffic Signal			X	X	X
Southwest Gas	Gas	X			X	X
SRP	Irrigation			X		X
	Power	X				X
Cox	Cable TV, Fiber Optic	X				X
Qwest	Telephone, Fiber Optic	X				X
CBS Outdoor	Power	X				X
AT&T / TCG	Fiber Optic			X	X	X
Verizon / MFS / MCI	Fiber Optic			X	X	X

A pothole list is being prepared and potholes will be performed at the storm drain crossings to identify potential conflicts. The existing utilities are shown in the preliminary plans which are provided with this report. The following sections discuss the major utilities within the project area.

7.1 City of Phoenix Waterlines

There are water distribution and transmission lines within the project area that will cross or be in close proximity to the proposed drainage improvements. These water facilities are owned and operated by the City of Phoenix Water Services Department, and review, approval and coordination with them are required for any relocation design. The following describes the waterlines along the storm drain reaches.

7.1.1 Arcadia Drive

An 8-inch waterline runs approximately 8 feet east of the roadway centerline along Arcadia Drive. The 8-inch pipe will cross the proposed storm drain on the south side near the tie-in and then will parallel the storm drain to the east. The pipe crosses the proposed storm drain again at Lafayette and switches to the west side of the roadway. Additionally, there are 6-inch waterlines along Calle Redonda, Calle Ventura, and Calle Tuberia that will cross the proposed storm drain to connect to the 8" waterline. The storm drain is deep in this location and would not be in conflict with the existing waterlines, but potholes are proposed to verify their location and depth. The waterlines at the crossing locations should be supported during construction.

7.1.2 Lafayette Boulevard

There are two waterlines that run along Lafayette that will run parallel to the proposed storm drain. The 4-inch pipe is approximately 8 feet north of the Lafayette centerline and the 8-inch pipe is approximately 21 feet north of centerline. The 8-inch waterline crosses the proposed storm drain at Launfal Avenue and switches to the south side approximately 18 feet south of centerline. The 8-inch waterline runs at 18 feet south of centerline until 47th Place, then moves to about 26 feet south of centerline west of 47th Place. The new storm drain is proposed at 12 feet south of centerline which may require approximately 450 feet of the 8-inch waterline to be relocated between Launfal Avenue and 47th Place. Waterlines along the north-south streets also cross the proposed storm drain at various locations to connect to the pipes on Lafayette. Potholes are proposed at the crossing locations to verify the location and depth of each waterline.

There are numerous water service lines that serve the homes on the north and south sides of Lafayette Boulevard. It is assumed that these service lines are relatively shallow and would not be in conflict with the proposed storm drain. No potholes are proposed for the water service lines. Protection of the service lines should be provided during construction.

7.1.3 Camelback Road

The proposed storm drain will cross Camelback Road to pick up runoff from the northeast area of Camelback Road and 44th Street. There are four waterlines along Camelback Road

that will impact the proposed storm drain. Two of the pipes are 4-inch/8-inch and 12-inch distribution lines, while the other two are 16-inch and 20-inch water transmission lines. The 4-inch/8-inch pipe is approximately 17 feet/24 feet south of the Camelback centerline. The 12" waterline is approximately 36 feet north of centerline. The 16" transmission is located approximately 9 feet north of centerline, and the 20" transmission is approximately 39 feet south of centerline.

As-built plans were obtained for the 16-inch and 20-inch water transmission lines. The plans show that the 16-inch pipe has approximately 7.5 feet of cover at the crossing with the proposed storm drain, while the 20-inch pipe is approximately 9 feet deep at the storm drain crossing location. The as-builts also indicate the water pipe to be pre-stressed cylindrical concrete pipe (PCCP). Preliminary design of the storm drain profile shows that the storm drain pipe is approximately 8 feet deep at the crossing with the transmission pipes, which would place the transmission pipes and proposed storm drain in conflict. While the water transmission lines can be relocated, solutions to avoid relocation should be explored before relocating the transmission pipes. Relocating the water transmission pipes would require coordination with the City of Phoenix Water Services Department. A shutdown request will have to be submitted and scheduled with the Water Services Department. These are accepted on a first come, first serve basis, so advanced planning will be required for the transmission relocation. Based on experience from a previous project, no transmission main shutdowns are permitted from April 15 to October 15. Since the elevation of the 102" storm drain pipe at the tie-in is approximately 10 feet deeper than originally shown in the pre-design plans, there is some flexibility to provide the clearance needed to get under the water transmission pipes.

7.2 City of Phoenix Sewer Lines

While there are sewer lines within the project area, most of the pipes run are located in the alleys and do not impact the proposed storm drain construction. There is an 8-inch sewer line along Arcadia Drive from the Arizona Canal to Lafayette Boulevard that may be impacted based on the alignment of the proposed storm drain. If it is determined necessary to protect the historical dirt canal on the east side of Arcadia Drive at all cost,

then the storm drain alignment would need to be moved further to the west. This would require approximately 1,000 feet of the 8-inch sewer line to be relocated.

There are no sewer lines along Lafayette Boulevard west of Arcadia Drive. However, there are north-south sewer lines that cross the proposed storm drain at Dromedary Road, 46th Street, and at the utility easement near 44th Street. The quarter section maps show the sewer to be 7.5 to 9.0 feet deep, which is above the proposed storm drain pipe. There are sewer manholes at the middle of Lafayette at these crossings. The manhole at the 46th Street crossing will be within the construction zone of the storm drain and will need to be relocated. The sewer pipe at the other locations will need to be supported during construction.

7.3 Southwest Gas Lines

Southwest Gas has numerous gas facilities along the project corridor, including regular and high pressure gas lines and gas monitoring stations. The gas lines range in size from 2" to 8" and include a steel high pressure 8" line. Southwest Gas facilities are typically in by permit and would have to be relocated at their expense if they are in conflict with the proposed drainage improvements.

7.3.1 8" High Pressure Gas Line

The 8" high pressure gas line runs on the west side of the canal bridge deck on Arcadia Drive, then crosses the roadway to approximately 5 feet east of the Arcadia centerline after the bridge. At Lafayette Boulevard, the gas line turns west and runs along the north side of Lafayette approximately 25 feet north of the road centerline. The high pressure gas line continues west along Lafayette to 44th Street, where it turns north and continues up 44th Street approximately 18 feet east of centerline.

Due to the danger and risk of working near a high pressure gas line, the storm drain will be designed to provide a safe clearance to the 8-inch high pressure gas line to minimize the risk of an accident during excavation for the storm drain. There will be several locations where the proposed storm drain will cross under the 8-inch high pressure gas

line. The gas line should be supported at these crossing locations per Southwest Gas requirements, and care and caution should be exercised when working near the gas line.

7.3.2 2" and 4" Gas Lines

A 2" steel gas line runs along Arcadia Drive approximately 17 feet west of centerline. The 2" gas line also runs along the south side of Lafayette Boulevard approximately 13 to 26 feet from the south right-of-way line. The trenching for the storm drain pipe will most likely impact the 2" gas line and require it to be relocated along Arcadia Drive and Lafayette Boulevard. The 2" PE gas line along the east side of North Village Drive may also need to be relocated.

A 4" steel gas line runs along Camelback Road approximately 18 feet from the south right-of-way line. The gas line should be supported and protected in place at the crossing location with the proposed storm drain during construction.

7.3.3 Gas Service Lines

Gas services for the homes along Lafayette Boulevard are provided at the front of the homes. Therefore, the proposed storm drain pipe will cross these gas service lines on Lafayette. The location of the gas service lines are approximated from the facility maps, and their exact locations will be located during construction. Since gas service lines are typically shallow (below 3 feet), it is assumed there will be no vertical conflict between the gas service lines and proposed storm drain. The gas service lines should be supported and protected in place at the crossing locations with the storm drain during construction.

7.4 SRP Irrigation Facilities

SRP owns, operates, and maintains a number of irrigation facilities throughout the project area, including the Arizona Canal, open ditches, underground irrigation pipes, and structures for delivery and disposal of irrigation water.

7.4.1 Lateral 4.7

Lateral 4.7 is the main irrigation reach within the project area, and runs westward as an open ditch along the south side of Lafayette Boulevard beginning at 56th Street. At

Arcadia Drive, an irrigation structure splits the flow to the south and west. The south and east open ditch segments of the lateral are considered historic, and reasonable efforts must be made to protect these historic portions of the canal during construction, such as dewatering of the ditch before and during construction to reduce the risk of trench failure. The segment of the lateral west of Arcadia Drive is mostly piped underground, with a small section of approximately 430 feet that is open ditch that is not considered historic. The proposed storm drain will cross under the 30" irrigation pipe at Arcadia Drive. Depending on the material of the irrigation pipe, it could either be supported during construction (if reinforced concrete pipe) or replaced with RCP (if cast-in-place pipe) .

7.5 SRP Power Facilities

SRP has overhead and underground power facilities within the project area. Caution should be exercised when working near the power facilities. Overhead power lines run along the west side of Arcadia Drive and the south side of Lafayette Boulevard. An effort will be made to locate the proposed storm drain at a safe distance from the overhead power lines. However, the extent of trenching for the storm drain may require the poles to be braced during construction.

Underground power conduits are present within the project corridor to provide power for street lights, traffic signals, and numerous other electrical facilities. Based on available documents and information, the power conduits are typically behind curb and gutter, and there does not appear to be any power duct banks within the roadway prism. There are several locations where the proposed storm drain pipe will be crossing under the power conduits. At these crossing locations, the power conduits should be supported and protected in place, and caution should be exercised when excavating near the power conduits.

7.6 Cox Communications Facilities

Cox Communications has overhead and underground communications, fiber optic, and cable TV facilities within the project area. The overhead Cox cables generally run under the SRP overhead power cables on the SRP power poles along the west side of Arcadia Drive and south side of Lafayette Boulevard. Underground Cox cables come off of the

poles at various locations to provide service. The underground Cox conduits are generally located behind the sidewalk and not within the roadway. There are several locations where the proposed storm drain pipe cross under the Cox conduits, which should be supported and protected in place.

7.7 Qwest Facilities

The mapping of Qwest facilities were determined mostly from survey of telephone manholes, Blue Stake markings, and field verification, since the buried facility maps obtained from Qwest were mostly illegible and difficult to read. Therefore, some of the Qwest facilities shown are the best approximation based on available information.

The available information indicates that there is a Qwest duct bank along the north side of Lafayette Boulevard. The duct bank alignment shifts between the gutter line and behind the back of curb. Potholes will be performed to verify the location of the Qwest duct bank. If the potholes indicate the duct bank is indeed at the assumed location of the gutter line or behind back of curb, they will need to be relocated. If it is determined that the duct bank cannot be relocated due to cost or physical constraint of the duct bank, a special catch basin may need to be designed to accommodate the duct bank. This will be evaluated as pothole data is complete and the storm drain design progresses further.

7.8 Fiber Optic Lines

A major fiber optic duct bank runs along the west side of 44th Street, approximately 38 feet west of the roadway centerline. The duct bank is shared by several providers including Verizon (formerly MCI), Nextlink, MFS, and TCG. The fiber duct bank turns west at Camelback Road and continues to the west. The TCG fiber line also continues north along the west side of 44th Street, then changes to the east side approximately 420 feet north of Camelback Road. If the storm drain alignment is placed along 44th Street, the TCG fiber line should be verified to determine potential conflict. Otherwise, there does not appear to be any conflict with the fiber optic duct bank.

8.0 STORM DRAIN ALIGNMENT

A preliminary alignment of the storm drain trunk line has been laid out, which is shown in the preliminary plans provided with this report. The location of the trunk line alignment was largely based on the goal to minimize impacts to existing utilities.

8.1 Utilities Impact

As discussed in Section 6.0, there are numerous utilities within the project corridor. Along Arcadia Drive there is a 2-inch gas line and 8-inch sewer line on the west side, and an 8" waterline and 8" high-pressure gas line on the east side. Since it has been determined by the project team that Arcadia Drive cannot remain open during construction, placing the trunk line down the middle of the roadway provides the best clearance between the sewer line and the high-pressure gas line (approximately 6' from storm drain outside wall to sewer line and approximately 8' from storm drain outside wall to the high-pressure gas line. The 2-inch gas line will need to be relocated due to the 2' separation between it and the storm drain pipe.

Along Lafayette Boulevard, most of the utilities are on the north side of the roadway, including the 8-inch high pressure gas line, 4-inch and 8-inch waterlines, and telephone duct bank. The south side has the 2-inch gas line and the 8-inch waterline. Since at least one lane of travel must be provided on Lafayette Boulevard during construction, the trunk line must be placed on one side of the roadway and not down the middle. Since the south side has fewer utilities, it was determined that placing the trunk line on the south side of Lafayette would impact the fewest utilities. Only the 2-inch gas line and a short segment of 8-inch waterline will need to be relocated.

The original alignment of the Lafayette Interceptor Drain as shown in the pre-design plans is along 44th Street up to Colter Street. Construction would have to go through the intersection of 44th Street and Camelback Road, which are major arterials with high volumes of traffic. There would be major traffic impacts at this intersection. Additionally, the original alignment would impact the median island on Lafayette, the gas

lines and monitoring station at the southeast corner of 44th Street and Camelback Road, and the water transmission lines along Camelback Road.

During the Value Engineering (VE) meeting held on March 7 and 8, an alternate alignment to avoid the intersection was suggested and further evaluated. This alternate alignment would take the trunk line up the water and sewer easement between 44th and 45th streets and up along North Village Drive to Colter Street. This alignment would avoid the intersection, the median island, and the gas conflicts. The crossing of the water transmission lines still occurs with this alternate storm drain alignment, but the profile of the transmission lines is shallower at this location, making it easier for the storm drain pipe to go under the transmission lines. Therefore, the alignment up the utility easement and North Village Drive is the preferred alignment across Camelback Road.

North Village Drive is designated a private roadway. The right-of-way quarter section map shows a public utility easement is present for water and sewer utilities. The plats for the Village at Camelback Mountain development shows there is a drainage easement for the east loop of North Village Drive. Research is being performed to determine if there is a drainage easement present in the western loop of North Village Drive where the proposed storm drain will be located.

9.0 CONSTRUCTABILITY

Construction of a large diameter storm drain system on Arcadia Drive and Lafayette Boulevard will be challenging. Besides the traffic impacts to the residents living in close proximity to the construction, there are other constructability issues and design constraints to be considered.

9.1 Arcadia Drive

Arcadia Drive is a local two-lane roadway with an average width of approximately 28 feet. The entire roadway width will be required for the construction of the proposed 102" pipe—16 feet for the trench width and 12 feet for the construction equipment. Access will have to be provided off of Arcadia Drive for residents living on Calle Redonda, Calle Ventura, and Calle Tuberia.

In addition to the tight work area available, the construction on Arcadia Drive will have to consider the historical features along the east side of the roadway, namely the open dirt ditch and the large eucalyptus trees. The open dirt ditch on the east side of Arcadia Drive is a historical canal that is being managed and maintained by SRP for the Bureau of Reclamation. This lateral is actively used for the delivery and disposal of irrigation water. Dewatering of the ditch is recommended before and during construction of the storm drain to minimize the risk of trench failure.

SRP has indicated that dewatering of the ditch is allowed. The most preferred time for construction of the storm drain is during the dry-up period, which is a 4-week period between early January and early February, when the dirt ditch will be completely dry. The next preferred time for construction would be during the winter months, when irrigation delivery takes place every three weeks. Irrigation delivery at any other time would be every two weeks. Bypass pumping with a redundant system and a manned person 24/7 are required for the dewatering operation.

The possibility of impacting the historical dirt ditch was considered and discussed with SRP. Reasonable precaution will be made to protect the ditch during construction, including dewatering it before and during construction. A question was posed to SRP of

what would be the consequence if in the remote chance that a sand lens is encountered during excavation and the trench collapses and damages the historical dirt ditch. SRP indicated that a precedence has been set at a historical ditch on Central Avenue that was damaged and repaired. SRP forces would have to do the repairs and a lot of paperwork would need to be filled out.

The large eucalyptus trees that line the canal are also considered historic and will have to be protected during construction. An arborist is recommended to evaluate the root system of the trees during design and construction to determine potential impacts.

9.2 Lafayette Boulevard

The pavement width on Lafayette Boulevard is between 36 to 46 feet with the addition of bike lanes on both sides. This wider pavement width will allow at least one lane to remain open during construction. A flagman is recommended to control traffic along the construction zone. Plating of the trench will not be possible due to the wide trench width.

Access to driveways on the south side of Lafayette will not be possible during the actual construction in front of the driveway. Coordination with the homeowners will be required to minimize impact and access of the driveway to the homeowners.

10.0 SUMMARY AND RECOMMENDATIONS

The base project of this project is a 10-year storm drain system along Arcadia Drive from the Arizona Canal to Lafayette Boulevard, along Lafayette Boulevard from Arcadia Drive to west of Calle Feliz, through the office complex from Lafayette Boulevard to Camelback Road, and along North Village Drive from Camelback Road to 44th Street. Design opportunities and constraints for this project were evaluated and are summarized below.

- The trunk line hydrology was updated for the entire Alternative 2 drainage system and shows that 686 cfs is the 10-year peak discharge at the concentration point at Arcadia Drive just north of the Arizona Canal. The 10-year peak discharge for this project (Lafayette Interceptor Drain and Outlet Design) is 358 cfs.
- The collection system hydrology was performed to determine the locations where runoff will be collected and how much water will be collected at each location. The collection system will be designed to collect a total of 462 cfs for the base project.
- The size of the pipe crossing the Arizona Canal was upsized to 102" in the Old Cross Cut Canal Improvements Project. This increased the capacity at the canal crossing to 990 cfs and provided an opportunity to collect an additional 304 cfs of runoff in the Arcadia area.
- Options to collect the additional 304 cfs of capacity include the future East Lafayette Collector System, an inlet structure at the existing retention basin at the Arcadia Estates development, and increasing the collection system capacity. It is recommended that a combination of the inlet structure and an increase in the collection system capacity be provided. The inlet structure should be designed to collect the entire 304 cfs and the collection system capacity should be increased by 10%. This combination would provide additional flood protection to the area southwest of Arcadia Drive and Lafayette Boulevard, and would also increase the level of flood protection to a higher than a 10-year event. An evaluation will be performed to determine if the collection system capacity increase will require the trunk line to be

upsized. A stubout for connection to the future East Lafayette Collector System is also recommended as part of this project.

- Rolled curb along the south side of Lafayette Boulevard is the recommended surface improvement alternative to collect and convey stormwater. This alternative is cost effective, blends better with the character of the Arcadia area, and minimizes driveway and right-of-way impacts.
- The floodplain analysis indicates that the proposed storm drain improvements will not reduce the 100-year Zone "A" floodplain. This is because the floodplain is based on the top of canal elevation, and while the proposed 10-year system will reduce the amount of water that overtops the canal, the amount of ponding that occurs upstream of the canal remains the same.
- There are numerous existing utilities along the project corridor to consider during the storm drain design. The preliminary trunk line alignment was located to minimize utility impacts, including avoiding the intersection of 44th Street and Camelback Road to minimize traffic and utility impacts at the intersection. The recommended trunk line alignment across Camelback Road is along the water and sewer easement corridor between 44th and 45th streets and up along the western loop of North Village Drive.
- The preliminary trunk line alignment locates the 102" along Arcadia Drive down the center of the roadway to avoid relocating the 8" sewer line on the west side of the roadway. It has been determined that Arcadia Drive is not wide enough to provide access during construction and will have to be closed. Local access for residents living on Calle Redonda, Calle Ventura, and Calle Tuberia will need to be provided. On Lafayette Boulevard, the trunk line alignment was located on the south side of the street to minimize utility impacts. Two-way traffic cannot be provided along the Lafayette reach and a flagman is recommended to provide one-way access at a time through the construction zone.

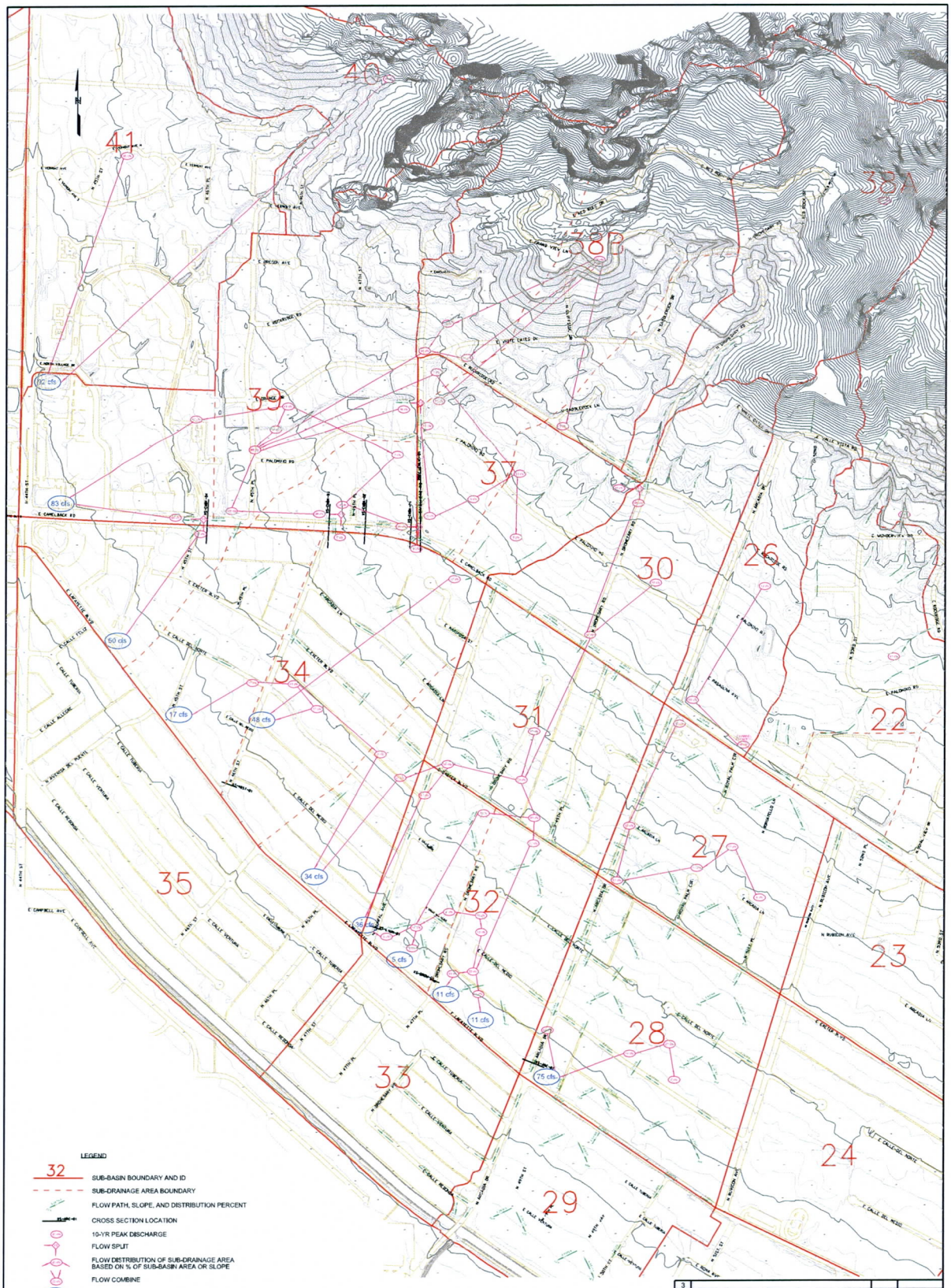
- The open dirt ditch and large eucalyptus trees along the east side of Arcadia Drive are considered and reasonable efforts must be taken to protect them during construction. Dewatering of the ditch is recommended before and during construction to minimize the risk of trench failure. A licensed arborist is recommended to evaluate the impact of the construction on the root system of the eucalyptus trees.

11.0 REFERENCES

1. *Drainage Design Manual for Maricopa County, Arizona, Volume 1 – Hydrology*, Flood Control District of Maricopa County, November 2003 (Draft).
2. *Drainage Design Manual for Maricopa County, Arizona, Volume 2 – Hydraulics*, Flood Control District of Maricopa County, September 2003 (Draft).
3. *Final Design Report, Old Cross Cut Canal Improvements, Arizona Canal to Indian School,* Olsson Associates for Flood Control District of Maricopa County, August 2010.
4. *Metro Phoenix Area Drainage Master Plan,* Engineering and Environmental Consultants, Inc. for Flood Control District of Maricopa County, September 2008.
5. *Storm Water Policies and Standards*, City of Phoenix, March 2004.
6. *Arcadia Area Drainage Project Final Recommendations Report*, Huitt-Zollars for Flood Control District of Maricopa County, FCD No. 94-21, March 1997.

Plate 1

Collection Hydrology Drainage Map



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

LAFAYETTE INTERCEPTOR DRAIN AND OUTLET DESIGN
PCN 625.02.30

	BY	DATE
DESIGNED	DVD	2/6/2012
DRAWN	BM	2/6/2012
CHECKED	JCF	2/6/2012

OLSSON ASSOCIATES
7250 North 16th Street
Suite 210
Phoenix, AZ 85020-4280
TEL 602.748.1000
FAX 602.748.1001

DRAWING NO. PLATE 1
COLLECTION SYSTEM HYDROLOGY
SHEET OF

Appendix A

Cost Estimates

LAFAYETTE INTERCEPTOR DRAIN AND OUTLET DESIGN
FCD PROJECT NO. 2010 C030

ENGINEER'S OPINION OF PROBABLE COST

Item No.	Item Description	Unit	Total Quantity	Unit Cost	Total Cost
105-1	Partnering ALLOWANCE	LS	1	$ 7,500.00	$ 7,500.00
105-2	Unforeseen Utility Relocation ALLOWANCE	LS	1	$ 50,000.00	$ 50,000.00
105-3	SRP 24" RGRCP Irrigation Pipe Replacement	LF	6	$ 150.00	$ 900.00
105-4	SRP 30" RGRCP Irrigation Pipe Replacement	LF	16	$ 160.00	$ 2,560.00
105-5	Southwest Gas 8" HP Gas Pipe Support	EACH	8	$ 2,500.00	$ 20,000.00
105-6	CenturyLink Duct Bank Support	EACH	6	$ 2,500.00	$ 15,000.00
107-1	AZPDES/SWPPP Permits	LS	1	$ 20,000.00	$ 20,000.00
107-2	Public Information and Notification ALLOWANCE	LS	1	$ 75,000.00	$ 75,000.00
107-3	Project Signs ALLOWANCE	LS	1	$ 7,500.00	$ 7,500.00
202-1	Mobilization	LS	1	$ 225,000.00	$ 225,000.00
215-1	Earthwork for Basin Grading	CY	210	$ 25.00	$ 5,250.00
215-2	Overexcavation ALLOWANCE	CY	5,000	$ 15.00	$ 75,000.00
220-1	Plain Riprap (d50= 6")	CY	14	$ 60.00	$ 840.00
336-1	Permanent Pavement Replacement - Structural Sect. No. 1 (7" AC over 6" ABC)	SY	1,517	$ 85.00	$ 128,945.00
336-2	Permanent Pavement Replacement - Structural Sect. No. 2 (4" AC over 6" ABC)	SY	13,104	$ 65.00	$ 851,760.00
336-3	Permanent Pavement Replacement - Structural Sect. No. 3 (5" AC over 6" ABC)	SY	2,087	$ 70.00	$ 146,090.00
336-4	Permanent Pavement Replacement - Structural Sect. No. 5 (2" AC)	SY	1,633	$ 40.00	$ 65,320.00
336-5	Permanent Pavement Replacement - Structural Sect. No. 6 (6" Concrete)	SY	110	$ 90.00	$ 9,900.00
336-6	Permanent Pavement Replacement ALLOWANCE	SY	1,700	$ 85.00	$ 144,500.00
336-7	Decorative Pavement, Replace in Kind	SF	354	$ 8.00	$ 2,832.00
336-8	Decorative Pavement, Salvage and Replace	SF	1,102	$ 10.00	$ 11,020.00
336-9	Decorative Pavement Replacement ALLOWANCE	SF	500	$ 10.00	$ 5,000.00
340-1	Concrete Curb and Gutter (MAG Det. 220-1, Type 'A', H=6")	LF	833	$ 18.00	$ 14,994.00
340-2	Concrete Roll Curb and Gutter (Detail, Dwg No. C-10.10)	LF	1,755	$ 15.00	$ 26,325.00
340-3	Single Curb (MAG Det. 222, Type 'A', H=6")	LF	16	$ 10.00	$ 160.00
340-4	Concrete Valley Gutter (MAG Det. 240)	SF	516	$ 8.00	$ 4,128.00
340-5	Concrete Sidewalk (COP Det. P-1230)	SF	662	$ 10.00	$ 6,620.00
340-6	Concrete Driveway Entrance (COP Det. P-1255-1, 9" Thick)	SF	436	$ 15.00	$ 6,540.00
340-7	Concrete Driveway (Detail, Dwg. C-10.10)	SF	1,565	$ 15.00	$ 23,475.00
345-1	Adjust Valve Box & Cover (COP Det. P-1270)	EACH	6	$ 300.00	$ 1,800.00
345-2	Adjust Manhole (COP Det. P-1422)	EACH	3	$ 400.00	$ 1,200.00
350-1	Remove Existing Pavement	SY	245	$ 7.00	$ 1,715.00
350-2	Remove Existing Sidewalk	SF	3,385	$ 5.00	$ 16,925.00
350-3	Remove Existing Concrete Pavement	SF	1,926	$ 4.00	$ 7,704.00
350-4	Remove Existing Decorative Pavement	SF	354	$ 5.00	$ 1,770.00
350-5	Remove Existing Single Curb	LF	585	$ 6.00	$ 3,510.00
350-6	Remove Existing Concrete Curb and Gutter	LF	1,479	$ 7.00	$ 10,353.00
350-7	Remove Existing 4" ACP Waterline	LF	4,116	$ 20.00	$ 82,320.00
350-8	Remove Existing 6" ACP Waterline	LF	268	$ 25.00	$ 6,700.00
350-9	Remove Existing 8" ACP Waterline	LF	1,150	$ 30.00	$ 34,500.00
350-10	Remove Existing 12" ACP Waterline	LF	81	$ 40.00	$ 3,240.00
350-11	Remove Existing 6" Sewer Pipe	LF	20	$ 25.00	$ 500.00
350-12	Remove Existing 8" Sewer Pipe	LF	414	$ 30.00	$ 12,420.00
350-13	Remove Existing 12" Storm Drain Pipe	LF	92	$ 40.00	$ 3,680.00
350-14	Remove Existing 18" Storm Drain Pipe	LF	19	$ 50.00	$ 950.00
350-15	Remove Existing 24" Storm Drain Pipe	LF	15	$ 60.00	$ 900.00
350-16	Remove Existing 24" Irrigation Pipe	LF	6	$ 60.00	$ 360.00
350-17	Remove Existing 30" Irrigation Pipe	LF	16	$ 75.00	$ 1,200.00
350-18	Remove Existing 36" Squash Pipe	LF	98	$ 20.00	$ 1,960.00
350-19	Remove Existing Fence	LF	44	$ 75.00	$ 3,300.00
350-20	Remove Existing Screen Wall	LF	293	$ 50.00	$ 14,650.00
350-21	Remove Existing Site Wall	LF	76	$ 50.00	$ 3,800.00
350-22	Remove Existing Catch Basin	EACH	1	$ 1,500.00	$ 1,500.00
350-23	Remove Existing Scupper	EACH	2	$ 750.00	$ 1,500.00
350-24	Remove Existing Water Valve, Box and Cover	EACH	17	$ 250.00	$ 4,250.00
350-25	Remove Existing Sewer Manhole	EACH	3	$ 1,200.00	$ 3,600.00
350-26	Salvage and Reconstruct Existing Private Sign	EACH	3	$ 150.00	$ 450.00
350-27	Remove and Salvage Existing Gate	EACH	1	$ 500.00	$ 500.00
350-28	Remove Existing Tree Well	EACH	1	$ 750.00	$ 750.00
350-29	Remove Existing Bollards	EACH	2	$ 300.00	$ 600.00
350-30	Remove and Salvage Existing Fire Hydrant to COP	EACH	1	$ 500.00	$ 500.00
350-31	Remove and Salvage Existing Traffic Sign to COP	EACH	1	$ 200.00	$ 200.00
350-32	Remove Existing 102" Pipe Plug	EACH	1	$ 2,500.00	$ 2,500.00
350-33	Abandon Existing Sewer Manhole	EACH	1	$ 1,500.00	$ 1,500.00
350-34	Removal and Disposal of Inert Material ALLOWANCE	TON	50	$ 250.00	$ 12,500.00
350-35	Removal and Disposal of Non-Inert Material ALLOWANCE	TON	10	$ 500.00	$ 5,000.00
351-1	New Tree Well, Match Existing	EACH	1	$ 500.00	$ 500.00
351-2	New Speed Hump, Replace in Kind	EACH	3	$ 400.00	$ 1,200.00
361-1	Microseal Coat	SY	35,612	$ 5.00	$ 178,060.00
401-1	Traffic Control	LS	1	$ 300,000.00	$ 300,000.00
405-1	Survey Marker (MAG Detail 120, Type 'A')	EACH	1	$ 500.00	$ 500.00
405-2	Survey Marker (MAG Detail 120, Type 'B')	EACH	27	$ 400.00	$ 10,800.00
420-1	New 8' High Iron Fence (Detail, Dwgs. D-2.02 & D-2.03)	LF	78	$ 120.00	$ 9,360.00
420-2	New 10' Wide Doulbe Iron Gate (Detail, Dwg. D-2.02)	EACH	1	$ 1,500.00	$ 1,500.00
420-3	Salvaged Gate, Replace in Kind	EACH	1	$ 250.00	$ 250.00
430-1	Landscape and Irrigation Replacement	LS	1	$ 15,000.00	$ 15,000.00
505-1	Catch Basin (COP Det. P-1569-1, Type M-1, L=6')	EACH	3	$ 4,000.00	$ 12,000.00
505-2	Catch Basin (COP Det. P-1569-1, Type M-2, L1=17', L2=10')	EACH	1	$ 4,600.00	$ 4,600.00
505-3	Catch Basin (COP Det. P-1569-1, Type M-2, L1=17', L2=17')	EACH	13	$ 5,000.00	$ 65,000.00
505-4	Catch Basin (COP Det. P-1569-2, Type M-1, L=3')	EACH	9	$ 5,700.00	$ 51,300.00
505-5	Catch Basin (COP Det. P-1569-2, Type M-1, L=6')	EACH	4	$ 6,200.00	$ 24,800.00
505-6	Catch Basin (COP Det. P-1569-2, Type M-1, L=10')	EACH	2	$ 6,700.00	$ 13,400.00
505-7	Catch Basin (COP Det. P-1569-2, Type M-1, L=17')	EACH	1	$ 6,850.00	$ 6,850.00

LAFAYETTE INTERCEPTOR DRAIN AND OUTLET DESIGN
FCD PROJECT NO. 2010 C030

ENGINEER'S OPINION OF PROBABLE COST

Item No.	Item Description	Unit	Total Quantity	Unit Cost	Total Cost
505-8	Catch Basin (COP Det. P-1569-2, Type M-2, L1=10', L2=10')	EACH	2	$ 7,000.00	$ 14,000.00
505-9	Catch Basin (COP Det. P-1569-2, Type M-2, L1=17', L2=10')	EACH	1	$ 7,500.00	$ 7,500.00
505-10	Catch Basin (COP Det. P-1569-2, Type M-2, L1=17', L2=17')	EACH	3	$ 8,000.00	$ 24,000.00
505-11	Catch Basin (Structure 7, Modified COP P-1569-1 for V>8', Type M-1, L=3')	EACH	1	$ 5,000.00	$ 5,000.00
505-12	Catch Basin (Structure 7, Modified COP P-1569-1 for V>8', Type M-2, L1=10', L2=10')	EACH	1	$ 8,500.00	$ 8,500.00
505-13	Catch Basin (Structure 7, Modified COP P-1569-1 for V>8', Type M-2, L1=17', L2=17')	EACH	3	$ 10,000.00	$ 30,000.00
505-14	Catch Basin (Structure 8, Modified COP P-1569-1 with Overflow)	EACH	2	$ 4,000.00	$ 8,000.00
505-15	Catch Basin (Structure 9, Type M-1, L=3')	EACH	2	$ 3,700.00	$ 7,400.00
505-16	Catch Basin (Structure 9, Type M-1, L=6')	EACH	3	$ 4,200.00	$ 12,600.00
505-17	Catch Basin (Structure 9, Type M-1, L=10')	EACH	1	$ 4,500.00	$ 4,500.00
505-18	Catch Basin (Structure 9, Type M-1, L=17')	EACH	1	$ 5,000.00	$ 5,000.00
505-19	Catch Basin (Structure 9, Type M-2, L1=10', L2=10')	EACH	4	$ 7,500.00	$ 30,000.00
505-20	Catch Basin (Structure 9, Type M-2, L1=17', L2=17')	EACH	5	$ 8,500.00	$ 42,500.00
505-21	Catch Basin (MAG Det. 535)	EACH	4	$ 4,000.00	$ 16,000.00
505-22	Catch Basin, Double Grate (MAG Det. 537)	EACH	1	$ 5,000.00	$ 5,000.00
505-23	Structure No. 1, Drop Structure	EACH	1	$ 35,000.00	$ 35,000.00
505-24	Structure No. 2, Drop Inlet, 66" Pipe	EACH	1	$ 30,000.00	$ 30,000.00
505-25	Structure No. 3, Drop Structure	EACH	1	$ 25,000.00	$ 25,000.00
505-26	Structure No. 4, Drop Inlet, 36" Pipe	EACH	1	$ 15,000.00	$ 15,000.00
505-27	Structure No. 5, Junction Structure	EACH	1	$ 20,000.00	$ 20,000.00
505-28	Structure No. 6, Drop Inlet, 36" Pipe and Squash Pipes	EACH	1	$ 20,000.00	$ 20,000.00
505-29	Concrete Pad (Detail, Dwg. D-2.06)	CY	7	$ 250.00	$ 1,750.00
510-1	New Screen Wall, Replace in Kind	LF	293	$ 50.00	$ 14,650.00
510-2	New Site Wall, Replace in Kind	LF	76	$ 50.00	$ 3,800.00
515-1	Bollard, 6" Dia., MAG Det. 140, Type I	EACH	2	$ 150.00	$ 300.00
520-1	Safety Rail (COP Det. P-1173)	LF	29	$ 50.00	$ 1,450.00
601-1	CLSM ALLOWANCE	CY	2,500	$ 50.00	$ 125,000.00
610-1	4" Class 350 Ductile Iron Water Pipe & Fittings, Restrained	LF	174	$ 50.00	$ 8,700.00
610-2	6" Class 350 Ductile Iron Water Pipe & Fittings, Restrained	LF	277	$ 55.00	$ 15,235.00
610-3	8" Class 350 Ductile Iron Water Pipe & Fittings, Restrained	LF	1,262	$ 60.00	$ 75,720.00
610-4	12" Class 350 Ductile Iron Water Pipe & Fittings, Restrained	LF	81	$ 75.00	$ 6,075.00
610-5	4" Water Valve, Box and Cover (COP Det. P-1391)	EACH	1	$ 500.00	$ 500.00
610-6	6" Water Valve, Box and Cover (COP Det. P-1391)	EACH	3	$ 600.00	$ 1,800.00
610-7	8" Water Valve, Box and Cover (COP Det. P-1391)	EACH	3	$ 750.00	$ 2,250.00
610-8	COP Furnished Fire Hydrant Assembly (COP Det. P-1360)	EACH	1	$ 800.00	$ 800.00
610-9	New Water Service Connection (COP Det. P-1342)	EACH	27	$ 1,000.00	$ 27,000.00
610-10	New Water Plug with 2" Corp. Stop (COP Det. P-1343)	EACH	23	$ 750.00	$ 17,250.00
610-11	8"x4" Tapping Sleeve and Valve per COP Det. P-1391	EACH	2	$ 1,200.00	$ 2,400.00
610-12	8"x6" Tapping Sleeve and Valve per COP Det. P-1391	EACH	3	$ 1,500.00	$ 4,500.00
615-1	6" VCP Sewer Pipe	LF	20	$ 40.00	$ 800.00
615-2	8" VCP Sewer Pipe	LF	323	$ 50.00	$ 16,150.00
615-3	8" DIP Sewer Pipe	LF	159	$ 60.00	$ 9,540.00
615-4	Sewer Manhole (COP Det. P-1430)	EACH	6	$ 7,500.00	$ 45,000.00
615-5	Pipe Plug (MAG Det. 427), 8" Sewer Pipe	EACH	4	$ 500.00	$ 2,000.00
615-6	Temporary Sewer Bypass	LS	1	$ 7,500.00	$ 7,500.00
618-1	12-Inch Storm Drain Pipe	LF	38	$ 90.00	$ 3,420.00
618-2	18-Inch Storm Drain Pipe	LF	1,091	$ 125.00	$ 136,375.00
618-3	24-Inch Storm Drain Pipe	LF	812	$ 150.00	$ 121,800.00
618-4	30-Inch Storm Drain Pipe	LF	177	$ 160.00	$ 28,320.00
618-5	36-Inch Storm Drain Pipe	LF	605	$ 175.00	$ 105,875.00
618-6	42-Inch Storm Drain Pipe	LF	118	$ 200.00	$ 23,600.00
618-7	48-Inch Storm Drain Pipe	LF	589	$ 225.00	$ 132,525.00
618-8	54-Inch Storm Drain Pipe	LF	482	$ 275.00	$ 132,550.00
618-9	60-Inch Storm Drain Pipe	LF	464	$ 300.00	$ 139,200.00
618-10	66-Inch Storm Drain Pipe	LF	414	$ 325.00	$ 134,550.00
618-11	72-Inch Storm Drain Pipe	LF	723	$ 350.00	$ 253,050.00
618-12	78-Inch Storm Drain Pipe	LF	264	$ 400.00	$ 105,600.00
618-13	84-Inch Storm Drain Pipe	LF	4,395	$ 450.00	$ 1,977,750.00
618-14	102-Inch Storm Drain Pipe	LF	999	$ 650.00	$ 649,350.00
618-15	36" Equivalent CMP Squash Pipe	LF	98	$ 80.00	$ 7,840.00
618-16	Pipe Plug, 12" Pipe (MAG Det. 427)	EACH	1	$ 750.00	$ 750.00
618-17	Pipe Plug, 18" Pipe (MAG Det. 427)	EACH	2	$ 1,000.00	$ 2,000.00
618-18	Pipe Plug, 24" Pipe (MAG Det. 427)	EACH	5	$ 1,250.00	$ 6,250.00
618-19	Pipe Plug, 30" Pipe (MAG Det. 427)	EACH	1	$ 1,500.00	$ 1,500.00
618-20	Pipe Plug, 36" Pipe (MAG Det. 427)	EACH	1	$ 1,750.00	$ 1,750.00
618-21	Pipe Plug, 48" Pipe (MAG Det. 427)	EACH	4	$ 2,000.00	$ 8,000.00
618-22	Pipe Plug, 78" Pipe (MAG Det. 427)	EACH	1	$ 3,500.00	$ 3,500.00
618-23	102" x 48" 55° Wye	EACH	1	$ 5,000.00	$ 5,000.00
618-24	84"x42" 58.5° Wye	EACH	1	$ 4,000.00	$ 4,000.00
618-25	72"x48" 47° Wye	EACH	1	$ 3,500.00	$ 3,500.00
625-1	Storm Drain Manhole Base (48" and Smaller Pipe) (COP Det. P-1520) with Manhole Shaft (MAG Det. 522)	EACH	7	$ 7,500.00	$ 52,500.00
625-2	Storm Drain Manhole Shaft (51" and Larger Pipe) (COP Det. P-1560) with Manhole Shaft (MAG Det. 522)	EACH	18	$ 8,000.00	$ 144,000.00
	TOTAL				**$ 7,837,811.00**

Appendix B

Technical Memos

TECHNICAL MEMORANDUM

Date: May 11, 2011

To: Bobbie Ohler, Project Manager

From: Jeff Ford, P.E.

Project: Lafayette Interceptor Drain and Outlet Design

Project No.: 2010C030 (OA Project 010-2312)

RE: MAXIMUM ALLOWABLE VELOCITIES IN STORM DRAIN PIPE

Introduction

The purpose of this memorandum is to present a random sampling of maximum allowable velocity requirements for storm drains in selected municipalities and agencies across the United States. These standards are then compared to current Flood Control District of Maricopa County standards to determine if the District's 15 cfs design standard should be reevaluated.

Background

The district has established 3 feet per second (fps) and 15 fps as the minimum and maximum pipe culvert velocities as specified in Section 5.3.2 of the *Hydraulic Drainage Design Manual.*

Pipe Velocity Criteria of Other Municipalities

This section summarizes the pipe culvert velocity criteria from a random sampling of municipalities and agencies throughout the United States.

Arizona Department of Transportation

No Explicit Criteria for Maximum Velocity

City and County of Denver

9.3 Hydraulic Design

"The maximum velocity in all storm sewers shall be 18 ft/sec. The minimum velocity shall be 3 ft/sec at half-full or full-conduit flow conditions."

Storm Drainage Design and Technical Criteria, City and County of Denver, January 2006.

City of Dallas

3.8 Hydraulic Design

"The maximum hydraulic gradient shall not produce a velocity that exceeds 15 feet per second (fps). Table 3.8 shows the desirable velocities for most storm drainage design. Storm drains shall be designed to have a minimum mean velocity flowing full at 2.5 fps."

Table 3.8 Desirable Velocity in Storm Drains	
Description	Maximum Desirable Velocity
Culverts (All types)	15 fps
Storm Drains (Inlet laterals)	No Limit
Storm Drains (Collectors)	15 fps
Storm Drains (Mains)	12 fps

iSWM Criteria Manual for Site Development and Construction, North Central Texas Council of Governments, December 2003.

State of Georgia

4.2.8.3 Design Criteria

"The maximum hydraulic gradient should not produce a velocity that exceeds 15 ft/s."

Georgia Stormwater Management Manual Volume 2 (Technical Handbook), Georgia Stormwater Management, August 2001.

City of Houston

9.05 – C – 2. Velocity Considerations

b. Minimum velocities should not be less than 3 feet per second with the pipe flowing full, under design conditions.
c. Minimum velocities should not exceed 8 feet per second without use of energy dissipation downstream.
d. Maximum velocities should not exceed 12 feet per second.

Infrastructure Design Manual, Chapter 9, City of Houston Department of Public Works & Engineering, July 2009.

City of Kansas City, MO

5600.5 Velocity Within the System

"The velocity within the system shall be between 3 and 20 feet per second."

Public Works Design Criteria & Construction Specifications, City of Kansas City, MO, October 2006.

City of Lincoln, NE

3.5.2 Design Criteria

The standard recommended maximum and minimum slopes for storm drains shall conform to the following criteria:

1. The maximum hydraulic gradient shall not produce a velocity that exceeds 20 feet per second.

Stormwater/Floodplain Procedures and Requirements, City of Lincoln, NE, May 2004.

Tennessee Department of Transportation

7.03.4.3 MINIMUM AND MAXIMUM VELOCITY

"Slopes that incur uniform flow velocities in excess of 12 feet per second should be avoided due to the potential for abrasion."

Design Division Drainage Manual, Tennessee Department of Transportation, January 2010.

Summary

The District's current standard for maximum allowable velocity in storm drain pipe (15 fps) falls well within a random sampling of other municipalities and agencies standards and requirements.

Agency/Municipality	Maximum Velocity (fps)
Kansas City, city	20
Lincoln, city	20
Denver, city/county	18
Georgia, state	15
FCDMC	15
Dallas, city	12
Houston, city	12
Tennessee, DOT	12
Arizona, DOT	No Explicit Criteria

OLSSON ASSOCIATES

TECHNICAL MEMORANDUM

Date: Jan 13, 2011

To: Bobbie Ohler, Project Manager

From: Duc V. Dao, P.E.

Project: Lafayette Interceptor Drain and Outlet Design
Arcadia Drive to 44th Street

Project No: 2010C030 (OA Project 010-2312)

RE: TRUNKLINE HYDROLOGY AND ALTERNATIVES EVALUATION

Introduction

This purpose of this memorandum is to review and update the trunk line hydrology for the trunk line design, and to evaluate alternatives to maximize the capacityof the storm drain at the Arizona Canal crossing.

Background

The Arcadia Area Drainage Improvement project is a regional drainage system proposed by the Flood Control District of Maricopa County, in partnership with the City of Phoenix, to mitigate flooding to homes and structures upstream of the Arizona Canal within the Arcadia area watershed. A pre-design study was performed in 1995, and a Final Recommendations Report was prepared in 1997. This report recommended Alternative 2 from the list of proposed alternatives. A copy of the recommended Alternative 2 is shown in Figure 1.

The recommended alternative proposes a 10-year storm drain system along Arcadia Drive, Lafayette Boulevard, and Camelback Road to collect and convey stormwater from the Arcadia area. This alternative collects a total of 681 cfs into the storm drain at the Arizona Canal crossing.

During final design of the first phase of regional project (Old Cross Cut Canal Improvements), the pipe across the Arizona Canal was upsized to 102", which increased the capacity of the storm drain from 681 cfs to 990 cfs. As part of the pre-design for this project (Lafayette Interceptor Drain and Outlet Design), an evaluation will be performed to determine alternatives to get more flow into the storm drain system to maximize its capacity.

Trunk Line Hydrology

The Alternative 2 HEC-1 model from the Recommendations Report was used as the basis for the trunk line hydrology (file ALT2.DAT). Olsson Associates has reviewed the model and sub-basin parameters and find that, with the exception of sub-basin 38, the sub-basin parameters are acceptable. The model shows most of the runoff flows to the south, with 16 cfs breaking to the west. Based on topographic data and field observations, Olsson believes that sub-basin 38 should be divided into 2 sub-basins, 38A and 38B, with runoff in sub-basin 38A flowing south and runoff in sub-basin 38B flowing west.

A new base model called LID10a.dat was created with this revision. The revised HEC-1 schematic is shown in Figure 2. This model reduces the flow going into the storm drain on Camelback Road and increases the flow going into the storm drain on Lafayette Boulevard. This did not change the proposed pipe size on Lafayette Boulevard, since the pre-design plan shows the 84" pipe not flowing full. The proposed 42" pipe on Camelback Road was able to be reduced to 36". The total flow at the Arizona Canal increases negibly from 681 cfs to 686 cfs. Table 1 provides a summary of the hydrology results, and the HEC-1 model is included in the Appendix. Figure 3A shows the revised base model system.

Alternatives Evaluation

Olsson Associates proposes an "East" Lafayette storm drain system to utilize the capacity of the Arcadia storm drain system. This future storm drain system would run along Lafayette Boulevard from 56th Street to 50th Street, then down 50th Street and under the existing retention basin north of the Arizona Canal. The storm drain would provide flood protection to homes south of Camelback Road and east of Arcadia Drive, which Alternative 2 in the pre-design does not.

The base model was modified to add the proposed "East" Lafayette storm drain system in the file called LID10b.dat. This system collects an additional 112 cfs from the area bounded by Camelback Road, Arcadia Drive, Lafayette Boulevard, and Jokake Road. The total flow north of the Arizona Canal increases from 686 cfs to 798 cfs. The proposed "East" Lafayette storm drain system is shown in Figure 3B.

Another alternative to utilize the extra capacity of the Arcadia storm drain system is to take the 125 cfs from the proposed "East" Camelback Road system. The pre-design plans show the storm drain flowing east, then down 64th Street, and outletting into the Indian Bend Wash system. This is probably due to the high point located west of Jokake Road. Depending on who owns and maintains the Indian Bend Wash system, coordination with the City of Scottsdale may be required to construct this sytem.

The tie-in elevation to the 102" pipe north of the Arizona Canal is almost 10 feet lower than the elevation shown in the pre-design profile. It is thus possible to take the "East" Camelback Road system west and connect it with the future "Central" Camelback Road system, which connects to the Arcadia Drive system and outlets into the Old Cross Cut Canal system. However, excavation depths along Camelback Road could reach well over 40', which could present a constructablity problem. Therefore, it is recommended that the "East" Camelback Road system remain as proposed in the pre-design report.

Another alternative that was evaluated is to extend laterals from Lafayette Boulevard south to the canal. Laterals were evaluated at 46th Street, 47th Street, and 56th Street. However, the storm drain profile would be going against the steep 1.2% grade and does not work at any of the evaluated locations. An east-west lateral at Calle Redonda connecting to the trunk line on Arcadia Drive was also evaluated. The lateral on Calle Redonda does work, and picks up a maximum of 22 cfs from sub-basin 33. The benefit of picking up an additional 22 cfs versus impacting homeowners along this small residential street was considered, and this lateral is not recommended.

The "East" Lafayette storm drain system appears to be the most feasible alternative that also provides additional flooding protection. This could be a future system that the District may consider. While the system could be built at a future date, constructing a stubout for the system should be done as part of this project if the District feels this could be a viable future project. To offset the cost of this system, the proposed 10-year system on Camelback Road and Arcadia Drive north of Lafayette Boulevard could be downsized to a 2-year system. A HEC-1 model was created to show what this alternative would look like. This is shown in Figure 3C. A relative cost comparison of the base system, "East" Lafayette system, and base and "East" Lafayette system with the 2-year system in place is provided in Table 2.

Recommendation

To utilize the available capacity of the 102" pipe in the Arcadia storm drain system, it is recommended that the "East" Lafayette storm drain be considered as a future drainage project. This system would provide additional flooding protection to homes and structures in the area bounded by Arcadia Drive, Lafayette Boulevard, Jokake Road, and the Arizona Canal. This project could be funded partly by downsizing the storm drain system on Camelback Road and Arcadia Drive north of Lafayette Boulevard.

Please feel free to contact me at (480) 333-4314 or email me ddao@osconsulting.com if you have any questions or concerns.

LAFAYETTE INTERCEPTOR DRAIN AND OUTLET
ARCADIA DRIVE TO 44TH STREET
FCD PROJECT NO. 2010C030

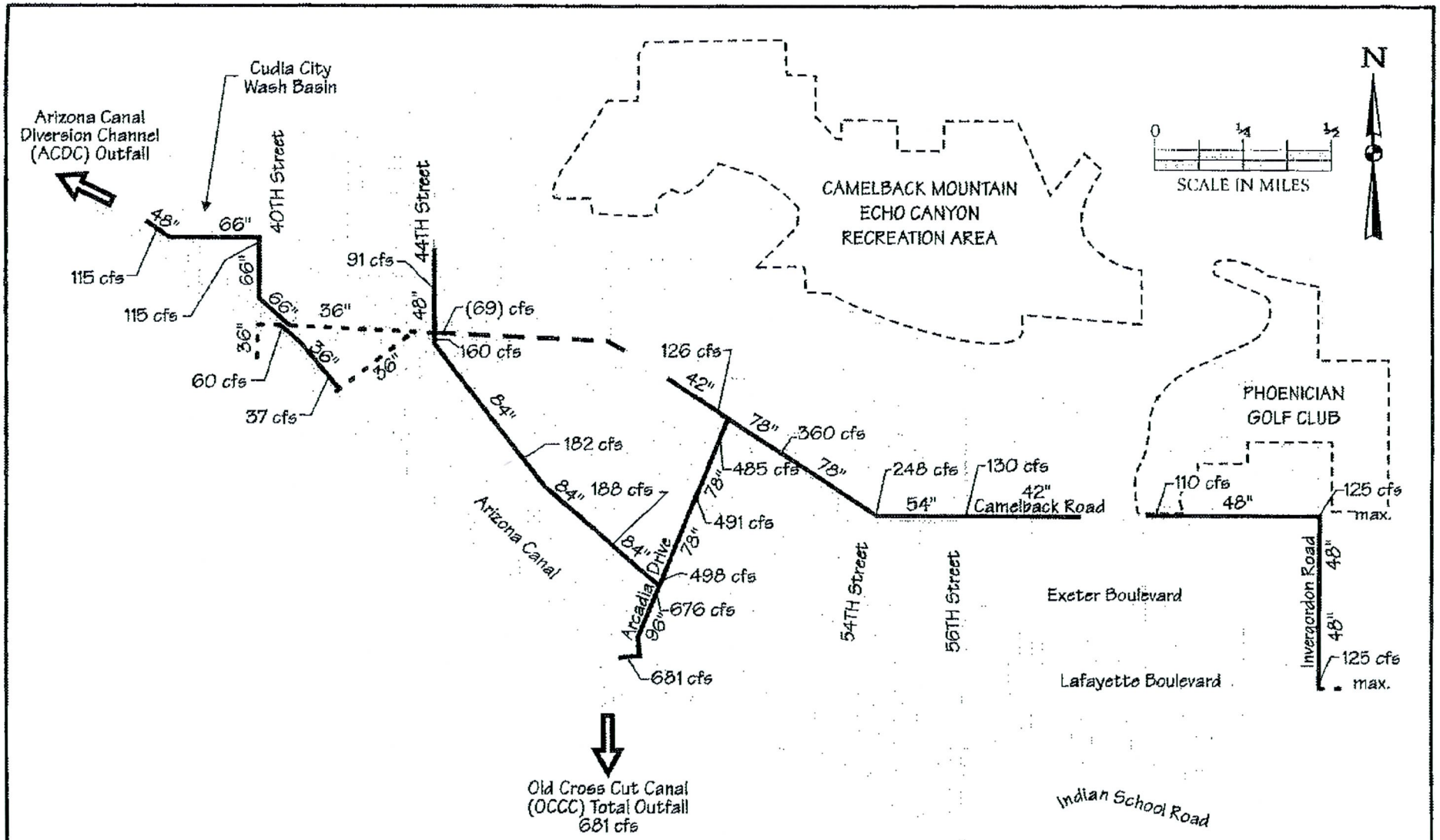
TABLE 1
HYDROLOGY SUMMARY

Sub-Basin	Huitt-Zollars 10-yr Peak Flow	LID10a Base Model 10-yr Peak Flow	LID02 Model 2-yr Peak Flow	Q2/Q10
1	31	31	17	0.55
2	22	22	4	0.18
3	18	18	5	0.28
4	25	25	5	0.20
5	15	15	3	0.20
6	81	81	36	0.44
7	61	61	16	0.26
8	14	14	3	0.21
9	21	21	5	0.24
10	31	31	6	0.19
11	64	64	24	0.38
12	77	77	15	0.19
13	89	89	14	0.16
14	39	39	10	0.26
15	45	45	9	0.20
16	100	100	38	0.38
17	25	25	6	0.24
18	18	18	5	0.28
19	21	21	5	0.24
20	45	45	10	0.22
21	101	101	39	0.39
22	23	23	7	0.30
23	18	18	5	0.28
24	20	20	5	0.25
25	19	19	5	0.26
26	12	12	5	0.42
27	17	17	5	0.29
28	21	21	6	0.29
29	14	14	4	0.29
30	18	18	4	0.22
31	13	13	5	0.38
32	16	16	4	0.25
33	22	22	7	0.32
34	41	41	14	0.34
35	67	67	28	0.42
36	37	37	17	0.46
37	13	13	1	0.08
38	127	NA	NA	NA
38A	NA	64	26	0.41
38B	NA	74	24	0.32
39	61	61	28	0.46
40	46	46	9	0.20
41	55	55	11	0.20
42	125	125	32	0.26
TOTAL	**1,728**	**1,739**	**527**	

LAFAYETTE INTERCEPTOR DRAIN AND OUTLET
ARCADIA DRIVE TO 44TH STREET
FCD PROJECT NO. 2010C030

TABLE 2
PRE-DESIGN COST ESTIMATE

Item No.	Item Description	Unit	Unit Cost	Quantity				Cost			
				Base	East Lafayette SD	Base w/ 2-yr SD	East LID w/ 2-yr SD	Base	East Lafayette SD	Base w/ 2-yr SD	East LID w/ 2-yr SD
618-1	24" RGRCP	LF	$ 150			753				$ 112,950	
618-2	30" RGRCP	LF	$ 175			1,420				$ 248,500	
618-3	36" RGRCP	LF	$ 200	753		1,230		$ 150,600		$ 246,000	
618-4	42" RGRCP	LF	$ 225	2,607	1,860	2,351		$ 586,575	$ 418,500	$ 528,975	
618-5	48" RGRCP	LF	$ 250		4,014	4,052		$ -	$ 1,003,500	$ 1,013,000	
618-6	54" RGRCP	LF	$ 300	1,230				$ 369,000			
618-7	60" RGRCP	LF	$ 350				1,860				$ 651,000
618-8	72" RGRCP	LF	$ 400	2,174		2,174	4,014	$ 869,600		$ 869,600	$ 1,605,600
618-9	78" RGRCP	LF	$ 450	5,216				$ 2,347,200			
618-10	84" RGRCP	LF	$ 500	2,819		2,819		$ 1,409,500		$ 1,409,500	
618-11	90" RGRCP	LF	$ 550			941				$ 517,550	
618-12	96" RGRCP	LF	$ 650	941				$ 611,650			
618-13	102" RGRCP	LF	$ 725								
	TOTAL			15,740	5,874	15,740	5,874	**$ 6,344,125**	**$ 1,422,000**	**$ 4,946,075**	**$ 2,256,600**
				21,614		21,614		**$ 7,766,125**		**$ 7,202,675**	
							Difference	$			**563,450.00**



LAFAYETTE INTERCEPTOR DRAIN AND OUTLET DESIGN 30% PRE-DESIGN	LEGEND 681 10-Year Flows (69) 2-Year Flows —— FCDMC 10-Year S.D. – – C.O.P. 2-Year S.D. ···· Existing S.D.	PROPOSED ALTERNATIVE 2 IMPROVEMENTS ALTERNATE 2 — FIGURE 1

1			
2			
NO.	REVISION	BY	DATE

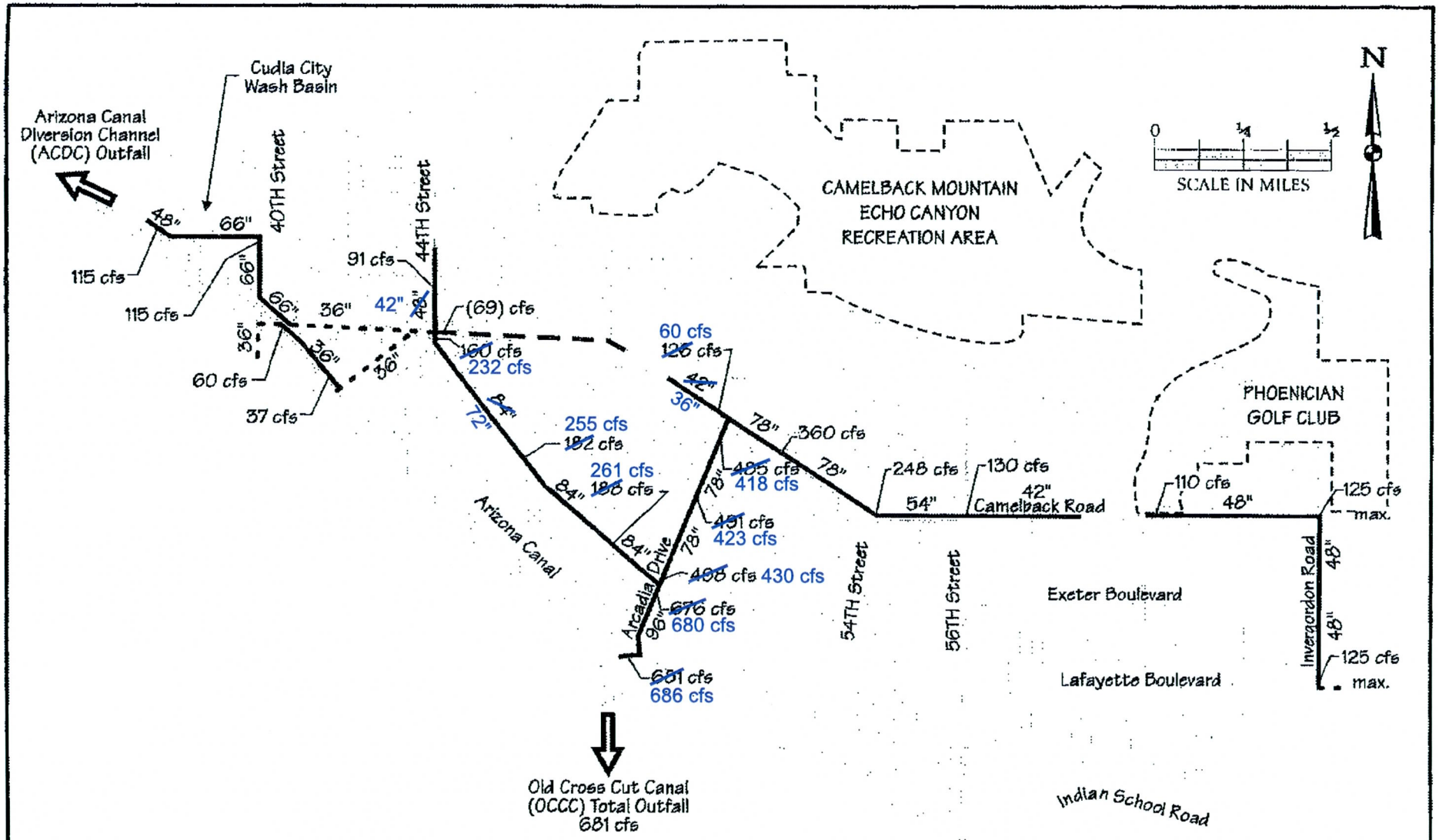
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

LAFAYETTE INTERCEPTOR DRAIN
AND OUTLET DESIGN
30% PRE-DESIGN

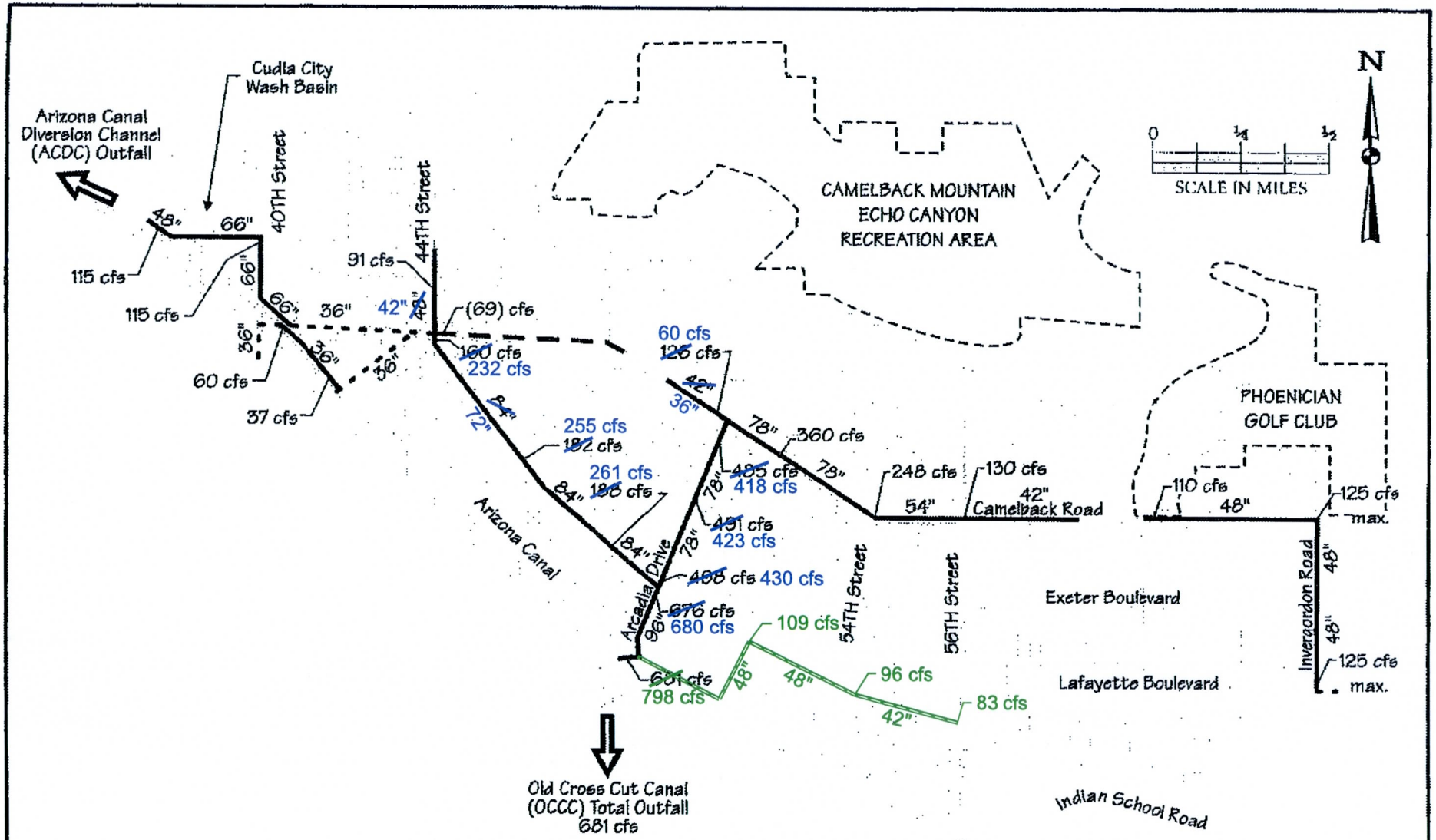
	BY	DATE
DESIGNED		
DRAWN		
CHECKED		

OLSSON ASSOCIATES

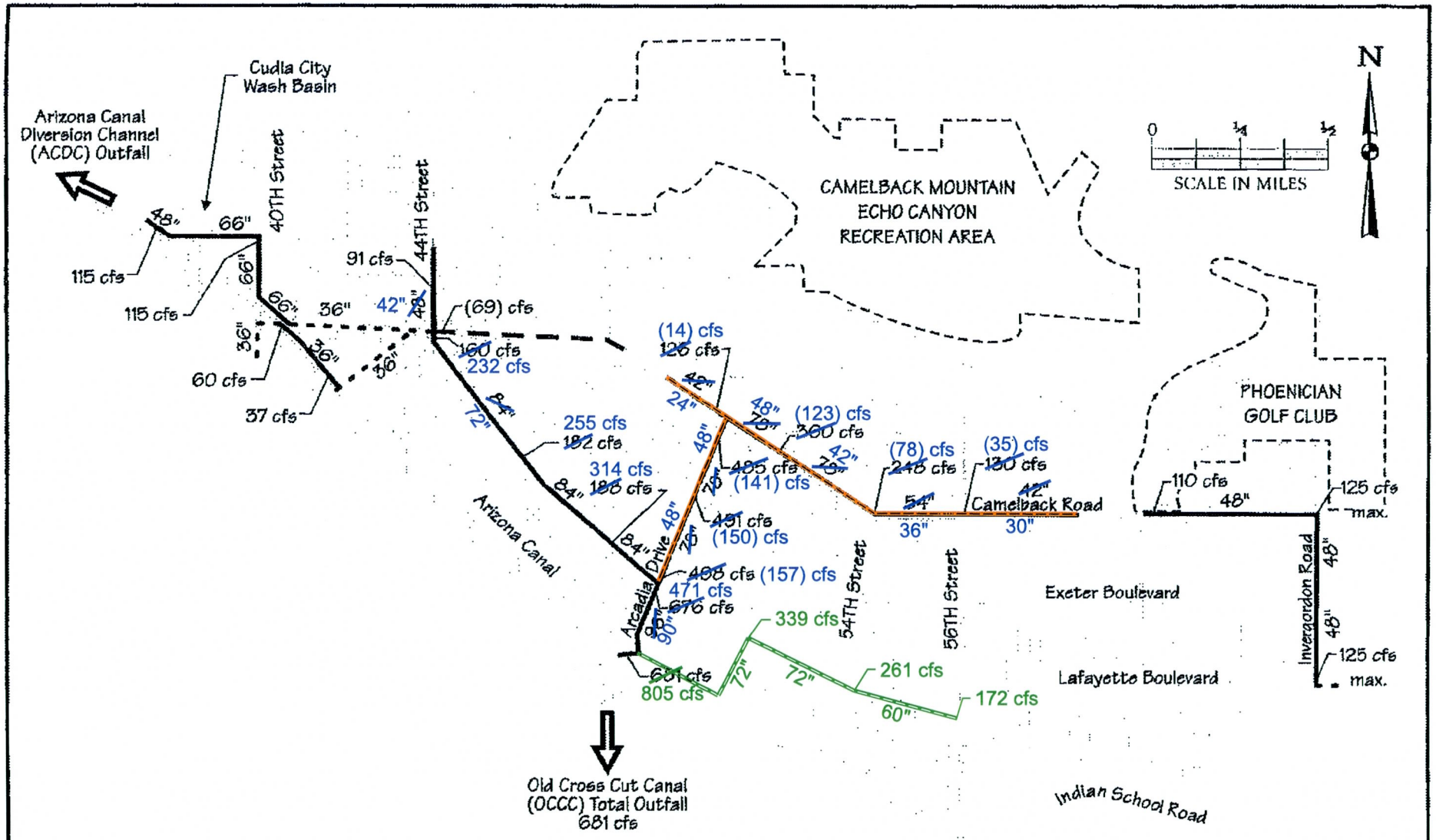
HEC-1 FLOW DIAGRAM (EXIST.) FIGURE 2



LAFAYETTE INTERCEPTOR DRAIN AND OUTLET DESIGN 30% PRE-DESIGN	LEGEND 681 10-Year Flows (69) 2-Year Flows —— FCDMC 10-Year S.D. – – C.O.P. 2-Year S.D. ---- Existing S.D.	DATA FILE: LID10a.DAT BASE MODEL WITH REVISED SUB-BASIN 38 ALTERNATE 2 — FIGURE 3A



LAFAYETTE INTERCEPTOR DRAIN AND OUTLET DESIGN 30% PRE-DESIGN	LEGEND 681 10-Year Flows (69) 2-Year Flows FCDMC 10-Year S.D. C.O.P. 2-Year S.D. Existing S.D.	DATA FILE: LID10b.DAT BASE MODEL WITH "EAST" LAFAYETTE STORM DRAIN ALTERNATE 2 — FIGURE 3B



LAFAYETTE INTERCEPTOR DRAIN AND OUTLET DESIGN 30% PRE-DESIGN	LEGEND 681 10-Year Flows (69) 2-Year Flows FCDMC 10-Year S.D. C.O.P. 2-Year S.D. Existing S.D.	DATA FILE: LID10c.DAT "EAST" LAFAYETTE STORM DRAIN WITH 2-YR STORM DRAIN ALTERNATE 2 — FIGURE 3C

OLSSON ASSOCIATES

TECHNICAL MEMORANDUM

Date: March 1, 2011

To: Bobbie Ohler, Project Manager

From: Duc V. Dao, P.E.

Project: Lafayette Interceptor Drain and Outlet Design
Arcadia Drive to 44th Street

Project No: 2010C030 (OA Project 010-2312)

RE: COLLECTION SYSTEM HYDROLOGY

Introduction

The purpose of this memorandum is to document the methodology, procedure, and assumptions used in the collections system hydrology and to summarize the peak discharges to be used in the design of the collection system.

Background

The overal Arcadia Area Drainage Improvement Project proposes to construct a 10-year storm drain system along Arcadia Drive, Lafayette Boulevard, Camelback Road, and 44th Street to mitigate flooding to homes and structures upstream of the Arizona Canal within the Arcadia area watershed. This project is a joint partnership between the Flood Control District of Maricopa County and the City of Phoenix.

This phase will construct the segments along Arcadia Drive from the Arizona Canal to Lafayette Boulevard, along Lafayette Boulevard from Arcadia Drive to 44th Street, and along 44th Street from Lafayette Boulevard to Colter Street. The earlier phase constructed the system to the south including the Arizona Canal crossing. The earlier also upsized the pipe at the canal crossing to increase the capacity of the system from 681 cfs to 990 cfs just north of the canal.

Trunk Line Hydrology

Olsson Associates reviewed and updated the regional hydrology used for the trunk line design. The revised HEC-1 model indicated a slight increase in the total discharge at the canal, from 681 cfs to 686 cfs. A technical memorandum was submitted to the District on January 13, 2011, and the trunk line hydrology was consequently approved by the District.

Collection System Hydrology

The collection system hydrology is a separate evaluation after the trunk line hydrology to determine the specific locations where flows can be collected and the peak discharge at each collection point. Typically the regional hydrology is refined into smaller sub-drainage areas, and the peak discharge is computed using the Rational Method. The times of concentration from the Rational Method is usually shorter than the time from the HEC-1 method, resulting in a higher rainfall intensity and, consequently, a higher peak discharge than the HEC-1 method. On average, the peak discharge from the Rational Method is about 1.3 times the HEC-1 value.

A limitation of the Rational Method is that it cannot perform flow diversions that is available in the HEC-1 program. For example, in the base HEC-1 model, flow was diverted from each sub-basin that had irrigated lots. This operation cannot be performed with the Rational Method. The runoff coefficient would have to be adjusted, using best engineering judgment. As an example, a few sample Rational calculations were performed for sub-basins 37, 38A, 38B, 39, 40, and 41 using the DDMS software. These were delineated as sub-basins K through R. The total peak discharge for these sub-basins using HEC-1 is 313 cfs, while the Rational Method (without 'C' value adjustment) is over 3 times higher at 979 cfs. Using the Rational Method for the collection system hydrology would result in the collection system being overdesigned. In lieu of the Rational Method, the following procedures were developed to perform the collection system hydrology.

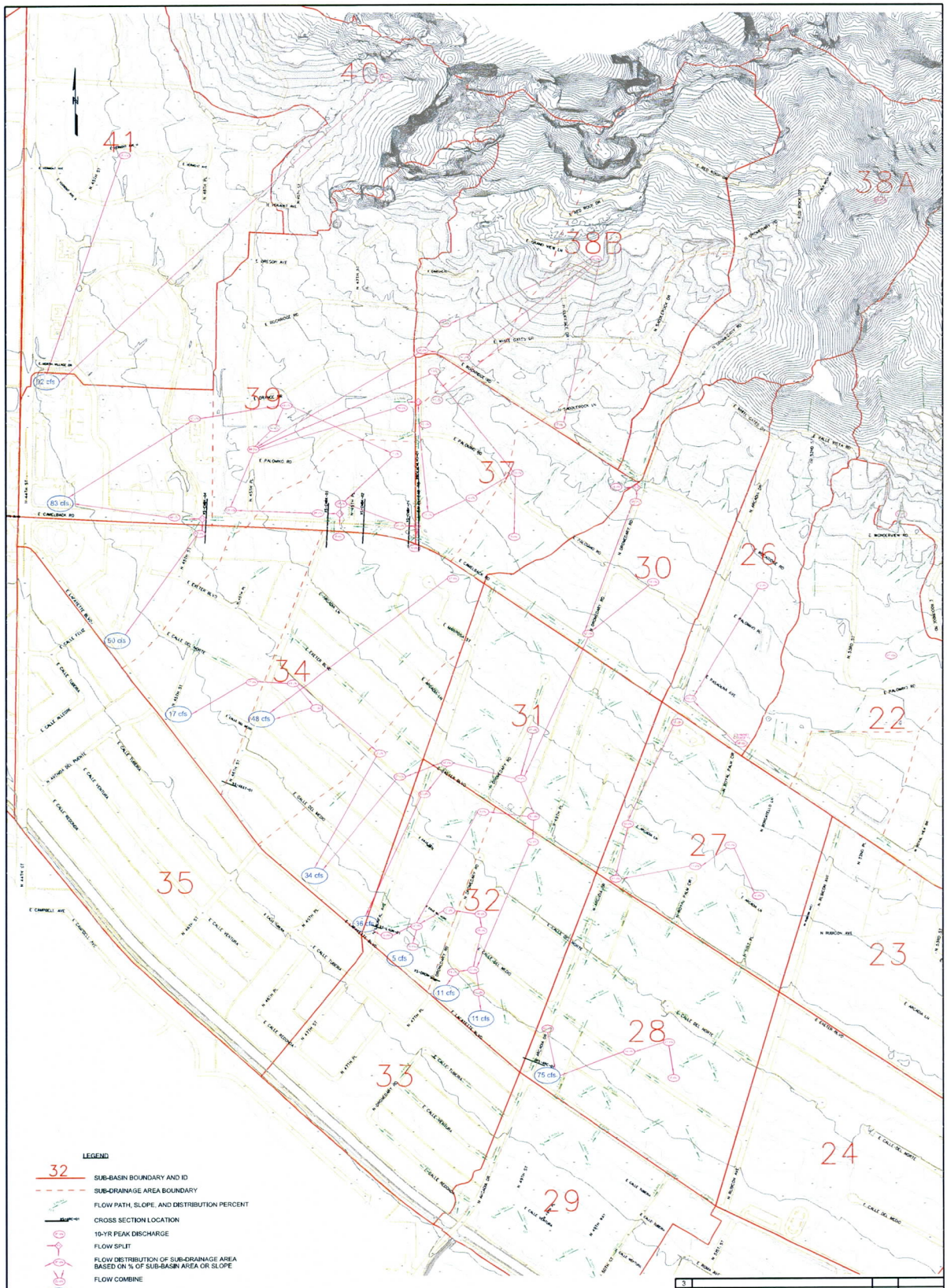
The peak discharge without diversion of each sub-basin from the HEC-1 results was used as the starting point. Next, the sub-basins were divided into smaller drainage areas, typically for flow splits that occur where two streets intersect. This was performed using ground survey data, GIS topo, and field observations. Flow splits were determined by cutting cross sections and computing the capacity of the section. If no defined sections are present at the split location, the flow distribution was determined by the magnitude of the slope in each direction. For example, if the slope to the south is 1.5% and the slope the west is 0.5%, then the flow distribution would be 75% to the south and 25% to the west. Plate 1 shows the result of the collection system hydrology including the collection location and discharge value.

Summary

The collection system hydrology is a refinement of the trunk line hydrology to determine the collection locations and discharges. Flow splits were determined using capacity analysis where a conveyance section exists, or by evaluating the magnitude of the slope in each flow direction. Using the above methodology, the total 10-year collection system discharge is 462 cfs. In comparison, the total discharge from the HEC-1 program for the same drainage area is 358 cfs. The collection system total discharge is approximately 1.29 times the total trunk line peak flow. This is in line with the general rule of thumb for collection system hydrology.

Please feel free to contact me at (480) 333-4314 or email me ddao@oaconsulting.com if you have any questions or concerns.

PLATE 1
COLLECTION SYSTEM HYDROLOGY MAP



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

LAFAYETTE INTERCEPTOR DRAIN
AND OUTLET DESIGN
PCN 625.02.30

	BY	DATE
DESIGNED	DVD	3/2/2011
DRAWN	BM	3/2/2011
CHECKED	JCF	3/2/2011

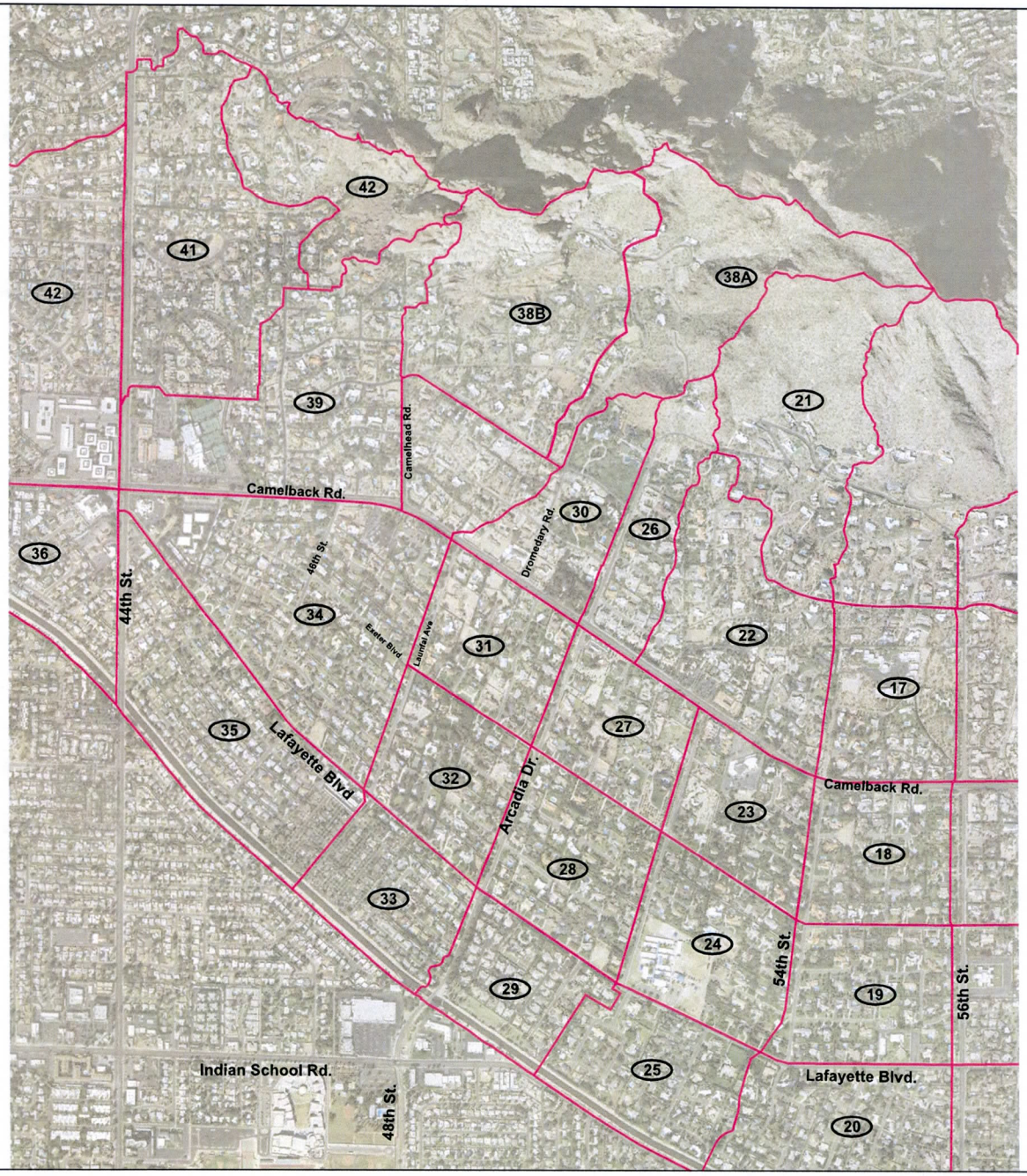
30%
PRELIMINARY
NOT FOR
CONSTRUCTION

OLSSON ASSOCIATES
7250 North 16th Street
Suite 310
Phoenix, AZ 85020-5242
TEL 602.748.1000
FAX 602.748.1001

DRAWING NO. PLATE 1
COLLECTION SYSTEM HYDROLOGY
SHEET OF

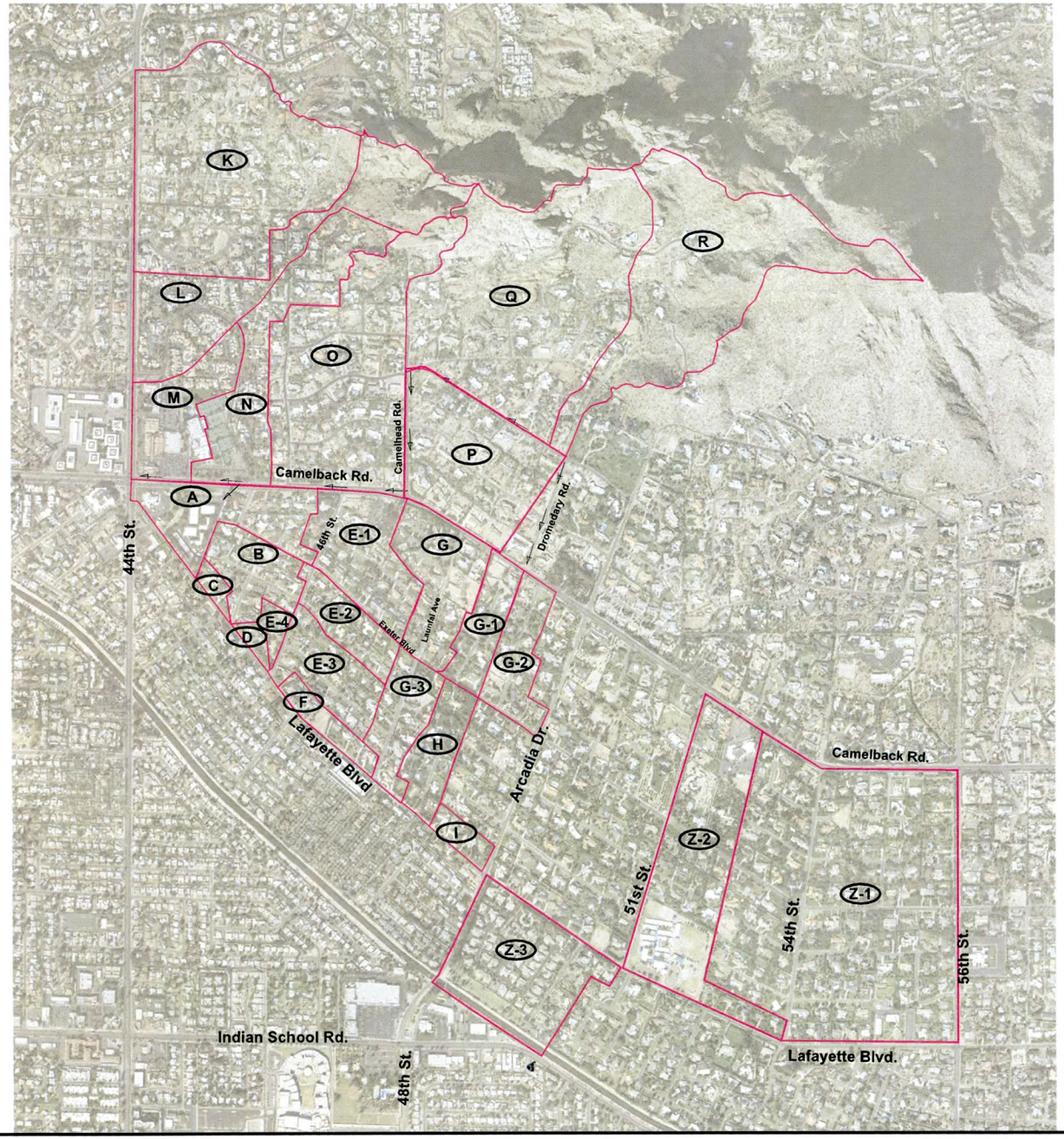
APPENDIX

COMPARISON OF HEC-1 AND RATIONAL METHOD PEAK DISCHARGES



Sub-Basin ID	10-yr Peak Discharge
17	25.0
18	18.0
19	21.0
20	45.0
21	101.0
22	23.0
23	18.0
24	20.0
25	19.0
26	12.0
27	17.0
28	21.0
29	14.0
30	18.0
31	13.0
32	16.0
33	22.0
34	41.0
35	67.0
36	37.0
37	13.0
38A	64.0
38B	74.0
39	61.0
40	46.0
41	55.0
42	125.0

HEC-1 DRAINAGE MAP



Sub-Basin ID	10-yr Peak Discharge
A	61.1
B	29.1
C	4.6
D	4.0
E-1	40.9
E-2	16.4
E-3	30.1
E-4	5.7
F	8.3
G	46.0
G-1	20.0
G-2	29.2
G-3	28.0
H	25.4
I	7.5
K	166.5
L	82.3
M	73.8
N	90.5
O	140.9
P	70.9
Q	195.0
Z-1	255.3
Z-2	115.0
Z-3	67.7

RATIONAL METHOD DRAINAGE MAP

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: ARCADIA

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
A	21.4	2,430	1,294.00	1,263.30	66.7	0.032	Q (cfs)	32.4	49.3	61.1	84.6	101.5	116.2
							C	0.67	0.67	0.67	0.74	0.77	0.78
							CA (ac)	14.34	14.34	14.34	15.84	16.48	16.69
							Tc (min)	15	13	12	11	10	10
							i (in/hr)	2.26	3.44	4.26	5.34	6.16	6.96
B	13.3	1,210	1,280.00	1,264.90	65.9	0.033	Q (cfs)	17.9	24.5	29.1	38.9	48.1	55.5
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	6.38	6.38	6.38	7.05	7.71	7.98
							Tc (min)	10	10	10	10	10	10
							i (in/hr)	2.80	3.84	4.56	5.52	6.24	6.96
C	2.1	518	1,265.40	1,264.00	14.3	0.038	Q (cfs)	2.6	3.8	4.6	6.1	7.6	8.8
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	1.01	1.01	1.01	1.11	1.22	1.26
							Tc (min)	12	10	10	10	10	10
							i (in/hr)	2.61	3.81	4.56	5.52	6.24	6.96
D	1.8	291	1,265.50	1,265.10	7.3	0.038	Q (cfs)	2.4	3.4	4.0	5.4	6.6	7.7
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	0.88	0.88	0.88	0.97	1.06	1.10
							Tc (min)	11	10	10	10	10	10
							i (in/hr)	2.73	3.84	4.56	5.52	6.24	6.96
E-1	19.4	1,465	1,293.00	1,282.80	36.8	0.032	Q (cfs)	22.1	33.2	40.9	56.3	70.2	81.0
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	9.31	9.31	9.31	10.28	11.25	11.64
							Tc (min)	14	12	11	10	10	10
							i (in/hr)	2.37	3.57	4.39	5.48	6.24	6.96
E-2	10.5	1,123	1,277.00	1,276.00	4.7	0.034	Q (cfs)	8.1	12.9	16.4	23.3	29.8	35.4
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	5.04	5.04	5.04	5.57	6.09	6.30

* Non default value

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
							Tc (min)	28	23	21	19	18	17
							i (in/hr)	1.61	2.56	3.25	4.18	4.89	5.62
E-3	14.9	1,460	1,272.00	1,264.20	28.2	0.033	Q (cfs)	16.0	24.2	30.1	41.7	52.7	62.0
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	7.17	7.17	7.17	7.92	8.67	8.96
							Tc (min)	16	14	12	11	11	10
							i (in/hr)	2.23	3.38	4.20	5.27	6.08	6.92
E-4	2.6	870	1,280.00	1,264.20	95.9	0.037	Q (cfs)	3.5	4.8	5.7	7.6	9.4	10.9
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	1.25	1.25	1.25	1.38	1.51	1.56
							Tc (min)	10	10	10	10	10	10
							i (in/hr)	2.82	3.84	4.56	5.52	6.24	6.96
F	6.0	1,132	1,265.60	1,264.90	3.3	0.035	Q (cfs)	4.1	6.5	8.3	12.0	15.5	18.6
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	2.87	2.87	2.87	3.17	3.47	3.59
							Tc (min)	33	28	26	23	22	21
							i (in/hr)	1.44	2.25	2.90	3.79	4.47	5.17
G	21.0	1,611	1,305.10	1,285.70	63.6	0.032	Q (cfs)	26.1	38.1	46.0	61.5	76.1	87.8
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	10.09	10.09	10.09	11.14	12.19	12.61
							Tc (min)	12	10	10	10	10	10
							i (in/hr)	2.59	3.78	4.56	5.52	6.24	6.96
G-1	9.1	1,242	1,306.20	1,285.70	87.1	0.034	Q (cfs)	12.4	16.8	20.0	26.7	33.1	38.1
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	4.38	4.38	4.38	4.84	5.30	5.48
							Tc (min)	10	10	10	10	10	10
							i (in/hr)	2.82	3.84	4.56	5.52	6.24	6.96

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: ARCADIA

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
G-2	13.4	1,563	1,314.00	1,290.00	81.1	0.033	Q (cfs)	17.3	24.6	29.2	39.1	48.3	55.7
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	6.41	6.41	6.41	7.08	7.74	8.01
							Tc (min)	11	10	10	10	10	10
							i (in/hr)	2.70	3.84	4.56	5.52	6.24	6.96
G-3	12.8	1,214	1,285.70	1,265.50	87.9	0.033	Q (cfs)	17.3	23.6	28.0	37.5	46.4	53.5
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	6.15	6.15	6.15	6.79	7.44	7.69
							Tc (min)	10	10	10	10	10	10
							i (in/hr)	2.82	3.84	4.56	5.52	6.24	6.96
H	11.6	1,173	1,280.30	1,266.20	63.5	0.033	Q (cfs)	15.6	21.4	25.4	33.9	41.9	48.4
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	5.56	5.56	5.56	6.14	6.72	6.95
							Tc (min)	10	10	10	10	10	10
							i (in/hr)	2.80	3.84	4.56	5.52	6.24	6.96
I	3.9	640	1,266.70	1,265.80	7.4	0.036	Q (cfs)	4.0	6.0	7.5	10.5	13.3	15.7
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	1.85	1.85	1.85	2.05	2.24	2.32
							Tc (min)	17	15	13	12	12	11
							i (in/hr)	2.17	3.26	4.07	5.13	5.95	6.77
K	79.2	2,863	1,338.00	1,278.00	110.7	0.033	Q (cfs)	89.7	135.4	166.5	234.0	291.6	336.2
							C	0.48	0.48	0.48	0.54	0.59	0.61
							CA (ac)	38.02	38.02	38.02	42.77	46.73	48.31
							Tc (min)	14	12	11	10	10	10
							i (in/hr)	2.36	3.56	4.38	5.47	6.24	6.96
L	42.0	3,480	1,360.00	1,270.00	136.6	0.060	Q (cfs)	42.9	66.0	82.3	116.2	146.6	173.1
							C	0.54	0.54	0.54	0.60	0.65	0.67
							CA (ac)	22.68	22.68	22.68	25.20	27.30	28.14

* Non default value

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
							Tc (min)	22	19	17	16	15	14
							i (in/hr)	1.89	2.91	3.63	4.61	5.37	6.15
M	20.1	1,945	1,288.00	1,263.30	67.1	0.032	Q (cfs)	40.4	60.2	73.8	101.0	117.9	132.9
							C	0.82	0.82	0.82	0.91	0.94	0.95
							CA (ac)	16.48	16.48	16.48	18.29	18.89	19.10
							Tc (min)	13	11	11	10	10	10
							i (in/hr)	2.45	3.65	4.48	5.52	6.24	6.96
N	32.0	3,840	1,380.00	1,271.00	149.9	0.031	Q (cfs)	48.5	73.2	90.5	125.1	155.8	180.4
							C	0.65	0.65	0.65	0.72	0.78	0.81
							CA (ac)	20.80	20.80	20.80	23.04	24.96	25.92
							Tc (min)	15	12	11	11	10	10
							i (in/hr)	2.33	3.52	4.35	5.43	6.24	6.96
O	64.4	3,140	1,410.00	1,286.00	208.5	0.029	Q (cfs)	84.4	118.7	140.9	188.4	233.1	268.9
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	30.91	30.91	30.91	34.13	37.35	38.64
							Tc (min)	11	10	10	10	10	10
							i (in/hr)	2.73	3.84	4.56	5.52	6.24	6.96
P	37.0	1,580	1,385.00	1,310.90	247.6	0.030	Q (cfs)	43.8	59.7	70.9	94.0	115.4	136.5
							C	0.42	0.42	0.42	0.46	0.50	0.53
							CA (ac)	15.54	15.54	15.54	17.02	18.50	19.61
							Tc (min)	10	10	10	10	10	10
							i (in/hr)	2.82	3.84	4.56	5.52	6.24	6.96
Q	91.0	3,000	1,590.00	1,325.00	466.4	0.057	Q (cfs)	111.2	162.5	195.0	261.2	318.0	373.7
							C	0.47	0.47	0.47	0.52	0.56	0.59
							CA (ac)	42.77	42.77	42.77	47.32	50.96	53.69
							Tc (min)	12	10	10	10	10	10
							i (in/hr)	2.60	3.80	4.56	5.52	6.24	6.96

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: ARCADIA

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
Z-1	131.0	3,766	1,321.60	1,267.70	75.6	0.027	Q (cfs)	135.2	204.4	255.3	355.5	450.6	530.6
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	62.88	62.88	62.88	69.43	75.98	78.60
							Tc (min)	17	15	13	12	12	11
							i (in/hr)	2.15	3.25	4.06	5.12	5.93	6.75
Z-2	48.0	3,276	1,316.10	1,267.30	78.7	0.029	Q (cfs)	61.2	92.4	115.0	159.7	199.1	236.0
							C	0.58	0.58	0.58	0.64	0.69	0.72
							CA (ac)	27.84	27.84	27.84	30.72	33.12	34.56
							Tc (min)	16	14	13	12	11	11
							i (in/hr)	2.20	3.32	4.13	5.20	6.01	6.83
Z-3	35.0	2,065	1,265.00	1,251.50	34.5	0.030	Q (cfs)	36.0	54.1	67.7	94.6	120.0	141.3
							C	0.48	0.48	0.48	0.53	0.58	0.60
							CA (ac)	16.80	16.80	16.80	18.55	20.30	21.00
							Tc (min)	17	15	14	12	12	11
							i (in/hr)	2.14	3.22	4.03	5.10	5.91	6.73
R	70.0	2,580	1,576.00	1,352.00	458.4	0.089	Q (cfs)	84.1	127.8	157.6	219.6	275.2	321.6
							C	0.52	0.52	0.52	0.58	0.63	0.66
							CA (ac)	36.40	36.40	36.40	40.60	44.10	46.20
							Tc (min)	15	13	12	11	10	10
							i (in/hr)	2.31	3.51	4.33	5.41	6.24	6.96

* Non default value

FLOW SPLIT AND CAPACITY CALCULATIONS

Worksheet for XS-CMBK-01 (Camelback & Camelhead - East XS)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02000	ft/ft
Normal Depth	7.80	in

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1303.50
0+10.00	1303.46
0+12.45	1303.25
0+16.02	1303.27
0+17.90	1303.10
0+22.28	1303.00
0+24.74	1302.81
0+37.59	1303.18
0+47.36	1303.46
0+57.35	1304.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1303.50)	(0+22.28, 1303.00)	0.030
(0+22.28, 1303.00)	(0+47.36, 1303.46)	0.016
(0+47.36, 1303.46)	(0+57.35, 1304.00)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	54.59	ft³/s

Worksheet for XS-CMBK-01 (Camelback & Camelhead - East XS)

Results

Elevation Range	1302.81 to 1304.00 ft		
Flow Area		11.99	ft²
Wetted Perimeter		37.39	ft
Hydraulic Radius		3.85	in
Top Width		37.36	ft
Normal Depth		7.80	in
Critical Depth		0.75	ft
Critical Slope		0.00982	ft/ft
Velocity		4.55	ft/s
Velocity Head		0.32	ft
Specific Energy		0.97	ft
Froude Number		1.42	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	7.80	in
Critical Depth	0.75	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00982	ft/ft

Worksheet for XS-CMBK-02 (Camelback & Camelhead - West XS)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02000	ft/ft
Normal Depth	7.80	in

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1303.50
0+10.00	1303.46
0+12.45	1303.25
0+16.02	1303.27
0+17.90	1303.10
0+21.19	1303.01
0+22.28	1303.00
0+24.74	1302.81
0+37.59	1303.18
0+47.35	1303.46
0+57.35	1304.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1303.50)	(0+21.19, 1303.01)	0.030
(0+21.19, 1303.01)	(0+47.35, 1303.46)	0.016
(0+47.35, 1303.46)	(0+57.35, 1304.00)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for XS-CMBK-02 (Camelback & Camelhead - West XS)

Results

Discharge		55.97	ft^3/s
Elevation Range	1302.81 to 1304.00 ft		
Flow Area		12.02	ft^2
Wetted Perimeter		37.38	ft
Hydraulic Radius		3.86	in
Top Width		37.35	ft
Normal Depth		7.80	in
Critical Depth		0.75	ft
Critical Slope		0.00938	ft/ft
Velocity		4.65	ft/s
Velocity Head		0.34	ft
Specific Energy		0.99	ft
Froude Number		1.45	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	7.80	in
Critical Depth	0.75	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00938	ft/ft

Worksheet for XS-CMBK-03 (Camelback & 46th St)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01980	ft/ft
Normal Depth	6.00	in

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1298.60
0+06.00	1298.50
0+06.05	1298.00
0+25.00	1298.38
0+25.05	1298.88
0+30.50	1299.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1298.60)	(0+06.00, 1298.50)	0.030
(0+06.00, 1298.50)	(0+25.05, 1298.88)	0.016
(0+25.05, 1298.88)	(0+30.50, 1299.00)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	34.54	ft^3/s
Elevation Range	1298.00 to 1299.00 ft	
Flow Area	5.89	ft^2
Wetted Perimeter	19.58	ft
Hydraulic Radius	3.61	in

Worksheet for XS-CMBK-03 (Camelback & 46th St)

Results

Top Width		19.01	ft
Normal Depth		6.00	in
Critical Depth		0.67	ft
Critical Slope		0.00532	ft/ft
Velocity		5.87	ft/s
Velocity Head		0.53	ft
Specific Energy		1.03	ft
Froude Number		1.86	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	6.00	in
Critical Depth	0.67	ft
Channel Slope	0.01980	ft/ft
Critical Slope	0.00532	ft/ft

Worksheet for XS-CMBK-04 (Camelback & 45th St)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00900	ft/ft
Normal Depth	8.40	in

Section Definitions

Station (ft)	Elevation (ft)
0+90.00	100.26
0+95.00	100.13
1+00.00	100.00
1+00.50	100.00
1+00.51	99.50
1+35.51	100.20
1+70.51	99.50
1+70.52	100.00
1+71.02	100.00
1+76.02	100.13
1+81.02	100.26

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+90.00, 100.26)	(1+00.00, 100.00)	0.030
(1+00.00, 100.00)	(1+71.02, 100.00)	0.016
(1+71.02, 100.00)	(1+81.02, 100.26)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for XS-CMBK-04 (Camelback & 45th St)

Results

Discharge		65.86	ft^3/s
Elevation Range	99.50 to 100.26 ft		
Flow Area		26.25	ft^2
Wetted Perimeter		87.40	ft
Hydraulic Radius		3.60	in
Top Width		86.40	ft
Normal Depth		8.40	in
Critical Depth		0.65	ft
Critical Slope		0.01431	ft/ft
Velocity		2.51	ft/s
Velocity Head		0.10	ft
Specific Energy		0.80	ft
Froude Number		0.80	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	8.40	in
Critical Depth	0.65	ft
Channel Slope	0.00900	ft/ft
Critical Slope	0.01431	ft/ft

Worksheet for PROF-CMLHD-01 (Profile along Camelhead Rd)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	3.48	in

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1310.30
0+00.20	1310.29
0+03.17	1310.15
0+06.14	1310.00
0+80.02	1310.00
0+88.03	1310.19
0+92.56	1310.29
1+09.50	1310.48
1+22.94	1310.59

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1310.30)	(1+22.94, 1310.59)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	91.13	ft^3/s
Elevation Range	1310.00 to 1310.59 ft	
Flow Area	24.06	ft^2
Wetted Perimeter	92.37	ft

Worksheet for PROF-CMLHD-01 (Profile along Camelhead Rd)

Results

Hydraulic Radius		3.13	in
Top Width		92.36	ft
Normal Depth		3.48	in
Critical Depth		0.35	ft
Critical Slope		0.00557	ft/ft
Velocity		3.79	ft/s
Velocity Head		0.22	ft
Specific Energy		0.51	ft
Froude Number		1.31	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.48	in
Critical Depth	0.35	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00557	ft/ft

Worksheet for XS-ARC-01 - (NEC Arcadia & Lafayette)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01600	ft/ft
Normal Depth	14.52	in

Section Definitions

Station (ft)	Elevation (ft)
0+11.25	1267.25
0+33.82	1267.07
0+57.13	1266.97
0+63.41	1267.00
0+74.11	1267.09
0+79.57	1266.79
0+90.38	1266.13
0+91.03	1266.07
0+91.62	1266.01
0+91.97	1266.25
0+92.35	1266.48
0+94.35	1266.51
0+96.30	1266.52
0+96.36	1269.26
0+99.42	1269.68

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+11.25, 1267.25)	(0+74.11, 1267.09)	0.030
(0+74.11, 1267.09)	(0+96.30, 1266.52)	0.016
(0+96.30, 1266.52)	(0+99.42, 1269.68)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method

Worksheet for XS-ARC-01 - (NEC Arcadia & Lafayette)

Options

Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge		74.42	ft^3/s
Elevation Range	1266.01 to 1269.68 ft		
Flow Area		24.13	ft^2
Wetted Perimeter		82.16	ft
Hydraulic Radius		3.52	in
Top Width		81.30	ft
Normal Depth		14.52	in
Critical Depth		1.21	ft
Critical Slope		0.01606	ft/ft
Velocity		3.08	ft/s
Velocity Head		0.15	ft
Specific Energy		1.36	ft
Froude Number		1.00	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	14.52	in
Critical Depth	1.21	ft
Channel Slope	0.01600	ft/ft
Critical Slope	0.01606	ft/ft

Worksheet for XS-DROM-01 (Dromedary Rd N. of Lafayette)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01640	ft/ft
Normal Depth	8.04	in

Section Definitions

Station (ft)	Elevation (ft)
0+09.63	1266.41
0+18.23	1266.33
0+19.10	1266.02
0+19.93	1266.02
0+33.14	1266.32
0+48.09	1265.82
0+48.51	1265.74
0+48.81	1265.74
0+50.09	1266.10
0+50.18	1266.10
0+56.95	1266.63

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.63, 1266.41)	(0+18.23, 1266.33)	0.030
(0+18.23, 1266.33)	(0+50.09, 1266.10)	0.016
(0+50.09, 1266.10)	(0+56.95, 1266.63)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for XS-DROM-01 (Dromedary Rd N. of Lafayette)

Results

Discharge		38.45	ft^3/s
Elevation Range	1265.74 to 1266.63 ft		
Flow Area		10.86	ft^2
Wetted Perimeter		44.64	ft
Hydraulic Radius		2.92	in
Top Width		44.51	ft
Normal Depth		8.04	in
Critical Depth		0.71	ft
Critical Slope		0.00979	ft/ft
Velocity		3.54	ft/s
Velocity Head		0.19	ft
Specific Energy		0.86	ft
Froude Number		1.26	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	8.04	in
Critical Depth	0.71	ft
Channel Slope	0.01640	ft/ft
Critical Slope	0.00979	ft/ft

Worksheet for XS-LAUN-01 (Launfal Ave N. of Lafayette)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01460	ft/ft
Normal Depth	8.16	in

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1266.73
0+10.00	1266.54
0+18.70	1266.49
0+20.59	1266.04
0+21.17	1266.08
0+40.08	1266.61
0+57.99	1266.95
0+58.48	1266.92
0+60.03	1267.26
0+60.08	1267.22
0+70.00	1267.37
0+80.00	1267.51

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1266.73)	(0+18.70, 1266.49)	0.030
(0+18.70, 1266.49)	(0+60.03, 1267.26)	0.016
(0+60.03, 1267.26)	(0+80.00, 1267.51)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for XS-LAUN-01 (Launfal Ave N. of Lafayette)

Results

Discharge		35.35	ft^3/s
Elevation Range	1266.04 to 1267.51 ft		
Flow Area		11.29	ft^2
Wetted Perimeter		45.41	ft
Hydraulic Radius		2.98	in
Top Width		45.35	ft
Normal Depth		8.16	in
Critical Depth		0.70	ft
Critical Slope		0.01175	ft/ft
Velocity		3.13	ft/s
Velocity Head		0.15	ft
Specific Energy		0.83	ft
Froude Number		1.11	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	8.16	in
Critical Depth	0.70	ft
Channel Slope	0.01460	ft/ft
Critical Slope	0.01175	ft/ft

Worksheet for XS-46ST-01 (46th St N. of Lafayette)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02222	ft/ft
Normal Depth	7.32	in

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1266.27
0+02.24	1265.96
0+05.01	1265.45
0+06.97	1264.83
0+07.60	1264.49
0+21.70	1265.09
0+39.48	1264.56
0+39.95	1264.58
0+41.94	1264.99
0+45.02	1266.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1266.27)	(0+06.97, 1264.83)	0.030
(0+06.97, 1264.83)	(0+41.94, 1264.99)	0.016
(0+41.94, 1264.99)	(0+45.02, 1266.00)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	61.38	ft³/s

Worksheet for XS-46ST-01 (46th St N. of Lafayette)

Results

Elevation Range	1264.49 to 1266.27 ft		
Flow Area		10.55	ft²
Wetted Perimeter		36.37	ft
Hydraulic Radius		3.48	in
Top Width		36.16	ft
Normal Depth		7.32	in
Critical Depth		0.77	ft
Critical Slope		0.00538	ft/ft
Velocity		5.82	ft/s
Velocity Head		0.53	ft
Specific Energy		1.14	ft
Froude Number		1.90	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	7.32	in
Critical Depth	0.77	ft
Channel Slope	0.02222	ft/ft
Critical Slope	0.00538	ft/ft

Worksheet for Concrete Channel - NEC Cmbk & Arcadia

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	12.00	in

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	100.00
0+00.50	100.00
0+00.51	99.50
0+01.76	99.00
0+06.76	99.00
0+08.01	99.50
0+08.02	102.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 100.00)	(0+08.02, 102.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	38.64	ft^3/s
Elevation Range	99.00 to 102.00 ft	
Flow Area	6.88	ft^2
Wetted Perimeter	8.69	ft
Hydraulic Radius	9.49	in
Top Width	7.51	ft

Worksheet for Concrete Channel - NEC Cmbk & Arcadia

Results

Normal Depth		12.00	in
Critical Depth		1.04	ft
Critical Slope		0.00470	ft/ft
Velocity		5.62	ft/s
Velocity Head		0.49	ft
Specific Energy		1.49	ft
Froude Number		1.04	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	12.00	in
Critical Depth	1.04	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00470	ft/ft

OLSSON ASSOCIATES

TECHNICAL MEMORANDUM

Date: March 22, 2011

To: Bobbie Ohler, Project Manager

From: Duc V. Dao, P.E.

Project: Lafayette Interceptor Drain and Outlet Design
Arcadia Drive to 44th Street

Project No: 2010C030 (OA Project 010-2312)

RE: ADDITIONAL OCCC CAPACITY EVALUATION

Introduction

The purpose of this memorandum is to evaluate the options to utilize the additional capacity of the drainage system at the Old Cross Cut Canal (OCCC) and to provide a recommendation.

Background

The Arcadia Area Drainage Project is a regional flood control project by the Flood Control District of Maricopa County, in partnership with the City of Phoenix, to mitigate flooding problems within the Arcadia area watershed.

A drainage study was performed in the early 1990s to evaluate drainage improvement alternatives, and a *Final Recommendations Report* was prepared in 1997 that recommended the preferred alternative (Alternative 2) from five alternatives evaluated. The preferred alternative proposed a 10-year storm drain system along Arcadia Drive, Lafayette Boulevard, Camelback Road, and 44th Street. Figure 1 shows the preferred Alternative 2 proposed improvements.

The preferred alternative in Figure 1 shows 681 cfs outletting into the Old Cross Cut Canal, and 115 cfs outletting into the Arizona Canal Diversion Channel (ACDC). As part of this project, the HEC-1 model was evaluated and updated. The result of the revised HEC-1 model indicates a slight increase at the OCCC outfall to 686 cfs for the 10-year event.

The Old Cross Cut Canal Improvement Project designed and constructed the first phase of the regional project, replacing the Old Cross Cut earthern ditch with a 120" cast-in-place pipe (CIPP) to accommodate 1000 cfs from SRP's release from the canal, and a 102" RGRCP segment to accommodate stormwater flows from the Arcadia area. The 102" pipe is an

increase from the 96" pipe size shown in the pre-design plan. The 102" size was determined to be the largest cost effective size to cross the Arizona Canal. This increased the capacity of the system at the canal crossing from 686 cfs to 990 cfs, or an additional 304 cfs. This additional capacity increases the potential to increase the level of protection of the storm drain from a 10-year system to a 10-plus year system.

This memorandum will evaluate the options to use the additional capacity of the Old Crross Cut storm drain system.

Option 1: Construct Inlet Structure at Existing Basin

The first option is to collect water at the existing basin at the northeast corner of the Arcadia Drive and the Arizona Canal. This would reduce the amount of water that crosses Arcadia Drive to the west and mitigate flooding to homes upstream of the canal west of Arcadia Drive.

The basin is owned and maintained by of the Arcadia Estates Homeowner's Association, and designed to function as a detention basin for runoff from the development. However, water from upstream areas to the north and east of the development also find its way into the basin. Water from the watershed originates from Camelback Mountain, then flows from north to south due to the topography. Water is conveyed within the north-south roadways to the Arizona Canal, where it ponds on the upstream side of the elevated north bank. While the topography in the east-west direction is very flat, the runoff tends to move from east to west along the upstream side of the canal during events that do not overtop the canal. At the existing basin location, the HEC-1 model indicates a peak flow of 205 cfs for the 10-year event. This value assumes the East Camelback System is in place.

An inlet structure could be designed at the basin location to collect the water that currently concentrates there and convey it into the OCCC system. The structure and conveyance pipe could be sized for just the 10-year event (205 cfs), or for the entire 304 cfs additional capacity (10-plus year system). Two 42" pipes would be needed to convey the 205 cfs, or two 48" for the 304 cfs. The pipes would outlet into a new junction structure to connect the Phase 1 and Phase 2 pipes. This proposed option is shown in Figure 2. The cost of this option would be for the inlet structure and the conveyance pipes. The inlet system for the 10-year event (205 cfs) would cost approximately $64,000 while the 10-plus year system (304 cfs) would cost approximately $80,000.

Option 2: East Lafayette Collector System

The preferred alternative as proposed does not collect stormwater runoff in the area south of Camelback Road and east of Arcadia Drive, even with the East Camelback System in place. To mitigate flooding to homes and structures in this area, a storm drain system along Lafayette Boulevard east of Arcadia Drive is proposed. This system, called the East Lafayette Collector System, was described in the Alternatives Evaluation Technical Memorandum dated January 13, 2011. The alignment of this sytem begins near 58th Street, then turns south at 50th Street, then west under the existing detention basin and connecting to the junction structure at Arcadia Drive north of the Arizona Canal. An alignment variation of this option would be to continue the alignment west past 50th Street and connecting to the junction at Lafayette Boulevard and Arcadia Drive. The layout of this option is shown in Figure 3.

The East Lafayette Collector System would collect stormwater runoff from the area bounded by Arcadia Drive, Camelback Road, 60th Street/Jokake Road, and Lafayette Boulevard. It would be a 10-year system and collect approximately 112 cfs. This would leave 192 cfs of capacity left to be collected either at the inlet structure proposed in Option 1, or by increasing the collection system of the Lafayette Interceptor Drain to the west.

A detailed cost estimate of this option is provided in the Appendix. The cost of the East Lafayette Collection System through 50th Street is approximately $2.71 million, while the continuous route along Lafayette Boulevard is approximately $2.57 million. While the 50th Street alignment is more expensive, this was the preferred alignment initially in an attempt to keep Arcadia Drive from the Arizona Canal to Lafayette Boulevard open during construction. However, it has been determined that Arcadia Drive cannot remain open during construction, which would allow the 102" pipe to continue up to Lafayette Boulevard and be connected with the East and West Lafayette and North Arcadia drainage systems. Therefore, the continuous alignment along Lafayette Boulevard from 58th Street to Arcadia Drive is the preferred preferred route for the East Lafayette Collector System because of the lower cost and less impact to residents along 50th Street.

The East Lafayette Collector System is a proposed future improvement that the District and City can seek final design and construction on when funding becomes available. To accommodate this system in the future, it is recommended as part of this project that a stubout be provided at the junction stucture at the intersection of Lafayette Boulevard and Arcadia Drive.

Option 3: Increasing Collection System Capacity

The third option to use the available capacity of the OCCC system is to increase the capacity of the collection system for the entire storm drain system outletting into the Old Cross Cut Canal. This would provide a higher than a 10-year level of flood protection to homes and structures within the project area.

The collection system is typically designed to collect approximately 1.3 times the flow from the trunk line hydrology. Following this rule of thumb, the collection system would be designed for approximately 892 cfs for the 10-year flow of 686 cfs in the trunk line. The collection system could be increased to take all the available capacity in the trunk line, or increased up to a certain percent that would be reasonable and practical. Table 1 below summarizes the collection and trunk line flow values for the various incremental increases.

Table 1 shows that the collection system would have to be increased about 45% to use all of the available 304 cfs of additional capacity in the OCCC system. This would require additional inlets to collect an additional 395 cfs. Assuming a City of Phoenix P-1569 M-2 double wing curb opening catch basin with L=10' (total curb opening length = 23') and one foot of curb opening would capture approximately 1 cfs of flow, approximately 18 additional catch basins would be needed. It is also assumed that the trunk line pipes would need to be upsized to the next 6" size to accommodate the additional flow. The cost to increase the collection system to collect the entire 304 cfs of available capacity in the OCCC system is estimated to be approximately $640,000. It should be noted that the cost for the pipe size upgrade in this estimate is only for pipes in the base project, and does not include pipes in the north Arcadia (Lafayette to Camelback) and Camelback Road reaches.

TABLE 1
HYDROLOGY SUMMARY FOR ADDITIONAL CAPACITY

Percent Increase	Trunkline System Total (cfs)	Collection System Total (cfs)	Additional Trunkline Flow (cfs)	Additional Collection System Flow (cfs)
10	755	982	69	90
15	789	1,026	103	134
20	823	1,070	137	178
25	858	1,115	172	223
30	892	1,160	206	268
35	926	1,204	240	312
40	960	1,248	274	356
45	995	1,294	309	402

Summary and Recommendation

This memorandum evaluated three options to use the 304 cfs of additional capacity available in the Old Cross Cut Canal drainage sytem. A summary and cost of each option is provided in the table below.

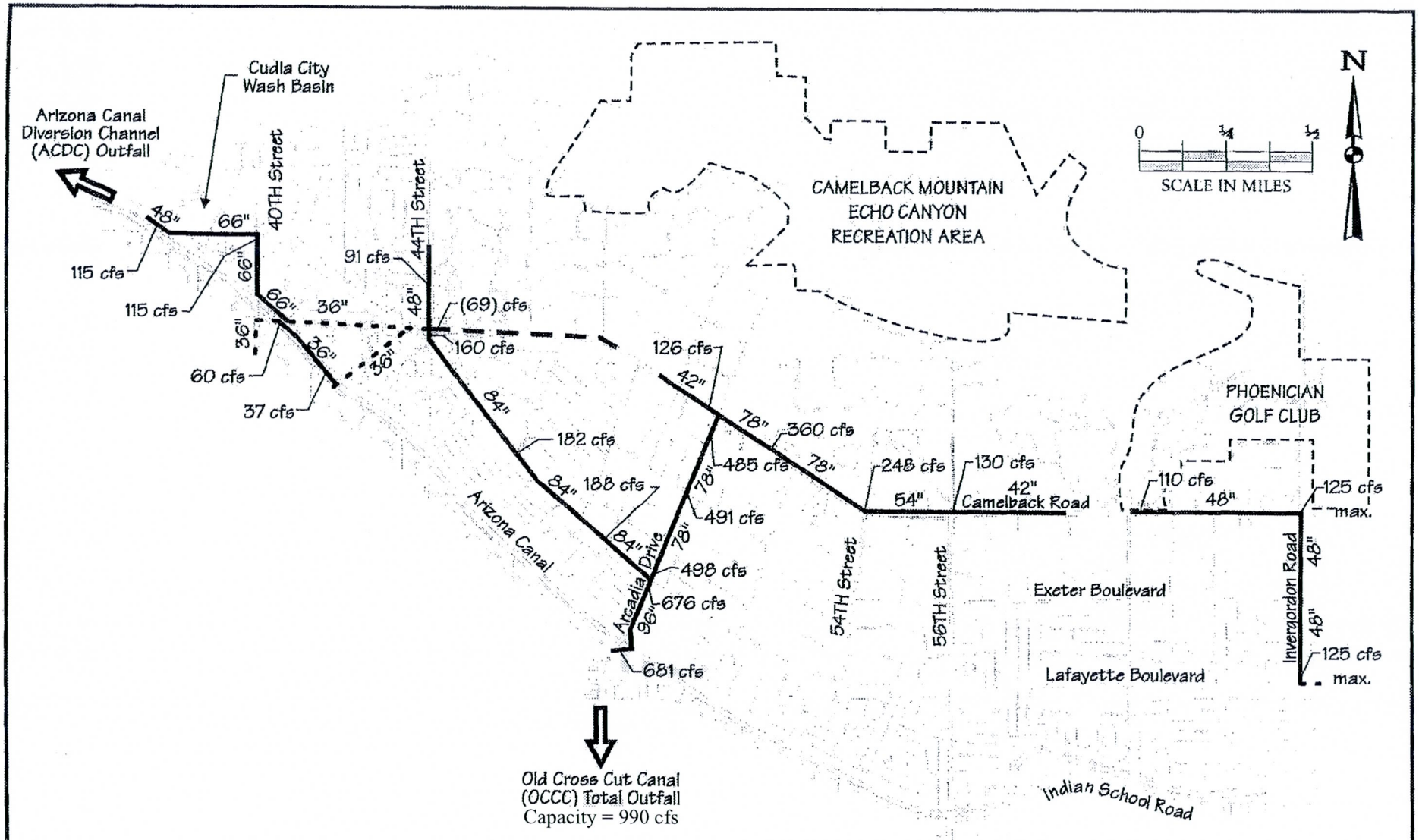
TABLE 2
OPTIONS BENEFIT AND COST SUMMARY

OPTION	DESCRIPTION	BENEFIT	COST
1	Inlet structure at northeast corner of Arcadia Drive and Arizona Canal	• Can collect up to 304 cfs • Provide flood protection to structures upstream of canal west of Arcadia Drive	$64,000 to $80,000
2	East Lafayette Collector System – 10-yr storm drain along Lafayette Boulevard from 58th Street to Arcadia Drive	• Can collect 10-yr flow of 112 cfs • Provide 10-year flood protection to structures in area bounded by Arcadia Drive, Lafayette Boulevard, Camelback Road, and 60th Street/ Jokake Road	$2.57M to $2.71M
3	Increase entire collection system capacity by 45%	• Can collect up to 304 cfs • Provide increased flood protection above the 10-yr event to structures in project area	$640,000

The least expensive option would be the inlet structure at the existing basin at the northeast corner of Arcadia Drive and the Arizona Canal. However, a combination of Option 1 and Option 3 is recommended to provide a higher level of protection to a larger area. The inlet structure could be designed to collect the 10-year flow of 205 cfs, and the inlet collection system could be upsized about 15% to collect the remaining 99 cfs. The pipes may not need to be upsized to collect 99 cfs, which would reduce the cost of Option 3 to approximately $82,000. As a result, the cost of a combination of Option 1 for 205 cfs and Option 3 for 99 cfs is estimated to be $146,000. It is also recommended that a stub-out be provided for the future East Lafayette Collection System as part of this project.

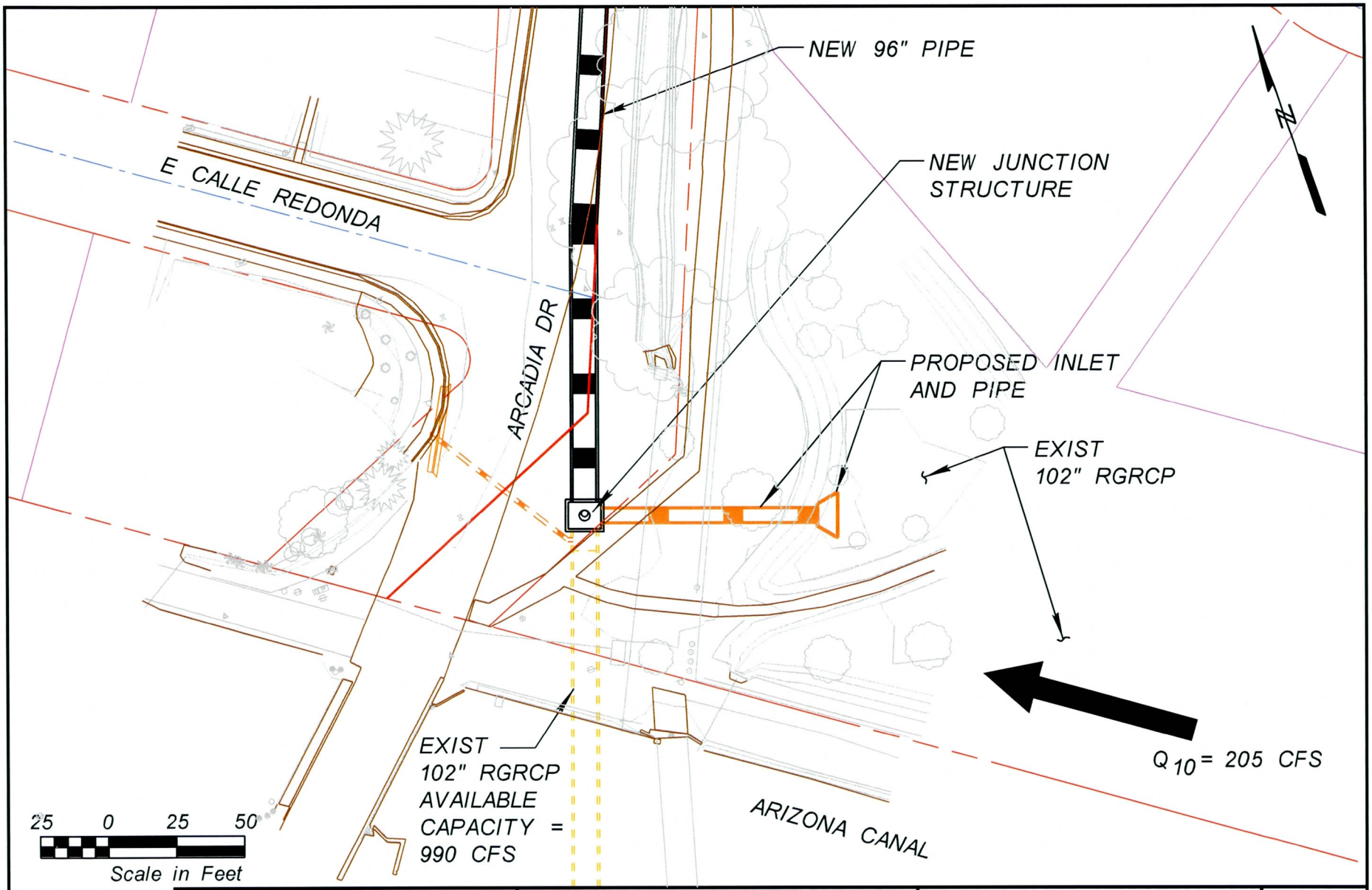
Please feel free to contact me at (480) 333-4314 or email me ddao@oaconsulting.com if you have any questions or concerns.

APPENDIX



Reference: *Arcadia Area Drainage Project Final Recommendations Report,*
Huitt-Zollars, for Flood Control District of Maricopa County, FCD No. 94-21, March 1997

LAFAYETTE INTERCEPTOR DRAIN AND OUTLET DESIGN 30% PRE-DESIGN	LEGEND 681 10-Year Flows (69) 2-Year Flows —— FCDMC 10-Year S.D. – – C.O.P. 2-Year S.D. ---- Existing S.D.	PROPOSED ALTERNATIVE 2 IMPROVEMENTS ALTERNATE 2 | FIGURE 1

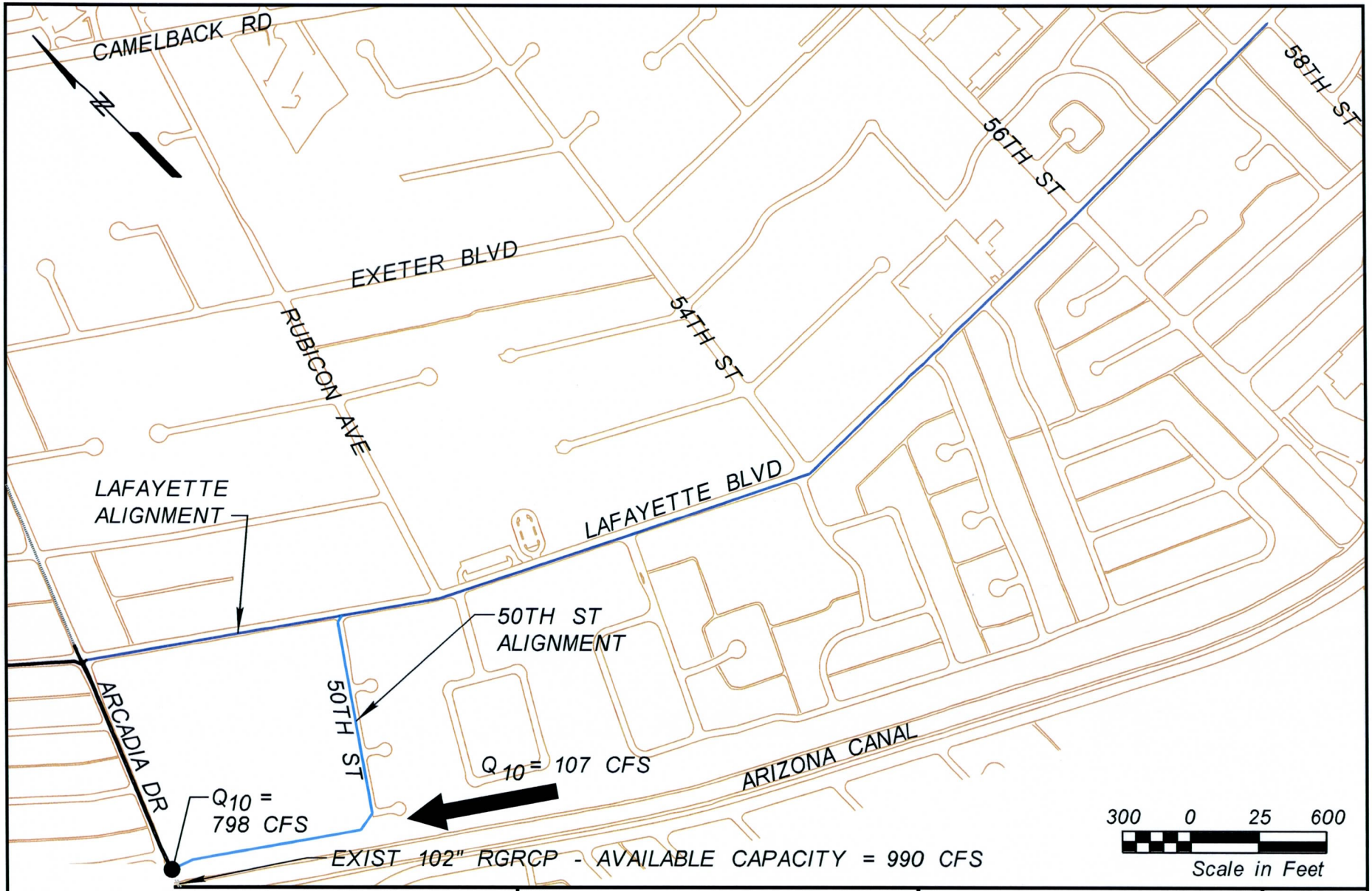


ETTE INTERCEPTOR DRAIN
AND OUTLET
30% PRE-DESIGN
COP ST 83110068
D PROJ. NO. 2010C030

OPTION 1
INLET STRUCTURE
AT EXISTING BASIN

OLSSON ASSOCIATES
7250 North 16th Street
Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001

FIGURE
2



ETTE INTERCEPTOR DRAIN
AND OUTLET
30% PRE-DESIGN
COP ST 83110068
D PROJ. NO. 2010C030

OPTION 2
EAST LAFAYETTE
COLLECTOR SYSTEM

OLSSON ASSOCIATES
7250 North 16th Street
Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001

FIGURE
3

LAFAYETTE INTERCEPTOR DRAIN AND OUTLET
ARCADIA DRIVE TO 44TH STREET
FCD PROJECT NO. 2010C030

PRELIMINARY COST ESTIMATE FOR USING ADDITIONAL 304 CFS CAPACITY

Item No.	Item Description	Unit	Unit Cost	Quantity					Cost				
				Option 1 Inlet Structure (10-yr Flow)	Option 1 Inlet Structure (Max Add'l Capacity)	Option 2 East LID (Lafayette Alignment)	Option 2 East LID (50th St Alignment)	Option 3 Increase Collection Capacity	Option 1 Inlet Structure (10-yr Flow)	Option 1 Inlet Structure (Max Add'l Capacity)	Option 2 East LID (Lafayette Alignment)	Option 2 East LID (50th St Alignment)	Option 3 Increase Collection Capacity
336-1	PERMANENT PAVEMENT REPLACEMENT	SY	$ 50.00			4,233	3,627	758			$ 211,650	$ 181,350	$ 37,900
404-1	TRAFFIC CONTROL	LS									$ 50,000	$ 42,000	
430-1	LANDSCAPE RECONSTRUCTION	LS	$ 25,000.00				1					$ 25,000	
505-1	INLET STRUCTURE NO. 1	EA	$ 15,000.00	1					$ 15,000				
505-2	INLET STRUCTURE NO. 2	EA	$ 20,000.00		1					$ 20,000			
505-3	CURB OPENING CATCH BASIN	EA	$ 7,500.00			6	6	18			$ 45,000	$ 45,000	$ 135,000
618-1	24" RGRCP	LF	$ 150			240	240	500			$ 36,000	$ 36,000	$ 75,000
618-2	42" RGRCP	LF	$ 225	160		2,845	2,845		$ 36,000		$ 640,125	$ 640,125	
618-3	48" RGRCP	LF	$ 275		160	3,306	4,005			$ 44,000	$ 909,150	$ 1,101,375	
618-4	102" RGRCP (UPGRADE FROM 96" RGRCP)	LF	$ 75			978					$ 73,350		
618-5	UPSIZE PIPE TO NEXT 6" SIZE	LS	$ 263,400					1					$ 263,400
618-5	PIPE PLUG	EA	$ 1,500			1	1				$ 1,500	$ 1,500	
625-1	STORM DRAIN MANHOLE (MAG DET 520/521)	EA	$ 7,500			12	13				$ 90,000	$ 97,500	
	SUBTOTAL								***$ 51,000***	***$ 64,000***	***$ 2,056,775***	***$ 2,169,850***	***$ 511,300***
	CONTINGENCY	25%							***$ 12,750***	***$ 16,000***	***$ 514,194***	***$ 542,463***	***$ 127,825***
	TOTAL								**$ 63,750**	**$ 80,000**	**$ 2,570,969**	**$ 2,712,313**	**$ 639,125**

OLSSON ASSOCIATES

TECHNICAL MEMORANDUM

Date: March 23, 2011

To: Bobbie Ohler, Project Manager

From: Duc V. Dao, P.E.

Project: Lafayette Interceptor Drain and Outlet Design

Project No.: 2010C030 (OA Project 010-2312)

RE: FLOODPLAIN ANALYSIS NORTH OF THE ARIZONA CANAL

Introduction

The purpose of this memorandum is to evaluate the effect of the proposed Lafayette Interceptor Drain system on the existing Special Flood Hazard Area (SFHA) on the north side of the Arizona Canal and to determine the need for a Letter of Map Revision (LOMR). This memorandum also documents the 100-year 6-hour regional hydrology and HEC-RAS model that were used for the floodplain analysis of the area north of the Arizona Canal.

Background

Stormwater from the Arcadia area drainage watershed sheet flows in a southerly direction, originating from the Camelback Mountains and continuing south until it reaches the Arizona Canal. The canal, being elevated several feet above existing ground, traps water and floods properties along its upstream bank during large storm events. Properties inside this flood area are within FEMA's Zone "A" floodplain designation, which corresponds to the 100-year floodplains that are determined by approximate methods with no base flood elevations or depths. The floodplain is based on the top of canal bank elevation. Please refer to Figure 1 for the Flood Insurance Rate Map (FIRM).

The scope of the Lafayette Interceptor Drain and Outlet Design project includes revising the existing 100-year regional hydrology (HEC-1 model) for the Arcadia area to determine if the proposed regional drainage system (Alternative 2 from the *Arcadia Area Drainage Project Final Recommendations Report*) would reduce the floodplain along the north side of the Arizona Canal enough to warrant a FEMA standard Letter of Map Revision (LOMR) process for flood map.

Regional Hydrology

The initial approach to perform the LOMR evaluation was to use the 100-year regional hydrology from the Phoenix Metro Area ADMP and divert out the flow from the proposed drainage system to obtain the 100-year peak discharge with project-in-place. A review of that report indicates that the Phoenix Metro Area ADMP does not cover the area north of the Arizona Canal.

A 100-year model with project in place was created from the updated Alternative 2 base model by replacing the precipitation data with the 100-year, 6-hour rainfall depth. No changes were made to the sub-basin, diversion, or routing parameters. While it is understood that this does not provide a true 100-year model, it is assumed that the model will provide a reasonable approximation of the 100-year peak discharge. The 100-year HEC-1 model is provided in the Appendix. Figure 2 shows the Hydrology Map with 100-year, 6-hour peak discharges that concentrate along the Arizona Canal.

HEC-RAS Model along the Arizona Canal

A HEC-2 model was prepared as part of the *Arcadia Area Drainage Project* to determine the storage-discharge relationship of the north canal bank area. This model (OCCC.DAT) was imported into HEC-RAS and the flow data of the model was updated with the 100-year, 6-hour peak discharges that were determined from the 100-year model with project-in-place. No changes were made to the manning's roughness, contraction and expansion coefficient, ineffective flow area, or channel reach length parameters. The output from the HEC-RAS model is provided in Appendix A.

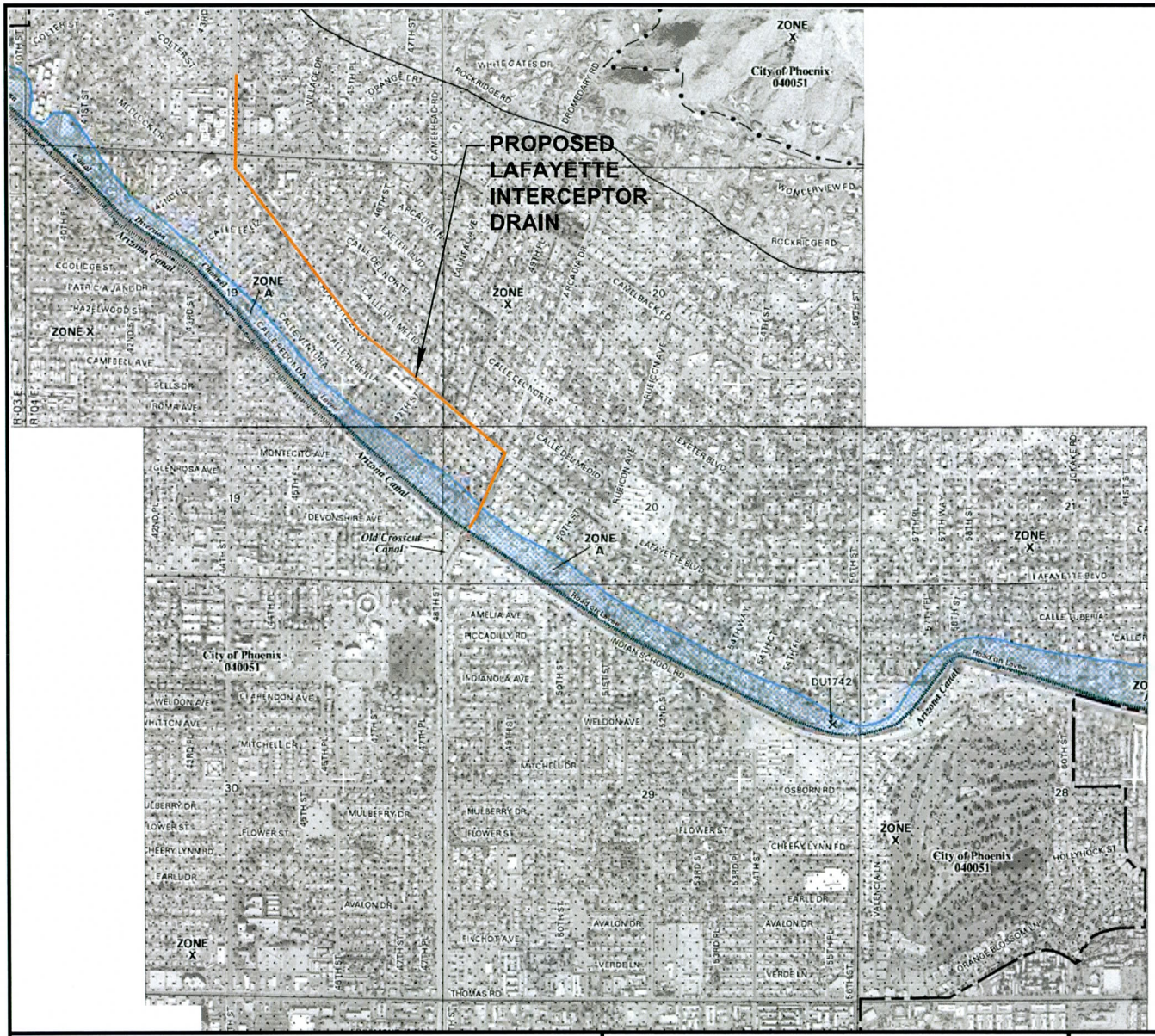
The modeling reach extends from 64th street to 37th Place and covers a sufficient area north of the Arizona Canal to evaluate the storage capacity at the 100-year peak discharge. Outputs from the HEC-RAS model show that the area north of the Arizona Canal between east of 56th Street to 64th Street has the capacity to contain the 100-year, 6-hour peak discharge. However, the area north of the Arizona Canal between west of 56th Street to 37th Place does not have the capacity to contain the 100-year peak discharge and flow overtops the canal. This is shown in the HEC-RAS model between river station 99327 to river station 84000. The overtopping occurs because the 100-year peak discharge increases as ponded water along the north canal bank slowly migrates westerly and combines with runoff from the north.

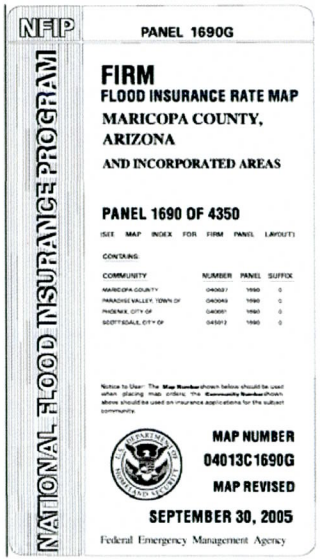
The overtopping with project-in-place indicates that ponding still occurs to the top of canal bank elevation on the north side of the Arizona Canal. Since the top of canal bank elevation does not change, the existing floodplain on the north side of the Arizona Canal remains the same. The proposed storm drain system will only reduce the amount of overtopping that occurs over the canal. It does not reduce the amount of ponding on the upstream side of the canal. Therefore, the floodplain is not reduced.

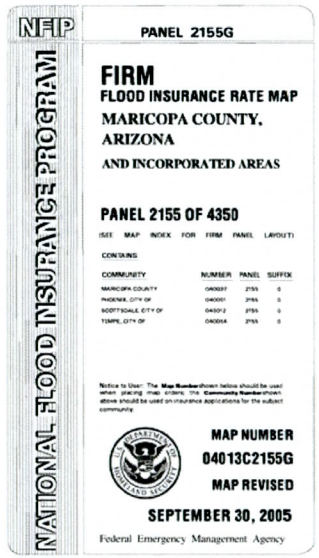
Summary

The proposed regional drainage system as presented in the *Arcadia Area Drainage Project Final Recommendations Report* is a 10-year storm drain system. While this system will reduce the amount of flooding for the more frequent storms up to 10-year event, it will not reduce the 100-year floodplain limit of the existing Special Flood Hazard Area (SFHA) on the north side of the Arizona Canal. Therefore, a FEMA Letter of Map Revision (LOMR) is not warranted.

Please feel free to contact me at (480) 333-4313 or email me ddao@oaconsulting.com if you have any questions or concerns.





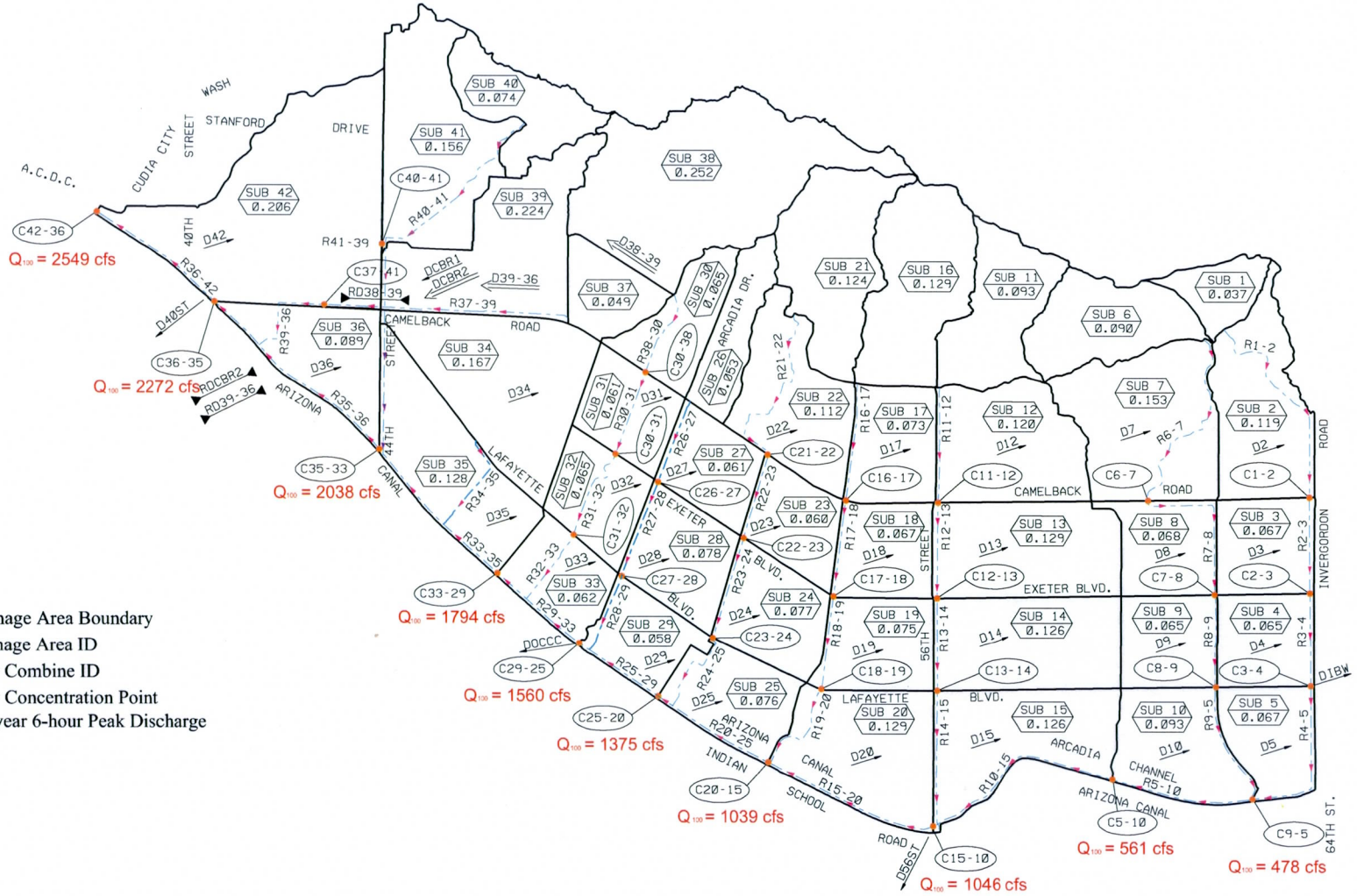


:TTE INTERCEPTOR DRAIN
AND OUTLET
30% PRE-DESIGN
COP ST 83110068
D PROJ. NO. 2010C030

FIRM MAP

OLSSON ASSOCIATES
7250 North 16th Street
Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001

FIGURE
1



LEGEND

- Drainage Area Boundary
- SUB 34 0.137 — Drainage Area ID
- C33-29 — Flow Combine ID
- Flow Concentration Point
- Q_{100} = 1560 cfs — 100-year 6-hour Peak Discharge

Reference: *Arcadia Area Drainage Project Final Recommendations Report,*
Huitt-Zollars, for Flood Control District of Maricopa County, FCD No. 94-21, March 1997

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY FCD PROJ. NO. 2010C010	HYDROLOGY MAP LAFAYETTE DRAIN INTERCEPTOR AND OUTLET DESIGN (LDIOD)	1500' 750' 0' 1500' SCALE IN FEET	OLSSON ASSOCIATES 7250 North 16th Street Suite 210 Phoenix, AZ 85020 TEL 602.748.1000 FAX 602.748.1001	FIGURE 2

APPENDIX

100-year, 6-hour HEC-1 Model Output

```
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998            *
*            VERSION 4.1            *
*                                   *
*  RUN DATE   01MAR11  TIME  12:04:03   *
*                                   *
*************************************
```

```
*************************************
*                                   *
*    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

                *       ARCADIA AREA
    1           ID        LID100a.DAT
                *       100-YR, 6-HR MODEL FOR ALTERNATE 2
                *       FROM BASE MODEL LID10a.DAT
                *       THIS MODEL REVISES SUB-BASIN 38 INTO 2 SUB-BASINS 38A & 38B TO CORRECT
                *       THE FLOW SPLIT OF THE ORIGINAL SUB-BASIN
                *
    2           IT       5                    300
    3           IO       5
                *DIAGRAM
                *

    4           KK    SUB1
    5           KM    SUB-BASIN SUB1
    6           KM    6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
    7           KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
    8           KM      L =  .28  Kb = .108  Adj. Slope = 2120.0
    9           BA     .037
   10           IN       15
   11           KM    RAINFALL DEPTH OF 3.19 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
   12           PB     3.19
   13           KM    THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 2.20
   14           PC     .000    .010    .017    .026    .037    .046    .056    .065    .075    .085
   15           PC     .097    .111    .131    .175    .263    .455    .689    .829    .893    .933
   16           PC     .949    .962    .975    .988   1.000
   17           LG     .119    .337   4.650    .260  51.000
   18           UC     .154    .110
   19           UA        0       3       5       8      12      20      43      75      90      96
   20           UA      100
                *

   21           KK    R1-2
   22           KM        ROUTE FLOW FROM SUB1 TO SUB2
   23           RK  3183.8   .0166     .07       0    TRAP       0       3     YES
                *

   24           KK    SUB2
   25           KM    SUB-BASIN SUB2
   26           KM    6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
   27           KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
   28           KM      L =  .60  Kb = .041  Adj. Slope =   88.0
   29           BA     .117
   30           LG     .343    .250   4.650    .440   9.000
   31           UC     .587    .463
   32           UA        0       5      16      30      65      77      84      90      94      97
   33           UA      100
                *

   34           KK    DIV2
   35           KM        DIVERT FOR IRRIGATED LAWNS SUB2
   36           DT      D2      .80
   37           DI       0       1
   38           DQ       0    .382
                *
```



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

   39           KK    C1-2
   40           KM        COMBINE HYDROGRAPHS SUB1 AND SUB2 AT CP2
   41           HC       2
                *

   42           KK   D2-64
   43           KM        DIVERT FLOW
```

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	SUB1	59.	4.08	9.	2.	2.	.04		
+	ROUTED TO	R1-2	58.	4.17	9.	2.	2.	.04		
+	HYDROGRAPH AT	SUB2	84.	4.33	15.	4.	4.	.12		
+	DIVERSION TO	D2	25.	4.33	2.	0.	0.	.12		
+	HYDROGRAPH AT	DIV2	84.	4.33	14.	3.	3.	.12		
+	2 COMBINED AT	C1-2	139.	4.25	23.	6.	6.	.15		
+	DIVERSION TO	DSUB2	18.	4.25	0.	2.	2.	.15		
+	HYDROGRAPH AT	D2-64	121.	4.25	15.	4.	4.	.15		
+	ROUTED TO	R2-3	118.	4.33	15.	4.	4.	.15		
+	HYDROGRAPH AT	SUB3	60.	4.25	9.	2.	2.	.07		
+	DIVERSION TO	D3	30.	4.25	2.	0.	0.	.07		
+	HYDROGRAPH AT	DIV3	60.	4.25	8.	2.	2.	.07		
+	2 COMBINED AT	C2-3	175.	4.33	22.	6.	5.	.22		
+	ROUTED TO	R3-4	173.	4.33	22.	6.	5.	.22		
+	HYDROGRAPH AT	SUB4	69.	4.17	10.	3.	2.	.06		
+	DIVERSION TO	D4	31.	4.17	2.	1.	0.	.06		
+	HYDROGRAPH AT	DIV4	69.	4.17	8.	2.	2.	.06		
+	2 COMBINED AT	C3-4	236.	4.33	31.	8.	7.	.29		
+	DIVERSION TO	DSUB4	3.	4.33	2.	0.	0.	.29		
+	HYDROGRAPH AT	D4-64	233.	4.33	29.	7.	7.	.29		
+	ROUTED TO	R4-5	229.	4.33	29.	7.	7.	.29		
+	HYDROGRAPH AT	SUB5	42.	4.50	10.	3.	3.	.07		
+	DIVERSION TO	D5	21.	4.58	2.	0.	0.	.07		
+	HYDROGRAPH AT	DIV5	41.	4.58	9.	2.	2.	.07		
+	2 COMBINED AT	C4-5	248.	4.33	38.	9.	9.	.35		
+	HYDROGRAPH AT	SUB6	152.	4.00	22.	6.	5.	.09		
+	ROUTED TO	R6-7	147.	4.08	22.	6.	5.	.09		
+	HYDROGRAPH AT	SUB7	152.	4.25	27.	7.	7.	.15		
+	DIVERSION TO	D7	63.	4.33	5.	1.	1.	.15		
+	HYDROGRAPH AT	DIV7	150.	4.33	22.	6.	5.	.15		
+	2 COMBINED AT	C6-7	253.	4.33	45.	11.	11.	.24		
+	DIVERSION TO	DSUB7	110.	4.33	31.	8.	8.	.24		

+	HYDROGRAPH AT	D7-64	143.	4.33	13.	3.	3.	.24
+	ROUTED TO	R7-8	140.	4.42	14.	3.	3.	.24
+	HYDROGRAPH AT	SUB8	47	4.42	10.	2.	2.	.07
+	DIVERSION TO	D8	27.	4.42	2.	0.	0.	.07
+	HYDROGRAPH AT	DIV8	47.	4.42	8.	2.	2.	.07
+	2 COMBINED AT	C7-8	186.	4.42	22.	5.	5.	.31
+	ROUTED TO	R8-9	183.	4.42	22.	5.	5.	.31
+	HYDROGRAPH AT	SUB9	65.	4.17	10.	2.	2.	.06
+	DIVERSION TO	D9	31.	4.17	2.	0.	0.	.06
+	HYDROGRAPH AT	DIV9	65.	4.17	8.	2.	2.	.06
+	2 COMBINED AT	C8-9	235.	4.42	29.	7.	7.	.38
+	ROUTED TO	R9-5	230.	4.42	29.	7.	7.	.38
+	2 COMBINED AT	C9-5	478.	4.42	67.	17.	16.	.73
+	HYDROGRAPH AT	SUB10	88.	4.25	15.	4.	4.	.09
+	DIVERSION TO	D10	36.	4.25	2.	1.	1.	.09
+	HYDROGRAPH AT	DIV10	88.	4.25	12.	3.	3.	.09
+	2 COMBINED AT	C5-10	561.	4.42	79.	20.	19.	.82
+	HYDROGRAPH AT	SUB11	131.	4.08	21.	5.	5.	.09
+	ROUTED TO	R11-12	130.	4.17	21.	5.	5.	.09
+	HYDROGRAPH AT	SUB12	172.	4.00	21.	5.	5.	.12
+	DIVERSION TO	D12	12.	4.00	1.	0.	0.	.12
+	HYDROGRAPH AT	DIV12	171.	4.00	20.	5.	5.	.12
+	2 COMBINED AT	C11-12	296.	4.08	40.	10.	10.	.21
+	DIVERSION TO	DSUB12	130.	4.08	28.	7.	7.	.21
+	HYDROGRAPH AT	D12-48	166.	4.08	12.	3.	3.	.21
+	ROUTED TO	R12-13	161.	4.08	12.	3.	3.	.21
+	HYDROGRAPH AT	SUB13	191.	4.08	24.	6.	6.	.13
+	DIVERSION TO	D13	33.	4.08	2.	0.	0.	.13
+	HYDROGRAPH AT	DIV13	191.	4.08	22.	6.	5.	.13
+	2 COMBINED AT	C12-13	352.	4.08	35.	9.	8.	.34
+	ROUTED TO	R13-14	342.	4.08	35.	9.	8.	.34
+	HYDROGRAPH AT	SUB14	133.	4.08	17.	4.	4.	.13
+	DIVERSION TO	D14	57.	4.08	3.	1.	1.	.13
+	HYDROGRAPH AT	DIV14	133.	4.08	14.	4.	3.	.13
+	2 COMBINED AT	C13-14	474.	4.08	49.	12.	12.	.47

+	ROUTED TO	R14-15	465.	4.17	49.	12.	12.	.47
+	HYDROGRAPH AT	SUB15	127.	4.25	20.	5.	5.	.13
+	DIVERSION TO	D15	67.	4.25	4.	1.	1.	.13
+	HYDROGRAPH AT	DIV15	127.	4.25	16.	4.	4.	.13
+	2 COMBINED AT	C15-14	572.	4.17	65.	16.	16.	.60
+	2 COMBINED AT	C15-10	1046.	4.25	143.	36.	35.	1.42
+	DIVERSION TO	D56ST	405.	4.25	37.	9.	9.	1.42
+	HYDROGRAPH AT	D56ST	641.	4.25	106.	27.	26.	1.42
+	HYDROGRAPH AT	SUB16	194.	4.08	31.	8.	7.	.13
+	ROUTED TO	R16-17	190.	4.17	31.	8.	8.	.13
+	HYDROGRAPH AT	SUB17	78.	4.08	10.	3.	2.	.07
+	DIVERSION TO	D17	4.	4.08	0.	0.	0.	.07
+	HYDROGRAPH AT	DIV17	78.	4.08	10.	2.	2.	.07
+	2 COMBINED AT	C16-17	267.	4.17	41.	10.	10.	.20
+	DIVERSION TO	DSUB17	121.	4.17	29.	7.	7.	.20
+	HYDROGRAPH AT	D17-48	146.	4.17	11.	3.	3.	.20
+	ROUTED TO	R17-18	145.	4.17	11.	3.	3.	.20
+	HYDRCGRAPH AT	SUB18	64.	4.17	9.	2.	2.	.07
+	DIVERSION TO	D18	26.	4.17	2.	0.	0.	.07
+	HYDRCGRAPH AT	DIV18	64.	4.17	7.	2.	2.	.07
+	2 COMBINED AT	C17-18	209.	4.17	19.	5.	5.	.27
+	ROUTED TO	R18-19	207.	4.17	19.	5.	5.	.27
+	HYDROGRAPH AT	SUB19	71.	4.17	10.	3.	2.	.08
+	DIVERSION TO	D19	31.	4.17	2.	0.	0.	.08
+	HYDROGRAPH AT	DIV19	71.	4.17	8.	2.	2.	.08
+	2 COMBINED AT	C18-19	279.	4.17	27.	7.	7.	.34
+	ROUTED TO	R19-20	272.	4.17	27.	7.	7.	.34
+	HYDROGRAPH AT	SUB20	138.	4.17	19.	5.	5.	.13
+	DIVERSION TO	D20	69.	4.17	4.	1.	1.	.13
+	HYDROGRAPH AT	DIV20	138.	4.17	15.	4.	4.	.13
+	2 COMBINED AT	C20-19	411.	4.17	42.	11.	10.	.47
+	2 COMBINED AT	C20-15	1039.	4.25	149.	37.	36.	1.89
+	HYDROGRAPH AT	SUB21	194.	4.08	30.	7.	7.	.12
+	ROUTED TO	R21-22	192.	4.17	30.	7.	7.	.12
	HYDROGRAPH AT							

+		SUB22	84.	4.33	15.	4.	4.	.11
+	DIVERSION TO	D22	4.	4.33	0.	0.	0.	.11
+	HYDROGRAPH AT	DIV22	84.	4.33	14.	4.	3.	.11
+	2 COMBINED AT	C21-22	268.	4.17	44.	11.	11.	.24
+	DIVERSION TO	DSUB22	117.	4.17	31.	8.	8.	.24
+	HYDROGRAPH AT	D22-48	151.	4.17	13.	3.	3.	.24
+	ROUTED TO	R22-23	148.	4.17	13.	3.	3.	.24
+	HYDROGRAPH AT	SUB23	63.	4.08	8.	2.	2.	.06
+	DIVERSION TO	D23	27.	4.08	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV23	63.	4.08	7.	2.	2.	.06
+	2 COMBINED AT	C22-23	209.	4.17	19.	5.	5.	.30
+	ROUTED TO	R23-24	205.	4.17	19.	5.	5.	.30
+	HYDROGRAPH AT	SUB24	70.	4.17	10.	3.	2.	.08
+	DIVERSION TO	D24	33.	4.17	2.	0.	0.	.08
+	HYDROGRAPH AT	DIV24	70.	4.17	8.	2.	2.	.08
+	2 COMBINED AT	C23-24	274.	4.17	28.	7.	7.	.37
+	ROUTED TO	R24-25	270.	4.25	28.	7.	7.	.37
+	HYDROGRAPH AT	SUB25	66.	4.25	10.	3.	2.	.08
+	DIVERSION TO	D25	28.	4.25	2.	0.	0.	.08
+	HYDROGRAPH AT	DIV25	66.	4.25	8.	2.	2.	.08
+	2 COMBINED AT	C25-24	336.	4.25	36.	9.	9.	.45
+	2 COMBINED AT	C25-20	1375.	4.25	185.	47.	45.	2.34
+	HYDROGRAPH AT	SUB26	45.	4.25	7.	2.	2.	.05
+	DIVERSION TO	D26	10.	4.25	1.	0.	0.	.05
+	HYDROGRAPH AT	DIV26	45.	4.25	6.	2.	2.	.05
+	DIVERSION TO	DSUB26	7.	4.25	2.	1.	1.	.05
+	HYDROGRAPH AT	D26-48	38.	4.25	4.	1.	1.	.05
+	ROUTED TO	R26-27	38.	4.25	4.	1.	1.	.05
+	HYDROGRAPH AT	SUB27	60.	4.08	8.	2.	2.	.06
+	DIVERSION TO	D27	25.	4.08	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV27	60.	4.08	7.	2.	2.	.06
+	DIVERSION TO	DSUB27	12.	4.08	3.	1.	1.	.06
+	HYDROGRAPH AT	D27-48	48.	4.08	4.	1.	1.	.06
+	2 COMBINED AT	C26-27	81.	4.17	8.	2.	2.	.12
+	ROUTED TO	R27-28	81.	4.25	8.	2.	2.	.12

+	HYDROGRAPH AT	SUB28	74.	4.17	10.	3.	3.	.08
+	DIVERSION TO	D28	34.	4.17	2.	0.	0.	.08
+	HYDROGRAPH AT	DIV28	74.	4.17	9.	2.	2.	.08
+	DIVERSION TO	DSUB28	7.	4.17	2.	1.	1.	.08
+	HYDROGRAPH AT	D28-48	67.	4.17	6.	2.	1.	.08
+	2 COMBINED AT	C27-28	145.	4.25	14.	3.	3.	.19
+	ROUTED TO	R28-29	144.	4.25	14.	3.	3.	.19
+	HYDROGRAPH AT	SUB29	51.	4.17	8.	2.	2.	.06
+	DIVERSION TO	D29	23.	4.17	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV29	51.	4.17	6.	2.	2.	.06
+	DIVERSION TO	DSUB29	10.	4.17	3.	1.	1.	.06
+	HYDROGRAPH AT	D29-48	41.	4.17	4.	1.	1.	.06
+	2 COMBINED AT	C29-28	186.	4.25	17.	4.	4.	.25
+	2 COMBINED AT	C29-25	1560.	4.25	203.	51.	49.	2.59
+	HYDROGRAPH AT	SUB38A	120.	4.42	31.	8.	8.	.12
+	DIVERSION TO	DSUB38	16.	4.42	11.	3.	3.	.12
+	HYDROGRAPH AT	D38-39	104.	4.42	20.	5.	5.	.12
+	ROUTED TO	R38-30	104.	4.42	20.	5.	5.	.12
+	HYDROGRAPH AT	SUB30	60.	4.17	8.	2.	2.	.06
+	2 COMBINED AT	C30-38	154.	4.33	28.	7.	7.	.18
+	DIVERSION TO	DSUB30	60.	4.33	18.	4.	4.	.18
+	HYDROGRAPH AT	D30-48	94.	4.33	11.	3.	3.	.18
+	ROUTED TO	R30-31	94.	4.33	11.	3.	3.	.18
+	HYDROGRAPH AT	SUB31	54.	4.25	8.	2.	2.	.06
+	DIVERSION TO	D31	16.	4.25	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV31	54.	4.25	7.	2.	2.	.06
+	2 COMBINED AT	C30-31	146.	4.25	17.	4.	4.	.24
+	ROUTED TO	R31-32	145.	4.33	17.	4.	4.	.24
+	HYDROGRAPH AT	SUB32	56.	4.17	9.	2.	2.	.06
+	DIVERSION TO	D32	26.	4.17	2.	0.	0.	.06
+	HYDROGRAPH AT	DIV32	56.	4.17	7.	2.	2.	.06
+	DIVERSION TO	DSUB32	13.	4.17	3.	1.	1.	.06
+	HYDROGRAPH AT	DLAF2	43.	4.17	4.	1.	1.	.06
+	2 COMBINED AT	C31-32	185.	4.25	21.	5.	5.	.31
+	ROUTED TO	R32-33	185.	4.33	21.	5.	5.	.31

+	HYDROGRAPH AT	SUB33	65.	4.17	9.	2.	2.	.06
+	DIVERSION TO	D33	20.	4.17	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV33	65.	4.17	8.	2.	2.	.06
+	2 COMBINED AT	C33-32	239.	4.33	29.	7.	7.	.37
+	2 COMBINED AT	C33-29	1794.	4.25	232.	58.	56.	2.96
+	HYDROGRAPH AT	SUB34	131.	4.25	24.	6.	6	.17
+	DIVERSION TO	D34	45.	4.33	3.	1.	1.	.17
+	HYDROGRAPH AT	DIV34	131.	4.33	21.	5.	5.	.17
+	DIVERSION TO	DSUB34	25.	4.33	10.	2.	2.	.17
+	HYDROGRAPH AT	DLAF1	106.	4.33	12.	3.	3.	.17
+	ROUTED TO	R34-35	105.	4.33	12.	3.	3.	.17
+	HYDROGRAPH AT	SUB35	158.	4.25	25.	6.	6.	.13
+	DIVERSION TO	D35	13.	4.25	1.	0.	0.	.13
+	HYDROGRAPH AT	DIV35	158.	4.25	24.	6.	6.	.13
+	2 COMBINED AT	C35-34	248.	4.33	35.	9.	9.	.30
+	2 COMBINED AT	C35-33	2038.	4.25	267.	67.	65.	3.25
+	HYDROGRAPH AT	SUB40	106.	4.00	13.	3.	3.	.07
+	ROUTED TO	R40-41	102.	4.00	13.	3.	3.	.07
+	HYDROGRAPH AT	SUB41	145.	4.25	24.	6.	6.	.14
+	2 COMBINED AT	C40-41	235.	4.08	37.	9.	9.	.22
+	DIVERSION TO	DSUB41	92.	4.08	24.	6.	6.	.22
+	HYDROGRAPH AT	D41-44	143.	4.08	13.	3.	3.	.22
+	ROUTED TO	R41-39	142.	4.17	13.	3.	3.	.22
+	HYDROGRAPH AT	SUB38B	161.	4.25	30.	8.	7.	.14
+	HYDROGRAPH AT	RD3839	16.	3.50	11.	3.	3.	.00
+	2 COMBINED AT	C-38B	177.	4.25	41.	11.	10.	.14
+	HYDROGRAPH AT	SUB37	48.	4.08	6.	1.	1.	.05
+	ROUTED TO	R37-39	48.	4.25	6.	2.	1.	.05
+	HYDROGRAPH AT	SUB39	151.	4.50	35.	9.	8.	.19
+	3 COMBINED AT	C37-39	350.	4.33	82.	21.	20.	.38
+	DIVERSION TO	DSUB39	323.	4.33	79.	20.	19.	.38
+	HYDROGRAPH AT	D39-44	27.	4.33	3.	1.	1.	.38
+	2 COMBINED AT	C41-39	164.	4.17	16.	4.	4.	.60
+	ROUTED TO	R39-36	160.	4.25	15.	4.	4.	.60
	HYDROGRAPH AT							

+		SUB36	88.	4.25	18.	4.	4.	.09
+	DIVERSION TO	D36	13.	4.33	1.	0.	0.	.09
+	HYDROGRAPH AT	DIV36	86.	4.33	16.	4.	4.	.09
+	2 COMBINED AT	C39-36	236.	4.33	32.	8.	8.	.68
+	2 COMBINED AT	C36-35	2272.	4.25	299.	75.	72.	3.94
+	HYDROGRAPH AT	SUB42	285.	4.25	48.	12.	12.	.25
+	DIVERSION TO	D42	20.	4.25	2.	0.	0.	.25
+	HYDROGRAPH AT	DIV42	277.	4.25	47.	12.	11.	.25
+	2 COMBINED AT	C42-36	2549.	4.25	345.	87.	84.	4.19
	HYDROGRAPH AT	RSUB7	110.	3.83	31.	8.	8.	.00
+	ROUTED TO	R64TH1	110.	3.92	31.	8.	8.	.00
+	HYDROGRAPH AT	RSUB2	18.	3.75	8.	2.	2.	.00
+	2 COMBINED AT	COMB1	128.	3.92	39.	10.	10.	.00
+	ROUTED TO	R64TH2	128.	4.00	39.	10.	10.	.00
+	HYDROGRAPH AT	RSUB12	130.	3.75	28.	7.	7.	.00
+	ROUTED TO	R48TH1	130.	3.83	28.	7.	7.	.00
+	HYDROGRAPH AT	RSUB17	121.	3.83	29.	7.	7.	.00
+	2 COMBINED AT	COMB2	251.	3.83	58.	14.	14.	.00
+	ROUTED TO	R48TH2	251.	3.92	58.	14.	14.	.00
+	HYDROGRAPH AT	RSUB22	117.	3.83	31.	8.	8.	.00
+	2 COMBINED AT	COMB3	368.	3.92	89.	22.	21.	.00
+	ROUTED TO	R48TH3	368.	4.00	89.	22.	22.	.00
+	HYDROGRAPH AT	RSUB26	7.	3.83	2.	1.	1.	.00
+	2 COMBINED AT	COMB6	375.	4.00	91.	23.	22.	.00
+	HYDROGRAPH AT	RSUB30	60.	3.83	18.	4.	4.	.00
+	2 COMBINED AT	COMB7	435.	4.00	109.	27.	26.	.00
+	ROUTED TO	R48TH4	435.	4.08	109.	27.	26.	.00
+	HYDROGRAPH AT	RSUB27	12.	3.83	3.	1.	1.	.00
+	2 COMBINED AT	COMB9	447.	4.08	112.	28.	27.	.00
+	ROUTED TO	R48TH5	447.	4.17	112.	28.	27.	.00
+	HYDROGRAPH AT	RSUB28	7.	3.75	2.	1.	1.	.00
+	2 COMBINED AT	COMB10	454.	4.17	114.	29.	28.	.00
+	ROUTED TO	R48TH6	454.	4.25	114.	29.	28.	.00
+	HYDROGRAPH AT	RSUB41	92.	3.75	24.	6.	6.	.00
+	ROUTED TO	R44TH1	92.	3.83	24.	6.	6.	.00

+	HYDROGRAPH AT	RSUB39	323.	4.33	79.	20.	19.	.00
+	2 COMBINED AT	COMB13	415.	4.33	102.	26.	25.	.00
+	ROUTED TO	R-LAF1	413.	4.42	102.	26.	25.	.00
+	HYDROGRAPH AT	RSUB34	25.	3.83	10.	2.	2.	.00
+	2 COMBINED AT	COMB14	438.	4.42	112.	28.	27.	.00
+	ROUTED TO	R-LAF2	437.	4.42	112.	28.	27.	.00
+	HYDROGRAPH AT	RSUB32	13.	3.92	3.	1.	1.	.00
+	2 COMBINED AT	COMB15	450.	4.42	115.	29.	28.	.00
+	2 COMBINED AT	COMB16	904.	4.42	230.	58.	56.	.00
+	HYDROGRAPH AT	RSUB29	10.	3.92	3.	1.	1.	.00
+	2 COMBINED AT	COMB11	914.	4.42	232.	59.	57.	.00

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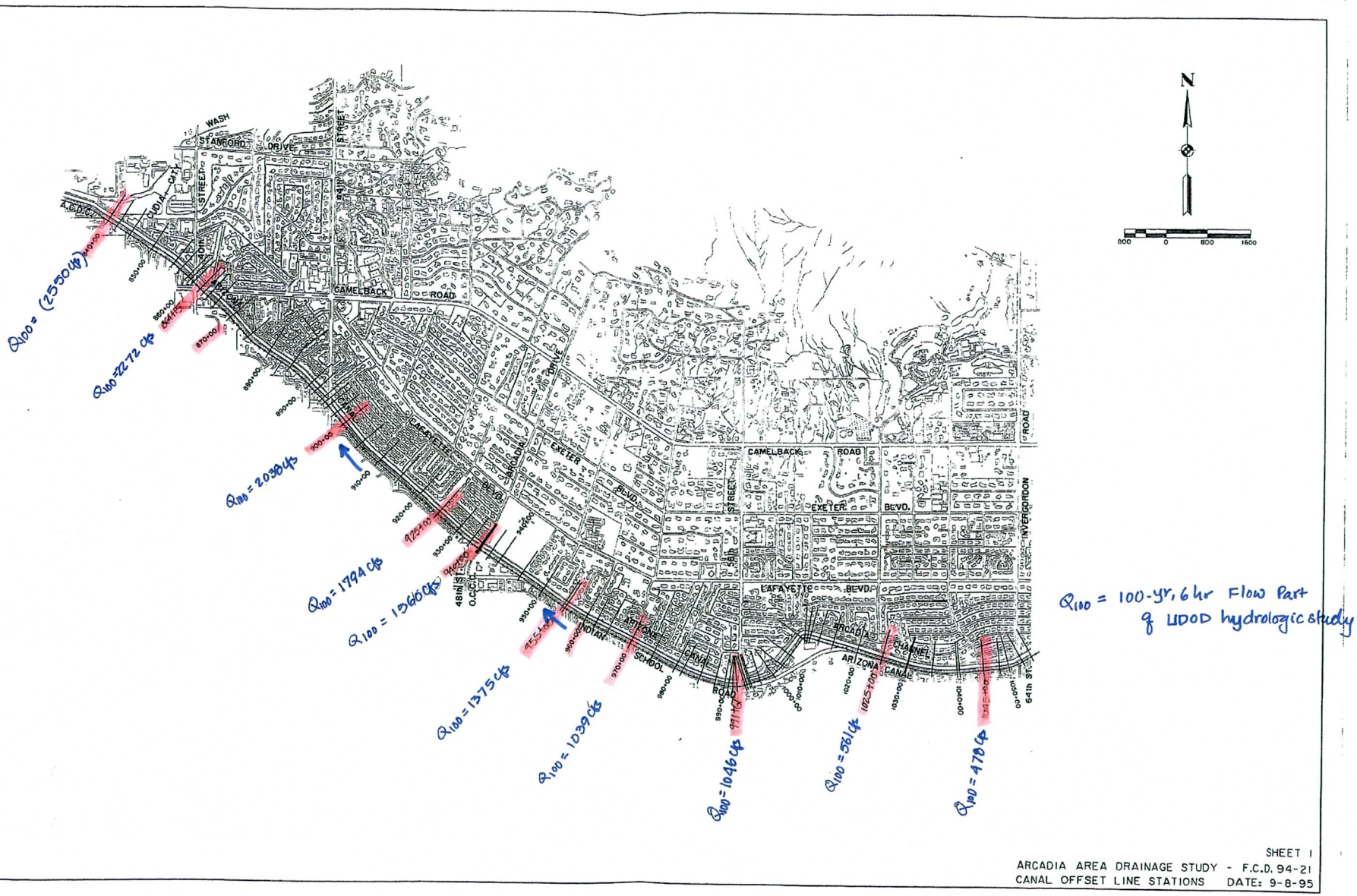
HEC-RAS Analysis Output Data

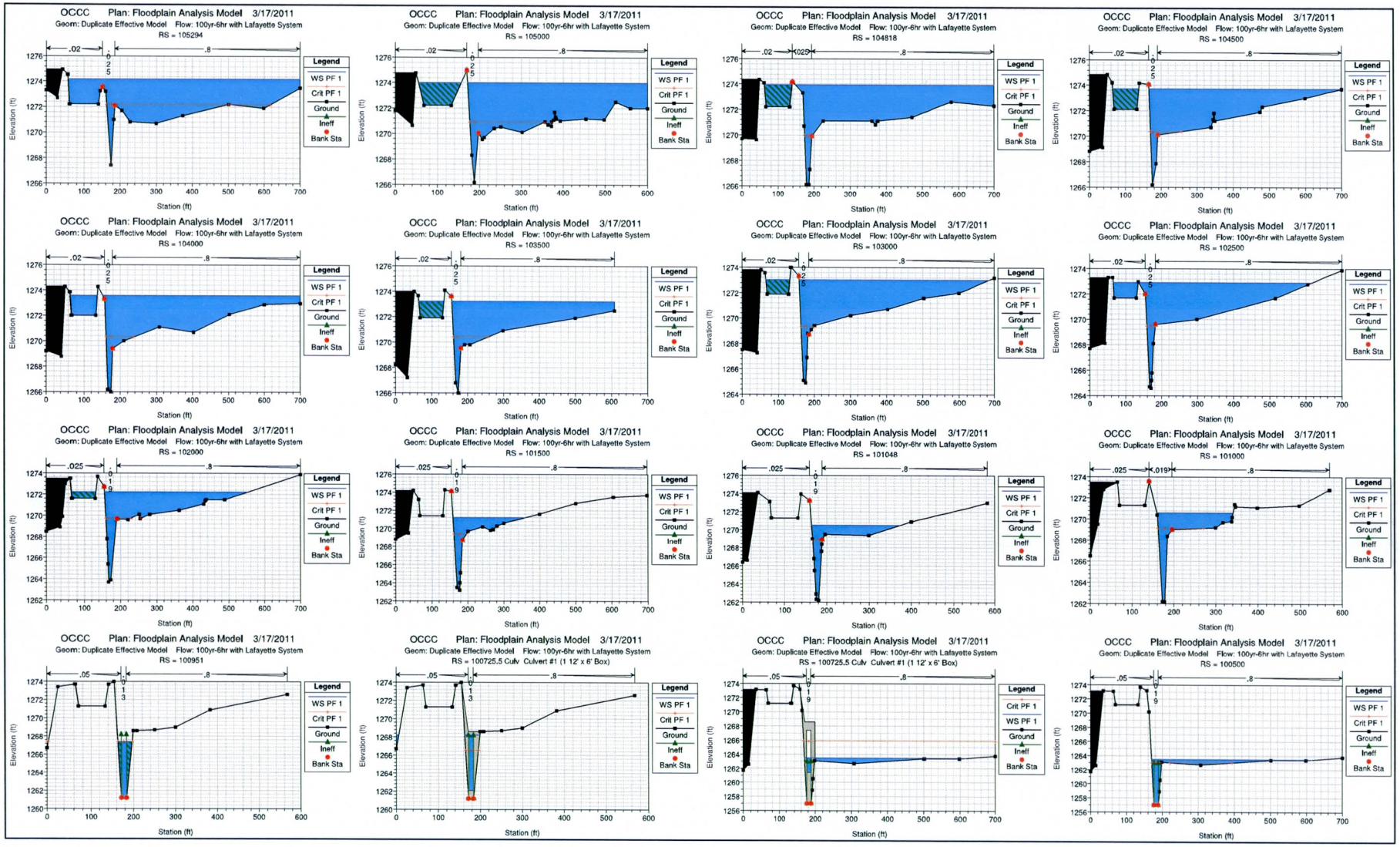

N
800 0 800 1600
WASH
STANFORD DRIVE
STREET
CAMELBACK ROAD
LAFAYETTE BLVD.
EXETER BLVD.
ARCADIA
ARIZONA CANAL
SCHOOL ROAD
64th ST.
RIVER ROAD
Q100 = (2550cfs)
Q100 = 2272 cfs
Q100 = 2090cfs
Q100 = 1994 cfs
Q100 = 1960cfs
Q100 = 1375cfs
Q100 = 1039cfs
Q100 = 1046cfs
Q100 = 561cfs
Q100 = 470cfs
Q100 = 100-yr, 6 hr Flow Part of UDOD hydrologic study
SHEET 1
ARCADIA AREA DRAINAGE STUDY - F.C.D. 94-21
CANAL OFFSET LINE STATIONS DATE: 9-8-95

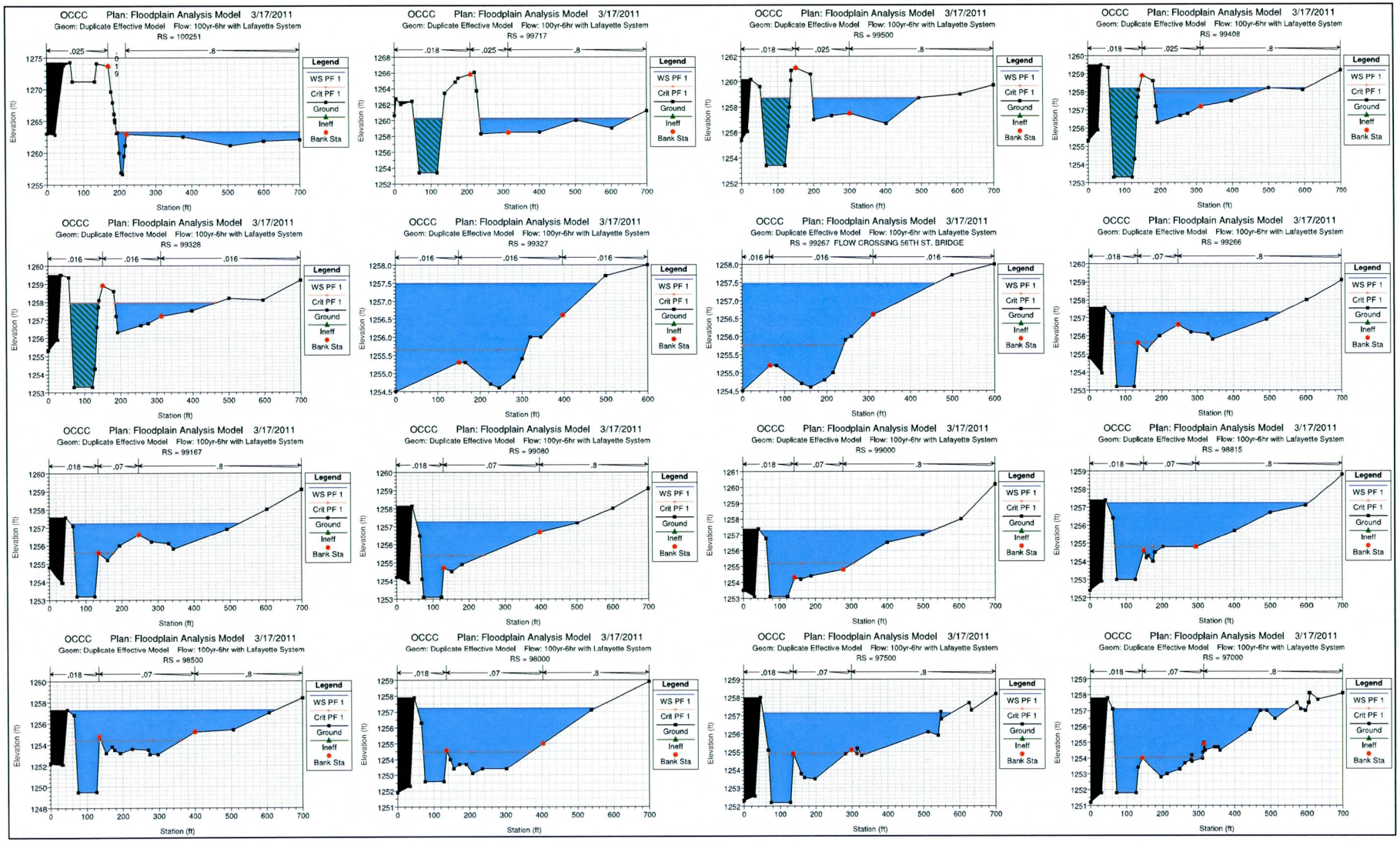
HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 Profile: PF 1

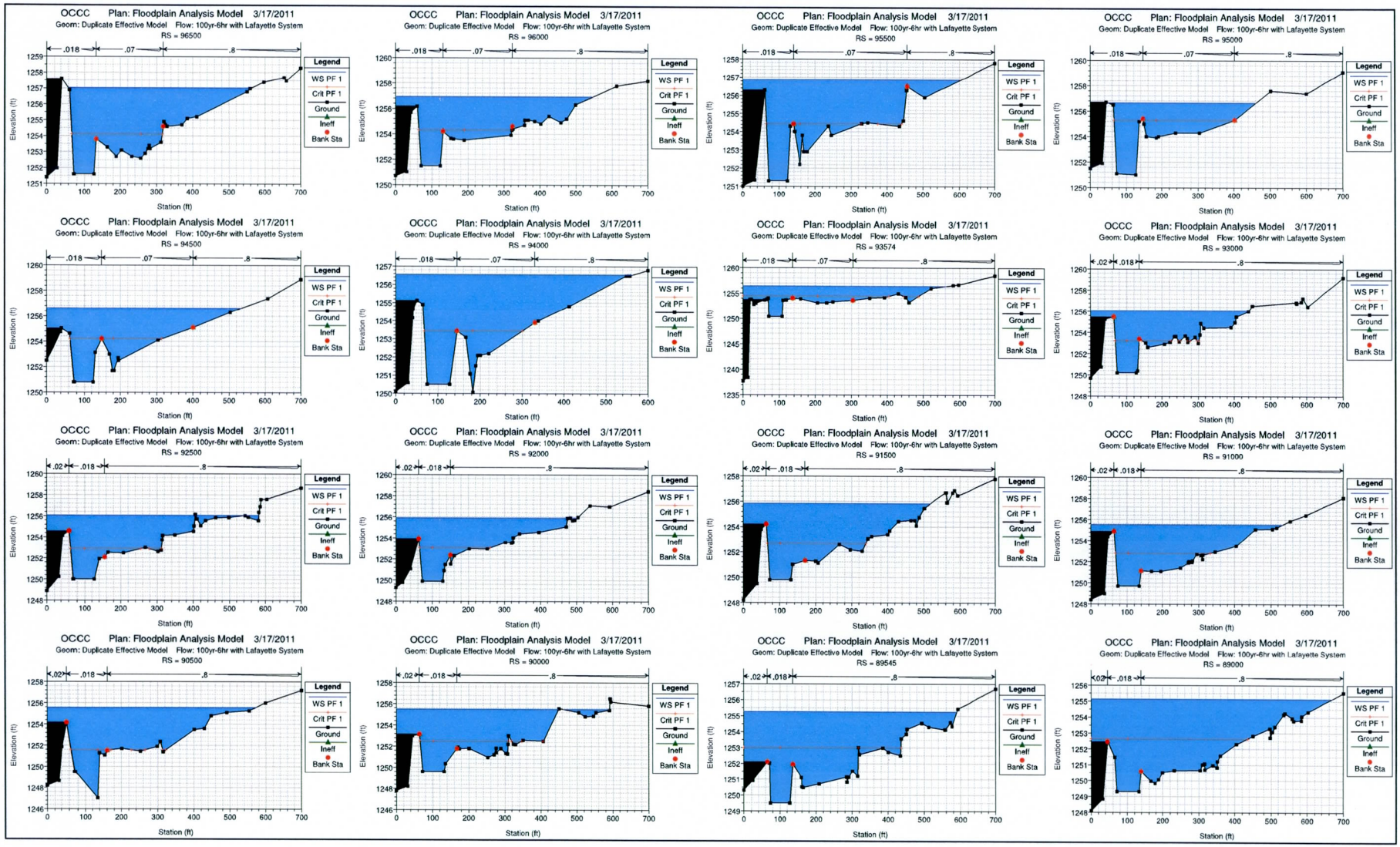
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	105294	PF 1	478.00	1267.42	1274.18	1272.20	1274.22	0.000168	1.62	1542.92	640.71	0.16
Reach-1	105000	PF 1	478.00	1266.17	1274.00	1270.90	1274.12	0.000377	3.11	1326.30	530.69	0.25
Reach-1	104818	PF 1	478.00	1266.10	1273.94	1269.98	1274.03	0.000452	2.62	1333.79	630.37	0.26
Reach-1	104500	PF 1	478.00	1266.18	1273.72	1270.37	1273.87	0.000410	3.33	1092.87	607.80	0.26
Reach-1	104000	PF 1	561.00	1266.00	1273.60	1270.30	1273.68	0.000258	2.73	1300.90	621.42	0.20
Reach-1	103500	PF 1	561.00	1266.00	1273.22	1270.40	1273.45	0.000644	4.07	951.68	522.23	0.32
Reach-1	103000	PF 1	561.00	1264.90	1273.03	1269.32	1273.18	0.000368	3.29	1151.32	595.74	0.25
Reach-1	102500	PF 1	561.00	1264.60	1272.91	1269.45	1273.00	0.000249	2.71	1107.66	548.21	0.20
Reach-1	102000	PF 1	1046.00	1263.70	1272.21	1269.74	1272.67	0.000628	5.51	718.49	460.97	0.42
Reach-1	101500	PF 1	1046.00	1263.20	1271.21	1269.41	1272.11	0.001257	7.63	301.95	202.83	0.58
Reach-1	101048	PF 1	1046.00	1262.20	1270.50	1268.89	1271.47	0.001467	7.94	289.62	209.98	0.62
Reach-1	101000	PF 1	1046.00	1262.17	1270.59	1269.15	1271.25	0.001228	6.59	349.09	181.87	0.57
Reach-1	100951	PF 1	1046.00	1261.20	1267.40	1267.40	1270.47	0.001330	14.07	74.37	36.40	1.00
Reach-1	100725.5		Culvert									
Reach-1	100500	PF 1	1046.00	1257.00	1263.46	1263.01	1265.85	0.002207	12.75	278.93	443.59	0.88
Reach-1	100251	PF 1	1046.00	1256.60	1263.33	1263.33	1264.67	0.003178	9.63	718.18	508.34	0.89
Reach-1	99717	PF 1	1046.00	1258.30	1260.26	1260.15	1260.94	0.005957	6.82	511.96	501.65	0.89
Reach-1	99500	PF 1	1046.00	1257.00	1258.70	1258.70	1259.40	0.008661	6.88	397.76	377.51	1.03
Reach-1	99408	PF 1	1046.00	1256.30	1258.20	1257.99	1258.65	0.005026	5.45	303.25	500.21	0.79
Reach-1	99328	PF 1	1046.00	1256.30	1257.95	1257.95	1258.35	0.002609	5.46	224.56	359.60	0.87
Reach-1	99327	PF 1	1046.00	1254.60	1257.48	1255.65	1257.50	0.000051	1.08	938.10	479.53	0.13
Reach-1	99267	PF 1	1046.00	1254.60	1257.47	1255.75	1257.50	0.000083	1.41	766.84	459.84	0.17
Reach-1	99266	PF 1	1046.00	1255.20	1257.29	1255.61	1257.48	0.000424	0.55	662.85	474.44	0.08
Reach-1	99167	PF 1	1046.00	1255.20	1257.24	1255.61	1257.44	0.000434	0.54	638.66	467.00	0.08
Reach-1	99080	PF 1	1039.00	1254.51	1257.26	1255.41	1257.38	0.000287	0.51	738.91	454.70	0.07
Reach-1	99000	PF 1	1039.00	1254.20	1257.27	1255.20	1257.35	0.000224	0.63	931.87	481.86	0.07
Reach-1	98815	PF 1	1039.00	1254.00	1257.24	1254.80	1257.31	0.000187	0.55	1055.91	559.76	0.06
Reach-1	98500	PF 1	1039.00	1253.10	1257.25	1254.42	1257.28	0.000037	0.30	1735.75	575.91	0.03
Reach-1	98000	PF 1	1039.00	1253.10	1257.22	1254.47	1257.26	0.000100	0.48	1386.59	494.89	0.05
Reach-1	97500	PF 1	1039.00	1253.50	1257.13	1254.91	1257.20	0.000130	0.50	1232.31	524.91	0.05
Reach-1	97000	PF 1	1039.00	1252.80	1257.10	1254.05	1257.14	0.000077	0.44	1314.89	500.69	0.04
Reach-1	96500	PF 1	1375.00	1252.60	1257.01	1254.12	1257.09	0.000135	0.61	1412.89	500.64	0.05
Reach-1	96000	PF 1	1375.00	1253.50	1256.94	1254.33	1257.00	0.000200	0.66	1362.38	547.93	0.06
Reach-1	95500	PF 1	1375.00	1252.20	1256.86	1254.44	1256.91	0.000173	0.55	1366.99	602.74	0.06
Reach-1	95000	PF 1	1560.00	1253.90	1256.66	1255.30	1256.79	0.000269	0.59	984.91	412.85	0.07
Reach-1	94500	PF 1	1560.00	1251.70	1256.61	1254.21	1256.67	0.000144	0.52	1349.95	532.51	0.05
Reach-1	94000	PF 1	1560.00	1250.07	1256.55	1253.44	1256.60	0.000120	0.57	1555.64	563.69	0.05
Reach-1	93574	PF 1	1794.00	1253.10	1256.39	1254.45	1256.50	0.000246	0.68	1444.39	561.76	0.07

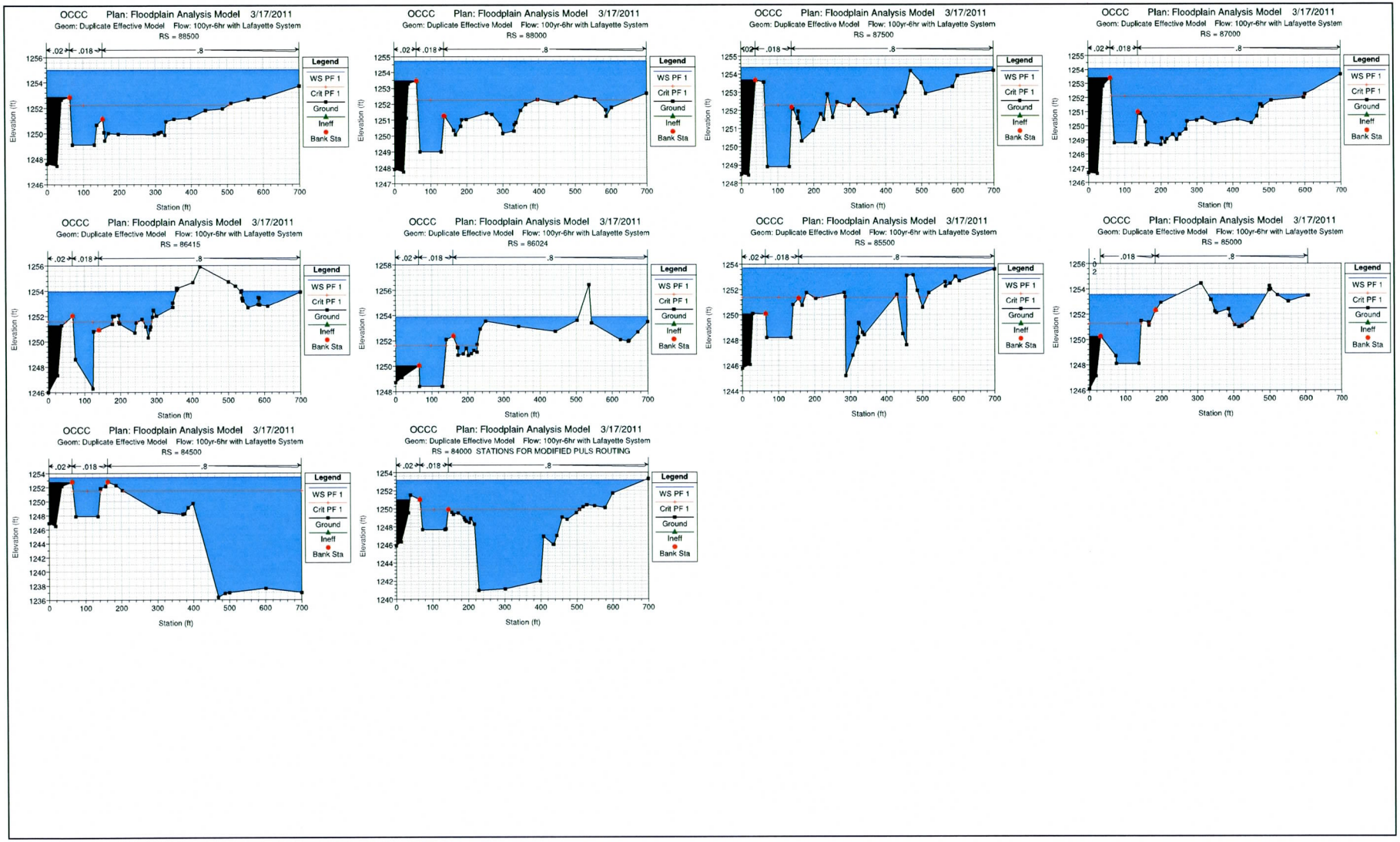
HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 Profile: PF 1 (Continued)

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-1	93000	PF 1	1794.00	1250.20	1256.06	1253.24	1256.36	0.000323	4.48	1083.66	440.61	0.34
Reach-1	92500	PF 1	1794.00	1250.00	1256.05	1252.90	1256.20	0.000170	3.26	1333.89	580.02	0.25
Reach-1	92000	PF 1	2038.00	1249.90	1255.90	1253.06	1256.10	0.000230	3.81	1292.48	493.70	0.29
Reach-1	91500	PF 1	2038.00	1249.80	1255.84	1252.67	1255.99	0.000165	3.23	1648.41	519.07	0.25
Reach-1	91000	PF 1	2038.00	1249.70	1255.52	1252.82	1255.85	0.000352	4.72	1460.72	532.27	0.36
Reach-1	90500	PF 1	2038.00	1247.04	1255.57	1251.57	1255.70	0.000121	2.97	1729.27	572.70	0.21
Reach-1	90000	PF 1	2038.00	1249.60	1255.48	1252.50	1255.63	0.000165	3.19	1657.74	577.89	0.25
Reach-1	89545	PF 1	2272.00	1249.50	1255.25	1253.01	1255.49	0.000309	4.38	1801.28	589.99	0.33
Reach-1	89000	PF 1	2272.00	1249.30	1255.14	1252.67	1255.36	0.000258	3.95	2138.24	668.54	0.31
Reach-1	88500	PF 1	2272.00	1249.10	1255.03	1252.25	1255.23	0.000232	3.84	2553.65	700.00	0.29
Reach-1	88000	PF 1	2272.00	1249.00	1254.73	1252.28	1255.07	0.000388	4.92	2205.75	700.00	0.37
Reach-1	87500	PF 1	2272.00	1248.90	1254.40	1252.30	1254.81	0.000653	5.31	1412.95	700.00	0.46
Reach-1	87000	PF 1	2272.00	1248.80	1254.09	1252.12	1254.51	0.000551	5.50	2203.16	700.00	0.44
Reach-1	86415	PF 1	2272.00	1246.29	1253.95	1251.55	1254.22	0.000332	4.54	1198.92	519.11	0.34
Reach-1	86024	PF 1	2549.00	1248.40	1253.85	1251.62	1254.07	0.000344	4.09	1246.86	664.09	0.34
Reach-1	85500	PF 1	2549.00	1248.20	1253.69	1251.40	1253.90	0.000289	4.01	2029.19	700.00	0.32
Reach-1	85000	PF 1	2549.00	1248.10	1253.56	1251.25	1253.75	0.000294	3.61	1026.07	491.10	0.31
Reach-1	84500	PF 1	2549.00	1247.90	1253.42	1251.50	1253.59	0.000342	3.96	5781.32	700.00	0.34
Reach-1	84000	PF 1	2549.00	1247.70	1253.15	1249.90	1253.40	0.000350	4.60	3867.19	690.83	0.36


OCCC Plan: Floodplain Analysis Model 3/17/2011
Geom: Duplicate Effective Model Flow: 100yr-6hr with Lafayette System
RS = 105294
RS = 105000
RS = 104818
RS = 104500
RS = 104000
RS = 103500
RS = 103000
RS = 102500
RS = 102000
RS = 101500
RS = 101048
RS = 101000
RS = 100951
RS = 100725.5 Culv Culvert #1 (1 12' x 6' Box)
RS = 100500
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


OCCC Plan: Floodplain Analysis Model 3/17/2011
Geom: Duplicate Effective Model Flow: 100yr-6hr with Lafayette System
RS = 100251
RS = 99717
RS = 99500
RS = 99408
RS = 99328
RS = 99327
RS = 99267 FLOW CROSSING 56TH ST. BRIDGE
RS = 99266
RS = 99167
RS = 99080
RS = 99000
RS = 98815
RS = 98500
RS = 98000
RS = 97500
RS = 97000
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


OCCC Plan: Floodplain Analysis Model 3/17/2011
Geom: Duplicate Effective Model Flow: 100yr-6hr with Lafayette System
RS = 96500
RS = 96000
RS = 95500
RS = 95000
RS = 94500
RS = 94000
RS = 93574
RS = 93000
RS = 92500
RS = 92000
RS = 91500
RS = 91000
RS = 90500
RS = 90000
RS = 89545
RS = 89000
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


OCCC Plan: Floodplain Analysis Model 3/17/2011
Geom: Duplicate Effective Model Flow: 100yr-6hr with Lafayette System
RS = 88500
RS = 88000
RS = 87500
RS = 87000
RS = 86415
RS = 86024
RS = 85500
RS = 85000
RS = 84500
RS = 84000 STATIONS FOR MODIFIED PULS ROUTING
.02
.018
.8
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

Appendix C

HEC-1 Outputs

Model: LID10a UPDATED 10-YR MODEL WITH REVISED SUB-BASIN 38

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   040CT11  TIME  11:28:38   *
*                                       *
*****************************************
```

