

PRELIMINARY DRAINAGE REPORT
Brent Lane Drainage System & Trail
(Durango Dr. to Floyd Lamb Detention Basin)
City of Las Vegas, Nevada

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1 INTRODUCTION

1.1 Project Overview & Study Purpose

The Brent Lane Drainage System and Trail project (BLP) is a proposed flood control conveyance facility and recreational trail located along Brent Lane between Durango Drive and the Floyd Lamb Detention Basin within the City of Las Vegas (CLV), Nevada. The proposed flood control facility is identified in the Clark County Regional Flood Control District (CCRFCD) Master Plan Update (MPU) as regional facilities BRDB 0043 and BRDB 0033. The MPU identifies facility BRDB 0043 as an 8'w by 6'h RCB and facility BRDB 0033 as an energy dissipater.

The purpose of this Preliminary Drainage Report is to provide detailed and comprehensive hydrologic analyses contributing to the facility in order to establish design flows. The hydrologic analyses assess both the existing and ultimate conditions and are inclusive of evaluation of existing relevant studies and comparison to reported flows by various sources. The purpose of this study also includes evaluation of alternative flood control facilities with regard to alignment, type and collection. This report provides a preliminary evaluation of facility sizing for each alternative in order to provide estimates of probable cost.

The following items have been performed and included in this report:

- Identified the relevant FEMA Special Flood Hazard Area (SFHA) mapping.
- Identified the project in relation to CCRFCD regional drainage facilities.
- Identified and reviewed previously approved drainage studies and improvement plans in the vicinity of the project.
- Provided an inventory of existing drainage facilities impacting the BLP.
- Conducted detailed and comprehensive existing and ultimate condition "regional" hydrologic analyses for the purpose of determining mainline flood control facility 100-year storm event design flows.
- Conducted a detailed and comprehensive ultimate condition "local" hydrologic analysis for the purpose of determining drop inlet and lateral storm drain flood control facility 100-year storm event design flows.
- Evaluated flood control facility alternatives.
- Analyzed street flow, such that hydraulic characteristics within the street sections are in accordance with local storm water criteria.
- Performed preliminary flood control facility sizing for each alternative
- Performed estimates of probable cost for each flood control facility and trail alternative.

As the prime engineering consultant for the design of the BLP project, Slater Hanifan Group (SHG) is responsible for project management, preparation of design reports, and preparation of construction documents. Assisting SHG are sub-consultants in the fields of geotechnical engineering, surveying, subsurface utility engineering, and environmental assessment. GES is conducting the geotechnical field exploration and interpretive report. Stanley Consultants is conducting the survey mapping, control, and right-of-way mapping. Horrocks is conducting the subsurface utility designation and potholing. Newfields is conducting the Environmental Screening Analysis.

1.2 Site Description

The BLP extends approximately 2,850 LF along the Brent Lane alignment, from Durango Drive to the Floyd Lamb Detention Basin. The improvements are located within Section 9, Township 19 South, Range 60 East within the City of Las Vegas, Nevada. Note that the northwest quadrant of the Brent Lane/Durango Drive intersection is the boundary limit of City of Las Vegas and unincorporated Clark County jurisdiction. It is noted that Clark County concurrence will be required for this project. Public right-of-way exists in the northwest, southwest, and southeast quadrants of the Brent Lane/Durango Drive intersection. The remaining portions of the project are located within City of Las Vegas property.

Currently, the southeast and southwest quadrants of the Brent Lane/Durango Drive intersection consist of fully improved roadway with curb and gutter. The northwest and northeast quadrants of the intersection do not have curb and gutter. Brent Lane extends to the east generally as a 40-foot pavement section with residential homes fronting along the south and no improvements along the north. Brent Lane extends to the west generally as a 40-foot pavement section with an equestrian trail adjacent to residential homes along the south and no improvements along the north. As Brent Lane enters the Floyd Lamb Recreation Area Brent Lane changes to Tule Springs Road and bends to the north. The BLP follows the Tule Springs Road alignment and generally terminates by crossing Tule Springs Road and discharging into the Floyd Lamb Detention Basin. Existing improvements and topography shows that Brent Lane drains from west to east towards Floyd Lamb Detention Basin.

A location map, identified as Exhibit A, has been included in Appendix A for reference.

1.3 FEMA Flood Zone Designation

The limits of the BLP are located on FEMA Flood Insurance Rate Map (FIRM) Panel 32003C1734F dated November 16, 2011. The project is located within an un-shaded Zone 'X'. An un-shaded Zone 'X' is defined as an area determined to be outside the 0.2% annual chance flood.

Exhibit B, identifying the project site on the FIRM Panel identified above, has been included in Appendix A for reference.

1.4 CCRFCD MPU & CLV Neighborhood Study Information

Figure F-13, from the 2013 CCRFCD Las Vegas Valley Flood Control Master Plan Update (CCRFCD 2013 MPU, Reference 1), identifies the project as regional facilities BRDB 0043 and BRDB 0033. Facility BRDB 0043 is identified as an 8'w by 6'h RCB for conveyance of 957 cfs and facility BRDB 0033 is identified as an energy dissipater. Exhibit C identifying the project on Figure F-13 of the CCRFCD 2013 MPU and Exhibit D identifying the project on Figure H-13 of the 2008 CCRFCD MPU has been included in Appendix A for reference. Note that the CCRFCD 2013 MPU did not update H Maps.

It is noted that an amendment to the 2008 CCRFCD MPU was processed as part of the upstream Kyle Canyon project in 2013 which impacted the Brent Lane facilities. The amendment was incorporated into the 2013 MPU; however changes to the facility size and design flows per the amendment were inadvertently not revised in the 2013 MPU. The amendment identifies facility BRDB as an 8'w by 7'h RCB for conveyance of 1,078 cfs. The

amendment was approved through CCRFCD Boards, but never received CLV City Council approval due to known changes to the Kyle Canyon project. It is noted that anticipated changes to the Kyle Canyon project (now known as Skye Canyon) will maintain drainage patterns and discharges to the Brent Lane facility as established by the amendment. CCRFCD approval will be required for this project. Relevant reference material from the Kyle Canyon MPU Amendment is included in Appendix E.

The BLP is included in the CLV Northwest Neighborhood Study-Phase 2 (Reference 2) document. The study does not identify the BLP as a regional facility. Exhibits E and F identifying the project on the CLV Northwest Neighborhood Study-Phase 2 existing and future condition exhibits have been included in Appendix A for reference.

1.5 Reference Studies

Various approved drainage studies and improvement plans for projects in the vicinity of the BLP have been reviewed in preparation of this study. The following documents have been identified as relevant and are considered acceptable for reference. Relevant reference material utilized in preparation of this report has been excerpted and included in Appendix E.

- *Kyle Canyon Master Drainage Study*, G.C. Wallace (Reference 3): This study was utilized to reference portions of the existing condition hydrologic analysis west of the Fort Apache Drive match line.
- *Kyle Canyon Master Drainage Study, Addendum #1*, SHG (Reference 4): This study was utilized to reference flow splits at two culverts below U.S. 95 impacting the BLP for the existing condition hydrologic analysis.
- *Kyle Canyon Amendment to the 2008 Las Vegas Valley Master Plan Update*, SHG (Reference 5): This study was utilized to reference drainage patterns and flow splits along Fort Apache Drive for the ultimate condition hydrologic analysis.
- *Floyd Lamb Park North and South Environmental Enhancement Areas, Final Design Report*, LBG (Reference 6): This study was utilized to reference existing and ultimate condition flows along the project alignment for comparison to existing and ultimate condition flows determined by this study.
- *San Marino Estates III*, GCW (Reference 7): Drainage study exhibits and improvement plans were referenced from this project to verify drainage patterns and adjust drainage basins accordingly.
- *Mystic Valley PH1*, CVL Consultants (Reference 8): Drainage study exhibits and improvement plans were referenced from this project to verify drainage patterns and adjust drainage basins accordingly.
- *Spring Mountain Ranch*, VTN (Reference 9): Drainage study exhibits and improvement plans were referenced from this project to verify drainage patterns and adjust drainage basins accordingly.
- *Iron Mountain Estates* by VTN (Reference 10): Drainage study exhibits and improvement plans were referenced from this project to verify drainage patterns and adjust drainage basins accordingly.

- *Iron Mountain Estates West*, VTN (Reference 11): Drainage study exhibits and improvement plans were referenced from this project to verify drainage patterns and adjust drainage basins accordingly.
- *El Capitan/O'Hare*, VTN (Reference 12): Drainage study exhibits and improvement plans were referenced from this project to verify drainage patterns and adjust drainage basins accordingly.
- *Spring Mountain Ranch Unit 60*, VTN (Reference 13): Drainage study exhibits and improvement plans were referenced from this project to verify drainage patterns and adjust drainage basins accordingly.

1.6 Project Coordination

The following coordination has taken place in preparation of this report. The coordination documents are included in Appendix F for reference.

- CLV/CCRFGD Kickoff Meeting Minutes – March 6.
- CLV Email Correspondence (Trail) – March 11, 2014.
- CLV/CCRFGD Progress Meeting #1 Minutes – April 8, 2014
- CLV/CCRFGD Email Correspondence (Hydrology) – April 16, 2014

2 METHODOLOGY

2.1 Compliance

The methodologies utilized in the preparation of this study are in compliance with the Clark County Regional Flood Control District's Hydrologic and Drainage Design Manual (CCRFGD Manual, Reference 14).

2.2 Hydrologic Modeling

Modeling: Hydrologic modeling was performed based on a “regional” analysis and a “local” analysis. The regional analysis was performed for the existing and ultimate conditions for the purpose of determining design flows for the mainline conveyance facility. The local analysis was performed for the ultimate condition for the purpose of determining design flows for drop inlet and lateral storm drain facilities.

The SCS Unit Hydrograph Method (SCS Method) was utilized to determine peak flow rates. The SCS Method utilizes precipitation, drainage area, curve number and lag time parameters to determine peak flow rates. The SCS Method routine within the U.S. Army Corp of Engineers HEC-1 Flood Hydrograph Package program was utilized to model the drainage basins analyzed by this study.

Precipitation: Figure 513 of the CCRFGD manual was utilized to determine precipitation values for the BLP site and for the contributing watershed to the project site. While the BLP and most of the contributing watershed analyzed in this report are within the McCarran Rainfall Area, nearly all the watershed that was referenced from the Kyle Canyon Master Drainage Study (MDS) in the existing condition analysis is located outside the McCarran Rainfall Area. The precipitation values utilized in the HEC-1 models for areas within the McCarran Rainfall Area, referenced from Table 505 of the CCRFGD Manual, are 1.58 and 2.77-inches for the 10-

year and 100-year storm events, respectively. The precipitation value utilized in the HEC-1 models for areas outside the McCarran Rainfall Area, referenced from Figure 506 and Tables 501 and 502 of the CCRFCD Manual, is 2.86-inches for the 100-year storm event. Due to the size of the referenced Kyle Canyon MDS contributing watershed, precipitation values utilized in the HEC-1 models range from 2.77-inches to 3.39-inches for 100-year storm event. Additionally, since the drainage area is less than 8 square miles, the SDN 3 design storm distribution referenced from Table 503 of the CCRFCD Manual was used. Relevant tables and figures from the CCRFCD Manual have been included in Appendix B.

Curve Number: The SCS curve number loss rate methodology was utilized to approximate infiltration for the drainage subbasins. The soils information within the watershed was obtained from the SCS Soil Survey of the Las Vegas Valley Area. Exhibits G1, G2 and G3 depict the existing condition regional analysis, ultimate condition regional analysis and ultimate condition local analysis watershed on the soil map and have been included in Appendix A. Per coordination with CLV and CCRFCD (Progress Meeting #1 Minutes), curve numbers were determined based on Table 602 as included in the CCRFCD Manual as opposed to curve numbers established utilizing the MPU curve number matrix. The curve number computations are included in Appendix B.

Lag Time: The lag time is defined as the time measured from the center of mass of effective rainfall to the time to peak of the outflow hydrograph. The lag time is related to the time of concentration as 0.6 times the time of concentration. The time of concentration is defined as the time required for runoff to flow from the hydraulically most distant point of a subbasin to the outlet point of the subbasin. Standard Form 4, as outlined in the CCRFCD Manual, was utilized to determine the lag times for drainage basins modeled. The lag time computations are included in Appendix B.

2.3 Hydraulic Modeling

Street Flow: Street flow was analyzed utilizing the FlowMaster Version 7.0 software by Haestad Methods. In accordance with the CCRFCD Manual, the depth times velocity factor (DxV) for street flow for the 10-year storm event must be less than or equal to 6 with a maximum depth of 1 foot. The depth times velocity factor (DxV) for street flow for the 100-year storm event must be less than or equal to 8 with a maximum depth of 2 feet. Additionally, transverse street flow on through traffic streets shall be at a depth less than or equal to 1-ft for the 100-year storm event. Since some of the BLP improvements along Durango Drive are within a right-of-way greater than 80-ft in width, the following must also be satisfied:

- During the 10-year storm event, a 12-ft wide dry lane shall be maintained in each direction (without the use of a center turning lane),
- During the 10-year storm event, the flow depth at intersections with other streets of 80-ft or greater right-of-way width shall be at curb height or less.

Drop Inlets: Continuous grade drop inlets were designed using a spreadsheet which utilizes equations taken from Section 805 of the CCRFCD Manual. Sump drop inlets were designed using a spreadsheet incorporating orifice and weir equations.

Storm Drain & Open Channel Conveyance: Preliminary normal depth and full flow capacity hydraulic analyses were performed for mainline and lateral conveyance facilities, respectively, utilizing the FlowMaster Version 7.0 software by Haestad Methods. Conveyance facilities were assessed to convey the 100-year storm event flows.

Culverts: Culvert facility analysis was performed utilizing FHWA inlet control nomographs.

3 HYDROLOGY

3.1 Discussion

Three separate hydrologic analyses were performed to determine storm flows impacting the BLP: an Existing Condition Regional Analysis, an Ultimate Condition Regional Analysis, and an Ultimate Condition Local Analysis. The regional analysis was performed for determining design flows for the mainline regional conveyance facility and the local analysis was performed for determining design flows for the drop inlet and storm drain lateral facilities.

Various studies and improvement plans were acquired and reviewed in preparation of this study. Section 1.5 provides a summary of documents deemed relevant and utilized as reference for various uses including verification of drainage patterns, coordination of drainage basin and associated technical data, established flow splits, comparison of previously determined flows, etc. It is noted that the upstream Kyle Canyon project is the most recent study that analyzed a large portion of the contributing watershed to the BLP. Hydrologic analyses from the Kyle Canyon project were utilized as the base hydrologic models prepared for this study.

3.2 Summary of Various Source Reported Flows

Various planning documents have reported design flow for the BLP. The following table summarizes the reported flows from the various documents.

Table 1: Summary of Various Source Reported Flows (100-Year Storm Event)					
Location	CCRFC MPU¹ (cfs)	CCRFC MPU² (cfs)	CLV NWNS PH2³ (cfs)	LBG FLP EEA⁴ (cfs)	SHG Brent Lane⁵ (cfs)
Existing Condition					
Brent Lane at Durango Drive	N/A	N/A	1538	1328	1287
Brent Lane at Tule Springs Road	N/A	N/A	2974 ⁶	1945	2102
Ultimate Condition					
Brent Lane at Durango Drive	1078	957	34	1135	1183
Brent Lane at Tule Springs Road	1266	1151	34	1237	1354
1: 2013 CCRFC Kyle Canyon MPA by SHG 2: 2013 CCRFC MPU 3: CLV Northwest Neighborhood Study 4: Floyd Lamb Park N/S Environmental Enhancement Areas by Louis Berger Group 5: Brent Lane Drainage System & Trail by SHG 6: Flow value obtained by summing values on summary exhibit without considering DARF					

3.3 Regional Analysis

Two regional hydrologic analyses were performed to determine storm flows impacting the BLP, an Existing Condition Regional Analysis and an Ultimate Condition Regional Analysis.

Existing Conditions: The existing condition regional analysis was performed to determine storm flow rates currently impacting the project area. The existing condition hydrologic model referenced from the *Kyle Canyon Master Drainage Study* by G.C. Wallace (Reference 3) was utilized as the base model for the analysis. The model was also prepared in coordination with the *Floyd Lamb Park North and South Environmental Enhancement Areas, Final Design Report*, LBG (Reference 6). The base model was supplemented downstream of the Kyle Canyon analysis specific to the BLP project. A match line was established between the Kyle Canyon analysis and the supplemental downstream analysis. Subbasins and drainage patterns were determined based on topographic mapping, aerial photography and relevant approved drainage studies and design plans. An all-inclusive HEC-1 model was prepared incorporating the upstream referenced model and the downstream supplemental analysis. Exhibit H included in Appendix A provides a depiction of the existing condition regional analysis. The HEC-1 hydrologic analysis is included in Appendix B.

It is noted that the existing condition analysis was utilized to understand if existing condition flows are higher than ultimate condition flows along any portion of the project. The evaluation identified that existing condition flows are higher than ultimate condition flows at the Tule Springs Road Crossing of the facility and at the Brent Lane/Durango Drive intersection.

Table 2 and Table 3 provide a summary of existing condition regional analysis 100-year storm event flows determined for subbasins and concentration points respectively.

Table 2: Flow Rate Summary (Existing Conditions)		
Basin ID	Area (ac)	Q ₁₀₀ (cfs)
BAS1E	101.81	114
BAS2E	32.34	80
BAS3E	80.14	124
BAS4E	87.25	151
BAS5E	56.53	133
BAS6E	104.25	126
BAS7E	124.01	191
BAS8E	70.00	92

Table 3: Concentration Points Summary (Existing Conditions)		
Concentration Point	Area (sq-mi)	Q₁₀₀ (cfs)
*CP18	3.55	305
CP-A (*RDCHD02C + BAS1E)	2.46	173
CP-B (CP-A + BAS3E)	2.58	270
CP-C (*CP18 + BAS4E)	3.68	422
CP-D (CP-B + CP-C + BAS6E)	4.31	763
CP-E (CP-D + BAS8E)	4.24	816
CP-F (*CP21 + *ES2 + *95-9B + BAS2E)	4.69	1181
CP-G (CP-F + BAS5E)	4.78	1205
CP-H (CP-G + BAS7E)	4.98	1287
CP-I (CP-E + CP-H)	5.79	2102
* Referenced from GC Wallace Master Drainage Study		

Ultimate Conditions: The ultimate condition regional analysis was performed to determine design storm flow rates for the mainline BLP conveyance facilities. The ultimate condition hydrologic model was prepared in coordination with the ultimate condition hydrologic model referenced from the *Kyle Canyon Amendment to the 2008 Las Vegas Valley Master Plan Update*, SHG (Reference 5) and the *Floyd Lamb Park North and South Environmental Enhancement Areas, Final Design Report*, LBG (Reference 6). Subbasins and drainage patterns were determined based on topographic mapping, aerial photography and relevant approved drainage studies and design plans. Modifications to established regional subbasins were made accordingly. Flow splits and discharges along Fort Apache Drive are in coordination with the Kyle Canyon MPU Amendment. An all-inclusive HEC-1 model was prepared. Exhibit I included in Appendix A provides a depiction of the ultimate condition regional analysis. The HEC-1 hydrologic analysis is included in Appendix B.

In preparation of the ultimate condition analysis and review of the 2013 CCRFCD MPU established regional subbasins, it was noted that due to constructed physical features, MPU Basin NW115C partially drains away from the Brent Lane System and the South Environmental Enhancement Area (there is a constructed high point in El Capitan, as well as a local storm drain system in Log Cabin Way and topo runs from west to east). However the MPU has the entire NW115-C basin contributing to the Brent Lane Storm Drain facility. Additionally, review of the LBG Study subdivides MPU Basin NW115-C into three basins identified as NW100N, MW100S, and NW99. Under interim conditions the LBG study has all three basins/NW115C draining to the north enhancement area and away from the Brent Lane System and south enhancement area. Under ultimate conditions the LBG study has all three basins/NW115C draining to the Brent Lane System and south enhancement area per the MPU. Per our April 16, 2013 email coordination with CLV, it was decided to assume that the entire regional subbasin NW115-C will contribute to the BLP despite the potential that the

northern portion of the basin may be difficult to drain that direction due to the existing physical features.

Table 4 and Table 5 provide a summary of ultimate condition regional analysis 100-year storm event flows determined for subbasins and concentration points respectively.

Table 4: Flow Rate Summary (Ultimate Condition)		
Basin ID	Area (ac)	Q₁₀₀ (cfs)
BAS1U	225.54	489
BAS2U	93.83	263
BAS3U	80.14	126
BAS4U	87.25	156
BAS5U	56.53	133
BAS6U	108.25	126
BAS7U	124.01	190
BAS8U	71.01	104
BAS9U	61.97	136
BAS10U	82.84	178

Table 5: Concentration Points Summary (Ultimate Conditions)		
Concentration Point	Area (sq-mi)	Q₁₀₀ (cfs)
CP-A1 (DLOGC + BAS10U)	0.58	360
CP-A2 (DCBAS1D + BAS3U + CP-A1)	0.70	517
CP-B (DBAS4U + BAS4U + CP-A2)	0.84	769
CP-C (DBAS2U + BAS5U + CPB)	1.07	1023
CP-D NOT USED	N/A	N/A
CP-E (BAS7U + CP-C)	1.27	1183
CP-F (BAS6U + BAS8U)	0.28	223
CP-G (CP-E + CP-F)	1.55	1354

3.4 Local Analysis

An ultimate condition local analysis was performed in order to determine design flows for drop inlet and lateral storm drain facilities. Since the mainline facility will be extended to the west as a continuation of the regional facility as part of a future project, it was assumed that 100-year flows are cut off at major street intersections with Brent Lane (El Capitan Way and Homestead Road). The following table provides a summary of the local hydrologic analysis. Exhibit J included in Appendix A provides a watershed map for the local analysis. The HEC-1 hydrologic analysis is included in Appendix B.

Table 6: Ultimate Condition Flow Rate Summary Local Analysis			
Basin/Concentration Point ID	Area (ac)	Q₁₀₀ (cfs)	Q₁₀ (cfs)
LOC1	36.49	58	20
LOC2	10.21	21	7
LOC3	6.31	12	4
LOC4	13.42	23	8
LOC5	34.41	53	19
LOC6	1.84	5	3
LOC7	1.87	6	4
LOC8	15.94	27	9
LOC9	18.21	36	14
LOC10	15.64	34	14
CP1 (LOC4 + LOC5)	N/A	77	25

4 ALTERNATIVE ASSESSMENT – MAINLINE FACILITY

4.1 Discussion

Various alternatives were considered for the mainline storm drain conveyance facility. The alternatives assessed by this report are identified as Alternative A, Alternative B and Alternative C. The alternatives vary by facility type (i.e.: closed conduit, open channel, combined closed conduit/open channel). Only a single alignment was considered for all alternatives as the location for the upstream end of the facility and the location for the downstream end of the facility are well defined. It is noted that the alignment at the beginning of the facility has a slight shift through the intersection of Brent Lane/Durango Drive in order to avoid being below existing dry utilities at the termination of this project and for the future extension of the facility to the west. The selected alignment is located between the dry utilities to the north and a waterline to the south. Minimum separation issues in relation to the waterline will likely exist; however it is anticipated that the separation obtained will be acceptable to approving agencies in lieu of the alternative below the dry utilities.

Exhibit K included in Appendix A provides a depiction of the mainline alignment and summary of the varying segments of each alternative along the alignment. The mainline alignment was divided into six facility segments (Facility 1, Facility 2, Facility 3A, Facility 3B, Facility 4A and

Facility4B) in order to address the change in facility type along the alignment for each alternative. The following provides a general description of the three alternatives considered. Preliminary facility sizes related to each alternative are presented on Exhibit K and in Sections 4.3 to 4.6.

- **Alternative A:** Alternative A generally consists of a closed conduit facility extending from just west of the Brent Lane/Durango Drive intersection along the Brent Lane alignment to the east and terminating just east of the bend in Brent Lane. The facility then extends to the east along the curving Brent Lane alignment as an open channel to Tule Springs Road where it crosses through a culvert and terminates as discharge into the existing feeder channel of the Tule Springs Detention Basin.
- **Alternative B:** Alternative B generally consists of a closed conduit facility extending from just west of the Brent Lane/Durango Drive intersection along the entire Brent Lane alignment to the east to Tule Springs Road where it crosses through a culvert and terminates as discharge into the existing feeder channel of the Tule Springs Detention Basin.
- **Alternative C:** Alternative C generally consists of a closed conduit facility extending from just west of the Brent Lane/Durango Drive intersection along the Brent Lane alignment and terminating just east of the intersection. The facility then extends to the east along the Brent Lane alignment as an open channel to Tule Springs Road where it crosses through a culvert and terminates as discharge into the existing feeder channel of the Tule Springs Detention Basin.

In addition to evaluating the three primary alternatives, three options (Option 1, Option 2, and Option 3) were evaluated for collection of surface flow from the west directly discharging to the Tule Springs Road Crossing. The three options provide variation in Facility Segments 3B, 4A and 4B only for each alternative. Exhibit L included in Appendix A provides a depiction of the three options evaluated for the Tule Springs Crossing. The following provides a general description of the three options evaluated and which alternative they are relevant to respectively. Preliminary facility sizes related to each option are presented on Exhibit L and in Sections 4.3 to 4.6.

- **Option 1:** Option 1 is relevant to Alternative B only and effects Facility Segments 3B, 4A and 4B. Option 1 considers transitioning the closed conduit facility (Facility Segment 3A) to a rectangular open channel (Facility 3B) at the approach to the Tule Springs Crossing. This option allows for interception of surface flow from the west over the edge of the open channel and conveyance under Tule Springs Road thru a single culvert of same dimension as the rectangular channel. Preliminary facility designs were evaluated for the higher existing condition flows for conveyance below the road, but not necessarily meeting CCRFCD Manual criteria; and for lower ultimate condition flows for conveyance below the road and meeting CCRFCD Manual criteria.
- **Option 2:** Option 2 is relevant to Alternative B only and effects Facility Segments 4A and 4B. Option 2 considers continuing Facility Segment 3A, 3B and 4B as a closed conduit facility thru the Tule Springs Crossing and providing a separate culvert (Facility 4A) below Tule Springs Road to intercept surface flows from the west. This option allows for interception of surface flow from the west thru the culvert with some grading necessary to direct flow to the culvert entrance. Preliminary facility designs were evaluated for the higher existing condition flows for conveyance below the road, but not necessarily meeting CCRFCD Manual criteria; and for lower ultimate condition flows for conveyance below the road and meeting CCRFCD Manual criteria.
- **Option 3:** Option 3 is relevant to Alternatives A and C only and effects Facility Segments 4A and 4B. Since both Alternatives A and C include open channel conveyance at the approach to the Tule Springs Crossing, Option 3 considers the

open channel transition to a culvert (Facilities 4A and 4B). This option allows for interception of surface flow from the west over the edge of the open channel and conveyance under Tule Springs Road thru a single culvert. Preliminary facility designs were evaluated for the higher existing condition flows for conveyance below the road, but not necessarily meeting CCRFCD Manual criteria; and for lower ultimate condition flows for conveyance below the road and meeting CCRFCD Manual criteria.

4.2 Summary of Design Flows

Design flows established for the BLP mainline are based on the ultimate condition regional analysis. As previously stated, preliminary facility sizes were based on CCRFCD Manual criteria being met for the ultimate condition flows; however collection facilities at the Tule Springs Crossing were also evaluated with the higher existing condition flows to ensure conveyance capacity below the road, but without necessarily meeting CCRFCD Manual criteria. The following table provides a summary of mainline design flows relevant to each facility segment and applicable alternative.

Table 7: Summary of Mainline Design Flows		
Facility Segment ID¹	HEC-1 Node² Q₁₀₀ (cfs)	Design Flow Q₁₀₀ (cfs)
Facility 1 Alternatives A,B,C	CP-E	1183
Facility 2 Alternatives A,B,C	CP-E	1183
Facility 3A Alternatives A,B,C	CP-E	1183
Facility 3B Alternatives A,B1,C	CP-G	1354
Facility 3B Alternative B2	CP-E	1183
Facility 4A Alternatives A,B1,C	CP-G	1354
Facility 4A Alternative B2	CP-F	223
Facility 4B Alternatives A,B1,C	CP-G	1354
Facility 4B Alternative B2	CP-E	1183
1: See Exhibit K & L. 2: Ultimate Condition Regional Analysis. See Exhibit I.		

4.3 Alternative A/Tule Springs Crossing Option 3

- **Description:** Alternative A and Tule Springs Crossing Option 3 consist of facilities as described in Section 4.1.
- **Design Flow:** Design flows vary between 1183 cfs and 1354 cfs along the reach of the alignment as summarized in Table 7.
- **Hydraulic Analysis:** Preliminary normal depth hydraulic computations were performed for each facility. Normal depth computations are included in Appendix C. CCRFCD Manual criteria for freeboard is considered in the sizing of open channel and culvert facilities.

- **Summary of Assessment:** The following table provides a summary of preliminary facility sizes determined for Alternative A and the Tule Springs Crossing Option 3. The table also includes an assessment of pros and cons associated with the alternative for consideration.

Table 8: Mainline Alternative A/Tule Springs Crossing Option 3 Summary		
Facility Segment ID:Description ¹	Pros	Cons
1: 10'x6' RCB @ 2.3% 2: 10'x6' RCB @ 2.3% 3A: Concrete Trapezoidal Channel (10' BW, 6' D, 2:1 SS, 1.5%) 3B: Concrete Trapezoidal Channel (10' BW, 6' D, 2:1 SS, 1.5%) 4A&4B: Triple 10'x7' RCB Culvert	▪ Open channel most effectively intercepts large surface flows from west at Tule Springs Road ▪ Closed conduit adjacent to Brent Lane is favorable to future development of adjacent property ▪ Allows for dual use trail and maintenance access	▪ Culvert facility more expensive ▪ Higher maintenance cost associated with open channel segment ▪ Open channel portion less favorable to future development of adjacent property
1: See Exhibit K & L.		

4.4 Alternative B/Tule Springs Crossing Option 1

- **Description:** Alternative B and Tule Springs Crossing Option 1 consist of facilities as described in Section 4.1.
- **Design Flow:** Design flows vary between 1183 cfs and 1354 cfs along the reach of the alignment as summarized in Table 7.
- **Hydraulic Analysis:** Preliminary normal depth hydraulic computations were performed for each facility. Normal depth computations are included in Appendix C. CCRFCD Manual criteria for freeboard is considered in the sizing of open channel and culvert facilities.

Summary of Assessment: The following table provides a summary of preliminary facility sizes determined for Alternative B and the Tule Springs Crossing Option 1. The table also includes an assessment of pros and cons associated with the alternative for consideration.