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

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

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

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

1 HEC-1 INPUT PAGE 1

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

              *       ARCADIA AREA
    1         ID        LID10a.DAT
              *       LAFAYETTE BLVD & CAMELBACK RD ALTERNATE
              *       REVISED ORIGINAL HUITT-ZOLLARS MODEL FILE ALT2.DAT
              *       THIS MODEL REVISES SUB-BASIN 38 INTO 2 SUB-BASINS 38A & 38B TO CORRECT
              *       THE FLOW SPLIT OF THE ORIGINAL SUB-BASIN
              *
    2         IT       5                    300
    3         IO       5
              *DIAGRAM
              *
    4         KK    SUB1
    5         KM   SUB-BASIN SUB1
    6         KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
    7         KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
    8         KM     L =  .28  Kb = .108  Adj. Slope = 2120.0
    9         BA    .037
   10         IN      15
   11         KM   RAINFALL DEPTH OF 2.00 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
   12         PB   1.933
   13         KM   THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 2.20
   14         PC    .000    .010    .017    .026    .037    .046    .056    .065    .075    .085
   15         PC    .097    .111    .131    .175    .263    .455    .689    .829    .893    .933
   16         PC    .949    .962    .975    .988   1.000
   17         LG    .119    .337   4.650    .260  51.000
   18         UC    .154    .110
   19         UA       0       3       5       8      12      20      43      75      90      96
   20         UA     100
              *
   21         KK    R1-2
   22         KM        ROUTE FLOW FROM SUB1 TO SUB2
   23         RK  3183.8   .0166     .07       0    TRAP       0       3     YES
              *
   24         KK    SUB2
   25         KM   SUB-BASIN SUB2
   26         KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
   27         KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
   28         KM     L =  .60  Kb = .041  Adj. Slope =   88.0
   29         BA    .117
   30         LG    .343    .250   4.650    .440   9.000
   31         UC    .587    .463
   32         UA       0       5      16      30      65      77      84      90      94      97
   33         UA     100
              *
   34         KK    DIV2
   35         KM       DIVERT FOR IRRIGATED LAWNS SUB2
   36         DT     D2     .80
   37         DI      0       1
   38         DQ      0    .382
              *
```

1 HEC-1 INPUT PAGE 2

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

   39         KK    C1-2
   40         KM       COMBINE HYDROGRAPHS SUB1 AND SUB2 AT CP2
```

```
                41          HC       2
                            *

                42          KK   D2-64
                43          KM        DIVERT FLOW
                44          DT   DSUB2
                            *      DQ CARD REVISED TO REFLECT 125 CFS MAX CAPACITY OF EXIST SCOTTDALE SD
                45          DI       0      18      43      93     100     150
                46          DQ       0      18      18      18      18      18
                            *

                47          KK    R2-3
                48          KM        ROUTE FLOW FROM SUB2 TO SUB3
                49          RK  1367.5    .009    .016            TRAP      60       1     YES
                            *

                50          KK    SUB3
                51          KM   SUB-BASIN SUB3
                52          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
                53          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
                54          KM     L =  .26  Kb = .058  Adj. Slope =   47.0
                55          BA    .067
                56          LG    .298    .250   4.200    .520  16.000
                57          UC    .533    .293
                58          UA       0       5      16      30      65      77      84      90      94      97
                59          UA     100
                            *

                60          KK    DIV3
                61          KM        DIVERT FOR IRRIGATED LAWNS SUB3
                62          DT      D3     .88
                63          DI       0       1
                64          DQ       0    .573
                            *

                65          KK    C2-3
                66          KM        COMBINE HYDROGRAPHS SUB2 & SUB3 AT CP3
                67          HC       2
                            *

                68          KK    R3-4
                69          KM        ROUTE FLOW FROM CP3 TO CP4
                70          RK    1320    .008    .016            TRAP      44       1     YES
                            *

                71          KK    SUB4
                72          KM   SUB-BASIN SUB4
                73          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
                74          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
                75          KM     L =  .25  Kb = .058  Adj. Slope =   42.0
                76          BA    .065
                77          LG    .300    .250   4.800    .360  15.000
1                                                HEC-1 INPUT                                                    PAGE  3

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

                78          UC    .463    .246
                79          UA       0       5      16      30      65      77      84      90      94      97
                80          UA     100
                            *

                81          KK    DIV4
                82          KM        DIVERT FOR IRRIGATED LAWNS SUB4
                83          DT      D4     1.0
                84          DI       0       1
                85          DQ       0     .55
                            *

                86          KK    C3-4
                87          KM        COMBINE HYDROGRAPHS SUB3 & SUB4 AT CP4
                88          HC       2
                            *

                89          KK   D4-64
                90          KM        DIVERT FLOW TO LAFAYETTE S.D.
                91          DT   DSUB4
                92          DI       0       3      10      50     100
                93          DQ       0       3       3       3       3
                            *

                94          KK    R4-5
                95          KM        ROUTE FLOW FROM CP4 TO CP5
                96          RK  2307.4    .005    .016            TRAP      44       1     YES
                            *

                97          KK    SUB5
                98          KM   SUB-BASIN SUB5
                99          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
               100          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
               101          KM     L =  .44  Kb = .058  Adj. Slope =   24.0
               102          BA    .067
               103          LG    .300    .250   4.800    .360  15.000
               104          UC    .837    .736
               105          UA       0       5      16      30      65      77      84      90      94      97
               106          UA     100
                            *

               107          KK    DIV5
               108          KM        DIVERT FOR IRRIGATED LAWNS SUB5
               109          DT      D5     .94
               110          DI       0       1
               111          DQ       0     .50
                            *
```

```
112          KK    C4-5
113          KM        COMBINE HYDROGRAPHS SUB4 & SUB5 AT CP5
114          HC        2
             *
1                                        HEC-1 INPUT                                        PAGE  4

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


115          KK    SUB6
116          KM   SUB-BASIN SUB6
117          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
118          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
119          KM     L =  .26  Kb = .104  Adj. Slope = 2367.0
120          BA    .090
121          LG    .106    .346   4.700    .240  49.000
122          UC    .142    .057
123          UA       0       3       5       8      12      20      43      75      90      96
124          UA     100
             *

125          KK    R6-7
126          KM        ROUTE FLOW FROM SUB6 TO SUB7
127          RK  2972.0    .013     .07           TRAP       0       3     YES
             *

128          KK    SUB7
129          KM   SUB-BASIN SUB7
130          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
131          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
132          KM     L =  .56  Kb = .053  Adj. Slope =   71.0
133          BA    .153
134          LG    .290    .271   5.400    .280  20.000
135          UC    .546    .346
136          UA       0       5      16      30      65      77      84      90      94      97
137          UA     100
             *

138          KK    DIV7
139          KM        DIVERT FOR IRRIGATED LAWNS SUB7
140          DT      D7    2.30
141          DI       0       1
142          DQ       0    .427
             *

143          KK    C6-7
144          KM        COMBINE HYDROGRAPHS SUB6 & SUB7 AT CP7
145          HC        2
             *

146          KK   D7-64
147          KM        DIVERT FLOW
148          DT   DSUB7
149          DI       0      27     110     120     150     200
150          DQ       0      27     110     110     110     110
             *

151          KK    R7-8
152          KM        ROUTE FLOW FROM SUB7 TO SUB8
153          RK  2302.1    .001    .016           TRAP      40       1     YES
             *
1                                        HEC-1 INPUT                                        PAGE  5

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


154          KK    SUB8
155          KM   SUB-BASIN SUB8
156          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
157          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
158          KM     L =  .44  Kb = .057  Adj. Slope =   52.0
159          BA    .068
160          LG    .300    .250   4.450    .450  15.000
161          UC    .667    .566
162          UA       0       5      16      30      65      77      84      90      94      97
163          UA     100
             *

164          KK    DIV8
165          KM        DIVERT FOR IRRIGATED LAWNS SUB8
166          DT      D8     .99
167          DI       0       1
168          DQ       0      .6
             *

169          KK    C7-8
170          KM        COMBINE HYDROGRAPHS SUB7 & SUB8 AT CP8
171          HC        2
             *

172          KK    R8-9
173          KM        ROUTE FLOW FROM SUB8 TO SUB9
174          RK  1314.7    .010    .016           TRAP      20       1     YES
             *

175          KK    SUB9
176          KM   SUB-BASIN SUB9
177          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
178          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
179          KM     L =  .25  Kb = .058  Adj. Slope =   55.0
180          BA    .065
181          LG    .300    .250   4.450    .450  15.000
182          UC    .463    .246
183          UA       0       5      16      30      65      77      84      90      94      97
```

```
184          UA     100
             *

185          KK    DIV9
186          KM        DIVERT FOR IRRIGATED LAWNS SUB9
187          DT      D9      .94
188          DI       0       1
189          DQ       0      .6
             *

190          KK    C8-9
191          KM        COMBINE HYDROGRAPHS SUB8 & SUB9   AT CP9
192          HC       2
             *
```



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

193          KK    R9-5
194          KM        ROUTE FLOW FROM SUB9 TO  SUB5
195          RK  1784.7    .007    .016            TRAP      40       1     YES
             *

196          KK    C9-5
197          KM        COMBINE HYDROGRAPH SUB9  & SUB5  AT CP5
198          HC       2
             *

199          KK   SUB10
200          KM   SUB-BASIN SUB10
201          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
202          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
203          KM     L =  .34  Kb = .056  Adj. Slope =   37.0
204          BA    .093
205          LG    .299    .250   4.800    .360  15.000
206          UC    .575    .327
207          UA       0       5      16      30      65      77      84      90      94      97
208          UA     100
             *

209          KK   DIV10
210          KM        DIVERT FOR IRRIGATED LAWNS SUB10
211          DT     D10    1.17
212          DI       0       1
213          DQ       0    .445
             *

214          KK   C5-10
215          KM        COMBINE HYDROGRAPH SUB5  & SUB10 AT CP10
216          HC       2
             *

217          KK   SUB11
218          KM   SUB-BASIN SUB11
219          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
220          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
221          KM     L =  .56  Kb = .106  Adj. Slope = 1740.0
222          BA    .093
223          LG    .115    .350   4.550    .270  39.000
224          UC    .237    .183
225          UA       0       3       5       8      12      20      43      75      90      96
226          UA     100
             *

227          KK  R11-12
228          KM        ROUTE FLOW FROM SUB11 TO   SUB12
229          RK    1632    .058     .07            TRAP       0       3     YES
             *
```



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

230          KK   SUB12
231          KM   SUB-BASIN SUB12
232          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
233          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
234          KM     L =  .31  Kb = .064  Adj. Slope =  304.0
235          BA    .120
236          LG    .269    .277   5.600    .210   9.000
237          UC    .246    .102
238          UA       0       5      16      30      65      77      84      90      94      97
239          UA     100
             *

240          KK   DIV12
241          KM        DIVERT FOR IRRIGATED LAWNS SUB12
242          DT     D12     .31
243          DI       0       1
244          DQ       0    .079
             *

245          KK  C11-12
246          KM        COMBINE HYDROGRAPH SUB11 & SUB12 AT CP12
247          HC       2
             *

248          KK  D12-48
249          KM        DIVERT FLOW
250          DT  DSUB12
251          DI       0      50     100     130     150
252          DQ       0      50     100     130     130
             *
```

```
253          KK  R12-13
254          KM        ROUTE FLOW FROM SUB12 TO SUB13
255          RK  1362.2    .020    .016            TRAP      60       1     YES      50
             *

256          KK   SUB13
257          KM   SUB-BASIN SUB13
258          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
259          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
260          KM     L =  .26  Kb = .054  Adj. Slope =  107.0
261          BA    .129
262          LG    .300    .230   6.200    .200  15.000
263          UC    .283    .100
264          UA       0       5      16      30      65      77      84      90      94      97
265          UA     100
             *

266          KK   DIV13
267          KM        DIVERT FOR IRRIGATED LAWNS SUB13
268          DT     D13     .98
269          DI       0       1
270          DQ       0      .2
             *
1                                        HEC-1 INPUT                                                PAGE  8

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

271          KK  C12-13
272          KM        COMBINE HYDROGRAPHS SUB12 & SUB13 AT CP13
273          HC       2
             *

274          KK  R13-14
275          KM        ROUTE FL OW FROM SUB13 TO SUB14
276          RK  1314.7    .014    .016            TRAP      60       1     YES
             *

277          KK   SUB14
278          KM   SUB-BASIN SUB14
279          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
280          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
281          KM     L =  .25  Kb = .054  Adj. Slope =   74.0
282          BA    .126
283          LG    .300    .250   4.100    .550  15.000
284          UC    .429    .155
285          UA       0       5      16      30      65      77      84      90      94      97
286          UA     100
             *

287          KK   DIV14
288          KM        DIVERT FOR IRRIGATED LAWNS SUB14
289          DT     D14    1.57
290          DI       0       1
291          DQ       0      .6
             *

292          KK  C13-14
293          KM        COMBINE HYDROGRAPHS SUB13 & SUB14 AT CP14
294          HC       2
             *

295          KK  R14-15
296          KM        ROUTE FLOW FROM SUB 14 TO SUB15
297          RK  1985.3    .011    .016            TRAP      60       1     YES
             *

298          KK   SUB15
299          KM   SUB-BASIN SUB15
300          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
301          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
302          KM     L =  .38  Kb = .054  Adj. Slope =   56.0
303          BA    .127
304          LG    .296    .250   4.650    .390  16.000
305          UC    .525    .271
306          UA       0       5      16      30      65      77      84      90      94      97
307          UA     100
             *
1                                        HEC-1 INPUT                                                PAGE  9

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

308          KK   DIV15
309          KM        DIVERT FOR IRRIGATED LAWNS SUB15
310          DT     D15    2.05
311          DI       0       1
312          DQ       0    .585
             *

313          KK  C15-14
314          KM        COMBINE SUB14 WITH SUB15
315          HC       2
             *

316          KK  C15-10
317          KM        COMBINE SUB10 WITH SUB15
318          HC       2
             *

319          KK   D56ST
320          KM        DIVERT FLOW THAT CROSSES 56TH ST. BRIDGE
321          DT   D56ST
```

```
322          DI       0     400     650     790    1040    1139    1334    1484    1689    1900
323          DQ       0       0     240     318     400     489     584     684     789     900
             *
324          KK   SUB16
325          KM   SUB-BASIN SUB16
326          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
327          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
328          KM     L =  .65  Kb = .102  Adj. Slope = 2052.0
329          BA    .129
330          LG    .104    .350   4.700    .240  47.000
331          UC    .233    .167
332          UA       0       3       5       8      12      20      43      75      90      96
333          UA     100
             *
334          KK  R16-17
335          KM        ROUTE FLOW FROM SUB16 TO SUB17
336          RK    1668    .058     .07            TRAP       0       3     YES
             *
337          KK   SUB17
338          KM   SUB-BASIN SUB17
339          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
340          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
341          KM     L =  .32  Kb = .058  Adj. Slope =  183.0
342          BA    .073
343          LG    .298    .252   4.150    .450  10.000
344          UC    .342    .201
345          UA       0       5      16      30      65      77      84      90      94      97
346          UA     100
             *
1                                        HEC-1 INPUT                                        PAGE 10

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

347          KK   DIV17
348          KM        DIVERT FOR IRRIGATED LAWNS SUB17
349          DT     D17     .11
350          DI       0       1
351          DQ       0    .074
             *
352          KK  C16-17
353          KM        COMBINE HYDROGRAPH SUB16 & SUB17 AT CP17
354          HC       2
             *
355          KK  D17-48
356          KM        DIVERT FLOW
357          DT  DSUB17
358          DI       0      50     100     121     150     200
359          DQ       0      50     100     121     121     121
             *
360          KK  R17-18
361          KM        ROUTE FLOW FROM SUB17 TO SUB18
362          RK  1378.1    .019    .016            TRAP      40       1     YES
             *
363          KK   SUB18
364          KM   SUB-BASIN SUB18
365          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
366          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
367          KM     L =  .26  Kb = .058  Adj. Slope =  102.0
368          BA    .067
369          LG    .300    .250   3.950    .580  15.000
370          UC    .417    .222
371          UA       0       5      16      30      65      77      84      90      94      97
372          UA     100
             *
373          KK   DIV18
374          KM        DIVERT FOR IRRIGATED LAWNS SUB18
375          DT     D18     .81
376          DI       0       1
377          DQ       0      .6
             *
378          KK  C17-18
379          KM        COMBINE  HYDROGRAPH SUB17 & SUB18 AT CP18
380          HC       2
             *
381          KK  R18-19
382          KM        ROUTE FLOW SUB18 TO SUB19
383          RK  1335.8    .014    .016            TRAP      40       1     YES
             *
1                                        HEC-1 INPUT                                        PAGE 11

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

384          KK   SUB19
385          KM   SUB-BASIN SUB19
386          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
387          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
388          KM     L =  .25  Kb = .057  Adj. Slope =   77.0
389          BA    .075
390          LG    .300    .250   3.950    .580  15.000
391          UC    .446    .218
392          UA       0       5      16      30      65      77      84      90      94      97
393          UA     100
```

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                *
394             KK   DIV19
395             KM        DIVERT FOR IRRIGATED LAWNS SUB19
396             DT     D19     .91
397             DI       0       1
398             DQ       0      .6
                *
399             KK  C18-19
400             KM        COMBINE HYDROGRAPH SUB18 & SUB19 AT CP19
401             HC       2
                *
402             KK  R19-20
403             KM        ROUTE FLOW FROM SUB19 TO SUB20
404             RK  1473.1    .010    .016            TRAP      30       1     YES
                *
405             KK   SUB20
406             KM   SUB-BASIN SUB20
407             KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
408             KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
409             KM     L =  .28  Kb = .054  Adj. Slope =   54.0
410             BA    .129
411             LG    .300    .250   4.450    .450  15.000
412             UC    .475    .188
413             UA       0       5      16      30      65      77      84      90      94      97
414             UA     100
                *
415             KK   DIV20
416             KM        DIVERT FOR IRRIGATED LAWNS SUB20
417             DT     D20    1.86
418             DI       0       1
419             DQ       0      .6
                *
420             KK  C20-19
421             KM        COMBINE SUB19 WITH SUB20
422             HC       2
                *
1                                       HEC-1 INPUT                                     PAGE 12

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

423             KK  C20-15
424             KM        COMBINE SUB15 WITH SUB20
425             HC       2
                *
426             KK   SUB21
427             KM   SUB-BASIN SUB21
428             KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
429             KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
430             KM     L =  .56  Kb = .102  Adj. Slope = 2352.0
431             BA    .124
432             LG    .106    .350   4.700    .240  46.000
433             UC    .208    .134
434             UA       0       3       5       8      12      20      43      75      90      96
435             UA     100
                *
436             KK  R21-22
437             KM        ROUTE FLOW FROM SUB21 TO SUB22
438             RK    2735    .026     .07            TRAP       0       3     YES
                *
439             KK   SUB22
440             KM   SUB-BASIN SUB22
441             KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
442             KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
443             KM     L =  .52  Kb = .059  Adj. Slope =  134.0
444             BA    .112
445             LG    .286    .261   4.000    .490   9.000
446             UC    .579    .417
447             UA       0       5      16      30      65      77      84      90      94      97
448             UA     100
                *
449             KK   DIV22
450             KM        DIVERT FOR IRRIGATED LAWNS SUB22
451             DT     D22     .12
452             DI       0       1
453             DQ       0    .063
                *
454             KK  C21-22
455             KM        COMBINE HYDROGRAPH SUB21 & SUB22 AT CP22
456             HC       2
                *
457             KK  D22-48
458             KM        DIVERT FLOW
459             DT  DSUB22
460             DI       0      50     100     117     150     200
461             DQ       0      50     100     117     117     117
                *
1                                       HEC-1 INPUT                                     PAGE 13

            LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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```
462          KK  R22-23
463          KM        ROUTE FLOW FROM SUB22 TO SUB23
464          RK  1240.8    .025    .016            TRAP      20       1     YES
             *

465          KK   SUB23
466          KM   SUB-BASIN SUB23
467          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
468          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
469          KM     L =  .23  Kb = .058  Adj. Slope =  132.0
470          BA    .060
471          LG    .300    .250   3.950    .580  15.000
472          UC    .346    .175
473          UA       0       5      16      30      65      77      84      90      94      97
474          UA     100
             *

475          KK   DIV23
476          KM        DIVERT FOR IRRIGATED LAWNS SUB23
477          DT     D23     .72
478          DI       0       1
479          DQ       0    .593
             *

480          KK  C22-23
481          KM        COMBINE HYDROGRAPH SUB22 & SUB23 AT CP23
482          HC       2
             *

483          KK  R23-24
484          KM        ROUTE FLOW FROM SUB 23 TO SUB24
485          RK  1088.9    .015    .016            TRAP      32       1     YES
             *

486          KK   SUB24
487          KM   SUB-BASIN SUB24
488          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
489          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
490          KM     L =  .28  Kb = .057  Adj. Slope =   78.0
491          BA    .077
492          LG    .300    .250   3.950    .580  15.000
493          UC    .475    .252
494          UA       0       5      16      30      65      77      84      90      94      97
495          UA     100
             *

496          KK   DIV24
497          KM        DIVERT FOR IRRIGATED LAWNS SUB24
498          DT     D24     .93
499          DI       0       1
500          DQ       0      .6
             *
1                                        HEC-1 INPUT                                        PAGE 14

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

501          KK  C23-24
502          KM        COMBINE HYDROGRAPH SUB23 & SUB24 AT CP24
503          HC       2
             *

504          KK  R24-25
505          KM        ROUTE FLOW FROM SUB24 TO SUB25
506          RK  1346.4    .009    .016            TRAP      40       1     YES
             *

507          KK   SUB25
508          KM   SUB-BASIN SUB25
509          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
510          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
511          KM     L =  .25  Kb = .057  Adj. Slope =   46.0
512          BA    .076
513          LG    .300    .250   3.950    .580  15.000
514          UC    .546    .271
515          UA       0       5      16      30      65      77      84      90      94      97
516          UA     100
             *

517          KK   DIV25
518          KM        DIVERT FOR IRRIGATED LAWNS SUB25
519          DT     D25     .93
520          DI       0       1
521          DQ       0      .6
             *

522          KK  C25-24
523          KM        COMBINE SUB24 WITH SUB25
524          HC       2
             *

525          KK  C25-20
526          KM        COMBINE SUB20 WITH SUB25
527          HC       2
             *

528          KK   SUB26
529          KM   SUB-BASIN SUB26
530          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
531          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
532          KM     L =  .52  Kb = .063  Adj. Slope =  840.0
533          BA    .054
534          LG    .289    .289   4.200    .550  14.000
535          UC    .313    .318
```

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536          UA       0       3       5       8      12      20      43      75      90      96
537          UA     100
             *
1                                        HEC-1 INPUT                                          PAGE 15

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

538          KK   DIV26
539          KM        DIVERT FOR GOLF   COURSE
540          DT     D26     .31
541          DI       0       1
542          DQ       0    .312
             *

543          KK  D26-48
544          KM        DIVERT FLOW
545          DT  DSUB26
546          DI       0       1       7      20      50     100
547          DQ       0       1       7       7       7       7
             *

548          KK  R26-27
549          KM        ROUTE FLOW FROM SUB26 TO SUB27
550          RK  1293.6    .024    .016            TRAP      35       1     YES
             *

551          KK   SUB27
552          KM   SUB-BASIN SUB27
553          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
554          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
555          KM     L =  .25  Kb = .058  Adj. Slope =  122.0
556          BA    .061
557          LG    .300    .250   3.950    .580  15.000
558          UC    .375    .202
559          UA       0       5      16      30      65      77      84      90      94      97
560          UA     100
             *

561          KK   DIV27
562          KM        DIVERT FOR IRRIGATED LAWNS SUB27
563          DT     D27     .74
564          DI       0     1.0
565          DQ       0     .60
             *

566          KK  D27-48
567          KM        DIVERT FLOW
568          DT  DSUB27
569          DI       0       5      12      20      50
570          DQ       0       5      12      12      12
             *

571          KK  C26-27
572          KM        COMBINE HYDROGRAPH SUB 26 & SUB27 AT CP27
573          HC       2
             *
1                                        HEC-1 INPUT                                          PAGE 16

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

574          KK  R27-28
575          KM        ROUTE FLOW FROM SUB 27 TO SUB28
576          RK  1436.2    .017    .016            TRAP      35       1     YES
             *

577          KK   SUB28
578          KM   SUB-BASIN SUB28
579          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
580          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
581          KM     L =  .27  Kb = .057  Adj. Slope =   89.0
582          BA    .078
583          LG    .300    .250   3.950    .580  15.000
584          UC    .442    .224
585          UA       0       5      16      30      65      77      84      90      94      97
586          UA     100
             *

587          KK   DIV28
588          KM        DIVERT FOR IRRIGATED LAWNS SUB28
589          DT     D28     .95
590          DI       0       1
591          DQ       0     .60
             *

592          KK  D28-48
593          KM        DIVERT FLOW
594          DT  DSUB28
595          DI       0       4       7      10      15
596          DQ       0       4       7       7       7
             *

597          KK  C27-28
598          KM        COMBINE HYDROGRAPH SUB27 & SUB28 AT CP28
599          HC       2
             *

600          KK  R28-29
601          KM        ROUTE FLOW FROM SUB 28 TO SUB29
602          RK  1161.6    .009    .016            TRAP      35       1     YES
             *

603          KK   SUB29
```

```
                KM   SUB-BASIN SUB29
                KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
                KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
                KM     L =  .22  Kb = .058  Adj. Slope =   47.0
                BA    .058
                LG    .299    .250   3.950    .580  15.000
                UC    .504    .261
                UA       0       5      16      30      65      77      84      90      94      97
                UA     100
                *
1                                          HEC-1 INPUT                                                PAGE 17

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


                KK   DIV29
                KM        DIVERT FOR IRRIGATED LAWNS SUB29
                DT     D29     .70
                DI       0       1
                DQ       0    .587
                *

                KK  D29-48
                KM        DIVERT FLOW
                DT  DSUB29
                DI       0       2      10      25      50
                DQ       0       2      10      10      10
                *

                KK  C29-28
                KM        COMBINE SUB29 WITH SUB28
                HC       2
                *

                KK  C29-25
                KM        COMBINE SUB25 WITH SUB29
                HC       2
                *
                * DIVIDE SUB 38 INTO 2 SUBBASINS 38A & 38B.  SUB38A WILL FLOW SOUTH INTO
                * CENTRAL CMBK SD SYSTEM.  16CFS FROM SUB 38A WILL BE DIVERTED WEST INTO
                * 44TH ST SYSTEM VIA SUB 38B.

                KK  SUB38A
                KM   SUB-BASIN SUB38A
                KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
                KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
                KM     L = 1.28  Kb = .090  Adj. Slope = 1079.0
                *      BA  .252
                *      LG  .133    .340   4.500    .290  36.000
                *      UC  .412    .370
                *      UA     0       5      16      30      65      77      84      90      94
                *      UA   100
                BA    .118
                LG    0.15    0.33    4.70    0.26      62
                UC   0.500   0.566
                * HEC-1 DEFAULT FOR UNIT HYDROGRAPH TIME-AREA
                UA       0     4.5    12.6    23.2    35.8    50.0    64.2    76.8    87.4    95.5
                UA     100
                *

                KK  D38-39
                KM        DIVERT 16CFS FROM SUB38A TO SUB38B
                DT  DSUB38
                DI       0       5      10      16      50     100     200     400     600
                DQ       0       5      10      16      16      16      16      16      16
                *
1                                          HEC-1 INPUT                                                PAGE 18

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


                KK  R38-30
                KM        ROUTE FLOW FROM SUB38A TO SUB30
                RK    1200    .035    .016            TRAP      30       1     YES
                *

                KK   SUB30
                KM   SUB-BASIN SUB30
                KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
                KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
                KM     L =  .48  Kb = .064  Adj. Slope =  571.0
                BA    .064
                LG    .279    .263   3.950    .480   8.000
                UC    .313    .271
                UA       0       5      16      30      65      77      84      90      94      97
                UA     100
                *

                KK  C30-38
                KM        COMBINE SUB38A & SUB30 AT CP30
                HC       2
                *

                KK  D30-48
                KM        DIVERT FLOW
                DT  DSUB30
                DI       0      50      60     100
                DQ       0      50      60      60
                *

                KK  R30-31
                KM        ROUTE FLOW FROM SUB30 TO SUB31
                RK    1304   .0225    .025            TRAP      20       1     YES
                *
```

```
668          KK   SUB31
669          KM   SUB-BASIN SUB31
670          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
671          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
672          KM     L =  .25  Kb = .058  Adj. Slope =  118.0
673          BA    .061
674          LG    .300    .260   3.670    .690  15.000
675          UC    .429    .235
676          UA       0       3       5       8      12      20      43      75      90      96
677          UA     100
             *

678          KK   DIV31
679          KM        DIVERT FOR IRRIGATED LAWNS SUB31
680          DT     D31     .45
681          DI       0       1
682          DQ       0    .400
             *
1                                        HEC-1 INPUT                                        PAGE 19

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


683          KK  C30-31
684          KM        COMBINE SUB30 & SUB31 AT CP31
685          HC       2
             *

686          KK  R31-32
687          KM        ROUTE FLOW FROM SUB31 TO SUB32
688          RK    1260    .019    .016       0    TRAP      30       1     YES
             *

689          KK   SUB32
690          KM   SUB-BASIN SUB32
691          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
692          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
693          KM     L =  .27  Kb = .058  Adj. Slope =   77.0
694          BA    .064
695          LG    .300    .250   3.950    .580  15.000
696          UC    .475    .272
697          UA       0       5      16      30      65      77      84      90      94      97
698          UA     100
             *

699          KK   DIV32
700          KM        DIVERT FOR IRRIGATED LAWNS SUB32
701          DT     D32     .79
702          DI     0.0     1.0
703          DQ       0     .60
             *

704          KK   DLAF2
705          KM        DIVERT FLOW TO LAFAYETTE S.D.
706          DT  DSUB32
707          DI       0       5      10      13      15      20
708          DQ       0       5      10      13      13      13
             *

709          KK  C31-32
710          KM        COMBINE HYDROGRAPH SUB31 & SUB32 AT CP32
711          HC       2
             *

712          KK  R32-33
713          KM        ROUTE FLOW FROM SUB32 TO SUB33
714          RK    1447   .0144     .07            TRAP       0       3     YES
             *

715          KK   SUB33
716          KM   SUB-BASIN SUB33
717          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
718          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
719          KM     L =  .22  Kb = .058  Adj. Slope =   65.0
720          BA    .062
721          LG    .277    .250   3.950    .580  22.000
722          UC    .404    .197
1                                        HEC-1 INPUT                                        PAGE 20

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

723          UA       0       5      16      30      65      77      84      90      94      97
724          UA     100
             *

725          KK   DIV33
726          KM        DIVERT FOR IRRIGATED LAWNS SUB33
727          DT     D33     .62
728          DI       0       1
729          DQ       0     .37
             *
             *

730          KK  C33-32
731          KM        COMBINE SUB32 WITH SUB33
732          HC       2
             *

733          KK  C33-29
734          KM        COMBINE SUB29 WITH SUB33
735          HC       2
             *
```

```
736          KK   SUB34
737          KM   SUB-BASIN SUB34
738          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
739          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
740          KM     L =  .57  Kb = .050  Adj. Slope =   87.0
741          BA    .167
742          LG    .284    .250   3.950    .590  20.000
743          UC    .613    .380
744          UA       0       5      16      30      65      77      84      90      94      97
745          UA     100
             *

746          KK   DIV34
747          KM        DIVERT FOR IRRIGATED LAWNS SUB34
748          DT     D34    1.53
749          DI       0       1
750          DQ       0    .366
             *

751          KK   DLAF1
752          KM        DIVERT FLOW TO LAFAYETTE S.D.
753          DT  DSUB34
754          DI       0      10      25      30      50
755          DQ       0      10      25      25      25
             *

756          KK  R34-35
757          KM        ROUTE FLOW FROM SUB34 TO SUB35
758          RK  1531.2    .018    .016            TRAP      40       1     YES
             *
1                                        HEC-1 INPUT                                        PAGE 21

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

759          KK   SUB35
760          KM   SUB-BASIN SUB35
761          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
762          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
763          KM     L =  .29  Kb = .048  Adj. Slope =   51.0
764          BA    .128
765          LG    .223    .250   3.950    .600  39.000
766          UC    .400    .160
767          UA       0       3       5       8      12      20      43      75      90      96
768          UA     100
             *

769          KK   DIV35
770          KM        DIVERT FOR IRRIGATED LAWNS SUB35
771          DT     D35     .53
772          DI     0.0     1.0
773          DQ     0.0    .095
             *

774          KK  C35-34
775          KM        COMBINE SUB34 WITH SUB35
776          HC       2
             *

777          KK  C35-33
778          KM        COMBINE SUB33 WITH SUB35
779          HC       2
             *

780          KK   SUB40
781          KM   SUB-BASIN SUB40
782          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
783          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
784          KM     L =  .31  Kb = .099  Adj. Slope = 1822.0
785          BA    .074
786          LG    .162    .332   4.250    .350  22.000
787          UC    .183    .097
788          UA       0       5      16      30      65      77      84      90      94      97
789          UA     100
             *

790          KK  R40-41
791          KM        ROUTE FLOW FROM SUB40 TO SUB41
792          RK   1452    .0221     .05            TRAP       6       2     YES
             *

793          KK   SUB41
794          KM   SUB-BASIN SUB41
795          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
796          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
797          KM     L =  .54  Kb = .054  Adj. Slope =  110.0
798          BA    .144
799          LG    .283    .251   4.600    .360  17.000
800          UC    .479    .301
1                                        HEC-1 INPUT                                        PAGE 22

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

801          UA       0       5      16      30      65      77      84      90      94      97
802          UA     100
             *

803          KK  C40-41
804          KM        COMBINE HYDROGRAPH SUB40 & SUB41 AT CP41
805          HC       2
             *

806          KK  D41-44
807          KM        DIVERT FLOW FOR NORTH VILLAGE DR. SYSTEM
```

```
808          DT  DSUB41
809          DI       0      50      93     100     150
810          DQ       0      50      92      92      92
             *
811          KK  R41-39
812          KM        ROUTE FLOW FROM SUB41 TO   SUB39
813          RK    2865   .0341     .05            TRAP       4       3     YES
             *
             * ADD SUBBASIN 38B

814          KK  SUB38B
815          BA   0.141
816          LG    0.25    0.27    4.35    0.38      42
817          UC   0.390   0.306
818          UA       0     4.5    12.6    23.2    35.8    50.0    64.2    76.8    87.4    95.5
819          UA     100

820          KK  RD3839
821          KM        RECALL DIVERSION FROM SUBBASIN 38
822          DR  DSUB38
             *

823          KK   C-38B
824          KM   COMBINE SUB 38B WITH 38A WEST DIVERSION
825          HC       2
             *

826          KK   SUB37
827          KM   SUB-BASIN SUB37
828          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
829          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
830          KM     L =  .30  Kb = .059  Adj. Slope =  247.0
831          BA    .049
832          LG    .300    .250   3.950    .490   5.000
833          UC    .317    .220
834          UA       0       5      16      30      65      77      84      90      94      97
835          UA     100
             *
1                                        HEC-1 INPUT                                        PAGE 23

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

836          KK  R37-39
837          KM        ROUTE FLOW FROM SUB37 TO   SUB39
838          RK    3500    .018    .016            TRAP      70       1     YES
             *

839          KK   SUB39
840          KM   SUB-BASIN SUB39
841          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
842          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
843          KM     L =  .84  Kb = .051  Adj. Slope =   79.0
844          BA    .188
845          LG    .220    .262   4.000    .530  34.000
846          UC    .671    .536
847          UA       0       3       5       8      12      20      43      75      90      96
848          UA     100
             *

849          KK  C37-39
850          KM        COMBINE SUB39 WITH SUB37 WITH COMBINED FROM SUB38B & 38A WEST DIVERSION
851          HC       3
             *
             * KKD39-44
             * KM      DIVERT FOR 44TH ST SYSTEM
             * DTDSUB39
             * DI     0      50     100     150     153    175      200
             * DQ     0      50     100     150     153    153      153
             *

852          KK   DIV39
853          KM    CAMELBACK STREET CAPACITY IS 87CFS, FLOW BREAKS OUT SOUTH INTO SUB34 AND
854          KM    WILL BE CAPTURED BY LAFAYETTE BLVD. SD SYSTEM
855          DT  DSUB39
856          DI       0      50      87     150     154    175      200
857          DQ       0       0       0      63      67     88      113
             *

858          KK  D39-44
859          KM    DIVERT EAST TOWARDS NORTH VILLAGE DR.TO COMBINE FLOW FROM NORTH
860          DT  DDIV39
861          DI       0      50     100     150     180     200     250
862          DQ       0      50     100     150     180     200     250
             *

863          KK  C41-39
864          KM        COMBINE SUB41 WITH SUB39
865          HC       2
             *

866          KK  R39-36
867          KM        ROUTE FLOW FROM SUB39 TO   SUB36
868          RK    1250    .006    .016            TRAP      26       1     YES
             *
1                                        HEC-1 INPUT                                        PAGE 24

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

869          KK   SUB36
870          KM   SUB-BASIN SUB36
871          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
```

```
872          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
873          KM     L =  .28  Kb = .052  Adj. Slope =   14.0
874          BA    .089
875          LG    .232    .250   3.950    .590  41.000
876          UC    .642    .324
877          UA       0       5      16      30      65      77      84      90      94      97
878          UA     100
             *
879          KK   DIV36
880          KM        DIVERT FOR IRRIGATED LAWNS SUB36
881          DT     D36     .61
882          DI     0.0     1.0
883          DQ     0.0    .150
             *
884          KK  C39-36
885          KM        COMBINE SUB39 WITH SUB36
886          HC       2
             *
887          KK  C36-35
888          KM        COMBINE SUB36 WITH SUB35
889          HC       2
             *
890          KK   SUB42
891          KM   SUB-BASIN SUB42
892          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
893          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
894          KM     L =  .51  Kb = .044  Adj. Slope =   29.0
895          BA    .251
896          LG    .256    .250   5.600    .250  23.000
897          UC    .596    .267
898          UA       0       5      16      30      65      77      84      90      94      97
899          UA     100
             *
900          KK   DIV42
901          KM        DIVERT FOR IRRIGATED LAWNS SUB42
902          DT     D42     .75
903          DI       0       1
904          DQ       0    .072
             *
905          KK  C42-36
906          KM        COMBINE HYDROGRAPH SUB42 WITH SUB36
907          HC       2
             *
             *
             *
             *
             *       100-YR PEAK FLOW AFTER 2-YR FLUSH HYDROGRAPH FOR DETENTION SIZING
             *
             *       64TH STREET TRUNK LINE
             *       DIVERTS FIRST 127 CFS TO LAFAYETTE STORM DRAIN
             *       AT LAFAYETTE BLVD. AND 64TH ST.
             *
1                                        HEC-1 INPUT                                        PAGE 25

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

908          KK   RSUB7
909          KM        RECALL DIVERSION
910          DR   DSUB7
             *
911          KK  R64TH1
912          KM        ROUTE FLOW
913          RK    2400    .005    .018            CIRC       4             YES
             *
914          KK   RSUB2
915          KM        RECALL DIVERSION
916          DR   DSUB2
             *
917          KK   COMB1
918          KM        COMBINE FLOW
919          HC       2
             *
920          KK  R64TH2
921          KM        ROUTE FLOW
922          RK    2700    .005    .018            CIRC       4             YES
             *
             *
             *
             *
             *
             *
             *       48TH STREET TRUNK LINE
             *       2-YR FLOWS FROM N. OF CAMELBACK AND SUBS 29,30, & 31.
             *
             *
             *
923          KK  RSUB12
924          KM        RECALL DIVERSION
925          DR  DSUB12
             *
926          KK  R48TH1
```

```
927          KM        ROUTE FLOW
928          RK    2200    .005    .018           CIRC       4            YES
             *

929          KK  RSUB17
930          KM        RECALL DIVERSION
931          DR  DSUB17
             *
1                                        HEC-1 INPUT                                          PAGE 26

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

932          KK   COMB2
933          KM        COMBINE FLOW
934          HC        2
             *

935          KK  R48TH2
936          KM        ROUTE FLOW
937          RK    1300    .005    .018           CIRC     4.5            YES
             *

938          KK  RSUB22
939          KM        RECALL DIVERSION
940          DR  DSUB22
             *

941          KK   COMB3
942          KM        COMBINE FLOW
943          HC        2
             *

944          KK  R48TH3
945          KM        ROUTE FLOW
946          RK    1000    .005    .018           CIRC       5            YES
             *

947          KK  RSUB26
948          KM        RECALL DIVERSION
949          DR  DSUB26
             *

950          KK   COMB6
951          KM        COMBINE FLOW
952          HC        2
             *

953          KK  RSUB30
954          KM        RECALL DIVERSION
955          DR  DSUB30
             *

956          KK   COMB7
957          KM        COMBINE FLOW
958          HC        2
             *

959          KK  R48TH4
960          KM        ROUTE FLOW
961          RK    1300    .005    .018           CIRC     5.5            YES
             *
1                                        HEC-1 INPUT                                          PAGE 27

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

962          KK  RSUB27
963          KM        RECALL DIVERSION
964          DR  DSUB27
             *

965          KK   COMB9
966          KM        COMBINE FLOW
967          HC        2
             *

968          KK  R48TH5
969          KM        ROUTE FLOW
970          RK    1300    .005    .018           CIRC       6            YES
             *

971          KK  RSUB28
972          KM        RECALL DIVERSION
973          DR  DSUB28
             *

974          KK  COMB10
975          KM        COMBINE FLOW
976          HC        2
             *

977          KK  R48TH6
978          KM        ROUTE FLOW
979          RK    1175    .005    .018           CIRC     6.5            YES
             *
             *
             *
             *       NORTH VILLAGE DRIVE TRUNK LINE SYSTEM
             *

980          KK  RSUB41
981          KM        RECALL DIVERSION
982          DR  DSUB41
```

```
                *
          983   KK  RNVDR1
          984   KM        ROUTE FLOW
          985   RK    1570    .002    .018            CIRC       5             YES
                *

          986   KK  RDIV39
          987   KM        RECALL DIVERSION
          988   DR  DDIV39
                *
1                                          HEC-1 INPUT                                                    PAGE 28

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

          989   KK  COMB13
          990   KM   REMANING FLOW FROM SUB39 COMBINE WITH FLOW FROM NORTH SUB41
          991   KM        COMBINE  FLOW
          992   HC       2
                *

          993   KK  RSUB39
          994   KM    FLOW BREAKOUT SOUTH FROM C37-39 onto SUB34 IS PICKED UP AT DROPINLET LOCATIO
          995   KM        RECALL DIVERSION
          996   DR  DSUB39
                *

          997   KK  COMB14
          998   KM        COMBINE  FLOW
          999   HC       2
                *

         1000   KK  R-LAF1
         1001   KM        ROUTE FLOW
         1002   RK    3400    .005    .018            CIRC       6             YES
                *

         1003   KK  RSUB34
         1004   KM        RECALL DIVERSION
         1005   DR  DSUB34
                *

         1006   KK  COMB15
         1007   KM        COMBINE  FLOW
         1008   HC       2
                *

         1009   KK  R-LAF2
         1010   KM        ROUTE FLOW
         1011   RK    1600    .005    .018            CIRC     6.5             YES
                *

         1012   KK  RSUB32
         1013   KM        RECALL DIVERSION
         1014   DR  DSUB32
                *

         1015   KK  COMB16
         1016   KM        COMBINE  FLOW
         1017   HC       2
                *

         1018   KK  COMB17
         1019   KM        COMBINE  FLOW
         1020   HC       2
                *
1                                          HEC-1 INPUT                                                    PAGE 29

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

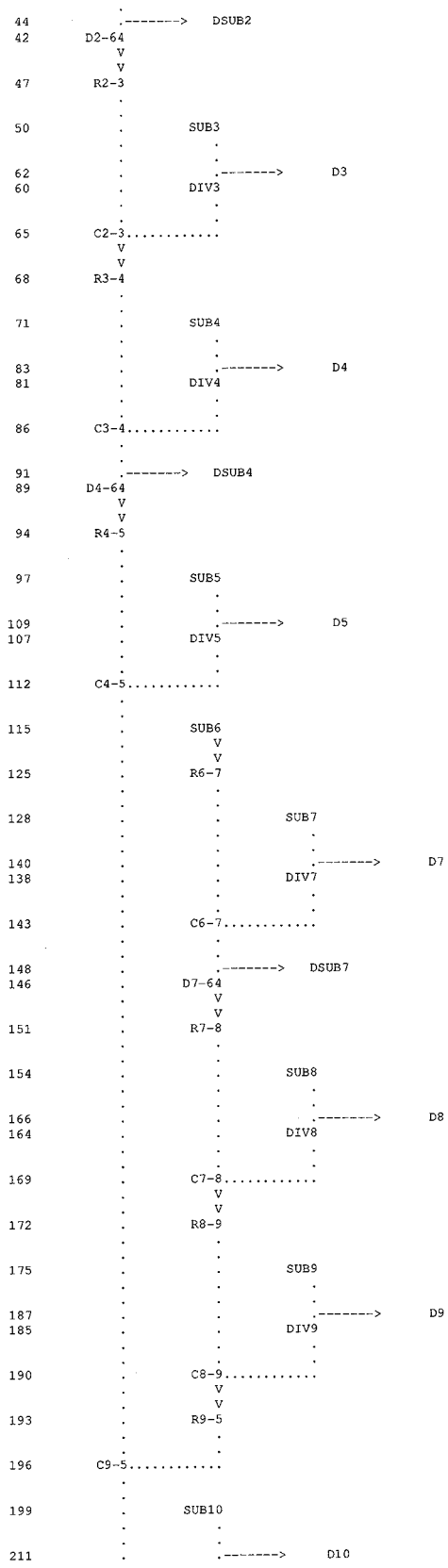
         1021   KK  RSUB29
         1022   KM        RECALL DIVERSION
         1023   DR  DSUB29
                *

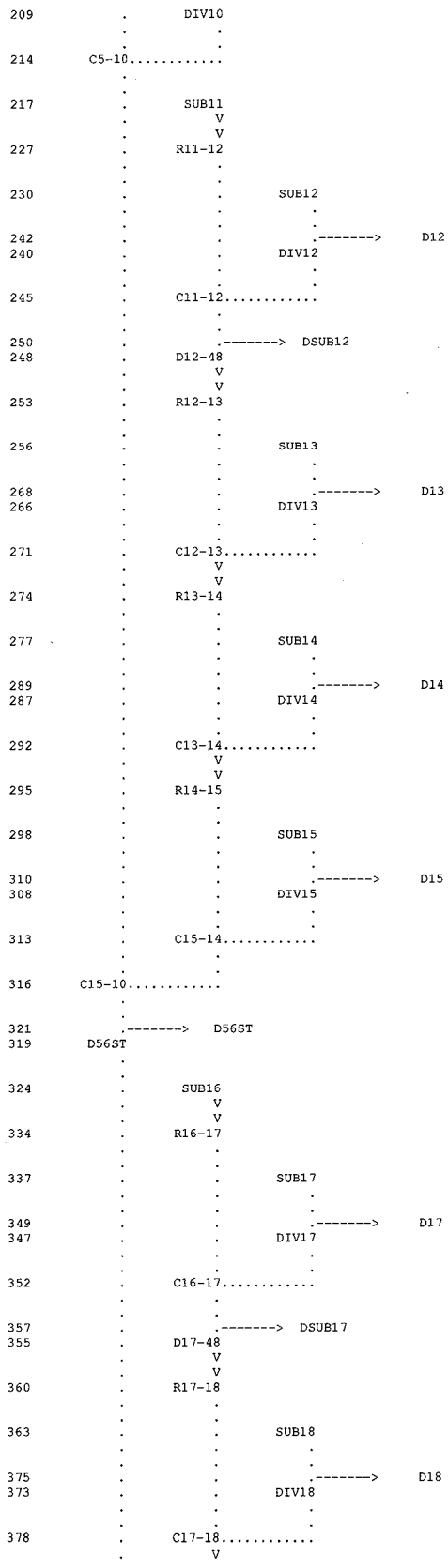
         1024   KK  COMB11
         1025   KM        COMBINE FLOW
         1026   HC       2
                *
         1027   ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

     4        SUB1
                 V
                 V
    21        R1-2
                 .
                 .
    24           .        SUB2
                 .          .
                 .          .
    36           .          .-------->      D2
    34           .        DIV2
                 .          .
                 .          .
    39        C1-2...........
                 .
```


44
DSUB2
42
D2-64
47
R2-3
50
SUB3
62
D3
60
DIV3
65
C2-3
68
R3-4
71
SUB4
83
D4
81
DIV4
86
C3-4
91
DSUB4
89
D4-64
94
R4-5
97
SUB5
109
D5
107
DIV5
112
C4-5
115
SUB6
125
R6-7
128
SUB7
140
D7
138
DIV7
143
C6-7
148
DSUB7
146
D7-64
151
R7-8
154
SUB8
166
D8
164
DIV8
169
C7-8
172
R8-9
175
SUB9
187
D9
185
DIV9
190
C8-9
193
R9-5
196
C9-5
199
SUB10
211
D10


209 DIV10
214 C5-10
217 SUB11
227 R11-12
230 SUB12
242 D12
240 DIV12
245 C11-12
250 DSUB12
248 D12-48
253 R12-13
256 SUB13
268 D13
266 DIV13
271 C12-13
274 R13-14
277 SUB14
289 D14
287 DIV14
292 C13-14
295 R14-15
298 SUB15
310 D15
308 DIV15
313 C15-14
316 C15-10
321 D56ST
319 D56ST
324 SUB16
334 R16-17
337 SUB17
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355 D17-48
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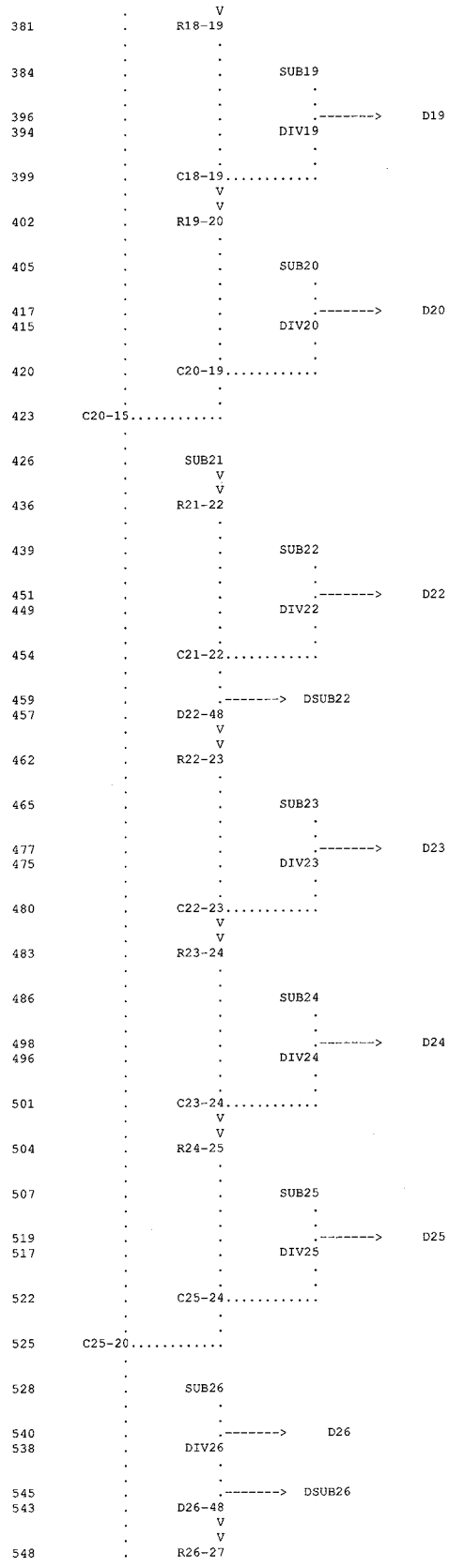
373 DIV18
378 C17-18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426 SUB21
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501 C23-24
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507 SUB25
519
517 DIV25
522 C25-24
525 C25-20
528 SUB26
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538 DIV26
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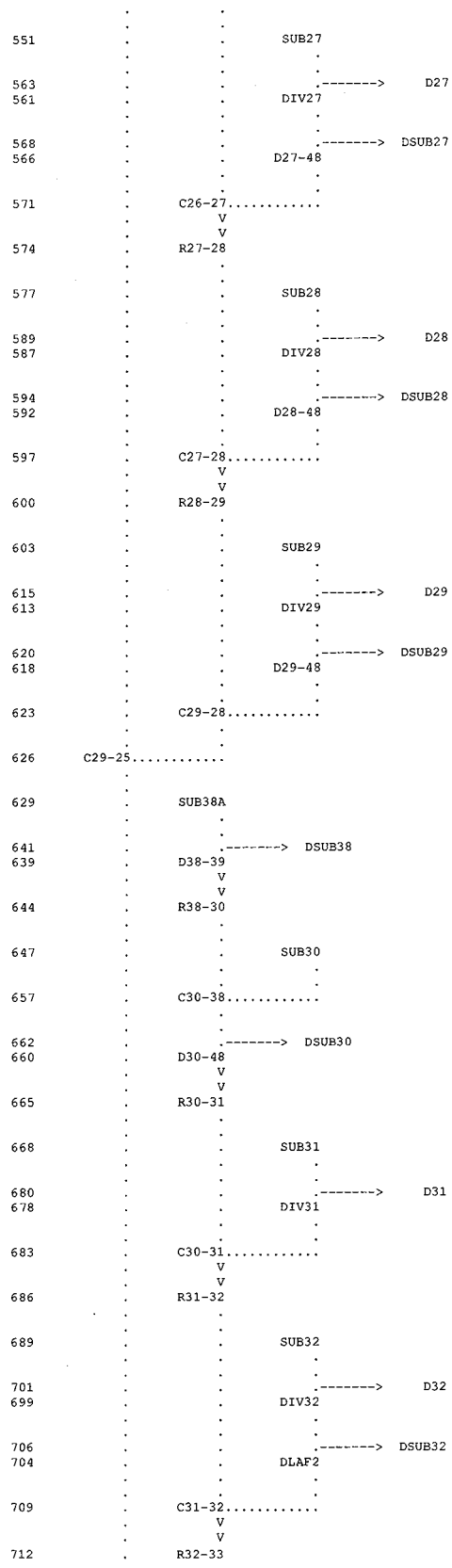
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592 D28-48
597 C27-28
600 R28-29
603 SUB29
615 D29
613 DIV29
620 DSUB29
618 D29-48
623 C29-28
626 C29-25
629 SUB38A
641 DSUB38
639 D38-39
644 R38-30
647 SUB30
657 C30-38
662 DSUB30
660 D30-48
665 R30-31
668 SUB31
680 D31
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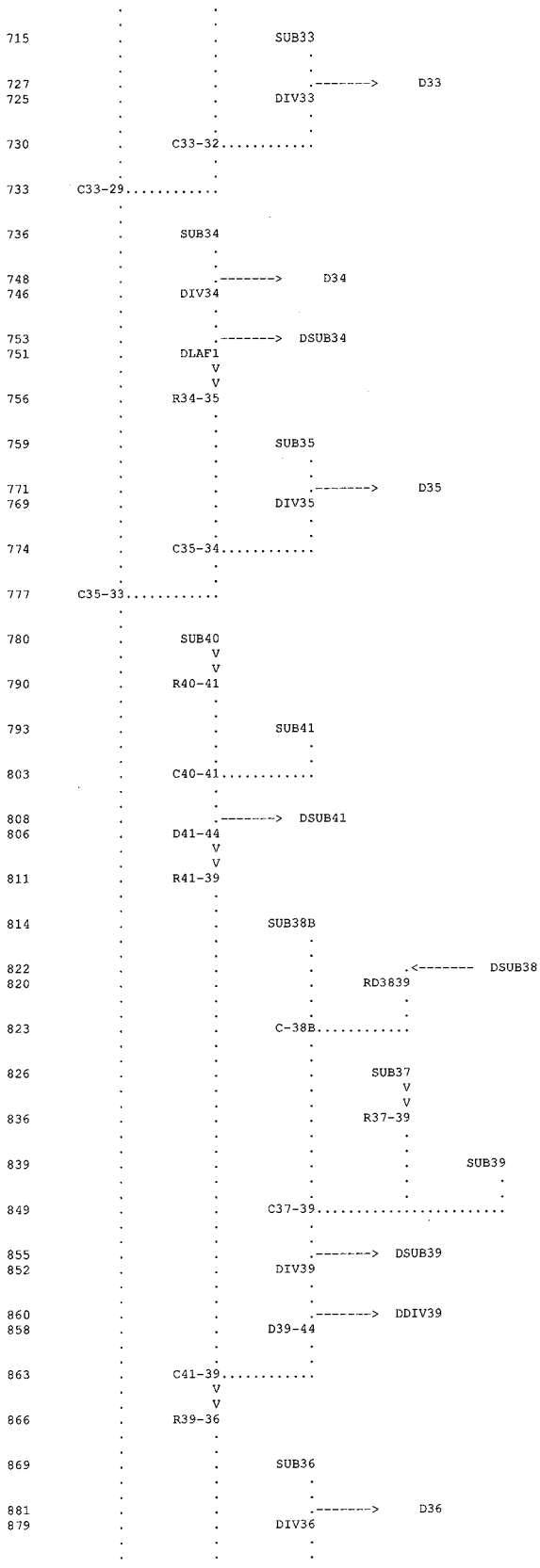
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756 R34-35
759 SUB35
771 D35
769 DIV35
774 C35-34
777 C35-33
780 SUB40
790 R40-41
793 SUB41
803 C40-41
808 DSUB41
806 D41-44
811 R41-39
814 SUB38B
822 DSUB38
820 RD3839
823 C-38B
826 SUB37
836 R37-39
839 SUB39
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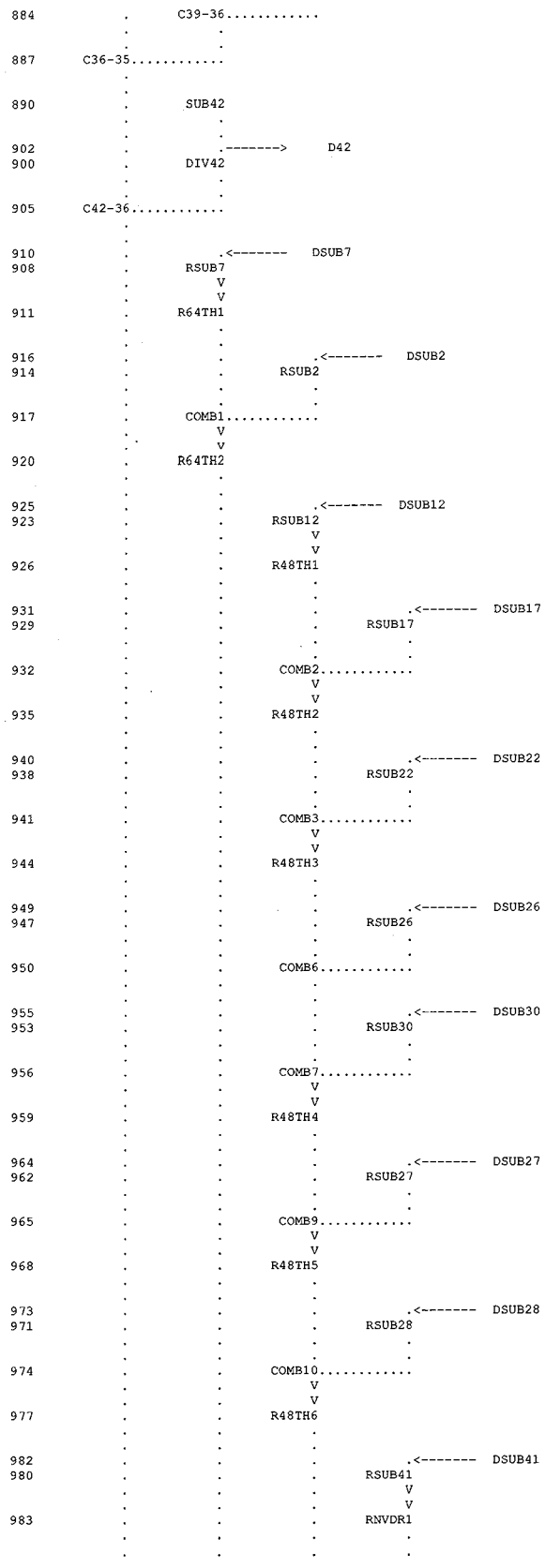
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916 DSUB2
914 RSUB2
917 COMB1
920 R64TH2
925 DSUB12
923 RSUB12
926 R48TH1
931 DSUB17
929 RSUB17
932 COMB2
935 R48TH2
940 DSUB22
938 RSUB22
941 COMB3
944 R48TH3
949 DSUB26
947 RSUB26
950 COMB6
955 DSUB30
953 RSUB30
956 COMB7
959 R48TH4
964 DSUB27
962 RSUB27
965 COMB9
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971 RSUB28
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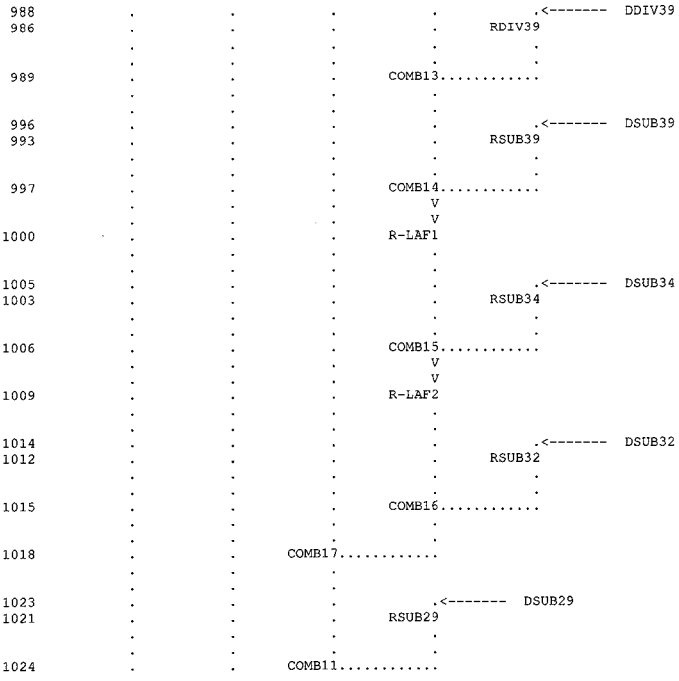
982 DSUB41
980 RSUB41
983 RNVDR1



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   04OCT11  TIME  11:28:38   *
*                                       *
*****************************************
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*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

LID10a.DAT

```
   3 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         300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2    0  ENDING DATE
                     NDTIME        0055  ENDING TIME
                     ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   24.92 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
```

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	SUB1	31.	4.08	5.	1.	1.	.04		
+	ROUTED TO	R1-2	31.	4.25	5.	1.	1.	.04		
+	HYDROGRAPH AT	SUB2	22.	4.33	4.	1.	1.	.12		
+	DIVERSION TO	D2	8.	4.33	2.	0.	0.	.12		
+	HYDROGRAPH AT	DIV2	14.	4.33	3.	1.	1.	.12		
+	2 COMBINED AT	C1-2	44.	4.25	7.	2.	2.	.15		
+	DIVERSION TO	DSUB2	18.	4.25	5.	1.	1.	.15		
+	HYDROGRAPH AT	D2-64	26.	4.25	2.	1.	0.	.15		
+	ROUTED TO	R2-3	25.	4.33	2.	1.	1.	.15		
+	HYDROGRAPH AT	SUB3	18.	4.25	3.	1.	1.	.07		
+	DIVERSION TO	D3	10.	4.25	2.	0.	0.	.07		
+	HYDROGRAPH AT	DIV3	8.	4.25	1.	0.	0.	.07		
+	2 COMBINED AT	C2-3	33.	4.25	3.	1.	1.	.22		
+	ROUTED TO	R3-4	32.	4.33	3.	1.	1.	.22		
+	HYDROGRAPH AT	SUB4	25.	4.17	4.	1.	1.	.06		
+	DIVERSION TO	D4	14.	4.17	2.	1.	0.	.06		
+	HYDROGRAPH AT	DIV4	11.	4.17	2.	0.	0.	.06		
+	2 COMBINED AT	C3-4	43.	4.33	5.	1.	1.	.29		
+	DIVERSION TO	DSUB4	3.	4.33	1.	0.	0.	.29		
+	HYDROGRAPH AT	D4-64	40.	4.33	4.	1.	1.	.29		
+	ROUTED TO	R4-5	39.	4.42	4.	1.	1.	.29		
+	HYDROGRAPH AT	SUB5	15.	4.50	4.	1.	1.	.07		
+	DIVERSION TO	D5	7.	4.50	2.	0.	0.	.07		
+	HYDROGRAPH AT	DIV5	7.	4.50	2.	0.	0.	.07		
+	2 COMBINED AT	C4-5	46.	4.42	6.	1.	1.	.35		
+	HYDROGRAPH AT	SUB6	81.	4.00	12.	3.	3.	.09		
+	ROUTED TO	R6-7	78.	4.17	12.	3.	3.	.09		
+	HYDROGRAPH AT	SUB7	61.	4.25	11.	3.	3.	.15		
+	DIVERSION TO	D7	26.	4.25	5.	1.	1.	.15		
+	HYDROGRAPH AT	DIV7	35.	4.25	6.	2.	2.	.15		

+	2 COMBINED AT	C6-7	111.	4.17	18.	4.	4.	.24
+	DIVERSION TO	DSUB7	110.	4.17	18.	4.	4.	.24
+	HYDROGRAPH AT	D7-64	1.	4.17	0.	0.	0.	.24
+	ROUTED TO	R7-8	1.	5.00	0.	0.	0.	.24
+	HYDROGRAPH AT	SUB8	14.	4.42	3.	1.	1.	.07
+	DIVERSION TO	D8	9.	4.42	2.	0.	0.	.07
+	HYDROGRAPH AT	DIV8	6.	4.42	1.	0.	0.	.07
+	2 COMBINED AT	C7-8	6.	4.42	1.	0.	0.	.31
+	ROUTED TO	R8-9	6.	4.42	1.	0.	0.	.31
+	HYDROGRAPH AT	SUB9	21.	4.17	3.	1.	1.	.06
+	DIVERSION TO	D9	13.	4.17	2.	0.	0.	.06
+	HYDROGRAPH AT	DIV9	8.	4.17	1.	0.	0.	.06
+	2 COMBINED AT	C8-9	13.	4.25	3.	1.	1.	.38
+	ROUTED TO	R9-5	13.	4.42	3.	1.	1.	.38
+	2 COMBINED AT	C9-5	59.	4.42	8.	2.	2.	.73
+	HYDROGRAPH AT	SUB10	31.	4.25	5.	1.	1.	.09
+	DIVERSION TO	D10	14.	4.25	2.	1.	1.	.09
+	HYDROGRAPH AT	DIV10	17.	4.25	3.	1.	1.	.09
+	2 COMBINED AT	C5-10	76.	4.42	11.	3.	3.	.82
+	HYDROGRAPH AT	SUB11	64.	4.08	10.	3.	2.	.09
+	ROUTED TO	R11-12	64.	4.17	10.	3.	2.	.09
+	HYDROGRAPH AT	SUB12	77.	4.08	8.	2.	2.	.12
+	DIVERSION TO	D12	6.	4.08	1.	0.	0.	.12
+	HYDROGRAPH AT	DIV12	70.	4.08	7.	2.	2.	.12
+	2 COMBINED AT	C11-12	131.	4.08	17.	4.	4.	.21
+	DIVERSION TO	DSUB12	130.	4.08	17.	4.	4.	.21
+	HYDROGRAPH AT	D12-48	1.	4.08	0.	0.	0.	.21
+	ROUTED TO	R12-13	0.	4.42	0.	0.	0.	.21
+	HYDROGRAPH AT	SUB13	89.	4.08	10.	2.	2.	.13
+	DIVERSION TO	D13	18.	4.08	2.	0.	0.	.13
+	HYDROGRAPH AT	DIV13	72.	4.08	8.	2.	2.	.13
+	2 COMBINED AT	C12-13	72.	4.08	8.	2.	2.	.34
+	ROUTED TO	R13-14	70.	4.08	8.	2.	2.	.34
+	HYDROGRAPH AT	SUB14	39.	4.17	5.	1.	1.	.13
+	DIVERSION TO	D14	24.	4.17	3.	1.	1.	.13

+	HYDROGRAPH AT	DIV14	16.	4.17	2.	1.	1.	.13
+	2 COMBINED AT	C13-14	85.	4.08	10.	3.	2.	.47
+	ROUTED TO	R14-15	84.	4.17	10.	3.	2.	.47
+	HYDROGRAPH AT	SUB15	45.	4.25	7.	2.	2.	.13
+	DIVERSION TO	D15	26.	4.25	4.	1.	1.	.13
+	HYDROGRAPH AT	DIV15	19.	4.25	3.	1.	1.	.13
+	2 COMBINED AT	C15-14	102.	4.17	13.	3.	3.	.60
+	2 COMBINED AT	C15-10	153.	4.33	24.	6.	6.	1.42
+	DIVERSION TO	D56ST	0.	4.33	0.	0.	0.	1.42
+	HYDROGRAPH AT	D56ST	153.	4.33	24.	6.	6.	1.42
+	HYDROGRAPH AT	SUB16	100.	4.08	16.	4.	4.	.13
+	ROUTED TO	R16-17	99.	4.17	16.	4.	4.	.13
+	HYDROGRAPH AT	SUB17	25.	4.17	3.	1.	1.	.07
+	DIVERSION TO	D17	2.	4.17	0.	0.	0.	.07
+	HYDROGRAPH AT	DIV17	23.	4.17	3.	1.	1.	.07
+	2 COMBINED AT	C16-17	122.	4.17	19.	5.	5.	.20
+	DIVERSION TO	DSUB17	121.	4.17	19.	5.	5.	.20
+	HYDROGRAPH AT	D17-48	1.	4.17	0.	0.	0.	.20
+	ROUTED TO	R17-18	1.	4.42	0.	0.	0.	.20
+	HYDROGRAPH AT	SUB18	18.	4.17	3.	1.	1.	.07
+	DIVERSION TO	D18	11.	4.17	2.	0.	0.	.07
+	HYDROGRAPH AT	DIV18	7.	4.17	1.	0.	0.	.07
+	2 COMBINED AT	C17-18	7.	4.17	1.	0.	0.	.27
+	ROUTED TO	R18-19	7.	4.25	1.	0.	0.	.27
+	HYDROGRAPH AT	SUB19	21.	4.17	3.	1.	1.	.08
+	DIVERSION TO	D19	12.	4.17	2.	0.	0.	.08
+	HYDROGRAPH AT	DIV19	8.	4.17	1.	0.	0.	.08
+	2 COMBINED AT	C18-19	15.	4.17	2.	1.	1.	.34
+	ROUTED TO	R19-20	15.	4.25	2.	1.	1.	.34
+	HYDROGRAPH AT	SUB20	45.	4.17	6.	2.	2.	.13
+	DIVERSION TO	D20	27.	4.17	4.	1.	1.	.13
+	HYDROGRAPH AT	DIV20	18.	4.17	3.	1.	1.	.13
+	2 COMBINED AT	C20-19	32.	4.25	5.	1.	1.	.47
+	2 COMBINED AT	C20-15	183.	4.33	29.	7.	7.	1.89
	HYDROGRAPH AT							

+	SUB21	101.	4.08	15.	4.	4.	.12
+ ROUTED TO	R21-22	99.	4.17	15.	4.	4.	.12
+ HYDROGRAPH AT	SUB22	23.	4.25	4.	1.	1.	.11
+ DIVERSION TO	D22	1.	4.25	0.	0.	0.	.11
+ HYDROGRAPH AT	DIV22	21.	4.25	4.	1.	1.	.11
+ 2 COMBINED AT	C21-22	118.	4.17	19.	5.	5.	.24
+ DIVERSION TO	DSUB22	117.	4.17	19.	5.	5.	.24
+ HYDROGRAPH AT	D22-48	1.	4.17	0.	0.	0.	.24
+ ROUTED TO	R22-23	1.	4.33	0.	0.	0.	.24
+ HYDROGRAPH AT	SUB23	18.	4.08	2.	1.	1.	.06
+ DIVERSION TO	D23	11.	4.08	1.	0.	0.	.06
+ HYDROGRAPH AT	DIV23	7.	4.08	1.	0.	0.	.06
+ 2 COMBINED AT	C22-23	7.	4.08	1.	0.	0.	.30
+ ROUTED TO	R23-24	7.	4.17	1.	0.	0.	.30
+ HYDROGRAPH AT	SUB24	20.	4.17	3.	1.	1.	.08
+ DIVERSION TO	D24	12.	4.17	2.	0.	0.	.08
+ HYDROGRAPH AT	DIV24	8.	4.17	1.	0.	0.	.08
+ 2 COMBINED AT	C23-24	15.	4.17	2.	1.	1.	.37
+ ROUTED TO	R24-25	15.	4.25	2.	1.	1.	.37
+ HYDROGRAPH AT	SUB25	19.	4.25	3.	1.	1.	.08
+ DIVERSION TO	D25	11.	4.25	2.	0.	0.	.08
+ HYDROGRAPH AT	DIV25	7.	4.25	1.	0.	0.	.08
+ 2 COMBINED AT	C25-24	22.	4.25	4.	1.	1.	.45
+ 2 COMBINED AT	C25-20	204.	4.33	33.	8.	8.	2.34
+ HYDROGRAPH AT	SUB26	12.	4.25	2.	1.	0.	.05
+ DIVERSION TO	D26	4.	4.25	1.	0.	0.	.05
+ HYDROGRAPH AT	DIV26	8.	4.25	1.	0.	0.	.05
+ DIVERSION TO	DSUB26	7.	4.25	1.	0.	0.	.05
+ HYDROGRAPH AT	D26-48	1.	4.25	0.	0.	0.	.05
+ ROUTED TO	R26-27	1.	4.33	0.	0.	0.	.05
+ HYDROGRAPH AT	SUB27	17.	4.17	3.	1.	1.	.06
+ DIVERSION TO	D27	10.	4.17	1.	0.	0.	.06
+ HYDROGRAPH AT	DIV27	7.	4.17	1.	0.	0.	.06
+ DIVERSION TO	DSUB27	7.	.00	1.	0.	0.	.06
+ HYDROGRAPH AT	D27-48	0.	.00	0.	0.	0.	.06

+	2 COMBINED AT	C26-27	1.	4.33	0.	0.	0.	.12
+	ROUTED TO	R27-28	1.	4.58	0.	0.	0.	.12
+	HYDROGRAPH AT	SUB28	21.	4.17	3.	1.	1.	.08
+	DIVERSION TO	D28	13.	4.17	2.	0.	0.	.08
+	HYDROGRAPH AT	DIV28	8.	4.17	1.	0.	0.	.08
+	DIVERSION TO	DSUB28	7.	4.17	1.	0.	0.	.08
+	HYDROGRAPH AT	D28-48	1.	4.17	0.	0.	0.	.08
+	2 COMBINED AT	C27-28	1.	4.17	0.	0.	0.	.19
+	ROUTED TO	R28-29	1.	4.33	0.	0.	0.	.19
+	HYDROGRAPH AT	SUB29	14.	4.17	2.	1.	1.	.06
+	DIVERSION TO	D29	9.	4.17	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV29	6.	4.17	1.	0.	0.	.06
+	DIVERSION TO	DSUB29	6.	.00	1.	0.	0.	.06
+	HYDROGRAPH AT	D29-48	0.	.00	0.	0.	0.	.06
+	2 COMBINED AT	C29-28	1.	4.33	0.	0.	0.	.25
+	2 COMBINED AT	C29-25	205.	4.33	33.	8.	8.	2.59
+	HYDROGRAPH AT	SUB38A	64.	4.42	17.	4.	4.	.12
+	DIVERSION TO	DSUB38	16.	4.42	9.	2.	2.	.12
+	HYDROGRAPH AT	D38-39	48.	4.42	8.	2.	2.	.12
+	ROUTED TO	R38-30	48.	4.42	8.	2.	2.	.12
+	HYDROGRAPH AT	SUB30	18.	4.17	2.	1.	1.	.06
+	2 COMBINED AT	C30-38	61.	4.33	10.	3.	2.	.18
+	DIVERSION TO	DSUB30	60.	4.33	10.	3.	2.	.18
+	HYDROGRAPH AT	D30-48	1.	4.33	0.	0.	0.	.18
+	ROUTED TO	R30-31	1.	4.50	0.	0.	0.	.18
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+	DIVERSION TO	D31	5.	4.25	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV31	8.	4.25	1.	0.	0.	.06
+	2 COMBINED AT	C30-31	8.	4.25	1.	0.	0.	.24
+	ROUTED TO	R31-32	8.	4.33	1.	0.	0.	.24
+	HYDROGRAPH AT	SUB32	16.	4.17	3.	1.	1.	.06
+	DIVERSION TO	D32	10.	4.17	2.	0.	0.	.06
+	HYDROGRAPH AT	DIV32	6.	4.17	1.	0.	0.	.06
+	DIVERSION TO	DSUB32	6.	.00	1.	0.	0.	.06
+	HYDROGRAPH AT	DLAF2	0.	.00	0.	0.	0.	.06

+	2 COMBINED AT C31-32	8.	4.33	1.	0.	0.	.31
+	ROUTED TO R32-33	8.	4.42	1.	0.	0.	.31
+	HYDROGRAPH AT SUB33	22.	4.17	3.	1.	1.	.06
+	DIVERSION TO D33	8.	4.17	1.	0.	0.	.06
+	HYDROGRAPH AT DIV33	14.	4.17	2.	1.	1.	.06
+	2 COMBINED AT C33-32	18.	4.17	4.	1.	1.	.37
+	2 COMBINED AT C33-29	222.	4.33	37.	9.	9.	2.96
+	HYDROGRAPH AT SUB34	41.	4.25	8.	2.	2.	.17
+	DIVERSION TO D34	15.	4.25	3.	1.	1.	.17
+	HYDROGRAPH AT DIV34	26.	4.25	5.	1.	1.	.17
+	DIVERSION TO DSUB34	25.	4.25	5.	1.	1.	.17
+	HYDROGRAPH AT DLAF1	1.	4.25	0.	0.	0.	.17
+	ROUTED TO R34-35	1.	4.50	0.	0.	0.	.17
+	HYDROGRAPH AT SUB35	67.	4.25	11.	3.	3.	.13
+	DIVERSION TO D35	6.	4.25	1.	0.	0.	.13
+	HYDROGRAPH AT DIV35	60.	4.25	10.	3.	2.	.13
+	2 COMBINED AT C35-34	60.	4.25	10.	3.	2.	.30
+	2 COMBINED AT C35-33	280.	4.25	47.	12.	11.	3.25
+	HYDROGRAPH AT SUB40	46.	4.00	5.	1.	1.	.07
+	ROUTED TO R40-41	44.	4.08	5.	1.	1.	.07
+	HYDROGRAPH AT SUB41	55.	4.25	9.	2.	2.	.14
+	2 COMBINED AT C40-41	92.	4.17	14.	4.	3.	.22
+	DIVERSION TO DSUB41	91.	4.17	14.	4.	3.	.22
+	HYDROGRAPH AT D41-44	1.	4.17	0.	0.	0.	.22
+	ROUTED TO R41-39	1.	4.42	0.	0.	0.	.22
+	HYDROGRAPH AT SUB38B	74.	4.25	15.	4.	4.	.14
+	HYDROGRAPH AT RD3839	16.	3.67	9.	2.	2.	.00
+	2 COMBINED AT C-38B	90.	4.25	24.	6.	6.	.14
+	HYDROGRAPH AT SUB37	13.	4.17	1.	0.	0.	.05
+	ROUTED TO R37-39	13.	4.33	1.	0.	0.	.05
+	HYDROGRAPH AT SUB39	61.	4.50	15.	4.	4.	.19
+	3 COMBINED AT C37-39	154.	4.33	40.	10.	10.	.38
+	DIVERSION TO DSUB39	67.	4.00	6.	2.	2.	.38
+	HYDROGRAPH AT DIV39	87.	4.00	34.	9.	8.	.38
	DIVERSION TO						

+	DDIV39	87.	.00	34.	9.	8.	.38
+ HYDROGRAPH AT	D39-44	0.	.00	0.	0.	0.	.38
+ 2 COMBINED AT	C41-39	1.	4.42	0.	0.	0.	.60
+ ROUTED TO	R39-36	1.	4.67	0.	0.	0.	.60
+ HYDROGRAPH AT	SUB36	37.	4.25	8.	2.	2.	.09
+ DIVERSION TO	D36	6.	4.25	1.	0.	0.	.09
+ HYDROGRAPH AT	DIV36	32.	4.25	7.	2.	2.	.09
+ 2 COMBINED AT	C39-36	32.	4.25	7.	2.	2.	.68
+ 2 COMBINED AT	C36-35	312.	4.25	54.	14.	13.	3.94
+ HYDROGRAPH AT	SUB42	125.	4.25	21.	5.	5.	.25
+ DIVERSION TO	D42	9.	4.25	2.	0.	0.	.25
+ HYDROGRAPH AT	DIV42	116.	4.25	19.	5.	5.	.25
+ 2 COMBINED AT	C42-36	428.	4.25	73.	19.	18.	4.19
+ HYDROGRAPH AT	RSUB7	110.	4.17	18.	4.	4.	.00
+ ROUTED TO	R64TH1	108.	4.25	18.	4.	4.	.00
+ HYDROGRAPH AT	RSUB2	18.	3.92	5.	1.	1.	.00
+ 2 COMBINED AT	COMB1	126.	4.25	23.	6.	6.	.00
+ ROUTED TO	R64TH2	125.	4.25	23.	6.	6.	.00
+ HYDROGRAPH AT	RSUB12	130.	4.08	17.	4.	4.	.00
+ ROUTED TO	R48TH1	127.	4.17	17.	4.	4.	.00
+ HYDROGRAPH AT	RSUB17	121.	4.17	19.	5.	5.	.00
+ 2 COMBINED AT	COMB2	248.	4.17	36.	9.	9.	.00
+ ROUTED TO	R48TH2	246.	4.17	36.	9.	9.	.00
+ HYDROGRAPH AT	RSUB22	117.	4.17	19.	5.	5.	.00
+ 2 COMBINED AT	COMB3	363.	4.17	55.	14.	13.	.00
+ ROUTED TO	R48TH3	360.	4.17	55.	14.	13.	.00
+ HYDROGRAPH AT	RSUB26	7.	4.17	1.	0.	0.	.00
+ 2 COMBINED AT	COMB6	367.	4.17	57.	14.	14.	.00
+ HYDROGRAPH AT	RSUB30	60.	4.33	10.	3.	2.	.00
+ 2 COMBINED AT	COMB7	423.	4.17	67.	17.	16.	.00
+ ROUTED TO	R48TH4	418.	4.25	67.	17.	16.	.00
+ HYDROGRAPH AT	RSUB27	7.	4.17	1.	0.	0.	.00
+ 2 COMBINED AT	COMB9	424.	4.25	68.	17.	16.	.00
+ ROUTED TO	R48TH5	423.	4.25	68.	17.	16.	.00
+ HYDROGRAPH AT	RSUB28	7.	4.08	1.	0.	0.	.00

+	2 COMBINED AT	COMB10	430.	4.25	69.	17.	17.	.00
+	ROUTED TO	R48TH6	428.	4.25	69.	17.	17.	.00
+	HYDROGRAPH AT	RSUB41	91.	4.17	14.	4.	3.	.00
+	ROUTED TO	RNVDR1	91.	4.17	14.	4.	3.	.00
+	HYDROGRAPH AT	RDIV39	87.	4.00	34.	9.	8.	.00
+	2 COMBINED AT	COMB13	178.	4.17	48.	12.	12.	.00
+	HYDROGRAPH AT	RSUB39	67.	4.33	6.	2.	2.	.00
+	2 COMBINED AT	COMB14	234.	4.25	54.	14.	13.	.00
+	ROUTED TO	R-LAF1	234.	4.33	54.	14.	13.	.00
+	HYDROGRAPH AT	RSUB34	25.	4.25	5.	1.	1.	.00
+	2 COMBINED AT	COMB15	259.	4.33	60.	15.	15.	.00
+	ROUTED TO	R-LAF2	257.	4.33	60.	15.	15.	.00
+	HYDROGRAPH AT	RSUB32	6.	4.17	1.	0.	0.	.00
+	2 COMBINED AT	COMB16	263.	4.33	61.	15.	15.	.00
+	2 COMBINED AT	COMB17	680.	4.25	130.	33.	32.	.00
+	HYDROGRAPH AT	RSUB29	6.	4.17	1.	0.	0.	.00
+	2 COMBINED AT	COMB11	686.	4.25	131.	33.	32.	.00

1

MODEL: LID10b ADDED FUTURE "EAST" LAFAYETTE SD TO LID10A MODEL

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN  1998               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   29DEC10  TIME  15:15:14   *
*                                       *
*****************************************
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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           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX           XXX
```

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

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

1 HEC-1 INPUT PAGE 1

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

              *       ARCADIA AREA
    1         ID        LID10b.DAT
              *       LAFAYETTE BLVD & CAMELBACK RD ALTERNATE
              *       REVISED OLSSON ASSOCIATES BASE MODEL LID10a.DAT
              *       ADDED FUTURE "EAST" LAFAYETTE STORM DRAIN FROM ARCADIA EAST
              *       TO 56TH STREET TO CAPTURE 10-YEAR RUNOFF FROM SUB-BASINS 13,
              *       14, 18, 19, 23, AND 24
              *
    2         IT       5                    300
    3         IO       5
              *DIAGRAM
              *

    4         KK    SUB1
    5         KM    SUB-BASIN SUB1
    6         KM    6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
    7         KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
    8         KM      L =  .28  Kb = .108  Adj. Slope = 2120.0
    9         BA    .037
   10         IN      15
   11         KM    RAINFALL DEPTH OF 2.00 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
   12         PB    1.933
   13         KM    THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 2.20
   14         PC    .000    .010    .017    .026    .037    .046    .056    .065    .075    .085
   15         PC    .097    .111    .131    .175    .263    .455    .689    .829    .893    .933
   16         PC    .949    .962    .975    .988   1.000
   17         LG    .119    .337   4.650    .260  51.000
   18         UC    .154    .110
   19         UA       0       3       5       8      12      20      43      75      90      96
   20         UA     100
              *

   21         KK    R1-2
   22         KM        ROUTE FLOW FROM SUB1 TO SUB2
   23         RK  3183.8   .0166     .07       0    TRAP       0       3     YES
              *

   24         KK    SUB2
   25         KM    SUB-BASIN SUB2
   26         KM    6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
   27         KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
   28         KM      L =  .60  Kb = .041  Adj. Slope =   88.0
   29         BA    .117
   30         LG    .343    .250   4.650    .440   9.000
   31         UC    .587    .463
   32         UA       0       5      16      30      65      77      84      90      94      97
   33         UA     100
              *

   34         KK    DIV2
   35         KM       DIVERT FOR IRRIGATED LAWNS SUB2
   36         DT      D2     .80
   37         DI       0       1
   38         DQ       0    .382
              *
```

1 HEC-1 INPUT PAGE 2

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

   39         KK    C1-2
   40         KM        COMBINE HYDROGRAPHS SUB1 AND SUB2 AT CP2
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```
 41          HC       2
             *

 42          KK   D2-64
 43          KM        DIVERT FLOW
 44          DT   DSUB2
             *      DQ CARD REVISED TO REFLECT 125 CFS MAX CAPACITY OF EXIST SCOTTDALE SD
 45          DI       0      18      43      93     100     150
 46          DQ       0      18      18      18      18      18
             *

 47          KK    R2-3
 48          KM        ROUTE FLOW FROM SUB2 TO SUB3
 49          RK  1367.5    .009    .016            TRAP      60       1     YES
             *

 50          KK    SUB3
 51          KM   SUB-BASIN SUB3
 52          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 53          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 54          KM     L =  .26  Kb = .058  Adj. Slope =   47.0
 55          BA    .067
 56          LG    .298    .250   4.200    .520  16.000
 57          UC    .533    .293
 58          UA       0       5      16      30      65      77      84      90      94      97
 59          UA     100
             *

 60          KK    DIV3
 61          KM        DIVERT FOR IRRIGATED LAWNS SUB3
 62          DT      D3     .88
 63          DI       0       1
 64          DQ       0    .573
             *

 65          KK    C2-3
 66          KM        COMBINE HYDROGRAPHS SUB2 & SUB3 AT CP3
 67          HC       2
             *

 68          KK    R3-4
 69          KM        ROUTE FLOW FROM CP3 TO CP4
 70          RK    1320    .008    .016            TRAP      44       1     YES
             *

 71          KK    SUB4
 72          KM   SUB-BASIN SUB4
 73          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 74          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 75          KM     L =  .25  Kb = .058  Adj. Slope =   42.0
 76          BA    .065
 77          LG    .300    .250   4.800    .360  15.000
1                                          HEC-1 INPUT                                                    PAGE  3

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

 78          UC    .463    .246
 79          UA       0       5      16      30      65      77      84      90      94      97
 80          UA     100
             *

 81          KK    DIV4
 82          KM        DIVERT FOR IRRIGATED LAWNS SUB4
 83          DT      D4     1.0
 84          DI       0       1
 85          DQ       0     .55
             *

 86          KK    C3-4
 87          KM        COMBINE HYDROGRAPHS SUB3 & SUB4 AT CP4
 88          HC       2
             *

 89          KK   D4-64
 90          KM        DIVERT FLOW TO LAFAYETTE S.D.
 91          DT   DSUB4
 92          DI       0       3      10      50     100
 93          DQ       0       3       3       3       3
             *

 94          KK    R4-5
 95          KM        ROUTE FLOW FROM CP4 TO CP5
 96          RK  2307.4    .005    .016            TRAP      44       1     YES
             *

 97          KK    SUB5
 98          KM   SUB-BASIN SUB5
 99          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
100          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
101          KM     L =  .44  Kb = .058  Adj. Slope =   24.0
102          BA    .067
103          LG    .300    .250   4.800    .360  15.000
104          UC    .837    .736
105          UA       0       5      16      30      65      77      84      90      94      97
106          UA     100
             *

107          KK    DIV5
108          KM        DIVERT FOR IRRIGATED LAWNS SUB5
109          DT      D5     .94
110          DI       0       1
111          DQ       0     .50
             *
```

```
                KK    C4-5
                KM        COMBINE HYDROGRAPHS SUB4 & SUB5 AT CP5
                HC        2
                *
1                                          HEC-1 INPUT                                                    PAGE  4

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

                KK    SUB6
                KM    SUB-BASIN SUB6
                KM    6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
                KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
                KM      L =  .26  Kb = .104  Adj. Slope = 2367.0
                BA    .090
                LG    .106    .346   4.700    .240  49.000
                UC    .142    .057
                UA       0       3       5       8      12      20      43      75      90      96
                UA     100
                *

                KK    R6-7
                KM        ROUTE FLOW FROM SUB6 TO SUB7
                RK  2972.0    .013     .07            TRAP       0       3     YES
                *

                KK    SUB7
                KM    SUB-BASIN SUB7
                KM    6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
                KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
                KM      L =  .56  Kb = .053  Adj. Slope =   71.0
                BA    .153
                LG    .290    .271   5.400    .280  20.000
                UC    .546    .346
                UA       0       5      16      30      65      77      84      90      94      97
                UA     100
                *

                KK    DIV7
                KM        DIVERT FOR IRRIGATED LAWNS SUB7
                DT      D7    2.30
                DI       0       1
                DQ       0    .427
                *

                KK    C6-7
                KM        COMBINE HYDROGRAPHS SUB6 & SUB7 AT CP7
                HC        2
                *

                KK   D7-64
                KM        DIVERT FLOW
                DT   DSUB7
                DI       0      27     110     120     150     200
                DQ       0      27     110     110     110     110
                *

                KK    R7-8
                KM        ROUTE FLOW FROM SUB7 TO SUB8
                RK  2302.1    .001    .016            TRAP      40       1     YES
                *
1                                          HEC-1 INPUT                                                    PAGE  5

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

                KK    SUB8
                KM    SUB-BASIN SUB8
                KM    6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
                KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
                KM      L =  .44  Kb = .057  Adj. Slope =   52.0
                BA    .068
                LG    .300    .250   4.450    .450  15.000
                UC    .667    .566
                UA       0       5      16      30      65      77      84      90      94      97
                UA     100
                *

                KK    DIV8
                KM        DIVERT FOR IRRIGATED LAWNS SUB8
                DT      D8     .99
                DI       0       1
                DQ       0      .6
                *

                KK    C7-8
                KM        COMBINE HYDROGRAPHS SUB7 & SUB8 AT CP8
                HC        2
                *

                KK    R8-9
                KM        ROUTE FLOW FROM SUB8 TO SUB9
                RK  1314.7    .010    .016            TRAP      20       1     YES
                *

                KK    SUB9
                KM    SUB-BASIN SUB9
                KM    6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
                KM    THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
                KM      L =  .25  Kb = .058  Adj. Slope =   55.0
                BA    .065
                LG    .300    .250   4.450    .450  15.000
                UC    .463    .246
                UA       0       5      16      30      65      77      84      90      94      97
```

```
184          UA     100
             *

185          KK    DIV9
186          KM        DIVERT FOR IRRIGATED LAWNS SUB9
187          DT      D9     .94
188          DI       0       1
189          DQ       0      .6
             *

190          KK    C8-9
191          KM        COMBINE HYDROGRAPHS SUB8 & SUB9   AT CP9
192          HC       2
             *
1                                        HEC-1 INPUT                                        PAGE  6

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

193          KK    R9-5
194          KM        ROUTE FLOW FROM SUB9 TO  SUB5
195          RK  1784.7    .007    .016            TRAP      40       1     YES
             *

196          KK    C9-5
197          KM        COMBINE HYDROGRAPH SUB9  & SUB5  AT CP5
198          HC       2
             *

199          KK   SUB10
200          KM   SUB-BASIN SUB10
201          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
202          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
203          KM     L =  .34  Kb = .056  Adj. Slope =   37.0
204          BA    .093
205          LG    .299    .250   4.800    .360  15.000
206          UC    .575    .327
207          UA       0       5      16      30      65      77      84      90      94      97
208          UA     100
             *

209          KK   DIV10
210          KM        DIVERT FOR IRRIGATED LAWNS SUB10
211          DT     D10    1.17
212          DI       0       1
213          DQ       0    .445
             *

214          KK   C5-10
215          KM        COMBINE HYDROGRAPH SUB5  & SUB10 AT CP10
216          HC       2
             *

217          KK   SUB11
218          KM   SUB-BASIN SUB11
219          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
220          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
221          KM     L =  .56  Kb = .106  Adj. Slope = 1740.0
222          BA    .093
223          LG    .115    .350   4.550    .270  39.000
224          UC    .237    .183
225          UA       0       3       5       8      12      20      43      75      90      96
226          UA     100
             *

227          KK  R11-12
228          KM        ROUTE FLOW FROM SUB11 TO   SUB12
229          RK    1632    .058     .07            TRAP       0       3     YES
             *
1                                        HEC-1 INPUT                                        PAGE  7

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

230          KK   SUB12
231          KM   SUB-BASIN SUB12
232          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
233          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
234          KM     L =  .31  Kb = .064  Adj. Slope =  304.0
235          BA    .120
236          LG    .269    .277   5.600    .210   9.000
237          UC    .246    .102
238          UA       0       5      16      30      65      77      84      90      94      97
239          UA     100
             *

240          KK   DIV12
241          KM        DIVERT FOR IRRIGATED LAWNS SUB12
242          DT     D12     .31
243          DI       0       1
244          DQ       0    .079
             *

245          KK  C11-12
246          KM        COMBINE HYDROGRAPH SUB11 & SUB12 AT CP12
247          HC       2
             *

248          KK  D12-48
249          KM        DIVERT FLOW
250          DT  DSUB12
251          DI       0      50     100     130     150
252          DQ       0      50     100     130     130
             *
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```
253          KK  R12-13
254          KM        ROUTE FLOW FROM SUB12 TO SUB13
255          RK  1362.2    .020    .016            TRAP      60       1     YES      50
             *

256          KK   SUB13
257          KM   SUB-BASIN SUB13
258          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
259          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
260          KM     L =  .26  Kb = .054  Adj. Slope =  107.0
261          BA    .129
262          LG    .300    .230   6.200    .200  15.000
263          UC    .283    .100
264          UA       0       5      16      30      65      77      84      90      94      97
265          UA     100
             *

266          KK   DIV13
267          KM        DIVERT FOR IRRIGATED LAWNS SUB13
268          DT     D13     .98
269          DI       0       1
270          DQ       0      .2
             *
1                                        HEC-1 INPUT                                                    PAGE  8

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

271          KK  C12-13
272          KM        COMBINE HYDROGRAPHS SUB12 & SUB13 AT CP13
273          HC       2
             *

274          KK  R13-14
275          KM        ROUTE FL OW FROM SUB13 TO SUB14
276          RK  1314.7    .014    .016            TRAP      60       1     YES
             *

277          KK   SUB14
278          KM   SUB-BASIN SUB14
279          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
280          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
281          KM     L =  .25  Kb = .054  Adj. Slope =   74.0
282          BA    .126
283          LG    .300    .250   4.100    .550  15.000
284          UC    .429    .155
285          UA       0       5      16      30      65      77      84      90      94      97
286          UA     100
             *

287          KK   DIV14
288          KM        DIVERT FOR IRRIGATED LAWNS SUB14
289          DT     D14    1.57
290          DI       0       1
291          DQ       0      .6
             *

292          KK  C13-14
293          KM        COMBINE HYDROGRAPHS SUB13 & SUB14 AT CP14
294          HC       2
             *

295          KK  D14-48
296          KM        DIVERT FLOW FOR FUTURE "EAST" LAFAYETTE SD
297          DT  DSUB14
298          DI       0      50      84     100     150
299          DQ       0      50      84      84      84
             *

300          KK  R14-15
301          KM        ROUTE FLOW FROM SUB 14 TO SUB15
302          RK  1985.3    .011    .016            TRAP      60       1     YES
             *

303          KK   SUB15
304          KM   SUB-BASIN SUB15
305          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
306          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
307          KM     L =  .38  Kb = .054  Adj. Slope =   56.0
308          BA    .127
309          LG    .296    .250   4.650    .390  16.000
310          UC    .525    .271
1                                        HEC-1 INPUT                                                    PAGE  9

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

311          UA       0       5      16      30      65      77      84      90      94      97
312          UA     100
             *

313          KK   DIV15
314          KM        DIVERT FOR IRRIGATED LAWNS SUB15
315          DT     D15    2.05
316          DI       0       1
317          DQ       0    .585
             *

318          KK  C15-14
319          KM        COMBINE SUB14 WITH SUB15
320          HC       2
             *

321          KK  C15-10
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322          KM        COMBINE SUB10 WITH SUB15
323          HC       2
             *

324          KK   D56ST
325          KM        DIVERT FLOW THAT CROSSES 56TH ST. BRIDGE
326          DT   D56ST
327          DI        0     400     650     790    1040    1139    1334    1484    1689    1900
328          DQ        0       0     240     318     400     489     584     684     789     900
             *

329          KK   SUB16
330          KM   SUB-BASIN SUB16
331          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
332          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
333          KM     L =  .65  Kb = .102  Adj. Slope = 2052.0
334          BA    .129
335          LG    .104    .350   4.700    .240  47.000
336          UC    .233    .167
337          UA       0       3       5       8      12      20      43      75      90      96
338          UA     100
             *

339          KK  R16-17
340          KM        ROUTE FLOW FROM SUB16 TO SUB17
341          RK    1668    .058    .07            TRAP       0       3     YES
             *

342          KK   SUB17
343          KM   SUB-BASIN SUB17
344          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
345          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
346          KM     L =  .32  Kb = .058  Adj. Slope =  183.0
347          BA    .073
348          LG    .298    .252   4.150    .450  10.000
349          UC    .342    .201
350          UA       0       5      16      30      65      77      84      90      94      97
351          UA     100
             *
1                                        HEC-1 INPUT                                        PAGE 10

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

352          KK   DIV17
353          KM        DIVERT FOR IRRIGATED LAWNS SUB17
354          DT     D17     .11
355          DI       0       1
356          DQ       0    .074
             *

357          KK  C16-17
358          KM        COMBINE HYDROGRAPH SUB16 & SUB17 AT CP17
359          HC       2
             *

360          KK  D17-48
361          KM        DIVERT FLOW
362          DT  DSUB17
363          DI       0      50     100     121     150     200
364          DQ       0      50     100     121     121     121
             *

365          KK  R17-18
366          KM        ROUTE FLOW FROM SUB17 TO SUB18
367          RK  1378.1    .019    .016            TRAP      40       1     YES
             *

368          KK   SUB18
369          KM   SUB-BASIN SUB18
370          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
371          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
372          KM     L =  .26  Kb = .058  Adj. Slope =  102.0
373          BA    .067
374          LG    .300    .250   3.950    .580  15.000
375          UC    .417    .222
376          UA       0       5      16      30      65      77      84      90      94      97
377          UA     100
             *

378          KK   DIV18
379          KM        DIVERT FOR IRRIGATED LAWNS SUB18
380          DT     D18     .81
381          DI       0       1
382          DQ       0      .6
             *

383          KK  C17-18
384          KM        COMBINE  HYDROGRAPH SUB17 & SUB18 AT CP18
385          HC       2
             *

386          KK  R18-19
387          KM        ROUTE FLOW SUB18 TO SUB19
388          RK  1335.8    .014    .016            TRAP      40       1     YES
             *
1                                        HEC-1 INPUT                                        PAGE 11

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

389          KK   SUB19
390          KM   SUB-BASIN SUB19
391          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
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392          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
393          KM     L =  .25  Kb = .057  Adj. Slope =   77.0
394          BA    .075
395          LG    .300    .250   3.950    .580  15.000
396          UC    .446    .218
397          UA       0       5      16      30      65      77      84      90      94      97
398          UA     100
             *

399          KK   DIV19
400          KM        DIVERT FOR IRRIGATED LAWNS SUB19
401          DT     D19     .91
402          DI       0       1
403          DQ       0      .6
             *

404          KK  C18-19
405          KM        COMBINE HYDROGRAPH SUB18 & SUB19 AT CP19
406          HC       2
             *

407          KK  D19-48
408          KM        DIVERT FLOW FOR FUTURE "EAST" LAFAYETTE SD
409          DT  DSUB19
410          DI       0      14      50      75     100
411          DQ       0      14      14      14      14
             *

412          KK  R19-20
413          KM        ROUTE FLOW FROM SUB19 TO SUB20
414          RK  1473.1    .010    .016            TRAP      30       1     YES
             *

415          KK   SUB20
416          KM   SUB-BASIN SUB20
417          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
418          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
419          KM     L =  .28  Kb = .054  Adj. Slope =   54.0
420          BA    .129
421          LG    .300    .250   4.450    .450  15.000
422          UC    .475    .188
423          UA       0       5      16      30      65      77      84      90      94      97
424          UA     100
             *

425          KK   DIV20
426          KM        DIVERT FOR IRRIGATED LAWNS SUB20
427          DT     D20    1.86
428          DI       0       1
429          DQ       0      .6
             *
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LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

430          KK  C20-19
431          KM        COMBINE SUB19 WITH SUB20
432          HC       2
             *

433          KK  C20-15
434          KM        COMBINE SUB15 WITH SUB20
435          HC       2
             *

436          KK   SUB21
437          KM   SUB-BASIN SUB21
438          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
439          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
440          KM     L =  .56  Kb = .102  Adj. Slope = 2352.0
441          BA    .124
442          LG    .106    .350   4.700    .240  46.000
443          UC    .208    .134
444          UA       0       3       5       8      12      20      43      75      90      96
445          UA     100
             *

446          KK  R21-22
447          KM        ROUTE FLOW FROM SUB21 TO SUB22
448          RK    2735    .026     .07            TRAP       0       3     YES
             *

449          KK   SUB22
450          KM   SUB-BASIN SUB22
451          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
452          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
453          KM     L =  .52  Kb = .059  Adj. Slope =  134.0
454          BA    .112
455          LG    .286    .261   4.000    .490   9.000
456          UC    .579    .417
457          UA       0       5      16      30      65      77      84      90      94      97
458          UA     100
             *

459          KK   DIV22
460          KM        DIVERT FOR IRRIGATED LAWNS SUB22
461          DT     D22     .12
462          DI       0       1
463          DQ       0    .063
             *

464          KK  C21-22
465          KM        COMBINE HYDROGRAPH SUB21 & SUB22 AT CP22
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```
 466          HC       2
              *
1                                        HEC-1 INPUT                                                PAGE 13

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

 467          KK  D22-48
 468          KM        DIVERT FLOW
 469          DT  DSUB22
 470          DI        0      50     100     117     150     200
 471          DQ        0      50     100     117     117     117
              *

 472          KK  R22-23
 473          KM        ROUTE FLOW FROM SUB22 TO SUB23
 474          RK  1240.8    .025    .016            TRAP      20       1     YES
              *

 475          KK   SUB23
 476          KM   SUB-BASIN SUB23
 477          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 478          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 479          KM     L =  .23  Kb = .058  Adj. Slope =  132.0
 480          BA    .060
 481          LG    .300    .250   3.950    .580  15.000
 482          UC    .346    .175
 483          UA       0       5      16      30      65      77      84      90      94      97
 484          UA     100
              *

 485          KK   DIV23
 486          KM        DIVERT FOR IRRIGATED LAWNS SUB23
 487          DT     D23     .72
 488          DI       0       1
 489          DQ       0    .593
              *

 490          KK  C22-23
 491          KM        COMBINE HYDROGRAPH SUB22 & SUB23 AT CP23
 492          HC       2
              *

 493          KK  R23-24
 494          KM        ROUTE FLOW FROM SUB 23 TO SUB24
 495          RK  1088.9    .015    .016            TRAP      32       1     YES
              *

 496          KK   SUB24
 497          KM   SUB-BASIN SUB24
 498          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 499          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 500          KM     L =  .28  Kb = .057  Adj. Slope =   78.0
 501          BA    .077
 502          LG    .300    .250   3.950    .580  15.000
 503          UC    .475    .252
 504          UA       0       5      16      30      65      77      84      90      94      97
 505          UA     100
              *
1                                        HEC-1 INPUT                                                PAGE 14

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

 506          KK   DIV24
 507          KM        DIVERT FOR IRRIGATED LAWNS SUB24
 508          DT     D24     .93
 509          DI       0       1
 510          DQ       0      .6
              *

 511          KK  C23-24
 512          KM        COMBINE HYDROGRAPH SUB23 & SUB24 AT CP24
 513          HC       2
              *

 514          KK  D24-54
 515          KM        DIVERT FLOW FOR FUTURE "EAST" LAFAYETTE SD
 516          DT  DSUB24
 517          DI        0      10      14      50     100
 518          DQ        0      10      14      14      14
              *

 519          KK  R24-25
 520          KM        ROUTE FLOW FROM SUB24 TO SUB25
 521          RK  1346.4    .009    .016            TRAP      40       1     YES
              *

 522          KK   SUB25
 523          KM   SUB-BASIN SUB25
 524          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 525          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 526          KM     L =  .25  Kb = .057  Adj. Slope =   46.0
 527          BA    .076
 528          LG    .300    .250   3.950    .580  15.000
 529          UC    .546    .271
 530          UA       0       5      16      30      65      77      84      90      94      97
 531          UA     100
              *

 532          KK   DIV25
 533          KM        DIVERT FOR IRRIGATED LAWNS SUB25
 534          DT     D25     .93
 535          DI       0       1
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```
536          DQ       0      .6
             *

537          KK  C25-24
538          KM        COMBINE SUB24 WITH SUB25
539          HC       2
             *
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

540          KK  D25-54
541          KM        DIVERT FLOW FOR FUTURE "EAST" LAFAYETTE SD
542          DT  DSUB25
543          DI       0       7      20      50     100
544          DQ       0       7       7       7       7
             *

545          KK  C25-20
546          KM        COMBINE SUB20 WITH SUB25
547          HC       2
             *

548          KK   SUB26
549          KM   SUB-BASIN SUB26
550          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
551          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
552          KM     L =  .52  Kb = .063  Adj. Slope =  840.0
553          BA    .054
554          LG    .289    .289   4.200    .550  14.000
555          UC    .313    .318
556          UA       0       3       5       8      12      20      43      75      90      96
557          UA     100
             *

558          KK   DIV26
559          KM        DIVERT FOR GOLF   COURSE
560          DT     D26     .31
561          DI       0       1
562          DQ       0    .312
             *

563          KK  D26-48
564          KM        DIVERT FLOW
565          DT  DSUB26
566          DI       0       1       7      20      50     100
567          DQ       0       1       7       7       7       7
             *

568          KK  R26-27
569          KM        ROUTE FLOW FROM SUB26 TO SUB27
570          RK  1293.6    .024    .016            TRAP      35       1     YES
             *

571          KK   SUB27
572          KM   SUB-BASIN SUB27
573          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
574          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
575          KM     L =  .25  Kb = .058  Adj. Slope =  122.0
576          BA    .061
577          LG    .300    .250   3.950    .580  15.000
578          UC    .375    .202
579          UA       0       5      16      30      65      77      84      90      94      97
580          UA     100
             *
```



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

581          KK   DIV27
582          KM        DIVERT FOR IRRIGATED LAWNS SUB27
583          DT     D27     .74
584          DI       0     1.0
585          DQ       0     .60
             *

586          KK  D27-48
587          KM        DIVERT FLOW
588          DT  DSUB27
589          DI       0       5      12      20      50
590          DQ       0       5      12      12      12
             *

591          KK  C26-27
592          KM        COMBINE HYDROGRAPH SUB 26 & SUB27 AT CP27
593          HC       2
             *

594          KK  R27-28
595          KM        ROUTE FLOW FROM SUB 27 TO SUB28
596          RK  1436.2    .017    .016            TRAP      35       1     YES
             *

597          KK   SUB28
598          KM   SUB-BASIN SUB28
599          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
600          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
601          KM     L =  .27  Kb = .057  Adj. Slope =   89.0
602          BA    .078
603          LG    .300    .250   3.950    .580  15.000
604          UC    .442    .224
```

```
605          UA       0       5      16      30      65      77      84      90      94      97
606          UA     100
             *

607          KK   DIV28
608          KM        DIVERT FOR IRRIGATED LAWNS SUB28
609          DT     D28     .95
610          DI       0       1
611          DQ       0     .60
             *

612          KK  D28-48
613          KM        DIVERT FLOW
614          DT  DSUB28
615          DI       0       4       7      10      15
616          DQ       0       4       7       7       7
             *
1                                      HEC-1 INPUT                                          PAGE 17

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

617          KK  C27-28
618          KM        COMBINE HYDROGRAPH SUB27 & SUB28 AT CP28
619          HC       2
             *

620          KK  R28-29
621          KM        ROUTE FLOW FROM SUB 28 TO SUB29
622          RK  1161.6    .009    .016            TRAP      35       1     YES
             *

623          KK   SUB29
624          KM   SUB-BASIN SUB29
625          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
626          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
627          KM     L =  .22  Kb = .058  Adj. Slope =   47.0
628          BA    .058
629          LG    .299    .250   3.950    .580  15.000
630          UC    .504    .261
631          UA       0       5      16      30      65      77      84      90      94      97
632          UA     100
             *

633          KK   DIV29
634          KM        DIVERT FOR IRRIGATED LAWNS SUB29
635          DT     D29     .70
636          DI       0       1
637          DQ       0    .587
             *

638          KK  D29-48
639          KM        DIVERT FLOW
640          DT  DSUB29
641          DI       0       2      10      25      50
642          DQ       0       2      10      10      10
             *

643          KK  C29-28
644          KM        COMBINE SUB29 WITH SUB28
645          HC       2
             *

646          KK  C29-25
647          KM        COMBINE SUB25 WITH SUB29
648          HC       2
             *
             * DIVIDE SUB 38 INTO 2 SUBBASINS 38A & 38B.  SUB38A WILL FLOW SOUTH INTO
             * CENTRAL CMBK SD SYSTEM.  16CFS FROM SUB 38A WILL BE DIVERTED WEST INTO
             * 44TH ST SYSTEM VIA SUB 38B.
1                                      HEC-1 INPUT                                          PAGE 18

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

649          KK  SUB38A
650          KM   SUB-BASIN SUB38A
651          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
652          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
653          KM     L = 1.28  Kb = .090  Adj. Slope = 1079.0
             *      BA  .252
             *      LG  .133    .340   4.500    .290  36.000
             *      UC  .412    .370
             *      UA     0       5      16      30      65      77      84      90      94
             *      UA   100
654          BA    .118
655          LG   0.15    0.33    4.70    0.26      62
656          UC  0.500   0.566
             * HEC-1 DEFAULT FOR UNIT HYDROGRAPH TIME-AREA
657          UA       0     4.5    12.6    23.2    35.8    50.0    64.2    76.8    87.4    95.5
658          UA     100
             *

659          KK  D38-39
660          KM        DIVERT 16CFS FROM SUB38A TO SUB38B
661          DT  DSUB38
662          DI       0       5      10      16      50     100     200     400     600
663          DQ       0       5      10      16      16      16      16      16      16
             *

664          KK  R38-30
665          KM        ROUTE FLOW FROM SUB38A TO SUB30
666          RK    1200    .035    .016            TRAP      30       1     YES
             *
```

```
667          KK   SUB30
668          KM   SUB-BASIN SUB30
669          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
670          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
671          KM     L =  .48  Kb = .064  Adj. Slope =  571.0
672          BA    .064
673          LG    .279    .263   3.950    .480   8.000
674          UC    .313    .271
675          UA       0       5      16      30      65      77      84      90      94      97
676          UA     100
             *

677          KK  C30-38
678          KM       COMBINE SUB38A & SUB30 AT CP30
679          HC       2
             *

680          KK  D30-48
681          KM       DIVERT FLOW
682          DT  DSUB30
683          DI       0      50      60     100
684          DQ       0      50      60      60
             *
1                                        HEC-1 INPUT                                                    PAGE 19

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

685          KK  R30-31
686          KM       ROUTE FLOW FROM SUB30 TO SUB31
687          RK    1304   .0225    .025            TRAP      20       1     YES
             *

688          KK   SUB31
689          KM   SUB-BASIN SUB31
690          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
691          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
692          KM     L =  .25  Kb = .058  Adj. Slope =  118.0
693          BA    .061
694          LG    .300    .260   3.670    .690  15.000
695          UC    .429    .235
696          UA       0       3       5       8      12      20      43      75      90      96
697          UA     100
             *

698          KK   DIV31
699          KM       DIVERT FOR IRRIGATED LAWNS SUB31
700          DT     D31     .45
701          DI       0       1
702          DQ       0    .400
             *

703          KK  C30-31
704          KM       COMBINE SUB30 & SUB31 AT CP31
705          HC       2
             *

706          KK  R31-32
707          KM       ROUTE FLOW FROM SUB31 TO SUB32
708          RK    1260    .019    .016       0    TRAP      30       1     YES
             *

709          KK   SUB32
710          KM   SUB-BASIN SUB32
711          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
712          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
713          KM     L =  .27  Kb = .058  Adj. Slope =   77.0
714          BA    .064
715          LG    .300    .250   3.950    .580  15.000
716          UC    .475    .272
717          UA       0       5      16      30      65      77      84      90      94      97
718          UA     100
             *

719          KK   DIV32
720          KM       DIVERT FOR IRRIGATED LAWNS SUB32
721          DT     D32     .79
722          DI     0.0     1.0
723          DQ       0     .60
             *
1                                        HEC-1 INPUT                                                    PAGE 20

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

724          KK   DLAF2
725          KM       DIVERT FLOW TO LAFAYETTE S.D.
726          DT  DSUB32
727          DI       0       5      10      13      15      20
728          DQ       0       5      10      13      13      13
             *

729          KK  C31-32
730          KM       COMBINE HYDROGRAPH SUB31 & SUB32 AT CP32
731          HC       2
             *

732          KK  R32-33
733          KM       ROUTE FLOW FROM SUB32 TO SUB33
734          RK    1447   .0144     .07            TRAP       0       3     YES
             *

735          KK   SUB33
```

```
736          KM   SUB-BASIN SUB33
737          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
738          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
739          KM     L =  .22  Kb = .058  Adj. Slope =   65.0
740          BA    .062
741          LG    .277    .250   3.950    .580  22.000
742          UC    .404    .197
743          UA       0       5      16      30      65      77      84      90      94      97
744          UA     100
             *

745          KK   DIV33
746          KM        DIVERT FOR IRRIGATED LAWNS SUB33
747          DT     D33     .62
748          DI       0       1
749          DQ       0     .37
             *
             *

750          KK  C33-32
751          KM        COMBINE SUB32 WITH SUB33
752          HC       2
             *

753          KK  C33-29
754          KM        COMBINE SUB29 WITH SUB33
755          HC       2
             *

756          KK   SUB34
757          KM   SUB-BASIN SUB34
758          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
759          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
760          KM     L =  .57  Kb = .050  Adj. Slope =   87.0
761          BA    .167
762          LG    .284    .250   3.950    .590  20.000
1                                        HEC-1 INPUT                                        PAGE 21

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

763          UC    .613    .380
764          UA       0       5      16      30      65      77      84      90      94      97
765          UA     100
             *

766          KK   DIV34
767          KM        DIVERT FOR IRRIGATED LAWNS SUB34
768          DT     D34    1.53
769          DI       0       1
770          DQ       0    .366
             *

771          KK   DLAF1
772          KM        DIVERT FLOW TO LAFAYETTE S.D.
773          DT  DSUB34
774          DI       0      10      25      30      50
775          DQ       0      10      25      25      25
             *

776          KK  R34-35
777          KM        ROUTE FLOW FROM SUB34 TO SUB35
778          RK  1531.2    .018    .016           TRAP      40       1     YES
             *

779          KK   SUB35
780          KM   SUB-BASIN SUB35
781          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
782          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
783          KM     L =  .29  Kb = .048  Adj. Slope =   51.0
784          BA    .128
785          LG    .223    .250   3.950    .600  39.000
786          UC    .400    .160
787          UA       0       3       5       8      12      20      43      75      90      96
788          UA     100
             *

789          KK   DIV35
790          KM        DIVERT FOR IRRIGATED LAWNS SUB35
791          DT     D35     .53
792          DI     0.0     1.0
793          DQ     0.0    .095
             *

794          KK  C35-34
795          KM        COMBINE SUB34 WITH SUB35
796          HC       2
             *

797          KK  C35-33
798          KM        COMBINE SUB33 WITH SUB35
799          HC       2
             *
1                                        HEC-1 INPUT                                        PAGE 22

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

800          KK   SUB40
801          KM   SUB-BASIN SUB40
802          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
803          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
804          KM     L =  .31  Kb = .099  Adj. Slope = 1822.0
805          BA    .074
806          LG    .162    .332   4.250    .350  22.000
```

```
 807          UC    .183    .097
 808          UA       0       5      16      30      65      77      84      90      94      97
 809          UA     100
              *

 810          KK  R40-41
 811          KM        ROUTE FLOW FROM SUB40 TO SUB41
 812          RK    1452   .0221     .05            TRAP       6       2     YES
              *

 813          KK   SUB41
 814          KM   SUB-BASIN SUB41
 815          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 816          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 817          KM     L =  .54  Kb = .054  Adj. Slope =  110.0
 818          BA    .144
 819          LG    .283    .251   4.600    .360  17.000
 820          UC    .479    .301
 821          UA       0       5      16      30      65      77      84      90      94      97
 822          UA     100
              *

 823          KK  C40-41
 824          KM        COMBINE HYDROGRAPH SUB40 & SUB41 AT CP41
 825          HC       2
              *

 826          KK  D41-44
 827          KM        DIVERT FLOW FOR 44TH ST. SYSTEM
 828          DT  DSUB41
 829          DI       0      50      93     100     150
 830          DQ       0      50      92      92      92
              *

 831          KK  R41-39
 832          KM        ROUTE FLOW FROM SUB41 TO   SUB39
 833          RK    2865   .0341     .05            TRAP       4       3     YES
              *
              * ADD SUBBASIN 38B

 834          KK  SUB38B
 835          BA   0.141
 836          LG    0.25    0.27    4.35    0.38      42
 837          UC   0.390   0.306
 838          UA       0     4.5    12.6    23.2    35.8    50.0    64.2    76.8    87.4    95.5
 839          UA     100
```



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

 840          KK  RD3839
 841          KM        RECALL DIVERSION FROM SUBBASIN 38
 842          DR  DSUB38
              *

 843          KK   C-38B
 844          KM   COMBINE SUB 38B WITH 38A WEST DIVERSION
 845          HC       2
              *

 846          KK   SUB37
 847          KM   SUB-BASIN SUB37
 848          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 849          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 850          KM     L =  .30  Kb = .059  Adj. Slope =  247.0
 851          BA    .049
 852          LG    .300    .250   3.950    .490   5.000
 853          UC    .317    .220
 854          UA       0       5      16      30      65      77      84      90      94      97
 855          UA     100
              *

 856          KK  R37-39
 857          KM        ROUTE FLOW FROM SUB37 TO   SUB39
 858          RK    3500    .018    .016            TRAP      70       1     YES
              *

 859          KK   SUB39
 860          KM   SUB-BASIN SUB39
 861          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 862          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 863          KM     L =  .84  Kb = .051  Adj. Slope =   79.0
 864          BA    .188
 865          LG    .220    .262   4.000    .530  34.000
 866          UC    .671    .536
 867          UA       0       3       5       8      12      20      43      75      90      96
 868          UA     100
              *

 869          KK  C37-39
 870          KM        COMBINE SUB39  WITH SUB37 WITH COMBINED FROM SUB38B & 38A WEST DIVERSION
 871          HC       3
              *

 872          KK  D39-44
 873          KM        DIVERT FOR 44TH ST SYSTEM
 874          DT  DSUB39
 875          DI       0      10      20     100     150     153     175     200
 876          DQ       0      10      20     100     150     153     153     153
              *
```



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

```
877          KK  C41-39
878          KM        COMBINE SUB41 WITH SUB39
879          HC       2
             *

880          KK  R39-36
881          KM        ROUTE FLOW FROM SUB39 TO   SUB36
882          RK    1250    .006    .016            TRAP      26       1     YES
             *

883          KK   SUB36
884          KM   SUB-BASIN SUB36
885          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
886          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
887          KM     L =  .28  Kb = .052  Adj. Slope =   14.0
888          BA    .089
889          LG    .232    .250   3.950    .590  41.000
890          UC    .642    .324
891          UA       0       5      16      30      65      77      84      90      94      97
892          UA     100
             *

893          KK   DIV36
894          KM        DIVERT FOR IRRIGATED LAWNS SUB36
895          DT     D36     .61
896          DI     0.0     1.0
897          DQ     0.0    .150
             *

898          KK  C39-36
899          KM        COMBINE SUB39 WITH SUB36
900          HC       2
             *

901          KK  C36-35
902          KM        COMBINE SUB36 WITH SUB35
903          HC       2
             *

904          KK   SUB42
905          KM   SUB-BASIN SUB42
906          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
907          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
908          KM     L =  .51  Kb = .044  Adj. Slope =   29.0
909          BA    .251
910          LG    .256    .250   5.600    .250  23.000
911          UC    .596    .267
912          UA       0       5      16      30      65      77      84      90      94      97
913          UA     100
             *
```



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

914          KK   DIV42
915          KM        DIVERT FOR IRRIGATED LAWNS SUB42
916          DT     D42     .75
917          DI       0       1
918          DQ       0    .072
             *

919          KK  C42-36
920          KM        COMBINE HYDROGRAPH SUB42 WITH SUB36
921          HC       2
             *
             *
             *
             *
             *       100-YR PEAK FLOW AFTER 2-YR FLUSH HYDROGRAPH FOR DETENTION SIZING
             *
             *       64TH STREET TRUNK LINE
             *       DIVERTS FIRST 127 CFS TO LAFAYETTE STORM DRAIN
             *       AT LAFAYETTE BLVD. AND 64TH ST.
             *

922          KK   RSUB7
923          KM        RECALL DIVERSION
924          DR   DSUB7
             *

925          KK  R64TH1
926          KM        ROUTE FLOW
927          RK    2400    .005    .018            CIRC       4             YES
             *

928          KK   RSUB2
929          KM        RECALL DIVERSION
930          DR   DSUB2
             *

931          KK   COMB1
932          KM        COMBINE FLOW
933          HC       2
             *

934          KK  R64TH2
935          KM        ROUTE FLOW
936          RK    2700    .005    .018            CIRC       4             YES
             *
             *
             *
```

```
                *
                *
                *
                *       48TH STREET TRUNK LINE
                *       2-YR FLOWS FROM N. OF CAMELBACK AND SUBS 29,30, & 31.
                *
                *
                *
1                                                HEC-1 INPUT                                                PAGE 26

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

            937     KK  RSUB12
            938     KM        RECALL DIVERSION
            939     DR  DSUB12
                    *
            940     KK  R48TH1
            941     KM        ROUTE FLOW
            942     RK    2200    .005    .018          CIRC       4             YES
                    *
            943     KK  RSUB17
            944     KM        RECALL DIVERSION
            945     DR  DSUB17
                    *
            946     KK   COMB2
            947     KM        COMBINE FLOW
            948     HC       2
                    *
            949     KK  R48TH2
            950     KM        ROUTE FLOW
            951     RK    1300    .005    .018          CIRC     4.5             YES
                    *
            952     KK  RSUB22
            953     KM        RECALL DIVERSION
            954     DR  DSUB22
                    *
            955     KK   COMB3
            956     KM        COMBINE FLOW
            957     HC       2
                    *
            958     KK  R48TH3
            959     KM        ROUTE FLOW
            960     RK    1000    .005    .018          CIRC       5             YES
                    *
            961     KK  RSUB26
            962     KM        RECALL DIVERSION
            963     DR  DSUB26
                    *
            964     KK   COMB6
            965     KM        COMBINE FLOW
            966     HC       2
                    *
1                                                HEC-1 INPUT                                                PAGE 27

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

            967     KK  RSUB30
            968     KM        RECALL DIVERSION
            969     DR  DSUB30
                    *
            970     KK   COMB7
            971     KM        COMBINE FLOW
            972     HC       2
                    *
            973     KK  R48TH4
            974     KM        ROUTE FLOW
            975     RK    1300    .005    .018          CIRC     5.5             YES
                    *
            976     KK  RSUB27
            977     KM        RECALL DIVERSION
            978     DR  DSUB27
                    *
            979     KK   COMB9
            980     KM        COMBINE FLOW
            981     HC       2
                    *
            982     KK  R48TH5
            983     KM        ROUTE FLOW
            984     RK    1300    .005    .018          CIRC       6             YES
                    *
            985     KK  RSUB28
            986     KM        RECALL DIVERSION
            987     DR  DSUB28
                    *
            988     KK  COMB10
            989     KM        COMBINE FLOW
```

```
 990          HC       2
              *

 991          KK  R48TH6
 992          KM        ROUTE FLOW
 993          RK    1175    .005    .018            CIRC     6.5            YES
              *
              *
              *
              *       44TH STREET TRUNK LINE SYSTEM
              *
1                                        HEC-1 INPUT                                        PAGE 28

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

 994          KK  RSUB41
 995          KM        RECALL DIVERSION
 996          DR  DSUB41
              *

 997          KK  R44TH1
 998          KM        ROUTE FLOW
 999          RK     900    .005    .018            CIRC       5            YES
              *

1000          KK  RSUB39
1001          KM        RECALL DIVERSION
1002          DR  DSUB39
              *

1003          KK  COMB13
1004          KM        COMBINE  FLOW
1005          HC       2
              *

1006          KK  R-LAF1
1007          KM        ROUTE FLOW
1008          RK    3400    .005    .018            CIRC       6            YES
              *

1009          KK  RSUB34
1010          KM        RECALL DIVERSION
1011          DR  DSUB34
              *

1012          KK  COMB14
1013          KM        COMBINE  FLOW
1014          HC       2
              *

1015          KK  R-LAF2
1016          KM        ROUTE FLOW
1017          RK    1600    .005    .018            CIRC     6.5            YES
              *

1018          KK  RSUB32
1019          KM        RECALL DIVERSION
1020          DR  DSUB32
              *

1021          KK  COMB15
1022          KM        COMBINE  FLOW
1023          HC       2
              *
1                                        HEC-1 INPUT                                        PAGE 29

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

1024          KK  COMB16
1025          KM        COMBINE  FLOW
1026          HC       2
              *

1027          KK  RSUB29
1028          KM        RECALL DIVERSION
1029          DR  DSUB29
              *

1030          KK  COMB11
1031          KM        COMBINE FLOW
1032          HC       2
              *

1033          KK  RSUB14
1034          KM        RECALL "EAST" LID DIVERSION
1035          DR  DSUB14
              *

1036          KK .RLIDE1
1037          KM        ROUTE SD FROM SUB14 TO SUB19
1038          RK    1650    .008    .013            CIRC       4            YES
              *

1039          KK  RSUB19
1040          KM        RECALL "EAST" LID DIVERSION
1041          DR  DSUB19
              *

1042          KK  COMB20
1043          KM        COMBINE  FLOW
1044          HC       2
```

```
          1045           KK  RLIDE2
          1046           KM        ROUTE SD FROM SUB19 TO SUB24
          1047           RK    1700    .008    .013           CIRC       4             YES
                         *

          1048           KK  RSUB24
          1049           KM        RECALL "EAST" LID DIVERSION
          1050           DR  DSUB24
                         *

          1051           KK  COMB21
          1052           KM        COMBINE  FLOW
          1053           HC       2

          1054           KK  RLIDE3
          1055           KM        ROUTE SD SOUTH AT 50TH ST, THEN WEST THROUGH BASIN
          1056           RK    1375    .005    .013           CIRC     4.5             YES
                         *
1                                                    HEC-1 INPUT                                                    PAGE 30

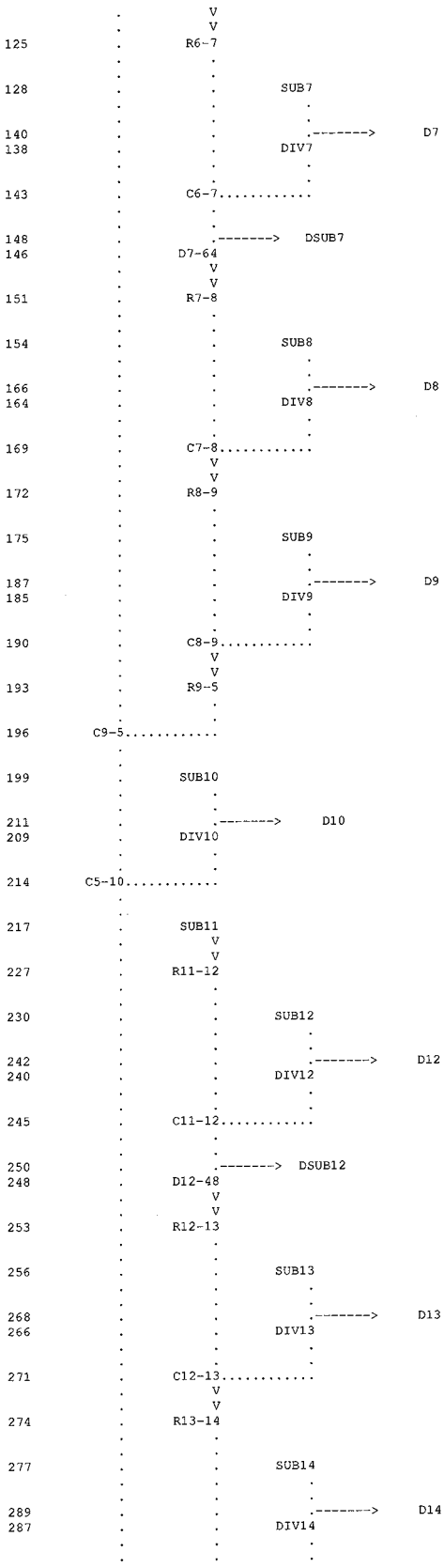
          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          1057           KK  RSUB25
          1058           KM        RECALL "EAST" LID DIVERSION
          1059           DR  DSUB25
                         *

          1060           KK  COMB22
          1061           KM        COMBINE FLOWS FROM "EAST" LID, ARCADIA SD, & SUB-BASIN 25
          1062           HC       3
                         *
          1063           ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

     4        SUB1
                 V
                 V
    21        R1-2
                 .
                 .
    24           .        SUB2
                 .           .
                 .           .
    36           .           .-------->      D2
    34           .        DIV2
                 .           .
                 .           .
    39        C1-2............
                 .
                 .
    44           .-------->   DSUB2
    42       D2-64
                 V
                 V
    47        R2-3
                 .
                 .
    50           .        SUB3
                 .           .
                 .           .
    62           .           .-------->      D3
    60           .        DIV3
                 .           .
                 .           .
    65        C2-3............
                 V
                 V
    68        R3-4
                 .
                 .
    71           .        SUB4
                 .           .
                 .           .
    83           .           .-------->      D4
    81           .        DIV4
                 .           .
                 .           .
    86        C3-4............
                 .
                 .
    91           .-------->   DSUB4
    89       D4-64
                 V
                 V
    94        R4-5
                 .
                 .
    97           .        SUB5
                 .           .
                 .           .
   109           .           .-------->      D5
   107           .        DIV5
                 .           .
                 .           .
   112        C4-5............
                 .
                 .
   115           .        SUB6
```


R6-7
SUB7
D7
DIV7
C6-7
DSUB7
D7-64
R7-8
SUB8
D8
DIV8
C7-8
R8-9
SUB9
D9
DIV9
C8-9
R9-5
C9-5
SUB10
D10
DIV10
C5-10
SUB11
R11-12
SUB12
D12
DIV12
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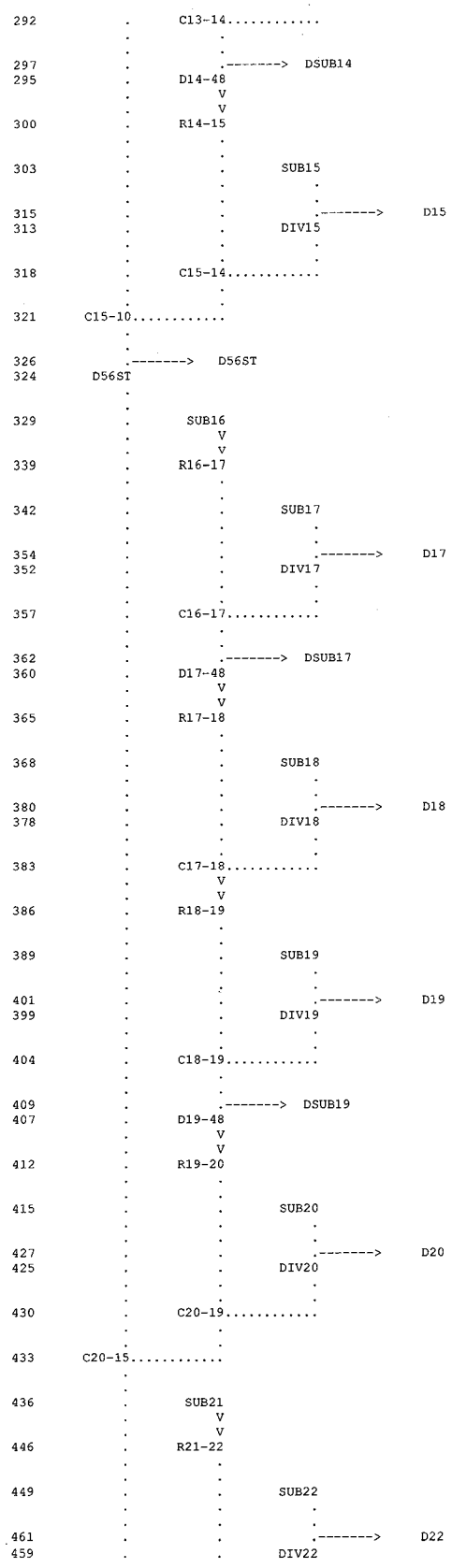
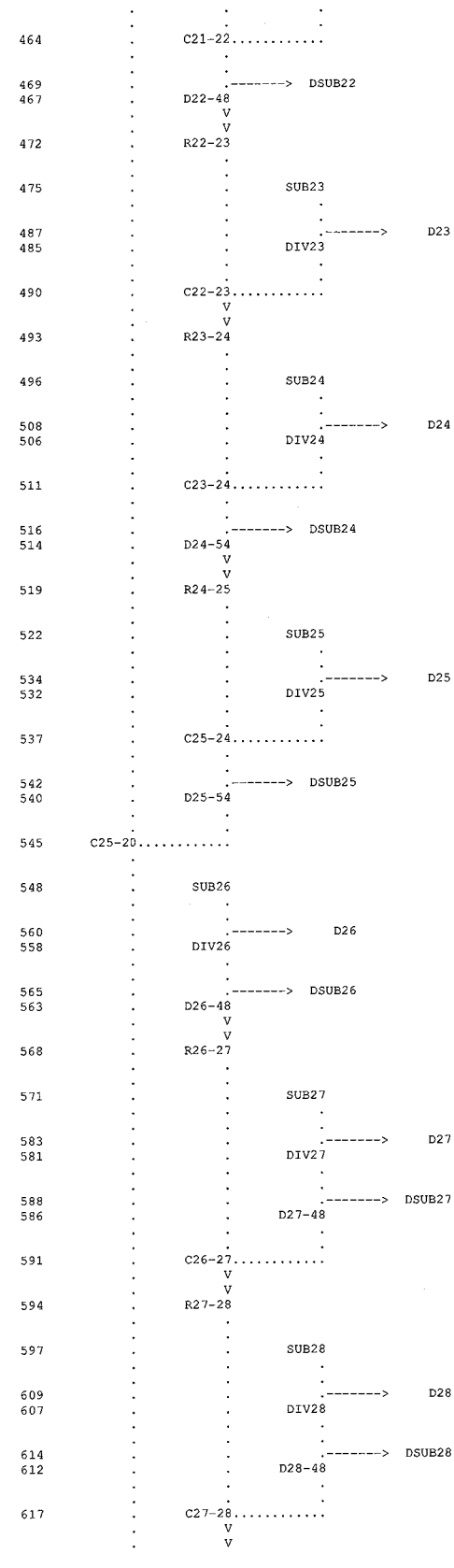
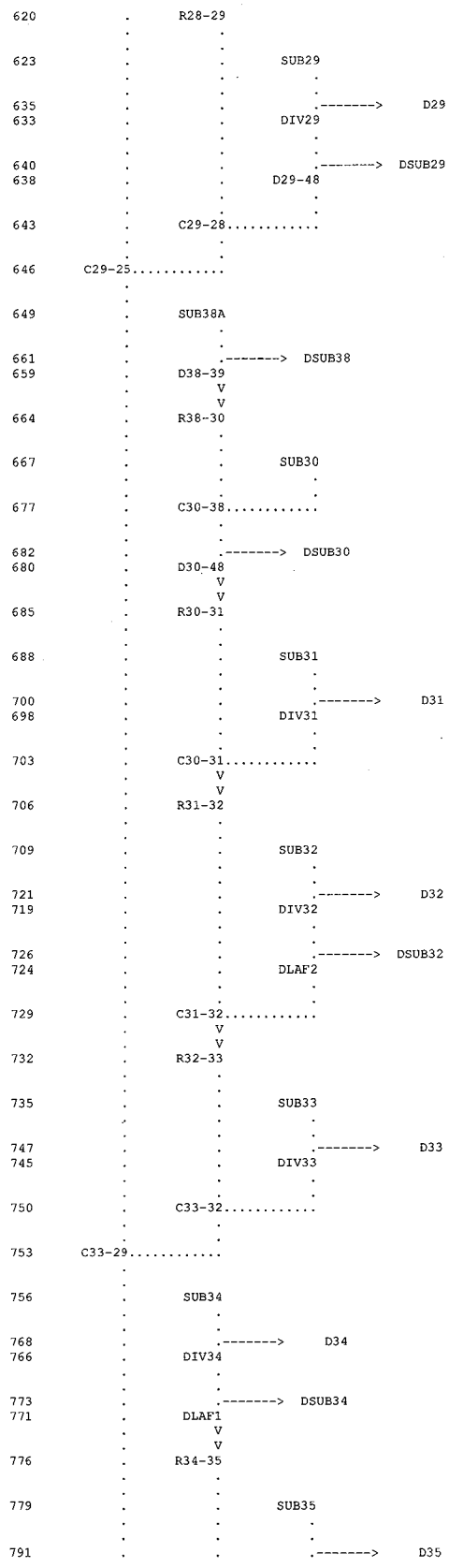
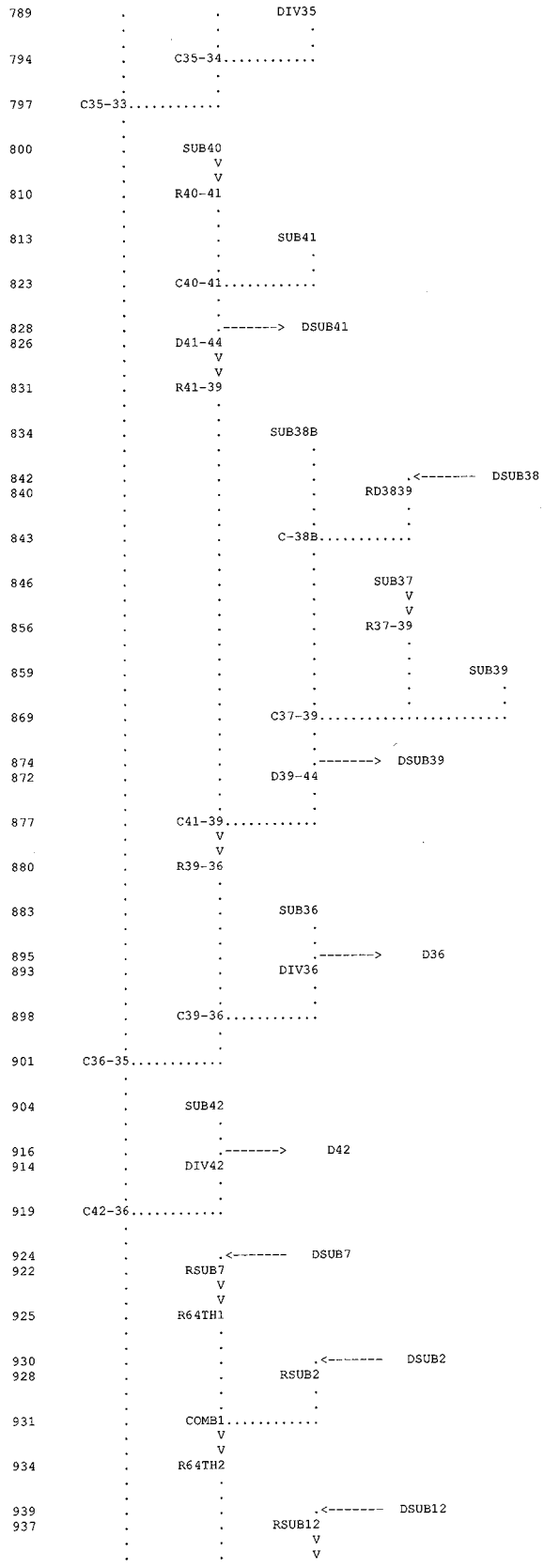
DIV13
C12-13
R13-14
SUB14
D14
DIV14


292 C13-14
297 DSUB14
295 D14-48
300 R14-15
303 SUB15
315 D15
313 DIV15
318 C15-14
321 C15-10
326 D56ST
324 D56ST
329 SUB16
339 R16-17
342 SUB17
354 D17
352 DIV17
357 C16-17
362 DSUB17
360 D17-48
365 R17-18
368 SUB18
380 D18
378 DIV18
383 C17-18
386 R18-19
389 SUB19
401 D19
399 DIV19
404 C18-19
409 DSUB19
407 D19-48
412 R19-20
415 SUB20
427 D20
425 DIV20
430 C20-19
433 C20-15
436 SUB21
446 R21-22
449 SUB22
461 D22
459 DIV22


464 C21-22
469
467 D22-48
472 R22-23
475 SUB23
487 D23
485 DIV23
490 C22-23
493 R23-24
496 SUB24
508 D24
506 DIV24
511 C23-24
516 DSUB24
514 D24-54
519 R24-25
522 SUB25
534 D25
532 DIV25
537 C25-24
542 DSUB25
540 D25-54
545 C25-20
548 SUB26
560 D26
558 DIV26
565 DSUB26
563 D26-48
568 R26-27
571 SUB27
583 D27
581 DIV27
588 DSUB27
586 D27-48
591 C26-27
594 R27-28
597 SUB28
609 D28
607 DIV28
614 DSUB28
612 D28-48
617 C27-28


620 R28-29
623 SUB29
635 D29
633 DIV29
640 DSUB29
638 D29-48
643 C29-28
646 C29-25
649 SUB38A
661 DSUB38
659 D38-39
664 R38-30
667 SUB30
677 C30-38
682 DSUB30
680 D30-48
685 R30-31
688 SUB31
700 D31
698 DIV31
703 C30-31
706 R31-32
709 SUB32
721 D32
719 DIV32
726 DSUB32
724 DLAF2
729 C31-32
732 R32-33
735 SUB33
747 D33
745 DIV33
750 C33-32
753 C33-29
756 SUB34
768 D34
766 DIV34
773 DSUB34
771 DLAF1
776 R34-35
779 SUB35
791 D35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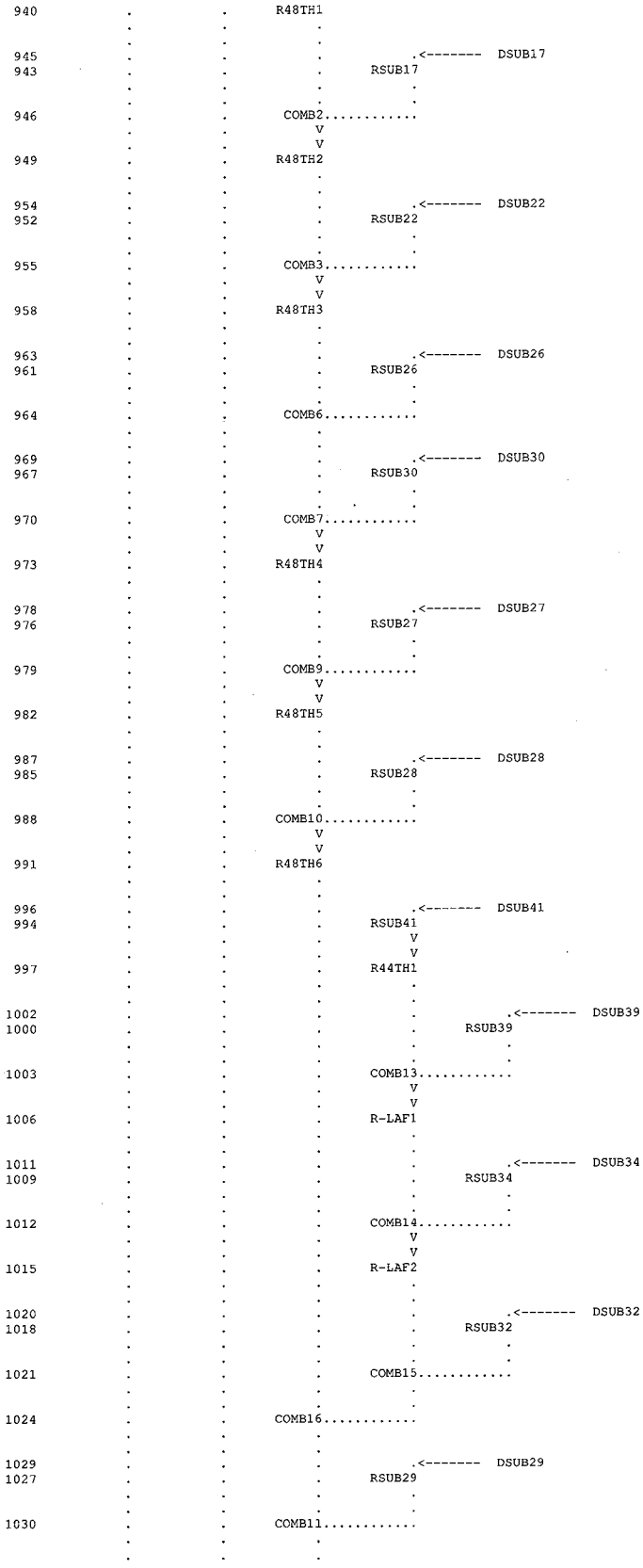
DIV35
794
C35-34
797
C35-33
800
SUB40
810
R40-41
813
SUB41
823
C40-41
828
DSUB41
826
D41-44
831
R41-39
834
SUB38B
842
DSUB38
840
RD3839
843
C-38B
846
SUB37
856
R37-39
859
SUB39
869
C37-39
874
DSUB39
872
D39-44
877
C41-39
880
R39-36
883
SUB36
895
D36
893
DIV36
898
C39-36
901
C36-35
904
SUB42
916
D42
914
DIV42
919
C42-36
924
DSUB7
922
RSUB7
925
R64TH1
930
DSUB2
928
RSUB2
931
COMB1
934
R64TH2
939
DSUB12
937
RSUB12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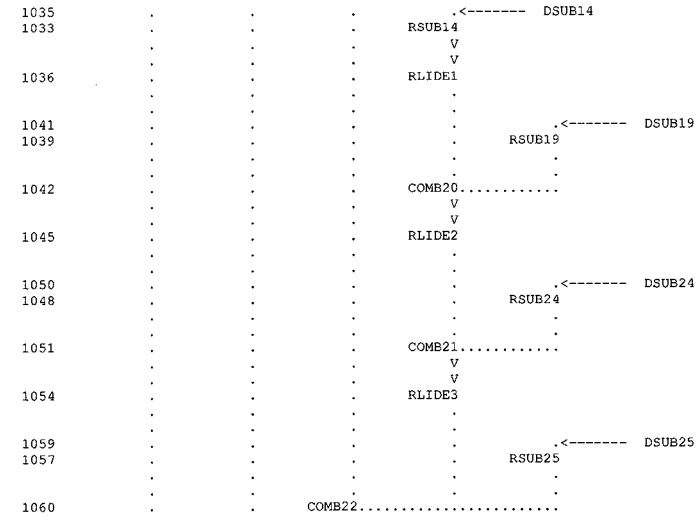
945
943 RSUB17
DSUB17
946 COMB2
949 R48TH2
954
952 RSUB22
DSUB22
955 COMB3
958 R48TH3
963
961 RSUB26
DSUB26
964 COMB6
969
967 RSUB30
DSUB30
970 COMB7
973 R48TH4
978
976 RSUB27
DSUB27
979 COMB9
982 R48TH5
987
985 RSUB28
DSUB28
988 COMB10
991 R48TH6
996
994 RSUB41
DSUB41
997 R44TH1
1002
1000 RSUB39
DSUB39
1003 COMB13
1006 R-LAF1
1011
1009 RSUB34
DSUB34
1012 COMB14
1015 R-LAF2
1020
1018 RSUB32
DSUB32
1021 COMB15
1024 COMB16
1029
1027 RSUB29
DSUB29
1030 COMB11



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   29DEC10  TIME  15:15:14   *
*                                       *
*****************************************
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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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LID10b.DAT

3 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		300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2	0	ENDING DATE
NDTIME		0055	ENDING TIME
ICENT		19	CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 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

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	SUB1	31.	4.08	5.	1.	1.	.04		
+	ROUTED TO	R1-2	31.	4.25	5.	1.	1.	.04		
+	HYDROGRAPH AT	SUB2	22.	4.33	4.	1.	1.	.12		
+	DIVERSION TO	D2	8.	4.33	2.	0.	0.	.12		
+	HYDROGRAPH AT	DIV2	14.	4.33	3.	1.	1.	.12		
+	2 COMBINED AT	C1-2	44.	4.25	7.	2.	2.	.15		
+	DIVERSION TO	DSUB2	18.	4.25	5.	1.	1.	.15		
+	HYDROGRAPH AT	D2-64	26.	4.25	2.	1.	0.	.15		
+	ROUTED TO	R2-3	25.	4.33	2.	1.	1.	.15		
+	HYDROGRAPH AT	SUB3	18.	4.25	3.	1.	1.	.07		
+	DIVERSION TO	D3	10.	4.25	2.	0.	0.	.07		
+	HYDROGRAPH AT	DIV3	8.	4.25	1.	0.	0.	.07		
+	2 COMBINED AT	C2-3	33.	4.25	3.	1.	1.	.22		
+	ROUTED TO	R3-4	32.	4.33	3.	1.	1.	.22		
+	HYDROGRAPH AT	SUB4	25.	4.17	4.	1.	1.	.06		
+	DIVERSION TO	D4	14.	4.17	2.	1.	0.	.06		
+	HYDROGRAPH AT	DIV4	11.	4.17	2.	0.	0.	.06		
+	2 COMBINED AT	C3-4	43.	4.33	5.	1.	1.	.29		
+	DIVERSION TO	DSUB4	3.	4.33	1.	0.	0.	.29		
+	HYDROGRAPH AT	D4-64	40.	4.33	4.	1.	1.	.29		
+	ROUTED TO	R4-5	39.	4.42	4.	1.	1.	.29		
+	HYDROGRAPH AT	SUB5	15.	4.50	4.	1.	1.	.07		
+	DIVERSION TO	D5	7.	4.50	2.	0.	0.	.07		
+	HYDROGRAPH AT	DIV5	7.	4.50	2.	0.	0.	.07		
+	2 COMBINED AT	C4-5	46.	4.42	6.	1.	1.	.35		
+	HYDROGRAPH AT	SUB6	81.	4.00	12.	3.	3.	.09		
+	ROUTED TO	R6-7	78.	4.17	12.	3.	3.	.09		
+	HYDROGRAPH AT	SUB7	61.	4.25	11.	3.	3.	.15		
+	DIVERSION TO	D7	26.	4.25	5.	1.	1.	.15		
+	HYDROGRAPH AT	DIV7	35.	4.25	6.	2.	2.	.15		
+	2 COMBINED AT	C6-7	111.	4.17	18.	4.	4.	.24		

+	DIVERSION TO	DSUB7	110.	4.17	18.	4.	4.	.24
+	HYDROGRAPH AT	D7-64	1.	4.17	0.	0.	0.	.24
+	ROUTED TO	R7-8	1.	5.00	0.	0.	0.	.24
+	HYDROGRAPH AT	SUB8	14.	4.42	3.	1.	1.	.07
+	DIVERSION TO	D8	9.	4.42	2.	0.	0.	.07
+	HYDROGRAPH AT	DIV8	6.	4.42	1.	0.	0.	.07
+	2 COMBINED AT	C7-8	6.	4.42	1.	0.	0.	.31
+	ROUTED TO	R8-9	6.	4.42	1.	0.	0.	.31
+	HYDROGRAPH AT	SUB9	21.	4.17	3.	1.	1.	.06
+	DIVERSION TO	D9	13.	4.17	2.	0.	0.	.06
+	HYDROGRAPH AT	DIV9	8.	4.17	1.	0.	0.	.06
+	2 COMBINED AT	C8-9	13.	4.25	3.	1.	1.	.38
+	ROUTED TO	R9-5	13.	4.42	3.	1.	1.	.38
+	2 COMBINED AT	C9-5	59.	4.42	8.	2.	2.	.73
+	HYDROGRAPH AT	SUB10	31.	4.25	5.	1.	1.	.09
+	DIVERSION TO	D10	14.	4.25	2.	1.	1.	.09
+	HYDROGRAPH AT	DIV10	17.	4.25	3.	1.	1.	.09
+	2 COMBINED AT	C5-10	76.	4.42	11.	3.	3.	.82
+	HYDROGRAPH AT	SUB11	64.	4.08	10.	3.	2.	.09
+	ROUTED TO	R11-12	64.	4.17	10.	3.	2.	.09
+	HYDROGRAPH AT	SUB12	77.	4.08	8.	2.	2.	.12
+	DIVERSION TO	D12	6.	4.08	1.	0.	0.	.12
+	HYDROGRAPH AT	DIV12	70.	4.08	7.	2.	2.	.12
+	2 COMBINED AT	C11-12	131.	4.08	17.	4.	4.	.21
+	DIVERSION TO	DSUB12	130.	4.08	17.	4.	4.	.21
+	HYDROGRAPH AT	D12-48	1.	4.08	0.	0.	0.	.21
+	ROUTED TO	R12-13	0.	4.42	0.	0.	0.	.21
+	HYDROGRAPH AT	SUB13	89.	4.08	10.	2.	2.	.13
+	DIVERSION TO	D13	18.	4.08	2.	0.	0.	.13
+	HYDROGRAPH AT	DIV13	72.	4.08	8.	2.	2.	.13
+	2 COMBINED AT	C12-13	72.	4.08	8.	2.	2.	.34
+	ROUTED TO	R13-14	70.	4.08	8.	2.	2.	.34
+	HYDROGRAPH AT	SUB14	39.	4.17	5.	1.	1.	.13
+	DIVERSION TO	D14	24.	4.17	3.	1.	1.	.13
+	HYDROGRAPH AT	DIV14	16.	4.17	2.	1.	1.	.13

+	2 COMBINED AT C13-14	85.	4.08	10.	3.	2.	.47
+	DIVERSION TO DSUB14	84.	4.08	10.	3.	2.	.47
+	HYDROGRAPH AT D14-48	1.	4.08	0.	0.	0.	.47
+	ROUTED TO R14-15	1.	4.50	0.	0.	0.	.47
+	HYDROGRAPH AT SUB15	45.	4.25	7.	2.	2.	.13
+	DIVERSION TO D15	26.	4.25	4.	1.	1.	.13
+	HYDROGRAPH AT DIV15	19.	4.25	3.	1.	1.	.13
+	2 COMBINED AT C15-14	19.	4.25	3.	1.	1.	.60
+	2 COMBINED AT C15-10	92.	4.42	14.	4.	4.	1.42
+	DIVERSION TO D56ST	0.	4.42	0.	0.	0.	1.42
+	HYDROGRAPH AT D56ST	92.	4.42	14.	4.	4.	1.42
+	HYDROGRAPH AT SUB16	100.	4.08	16.	4.	4.	.13
+	ROUTED TO R16-17	99.	4.17	16.	4.	4.	.13
+	HYDROGRAPH AT SUB17	25.	4.17	3.	1.	1.	.07
+	DIVERSION TO D17	2.	4.17	0.	0.	0.	.07
+	HYDROGRAPH AT DIV17	23.	4.17	3.	1.	1.	.07
+	2 COMBINED AT C16-17	122.	4.17	19.	5.	5.	.20
+	DIVERSION TO DSUB17	121.	4.17	19.	5.	5.	.20
+	HYDROGRAPH AT D17-48	1.	4.17	0.	0.	0.	.20
+	ROUTED TO R17-18	1.	4.42	0.	0.	0.	.20
+	HYDROGRAPH AT SUB18	18.	4.17	3.	1.	1.	.07
+	DIVERSION TO D18	11.	4.17	2.	0.	0.	.07
+	HYDROGRAPH AT DIV18	7.	4.17	1.	0.	0.	.07
+	2 COMBINED AT C17-18	7.	4.17	1.	0.	0.	.27
+	ROUTED TO R18-19	7.	4.25	1.	0.	0.	.27
+	HYDROGRAPH AT SUB19	21.	4.17	3.	1.	1.	.08
+	DIVERSION TO D19	12.	4.17	2.	0.	0.	.08
+	HYDROGRAPH AT DIV19	8.	4.17	1.	0.	0.	.08
+	2 COMBINED AT C18-19	15.	4.17	2.	1.	1.	.34
+	DIVERSION TO DSUB19	14.	4.17	2.	1.	1.	.34
+	HYDROGRAPH AT D19-48	1.	4.17	0.	0.	0.	.34
+	ROUTED TO R19-20	1.	4.42	0.	0.	0.	.34
+	HYDROGRAPH AT SUB20	45.	4.17	6.	2.	2.	.13
+	DIVERSION TO D20	27.	4.17	4.	1.	1.	.13
	HYDROGRAPH AT						

+		DIV20	18.	4.17	3.	1.	1.	.13
+	2 COMBINED AT	C20-19	18.	4.17	3.	1.	1.	.47
+	2 COMBINED AT	C20-15	106.	4.42	17.	4.	4.	1.89
+	HYDROGRAPH AT	SUB21	101.	4.08	15.	4.	4.	.12
+	ROUTED TO	R21-22	99.	4.17	15.	4.	4.	.12
+	HYDROGRAPH AT	SUB22	23.	4.25	4.	1.	1.	.11
+	DIVERSION TO	D22	1.	4.25	0.	0.	0.	.11
+	HYDROGRAPH AT	DIV22	21.	4.25	4.	1.	1.	.11
+	2 COMBINED AT	C21-22	118.	4.17	19.	5.	5.	.24
+	DIVERSION TO	DSUB22	117.	4.17	19.	5.	5.	.24
+	HYDROGRAPH AT	D22-48	1.	4.17	0.	0.	0.	.24
+	ROUTED TO	R22-23	1.	4.33	0.	0.	0.	.24
+	HYDROGRAPH AT	SUB23	18.	4.08	2.	1.	1.	.06
+	DIVERSION TO	D23	11.	4.08	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV23	7.	4.08	1.	0.	0.	.06
+	2 COMBINED AT	C22-23	7.	4.08	1.	0.	0.	.30
+	ROUTED TO	R23-24	7.	4.17	1.	0.	0.	.30
+	HYDROGRAPH AT	SUB24	20.	4.17	3.	1.	1.	.08
+	DIVERSION TO	D24	12.	4.17	2.	0.	0.	.08
+	HYDROGRAPH AT	DIV24	8.	4.17	1.	0.	0.	.08
+	2 COMBINED AT	C23-24	15.	4.17	2.	1.	1.	.37
+	DIVERSION TO	DSUB24	14.	4.17	2.	1.	1.	.37
+	HYDROGRAPH AT	D24-54	1.	4.17	0.	0.	0.	.37
+	ROUTED TO	R24-25	1.	4.42	0.	0.	0.	.37
+	HYDROGRAPH AT	SUB25	19.	4.25	3.	1.	1.	.08
+	DIVERSION TO	D25	11.	4.25	2.	0.	0.	.08
+	HYDROGRAPH AT	DIV25	7.	4.25	1.	0.	0.	.08
+	2 COMBINED AT	C25-24	7.	4.25	1.	0.	0.	.45
+	DIVERSION TO	DSUB25	7.	4.25	1.	0.	0.	.45
+	HYDROGRAPH AT	D25-54	0.	4.25	0.	0.	0.	.45
+	2 COMBINED AT	C25-20	106.	4.42	17.	4.	4.	2.34
+	HYDROGRAPH AT	SUB26	12.	4.25	2.	1.	0.	.05
+	DIVERSION TO	D26	4.	4.25	1.	0.	0.	.05
+	HYDROGRAPH AT	DIV26	8.	4.25	1.	0.	0.	.05
+	DIVERSION TO	DSUB26	7.	4.25	1.	0.	0.	.05

+	HYDROGRAPH AT	D26-48	1.	4.25	0.	0.	0.	.05
+	ROUTED TO	R26-27	1.	4.33	0.	0.	0.	.05
+	HYDROGRAPH AT	SUB27	17.	4.17	3.	1.	1.	.06
+	DIVERSION TO	D27	10.	4.17	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV27	7.	4.17	1.	0.	0.	.06
+	DIVERSION TO	DSUB27	7.	.00	1.	0.	0.	.06
+	HYDROGRAPH AT	D27-48	0.	.00	0.	0.	0.	.06
+	2 COMBINED AT	C26-27	1.	4.33	0.	0.	0.	.12
+	ROUTED TO	R27-28	1.	4.58	0.	0.	0.	.12
+	HYDROGRAPH AT	SUB28	21.	4.17	3.	1.	1.	.08
+	DIVERSION TO	D28	13.	4.17	2.	0.	0.	.08
+	HYDROGRAPH AT	DIV28	8.	4.17	1.	0.	0.	.08
+	DIVERSION TO	DSUB28	7.	4.17	1.	0.	0.	.08
+	HYDROGRAPH AT	D28-48	1.	4.17	0.	0.	0.	.08
+	2 COMBINED AT	C27-28	1.	4.17	0.	0.	0.	.19
+	ROUTED TO	R28-29	1.	4.33	0.	0.	0.	.19
+	HYDROGRAPH AT	SUB29	14.	4.17	2.	1.	1.	.06
+	DIVERSION TO	D29	9.	4.17	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV29	6.	4.17	1.	0.	0.	.06
+	DIVERSION TO	DSUB29	6.	.00	1.	0.	0.	.06
+	HYDROGRAPH AT	D29-48	0.	.00	0.	0.	0.	.06
+	2 COMBINED AT	C29-28	1.	4.33	0.	0.	0.	.25
+	2 COMBINED AT	C29-25	107.	4.42	17.	4.	4.	2.59
+	HYDROGRAPH AT	SUB38A	64.	4.42	17.	4.	4.	.12
+	DIVERSION TO	DSUB38	16.	4.42	9.	2.	2.	.12
+	HYDROGRAPH AT	D38-39	48.	4.42	8.	2.	2.	.12
+	ROUTED TO	R38-30	48.	4.42	8.	2.	2.	.12
+	HYDROGRAPH AT	SUB30	18.	4.17	2.	1.	1.	.06
+	2 COMBINED AT	C30-38	61.	4.33	10.	3.	2.	.18
+	DIVERSION TO	DSUB30	60.	4.33	10.	3.	2.	.18
+	HYDROGRAPH AT	D30-48	1.	4.33	0.	0.	0.	.18
+	ROUTED TO	R30-31	1.	4.50	0.	0.	0.	.18
+	HYDROGRAPH AT	SUB31	13.	4.25	2.	1.	1.	.06
+	DIVERSION TO	D31	5.	4.25	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV31	8.	4.25	1.	0.	0.	.06

	2 COMBINED AT							
+		C30-31	8.	4.25	1.	0.	0.	.24
	ROUTED TO							
+		R31-32	8.	4.33	1.	0.	0.	.24
	HYDROGRAPH AT							
+		SUB32	16.	4.17	3.	1.	1.	.06
	DIVERSION TO							
+		D32	10.	4.17	2.	0.	0.	.06
	HYDROGRAPH AT							
+		DIV32	6.	4.17	1.	0.	0.	.06
	DIVERSION TO							
+		DSUB32	6.	.00	1.	0.	0.	.06
	HYDROGRAPH AT							
+		DLAF2	0.	.00	0.	0.	0.	.06
	2 COMBINED AT							
+		C31-32	8.	4.33	1.	0.	0.	.31
	ROUTED TO							
+		R32-33	8.	4.42	1.	0.	0.	.31
	HYDROGRAPH AT							
+		SUB33	22.	4.17	3.	1.	1.	.06
	DIVERSION TO							
+		D33	8.	4.17	1.	0.	0.	.06
	HYDROGRAPH AT							
+		DIV33	14.	4.17	2.	1.	1.	.06
	2 COMBINED AT							
+		C33-32	18.	4.17	4.	1.	1.	.37
	2 COMBINED AT							
+		C33-29	123.	4.42	21.	5.	5.	2.96
	HYDROGRAPH AT							
+		SUB34	41.	4.25	8.	2.	2.	.17
	DIVERSION TO							
+		D34	15.	4.25	3.	1.	1.	.17
	HYDROGRAPH AT							
+		DIV34	26.	4.25	5.	1.	1.	.17
	DIVERSION TO							
+		DSUB34	25.	4.25	5.	1.	1.	.17
	HYDROGRAPH AT							
+		DLAF1	1.	4.25	0.	0.	0.	.17
	ROUTED TO							
+		R34-35	1.	4.50	0.	0.	0.	.17
	HYDROGRAPH AT							
+		SUB35	67.	4.25	11.	3.	3.	.13
	DIVERSION TO							
+		D35	6.	4.25	1.	0.	0.	.13
	HYDROGRAPH AT							
+		DIV35	60.	4.25	10.	3.	2.	.13
	2 COMBINED AT							
+		C35-34	60.	4.25	10.	3.	2.	.30
	2 COMBINED AT							
+		C35-33	175.	4.33	31.	8.	8.	3.25
	HYDROGRAPH AT							
+		SUB40	46.	4.00	5.	1.	1.	.07
	ROUTED TO							
+		R40-41	44.	4.08	5.	1.	1.	.07
	HYDROGRAPH AT							
+		SUB41	55.	4.25	9.	2.	2.	.14
	2 COMBINED AT							
+		C40-41	92.	4.17	14.	4.	3.	.22
	DIVERSION TO							
+		DSUB41	91.	4.17	14.	4.	3.	.22
	HYDROGRAPH AT							
+		D41-44	1.	4.17	0.	0.	0.	.22
	ROUTED TO							
+		R41-39	1.	4.42	0.	0.	0.	.22
	HYDROGRAPH AT							
+		SUB38B	74.	4.25	15.	4.	4.	.14
	HYDROGRAPH AT							
+		RD3839	16.	3.67	9.	2.	2.	.00
	2 COMBINED AT							

+	C-38B	90.	4.25	24.	6.	6.	.14
+ HYDROGRAPH AT	SUB37	13.	4.17	1.	0.	0.	.05
+ ROUTED TO	R37-39	13.	4.33	1.	0.	0.	.05
+ HYDROGRAPH AT	SUB39	61.	4.50	15.	4.	4.	.19
+ 3 COMBINED AT	C37-39	154.	4.33	40.	10.	10.	.38
+ DIVERSION TO	DSUB39	154.	4.33	40.	10.	10.	.38
+ HYDROGRAPH AT	D39-44	0.	4.33	0.	0.	0.	.38
+ 2 COMBINED AT	C41-39	1.	4.42	0.	0.	0.	.60
+ ROUTED TO	R39-36	1.	4.67	0.	0.	0.	.60
+ HYDROGRAPH AT	SUB36	37.	4.25	8.	2.	2.	.09
+ DIVERSION TO	D36	6.	4.25	1.	0.	0.	.09
+ HYDROGRAPH AT	DIV36	32.	4.25	7.	2.	2.	.09
+ 2 COMBINED AT	C39-36	32.	4.25	7.	2.	2.	.68
+ 2 COMBINED AT	C36-35	206.	4.33	38.	10.	9.	3.94
+ HYDROGRAPH AT	SUB42	125.	4.25	21.	5.	5.	.25
+ DIVERSION TO	D42	9.	4.25	2.	0.	0.	.25
+ HYDROGRAPH AT	DIV42	116.	4.25	19.	5.	5.	.25
+ 2 COMBINED AT	C42-36	319.	4.33	57.	14.	14.	4.19
+ HYDROGRAPH AT	RSUB7	110.	4.17	18.	4.	4.	.00
+ ROUTED TO	R64TH1	108.	4.25	18.	4.	4.	.00
+ HYDROGRAPH AT	RSUB2	18.	3.92	5.	1.	1.	.00
+ 2 COMBINED AT	COMB1	126.	4.25	23.	6.	6.	.00
+ ROUTED TO	R64TH2	125.	4.25	23.	6.	6.	.00
+ HYDROGRAPH AT	RSUB12	130.	4.08	17.	4.	4.	.00
+ ROUTED TO	R48TH1	127.	4.17	17.	4.	4.	.00
+ HYDROGRAPH AT	RSUB17	121.	4.17	19.	5.	5.	.00
+ 2 COMBINED AT	COMB2	248.	4.17	36.	9.	9.	.00
+ ROUTED TO	R48TH2	246.	4.17	36.	9.	9.	.00
+ HYDROGRAPH AT	RSUB22	117.	4.17	19.	5.	5.	.00
+ 2 COMBINED AT	COMB3	363.	4.17	55.	14.	13.	.00
+ ROUTED TO	R48TH3	360.	4.17	55.	14.	13.	.00
+ HYDROGRAPH AT	RSUB26	7.	4.17	1.	0.	0.	.00
+ 2 COMBINED AT	COMB6	367.	4.17	57.	14.	14.	.00
+ HYDROGRAPH AT	RSUB30	60.	4.33	10.	3.	2.	.00
+ 2 COMBINED AT	COMB7	423.	4.17	67.	17.	16.	.00

+	ROUTED TO	R48TH4	418.	4.25	67.	17.	16.	.00
+	HYDROGRAPH AT	RSUB27	7.	4.17	1.	0.	0.	.00
+	2 COMBINED AT	COMB9	424.	4.25	68.	17.	16.	.00
+	ROUTED TO	R48TH5	423.	4.25	68.	17.	16.	.00
+	HYDROGRAPH AT	RSUB28	7.	4.08	1.	0.	0.	.00
+	2 COMBINED AT	COMB10	430.	4.25	69.	17.	17.	.00
+	ROUTED TO	R48TH6	428.	4.25	69.	17.	17.	.00
+	HYDROGRAPH AT	RSUB41	91.	4.17	14.	4.	3.	.00
+	ROUTED TO	R44TH1	91.	4.17	14.	4.	3.	.00
+	HYDROGRAPH AT	RSUB39	154.	4.33	40.	10.	10.	.00
+	2 COMBINED AT	COMB13	232.	4.25	54.	14.	13.	.00
+	ROUTED TO	R-LAF1	232.	4.33	54.	14.	13.	.00
+	HYDROGRAPH AT	RSUB34	25.	4.25	5.	1.	1.	.00
+	2 COMBINED AT	COMB14	257.	4.33	60.	15.	15.	.00
+	ROUTED TO	R-LAF2	255.	4.33	60.	15.	15.	.00
+	HYDROGRAPH AT	RSUB32	6.	4.17	1.	0.	0.	.00
+	2 COMBINED AT	COMB15	261.	4.33	61.	15.	15.	.00
+	2 COMBINED AT	COMB16	680.	4.25	130.	33.	32.	.00
+	HYDROGRAPH AT	RSUB29	6.	4.17	1.	0.	0.	.00
+	2 COMBINED AT	COMB11	686.	4.25	131.	33.	32.	.00
+	HYDROGRAPH AT	RSUB14	84.	4.08	10.	3.	2.	.00
+	ROUTED TO	RLIDE1	83.	4.17	10.	3.	2.	.00
+	HYDROGRAPH AT	RSUB19	14.	4.17	2.	1.	1.	.00
+	2 COMBINED AT	COMB20	97.	4.17	13.	3.	3.	.00
+	ROUTED TO	RLIDE2	96.	4.17	13.	3.	3.	.00
+	HYDROGRAPH AT	RSUB24	14.	4.17	2.	1.	1.	.00
+	2 COMBINED AT	COMB21	110.	4.17	15.	4.	4.	.00
+	ROUTED TO	RLIDE3	109.	4.17	15.	4.	4.	.00
+	HYDROGRAPH AT	RSUB25	7.	4.17	1.	0.	0.	.00
+	3 COMBINED AT	COMB22	798.	4.25	147.	37.	36.	.00

1

MODEL: LID100a 100-yr, 6-hr MODEL

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN  1998               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   01MAR11  TIME  12:04:03   *
*                                       *
*****************************************
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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           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX           XXX
```

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

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

1 HEC-1 INPUT PAGE 1

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

              *       ARCADIA AREA
    1         ID        LID100a.DAT
              *       100-YR, 6-HR MODEL FOR ALTERNATE 2
              *       FROM BASE MODEL LID10a.DAT
              *       THIS MODEL REVISES SUB-BASIN 38 INTO 2 SUB-BASINS 38A & 38B TO CORRECT
              *       THE FLOW SPLIT OF THE ORIGINAL SUB-BASIN
              *
    2         IT       5                    300
    3         IO       5
              *DIAGRAM
              *

    4         KK    SUB1
    5         KM   SUB-BASIN SUB1
    6         KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
    7         KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
    8         KM     L =  .28  Kb = .108  Adj. Slope = 2120.0
    9         BA    .037
   10         IN      15
   11         KM   RAINFALL DEPTH OF 3.19 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
   12         PB    3.19
   13         KM   THE FOLLOWING PC RECORD USED A 6-HOUR STORM WITH A PATTERN No. OF 2.20
   14         PC    .000    .010    .017    .026    .037    .046    .056    .065    .075    .085
   15         PC    .097    .111    .131    .175    .263    .455    .689    .829    .893    .933
   16         PC    .949    .962    .975    .988   1.000
   17         LG    .119    .337   4.650    .260  51.000
   18         UC    .154    .110
   19         UA       0       3       5       8      12      20      43      75      90      96
   20         UA     100
              *

   21         KK    R1-2
   22         KM        ROUTE FLOW FROM SUB1 TO SUB2
   23         RK  3183.8   .0166     .07       0    TRAP       0       3     YES
              *

   24         KK    SUB2
   25         KM   SUB-BASIN SUB2
   26         KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
   27         KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
   28         KM     L =  .60  Kb = .041  Adj. Slope =   88.0
   29         BA    .117
   30         LG    .343    .250   4.650    .440   9.000
   31         UC    .587    .463
   32         UA       0       5      16      30      65      77      84      90      94      97
   33         UA     100
              *

   34         KK    DIV2
   35         KM       DIVERT FOR IRRIGATED LAWNS SUB2
   36         DT      D2     .80
   37         DI       0       1
   38         DQ       0    .382
              *
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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  39      KK    C1-2
  40      KM        COMBINE HYDROGRAPHS SUB1 AND SUB2 AT CP2
  41      HC       2
          *

  42      KK   D2-64
  43      KM        DIVERT FLOW
  44      DT   DSUB2
          *      DQ CARD REVISED TO REFLECT 125 CFS MAX CAPACITY OF EXIST SCOTTDALE SD
  45      DI       0      18      43      93     100     150
  46      DQ       0      18      18      18      18      18
          *

  47      KK    R2-3
  48      KM        ROUTE FLOW FROM SUB2 TO SUB3
  49      RK  1367.5    .009    .016            TRAP      60       1     YES
          *

  50      KK    SUB3
  51      KM   SUB-BASIN SUB3
  52      KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  53      KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  54      KM     L =  .26  Kb = .058  Adj. Slope =   47.0
  55      BA    .067
  56      LG    .298    .250   4.200    .520  16.000
  57      UC    .533    .293
  58      UA       0       5      16      30      65      77      84      90      94      97
  59      UA     100
          *

  60      KK    DIV3
  61      KM        DIVERT FOR IRRIGATED LAWNS SUB3
  62      DT      D3     .88
  63      DI       0       1
  64      DQ       0    .573
          *

  65      KK    C2-3
  66      KM        COMBINE HYDROGRAPHS SUB2 & SUB3 AT CP3
  67      HC       2
          *

  68      KK    R3-4
  69      KM        ROUTE FLOW FROM CP3 TO CP4
  70      RK    1320    .008    .016            TRAP      44       1     YES
          *

  71      KK    SUB4
  72      KM   SUB-BASIN SUB4
  73      KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  74      KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  75      KM     L =  .25  Kb = .058  Adj. Slope =   42.0
  76      BA    .065
  77      LG    .300    .250   4.800    .360  15.000
```



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

  78      UC    .463    .246
  79      UA       0       5      16      30      65      77      84      90      94      97
  80      UA     100
          *

  81      KK    DIV4
  82      KM        DIVERT FOR IRRIGATED LAWNS SUB4
  83      DT      D4     1.0
  84      DI       0       1
  85      DQ       0     .55
          *

  86      KK    C3-4
  87      KM        COMBINE HYDROGRAPHS SUB3 & SUB4 AT CP4
  88      HC       2
          *

  89      KK   D4-64
  90      KM        DIVERT FLOW TO LAFAYETTE S.D.
  91      DT   DSUB4
  92      DI       0       3      10      50     100
  93      DQ       0       3       3       3       3
          *

  94      KK    R4-5
  95      KM        ROUTE FLOW FROM CP4 TO CP5
  96      RK  2307.4    .005    .016            TRAP      44       1     YES
          *

  97      KK    SUB5
  98      KM   SUB-BASIN SUB5
  99      KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
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100          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
101          KM     L =  .44  Kb = .058  Adj. Slope =   24.0
102          BA    .067
103          LG    .300    .250   4.800    .360  15.000
104          UC    .837    .736
105          UA       0       5      16      30      65      77      84      90      94      97
106          UA     100
             *

107          KK    DIV5
108          KM        DIVERT FOR IRRIGATED LAWNS SUB5
109          DT      D5     .94
110          DI       0       1
111          DQ       0     .50
             *

112          KK    C4-5
113          KM        COMBINE HYDROGRAPHS SUB4 & SUB5 AT CP5
114          HC       2
             *
1                                        HEC-1 INPUT                                          PAGE  4

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

115          KK    SUB6
116          KM   SUB-BASIN SUB6
117          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
118          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
119          KM     L =  .26  Kb = .104  Adj. Slope = 2367.0
120          BA    .090
121          LG    .106    .346   4.700    .240  49.000
122          UC    .142    .057
123          UA       0       3       5       8      12      20      43      75      90      96
124          UA     100
             *

125          KK    R6-7
126          KM        ROUTE FLOW FROM SUB6 TO SUB7
127          RK  2972.0    .013     .07            TRAP       0       3     YES
             *

128          KK    SUB7
129          KM   SUB-BASIN SUB7
130          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
131          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
132          KM     L =  .56  Kb = .053  Adj. Slope =   71.0
133          BA    .153
134          LG    .290    .271   5.400    .280  20.000
135          UC    .546    .346
136          UA       0       5      16      30      65      77      84      90      94      97
137          UA     100
             *

138          KK    DIV7
139          KM        DIVERT FOR IRRIGATED LAWNS SUB7
140          DT      D7    2.30
141          DI       0       1
142          DQ       0    .427
             *

143          KK    C6-7
144          KM        COMBINE HYDROGRAPHS SUB6 & SUB7 AT CP7
145          HC       2
             *

146          KK   D7-64
147          KM        DIVERT FLOW
148          DT   DSUB7
149          DI       0      27     110     120     150     200
150          DQ       0      27     110     110     110     110
             *

151          KK    R7-8
152          KM        ROUTE FLOW FROM SUB7 TO SUB8
153          RK  2302.1    .001    .016            TRAP      40       1     YES
             *
1                                        HEC-1 INPUT                                          PAGE  5

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

154          KK    SUB8
155          KM   SUB-BASIN SUB8
156          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
157          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
158          KM     L =  .44  Kb = .057  Adj. Slope =   52.0
159          BA    .068
160          LG    .300    .250   4.450    .450  15.000
161          UC    .667    .566
162          UA       0       5      16      30      65      77      84      90      94      97
163          UA     100
             *

164          KK    DIV8
```

```
165          KM        DIVERT FOR IRRIGATED LAWNS SUB8
166          DT      D8     .99
167          DI       0       1
168          DQ       0      .6
             *

169          KK    C7-8
170          KM        COMBINE HYDROGRAPHS SUB7 & SUB8 AT CP8
171          HC       2
             *

172          KK    R8-9
173          KM        ROUTE FLOW FROM SUB8 TO SUB9
174          RK  1314.7    .010    .016            TRAP      20       1     YES
             *

175          KK    SUB9
176          KM   SUB-BASIN SUB9
177          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
178          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
179          KM     L =  .25  Kb = .058  Adj. Slope =   55.0
180          BA    .065
181          LG    .300    .250   4.450    .450  15.000
182          UC    .463    .246
183          UA       0       5      16      30      65      77      84      90      94      97
184          UA     100
             *

185          KK    DIV9
186          KM        DIVERT FOR IRRIGATED LAWNS SUB9
187          DT      D9     .94
188          DI       0       1
189          DQ       0      .6
             *

190          KK    C8-9
191          KM        COMBINE HYDROGRAPHS SUB8 & SUB9   AT CP9
192          HC       2
             *
1                                        HEC-1 INPUT                                        PAGE  6

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

193          KK    R9-5
194          KM        ROUTE FLOW FROM SUB9 TO  SUB5
195          RK  1784.7    .007    .016            TRAP      40       1     YES
             *

196          KK    C9-5
197          KM        COMBINE HYDROGRAPH SUB9  & SUB5  AT CP5
198          HC       2
             *

199          KK   SUB10
200          KM   SUB-BASIN SUB10
201          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
202          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
203          KM     L =  .34  Kb = .056  Adj. Slope =   37.0
204          BA    .093
205          LG    .299    .250   4.800    .360  15.000
206          UC    .575    .327
207          UA       0       5      16      30      65      77      84      90      94      97
208          UA     100
             *

209          KK   DIV10
210          KM        DIVERT FOR IRRIGATED LAWNS SUB10
211          DT     D10    1.17
212          DI       0       1
213          DQ       0    .445
             *

214          KK   C5-10
215          KM        COMBINE HYDROGRAPH SUB5  & SUB10 AT CP10
216          HC       2
             *

217          KK   SUB11
218          KM   SUB-BASIN SUB11
219          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
220          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
221          KM     L =  .56  Kb = .106  Adj. Slope = 1740.0
222          BA    .093
223          LG    .115    .350   4.550    .270  39.000
224          UC    .237    .183
225          UA       0       3       5       8      12      20      43      75      90      96
226          UA     100
             *

227          KK  R11-12
228          KM        ROUTE FLOW FROM SUB11 TO   SUB12
229          RK   1632    .058     .07             TRAP       0       3     YES
             *
1                                        HEC-1 INPUT                                        PAGE  7
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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  230     KK   SUB12
  231     KM   SUB-BASIN SUB12
  232     KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  233     KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  234     KM     L =  .31  Kb = .064  Adj. Slope =  304.0
  235     BA    .120
  236     LG    .269    .277   5.600    .210   9.000
  237     UC    .246    .102
  238     UA       0       5      16      30      65      77      84      90      94      97
  239     UA     100
          *

  240     KK   DIV12
  241     KM        DIVERT FOR IRRIGATED LAWNS SUB12
  242     DT     D12     .31
  243     DI       0       1
  244     DQ       0    .079
          *

  245     KK  C11-12
  246     KM        COMBINE HYDROGRAPH SUB11 & SUB12 AT CP12
  247     HC        2
          *

  248     KK  D12-48
  249     KM        DIVERT FLOW
  250     DT  DSUB12
  251     DI       0      50     100     130     150
  252     DQ       0      50     100     130     130
          *

  253     KK  R12-13
  254     KM        ROUTE FLOW FROM SUB12 TO SUB13
  255     RK  1362.2    .020    .016            TRAP      60       1     YES      50
          *

  256     KK   SUB13
  257     KM   SUB-BASIN SUB13
  258     KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  259     KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  260     KM     L =  .26  Kb = .054  Adj. Slope =  107.0
  261     BA    .129
  262     LG    .300    .230   6.200    .200  15.000
  263     UC    .283    .100
  264     UA       0       5      16      30      65      77      84      90      94      97
  265     UA     100
          *

  266     KK   DIV13
  267     KM        DIVERT FOR IRRIGATED LAWNS SUB13
  268     DT     D13     .98
  269     DI       0       1
  270     DQ       0      .2
          *

1                                    HEC-1 INPUT                                    PAGE  8

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

  271     KK  C12-13
  272     KM        COMBINE HYDROGRAPHS SUB12 & SUB13 AT CP13
  273     HC        2
          *

  274     KK  R13-14
  275     KM        ROUTE FL OW FROM SUB13 TO SUB14
  276     RK  1314.7    .014    .016            TRAP      60       1     YES
          *

  277     KK   SUB14
  278     KM   SUB-BASIN SUB14
  279     KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  280     KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  281     KM     L =  .25  Kb = .054  Adj. Slope =   74.0
  282     BA    .126
  283     LG    .300    .250   4.100    .550  15.000
  284     UC    .429    .155
  285     UA       0       5      16      30      65      77      84      90      94      97
  286     UA     100
          *

  287     KK   DIV14
  288     KM        DIVERT FOR IRRIGATED LAWNS SUB14
  289     DT     D14    1.57
  290     DI       0       1
  291     DQ       0      .6
          *

  292     KK  C13-14
  293     KM        COMBINE HYDROGRAPHS SUB13 & SUB14 AT CP14
  294     HC        2
```

```
                *
  295           KK  R14-15
  296           KM        ROUTE FLOW FROM SUB 14 TO SUB15
  297           RK  1985.3    .011    .016            TRAP      60       1     YES
                *

  298           KK   SUB15
  299           KM   SUB-BASIN SUB15
  300           KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  301           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  302           KM     L =  .38  Kb = .054  Adj. Slope =   56.0
  303           BA    .127
  304           LG    .296    .250   4.650    .390  16.000
  305           UC    .525    .271
  306           UA       0       5      16      30      65      77      84      90      94      97
  307           UA     100
                *
1                                        HEC-1 INPUT                                                PAGE  9

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


  308           KK   DIV15
  309           KM        DIVERT FOR IRRIGATED LAWNS SUB15
  310           DT     D15    2.05
  311           DI       0       1
  312           DQ       0    .585
                *

  313           KK  C15-14
  314           KM        COMBINE SUB14 WITH SUB15
  315           HC       2
                *

  316           KK  C15-10
  317           KM        COMBINE SUB10 WITH SUB15
  318           HC       2
                *

  319           KK   D56ST
  320           KM        DIVERT FLOW THAT CROSSES 56TH ST. BRIDGE
  321           DT   D56ST
  322           DI       0     400     650     790    1040    1139    1334    1484    1689    1900
  323           DQ       0       0     240     318     400     489     584     684     789     900
                *

  324           KK   SUB16
  325           KM   SUB-BASIN SUB16
  326           KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  327           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  328           KM     L =  .65  Kb = .102  Adj. Slope = 2052.0
  329           BA    .129
  330           LG    .104    .350   4.700    .240  47.000
  331           UC    .233    .167
  332           UA       0       3       5       8      12      20      43      75      90      96
  333           UA     100
                *

  334           KK  R16-17
  335           KM        ROUTE FLOW FROM SUB16 TO SUB17
  336           RK    1668    .058     .07            TRAP       0       3     YES
                *

  337           KK   SUB17
  338           KM   SUB-BASIN SUB17
  339           KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  340           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  341           KM     L =  .32  Kb = .058  Adj. Slope =  183.0
  342           BA    .073
  343           LG    .298    .252   4.150    .450  10.000
  344           UC    .342    .201
  345           UA       0       5      16      30      65      77      84      90      94      97
  346           UA     100
                *
1                                        HEC-1 INPUT                                                PAGE 10

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


  347           KK   DIV17
  348           KM        DIVERT FOR IRRIGATED LAWNS SUB17
  349           DT     D17     .11
  350           DI       0       1
  351           DQ       0    .074
                *

  352           KK  C16-17
  353           KM        COMBINE HYDROGRAPH SUB16 & SUB17 AT CP17
  354           HC       2
                *

  355           KK  D17-48
  356           KM        DIVERT FLOW
  357           DT  DSUB17
```

```
358          DI       0      50     100     121     150     200
359          DQ       0      50     100     121     121     121
             *

360          KK  R17-18
361          KM        ROUTE FLOW FROM SUB17 TO SUB18
362          RK  1378.1    .019    .016            TRAP      40       1     YES
             *

363          KK   SUB18
364          KM   SUB-BASIN SUB18
365          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
366          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
367          KM     L =  .26  Kb = .058  Adj. Slope =  102.0
368          BA    .067
369          LG    .300    .250   3.950    .580  15.000
370          UC    .417    .222
371          UA       0       5      16      30      65      77      84      90      94      97
372          UA     100
             *

373          KK   DIV18
374          KM        DIVERT FOR IRRIGATED LAWNS SUB18
375          DT     D18     .81
376          DI       0       1
377          DQ       0      .6
             *

378          KK  C17-18
379          KM        COMBINE  HYDROGRAPH SUB17 & SUB18 AT CP18
380          HC       2
             *

381          KK  R18-19
382          KM        ROUTE FLOW SUB18 TO SUB19
383          RK  1335.8    .014    .016            TRAP      40       1     YES
             *
```



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

384          KK   SUB19
385          KM   SUB-BASIN SUB19
386          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
387          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
388          KM     L =  .25  Kb = .057  Adj. Slope =   77.0
389          BA    .075
390          LG    .300    .250   3.950    .580  15.000
391          UC    .446    .218
392          UA       0       5      16      30      65      77      84      90      94      97
393          UA     100
             *

394          KK   DIV19
395          KM        DIVERT FOR IRRIGATED LAWNS SUB19
396          DT     D19     .91
397          DI       0       1
398          DQ       0      .6
             *

399          KK  C18-19
400          KM        COMBINE HYDROGRAPH SUB18 & SUB19 AT CP19
401          HC       2
             *

402          KK  R19-20
403          KM        ROUTE FLOW FROM SUB19 TO SUB20
404          RK  1473.1    .010    .016            TRAP      30       1     YES
             *

405          KK   SUB20
406          KM   SUB-BASIN SUB20
407          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
408          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
409          KM     L =  .28  Kb = .054  Adj. Slope =   54.0
410          BA    .129
411          LG    .300    .250   4.450    .450  15.000
412          UC    .475    .188
413          UA       0       5      16      30      65      77      84      90      94      97
414          UA     100
             *

415          KK   DIV20
416          KM        DIVERT FOR IRRIGATED LAWNS SUB20
417          DT     D20    1.86
418          DI       0       1
419          DQ       0      .6
             *

420          KK  C20-19
421          KM        COMBINE SUB19 WITH SUB20
422          HC       2
             *
```

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

 423      KK  C20-15
 424      KM        COMBINE SUB15 WITH SUB20
 425      HC        2
          *

 426      KK   SUB21
 427      KM   SUB-BASIN SUB21
 428      KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 429      KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 430      KM     L =  .56  Kb = .102  Adj. Slope = 2352.0
 431      BA    .124
 432      LG    .106    .350   4.700    .240  46.000
 433      UC    .208    .134
 434      UA       0       3       5       8      12      20      43      75      90      96
 435      UA     100
          *

 436      KK  R21-22
 437      KM        ROUTE FLOW FROM SUB21 TO SUB22
 438      RK    2735    .026     .07            TRAP       0       3     YES
          *

 439      KK   SUB22
 440      KM   SUB-BASIN SUB22
 441      KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 442      KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 443      KM     L =  .52  Kb = .059  Adj. Slope =  134.0
 444      BA    .112
 445      LG    .286    .261   4.000    .490   9.000
 446      UC    .579    .417
 447      UA       0       5      16      30      65      77      84      90      94      97
 448      UA     100
          *

 449      KK   DIV22
 450      KM        DIVERT FOR IRRIGATED LAWNS SUB22
 451      DT     D22     .12
 452      DI       0       1
 453      DQ       0    .063
          *

 454      KK  C21-22
 455      KM        COMBINE HYDROGRAPH SUB21 & SUB22 AT CP22
 456      HC        2
          *

 457      KK  D22-48
 458      KM        DIVERT FLOW
 459      DT  DSUB22
 460      DI       0      50     100     117     150     200
 461      DQ       0      50     100     117     117     117
          *
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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 462      KK  R22-23
 463      KM        ROUTE FLOW FROM SUB22 TO SUB23
 464      RK  1240.8    .025    .016            TRAP      20       1     YES
          *

 465      KK   SUB23
 466      KM   SUB-BASIN SUB23
 467      KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 468      KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 469      KM     L =  .23  Kb = .058  Adj. Slope =  132.0
 470      BA    .060
 471      LG    .300    .250   3.950    .580  15.000
 472      UC    .346    .175
 473      UA       0       5      16      30      65      77      84      90      94      97
 474      UA     100
          *

 475      KK   DIV23
 476      KM        DIVERT FOR IRRIGATED LAWNS SUB23
 477      DT     D23     .72
 478      DI       0       1
 479      DQ       0    .593
          *

 480      KK  C22-23
 481      KM        COMBINE HYDROGRAPH SUB22 & SUB23 AT CP23
 482      HC        2
          *

 483      KK  R23-24
 484      KM        ROUTE FLOW FROM SUB 23 TO SUB24
 485      RK  1088.9    .015    .016            TRAP      32       1     YES
          *
```

```
486          KK   SUB24
487          KM   SUB-BASIN SUB24
488          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
489          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
490          KM     L =  .28  Kb = .057  Adj. Slope =   78.0
491          BA    .077
492          LG    .300    .250   3.950    .580  15.000
493          UC    .475    .252
494          UA       0       5      16      30      65      77      84      90      94      97
495          UA     100
             *

496          KK   DIV24
497          KM        DIVERT FOR IRRIGATED LAWNS SUB24
498          DT     D24     .93
499          DI       0       1
500          DQ       0      .6
             *
```



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

501          KK  C23-24
502          KM        COMBINE HYDROGRAPH SUB23 & SUB24 AT CP24
503          HC       2
             *

504          KK  R24-25
505          KM        ROUTE FLOW FROM SUB24 TO SUB25
506          RK  1346.4    .009    .016            TRAP      40       1     YES
             *

507          KK   SUB25
508          KM   SUB-BASIN SUB25
509          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
510          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
511          KM     L =  .25  Kb = .057  Adj. Slope =   46.0
512          BA    .076
513          LG    .300    .250   3.950    .580  15.000
514          UC    .546    .271
515          UA       0       5      16      30      65      77      84      90      94      97
516          UA     100
             *

517          KK   DIV25
518          KM        DIVERT FOR IRRIGATED LAWNS SUB25
519          DT     D25     .93
520          DI       0       1
521          DQ       0      .6
             *

522          KK  C25-24
523          KM        COMBINE SUB24 WITH SUB25
524          HC       2
             *

525          KK  C25-20
526          KM        COMBINE SUB20 WITH SUB25
527          HC       2
             *

528          KK   SUB26
529          KM   SUB-BASIN SUB26
530          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
531          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
532          KM     L =  .52  Kb = .063  Adj. Slope =  840.0
533          BA    .054
534          LG    .289    .289   4.200    .550  14.000
535          UC    .313    .318
536          UA       0       3       5       8      12      20      43      75      90      96
537          UA     100
             *
```



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

538          KK   DIV26
539          KM        DIVERT FOR GOLF   COURSE
540          DT     D26     .31
541          DI       0       1
542          DQ       0    .312
             *

543          KK  D26-48
544          KM        DIVERT FLOW
545          DT  DSUB26
546          DI       0       1       7      20      50     100
547          DQ       0       1       7       7       7       7
             *

548          KK  R26-27
549          KM        ROUTE FLOW FROM SUB26 TO SUB27
550          RK  1293.6    .024    .016            TRAP      35       1     YES
```

```
                *
  551           KK   SUB27
  552           KM   SUB-BASIN SUB27
  553           KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  554           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  555           KM     L =  .25  Kb = .058  Adj. Slope =  122.0
  556           BA    .061
  557           LG    .300    .250   3.950    .580  15.000
  558           UC    .375    .202
  559           UA       0       5      16      30      65      77      84      90      94      97
  560           UA     100
                *
  561           KK   DIV27
  562           KM        DIVERT FOR IRRIGATED LAWNS SUB27
  563           DT     D27     .74
  564           DI       0     1.0
  565           DQ       0     .60
                *
  566           KK  D27-48
  567           KM        DIVERT FLOW
  568           DT  DSUB27
  569           DI       0       5      12      20      50
  570           DQ       0       5      12      12      12
                *
  571           KK  C26-27
  572           KM        COMBINE HYDROGRAPH SUB 26 & SUB27 AT CP27
  573           HC       2
                *
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 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  574           KK  R27-28
  575           KM        ROUTE FLOW FROM SUB 27 TO SUB28
  576           RK  1436.2    .017    .016            TRAP      35       1     YES
                *
  577           KK   SUB28
  578           KM   SUB-BASIN SUB28
  579           KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  580           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  581           KM     L =  .27  Kb = .057  Adj. Slope =   89.0
  582           BA    .078
  583           LG    .300    .250   3.950    .580  15.000
  584           UC    .442    .224
  585           UA       0       5      16      30      65      77      84      90      94      97
  586           UA     100
                *
  587           KK   DIV28
  588           KM        DIVERT FOR IRRIGATED LAWNS SUB28
  589           DT     D28     .95
  590           DI       0       1
  591           DQ       0     .60
                *
  592           KK  D28-48
  593           KM        DIVERT FLOW
  594           DT  DSUB28
  595           DI       0       4       7      10      15
  596           DQ       0       4       7       7       7
                *
  597           KK  C27-28
  598           KM        COMBINE HYDROGRAPH SUB27 & SUB28 AT CP28
  599           HC       2
                *
  600           KK  R28-29
  601           KM        ROUTE FLOW FROM SUB 28 TO SUB29
  602           RK  1161.6    .009    .016            TRAP      35       1     YES
                *
  603           KK   SUB29
  604           KM   SUB-BASIN SUB29
  605           KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  606           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  607           KM     L =  .22  Kb = .058  Adj. Slope =   47.0
  608           BA    .058
  609           LG    .299    .250   3.950    .580  15.000
  610           UC    .504    .261
  611           UA       0       5      16      30      65      77      84      90      94      97
  612           UA     100
                *
1                                        HEC-1 INPUT                                        PAGE 17

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

  613           KK   DIV29
```

```
614          KM        DIVERT FOR IRRIGATED LAWNS SUB29
615          DT     D29     .70
616          DI       0       1
617          DQ       0    .587
             *

618          KK  D29-48
619          KM        DIVERT FLOW
620          DT  DSUB29
621          DI       0       2      10      25      50
622          DQ       0       2      10      10      10
             *

623          KK  C29-28
624          KM        COMBINE SUB29 WITH SUB28
625          HC       2
             *

626          KK  C29-25
627          KM        COMBINE SUB25 WITH SUB29
628          HC       2
             *
             * DIVIDE SUB 38 INTO 2 SUBBASINS 38A & 38B.  SUB38A WILL FLOW SOUTH INTO
             * CENTRAL CMBK SD SYSTEM.  16CFS FROM SUB 38A WILL BE DIVERTED WEST INTO
             * 44TH ST SYSTEM VIA SUB 38B.

629          KK  SUB38A
630          KM   SUB-BASIN SUB38A
631          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
632          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
633          KM     L = 1.28  Kb = .090  Adj. Slope = 1079.0
             *      BA  .252
             *      LG  .133    .340   4.500    .290  36.000
             *      UC  .412    .370
             *      UA     0       5      16      30      65      77      84      90      94
             *      UA   100
634          BA    .118
635          LG   0.15    0.33    4.70    0.26      62
636          UC  0.500   0.566
             * HEC-1 DEFAULT FOR UNIT HYDROGRAPH TIME-AREA
637          UA       0     4.5    12.6    23.2    35.8    50.0    64.2    76.8    87.4    95.5
638          UA     100
             *

639          KK  D38-39
640          KM        DIVERT 16CFS FROM SUB38A TO SUB38B
641          DT  DSUB38
642          DI       0       5      10      16      50     100     200     400     600
643          DQ       0       5      10      16      16      16      16      16      16
             *
```



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

644          KK  R38-30
645          KM        ROUTE FLOW FROM SUB38A TO SUB30
646          RK    1200    .035    .016            TRAP      30       1     YES
             *

647          KK   SUB30
648          KM   SUB-BASIN SUB30
649          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
650          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
651          KM     L =  .48  Kb = .064  Adj. Slope =  571.0
652          BA    .064
653          LG    .279    .263   3.950    .480   8.000
654          UC    .313    .271
655          UA       0       5      16      30      65      77      84      90      94      97
656          UA     100
             *

657          KK  C30-38
658          KM        COMBINE SUB38A & SUB30 AT CP30
659          HC       2
             *

660          KK  D30-48
661          KM        DIVERT FLOW
662          DT  DSUB30
663          DI       0      50      60     100
664          DQ       0      50      60      60
             *

665          KK  R30-31
666          KM        ROUTE FLOW FROM SUB30 TO SUB31
667          RK    1304   .0225    .025            TRAP      20       1     YES
             *

668          KK   SUB31
669          KM   SUB-BASIN SUB31
670          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
671          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
672          KM     L =  .25  Kb = .058  Adj. Slope =  118.0
673          BA    .061
```

```
674          LG    .300    .260   3.670    .690  15.000
675          UC    .429    .235
676          UA       0       3       5       8      12      20      43      75      90      96
677          UA     100
             *

678          KK   DIV31
679          KM        DIVERT FOR IRRIGATED LAWNS SUB31
680          DT     D31     .45
681          DI       0       1
682          DQ       0    .400
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

683          KK  C30-31
684          KM        COMBINE SUB30 & SUB31 AT CP31
685          HC       2
             *

686          KK  R31-32
687          KM        ROUTE FLOW FROM SUB31 TO SUB32
688          RK    1260    .019    .016       0    TRAP      30       1     YES
             *

689          KK   SUB32
690          KM   SUB-BASIN SUB32
691          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
692          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
693          KM     L =  .27  Kb = .058  Adj. Slope =   77.0
694          BA    .064
695          LG    .300    .250   3.950    .580  15.000
696          UC    .475    .272
697          UA       0       5      16      30      65      77      84      90      94      97
698          UA     100
             *

699          KK   DIV32
700          KM        DIVERT FOR IRRIGATED LAWNS SUB32
701          DT     D32     .79
702          DI     0.0     1.0
703          DQ       0     .60
             *

704          KK   DLAF2
705          KM        DIVERT FLOW TO LAFAYETTE S.D.
706          DT  DSUB32
707          DI       0       5      10      13      15      20
708          DQ       0       5      10      13      13      13
             *

709          KK  C31-32
710          KM        COMBINE HYDROGRAPH SUB31 & SUB32 AT CP32
711          HC       2
             *

712          KK  R32-33
713          KM        ROUTE FLOW FROM SUB32 TO SUB33
714          RK    1447   .0144     .07           TRAP       0       3     YES
             *

715          KK   SUB33
716          KM   SUB-BASIN SUB33
717          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
718          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
719          KM     L =  .22  Kb = .058  Adj. Slope =   65.0
720          BA    .062
721          LG    .277    .250   3.950    .580  22.000
722          UC    .404    .197
1                                        HEC-1 INPUT                                        PAGE 20

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

723          UA       0       5      16      30      65      77      84      90      94      97
724          UA     100
             *

725          KK   DIV33
726          KM        DIVERT FOR IRRIGATED LAWNS SUB33
727          DT     D33     .62
728          DI       0       1
729          DQ       0     .37
             *
             *

730          KK  C33-32
731          KM        COMBINE SUB32 WITH SUB33
732          HC       2
             *

733          KK  C33-29
734          KM        COMBINE SUB29 WITH SUB33
735          HC       2
```

```
                *
  736           KK   SUB34
  737           KM   SUB-BASIN SUB34
  738           KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  739           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  740           KM     L =  .57  Kb = .050  Adj. Slope =   87.0
  741           BA    .167
  742           LG    .284    .250   3.950    .590  20.000
  743           UC    .613    .380
  744           UA       0       5      16      30      65      77      84      90      94      97
  745           UA     100
                *
  746           KK   DIV34
  747           KM        DIVERT FOR IRRIGATED LAWNS SUB34
  748           DT     D34    1.53
  749           DI       0       1
  750           DQ       0    .366
                *
  751           KK   DLAF1
  752           KM        DIVERT FLOW TO LAFAYETTE S.D.
  753           DT  DSUB34
  754           DI       0      10      25      30      50
  755           DQ       0      10      25      25      25
                *
  756           KK  R34-35
  757           KM        ROUTE FLOW FROM SUB34 TO SUB35
  758           RK  1531.2    .018    .016            TRAP      40       1     YES
                *
1                                      HEC-1 INPUT                                                    PAGE 21

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

  759           KK   SUB35
  760           KM   SUB-BASIN SUB35
  761           KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  762           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  763           KM     L =  .29  Kb = .048  Adj. Slope =   51.0
  764           BA    .128
  765           LG    .223    .250   3.950    .600  39.000
  766           UC    .400    .160
  767           UA       0       3       5       8      12      20      43      75      90      96
  768           UA     100
                *
  769           KK   DIV35
  770           KM        DIVERT FOR IRRIGATED LAWNS SUB35
  771           DT     D35     .53
  772           DI     0.0     1.0
  773           DQ     0.0    .095
                *
  774           KK  C35-34
  775           KM        COMBINE SUB34 WITH SUB35
  776           HC       2
                *
  777           KK  C35-33
  778           KM        COMBINE SUB33 WITH SUB35
  779           HC       2
                *
  780           KK   SUB40
  781           KM   SUB-BASIN SUB40
  782           KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  783           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  784           KM     L =  .31  Kb = .099  Adj. Slope = 1822.0
  785           BA    .074
  786           LG    .162    .332   4.250    .350  22.000
  787           UC    .183    .097
  788           UA       0       5      16      30      65      77      84      90      94      97
  789           UA     100
                *
  790           KK  R40-41
  791           KM        ROUTE FLOW FROM SUB40 TO SUB41
  792           RK   1452   .0221     .05            TRAP       6       2     YES
                *
  793           KK   SUB41
  794           KM   SUB-BASIN SUB41
  795           KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
  796           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
  797           KM     L =  .54  Kb = .054  Adj. Slope =  110.0
  798           BA    .144
  799           LG    .283    .251   4.600    .360  17.000
  800           UC    .479    .301
1                                      HEC-1 INPUT                                                    PAGE 22

 LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
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801          UA       0       5      16      30      65      77      84      90      94      97
802          UA     100
             *

803          KK  C40-41
804          KM        COMBINE HYDROGRAPH SUB40 & SUB41 AT CP41
805          HC       2
             *

806          KK  D41-44
807          KM        DIVERT FLOW FOR 44TH ST. SYSTEM
808          DT  DSUB41
809          DI       0      50      93     100     150
810          DQ       0      50      92      92      92
             *

811          KK  R41-39
812          KM        ROUTE FLOW FROM SUB41 TO   SUB39
813          RK    2865   .0341     .05            TRAP       4       3     YES
             *
             * ADD SUBBASIN 38B

814          KK  SUB38B
815          BA   0.141
816          LG    0.25    0.27    4.35    0.38      42
817          UC   0.390   0.306
818          UA       0     4.5    12.6    23.2    35.8    50.0    64.2    76.8    87.4    95.5
819          UA     100

820          KK  RD3839
821          KM        RECALL DIVERSION FROM SUBBASIN 38
822          DR  DSUB38
             *

823          KK   C-38B
824          KM   COMBINE SUB 38B WITH 38A WEST DIVERSION
825          HC       2
             *

826          KK   SUB37
827          KM   SUB-BASIN SUB37
828          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
829          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
830          KM     L =  .30  Kb = .059  Adj. Slope =  247.0
831          BA    .049
832          LG    .300    .250   3.950    .490   5.000
833          UC    .317    .220
834          UA       0       5      16      30      65      77      84      90      94      97
835          UA     100
             *
1                                        HEC-1 INPUT                                          PAGE 23

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

836          KK  R37-39
837          KM        ROUTE FLOW FROM SUB37 TO   SUB39
838          RK    3500    .018    .016            TRAP      70       1     YES
             *

839          KK   SUB39
840          KM   SUB-BASIN SUB39
841          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
842          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
843          KM     L =  .84  Kb = .051  Adj. Slope =   79.0
844          BA    .188
845          LG    .220    .262   4.000    .530  34.000
846          UC    .671    .536
847          UA       0       3       5       8      12      20      43      75      90      96
848          UA     100
             *

849          KK  C37-39
850          KM        COMBINE SUB39 WITH SUB37 WITH COMBINED FROM SUB38B & 38A WEST DIVERSION
851          HC       3
             *

852          KK  D39-44
853          KM        DIVERT FOR 44TH ST SYSTEM
854          DT  DSUB39
855          DI       0      50     100     150     153     175     200
856          DQ       0      50     100     150     153     153     153
             *

857          KK  C41-39
858          KM        COMBINE SUB41 WITH SUB39
859          HC       2
             *

860          KK  R39-36
861          KM        ROUTE FLOW FROM SUB39 TO   SUB36
862          RK    1250    .006    .016            TRAP      26       1     YES
             *

863          KK   SUB36
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 864          KM   SUB-BASIN SUB36
 865          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 866          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 867          KM     L =  .28  Kb = .052  Adj. Slope =   14.0
 868          BA    .089
 869          LG    .232    .250   3.950    .590  41.000
 870          UC    .642    .324
 871          UA       0       5      16      30      65      77      84      90      94      97
 872          UA     100
              *
1                                        HEC-1 INPUT                                                    PAGE 24

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

 873          KK   DIV36
 874          KM        DIVERT FOR IRRIGATED LAWNS SUB36
 875          DT     D36     .61
 876          DI     0.0     1.0
 877          DQ     0.0    .150
              *

 878          KK  C39-36
 879          KM        COMBINE SUB39 WITH SUB36
 880          HC       2
              *

 881          KK  C36-35
 882          KM        COMBINE SUB36 WITH SUB35
 883          HC       2
              *

 884          KK   SUB42
 885          KM   SUB-BASIN SUB42
 886          KM   6-HOUR RAINFALL, PATTERN NO. 2.20 WAS USED TO FIND TC & R FOR THIS BASIN
 887          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .967
 888          KM     L =  .51  Kb = .044  Adj. Slope =   29.0
 889          BA    .251
 890          LG    .256    .250   5.600    .250  23.000
 891          UC    .596    .267
 892          UA       0       5      16      30      65      77      84      90      94      97
 893          UA     100
              *

 894          KK   DIV42
 895          KM        DIVERT FOR IRRIGATED LAWNS SUB42
 896          DT     D42     .75
 897          DI       0       1
 898          DQ       0    .072
              *

 899          KK  C42-36
 900          KM        COMBINE HYDROGRAPH SUB42 WITH SUB36
 901          HC       2
              *
              *
              *
              *
              *       100-YR PEAK FLOW AFTER 2-YR FLUSH HYDROGRAPH FOR DETENTION SIZING
              *
              *       64TH STREET TRUNK LINE
              *       DIVERTS FIRST 127 CFS TO LAFAYETTE STORM DRAIN
              *       AT LAFAYETTE BLVD. AND 64TH ST.
              *
1                                        HEC-1 INPUT                                                    PAGE 25

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

 902          KK   RSUB7
 903          KM        RECALL DIVERSION
 904          DR   DSUB7
              *

 905          KK  R64TH1
 906          KM        ROUTE FLOW
 907          RK    2400    .005    .018            CIRC       4            YES
              *

 908          KK   RSUB2
 909          KM        RECALL DIVERSION
 910          DR   DSUB2
              *

 911          KK   COMB1
 912          KM        COMBINE FLOW
 913          HC       2
              *

 914          KK  R64TH2
 915          KM        ROUTE FLOW
 916          RK    2700    .005    .018            CIRC       4            YES
              *
              *
              *
```

```
                *
                *
                *
                *       48TH STREET TRUNK LINE
                *       2-YR FLOWS FROM N. OF CAMELBACK AND SUBS 29,30, & 31.
                *
                *
                *

  917           KK  RSUB12
  918           KM        RECALL DIVERSION
  919           DR  DSUB12
                *

  920           KK  R48TH1
  921           KM        ROUTE FLOW
  922           RK    2200    .005    .018            CIRC       4             YES
                *

  923           KK  RSUB17
  924           KM        RECALL DIVERSION
  925           DR  DSUB17
                *
1                                        HEC-1 INPUT                                                    PAGE 26

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

  926           KK   COMB2
  927           KM        COMBINE FLOW
  928           HC       2
                *

  929           KK  R48TH2
  930           KM        ROUTE FLOW
  931           RK    1300    .005    .018            CIRC     4.5             YES
                *

  932           KK  RSUB22
  933           KM        RECALL DIVERSION
  934           DR  DSUB22
                *

  935           KK   COMB3
  936           KM        COMBINE FLOW
  937           HC       2
                *

  938           KK  R48TH3
  939           KM        ROUTE FLOW
  940           RK    1000    .005    .018            CIRC       5             YES
                *

  941           KK  RSUB26
  942           KM        RECALL DIVERSION
  943           DR  DSUB26
                *

  944           KK   COMB6
  945           KM        COMBINE FLOW
  946           HC       2
                *

  947           KK  RSUB30
  948           KM        RECALL DIVERSION
  949           DR  DSUB30
                *

  950           KK   COMB7
  951           KM        COMBINE FLOW
  952           HC       2
                *

  953           KK  R48TH4
  954           KM        ROUTE FLOW
  955           RK    1300    .005    .018            CIRC     5.5             YES
                *
1                                        HEC-1 INPUT                                                    PAGE 27

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

  956           KK  RSUB27
  957           KM        RECALL DIVERSION
  958           DR  DSUB27
                *

  959           KK   COMB9
  960           KM        COMBINE FLOW
  961           HC       2
                *

  962           KK  R48TH5
  963           KM        ROUTE FLOW
  964           RK    1300    .005    .018            CIRC       6             YES
```

```
                *
 965            KK  RSUB28
 966            KM        RECALL DIVERSION
 967            DR  DSUB28
                *
 968            KK  COMB10
 969            KM        COMBINE FLOW
 970            HC       2
                *
 971            KK  R48TH6
 972            KM        ROUTE FLOW
 973            RK    1175    .005    .018            CIRC     6.5             YES
                *
                *
                *
                *       44TH STREET TRUNK LINE SYSTEM
                *
 974            KK  RSUB41
 975            KM        RECALL DIVERSION
 976            DR  DSUB41
                *
 977            KK  R44TH1
 978            KM        ROUTE FLOW
 979            RK     900    .005    .018            CIRC       5             YES
                *
 980            KK  RSUB39
 981            KM        RECALL DIVERSION
 982            DR  DSUB39
                *
1                                        HEC-1 INPUT                                        PAGE 28

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

 983            KK  COMB13
 984            KM        COMBINE  FLOW
 985            HC       2
                *
 986            KK  R-LAF1
 987            KM        ROUTE FLOW
 988            RK    3400    .005    .018            CIRC       6             YES
                *
 989            KK  RSUB34
 990            KM        RECALL DIVERSION
 991            DR  DSUB34
                *
 992            KK  COMB14
 993            KM        COMBINE  FLOW
 994            HC       2
                *
 995            KK  R-LAF2
 996            KM        ROUTE FLOW
 997            RK    1600    .005    .018            CIRC     6.5             YES
                *
 998            KK  RSUB32
 999            KM        RECALL DIVERSION
1000            DR  DSUB32
                *
1001            KK  COMB15
1002            KM        COMBINE  FLOW
1003            HC       2
                *
1004            KK  COMB16
1005            KM        COMBINE  FLOW
1006            HC       2
                *
1007            KK  RSUB29
1008            KM        RECALL DIVERSION
1009            DR  DSUB29
                *
1010            KK  COMB11
1011            KM        COMBINE FLOW
1012            HC       2
                *
1013            ZZ
```

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	SUB1	59.	4.08	9.	2.	2.	.04		
+	ROUTED TO	R1-2	58.	4.17	9.	2.	2.	.04		
+	HYDROGRAPH AT	SUB2	84.	4.33	15.	4.	4.	.12		
+	DIVERSION TO	D2	25.	4.33	2.	0.	0.	.12		
+	HYDROGRAPH AT	DIV2	84.	4.33	14.	3.	3.	.12		
+	2 COMBINED AT	C1-2	139.	4.25	23.	6.	6.	.15		
+	DIVERSION TO	DSUB2	18.	4.25	8.	2.	2.	.15		
+	HYDROGRAPH AT	D2-64	121.	4.25	15.	4.	4.	.15		
+	ROUTED TO	R2-3	118.	4.33	15.	4.	4.	.15		
+	HYDROGRAPH AT	SUB3	60.	4.25	9.	2.	2.	.07		
+	DIVERSION TO	D3	30.	4.25	2.	0.	0.	.07		
+	HYDROGRAPH AT	DIV3	60.	4.25	8.	2.	2.	.07		
+	2 COMBINED AT	C2-3	175.	4.33	22.	6.	5.	.22		
+	ROUTED TO	R3-4	173.	4.33	22.	6.	5.	.22		
+	HYDROGRAPH AT	SUB4	69.	4.17	10.	3.	2.	.06		
+	DIVERSION TO	D4	31.	4.17	2.	1.	0.	.06		
+	HYDROGRAPH AT	DIV4	69.	4.17	8.	2.	2.	.06		
+	2 COMBINED AT	C3-4	236.	4.33	31.	8.	7.	.29		
+	DIVERSION TO	DSUB4	3.	4.33	2.	0.	0.	.29		
+	HYDROGRAPH AT	D4-64	233.	4.33	29.	7.	7.	.29		
+	ROUTED TO	R4-5	229.	4.33	29.	7.	7.	.29		
+	HYDROGRAPH AT	SUB5	42.	4.50	10.	3.	3.	.07		
+	DIVERSION TO	D5	21.	4.58	2.	0.	0.	.07		
+	HYDROGRAPH AT	DIV5	41.	4.58	9.	2.	2.	.07		
+	2 COMBINED AT	C4-5	248.	4.33	38.	9.	9.	.35		
+	HYDROGRAPH AT	SUB6	152.	4.00	22.	6.	5.	.09		
+	ROUTED TO	R6-7	147.	4.08	22.	6.	5.	.09		
+	HYDROGRAPH AT	SUB7	152.	4.25	27.	7.	7.	.15		
+	DIVERSION TO	D7	63.	4.33	5.	1.	1.	.15		
+	HYDROGRAPH AT	DIV7	150.	4.33	22.	6.	5.	.15		
+	2 COMBINED AT	C6-7	253.	4.33	45.	11.	11.	.24		
	DIVERSION TO									

+		DSUB7	110.	4.33	31.	8.	8.	.24
+	HYDROGRAPH AT	D7-64	143.	4.33	13.	3.	3.	.24
+	ROUTED TO	R7-8	140.	4.42	14.	3.	3.	.24
+	HYDROGRAPH AT	SUB8	47.	4.42	10.	2.	2.	.07
+	DIVERSION TO	D8	27.	4.42	2.	0.	0.	.07
+	HYDROGRAPH AT	DIV8	47.	4.42	8.	2.	2.	.07
+	2 COMBINED AT	C7-8	186.	4.42	22.	5.	5.	.31
+	ROUTED TO	R8-9	183.	4.42	22.	5.	5.	.31
+	HYDROGRAPH AT	SUB9	65.	4.17	10.	2.	2.	.06
+	DIVERSION TO	D9	31.	4.17	2.	0.	0.	.06
+	HYDROGRAPH AT	DIV9	65.	4.17	8.	2.	2.	.06
+	2 COMBINED AT	C8-9	235.	4.42	29.	7.	7.	.38
+	ROUTED TO	R9-5	230.	4.42	29.	7.	7.	.38
+	2 COMBINED AT	C9-5	478.	4.42	67.	17.	16.	.73
+	HYDROGRAPH AT	SUB10	88.	4.25	15.	4.	4.	.09
+	DIVERSION TO	D10	36.	4.25	2.	1.	1.	.09
+	HYDROGRAPH AT	DIV10	88.	4.25	12.	3.	3.	.09
+	2 COMBINED AT	C5-10	561.	4.42	79.	20.	19.	.82
+	HYDROGRAPH AT	SUB11	131.	4.08	21.	5.	5.	.09
+	ROUTED TO	R11-12	130.	4.17	21.	5.	5.	.09
+	HYDROGRAPH AT	SUB12	172.	4.00	21.	5.	5.	.12
+	DIVERSION TO	D12	12.	4.00	1.	0.	0.	.12
+	HYDROGRAPH AT	DIV12	171.	4.00	20.	5.	5.	.12
+	2 COMBINED AT	C11-12	296.	4.08	40.	10.	10.	.21
+	DIVERSION TO	DSUB12	130.	4.08	28.	7.	7.	.21
+	HYDROGRAPH AT	D12-48	166.	4.08	12.	3.	3.	.21
+	ROUTED TO	R12-13	161.	4.08	12.	3.	3.	.21
+	HYDROGRAPH AT	SUB13	191.	4.08	24.	6.	6.	.13
+	DIVERSION TO	D13	33.	4.08	2.	0.	0.	.13
+	HYDROGRAPH AT	DIV13	191.	4.08	22.	6.	5.	.13
+	2 COMBINED AT	C12-13	352.	4.08	35.	9.	8.	.34
+	ROUTED TO	R13-14	342.	4.08	35.	9.	8.	.34
+	HYDROGRAPH AT	SUB14	133.	4.08	17.	4.	4.	.13
+	DIVERSION TO	D14	57.	4.08	3.	1.	1.	.13
+	HYDROGRAPH AT	DIV14	133.	4.08	14.	4.	3.	.13

+	2 COMBINED AT C13-14	474.	4.08	49.	12.	12.	.47
+	ROUTED TO R14-15	465.	4.17	49.	12.	12.	.47
+	HYDROGRAPH AT SUB15	127.	4.25	20.	5.	5.	.13
+	DIVERSION TO D15	67.	4.25	4.	1.	1.	.13
+	HYDROGRAPH AT DIV15	127.	4.25	16.	4.	4.	.13
+	2 COMBINED AT C15-14	572.	4.17	65.	16.	16.	.60
+	2 COMBINED AT C15-10	1046.	4.25	143.	36.	35.	1.42
+	DIVERSION TO D56ST	405.	4.25	37.	9.	9.	1.42
+	HYDROGRAPH AT D56ST	641.	4.25	106.	27.	26.	1.42
+	HYDROGRAPH AT SUB16	194.	4.08	31.	8.	7.	.13
+	ROUTED TO R16-17	190.	4.17	31.	8.	8.	.13
+	HYDROGRAPH AT SUB17	78.	4.08	10.	3.	2.	.07
+	DIVERSION TO D17	4.	4.08	0.	0.	0.	.07
+	HYDROGRAPH AT DIV17	78.	4.08	10.	2.	2.	.07
+	2 COMBINED AT C16-17	267.	4.17	41.	10.	10.	.20
+	DIVERSION TO DSUB17	121.	4.17	29.	7.	7.	.20
+	HYDROGRAPH AT D17-48	146.	4.17	11.	3.	3.	.20
+	ROUTED TO R17-18	145.	4.17	11.	3.	3.	.20
+	HYDROGRAPH AT SUB18	64.	4.17	9.	2.	2.	.07
+	DIVERSION TO D18	26.	4.17	2.	0.	0.	.07
+	HYDROGRAPH AT DIV18	64.	4.17	7.	2.	2.	.07
+	2 COMBINED AT C17-18	209.	4.17	19.	5.	5.	.27
+	ROUTED TO R18-19	207.	4.17	19.	5.	5.	.27
+	HYDROGRAPH AT SUB19	71.	4.17	10.	3.	2.	.08
+	DIVERSION TO D19	31.	4.17	2.	0.	0.	.08
+	HYDROGRAPH AT DIV19	71.	4.17	8.	2.	2.	.08
+	2 COMBINED AT C18-19	279.	4.17	27.	7.	7.	.34
+	ROUTED TO R19-20	272.	4.17	27.	7.	7.	.34
+	HYDROGRAPH AT SUB20	138.	4.17	19.	5.	5.	.13
+	DIVERSION TO D20	69.	4.17	4.	1.	1.	.13
+	HYDROGRAPH AT DIV20	138.	4.17	15.	4.	4.	.13
+	2 COMBINED AT C20-19	411.	4.17	42.	11.	10.	.47
+	2 COMBINED AT C20-15	1039.	4.25	149.	37.	36.	1.89
+	HYDROGRAPH AT SUB21	194.	4.08	30.	7.	7.	.12

+	ROUTED TO R21-22	192.	4.17	30.	7.	7.	.12
+	HYDROGRAPH AT SUB22	84.	4.33	15.	4.	4.	.11
+	DIVERSION TO D22	4.	4.33	0.	0.	0.	.11
+	HYDROGRAPH AT DIV22	84.	4.33	14.	4.	3.	.11
+	2 COMBINED AT C21-22	268.	4.17	44.	11.	11.	.24
+	DIVERSION TO DSUB22	117.	4.17	31.	8.	8.	.24
+	HYDROGRAPH AT D22-48	151.	4.17	13.	3.	3.	.24
+	ROUTED TO R22-23	148.	4.17	13.	3.	3.	.24
+	HYDROGRAPH AT SUB23	63.	4.08	8.	2.	2.	.06
+	DIVERSION TO D23	27.	4.08	1.	0.	0.	.06
+	HYDROGRAPH AT DIV23	63.	4.08	7.	2.	2.	.06
+	2 COMBINED AT C22-23	209.	4.17	19.	5.	5.	.30
+	ROUTED TO R23-24	205.	4.17	19.	5.	5.	.30
+	HYDROGRAPH AT SUB24	70.	4.17	10.	3.	2.	.08
+	DIVERSION TO D24	33.	4.17	2.	0.	0.	.08
+	HYDROGRAPH AT DIV24	70.	4.17	8.	2.	2.	.08
+	2 COMBINED AT C23-24	274.	4.17	28.	7.	7.	.37
+	ROUTED TO R24-25	270.	4.25	28.	7.	7.	.37
+	HYDROGRAPH AT SUB25	66.	4.25	10.	3.	2.	.08
+	DIVERSION TO D25	28.	4.25	2.	0.	0.	.08
+	HYDROGRAPH AT DIV25	66.	4.25	8.	2.	2.	.08
+	2 COMBINED AT C25-24	336.	4.25	36.	9.	9.	.45
+	2 COMBINED AT C25-20	1375.	4.25	185.	47.	45.	2.34
+	HYDROGRAPH AT SUB26	45.	4.25	7.	2.	2.	.05
+	DIVERSION TO D26	10.	4.25	1.	0.	0.	.05
+	HYDROGRAPH AT DIV26	45.	4.25	6.	2.	2.	.05
+	DIVERSION TO DSUB26	7.	4.25	2.	1.	1.	.05
+	HYDROGRAPH AT D26-48	38.	4.25	4.	1.	1.	.05
+	ROUTED TO R26-27	38.	4.25	4.	1.	1.	.05
+	HYDROGRAPH AT SUB27	60.	4.08	8.	2.	2.	.06
+	DIVERSION TO D27	25.	4.08	1.	0.	0.	.06
+	HYDROGRAPH AT DIV27	60.	4.08	7.	2.	2.	.06
+	DIVERSION TO DSUB27	12.	4.08	3.	1.	1.	.06
+	HYDROGRAPH AT D27-48	48.	4.08	4.	1.	1.	.06
	2 COMBINED AT						

+	C26-27	81.	4.17	8.	2.	2.	.12
+	ROUTED TO R27-28	81.	4.25	8.	2.	2.	.12
+	HYDROGRAPH AT SUB28	74.	4.17	10.	3.	3.	.08
+	DIVERSION TO D28	34.	4.17	2.	0.	0.	.08
+	HYDROGRAPH AT DIV28	74.	4.17	9.	2.	2.	.08
+	DIVERSION TO DSUB28	7.	4.17	2.	1.	1.	.08
+	HYDROGRAPH AT D28-48	67.	4.17	6.	2.	1.	.08
+	2 COMBINED AT C27-28	145.	4.25	14.	3.	3.	.19
+	ROUTED TO R28-29	144.	4.25	14.	3.	3.	.19
+	HYDROGRAPH AT SUB29	51.	4.17	8.	2.	2.	.06
+	DIVERSION TO D29	23.	4.17	1.	0.	0.	.06
+	HYDROGRAPH AT DIV29	51.	4.17	6.	2.	2.	.06
+	DIVERSION TO DSUB29	10.	4.17	3.	1.	1.	.06
+	HYDROGRAPH AT D29-48	41.	4.17	4.	1.	1.	.06
+	2 COMBINED AT C29-28	186.	4.25	17.	4.	4.	.25
+	2 COMBINED AT C29-25	1560.	4.25	203.	51.	49.	2.59
+	HYDROGRAPH AT SUB38A	120.	4.42	31.	8.	8.	.12
+	DIVERSION TO DSUB38	16.	4.42	11.	3.	3.	.12
+	HYDROGRAPH AT D38-39	104.	4.42	20.	5.	5.	.12
+	ROUTED TO R38-30	104.	4.42	20.	5.	5.	.12
+	HYDROGRAPH AT SUB30	60.	4.17	8.	2.	2.	.06
+	2 COMBINED AT C30-38	154.	4.33	28.	7.	7.	.18
+	DIVERSION TO DSUB30	60.	4.33	18.	4.	4.	.18
+	HYDROGRAPH AT D30-48	94.	4.33	11.	3.	3.	.18
+	ROUTED TO R30-31	94.	4.33	11.	3.	3.	.18
+	HYDROGRAPH AT SUB31	54.	4.25	8.	2.	2.	.06
+	DIVERSION TO D31	16.	4.25	1.	0.	0.	.06
+	HYDROGRAPH AT DIV31	54.	4.25	7.	2.	2.	.06
+	2 COMBINED AT C30-31	146.	4.25	17.	4.	4.	.24
+	ROUTED TO R31-32	145.	4.33	17.	4.	4.	.24
+	HYDROGRAPH AT SUB32	56.	4.17	9.	2.	2.	.06
+	DIVERSION TO D32	26.	4.17	2.	0.	0.	.06
+	HYDROGRAPH AT DIV32	56.	4.17	7.	2.	2.	.06
+	DIVERSION TO DSUB32	13.	4.17	3.	1.	1.	.06
+	HYDROGRAPH AT DLAF2	43.	4.17	4.	1.	1.	.06

+	2 COMBINED AT	C31-32	185.	4.25	21.	5.	5.	.31
+	ROUTED TO	R32-33	185.	4.33	21.	5.	5.	.31
+	HYDROGRAPH AT	SUB33	65.	4.17	9.	2.	2.	.06
+	DIVERSION TO	D33	20.	4.17	1.	0.	0.	.06
+	HYDROGRAPH AT	DIV33	65.	4.17	8.	2.	2.	.06
+	2 COMBINED AT	C33-32	239.	4.33	29.	7.	7.	.37
+	2 COMBINED AT	C33-29	1794.	4.25	232.	58.	56.	2.96
+	HYDROGRAPH AT	SUB34	131.	4.25	24.	6.	6.	.17
+	DIVERSION TO	D34	45.	4.33	3.	1.	1.	.17
+	HYDROGRAPH AT	DIV34	131.	4.33	21.	5.	5.	.17
+	DIVERSION TO	DSUB34	25.	4.33	10.	2.	2.	.17
+	HYDROGRAPH AT	DLAF1	106.	4.33	12.	3.	3.	.17
+	ROUTED TO	R34-35	105.	4.33	12.	3.	3.	.17
+	HYDROGRAPH AT	SUB35	158.	4.25	25.	6.	6.	.13
+	DIVERSION TO	D35	13.	4.25	1.	0.	0.	.13
+	HYDROGRAPH AT	DIV35	158.	4.25	24.	6.	6.	.13
+	2 COMBINED AT	C35-34	248.	4.33	35.	9.	9.	.30
+	2 COMBINED AT	C35-33	2038.	4.25	267.	67.	65.	3.25
+	HYDROGRAPH AT	SUB40	106.	4.00	13.	3.	3.	.07
+	ROUTED TO	R40-41	102.	4.00	13.	3.	3.	.07
+	HYDROGRAPH AT	SUB41	145.	4.25	24.	6.	6.	.14
+	2 COMBINED AT	C40-41	235.	4.08	37.	9.	9.	.22
+	DIVERSION TO	DSUB41	92.	4.08	24.	6.	6.	.22
+	HYDROGRAPH AT	D41-44	143.	4.08	13.	3.	3.	.22
+	ROUTED TO	R41-39	142.	4.17	13.	3.	3.	.22
+	HYDROGRAPH AT	SUB38B	161.	4.25	30.	8.	7.	.14
+	HYDROGRAPH AT	RD3839	16.	3.50	11.	3.	3.	.00
+	2 COMBINED AT	C-38B	177.	4.25	41.	11.	10.	.14
+	HYDROGRAPH AT	SUB37	48.	4.08	6.	1.	1.	.05
+	ROUTED TO	R37-39	48.	4.25	6.	2.	1.	.05
+	HYDROGRAPH AT	SUB39	151.	4.50	35.	9.	8.	.19
+	3 COMBINED AT	C37-39	350.	4.33	82.	21.	20.	.38
+	DIVERSION TO	DSUB39	323.	4.33	79.	20.	19.	.38
+	HYDROGRAPH AT	D39-44	27.	4.33	3.	1.	1.	.38

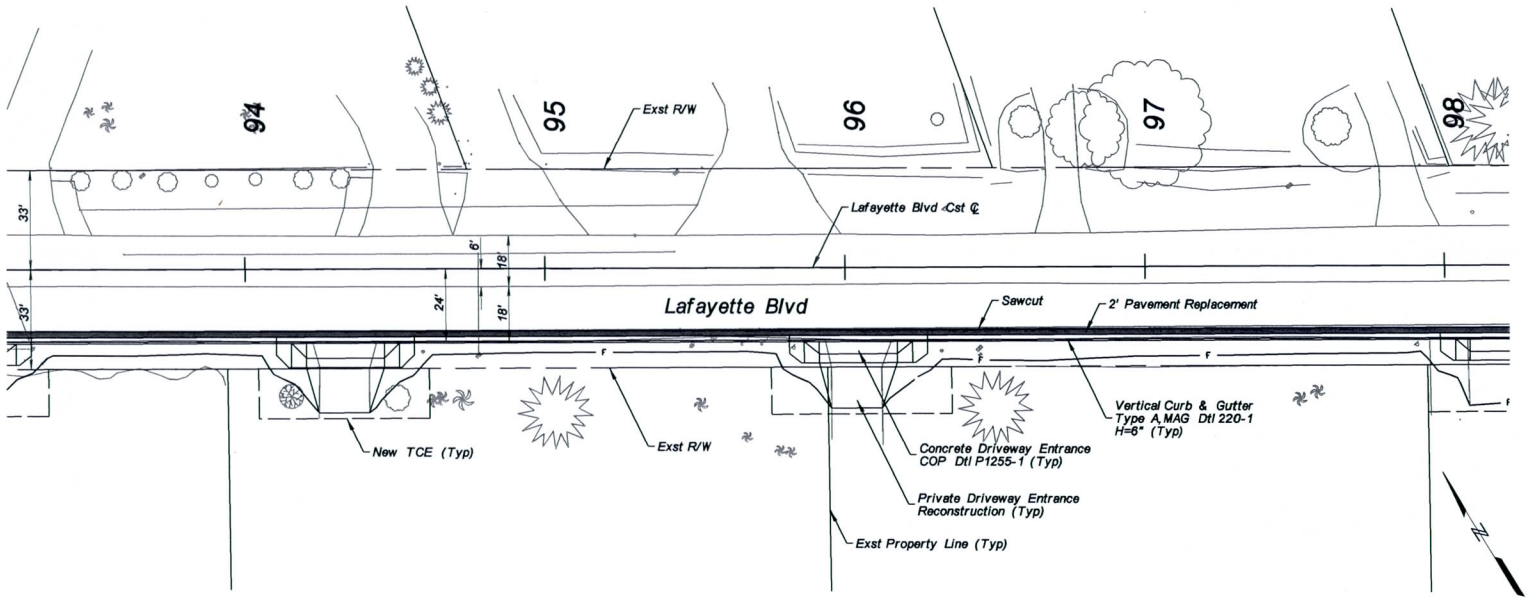
	2 COMBINED AT							
+		C41-39	164.	4.17	16.	4.	4.	.60
	ROUTED TO							
+		R39-36	160.	4.25	15.	4.	4.	.60
	HYDROGRAPH AT							
+		SUB36	88.	4.25	18.	4.	4.	.09
	DIVERSION TO							
+		D36	13.	4.33	1.	0.	0.	.09
	HYDROGRAPH AT							
+		DIV36	86.	4.33	16.	4.	4.	.09
	2 COMBINED AT							
+		C39-36	236.	4.33	32.	8.	8.	.68
	2 COMBINED AT							
+		C36-35	2272.	4.25	299.	75.	72.	3.94
	HYDROGRAPH AT							
+		SUB42	285.	4.25	48.	12.	12.	.25
	DIVERSION TO							
+		D42	20.	4.25	2.	0.	0.	.25
	HYDROGRAPH AT							
+		DIV42	277.	4.25	47.	12.	11.	.25
	2 COMBINED AT							
+		C42-36	2549.	4.25	345.	87.	84.	4.19
	HYDROGRAPH AT							
+		RSUB7	110.	3.83	31.	8.	8.	.00
	ROUTED TO							
+		R64TH1	110.	3.92	31.	8.	8.	.00
	HYDROGRAPH AT							
+		RSUB2	18.	3.75	8.	2.	2.	.00
	2 COMBINED AT							
+		COMB1	128.	3.92	39.	10.	10.	.00
	ROUTED TO							
+		R64TH2	128.	4.00	39.	10.	10.	.00
	HYDROGRAPH AT							
+		RSUB12	130.	3.75	28.	7.	7.	.00
	ROUTED TO							
+		R48TH1	130.	3.83	28.	7.	7.	.00
	HYDROGRAPH AT							
+		RSUB17	121.	3.83	29.	7.	7.	.00
	2 COMBINED AT							
+		COMB2	251.	3.83	58.	14.	14.	.00
	ROUTED TO							
+		R48TH2	251.	3.92	58.	14.	14.	.00
	HYDROGRAPH AT							
+		RSUB22	117.	3.83	31.	8.	8.	.00
	2 COMBINED AT							
+		COMB3	368.	3.92	89.	22.	21.	.00
	ROUTED TO							
+		R48TH3	368.	4.00	89.	22.	22.	.00
	HYDROGRAPH AT							
+		RSUB26	7.	3.83	2.	1.	1.	.00
	2 COMBINED AT							
+		COMB6	375.	4.00	91.	23.	22.	.00
	HYDROGRAPH AT							
+		RSUB30	60.	3.83	18.	4.	4.	.00
	2 COMBINED AT							
+		COMB7	435.	4.00	109.	27.	26.	.00
	ROUTED TO							
+		R48TH4	435.	4.08	109.	27.	26.	.00
	HYDROGRAPH AT							
+		RSUB27	12.	3.83	3.	1.	1.	.00
	2 COMBINED AT							
+		COMB9	447.	4.08	112.	28.	27.	.00
	ROUTED TO							
+		R48TH5	447.	4.17	112.	28.	27.	.00
	HYDROGRAPH AT							
+		RSUB28	7.	3.75	2.	1.	1.	.00
	2 COMBINED AT							
+		COMB10	454.	4.17	114.	29.	28.	.00
	ROUTED TO							

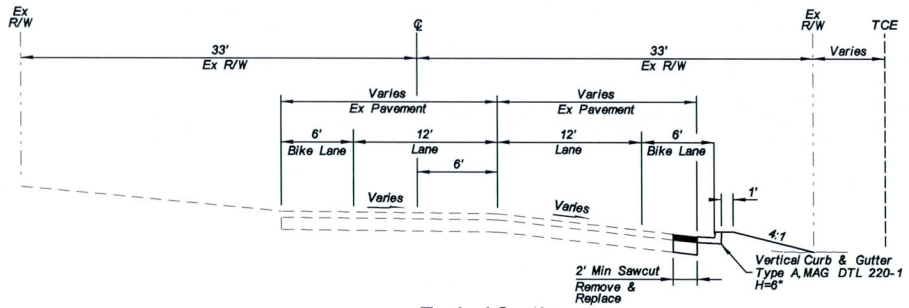
+		R48TH6	454.	4.25	114.	29.	28.	.00
+	HYDROGRAPH AT	RSUB41	92.	3.75	24.	6.	6.	.00
+	ROUTED TO	R44TH1	92.	3.83	24.	6.	6.	.00
+	HYDROGRAPH AT	RSUB39	323.	4.33	79.	20.	19.	.00
+	2 COMBINED AT	COMB13	415.	4.33	102.	26.	25.	.00
+	ROUTED TO	R-LAF1	413.	4.42	102.	26.	25.	.00
+	HYDROGRAPH AT	RSUB34	25.	3.83	10.	2.	2.	.00
+	2 COMBINED AT	COMB14	438.	4.42	112.	28.	27.	.00
+	ROUTED TO	R-LAF2	437.	4.42	112.	28.	27.	.00
+	HYDROGRAPH AT	RSUB32	13.	3.92	3.	1.	1.	.00
+	2 COMBINED AT	COMB15	450.	4.42	115.	29.	28.	.00
+	2 COMBINED AT	COMB16	904.	4.42	230.	58.	56.	.00
+	HYDROGRAPH AT	RSUB29	10.	3.92	3.	1.	1.	.00
+	2 COMBINED AT	COMB11	914.	4.42	232.	59.	57.	.00

1

Appendix D

Surface Improvement Alternatives





Typical Section

REMOVE

RELOCATE

RELOCATE BY OTHERS

CONSTRUCT

Horizontal Scale In Feet
10 0 10 20

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

LAFAYETTE INTERCEPTOR DRAIN
AND OUTLET DESIGN
PCN 625.02.30

	BY	DATE
DESIGNED	JDM	03/2011
DRAWN	JDM	03/2011
CHECKED	DRR	03/2011

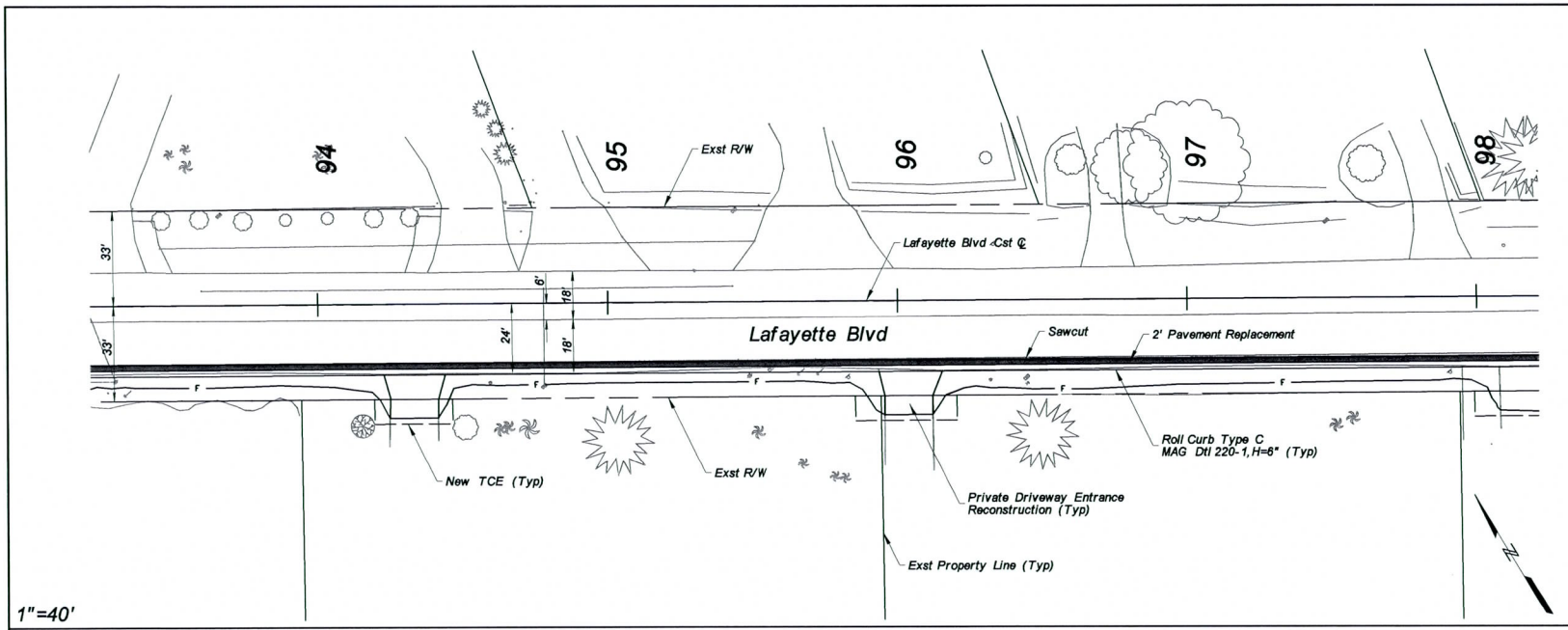
30%
PRELIMINARY
NOT FOR
CONSTRUCTION

AZTEC

DRAWING NO.

ROADWAY ALTERNATIVE 1

SHEET OF
1 4



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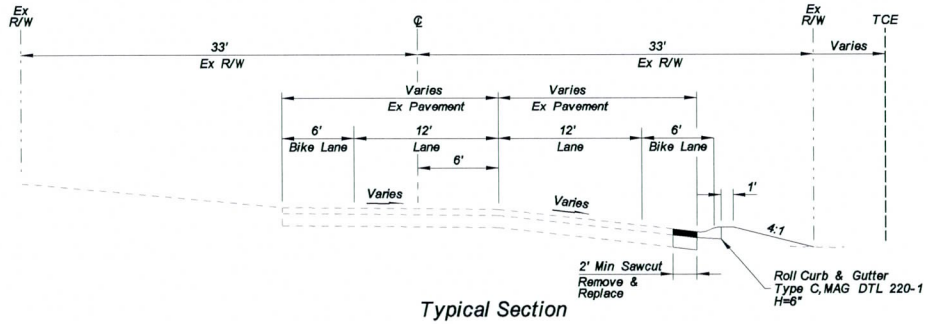


Typical Section

☐ REMOVE ☐

⬠ RELOCATE ⬠

◇ RELOCATE BY OTHERS ◇

○ CONSTRUCT ○

Call at least two full working days before you begin excavation.
ARIZONA811
Arizona Blue Stake, Inc.
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

10 0 10 20
Horizontal Scale In Feet

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

LAFAYETTE INTERCEPTOR DRAIN
AND OUTLET DESIGN
PCN 625.02.30

	BY	DATE
DESIGNED	JDM	03/2011
DRAWN	JDM	03/2011
CHECKED	DRR	03/2011

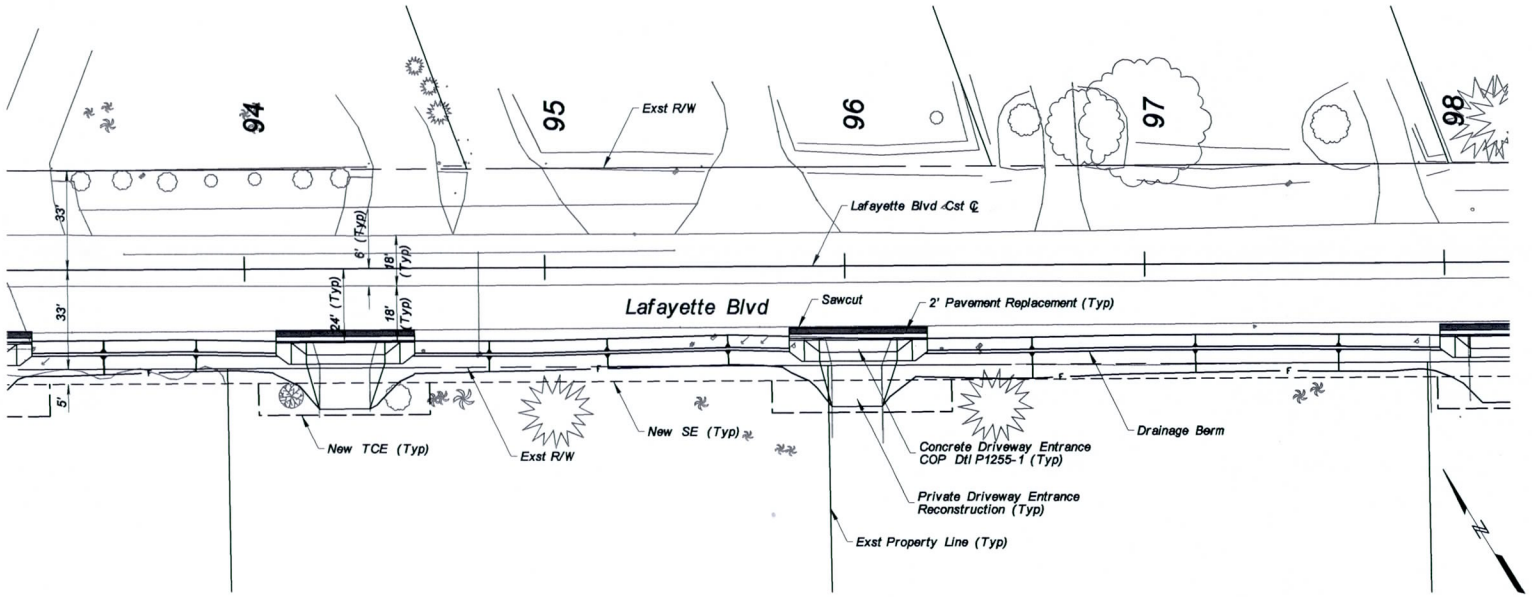
30%
PRELIMINARY
NOT FOR
CONSTRUCTION

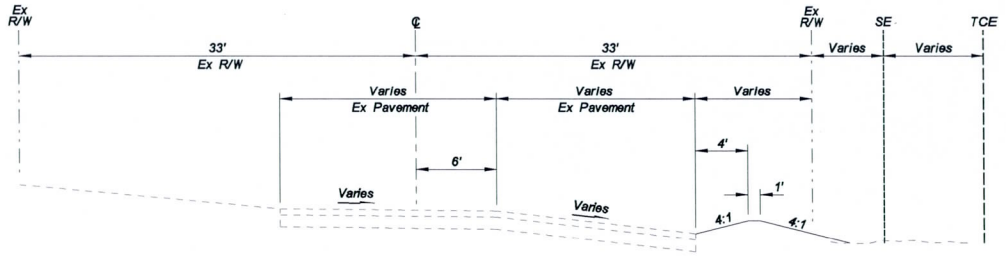
AZTEC
4991 E. McDowell Road
Phoenix, AZ 85008-4891
Tel (602) 484-3400
Fax (602) 484-3405
www.aztec.us

DRAWING NO.

ROADWAY ALTERNATIVE 2

SHEET OF
2 4





Typical Section

REMOVE

RELOCATE

RELOCATE BY OTHERS

CONSTRUCT

Call at least two full working days before you begin excavation. Arizona Blue Stake, Inc. 8-1-1 or 1-800-STAKE-IT (782-5348) In Northern County (602) 263-1100

10 0 10 20
Horizontal Scale In Feet

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

LAFAYETTE INTERCEPTOR DRAIN
AND OUTLET DESIGN
PCN 625.02.30

	BY	DATE
DESIGNED	JDM	03/2011
DRAWN	JDM	03/2011
CHECKED	DRR	03/2011

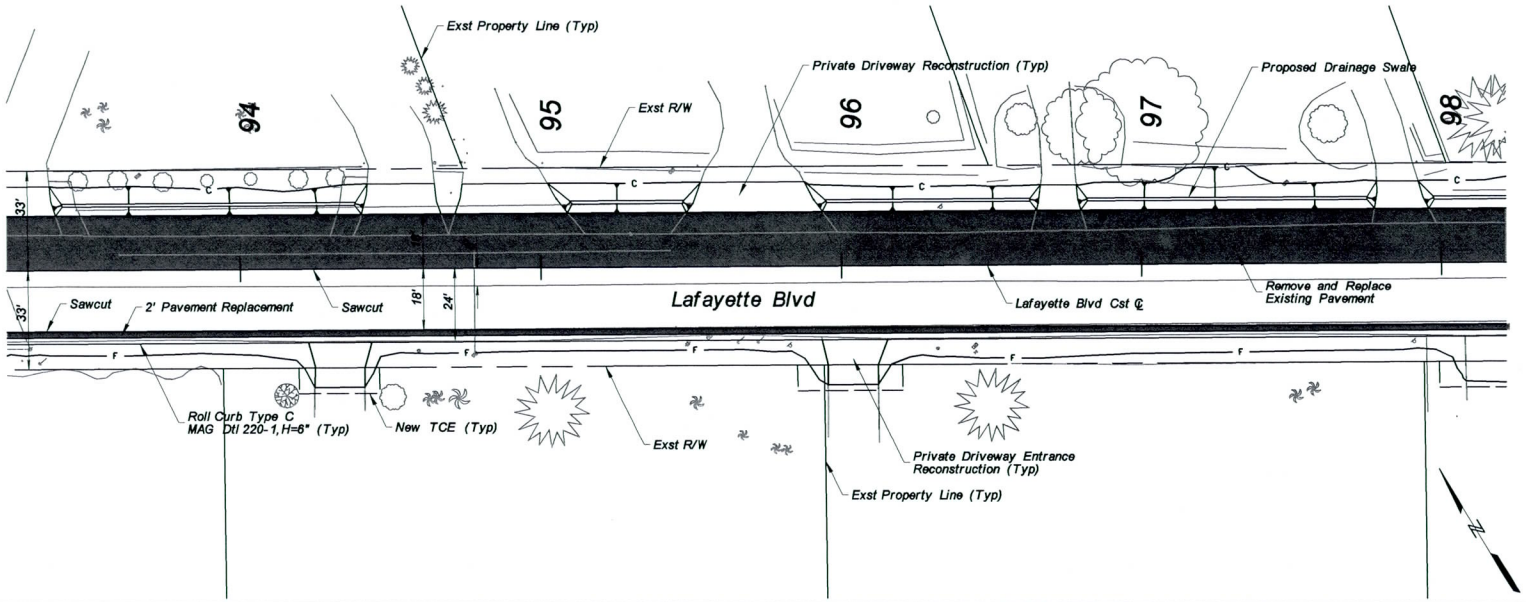
30%
PRELIMINARY
NOT FOR
CONSTRUCTION

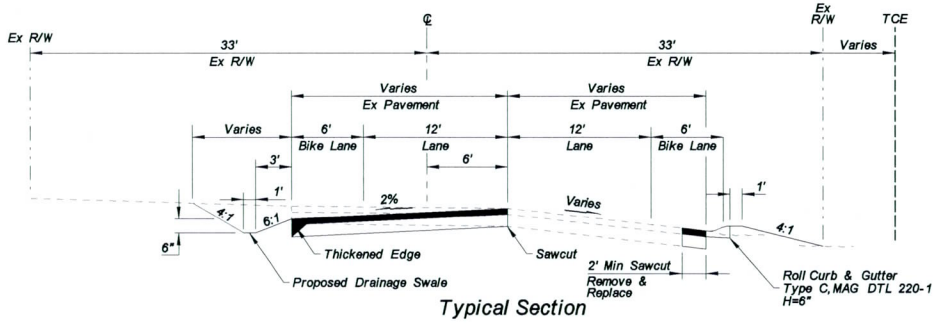
AZTEC 4021 E. McDowell Road Phoenix, AZ 85008-4906 Tel (602) 454-3402 Fax (602) 454-3405 www.aztec.us

DRAWING NO.

ROADWAY ALTERNATIVE 3

SHEET OF
3 4





Typical Section

☐ REMOVE ☐

⬠ RELOCATE ⬠

◇ RELOCATE BY OTHERS ◇

○ CONSTRUCT ○

Call at least two full working days before you begin excavation.
ARIZONA 811
(Arizona Blue Stake, Inc.)
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

10 0 10 20
Horizontal Scale In Feet

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

LAFAYETTE INTERCEPTOR DRAIN
AND OUTLET DESIGN
PCN 625.02.30

	BY	DATE
DESIGNED	JDM	03/2011
DRAWN	JDM	03/2011
CHECKED	DRR	03/2011

30%
PRELIMINARY
NOT FOR
CONSTRUCTION

AZTEC
4021 E. McDowell Road
Phoenix, AZ 85008-4205
Tel (602) 454-3402
Fax (602) 454-3403
www.aztec.us

DRAWING NO.

ROADWAY ALTERNATIVE 4

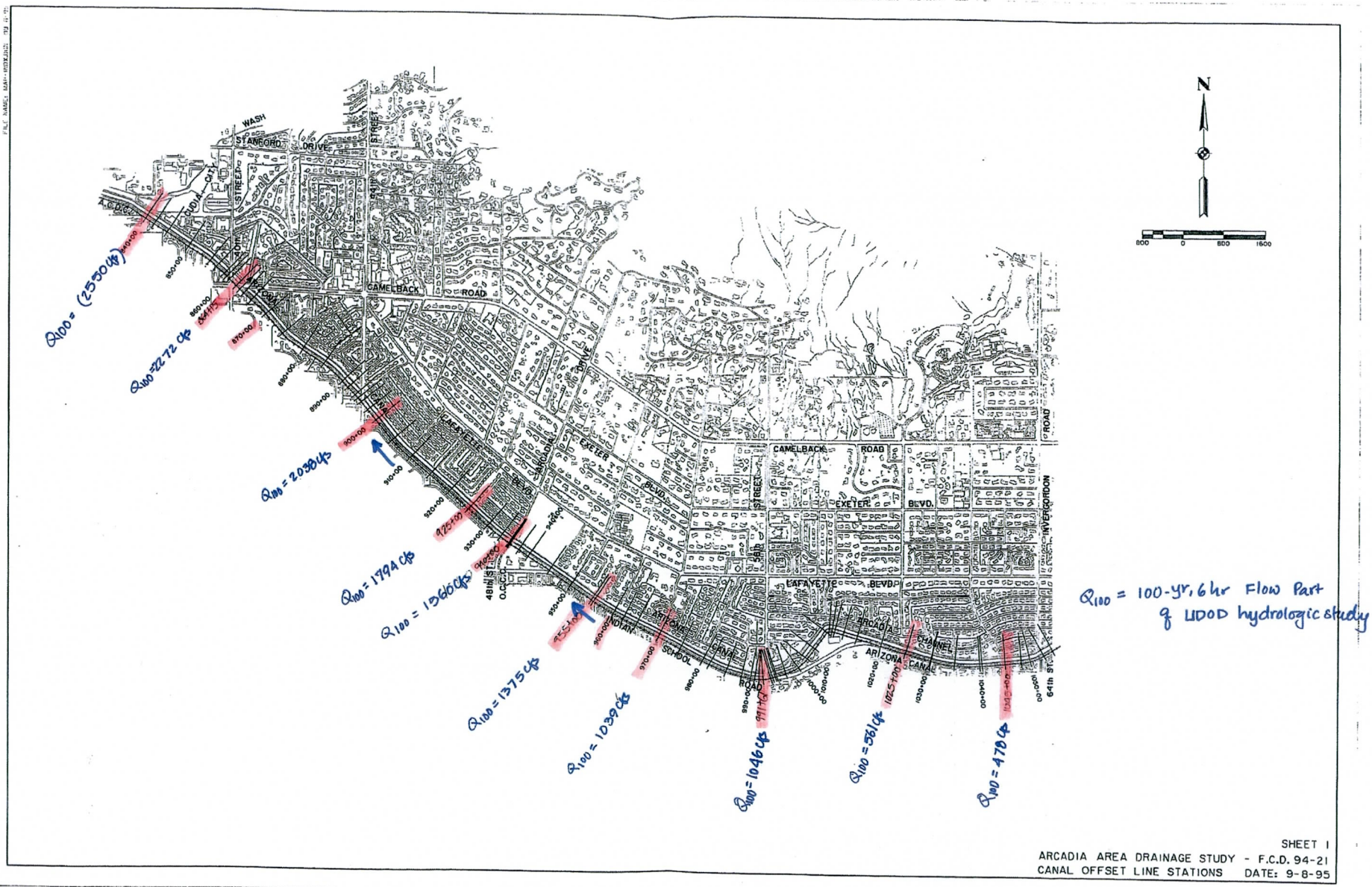
SHEET OF
4 4

Appendix E

Hydraulics Supporting Documents

E-1

HEC-RAS Outputs

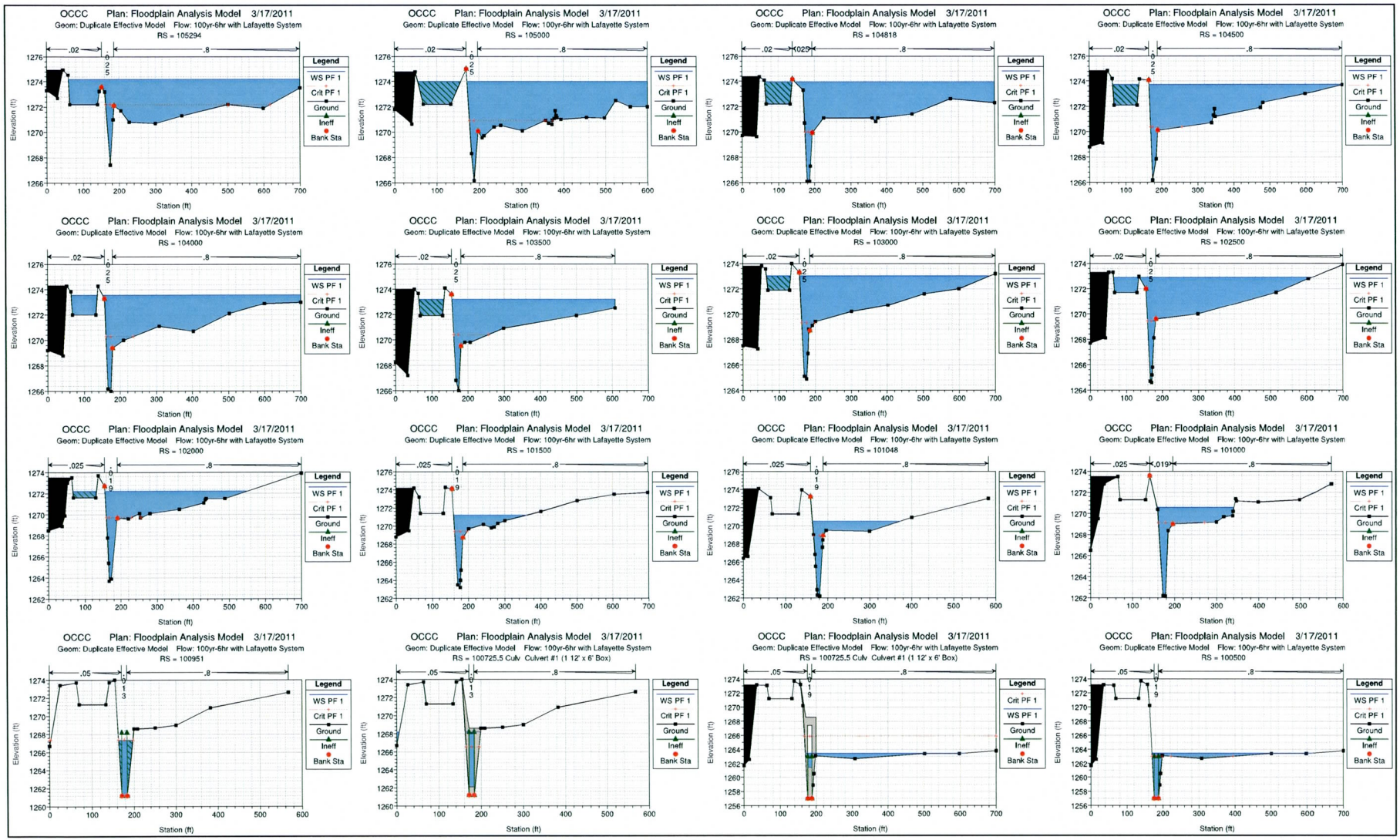

N
800 0 800 1600
WASH
STAMFORD DRIVE
CAMELBACK ROAD
EXETER BLVD.
LAFAYETTE BLVD.
ARIZONA CANAL
SCHOOL
INDIANA
48TH ST.
56TH ST.
64th ST.
INVERGORDON
Q100 = (2530 cfs)
Q100 = 2272 cfs
Q100 = 2038 cfs
Q100 = 1994 cfs
Q100 = 1366 cfs
Q100 = 1375 cfs
Q100 = 1039 cfs
Q100 = 1046 cfs
Q100 = 561 cfs
Q100 = 478 cfs
Q100 = 100-yr, 6 hr Flow Part of LIDOD hydrologic study
SHEET 1
ARCADIA AREA DRAINAGE STUDY - F.C.D. 94-21
CANAL OFFSET LINE STATIONS DATE: 9-8-95

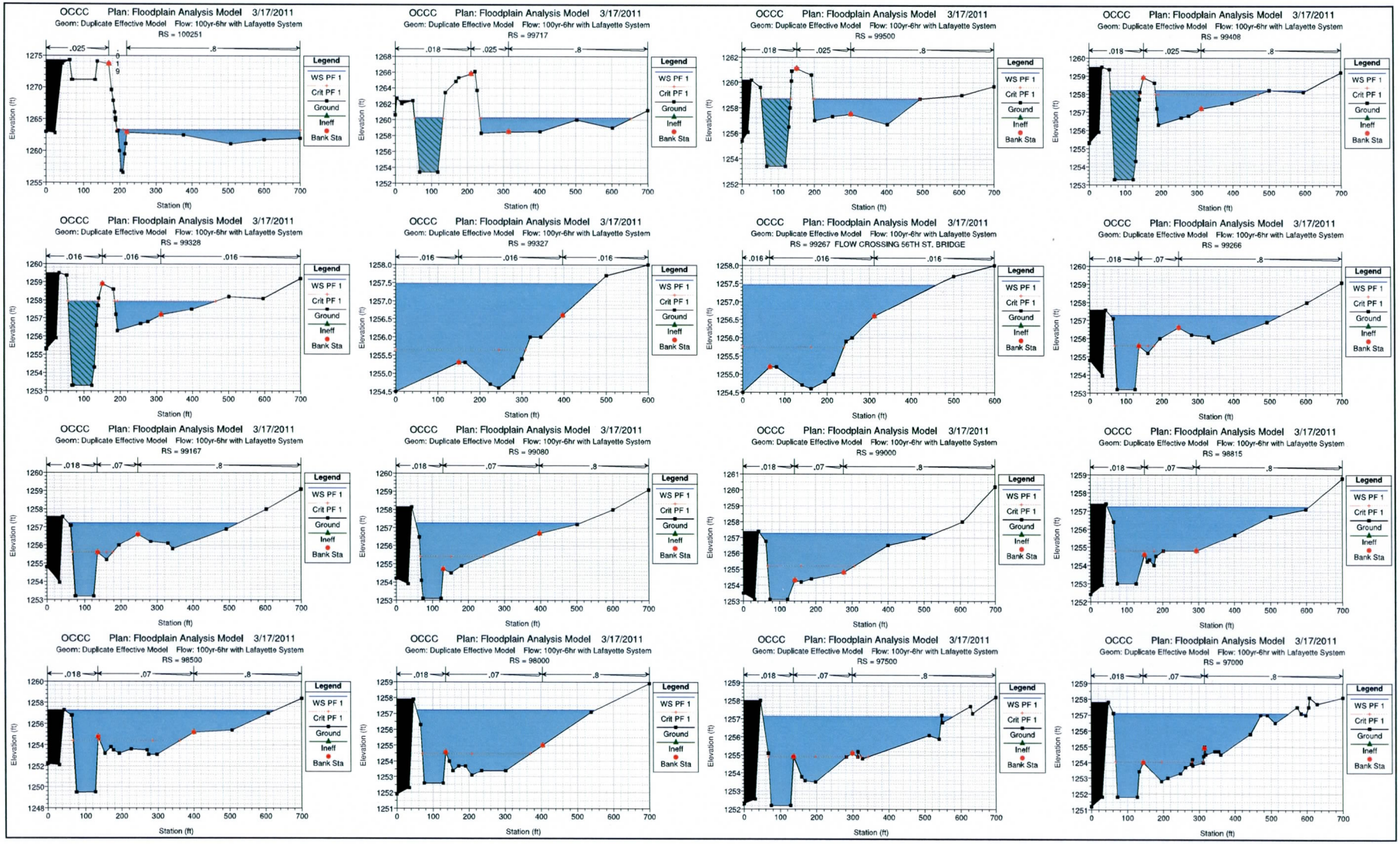
HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 Profile: PF 1

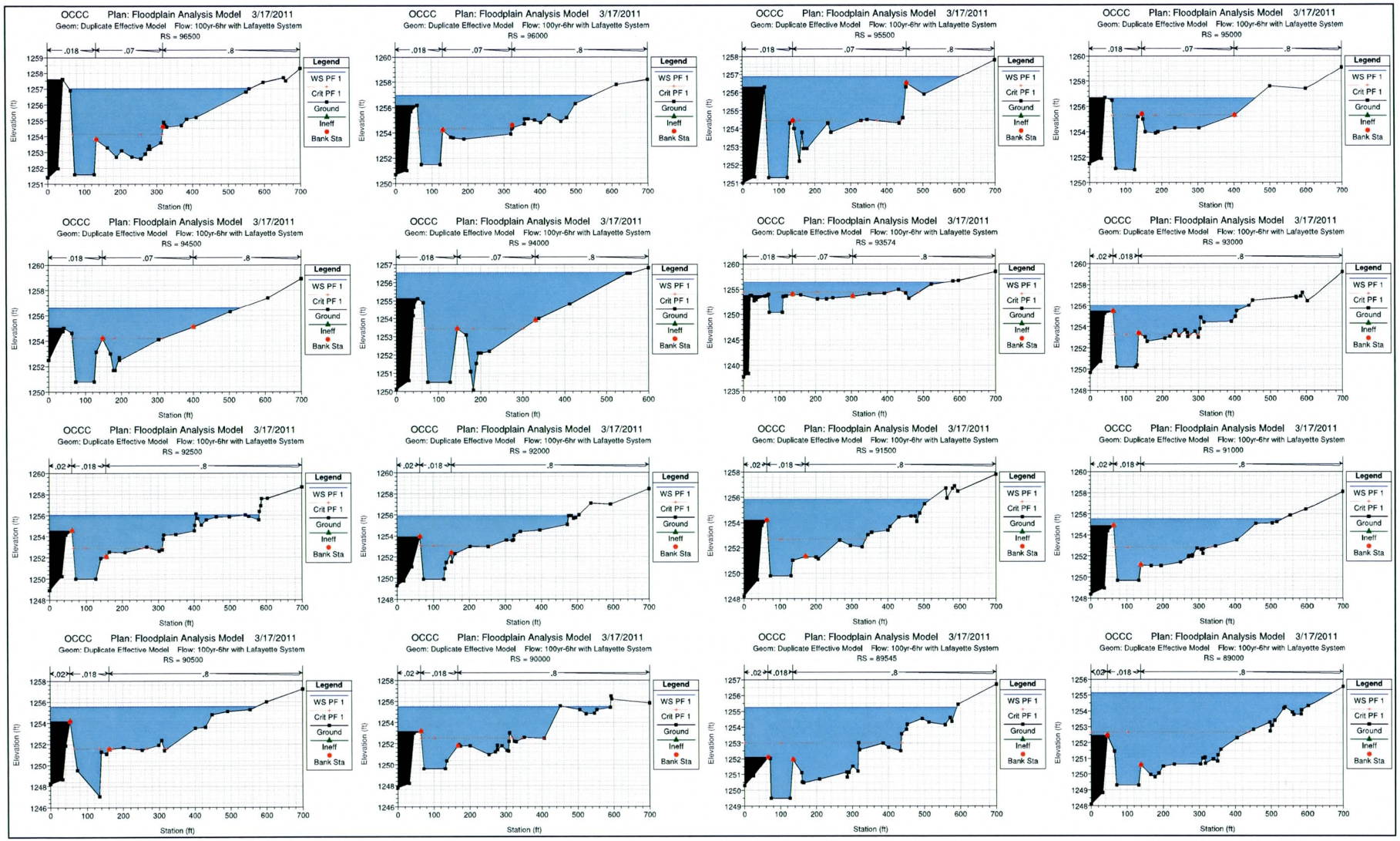
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	105294	PF 1	478.00	1267.42	1274.18	1272.20	1274.22	0.000168	1.62	1542.92	640.71	0.16
Reach-1	105000	PF 1	478.00	1266.17	1274.00	1270.90	1274.12	0.000377	3.11	1326.30	530.69	0.25
Reach-1	104818	PF 1	478.00	1266.10	1273.94	1269.98	1274.03	0.000452	2.62	1333.79	630.37	0.26
Reach-1	104500	PF 1	478.00	1266.18	1273.72	1270.37	1273.87	0.000410	3.33	1092.87	607.80	0.26
Reach-1	104000	PF 1	561.00	1266.00	1273.60	1270.30	1273.68	0.000258	2.73	1300.90	621.42	0.20
Reach-1	103500	PF 1	561.00	1266.00	1273.22	1270.40	1273.45	0.000644	4.07	951.68	522.23	0.32
Reach-1	103000	PF 1	561.00	1264.90	1273.03	1269.32	1273.18	0.000368	3.29	1151.32	595.74	0.25
Reach-1	102500	PF 1	561.00	1264.60	1272.91	1269.45	1273.00	0.000249	2.71	1107.66	548.21	0.20
Reach-1	102000	PF 1	1046.00	1263.70	1272.21	1269.74	1272.67	0.000628	5.51	718.49	460.97	0.42
Reach-1	101500	PF 1	1046.00	1263.20	1271.21	1269.41	1272.11	0.001257	7.63	301.95	202.83	0.58
Reach-1	101048	PF 1	1046.00	1262.20	1270.50	1268.89	1271.47	0.001467	7.94	289.62	209.98	0.62
Reach-1	101000	PF 1	1046.00	1262.17	1270.59	1269.15	1271.25	0.001228	6.59	349.09	181.87	0.57
Reach-1	100951	PF 1	1046.00	1261.20	1267.40	1267.40	1270.47	0.001330	14.07	74.37	36.40	1.00
Reach-1	100725.5		Culvert									
Reach-1	100500	PF 1	1046.00	1257.00	1263.46	1263.01	1265.85	0.002207	12.75	278.93	443.59	0.88
Reach-1	100251	PF 1	1046.00	1256.60	1263.33	1263.33	1264.67	0.003178	9.63	718.18	508.34	0.89
Reach-1	99717	PF 1	1046.00	1258.30	1260.26	1260.15	1260.94	0.005957	6.82	511.96	501.65	0.89
Reach-1	99500	PF 1	1046.00	1257.00	1258.70	1258.70	1259.40	0.008661	6.88	397.76	377.51	1.03
Reach-1	99408	PF 1	1046.00	1256.30	1258.20	1257.99	1258.65	0.005026	5.45	303.25	500.21	0.79
Reach-1	99328	PF 1	1046.00	1256.30	1257.95	1257.95	1258.35	0.002609	5.46	224.56	359.60	0.87
Reach-1	99327	PF 1	1046.00	1254.60	1257.48	1255.65	1257.50	0.000051	1.08	938.10	479.53	0.13
Reach-1	99267	PF 1	1046.00	1254.60	1257.47	1255.75	1257.50	0.000083	1.41	766.84	459.84	0.17
Reach-1	99266	PF 1	1046.00	1255.20	1257.29	1255.61	1257.48	0.000424	0.55	662.85	474.44	0.08
Reach-1	99167	PF 1	1046.00	1255.20	1257.24	1255.61	1257.44	0.000434	0.54	638.66	467.00	0.08
Reach-1	99080	PF 1	1039.00	1254.51	1257.26	1255.41	1257.38	0.000287	0.51	738.91	454.70	0.07
Reach-1	99000	PF 1	1039.00	1254.20	1257.27	1255.20	1257.35	0.000224	0.63	931.87	481.86	0.07
Reach-1	98815	PF 1	1039.00	1254.00	1257.24	1254.80	1257.31	0.000187	0.55	1055.91	559.76	0.06
Reach-1	98500	PF 1	1039.00	1253.10	1257.25	1254.42	1257.28	0.000037	0.30	1735.75	575.91	0.03
Reach-1	98000	PF 1	1039.00	1253.10	1257.22	1254.47	1257.26	0.000100	0.48	1386.59	494.89	0.05
Reach-1	97500	PF 1	1039.00	1253.50	1257.13	1254.91	1257.20	0.000130	0.50	1232.31	524.91	0.05
Reach-1	97000	PF 1	1039.00	1252.80	1257.10	1254.05	1257.14	0.000077	0.44	1314.89	500.69	0.04
Reach-1	96500	PF 1	1375.00	1252.60	1257.01	1254.12	1257.09	0.000135	0.61	1412.89	500.64	0.05
Reach-1	96000	PF 1	1375.00	1253.50	1256.94	1254.33	1257.00	0.000200	0.66	1362.38	547.93	0.06
Reach-1	95500	PF 1	1375.00	1252.20	1256.86	1254.44	1256.91	0.000173	0.55	1366.99	602.74	0.06
Reach-1	95000	PF 1	1560.00	1253.90	1256.66	1255.30	1256.79	0.000269	0.59	984.91	412.85	0.07
Reach-1	94500	PF 1	1560.00	1251.70	1256.61	1254.21	1256.67	0.000144	0.52	1349.95	532.51	0.05
Reach-1	94000	PF 1	1560.00	1250.07	1256.55	1253.44	1256.60	0.000120	0.57	1555.64	563.69	0.05
Reach-1	93574	PF 1	1794.00	1253.10	1256.39	1254.45	1256.50	0.000246	0.68	1444.39	561.76	0.07

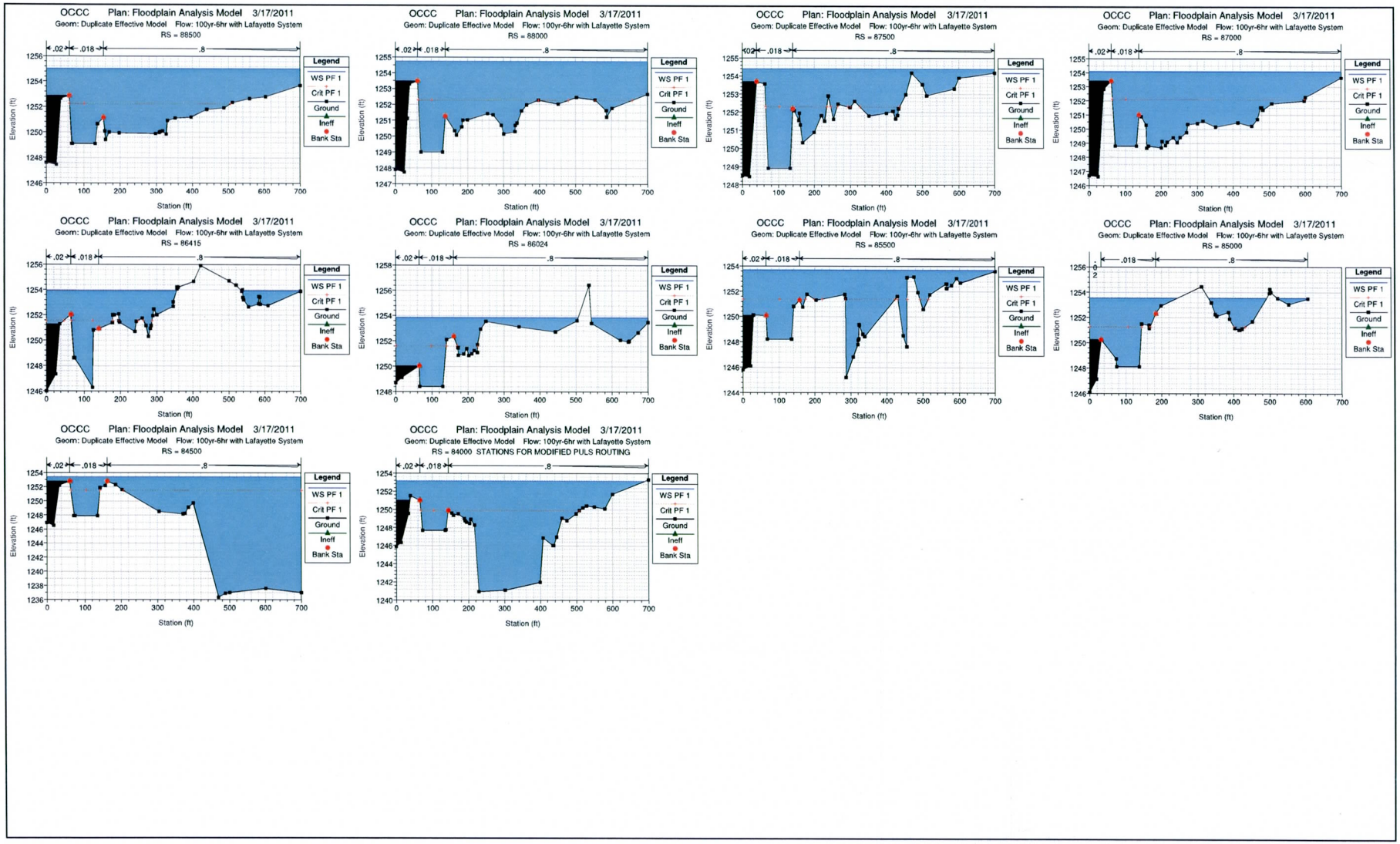
HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 Profile: PF 1 (Continued)

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-1	93000	PF 1	1794.00	1250.20	1256.06	1253.24	1256.36	0.000323	4.48	1083.66	440.61	0.34
Reach-1	92500	PF 1	1794.00	1250.00	1256.05	1252.90	1256.20	0.000170	3.26	1333.89	580.02	0.25
Reach-1	92000	PF 1	2038.00	1249.90	1255.90	1253.06	1256.10	0.000230	3.81	1292.48	493.70	0.29
Reach-1	91500	PF 1	2038.00	1249.80	1255.84	1252.67	1255.99	0.000165	3.23	1648.41	519.07	0.25
Reach-1	91000	PF 1	2038.00	1249.70	1255.52	1252.82	1255.85	0.000352	4.72	1460.72	532.27	0.36
Reach-1	90500	PF 1	2038.00	1247.04	1255.57	1251.57	1255.70	0.000121	2.97	1729.27	572.70	0.21
Reach-1	90000	PF 1	2038.00	1249.60	1255.48	1252.50	1255.63	0.000165	3.19	1657.74	577.89	0.25
Reach-1	89545	PF 1	2272.00	1249.50	1255.25	1253.01	1255.49	0.000309	4.38	1801.28	589.99	0.33
Reach-1	89000	PF 1	2272.00	1249.30	1255.14	1252.67	1255.36	0.000258	3.95	2138.24	668.54	0.31
Reach-1	88500	PF 1	2272.00	1249.10	1255.03	1252.25	1255.23	0.000232	3.84	2553.65	700.00	0.29
Reach-1	88000	PF 1	2272.00	1249.00	1254.73	1252.28	1255.07	0.000388	4.92	2205.75	700.00	0.37
Reach-1	87500	PF 1	2272.00	1248.90	1254.40	1252.30	1254.81	0.000653	5.31	1412.95	700.00	0.46
Reach-1	87000	PF 1	2272.00	1248.80	1254.09	1252.12	1254.51	0.000551	5.50	2203.16	700.00	0.44
Reach-1	86415	PF 1	2272.00	1246.29	1253.95	1251.55	1254.22	0.000332	4.54	1198.92	519.11	0.34
Reach-1	86024	PF 1	2549.00	1248.40	1253.85	1251.62	1254.07	0.000344	4.09	1246.86	664.09	0.34
Reach-1	85500	PF 1	2549.00	1248.20	1253.69	1251.40	1253.90	0.000289	4.01	2029.19	700.00	0.32
Reach-1	85000	PF 1	2549.00	1248.10	1253.56	1251.25	1253.75	0.000294	3.61	1026.07	491.10	0.31
Reach-1	84500	PF 1	2549.00	1247.90	1253.42	1251.50	1253.59	0.000342	3.96	5781.32	700.00	0.34
Reach-1	84000	PF 1	2549.00	1247.70	1253.15	1249.90	1253.40	0.000350	4.60	3867.19	690.83	0.36


OCCC Plan: Floodplain Analysis Model 3/17/2011
Geom: Duplicate Effective Model Flow: 100yr-6hr with Lafayette System
RS = 105294
RS = 105000
RS = 104818
RS = 104500
RS = 104000
RS = 103500
RS = 103000
RS = 102500
RS = 102000
RS = 101500
RS = 101048
RS = 101000
RS = 100951
RS = 100725.5 Culv Culvert #1 (1 12' x 6' Box)
RS = 100500
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


OCCC Plan: Floodplain Analysis Model 3/17/2011
Geom: Duplicate Effective Model Flow: 100yr-6hr with Lafayette System
RS = 100251
RS = 99717
RS = 99500
RS = 99408
RS = 99328
RS = 99327
RS = 99267 FLOW CROSSING 56TH ST. BRIDGE
RS = 99266
RS = 99167
RS = 99080
RS = 99000
RS = 98815
RS = 98500
RS = 98000
RS = 97500
RS = 97000
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


OCCC Plan: Floodplain Analysis Model 3/17/2011
Geom: Duplicate Effective Model Flow: 100yr-6hr with Lafayette System
RS = 96500
RS = 96000
RS = 95500
RS = 95000
RS = 94500
RS = 94000
RS = 93574
RS = 93000
RS = 92500
RS = 92000
RS = 91500
RS = 91000
RS = 90500
RS = 90000
RS = 89545
RS = 89000
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


OCCC Plan: Floodplain Analysis Model 3/17/2011
Geom: Duplicate Effective Model Flow: 100yr-6hr with Lafayette System
RS = 88500
RS = 88000
RS = 87500
RS = 87000
RS = 86415
RS = 86024
RS = 85500
RS = 85000
RS = 84500
RS = 84000 STATIONS FOR MODIFIED PULS ROUTING
.02
.018
.8
Legend
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

E-2

Trunk Line Hydraulics (Storm CAD)

Headlosses through the Trunk Line System:

The headlosses in the Trunk Line System were computed for the junctions, manholes, exit, pipe, and transition structures. Methods for determining headlosses was selected from Flood Control District of Maricopa County (FCDMC) Drainage Design Manual Volume-II Hydraulics. Friction losses in the storm drain pipe were calculated using Manning's roughness coefficient of n=0.013.

Junctions and Manhole Structures:

There are several locations along the camelback trunk line where a single lateral connects with the mainline at a junction/manhole as shown in the Figure 1 below. Junction headloss for a single lateral can be determined by the Energy Equation and the Thompson Equation expressed below.

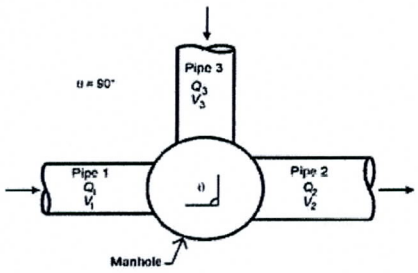


Figure 1: A typical storm drain junction at manhole with single lateral. (*source :FCDMC hydraulics manual*)

$$h_j = \frac{2*(Q_2V_2 - Q_1V_1 - Q_3V_3Cos\theta)}{(A_1 + A_2)g} + \frac{V_1^2}{2g} - \frac{V_2^2}{2g} + \left(\frac{S_{f1} + S_{f2}}{2}\right)L \quad \text{.....EQ(1)}$$

h_j = Junction headloss, ft

A_1 = Upstream flow area, sq ft

A_2 = Downstream flow area, sq ft

Q_1 = Upstream flow rate, cfs

Q_2 = Downstream flow rate, cfs

Q_3 = Lateral flow rate, cfs

V_1 = Upstream flow velocity, ft/s

V_2 = Downstream flow velocity, ft/s

V_3 = Lateral flow velocity, ft/s

S_{f1} = Upstream friction slope, ft

S_{f2} = Downstream friction slope, ft

L = Length of transition, ft

$$S_f = K\frac{V^2}{2gR^{3/4}}$$

V = Velocity, ft/s

g = Acceleration due to gravity, 32.2, ft/sec^2

R = Hydraulic radius, ft (D/4, when pipe is full)

$$K = \frac{2gn^2}{2.21}$$

n = Manning's roughness coefficient

Bend Structure:

Figure 4.8 from FCDMC Drainage Design Manual Volume-II was used to determine the bend loss coefficient for no special shaping bends. A bend loss coefficient 0.21, 0.38, and 0.54 were determined for 30^0, 45^0 and 55^0 bends respectively from the graph and used in the trunk line storm drain model.

Similar methodology was also used to determine the bend loss at each lateral that bends before it connects with trunk line.

FIGURE 4.7A
FORMED OR PREFAB STORM DRAIN JUNCTION

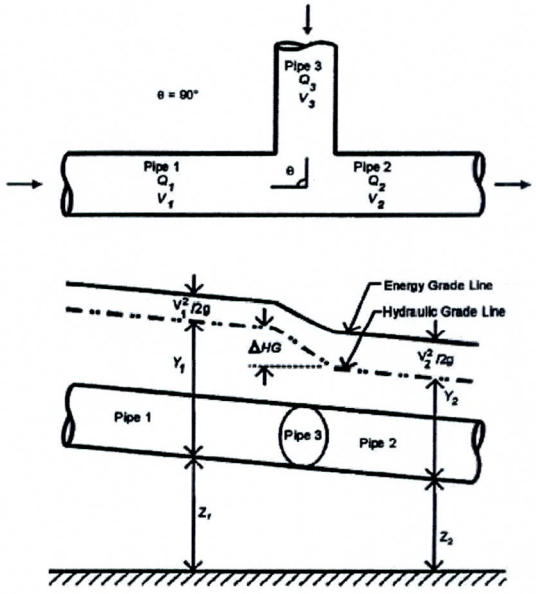
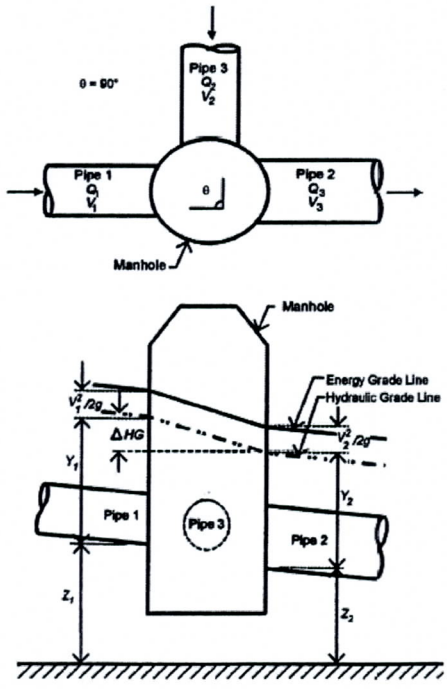


FIGURE 4.7B
STORM DRAIN JUNCTION AT MANHOLE WITH ALIGNED CROWNS UNDER PRESSURE FLOW



$$h_j = \frac{2(Q_2V_2 - Q_1V_1 - Q_3V_3Cos\theta)}{(A_1 + A_2)g} + V_1^2/2g - V_2^2/2g + k_{je}\left(\frac{V_1^2}{2g} - \frac{V_2^2}{2g}\right) \quad (4.10d)$$

where:

k_{je} = Coefficient for transition loss due to expansion at a junction.

k_{je} = 3.50 x (Tan θ /2) $^{1.22}$(California Department of Transportation, 1985). See Figure 4.7A through Figure 4.7C for location of θ angle.

V_1 = Upstream velocity, ft/sec

V_2 = Downstream velocity, ft/sec

g = Acceleration due to gravity, 32.2 ft/sec^2

In situations where crowns at a junction are not matching, a pressure momentum approach for solving headloss is suggested. A pressure momentum approach is described in Section 4.8.

Straight-Through Manhole Losses (no laterals) - In a straight-through manhole where there is no change in pipe size or rate of flow, the loss can be estimated by: $h_{mh} = 0.05\frac{V^2}{2g}$ (4.11)

where:

h_{mh} = Headloss due to a manhole, ft

V = Velocity, ft/sec

Bend Losses at Manholes (no laterals) - The bend loss at a manhole is determined using Equation (4.12). The bend loss coefficient, k_b, can be determined using Figure 4.8.

$$h_{mh} = k_b\frac{V^2}{2g} \quad (4.12)$$

where:

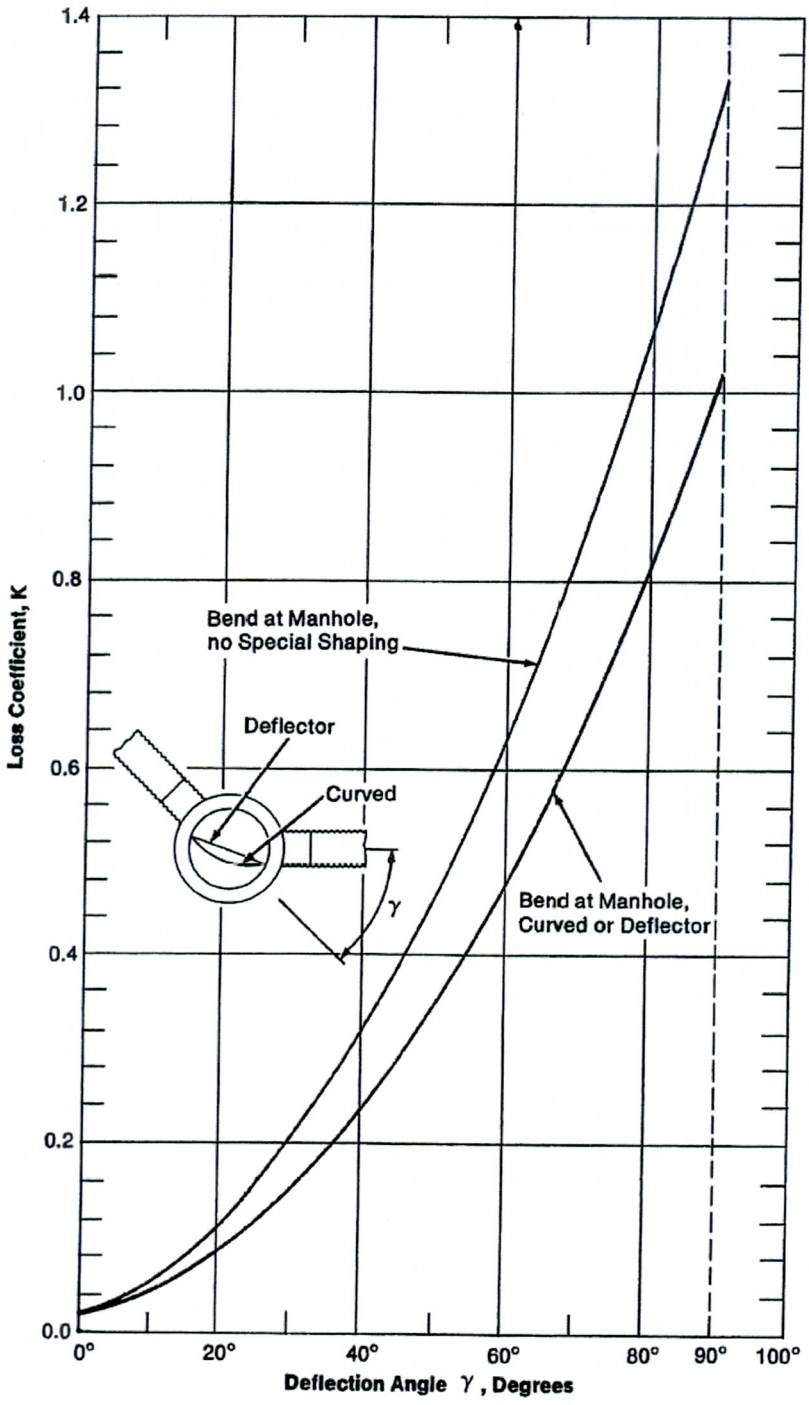
h_{mh} = Headloss due to a manhole, ft

k_b = Bend loss coefficient

V = Velocity, ft/sec

g = Acceleration due to gravity, 32.2 ft/sec^2

FIGURE 4.8
BEND LOSS COEFFICIENT
(MODIFIED FROM AISI, 1990)



Bendloss Coefficeint in Trunk line Node Structures

Node Name	Bend Angle (Degree)	Bendloss Coefficient Figure 4.8 FCDMC Hydraulic Design Manual
BND 7	45	0.38
MH 8	45	0.38
MH 17	45	0.38
MH 16	45	0.38
MH 15	45	0.38
MH 14	45	0.38
MH 12	45	0.38
MH11	45	0.38
JS 5	45	0.38
MH 7	25	0.21
BD5	15	0.05
BD2	15	0.05
BD 1	45	0.38

Headloss Coefficeint in Straight through Manhole in Trunk Line System

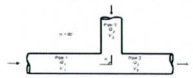
Node Name	Upstream of Node		Downstream of Node		Headloss Coefficeint
	Pipe size (inches)	Discharge (cfs)	Pipe size (inches)	Discharge (cfs)	
MH 19	48	78	48	78	0.05
MH 13	72	146	72	146	0.05
MH 10	84	257	84	257	0.05
MH 9	84	257	84	257	0.05
MH 6	84	285	84	285	0.05
MH 3	84	289	84	289	0.05
MH 1	102	865	102	865	0.05

Lafayette Storm Drain Project
Trunkline Junction Loss Calculation

Structure / Intersection Name	Upstream Flow Q_1 (cfs)	Upstream Flow Velocity V_1 (ft/s)	Upstream Pipe Size (inches)	Upstream Pipe Flow Area A_1 (sq.ft)	Dnstream Flow Q_2 (cfs)	Dnstream Flow Velocity V_2 (ft/s)	Dnstream Pipe Size (inches)	Dnstream Pipe Flow Area A_2 (sq.ft)	Lateral Flow Q_3 (cfs)	Lateral Flow Velocity V_3 (ft/s)	Lateral Pipe Insertion Angle (Degree)	Acceleration due to gravity 'g'	Upstream Friction Slope Sf_1 (ft)	Hydraulic Radius of Upstream Pipe R1	Upstream Pipe P1 manning's n	K1	Dnstream Friction Slope Sf_2 (ft)	Hydraulic Radius of Dnstream Pipe R2	Dnstream Pipe P2 Manning's n	K2	Length of Transition L (ft)	Head Loss h_j (ft)
Drop Inlet (DI) Village Drive	78	4.9	54	15.90	100	5	60	19.63	22	5	90	32.2	0.0017	1.125	0.013	0.0049	0.0014	1.25	0.013	0.0049	8	0.20
Camelback Road	146	6.15	66	23.76	196	6.93	72	28.27	50	3.98	90	32.2	0.0023	1.375	0.013	0.0049	0.0021	1.5	0.013	0.0049	8	0.41
Drop Inlet (DI) Lafayette Blvd	196	5.09	84	38.48	257	6.68	84	38.48	64	9.08	90	32.2	0.0013	1.75	0.013	0.0049	0.0016	1.75	0.013	0.0049	8	0.30
45th Street	238	6.18	84	38.48	257	6.68	84	38.48	24	6.05	55	32.2	0.0019	1.75	0.013	0.0049	0.0016	1.75	0.013	0.0049	8	0.05
46th Street	237	6.18	84	38.48	285	7.41	84	38.48	48	4.99	50	32.2	0.0019	1.75	0.013	0.0049	0.0020	1.75	0.013	0.0049	8	0.15
Launfel Avenue	249	6.47	84	38.48	285	7.41	84	38.48	36	9.42	65	32.2	0.0021	1.75	0.013	0.0049	0.0020	1.75	0.013	0.0049	8	0.10
Dromedary Road	275	7.15	84	38.48	289	7.51	84	38.48	14	7.59	50	32.2	0.0026	1.75	0.013	0.0049	0.0020	1.75	0.013	0.0049	8	0.05
DS3 Arcadia Drive (Flow From West)	473	14.25	78	33.18	762	13.43	102	56.75	289	7.51	60	32.2	0.0108	1.625	0.013	0.0049	0.0050	2.125	0.013	0.0049	8	2.1
JS 1 Arcadia Drive (Flow from East)	762	13.43	102	56.75	865	15.24	102	56.75	120	9.55	60	32.2	0.0078	2.125	0.013	0.0049	0.0065	2.125	0.013	0.0049	10	0.6
Drop Stru (DS1)	686	12.09	102	56.75	990	17.45	102	56.75	304	12.8	65	32.2	0.0064	2.125	0.013	0.0049	0.0085	2.125	0.013	0.0049	10	1.63

Note: This calculation is done considering full flow condition

$$h_j = \frac{2*(Q_2V_2 - Q_1V_1 - Q_3V_3Cos\,\theta)}{(A_1 + A_2)g} + \frac{V_1^2}{2g} - \frac{V_2^2}{2g} + \left(\frac{S_{f1} + S_{f2}}{2}\right)L$$



h_j = Junction head loss, ft
A_1 = Upstream flow area, sq ft
A_2 = Downstream flow area, sq ft
Q_1 = Upstream flow rate, cfs
Q_2 = Downstream flow rate, cfs
Q_3 = Lateral flow rate, cfs
V_1 = Upstream flow velocity, ft/s
V_2 = Downstream flow velocity, ft/s
V_3 = Lateral flow velocity, ft/s
S_{f1} = Upstream friction slope, ft
S_{f2} = Downstream friction slope, ft
L = Length of transition, ft

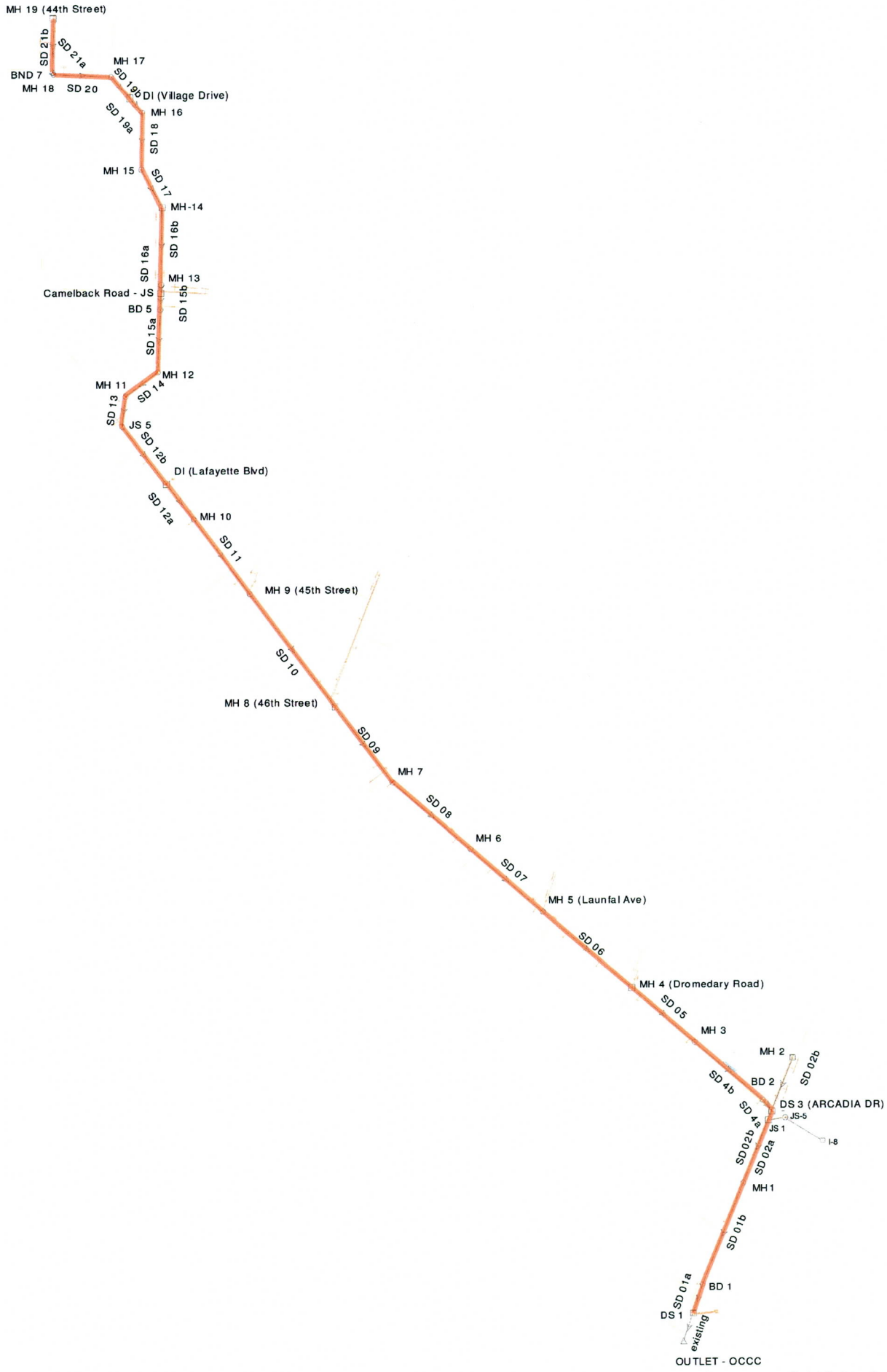
$$S_f = K\frac{V^2}{2gR^{\frac{4}{3}}}$$

V = Velocity, ft/s
g = Acceleration due to gravity, 32.2, ft/sec^2
R = Hydraulic radius, ft (D/4, when pipe is full)

$$K = \frac{2gn^2}{2.21}$$

n = Manning's roughness coefficient

Scenario: Lafayette Interceptor Drain and Outlet Design (LIDOD)



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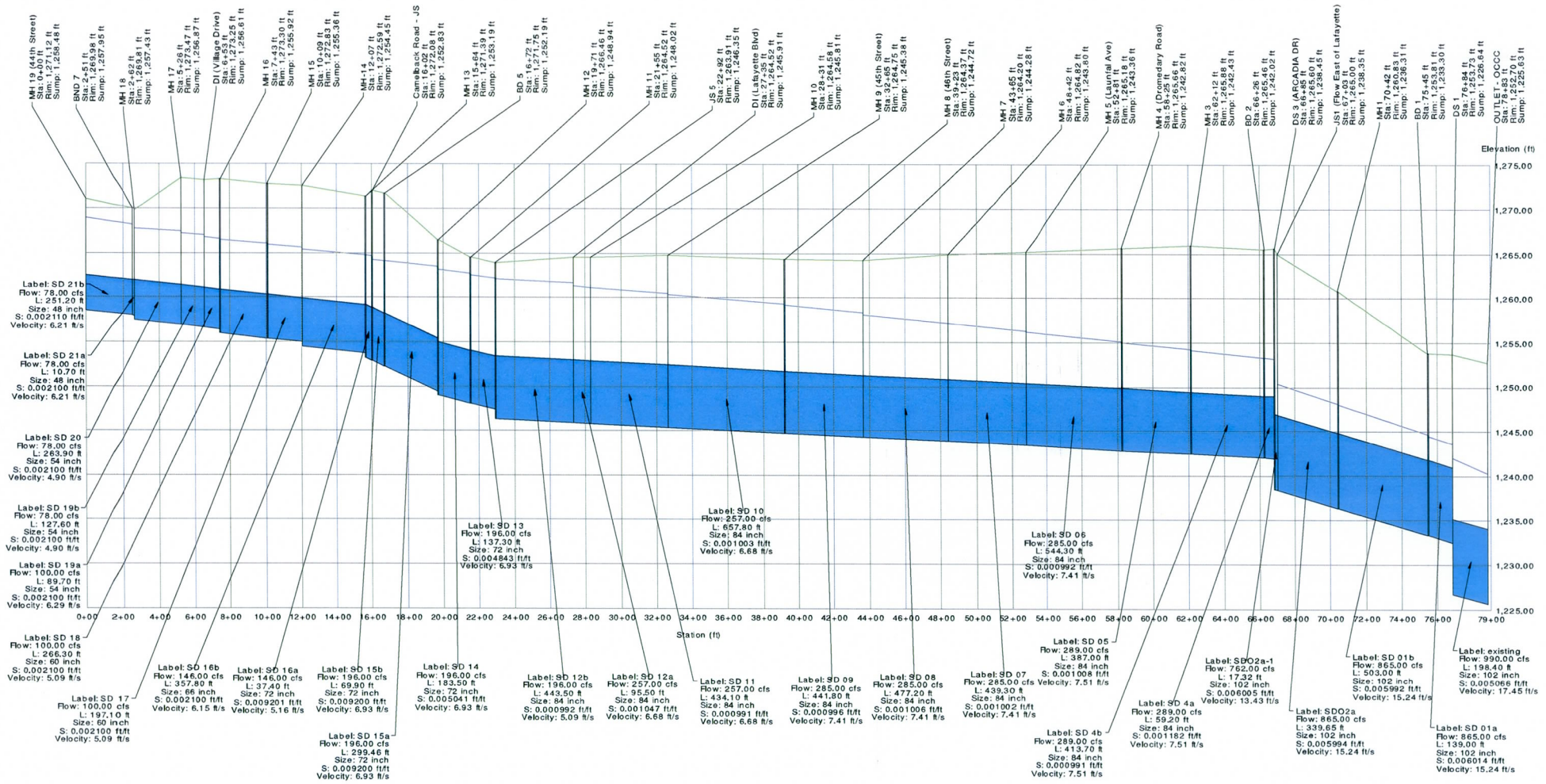
Profile

Scenario: Lafayette Interceptor Drain and Outlet Design (LIDOD)

Lafayette Interceptor Drain and Outlet Design

Trunkline Hydraulics



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Scenario: Lafayette Interceptor Drain and Outlet Design (LIDOD)

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Average Velocity (ft/s)	Description
existing	DS 1	OUTLET - OCCC	990.00	198.40	0.005066	102 inch	0.013	763.01	1,226.64	1,225.63	1,253.73	1,252.70	18.60	18.57	1,241.99	1,240.30	17.45	
SD 01b	MH1	BD 1	865.00	503.00	0.005992	102 inch	0.013	829.86	1,236.31	1,233.30	1,260.83	1,253.81	16.02	12.01	1,247.98	1,244.71	15.24	
SD 01a	BD 1	DS 1	865.00	139.00	0.006014	102 inch	0.013	831.41	1,233.30	1,232.46	1,253.81	1,253.73	12.01	12.77	1,244.53	1,243.62	15.24	
SD 4b	MH 3	BD 2	289.00	413.70	0.000991	84 inch	0.013	201.10	1,242.43	1,242.02	1,265.88	1,265.46	16.45	16.44	1,254.17	1,253.33	7.51	
SD 4a	BD 2	DS 3 (ARCADIA DR)	289.00	59.20	0.001182	84 inch	0.013	219.66	1,242.02	1,241.95	1,265.46	1,265.60	16.44	16.65	1,253.28	1,253.16	7.51	
SD 08	MH 7	MH 6	285.00	477.20	0.001006	84 inch	0.013	202.60	1,244.28	1,243.80	1,264.20	1,264.82	12.92	14.02	1,258.11	1,257.16	7.41	
SD 07	MH 6	MH 5 (Launfal Ave)	285.00	439.30	0.001002	84 inch	0.013	202.17	1,243.80	1,243.36	1,264.82	1,265.18	14.02	14.82	1,257.12	1,256.24	7.41	
SD 12a	DI (Lafayette Blvd)	MH 10	257.00	95.50	0.001047	84 inch	0.013	206.71	1,245.91	1,245.81	1,264.52	1,264.58	11.61	11.77	1,261.32	1,261.17	6.68	
SD 11	MH 10	MH 9 (45th Street)	257.00	434.10	0.000991	84 inch	0.013	201.05	1,245.81	1,245.38	1,264.58	1,264.75	11.77	12.37	1,261.13	1,260.43	6.68	
SD 10	MH 9 (45th Street)	MH 8 (46th Street)	257.00	657.80	0.001003	84 inch	0.013	202.34	1,245.38	1,244.72	1,264.75	1,264.37	12.37	12.65	1,260.38	1,259.32	6.68	
SD 09	MH 8 (46th Street)	MH 7	285.00	441.80	0.000996	84 inch	0.013	201.59	1,244.72	1,244.28	1,264.37	1,264.20	12.65	12.92	1,259.17	1,258.29	7.41	
SD 06	MH 5 (Launfal Ave)	MH 4 (Dromedary Road)	285.00	544.30	0.000992	84 inch	0.013	201.21	1,243.36	1,242.82	1,265.18	1,265.66	14.82	15.84	1,256.14	1,255.06	7.41	
SD 05	MH 4 (Dromedary Road)	MH 3	289.00	387.00	0.001008	84 inch	0.013	202.79	1,242.82	1,242.43	1,265.66	1,265.88	15.84	16.45	1,255.01	1,254.22	7.51	
SD 15b	Camelback Road - JS	BD 5	196.00	69.90	0.009200	72 inch	0.013	406.20	1,252.83	1,252.19	1,272.08	1,271.75	13.25	13.56	1,264.27	1,264.12	6.93	
SD 15a	BD 5	MH 12	196.00	299.46	0.009200	72 inch	0.013	406.19	1,252.19	1,249.43	1,271.75	1,266.46	13.56	11.03	1,264.08	1,263.44	6.93	
SD 14	MH 12	MH 11	196.00	183.50	0.005041	72 inch	0.013	300.67	1,248.94	1,248.02	1,266.46	1,264.52	11.52	10.50	1,263.16	1,262.77	6.93	
SD 13	MH 11	JS 5	196.00	137.30	0.004843	72 inch	0.013	294.72	1,248.02	1,247.35	1,264.52	1,263.91	10.50	10.56	1,262.49	1,262.19	6.93	
SD 12b	JS 5	DI (Lafayette Blvd)	196.00	443.50	0.000992	84 inch	0.013	201.21	1,246.35	1,245.91	1,263.91	1,264.52	10.56	11.61	1,262.04	1,261.62	5.09	
SD 19b	MH 17	DI (Village Drive)	78.00	127.60	0.002100	54 inch	0.013	90.12	1,256.88	1,256.61	1,273.47	1,273.25	12.09	12.14	1,267.26	1,267.06	4.90	
SD 19a	DI (Village Drive)	MH 16	100.00	89.70	0.002100	54 inch	0.013	90.12	1,256.61	1,256.42	1,273.25	1,273.30	12.14	12.38	1,266.86	1,266.63	6.29	
SD 18	MH 16	MH 15	100.00	266.30	0.002100	60 inch	0.013	119.34	1,255.92	1,255.36	1,273.30	1,272.83	12.38	12.47	1,266.47	1,266.08	5.09	
SD 17	MH 15	MH-14	100.00	197.10	0.002100	60 inch	0.013	119.36	1,255.36	1,254.95	1,272.83	1,272.59	12.47	12.64	1,265.93	1,265.64	5.09	
SD 16b	MH-14	MH 13	146.00	357.80	0.002100	66 inch	0.013	153.88	1,254.45	1,253.69	1,272.59	1,271.39	12.64	12.20	1,265.42	1,264.74	6.15	
SD 20	MH 18	MH 17	78.00	263.90	0.002100	54 inch	0.013	90.11	1,257.43	1,256.88	1,269.81	1,273.47	7.88	12.09	1,267.81	1,267.40	4.90	
SD 21b	MH 19 (44th Street)	BND 7	78.00	251.20	0.002110	48 inch	0.013	65.98	1,258.48	1,257.95	1,271.12	1,269.98	8.64	8.03	1,268.95	1,268.21	6.21	
SD 21a	BND 7	MH 18	78.00	10.70	0.002100	48 inch	0.013	65.82	1,257.95	1,257.93	1,269.98	1,269.81	8.03	7.88	1,267.99	1,267.95	6.21	
SD 16a	MH 13	Camelback Road - JS	146.00	37.40	0.009201	72 inch	0.013	406.20	1,253.19	1,252.84	1,271.39	1,272.08	12.21	13.24	1,264.72	1,264.68	5.16	
SDO2a-1	DS 3 (ARCADIA DR)	JS1 (Flow East of Lafayet	762.00	17.32	0.006005	102 inch	0.013	830.73	1,238.45	1,238.35	1,265.60	1,265.00	18.65	18.15	1,251.06	1,250.97	13.43	
SDO2a	JS1 (Flow East of Lafayette	MH1	865.00	339.65	0.005994	102 inch	0.013	830.03	1,238.35	1,236.31	1,265.00	1,260.83	18.15	16.02	1,250.37	1,248.16	15.24	

Scenario: Lafayette Interceptor Drain and Outlet Design (LIDOD)

Node Report

Label	Headloss Coefficient	Absolute Headloss (ft)	Sump Elevation (ft)	Rim Elevation (ft)	Total System Flow (cfs)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Headloss Method
MH 19 (44th Street)	0.05		1,258.48	1,271.12	78.00	1,268.98	1,268.95	Standard
BND 7	0.38		1,257.95	1,269.98	78.00	1,268.21	1,267.99	Standard
MH 18	0.38		1,257.43	1,269.81	78.00	1,267.95	1,267.81	Standard
MH 17	0.38		1,256.87	1,273.47	78.00	1,267.40	1,267.26	Standard
DI (Village Drive)		0.20	1,256.61	1,273.25	100.00	1,267.06	1,266.86	Absolute
MH 16	0.38		1,255.92	1,273.30	100.00	1,266.63	1,266.47	Standard
MH 15	0.38		1,255.36	1,272.83	100.00	1,266.08	1,265.93	Standard
MH-14	0.38		1,254.45	1,272.59	146.00	1,265.64	1,265.42	Standard
MH 13	0.05		1,253.19	1,271.39	146.00	1,264.74	1,264.72	Standard
Camelback Road - JS		0.41	1,252.83	1,272.08	196.00	1,264.68	1,264.27	Absolute
BD 5	0.05		1,252.19	1,271.75	196.00	1,264.12	1,264.08	Standard
MH 12	0.38		1,248.94	1,266.46	196.00	1,263.44	1,263.16	Standard
MH 11	0.38		1,248.02	1,264.52	196.00	1,262.77	1,262.49	Standard
JS 5	0.38		1,246.35	1,263.91	196.00	1,262.19	1,262.04	Standard
DI (Lafayette Blvd)		0.30	1,245.91	1,264.52	257.00	1,261.62	1,261.32	Absolute
MH 10	0.05		1,245.81	1,264.58	257.00	1,261.17	1,261.13	Standard
MH 9 (45th Street)		0.05	1,245.38	1,264.75	257.00	1,260.43	1,260.38	Absolute
MH 8 (46th Street)		0.15	1,244.72	1,264.37	285.00	1,259.32	1,259.17	Absolute
MH 7	0.21		1,244.28	1,264.20	285.00	1,258.29	1,258.11	Standard
MH 6	0.05		1,243.80	1,264.82	285.00	1,257.16	1,257.12	Standard
MH 5 (Launfal Ave)		0.10	1,243.36	1,265.18	285.00	1,256.24	1,256.14	Absolute
MH 4 (Dromedary Road)		0.05	1,242.82	1,265.66	289.00	1,255.06	1,255.01	Absolute
MH 3	0.05		1,242.43	1,265.88	289.00	1,254.22	1,254.17	Standard
BD 2	0.05		1,242.02	1,265.46	289.00	1,253.33	1,253.28	Standard
DS 3 (ARCADIA DR)		2.10	1,238.45	1,265.60	762.00	1,253.16	1,251.06	Absolute
JS1 (Flow East of Lafayette)		0.60	1,238.35	1,265.00	865.00	1,250.97	1,250.37	Absolute
MH1	0.05		1,236.31	1,260.83	865.00	1,248.16	1,247.98	Standard
BD 1	0.05		1,233.30	1,253.81	865.00	1,244.71	1,244.53	Standard
DS 1		1.63	1,226.64	1,253.73	990.00	1,243.62	1,241.99	Absolute
OUTLET - OCCC			1,225.63	1,252.70	990.00	1,240.30	1,240.30	

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Scenario: Lafayette Interceptor Drain and Outlet Design (LIDOD)

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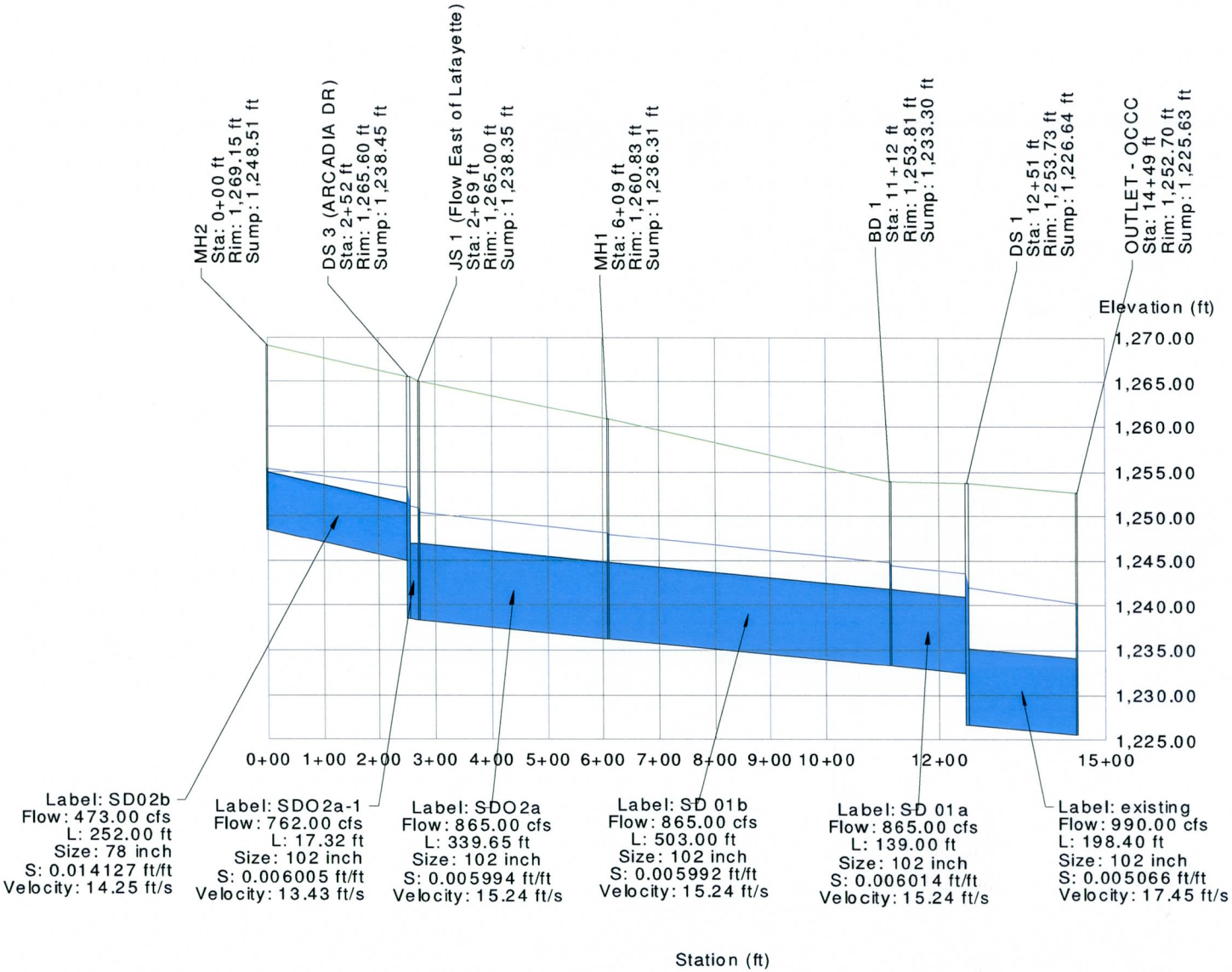
Profile: Lafayette Interceptor Drain and Outlet Design

Trunk Line Hydraulics



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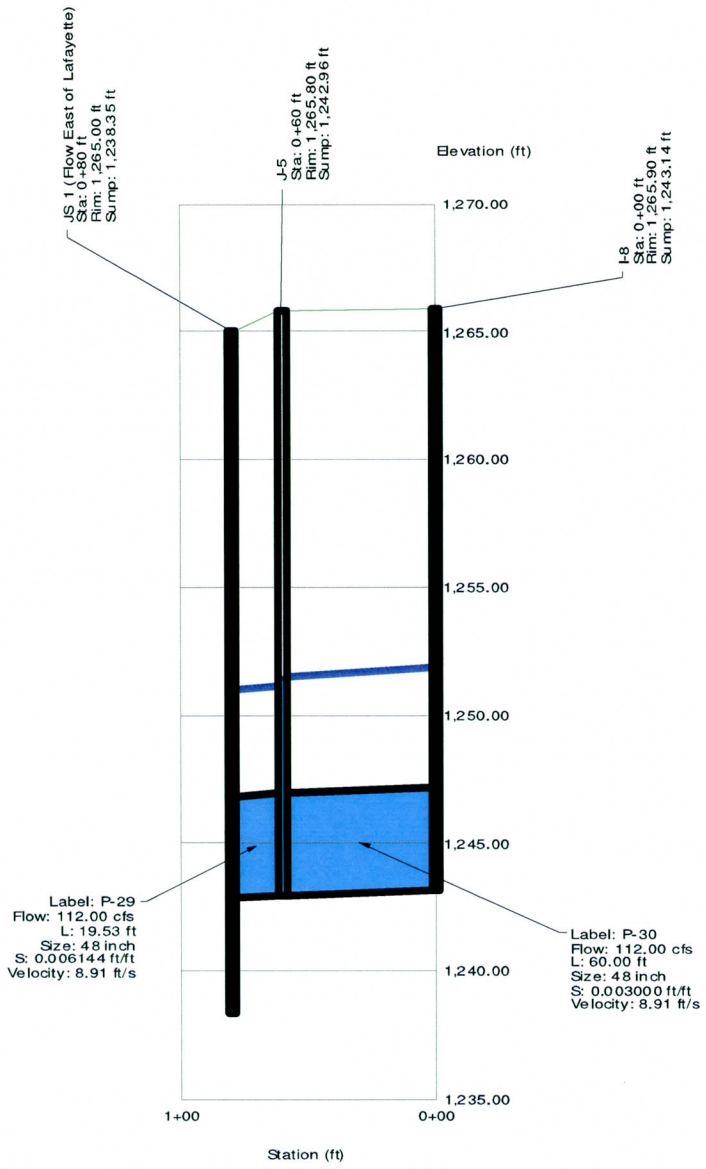
Profile: Lafayette Interceptor Drain and Outlet Design



Scenario: Lafayette Interceptor Drain and Outlet Design (LIDOD)

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Average Velocity (ft/s)	Description
existing	DS 1	OUTLET - OCCC	990.00	198.40	0.005066	102 inch	0.013	763.01	1,226.64	1,225.63	1,253.73	1,252.70	18.60	18.57	1,241.99	1,240.30	17.45	
SD 01b	MH1	BD 1	865.00	503.00	0.005992	102 inch	0.013	829.86	1,236.31	1,233.30	1,260.83	1,253.81	16.02	12.01	1,247.98	1,244.71	15.24	
SD 01a	BD 1	DS 1	865.00	139.00	0.006014	102 inch	0.013	831.41	1,233.30	1,232.46	1,253.81	1,253.73	12.01	12.77	1,244.53	1,243.62	15.24	
SD 4b	MH 3	BD 2	289.00	413.70	0.000991	84 inch	0.013	201.10	1,242.43	1,242.02	1,265.88	1,265.46	16.45	16.44	1,254.17	1,253.33	7.51	
SD 4a	BD 2	DS 3 (ARCADIA DR)	289.00	59.20	0.001182	84 inch	0.013	219.66	1,242.02	1,241.95	1,265.46	1,265.60	16.44	16.65	1,253.28	1,253.16	7.51	
SD 05	MH 4 (Dromedary Road)	MH 3	289.00	387.00	0.001008	84 inch	0.013	202.79	1,242.82	1,242.43	1,265.66	1,265.88	15.84	16.45	1,255.01	1,254.22	7.51	
SDO2a-1	DS 3 (ARCADIA DR)	JS 1 (Flow East of Lafaye	762.00	17.32	0.006005	102 inch	0.013	830.73	1,238.45	1,238.35	1,265.60	1,265.00	18.65	18.15	1,251.06	1,250.97	13.43	
SDO2a	JS 1 (Flow East of Lafayett	MH1	865.00	339.65	0.005994	102 inch	0.013	830.03	1,238.35	1,236.31	1,265.00	1,260.83	18.15	16.02	1,250.37	1,248.16	15.24	
SD02b	MH2	DS 3 (ARCADIA DR)	473.00	252.00	0.014127	78 inch	0.013	623.11	1,248.51	1,244.95	1,269.15	1,265.60	14.14	14.15	1,255.21	1,253.16	14.25	
P-29	J-5	JS 1 (Flow East of Lafaye	112.00	19.53	0.006144	48 inch	0.013	112.59	1,242.96	1,242.84	1,265.80	1,265.00	18.84	18.16	1,251.09	1,250.97	8.91	
P-30	I-8	J-5	112.00	60.00	0.003000	48 inch	0.013	78.67	1,243.14	1,242.96	1,265.90	1,265.80	18.76	18.84	1,251.84	1,251.47	8.91	

Scenario: Lafayette Interceptor Drain and Outlet Design (LIDOD)

Node Report

Label	Headloss Coefficient	Absolute Headloss (ft)	Sump Elevation (ft)	Rim Elevation (ft)	Total System Flow (cfs)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Headloss Method
MH 4 (Dromedary Road)		0.05	1,242.82	1,265.66	289.00	1,255.06	1,255.01	Absolute
MH 3	0.05		1,242.43	1,265.88	289.00	1,254.22	1,254.17	Standard
BD 2	0.05		1,242.02	1,265.46	289.00	1,253.33	1,253.28	Standard
MH2	0.05		1,248.51	1,269.15	473.00	1,255.37	1,255.21	Standard
I-8	0.05		1,243.14	1,265.90	112.00	1,251.90	1,251.84	Standard
DS 3 (ARCADIA DR)		2.10	1,238.45	1,265.60	762.00	1,253.16	1,251.06	Absolute
J-5		0.38	1,242.96	1,265.80	112.00	1,251.47	1,251.09	Absolute
JS 1 (Flow East of Lafayette)		0.60	1,238.35	1,265.00	865.00	1,250.97	1,250.37	Absolute
MH1	0.05		1,236.31	1,260.83	865.00	1,248.16	1,247.98	Standard
BD 1	0.05		1,233.30	1,253.81	865.00	1,244.71	1,244.53	Standard
DS 1		1.63	1,226.64	1,253.73	990.00	1,243.62	1,241.99	Absolute
OUTLET - OCCC			1,225.63	1,252.70	990.00	1,240.30	1,240.30	

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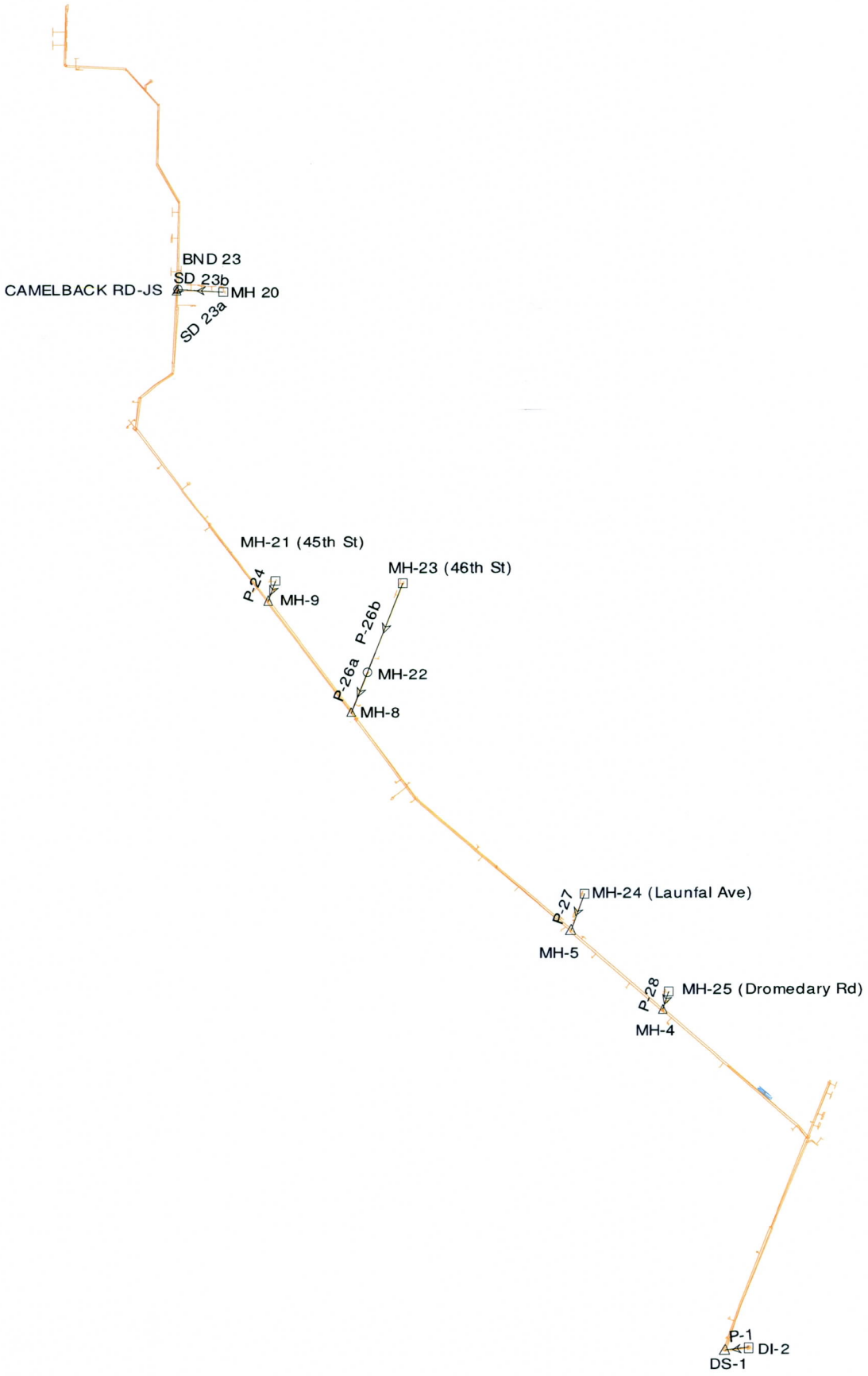
Scenario: LIDOD-Lateral Storm Drain



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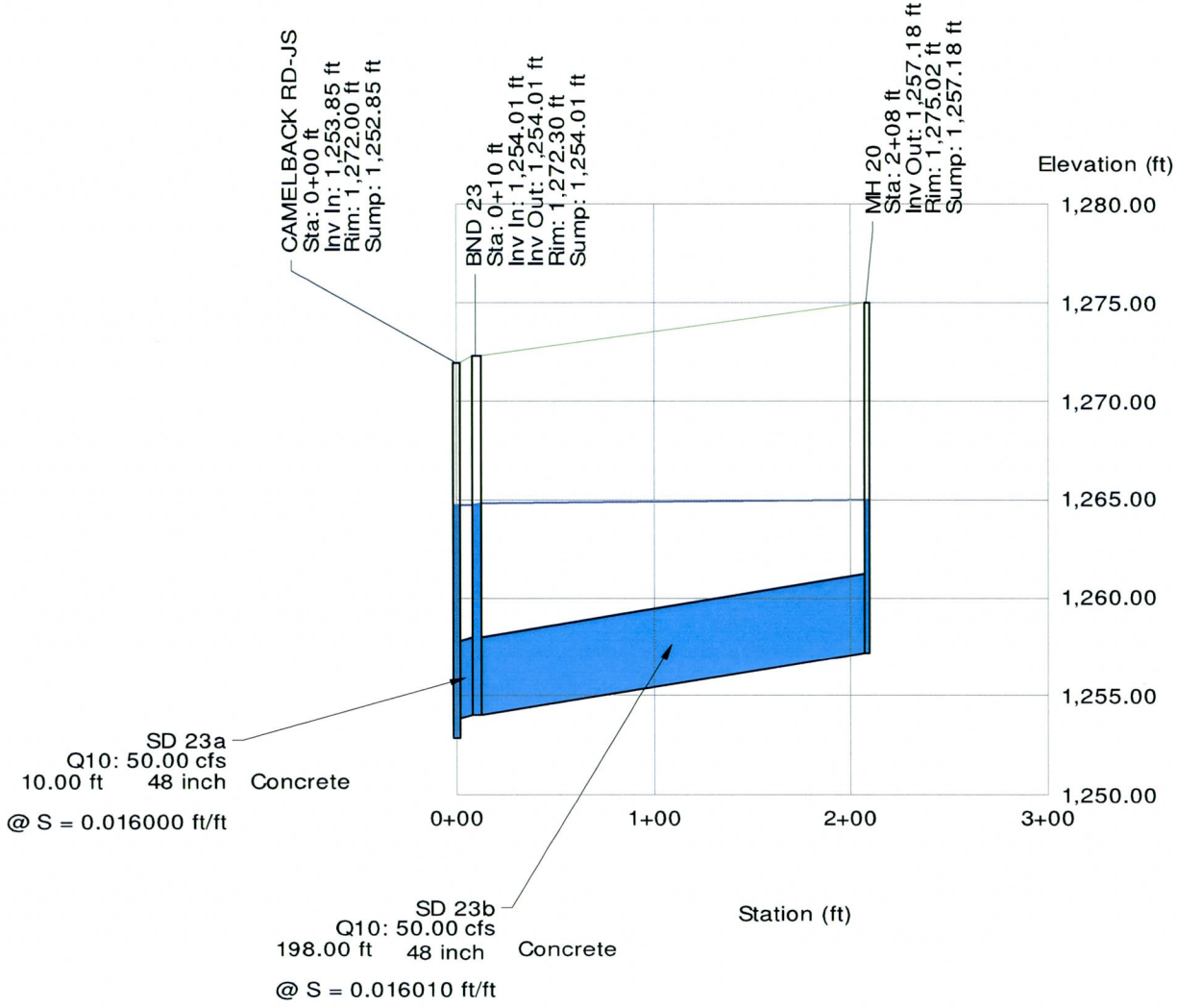
Profile: Lafayette Interceptor Drain and Outlet Design

Camelback Road Junction



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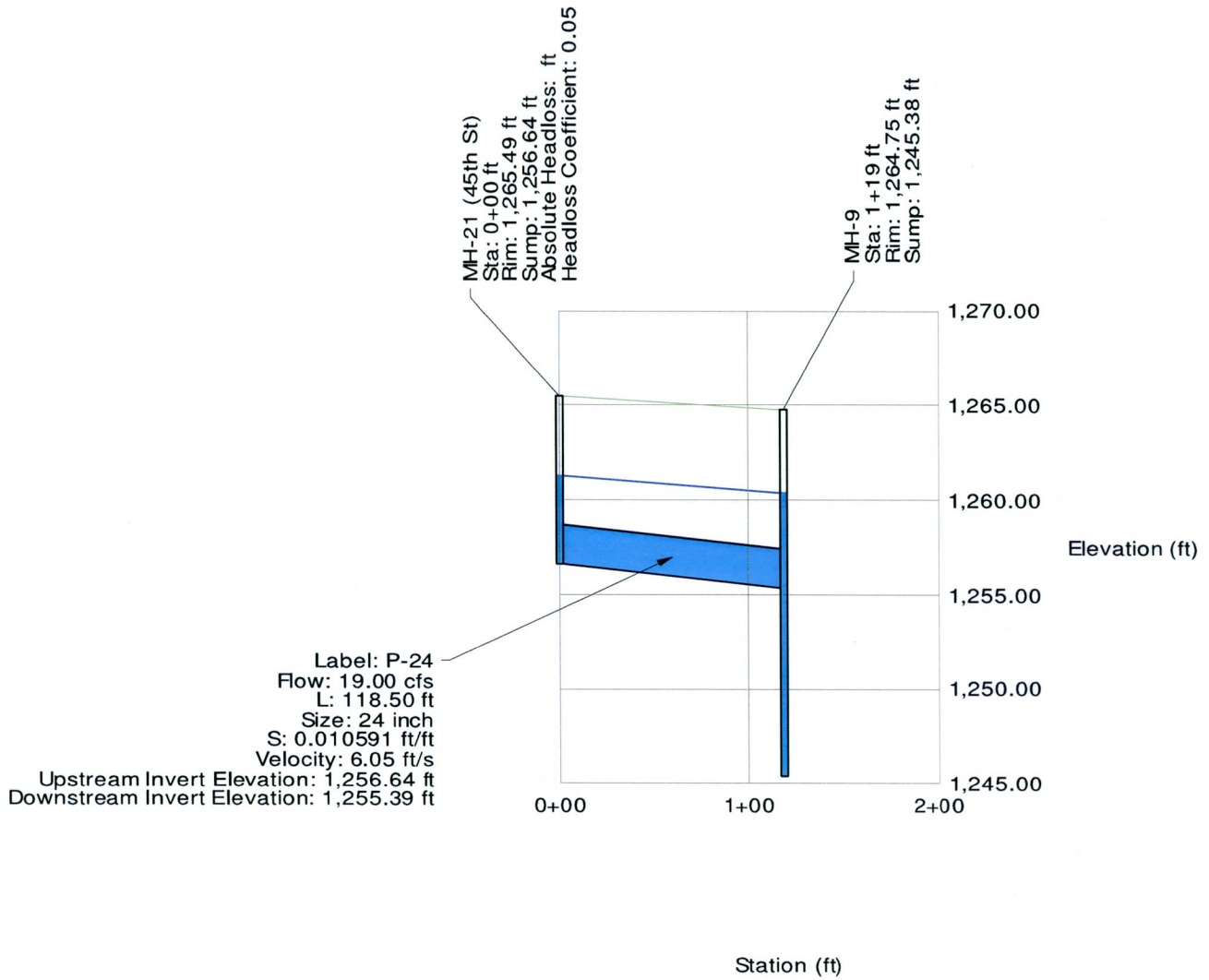
Profile: Lafayette Interceptor Drain and Outlet Design

45th Street



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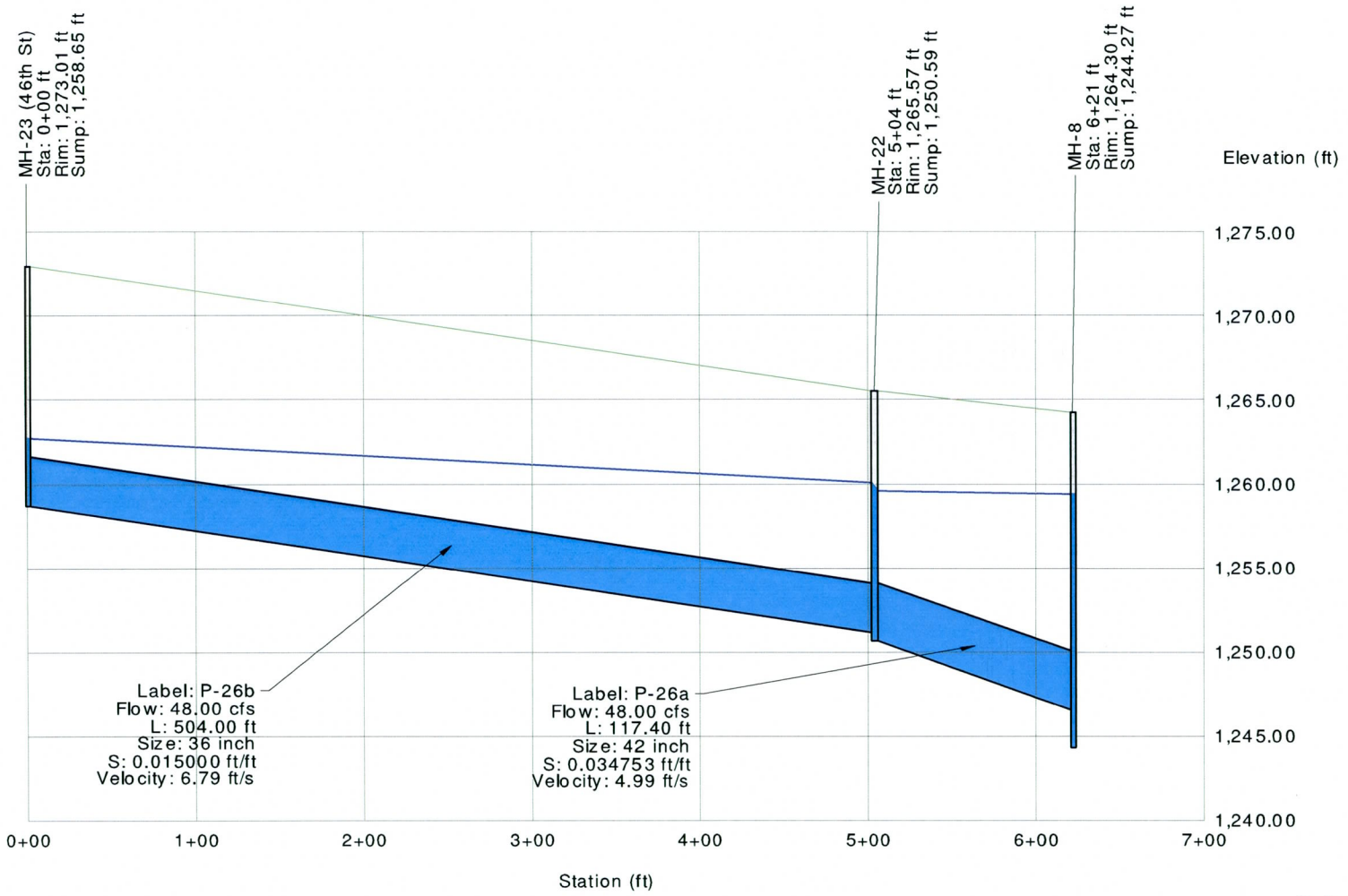
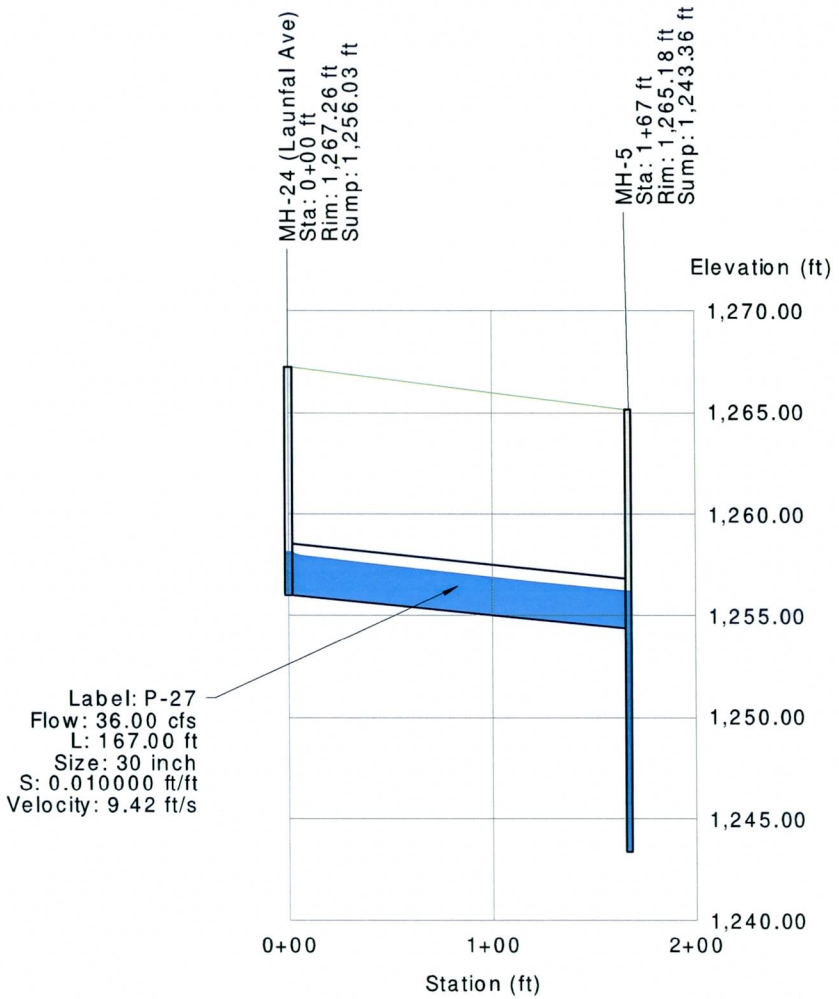
Profile: Lafayette Interceptor Drain and Outlet Design

46th Street



Profile: Lafayette Interceptor Drain and Outlet Design
Launfal Avenue



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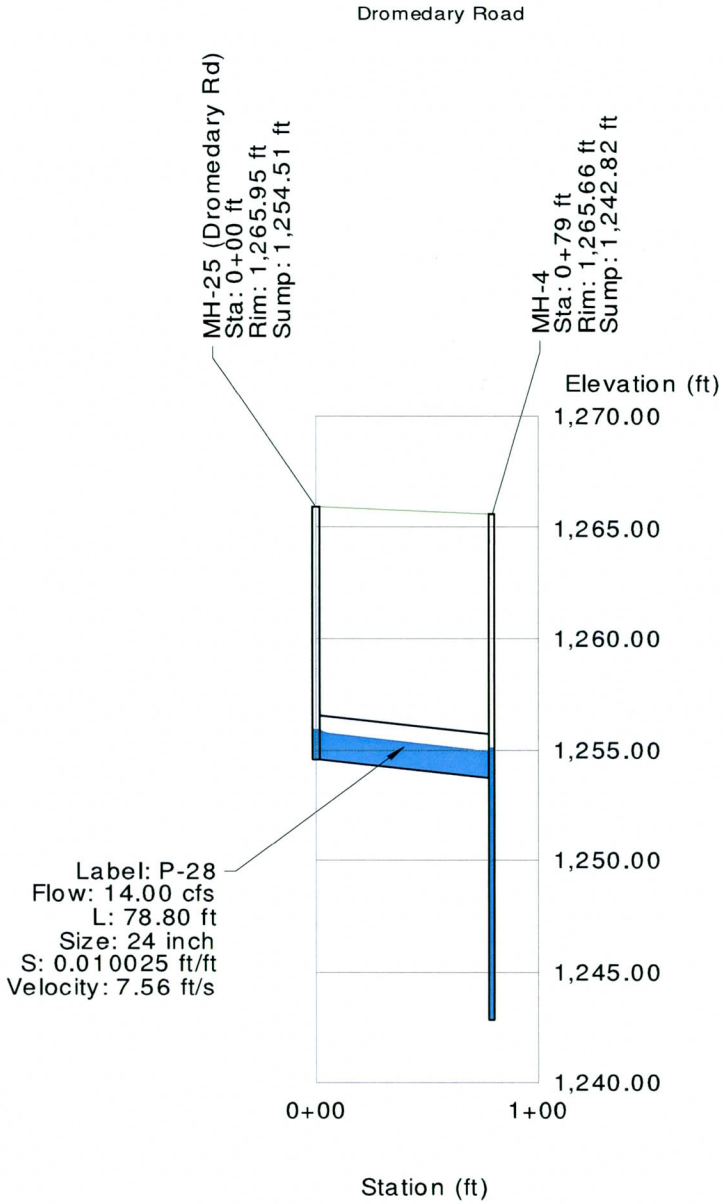
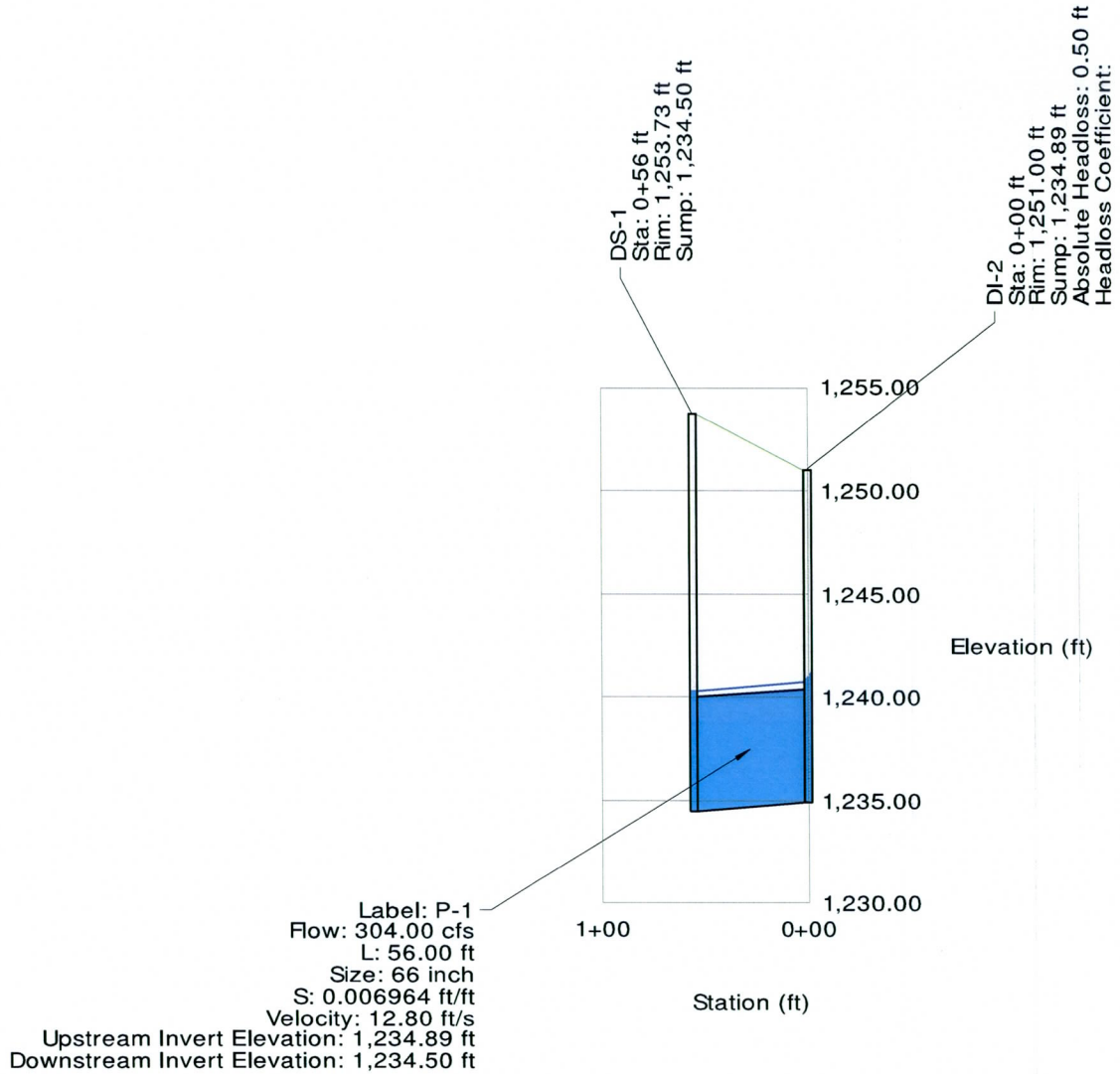


Profile: Lafayette Interceptor Drain and Outlet Design

Arcadia Drive Drop Inlet



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Scenario: LIDOD-Lateral Storm Drain

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Average Velocity (ft/s)	Description
SD 23b	MH 20	BND 23	50.00	198.00	0.016010	48 inch	0.013	181.74	1,257.18	1,254.01	1,275.02	1,272.30	13.84	14.29	1,265.03	1,264.79	3.98	
SD 23a	BND 23	CAMELBACK RD-JS	50.00	10.00	0.016000	48 inch	0.013	181.69	1,254.01	1,253.85	1,272.30	1,272.00	14.29	14.15	1,264.69	1,264.68	3.98	
P-26b	MH-23 (46th St)	MH-22	48.00	504.00	0.015000	36 inch	0.013	81.68	1,258.65	1,251.09	1,273.01	1,265.57	11.36	11.48	1,262.70	1,260.09	6.79	
P-26a	MH-22	MH-8	48.00	117.40	0.034753	42 inch	0.013	187.55	1,250.59	1,246.51	1,265.57	1,264.30	11.48	14.29	1,259.59	1,259.32	4.99	
P-1	DI-2	DS-1	304.00	56.00	0.006964	66 inch	0.013	280.23	1,234.89	1,234.50	1,251.00	1,253.73	10.61	13.73	1,240.76	1,240.30	12.80	
P-27	MH-24 (Launfal Ave)	MH-5	36.00	167.00	0.010000	30 inch	0.013	41.01	1,256.03	1,254.36	1,267.26	1,265.18	8.73	8.32	1,258.07	1,256.18	9.42	
P-28	MH-25 (Dromedary Rd)	MH-4	14.00	78.80	0.010025	24 inch	0.013	22.65	1,254.51	1,253.72	1,265.95	1,265.66	9.44	9.94	1,255.86	1,254.86	7.59	
P-24	MH-21 (45th St)	MH-9	19.00	118.50	0.010591	24 inch	0.013	23.28	1,256.64	1,255.39	1,265.49	1,264.75	6.85	7.37	1,261.27	1,260.43	6.05	

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Scenario: LIDOD-Lateral Storm Drain

Node Report

Label	Headloss Coefficient	Absolute Headloss (ft)	Sump Elevation (ft)	Rim Elevation (ft)	Total System Flow (cfs)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Headloss Method
CAMELBACK RD-JS			1,252.85	1,272.00	50.00	1,264.68	1,264.68	
BND 23	0.38		1,254.01	1,272.30	50.00	1,264.79	1,264.69	Standard
MH 20	0.05		1,257.18	1,275.02	50.00	1,265.04	1,265.03	Standard
MH-8			1,244.27	1,264.30	48.00	1,259.32	1,259.32	
MH-22		0.50	1,250.59	1,265.57	48.00	1,260.09	1,259.59	Absolute
MH-23 (46th St)	0.05		1,258.65	1,273.01	48.00	1,262.73	1,262.70	Standard
DI-2		0.50	1,234.89	1,251.00	304.00	1,241.26	1,240.76	Absolute
DS-1			1,234.50	1,253.73	304.00	1,240.30	1,240.30	
MH-5			1,243.36	1,265.18	36.00	1,256.24	1,256.24	
MH-24 (Launfal Ave)	0.05		1,256.03	1,267.26	36.00	1,258.12	1,258.07	Standard
MH-4			1,242.82	1,265.66	14.00	1,255.06	1,255.06	
MH-25 (Dromedary Rd)	0.05		1,254.51	1,265.95	14.00	1,255.89	1,255.86	Standard
MH-9			1,245.38	1,264.75	19.00	1,260.43	1,260.43	
MH-21 (45th St)	0.05		1,256.64	1,265.49	19.00	1,261.29	1,261.27	Standard

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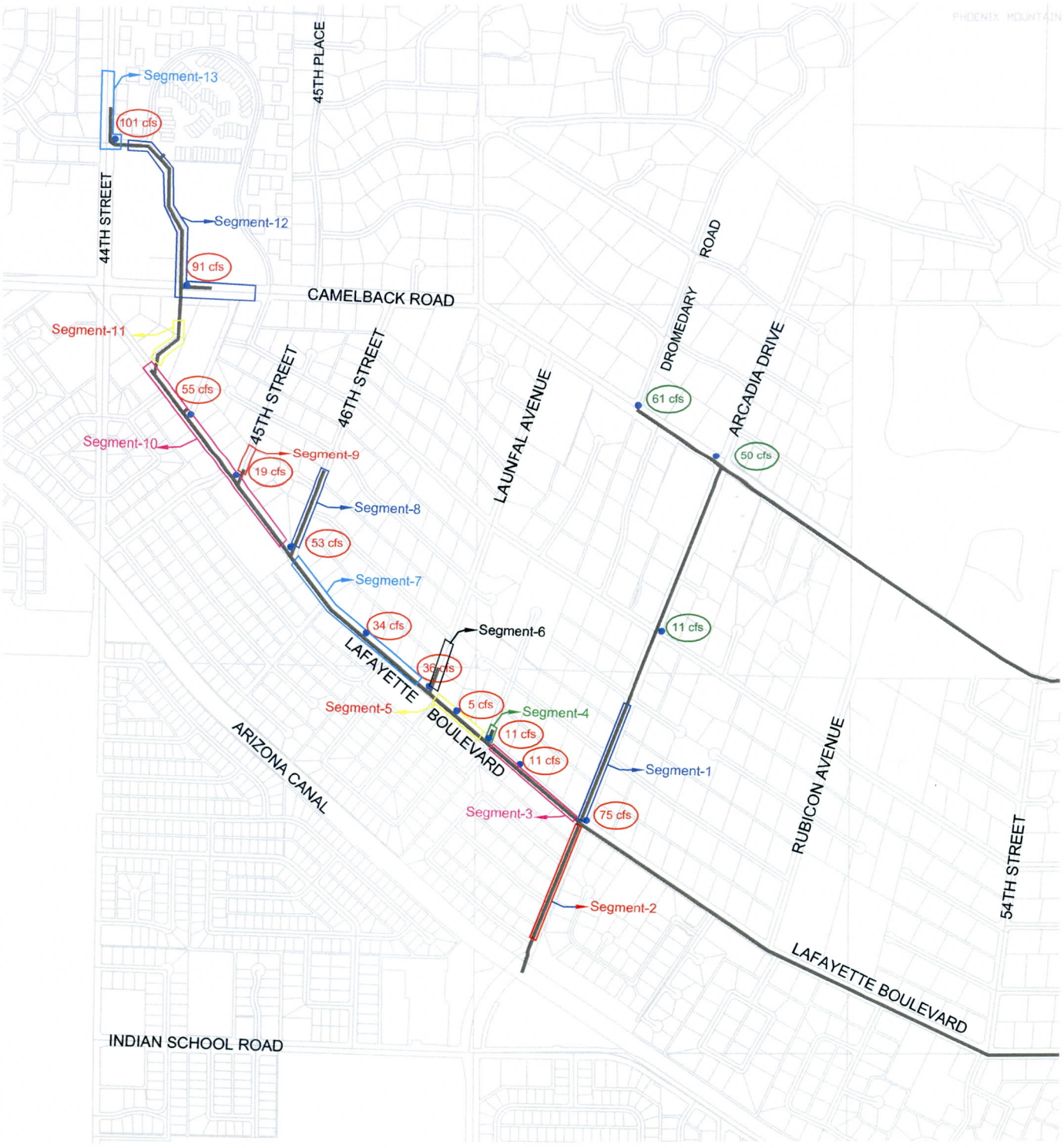
Collection System Hydraulics (Flow Master)



PROJECT NO: 010-2312	Collection System Design Discharge	OLSSON ASSOCIATES 7250 North 16th Street Suite 210 Phoenix, AZ 85020-5282 TEL 602.748.1000 FAX 602.748.1001	FIGURE
DRAWN BY: TGB	LAFAYETTE INTERCEPTOR STORM DRAIN SYSTEM		4.21
DATE: 03/29/2012			

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Lafayette Interceptor Drain and Outlet Design (LIDOD)
Curb Inlet Design

Basin ID	Inlet Type	Catch Basin	
		Physical Length (ft)	Capture Capacity (cfs)
Arcadia Drive North of Lafayette Blvd		**Segment-1**	
CB-201	Curb Opening Inlet	20	14
CB-105	Curb Opening Inlet	30	14
CB-106	Grate Inlet	3.3 x 2	1
CB-107	Curb Opening Inlet	37	21
CB-108	Curb Opening Inlet	37	16
CB-109	Grate Inlet	3.3 x 2	1
CB-110	Curb Opening Inlet	37	17
		Total Capacity	**84**
Arcadia Drive South of Lafayette Blvd		**Segment-2**	
CB-101	Grate Inlet	3.3 x 2	1
CB-102	Curb Opening Inlet	9	5.5
CB-103	Curb Opening Inlet	9	3
CB-104	Curb Opening Inlet	9	3
		Total Capacity	**12.5**
Lafayette Blvd between Dromedary Rd to Arcadia Drive		**Segment-3**	
CB-202	Curb Opening Inlet	9	3.5
CB-203	Curb Opening Inlet	20	6
CB-204	Curb Opening Inlet	6	3
CB-205	Curb Opening Inlet	13	7
		Total Capacity	**20**
Dromedary Road		**Segment-4**	
CB-301	Curb Opening Inlet	23	8
CB-302	Curb Opening Inlet	23	6
		Total Capacity	**14**
Lafayette Blvd between Launfal Ave to Dromedary Rd		**Segment-5**	
CB-207	Curb Opening Inlet	6	2
CB-208	Curb Opening Inlet	6	2
CB-209	Curb Opening Inlet	23	8
		Total Capacity	**12**
Launfal Avenue		**Segment-6**	
CB-401	Curb Opening Inlet	37	15
CB-402	Curb Opening Inlet	37	18
CB-211	Curb Opening Inlet	23	11
		Total Capacity	**44**

Lafayette Interceptor Drain and Outlet Design (LIDOD)
Curb Inlet Design

Basin ID	Inlet Type	Catch Basin	
		Physical Length (ft)	Capture Capacity (cfs)
Lafayette Blvd between 46th Street to Launfal Avenue		**Segment-7**	
CB-210	Curb Opening Inlet	3	3.5
CB-212	Curb Opening Inlet	3	3.5
CB-213	Curb Opening Inlet	6	2.5
CB-214	Curb Opening Inlet	23	17
CB-215	Curb Opening Inlet	6	1
CB-216	Curb Opening Inlet	23	6.5
CB-217	Curb Opening Inlet	9	3
CB-218	Curb Opening Inlet	9	2
CB-219	Grate Inlet	6.6 x 2	2
CB-220	Curb Opening Inlet	9	4
		Total Capacity	**45**
46th Street		**Segment-8**	
CB-501	Curb Opening Inlet	9	4
CB-502	Curb Opening Inlet	9	3.5
CB-503	Curb Opening Inlet	13	5.5
CB-504	Curb Opening Inlet	9	3.5
CB-505	Curb Opening Inlet	37	20
CB-506	Curb Opening Inlet	37	20
		Total Capacity	**57**
45th Street		**Segment-9**	
CB-601	Curb Opening Inlet	37	10
CB-602	Curb Opening Inlet	37	15
		Total Capacity	**25**
Lafayette Blvd. from 46th Street to 44th Street		**Segment-10**	
CB-221	Curb Opening Inlet	13	11
CB-222	Curb Opening Inlet	6	3
CB-223	Curb Opening Inlet	6	2.5
CB-224	Curb Opening Inlet	6	3
CB-225	Curb Opening Inlet	6	3
DI-2	Drop Inlet	1-36" CP	64
CB-226	Curb Opening Inlet	6	1.5
CB-227	Curb Opening Inlet	6	1.5
CB-228	Curb Opening Inlet	6	3
		Total Capacity	**93**

Please refer Appendix E for Drop Inlet Calculations

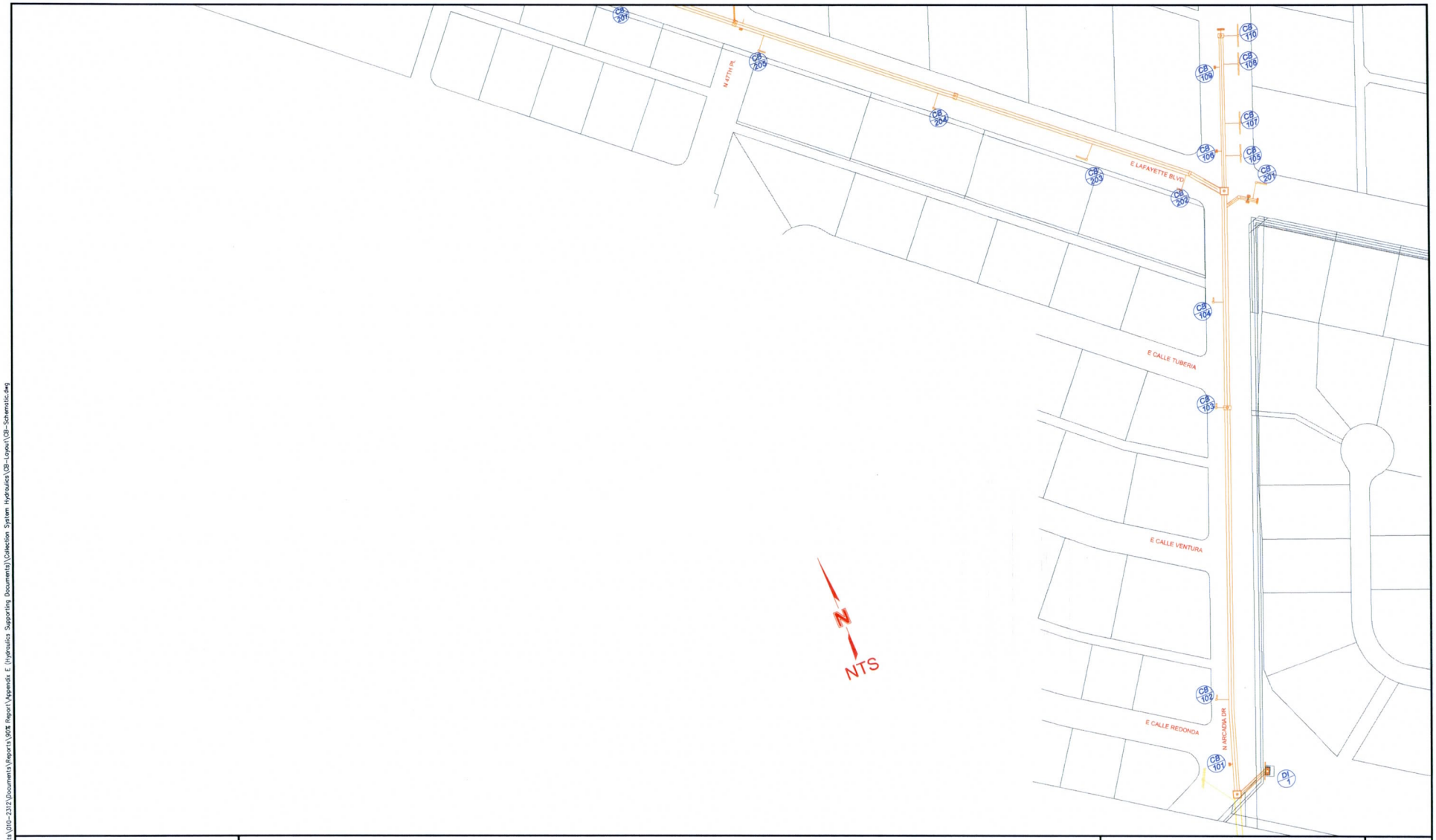
Office Complex between Camelback Rd and Lafayette B		**Segment-11**	
CB-701	Grate	3.3 x 2	5
CB-702	Grate	3.3 x 2	5
		Total Capacity	**10**

Lafayette Interceptor Drain and Outlet Design (LIDOD)
Curb Inlet Design

Basin ID	Inlet Type	Catch Basin	
		Physical Length (ft)	Capture Capacity (cfs)
Camelback Road & North Village Drive		**Segment-12**	
CB-703	Curb Opening Inlet	37	10
CB-704	Curb Opening Inlet	37	9
CB-705	Curb Opening Inlet	37	12.5
CB-706	Curb Opening Inlet	37	12
DI-3	Drop inlet	1-36" CP	87
CB-708	Curb Opening Inlet	30	14
CB-802	Curb Opening Inlet	37	10
CB-803	Curb Opening Inlet	37	10.5
CB-804	Curb Opening Inlet	37	9.5
CB-805	Curb Opening Inlet	37	9.5
CB-806	Curb Opening Inlet	37	9.5
		Total Capacity	**194**

Please refer Appendix E for Drop Inlet Calculations

44th Street		**Segment-13**	
CB-901	Curb Opening Inlet	37	17
CB-902	Curb Opening Inlet	37	16
CB-903	Curb Opening Inlet	37	17
CB-904	Curb Opening Inlet	37	14
CB-905	Curb Opening Inlet	37	17
CB-905	Curb Opening Inlet	37	15
CB-709	Curb Opening Inlet	23	10
		Total Capacity	**106**



PROJECT NO: 010-2312 DRAWN BY: gms DATE: 08/15/2011	Lafayette Interceptor Drain & Outlet Design : Catch Basin Location	OLSSON ASSOCIATES 7250 North 16th Street Suite 210 Phoenix, AZ 85020-5282 TEL 602.748.1000 FAX 602.748.1001	EXHIBIT F-1

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PROJECT NO: 010-2312 DRAWN BY: gms DATE: 08/15/2011	Lafayette Interceptor Drain & Outlet Design : Catch Basin Location	OLSSON ASSOCIATES 7250 North 16th Street Suite 210 Phoenix, AZ 85020-5282 TEL 602.748.1000 FAX 602.748.1001	EXHIBIT F-2

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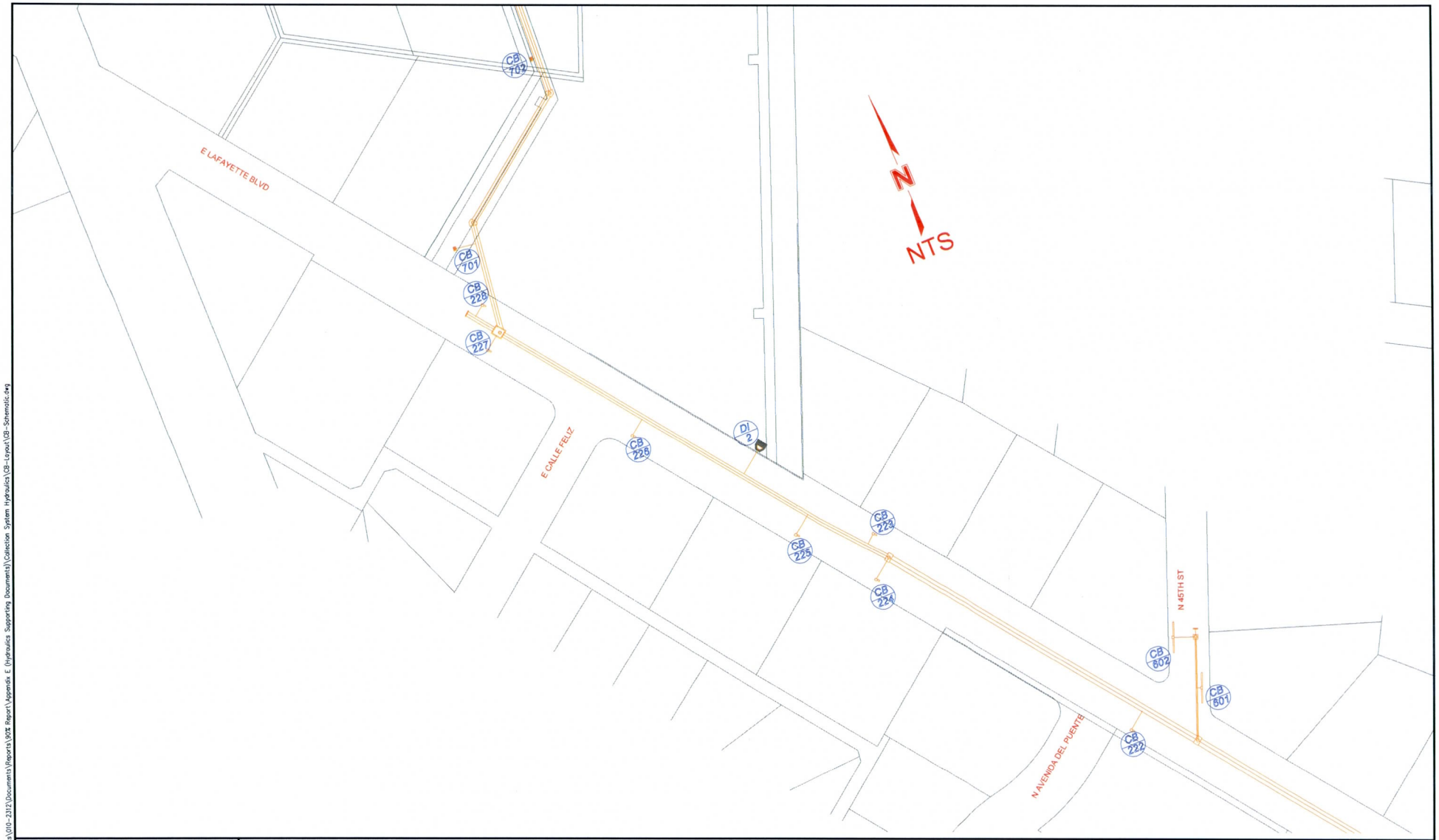

PROJECT NO:	010-2312
DRAWN BY:	gms
DATE:	08/15/2011

Lafayette Interceptor Drain & Outlet Design : Catch Basin Location

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EXHIBIT

F-3

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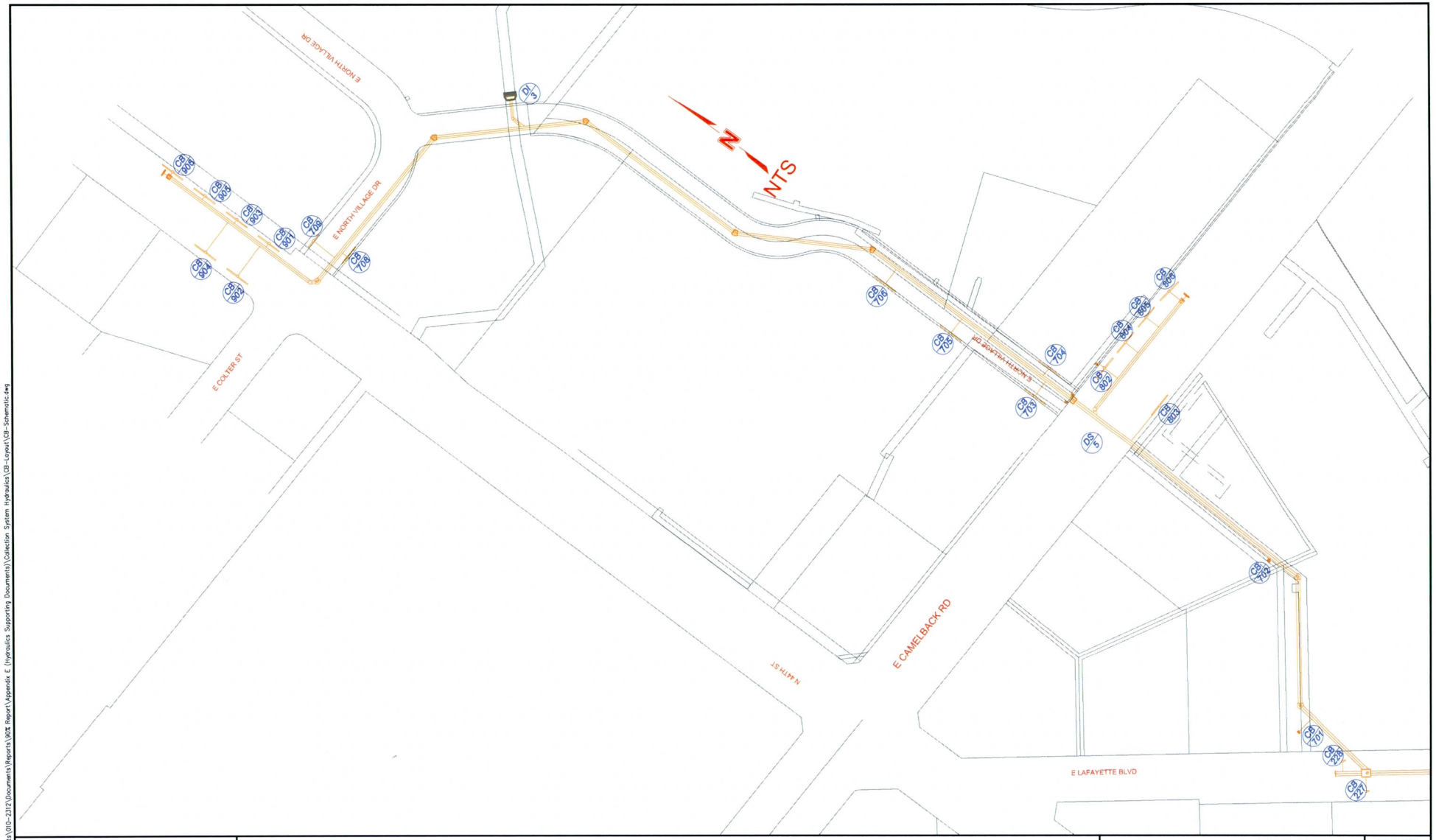

PROJECT NO:	010-2312
DRAWN BY:	gms
DATE:	08/15/2011

Lafayette Interceptor Drain & Outlet Design : Catch Basin Location

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EXHIBIT

F-4

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Weir/Orifice Rating Curves of Grate Inlets in SAG

Based on C.O.P Standard Detail P1565

Weir Eq. [1] $Q_i = C_w P d^{1.5}$ **Orifice Eq.** [2] $Q_i = C_o A (2gd)^{0.5}$

Where: Cw = **3.0** and Co = **0.67**

Single Grate

P = 8.66 ft Assumes all sides open

A = 4.00 sq ft Grate Opening

Depth (ft)	Weir Qi (cfs)	Weir 50% Clogging	Orifice Qi (cfs)	Orifice 50% Clogging
0.00	0.00	0.00	0.00	0.00
0.10	0.82	0.41	6.80	3.40
0.20	2.32	1.16	9.62	4.81
0.30	4.27	2.13	11.78	5.89
0.40	6.57	3.29	13.60	6.80
0.50	9.19	4.59	15.21	7.60
0.60	12.07	6.04	16.66	8.33
0.70	15.22	7.61	17.99	9.00
0.80	18.59	9.29	19.24	9.62
0.90	22.18	11.09	20.40	10.20
1.00	25.98	12.99	21.51	10.75
1.10	29.97	14.99	22.56	11.28
1.20	34.15	17.08	23.56	11.78
1.30	38.51	19.25	24.52	12.26
1.40	43.04	21.52	25.45	12.72
1.50	47.73	23.86	26.34	13.17
1.60	52.58	26.29	27.20	13.60
1.70	57.59	28.79	28.04	14.02
1.80	62.74	31.37	28.85	14.43
1.90	68.04	34.02	29.65	14.82
2.00	73.48	36.74	30.42	15.21
2.10	79.06	39.53	31.17	15.58
2.20	84.78	42.39	31.90	15.95
2.30	90.62	45.31	32.62	16.31
2.40	96.60	48.30	33.32	16.66
2.50	102.69	51.35	34.01	17.00
2.60	108.92	54.46	34.68	17.34
2.70	115.26	57.63	35.34	17.67
2.80	121.72	60.86	35.99	17.99

Grate Inlet ID	Depth (ft)	$Q_{intercept}$ (Cfs)
CB-101	0.2	1
CB-105	0.2	1

Worksheet for CB-102 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	11.00	ft³/s
Slope	0.01040	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.05	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	7.20	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	51.77	%
Intercepted Flow	5.70	ft³/s
Bypass Flow	5.30	ft³/s
Spread	9.90	ft
Depth	0.49	ft
Flow Area	2.36	ft²
Gutter Depression	0.02	ft
Total Depression	0.18	ft
Velocity	4.65	ft/s
Equivalent Cross Slope	0.09271	ft/ft
Length Factor	0.33	
Total Interception Length	21.61	ft

Messages

Notes

At the given condition (flow depth = curb height), capture capacity of the curb opeing inlet is only 52% which is 0.52 x 11 = 5.7 cfs

Worksheet for CB-103 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	5.00	ft³/s
Slope	0.01020	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	7.20	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	61.15	%
Intercepted Flow	3.06	ft³/s
Bypass Flow	1.94	ft³/s
Spread	11.53	ft
Depth	0.32	ft
Flow Area	1.57	ft²
Gutter Depression	0.05	ft
Total Depression	0.22	ft
Velocity	3.19	ft/s
Equivalent Cross Slope	0.07432	ft/ft
Length Factor	0.41	
Total Interception Length	17.62	ft

Messages

Notes

At the given condition (flow depth = curb height), capture capacity of the curb opeing inlet is only 61% which is 0.61 x 5 = 3 cfs

Worksheet for CB-104 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	5.00	ft³/s
Slope	0.01000	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	7.20	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	65.22	%
Intercepted Flow	3.26	ft³/s
Bypass Flow	1.74	ft³/s
Spread	9.83	ft
Depth	0.34	ft
Flow Area	1.48	ft²
Gutter Depression	0.04	ft
Total Depression	0.21	ft
Velocity	3.38	ft/s
Equivalent Cross Slope	0.08446	ft/ft
Length Factor	0.44	
Total Interception Length	16.22	ft

Messages

Notes

At the given condition (flow depth = curb height), capture capacity of the curb opeing inlet is only 65% which is 0.65 x 5 = 3 cfs

Worksheet for CB-105 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	14.00	ft³/s
Slope	0.01660	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.07	ft/ft
Road Cross Slope	0.07	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	24.00	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	14.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	7.94	ft
Depth	0.55	ft
Flow Area	2.18	ft²
Gutter Depression	0.00	ft
Total Depression	0.17	ft
Velocity	6.43	ft/s
Equivalent Cross Slope	0.11744	ft/ft
Length Factor	1.01	
Total Interception Length	23.88	ft

Weir/Orifice Rating Curves of Grate Inlets in SAG

Based on C.O.P Standard Detail P1565

Weir Eq. [1] $Q_i = C_w P d^{1.5}$ **Orifice Eq.** [2] $Q_i = C_o A (2gd)^{0.5}$

Where: Cw = **3.0** and Co = **0.67**

Single Grate

P = 8.66 ft Assumes all sides open

A = 4.00 sq ft Grate Opening

Depth (ft)	Weir Qi (cfs)	Weir 50% Clogging	Orifice Qi (cfs)	Orifice 50% Clogging
0.00	0.00	0.00	0.00	0.00
0.10	0.82	0.41	6.80	3.40
0.20	2.32	1.16	9.62	4.81
0.30	4.27	2.13	11.78	5.89
0.40	6.57	3.29	13.60	6.80
0.50	9.19	4.59	15.21	7.60
0.60	12.07	6.04	16.66	8.33
0.70	15.22	7.61	17.99	9.00
0.80	18.59	9.29	19.24	9.62
0.90	22.18	11.09	20.40	10.20
1.00	25.98	12.99	21.51	10.75
1.10	29.97	14.99	22.56	11.28
1.20	34.15	17.08	23.56	11.78
1.30	38.51	19.25	24.52	12.26
1.40	43.04	21.52	25.45	12.72
1.50	47.73	23.86	26.34	13.17
1.60	52.58	26.29	27.20	13.60
1.70	57.59	28.79	28.04	14.02
1.80	62.74	31.37	28.85	14.43
1.90	68.04	34.02	29.65	14.82
2.00	73.48	36.74	30.42	15.21
2.10	79.06	39.53	31.17	15.58
2.20	84.78	42.39	31.90	15.95
2.30	90.62	45.31	32.62	16.31
2.40	96.60	48.30	33.32	16.66
2.50	102.69	51.35	34.01	17.00
2.60	108.92	54.46	34.68	17.34
2.70	115.26	57.63	35.34	17.67
2.80	121.72	60.86	35.99	17.99

Grate Inlet ID	Depth (ft)	$Q_{intercept}$ (Cfs)
CB-101	0.2	1
CB-105	0.2	1

CB-109 0.2

1

Worksheet for CB-107 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	21.00	ft³/s
Slope	0.01500	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.07	ft/ft
Road Cross Slope	0.06	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	21.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	9.88	ft
Depth	0.63	ft
Flow Area	3.12	ft²
Gutter Depression	0.00	ft
Total Depression	0.17	ft
Velocity	6.73	ft/s
Equivalent Cross Slope	0.10418	ft/ft
Length Factor	1.00	
Total Interception Length	29.51	ft

Worksheet for CB-108 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	16.00	ft³/s
Slope	0.01640	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.05	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	16.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	10.46	ft
Depth	0.52	ft
Flow Area	2.64	ft²
Gutter Depression	0.02	ft
Total Depression	0.18	ft
Velocity	6.06	ft/s
Equivalent Cross Slope	0.09055	ft/ft
Length Factor	1.01	
Total Interception Length	29.41	ft

Worksheet for CB-110 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	17.00	ft³/s
Slope	0.01640	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.05	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	17.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	10.20	ft
Depth	0.54	ft
Flow Area	2.71	ft²
Gutter Depression	0.01	ft
Total Depression	0.18	ft
Velocity	6.27	ft/s
Equivalent Cross Slope	0.09387	ft/ft
Length Factor	1.00	
Total Interception Length	29.53	ft

Worksheet for CB-201 (6" VC on Sump)

Project Description

Solve For	Spread

Input Data

Discharge		14.00	ft³/s
Gutter Width		1.42	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.05	ft/ft
Curb Opening Length		16.00	ft
Opening Height		0.42	ft
Curb Throat Type	Horizontal		
Local Depression		2.00	in
Local Depression Width		1.42	ft
Throat Incline Angle		90.00	degrees

Results

Spread	8.97	ft
Depth	0.49	ft
Gutter Depression	0.01	ft
Total Depression	0.18	ft

Worksheet for CB-202 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	3.50	ft³/s
Slope	0.00140	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	7.20	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	14.36	ft
Depth	0.40	ft
Flow Area	2.51	ft²
Gutter Depression	0.05	ft
Total Depression	0.38	ft
Velocity	1.39	ft/s
Equivalent Cross Slope	0.09617	ft/ft
Length Factor	1.01	
Total Interception Length	7.16	ft

Worksheet for CB-203 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	6.00	ft³/s
Slope	0.00500	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	16.00	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	6.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	17.80	ft
Depth	0.35	ft
Flow Area	2.58	ft²
Gutter Depression	0.06	ft
Total Depression	0.40	ft
Velocity	2.33	ft/s
Equivalent Cross Slope	0.08003	ft/ft
Length Factor	1.09	
Total Interception Length	14.69	ft

Worksheet for CB-204 (4" RC on Sump)

Project Description

Solve For	Spread

Input Data

Discharge		3.00	ft³/s
Gutter Width		1.42	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.04	ft/ft
Curb Opening Length		4.80	ft
Opening Height		0.42	ft
Curb Throat Type	Horizontal		
Local Depression		4.00	in
Local Depression Width		1.42	ft
Throat Incline Angle		90.00	degrees

Results

Spread	7.89	ft
Depth	0.34	ft
Gutter Depression	0.03	ft
Total Depression	0.36	ft

Worksheet for CB-205 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	7.00	ft³/s
Slope	0.00230	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.04	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	10.40	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	7.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.41	ft
Depth	0.52	ft
Flow Area	3.10	ft²
Gutter Depression	0.03	ft
Total Depression	0.36	ft
Velocity	2.26	ft/s
Equivalent Cross Slope	0.11311	ft/ft
Length Factor	1.03	
Total Interception Length	10.09	ft

Worksheet for CB-207 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	2.00	ft³/s
Slope	0.00060	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	4.80	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	13.63	ft
Depth	0.38	ft
Flow Area	2.27	ft²
Gutter Depression	0.05	ft
Total Depression	0.38	ft
Velocity	0.88	ft/s
Equivalent Cross Slope	0.09996	ft/ft
Length Factor	1.12	
Total Interception Length	4.29	ft

Worksheet for CB-208 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	2.00	ft³/s
Slope	0.00135	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	4.80	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	10.16	ft
Depth	0.35	ft
Flow Area	1.58	ft²
Gutter Depression	0.04	ft
Total Depression	0.38	ft
Velocity	1.27	ft/s
Equivalent Cross Slope	0.12491	ft/ft
Length Factor	1.00	
Total Interception Length	4.79	ft

Worksheet for CB-209 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	8.00	ft³/s
Slope	0.00180	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	18.40	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	8.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	37.28	ft
Depth	0.37	ft
Flow Area	5.61	ft²
Gutter Depression	0.07	ft
Total Depression	0.41	ft
Velocity	1.43	ft/s
Equivalent Cross Slope	0.04176	ft/ft
Length Factor	1.02	
Total Interception Length	18.03	ft

Worksheet for CB-210 (6" VC on Sump)

Project Description

Solve For	Spread

Input Data

Discharge		3.50	ft³/s
Gutter Width		1.42	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.03	ft/ft
Curb Opening Length		2.40	ft
Opening Height		0.42	ft
Curb Throat Type	Horizontal		
Local Depression		2.00	in
Local Depression Width		1.42	ft
Throat Incline Angle		90.00	degrees

Results

Spread	14.68	ft
Depth	0.50	ft
Gutter Depression	0.04	ft
Total Depression	0.21	ft

Worksheet for CB-211 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	11.00	ft³/s
Slope	0.00600	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	18.40	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	11.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	14.98	ft
Depth	0.48	ft
Flow Area	3.29	ft²
Gutter Depression	0.04	ft
Total Depression	0.38	ft
Velocity	3.35	ft/s
Equivalent Cross Slope	0.09524	ft/ft
Length Factor	1.02	
Total Interception Length	18.03	ft

Worksheet for CB-212 (6" VC on Sump)

Project Description

Solve For	Spread

Input Data

Discharge		3.50	ft³/s
Gutter Width		1.42	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.03	ft/ft
Curb Opening Length		2.40	ft
Opening Height		0.42	ft
Curb Throat Type	Horizontal		
Local Depression		2.00	in
Local Depression Width		1.42	ft
Throat Incline Angle		90.00	degrees

Results

Spread	17.51	ft
Depth	0.50	ft
Gutter Depression	0.05	ft
Total Depression	0.21	ft

Worksheet for CB-213 (4" RC on Sump)

Project Description

Solve For	Spread

Input Data

Discharge		2.50	ft^3/s
Gutter Width		1.42	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.01	ft/ft
Curb Opening Length		4.80	ft
Opening Height		0.42	ft
Curb Throat Type	Horizontal		
Local Depression		4.00	in
Local Depression Width		1.42	ft
Throat Incline Angle		90.00	degrees

Results

Spread	27.95	ft
Depth	0.35	ft
Gutter Depression	0.07	ft
Total Depression	0.40	ft

Worksheet for CB-214 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	17.00	ft³/s
Slope	0.00200	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	18.40	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	17.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	22.23	ft
Depth	0.67	ft
Flow Area	6.95	ft²
Gutter Depression	0.05	ft
Total Depression	0.38	ft
Velocity	2.44	ft/s
Equivalent Cross Slope	0.07334	ft/ft
Length Factor	1.01	
Total Interception Length	18.21	ft

Worksheet for CB-215 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	1.00	ft³/s
Slope	0.00700	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	4.80	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	96.78	%
Intercepted Flow	0.97	ft³/s
Bypass Flow	0.03	ft³/s
Spread	10.82	ft
Depth	0.18	ft
Flow Area	0.64	ft²
Gutter Depression	0.07	ft
Total Depression	0.40	ft
Velocity	1.57	ft/s
Equivalent Cross Slope	0.13339	ft/ft
Length Factor	0.85	
Total Interception Length	5.64	ft

Worksheet for CB-216 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	6.50	ft³/s
Slope	0.00880	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	18.40	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	6.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	18.73	ft
Depth	0.31	ft
Flow Area	2.33	ft²
Gutter Depression	0.07	ft
Total Depression	0.40	ft
Velocity	2.79	ft/s
Equivalent Cross Slope	0.07691	ft/ft
Length Factor	1.00	
Total Interception Length	18.44	ft

Worksheet for CB-217 (4" RC on Sump)

Project Description

Solve For	Spread

Input Data

Discharge		3.00	ft³/s
Gutter Width		1.42	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.01	ft/ft
Curb Opening Length		7.20	ft
Opening Height		0.42	ft
Curb Throat Type	Horizontal		
Local Depression		4.00	in
Local Depression Width		1.42	ft
Throat Incline Angle		90.00	degrees

Results

Spread	23.77	ft
Depth	0.33	ft
Gutter Depression	0.07	ft
Total Depression	0.40	ft

Worksheet for CB-218 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	2.00	ft³/s
Slope	0.00200	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	7.20	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	18.60	ft
Depth	0.26	ft
Flow Area	1.78	ft²
Gutter Depression	0.07	ft
Total Depression	0.40	ft
Velocity	1.12	ft/s
Equivalent Cross Slope	0.07924	ft/ft
Length Factor	1.02	
Total Interception Length	7.08	ft

Weir/Orifice Rating Curves of Grate Inlets in Sag

Based on C.O.P Standard Detail P1565

Weir Eq. [1] $Q_i = C_w P d^{1.5}$ **Orifice Eq.** [2] $Q_i = C_o A (2gd)^{0.5}$

Where: Cw = **3.0** and Co = **0.67**

Single Grate

P = 8.66 ft Assumes one side against the curb

A = 8.00 sq ft Grate Opening

Depth (ft)	Weir Qi (cfs)	Weir 50% Clogging	Orifice Qi (cfs)	Orifice 50% Clogging
0.00	0.00	0.00	0.00	0.00
0.10	0.82	0.41	13.60	6.80
0.20	2.32	1.16	19.24	9.62
0.30	4.27	2.13	23.56	11.78
0.40	6.57	3.29	27.20	13.60
0.50	9.19	4.59	30.42	15.21
0.60	12.07	6.04	33.32	16.66
0.70	15.22	7.61	35.99	17.99
0.80	18.59	9.29	38.47	19.24
0.90	22.18	11.09	40.81	20.40
1.00	25.98	12.99	43.01	21.51
1.10	29.97	14.99	45.11	22.56
1.20	34.15	17.08	47.12	23.56
1.30	38.51	19.25	49.04	24.52
1.40	43.04	21.52	50.89	25.45
1.50	47.73	23.86	52.68	26.34
1.60	52.58	26.29	54.41	27.20
1.70	57.59	28.79	56.08	28.04
1.80	62.74	31.37	57.71	28.85
1.90	68.04	34.02	59.29	29.65
2.00	73.48	36.74	60.83	30.42
2.10	79.06	39.53	62.33	31.17
2.20	84.78	42.39	63.80	31.90
2.30	90.62	45.31	65.23	32.62
2.40	96.60	48.30	66.64	33.32
2.50	102.69	51.35	68.01	34.01
2.60	108.92	54.46	69.36	34.68
2.70	115.26	57.63	70.68	35.34
2.80	121.72	60.86	71.98	35.99

Grate Inlet ID	Depth (ft)	$Q_{intercept}$ (Cfs)
CB-219	0.3	2

Worksheet for CB-220 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	4.00	ft³/s
Slope	0.00100	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	7.20	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	4.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	14.04	ft
Depth	0.46	ft
Flow Area	2.99	ft²
Gutter Depression	0.04	ft
Total Depression	0.38	ft
Velocity	1.34	ft/s
Equivalent Cross Slope	0.09995	ft/ft
Length Factor	1.08	
Total Interception Length	6.69	ft

Worksheet for CB-221 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	11.00	ft³/s
Slope	0.00150	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.06	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	10.40	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	11.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.42	ft
Depth	0.75	ft
Flow Area	4.63	ft²
Gutter Depression	0.00	ft
Total Depression	0.33	ft
Velocity	2.38	ft/s
Equivalent Cross Slope	0.12493	ft/ft
Length Factor	1.03	
Total Interception Length	10.11	ft

Worksheet for CB-222 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	3.00	ft³/s
Slope	0.00060	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.04	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	4.80	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.61	ft
Depth	0.48	ft
Flow Area	2.81	ft²
Gutter Depression	0.04	ft
Total Depression	0.37	ft
Velocity	1.07	ft/s
Equivalent Cross Slope	0.10958	ft/ft
Length Factor	1.00	
Total Interception Length	4.81	ft

Worksheet for CB-223 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	2.50	ft³/s
Slope	0.00070	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	4.80	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	2.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	12.07	ft
Depth	0.43	ft
Flow Area	2.36	ft²
Gutter Depression	0.04	ft
Total Depression	0.37	ft
Velocity	1.06	ft/s
Equivalent Cross Slope	0.11148	ft/ft
Length Factor	1.04	
Total Interception Length	4.62	ft

Worksheet for CB-224 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	3.00	ft³/s
Slope	0.00040	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	4.80	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	15.63	ft
Depth	0.48	ft
Flow Area	3.45	ft²
Gutter Depression	0.05	ft
Total Depression	0.38	ft
Velocity	0.87	ft/s
Equivalent Cross Slope	0.09207	ft/ft
Length Factor	1.01	
Total Interception Length	4.73	ft

Worksheet for CB-225 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	3.00	ft³/s
Slope	0.00040	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	4.80	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	15.63	ft
Depth	0.48	ft
Flow Area	3.45	ft²
Gutter Depression	0.05	ft
Total Depression	0.38	ft
Velocity	0.87	ft/s
Equivalent Cross Slope	0.09207	ft/ft
Length Factor	1.01	
Total Interception Length	4.73	ft

Worksheet for CB-226 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	1.50	ft³/s
Slope	0.00520	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.05	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	4.80	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	1.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	4.95	ft
Depth	0.28	ft
Flow Area	0.67	ft²
Gutter Depression	0.01	ft
Total Depression	0.34	ft
Velocity	2.25	ft/s
Equivalent Cross Slope	0.19885	ft/ft
Length Factor	1.00	
Total Interception Length	4.81	ft

Worksheet for CB-227 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	1.50	ft³/s
Slope	0.00240	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.04	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	4.80	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	1.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	6.46	ft
Depth	0.31	ft
Flow Area	0.93	ft²
Gutter Depression	0.02	ft
Total Depression	0.36	ft
Velocity	1.61	ft/s
Equivalent Cross Slope	0.17012	ft/ft
Length Factor	1.15	
Total Interception Length	4.19	ft

Worksheet for CB-228 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	3.00	ft³/s
Slope	0.00060	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.04	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	4.80	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	3.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	11.99	ft
Depth	0.49	ft
Flow Area	2.75	ft²
Gutter Depression	0.03	ft
Total Depression	0.36	ft
Velocity	1.09	ft/s
Equivalent Cross Slope	0.11454	ft/ft
Length Factor	1.02	
Total Interception Length	4.69	ft

Worksheet for CB-301 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	8.00	ft³/s
Slope	0.00990	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	18.40	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	8.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	14.30	ft
Depth	0.37	ft
Flow Area	2.29	ft²
Gutter Depression	0.05	ft
Total Depression	0.39	ft
Velocity	3.50	ft/s
Equivalent Cross Slope	0.09601	ft/ft
Length Factor	1.01	
Total Interception Length	18.24	ft

Worksheet for CB-302 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	6.00	ft³/s
Slope	0.01420	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	18.40	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	6.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	13.99	ft
Depth	0.30	ft
Flow Area	1.71	ft²
Gutter Depression	0.06	ft
Total Depression	0.39	ft
Velocity	3.51	ft/s
Equivalent Cross Slope	0.09773	ft/ft
Length Factor	1.03	
Total Interception Length	17.82	ft

Worksheet for CB-401 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	18.00	ft³/s
Slope	0.01510	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	18.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	15.16	ft
Depth	0.48	ft
Flow Area	3.36	ft²
Gutter Depression	0.04	ft
Total Depression	0.38	ft
Velocity	5.35	ft/s
Equivalent Cross Slope	0.09448	ft/ft
Length Factor	1.01	
Total Interception Length	29.39	ft

Worksheet for CB-402 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	15.00	ft³/s
Slope	0.01640	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	15.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	16.07	ft
Depth	0.42	ft
Flow Area	3.01	ft²
Gutter Depression	0.05	ft
Total Depression	0.39	ft
Velocity	4.99	ft/s
Equivalent Cross Slope	0.08823	ft/ft
Length Factor	1.02	
Total Interception Length	29.08	ft

Worksheet for CB-501 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	7.00	ft³/s
Slope	0.01900	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	7.20	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	59.01	%
Intercepted Flow	4.13	ft³/s
Bypass Flow	2.87	ft³/s
Spread	10.80	ft
Depth	0.33	ft
Flow Area	1.55	ft²
Gutter Depression	0.05	ft
Total Depression	0.38	ft
Velocity	4.52	ft/s
Equivalent Cross Slope	0.11912	ft/ft
Length Factor	0.39	
Total Interception Length	18.43	ft

Messages

Notes

Qi = 0.59x7 = 4 cfs

Worksheet for CB-502 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	4.50	ft³/s
Slope	0.01440	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.05	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	7.20	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	82.65	%
Intercepted Flow	3.72	ft³/s
Bypass Flow	0.78	ft³/s
Spread	6.80	ft
Depth	0.33	ft
Flow Area	1.08	ft²
Gutter Depression	0.02	ft
Total Depression	0.35	ft
Velocity	4.18	ft/s
Equivalent Cross Slope	0.16524	ft/ft
Length Factor	0.62	
Total Interception Length	11.57	ft

Messages

Notes

Qi = 0.82 x 4.5 = 3.5 cfs

Worksheet for CB-503 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	7.50	ft³/s
Slope	0.01860	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	10.40	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	74.50	%
Intercepted Flow	5.59	ft³/s
Bypass Flow	1.91	ft³/s
Spread	11.70	ft
Depth	0.33	ft
Flow Area	1.68	ft²
Gutter Depression	0.05	ft
Total Depression	0.38	ft
Velocity	4.47	ft/s
Equivalent Cross Slope	0.11209	ft/ft
Length Factor	0.53	
Total Interception Length	19.55	ft

Messages

Notes

Qi = 0.74 x 7.5 = 5.5 cfs

Worksheet for CB-504 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	4.00	ft³/s
Slope	0.01530	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.05	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	7.20	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	86.23	%
Intercepted Flow	3.45	ft³/s
Bypass Flow	0.55	ft³/s
Spread	6.12	ft
Depth	0.32	ft
Flow Area	0.95	ft²
Gutter Depression	0.01	ft
Total Depression	0.35	ft
Velocity	4.23	ft/s
Equivalent Cross Slope	0.17642	ft/ft
Length Factor	0.67	
Total Interception Length	10.79	ft

Messages

Notes

Qi = 0.86 x 4 = 3.5 cfs

Worksheet for CB-505 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	20.00	ft³/s
Slope	0.01560	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.06	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	20.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	10.02	ft
Depth	0.60	ft
Flow Area	3.01	ft²
Gutter Depression	0.00	ft
Total Depression	0.33	ft
Velocity	6.64	ft/s
Equivalent Cross Slope	0.13858	ft/ft
Length Factor	1.20	
Total Interception Length	24.65	ft

Worksheet for CB-506 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	20.00	ft³/s
Slope	0.01380	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.04	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	20.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	14.29	ft
Depth	0.54	ft
Flow Area	3.60	ft²
Gutter Depression	0.04	ft
Total Depression	0.37	ft
Velocity	5.56	ft/s
Equivalent Cross Slope	0.10128	ft/ft
Length Factor	1.03	
Total Interception Length	28.68	ft

Worksheet for CB-602 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	15.00	ft³/s
Slope	0.01440	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	15.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	15.65	ft
Depth	0.44	ft
Flow Area	3.10	ft²
Gutter Depression	0.05	ft
Total Depression	0.38	ft
Velocity	4.85	ft/s
Equivalent Cross Slope	0.09071	ft/ft
Length Factor	1.08	
Total Interception Length	27.50	ft

Worksheet for CB-601 (4" RC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	10.00	ft³/s
Slope	0.01170	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.01	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	4.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	10.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	26.36	ft
Depth	0.31	ft
Flow Area	3.18	ft²
Gutter Depression	0.07	ft
Total Depression	0.41	ft
Velocity	3.15	ft/s
Equivalent Cross Slope	0.05738	ft/ft
Length Factor	1.03	
Total Interception Length	28.69	ft

Weir/Orifice Rating Curves of Grate Inlets

Based on C.O.P Standard Detail P1565

Weir Eq. [1] $Q_i = C_w P d^{1.5}$ **Orifice Eq.** [2] $Q_i = C_o A (2gd)^{0.5}$

Where: Cw = 3.0 and Co = 0.67

Single Grate

P = 8.66 ft Assumes all sides open

A = 4.00 sq ft Grate Opening

Depth (ft)	Weir Qi (cfs)	Weir 50% Clogging	Orifice Qi (cfs)	Orifice 50% Clogging
0.00	0.00	0.00	0.00	0.00
0.10	0.82	0.41	6.80	3.40
0.20	2.32	1.16	9.62	4.81
0.30	4.27	2.13	11.78	5.89
0.40	6.57	3.29	13.60	6.80
0.50	9.19	4.59	15.21	7.60
0.60	12.07	6.04	16.66	8.33
0.70	15.22	7.61	17.99	9.00
0.80	18.59	9.29	19.24	9.62
0.90	22.18	11.09	20.40	10.20
1.00	25.98	12.99	21.51	10.75
1.10	29.97	14.99	22.56	11.28
1.20	34.15	17.08	23.56	11.78
1.30	38.51	19.25	24.52	12.26
1.40	43.04	21.52	25.45	12.72
1.50	47.73	23.86	26.34	13.17
1.60	52.58	26.29	27.20	13.60
1.70	57.59	28.79	28.04	14.02
1.80	62.74	31.37	28.85	14.43
1.90	68.04	34.02	29.65	14.82
2.00	73.48	36.74	30.42	15.21
2.10	79.06	39.53	31.17	15.58
2.20	84.78	42.39	31.90	15.95
2.30	90.62	45.31	32.62	16.31
2.40	96.60	48.30	33.32	16.66
2.50	102.69	51.35	34.01	17.00
2.60	108.92	54.46	34.68	17.34
2.70	115.26	57.63	35.34	17.67
2.80	121.72	60.86	35.99	17.99

Grate Inlet ID	Depth (ft)	$Q_{intercept}$ (Cfs)
CB-701	0.5	5
CB-702	0.5	5

Worksheet for CB-703 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	10.00	ft³/s
Slope	0.00130	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	22.20	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	10.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	29.13	ft
Depth	0.50	ft
Flow Area	6.41	ft²
Gutter Depression	0.06	ft
Total Depression	0.23	ft
Velocity	1.56	ft/s
Equivalent Cross Slope	0.03752	ft/ft
Length Factor	1.16	
Total Interception Length	19.15	ft

Worksheet for CB-704 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	9.00	ft³/s
Slope	0.00150	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.03	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	22.20	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	9.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	19.81	ft
Depth	0.54	ft
Flow Area	4.94	ft²
Gutter Depression	0.05	ft
Total Depression	0.22	ft
Velocity	1.82	ft/s
Equivalent Cross Slope	0.05439	ft/ft
Length Factor	1.45	
Total Interception Length	15.30	ft

Worksheet for CB-705 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	12.50	ft³/s
Slope	0.00260	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	22.20	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	12.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	21.89	ft
Depth	0.54	ft
Flow Area	5.31	ft²
Gutter Depression	0.05	ft
Total Depression	0.22	ft
Velocity	2.35	ft/s
Equivalent Cross Slope	0.04953	ft/ft
Length Factor	1.01	
Total Interception Length	21.92	ft

Worksheet for CB-706 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	12.00	ft³/s
Slope	0.00220	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	22.20	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	12.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	24.38	ft
Depth	0.52	ft
Flow Area	5.69	ft²
Gutter Depression	0.06	ft
Total Depression	0.22	ft
Velocity	2.11	ft/s
Equivalent Cross Slope	0.04462	ft/ft
Length Factor	1.02	
Total Interception Length	21.82	ft

Worksheet for CB-708 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	14.00	ft³/s
Slope	0.01290	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.06	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	24.00	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	14.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	9.08	ft
Depth	0.54	ft
Flow Area	2.47	ft²
Gutter Depression	0.00	ft
Total Depression	0.17	ft
Velocity	5.66	ft/s
Equivalent Cross Slope	0.10279	ft/ft
Length Factor	1.00	
Total Interception Length	23.98	ft

Worksheet for CB-709 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	15.00	ft³/s
Slope	0.01240	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	18.40	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	68.17	%
Intercepted Flow	10.23	ft³/s
Bypass Flow	4.77	ft³/s
Spread	21.26	ft
Depth	0.40	ft
Flow Area	3.66	ft²
Gutter Depression	0.06	ft
Total Depression	0.23	ft
Velocity	4.10	ft/s
Equivalent Cross Slope	0.04682	ft/ft
Length Factor	0.47	
Total Interception Length	39.10	ft

Messages

Notes

Qi = 0.68 x 15 = 10 cfs

Worksheet for CB-802 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	10.00	ft³/s
Slope	0.01640	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	10.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	13.76	ft
Depth	0.37	ft
Flow Area	2.21	ft²
Gutter Depression	0.05	ft
Total Depression	0.22	ft
Velocity	4.52	ft/s
Equivalent Cross Slope	0.06621	ft/ft
Length Factor	1.02	
Total Interception Length	29.13	ft

Worksheet for CB-803 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	10.50	ft³/s
Slope	0.01550	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	10.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	14.17	ft
Depth	0.38	ft
Flow Area	2.35	ft²
Gutter Depression	0.05	ft
Total Depression	0.22	ft
Velocity	4.47	ft/s
Equivalent Cross Slope	0.06497	ft/ft
Length Factor	1.00	
Total Interception Length	29.57	ft

Worksheet for CB-804 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	9.50	ft³/s
Slope	0.01640	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	9.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	14.27	ft
Depth	0.36	ft
Flow Area	2.18	ft²
Gutter Depression	0.06	ft
Total Depression	0.22	ft
Velocity	4.36	ft/s
Equivalent Cross Slope	0.06385	ft/ft
Length Factor	1.02	
Total Interception Length	29.14	ft

Worksheet for CB-805 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	9.50	ft³/s
Slope	0.01640	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	9.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	14.27	ft
Depth	0.36	ft
Flow Area	2.18	ft²
Gutter Depression	0.06	ft
Total Depression	0.22	ft
Velocity	4.36	ft/s
Equivalent Cross Slope	0.06385	ft/ft
Length Factor	1.02	
Total Interception Length	29.14	ft

Worksheet for CB-806 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	9.50	ft³/s
Slope	0.01640	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	9.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	14.27	ft
Depth	0.36	ft
Flow Area	2.18	ft²
Gutter Depression	0.06	ft
Total Depression	0.22	ft
Velocity	4.36	ft/s
Equivalent Cross Slope	0.06385	ft/ft
Length Factor	1.02	
Total Interception Length	29.14	ft

Worksheet for CB-901 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	17.00	ft³/s
Slope	0.00520	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	17.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	20.43	ft
Depth	0.54	ft
Flow Area	5.04	ft²
Gutter Depression	0.05	ft
Total Depression	0.22	ft
Velocity	3.37	ft/s
Equivalent Cross Slope	0.05283	ft/ft
Length Factor	1.00	
Total Interception Length	29.54	ft

Worksheet for CB-902 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	16.00	ft³/s
Slope	0.00500	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	16.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	21.23	ft
Depth	0.52	ft
Flow Area	5.00	ft²
Gutter Depression	0.05	ft
Total Depression	0.22	ft
Velocity	3.20	ft/s
Equivalent Cross Slope	0.05039	ft/ft
Length Factor	1.01	
Total Interception Length	29.28	ft

Worksheet for CB-903 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	17.00	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	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	17.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	19.99	ft
Depth	0.55	ft
Flow Area	5.03	ft²
Gutter Depression	0.05	ft
Total Depression	0.22	ft
Velocity	3.38	ft/s
Equivalent Cross Slope	0.05413	ft/ft
Length Factor	1.02	
Total Interception Length	28.94	ft

Worksheet for CB-904 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	14.00	ft³/s
Slope	0.00560	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	14.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	20.96	ft
Depth	0.48	ft
Flow Area	4.43	ft²
Gutter Depression	0.06	ft
Total Depression	0.22	ft
Velocity	3.16	ft/s
Equivalent Cross Slope	0.04949	ft/ft
Length Factor	1.02	
Total Interception Length	28.95	ft

Worksheet for CB-905 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

Discharge	17.00	ft^3/s
Slope	0.00520	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	17.00	ft^3/s
Bypass Flow	0.00	ft^3/s
Spread	20.43	ft
Depth	0.54	ft
Flow Area	5.04	ft^2
Gutter Depression	0.05	ft
Total Depression	0.22	ft
Velocity	3.37	ft/s
Equivalent Cross Slope	0.05283	ft/ft
Length Factor	1.00	
Total Interception Length	29.54	ft

Worksheet for CB-906 (6" VC on Grade)

Project Description

Solve For	Efficiency

Input Data

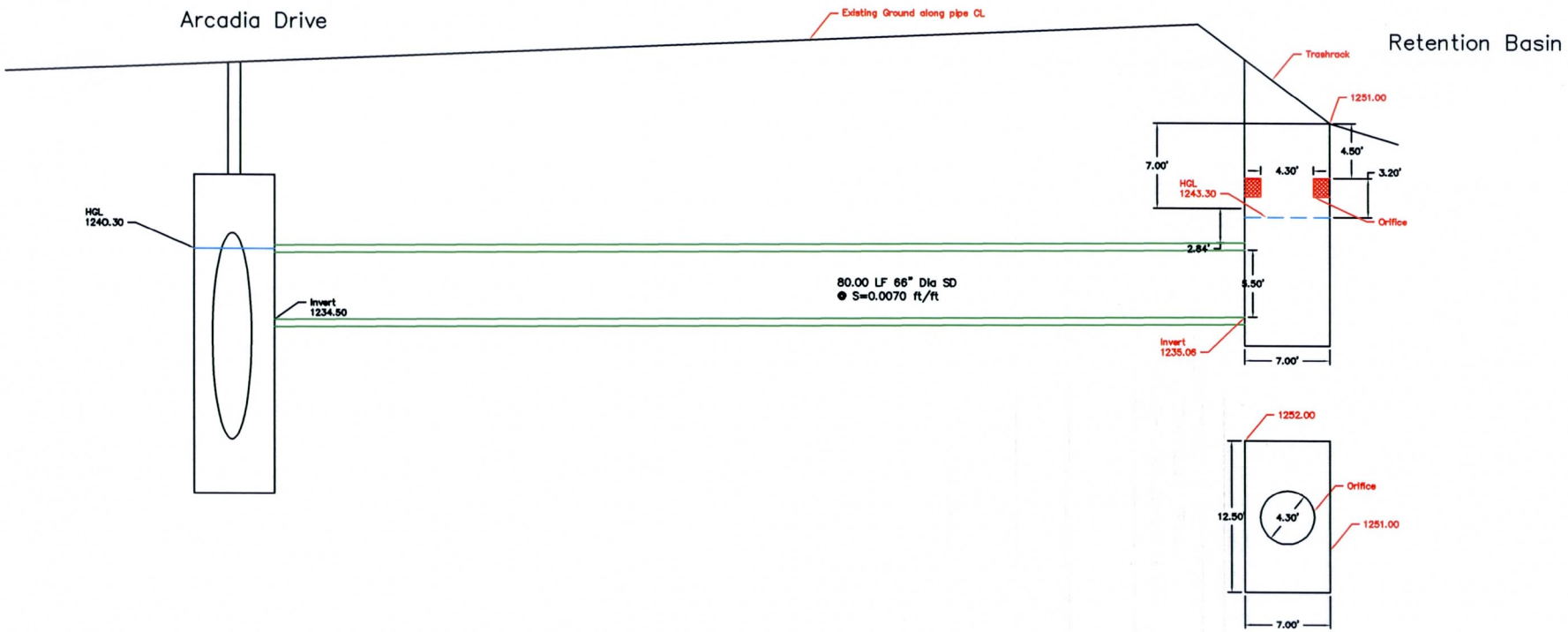
Discharge	15.00	ft³/s
Slope	0.00520	ft/ft
Gutter Width	1.42	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	29.60	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	100.00	%
Intercepted Flow	15.00	ft³/s
Bypass Flow	0.00	ft³/s
Spread	21.17	ft
Depth	0.50	ft
Flow Area	4.75	ft²
Gutter Depression	0.06	ft
Total Depression	0.22	ft
Velocity	3.16	ft/s
Equivalent Cross Slope	0.04983	ft/ft
Length Factor	1.02	
Total Interception Length	29.03	ft

Drop Inlet Structure Calculation

Drop Inlet on Arcadia Dr. South of Calle Redonda


Arcadia Drive
Existing Ground along pipe CL
Retention Basin
Trashrack
1251.00
4.50'
3.20'
7.00'
4.30'
HGL
1243.30
Orifice
2.84'
HGL
1240.30
80.00 LF 66" Dia SD
@ S=0.0070 ft/ft
5.50'
Invert
1234.50
Invert
1235.08
7.00'
1252.00
Orifice
12.50'
4.30'
1251.00
7.00'

Lafayette Interceptor Drain Outlet Design Project

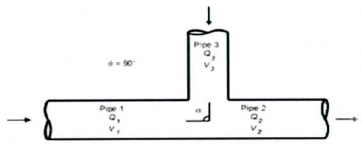
Dropinlet Design at Arcadia Drive

Intersection Name	Upstream Flow Q_1 (cfs)	Upstream Flow Velocity V_1 (ft/s)	Upstream Pipe Size (inches)	Upstream Pipe Flow Area A_1 (sq.ft)	Dnstream Flow Q_2 (cfs)	Dnstream Flow Velocity V_2 (ft/s)	Dnstream Pipe Size (inches)	Dnstream Pipe Flow Area A_2 (sq.ft)	Lateral Flow Q_3 (cfs)	Lateral Flow Velocity V_3 (ft/s)	Lateral Pipe Insertion Angle (Degree)	Acceleration due to gravity 'g'	Upstream Friction Slope Sf_1 (ft)	Upstream Pipe P1 manning's n	Dnstream Friction Slope Sf_2 (ft)	Dnstream Pipe P2 Manning's n	Length of Transition L (ft)	Head Loss h_j (ft)
Arcadia Dr. DS-1	686	12.09	102	56.75	990	17.45	102	56.75	304	12.81	65	32.2	0.0064	0.013	0.0085	0.013	10	1.63

Note: Upstream Flow in the Trunkline is based on the Intrim Condition.

$$h_j = \frac{2*(Q_2V_2 - Q_1V_1 - Q_3V_3Cos\,\theta)}{(A_1 + A_2)g} + \frac{V_1^2}{2g} - \frac{V_2^2}{2g} + \left(\frac{S_{f1} + S_{f2}}{2}\right)L$$

h_j = Junction head loss, ft
A_1 = Upstream flow area, sq ft
A_2 = Downstream flow area, sq ft
Q_1 = Upstream flow rate, cfs
Q_2 = Downstream flow rate, cfs
Q_3 = Lateral flow rate, cfs
V_1 = Upstream flow velocity, ft/s
V_2 = Downstream flow velocity, ft/s
V_3 = Lateral flow velocity, ft/s
S_{f1} = Upstream friction slope, ft
S_{f2} = Downstream friction slope, ft
L = Length of transition, ft



$$S_f = K\frac{V^2}{2gR^{4/3}}$$

V = Velocity, ft/s
g = Acceleration due to gravity, 32.2, ft/sec^2
R = Hydraulic radius, ft (D/4, when pipe is full)
$K = \frac{2gn^2}{2.21}$
n = Manning's roughness coefficient

Tailwater Elevation	**1240.3 ft**
Lateral Length of the pipe	70 ft
Later Pipe Slope	0.007 ft/ft
Discharge	304 cfs
Pipe Size	5.5 ft
Number of Pipes	1
Velocity	12.81 ft/sec
Juntion Loss (hj)	**1.6 ft**
K	0.0049
Hydraulic Radius (R)	1 Full Flow
Friction Slope (Sf)	0.012 ft/ft
Friction Loss (hf)	**0.87 ft**
Inlet Type	head wall
Entrance Loss Coefficient	0.2
Entrance Loss (he)	**0.5 ft**
Head Water Elevation	
Tailwater Elevation + hj+hb+hf+he	**1243.3** ft

Orifice Flow

$Q_0 = C\,A\sqrt{2gh}$

Orifice Coefficient (C)	0.97		
Ret Basin Flow Breakout elev	1253.8	ft	
Elevation of orifice plate	1246.3	ft	
Head loss due to trash rack	0.26	ft	
Flow Depth	7.24	ft	
Size of Orifice	4.30	ft	
Area of Orifice	14.5	ft^2	
Orifice Flow at flow breakout elevation (Q_0)	**304**	**cfs**	
Drop structure inlet elevation	1251	ft	
Flow Depth	4.50	ft	
Orifice Flow at Trash Rack inlet elevation (Q_i)	**240**	**cfs**	

Table 17.5 Approximate Orifice Coefficients for Turbulent Water

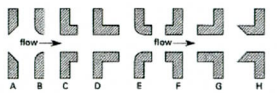


illustration	description	C_d	C_c	C_v
A	sharp-edged	0.62	0.63	0.98
B	round-edged	0.98	1.00	0.98
C	short tube[a] (fluid separates from walls)	0.61	1.00	0.61
D	sharp tube (no separation)	0.82	1.00	0.82
E	sharp tube with rounded entrance	0.97	0.99	0.98
F	reentrant tube, length less than one-half of pipe diameter	0.54	0.55	0.99
G	reentrant tube, length 2 to 3 pipe diameters	0.72	1.00	0.72
H	Borda	0.51	0.52	0.98
(none)	smooth, well-tapered nozzle	0.98	0.99	0.99

Worksheet for 66" Pipe

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.012	
Channel Slope	0.00700	ft/ft
Normal Depth	5.50	ft
Diameter	5.50	ft
Discharge	304.35	ft^3/s

Results

Discharge	304.35	ft^3/s
Normal Depth	5.50	ft
Flow Area	23.76	ft^2
Wetted Perimeter	17.28	ft
Hydraulic Radius	1.38	ft
Top Width	0.00	ft
Critical Depth	4.79	ft
Percent Full	100.0	%
Critical Slope	0.00637	ft/ft
Velocity	12.81	ft/s
Velocity Head	2.55	ft
Specific Energy	8.05	ft
Froude Number	0.00	
Maximum Discharge	327.40	ft^3/s
Discharge Full	304.35	ft^3/s
Slope Full	0.00700	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

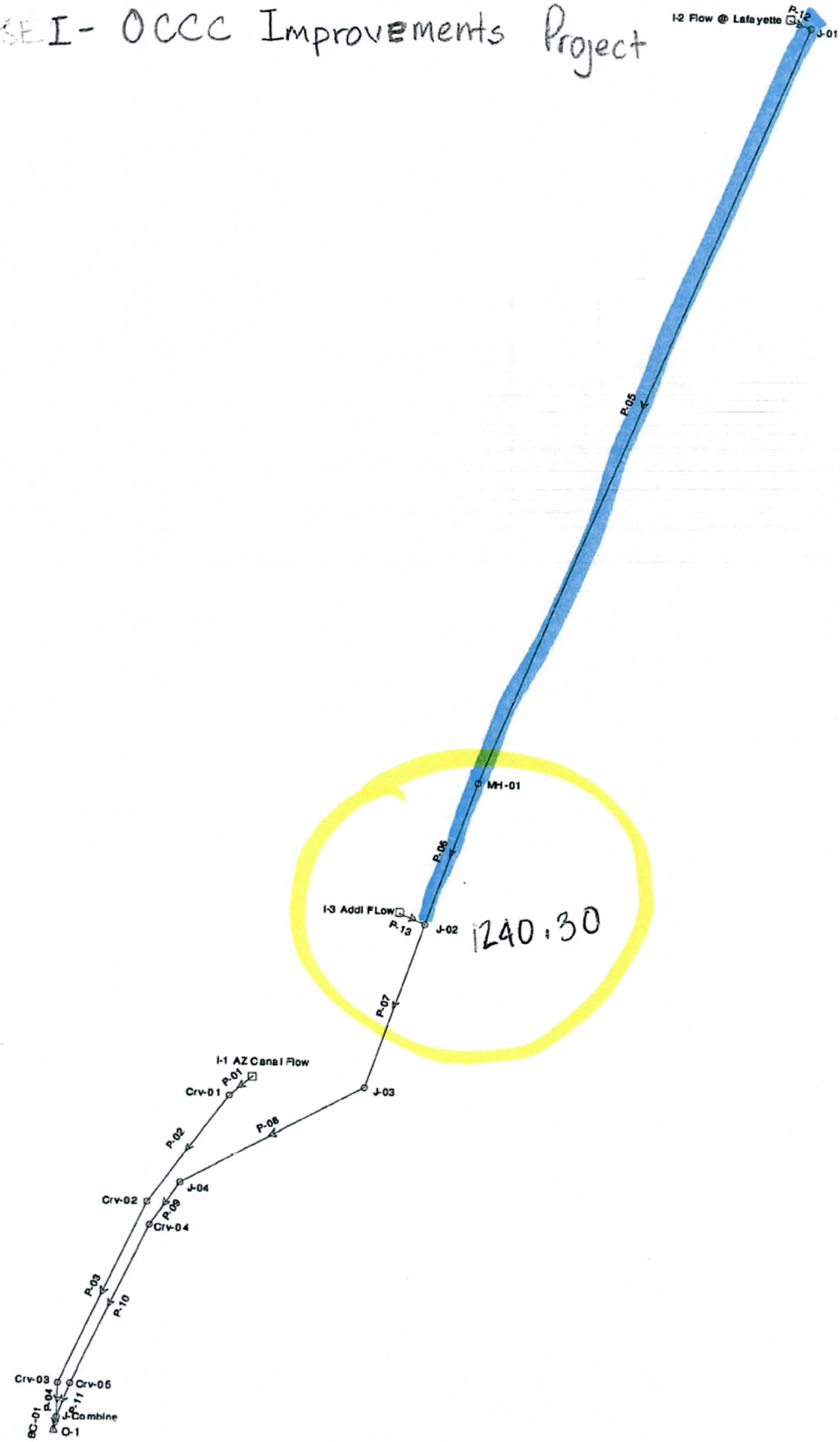
Worksheet for 66" Pipe

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	5.50	ft
Critical Depth	4.79	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00637	ft/ft

Scenario: Scenario 3B - 120" CIPP at OCC & 102" Arcadia SD S. of Canal

PHASE I - OCCC Improvements Project



Title: Arcadia-Dual System
f:\...\calcs\stormcad\arcadia-dual-100-01.stm
07/26/10 10:56:34 AM

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Olsson Associates
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Project Engineer: Duc
StormCAD v5.5 [5.5003]

Calculation Results Summary

Scenario: Scenario 3B - 120" CIPP at OCC & 102" Arcadia SD S. of Canal

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)
I-2 Flow @ Lafayette	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00
I-3 Addl FLow	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00
I-1 AZ Canal Flow	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
BC-01	2	10 x 10 ft	Box	1.16	1,990.00	19.64	1,229.94	1,230.00
P-11	1	102 inch	Circular	44.84	990.00	17.45	1,232.02	1,231.63
P-04	1	120 inch	Circular	41.97	1,000.00	14.08	1,231.78	1,231.63
P-10	1	102 inch	Circular	181.50	990.00	17.45	1,233.75	1,232.20
P-03	1	120 inch	Circular	285.55	1,000.00	14.55	1,232.79	1,231.90
P-09	1	102 inch	Circular	41.32	990.00	17.45	1,234.25	1,233.89
P-02	1	120 inch	Circular	40.26	1,000.00	14.65	1,233.03	1,232.91
P-08	1	102 inch	Circular	207.32	990.00	17.45	1,236.72	1,234.96
P-01	1	12 x 10 ft	Box	10.00	1,000.00	11.34	1,233.04	1,233.03
P-07	1	102 inch	Circular	197.08	990.00	17.45	1,240.30	1,238.62
P-13	1	60 inch	Circular	1.00	309.00	15.74	1,245.04	1,245.03
P-06	1	96 inch	Circular	490.01	681.00	13.55	1,247.76	1,245.03
P-05	1	96 inch	Circular	484.84	681.00	13.55	1,253.31	1,250.61
P-12	1	96 inch	Circular	1.00	681.00	13.55	1,255.32	1,255.31

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	1,990.00	1,245.40	1,230.00	1,230.00
J-Combine	1,990.00	1,245.40	1,231.63	1,229.94
Crv-05	990.00	1,245.80	1,232.20	1,232.02
Crv-03	1,000.00	1,245.00	1,231.90	1,231.78
Crv-04	990.00	1,248.10	1,233.89	1,233.75
Crv-02	1,000.00	1,249.50	1,232.91	1,232.79
J-04	990.00	1,248.80	1,234.96	1,234.25
Crv-01	1,000.00	1,253.75	1,233.03	1,233.03
J-03	990.00	1,252.70	1,238.62	1,236.72
I-1 AZ Canal Flow	1,000.00	1,253.75	1,233.34	1,233.04
J-02	990.00	1,253.90	1,245.03	1,240.30
I-3 Addl FLow	309.00	1,254.00	1,245.04	1,245.04
MH-01	681.00	1,258.70	1,250.61	1,247.76
J-01	681.00	1,265.50	1,255.31	1,253.31
I-2 Flow @ Lafayette	681.00	1,265.50	1,255.32	1,255.32

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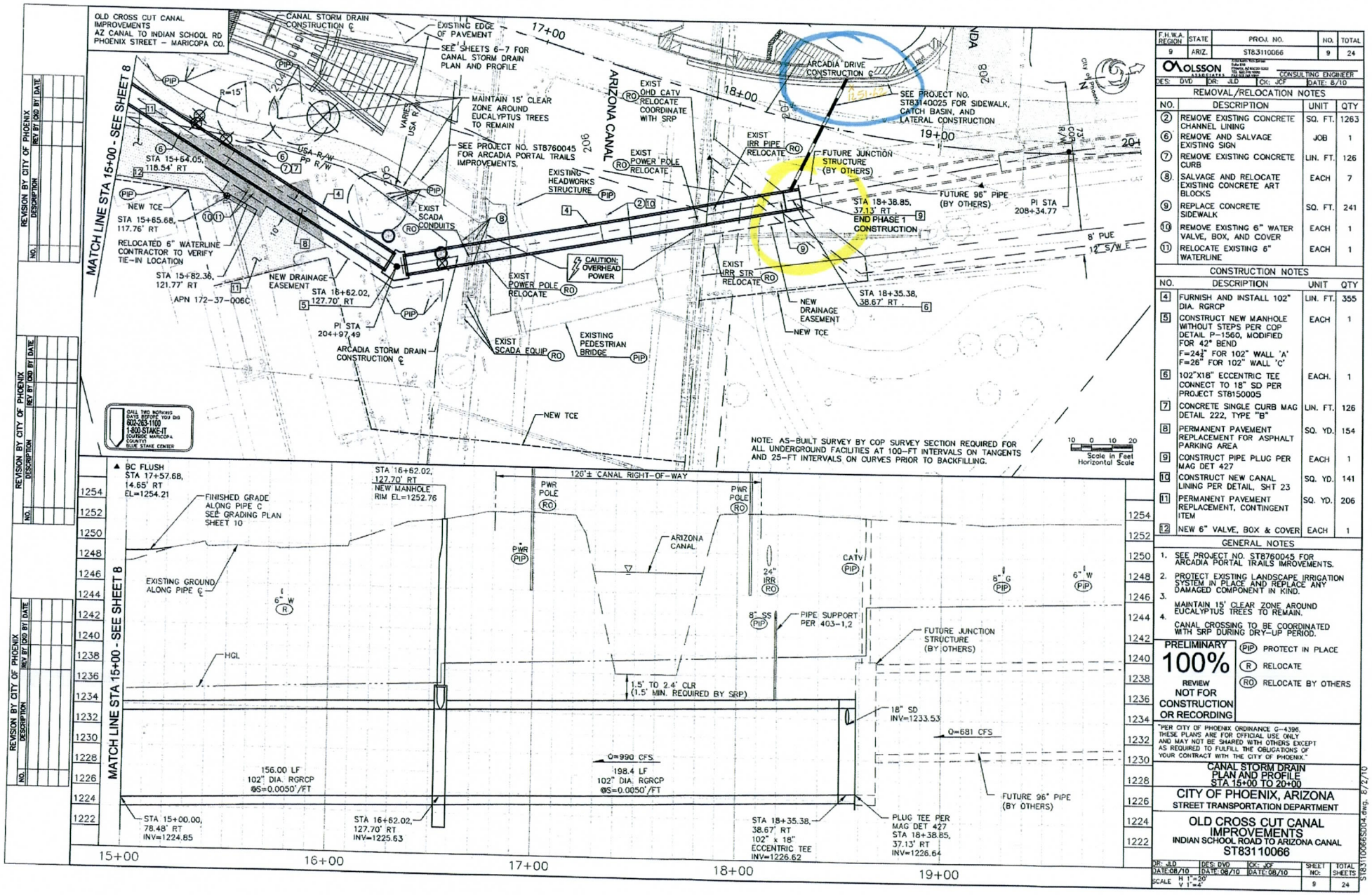


F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL
9	ARIZ.	ST83110066	9	24

OLSSON ASSOCIATES CONSULTING ENGINEER

DES: DVD DR: JLD CK: JCF DATE: 8/10

REMOVAL/RELOCATION NOTES

NO.	DESCRIPTION	UNIT	QTY
(2)	REMOVE EXISTING CONCRETE CHANNEL LINING	SQ. FT.	1263
(6)	REMOVE AND SALVAGE EXISTING SIGN	JOB	1
(7)	REMOVE EXISTING CONCRETE CURB	LIN. FT.	126
(8)	SALVAGE AND RELOCATE EXISTING CONCRETE ART BLOCKS	EACH	7
(9)	REPLACE CONCRETE SIDEWALK	SQ. FT.	241
(10)	REMOVE EXISTING 6" WATER VALVE, BOX, AND COVER	EACH	1
(11)	RELOCATE EXISTING 6" WATERLINE	EACH	1

CONSTRUCTION NOTES

NO.	DESCRIPTION	UNIT	QTY
[4]	FURNISH AND INSTALL 102" DIA. RGRCP	LIN. FT.	355
[5]	CONSTRUCT NEW MANHOLE WITHOUT STEPS PER COP DETAIL P-1560, MODIFIED FOR 42" BEND F=24" FOR 102" WALL 'A' F=26" FOR 102" WALL 'C'	EACH	1
[6]	102"X18" ECCENTRIC TEE CONNECT TO 18" SD PER PROJECT ST8150005	EACH.	1
[7]	CONCRETE SINGLE CURB MAG DETAIL 222, TYPE "B"	LIN. FT.	126
[8]	PERMANENT PAVEMENT REPLACEMENT FOR ASPHALT PARKING AREA	SQ. YD.	154
[9]	CONSTRUCT PIPE PLUG PER MAG DET 427	EACH	1
[10]	CONSTRUCT NEW CANAL LINING PER DETAIL, SHT 23	SQ. YD.	141
[11]	PERMANENT PAVEMENT REPLACEMENT, CONTINGENT ITEM	SQ. YD.	206
[12]	NEW 6" VALVE, BOX & COVER	EACH	1

GENERAL NOTES

1. SEE PROJECT NO. ST8760045 FOR ARCADIA PORTAL TRAILS IMROVEMENTS.
2. PROTECT EXISTING LANDSCAPE IRRIGATION SYSTEM IN PLACE AND REPLACE ANY DAMAGED COMPONENT IN KIND.
3. MAINTAIN 15' CLEAR ZONE AROUND EUCALYPTUS TREES TO REMAIN.
4. CANAL CROSSING TO BE COORDINATED WITH SRP DURING DRY-UP PERIOD.