Table 9: Mainline Alternative B/Tule Springs Crossing Option 1 Summary		
Facility Segment ID:Description ¹	Pros	Cons
1: 10'x6' RCB @ 2.3% 2: 10'x6' RCB @ 2.3% 3A: 10'x6' RCB @ 1.5% 3B: Concrete Rectangular Channel (15' BW, 6' D, 2:1 SS, 1.5%) 4A&4B: 15'x6' RCB Culvert	▪ Minimized fencing/access ▪ Minimizes culvert crossing size/expense ▪ More useable ground after installation ▪ Open channel most effectively intercepts large surface flows from west at Tule Springs Road ▪ Allows for dual use trail and maintenance access	▪ Higher maintenance cost associated with open channel segment ▪ Open channel portion less favorable to future development of adjacent property
1: See Exhibit K & L.		

4.5 Alternative B/Tule Springs Crossing Option 2

- **Description:** Alternative B and Tule Springs Crossing Option 2 consist of facilities as described in Section 4.1.
- **Design Flow:** Design flows vary between 223 cfs and 1354 cfs along the reach of the alignment as summarized in Table 7.
- **Hydraulic Analysis:** Preliminary normal depth hydraulic computations were performed for each facility. Normal depth computations are included in Appendix C. CCRFCD Manual criteria for freeboard is considered in the sizing of open channel and culvert facilities.

Summary of Assessment: The following table provides a summary of preliminary facility sizes determined for Alternative B and the Tule Springs Crossing Option 2. The table also includes an assessment of pros and cons associated with the alternative for consideration.

Table 10: Mainline Alternative B/Tule Springs Crossing Option 2 Summary		
Facility Segment ID:Description ¹	Pros	Cons
1: 10'x6' RCB @ 2.3% 2: 10'x6' RCB @ 2.3% 3A: 10'x6' RCB @ 1.5% 3B: 10'x6' RCB @ 1.5% 4A: 14'x6' RCB Culvert 4B: 10'x6' RCB @ 1.5%	▪ Minimized fencing/access ▪ Most useable ground after installation ▪ Least Maintenance Cost ▪ Allows for dual use trail and maintenance access	▪ Grading associated with directing surface flows to culvert ▪ Culvert less effective at intercepting surface flows from west at Tule Springs Road ▪ Poor earthwork balance
1: See Exhibit K & L.		

4.6 Alternative C/Tule Springs Crossing Option 3

- **Description:** Alternative C and Tule Springs Crossing Option 3 consist of facilities as described in Section 4.1.
- **Design Flow:** Design flows vary between 1183 cfs and 1354 cfs along the reach of the alignment as summarized in Table 7.
- **Hydraulic Analysis:** Preliminary normal depth hydraulic computations were performed for each facility. Normal depth computations are included in Appendix C. CCRFCD Manual criteria for freeboard is considered in the sizing of open channel and culvert facilities.

Summary of Assessment: The following table provides a summary of preliminary facility sizes determined for Alternative C and the Tule Springs Crossing Option 3. The table also includes an assessment of pros and cons associated with the alternative for consideration.

Table 11: Mainline Alternative C/Tule Springs Crossing Option 3 Summary		
Facility Segment ID:Description¹	Pros	Cons
1: 10'x6' RCB @ 2.3% 2: Concrete Trapezoidal Channel (10' BW, 5'D, 2:1 SS, 2.3%) 3A: Concrete Trapezoidal Channel (10' BW, 6'D, 2:1 SS, 1.5%) 3B: Concrete Trapezoidal Channel (10' BW, 6'D, 2:1 SS, 1.5%) 4A&4B: Triple 10'x7' RCB Culvert	▪ Less expensive than RCB ▪ Open channel most effectively intercepts large surface flows from west at Tule Springs Road ▪ Allows for dual use trail and maintenance access	▪ Culvert facility more expensive ▪ More fencing/access req'd ▪ Higher maintenance cost associated with open channel segment ▪ Open channel portion less favorable to future development of adjacent property
1: See Exhibit K & L.		

4.7 Alternatives Cost Comparison

Estimates of probable cost were performed for each alternative evaluated. The following table provides a comparison of estimated costs. A breakdown of costs for each alternative is included in Appendix D.

Table 12: Mainline Drainage System Alternatives Cost Comparison	
Alternative	Estimate of Probable Cost¹
Alternative A/Tule Springs Crossing Option 3	\$2,867,493
Alternative B/Tule Springs Crossing Option 1	\$3,103,107
Alternative B/Tule Springs Crossing Option 2	\$3,218,667
Alternative C/Tule Springs Crossing Option 3	\$2,184,084
1: See Appendix D for Cost Breakdown.	

5 ALTERNATIVE ASSESSMENT – COLLECTION FACILITIES

5.1 Discussion

This section addresses “local” collection facilities (drop inlets and storm drain laterals) along the BLP mainline facility. More specifically, it addresses local collection facilities at the Brent Lane/Durango Drive intersection and along the paved portion of Brent Lane. Drop inlet and storm drain lateral facilities were preliminarily sized based on the ultimate condition “local” analysis as discussed in Section 3.4. No alternative facility alignments were considered for the local collection facilities as the necessity of drop inlet locations are well established by the existing conditions. Street flow analysis was performed in order to evaluate compliance with street flow criteria in determining the necessity for extension of lateral facilities along Brent Lane and Durango Drive. Since the mainline facility will be extended to the west as a continuation of the regional facility as part of a future project, it was assumed that 100-year flows are cut off at major street intersections with Brent Lane (El Capitan Way and Homestead Road).

5.2 Street Flow Hydraulics

The local storm drain design was initiated by first evaluating street flow hydraulics and assessing the need/location for drop inlets necessary to intercept flow in order to meet CCRFCD street flow criteria. Drop inlets were then provided based on locations where street flow criteria would be exceeded and/or to meet the intent of the 100-year design flow conveyance of the regional facility. Preliminary street flow hydraulic computations are included in Appendix C. The following table provides a summary of 100-year storm event street flow hydraulics.

Table 13: Summary of Street Flow Hydraulics: 100-Year						
Street Section¹	Slope (%)	Cross Slope (%)	Q₁₀₀ (cfs)	D₁₀₀ (ft)	V₁₀₀ (ft/s)	D₁₀₀*V₁₀₀
Durango Drive-Half Street Section 1-W	1.50	2.0	58	0.76	5.27	4.01
Durango Drive-Half Street Section 1-E	1.50	2.0	5	0.37	3.40	1.26
Durango Drive-Half Street Section 2-W	1.50	2.0	77	0.83	5.71	4.74
Durango Drive-Half Street Section 2-E	1.50	2.0	5	0.37	3.38	1.25
Brent Lane-Half Street Section 3-N	1.98	2.0	21	0.31	4.80	1.49
Brent Lane-Half Street Section 3-S	1.98	2.0	12	0.25	4.13	1.03
Brent Lane-Half Street Section 4-N	2.00	2.0	27	0.60	4.68	2.81
Brent Lane-Half Street Section 4-S	2.00	2.0	6	0.38	3.93	1.49
1: See Exhibit L.						

Review of the table above indicates the proposed design will be in compliance with CCRFCD street flow criteria for the 100-year storm event.

Since Durango Drive is a greater than 80-foot right-of-way street, the 10-year CCRFCD criteria must also be met. The following table provides a summary of the 10-year street flow hydraulics along Durango Drive.

Table 14: Summary of Street Flow Hydraulics: 10-Year							
Street Section ¹	Slope (%)	Cross Slope (%)	Q ₁₀ (cfs)	D ₁₀ (ft)	V ₁₀ (ft/s)	D ₁₀ *V ₁₀	10-Year Dry Lane Width (ft)
Durango Drive-Half Street Section 1-W	1.50	2.0	20	0.58	3.94	2.29	23.9
Durango Drive-Half Street Section 1-E	1.50	2.0	3	Dry Lane Met By Inspection			
Durango Drive-Half Street Section 2-W	1.50	2.0	25	0.61	4.13	2.52	21.0
Durango Drive-Half Street Section 2-E	1.50	2.0	3	Dry Lane Met By Inspection			
1: See Exhibit L.							

Review of the table above indicates that 10-year street flow criteria as described in Section 2.3 will be met.

5.3 Summary of Drop Inlets

The following table provides a summary of proposed drop inlets located based on where street flow criteria would be exceeded and/or to meet the intent of the 100-year design flow conveyance of the regional facility. Note that existing drop inlets were utilized if they were determined to be adequate. Preliminary drop inlet computations are included in Appendix C.

Table 15: Summary of Drop Inlets				
Facility ID¹	Size & Type	Total Inflow Q₁₀₀ (cfs)	Collected Q₁₀₀ (cfs)	Bypass Q₁₀₀ (cfs)
DI#1 (continuous)	12-ft Neenah R-3295 (4 Grates)	12	12	0.0
DI#2 (sump)	40-ft CM2	77	77	0.0
DI#3 (continuous)	5-ft CM2	5	5	0.0
DI#4 (sump)	Special Field Inlet 5'l x 3'w	21	21	0.0
DI#5 (sump)	Special Field Inlet 14'l x 3'w	58	58	0.0
DI#6 (sump)	Special Field Inlet 3'l x 3'w	6	6	0.0
1: See Exhibit L.				

5.4 Summary of Storm Drain Laterals

The following table provides a summary of the preliminary lateral storm drain sizes. Lateral storm drain was preliminarily sized based on normal depth full flow capacity computations. Storm drain lateral computations are included in Appendix C.

Table 16: Summary of Storm Drain Lateral Facilities		
Facility ID¹	Facility Description	Design Flow Q₁₀₀ (cfs)
SD#1	24" RCP	12
SD#2	36" RCP	77
SD#3	18" RCP	5
SD#4	36" RCP	82
SD#5	24" RCP	21
SD#6	30" RCP	58
SD#7	18" RCP	5
SD#8	36" RCP	63
SD#9	18" RCP	6
SD#10	24" RCP	27
1: See Exhibit L.		

6 CONCLUSIONS & RECOMMENDATIONS

1. The project site is not located within a FEMA designated SFHA. FEMA acceptance is not required.
2. The project is a planned CCRFCD regional drainage facility, per the CCRFCD 2013 MPU. CCRFCD approval is required.
3. A portion of the project improvements are located within and adjacent to unincorporated Clark County. Clark County approval is required.
4. The primary purpose of this Preliminary Drainage Study is to establish the hydrologic analysis and determine design flows, as well as to evaluate various alternatives. It is the intention of this report to obtain acceptance of the hydrologic analysis performed and to have evaluated an alternative that is acceptable for selection to all affected agencies/entities/owners to progress into the next design phase.
5. It has been determined that the existing storm drain system at the Brent Lane/Durango Drive intersection does **not** provide enough capacity for the surface flow at the intersection to meet CCRFCD Manual criteria during the 100-year and 10-year storm events.
6. The proposed BLP will effectively provide 100-year storm flow interception and conveyance for the street flow in Brent Lane and to accommodate future flows that will be connected to the system in order to meet CCRFCD Manual criteria during the 100-year and 10-year storm events.
7. The accompanying documents within this report support the concepts, drainage patterns, conclusions and/or recommendations discussed.

7 REFERENCES

1. *CCRFCD 2013 Las Vegas Valley Flood Control Master Plan Update*. CCRFCD, 2013.
2. *CLV Northwest Neighborhood Study Phase 2*. September 1999.
3. *Kyle Canyon Master Drainage Study*, G.C. Wallace. October 2006.
4. *Kyle Canyon Master Drainage Study, Addendum #1*, SHG. June 2010.
5. *Kyle Canyon Amendment to the 2008 Las Vegas Valley Master Plan Update*, SHG. May 2013.
6. *Floyd Lamb Park North and South Environmental Enhancement Areas, Final Design Report*, LBG, May 2009.
7. *San Marino Estates III*, GCW. April 2003.
8. *Mystic Valley PH1*, CVL Consultants. July 1996.
9. *Spring Mountain Ranch*, VTN. January 1997.
10. *Iron Mountain Estates* by VTN. April 1999.

11. *Iron Mountain Estates West*, VTN. September 2001.
12. *El Capitan/O'Hare*, VTN. April 2002.
13. *Spring Mountain Ranch Unit 60*, VTN. May 2002.
14. *Hydrologic Criteria and Drainage Design Manual*. Clark County Regional Flood Control District, 1990.

LIST OF APPENDICES

Appendix A Drainage Exhibits

- Exhibit A – Location Map
- Exhibit B – FEMA FIRM Map
- Exhibit C – CCRFCD 2013 MPU Facilities Map
- Exhibit D – CCRFCD 2008 MPU Hydrologic Map
- Exhibit E – NW Neighborhood Study Existing Conditions Exhibit
- Exhibit F – NW Neighborhood Study Future Conditions Exhibit
- Exhibit G1-G3 – Soils Maps
- Exhibit H – Regional Analysis - Existing Conditions Drainage Map
- Exhibit I – Regional Analysis – Ultimate Conditions Drainage Map
- Exhibit J – Local Analysis – Ultimate Conditions Drainage Map
- Exhibit K – Alternatives – Mainline Alignment
- Exhibit L – Alternatives – Collection Facilities

Appendix B Hydrologic Analysis

- Precipitation Data & Computations
- Curve Number Computations
- Lag Time Computations, Standard Form 4
- Regional Analysis – Existing Conditions HEC-1 Model
- Regional Analysis – Ultimate Conditions HEC-1 Model
- Local Analysis – Ultimate Conditions HEC-1 Model

Appendix C Hydraulic Analysis

- Mainline Drainage System – Alternative A & Associated Tule Springs Crossing Collection Options
- Mainline Drainage System – Alternative B & Associated Tule Springs Crossing Collection Options
- Mainline Drainage System – Alternative C & Associated Tule Springs Crossing Collection Options
- Street Flow Computations
- Drop Inlet Computations
- Storm Drain Lateral Computations

Appendix D Estimates of Probable Cost

Appendix E Reference Material

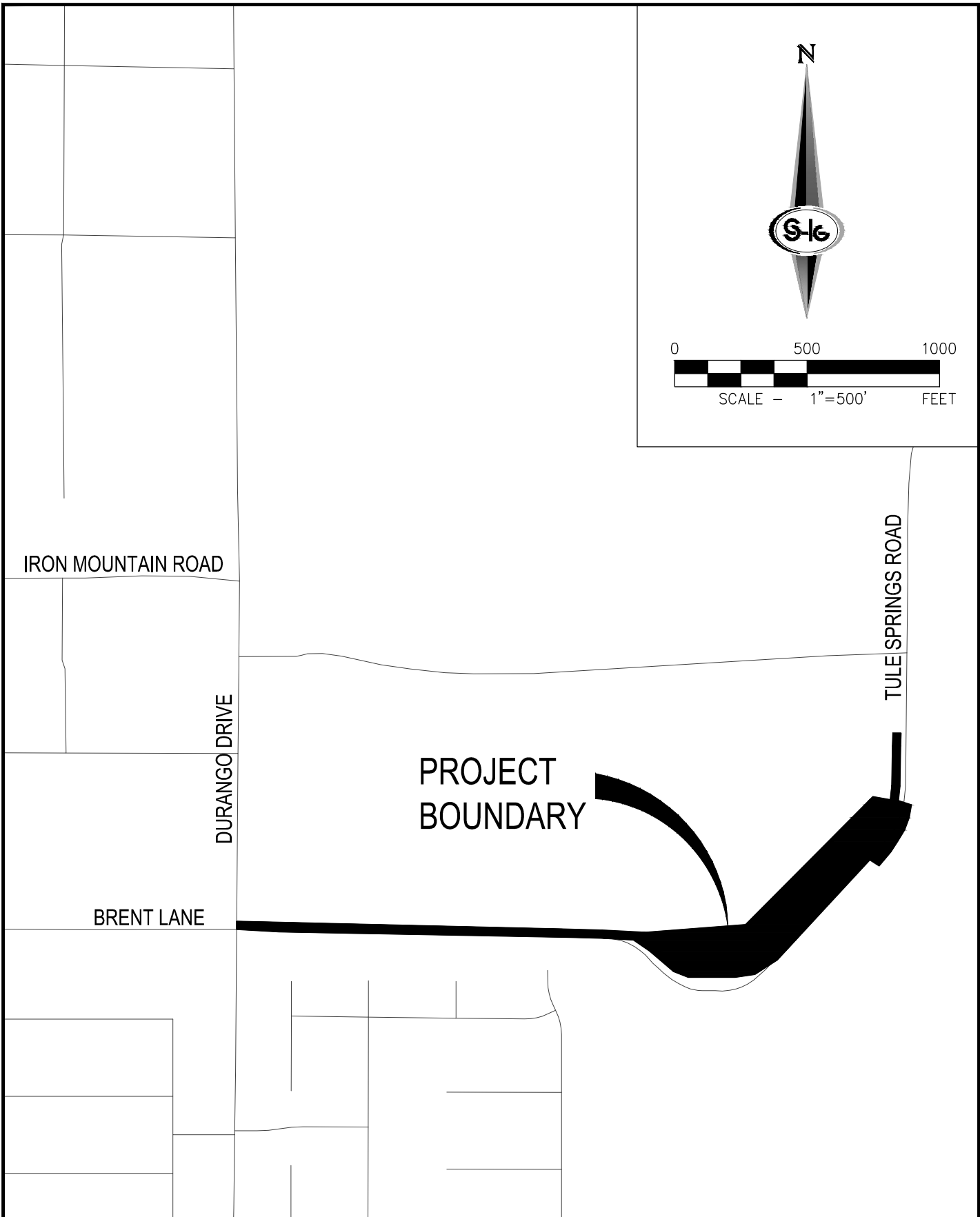
Appendix F Coordination Documents

- CLV/CCRFCD Kickoff Meeting Minutes – March 6, 2014
- CLV Email Correspondence (Trail) – March 11, 2014
- CLV/CCRFCD Progress Meeting #1 Minutes – April 8, 2014
- CLV/CCRFCD Email Correspondence (Hydrology) – April 16, 2014

APPENDIX A

Drainage Exhibits

f:\clv1401 - brent lane\drainage\preliminary report drainage\figures\clv1401-000 exhibit a vicinity map.dwg 4/22/2014 9:30 AM Andrew Howard



 SLATER HANIFAN GROUP CONSULTING ENGINEERS & PLANNERS 5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118 PHONE (702) 284-5300 FAX (702) 284-5399	CITY OF LAS VEGAS		DATE: MAY 2014	PROJECT NO.
	BRENT LANE DRAINAGE SYSTEM & TRAIL		DRAFTER: AJH	CLV1401.000
	LOCATION MAP		DESIGNER: AJH	EXHIBIT A
			CHECKED: MJF	SHEET 1 OF 1

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NFIP

PANEL 1734F

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY,
NEVADA
AND INCORPORATED AREAS

PANEL 1734 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLARK COUNTY	320003	1734	F
LAS VEGAS, CITY OF	325276	1734	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

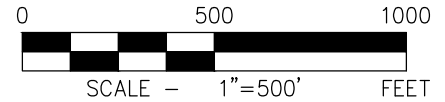


MAP NUMBER
32003C1734F

MAP REVISED
NOVEMBER 16, 2011

Federal Emergency Management Agency

AP AREA SHOWN ON THIS PANEL
OWNSHIP 18 SOUTH, RANGE 60
IP 19 SOUTH, RANGE 60 EAST.



AVENUE

CITY OF LAS VEGAS
325276

CLARK CO
UNINCORPORATED
32000

09

PROJECT
BOUNDARY

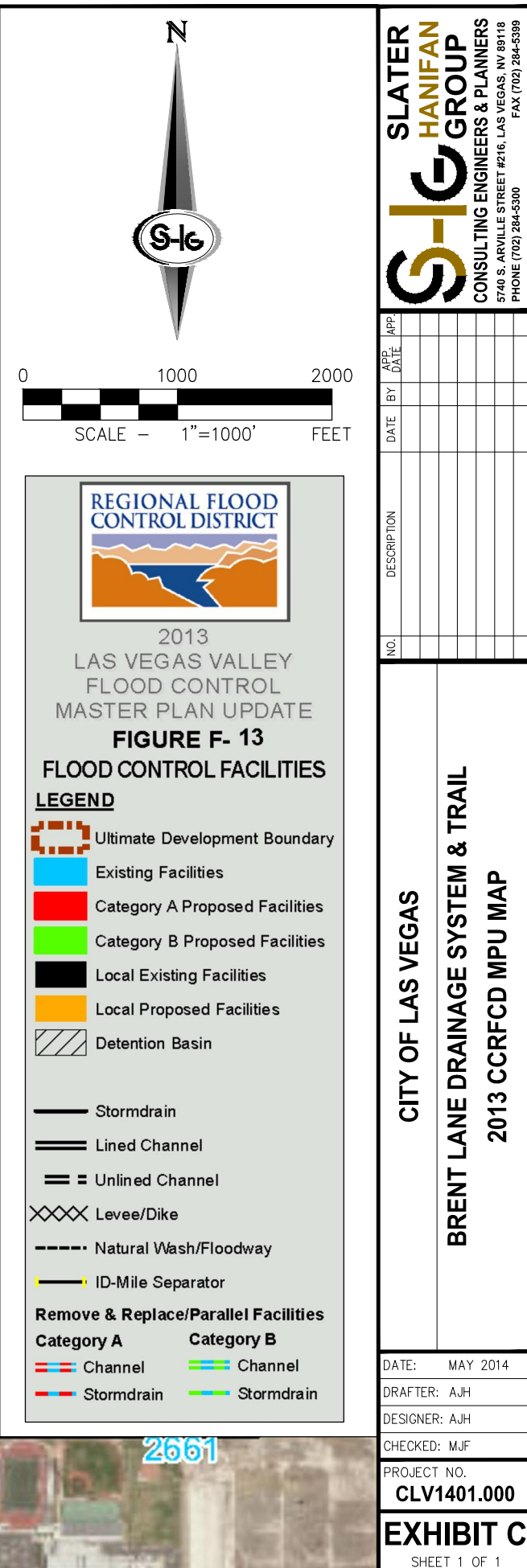
SLATER
HANIFAN
GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

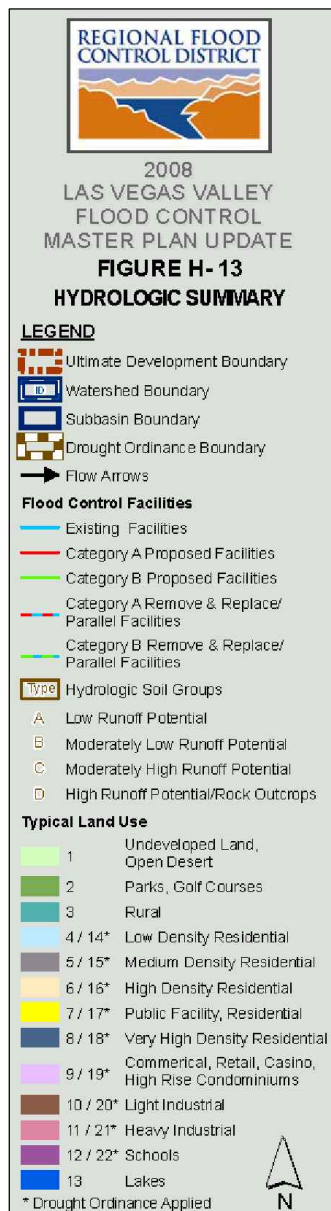
CITY OF LAS VEGAS
BRENT LANE DRAINAGE SYSTEM & TRAIL
FEMA FIRM MAP

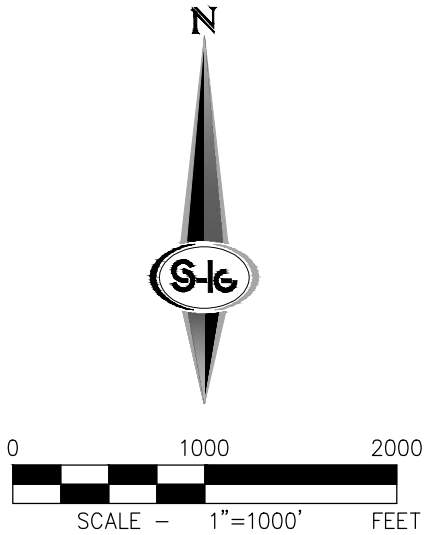
DATE: MAY 2014
DRAFTER: AJH
DESIGNER: AJH
CHECKED: MJF

PROJECT NO.
CLV1401.000
EXHIBIT B
SHEET 1 OF 1

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
BRDB		BRENT DRAINAGE SYSTEM						
0000	E	36" RCP with 18" Orifice Plate	2170	37	BRDB	WEST3	2.48	0.40
0031	E	45,080 cfs PMF Spillway		45080	CBRDB	WEST3	2.48	
0032	E	450 ac-ft South Environmental Enhancement Area		1902	CBRDB	WEST3	2.48	
0033	E	Energy Dissipator	100	957	CNW113-C	WEST3	1.58	
0043	P1	8' X 6' RCB	2920	957	CNW113-C	WEST3	1.58	2.10
0107	P1	8' X 6' RCB	2660	957	CNW113-C	WEST3	1.58	2.40
0157	P1	12' X 6' RCB	1260	741	CNW96-C	WEST3	0.95	0.25







NORTHWEST NEIGHBORHOOD STUDY PHASE 2

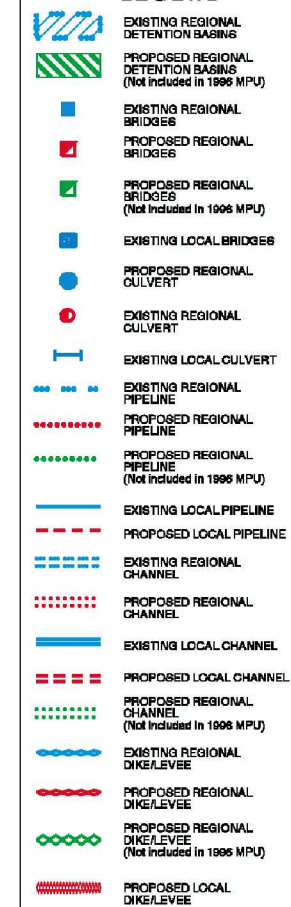
- LEGEND**
- SUB-BASIN BOUNDARY
 - FLOW ARROW
 - 250 10-YEAR STREET FLOW
 - 500 100-YEAR STREET FLOW
 - 300 10-YEAR FACILITY FLOW
 - 800 100-YEAR FACILITY FLOW
 - (FLOWS IN CFS)

BWJS Basin-ID
(13 / 59) Contributing flow
(10-Year / 100-Year)
from the basin (cfs)

PHOTO DATE: SEPTEMBER 1998

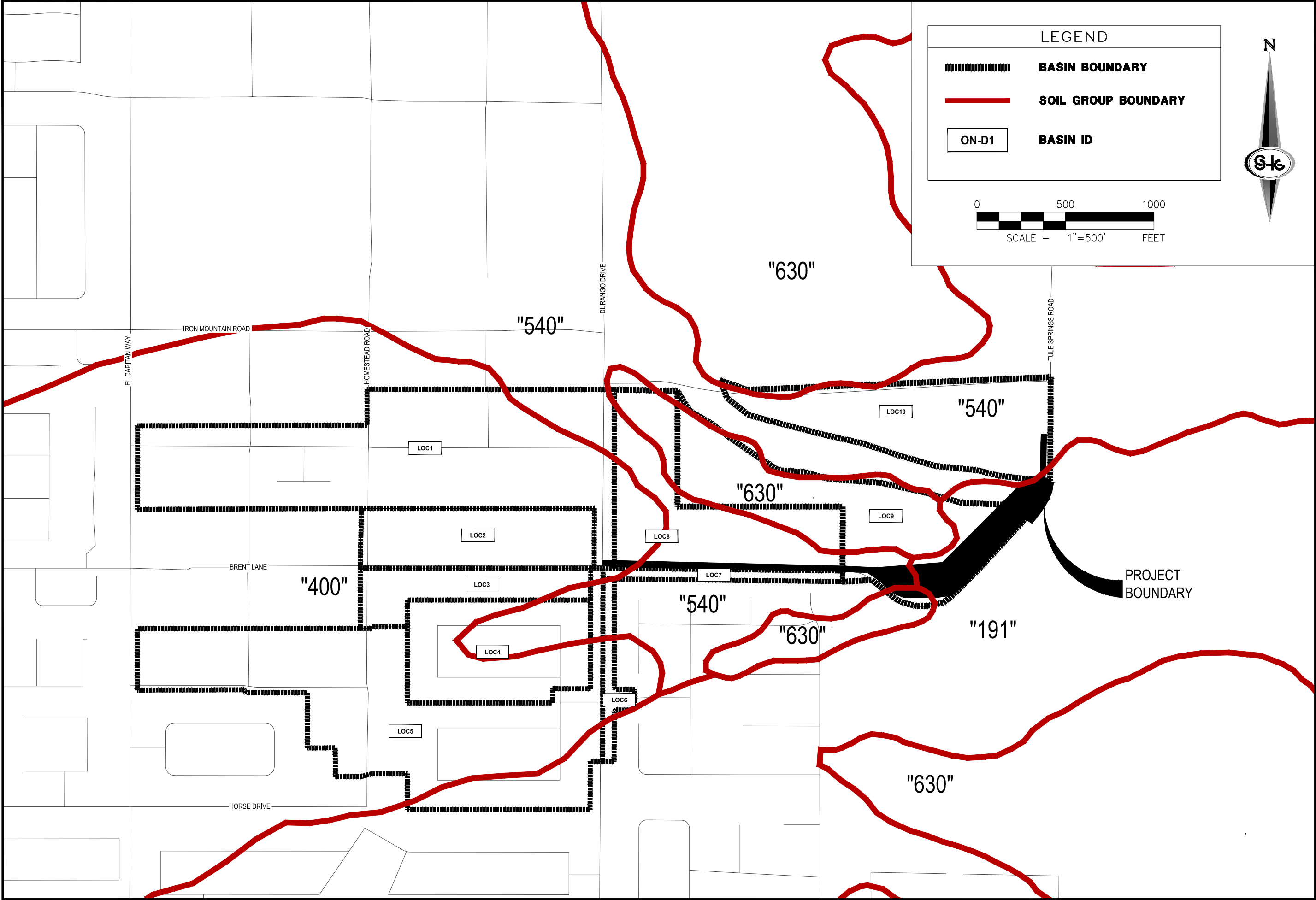
NO.	DESCRIPTION	DATE	BY	APP. DATE	APP.

CITY OF LAS VEGAS BRENT LANE DRAINAGE SYSTEM & TRAIL CLV NORTHWEST NEIGHBORHOOD STUDY EXISTING CONDITION



CITY OF LAS VEGAS BRENT LANE DRAINAGE SYSTEM & TRAIL EXISTING CONDITION SOILS MAP		NO.	DESCRIPTION	DATE	BY	APP. DATE
DATE: MAY 2014		SLATER HANIFAN GROUP CONSULTING ENGINEERS & PLANNERS 5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118 PHONE (702) 284-5300 FAX (702) 284-5399				
DRAFTER: AJH						
DESIGNER: AJH						
CHECKED: MJF						
PROJECT NO. CLV1401.000						
EXHIBIT G1						
SHEET 1 OF 1						

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GROUP

CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

NO.	DESCRIPTION	DATE	BY	APP. DATE

CITY OF LAS VEGAS

BRENT LANE DRAINAGE SYSTEM & TRAIL

ULTIMATE CONDITION LOCAL SOILS MAP

DATE:	MAY 2014
DRAFTER:	AJH
DESIGNER:	AJH
CHECKED:	MJF
PROJECT NO.	CLV1401.000
EXHIBIT G3	SHEET 1 OF 1



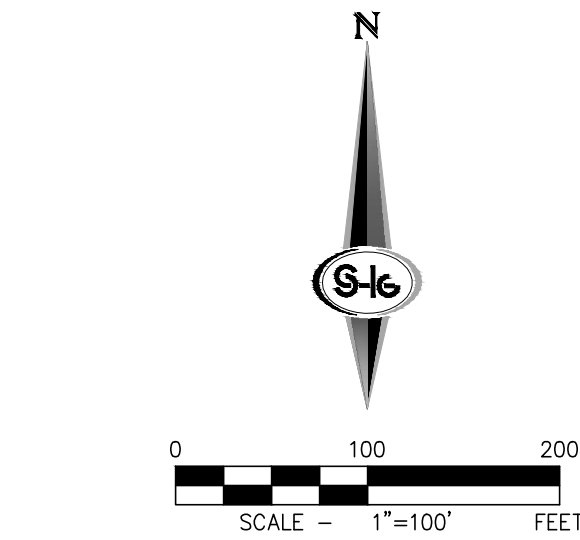


Mainline Alternative A/Tule Springs Crossing Option 3 Summary		
Facility Segment ID:Description	Pros	Cons
1: 10'x6' RCB @ 2.3% 2: 10'x6' RCB @ 2.3% 3A: Concrete Trapezoidal Channel (10' BW, 6' D, 2:1 SS, 1.5%) 3B: Concrete Trapezoidal Channel (10' BW, 6' D, 2:1 SS, 1.5%) 4A&4B: Triple 10"x7' RCB Culvert	- Open channel most effectively intercepts large surface flows from west at Tule Springs Road - Closed conduit adjacent to Brent Lane is favorable to future development of adjacent property - Allows for dual use trail and maintenance access	- Culvert facility more expensive - Higher maintenance cost associated with open channel segment - Open channel portion less favorable to future development of adjacent property

Mainline Alternative B/Tule Springs Crossing Option 2 Summary		
Facility Segment ID:Description	Pros	Cons
1: 10'x6' RCB @ 2.3% 2: 10'x6' RCB @ 2.3% 3A: 10'x6' RCB @ 1.5% 3B: 10'x6' RCB @ 1.5% 4A: 14'x6' RCB Culvert 4B: 10'x6' RCB @ 1.5%	- Minimized fencing/access - Most useable ground after installation - Least Maintenance Cost - Allows for dual use trail and maintenance access	- Grading associated with directing surface flows to culvert - Culvert less effective at intercepting surface flows from west at Tule Springs Road - Poor earthwork balance

Mainline Alternative B/Tule Springs Crossing Option 1 Summary		
Facility Segment ID:Description	Pros	Cons
1: 10'x6' RCB @ 2.3% 2: 10'x6' RCB @ 2.3% 3A: 10'x6' RCB @ 1.5% 3B: Concrete Rectangular Channel (15' BW, 6' D, 2:1 SS, 1.5%) 4A&4B: 15'x6' RCB Culvert	- Minimized fencing/access - Minimizes culvert crossing size/expense - More useable ground after installation - Open channel most effectively intercepts large surface flows from west at Tule Springs Road - Allows for dual use trail and maintenance access	- Higher maintenance cost associated with open channel segment - Open channel portion less favorable to future development of adjacent property

Mainline Alternative C/Tule Springs Crossing Option 3 Summary		
Facility Segment ID:Description	Pros	Cons
1: 10'x6' RCB @ 2.3% 2: Concrete Trapezoidal Channel (10' BW, 5' D, 2:1 SS, 2.3%) 3A: Concrete Trapezoidal Channel (10' BW, 6' D, 2:1 SS, 1.5%) 3B: Concrete Trapezoidal Channel (10' BW, 6' D, 2:1 SS, 1.5%) 4A&4B: Triple 10'x7' RCB Culvert	- Less expensive than RCB - Open channel most effectively intercepts large surface flows from west at Tule Springs Road - Allows for dual use trail and maintenance access	- Culvert facility more expensive - More fencing/access req'd - Higher maintenance cost associated with open channel segment - Open channel portion less favorable to future development of adjacent property



LEGEND	
	MAINLINE ALIGNMENT -ALTERNATIVES A, B & C
	FLOW DIRECTION
	FACILITY SEGMENT
	FACILITY ID

1-NOTE ONLY ONE (1) MAINLINE ALIGNMENT CONSIDERED

I:\CLV1401 - Brent Lane Drainage System and Trail\drainage\figures\clv1401-000 - exhibit k - mainline alignment.dwg 5/6/2014 10:48 AM Andrew Howard

NO.	DESCRIPTION	DATE	BY	APP.	DATE

CITY OF LAS VEGAS

BRENT LANE DRAINAGE SYSTEM AND TRAIL
ALTERNATIVES - MAINLINE ALIGNMENT

DATE: APRIL 2014
DRAFTER: ETM
DESIGNER: MJF
CHECKED: MJF
PROJECT NO. CLV1401-000



APPENDIX B

Hydrologic Analysis

Precipitation Data & Computations

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA (IN INCHES)

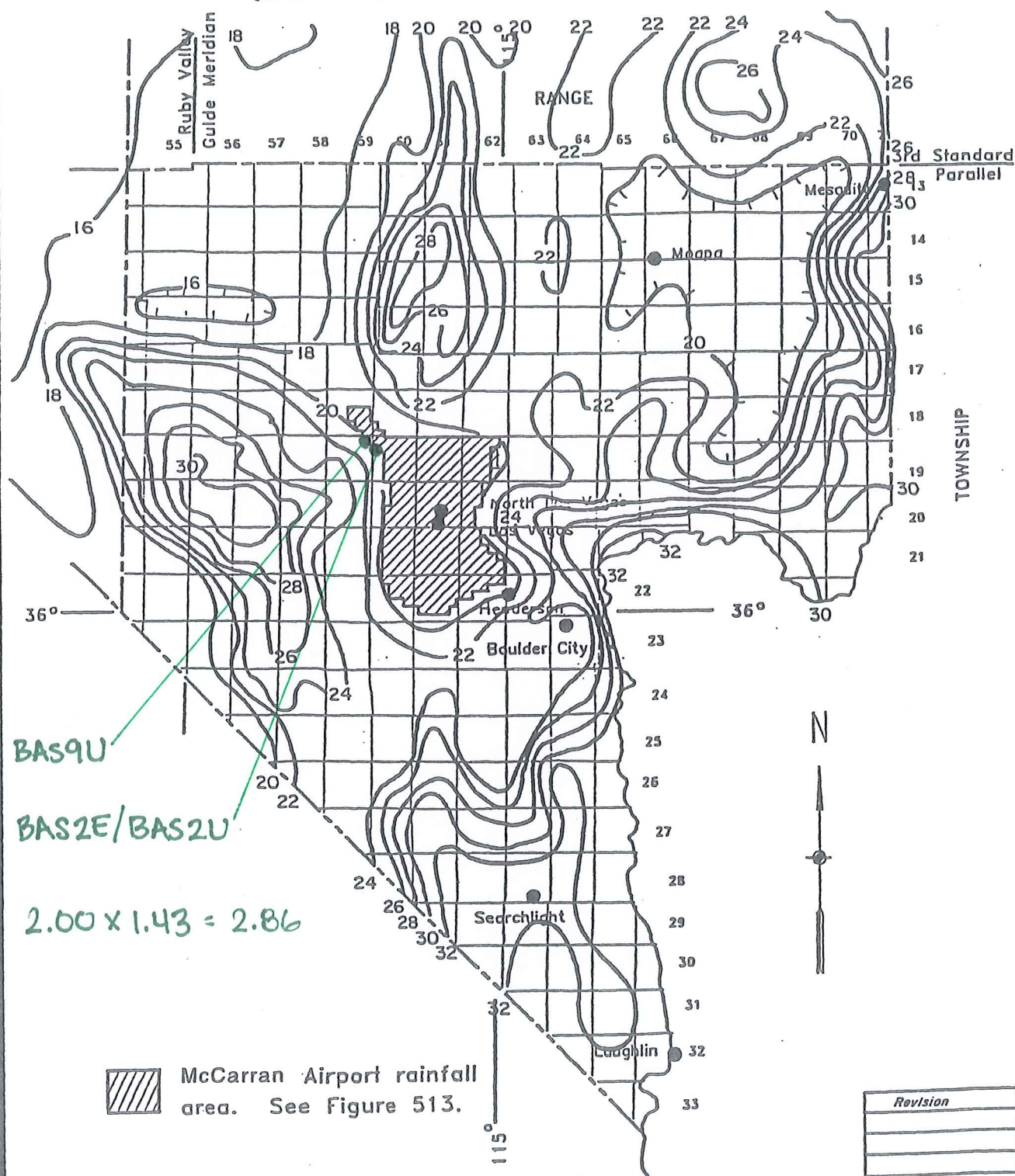
<u>TIME</u>	<u>RECURRENCE INTERVAL</u>					
	<u>2-YR</u>	<u>5-YR</u>	<u>10-YR</u>	<u>25-YR</u>	<u>50-YR</u>	<u>100-YR</u>
5 min.	0.15	0.27	0.35	0.46	0.54	0.63
10 min.	0.25	0.44	0.57	0.74	0.89	1.02
15 min.	0.33	0.57	0.74	0.97	1.15	1.32
30 min.	0.44	0.78	1.01	1.31	1.55	1.79
1 hour	0.52	0.89	1.15	1.50	1.78	2.06
2 hour	0.59	1.01	1.30	1.70	2.01	2.30
3 hour	0.64	1.08	1.39	1.82	2.15	2.48
6 hour	0.72	1.22	1.58	2.05	2.41	2.77
24 hour (TR-55)	1.20	1.60	1.80	2.40	2.70	2.96

- NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.
2. The 24 hour values presented above are for use with TR-55 only.
3. Table 501 adjustments not required.

<i>Revision</i>	<i>Date</i>

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RAINFALL DEPTH-DURATION-FREQUENCY 100-YEAR, 6-HOUR (DEPTHS IN TENTHS OF INCHES)



Revision	Date

PRECIPITATION ADJUSTMENT RATIOS

<u>Recurrence Interval</u>	<u>Ratio to NOAA Atlas 2</u>
2-year	1.00
5-year	1.16
10-year	1.24
25-year	1.33
50-year	1.39
100-year	1.43

- NOTE: 1. Multiply the values obtained from the NOAA Atlas 2 by the above ratios to obtain the adjusted precipitation values.
2. NOAA Atlas 2 values for use with TR-55 shall not be adjusted by the above ratios.
3. Tables 505 and 506 require no adjustments.

<i>Revision</i>	<i>Date</i>

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX-HOUR STORM DISTRIBUTIONS

Percent of Total Storm Depth				Percent of Total Storm Depth			
Storm Time (In Minutes)	SDN3	SDN4	SDN5	Storm Time (In Minutes)	SDN3	SDN4	SDN5
0	0.0	0.0	0.0	185	32.2	37.6	43.0
5	2.0	2.0	2.0	190	35.2	41.5	47.7
10	5.7	5.8	5.9	195	40.9	46.2	51.4
15	7.0	7.5	8.0	200	49.9	53.0	56.1
20	8.7	9.9	11.0	205	59.0	61.0	63.0
25	10.8	12.6	14.4	210	71.0	71.0	71.0
30	12.4	13.7	15.0	215	74.4	73.2	72.0
35	13.0	14.5	16.0	220	78.1	75.6	73.1
40	13.0	14.9	16.8	225	81.2	78.2	75.2
45	13.0	15.1	17.1	230	81.9	79.9	77.9
50	13.0	15.5	18.0	235	83.5	81.3	79.0
55	13.0	15.6	18.2	240	85.1	82.3	79.5
60	13.0	15.9	18.7	245	85.6	83.0	80.4
65	13.3	16.2	19.0	250	86.0	83.5	81.0
70	14.0	16.9	19.7	255	86.8	84.4	82.0
75	14.2	17.2	20.2	260	87.6	85.1	82.6
80	14.8	17.9	21.0	265	88.8	86.4	84.0
85	15.8	18.9	22.0	270	91.0	88.5	85.9
90	17.2	20.1	23.0	275	92.6	90.8	88.9
95	18.1	21.1	24.1	280	93.7	92.4	91.0
100	19.0	22.0	25.0	285	95.0	94.4	93.8
105	19.7	22.8	25.9	290	97.0	96.8	96.6
110	19.9	23.2	26.5	295	97.6	97.3	97.0
115	20.0	24.0	28.0	300	98.2	97.8	97.4
120	20.1	24.6	29.0	305	98.5	98.2	97.9
125	20.4	25.2	30.0	310	98.7	98.4	98.1
130	21.4	26.0	30.5	315	98.9	98.6	98.3
135	22.9	26.9	30.9	320	99.0	98.8	98.5
140	24.1	27.6	31.0	325	99.3	99.1	98.9
145	24.9	28.3	31.7	330	99.3	99.2	99.0
150	25.1	28.6	32.1	335	99.4	99.3	99.2
155	25.6	29.2	32.7	340	99.5	99.4	99.3
160	27.0	30.2	33.3	345	99.8	99.7	99.6
165	27.8	31.2	34.6	350	99.8	99.8	99.7
170	28.1	32.1	36.1	355	99.9	99.9	99.9
175	28.3	33.2	38.1	360	100.0	100.0	100.0
180	29.5	35.2	40.8				

- Notes: 1. For drainage areas less than 8 square miles in size, use SDN 3.
 2. For drainage areas greater than or equal to 8 square miles and less than 12 square miles in size, use SDN 4.
 3. For drainage areas greater than or equal to 12 square miles, use SDN 5.
 4. A graphical representation of these values is presented on Figure 515.

Revision	Date

REFERENCE:

TABLE 503

Curve Number Computations

Soil & Curve Number Computation

Project Name: Brent Lane Drainage System & Trail

Date: May 2014

File Name: CLV1401 Curve Number Calcs.xlsx

By: AJH/KC

Data:

Reference:

Soil Type & Description	A	B	C	D
191 Dalian very cobbly fine sandy loam, 2 to 8 percent slopes	5%	85%	0%	10%
400 Tencee very gravelly fine sandy loam, 2 to 8 percent slopes	0%	10%	0%	90%
540 Weiser extremely gravelly fine sandy loam, 2 to 8 percent slopes	5%	85%	0%	10%
630 Badland	0%	0%	0%	100%

Exhibit G
SCS Soil Data

Land Use	A	B	C	D
Desert Shrub (good)	49	68	79	84
Residential (40,000 sf)	51	68	79	84
Desert Shrub (good)	49	68	79	84
Gravel	76	85	89	91
Industrial	81	88	91	93
Open Space (poor)	68	79	86	89
Roadway	98	98	98	98
Roadway	98	98	98	98

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS1E	540	96.7%	Desert Shrub (poor)	5%	85%	0%	10%	63	77	85	88	98.40	74.81
	540	3.3%	Roadway	5%	85%	0%	10%	98	98	98	98	3.41	3.28
TOTAL PERCENT		100.0%	TOTAL AREA									101.81	78.09

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS2E	400	71.2%	Desert Shrub (poor)	0%	10%	0%	90%	63	77	85	88	23.02	61.86
	400	28.8%	Roadway	0%	10%	0%	90%	98	98	98	98	9.32	28.24
TOTAL PERCENT		100.0%	TOTAL AREA									32.34	90.10

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS3E	540	31.3%	Residential (<6,000 sf)	5%	85%	0%	10%	89	92	94	95	25.06	28.82
	540	18.7%	Residential (7,000 sf)	5%	85%	0%	10%	76	84	89	91	14.95	15.73
	540	41.7%	Residential (10,000 sf)	5%	85%	0%	10%	61	75	83	87	33.42	31.49
	540	8.4%	Roadway	5%	85%	0%	10%	98	98	98	98	6.71	8.21
TOTAL PERCENT		100.0%	TOTAL AREA									80.14	84.23

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS4E	400	35.8%	Residential (<6,000 sf)	0%	10%	0%	90%	89	92	94	95	31.25	33.92
	400	1.7%	Residential (14,000 sf)	0%	10%	0%	90%	57	72	81	86	1.51	1.46
	400	0.4%	Roadway	0%	10%	0%	90%	98	98	98	98	0.33	0.37
	540	14.2%	Residential (<6,000 sf)	5%	85%	0%	10%	89	92	94	95	12.40	13.10
	540	26.6%	Residential (10,000 sf)	5%	85%	0%	10%	61	75	83	87	23.23	20.10
	540	14.8%	Residential (14,000 sf)	5%	85%	0%	10%	57	72	81	86	12.90	10.74
	540	6.5%	Roadway	5%	85%	0%	10%	98	98	98	98	5.63	6.32
TOTAL PERCENT		100.0%	TOTAL AREA									87.25	86.02

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS5E	400	72.8%	Residential (<6,000 sf)	0%	10%	0%	90%	89	92	94	95	41.15	68.92
	400	7.5%	Residential (6,000 sf)	0%	10%	0%	90%	80	87	90	92	4.26	6.89
	400	10.6%	Residential (10,000 sf)	0%	10%	0%	90%	61	75	83	87	6.00	9.11
	400	9.1%	Roadway	0%	10%	0%	90%	98	98	98	98	5.13	8.89
TOTAL PERCENT		100.0%	TOTAL AREA									56.54	93.81

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS6E	400	3.2%	Commercial	0%	10%	0%	90%	89	92	94	95	3.37	3.06
	400	11.2%	Residential (20,000 sf)	0%	10%	0%	90%	54	70	80	85	11.67	9.35
	400	1.2%	Roadway	0%	10%	0%	90%	98	98	98	98	1.27	1.19
	540	12.4%	Commercial	5%	85%	0%	10%	89	92	94	95	12.89	11.39
	540	60.4%	Residential (20,000 sf)	5%	85%	0%	10%	54	70	80	85	62.97	42.70
	540	11.6%	Roadway	5%	85%	0%	10%	98	98	98	98	12.08	11.36
TOTAL PERCENT		100.0%	TOTAL AREA									104.25	79.06

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS7E	191	3.8%	Residential (10,000 sf)	5%	85%	0%	10%	61	75	83	87	4.70	2.86
	191	0.5%	Roadway	5%	85%	0%	10%	98	98	98	98	0.57	0.45
	400	17.9%	Residential (10,000 sf)	0%	10%	0%	90%	61	75	83	87	22.19	15.35
	400	64.3%	Residential (20,000 sf)	0%	10%	0%	90%	54	70	80	85	79.70	53.66
	400	6.7%	Roadway	0%	10%	0%	90%	98	98	98	98	8.26	6.53
	540	3.6%	Residential (10,000 sf)	5%	85%	0%	10%	61	75	83	87	4.50	2.74
	540	1.8%	Residential (20,000 sf)	5%	85%	0%	10%	54	70	80	85	2.19	1.25
	540	1.5%	Roadway	5%	85%	0%	10%	98	98	98	98	1.90	1.50
TOTAL PERCENT		100.0%						TOTAL AREA				124.01	84.35

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS8E	191	8.4%	Desert Shrub (poor)	5%	85%	0%	10%	63	77	85	88	5.86	6.48
	400	5.1%	Desert Shrub (poor)	0%	10%	0%	90%	63	77	85	88	3.59	4.46
	400	0.4%	Roadway	0%	10%	0%	90%	98	98	98	98	0.25	0.35
	540	56.7%	Desert Shrub (poor)	5%	85%	0%	10%	63	77	85	88	39.71	43.91
	540	3.8%	Roadway	5%	85%	0%	10%	98	98	98	98	2.69	3.77
	630	25.6%	Desert Shrub (poor)	0%	0%	0%	100%	63	77	85	88	17.90	22.50
TOTAL PERCENT		100.0%						TOTAL AREA				70.00	81.46

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS1U	400	0.7%	Commercial	0%	10%	0%	90%	89	92	94	95	1.48	0.62
	400	0.2%	Paved Open Ditches	0%	10%	0%	90%	83	89	92	93	0.55	0.23
	400	5.5%	Residential (<6,000 sf)	0%	10%	0%	90%	89	92	94	95	12.43	5.22
	400	0.8%	Roadway	0%	10%	0%	90%	98	98	98	98	1.86	0.81
	540	10.5%	Commercial	5%	85%	0%	10%	89	92	94	95	23.66	9.67
	540	3.5%	Open Space (fair)	5%	85%	0%	10%	49	69	79	84	7.90	2.43
	540	1.9%	Paved Open Ditches	5%	85%	0%	10%	83	89	92	93	4.34	1.71
	540	30.8%	Residential (<6,000 sf)	5%	85%	0%	10%	89	92	94	95	69.50	28.40
	540	31.7%	Residential (8,000 sf)	5%	85%	0%	10%	73	82	88	90	71.59	26.14
	540	14.3%	Roadway	5%	85%	0%	10%	98	98	98	98	32.23	14.00
TOTAL PERCENT		100.0%						TOTAL AREA				225.54	89.23

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS2U	400	53.7%	Commercial	0%	10%	0%	90%	89	92	94	95	49.90	50.90
	400	16.3%	Paved Open Ditches	0%	10%	0%	90%	83	89	92	93	15.17	15.13
	400	9.7%	Residential (<6,000 sf)	0%	10%	0%	90%	89	92	94	95	8.97	9.15
	400	20.2%	Roadway	0%	10%	0%	90%	98	98	98	98	18.80	19.84
TOTAL PERCENT		100.0%						TOTAL AREA				92.84	95.03

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS3U	540	31.3%	Residential (<6,000 sf)	5%	85%	0%	10%	89	92	94	95	25.12	28.88
	540	18.7%	Residential (7,000 sf)	5%	85%	0%	10%	76	84	89	91	14.95	15.73
	540	41.7%	Residential (10,000 sf)	5%	85%	0%	10%	61	75	83	87	33.41	31.48
	540	8.3%	Roadway	5%	85%	0%	10%	98	98	98	98	6.66	8.14
TOTAL PERCENT		100.0%						TOTAL AREA				80.14	84.23

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS4U	400	35.8%	Residential (<6,000 sf)	0%	10%	0%	90%	89	92	94	95	31.25	33.92
	400	1.7%	Residential (14,000 sf)	0%	10%	0%	90%	57	72	81	86	1.51	1.46
	400	0.3%	Roadway	0%	10%	0%	90%	98	98	98	98	0.30	0.34
	540	14.2%	Residential (<6,000 sf)	5%	85%	0%	10%	89	92	94	95	12.40	13.10
	540	26.7%	Residential (10,000 sf)	5%	85%	0%	10%	61	75	83	87	23.26	20.13
	540	14.8%	Residential (14,000 sf)	5%	85%	0%	10%	57	72	81	86	12.90	10.74
	540	6.5%	Roadway	5%	85%	0%	10%	98	98	98	98	5.63	6.32
TOTAL PERCENT		100.0%						TOTAL AREA				87.25	86.01

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS5U	400	72.8%	Residential (<6,000 sf)	0%	10%	0%	90%	89	92	94	95	41.15	68.92
	400	10.6%	Residential (6,000 sf)	0%	10%	0%	90%	80	87	90	92	6.01	9.73
	400	7.5%	Residential (10,000 sf)	0%	10%	0%	90%	61	75	83	87	4.26	6.46
	400	9.1%	Roadway	0%	10%	0%	90%	98	98	98	98	5.12	8.87
TOTAL PERCENT		100.0%						TOTAL AREA				56.54	93.99

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		

BAS6U	400	3.6%	Commercial	0%	10%	0%	90%	89	92	94	95	3.85	3.37
	400	12.9%	Residential (20,000 sf)	0%	10%	0%	90%	54	70	80	85	13.92	10.74
	400	1.6%	Roadway	0%	10%	0%	90%	98	98	98	98	1.77	1.60
	540	12.3%	Commercial	5%	85%	0%	10%	89	92	94	95	13.37	11.38
	540	58.5%	Residential (20,000 sf)	5%	85%	0%	10%	54	70	80	85	63.36	41.38
	540	11.1%	Roadway	5%	85%	0%	10%	98	98	98	98	11.99	10.85
TOTAL PERCENT		100.0%						TOTAL AREA				108.26	79.32

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS7U	191	3.9%	Residential (10,000 sf)	5%	85%	0%	10%	61	75	83	87	4.70	2.91
	191	0.5%	Roadway	5%	85%	0%	10%	98	98	98	98	0.57	0.46
	400	18.8%	Residential (10,000 sf)	0%	10%	0%	90%	61	75	83	87	22.97	16.17
	400	64.7%	Residential (20,000 sf)	0%	10%	0%	90%	54	70	80	85	78.82	53.99
	400	5.7%	Roadway	0%	10%	0%	90%	98	98	98	98	6.94	5.58
	540	3.7%	Residential (10,000 sf)	5%	85%	0%	10%	61	75	83	87	4.52	2.80
	540	1.9%	Residential (20,000 sf)	5%	85%	0%	10%	54	70	80	85	2.26	1.31
	540	0.9%	Roadway	5%	85%	0%	10%	98	98	98	98	1.13	0.91
TOTAL PERCENT		100.0%						TOTAL AREA				121.91	84.12

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS8U	191	8.2%	Open Space (poor)	5%	85%	0%	10%	68	79	86	89	5.85	6.55
	400	3.6%	Open Space (poor)	0%	10%	0%	90%	68	79	86	89	2.58	3.20
	400	0.3%	Roadway	0%	10%	0%	90%	98	98	98	98	0.18	0.25
	540	53.2%	Open Space (poor)	5%	85%	0%	10%	68	79	86	89	37.78	42.27
	540	9.7%	Roadway	5%	85%	0%	10%	98	98	98	98	6.91	9.54
	630	24.9%	Open Space (poor)	0%	0%	0%	100%	68	79	86	89	17.70	22.18
	630	0.0%	Roadway	0%	0%	0%	100%	98	98	98	98	0.01	0.01
TOTAL PERCENT		100.0%						TOTAL AREA				71.01	84.00

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS9U	540	12.8%	Desert Shrub (poor)	5%	85%	0%	10%	63	77	85	88	7.94	9.92
	540	87.2%	Paved Open Ditches	5%	85%	0%	10%	83	89	92	93	54.03	77.68
TOTAL PERCENT		100.0%						TOTAL AREA				61.97	87.60

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
BAS10U	540	66.2%	Residential (<6,000 sf)	5%	85%	0%	10%	89	92	94	95	54.84	61.00
	540	25.4%	Residential (7,000 sf)	5%	85%	0%	10%	76	84	89	91	21.00	21.37
	540	8.5%	Roadway	5%	85%	0%	10%	98	98	98	98	7.00	8.28
TOTAL PERCENT		100.0%						TOTAL AREA				82.84	90.65

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
LOC1	400	86.9%	Residential (20,000 sf)	0%	10%	0%	90%	54	70	80	85	31.70	72.54
	400	4.7%	Roadway	0%	10%	0%	90%	98	98	98	98	1.70	4.57
	540	6.0%	Residential (20,000 sf)	5%	85%	0%	10%	54	70	80	85	2.18	4.22
	540	2.5%	Roadway	5%	85%	0%	10%	98	98	98	98	0.91	2.44
TOTAL PERCENT		100.0%						TOTAL AREA				36.49	83.77

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
LOC2	400	90.9%	Residential (20,000 sf)	0%	10%	0%	90%	54	70	80	85	9.28	75.89
	400	9.1%	Roadway	0%	10%	0%	90%	98	98	98	98	0.93	8.93
TOTAL PERCENT		100.0%						TOTAL AREA				10.21	84.82

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
LOC3	400	79.7%	Residential (20,000 sf)	0%	10%	0%	90%	54	70	80	85	5.03	66.56
	400	14.7%	Roadway	0%	10%	0%	90%	98	98	98	98	0.93	14.44
	540	5.5%	Residential (20,000 sf)	5%	85%	0%	10%	54	70	80	85	0.35	3.92
TOTAL PERCENT		100.0%						TOTAL AREA				6.31	84.93

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
LOC4	400	70.0%	Residential (10,000 sf)	0%	10%	0%	90%	61	75	83	87	9.39	60.03
	540	30.0%	Residential (10,000 sf)	5%	85%	0%	10%	61	75	83	87	4.03	22.67
TOTAL PERCENT		100.0%						TOTAL AREA				13.42	82.71

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
LOC5	191	13.4%	Residential (10,000 sf)	5%	85%	0%	10%	61	75	83	87	4.62	10.14
	191	0.9%	Roadway	5%	85%	0%	10%	98	98	98	98	0.30	0.85

400	29.2%	Residential (10,000 sf)	0%	10%	0%	90%	61	75	83	87	10.04	25.03
400	52.3%	Residential (20,000 sf)	0%	10%	0%	90%	54	70	80	85	18.00	43.68
400	2.7%	Roadway	0%	10%	0%	90%	98	98	98	98	0.92	2.62
540	1.5%	Roadway	5%	85%	0%	10%	98	98	98	98	0.53	1.51
TOTAL PERCENT		100.0%	TOTAL AREA								34.41	83.83

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
LOC6	191	19.0%	Roadway	5%	85%	0%	10%	98	98	98	98	0.35	18.64
	400	54.3%	Roadway	0%	10%	0%	90%	98	98	98	98	1.00	53.26
	540	26.6%	Roadway	5%	85%	0%	10%	98	98	98	98	0.49	26.10
TOTAL PERCENT		100.0%		TOTAL AREA								1.84	98.00

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
LOC7	400	8.6%	Roadway	0%	10%	0%	90%	98	98	98	98	0.16	8.39
	540	91.4%	Roadway	5%	85%	0%	10%	98	98	98	98	1.71	89.61
TOTAL PERCENT		100.0%	TOTAL AREA								1.87	98.00	

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
LOC8	400	17.6%	Open Space (poor)	0%	10%	0%	90%	68	79	86	89	2.80	15.46
	540	54.8%	Open Space (poor)	5%	85%	0%	10%	68	79	86	89	8.73	43.51
	630	27.7%	Open Space (poor)	0%	0%	0%	100%	68	79	86	89	4.41	24.62
TOTAL PERCENT		100.0%		TOTAL AREA								15.94	83.59

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
LOC9	191	23.1%	Open Space (poor)	5%	85%	0%	10%	68	79	86	89	4.21	18.38
	540	9.6%	Open Space (poor)	5%	85%	0%	10%	68	79	86	89	1.74	7.60
	630	67.3%	Open Space (poor)	0%	0%	0%	100%	68	79	86	89	12.25	59.90
TOTAL PERCENT		100.0%								TOTAL AREA	18.20		85.88