PRELIMINARY 100% REVIEW NOT FOR CONSTRUCTION OR RECORDING

(PIP) PROTECT IN PLACE
(R) RELOCATE
(RO) RELOCATE BY OTHERS

"PER CITY OF PHOENIX ORDINANCE G-4396, THESE PLANS ARE FOR OFFICIAL USE ONLY AND MAY NOT BE SHARED WITH OTHERS EXCEPT AS REQUIRED TO FULFILL THE OBLIGATIONS OF YOUR CONTRACT WITH THE CITY OF PHOENIX."

CANAL STORM DRAIN PLAN AND PROFILE STA 15+00 TO 20+00

CITY OF PHOENIX, ARIZONA
STREET TRANSPORTATION DEPARTMENT

OLD CROSS CUT CANAL IMPROVEMENTS
INDIAN SCHOOL ROAD TO ARIZONA CANAL
ST83110066

DR: JLD	DES: DVD	CK: JCF	SHEET NO:	TOTAL SHEETS
DATE: 08/10	DATE: 08/10	DATE: 08/10	9	24

SCALE H 1"=20' V 1"=4'

ST83110066S004.dwg, 8/2/10

REVISION BY CITY OF PHOENIX

NO.	DESCRIPTION	REV. BY	DRD BY	DATE

Drop Inlet on Lafayette Blvd West of 45th St.

Culvert Calculator Report
Drop Inlet on Lafayette Blvd West of 45th St.

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	1,264.34	ft	Headwater Depth/Height	4.33	
Computed Headwater Elev	1,264.34	ft	Discharge	64.19	cfs
Inlet Control HW Elev.	1,261.59	ft	Tailwater Elevation	1,261.59	ft
Outlet Control HW Elev.	1,264.34	ft	Control Type	Outlet Control	

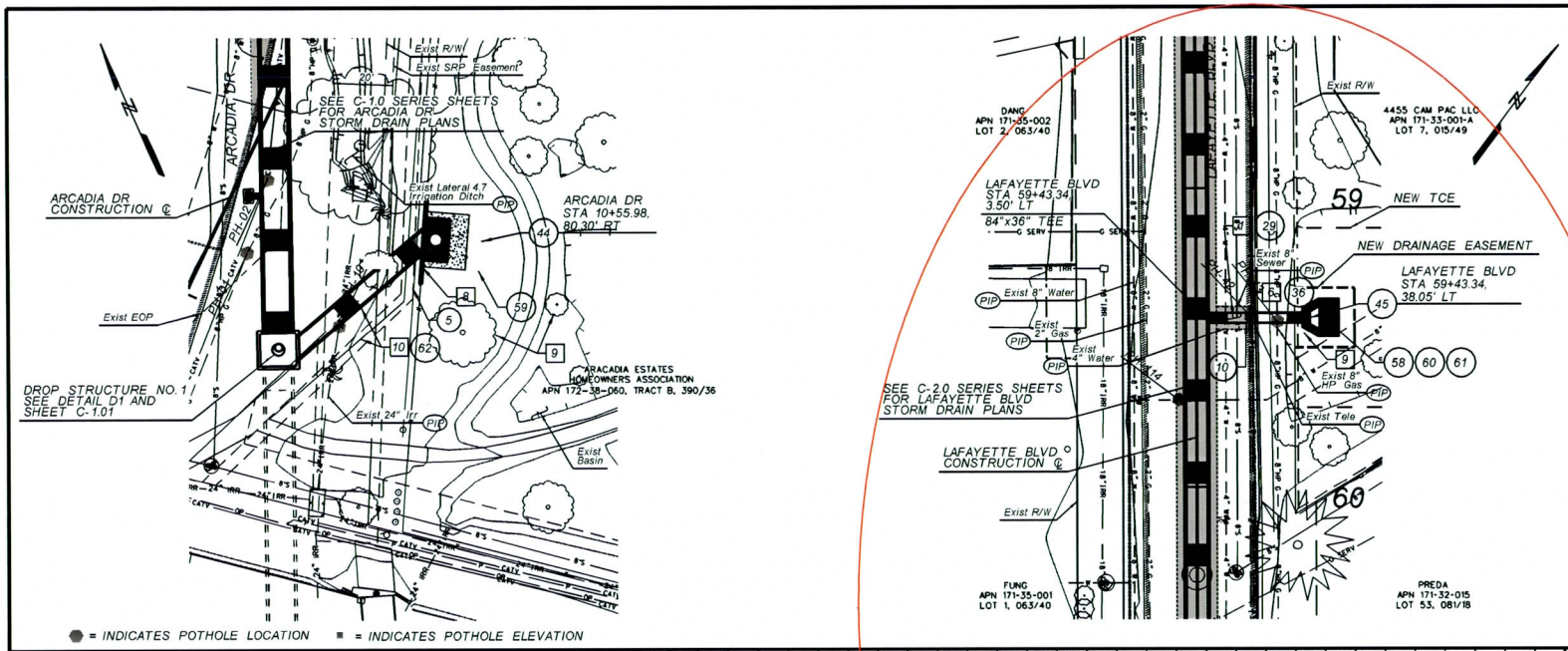
Grades					
Upstream Invert	1,251.34	ft	Downstream Invert	1,246.04	ft
Length	34.00	ft	Constructed Slope	0.155882	ft/ft

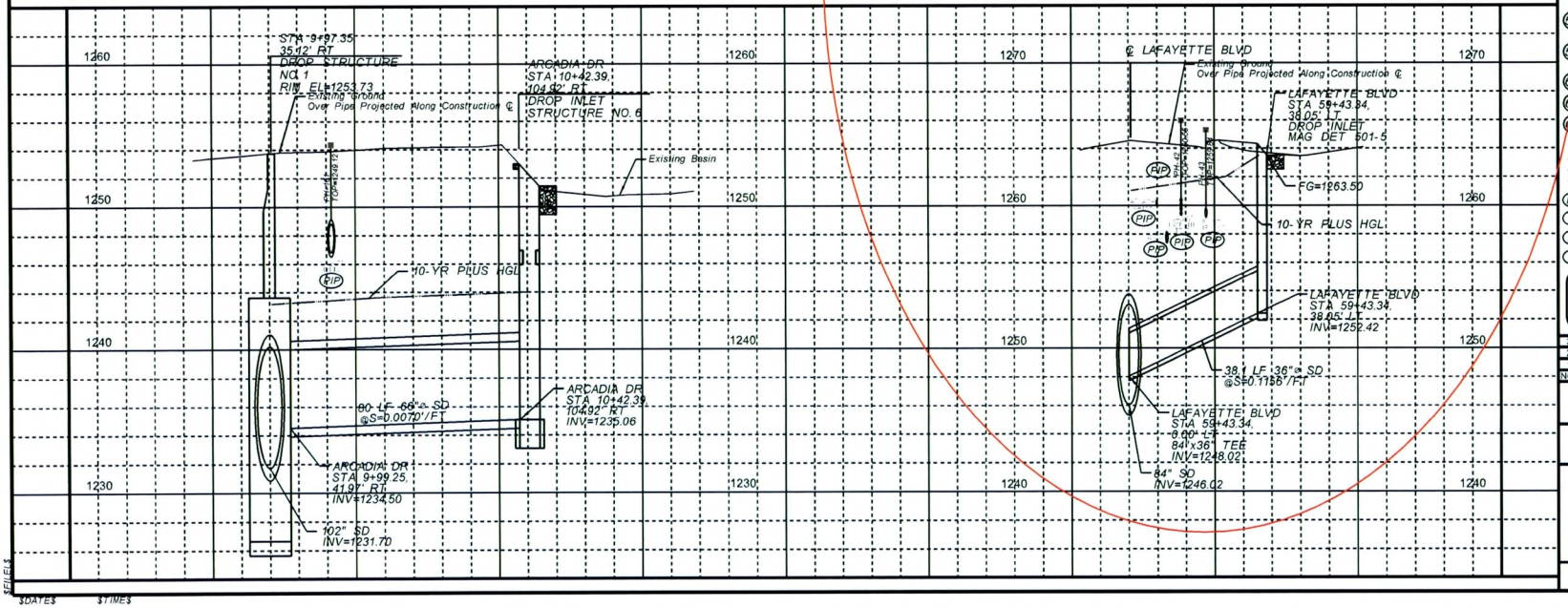
Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	15.55	ft
Slope Type	N/A		Normal Depth	1.01	ft
Flow Regime	N/A		Critical Depth	2.57	ft
Velocity Downstream	9.08	ft/s	Critical Slope	0.008613	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	1,264.34	ft	Upstream Velocity Head	1.28	ft
Ke	0.90		Entrance Loss	1.15	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,261.59	ft	Flow Control	Submerged	
Inlet Type	Square edge w/headwall		Area Full	7.1	ft^2
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				





REMOVE

1	EXIST AC PAVEMENT	25 SY
6	EXIST VERTICAL CURB AND GUTTER	15 LF
8	REMOVE AND REPLACE EXISTING WROUGHT IRON FENCE	15 LF
9	REMOVE AND REPLACE EXISTING LANDSCAPE IN KIND	1 LS
10	REMOVE EXISTING CONCRETE SIDEWALK	454 SF

RELOCATE

RELOCATE BY OTHERS

CONSTRUCT

5	NEW 66"ø STORM DRAIN PIPE	80 LF
10	NEW 36ø STORM DRAIN PIPE	49 LF
29	NEW AC REPLACEMENT PER STRUCTURAL SECTION 3	25 SY
36	NEW VERTICAL CURB AND GUTTER PER MAG STD.DTL 220-1, TYPE A, H=6"	15 LF
44	STRUCTURE NO. 6, NEW DROP INLET PER DETAIL D6	1 EA
45	NEW 36"ø DROP INLET HEADWALL PER MAG STD. DTL. 501-5	1 EA
58	DUMPED RIPRAP, D50=6", THICKNESS=12"	4.2 CY
59	DUMPED RIPRAP, D50=12", THICKNESS=24"	13.6 CY
60	SAFETY RAIL PER MAG DET. 145	13 LF
61	TRASH RACK PER MAG DET. 502	1 EA
62	NEW CONCRETE SIDEWALK PER C.O.P. DET. P-1230	454 SF

NOTE: TRASH RACK AND SAFETY RAIL FOR DROP STRUCTURE NO. 6 ARE INCLUDED IN THE STRUCTURE COST.

(PIP) PROTECT EXISTING UTILITY IN PLACE
(R) REPLACE EXISTING UTILITY
(RO) REPLACE EXISTING UTILITY BY OTHERS
(S) SAWCUT EXISTING PAVEMENT

Call at least two full working days before you begin excavation. Arizona Blue Stake, Inc. 1-800-STAKE-IT (782-5348) In Maricopa County (602) 263-1100

10 0 10 20 Horizontal Scale in Feet
2 0 2 4 Vertical Scale in Feet

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

LAFAYETTE INTERCEPTOR DRAIN AND OUTLET DESIGN
PCN 625.02.30

	BY	DATE
DESIGNED	DVD	12/06/2011
DRAWN	BM	12/06/2011
CHECKED	JCF	12/06/2011

90% PRELIMINARY NOT FOR CONSTRUCTION

OLSSON ASSOCIATES
7250 North 16th Street, Suite 215, Phoenix, AZ 85020-5262
TEL: 602.748.1000
FAX 602.748.1001

DRAWING NO. d-pp-25

STORM DRAIN PLAN & PROFILE DROP INLETS

SHEET OF pp-25TLSHT

$DATE$ $TIME$

Drop Inlet on North Village Dr. South of Colter St.

HY-8 Culvert Analysis Report for the Existing Culvert Under North Village Drive

Table 1 - Culvert Summary Table: North Village Drive

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
68.00	68.00	1273.14	2.235	3.771	4-FFf	2.550	1.270	2.550	3.300	3.601	0.000
68.00	68.00	1273.14	2.235	3.771	4-FFf	2.550	1.270	2.550	3.300	3.601	0.000
68.00	68.00	1273.14	2.235	3.771	4-FFf	2.550	1.270	2.550	3.300	3.601	0.000
68.00	68.00	1273.14	2.235	3.771	4-FFf	2.550	1.270	2.550	3.300	3.601	0.000
68.00	68.00	1273.14	2.235	3.771	4-FFf	2.550	1.270	2.550	3.300	3.601	0.000
68.00	68.00	1273.14	2.235	3.771	4-FFf	2.550	1.270	2.550	3.300	3.601	0.000
68.00	68.00	1273.14	2.235	3.771	4-FFf	2.550	1.270	2.550	3.300	3.601	0.000
68.00	68.00	1273.14	2.235	3.771	4-FFf	2.550	1.270	2.550	3.300	3.601	0.000
68.00	68.00	1273.14	2.235	3.771	4-FFf	2.550	1.270	2.550	3.300	3.601	0.000
68.00	68.00	1273.14	2.235	3.771	4-FFf	2.550	1.270	2.550	3.300	3.601	0.000

****

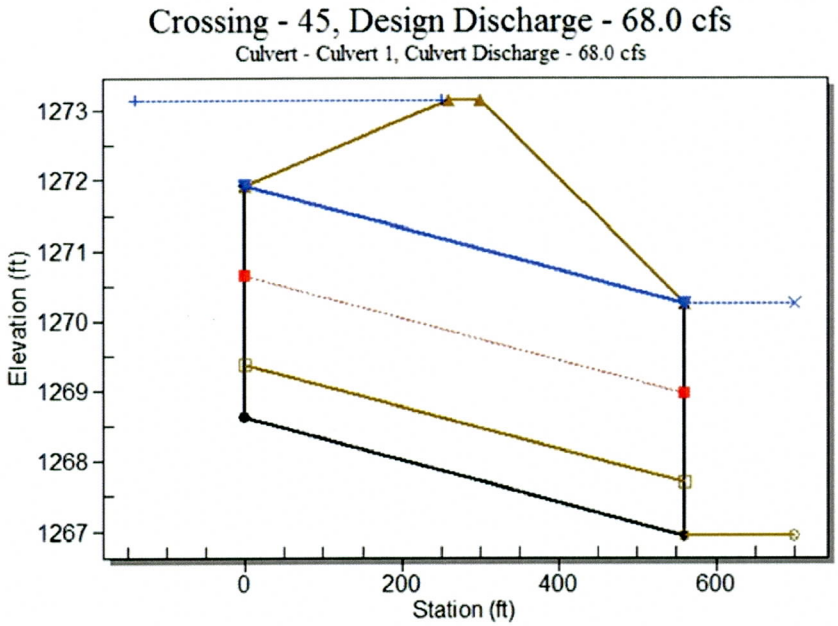
Inlet Elevation (invert): 1269.37 ft, Outlet Elevation (invert): 1267.69 ft

Culvert Length: 560.00 ft, Culvert Slope: 0.0030

****

Note: ** 1273.14 Flow Breakout elevation at inlet.

Water Surface Profile Plot for Culvert: North Village Drive



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1268.62 ft

Outlet Station: 560.00 ft

Outlet Elevation: 1266.94 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 1

Barrel Shape: User Defined

Barrel Span: 4.43 ft

Barrel Rise: 3.30 ft

Barrel Material: Corrugated Metal Pipe (CMP)

Embedment: 9.00 in (Total depth = 40", Opening height = 31")

Barrel Manning's n: 0.0240 (top and sides)

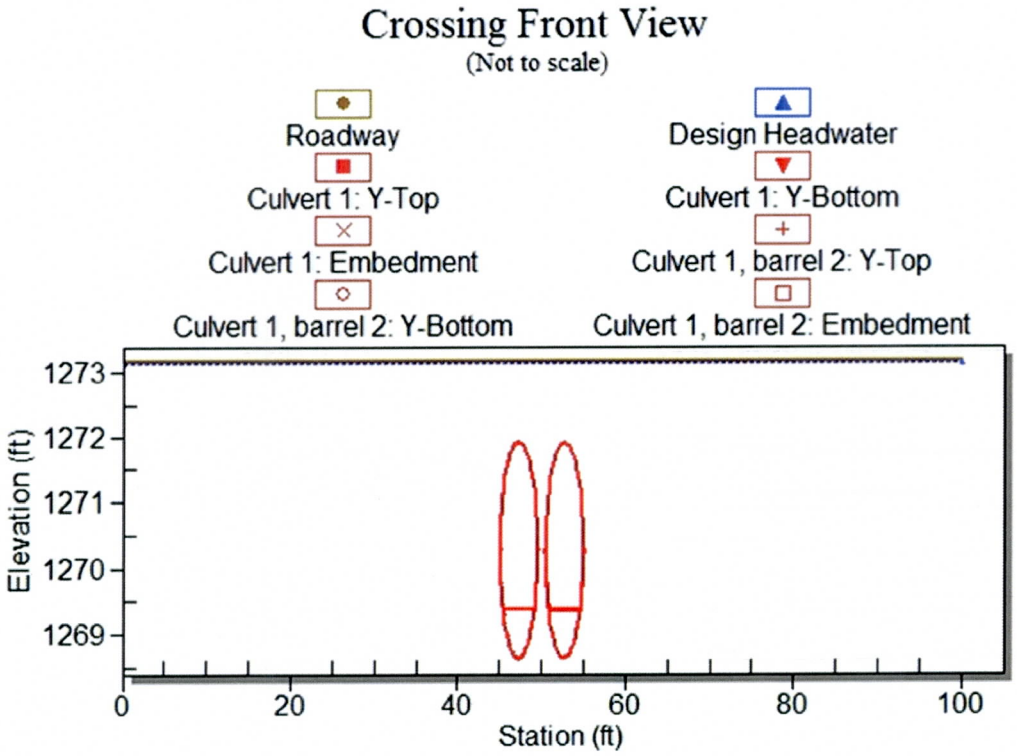
Manning's n: 0.0240 (bottom)

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: NONE

Crossing Front View (Roadway Profile): North Village Drive



Tailwater Channel Data -

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 1270.24 ft

Roadway Data for Crossing:

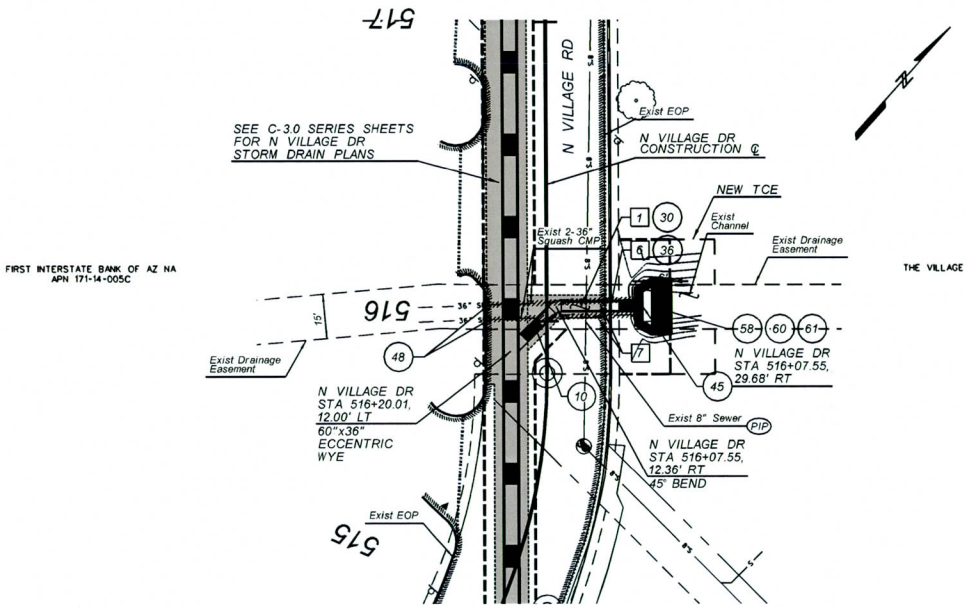
Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

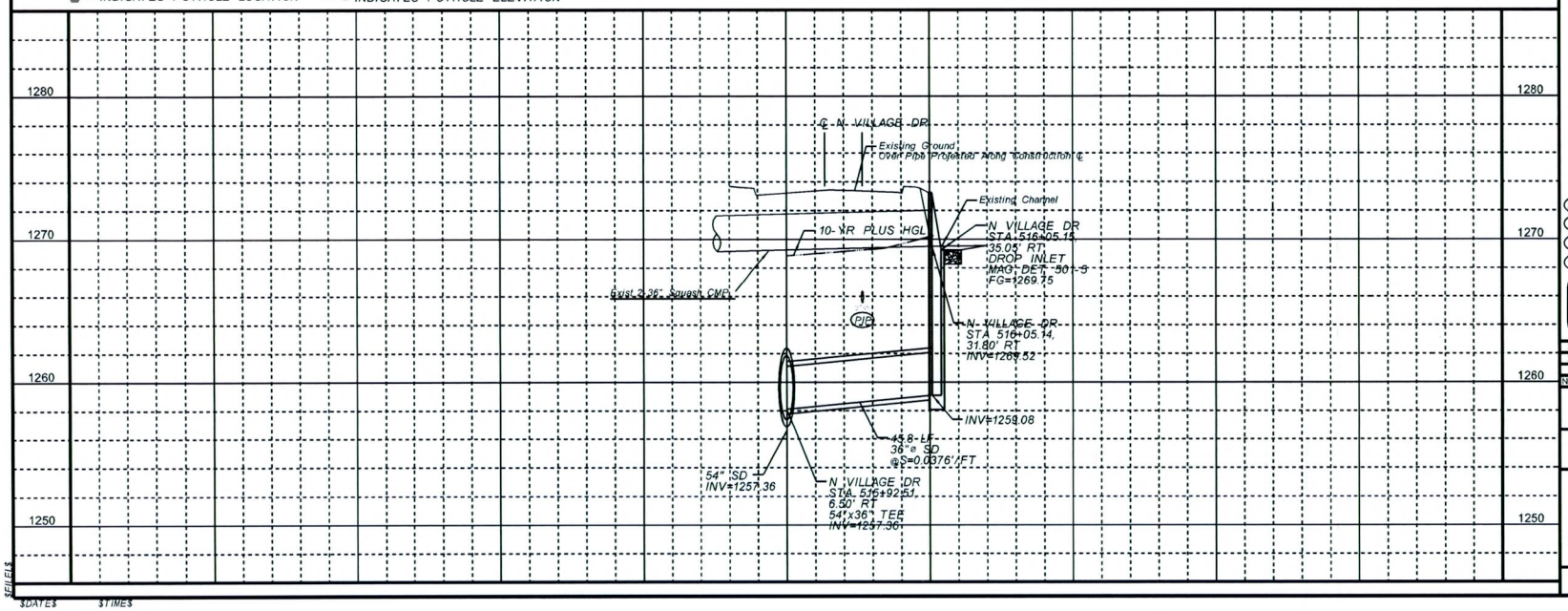
Crest Elevation: 1273.16 ft

Roadway Surface: Paved

Roadway Top Width: 40.00 ft



● = INDICATES POTHOLE LOCATION ■ = INDICATES POTHOLE ELEVATION



REMOVE

1	EXIST AC PAVEMENT	25 SY
6	EXIST VERTICAL CURB AND GUTTER	15 LF
7	EXIST 36" SQUASH CMP	100 LF

RELOCATE

RELOCATE BY OTHERS

CONSTRUCT

10	NEW 36"ø STORM DRAIN PIPE	53 LF
30	NEW AC REPLACEMENT PER STRUCTURAL SECTION 4	25 SY
36	NEW VERTICAL CURB AND GUTTER PER MAG STD. DTL 220-1, TYPE A, H=6"	15 LF
45	NEW 36"ø DROP INLET HEADWALL PER MAG STD. DTL. 501-5	1 EA
48	NEW 36" PIPE PLUG	2 EA
58	DUMPED RIPRAP, D50=6", THICKNESS=12"	4.2 CY
60	SAFETY RAIL PER MAG DET. 145	13 LF
61	TRASH RACK PER MAG DET. 502	1 EA

PIP	PROTECT EXISTING UTILITY IN PLACE
R	REPLACE EXISTING UTILITY
RO	REPLACE EXISTING UTILITY BY OTHERS
S	SAWCUT EXISTING PAVEMENT

Call at least two full working days before you begin excavation. ARIZONA811 Arizona Blue Stake, Inc. Dial 8-1-1 or 1-800-STAKE-IT (782-5348) In Maricopa County (602) 263-1100

Horizontal Scale in Feet: 10 0 10 20
Vertical Scale in Feet: 2 0 2 4

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

LAFAYETTE INTERCEPTOR DRAIN AND OUTLET DESIGN
PGN 625.02.30

	BY	DATE
DESIGNED	DVD	12/06/2011
DRAWN	BM	12/06/2011
CHECKED	JCF	12/06/2011

90% PRELIMINARY NOT FOR CONSTRUCTION

OLSSON ASSOCIATES
7250 North 16th Street Suite 210 Phoenix, AZ 85020-5262 TEL 602.748.1000 FAX 602.748.1001

DRAWING NO. d-pp-26

STORM DRAIN PLAN & PROFILE DROP INLETS

SHEET OF pp-26

$FILE$ $DATE$ $TIME$

Culvert Calculator Report
Drop Inlet on North Village Drive South of Colter St.

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	1,273.14	ft	Headwater Depth/Height	4.86	
Computed Headwater Elev	1,273.14	ft	Discharge	87.16	cfs
Inlet Control HW Elev.	1,268.07	ft	Tailwater Elevation	1,268.07	ft
Outlet Control HW Elev.	1,273.14	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	1,258.57	ft	Downstream Invert	1,257.68	ft
Length	34.00	ft	Constructed Slope	0.026176	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	10.39	ft
Slope Type	N/A		Normal Depth	2.04	ft
Flow Regime	N/A		Critical Depth	2.83	ft
Velocity Downstream	12.33	ft/s	Critical Slope	0.014763	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	1,273.14	ft	Upstream Velocity Head	2.36	ft
Ke	0.90		Entrance Loss	2.13	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,268.07	ft	Flow Control	Submerged	
Inlet Type	Square edge w/headwall		Area Full	7.1	ft^2
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Structural Analysis of Hydraulic Structures

NO	REVISIONS	DATE	DESIGNER	TM/SPE REVIEWER
0	ISSUED FOR APPROVAL			

OLSSON ASSOCIATES

OLSSON ASSOCIATES – 2111 SOUTH 67TH STREET, SUITE 200; OMAHA, NE 68106

Flood Control District of Maricopa County (FCDMC)

CALCULATION PACKAGE

Lafayette Interceptor Drain and Outlet Design

Underground Structures

010-2312

DATE	DESIGNER	CHECKER	TL/SPE REVIEWER
3/23/12	RDB	SAH	

PROJECT NUMBER	PAGES	REV
010-2312	89	0

OLSSON ASSOCIATES	CLIENT NAME: Flood Control District of Maricopa County (FCDMC)	NAME: RDB	DATE: 3/23/12	
	PROJECT NAME: Lafayette Interceptor Drain and Outlet Design	PROJECT NO: 010-2312		REV: 0
STANDARD CALCULATION SHEET	SUBJECT: Underground Structures			

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OLSSON ASSOCIATES	CLIENT NAME: Flood Control District of Maricopa County (FCDMC)	NAME: RDB	DATE: 3/23/12	
	PROJECT NAME: Lafayette Interceptor Drain and Outlet Design	PROJECT NO: 010-2312		REV: 0
STANDARD CALCULATION SHEET	SUBJECT: Underground Structures			

1.0 General

Design package for Lafayette drainage structures, nine in total.

2.0 Design Methodology / Code References

This calculation will be developed in accordance with the following:

- AASHTO LRFD 5th Ed.
- Engineering Monograph No. 27, "Moments and Reactions for Rectangular Plates"

3.0 Design Software

- RISA 3-D
- IES QuickRWall 1.50

4.0 Assumptions

None.

5.0 Design Notes

Buried boxes designed such that the top slab is supported through a fixed connection with the walls, and a rigid connection between the bottom footing slab and walls.

Geotechnical investigation utilized in this design was prepared by ATEK Engineering Consultants, LLC, 1114 Grand Avenue, Phoenix, Arizona 85007, project number 110009, dated July 22,2011.

DESIGN PROPERTIES

Concrete		
Unit Weight	w_c	150 pcf
Compressive Strength	f'_c	4.0 ksi
Modulus of Elasticity	E_c	3605 ksi
Modular Ratio	n	8.0
Reinforcing Steel		
Unit Weight	w_s	490 pcf
Yield Strength	F_y	60.0 ksi
Modulus of Elasticity	E_s	29000 ksi
Soil		
Unit Weight	w_g	120 pcf
Water Unit Weight	w_w	62.4 pcf
Equivalent Fluid Pressure		
Granular		
At Rest-Drained		55 pcf
Active-Drained		37 pcf
Passive-Drained		330 pcf
Coefficient of Friction		0.36

OLSSON ASSOCIATES	CLIENT NAME: Flood Control District of Maricopa County (FCDMC)	NAME: RDB	DATE: 3/23/12	
	PROJECT NAME: Lafayette Interceptor Drain and Outlet Design	PROJECT NO: 010-2312		REV: 0
STANDARD CALCULATION SHEET	SUBJECT: Underground Structures			

Structure #1, Drop Junction w/ 102" Outlet:

Olsson Associates
2111 S. 67th St., Suite 200 | Omaha, NE 68106
Office 402.341.1116 | Fax 402.341.5895

Project:	Lafayette Interceptor Drain and Outlet Design	OA Project Number:	010-2312	Date:	11/29/2011
Subject:	Structure No. 1 - Junction Box	Designed By:	Ross Barron	Checked By:	SAH

REINFORCED CONCRETE BOX STRUCTURE DESIGN

Lafayette Interceptor Drain and Outlet Design
Structure No. 1 - Junction Box

DESIGN NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications, 4th Edition. Fixed box design is based on a per foot of length basis. Live load anaylsis is based on the calculated effective height of fill, D_E. Member moment and shear was determined through use of RISA 3-Dimensional finite analysis.

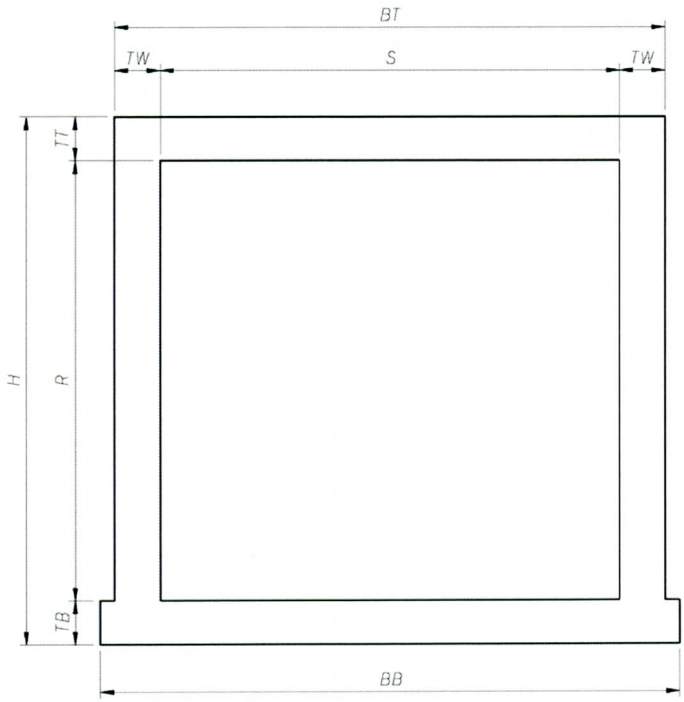
DESIGN PARAMETERS

BOX DIMENSIONS

Design Span	S	10.00	ft
Rise	R	16.50	ft
Top Slab Thickness	TT	12.00	in
Wall Thickness	TW	12.00	in
Bot. Slab Thickness	TB	14.00	in
Footing Extension	d	6.00	in.

Top Slab Width	BT	12.00	ft
Bot. Slab Width	BB	13.00	ft
Total Height	H	18.67	ft

Proposed Ground Elevation		1253.74
Outlet Invert Elevation		1226.64
Fill Height (ground to bot. of top slab)	h_f	10.60 ft



MATERIALS

Concrete Strength	f'_c	4.0	ksi
Conc. Mod. of Elast.	E_c	3,834	ksi
Stress Block Coeff.	β_1	0.85	
Rebar Strength	f_y	60	ksi
Steel Mod. of Elast.	E_s	29,000	ksi
Modular Ratio	n	7.6	

SOIL DATA

Description: At-Rest - Drained - Cohesionless Granular

Vertical Soil Wt.	γ_s	120	pcf
Lateral Eq. Fluid Density	γ_{eq}	55	pcf

OLSSON ASSOCIATES

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Project: Lafayette Interceptor Drain and Outlet Design | OA Project Number: 010-2312 | Date: 11/29/2011

Subject: Structure No. 1 - Junction Box | Designed By: Ross Barron | Checked By: SAH

LOADS

DEAD LOADS

Component	No.	Height *(ft)*	Length *(ft)*	Width *(ft)*	Area *(ft^2)*	Weight *(pcf)*	Weight *(k/ft)*	
Top Slab	1	1.000	1.000	12.000		150	1.800	
Walls	2	16.500	1.000	1.000		150	4.950	
Bottom Slab	1	1.167	1.000	13.000		150	2.275	
Concrete Fill	1	0.000	1.000	10.000		100.0	0.000	
Additional Wt.							0.000	
						Total	**9.025**	**k/ft**

LIVE LOADS

For fill > 2' Art. 3.6.1.2.6 is utilized; traffic travels parallel to the CBC span. Per Art. 4.6.2.10.2, the culvert shall be analyzed for a single loaded lane with the single lane multiple presence factor. The dynamic load allowance for culverts and buried structures is determined per Art. 3.6.2.2. The length of tire contact parallel to span, as specified in Art. 3.6.1.2.5 is 20"; width is 10". Although the earth fill depth is more than 8'-0", it does not exceed the effective span length, so Live Load effects shall be considered.

Wheel Load - Traffic Parallel to Span

TotalSpan Length for Analysis (CL wall to CL wall)	S	11.00	ft		
Minimum depth of Earth Cover	D_E	9.60	ft		
Wheel Load	P	16.0	k		
Impact Factor	IM	0	%	(3.6.2.2-1)	$IM = 33(1.0 - 0.125D_E) > 0\%$
Longitudinal Distribution Width	E_1	10.43	ft	(3.6.1.2.6)	$E_1 = 0.83 + 1.0D_E$
Transverse Distribution Width	E_2	11.27	ft	(3.6.1.2.6)	$E_2 = 1.67 + 1.0D_E$
Multiple Presence Factor	MPF	1.20			
Top Slab Axle Distribution (for RISA model)	E	10.43	ft		
Distributed Live Load to Top Slab (w/ IM & MPF) Distributed over Distance of E	w_T	0.163	k/ft		$w_T = 1.2 * \left(1 + \frac{IM}{100}\right) * \frac{P}{(E_2)}$
Bottom Slab Distributed Live Load (w/ IM & MPF)	w_B	0.15	k/ft		$w_B = \frac{w_T * E_1}{S}$

SOIL LOADS

Vertical Soil Loads

Soil Load	w_{EV}	1.152	ksf	$w_{EV} = D_E * \gamma_S$

Lateral Soil Loads

Earth Press. @ Top	$p_{EH@Top}$	0.528	k/ft	$p_{EH@Top} = D_E * \gamma_{EQ}$
Earth Press. @ Bot.	$p_{EH@Bot.}$	1.555	k/ft	$p_{EH@Bot} = (D_E + H) * \gamma_{EQ}$

Live Load Surcharge - Horz. Loads Only - 3.11.6.4.1

Abutment Height		28.267	ft	
Interpolated Soil Height	h_s	2.00	ft	
Horz. Pressure	Δ_p	110	psf	$\Delta_p = h_{eq} * \gamma_s$

Table 3.11.6.4-1 Equivalent Height of Soil for Vehicular Loading on Abutments Perpendicular to Traffic.

Abutment Height (ft.)	h_{eq} (ft.)
5.0	4.0
10.0	3.0
≥20.0	2.0

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Subject: Structure No. 1 - Junction Box | Designed By: Ross Barron | Checked By: SAH

STABILITY

For the live load bearing pressure, the wheel load applied to the top slab is distributed over the bearing area without an increase due to impact. Forces resisting buoyancy include the box self weight and soil weight above the box. No groundwater was considered as part of the design. Stability calculations are based on a one foot strip width.

BEARING CAPACITY (SERVICE LOADS)

Bearing Area	A_q	13.00	ft^2
Structural DL and Vert. Soil	q_{DL}	783	psf
LL Bearing Pressure	q_{LL}	0	psf
Factored Bearing Pressure	q	939	psf
All. Bearing Pressue	q_{all}	4,000	psf
Utilization Ratio	q/q_{all}	0.23	OK

BUOYANT FORCES

Depth to Bot. Slab	z	28.27	ft
Depth to Groundwater	z_w	0.00	ft
Buoyant Force	P_b	0.0	k
Self Weight	P_w	9.0	k
Factor of Safety	FS	N/A	OK > 1.1

TOP SLAB

DESIGN NOTES:

Designed as a fixed slab with the design span length being the distance from CL wall to CL wall. RISA 3-D is used to input joint coordinates, unreinforced concrete members of correct thicknesses, loads provided herein, and respective load factors. Structure self-weight calculations take place within RISA and are included in the output moments. Strength I combination governs for buried structures. For a rigid buried structure, 1.3 is used for vertical earth pressure load factor. Concrete shear strength is modified according to 5.14.5.3. Strength reduction factor for shear is taken as 0.85 for buried CIP concrete structures.

PARAMETERS

Slab Thickness	TT	12.00	in
Haunch Width (& Height)	W_H	1.00	ft

Member Loads for RISA Input (Service)

Soil Load	w_{EV}	1.152	k/ft
Distr. Live Load	w_{LL}	0.163	klf

SHEAR — Art. 5.14.5.3

Reduction Factor	Φ	0.90	
Width for Shear	b_v	12.00	in
Effective Depth	d_e	9.69	in
Conc. Shear Strength	V_c	14.7	k/ft
Reduced Nom. Cap.	ΦV_c	13.2	k/ft
Factored Ultimate Shear (RISA OUTPUT)	V_u	8.6	k/ft
Utilization Ratio	$V_u / \Phi V_c$	0.65	OK

Controlling Load Case: Strength 1 - Plate Shear

For Slabs with Earth FIII < 2'

5.8.3.3-3 $V_c = \left(0.0316\beta\sqrt{f'_c}\right)bd_e$

For Slabs with Earth FIII > 2'

5.14.5.3-1 $V_c = \left(0.0676\sqrt{f'_c} + 4.6\frac{A_S}{bd_e}\frac{V_u d_e}{M_u}\right)bd_e$

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Subject: Structure No. 1 - Junction Box | Designed By: Ross Barron | Checked By: SAH

FLEXURE (BOTTOM BARS) — Use #5 @ 12 in. Spa.

Parameters			
Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 5	
Spacing		12.0	in
Bar Diameter	d_b	0.63	in
Area of Steel	A_s	0.31	in^2/ft
Steel Depth	d	9.69	in
Eq. Stress Depth	a	0.46	in
Neutral Axis Depth	c	0.00	in
Spacing Limit - Art 5.10.3			
Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.38	in
Max. Spacing	S_{max}	12.0	in
Development Length - Art 5.11.2.1			
Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	14	in

Controlling Load Case: Strength 1 - Plate Moment x

Strain Calculation			
Extr. Tensile Strain	ε_t	244.43	
Min. Reinforcement - Art 5.7.3.3.2			
1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	10.5	k·ft/ft
Min. Moment Capacity	M_{min}	10.5	k·ft/ft
Temp & Shrink - Art 5.10.8			
Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$
Crack Control - Art 5.7.3.4			
Service Moment	M_s	5.7	k·ft/ft
Service Stress in Reinf.	f_{ss}	23.0	ksi
Concrete Cover	d_c	2.31	
Clear Cover Factor	β_s	1.34	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	18.0	in
Moment Capacity - Art 5.7.3.2.1			
Factored Ultimate Load	M_u	7.9	k·ft/ft
Reduced Nom. Cap.	ΦM_n	13.2	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.60	OK

FLEXURE (TOP CORNER BARS) — Use #5 @ 12 in. Spa.

Parameters			
Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	2
Bar Size		# 5	
Spacing		12.0	in
Bar Diameter	d_b	0.63	in
Area of Steel	A_s	0.31	in^2/ft
Steel Depth	d	9.69	in
Eq. Stress Depth	a	0.46	in
Neutral Axis Depth	c	0.00	in
Spacing Limit - Art 5.10.3			
Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.38	in
Max. Spacing	S_{max}	12.0	in
Development Length - Art 5.11.2.1			
Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	14	in

Controlling Load Case: Strength 1 - Plate Moment y

Strain Calculation			
Extr. Tensile Strain	ε_t	244.43	
Min. Reinforcement - Art 5.7.3.3.2			
1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	10.6	k·ft/ft
Min. Moment Capacity	M_{min}	10.6	k·ft/ft
Temp & Shrink - Art 5.10.8			
Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$
Crack Control - Art 5.7.3.4			
Service Moment	M_s	6.0	k·ft/ft
Service Stress in Reinf.	f_{ss}	24.2	ksi
Concrete Cover	d_c	2.31	
Clear Cover Factor	β_s	1.34	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	16.9	in
Moment Capacity - Art 5.7.3.2.1			
Factored Ultimate Load	M_u	8.0	k·ft/ft
Reduced Nom. Cap.	ΦM_n	13.2	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.61	OK

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Project: Lafayette Interceptor Drain and Outlet Design | OA Project Number: 010-2312 | Date: 11/29/2011

Subject: Structure No. 1 - Junction Box | Designed By: Ross Barron | Checked By: SAH

WALLS

DESIGN NOTES:
Designed with a fixed connection to the top slab and a rigid connection to the bottom slab. Clear span length is used to calculate forces. Strength I combination governs for buried structures. For a rigid buried structure, a load factor of 1.35 is used for at-rest horizontal earth pressure. Maximum shear was determined through a RISA 3-D model, utilizing finite element analysis. Axial load is not taken into consideration.

PARAMETERS

Outer Wall Thickness	TW	12.00	in
Span Length	L	16.50	ft
Point of Contraflexure	x	2.70	ft
Member Loads for RISA Input (Service)			
Earth Press. @ Top	p_{EH}	0.528	k/ft
Earth Press. @ Bot.	p_{EH}	1.555	k/ft
LL Surcharge	p_{LS}	0.110	k/ft

SHEAR — Art. 5.8.3.4.1

Reduction Factor	Φ	0.9	
Width for Shear	b_v	12.00	in
Steel Depth for Shear	d_v	9.69	in
Conc. Shear Strength	V_c	14.7	k/ft
	Art 5.8.3.3		
Factored Ultimate Load	V_u	8.6	k/ft
Reduced Nom. Cap.	ΦV_c	13.2	k/ft
Utilization Ratio	$V_u / \Phi V_c$	0.65	OK

Controlling Load Case: Strength 1 - Plate Shear

For Slabs with Earth FIll < 2'

5.8.3.3-3 $V_c = \left(0.0316\beta\sqrt{f'_c}\right)bd_e$

For Slabs with Earth FIll > 2'

5.14.5.3-1 $V_c = \left(0.0676\sqrt{f'_c} + 4.6\frac{A_S}{bd_e}\frac{V_u d_e}{M_u}\right)bd_e$

FLEXURE (Vertical Bars Inside Face) — Use #5 @ 12 in. Spa.

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 5	
Spacing		12.0	in
Bar Diameter	d_b	0.63	in
Area of Steel	A_s	0.31	in^2/ft
Steel Depth	d	9.69	in
Eq. Stress Depth	a	0.46	in
Neutral Axis Depth	c	0.00	in
Spacing Limit - Art 5.10.3			
Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.38	in
Max. Spacing	S_{max}	12.0	in
Development Length - Art 5.11.2.1			
Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	14	in

Controlling Load Case: Strength 1 - Plate Moment y

Strain Calculation			
Extr. Tensile Strain	ε_t	244.43	
Min. Reinforcement - Art 5.7.3.3.2			
1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	8.6	k·ft/ft
Min. Moment Capacity	M_{min}	8.6	k·ft/ft
Temp & Shrink - Art 5.10.8			
Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$
Crack Control - Art 5.7.3.4			
Service Moment	M_s	4.8	k·ft/ft
Service Stress in Reinf.	f_{ss}	19.3	ksi
Concrete Cover	d_c	2.31	
Clear Cover Factor	β_s	1.34	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	18.0	in
Moment Capacity - Art 5.7.3.2.1			
Factored Ultimate Load	M_u	6.5	k·ft/ft
Reduced Nom. Cap.	ΦM_n	13.2	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.49	OK

OLSSON ASSOCIATES

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Project: Lafayette Interceptor Drain and Outlet Design | OA Project Number: 010-2312 | Date: 11/29/2011

Subject: Structure No. 1 - Junction Box | Designed By: Ross Barron | Checked By: SAH

FLEXURE (BOTTOM CORNER BARS) — Use #5 @ 12 in. Spa.

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 5	
Spacing		12.0	in
Bar Diameter	d_b	0.63	in
Area of Steel	A_s	0.31	in^2/ft
Steel Depth	d	9.69	in
Eq. Stress Depth	a	0.46	in
Neutral Axis Depth	c	0.00	in

Spacing Limit - Art 5.10.3

Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.38	in
Max. Spacing	S_{max}	12.0	in

Development Length - Art 5.11.2.1

Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	14	in

Controlling Load Case: Strength 1 - Plate Moment y

Strain Calculation

Extr. Tensile Strain	ε_t	244.43	

Min. Reinforcement - Art 5.7.3.3.2

1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	10.6	k·ft/ft
Min. Moment Capacity	M_{min}	10.6	k·ft/ft

Temp & Shrink - Art 5.10.8

Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$

Crack Control - Art 5.7.3.4

Service Moment	M_s	6.0	k·ft/ft
Service Stress in Reinf.	f_{ss}	24.2	ksi
Concrete Cover	d_c	2.31	
Clear Cover Factor	β_s	1.34	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	16.9	in

Moment Capacity - Art 5.7.3.2.1

Factored Ultimate Load	M_u	8.0	k·ft/ft
Reduced Nom. Cap.	ΦM_n	13.2	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.61	OK

FLEXURE (Horizontal Neg. Moment) — Use #6 @ 12 in. Spa.

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 6	
Spacing		12.0	in
Bar Diameter	d_b	0.75	in
Area of Steel	A_s	0.44	in^2/ft
Steel Depth	d	9.63	in
Eq. Stress Depth	a	0.65	in
Neutral Axis Depth	c	0.00	in

Spacing Limit - Art 5.10.3

Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.25	in
Max. Spacing	S_{max}	12.0	in

Development Length - Art 5.11.2.1

Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	20	in

Controlling Load Case: Strength 1 - Plate Moment x

Strain Calculation

Extr. Tensile Strain	ε_t	171.10	

Min. Reinforcement - Art 5.7.3.3.2

1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	17.6	k·ft/ft
Min. Moment Capacity	M_{min}	17.6	k·ft/ft

Temp & Shrink - Art 5.10.8

Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$

Crack Control - Art 5.7.3.4

Service Moment	M_s	9.6	k·ft/ft
Service Stress in Reinf.	f_{ss}	27.6	ksi
Concrete Cover	d_c	2.38	
Clear Cover Factor	β_s	1.35	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	14.0	in

Moment Capacity - Art 5.7.3.2.1

Factored Ultimate Load	M_u	13.2	k·ft/ft
Reduced Nom. Cap.	ΦM_n	18.4	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.72	OK

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Project:	Lafayette Interceptor Drain and Outlet Design	OA Project Number:	010-2312	Date:	11/29/2011
Subject:	Structure No. 1 - Junction Box	Designed By:	Ross Barron	Checked By:	SAH

FOOTING SLAB

DESIGN NOTES:
Designed with rigid connections to the walls for flexure in the corners. The maximum moment and shear are taken from the RISA analysis. Loads are applied to the top slab and transfered into the footing.

PARAMETERS

Footing Thickness	TB	14.00	in

LOADS (Service)

Dead Load (structure)	w_{DL}	0.925	k/ft
Vertical Soil Load	w_{EV}	1.152	k/ft
Live Load	w_{LL}	0.155	k/ft

SHEAR — Art. 5.14.5.3

Reduction Factor	Φ	0.9	
Width for Shear	b_v	12.00	in
Steel Depth for Shear	d_v	10.75	in
Conc. Shear Strength	V_c	16.3	k/ft
	Art 5.8.3.3		
Factored Ultimate Load	V_u	6.9	k/ft
Reduced Nom. Cap.	ΦV_c	14.7	k/ft
Utilization Ratio	$V_u / \Phi V_c$	0.47	OK

Controlling Load Case: Strength 1 - LL @ Support

For Slabs with Earth FIll < 2'

5.8.3.3-3 $V_c = \left(0.0316\beta\sqrt{f'_c}\right)bd_e$

For Slabs with Earth FIll > 2'

5.14.5.3-1 $V_c = \left(0.0676\sqrt{f'_c} + 4.6\frac{A_S}{bd_e}\frac{V_u d_e}{M_u}\right)bd_e$

Project Name: Lafayette
Project Number: 010-2312
Analyst: RB
Date: 12/6/2011

Structure #1, Drop Junction

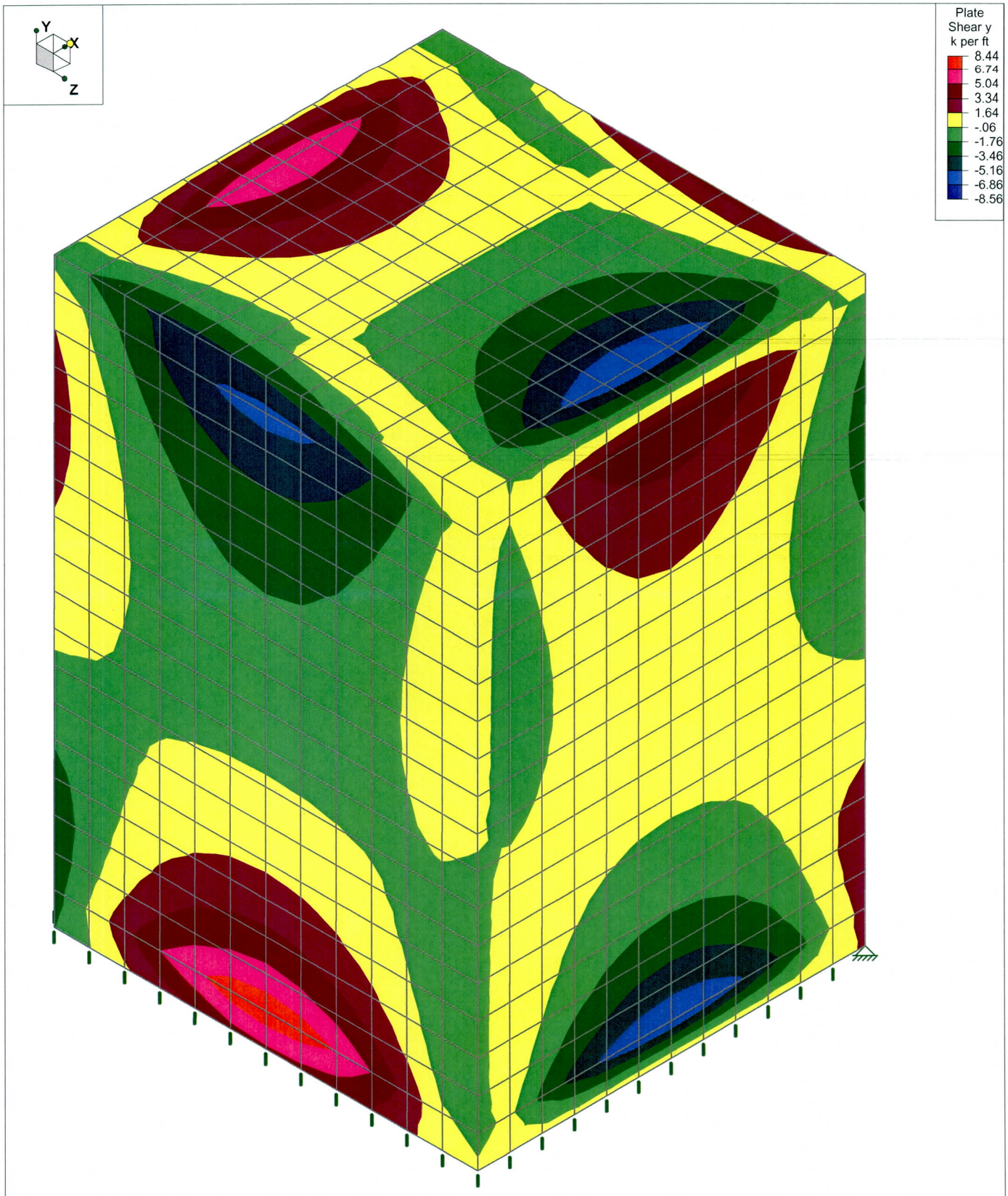
Summary

Concrete	41.5 yd³
Reinforcing	3,320.0 lb

*Reinforcing is estimated at 80 lbs./CY

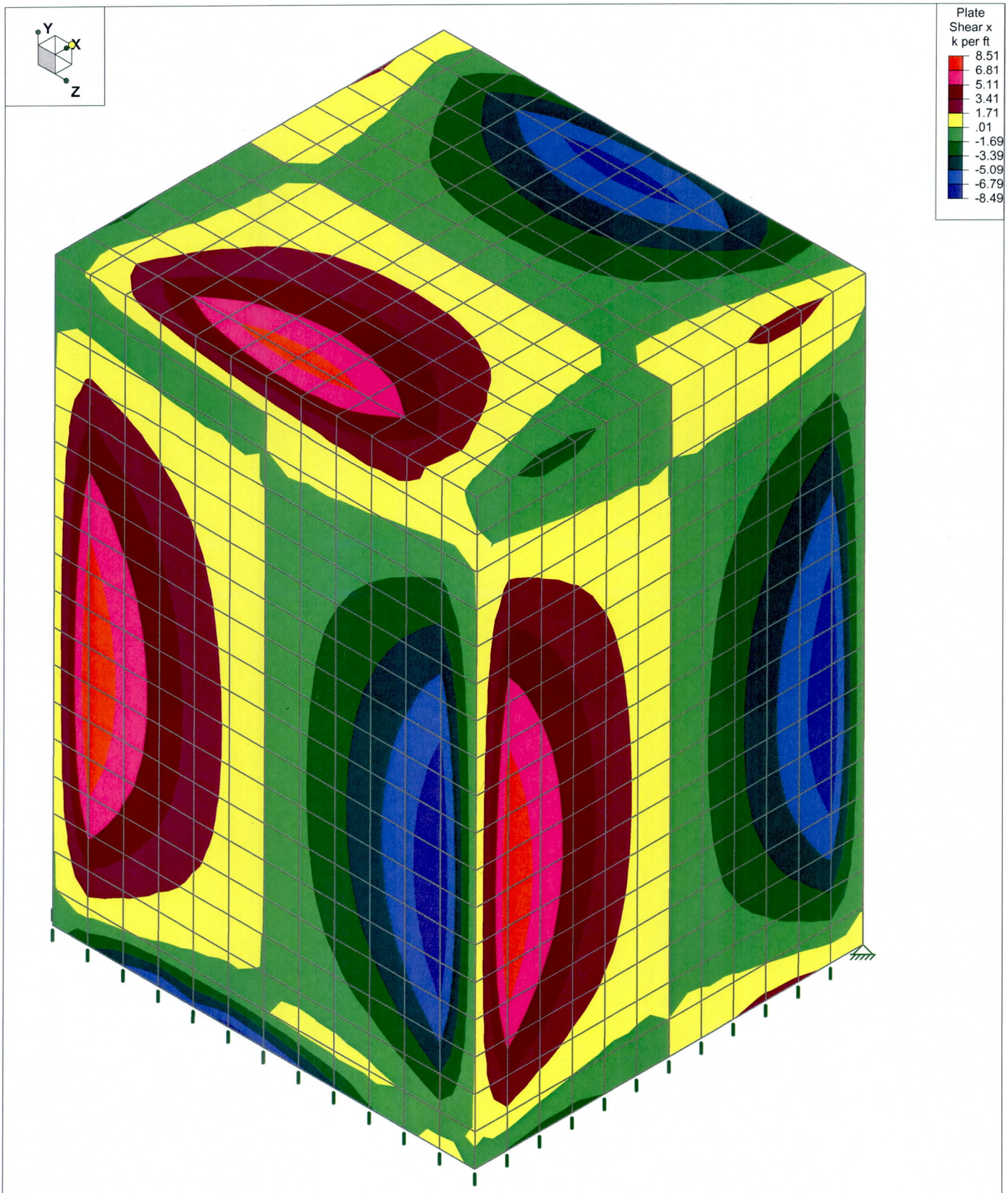
Concrete

	Total	41.5 yd³				
Location/Description	*Amount*	*Height*	*Length*	*Width*	*Area*	*Volume*	
Top Slab	1	1.00'	13'	14.30'		186 ft³	6.9 yd³
Walls	2	16.17'	14'	1.00'		461 ft³	17.1 yd³
	2	16.17'	11'	1.00'		356 ft³	13.2 yd³
Minus 102 "Pipe	-1		1'		82.52 ft²	-83 ft³	-3.1 yd³
Minus 102 "Pipe	-1		1'		82.52 ft²	-83 ft³	-3.1 yd³
Minus 66" RCP	-1		1'		41.28 ft²	-41 ft³	-1.5 yd³
Footing	1	1.17'	14.917'	13.833'		241 ft³	8.9 yd³
fillet	2		14.917'		2.33 ft²	70 ft³	2.6 yd³
MH Base	1		1.000'		12.57 ft²	13 ft³	0.5 yd³



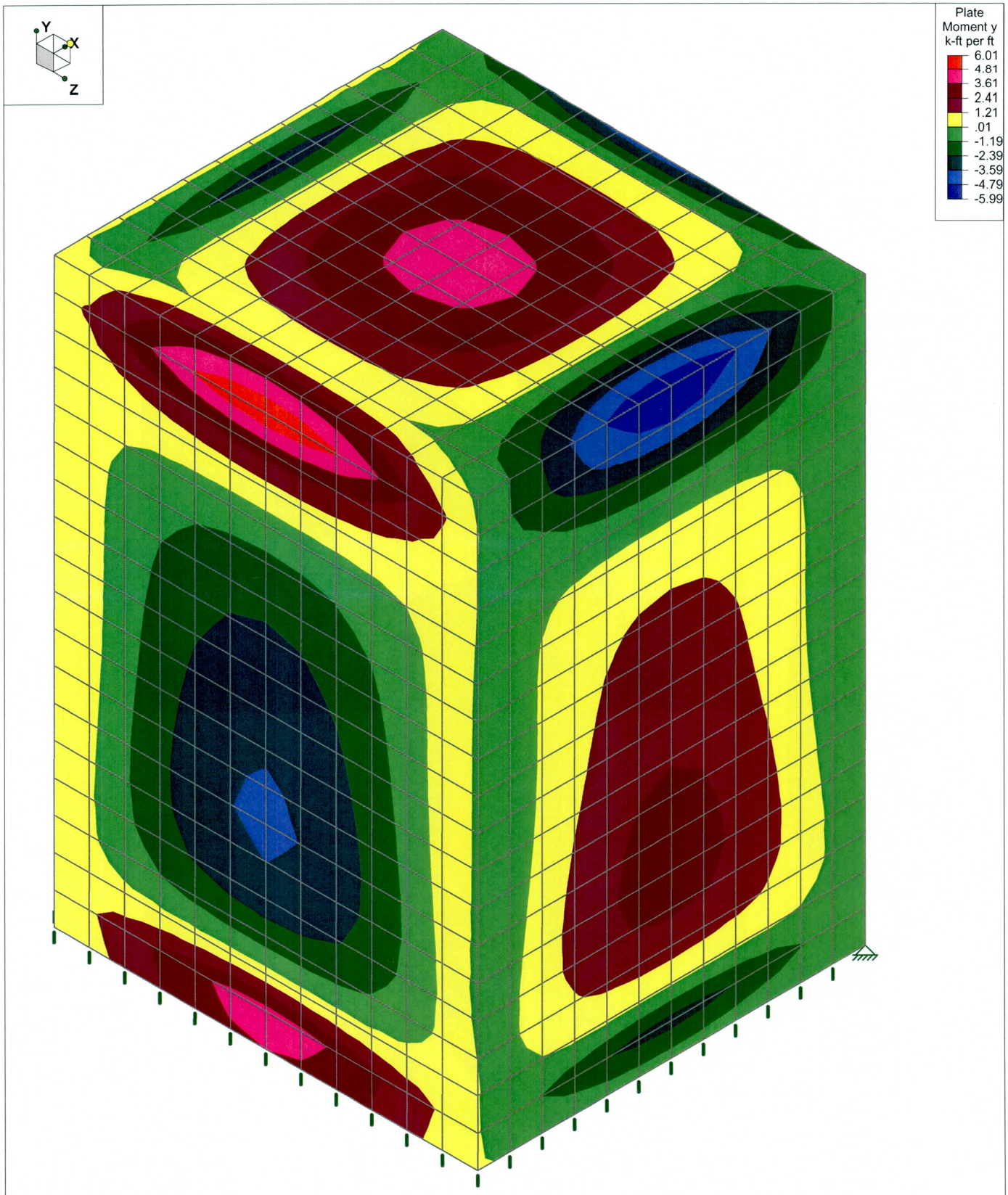
Results for LC 2, STRENGTH 1 - LL @ midspan
Member y Shear Forces (k)

Olsson Associates	Lafayette - Struct. #1	SK - 2
Ross Barron		Nov 29, 2011 at 2:24 PM
010-2312		Structure #1 Analysis 3-D.r3d



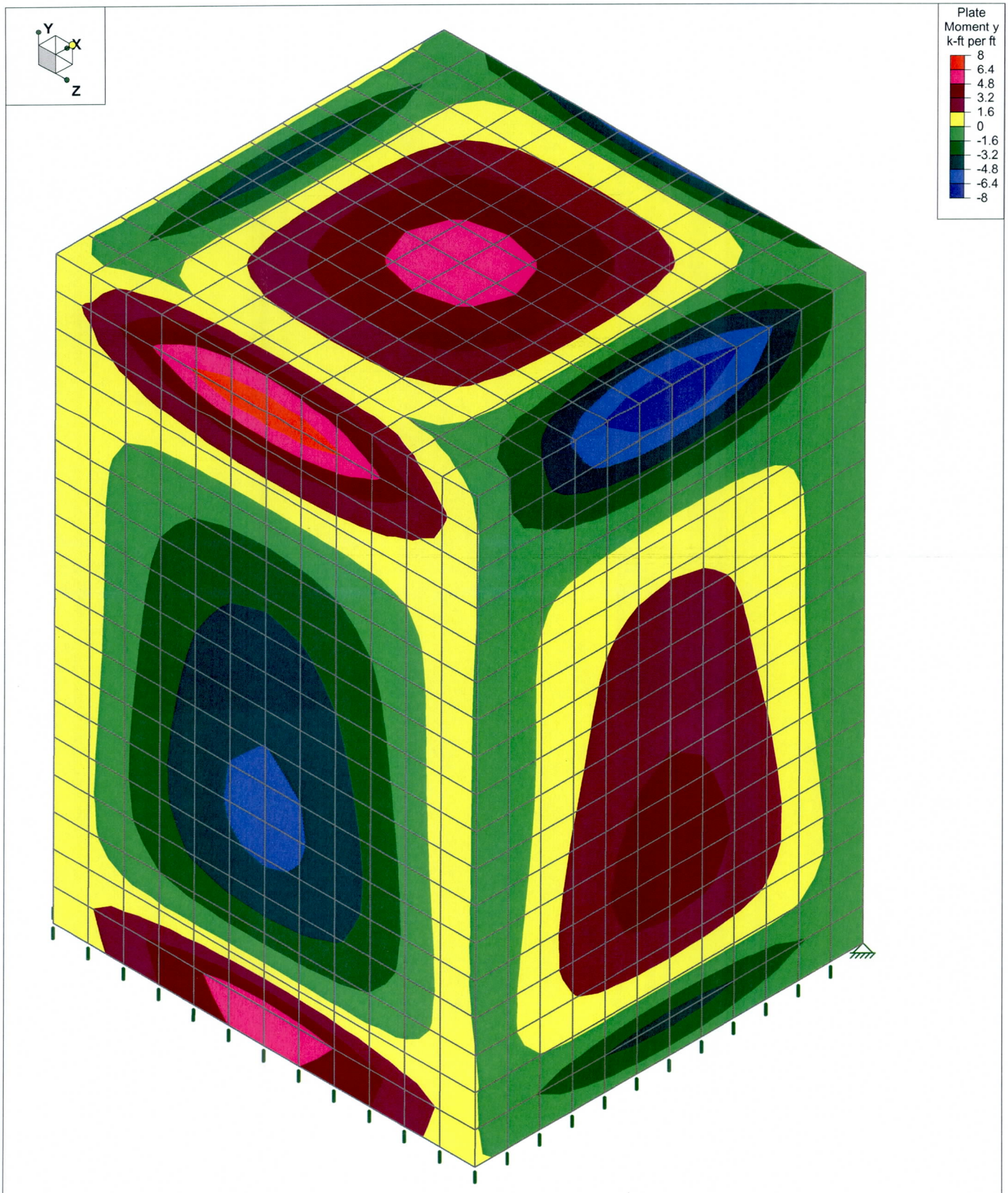
Results for LC 2, STRENGTH 1 - LL @ midspan
Member y Shear Forces (k)

Olsson Associates	Lafayette - Struct. #1	SK - 1
Ross Barron		Nov 29, 2011 at 2:24 PM
010-2312		Structure #1 Analysis 3-D.r3d



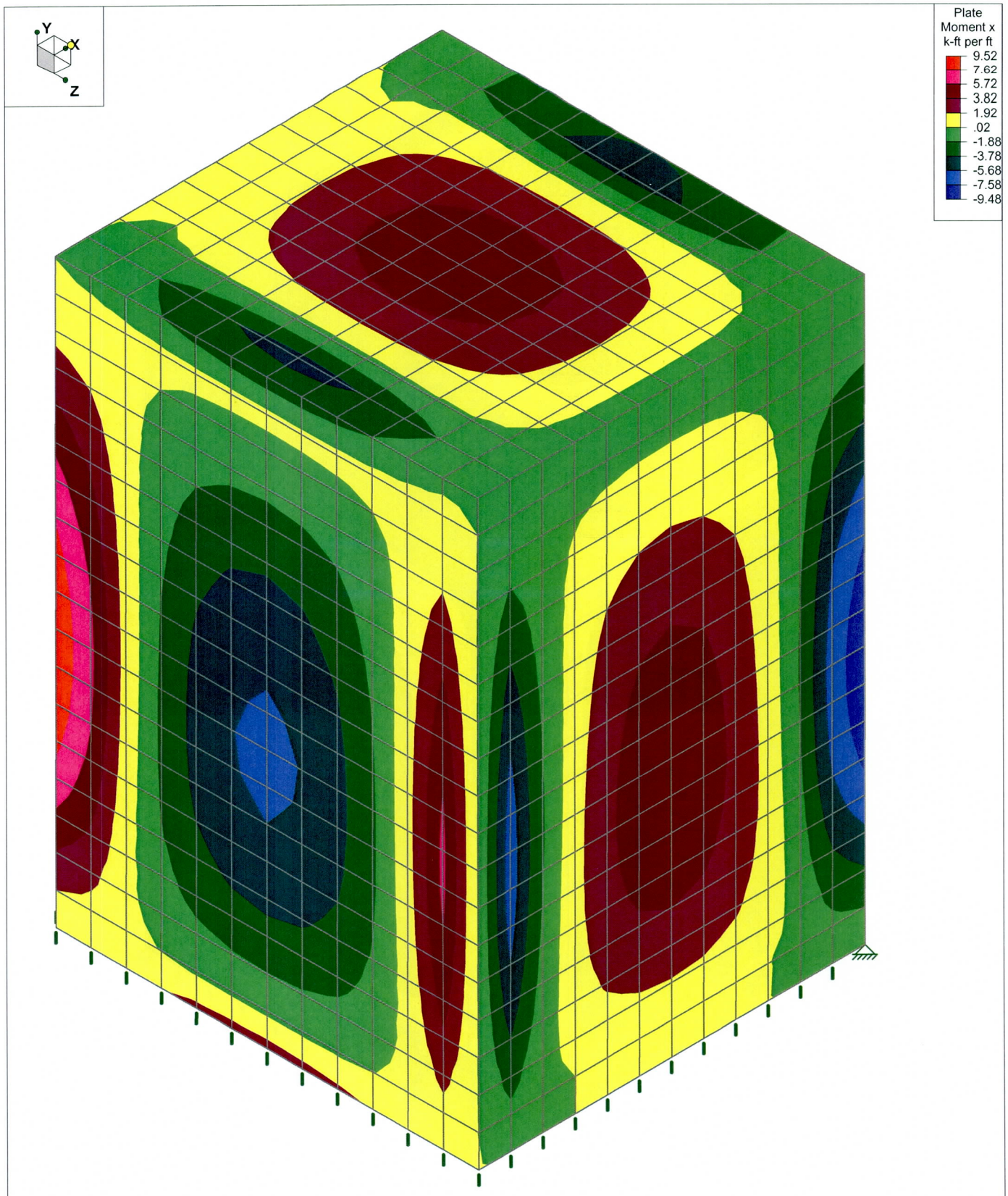
Results for LC 1, Service - LL @ midspan
Member y Shear Forces (k)

Olsson Associates	Lafayette - Struct. #1	SK - 6
Ross Barron		Nov 29, 2011 at 2:27 PM
010-2312		Structure #1 Analysis 3-D.r3d



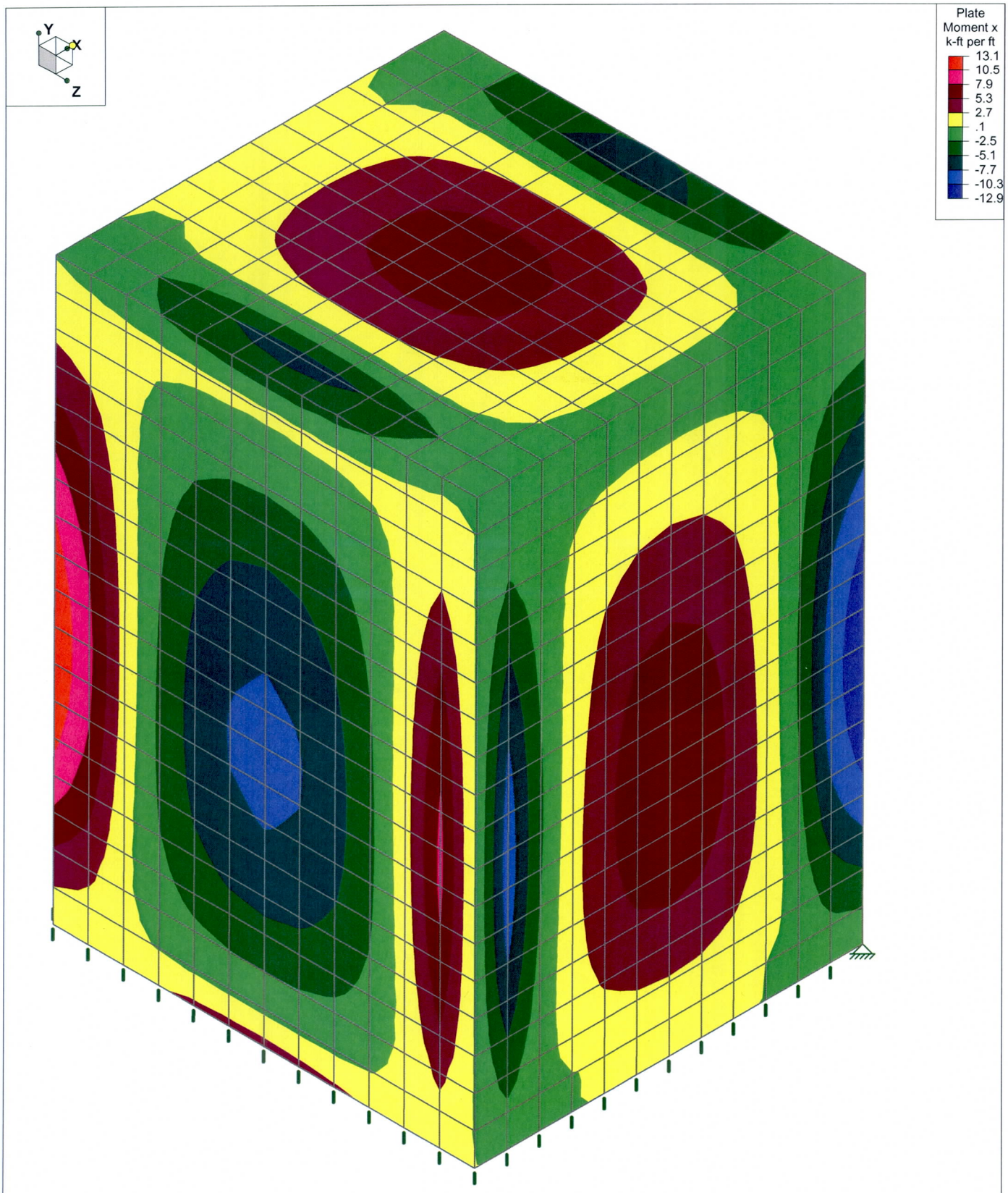
Results for LC 2, STRENGTH 1 - LL @ midspan
Member y Shear Forces (k)

Olsson Associates		SK - 5
Ross Barron	Lafayette - Struct. #1	Nov 29, 2011 at 2:26 PM
010-2312		Structure #1 Analysis 3-D.r3d



Results for LC 1, Service - LL @ midspan
Member y Shear Forces (k)

Olsson Associates	Lafayette - Struct. #1	SK - 7
Ross Barron		Nov 29, 2011 at 2:27 PM
010-2312		Structure #1 Analysis 3-D.r3d



Results for LC 2, STRENGTH 1 - LL @ midspan
Member y Shear Forces (k)

Olsson Associates		SK - 4
Ross Barron	Lafayette - Struct. #1	Nov 29, 2011 at 2:26 PM
010-2312		Structure #1 Analysis 3-D.r3d

OLSSON ASSOCIATES	CLIENT NAME: Flood Control District of Maricopa County (FCDMC)	NAME: RDB	DATE: 3/23/12	
	PROJECT NAME: Lafayette Interceptor Drain and Outlet Design	PROJECT NO: 010-2312		REV: 0
STANDARD CALCULATION SHEET	SUBJECT: Underground Structures			

Structure #2, Drop Inlet w/ 66" Outlet:

OLSSON ASSOCIATES

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Office 402.341.1116 | Fax 402.341.5895

Project: Lafayette Interceptor Drain and Outlet Design | OA Project Number: 010-2312 | Date: 11/27/2011

Subject: Structure No. 2 - Drop Inlet | Designed By: Ross Barron | Checked By: SAH

REINFORCED CONCRETE BOX STRUCTURE DESIGN

Lafayette Interceptor Drain and Outlet Design
Structure No. 2 - Drop Inlet

DESIGN NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications, 4th Edition. Shear and Moments determined using Engineering Monograph No. 27, "Moments and Reactions for Rectangular Plates."

DESIGN PARAMETERS

STRUCTURE DIMENSIONS

Proposed Inlet Elevation		1252.00	
Top of Footing Slab		1232.75	
Inlet Rise	R	19.25	ft
Struct. Width		12.50	ft
Struct. Length		7.00	ft
Wall Thickness	TW	10.00	in
Bot. Slab Thickness	TB	14.00	in
Footing Extension	d	6.00	in.
High Water Fluid Elevation		1244.00	

MATERIALS

Concrete Strength	f'_c	4.0	ksi
Conc. Mod. of Elast.	E_c	3,834	ksi
Stress Block Coeff.	β_1	0.85	
Rebar Strength	f_y	60	ksi
Steel Mod. of Elast.	E_s	29,000	ksi
Modular Ratio	n	7.6	

SOIL DATA

Description: At-Rest - Drained - Cohesionless Granular

Vertical Soil Wt.	γ_s	120	pcf
Lateral Eq. Fluid Density	γ_{eq}	55	pcf

LOADS

DEAD LOADS

Component	No.	Height *(ft)*	Length *(ft)*	Width *(ft)*	Area *(ft^2)*	Weight *(pcf)*	Weight *(k)*
Footing Slab	1	1.167	15.167	9.667		150	25.657
Long Walls	2	19.250	14.167	0.833		150	68.177
Side Walls	2	19.250	7.000	0.833		150	33.688
Orifice Plate	1	0.000	1.000	0.000		100.0	0.000
Additional Wt.							0.000
						Total	**127.5** k

SOIL LOADS

Lateral Soil Loads

Earth Press. @ Top	$p_{EH@Top}$	0.000	k/ft	
Earth Press. @ Bot.	$p_{EH@Bot.}$	1.059	k/ft	$p_{EH@Bot} = (R) * \gamma_{EQ}$

Live Load Surcharge - Horz. Loads Only - 3.11.6.4.1

Surcharge Soil Height	h_s	2.00	ft	
Horz. Pressure	Δ_p	0.110	ksf	$\Delta_p = h_{eq} * \gamma_s$

Vertical Soil Loads (Acting on Footing Extension - For Bearing Calculations)

Soil Load	w_{EV}	55.055	k	$w_{EV} = D_E * \gamma_S$

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Project:	Lafayette Interceptor Drain and Outlet Design	**OA Project Number:**	010-2312	**Date:**	11/27/2011
Subject:	Structure No. 2 - Drop Inlet	**Designed By:**	Ross Barron	**Checked By:**	SAH

STABILITY

High water elevation was considered in the bearing calculations. No groundwater was considered as part of the design, and therefore no buoyancy calculations were completed. Stability calculations are based on gross weights.

BEARING CAPACITY (SERVICE LOADS)

Bearing Area	A_q	146.61	ft^2
Structural DL and Vert. Soil	q_{DL}	183	k
H.W. Fluid Load	q_{FL}	61	k
Service Bearing Pressure	q	1,664	psf
All. Bearing Pressue	q_{all}	4,000	psf
Utilization Ratio	q/q_{all}	0.42	OK

BUOYANT FORCES

Depth to Bot. Slab	z	0.00	ft
Depth to Groundwater	z_w	0.00	ft
Buoyant Force	P_b	0.0	k
Self Weight	P_w	127.5	k
Factor of Safety	FS	N/A	OK > 1.1

WALLS

DESIGN NOTES:

Designed using Engineering Monograph No. 27, "Moments and Reactions for Rectangular Plates." The longest wall was considered under this design, and conservatively applied to the sidewalls. The wall/plate was modeled having fixed connections along the bottom and sides, and free along the top. Strength I combination governs for buried structures. A load factor of 1.35 is used for active horizontal earth pressure.

PARAMETERS

Outer Wall Thickness	TW	10.00	in
Wall Height	H	19.25	ft

Member Loads for RISA Input (Service)

Earth Press. @ Top	p_{EH}	0.000	k/ft
Earth Press. @ Bot.	p_{EH}	1.059	k/ft
LL Surcharge	p_{LS}	0.055	k/ft

SHEAR — Art. 5.8.3.4.1

Reduction Factor	Φ	0.9	
Width for Shear	b_v	12.00	in
Steel Depth for Shear	d_v	7.63	in
Conc. Shear Strength	V_c	11.6	k/ft

Art 5.8.3.3

Factored Ultimate Load	V_u	7.9	k/ft
Reduced Nom. Cap.	ΦV_c	10.4	k/ft
Utilization Ratio	$V_u / \Phi V_c$	0.76	OK

5.8.3.3-3 $V_c = \left(0.0316\beta\sqrt{f'_c}\right)bd_e$

OLSSON ASSOCIATES

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Project: Lafayette Interceptor Drain and Outlet Design | OA Project Number: 010-2312 | Date: 11/27/2011

Subject: Structure No. 2 - Drop Inlet | Designed By: Ross Barron | Checked By: SAH

FLEXURE (Vertical Bars, Both Faces) — Use #6 @ 11 in. Spa.

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	10.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 6	
Spacing		11.0	in
Bar Diameter	d_b	0.75	in
Area of Steel	A_s	0.48	in^2/ft
Steel Depth	d	7.63	in
Eq. Stress Depth	a	0.71	in
Neutral Axis Depth	c	0.00	in

Spacing Limit - Art 5.10.3

Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	10.25	in
Max. Spacing	S_{max}	12.0	in

Development Length - Art 5.11.2.1

Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	20	in

Controlling Load Case: Strength 1 - LL @ Midspan

Strain Calculation

Extr. Tensile Strain	ε_t	124.25	

Min. Reinforcement - Art 5.7.3.3.2

1.2 x Cracking Moment	$1.2M_{cr}$	14.8	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	17.6	k·ft/ft
Min. Moment Capacity	M_{min}	14.8	k·ft/ft

Temp & Shrink - Art 5.10.8

Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$

Crack Control - Art 5.7.3.4

Service Moment	M_s	8.7	k·ft/ft
Service Stress in Reinf.	f_{ss}	29.1	ksi
Concrete Cover	d_c	2.38	
Clear Cover Factor	β_s	1.44	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	11.9	in

Moment Capacity - Art 5.7.3.2.1

Factored Ultimate Load	M_u	13.2	k·ft/ft
Reduced Nom. Cap.	ΦM_n	15.7	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.84	OK

FLEXURE (Horizontal Bars) — Use #5 @ 8 in. Spa.

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	10.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 5	
Spacing		8.0	in
Bar Diameter	d_b	0.63	in
Area of Steel	A_s	0.47	in^2/ft
Steel Depth	d	7.69	in
Eq. Stress Depth	a	0.68	in
Neutral Axis Depth	c	0.00	in

Spacing Limit - Art 5.10.3

Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	7.38	in
Max. Spacing	S_{max}	12.0	in

Development Length - Art 5.11.2.1

Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	14	in

Controlling Load Case: Strength 1 - LL @ Midspan

Strain Calculation

Extr. Tensile Strain	ε_t	129.31	

Min. Reinforcement - Art 5.7.3.3.2

1.2 x Cracking Moment	$1.2M_{cr}$	8.7	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	19.4	k·ft/ft
Min. Moment Capacity	M_{min}	8.7	k·ft/ft

Temp & Shrink - Art 5.10.8

Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$

Crack Control - Art 5.7.3.4

Service Moment	M_s	9.5	k·ft/ft
Service Stress in Reinf.	f_{ss}	32.7	ksi
Concrete Cover	d_c	2.31	
Clear Cover Factor	β_s	1.43	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	10.4	in

Moment Capacity - Art 5.7.3.2.1

Factored Ultimate Load	M_u	14.6	k·ft/ft
Reduced Nom. Cap.	ΦM_n	15.4	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.95	OK

Project Name: Lafayette
Project Number: 010-2312
Analyst: RB
Date: 12/6/2011

Structure #2, Drop Inlet

Summary

Concrete	37.4 yd^3
Reinforcing	2,992.0 lb

*Reinforcing is estimated at 80 lbs./CY

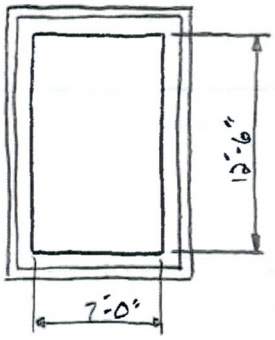
Concrete

	Total				37.4 yd^3		
Location/Description	*Amount*	*Height*	*Length*	*Width*	*Area*	*Volume*	
Footing	1	1.50'	14.83'	14.17'		315 ft^3	11.7 yd^3
Backwall	1	21.25'	14.17'	0.83'		251 ft^3	9.3 yd^3
Sidewalls	2	18.75'	7.00'	0.83'		219 ft^3	8.1 yd^3
Front Wall	1	18.25'	14.17'	0.83'		215 ft^3	8.0 yd^3
Orifice platform	1	0.50'	7.00'	12.50'		44 ft^3	1.6 yd^3
Minus 66" RCP, skew	-1		.83'		41.28 ft^2	-34 ft^3	-1.3 yd^3

OLSSON ASSOCIATES

STRUCTURE #2

MAXIMUM STRUCTURE HEIGHT = 19.25'



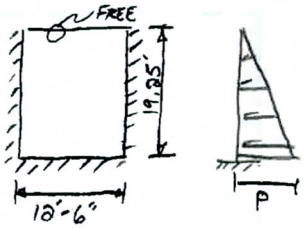
LOADS:

LATERAL EARTH PRESSURE ; $\gamma_{EFP} = 55$ pcf

LIVE LOAD SURCHARGE ; 2' EQUIV. = 0.11 ksf

UTILIZING E.M. No. 27 :

FIG. 4:



$a/b = 0.33$, $p = (55)(19.25)$ $p = 1.06$ ksf

$pb^2 = 392.79$

$\alpha_{R_{max}} = 0.26$;

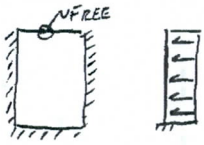
$\alpha_{M_{x(+)}} = 0.02$; $\alpha_{M_{x(-)}} = 0.009$

$\alpha_{M_{y(+)}} = 0.02$; $\alpha_{M_{y(-)}} = 0.006$

$V_{MAX} = 0.26(1.06)(19.25) = 5.3^k$

$M_{x(+)}, M_{y(+)} = 0.02(1.06)(19.25)^2 = 7.86^{k\text{-}ft}$; $M_{x(-)} = -3.53^{k\text{-}ft}$; $M_{y(-)} = -2.36^{k\text{-}ft}$

FIG. 1:



$p = 0.11$ ksf

$pb^2 = 40.76$

$\alpha_R = 0.38$;

$\alpha_{M_{x(+)}} = 0.04$; $\alpha_{M_{x(-)}} = -0.02$

$\alpha_{M_{y(+)}} = 0.02$; $\alpha_{M_{y(-)}} = -0.008$

$V_{MAX} = (0.11)(19.25)(0.38) = 0.8^k$

$M_{x(+)} = 1.63^{k\text{-}ft}$ $M_{x(-)}, M_{y(+)} = (-)\,0.82^{k\text{-}ft}$ $M_{y(-)} = -0.33^{k\text{-}ft}$

TOTAL FF LOADS

		SERVICE	STRENGTH 1
V:		$5.3 + 0.8 = 6.1^k$	$1.5(5.3) + 1.75(0.8) = 9.35^k$
M_x:	(+)	$7.86 + 1.63 = 9.49^k$	$1.5(7.86) + 1.75(1.63) = 14.6^{k\text{-}ft}$
	(-)	$-3.53 - 0.82 = -4.35^{k\text{-}ft}$	$1.5(-3.53) + 1.75(-0.82) = -6.73^{k\text{-}ft}$
M_y:	(+)	$7.86 + 0.82 = 8.68^{k\text{-}ft}$	$1.5(7.86) + 1.75(0.82) = 13.2^{k\text{-}ft}$
	(-)	$-2.36 - 0.33 = -2.69^{k\text{-}ft}$	$-1.5(2.36) + 1.75(0.33) = -4.12^{k\text{-}ft}$

project: LAFAYETTE INTERCEPTOR DRAIN & OUTLET DESIGN

subject STRUCT. #2 LOADS

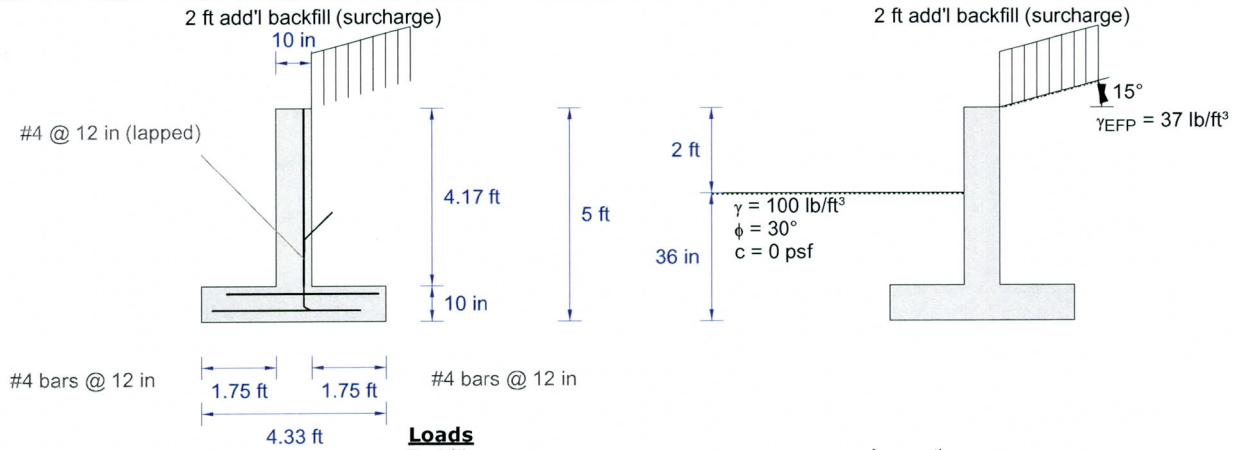
drawn by: RS date: 11/27 project no.: 010-2312 sheet 1 of 1

Katrina Marx
Olsson Associates

Lafayette - Struct. #2 Retaining Wall

Retaining wall to run along the back side of structure #2, drainage inlet.

Code: IBC 2003



Wall

General

Burial Depth	3 ft

Material

Rebar Fy	60 ksi
Concrete F'c	3 ksi
Unit Weight	150 lb/ft³

Footing

Footing Thickness	10 in
Heel Length	1.75 ft
Toe Length	1.75 ft
Heel Bar Size	#4
Heel Bar Spacing	12 in
Hook Heel Bars Downward	No
Heel Bar Ld	2 ft
Heel Bar Cover	2 in
Toe Bars Hook Into Stem	No
Toe Bar Size	#4
Toe Bar Spacing	12 in
Toe Bar Ld	2 ft
Toe Bar Cover	3 in

Key

Has Key	No

General

Stem Type	Single / Tapered
Bars Developed @ Top	No
Has Lateral Support (Restrained W	No
Extension Above Backfill	0 ft

Geometry

Stem Top Thickness	10 in
Tapered	No
Bar Cover	2 in

Reinforcement

Dowel Bar Size	#4
Dowel Bar Spacing	12 in
Bars are Centered	No
Dowel Bar Embedment	Hook into Heel
Has Lapped Bars	Yes
Lapped Bar Size	#4
Bar Lap Length	1.75 ft
Cutoff Alternate Bars	No

Loads

Backfill

Retained Height	2 ft
Slope	15°
Gamma (weight)	114.6 lb/ft³
Use Equiv. Fluid Pressure (EFP)	Yes
Equiv. Fluid Density	37 lb/ft³
Has Water in Backfill	No

Passive Pressure @ Toe

Calculation Method	Rankine
Phi (friction angle)	30°
Cohesion	0 psf
Gamma (weight)	100 lb/ft³
Apply Only to Key	No
Overburden Depth To Ignore	1 ft

Surcharge (Uniform)

Surcharge Type	Add'l Depth
Surcharge Depth	2 ft

Surcharge (Line/Strip)

Type	None

Axial Load

Apply Axial Load On Stem	No

Lateral Load

Apply Lateral Pressure To Stem	No

Seismic Loading

Has Backfill Seismic Load	No

Assumptions

Restrained Against Sliding	No
Neglect Bearing @ Heel	Yes
Use Vert. Comp. for OT	No
Use Vert. Comp. for Sliding	No
Use Vert. Comp. for Bearing	Yes
Use Surcharge for Sliding & OT	Yes
Use Surcharge for Bearing	Yes
Neglect soil over toe	No
Neglect Backfill Wt. for Coulomb	No
Factor Soil Wt as Dead	Yes
Use Passive Force for OT	Yes
Assume Pressure to Top	Yes

Geotechnical

Friction Coefficent	0.36
Wall Friction Angle	25°

Stability Criteria

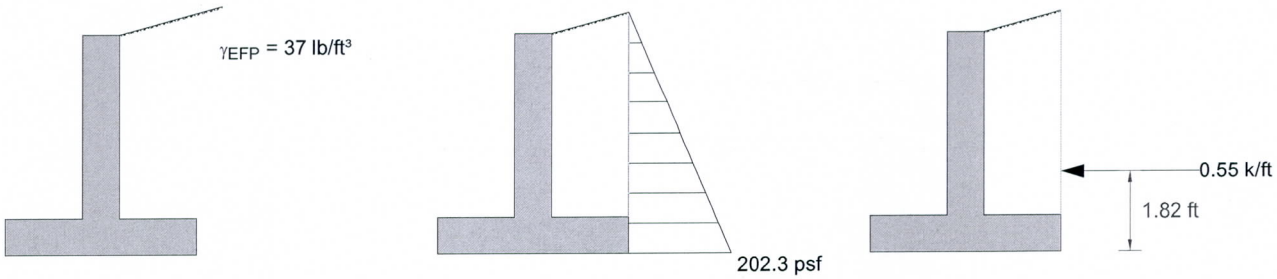
Required F.S. for Overturning	1.50
Required F.S. for Sliding	1.50
Allowable Bearing Pressure	3000 psf
Req'd Bearing Location	Middle third

Load Combinations Checked

	Stem Base Mu:	Stem Pos Mu:	Stem Base Vu:	Heel Mu:	Heel Vu:	Toe Mu:	Toe Vu:
1.4D	0 ft·k/ft	0 ft·k/ft	0 k/ft	0 ft·k/ft	0.13 ft·k/ft	0 ft·k/ft	0.08 ft·k/ft
1.2D + 1.6L + 1.6H	1.74 ft·k/ft	0 ft·k/ft	1.01 k/ft	1.73 ft·k/ft	0.16 ft·k/ft	1.4 ft·k/ft	0.09 ft·k/ft
1.2D + 0.5L	0.32 ft·k/ft	0 ft·k/ft	0.15 k/ft	0.32 ft·k/ft	0.13 ft·k/ft	0.32 ft·k/ft	0.08 ft·k/ft
0.9D + 1.6H	0.71 ft·k/ft	0 ft·k/ft	0.51 k/ft	0.71 ft·k/ft	0.08 ft·k/ft	0.71 ft·k/ft	0.05 ft·k/ft

Force Calculations

Backfill Pressure



Pressure calculated via equivalent fluid pressure method.

$\sigma = H\gamma_{EFP} = (5.47\text{ ft})(37\text{ lb/ft}^3) = 202.3\text{ psf}$

$P = \frac{1}{2}H\sigma = \frac{1}{2}(5.47\text{ ft})(202.3\text{ psf}) = 0.55\text{ k/ft}$ Location $= \frac{H}{3} = \frac{5.47\text{ ft}}{3} = 1.82\text{ ft}$

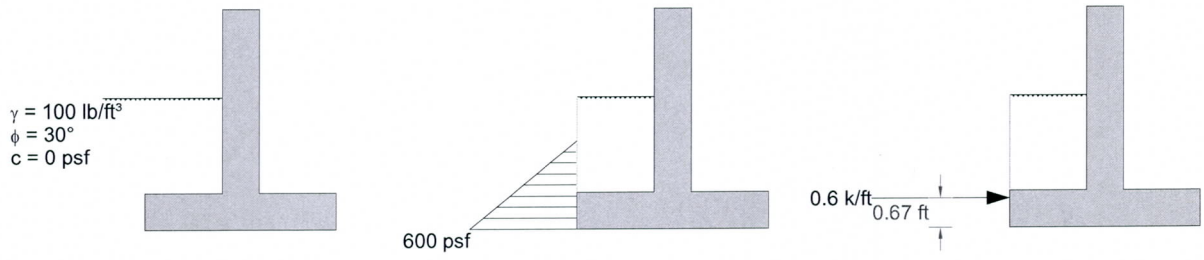
Surcharge:

$K_a = \frac{EFP}{\gamma} = \frac{37\text{ lb/ft}^3}{114.6\text{ lb/ft}^3} = 0.32$

$\sigma_s = K_a\gamma H_s = 0.32(114.6\text{ lb/ft}^3)(2\text{ ft}) = 74\text{ psf}$

$P_s = H\sigma_s = (5.47\text{ ft})(74\text{ psf}) = 0.4\text{ k/ft}$ Location $= t_f + \frac{1}{2}H = (10\text{ in}) + \frac{1}{2}(5.47\text{ ft}) = 2.73\text{ ft}$

Passive Pressure @ Toe



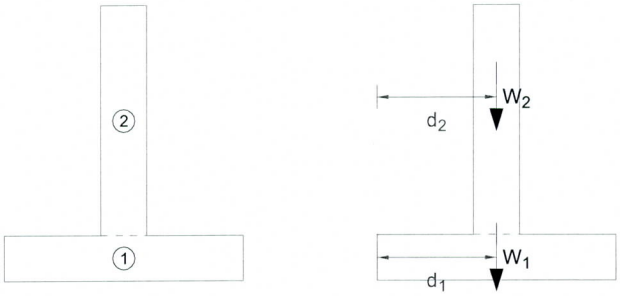
$K_p = \tan^2\left[45° + \frac{\phi}{2}\right] = \tan^2\left[45° + \frac{30°}{2}\right] = 3.00$

$\sigma_p = \gamma d_b K_p + 2c*\text{sqrt}(K_p) = (100\text{ lb/ft}^3)(2\text{ ft})\,3.00 + 2(0\text{ psf})*\text{sqrt}(3.00) = 600\text{ psf}$

$P_p = \frac{1}{2}(H_{press})\sigma_p = \frac{1}{2}(2\text{ ft})(600\text{ psf}) = 0.6\text{ k/ft}$ Location $= \frac{H_{press}}{3} - H_{key} = \frac{2\text{ ft}}{3} - 0\text{ ft} = 0.67\text{ ft}$

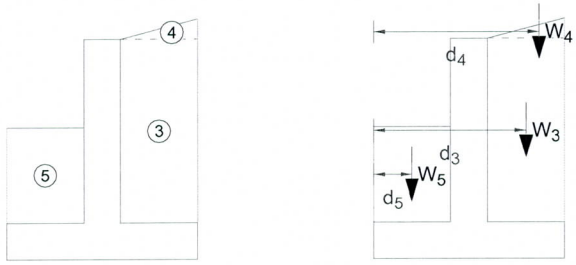
Force Calculations

Wall Weights



$W_1 = \gamma_1 A_1 = (150\ lb/ft^3)(3.61\ ft^2) = 0.54\ k/ft$
$W_2 = \gamma_2 A_2 = (150\ lb/ft^3)(3.47\ ft^2) = 0.52\ k/ft$
$d_1 = 2.17\ ft$
$d_2 = 2.17\ ft$

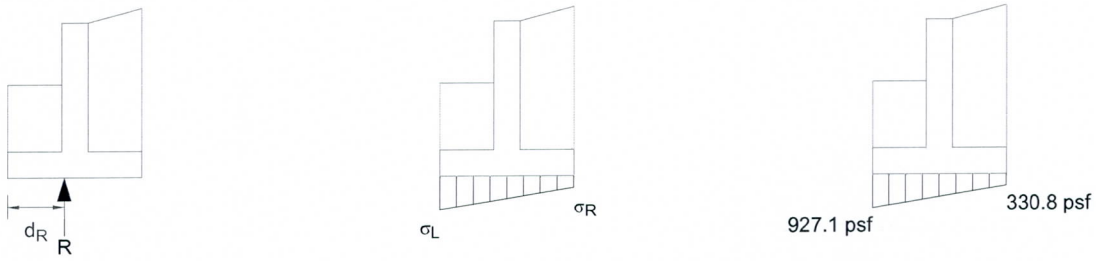
Backfill Weights



$W_3 = \gamma_3 A_3 = (114.6\ lb/ft^3)(7.29\ ft^2) = 0.84\ k/ft$
$W_4 = \gamma_4 A_4 = (114.6\ lb/ft^3)(0.41\ ft^2) = 0.05\ k/ft$
$W_5 = \gamma_5 A_5 = (100\ lb/ft^3)(3.79\ ft^2) = 0.38\ k/ft$
$d_3 = 3.46\ ft$
$d_4 = 3.75\ ft$
$d_5 = 0.88\ ft$

Force Calculations

Bearing Pressure



$$R = W_1 + W_2 + W_3 + W_4 + W_5 + P_{av} + P_{sur}$$
$$= 0.54\text{ k/ft} + 0.52\text{ k/ft} + 0.84\text{ k/ft} + 0.05\text{ k/ft} + 0.38\text{ k/ft} + 0\text{ k/ft} + 0.4\text{ k/ft}$$
$$= 2.73\text{ k/ft} \qquad (85.3\%\text{ dead, }14.7\%\text{ live, }0.0\%\text{ earth})$$

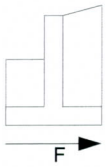
$$M = W_1d_1 + W_2d_2 + W_3d_3 + W_4d_4 + W_5d_5 + P_{av}b_f - P_{ah}\frac{H}{3} - P_{sur,h}d_{sur,h} + P_{sur,v}d_{sur,v}$$
$$= (2.17\text{ ft})(0.54\text{ k/ft}) + (2.17\text{ ft})(0.52\text{ k/ft}) + (3.46\text{ ft})(0.84\text{ k/ft}) + (3.75\text{ ft})(0.05\text{ k/ft}) + (0.88\text{ ft})(0.38\text{ k/ft})$$
$$+ (0\text{ k/ft})(4.33\text{ ft}) - (0.55\text{ k/ft})\frac{5.47\text{ ft}}{3} - (0.4\text{ k/ft})\,2.73\text{ ft} + (0.4\text{ k/ft})(3.46\text{ ft})$$
$$= 4.97\text{ ft·k/ft}$$

$$d_R = \frac{M}{R} = \frac{4.97\text{ ft·k/ft}}{2.73\text{ k/ft}} = 1.82\text{ ft}$$

$$\sigma_L = \frac{R}{L}\left[1 + 3\left(1 - 2\frac{d_R}{L}\right)\right] = \frac{2.73\text{ k/ft}}{4.33\text{ ft}}\left[1 + 3\left(1 - 2\frac{1.82\text{ ft}}{4.33\text{ ft}}\right)\right] = 927.1\text{ psf}$$

$$\sigma_R = \frac{R}{L}\left[1 - 3\left(1 - 2\frac{d_R}{L}\right)\right] = \frac{2.73\text{ k/ft}}{4.33\text{ ft}}\left[1 - 3\left(1 - 2\frac{1.82\text{ ft}}{4.33\text{ ft}}\right)\right] = 330.8\text{ psf}$$

Friction Force



$F = \mu R = (0.36)(2.73\text{ k/ft}) = 0.98\text{ k/ft}$

Note: Bearing resultant used here was decreased by 0 k/ft to remove vertical backfill component effect. (prevent vertical backfill component from contributing to sliding resistance)

Stability Checks

Overturning Check

Overturning Moments

	Force	Distance	Moment
Backfill pressure	0.55 k/ft	1.82 ft	1.01 ft·k/ft
Surcharge (resulting lateral)	0.4 k/ft	2.73 ft	1.11 ft·k/ft
		Total:	2.12 ft·k/ft

Resisting Moments

	Force	Distance	Moment
W1 (footing)	0.54 k/ft	2.17 ft	1.17 ft·k/ft
W2 (stem)	0.52 k/ft	2.17 ft	1.13 ft·k/ft
W3 (soil)	0.84 k/ft	3.46 ft	2.89 ft·k/ft
W4 (soil)	0.05 k/ft	3.75 ft	0.18 ft·k/ft
W5 (soil)	0.38 k/ft	0.88 ft	0.33 ft·k/ft
Passive pressure @ toe	0.6 k/ft	0.67 ft	0.4 ft·k/ft
Surcharge (applied vertical)	0.4 k/ft	3.46 ft	1.39 ft·k/ft
		Total:	7.49 ft·k/ft

$$\text{F.S.} = \frac{\text{RM}}{\text{OTM}} = \frac{7.49 \text{ ft·k/ft}}{2.12 \text{ ft·k/ft}} = 3.540 \text{ (OK)}$$

Sliding Check

Sliding Force(s)

Backfill lateral pressure	0.55 k/ft
Surcharge	0.4 k/ft
Total:	0.96 k/ft

Resisting Force(s)

Passive pressure @ toe	0.6 k/ft
Friction	0.98 k/ft
Total:	1.58 k/ft

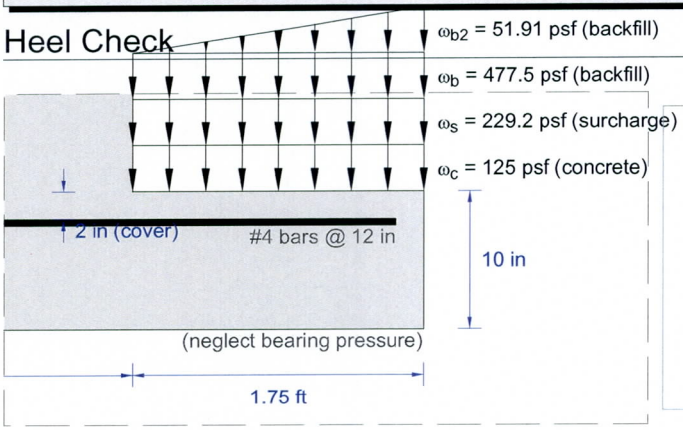
$$\text{F.S.} = \frac{\text{RF}}{\text{SF}} = \frac{1.58 \text{ k/ft}}{0.96 \text{ k/ft}} = 1.650 \text{ (OK)}$$

Bearing Capacity Check

Max bearing pressure < allowable (927.1 psf < 3000 psf), bearing OK

Resultant is within middle third (OK)

Heel Check



Min Reinforcement Check

Not needed: capacity 1/3 greater than req'd: $\frac{\phi M_n}{M_u} = \frac{6.8 \text{ ft·k/ft}}{1.73 \text{ ft·k/ft}} = 3.925$ ✓

Design Forces

Controlling combination: 1.2D + 1.6L + 1.6H

$M_u = 1.20\frac{1}{2}\omega_c L^2 + 1.20\frac{1}{2}\omega_b L^2 + 1.20\frac{1}{3}\omega_{b2} L^2 + 1.60\frac{1}{2}\omega_s L^2 = 1.20\frac{1}{2}(125 \text{ psf})(1.75 \text{ ft})^2 + 1.20\frac{1}{2}(477.5 \text{ psf})(1.75 \text{ ft})^2 + 1.20\frac{1}{3}(51.91 \text{ psf})(1.75 \text{ ft})^2 + 1.60\frac{1}{2}(229.2$

M_u @ stem base = 1.74 ft·k/ft > 1.73 ft·k/ft (does not control for heel)

$V_u = 1.20\omega_c L + 1.20\omega_b L + \frac{1}{2}1.20\omega_{b2} L + 1.60\omega_s L = 1.20(125 \text{ psf})(1.75 \text{ ft}) + 1.20(477.5 \text{ psf})(1.75 \text{ ft}) + \frac{1}{2}1.20(51.91 \text{ psf})(1.75 \text{ ft}) + 1.60(229.2 \text{ psf})(1.75 \text{ ft}) =$

Shear Check

$\phi V_n = \phi[2\sqrt{f'_c}]\, d = (0.75)[2\sqrt{3000 \text{ psi}}](7.75 \text{ in}) = 7.64 \text{ k/ft}$ $\phi V_n > V_u$ ✓

Min Tensile Strain Check

Extreme tensile strain = 0.0474 > 0.004 ✓

Flexure Check

$\phi M_n = \phi A_s F_y (d - a/2) = 0.90(0.2 \text{ in}^2/\text{ft})(60 \text{ ksi})[7.75 \text{ in} - (0.39 \text{ in})/2] = 6.8 \text{ ft·k/ft}$ $\phi M_n > M_u$ ✓

Heel Check

Development

$$\frac{L_d}{d_b} = \frac{3}{40}\frac{f_y}{\text{sqrt}(f'_c)}\frac{\alpha\beta\gamma\lambda}{\left[\frac{c + K_{tr}}{d_b}\right]} = \frac{3}{40}\frac{60000\text{ psi}}{\text{sqrt}(3000\text{ psi})}\frac{(1.0)(1.0)(0.8)(1.0)}{2.50} = 26.29$$

where: $\frac{c + K_{tr}}{d_b} = \frac{2.25\text{ in} + 0}{0.5\text{ in}} = 4.50 > 2.5 \therefore \text{use } 2.5$

where: $\alpha = 1.0$ (≤12" fresh concrete below) $\beta = 1.0$ (bars not coated) $\gamma = 0.8$ (bar size ≤ #6) $\lambda = 1.0$ (normal wt concrete)

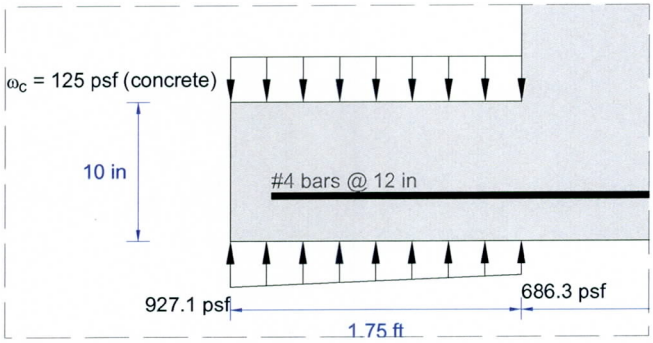
$K_{tr} = 0$ (no transverse reinforcement) $c = 2.25$ in (lesser of bar ctr to outer edge or half of ctr- to ctr spacing)

$$L_d = \frac{L_d}{d_b} d_b = (26.29)(0.5\text{ in}) = 13.15\text{ in}$$

Excess reinforcement reduction of 12.2.5: $25.5\%L_d = 25.5\%(13.15\text{ in}) = 3.35$ in

Required $L_d = 3.35$ in ≤ Actual L_d (24 in) ✓

Toe Check



Min Reinforcement Check

Not needed: capacity 1/3 greater than req'd: $\frac{\phi M_n}{M_u} = \frac{5.9 \text{ ft·k/ft}}{1.4 \text{ ft·k/ft}} = 4.205$ ✓

Design Forces

Controlling combination: 1.2D + 1.6L + 1.6H

Bearing load factor: take weighted average of factors from all sources based on contribution(see bearing calcs) :

85.3%(1.20 - Dead) + 14.7%(1.60 - Live) + 0.0%(1.60 - Earth) = 1.26

$$M_u = -1.20\left[\frac{1}{2}\omega_c L^2\right] + 1.26\left[\frac{1}{2}\omega_{br}L^2 + \frac{1}{3}(\omega_{bl} - \omega_{br})L^2\right]$$
$$= -1.20\left[\frac{1}{2}(125 \text{ psf})(1.75 \text{ ft})^2\right] + 1.26\left[\frac{1}{2}(686.3 \text{ psf})(1.75 \text{ ft})^2 + \frac{1}{3}(927.1 \text{ psf} - 686.3 \text{ psf})(1.75 \text{ ft})^2\right]$$
$$= 1.4 \text{ ft·k/ft}$$

M_u @ stem base = 1.74 ft·k/ft > 1.4 ft·k/ft (does not control for toe)

$V_u = -1.20\omega_c L + 1.26[\omega_{br}L + (\omega_{bl} - \omega_{br})L/2] = -1.20(125 \text{ psf})(1.19 \text{ ft}) + 1.26[(763.7 \text{ psf})(1.19 \text{ ft}) + (927.1 \text{ psf} - 763.7 \text{ psf})(1.19 \text{ ft})/2] = 1.09 \text{ k/ft}$

(taken @ 'd' from the base of the stem: d= 6.75 in, bearing pressure @ d= 763.7 psf)

Shear Check

$\phi V_n = \phi[2\sqrt{f'_c}]d = (0.75)[2\sqrt{3000 \text{ psi}}](6.75 \text{ in}) = 6.65 \text{ k/ft}$ $\phi V_n > V_u$ ✓

Min Tensile Strain Check

Extreme tensile strain = 0.0409 > 0.004 ✓

Flexure Check

$\phi M_n = \phi A_s F_y (d - a/2) = 0.90(0.2 \text{ in}^2/\text{ft})(60 \text{ ksi})[6.75 \text{ in} - (0.39 \text{ in})/2] = 5.9 \text{ ft·k/ft}$ $\phi M_n > M_u$ ✓

Toe Check

Development

$$\frac{L_d}{d_b} = \frac{3}{40}\frac{f_y}{\text{sqrt}(f'_c)}\frac{\alpha\beta\gamma\lambda}{\left[\frac{c + K_{tr}}{d_b}\right]} = \frac{3}{40}\frac{60000\text{ psi}}{\text{sqrt}(3000\text{ psi})}\frac{(1.0)(1.0)(0.8)(1.0)}{2.50} = 26.29$$

where: $\frac{c + K_{tr}}{d_b} = \frac{3.25\text{ in} + 0}{0.5\text{ in}} = 6.50 > 2.5 \therefore \text{use } 2.5$

where: $\alpha = 1.0$ (≤12" fresh concrete below) $\beta = 1.0$ (bars not coated) $\gamma = 0.8$ (bar size ≤ #6) $\lambda = 1.0$ (normal wt concrete)

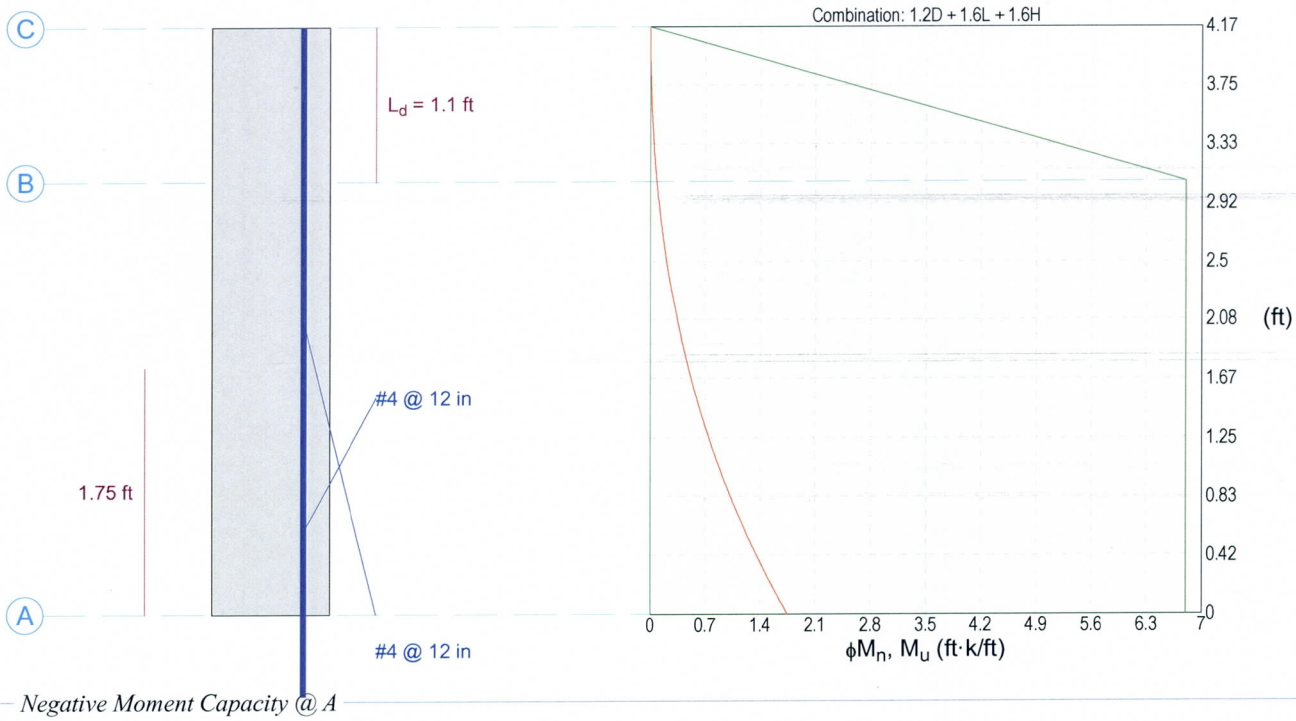
$K_{tr} = 0$ (no transverse reinforcement) $c = 3.25$ in (lesser of bar ctr to outer edge or half of ctr- to ctr spacing)

$L_d = \frac{L_d}{d_b} d_b = (26.29)(0.5\text{ in}) = 13.15\text{ in}$

Excess reinforcement reduction of 12.2.5: $23.8\% L_d = 23.8\%(13.15\text{ in}) = 3.13\text{ in}$

Required $L_d = 3.13$ in ≤ Actual L_d (24 in) ✓

Stem Check



Negative Moment Capacity @ A

$$\frac{A_s}{b} = \frac{0.2\ in^2}{6\ in} = 0.2\ in^2/ft$$

$$d = t_h - cover - \frac{d_b}{2} = 10\ in - 2\ in - \frac{0.5\ in}{2} = 7.75\ in$$

$$\phi M_n = \phi A_s F_y (d - a/2) = 0.90 (0.2\ in^2/ft)(60\ ksi)[7.75\ in - (0.39\ in)/2] = 6.8\ ft{\cdot}k/ft$$

Negative Moment Capacity @ B

$$\frac{A_s}{b} = \frac{0.2\ in^2}{12\ in} = 0.2\ in^2/ft$$

$$d = t_h - cover - \frac{d_b}{2} = 10\ in - 2\ in - \frac{0.5\ in}{2} = 7.75\ in$$

$$\phi M_n = \phi A_s F_y (d - a/2) = 0.90 (0.2\ in^2/ft)(60\ ksi)[7.75\ in - (0.39\ in)/2] = 6.8\ ft{\cdot}k/ft$$

Stem Check

Development length from C to B (#4 @ 12 in)

$$\frac{L_d}{d_b} = \frac{3}{40}\frac{f_y}{\text{sqrt}(f'_c)}\frac{\alpha\beta\gamma\lambda}{\left[\frac{c+K_{tr}}{d_b}\right]} = \frac{3}{40}\frac{60000\text{ psi}}{\text{sqrt}(3000\text{ psi})}\frac{(1.0)(1.0)(0.8)(1.0)}{2.50} = 26.29$$

where: $\frac{c+K_{tr}}{d_b} = \frac{2.25\text{ in}+0}{0.5\text{ in}} = 4.50 > 2.5 \therefore$ use 2.5

where: α = 1.0 (≤12" fresh concrete below) β = 1.0 (bars not coated) γ = 0.8 (bar size ≤ #6) λ = 1.0 (normal wt concrete)

K_{tr} = 0 (no transverse reinforcement) c = 2.25 in (lesser of bar ctr to outer edge or half of ctr- to ctr spacing)

$$L_d = \frac{L_d}{d_b} d_b = (26.29)(0.5\text{ in}) = 13.15\text{ in}$$

Shear checks

@ base: V_u = 1.01 k/ft $\phi V_n = \phi\,[2\text{ sqrt}(f'_c)]\,d = (0.75)\,[2\text{ sqrt}(3000\text{ psi})]\,(7.75\text{ in}) = 7.64$ k/ft $\phi V_n > V_u$ ✓

@ 50 in: V_u = 0 k/ft $\phi V_n = \phi\,[2\text{ sqrt}(f'_c)]\,d = (0.75)\,[2\text{ sqrt}(3000\text{ psi})]\,(7.75\text{ in}) = 7.64$ k/ft $\phi V_n > V_u$ ✓

Bar splices

#4 bars @ 12 in lapped with #4 bars @ 12 in from 0 in to 21 in

Bar sizes are #11 or smaller ✓

Class B splice: req'd lap = 1.3Ld = 1.3 (13.15 in) = 17.09 in

Actual lap length = 21 in ✓

Maximum transverse spacing = lesser of 6" and 1/5 req'd lap = 3.42 in

Actual transverse spacing = 0 in ✓

Development of bars into footing

#4 bars @ 12 in: Developed by 90° hook

$L_{dh} = (0.02\beta\lambda f_y/\text{sqrt}(f'_c))\,d_b = (0.02\,(1.0)\,(1.0)\,(60\text{ ksi})/\text{sqrt}(3\text{ ksi}))\,(0.5\text{ in}) = 10.95$ in

$L_{dh} = 0.7\,(10.95\text{ in}) = 7.67$ in (reduction allowed by ACI 12.5.3a)

Excess reinforcement reduction of 12.5.3(d): $25.6\%L_d = 25.6\%(7.67\text{ in}) = 1.96$ in

Actual L_{dh} (7 in) >= required L_{dh} (1.96 in) ✓

Minimum extension = $12d_b = 12\,(0.5\text{ in}) = 6\text{ in} \le 6\text{ in}$ (actual extension) ✓

Minimum inside bend diameter = $6d_b = 6\,(0.5\text{ in}) = 3\text{ in} \le 4\text{ in}$ (actual diameter) ✓

Stem Check

Check Minimum Steel

At 0 in:

Check not needed: capacity 1/3 greater than req'd: $\frac{\phi M_n}{M_u} = \frac{6.8 \text{ ft·k/ft}}{1.74 \text{ ft·k/ft}} = 3.904$ ✓

Check Min Tensile Strain

At 0 in:

Extreme tensile strain = 0.0474 > 0.004 ✓

At 21 in:

Extreme tensile strain = 0.0474 > 0.004 ✓

OLSSON ASSOCIATES	CLIENT NAME: Flood Control District of Maricopa County (FCDMC)	NAME: RDB	DATE: 3/23/12
	PROJECT NAME: Lafayette Interceptor Drain and Outlet Design	PROJECT NO: 010-2312	REV: 0
STANDARD CALCULATION SHEET	SUBJECT: Underground Structures		

Structure #3, Drop Junction w/ 102" Outlet:

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Project: Lafayette Interceptor Drain and Outlet Design | OA Project Number: 010-2312 | Date: 12/5/2011

Subject: Structure No. 3 - Junction Box | Designed By: Ross Barron | Checked By: SAH

REINFORCED CONCRETE BOX STRUCTURE DESIGN

Lafayette Interceptor Drain and Outlet Design
Structure No. 3 - Junction Box

DESIGN NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications, 4th Edition. Fixed box design is based on a per foot of length basis. Live load anaylsis is based on the calculated effective height of fill, D_E. Member moment and shear was determined through use of RISA 3-Dimensional finite analysis.

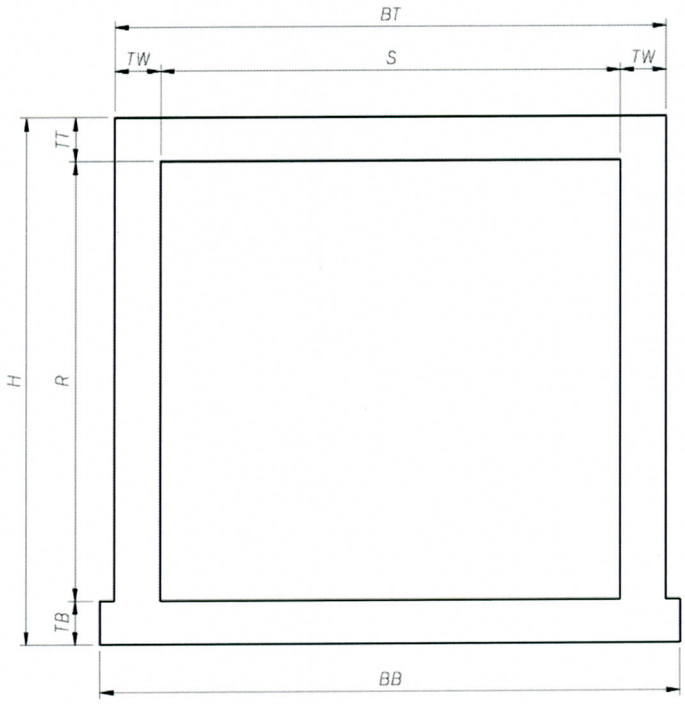
DESIGN PARAMETERS

BOX DIMENSIONS

Design Span	S	12.25	ft
Rise	R	16.17	ft
Top Slab Thickness	TT	12.00	in
Wall Thickness	TW	12.00	in
Bot. Slab Thickness	TB	14.00	in
Footing Extension	d	6.00	in.

Top Slab Width	BT	14.25	ft
Bot. Slab Width	BB	15.25	ft
Total Height	H	18.33	ft

Proposed Ground Elevation		1265.26	
Outlet Invert Elevation		1238.82	
Fill Height (ground to bot. of top slab)	h_f	10.27	ft



MATERIALS

Concrete Strength	f'_c	4.0	ksi
Conc. Mod. of Elast.	E_c	3,834	ksi
Stress Block Coeff.	β_1	0.85	
Rebar Strength	f_y	60	ksi
Steel Mod. of Elast.	E_s	29,000	ksi
Modular Ratio	n	7.6	

SOIL DATA

Description: At-Rest - Drained - Cohesionless Granular

Vertical Soil Wt.	γ_s	120	pcf
Lateral Eq. Fluid Density	γ_{eq}	55	pcf

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LOADS

DEAD LOADS

Component	No.	Height *(ft)*	Length *(ft)*	Width *(ft)*	Area *(ft^2)*	Weight *(pcf)*	Weight *(k/ft)*
Top Slab	1	1.000	1.000	14.250		150	2.138
Walls	2	16.167	1.000	1.000		150	4.850
Bottom Slab	1	1.167	1.000	15.250		150	2.669
Concrete Fill	1	0.000	1.000	12.250		100.0	0.000
Additional Wt.							0.000
						Total	**9.656** k/ft

LIVE LOADS

For fill > 2' Art. 3.6.1.2.6 is utilized; traffic travels parallel to the CBC span. Per Art. 4.6.2.10.2, the culvert shall be analyzed for a single loaded lane with the single lane multiple presence factor. The dynamic load allowance for culverts and buried structures is determined per Art. 3.6.2.2. The length of tire contact parallel to span, as specified in Art. 3.6.1.2.5 is 20"; width is 10". Although the earth fill depth is more than 8'-0", it does not exceed the effective span length, so Live Load effects shall be considered.

Wheel Load - Traffic Parallel to Span

TotalSpan Length for Analysis (CL wall to CL wall)	S	13.25	ft		
Minimum depth of Earth Cover	D_E	9.27	ft		
Wheel Load	P	16.0	k		
Impact Factor	IM	0	%	(3.6.2.2-1)	$IM = 33(1.0 - 0.125D_E) > 0\%$
Longitudinal Distribution Width	E_1	10.10	ft	(3.6.1.2.6)	$E_1 = 0.83 + 1.0D_E$
Transverse Distribution Width	E_2	10.94	ft	(3.6.1.2.6)	$E_2 = 1.67 + 1.0D_E$
Multiple Presence Factor	MPF	1.20			
Top Slab Axle Distribution (for RISA model)	E	10.10	ft		
Distributed Live Load to Top Slab (w/ IM & MPF) Distributed over Distance of E	w_T	0.174	k/ft		$w_T = 1.2 * \left(1 + \frac{IM}{100}\right) * \frac{P}{(E_2)}$
Bottom Slab Distributed Live Load (w/ IM & MPF)	w_B	0.13	k/ft		$w_B = \frac{w_T * E_1}{S}$

SOIL LOADS

Vertical Soil Loads

Soil Load	w_{EV}	1.113	ksf	$w_{EV} = D_E * \gamma_S$

Lateral Soil Loads

Earth Press. @ Top	$p_{EH@Top}$	0.510	k/ft	$p_{EH@Top} = D_E * \gamma_{EQ}$
Earth Press. @ Bot.	$p_{EH@Bot.}$	1.518	k/ft	$p_{EH@Bot} = (D_E + H) * \gamma_{EQ}$

Live Load Surcharge - Horz. Loads Only - 3.11.6.4.1

Abutment Height		27.607	ft	
Interpolated Soil Height	h_s	2.00	ft	
Horz. Pressure	Δ_p	110	psf	$\Delta_p = h_{eq} * \gamma_s$

Table 3.11.6.4-1 Equivalent Height of Soil for Vehicular Loading on Abutments Perpendicular to Traffic.

Abutment Height (ft.)	h_{eq} (ft.)
5.0	4.0
10.0	3.0
≥20.0	2.0

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Project:	Lafayette Interceptor Drain and Outlet Design	**OA Project Number:**	010-2312	**Date:**	12/5/2011
Subject:	Structure No. 3 - Junction Box	**Designed By:**	Ross Barron	**Checked By:**	SAH

STABILITY

For the live load bearing pressure, the wheel load applied to the top slab is distributed over the bearing area without an increase due to impact. Forces resisting buoyancy include the box self weight and soil weight above the box. No groundwater was considered as part of the design. Stability calculations are based on a one foot strip width.

BEARING CAPACITY (SERVICE LOADS)

Bearing Area	A_q	15.25	ft^2
Structural DL and Vert. Soil	q_{DL}	706	psf
LL Bearing Pressure	q_{LL}	0	psf
Factored Bearing Pressure	q	847	psf
All. Bearing Pressue	q_{all}	4,000	psf
Utilization Ratio	q/q_{all}	0.21	OK

BUOYANT FORCES

Depth to Bot. Slab	z	27.61	ft	
Depth to Groundwater	z_w	0.00	ft	
Buoyant Force	P_b	0.0	k	
Self Weight	P_w	9.7	k	
Factor of Safety	FS	N/A		OK > 1.1

TOP SLAB

DESIGN NOTES:

Designed as a fixed slab with the design span length being the distance from CL wall to CL wall. RISA 3-D is used to input joint coordinates, unreinforced concrete members of correct thicknesses, loads provided herein, and respective load factors. Structure self-weight calculations take place within RISA and are included in the output moments. Strength I combination governs for buried structures. For a rigid buried structure, 1.3 is used for vertical earth pressure load factor. Concrete shear strength is modified according to 5.14.5.3. Strength reduction factor for shear is taken as 0.85 for buried CIP concrete structures.

PARAMETERS

Slab Thickness	TT	12.00	in
Haunch Width (& Height)	W_H	1.00	ft

Member Loads for RISA Input (Service)

Soil Load	w_{EV}	1.113	k/ft
Distr. Live Load	w_{LL}	0.174	klf

SHEAR — Art. 5.14.5.3

Reduction Factor	Φ	0.90	
Width for Shear	b_v	12.00	in
Effective Depth	d_e	9.63	in
Conc. Shear Strength	V_c	14.6	k/ft
Reduced Nom. Cap.	ΦV_c	13.1	k/ft
Factored Ultimate Shear (RISA OUTPUT)	V_u	11.0	k/ft
Utilization Ratio	$V_u / \Phi V_c$	0.84	OK

Controlling Load Case: Strength 1 - Plate Shear

For Slabs with Earth FIll < 2'

5.8.3.3-3 $V_c = \left(0.0316\beta\sqrt{f'_c}\right)bd_e$

For Slabs with Earth FIll > 2'

5.14.5.3-1 $V_c = \left(0.0676\sqrt{f'_c} + 4.6\frac{A_S}{bd_e}\frac{V_u d_e}{M_u}\right)bd_e$

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Subject: Structure No. 3 - Junction Box | Designed By: Ross Barron | Checked By: SAH

FLEXURE (BOTTOM BARS) — Use #6 @ 12 in. Spa.

Parameters			
Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 6	
Spacing		12.0	in
Bar Diameter	d_b	0.75	in
Area of Steel	A_s	0.44	in²/ft
Steel Depth	d	9.63	in
Eq. Stress Depth	a	0.65	in
Neutral Axis Depth	c	0.00	in
Spacing Limit - Art 5.10.3			
Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.25	in
Max. Spacing	S_{max}	12.0	in
Development Length - Art 5.11.2.1			
Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	20	in

Controlling Load Case: Strength 1 - Plate Moment y

Strain Calculation			
Extr. Tensile Strain	ε_t	171.10	
Min. Reinforcement - Art 5.7.3.3.2			
1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	13.3	k·ft/ft
Min. Moment Capacity	M_{min}	13.3	k·ft/ft
Temp & Shrink - Art 5.10.8			
Min. Area of Steel	$A_{s,min}$	0.11	in²/ft/face
Crack Control - Art 5.7.3.4			
Service Moment	M_s	7.5	k·ft/ft
Service Stress in Reinf.	f_{ss}	21.5	ksi
Concrete Cover	d_c	2.38	
Clear Cover Factor	β_s	1.35	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	18.0	in
Moment Capacity - Art 5.7.3.2.1			
Factored Ultimate Load	M_u	10.0	k·ft/ft
Reduced Nom. Cap.	ΦM$_n$	18.4	k·ft/ft
Utilization Ratio	**M_u / ΦM$_n$**	**0.54**	**OK**

FLEXURE (TOP CORNER BARS) — Use #5 @ 6 in. Spa.

Parameters			
Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	2
Bar Size		# 5	
Spacing		6.0	in
Bar Diameter	d_b	0.63	in
Area of Steel	A_s	0.62	in²/ft
Steel Depth	d	9.69	in
Eq. Stress Depth	a	0.91	in
Neutral Axis Depth	c	0.00	in
Spacing Limit - Art 5.10.3			
Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	5.38	in
Max. Spacing	S_{max}	12.0	in
Development Length - Art 5.11.2.1			
Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	14	in

Controlling Load Case: Strength 1 - Plate Moment y

Strain Calculation			
Extr. Tensile Strain	ε_t	122.21	
Min. Reinforcement - Art 5.7.3.3.2			
1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	18.6	k·ft/ft
Min. Moment Capacity	M_{min}	18.6	k·ft/ft
Temp & Shrink - Art 5.10.8			
Min. Area of Steel	$A_{s,min}$	0.11	in²/ft/face
Crack Control - Art 5.7.3.4			
Service Moment	M_s	10.5	k·ft/ft
Service Stress in Reinf.	f_{ss}	21.3	ksi
Concrete Cover	d_c	2.31	
Clear Cover Factor	β_s	1.34	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	18.0	in
Moment Capacity - Art 5.7.3.2.1			
Factored Ultimate Load	M_u	14.0	k·ft/ft
Reduced Nom. Cap.	ΦM$_n$	25.8	k·ft/ft
Utilization Ratio	**M_u / ΦM$_n$**	**0.54**	**OK**

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WALLS

DESIGN NOTES:

Designed with a fixed connection to the top slab and a rigid connection to the bottom slab. Clear span length is used to calculate forces. Strength I combination governs for buried structures. For a rigid buried structure, a load factor of 1.35 is used for at-rest horizontal earth pressure. Maximum shear was determined through a RISA 3-D model, utilizing finite element analysis. Axial load is not taken into consideration.

PARAMETERS

Outer Wall Thickness	TW	12.00	in
Span Length	L	16.17	ft
Point of Contraflexure	x	2.70	ft

Member Loads for RISA Input (Service)

Earth Press. @ Top	p_{EH}	0.510	k/ft
Earth Press. @ Bot.	p_{EH}	1.518	k/ft
LL Surcharge	p_{LS}	0.110	k/ft

SHEAR — Art. 5.8.3.4.1

Reduction Factor	Φ	0.9	
Width for Shear	b_v	12.00	in
Steel Depth for Shear	d_v	9.63	in
Conc. Shear Strength	V_c	14.6	k/ft
	Art 5.8.3.3		
Factored Ultimate Load	V_u	12.7	k/ft
Reduced Nom. Cap.	ΦV_c	13.1	k/ft
Utilization Ratio	$V_u / \Phi V_c$	0.97	OK

Controlling Load Case: Strength 1 - Plate Shear

For Slabs with Earth FIll < 2'

5.8.3.3-3 $V_c = \left(0.0316\beta\sqrt{f'_c}\right)bd_e$

For Slabs with Earth FIll > 2'

5.14.5.3-1 $V_c = \left(0.0676\sqrt{f'_c} + 4.6\frac{A_S}{bd_e}\frac{V_u d_e}{M_u}\right)bd_e$

FLEXURE (Vertical Bars Inside Face) — Use #5 @ 12 in. Spa.

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 5	
Spacing		12.0	in
Bar Diameter	d_b	0.63	in
Area of Steel	A_s	0.31	in^2/ft
Steel Depth	d	9.69	in
Eq. Stress Depth	a	0.46	in
Neutral Axis Depth	c	0.00	in

Spacing Limit - Art 5.10.3

Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.38	in
Max. Spacing	S_{max}	12.0	in

Development Length - Art 5.11.2.1

Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	14	in

Controlling Load Case: Strength 1 - Plate Moment y

Strain Calculation

Extr. Tensile Strain	ε_t	244.43	

Min. Reinforcement - Art 5.7.3.3.2

1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	9.6	k·ft/ft
Min. Moment Capacity	M_{min}	9.6	k·ft/ft

Temp & Shrink - Art 5.10.8

Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$

Crack Control - Art 5.7.3.4

Service Moment	M_s	5.5	k·ft/ft
Service Stress in Reinf.	f_{ss}	22.2	ksi
Concrete Cover	d_c	2.31	
Clear Cover Factor	β_s	1.34	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	18.0	in

Moment Capacity - Art 5.7.3.2.1

Factored Ultimate Load	M_u	7.2	k·ft/ft
Reduced Nom. Cap.	ΦM_n	13.2	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.55	OK

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FLEXURE (BOTTOM CORNER BARS) — Use #6 @ 12 in. Spa.

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 6	
Spacing		12.0	in
Bar Diameter	d_b	0.75	in
Area of Steel	A_s	0.44	in^2/ft
Steel Depth	d	9.63	in
Eq. Stress Depth	a	0.65	in
Neutral Axis Depth	c	0.00	in

Spacing Limit - Art 5.10.3

Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.25	in
Max. Spacing	S_{max}	12.0	in

Development Length - Art 5.11.2.1

Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	20	in

Controlling Load Case: Strength 1 - Plate Moment y

Strain Calculation

Extr. Tensile Strain	ε_t	171.10	

Min. Reinforcement - Art 5.7.3.3.2

1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	18.2	k·ft/ft
Min. Moment Capacity	M_{min}	18.2	k·ft/ft

Temp & Shrink - Art 5.10.8

Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$

Crack Control - Art 5.7.3.4

Service Moment	M_s	10.5	k·ft/ft
Service Stress in Reinf.	f_{ss}	30.3	ksi
Concrete Cover	d_c	2.38	
Clear Cover Factor	β_s	1.35	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	12.4	in

Moment Capacity - Art 5.7.3.2.1

Factored Ultimate Load	M_u	14.0	k·ft/ft
Reduced Nom. Cap.	ΦM_n	18.4	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.76	OK

FLEXURE (Horizontal Neg. Moment) — Use #5 @ 8 in. Spa.

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 5	
Spacing		8.0	in
Bar Diameter	d_b	0.63	in
Area of Steel	A_s	0.47	in^2/ft
Steel Depth	d	9.69	in
Eq. Stress Depth	a	0.68	in
Neutral Axis Depth	c	0.00	in

Spacing Limit - Art 5.10.3

Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	7.38	in
Max. Spacing	S_{max}	12.0	in

Development Length - Art 5.11.2.1

Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	14	in

Controlling Load Case: Strength 1 - Plate Moment x

Strain Calculation

Extr. Tensile Strain	ε_t	162.95	

Min. Reinforcement - Art 5.7.3.3.2

1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	18.2	k·ft/ft
Min. Moment Capacity	M_{min}	18.2	k·ft/ft

Temp & Shrink - Art 5.10.8

Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$

Crack Control - Art 5.7.3.4

Service Moment	M_s	10.4	k·ft/ft
Service Stress in Reinf.	f_{ss}	28.2	ksi
Concrete Cover	d_c	2.31	
Clear Cover Factor	β_s	1.34	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	13.9	in

Moment Capacity - Art 5.7.3.2.1

Factored Ultimate Load	M_u	13.7	k·ft/ft
Reduced Nom. Cap.	ΦM_n	19.6	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.70	OK

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Subject: Structure No. 3 - Junction Box | Designed By: Ross Barron | Checked By: SAH

FOOTING SLAB

DESIGN NOTES:
Designed with rigid connections to the walls for flexure in the corners. The maximum moment and shear are taken from the RISA analysis. Loads are applied to the top slab and transfered into the footing.

PARAMETERS

Footing Thickness	TB	14.00	in

LOADS (Service)

Dead Load (structure)	w_{DL}	0.813	k/ft
Vertical Soil Load	w_{EV}	1.113	k/ft
Live Load	w_{LL}	0.132	k/ft

SHEAR — Art. 5.14.5.3

Reduction Factor	Φ	0.9	
Width for Shear	b_v	12.00	in
Steel Depth for Shear	d_v	10.75	in
Conc. Shear Strength	V_c	16.3	k/ft
	Art 5.8.3.3		
Factored Ultimate Load	V_u	12.8	k/ft
Reduced Nom. Cap.	ΦV_c	14.7	k/ft
Utilization Ratio	$V_u / \Phi V_c$	0.87	OK

Controlling Load Case: Strength 1 - LL @ Support

For Slabs with Earth FIll < 2'

5.8.3.3-3 $V_c = \left(0.0316\beta\sqrt{f'_c}\right)bd_e$

For Slabs with Earth FIll > 2'

5.14.5.3-1 $V_c = \left(0.0676\sqrt{f'_c} + 4.6\frac{A_S}{bd_e}\frac{V_u d_e}{M_u}\right)bd_e$

Project Name: Lafayette
Project Number: 010-2312
Analyst: RB
Date: 12/6/2011

Structure #3, Drop Junction

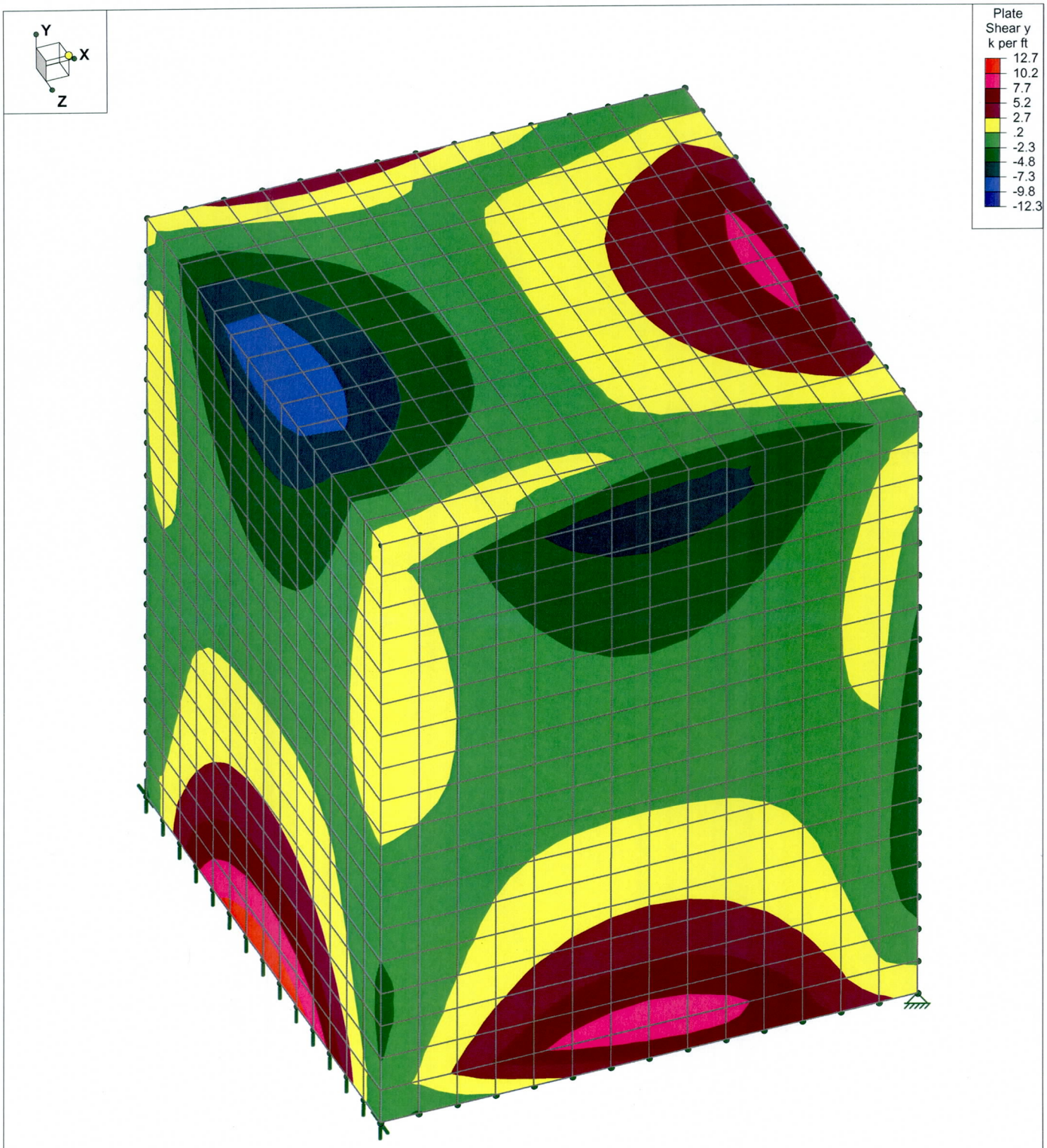
Summary

Concrete	49.0 yd³
Reinforcing	3,920.0 lb

*Reinforcing is estimated at 80 lbs./CY

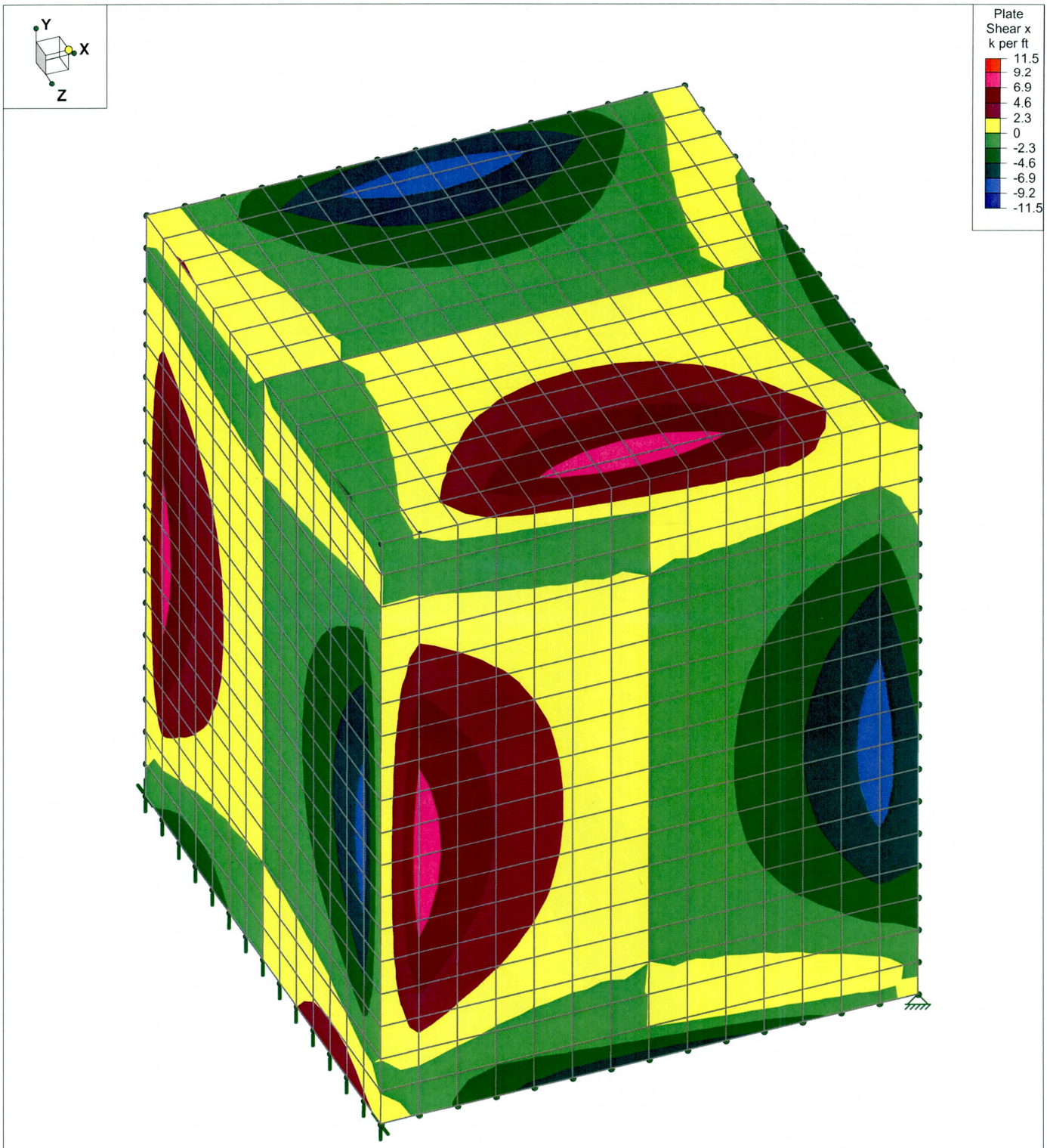
Concrete

	Total					49.0 yd³	
Location/Description	*Amount*	*Height*	*Length*	*Width*	*Area*	*Volume*	
Top Slab	1	1.00'	16.00'	14.25'		228 ft³	8.4 yd³
Walls	2	16.17'	16.00'	1.00'		517 ft³	19.2 yd³
	2	16.17'	12.25'	1.00'		396 ft³	14.7 yd³
Minus 102 "Pipe	-1		1.00'		82.52 ft²	-83 ft³	-3.1 yd³
Minus 78 "Pipe	-1		1.00'		51.32 ft²	-51 ft³	-1.9 yd³
Minus 84" RCP, skew	-1		1.00'		60.13 ft²	-60 ft³	-2.2 yd³
Footing	1	1.17'	16.833'	14.910'		293 ft³	10.8 yd³
fillet	2		14.910'		2.33 ft²	70 ft³	2.6 yd³
MH Base	1		1.000'		12.57 ft²	13 ft³	0.5 yd³



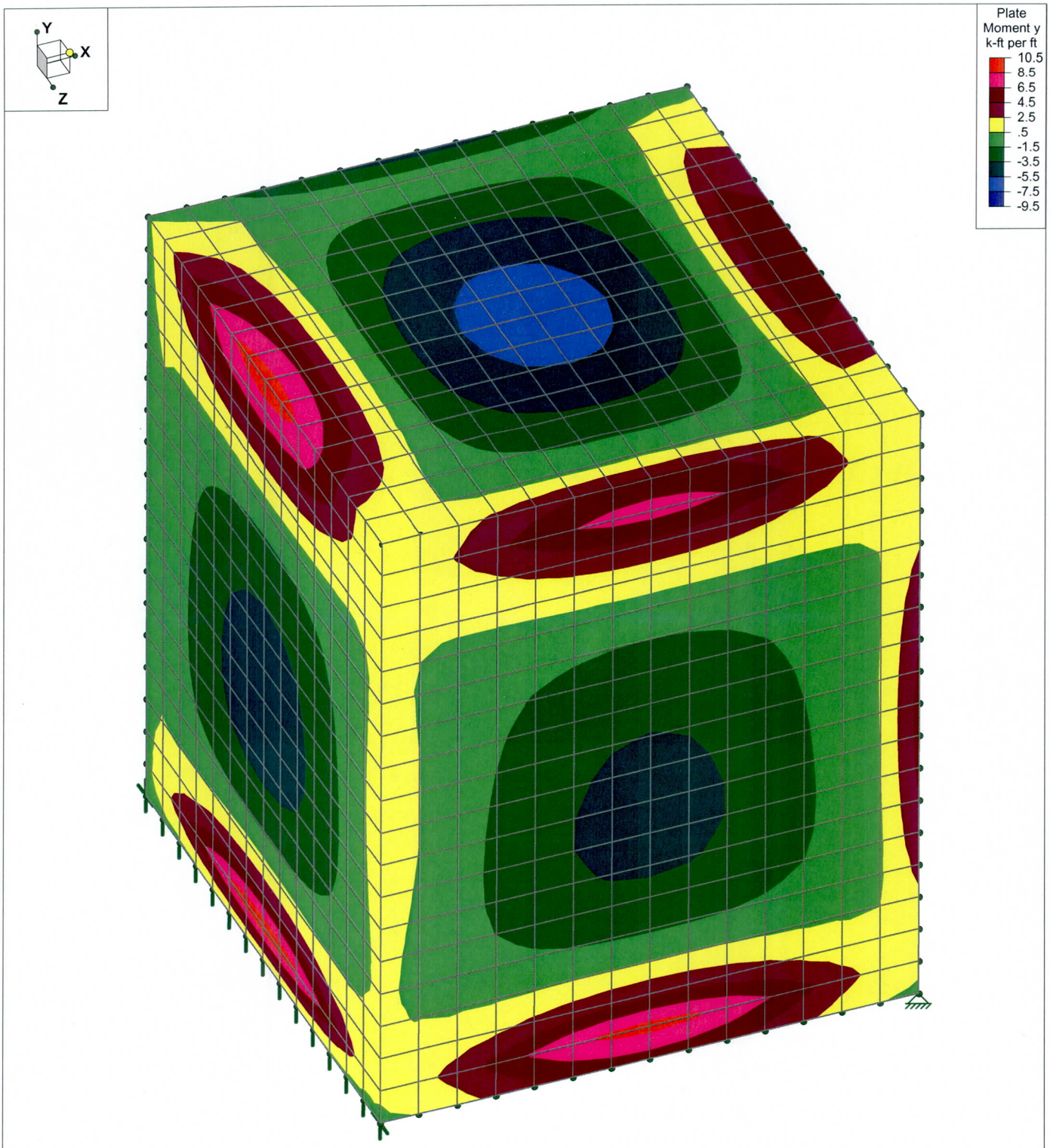
Results for LC 2, STRENGTH 1 - LL @ midspan
Member y Shear Forces (k)

Olsson Associates	Lafayette - Struct. #3	SK - 7
Ross Barron		Dec 5, 2011 at 2:19 PM
010-2312		Structure #3 Analysis - 3-D.r3d



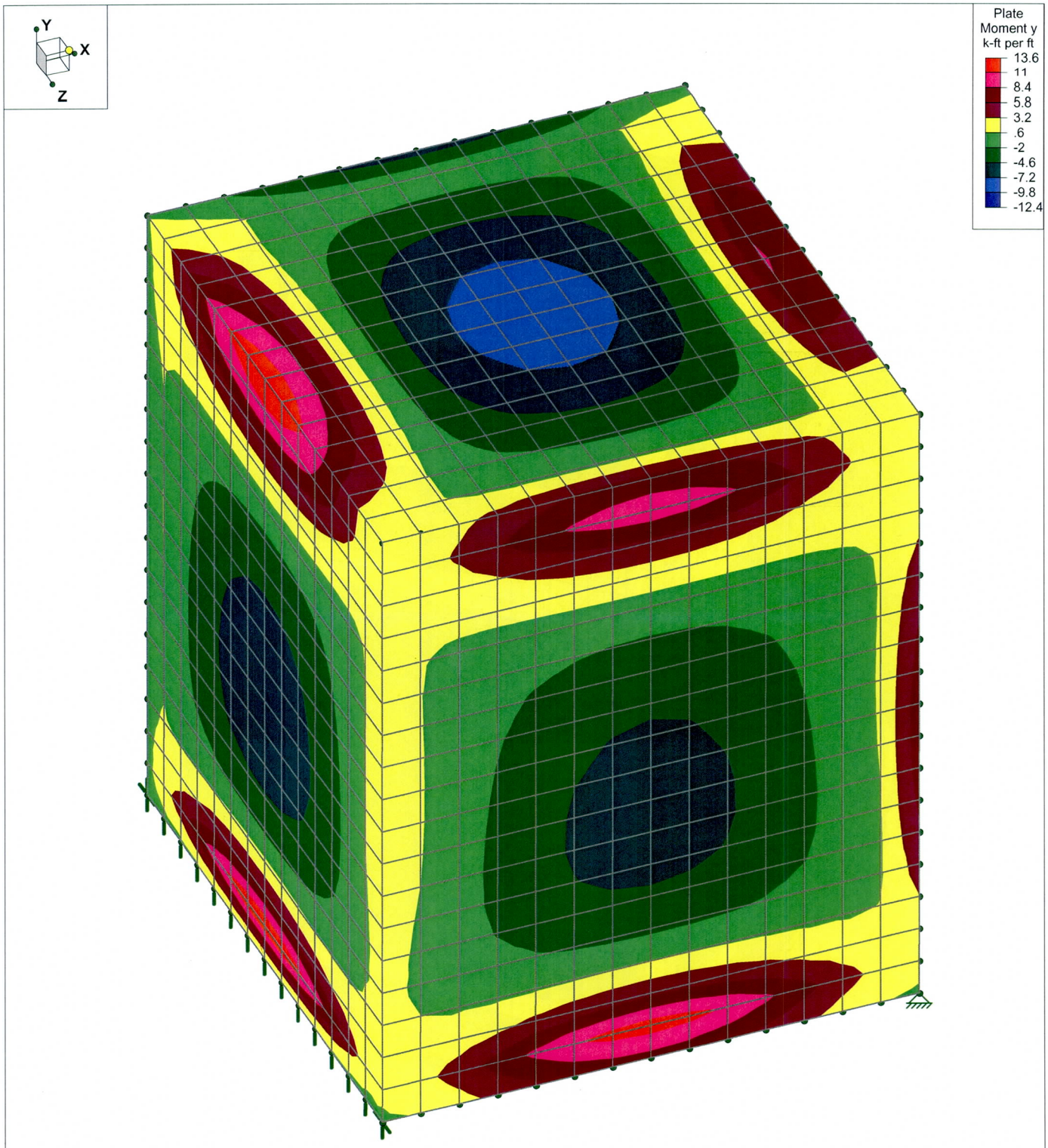
Results for LC 2, STRENGTH 1 - LL @ midspan
Member y Shear Forces (k)

Olsson Associates	Lafayette - Struct. #3	SK - 6
Ross Barron		Dec 5, 2011 at 2:19 PM
010-2312		Structure #3 Analysis - 3-D.r3d



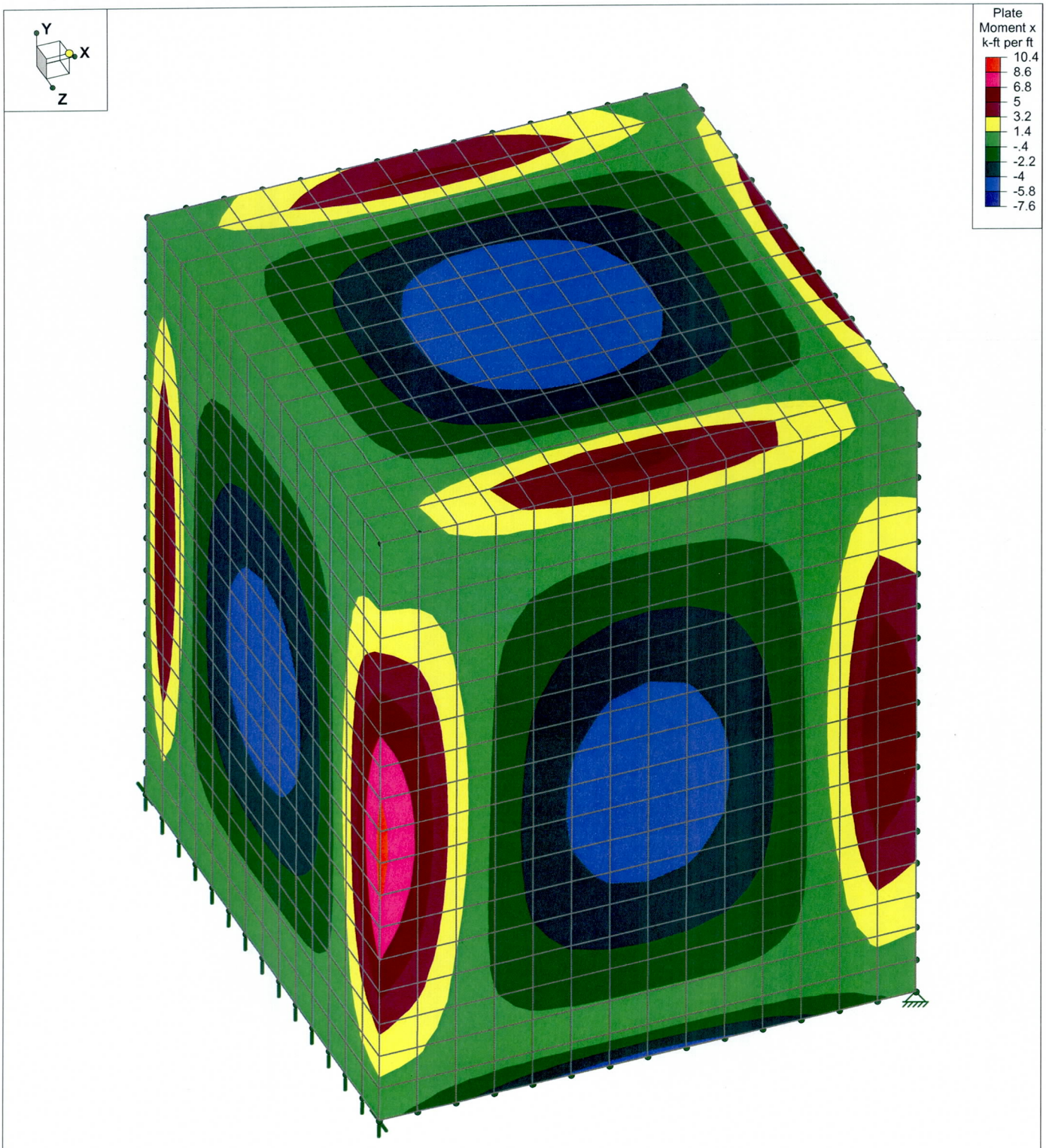
Results for LC 1, Service - LL @ midspan
Member y Shear Forces (k)

Olsson Associates	Lafayette - Struct. #3	SK - 4
Ross Barron		Dec 5, 2011 at 2:19 PM
010-2312		Structure #3 Analysis - 3-D.r3d



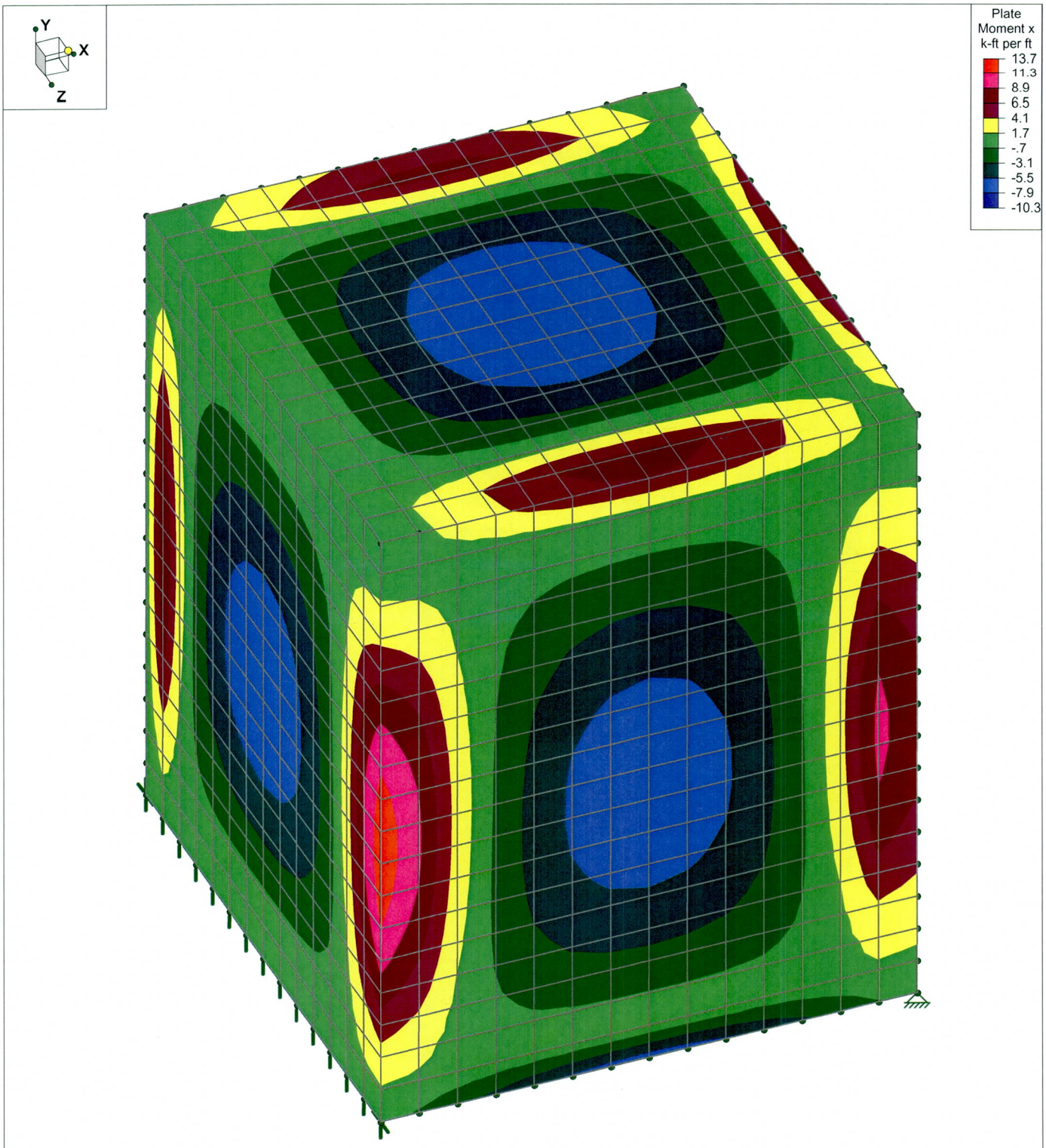
Results for LC 2, STRENGTH 1 - LL @ midspan
Member y Shear Forces (k)

Olsson Associates	Lafayette - Struct. #3	SK - 5
Ross Barron		Dec 5, 2011 at 2:19 PM
010-2312		Structure #3 Analysis - 3-D.r3d



Results for LC 1, Service - LL @ midspan
Member y Shear Forces (k)

Olsson Associates	Lafayette - Struct. #3	SK - 2
Ross Barron		Dec 5, 2011 at 2:18 PM
010-2312		Structure #3 Analysis - 3-D.r3d



Results for LC 2, STRENGTH 1 - LL @ midspan
Member y Shear Forces (k)

Olsson Associates	Lafayette - Struct. #3	SK - 3
Ross Barron		Dec 5, 2011 at 2:18 PM
010-2312		Structure #3 Analysis - 3-D.r3d

OLSSON ASSOCIATES	CLIENT NAME: Flood Control District of Maricopa County (FCDMC)	NAME: RDB	DATE: 3/23/12
	PROJECT NAME: Lafayette Interceptor Drain and Outlet Design	PROJECT NO: 010-2312	REV: 0
STANDARD CALCULATION SHEET	SUBJECT: Underground Structures		

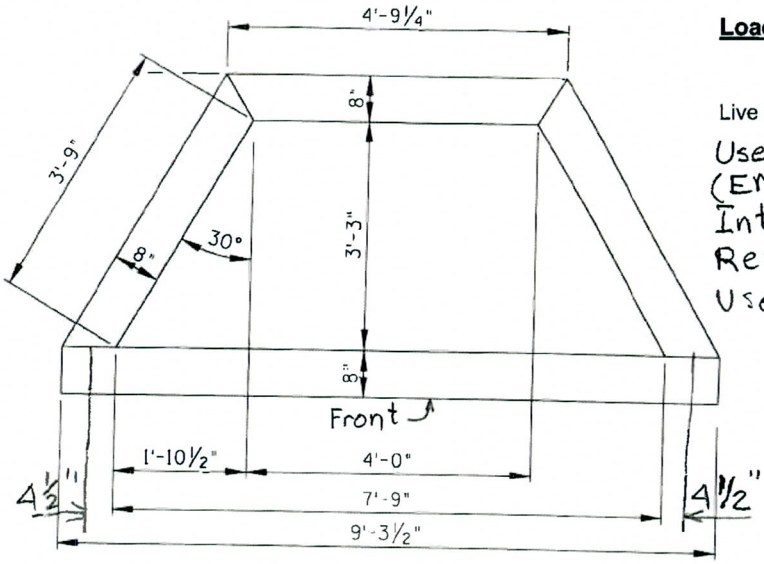
Structure #4, Drop Inlet w/ 36" Outlet:

OLSSON ASSOCIATES
Olsson Associates
7301 W. 133rd Street; Suite 200 | Overland Park, KS 66213
Ofc. 913.381.1170 | Fax. 913.381.1174

Project: Layfayette Interceptor drain - Structure No.4 | Designed By: KHJ | Date: 29-Nov-11
Subject: Drop Inlet structure for 36" dia. RCP (010-2312) | Checked By: | Sheet 1 - 2

Plan View of Drop Inlet Structure No. 4:

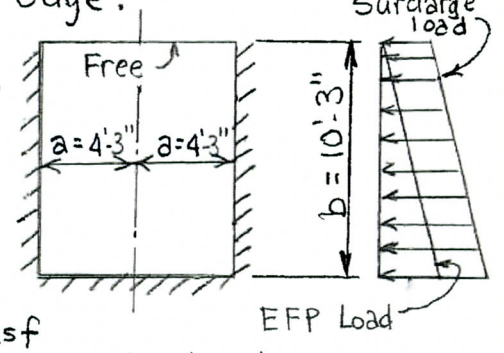
Maximum height = 10.25 ft. (front)



Loads:

Lateral Earth Pressure γ_{EFP} = 55 pcf
Live Load surcharge: 2 ft. equiv. fill ht. = 0.11 ksf

Use Engineering Monogram #27 (EM27) developed by U.S. Dept. of Interior to determine Moments & Reactions for Rectangular Plates
Use Case I - Plate fixed along three edges & free along fourth edge:



$a/b = \frac{4.25}{10.25} = 0.42$

EFP@ Top/footing = $P_E = (55)(10.25) = 0.564$ ksf
Interpolating between chart values for $a/b = 3/8$ and $a/b = 1/2$
Coefficients for R_x, R_y, $M_{x(+)}$, $M_{x(-)}$, $M_{y(+)}$ & $M_{y(-)}$:

$\alpha_{R_{y\,(Max.)}} = 0.29$ → $\alpha_{M_{x(+)\,(max.)}} = +0.023$ $\alpha_{M_{x(-)\,(Max.)}} = -0.011$
$\alpha_{M_{y(+)}} = +0.005$ $\alpha_{M_{y(-)}} = -0.008$

V_{max} (From EFP loads) $= 0.29(0.564)(10.25) = 1.7^k$

$M_{x(+)} = 0.023(0.564)(10.25)^2 = 1.36$ ft.-k
$M_{y(-)} = 0.47$ ft.-k

For uniform surcharge loading coefficients as follows:
P@ top/ftg. = 0.11 ksf
$\alpha_{R_{(max.)}} = 0.44 \Rightarrow V_{max.} = 0.44(0.11)(10.25) = 0.5^k$
$\alpha_{M_{x(+)}} = +0.061 \Rightarrow M^x_{+max.} = 0.061(0.11)(10.25)^2 = 0.71$ ft.-k
$\alpha_{M_{y(+)\,(Max.)}} = +0.012 \Rightarrow M^y_{+max.} = 0.14$ ft.-k

OLSSON ASSOCIATES
Olsson Associates
7301 W. 133rd Street; Suite 200 | Overland Park, KS 66213
Ofc. 913.381.1170 | Fax. 913.381.1174

Project: Layfayette Interceptor drain - Structure No.4 | Designed By: KHJ | Date: 29-Nov-11
Subject: Drop Inlet structure for 36" dia. RCP (010-2312) | Checked By: | Sheet 2 - 2

TOTAL ℄ LOADS:

	SERVICE	STRENGTH
V:	$1.7 + 0.44 = 2.14^k$	$1.5(1.7) + 1.75(0.44) = 3.32^k = V_u$
M_x:	$1.36 + 0.71 = 2.07$ ft.-k	$1.5(1.36) + 1.75(0.71) = 3.28$ ft.-k
M_y:	$0.47 + 0.14 = 0.61$ ft.-k	$1.5(0.47) + 1.75(0.14) = 0.95$ ft.-k

By Working Stress $A_s = \frac{M}{f_s\, jd} = 0.2$ in²/ft. → #6's @ 12" o.c. = 0.44 in²/ft.

$V_c = 2\sqrt{f'_c}\, b_w d$ (4,000 psi) b_w = 12" piece of wall; $d = 6" \Rightarrow V_c = 9.1^k$

Req'd. $V_n = \frac{V_u}{0.85} = \frac{3.32}{0.85} = 3.91^k < 9.1^k$ O.K.

∴ No additional steel reinf. req'd. for shear

Even if we plugged in the "strength" moment into the working stress formula for determining A_s, the #6's @ 12" o.c. would still be adequate. ∴ Say O.K. to #6's @12" o.c. E.F. & both ways.

P.S.: Per e-mail note from S. Hennessey rec'vd. on 12-1-2011, this structure should be designed in accordance with ACI 350-06 - Code Requirements for Environmental Engineering Concrete Structures.
This code stipulates that loads imposed due to weight and pressure of soil (designated 'H') and according to Appendix 'C', required strength is calculated by $U = 1.4D + 1.7L + 1.7H$

∴ V_u increases to 3.64^k & $M_u = 3.52$ ft.-k

Req'd. $M_n = 3.52/0.9 = 3.91$ ft.-k

Estimate of $A_{s(Req'd.)} = \frac{M_u}{4d} = \frac{3.52}{4(5)} = 0.176$ in²/ft. of wall

$\rho_{min} = 0.0030$ which $\Rightarrow A_{s(Req'd.)} = (0.0030)(12)(5) = 0.18$ in²

∴ #6's @12" o.c. O.K.

KHJ
12/1/2011

Project Name: Lafayette
Project Number: 010-2312
Analyst: RB
Date: 12/6/2011

Structure #4, Drop Inlet

Summary

Concrete	7.9 yd^3
Reinforcing	632.0 lb

*Reinforcing is estimated at 80 lbs./CY

Concrete

	Total				7.9 yd^3		
Location/Description	*Amount*	*Height*	*Length*	*Width*	*Area*	*Volume*	
Footing	1	1.17'			42.31 ft^2	49 ft^3	1.8 yd^3
Backwall	1	12.06'			3.44 ft^2	41 ft^3	1.5 yd^3
Front Wall	1	11.28'			6.20 ft^2	70 ft^3	2.6 yd^3
Side Walls	2	11.67'			2.50 ft^2	58 ft^3	2.2 yd^3
						0 ft^3	0.0 yd^3
Minus 36" RCP	-1		.67'		7.33 ft^2	-5 ft^3	-0.2 yd^3

OLSSON ASSOCIATES	CLIENT NAME: Flood Control District of Maricopa County (FCDMC)	NAME: RDB	DATE: 3/23/12
	PROJECT NAME: Lafayette Interceptor Drain and Outlet Design	PROJECT NO: 010-2312	REV: 0
STANDARD CALCULATION SHEET	SUBJECT: Underground Structures		

Structure #5, Drop Junction w/ 84" Outlet:

Olsson Associates
2111 S. 67th St., Suite 200 | Omaha, NE 68106
Office 402.341.1116 | Fax 402.341.5895

Project:	Lafayette Interceptor Drain and Outlet Design	OA Project Number:	010-2312	Date:	12/5/2011
Subject:	Structure No. 5 - Junction Box	Designed By:	Ross Barron	Checked By:	SAH

REINFORCED CONCRETE BOX STRUCTURE DESIGN

Lafayette Interceptor Drain and Outlet Design
Structure No. 5 - Junction Box

DESIGN NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications, 4th Edition. Fixed box design is based on a per foot of length basis. Live load anaylsis is based on the calculated effective height of fill, D_E. Member moment and shear was determined through use of RISA 3-Dimensional finite analysis.

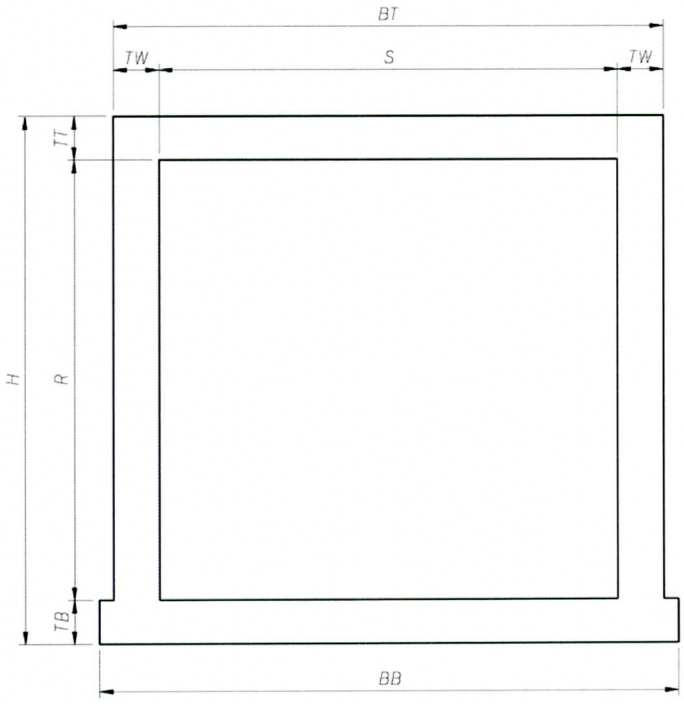
DESIGN PARAMETERS

BOX DIMENSIONS

Design Span	S	12.25	ft
Rise	R	8.50	ft
Top Slab Thickness	TT	12.00	in
Wall Thickness	TW	10.00	in
Bot. Slab Thickness	TB	14.00	in
Footing Extension	d	6.00	in.

Top Slab Width	BT	13.92	ft
Bot. Slab Width	BB	14.92	ft
Total Height	H	10.67	ft

Proposed Ground Elevation		1263.99
Outlet Invert Elevation		1246.51
Fill Height (ground to bot. of top slab)	h_f	8.98 ft



MATERIALS

Concrete Strength	f'_c	4.0	ksi
Conc. Mod. of Elast.	E_c	3,834	ksi
Stress Block Coeff.	β_1	0.85	
Rebar Strength	f_y	60	ksi
Steel Mod. of Elast.	E_s	29,000	ksi
Modular Ratio	n	7.6	

SOIL DATA

Description: At-Rest - Drained - Cohesionless Granular

Vertical Soil Wt.	γ_s	120	pcf
Lateral Eq. Fluid Density	γ_{eq}	55	pcf

OLSSON ASSOCIATES

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2111 S. 67th St., Suite 200 | Omaha, NE 68106
Office 402.341.1116 | Fax 402.341.5895

Project: Lafayette Interceptor Drain and Outlet Design | OA Project Number: 010-2312 | Date: 12/5/2011

Subject: Structure No. 5 - Junction Box | Designed By: Ross Barron | Checked By: SAH

LOADS

DEAD LOADS

Component	No.	Height *(ft)*	Length *(ft)*	Width *(ft)*	Area *(ft^2)*	Weight *(pcf)*	Weight *(k/ft)*	
Top Slab	1	1.000	1.000	13.917		150	2.088	
Walls	2	8.500	1.000	0.833		150	2.125	
Bottom Slab	1	1.167	1.000	14.917		150	2.610	
Concrete Fill	1	0.000	1.000	12.250		100.0	0.000	
Additional Wt.							0.000	
						Total	**6.823**	**k/ft**

LIVE LOADS

For fill > 2' Art. 3.6.1.2.6 is utilized; traffic travels parallel to the CBC span. Per Art. 4.6.2.10.2, the culvert shall be analyzed for a single loaded lane with the single lane multiple presence factor. The dynamic load allowance for culverts and buried structures is determined per Art. 3.6.2.2. The length of tire contact parallel to span, as specified in Art. 3.6.1.2.5 is 20"; width is 10". Although the earth fill depth is more than 8'-0", it does not exceed the effective span length, so Live Load effects shall be considered.

Wheel Load - Traffic Parallel to Span

TotalSpan Length for Analysis (CL wall to CL wall)	S	13.08	ft		
Minimum depth of Earth Cover	D_E	7.98	ft		
Wheel Load	P	16.0	k		
Impact Factor	IM	0	%	(3.6.2.2-1)	$IM = 33(1.0 - 0.125D_E) > 0\%$
Longitudinal Distribution Width	E_1	8.81	ft	(3.6.1.2.6)	$E_1 = 0.83 + 1.0D_E$
Transverse Distribution Width	E_2	9.65	ft	(3.6.1.2.6)	$E_2 = 1.67 + 1.0D_E$
Multiple Presence Factor	MPF	1.20			
Top Slab Axle Distribution (for RISA model)	E	8.81	ft		
Distributed Live Load to Top Slab (w/ IM & MPF) Distributed over Distance of E	w_T	0.226	k/ft		$w_T = 1.2 * \left(1 + \frac{IM}{100}\right) * \frac{P}{(E_2)}$
Bottom Slab Distributed Live Load (w/ IM & MPF)	w_B	0.15	k/ft		$w_B = \frac{w_T * E_1}{S}$

SOIL LOADS

Vertical Soil Loads

Soil Load	w_{EV}	0.958	ksf	$w_{EV} = D_E * \gamma_S$

Lateral Soil Loads

Earth Press. @ Top	$p_{EH@Top}$	0.439	k/ft	$p_{EH@Top} = D_E * \gamma_{EQ}$
Earth Press. @ Bot.	$p_{EH@Bot.}$	1.026	k/ft	$p_{EH@Bot} = (D_E + H) * \gamma_{EQ}$

Live Load Surcharge - Horz. Loads Only - 3.11.6.4.1

Abutment Height		18.647	ft	
Interpolated Soil Height	h_s	2.14	ft	
Horz. Pressure	Δ_p	117	psf	$\Delta_p = h_{eq} * \gamma_s$

Table 3.11.6.4-1 Equivalent Height of Soil for Vehicular Loading on Abutments Perpendicular to Traffic.

Abutment Height (ft.)	h_{eq} (ft.)
5.0	4.0
10.0	3.0
≥20.0	2.0

OLSSON ASSOCIATES

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2111 S. 67th St., Suite 200 | Omaha, NE 68106
Office 402.341.1116 | Fax 402.341.5895

Project: Lafayette Interceptor Drain and Outlet Design | OA Project Number: 010-2312 | Date: 12/5/2011

Subject: Structure No. 5 - Junction Box | Designed By: Ross Barron | Checked By: SAH

STABILITY

For the live load bearing pressure, the wheel load applied to the top slab is distributed over the bearing area without an increase due to impact. Forces resisting buoyancy include the box self weight and soil weight above the box. No groundwater was considered as part of the design. Stability calculations are based on a one foot strip width.

BEARING CAPACITY (SERVICE LOADS)

Bearing Area	A_q	14.92	ft^2
Structural DL and Vert. Soil	q_{DL}	522	psf
LL Bearing Pressure	q_{LL}	0	psf
Factored Bearing Pressure	q	626	psf
All. Bearing Pressue	q_{all}	4,000	psf
Utilization Ratio	q/q_{all}	0.16	OK

BUOYANT FORCES

Depth to Bot. Slab	z	18.65	ft	
Depth to Groundwater	z_w	0.00	ft	
Buoyant Force	P_b	0.0	k	
Self Weight	P_w	6.8	k	
Factor of Safety	FS	N/A		OK > 1.1

TOP SLAB

DESIGN NOTES:

Designed as a fixed slab with the design span length being the distance from CL wall to CL wall. RISA 3-D is used to input joint coordinates, unreinforced concrete members of correct thicknesses, loads provided herein, and respective load factors. Structure self-weight calculations take place within RISA and are included in the output moments. Strength I combination governs for buried structures. For a rigid buried structure, 1.3 is used for vertical earth pressure load factor. Concrete shear strength is modified according to 5.14.5.3. Strength reduction factor for shear is taken as 0.85 for buried CIP concrete structures.

PARAMETERS

Slab Thickness	TT	12.00	in
Haunch Width (& Height)	W_H	1.00	ft
Member Loads for RISA Input (Service)			
Soil Load	w_{EV}	0.958	k/ft
Distr. Live Load	w_{LL}	0.226	klf

SHEAR — Art. 5.14.5.3

Reduction Factor	Φ	0.90	
Width for Shear	b_v	12.00	in
Effective Depth	d_e	9.69	in
Conc. Shear Strength	V_c	14.7	k/ft
Reduced Nom. Cap.	ΦV_c	13.2	k/ft
Factored Ultimate Shear (RISA OUTPUT)	V_u	8.0	k/ft
Utilization Ratio	$V_u / \Phi V_c$	0.60	OK

Controlling Load Case: Strength 1 - Plate Shear

For Slabs with Earth FIll < 2'

5.8.3.3-3 $V_c = \left(0.0316\beta\sqrt{f'_c}\right)bd_e$

For Slabs with Earth FIll > 2'

5.14.5.3-1 $V_c = \left(0.0676\sqrt{f'_c} + 4.6\frac{A_S}{bd_e}\frac{V_u d_e}{M_u}\right)bd_e$

OLSSON ASSOCIATES

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Project: Lafayette Interceptor Drain and Outlet Design | **OA Project Number:** 010-2312 | **Date:** 12/5/2011

Subject: Structure No. 5 - Junction Box | **Designed By:** Ross Barron | **Checked By:** SAH

FLEXURE (BOTTOM BARS) — Use #5 @ 12 in. Spa.

Controlling Load Case: Strength 1 - Plate Moment y

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 5	
Spacing		12.0	in
Bar Diameter	d_b	0.63	in
Area of Steel	A_s	0.31	in^2/ft
Steel Depth	d	9.69	in
Eq. Stress Depth	a	0.46	in
Neutral Axis Depth	c	0.00	in

Spacing Limit - Art 5.10.3

Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.38	in
Max. Spacing	S_{max}	12.0	in

Development Length - Art 5.11.2.1

Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	14	in

Strain Calculation

Extr. Tensile Strain	ε_t	244.43	

Min. Reinforcement - Art 5.7.3.3.2

1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	10.8	k·ft/ft
Min. Moment Capacity	M_{min}	10.8	k·ft/ft

Temp & Shrink - Art 5.10.8

Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$

Crack Control - Art 5.7.3.4

Service Moment	M_s	6.2	k·ft/ft
Service Stress in Reinf.	f_{ss}	25.0	ksi
Concrete Cover	d_c	2.31	
Clear Cover Factor	β_s	1.34	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	16.2	in

Moment Capacity - Art 5.7.3.2.1

Factored Ultimate Load	M_u	8.1	k·ft/ft
Reduced Nom. Cap.	ΦMn	13.2	k·ft/ft
Utilization Ratio	M_u / ΦMn	0.61	OK

FLEXURE (TOP CORNER BARS) — Use #5 @ 12 in. Spa.

Controlling Load Case: Strength 1 - Plate Moment y

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	12.00	in
Clear Cover	c_c	2.00	2
Bar Size		# 5	
Spacing		12.0	in
Bar Diameter	d_b	0.63	in
Area of Steel	A_s	0.31	in^2/ft
Steel Depth	d	9.69	in
Eq. Stress Depth	a	0.46	in
Neutral Axis Depth	c	0.00	in

Spacing Limit - Art 5.10.3

Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.38	in
Max. Spacing	S_{max}	12.0	in

Development Length - Art 5.11.2.1

Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	14	in

Strain Calculation

Extr. Tensile Strain	ε_t	244.43	

Min. Reinforcement - Art 5.7.3.3.2

1.2 x Cracking Moment	$1.2M_{cr}$	21.3	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	12.0	k·ft/ft
Min. Moment Capacity	M_{min}	12.0	k·ft/ft

Temp & Shrink - Art 5.10.8

Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$

Crack Control - Art 5.7.3.4

Service Moment	M_s	6.8	k·ft/ft
Service Stress in Reinf.	f_{ss}	27.5	ksi
Concrete Cover	d_c	2.31	
Clear Cover Factor	β_s	1.34	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	14.4	in

Moment Capacity - Art 5.7.3.2.1

Factored Ultimate Load	M_u	9.0	k·ft/ft
Reduced Nom. Cap.	ΦMn	13.2	k·ft/ft
Utilization Ratio	M_u / ΦMn	0.68	OK

OLSSON ASSOCIATES

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Office 402.341.1116 | Fax 402.341.5895

Project: Lafayette Interceptor Drain and Outlet Design | OA Project Number: 010-2312 | Date: 12/5/2011

Subject: Structure No. 5 - Junction Box | Designed By: Ross Barron | Checked By: SAH

WALLS

DESIGN NOTES:
Designed with a fixed connection to the top slab and a rigid connection to the bottom slab. Clear span length is used to calculate forces. Strength I combination governs for buried structures. For a rigid buried structure, a load factor of 1.35 is used for at-rest horizontal earth pressure. Maximum shear was determined through a RISA 3-D model, utilizing finite element analysis. Axial load is not taken into consideration.

PARAMETERS

Outer Wall Thickness	TW	10.00	in
Span Length	L	8.50	ft
Point of Contraflexure	x	2.70	ft
Member Loads for RISA Input (Service)			
Earth Press. @ Top	p_{EH}	0.439	k/ft
Earth Press. @ Bot.	p_{EH}	1.026	k/ft
LL Surcharge	p_{LS}	0.117	k/ft

SHEAR — Art. 5.8.3.4.1

Reduction Factor	Φ	0.9	
Width for Shear	b_v	12.00	in
Steel Depth for Shear	d_v	7.63	in
Conc. Shear Strength	V_c	11.6	k/ft
	Art 5.8.3.3		
Factored Ultimate Load	V_u	8.0	k/ft
Reduced Nom. Cap.	ΦV_c	10.4	k/ft
Utilization Ratio	$V_u / \Phi V_c$	0.77	OK

Controlling Load Case: Strength 1 - Plate Shear

For Slabs with Earth FIll < 2'

5.8.3.3-3 $V_c = \left(0.0316\beta\sqrt{f'_c}\right)bd_e$

For Slabs with Earth FIll > 2'

5.14.5.3-1 $V_c = \left(0.0676\sqrt{f'_c} + 4.6\frac{A_S}{bd_e}\frac{V_u d_e}{M_u}\right)bd_e$

FLEXURE (Vertical Bars Inside Face) — Use #4 @ 12 in. Spa.

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	10.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 4	
Spacing		12.0	in
Bar Diameter	d_b	0.50	in
Area of Steel	A_s	0.20	in^2/ft
Steel Depth	d	7.75	in
Eq. Stress Depth	a	0.29	in
Neutral Axis Depth	c	0.00	in
Spacing Limit - Art 5.10.3			
Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.50	in
Max. Spacing	S_{max}	12.0	in
Development Length - Art 5.11.2.1			
Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	9	in

Controlling Load Case: Strength 1 - Plate Moment y

Strain Calculation			
Extr. Tensile Strain	ε_t	303.09	
Min. Reinforcement - Art 5.7.3.3.2			
1.2 x Cracking Moment	$1.2M_{cr}$	14.8	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	6.7	k·ft/ft
Min. Moment Capacity	M_{min}	6.7	k·ft/ft
Temp & Shrink - Art 5.10.8			
Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$
Crack Control - Art 5.7.3.4			
Service Moment	M_s	2.0	k·ft/ft
Service Stress in Reinf.	f_{ss}	15.6	ksi
Concrete Cover	d_c	2.25	
Clear Cover Factor	β_s	1.41	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	18.0	in
Moment Capacity - Art 5.7.3.2.1			
Factored Ultimate Load	M_u	5.0	k·ft/ft
Reduced Nom. Cap.	ΦM_n	6.8	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.73	OK

OLSSON ASSOCIATES

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Project: Lafayette Interceptor Drain and Outlet Design | OA Project Number: 010-2312 | Date: 12/5/2011

Subject: Structure No. 5 - Junction Box | Designed By: Ross Barron | Checked By: SAH

FLEXURE (BOTTOM CORNER BARS) — Use #6 @ 12 in. Spa.

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	10.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 6	
Spacing		12.0	in
Bar Diameter	d_b	0.75	in
Area of Steel	A_s	0.44	in^2/ft
Steel Depth	d	7.63	in
Eq. Stress Depth	a	0.65	in
Neutral Axis Depth	c	0.00	in

Spacing Limit - Art 5.10.3

Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.25	in
Max. Spacing	S_{max}	12.0	in

Development Length - Art 5.11.2.1

Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	20	in

Controlling Load Case: Strength 1 - Plate Moment y

Strain Calculation

Extr. Tensile Strain	ε_t	135.55	

Min. Reinforcement - Art 5.7.3.3.2

1.2 x Cracking Moment	$1.2M_{cr}$	14.8	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	13.0	k·ft/ft
Min. Moment Capacity	M_{min}	13.0	k·ft/ft

Temp & Shrink - Art 5.10.8

Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$

Crack Control - Art 5.7.3.4

Service Moment	M_s	7.0	k·ft/ft
Service Stress in Reinf.	f_{ss}	25.5	ksi
Concrete Cover	d_c	2.38	
Clear Cover Factor	β_s	1.44	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	14.2	in

Moment Capacity - Art 5.7.3.2.1

Factored Ultimate Load	M_u	10.0	k·ft/ft
Reduced Nom. Cap.	ΦM_n	14.5	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.69	OK

FLEXURE (Horizontal Neg. Moment) — Use #4 @ 12 in. Spa.

Parameters

Reduction Factor	Φ	0.90	
Width	b	12.00	in
Height	h	10.00	in
Clear Cover	c_c	2.00	in
Bar Size		# 4	
Spacing		12.0	in
Bar Diameter	d_b	0.50	in
Area of Steel	A_s	0.20	in^2/ft
Steel Depth	d	7.75	in
Eq. Stress Depth	a	0.29	in
Neutral Axis Depth	c	0.00	in

Spacing Limit - Art 5.10.3

Min. Clear Spacing	S_{min}	1.50	in
Actual Clear Spacing	S_{clr}	11.50	in
Max. Spacing	S_{max}	12.0	in

Development Length - Art 5.11.2.1

Epoxy Modifier	Ψ_e	1.2	
Top Bar Modifier	Ψ_t	1.0	
Development Length	L_d	9	in

Controlling Load Case: Strength 1 - Plate Moment x

Strain Calculation

Extr. Tensile Strain	ε_t	303.09	

Min. Reinforcement - Art 5.7.3.3.2

1.2 x Cracking Moment	$1.2M_{cr}$	14.8	k·ft/ft
1.33 x Ult. Moment	$1.33M_u$	2.7	k·ft/ft
Min. Moment Capacity	M_{min}	2.7	k·ft/ft

Temp & Shrink - Art 5.10.8

Min. Area of Steel	$A_{s,min}$	0.11	$in^2/ft/face$

Crack Control - Art 5.7.3.4

Service Moment	M_s	1.0	k·ft/ft
Service Stress in Reinf.	f_{ss}	7.8	ksi
Concrete Cover	d_c	2.25	
Clear Cover Factor	β_s	1.41	
Exposure Factor	γ_e	1.00	
Max. Spacing	S_{max}	18.0	in

Moment Capacity - Art 5.7.3.2.1

Factored Ultimate Load	M_u	2.0	k·ft/ft
Reduced Nom. Cap.	ΦM_n	6.8	k·ft/ft
Utilization Ratio	$M_u / \Phi M_n$	0.29	OK

OLSSON ASSOCIATES

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Project: Lafayette Interceptor Drain and Outlet Design | OA Project Number: 010-2312 | Date: 12/5/2011

Subject: Structure No. 5 - Junction Box | Designed By: Ross Barron | Checked By: SAH

FOOTING SLAB

DESIGN NOTES:
Designed with rigid connections to the walls for flexure in the corners. The maximum moment and shear are taken from the RISA analysis. Loads are applied to the top slab and transfered into the footing.

PARAMETERS

Footing Thickness	TB	14.00	in

LOADS (Service)

Dead Load (structure)	w_{DL}	0.595	k/ft
Vertical Soil Load	w_{EV}	0.958	k/ft
Live Load	w_{LL}	0.152	k/ft

SHEAR — Art. 5.14.5.3

Reduction Factor	Φ	0.9	
Width for Shear	b_v	12.00	in
Steel Depth for Shear	d_v	10.75	in
Conc. Shear Strength	V_c	16.3	k/ft
	Art 5.8.3.3		
Factored Ultimate Load	V_u	8.0	k/ft
Reduced Nom. Cap.	ΦV_c	14.7	k/ft
Utilization Ratio	$V_u / \Phi V_c$	0.55	OK

Controlling Load Case: Strength 1 - LL @ Support

For Slabs with Earth FIll < 2'

5.8.3.3-3 $V_c = \left(0.0316\beta\sqrt{f'_c}\right)bd_e$

For Slabs with Earth FIll > 2'

5.14.5.3-1 $V_c = \left(0.0676\sqrt{f'_c} + 4.6\frac{A_S}{bd_e}\frac{V_u d_e}{M_u}\right)bd_e$

Project Name: Lafayette
Project Number: 010-2312
Analyst: RB
Date: 12/6/2011

Structure #5, Drop Junction

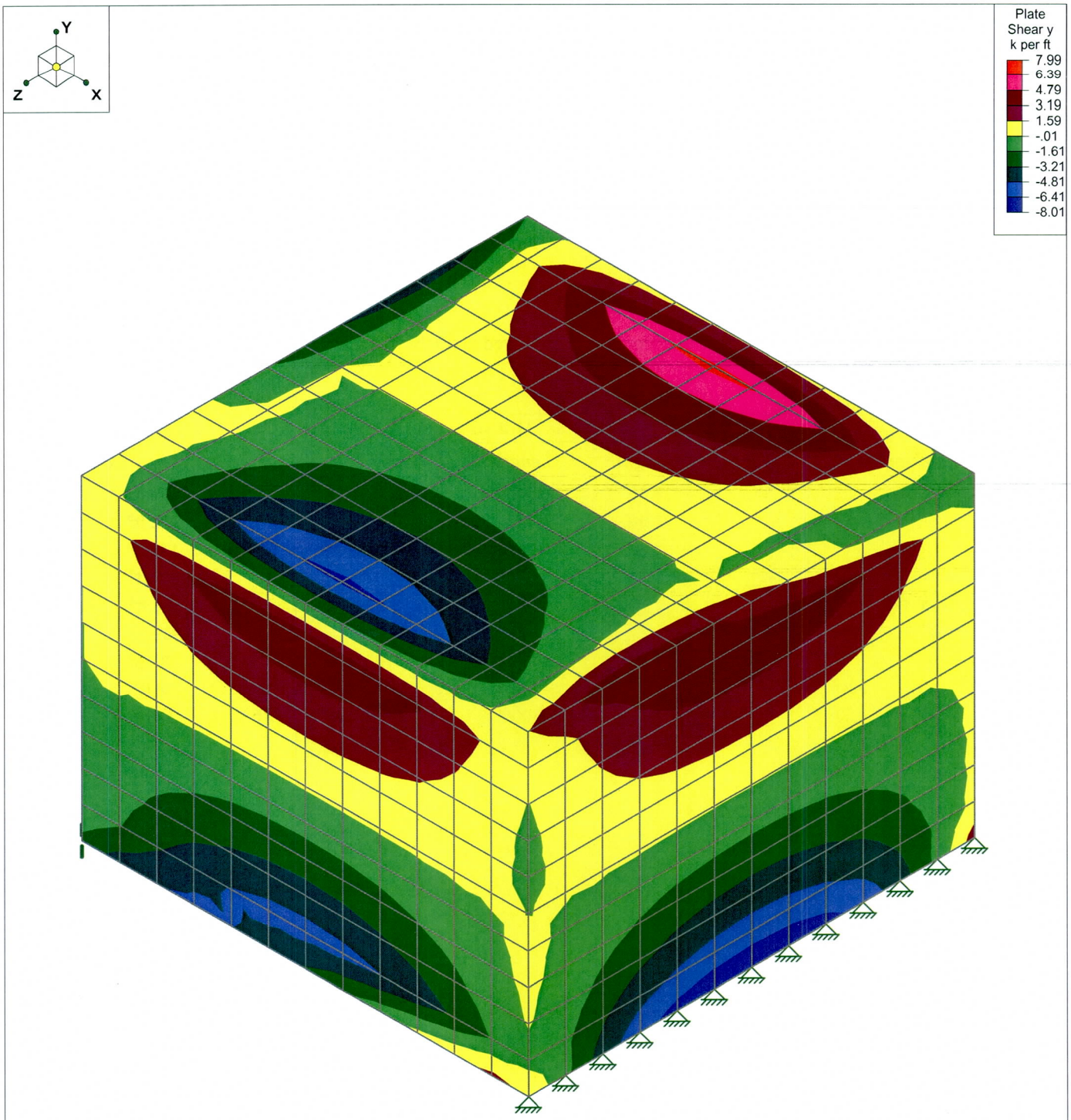
Summary

Concrete	31.0 yd^3
Reinforcing	2,480.0 lb

*Reinforcing is estimated at 80 lbs./CY

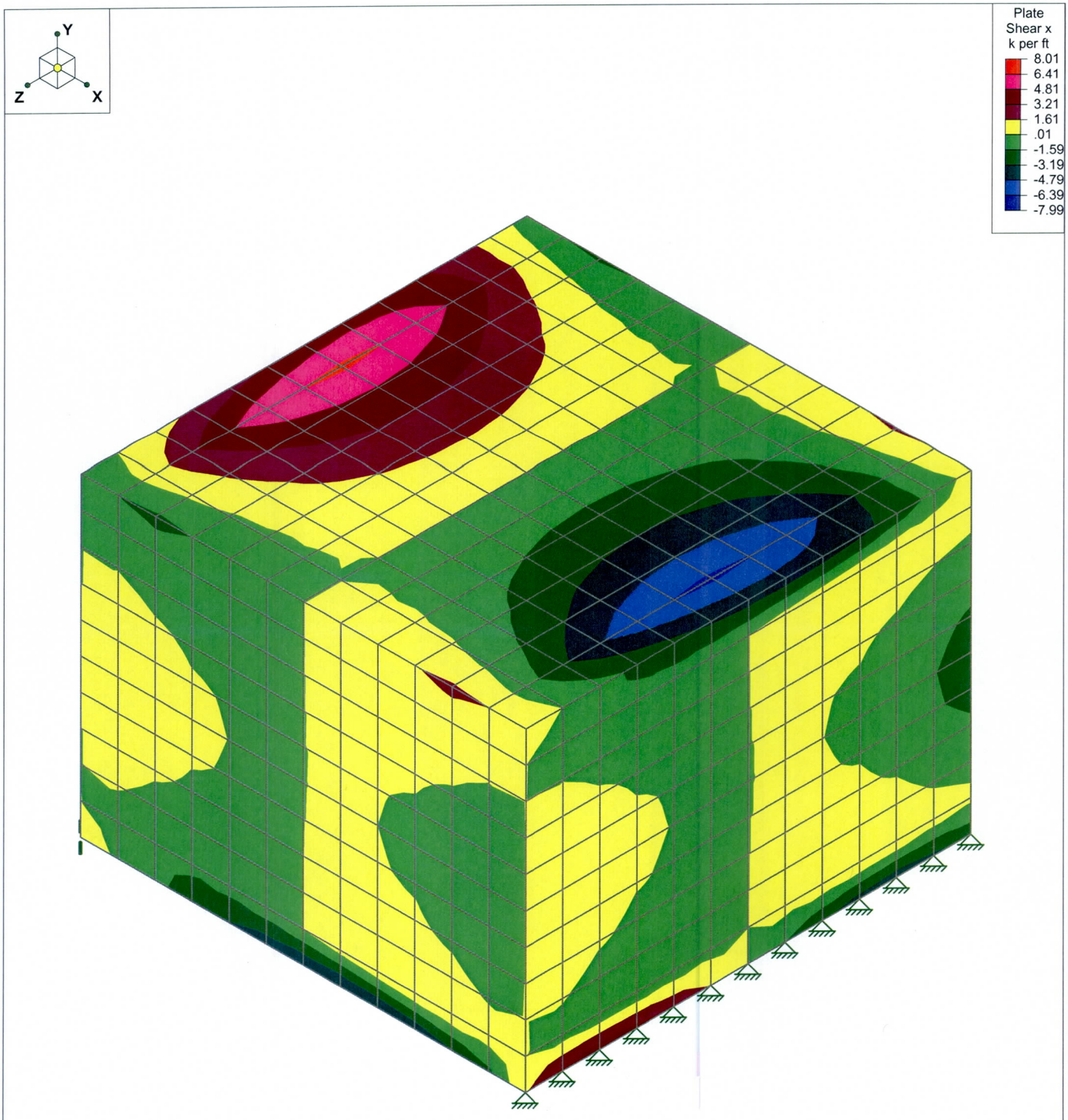
Concrete

	Total				31.0 yd^3		
Location/Description	*Amount*	*Height*	*Length*	*Width*	*Area*	*Volume*	
Top Slab	1	1.00'	15.67'	11.67'		183 ft^3	6.8 yd^3
Walls	2	8.50'	15.67'	0.83'		222 ft^3	8.2 yd^3
	2	8.50'	12.25'	0.83'		173 ft^3	6.4 yd^3
Minus 84"Pipe	-1		.83'		54.54 ft^2	-45 ft^3	-1.7 yd^3
Minus 48 "Pipe	-1		.83'		19.63 ft^2	-16 ft^3	-0.6 yd^3
Minus 72" RCP, skew	-1		.83'		47.17 ft^2	-39 ft^3	-1.5 yd^3
Footing	1	1.17'	16.499'	14.576'		281 ft^3	10.4 yd^3
fillet	2		14.576'		2.33 ft^2	68 ft^3	2.5 yd^3
MH Base	1		1.000'		12.57 ft^2	13 ft^3	0.5 yd^3



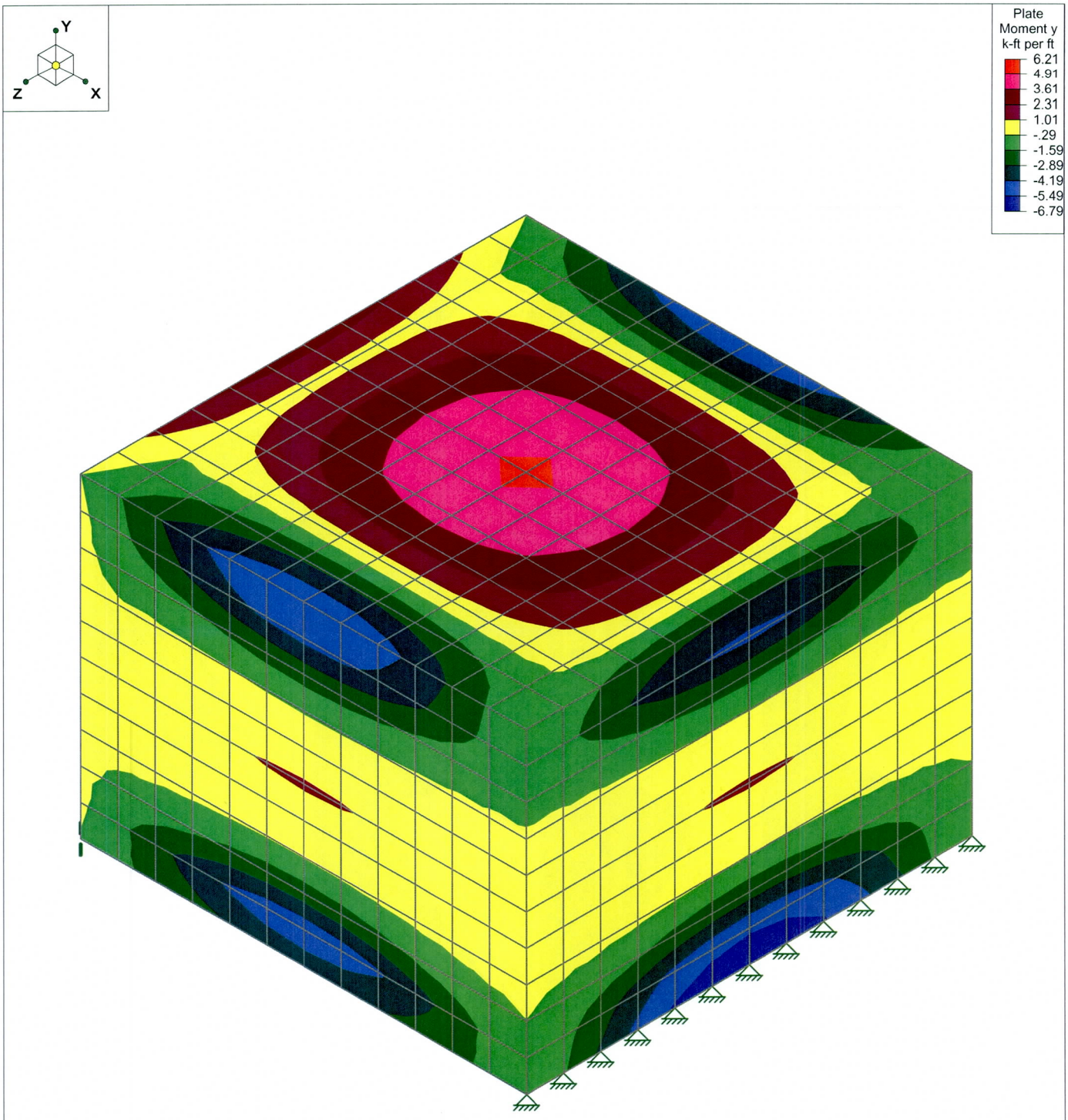
Results for LC 2, STRENGTH 1 - LL @ midspan

Olsson Associates	Lafayette - Struct. #5	SK - 6
Ross Barron		Dec 5, 2011 at 3:30 PM
010-2312		Structure #5 3D Analysis.r3d



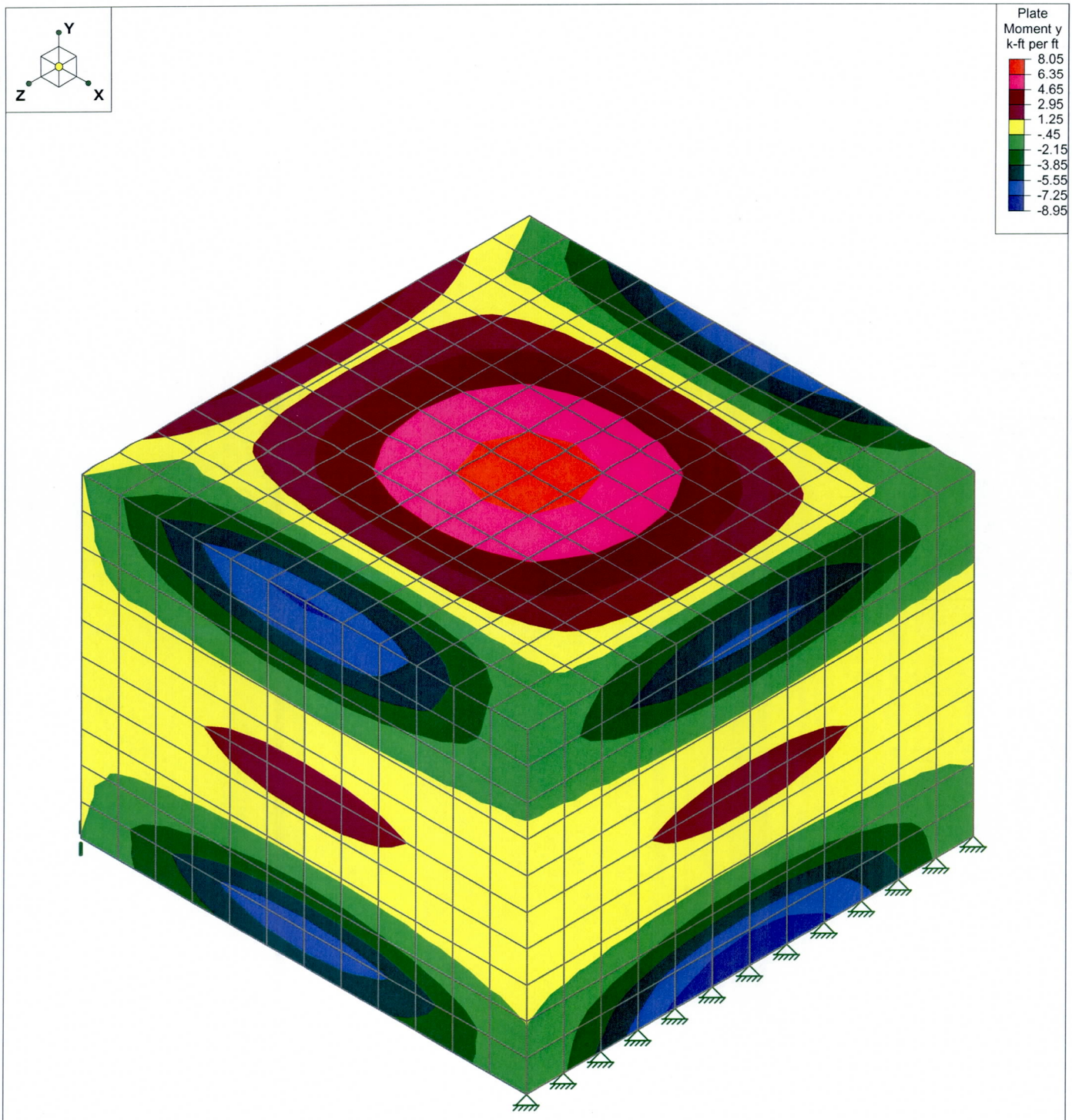
Results for LC 2, STRENGTH 1 - LL @ midspan

Olsson Associates	Lafayette - Struct. #5	SK - 5
Ross Barron		Dec 5, 2011 at 3:30 PM
010-2312		Structure #5 3D Analysis.r3d



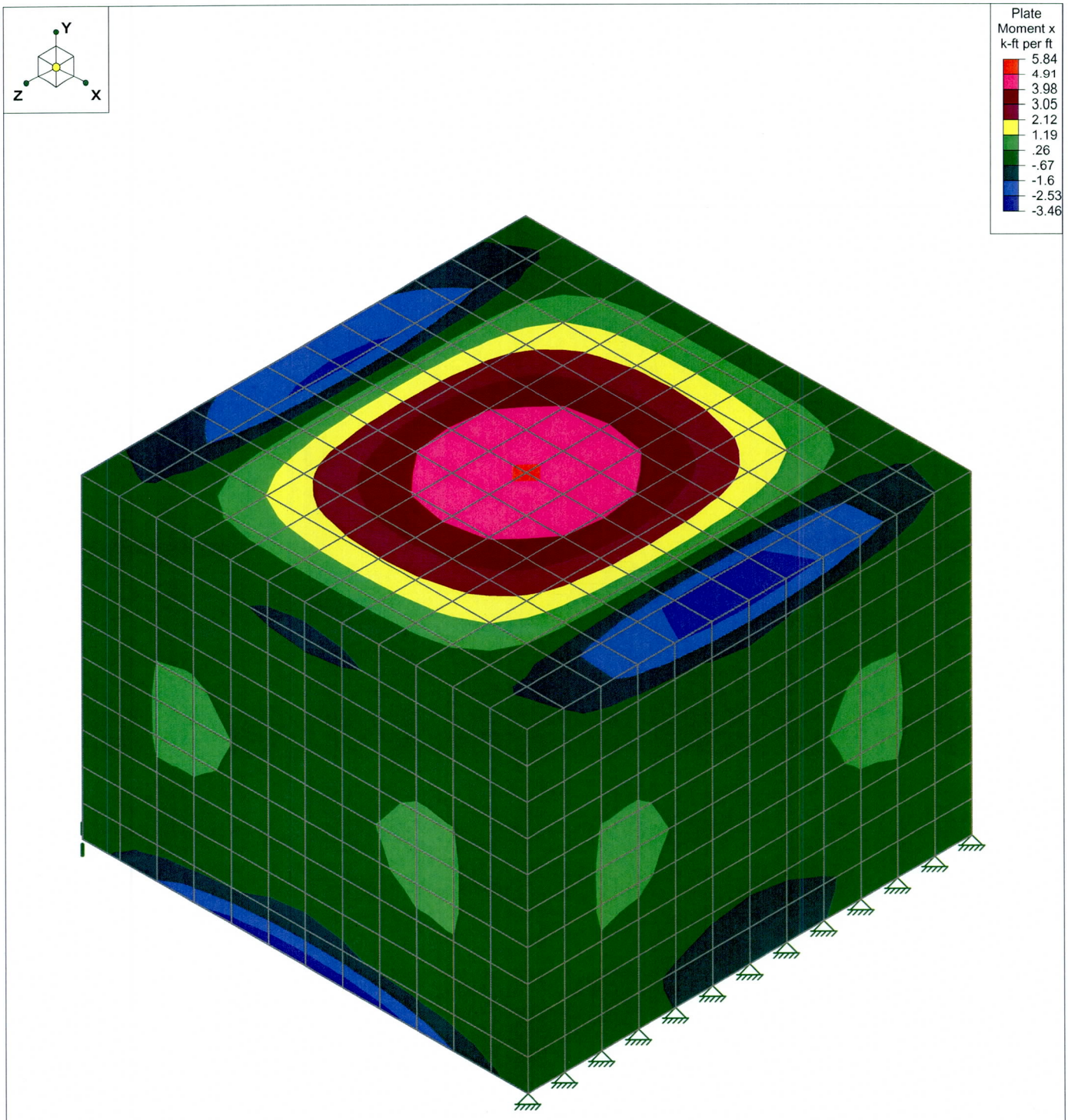
Results for LC 1, Service - LL @ midspan

Olsson Associates	Lafayette - Struct. #5	SK - 3
Ross Barron		Dec 5, 2011 at 3:29 PM
010-2312		Structure #5 3D Analysis.r3d



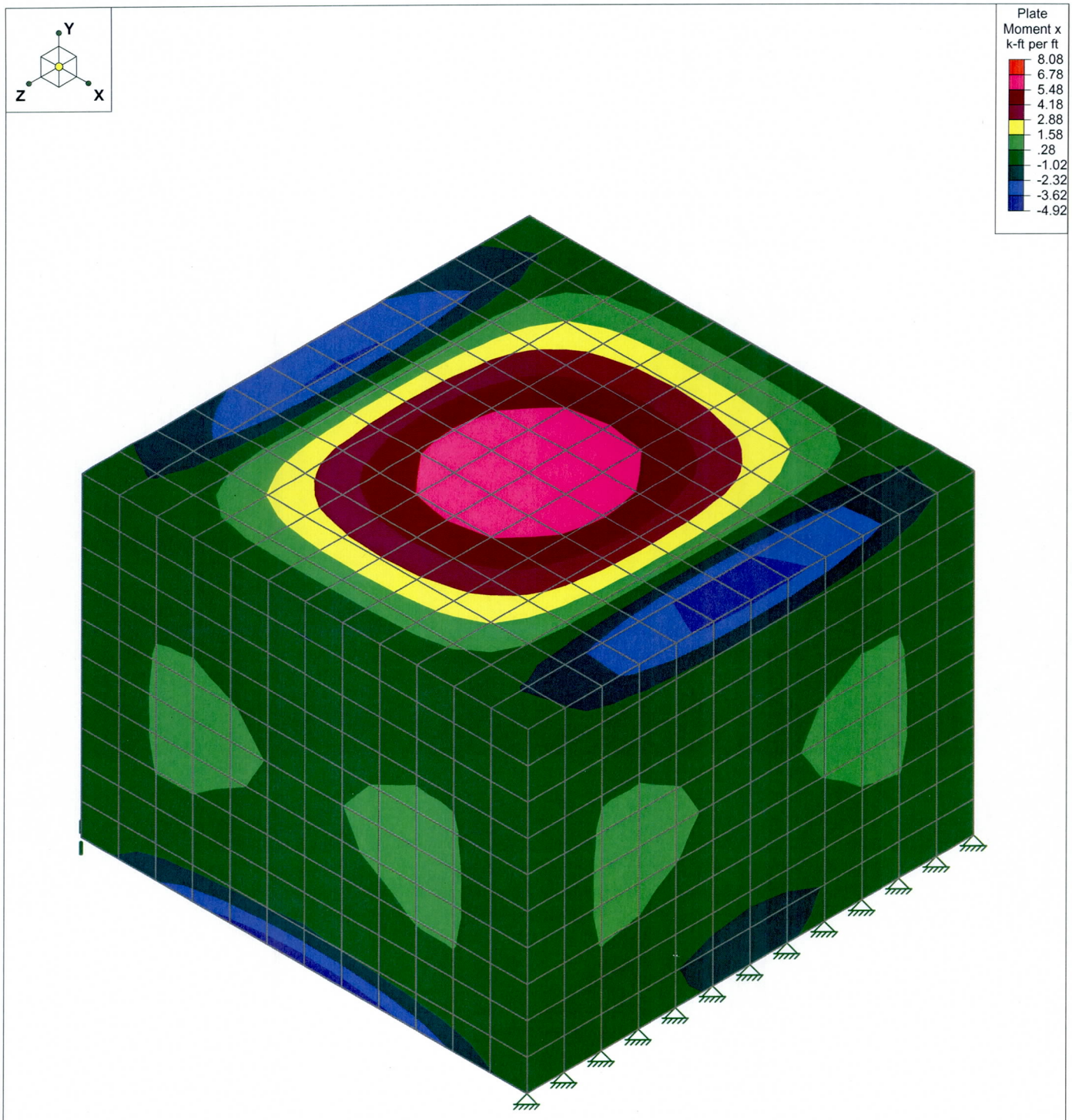
Results for LC 2, STRENGTH 1 - LL @ midspan

Olsson Associates	Lafayette - Struct. #5	SK - 4
Ross Barron		Dec 5, 2011 at 3:29 PM
010-2312		Structure #5 3D Analysis.r3d



Results for LC 1, Service - LL @ midspan

Olsson Associates	Lafayette - Struct. #5	SK - 1
Ross Barron		Dec 5, 2011 at 3:29 PM
010-2312		Structure #5 3D Analysis.r3d



Results for LC 2, STRENGTH 1 - LL @ midspan

Olsson Associates	Lafayette - Struct. #5	SK - 2
Ross Barron		Dec 5, 2011 at 3:29 PM
010-2312		Structure #5 3D Analysis.r3d

OLSSON ASSOCIATES	CLIENT NAME: Flood Control District of Maricopa County (FCDMC)	NAME: RDB	DATE: 3/23/12
	PROJECT NAME: Lafayette Interceptor Drain and Outlet Design	PROJECT NO: 010-2312	REV: 0
STANDARD CALCULATION SHEET	SUBJECT: Underground Structures		

Structure #6, Drop Inlet w/ additional 2-CMP inlets:

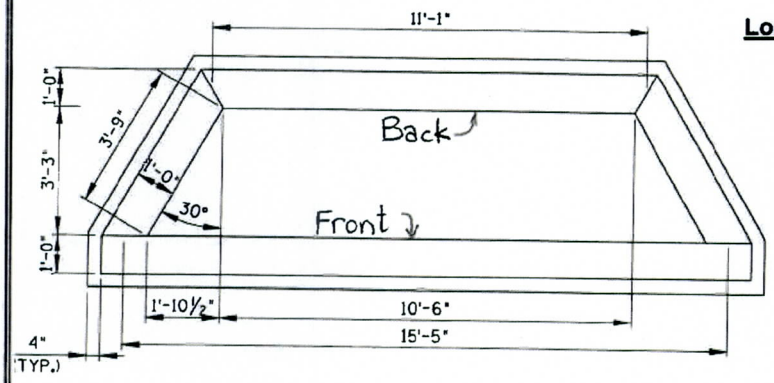
OLSSON ASSOCIATES
Olsson Associates
7301 W. 133rd Street; Suite 200 | Overland Park, KS 66213
Ofc. 913.381.1170 | Fax. 913.381.1174

Project: Layfayette Interceptor drain - Structure No.6 **Designed By:** KHJ **Date:** 30-Nov-11

Subject: Drop Inlet for 36" dia. RCP & 2 - 36" squash CMP's **Checked By:** _____ **Sheet** 1 -

Plan View of Drop Inlet Structure No. 6:

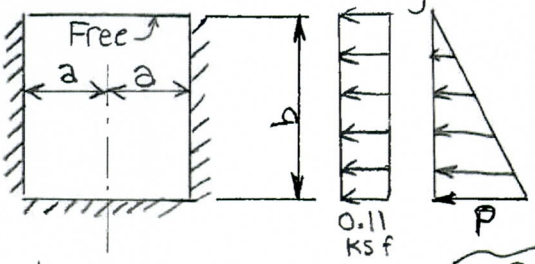
Maximum height = 10.67' (front)
= 14.58' back



Loads:

Lateral Earth Pressure · γ_{EFP} = 55pcf
Live Load surch.: 2 ft. equiv. fill height; horiz. pressure against walls = 0.11 ksf
Reference Eng'rg. Monogram #27 developed by U.S. Dept. of Interior to determine Moments & Reactions for Rectangular Plates.

Use Case I - ℔ fixed along three edges & free along fourth edge:



For front wall: a = 7'-8½"
b = 10'-8"
so a/b = 0.72

$P = \frac{(55)(10.67)}{1,000} = 0.59$ ksf

Use chart values for a/b = ¾:

For uniform surcharge load:
$\alpha R_x = +0.8592$ $\alpha R_y = +0.6725$
$\alpha +M_x = 0.1788$ $\alpha M_x^{(-)} = -0.0807$
$\alpha M_y^{(+)} = 0.1212$ $\alpha M_y^{(-)} = -0.0245$

For uniformly varying load:
$\alpha R_x = +0.2542$ $\alpha R_y = +0.4055$
$\alpha M_x^{(+)} = +0.0426$ $\alpha M_x^{(-)} = -0.0214$
$\alpha M_y^{(+)} = +0.0584$ $\alpha M_y^{(-)} = -0.0143$

Max. shear load (service) = $\underbrace{(0.8592)(0.11)(10.67)}_{1.01} + \underbrace{(0.4055)(0.59)(10.67)}_{2.55}$
= 3.56 k

$M_x(+) = \underbrace{(0.1788)0.11(10.67)^2}_{2.24} + \underbrace{0.0426(0.59)(10.67)^2}_{2.86} = 5.1$ ft.-k

$M_y(+) = \underbrace{0.1212(0.11)(10.67)^2}_{1.52} + \underbrace{0.0584(0.59)(10.67)^2}_{3.92} = 5.44$ ft.-k

OLSSON ASSOCIATES
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Project: Layfayette Interceptor drain - Structure No.6 | Designed By: KHJ | Date: 30-Nov-11
Subject: Drop Inlet for 36" dia. RCP & 2 - 36" squash CMP's | Checked By: _____ | Sheet 2 - 2

Total ℙ Loads:

	SERVICE	STRENGTH
V:	1.01 + 2.55 = 3.56	1.5(2.55)+1.75(1.01) = 5.59^k = V_u
M_x:	2.24 + 2.86 = 5.1 ft.-k	1.5(2.86)+1.75(2.24) = 8.21 ft.-k
M_y:	1.52 + 3.92 = 5.44 ft.-k	1.5(3.92)+1.75(1.52) = 8.54 ft.-k (M_u)

$$V_c = 2\sqrt{f'_c}\, b_w d = \frac{2\sqrt{4{,}000}\,(12)(9)}{1{,}000} = 13.66^k > V_u \text{ O.K.}$$

By working stress design $A_s = \frac{M}{f_s j d} = \frac{(5.44)(12)}{(24)(0.875)(9)}$

$= 0.35$ in.^{2}/ft. of wall

$M_n = \frac{8.54}{0.9} = 9.5$ ft.-k $\therefore$ Req'd. $R_u = \frac{M_n}{bd^2} = \frac{(9.5)(12{,}000)}{(12)(9)^2}$

$= 117.28$ psi

Will need to provide minimum amount of reinforcing as req'd. by ACI 318-08 Section 10.5.1 (and by reference to Section 7.12.2.1) which gives $\rho_{min.}$ for slabs/footings using $f_y = 60$ ksi $= 0.0018$ and thus $A_s = \rho_{min.} bd = 0.0018(12)(9) = 0.1944$ in.^{2}/ft. of wall

But utilizing $\rho_{min.} = 0.0018$ only gives a $R_u = 106.28$ which is slightly less than the 117.3 required. By inspection, utilizing No. 6's ($A_b = 0.44$ in.^{2}) @ 12" O.C. will be more than adequate. This size and spacing will be used on each face, each way.

P.S. - A check utilizing ACI 350-06 shows that the selected reinforcement satisfies requirements in this spec. as well.

KHJ
12/1/2011

Project Name: Lafayette
Project Number: 010-2312
Analyst: RB
Date: 12/6/2011

Structure #6, Drop Inlet

Summary

Concrete	20.1 yd^3
Reinforcing	1,608.0 lb

*Reinforcing is estimated at 80 lbs./CY

Concrete

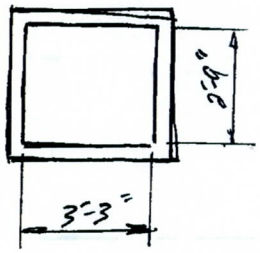
	Total				20.1 yd^3		
Location/Description	*Amount*	*Height*	*Length*	*Width*	*Area*	*Volume*	
Footing	1	1.50'			90.50 ft^2	136 ft^3	5.0 yd^3
Backwall	1	12.06'			12.25 ft^2	148 ft^3	5.5 yd^3
Front Wall	1	11.28'			16.70 ft^2	188 ft^3	7.0 yd^3
Side Walls	2	11.67'			3.75 ft^2	88 ft^3	3.2 yd^3
Minus 2-36" RCP	-2		.67'		7.33 ft^2	-10 ft^3	-0.4 yd^3
Minus 36" RCP	-1		.67'		7.33 ft^2	-5 ft^3	-0.2 yd^3

OLSSON ASSOCIATES	CLIENT NAME: Flood Control District of Maricopa County (FCDMC)	NAME: RDB	DATE: 3/23/12	
	PROJECT NAME: Lafayette Interceptor Drain and Outlet Design	PROJECT NO: 010-2312		REV: 0
STANDARD CALCULATION SHEET	SUBJECT: Underground Structures			

Structure #7 & #8, Modified Catch Basin:

OLSSON ASSOCIATES

STRUCTURE #7 & #8:



MAX DEPTH = 12'-6"

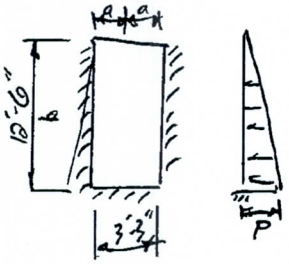
LOADS:

LATERAL EARTH; γ_{EFP} = 55 pcf

LL SURCHARGE; 2' EQUIV. = 0.11 ksf

UTILIZING E.M. NO. 27:

FIG. 4



p = 0.688 ksf

pb^2 = 107.42

a/b = 0.02

$\alpha M_{x_{max}}$ = 0.0038 ; $pb^2(\alpha)$ = 0.4 k-ft

$\alpha M_{y_{max}}$ = 0.0030

αR_{max} = 0.1056 ; $pb(\alpha)$ = 0.86 k

FIG. 1

pb^2 = 17.18

$\alpha M_{x_{MAX}}$ = 0.0052 ; $M_{MAX} = pb^2(\alpha)$ = 0.09

$\alpha M_{y_{MAX}}$ = 0.0033

αR_{MAX} = 0.1249 ; $R_{max} = pb(\alpha)$ = 0.17 k

TOTAL R LOADS

	SERVICE	STRENGTH I
V:	0.86 + 0.17 = 1 k	1.6 k
M_{MAX}:	–	≈ 1 k-ft

TEMP & SHRINK, AS WELL AS MIN. FLEXURAL STEEL CONTROLS.

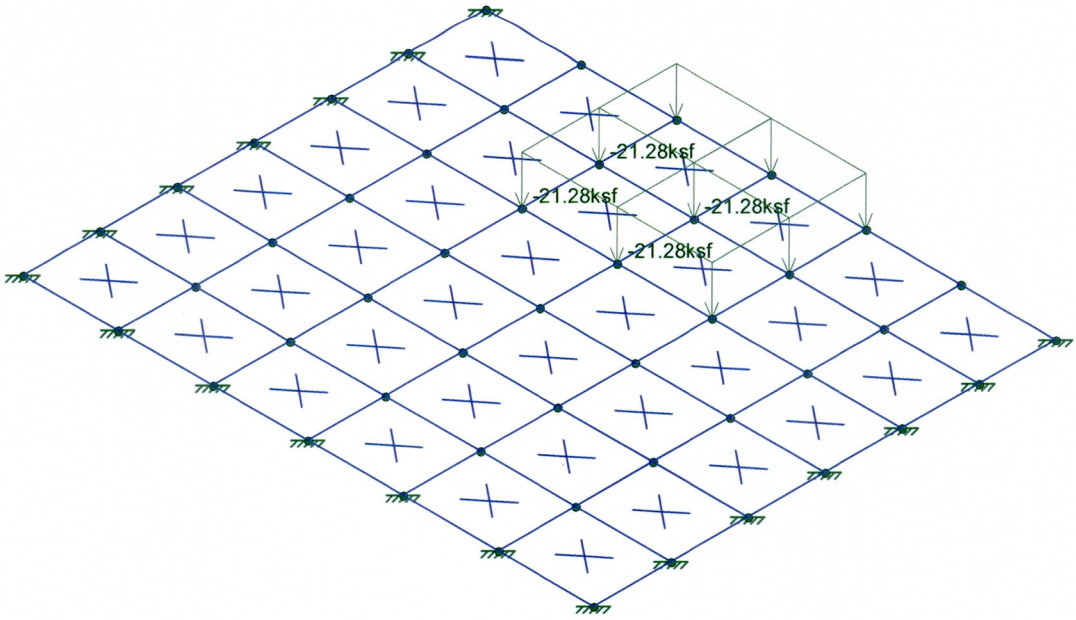
project: LAFAYETTE

subject STRUCT. #7 & #8

drawn by: RB date: project no.: 010-2312 sheet 1 of 1

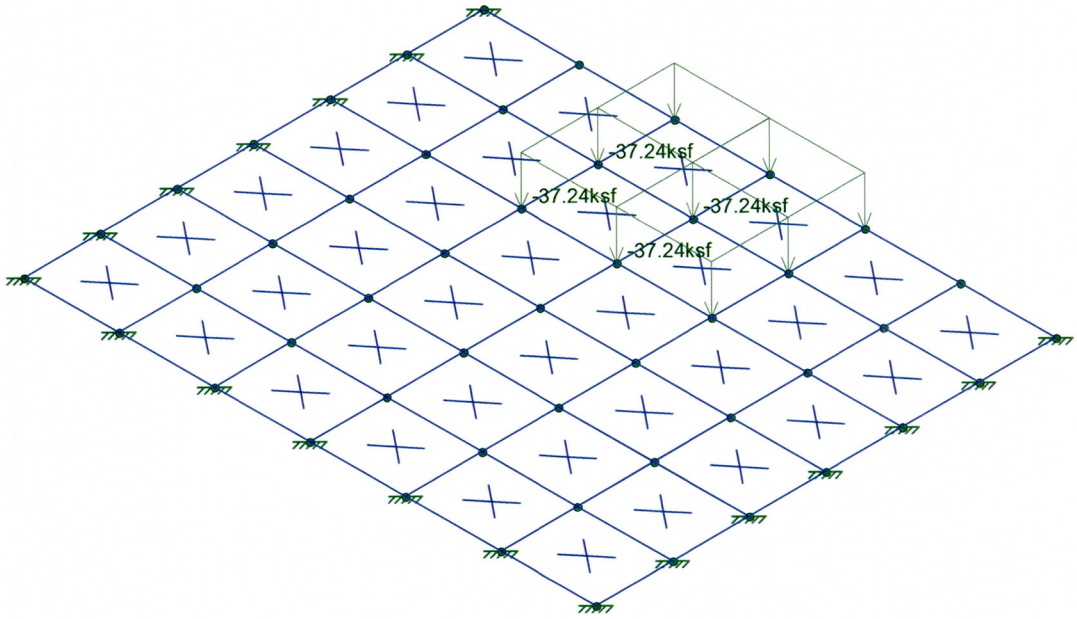
OLSSON ASSOCIATES	CLIENT NAME: Flood Control District of Maricopa County (FCDMC)	NAME: RDB	DATE: 3/23/12	
	PROJECT NAME: Lafayette Interceptor Drain and Outlet Design	PROJECT NO: 010-2312		REV: 0
STANDARD CALCULATION SHEET	SUBJECT: Underground Structures			

Structure #9, Modified Catch Basin - Cantilevered:



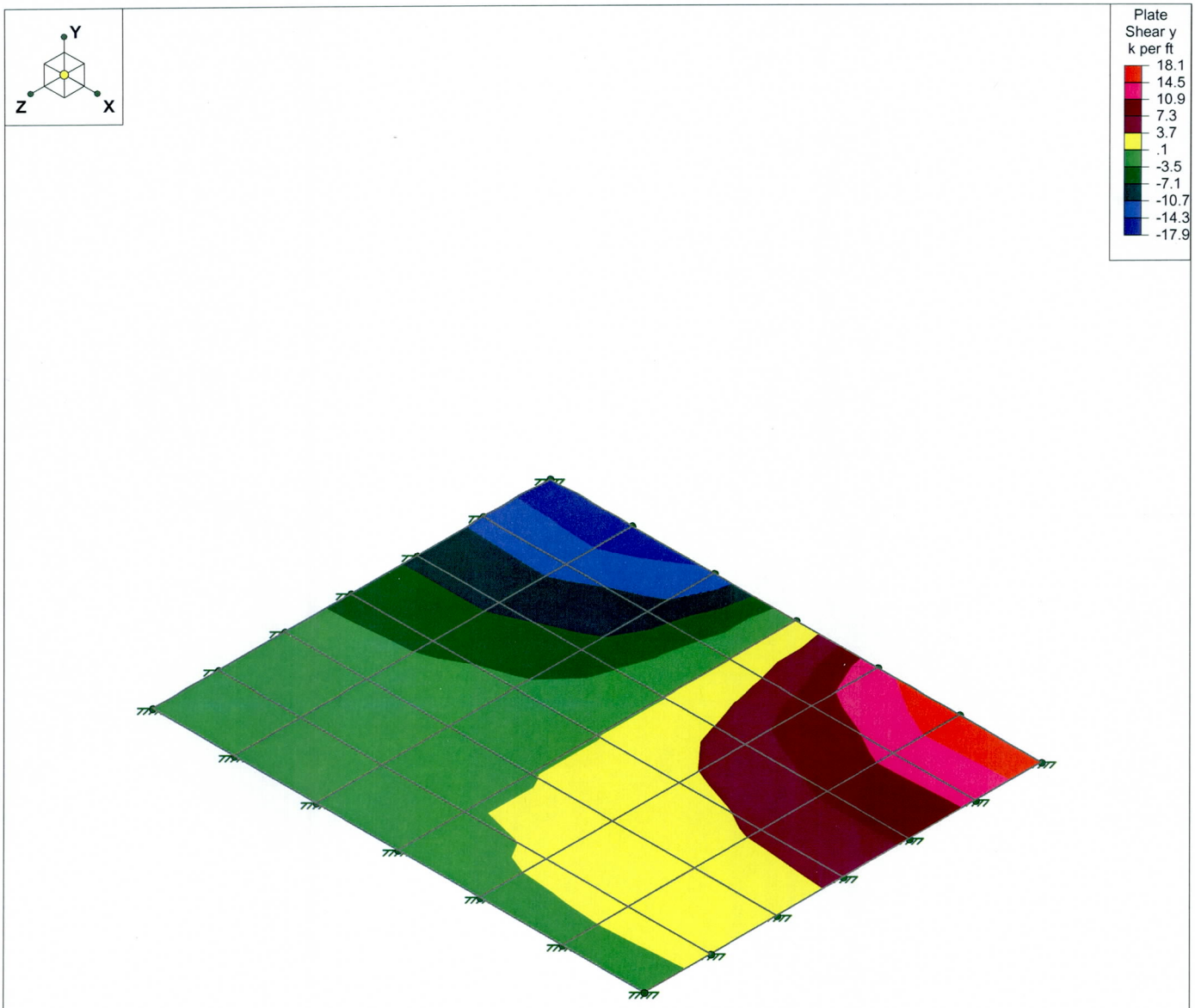
Loads: LC 1, truck load - service

Olsson Associates	Lafayette - Structure #9 Cantilever	SK - 4
Ross Barron		Dec 5, 2011 at 8:38 PM
010-2312		untitled.r3d



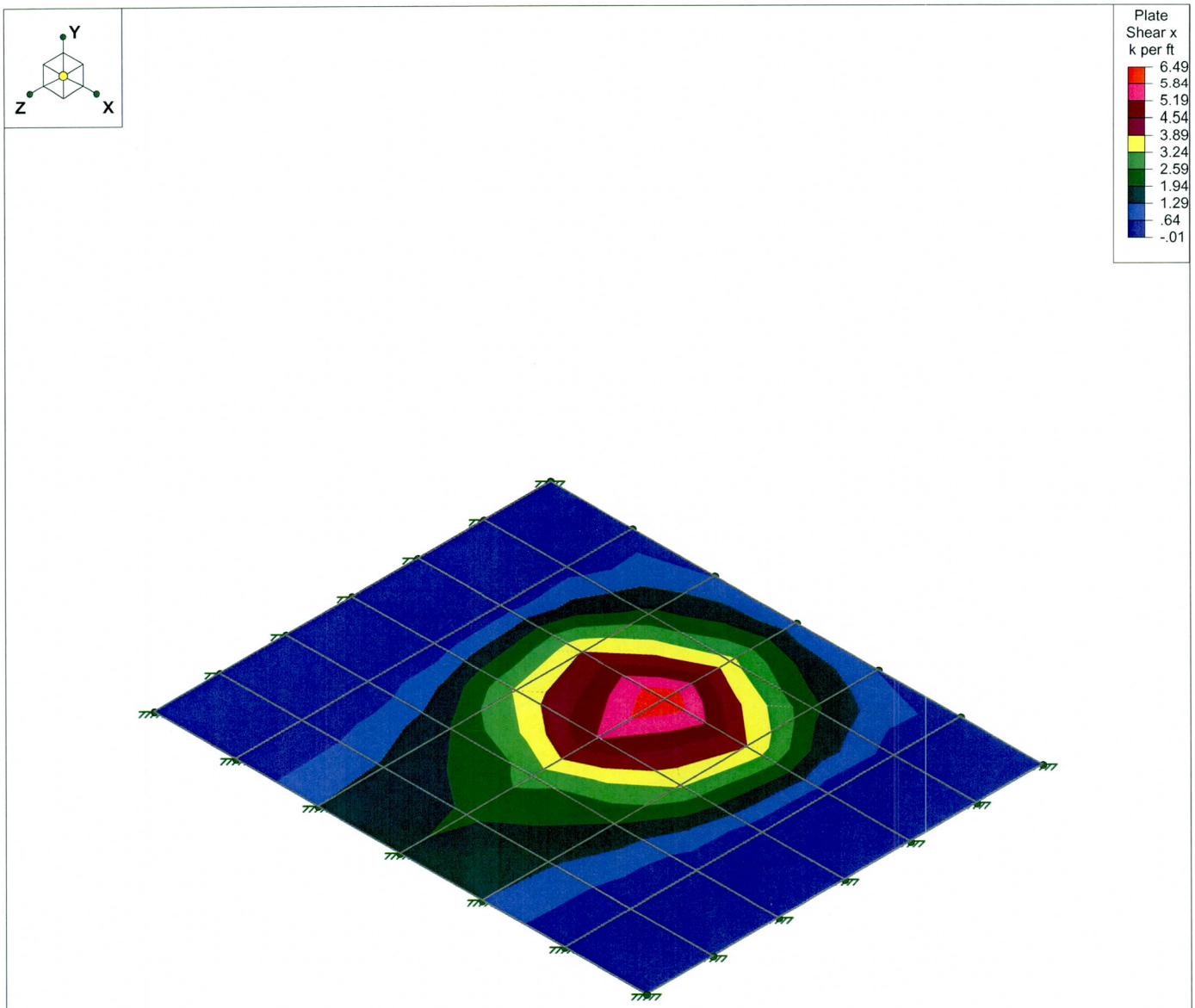
Loads: LC 2, truck load - strength

Olsson Associates	Lafayette - Structure #9 Cantilever	SK - 6
Ross Barron		Dec 5, 2011 at 8:38 PM
010-2312		untitled.r3d



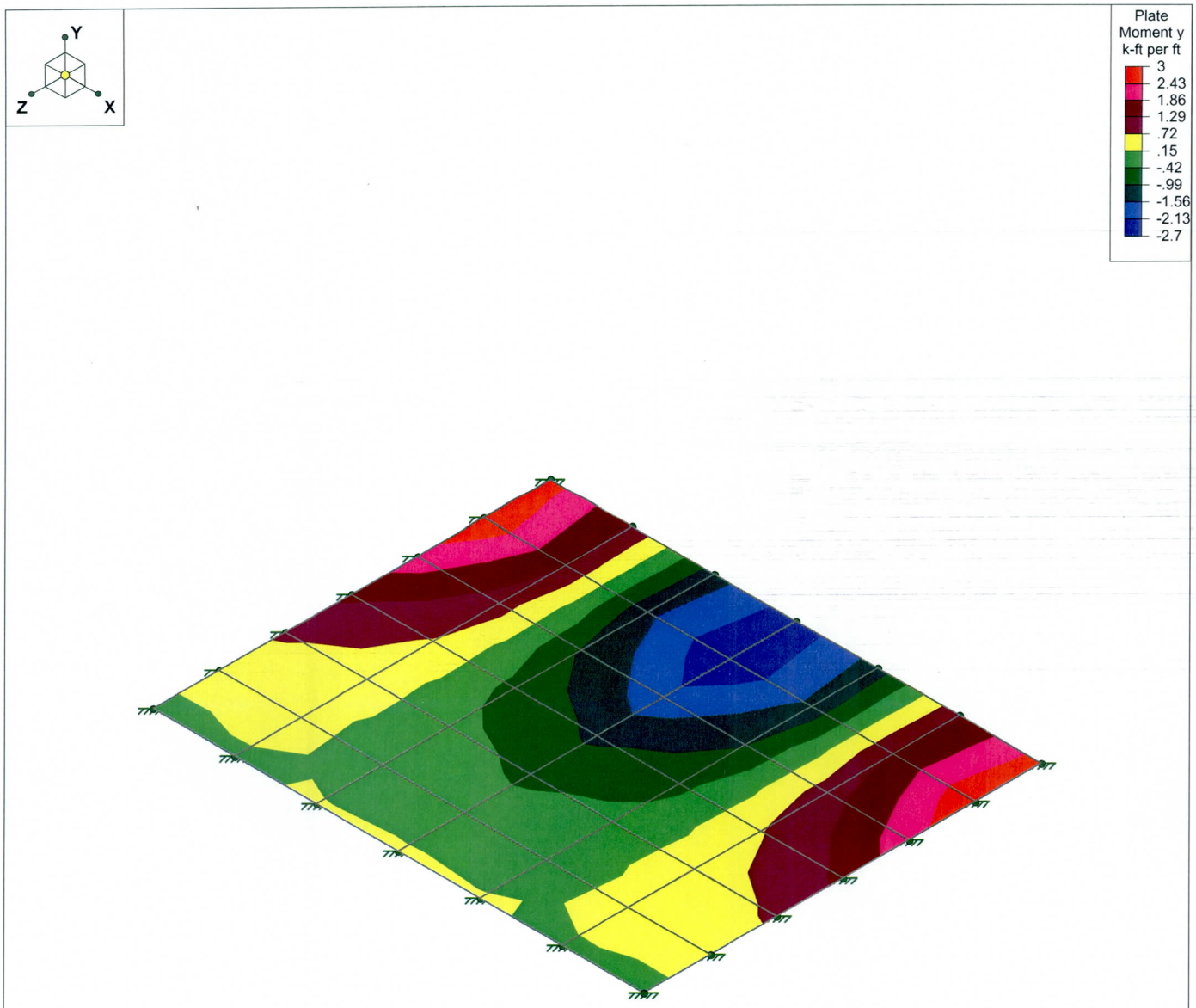
Results for LC 2, truck load - strength

Olsson Associates	Lafayette - Structure #9 Cantilever	SK - 8
Ross Barron		Dec 5, 2011 at 8:40 PM
010-2312		untitled.r3d



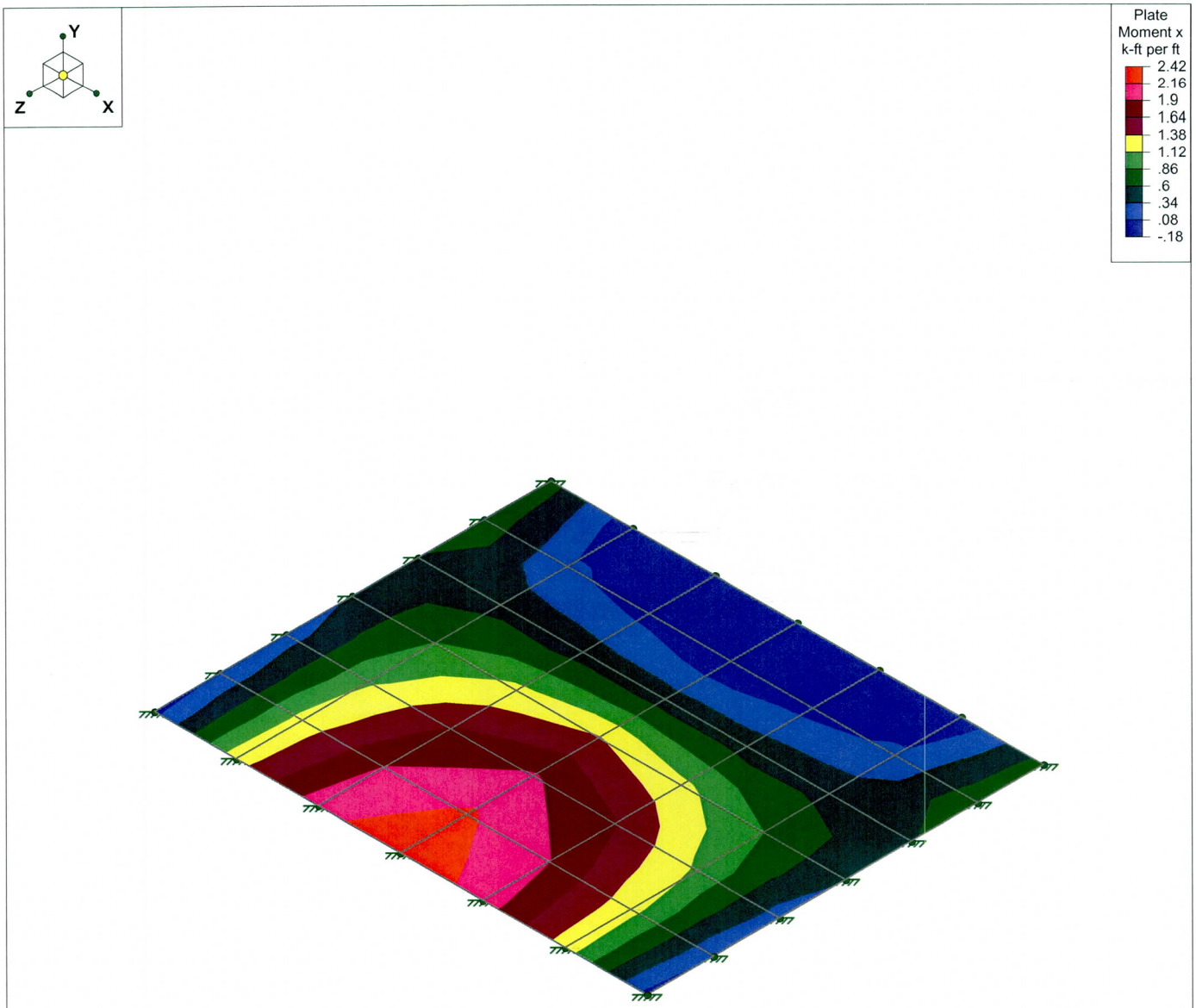
Results for LC 2, truck load - strength

Olsson Associates	Lafayette - Structure #9 Cantilever	SK - 7
Ross Barron		Dec 5, 2011 at 8:39 PM
010-2312		untitled.r3d



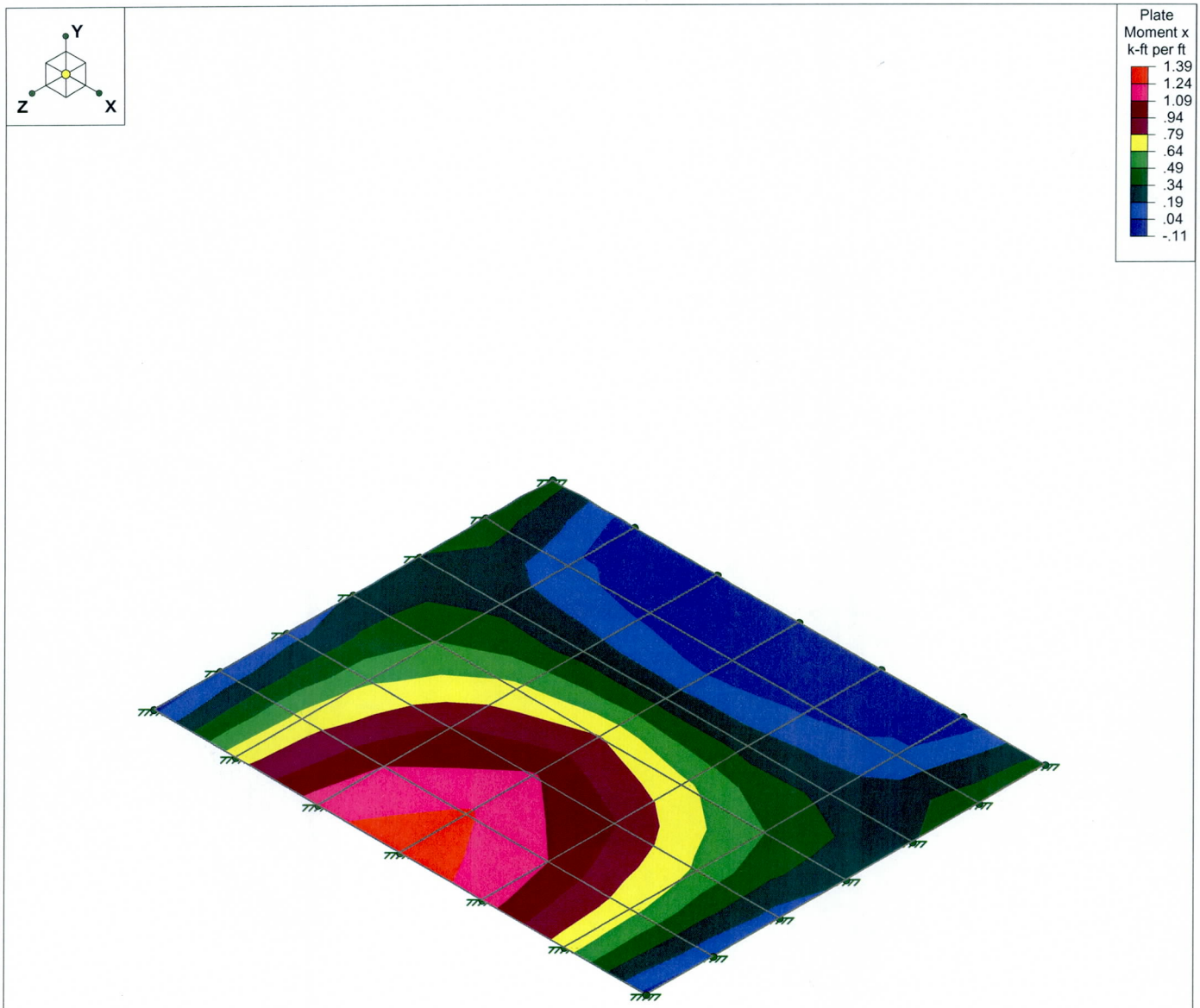
Results for LC 1, truck load - service

Olsson Associates	Lafayette - Structure #9 Cantilever	SK - 10
Ross Barron		Dec 5, 2011 at 8:40 PM
010-2312		untitled.r3d



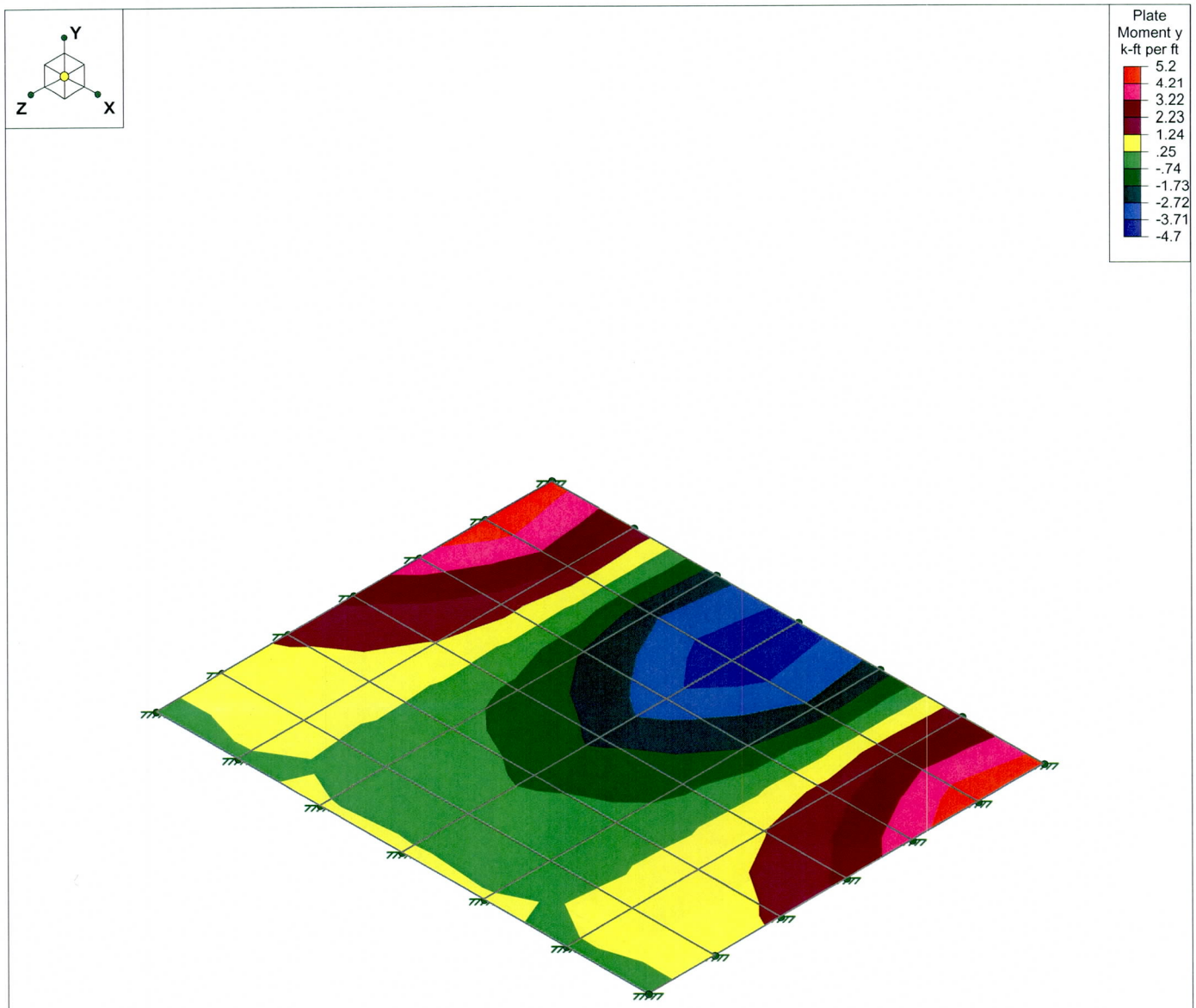
Results for LC 2, truck load - strength

Olsson Associates	Lafayette - Structure #9 Cantilever	SK - 12
Ross Barron		Dec 5, 2011 at 8:41 PM
010-2312		untitled.r3d



Results for LC 1, truck load - service

Olsson Associates	Lafayette - Structure #9 Cantilever	SK - 9
Ross Barron		Dec 5, 2011 at 8:40 PM
010-2312		untitled.r3d



Results for LC 2, truck load - strength

Olsson Associates	Lafayette - Structure #9 Cantilever	SK - 11
Ross Barron		Dec 5, 2011 at 8:41 PM
010-2312		untitled.r3d

OLSSON ASSOCIATES	CLIENT NAME: Flood Control District of Maricopa County (FCDMC)	NAME: RDB	DATE: 3/23/12
	PROJECT NAME: Lafayette Interceptor Drain and Outlet Design	PROJECT NO: 010-2312	REV: 0
STANDARD CALCULATION SHEET	SUBJECT: Underground Structures		

Appendix:

			M_x						M_y					
	y/b	R_x \ x/a	0	0.2	0.4	0.6	0.8	1.0	0	0.2	0.4	0.6	0.8	1.0
a/b = 1/8	1.0	+.1249	+.0052	+.0024	+.0002	−.0014	−.0024	−.0027	0	0	0	0	0	0
	0.8	+.1248	+.0051	+.0023	+.0002	−.0014	−.0023	−.0026	+.0010	+.0005	+.0000	−.0003	−.0005	−.0005
	0.6	+.1247	+.0052	+.0023	+.0002	−.0014	−.0023	−.0027	+.0010	+.0005	+.0000	−.0003	−.0005	−.0005
	0.4	+.1250	+.0051	+.0023	+.0001	−.0014	−.0023	−.0027	+.0010	+.0005	+.0000	−.0003	−.0005	−.0006
	0.2	+.1185	+.0048	+.0021	+.0001	−.0013	−.0021	−.0024	+.0010	+.0004	−.0001	−.0004	−.0006	−.0007
	0	+.0504	0	+.0001	+.0003	+.0005	+.0006	+.0007	0	+.0006	+.0016	+.0025	+.0031	+.0033
		R_x \ R_y	+.0504	+.0116	+.0568	+.0893	+.1084	+.1141						
a/b = 1/4	1.0	+.2483	+.0209	+.0096	+.0007	−.0057	−.0096	−.0109	0	0	0	0	0	0
	0.8	+.2523	+.0206	+.0093	+.0006	−.0056	−.0093	−.0105	+.0041	+.0019	+.0002	−.0009	−.0016	−.0019
	0.6	+.2513	+.0205	+.0093	+.0006	−.0056	−.0093	−.0105	+.0041	+.0018	+.0000	−.0013	−.0021	−.0023
	0.4	+.2512	+.0196	+.0085	+.0003	−.0054	−.0088	−.0099	+.0039	+.0016	−.0004	−.0018	−.0027	−.0030
	0.2	+.1905	+.0137	+.0053	−.0003	−.0039	−.0059	−.0065	+.0027	+.0007	−.0011	−.0024	−.0032	−.0034
	0	+.0295	0	+.0005	+.0013	+.0020	+.0025	+.0027	0	+.0023	+.0063	+.0101	+.0126	+.0135
		R_x \ R_y	+.0295	+.0236	+.1131	+.1786	+.2174	+.2301						
a/b = 3/8	1.0	+.3711	+.0476	+.0219	+.0016	−.0130	−.0218	−.0247	0	0	0	0	0	0
	0.8	+.3896	+.0466	+.0208	+.0012	−.0126	−.0208	−.0235	+.0093	+.0042	+.0004	−.0022	−.0038	−.0043
	0.6	+.3757	+.0442	+.0193	+.0007	−.0122	−.0198	−.0223	+.0088	+.0036	−.0007	−.0039	−.0059	−.0065
	0.4	+.3541	+.0379	+.0155	−.0003	−.0107	−.0167	−.0186	+.0076	+.0024	−.0021	−.0054	−.0075	−.0082
	0.2	+.2133	+.0210	+.0075	−.0009	−.0059	−.0085	−.0093	+.0042	+.0009	−.0017	−.0034	−.0044	−.0047
	0	−.0015	0	+.0010	+.0027	+.0043	+.0054	+.0058	0	+.0050	+.0135	+.0215	+.0269	+.0288
		R_x \ R_y	−.0015	+.0303	+.1666	+.2644	+.3220	+.3410						
a/b = 1/2	1.0	+.5101	+.0852	+.0384	+.0022	−.0233	−.0383	−.0432	0	0	0	0	0	0
	0.8	+.5331	+.0807	+.0349	+.0013	−.0218	−.0353	−.0397	+.0161	+.0068	−.0001	−.0049	−.0077	−.0086
	0.6	+.4805	+.0712	+.0298	−.0000	−.0199	−.0313	−.0350	+.0142	+.0051	−.0026	−.0084	−.0120	−.0132
	0.4	+.4148	+.0545	+.0209	−.0014	−.0156	−.0233	−.0258	+.0109	+.0026	−.0043	−.0094	−.0125	−.0135
	0.2	+.1928	+.0250	+.0087	−.0009	−.0063	−.0089	−.0096	+.0050	+.0015	−.0003	−.0008	−.0008	−.0007
	0	−.0294	0	+.0019	+.0050	+.0080	+.0100	+.0107	0	+.0094	+.0252	+.0399	+.0499	+.0534
		R_x \ R_y	−.0294	+.0482	+.2263	+.3559	+.4322	+.4572						
a/b = 3/4	1.0	+.8592	+.1788	+.0716	−.0010	−.0471	−.0726	−.0807	0	0	0	0	0	0
	0.8	+.7864	+.1552	+.0607	−.0020	−.0414	−.0630	−.0698	+.0310	+.0112	−.0027	−.0119	−.0172	−.0190
	0.6	+.5989	+.1207	+.0460	−.0033	−.0336	−.0498	−.0549	+.0241	+.0071	−.0067	−.0166	−.0225	−.0245
	0.4	+.4378	+.0786	+.0280	−.0033	−.0214	−.0306	−.0333	+.0157	+.0036	−.0049	−.0100	−.0127	−.0135
	0.2	+.1185	+.0289	+.0109	+.0009	−.0034	−.0049	−.0053	+.0058	+.0060	+.0115	+.0186	+.0241	+.0262
	0	−.0694	0	+.0042	+.0115	+.0182	+.0227	+.0242	0	+.0212	+.0576	+.0911	+.1135	+.1212
		R_x \ R_y	−.0694	+.0806	+.3383	+.5271	+.6368	+.6725						
a/b = 1	1.0	+1.2115	+.2613	+.0883	−.0105	−.0654	−.0927	−.1008	0	0	0	0	0	0
	0.8	+.9558	+.2146	+.0727	−.0097	−.0551	−.0774	−.0840	+.0429	+.0134	−.0051	−.0164	−.0224	−.0243
	0.6	+.6250	+.1547	+.0525	−.0083	−.0411	−.0566	−.0611	+.0309	+.0090	−.0069	−.0169	−.0222	−.0238
	0.4	+.3984	+.0916	+.0305	−.0043	−.0216	−.0290	−.0310	+.0183	+.0069	+.0029	+.0030	+.0045	+.0053
	0.2	+.0434	+.0303	+.0127	+.0047	+.0033	+.0042	+.0048	+.0061	+.0149	+.0339	+.0542	+.0689	+.0742
	0	−.0939	0	+.0074	+.0199	+.0311	+.0384	+.0409	0	+.0389	+.0996	+.1556	+.1919	+.2043
		R_x \ R_y	−.0939	+.1167	+.4453	+.6760	+.8043	+.8450						
a/b = 3/2	1.0	+1.6267	+.3304	+.0700	−.0345	−.0730	−.0844	−.0865	0	0	0	0	0	0
	0.8	+1.0875	+.2609	+.0565	−.0286	−.0589	−.0670	−.0683	+.0522	+.0116	−.0069	−.0143	−.0165	−.0169
	0.6	+.5876	+.1778	+.0399	−.0195	−.0385	−.0422	−.0422	+.0356	+.0115	+.0017	+.0011	+.0035	+.0049
	0.4	+.3166	+.0981	+.0239	−.0056	−.0116	−.0101	−.0090	+.0196	+.0177	+.0315	+.0495	+.0634	+.0685
	0.2	−.0540	+.0302	+.0140	+.0140	+.0211	+.0273	+.0296	+.0060	+.0389	+.0912	+.1388	+.1699	+.1805
	0	−.1168	0	+.0159	+.0388	+.0565	+.0668	+.0702	0	+.0796	+.1939	+.2823	+.3340	+.3508
		R_y	−.1168	+.2429	+.6510	+.8793	+.9832	+1.0123						

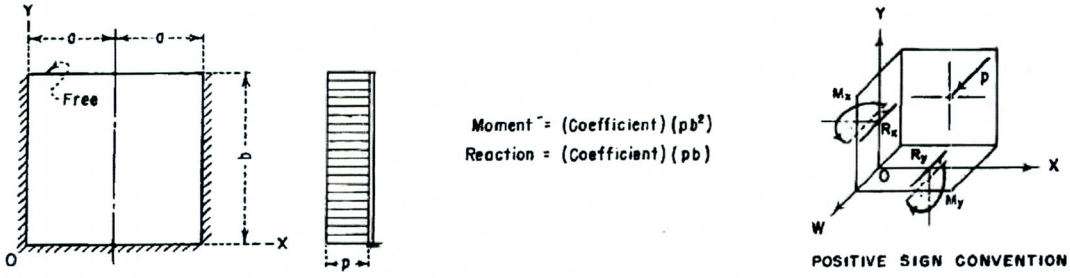


FIGURE 1.—*Plate fixed along three edges, moment and reaction coefficients, Load I, uniform load.*

			M_x						M_y					
	y/b	R_x \ x/a	0	0.2	0.4	0.6	0.8	1.0	0	0.2	0.4	0.6	0.8	1.0
a/b = 1/8	1.0	+.0082	+.0004	+.0002	+.0000	−.0001	−.0002	−.0002	0	0	0	0	0	0
	0.8	+.0251	+.0011	+.0005	+.0000	−.0003	−.0005	−.0005	+.0002	+.0001	+.0000	−.0000	−.0001	−.0001
	0.6	+.0496	+.0021	+.0009	+.0001	−.0006	−.0009	−.0011	+.0004	+.0002	+.0000	−.0001	−.0002	−.0002
	0.4	+.0751	+.0031	+.0014	+.0001	−.0008	−.0014	−.0016	+.0006	+.0003	+.0000	−.0002	−.0003	−.0003
	0.2	+.0942	+.0038	+.0016	+.0000	−.0010	−.0017	−.0019	+.0008	+.0003	−.0000	−.0003	−.0005	−.0005
	0	+.0460	0	+.0001	+.0003	+.0005	+.0006	+.0006	0	+.0005	+.0014	+.0023	+.0028	+.0030
		R_x \ R_y	+.0460	+.0136	+.0543	+.0839	+.1004	+.1056						
a/b = 1/4	1.0	+.0147	+.0022	+.0012	+.0002	−.0006	−.0012	−.0014	0	0	0	0	0	0
	0.8	+.0523	+.0046	+.0022	+.0002	−.0012	−.0021	−.0024	+.0009	+.0005	+.0002	−.0000	−.0002	−.0002
	0.6	+.1015	+.0083	+.0037	+.0002	−.0023	−.0038	−.0042	+.0017	+.0007	−.0000	−.0005	−.0009	−.0010
	0.4	+.1514	+.0114	+.0049	+.0001	−.0032	−.0051	−.0057	+.0023	+.0008	−.0004	−.0013	−.0019	−.0021
	0.2	+.1494	+.0102	+.0037	−.0004	−.0030	−.0043	−.0047	+.0020	+.0004	−.0011	−.0022	−.0029	−.0031
	0	+.0304	0	+.0004	+.0010	+.0016	+.0020	+.0021	0	+.0020	+.0052	+.0081	+.0100	+.0107
		R_x \ R_y	+.0304	+.0309	+.1052	+.1563	+.1856	+.1950						
a/b = 3/8	1.0	+.0189	+.0066	+.0040	+.0008	−.0020	−.0039	−.0045	0	0	0	0	0	0
	0.8	+.0885	+.0117	+.0056	+.0006	−.0031	−.0054	−.0062	+.0023	+.0012	+.0004	−.0002	−.0005	−.0007
	0.6	+.1541	+.0176	+.0075	+.0001	−.0049	−.0079	−.0088	+.0035	+.0013	−.0006	−.0020	−.0029	−.0032
	0.4	+.2107	+.0208	+.0079	−.0007	−.0061	−.0090	−.0099	+.0042	+.0009	−.0019	−.0042	−.0056	−.0061
	0.2	+.1691	+.0145	+.0045	−.0012	−.0042	−.0057	−.0061	+.0029	+.0001	−.0022	−.0039	−.0048	−.0051
	0	+.0102	0	+.0008	+.0020	+.0030	+.0038	+.0040	0	+.0039	+.0099	+.0152	+.0188	+.0200
		R_x \ R_y	+.0102	+.0474	+.1488	+.2154	+.2526	+.2645						
a/b = 1/2	1.0	+.0326	+.0151	+.0088	+.0015	−.0046	−.0084	−.0097	0	0	0	0	0	0
	0.8	+.1315	+.0216	+.0099	+.0007	−.0059	−.0099	−.0112	+.0043	+.0020	+.0002	−.0011	−.0019	−.0022
	0.6	+.1972	+.0273	+.0108	−.0005	−.0079	−.0119	−.0132	+.0055	+.0015	−.0020	−.0047	−.0064	−.0070
	0.4	+.2421	+.0277	+.0092	−.0019	−.0082	−.0115	−.0125	+.0055	+.0004	−.0042	−.0076	−.0097	−.0104
	0.2	+.1607	+.0160	+.0041	−.0017	−.0044	−.0055	−.0058	+.0032	−.0002	−.0026	−.0039	−.0044	−.0046
	0	−.0045	0	+.0014	+.0033	+.0050	+.0061	+.0065	0	+.0068	+.0167	+.0252	+.0307	+.0325
		R_x \ R_y	−.0045	+.0744	+.1942	+.2699	+.3108	+.3236						
a/b = 3/4	1.0	+.1061	+.0406	+.0196	+.0013	−.0115	−.0190	−.0214	0	0	0	0	0	0
	0.8	+.2077	+.0433	+.0177	−.0003	−.0119	−.0184	−.0205	+.0087	+.0031	−.0012	−.0042	−.0061	−.0067
	0.6	+.2408	+.0426	+.0145	−.0026	−.0124	−.0174	−.0189	+.0085	+.0010	−.0055	−.0102	−.0130	−.0139
	0.4	+.2542	+.0349	+.0091	−.0039	−.0102	−.0130	−.0138	+.0070	−.0011	−.0075	−.0115	−.0137	−.0143
	0.2	+.1337	+.0163	+.0031	−.0017	−.0031	−.0033	−.0033	+.0033	+.0001	−.0000	+.0014	+.0029	+.0035
	0	−.0196	0	+.0028	+.0064	+.0093	+.0111	+.0117	0	+.0139	+.0320	+.0465	+.0554	+.0584
		R_x \ R_y	−.0196	+.1256	+.2666	+.3496	+.3923	+.4055						
a/b = 1	1.0	+.1985	+.0644	+.0253	−.0013	−.0172	−.0252	−.0276	0	0	0	0	0	0
	0.8	+.2564	+.0601	+.0210	−.0028	−.0161	−.0226	−.0245	+.0120	+.0034	−.0026	−.0065	−.0088	−.0095
	0.6	+.2485	+.0515	+.0149	−.0047	−.0145	−.0189	−.0201	+.0103	+.0003	−.0075	−.0125	−.0151	−.0159
	0.4	+.2411	+.0372	+.0078	−.0049	−.0100	−.0118	−.0122	+.0074	−.0021	−.0076	−.0099	−.0106	−.0107
	0.2	+.1108	+.0154	+.0025	−.0006	−.0006	−.0000	+.0003	+.0031	+.0018	+.0060	+.0116	+.0160	+.0175
	0	−.0241	0	+.0044	+.0096	+.0137	+.0161	+.0169	0	+.0220	+.0482	+.0683	+.0804	+.0845
		R_x \ R_y	−.0241	+.1691	+.3199	+.4038	+.4457	+.4584						
a/b = 3/2	1.0	+.3127	+.0857	+.0207	−.0087	−.0199	−.0232	−.0238	0	0	0	0	0	0
	0.8	+.2929	+.0730	+.0158	−.0086	−.0172	−.0194	−.0198	+.0146	+.0023	−.0042	−.0072	−.0082	−.0085
	0.6	+.2352	+.0560	+.0094	−.0083	−.0134	−.0142	−.0141	+.0112	−.0013	−.0077	−.0096	−.0096	−.0094
	0.4	+.2148	+.0359	+.0038	−.0053	−.0065	−.0057	−.0053	+.0072	−.0021	−.0023	+.0012	+.0046	+.0059
	0.2	+.0897	+.0132	+.0021	+.0025	+.0050	+.0069	+.0076	+.0026	+.0077	+.0220	+.0356	+.0444	+.0474
	0	−.0204	0	+.0079	+.0158	+.0212	+.0243	+.0252	0	+.0396	+.0791	+.1062	+.1214	+.1262
		R_y	−.0204	+.2452	+.3964	+.4668	+.4966	+.5047						

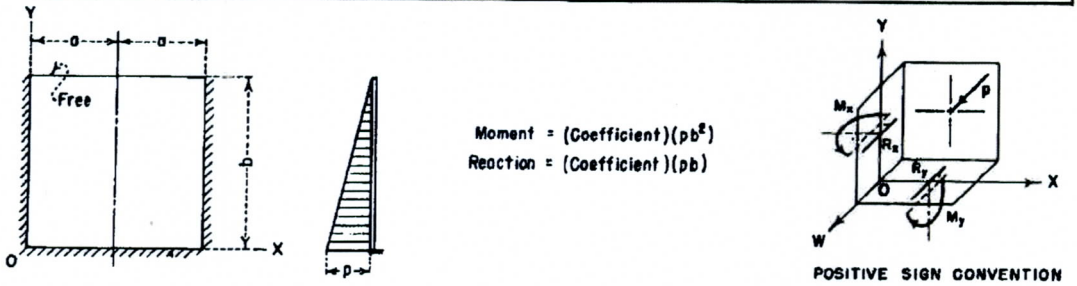


FIGURE 4.—*Plate fixed along three edges, moment and reaction coefficients, Load IV, uniformly varying load.*

Appendix F

Utility and Pothole Data

Testhole Data Summary

AZTEC
www.aztec.us TYPSA group

Date: 6/29/2011
Project Number: AZE1101-009
Project Name: Lafayette Interceptor Drain

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/2012

TH #	Location	Date of Excavation	Utility Owner	Utility Size	Utility Description	Coordinates		Stationing		Ground Elevation	Top Elevation	Bottom Elevation	Depth of Cover	Comments
						Northing	Easting	Stationing	Offset					
8	Arcadia Drive & Lafayette Boulevard	6/21/2011	Qwest Local Network	None	None	None	None	None	None					No facility in the requested location per ELM bluestake locator Larry 602-695-2181.
10	Arcadia Drive & Lafayette Boulevard	6/21/2011	Qwest Local Network	Eight 3.5"	Transite	909139.16	682029.71	20+24.85	5.48 LT	1266.06	1260.16	1258.34	5.90	
12	Arcadia Drive & Lafayette Boulevard	6/21/2011	Qwest Local Network	Two 2"	PE	909167.41	682041.07	20+55.29	5.50 LT	1266.60	1263.58	1263.36	3.02	
14	Lafayette Boulevard northwest of Arcadia Drive	6/20/2011	Qwest Local Network	Eight 3.5"	Transite	909310.41	681824.70	97+30.10	18.28 LT	1266.60	1262.18	1260.62	4.42	
17	Lafayette Boulevard & 44th Place	6/20/2011	Qwest Local Network	1"	PE	909637.93	681392.31	91+88.70	15.06 RT	1265.93	1263.23	1263.15	2.70	
18	Lafayette Boulevard & Dromedary Road	6/20/2011	Qwest Local Network	Eight 3.5"	Transite	909699.44	681372.55	91+33.63	18.71 LT	1265.90	1260.94	1258.86	4.96	
20	Lafayette Boulevard & Dromedary Road	6/20/2011	Qwest Local Network	0.5"	PE	909710.17	681377.98	91+30.76	30.40 LT	1265.94	1262.12	1262.08	3.82	
23	Lafayette Boulevard & 47th Street	6/21/2011	Qwest Local Network	1.5"	PE	909907.77	681077.19	87+73.84	15.73 RT	1265.37	1262.41	1262.25	2.96	
25	Lafayette Boulevard & Launfal Avenue	6/20/2011	Qwest Local Network	Eight 3.5"	Transite	910051.41	680960.83	85+91.98	17.39 LT	1265.29	1260.79	1258.99	4.50	
27	Lafayette Boulevard & Launfal Avenue	6/22/2011	Qwest Local Network	None	None	None	None	None	None					No facility in the requested location per ELM bluestake locator Larry 602-695-2181.
29	46th Place & Lafayette Boulevard	6/24/2011	Qwest Local Network	1.25"	PE	910304.21	680622.02	81+70.24	11.63 RT	1264.93	1259.71	1259.61	5.22	
31	Lafayette Boulevard west of 46th Street	6/22/2011	Qwest Local Network	1.25"	PE	910775.45	680136.64	74+92.93	10.30 RT	1264.02	1261.00	1260.90	3.02	
32	Lafayette Boulevard & 46th Street	6/23/2011	Qwest Local Network	None	None	None	None	None	None					No facility in the requested location per ELM bluestake locator Larry 602-695-2181.
34	Lafayette Boulevard & 46th Street	6/23/2011	Qwest Local Network	None	None	None	None	None	None					No facility in the requested location per ELM bluestake locator Larry 602-695-2181.
35	Lafayette Boulevard & 46th Street	6/22/2011	Qwest Local Network	Eight 3.5"	Transite	911032.54	679983.05	71+95.19	21.88 LT	1263.62	1260.22	1258.40	3.40	
37	Lafayette Boulevard & 46th Street	6/22/2011	Qwest Local Network	4"	PVC	911113.46	680013.87	71+49.15	95.21 LT	1265.68	1263.86	1263.48	1.82	
39	Lafayette Boulevard & 45th Street	6/22/2011	Qwest Local Network	Eight 3.5"	Transite	911529.69	679605.21	65+70.76	19.55 LT	1264.65	1261.23	1259.35	3.42	

41	Lafayette Boulevard & Ave Del Puente	6/29/2011	Qwest Local Network	4"	PVC	911753.95	679400.54	62+68.47	8.83 RT	1264.92	1258.94	1258.56	5.98	
42	Lafayette Boulevard & Calle Feliz	6/23/2011	Qwest Local Network	Eight 3.5"	Transite	912030.22	679226.31	59+42.99	18.40 LT	1264.35	1260.55	1258.74	3.80	
45	Lafayette Boulevard east of 44th Street	6/23/2011	Qwest Local Network	Eight 3.5"	Transite	912369.14	678974.38	55+20.71	21.34 LT	1264.17	1259.13	1257.41	5.04	
49	Camelback Road east of 44th Street	6/29/2011	Qwest Local Network	4"	PVC	912846.92	679176.56	505+85.15	6.05 LT	1271.23	1268.29	1267.91	2.94	
53	44th Street & Colter Street	6/28/2011	Qwest Local Network	4"	PVC	913914.47	678720.43	604+07.05	12.90 RT	1270.05	1267.79	1267.41	2.26	
101	Arcadia Drive & Calle Redonda	6/17/2011	Salt River Project Irrigation	24"	RCP	908177.61	681670.83	10+11.36	51.11 RT	1252.43	1249.12	1246.62	3.31	
102	Arcadia Drive & Calle Redonda	6/29/2011	City of Phoenix Water	None	None	908366.96	681734.27	11+98.21	9.31 RT	1254.83		1248.83	0.00	Dug to a depth of 6 ft in the requested location and no water facility was found.
102A	Arcadia Drive & Calle Redonda	6/29/2011	Southwest Gas	8"	STL	908366.96	681734.27	11+98.21	9.31 RT	1254.83	1250.19	1249.47	4.64	
103	Arcadia Drive & Lafayette Boulevard	6/21/2011	Salt River Project Irrigation	30"	RCP	909084.08	682005.26	19+64.62	7.58 LT	1265.18	1263.26	1260.18	1.92	
104	Arcadia Drive & Lafayette Boulevard	6/21/2011	City of Phoenix Water	8"	ACP	909118.85	682003.38	19+96.17	22.32 LT	1265.53	1261.21	1260.45	4.32	
105	Arcadia Drive & Lafayette Boulevard	6/21/2011	City of Phoenix Water	None	None	909092.35	682038.41	19+84.68	20.08 RT	1265.64		1259.64		Dug three holes in the requested location to a depth of 6 ft and no facilities were
106	Arcadia Drive & Lafayette Boulevard	6/21/2011	City of Phoenix Storm Drain	18"	RCP	909088.59	682050.47	19+85.70	32.67 RT	1265.60	1262.00	1260.08	3.60	
107	40th Place & Lafayette Boulevard	6/23/2011	Salt River Project Electric	None	None	None	None	None	None					No underground facility in the requested location per bluestake.
108	47th Street & Lafayette Boulevard	6/23/2011	Salt River Project Electric	None	None	None	None	None	None					No underground facility in the requested location per bluestake.
109	Lafayette Boulevard & Launfal Avenue	6/29/2011	City of Phoenix Water	8"	ACP	910034.57	680936.98	85+84.85	10.92 RT	1265.31	1261.65	1260.89	3.66	
110	46th Street & Lafayette Boulevard	6/24/2011	Salt River Project Electric	None	None	None	None	None	None					No underground facility in the requested location per bluestake.
111	Lafayette Boulevard & 46th Street	6/22/2011	City of Phoenix Water	None	None	911025.86	679947.97	71+79.41	10.15 RT	1264.90		1259.40		Dug to a depth of 5.5 ft in the requested location and no facility was found.
112	Lafayette Boulevard & 46th Street	6/22/2011	City of Phoenix Water	None	None	911056.97	679990.03	71+79.89	42.16 LT	1264.29		1259.79		Dug to a depth of 4.5 ft in the requested location and no facility was found.
113	Ave Del Puente & Lafayette Boulevard	6/24/2011	Salt River Project Electric	None	None	None	None	None	None					No underground facility in the requested location per bluestake.
114	Lafayette Boulevard east of Calle Feliz	6/23/2011	City of Phoenix Water	8"	ACP	911993.38	679223.69	59+70.83	5.86 RT	1264.75	1258.71	1257.95	6.04	
115	Lafayette Boulevard east of 44th Street	6/23/2011	City of Phoenix Water	8"	ACP	912354.08	678946.77	55+16.11	9.78 RT	1264.17	1258.33	1257.57	5.84	
116	Lafayette Boulevard east of 44th Street	6/23/2011	City of Phoenix Water	4"	ACP	912362.94	678965.23	55+20.15	10.30 LT	1263.99	1260.95	1260.55	3.04	

117	Camelback Road & Village Drive	6/27/2011	City of Phoenix Water	8"	ACP	912539.59	679175.09	502+77.85	1.80 LT	1266.81	1264.33	1263.57	2.48	
118	Camelback Road & Village Drive	6/24/2011	City of Phoenix Water	8"	ACP	912784.19	679187.40	505+22.64	5.96 RT	1271.77	1267.89	1267.13	3.88	
119	Camelback Road & Village Drive	6/28/2011	Salt River Project Electric	24" Wide	Slurry Duct	912840.10	679179.66	505+78.39	2.83 LT	1271.61	1268.71	1267.81	2.90	
119A	Camelback Road & Village Drive	6/28/2011	City of Phoenix Water	6"	CIP	912837.93	679179.79	505+76.23	2.65 LT	1271.45	1268.63	1268.04	2.82	
120	Camelback Road & Village Drive	6/27/2011	City of Phoenix Water	20"	ACP	912851.93	679182.53	505+90.28	0.18 LT	1271.55	1265.43	1263.49	6.12	
121	Camelback Road & Village Drive	6/27/2011	City of Phoenix Water	4"	ACP	912874.20	679186.52	506+12.61	3.40 RT	1272.06	1268.22	1267.82	3.84	
122	Camelback Road & Village Drive	6/27/2011	City of Phoenix Water	16"	ACP	912900.79	679188.99	506+39.25	5.38 RT	1272.20	1266.84	1265.30	5.36	
123	Camelback Road & Village Drive	6/27/2011	City of Phoenix Water	12"	ACP	912927.35	679191.93	506+65.86	7.82 RT	1271.87	1267.25	1266.09	4.62	
124	Camelback Road & Village Drive	6/28/2011	City of Phoenix Storm Drain	24"	RCP	912948.84	679193.20	506+87.36	8.70 RT	1271.90	1270.98	1268.48	0.92	
125	Camelback Road & Village Drive	6/28/2011	Salt River Project Electric	Three 1"	PE	912956.02	679210.07	506+94.86	25.43 RT	1272.69	1267.49	1267.41	5.20	
126	Camelback Road & Village Drive	6/28/2011	City of Phoenix Water	8"	ACP	913212.69	679190.31	509+51.11	0.90 RT	1272.72	1268.88	1268.12	3.84	
127	Camelback Road & Village Drive	6/28/2011	City of Phoenix Water	8"	ACP	913313.87	679189.84	510+52.27	1.45 LT	1273.03	1269.75	1269.03	3.28	

TEST HOLE DATA REPORT

Test Hole #	8	SUE Crew	J. Brandt
Date Dug	6/21/2011	Truck #	543
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Drive & Lafayette Boulevard		

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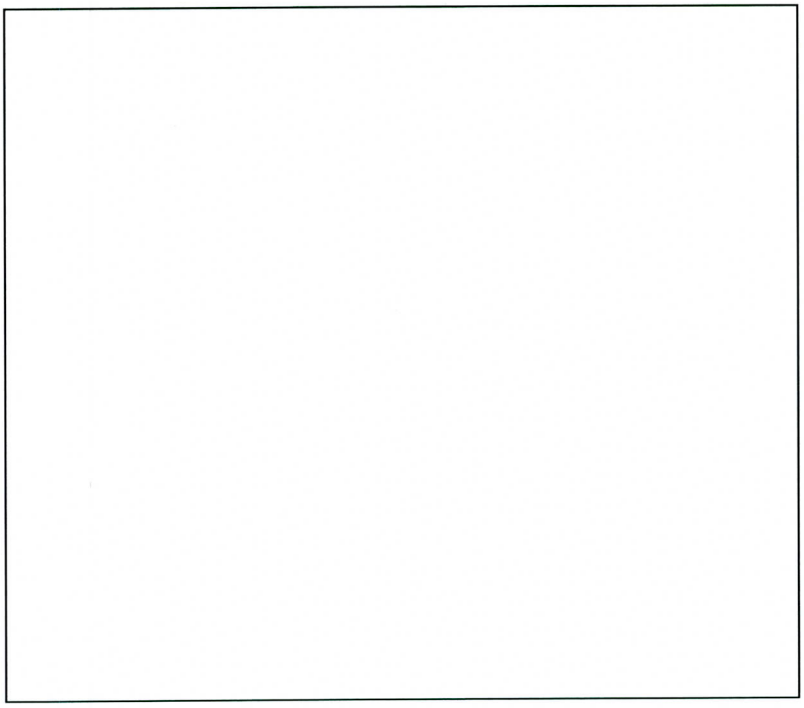
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

CROSS SECTION - NOT TO SCALE

FACING _____

SURFACE ELEVATION _____ WIDTH/O.D.

TOP ELEVATION _____ TOP DEPTH (FEET)

BOTTOM ELEVATION _____ BOTTOM (FEET)

RIBBON COLOR None

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION None

SIZE None TYPE None FACILITY OWNER Qwest Local Network

COMMENTS:

No facility in the requested location per ELM bluestake locator Larry 602-695-2181.

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	10	SUE Crew	J. Garcia
Date Dug	6/21/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Drive & Lafayette Boulevard		

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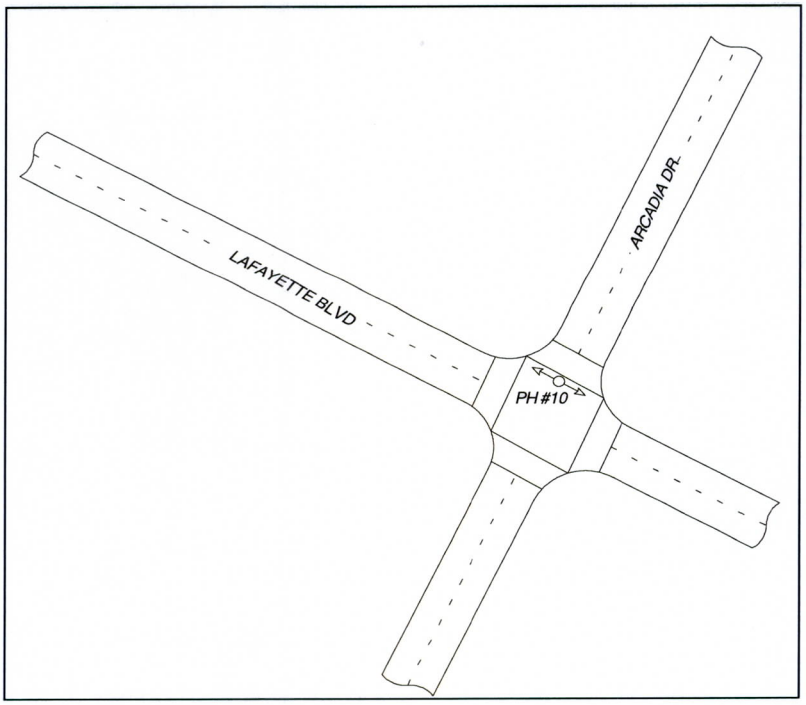
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK	
RIBBON COLOR	Orange

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1266.06	WIDTH/O.D. 12"	
TOP ELEVATION	1260.16	5.90	TOP DEPTH (FEET)
BOTTOM ELEVATION	1258.34	7.72	BOTTOM (FEET)

COORDINATES:	NORTHING	909139.16	EASTING	682029.71	
STATIONING:	STATION	20+24.85	OFFSET	5.48 LT	
PAVING THICKNESS	4"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	Eight 3.5"	TYPE	Transite	FACILITY OWNER	Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	12	SUE Crew	J. Garcia
Date Dug	6/21/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Drive & Lafayette Boulevard		

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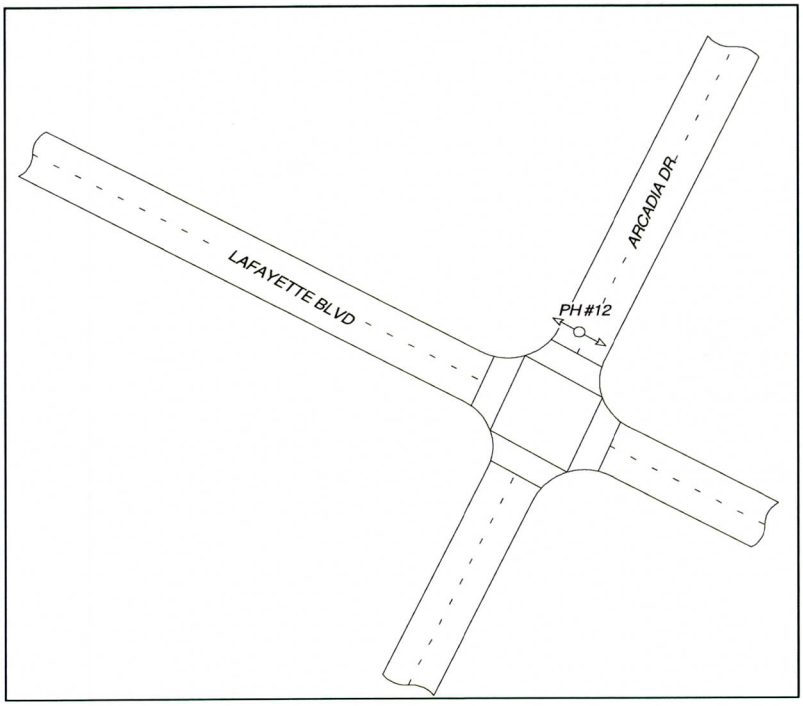
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1266.60	WIDTH/O.D. 4"	
TOP ELEVATION	1263.58		3.02 TOP DEPTH (FEET)
BOTTOM ELEVATION	1263.36		3.24 BOTTOM (FEET)

COORDINATES: NORTHING 909167.41 EASTING 682041.07

STATIONING: STATION 20+55.29 OFFSET 5.50 LT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE Two 2" TYPE PE FACILITY OWNER Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	14	SUE Crew	J. Garcia
Date Dug	6/20/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard northwest of Arcadia Drive		

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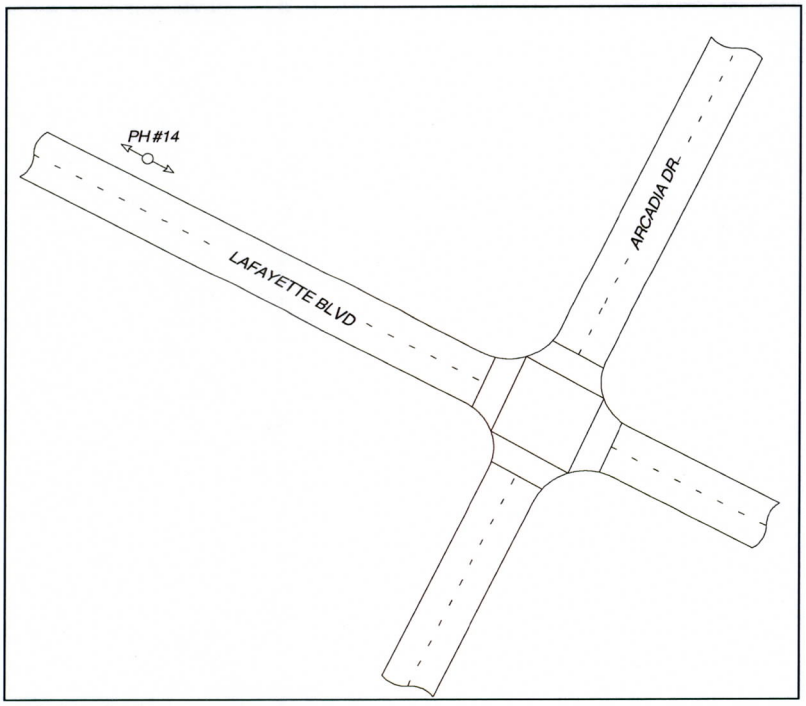
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1266.60	WIDTH/O.D. 12"	
TOP ELEVATION	1262.18	4.42	TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.62	5.98	BOTTOM (FEET)

COORDINATES: NORTHING	909310.41	EASTING	681824.70
STATIONING: STATION	97+30.10	OFFSET	18.28 LT

PAVING THICKNESS	None	PAVING TYPE	None	SOIL CONDITION	Dirt
SIZE	Eight 3.5"	TYPE	Transite	FACILITY OWNER	Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	17	SUE Crew	J. Garcia
Date Dug	6/20/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & 44th Place		

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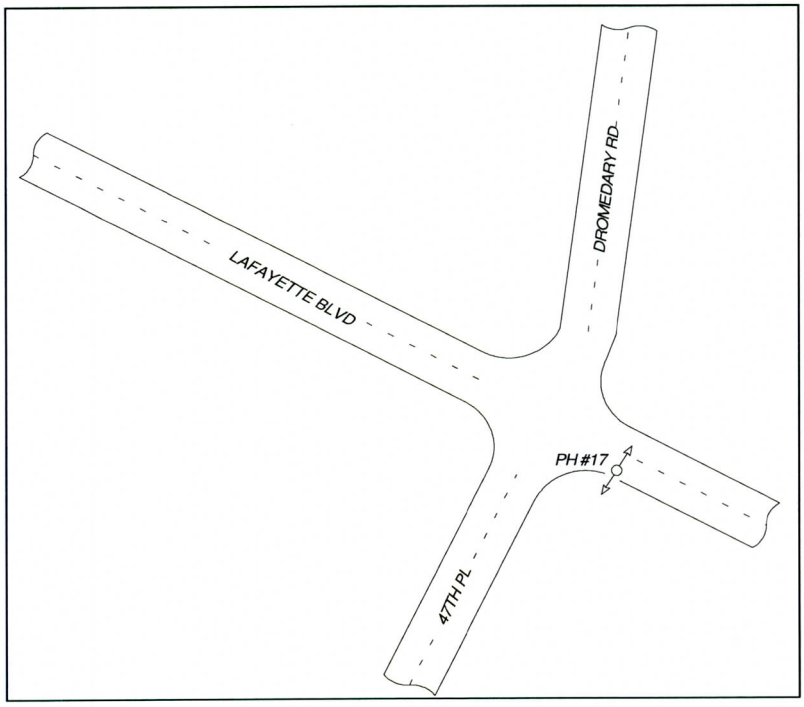
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: Northeast

SURFACE ELEVATION	1265.93	WIDTH/O.D. 1"	
TOP ELEVATION	1263.23	2.70	TOP DEPTH (FEET)
BOTTOM ELEVATION	1263.15	2.78	BOTTOM (FEET)

COORDINATES:	NORTHING	909637.93	EASTING	681392.31	
STATIONING:	STATION	91+88.70	OFFSET	15.06 RT	
PAVING THICKNESS	4"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	1"	TYPE	PE	FACILITY OWNER	Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	18	SUE Crew	J. Garcia
Date Dug	6/20/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & Dromedary Road		

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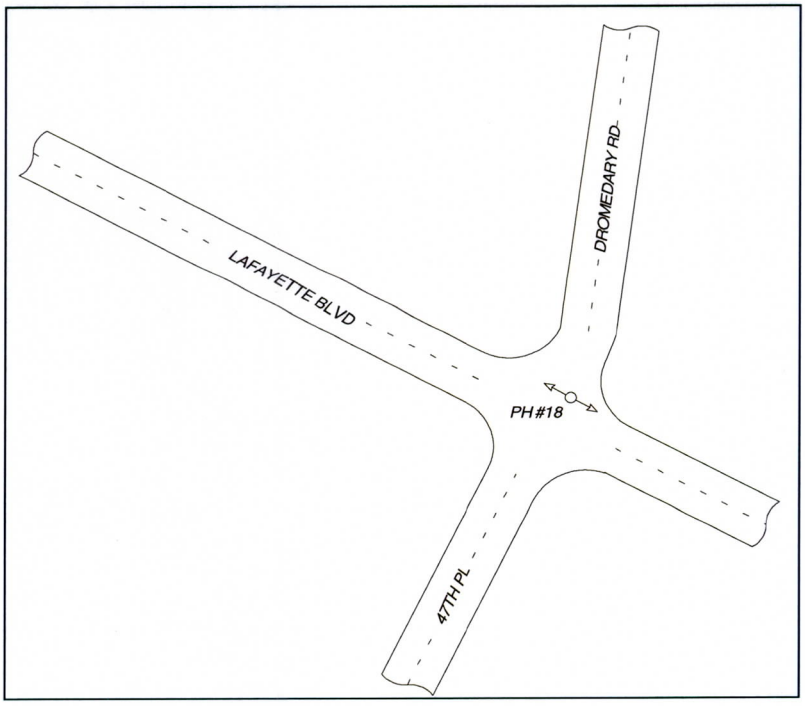
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1265.90		
TOP ELEVATION	1260.94	4.96	TOP DEPTH (FEET)
BOTTOM ELEVATION	1258.86	7.04	BOTTOM (FEET)

WIDTH/O.D. 12"

COORDINATES: NORTHING 909699.44 EASTING 681372.55

STATIONING: STATION 91+33.63 OFFSET 18.71 LT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE Eight 3.5" TYPE Transite FACILITY OWNER Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	20	SUE Crew	J. Garcia
Date Dug	6/20/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & Dromedary Road		

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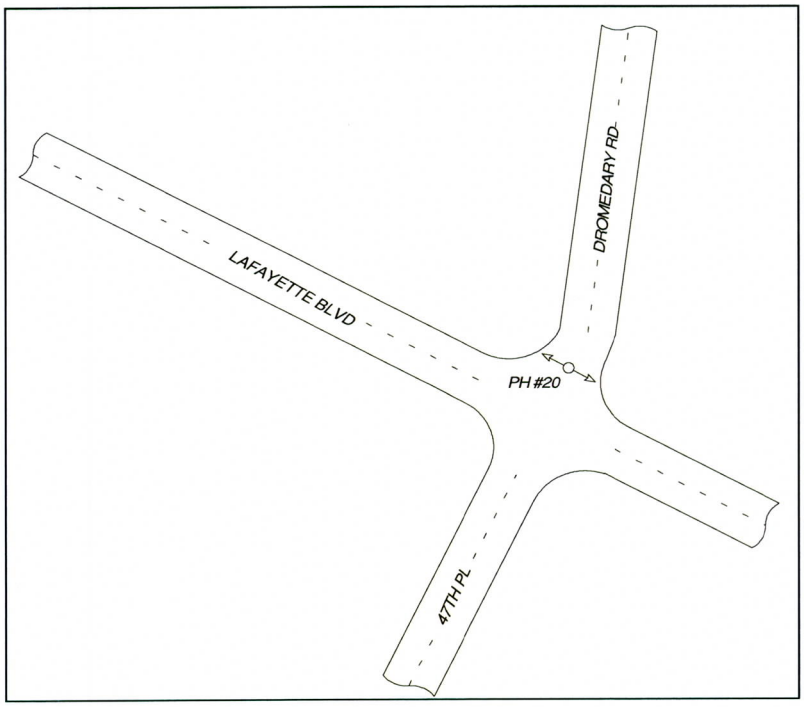
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

CROSS SECTION - NOT TO SCALE

FACING East

SURFACE ELEVATION	1265.94	WIDTH/O.D. 0.5"	
TOP ELEVATION	1262.12		3.82 TOP DEPTH (FEET)
BOTTOM ELEVATION	1262.08		3.86 BOTTOM (FEET)

RIBBON COLOR Orange

COORDINATES: NORTHING 909710.17 EASTING 681377.98

STATIONING: STATION 91+30.76 OFFSET 30.40 LT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 0.5" TYPE PE FACILITY OWNER Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	23	SUE Crew	J. Garcia
Date Dug	6/21/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & 47th Street		

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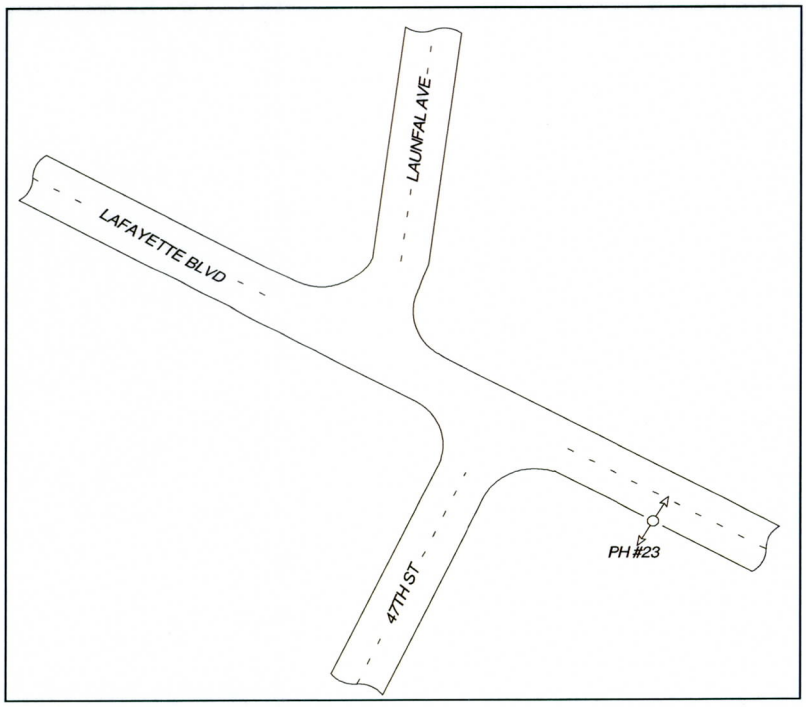
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1265.37	WIDTH/O.D. 1.9"	
TOP ELEVATION	1262.41	2.96	TOP DEPTH (FEET)
BOTTOM ELEVATION	1262.25	3.12	BOTTOM (FEET)

COORDINATES: NORTHING 909907.77 EASTING 681077.19

STATIONING: STATION 87+73.84 OFFSET 15.73 RT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 1.5" TYPE PE FACILITY OWNER Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	25	SUE Crew	J. Garcia
Date Dug	6/20/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & Launfal Avenue		

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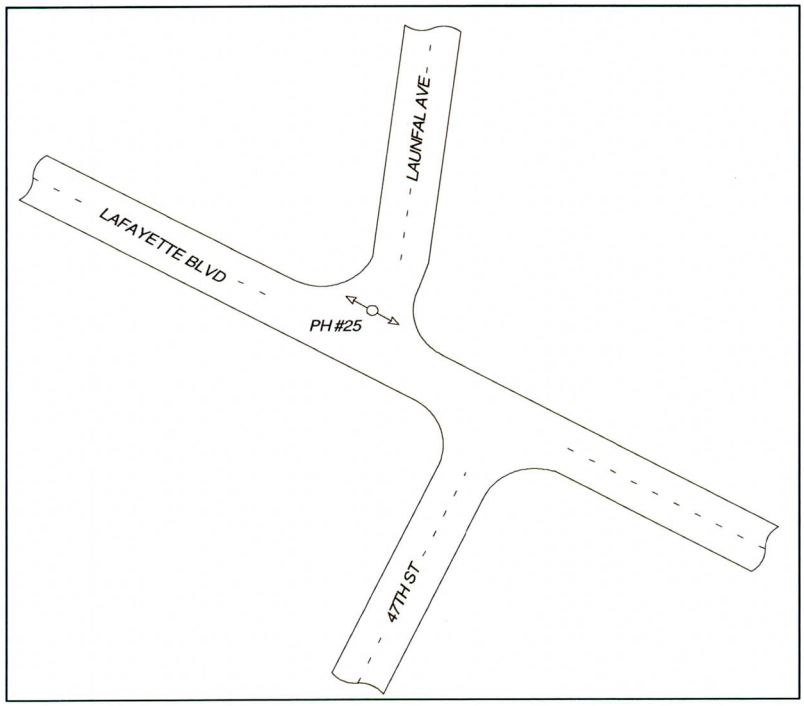
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1265.29		
TOP ELEVATION	1260.79	4.50	TOP DEPTH (FEET)
BOTTOM ELEVATION	1258.99	6.30	BOTTOM (FEET)

WIDTH/O.D. 12"

COORDINATES:	NORTHING 910051.41	EASTING 680960.83	
STATIONING:	STATION 85+91.98	OFFSET 17.39 LT	
PAVING THICKNESS	4"	PAVING TYPE Asphalt	SOIL CONDITION Dirt
SIZE	Eight 3.5"	TYPE Transite	FACILITY OWNER Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	27	SUE Crew	J. Brandt
Date Dug	6/22/2011	Truck #	543
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & Launfal Avenue		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE

N

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
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ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING _____

SURFACE ELEVATION _____ WIDTH/O.D.

TOP ELEVATION _____ TOP DEPTH (FEET)

BOTTOM ELEVATION _____ BOTTOM (FEET)

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION None

SIZE None TYPE None FACILITY OWNER Qwest Local Network

COMMENTS:

No facility in the requested location per ELM bluestake locator Larry 602-695-2181.

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	29	SUE Crew	A. Pablo-Bello
Date Dug	6/24/2011	Truck #	320
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th Place & Lafayette Boulevard		

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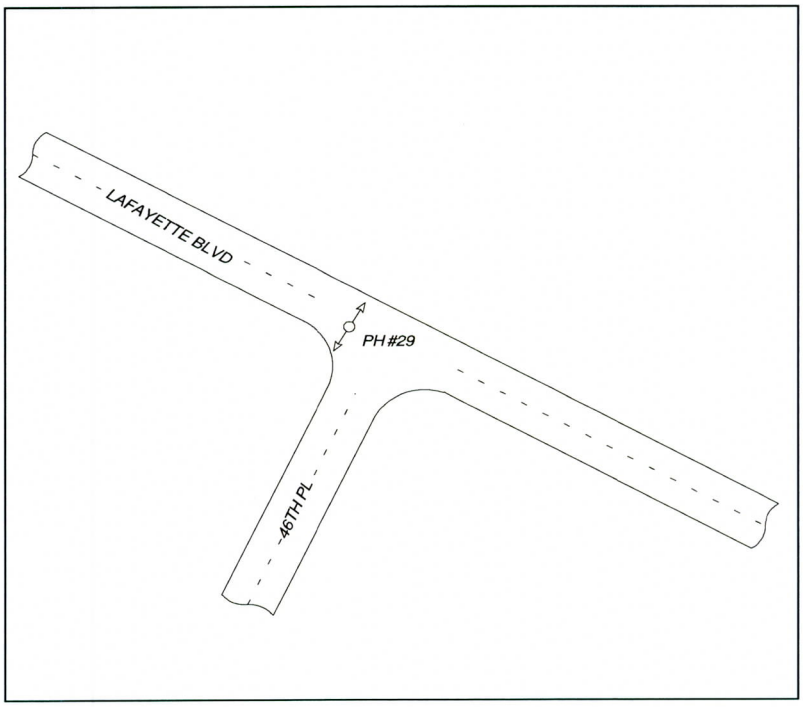
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: South

SURFACE ELEVATION	1264.93	WIDTH/O.D. 1.25"	
TOP ELEVATION	1259.71	5.22	TOP DEPTH (FEET)
BOTTOM ELEVATION	1259.61	5.32	BOTTOM (FEET)

COORDINATES:	NORTHING	910304.21	EASTING	680622.02	
STATIONING:	STATION	81+70.24	OFFSET	11.63 RT	
PAVING THICKNESS	4"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	1.25"	TYPE	PE	FACILITY OWNER	Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	31	SUE Crew	J. Garcia
Date Dug	6/22/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard west of 46th Street		

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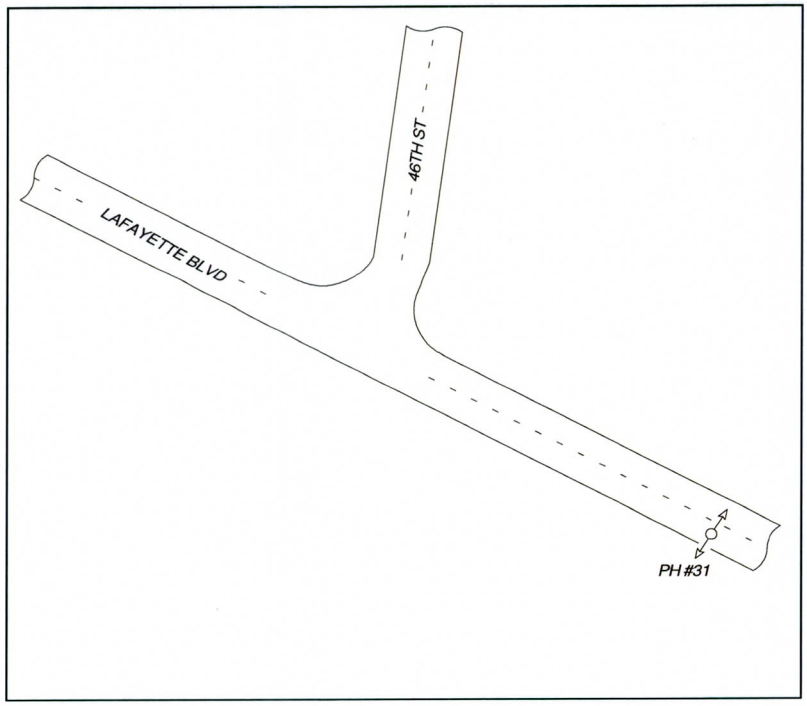
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: Northeast

SURFACE ELEVATION	1264.02	WIDTH/O.D. 1.25"	
TOP ELEVATION	1261.00	3.02	TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.90	3.12	BOTTOM (FEET)

COORDINATES:	NORTHING	910775.45	EASTING	680136.64	
STATIONING:	STATION	74+92.93	OFFSET	10.30 RT	
PAVING THICKNESS	4"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	1.25"	TYPE	PE	FACILITY OWNER	Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	32	SUE Crew	J. Brandt
Date Dug	6/23/2011	Truck #	543
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & 46th Street		

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LOCATION PLAN - NOT TO SCALE

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SITE BENCHMARK

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING _____

SURFACE ELEVATION
WIDTH/O.D.
TOP ELEVATION
TOP DEPTH (FEET)
BOTTOM ELEVATION
BOTTOM (FEET)

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION None

SIZE None TYPE None FACILITY OWNER Qwest Local Network

COMMENTS:

No facility in the requested location per ELM bluestake locator Larry 602-695-2181.

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	34	SUE Crew	J. Brandt
Date Dug	6/23/2011	Truck #	543
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & 46th Street		

AZTEC www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE

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SITE BENCHMARK

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING _____

SURFACE ELEVATION _____ WIDTH/O.D.

TOP ELEVATION _____ TOP DEPTH (FEET)

BOTTOM ELEVATION _____ BOTTOM (FEET)

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION None

SIZE None TYPE None FACILITY OWNER Qwest Local Network

COMMENTS:

No facility in the requested location per ELM bluestake locator Larry 602-695-2181.

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	35	SUE Crew	J. Garcia
Date Dug	6/22/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & 46th Street		

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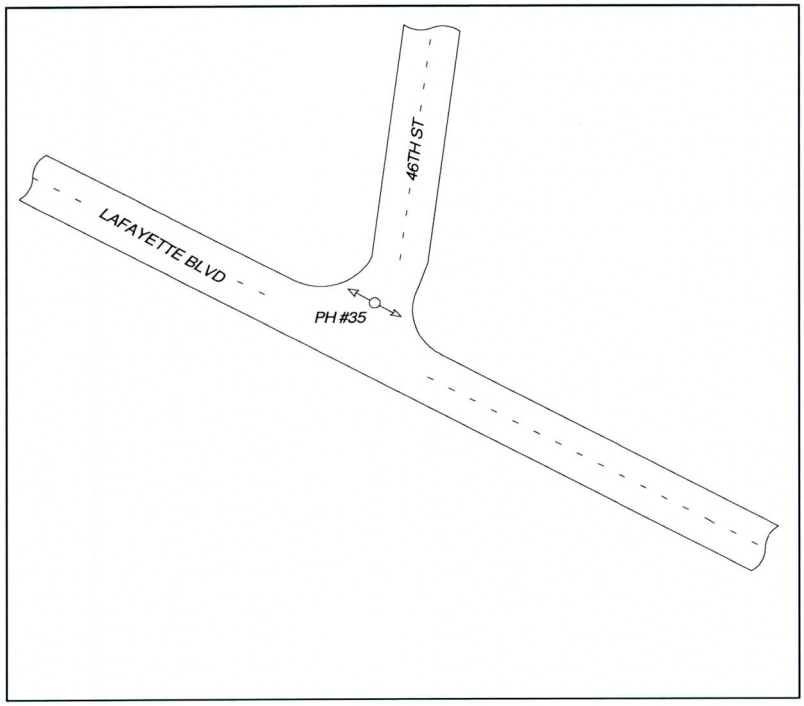
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: White Paint

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1263.62	WIDTH/O.D. 12"	
TOP ELEVATION	1260.22	3.40	TOP DEPTH (FEET)
BOTTOM ELEVATION	1258.40	5.22	BOTTOM (FEET)

COORDINATES: NORTHING	911032.54	EASTING	679983.05
STATIONING: STATION	71+95.19	OFFSET	21.88 LT
PAVING THICKNESS	4"	PAVING TYPE	Asphalt
SOIL CONDITION	Dirt		
SIZE	Eight 3.5"	TYPE	Transite
FACILITY OWNER	Qwest Local Network		

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	37	SUE Crew	J. Garcia
Date Dug	6/22/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & 46th Street		

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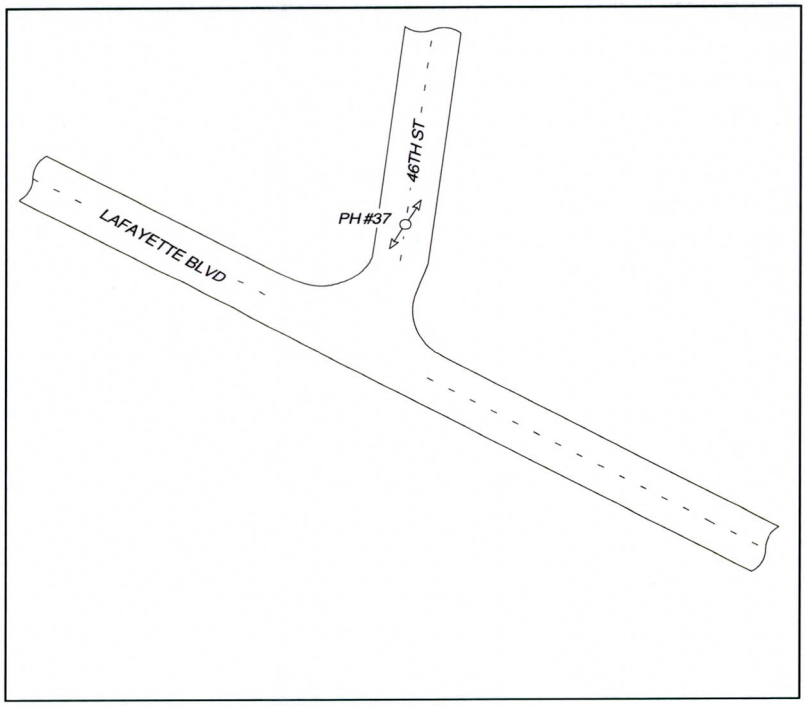
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: Northeast

SURFACE ELEVATION	1265.68	WIDTH/O.D. 4.5"	
TOP ELEVATION	1263.86		1.82 TOP DEPTH (FEET)
BOTTOM ELEVATION	1263.48		2.20 BOTTOM (FEET)

COORDINATES: NORTHING 911113.46 EASTING 680013.87

STATIONING: STATION 71+49.15 OFFSET 95.21 LT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 4" TYPE PVC FACILITY OWNER Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	39	SUE Crew	J. Garcia
Date Dug	6/22/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & 45th Street		

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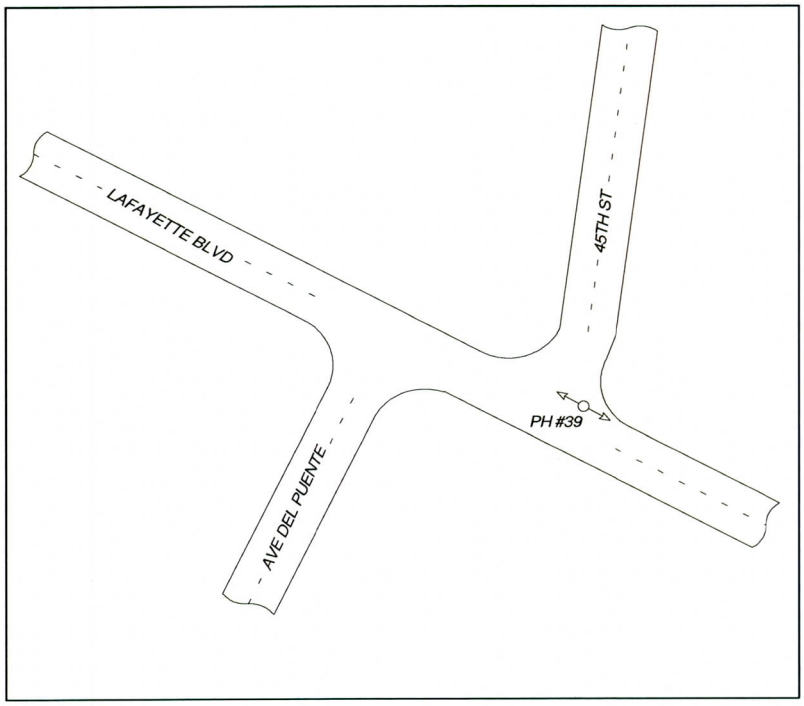
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1264.65		
TOP ELEVATION	1261.23	3.42	TOP DEPTH (FEET)
BOTTOM ELEVATION	1259.35	5.30	BOTTOM (FEET)

WIDTH/O.D. 12"

COORDINATES:	NORTHING 911529.69	EASTING 679605.21	
STATIONING:	STATION 65+70.76	OFFSET 19.55 LT	
PAVING THICKNESS	4"	PAVING TYPE: Asphalt	SOIL CONDITION: Dirt
SIZE	Eight 3.5"	TYPE: Transite	FACILITY OWNER: Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	41	SUE Crew	A. Pablo-Bello
Date Dug	6/29/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & Ave Del Puente		

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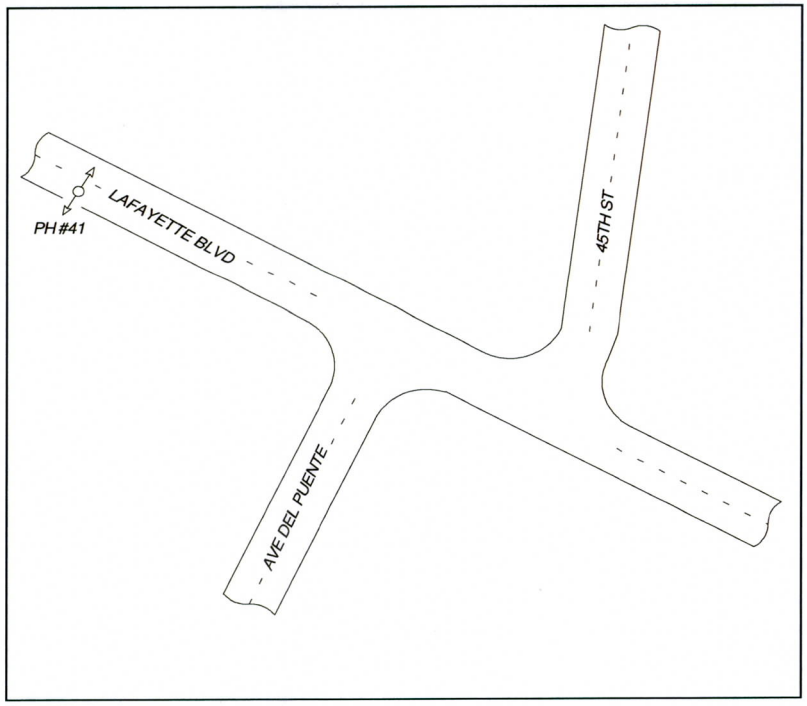
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1264.92	WIDTH/O.D. 4.5"	
TOP ELEVATION	1258.94		5.98 TOP DEPTH (FEET)
BOTTOM ELEVATION	1258.56		6.36 BOTTOM (FEET)

COORDINATES: NORTHING 911753.95 EASTING 679400.54

STATIONING: STATION 62+68.47 OFFSET 8.83 RT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 4" TYPE PVC FACILITY OWNER Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	42	SUE Crew	J. Garcia
Date Dug	6/23/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & Calle Feliz		

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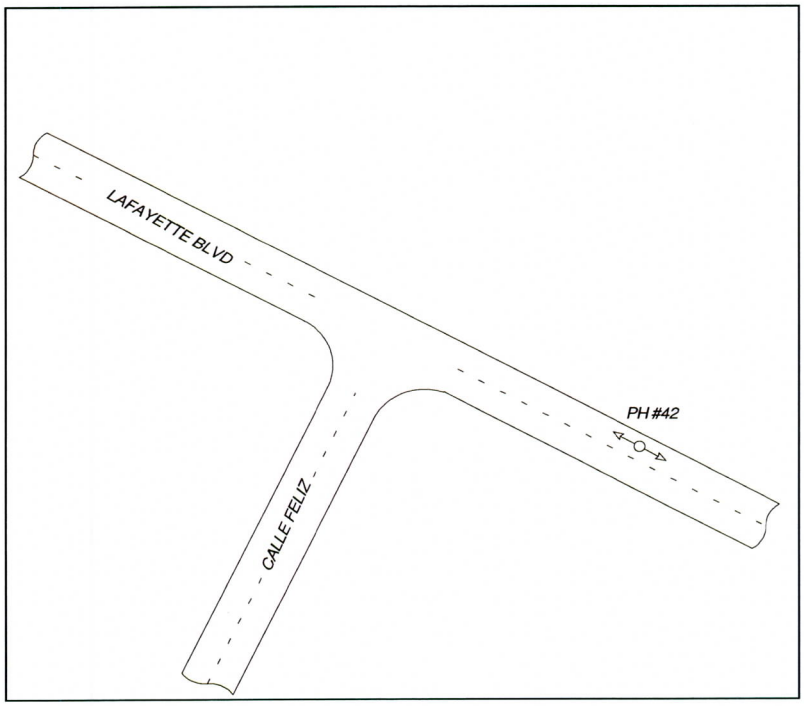
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1264.35	WIDTH/O.D. 12"	
TOP ELEVATION	1260.55	3.80	TOP DEPTH (FEET)
BOTTOM ELEVATION	1258.74	5.61	BOTTOM (FEET)

COORDINATES:	NORTHING	912030.22	EASTING	679226.31	
STATIONING:	STATION	59+42.99	OFFSET	18.40 LT	
PAVING THICKNESS	6"	PAVING TYPE	Concrete	SOIL CONDITION	Dirt
SIZE	Eight 3.5"	TYPE	Transite	FACILITY OWNER	Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	45	SUE Crew	J. Garcia
Date Dug	6/23/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard east of 44th Street		

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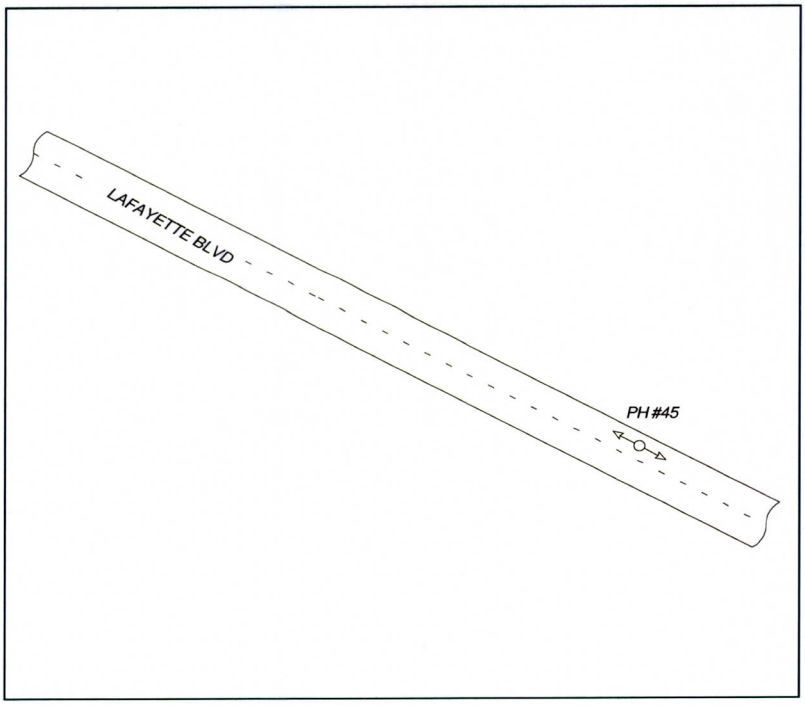
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1264.17	WIDTH/O.D. 12"	
TOP ELEVATION	1259.13		5.04 TOP DEPTH (FEET)
BOTTOM ELEVATION	1257.41		6.76 BOTTOM (FEET)

COORDINATES: NORTHING 912369.14 EASTING 678974.38

STATIONING: STATION 55+20.71 OFFSET 21.34 LT

PAVING THICKNESS 6" PAVING TYPE Concrete SOIL CONDITION Dirt

SIZE Eight 3.5" TYPE Transite FACILITY OWNER Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	49	SUE Crew	A. Pablo-Bello
Date Dug	6/29/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road east of 44th Street		

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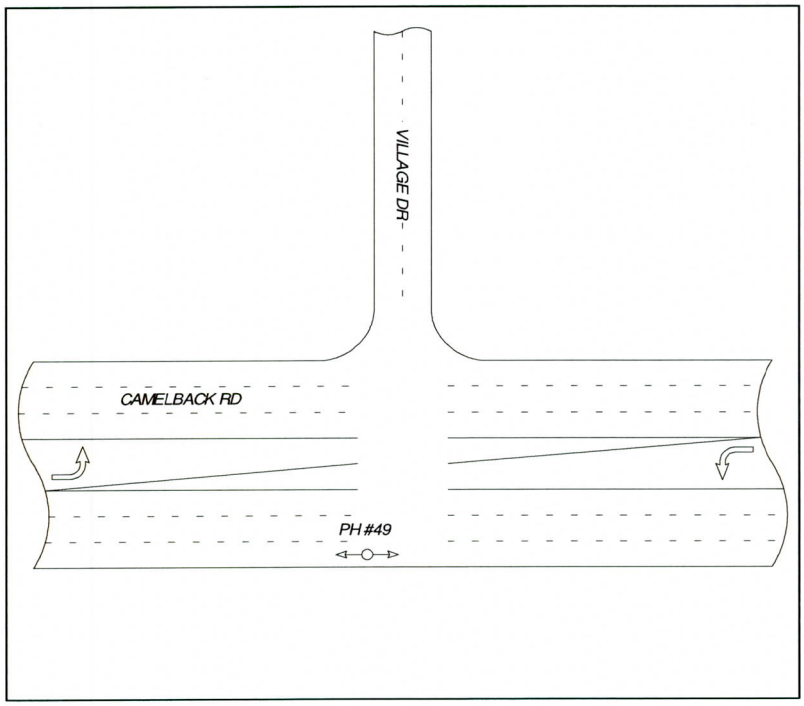
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1271.23	WIDTH/O.D. 4.5"	
TOP ELEVATION	1268.29	2.94	TOP DEPTH (FEET)
BOTTOM ELEVATION	1267.91	3.32	BOTTOM (FEET)

COORDINATES: NORTHING 912846.92 EASTING 679176.56

STATIONING: STATION 505+85.15 OFFSET 6.05 LT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 4" TYPE PVC FACILITY OWNER Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	53	SUE Crew	A. Pablo-Bello
Date Dug	6/28/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	44th Street & Colter Street		

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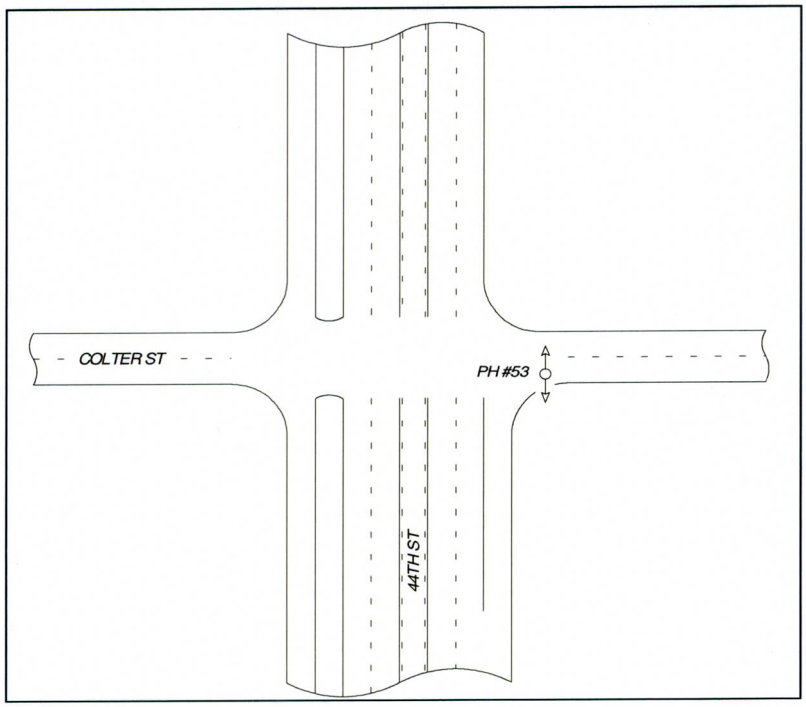
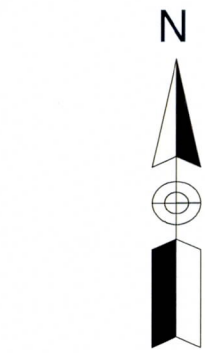
LOCATION PLAN - NOT TO SCALE





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SITE BENCHMARK

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1270.05	WIDTH/O.D. 4.5"	
TOP ELEVATION	1267.79	2.26	TOP DEPTH (FEET)
BOTTOM ELEVATION	1267.41	2.64	BOTTOM (FEET)

COORDINATES: NORTHING 913914.47 EASTING 678720.43

STATIONING: STATION 604+07.05 OFFSET 12.90 RT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 4" TYPE PVC FACILITY OWNER Qwest Local Network

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	101	SUE Crew	J. Garcia
Date Dug	6/17/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Drive & Calle Redonda		

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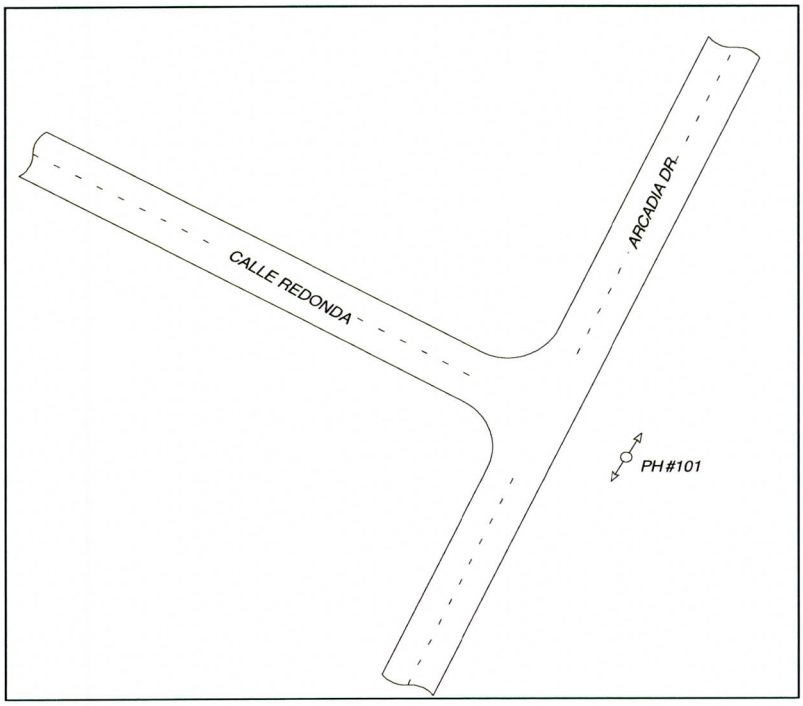
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: Northeast

SURFACE ELEVATION	1252.43		
TOP ELEVATION	1249.12	3.31	TOP DEPTH (FEET)
BOTTOM ELEVATION	1246.62	5.81	BOTTOM (FEET)

WIDTH/O.D. 30"

COORDINATES:	NORTHING 908177.61	EASTING 681670.83	
STATIONING:	STATION 10+11.36	OFFSET 51.11 RT	
PAVING THICKNESS	None	PAVING TYPE None	SOIL CONDITION Dirt
SIZE	24"	TYPE RCP	FACILITY OWNER Salt River Project Irrigation

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	102	SUE Crew	A. Pablo-Bello
Date Dug	6/29/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Drive & Calle Redonda		

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LOCATION PLAN - NOT TO SCALE

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SITE BENCHMARK

RIBBON COLOR: None

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION: 1254.83

WIDTH/O.D.

TOP ELEVATION:

TOP DEPTH (FEET)

BOTTOM ELEVATION: 1248.83

6.00 BOTTOM (FEET)

COORDINATES: NORTHING 908366.96 EASTING 681734.27

STATIONING: STATION 11+98.21 OFFSET 9.31 RT

PAVING THICKNESS: None PAVING TYPE: None SOIL CONDITION: Dirt

SIZE: None TYPE: None FACILITY OWNER: City of Phoenix Water

COMMENTS:

Dug to a depth of 6 ft in the requested location and no water facility was found.

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	102A	SUE Crew	A. Pablo-Bello
Date Dug	6/29/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Drive & Calle Redonda		

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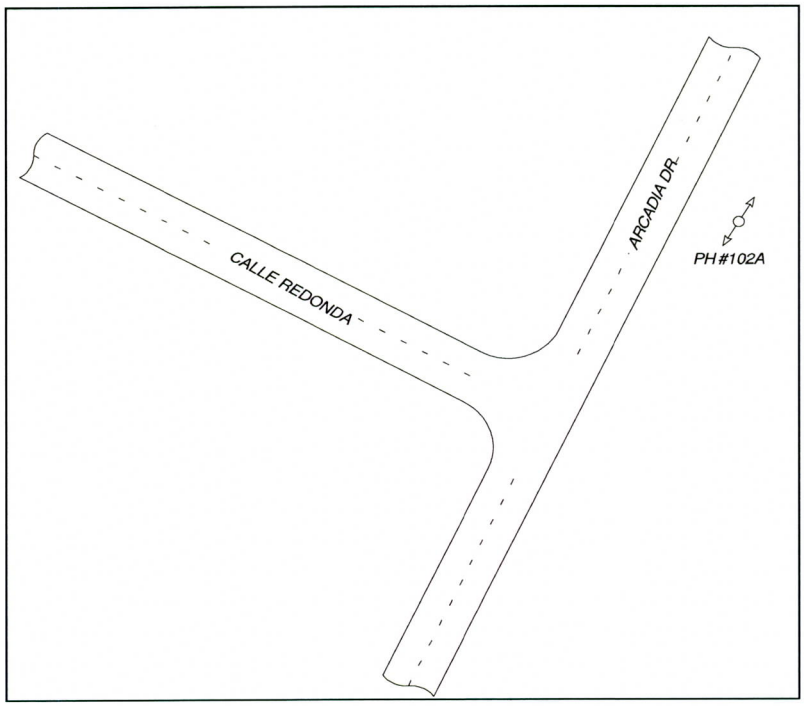
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR: Yellow

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1254.83	WIDTH/O.D. 8.63"	
TOP ELEVATION	1250.19		4.64 TOP DEPTH (FEET)
BOTTOM ELEVATION	1249.47		5.36 BOTTOM (FEET)

COORDINATES: NORTHING 908366.96 EASTING 681734.27

STATIONING: STATION 11+98.21 OFFSET 9.31 RT

PAVING THICKNESS: None PAVING TYPE: None SOIL CONDITION: Dirt

SIZE: 8" TYPE: STL FACILITY OWNER: Southwest Gas

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	103	SUE Crew	J. Garcia
Date Dug	6/21/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Drive & Lafayette Boulevard		

AZTEC
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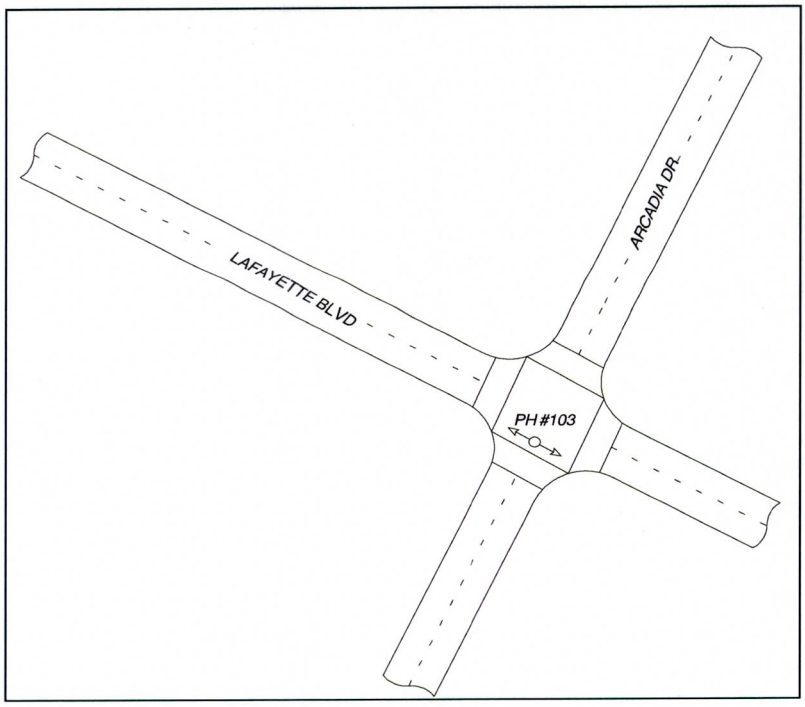
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1265.18	WIDTH/O.D. 37"	
TOP ELEVATION	1263.26	1.92	TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.18	5.00	BOTTOM (FEET)

COORDINATES: NORTHING	909084.08	EASTING	682005.26
STATIONING: STATION	19+64.62	OFFSET	7.58 LT
PAVING THICKNESS	4"	PAVING TYPE	Asphalt
SOIL CONDITION	Dirt		
SIZE	30"	TYPE	RCP
FACILITY OWNER	Salt River Project Irrigation		

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	104	SUE Crew	J. Garcia
Date Dug	6/21/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Drive & Lafayette Boulevard		

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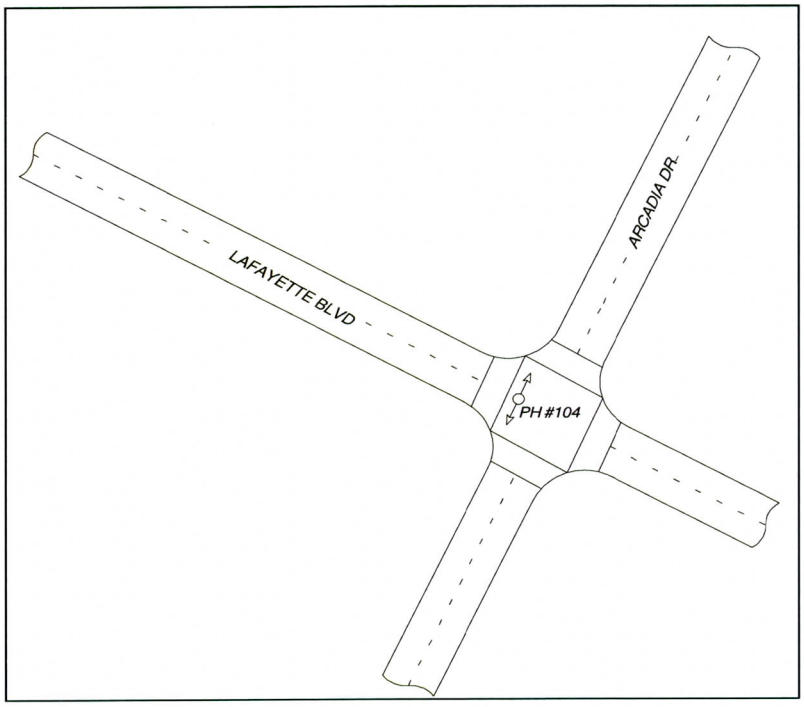
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: Northeast

SURFACE ELEVATION	1265.53	WIDTH/O.D. 9.11"	
TOP ELEVATION	1261.21	4.32	TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.45	5.08	BOTTOM (FEET)

COORDINATES:	NORTHING 909118.85	EASTING 682003.38			
STATIONING:	STATION 19+96.17	OFFSET 22.32 LT			
PAVING THICKNESS	4"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	8"	TYPE	ACP	FACILITY OWNER	City of Phoenix Water

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	105	SUE Crew	A. Pablo-Bello
Date Dug	6/21/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Drive & Lafayette Boulevard		

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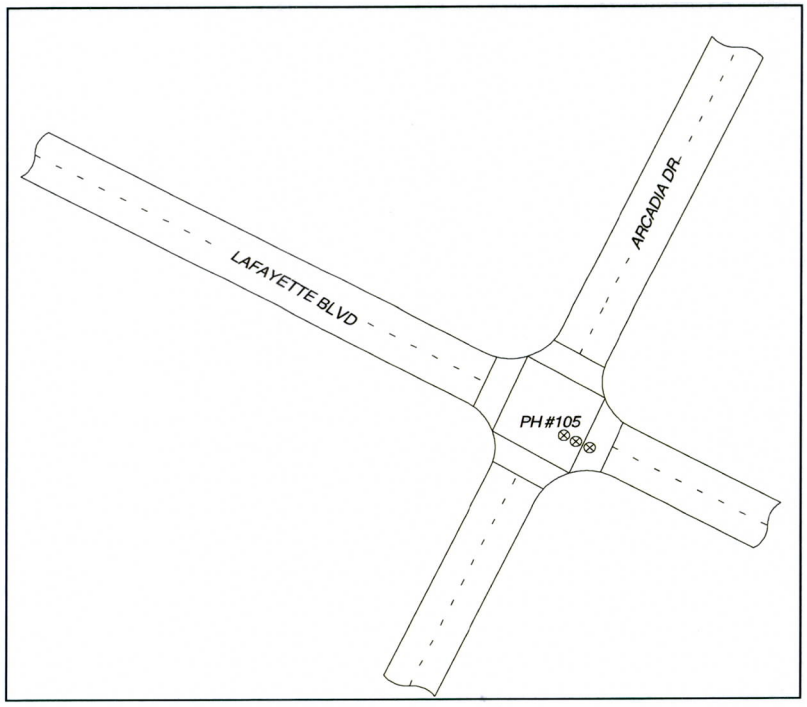
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING

SURFACE ELEVATION 1265.64

WIDTH/O.D.

TOP ELEVATION

TOP DEPTH (FEET)

BOTTOM ELEVATION 1259.64

6.00 BOTTOM (FEET)

COORDINATES: NORTHING 909092.35 EASTING 682038.41

STATIONING: STATION 19+84.68 OFFSET 20.08 RT

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE None TYPE None FACILITY OWNER City of Phoenix Water

COMMENTS:

Dug three holes in the requested location to a depth of 6 ft and no facilities were found.

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	106	SUE Crew	A. Pablo-Bello
Date Dug	6/21/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Drive & Lafayette Boulevard		

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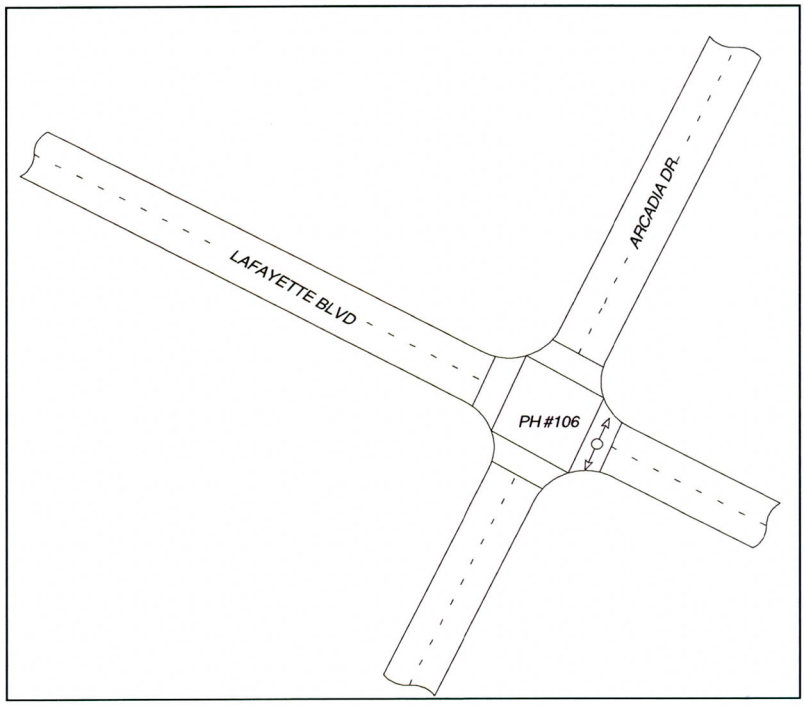
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1265.60	WIDTH/O.D. 23"	
TOP ELEVATION	1262.00	3.60	TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.08	5.52	BOTTOM (FEET)

COORDINATES: NORTHING 909088.59 EASTING 682050.47

STATIONING: STATION 19+85.70 OFFSET 32.67 RT

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 18" TYPE RCP FACILITY OWNER City of Phoenix Storm Drain

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	107	SUE Crew	J. Brandt
Date Dug	6/23/2011	Truck #	543
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	40th Place & Lafayette Boulevard		

AZTEC
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LOCATION PLAN - NOT TO SCALE

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SITE BENCHMARK

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING _____

SURFACE ELEVATION
WIDTH/O.D.
TOP ELEVATION
TOP DEPTH (FEET)
BOTTOM ELEVATION
BOTTOM (FEET)

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION None

SIZE None TYPE None FACILITY OWNER Salt River Project Electric

COMMENTS:

No underground facility in the requested location per bluestake.

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	108	SUE Crew	J. Brandt
Date Dug	6/23/2011	Truck #	543
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	47th Street & Lafayette Boulevard		

AZTEC
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LOCATION PLAN - NOT TO SCALE

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EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING _____

SURFACE ELEVATION
WIDTH/O.D.
TOP ELEVATION
TOP DEPTH (FEET)
BOTTOM ELEVATION
BOTTOM (FEET)

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION None

SIZE None TYPE None FACILITY OWNER Salt River Project Electric

COMMENTS:

No underground facility in the requested location per bluestake.

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	109	SUE Crew	A. Pablo-Bello
Date Dug	6/29/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & Launfal Avenue		

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4561 East McDowell Road, Phoenix, AZ 85008-4504
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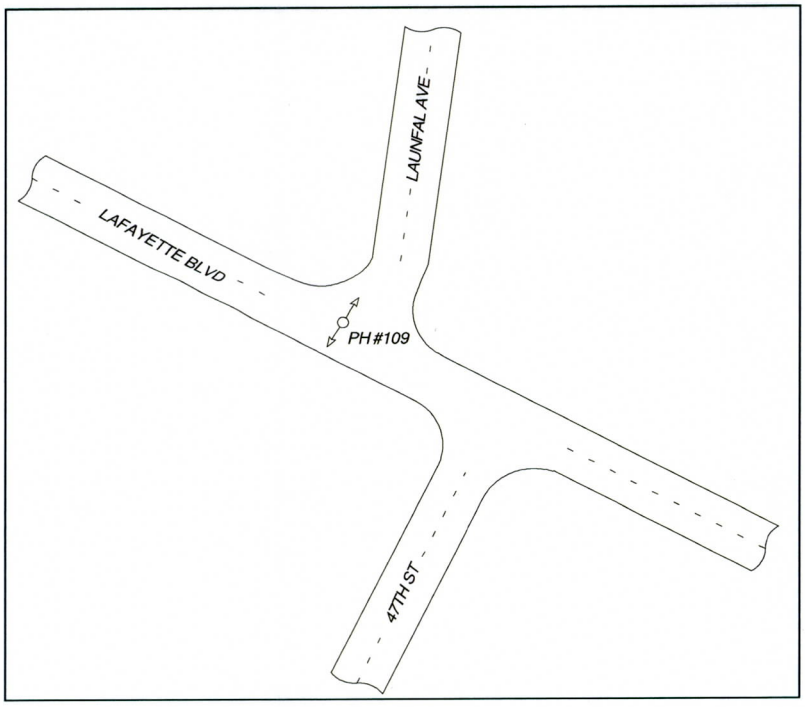
LOCATION PLAN - NOT TO SCALE



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ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1265.31	WIDTH/O.D. 9.11"	
TOP ELEVATION	1261.65		3.66 TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.89		4.42 BOTTOM (FEET)

COORDINATES: NORTHING 910034.57 EASTING 680936.98

STATIONING: STATION 85+84.85 OFFSET 10.92 RT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	110	SUE Crew	J. Brandt
Date Dug	6/24/2011	Truck #	543
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th Street & Lafayette Boulevard		

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LOCATION PLAN - NOT TO SCALE

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EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING _____

SURFACE ELEVATION
WIDTH/O.D.
TOP ELEVATION
TOP DEPTH (FEET)
BOTTOM ELEVATION
BOTTOM (FEET)

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION None

SIZE None TYPE None FACILITY OWNER Salt River Project Electric

COMMENTS:

No underground facility in the requested location per bluestake.

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	111	SUE Crew	A. Pablo-Bello
Date Dug	6/22/2011	Truck #	320
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & 46th Street		

AZTEC
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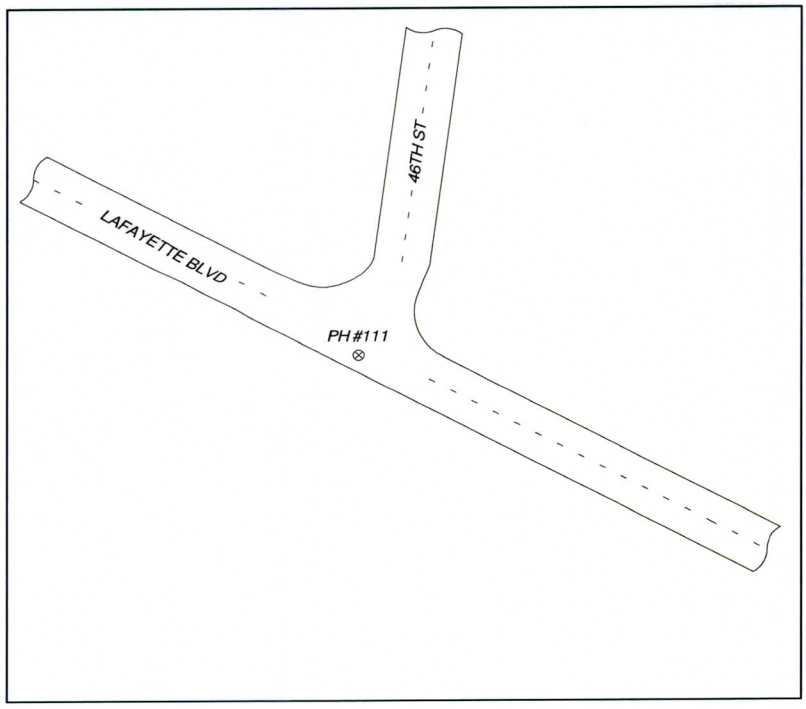
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING

SURFACE ELEVATION 1264.90

WIDTH/O.D.

TOP ELEVATION

TOP DEPTH (FEET)

BOTTOM ELEVATION 1259.40

5.50 BOTTOM (FEET)

COORDINATES: NORTHING 911025.86 EASTING 679947.97

STATIONING: STATION 71+79.41 OFFSET 10.15 RT

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE None TYPE None FACILITY OWNER City of Phoenix Water

COMMENTS:

Dug to a depth of 5.5 ft in the requested location and no facility was found.

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	112	SUE Crew	J. Garcia
Date Dug	6/22/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard & 46th Street		

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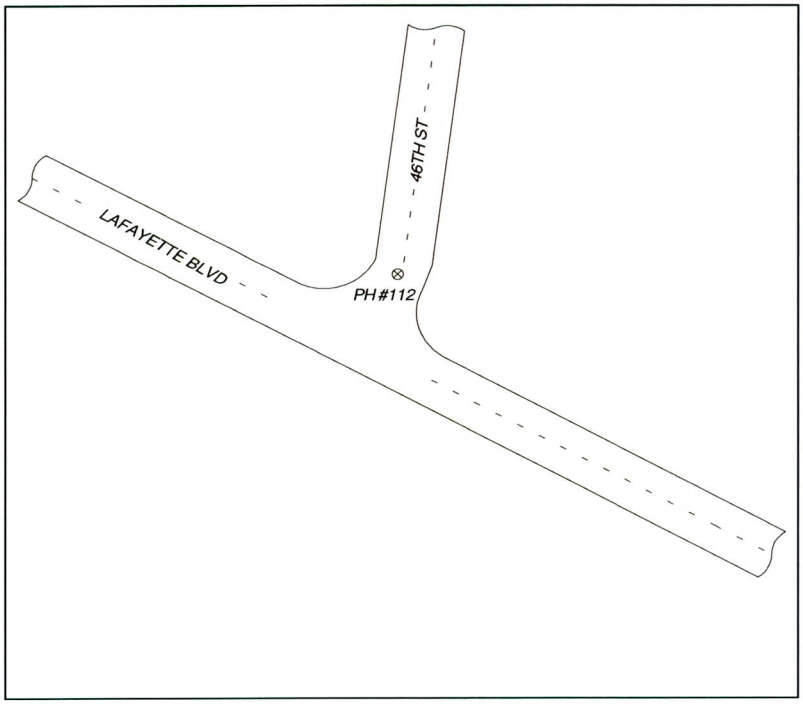
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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ARIZONA, U.S.A.

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SITE BENCHMARK

RIBBON COLOR: None

CROSS SECTION - NOT TO SCALE

FACING: _____

SURFACE ELEVATION	1264.29	WIDTH/O.D.	
TOP ELEVATION			TOP DEPTH (FEET)
BOTTOM ELEVATION	1259.79	4.50	BOTTOM (FEET)

COORDINATES:	NORTHING	911056.97	EASTING	679990.03	
STATIONING:	STATION	71+79.89	OFFSET	42.16 LT	
PAVING THICKNESS	4"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	None	TYPE	None	FACILITY OWNER	City of Phoenix Water

COMMENTS:

Dug to a depth of 4.5 ft in the requested location and no facility was found.

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	113	SUE Crew	J. Brandt
Date Dug	6/24/2011	Truck #	543
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Ave Del Puente & Lafayette Boulevard		

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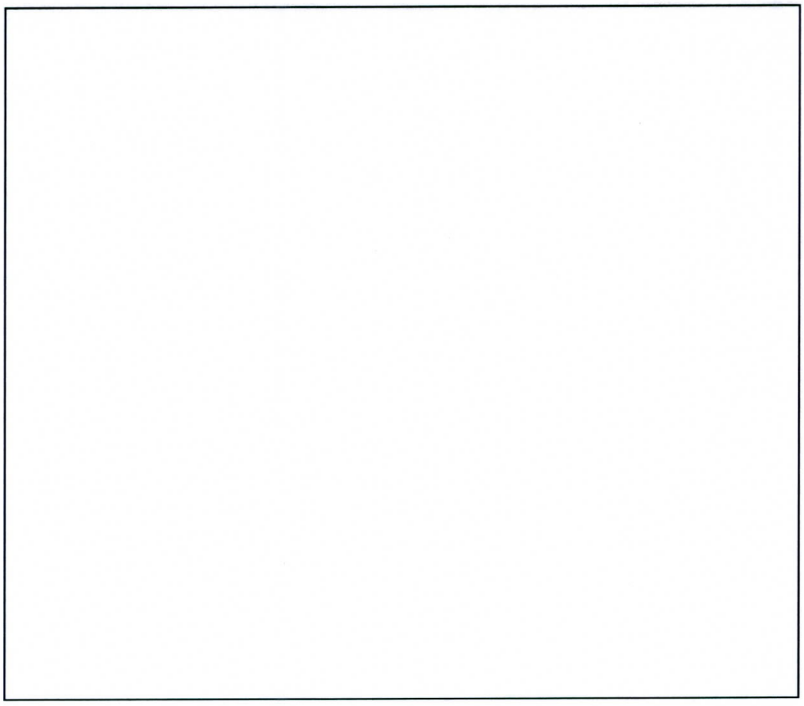
LOCATION PLAN - NOT TO SCALE

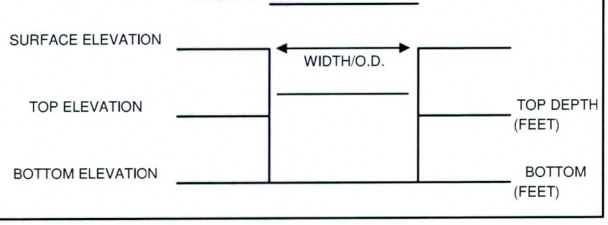


EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE



COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION None

SIZE None TYPE None FACILITY OWNER Salt River Project Electric

COMMENTS:

No underground facility in the requested location per bluestake.