BASIN ID	SOIL TYPE	SUBAREA	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA	CALCULATED
		PERCENT		A	B	C	D	A	B	C	D	ACRES	
LOC10	400	100.0%	Open Space (poor)	0%	10%	0%	90%	68	79	86	89	15.64	88.00
TOTAL PERCENT		100.0%	TOTAL AREA								15.64	88.00	

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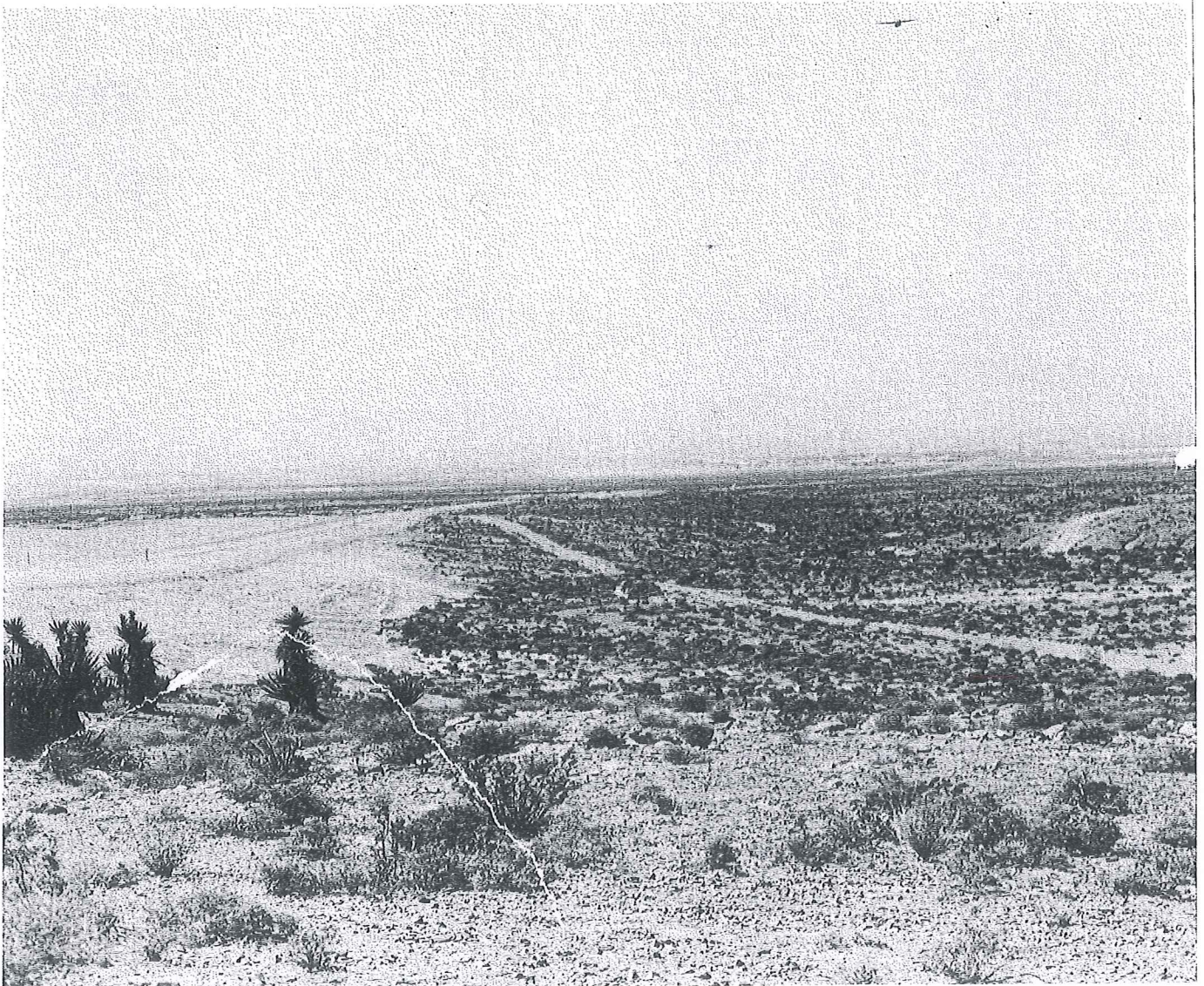
United States
Department of
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Soil
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In cooperation with
United States Department
of the Interior, Bureau
of Land Management, and
University of Nevada
Agricultural Experiment
Station

Soil Survey of Las Vegas Valley Area Nevada

Part of Clark County



sandy loam about 4 inches thick. The upper 7 inches of the underlying material is light yellowish brown extremely gravelly fine sandy loam, the next 6 inches is light yellowish brown very gravelly sandy loam, and the lower part to a depth of 61 inches is light yellowish brown extremely gravelly fine sandy loam. Pebbles cover 50 to 75 percent of the surface.

Included in this unit are about 5 percent Tencee soils on erosional fan remnants and 10 percent Arizo soils, flooded, in channels. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Dalian soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban development.

This unit is well suited to the construction of dwellings.

Septic tank absorption fields generally function well unless the density of housing is too high.

Roads are easily constructed and maintained.

The main limitation for lawns and landscaping is the pebbles on the surface and throughout the soil. Topsoil is needed for best results when landscaping, particularly in areas used for lawns. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

Intermittent streams form the drainageways in this unit. These drainageways are subject to rare or occasional periods of high-velocity flooding. Care should be taken during urbanization to accommodate the runoff from the drainageways. If drains become plugged during a major flood, accelerated erosion and damage to roads, buildings, and other structures can occur.

This map unit is in capability subclasses IVs, irrigated, and VIIs, nonirrigated. It is in horticultural group 2.

* ^B
191—Dalian very cobbly fine sandy loam, 2 to 8 percent slopes. This very deep, well drained soil is on fan skirts. It formed in alluvium derived dominantly from limestone and dolomite.

Typically, about 85 percent of the surface is covered with a desert pavement of rock fragments. The surface layer is light yellowish brown very cobbly fine sandy loam about 5 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown very gravelly sandy loam to extremely gravelly fine sandy loam.

Included in this unit are about 10 percent ^DTencee soils on erosional fan remnants and 5 percent Arizo soils, flooded, in channels. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Dalian soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate if the surface is disturbed. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

Most areas of this unit are used as habitat for desert wildlife and for recreation. A few areas are used for urban development.

The main limitation for construction of dwellings is the hazard of flooding. Dikes and channels that have outlets for floodwater can be used to protect buildings from flooding.

Dikes and channels that have outlets for floodwater can be used to protect onsite sewage disposal systems from flooding.

Channeling and deposition can be minimized and maintenance costs reduced by protecting roads from flooding.

The main limitations for lawns and landscaping are the cobbles and pebbles on the surface and throughout the soil. Topsoil is needed for best results when landscaping, particularly in areas used for lawns. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

This map unit is in capability subclass VIIs, nonirrigated, and in horticultural group 2.

192—Dalian-McCullough complex, 0 to 4 percent slopes. This map unit is on fan skirts.

This unit is 55 percent Dalian very gravelly fine sandy loam, 0 to 4 percent slopes, and 35 percent McCullough very gravelly very fine sandy loam, gravelly substratum, 0 to 4 percent slopes. Both the Dalian and McCullough soils are on alluvial fan skirts. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Las Vegas soils on basin floor remnants and 5 percent Tencee soils on erosional fan remnants. Included areas make up about 10 percent of the total acreage.

The Dalian soil is very deep and well drained. It formed in alluvium derived from various kinds of rock. Typically, about 75 percent of the surface is covered with a desert pavement of pebbles. The surface layer is light yellowish brown very gravelly fine sandy loam about 5 inches thick. The underlying material to a depth of 60 inches or more is light yellowish brown very gravelly sandy loam.

Permeability of the Dalian soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is

Because of the content of gypsum and other salts in the soil, salt-tolerant plants should be selected for lawns and landscaping. Because of the underlying hardpan, deep cuts should be avoided on this soil. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

This map unit is in capability subclasses IIIs, irrigated, and VIIs, nonirrigated. It is in horticultural group 6.

390—Spring clay loam. This very deep, moderately well drained soil is on alluvial flats. It formed in gypsiferous lacustrine sediment. Slope is 0 to 2 percent.

Typically, the surface layer is pale brown clay loam about 5 inches thick. The underlying material to a depth of 60 inches or more is stratified, light brown to pink silt loam to silty clay, averaging silty clay loam, and contains many gypsum crystals.

Included in this unit are about 10 percent Land soils on alluvial flats and 5 percent Las Vegas soils on relict alluvial flats. Included areas make up about 15 percent of the total acreage.

Permeability of the Spring soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are common along streambanks. This soil is strongly affected by salts to a depth of 5 inches, and it is moderately affected below this depth.

This unit is used mainly for urban development. It is also used as habitat for desert wildlife and for recreation.

The main limitation for construction of dwellings is the hazard of flooding. Dikes and channels that have outlets for floodwater can be used to protect buildings from flooding. Gypsum in the soil can induce electrochemical action that corrodes concrete. This limitation can be overcome by using cement that is resistant to sulfate corrosion.

The main limitation for septic tank absorption fields is restricted permeability. Special design of septic tank absorption fields is needed. Using long absorption lines and backfilling the trench with sandy material help to compensate for the restricted permeability.

The Spring soil is limited for roads because of limited ability to support a load. Roads and streets should be designed to compensate for the instability of the soil.

The main limitation for lawns and landscaping is the excess soluble salts in the soil. Intensive management is required to reduce the salinity and maintain soil productivity. Excess salts in the soil can be flushed out by using heavy periodic applications of water. Because of the content of gypsum and other salts in the soil, salt-tolerant plants should be selected.

This map unit is in capability subclasses VIIs, irrigated, and VIIs, nonirrigated. It is in horticultural group 4.



400—Tencee very gravelly fine sandy loam, 2 to 8 percent slopes. This shallow, well drained soil is on erosional fan remnants. It formed in alluvium derived dominantly from limestone and dolomite.

Typically, 75 percent of the surface is covered with a well developed desert pavement of pebbles. There is a dark desert varnish on the exposed surfaces of the rock fragments. The surface layer is light brown very gravelly fine sandy loam about 5 inches thick. The next layer is light brown very gravelly fine sandy loam and very gravelly sandy loam and is weakly cemented with lime to a depth of about 15 inches. An indurated, lime-cemented hardpan is at a depth of about 15 inches. Depth to the hardpan ranges from 7 to 20 inches.

Included in this unit are small areas of Dalian soils on side slopes of fan remnants and on inset fans. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Tencee soil is moderate above the hardpan. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate if the surface is disturbed.

This unit is used as habitat for desert wildlife and for recreation.

This unit is limited for roads because of the depth to the indurated hardpan. Roads should be designed to minimize cuts. Heavy equipment is needed for excavation.

This map unit is in capability subclass VIIs, nonirrigated, and in horticultural group 6.

415—Aztec very gravelly sandy loam, 2 to 8 percent slopes. This very deep, well drained soil is on erosional fan remnants. It formed in alluvium derived from various kinds of rock.

Typically, 80 percent of the surface is covered with pebbles. The surface layer is light yellowish brown very gravelly sandy loam about 2 inches thick. The underlying material to a depth of 63 inches is stratified, light yellowish brown, light brown, and light reddish brown very gravelly sandy loam to extremely gravelly loamy coarse sand with weak, continuous gypsum cementation in some layers.

Included in this unit are about 5 percent Bracken soils on pediment remnants, 5 percent Rock outcrop on isolated ridges, and 5 percent Caliza soils on erosional fan remnants. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Aztec soil is moderately slow. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is high.

varies from one area to another. About 500 acres, east of Henderson, is mostly an Akela soil that has slopes of 8 to 15 percent. About 40 acres of Rock outcrop, gypsum, shown by symbols, is in an area in the northeastern corner of sec. 33, T. 21 S., R. 63 E.

The Akela soil is shallow and well drained. It formed in residuum derived dominantly from basalt and andesite. Typically, about 92 percent of the surface is covered with a desert pavement of pebbles, cobbles, and stones. The surface layer is pale brown very cobbly fine sandy loam about 3 inches thick. The underlying material to a depth of 11 inches is light brown very gravelly fine sandy loam. Basalt is at a depth of about 11 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Akela soil is moderate above the bedrock. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate if the surface is disturbed.

Rock outcrop consists of exposed areas of undifferentiated volcanic rock.

This unit is used as habitat for desert wildlife and for recreation.

This unit is limited for roads because of the areas of Rock outcrop, steepness of slopes, and shallow depth to bedrock. Roads should be designed to minimize cuts. Cutting and filling can be reduced by building roads in the less sloping areas of the unit. Roads should be provided with adequate surface drainage. Erosion can be controlled and maintenance costs reduced by stabilizing areas that have been disturbed.

This map unit is in capability subclass VII_s, nonirrigated. The Akela soil is in horticultural group 6.

540—Weiser extremely gravelly fine sandy loam, 2 to 8 percent slopes. This very deep, well drained soil is on summits and side slopes of erosional fan remnants (fig. 1). It formed in alluvium derived from various kinds of rock that have a high content of lime.

Typically, 80 percent of the surface is covered with a desert pavement of pebbles. There is a dark desert varnish on the exposed surfaces of the rock fragments. The surface layer is light yellowish brown extremely gravelly fine sandy loam about 1 inch thick. The underlying material to a depth of 63 inches is light brown extremely gravelly fine sandy loam and very gravelly fine sandy loam, averaging extremely gravelly fine sandy loam.

Included in this unit are about 5 percent Arizo soils, flooded, in channels and 10 percent Goodsprings soils on erosional fan remnants. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Weiser soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil

blowing is moderate if the desert pavement is disturbed. Some pedons have an indurated, lime-cemented hardpan at a depth of 40 to 60 inches or more.

Most areas of this unit are used as habitat for desert wildlife and for recreation. A few areas are used for urban development.

This unit is well suited to the construction of dwellings.

Unless the density of housing is too high, septic tank absorption fields generally function well in this unit.

Roads can easily be constructed and maintained on this unit.

The main limitations for lawns and landscaping are the presence of pebbles throughout the soil and the very low available water capacity. Topsoil is needed for best results when landscaping, particularly in areas used for lawns. Frequent irrigation of lawns, gardens, and most other plantings is needed because of the limited available water capacity of the soil. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

Intermittent streams form the drainageways in this unit. These drainageways are subject to rare or occasional periods of high-velocity flooding. Care should be taken during urbanization to accommodate the runoff from the drainageways. If drains become plugged during a major flood, accelerated erosion and damage to roads, buildings, and other structures can occur.

This map unit is in capability subclasses IV_s, irrigated, and VII_s, nonirrigated. It is in horticultural group 2.

542—Weiser-Aztec complex, 2 to 8 percent slopes.

This map unit is on erosional fan remnants.

This unit is 55 percent Weiser extremely gravelly fine sandy loam, 2 to 8 percent slopes, and 30 percent Aztec very gravelly fine sandy loam, 2 to 8 percent slopes. The Weiser soil is on summits and side slopes of the fan remnants, and the Aztec soil is on side slopes of the fan remnants. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Arizo soils, flooded, in channels and 10 percent Goodsprings soils on erosional fan remnants. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Weiser soil is very deep and well drained. It formed in alluvium derived dominantly from limestone and dolomite. Typically, 95 percent of the surface is covered with a desert pavement of pebbles. There is a dark desert varnish on the exposed surfaces of the rock fragments. The surface layer is light yellowish brown extremely gravelly fine sandy loam about 1 inch thick. The underlying material to a depth of 63 inches is light brown extremely gravelly fine sandy loam and very

The main limitations for lawns and landscaping are the presence of pebbles throughout the soil and the very low available water capacity of the Weiser soil. Topsoil is needed for best results when landscaping, particularly in areas used for lawns. Frequent irrigation of lawns, gardens, and most other plantings is needed because of the limited available water capacity of the soil. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

Intermittent streams form the drainageways in this unit. These drainageways are subject to rare or occasional periods of high-velocity flooding. Care should be taken during urbanization to accommodate the runoff from the drainageways. If drains become plugged during a major flood, accelerated erosion and damage to roads, buildings, and other structures can occur.

This map unit is in capability subclasses IVs, irrigated, and VIIs, nonirrigated. It is in horticultural group 2.

545—Weiser-Goodsprings complex, 2 to 4 percent slopes. This map unit is on erosional fan remnants.

This unit is 60 percent Weiser extremely gravelly fine sandy loam, 2 to 4 percent slopes, and 25 percent Goodsprings very gravelly fine sandy loam, 2 to 4 percent slopes. The Weiser and Goodsprings soils are on summits and shoulders of the fan remnants. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Las Vegas soils and 10 percent Skyhaven soils on relict alluvial flats. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Weiser soil is very deep and well drained. It formed in alluvium derived dominantly from limestone and dolomite. Typically, 90 percent of the surface layer is covered with a desert pavement of pebbles. There is a dark desert varnish on the exposed surfaces of the rock fragments. The surface layer is light yellowish brown extremely gravelly fine sandy loam about 1 inch thick. The underlying material to a depth of 63 inches is light brown extremely gravelly fine sandy loam and very gravelly fine sandy loam, averaging extremely gravelly fine sandy loam.

Permeability of the Weiser soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate if the desert pavement is disturbed.

The Goodsprings soil is shallow and well drained. It formed in alluvium derived from various kinds of rock. Typically, 90 percent of the surface is covered with a desert pavement of pebbles. The surface layer is light brown very gravelly fine sandy loam about 5 inches

thick. The upper 10 inches of the underlying material is pink gravelly fine sandy loam, the next 37 inches is pinkish white, strongly lime-cemented hardpan, and the lower part to a depth of 60 inches or more is pink extremely gravelly loamy fine sand. Depth to the hardpan ranges from 9 to 20 inches.

Permeability of the Goodsprings soil is moderate above the hardpan. Available water capacity is very low. Effective rooting depth is 9 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is high if the desert pavement is disturbed.

This unit is used as habitat for desert wildlife and for recreation.

This unit is limited for roads because of the depth to the hardpan in areas of the Goodsprings soil. Roads should be designed to minimize cuts. Heavy equipment is needed for excavation.

This map unit is in capability subclass VIIs, nonirrigated. The Weiser soil is in horticultural group 2, and the Goodsprings soil is in horticultural group 6.

600—Slickens. Slickens consists of accumulations of fine-textured material such as that separated in ore-mill operations. It is largely freshly ground rock that commonly has undergone chemical treatment during the milling process. Slickens is commonly confined in specially constructed basins.

This map unit is in capability subclass VIIIs, nonirrigated.

605—Dumps. Dumps consists of areas of smoothed or uneven accumulations of waste rock and general refuse.

This map unit is in capability subclass VIIIs, nonirrigated.

610—Pits, gravel. Pits, gravel, consists of open excavations from which soil material and gravel have been removed, exposing rock, a hardpan, or other material.

This map unit is in capability subclass VIIIs, nonirrigated.

615—Urban land. Urban land consists of areas covered by asphalt, concrete, and buildings or other urban structures.

This map unit is in capability subclass VIIIs, nonirrigated.

*** 630—Badland.** Badland is moderately steep to very steep barren land dissected by many intermittent drainage channels that have cut into soft geologic material. The areas ordinarily are not stony. Local relief generally ranges from 25 to 100 feet. Potential runoff is very high, and erosion is active. Some small included areas of identifiable soils support vegetation.

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition ²	A ³	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bur sage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

¹Average runoff condition, and $I_a = 0.2S$.

²Poor: <30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: >70% ground cover.

³Curve numbers for group A have been developed only for desert shrub.

Revision	Date

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (URBAN AREAS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area ²	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
Open space (lawns, parks, golf courses, cemeteries, etc.) ³ :					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved: curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved: open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) ⁴ ...		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					

See Table 602A

Developing urban areas

Newly graded areas (pervious areas only, no vegetation) ⁵	77	86	91	94
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- 1 Average runoff condition, and $I_a = 0.2S$.
- 2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system. Impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using Figure 603.
- 3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
- 4 Composite CN's for natural desert landscaping should be computed using Figure 603 based on the impervious area percentage (CN #98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
- 5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using Figure 603 based on the degree of development impervious area percentage) and the CN's for the newly graded pervious areas.

Revision	Date

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

Average Lot Size or Usage ¹	Percent Impervious ²	Curve Number for Hydrologic Soil Groups			
		A	B	C	D
Apartments/Condos	72	81	88	91	93
Townhouses/6,000 sq ft lots or less	69	80	87	90	92
7,000 sq ft lots	63	76	84	89	91
8,000 sq ft lots	58	73	82	88	90
10,000 sq ft lots	38	61	75	83	87
14,000 sq ft lots	30	57	72	81	86
20,000 sq ft lots	25	54	70	80	85
40,000 sq ft lots	20	51	68	79	84
80,000 sq ft lots	12	46	65	77	82

1 Lot size should represent the size of the average lot and not the gross acreage divided by the number of lots.

2 Actual percent impervious value should be compared to selected land use type.

3 In cases where average residential lots are smaller than 6,000 sq ft, commercial/business/industrial land use should be used.

Revision	Date

REFERENCE:

TABLE 602A

Lag Time Computations, Standard Form 4

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

Project Name: Brent Lane Drainage System & Trail
File Name: CLV1401 Lag Time Standard Form 4.xls
By: AJH/KC
Date: May 2014

SUB-BASIN DATA					INITIAL / OVERLAND TIME (Ti)				TRAVEL TIME (Tt)						Tc	Tc Check	Flag		
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA Mi ²	INITIAL		Ti Min	TRAVEL LENGTH Feet	SLOPE %	VELOCITY FPS	V1 FPS	VELOCITY FPS	V2 FPS	Tt Min	Tc Calc.	Total Length Feet	Tc Check	Flag
						LENGTH Feet	SLOPE %												
					[2]			[3]				[4]		[5]	[6]	[7]	[8]	[9]	[10]

EXISTING CONDITION - REGIONAL ANALYSIS

BAS1E	E	78.1	0.641	101.81	0.1591	160	3.75	6.73	3980	2.51	2.35	4.66	16.00	22.73					0.227
BAS2E	E	90.1	0.799	32.34	0.0505	150	5.33	3.79	1635	2.81	2.48	4.93	7.19	10.99					0.110
BAS3E	D	84.2	0.722	80.14	0.1252	500	2.00	12.08	2615	2.68	3.30	5.01	9.56	21.64	3115	27.306			0.216
BAS4E	D	86.0	0.745	87.25	0.1363	100	1.00	6.38	3239	2.04	2.88	4.37	13.34	19.72	3339	28.550			0.197
BAS5E	D	93.8	0.848	56.53	0.0883	500	2.00	8.04	3003	2.20	2.99	4.54	11.98	20.02	3503	29.461			0.200
BAS6E	E	79.1	0.654	104.25	0.1629	200	3.00	7.88	2820	2.34	2.26	4.50	12.28	20.16					0.202
BAS7E	D	84.4	0.723	124.01	0.1938	500	2.00	12.03	2670	2.47	3.18	4.81	10.14	22.17	3170	27.611			0.222
BAS8E	E	81.5	0.685	70.00	0.1094	175	1.71	8.25	3045	1.58	1.86	3.69	15.98	24.23					0.242

ULTIMATE CONDITION - REGIONAL ANALYSIS

BAS1U	D	89.2	0.788	225.54	0.3524	130	3.08	4.40	3390	2.77	3.36	5.10	11.93	16.34	3520	29.556			0.163
BAS2U	D	95.0	0.864	93.83	0.1466	100	2.00	3.37	2430	2.96	3.48	5.27	8.50	11.87	2530	24.056			0.119
BAS3U	D	84.2	0.722	80.14	0.1252	500	2.00	12.08	2615	2.68	3.30	5.01	9.56	21.64	3115	27.306			0.216
BAS4U	D	86.0	0.745	87.25	0.1363	100	1.00	6.38	3239	2.28	3.05	4.63	12.60	18.98	3339	28.550			0.190
BAS5U	D	94.0	0.851	56.53	0.0883	500	2.00	7.97	3003	2.33	3.08	4.67	11.63	19.60	3503	29.461			0.196
BAS6U	D	79.3	0.657	108.25	0.1691	500	2.00	14.15	2625	2.44	3.15	4.78	10.05	24.21	3125	27.361			0.242
BAS7U	D	84.1	0.720	124.01	0.1938	500	2.00	12.13	2670	2.47	3.18	4.81	10.14	22.27	3170	27.611			0.223
BAS8U	E	84.0	0.719	71.01	0.1110	175	1.71	7.58	3045	1.58	1.86	3.69	15.98	23.56					0.236
BAS9U	D	87.6	0.766	61.97	0.0968	365	3.29	7.72	1980	3.13	3.57	5.41	6.89	14.60	2345	23.028			0.146
BAS10U	D	90.7	0.807	82.84	0.1294	100	1.00	5.28	3355	2.03	2.88	4.36	13.82	19.10	3455	29.194			0.191

- [1] $K = 0.0132 (CN) - 0.39$
- [2] $A = \text{Area}/640$
- [3] $T_i = (1.8 (1.1-K) L^{0.5})/S^{0.33}$
- [4] For Existing Conditions: $V_1 = 14.8 * (S/100)^{0.5}$
For Developed Conditions: $V_1 = 20.2 * (S/100)^{0.5}$
- [5] For Existing Conditions: $V_2 = 29.4 * (S/100)^{0.5}$
For Developed Conditions: $V_2 = 30.6 * (S/100)^{0.5}$
- [6] $T_t = L/(60*V)$
- [7] $T_c = T_i + T_t$
- [8] Total L = Initial L + Travel L
- [9] $T_c = (L/180) + 10$
- [10] $\text{Flag} = (0.6*T_c)/60$
- [11] Min Flag = 0.05
- Note: For Travel Time Calcs: V1 applies to first 500 feet and V2 applies to remaining distance.

REFERENCE :

STANDARD FORM 4



 CONSULTING ENGINEERS & PLANNERS Project Name: Brent Lane Drainage System & Trail File Name: CLV1401 Lag Time Standard Form 4.xls By: AJH/KC Date: May 2014																			
SUB-BASIN DATA					INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)				Tc		Tc Check		Tc Check		Tc Check	
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA Mi^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V1 VELOCITY FPS	V2 VELOCITY FPS	Tt Min	Tc Calc.	Total Length Feet	Tc Check	Urbanized Basins	Flag	Flag
					[2]			[3]			[4]	[5]	[6]	[7]	[8]	[9]			[10]
ULTIMATE CONDITION - LOCAL ANALYSIS																			
LOC1	D	83.8	0.716	36.49	0.0570	100	2.00	5.49	3260	1.96	2.83	4.29	13.67	19.16	3360	28.667			0.192
LOC2	D	84.8	0.730	10.21	0.0160	60	2.00	4.10	1300	2.46	3.17	4.80	5.41	9.51	1360	17.556			0.095
LOC3	D	84.9	0.731	6.31	0.0099	130	1.00	7.57	1560	2.05	2.89	4.38	6.91	14.48	1690	19.389			0.145
LOC4	D	82.7	0.702	13.42	0.0210	110	1.00	7.52	1245	1.77	2.69	4.07	6.16	13.67	1355	17.528			0.137
LOC5	D	83.8	0.717	34.41	0.0538	150	1.00	8.45	2899	2.28	3.05	4.62	11.39	19.85	3049	26.939			0.198
LOC6	D	98.0	0.904	1.84	0.0029	40	2.00	1.77	1025	0.39	1.26	1.91	11.18	12.96	1065	15.917			0.130
LOC7	D	98.0	0.904	1.87	0.0029	20	2.00	1.25	1340	2.24	3.02	4.58	5.81	7.07	1360	17.556			0.071
LOC8	D	83.3	0.709	15.94	0.0249	140	1.50	7.27	1820	1.54	2.51	3.80	9.12	16.40	1960	20.889			0.164
LOC9	D	85.7	0.741	18.21	0.0285	85	9.41	2.82	1970	2.23	3.02	4.57	8.12	10.94	2055	21.417			0.109
LOC10	D	88.0	0.772	15.64	0.0244	90	1.00	5.61	1600	1.88	2.77	4.19	7.39	13.00	1690	19.389			0.130
[1]	K = 0.0132 (CN) - 0.39					[5]	For Existing Conditions: V2 = 29.4 * (S/100)^0.5					[9]	Tc = (L/180) + 10						
[2]	A = Area/640					[5]	For Developed Conditions: V2 = 30.6 * (S/100)^0.5					[10]	Tlag = (0.6*Tc)/60						
[3]	Ti = (1.8 (1.1-K) L^0.5)/(S^0.33)					[6]	Tt = L/(60*V)					[11]	Min Tlag =0.05						
[4]	For Existing Conditions: V1 = 14.8 * (S/100)^0.5					[7]	Tc = Ti + Tt					Note: For Travel Time Calcs: V1 applies to first 500 feet and V2 applies to remaining distance.							
	For Developed Conditions: V1 = 20.2 * (S/100)^0.5					[8]	Total L = Initial L + Travel L												
REFERENCE :																			
STANDARD FORM 4																			

Regional Analysis-Existing Conditions HEC-1 Model


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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 28APR14 TIME 11:54:47
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EXREG-100.OUT

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

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

1 HEC-1 INPUT PAGE 1

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LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*** FREE ***
*DIAGRAM
1 ID SLATER HANIFAN GROUP
2 ID CITY OF LAS VEGAS
3 ID BRENT LANE DRAINAGE SYSTEM AND TRAIL
4 ID EXISTING CONDITION - REGIONAL ANALYSIS
5 ID
6 ID RETURN PERIOD ----- 100-YEAR
7 ID DISTRIBUTION ----- 6-HOUR SDN3
8 ID PROJECT NO. ----- CLV1401-000
9 ID FILENAME ----- EXREG-100.H1
10 ID DATE ----- MAY 2014
11 ID MODELED BY ----- AJH/KC
12 ID
13 ID SIX HOUR DEPTH-AREA REDUCTION FACTORS
14 ID DRAINAGE AREA (SQ.MI.) DARF
15 ID 0.0-0.5 0.99
16 ID 0.5-1.0 0.98
17 ID 1.0-2.0 0.95
18 ID 2.0-4.0 0.92
19 ID 4.0-6.0 0.91
20 ID 6.0-8.0 0.89
21 ID
22 ID
23 IT 5 0 0 300
24 IO 5
25 IN 5 0 0
26 JR PREC 1 0.98 0.95 0.92 0.91 0.89
*
* *** BEGIN REFERENCE FROM KYLE CANYON BY G.C. WALLACE ***
*
27 KK OFF10
28 KM AREA 429.5 AC
29 PB 3.39
30 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
31 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
32 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
33 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
34 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
35 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
36 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
37 PC 0.998 0.999 1
38 BA .6710
39 LS 0 86.2
40 UD 0.573
*

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1 HEC-1 INPUT PAGE 2

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LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
41 KK ROFF10
42 KM ROUTE OFF10 THRU OFF-A AND OFF-B
43 KM N-STEPS K X-FACTOR
44 RM 7 0.583 0.15
*
45 KK OFFF-A
46 KM AREA 636.0 AC
47 PB 3.19
48 BA .9938
49 LS 0 83.8
50 UD 0.441
*

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51 KK ROFFF-A
 52 KM ROUTE OFFF-A THRU OFFF-B
 53 KM N-STEPS K X-FACTOR
 54 RM 3 0.238 0.15
 *

55 KK OFFF-B
 56 KM AREA 391.2 AC
 57 PB 2.93
 58 BA 0.6112
 59 LS 0
 60 UD .490
 *

61 KK EX-W1
 62 KM AREA 15.36 AC
 63 PB 2.77
 64 BA 0.0240
 65 LS 0
 66 UD .141
 *

67 KK OFF11
 68 KM AREA 2.9 AC
 69 PB 2.77
 70 BA 0.0046
 71 LS 0
 72 UD .093
 *

73 KK CP9
 74 KM COMBINES ROFF10, ROFFF-A, OFFFB, EX-W1 AND OFF11
 75 HC 5
 *

HEC-1 INPUT

PAGE 3

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

76 KK DCP9
 77 KM FLOW SPLIT AT CULVERT
 78 KM DIVERSION TO THE EAST SIDE OF OSO BLANCA FRONTAGE ROAD
 79 DT DCHD02A
 80 DI 1500 150 300 450 600 750 900 1050 1100 1350
 81 DI 1500 122 186 230 261 283 316 353 366 445
 82 DQ 0
 83 DQ 497
 *

84 KK RCP9
 85 KM ROUTE TO BASIN OFF12
 86 KM LENGTH TO SLOPE n-VALUE
 87 RD 850 0.0165 0.02 0 SHAPE WIDTH S-SLOPE
 * TRAP 0 10

88 KK OFFG
 89 KM AREA 26.0 AC
 90 PB 2.79
 91 BA 0.0406
 92 LS 0
 93 UD .186
 *

94 KK EX-W2
 95 KM AREA 13.24 AC
 96 PB 2.77
 97 BA 0.0207
 98 LS 0
 99 UD .112
 *

100 KK OFF12
 101 KM AREA 6.0 AC
 102 PB 2.77
 103 BA 0.0094
 104 LS 0
 105 UD .115
 *

106 KK OFF16
 107 KM AREA 504.7 AC
 108 PB 3.06
 109 BA 0.7885
 110 LS 0
 111 UD .692
 *

112 KK ROFF16
 113 KM ROUTE OFF16 THRU EX-W3
 114 KM N-STEPS K X-FACTOR
 115 RM 2 0.198 0.15
 *

HEC-1 INPUT

PAGE 4

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

116 KK EX-W3
 117 KM AREA 172.93 AC
 118 PB 2.82
 119 BA 0.2702
 120 LS 0
 121 UD .295
 *

122 KK CP10

EXREG-100.OUT

123 KM COMBINES RCP9, OFFG, EX-W2, OFF12, ROFF16 AND EX-W3
 124 HC 6
 *

125 KK DCP10
 126 KM FLOW SPLIT AT CULVERT
 127 KM DIVERSION TO THE EAST SIDE OF OSO BLANCA FRONTAGE ROAD
 128 DT DCHD04A
 129 DI 0 300 600 900 1200 1500 1800 2100 2400 2540
 130 DI 3000
 131 DQ 0 132 316 514 710 907 1115 1252 1399 1468
 132 DQ 1684
 *

133 KK DSPHD04A
 134 KM FLOW SPLIT BETWEEN HD04A AND HD05A
 135 KM DIVERSION TO THE EAST SIDE OF OSO BLANCA FRONTAGE ROAD
 136 KM BASED ON CHANNEL CAPACITY = 527 CFS
 137 DT DSHD04A
 138 DI 0 527 2000
 139 DQ 0 1 1473
 *

140 KK RDCP10
 141 KM ROUTE TO THE NEXT CULVERT AT BASIN OFF11
 142 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
 143 RD 1068 0.0160 0.02 0 TRAP 0 10
 *

144 KK EX-W4
 145 KM AREA 67.06 AC
 146 PB 2.78
 147 BA 0.1048
 148 LS 0 86.9
 149 UD .199
 *

150 KK CP11
 151 KM COMBINES RDCP10 AND EX-W4
 152 HC 2
 *

1

HEC-1 INPUT

PAGE 5

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

153 KK DCP11
 154 KM FLOW SPLIT AT CULVERT
 155 KM DIVERSION TO THE EAST SIDE OF OSO BLANCA FRONTAGE ROAD
 156 DT DCHD05A
 157 DI 0 170 340 510 680 850 1020 1190 1360 1372
 158 DI 1700
 159 DQ 0 169 200 244 296 372 459 546 632 637
 160 DQ 807
 *

161 KK DSPHD05A
 162 KM FLOW SPLIT BETWEEN HD05A AND HD06A
 163 KM DIVERSION TO THE EAST SIDE OF OSO BLANCA FRONTAGE ROAD
 164 KM BASED ON CHANNEL CAPACITY = 605 CFS
 165 DT DSHD05A
 166 DI 0 605 2000
 167 DQ 0 1 1395
 *

168 KK RDCP11
 169 KM ROUTE TO THE NEXT CULVERT AT BASIN OFF12
 170 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
 171 RD 626 0.0134 0.02 0 TRAP 0 10
 *

172 KK OFF18
 173 KM AREA 351.4 AC
 174 PB 3.05
 175 BA 0.5491
 176 LS 0 86.3
 177 UD .445
 *

178 KK ROFF18
 179 KM ROUTE OFF18 THRU EX-W5
 180 KM N-STEPS K X-FACTOR
 181 RM 2 0.171 0.15
 *

182 KK EX-W5
 183 KM AREA 285.43 AC
 184 PB 2.86
 185 BA 0.4460
 186 LS 0 86.3
 187 UD .308
 *

188 KK CP12
 189 KM COMBINES ROFF18 AND EX-W5
 190 HC 2
 *

1

HEC-1 INPUT

PAGE 6

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

191 KK OFF14
 192 KM AREA 8.6 AC
 193 PB 2.77
 194 BA 0.0134

195 LS 0 86.9
 196 UD .090
 *

197 KK CP13
 198 KM COMBINES RDCP11, CP12 AND OFF14
 199 HC 3
 *

200 KK DCP13
 201 KM FLOW SPLIT AT CULVERT
 202 KM DIVERSION TO THE EAST SIDE OF OSO BLANCA FRONTAGE ROAD
 203 DT DCHD06A
 204 DI 0 200 400 600 800 1000 1200 1400 1600 1772
 205 DI 2000
 206 DQ 0 199.9 399.9 594 727 802 865 927 1017 1095
 207 DQ 1207
 *

208 KK DSDPHD06A
 209 KM FLOW SPLIT BETWEEN HD06A AND HD07A
 210 KM DIVERSION TO THE OTHER SIDE OF OSO BLANCA FRONTAGE ROAD
 211 KM BASED ON CHANNEL CAPACITY = 1,692 CFS
 212 DT DSHD06A
 213 DI 0 1692 2000
 214 DQ 0 1 308
 *

215 KK OFFE
 216 KM AREA 24.5 AC
 217 PB 2.78
 218 BA 0.0383
 219 LS 0 77.4
 220 UD .232
 *

221 KK 95-5
 222 KM AREA 23.6 AC
 223 PB 2.77
 224 BA 0.0369
 225 LS 0 89.1
 226 UD .082
 *

227 KK CHD01B
 228 KM COMBINES OFFE AND 95-5
 229 HC 2
 *

1

HEC-1 INPUT

PAGE 7

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

230 KK DHD01B
 231 KM FLOW SPLIT AT CULVERT
 232 DT DCHD01B
 233 DI 0 15 29 45 60 75 90 105 120 135
 234 DI 150
 235 DQ 0 14.9 28.9 44.9 59.9 74.9 89.9 104.9 116 121
 236 DQ 125
 *

237 KK RDHD01B
 238 KM ROUTE TO THE NEXT CULVERT
 239 KM LENGTH SLOPE n-VALUE
 240 RD 1000 0.0165 0.02 0 SHAPE TRAP WIDTH 0 S-SLOPE 10
 *

241 KK OFF8
 242 KM AREA 8.5 AC
 243 PB 2.77
 244 BA 0.0133
 245 LS 0 89.1
 246 UD .111
 *

247 KK RETDCHD02A
 248 DR DCHD02A
 *

249 KK CHD02B
 250 KM COMBINES RDHD01B, OFF8 AND RETCHD02A
 251 HC 3
 *

252 KK CHD02B
 253 KM FLOW SPLIT AT CULVERT HD02B
 254 DT DCHD02B
 255 DI 0 50 100 150 200 250 300 350 400 450
 256 DI 500
 257 DQ 0 49.9 82 99 124 149 178 211 241 271
 258 DQ 299
 *

259 KK RDHD02B
 260 KM ROUTE TO THE NEXT CULVERT
 261 KM LENGTH SLOPE n-VALUE
 262 RD 1320 0.0165 0.02 0 SHAPE TRAP WIDTH 0 S-SLOPE 10
 *

263 KK 95-6
 264 KM AREA 6.7 AC
 265 PB 2.77
 266 BA 0.0104
 267 LS 0 89.9
 268 UD .095

1

HEC-1 INPUT

PAGE 8

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

269 KKRETDCHD04A
270 DR DCHD04A
*

271 KK CHD04B
272 KM COMBINES RDHD02B, 95-6 AND RETDCHD04A
273 HC 3
*

274 KK DHD04B
275 KM SPLIT FLOW AT CULVERT HD04B
276 DT DCHD04B
277 DI 0 200 400 600 800 1000 1200 1400 1600 1800
278 DI 2000
279 DQ 0 199.9 287 359 443 529 620 710 800 895
280 DQ 988
*

281 KKRETDSDH04A
282 DR DSHD04A
*

283 KK CHD04B2
284 KM COMBINES 95-7A WITH BYPASS AND SPILL FLOW
285 HC 2
*

286 KKDSPHD04B
287 KM FLOW SPLIT BETWEEN HD04B AND HD05B
288 KM DIVERSION TO THE EAST SIDE OF US95
289 KM BASED ON CHANNEL CAPACITY = 1004 CFS
290 DT DSHD04B
291 DI 0 1004 2000
292 DQ 0 1 996
*

293 KK RDHD04B
294 KM ROUTE TO THE NEXT CULVERT
295 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
296 RD 1068 0.0160 0.02 0 TRAP 0 10
*

297 KK 95-7A
298 KM AREA 4.4 AC
299 PB 2.77
300 BA 0.0069
301 LS 0 92.6
302 UD .075
*

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HEC-1 INPUT

PAGE 9

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

303 KKRETHD05A
304 DR DCHD05A
*

305 KKRETSHD05A
306 DR DSHD05A
*

307 KK CHD05B2
308 KM COMBINES 95-7A WITH BYPASS AND SPILL FLOW
309 HC 4
*

310 KK DHD05B
311 KM SPLIT PER KYLE CANYON BY SHG***
312 KM FACILITY E-12
313 KM FLOW SPLIT AT VTN CULVERT 5
314 KM FLOW SPLITS TO BETWEEN NB AND SB ROADS OF US-95
315 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
316 DT DCHD5B
317 DI 0 87 209 520 734 928 1120 1292
318 DQ 0 87 173 260 346 433 520 606
*

319 KK 95-8A
320 KM AREA 3.3 AC
321 PB 2.77
322 BA 0.0052
323 LS 0 92.6
324 UD .064
*

325 KKRETHD06A
326 DR DCHD06A
*

327 KKRETHD06A
328 DR DSHD06A
*

329 KK CHD06B
330 HC 4
*

331 KK RCHD6B
332 KM SPLIT PER KYLE CANYON BY SHG***

333 KM FLOW SPLIT INTO US-95 MPU FACILITY
 334 KM 33% FLOW INTO 8'X6' MPU FACILITY
 335 DT DCMPU6
 336 DI 0 425
 337 DQ 0 142
 *

EXREG-100.OUT

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HEC-1 INPUT

PAGE 10

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

338 KK DHD06B
 339 KM SPLIT PER KYLE CANYON BY SHG***
 340 KM FACILITY E-13
 341 KM FLOW SPLIT AT VTN CULVERT 6
 342 KM FLOW SPLITS TO BETWEEN NB AND SB ROADS OF US-95
 343 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
 344 DT DCHD6B
 345 DI 0 580 881 1846 2671 3498 4331
 346 DQ 0 580 725 869 1014 1159 1304
 *

347 KKRETDCHD01B
 348 DR DCHD01B
 *

349 KK DHD01C
 350 KM SPLIT FLOW AT CULVERT HD01C
 351 DT DCHD01C
 352 DI 0 10.0 50.0
 353 DQ 0 9.9 49.9
 *

354 KK RDHD01C
 355 KM ROUTE TO THE NEXT CULVERT
 356 KM LENGTH SLOPE n-VALUE 0 SHAPE WIDTH S-SLOPE
 357 RK 1000 0.0165 0.02 0 TRAP 13 20
 *

358 KKRETHD02B
 359 DR DCHD02B
 *

360 KK CHD02C
 361 HC 2
 *

362 KK DHD02C
 363 KM SPLIT FLOW AT CULVERT HD02C
 364 DT DCHD02C
 365 DI 0 100 200 250 400 500 600 700 800 900
 366 DI 1000
 367 DQ 0 65 100 122 201 258 323 384 447 514
 368 DQ 581
 *

369 KK RDHD02C
 370 KM ROUTE TO THE NEXT CULVERT
 371 KM LENGTH SLOPE n-VALUE 0 SHAPE WIDTH S-SLOPE
 372 RK 1320 0.0165 0.02 0 TRAP 13 20
 *

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HEC-1 INPUT

PAGE 11

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

373 KKRETHD04B
 374 DR DCHD04B
 *

375 KK CHD04C
 376 HC 2
 *

377 KK DHD04C
 378 KM SPLIT FLOW AT CULVERT HD04C
 379 DT DCHD04C
 380 DI 0 200 400 600 800 1000 1200 1400 1600 1800
 381 DI 2000
 382 DQ 0 181 212 262 336 416 503 609 719 823
 383 DQ 933
 *

384 KKRETSHD04B
 385 DR DSHD04B
 *

386 KK CHD04C2
 387 HC 2
 *

388 KKDSPHD04C
 389 KM FLOW SPLIT BETWEEN HD04C AND HD05C
 390 KM DIVERSION TO THE OTHER SIDE OF US95
 391 KM BASED ON CHANNEL CAPACITY = 1079 CFS
 392 DT DSHD04C
 393 DI 0 1079 2000
 394 DQ 0 1 921
 *

395 KK RDHD04C
 396 KM ROUTE TO THE NEXT CULVERT
 397 KM LENGTH SLOPE n-VALUE 0 SHAPE WIDTH S-SLOPE
 398 RK 1068 0.0160 0.02 0 TRAP 13 20
 *

399 KKRETD5B
400 DR DCHD5B
*

401 KK CHD05C2
402 KM COMBINE BYPASS WITH SPILL FLOW
403 HC 2
*

HEC-1 INPUT

PAGE 12

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

404 KK DHD5C
405 KM SPLIT PER KYLE CANYON BY SHG***
406 KM FACILITY E-12A
407 KM FLOW SPLIT AT VTN CULVERT 5
408 KM DIVERSION TO EAST SIDE OF US-95
409 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
410 DT DCHD5C
411 DI 0 150 300 450 600 750 800 1050 1200 1350
412 DI 1500
413 DQ 0 132 171 193 208 232 245 321 380 444
414 DQ 513
*

415 KK RDHD05C
416 KM ROUTE TO THE NEXT CULVERT
417 KM LENGTH SLOPE n-VALUE 0 SHAPE WIDTH S-SLOPE
418 RK 626 0.0134 0.02 0 TRAP 13 20
*

419 KKRETDMPU6
420 DR DCMU6
*

421 KKRETDCHD6B
422 DR DCHD6B
*

423 KK CHD06C
424 HC 3
*

425 KK DHD6C
426 KM SPLIT PER KYLE CANYON BY SHG***
427 KM FACILITY E-13A
428 KM FLOW SPLIT AT VTN CULVERT 6
429 KM DIVERSION TO EAST SIDE OF US-95
430 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
431 DT DCHD6C
432 DI 0 200 400 600 800 1000 1200 1400 1600 1680
433 DI 2000
434 DQ 0 199.9 399.9 560 647 713 786 860 948 988
435 DQ 1142
*

436 KKCPW-DUMMY
437 KM COMBINATION POINT CPW-DUMMY
438 KM COMBINE DSPHD07A, DSPHD07B, AND DSPHD07C
439 HC 3
*

HEC-1 INPUT

PAGE 13

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

440 KKRETDCHD02C
441 DR DCHD02C
*

442 KKRDCHD02C
443 KM ROUTE DCHC01C TO CP-A
444 KM LENGTH SLOPE n-VALUE 0 SHAPE WIDTH S-SLOPE
445 RD 3980 .025 .025 0 TRAP 10 10
*

*** END REFERENCE FROM KYLE CANYON BY G.C. WALLACE ***

446 KK BAS1E
447 KM AREA 101.81 AC
448 PB 2.77
449 BA 0.1591
450 LS 0 78.1
451 UD .227
*

452 KK CP-A
453 KM COMBINES RDCHD02C AND BAS1E
454 HC 2
*

455 KK RCP-A
456 KM ROUTE CP-A TO CP-B
457 KM LENGTH SLOPE n-VALUE 0 SHAPE WIDTH S-SLOPE
458 RD 2600 0.027 0.016 0 TRAP 0 50
*

459 KK BAS3E
460 KM AREA 80.14 AC
461 PB 2.77
462 BA 0.1252
463 LS 0 84.2
464 UD .216

*
 465 KK CP-B
 466 KM COMBINES CP-A AND BAS3E
 467 HC 2
 *
 468 KK RCP-B
 469 KM ROUTE CP-B TO CP-D
 470 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
 471 RD 3580 0.027 0.016 0 TRAP 0 50
 *
 * *** BEGIN REFERENCE FROM KYLE CANYON BY G.C. WALLACE ***
 *
 *

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HEC-1 INPUT

PAGE 14

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

472 KKRETDCHD04C
 473 DR DCHD04C
 *
 474 KK OFFH
 475 KM AREA 5.6 AC
 476 PB 2.77
 477 BA 0.0088
 478 LS 0 89.5
 479 UD .082
 *

480 KK CP17
 481 KM COMBINES DCHD04C AND OFFH
 482 HC 2
 *

483 KK RCP17
 484 KM ROUTE CP1 THRU EX-E5
 485 KM N-STEPS K X-FACTOR
 486 RM 1 0.073 0.15
 *

487 KK EX-E5
 488 KM AREA 63.3 AC
 489 PB 2.77
 490 BA 0.0989
 491 LS 0 79.5
 492 UD .202
 *

493 KK ES1
 494 KM AREA 11.1 AC
 495 PB 2.77
 496 BA 0.0173
 497 LS 0 92.7
 498 UD .109
 *

499 KK CP18
 500 KM COMBINES RCP17, EX-E5 AND ES1
 501 HC 3
 *

502 KK RCP18
 503 KM ROUTE CP18 TO CP-C
 504 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
 505 RD 2590 0.029 0.016 0 TRAP 7 50
 *
 * *** END REFERENCE FROM KYLE CANYON BY G.C. WALLACE ***
 *
 *

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HEC-1 INPUT

PAGE 15

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

506 KK BAS4E
 507 KM AREA 87.25 AC
 508 PB 2.77
 509 BA 0.1363
 510 LS 0 86.0
 511 UD .197
 *

512 KK CP-C
 513 KM COMBINES CP18 AND BAS4E
 514 HC 2
 *

515 KK RCP-C
 516 KM ROUTE CP-C TO CP-D
 517 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
 518 RD 2620 0.024 0.016 0 TRAP 0 50
 *

519 KK BAS6E
 520 KM AREA 104.25 AC
 521 PB 2.77
 522 BA 0.1629
 523 LS 0 78.8
 524 UD .202
 *

EXREG-100.OUT

525	KK	CP-D							
526	KM	COMBINES	CP-B, CP-C AND BAS6E						
527	HC	3							
	*								
528	KK	RCP-D							
529	KM	ROUTE	CP-D TO CP-E						
530	KM	LENGTH	SLOPE	n-VALUE	0	SHAPE	WIDTH	S-SLOPE	
531	RD	3045	0.028	0.016		TRAP	0	50	
	*								
532	KK	BAS8E							
533	KM		AREA	70.00	AC				
534	PB	2.77							
535	BA	0.1094							
536	LS	0	81.5						
537	UD	.242							
	*								
538	KK	CP-E							
539	KM	COMBINES	CP-D, BAS8E						
540	HC	2							
	*								

*** BEGIN REFERENCE FROM KYLE CANYON BY G.C. WALLACE ***

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HEC-1 INPUT

PAGE 16

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

541	KK	RETDSHD04C							
542	DR	DSHD04C							
	*								
543	KK	95-7B							
544	KM		AREA	7.2	AC				
545	PB	2.77							
546	BA	0.0112							
547	LS	0	92.6						
548	UD	.087							
	*								
549	KK	CP19							
550	KM	COMBINE	DSHD04C, DCHD05C AND 95-7B						
551	HC	2							
	*								
552	KK	RETDCHD5C							
553	DR	DCHD5C							
	*								
554	KK	RETDCHD6C							
555	DR	DCHD6C							
	*								
556	KK	95-8B							
557	KM		AREA	2.6	AC				
558	PB	2.77							
559	BA	0.0040							
560	LS	0	92.6						
561	UD	.052							
	*								
562	KK	CP20							
563	KM	COMBINES	DSHD05C, DCHD06C AND 95-8B						
564	HC	3							
	*								
565	KK	EX-E6							
566	KM		AREA	10.26	AC				
567	PB	2.77							
568	BA	0.0160							
569	LS	0	86.9						
570	UD	.111							
	*								
571	KK	CP21							
572	KM	COMBINE	CP19, CP20 AND EX-E6						
573	HC	3							
	*								

HEC-1 INPUT

PAGE 17

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

574	KK	ES2							
575	KM		AREA	31.4	AC				
576	PB	2.77							
577	BA	0.0490							
578	LS	0	94.7						
579	UD	.148							
	*								
580	KK	95-9B							
581	KM		AREA	8.5	AC				
582	PB	2.77							
583	BA	0.0133							
584	LS	0	92.6						
585	UD	.139							
	*								
	*								
	*	***	END REFERENCE FROM KYLE CANYON BY G.C. WALLACE	***					
	*								
	*								


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586      KK  BAS2E
587      KM
588      PB  2.86
589      BA  0.0505
590      LS  0
591      UD  .110
      *

592      KK  CP-F
593      KM  COMBINES CP21, ES2, 95-9B AND BAS2E
594      HC  4
      *

595      KK  RCP-F
596      KM  ROUTE CP-F TO CP-G
597      KM  LENGTH 2630 SLOPE 0.027 n-VALUE 0.016
598      RD  0 SHAPE TRAP WIDTH 0 S-SLOPE 50
      *

599      KK  BAS5E
600      KM
601      PB  2.77
602      BA  0.0883
603      LS  0
604      UD  .199
      *

605      KK  CP-G
606      KM  COMBINES CP-F AND BAS5E
607      HC  2
      *

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HEC-1 INPUT

PAGE 18

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

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608      KK  RCP-G
609      KM  ROUTE CP-G TO CP-H
610      KM  LENGTH 2670 SLOPE 0.025 n-VALUE 0.016
611      RD  0 SHAPE TRAP WIDTH 0 S-SLOPE 50
      *

612      KK  BAS7E
613      KM
614      PB  2.77
615      BA  0.1938
616      LS  0
617      UD  .223
      *

618      KK  CP-H
619      KM  COMBINES CP-G AND BAS7E
620      HC  2
      *

621      KK  RCP-H
622      KM  ROUTE CP-H TO CP-I
623      KM  LENGTH 2600 SLOPE 0.020 n-VALUE 0.016
624      RD  0 SHAPE TRAP WIDTH 0 S-SLOPE 50
      *

625      KK  CP-I
626      KM  COMBINES CP-E AND CP-H
627      HC  2
      *

628      ZZ

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SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

27 OFF10
  V
  V
41 ROFF10
  .
  .
45 . OFFF-A
  . V
  . V
51 . ROFFF-A
  .
  .
55 . OFFF-B
  .
  .
61 . EX-W1
  .
  .
67 . OFF11
  .
  .
73 CP9.....
  .
  .
79 .-----> DCHD02A
76 DCP9
  V
  V
84 RCP9
  .
  .
88 . OFFG

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      CP10.....
128     .      .      .      .      .      .      .      .      .      .
125     .      .      .      .      .      .      .      .      .      .
      DCP10-----> DCHD04A
137     .      .      .      .      .      .      .      .      .      .
133     .      .      .      .      .      .      .      .      .      .
      DSPHD04A-----> DSHD04A
      .      .      .      .      .      .      .      .      .      .
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95-6
 RETDCHD0 <----- DCHD04A
 CHD04B
 DHD04B -----> DCHD04B
 RETDSHD0 <----- DSHD04A
 CHD04B2
 DSPHD04B -----> DSHD04B
 V
 RDHD04B
 95-7A
 RETHD05A <----- DCHD05A
 RETSHD05 <----- DSHD05A
 CHD05B2
 DHD05B -----> DCHD05B
 95-8A
 RETHD06A <----- DCHD06A
 RETHD06A <----- DSHD06A
 CHD06B
 RCHD6B -----> DCMPU6
 DHD06B -----> DCHD6B
 RETDCHD0 <----- DCHD01B
 DHD01C -----> DCHD01C
 V
 RDHD01C
 RETHD02B <----- DCHD02B
 CHD02C
 DHD02C -----> DCHD02C
 V
 RDHD02C
 RETHD04B <----- DCHD04B
 CHD04C
 DHD04C -----> DCHD04C
 <----- DSHD04B


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384      .          .          .          RETSHD04          EXREG-100.OUT
386      .          .          CHD04C2.....
392      .          .          .          DSHD04C
388      .          .          DSPHD04C----->
395      .          .          RDHD04C
400      .          .          .          <----- DCHD5B
399      .          .          RETCHD5B
401      .          .          CHD05C2.....
410      .          .          .          DCHD5C
404      .          .          DHD5C----->
415      .          .          RDHD05C
420      .          .          .          <----- DCMPU6
419      .          .          RETDCMPU
422      .          .          .          <----- DCHD6B
421      .          .          RETDCHD6
423      .          .          CHD06C.....
431      .          .          .          DCHD6C
425      .          .          DHD6C----->
436      CPW-DUMM.....
441      .          .          <----- DCHD02C
440      .          .          RETDCHD0
442      .          .          V
442      .          .          RDCHD02C
446      .          .          BAS1E
452      .          .          CP-A.....
455      .          .          RCP-A
459      .          .          BAS3E
465      .          .          CP-B.....
468      .          .          RCP-B
473      .          .          <----- DCHD04C
472      .          .          RETDCHD0
474      .          .          OFFH
480      .          .          CP17.....
483      .          .          RCP17
487      .          .          EX-E5
493      .          .          ES1
499      .          .          CP18.....
502      .          .          RCP18
506      .          .          BAS4E
512      .          .          CP-C.....
515      .          .          RCP-C
519      .          .          BAS6E

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525      CP-D.....
      V
528      RCP-D
      .
532      BAS8E
      .
538      CP-E.....
      .
542      RETDSHD0 <----- DSHD04C
541      .
543      95-7B
      .
549      CP19.....
      .
553      RETDCHD5 <----- DCHD5C
552      .
555      RETDCHD6 <----- DCHD6C
554      .
556      95-8B
      .
562      CP20.....
      .
565      EX-E6
      .
571      CP21.....
      .
574      ES2
      .
580      95-9B
      .
586      BAS2E
      .
592      CP-F.....
      V
595      RCP-F
      .
599      BAS5E
      .
605      CP-G.....
      V
608      RCP-G
      .
612      BAS7E
      .
618      CP-H.....
      V
621      RCP-H
      .
625      CP-I.....