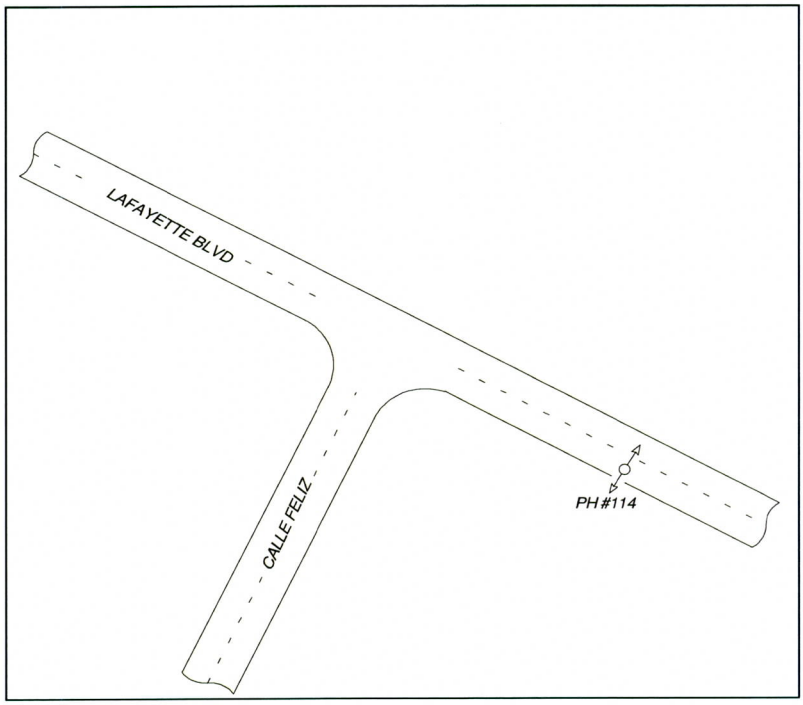
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	114	SUE Crew	J. Garcia
Date Dug	6/23/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard east of Calle Feliz		

AZTEC www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1264.75	WIDTH/O.D. 9.11"	
TOP ELEVATION	1258.71	6.04	TOP DEPTH (FEET)
BOTTOM ELEVATION	1257.95	6.80	BOTTOM (FEET)

COORDINATES: NORTHING	911993.38	EASTING	679223.69
STATIONING: STATION	59+70.83	OFFSET	5.86 RT
PAVING THICKNESS	4"	PAVING TYPE	Asphalt
SOIL CONDITION	Dirt		
SIZE	8"	TYPE	ACP
FACILITY OWNER	City of Phoenix Water		

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	115	SUE Crew	J. Garcia
Date Dug	6/23/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard east of 44th Street		

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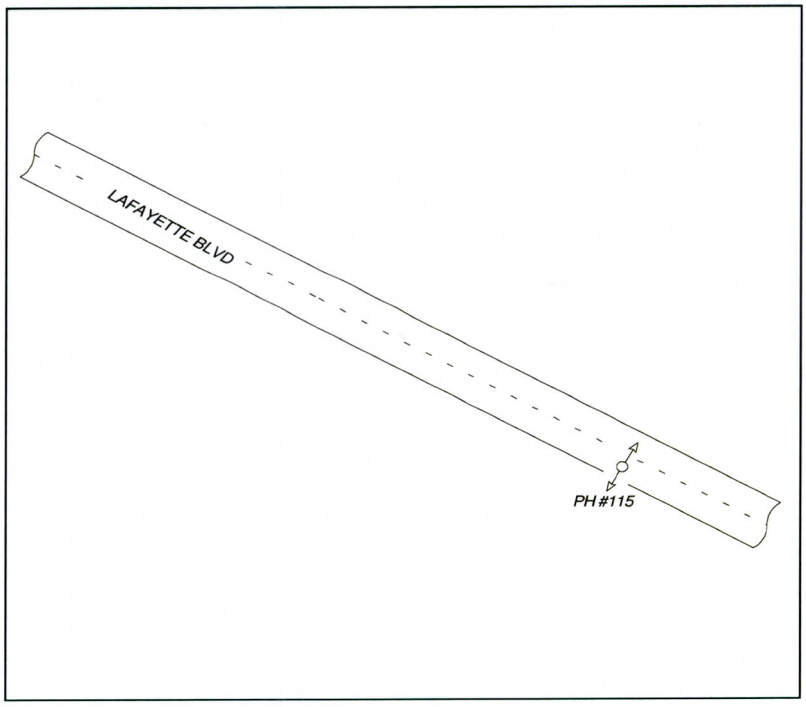
LOCATION PLAN - NOT TO SCALE



EXPIRES 09/30/2012

SITE BENCHMARK

CROSS SECTION - NOT TO SCALE

FACING: Northeast

SURFACE ELEVATION	1264.17	WIDTH/O.D. 9.11"	
TOP ELEVATION	1258.33		5.84 TOP DEPTH (FEET)
BOTTOM ELEVATION	1257.57		6.60 BOTTOM (FEET)

RIBBON COLOR: Blue

COORDINATES: NORTHING 912354.08 EASTING 678946.77

STATIONING: STATION 55+16.11 OFFSET 9.78 RT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	116	SUE Crew	J. Garcia
Date Dug	6/23/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Boulevard east of 44th Street		

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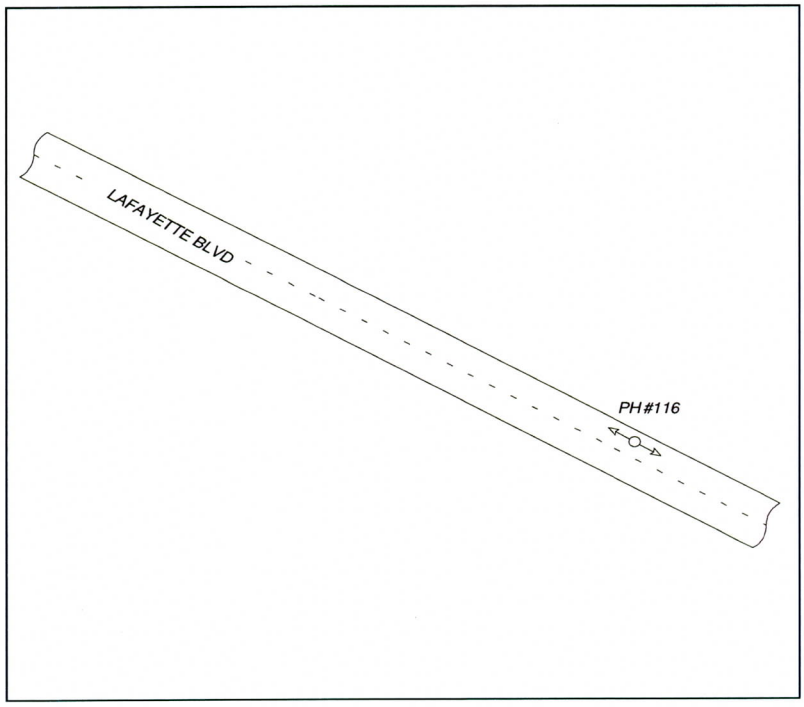
LOCATION PLAN - NOT TO SCALE



EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1263.99	WIDTH/O.D. 4.81"	
TOP ELEVATION	1260.95	3.04	TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.55	3.44	BOTTOM (FEET)

COORDINATES:	NORTHING	912362.94	EASTING	678965.23	
STATIONING:	STATION	55+20.15	OFFSET	10.30 LT	
PAVING THICKNESS	4"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	4"	TYPE	ACP	FACILITY OWNER	City of Phoenix Water

COMMENTS:

PREPARED BY: M. Huber

CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	117	SUE Crew	A. Pablo-Bello
Date Dug	6/27/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC
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4561 East McDowell Road, Phoenix, AZ 85008-4504
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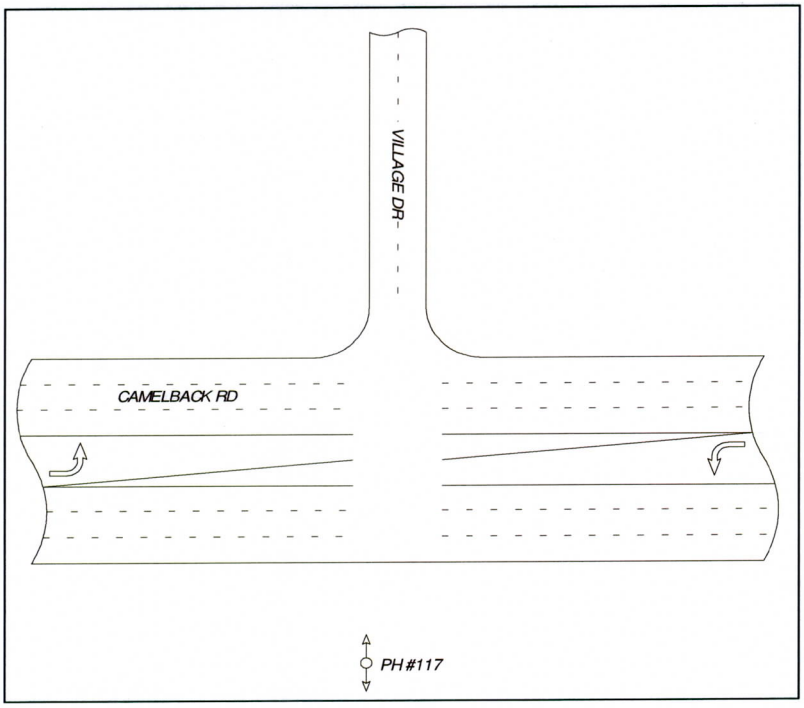
LOCATION PLAN - NOT TO SCALE



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EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1266.81	WIDTH/O.D. 9.11"	
TOP ELEVATION	1264.33		2.48 TOP DEPTH (FEET)
BOTTOM ELEVATION	1263.57		3.24 BOTTOM (FEET)

COORDINATES: NORTHING 912539.59 EASTING 679175.09

STATIONING: STATION 502+77.85 OFFSET 1.80 LT

PAVING THICKNESS 3" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

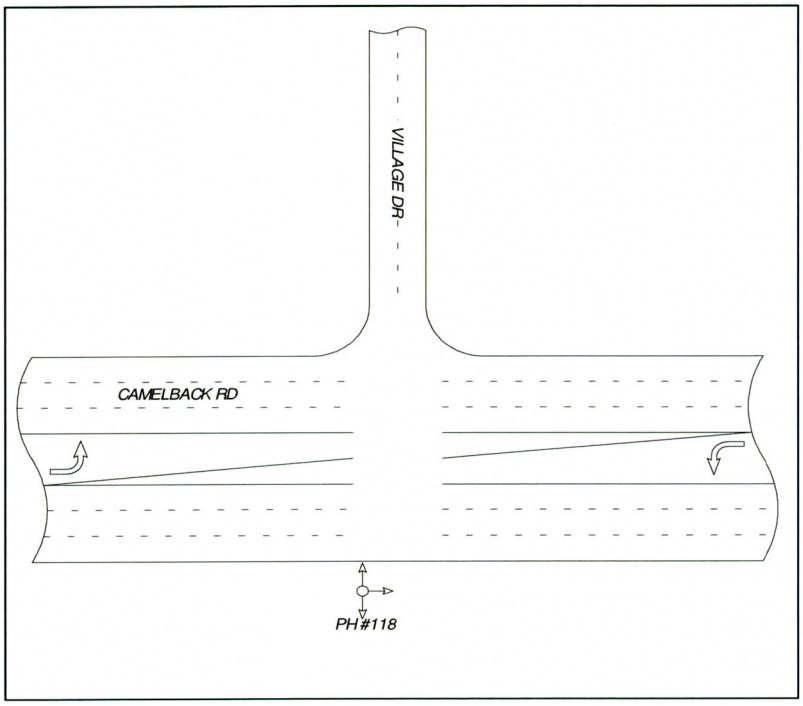
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	118	SUE Crew	A. Pablo-Bello
Date Dug	6/24/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1271.77	WIDTH/O.D. 9.11"	
TOP ELEVATION	1267.89	3.88	TOP DEPTH (FEET)
BOTTOM ELEVATION	1267.13	4.64	BOTTOM (FEET)

RIBBON COLOR: Blue

COORDINATES: NORTHING 912784.19 EASTING 679187.40

STATIONING: STATION 505+22.64 OFFSET 5.96 RT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

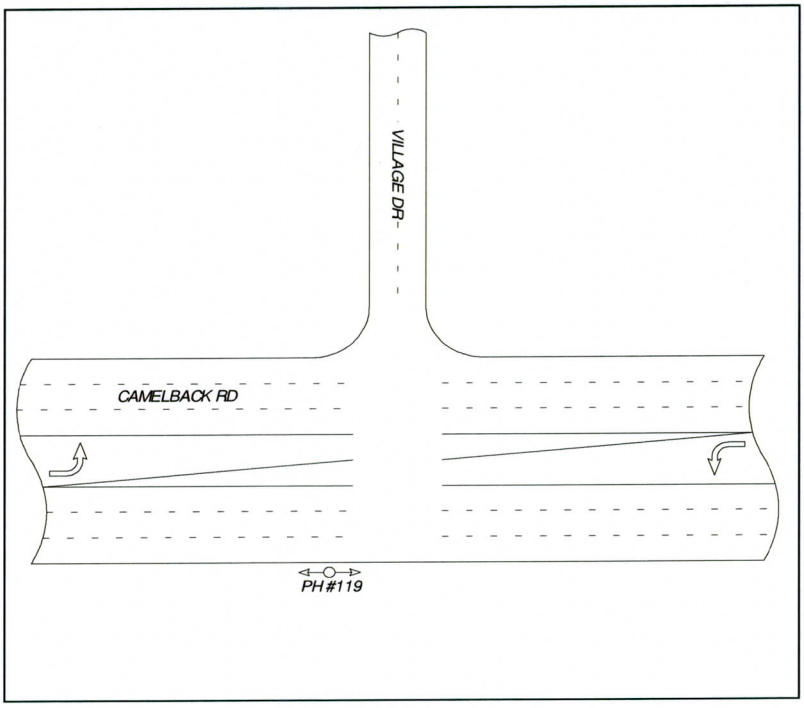
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	119	SUE Crew	A. Pablo-Bello
Date Dug	6/28/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Red

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1271.61	WIDTH/O.D. 24"	
TOP ELEVATION	1268.71	2.90	TOP DEPTH (FEET)
BOTTOM ELEVATION	1267.81	3.80	BOTTOM (FEET)

COORDINATES: NORTHING 912840.10 EASTING 679179.66

STATIONING: STATION 505+78.39 OFFSET 2.83 LT

PAVING THICKNESS: None PAVING TYPE: None SOIL CONDITION: Dirt

SIZE: 24" Wide TYPE: Slurry Duct FACILITY OWNER: Salt River Project Electric

COMMENTS:

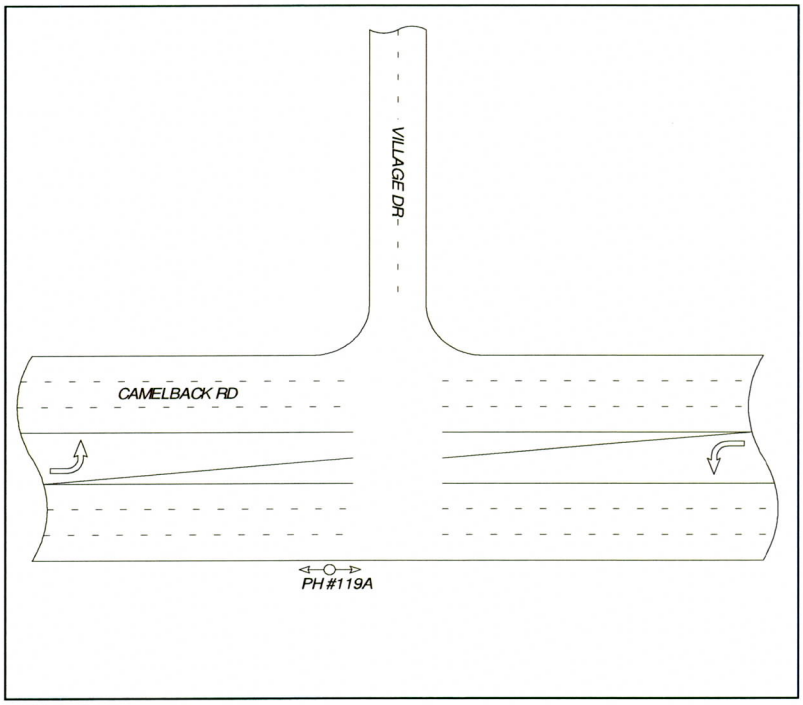
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	119A	SUE Crew	A. Pablo-Bello
Date Dug	6/28/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1271.45	WIDTH/O.D. 7.1"	
TOP ELEVATION	1268.63	2.82	TOP DEPTH (FEET)
BOTTOM ELEVATION	1268.04	3.41	BOTTOM (FEET)

COORDINATES: NORTHING 912837.93 EASTING 679179.79

STATIONING: STATION 505+76.23 OFFSET 2.65 LT

PAVING THICKNESS: None PAVING TYPE: None SOIL CONDITION: Dirt

SIZE: 6" TYPE: CIP FACILITY OWNER: City of Phoenix Water

COMMENTS:

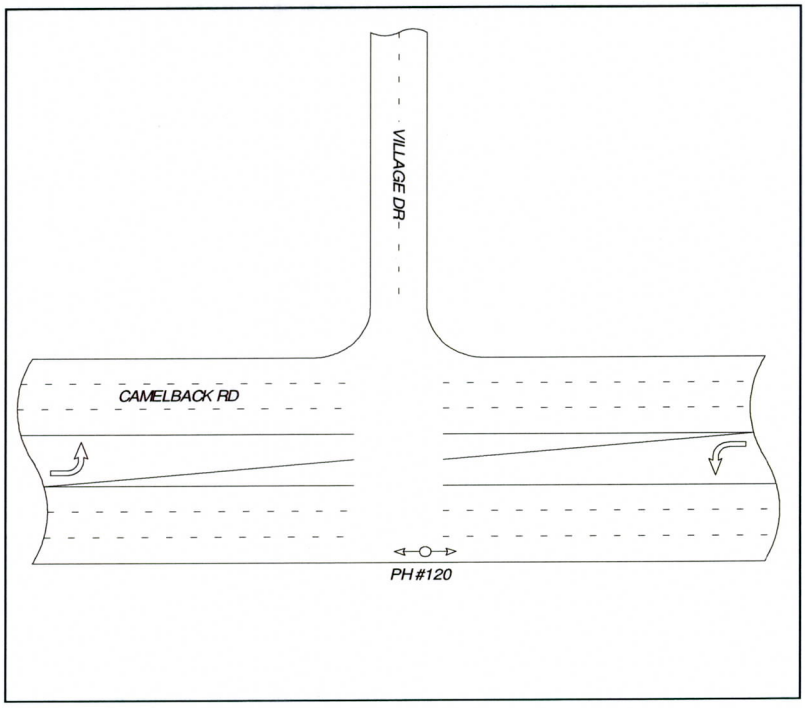
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	120	SUE Crew	A. Pablo-Bello
Date Dug	6/27/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1271.55	WIDTH/O.D. 23.28"	
TOP ELEVATION	1265.43	6.12	TOP DEPTH (FEET)
BOTTOM ELEVATION	1263.49	8.06	BOTTOM (FEET)

COORDINATES: NORTHING 912851.93 EASTING 679182.53

STATIONING: STATION 505+90.28 OFFSET 0.18 LT

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 20" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

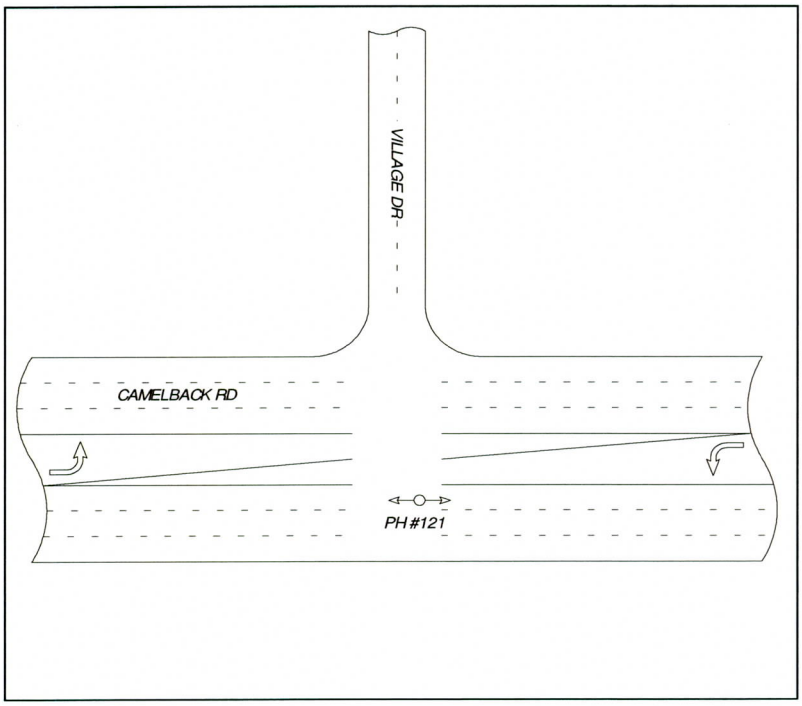
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	121	SUE Crew	A. Pablo-Bello
Date Dug	6/27/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

CROSS SECTION - NOT TO SCALE

FACING East

SURFACE ELEVATION	1272.06	WIDTH/O.D. 4.81"	
TOP ELEVATION	1268.22	3.84	TOP DEPTH (FEET)
BOTTOM ELEVATION	1267.82	4.24	BOTTOM (FEET)

RIBBON COLOR Blue

COORDINATES: NORTHING 912874.20 EASTING 679186.52

STATIONING: STATION 506+12.61 OFFSET 3.40 RT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 4" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

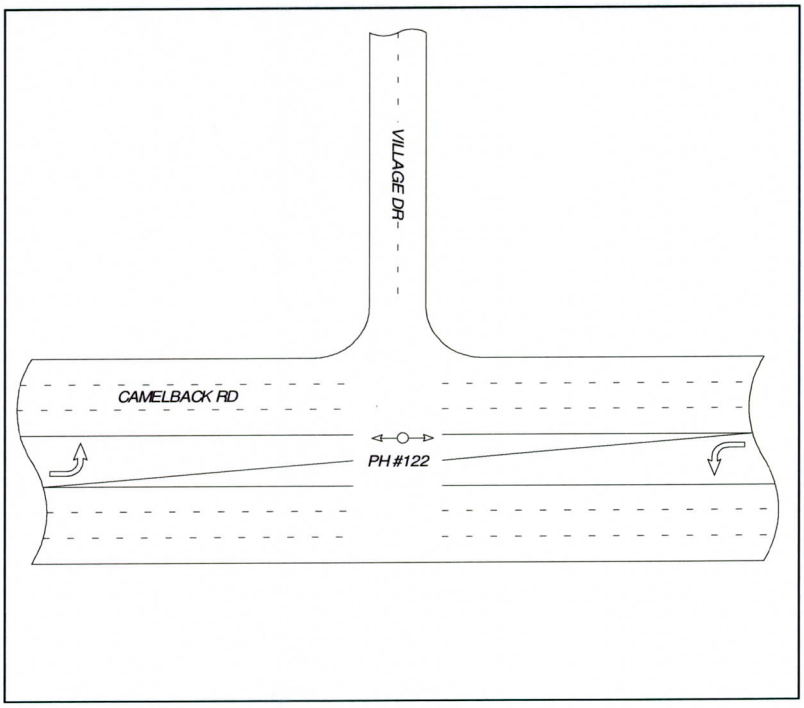
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	122	SUE Crew	A. Pablo-Bello
Date Dug	6/27/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1272.20	WIDTH/O.D. 18.46"	
TOP ELEVATION	1266.84	5.36	TOP DEPTH (FEET)
BOTTOM ELEVATION	1265.30	6.90	BOTTOM (FEET)

COORDINATES: NORTHING 912900.79 EASTING 679188.99

STATIONING: STATION 506+39.25 OFFSET 5.38 RT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 16" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

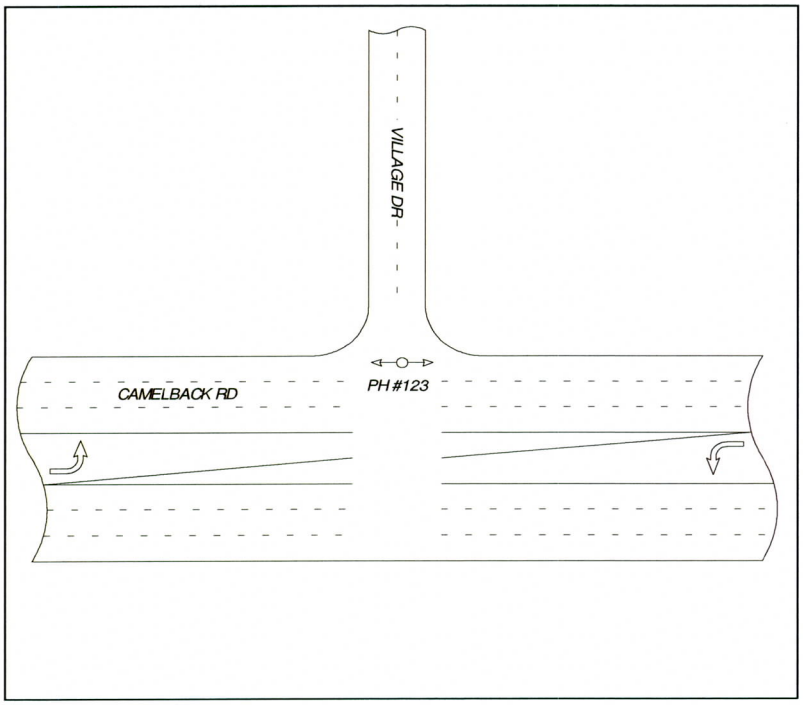
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	123	SUE Crew	A. Pablo-Bello
Date Dug	6/27/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1271.87	WIDTH/O.D. 13.92"	
TOP ELEVATION	1267.25	4.62	TOP DEPTH (FEET)
BOTTOM ELEVATION	1266.09	5.78	BOTTOM (FEET)

COORDINATES: NORTHING 912927.35 EASTING 679191.93

STATIONING: STATION 506+65.86 OFFSET 7.82 RT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 12" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

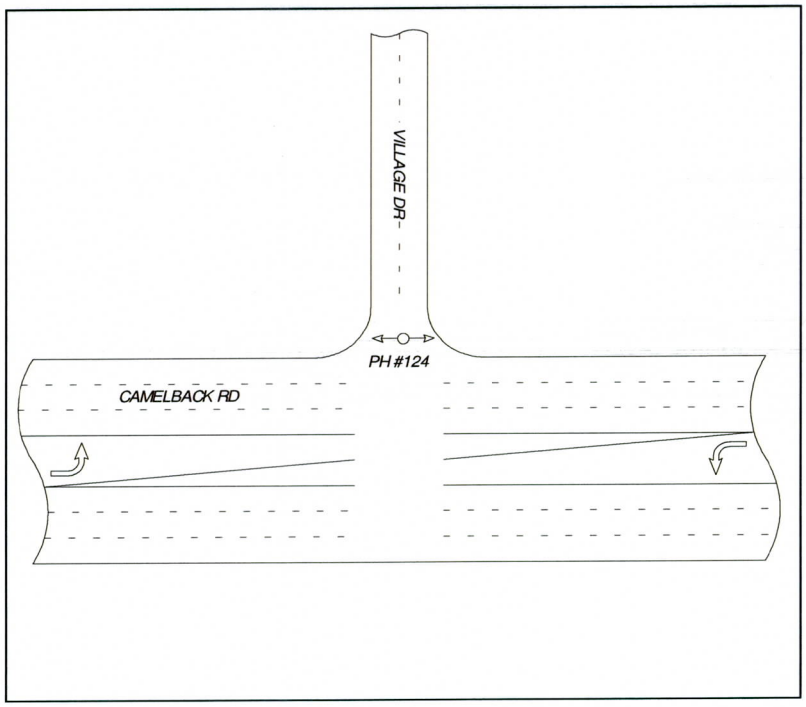
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	124	SUE Crew	A. Pablo-Bello
Date Dug	6/28/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1271.90	WIDTH/O.D. 30"	
TOP ELEVATION	1270.98		0.92 TOP DEPTH (FEET)
BOTTOM ELEVATION	1268.48		3.42 BOTTOM (FEET)

COORDINATES: NORTHING 912948.84 EASTING 679193.20

STATIONING: STATION 506+87.36 OFFSET 8.70 RT

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 24" TYPE RCP FACILITY OWNER City of Phoenix Storm Drain

COMMENTS:

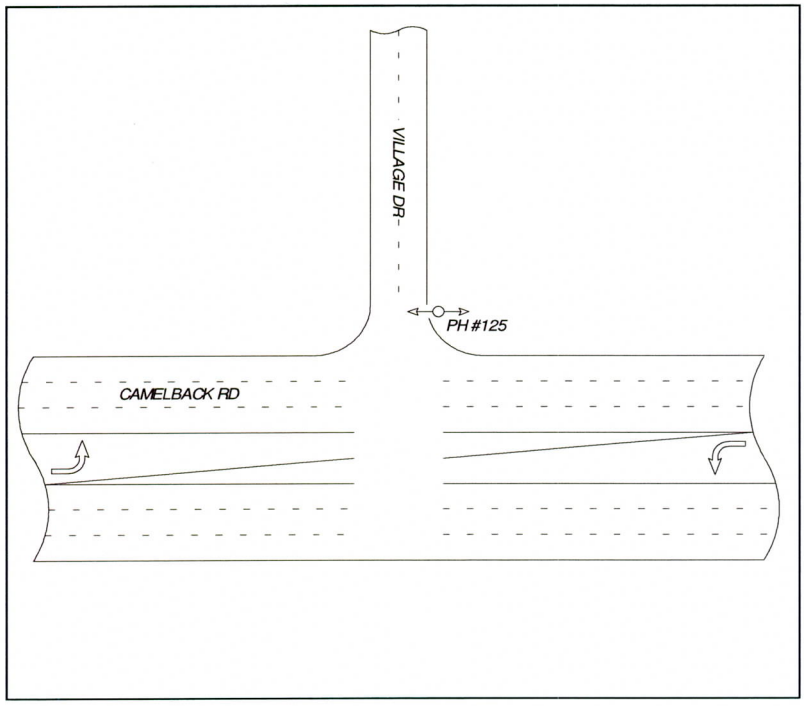
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	125	SUE Crew	A. Pablo-Bello
Date Dug	6/28/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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EXPIRES 09/30/2012

SITE BENCHMARK

CROSS SECTION - NOT TO SCALE

FACING East

SURFACE ELEVATION	1272.69	WIDTH/O.D. 10"	
TOP ELEVATION	1267.49	5.20	TOP DEPTH (FEET)
BOTTOM ELEVATION	1267.41	5.28	BOTTOM (FEET)

RIBBON COLOR Red

COORDINATES: NORTHING 912956.02 EASTING 679210.07

STATIONING: STATION 506+94.86 OFFSET 25.43 RT

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Dirt

SIZE Three 1" TYPE PE FACILITY OWNER Salt River Project Electric

COMMENTS:

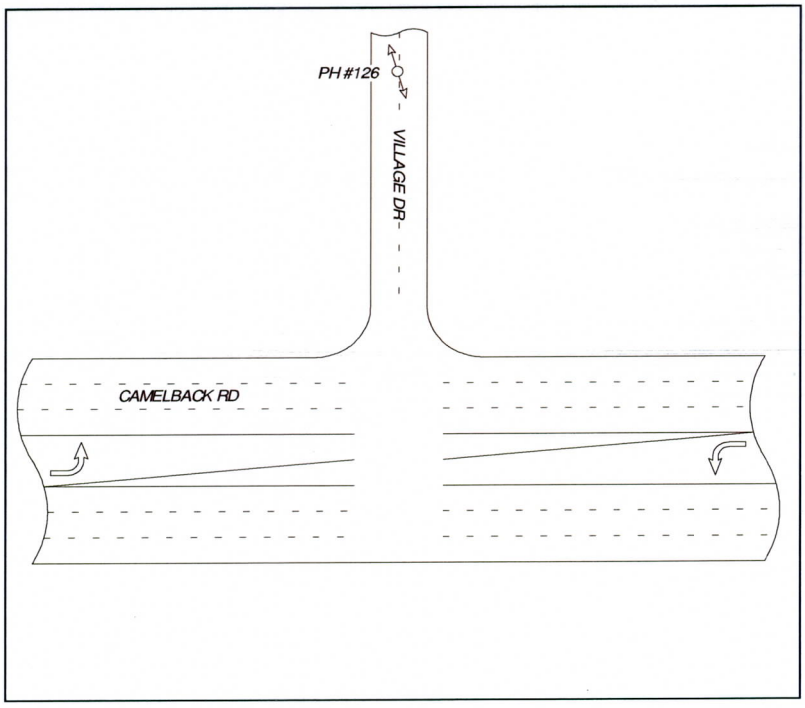
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	126	SUE Crew	A. Pablo-Bello
Date Dug	6/28/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK

CROSS SECTION - NOT TO SCALE

FACING: Northwest

SURFACE ELEVATION	1272.72	WIDTH/O.D. 9.11"	
TOP ELEVATION	1268.88		3.84 TOP DEPTH (FEET)
BOTTOM ELEVATION	1268.12		4.60 BOTTOM (FEET)

RIBBON COLOR: Blue

COORDINATES: NORTHING 913212.69 EASTING 679190.31

STATIONING: STATION 509+51.11 OFFSET 0.90 RT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

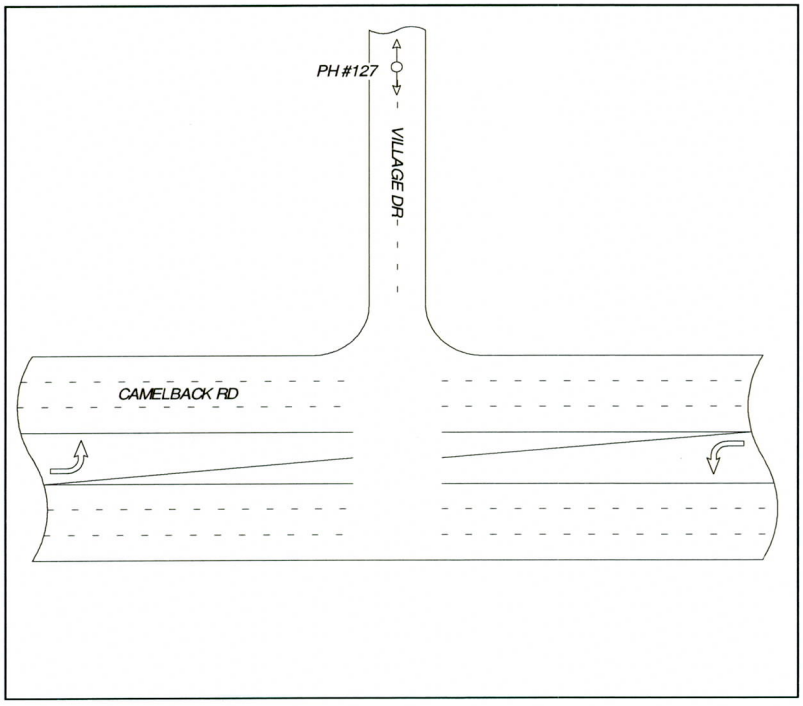
PREPARED BY: M. Huber CHECKED BY: J. Cherry

TEST HOLE DATA REPORT

Test Hole #	127	SUE Crew	A. Pablo-Bello
Date Dug	6/28/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Road & Village Drive		

AZTEC www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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EXPIRES 09/30/2012

SITE BENCHMARK

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1273.03	WIDTH/O.D. 8.63"	
TOP ELEVATION	1269.75	3.28	TOP DEPTH (FEET)
BOTTOM ELEVATION	1269.03	4.00	BOTTOM (FEET)

COORDINATES: NORTHING 913313.87 EASTING 679189.84

STATIONING: STATION 510+52.27 OFFSET 1.45 LT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: M. Huber CHECKED BY: J. Cherry

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number	
Invoice Date	
Project Name	Arcadia Drainage Impr
Contract Number	119303
Contractor Job #	AZU0901-194
Hole Cost	
Survey Cost	
SUE Exploration Cost	
SUE Exploration Hours	
Barricade Cost	
Police Cost	
Police Hours	
Rental Cost	
Location	Arcadia Dr. and E. Calle Redonda

Certification

REGISTERED LAND SURVEYOR CERTIFICATE NO. 35316 CHAD HUBER Date Signed ..... ARIZONA, U.S.A.

EXPIRES 09/30/12

Contractor	AZTEC
COP Hole #	2
Contractor Hole #	2
Project #	ST83110068
Crew Name	J. Garcia
Truck #	557
Date Requested	6/8/2011 (format 8/28/2003)
Exploration/Dug Date	6/10/2011 (format 8/28/2003)
Date Received	6/17/2011 (format 8/28/2003)
Survey Recorded	6/15/2011 (format 8/28/2003)
Utility Company	COX
Traffic Cost	
SHPO Cost	

Station / Offset / Dir	10+43.04	6.000	RT	Requested
Station / Offset / Dir	10+45.95	8.83	RT	Surveyed
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	681659.62
Y - Location	908232.19
Z - Location	1252.97

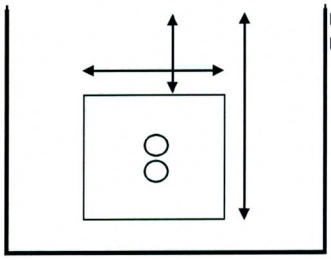
Profile View / not to scale

Pavement & Soil Information

Upper	OR	(feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	1.0 (in)
Type Code	CATV
Structure	C
Material	PE



Surface Elevation	1252.97
Utility Elevation Top	1250.93
Utility Elevation Bottom	1250.68

Top	2.04 (feet)
Bottom	2.3 (feet)

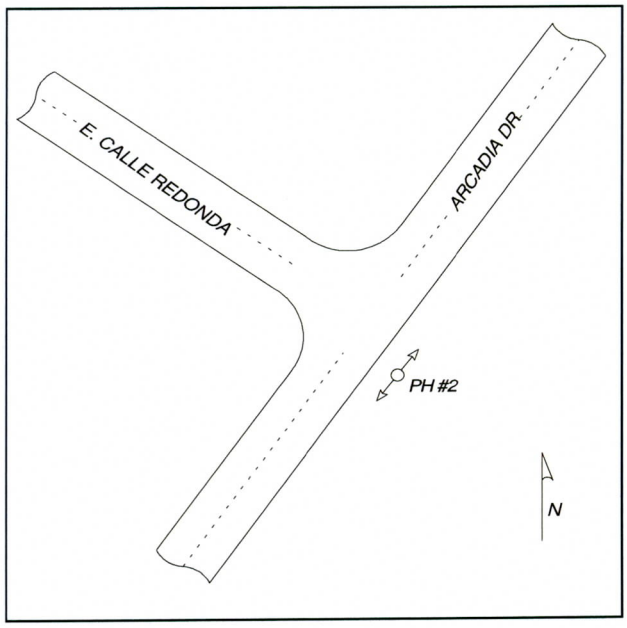
Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

Found two 1" PE cables in a bundle.

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Contractor**	AZTEC
Invoice Date		**COP Hole #**	6
Project Name	Arcadia Drainage Impr	**Contractor Hole #**	6
Contract Number	119303	**Project #**	ST83110068
Contractor Job #	AZU0901-194	**Crew Name**	A. Pablo-Bello
Hole Cost		**Truck #**	558
Survey Cost		**Date Requested**	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		**Exploration/Dug Date**	6/14/2011 (format 8/28/2003)
SUE Exploration Hours		**Date Received**	6/17/2011 (format 8/28/2003)
Barricade Cost		**Survey Recorded**	6/15/2011 (format 8/28/2003)
Police Cost		**Utility Company**	COX
Police Hours		**Traffic Cost**	
Rental Cost		**SHPO Cost**	
Location	Arcadia Dr. and Lafayette Blvd.		

Certification

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EXPIRES 09/30/12

Station / Offset / Dir	19+77.06	1.500	RT	**Requested**
Station / Offset / Dir	19+40.22	0.33	LT	**Surveyed**
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	682002.86
Y - Location	909058.74
Z - Location	1264.69

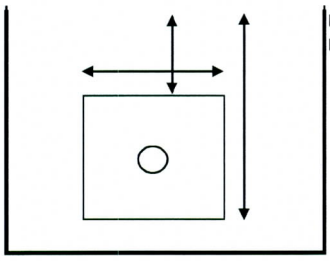
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	3.5 (in)
Type Code	CATV
Structure	D
Material	PVC



Surface Elevation	1264.69	
Utility Elevation Top	1262.17	
Utility Elevation Bottom	1261.88	
Top	2.52	(feet)
Bottom	2.8	(feet)

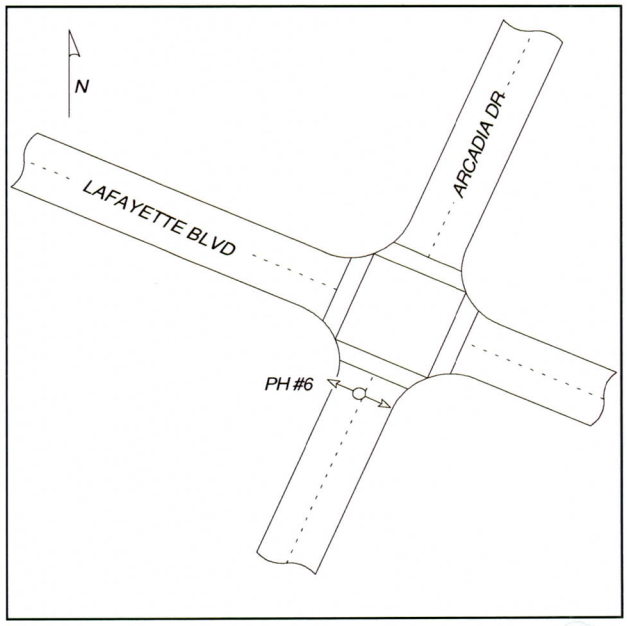
Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

Moved hole to conform to bluestake.

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Contractor**	AZTEC
Invoice Date		**COP Hole #**	13
Project Name	Arcadia Drainage Impr	**Contractor Hole #**	13
Contract Number	119303	**Project #**	ST83110068
Contractor Job #	AZU0901-194	**Crew Name**	A. Pablo-Bello
Hole Cost		**Truck #**	558
Survey Cost		**Date Requested**	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		**Exploration/Dug Date**	6/10/2011 (format 8/28/2003)
SUE Exploration Hours		**Date Received**	6/17/2011 (format 8/28/2003)
Barricade Cost		**Survey Recorded**	6/15/2011 (format 8/28/2003)
Police Cost		**Utility Company**	COX
Police Hours		**Traffic Cost**	
Rental Cost		**SHPO Cost**	
Location	Arcadia Dr. and Lafayette Blvd.		

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	97+53.56	25.030	RT	**Requested**
Station / Offset / Dir	97+53.82	23.96	RT	**Surveyed**
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	681815.16
Y - Location	909262.92
Z - Location	1265.41

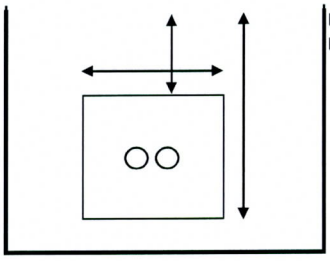
Profile View / not to scale

Pavement & Soil Information

Upper	OR	(feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.0 (in)
Type Code	CATV
Structure	C
Material	PE



Surface Elevation	1265.41	
Utility Elevation Top	1262.77	
Utility Elevation Bottom	1262.71	
Top	2.64	(feet)
Bottom	2.7	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
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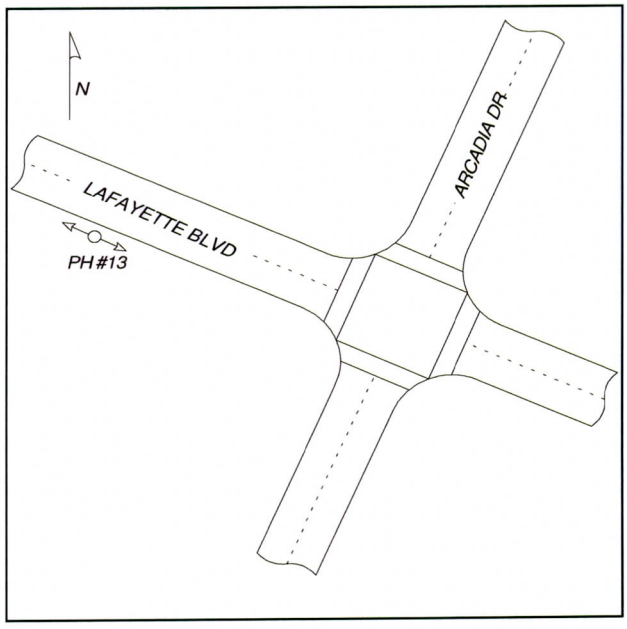
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

Found two 0.75" PE cables in a bundle.

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Contractor**	AZTEC
Invoice Date		**COP Hole #**	21
Project Name	Arcadia Drainage Impr	**Contractor Hole #**	21
Contract Number	119303	**Project #**	ST83110068
Contractor Job #	AZU0901-194	**Crew Name**	A. Pablo-Bello
Hole Cost		**Truck #**	558
Survey Cost		**Date Requested**	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		**Exploration/Dug Date**	6/10/2011 (format 8/28/2003)
SUE Exploration Hours		**Date Received**	6/17/2011 (format 8/28/2003)
Barricade Cost		**Survey Recorded**	6/15/2011 (format 8/28/2003)
Police Cost		**Utility Company**	COX
Police Hours		**Traffic Cost**	
Rental Cost		**SHPO Cost**	
Location	Lafayette Blvd. east of 47th St.		

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	89+06.31	12.000	RT	**Requested**	
Station / Offset / Dir	89+05.15	9.39	RT	**Surveyed**	
Bench Mark Elevation	1256.4				

NAD83 Location

X - Location	681180.93
Y - Location	909827.01
Z - Location	1265.6

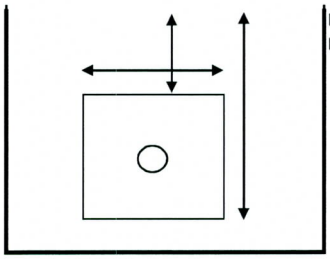
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.42 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4 (in)
Type Code	CATV
Structure	D
Material	PVC



Surface Elevation	1265.60
Utility Elevation Top	1263.48
Utility Elevation Bottom	1263.28

Top	2.12 (feet)
Bottom	2.3 (feet)

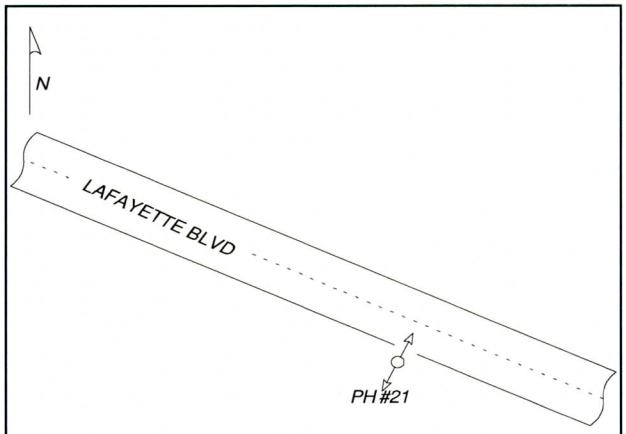
Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number	
Invoice Date	
Project Name	Arcadia Drainage Impr
Contract Number	119303
Contractor Job #	AZU0901-194
Hole Cost	
Survey Cost	
SUE Exploration Cost	
SUE Exploration Hours	
Barricade Cost	
Police Cost	
Police Hours	
Rental Cost	
Location	Camelback Rd. and Village Dr.

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/12

Contractor	AZTEC
COP Hole #	50
Contractor Hole #	50
Project #	ST83110068
Crew Name	J. Garcia
Truck #	558
Date Requested	6/8/2011 (format 8/28/2003)
Exploration/Dug Date	6/17/2011 (format 8/28/2003)
Date Received	6/17/2011 (format 8/28/2003)
Survey Recorded	6/17/2011 (format 8/28/2003)
Utility Company	COX
Traffic Cost	
SHPO Cost	

Station / Offset / Dir	506+94.52	19.310	RT	Requested
Station / Offset / Dir	506+92.17	26.46	RT	Surveyed
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	679211.05
Y - Location	912953.32
Z - Location	1272.63

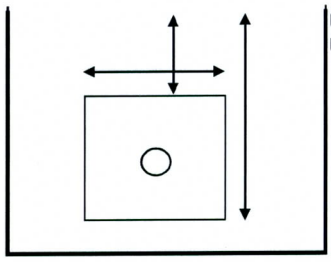
Profile View / not to scale

Pavement & Soil Information

Upper	OR	(feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4 (in)
Type Code	CATV
Structure	D
Material	PVC



Surface Elevation	1272.63
Utility Elevation Top	1270.89
Utility Elevation Bottom	1270.69

Top	1.74	(feet)
Bottom	1.9	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
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SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
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W - Water

Structure Codes
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D – Duct Bank
P – Pipe
V – Vault

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CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
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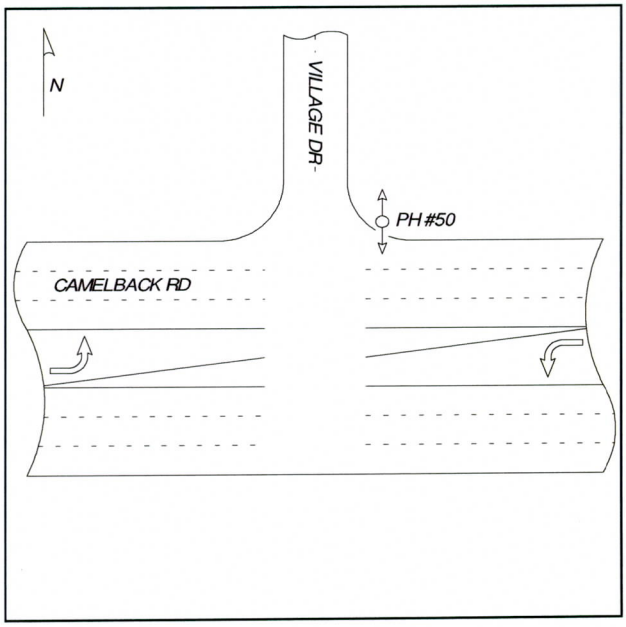
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

Moved hole to conform to bluestake.

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date			**COP Hole #**	51	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	51	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	J. Garcia	
Hole Cost			**Truck #**	558	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/17/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/17/2011	(format 8/28/2003)
Police Cost			**Utility Company**	COX	
Police Hours			**Traffic Cost**		
Rental Cost		EXPIRES 09/30/12	**SHPO Cost**		
Location	Camelback Rd. and Village Dr.				

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

Station / Offset / Dir	507+02.93	15.260	RT	**Requested**	**NAD83 Location**
Station / Offset / Dir	507+01.45	23.37	RT	**Surveyed**	**X - Location** 679208.13
Bench Mark Elevation	1256.4				**Y - Location** 912962.65
					Z - Location 1272.58

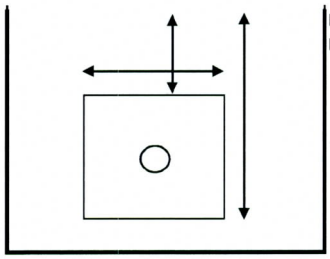
Profile View / not to scale

Pavement & Soil Information

Upper	OR		(feet)
Soil Code	GP		

Visual Utility Identification Information

Size/Width	2.4	(in)
Type Code	CATV	
Structure	D	
Material	PVC	



Surface Elevation	1272.58		
Utility Elevation Top	1270.76	**Top**	1.82 (feet)
Utility Elevation Bottom	1270.56	**Bottom**	2.0 (feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
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W - Water

Structure Codes
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D – Duct Bank
P – Pipe
V – Vault

Material Codes
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CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
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BM - Bench Mark
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CL - Construction Line
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PL - Property Line
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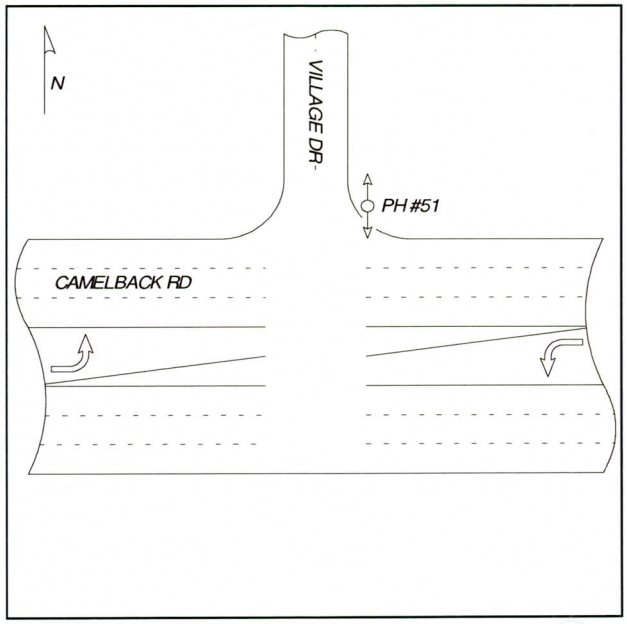
PL - Property Line
P/P Power Pole



Comments

Moved hole to conform to bluestake.

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number	
Invoice Date	
Project Name	Arcadia Drainage Impr
Contract Number	119303
Contractor Job #	AZU0901-194
Hole Cost	
Survey Cost	
SUE Exploration Cost	
SUE Exploration Hours	
Barricade Cost	
Police Cost	
Police Hours	
Rental Cost	
Location	Camelback Rd. and Village Dr.

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/12

Contractor	AZTEC	
COP Hole #	51	
Contractor Hole #	51A	
Project #	ST83110068	
Crew Name	J. Garcia	
Truck #	558	
Date Requested	6/8/2011	(format 8/28/2003)
Exploration/Dug Date	6/17/2011	(format 8/28/2003)
Date Received	6/17/2011	(format 8/28/2003)
Survey Recorded	6/17/2011	(format 8/28/2003)
Utility Company	UNKN	
Traffic Cost		
SHPO Cost		

Station / Offset / Dir	507+02.93	15.260	RT	Requested
Station / Offset / Dir	507+01.33	25.52	RT	Surveyed
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	679210.28
Y - Location	912962.49
Z - Location	1272.72

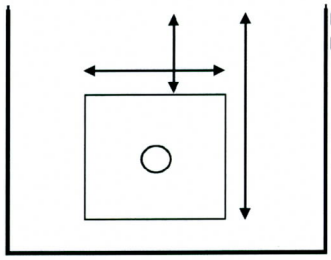
Profile View / not to scale

Pavement & Soil Information

Upper	OR	(feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	1.0	(in)
Type Code		
Structure	C	
Material	PE	



Surface Elevation	1272.72
Utility Elevation Top	1271.56
Utility Elevation Bottom	1271.48

Top	1.16	(feet)
Bottom	1.2	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
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SS - Sanitary Sewer
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V – Vault

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CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
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PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
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STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
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CU - Cooper
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BCHH - Brass Cap Hand Hole
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CL - Construction Line
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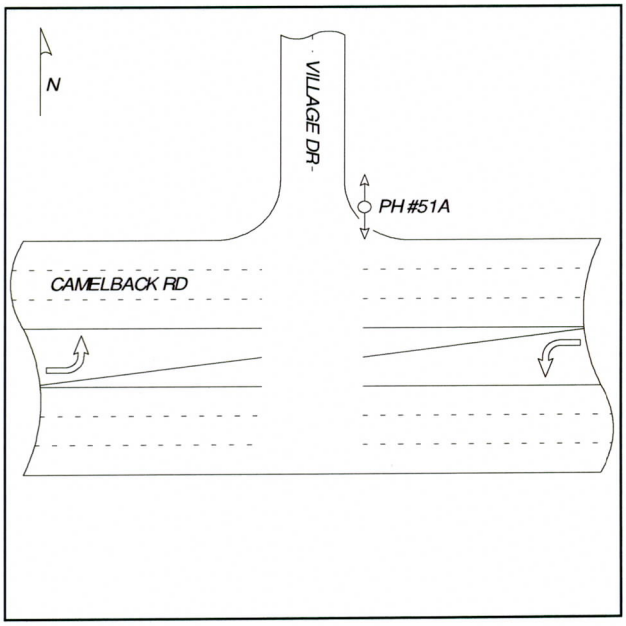
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

Moved to conform to bluestake.

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date			**COP Hole #**	1	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	1	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	A. Pablo-Bello	
Hole Cost			**Truck #**	558	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/17/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/17/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost			**SHPO Cost**		
Location	Arcadia Dr. and E. Calle Redonda				

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	10+18.87	21.230	RT	**Requested**	
Station / Offset / Dir	10+20.77	12.89	RT	**Surveyed**	
Bench Mark Elevation	1256.4				

NAD83 Location

X - Location	681647.32
Y - Location	908209.33
Z - Location	1253.45

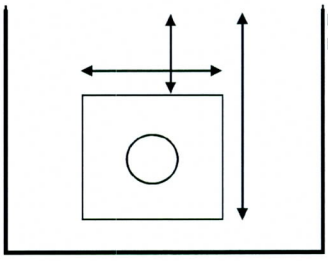
Profile View / not to scale

Pavement & Soil Information

Upper	OR	(feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	8.6 (in)
Type Code	G
Structure	P
Material	STL



Surface Elevation	1253.45
Utility Elevation Top	1247.99
Utility Elevation Bottom	1247.27

Top	5.46	(feet)
Bottom	6.2	(feet)

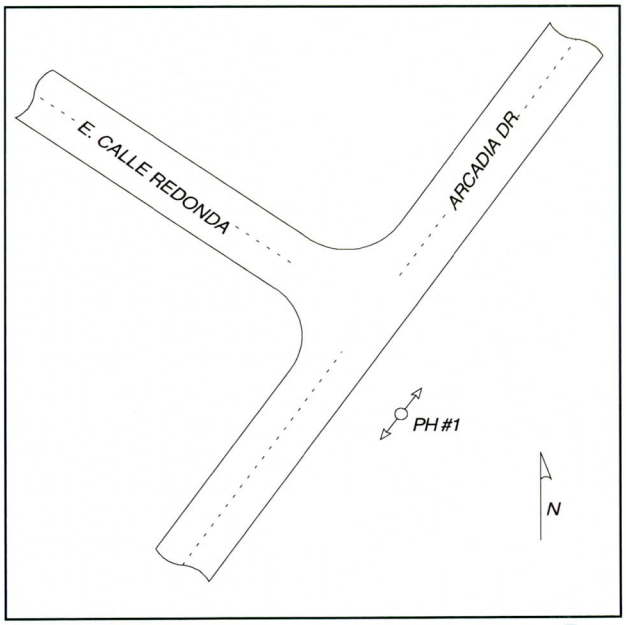
Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

Moved hole to comform to bluestake.

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Contractor**	AZTEC
Invoice Date		**COP Hole #**	3
Project Name	Arcadia Drainage Impr	**Contractor Hole #**	3
Contract Number	119303	**Project #**	ST83110068
Contractor Job #	AZU0901-194	**Crew Name**	A. Pablo-Bello
Hole Cost		**Truck #**	558
Survey Cost		**Date Requested**	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		**Exploration/Dug Date**	6/11/2011 (format 8/28/2003)
SUE Exploration Hours		**Date Received**	6/17/2011 (format 8/28/2003)
Barricade Cost		**Survey Recorded**	6/15/2011 (format 8/28/2003)
Police Cost		**Utility Company**	SWG
Police Hours		**Traffic Cost**	
Rental Cost		**SHPO Cost**	
Location	Arcadia Dr. and E. Calle Ventura		

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	13+58.43	16.220	LT	**Requested**
Station / Offset / Dir	13+59.34	16.68	LT	**Surveyed**
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	681770.64
Y - Location	908526.08
Z - Location	1255.94

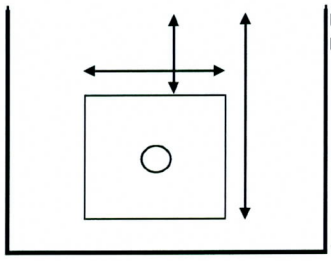
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4 (in)
Type Code	G
Structure	P
Material	STL



Surface Elevation	1255.94
Utility Elevation Top	1252.78
Utility Elevation Bottom	1252.58

Top	3.16 (feet)
Bottom	3.4 (feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
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CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
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PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
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CMU - Conc. Mason Wall
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FC - Face of Curb
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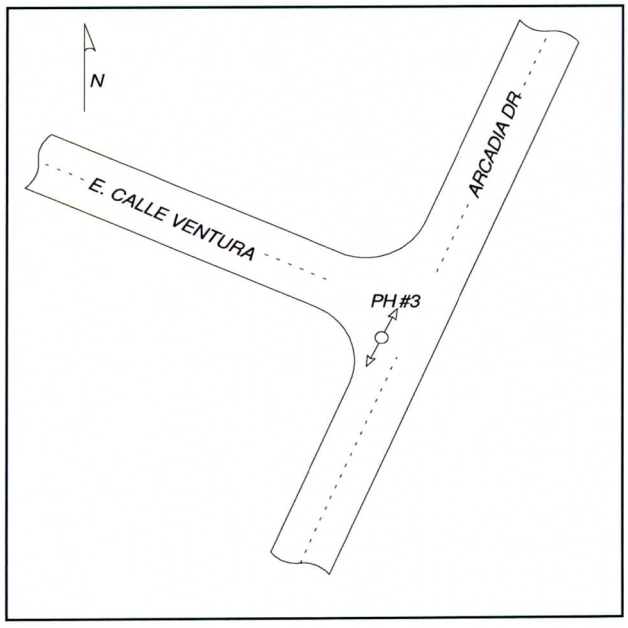
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole

Comments



AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date			**COP Hole #**	4	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	4	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	A. Pablo-Bello	
Hole Cost			**Truck #**	558	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/17/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/17/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost		EXPIRES 09/30/12	**SHPO Cost**		
Location	Arcadia Dr. and E. Calle Tuberia				

REGISTERED LAND SURVEYOR CERTIFICATE NO. 35316 CHAD HUBER Date Signed ..... ARIZONA, U.S.A.

Station / Offset / Dir	17+03.84	9.750	LT	**Requested**	**NAD83 Location**
Station / Offset / Dir	17+06.86	16.52	LT	**Surveyed**	**X - Location** 681900.65
Bench Mark Elevation	1256.4				**Y - Location** 908848.33
					Z - Location 1261.9

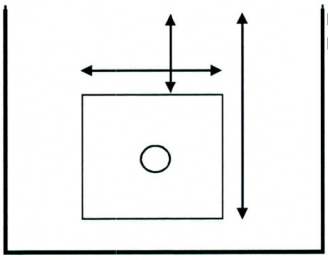
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4	(in)
Type Code	G	
Structure	P	
Material	STL	



Surface Elevation	1261.90	
Utility Elevation Top	1259.20	
Utility Elevation Bottom	1259.00	
Top	2.70	(feet)
Bottom	2.9	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
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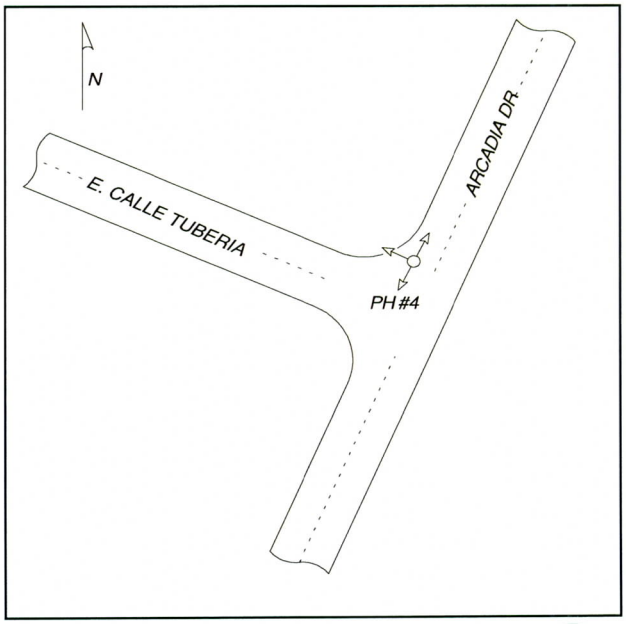
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

Moved hole to conform to bluestake.

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Contractor**	AZTEC
Invoice Date		**COP Hole #**	5
Project Name	Arcadia Drainage Impr	**Contractor Hole #**	5
Contract Number	119303	**Project #**	ST83110068
Contractor Job #	AZU0901-194	**Crew Name**	A. Pablo-Bello
Hole Cost		**Truck #**	558
Survey Cost		**Date Requested**	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		**Exploration/Dug Date**	6/11/2011 (format 8/28/2003)
SUE Exploration Hours		**Date Received**	6/17/2011 (format 8/28/2003)
Barricade Cost		**Survey Recorded**	6/15/2011 (format 8/28/2003)
Police Cost		**Utility Company**	SWG
Police Hours		**Traffic Cost**	
Rental Cost		**SHPO Cost**	
Location	Arcadia Dr. and Lafayette Blvd.		

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	19+89.09	5.160	RT	**Requested**
Station / Offset / Dir	19+86.03	10.25	RT	**Surveyed**
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	682029.8
Y - Location	909097.28
Z - Location	1265.44

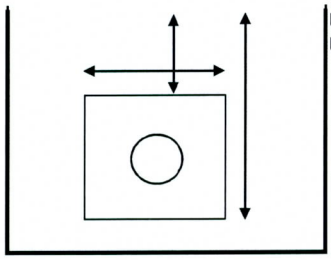
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.42 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	8.6	(in)
Type Code	G	
Structure	P	
Material	STL	



Surface Elevation	1265.44
Utility Elevation Top	1260.46
Utility Elevation Bottom	1259.74

Top	4.98	(feet)
Bottom	5.7	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
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SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
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D – Duct Bank
P – Pipe
V – Vault

Material Codes
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ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
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CMU - Conc. Mason Wall
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FC - Face of Curb
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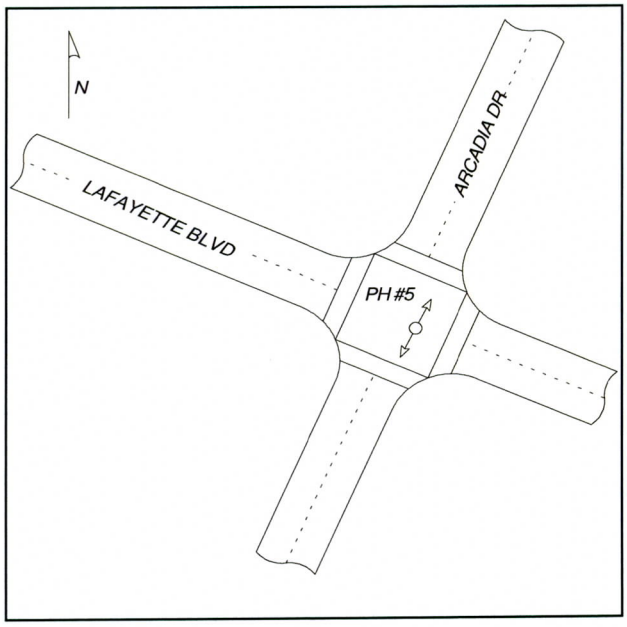
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

5" of concrete under 5" of asphalt.

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date			**COP Hole #**	7	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	7	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	J. Garcia	
Hole Cost			**Truck #**	557	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/11/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/15/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost			**SHPO Cost**		
Location	Arcadia Dr. and Lafayette Blvd.				

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	19+84.05	16.210	LT	**Requested**	**NAD83 Location**
Station / Offset / Dir	19+84.95	15.64	LT	**Surveyed**	**X - Location** 682005.38
Bench Mark Elevation	1256.4				**Y - Location** 909105.95
					Z - Location 1265.39

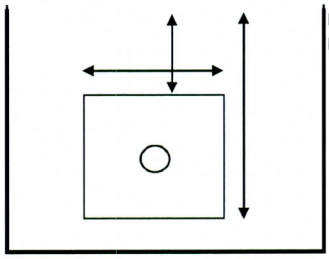
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.50 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4	(in)
Type Code	G	
Structure	P	
Material	STL	



Surface Elevation	1265.39
Utility Elevation Top	1261.50
Utility Elevation Bottom	1261.30

Top	3.89	(feet)
Bottom	4.1	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
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P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
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CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
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RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
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CSP - Corrugated Steel Pipe
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Permanent Fixture Codes
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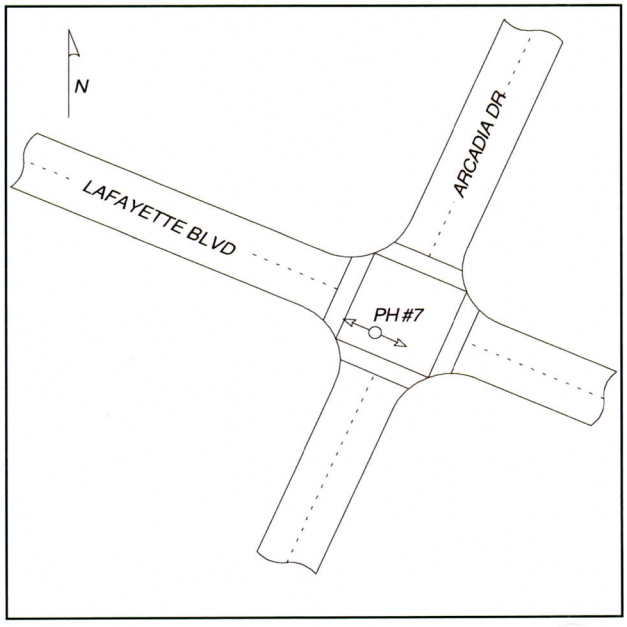
P/P Power Pole



Comments

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number	
Invoice Date	
Project Name	Arcadia Drainage Impr
Contract Number	119303
Contractor Job #	AZU0901-194
Hole Cost	
Survey Cost	
SUE Exploration Cost	
SUE Exploration Hours	
Barricade Cost	
Police Cost	
Police Hours	
Rental Cost	
Location	Arcadia Dr. and Lafayette Blvd.

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/12

Contractor	AZTEC
COP Hole #	9
Contractor Hole #	9
Project #	ST83110068
Crew Name	J. Garcia
Truck #	557
Date Requested	6/8/2011 (format 8/28/2003)
Exploration/Dug Date	6/17/2011 (format 8/28/2003)
Date Received	6/17/2011 (format 8/28/2003)
Survey Recorded	6/17/2011 (format 8/28/2003)
Utility Company	SWG
Traffic Cost	
SHPO Cost	

Station / Offset / Dir	19+97.48	28.260	LT	Requested
Station / Offset / Dir	19+97.07	32.52	LT	Surveyed
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	681994.25
Y - Location	909123.5
Z - Location	1265.54

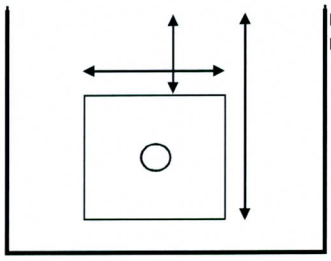
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4 (in)
Type Code	G
Structure	P
Material	STL



Surface Elevation	1265.54
Utility Elevation Top	1262.74
Utility Elevation Bottom	1262.54

Top	2.80 (feet)
Bottom	3.0 (feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
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G - Gas/Petrol/Lp
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GSP - Galvanized Steel
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PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
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STLW – Steel Wrapped
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BM - Bench Mark
CL - Center Line
CL - Construction Line
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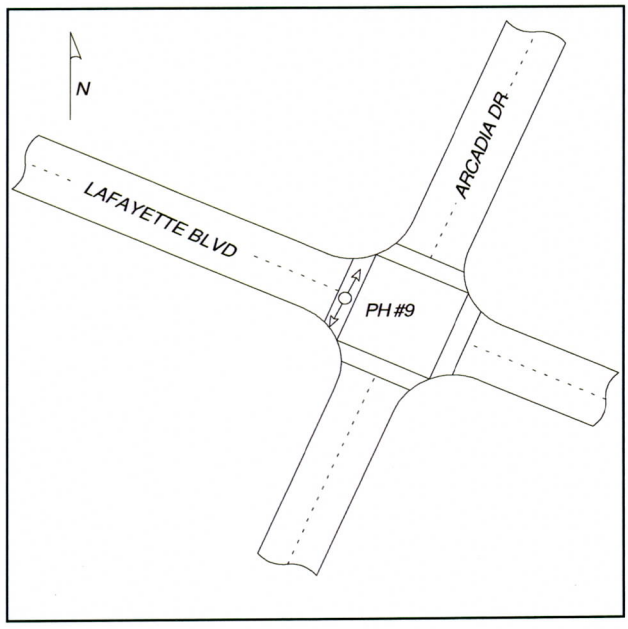
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole

Comments



AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Contractor**	AZTEC
Invoice Date		**COP Hole #**	11
Project Name	Arcadia Drainage Impr	**Contractor Hole #**	11
Contract Number	119303	**Project #**	ST83110068
Contractor Job #	AZU0901-194	**Crew Name**	A. Pablo-Bello
Hole Cost		**Truck #**	558
Survey Cost		**Date Requested**	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		**Exploration/Dug Date**	6/11/2011 (format 8/28/2003)
SUE Exploration Hours		**Date Received**	6/17/2011 (format 8/28/2003)
Barricade Cost		**Survey Recorded**	6/15/2011 (format 8/28/2003)
Police Cost		**Utility Company**	SWG
Police Hours		**Traffic Cost**	
Rental Cost		**SHPO Cost**	
Location	Arcadia Dr. and Lafayette Blvd.		

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	20+29.60	8.990	LT	**Requested**	**NAD83 Location**
Station / Offset / Dir	20+31.33	8.91	LT	**Surveyed**	**X - Location** 682028.95
Bench Mark Elevation	1256.4				**Y - Location** 909146.45
					Z - Location 1265.94

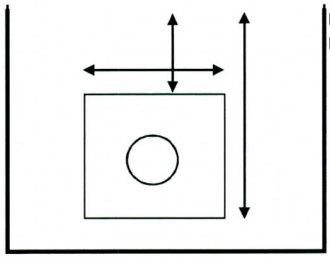
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	8.6 (in)
Type Code	G
Structure	P
Material	STL



Surface Elevation	1265.94
Utility Elevation Top	1261.50
Utility Elevation Bottom	1260.78

Top	4.44	(feet)
Bottom	5.2	(feet)

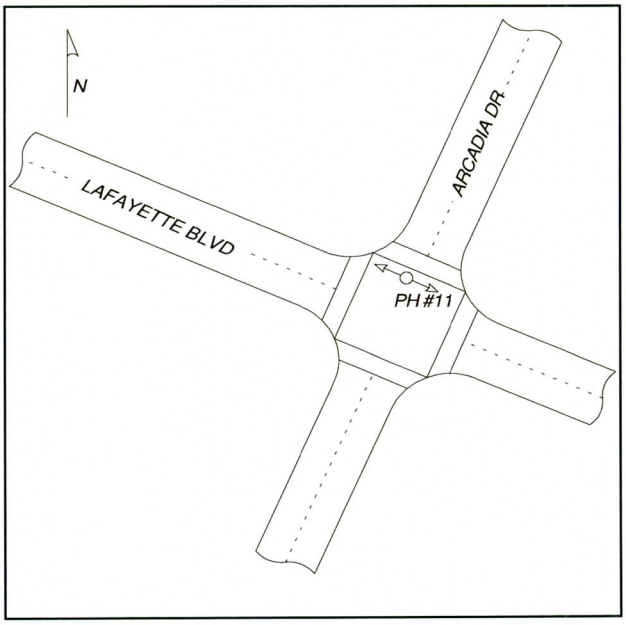
Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

4" of concrete under 4" of asphalt.

AZTEC

www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date		REGISTERED LAND SURVEYOR CERTIFICATE NO. 35316 CHAD HUBER Date Signed ..... ARIZONA, U.S.A.	**COP Hole #**	15	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	15	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	J. Garcia	
Hole Cost			**Truck #**	558	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/14/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/15/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost		EXPIRES 09/30/12	**SHPO Cost**		
Location	Lafayette Blvd. northwest of Arcadia Dr.				

Station / Offset / Dir	97+08.04	24.920	LT	**Requested**	**NAD83 Location**
Station / Offset / Dir	97+06.12	27.05	LT	**Surveyed**	**X - Location** 681812.22
Bench Mark Elevation	1256.4				**Y - Location** 909332.7
					Z - Location 1266.36

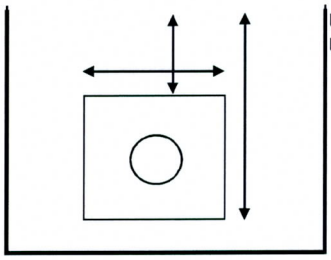
Profile View / not to scale

Pavement & Soil Information

Upper	OR	(feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	8.6	(in)
Type Code	G	
Structure	P	
Material	STL	



Surface Elevation	1266.36	
Utility Elevation Top	1261.44	
Utility Elevation Bottom	1260.72	
Top	4.92	(feet)
Bottom	5.6	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

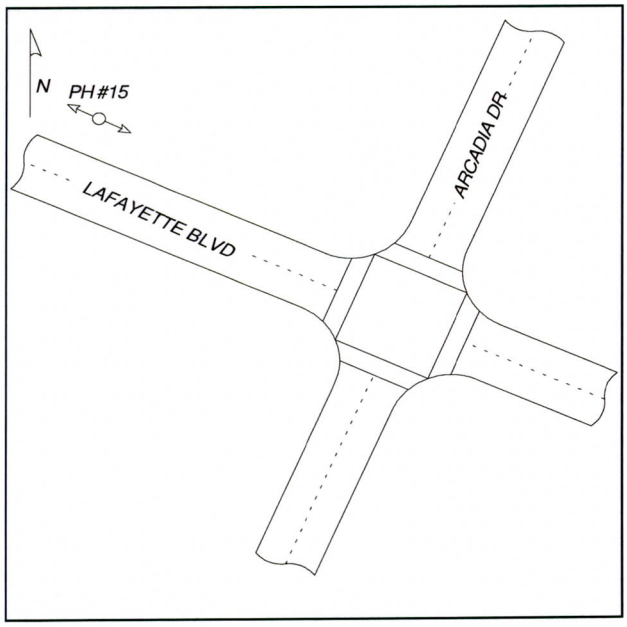
Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole

Comments



AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date		REGISTERED LAND SURVEYOR CERTIFICATE NO. 35316 CHAD HUBER Date Signed ..... ARIZONA, U.S.A.	**COP Hole #**	16	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	16	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	J. Garcia	
Hole Cost			**Truck #**	557	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/10/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/15/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost		EXPIRES 09/30/12	**SHPO Cost**		
Location	47th Pl. and Lafayette Blvd.				

Station / Offset / Dir	91+96.44	19.930	RT	**Requested**	**NAD83 Location**
Station / Offset / Dir	91+94.15	19.87	RT	**Surveyed**	**X - Location** 681393.3
Bench Mark Elevation	1256.4				**Y - Location** 909630.74
					Z - Location 1265.61

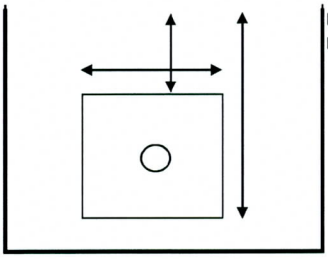
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4	(in)
Type Code	G	
Structure	P	
Material	STL	



Surface Elevation	1265.61	
Utility Elevation Top	1262.87	
Utility Elevation Bottom	1262.67	
Top	2.74	(feet)
Bottom	2.9	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
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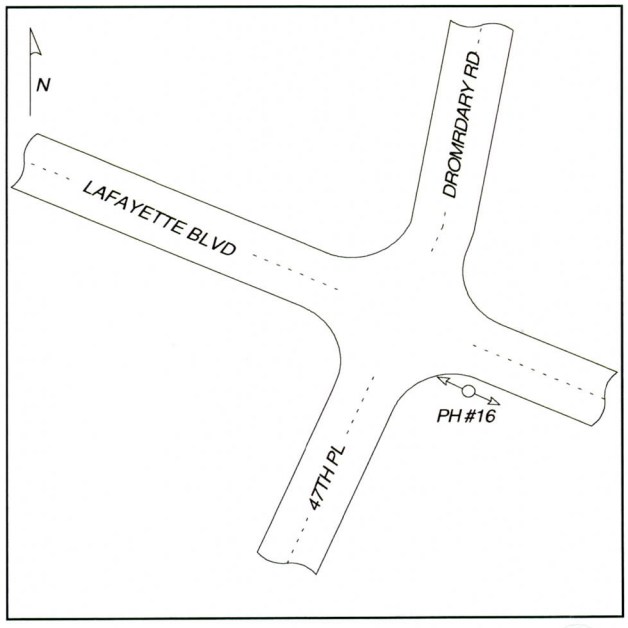
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Contractor**	AZTEC
Invoice Date		**COP Hole #**	19
Project Name	Arcadia Drainage Impr	**Contractor Hole #**	19
Contract Number	119303	**Project #**	ST83110068
Contractor Job #	AZU0901-194	**Crew Name**	A. Pablo-Bello
Hole Cost		**Truck #**	558
Survey Cost		**Date Requested**	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		**Exploration/Dug Date**	6/10/2011 (format 8/28/2003)
SUE Exploration Hours		**Date Received**	6/17/2011 (format 8/28/2003)
Barricade Cost		**Survey Recorded**	6/15/2011 (format 8/28/2003)
Police Cost		**Utility Company**	SWG
Police Hours		**Traffic Cost**	
Rental Cost		**SHPO Cost**	
Location	Dromedary Rd. and Lafayette Blvd.		

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	91+33.07	25.380	LT	**Requested**	**NAD83 Location**
Station / Offset / Dir	91+29.73	26.33	LT	**Surveyed**	**X - Location** 681374.55
Bench Mark Elevation	1256.4				**Y - Location** 909707.76
					Z - Location 1265.66

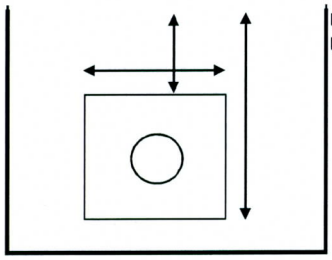
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.50 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	8.6 (in)
Type Code	G
Structure	P
Material	STL



Surface Elevation	1265.66
Utility Elevation Top	1261.12
Utility Elevation Bottom	1260.40

Top	4.54	(feet)
Bottom	5.3	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

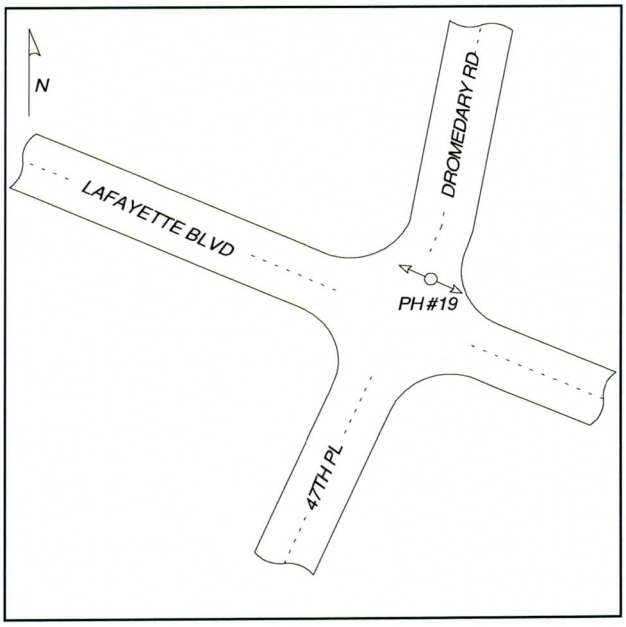
Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole

Comments



AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**		**Contractor**	AZTEC	
Invoice Date				**COP Hole #**	22	
Project Name	Arcadia Drainage Impr			**Contractor Hole #**	22	
Contract Number	119303			**Project #**	ST83110068	
Contractor Job #	AZU0901-194			**Crew Name**	J. Garcia	
Hole Cost				**Truck #**	557	
Survey Cost				**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost				**Exploration/Dug Date**	6/10/2011	(format 8/28/2003)
SUE Exploration Hours				**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost				**Survey Recorded**	6/15/2011	(format 8/28/2003)
Police Cost				**Utility Company**	SWG	
Police Hours				**Traffic Cost**		
Rental Cost		EXPIRES 09/30/12		**SHPO Cost**		
Location	Lafayette Blvd. east of 47th St.					

REGISTERED LAND SURVEYOR CERTIFICATE NO. 35316 CHAD HUBER Date Signed ..... ARIZONA, U.S.A.

Station / Offset / Dir	87+81.32	18.820	RT	**Requested**	
Station / Offset / Dir	87+80.45	19.09	RT	**Surveyed**	
Bench Mark Elevation	1256.4				

NAD83 Location

X - Location	681080.02
Y - Location	909900.92
Z - Location	1264.87

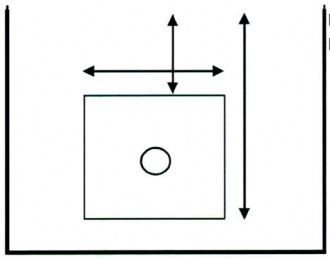
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4 (in)
Type Code	G
Structure	P
Material	STL



Surface Elevation	1264.87
Utility Elevation Top	1261.39
Utility Elevation Bottom	1261.19

Top	3.48	(feet)
Bottom	3.7	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
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D – Duct Bank
P – Pipe
V – Vault

Material Codes
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ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
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CLF - Chain Link Fence
CMU - Conc. Mason Wall
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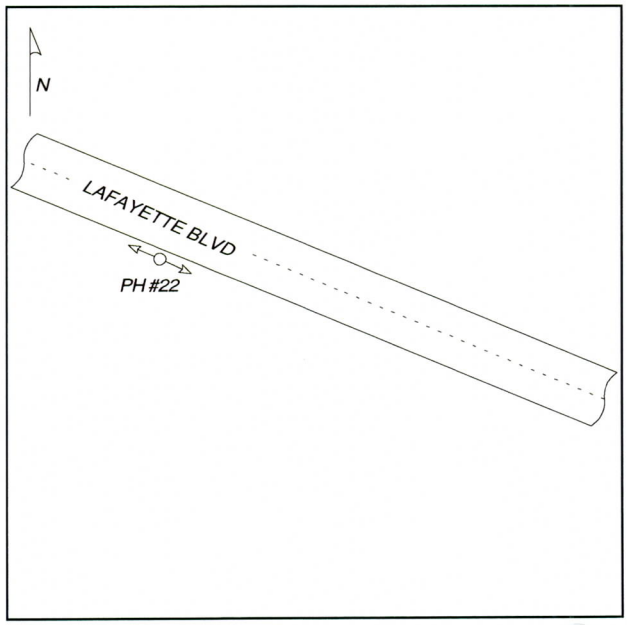
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date			**COP Hole #**	24	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	24	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	A. Pablo-Bello	
Hole Cost			**Truck #**	558	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/10/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/15/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost			**SHPO Cost**		
Location	Lafayette Blvd. west of 47th St.				

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	86+25.26	12.310	RT	**Requested**	**NAD83 Location**
Station / Offset / Dir	86+21.97	12.03	RT	**Surveyed**	**X - Location** 680964.41
Bench Mark Elevation	1256.4				**Y - Location** 910009.54
					Z - Location 1265.17

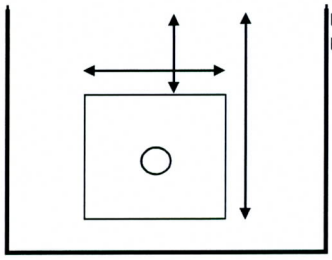
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.42 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4 (in)
Type Code	G
Structure	P
Material	STL



Surface Elevation	1265.17
Utility Elevation Top	1262.13
Utility Elevation Bottom	1261.93

Top	3.04	(feet)
Bottom	3.2	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
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Structure Codes
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CIP - Cast Iron Pipe
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GSP - Galvanized Steel
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PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
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STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
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VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
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Permanent Fixture Codes
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FC - Face of Curb
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MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
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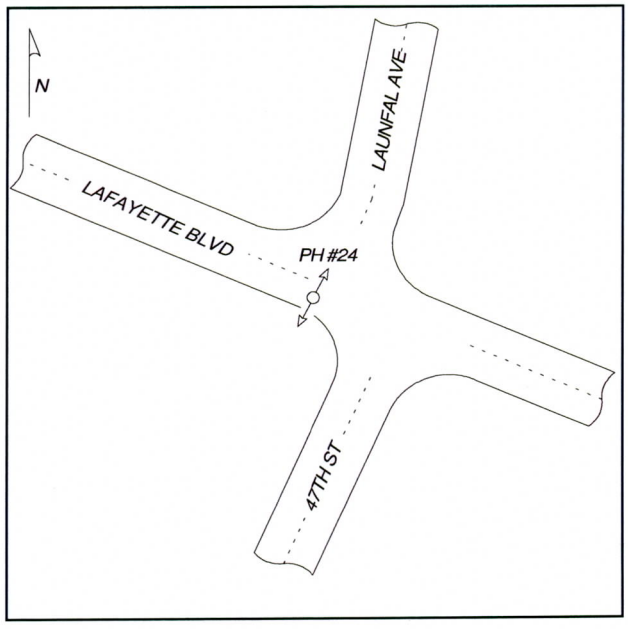
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date			**COP Hole #**	26	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	26	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	J. Garcia	
Hole Cost			**Truck #**	557	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/10/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/15/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost		EXPIRES 09/30/12	**SHPO Cost**		
Location	47th St. and Lafayette Blvd.				

REGISTERED LAND SURVEYOR CERTIFICATE NO. 35316 CHAD HUBER Date Signed ..... ARIZONA, U.S.A.

Station / Offset / Dir	85+88.38	25.690	LT	**Requested**	**NAD83 Location**
Station / Offset / Dir	85+90.14	26.52	LT	**Surveyed**	**X - Location** 680965.39
Bench Mark Elevation	1256.4				**Y - Location** 910059.53
					Z - Location 1265.45

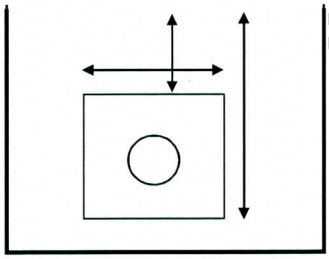
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	8.6	(in)
Type Code	G	
Structure	P	
Material	STL	



Surface Elevation	1265.45
Utility Elevation Top	1261.03
Utility Elevation Bottom	1260.31

Top	4.42	(feet)
Bottom	5.1	(feet)

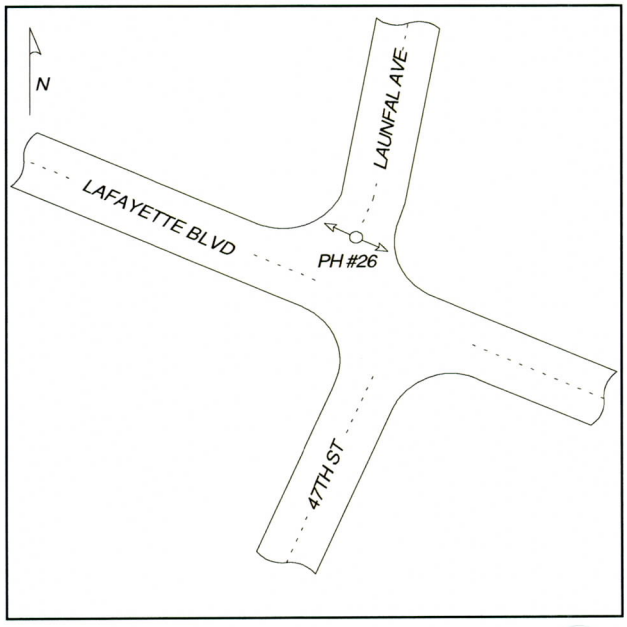
Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Contractor**	AZTEC
Invoice Date		**COP Hole #**	28
Project Name	Arcadia Drainage Impr	**Contractor Hole #**	28
Contract Number	119303	**Project #**	ST83110068
Contractor Job #	AZU0901-194	**Crew Name**	A. Pablo-Bello
Hole Cost		**Truck #**	558
Survey Cost		**Date Requested**	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		**Exploration/Dug Date**	6/11/2011 (format 8/28/2003)
SUE Exploration Hours		**Date Received**	6/17/2011 (format 8/28/2003)
Barricade Cost		**Survey Recorded**	6/15/2011 (format 8/28/2003)
Police Cost		**Utility Company**	SWG
Police Hours		**Traffic Cost**	
Rental Cost		**SHPO Cost**	
Location	46th Pl. and Lafayette Blvd.		

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/12

Station / Offset / Dir	82+65.13	21.410	RT	**Requested**
Station / Offset / Dir	82+67.68	20.01	RT	**Surveyed**
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	680690.47
Y - Location	910234.37
Z - Location	1264.66

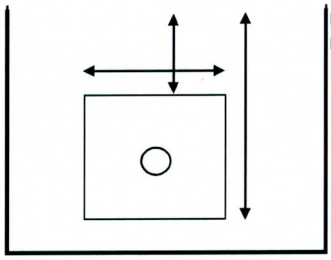
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.42 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4 (in)
Type Code	G
Structure	P
Material	STL



Surface Elevation	1264.66
Utility Elevation Top	1261.56
Utility Elevation Bottom	1261.36

Top	3.10 (feet)
Bottom	3.3 (feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

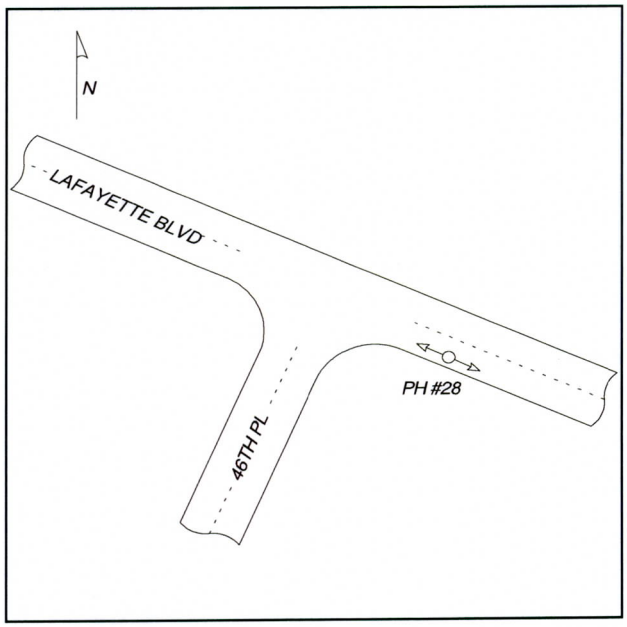
Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole

Comments



AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date			**COP Hole #**	30	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	30	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	A. Pablo-Bello	
Hole Cost			**Truck #**	558	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/10/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/15/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost			**SHPO Cost**		
Location	46th St. and Lafayette Blvd.				

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	76+87.21	15.620	RT	**Requested**	**NAD83 Location**
Station / Offset / Dir	76+84.26	16.24	RT	**Surveyed**	**X - Location** 680250.4
Bench Mark Elevation	1256.4				**Y - Location** 910617.41
					Z - Location 1264.41

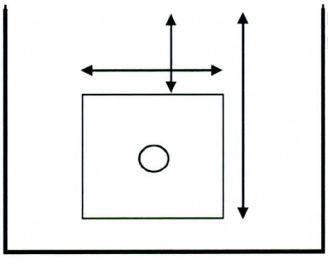
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.42 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4 (in)
Type Code	G
Structure	P
Material	STLC



Surface Elevation	1264.41
Utility Elevation Top	1260.17
Utility Elevation Bottom	1259.97

Top	4.24	(feet)
Bottom	4.4	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

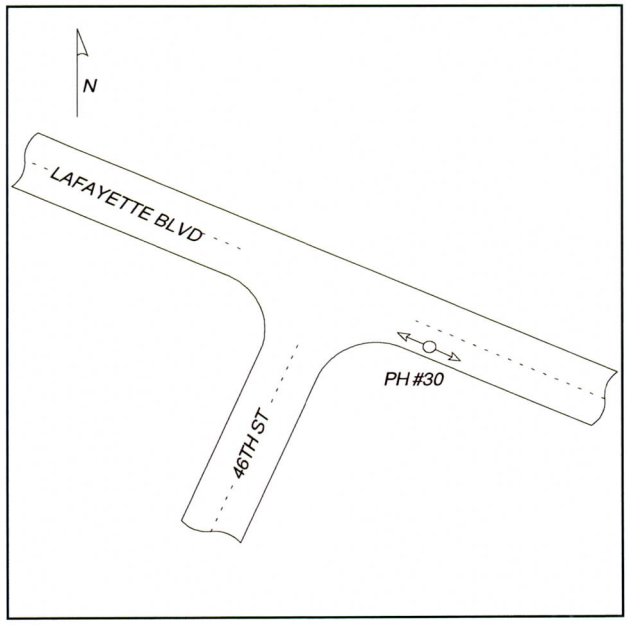
Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole

Comments



AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Contractor**	AZTEC
Invoice Date		**COP Hole #**	33
Project Name	Arcadia Drainage Impr	**Contractor Hole #**	33
Contract Number	119303	**Project #**	ST83110068
Contractor Job #	AZU0901-194	**Crew Name**	A. Pablo-Bello
Hole Cost		**Truck #**	558
Survey Cost		**Date Requested**	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		**Exploration/Dug Date**	6/10/2011 (format 8/28/2003)
SUE Exploration Hours		**Date Received**	6/17/2011 (format 8/28/2003)
Barricade Cost		**Survey Recorded**	6/15/2011 (format 8/28/2003)
Police Cost		**Utility Company**	SWG
Police Hours		**Traffic Cost**	
Rental Cost		**SHPO Cost**	
Location	46th St. and Lafayette Blvd.		

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/12

Station / Offset / Dir	72+26.04	16.170	RT	**Requested**
Station / Offset / Dir	72+23.86	16.76	RT	**Surveyed**
Bench Mark Elevation	1256.4			

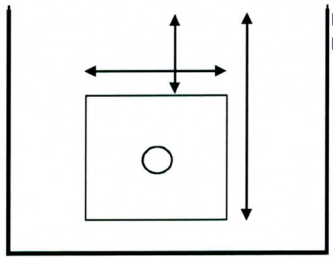
NAD83 Location

X - Location	679969.46
Y - Location	910986.39
Z - Location	1264.47

Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.50 (feet)
Soil Code	GP	



Surface Elevation	1264.47
Utility Elevation Top	1259.67
Utility Elevation Bottom	1259.47

Visual Utility Identification Information

Size/Width	2.4	(in)
Type Code	G	
Structure	P	
Material	STL	

Top	4.80 (feet)
Bottom	5.0 (feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
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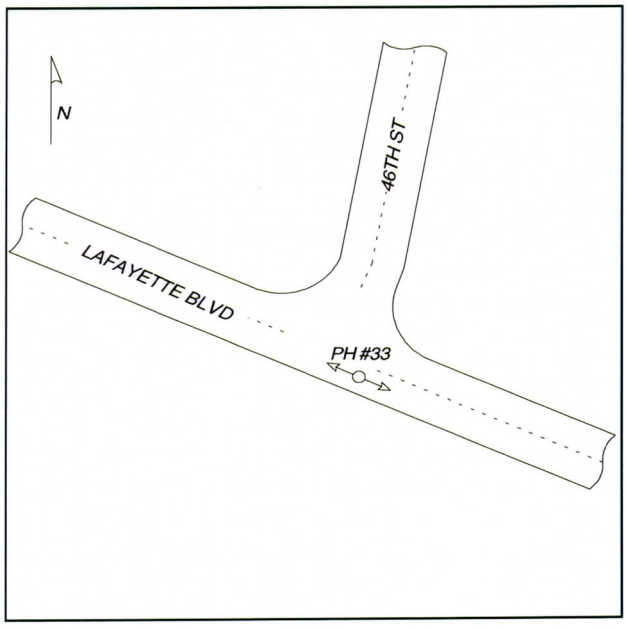
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Contractor**	AZTEC
Invoice Date		**COP Hole #**	36
Project Name	Arcadia Drainage Impr	**Contractor Hole #**	36
Contract Number	119303	**Project #**	ST83110068
Contractor Job #	AZU0901-194	**Crew Name**	A. Pablo-Bello
Hole Cost		**Truck #**	558
Survey Cost		**Date Requested**	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		**Exploration/Dug Date**	6/10/2011 (format 8/28/2003)
SUE Exploration Hours		**Date Received**	6/17/2011 (format 8/28/2003)
Barricade Cost		**Survey Recorded**	6/15/2011 (format 8/28/2003)
Police Cost		**Utility Company**	SWG
Police Hours		**Traffic Cost**	
Rental Cost		**SHPO Cost**	
Location	46th St. and Lafayette Blvd.		

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/12

Station / Offset / Dir	71+90.25	27.050	LT	**Requested**
Station / Offset / Dir	71+89.68	26.87	LT	**Surveyed**
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	679983.72
Y - Location	911039.95
Z - Location	1263.69

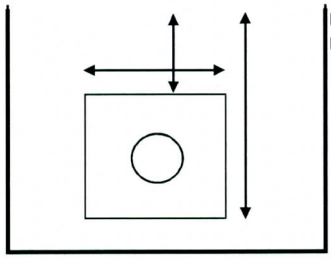
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.42 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	8.6 (in)
Type Code	G
Structure	P
Material	STL



Surface Elevation	1263.69
Utility Elevation Top	1260.21
Utility Elevation Bottom	1259.49

Top	3.48 (feet)
Bottom	4.2 (feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
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E/P - Edge of Pavement
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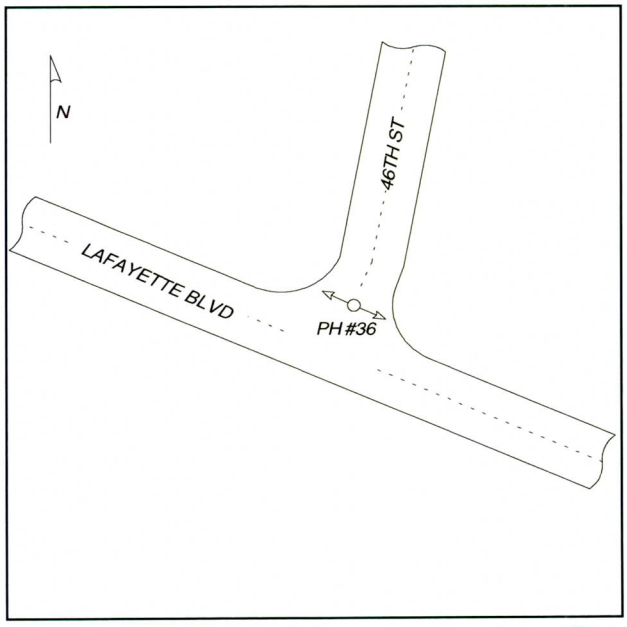
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole

Comments



AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date			**COP Hole #**	38	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	38	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	A. Pablo-Bello	
Hole Cost			**Truck #**	558	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/17/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/17/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost		EXPIRES 09/30/12	**SHPO Cost**		
Location	45th St. and Lafayette Blvd.				

REGISTERED LAND SURVEYOR CERTIFICATE NO. 35316 CHAD HUBER Date Signed ARIZONA, U.S.A.

Station / Offset / Dir	65+53.26	10.000	RT	**Requested**	**NAD83 Location**
Station / Offset / Dir	65+52.23	9.62	RT	**Surveyed**	**X - Location** 679570.76
Bench Mark Elevation	1256.4				**Y - Location** 911526.92
					Z - Location 1264.96

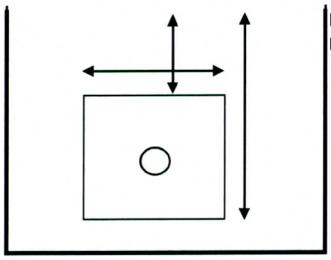
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33	(feet)
Soil Code	GP		

Visual Utility Identification Information

Size/Width	2.4	(in)
Type Code	G	
Structure	P	
Material	STL	



Surface Elevation	1264.96	
Utility Elevation Top	1261.82	
Utility Elevation Bottom	1261.62	
Top	3.14	(feet)
Bottom	3.3	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
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Structure Codes
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CAP - Corrugated Alum
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GIP - Galvanized Iron
GSP - Galvanized Steel
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PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
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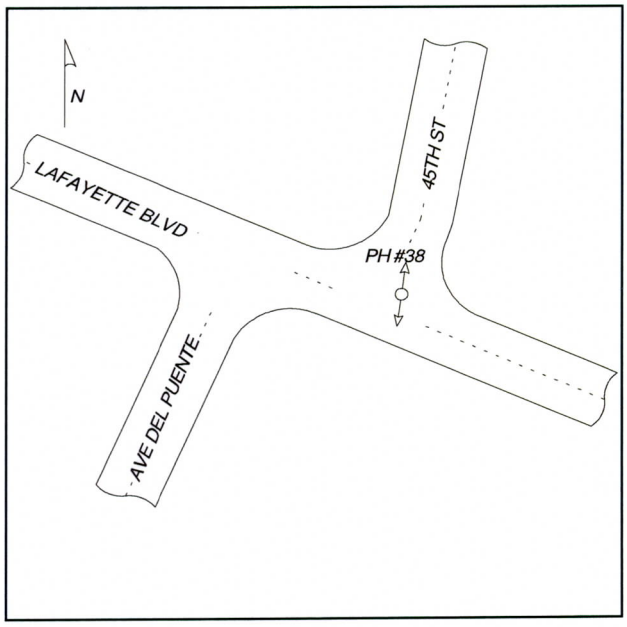
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole

Comments



AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number	
Invoice Date	
Project Name	Arcadia Drainage Impr
Contract Number	119303
Contractor Job #	AZU0901-194
Hole Cost	
Survey Cost	
SUE Exploration Cost	
SUE Exploration Hours	
Barricade Cost	
Police Cost	
Police Hours	
Rental Cost	
Location	45th St. and Lafayette Blvd.

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Contractor	AZTEC
COP Hole #	40
Contractor Hole #	40
Project #	ST83110068
Crew Name	J. Garcia
Truck #	557
Date Requested	6/8/2011 (format 8/28/2003)
Exploration/Dug Date	6/10/2011 (format 8/28/2003)
Date Received	6/17/2011 (format 8/28/2003)
Survey Recorded	6/15/2011 (format 8/28/2003)
Utility Company	SWG
Traffic Cost	
SHPO Cost	

Station / Offset / Dir	65+65.32	27.580	LT	Requested
Station / Offset / Dir	65+67.68	27.5	LT	Surveyed
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	679609.7
Y - Location	911536.94
Z - Location	1264.54

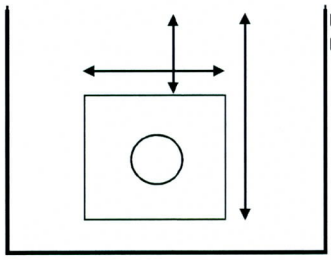
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	8.6	(in)
Type Code	G	
Structure	P	
Material	STL	



Surface Elevation	1264.54
Utility Elevation Top	1259.68
Utility Elevation Bottom	1258.96

Top	4.86	(feet)
Bottom	5.6	(feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

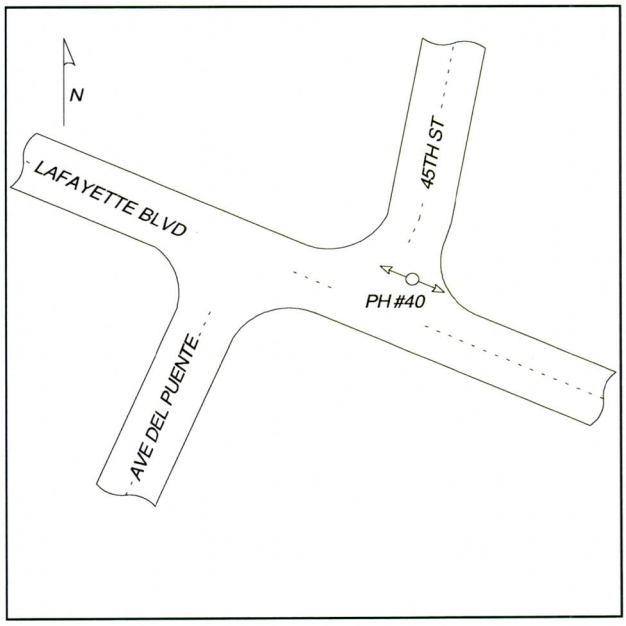
Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole

Comments



AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		Contractor	AZTEC
Invoice Date		COP Hole #	43
Project Name	Arcadia Drainage Impr	Contractor Hole #	43
Contract Number	119303	Project #	ST83110068
Contractor Job #	AZU0901-194	Crew Name	J. Garcia
Hole Cost		Truck #	557
Survey Cost		Date Requested	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		Exploration/Dug Date	6/11/2011 (format 8/28/2003)
SUE Exploration Hours		Date Received	6/17/2011 (format 8/28/2003)
Barricade Cost		Survey Recorded	6/15/2011 (format 8/28/2003)
Police Cost		Utility Company	SWG
Police Hours		Traffic Cost	
Rental Cost		SHPO Cost	
Location	E. Calle Feliz and Lafayette Blvd.		

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	59+43.27	27.380	LT	Requested
Station / Offset / Dir	59+44.56	27.1	LT	Surveyed
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	679234.2
Y - Location	912034.2
Z - Location	1264.16

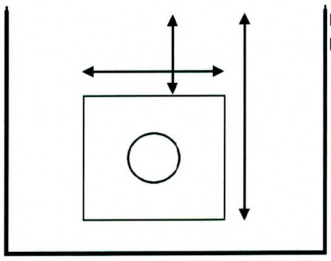
Profile View / not to scale

Pavement & Soil Information

Upper	OR	(feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	8.6	(in)
Type Code	G	
Structure	P	
Material	STL	



Surface Elevation	1264.16
Utility Elevation Top	1259.84
Utility Elevation Bottom	1259.12

Top	4.32	(feet)
Bottom	5.0	(feet)

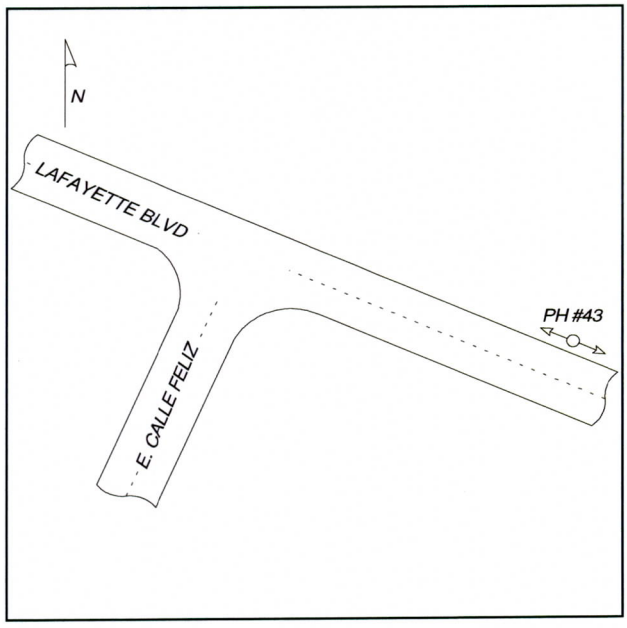
Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date			**COP Hole #**	44	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	44	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	A. Pablo-Bello	
Hole Cost			**Truck #**	558	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/10/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/15/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost			**SHPO Cost**		
Location	Lafayette Blvd. east of 44th St.				

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	55+01.97	15.470	RT	**Requested**	
Station / Offset / Dir	55+01.72	17.72	RT	**Surveyed**	
Bench Mark Elevation	1256.4				

NAD83 Location

X - Location	678931.76
Y - Location	912360.78
Z - Location	1263.64

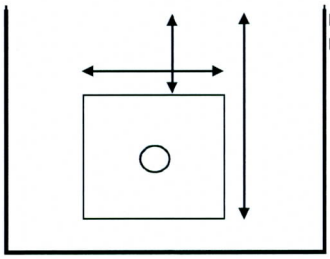
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4	(in)
Type Code	G	
Structure	P	
Material	STL	



Surface Elevation	1263.64
Utility Elevation Top	1260.66
Utility Elevation Bottom	1260.46

Top	2.98	(feet)
Bottom	3.2	(feet)

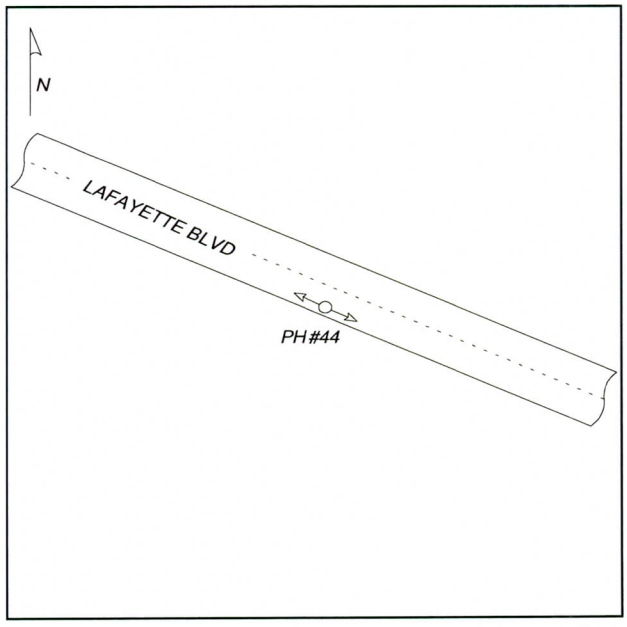
Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number	
Invoice Date	
Project Name	Arcadia Drainage Impr
Contract Number	119303
Contractor Job #	AZU0901-194
Hole Cost	
Survey Cost	
SUE Exploration Cost	
SUE Exploration Hours	
Barricade Cost	
Police Cost	
Police Hours	
Rental Cost	
Location	Lafayette Blvd. east of 44th St.

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/12

Contractor	AZTEC
COP Hole #	46
Contractor Hole #	46
Project #	ST83110068
Crew Name	J. Garcia
Truck #	557
Date Requested	6/8/2011 (format 8/28/2003)
Exploration/Dug Date	6/10/2011 (format 8/28/2003)
Date Received	6/17/2011 (format 8/28/2003)
Survey Recorded	6/15/2011 (format 8/28/2003)
Utility Company	SWG
Traffic Cost	
SHPO Cost	

Station / Offset / Dir	55+06.63	27.440	LT	Requested
Station / Offset / Dir	55+05.84	26.64	LT	Surveyed
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	678969.66
Y - Location	912384.2
Z - Location	1264.13

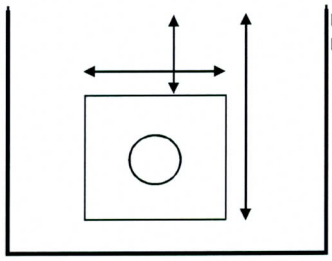
Profile View / not to scale

Pavement & Soil Information

Upper	OR	(feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	8.6 (in)
Type Code	G
Structure	P
Material	STL



Surface Elevation	1264.13
Utility Elevation Top	1259.53
Utility Elevation Bottom	1258.81

Top	4.60	(feet)
Bottom	5.3	(feet)

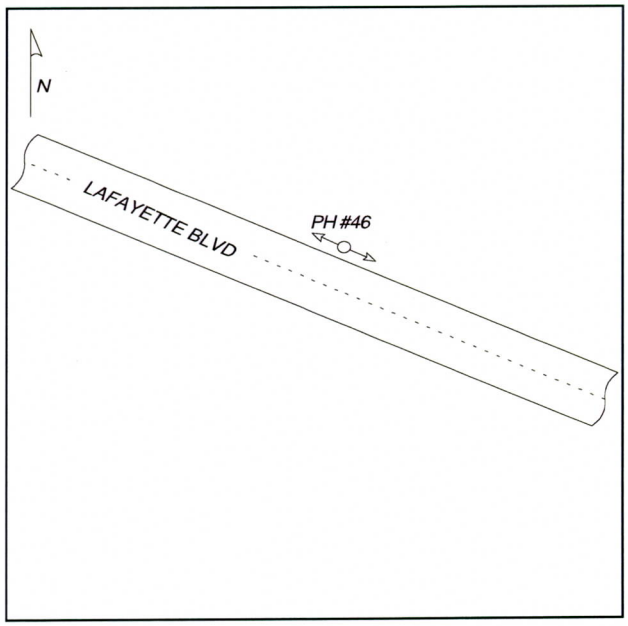
Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Contractor**	AZTEC
Invoice Date		**COP Hole #**	47
Project Name	Arcadia Drainage Impr	**Contractor Hole #**	47
Contract Number	119303	**Project #**	ST83110068
Contractor Job #	AZU0901-194	**Crew Name**	J. Garcia
Hole Cost		**Truck #**	558
Survey Cost		**Date Requested**	6/8/2011 (format 8/28/2003)
SUE Exploration Cost		**Exploration/Dug Date**	6/14/2011 (format 8/28/2003)
SUE Exploration Hours		**Date Received**	6/17/2011 (format 8/28/2003)
Barricade Cost		**Survey Recorded**	6/15/2011 (format 8/28/2003)
Police Cost		**Utility Company**	SWG
Police Hours		**Traffic Cost**	
Rental Cost		**SHPO Cost**	

Certification

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/12

Location Camelback Rd. and Village Dr.

Station / Offset / Dir	506+09.72	4.850	RT	**Requested**
Station / Offset / Dir	506+07.92	4.78	RT	**Surveyed**
Bench Mark Elevation	1256.4			

NAD83 Location

X - Location	679187.81
Y - Location	912869.48
Z - Location	1271.82

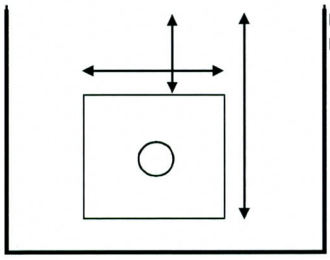
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.83 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	4.5 (in)
Type Code	G
Structure	P
Material	STL



Surface Elevation	1271.82
Utility Elevation Top	1267.42
Utility Elevation Bottom	1267.04

Top	4.40	(feet)
Bottom	4.8	(feet)

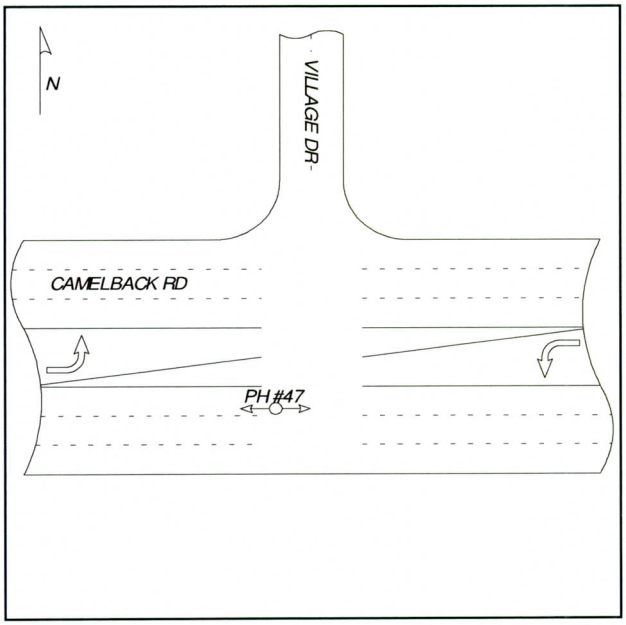
Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date			**COP Hole #**	48	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	48	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	J. Garcia	
Hole Cost			**Truck #**	558	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/14/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/15/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost			**SHPO Cost**		
Location	Camelback Rd. and Village Dr.				

REGISTERED LAND SURVEYOR CERTIFICATE NO. 35316 CHAD HUBER Date Signed ..... ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	506+18.64	13.780	RT	**Requested**	
Station / Offset / Dir	506+17.59	12.4	RT	**Surveyed**	
Bench Mark Elevation	1256.4				

NAD83 Location

X - Location	679195.61
Y - Location	912879.01
Z - Location	1272.12

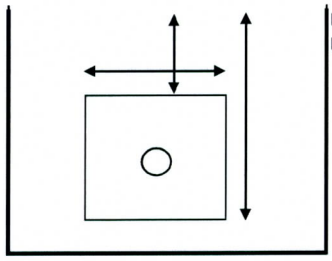
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.83 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	2.4 (in)
Type Code	G
Structure	P
Material	PE



Surface Elevation	1272.12
Utility Elevation Top	1268.60
Utility Elevation Bottom	1268.40

Top	3.52 (feet)
Bottom	3.7 (feet)

Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
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CIPP - Cast Iron Pipe
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GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

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CMU - Conc. Mason Wall
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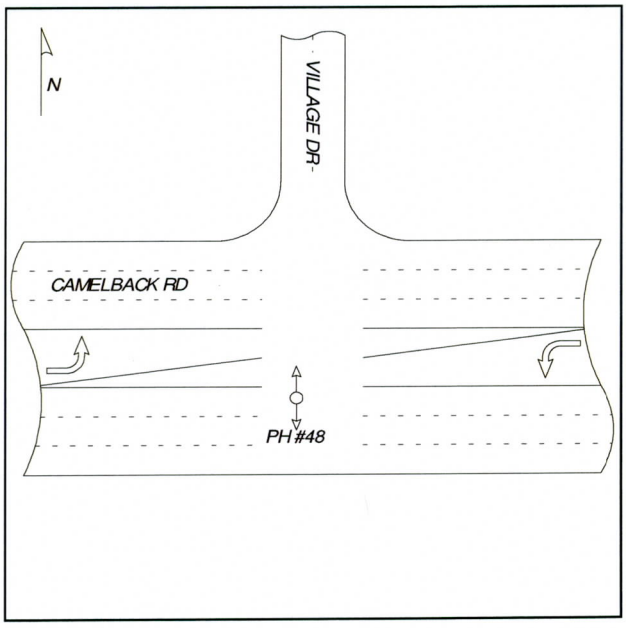
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole

Comments



AZTEC
www.aztec.us TYPSA group

4561 East McDowell Road Phoenix, AZ 85008

Invoice Number		**Certification**	**Contractor**	AZTEC	
Invoice Date			**COP Hole #**	52	
Project Name	Arcadia Drainage Impr		**Contractor Hole #**	52	
Contract Number	119303		**Project #**	ST83110068	
Contractor Job #	AZU0901-194		**Crew Name**	J. Garcia	
Hole Cost			**Truck #**	558	
Survey Cost			**Date Requested**	6/8/2011	(format 8/28/2003)
SUE Exploration Cost			**Exploration/Dug Date**	6/14/2011	(format 8/28/2003)
SUE Exploration Hours			**Date Received**	6/17/2011	(format 8/28/2003)
Barricade Cost			**Survey Recorded**	6/15/2011	(format 8/28/2003)
Police Cost			**Utility Company**	SWG	
Police Hours			**Traffic Cost**		
Rental Cost			**SHPO Cost**		
Location	Village Dr. north of Camelback Rd.				

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.
EXPIRES 09/30/12

Station / Offset / Dir	508+50.14	4.280	RT	**Requested**	**NAD83 Location**
Station / Offset / Dir	509+04.25	8.23	RT	**Surveyed**	**X - Location** 679196.76
Bench Mark Elevation	1256.4				**Y - Location** 913165.7
					Z - Location 1272.59

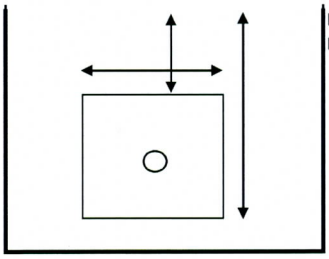
Profile View / not to scale

Pavement & Soil Information

Upper	AC	0.33 (feet)
Soil Code	GP	

Visual Utility Identification Information

Size/Width	1.3	(in)
Type Code	G	
Structure	P	
Material	PE	



Surface Elevation	1272.59
Utility Elevation Top	1270.15
Utility Elevation Bottom	1270.04

Top	2.44	(feet)
Bottom	2.6	(feet)

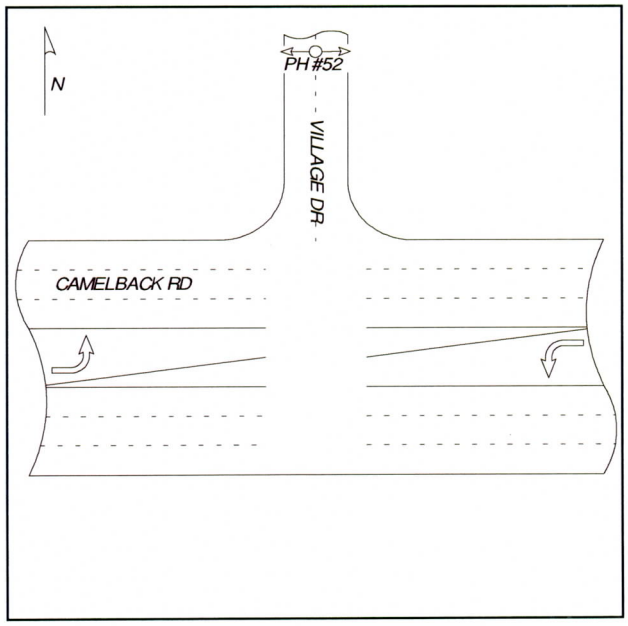
Pavement Codes
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road

Utility Type Codes
CATV - Cable TV
E - Electrical
FO - Fiber Optic
G - Gas/Petrol/Lp
IR - Irrigation
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water

Structure Codes
C – Cable
D – Duct Bank
P – Pipe
V – Vault

Material Codes
ABC - Plastic Pipe
ACP - Asbes Cement
CAP - Corrugated Alum
CIP - Cast Iron Pipe
CIPP - Cast Iron Pipe
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - Polyvinyl Chlor
RCP – Reinforced Conc.Pipe
SL – Slurry
STL - Steel
STLC – Steel Coated
STLW – Steel Wrapped
TR – Transite
VCP - Vitrified Clay Pipe
WD - Wood
CU - Cooper
CSP - Corrugated Steel Pipe
RC - Reinforced Conc.

Permanent Fixture Codes
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
FC - Face of Curb
FH - Fire Hydrant
MH - Man Hole
S/W - Side Walk
WM -Water Meter
WV - Water Valve
BCF - Brass Cap Flush
BCHH - Brass Cap Hand Hole
BM - Bench Mark
CL - Center Line
CL - Construction Line
ML - Monument Line
PL - Property Line
P/P Power Pole
PL - Property Line
P/P Power Pole



Comments

Moved hole to conform to bluestake.

Testhole Data Summary

AZTEC
www.aztec.us TYPSA group

Date: 11/14/2011

Project Number: AZE1101

Project Name: Lafayette Interceptor Drain

REGISTERED LAND SURVEYOR
CERTIFICATE NO
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/2012

TH #	Location	Date of Excavation	Utility Owner	Utility Size	Utility Description	Coordinates		Stationing		Ground Elevation	Top Elevation	Bottom Elevation	Depth of Cover	Comments
						Northing	Easting	Stationing	Offset					
201	Arcadia Dr and Calle Redonda	11/11/2011	City of Phoenix Water	8"	ACP	908315.20	681695.96	11+35.37	4.05' LT	1253.74	1249.20	1248.44	4.54	
202	Arcadia Dr and Calle Redonda	11/11/2011	Southwest Gas	2"	Steel	908339.81	681671.34	11+46.52	37.16' LT	1253.85	1250.55	1250.35	3.30	
203	Arcadia Dr and Calle Tuberia	11/9/2011	Century Link Communications	3/4"	PE	908787.74	681861.91	16+36.19	29.83' LT	1261.08	1258.66	1258.60	2.42	
204	Arcadia Dr and Lafayette Blvd	11/11/2011	City of Phoenix Water	8"	ACP	909069.59	682000.40	19+49.36	6.67' LT	1264.93	1260.63	1259.87	4.30	
205	Arcadia Dr and Lafayette Blvd	11/9/2011	Century Link Communications	Eight 3.5	Transite	909110.17	682073.13	20+14.19	45.63' RT	1264.88	1260.10	1258.58	4.78	
206	Arcadia Dr and Lafayette Blvd	11/8/2011	City of Phoenix Water	4"	ACP	909161.47	682061.41	20+57.39	15.59' RT	1265.62	1262.26	1261.86	3.36	
207	46th St and Calle Del Medio	11/7/2011	Century Link Communications	One 3/4" & One 1/2"	PE	911257.45	680087.18	402+73.78	14.15' RT	1268.25	1265.00	1264.89	3.25	
208	Arcadia Dr and Lafayette Blvd	11/8/2011	City of Phoenix Water	4"	ACP	909346.46	682134.51	22+56.29	14.28' RT	1268.72	1265.38	1264.98	3.34	
209	Lafayette Blvd west of Arcadia Dr	10/31/2011	City of Phoenix Water	8"	ACP	909314.02	681826.68	97+29.26	22.30' LT	1266.44	1262.34	1261.58	4.10	
210	Dromedary Rd and Lafayette Blvd	10/31/2011	City of Phoenix Storm Drain	12"	RCP	909686.31	681389.76	91+55.24	19.97' LT	1265.57	1264.83	1263.50	0.74	
211	Dromedary Rd and Lafayette Blvd	10/31/2011	City of Phoenix Water	None	None	None	None	None	None	1265.75	1265.75	1259.75	0.00	Dug to a depth of 6 ft in the requested location as well
212	Dromedary Rd and Lafayette Blvd	10/31/2011	City of Phoenix Water	6"	ACP	909767.02	681368.97	90+86.89	67.64' LT	1266.52	1262.24	1261.66	4.28	
213	47th St and Lafayette Blvd	10/31/2011	City of Phoenix Water	8"	ACP	909968.44	681064.36	87+24.57	21.93' LT	1265.76	1261.56	1260.80	4.20	
213A	47th St and Kafayette Blvd	10/31/2011	Century Link Communications	Six 3.5"	Transite	909964.57	681060.95	87+24.50	16.76' LT	1265.40	1261.32	1260.08	4.08	
214	47th St and Lafayette Blvd	11/6/2011	Salt River Project Electric	2"	PVC	909972.55	681030.09	86+95.9	2.72' LT	1265.36	1261.72	1261.52	3.64	
215	Launfal Ave and Lafayette Blvd	11/1/2011	City of Phoenix Water	6"	ACP	910124.95	680969.76	85+50.83	78.99' LT	1266.54	1262.86	1262.28	3.68	
216	Lafayette Blvd west of 46th Pl	11/1/2011	City of Phoenix Water	8"	ACP	910353.65	680539.07	80+75.11	28.19' RT	1264.71	1261.35	1264.71	3.36	
217	Lafayette Blvd west of 46th Pl	11/1/2011	Century Link Communications	Eight 3.5"	Transite	910415.88	680537.76	80+33.56	18.15' LT	1264.19	1260.49	1258.63	3.70	
218	Lafayette Blvd west of 46th Pl	11/1/2011	Southwest Gas	8"	Steel	910421.85	680542.12	80+32.98	25.53' LT	1264.78	1260.08	1259.36	4.70	
219	46th St and Lafayette Blvd	11/1/2011	Salt River Project Irrigation	24"	RCP	910664.11	680192.27	76+15.33	32.92' RT	1263.58	1262.52	1260.02	1.06	
220	46th St and Lafayette Blvd	11/11/2011	Salt River Project Electric	None	None	None	None	None	None	0.00	0.00	0.00	0.00	No facility in the requested location per SRP bluestake
221	46th St and Lafayette	11/1/2011	City of Phoenix Water	6"	ACP	910643.52	680158.44	76+11.39	72.33' RT	1263.23	1258.97	1257.39	4.26	
222	46th St and Lafayette Blvd	11/1/2011	Century Link Communications	Eight 3.5"	Transite	910703.25	680229.46	76+06.47	20.34' LT	1263.60	1260.20	1258.36	3.40	
222A	46th St and Lafayette Blvd	11/1/2011	Unknown	2"	Steel	910700.68	680226.29	76+06.61	16.26' LT	1263.55	1261.25	1261.07	2.30	
223	46th St and Lafayette Blvd	11/1/2011	Southwest Gas	8"	Steel	910707.34	680234.02	76+05.94	26.44' LT	1264.87	1259.11	1258.39	5.76	
224	46th St and Lafayette Blvd	11/1/2011	City of Phoenix Water	8"	ACP	910702.20	680170.00	75+71.51	27.77' RT	1263.94	1261.04	1260.28	2.90	
225	46th St and Lafayette Blvd	11/2/2011	City of Phoenix Storm Drain	12"	PVC	910994.75	680002.18	72+36.89	14.39' LT	1264.10	1262.88	1261.82	1.22	
226	46th St and Lafayette Blvd	11/2/2011	City of Phoenix Storm Drain	12"	PVC	910993.83	680002.84	72+38.02	14.37' LT	1264.09	1262.87	1261.81	1.22	

Testhole Data Summary

AZTEC
www.aztec.us TYPSA group

Date: 11/14/2011

Project Number: AZE1101

Project Name: Lafayette Interceptor Drain

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed
ARIZONA, U.S.A.

EXPIRES 09/30/2012

TH #	Location	Date of Excavation	Utility Owner	Utility Size	Utility Description	Coordinates		Stationing		Ground Elevation	Top Elevation	Bottom Elevation	Depth of Cover	Comments
						Northing	Easting	Stationing	Offset					
226A	46th St and Lafayette Blvd	11/2/2011	Unknown	2"	Steel	910991.89	680004.98	72+40.86	14.91' LT	1264.03	1261.55	1261.37	2.48	
227	46th St and Lafayette Blvd	11/7/2011	City of Phoenix Storm Drain	12"	PVC	910984.01	679984.74	72+34.96	5.99' RT	1264.75	1262.81	1261.75	1.94	
228	46th St and Lafayette Blvd	11/7/2011	City of Phoenix Storm Drain	12"	PVC	910982.98	679985.73	72+36.38	5.82' RT	1264.73	1262.79	1261.73	1.94	
229	46th St and Lafayette Blvd	11/7/2011	City of Phoenix Water	None	None	None	None	None	None	0.00	0.00	0.00	0.00	Dug to a depth of 6' and no facilty found in the
230	46th St and Lafayette Blvd	11/7/2011	City of Phoenix Water	8"	ACP	911045.36	680012.14	72+02.47	52.82' LT	1265.78	1261.38	1260.62	4.40	
231	46th St and Calle Del Medio	11/7/2011	Salt River Project Electric	None	None	None	None	None	None	0.00	0.00	0.00	0.00	No facility in requested location per SRP Blue
232	46th St and Calle Del Medio	11/7/2011	Southwest Gas	2"	PE	911402.29	680126.91	404+23.15	1.46' LT	1270.63	1267.81	1267.61	2.82	
233	46th St and Calle Del Medio	11/7/2011	Water	4"	ACP	911457.38	680149.66	404+82.75	0.29' LT	1271.69	1267.13	1266.73	4.56	
234	46th St and Calle Del Medio	11/7/2011	City of Phoenix Water	8"	CIP	911587.31	680208.74	406+25.26	7.55' RT	1273.43	1270.53	1269.75	2.90	
235	46th St and Lafayette Blvd	11/7/2011	Century Link Communications	Eight 3.5"	Transite	911104.03	679926.58	71+04.11	19.84' LT	1263.88	1260.50	1259.08	3.38	
236	45th St and Lafayette Blvd	11/7/2011	City of Phoenix Water	6"	ACP	911638.83	679616.33	64+90.32	94.14' LT	1265.65	1262.27	1261.69	3.38	
237	45th St and Lafayette Blvd	11/7/2011	Southwest Gas	2"	Steel	911639.55	679614.62	64+88.71	93.21' LT	1265.63	1262.99	1262.79	2.64	
238	Avenida Del Puente and Lafayette Blvd	11/7/2011	Southwest Gas	2"	Steel	911560.12	679533.56	65+03.33	19.33' RT	1264.55	1261.69	1261.49	2.86	
239	Avenida Del Puente and Lafayette Blvd	11/7/2011	City of Phoenix Water	8"	ACP	911560.47	679530.78	65+01.37	21.35' RT	1264.47	1261.43	1260.67	3.04	
240	West of Avenida Del Puente	11/7/2011	Century Link Communications	Eight 3.5"	Transite	911896.97	679326.97	61+09.99	18.54' LT	1264.29	1260.79	1259.39	3.50	
241	Camelback Rd and Village Dr	11/8/2011	Cox Communications	2"	PVC	912939.36	679257.89	506+78.92	73.55' RT	1272.57	1270.51	1270.31	2.06	
242	Village Dr north of Camelback Rd	11/8/2011	City of Phoenix Water	8"	ACP	912990.85	679184.03	507+29.03	1.25' LT	1272.22	1268.42	1267.66	3.80	
243	Village Dr north of Camelback Rd	11/8/2011	Southwest Gas	2"	PE	912999.16	679199.03	507+37.61	13.59' RT	1272.25	1269.35	1272.25	2.90	
244	Village Dr north of Camelback Rd	11/8/2011	Salt River Project Electric	Three .75"	PE	912999.55	679204.73	507+38.11	19.28' RT	1272.18	1267.58	1267.37	4.60	
244A	Village Dr north of Camelback Rd	11/8/2011	Unknown	1.5"	PVC	912999.64	679204.20	507+38.2	18.75' RT	1272.19	1268.43	1268.27	3.76	
245	Village Dr north of Camelback Rd	11/8/2011	Cox Communications	2"	PVC	912998.97	679210.40	507+37.64	24.96' RT	1272.81	1270.41	1270.21	2.40	
246	Village Dr north of Camelback Rd	11/9/2011	City of Phoenix Water	8"	ACP	913221.20	679187.90	509+59.41	1.66' LT	1272.72	1269.52	1268.76	3.20	
246A	Village Dr north of Camelback Rd	11/11/2011	City of Phoenix Water	8"	ACP	913225.95	679188.06	509+64.16	1.60' LT	1272.78	1269.54	1268.78	3.24	
246B	Village Dr north of Camelback Rd	11/11/2011	City of Phoenix Water	8"	ACP	913231.98	679188.11	509+70.19	1.66' LT	1272.57	1269.31	1268.55	3.26	
246C	Village Dr north of Camelback Rd	11/11/2011	City of Phoenix Water	8"	ACP	913238.99	679188.05	509+77.20	1.84' LT	1272.66	1269.43	1268.67	3.23	
247	Village Dr north of Camelback Rd	11/8/2011	Southwest Gas	2"	PE	913297.70	679203.23	510+30.71	18.68' RT	1272.47	1269.83	1269.63	2.64	
248	Village Dr north of Camelback Rd	11/9/2011	City of Phoenix Water	8"	ACP	913367.47	679169.95	510+92.22	32.79' RT	1272.66	1269.35	1268.59	3.31	
249	Village Dr north of Camelback Rd	11/9/2011	Southwest Gas	2"	PE	913431.45	679132.88	511+96.10	23.43' RT	1273.04	1270.94	1270.74	2.10	

Testhole Data Summary

AZTEC
www.aztec.us TYPSA group

Date: 11/14/2011

Project Number: AZE1101

Project Name: Lafayette Interceptor Drain

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/2012

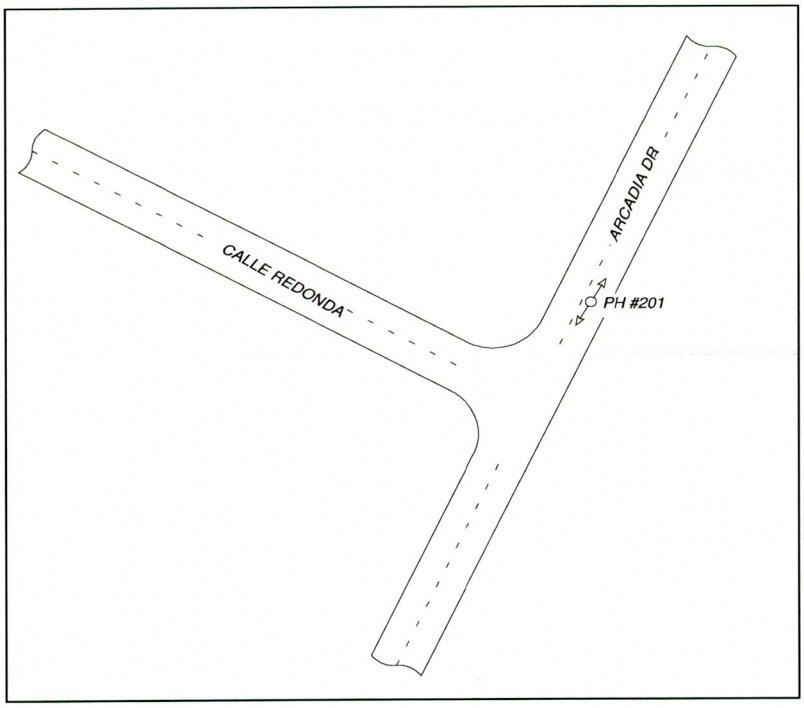
TH #	Location	Date of Excavation	Utility Owner	Utility Size	Utility Description	Coordinates		Stationing		Ground Elevation	Top Elevation	Bottom Elevation	Depth of Cover	Comments
						Northing	Easting	Stationing	Offset					
250	44th St and Colter St	11/8/2011	City of Phoenix Water	8"	ACP	913951.43	678742.60	236+97.45	78.27' RT	1270.52	1268.50	1267.74	2.02	
251	44th St and Colter St	11/9/2011	Southwest Gas	8"	Steel	914040.00	678680.82	237+84.91	14.92' RT	1270.92	1267.14	1266.42	3.78	
252	44th St and Colter St	11/9/2011	Southwest Gas	2'	Steel	914038.88	678651.75	237+83.26	14.13' LT	1271.03	1266.95	1266.75	4.08	
253	44th St and Colter St	11/9/2011	Century Link Communications	None	None	None	None	None	None	0.00	0.00	0.00	0.00	No facility in the requested location per ELM Blue
254	44th St and Colter St	11/9/2011	City of Phoenix Water	8"	ACP	914042.31	678644.80	237+86.57	21.14' LT	1270.84	1266.64	1265.88	4.20	
255	44th St and Colter St	11/11/2011	Century Link Communications	Two 3.5"	Transite	914039.21	678628.93	237+83.18	36.95' LT	1270.83	1266.63	1270.83	4.20	
256	44th St and Colter St	11/9/2011	Century Link Communications	4"	PVC	914058.62	678707.62	238+04	41.38' RT	1271.04	1268.24	1267.86	2.80	
257	Village Dr north of Camelback Rd	11/11/2011	Century Link Communications	None	None	None	None	None	None	0.00	0.00	0.00	0.00	No facility in the requested location per ELM Blue

TEST HOLE DATA REPORT

Test Hole #	201	SUE Crew	A. Pablo Bello
Date Dug	11/11/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Dr and Calle Redonda		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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REGISTERED LAND SURVEYOR
CERTIFICATE NO.
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Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK	CROSS SECTION - NOT TO SCALE
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING: North SURFACE ELEVATION: 1253.74 WIDTH/O.D.: 9.11" TOP ELEVATION: 1249.20 — 4.54 TOP DEPTH (FEET) BOTTOM ELEVATION: 1248.44 — 5.30 BOTTOM (FEET)
RIBBON COLOR: Blue	

COORDINATES:	NORTHING: 908315.20		EASTING: 681695.96		
STATIONING:	STATION: 11+35.37		OFFSET: 4.05' LT		
PAVING THICKNESS:	4"	PAVING TYPE:	Asphalt	SOIL CONDITION:	Dirt
SIZE:	8"	TYPE:	ACP	FACILITY OWNER:	City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	202	SUE Crew	A. Pablo Bello
Date Dug	11/11/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Dr and Calle Redonda		

AZTEC
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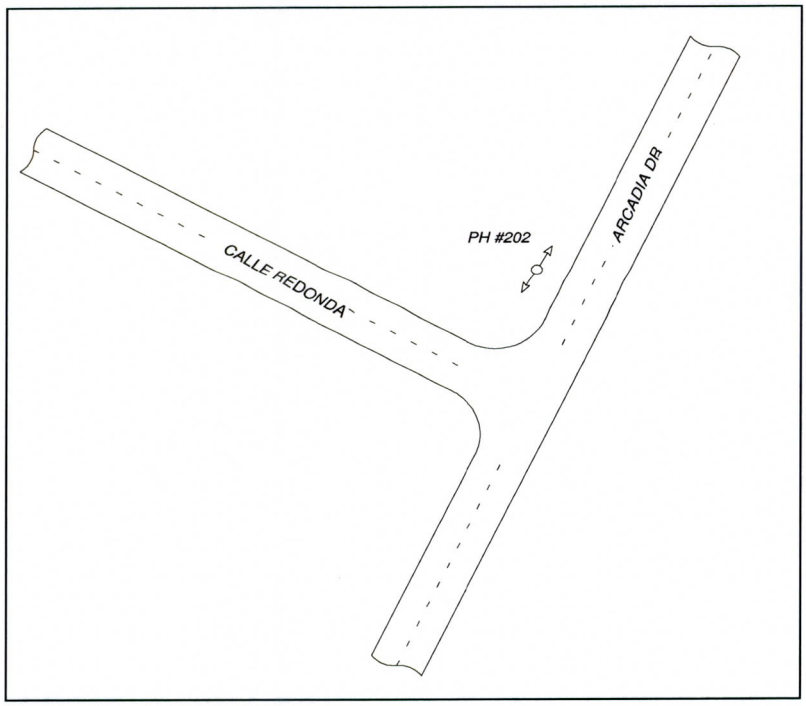
LOCATION PLAN - NOT TO SCALE



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REGISTERED LAND SURVEYOR
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Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK	CROSS SECTION - NOT TO SCALE
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING: North SURFACE ELEVATION: 1253.85 WIDTH/O.D.: 2.38" TOP ELEVATION: 1250.55 — 3.30 TOP DEPTH (FEET) BOTTOM ELEVATION: 1250.35 — 3.50 BOTTOM (FEET)
RIBBON COLOR: Yellow	

COORDINATES: NORTHING 908339.81 EASTING 681671.34

STATIONING: STATION 11+46.52 OFFSET 37.16' LT

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Dirt

SIZE 2" TYPE Steel FACILITY OWNER Southwest Gas

COMMENTS:

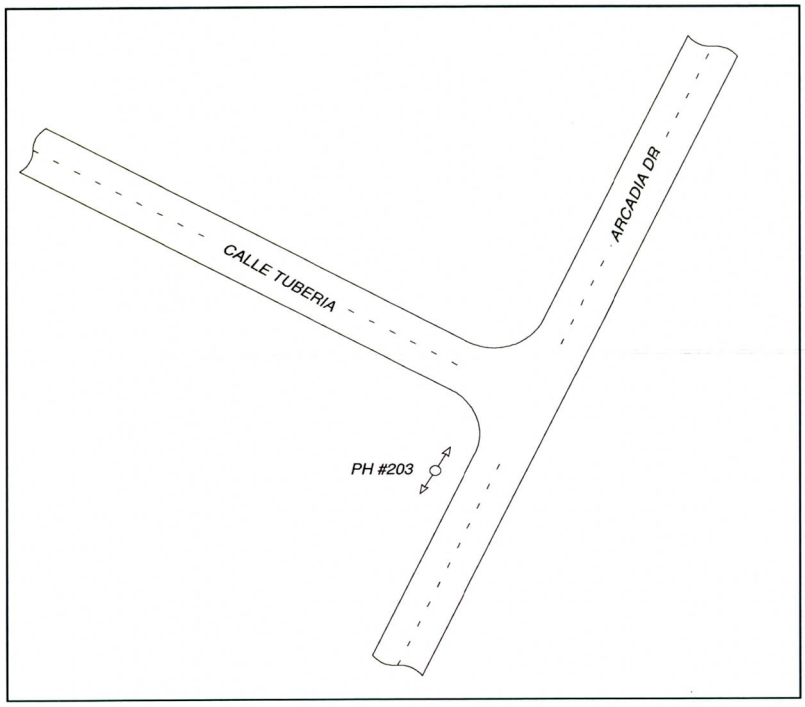
PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	203	SUE Crew	J. Garcia
Date Dug	11/9/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Dr and Calle Tuberia		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1261.08	WIDTH/O.D. 0.75"	
TOP ELEVATION	1258.66		2.42 TOP DEPTH (FEET)
BOTTOM ELEVATION	1258.60	O	2.48 BOTTOM (FEET)

COORDINATES: NORTHING 908787.74 EASTING 681861.91

STATIONING: STATION 16+36.19 OFFSET 29.83' LT

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Dirt

SIZE 3/4" TYPE PE FACILITY OWNER Century Link Communications

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	204	SUE Crew	A. Pablo Bello
Date Dug	11/11/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Dr and Lafayette Blvd		

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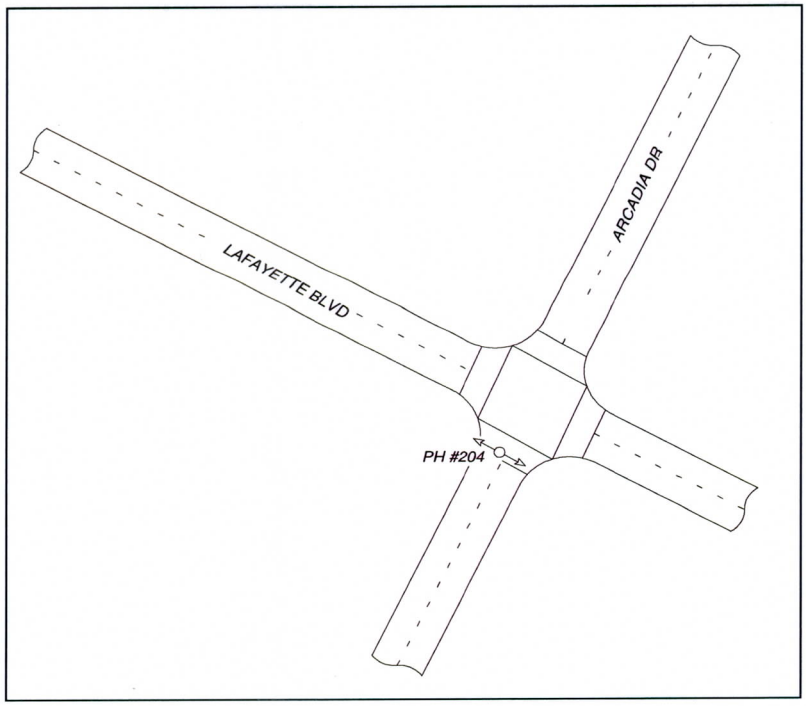
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1264.93	WIDTH/O.D. 9.11"	
TOP ELEVATION	1260.63		4.30 TOP DEPTH (FEET)
BOTTOM ELEVATION	1259.87		5.06 BOTTOM (FEET)

COORDINATES: NORTHING 909069.59 EASTING 682000.40

STATIONING: STATION 19+49.36 OFFSET 6.67' LT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

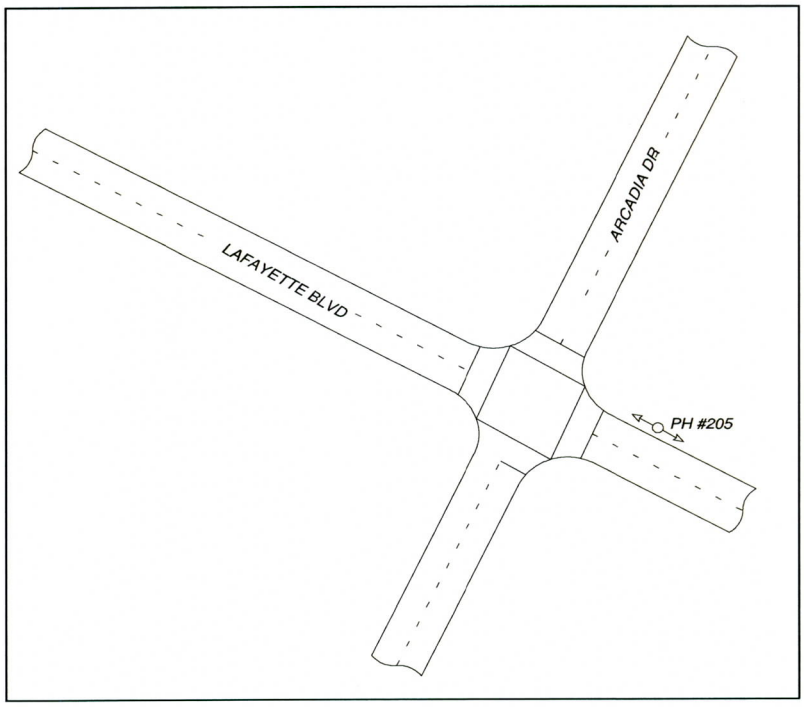
Test Hole #	205	SUE Crew	A. Pablo Bello
Date Dug	11/9/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Dr and Lafayette Blvd		

AZTEC www.aztec.us TYPSA group

4561 East McDowell Road, Phoenix, AZ 85008-4504

Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1264.88	WIDTH/O.D. 11"	
TOP ELEVATION	1260.10	4.78	TOP DEPTH (FEET)
BOTTOM ELEVATION	1258.58	6.30	BOTTOM (FEET)

COORDINATES: NORTHING 909110.17 EASTING 682073.13

STATIONING: STATION 20+14.19 OFFSET 45.63' RT

PAVING THICKNESS 4" PAVING TYPE Concrete SOIL CONDITION Dirt

SIZE Eight 3.5 TYPE Transite FACILITY OWNER Century Link Communications

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	206	SUE Crew	A. Pablo Bello
Date Dug	11/8/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Dr and Lafayette Blvd		

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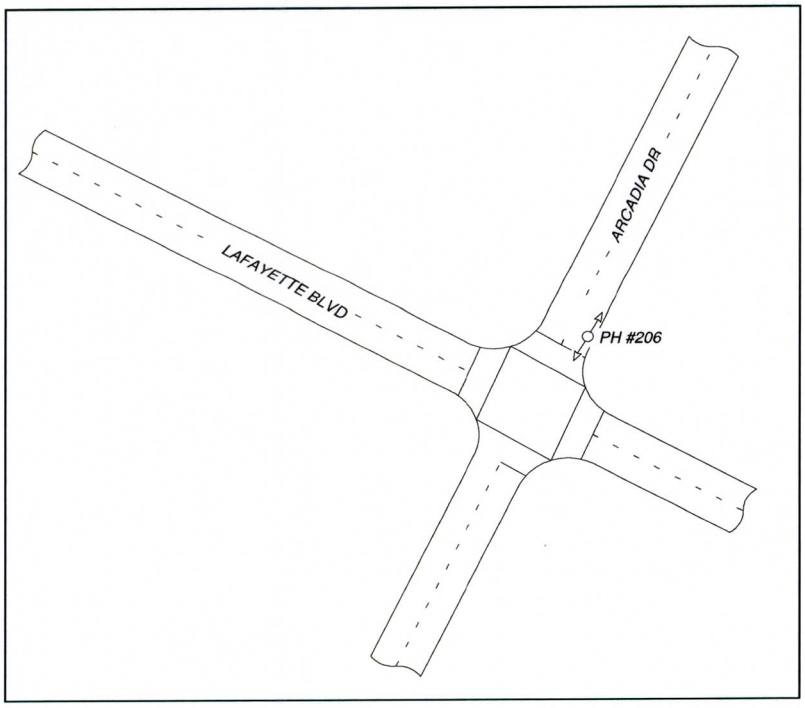
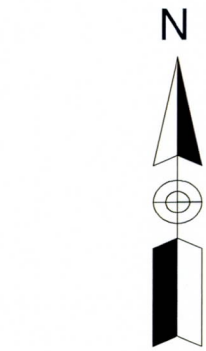
LOCATION PLAN - NOT TO SCALE





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SITE BENCHMARK	CROSS SECTION - NOT TO SCALE
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING: North SURFACE ELEVATION: 1265.62 WIDTH/O.D.: 4.81" TOP ELEVATION: 1262.26 — 3.36 TOP DEPTH (FEET) BOTTOM ELEVATION: 1261.86 — 3.76 BOTTOM (FEET)
RIBBON COLOR: Blue	

COORDINATES: NORTHING 909161.47 EASTING 682061.41

STATIONING: STATION 20+57.39 OFFSET 15.59' RT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 4" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	207	SUE Crew	J. Garcia
Date Dug	11/7/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Calle Del Medio		

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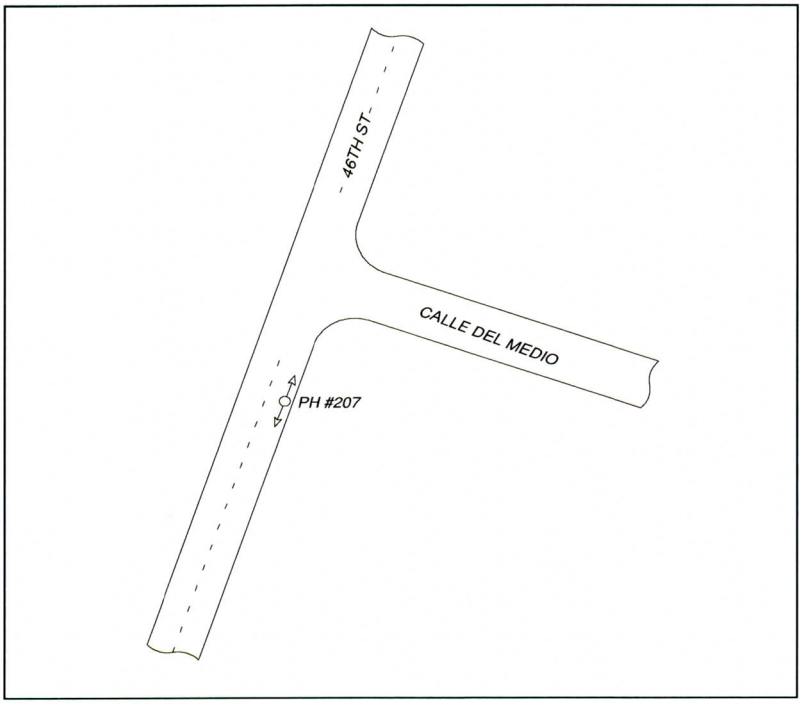
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1268.25	WIDTH/O.D. 2"	
TOP ELEVATION	1265.00	3.25	TOP DEPTH (FEET)
BOTTOM ELEVATION	1264.89	3.36	BOTTOM (FEET)

COORDINATES:	NORTHING	911257.45	EASTING	680087.18	
STATIONING:	STATION	402+73.78	OFFSET	14.15' RT	
PAVING THICKNESS	6"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	One 3/4" & One 1 1/2"	TYPE	PE	FACILITY OWNER	Century Link Communications

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	208	SUE Crew	A. Pablo Bello
Date Dug	11/8/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Arcadia Dr and Lafayette Blvd		

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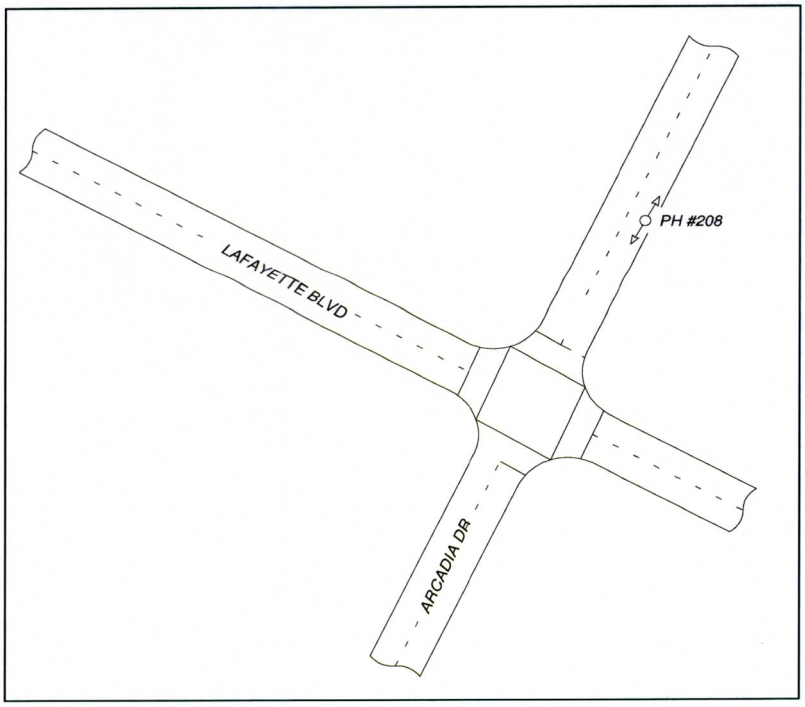
LOCATION PLAN - NOT TO SCALE



EXPIRES 09/30/2012

SITE BENCHMARK
BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42
RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1268.72	WIDTH/O.D. 4.81"	
TOP ELEVATION	1265.38	3.34	TOP DEPTH (FEET)
BOTTOM ELEVATION	1264.98	3.74	BOTTOM (FEET)

COORDINATES: NORTHING 909346.46 EASTING 682134.51

STATIONING: STATION 22+56.29 OFFSET 14.28' RT

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 4" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	209	SUE Crew	J. Garcia
Date Dug	10/31/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Blvd west of Arcadia Dr		

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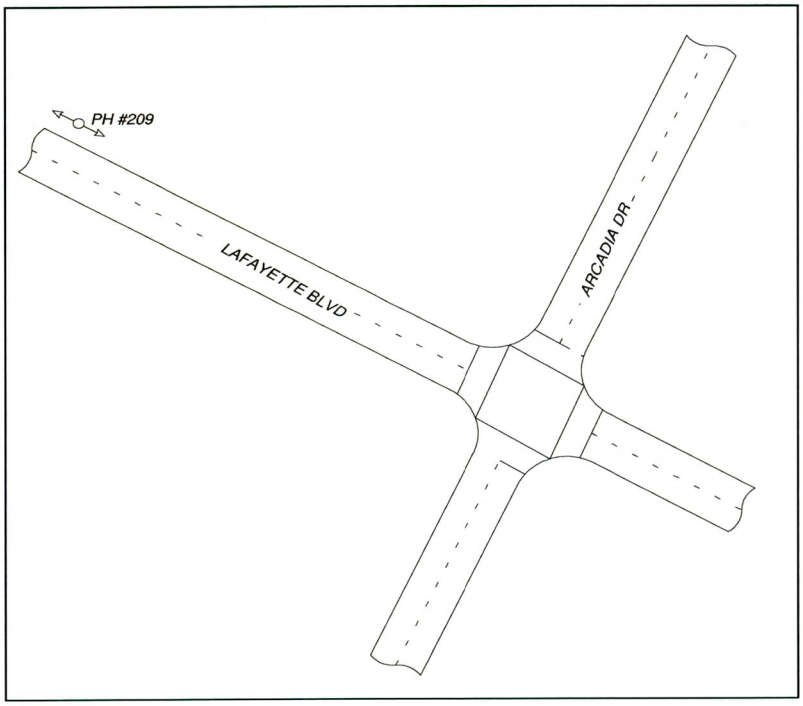
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1266.44	WIDTH/O.D. 9.11"	
TOP ELEVATION	1262.34	4.10	TOP DEPTH (FEET)
BOTTOM ELEVATION	1261.58	4.86	BOTTOM (FEET)

COORDINATES: NORTHING 909314.02 EASTING 681826.68

STATIONING: STATION 97+29.26 OFFSET 22.30' LT

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	210	SUE Crew	J. Garcia
Date Dug	10/31/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Dromedary Rd and Lafayette Blvd		

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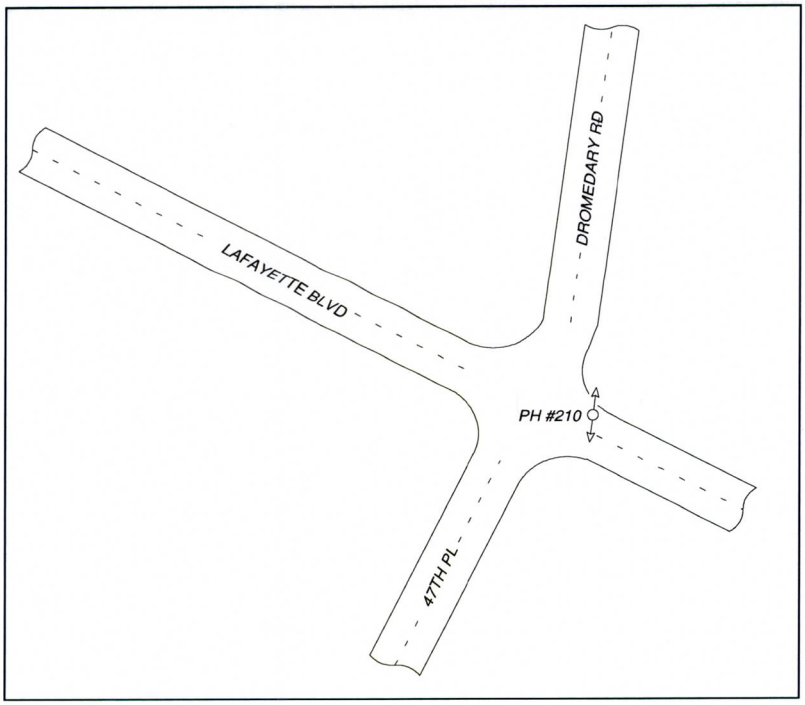
LOCATION PLAN - NOT TO SCALE



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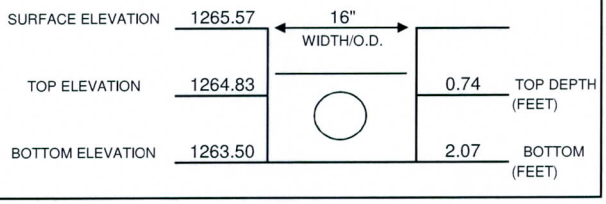
SITE BENCHMARK
BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42
RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North



COORDINATES:	NORTHING	909686.31	EASTING	681389.76	
STATIONING:	STATION	91+55.24	OFFSET	19.97' LT	
PAVING THICKNESS	4"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	12"	TYPE	RCP	FACILITY OWNER	City of Phoenix Storm Drain

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	211	SUE Crew	J. Garcia
Date Dug	10/31/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Dromedary Rd and Lafayette Blvd		

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LOCATION PLAN - NOT TO SCALE

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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR

CROSS SECTION - NOT TO SCALE

FACING

SURFACE ELEVATION	1265.75	WIDTH/O.D.	
TOP ELEVATION	1265.75		TOP DEPTH (FEET)
BOTTOM ELEVATION	1259.75	6.00	BOTTOM (FEET)

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE None TYPE None FACILITY OWNER City of Phoenix Water

COMMENTS:

Dug to a depth of 6 ft in the requested location as well as the Blue Staked location and no water facility was found.

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	212	SUE Crew	J. Garcia
Date Dug	10/31/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Dromedary Rd and Lafayette Blvd		

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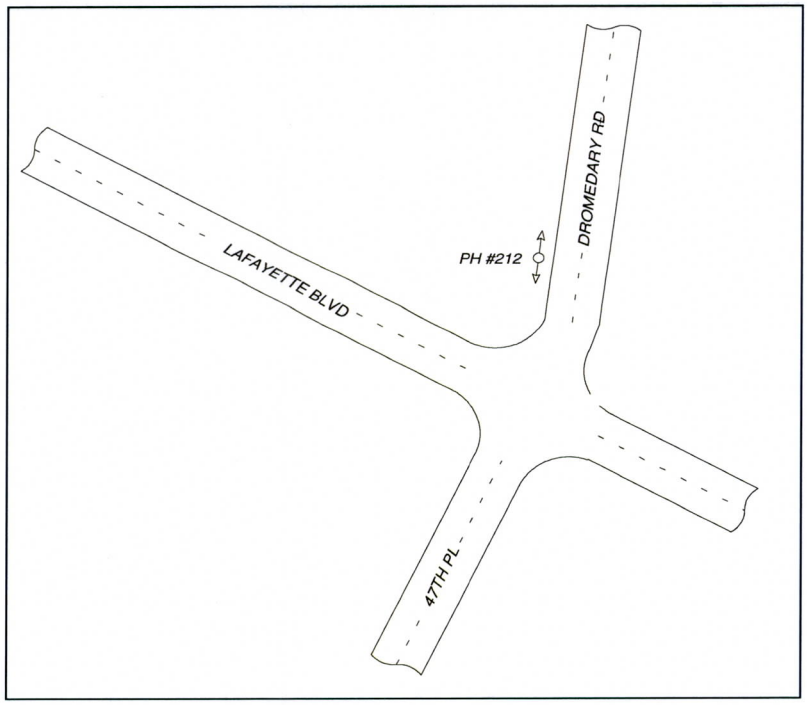
LOCATION PLAN - NOT TO SCALE



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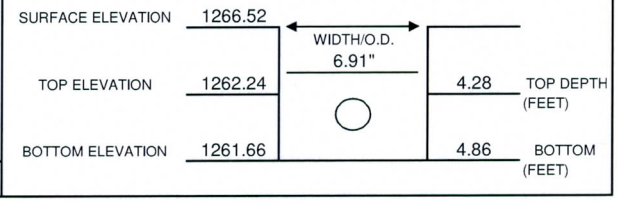
SITE BENCHMARK
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42
RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North



COORDINATES:	NORTHING	909767.02	EASTING	681368.97	
STATIONING:	STATION	90+86.89	OFFSET	67.64' LT	
PAVING THICKNESS	None	PAVING TYPE	None	SOIL CONDITION	Dirt
SIZE	6"	TYPE	ACP	FACILITY OWNER	City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	213	SUE Crew	A. Pablo Bello
Date Dug	10/31/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	47th St and Lafayette Blvd		

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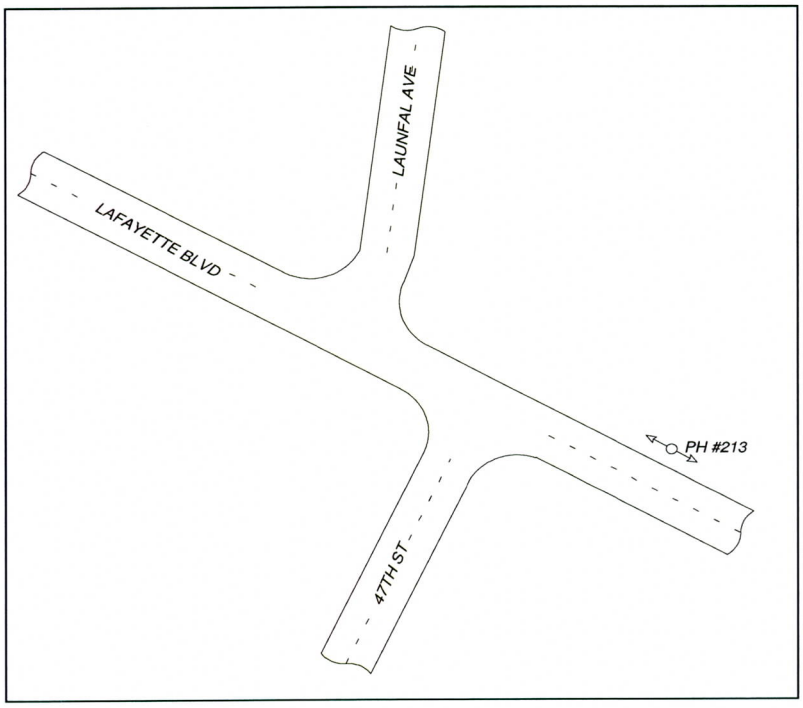
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1265.76	WIDTH/O.D. 9.11"	
TOP ELEVATION	1261.56	4.20	TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.80	4.96	BOTTOM (FEET)

COORDINATES: NORTHING 909968.44 EASTING 681064.36

STATIONING: STATION 87+24.57 OFFSET 21.93' LT

PAVING THICKNESS: None PAVING TYPE: None SOIL CONDITION: Dirt

SIZE: 8" TYPE: ACP FACILITY OWNER: City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	213A	SUE Crew	A. Pablo Bello
Date Dug	10/31/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	47th St and Kafayette Blvd		

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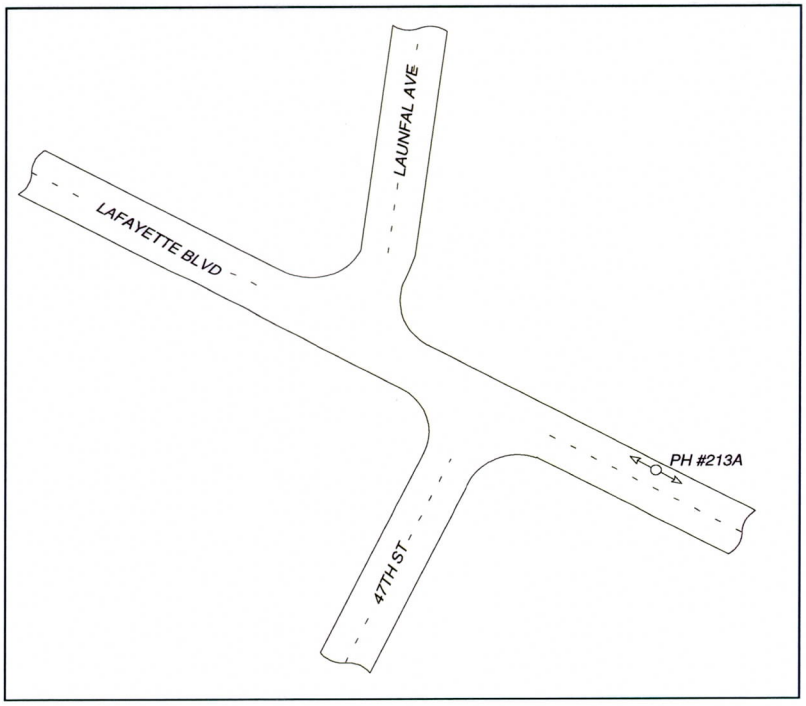
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1265.40	WIDTH/O.D. 10"	
TOP ELEVATION	1261.32		4.08 TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.08		5.32 BOTTOM (FEET)

COORDINATES: NORTHING 909964.57 EASTING 681060.95

STATIONING: STATION 87+24.50 OFFSET 16.76' LT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE Six 3.5" TYPE Transite FACILITY OWNER Century Link Communications

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	214	SUE Crew	A. Pablo Bello
Date Dug	11/6/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	47th St and Lafayette Blvd		

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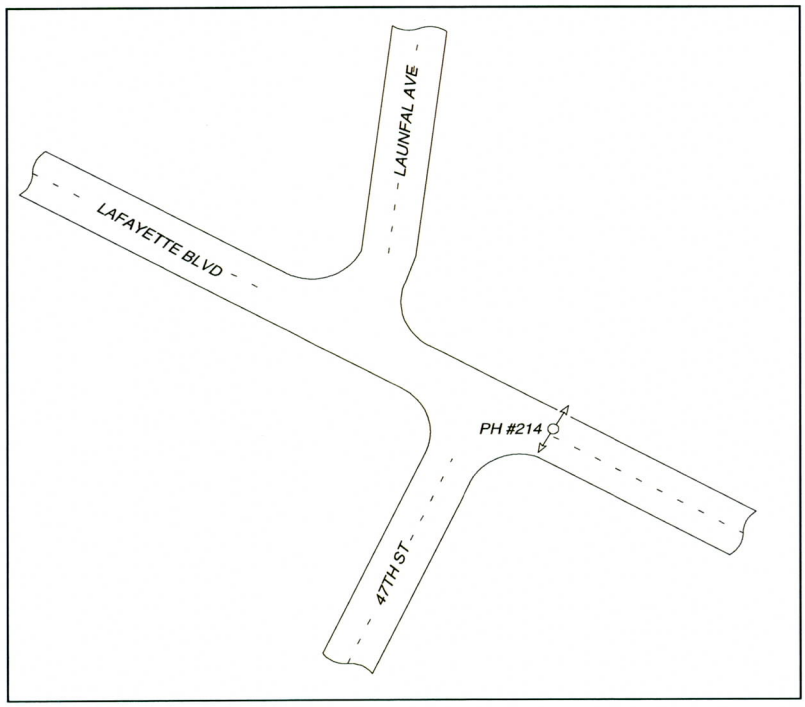
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Red

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1265.36	WIDTH/O.D. 2.38"	
TOP ELEVATION	1261.72	3.64	TOP DEPTH (FEET)
BOTTOM ELEVATION	1261.52	3.84	BOTTOM (FEET)

COORDINATES: NORTHING 909972.55 EASTING 681030.09

STATIONING: STATION 86+95.9 OFFSET 2.72' LT

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 2" TYPE PVC FACILITY OWNER Salt River Project Electric

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	215	SUE Crew	J. Garcia
Date Dug	11/1/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Launfal Ave and Lafayette Blvd		

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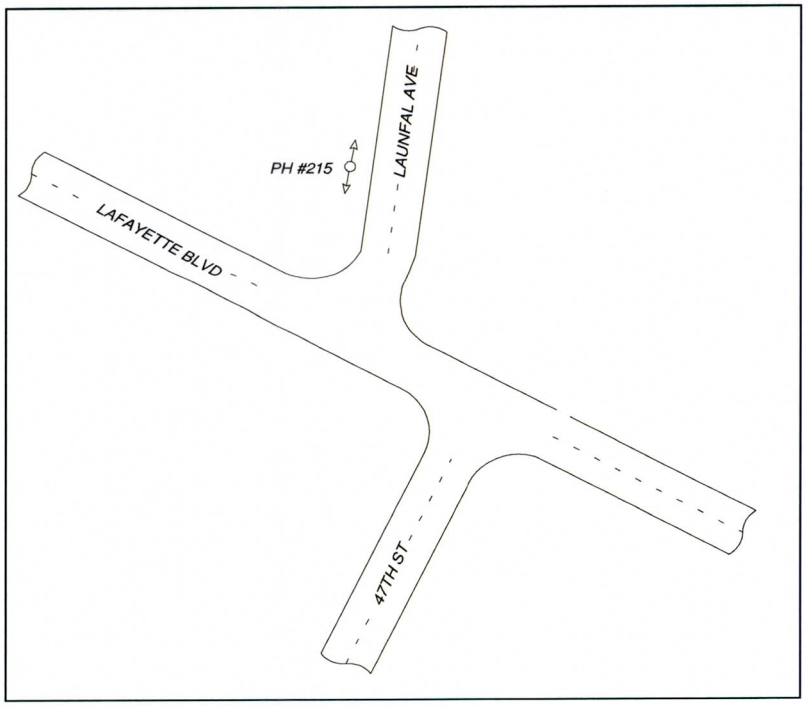
LOCATION PLAN - NOT TO SCALE



EXPIRES 09/30/2012

SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1266.54	WIDTH/O.D. 6.91"	
TOP ELEVATION	1262.86		3.68 TOP DEPTH (FEET)
BOTTOM ELEVATION	1262.28		4.26 BOTTOM (FEET)

COORDINATES: NORTHING 910124.95 EASTING 680969.76

STATIONING: STATION 85+50.83 OFFSET 78.99' LT

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Dirt

SIZE 6" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	216	SUE Crew	J. Garcia
Date Dug	11/1/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Blvd west of 46th Pl		

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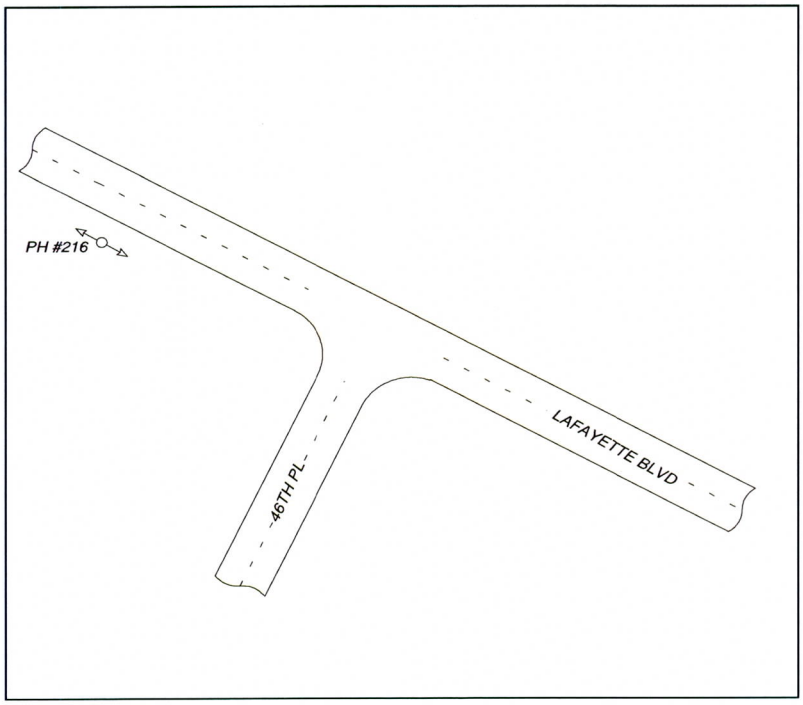
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1264.71	WIDTH/O.D. 9.11"	
TOP ELEVATION	1261.35	3.36	TOP DEPTH (FEET)
BOTTOM ELEVATION	1264.71		BOTTOM (FEET)

COORDINATES: NORTHING 910353.65 EASTING 680539.07

STATIONING: STATION 80+75.11 OFFSET 28.19' RT

PAVING THICKNESS: None PAVING TYPE: None SOIL CONDITION: Dirt

SIZE: 8" TYPE: ACP FACILITY OWNER: City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	217	SUE Crew	J. Garcia
Date Dug	11/1/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Blvd west of 46th Pl		

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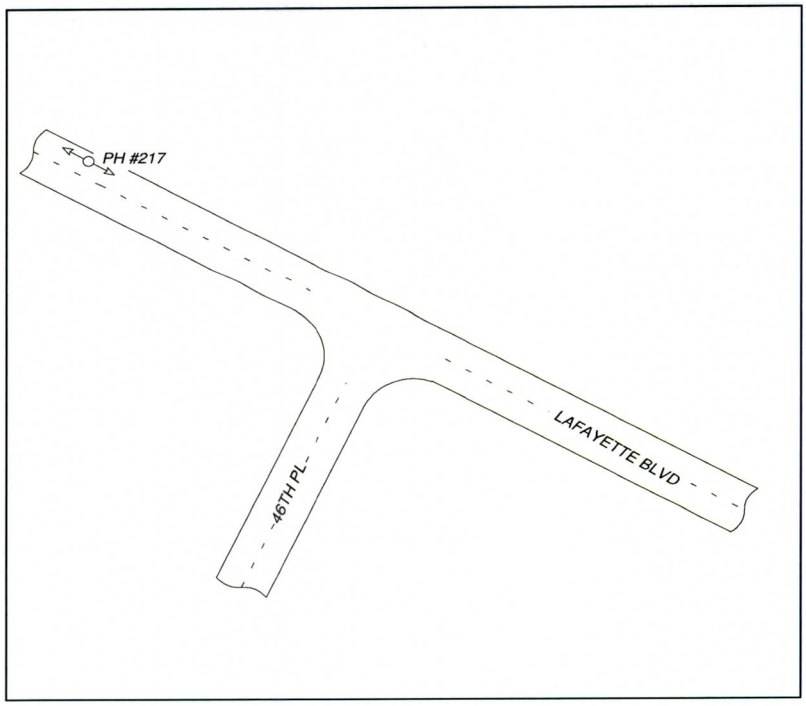
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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EXPIRES 09/30/2012

SITE BENCHMARK
BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42
RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1264.19	WIDTH/O.D. 10"	
TOP ELEVATION	1260.49		3.70 TOP DEPTH (FEET)
BOTTOM ELEVATION	1258.63		5.56 BOTTOM (FEET)

COORDINATES: NORTHING 910415.88 EASTING 680537.76

STATIONING: STATION 80+33.56 OFFSET 18.15' LT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE Eight 3.5" TYPE Transite FACILITY OWNER Century Link Communications

COMMENTS:

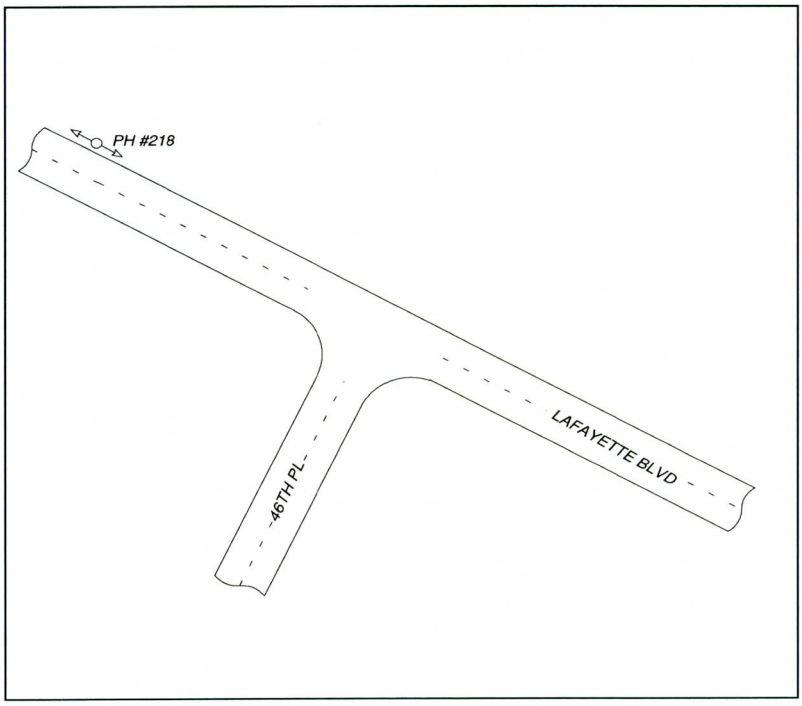
PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	218	SUE Crew	J. Garcia
Date Dug	11/1/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Blvd west of 46th Pl		

AZTEC www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
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HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK	CROSS SECTION - NOT TO SCALE			
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING West			
	SURFACE ELEVATION	1264.78	WIDTH/O.D. 8.63"	
	TOP ELEVATION	1260.08	4.70	TOP DEPTH (FEET)
	BOTTOM ELEVATION	1259.36	5.42	BOTTOM (FEET)
RIBBON COLOR Yellow				

COORDINATES:	NORTHING 910421.85		EASTING 680542.12		
STATIONING:	STATION 80+32.98		OFFSET 25.53' LT		
PAVING THICKNESS	None	PAVING TYPE	None	SOIL CONDITION	Dirt
SIZE	8"	TYPE	Steel	FACILITY OWNER	Southwest Gas

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	219	SUE Crew	J. Garcia
Date Dug	11/1/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

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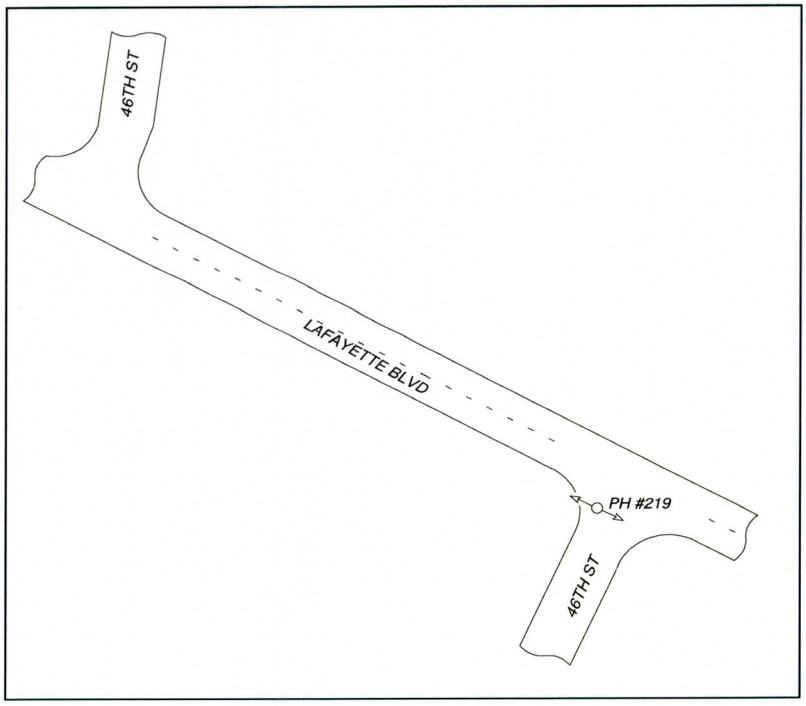
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK	CROSS SECTION - NOT TO SCALE
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING: West SURFACE ELEVATION: 1263.58 WIDTH/O.D.: 30" TOP ELEVATION: 1262.52 — 1.06 TOP DEPTH (FEET) BOTTOM ELEVATION: 1260.02 — 3.56 BOTTOM (FEET)
RIBBON COLOR: Blue	

COORDINATES: NORTHING 910664.11 EASTING 680192.27

STATIONING: STATION 76+15.33 OFFSET 32.92' RT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 24" TYPE RCP FACILITY OWNER Salt River Project Irrigation

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	220	SUE Crew	J. Brandt
Date Dug	11/11/2011	Truck #	543
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

AZTEC
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4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE

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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING _____

SURFACE ELEVATION _____ WIDTH/O.D. _____

TOP ELEVATION 0.00 TOP DEPTH (FEET)

BOTTOM ELEVATION 0.00 BOTTOM (FEET)

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION None

SIZE None None None FACILITY OWNER Salt River Project Electric

COMMENTS:

No facility in the requested location per SRP bluestake locator Mike.

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	221	SUE Crew	J. Garcia
Date Dug	11/1/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette		

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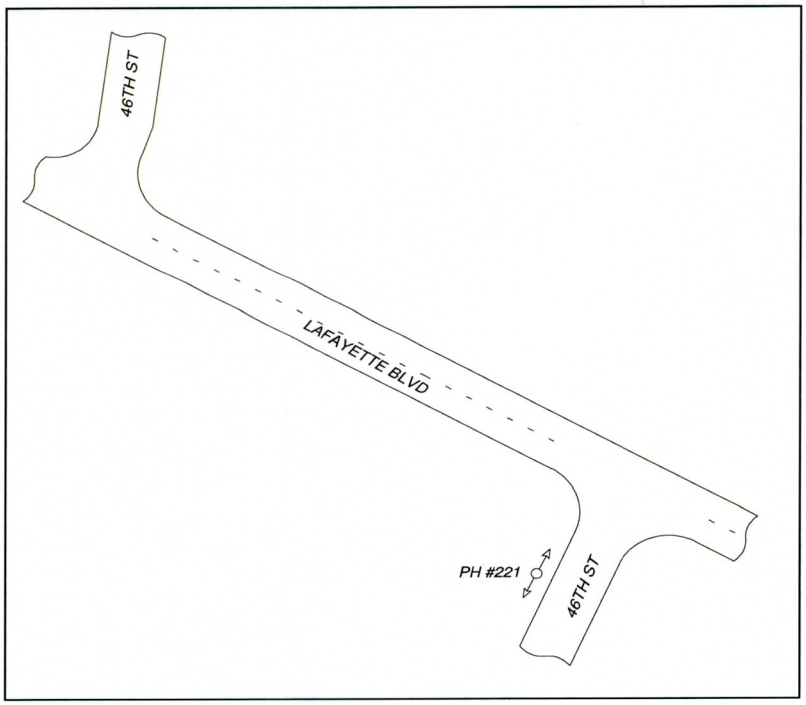
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1263.23	WIDTH/O.D. 6.91"	
TOP ELEVATION	1258.97	4.26	TOP DEPTH (FEET)
BOTTOM ELEVATION	1257.39	5.84	BOTTOM (FEET)

COORDINATES: NORTHING 910643.52 EASTING 680158.44

STATIONING: STATION 76+11.39 OFFSET 72.33' RT

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Dirt

SIZE 6" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	222	SUE Crew	J. Garcia
Date Dug	11/1/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

AZTEC www.aztec.us TYPSA group
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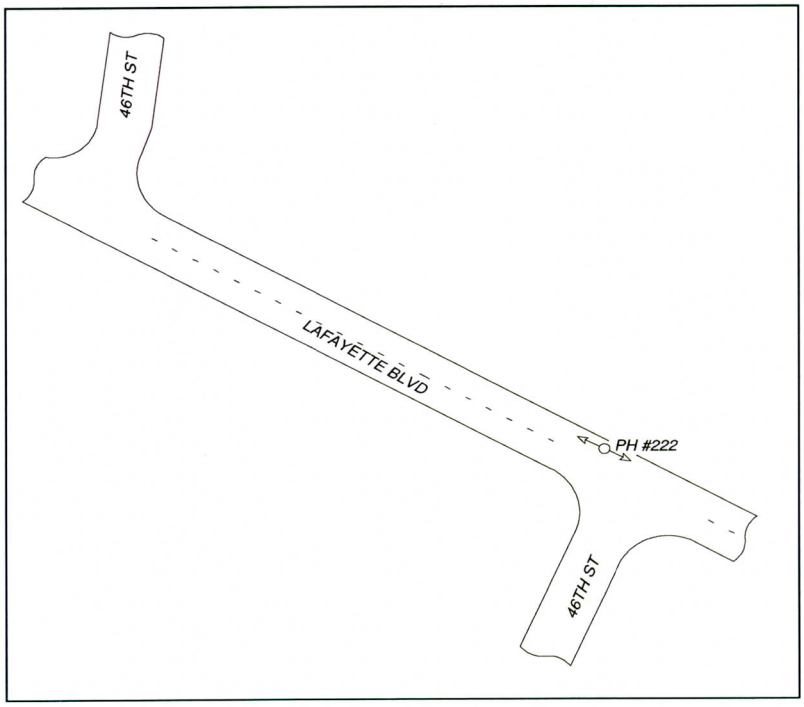
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1263.60	WIDTH/O.D. 10"	
TOP ELEVATION	1260.20	3.40	TOP DEPTH (FEET)
BOTTOM ELEVATION	1258.36	5.24	BOTTOM (FEET)

COORDINATES: NORTHING 910703.25 EASTING 680229.46

STATIONING: STATION 76+06.47 OFFSET 20.34' LT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE Eight 3.5" TYPE Transite FACILITY OWNER Century Link Communications

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	222A	SUE Crew	J. Garcia
Date Dug	11/1/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

AZTEC
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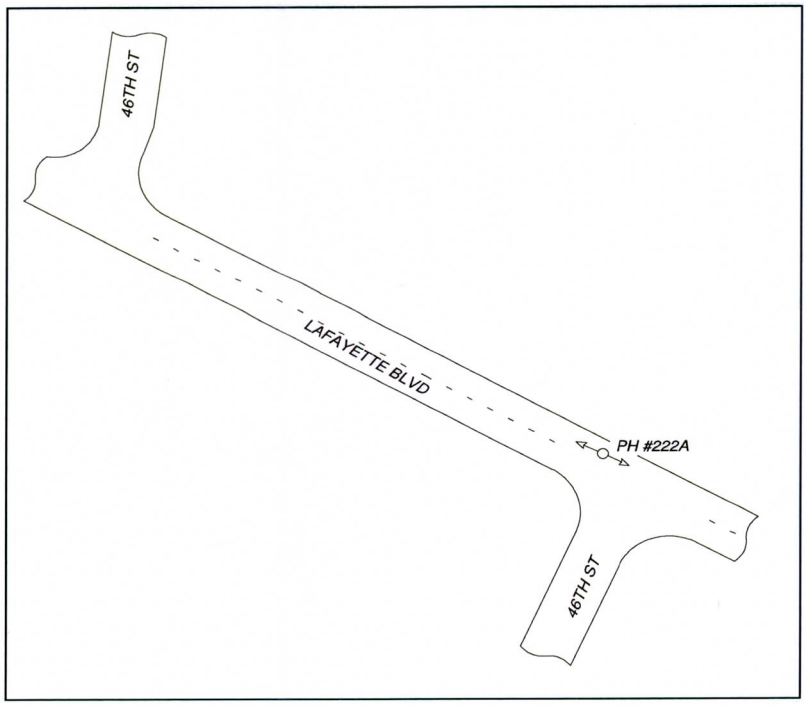
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: White

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1263.55	WIDTH/O.D. 2"	
TOP ELEVATION	1261.25		2.30 TOP DEPTH (FEET)
BOTTOM ELEVATION	1261.07		2.48 BOTTOM (FEET)

COORDINATES: NORTHING 910700.68 EASTING 680226.29

STATIONING: STATION 76+06.61 OFFSET 16.26' LT

PAVING THICKNESS 6" PAVING TYPE Aspahalt SOIL CONDITION Dirt

SIZE 2" TYPE Steel FACILITY OWNER Unknown

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	223	SUE Crew	J. Garcia
Date Dug	11/1/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

AZTEC
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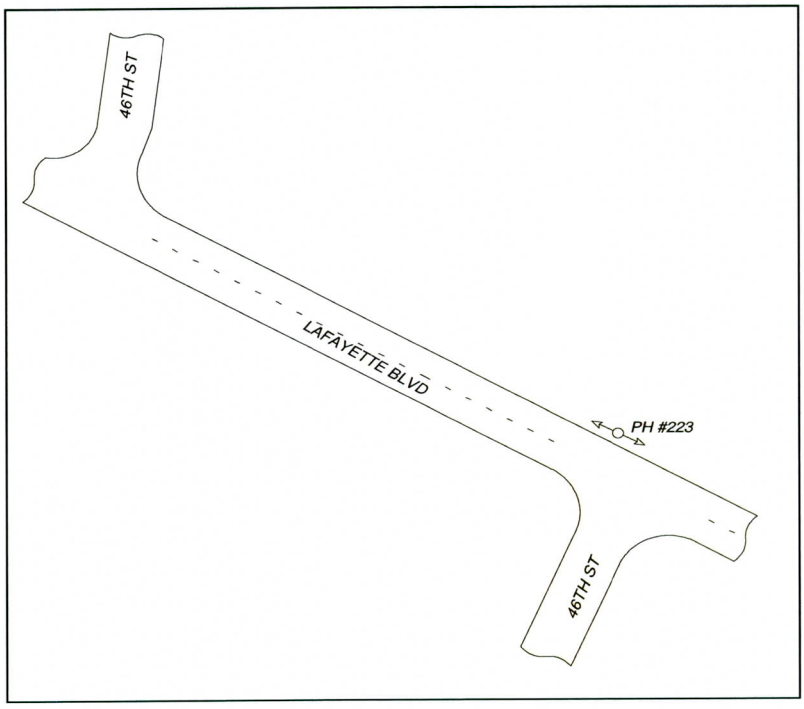
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



EXPIRES 09/30/2012

SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Yellow

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1264.87	WIDTH/O.D. 8.63"		
TOP ELEVATION	1259.11		5.76	TOP DEPTH (FEET)
BOTTOM ELEVATION	1258.39		6.48	BOTTOM (FEET)

COORDINATES: NORTHING 910707.34 EASTING 680234.02

STATIONING: STATION 76+05.94 OFFSET 26.44' LT

PAVING THICKNESS: None PAVING TYPE: None SOIL CONDITION: Dirt

SIZE: 8" TYPE: Steel FACILITY OWNER: Southwest Gas

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	224	SUE Crew	J. Garcia
Date Dug	11/1/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

AZTEC
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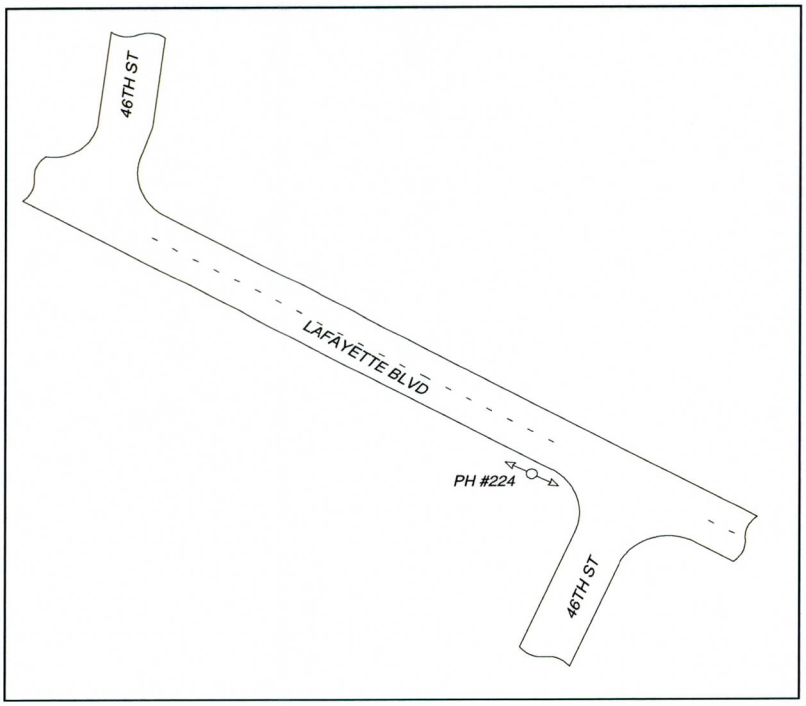
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1263.94	WIDTH/O.D. 9.11"	
TOP ELEVATION	1261.04	2.90	TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.28	3.66	BOTTOM (FEET)

COORDINATES: NORTHING 910702.20 EASTING 680170.00

STATIONING: STATION 75+71.51 OFFSET 27.77' RT

PAVING THICKNESS: None PAVING TYPE: None SOIL CONDITION: Dirt

SIZE: 8" TYPE: ACP FACILITY OWNER: City of Phoenix Water

COMMENTS:

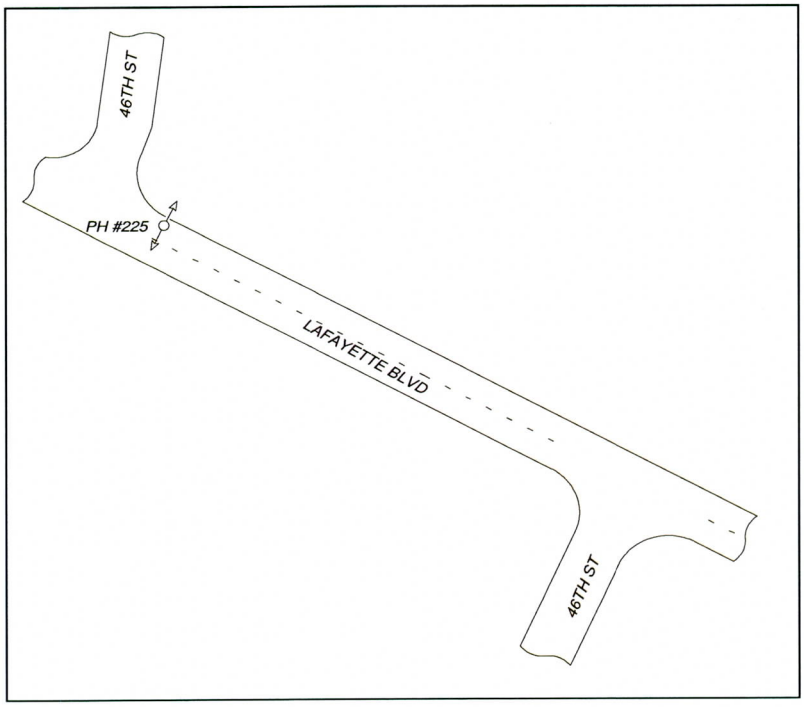
PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	225	SUE Crew	J. Garcia
Date Dug	11/2/2011	Truck #	320
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1264.10	WIDTH/O.D. 12.75"	
TOP ELEVATION	1262.88	1.22	TOP DEPTH (FEET)
BOTTOM ELEVATION	1261.82	2.28	BOTTOM (FEET)

COORDINATES: NORTHING 910994.75 EASTING 680002.18

STATIONING: STATION 72+36.89 OFFSET 14.39' LT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 12" TYPE PVC FACILITY OWNER City of Phoenix Storm Drain

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	226	SUE Crew	J Garcia
Date Dug	11/2/2011	Truck #	320
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

AZTEC
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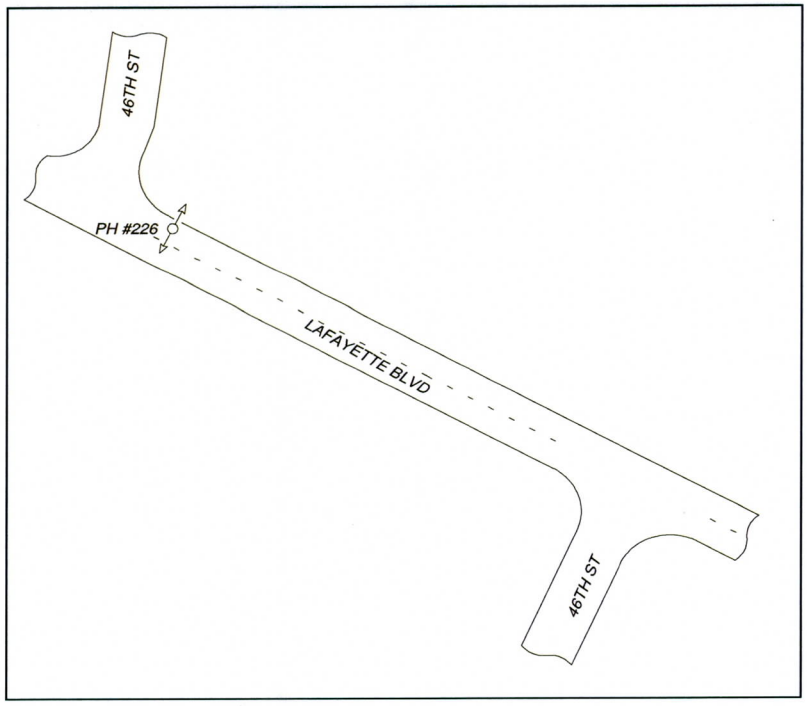
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK	CROSS SECTION - NOT TO SCALE
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING: North SURFACE ELEVATION: 1264.09 WIDTH/O.D.: 12.75" TOP ELEVATION: 1262.87 — 1.22 TOP DEPTH (FEET) BOTTOM ELEVATION: 1261.81 — 2.28 BOTTOM (FEET)
RIBBON COLOR: Blue	

COORDINATES:	NORTHING: 910993.83		EASTING: 680002.84		
STATIONING:	STATION: 72+38.02		OFFSET: 14.37' LT		
PAVING THICKNESS:	6"	PAVING TYPE:	Asphalt	SOIL CONDITION:	Dirt
SIZE:	12"	TYPE:	PVC	FACILITY OWNER:	City of Phoenix Storm Drain

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	226A	SUE Crew	J. Garcia
Date Dug	11/2/2011	Truck #	320
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

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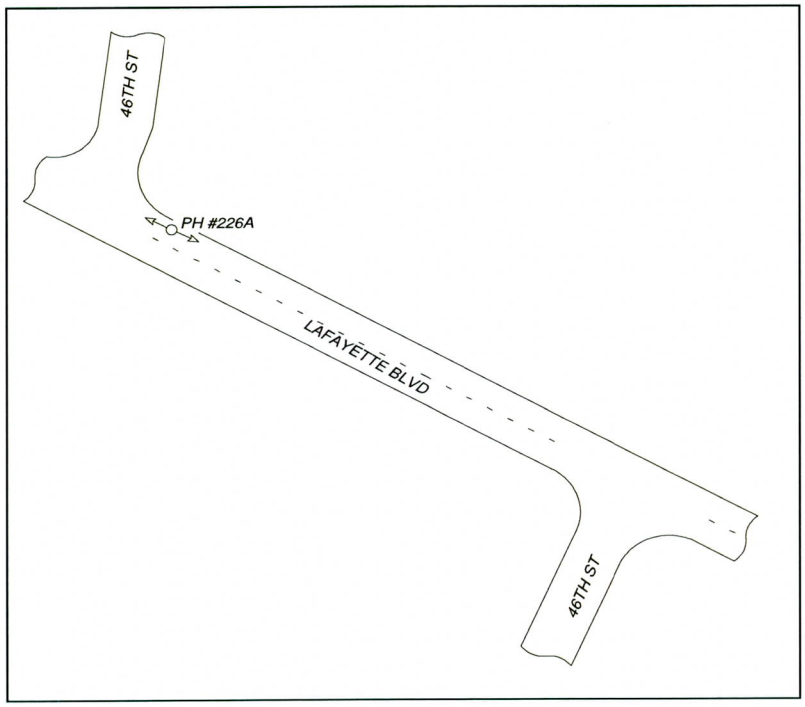
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: White

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1264.03	WIDTH/O.D. 2"	
TOP ELEVATION	1261.55		2.48 TOP DEPTH (FEET)
BOTTOM ELEVATION	1261.37		2.66 BOTTOM (FEET)

COORDINATES: NORTHING 910991.89 EASTING 680004.98

STATIONING: STATION 72+40.86 OFFSET 14.91' LT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 2" TYPE Steel FACILITY OWNER Unknown

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	227	SUE Crew	J. Garcia
Date Dug	11/7/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

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4561 East McDowell Road, Phoenix, AZ 85008-4504
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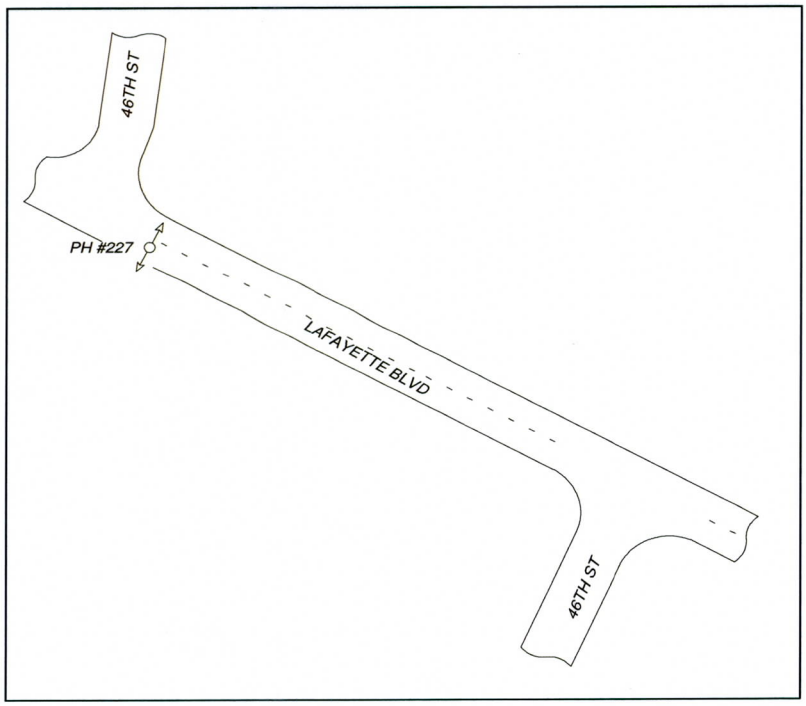
LOCATION PLAN - NOT TO SCALE



EXPIRES 09/30/2012

SITE BENCHMARK	CROSS SECTION - NOT TO SCALE
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING: North SURFACE ELEVATION: 1264.75 WIDTH/O.D.: 12.75 TOP ELEVATION: 1262.81 TOP DEPTH (FEET): 1.94 BOTTOM ELEVATION: 1261.75 BOTTOM (FEET): 3.00
RIBBON COLOR: Blue	

COORDINATES: NORTHING 910984.01 EASTING 679984.74

STATIONING: STATION 72+34.96 OFFSET 5.99' RT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 12" TYPE PVC FACILITY OWNER City of Phoenix Storm Drain

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	228	SUE Crew	J. Garcia
Date Dug	11/7/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

AZTEC
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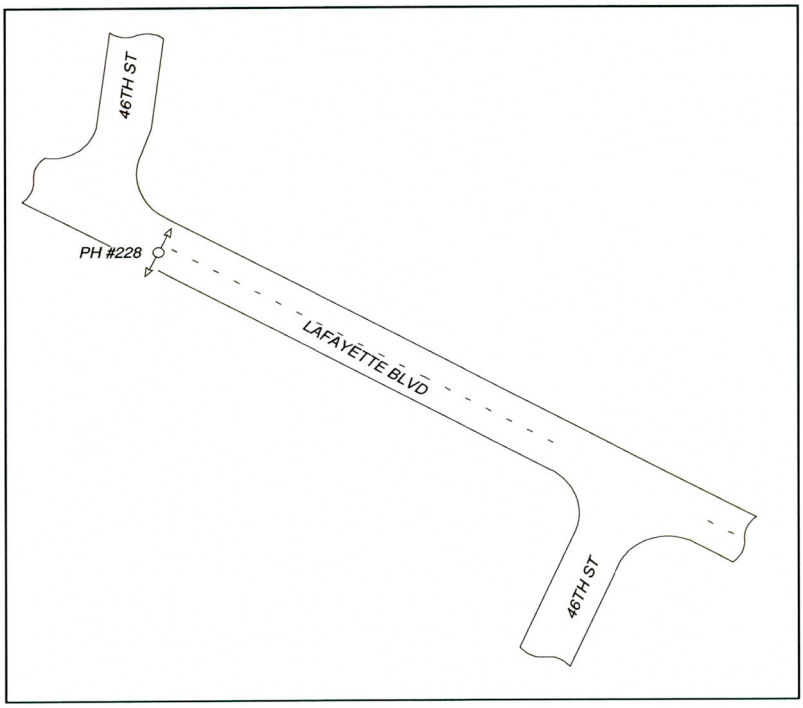
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK	CROSS SECTION - NOT TO SCALE			
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING North			
	SURFACE ELEVATION 1264.73	WIDTH/O.D. 12.75"		
	TOP ELEVATION 1262.79		1.94	TOP DEPTH (FEET)
	BOTTOM ELEVATION 1261.73		3.00	BOTTOM (FEET)
RIBBON COLOR Blue				

COORDINATES: NORTHING 910982.98 EASTING 679985.73

STATIONING: STATION 72+36.38 OFFSET 5.82' RT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 12" TYPE PVC FACILITY OWNER City of Phoenix Storm Drain

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	229	SUE Crew	A. Pablo Bello
Date Dug	11/7/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE

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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING _____

SURFACE ELEVATION _____ WIDTH/O.D. _____

TOP ELEVATION 0.00 TOP DEPTH (FEET) _____

BOTTOM ELEVATION 0.00 BOTTOM (FEET) _____

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE None TYPE None FACILITY OWNER City of Phoenix Water

COMMENTS:

Dug to a depth of 6' and no facilty found in the requested location.

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	230	SUE Crew	J. Garcia
Date Dug	11/7/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

AZTEC
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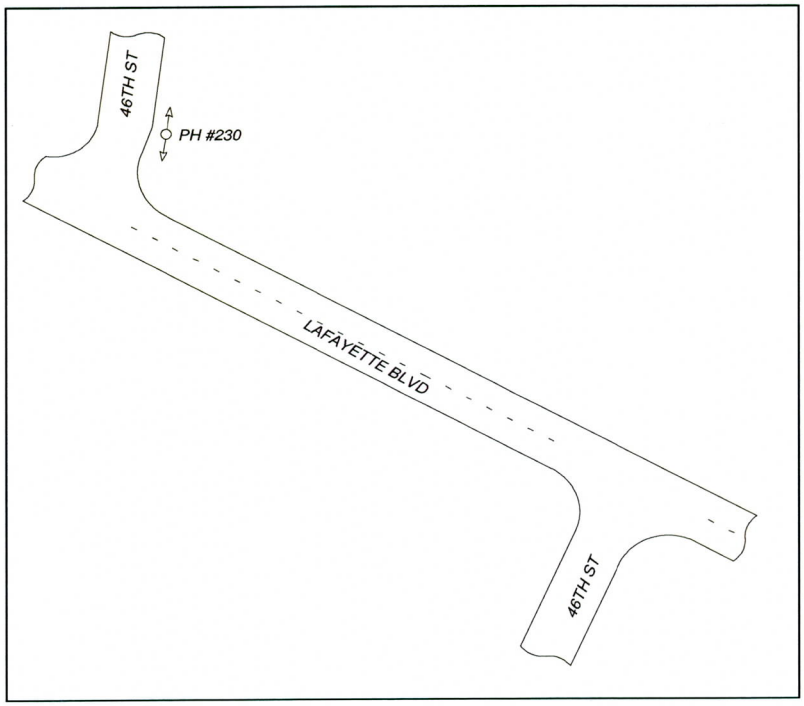
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



EXPIRES 09/30/2012

SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1265.78	WIDTH/O.D. 9.11"	
TOP ELEVATION	1261.38	4.40	TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.62	5.16	BOTTOM (FEET)

COORDINATES:	NORTHING	911045.36	EASTING	680012.14	
STATIONING:	STATION	72+02.47	OFFSET	52.82' LT	
PAVING THICKNESS	None	PAVING TYPE	None	SOIL CONDITION	Dirt
SIZE	8"	TYPE	ACP	FACILITY OWNER	City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	231	SUE Crew	J. Garcia
Date Dug	11/7/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Calle Del Medio		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE

N

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING _____

SURFACE ELEVATION _____ WIDTH/O.D. _____

TOP ELEVATION 0.00 TOP DEPTH (FEET)

BOTTOM ELEVATION 0.00 BOTTOM (FEET)

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Dirt

SIZE None TYPE None FACILITY OWNER Salt River Project Electric

COMMENTS:

No facility in requested location per SRP Blue Stake locator.