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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 28APR14 TIME 11:54:47 *
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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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SLATER HANIFAN GROUP
CITY OF LAS VEGAS
BRENT LANE DRAINAGE SYSTEM AND TRAIL
EXISTING CONDITION - REGIONAL ANALYSIS

RETURN PERIOD ----- 100-YEAR
DISTRIBUTION ----- 6-HOUR SDN3
PROJECT NO. ----- CLV1401-000
FILENAME ----- EXREG-100.H1
DATE ----- MAY 2014
MODELED BY ----- AJH/KC

SIX HOUR DEPTH-AREA REDUCTION FACTORS
Page 14

EXREG-100.OUT

DRAINAGE AREA (SQ.MI.)	DARF
0.0-0.5	0.99
0.5-1.0	0.98
1.0-2.0	0.95
2.0-4.0	0.92
4.0-6.0	0.91
6.0-8.0	0.89

24 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	STARTING DATE
ITIME	0000	STARTING TIME
NQ	300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2	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

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
1.00 .98 .95 .92 .91 .89

*** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

*** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION					
				RATIO 1 1.00	RATIO 2 .98	RATIO 3 .95	RATIO 4 .92	RATIO 5 .91	RATIO 6 .89
HYDROGRAPH AT	OFF10	.67	1	608. 4.00	591. 4.00	565. 4.00	539. 4.00	530. 4.00	513. 4.00
ROUTED TO	ROFF10	.67	1	548. 4.58	532. 4.58	508. 4.58	485. 4.58	477. 4.58	462. 4.58
HYDROGRAPH AT	OFFF-A	.99	1	870. 3.92	843. 3.92	803. 3.92	763. 3.92	750. 3.92	723. 3.92
ROUTED TO	ROFFF-A	.99	1	819. 4.17	793. 4.17	755. 4.17	718. 4.17	705. 4.17	680. 4.17
HYDROGRAPH AT	OFFF-B	.61	1	447. 3.92	433. 3.92	411. 3.92	390. 3.92	383. 3.92	369. 3.92
HYDROGRAPH AT	EX-W1	.02	1	20. 3.58	19. 3.58	18. 3.58	17. 3.58	16. 3.58	16. 3.58
HYDROGRAPH AT	OFF11	.00	1	4. 3.50	4. 3.50	4. 3.50	3. 3.50	3. 3.50	3. 3.50
5 COMBINED AT	CP9	2.30	1	1489. 4.17	1443. 4.17	1374. 4.17	1305. 4.17	1282. 4.17	1237. 4.17
DIVERSION TO	DCHD02A	2.30	1	493. 4.17	477. 4.17	453. 4.17	431. 4.17	424. 4.17	409. 4.17
HYDROGRAPH AT	DCP9	2.30	1	996. 4.17	965. 4.17	920. 4.17	874. 4.17	859. 4.17	828. 4.17
ROUTED TO	RCP9	2.30	1	992. 4.17	962. 4.17	917. 4.17	870. 4.17	855. 4.17	824. 4.17

HYDROGRAPH AT

+	OFFG	.04	1	FLOW TIME	EXREG-100.OUT					
					48. 3.58	47. 3.58	44. 3.58	42. 3.58	41. 3.58	40. 3.58
+	HYDROGRAPH AT EX-W2	.02	1	FLOW TIME	22. 3.58	21. 3.58	20. 3.58	19. 3.58	19. 3.58	18. 3.58
+	HYDROGRAPH AT OFF12	.01	1	FLOW TIME	8. 3.58	8. 3.58	7. 3.58	7. 3.58	7. 3.58	6. 3.58
+	HYDROGRAPH AT OFF16	.79	1	FLOW TIME	555. 4.17	538. 4.17	514. 4.17	490. 4.17	482. 4.17	466. 4.17
+	ROUTED TO ROFF16	.79	1	FLOW TIME	537. 4.33	521. 4.33	498. 4.33	474. 4.33	466. 4.33	451. 4.33
+	HYDROGRAPH AT EX-W3	.27	1	FLOW TIME	268. 3.75	260. 3.75	248. 3.75	236. 3.75	232. 3.75	224. 3.75
+	6 COMBINED AT CP10	3.43	1	FLOW TIME	1613. 4.17	1564. 4.17	1492. 4.25	1419. 4.25	1395. 4.25	1347. 4.25
+	DIVERSION TO DCHD04A	3.43	1	FLOW TIME	985. 4.17	952. 4.17	902. 4.25	854. 4.25	838. 4.25	806. 4.25
+	HYDROGRAPH AT DCP10	3.43	1	FLOW TIME	628. 4.17	613. 4.17	590. 4.25	565. 4.25	557. 4.25	540. 4.25
+	DIVERSION TO DSHD04A	3.43	1	FLOW TIME	102. 4.17	87. 4.17	64. 4.25	39. 4.25	31. 4.25	14. 4.25
+	HYDROGRAPH AT DSPHD04A	3.43	1	FLOW TIME	526. 4.17	526. 4.17	526. 4.17	526. 4.17	526. 4.17	526. 4.17
+	ROUTED TO RDCP10	3.43	1	FLOW TIME	526. 4.25	526. 4.08	526. 4.17	526. 4.25	526. 4.25	526. 4.25
+	HYDROGRAPH AT EX-W4	.10	1	FLOW TIME	121. 3.58	117. 3.58	112. 3.58	106. 3.58	104. 3.58	101. 3.58
+	2 COMBINED AT CP11	3.54	1	FLOW TIME	578. 3.92	572. 3.92	564. 4.00	558. 4.08	555. 4.08	550. 4.17
+	DIVERSION TO DCHD05A	3.54	1	FLOW TIME	265. 3.92	263. 3.92	261. 4.00	259. 4.08	258. 4.08	256. 4.17
+	HYDROGRAPH AT DCP11	3.54	1	FLOW TIME	313. 3.92	309. 3.92	304. 4.00	299. 4.08	297. 4.08	294. 4.17
+	DIVERSION TO DSHD05A	3.54	1	FLOW TIME	1. 3.92	1. 3.92	1. 4.00	0. 4.08	0. 4.08	0. 4.17
+	HYDROGRAPH AT DSPHD05A	3.54	1	FLOW TIME	313. 3.92	309. 3.92	303. 4.00	299. 4.08	297. 4.08	293. 4.17
+	ROUTED TO RDCP11	3.54	1	FLOW TIME	310. 4.00	308. 4.00	301. 4.00	298. 4.08	295. 4.08	293. 4.17
+	HYDROGRAPH AT OFF18	.55	1	FLOW TIME	495. 3.92	480. 3.92	459. 3.92	437. 3.92	430. 3.92	416. 3.92
+	ROUTED TO ROFF18	.55	1	FLOW TIME	473. 4.08	459. 4.08	439. 4.08	418. 4.08	411. 4.08	397. 4.08
+	HYDROGRAPH AT EX-W5	.45	1	FLOW TIME	443. 3.75	429. 3.75	410. 3.75	390. 3.75	383. 3.75	370. 3.75
+	2 COMBINED AT CP12	1.00	1	FLOW TIME	792. 3.92	768. 3.92	733. 3.92	698. 3.92	686. 3.92	663. 3.92
+	HYDROGRAPH AT OFF14	.01	1	FLOW TIME	19. 3.50	19. 3.50	18. 3.50	17. 3.50	17. 3.50	16. 3.50
+	3 COMBINED AT CP13	4.55	1	FLOW TIME	1105. 3.92	1076. 3.92	1024. 3.92	971. 3.92	953. 3.92	917. 3.92
+	DIVERSION TO DCHD06A	4.55	1	FLOW TIME	835. 3.92	826. 3.92	810. 3.92	791. 3.92	784. 3.92	771. 3.92
+	HYDROGRAPH AT DCP13	4.55	1	FLOW TIME	270. 3.92	250. 3.92	214. 3.92	180. 3.92	169. 3.92	146. 3.92

EXREG-100.OUT

DIVERSION TO	DSHD06A	4.55	1	FLOW TIME	0. 3.92	0. 3.92	0. 3.92	0. 3.92	0. 3.92	0. 3.92
HYDROGRAPH AT	DSPHD06A	4.55	1	FLOW TIME	270. 3.92	250. 3.92	214. 3.92	180. 3.92	169. 3.92	146. 3.92
HYDROGRAPH AT	OFFE	.04	1	FLOW TIME	26. 3.67	25. 3.67	24. 3.67	22. 3.67	22. 3.67	21. 3.67
HYDROGRAPH AT	95-5	.04	1	FLOW TIME	60. 3.50	59. 3.50	56. 3.50	54. 3.50	53. 3.50	51. 3.50
2 COMBINED AT	CHD01B	.08	1	FLOW TIME	77. 3.50	74. 3.50	71. 3.50	67. 3.50	66. 3.50	64. 3.50
DIVERSION TO	DCHD01B	.08	1	FLOW TIME	77. 3.50	74. 3.50	71. 3.50	67. 3.50	66. 3.50	64. 3.50
HYDROGRAPH AT	DHD01B	.08	1	FLOW TIME	0. 3.25	0. 3.25	0. 3.25	0. 3.25	0. 3.25	0. 3.25
ROUTED TO	RDHD01B	.08	1	FLOW TIME	0. 4.75	0. 4.75	0. 3.50	0. 3.50	0. 3.50	0. 3.50
HYDROGRAPH AT	OFF8	.01	1	FLOW TIME	19. 3.58	19. 3.58	18. 3.58	17. 3.58	17. 3.58	17. 3.58
HYDROGRAPH AT	RETDCHD0	.00	1	FLOW TIME	493. 4.17	477. 4.17	453. 4.17	431. 4.17	424. 4.17	409. 4.17
3 COMBINED AT	CHD02B	.09	1	FLOW TIME	495. 4.17	479. 4.17	455. 4.17	433. 4.17	426. 4.17	411. 4.17
DIVERSION TO	DCHD02B	.09	1	FLOW TIME	296. 4.17	287. 4.17	274. 4.17	261. 4.17	256. 4.17	248. 4.17
HYDROGRAPH AT	CHD02B	.09	1	FLOW TIME	199. 4.17	192. 4.17	181. 4.17	172. 4.17	169. 4.17	164. 4.17
ROUTED TO	RDHD02B	.09	1	FLOW TIME	197. 4.17	190. 4.25	181. 4.25	171. 4.25	168. 4.25	163. 4.25
HYDROGRAPH AT	95-6	.01	1	FLOW TIME	17. 3.50	16. 3.50	16. 3.50	15. 3.50	15. 3.50	14. 3.50
HYDROGRAPH AT	RETDCHD0	.00	1	FLOW TIME	985. 4.17	952. 4.17	902. 4.25	854. 4.25	838. 4.25	806. 4.25
3 COMBINED AT	CHD04B	.10	1	FLOW TIME	1184. 4.17	1143. 4.17	1084. 4.25	1027. 4.25	1008. 4.25	970. 4.25
DIVERSION TO	DCHD04B	.10	1	FLOW TIME	613. 4.17	594. 4.17	567. 4.25	541. 4.25	533. 4.25	516. 4.25
HYDROGRAPH AT	DHD04B	.10	1	FLOW TIME	571. 4.17	549. 4.17	517. 4.25	485. 4.25	475. 4.25	454. 4.25
HYDROGRAPH AT	RETDSHD0	.00	1	FLOW TIME	102. 4.17	87. 4.17	64. 4.25	39. 4.25	31. 4.25	14. 4.25
2 COMBINED AT	CHD04B2	.10	1	FLOW TIME	673. 4.17	636. 4.17	581. 4.25	525. 4.25	506. 4.25	468. 4.25
DIVERSION TO	DSHD04B	.10	1	FLOW TIME	1. 4.17	1. 4.17	1. 4.17	1. 4.25	1. 4.25	0. 4.25
HYDROGRAPH AT	DSPHD04B	.10	1	FLOW TIME	672. 4.17	635. 4.17	580. 4.25	524. 4.25	506. 4.25	468. 4.25
ROUTED TO	RDHD04B	.10	1	FLOW TIME	671. 4.25	634. 4.25	580. 4.25	523. 4.25	505. 4.25	467. 4.25
HYDROGRAPH AT	95-7A	.01	1	FLOW TIME	13. 3.50	13. 3.50	12. 3.50	12. 3.50	12. 3.50	11. 3.50
HYDROGRAPH AT	RETHD05A	.00	1	FLOW TIME	265. 3.92	263. 3.92	261. 4.00	259. 4.08	258. 4.08	256. 4.17
HYDROGRAPH AT										

				EXREG-100.OUT						
+	RETSHD05	.00	1	FLOW TIME	1. 3.92	1. 3.92	1. 4.00	0. 4.08	0. 4.08	0. 4.17
+	4 COMBINED AT CHD05B2	.11	1	FLOW TIME	928. 4.25	891. 4.25	836. 4.25	779. 4.25	761. 4.25	723. 4.25
+	DIVERSION TO DCHD5B	.11	1	FLOW TIME	433. 4.25	416. 4.25	392. 4.25	366. 4.25	358. 4.25	341. 4.25
+	HYDROGRAPH AT DHD05B	.11	1	FLOW TIME	495. 4.25	475. 4.25	444. 4.25	413. 4.25	403. 4.25	381. 4.25
+	HYDROGRAPH AT 95-8A	.01	1	FLOW TIME	10. 3.50	10. 3.50	10. 3.50	9. 3.50	9. 3.50	9. 3.50
+	HYDROGRAPH AT RETHD06A	.00	1	FLOW TIME	835. 3.92	826. 3.92	810. 3.92	791. 3.92	784. 3.92	771. 3.92
+	HYDROGRAPH AT RETHD06A	.00	1	FLOW TIME	0. 3.92	0. 3.92	0. 3.92	0. 3.92	0. 3.92	0. 3.92
+	4 COMBINED AT CHD06B	.11	1	FLOW TIME	1282. 4.08	1254. 4.08	1211. 4.08	1167. 4.08	1152. 4.08	1121. 4.08
+	DIVERSION TO DCMPU6	.11	1	FLOW TIME	428. 4.08	419. 4.08	405. 4.08	390. 4.08	385. 4.08	375. 4.08
+	HYDROGRAPH AT RCHD6B	.11	1	FLOW TIME	853. 4.08	835. 4.08	806. 4.08	777. 4.08	767. 4.08	747. 4.08
+	DIVERSION TO DCHD6B	.11	1	FLOW TIME	712. 4.08	703. 4.08	689. 4.08	675. 4.08	670. 4.08	660. 4.08
+	HYDROGRAPH AT DHD06B	.11	1	FLOW TIME	142. 4.08	132. 4.08	117. 4.08	102. 4.08	97. 4.08	86. 4.08
+	HYDROGRAPH AT RETDCHD0	.00	1	FLOW TIME	77. 3.50	74. 3.50	71. 3.50	67. 3.50	66. 3.50	64. 3.50
+	DIVERSION TO DCHD01C	.00	1	FLOW TIME	77. 3.50	74. 3.50	71. 3.50	67. 3.50	66. 3.50	63. 3.50
+	HYDROGRAPH AT DHD01C	.00	1	FLOW TIME	0. 3.17	0. 3.17	0. 3.17	0. 3.17	0. 3.17	0. 3.25
+	ROUTED TO RDHD01C	.00	1	FLOW TIME	0. 3.42	0. 3.42	0. 3.42	0. 3.42	0. 3.42	0. 3.42
+	HYDROGRAPH AT RETHD02B	.00	1	FLOW TIME	296. 4.17	287. 4.17	274. 4.17	261. 4.17	256. 4.17	248. 4.17
+	2 COMBINED AT CHD02C	.00	1	FLOW TIME	297. 4.17	288. 4.17	274. 4.17	261. 4.17	257. 4.17	248. 4.17
+	DIVERSION TO DCHD02C	.00	1	FLOW TIME	146. 4.17	142. 4.17	135. 4.17	128. 4.17	125. 4.17	121. 4.17
+	HYDROGRAPH AT DHD02C	.00	1	FLOW TIME	150. 4.17	146. 4.17	139. 4.17	133. 4.17	131. 4.17	127. 4.17
+	ROUTED TO RDHD02C	.00	1	FLOW TIME	149. 4.17	145. 4.17	139. 4.25	132. 4.25	130. 4.25	126. 4.25
+	HYDROGRAPH AT RETHD04B	.00	1	FLOW TIME	613. 4.17	594. 4.17	567. 4.25	541. 4.25	533. 4.25	516. 4.25
+	2 COMBINED AT CHD04C	.00	1	FLOW TIME	762. 4.17	739. 4.17	706. 4.25	673. 4.25	663. 4.25	642. 4.25
+	DIVERSION TO DCHD04C	.00	1	FLOW TIME	322. 4.17	313. 4.17	301. 4.25	289. 4.25	285. 4.25	278. 4.25
+	HYDROGRAPH AT DHD04C	.00	1	FLOW TIME	440. 4.17	426. 4.17	405. 4.25	384. 4.25	378. 4.25	365. 4.25
+	HYDROGRAPH AT RETSHD04	.00	1	FLOW TIME	1. 4.17	1. 4.17	1. 4.17	1. 4.25	1. 4.25	0. 4.25
+	2 COMBINED AT CHD04C2	.00	1	FLOW TIME	441. 4.17	426. 4.17	405. 4.25	385. 4.25	378. 4.25	365. 4.25

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DIVERSION TO	DSHD04C	.00	1	FLOW TIME	0. 4.17	0. 4.17	0. 4.17	0. 4.17	0. 4.17	0. 4.17
+ HYDROGRAPH AT	DSPHD04C	.00	1	FLOW TIME	440. 4.17	426. 4.17	405. 4.25	384. 4.25	378. 4.25	365. 4.25
+ ROUTED TO	RDHD04C	.00	1	FLOW TIME	440. 4.25	426. 4.25	405. 4.25	384. 4.25	378. 4.25	365. 4.25
+ HYDROGRAPH AT	RETDCHD5B	.00	1	FLOW TIME	433. 4.25	416. 4.25	392. 4.25	366. 4.25	358. 4.25	341. 4.25
+ 2 COMBINED AT	CHD05C2	.00	1	FLOW TIME	873. 4.25	842. 4.25	796. 4.25	751. 4.25	736. 4.25	706. 4.25
+ DIVERSION TO	DCHD5C	.00	1	FLOW TIME	267. 4.25	258. 4.25	244. 4.25	232. 4.25	230. 4.25	225. 4.25
+ HYDROGRAPH AT	DHD5C	.00	1	FLOW TIME	606. 4.25	584. 4.25	552. 4.25	519. 4.25	506. 4.25	481. 4.25
+ ROUTED TO	RDHD05C	.00	1	FLOW TIME	605. 4.25	584. 4.25	552. 4.25	518. 4.25	505. 4.25	480. 4.25
+ HYDROGRAPH AT	RETDCHD6	.00	1	FLOW TIME	428. 4.08	419. 4.08	405. 4.08	390. 4.08	385. 4.08	375. 4.08
+ HYDROGRAPH AT	RETDCHD6	.00	1	FLOW TIME	712. 4.08	703. 4.08	689. 4.08	675. 4.08	670. 4.08	660. 4.08
+ 3 COMBINED AT	CHD06C	.00	1	FLOW TIME	1736. 4.17	1696. 4.17	1636. 4.17	1573. 4.17	1551. 4.17	1507. 4.17
+ DIVERSION TO	DCHD6C	.00	1	FLOW TIME	1015. 4.17	996. 4.17	966. 4.17	936. 4.17	926. 4.17	907. 4.17
+ HYDROGRAPH AT	DHD6C	.00	1	FLOW TIME	721. 4.17	700. 4.17	670. 4.17	637. 4.17	625. 4.17	600. 4.17
+ 3 COMBINED AT	CPW-DUMM	4.66	1	FLOW TIME	1064. 4.08	1020. 4.08	953. 4.08	881. 4.08	855. 4.08	805. 4.08
+ HYDROGRAPH AT	RETDCHD0	.00	1	FLOW TIME	146. 4.17	142. 4.17	135. 4.17	128. 4.17	125. 4.17	121. 4.17
+ ROUTED TO	RDCHD02C	.00	1	FLOW TIME	147. 4.25	142. 4.25	134. 4.25	127. 4.33	125. 4.33	121. 4.33
+ HYDROGRAPH AT	BAS1E	.16	1	FLOW TIME	114. 3.67	109. 3.67	103. 3.67	96. 3.67	94. 3.67	90. 3.67
+ 2 COMBINED AT	CP-A	.16	1	FLOW TIME	193. 3.75	188. 3.75	180. 3.75	173. 3.75	170. 3.75	165. 3.75
+ ROUTED TO	RCP-A	.16	1	FLOW TIME	194. 3.75	189. 3.75	181. 3.75	172. 3.83	170. 3.83	165. 3.83
+ HYDROGRAPH AT	BAS3E	.13	1	FLOW TIME	124. 3.67	120. 3.67	114. 3.67	109. 3.67	107. 3.67	103. 3.67
+ 2 COMBINED AT	CP-B	.28	1	FLOW TIME	306. 3.75	297. 3.75	284. 3.75	270. 3.75	266. 3.75	257. 3.75
+ ROUTED TO	RCP-B	.28	1	FLOW TIME	308. 3.83	299. 3.83	286. 3.83	272. 3.83	268. 3.83	259. 3.83
+ HYDROGRAPH AT	RETDCHD0	.00	1	FLOW TIME	322. 4.17	313. 4.17	301. 4.25	289. 4.25	285. 4.25	278. 4.25
+ HYDROGRAPH AT	OFFH	.01	1	FLOW TIME	15. 3.50	14. 3.50	14. 3.50	13. 3.50	13. 3.50	12. 3.50
+ 2 COMBINED AT	CP17	.01	1	FLOW TIME	323. 4.17	315. 4.17	302. 4.25	290. 4.25	286. 4.25	279. 4.25
+ ROUTED TO	RCP17	.01	1	FLOW TIME	321. 4.25	313. 4.25	301. 4.25	289. 4.25	285. 4.25	277. 4.25
+ HYDROGRAPH AT										

+	EX-E5	.10	1	FLOW TIME	79. 3.67	EXREG-100.OUT 76. 3.67	72. 3.67	68. 3.67	66. 3.67	63. 3.67
+	HYDROGRAPH AT ES1	.02	1	FLOW TIME	29. 3.50	28. 3.50	27. 3.50	26. 3.50	26. 3.50	25. 3.50
+	3 COMBINED AT CP18	.13	1	FLOW TIME	340. 4.25	331. 4.25	318. 4.25	305. 4.25	301. 4.25	293. 4.25
+	ROUTED TO RCP18	.13	1	FLOW TIME	340. 4.25	331. 4.25	318. 4.25	305. 4.25	301. 4.25	292. 4.25
+	HYDROGRAPH AT BAS4E	.14	1	FLOW TIME	151. 3.58	146. 3.58	139. 3.58	132. 3.58	130. 3.58	125. 3.58
+	2 COMBINED AT CP-C	.26	1	FLOW TIME	462. 3.67	453. 3.67	438. 3.67	422. 3.67	420. 3.67	405. 3.67
+	ROUTED TO RCP-C	.26	1	FLOW TIME	455. 3.75	445. 3.75	437. 3.75	415. 3.75	412. 3.75	406. 3.75
+	HYDROGRAPH AT BAS6E	.16	1	FLOW TIME	126. 3.67	121. 3.67	114. 3.67	107. 3.67	105. 3.67	100. 3.67
+	3 COMBINED AT CP-D	.71	1	FLOW TIME	867. 3.75	843. 3.75	816. 3.75	773. 3.75	763. 3.75	744. 3.75
+	ROUTED TO RCP-D	.71	1	FLOW TIME	851. 3.83	838. 3.83	800. 3.83	767. 3.83	752. 3.83	734. 3.83
+	HYDROGRAPH AT BAS8E	.11	1	FLOW TIME	92. 3.67	88. 3.67	83. 3.67	79. 3.67	77. 3.67	74. 3.67
+	2 COMBINED AT CP-E	.82	1	FLOW TIME	927. 3.83	911. 3.83	869. 3.83	833. 3.83	816. 3.83	796. 3.83
+	HYDROGRAPH AT RETDSHD0	.00	1	FLOW TIME	0. 4.17	0. 4.17	0. 4.17	0. 4.17	0. 4.17	0. 4.17
+	HYDROGRAPH AT 95-7B	.01	1	FLOW TIME	20. 3.50	20. 3.50	19. 3.50	18. 3.50	18. 3.50	18. 3.50
+	2 COMBINED AT CP19	.01	1	FLOW TIME	20. 3.50	20. 3.50	19. 3.50	18. 3.50	18. 3.50	18. 3.50
+	HYDROGRAPH AT RETDCHD5	.00	1	FLOW TIME	267. 4.25	258. 4.25	244. 4.25	232. 4.25	230. 4.25	225. 4.25
+	HYDROGRAPH AT RETDCHD6	.00	1	FLOW TIME	1015. 4.17	996. 4.17	966. 4.17	936. 4.17	926. 4.17	907. 4.17
+	HYDROGRAPH AT 95-8B	.00	1	FLOW TIME	8. 3.50	8. 3.50	8. 3.50	7. 3.50	7. 3.50	7. 3.50
+	3 COMBINED AT CP20	.00	1	FLOW TIME	1281. 4.17	1252. 4.17	1209. 4.17	1168. 4.17	1156. 4.17	1131. 4.17
+	HYDROGRAPH AT EX-E6	.02	1	FLOW TIME	21. 3.58	21. 3.58	20. 3.58	19. 3.58	19. 3.58	18. 3.58
+	3 COMBINED AT CP21	.03	1	FLOW TIME	1285. 4.17	1257. 4.17	1213. 4.17	1172. 4.17	1160. 4.17	1135. 4.17
+	HYDROGRAPH AT ES2	.05	1	FLOW TIME	84. 3.58	82. 3.58	79. 3.58	76. 3.58	75. 3.58	73. 3.58
+	HYDROGRAPH AT 95-9B	.01	1	FLOW TIME	22. 3.58	21. 3.58	20. 3.58	20. 3.58	19. 3.58	19. 3.58
+	HYDROGRAPH AT BAS2E	.05	1	FLOW TIME	80. 3.50	78. 3.50	75. 3.50	72. 3.50	71. 3.50	69. 3.50
+	4 COMBINED AT CP-F	.14	1	FLOW TIME	1309. 4.17	1280. 4.17	1236. 4.17	1193. 4.17	1181. 4.17	1156. 4.17
+	ROUTED TO RCP-F	.14	1	FLOW TIME	1305. 4.17	1277. 4.17	1232. 4.17	1191. 4.17	1179. 4.17	1154. 4.17
+	HYDROGRAPH AT BAS5E	.09	1	FLOW TIME	133. 3.58	130. 3.58	126. 3.58	121. 3.58	119. 3.58	116. 3.58

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2 COMBINED AT	CP-G	.23	1	FLOW TIME	1334. 4.17	1305. 4.17	1259. 4.17	1217. 4.17	1205. 4.17	1180. 4.17
ROUTED TO	RCP-G	.23	1	FLOW TIME	1330. 4.25	1301. 4.25	1256. 4.25	1213. 4.17	1201. 4.17	1177. 4.17
HYDROGRAPH AT	BAS7E	.19	1	FLOW TIME	191. 3.67	185. 3.67	176. 3.67	166. 3.67	163. 3.67	157. 3.67
2 COMBINED AT	CP-H	.43	1	FLOW TIME	1419. 3.75	1383. 3.75	1353. 3.75	1299. 3.83	1287. 3.75	1261. 3.75
ROUTED TO	RCP-H	.43	1	FLOW TIME	1407. 3.83	1371. 3.83	1347. 3.83	1294. 3.83	1286. 3.83	1259. 3.83
2 COMBINED AT	CP-I	1.24	1	FLOW TIME	2334. 3.83	2282. 3.83	2217. 3.83	2127. 3.83	2102. 3.83	2056. 3.83

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

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN RCP9	= 1 MANE	RATIO= .00 1.04	994.73	250.92	1.00	5.00	992.09	250.00	1.00
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1224E+03 EXCESS= .0000E+00 OUTFLOW= .1224E+03 BASIN STORAGE= .2934E-03 PERCENT ERROR= .0									
FOR PLAN RCP9	= 1 MANE	RATIO= .00 1.05	964.16	251.80	.96	5.00	961.89	250.00	.96
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1181E+03 EXCESS= .0000E+00 OUTFLOW= .1181E+03 BASIN STORAGE= .3029E-03 PERCENT ERROR= .0									
FOR PLAN RCP9	= 1 MANE	RATIO= .00 1.06	919.51	251.64	.91	5.00	916.79	250.00	.91
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1117E+03 EXCESS= .0000E+00 OUTFLOW= .1117E+03 BASIN STORAGE= .2896E-03 PERCENT ERROR= .0									
FOR PLAN RCP9	= 1 MANE	RATIO= .00 1.08	873.48	251.67	.86	5.00	870.50	250.00	.86
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1052E+03 EXCESS= .0000E+00 OUTFLOW= .1052E+03 BASIN STORAGE= .2878E-03 PERCENT ERROR= .0									
FOR PLAN RCP9	= 1 MANE	RATIO= .00 1.08	857.94	251.73	.84	5.00	854.95	250.00	.84
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1031E+03 EXCESS= .0000E+00 OUTFLOW= .1031E+03 BASIN STORAGE= .2985E-03 PERCENT ERROR= .0									
FOR PLAN RCP9	= 1 MANE	RATIO= .00 1.09	826.95	251.87	.80	5.00	823.97	250.00	.80
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9881E+02 EXCESS= .0000E+00 OUTFLOW= .9881E+02 BASIN STORAGE= .2986E-03 PERCENT ERROR= .0									
FOR PLAN RDCP10	= 1 MANE	RATIO= .00 1.55	526.69	237.48	.51	5.00	526.07	255.00	.51
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9259E+02 EXCESS= .0000E+00 OUTFLOW= .9259E+02 BASIN STORAGE= .4003E-03 PERCENT ERROR= .0									
FOR PLAN RDCP10	= 1 MANE	RATIO= .00 1.55	527.06	237.48	.50	5.00	526.06	255.00	.50
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9077E+02 EXCESS= .0000E+00 OUTFLOW= .9077E+02 BASIN STORAGE= .3931E-03 PERCENT ERROR= .0									
FOR PLAN RDCP10	= 1 MANE	RATIO= .00 1.55	526.30	242.14	.48	5.00	526.07	250.00	.48
CONTINUITY SUMMARY (AC-FT) - INFLOW= .8782E+02 EXCESS= .0000E+00 OUTFLOW= .8782E+02 BASIN STORAGE= .3755E-03 PERCENT ERROR= .0									
FOR PLAN RDCP10	= 1 MANE	RATIO= .00 1.55	526.26	246.80	.46	5.00	526.03	255.00	.46
CONTINUITY SUMMARY (AC-FT) - INFLOW= .8474E+02 EXCESS= .0000E+00 OUTFLOW= .8474E+02 BASIN STORAGE= .3646E-03 PERCENT ERROR= .0									
FOR PLAN RDCP10	= 1 MANE	RATIO= .00 1.55	526.29	248.35	.46	5.00	526.04	255.00	.46

EXREG-100.OUT

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8364E+02 EXCESS= .0000E+00 OUTFLOW= .8364E+02 BASIN STORAGE= .4061E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDCP10 MANE 1.55 526.28 251.46 .44 5.00 526.03 255.00 .44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8136E+02 EXCESS= .0000E+00 OUTFLOW= .8136E+02 BASIN STORAGE= .3980E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDCP11 MANE 1.11 312.32 237.00 .22 5.00 309.85 240.00 .22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4168E+02 EXCESS= .0000E+00 OUTFLOW= .4168E+02 BASIN STORAGE= .2346E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDCP11 MANE 1.11 308.85 236.64 .21 5.00 308.45 240.00 .21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4052E+02 EXCESS= .0000E+00 OUTFLOW= .4052E+02 BASIN STORAGE= .2353E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDCP11 MANE 1.12 302.80 241.08 .20 5.00 301.08 245.00 .20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3861E+02 EXCESS= .0000E+00 OUTFLOW= .3861E+02 BASIN STORAGE= .2278E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDCP11 MANE 1.12 298.29 246.44 .19 5.00 297.93 245.00 .19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3660E+02 EXCESS= .0000E+00 OUTFLOW= .3661E+02 BASIN STORAGE= .2336E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDCP11 MANE 1.12 296.56 246.82 .19 5.00 295.34 245.00 .19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3589E+02 EXCESS= .0000E+00 OUTFLOW= .3589E+02 BASIN STORAGE= .2341E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDCP11 MANE 1.13 293.19 249.82 .18 5.00 293.17 250.00 .18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3442E+02 EXCESS= .0000E+00 OUTFLOW= .3442E+02 BASIN STORAGE= .2350E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD01B MANE 3.00 .10 285.00 .00 5.00 .10 285.00 .00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1986E-01 EXCESS= .0000E+00 OUTFLOW= .1997E-01 BASIN STORAGE= .3515E-03 PERCENT ERROR= -2.3

FOR PLAN = 1 RATIO= .00
RDHD01B MANE 3.00 .11 285.00 .00 5.00 .11 285.00 .00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1955E-01 EXCESS= .0000E+00 OUTFLOW= .1967E-01 BASIN STORAGE= .3484E-03 PERCENT ERROR= -2.4

FOR PLAN = 1 RATIO= .00
RDHD01B MANE 3.00 .10 210.00 .00 5.00 .10 210.00 .00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1907E-01 EXCESS= .0000E+00 OUTFLOW= .1919E-01 BASIN STORAGE= .3392E-03 PERCENT ERROR= -2.4

FOR PLAN = 1 RATIO= .00
RDHD01B MANE 3.00 .11 210.00 .00 5.00 .11 210.00 .00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1858E-01 EXCESS= .0000E+00 OUTFLOW= .1870E-01 BASIN STORAGE= .3582E-03 PERCENT ERROR= -2.5

FOR PLAN = 1 RATIO= .00
RDHD01B MANE 3.00 .11 210.00 .00 5.00 .11 210.00 .00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1841E-01 EXCESS= .0000E+00 OUTFLOW= .1852E-01 BASIN STORAGE= .3597E-03 PERCENT ERROR= -2.6

FOR PLAN = 1 RATIO= .00
RDHD01B MANE 3.00 .11 210.00 .00 5.00 .11 210.00 .00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1804E-01 EXCESS= .0000E+00 OUTFLOW= .1814E-01 BASIN STORAGE= .3559E-03 PERCENT ERROR= -2.5

FOR PLAN = 1 RATIO= .00
RDHD02B MANE 2.42 198.24 253.92 6.61 5.00 197.42 250.00 6.61

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3119E+02 EXCESS= .0000E+00 OUTFLOW= .3119E+02 BASIN STORAGE= .4506E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD02B MANE 2.44 191.22 253.78 6.42 5.00 190.44 255.00 6.42

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CONTINUITY SUMMARY (AC-FT) - INFLOW= .3031E+02 EXCESS= .0000E+00 OUTFLOW= .3031E+02 BASIN STORAGE= .4537E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD02B MANE 2.47 180.72 252.44 6.15 5.00 180.63 255.00 6.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2904E+02 EXCESS= .0000E+00 OUTFLOW= .2904E+02 BASIN STORAGE= .4546E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD02B MANE 2.51 171.64 253.24 5.89 5.00 171.32 255.00 5.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2779E+02 EXCESS= .0000E+00 OUTFLOW= .2779E+02 BASIN STORAGE= .4705E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD02B MANE 2.52 168.85 254.31 5.80 5.00 168.48 255.00 5.80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2740E+02 EXCESS= .0000E+00 OUTFLOW= .2740E+02 BASIN STORAGE= .4752E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD02B MANE 2.54 163.11 253.98 5.64 5.00 162.73 255.00 5.64

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2661E+02 EXCESS= .0000E+00 OUTFLOW= .2661E+02 BASIN STORAGE= .4836E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD04B MANE 1.46 672.71 252.55 12.44 5.00 671.08 255.00 12.44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6561E+02 EXCESS= .0000E+00 OUTFLOW= .6562E+02 BASIN STORAGE= .3790E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD04B MANE 1.48 635.80 253.20 11.73 5.00 634.14 255.00 11.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6189E+02 EXCESS= .0000E+00 OUTFLOW= .6189E+02 BASIN STORAGE= .3632E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD04B MANE 1.51 581.06 252.93 10.72 5.00 579.61 255.00 10.72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5656E+02 EXCESS= .0000E+00 OUTFLOW= .5657E+02 BASIN STORAGE= .3754E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD04B MANE 1.55 524.55 253.22 9.74 5.00 523.26 255.00 9.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5136E+02 EXCESS= .0000E+00 OUTFLOW= .5136E+02 BASIN STORAGE= .3740E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD04B MANE 1.57 505.21 253.95 9.42 5.00 504.99 255.00 9.42

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4968E+02 EXCESS= .0000E+00 OUTFLOW= .4969E+02 BASIN STORAGE= .3773E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RDHD04B MANE 1.60 467.01 252.55 8.81 5.00 466.93 255.00 8.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4644E+02 EXCESS= .0000E+00 OUTFLOW= .4645E+02 BASIN STORAGE= .3783E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= 1.00
RDHD01C MANE 4.57 .10 251.47 -1.00 5.00 .10 255.00 -1.00

FOR PLAN = 1 RATIO= .98
RDHD01C MANE 4.49 .10 251.78 -1.00 5.00 .10 255.00 -1.00

FOR PLAN = 1 RATIO= .95
RDHD01C MANE 4.45 .10 200.70 -1.00 5.00 .10 250.00 -1.00

FOR PLAN = 1 RATIO= .92
RDHD01C MANE 4.42 .10 305.40 -1.00 5.00 .10 305.00 -1.00

FOR PLAN = 1 RATIO= .91
RDHD01C MANE 4.50 .10 200.57 -1.00 5.00 .10 285.00 -1.00

FOR PLAN = 1 RATIO= .89
RDHD01C MANE 4.50 .10 279.55 -1.00 5.00 .10 280.00 -1.00

FOR PLAN = 1 RATIO= 1.00
RDHD02C MANE .97 149.85 251.63 -1.00 5.00 149.16 250.00 -1.00

EXREG-100.OUT

FOR PLAN = 1 RDHD02C	RATIO= MANE	.98 .97	145.67	251.84	-1.00	5.00	144.90	250.00	-1.00
FOR PLAN = 1 RDHD02C	RATIO= MANE	.95 .92	139.39	251.83	-1.00	5.00	138.55	255.00	-1.00
FOR PLAN = 1 RDHD02C	RATIO= MANE	.92 1.08	133.02	252.05	-1.00	5.00	132.39	255.00	-1.00
FOR PLAN = 1 RDHD02C	RATIO= MANE	.91 1.07	130.89	252.71	-1.00	5.00	130.38	255.00	-1.00
FOR PLAN = 1 RDHD02C	RATIO= MANE	.89 1.07	126.70	252.02	-1.00	5.00	126.07	255.00	-1.00
FOR PLAN = 1 RDHD04C	RATIO= MANE	1.00 .60	440.26	251.65	-1.00	5.00	439.91	255.00	-1.00
FOR PLAN = 1 RDHD04C	RATIO= MANE	.98 .57	425.88	251.37	-1.00	5.00	425.71	255.00	-1.00
FOR PLAN = 1 RDHD04C	RATIO= MANE	.95 .72	404.73	254.94	-1.00	5.00	404.72	255.00	-1.00
FOR PLAN = 1 RDHD04C	RATIO= MANE	.92 .68	384.38	255.38	-1.00	5.00	384.36	255.00	-1.00
FOR PLAN = 1 RDHD04C	RATIO= MANE	.91 .73	377.69	255.63	-1.00	5.00	377.67	255.00	-1.00
FOR PLAN = 1 RDHD04C	RATIO= MANE	.89 .73	364.59	255.78	-1.00	5.00	364.56	255.00	-1.00
FOR PLAN = 1 RDHD05C	RATIO= MANE	1.00 .47	605.43	255.33	-1.00	5.00	605.29	255.00	-1.00
FOR PLAN = 1 RDHD05C	RATIO= MANE	.98 .33	584.11	255.41	-1.00	5.00	583.84	255.00	-1.00
FOR PLAN = 1 RDHD05C	RATIO= MANE	.95 .43	552.10	255.49	-1.00	5.00	551.85	255.00	-1.00
FOR PLAN = 1 RDHD05C	RATIO= MANE	.92 .41	518.23	255.45	-1.00	5.00	517.87	255.00	-1.00
FOR PLAN = 1 RDHD05C	RATIO= MANE	.91 .50	505.60	255.35	-1.00	5.00	505.31	255.00	-1.00
FOR PLAN = 1 RDHD05C	RATIO= MANE	.89 .49	480.67	255.61	-1.00	5.00	480.33	255.00	-1.00
FOR PLAN = 1 RDCHD02C	RATIO= MANE	.00 5.00	146.59	255.00	-1.00	5.00	146.59	255.00	-1.00
FOR PLAN = 1 RDCHD02C	RATIO= MANE	.00 5.00	141.78	255.00	-1.00	5.00	141.78	255.00	-1.00
FOR PLAN = 1 RDCHD02C	RATIO= MANE	.00 5.00	134.46	255.00	-1.00	5.00	134.46	255.00	-1.00
FOR PLAN = 1 RDCHD02C	RATIO= MANE	.00 5.00	127.42	260.00	-1.00	5.00	127.42	260.00	-1.00

EXREG-100.OUT

FOR PLAN = 1	RATIO=	.00							
RDCHD02C	MANE	5.00	125.18	260.00	-1.00	5.00	125.18	260.00	-1.00
FOR PLAN = 1	RATIO=	.00							
RDCHD02C	MANE	5.00	121.04	260.00	-1.00	5.00	121.04	260.00	-1.00
FOR PLAN = 1	RATIO=	.00							
RCP-A	MANE	5.00	194.25	225.00	4.67	5.00	194.25	225.00	4.67
CONTINUITY SUMMARY (AC-FT) - INFLOW= .3966E+02 EXCESS= .0000E+00 OUTFLOW= .3966E+02 BASIN STORAGE= .1007E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-A	MANE	5.00	189.05	225.00	4.55	5.00	189.05	225.00	4.55
CONTINUITY SUMMARY (AC-FT) - INFLOW= .3860E+02 EXCESS= .0000E+00 OUTFLOW= .3861E+02 BASIN STORAGE= .9910E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-A	MANE	5.00	180.78	225.00	4.37	5.00	180.78	225.00	4.37
CONTINUITY SUMMARY (AC-FT) - INFLOW= .3704E+02 EXCESS= .0000E+00 OUTFLOW= .3705E+02 BASIN STORAGE= .9673E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-A	MANE	5.00	172.42	230.00	4.19	5.00	172.42	230.00	4.19
CONTINUITY SUMMARY (AC-FT) - INFLOW= .3553E+02 EXCESS= .0000E+00 OUTFLOW= .3553E+02 BASIN STORAGE= .9432E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-A	MANE	5.00	169.85	230.00	4.13	5.00	169.85	230.00	4.13
CONTINUITY SUMMARY (AC-FT) - INFLOW= .3502E+02 EXCESS= .0000E+00 OUTFLOW= .3503E+02 BASIN STORAGE= .9351E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-A	MANE	5.00	164.85	230.00	4.01	5.00	164.85	230.00	4.01
CONTINUITY SUMMARY (AC-FT) - INFLOW= .3404E+02 EXCESS= .0000E+00 OUTFLOW= .3405E+02 BASIN STORAGE= .9187E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	5.00	307.62	230.00	3.21	5.00	307.62	230.00	3.21
CONTINUITY SUMMARY (AC-FT) - INFLOW= .4862E+02 EXCESS= .0000E+00 OUTFLOW= .4863E+02 BASIN STORAGE= .1420E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	5.00	298.84	230.00	3.12	5.00	298.84	230.00	3.12
CONTINUITY SUMMARY (AC-FT) - INFLOW= .4727E+02 EXCESS= .0000E+00 OUTFLOW= .4728E+02 BASIN STORAGE= .1399E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	5.00	285.76	230.00	2.99	5.00	285.76	230.00	2.99
CONTINUITY SUMMARY (AC-FT) - INFLOW= .4527E+02 EXCESS= .0000E+00 OUTFLOW= .4527E+02 BASIN STORAGE= .1528E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	5.00	272.29	230.00	2.86	5.00	272.29	230.00	2.86
CONTINUITY SUMMARY (AC-FT) - INFLOW= .4331E+02 EXCESS= .0000E+00 OUTFLOW= .4332E+02 BASIN STORAGE= .1493E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	5.00	267.95	230.00	2.81	5.00	267.95	230.00	2.81
CONTINUITY SUMMARY (AC-FT) - INFLOW= .4267E+02 EXCESS= .0000E+00 OUTFLOW= .4267E+02 BASIN STORAGE= .1438E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	5.00	259.14	230.00	2.73	5.00	259.14	230.00	2.73
CONTINUITY SUMMARY (AC-FT) - INFLOW= .4140E+02 EXCESS= .0000E+00 OUTFLOW= .4140E+02 BASIN STORAGE= .1415E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP18	MANE	4.25	340.45	255.24	11.33	5.00	340.25	255.00	11.33
CONTINUITY SUMMARY (AC-FT) - INFLOW= .7552E+02 EXCESS= .0000E+00 OUTFLOW= .7552E+02 BASIN STORAGE= .9058E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP18	MANE	4.28	331.04	256.96	11.07	5.00	330.51	255.00	11.07

EXREG-100.OUT

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7381E+02 EXCESS= .0000E+00 OUTFLOW= .7382E+02 BASIN STORAGE= .9082E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP18 MANE 4.33 318.21 255.27 10.69 5.00 318.00 255.00 10.69

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7127E+02 EXCESS= .0000E+00 OUTFLOW= .7127E+02 BASIN STORAGE= .1049E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP18 MANE 4.37 304.96 257.92 10.32 5.00 304.73 255.00 10.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6879E+02 EXCESS= .0000E+00 OUTFLOW= .6879E+02 BASIN STORAGE= .9279E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP18 MANE 4.39 300.92 254.43 10.20 5.00 300.91 255.00 10.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6799E+02 EXCESS= .0000E+00 OUTFLOW= .6799E+02 BASIN STORAGE= .1035E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP18 MANE 4.42 292.61 256.22 9.95 5.00 292.18 255.00 9.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6632E+02 EXCESS= .0000E+00 OUTFLOW= .6632E+02 BASIN STORAGE= .1035E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-C MANE 4.26 455.53 226.01 6.18 5.00 454.80 225.00 6.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8614E+02 EXCESS= .0000E+00 OUTFLOW= .8615E+02 BASIN STORAGE= .1176E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-C MANE 4.28 449.65 222.80 6.04 5.00 444.92 225.00 6.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8413E+02 EXCESS= .0000E+00 OUTFLOW= .8414E+02 BASIN STORAGE= .9753E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-C MANE 4.32 438.86 224.65 5.82 5.00 437.44 225.00 5.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8111E+02 EXCESS= .0000E+00 OUTFLOW= .8111E+02 BASIN STORAGE= .1207E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-C MANE 4.36 414.58 226.71 5.60 5.00 414.56 225.00 5.60

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7807E+02 EXCESS= .0000E+00 OUTFLOW= .7807E+02 BASIN STORAGE= .1126E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-C MANE 4.37 413.05 222.65 5.54 5.00 411.62 225.00 5.53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7716E+02 EXCESS= .0000E+00 OUTFLOW= .7716E+02 BASIN STORAGE= .1026E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-C MANE 4.41 407.25 224.68 5.40 5.00 406.36 225.00 5.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7519E+02 EXCESS= .0000E+00 OUTFLOW= .7520E+02 BASIN STORAGE= .1228E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-D MANE 4.00 858.90 227.76 3.80 5.00 851.36 230.00 3.80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1436E+03 EXCESS= .0000E+00 OUTFLOW= .1436E+03 BASIN STORAGE= .1345E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-D MANE 4.02 842.26 229.34 3.70 5.00 837.63 230.00 3.70

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1398E+03 EXCESS= .0000E+00 OUTFLOW= .1398E+03 BASIN STORAGE= .1317E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-D MANE 4.06 800.27 231.24 3.56 5.00 799.97 230.00 3.56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1344E+03 EXCESS= .0000E+00 OUTFLOW= .1344E+03 BASIN STORAGE= .1182E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-D MANE 4.11 768.98 230.29 3.41 5.00 767.35 230.00 3.41

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1288E+03 EXCESS= .0000E+00 OUTFLOW= .1288E+03 BASIN STORAGE= .1147E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-D MANE 4.13 754.95 231.01 3.36 5.00 751.86 230.00 3.36

EXREG-100.OUT

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1271E+03 EXCESS= .0000E+00 OUTFLOW= .1271E+03 BASIN STORAGE= .1323E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-D MANE 4.15 739.69 228.30 3.27 5.00 734.19 230.00 3.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1237E+03 EXCESS= .0000E+00 OUTFLOW= .1237E+03 BASIN STORAGE= .1328E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-F MANE 3.16 1308.86 252.48 30.43 5.00 1305.48 250.00 30.44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2337E+03 EXCESS= .0000E+00 OUTFLOW= .2337E+03 BASIN STORAGE= .9404E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-F MANE 3.17 1278.92 250.74 29.71 5.00 1276.63 250.00 29.71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2282E+03 EXCESS= .0000E+00 OUTFLOW= .2282E+03 BASIN STORAGE= .1120E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-F MANE 3.20 1234.99 252.96 28.64 5.00 1231.71 250.00 28.64

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2199E+03 EXCESS= .0000E+00 OUTFLOW= .2200E+03 BASIN STORAGE= .9645E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-F MANE 3.23 1193.61 251.94 27.58 5.00 1191.09 250.00 27.58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2118E+03 EXCESS= .0000E+00 OUTFLOW= .2118E+03 BASIN STORAGE= .1038E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-F MANE 3.24 1180.80 252.60 27.23 5.00 1178.60 250.00 27.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2091E+03 EXCESS= .0000E+00 OUTFLOW= .2091E+03 BASIN STORAGE= .9336E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-F MANE 3.26 1155.61 250.69 26.53 5.00 1154.43 250.00 26.53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2038E+03 EXCESS= .0000E+00 OUTFLOW= .2038E+03 BASIN STORAGE= .1114E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-G MANE 3.28 1332.48 252.73 19.68 5.00 1330.19 255.00 19.68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2438E+03 EXCESS= .0000E+00 OUTFLOW= .2438E+03 BASIN STORAGE= .9807E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-G MANE 3.30 1301.84 254.15 19.21 5.00 1300.52 255.00 19.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2380E+03 EXCESS= .0000E+00 OUTFLOW= .2380E+03 BASIN STORAGE= .1190E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-G MANE 3.33 1257.77 253.10 18.51 5.00 1255.79 255.00 18.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2294E+03 EXCESS= .0000E+00 OUTFLOW= .2294E+03 BASIN STORAGE= .1021E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-G MANE 3.36 1216.67 251.87 17.83 5.00 1213.11 250.00 17.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2208E+03 EXCESS= .0000E+00 OUTFLOW= .2208E+03 BASIN STORAGE= .1140E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-G MANE 3.37 1203.60 252.54 17.60 5.00 1200.52 250.00 17.60

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2180E+03 EXCESS= .0000E+00 OUTFLOW= .2180E+03 BASIN STORAGE= .1013E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-G MANE 3.38 1177.96 250.47 17.15 5.00 1176.71 250.00 17.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2124E+03 EXCESS= .0000E+00 OUTFLOW= .2124E+03 BASIN STORAGE= .9911E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-H MANE 3.42 1410.04 229.30 11.34 5.00 1406.82 230.00 11.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2577E+03 EXCESS= .0000E+00 OUTFLOW= .2577E+03 BASIN STORAGE= .1242E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-H MANE 3.44 1386.58 227.31 11.06 5.00 1371.13 230.00 11.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2514E+03 EXCESS= .0000E+00 OUTFLOW= .2514E+03 BASIN STORAGE= .1126E-02 PERCENT ERROR= .0

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EXREG-100.OUT

FOR PLAN = 1 RATIO= .00
RCP-H MANE 3.46 1355.64 228.55 10.66 5.00 1347.35 230.00 10.66

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2421E+03 EXCESS= .0000E+00 OUTFLOW= .2421E+03 BASIN STORAGE= .1143E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-H MANE 3.50 1297.88 227.42 10.25 5.00 1294.07 230.00 10.25

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2329E+03 EXCESS= .0000E+00 OUTFLOW= .2329E+03 BASIN STORAGE= .1216E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-H MANE 3.51 1288.16 227.94 10.11 5.00 1285.72 230.00 10.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2298E+03 EXCESS= .0000E+00 OUTFLOW= .2299E+03 BASIN STORAGE= .1084E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-H MANE 3.52 1261.37 229.09 9.85 5.00 1259.47 230.00 9.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2238E+03 EXCESS= .0000E+00 OUTFLOW= .2238E+03 BASIN STORAGE= .1086E-02 PERCENT ERROR= .0

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

Regional Analysis – Ultimate Conditions HEC-1 Model

ULTREG-100.OUT

1*****
 *
 * FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 * JUN 1998 *
 * VERSION 4.1 *
 *
 * RUN DATE 18APR14 TIME 14:25:06 *
 *

 *
 * 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   X   XX
X   X X   X   X   X   X
XXXXXXX XXXX   X   XXXXX X
X   X X   X   X   X   X
X   X X   X   X   X   X
X   X XXXXXXX XXXXX   XXX
  
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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

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HEC-1 INPUT

PAGE 1

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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*** DIAGRAM
*** FREE ***
1  ID      SLATER HANIFAN GROUP
2  ID      CITY OF LAS VEGAS
3  ID      BRENT LANE DRAINAGE SYSTEM AND TRAIL
4  ID      ULTIMATE CONDITION - REGIONAL ANALYSIS (100-YR STORM)
5  ID
6  ID      RETURN PERIOD ----- 100-YEAR
7  ID      DISTRIBUTION ----- 6-HOUR SDN3
8  ID      PROJECT NO. ----- CLV1401-000
9  ID      FILENAME ----- ULTREG-100.H1
10 ID      DATE ----- 04/11/14
11 ID      MODELED BY ----- AJH
12 ID
13 ID      SIX HOUR DEPTH-AREA REDUCTION FACTORS
14 ID      DRAINAGE AREA (SQ.MI.)   DARF
15 ID      0.0-0.5                   0.99
16 ID      0.5-1.0                   0.98
17 ID      1.0-2.0                   0.95
18 ID      2.0-4.0                   0.92
19 ID      4.0-6.0                   0.91
20 ID      6.0-8.0                   0.89
21 ID
22 ID
23 IT      5      0      0      300
24 IO      5
25 IN      5      0      0
26 JR      PREC   1    0.98  0.95  0.92  0.91  0.89
   *
27 KK      BAS9U
28 KM      AREA  61.97 AC
29 PB      2.86
30 PC      0    0.020  0.057  0.070  0.087  0.108  0.124  0.130  0.130  0.130
31 PC      0.130  0.130  0.130  0.133  0.140  0.142  0.148  0.158  0.172  0.181
32 PC      0.190  0.197  0.199  0.200  0.201  0.204  0.214  0.229  0.241  0.249
33 PC      0.251  0.256  0.270  0.278  0.281  0.283  0.295  0.322  0.352  0.409
34 PC      0.499  0.590  0.710  0.744  0.781  0.812  0.819  0.835  0.851  0.856
35 PC      0.860  0.868  0.876  0.888  0.910  0.926  0.937  0.950  0.970  0.976
36 PC      0.982  0.985  0.987  0.989  0.990  0.993  0.993  0.994  0.995  0.998
37 PC      0.998  0.999      1
38 BA      .0968
39 LS      0      87.6
40 UD      0.146
   *
41 KK      RBAS9U
42 KM      ROUTE BAS9U TO CBAS1DUM
43 KM      LENGTH 4590  SLOPE 0.025  n-VALUE 0.016
44 RD      4590  0.025  0.016      0  SHAPE  TRAP  WIDTH  0  S-SLOPE  50
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1

HEC-1 INPUT

PAGE 2

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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
45 KK      BAS1U
46 KM      AREA  225.54 AC
47 PB      2.77
48 BA      0.3524
49 LS      0      89.2
50 UD      .163
   *
51 KK      DBAS1U
52 KM      DIVERT OUT 118 CFS ON IRON MOUNTAIN ROAD
53 KM      REFERENCED FROM "ADDENDUM #3 TO MASTER DRAINAGE STUDY FOR KYLE CANYON"
54 KM      BY SLATER HANIFAN GROUP DATED FEBRUARY 2012

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55 KM REFERENCE NODE: IREAST
56 DT DIRONM
57 DI 0 118 1000
58 DQ 0 118 118
*

59 KKBAS1DUM
60 KM COMBINES RBAS9U AND DBAS1U
61 HC 2
*

62 KK DOHARE
63 KM FLOW ROUTED THRU BAS3U: 47 CFS(OHARE)
64 KM TOTAL FLOW IS 234 CFS TOWARDS BAS3U
65 KM REMAINDER OF FLOW ROUTED NORTH TOWARD MOCCASIN IN MOFA STORM DRAIN
66 KM REFERENCED FROM "ADDENDUM #3 TO MASTER DRAINAGE STUDY FOR KYLE CANYON"
67 KM BY SLATER HANIFAN GROUP DATED FEBRUARY 2012
68 KM IN CONFORMANCE WITH CLV NORTHWEST NEIGHBORHOOD STUDY
69 KM REFERENCE NODE: OHARE & LOGCAB
70 DT NORTH
71 DI 0 47 1000
72 DQ 0 0 953
*

73 KK RDOHARE
74 KM ROUTE DCBAS1U TO CP-A2
75 KM DIVERTED FLOW IN OHARE = 47 CFS
76 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
77 RD 2600 0.027 0.016 0 TRAP 0 50
*

78 KK BAS3U
79 KM AREA 80.14 AC
80 PB 2.77
81 BA 0.1252
82 LS 0 84.4
83 UD .216
*

HEC-1 INPUT

PAGE 3

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

84 KKRETNORTH
85 KM RETREIVE SPLIT FLOW IN FORT APACHE AT OHARE
86 DR NORTH
*

87 KK DLOGC
88 KM FLOW ROUTED THRU BAS10U: 187(LOG CABIN)
89 KM TOTAL FLOW IS 234 CFS TOWARDS BAS3U
90 KM REMAINDER OF FLOW ROUTED NORTH TOWARD MOCCASIN IN MOFA STORM DRAIN
91 KM REFERENCED FROM "ADDENDUM #3 TO MASTER DRAINAGE STUDY FOR KYLE CANYON"
92 KM BY SLATER HANIFAN GROUP DATED FEBRUARY 2012
93 KM IN CONFORMANCE WITH CLV NORTHWEST NEIGHBORHOOD STUDY
94 KM REFERENCE NODE: OHARE & LOGCAB
95 DT NORTH2
96 DI 0 187 1000
97 DQ 0 0 813
*

98 KK RDLOGC
99 KM ROUTE DLOGC TO CP-A1
100 KM DIVERTED FLOW IN LOG CABIN = 187 CFS
101 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
102 RD 2600 0.026 0.016 0 TRAP 0 50
*

103 KK BAS10U
104 KM AREA 82.84 AC
105 PB 2.77
106 BA 0.1294
107 LS 0 90.7
108 UD .191
*

109 KK CP-A1
110 KM COMBINES BAS10U AND DLOGC
111 HC 2
*

112 KK RCP-A1
113 KM ROUTE CP-A1 TO CP-A2
114 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
115 RD 1290 0.0050 0.016 0 TRAP 0 50
*

116 KK CP-A2
117 KM COMBINES CP-A1, BAS3U AND DOHARE
118 HC 3
*

HEC-1 INPUT

PAGE 4

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

119 KK RCP-A2
120 KM ROUTE CP-A2 TO CP-B
121 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
122 RD 1315 0.0025 0.013 0 TRAP 12 0
*

123 KKRETDIRONM
124 KM RETREIVE SPLIT FLOW IN IRON MOUNTAIN AT FORT APACHE
125 DR DIRONM
*

ULTREG-100.OUT

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126 KK RDIROMM
127 KM ROUTE DIRONM TO CP-B
128 KM LENGTH SLOPE n-VALUE 0 SHAPE WIDTH S-SLOPE
129 RD 2600 0.028 0.016 0 TRAP 0 50
    *

130 KK BAS4U
131 KM AREA 87.25 AC
132 PB 2.77
133 BA 0.1363
134 LS 0 86.2
135 UD .189
    *

136 KK CP-B
137 KM COMBINES CP-A2, BAS4U AND DIRONM
138 HC 3
    *

139 KK RCP-B
140 KM ROUTE CP-B TO CP-C
141 KM LENGTH SLOPE n-VALUE 0 SHAPE WIDTH S-SLOPE
142 RD 1350 0.0025 0.013 0 TRAP 12 0
    *

143 KK BAS2U
144 KM AREA 92.84 AC
145 PB 2.86
146 BA 0.1451
147 LS 0 95.0
148 UD .119
    *

149 KK DBRENT
150 KM REVISED PER KYLE CANYON MPA
151 KM ROUTE 178 CFS IN BRENT LANE THRU BASSU
152 KM REFERENCED FROM "ADDENDUM #3 TO MASTER DRAINAGE STUDY FOR KYLE CANYON"
153 KM BY SLATER HANIFAN GROUP DATED FEBRUARY 2012
154 KM REFERENCE NODE: BRENT
155 KM REMAINING FLOW ENTERS THE RACO STORM DRAIN
156 DT SOUTH
157 DI 0 200 300 500 1000
158 DQ 0 22 122 322 822 4822
    *

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HEC-1 INPUT

PAGE 5

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

```

159 KK RDBRENT
160 KM ROUTE DBRENT TO CP-E
161 KM LENGTH SLOPE n-VALUE 0 SHAPE WIDTH S-SLOPE
162 RD 1600 0.026 0.022 0 TRAP 2 5
    *

163 KK BAS5U
164 KM AREA 56.54 AC
165 PB 2.77
166 BA 0.0883
167 LS 0 93.8
168 UD .197
    *

169 KK CP-C
170 KM COMBINES BAS5U, DBRENT AND CP-B
171 HC 3
    *

172 KK RCP-C
173 KM ROUTE CP-C TO CP-E
174 KM LENGTH SLOPE n-VALUE 0 SHAPE WIDTH S-SLOPE
175 RD 2670 0.024 0.013 0 TRAP 8 0
    *

176 KK BAS7U
177 KM AREA 124.01 AC
178 PB 2.77
179 BA 0.1938
180 LS 0 84.1
181 UD .223
    *

182 KK CP-E
183 KM COMBINES CP-C AND BAS7U
184 HC 2
    *

185 KK RCP-E
186 KM ROUTE CP-E TO CP-G
187 KM LENGTH SLOPE n-VALUE 0 SHAPE WIDTH S-SLOPE
188 RD 2600 0.021 0.013 0 TRAP 8 0
    *

189 KK BAS6U
190 KM AREA 108.25 AC
191 PB 2.77
192 BA 0.1691
193 LS 0 79.3
194 UD .242
    *

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HEC-1 INPUT

PAGE 6

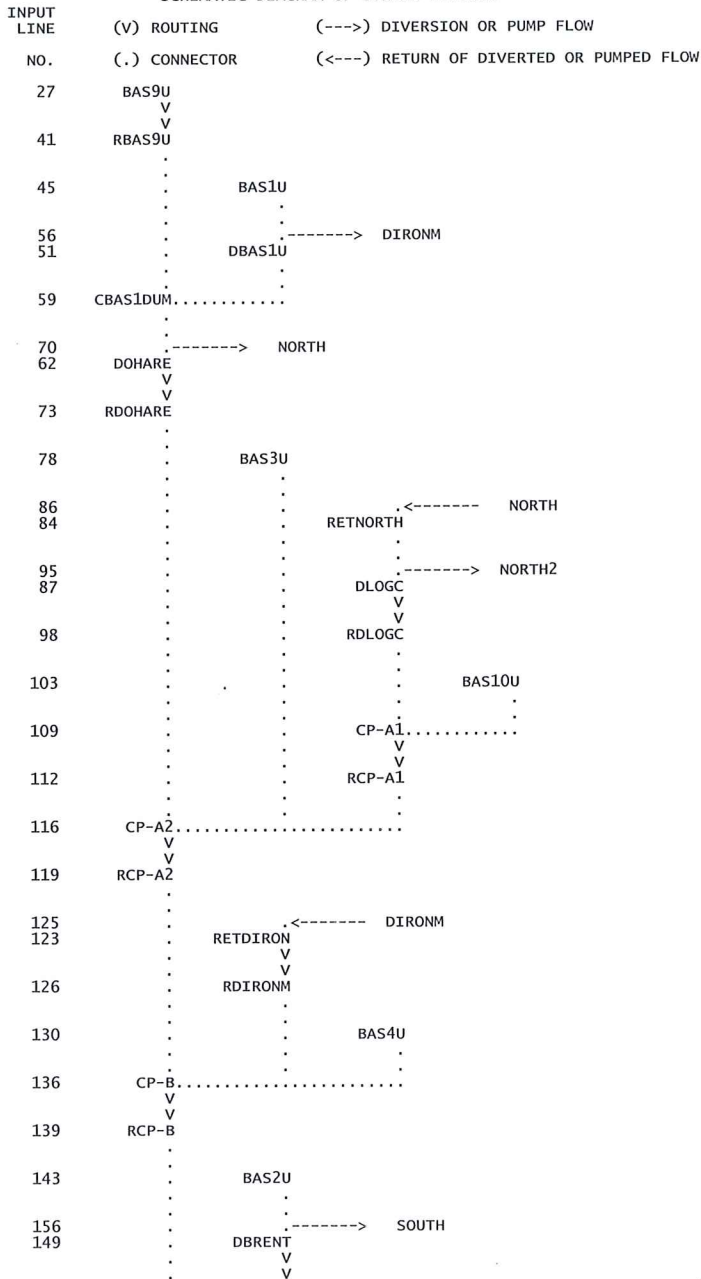
1 LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

ULTREG-100.OUT

LINE NO.	KK	ROUTE	BAS6U TO CP-F	SHAPE	WIDTH	S-SLOPE
195	KK	RBAS6U	CP-F			
196	KM	ROUTE	CP-F			
197	KM	LENGTH	CP-F			
198	RD	3045	CP-F	0	0	50
	*					
199	KK	BAS8U				
200	KM		AREA	70.00	AC	
201	PB	2.77				
202	BA	0.1094				
203	LS	0	83.9			
204	UD	.236				
	*					
205	KK	CP-F				
206	KM	COMBINES	CP-D, BAS8E			
207	HC	2				
	*					
208	KK	CP-G				
209	KM	COMBINES	CP-E AND CP-F			
210	HC	2				
	*					
211	ZZ					

1

SCHEMATIC DIAGRAM OF STREAM NETWORK




```

159      .      RDBRENT
163      .      .      BAS5U
169      CP-C.....
172      RCP-C.....
176      .      .      BAS7U
182      CP-E.....
185      RCP-E.....
189      .      .      BAS6U
195      .      .      RBAS6U
199      .      .      BAS8U
205      .      .      CP-F.....
208      CP-G.....