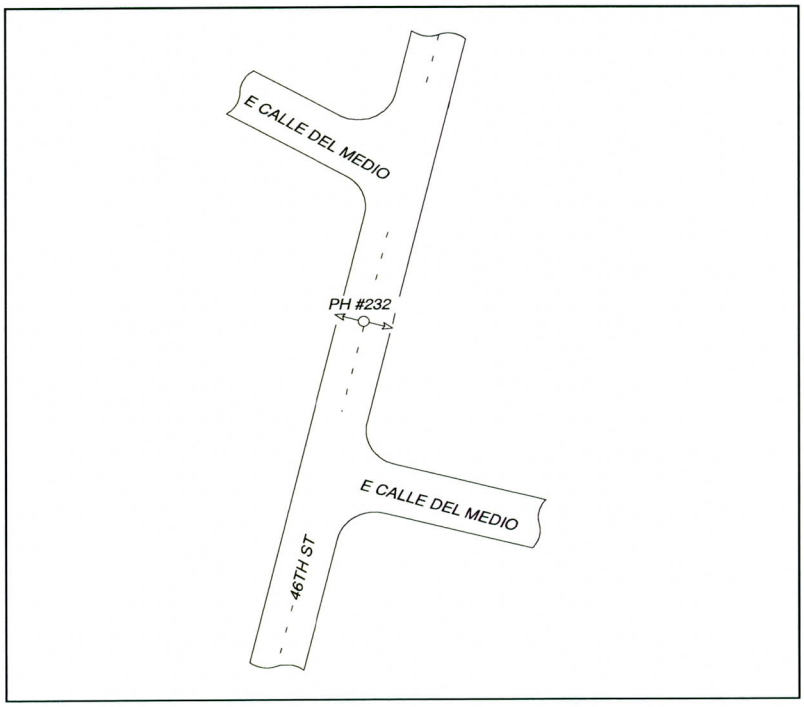
PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	232	SUE Crew	J. Garcia
Date Dug	11/7/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Calle Del Medio		

AZTEC www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK	CROSS SECTION - NOT TO SCALE
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING: West SURFACE ELEVATION: 1270.63 WIDTH/O.D.: 2.38" TOP ELEVATION: 1267.81 — 2.82 TOP DEPTH (FEET) BOTTOM ELEVATION: 1267.61 — 3.02 BOTTOM (FEET)
RIBBON COLOR: Yellow	

COORDINATES: NORTHING 911402.29 EASTING 680126.91

STATIONING: STATION 404+23.15 OFFSET 1.46' LT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 2" TYPE PE FACILITY OWNER Southwest Gas

COMMENTS:

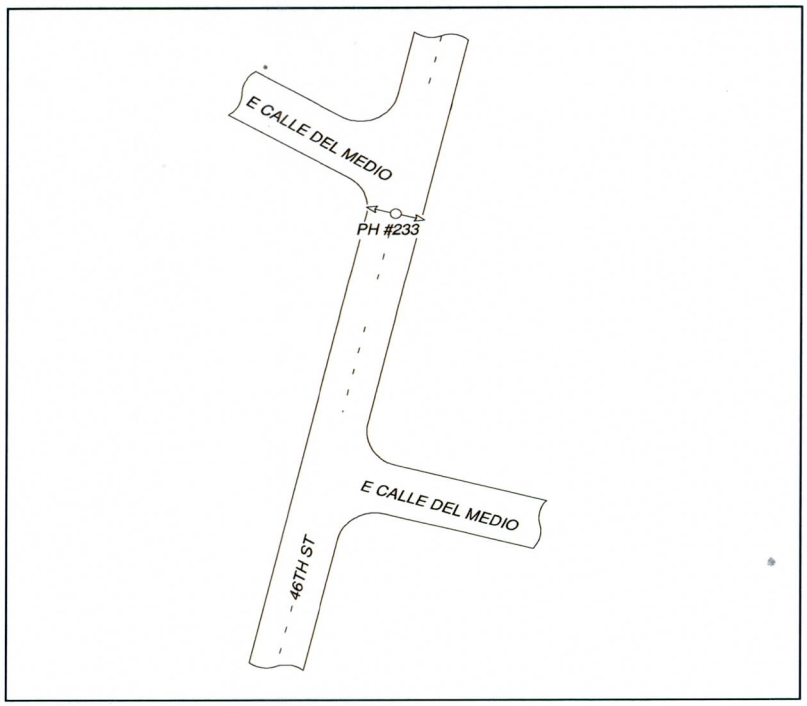
PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	233	SUE Crew	A. Pablo Bello
Date Dug	11/7/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Calle Del Medio		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK
BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42
RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1271.69	WIDTH/O.D. 4.81"	
TOP ELEVATION	1267.13		4.56 TOP DEPTH (FEET)
BOTTOM ELEVATION	1266.73		4.96 BOTTOM (FEET)

COORDINATES: NORTHING 911457.38 EASTING 680149.66

STATIONING: STATION 404+82.75 OFFSET 0.29' LT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 4" TYPE ACP FACILITY OWNER Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	234	SUE Crew	A. Pablo Bello
Date Dug	11/7/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Calle Del Medio		

AZTEC
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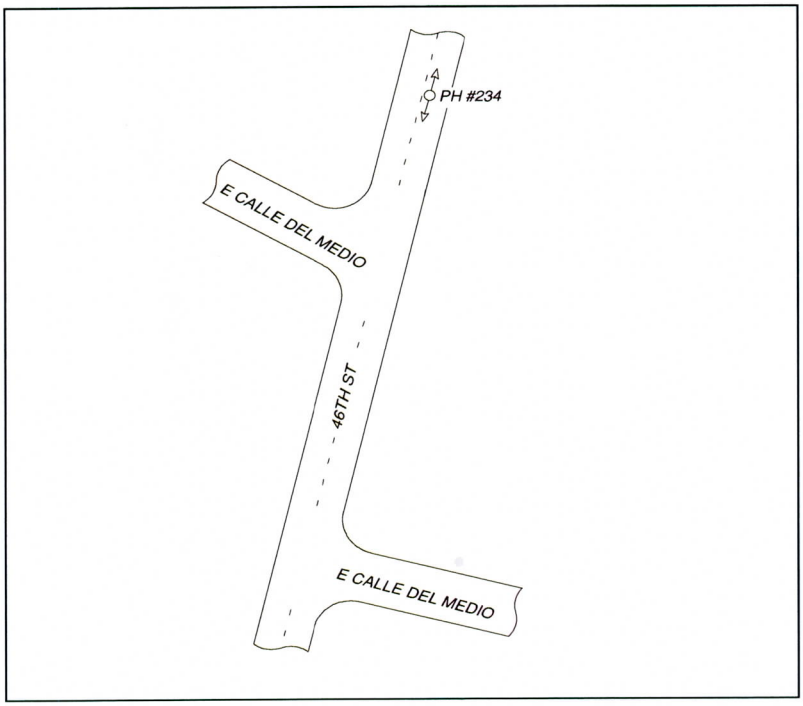
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK	CROSS SECTION - NOT TO SCALE
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING: North SURFACE ELEVATION: 1273.43 WIDTH/O.D.: 9.3" TOP ELEVATION: 1270.53 — 2.90 TOP DEPTH (FEET) BOTTOM ELEVATION: 1269.75 — 3.68 BOTTOM (FEET)
RIBBON COLOR: Blue	

COORDINATES: NORTHING 911587.31 EASTING 680208.74

STATIONING: STATION 406+25.26 OFFSET 7.55' RT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE CIP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	235	SUE Crew	A. Pablo Bello
Date Dug	11/7/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	46th St and Lafayette Blvd		

AZTEC
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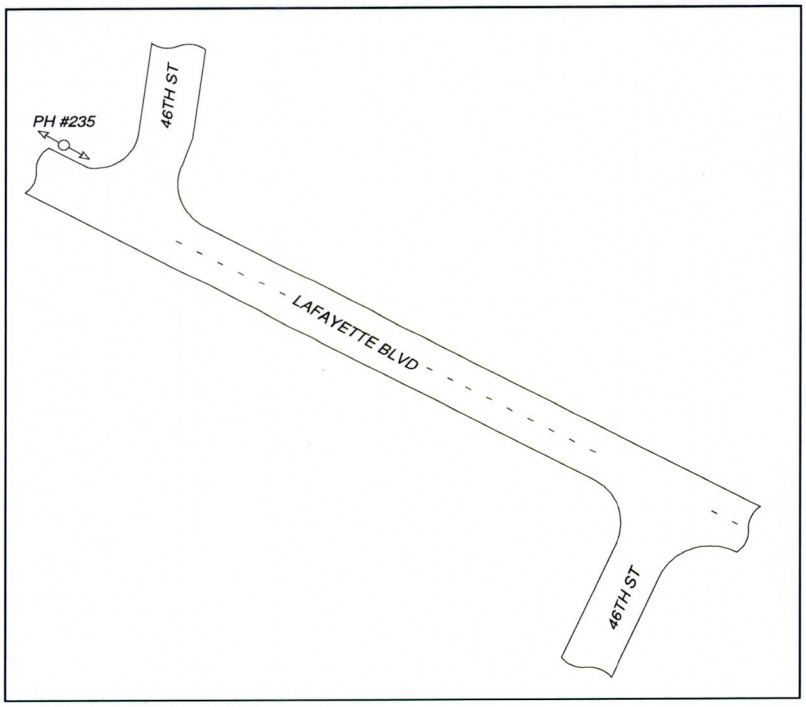
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1263.88	WIDTH/O.D. 10"	
TOP ELEVATION	1260.50	3.38	TOP DEPTH (FEET)
BOTTOM ELEVATION	1259.08	4.80	BOTTOM (FEET)

COORDINATES: NORTHING 911104.03 EASTING 679926.58

STATIONING: STATION 71+04.11 OFFSET 19.84' LT

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE Eight 3.5" TYPE Transite FACILITY OWNER Century Link Communications

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	236	SUE Crew	A. Pablo Bello
Date Dug	11/7/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	45th St and Lafayette Blvd		

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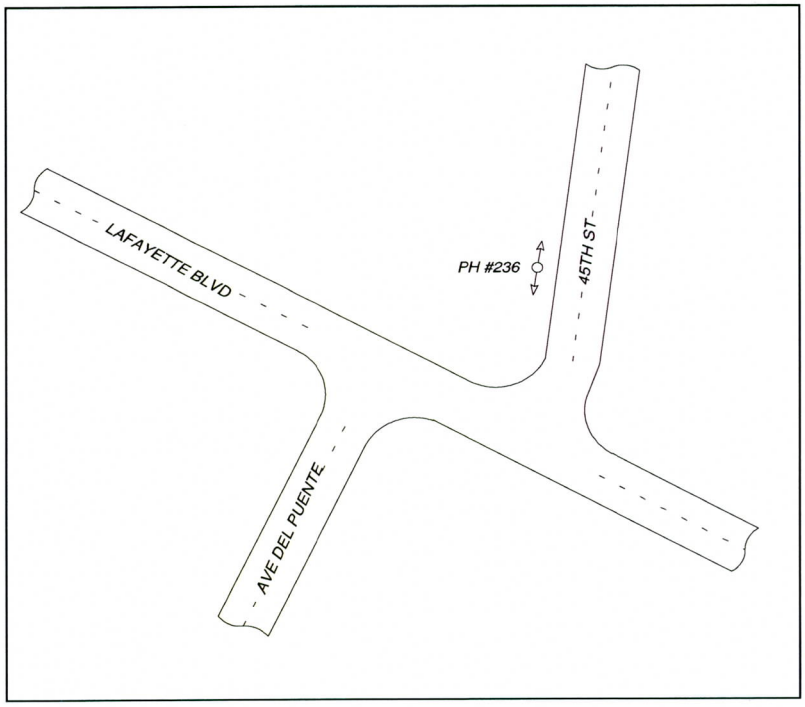
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1265.65	WIDTH/O.D. 6.91"	
TOP ELEVATION	1262.27	3.38	TOP DEPTH (FEET)
BOTTOM ELEVATION	1261.69	3.96	BOTTOM (FEET)

COORDINATES: NORTHING 911638.83 EASTING 679616.33

STATIONING: STATION 64+90.32 OFFSET 94.14' LT

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Dirt

SIZE 6" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	237	SUE Crew	A. Pablo Bello
Date Dug	11/7/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	45th St and Lafayette Blvd		

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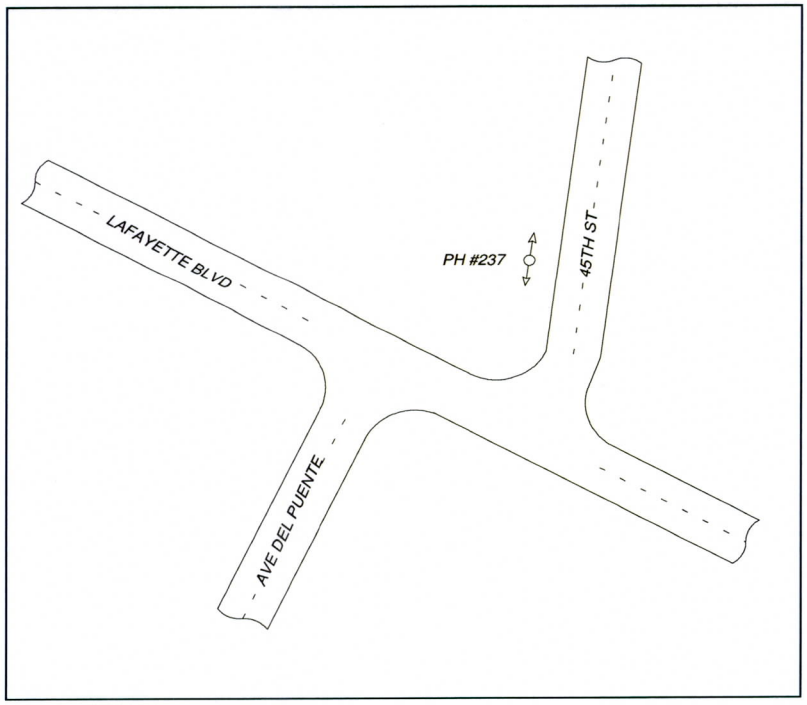
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Yellow

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1265.63	WIDTH/O.D. 2.38"	
TOP ELEVATION	1262.99		2.64 TOP DEPTH (FEET)
BOTTOM ELEVATION	1262.79		2.84 BOTTOM (FEET)

COORDINATES: NORTHING 911639.55 EASTING 679614.62

STATIONING: STATION 64+88.71 OFFSET 93.21' LT

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Done

SIZE 2" TYPE Steel FACILITY OWNER Southwest Gas

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	238	SUE Crew	J. Garcia
Date Dug	11/7/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Avenida Del Puente and Lafayette Blvd		

AZTEC
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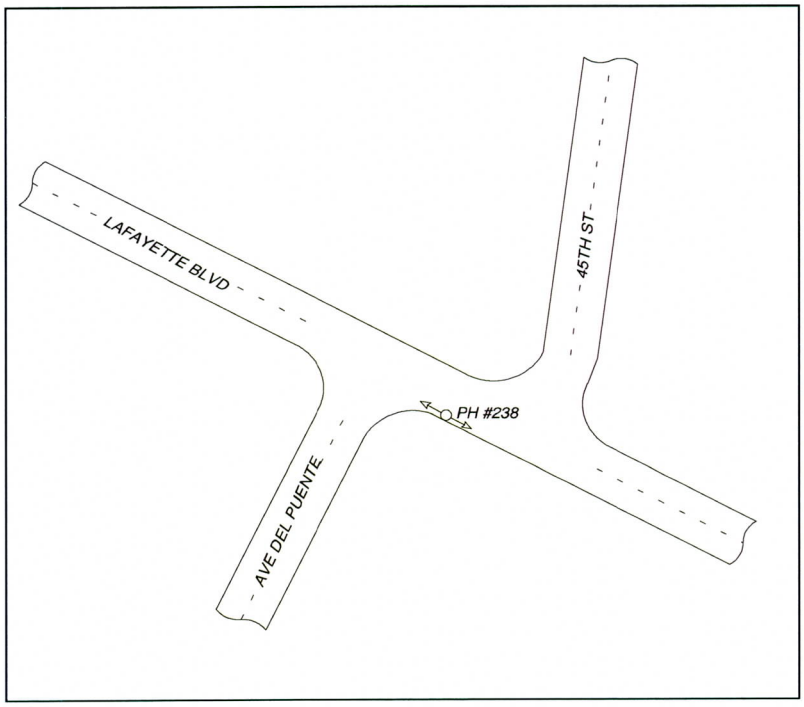
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Yellow

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1264.55	WIDTH/O.D. 2.38	
TOP ELEVATION	1261.69	2.86	TOP DEPTH (FEET)
BOTTOM ELEVATION	1261.49	3.06	BOTTOM (FEET)

COORDINATES: NORTHING 911560.12 EASTING 679533.56

STATIONING: STATION 65+03.33 OFFSET 19.33' RT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 2" TYPE Steel FACILITY OWNER Southwest Gas

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	239	SUE Crew	J. Garcia
Date Dug	11/7/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Avenida Del Puente and Lafayette Blvd		

AZTEC
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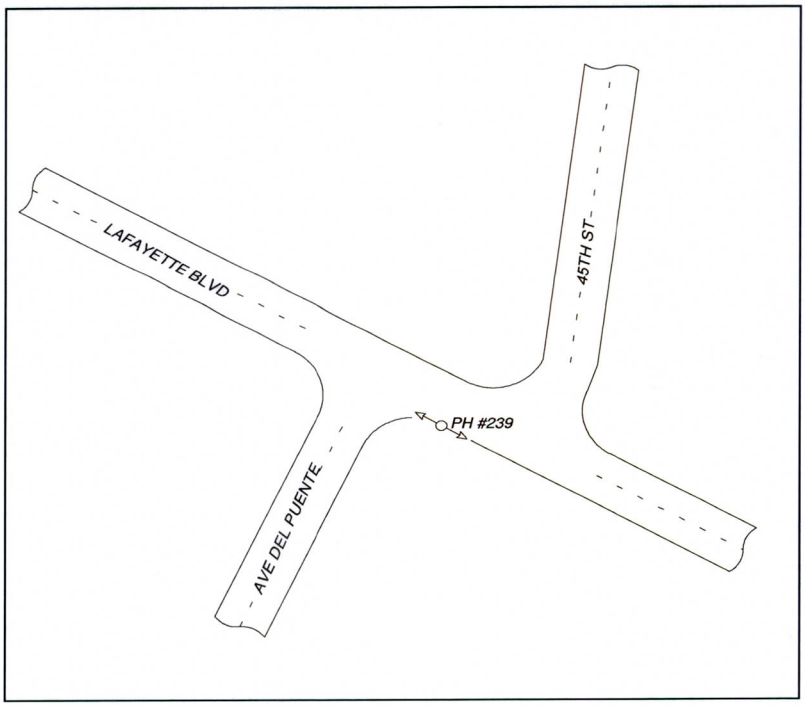
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1264.47	WIDTH/O.D. 9.11	
TOP ELEVATION	1261.43	3.04	TOP DEPTH (FEET)
BOTTOM ELEVATION	1260.67	3.80	BOTTOM (FEET)

COORDINATES:	NORTHING	911560.47	EASTING	679530.78	
STATIONING:	STATION	65+01.37	OFFSET	21.35' RT	
PAVING THICKNESS	6"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	8"	TYPE	ACP	FACILITY OWNER	City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	240	SUE Crew	A. Pablo Bello
Date Dug	11/7/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Lafayette Blvd West of Avenida Del Puente		

AZTEC www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
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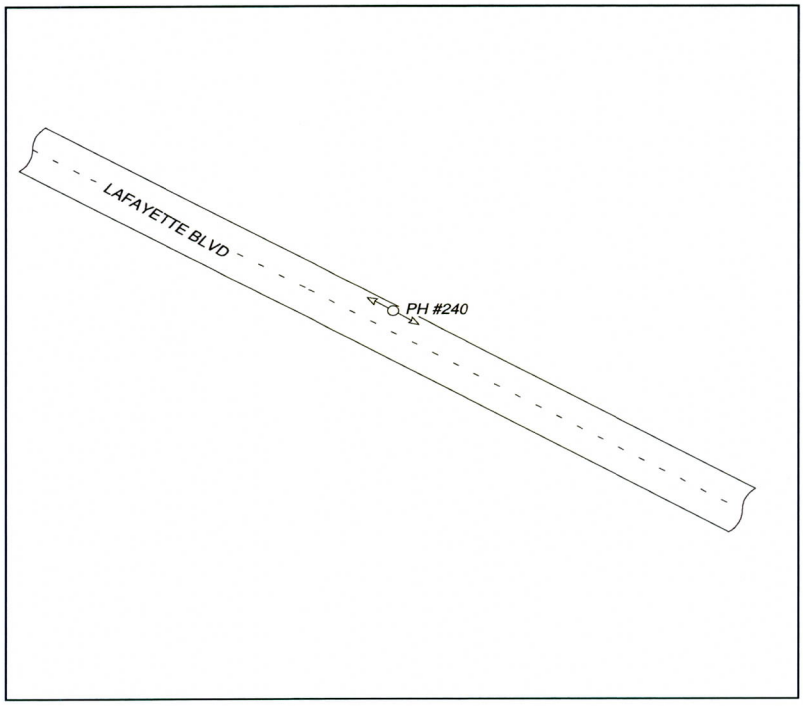
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: East

SURFACE ELEVATION	1264.29	WIDTH/O.D. 11"	
TOP ELEVATION	1260.79	3.50	TOP DEPTH (FEET)
BOTTOM ELEVATION	1259.39	4.90	BOTTOM (FEET)

COORDINATES: NORTHING	911896.97	EASTING	679326.97
STATIONING: STATION	61+09.99	OFFSET	18.54' LT

PAVING THICKNESS	5"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	Eight 3.5"	TYPE	Transite	FACILITY OWNER	Century Link Communications

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	241	SUE Crew	J. Garcia
Date Dug	11/8/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Camelback Rd and Village Dr		

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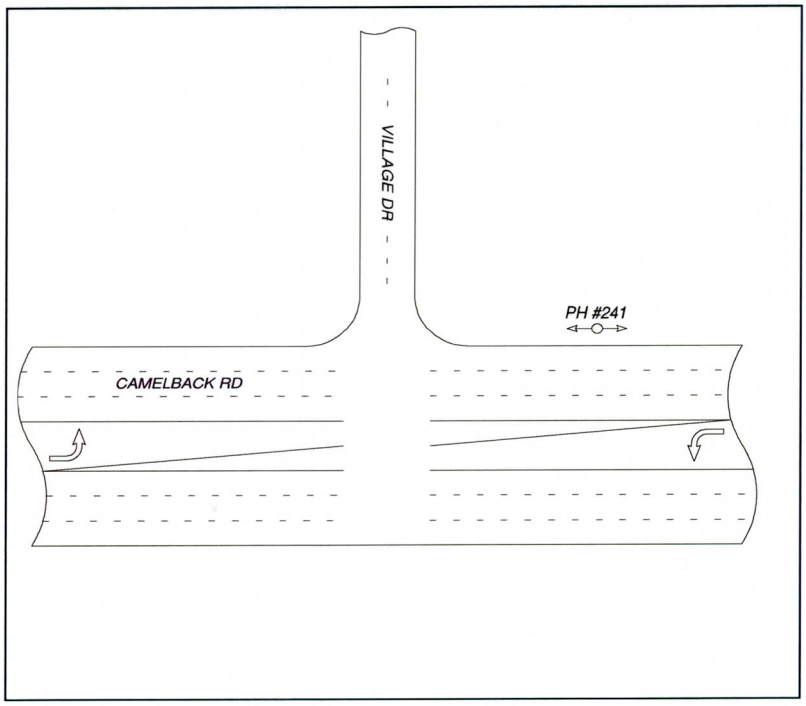
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK	CROSS SECTION - NOT TO SCALE
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING: West SURFACE ELEVATION: 1272.57 WIDTH/O.D.: 2.38 TOP ELEVATION: 1270.51 — 2.06 TOP DEPTH (FEET) BOTTOM ELEVATION: 1270.31 — 2.26 BOTTOM (FEET)
RIBBON COLOR: Orange	

COORDINATES: NORTHING 912939.36 EASTING 679257.89

STATIONING: STATION 506+78.92 OFFSET 73.55' RT

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Dirt

SIZE 2" TYPE PVC FACILITY OWNER Cox Communications

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	242	SUE Crew	A. Pablo Bello
Date Dug	11/8/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

AZTEC
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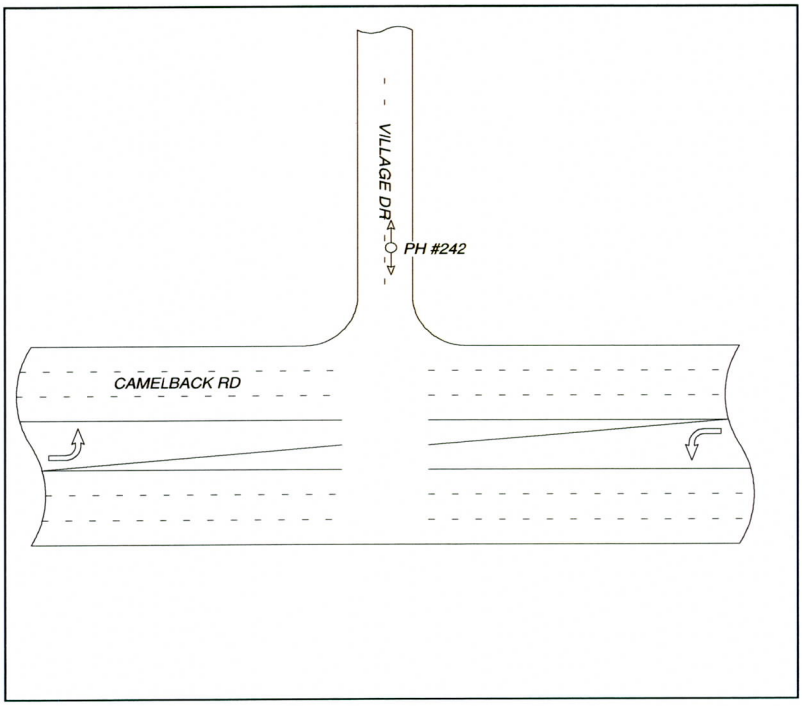
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1272.22	WIDTH/O.D. 9.11	
TOP ELEVATION	1268.42	3.80	TOP DEPTH (FEET)
BOTTOM ELEVATION	1267.66	4.56	BOTTOM (FEET)

COORDINATES:	NORTHING	912990.85	EASTING	679184.03	
STATIONING:	STATION	507+29.03	OFFSET	1.25' LT	
PAVING THICKNESS	5"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	8"	TYPE	ACP	FACILITY OWNER	City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	243	SUE Crew	A. Pablo Bello
Date Dug	11/8/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

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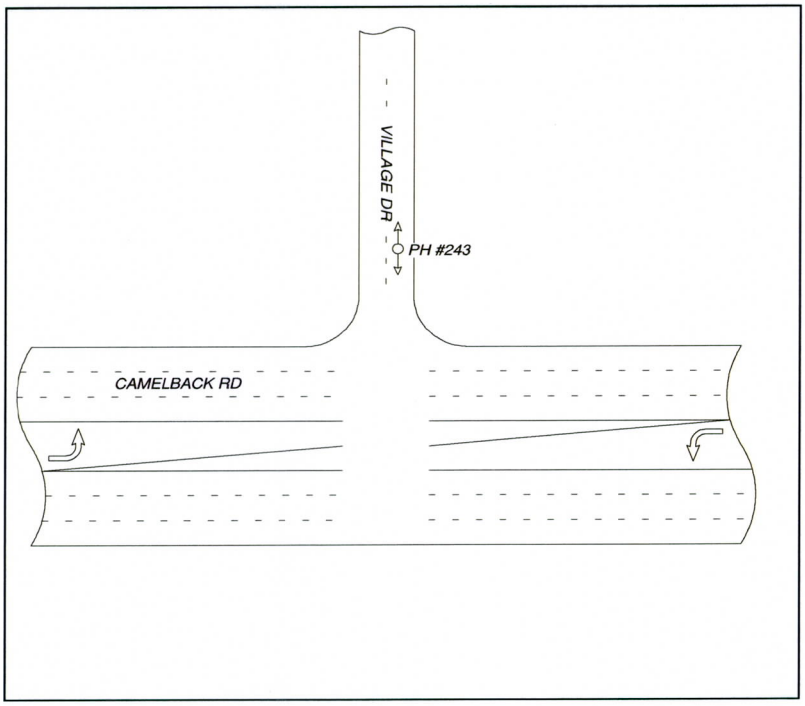
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Yellow

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1272.25	WIDTH/O.D. 2.38"	
TOP ELEVATION	1269.35		2.90 TOP DEPTH (FEET)
BOTTOM ELEVATION	1272.25		BOTTOM (FEET)

COORDINATES: NORTHING 912999.16 EASTING 679199.03

STATIONING: STATION 507+37.61 OFFSET 13.59' RT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 2" TYPE PE FACILITY OWNER Southwest Gas

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	244	SUE Crew	A. Pablo Bello
Date Dug	11/8/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

AZTEC
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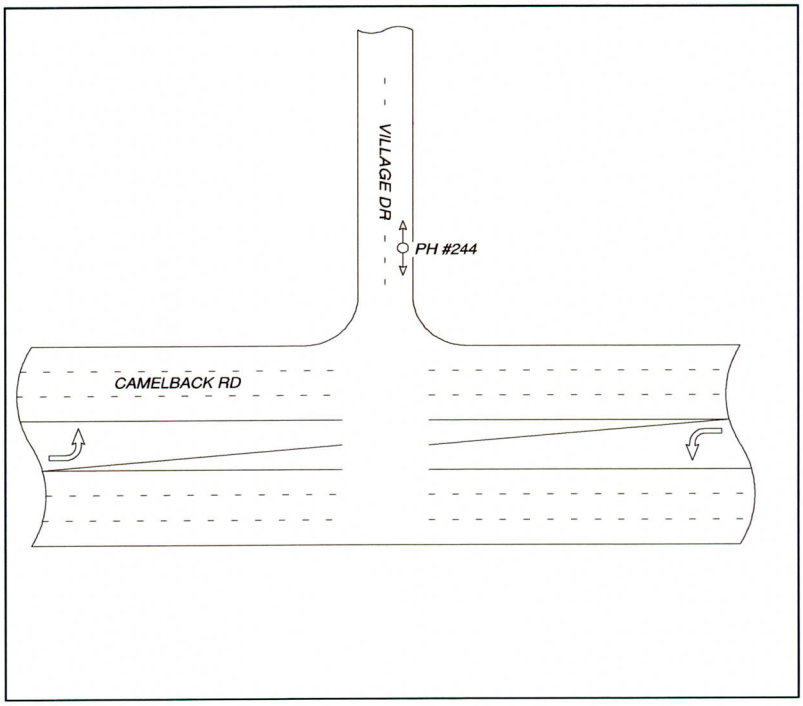
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Red

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1272.18	WIDTH/O.D. 2.5"	
TOP ELEVATION	1267.58		4.60 TOP DEPTH (FEET)
BOTTOM ELEVATION	1267.37		4.81 BOTTOM (FEET)

COORDINATES: NORTHING 912999.55 EASTING 679204.73

STATIONING: STATION 507+38.11 OFFSET 19.28' RT

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE Three .75" TYPE PE FACILITY OWNER Salt River Project Electric

COMMENTS:

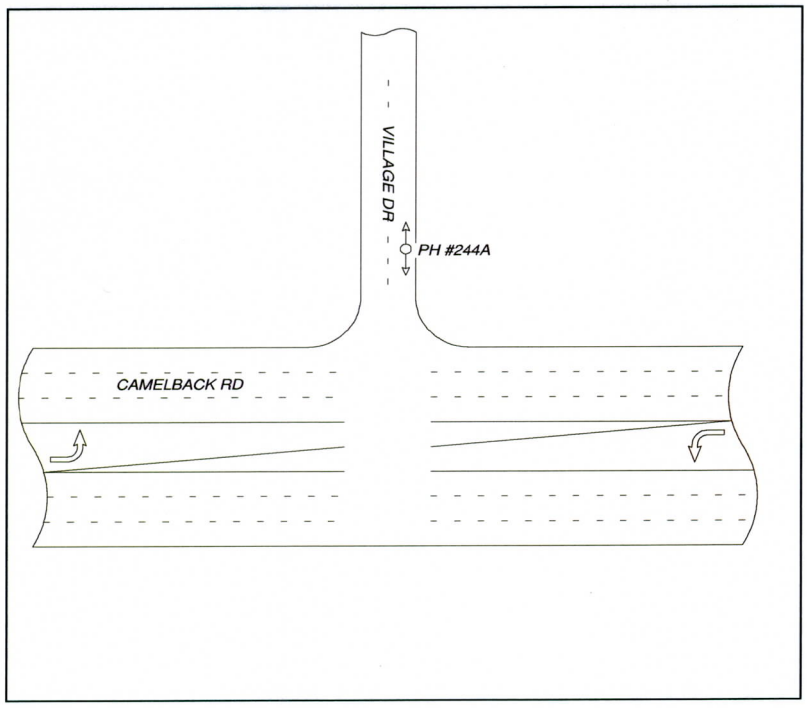
PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	244A	SUE Crew	A. Pablo Bello
Date Dug	11/8/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK	CROSS SECTION - NOT TO SCALE
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING: North SURFACE ELEVATION: 1272.19 WIDTH/O.D.: 1.90" TOP ELEVATION: 1268.43 — 3.76 TOP DEPTH (FEET) BOTTOM ELEVATION: 1268.27 — 3.92 BOTTOM (FEET)
RIBBON COLOR: White	

COORDINATES: NORTHING 912999.64 EASTING 679204.20

STATIONING: STATION 507+38.2 OFFSET 18.75' RT

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 1.5" TYPE PVC FACILITY OWNER Unknown

COMMENTS:

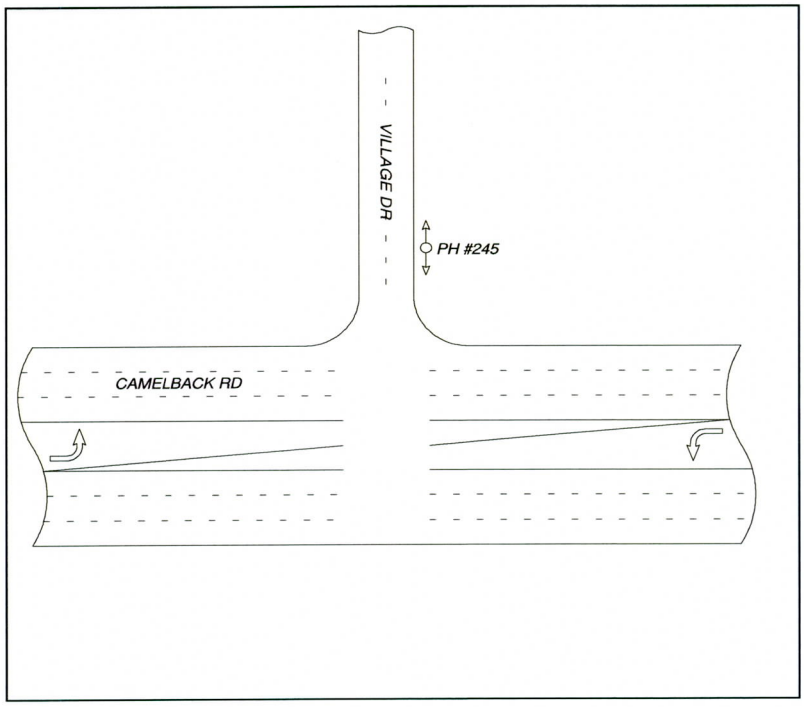
PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	245	SUE Crew	A. Pablo Bello
Date Dug	11/8/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

AZTEC www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1272.81	WIDTH/O.D. 2.38"	
TOP ELEVATION	1270.41	2.40	TOP DEPTH (FEET)
BOTTOM ELEVATION	1270.21	2.60	BOTTOM (FEET)

COORDINATES:	NORTHING	912998.97	EASTING	679210.40	
STATIONING:	STATION	507+37.64	OFFSET	24.96' RT	
PAVING THICKNESS	None	PAVING TYPE	None	SOIL CONDITION	Dirt
SIZE	2"	TYPE	PVC	FACILITY OWNER	Cox Communications

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	246	SUE Crew	A. Pablo Bello
Date Dug	11/9/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

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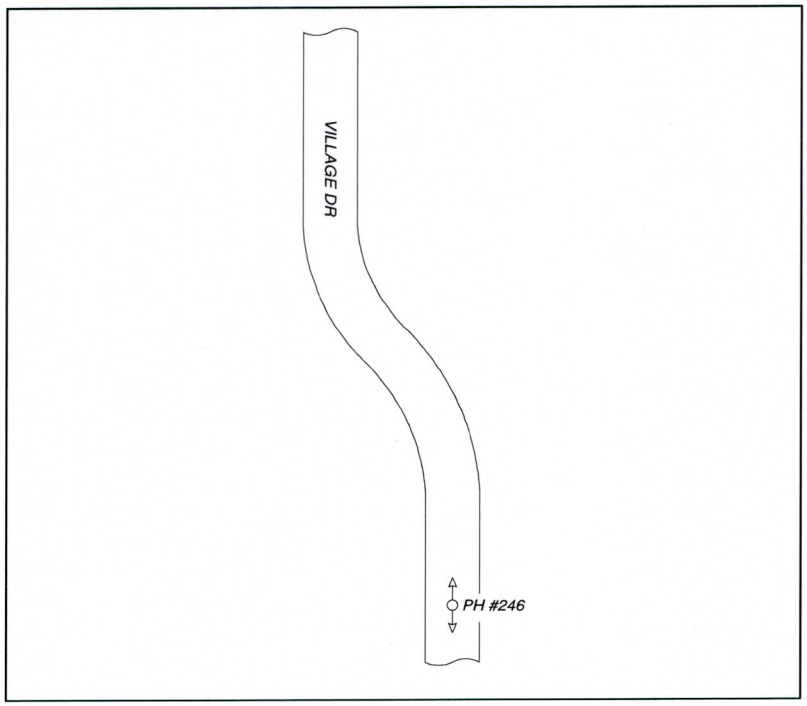
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1272.72	WIDTH/O.D. 9.11"	
TOP ELEVATION	1269.52		3.20 TOP DEPTH (FEET)
BOTTOM ELEVATION	1268.76		3.96 BOTTOM (FEET)

COORDINATES: NORTHING 913221.20 EASTING 679187.90

STATIONING: STATION 509+59.41 OFFSET 1.66' LT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	246A	SUE Crew	A. Pablo Bello
Date Dug	11/11/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

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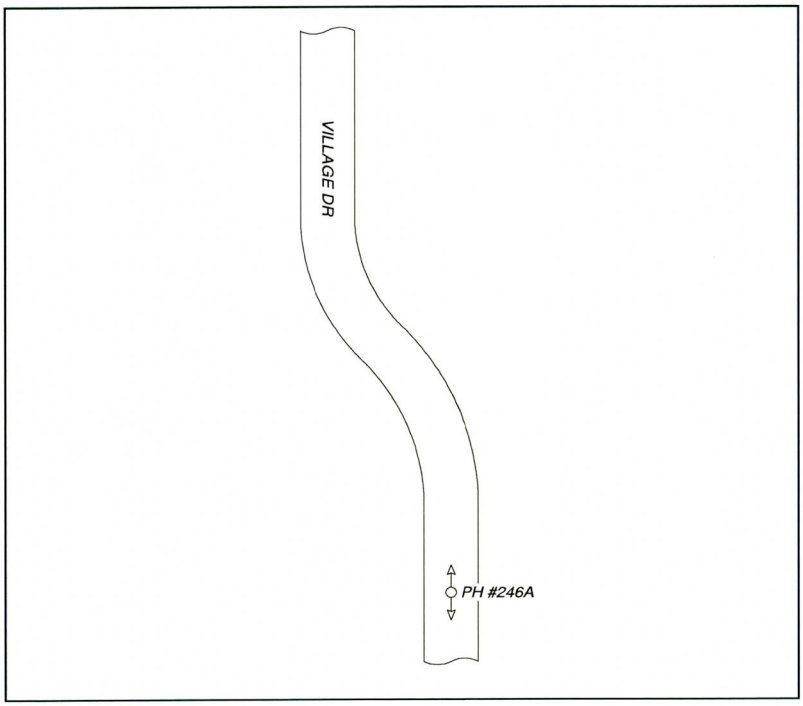
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1272.78	WIDTH/O.D. 9.11"	
TOP ELEVATION	1269.54	3.24	TOP DEPTH (FEET)
BOTTOM ELEVATION	1268.78	4.00	BOTTOM (FEET)

COORDINATES: NORTHING	913225.95	EASTING	679188.06
STATIONING: STATION	509+64.16	OFFSET	1.60' LT
PAVING THICKNESS	4"	PAVING TYPE	Asphalt
SOIL CONDITION	Dirt		
SIZE	8"	TYPE	ACP
FACILITY OWNER	City of Phoenix Water		

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	246B	SUE Crew	A. Pablo Bello
Date Dug	11/11/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

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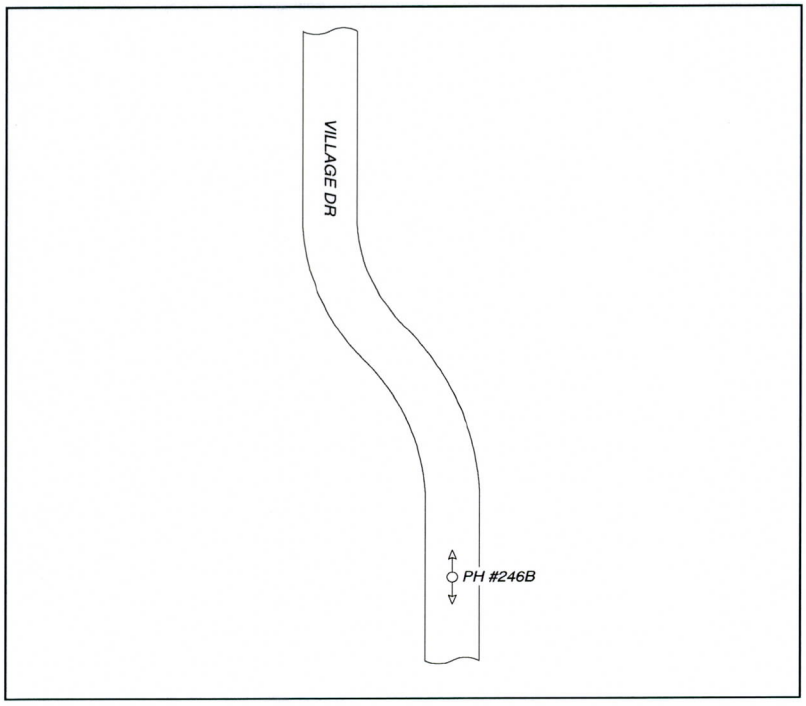
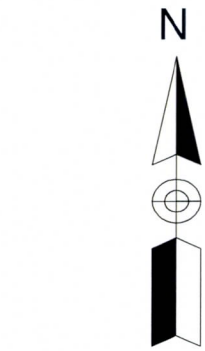
LOCATION PLAN - NOT TO SCALE





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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1272.57	WIDTH/O.D. 9.11"	
TOP ELEVATION	1269.31	3.26	TOP DEPTH (FEET)
BOTTOM ELEVATION	1268.55	4.02	BOTTOM (FEET)

COORDINATES:	NORTHING	913231.98	EASTING	679188.11	
STATIONING:	STATION	509+70.19	OFFSET	1.66' LT	
PAVING THICKNESS	4"	PAVING TYPE	Asphalt	SOIL CONDITION	Dirt
SIZE	8"	TYPE	ACP	FACILITY OWNER	City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	246C	SUE Crew	A. Pablo Bello
Date Dug	11/11/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

AZTEC
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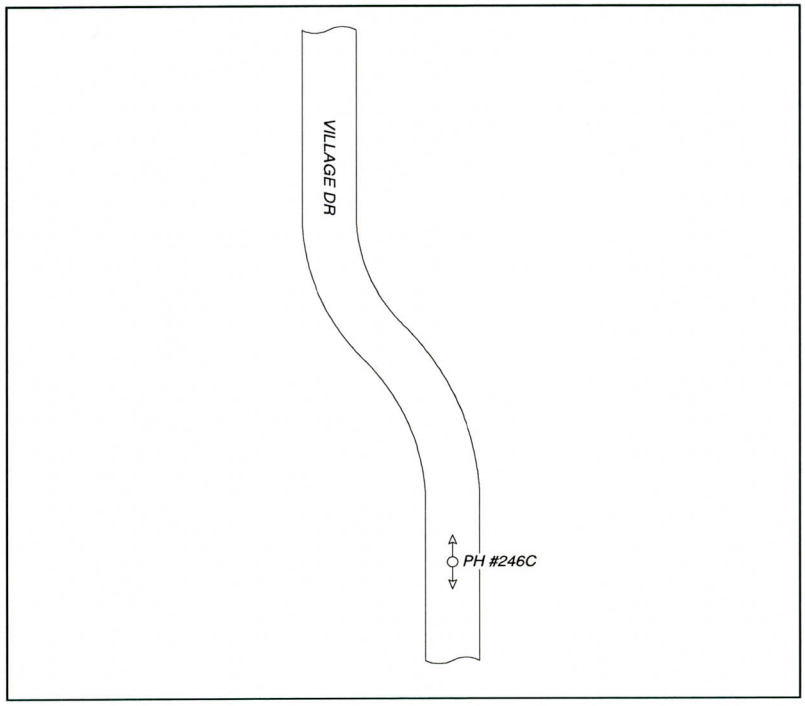
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1272.66	WIDTH/O.D. 9.11"	
TOP ELEVATION	1269.43	3.23	TOP DEPTH (FEET)
BOTTOM ELEVATION	1268.67	3.99	BOTTOM (FEET)

COORDINATES: NORTHING 913238.99 EASTING 679188.05

STATIONING: STATION 509+77.20 OFFSET 1.84' LT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	247	SUE Crew	J. Garcia
Date Dug	11/8/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

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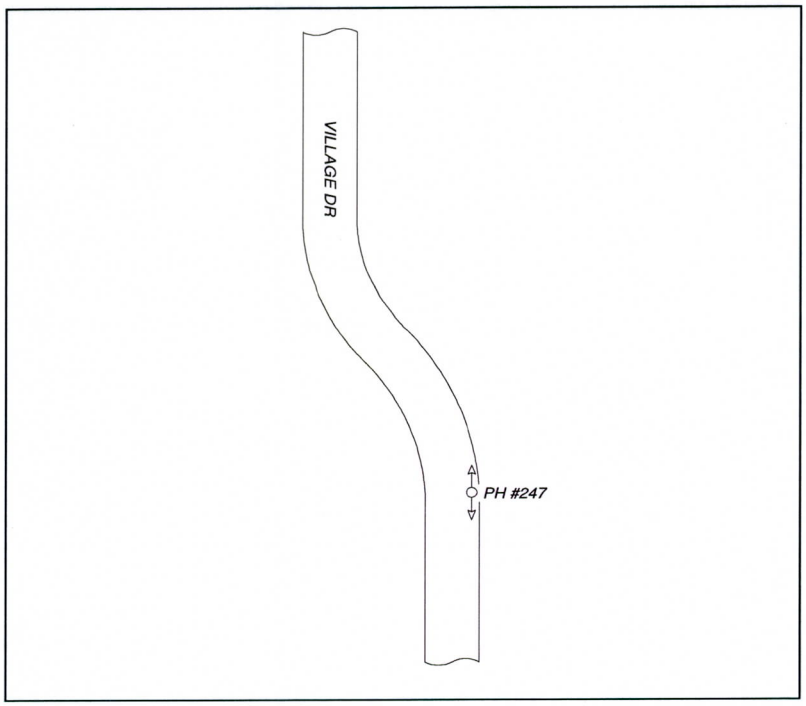
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK
BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42
RIBBON COLOR: Yellow

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1272.47	WIDTH/O.D. 2.38"	
TOP ELEVATION	1269.83		2.64 TOP DEPTH (FEET)
BOTTOM ELEVATION	1269.63		2.84 BOTTOM (FEET)

COORDINATES: NORTHING 913297.70 EASTING 679203.23

STATIONING: STATION 510+30.71 OFFSET 18.68' RT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 2" TYPE PE FACILITY OWNER Southwest Gas

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	248	SUE Crew	J. Garcia
Date Dug	11/9/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

AZTEC www.aztec.us TYPSA group
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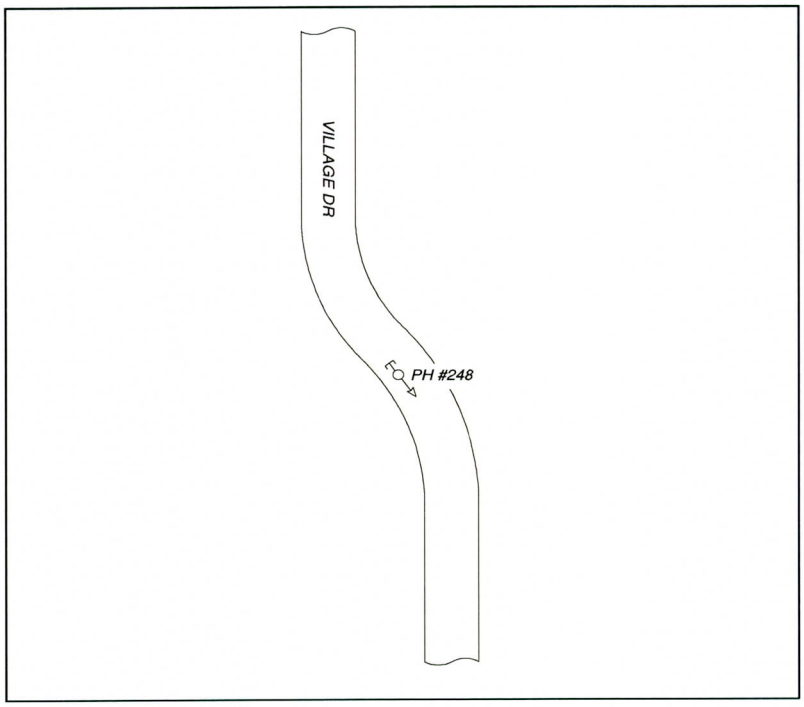
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1272.66	WIDTH/O.D. 9.11	
TOP ELEVATION	1269.35	3.31	TOP DEPTH (FEET)
BOTTOM ELEVATION	1268.59	4.07	BOTTOM (FEET)

COORDINATES: NORTHING	913367.47	EASTING	679169.95
STATIONING: STATION	510+92.22	OFFSET	32.79' RT
PAVING THICKNESS	4"	PAVING TYPE	Asphalt
SOIL CONDITION	Dirt		
SIZE	8"	TYPE	ACP
FACILITY OWNER	City of Phoenix Water		

COMMENTS:

PREPARED BY: J. Cherry

CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	249	SUE Crew	A. Pablo Bello
Date Dug	11/9/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

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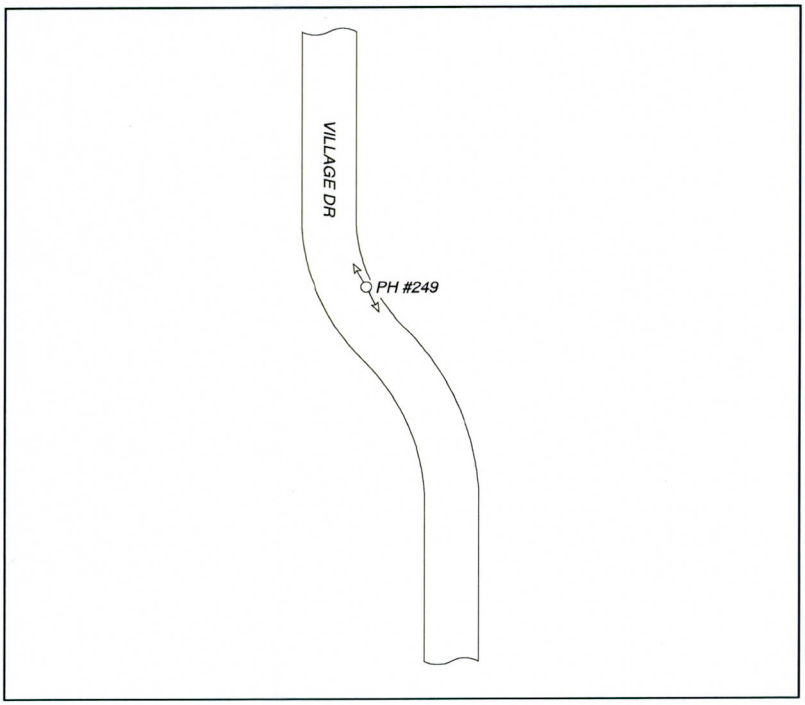
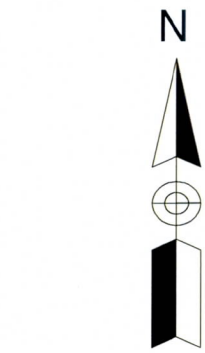
LOCATION PLAN - NOT TO SCALE





EXPIRES 09/30/2012

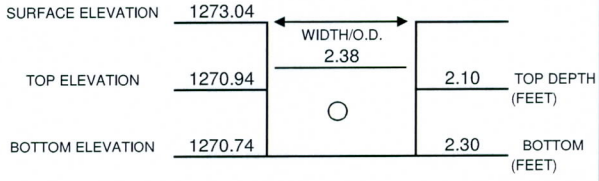
SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Yellow

CROSS SECTION - NOT TO SCALE

FACING: North



COORDINATES: NORTHING 913431.45 EASTING 679132.88

STATIONING: STATION 511+96.10 OFFSET 23.43' RT

PAVING THICKNESS 4" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 2" TYPE PE FACILITY OWNER Southwest Gas

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	250	SUE Crew	J. Garcia
Date Dug	11/8/2011	Truck #	9218
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	44th St and Colter St		

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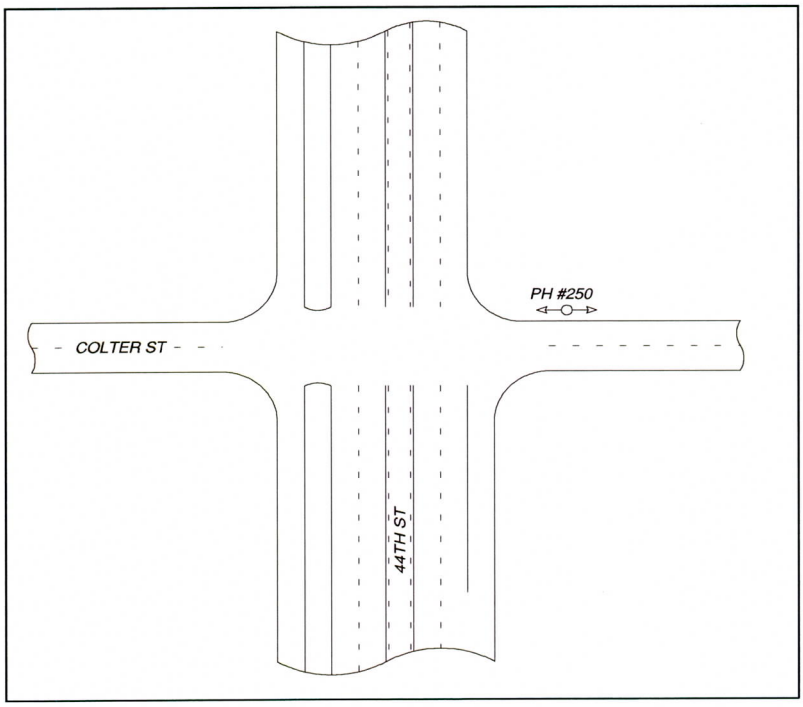
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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REGISTERED LAND SURVEYOR
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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Blue

CROSS SECTION - NOT TO SCALE

FACING: West

SURFACE ELEVATION	1270.52	WIDTH/O.D. 9.11"	
TOP ELEVATION	1268.50	2.02	TOP DEPTH (FEET)
BOTTOM ELEVATION	1267.74	2.78	BOTTOM (FEET)

COORDINATES: NORTHING 913951.43 EASTING 678742.60

STATIONING: STATION 236+97.45 OFFSET 78.27' RT

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	251	SUE Crew	A. Pablo Bello
Date Dug	11/9/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	44th St and Colter St		

AZTEC
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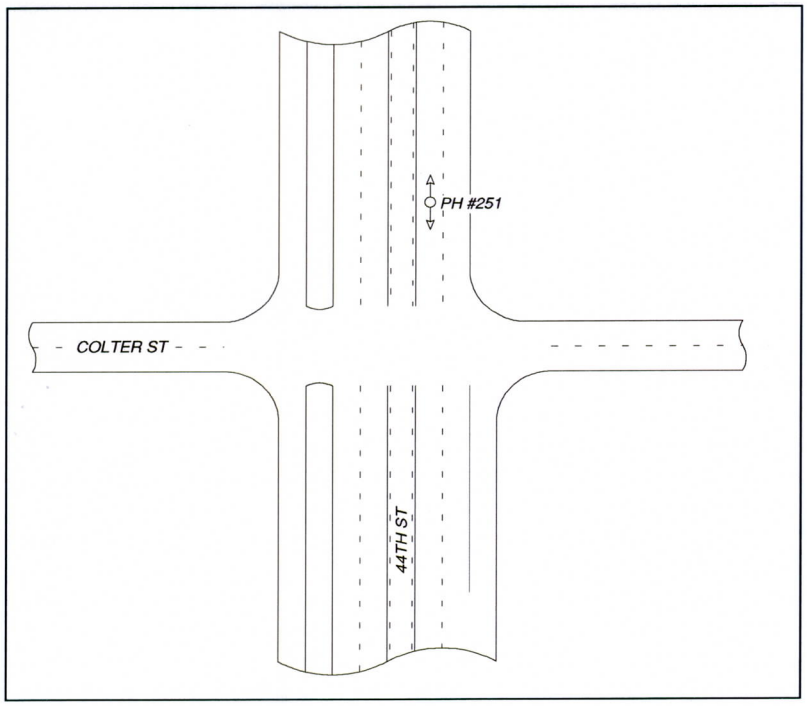
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Yellow

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1270.92	WIDTH/O.D. 8.63"	
TOP ELEVATION	1267.14	3.78	TOP DEPTH (FEET)
BOTTOM ELEVATION	1266.42	4.50	BOTTOM (FEET)

COORDINATES: NORTHING 914040.00 EASTING 678680.82

STATIONING: STATION 237+84.91 OFFSET 14.92' RT

PAVING THICKNESS 5" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE Steel FACILITY OWNER Southwest Gas

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	252	SUE Crew	J. Garcia
Date Dug	11/9/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	44th St and Colter St		

AZTEC
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4561 East McDowell Road, Phoenix, AZ 85008-4504
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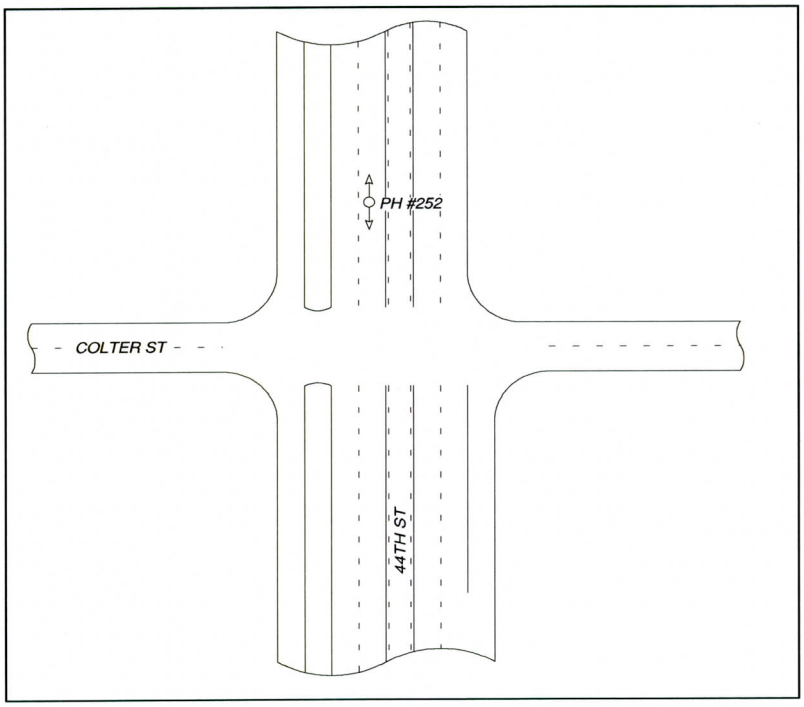
LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Yellow

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1271.03	WIDTH/O.D. 2.38"	
TOP ELEVATION	1266.95	4.08	TOP DEPTH (FEET)
BOTTOM ELEVATION	1266.75	4.28	BOTTOM (FEET)

COORDINATES: NORTHING 914038.88 EASTING 678651.75

STATIONING: STATION 237+83.26 OFFSET 14.13' LT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 2' TYPE Steel FACILITY OWNER Southwest Gas

COMMENTS:

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	253	SUE Crew	J. Garcia
Date Dug	11/9/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	44th St and Colter St		

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LOCATION PLAN - NOT TO SCALE

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SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR None

CROSS SECTION - NOT TO SCALE

FACING _____

SURFACE ELEVATION _____ WIDTH/O.D. _____

TOP ELEVATION 0.00 TOP DEPTH (FEET) _____

BOTTOM ELEVATION 0.00 BOTTOM (FEET) _____

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION None

SIZE None TYPE None FACILITY OWNER Century Link Communications

COMMENTS:

No facility in the requested location per ELM Blue Stake locator.

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	254	SUE Crew	J. Garcia
Date Dug	11/9/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	44th St and Colter St		

AZTEC
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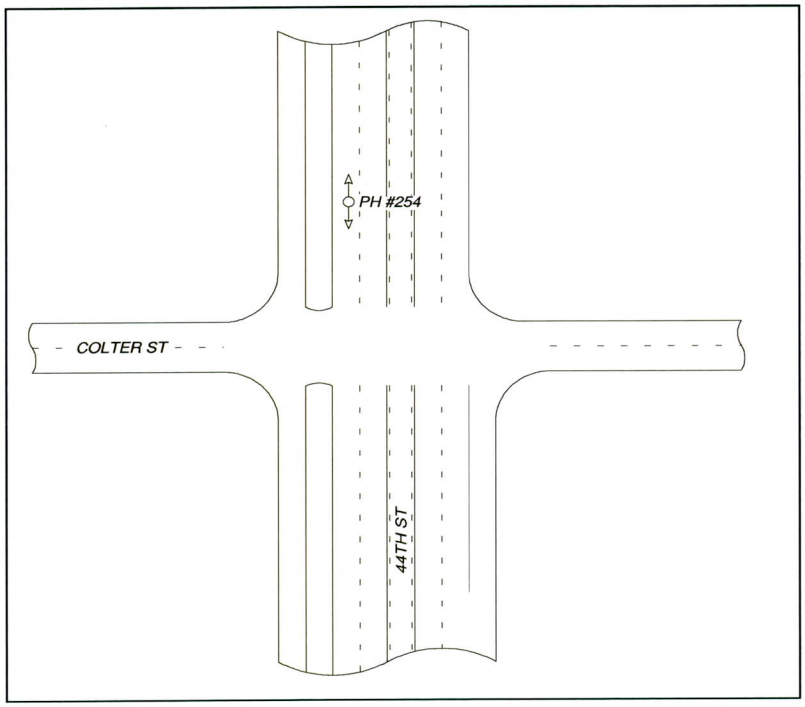
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



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SITE BENCHMARK	CROSS SECTION - NOT TO SCALE			
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING: North			
	SURFACE ELEVATION: 1270.84	WIDTH/O.D. 9.11"		
	TOP ELEVATION: 1266.64		4.20	TOP DEPTH (FEET)
	BOTTOM ELEVATION: 1265.88		4.96	BOTTOM (FEET)
RIBBON COLOR: Blue				

COORDINATES: NORTHING 914042.31 EASTING 678644.80

STATIONING: STATION 237+86.57 OFFSET 21.14' LT

PAVING THICKNESS 6" PAVING TYPE Asphalt SOIL CONDITION Dirt

SIZE 8" TYPE ACP FACILITY OWNER City of Phoenix Water

COMMENTS:

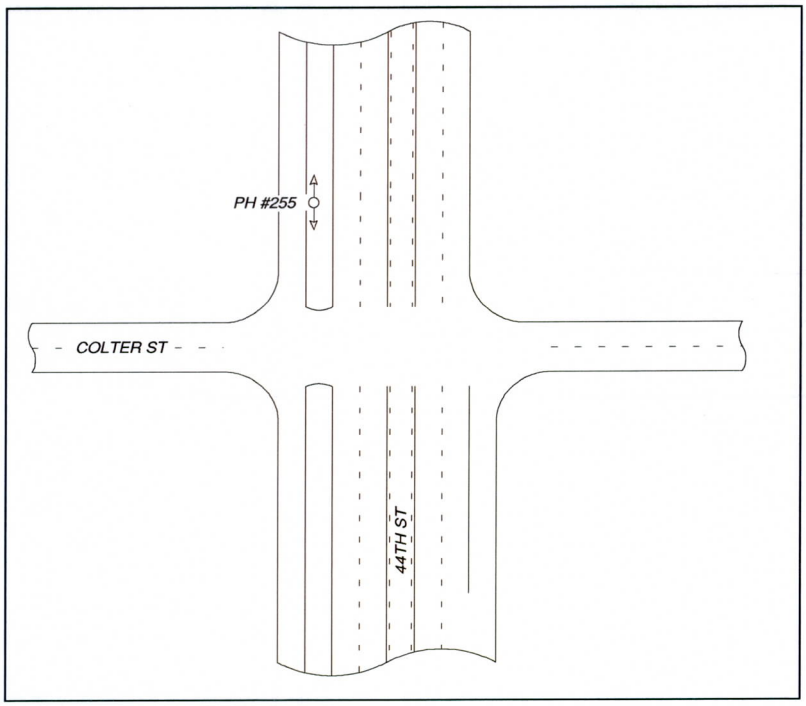
PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	255	SUE Crew	J. Garcia
Date Dug	11/11/2011	Truck #	557
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	44th St and Colter St		

AZTEC www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



EXPIRES 09/30/2012

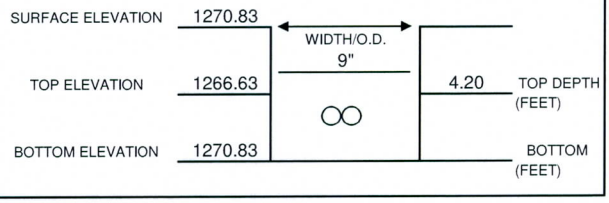
SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: North



COORDINATES: NORTHING 914039.21 EASTING 678628.93

STATIONING: STATION 237+83.18 OFFSET 36.95' LT

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION Dirt

SIZE Two 3.5" TYPE Transite FACILITY OWNER Century Link Communications

COMMENTS:

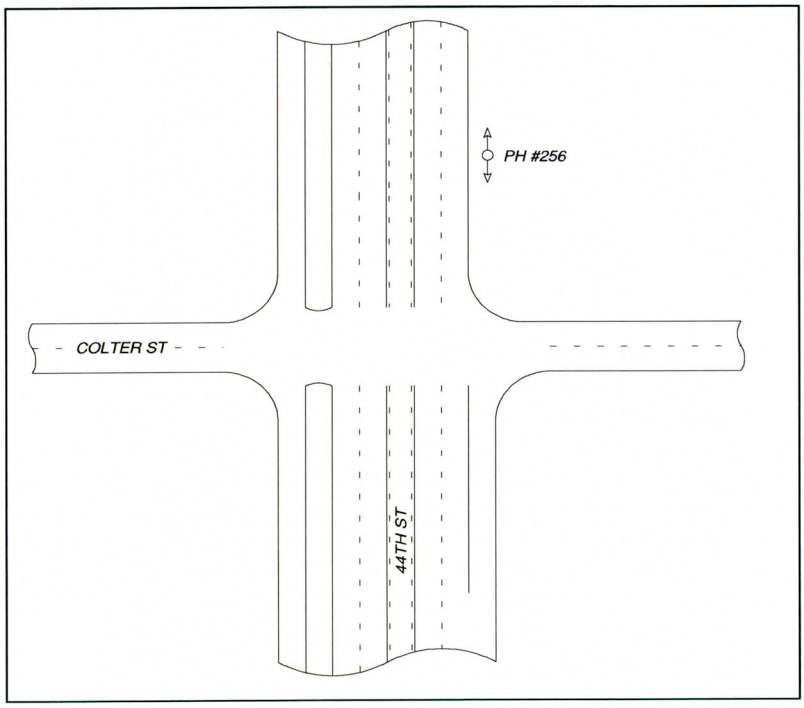
PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	256	SUE Crew	A. Pablo Bello
Date Dug	11/9/2011	Truck #	558
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	44th St and Colter St		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



N

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
35316
CHAD
HUBER
Date Signed .....
ARIZONA, U.S.A.

EXPIRES 09/30/2012

SITE BENCHMARK

BM = BCHH at Lafayette Blvd and Arcadia Dr.
ELEV = 1264.42

RIBBON COLOR: Orange

CROSS SECTION - NOT TO SCALE

FACING: North

SURFACE ELEVATION	1271.04	WIDTH/O.D. 4.5	
TOP ELEVATION	1268.24	2.80	TOP DEPTH (FEET)
BOTTOM ELEVATION	1267.86	3.18	BOTTOM (FEET)

COORDINATES: NORTHING 914058.62 EASTING 678707.62

STATIONING: STATION 238+04 OFFSET 41.38' RT

PAVING THICKNESS 4" PAVING TYPE Concrete SOIL CONDITION Dirt

SIZE 4" TYPE PVC FACILITY OWNER Century Link Communications

COMMENTS:

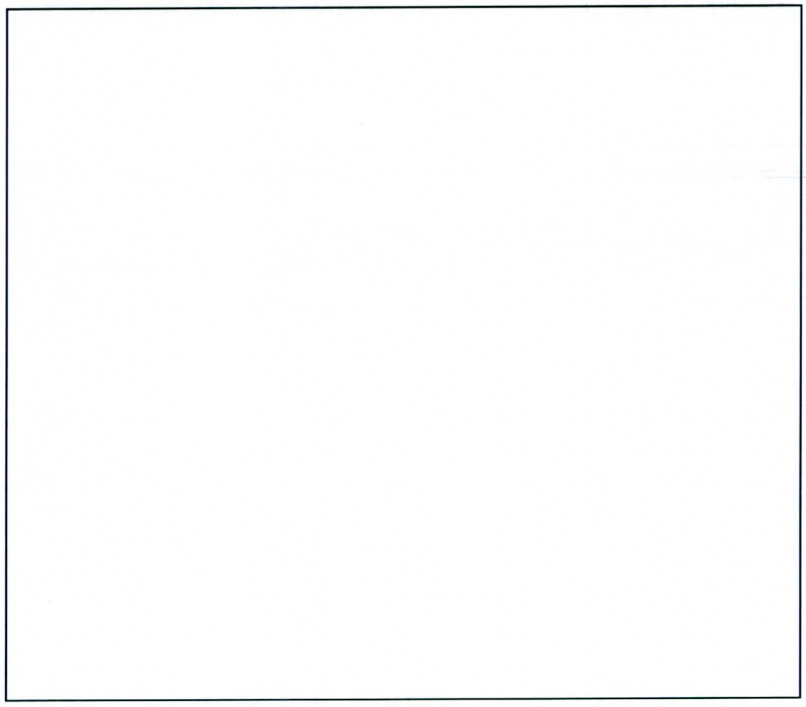
PREPARED BY: J. Cherry CHECKED BY: A. Mehler

TEST HOLE DATA REPORT

Test Hole #	257	SUE Crew	J. Brandt
Date Dug	11/11/2011	Truck #	543
Project #	AZE1101	City	Phoenix
Phase #	009	County	Maricopa
Location	Village Dr north of Camelback Rd		

AZTEC
www.aztec.us TYPSA group
4561 East McDowell Road, Phoenix, AZ 85008-4504
Tel. (602) 454-0402 Fax. (602) 458-9359

LOCATION PLAN - NOT TO SCALE



EXPIRES 09/30/2012

SITE BENCHMARK	CROSS SECTION - NOT TO SCALE
BM = BCHH at Lafayette Blvd and Arcadia Dr. ELEV = 1264.42	FACING _____ SURFACE ELEVATION _____ WIDTH/O.D. _____ TOP ELEVATION 0.00 TOP DEPTH (FEET) _____ BOTTOM ELEVATION 0.00 BOTTOM (FEET) _____
RIBBON COLOR None	

COORDINATES: NORTHING None EASTING None

STATIONING: STATION None OFFSET None

PAVING THICKNESS None PAVING TYPE None SOIL CONDITION None

SIZE None TYPE None FACILITY OWNER Century Link Communications

COMMENTS:

No facility in the requested location per ELM Blue Stake Locator.

PREPARED BY: J. Cherry CHECKED BY: A. Mehler

Appendix G

Geotechnical Investigation Report

GEOTECHNICAL EXPLORATION
LAFAYETTE INTERCEPTOR DRAIN AND OUTLET - FINAL DESIGN
CAMELBACK ROAD AND 46TH STREET
PHOENIX, ARIZONA

PROJECT # 110009

atek
ENGINEERING CONSULTANTS

Prepared by:
ATEK Engineering Consultants, LLC
1114 Grand Avenue
Phoenix, Arizona 85007

Expires 9/30/2012

November 29, 2011

atek
ENGINEERING CONSULTANTS

November 29, 2011
ATEK Project #110009

Olsson Associates
7250 N 16th Street, Suite 210
Phoenix, Arizona 85020

Attention: Mr. Jeff Ford, P.E.

RE: GEOTECHNICAL EXPLORATION
Lafayette Interceptor Drain and Outlet - Final Design
Phoenix, Arizona

Dear Mr. Ford:

ATEK Engineering Consultants, LLC is pleased to present the attached geotechnical Exploration Report for the proposed Lafayette Interceptor Drain and Outlet located along Lafayette Boulevard in Phoenix, Arizona. The purpose of our investigation was to explore and evaluate the subsurface conditions in order to develop geotechnical engineering recommendations for project design and construction.

Based on our findings, the site is considered suitable for the proposed construction, provided geotechnical recommendations presented in the attached reports are followed. Specific recommendations regarding the geotechnical aspects of project design and construction are presented in the attached report.

The recommendations contained within this report are dependent on the provisions provided in the Limitations and Recommended Additional Services sections of this report.

We appreciate the opportunity of providing our services for this project. If you have questions regarding this report or if we may be of further assistance, please contact the undersigned.

Sincerely,

ATEK Engineering Consultants, LLC

Registered Professional Engineer (Civil)
CERTIFICATE NO.
39511
ARMANDO
ORTEGA
Date Signed 11/29/11
ARIZONA, U.S.A.

Armando Ortega, P.E.
Principal Geotechnical Engineer

Expires 9/30/2012

atek
ENGINEERING CONSULTANTS

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Expires 9/30/2012

1. INTRODUCTION

This report presents the results of our geotechnical exploration for the proposed Lafayette Interceptor Drain and Outlet to be constructed near Camelback Road and 46TH Street in Phoenix, Arizona. A Site Location Map is presented in **Appendix A**. The following sections of this report describe our understanding of the project and our scope of services.

1.1. Proposed Project

The proposed project consists of approximately 8,000 linear feet of storm drain to be installed along Arcadia Drive, north of the Arizona Canal, to Lafayette Boulevard to 44th Street and north from Lafayette Boulevard to Colter Street along the Village Drive alignment in Phoenix, Arizona. Proposed construction for this project will include the installation of concrete reinforced storm drain pipe ranging in size from 18 to 102-inch diameter. In addition the project will include the construction of several drop structures and headwalls. The depth of storm drain ranges between approximately 15 and 30 feet below existing grade.

1.2. Purpose

The purpose of this geotechnical exploration was to evaluate the general surface and subsurface conditions at the subject site, and to present recommendations related to geotechnical aspects of design and construction of the proposed storm drain.

1.3. Scope of Services

Our study included a site reconnaissance, subsurface exploration, soil sampling, field and laboratory testing, engineering analyses, and preparation of this report. This report presents geotechnical recommendations for design and construction of proposed storm drain. The recommendations contained in this report are subject to

the limitations presented herein. Attention is directed to the "Limitations" section of this report.

2. FIELD EXPLORATION

The field exploration was performed between May 20, 2011 and July 12, 2011. The field exploration consisted of drilling thirteen soil borings to depths ranging from approximately twenty (20) feet to forty (40) feet below existing ground level. The soil test borings were drilled using Diedrich D-120 power drill rig equipped with an 8-inch hollow stem augers and automatic hammer. The borings were located in the field at the approximate locations shown on the sample location plan included in the **Appendix B** of this report.

Prior to the start of drilling, the Arizona Blue Stake Center was contacted to locate existing utilities at the boring locations. Upon completion of the borings, the boreholes were backfilled with excavated materials and the pavement was patched with cold mix asphalt.

Disturbed and relatively undisturbed samples were taken at the direction of the field engineer during drilling. Relatively undisturbed samples of the subsurface materials were obtained using a California sampler with a 2.5-inch inside diameter and a 3.0-inch outside diameter. Disturbed samples were obtained using a Standard Penetration/Split Spoon Sampler (SPT) with a 1.5-inch inside diameter and 2.0-inch outside diameter. The California and the SPT samplers were driven 12 and 18 inches, respectively, using a 140-pound hammer falling 30 inches, and blow counts for successive 6-inch penetration intervals were recorded. After the sampler was withdrawn from the borehole, the samples were removed, sealed to minimize moisture loss, and submitted to the laboratory.

Soil classifications made in the field from auger cuttings and samples were re-evaluated in the laboratory after further examination and testing. The soils were classified in accordance with the Unified Soil Classification System presented on C-1 **in Appendix C**.

Sample classifications, blow counts recorded during sampling, and other related information, were recorded on the soil boring logs. The boring logs for B-1 through B-13 are presented in **Appendix C**.

3. LABORATORY TESTING

Selected soil samples from the borings were tested in the laboratory for classification purposes and to evaluate their engineering properties. The laboratory tests included:

- Gradation;
- Atterberg limits;
- Moisture content;
- Undisturbed ring density;
- Consolidation tests;
- Sulfate content;
- Chloride content;
- Swell tests;
- pH tests;
- And resistivity tests.

A brief description of each test performed on the soil samples and the results are presented in **Appendix D**.

4. GENERAL SITE CONDITIONS

4.1. Surface Conditions

The project area includes right-of-ways along Arcadia Drive, Lafayette Boulevard, 44th Street and Village Drive in Phoenix, Arizona. These roadways are currently paved with

asphaltic concrete with varying thickness. The thickness and roadway classification are tabulated below.

Boring Number	Asphaltic Concrete (inches)	Aggregate Base (inches)
Arcadia Drive (Minor Collector)		
B-1	2 ¼	4
B-2	2 ½	3
Lafayette Boulevard (Minor Collector)		
B-3	3	0
B-4	3 ¾	0
B-5	3 ½	0
B-6	5	0
B-7	3	3 ½
B-8	3	3 ½
B-9	3	4
Camelback Road (Arterial)		
B-10	10	9
Village Drive (Local)		
B-11	5 ½	5
B-12	6	10
46th Street (Local)		
B-13	4	6

4.2. Subsurface Conditions

As indicated by the exploratory borings, in general the subsoils underlying the site consist of Clayey Sands and Sandy Clays (SC and CL) overlying intermittent layers of Silty Sands with and without Gravel (SM). The Sandy Clays and Clayey Sands (CL and SC) are generally medium plasticity and range from soft to hard. The Silty Sands (SM) are generally non to low plasticity and range from loose to very dense. For additional information see Boring Logs presented in **Appendix C**.

4.3. Groundwater Conditions

Based on visual observations of the soils retrieved from all of the boring locations, no groundwater was encountered. Groundwater is expected to be on the order of 300

feet below ground surface in the vicinity of the site. Therefore, groundwater should not be a factor in design or construction of proposed storm drain. It should be noted that soil moisture conditions within the area will vary depending on rainfall and/or runoff conditions not apparent at the time of our field study.

4.4. Geologic Hazards

4.4.1. Liquefaction Potential

Based on the site soils encountered during this investigation and groundwater not being encountered at depth explored, the potential for soil liquefaction is considered to be negligible.

4.4.2. Seismic Considerations

For the vicinity of the project alignment, a peak horizontal ground acceleration of 0.03 with a 90 percent probability of non-exceedance in 50 years is presented in ADOT report AZ92-344 (Euge, et al, 1992). The project is located in the western portion of the Sonoran Zone (SZ) of the ADOT report. The project area is not located near a significant source of seismic activity and the SZ is not considered to be a seismically active area.

5. ENGINEERING ANALYSES AND RECOMMENDATIONS

5.1. Earthwork

5.1.1. Grading Below Structure

The native soils below the structures supported on site soil within 10 feet in depth of exiting grade (i.e. headwalls) should be scarified to a depth of 8-inches: moisture conditioned to $\pm$2 percent of optimal moisture content and compacted to a minimum

of 95 percent of maximum dry density. Optimum moisture content and maximum dry density should be determined by ASTM D 698.

Structures supported on native site soils in depth greater than 10 feet below existing grade may bear on undisturbed native soils.

All the excavations should be observed by the Geotechnical Engineer prior to placement of reinforcing steel and/or concrete. If unstable subsurface conditions are encountered, revised recommendations may be required.

5.1.2. Pavement Subgrade

The near surface site soils have correlated R-Values ranging between 25 to 54 (based on percent passing the No. 200 screen and the plasticity index) and as roadway subgrade provide low to moderate subgrade Resilient Modulus. The native soils should be processed to a depth of 12-inches: moisture conditioned to within $\pm$2 percent of optimum moisture content and compacted to a minimum of 95 percent of maximum dry density. Optimum moisture content and maximum dry density should be determined by American Society for Testing and Materials (ASTM) D 698.

5.1.3. Aggregate Base Course

Aggregate base used in support of concrete or asphalt pavements should conform to the local governing agency and/or MAG Section 702 Specifications. The plasticity index of the fraction of material passing the No. 40 sieve should not exceed five when tested in accordance with ASTM Test Method D 4318. Coarse aggregate should have a percent of wear, when subjected to the Los Angeles abrasion test (ASTM Test Method C 131), of no greater than 40.

All aggregate base material should be placed in lifts not greater than eight inches and compacted to a minimum of 98 percent of maximum dry density as determined by

American Society for Testing and Materials (ASTM) Test Method D 698 or as specified by local specification. The moisture content during compaction should be maintained within two percent of optimum moisture content.

5.1.4. Engineered Fill

Engineered fill materials should be composed of onsite soils or imported soils meeting the requirements for imported soils presented below. The site soils tested are relatively low expansive and are suitable for use as engineered fill, **although site soils with resistivities** below **2000 Ohm-cm should not be used in direct contact with the concrete structure**. All engineered fills should be compacted as noted.

1. Native soils or imported soils with low expansive potentials could be used as fill material for the following:

- general site grading
- embankment construction

2. Structural backfill should be used against concrete structures designed to resist earth loads, such as box culverts, wing walls and retaining walls. All Structural backfill should meet the material requirements of Section 206 MAG Uniform Standard Specification.

3. Imported soils (if required) should conform to the following:

	Percent finer by weight
Gradation	**(ASTM C136)**
6"	100
No. 200 Sieve	60 (max)
Expansion Index	**(ASTM D4829)**
Maximum expansive index	20

Additional requirements for import in contact with ferrous material or concrete:

Corrosion Potential	Maximum
Minimum Resistivity (ohm-cm)	2,000
Sulfate Content (percent)	0.1

4. Aggregate base should conform to MAG and/or local governing specifications.

5. The following are intended to guide in establishing adequate support for the conventional foundation elements:

   - Any natural washes, depressions or new excavations which are to be filled, should be widened as necessary to accommodate compaction equipment and provide a level base for placing fill.
   - Any engineered fill (backfill) materials placed beneath the foundations should meet the requirements for Engineered Fill Materials.
   - All footing excavations should be relatively level and free of loose or disturbed material and inspected by a qualified representative of the Geotechnical Engineer.

6. All fill soils to be used beneath the foundations and pavements should be approved by the Geotechnical Engineer. Fill should be placed in 8-inch loose lift, moisture conditioned to within ±2 percent of optimum moisture content and compacted to a minimum of 95 percent of maximum dry density. Optimum moisture content and maximum dry density should be determined by American Society for Testing and Materials (ASTM) D 698..

5.2. Excavation

The field sampling and exploration was performed using a truck-mounted drill rig with 8-inch diameter hollow stem augers. We present the following general comments

regarding excavatability with the understanding that they are opinions based on the test borings. The project consultant and contractor should become familiar with this report including boring logs to evaluate potential hard dig conditions.

It is anticipated that excavations in the site soils can most likely be accomplished by conventional earth moving equipment, although some oversized material should be expected. Please refer to Section 4 and sample logs presented in Appendix C of this report for more information.

5.2.1. Trench Backfill

Materials

Pipe zone backfill (i.e., material beneath and in the immediate vicinity of the pipe) should consist of soil with a maximum particle size less than one inch. Trench zone backfill (i.e., material placed between the pipe zone backfill and finished subgrade) may consist of soil that meets the requirements for structural fill provided above.

If import material is used for pipe or trench zone backfill, we recommend it consist of fine-grained sand or well graded sand/gravel materials (aggregate base). In general, poorly graded coarse-grained sand and gravel should not be used for pipe or trench zone backfill due to the potential for soil migration into the relatively large void spaces present in this type of material and water seepage along trenches backfilled with coarse-grained sand and/or gravel.

Recommendations provided above for pipe zone backfill are minimum requirements only. More stringent material specifications may be required to fulfill local codes and/or bedding requirements for specific types of pipes. We recommend the project Civil Engineer develop these material specifications based on planned pipe types, bedding conditions, and other factors beyond the scope of this study.

Compaction Criteria

Backfill of trenches should utilize non-expansive (preferably granular) soils, in order to aid compaction and reduce potential differential settlement problems. Backfilling of utility trenches should be in 6 to 8-inch maximum loose lifts, and compacted to a minimum of 90%, and 95% of ASTM D-698 (standard Proctor), in non-structural areas and structurally loaded areas, respectively. Please note that the local governing agency specifications may surpass these trench backfill requirements. Jetting, flooding, or pudding of cohesive backfill soils should not be utilized under any circumstances.

5.2.2. Temporary Excavations

General

All excavations must comply with applicable local, state, and federal safety regulations including the current Occupational Safety and Health Administration (OSHA) Excavation and Trench Safety Standards. Generally, Construction site safety is solely the responsibility of the Contractor, who shall also be responsible for the means, methods, and sequencing of construction operations. We are providing the information below strictly as a service to our client. Under no circumstances should the information be interpreted that ATEK is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

Excavations and Slopes

The Contractor should be aware that slope height, slope inclination, or excavation depths (including utility trench excavations) should in no case exceed those specified in local, state, and/or federal safety regulations (e.g., OSHA Health and Safety

Standards for Excavations, 29 CFR Part 1926, or successor regulations). Such regulations are strictly enforced; and, if not followed, could result in substantial penalties to the Owner, Contractor, and/or earthwork subcontractor and/or utility subcontractors.

Near-surface soils encountered during our field investigation consisted predominantly of clayey sands. In our opinion, these soils would be considered a Type C soil when applying OSHA regulations. For this soils type OSHA recommends a maximum slope inclination of 1½(h):1(v) or flatter for excavations 20 feet or less in depth. Steeper cut slopes may be utilized for excavations less than 5 feet deep depending on the strength, moisture content, and homogeneity of the soils as observed in the field. Flatter slopes and/or trench shields may be required if loose, cohesionless soils and/or water are encountered along the slope face.

Construction Considerations

Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed within one-third the slope height from the top of any excavation. Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning may be required to provide structural stability and to protect personnel working within the excavation. Shoring, bracing, or underpinning required for the project (if any) should be designed by a professional engineer registered in the State of Arizona.

During wet weather, earthen berms or other methods should be used to prevent runoff water from entering all excavations. All runoff water should be collected and disposed of outside the construction limits.

5.3. Structures

5.3.1. Shallow spread footings

Shallow spread footings bearing on undisturbed native or engineered fill can be used to support the structures as recommended. Recommended footing depths and allowable bearing pressures are presented below.

Allowable Bearing Pressure for Shallow Foundations

Footing Depth Below Finished Grade (ft.)*	Allowable Bearing Pressure
2.0	2,000
3.0	3,000
4.0 and greater	4,000

***Note:** Footing depth is defined as the depth below the lowest adjacent finished grade elevation within 2-feet of the edge of the footing.

A one-third increase may be applied to the design bearing pressures when considering short duration loads, such as wind and seismic.

Continuous footings should have a minimum width of 12-inches. The minimum widths are recommended for ease of construction, and to provide a margin of safety against a local or punching shear failure of the foundation soils. All footings should be reinforced to reduce potential distress caused by differential foundation movement.

All the footing excavations should be observed by the Geotechnical Engineer prior to placement of reinforcing steel and/or concrete. If subsurface conditions are encountered that are different than indicated by the test borings, revised recommendations may be required.

5.3.1.1. Estimated Settlements

Settlement of footings designed as recommended above are estimated not to exceed 1-inch. Differential settlements between similarly loaded, adjacent footings are expected to be less than ½-inch. Significant moisture increases above those recommended for compaction could result in additional movements. In order to minimize the sensitivity of the structure to differential settlements, footings should be reinforced to allow for a degree of load redistribution should a localized zone of supporting soils become saturated.

5.3.1.2. Resistance to Lateral Loads

Proposed walls/structures that will retain soil must be designed to withstand lateral soil pressures. Cantilevered retaining walls, or unrestrained walls subject to lateral earth pressures, should be designed for an equivalent fluid pressure (EFP) of 37 PCF. Restrained walls should be designed to withstand a residual or long-term at-rest (Ko) earth pressure condition of 55 pounds per cubic foot (PCF).

A passive EFP of 330 PCF may be used for shallow spread footings. A coefficient of friction of 0.36 is recommended for computing lateral resistance between the base of footing and soil in analyzing lateral loads. Vehicular surcharge loads and/or hydrostatic pressure will increase the recommended EFP.

Only cohesionless, free-draining granular materials should be used as backfill, adjacent to earth-retaining structures. We recommend that backfill directly behind the walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within 3 feet of the walls during backfilling, to avoid developing excessive temporary or long-term lateral soil pressures. Positive gravity drainage of the backfill should be provided.

5.3.2. Retaining Walls

5.3.2.1. Lateral Earth Pressures

If retaining walls are utilized in this project, they should be designed to resist the earth pressure exerted by the retained, compacted backfill plus any additional lateral force that will be applied to the wall due to surface loads placed at or near the top of the wall. The at-rest earth pressure against walls that are restrained at the top and with level backfill may be taken as equivalent to the pressure exerted by a fluid weighing 55 pounds per cubic foot (pcf). Fifty percent of any uniform areal surcharge placed at the top of a restrained wall may be assumed to act as a uniform horizontal pressure over the entire height of the wall.

Retaining walls that are not restrained at the top and with backfill, which is level behind the wall, may be designed for an active earth pressure developed by an equivalent fluid weighing 37 pcf. Thirty percent of any uniform surcharge may be assumed to act as a uniform horizontal pressure over the entire height of the wall.

5.3.2.2. Wall Drainage

The above-recommended values do not include lateral pressures due to hydrostatic forces. Therefore, wall backfill should be free draining and provisions should be made to collect and dispose of excess water that may accumulate behind earth retaining structures.

Wall drainage should be collected by continuous perforated drainpipes, filter fabric, and gravel connected to weep holes. The drainpipe must run parallel to the wall. We recommend drainrock consist of durable stone having 100 percent passing the 1-inch sieve and zero percent passing the No. 4 sieve. Synthetic filter fabric should have an equivalent opening size (EOS), U.S. Standard Sieve, of between 40 and 70, a

permeability of at least 0.02 centimeters per second and minimum puncture strength of 50 pounds.

5.3.2.3. Backfill Placement

All backfill should be placed and compacted in accordance with recommendations provided above for engineered fill. Light equipment should be used during backfill compaction to minimize possible overstressing of the wall.

5.4. Design Values for Buried Pipes

The following sections provide design information relative to rigid pipes. The recommendations provided within the following sections are based on the pipe being installed by open cut excavations. If an alternative construction process is utilized, ATEK should be contacted for additional recommendations.

5.4.1. Soil Loads on Buried Rigid Pipes

Soil loads on buried rigid pipes such as concrete or clay pipes can be analyzed using the Marston's Formula as follows:

$$W_c = C_d \gamma B_d^2$$

C_d = Load Coefficient based on Kμ'
γ = Moist unit weight of backfill material (pcf)
B_d = Width of trench at top of pipe (ft)

The coefficient, C_d, is dependent on the back fill type, which is dependent on the pipe manufacture's recommendation or local municipality requirements, the trench width, and pipe installation depth. Where the ratio of the backfill depth to trench width at the top of the pipe (H/B_d) is at least 1 and where trench width, at top of

pipe, is no greater than 3 times the pipe diameter, the value of C_d may be determined using the following formula for load coefficient, C_d:

$$C_d = \frac{1 - e^{-2K\mu' (H / B_d)}}{2K\mu'}$$

K = Active earth pressure coefficient

μ' = Friction coefficient between fill material and sides of trench

H = Backfill height above the pipe crown

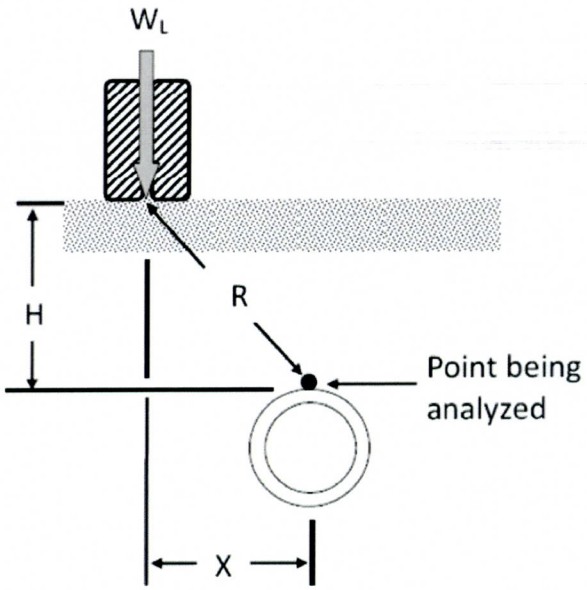
The product Kμ' in the above referenced equation is dependent on the backfill type, degree of compaction, and moisture content. The following table provides estimates for the Kμ' product based on various soil types.

Soil Type	Kμ'
Clay (CL,CH)	0.12
Silt (ML)	0.13
Silty Sand (SM)	0.15
Well and Poorly Graded 'Clean' Sands (SW, SP)	0.165
Sandy Gravels and Cobbles (GW, GP, GM, GC)	0.18
Source: ASCE (1982)	

Based on soils encountered during our field investigation; we recommend using a Kμ' value of 0.12 for design and a wet soil unit weight, γ, equal to 118 pcf for soil backfill material.

5.4.2. Live Loads on Buried Conduits

Live loads on buried conduits due to vehicular loads may be determined as presented below:



$$P_L = \frac{3I_f W_L H^3}{2\pi R^5}$$

Where:

P_L = live load soil pressure from a concentrated surface load, psf
I_f = impact factor, dimensionless (See Table below)
W_L = live load, lbs
H = height of fill above the top of the pipe, ft
R = distance from the point of load application to top of pipe, ft

Height of Cover , H (ft)	Impact Factor, I_f
0 to 1 ft	1.3
1 ft, 1 in to 2 ft	1.2
2 ft, 1 in to 3 ft	1.1
Over 3 ft	1.0

Source: ASCE Manual No. 60 / WEF MOP No. FD-5, 2007

5.5. Asphaltic Concrete Pavement

5.5.1. Existing Roadways

The existing roadways of Arcadia Drive, Lafayette Boulevard, Camelback Road, 46th Street and Village Drive are classified as a Minor Collector, Minor Collector, Arterial, Local Residential and Local Residential, respectively based on the City of Phoenix, Street Classification Map, last revised by Resolution #20882, January 20, 2010. The most recent published traffic counts indicate approximately 3,500, 1,500 and 17,600 vehicles per day in the section of Arcadia Drive, Lafayette Boulevard and Camelback Road within the project limits. During our field work measurements of the existing pavement sections were taken and the results are presented in section 4.1 of this report.

5.5.2. Subgrade

5.5.2.1. Local Residential

Near surface site soils were collected from each local residential roadway and tested for percent passing the No. 200 screen and the plasticity index. The pavement sections presented for local residential roadways are based on the City of Phoenix Standard Detail P-1102. The values used for evaluation of the pavement section for each segment were as follows; Village Drive - percent passing the No. 200 screen equal to 31 and plasticity index equal to 18; and Village Drive - percent passing the No. 200 screen equal to 22 and plasticity index equal to 7.

5.5.2.2. Minor Collector

Near surface site soils were collected from each minor collector roadway and tested for percent passing the No. 200 screen and the plasticity index. The pavement sections presented for Minor Collectors are based on the City of Phoenix Standard Detail P-1103. The values used for evaluation of the pavement section for each segment were as follows; Arcadia Drive - percent passing the No. 200 screen equal to

23 and plasticity index equal to 26; and Lafayette Boulevard - percent passing the No. 200 screen equal to 22 and plasticity index equal to 20.

5.5.2.3. Arterial

The near surface site soils on Camelback Road have correlated R-Value (based on percent passing the No. 200 screen and the plasticity index) of 54 and a Resilient Modulus of 26,000. For additional information see the pavement Flexible Pavement Design presented in **Appendix E**.

5.5.3. Pavement Recommendations

Our calculations for design of the pavement sections are based upon our classification of the subsurface soils and the *City of Phoenix Street Planning and Design Guidelines*, dated December 1, 2009. The recommended pavement sections are based on the assumption that the subgrade soils are prepared in accordance with section 5.1.2 of this report.

The flexible pavement section should consist of Central Plant Mix Asphaltic Concrete Pavement (AC) on compacted Aggregate Base Course (ABC) as recommended in the table below. Flexible pavement should be placed in accordance with MAG Section 321 and local municipality supplements.

Pavement Area	Asphalt Surface Thickness (IN)	Aggregate Base Course Thickness (IN)	Structural Number (SN)
Arcadia Drive COP P-1103 (Minor Collector)	2	15	2.58
Arcadia Drive Proposed Alternate	4	9	2.64
Lafayette Boulevard COP P-1103 (Minor Collector)	2	13	2.34
Lafayette Boulevard Proposed Alternate	4	7	2.40
Camelback Road (Arterial)	5	8	2.91
Village Drive (Local)	2	8	1.74
Village Drive Proposed Alternate	3	5	1.77
46th Street (Local)	2	6	1.5

5.5.4. Aggregate Base Course

Aggregate base used in support of concrete or asphalt pavements should conform to the local governing and/or M.A.G. Section 702 Specifications. The plasticity index of the fraction of material passing the No. 40 sieve should not exceed five when tested in accordance with ASTM Test Method D 4318. Coarse aggregate should have a percent of wear, when subjected to the Los Angeles abrasion test (ASTM Test Method C 131), of no greater than 40.

All aggregate base should be placed in lifts not thicker than eight inches and compacted to a minimum of 98 percent of maximum dry density as determined by American Society for Testing and Materials (ASTM) Test Method D 698 or as specified

by local specifications. The moisture content during compaction should be maintained within two percent of optimum moisture content.

5.6. Corrosion Potential

5.6.1. Electrical Resistivity

Electrical Resistivity of a soil is a measure of resistance to the flow of electrical current. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportional to the flow of electrical current (DC) from the metal into the soil. As a soil's resistivity decreases, its corrosivity increases.

A commonly accepted correlation between soil resistivity and corrosivity towards ferrous metals is shown in the following table.

Resistivity (ohm-cm)	Corrosivity Classification
0 to 1,000	Severely corrosive
1,000 to 2,000	Corrosive
2,000 to 10,000	Moderately corrosive
Over 10,000	Mildly corrosive

Sample Location	pH	Resistivity (Ohm-cm)
Bulk Sample B-9 @ 16'-20'	7.8	2,281
Bulk Sample B-10 @ 3'-5'	7.9	3,154
Bulk Sample B-12 @ 15'-20'	7.9	1,409
Bulk Sample B-13 @ 16'-19'	7.7	2,013
Bulk Sample B-4 @ 25'-30'	8.1	1,879
Bulk Sample B-5 @ 1'-5'	7.8	1,342

Based on the laboratory tests as shown above, this soil would be considered "corrosive to moderately corrosive". It should be noted that these corrosion conditions are for the soils at submerged moisture conditions. Resistivities at drier moisture contents would be less corrosive than the results of the tests above.

The pH values of the samples tested were slightly basic. In most cases, pH is not a significant factor in corrosion in the near-neutral pH range (5<pH<9).

Based on Figure 6.7 of the Handbook of Steel Drainage & Highway Construction Products (published by American Iron and Steel Institute Fourth Edition, 1993), the estimated life for various gage galvanized CMP are tabulated below. Details of the laboratory test results are presented in **Appendix C** of this report.

Sample Location	Design Life (Yrs)		
	16 Gage	14 Gage	12 Gage
Bulk Sample B-9 @ 16'-20'	91	112	154
Bulk Sample B-10 @ 3'-5'	104	128	176
Bulk Sample B-12 @ 15'-20'	75	92	126
Bulk Sample B-13 @ 16'-19'	86	106	146
Bulk Sample B-4 @ 25'-30'	84	103	142
Bulk Sample B-5 @ 1'-5'	73	90	124

5.6.2. Sulfate and Chloride Content

Selected samples of the near-surface soils encountered at the site were subjected to chemical analysis for the purpose of corrosion assessment. The samples were tested for soluble sulfates and soluble chlorides. The samples were tested in general accordance with Arizona Test Methods 733 for soluble chlorides and 736 for soluble sulfates. The test results are provided in **Appendix C**.

Based on provisions of American Concrete Institute (ACI) 318 Section 4.3, Table 4.3.1, *Requirements for Concrete Exposed to Sulfate-Containing Solutions* a sulfate concentration below 0.10 percent by weight (1,000 ppm) is negligible. Based on the laboratory results, sulfate contents of the site soils tested indicate a negligible corrosion potential to concrete.

6. CLOSURE

6.1. Limitations

Our professional services have been performed using that degree and skill ordinarily exercised, under similar circumstances, by reputable Geotechnical Engineers practicing in this or similar localities. No warranty is expressed or implied.

The recommendations contained in this report are based on our field exploration, laboratory test results, and our understanding of the proposed construction. The subsurface data used in the preparation of this report was obtained from the test borings excavated during the field subsurface exploration. It is anticipated that some variations in the soil conditions will exist on-site. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this report, we should be immediately notified so that we may make any necessary revisions to the recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, our firm should also be notified.

It is the Client's responsibility to see that all parties to the project including the designer, contractor, subcontractor, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

This report is for the exclusive purpose of providing Geotechnical Engineering and/or testing information and recommendations. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should

be undertaken. This report has also not addressed the site geology and the possible presence of geologic hazards.

This report may be used only by the Client and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on and off-site), or other factors may change over time, and additional work may be required with the passage of time. Any party, other than the Client, who wishes to use this report, shall notify ATEK of such intended use. Based on the intended use of this report, ATEK may require that additional work be performed and that an updated report be issued.

6.2. Recommended Additional Services

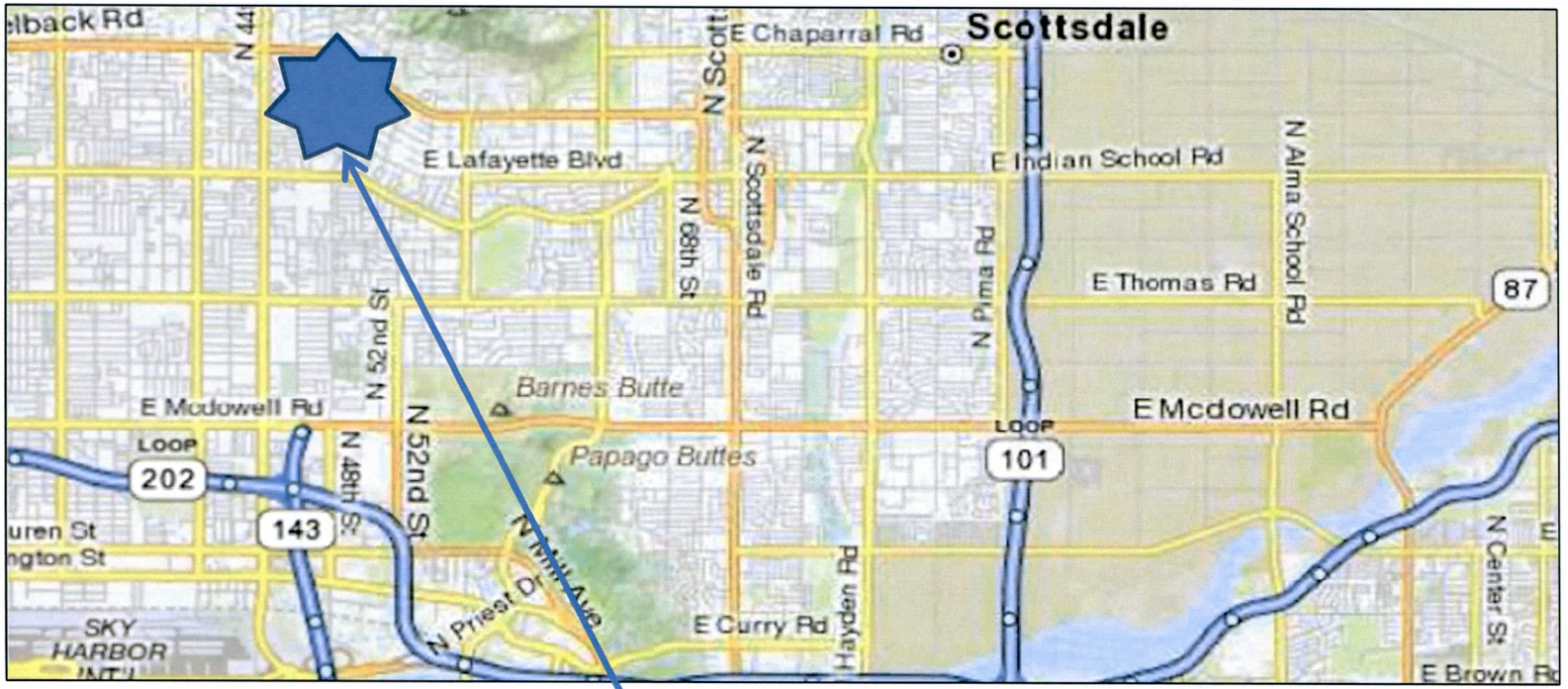
The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be performed during the construction. These tests and observations should be performed by the Geotechnical Engineer's representative and should include, but not limited to the following:

- Observe and document that any existing surficial vegetation and other deleterious materials have been removed from the site as required in site preparation section.
- Approve any material used as import to document that it meets the requirements outlined above before placement.
- Monitor the backfill procedures.
- Perform field density tests, as needed, to verify compaction compliance. The representative should monitor the progress of compaction and filling operations.
- Keep records of on-site activities and progress.

Observation of footing excavations should be performed prior to placement of reinforcing and concrete to confirm that satisfactory bearing materials are present.

Construction testing, including field and laboratory evaluation of fill and backfill materials, concrete and steel should be performed to determine whether applicable project requirements have been met.

APPENDIX A
Site Location Map



Site Location

North

atek ENGINEERING CONSULTANTS

ATEK Engineering Consultants, LLC
1114 Grand Avenue
Phoenix, AZ 85007

Sheet 1 of 1

LAFAYETTE Interceptor Drain and Outlet

Project Number:	110009
Date:	July 22, 2011
Drawn By:	Armando Ortega

APPENDIX B
Sample Location Plan

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Legend:

Boring

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ATEK Engineering Consultants, LLC
1114 Grand Avenue
Phoenix, AZ 85007

Sheet 1 of 4

LAFAYETTE Interceptor Drain and Outlet

Project Number:	110009
Date:	July 22, 2011
Drawn By:	Armando Ortega

Legend:

Boring

ATEK Engineering Consultants, LLC
1114 Grand Avenue
Phoenix, AZ 85007

Sheet 2 of 4

LAFAYETTE Interceptor Drain and Outlet

Project Number:	110009
Date:	July 22, 2011
Drawn By:	Armando Ortega

Legend:

Boring

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1114 Grand Avenue
Phoenix, AZ 85007

Sheet 3 of 4

LAFAYETTE Interceptor Drain and Outlet

Project Number:	110009
Date:	July 22, 2011
Drawn By:	Armando Ortega

Legend:

Boring

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Phoenix, AZ 85007

Sheet 4 of 4

LAFAYETTE Interceptor Drain and Outlet

Project Number:	110009
Date:	July 22, 2011
Drawn By:	Armando Ortega

APPENDIX C
FIELD STUDY AND BORING LOGS

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APPENDIX C
FIELD INVESTIGATION

BORINGS

The subsurface conditions at the site were explored between May 20, 2011 and July 12, 2011, by drilling thirteen soil borings using a Diedrich D-120 drill rig with an eight inch diameter hollow stem auger. The locations of soil test borings performed for this investigation are shown in **Appendix B** of this report.

The locations of borings were located by visual sighting and pacing from existing site features and, therefore, should be considered approximate. Actual boring locations may vary from those indicated in **Appendix B**.

Our field engineer maintained a log of the excavations; visually classified soils encountered according to the Unified Soil Classification System (USCS) (see USCS Table); and obtained samples of the subsurface materials.

SAMPLING PROCEDURES

Soil samples obtained from the borings were packaged and sealed in the field to reduce moisture loss and disturbance, and returned to our laboratory for further testing. After borings were completed, they were backfilled with the excavated soils.

LIST OF ATTACHMENTS

The following plates are attached and complete this appendix.

Unified Soil Classification System
Logs of Soil Borings

UNIFIED SOIL CLASSIFICATION SYSTEM					CONSISTENCY OR RELATIVE DENSITY	
Major Divisions			Group Symbols	Typical Names	CRITERIA	
Coarse-Grained Soils (More than 50% retained on No. 4 sieve)	Gravels (50% or more of coarse fraction retained on No. 4 sieve)	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	**Standard Penetration Test** Density of Granular Soils	
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines	Penetration Resistance N (blows/ft)	Relative Density
		Gravels With Fines	GM	Silty gravels, gravel-sand-silt mixtures		
			GC	Clayey gravels, gravel-sand-clay mixtures	0-4	Very Loose
	Sands (More than 50% of coarse fraction passes No. 4 sieve)	Clean Sands	SW	Well-graded sands and sand-gravel mixtures, little or no fines	5-10	Loose
			SP	Poorly graded sands and sand-gravel mixtures, little or no fines	11-30	Medium
		Sands With Fines	SM	Silty sands, sand-gravel-silt mixtures	31-50	Dense Very
			SC	Clayey sands, sand-gravel-clay mixtures	>50	Dense
Fine-Grained Soils (50% or more passes No. 200 sieve)	Silts and Clays (Liquid Limit 50% or less)		ML	inorganic silts, very fine sands, silty or clayey fine sands, clayey silts with slight plasticity	**Standard Penetration Test** Consistency of Cohesive Soils	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, siltly clays, sandy clays lean clays	Penetration Resistance N (blows/ft)	Consistency / Unconfined Compressive Strength (Tons/ft2)
			OL	Organic silts and organic silty clays of low plasticity	<2	Very Soft / <0.25
	Silts and Clays (Liquid Limit greater than 50%)		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	2-4	Soft / 0.25-0.50
			CH	Inorganic clays of high plasticity, fat clays	4-8	Firm / 0.50-1.00
			OH	Organic clays and organic silts of medium to high plasticity	8-15	Stiff / 1.00-2.00
					15-30	Very Stiff / 2.00-4.00
Highly Organic Soils			PT	Peat, humus, and swamp soils with high organic content	>30	Hard / >4.0

		3"	3/4"	#4	#10	#40	#200 U.S. Standard Sieve
Unified Soil Classification	Cobbles	Gravel		Sand			Silt or Clay
		coarse	fine	coarse	medium	fine	

MOISTURE CONDITIONS

Dry	Absence of moist, dusty, dry to the touch
Slightly	Below optimum moisture content for compaction
Moist	Near optimum moisture content, will moisten the hand
Very Moist	Above optimum moisture content
Wet	Visible free water; below water table

MATERIAL QUANTITY

trace	0-5%
few	5-10%
little	10-25%
some	25-45%
mostly	50-100%

OTHER SYMBOLS

C	Core Sample
S	SPT Sample
B	Bulk Sample
▼	Groundwater
Qp	Pocket Penetrometer

BASIC LOG FORMAT:
Group name, Group symbol, (grain size), color, moisture, consistency or relative density. Additional comments: odor, presence of roots, mica, gypsum, coarse grained particles, ect

EXAMPLE
Brown, loose, fine to medium Sand (SP), trace silt, little fine gravel, damp

UNIFIED SOIL CLASSIFICATION SYSTEM

Project Number:	110009	**Log of Boring No.**	B-1
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Sample collected from 1'-5', Ring Sample driven at 25'-26', and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-11.5', 15'-16.5', 20'-21.5', 30'-31.5, and 35'-36.5'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (2 1/4")
S/B	3-3-6		4.7	3		**AGGREGATE BASE COURSE (4")**
S	4-6-6			6	SC	**CLAYEY SAND** Light brown, predominately fine graded, subrounded, moderately firm to hard, moist, medium plasticity, non to weakly cemented.
S	34-33-25			9		
				12		
S	18-16-24			15	CL-ML	**SILTY CLAY** Light brown, well graded, angular, very firm to firm, slightly damp, medium plasticity, weakly cementation.
S	6-7-16			18		
				21	SC	**CLAYEY SAND** Light brown, well graded, subangular, moist, medium plasticity, weakly cemented.
R	6-14	110	15.1	24		
				27	CL-ML	**SILTY CLAY** Medium brown, predominately medium to coarse graded, angular, moist, low plasticity, non-cemented.
S	10-9-9			30	SC	**CLAYEY SAND** Medium brown, predominately coarse graded, subangular, firm, moist to wet, low plasticity, non-cemented.
				33		
S	10-10-8		19.5	36		
				39		**Bottom of boring @ 36.5'; no groundwater encountered.**
				42		
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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1114 Grand Avenue
Phoenix, Arizona 85007

Sample Date: 05/20/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-2
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Samples collected from 1'-5' and 25'-30', Ring Sample driven at 30'-31', and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-11.5', 15'-16.5', 20'-21.5', 25'-26.5, 35'-36.5', and 40'-41.5'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (2 1/2")
S/B	6-10-13			3		**AGGREGATE BASE COURSE (3")**
					SC	**CLAYEY SAND**
S	18-20-18			6		Reddish to light brown, predominately medium to coarse graded, angular to subangular, firm to very firm to hard, moist to slightly damp, medium plasticity, non-cemented.
S	12-32-26			9		
				12		
S	23-43-47		6.7	15		
				18		
S	17-29-50			21		
				24		
S	10-9-7					
				27	SM	**SILTY SAND**
R/B	10-23		14.1	30		Medium brown, predominately medium to fine graded, subrounded, medium dense to dense, moist, non-plastic, non-cemented.
				33		Note: graded to fine grained SAND.
S	9-17-28			36	SC	**CLAYEY SAND WITH GRAVEL**
						Reddish brown, well graded, subangular, very firm to firm, slightly damp, low plasticity, non-cemented.
S	7-13-17		8.6	39		
				42		**Bottom of boring @ 41.5'; no groundwater encountered.**
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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1114 Grand Avenue
Phoenix, Arizona 85007

Sample Date: 05/20/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-3
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Sample collected from 1'-5' and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-11.5', 15'-16.5', 20'-21.5', 25'-26.5, 30'-30.5', 35'-36.5', and 40'-41.5'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (3") **AGGREGATE BASE COURSE (0")**
S/B	5-10-10			3	SC	**CLAYEY SAND** Light brown, well graded, subangular, firm to very firm to firm to hard, moist, medium plasticity, non-cemented.
S	13-15-18			6		
S	10-15-13		11.0	9		
				12	SM	**SILTY SAND** Light brown, well graded, subangular, medium dense to very dense, moist, medium plasticity, non-cemented.
S	15-27-50/3"			15		
				18		
S	15-20-28			21	CL	**SANDY CLAY** Light brown, well graded, subangular, very firm, moist, medium plasticity, non-cemented.
S	15-21-25			24		
				27	SM	**SILTY SAND WITH GRAVEL** Reddish brown, predominately medium to fine graded, angular, dense, moist, non-plastic, non-cemented.
S	50/6"		6.8	30	CL	**SANDY CLAY** Light brown, well graded, subangular, hard, moist, medium plasticity, weakly cemented.
				33		
S	8-12-13			36	SC	**CLAYEY SAND WITH GRAVEL** Medium brown, predominately coarse graded, subangular, firm, moist, low plasticity, non-cemented.
S	5-5-5			39		
				42	CL	**SANDY CLAY** Reddish brown, well graded, subangular, moderately firm, wet, low plasticity, non-cemented.
				45		
				48		**Bottom of boring @ 41.5'; no groundwater encountered.**
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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1114 Grand Avenue
Phoenix, Arizona 85007

Sample Date: 05/20/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-4
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Samples collected from 1'-5', and 25'-30', and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-11.5', 15'-15.5', 20'-21.5', 25'-26.5, 30'-31.5', 35'-36.5', and 40'-41.5'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (3 3/4")
S/B	9-20-20			3		**AGGREGATE BASE COURSE (0")**
S	12-14-14			6	CL	**SANDY CLAY** Light brown, well graded, angular, very firm to firm, moist, medium plasticity, non-cemented.
S	18-24-50/4"			9	SC	**CLAYEY SAND** Light brown, predominately medium to coarse graded, angular, hard, slightly damp, medium plasticity, weakly cemented.
				12	CL	**SANDY CLAY WITH GRAVEL** Light brown, well graded, angular, moist, medium plasticity, weakly cemented.
S	50/6"			15		
				18	SM	**SILTY SAND WITH FINE GRADED GRAVEL** Reddish brown, predominately coarse graded, subangular, very dense, moist, non-plastic, non-cemented.
S	20-32-33			21	CL	**SANDY CLAY** Light brown, well graded, angular, hard, moist, medium plasticity, weakly cemented.
S/B	7-7-25			24		
				27	SM	**SILTY SAND** Reddish brown, predominately fine graded, angular, dense, moist, low plasticity, non-cemented.
S	32-48-48			30	CL	**SANDY CLAY** Light brown, well graded, subangular, hard, moist, medium plasticity, weakly cemented.
				33		
S	19-18-17			36	SC	**CLAYEY SAND WITH GRAVEL** Medium brown, predominately coarse graded, subangular, firm, moist, low plasticity, weakly cemented.
S	12-14-13			39		
				42		**Bottom of boring @ 41.5'; no groundwater encountered.**
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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1114 Grand Avenue
Phoenix, Arizona 85007

Sample Date: 05/20/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-5
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Samples collected from 1'-5', and 20'-25', and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-10.5', 15'-15.5', 20'-21.5', 25'-26.5, 30'-30.5', and 35'-35.5'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (3 1/2")
S/B	14-26-25		5.4	3		**AGGREGATE BASE COURSE (0")**
					SC	**CLAYEY SAND WITH FINE GRAINED GRAVEL**
S	12-25-27			6		Light brown, predominately medium to fine graded, subangular, hard, moist, low to medium plasticity, weakly cemented.
S	50/5"			9		
				12		Note: trace gravel.
S	50/8"			15		Note: medium cemented.
				18		
S/B	25-40-29			21		Note: increasing cementation with gravel and slow drilling between 16'-18'.
S	32-26-23			24		
				27	CL	**SANDY CLAY** Light brown, well graded, angular, very firm, moist, medium plasticity, weakly to non-cemented.
S	50/4"			30	SC	**CLAYEY SAND** Light brown, predominately medium to coarse graded, subangular, hard, low plasticity, weakly cemented.
S	50/4"			33		
				36		**Bottom of boring @ 35.5'; no groundwater encountered.**
				39		
				42		
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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Sample Date: 05/20/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-6
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Sample collected from 10'-15', and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-11.5', 15'-16.5', 20'-21.5', 25'-26.5, and 30'-31.5'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (5")
						AGGREGATE BASE COURSE (0")
S	12-10-13			3	SM	**SILTY SAND WITH GRAVEL**
S	37-44-50/5"			6		Reddish brown, predominately medium to coarse graded, subangular, medium dense, moist, non-plastic, non-cemented.
S/B	27-47-50/5"			9	SC	**CLAYEY SAND WITH GRAVEL**
				12		Light brown, predominately medium to coarse graded, subangular, hard to very firm to hard, medium plasticity, non-cemented.
S	17-26-32			15		
				18		Note: predominately coarse graded and angular.
S	13-14-18			21		
S	31-41-47			24		
				27		
S	17-24-23			30	CL	**SANDY CLAY**
				33		Light brown, predominately medium to coarse graded, subangular, very firm, medium plasticity, non-cemented.
				36		**Bottom of boring @ 31.5'; no groundwater encountered.**
				39		
				42		
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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Sample Date: 05/20/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-7
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Sample collected from 10'-15', and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-11.5', 15'-16.5', 20'-21.5', 25'-26.5, and 30'-31.5'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (3")
						AGGREGATE BASE COURSE (3 1/2")
S	6-8-10			3	SC	**CLAYEY SAND**
S	10-13-12			6		Reddish to light brown, well graded, subangular, firm to hard, moist, medium plasticity, non-cemented.
S	26-32-38		10.8	9		
				12		
					SM	**SILTY SAND**
S	6-8-12		4.4	15		Medium brown, well graded, subangular, medium dense, slightly damp, low plasticity, non-cemented.
				18		
S	23-35-38			21	GC-GM	**SILTY CLAYEY GRAVEL WITH SAND**
						Light brown, predominately coarse graded, subrounded, very dense, slightly damp, low plasticity, non-cemented.
S	26-50/4"			24	SM	**SILTY SAND WITH GRAVEL**
						Light brown, well graded, subrounded, slightly damp, low plasticity, non-cemented.
						Bottom of boring @ 26'; no groundwater encountered.
				27		
				30		
				33		
				36		
				39		
				42		
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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Sample Date: 07/12/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-8
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Sample collected from 1'-5', Ring Sample driven at 15-16', and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-11', 20'-21.5', and 25'-26'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (3")
S/B	3-3-3		8.6	3		**AGGREGATE BASE COURSE (3 1/2")**
S	20-23-26			6	SC	**CLAYEY SAND** Light brown, well graded, subrounded, loose to dense moist to slightly damp, medium plasticity, non-cemented.
S	22-50/5"			9		
				12		**SILTY SAND WITH GRAVEL** Medium to light brown, well graded, subrounded, dense to very dense, moist to slightly damp, low plasticity, non-cemented.
R	24-41	112	11.2	15		
				18		
S	26-27-31		12.5	21		
S	21-50/6"			24		
				27		**Bottom of boring @ 26'; no groundwater encountered.**
				30		
				33		
				36		
				39		
				42		
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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Sample Date: 07/12/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-9
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Sample collected from 16'-20', Ring Sample driven at 15-16', and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-11.5', and 20'-20.5'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (3")
S	4-3-4			3		**AGGREGATE BASE COURSE (4")**
					SM	**SILTY SAND**
S	19-22-26			6		Medium brown, well graded, subrounded, loose, moist to slightly damp, non plastic, non-cemented.
					SC	**CLAYEY SAND**
S	13-16-24		8.9	9		Light brown, predominately fine graded, subrounded, very firm, slightly damp, low plasticity, weakly cemented.
				12		
B/R	50/4"	108	4.8	15	SM	**SILTY SAND**
				18		Medium brown, well graded, subrounded, very dense, slightly damp, non-plastic, non-cemented.
S	50/2"					Note: no recovery.
				21		**Bottom of boring @ 20.5'; no groundwater encountered.**
				24		
				27		
				30		
				33		
				36		
				39		
				42		
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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Sample Date: 07/12/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-10
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Samples collected from 1.5'-5', and 21'-25', Ring Sample driven at 10-11', and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 15'-15.5', 20'-20.5', and 25'-25.5'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (10")
S/B	1-2-2		5.6	3		**AGGREGATE BASE COURSE (9")**
S	14-13-12			6	SM	**SILTY SAND** Medium brown, well graded, subrounded, very loose to medium dense, slightly damp, non to low plasticity, non-cemented.
R	15-23	109	7.2	9	SC	**CLAYEY SAND** Light brown, well graded, subangular, very firm to hard, moist to slightly damp, low plasticity, weakly cemented.
				12		
S	50/3"			15		Note: no recovery.
				18	GM	**SILTY GRAVEL WITH SAND** Light brown, well graded, subrounded, slightly damp, low plasticity, non-cemented.
S	50/4.5"			21	SC	**CLAYEY SAND** Light brown, well graded, subangular, hard, slightly damp, low plasticity, weakly cemented. Note: no recovery at 20' or 25'.
S	50/3"			24		
				27		**Bottom of boring @ 25.5'; no groundwater encountered.**
				30		
				33		
				36		
				39		
				42		
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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Sample Date: 07/12/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-11
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-11.5', 15'-16.5', 20'-20.5', and 25'-25.5'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (5.5")
						AGGREGATE BASE COURSE (5")
S	8-13-12			3	SC	**CLAYEY SAND**
S	15-20-22			6		Reddish brown, predominately coarse graded, subangular, firm to very firm, moist to slightly damp, low plasticity, non-cemented.
S	17-21-23		5.4	9	GP	**GRAVEL WITH SAND**
				12		Light brown, predominately coarse graded, subangular, dense to medium dense to very dense, slightly damp, medium plasticity, non-cemented.
S	23-19-10			15		
				18		
S	50/4"			21		
				24		
S	50/2"					Note: no recovery.
				27		**Bottom of boring @ 25.5'; no groundwater encountered.**
				30		
				33		
				36		
				39		
				42		
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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Sample Date: 07/12/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-12
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Samples collected at 2'-5' and 15'-20' and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-11.5', 15'-15.5', 20'-20.5', and 25'-25.5'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
						ASPHALTIC CONCRETE (6")
B/S	3-3-4		9.9	3		**AGGREGATE BASE COURSE (10")**
					SM	**SILTY SAND WITH GRAVEL**
S	6-10-12			6		Reddish brown, predominately fine graded, subrounded, loose, slightly damp, medium plasticity, non-cemented.
				9	GM	**SILTY GRAVEL WITH SAND**
S	12-11-11			12		Light brown, predominately coarse graded, subangular, medium dense, slightly damp, low plasticity, non-cemented.
S/B	50/2"		6.8	15	SM	**SILTY SAND WITH GRAVEL**
				18		Reddish brown, predominately fine graded, subrounded, very dense, slightly damp, non-plastic, non-cemented.
S	50/4"			21		Note: no recovery.
S	50/2"			24		Note: no recovery.
				27		**Bottom of boring @ 25.5'; no groundwater encountered.**
				30		
				33		
				36		
				39		
				42		
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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Sample Date: 07/12/11

Drill Rig: Diedrich-D-120

Project Number:	110009	**Log of Boring No.**	B-13
Project:	Lafayette Storm Drain	**Client:**	Olsson Associates
Project Location:	Phoenix, Arizona	**Boring Location:**	See attached site plan

Latitude: Not Reported **Longitude:** Not Reported

Remarks: Bulk Samples collected at 2'-5' and 15'-20' and Split Spoon Samples driven at 2'-3.5', 5'-6.5', 10'-11.5', 15'-16', and 20'-21'.

Sample Type	Blows Per 6"	Dry Density (PCF)	Moisture (%)	Depth (Feet)	USCS Code	Description of Subsurface Conditions
S/B	4-4-5		7.5	3		**ASPHALTIC CONCRETE (4")**
						AGGREGATE BASE COURSE (6")
S	10-12-14			6	SM	**SILTY SAND** Medium to light brown, well graded, subangular, loose to medium dense to very dense, moist to slightly damp, low plasticity, non-cemented.
S	27-31-34			9		
				12		Note: some gravel.
S/B	36-50/4"			15		
				18		
S	39-50/5"			21		
				24		**Bottom of boring @ 21'; no groundwater encountered.**
				27		
				30		
				33		
				36		
				39		
				42		
				45		
				48		
				51		

The stratification lines represent the approximate boundary lines Between soil and rock types: In-situ, the transition may be gradual.

Sample Type Key: S = Split Spoon B = Bulk Sample BN = Bull Nose R = Ring Sample

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Sample Date: 07/12/11

Drill Rig: Diedrich-D-120

APPENDIX D
Laboratory Test

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APPENDIX D
LABORATORY TESTING

LABORATORY TESTS

Laboratory tests were performed on selected samples to aid in soil classification and to evaluate physical properties of the soils, which may affect the Geotechnical aspects of project design and construction. A description of the laboratory testing program is presented below.

Sieve Analysis

Sieve analyses were performed to evaluate the gradation characteristics of the material and to aid in soil classification. Tests were performed in general accordance with ASTM Test Method C 136 and D 2487.

Atterberg Limits

Atterberg Limits tests were performed to aid in soil classification and to evaluate the plasticity characteristics of the material. Additionally, test results were correlated to published data to evaluate the shrink/swell potential of near-surface site soils. Tests were performed in general accordance with ASTM Test Method D 4318.

Moisture Content

Moisture content tests were performed to evaluate moisture-conditioning requirements during site preparation and earthwork grading. Moisture content was evaluated in general accordance with ASTM Test Method D 2216.

Sulfate Content

Sulfate content tests were performed to evaluate the corrosion potential of the on-site soils. Tests were performed in general accordance with ARIZ 733.

Chloride Content

Chloride content tests were performed to evaluate the corrosion potential of the on-site soils. Tests were performed in general accordance with ARIZ 736.

pH and Resistivity

pH and resistivity tests were performed on the bulk soil sample to evaluate the site soil corrosion potential. Test procedure was in general accordance with Arizona Test Method 236.

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PROJECT NAME: LAFAYETTE Interceptor Drain and Outlet - Final Design
LOCATION: Phoenix, AZ
SAMPLE DATE: 5/20/2011

PROJECT: 11009
REVIEWED BY: A.Ortega

MECHANICAL SIEVE ANALYSIS GROUP SYMBOL, USCS (ASTM D-2487)

							SIEVE SIZES: PERCENT PASSING BY WEIGHT																			
							COBBLES		GRAVEL									SAND								Silt or
		CLASSIFICATION							Coarse					Fine				Coarse		Medium			Fine			Clay
Sample	Sample Source	USCS	AASHTO	LL	PL	PI	6"	4"	3"	2"	1½"	1¼"	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#10	#16	#30	#40	#50	#100	#200
1-1	B-1 @ 0-5'	SC	A-2-7(0): Clayey gravel and sand	46	21	25	100	100	100	100	100	100	100	100	100	99	99	85	60	55	44	36	34	32	28	23
1-10	B-2 @ 0-5'	SC	A-2-7(0): Clayey gravel and sand	56	30	26	100	100	100	100	100	100	100	100	100	99	99	82	60	55	44	36	34	32	28	23
1-11	B-2 @ 10-11.5'	SC	A-7-6(5): Clayey soils	55	29	26	100	100	100	100	100	100	100	100	100	100	100	100	82	78	67	58	55	52	46	38
1-24	B-3 @ 10-11.5'	SM	A-2-7(6): Clayey gravel and sand	50	38	12	100	100	100	100	100	100	100	100	100	100	100	100	77	71	63	54	51	49	43	35
1-31	B-4 @ 25-30'	SM	A-2-6(0): Clayey gravel and sand	35	24	11	100	100	100	100	100	100	100	100	99	96	96	72	41	37	28	22	20	19	17	14
1-41	B-5 @ 0-5'	SC	A-2-6(0): Clayey gravel and sand	36	23	13	100	100	100	100	100	100	100	100	100	100	91	77	59	54	44	36	34	32	27	21

This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at client's request.

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PROJECT NAME: LAFAYETTE Interceptor Drain and Outlet - Final Design
LOCATION: Phoenix, AZ
SAMPLE DATE: 5/20/2011

PROJECT: 11009
REVIEWED BY: A.Ortega

MECHANICAL SIEVE ANALYSIS GROUP SYMBOL, USCS (ASTM D-2487)

							SIEVE SIZES: PERCENT PASSING BY WEIGHT																			
							COBBLES		GRAVEL									SAND								Silt or
		CLASSIFICATION							Coarse					Fine				Coarse		Medium			Fine			Clay
Sample	Sample Source	USCS	AASHTO	LL	PL	PI	6"	4"	3"	2"	1½"	1¼"	1"	3/4"	1/2"	3/8"	1/4"	#4	#8	#10	#16	#30	#40	#50	#100	#200
6387-1	B-8 @ 2-5" (B)	SC	A-2-7(0): Clayey gravel and sand	47	21	26	100	100	100	100	100	100	99	97	92	89	79	71	59	56	45	37	34	32	29	23
6387-2	B-8 @ 20-21.5" (S)	SM	A-2-7(0): Clayey gravel and sand	55	40	15	100	100	100	100	100	100	100	100	98	97	92	88	67	63	51	43	40	38	33	24
6387-4	B-10 @ 2-5" (B)	SC-SM	A-2-6(0): Clayey gravel and sand	27	21	6	100	100	100	100	100	100	100	98	94	89	80	72	59	55	44	36	33	31	27	22
6387-5	B-11 @ 10-11.5" (S)	GP	A-2-7(0): Clayey gravel and sand	42	23	19	100	100	100	100	100	100	98	93	84	72	46	27	17	16	12	8.8	7.9	7.1	6	4.5
6387-6	B-12 @ 2-5" (B)	SM	A-2-7(2): Clayey gravel and sand	45	27	18	100	100	100	100	100	100	99	98	95	92	84	78	67	65	56	49	47	44	40	31
6387-7	B-13 @ 2-5" (B)	SM	A-2-7(0): Clayey gravel and sand	41	34	7	100	100	100	100	100	100	100	100	99	97	90	82	63	59	46	36	33	31	28	22
6387-8	B-12 @ 15-20" (B)	SM	A-1-a(0): Stone fragments, gravel and sand	NV	NP	NP	100	100	100	100	100	100	97	93	87	79	69	61	43	39	29	22	21	19	17	14
6387-16	B-9 @ 16-20" (B)	SM	A-1-b(0): Stone fragments, gravel and sand	NV	NP	NP	100	100	100	100	100	100	99	99	97	94	87	79	60	56	45	37	34	31	27	21

This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at client's request.

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PROJECT: LAFAYETTE Interceptor Drain and Outlet - Final Design
LOCATION: Phoenix, AZ
SAMPLE DATE: 5/20/2011, 7/12/2011

PROJECT: 110009
WORK ORDER: 6387, (1)
REVIEWED BY: A. Ortega

Standard Test Methods for Laboratory Determination of (Moisture) Content of Soil and Rock by Mass -- ASTM D2216 — **Water**

LAB #	SAMPLE SOURCE		MOISTURE CONTENT
1	B-8 @ 2-5'	--	8.6%
2	B-8 @ 20-21.5'	--	12.5%
4	B-10 @ 2-5'	--	5.6%
5	B-11 @ 10-11.5'	--	5.4%
6	B-12 @ 2-5'	--	9.9%
7	B-13 @ 2-5'	--	7.5%
8	B-12 @ 15-20'	--	6.8%
10	B-8 @ 15-16'	--	11.2%
11	B-9 @ 15-16'	--	4.8%
12	B-10 @ 10-11'	--	7.2%
13	B-7 @ 10-11.5'	--	10.8%
14	B-7 @ 15-16.5'	--	4.4%
15	B-9 @ 10-11.5'	--	8.9%
16	B-9 @ 16-20'	--	7.6%
1 (1)	B-1 @ 1-5'	--	4.7%
7 (1)	B-1 @ 25-26'	--	15.1%
9 (1)	B-1 @ 35-36'	--	19.5%
15 (1)	B-2 @ 15-16.5'	--	6.7%
18 (1)	B-2 @ 30-31.5'	--	14.1%
20 (1)	B-2 @ 40-41.5'	--	8.6%
24 (1)	B-3 @ 10-11.5'	--	11.0%
28 (1)	B-3 @ 30-30.5'	--	6.8%
55 (1)	B-5 @ 10-10.5'	--	5.4%
41 (1)	B-5 @ 1-5'	--	5.4%

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PROJECT: LAFAYETTE Interceptor Drain and Outlet - Final Design
LOCATION: Phoenix, AZ
SAMPLE DATE: 5/20/2011, 7/12/2011

PROJECT: 110009
WORK ORDER: 6387, (1)
REVIEWED BY: A. Ortega

DENSITY OF SOIL IN PLACE BY THE DRIVE-CYLINDER METHOD -- ASTM D 2937

LAB #	SAMPLE SOURCE	MOISTURE			HGT. (in)	WET WEIGHT + RINGS (g)	WEIGHT WEIGHT OF RINGS (g)	DRY DENSITY (pcf)
		WET WEIGHT (g)	DRY WEIGHT (g)	MOISTURE CONTENT				
7 (1)	B-1 @ 25-26'	304.3	264.4	15.1%	1	392.9	88.6	109.5
10	B-8 @ 15-16'	600.6	540.2	11.2%	1	779.5	178.9	111.8
11	B-9 @ 15-15.25'	546.2	521.4	4.8%	1	715.2	169.0	107.9
12	B-10 @ 10-11'	423.9	395.6	7.2%	1	558.4	134.5	109.2

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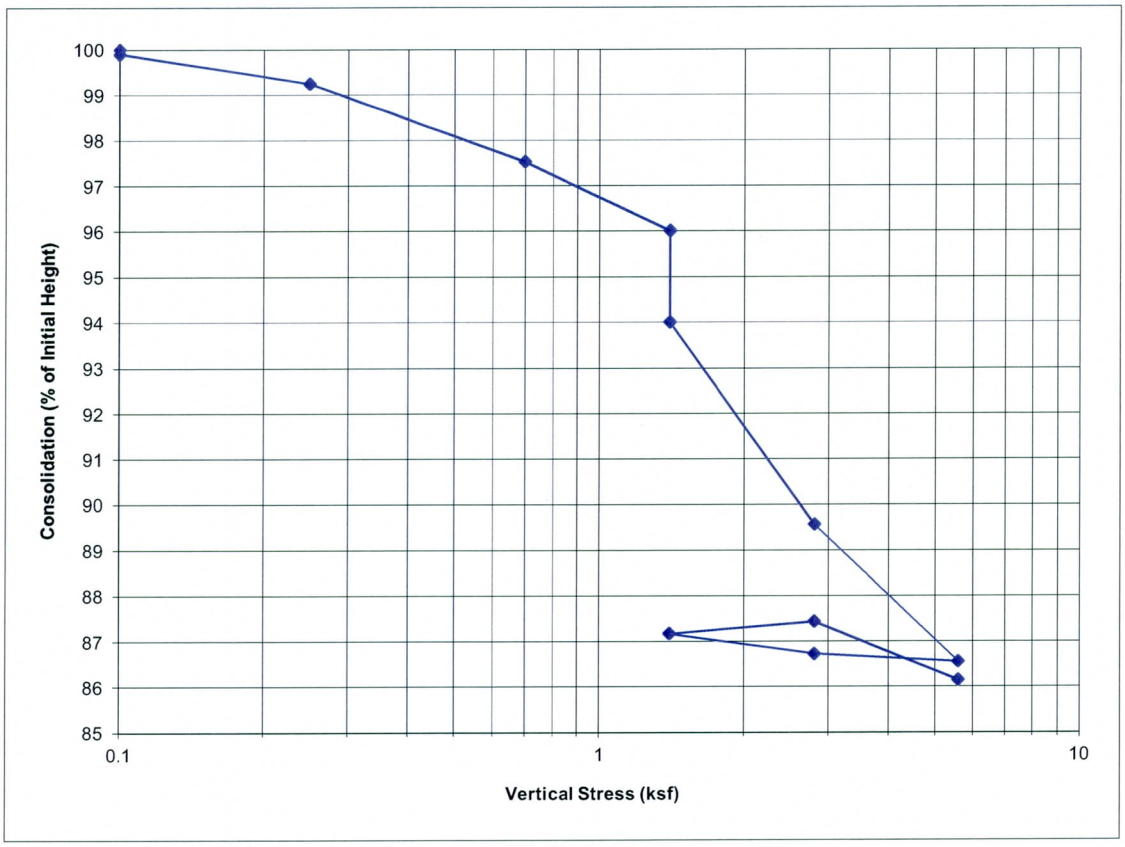
Project:	LAFAYETTE Interceptor Drain and Outlet - Final Design	**Project Number:**	10-G-1766
Project Loaction:	Phoenix, AZ	**Work Order Number:**	1
Client:	Olsson Associates	**Lab Number:**	7
Material:	Native	**Date Sampled:**	05/20/11
Sample Source:	Ring Sample B-1 @ 25'-26'		
Sample Prep:	Insitu		

One-Dimensional Consolidation Properties of Soils (ASTM D2435)

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	3.97
Initial Moisture Content	16.3%	Final Moisture Content	17.8%
Initial Dry Density(pcf)	108.7	FInal Dry Density(pcf)	126.2
Initial Degree of Saturation	68%	FInal Degree of Saturation	110%
Initial Void Ratio	0.7	Final Void Ratio	0.5
Estimated Specific Gravity	3.00	Saturated at	ksf



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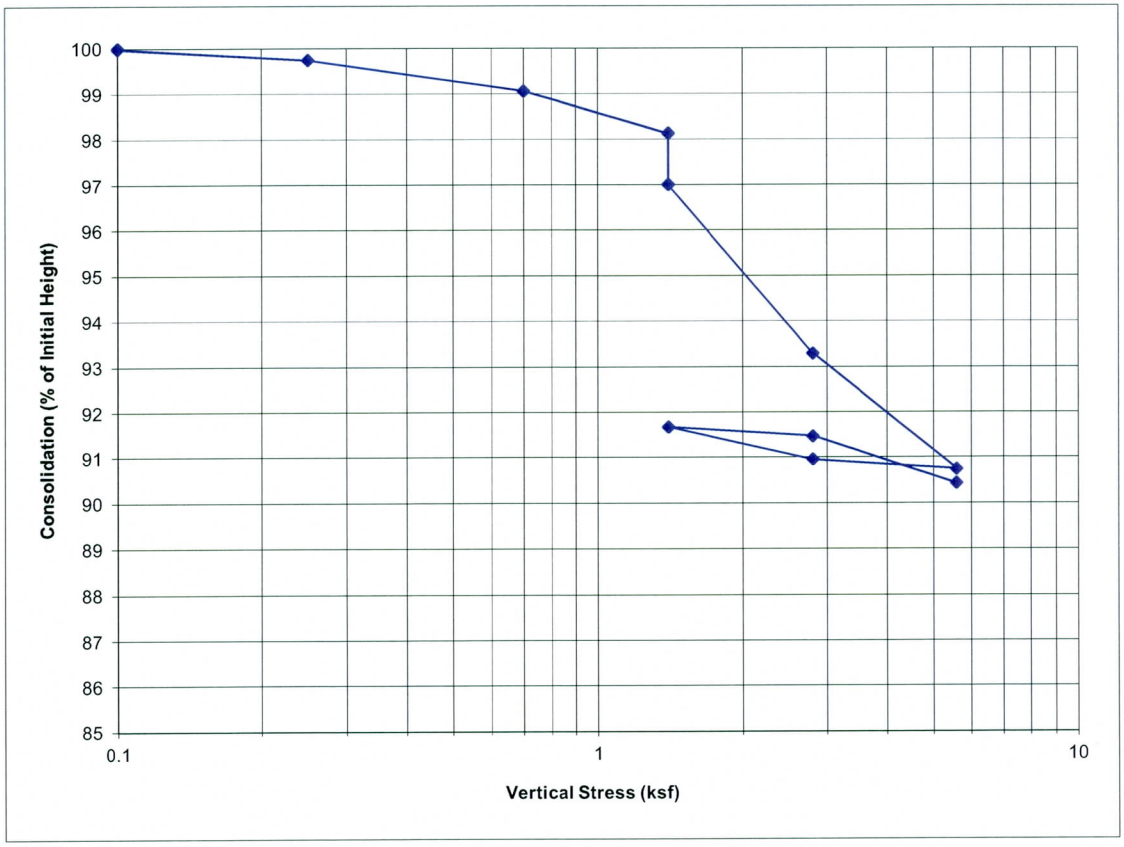
Project:	LAFAYETTE Interceptor Drain and Outlet - Final Design	**Project Number:**	10-G-1766
Project Loaction:	Phoenix, AZ	**Work Order Number:**	2
Client:	Olsson Associates	**Lab Number:**	61
Material:	Native	**Date Sampled:**	05/20/11
Sample Source:	Ring Sample B-10 @ 10-11'		
Sample Prep:	Insitu		

One-Dimensional Consolidation Properties of Soils (ASTM D2435)

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.16
Initial Moisture Content	13.1%	Final Moisture Content	23.0%
Initial Dry Density(pcf)	99.2	FInal Dry Density(pcf)	109.7
Initial Degree of Saturation	47%	FInal Degree of Saturation	105%
Initial Void Ratio	0.8	Final Void Ratio	0.6
Estimated Specific Gravity	2.85	Saturated at	ksf



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Project:	LAFAYETTE Interceptor Drain and Outlet - Final Design	**Project Number:**	110009
Location:	Phoenix, AZ	**Work Order Number:**	6387
Client:	Olsson Associates	**Lab Number:**	See Below
Material:	See Below	**Date Sampled:**	Various
Sample Source:	See Below	**Reviewed:**	A. Ortega

pH & Resistivity (AZ 236)

Lab Number	Sample Source	Material	Resistivity (Ohm-cm)	pH
3	Bulk Sample B-9 @ 16'-20'	Native	2,281	7.8
4	Bulk Sample B-10 @ 3'-5'	Native	3,154	7.9
8	Bulk Sample B-12 @ 15'-20'	Native	1,409	7.9
9	Bulk Sample B-13 @ 16'-19'	Native	2,013	7.7
37	Bulk Sample B-4 @ 25'-30'	Native	1,879	8.1
41	Bulk Sample B-5 @ 1'-5'	Native	1,342	7.8

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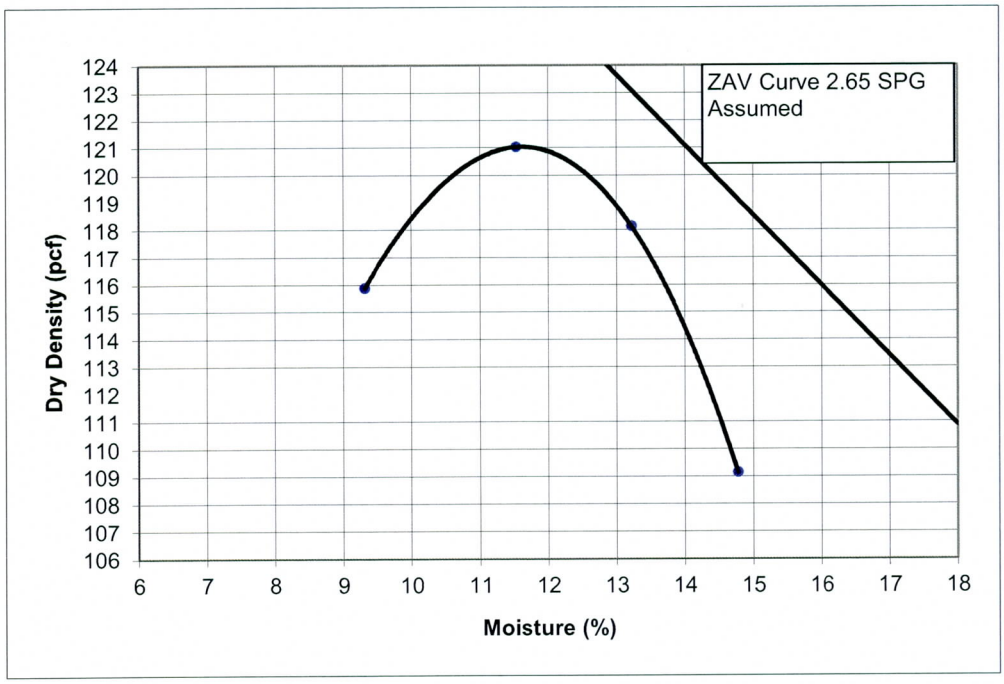
PROJECT:	LAFAYETTE Interceptor Drain and Outlet - Final Design	**PROJECT NO:**	110009
LOCATION:	Phoenix, AZ	**WORK ORDER NO:**	1
MATERIAL:	Soil	**LAB NO:**	10
SAMPLE SOURCE:	B-2 @ 0-5'	**SAMPLE DATE:**	5/20/2011

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING STANDARD EFFORT (12,400ft-lb-ft/cu.ft) (ASTMD698A)

	English (pcf)	Metric (kg/ cu.m.)
Maximum dry density:	121.0	1939
Optimum moisture (%):	11.6	11.6



NOTES:

- The zero air void curve represents a specific gravity of: 2.65 (assumed).
- This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at clients request.

Reviewed by: A.Ortega

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MOTZZ LABORATORY, INC.
2113 S 48th St Suite 109
Tempe, AZ 85282

Soil Analysis Report

Atek Engineering Consultants
Armando Ortega
1114 Grand Avenue
Phoenix, AZ 85007

Project: Soil
Sampler:
Date Received: 7/18/2011
Date Reported: 7/19/2011
PO Number:

Lab Number: 903805-01 **B-4 25-30'**

Sulfate & Chloride	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	41	ppm	
Chloride, Cl	ARIZ 736	34	ppm	

Sulfate 0.0041% ; Chloride 0.0034%

Lab Number: 903805-02 **B-5 0-5'**

Sulfate & Chloride	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	207	ppm	
Chloride, Cl	ARIZ 736	279	ppm	

Sulfate 0.021% ; Chloride 0.028%

Lab Number: 903805-03 **B-8 2-5'**

Sulfate & Chloride	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	56	ppm	
Chloride, Cl	ARIZ 736	14	ppm	

Sulfate 0.0056% ; Chloride 0.0014 %

Lab Number: 903805-04 **B-9 5-6.5'**

Sulfate & Chloride	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	104	ppm	
Chloride, Cl	ARIZ 736	13	ppm	

Sulfate 0.010% ; Chloride 0.0013%

Lab Number: 903805-05 **B-9 16-20'**

Sulfate & Chloride	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	74	ppm	
Chloride, Cl	ARIZ 736	62	ppm	

Sulfate 0.0074% ; Chloride 0.0062%

MOTZZ LABORATORY, INC.
2113 S 48th St Suite 109
Tempe, AZ 85282

Soil Analysis Report

Atek Engineering Consultants
Armando Ortega
1114 Grand Avenue
Phoenix, AZ 85007

Project: Soil
Sampler:
Date Received: 7/18/2011
Date Reported: 7/19/2011
PO Number:

Lab Number: 903805-06 **B-10 20-25'**

Sulfate & Chloride	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	304	ppm	
Chloride, Cl	ARIZ 736	130	ppm	

Sulfate 0.030% ; Chloride 0.013%

Lab Number: 903805-07 **B-12 2-5'**

Sulfate & Chloride	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	78	ppm	
Chloride, Cl	ARIZ 736	11	ppm	

Sulfate 0.0078% ; Chloride 0.0011%

Lab Number: 903805-08 **B-12 15-20'**

Sulfate & Chloride	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	29	ppm	
Chloride, Cl	ARIZ 736	194	ppm	

Sulfate 0.0029% ; Chloride 0.019%

Lab Number: 903805-09 **B-13 2-5'**

Sulfate & Chloride	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	89	ppm	
Chloride, Cl	ARIZ 736	28	ppm	

Sulfate 0.0089% ; Chloride 0.0028 %

Lab Number: 903805-10 **B-13 16-19'**

Sulfate & Chloride	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	95	ppm	
Chloride, Cl	ARIZ 736	30	ppm	

Sulfate 0.0095% ; Chloride 0.0030%

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ENGINEERING CONSULTANTS

Flexible Pavement Design (AASHTO)

Project Name:	Lafayette Interceptor Drain and Outlet - Final Design
Project Number:	11009
Client:	Olsson Associates
Location:	Phoenix, AZ
Design Section:	Camelback Road
Engineer:	A.Ortega
Date:	7/22/2011

Flexible Pavement Structural Design:

Resilient Modulus (psi)	26,000
SubgradeType	N/A
Subgrade Thickness (inches)	-
Subbase Type	AB
Subbase Thickness (inches)	8.0
Asphaltic Concrete Thickness (inches)	5.0
Structural Number (Required)	2.82
Structural Number (Section)	2.91
Performance (years)	20.0
Allowable 18-kip ESAL Repetition	5,434,420

Design Parameters:

Standard Normal Deviate	-1.645
Combined Standard error	0.40
Design Serviceability Loss	2.5
Desired Level of Reliability (percent)	95.0
Asphaltic Concrete Layer Coefficient	0.39
Subbase Layer Coefficient AB	0.12
Subgrade Layer Coefficient N/A	0.11

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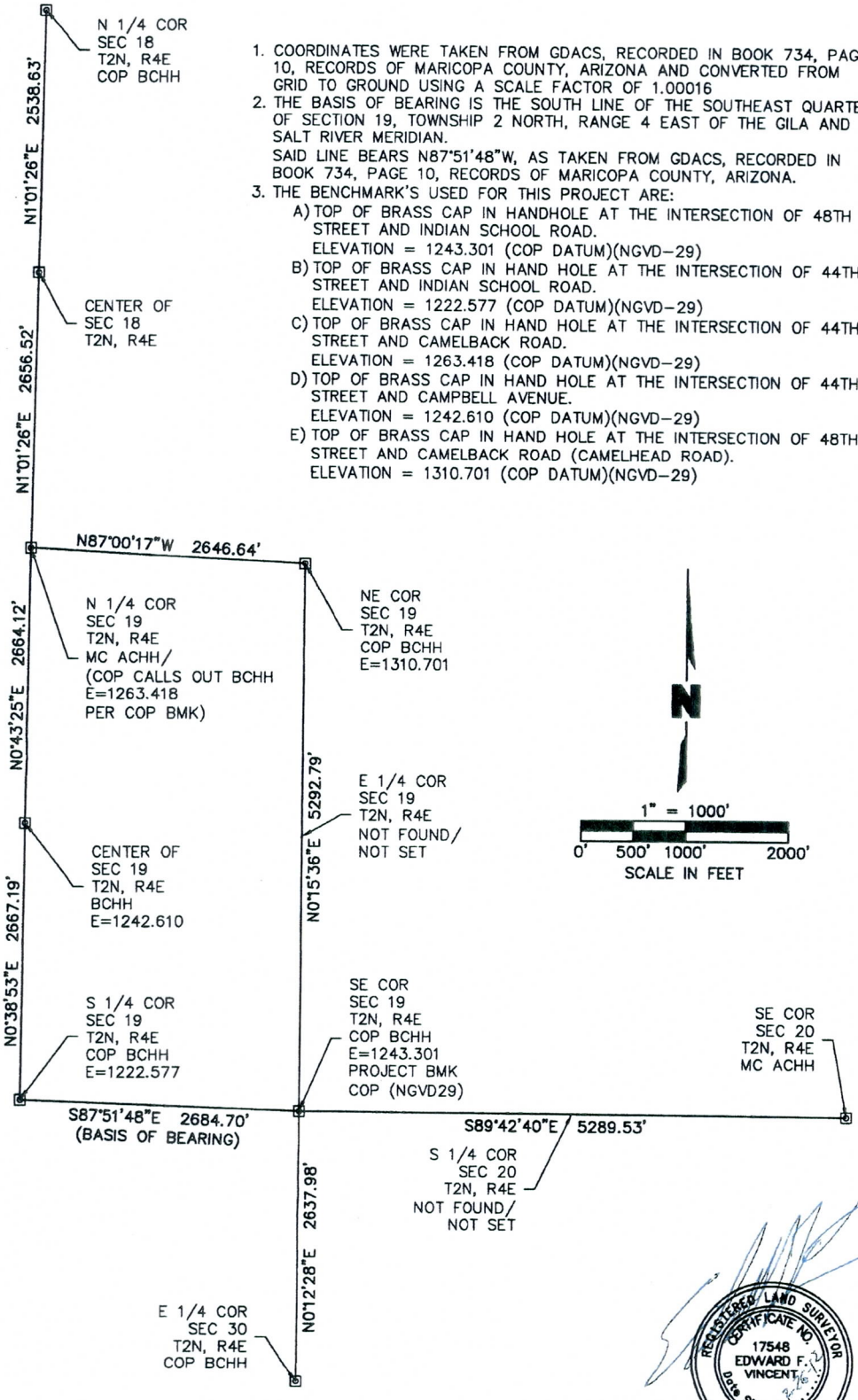
Appendix H

Survey Data



1. COORDINATES WERE TAKEN FROM GDACS, RECORDED IN BOOK 734, PAGE 10, RECORDS OF MARICOPA COUNTY, ARIZONA AND CONVERTED FROM GRID TO GROUND USING A SCALE FACTOR OF 1.00016
2. THE BASIS OF BEARING IS THE SOUTH LINE OF THE SOUTHEAST QUARTER OF SECTION 19, TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER MERIDIAN.
   SAID LINE BEARS N87°51'48"W, AS TAKEN FROM GDACS, RECORDED IN BOOK 734, PAGE 10, RECORDS OF MARICOPA COUNTY, ARIZONA.
3. THE BENCHMARK'S USED FOR THIS PROJECT ARE:
   A) TOP OF BRASS CAP IN HANDHOLE AT THE INTERSECTION OF 48TH STREET AND INDIAN SCHOOL ROAD.
      ELEVATION = 1243.301 (COP DATUM)(NGVD-29)
   B) TOP OF BRASS CAP IN HAND HOLE AT THE INTERSECTION OF 44TH STREET AND INDIAN SCHOOL ROAD.
      ELEVATION = 1222.577 (COP DATUM)(NGVD-29)
   C) TOP OF BRASS CAP IN HAND HOLE AT THE INTERSECTION OF 44TH STREET AND CAMELBACK ROAD.
      ELEVATION = 1263.418 (COP DATUM)(NGVD-29)
   D) TOP OF BRASS CAP IN HAND HOLE AT THE INTERSECTION OF 44TH STREET AND CAMPBELL AVENUE.
      ELEVATION = 1242.610 (COP DATUM)(NGVD-29)
   E) TOP OF BRASS CAP IN HAND HOLE AT THE INTERSECTION OF 48TH STREET AND CAMELBACK ROAD (CAMELHEAD ROAD).
      ELEVATION = 1310.701 (COP DATUM)(NGVD-29)

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
17548
EDWARD F. VINCENT
Date Signed 3/16/12
ARIZONA U.S.A.

EXPIRES 09/30/13

DWG: F:\Projects\010-2312_SRVY\MasterXrefs\102312_CTRL.dwg USER: baeaton
DATE: Mar 26, 2012 1:26pm XREFS: 102312_XRWAY EDWARD_VINCENT_LS_AZ

PROJECT NO: 010-2312	LAFAYETTE - CONTROL	OLSSON ASSOCIATES	EXHIBIT
DRAWN BY: BES		7250 North 16th Street Suite 210 Phoenix, AZ 85020-5282 TEL 602.748.1000 FAX 602.748.1001	1
DATE: 12.03.2010			

Search Results

Location	NGVD-29 Elevation	Description	Stamped	Tie
48 STR AND INDIAN SCHOOL ROAD	1243.301	C.O.P. B.C. IN H.H. JUST EAST OF INTERSECTION		

1 **Returned Matching your search criteria**

NEW SEARCH

Search Results

Location	NGVD-29 Elevation	Description	Stamped	Tie
44 STR AND INDIAN SCHOOL ROAD	1222.577	C.O.P. B.C. IN H.H.		

1 **Returned Matching your search criteria**

NEW SEARCH

Search Results

Location	NGVD-29 Elevation	Description	Stamped	Tie
44 STR AND CAMELBACK ROAD	1263.418	C.O.P. B.C. IN H.H.		

1 **Returned Matching your search criteria**

NEW SEARCH

Search Results

Location	NGVD-29 Elevation	Description	Stamped	Tie
44 STR AND CAMPBELL	1242.610	B.C. IN H.H.		

1 Returned Matching your search criteria

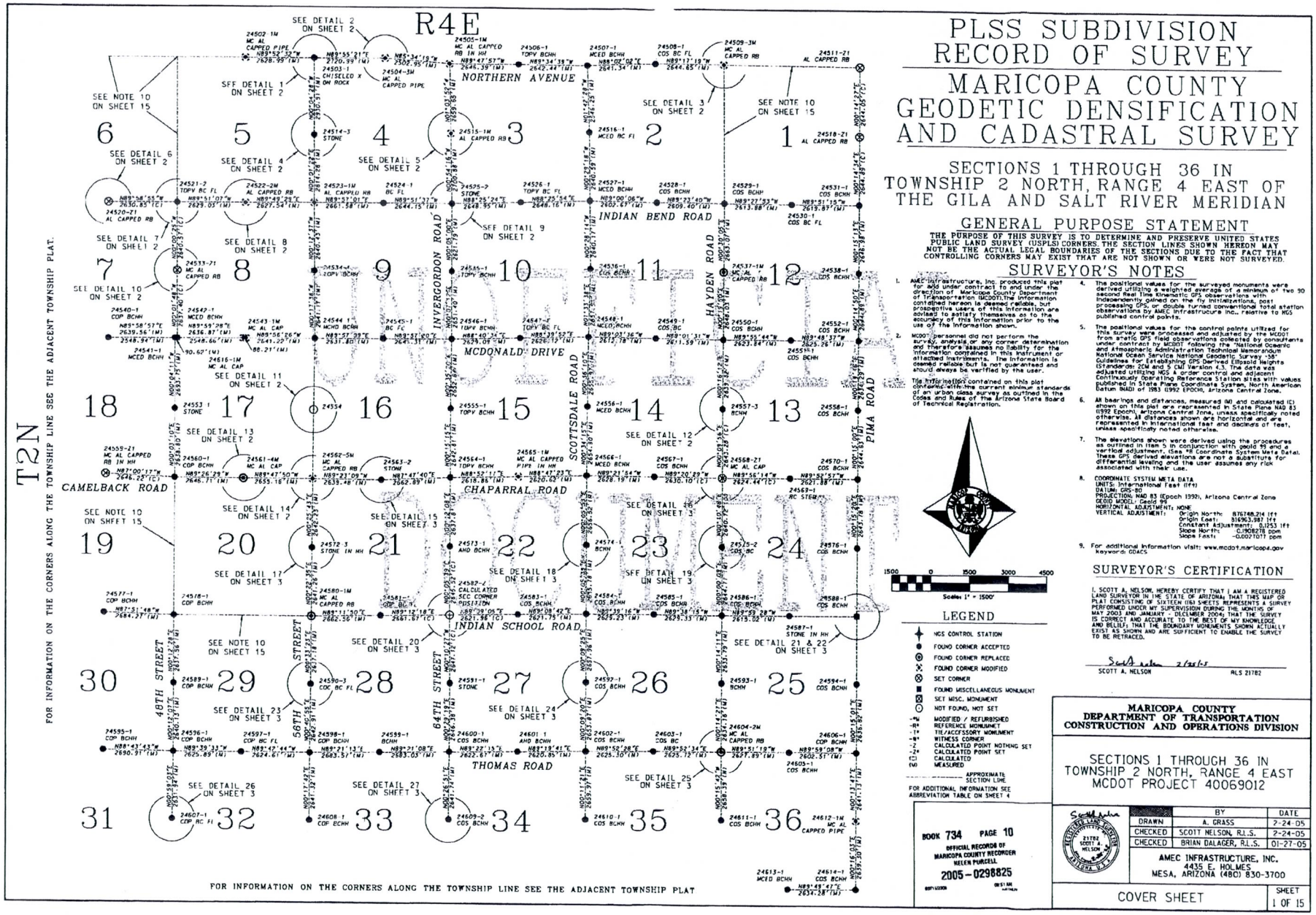
NEW SEARCH

Search Results

Location	NGVD-29 Elevation	Description	Stamped	Tie
48 STR AND CAMELBACK (CAMELHEAD)	1310.701	C.O.P. B.C. IN H.H.		

1 Returned Matching your search criteria

NEW SEARCH



PLSS SUBDIVISION RECORD OF SURVEY

MARICOPA COUNTY GEODETIC DENSIFICATION AND CADASTRAL SURVEY

SECTIONS 1 THROUGH 36 IN TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER MERIDIAN

GENERAL PURPOSE STATEMENT

THE PURPOSE OF THIS SURVEY IS TO DETERMINE AND PRESERVE UNITED STATES PUBLIC LAND SURVEY (USPLS) CORNERS. THE SECTION LINES SHOWN HEREON MAY NOT BE THE ACTUAL LEGAL BOUNDARIES OF THE SECTIONS DUE TO THE FACT THAT CONTROLLING CORNERS MAY EXIST THAT ARE NOT SHOWN OR WERE NOT SURVEYED.

SURVEYOR'S NOTES

1. AMEC Infrastructure, Inc. produced this plat for and under contract to and under the direction of Maricopa County Department of Transportation (MCDOT).The information contained heron is deemed reliable, but prospective users of this information are advised to satisfy themselves as to the accuracy of this information prior to the use of the information shown.
2. MCDOT personnel did not perform the survey, analysis, or any other determination and therefore assumes no liability for the information contained in this instrument or attached instruments. The information is deemed reliable but is not guaranteed and should always be verified by the user.
3. The information contained on this plat complies with the current minimum standards of an urban class survey as outlined in the Codes and Rules of the Arizona State Board of Technical Registration.
4. The positional values for the surveyed monuments were derived utilizing a weighted average of a minimum of two 90 second Real Time Kinematic GPS observations with independently gained on the fly initializations, post processing GPS, or double turned conventional total station observations by AMEC Infrastructure Inc., relative to NGS published control points.
5. The positional values for the control points utilized for this survey were processed and adjusted by the MCDOT from static GPS field observations collected by consultants under contract by MCDOT following the "National Oceanic and Atmospheric Administration Technical Memorandum National Ocean Service National Geodetic Survey -58" Guidelines for Establishing GPS Derived Ellipsoid Heights (Standards- 2cm and 5 cm Version 4.3. The data was adjusted utilizing NGS 4 order control and adjacent Continuously Operating Reference Station sites with values published in State Plane Coordinate System, North American Datum (NAD) of 1983 (1992 EPOCH), Arizona Central Zone.
6. All bearings and distances, measured (M) and calculated (C) shown on this plat are represented in State Plane NAD 83 (1992 Epoch), Arizona Central Zone, unless specifically noted otherwise. All distances shown are horizontal and are represented in international feet and decimals of feet, unless specifically noted otherwise.
7. The elevations shown were derived using the procedures as outlined in Item 5 in conjunction with geoid 99 and a vertical adjustment. (See "R Coordinate System Meta Data). These GPS derived elevations are not a substitute for differential leveling and the user assumes any risk associated with their use.
8. COORDINATE SYSTEM META DATA
   UNITS: International Feet (ift)
   DATUM: GRS-80
   PROJECTION: NAD 83 (Epoch 1992), Arizona Central Zone
   GEOID MODEL: Geoid 99
   HORIZONTAL ADJUSTMENT: NONE
   VERTICAL ADJUSTMENT:
   Origin North: 876748.214 ift
   Origin East: 349963.987 ift
   Constant Adjustment: 0.1253 ift
   Slope North: 0.1900878 ppm
   Slope East: -0.0077077 ppm
9. For additional information visit: www.mcdot.maricopa.gov
   Keywords: GDACS

1500 0 1500 3000 4500
Scale: 1" = 1500'

LEGEND

- NGS CONTROL STATION
- FOUND CORNER ACCEPTED
- FOUND CORNER REPLACED
- FOUND CORNER MODIFIED
- SET CORNER
- FOUND MISCELLANEOUS MONUMENT
- SET MISC. MONUMENT
- NOT FOUND, NOT SET
- MODIFIED / REFURBISHED
- REFERENCE MONUMENT
- TIE/ACCESSORY MONUMENT
- WITNESS CORNER
- CALCULATED POINT NOTHING SET
- CALCULATED POINT SET
- CALCULATED
- MEASURED
- APPROXIMATE SECTION LINE

FOR ADDITIONAL INFORMATION SEE ABBREVIATION TABLE ON SHEET 4

SURVEYOR'S CERTIFICATION

I, SCOTT A. NELSON, HEREBY CERTIFY THAT I AM A REGISTERED LAND SURVEYOR IN THE STATE OF ARIZONA; THAT THIS MAP OR PLAT CONSISTING OF SIXTEEN (16) SHEETS REPRESENTS A SURVEY PERFORMED UNDER MY SUPERVISION DURING THE MONTHS OF MAY 2003 AND JANUARY - DECEMBER 2004; THAT THE SURVEY IS CORRECT AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF; THAT THE BOUNDARY MONUMENTS SHOWN ACTUALLY EXIST AS SHOWN AND ARE SUFFICIENT TO ENABLE THE SURVEY TO BE RETRACED.

Scott A. Nelson 2/25/05
SCOTT A. NELSON RLS 21782

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

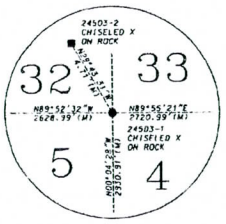
SECTIONS 1 THROUGH 36 IN TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

	BY	DATE
DRAWN	A. GRASS	2-24-05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

COVER SHEET — SHEET 1 OF 15

BOOK 734 PAGE 10
OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-0298825



DETAIL 1
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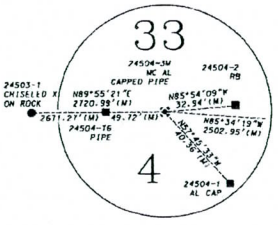

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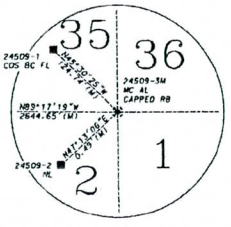

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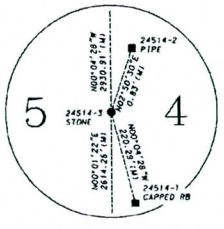

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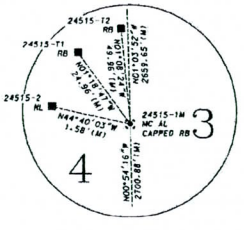

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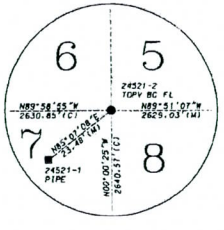

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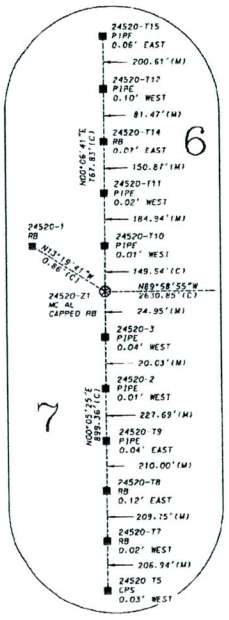

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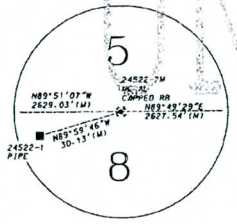

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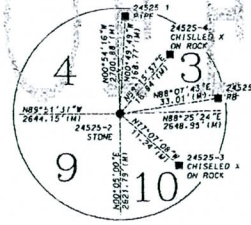

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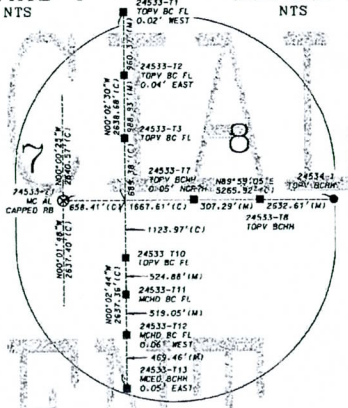

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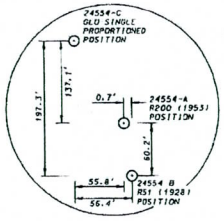

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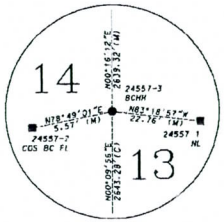

DETAIL 12
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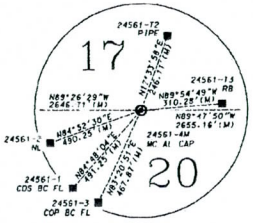

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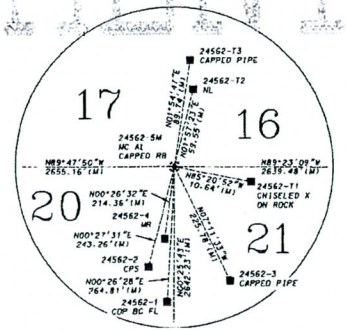

DETAIL 14
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MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-0298825
01/31/05

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN
TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

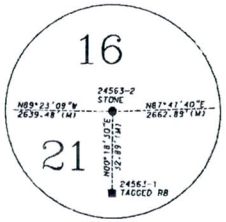
	BY	DATE
DRAWN	A. GRASS	2-24-05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

21782 SCOTT A. NELSON — REGISTERED LAND SURVEYOR — ARIZONA U.S.A.

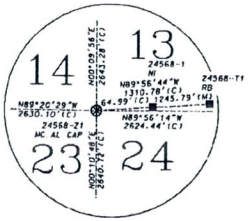
AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

DETAILS

SHEET 2 OF 15



DETAIL 15
NTS



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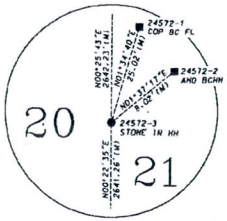

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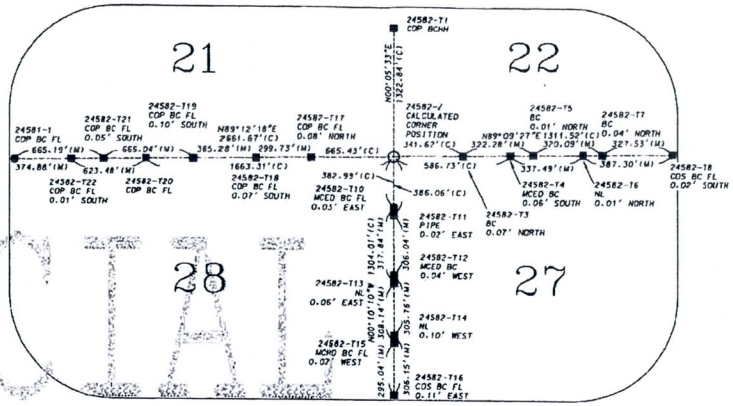

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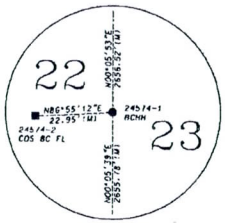

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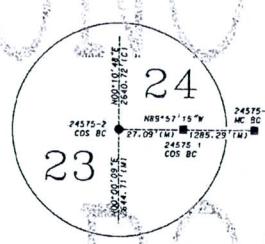

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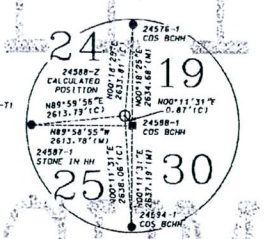

DETAIL 21
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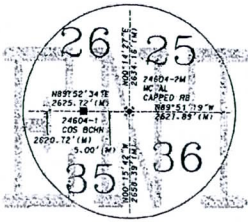

DETAIL 25
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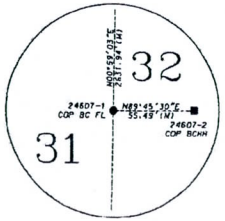

DETAIL 26
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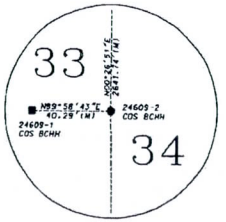

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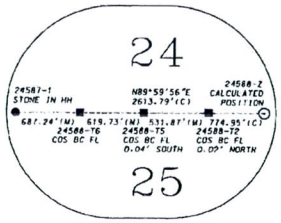

DETAIL 22
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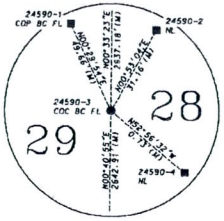

DETAIL 23
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DETAIL 24
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UNOFFICIAL DOCUMENT

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REGISTERED LAND SURVEYOR
21782
SCOTT A. NELSON
ARIZONA U.S.A.

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

DETAILS

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COORDINATE TABLE

THIS DATA TABLE REPORTS A GREATER DEGREE OF PRECISION THAN ACTUALLY SURVEYED.
CAUTION SHOULD BE EXERCISED WHEN USING THE DATA.
THE INFORMATION IS DEEMED RELIABLE TO THE EXTENT OF THE METHODS USED TO COLLECT THE DATA
BUT MCDOT NOR AMEC INFRASTRUCTURE, INC. GUARANTEES ITS ACCURACY FOR ANY PARTICULAR PURPOSE.
PROSPECTIVE USERS ARE ADVISED TO SATISFY THEMSELVES AS TO THE ACCURACY PRIOR TO USE.
FOR FURTHER INFORMATION ON HOW THE VALUES WERE GENERATED PLEASE SEE NOTE 4 THROUGH NOTE 8 ON SHEET 1.

CORNER	LOCATION	LATITUDE NAD83	LONGITUDE NAD83	ELLIP HGT. NAD83 I-FEET	NORTHING NAD83 (1992 EPOCH) I-FEET	EASTING	ELEVATION NAVD88 I-FEET	COMBINED SCALE FACTOR (GRID TO GROUND)	CONVERGENCE ANGLE	LAST DATE VISITED	DESCRIPTION
24502-1M	T2N R4E 5 N	33°33'12.83063"N	111°58'09.05698"W	1300.394	928943.878	684001.282	1397.343	1.000161806	-0°01'44"	10/29/2004	FD 1" IP 0.3' DN W/O ID. AFFIXED 2" MARICOPA COUNTY AL CAP 0.3' DN STAMPED "T3N R4E 1/4 S32 S5 T2N 2004 RLS 21782"
24503-1	T2N R4E 5 NE	33°33'12.78620"N	111°57'37.99028"W	1711.109	928938.165	686630.262	1808.065	1.000181503	-0°01'27"	06/30/2004	FD CHISELED X ON STONE NOTE- X ON BEDROCK. 6 NOTCHES ON NORTH SIDE. 4 NOTCHES ON EAST SIDE. 6 NOTCHES ON SOUTH SIDE
24503-2		33°33'12.87669"N	111°57'38.01791"W	1708.652	928942.258	686627.925	1805.608	1.000181383	-0°01'27"	06/30/2004	FD CHISELED X ON STONE
24504-1		33°33'12.51991"N	111°57'05.43282"W	1279.316	928920.311	689385.393	1376.288	1.000160956	-0°01'09"	05/15/2003	FD 1 1/2" AL CAP 0.1' UP STAMPED "AERIAL MAPPING CO. PHX"
24504-2		33°33'12.80966"N	111°57'05.44803"W	1278.701	928939.490	689384.112	1375.673	1.000160936	-0°01'09"	05/15/2003	FD 1/2" RB W/O ID 0.2' UP
24504-3M	T2N R4E 4 N	33°33'12.83284"N	111°57'05.83633"W	1278.644	928941.844	689351.253	1375.616	1.000160926	-0°01'10"	11/04/2004	FD 1" IP 0.4' UP W/O ID. AFFIXED 2" MARICOPA COUNTY AL CAP 0.4' UP STAMPED "T3N R4E 1/4 S33 S4 T2N 2004 RLS 21782"
24504-16		33°33'12.83191"N	111°57'06.42386"W	1281.334	928941.766	689301.534	1378.305	1.000161056	-0°01'10"	09/14/2004	FD 7/8" IP 0.1' UP W/O ID
24505-1M	T2N R4E 4 NE	33°33'10.92823"N	111°56'36.34664"W	1236.699	928748.600	691846.733	1333.689	1.000158975	-0°00'53"	11/01/2004	FD 1/2" RB W/O ID IN HH 0.5' DN. AFFIXED 2" MARICOPA COUNTY AL CAP IN HH 0.5' DN STAMPED "T3N R4E S33 S34 S4 S3 T2N 2004 RLS 21782"
24506-1	T2N R4E 3 N	33°33'10.84217"N	111°56'05.07460"W	1214.022	928739.329	694493.106	1311.035	1.000157935	-0°00'36"	05/20/2003	FD 3" PV BC IN HH 0.9' DN NO STAMPING
24507-1	T2N R4E 3 NE	33°33'10.65285"N	111°55'33.84984"W	1201.362	928719.844	697135.479	1298.392	1.000157355	-0°00'19"	05/20/2003	FD 4" MC ENG DPT BC IN HH 0.6' DN NO STAMPING
24508-1	T2N R4E 2 N	33°33'11.55076"N	111°55'02.65516"W	1206.650	928810.468	699775.259	1303.692	1.000157625	-0°00'01"	05/20/2003	FD 3" SCOTTSDALE BC 0.1' DN NO STAMPING
24509-1		33°33'12.09001"N	111°54'32.45791"W	1208.624	928865.055	702330.721	1305.874	1.000157715	0°00'15"	11/04/2004	FD 3" SCOTTSDALE BC FL NO STAMPING NOTE INTERSECTION OF VIA MARINA AND VIA PALMA
24509-2		33°33'11.22168"N	111°54'31.41077"W	1208.964	928777.299	702419.341	1306.016	1.000157725	0°00'16"	04/26/2004	FD 60d NL 0.35' DN
24509-3M	T2N R4E 2 NE	33°33'11.22499"N	111°54'31.40649"W	1208.954	928777.634	702419.703	1306.005	1.000157725	0°00'16"	11/04/2004	FD 1/2" RB W/O ID 0.4' DN, AFFIXED 2" MARICOPA COUNTY AL CAP 0.4' DN STAMPED "T3N R4E S35 S36 S2 S1 T2N 2004 RLS 21782"
24511-Z1	T2N R4E 1 NE	33°33'10.63743"N	111°53'28.99367"W	1215.977	928719.095	707701.355	1313.036	1.000157995	0°00'50"	12/08/2004	SET 5/8" RB W/ 2" AL CAP FL STAMPED "2004 T3N R4E T2N S36 R5E S1 S6 T2N RLS 21782"
24514-1		33°32'41.60814"N	111°57'37.92606"W	1979.846	925786.964	686634.363	2076.845	1.000194328	-0°01'27"	05/27/2003	FD 1/2" RB W/ 1" PLASTIC CAP STAMPING ILLEGIBLE
24514-2		33°32'43.79586"N	111°57'37.93007"W	1956.628	926008.079	686634.118	2053.623	1.000193227	-0°01'27"	06/30/2004	FD 3/4" IP 0.6' UP W/O ID
24514-3	T2N R4E 5 E	33°32'43.78769"N	111°57'37.93055"W	1957.823	926007.253	686634.077	2054.819	1.000193277	-0°01'27"	06/30/2004	FD STONE 1' UP MARKED "1/4" ON WEST SIDE OF STONE
24515-1M	T2N R4E 4 E	33°32'44.61820"N	111°56'35.75418"W	1276.037	926089.406	691896.136	1373.058	1.000160856	-0°00'53"	11/04/2004	FD 1/2" RB W/O ID 0.1' DN, AFFIXED 2" AL CAP FL STAMPED "T2N R4E 1/4 S4 S3 2004 RLS 21782"
24515-2		33°32'44.62935"N	111°56'35.76795"W	1276.057	926090.533	691895.022	1373.078	1.000160856	-0°00'53"	04/30/2004	FD PK NL FL
24515-T1		33°32'44.86513"N	111°56'35.76162"W	1275.220	926114.363	691895.564	1372.241	1.000160816	-0°00'53"	09/01/2004	FD 1/2" RB W/O ID 0.2' DN
24515-T2		33°32'45.11238"N	111°56'35.76668"W	1274.998	926139.354	691895.142	1372.019	1.000160806	-0°00'53"	09/01/2004	FD 1/2" RB W/O ID 0.2' DN
24516-1	T2N R4E 3 E	33°32'45.47146"N	111°55'32.95041"W	1198.016	926174.729	697211.368	1295.075	1.000157195	-0°00'18"	05/20/2003	FD 4" MC ENG DPT BC FL NO STAMPING
24518-Z1	T2N R4E 1 E	33°32'44.47736"N	111°53'29.13259"W	1205.824	926075.068	707690.242	1302.925	1.000157515	0°00'50"	12/08/2004	SET 5/8" RB W/ 2" AL CAP FL STAMPED "T2N 1/4 R4E R5E S1 S6 RLS 21782"
24520-1		33°32'17.88364"N	111°59'11.12113"W	1418.626	923393.429	678745.443	1515.697	1.000167228	-0°02'19"	09/01/2004	FD 1/2" RB W/O ID 0.3' UP NOTE- OLD STONE FOUND DISTURBED AND LYING TO NORTH OF RB
24520-2		33°32'17.43028"N	111°59'11.11934"W	1420.598	923347.608	678745.562	1517.669	1.000167318	-0°02'19"	05/14/2003	FD 1" IP 0.8' UP W/O ID
24520-3		33°32'17.52846"N	111°59'11.11953"W	1419.649	923357.638	678745.559	1516.720	1.000167268	-0°02'19"	05/14/2003	FD 1" IP 0.2' UP W/O ID
24520-T5		33°32'08.97707"N	111°59'11.12870"W	1323.017	922493.235	678744.195	1420.108	1.000162656	-0°02'19"	04/22/2004	FD CPS FL
24520-T7		33°32'11.02456"N	111°59'11.12645"W	1335.469	922700.177	678744.525	1432.555	1.000163257	-0°02'19"	04/22/2004	FD 1/2" RB W/O ID 0.3' UP
24520-T8		33°32'13.09982"N	111°59'11.12254"W	1365.617	922909.924	678744.996	1462.698	1.000164697	-0°02'19"	04/22/2004	FD 1/2" RB W/O ID 0.3' UP
24520-T9		33°32'15.17753"N	111°59'11.12122"W	1404.109	923119.921	678745.249	1501.185	1.000166528	-0°02'19"	04/22/2004	FD 1" IP 0.2' UP W/O ID
24520-T10		33°32'19.35886"N	111°59'11.11660"W	1389.482	923542.530	678745.925	1486.549	1.000165827	-0°02'19"	04/29/2004	FD 1" IP 0.3' UP W/O ID
24520-T11		33°32'21.18862"N	111°59'11.11399"W	1390.240	923727.466	678746.277	1487.502	1.000165878	-0°02'19"	04/29/2004	FD 1" IP 0.3' UP W/O ID
24520-T12		33°32'23.48742"N	111°59'11.11149"W	1468.601	923959.808	678746.638	1565.858	1.000169619	-0°02'19"	04/29/2004	FD 1" IP 0.3' UP W/O ID
24520-T14		33°32'22.68137"N	111°59'11.11072"W	1438.215	923878.339	678746.649	1535.274	1.000168158	-0°02'19"	09/01/2004	FD 1/2" RB W/O ID 0.3' UP
24520-T15		33°32'25.47227"N	111°59'11.10653"W	1557.615	924160.418	678747.193	1654.868	1.000173870	-0°02'19"	09/01/2004	FD 1" IP 0.6' UP W/O ID
24520-Z1	T2N R4E 7 N	33°32'17.87533"N	111°59'11.11877"W	1418.095	923392.589	678745.640	1515.465	1.000167198	-0°02'19"	10/29/2004	SET 5/8" RB W/ 2" AL CAP 0.2' UP STAMPED "T2N R4E 1/4 S6 S7 2004 RLS 21782"
24521-1		33°32'17.86361"N	111°58'40.31184"W	1322.971	923389.758	681353.098	1420.027	1.000162776	-0°02'02"	10/18/2004	FD 1/2" IP 0.1' DN W/O ID
24521-2	T2N R4E 7 NE	33°32'17.88352"N	111°58'40.03542"W	1322.747	923391.756	681376.494	1419.804	1.000162766	-0°02'02"	04/27/2004	FD 3" PV BC FL NO STAMPING
24522-1		33°32'17.83043"N	111°58'09.32967"W	1304.266	923384.966	683975.386	1401.313	1.000161986	-0°01'45"	05/14/2003	FD 1 1/2" IP 0.3' DN W/O ID
24522-2M	T2N R4E 8 N	33°32'17.83056"N	111°58'08.97374"W	1304.404	923384.964	684005.512	1401.451	1.000161996	-0°01'44"	11/03/2004	FD 1/2" RB W/O ID 0.2' DN, AFFIXED 2" AL CAP 0.2' DN STAMPED "T2N R4E 1/4 S5 S8 2004 RLS 21782"
24523-1M	T2N R4E 8 NE	33°32'17.92210"N	111°57'37.92970"W	1361.225	923392.996	686633.042	1458.269	1.000164797	-0°01'27"	11/01/2004	FD 1/2" RB W/ 1 1/2" APS PLAS CAP 0.1' UP STAMPED "RLS 16292", AFFIXED 2" AL CAP FL STAMPED "T2N R4E S5 S4 S8 S9 2004 RLS 21782"
24524-1	T2N R4E 9 N	33°32'17.95502"N	111°57'06.48334"W	1326.826	923395.308	689294.621	1423.873	1.000163227	-0°01'10"	04/27/2004	FD 3" BC FL NO STAMPING
24525-1		33°32'19.56871"N	111°56'35.27235"W	1530.951	923557.621	691936.319	1628.006	1.000173030	-0°00'53"	05/14/2003	FD 1" IP 0.2' UP W/O ID
24525-2	T2N R4E 9 NE	33°32'17.89903"N	111°56'35.24295"W	1446.004	923388.865	691938.765	1543.061	1.000168979	-0°00'53"	04/26/2004	FD STONE 0.25' UP MARKED "X" ON TOP, 5 NOTCHES ON NORTH, 3 NOTCHES ON WEST
24525-3		33°32'17.87427"N	111°56'35.11351"W	1446.103	923386.360	691949.719	1543.160	1.000168979	-0°00'53"	04/26/2004	FD CHISELED X ON STONE
24525-4		33°32'17.99399"N	111°56'35.07952"W	1453.088	923398.459	691952.600	1550.145	1.000169309	-0°00'53"	04/26/2004	FD CHISELED X ON STONE
24525-5		33°32'17.90979"N	111°56'34.85316"W	1448.082	923389.943	691971.756	1545.139	1.000169079	-0°00'52"	04/26/2004	FD 1/2" RB W/O ID 0.1' UP
24526-1	T2N R4E 10 N	33°32'18.62577"N	111°56'03.95780"W	1219.368	923461.752	694586.711	1316.441	1.000158195	-0°00'35"	04/29/2004	FD 3" PV BC FL NO STAMPING
24527-1	T2N R4E 10 NE	33°32'19.34628"N	111°55'32.68168"W	1202.153	923534.233	697233.879	1299.240	1.000157395	-0°00'18"	05/20/2003	FD 4" MC ENG DPT BC IN HH 0.6' DN NO STAMPING
24528-1	T2N R4E 11 N	33°32'18.89881"N	111°55'01.93568"W	1183.813	923488.885	699836.150	1280.916	1.000156534	-0°00'01"	05/20/2003	FD 3" SCOTTSDALE BC IN HH 0.8' DN NO STAMPING
24529-1	T2N R4E 11 NE	33°32'18.62496"N	111°54'31.10768"W	1187.348	923461.301	702445.402	1284.465	1.000156695	0°00'16"	01/13/2004	FD 3" SCOTTSDALE BC IN HH 0.4' DN NO STAMPING
24530-1	T2N R4E 12 N	33°32'18.38022"N	111°54'00.22617"W	1189.244	923436.876	705059.169	1286.373	1.000156765	0°00'33"	01/15/2004	FD 3" SCOTTSDALE BC FL NO STAMPING
24531-1	T2N R4E 12 NE	33°32'18.30899"N	111°53'29.27266"W	1194.541	923430.204	707679.031	1291.680	1.000156975	0°00'50"	02/11/2004	FD 3" SCOTTSDALE BC IN HH 0.8' DN NO STAMPING
24533-T1		33°32'17.87026"N	111°58'32.27555"W	1300.430	923390.037	682033.279	1397.483	1.000161726	-0°01'57"	10/18/2004	FD 3" PV BC FL NO STAMPING NOTE- CL OF TATUM BLVD AND INDIAN BEND
24533-T2		33°32'08.36836"N	111°58'32.26020"W	1281.850	922429.671	682034.032	1378.923	1.000160846	-0°01'57"	10/18/2004	FD 3" PV BC FL NO STAMPING NOTE- CL OF TATUM BLVD AND JOSHUA TREE
24533-T3		33°31'58.58381"N	111°58'32.24540"W	1262.491	921440.736	682034.723	1359.591	1.000159916	-0°01'57"	10/18/2004	FD 3" PV BC FL NO STAMPING NOTE- CL OF TATUM BLVD AND PRAYING MONK
24533-T7		33°31'51.77686"N	111°58'12.53361"W	1245.593	920751.851	683702.834	1342.691	1.000159175	-0°01'46"	10/18/2004	FD 3" PV BC IN HH 0.5' DN NO STAMPING NOTE- CL OF LINCOLN DR AND 51ST PL
24533-T8		33°31'51.77875"N	111°58'08.90348"W	1246.752	920751.885	684010.126	1343.849	1.000159245	-0°01'44"	10/18/2004	FD 3" PV BC IN HH 0.9' DN NO STAMPING
24533-T10		33°31'40.64245"N	111°58'32.21679"W	1231.289	919627.391	682036.114	1328.420	1.000158425	-0°01'57"	10/18/2004	FD 3" PV BC FL NO STAMPING NOTE- CL OF TATUM BLVD AND ARROYO VERDE
24533-T11		33°31'35.44926"N	111°58'32.20852"W	1228.283	919102.511	682036.516	1325.426	1.000158285	-0°01'57"	10/18/2004	FD 3" MCHD BC FL NO STAMPING NOTE- CL OF TATUM BLVD AND MARSTON DR
24533-T12		33°31'30.31374"N	111°58'32.20073"W	1242.106	918583.461	682036.880	1339.260	1.000158945	-0°01'57"	10/20/2004	FD 3" MCHD BC FL NO STAMPING NOTE- CL OF TATUM BLVD AND ROVEY AVE
24533-T13		33°31'25.66888"N	111°58'32.19196"W	1260.492	918114.001	682037.356	1357.657	1.000159826	-0°01'57"	10/18/2004	FD 4" MC ENG DPT BC IN HH 0.5' DN NO STAMPING NOTE- CL OF TATUM BLVD AND MCDONALD DR
24533-Z1	T2N R4E 7 E	33°31'51.75755"N	111°58'40.01329"W	1254.570	920751.184	681376.812	1351.682	1.000159515	-0°02'02"	11/03/2004	SET 5/8" RB W/ 2" MARICOPA COUNTY AL CAP FL STAMPED "T2N R4E 1/4 S7 S8 2004 RLS 21782"
24534-1	T2N R4E 8 E	33°31'51.79779"N	111°57'37.80200"W	1266.337	920752.586	686642.735	1363.426	1.000160266	-0°01'27"	05/15/2003	FD 3" PV BC IN HH 0.45' DN NO STAMPING
24535-1	T2N R4E 9 E	33°31'51.95888"N	111°56'35.28016"W	1245.830	920767.074	691934.946	1342.923	1.000159415	-0°00'53"	05/13/2003	FD 3" PV BC IN HH 0.25' DN NO STAMPING
24536-1	T2N R4E 10 E	33°31'53.22522"N	111°55'32.42283"W	1205.164	920894.155	697255.559	1302.283	1.000157545	-0°00'18"	05/20/2003	FD 3" SCOTTSDALE BC IN HH 0.6' DN NO STAMPING
24537-1M	T2N R4E 11 E	33°31'52.27736"N	111°54'31.38539"W	1181.413	920798.328	702422.101	1278.564	1.000156404	0°00'16"	12/08/2004	FD CPS FL, REPLACED W/ 5/8" RB W/ 2" MARICOPA COUNTY AL CAP 0.1' DN STAMPED "T2N R4E 1/4 S11 S12 2004 RLS 21782"
24538-1	T2N R4E 12 E	33°31'52.11993"N	111°53'29.41867"W	1187.523	920783.253	707667.315	1284.700	1.000156645	0°00'50"	02/11/2004	FD 3" SCOTTSDALE BC IN HH 1.2' DN NO STAMPING
24540-1	T2N R4E 18 N	33°31'25.63853"N	111°59'11.15969"W	1215.071	918112.981	678738.625	1312.266	1.000157505	-0°02'19"	11/03/2004	FD 3" PHOENIX BC IN HH 0.4' DN STAMPED "57-38.10"
24541-1	T2N R4E 18 NE	33°31'25.66249"N	111°58'41.04917"W	1240.730	918113.791	681287.568	1337.901	1.000158845	-0°02'02"	05/27/2003	FD 4" MC ENG DPT BC IN HH 0.5' DN NO STAMPING
24542-1	T2N R4E 7 SE	33°31'25.66298"N	111°58'39.97869"W	1243.486	918113.787	681378.183	1340.656	1.000158985	-0°02'01"	05/27/2003	FD 4" MC ENG DPT BC IN HH 0.4' DN NO STAMPING
24543-1M	T2N R4E 8 S	33°31'25.68128"N	111°58'08.82943"W	1309.890	918114.193	684015.060	1407.038	1.000162256	-0°01'44"	11/04/2004	SC CPS W/ SHINER 0.36' DN, SET ABOVE IN CONC A 2" MARICOPA COUNTY AL CAP FL STAMPED "T2N R4E 1/4 S8 2004 RLS 21782"
24544-1	T2N R4E 17 NE	33°31'25.66627"N	111°57'37.62878"W	1320.391	918111.451	686656.282	1417.522	1.000162847	-0°01'27"	05/12/2003	FD 3" MCHD BC IN HH 1' DN NO STAMPING
24545-1	T2N R4E 16 N	33°31'25.69771"N	111°57'06.53945"W	1304.347	918113.678	689288.083	1401.470	1.000162156	-0°01'10"	05/12/2003	FD 3" PV BC 0.1' DN NO STAMPING
24546-1	T2N R4E 16 NE	33°31'25.72580"N	111°56'35.33782"W	1264.466	918115.681	691929.388	1361.597	1.000160306	-0°00'53"	09/14/2004	FD 3" PV BC IN HH 0.3' DN NO STAMPING
24547-1	T2N R4E 15 N	33°31'26.33231"N	111°56'04.28889"W	1231.089	918176.420	694557.777	1328.233	1.000158755	-0°00'36"	05/12/2003	FD 3" PV BC FL NO STAMPING
24548-1	T2N R4E 15 NE	33°31'26.94127"N	111°55'33.27504"W	1204.125	918237.626	697183.186	1301.881	1.000157515	-0°00'18"	05/20/2003	FD 4" MC ENG DPT BC IN HH 0.6' DN NO STAMPING
24549-1	T2N R4E 14 N	33°31'26.51842"N	111°55'02.41444"W	1185.796	918194.763	699795.611	1282.968	1.000156625	-0°00'01"	05/13/2003	FD 3" SCOTTSDALE BC 0.2' DN NO STAMPING
24550-1	T2N R4E 14 NE	33°31'26.07800"N	111°54'31.56822"W	1168.715	918150.341	702406.826	1265.902	1.000155804	0°00'16"	01/19/2004	FD 3" SCOTTSDALE BC IN HH 0.5' DN NO STAMPING
24551-1	T2N R4E 13 N	33°31'26.04270"N	111°54'00.57293"W	1172.223	918147.082	705030.662	1269.425	1.000155944	0°00'33"	01/15/2004	FD 3" MC ENG DPT BC IN HH 1' DN NO STAMPING
24552-1	T2N R4E 13 NE	33°31'25.95151"N	111°53'29.56101"W	1173.065	918138.391	707655.906	1270.278	1.000155954	0°00'50"	02/17/2004	FD 3" SCOTTSDALE BC IN HH 0.9' DN NO STAMPING
24553-1	T2N R4E 18 E	33°30'59.01008"N	111°58'40.99156"W	1597.453	915420.014	681290.851	1694.682	1.000175881	-0°02'02"	04/21/2004	FD STONE 1.2' UP MARKED "1/4" ON EAST SIDE
24554-4		33°30'57.35133"N	111°57'37.35271"W	N/A	915249.635	686678.447	N/A	1.000193998	-0°01'27"	N/A	CALCULATED POSITION PER R200 FROM 1953 - NOTHING FD OR SET
24554-5		33°30'56.75575"N	111°57'37.34438"W	N/A	915189.439	686679.126	N/A	1.000195908	-0°01'27"	N/A	CALCULATED POSITION PER R51 FROM 1928 - NOTHING FD OR SET

ABBREVIATION TABLE

AHD	ARIZONA HIGHWAY DEPARTMENT
AL	ALUMINUM
AZ	ARIZONA
BC	BRASS CAP
BCHH	BRASS CAP IN HAND HOLE
CL	CENTERLINE
COC	CITY OF CHANDLER
CONC	CONCRETE
COP	CITY OF PHOENIX
COS	CITY OF SCOTTSDALE
CPS	COTTON PICKER SPINDLE
DN	DOWN
DPT	DEPARTMENT
DIA	DIAMETER
DN	DOWN
ENG	ENGINEERING
FD	FOUND
FL	FLUSH
HH	HAND HOLE
ID	IDENTIFICATION
IP	IRON PIPE
MC	MARICOPA COUNTY
MCED	MARICOPA COUNTY ENGINEERING DEPARTMENT
MCHD	MARICOPA COUNTY HIGHWAY DEPARTMENT
MR	METAL ROD
NL	NAIL
PV	PARADISE VALLEY
RB	REBAR
TOPV	TOWN OF PARADISE VALLEY
Z	CALCULATED POINT
-*M	MODIFIED / REFURBISHED
-R*	REFERENCE MONUMENT
-T*	TIE/ACCESSORY MONUMENT
-W*	WITNESS MONUMENT

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OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN
TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

REGISTERED LAND SURVEYOR
CERTIFICATE NO. 21782
SCOTT A. NELSON
ARIZONA U.S.A.

	BY	DATE
DRAWN	A. GRASS	12-19-04
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

COORDINATE TABLE

SHEET 4 OF 15

COORDINATE TABLE

THIS DATA TABLE REPORTS A GREATER DEGREE OF PRECISION THAN ACTUALLY SURVEYED.
CAUTION SHOULD BE EXERCISED WHEN USING THE DATA.
THE INFORMATION IS DEEMED RELIABLE TO THE EXTENT OF THE METHODS USED TO COLLECT THE DATA
BUT MCDOT NOR AMEC INFRASTRUCTURE, INC. GUARANTEES ITS ACCURACY FOR ANY PARTICULAR PURPOSE.
PROSPECTIVE USERS ARE ADVISED TO SATISFY THEMSELVES AS TO THE ACCURACY PRIOR TO USE.
FOR FURTHER INFORMATION ON HOW THE VALUES WERE GENERATED PLEASE SEE NOTE 4 THROUGH NOTE 8 ON SHEET 1.

CORNER	LOCATION	LATITUDE NAD83	LONGITUDE NAD83	ELLIP. HGT. NAD83 I-FEET	NORTHING NAD83 (1992 EPOCH) I-FEET	EASTING	ELEVATION NAVD88 I-FEET	COMBINED SCALE FACTOR (GRID TO GROUND)	CONVERGENCE ANGLE	LAST DATE VISITED	DESCRIPTION
24554-C		33°30'58.70793"N	111°57'38.01191"W	N/A	915386.771	686622.697	N/A	1.000195128	-0°01'27"	N/A	CALCULATED POSITION PER GLO NOTES - NOTHING FD OR SET
24555-1	T2N R4E 16 E	33°30'59.47967"N	111°56'35.65190"W	1278.660	915462.978	691902.121	1375.831	1.000160986	-0°00'53"	05/19/2003	FD 3" PV BC IN HH 0.3' DN NO STAMPING
24556-1	T2N R4E 15 E	33°31'00.66430"N	111°55'33.60230"W	1202.249	915581.801	697155.244	1299.440	1.000157405	-0°00'19"	05/20/2003	FD 4" MC ENG DPT BC IN HH 0.6' DN NO STAMPING
24557-1		33°30'59.93840"N	111°54'31.45047"W	1163.689	915508.398	702416.996	1260.910	1.000155564	0°00'16"	01/19/2004	FD PK NL FL NOTE- CL OF HAYDEN RD AND JACKRABBIT RD
24557-2		33°30'59.95393"N	111°54'31.78206"W	1163.856	915509.966	702388.924	1261.077	1.000155574	0°00'16"	04/26/2004	FD 3" SCOTTSDALE BC FL STAMPED "CONST. CL"
24557-3	T2N R4E 14 E	33°30'59.96463"N	111°54'31.71747"W	1162.939	915511.047	702394.392	1260.159	1.000155524	0°00'16"	04/26/2004	FD 3" BC IN HH 0.75' DN NO STAMPING
24558-1	T2N R4E 13 E	33°30'59.88789"N	111°53'29.70219"W	1167.937	915504.125	707644.592	1265.184	1.000155704	0°00'50"	02/17/2004	FD 3" SCOTTSDALE BC IN HH 1.1' DN NO STAMPING
24559-21	T2N R4E 19 N	33°30'34.25309"N	111°59'12.21470"W	1167.758	912919.489	678645.810	1265.072	1.000155244	-0°02'19"	11/16/2004	SET 2" MARICOPA COUNTY AL CAP IN CONC IN HH 0.4' DN STAMPED "T2N R4E 1/4 S18 S19 2004 RLS 21782"
24560-1	T2N R4E 19 NE	33°30'32.90159"N	111°58'41.00188"W	1215.362	912781.219	681288.416	1312.646	1.000157635	-0°02'02"	05/27/2003	FD 3" PHOENIX BC IN HH 0.3' DN NO STAMPING
24561-1		33°30'32.21779"N	111°58'15.52103"W	1252.334	912710.904	683445.769	1349.594	1.000159485	-0°01'48"	05/22/2003	FD 3" SCOTTSDALE BC FL NO STAMPING NOTE- CL OF ARCADIA DR AND ROCKRIDGE RD
24561-2		33°30'32.22491"N	111°58'15.50994"W	1252.275	912711.624	683446.708	1349.534	1.000159485	-0°01'48"	05/22/2003	FD 60d NL FL
24561-3		33°30'32.12205"N	111°58'15.23148"W	1252.040	912701.215	683470.280	1349.300	1.000159475	-0°01'48"	05/22/2003	FD 3" PHOENIX BC FL NO STAMPING
24561-4M	T2N R4E 20 N	33°30'32.66070"N	111°58'09.74302"W	1277.196	912755.417	683935.001	1374.450	1.000160696	-0°01'45"	11/16/2004	FD PK NL FL NOTE- ON TOP OF 6' BLOCK WALL, REPLACED BY EPOXING 2" MARICOPA COUNTY AL CAP FL STAMPED "T2N R4E 1/4 S17 S20 2004 RLS 21782"
24561-12		33°30'34.98260"N	111°58'08.86711"W	1287.382	912990.055	684009.280	1384.630	1.000161186	-0°01'44"	04/14/2004	FD 1 1/2" IP 0.1' UP W/O ID
24561-13		33°30'32.65761"N	111°58'06.07830"W	1276.748	912754.949	684245.282	1373.999	1.000160686	-0°01'43"	04/14/2004	FD 1/4" RB W/O ID 0.2' DN
24562-1		33°30'29.95988"N	111°57'38.40592"W	1398.311	912481.208	686588.107	1495.553	1.000166568	-0°01'27"	10/20/2004	FD 3" PHOENIX BC FL NO STAMPING
24562-2		33°30'30.17317"N	111°57'38.40495"W	1400.162	912502.765	686588.199	1497.398	1.000166658	-0°01'27"	05/21/2003	FD CPS FL
24562-3		33°30'30.36374"N	111°57'38.04818"W	1405.057	912522.013	686618.414	1502.292	1.000166888	-0°01'27"	05/21/2003	FD 1 1/2" IP 0.7' UP W/ 1 1/2" PLAS CAP STAMPED "WIER"
24562-4		33°30'30.45903"N	111°57'38.40164"W	1404.458	912531.658	686588.492	1501.694	1.000166858	-0°01'27"	05/21/2003	FD 1" ROUND IRON METAL ROD 0.6' UP W/O ID
24562-5M	T2N R4E 20 NE	33°30'32.57990"N	111°57'38.38318"W	1471.912	912746.014	686590.146	1569.143	1.000170079	-0°01'27"	11/15/2004	FD 1/2" RB W/ 1" PLAS CAP 0.4' UP STAMPED "LS 9087". AFFIXED 2" MARICOPA COUNTY AL CAP FL STAMPED "T2N R4E S17 S16 S20 S21 2004 RLS 21782"
24562-11		33°30'32.57141"N	111°57'38.25791"W	1476.788	912745.151	686600.751	1574.019	1.000170309	-0°01'27"	09/22/2004	FD CHISELED "X" ON STONE NOTE- 10 FT +/- EAST OF 24562-5
24562-12		33°30'33.16878"N	111°57'38.35946"W	1483.683	912805.531	686592.179	1580.920	1.000170639	-0°01'27"	09/22/2004	FD PK NL FL
24562-13		33°30'33.46734"N	111°57'38.34824"W	1499.188	912835.706	686593.142	1592.448	1.000171189	-0°01'27"	09/22/2004	FD 1 1/2" IP UP W/ 1 1/4" PLAS CAP STAMPED "WIER 7247"
24563-1		33°30'31.98448"N	111°57'07.21201"W	1528.669	912684.825	689229.293	1625.886	1.000172860	-0°01'10"	05/22/2003	FD 1/2" RB W/TAG 0.4' UP STAMPED "LS 22281"
24563-2	T2N R4E 21 N	33°30'32.30990"N	111°57'07.21006"W	1550.946	912717.716	689229.476	1648.164	1.000173930	-0°01'10"	05/03/2004	FD STONE 0.8' UP MARKED "1/4" ON WEST SIDE
24564-1	T2N R4E 21 NE	33°30'33.33172"N	111°56'35.78237"W	1244.694	912820.197	691890.398	1341.906	1.000159365	-0°00'53"	12/09/2004	FD 3" PV BC IN HH 0.3' DN NO STAMPING
24565-1M	T2N R4E 22 N	33°30'33.84765"N	111°56'04.85712"W	1214.005	912871.779	694508.754	1311.223	1.000157935	-0°00'36"	11/04/2004	FD 1 1/2" IP IN HH 0.5' DN W/O ID NOTE- 1/4" RB IN CENTER OF PIPE, AFFIXED 2" MARICOPA COUNTY AL CAP 0.4' DN STAMPED "T2N R4E 1/4 S15 S22 2004 RLS 21782"
24566-1	T2N R4E 22 NE	33°30'34.39879"N	111°55'33.91188"W	1191.994	912927.137	697128.794	1288.120	1.000156905	-0°00'19"	05/20/2003	FD 4" MC ENG DPT BC IN HH 0.4' DN NO STAMPING
24567-1	T2N R4E 23 N	33°30'34.11191"N	111°55'02.87212"W	1172.544	912898.013	699756.827	1269.783	1.000155994	-0°00'02"	05/13/2003	FD 3" SCOTTSDALE BC IN HH 0.65' DN NO STAMPING
24568-1		33°30'33.81121"N	111°54'31.04251"W	1153.386	912867.715	702451.739	1250.639	1.000155074	0°00'16"	01/19/2004	FD PK NL FL NOTE- CL OF HAYDEN RD AND CHAPARRAL RD
24568-11		33°30'33.79828"N	111°54'16.32852"W	1157.155	912866.529	703697.526	1254.415	1.000155244	0°00'24"	09/07/2004	FD 5/8" RB W/O ID 1' DN NOTE- CL OF CHAPARRAL RD AND 82ND ST
24568-21	T2N R4E 23 NE	33°30'33.81187"N	111°54'31.81010"W	1153.646	912867.777	702386.749	1250.898	1.000155084	0°00'16"	11/16/2004	SET 5/8" RB W/ 2" MARICOPA COUNTY AL CAP FL STAMPED "T2N R4E S14 S13 S23 S24 2004 RLS 21782"
24569-1	T2N R4E 24 N	33°30'33.78033"N	111°54'00.81286"W	1162.662	912864.897	705011.189	1259.929	1.000155494	0°00'33"	01/15/2004	FD BC STEM FL
24570-1	T2N R4E 24 NE	33°30'33.72200"N	111°53'29.84597"W	1158.626	912859.524	707633.059	1255.904	1.000155264	0°00'50"	01/19/2004	FD 3" SCOTTSDALE BC IN HH 1' DN NO STAMPING
24572-1		33°30'06.68559"N	111°57'38.59538"W	1227.840	910128.876	686571.068	1325.124	1.000158425	-0°01'28"	05/29/2003	FD 3" PHOENIX BC FL NO STAMPING
24572-2		33°30'06.51743"N	111°57'38.60075"W	1226.805	910111.880	686570.606	1324.089	1.000158375	-0°01'28"	05/29/2003	FD 3" AZ HIGHWAY DPT BC IN HH 0.9' DN NO STAMPING
24572-3	T2N R4E 20 E	33°30'06.43808"N	111°57'38.60340"W	1226.512	910103.861	686570.379	1323.896	1.000158365	-0°01'28"	04/14/2004	FD STONE IN HH 1' DN
24573-1	T2N R4E 21 E	33°30'07.23309"N	111°56'35.88429"W	1207.88[illegible]	910182.404	691881.082	1305.137	1.000157605	-0°00'53"	05/13/2003	FD 3" AZ HIGHWAY DPT BC IN HH 0.75' DN NO STAMPING
24574-1	T2N R4E 22 E	33°30'08.11490"N	111°55'33.96278"W	1180.255	910270.618	697124.243	1277.516	1.000156354	-0°00'19"	05/29/2003	FD 3" AGENCY UNREADABLE BC IN HH 0.8' DN NO STAMPING
24574-2		33°30'08.10269"N	111°55'34.23340"W	1180.841	910269.385	697101.328	1278.102	1.000156374	-0°00'19"	05/29/2003	FD 3" SCOTTSDALE BC FL NO STAMPING
24575-1		33°30'07.68418"N	111°54'31.59047"W	1147.336	910227.046	702405.545	1244.619	1.000154784	0°00'16"	01/19/2004	FD 3" SCOTTSDALE BC 0.2' DN STAMPED "CONST CL"
24575-2	T2N R4E 23 E	33°30'07.68443"N	111°54'31.91037"W	1147.420	910227.069	702378.459	1244.702	1.000154784	0°00'16"	12/09/2004	FD 3" SCOTTSDALE BC 0.3' DN NO STAMPING
24575-11		33°30'07.67279"N	111°54'16.41117"W	1153.650	910226.018	703690.835	1250.940	1.000155074	0°00'24"	09/07/2004	FD 3 1/2" MARICOPA COUNTY BC 0.2' DN NO STAMPING NOTE- CL OF CAMELBACK RD AND 82ND ST
24576-1	T2N R4E 24 E	33°30'07.56440"N	111°53'29.99276"W	1151.532	910215.766	707621.267	1248.838	1.000154924	0°00'50"	02/17/2004	FD 3" SCOTTSDALE BC IN HH 1.1' DN NO STAMPING
24577-1	T2N R4E 30 N	33°29'41.51629"N	111°59'12.92567"W	1126.919	907589.407	678582.006	1224.340	1.000153793	-0°02'20"	04/29/2004	FD 3" PHOENIX BC IN HH 0.5' DN NO STAMPING
24578-1	T2N R4E 30 NE	33°29'40.54293"N	111°58'41.24840"W	1147.738	907489.329	681264.411	1245.124	1.000154404	-0°02'02"	05/29/2003	FD 3" PHOENIX BC IN HH 0.4' DN NO STAMPING
24580-1M	T2N R4E 29 NE	33°29'40.30563"N	111°57'38.79502"W	1180.496	907462.656	686553.031	1277.820	1.000156164	-0°01'28"	11/05/2004	FD PK NL W/ SHINER FL. REPLACED W/ 5/8" RB W/ 2" MARICOPA COUNTY AL CAP FL STAMPED "T2N R4E S20 S21 S29 S28 2004 RLS 21782"
24581-1	T2N R4E 28 N	33°29'40.68479"N	111°57'07.35613"W	1187.362	907499.958	689215.330	1284.663	1.000156565	-0°01'10"	05/13/2003	FD 3" PHOENIX BC FL NO STAMPING
24582-11		33°29'54.14637"N	111°56'35.90633"W	1195.372	908859.727	691878.886	1292.645	1.000157005	-0°00'53"	09/09/2004	FD 3" PHOENIX BC IN HH 0.3' DN NO STAMPING NOTE- CL OF 64TH ST AND EXETER BLVD
24582-13		33°29'41.10921"N	111°56'31.89387"W	1183.335	907541.974	692218.328	1280.624	1.000156434	-0°00'51"	09/09/2004	FD 3" BC 0.3' DN NO STAMPING NOTE- CL OF LAFAYETTE BLVD AND 64TH PL
24582-14		33°29'41.14421"N	111°56'28.99965"W	1182.253	907545.453	692463.414	1279.543	1.000156394	-0°00'49"	09/09/2004	FD 4" MC ENG DPT BC 0.3' DN NO STAMPING NOTE- CL OF LAFAYETTE BLVD AND 65TH ST SOUTH
24582-15		33°29'41.15630"N	111°56'28.08830"W	1182.029	907546.655	692540.572	1279.319	1.000156384	-0°00'49"	09/09/2004	FD 2 1/2" BC 0.3' DN NO STAMPING NOTE- CL OF LAFAYETTE BLVD AND 65TH ST NORTH
24582-16		33°29'41.19414"N	111°56'25.01466"W	1181.530	907550.480	692800.868	1278.819	1.000156364	-0°00'47"	09/09/2004	FD 60d NL FL NOTE- CL OF LAFAYETTE BLVD AND 65TH PL SOUTH
24582-17		33°29'41.20392"N	111°56'24.30898"W	1180.931	907551.395	692860.627	1278.220	1.000156334	-0°00'47"	09/09/2004	FD 2 1/2" BC 0.3' DN NO STAMPING NOTE- CL OF LAFAYETTE BLVD AND 65TH PL NORTH
24582-18		33°29'41.25170"N	111°56'20.44150"W	1179.788	907556.152	693188.130	1277.077	1.000156284	-0°00'44"	09/09/2004	FD 3" SCOTTSDALE BC FL NO STAMPING NOTE- CL OF LAFAYETTE BLVD AND 66TH ST
24582-110		33°29'37.26868"N	111°56'35.91274"W	1181.032	907153.896	691877.906	1278.326	1.000156324	-0°00'53"	09/09/2004	FD 3 1/2" MC ENG DPT BC FL NO STAMPING NOTE- CL OF 64TH ST AND CALLE ROSA WEST
24582-111		33°29'37.23824"N	111°56'35.91268"W	1180.696	907150.820	691877.910	1277.990	1.000156304	-0°00'53"	09/10/2004	FD 1 1/2" IP 0.3' DN W/O ID NOTE- CL OF 64TH ST AND CALLE ROSA EAST
24582-112		33°29'34.21028"N	111°56'35.90180"W	1178.522	906844.784	691878.753	1275.820	1.000156204	-0°00'53"	09/10/2004	FD 3 1/2" MC ENG DPT BC 0.2' DN NO STAMPING NOTE- CL OF 64TH ST AND CALLE DEL PAISANO EAST
24582-113		33°29'34.12391"N	111°56'35.90031"W	1178.476	906836.054	691878.872	1275.774	1.000156204	-0°00'53"	09/10/2004	FD PK NL FL NOTE- CL OF 64TH ST AND CALLE DEL PAISANO WEST
24582-114		33°29'31.18511"N	111°56'35.89093"W	1176.356	906539.029	691879.595	1273.657	1.000156094	-0°00'53"	09/10/2004	FD PK NL FL NOTE- CL OF 64TH ST AND CALLE CAMELIA EAST
24582-115		33°29'31.07514"N	111°56'35.89012"W	1176.347	906527.914	691879.661	1273.648	1.000156094	-0°00'53"	09/10/2004	FD 3 1/2" MCHD BC FL NO STAMPING NOTE- CL OF 64TH ST AND CALLE CAMELIA WEST
24582-116		33°29'28.15605"N	111°56'35.87679"W	1175.068	906232.882	691880.713	1272.373	1.000156034	-0°00'53"	09/10/2004	FD 2 1/2" SCOTTSDALE BC FL NO STAMPING NOTE- CL OF 64TH ST AND CALLE REDONDA
24582-117		33°29'40.96565"N	111°56'43.78491"W	1186.459	907527.728	691211.377	1283.750	1.000156569	-0°00'57"	09/10/2004	FD 3" PHOENIX BC FL NO STAMPING
24582-118		33°29'40.92225"N	111°56'47.32401"W	1186.823	907523.426	690911.581	1284.115	1.000156575	-0°00'59"	09/10/2004	FD 3" PHOENIX BC FL NO STAMPING NOTE- CL OF LAFAYETTE BLVD AND 62ND PL
24582-119		33°29'40.87072"N	111°56'51.63718"W	1187.065	907518.325	690546.435	1284.359	1.000156585	-0°01'02"	09/10/2004	FD 3" PHOENIX BC FL NO STAMPING NOTE- CL OF LAFAYETTE BLVD AND 62ND ST
24582-120		33°29'40.82504"N	111°56'55.56762"W	1188.040	907513.809	690213.600	1285.336	1.000156625	-0°01'04"	09/10/2004	FD 3" PHOENIX BC FL NO STAMPING
24582-121		33°29'40.77773"N	111°56'59.50185"W	1188.108	907509.132	689880.460	1285.406	1.000156615	-0°01'06"	09/10/2004	FD 3" PHOENIX BC FL NO STAMPING NOTE- CL OF LAFAYETTE BLVD AND 61ST ST
24582-122		33°29'40.73740"N	111°57'02.92958"W	1187.818	907505.151	689590.178	1285.117	1.000156595	-0°01'08"	09/10/2004	FD 3" PHOENIX BC FL NO STAMPING NOTE- CL OF LAFAYETTE BLVD AND PARADISE WAY
24582-Z	T2N R4E 28 NE	33°29'41.05800"N	111°56'35.92757"W	N/A	907536.884	691876.748	N/A	1.000156404	-0°00'53"	N/A	CALCULATED POSITION - NOTHING FD OR SET
24583-1	T2N R4E 27 N	33°29'41.44784"N	111°56'04.96826"W	1177.160	907575.721	694498.424	1274.449	1.000156174	-0°00'36"	11/15/2004	FD 3" SCOTTSDALE BC IN HH 0.55' DN NO STAMPING
24584-1	T2N R4E 27 NE	33°29'41.83834"N	111°55'34.01143"W	1163.076	907614.842	697119.882	1260.366	1.000155534	-0°00'19"	05/23/2003	FD 3" SCOTTSDALE BC IN HH 0.6' DN NO STAMPING
24585-1	T2N R4E 26 N	33°29'41.68275"N	111°55'02.96326"W	1148.881	907598.986	699749.069	1246.180	1.000154864	-0°00'02"	01/19/2004	FD 3" SCOTTSDALE BC IN HH 0.4' DN NO STAMPING
24586-1	T2N R4E 26 NE	33°29'41.51733"N	111°54'31.91402"W	1139.984	907582.355	702378.348	1237.283	1.000154434	0°00'14"	01/19/2004	FD 3" SCOTTSDALE BC IN HH 0.6' DN NO STAMPING
24587-1	T2N R4E 25 N	33°29'41.51033"N	111°54'01.03318"W	1147.597	907581.952	704993.368	1244.913	1.000154774	0°00'33"	01/15/2004	FD STONE IN HH 1.5' DN MARKED "X" ON TOP
24588-1		33°29'41.49700"N	111°53'30.16696"W	1144.217	907581.125	707607.150	1241.546	1.000154574	0°00'50"	02/17/2004	FD 3" SCOTTSDALE BC IN HH 1' DN NO STAMPING
24588-12		33°29'41.50745"N	111°53'39.31829"W	1146.084	907582.005	706832.206	1243.410	1.000154674	0°00'45"	10/20/2004	FD 3" SCOTTSDALE BC 0.1' DN NO STAMPING NOTE- CL OF INDIAN SCHOOL RD AND 87TH ST
24588-15		33°29'41.50786"N	111°53'45.59910"W	1147.212	907581.936	706300.341	1244.537	1.000154734	0°00'41"	10/20/2004	FD 3" SCOTTSDALE BC 0.1' DN NO STAMPING NOTE- CL OF INDIAN SCHOOL RD AND 86TH ST
24588-16		33°29'41.50929"N	111°53'52.91749"W	1147.629	907581.964	705680.612	1244.952	1.000154764	0°00'37"	10/20/2004	FD 3" SCOTTSDALE BC FL NO STAMPING NOTE- CL OF INDIAN SCHOOL RD AND 85TH ST
24588-2		33°29'41.50563"N	111°53'30.16692"W	N/A	907581.997	707607.153	N/A	1.000154624	0°00'50"	N/A	CALCULATED POSITION - NOTHING FD OR SET
24589-1	T2N R4E 30 E	33°29'14.44670"N	111°58'41.34285"W	1126.120	904851.786	681254.851	1223.542	1.000153374	-0°02'02"	11/16/2004	FD 3" BC IN HH 0.6' DN NO STAMPING
24590-1		33°29'14.70551"N	111°57'39.07939"W	1153.891	904875.261	686527.849	1251.248	1.000154894	-0°01'28"	05/21/2003	FD 3" PHOENIX BC FL NO STAMPING
24590-2		33°29'14.52242"N	111°57'39.07872"W	1153.670	904856.756	686527.898	1251.027	1.000154884	-0°01'28"	05/21/2003	FD CONC NL W/ SHINER FL
24590-3	T2N R4E 29 E	33°29'14.21415"N	111°57'39.08424"W	1153.264	904825.599	686527.417	1250.672	1.000154864	-0°01'28"	05/21/2003	FD 3" CHANDLER BC FL NO STAMPING
24590-4		33°29'14.20979"N	111°57'39.07734"W	1153.288	904825.158	686528.001	1250.645	1.000154864	-0°01'28"	05/21/2003	FD CONC NL W/ SHINER FL
24591-1	T2N R4E 28 E	33°29'14.86717"N	111°56'35.82461"W	1166.703	904889.773	691884.789	1264.022	1.000155634	-0°00'53"	04/14/2004	FD STONE 1.2' DN MARKED "X"

BOOK 734 PAGE 10
OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-0298825

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN
TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

Scott Nelson
21782
SCOTT A. NELSON
ARIZONA, U.S.A.

	BY	DATE
DRAWN	A. GRASS	2-24-05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

COORDINATE TABLE

SHEET
5 OF 15

COORDINATE TABLE

THIS DATA TABLE REPORTS A GREATER DEGREE OF PRECISION THAN ACTUALLY SURVEYED.
CAUTION SHOULD BE EXERCISED WHEN USING THE DATA.
THE INFORMATION IS DEEMED RELIABLE TO THE EXTENT OF THE METHODS USED TO COLLECT THE DATA
BUT MCDOT NOR AMEC INFRASTRUCTURE, INC. GUARANTEES ITS ACCURACY FOR ANY PARTICULAR PURPOSE.
PROSPECTIVE USERS ARE ADVISED TO SATISFY THEMSELVES AS TO THE ACCURACY PRIOR TO USE.
FOR FURTHER INFORMATION ON HOW THE VALUES WERE GENERATED PLEASE SEE NOTE 4 THROUGH NOTE 8 ON SHEET 1.

CORNER	LOCATION	LATITUDE NAD83	LONGITUDE NAD83	ELLIP. HGT NAD83 I-FEET	NORTHING NAD83 (1992 I-FEET	EASTING EPOCH)	ELEVATION NAVD88 I-FEET	COMBINED SCALE FACTOR (GRID TO GROUND)	CONVERGENCE ANGLE	LAST DATE VISITED	DESCRIPTION
24592-1	T2N R4E 27 E	33°29'15.54023"N	111°55'34.09457"W	1149.358	904956.891	697112.599	1246.674	1.000154874	-0°00'19"	11/17/2004	FD 3" SCOTTSDALE BC IN HH 0.4' DN NO STAMPING
24592-2		33°29'15.53986"N	111°55'34.16118"W	1149.205	904956.854	697106.958	1246.520	1.000154864	-0°00'19"	05/29/2003	FD 3" SCOTTSDALE BC IN HH 0.4' DN NO STAMPING
24593-1	T2N R4E 26 E	33°29'15.45850"N	111°54'32.04468"W	1137.684	904948.588	702367.480	1235.015	1.000154324	0°00'15"	01/19/2004	FD 3" BC IN HH 0.5' DN NO STAMPING
24594-1	T2N R4E 25 E	33°29'15.40448"N	111°53'30.27882"W	1137.375	904943.951	707598.310	1234.724	1.000154244	0°00'50"	02/17/2004	FD 3" SCOTTSDALE BC IN HH 1.1' DN NO STAMPING
24595-1	T2N R4E 31 N	33°28'48.89890"N	111°59'13.19858"W	1098.505	902271.383	678555.294	1195.391	1.000151933	0°02'20"	05/28/2003	FD 3" PHOENIX BC IN HH 0.4' DN NO STAMPING
24596-1	T2N R4E 31 NE	33°28'48.32503"N	111°58'41.43433"W	1114.876	902211.675	681245.540	1212.323	1.000152833	-0°02'02"	05/28/2003	FD 3" PHOENIX BC IN HH 0.4' DN NO STAMPING
24597-1	T2N R4E 32 N	33°28'48.18481"N	111°58'10.43080"W	1133.839	902196.056	683871.388	1231.250	1.000153844	-0°01'45"	05/28/2003	FD 3" PHOENIX BC FL NO STAMPING
24598-1	T2N R4E 32 NE	33°28'48.06658"N	111°57'39.44238"W	1159.145	902182.879	686495.960	1256.527	1.000155144	-0°01'28"	05/28/2003	FD 3" PHOENIX BC IN HH 0.4' DN NO STAMPING
24599-1	T2N R4E 33 N	33°28'48.37633"N	111°57'07.75959"W	1174.185	902213.155	689179.358	1271.542	1.000155934	-0°01'10"	05/21/2003	FD 3" BC IN HH 1.3' DN NO STAMPING
24600-1	T2N R4E 33 NE	33°28'48.68446"N	111°56'36.08311"W	1174.765	902243.494	691862.216	1272.107	1.000156024	-0°00'53"	05/28/2003	FD 3" SCOTTSDALE BC IN HH 0.7' DN NO STAMPING
24601-1	T2N R4E 34 N	33°28'48.97505"N	111°56'05.11910"W	1154.918	902272.299	694484.726	1252.254	1.000155114	-0°00'36"	05/28/2003	FD 3" AZ HIGHWAY DPT BC IN HH 0.4' DN NO STAMPING
24602-1	T2N R4E 34 NE	33°28'49.28259"N	111°55'34.17679"W	1140.094	902303.033	697105.393	1237.430	1.000154434	-0°00'19"	05/28/2003	FD 3" SCOTTSDALE BC IN HH 0.6' DN NO STAMPING
24603-1	T2N R4E 35 N	33°28'49.34076"N	111°55'03.17980"W	1128.712	902308.782	699730.687	1226.056	1.000153904	-0°00'02"	05/13/2003	FD 3" SCOTTSDALE BC 0.2' DN NO STAMPING
24604-1		33°28'49.39593"N	111°54'32.23682"W	1131.250	902314.444	702351.404	1228.601	1.000154014	0°00'15"	01/19/2004	FD 3" SCOTTSDALE BC IN HH 0.5' DN NO STAMPING
24604-2M	T2N R4E 35 NE	33°28'49.39603"N	111°54'32.11780"W	1131.814	902314.455	702356.403	1229.165	1.000154044	0°00'15"	12/09/2004	FD CPS FL, REPLACED W/ 5/8" RB W/ 2" MARICOPA COUNTY AL CAP FL STAMPED "T2N R4E S26 S25 S35 S36 2004 RLS 21782"
24605-1	T2N R4E 36 N	33°28'49.32732"N	111°54'01.15020"W	1135.237	902307.815	704984.289	1232.598	1.000154184	0°00'32"	01/15/2004	FD 3" SCOTTSDALE BC IN HH 0.5' DN NO STAMPING
24606-1	T2N R4E 36 NE	33°28'49.31568"N	111°53'30.42221"W	1128.627	902307.155	707586.798	1225.995	1.000153834	0°00'49"	02/18/2004	FD 3" PHOENIX BC IN HH 1' DN NO STAMPING
24607-1	T2N R4E 31 E	33°28'22.28779"N	111°58'41.94969"W	1106.494	899580.122	681200.329	1203.956	1.000152433	-0°02'02"	05/28/2003	FD 3" PHOENIX BC FL STAMPED "S31 1/4 S32"
24607-2		33°28'22.29044"N	111°58'41.29456"W	1108.272	899580.356	681255.821	1205.733	1.000152523	-0°02'02"	05/28/2003	FD 3" PHOENIX BC IN HH 0.3' DN NO STAMPING
24608-1	T2N R4E 32 E	33°28'21.93323"N	111°57'39.58966"W	1178.156	899541.591	686482.359	1275.551	1.000156054	-0°01'28"	05/21/2003	FD 3" PHOENIX BC IN HH 0.6' DN NO STAMPING
24609-1		33°28'22.54718"N	111°56'36.79442"W	1187.577	899601.820	691801.288	1284.930	1.000156635	-0°00'53"	05/21/2003	FD 3" SCOTTSDALE BC IN HH 0.6' DN NO STAMPING
24609-2	T2N R4E 33 E	33°28'22.54743"N	111°56'36.31876"W	1187.099	899601.835	691841.877	1284.453	1.000156615	-0°00'53"	04/14/2004	FD 3" SCOTTSDALE BC IN HH 0.4' DN NO STAMPING
24610-1	T2N R4E 34 E	33°28'22.96454"N	111°55'34.27764"W	1138.235	899643.074	697096.609	1235.884	1.000154364	-0°00'18"	05/27/2003	FD 3" SCOTTSDALE BC IN HH 0.2' DN NO STAMPING
24611-1	T2N R4E 35 E	33°28'23.09374"N	111°54'32.03682"W	1129.541	899656.088	702368.542	1226.907	1.000153934	0°00'15"	12/09/2004	FD 3" SCOTTSDALE BC IN HH 0.4' DN NO STAMPING
24612-1M	T2N R4E 36 E	33°28'23.18418"N	111°53'30.55471"W	1129.792	899666.047	707576.208	1227.175	1.000153884	0°00'49"	11/17/2004	FD 1" IP 0.4' DN W/O ID. SET ABOVE IN CONC A 2" MARICOPA COUNTY AL CAP FL STAMPED "T2N 1/4 R4E R5E S36 S31 2004 RLS 21782"
24613-1	T1N R4E 1 N	33°27'56.99853"N	111°54'01.80532"W	1120.553	897018.948	704929.626	1217.945	1.000153484	0°00'32"	01/15/2004	FD 4" MC ENG DPT BC IN HH 0.5' DN NO STAMPING
24614-1	T1N R4E 1 NE	33°27'57.07080"N	111°53'30.70757"W	1124.043	897026.772	707563.891	1221.441	1.000153614	0°00'49"	09/22/2004	FD 3" SCOTTSDALE BC IN HH 0.5' DN NO STAMPING
24616-1M	T2N R4E 17 N	33°31'25.68221"N	111°58'09.87142"W	1307.247	918199.332	683926.853	1404.395	1.000167126	-0°01'45"	11/04/2004	FD 1/2" IP 0.7' DN W/O ID, SET ABOVE IN CONC A 2" MARICOPA COUNTY AL CAP FL STAMPED "T2N R4E 1/4 S17 2004 RLS 21782"

GENERAL TIME LINE

1868 The south township line of Township 2 North, Range 4 East was originaly surveyed by the GLO in 1868 under the direction of Wilfred F. Ingalls. During which they placed posts at the corner positions.

1868 A portion of the north and west township lines, the east township line and a portion of the subdivision lines of Township 2 North, Range 4 East were originaly surveyed by the GLO in 1868 under the direction of George P. Ingalls (the northwesternmost portion of the township was considered too mountainous and unfit for cultivation). During which they placed posts or stones at the corner positions.

No monuments recovered today are from the above mentioned surveys. Based on the record distances from the above mentioned surveys and our measurements between existing monumentation today, there are variances of from -106 feet to +61 feet between record and measured distances.

1880-1890 In the 1880's, the Arizona Canal Company (A.C.Co.) surveyed the location of the Arizona Canal in Township 2 North, Ranges 3, 4, 5 and 6 East and Township 3 North, Ranges 1, 2 and 3 East of the Gila and Salt River Meridian under the direction of their engineer, H.F. Robinson. GLO field notes (noted below) and Maricopa County and Salt River Project corner tie records indicate that during the A.C.Co. survey, stones were set at section and quarter section corner positions. The method used to set these stones (reset original GLO posts, single or double proportionate method, local testimony, etc.) is unknown. Per Gregory M. Tuttle, RLS, of Salt River Project, the stones may have been set to assist in establishing boundary lines for land owners who would be receiving water from the canal company. Due to insufficient evidence, it is uncertain if any monuments recovered today are from this survey.

Based on Maricopa County and Salt River Project corner tie records at some section and quarter section corners, stones were found marked with an "ACC".

1888 In 1888, the GLO performed a survey of the exteriors of the Salt River Indian Reservation (a portion of said exteriors being the east township line of Township 2 North, Range 4 East). During which they placed posts with charred stakes or stones at the corner positions (the corners are noted as being also marked by a stone as established by private survey). It is noted that this survey established corners at 1/4 mile intervals.

1889 An original survey of the extension of the subdivision lines of Township 2 North, Range 4 East was performed by the GLO in 1889 under the direction of Andrew Barry. During which they placed stones at the corner positions.

1892 An original survey of the extension of the south boundary of Township 3 North, Range 4 East was performed by the GLO in 1892 under the direction of Ridgley C. Powers. During which they placed stones or marked x on rocks at the corner positions.

1902 In 1902, the GLO under the direction of H.F. Robinson performed a retracement, a resurvey and/or an original survey of portions of the north and west township lines and subdivision lines in the northwesternmost portion of the township. During which they placed stones or marked x on rocks at the corner positions.

It should be noted that said field notes state said surveyor during the years 1887-1888, being supplied with a copy of the field notes for said township, made a resurvey of the entire surveyed portions of this township and all original corners found that were marked with stake, mound and pits were further marked for their perservation with a stone with the proper marks and also the letters "G.C." (for government corner).

As a general note, it appears the same surveyor, H.F. Robinson, performed the Arizona Canal Company survey and the GLO survey in 1902. However, based on Maricopa County and Salt River Project corner tie records at some section and quarter section corners, stones were found marked with an "ACC" which is in conflict with the statement in the GLO notes from 1902 stating the stones were marked with "G.C.".

It is unknown whether the "ACC" stones were set at the original GLO posts or whether they are in the same position as the "G.C." stones.

5 monuments recovered today are from the above mentioned surveys (GLO surveys from 1888-1902). Based on the record distances from the above mentioned surveys and our measurements between existing monumentation today, there are variances of from -81 feet to +58 feet between record and measured distances.

1902-1917 In the early 1900's, the United States Reclamation Service (USRS) was given authorization from the Department of Interior to perform official dependent resurveys of the lands within the Salt River Valley project service area to establish boundary lines and to apportion the irrigable lands of the Salt River Valley. In many cases, the USRS was unable to recover the section corners so they reset them, often in sharp contrast to where the GLO corner was set. Also in some cases, the original GLO corners were recovered (by others) after the USRS had set their version of the section corner. Generally, the effects of the USRS are felt where ever farmland is/was located in the Salt River Valley. Based on some early Salt River Project corner tie records, it appears that the USRS set stones at their corner positions. Due to insufficient evidence, it is uncertain if any monuments recovered today are from the above mentioned surveys.

1900's - 1960's Based on Maricopa County and Salt River Project corner tie records during the 1900's - 1960's, stones were located at some section and quarter section corners. The corner tie records note GC stones, ACC stones, USRS stones or just a stone or rock. In a few cases, the corner tie record will note that a stone was set and may include the date (typically early 1900's) and name of the surveyor who set the stone. It may even note the method used to set said stone (said methods typically being based on fence lines or proportionate measure). However, most of the corner tie records will only note that a stone (possibly type, GC, ACC, USRS) was found. Any ties shown to said stones were not found at the time of this survey.

1910 In 1910, the GLO under the direction of Robert A. Farmer performed a survey of the subdivision of Sections 1 and 12, Township 1 North, Range 4 East and a resurvey of the west township line of Township 2 North, Range 5 East. During which they placed brass caps on pipes at the corner positions or found stones at the corner positions as mentioned in the original field notes and placed brass caps on pipes as witness corners west of and alongside the stones (the field notes do not give a distance to said witness corners). It is noted that this survey established corners at 1/4 mile intervals.

1914 In 1914, the GLO under the direction of Sidney E. Blout performed a retracement and resurvey of the south township line of Township 3 North, Range 4 East. During which they reestablished the original stones at the corner positions or placed brass caps on pipes at the corner positions.

1931 In 1931, the GLO under the direction of Francis N. Joy performed a dependent resurvey of part of the north boundary and part of the subdivision lines of Township 1 North, Range 4 East. During which they found a stone, which they reconstructed by placing an iron pipe with brass cap along side, at the southwest corner of Section 34, they found an 1/2" square iron bar, which they reconstructed by placing an iron pipe with brass cap along side, at the south quarter corner of Section 34 and they found a 1" dia. iron pipe, which they perpetuated by placing two iron pipes with brass caps as witness corners, at the southeast corner of Section 34.

No monuments recovered today are from the above mentioned surveys (GLO surveys from 1910-1931). Our measurements between existing monumentation today and the record distances from the above mentioned surveys agree by an average of 3.0 +/- feet.

In summary, based on all of the above, the GLO, the Arizona Canal Company (A.C.Co.), the United States Reclamation Service (USRS) and private or public (non-GLO) surveyors, appear to have set stones at corner positions in this township. There is an uncertainty as to whether the GLO, A.C.Co. and USRS corner positions are in agreement with each other and/or with existing monumentation found today. This uncertainity is due to few monuments recovered being from the above mentioned GLO surveys, the uncertainty of any monuments recovered being from the above mentioned A.C.Co. and USRS surveys and large variances between GLO measurements and measurements today. Therefore it cannot be assumed that the positions of monuments found and held by this survey today, are necessarily a perpetuation of the position of the original corner. But it is rather, based on the recorded and unrecorded documents noted in this survey, the best available evidence of the perpetuated position of previously set monuments. Said previously set monuments may or may not have been related to the original survey.

A search of the MCDOT Plat Index showed approximately 2000 recorded surveys. Some additional unrecorded surveys from public agencies and private surveyors were obtained.

Some of the above mentioned surveys were used to determine existing corners and to set obliterated corners.

BOOK 734 PAGE 10
OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-0298825

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN
TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

REGISTERED LAND SURVEYOR 21782 SCOTT A. NELSON ARIZONA U.S.A.

	BY	DATE
DRAWN	A. GRASS	2-24-05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

COORDINATE TABLE

CORNER DETERMINATION TABLE

** MONUMENTS CALLED FOR IN THIS TABLE HAVE BEEN ACCEPTED FOR THE CORNER **
** SPECIFIED IN THE LOCATION COLUMN IN THE COORDINATE TABLE, ALL MONUMENTS **
** NOT APPEARING IN THIS TABLE HAVE NOT BEEN ACCEPTED AS A CORNER **

POINT	CORNER DETERMINATION ANALYSIS / PROCEDURE
24502-1M	Per R808, R842, R992 and R997, dated between 1970 and 1974, an iron bar by stone or a marked stone was found at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1665, R1854, R2000 and U28, the oldest being R1665 from 1994. This position substantially agrees with R444, R808, R842, R992, R997, R1665, R1854, R2000 and U28, the oldest being R444 from 1958. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24503-1	Found and accepted original GLO monument (chiseled 'x' on rock) set by H.F. Robinson, U.S. Deputy Surveyor, per U7 in 1902. Said monument is called for and agrees with R157, R208, R992, R997, R1012, R1632, R1919 and U10. It should be noted that R1748 found said chiseled "x" on rock, but did not accept as the corner. It states said chiseled 'x' on rock is 2.50' s. × 1.60' e. of corner. As a general note, a chiseled "x" on rock (24503-2) found 4.7' +/- to the north is of unknown origin and is not noted on any of the above mentioned documents.
24504-3M	Per U2 in 1868, the GLO originally set a post with mound and pits at the corner. Per U6 in 1892, the GLO during a resurvey found no trace of said wood post and set a stone at the corner. Per U7 and U10, in 1902 and 1914 respectively, the GLO during retracements and resurveys, found the original stone or reset the original stone. Per R208, R678 and R1681, dated 1953, 1965 and 1994 respectively, a GLO post was found at this corner. It is this surveyor's opinion that said GLO post is not the original post from 1868, but may be the original stone from 1892. It is noted that R1592, dated 1990, located a 3/4" iron pipe with marked stone alongside at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1592, R1632 and R1919, the oldest being R1592 from 1990. This position substantially agrees with R208, R678, R1095, R1592, R1632, R1681 and R1919, the oldest being R208 from 1953. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary. As a general note, per R208, the monument (24504-T6) found 49.7' +/- to the west appears to be the northwest corner of Lot 73 of said R208. The monument (24504-1) found 40.4' +/- to the southeast was set by Aerial Mapping Company at an unknown time and appears to be an aerial panel. The monument (24504-2) found 32.9' +/- to the east is of unknown origin and is not noted on any of the above mentioned documents.
24505-1M	The time and origin of who set the monument is unknown. R208, dated 1953, located a GLO post at the corner. It is this surveyor's opinion that said GLO post is the iron post and brass cap set per U10 in 1914. The physical monument is called for in R678, R843, R1045, R1567, R1762, R1825, R1826, R1851, R1876, R1919 and R1940, the oldest being R678 from 1965. This position substantially agrees with R208, R678, R843, R1045, R1567, R1674, R1735, R1762, R1777, R1825, R1826, R1851, R1876, R1919 and R1940, the oldest being R208 from 1953. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24506-1	Per U58, dated 1947, a USGLO brass cap was found at this corner. Said corner tie record showed no ties to the USGLO brass cap, only what was found. Based on GLO field notes, no brass cap was set at this corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1645, R1646, R1659, R1750, R1762, R1770 and R1940, the oldest being R1645 from 1993. This position substantially agrees with R587, R843, R931, R1045, R1428, R1482, R1645, R1646, R1659, R1750, R1762, R1770 and R1940, the oldest being R587 from 1961. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24507-1	Per U58, dated 1947, a USGLO brass cap was found at this corner. Said corner tie record showed no ties to the USGLO brass cap, only what was found. No other documents, other than the original GLO notes, were found calling for the original monument. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1403, R1482, R1623, R1645, R1750, R1762, R1770, R1940 and U11, the oldest being R1403 from 1983. This position substantially agrees with R931, R1079, R1089, R1291, R1403, R1482, R1623, R1645, R1750, R1762, R1770, R1940 and U11, the oldest being R931 from 1973. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24508-1	The time and origin of who set the monument is unknown. The original GLO monument is noted in R736 and U57 (U57 is an APS corner tie record of which none of the ties were found at the time of this survey). The physical monument is called for in U11 and its position substantially agrees with same and with R736, R968 and R1089, the oldest being R736 from 1967. The monument is accepted as the best available evidence of the perpetuated position of the original corner and of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24509-3M	No evidence, other than the original GLO notes, were found calling for the original monument. The monument was set by Howard R. Standage, PE of Collar, Williams & White Engineering, Inc per R1070 in 1977. This position substantially agrees with U11. The monument is accepted as the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary. As a general note, per R1071, the monument (24509-1) found 124.7' +/- to the northwest appears to be the Via Palma centerline - Via Marina centerline intersection. The monument (24509-2) found 0.5' +/- to the southwest is of unknown origin and was disturbed (and removed) during the location of the accepted monument 24509-3M.
24511-Z1	Per U9, dated 1910, Robert A. Farmer, Topographer and U.S. Surveyor, during a resurvey of the west township line of Township 2 North, Range 5 East, found and accepted a granite stone mkd. with 6 notches on N., E., S. and W. faces at the corner. He also found north of and alongside stone, a wooden post mkd. S R R on E. face and 6 notches on N., E., S. and W. faces. He set west of and alongside the stone an iron post with brass cap as a witness corner. No distance was given from the stone to the brass cap witness corner. It is noted that R874, R1150, R1469 and U58, dated between 1965 and 1985, located a stone at the corner. The corner position was established by calculating an average difference between U62 coordinates and GDACS coordinates at corners common to both surveys that were found along the west line of Township 2 North, Range 5 East. This position substantially agrees with R874, R1098, R1150, R1469, R1523, R1699, R1705, U58, U62 and U63, the oldest being U58 from 1965.
24514-3	Found and accepted original GLO monument set by H.F. Robinson, U.S. Deputy Surveyor, per U8 in 1902. Said monument is called for and agrees with R555, R1386 and R1748. As a general note, the monument (24514-2) found 0.8' +/- to the north is of unknown origin and is not noted on any of the above mentioned documents. Per R1386, the monument (24514-1) found 220.3' +/- to the south appears to be the southwest corner of Lot 13 of said R1386.
24515-1M	Per R5, R208 and R605, dated between 1953 and 1974, a GLO stone or stone was found at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1567, R1674, R1851, R1940, R1961 and R1987, the oldest being R1567 from 1989. This position substantially agrees with R5, R208, R605, R1447, R1567, R1674, R1851, R1940, R1961 and R1987, the oldest being R208 from 1953. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary. As a general note, the monument (24515-2) found 1.6' +/- to the northwest is of unknown origin and appears to be an aerial panel. Per R208, R605, R1567, R1672, R1674 and R1851, the monument (24515-T1) found 25.0' +/- to the north appears to be the Invergordon Road centerline - Cheney Drive centerline intersection. Per R208, the monument (24515-T2) found 50.0' +/- to the north appears to be on the north right-of-way line of Cheney Drive.
24516-1	Per U57 and R314, dated 1955 and 1956 respectively, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1623, R1940, R1948 and U11, the oldest being R1623 from 1992. This position substantially agrees with R314, R1051, R1403, R1482, R1623, R1693, R1940, R1948 and U11, the oldest being R314 from 1956. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24518-Z1	Per U9, dated 1910, Robert A. Farmer, Topographer and U.S. Surveyor, during a resurvey of the west township line of Township 2 North, Range 5 East, found and accepted a granite stone mkd. A C Co 1/4 on W. face and W L R E S on E. face at the corner. He set west of and alongside the stone an iron post with brass cap as a witness corner. No distance was given from the stone to the brass cap witness corner. It is noted that R711, R874, R917, R1150, R1699 and U61, dated between 1966 and 1995, located a stone at the corner. The corner was established by calculating an average difference between U61 coordinates and GDACS coordinates at corners common to both surveys that were found along the west line of Township 2 North, Range 5 East. This position substantially agrees with R711, R874, R915, R917, R1150, R1699 and U61, the oldest being R711 from 1966.
24520-Z1	Per R359, R532, R535 and R560, dated between 1956 and 1960, a stone was found at the corner. At the time of this survey, the original GLO stone was found disturbed, out of the ground and lying on its side, at the corner. A rebar of unknown origin had been set next to said stone. The corner position was established by a best fit solution using monuments (24520-2, 24520-T5, 24520-T7 through 24520-T12, 24520-T14 and 24520-T15) located to the north and south per R535 information (all but three of said found monuments were original corners per R535). Some additional monuments found to the west generally agree with this best fit solution (multiple monuments were found at some property corners to the west). This position substantially agrees with R359, R532, R535 and R560, the oldest being R359 from 1956. It is noted that R1545 and R1558, dated 2002 and 2003 respectively, appear to have held the rebar (24520-1) found next to the stone as the corner.
24521-2	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. The physical monument is called for in R1891, R1945 and U56, the oldest being U56 from 1981. This position substantially agrees with R213, R761, R875, R938, R1891 and R1945, the oldest being R213 from 1953. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, the monument (24521-1) found 23.5' +/- to the west is of unknown origin and is not noted on any of the above mentioned documents.
24522-2M	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. The physical monument is called for in R1607 and R1854, the oldest being R1607 from 1991. This position substantially agrees with R213, R1607 and R1854, the oldest being R213 from 1953. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, per R250, the monument (23522-1) found 30' +/- to the west appears to be the Desert Fairways Drive centerline - Palo Verde Place centerline intersection.
24523-1M	Per R429 and R557, dated 1957 and 1960, a stone was found at the corner. The monument was set by Michael Braden of Arizona Public Service in 2004. This position substantially agrees with R429, R577, R684, R1039 and R1386, the oldest being R429 from 1957. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24524-1	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. No documents were found calling for the physical monument. This position substantially agrees with R410, R557, R1386, R1630, R1716 and R1817, the oldest being R410 from 1957. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24525-2	The original GLO stone was found disturbed and reset by Jay N. Vaughn, RLS of Vaughn Land Surveying Inc. per R1961 in 2003. Said original GLO stone appears to be called for in R2, R5, R339, R904, R1371, R1618, R1716 and R1916 and its position substantially agrees with same, the oldest being R339 from 1956.
24526-1	Per U58 and U56, dated 1946 and date unknown respectively, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1678, R1689, R1695, R1738, R1763, R1870, R1940, R1961, R1987 and U11, the oldest being R1678 from 1994. This position substantially agrees with R5, R548, R1678, R1689, R1695, R1738, R1763, R1870, R1940, R1961, R1987 and U11, the oldest being R548 from 1959. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24527-1	Per U58 and U68, dated 1941 and 1948 respectively, a stone or stone in handhole was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1940, R1948, R1959, U11 and U31, the oldest being U11 from 1995. This position substantially agrees with R836, R1051, R1403, R1695, R1940, R1948, R1959, U11, U31 and U68, the oldest being U68 from 1948. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24528-1	Per U68 and U69, both dated 1948, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1937, R1948 and R1959, the oldest being R1937 from 2002. This position substantially agrees with R1067, R1937, R1948, R1959, U68 and U69, the oldest being U68 from 1948. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24529-1	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. The physical monument is called for in R1937, R1953 and U11, the oldest being U11 from 1995. This position substantially agrees with R861, R874, R900, R969, R1067, R1220, R1440, R1656, R1914, R1937, R1953, U11 and U15, the oldest being R861 from 1971. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. It should be noted that per U56 and U69, both dated 1948 (and both by F.N. Holmquist) two monuments were located at the corner. A pipe was found at the position of the current monument (24529-1) which was not accepted as the corner. U56 notes said pipe was set by Gilliam in error (it is unknown the date Gilliam set said pipe or method used). Per U56 and U69, a 4" dia. iron hub of wheel with 1 1/2" pipe inside was accepted as the corner. Said monument was located 18.45' south and 7.0' west of the current monument (24529-1). It should also be noted though that R969 (by Holmquist and King) in 1974, accepted the position of the current monument (24529-1) as the corner. It is also noted that other U56 documents (MCDOT corner tie records) note said iron pipe (set by Gilliam) as the corner.
24530-1	Per U56, date unknown, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1845 and R1953, the oldest being R1845 from 1999. This position substantially agrees with R514, R861, R874, R919, R969, R991, R1074, R1227, R1656, R1845, R1914, R1953, U11 and U15, the oldest being R514 from 1959. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24531-1	Per U9, dated 1910, Robert A. Farmer, Topographer and U.S. Surveyor, during a resurvey of the west township line of Township 2 North, Range 5 East, found and accepted a granite stone mkd. A C Co on W. face, W L R E S on E. face, 5 notches on S. face and 1 notch on N. face at the corner. He also set west of and alongside the stone an iron post with brass cap as a witness corner. No distance was given from the stone to the brass cap witness corner. Per U58, dated 1949, an ACC stone with brass cap beside was found at the corner. None of the ties to this stone and/or GLO brass cap were found at the time of this survey and no other documents, other than the original GLO notes, were found calling for the original monument. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1797, R1845, U11, U61, U62 and U63, the oldest being U61 from 1986. This position substantially agrees with R514, R874, R917, R919, R1074, R1227, R1797, R1845, U11, U61, U62 and U63, the oldest being R514 from 1959. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24533-Z1	Per U29, U57 and U58, dated between 1940 and 1949, a stone was found at the corner. The corner position was established by projecting a line to the west from the east quarter corner (24534-1) of Section 8 through the center (24534-T8) of Section 8 at record distance per R213 west from the intersection of Lincoln Drive and Tatum Boulevard. This position substantially agrees with R213, R751, R878, R953, R1130, R1641, R1745, U29, U53 and U54, the oldest being U29 from 1940.
24534-1	Per R82, R409, R595, R684, R1039 and U54, dated between 1938 and 1978, a stone or stone in handhole was found at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1727, R1756 and U65, the oldest being U65 from 1990. This position substantially agrees with R82, R409, R595, R684, R1039, R1727, R1756, U54 and U65, the oldest being R82 from 1938. The monument is accepted as the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24535-1	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. The physical monument is called for in R1634, R1640, R1679, R1783, R1798, R1895, R1961 and U21, the oldest being R1634 from 1993. This position substantially agrees with R170, R727, R1116, R1190, R1259, R1321, R1634, R1640, R1679, R1783, R1798, R1895, R1961, U21 and U54, the oldest being R170 from 1951. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24536-1	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. The physical monument is called for in R1730, U11 and U31, the oldest being U11 from 1995. This position substantially agrees with R884, R988, R1138, R1730, U11, U13, U31, U54 and U68, the oldest being U68 from 1948. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24537-1M	Per R4, R949, R969, U56 (multiple corner tie records) and U58, dated between 1920 and 1974, a stone or rock was found at the corner (U56, per one corner tie record, notes locating a stone marked ACC). See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. No documents were found calling for the physical monument. This position substantially agrees with R4, R949, R969, R1196, R1220, R1342 and R1914, the oldest being R949 from 1955. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.

CORNER DETERMINATION NOTES

1. The goal of this survey was to perpetuate the position of the original section and quarter section corners. This survey is not meant to determine occuption lines, title lines, boundary lines, record lines and/or ownership lines. However, any one or a combination of the above may have been utilized in the final determination of the corner position. Situations may occur where evidence of the perpetuation of the original corner position may disagree with locally accepted monuments, occupation lines, title lines, boundary lines, record lines, and/or ownership lines.

2. The term "substantially agrees" refers to one or a combination of the following:

   The character of the physical monument recovered is similar to the monument descriptions in the documents referenced for a corner point in the determination table.

   The measurements observed during this survey are similar to the measurements indicated in the documents referenced for a corner point in the determination table. Professional judgment has been applied to the differences in survey measurements based on survey technology and techniques at the time of the survey record. Generally, larger differences in measurements are acceptable in earlier surveys with less technology and smaller differences in later surveys using newer survey technology and techniques. Also considered were differences in position due to the removal and replacement of monuments due to development and/or construction.

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OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-0298825

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN
TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

REGISTERED LAND SURVEYOR
21782
SCOTT A.
NELSON
ARIZONA U.S.A.

	BY	DATE
DRAWN	A. GRASS	2 24 05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
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CORNER DETERMINATION

CORNER DETERMINATION TABLE

** MONUMENTS CALLED FOR IN THIS TABLE HAVE BEEN ACCEPTED FOR THE CORNER **
** SPECIFIED IN THE LOCATION COLUMN IN THE COORDINATE TABLE, ALL MONUMENTS **
** NOT APPEARING IN THIS TABLE HAVE NOT BEEN ACCEPTED AS A CORNER **

POINT	CORNER DETERMINATION ANALYSIS / PROCEDURE
24538-1	Per U9, dated 1910, Robert A. Farmer, Topographer and U.S. Surveyor, during a resurvey of the west township line of Township 2 North, Range 5 East, found and accepted a granite stone mkd. A C Co 1/4 on W. face and W L R E S on E. face at the corner. He also set west of and alongside the stone an iron post with brass cap as a witness corner. No distance was given from the stone to the brass cap witness corner. Per U58 and U56, dated 1912 and date unknown respectively, an A.C.Co. rock was found at the corner. Per U58 (a second corner tie record), dated 1949, a GLO post bent over was found at the corner. None of the ties to this rock or GLO post were found at the time of this survey and no other documents, other than the original GLO notes, were found calling for the original monument. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1797, R1845, U11, U61, U62 and U63, the oldest being U61 from 1986. This position substantially agrees with R514, R679, R861, R1797, R1845, U11, U61, U62 and U63, the oldest being R514 from 1959. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24540-1	Per R76, dated 1930, a stone was found at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1669 and its position substantially agrees with same and with R76, R86, R187, R361, R366, R798 and U59, the oldest being R76 from 1930. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24541-1	Per R51, R76 and U29, dated between 1928 and 1940, a stone was found at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1663 and its position substantially agrees with same and with R51, R76, R86, R798, R870, U29, U34 and U59, the oldest being R51 from 1928. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24542-1	Per R51, dated 1928, a stone was found at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1641 and R1669, the oldest being R1641 from 1993. This position substantially agrees with R51, R192, R878, R1011, R1091, R1641, R1669, U29 and U59, the oldest being R51 from 1928. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24543-1M	Per R51, dated 1928, a stone was found at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1971 and U19, the oldest being U19 from 2001. This position substantially agrees with R51, R192, R363, R1971, U19 and U59, the oldest being R51 from 1928. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24544-1	Per R51, R82 and U56, dated between 1928 and 1942, a stone was found at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1873 and R1971, the oldest being R1873 from 2000. This position substantially agrees with R51, R82, R122, R200, R274, R595, R709, R1116, R1378, R1452, R1873, R1971 and U59, the oldest being R51 from 1928. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24545-1	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. The physical monument is called for in R1759, R1783, R1795 and R1873, the oldest being R1759 from 1997. This position substantially agrees with R102, R158, R200, R709, R1115, R1116, R1759, R1783, R1795, R1873 and U59, the oldest being R102 from 1947. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24546-1	Per R102, R255, U56, U58 and U59, dated between 1947 and 1962, a stone was found at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1679, R1702, R1783, R1790, R1798 and U20, the oldest being R1679 from 1994. This position substantially agrees with R102, R255, R727, R1041, R1115, R1116, R1487, R1679, R1702, R1783, R1790, R1798, U20, U56 and U59, the oldest being R102 from 1947. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24547-1	Per U56 and U58, dated 1950 and unknown respectively, a stone and pipe were found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1790, R1935, R1970 and U11, the oldest being U11 from 1996. This position substantially agrees with R694, R806, R1487, R1702, R1790, R1935, R1970, U11, U13 and U30, the oldest being R694 from 1965. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24548-1	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. The physical monument is called for in R1554, R1970, R1997, U11 and U13, the oldest being U13 from 1987. This position substantially agrees with R806, R832, R879, R1138, R1157, R1175, R1180, R1184, R1215, R1217, R1554, R1970, R1997, U11, U13, U33 and U56, the oldest being U33 from 1946. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24549-1	Per R554, U33, U56 and U58, dated between 1946 and 1960, a stone was found at the corner (U58 notes as a stone marked 1/4 and A.C.Co.). It is noted that U33 and R554 located a pipe on the north side of stone at the corner. U33 notes the stone was used as the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1554, R1775, R1880 and U11, the oldest being R1554 from 1988. This position substantially agrees with R4, R438, R926, R983, R1125, R1157, R1175, R1180, R1242, R1317, R1401, R1519, R1554, R1625, R1775, R1880, U11 and U33, the oldest being U33 from 1946. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24550-1	Per U58 and U56, dated 1920 and 1966 respectively, a stone was found at the corner (U58 notes as a granite stone 4" x 18" x 10" above ground. 5 notches on w. side, 1 notch on e. side, 5 notches on s., 2 on n.). See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1775 and U11, the oldest being U11 from 1995. This position substantially agrees with R4, R926, R959, R969, R983, R1002, R1073, R1087, R1125, R1146, R1153, R1220, R1242, R1317, R1342, R1401, R1519, R1775, U11 and U32, the oldest being R4 from 1973. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24551-1	Per U58 and U56, dated 1910 and 1962 respectively, a stone or rock was found at the corner. See the general time line for further information. U56 notes setting a 3/4" iron pipe over the stone. It is noted that R607, R773 and R1146, dated between 1961 and 1978, located a pipe at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in U11 and its position substantially agrees with same and with R607, R663, R773, R114 and U32, the oldest being R607 from 1961. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24552-1	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. No documents were found calling for the physical monument. This position substantially agrees with R607, U11, U61 and U62, the oldest being R607 from 1961. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24553-1	Found and accepted original GLO monument set by H.F. Robinson, U.S. Deputy Surveyor, per U8 in 1902. Said monument is called for and agrees with R51, R76, R360 and U59. As a general note, R86, dated 1945, notes locating a pipe at the corner. R870, dated 1977, notes setting an iron pipe at the corner. R1199 and R1772, dated 1979 and 1997 respectively, note locating a 1/2" pipe at the corner. During this survey, no pipe was found in the vicinity of the original GLO monument.
24554	No determination was made at this time. See note on this sheet.
24555-1	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. The physical monument is called for in R1774, U11 and U20, the oldest being U11 from 1996. This position substantially agrees with R89, R102, R103, R586, R1037, R1109, R1370, R1405, R1487, R1631, R1649, R1651, R1702, R1774, U11, U20, U56 and U59, the oldest being R89 from 1945. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24556-1	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. The physical monument is called for in R1896 and R1997, the oldest being R1896 from 2001. This position substantially agrees with R165, R806, R832, R1099, R1157, R1175, R1184, R1215, R1680, R1896, R1997, U11, U14 and U33, the oldest being U33 from 1946. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24557-3	Per U58, date unknown, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. No documents were found calling for the physical monument. This position substantially agrees with R602, R867, R959, R1073, R1082, R1142, R1153, R1157, R1280, R1293 and U32, the oldest being R602 from 1961. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, both the survey department and the capital projects department at the City of Scottsdale were contacted in trying to obtain Hayden Road Improvement plans. Neither department was able to locate said plans. The monument (24557-2) found 5.6' +/- to the west appears to be on the Hayden Road construction centerline. The monument (24557-1) found 22.8' +/- to the east is of unknown origin and is not noted on any of the above mentioned documents.
24558-1	Per U9, dated 1910, Robert A. Farmer, Topographer and U.S. Surveyor, during a resurvey of the west township line of Township 2 North, Range 5 East, found and accepted a granite stone mkd. A C Co 1/4 on W. face and W L R E S on E. face at the corner. He also set west of and alongside the stone an iron post with brass cap as a witness corner. No distance was given from the stone to the brass cap witness corner. Per U58, dated 1912, a rock marked WLRES and a brass cap to west of rock were found at the corner. Per R590 and R607, both dated 1961, a GLO brass cap was found at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in U11 and U62, the oldest being U11 from 1996. This position substantially agrees with R590, R607, U11, U61, U62 and U63, the oldest being R590 from 1961. The monument is accepted as the best available evidence of the perpetuated position of the original corner and of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24559-T1	Per U58 (multiple corner tie records), dated between 1910 and 1933, a stone was found at the corner (some note as ACC stone). See the general time line for further information. The corner position was established by proration using U59 information from the north quarter corner (24540-1) of Section 18, the northeast corner (24560-1) of Section 19, the north quarter corner (24577-1) of Section 30, all of Township 2 North, Range 4 East and the northeast corner (24065-1) of Section 24, Township 2 North, Range 3 East. This position substantially agrees with R17, R57, R119, R502, R691, R725, R965, R1048, R1170, R1595, R1604, U35, U50 and U59, the oldest being R17 from 1897. It is noted that R119, dated 1948, located 2 pipes at the corner (about 2' apart in an east-west direction) with the east pipe being accepted as the corner. U45, dated 1946, appears to have held the west pipe as the corner.
24560-1	Per U45, U56 and U58, dated between 1920 and 1946, a stone was found at the corner (U56, dated 1946, notes as as ACCO stone). See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1604, R1719, R1723 and R1772, the oldest being R1604 from 1991. This position substantially agrees with R173, R651, R691, R965, R1149, R1604, R1719, R1723, R1772, U45, U50 and U59, the oldest being U45 from 1946. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24561-4M	Per R51 and R381, dated 1928 and 1957 respectively, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. No documents were found calling for the physical monument. This position substantially agrees with R51, R295, R381, R1719, R1723 and U49, the oldest being R51 from 1928. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, per R1723, the monuments 24561-1 and 24561-3 appear to be Rockridge Road centerline monumentation. Monument 24561-2 is of unknown origin and is not noted on any of the above mentioned documents. Per R1723, the monument 24561-T2 appears to be a subdivision corner. Per R295, the monument 24561-T3 appears to be the 53rd Street centerline - Wonderview Road centerline intersection.
24562-5M	Per U58, dated 1958, a stone was found at the corner. U59 and R1747, dated 1962 and 1996 respectively, note locating an "x" in stone at the corner, but it is believed this may be one of the references noted per U58 (said "x" in stone being 24562-T1). The monument found at the time of this survey was set by Henry Shearrow, RLS of Shearrow & Sons Surveying per U67 in 1999. This position substantially agrees with R51, R77, R242, R280, R381, R423, R922 and U58, the oldest being R51 from 1928. The monument is accepted as the best available evidence of the perpetuated position of the original corner and of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, per R280, the monument 24562-1 appears to be the centerline point of curve on 56th Street. Per Document 1999-0561700, the monuments 24562-2 and 24562-3 appear to be property corners for the parcel described in said document. Monument 24562-4 is of unknown origin and is not noted on any of the above mentioned documents. Monument 24562-T2 is of unknown origin and is an aerial panel. Monument 24562-T3 was set by Michael Wier, RLS at an unknown time and is not noted on any of the above mentioned documents.
24563-2	Found and accepted original GLO monument set by Andrew Barry, U.S. Deputy Surveyor, per U5 in 1889. Said monument is called for and agrees with R1364, R1365, R1565 and U59 and its position agrees with R77. As a general note, the monument (24563-1) found 32.9' +/- to the south was set by John Snodgrass, RLS at an unknown time and is not noted on any of the above mentioned documents.
24564-1	Per R89, R103, R822, R1365, U58 and U59, dated between 1945 and 1982, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1774 and U11, the oldest being U11 from 1996. This position substantially agrees with R89, R103, R309, R822, R1364, R1365, R1368, R1370, R1405, R1566, R1631, R1651, R1774, U11 and U59, the oldest being R89 from 1945. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24565-1M	Per R511, U56 and U58, dated between 1939 and 1959, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1984, U11 and U37, the oldest being U37 from 1985. This position substantially agrees with R61, R511, R744, R756, R1368, R1493, R1589, R1984, U11 and U37, the oldest being R61 from 1929. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24566-1	Per R53 and R470, dated 1928 and 1958 respectively, a rock or stone in handhole was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1883 and its position substantially agrees with same and with R53, R116, R162, R209, R470, R1099, R1197, R1211, R1596, R1680, U11, U37 and U38, the oldest being R53 from 1928. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24567-1	Per R653, U56, U57 and U58, dated between 1919 and 1963, a rock or stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in U11 and its position substantially agrees with same and with R653, R654, R717, R972, R996, R1050, R1082, R1142, R1211 and U56, the oldest being R653 from 1963. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24568-T1	Per U57 and U56, dated 1949 and unknown respectively, a stone was found at the corner. See the general time line for further information. The corner position was established per R1333 information by projecting a line from the monument 24568-T1 through the monument 24568-1 and at record distance from monument 24568-1. This position substantially agrees with R602, R1142, R1333 and R1559, the oldest being R602 from 1961. As a general note, both the survey department and the capital projects department at the City of Scottsdale were contacted in trying to obtain Hayden Road Improvement plans. Neither department was able to locate said plans. Per R1333 and R1559, the monument 24568-1 found 65' to the east appears to be the Hayden Road construction centerline - Chaparral Road centerline intersection. It is noted that R1082 and U11 appear to have held a position in the vicinity of the monument 24568-1 as the corner.

UNDETERMINED CORNER(S)/AREA(S)

Due to significant ambiguity surrounding the following area(s) the quarter and/or section corner(s) will not be determined. The monument(s) displayed on the Results of Survey was (were) found as of the date of the survey and is (are) shown for informational purposes only. To help aid future analysis the following information has been provided. Once again, this (these) particular corner(s)/area(s) on this survey is (are) NOT being determined and is (are) being left unresolved.

24554 Per U8, in 1902, the GLO under the direction of H.F. Robinson, U.S. Deputy Surveyor "marked on rock in place size undetermined, part of mountain bedrock an x and 1/4 on west". This monument was not found during the course of this survey.

Based on documents noted below dating back to 1928, there appear to be two different positions being used for this corner. At the time of this survey, no monuments were found in the vicinity of either corner position. The two corner positions are 60.2' +/- north-south apart. It should also be noted that neither of these corner positions agree with a single proportioned GLO position. Said single proportioned GLO position is up to 205' +/- to the north-northwest from these two corner positions.

Per R51, in 1928, F.N. Holmquist of Holmquist & Maddock Engineers located a stone at the corner (based on symbol and legend shown on said document). This position was established by proration using the bearings and distances from the northeast corner (24562-5M) of Section 20 and the northeast corner (24544-1) of Section 17. It appears this position has been held as the east quarter corner of Section 17.

Per R200, in 1953, Preston A. Padon of Padon Engineering Company located a stone marked x with a stone monument over same at the corner. This position was established by proration using R102 and R200 bearings and distances from the northeast corner (24544-1) of Section 17 and the east quarter corner (24555-1) of Section 16. It appears this position has been held as the west quarter corner of Section 16.

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OFFICIAL RECORDS OF MARICOPA COUNTY RECORDER HELEN PURCELL
2005-0298825
03/11/2005 08:51 AM

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

	BY	DATE
DRAWN	A. GRASS	2-24 05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27 05

REGISTERED LAND SURVEYOR 21782 SCOTT A. NELSON ARIZONA U.S.A.

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
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CORNER DETERMINATION

SHEET 8 OF 15

CORNER DETERMINATION TABLE

** MONUMENTS CALLED FOR IN THIS TABLE HAVE BEEN ACCEPTED FOR THE CORNER **
** SPECIFIED IN THE LOCATION COLUMN IN THE COORDINATE TABLE, ALL MONUMENTS **
** NOT APPEARING IN THIS TABLE HAVE NOT BEEN ACCEPTED AS A CORNER **

POINT	CORNER DETERMINATION ANALYSIS / PROCEDURE
24569-1	Per R733, R740, U56 and U58, dated between 1952 and 1967 (U58 undated), a stone or rock was found at the corner (U56 notes as a "Large Granite Stone 1/4 on No ACC on So"). See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. No documents were found calling for the physical monument. This position substantially agrees with R534, R566, R599, R733, R740, R793 and U11, the oldest being R534 from 1959. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24570-1	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. The physical monument is called for in U11 and U62, the oldest being U11 from 1996. This position substantially agrees with R533, R600, R1271, U11, U61, U62 and U63, the oldest being R533 from 1955. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. It is noted that per R732, dated 1967, Coe and Van Loo Engineering found two monuments that were 1.00' apart in a north - south direction at the corner. R732 held the north monument as the corner. However, it appears the south monument agreed with the corner position based on previously dated documents. Said south monument's position also agrees with the monument found and accepted at the time of this survey.
24572-3	Per R272, R833, R922, R1399, U45, U56 and U58, dated between 1919 and 1983, a stone, stone in handhole or rock was found at the corner (U45 and U56 note as an ACCo Rock marked 1/4 on north). See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R272, R833, R922, R1399, U45, U56 and U58, the oldest being U58 from 1919. This position substantially agrees with R75, R272, R682, R833, R922, R1399 and U45, the oldest being R75 from 1930. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, per U45, the monument (24572-1) found 25.0' +/- to the north appears to be the Camelback Road construction centerline - 56th Street centerline intersection. Per R1399 and U45, the monument (24572-2) found 8.0' +/- to the north appears to be the Camelback Road survey centerline - 56th Street centerline intersection. It should be noted that R1747, R1755 and R1832 appears to have held 24572-2 as the quarter corner.
24573-1	The time and origin of who set the monument is unknown. No evidence, other than the GLO notes, were found calling for the original monument. The physical monument is called for in R1712, R1872, R1889, R1928 and U11, the oldest being R1712 from 1995. This position substantially agrees with R123, R309, R822, R1013, R1166, R1330, R1364, R1368, R1712, R1872, R1889, R1928, U11, U45, U52 and U59, the oldest being U45 from 1946. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24574-1	Per U58, date unknown, a USRS rock was found at the corner. See the general time line for further information. U58 notes that said USRS rock is 2593.5' south from the northwest corner of Section 23. The corner was restored by setting a bolt 2 1/2' long 1 1/2" head flush at a point mid distance between the northwest and southwest corners of Section 23 (distance of 2654' north and south). The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1794 and U11, the oldest being U11 from 1996. This position substantially agrees with R53, R112, R116, R189, R1616, R1794, U11, U23, U38, U52 and U58, the oldest being R53 from 1928. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, the monument (24574-2) found 23.0' +/- to the west is of unknown origin and is not noted on any of the above mentioned documents.
24575-2	Per U58 and U56, dated 1950 and unknown respectively, a rock or stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1815 and its position substantially agrees with same and with R839, R886 and R1333, the oldest being R839 from 1971. As a general note, both the survey department and the capital projects department at the City of Scottsdale were contacted in trying to obtain Hayden Road improvement plans. Neither department was able to locate said plans. Per R1333, the monument 24575-1 found 27.1' +/- to the east appears to be the Hayden Road construction centerline - Camelback Road centerline intersection. It is noted that R1911 and U11 appear to have held the monument 24575-1 as the corner.
24576-1	Per U9, dated 1910, Robert A. Farmer, Topographer and U.S. Surveyor, during a resurvey of the west township line of Township 2 North, Range 5 East, found and accepted a granite stone mkd. A C Co on W. face and W L R E S on E. face at the corner. He also set west of and alongside the stone an iron post with brass cap as a witness corner. No distance was given from the stone to the brass cap witness corner. Per U58, dated 1912, said stone and iron post with brass cap were found at the corner. Said corner tie record also notes the pipe without brass cap was found at the corner in 1958. Per R700, dated 1966, a stone with "x" was found at the corner (said stone noted as "disturbed 0.58' south"). The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in U62 and its position substantially agrees with same and with R604, R673, R700, U61 and U63, the oldest being R604 from 1961. The monument is accepted as the best available evidence of the perpetuated position of the original corner and of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24577-1	Per U58 and U64, dated 1920 and 1923 respectively, a stone was found at the corner. See the general time line for further information. U64 notes replacing the stone with an iron pipe in pavement. It is noted that R47, R241, U36, U46 and U47, dated between 1927 and 1953, located a iron pipe or 3/4" iron pipe in lead plug at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1713, R1791, R1884 and R1968, the oldest being R1713 from 1995. This position substantially agrees with R55, R241, R914, R1413, R1713, R1791, R1884, R1968, U36, U46, U47, U55, U59 and U64, the oldest being U64 from 1923. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24578-1	Per U56 and U58, date unknown and 1912 respectively, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1713, R1838 and R1968, the oldest being R1713 from 1995. This position substantially agrees with R228, R305, R1713, R1838, R1968, U36, U46, U55 and U59, the oldest being U46 from 1953. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24580-1M	Per R251, R329, R330, R661, U56, U58 and U59, dated between 1919 and 1964, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. No documents were found calling for the physical monument. This position substantially agrees with R28, R251, R329, R330, R432, R661, R682, R701 and U59, the oldest being R28 from 1915. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24581-1	The time and origin of who set the monument is unknown. No evidence, other than the original GLO notes, were found calling for the original monument. The physical monument is called for in R1668 and U11, the oldest being R1668 from 1994. This position substantially agrees with R251, R306, R330, R337, R369, R467, R701, R730, R960, 1668, U11 and U59, the oldest being R251 from 1954. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24582-2	No evidence, other than the original GLO notes, were found calling for the original monument. The calculated northeast corner position of Section 28 was established by a best fit solution from monuments (24581-1, 24582-T1, 24582-T3 through 24582-T8 and 24582-T10 through 24582-T22) located to the north, east, south and west using R123, R245, R408, R430, R457, R578 and R730 information. This position substantially agrees with R45, R123, R233, R245, R408, R430, R457, R578, R662, R730 and U59, the oldest being R45 from 1927.
24583-1	Per U56 and U58, dates unknown, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1700, R1780, R1809 and U11, the oldest being U11 from 1998. This position substantially agrees with R123, R233, R316, R399, R593, R1700, R1780, R1809 and U11, the oldest being R123 from 1948. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. It is noted that R1793 has not held the monument (24583-1), as it is not within allowable tolerances for an ALTA survey. R1793 has held the City of Scottsdale Geodetic Control Data position.
24584-1	Per U58 and R27, dated 1910 and 1911 respectively, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1792, R1793, R1794, R1828, R1856, R1908 and U11, the oldest being U11 from 1996. This position substantially agrees with R27, R27, R36, R124, R267, R312, R1792, R1793, R1794, R1828, R1856, R1908 and U11, the oldest being R27 from 1911. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24585-1	Per U58, dated 1910, a rock was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1793, R1828, R1856, R1887, R1908, R1954 and U11, the oldest being U11 from 1996. This position substantially agrees with R36, R134, R722, R1081, R1088, R1177, R1793, R1828, R1856, R1887, R1908, R1954, U11 and U23, the oldest being R36 from 1920. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24586-1	Per U58, dated 1910, a rock was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. No documents were found calling for the physical monument. This position substantially agrees with R411, R839, R1081, R1177, R1275, R1815, R1911, U11, U27 and U58, the oldest being U58 from 1949. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24587-1	Per R646, R752, R1815, R1911, U11, U56 and U58, dated between 1912 and 2002, a stone in handhole or rock was found at the corner (U58 notes as a "Rock A.C.Co. 1/4"). See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R646, R752, R1815, R1911 and U11, the oldest being R646 from 1963. This position substantially agrees with R478, R493, R646, R752, R881, R1815, R1911 and U11, the oldest being R478 from 1958. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24588	No determination was made at this time. See note on this sheet.
24589-1	The time and origin of who set the monument is unknown. No evidence, other than the original GLO notes, were found calling for the original monument. The physical monument is called for in R1838, R1905, R1926 and R1968, the oldest being R1838 from 1999. This position substantially agrees with R228, R259, R305, R498, R630, R1546, R1838, R1905, R1926, R1968, U55 and U59, the oldest being R228 from 1954. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24590-3	Per R42, U56 and U58 (multiple corner tie records), dated between 1910 and 1948, a stone was found at the corner (U58, dated 1910, notes as a GC rock). See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1900 and R1926, the oldest being R1900 from 2001. This position substantially agrees with R42, R661, R1183, R1459, R1546, R1900, R1926 and U59, the oldest being R42 from 1927. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, per R42, R1546 and R1926, the monument (24590-1) found 49.7' +/- to the north appears to be the Osborn Road construction centerline - 56th Street centerline intersection. The monument (24590-2) found 31.2' +/- to the north and the monument (24590-4) found 0.7' +/- to the southeast are of unknown origin and are not noted on any of the above mentioned documents.
24591-1	Per R142, R233, R370, R396, R522, R771, U11, U58 (multiple corner tie records) and U59, dated between 1910 and 1996, a stone was found at the corner. Per U58, dated 1920, a stone marked 1/4 on the west side was found 2" above ground at the corner. It was reset 14" below ground. Per U58, dated 1921, a granite stone was set over one in position. Said granite stone was marked with an x on top set flush with ground. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R142, R233, R370, R396, R522, R771, U11, U58 and U59 and its position substantially agrees with same, the oldest being U58 from 1920. The monument is accepted as called for in the above referenced documents. No evidence was found showing the contrary.
24592-1	Per U58 (multiple corner tie records), a rock was found at the corner. Said corner tie records note that, in 1910, the rock was reset due to road work, that, in 1920, the rock was reset 1' below road grade and that, in 1949, a "rock 1' down (pipe in paving)" was found. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1898 and U11, the oldest being U11 from 1996. This position substantially agrees with R36, R88, R982, R1397, R1898 and U11, the oldest being R36 from 1920. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, the monument (24592-2) found 5.6' +/- to the west is of unknown origin and is not noted on any of the above mentioned documents.
24593-1	Per U58, dated 1912, a "rock 1/4 on E 1.5 above surface" was found at the corner. Said corner tie record also notes "could not trace any of these ties" in 1922. See the general time line for further information. Per U58 (a second corner tie record), dated 1949, notes that Fisher "set 3/4" iron bar 0.5' down on line & middistance between section corners". The monument 24593-1 appears to substantially agree with the position of this second corner tie record. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R20 and U11, the oldest being R20 from 1991. This position substantially agrees with R20, R448, R561, R1081, R1314, U11 and U58, the oldest being U58 from 1949. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24594-1	Per U9, dated 1910, Robert A. Farmer, Topographer and U.S. Surveyor, during a resurvey of the west township line of Township 2 North, Range 5 East, found and accepted a granite stone mkd. A C Co on W. face and W L R E S on E. face at the corner. He also set west of and alongside the stone an iron post with brass cap as a witness corner. No distance was given from the stone to the brass cap witness corner. Per U58, dated 1949, a USGLO brass cap at surface (stamped W.C.) was found at the corner. None of the ties to this brass cap were found at the time of this survey and no other documents, other than the original GLO notes, were found calling for the original monument. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1972 and U62, the oldest being U62 from 1997. This position substantially agrees with R831, R924, R1972, U62 and U63, the oldest being R831 from 1971. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24595-1	Per U58 and U44, dated 1912 and 1923 respectively, a rock or stone was found at the corner. See the general time line for further information. U44 notes replacing the stone with an iron pipe in pavement. It is noted that U56 and R48, dated 1943 and 1952 respectively, located an iron pipe in pavement at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1516, R1682, R1818, R1890 and R1967, the oldest being R1516 from 1986. This position substantially agrees with R660, R1092, R1212, R1214, R1499, R1516, R1535, R1682, R1818, R1890, R1967, U16, U44, U48, U56 and U59, the oldest being U16 from 1918. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24596-1	Per R6 and U57, dated 1890 and date unknown respectively, a stone was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1862, R1905 and R1926, the oldest being R1862 from 2000. This position substantially agrees with R6, R50, R126, R739, R812, R827, R1077, R1235, R1862, R1905, R1926, U42, U48 and U59, the oldest being R6 from 1890. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.

UNDETERMINED CORNER(S)/AREA(S)

Due to significant ambiguity surrounding the following area(s) the quarter and/or section corner(s) will not be determined. The monument(s) displayed on the Results of Survey was (were) found as of the date of the survey and is (are) shown for informational purposes only. To help aid future analysis the following information has been provided. Once again, this (these) particular corner(s)/area(s) on this survey is (are) NOT being determined and is (are) being left unresolved.

24588 Per U9, dated 1910, Robert A. Farmer, Topographer and U.S. Surveyor, during a resurvey of the west township line of Township 2 North, Range 5 East, found and accepted a granite stone mkd. A C Co on W. face, W L R E S on E. face, 2 notches on the S. and 4 notches on the N. at the corner. He also set west of and alongside the stone an iron post with brass cap as a witness corner. No distance was given from the stone to the brass cap witness corner. Per U56, dated 1940, a rock was found at the corner. None of the ties to this rock were found at the time of this survey and no other documents, other than the original GLO notes, were found calling for the original monument.

Based on documents noted below dating back to 1963, there appear to be two different positions being used for this corner. At the time of this survey, only one monument (24588-1) was found in the vicinity of the corner position. The other corner position is 0.9' +/- north of said monument. Each position has been accepted by various surveyors as the corner.

Per R700, R748 and R797, dated between 1966 and 1970, a pipe was found at the corner (said pipe being in the position that is 0.9' +/- north of monument 24588-1).

Per R802, dated 1970, a brass cap in handhole was found at the corner. It is noted that said brass cap in handhole was set in error and the position noted above has been held as the corner. R805, R831 and R924, dated between 1970 and 1973, (all by Coe & Van Loo Engineers, Inc) note locating a 1/2" bar at the corner and said brass cap in handhole being 0.90' south. Larry Sullivan, RLS of Coe and Van Loo was contacted in June 2004, but Larry was unable to locate any additional information regarding this corner from their files. This brass cap in handhole is in the position of monument 24588-1.

Based on documents noted below dating back to 1963, it appears that the position 0.90' +/- north of monument 24588-1 has been accepted as the southeast corner of Section 24 and the northeast corner of Section 25, Township 2 North, Range 4 North and that monument 24588-1 has been accepted as the southwest corner of Section 19 and the northwest corner of Section 30, Township 2 North, Range 5 East.

The position 0.90' +/- north of monument 24588-1 substantially agrees with R646, R700, R748, R750, R797, R802, R805, R831, R881 and R924, the oldest being R646 from 1963.

The monument 24588-1 substantially agrees with U61, U62 and U63, the oldest being U61 from 1986.

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OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-0298825

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN
TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

Registered Land Surveyor seal: 21782 SCOTT A. NELSON, ARIZONA U.S.A.

	BY	DATE
DRAWN	A. GRASS	2-24-05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

CORNER DETERMINATION

CORNER DETERMINATION TABLE

** MONUMENTS CALLED FOR IN THIS TABLE HAVE BEEN ACCEPTED FOR THE CORNER **
** SPECIFIED IN THE LOCATION COLUMN IN THE COORDINATE TABLE, ALL MONUMENTS **
** NOT APPEARING IN THIS TABLE HAVE NOT BEEN ACCEPTED AS A CORNER **

POINT	CORNER DETERMINATION ANALYSIS / PROCEDURE
24597-1	Per R6, U44 and U58 (multiple corner tie records), dated between 1890 and 1919, a stone or rock was found at the corner (U58 notes as as A.C.C. rock in 1910). See the general time line for further information. U44, dated 1923, notes replacing the stone with an iron pipe in pavement. It is noted that R44, R73, R156, R218 and R476, dated between 1927 and 1958, located a pipe or iron pipe in concrete at the corner. However, R739, R812, R827, R973, R1200 and R1235, dated between 1967 and 1979, note locating a stone in handhole at the corner. The origin of this "stone in handhole" is unknown, but its position substantially agrees with said previous monuments. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1492, R1862, R1905, R1926, R1949 and U42, the oldest being R1492 from 1985. This position substantially agrees with R6, R44, R73, R156, R218, R476, R739, R812, R827, R973, R1077, R1117, R1200, R1235, R1492, R1511, R1862, R1905, R1926, R1949, U42 and U59, the oldest being R6 from 1890. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24598-1	Per U58 (multiple corner tie records), dated between 1910 and 1918, a GC Rock or 1" x 2" redwood stake was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1900, R1949 and U11, the oldest being U11 from 1996. This position substantially agrees with R42, R44, R58, R68, R168, R218, R973, R1038, R1183, R1200, R1261, R1406, R1459, R1511, R1900, R1949, U11, U56 and U59, the oldest being R42 from 1927. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24599-1	The time and origin of who set the monument is unknown. No evidence, other than the original GLO notes, were found calling for the original monument. The physical monument is called for in R1688, R1900 and U11, the oldest being R1688 from 1994. This position substantially agrees with R42, R60, R68, R71, R769, R814, R837, R1261, R1357, R1688, R1900, U11 and U59, the oldest being R42 from 1927. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24600-1	Per U58 and U44, dated 1920 and 1923 respectively, a stone was found at the corner. See the general time line for further information. U44 notes replacing the stone with an iron pipe in pavement. It is noted that R519, R659, U44 and U56, dated between 1943 and 1963, located a 3/4" or 1" iron pipe in concrete at the corner. The time and origin of who set the monument found at the time of this survey is unknown. No documents were found calling for the physical monument. This position substantially agrees with R68, R519, R659, R892, R1357, R1411, R1688, R1831, U11, U44, U49, U58 and U59, the oldest being U58 from 1920. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24601-1	Per U44, U56 and U58, dated between 1914 and 1923, a stone was found at the corner (U58 notes as a stone marked with "1/4" on the north face and "A.C.Co." on the south face). See the general time line for further information. U44, dated 1923, notes replacing the stone with an iron pipe in pavement. It is noted that R101, R222, R290, R450 and R639, dated between 1947 and 1962, located an iron pipe in pavement or iron bar at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in U11 and its position substantially agrees with same and with R101, R222, R282, R290, R1218, R1397 and R1411, the oldest being R101 from 1947. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24602-1	Per U58, dated 1912, a stake was found at the corner and replaced with a stone with "x" on top. Per U44, dated 1923, a stone was found at the corner and replaced with an iron pipe in pavement. See the general time line for further information. It is noted that U56 and R222, dated 1953 and 1954 respectively, located a lead plug in concrete pavement or an iron pipe in pavement at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1918 and R1920, both from 2002. This position substantially agrees with R12, R36, R101, R131, R222, R1397, R1584, R1620, R1918, R1920, U12, U41, U51 and U56, the oldest being R36 from 1920. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24603-1	Per U58, dated 1912, an A.C.Co. rock was found lying to one side of road. Said corner tie record also notes that an 'old lime stone mkd ACC set on st line between corners & on right line 2625.4 ft' at the corner. See the general time line for further information. The monument 24603-1 appears to substantially agrees with the position per U58. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1685, R1821 and R1920, the oldest being R1685 from 1994. This position substantially agrees with R36, R138, R322, R473, R796, R1081, R1149, R1278, R1416, R1685, R1821, R1920, U11, U12, U22, U39, U43, U51 and U58, the oldest being U58 from 1912. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24604-2M	Per U58, dated 1912, an A.C.Co. rock was found at the corner. See the general time line for further information. The physical monument is called for in R1994 and its position substantially agrees with same and with R558, R671, R800, R868, R1081, R1314, R1398, R1425, R1581, R1721, U24, U39, U43, U51, U56, U58 and U66, the oldest being U58 from 1949. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, per R1581, U43 and U66, the monument (24604-1) found 5' +/- to the west appears to be the Hayden Road construction centerline - Thomas Road centerline intersection. Said monument is also noted on R1994. It is noted that R1692 and U11 appear to have held the monument (24604-1) as the corner.
24605-1	Per U58, dated 1912, an A.C.Co. rock was found at the corner. Per U56, dated 1943, an old ACCO stone was found badly decomposed at the corner and replaced with a good stone. A monument cover was also set. Per R484, R868, R942 and R1398, dated between 1958 and 1983, a stone in handhole was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1692, R1972 and R1994, the oldest being R1692 from 1994. This position substantially agrees with R484, R538, R585, R621, R868, R942, R1398, R1465, R1692, R1972 and R1994, the oldest being R484 from 1958. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24606-1	Per U9, dated 1910, Robert A. Farmer, Topographer and U.S. Surveyor, during a resurvey of the west township line of Township 2 North, Range 5 East, set an iron post with brass cap at the corner. Per U58 and U51, dated 1922 and 1961 respectively, a GLO brass cap was found at the corner (U51 notes the GLO brass cap was battered and a new survey monument was installed). The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1972, U11 and U62, the oldest being U11 from 1996. This position substantially agrees with R567, R824, R1465, R1633, R1972, U11, U51, U62 and U63, the oldest being R567 from 1960. The monument is accepted as the best available evidence of the perpetuated position of the original corner and of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24607-1	No evidence, other than the original GLO notes, were found calling for the original monument. The monument was set by Allen C. Aerni, RLS and Samuel S. Hersey, Jr. RLS of Brooks, Hersey and Associates, Inc. per R1811 in 1998. The physical monument is called for in U18 and its position substantially agrees with same and with R6, R239, R785, U16 and U59, the oldest being R6 from 1890. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, the monument (24607-2) found 55.5' +/- to the east is of unknown origin and is not noted on any of the above mentioned documents.
24608-1	Per U58, date unknown, a GC Rock was found at the corner. See the general time line for further information. Per U56, dated 1944, a 3/4" steel reinf. rod was set at the corner by Bartlett. The corner was restored by lines intersecting through found monuments to the north and west. The monument 24608-1 appears to substantially agree with the position per U56. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1949 and U11, the oldest being U11 from 1996. This position substantially agrees with R156, R296, R1038, R1575, R1949, U11, U56 and U59, the oldest being U56 from 1944. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24609-2	Per U58, date unknown, a granite rock marked GC on the east side was found at the corner. See the general time line for further information. The time and origin of the monument found at the time of this survey is unknown. The physical monument is called for in R1831 and its position substantially agrees with same and with R519, R542, R588, R928, R1529 and U11, the oldest being R519 from 1959. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary. As a general note, the monument (24609-1) found 40.3' +/- to the west is of unknown origin and is not noted on any of the above mentioned documents.
24610-1	Per U58, dated 1910, a "red sandstone rock at 2659.0 with a mesq. post on w. side of it" was found at the corner. See the general time line for further information. The time and origin of the monument found at the time of this survey is unknown. The physical monument is called for in R12, R1584, R1620, R1991, U11 and U12, the oldest being U12 from 1989. This position substantially agrees with R12, R101, R222, R273, R404, R1277, R1584, R1620, R1591, U11 and U12, the oldest being R101 from 1947. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24611-1	Per U58, dated 1910, a "blue broken rock flush with road grade" was set at the corner. The corner was set "at fence line E. N side ditch dist 2654 from N. 2645 from S. 2645.4 checks plat distance as corrected by .3/chain & shows error in N 1/2 mi". Per U58 (a second corner tie record), dated 1940, a "Blue Malipai Rock with drill hole at surface of old road bed" was found at the corner. See the general time line for further information. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1721 and U11, the oldest being R1721 from 1996. This position substantially agrees with R524, R596, R890, R1425, R1721 and U11, the oldest being R524 from 1959. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24612-1M	Per U9, dated 1910, Robert A. Farmer, Topographer and U.S. Surveyor, during a resurvey of the west township line of Township 2 North, Range 5 East, found and accepted a granite stone mkd. A C Co on W. face and W L R E 5 on E. face at the corner. He also set west of and alongside the stone an iron post with brass cap as a witness corner. No distance was given from the stone to the brass cap witness corner. Per U58 (multiple corner tie records), dated between 1912 and 1966, a stone and/or GLO brass cap was found at the corner. None of the ties to this stone and/or GLO brass cap were found at the time of this survey and no other documents, other than the original GLO notes, were found calling for the original monument. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1633, U61, U62 and U63, the oldest being U61 from 1986. This position substantially agrees with R567, R579, R824, R849, R1007, R1450, R1633, U61, U62 and U63, the oldest being R567 from 1960. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. Said documents are the best available evidence of the perpetuated position of the original corner. No evidence was found showing the contrary.
24613-1	Per U60, dated 1910, Robert A. Farmer, Topographer and U.S. Surveyor, during a survey of the subdivision of Sections 1 and 12, Township 1 North, Range 4 East, found and accepted a "stone loosely set in the ground, mkd. 1/4 on N. face" at the corner. He also set south of and alongside the stone an iron post with brass cap as a witness corner. No distance was given from the stone to the brass cap witness corner. Per R147, R850 and U58, dated between 1912 and 1971, a GLO brass cap or monument was found at the corner. The time and origin of who set the monument found at the time of this survey is unknown. The physical monument is called for in R1957 and U11, the oldest being U11 from 1996. This position substantially agrees with R147, R574, R850, R1477, R1957, U11, U25 and U60, the oldest being U60 from 1910. The monument is accepted as the best available evidence of the perpetuated position of the original corner and of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24614-1	The time and origin of who set the monument is unknown. No evidence, other than the original GLO notes, were found calling for the original monument. The physical monument is called for in U11 and U62, the oldest being U11 from 1997. This position substantially agrees with R579, R824, R849, R1007, R1044, R1391, R1450, R1957, U11, U25, U61, U67 and U63, the oldest being R579 from 1960. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.
24616-1M	The time and origin of who set the monument is unknown. The physical monument is called for in R274, U34 and U59, the oldest being R274 from 1955. This position substantially agrees with R51, R274, R328, U8, U34 and U59, the oldest being U8 from 1902. The monument is accepted as the best available evidence of the perpetuated position of previously set monuments as called for in the above referenced documents. No evidence was found showing the contrary.

UNOFFICIAL DOCUMENT

BOOK 734 PAGE 10
OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-0298825
03/11/2005 08:51 AM

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN
TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

REGISTERED LAND SURVEYOR 21782 SCOTT A. NELSON ARIZONA U.S.A.

	BY	DATE
DRAWN	A. GRASS	2-24-05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

CORNER DETERMINATION

RECORDED SURVEY TABLE

RECORD •	RECORDING • (BOOK/PAGE)	TITLE
R1	MCR 1/2	SURVEY OF LOTS 155 THRU 167 AND TRACTS A, B, C, D & E, INGLESIDE CLUB TRACT
R2	MCR 1/4	RESULTS OF SURVEY FOR MRS HELEN CLARK DONAHOE
R3	MCR 1/6	MAP SHOWING RESULTS OF SURVEY
R4	MCR 1/20	RECORD OF SURVEY
R5	MCR 1/34	RESULT OF SURVEY
R6	MCR 1/35	PLAT OF ORANGEDALE TRACT
R7	MCR 1/39	RESULT OF SURVEY
R8	MCR 1/45	RESULT OF SURVEY
R9	MCR 1/67	HARBERTS SUBDIVISION
R10	MCR 1/95	RESULT OF SURVEY
R11	MCR 2/7	RESULTS OF SURVEY
R12	MCR 2/18	TOTAL TRACT ALTA SURVEY
R13	MCR 2/19	HAR ZION SYNAGOGUE
R14	MCR 2/20	HAR ZION SYNAGOGUE
R15	MCR 2/28	RECORD OF SURVEY
R16	MCR 2/52	TRANSFER OF PROPERTY • MERRILL CANTATIERRA LOT # 1 TO LOT # 2
R17	MCR 2/64	ORANGE/LEMON GROVE
R18	MCR 2/77	TRANSFER OF PROPERTY • MERRIL CANTATIERRA LOT # 1 TO LOT # 2
R19	MCR 2/90	RED WING ESTATES
R20	MCR 3/11	ALTS SURVEY
R21	MCR 3/17	SURVEY
R22	MCR 3/19	ALTA / SCSM LAND TITLE SURVEY
R23	MCR 3/21	ALTA / ACSM LAND TITLE SURVEY
R24	MCR 3/47	PARR & GAERTNER ORANGE
R25	MCR 3/51	INGLESIDE
R26	MCR 6/26	SCOTTSDALE, CITY OF
R27	MCR 6/27	SCOTTSDALE, CITY OF
R28	MCR 7/40	CITRUS HOMES
R29	MCR 8/4	SECURITY ACRES
R30	MCR 8/6	INGLESIDE WEST
R31	MCR 8/8	CAMELBACK CEMETERY
R32	MCR 8/23	PARADISE VERDE
R33	MCR 8/30	SEQUOIA PARK ADDITION
R34	MCR 8/44	SURVEY
R35	MCR 8/51	ARCADIA
R36	MCR 8/59	SECURITY ACRES
R37	MCR 15/21	WEST INGLESIDE AMENDED
R38	MCR 15/22	ARCADIA ESTATES (MAP)
R39	MCR 15/35	NORTH INGLESIDE
R40	MCR 15/42	CHUMBLEY PLACE
R41	MCR 15/49	ARCADIA REPLAT
R42	MCR 16/29	INGLESIDE CLUB TRACT
R43	MCR 16/34	OLIVETTE ACRES
R44	MCR 16/41	ORANGEDALE PLACE
R45	MCR 16/49	ARCADIA ACRES
R46	MCR 17/17	INGLESIDE
R47	MCR 17/43	BUKLEN TRACT
R48	MCR 17/44	ARIZONA FALLS TRACT
R49	MCR 17/50	MOUNDVIEW
R50	MCR 18/6	RICHARDSON
R51	MCR 18/36	O'BRIEN'S CAMELBACK LANDS
R52	MCR 18/46	EAST CITRUS ACRES
R53	MCR 19/3	MARTIN TRACT
R54	MCR 19/13	GLENCOE HIGHLANDS
R55	MCR 20/3	ARIZONA ORCHARD
R56	MCR 20/13	CHICAGO TRACT
R57	MCR 20/17	GILLAND GALEY RANCH
R58	MCR 20/27	INGLESIDE ESTENSION
R59	MCR 20/29	ARCADIA TRACT
R60	MCR 21/15	INGLESIDE INN UNIT 1
R61	MCR 21/17	ARCADIA VISTA UNIT 1
R62	MCR 21/25	ALTA HACIENDA
R63	MCR 21/33	ARCADIA VISTA
R64	MCR 21/36	ARCADIA VISTA UNIT 3
R65	MCR 21/38	ARCADIA VISTA
R66	MCR 22/1	INGLESIDE INN
R67	MCR 22/3	TATLORS ADDITION
R68	MCR 22/9	INGLESIDE INN UNIT 3
R69	MCR 22/10	INGLESIDE INN UNIT 4
R70	MCR 22/18	INGLESIDE INN UNIT 4 AMENDED
R71	MCR 22/22	INGLESIDE INN UNIT 5
R72	MCR 22/31	CAMELBACK WATER CONSERVATION DISTRICT
R73	MCR 22/32	ORANGE HOMESITES
R74	MCR 22/35	GLENCOE HEIGHTS PLAT 1
R75	MCR 22/42	HACIENDA ALLENADA
R76	MCR 23/12	VALHALLA
R77	MCR 23/13	GLENCOE HEIGHTS PLAT 2
R78	MCR 23/16	MOUND VIEW BLOCK 2 REPLAT
R79	MCR 23/21	GLENCOE HIGHLANDS AMENDED
R80	MCR 23/44	ALTA HACIENDA
R81	MCR 25/23	BLAND PLACE UNIT 1
R82	MCR 25/30	WRIGHTS DESERT
R83	MCR 27/46	VALHALLA AMENDED
R84	MCR 30/3	ORANGEDALE ESTATES
R85	MCR 30/16	MOUNTAIN VIEW BUNGALOWS
R86	MCR 30/19	VALHALLA REPLAT
R87	MCR 30/43	VENTURA MANOR
R88	MCR 31/14	ORANGE ACRES
R89	MCR 31/26	CAMELBACK LANDS
R90	MCR 32/50	MATLOCK PLACE
R91	MCR 33/46	REDDELL SUBDIVISION
R92	MCR 34/10	RANCHO VENTURA
R93	MCR 34/15	CLAPP TRACT
R94	MCR 34/19	DUHAME HEIGHTS UNIT 1
R95	MCR 34/20	REDDELL SUBDIVISION AMENDED
R96	MCR 35/10	GROVE PARK ESTATES
R97	MCR 35/34	RANCHO VENTURO TRACT 2
R98	MCR 36/48	ARCADIA MANORS
R99	MCR 37/21	REDDELL SUBDIVISION PLAT 2
R100	MCR 37/25	RANCHO MARIZONA
R101	MCR 37/35	AUSTIN TRACT
R102	MCR 37/38	JOKAKE CAMELBACK PROPERTIES TRACT A
R103	MCR 37/39	JOKAKE CAMELBACK PROPERTIES TRACT B
R104	MCR 38/1	AVERY
R105	MCR 38/7	RANCHO VENTURA TRACT 3
R106	MCR 39/10	CAMELBACK ACRES
R107	MCR 40/14	RANCHO VENTURA UNIT 4
R108	MCR 40/29	GROVE PARK ESTATES
R109	MCR 41/13	RANCHO VENTURA UNIT 5
R110	MCR 41/50	HACIENDA ESTATES
R111	MCR 42/21	COOL HEIGHTS
R112	MCR 42/31	SHOEMAN TRACT
R113	MCR 42/33	SUNBEAM UNIT 2
R114	MCR 43/3	RANCHITOS HERMOSOS
R115	MCR 43/26	BRITTAN ESTATES
R116	MCR 43/35	PARADISE SHOPPING CENTER
R117	MCR 43/36	PARADISE PLANTATION
R118	MCR 43/37	PARADISE PLANTATION UNIT 1
R119	MCR 43/40	CAMELBACK VIEW ESTATES
R120	MCR 43/44	CAMELBACK MANOR
R121	MCR 43/48	LOS VECINOS
R122	MCR 44/9	NAUNI VALLEY RANCH
R123	MCR 44/18	LOMBARDI ESTATES
R124	MCR 44/23	CIRCLE "X" ACRES
R125	MCR 44/31	PALO ALTO PARK
R126	MCR 44/41	SKY VIEW
R127	MCR 44/45	JESSIE BENTON EVANS TRACT
R128	MCR 45/2	MIDDLETON HOMES
R129	MCR 45/5	MACDONALD ACRES
R130	MCR 45/6	INGLESIDE CLUB LOT 71 REPLAT
R131	MCR 46/17	JUANITA "Y" OLMO FRONTIER
R132	MCR 46/20	ORANGE DELL
R133	MCR 46/21	NEARY PLACE
R134	MCR 46/24	SCOTTSDALE MANOR
R135	MCR 46/26	PARADISE TRIANGLE
R136	MCR 46/38	SIMPATICA SUBDIVISION
R137	MCR 46/40	RANCHO VENTURA UNIT 6
R138	MCR 47/1	LA ROSA PLACE
R138	MCR 47/8	SECURITY MANOR
R140	MCR 47/16	PARAMOUNT VISTA
R141	MCR 47/22	SIMPATICA ACRES
R142	MCR 47/31	GIBRALTAR MANOR
R143	MCR 47/35	DATELAND
R144	MCR 48/4	RANCHO VENTURA #7
R145	MCR 48/5	OLENE PLACE
R146	MCR 48/14	ARCADIA COUNTRY MART
R147	MCR 48/24	PARK MCDOWELL #1
R148	MCR 48/28	GARY LYN SUBDIVISION
R149	MCR 48/34	BISSELL MANOR
R150	MCR 48/38	LEROY VISTA
R151	MCR 49/5	RANCHO VENTURA TRACT 8
R152	MCR 49/11	ARCADIA GROVES UNIT 1
R153	MCR 49/15	RANCHO MARIZONA REPLAT
R154	MCR 49/17	GIBRALTAR MANOR PLAT 2
R155	MCR 49/27	REDDELL MANOR
R156	MCR 49/36	PINNICK PLACE
R157	MCR 49/40	MUMMY MOUNTAIN ESTATES
R158	MCR 49/41	TILYOU RANCHITOS
R159	MCR 49/44	ROBERT T EVANS
R160	MCR 50/6	SCHERER HEIGHTS #2
R161	MCR 50/13	RANCHO VENTURA TRACT 10
R162	MCR 50/25	CAMELBACK PARK ESTATES
R163	MCR 50/32	ROBERT T EVANS AMENDED
R164	MCR 50/40	ROYAL VIEW
R165	MCR 50/50	RANCHOS PAQUENOS
R166	MCR 51/7	SPHINX CLUB
R167	MCR 51/22	RANCHO VENTURA TRACT 9
R168	MCR 51/27	FAIRWAY PARK
R169	MCR 51/32	FRESNO ESTATES
R170	MCR 51/42	SCOTTSDALE DESERT ESTATES
R171	MCR 51/48	EDGEWOOD ESTATES
R172	MCR 51/49	DATELAND HOMES
R173	MCR 52/4	CAMELBACK ESTATE PLAT 1
R174	MCR 52/15	ARCADIA COUNTRY MART REPLAT
R175	MCR 52/16	RANCHO VENTURA #11
R176	MCR 52/21	SCHERER HEIGHTS PLAT 1
R177	MCR 52/34	LONG MANOR
R178	MCR 52/38	RANCHO VENTURA
R179	MCR 52/43	ARCADIA MANORS ANNEX
R180	MCR 52/46	LINCOLN DRIVE VISTA
R181	MCR 52/50	RANCHO VENTURA TRACT 14
R182	MCR 53/3	SCHERER HEIGHTS PLAT 1
R183	MCR 53/15	RANCHO MIO
R184	MCR 53/19	PARADISE MANOR PLAT A
R185	MCR 53/39	MATTINGLY HOMES
R186	MCR 53/50	RANCHO VENTURA TRACT 13
R187	MCR 54/3	MARION ESTATES
R188	MCR 54/11	JEFFERY LEIGH
R189	MCR 54/13	PARADISE PALMS
R190	MCR 54/44	DARYLL ESTATES
R191	MCR 54/46	RANCHO VENTURA
R192	MCR 55/4	CAMELBACK RANCHOS
R193	MCR 55/11	RIDE-N-ROCK RANCHOS
R194	MCR 55/16	HACIENDA GRANADA UNIT 1
R195	MCR 55/17	HACIENDA GRANADA UNIT 2
R196	MCR 55/22	RANCHO VENTURA TRACT 16
R197	MCR 55/23	RANCHO VENTURA TRACT 17
R198	MCR 55/28	HACIENDA DEL CAMPO
R199	MCR 55/33	MOCKINGBIRD ACRES
R200	MCR 55/38	CAMELDALE PROPERTIES
R201	MCR 55/46	LA MAZA VILLAGE PLAT 1
R202	MCR 55/47	CAVALIER PALMS
R203	MCR 56/25	GRIFFITH SQUARE
R204	MCR 56/33	NEARY PLACE PLAT 2
R205	MCR 56/37	CUDIA CITY ESTATES
R206	MCR 56/41	BAR - C - RANCH
R207	MCR 56/45	PAPAGO VILLAGE
R208	MCR 57/1	MUMMY MOUNTAIN PARK
R209	MCR 57/3	THORNWOOD ACRES
R210	MCR 57/4	RANCHO VISTA
R211	MCR 57/6	ARCADIA VISTA MANOR
R212	MCR 57/10	LA MAZA VILLA PLAT 2
R213	MCR 57/11	PARADISE HILLS
R214	MCR 57/12	MOUNT GROVE
R215	MCR 57/23	RANCHO VENTURA #18
R216	MCR 57/24	SCOTTSDALE VILLAGE
R217	MCR 57/30	IRONWOOD ACRES
R218	MCR 57/32	SHERWOOD TOWNE
R219	MCR 57/50	HILKER ESTATES
R220	MCR 58/1	ARCADIA VILLA
R221	MCR 58/13	ORANGEDALE MANOR
R222	MCR 58/17	CRANBROOKE MANOR
R223	MCR 58/21	RANCHO VENTURA TRACT 19
R224	MCR 58/32	EL CAMELLO
R225	MCR 58/38	MOUNT GROVE UNIT 2
R226	MCR 58/39	SUNCREST GARDENS
R227	MCR 58/47	CRANBROOKE MANOR REPLAT
R228	MCR 59/1	INDIAN VILLA
R229	MCR 59/11	RANCHO SUNNYVALE
R230	MCR 59/13	DEL RAY ESTATES
R231	MCR 59/24	RANCHO VENTURA TRACT 20
R232	MCR 59/25	FRANCIS PARK
R233	MCR 59/27	SOUTHWEST VILLAGE
R234	MCR 59/38	WHITE GATES
R235	MCR 59/42	ARCADIAN TERRACE
R236	MCR 60/1	ARCADIA VILLA PLAT 2
R237	MCR 60/3	RANCHO VENTURA
R238	MCR 60/6	INDIAN VILLA AMENDED
R239	MCR 60/9	LINDON PARK
R240	MCR 60/24	ORANGE GROVE HEIGHTS
R241	MCR 60/26	MARY ANNE MANOR
R242	MCR 60/27	HIGHLANDS, THE
R243	MCR 60/31	DENNIS MANOR
R244	MCR 60/37	RANCHO VENTURA TRACT 22
R245	MCR 60/41	PICKWICK ACRES
R246	MCR 60/43	PAPAGO VISTA ESTATES
R247	MCR 60/48	SOUTHWEST VILLAGE UNIT 2
R248	MCR 60/50	WESTERN PARK PROPERTIES
R249	MCR 61/1	DEL RAY ESTATES #2
R250	MCR 61/4	PARADISE VALLEY ESTATES
R251	MCR 61/7	ARGYLE CIRCLE
R252	MCR 61/11	KACHINA ESTATES
R253	MCR 61/20	HACIENDA GRANADA UNIT 3
R254	MCR 61/33	WESTERN PARK PROPERTIES UNIT 2
R255	MCR 61/37	BECKWOOD ESTATES
R256	MCR 61/41	WINDEMERE
R257	MCR 61/43	GRIFFITH PARK
R258	MCR 61/45	WOODSHIRE
R259	MCR 61/47	ORANGE VALLEY ESTATES
R260	MCR 61/48	DARYL ESTATES
R261	MCR 61/49	IRONWOOD HILLS
R262	MCR 62/4	EXETER SQUARE
R263	MCR 62/6	SOUTHWEST VILLAGE UNIT 6
R264	MCR 62/7	RANCHO VENTURA TRACT 23
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OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
2005—0298825
03/11/2005 09:51 AM

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN
TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
21782
SCOTT A. NELSON
ARIZONA, U.S.A.

	BY	DATE
DRAWN	A. GRASS	2-24-05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01 27-05

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

RECORD TABLE

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R682	MCR 108/7	DEL RAY ESTATES #14
R683	MCR 108/12	SCOTTSDALE DESERT ESTATES
R684	MCR 108/22	COLONIA MIRAMONTE
R685	MCR 108/26	GREEN ACRES MEMORIAL GARDEN OF PRAYER
R686	MCR 108/30	HEATHERBRAE HOUSE UNIT 2
R687	MCR 108/40	GREEN ACRES MEMORIAL JEWISH GARDENS
R688	MCR 108/42	SURVEY
R689	MCR 108/49	VILLA MONTEREY #5A
R690	MCR 109/10	MARINO ESTATES
R691	MCR 109/17	DEL RAY ESTATES #15
R692	MCR 109/18	VILLAGE GROVE #18
R693	MCR 109/30	GREEN ACRES MEMORIAL GARDEN OF PRAYER
R694	MCR 109/32	MCDONALD ESTATES
R695	MCR 109/40	GREEN ACRES MEMORIAL GARDEN OF LOVE
R696	MCR 109/41	GREEN ACRES MEMORIAL GARDEN OF PRAYER
R697	MCR 109/44	CASA GRANADA TOWNHOUSES
R698	MCR 110/3	COLONIA MIRAMONTE UNIT 2
R699	MCR 110/16	VILLA D'ESTE
R700	MCR 110/23	SANDS EAST
R701	MCR 110/26	JOKAKE TERRACE
R702	MCR 110/42	VISTA ACRES
R703	MCR 110/46	ARCADIA GREEN
R704	MCR 110/47	ARCADIA GREEN
R705	MCR 111/6	BRAECREST
R706	MCR 111/15	FRANCISCAN TERRACE
R707	MCR 111/22	GREEN ACRES MEMORIAL GARDEN OF SONG
R708	MCR 111/27	VILLAGE GROVE #19
R709	MCR 111/28	SOLCITE
R710	MCR 111/37	GREEN ACRES MEMORIAL GARDEN OF LILIES
R711	MCR 111/42	INNER CIRCLE
R712	MCR 111/43	PARK SCOTTSDALE #9
R713	MCR 112/2	MOCKINGBIRD MEADOWS
R714	MCR 112/3	PARK SCOTTSDALE #9
R715	MCR 112/3	PARK SCOTTSDALE #9
R716	MCR 112/4	GREEN ACRES MEMORIAL GARDEN OF FLOWERS
R717	MCR 112/8	VILLA MONTEREY #6
R718	MCR 112/25	GOLDEN KEYS #4
R719	MCR 112/36	VILLA MONTEREY #6
R720	MCR 112/37	TRAIL WEST UNIT 4
R721	MCR 112/45	DEL RAY ESTATES #16
R722	MCR 113/2	CASA GRANADA EAST TOWNHOMES
R723	MCR 113/14	VILLA MONTEREY #6
R724	MCR 113/19	COLONIA MIRAMONTE #3
R725	MCR 113/25	CAMELHEAD RANCH
R726	MCR 113/27	EL CUADRO ESTATES
R727	MCR 113/42	BEL AIRE DESERT ESTATES
R728	MCR 113/49	SCOTTSDALE GARDEN MANOR
R729	MCR 114/3	CABALLO RANCHOS #2A
R730	MCR 114/5	WOODSHIRE
R731	MCR 114/6	SALT RIVER VALLEY WATER USERS ASSOC.
R732	MCR 114/7	PARK SCOTTSDALE #11
R733	MCR 114/18	LA BUENA VIDA TOWNHOUSES
R734	MCR 114/25	GOLDEN KEYS #5
R735	MCR 114/48	COLONIA MIRAMONTE UNIT 3
R736	MCR 115/6	PARADISE VALLEY FARMS
R737	MCR 115/12	GOLDEN KEYS #6
R738	MCR 115/45	VILLA MONTEREY #7
R739	MCR 115/47	FORREST ANDERSON ESTATES
R740	MCR 116/7	LA BUENA VIDA 2 TOWNHOUSE
R741	MCR 116/18	VILLAGE GROVE #20
R742	MCR 116/22	VILLA MONTEREY #7 AMENDED
R743	MCR 116/24	MONTE VIVIENDA
R744	MCR 116/28	SCOTTSDALE HOUSE #1
R745	MCR 116/43	INGLESIDE INN TRACT LOT 10
R746	MCR 117/26	VILLA BIANCA D'ORO
R747	MCR 117/27	INGLESIDE INN TRACT #3 BLOCK A
R748	MCR 117/37	SANDS EAST #2
R749	MCR 117/44	EXETER SQUARE AMENDED
R750	MCR 117/45	SANDS EAST TOWNHOUSES
R751	MCR 118/17	CORONADO FOOTHILLS UNIT 1
R752	MCR 118/27	PARK ORLEANS
R753	MCR 118/28	EL CORONADO UNIT 2
R754	MCR 118/29	EL CORONADO UNIT 2
R755	MCR 119/6	DEL RAY ESTATES #17
R756	MCR 119/14	SCOTTSDALE HOUSE PLAT 2
R757	MCR 119/15	SCOTTSDALE HOUSE PLAT 2
R758	MCR 119/16	SCOTTSDALE HOUSE PLAT 2
R759	MCR 119/17	SCOTTSDALE HOUSE PLAT 2
R760	MCR 119/38	LA VISTA
R761	MCR 119/42	SCOTTSDALE HOUSE PLAT 2
R762	MCR 119/43	SCOTTSDALE HOUSE PLAT 2
R763	MCR 119/44	SCOTTSDALE HOUSE PLAT 2
R764	MCR 119/45	SCOTTSDALE HOUSE PLAT 2
R765	MCR 119/47	VILLA MONTEREY #7
R766	MCR 120/26	DEB LIN TERRACE
R767	MCR 120/33	DOUBLETREE RANCHOS
R768	MCR 120/40	COUNTRY CLUB VISTA
R769	MCR 120/41	HERITAGE EAST UNIT 1
R770	MCR 120/45	CHATEAU DE VIE #2
R771	MCR 121/2	INDIAN MEADOWS
R772	MCR 121/7	SCOTTSDALE NORTH
R773	MCR 121/35	CONTINENTAL VILLAS
R774	MCR 121/38	PARADISE DEL ESTE
R775	MCR 121/44	CLEARWATER HILLS
R776	MCR 122/14	EL DORADO HERMOSA
R777	MCR 122/39	CLEARWATER HILLS #19 PARCEL 13-A
R778	MCR 122/46	DEL RAY ESTATES
R779	MCR 123/4	ROLLING HILLS HEIGHTS
R780	MCR 124/12	HERITAGE EAST #2
R781	MCR 124/24	VALLE VISTA #2
R782	MCR 124/28	CHATEAU DE VIE #3
R783	MCR 124/34	VILLA ADRIAN
R784	MCR 124/35	TENNIS RANCH @ CAMELBACK
R785	MCR 125/4	DEB LIN TERRACE UNIT 2
R786	MCR 125/11	PARK SCOTTSDALE #12
R787	MCR 125/26	CHATEAU DE VIE
R788	MCR 126/19	SCOTTSDALE NORTH REPLAT
R789	MCR 126/23	VILLA MONTEREY #8
R790	MCR 126/38	HACIENDA GRANADA LOT 10 UNIT 1
R791	MCR 126/46	GARDEN OF THE GOOD SHEPHERD
R792	MCR 127/2	VILLA MADEROS DEL CUENTA
R793	MCR 127/18	CHATEAU DE VIE #4
R794	MCR 127/24	SCOTTSDALE HOUSE PLAT 2 REPLAT
R795	MCR 127/34	VILLA MONTEREY #8A
R796	MCR 127/48	VILLA CORONADO
R797	MCR 128/14	SANDS EAST TOWNHOUSES #2
R798	MCR 128/24	HERITAGE HILLS UNIT 1
R799	MCR 128/25	HERITAGE HILLS UNIT 1 SITE PLAN
R800	MCR 128/40	TRAIL WEST UNIT 5
R801	MCR 128/46	SCOTTSDALE HOUSE PLAT 3
R802	MCR 129/2	PARK SCOTTSDALE #14
R803	MCR 129/24	ROYAL TERRACE AMD
R804	MCR 130/9	RIEGER ACRES
R805	MCR 130/36	PARK SCOTTSDALE #15
R806	MCR 130/43	VILLA SERENA
R807	MCR 131/12	VILLA CORONADO AMENDED
R808	MCR 131/28	VALLEY VIEW ESTATES
R809	MCR 131/35	MOCKINGBIRD LANE ESTATES
R810	MCR 132/8	ROYAL TERRACE
R811	MCR 132/20	WATER SUPPLY LOCATION
R812	MCR 132/27	EAST EARLL ESTATES
R813	MCR 132/39	CASA AMIGOS
R814	MCR 132/40	VILLA SOLANO
R815	MCR 132/41	VILLA SOLANO #2
R816	MCR 133/17	DEB LIN VILLA
R817	MCR 133/29	THOMAS MALL VILLA
R818	MCR 134/4	JOE'S PLACE
R819	MCR 134/21	VILLA SAN MARCOS
R820	MCR 134/32	SUNSET HILLS UNIT 2
R821	MCR 134/40	VILLA MONTEREY #8B
R822	MCR 135/11	CAMELBACK EAST
R823	MCR 135/17	CHENEY HEIGHTS
R824	MCR 135/19	PIMA MEADOWS #1
R825	MCR 135/20	PIMA MEADOWS #2
R826	MCR 135/41	SARKIS MANOR
R827	MCR 135/43	CAMDEN HOUSE
R828	MCR 136/10	HERITAGE HILLS UNIT 1
R829	MCR 136/38	R/W STREET
R830	MCR 136/39	SU CASA
R831	MCR 136/42	PARK SCOTTSDALE #16
R832	MCR 136/43	VILLA DEL ORO
R833	MCR 137/1	CASA DE CAMELBACK
R834	MCR 137/12	INGLESIDE INN TRACT
R835	MCR 137/29	WEST PHOENIX ESTATES UNIT 11
R836	MCR 137/46	SANDS NORTH TOWNHOUSES
R837	MCR 138/14	HERITAGE EAST UNIT 3
R838	MCR 138/46	MOCKINGBIRD LANE ESTATES #2
R839	MCR 139/1	WENTWORTH EAST
R840	MCR 139/8	VILLA MONTEREY #8B AMENDED
R841	MCR 139/11	SCOTTSDALE PARKWAY TOWNHOUSE CONDOS
R842	MCR 139/27	PARADISE CANYON FOOTHILLS
R843	MCR 139/33	CAMELBACK COUNTRY CLUB ESTATES
R844	MCR 139/34	CAMELBACK COUNTRY CLUB ESTATES #2
R845	MCR 139/46	PARADISE VIEW ESTATES
R846	MCR 139/50	CHATEAU DE VIE #5
R847	MCR 140/1	PARK SCOTTSDALE #17
R848	MCR 140/3	CAMELBACK COUNTRY CLUB ESTATES #2
R849	MCR 140/24	PIMA PLAZA ESTATES
R850	MCR 140/26	SUMMERFIELD UNIT 1
R851	MCR 140/27	SUMMERFIELD UNIT 2
R852	MCR 140/31	HALLCRAFT VILLAS SCOTTSDALE
R853	MCR 140/35	CONTINENTAL VILLAS EAST
R854	MCR 140/49	CAMELHEAD HEIGHTS
R855	MCR 141/6	PARK SCOTTSDALE #18
R856	MCR 141/7	DEB LIN TERRACE
R857	MCR 141/9	TRAIL EAST
R858	MCR 141/22	CONTINENTAL VILLAS EAST
R859	MCR 141/36	CHATEAU DE VIE #6
R860	MCR 142/11	MOCKINGBIRD LANE ESTATES #3
R861	MCR 142/14	R/W ARIZONA CANAL
R862	MCR 142/34	ARROYO VERDE
R863	MCR 144/5	EL CUADRO
R864	MCR 144/21	PIMA MEADOWS #3
R865	MCR 144/22	PIMA MEADOWS #4
R866	MCR 144/32	VILLA DEL MONTE
R867	MCR 144/36	LAGUNA SAN JUAN
R868	MCR 145/3	TELA VISTA #1
R869	MCR 146/2	PALO VERDE VILLAS EXHIBIT A
R870	MCR 146/40	ECHO CANYON DEDICATION
R871	MCR 146/45	PALO VERDE VILLAS EXHIBIT A
R872	MCR 147/3	SURVEY DEDICATION
R873	MCR 147/12	MOCKINGBIRD ESTATES UNIT 4
R874	MCR 147/18	PASEO VILLAGE
R875	MCR 147/24	CHOLLA GARDENS UNIT 1
R876	MCR 147/38	4935 THOMAS ROAD EAST
R877	MCR 147/39	PARADISE VIEW ESTATES
R878	MCR 147/40	VILLA DE CORBILLO
R879	MCR 147/48	BRIARWOOD
R880	MCR 148/5	PLAT OF DEDICATION
R881	MCR 148/13	CASITA REAL
R882	MCR 148/22	SUMMERFIELD
R883	MCR 149/45	RHONDA APARTMENTS
R884	MCR 149/49	HILTON CASITAS
R885	MCR 149/50	HILTON CASITAS
R886	MCR 150/3	R/W DEDICATION
R887	MCR 150/13	R/W STREETS
R888	MCR 150/19	VILLA SERENA AMENDED
R889	MCR 150/33	SANDPIPER SCOTTSDALE #2
R890	MCR 150/35	BOUNDARY SURVEY
R891	MCR 151/1	HERITAGE HILLS UNIT 2
R892	MCR 151/13	CASAS, THE
R893	MCR 151/38	SANDPIPER SCOTTSDALE #2
R894	MCR 151/39	CHATEAU DE VIE #7
R895	MCR 151/40	SUMMERFIELD UNIT 3
R896	MCR 151/41	SUMMERFIELD UNIT 4
R897	MCR 152/7	SUMMERFIELD UNIT 5
R898	MCR 152/23	4255 CAMELBACK ROAD EAST
R899	MCR 152/33	R/W STREETS
R900	MCR 152/34	CAMELLO VISTA #1
R901	MCR 152/38	SUMMERFIELD UNIT 3
R902	MCR 152/39	SUMMERFIELD UNIT 4
R903	MCR 152/40	SUMMERFIELD UNIT 5
R904	MCR 153/7	HUMMINGBIRD VISTA
R905	MCR 153/13	HAY ESTATES
R906	MCR 153/32	BRIARWOOD
R907	MCR 153/48	SCOTTSDALE PARKWAY
R908	MCR 154/12	SCOTTSDALE PARK VILLAS
R909	MCR 154/13	PASEO VILLAGE AMENDED
R910	MCR 154/20	PASEO VILLAS
R911	MCR 154/34	VIA LOS RANCHOS
R912	MCR 154/37	SUMMERFIELD UNIT 6
R913	MCR 154/43	MOCKINGBIRD LANE ESTATES #5
R914	MCR 155/17	SANDS ARCADIS TOWNHOUSES
R915	MCR 156/21	SANDS SCOTTSDALE PATIO HOMES
R916	MCR 156/22	SANDS SCOTTSDALE #1
R917	MCR 156/23	SANDS SCOTTSDALE TOWNHOMES #1
R918	MCR 156/33	INGLESIDE CLUB TRACT 10
R919	MCR 156/34	R/W STREETS
R920	MCR 156/42	CAMELBACK INN
R921	MCR 157/13	CAMELBACK HOUSE
R922	MCR 157/30	CAMELBACK VISTA ESTATES
R923	MCR 157/31	CAMELBACK INN
R924	MCR 157/34	PARK SCOTTSDALE #16
R925	MCR 157/40	INDIAN SQUARE
R926	MCR 157/41	MARTIN MANOR
R927	MCR 157/42	HALLCRAFT VILLAS SCOTTSDALE #2
R928	MCR 157/50	HERITAGE EAST UNIT 4
R929	MCR 158/2	EL NORTE CUARENTA
R930	MCR 158/25	HALLCRAFT VILLAS SCOTTSDALE #3
R931	MCR 158/28	CAMELBACK COUNTRY CLUB ESTATES #3
R932	MCR 158/29	CAMELBACK COUNTRY CLUB ESTATES FOUR
R933	MCR 158/30	BRIARWOOD RE-AMENDED
R934	MCR 158/33	SCOTTSDALE WEST BLOCK 2
R935	MCR 158/34	PARK SCOTTSDALE #20
R936	MCR 158/49	PRAYING MONK VIEW ESTATES
R937	MCR 159/34	R/W PUBLIC UTILITIES
R938	MCR 160/1	CHOLLA GARDENS UNIT 2
R939	MCR 160/34	R/W PUBLIC UTILITIES
R940	MCR 160/42	VILLA DEL ORO UNIT 2
R941	MCR 161/6	FOUR SEASONS CONDOMINIUM
R942	MCR 161/37	SCOTTSDALE ESTATES SURVEY
R943	MCR 162/15	SUNRISE VILLAS
R944	MCR 162/18	VARIANT APARTMENTS
R945	MCR 162/45	SANDS SCOTTSDALE #2
R946	MCR 163/3	BAKER PROPERTY SURVEY
R947	MCR 163/14	EASTSIDE ESTATES
R948	MCR 163/15	SURVEY
R949	MCR 163/16	SURVEY
R950	MCR 163/25	SANDPIPER SCOTTSDALE #3
R951	MCR 163/26	SANDPIPER SCOTTSDALE #4
R952	MCR 163/30	VILLA WEST CONDOMINIUMS
R953	MCR 164/45	PEBBLE RIDGE
R954	MCR 165/4	SCOTTSDALE SHADOWS #4
R955	MCR 165/7	EL MATADOR #1 CONDOS
R956	MCR 167/4	MOCKINGBIRD LANE ESTATES #6
R957	MCR 167/11	VILLA LAFAYETTE FIRST FLOOR
R958	MCR 167/26	SURVEY
R959	MCR 167/47	CASITAS CHAPARRAL
R960	MCR 167/48	JOKAKE ESTATES
R961	MCR 168/19	ROSE CIRCLE GARDENS
R962	MCR 168/24	VALLE VISTA ESTATES
R963	MCR 168/27	PLEASANT RUN
R964	MCR 168/30	PLEASANT RUN
R965	MCR 169/17	CAMELBACK MOUNTAIN, THE VILLAGE AT
R966	MCR 169/18	CAMELBACK MOUNTAIN, THE VILLAGE AT
R967	MCR 169/19	VILLAGE AT CAMELBACK MOUNTAIN, THE
R968	MCR 169/20	PALO VIENTO #1
R969	MCR 169/22	SURVEY RESULTS OF
R970	MCR 169/27	CASA FELIZ CONDO
R971	MCR 169/29	SCOTTSDALE TENNIS CLUB
R972	MCR 169/34	CASITA EL PUENTE
R973	MCR 170/1	ORANGEWOOD APARTMENTS PLAT OF DED
R974	MCR 170/2	SCOTTSDALE MALL
R975	MCR 170/6	GLENCOE HIGHLANDS SURVEY OF PART
R976	MCR 170/20	CASA DEL MONTE
R977	MCR 170/27	REDDELL MANOR
R978	MCR 170/29	CASAS NORTE
R979	MCR 170/32	GRANADA RESORT APARTMENTS
R980	MCR 170/39	CIVIC CENTER PROFESSIONAL AMENDED
R981	MCR 170/42	VILLA HERMITAGE
R982	MCR 170/46	SCOTTSDALE OSBORN PLAZA
R983	MCR 171/17	COLONY AT SCOTTSDALE, THE
R984	MCR 171/37	ROSE CIRCLE GARDENS AMD
R985	MCR 172/17	BRIARWOOD #2
R986	MCR 172/22	SCOTTSDALE LODGE
R987	MCR 172/26	CASABELLA PATIO HOMES
R988	MCR 172/29	CUERNAVACA TOWNHOUSES
R989	MCR 172/47	THREE FOUNTAINS
R990	MCR 173/1	COLONY CAMELBACK CONDOS
R991	MCR 173/13	SANDS SCOTTSDALE #3
R992	MCR 173/35	VISTA RICA #2
R993	MCR 174/3	VILLA MONTEREY #4B AMENDED
R994	MCR 174/4	PLEASANT RUN
R995	MCR 174/6	GLENWOOD PARKWAY
R996	MCR 174/7	EL CHAPARRAL VILLAS
R997	MCR 174/26	EL DORADO ESTATES
R998	MCR 175/26	PASEO VILLAGE UNIT 2
R999	MCR 175/29	CAMELBACK CASTILLE CONDOS
R1000	MCR 175/38	CAMELBACK INN PHASE 1
R1001	MCR 175/39	VILLA MONTEREY #4C
R1002	MCR 175/45	MACDONALD SQUARE CONDO #1
R1003	MCR 175/47	EASEMENT MAP
R1004	MCR 176/23	SHORES, THE
R1005	MCR 176/34	PLAT OF EASEMENT DEDICATION
R1006	MCR 176/35	CAMELBACK CASTILLE CONDOS REPLAT
R1007	MCR 176/36	PIMA PLAZA ESTATES
R1008	MCR 177/2	VISTA MONTANA
R1009	MCR 177/7	TATUM CANYON
R1010	MCR 177/20	PASEO VILLAGE REPLAT
R1011	MCR 177/28	CAMELHEAD ESTATES
R1012	MCR 177/39	LAS BRISAS AMENDED
R1013	MCR 178/12	APACHE ESTATES
R1014	MCR 178/18	TATUM SHADOWS
R1015	MCR 178/24	PASEO VILLAGE #2 REPLAT
R1016	MCR 178/49	HACIENDA ESTATES
R1017	MCR 179/2	SURVEY RESULT OF
R1018	MCR 179/9	HUMMINGBIRD ESTATES
R1019	MCR 179/21	CAMELBACK INN PHASE 1
R1020	MCR 179/22	CAMELBACK MOUNTAIN, THE VILLAGE AT
R1021	MCR 179/34	WEEKS ESTATES
R1022	MCR 179/41	CAMEL SQUARE MAP OF DEDICATION
R1023	MCR 179/45	SCOTTSDALE OSBORN PLAZA
R1024	MCR 180/10	INGLESIDE INN LOT SPLIT
R1025	MCR 180/16	SCOTTSDALE CONFERENCE CENTER @McCORMICK
R1026	MCR 180/22	DESERT ARROYOS
R1027	MCR 180/32	HACIENDAS DE GUILLERMO
R1028	MCR 180/50	CAMELBACK INN PHASE 2
R1029	MCR 181/28	PASEO VILLAS REPLAT
R1030	MCR 181/33	CASABELLA PATIO HOMES AMD
R1031	MCR 181/38	VILLA MONTEREY #9
R1032	MCR 181/42	WILLIS E FISH ESTATES
R1033	MCR 181/50	CAMELBACK INN PHASE 1 AMENDED
R1034	MCR 182/17	RANCHO VISTA TOWNHOMES
R1035	MCR 182/22	EDGEWATER MOD
R1036	MCR 182/28	CAMELBACK COUNTRY CLUB ESTATES #5
R1037	MCR 183/2	CHAP-BARN MANOR
R1038	MCR 183/16	PAPAGO SEVENTY SIX
R1039	MCR 183/19	CAMELBACK INN PHASE 4
R1040	MCR 184/1	PASEO VISTA
R1041	MCR 184/2	INVERGORDON ESTATES LOT SPLIT
R1042	MCR 184/3	VIVIENNE B JENNINGS SUB
R1043	MCR 184/26	PALO VIENTO #2
R1044	MCR 184/37	TRAILS AT SCOTTSDALE, THE
R1045	MCR 184/47	MARICOPA J G RANCH
R1046	MCR 185/1	CAMELHEAD ESTATES UNIT 2
R1047	MCR 185/2	MUMMY MOUNTAIN VISTA
R1048	MCR 185/30	VILLA FRANCESCA
R1049	MCR 185/42	SUNSHINE ACRES
R1050	MCR 186/14	VILLA MONTEREY #4D
R1051	MCR 186/39	R/W PUBLIC UTILITIES
R1052	MCR 186/43	CAMELBACK COUNTRY CLUB ESTATES #6
R1053	MCR 186/45	RANCHO VISTA TOWNHOMES UNIT 2
R1054	MCR 187/6	EASTWOOD
R1055	MCR 187/9	OLIVE VIEW MANOR
R1056	MCR 187/20	BRIARWOOD #3
R1057	MCR 187/25	EARL ESTATES
R1058	MCR 187/32	CASA DEL MONTE PHASE 2 AMD
R1059	MCR 188/3	EASTWOOD AMD
R1060	MCR 188/5	SEVILLE EAST
R1061	MCR 188/7	SANTA FE
R1062	MCR 188/21	SURVEY & TOPO
R1063	MCR 188/41	TATUM CANYON REPLAT LOTS 4,5,16,17,&18
R1064	MCR 188/49	RANCHO VISTA TOWNHOMES
R1065	MCR 189/12	VISTA DE LA TIERRA
R1066	MCR 189/18	SANTA FE AMD
R1067	MCR 189/22	VILLA LA PLAYA
R1068	MCR 189/38	VISTA DEL LAGO
R1069	MCR 189/45	SANDS SCOTTSDALE #4
R1070	MCR 189/46	HERITAGE VILLAGE #1
R1071	MCR 189/47	HERITAGE VILLAGE #2
R1072	MCR 189/49	LOS CUATROS FIRST FLOOR
R1073	MCR 190/3	PARK LANE #1
R1074	MCR 190/5	CARRIAGE SQUARE
R1075	MCR 190/6	SANDS SCOTTSDALE TOWNHOMES #2
R1076	MCR 190/20	TIERRA DEL PARAISO
R1077	MCR 190/47	4915 THOMAS ROAD
R1078	MCR 191/6	LAS CASAS ESCONDIDAS
R1079	MCR 191/7	SANTO TOMAS SCOTTSDALE #1
R1080	MCR 191/8	SANTO TOMAS SCOTTSDALE #2
R1081	MCR 191/37	R/W STREETS DRAINAGE
R1082	MCR 191/48	R/W ARIZONA CANAL
R1083	MCR 192/5	CASA DEL MONTE PHASE 3 AMENDED
R1084	MCR 192/6	SCOTTSDALE IN TOWNE VILLAGE
R1085	MCR 192/8	DEL NORTE GARDENS
R1086	MCR 192/30	RANCHO VISTA TOWNHOMES UNIT 4
R1087	MCR 192/38	SUGGS RANCHO MCCORMICK
R1088	MCR 192/49	CAMELBACK & MILLER SHOPPING CENTER
R1089	MCR 193/11	CUERNAVACA SEGUNDO UNIT 1
R1090	MCR 193/26	TATUM CANYON
R1091	MCR 193/28	CAMELHEAD ESTATES UNIT 3
R1092	MCR 193/32	SHADOW TREE PHOENIX
R1093	MCR 193/35	PARK LANE #2
R1094	MCR 194/11	MEADOWLARK ACRES
R1095	MCR 194/15	MORTON MESA
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MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-0298825

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN
TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

REGISTERED LAND SURVEYOR — 21782 — SCOTT A. NELSON — ARIZONA U.S.A.

	BY	DATE
DRAWN	A. GRASS	2-24-05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

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OFFICIAL RECORDS OF MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-0298825

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN
TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

REGISTERED LAND SURVEYOR
21782
SCOTT A. NELSON
ARIZONA U.S.A.

	BY	DATE
DRAWN	A. GRASS	2-24-05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

RECORD TABLE

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R1811	MCR 477/30	RECORD OF SURVEY
R1812	MCR 477/35	SCOTTSDALE PALMS APARTMENTS CONDOMINIUM
R1813	MCR 477/50	SCOTTSDALE PALMS APARTMENTS CONDOMINIUM
R1814	MCR 478/16	"BERTUCCIO PLACE
R1815	MCR 479/42	CONDOMINIUM PLAT AND MAP OF DEDICATION OF SCOTTSDALE ABRIVADO
R1816	MCR 480/47	MAP OF DEDICATION FOR SCOTTSDALE HIGH PARCEL "B"
R1817	MCR 481/1	A REPLAT OF LOTS 14 & 15, WHISPERING HILLS
R1818	MCR 484/37	SPIRAL OFFICE BUILDING: A RE-PLAT OF A PART OF LOTS 54 & 55 LEROY VISTA
R1819	MCR 485/18	EXEMPT LOT SPLIT MAP
R1820	MCR 486/22	LOT LINE ADJUSTMENT MAP KEITH AND PATRICIA WITHYCOMBE PROPERTY
R1821	MCR 486/44	VILLAS AT BELLAGIO CONDOMINIUM PHASE II
R1822	MCR 487/40	FINAL PLAT FOR CHAPARRAL VILLAS NORTH CONDOMINIUMS COMPRISING A PORTION OF CHAPARRAL VILLAS CONDOMINIUMS
R1823	MCR 487/41	FINAL PLAT FOR CHAPARRAL VILLAS SOUTH CONDOMINIUMS
R1824	MCR 489/9	FINAL PLAT OF "THE CROSSINGS"
R1825	MCR 490/44	COLLUM LOT SPLIT
R1826	MCR 490/45	FINAL PLAT FOR STALLION ESTATES II
R1827	MCR 490/46	PV MANOR A FINAL PLAT
R1828	MCR 492/35	MAP OF DEDICATION FOR SCOTTSDALE HIGH PARCEL "C"
R1829	MCR 493/18	PARIDISE VISTA ESTATES
R1830	MCR 494/44	LOT LINE ADJUSTMENT OF THE REPLAT OF LOT 2 AND 3 VISTA CAMELLO
R1831	MCR 497/39	PAPAGO BUTTES
R1832	MCR 499/34	STANDARD LOT SUBDIVISION
R1833	MCR 500/6	VENTURA TRACT #17
R1834	MCR 500/14	LOT LINE ADJUSTMENT
R1835	MCR 505/9	GEORGE PORTNOFF ESTATES
R1836	MCR 506/15	COLLICE PORTNOFF ESTATES
R1837	MCR 506/32	DUNATOV LOT LINE ADJUSTMENT
R1838	MCR 508/3	48TH ST RETAIL
R1839	MCR 510/36	KENSINGTON ESTATES LOT LINE ADJUSTMENT
R1840	MCR 511/9	LOT LINE ADJUSTMENT/REPLAT DESERT FOOTHILLS MANOR
R1841	MCR 511/16	PYLAND ESTATES FINAL PLAT
R1842	MCR 511/36	COLLICE PORTNOFF ESTATES
R1843	MCR 512/18	PAPAGO BUTTES
R1844	MCR 515/7	GAINEY CENTER
R1845	MCR 516/41	SCOTTSDALE LINKS ESTATES
R1846	MCR 519/43	EL CHORRO ACRES AMENDED
R1847	MCR 519/44	LOT SPLIT
R1848	MCR 521/10	6900 EAST CAMELBACK CONDOMINIUM
R1849	MCR 522/15	SUSAN ACRES I LOT SPLIT
R1850	MCR 522/30	MCCORMICK PLACE
R1851	MCR 522/34	MUMMY MOUNTAIN PARK 5
R1852	MCR 523/24	HAGUE EXEMPT LOT SPLIT
R1853	MCR 524/7	SCOTTSDALE LINKS ESTATES
R1854	MCR 525/29	PARADISE HILLS SUBDIVISION
R1855	MCR 525/30	LOT LINE ADJUSTMENT
R1856	MCR 527/43	MAP OF DEDICATION OF THE REGENCY AT LINCOLN CENTRE
R1857	MCR 530/37	JOSEPHSON LOT SPLIT
R1858	MCR 531/2	GOLDWATER LAND SPLIT
R1859	MCR 531/3	MAP OF RIGHT OF WAY DEDICATION
R1860	MCR 532/48	LOT 1, PARADISE HILLS II
R1861	MCR 534/27	DONAHOE LOT SPLIT
R1862	MCR 534/34	FINAL PLAT FOR ARCADIA COUNTRY ESTATES
R1863	MCR 535/31	JW TEETS LOT SPLIT
R1864	MCR 535/46	VILLARESI
R1865	MCR 538/49	ADOBE VILLAS
R1866	MCR 540/6	A FINAL PLAT OF TATUM GLEN SUBJECT TO SINGLE DESIGN REVIEW
R1867	MCR 540/11	CONDOMINIUM FOR CASA ARCADIA
R1868	MCR 540/37	AZURA EAST CONDOMINIUMS
R1869	MCR 540/46	LOT SPLIT OF THE BLUEBIRD ESTATES
R1870	MCR 541/26	FINAL PLAT JUDSON
R1871	MCR 541/30	RESULTS OF SURVEY
R1872	MCR 542/27	FINAL PLAT FOR "APACHE ESTATES UNIT I"
R1873	MCR 543/39	LOT LINE ADJUSTMENT SURVEY
R1874	MCR 543/40	LOT LINE ADJUSTMENT
R1875	MCR 544/4	ROEHLER ESTATES
R1876	MCR 544/28	JOHN VINCENT KELLY TRUST EXEMPT LOT SPLIT MAP
R1877	MCR 551/22	DESERT FAIRWAYS ESTATES
R1878	MCR 553/6	A.L.T.A. SURVEY
R1879	MCR 553/9	HAMPSON TAYLOR ESTATES
R1880	MCR 553/40	LOT SPLIT MAP
R1881	MCR 553/48	RESULTS OF SURVEY LOT 68 OF MUMMY MOUNTAIN PARK
R1882	MCR 554/14	A REPLAT OF A LOT SPLIT GOLDBERG PROPERTY
R1883	MCR 554/30	MAP OF DEDICATION AND CONDOMINIUM PLAT FOR 5000 PORTALES PLACE
R1884	MCR 558/35	FINAL PLAT OF ARCADIA PROMENADE
R1885	MCR 558/43	FINAL PLAT CAMELBACK MOUNTAIN VIEWS
R1886	MCR 559/18	THE RIVERWALK CONDOMINIUM
R1887	MCR 561/29	FINAL CONDOMINIUM PLAT SIESTA SUITES, A CONDOMINIUM
R1888	MCR 563/8	CAMELBACK FOOTHILLS III, A LOT LINE ADJUSTMENT
R1889	MCR 564/21	6500 CAMELBACK A REPLAT OF LOTS 1-6 OF LOMBARDI ESTATES
R1890	MCR 564/35	FINAL PLAT FOR WELLS FARGO
R1891	MCR 567/50	FINAL PLAT OF THE ENCLAVE IN PARADISE VALLEY, ARIZONA
R1892	MCR 568/13	PLAT FOR: GREEN ACRES - HERITAGE GARDEN PRIVATE ESTATES PHASE 1
R1893	MCR 568/20	FINAL PLAT FOR AMBRE A REPLAT
R1894	MCR 568/23	RECORD OF SURVEY
R1895	MCR 568/41	GEITZ LOT LINE ADJUSTMENT
R1896	MCR 569/25	BOUNDARY/TOPOGRAPHIC SURVEY
R1897	MCR 573/45	PARADISE HILLS ESTATES I, A REPLAT OF LOTS 43 AND 44 OF PARADISE HILLS ESTATES
R1898	MCR 576/16	MAP OF DEDICATION FOR SCOTTSDALE HEALTHCARE OSBORN CAMPUS SOUTH PHASE
R1899	MCR 576/17	MAP OF DEDICATION FOR SCOTTSDALE HEALTHCARE OSBORN CAMPUS NORTH PHASE
R1900	MCR 576/38	FINAL PLAT OF ARIZONA COUNTRY CLUB-PARKING LOT EXPANSION
R1901	MCR 577/6	NAUNI VALLEY RANCH LOT LINE ADJUSTMENT LOTS 8 & 9
R1902	MCR 577/38	A PLAT OF SUNDELL CONDOMINIUMS
R1903	MCR 578/11	FINAL PLAT FOR ARCADIA GROVE SUBDIVISION
R1904	MCR 578/20	6500 CAMELBACK AMENDED
R1905	MCR 578/42	FINAL PLAT OF ARTISAN COMMONS
R1906	MCR 579/12	PLAT OF ARCADIA GROVE CONDOMINIUM
R1907	MCR 579/25	CAMELBACK MANOR I
R1908	MCR 580/27	THIRD AVENUE LOFTS A CONDOMINIUM
R1909	MCR 580/35	LISHERNESS LOT LINE ADJUSTMENT
R1910	MCR 582/30	DOUBLETREE ESTATES I
R1911	MCR 582/31	A CONDOMIUM PLAT OF SCOTTSDALE PARK PLACE, A CONDOMINIUM
R1912	MCR 582/38	A REPLAT OF A LOT SPLIT MUMMY MOUNTAIN PARK 7
R1913	MCR 584/9	UNITARIAN CHURCH LOT LINE ADJUSTMENT
R1914	MCR 585/3	PLAT OF SCOTTSDALE CLUB VILLAS CONDOMINIUM
R1915	MCR 586/42	KIMBERLY SHACHNAI LOT COMBINATION
R1916	MCR 587/11	CORRECTED DONAHOE LOT SPLIT
R1917	MCR 587/13	12 GATES - RANCH I
R1918	MCR 592/24	CONDOMINIUM MAP FOR SCOTTSDALE OLD TOWN PLAZA
R1919	MCR 593/2	RESULTS OF SURVEY
R1920	MCR 595/15	LOT SPLIT
R1921	MCR 595/49	DECLARATION OF EASEMENTS SITE PLAN
R1922	MCR 597/6	FINAL PLAT LOLOMA
R1923	MCR 598/5	PARADISE HILLS II
R1924	MCR 598/6	TATUM CANYON I
R1925	MCR 598/36	PLAT OF SIENNA CONDOMINIUMS
R1926	MCR 600/11	RESULTS OF SURVEY
R1927	MCR 601/32	SANCTUARY I
R1928	MCR 602/47	RECORD OF SURVEY AND PROPERTY DIVISION MAP
R1929	MCR 603/16	PARADISE HILLS III, A REPLAT OF LOT 1 PARADISE HILLS I
R1930	MCR 603/21	TIED PARCEL OF LOTS 15 THROUGH 20 INCLUSIVE OF SCOTTSDALE INDUSTRAIL PARK
R1931	MCR 604/43	BOUNDARY SURVEY
R1932	MCR 607/26	FINAL PLAT FOR MILLER 1700
R1933	MCR 608/46	RESULTS OF SURVEY
R1934	MCR 609/15	A CONDOMINIUM PLAT OF PUEBLOS OF SCOTTSDALE CONDOMINIUM
R1935	MCR 611/5	JENSEN LOT COMBINATION
R1936	MCR 611/34	RESULTS OF SURVEY LOT 7 CAMELHEAD VISTA 2
R1937	MCR 613/16	PARADISE VIEW VILLAS CONDOMINIUMS
R1938	MCR 616/20	RESULTS OF SURVEY
R1939	MCR 616/45	DAVE'S TEXACO BOUNDARY SURVEY
R1940	MCR 616/46	BOUNDARY SURVEY LENNON RESIDENCE
R1941	MCR 616/47	LOT 9, RODLING HILLS BOUNDARY SURVEY
R1942	MCR 617/1	RESULTS OF SURVEY OF LOT 16, CLEARWATER HILLS
R1943	MCR 617/2	RESULTS OF SURVEY
R1944	MCR 617/16	FINAL PLAT OF CAPRI CONDOMINIUM
R1945	MCR 617/19	HEDLEY
R1946	MCR 617/46	RECORD OF SURVEY
R1947	MCR 618/10	PARADISE HIGHLANDS I
R1948	MCR 618/35	LOT SPLIT MAP
R1949	MCR 621/29	RESULTS OF SURVEY
R1950	MCR 622/32	BOUNDARY SURVEY
R1951	MCR 623/38	MacDONALD ACRES I
R1952	MCR 624/37	TIED LOTS 20 & 30
R1953	MCR 625/2	CONDOMINIUM PLAT INDIAN BEND CORPORATE CENTRE
R1954	MCR 625/15	CONDOMINIUM PLAT FOR SCOTTSDALE CONDO VILLAS
R1955	MCR 627/4	VALLEY VIEW ESTATES II
R1956	MCR 627/5	PRIMROSE LOT COMBINATION
R1957	MCR 627/7	LOT TIE
R1958	MCR 631/26	RESULTS OF UTILITY SURVEY
R1959	MCR 632/5	CONDOMINIUM PLAT FOR TRAVIATA CONDOMINIUMS
R1960	MCR 634/21	CORRECTED JW TEETS LOT SPLIT
R1961	MCR 635/25	RESULTS OF SURVEY
R1962	MCR 635/38	MARSHMALLOW MOUNTAIN LANDS REPLAT AMENDED
R1963	MCR 636/26	CAMELBACK COUNTRY CLUB ESTATES AMENDED
R1964	MCR 636/30	FINAL PLAT OF LIFFERTY COMMERCE PARK
R1965	MCR 637/34	RESULTS OF SURVEY
R1966	MCR 637/35	RESULTS OF SURVEY FOR LOT 28 OF LA PLACE DU SOMMET
R1967	MCR 639/16	RESULT OF A.L.T.A. SURVEY
R1968	MCR 639/23	A.L.T.A. / A.C.S.M. LAND TITLE SURVEY
R1969	MCR 640/24	AMENDED A.L.T.A. / A.C.S.M. LAND TITLE SURVEY
R1970	MCR 640/49	ALTA/ACSM LAND TITLE SURVEY
R1971	MCR 642/38	KABOT LOT LINE ADJUSTMENT
R1972	MCR 644/16	RESULTS OF SURVEY
R1973	MCR 644/44	SECOND AMENDED A.L.T.A. / A.C.S.M. LAND TITLE SURVEY
R1974	MCR 645/1	RESULTS OF SURVEY
R1975	MCR 645/24	BRIMLEY ESTATES OF LOT 471 AND TRACT H OF HIDDEN VILLAGE 10-B
R1976	MCR 645/33	RESULTS OF SURVEY LOT 128 DEL RAY ESTATES NO. 8
R1977	MCR 647/4	BOUNDARY SURVEY BOLAND RESIDENCE
R1978	MCR 647/5	BOUNDARY SURVEY RAGLAND RESIDENCE
R1979	MCR 647/6	BOUNDARY SURVEY FRANK RESIDENCE
R1980	MCR 647/8	BOUNDARY SURVEY SORENSEN RESIDENCE
R1981	MCR 647/11	BOUNDARY SURVEY GREULICH RESIDENCE
R1982	MCR 648/42	RESULTS OF SURVEY
R1983	MCR 648/43	RESULTS OF SURVEY OF LOT 10 OF SUNSET HILLS
R1984	MCR 648/44	RESULTS OF SURVEY OF LOT 1 AND 2 OF ARCADIA VISTA
R1985	MCR 649/27	FINAL PLAT FOR THE VINEYARDS AT ARCADIA
R1986	MCR 649/47	BOUNDARY SURVEY LOT FIVE (5), CAMELHEAD ESTATES
R1987	MCR 650/33	LOT TIE TRUEBLOOD ESTATE
R1988	MCR 651/21	BOUNDARY SURVEY BLAVIN RESIDENCE
R1989	MCR 651/22	RESULTS OF SURVEY LOT 1 McDONALD ESTATES
R1990	MCR 651/23	BOUNDARY SURVEY LOT 28 MOCKINGBIRD LANE ESTATES II
R1991	MCR 652/30	L.A. FITNESS CENTER - LOT 1
R1992	MCR 654/14	SABRETOOTH HOUSE
R1993	MCR 654/17	LOLOMA II
R1994	MCR 654/48	RECORD OF SURVEY
R1995	MCR 655/18	BOUNDARY SURVEY LOT 10, CAMELBACK COUNTRY ESTATES, UNIT 1
R1996	MCR 655/36	MUMMY MOUNTAIN PARK-A A LOT LINE ADJUSTMENT
R1997	MCR 656/26	SCOTTSDALE PLACE OFFICE CONDIMINIUM & MAP OF DEDICATION
R1998	MCR 657/36	L.A. FITNESS CENTER - LOT 1
R1999	MCR 980184369	LOT SURVEY
R2000	MCR 381/24	CANYON HORIZON

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OFFICIAL RECORDS OF MARICOPA COUNTY RECORDER HELEN PURCELL
2005-0298825

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

REGISTERED LAND SURVEYOR 21782 SCOTT A. NELSON ARIZONA U.S.A.

	BY	DATE
DRAWN	A. GRASS	2-24-05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

RECORD TABLE

SHEET 14 OF 15

UNRECORDED SURVEY TABLE

RECORD *	TITLE	FIRM NAME	SURVEYOR	DATE	PROJECT *	DIN *
U1	GLO ORIGINAL SURVEY FIELD NOTES AND PLAT VOL. 1480	GENERAL LAND OFFICE	INGALLS	1858		
U2	GLO ORIGINAL SURVEY FIELD NOTES AND PLAT VOL. 1257	GENERAL LAND OFFICE	INGALLS	1858		
U3	GLO ORIGINAL SURVEY FIELD NOTES AND PLAT VOL. I	GENERAL LAND OFFICE	INGALLS	1858		
U4	GLO ORIGINAL SURVEY FIELD NOTES VOL. 2013	GENERAL LAND OFFICE		1858		
U5	GLO ORIGINAL SURVEY FIELD NOTES AND PLAT VOL. I	GENERAL LAND OFFICE		1888		
U6	GLO ORIGINAL SURVEY FIELD NOTES VOL. 1269	GENERAL LAND OFFICE	BARRT	1889		
U7	GLO ORIGINAL SURVEY FIELD NOTES AND PLAT VOL. 1734	GENERAL LAND OFFICE	POWERS	1892		
U8	GLO ORIGINAL SURVEY FIELD NOTES AND PLAT VOL. 1735	GENERAL LAND OFFICE	ROBINSON	1902		
U9	GLO RETRACEMENT AND RESURVEY FIELD NOTES AND PLAT VOL. 2398	GENERAL LAND OFFICE	ROBINSON	1902		
U10	GLO RETRACEMENT AND RESURVEY FIELD NOTES VOL. 2827	GENERAL LAND OFFICE	FARMER	1910		
U11	LAND SURVEY SYSTEM HORIZONTAL & VERTICAL DATUM STATION INDEX MAP	GENERAL LAND OFFICE	BLOUT	1924		
U12	JUANITA "Y" OLMO FRONTIER PLACE	CITY OF SCOTTSDALE				
U13	ALTA SURVEY	BROOKS, HERSEY AND ASSOCIATES, INC.	11750	09/13/1989		27930
U14	ALTA SURVEY	BROOKS, HERSEY AND ASSOCIATES, INC.	11750	09/01/1987		28083
U15	ALTA SURVEY	BROOKS, HERSEY AND ASSOCIATES, INC.	11750	12/11/1987		28026
U16	MAP OF ELY'S SEC 31	BROOKS, HERSEY AND ASSOCIATES, INC.	11750	03/20/1989		28097
U17	PLAT OF SURVEY LOT 14 JORAKE CAMELBACK PROPERTIES	F.N. HOLMQUIST		01/01/1918		28111
U18	RESULTS OF SURVEY	BROWN ENGINEERING COMPANY, INC.	30045			28230
U19	RESULTS OF SURVEY	VAUGHN LAND SURVEYING INC.	14216	10/01/2000	208	28328
U20	A.L.T.A. / A.C.S.M. LAND TITLE SURVEY	VAUGHN LAND SURVEYING INC.	14216	01/26/2001	283	30155
U21	A.L.T.A. / A.C.S.M. LAND TITLE SURVEY	VAUGHN LAND SURVEYING INC.	14216	03/04/1933	3009	30181
U22	JARDIN DEL ESTE	VAUGHN LAND SURVEYING INC.	14216	02/01/2000	98	30204
U23	ALTA SURVEY @ CAMELBACK ROAD & MILLER ROAD	ASSOCIATED ENGINEERS			279-5	30211
U24	SURVEY OF S/C COR-THOMAS RD & HAYDEN RD(apotfsdale az)	ASSOCIATED ENGINEERS	6391	10/25/1979	875-3	30881
U25	RESULTS OF SURVEY McDOWELL & GRANITE REEF ROD(USA PROPERTIES)	SHELL OIL CO.	6391	02/05/1969	169-10	30886
U26	SURVEY, e HAYDEN ROAD & INDIAN SCHOOL ROAD	ASSOCIATED ENGINEERS	6391	03/07/1974	1274-4	31001
U27	RESULTS OF SURVEY HAYDEN RD & INDIAN SCHOOL RD SCOTTSDALE AZ	ASSOCIATED ENGINEERS	6391	02/24/1969	159-11	31011
U28	ALTA/ACSM LAND TITLE SURVEY	ASSOCIATED ENGINEERS	6391	05/01/1975	475-9	31023
U29	RESULTS OF SURVEY	MUNDY SURVEYING INC	19357	11/12/1996	96245	31066
U30	RESULTS OF SURVEY	F.N. HOLMQUIST		03/30/1940	1557	
U31	ALTA/ACSM LAND TITLE SURVEY	COLLAR, WILLIAMS & WHITE ENGINEERING, INC	9576	05/02/1979	790329	
U32	FIELD NOTES FOR ALTA SURVEY	CMX GROUP INC	13182	10/19/1998	5432	
U33	RESULTS OF SURVEY	VAUGHN & STANDAGE ENGINEERING	14126	11/11/1986	960114	
U34	RESULTS OF SURVEY	F.N. HOLMQUIST		04/05/1946	3077	
U35	RESULTS OF SURVEY	HAVILL ENGINEERING CO		11/01/1972	1011-10	
U36	SURVEY	HAVILL ENGINEERING CO		07/01/1965	540-11	
U37	FIELD NOTES FOR SURVEY	SCOLL ENGINEERING CO			8-550	
U38	ALTA SURVEY	VAUGHN LAND SURVEYING INC.	14126	05/02/1985		
U39	FIELD NOTES FOR SURVEY	COLLAR, WILLIAMS & WHITE ENGINEERING, INC.,	18214	06/09/1986	860543	
U40	RIGHT OF WAY MAP	UNKNOWN		11/08/1954		
U41	RESULTS OF SURVEY	YOST AND GARDNER ENGINEERS		05/01/1948	1823	
U42	ALTA SURVEY	HAVILL ENGINEERING CO		03/01/1965	555-11	
U43	RESULTS OF SURVEY	WOOD & ASSOCIATES, INC	16827	11/14/1986	8Dc6	
U44	COUNTY HIGHWAY COMMISSION ENGINEERING DEPARTMENT PROJECT NO. 11	HAVILL ENGINEERING CO	16513	05/29/1934	7H3121	
U45	MARICOPA COUNTY HIGHWAY DEPARTMENT CAMELBACK ROAD-90TH ST. TO INVERGORDON RD	MCHD		02/01/1973		
U46	MARICOPA COUNTY HIGHWAY DEPARTMENT INDIAN SCHOOL ROAD	MCHD		01/08/1945		
U47	STATE OF ARIZONA STATE HIGHWAY DEPARTMENT COUNTY HIGHWAY E. INDIAN SCHOOL ROAD	MCHD		05/28/1952	S-225(9)	
U48	STATE OF ARIZONA STATE HIGHWAY DEPARTMENT COUNTY HIGHWAY E. THOMAS ROAD	MCHD		06/01/1952	S-225(5)	
U49	STATE OF ARIZONA STATE HIGHWAY DEPARTMENT COUNTY HIGHWAY E. THOMAS ROAD & CROSSCUT CANAL	MCHD		11/01/1952	S-351(1)	
U50	STATE OF ARIZONA STATE HIGHWAY DEPARTMENT COUNTY HIGHWAY E. CAMELBACK ROAD	MCHD		11/01/1952	S-351(2)	
U51	MARICOPA COUNTY HIGHWAY DEPARTMENT THOMAS ROAD	MCHD		07/02/1956	S-335(3)	
U52	STATE OF ARIZONA STATE HIGHWAY DEPARTMENT COUNTY HIGHWAY E. CAMELBACK ROAD-ARCADIA TO SCOTTSDALE ROAD	MCHD		01/01/1956	SC-CPE	
U53	MARICOPA COUNTY HIGHWAY DEPARTMENT LINCOLN DRIVE	MCHD		07/17/1960	S-335(6)	
U54	MARICOPA COUNTY HIGHWAY DEPARTMENT LINCOLN DRIVE-TATUM BLVD TO SCOTTSDALE RD	MCHD		03/13/1975	05700	
U55	RESULTS OF SURVEY	F.N. HOLMQUIST		08/28/1978	05101	
U56	MCDOT SECTION AND QUARTER SECTION CORNER TIE RECORDS	MCDOT		01/17/1958	1409	
U57	APS SECTION AND QUARTER SECTION CORNER TIE RECORDS	APS				
U58	SRP SECTION AND QUARTER SECTION CORNER TIE RECORDS	SRP				
U59	CITY OF PHOENIX QUARTER SECTION SURVEY DATA	CITY OF PHOENIX				
U60	GLO SURVEY ORIGINAL FIELD NOTES AND PLAT VOL. 2388	GENERAL LAND OFFICE	FARMER	03/01/1962		
U61	COORDINATES PER SRPMIC SURVEYS (VIA MERRICK & CO. AND DUNGLESS & NIPPLE)	SAL RIVER PIMA MARICOPA INDIAN RESERVATION		1910		
U62	COORDINATES PER SRPMIC SURVEYS	SAL RIVER PIMA MARICOPA INDIAN RESERVATION	RICK KLEBEKO	1986/1991		
U63	STATE OF ARIZONA DOT RIGHT OF WAY PLAN OF THE NORTHEAST OUTER LOOP DOUBLE TREE RANCH RD. - SOUTH SEC. BNDRY	ADOT / THE WLB GROUP		1997		
U64	COUNTY HIGHWAY COMMISSION ENGINEERING DEPARTMENT PROJECT NO. 12	MCHD		1930		101L MA 000 H0829 01R (600-1-T021
U65	FIELD NOTES FOR BOUNDARY & TOPO OF EL CHORRO LODGE INC	LYON ENGINEERING, INC		04/05/1923		
U66	HAYDEN ROAD - DRAINAGE - PH IV IMPROVEMENT PLANS	CITY OF SCOTTSDALE	SCOTT A. NELSON	05/8/1990	2610	
U67	GRADING AND DRAINAGE PLAN	DESERT LAND ENGINEERING, INC.	ALVIS DRESKA	01/21/1988	53908	
U68	RESULTS OF SURVEY (INCLUDING FIELD NOTES)	F.N. HOLMQUIST - ENGINEER	SEDOMICO J. GUTIERREZ	06/08/1933	990511	
U69	RESULTS OF SURVEY (INCLUDING FIELD NOTES)	F.N. HOLMQUIST - ENGINEER	F.N. HOLMQUIST	01/06/1948	4111	
U70	RESULTS OF SURVEY (INCLUDING FIELD NOTES)	F.N. HOLMQUIST - ENGINEER	F.N. HOLMQUIST	04/02/1948	4212	
		F.N. HOLMQUIST - ENGINEER	F.N. HOLMQUIST	06/15/1948	4362	

DOCUMENT

SURVEYOR'S NOTES

10. The northeast corner and the east quarter corner of Section 6, the north and west quarter corners of Section 5 and the west and south quarter corners of Section 20 were not determined by this survey. It appears unlikely that these corners were or will be necessary to determine boundary lines in their immediate areas. Due to this and cost considerations, it was accepted by MCDOT that these corners would not be determined by this survey. A cursory search was made at the time of this survey however no monuments were found in the above mentioned corner areas.
The north quarter corner of Section 6 is located in the Phoenix Mountain Preserve and was not determined by this survey. No search was made for this corner.

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OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
2005-0298825
01/27/2005 08:51 AM

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND OPERATIONS DIVISION

SECTIONS 1 THROUGH 36 IN
TOWNSHIP 2 NORTH, RANGE 4 EAST
MCDOT PROJECT 40069012

	BY	DATE
DRAWN	A. GRASS	2-24-05
CHECKED	SCOTT NELSON, R.L.S.	2-24-05
CHECKED	BRIAN DALAGER, R.L.S.	01-27-05

21782 SCOTT A. NELSON — REGISTERED LAND SURVEYOR — ARIZONA U.S.A.

AMEC INFRASTRUCTURE, INC.
4435 E. HOLMES
MESA, ARIZONA (480) 830-3700

RECORD TABLE

SHEET 15 OF 15

010-2312

12-08-10

N. CRAIG

J. HAEHN

SUNNY 65°

PT	+	HI	-	ELEV.
B.M. 1011	7.90			1243.30
		1251.20		
T.P. 1			0.59	1250.61
	8.82			
		1259.43		
T.P. 2 514	8.60		5.27	1254.16
		1262.76		
T.P. 3 513	7.99		0.10	1262.66
		1270.65		
T.P. 4 512	5.45		5.09	1265.56
		1271.01		
T.P. 5/511			5.54	1265.47

DESC.

FOUND C.O.P. BC.HH @ INTESEC. OF ARCADIA/INDIAN SCHOOL

SET P.K. 500'+/- UP ARCADIA IN N. BOUND TRAFFIC LANE

SET P.K. 500'+/- N. OF T.P. 1 @ W. BACK OF WALK ON ARCADIA @ ALLEY HALF WAY BETWEEN DROMEDARY & REDONDO

SET P.K. 500'+/- N. OF T.P. 2 @ N/E CURB RETURN OF TUBERIA & ARCADIA

SET P.K. 250'+/- W. OF ARCADIA ON S. SIDE OF LAFYETTE IN BIKE LANE

SET P.K. 500'+/- W. OF T.P. 4 ON S. SIDE OF LAFYETTE IN BIKE LANE

Pt	+	Hi	-	Elev.	Desc.
	5.62				
		1271.09			
T.P. 6			6.16	1264.93	Set P.K. 50'+/- E. of 47st on S. side Lafayette In Bike Lane
510	5.81				
		1270.74			
T.P. 7			5.73	1265.01	Set P.K. 40'+/- E. of 46pl on S. side Lafyette In Bike Lane
509	5.31				
		1270.32			
T.P. 8			5.40	1264.92	Set P.K. 110'+/- E. of 46st on S. side Lafyette In Bike Lane
508	4.36				
		1268.28			
				.31 1264.~~55~~	
T.P. 9			4.97		Set P.K. 500'+/- W. of T.P. 8 on S. side Lafayette In. Bike Lane
507	5.99				
		.30 1270.~~54~~			
				.65 R64.~~89~~	
T.P. 10/506			5.65		Set P.K. 500'+/- W. of T.P. 9 on S. side Lafayette In Bike Lane

PT	+	HI	-	ELEV.
	5.46			
		.11 1270.35		
				.04
T.P. 11			6.07	1264.28
505	5.02			
		.06 1269.30		
				.10
T.P. 12			5.66	1263.64
504	6.35			
		1269.75 ~~1270.14~~		
				1263.86
T.P. 13			5.89	~~1264.25~~
503	4.76			
		~~1268.62~~ ~~1269.01~~		
				.15
T.P. 14			5.47	1263.54
	6.75			
		1269.90 ~~1270.29~~		
				.16
T.P. 15/502			3.74	1266.55

DESC.

SRB 500' +/- W. OF TP. 10. 10' +/- OFF OF S. 60A LAFAYETTE

SET P.K. ON N.V. CONC. @ S/E COR. OF LAFAYETTE & FELIZ

SET P.K. IN ENTRANCE DRIVE TO CHASE BANK OFF LAFAYETTE

FND MCDOT 2" ALH LS 81732 @ INTERSEC. OF 44ST / CAMELBACK

SET PK CLN SIDEWALK E. SIDE. 44ST IN FRONT OF WALLYS AMER. PUB & GRILL

Pt	+	HI	−	ELEV.	DESC.
	7.62				
		1273.78 ~~1274.17~~			
				1269.88	
T.P. 16			3.90	~~1270.27~~	SET P.K. @ S/W CURB RTN. @ COLTER / 44 ST.
501	6.85				
		1276.73 ~~1277.12~~			
				.59	
T.P. 17			4.14	1272.98	SET P.K. 500' +/- N. OF T.P. 16 @ CLN. SIDEWALK E. SIDE OF 44 ST
500	3.97				
		.56 1276.95			
				1269.89	
T.P. 16			6.67	~~1270.28~~	SEE ABOVE
	3.88				
		1273.77 ~~1274.16~~			
				.17	
T.P. 15			7.60	1266.56	SEE PG. 9
	3.88				
		.05 ~~1270.44~~			
				.17	
T.P. 14			6.88	1263.56	SEE PG. 9

Pt.	+	HI	−	ELEV.
	5.51			
		1268.68 ~~1269.07~~		
				1263.87
T.P. 13			4.81	~~1264.26~~
	5.88			
		1269.75 ~~1270.14~~		
				.41
T.P. 12			6.34	1263.80
	5.86			
		.17 1269.~~26~~		
				.05
T.P. 11			5.22	1264.~~44~~
	6.21			
		.26 1270.65		
				1264.46
T.P. 10			5.60	~~1265.05~~
	5.69			
		.35 1270.74		
				.31
T.P. 9			6.04	1264.~~70~~

DESC.

SEE PG. 9

SEE PG. 9

SEE PG. 9

SEE PG. 7

SEE PG. 7

Pt	+	HI	−	ELEV.	DESC.
	5.04				
		.35			
		1269.74			
				1264.91	
T.P. 8			4.44	~~1265.30~~	SEE PG. 7
	5.48				
		.39			
		1270.78			
				1264.99	
T.P. 7			5.40	~~1265.38~~	SEE PG. 7
	5.84				
		1270.83			
		~~1271.22~~			
				1264.91	
T.P. 6			5.92	~~1265.30~~	SEE PG. 7
	6.22				
		.13			
		1271.52			
				.45	
T.P. 5			5.68	1265.84	SEE PG. 5
	5.56				
		.01			
		1271.40			
				.54	
T.P. 4			5.47	1265.93	SEE PG. 5

16

Pt	+	HI	-	ELEV.
	5.09			
		1270.63 ~~1271.02~~		
				1262.63
T.P. 3			8.00	~~1263.02~~
	0.07			
		1262.70 ~~1263.09~~		
				.12
T.P. 2			8.58	1254.51
	5.23			
		.35 1259.74		
				.58
T.P. 1			8.77	1250.97
	0.78 JJ			
		.36 1251.75		
B.M 1011			8.09	1243.27 -.03 ✓

17

DESC.

SEE PG. 5

SEE PG. 5

SEE PG. 5

SEE PG. 5

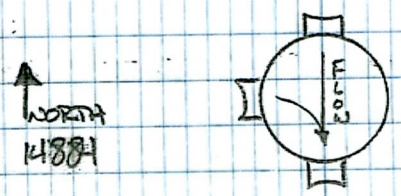
10-2312
LAFAYETTE
2-04-11
N. CRAIG
J. HAHN
FINISH FLOOR ELEVATIONS
SUNNY 30°F.

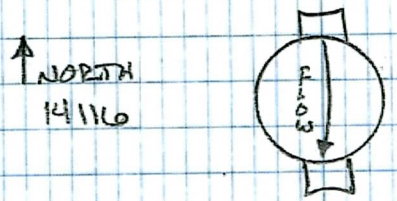
TBM	ELV.	F.F. ELV.		DESC.
BCF @ 45ST.	1264.86	1267.62	TILED	FFE @ 4498 E. LAFAYETTE BLVD.
506	1264.65	1266.94	ON PAD	FFE @ 4502 E. LAFAYETTE BLVD.
507	1264.31	1266.75	ON PAD	FFE @ 4602 E. LAFAYETTE BLVD.
507	1264.31	1266.77	TILED	FFE @ 4522 E. LAFAYETTE BLVD.
TBM @ E. DRIVEWAY BCR	1264.02	1266.85	TILED	FFE @ OUTBUILDING 4522 E. LAFAYETTE
510	1264.93	1268.35	ON PAD	FFE @ 4736 E. LAFAYETTE BLVD.
510	1264.93	1268.38	TILED	FFE @ 4461 N. LAUREL AVE.

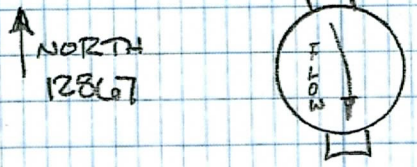
TBM	ELV.	F.F. ELV.		DESC.
511/ BCF @ 47??	1265.47	1268.99	FRONT DOOR TILED	FFE @ 4444 N. DROMEDARY RD.
		1268.86	DOOR TO THE SOUTH NOT TILED	
	1265.94	1269.17	TILED	FFE @ 4465 N. DROMEDARY RD.
549	1266.77	1269.28	TILED	FFE @ 4402 N. ARCADIA DR.
549	1266.77	1267.54	TILED	FFE @ 4301 N. ARCADIA DR.

10-2312
LAFAYETTE MANHOLE DIPS
2-11-11
N. CRAIG
J. HAEHN
CLEAR SKIES 40-50° F.

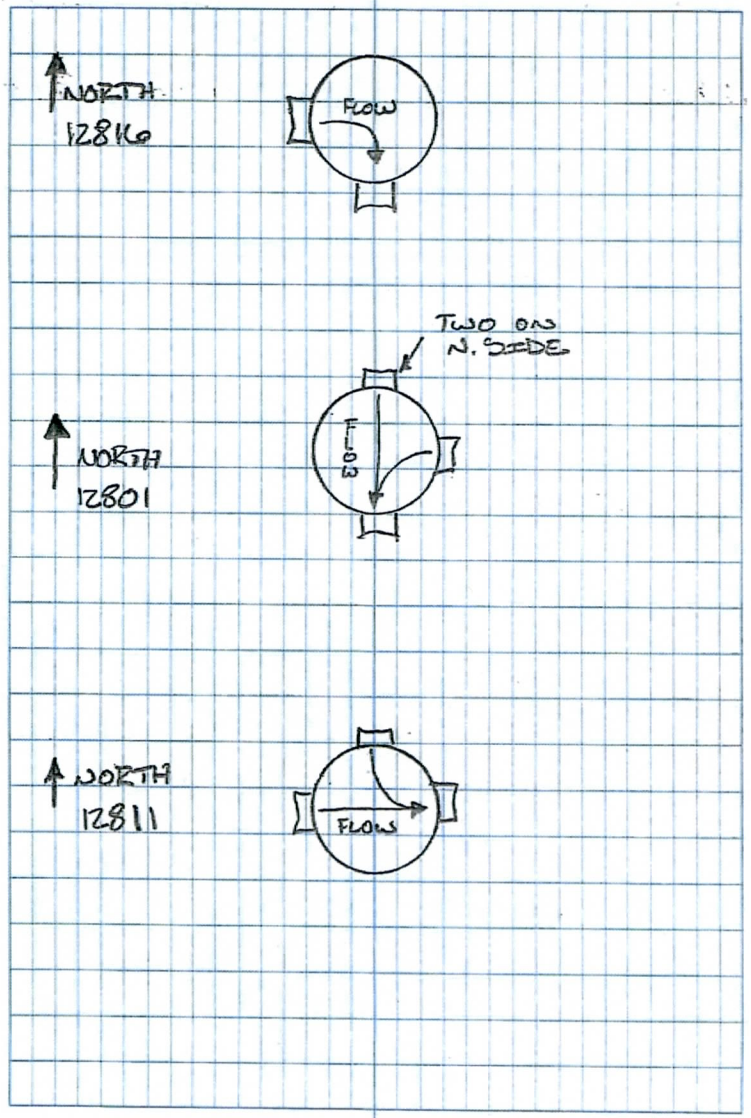
Pt #	N.	S.	E.	W.	RIM
14884	-9.20	-9.27		-7.53	1263.51
	1254.31	1254.24		1255.98	
14116	-8.02	-8.20			1265.83
	1257.81	1257.63			
12867	-8.82	-8.90			1264.73
	1255.91	1255.83			



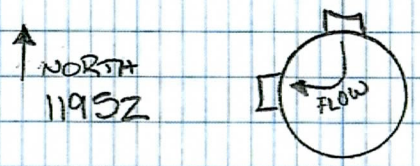


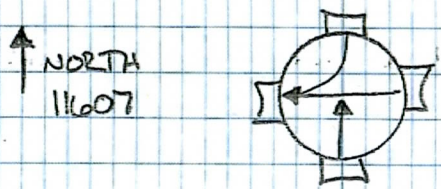


Pt #	N.	S.	E.	W.	Rim
12816		-7.49		-7.55	1263.59
		(CHECKED 3 TIMES)			
		1256.10		1256.04	
12801	-8.39	-8.72	-8.60		1265.51
	-5.35				
	1257.12	1256.79	1256.91		
	1260.16				
12811	-7.70		-7.70	-7.66	1263.90
	1256.20		1256.20	1256.24	



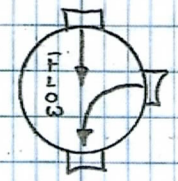
Pt #	N.	S.	E.	W.	RIM
12483			-7.65	-7.56	1265.37
			1257.72	1257.81	
11952	-6.64			-6.80	1264.42
	1257.78			1257.62	
11830			-7.30	-7.30	1264.08
			1256.78	1256.78	
11607	-7.80	-7.46	-7.80	-8.10	1263.68
	1255.88	1256.22	1255.88	1255.58	



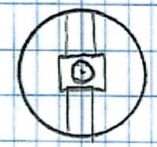


Pt #	N.	S.	E.	W.	Rim
11554	-7.20	-9.20	-8.40		1263.57
	1256.37	1254.37	1255.17		
11627	NOTHING TO DIP SEEMS TO BE A CLEANOUT SEE PHOTO				1262.84
10163	-6.30		-6.60	-6.91	1270.18
	1263.88		1263.58	1263.27	
11214	N.W. -4.80	-4.78			1261.78
	NOT FLOWING				
	1256.98	1257.00			

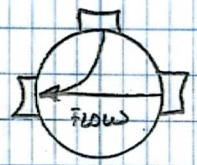
NORTH
11554



NORTH
11627

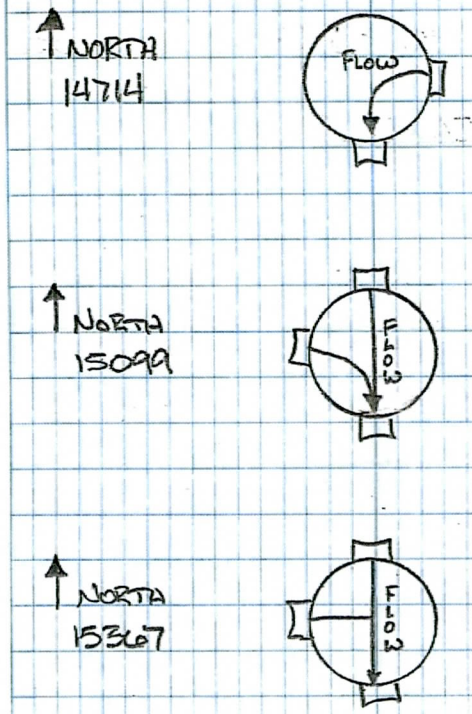


NORTH
10163

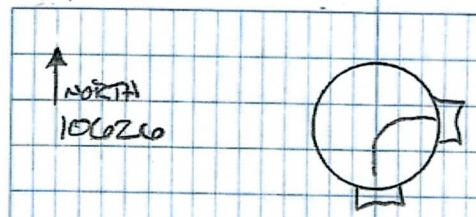


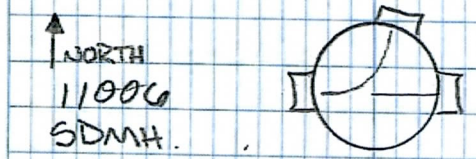
NORTH
11214

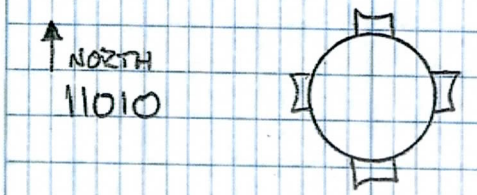
Pt #	N.	S.	E.	W.	Rim
14714		-8.70	-8.04		1265.65
		1256.95	1257.61		
15099	-9.74	-9.75		-9.50	1258.98
	1249.24	1249.23		1249.48	
15367	-8.54	-8.56		-8.35	1253.69
	1245.15	1245.13		1245.34	



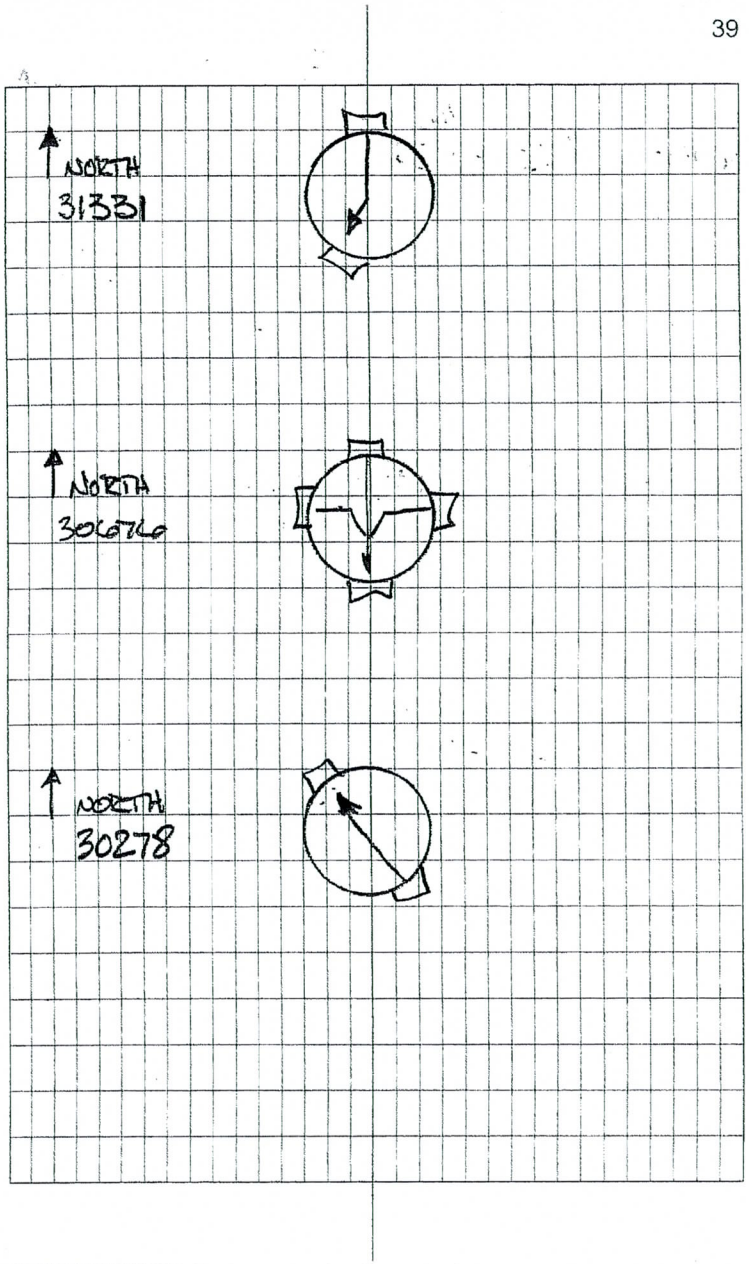
Pt #	N.	S.	E.	W.	Rim
10626		-9.44	-8.47		1265.82
		1256.38	1257.35		
	N.E.				
11006	-12.43		-11.06	-12.56	1263.16
	1250.73		1252.10	1250.60	
11010	~~-11.00~~	~~-10.85~~	~~-10.95~~	~~-11.04~~	1264.24
	-11.05	-10.90	-11.00	-11.09	
	1253.19	1253.34	1253.24	1253.15	



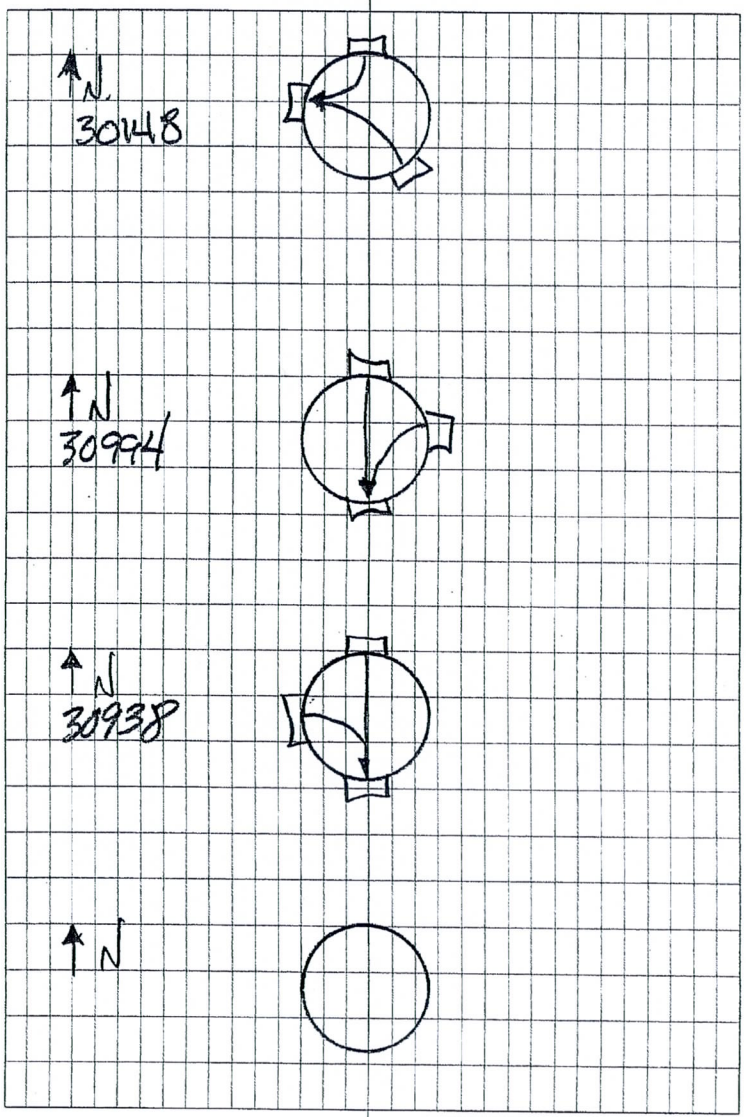




R #	N.	S.	E.	W.	RIM
		S/W			
31331	-7.23	-7.37			
306716	-8.53	-9.63	-9.27	-9.53	
	N/W	S/E			
30278	-7.50	-7.43			

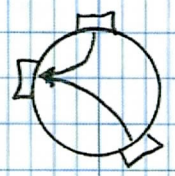


Pt #	N.	S. S/E	E.	W.	Rem
30148	-8.20	-8.24		-8.48	
30994	-8.83	-9.44	-9.36		
30938	-9.05	-9.55		-9.45	



Pt #	N.	S. S/E	E.	W.	Rim
30148	-8.20	-8.24		-8.48	1273.49
	1265.29	1265.25		1265.01	
30994	-8.83	-9.44	-9.36		1271.95
	1263.12	1262.51	1262.59		
30938	-9.05	-9.55		-9.45	1271.14
	1262.09	1261.59		1261.69	
20049	DIPPED CENTER STORM?			-4.15	1273.86
				1269.71	

N.
30148



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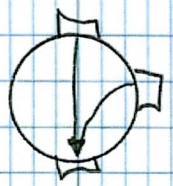

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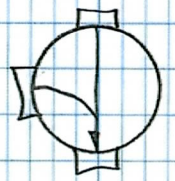

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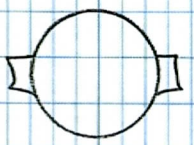

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11230,912890.418,678698.079,1266.384,DTR 6
11231,912880.328,678697.584,1262.028,PLM 24
11232,912881.704,678701.983,1263.497,ISP/3.8FT DIAMETER

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11263,912879.034,678743.856,1263.077,EOC02
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12840,911183.651,680121.588,1265.305,TOE02 BC
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12843,911150.532,680121.862,1265.841,TOP02 EC
12844,911152.225,680123.977,1265.184,TOE02 EC
12845,911176.700,680151.327,1265.270,Z
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12848,911180.830,680113.175,1263.471,GUT01 BC
12849,911164.468,680111.256,1263.442,GUT01 POC
12850,911164.598,680111.842,1263.777,BCV01 POC

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12855,911139.255,680120.258,1263.483,EOA01
12856,911136.996,680123.236,1263.428,EOA01
12857,911141.069,680121.995,1263.200,GUT01
12858,911137.550,680123.938,1263.279,GUT01
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12865,911154.258,680093.940,1264.370,WVL
12866,911131.597,680109.400,1264.346,WVL
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12919,911050.103,680128.533,1264.330,DTR 4
12920,911038.443,680136.920,1264.500,DTR 4
12921,911034.903,680135.689,1266.527,CCW01 BC
12922,911032.173,680136.316,1266.540,CCW01
12923,911029.931,680135.433,1266.581,CCW01
12924,911028.280,680134.458,1266.843,CCW01
12925,911026.168,680134.899,1267.618,CCW01 EC
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12943,911026.553,680148.669,1264.218,EOB04 B
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12946,911018.644,680142.219,1265.175,COL/1.35X1.35
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12987,911039.705,680267.941,1266.404,Z
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13058,910847.098,680263.091,1263.327,CSP
13059,910843.799,680258.654,1262.781,CSP
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13104,910778.190,680252.940,1263.444,CCW01 E
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13137,910846.126,680350.946,1264.335,WIF01 COL/2X2
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13140,910844.135,680374.127,1265.984,WIF01 E
13141,910844.832,680375.076,1266.810,COL/2X2
13142,910838.263,680361.503,1266.000,TOP03
13143,910844.866,680372.944,1265.973,TOP03 E
13144,910830.747,680356.734,1263.936,CCD01 B
13145,910832.538,680360.392,1264.245,CCD01
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13150,910831.157,680381.985,1265.927,TOP03 B
13151,910829.012,680385.064,1265.561,TOE02 B
13152,910821.392,680378.977,1265.518,TOE02
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13169,910936.961,680276.578,1263.810,CCD02 B BCR09 CPN13002
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13172,910963.453,680292.741,1265.907,CCD01
13173,910969.194,680300.468,1265.854,CCD01 E
13174,910808.144,680375.886,1263.979,BCR01

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13178,910755.208,680393.912,1264.782,CRN06
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13181,910772.387,680410.827,1263.948,BCR01
13182,910755.642,680429.489,1264.046,BCR01 EC
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13184,910754.174,680428.075,1263.802,EOA01 EC
13185,910737.310,680414.368,1264.879,CRN06
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13188,910759.248,680434.139,1266.042,TOP03
13189,910764.151,680434.719,1265.374,TOE02
13190,910771.827,680442.092,1265.590,TOE02 E
13191,910770.132,680444.275,1266.100,TOP03 E WIF01 E
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13194,910763.482,680455.714,1265.910,GAT01 E CCD02 B
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13200,910748.270,680445.173,1264.450,WIF01 COL/2X2
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13202,910741.021,680465.286,1265.513,DTR 6
13203,910724.275,680480.959,1265.655,TOE03
13204,910719.476,680482.167,1266.203,TOP02
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13214,910717.602,680485.098,1266.429,TOP02 B
13215,910713.351,680480.439,1264.653,GMK
13216,910714.140,680480.343,1264.818,SGN/BIKE LN
13217,910727.524,680470.080,1264.426,COL/2X2
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13234,910741.550,680372.280,1264.774,EOB01 E
13235,910730.716,680356.800,1264.236,CSP
13236,910727.051,680355.291,1263.710,CSP
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13327,910586.753,680552.460,1265.116,EOB02 B
13328,910585.585,680548.710,1265.054,EOB02
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13342,910541.068,680577.501,1263.899,RKD01
13343,910524.829,680564.441,1263.324,RKD01 E
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13454,910442.132,680701.696,1265.233,HWL01/IRRG STRUCTURE
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13456,910442.076,680710.643,1265.291,HWL01 CLS/IRRG STRUCTURE
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15411,908493.558,681778.840,1253.505,Z WDF10
15412,908503.113,681765.534,1253.452,Z WDF10 E GAT10 B
15413,908505.207,681762.424,1253.483,Z GAT10 E
15414,908497.503,681747.638,1253.678,CCD11 B
15415,908483.484,681739.889,1253.695,CCD10 E
15416,908475.066,681780.803,1253.544,CCD11 E
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15421,908449.656,681751.566,1253.075,TOE03 EC
15422,908452.044,681765.198,1253.629,TOP03 BC
15423,908445.991,681758.808,1253.602,TOP03
15424,908447.146,681750.139,1253.594,TOP03 EC
15425,908450.558,681767.488,1253.238,PPL OHE10
15426,908450.194,681768.137,1253.273,EOS10 BC
15427,908448.328,681771.688,1253.160,BCV10 BC
15428,908448.029,681772.164,1252.650,GUT10 BC
15429,908447.462,681773.495,1252.714,EOA02 BC
15430,908437.214,681760.583,1252.503,EOA02
15431,908439.780,681745.684,1252.301,EOA02 EC
15432,908443.376,681760.185,1253.003,EOS10
15433,908444.617,681748.706,1252.658,EOS10 EC
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15435,908440.705,681746.316,1252.193,GUT10 EC
15436,908441.874,681743.128,1252.245,GUT10
15437,908444.546,681768.860,1252.778,BCV10
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15442,908415.075,681751.587,1252.275,P
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15444,908406.333,681731.500,1251.911,GVL
15445,908359.546,681703.488,1251.605,GUT11 B BC
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15452,908431.238,681707.162,1251.940,GUT11
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15456,908419.657,681702.577,1252.091,FXC10 BC
15457,908416.261,681701.569,1252.003,FXC10
15458,908412.106,681702.205,1251.922,FXC10 EC
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15466,908383.335,681695.479,1252.000,CCW10
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15468,908368.655,681700.672,1252.622,CCW10
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15471,908416.753,681712.238,1252.411,TOP04
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15476,908420.670,681701.832,1251.871,TOE04 EC
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15478,908405.383,681708.974,1252.710,CTR 4
15479,908395.594,681705.505,1252.610,CTR 4
15480,908396.686,681715.643,1253.762,CTR 4
15481,908383.111,681704.729,1253.079,CTR 3
15482,908378.056,681716.303,1252.313,SGN/PED X-ING
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15499,908481.923,681698.024,1253.621,TOP03
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15506,908497.500,681659.925,1252.327,EOA02 E
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15508,908505.917,681690.564,1253.203,Z
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15511,908426.636,681738.057,1252.238,CRN01 E
15512,908461.241,681752.040,1253.044,Z
15513,908482.951,681720.223,1253.094,Z
15514,908470.778,681741.466,1253.368,CTR 24
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15516,908443.665,681685.891,1252.346,BCR11
15517,908440.447,681683.489,1252.430,EOS11
15518,908435.448,681679.647,1251.600,TOE04
15519,908449.440,681667.944,1252.368,WMT
15520,908458.563,681645.526,1251.992,TOE04
15521,908447.809,681638.285,1251.762,TOE04 E
15522,908444.286,681630.016,1252.188,CCD10 B
15523,908466.358,681644.975,1252.541,CCD10 E
15524,908469.370,681640.611,1252.566,EOS11 E
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15531,908416.451,681690.566,1252.144,PLM 24
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15535,908359.566,681706.465,1251.654,EOA10 EC
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15537,908354.276,681689.588,1251.249,CTR 18
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15540,908425.708,681847.771,1254.358,EOS10 B
15541,908460.014,681862.908,1254.555,EOS10 BC
15542,908469.426,681866.515,1254.633,EOS10
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15549,908500.619,681868.564,1254.560,EOS11
15550,908519.634,681875.650,1254.661,EOS11 EC
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15558,908704.186,681958.295,1256.711,EOS10
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15568,908497.083,681877.098,1254.414,Z BUR10
15569,908465.317,681871.339,1254.502,IVL/CTRL
15570,908559.671,681902.093,1255.049,Z
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15572,908615.232,681927.287,1263.336,COL/2.4X2.4
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15575,908699.015,681958.452,1256.651,Z BUR10
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15579,908784.219,681990.211,1266.474,COL2.4X2.4
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15581,908689.133,681938.597,1256.481,PLM 18
15582,908687.073,681937.789,1256.465,PLM 18
15583,908671.219,681924.437,1256.431,DTR 54
15584,908662.799,681928.299,1256.303,PLM 36
15585,908631.346,681916.877,1255.790,PLM 30
15586,908625.351,681913.842,1255.665,PLM 30
15587,908620.521,681904.269,1256.105,DTR 36
15588,908605.021,681904.952,1256.156,DTR 15
15589,908581.088,681889.579,1255.310,DTR 48
15590,908536.770,681868.869,1254.833,DTR 72
15591,908497.868,681859.964,1254.574,PLM 36
15592,908487.823,681858.661,1254.424,PLM 30
15593,908466.226,681845.641,1254.793,DTR 60
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15595,908774.508,681982.594,1257.615,EOS10
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15615,908896.492,682032.650,1260.820,EOS10 BC
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15617,908907.431,682036.247,1261.255,EOS10 EC
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15620,908731.502,681956.990,1256.806,PLM 30
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15622,908808.279,681979.869,1258.606,DTR 48
15623,908850.510,681997.649,1259.641,DTR 84
15624,908867.527,682009.917,1259.781,PLM 42
15625,908875.704,682011.171,1259.904,PLM 30
15626,908894.582,682016.696,1260.686,DTR 84
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15631,908944.200,682033.088,1262.035,DTR 84
15632,908970.016,682050.647,1262.207,PLM 24
15633,908971.193,682050.113,1262.197,PLM 24
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15665,909128.726,682136.044,1264.402,DTR 30
15666,909106.554,682126.167,1264.590,DTR 42
15667,909092.872,682120.713,1264.689,DTR 60
15668,909075.174,682112.259,1264.210,DTR 36
15669,909068.919,682108.946,1264.049,DTR 48
15670,909052.816,682100.989,1263.667,DTR 36
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15672,909027.177,682090.732,1263.305,DTR 48
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15724,909361.514,682235.592,1266.748,TOE03 E
15725,909362.972,682241.682,1267.306,CCD03 B BC
15726,909373.824,682232.909,1267.355,CCD03
15727,909383.702,682217.418,1267.124,CCD03
15728,909383.406,682209.942,1267.023,CCD03 EC
15729,909405.634,682218.634,1267.487,CCD03 BC
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15731,909396.173,682227.104,1267.681,CCD03 BC
15732,909385.014,682240.472,1267.817,CCD03
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15736,909390.932,682259.294,1269.040,Z CCW04 B
15737,909393.969,682256.439,1268.937,TOP05 B
15738,909399.376,682258.833,1268.657,TOE05 B
15739,909387.439,682251.429,1268.667,PLM 30
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15741,909400.618,682234.224,1268.420,PLM 24
15742,909401.626,682233.048,1268.477,DTR 12
15743,909411.207,682227.589,1268.988,TOP03 E
15744,909408.374,682221.140,1267.664,TOE03 E
15745,909414.849,682223.736,1267.989,Z CCW04 E
15746,909415.379,682222.410,1267.943,FSC04 B
15747,909405.875,682218.706,1267.804,FSC04 BC
15748,909402.340,682221.145,1267.825,FSC04
15749,909399.565,682223.522,1267.892,FSC04 E
15750,909399.996,682224.921,1270.858,COL/2.X2.
15751,909406.548,682221.878,1271.377,COL/2.X1.3
15752,909406.551,682221.878,1271.377,MLB
15753,909413.361,682223.166,1268.003,SGN/BIKE LN NO PARK
15754,909330.441,682194.971,1267.360,TOP04
15755,909375.736,682208.512,1267.272,WMT
15756,909377.966,682213.476,1267.631,BUR03 E
15757,909381.651,682216.540,1267.594,CCW 03 E TOP03 E
15758,909382.242,682218.107,1270.903,COL/2.X2.
15759,909383.296,682209.907,1267.387,FSC03 BC
15760,909383.742,682213.815,1267.478,FSC03
15761,909383.564,682217.356,1267.447,FSC03 E
15762,909383.428,682209.837,1267.011,EOS03
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15764,909385.189,682205.466,1266.457,GUT03
15765,909385.631,682204.259,1266.588,EOA03
15766,909388.883,682207.555,1266.674,BCV03
15767,909403.372,682213.306,1266.932,BCV03
15768,909407.189,682214.921,1267.353,BCV03
15769,909416.859,682222.793,1267.603,CCW03 B EOS03
15770,909425.297,682222.039,1267.665,BCV03

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15772,909426.028,682220.194,1267.268,EOA03
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15774,909435.460,682231.066,1271.099,COL/1.3X1.3
15775,909455.353,682238.899,1271.395,COL/1.3X1.3
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15783,909470.436,682246.583,1269.198,TOP05 E
15784,909467.582,682251.951,1268.684,TOE05 E
15785,909458.806,682273.942,1268.503,Z
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15787,909419.551,682243.965,1268.426,CTR 12
15788,909459.257,682259.971,1268.448,CTR 12
15789,909471.704,682192.568,1268.534,BUR01 B/8.W
15790,909502.519,682194.128,1268.626,Z
15791,909508.483,682186.436,1268.898,Z CCW01 B
15792,909496.573,682181.704,1268.634,Z CCW01 E
15793,909495.724,682179.534,1270.022,Z CCW01 B
15794,909497.771,682174.424,1269.786,Z CCW01 E
15795,909497.311,682173.488,1269.645,Z CCW01 B
15796,909482.818,682167.618,1269.653,Z CCW01 E
15797,909481.766,682168.028,1269.661,Z CCW01 B
15798,909479.704,682173.297,1269.742,Z CCW01 E
15799,909477.610,682174.226,1268.450,Z CCW01 B
15800,909442.618,682160.269,1267.900,Z CCW01 E
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15802,909494.432,682180.678,1269.667,CCW01 E
15803,909494.742,682179.843,1270.006,CCW01 B
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15806,909489.057,682170.089,1269.972,CCW01 B
15807,909480.244,682174.107,1269.972,CCW01 E
15808,909478.878,682174.150,1274.188,COL/2.X2.
15809,909481.842,682166.782,1274.122,COL/2.X2.
15810,909495.792,682180.909,1274.191,COL/2.X2.
15811,909488.410,682173.652,1269.122,PLM 6
15812,909483.092,682189.144,1268.296,Z
15813,909452.624,682170.740,1267.950,Z
15814,909463.003,682173.072,1267.908,WMT
15815,909471.216,682156.510,1269.150,DTR 24
15816,909499.609,682158.806,1268.397,Z
15817,909467.882,682152.677,1268.105,Z
15818,909408.984,682050.813,1267.246,Z
15819,909394.586,682054.368,1267.188,DTR 18
15820,909362.661,682084.702,1267.074,DTR 12
15821,909349.992,682100.587,1267.045,DTR 12
15822,909347.736,682115.080,1267.164,Z
15823,909392.184,682112.904,1267.222,Z
15824,909381.938,682085.741,1267.098,Z

15825,909368.176,682113.676,1267.180,DTR 36
15826,909411.159,682115.164,1269.166,CTR 36
15827,909363.037,682128.193,1272.834,COL/2.X2.
15828,909408.237,682146.111,1273.434,COL/2.X2.
15829,909408.712,682145.072,1273.178,CCW01 B
15830,909410.805,682139.820,1273.233,CCW01 E
15831,909411.329,682138.706,1273.461,COL/2.X2.
15832,909412.252,682139.174,1273.230,CCW01 B
15833,909417.540,682141.262,1273.206,CCW01 E
15834,909418.597,682141.573,1275.006,COL/2.X2.
15835,909437.409,682149.027,1275.026,COL/2.X2.
15836,909441.606,682159.696,1278.582,COL/2.X2.
15837,909444.377,682152.010,1278.608,COL/2.X2.
15838,909438.305,682149.882,1269.280,CCW01 B
15839,909443.500,682151.962,1272.567,CCW01 E
15840,909443.913,682152.853,1272.526,CCW01 B
15841,909441.702,682158.110,1269.307,CCW01 E
15842,909440.778,682158.344,1269.307,CCW01 B
15843,909437.508,682150.415,1269.293,CCW01 E
15844,909417.547,682142.601,1269.276,CCW01 B
15845,909409.529,682146.044,1269.265,CCW01 E
15846,909421.416,682115.560,1268.229,CCD01 B
15847,909419.087,682140.506,1267.765,CCD01 E
15848,909442.588,682136.722,1268.068,CCD01 B
15849,909438.148,682147.907,1267.823,CCD01 E
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15854,909390.978,682165.764,1267.477,EOA01
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15856,909440.822,682188.184,1267.917,EOA01
15857,909440.735,682190.274,1268.073,EOA01
15858,909385.408,682186.710,1267.402,CRN02
15859,909433.831,682205.928,1268.134,CRN02
15860,909479.961,682224.276,1268.900,CRN02 E
15861,909486.761,682208.338,1268.775,EOA01 E
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15865,909414.013,682180.252,1267.642,P
15866,909393.331,682169.367,1267.257,P
15867,909392.586,682171.592,1267.264,P
15868,909386.865,682161.303,1267.549,SGN/BIKE ROUTE < >
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15874,909399.974,682162.576,1267.579,CCD01 BC
15875,909396.279,682164.411,1267.549,CCD01
15876,909394.415,682166.986,1267.536,CCD01 EC
15877,909437.490,682184.049,1268.007,CCD01 BC
15878,909437.845,682181.085,1267.959,CCD01

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15880,909435.793,682174.550,1267.875,CCD01
15881,909436.514,682169.957,1267.831,CCD01 EC
15882,909440.351,682160.151,1267.752,CCD01 E
15883,909436.313,682147.782,1267.816,GAT01 B
15884,909420.268,682141.494,1267.768,GAT01 E
15585,908631.346,681916.877,1255.790,PLM 30
15586,908625.351,681913.842,1255.665,PLM 30
15587,908620.521,681904.269,1256.105,DTR 36
15588,908605.021,681904.952,1256.156,DTR 15
15589,908581.088,681889.579,1255.310,DTR 48
15590,908536.770,681868.869,1254.833,DTR 72
15591,908497.868,681859.964,1254.574,PLM 36
15592,908487.823,681858.661,1254.424,PLM 30
15593,908466.226,681845.641,1254.793,DTR 60
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15595,908774.508,681982.594,1257.615,EOS10
15596,908780.607,681985.562,1257.811,EOS10 BC
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15598,908796.913,681993.204,1258.262,EOS10 EC
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15605,908864.765,682012.359,1259.737,EOS11
15606,908883.231,682019.669,1260.343,EOS11 EC
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15611,908910.839,682029.054,1261.113,EOS11 EC
15612,908843.628,682012.041,1259.404,EOS10
15613,908888.494,682030.196,1260.590,EOS10 BC
15614,908892.263,682031.604,1260.734,EOS10
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15617,908907.431,682036.247,1261.255,EOS10 EC
15618,908754.833,681977.485,1257.046,Z BUR10 E
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15620,908731.502,681956.990,1256.806,PLM 30
15621,908761.550,681962.110,1257.621,DTR 72
15622,908808.279,681979.869,1258.606,DTR 48
15623,908850.510,681997.649,1259.641,DTR 84
15624,908867.527,682009.917,1259.781,PLM 42
15625,908875.704,682011.171,1259.904,PLM 30
15626,908894.582,682016.696,1260.686,DTR 84
15627,908891.495,682033.268,1269.094,COL/2.4X2.4
15628,908910.632,682039.804,1261.290,Z BUR10 B/3.W
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15630,908930.662,682032.029,1261.788,PLM 24
15631,908944.200,682033.088,1262.035,DTR 84
15632,908970.016,682050.647,1262.207,PLM 24

15633,908971.193,682050.113,1262.197,PLM 24
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15635,908988.234,682054.972,1262.138,DTR 54
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15637,908934.435,682049.132,1262.098,EOS10
15638,908937.995,682041.968,1261.998,EOS11
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15640,908977.817,682069.756,1262.394,EOS10
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15647,909083.284,682103.312,1264.239,EOS11 BC
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15653,909017.484,682083.013,1262.977,EOS10 BC
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15665,909128.726,682136.044,1264.402,DTR 30
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15667,909092.872,682120.713,1264.689,DTR 60
15668,909075.174,682112.259,1264.210,DTR 36
15669,909068.919,682108.946,1264.049,DTR 48
15670,909052.816,682100.989,1263.667,DTR 36
15671,909040.338,682096.326,1263.438,DTR 42
15672,909027.177,682090.732,1263.305,DTR 48
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15717,909319.991,682219.398,1266.341,Z
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15719,909329.352,682196.809,1267.016,TOP03
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15721,909380.665,682217.557,1267.175,TOP03 E
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15738,909399.376,682258.833,1268.657,TOE05 B
15739,909387.439,682251.429,1268.667,PLM 30
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16287,908333.102,681662.835,1252.070,CCP01 CLS
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20014,914083.881,678844.158,1270.326,UGW01 E
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20016,913311.351,679277.315,1272.192,UGG01 E
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32312,909578.278,681715.402,1263.571,COL/2.65SQ