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
 1*****
 * FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 * JUN 1998 *
 * VERSION 4.1 *
 * RUN DATE 18APR14 TIME 14:25:06 *

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

SLATER HANIFAN GROUP
 CITY OF LAS VEGAS
 BRENT LANE DRAINAGE SYSTEM AND TRAIL
 ULTIMATE CONDITION - REGIONAL ANALYSIS (100-YR STORM)

RETURN PERIOD ----- 100-YEAR
 DISTRIBUTION ----- 6-HOUR SDN3
 PROJECT NO. ----- CLV1401-000
 FILENAME ----- ULTREG-100.H1
 DATE ----- 04/11/14
 MODELED BY ----- AJH

SIX HOUR DEPTH-AREA REDUCTION FACTORS	
DRAINAGE AREA (SQ.MI.)	DARF
0.0-0.5	0.99
0.5-1.0	0.98
1.0-2.0	0.95
2.0-4.0	0.92
4.0-6.0	0.91
6.0-8.0	0.89

24 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

JP MULTI-PLAN OPTION
 NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
 RATIOS OF PRECIPITATION
 1.00 .98 .95 .92 .91 .89

ULTREG-100.OUT

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION					
					RATIO 1 1.00	RATIO 2 .98	RATIO 3 .95	RATIO 4 .92	RATIO 5 .91	RATIO 6 .89
HYDROGRAPH AT +	BAS9U	.10	1	FLOW TIME	136. 3.58	132. 3.58	127. 3.58	121. 3.58	119. 3.58	115. 3.58
ROUTED TO +	RBAS9U	.10	1	FLOW TIME	128. 3.75	124. 3.75	124. 3.75	119. 3.75	112. 3.75	113. 3.75
HYDROGRAPH AT +	BAS1U	.35	1	FLOW TIME	489. 3.58	476. 3.58	456. 3.58	436. 3.58	429. 3.58	415. 3.58
DIVERSION TO +	DIRONM	.35	1	FLOW TIME	118. 3.33	118. 3.33	118. 3.33	118. 3.33	118. 3.33	118. 3.33
HYDROGRAPH AT +	DBAS1U	.35	1	FLOW TIME	371. 3.58	358. 3.58	338. 3.58	318. 3.58	311. 3.58	297. 3.58
2 COMBINED AT +	CBAS1DUM	.45	1	FLOW TIME	461. 3.58	444. 3.58	419. 3.58	394. 3.58	385. 3.58	369. 3.58
DIVERSION TO +	NORTH	.45	1	FLOW TIME	414. 3.58	397. 3.58	372. 3.58	347. 3.58	338. 3.58	322. 3.58
HYDROGRAPH AT +	DOHARE	.45	1	FLOW TIME	47. 3.33	47. 3.33	47. 3.33	47. 3.33	47. 3.33	47. 3.42
ROUTED TO +	RDOHARE	.45	1	FLOW TIME	49. 3.50	51. 3.50	51. 3.50	50. 3.50	52. 3.50	55. 3.50
HYDROGRAPH AT +	BAS3U	.13	1	FLOW TIME	126. 3.67	122. 3.67	116. 3.67	110. 3.67	108. 3.67	104. 3.67
HYDROGRAPH AT +	RETNORTH	.00	1	FLOW TIME	414. 3.58	397. 3.58	372. 3.58	347. 3.58	338. 3.58	322. 3.58
DIVERSION TO +	NORTH2	.00	1	FLOW TIME	227. 3.58	210. 3.58	185. 3.58	160. 3.58	151. 3.58	135. 3.58
HYDROGRAPH AT +	DLOGC	.00	1	FLOW TIME	187. 3.50	187. 3.50	187. 3.50	187. 3.50	187. 3.50	187. 3.50
ROUTED TO +	RDLOGC	.00	1	FLOW TIME	187. 3.75	187. 3.58	188. 3.58	188. 3.58	189. 3.58	187. 3.75
HYDROGRAPH AT +	BAS10U	.13	1	FLOW TIME	178. 3.58	173. 3.58	166. 3.58	159. 3.58	157. 3.58	152. 3.58
2 COMBINED AT +	CP-A1	.13	1	FLOW TIME	365. 3.58	360. 3.58	354. 3.58	347. 3.58	345. 3.58	338. 3.58
ROUTED TO +	RCP-A1	.13	1	FLOW TIME	357. 3.67	352. 3.67	350. 3.67	349. 3.67	346. 3.67	330. 3.75
3 COMBINED AT +	CP-A2	.70	1	FLOW TIME	531. 3.67	517. 3.67	515. 3.67	506. 3.67	501. 3.67	482. 3.67
ROUTED TO +	RCP-A2	.70	1	FLOW TIME	518. 3.67	508. 3.75	497. 3.67	484. 3.67	481. 3.75	470. 3.75
HYDROGRAPH AT +	RETDIRON	.00	1	FLOW TIME	118. 3.33	118. 3.33	118. 3.33	118. 3.33	118. 3.33	118. 3.33
ROUTED TO +	RDIRONM	.00	1	FLOW TIME	119. 3.58	119. 3.58	118. 3.58	118. 3.67	118. 3.50	120. 3.50
HYDROGRAPH AT +	BAS4U	.14	1	FLOW TIME	156. 3.58	151. 3.58	144. 3.58	137. 3.58	134. 3.58	130. 3.58
3 COMBINED AT +	CP-B	.84	1	FLOW TIME	787. 3.67	769. 3.67	755. 3.67	735. 3.67	729. 3.67	704. 3.67
ROUTED TO +	RCP-B	.84	1	FLOW TIME	771. 3.67	754. 3.67	735. 3.67	717. 3.75	713. 3.75	695. 3.75

ULTREG-100.OUT

HYDROGRAPH AT	BAS2U	.15	1	FLOW	263.	257.	248.	240.	237.	231.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58
DIVERSION TO	SOUTH	.15	1	FLOW	85.	79.	70.	62.	59.	53.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT	DBRENT	.15	1	FLOW	178.	178.	178.	178.	178.	178.
+				TIME	3.42	3.42	3.50	3.50	3.50	3.50
ROUTED TO	RDBRENT	.15	1	FLOW	180.	181.	179.	179.	179.	179.
+				TIME	3.50	3.50	3.58	3.58	3.58	3.58
HYDROGRAPH AT	BAS5U	.09	1	FLOW	133.	130.	125.	121.	119.	116.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT	CP-C	1.07	1	FLOW	1072.	1050.	1023.	995.	988.	954.
+				TIME	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO	RCP-C	1.07	1	FLOW	1059.	1037.	1008.	979.	973.	938.
+				TIME	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT	BAS7U	.19	1	FLOW	190.	184.	175.	166.	163.	157.
+				TIME	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT	CP-E	1.27	1	FLOW	1249.	1221.	1183.	1144.	1135.	1094.
+				TIME	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO	RCP-E	1.27	1	FLOW	1233.	1203.	1165.	1127.	1117.	1076.
+				TIME	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT	BAS6U	.17	1	FLOW	126.	121.	114.	107.	104.	100.
+				TIME	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO	RBAS6U	.17	1	FLOW	126.	121.	114.	105.	103.	98.
+				TIME	3.75	3.75	3.75	3.75	3.83	3.83
HYDROGRAPH AT	BAS8U	.11	1	FLOW	104.	101.	96.	91.	89.	86.
+				TIME	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT	CP-F	.28	1	FLOW	223.	215.	203.	190.	186.	178.
+				TIME	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT	CP-G	1.55	1	FLOW	1443.	1405.	1354.	1304.	1290.	1247.
+				TIME	3.67	3.67	3.67	3.67	3.67	3.75

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

ISTAQ	ELEMENT	DT	PEAK	TIME TO	VOLUME	DT	INTERPOLATED TO	COMPUTATION INTERVAL	TIME TO	VOLUME
		(MIN)	(CFS)	PEAK	(IN)	(MIN)	PEAK	PEAK	PEAK	(IN)
FOR PLAN = 1	RATIO=	.00								
RBAS9U	MANE	4.75	131.71	223.25	1.66	5.00	127.84	225.00		1.66

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8581E+01 EXCESS= .0000E+00 OUTFLOW= .8593E+01 BASIN STORAGE= .2579E-02 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO=	.00								
RBAS9U	MANE	4.75	127.94	223.25	1.61	5.00	124.32	225.00		1.61

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8324E+01 EXCESS= .0000E+00 OUTFLOW= .8335E+01 BASIN STORAGE= .2545E-02 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO=	.00								
RBAS9U	MANE	5.00	124.37	225.00	1.54	5.00	124.37	225.00		1.54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7945E+01 EXCESS= .0000E+00 OUTFLOW= .7956E+01 BASIN STORAGE= .2172E-02 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO=	.00								
RBAS9U	MANE	5.00	118.88	225.00	1.47	5.00	118.88	225.00		1.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7563E+01 EXCESS= .0000E+00 OUTFLOW= .7574E+01 BASIN STORAGE= .2127E-02 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO=	.00								
RBAS9U	MANE	4.75	114.71	223.25	1.44	5.00	111.96	225.00		1.44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7432E+01 EXCESS= .0000E+00 OUTFLOW= .7442E+01 BASIN STORAGE= .2422E-02 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO=	.00								
RBAS9U	MANE	5.00	113.37	225.00	1.39	5.00	113.37	225.00		1.39

ULTREG-100.OUT

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7184E+01 EXCESS= .0000E+00 OUTFLOW= .7195E+01 BASIN STORAGE= .2081E-02 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .00
RDOHARE MANE 4.50 56.21 211.50 .28 5.00 49.48 210.00 .28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6739E+01 EXCESS= .0000E+00 OUTFLOW= .6744E+01 BASIN STORAGE= .1160E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RDOHARE MANE 4.75 54.99 213.75 .28 5.00 50.59 210.00 .28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6637E+01 EXCESS= .0000E+00 OUTFLOW= .6644E+01 BASIN STORAGE= .1103E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RDOHARE MANE 4.25 55.68 212.50 .27 5.00 51.00 210.00 .27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6466E+01 EXCESS= .0000E+00 OUTFLOW= .6473E+01 BASIN STORAGE= .1040E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RDOHARE MANE 4.50 56.64 211.50 .26 5.00 49.57 210.00 .26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6305E+01 EXCESS= .0000E+00 OUTFLOW= .6311E+01 BASIN STORAGE= .1187E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RDOHARE MANE 4.00 56.94 212.00 .26 5.00 51.80 210.00 .26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6295E+01 EXCESS= .0000E+00 OUTFLOW= .6300E+01 BASIN STORAGE= .1127E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RDOHARE MANE 3.75 54.76 210.00 .26 5.00 54.76 210.00 .26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6103E+01 EXCESS= .0000E+00 OUTFLOW= .6109E+01 BASIN STORAGE= .1290E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RDLOGC MANE .75 188.11 216.00 -1.00 5.00 187.15 225.00 -1.00

FOR PLAN = 1 RATIO= .00
RDLOGC MANE .75 188.26 216.00 -1.00 5.00 187.35 215.00 -1.00

FOR PLAN = 1 RATIO= .00
RDLOGC MANE .75 188.43 216.00 -1.00 5.00 187.75 215.00 -1.00

FOR PLAN = 1 RATIO= .00
RDLOGC MANE .75 189.13 215.25 -1.00 5.00 188.26 215.00 -1.00

FOR PLAN = 1 RATIO= .00
RDLOGC MANE .75 189.87 215.25 -1.00 5.00 188.56 215.00 -1.00

FOR PLAN = 1 RATIO= .00
RDLOGC MANE .50 190.66 215.50 -1.00 5.00 187.07 225.00 -1.00

FOR PLAN = 1 RATIO= .00
RCP-A1 MANE 4.01 360.97 216.53 3.10 5.00 357.33 220.00 3.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2140E+02 EXCESS= .0000E+00 OUTFLOW= .2141E+02 BASIN STORAGE= .9052E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-A1 MANE 4.02 362.90 217.20 3.02 5.00 352.01 220.00 3.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2087E+02 EXCESS= .0000E+00 OUTFLOW= .2087E+02 BASIN STORAGE= .1215E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-A1 MANE 4.04 355.66 218.21 2.92 5.00 350.38 220.00 2.91

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2015E+02 EXCESS= .0000E+00 OUTFLOW= .2016E+02 BASIN STORAGE= .9499E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP-A1 MANE 4.06 349.37 219.23 2.79 5.00 348.54 220.00 2.80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1926E+02 EXCESS= .0000E+00 OUTFLOW= .1927E+02 BASIN STORAGE= .1179E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP-A1	MANE	4.07	346.17	219.56	2.75	5.00	345.66	220.00	2.76
--------	------	------	--------	--------	------	------	--------	--------	------

ULTREG-100.OUT
 2.75 5.00 345.66 220.00 2.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1899E+02 EXCESS= .0000E+00 OUTFLOW= .1899E+02 BASIN STORAGE= .1070E-02 PERCENT ERROR= .0

FOR PLAN = 1	RATIO=	.00							
RCP-A1	MANE	4.09	338.09	220.64	2.64	5.00	330.13	225.00	2.65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1824E+02 EXCESS= .0000E+00 OUTFLOW= .1824E+02 BASIN STORAGE= .8596E-03 PERCENT ERROR= .0

FOR PLAN = 1	RATIO=	.00							
RCP-A2	MANE	1.34	526.00	221.95	.99	5.00	518.02	220.00	.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3720E+02 EXCESS= .0000E+00 OUTFLOW= .3720E+02 BASIN STORAGE= .1874E-02 PERCENT ERROR= .0

FOR PLAN = 1	RATIO=	.00							
RCP-A2	MANE	1.35	514.30	221.66	.96	5.00	508.05	225.00	.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3619E+02 EXCESS= .0000E+00 OUTFLOW= .3619E+02 BASIN STORAGE= .1869E-02 PERCENT ERROR= .0

FOR PLAN = 1	RATIO=	.00							
RCP-A2	MANE	1.35	508.54	221.89	.93	5.00	496.75	220.00	.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3486E+02 EXCESS= .0000E+00 OUTFLOW= .3486E+02 BASIN STORAGE= .2006E-02 PERCENT ERROR= .0

FOR PLAN = 1	RATIO=	.00							
RCP-A2	MANE	1.36	498.65	222.14	.89	5.00	484.23	220.00	.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3352E+02 EXCESS= .0000E+00 OUTFLOW= .3352E+02 BASIN STORAGE= .1829E-02 PERCENT ERROR= .0

FOR PLAN = 1	RATIO=	.00							
RCP-A2	MANE	1.37	496.53	221.59	.88	5.00	481.39	225.00	.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3309E+02 EXCESS= .0000E+00 OUTFLOW= .3309E+02 BASIN STORAGE= .1994E-02 PERCENT ERROR= .0

FOR PLAN = 1	RATIO=	.00							
RCP-A2	MANE	1.39	476.93	222.37	.85	5.00	469.60	225.00	.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3183E+02 EXCESS= .0000E+00 OUTFLOW= .3183E+02 BASIN STORAGE= .1845E-02 PERCENT ERROR= .0

FOR PLAN = 1	RATIO=	.00							
RDIRONM	MANE	3.75	120.34	213.75	-1.00	5.00	118.98	215.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RDIRONM	MANE	3.75	119.84	213.75	-1.00	5.00	118.76	215.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RDIRONM	MANE	3.75	119.08	213.75	-1.00	5.00	118.42	215.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RDIRONM	MANE	3.75	118.86	206.25	-1.00	5.00	118.09	220.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RDIRONM	MANE	3.75	118.86	206.25	-1.00	5.00	118.19	210.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RDIRONM	MANE	4.00	122.41	208.00	-1.00	5.00	119.95	210.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	1.17	781.25	221.58	1.53	5.00	771.16	220.00	1.53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6843E+02 EXCESS= .0000E+00 OUTFLOW= .6843E+02 BASIN STORAGE= .1901E-02 PERCENT ERROR= .0

FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	1.18	765.07	221.29	1.49	5.00	754.08	220.00	1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6669E+02 EXCESS= .0000E+00 OUTFLOW= .6669E+02 BASIN STORAGE= .1937E-02 PERCENT ERROR= .0

FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	1.19	747.90	221.78	1.43	5.00	734.64	220.00	1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6424E+02 EXCESS= .0000E+00 OUTFLOW= .6423E+02 BASIN STORAGE= .2038E-02 PERCENT ERROR= .0

ULTREG-100.OUT

FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	1.20	729.98	221.68	1.38	5.00	717.32	225.00	1.38
CONTINUITY SUMMARY (AC-FT) - INFLOW= .6180E+02 EXCESS= .0000E+00 OUTFLOW= .6179E+02 BASIN STORAGE= .1887E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	1.21	724.80	221.22	1.36	5.00	713.04	225.00	1.36
CONTINUITY SUMMARY (AC-FT) - INFLOW= .6101E+02 EXCESS= .0000E+00 OUTFLOW= .6101E+02 BASIN STORAGE= .2029E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-B	MANE	1.23	700.16	221.94	1.32	5.00	694.61	225.00	1.32
CONTINUITY SUMMARY (AC-FT) - INFLOW= .5905E+02 EXCESS= .0000E+00 OUTFLOW= .5905E+02 BASIN STORAGE= .1877E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RDBRENT	MANE	2.33	180.88	209.81	1.96	5.00	180.45	210.00	1.96
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1513E+02 EXCESS= .0000E+00 OUTFLOW= .1514E+02 BASIN STORAGE= .4379E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RDBRENT	MANE	2.33	180.97	209.81	1.92	5.00	180.53	210.00	1.92
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1485E+02 EXCESS= .0000E+00 OUTFLOW= .1485E+02 BASIN STORAGE= .4315E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RDBRENT	MANE	2.33	179.58	214.47	1.86	5.00	178.79	215.00	1.86
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1439E+02 EXCESS= .0000E+00 OUTFLOW= .1440E+02 BASIN STORAGE= .6080E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RDBRENT	MANE	2.33	179.74	214.47	1.80	5.00	178.81	215.00	1.80
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1393E+02 EXCESS= .0000E+00 OUTFLOW= .1393E+02 BASIN STORAGE= .5940E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RDBRENT	MANE	2.33	179.79	214.47	1.78	5.00	178.81	215.00	1.78
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1377E+02 EXCESS= .0000E+00 OUTFLOW= .1378E+02 BASIN STORAGE= .5892E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RDBRENT	MANE	2.33	179.90	214.47	1.74	5.00	178.82	215.00	1.74
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1346E+02 EXCESS= .0000E+00 OUTFLOW= .1347E+02 BASIN STORAGE= .5797E-03 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-C	MANE	.88	1070.09	220.97	1.63	5.00	1059.39	220.00	1.64
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9354E+02 EXCESS= .0000E+00 OUTFLOW= .9354E+02 BASIN STORAGE= .1769E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-C	MANE	.89	1047.72	221.04	1.59	5.00	1036.90	220.00	1.60
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9127E+02 EXCESS= .0000E+00 OUTFLOW= .9127E+02 BASIN STORAGE= .1663E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-C	MANE	.90	1018.74	220.65	1.54	5.00	1008.18	220.00	1.54
CONTINUITY SUMMARY (AC-FT) - INFLOW= .8797E+02 EXCESS= .0000E+00 OUTFLOW= .8798E+02 BASIN STORAGE= .1723E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-C	MANE	.91	990.26	221.35	1.48	5.00	978.90	220.00	1.48
CONTINUITY SUMMARY (AC-FT) - INFLOW= .8469E+02 EXCESS= .0000E+00 OUTFLOW= .8470E+02 BASIN STORAGE= .1585E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-C	MANE	.91	985.95	221.04	1.46	5.00	972.92	220.00	1.46
CONTINUITY SUMMARY (AC-FT) - INFLOW= .8364E+02 EXCESS= .0000E+00 OUTFLOW= .8365E+02 BASIN STORAGE= .1746E-02 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RCP-C	MANE	.93	950.23	221.41	1.42	5.00	937.86	220.00	1.42
CONTINUITY SUMMARY (AC-FT) - INFLOW= .8111E+02 EXCESS= .0000E+00 OUTFLOW= .8111E+02 BASIN STORAGE= .1646E-02 PERCENT ERROR= .0									
FOR PLAN = 1 RATIO= .00									

					ULTREG-100.OUT				
RCP-E	MANE	.84	1247.48	220.82	1.59	5.00	1233.43	220.00	1.59
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1074E+03 EXCESS= .0000E+00 OUTFLOW= .1074E+03 BASIN STORAGE= .1626E-02 PERCENT ERROR= .0									
FOR PLAN	= 1	RATIO=	.00						
RCP-E	MANE	.85	1217.39	221.17	1.55	5.00	1203.20	220.00	1.55
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1047E+03 EXCESS= .0000E+00 OUTFLOW= .1047E+03 BASIN STORAGE= .1630E-02 PERCENT ERROR= .0									
FOR PLAN	= 1	RATIO=	.00						
RCP-E	MANE	.86	1178.38	221.39	1.49	5.00	1164.54	220.00	1.49
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1007E+03 EXCESS= .0000E+00 OUTFLOW= .1007E+03 BASIN STORAGE= .1667E-02 PERCENT ERROR= .0									
FOR PLAN	= 1	RATIO=	.00						
RCP-E	MANE	.87	1143.14	220.84	1.43	5.00	1127.40	220.00	1.43
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9676E+02 EXCESS= .0000E+00 OUTFLOW= .9676E+02 BASIN STORAGE= .1605E-02 PERCENT ERROR= .0									
FOR PLAN	= 1	RATIO=	.00						
RCP-E	MANE	.88	1131.09	221.54	1.41	5.00	1116.97	220.00	1.41
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9548E+02 EXCESS= .0000E+00 OUTFLOW= .9548E+02 BASIN STORAGE= .1652E-02 PERCENT ERROR= .0									
FOR PLAN	= 1	RATIO=	.00						
RCP-E	MANE	.89	1092.49	221.28	1.37	5.00	1076.02	220.00	1.37
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9250E+02 EXCESS= .0000E+00 OUTFLOW= .9250E+02 BASIN STORAGE= .1654E-02 PERCENT ERROR= .0									
FOR PLAN	= 1	RATIO=	.00						
RBAS6U	MANE	5.00	125.92	225.00	1.04	5.00	125.92	225.00	1.04
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9381E+01 EXCESS= .0000E+00 OUTFLOW= .9386E+01 BASIN STORAGE= .1234E-02 PERCENT ERROR= -.1									
FOR PLAN	= 1	RATIO=	.00						
RBAS6U	MANE	5.00	121.00	225.00	1.00	5.00	121.00	225.00	1.00
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9027E+01 EXCESS= .0000E+00 OUTFLOW= .9032E+01 BASIN STORAGE= .1210E-02 PERCENT ERROR= -.1									
FOR PLAN	= 1	RATIO=	.00						
RBAS6U	MANE	5.00	113.67	225.00	.94	5.00	113.67	225.00	.94
CONTINUITY SUMMARY (AC-FT) - INFLOW= .8503E+01 EXCESS= .0000E+00 OUTFLOW= .8508E+01 BASIN STORAGE= .1175E-02 PERCENT ERROR= -.1									
FOR PLAN	= 1	RATIO=	.00						
RBAS6U	MANE	4.50	106.02	229.50	.89	5.00	104.99	225.00	.89
CONTINUITY SUMMARY (AC-FT) - INFLOW= .7997E+01 EXCESS= .0000E+00 OUTFLOW= .8001E+01 BASIN STORAGE= .1407E-02 PERCENT ERROR= -.1									
FOR PLAN	= 1	RATIO=	.00						
RBAS6U	MANE	4.50	103.82	229.50	.87	5.00	102.76	230.00	.87
CONTINUITY SUMMARY (AC-FT) - INFLOW= .7827E+01 EXCESS= .0000E+00 OUTFLOW= .7831E+01 BASIN STORAGE= .1391E-02 PERCENT ERROR= -.1									
FOR PLAN	= 1	RATIO=	.00						
RBAS6U	MANE	4.50	99.43	229.50	.83	5.00	98.44	230.00	.83
CONTINUITY SUMMARY (AC-FT) - INFLOW= .7489E+01 EXCESS= .0000E+00 OUTFLOW= .7493E+01 BASIN STORAGE= .1361E-02 PERCENT ERROR= -.1									

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

Local Analysis – Ultimate Conditions HEC-1 Model

ULTLOC.OUT

1*****
 *
 * FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 * JUN 1998 *
 * VERSION 4.1 *
 *
 * RUN DATE 18APR14 TIME 14:24:52 *
 *

 *
 * 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 -AMSK- 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
*** FREE ***
1          ID      SLATER HANIFAN GROUP
2          ID      CITY OF LAS VEGAS
3          ID      BRENT LANE DRAINAGE SYSTEM AND TRAIL
4          ID      ULTIMATE CONDITION - LOCAL ANALYSIS
5          ID
6          ID      RETURN PERIOD ----- 100 & 10-YEAR
7          ID      DISTRIBUTION ----- 6-HOUR SDN3
8          ID      PROJECT NO. ----- CLV1401-000
9          ID      FILENAME ----- ULTLOC.H1
10         ID      DATE ----- 04/13/14
11         ID      MODELED BY ----- AJH
12         ID
13         ID      SIX HOUR DEPTH-AREA REDUCTION FACTORS
14         ID      DRAINAGE AREA (MI^2)      DARF
15         ID      100-YR                      1.00
16         ID      10-YR                       0.57
17         ID
18         IT      5      0      0      300
19         IO      5      0      0
20         IN      5      0      0
21         JR      PREC  1.00  0.57
22         *
23         KK      LOC1
24         KM
25         PB      2.77      AREA  36.49 AC
26         PC      0      0.020  0.057  0.070  0.087  0.108  0.124  0.130  0.130  0.130
27         PC      0.130  0.130  0.130  0.133  0.140  0.142  0.148  0.158  0.172  0.181
28         PC      0.190  0.197  0.199  0.200  0.201  0.204  0.214  0.229  0.241  0.249
29         PC      0.251  0.256  0.270  0.278  0.281  0.283  0.295  0.322  0.352  0.409
30         PC      0.499  0.590  0.710  0.744  0.781  0.812  0.819  0.835  0.851  0.856
31         PC      0.860  0.868  0.876  0.888  0.910  0.926  0.937  0.950  0.970  0.976
32         PC      0.982  0.985  0.987  0.989  0.990  0.993  0.993  0.994  0.995  0.998
33         PC      0.998  0.999      1
34         BA      .0570
35         LS      0      83.8
36         UD      0.192
37         *
38         KK      LOC2
39         KM
40         BA      .0160      AREA  10.21 AC
41         LS      0      84.8
42         UD      0.095
43         *
44         KK      LOC3
45         KM
46         BA      .0099      AREA  6.31 AC
47         LS      0      84.9
48         UD      0.145
49         *
  
```

1

HEC-1 INPUT

PAGE 2

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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
46         KK      LOC4
47         KM
48         BA      .0210      AREA  13.42 AC
49         LS      0      82.7
50         UD      0.137
51         *
52         KK      LOC5
53         KM
54         BA
55         LS
56         UD
  
```


ULTLOC.OUT

53	BA	.0538		
54	LS	0	83.8	
55	UD	0.198		
	*			
56	KK	CP1		
57	KM	COMBINES	LOC4 AND LOC5	
58	HC	2		
	*			
59	KK	LOC6		
60	KM		AREA	1.84 AC
61	BA	.0029		
62	LS	0	98.0	
63	UD	0.130		
	*			
64	KK	LOC7		
65	KM		AREA	1.87 AC
66	BA	.0029		
67	LS	0	98.0	
68	UD	0.071		
	*			
69	KK	LOC8		
70	KM		AREA	15.94 AC
71	BA	.0249		
72	LS	0	83.3	
73	UD	0.164		
	*			
74	KK	LOC9		
75	KM		AREA	18.21 AC
76	BA	.0285		
77	LS	0	85.7	
78	UD	0.109		
	*			
79	KK	LOC10		
80	KM		AREA	15.64 AC
81	BA	.0244		
82	LS	0	88.0	
83	UD	0.130		
	*			
84	ZZ			

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
22	LOC1	
	.	
36	LOC2	
	.	
41	LOC3	
	.	
46	LOC4	
	.	
51	LOC5	
	.	
56	CP1.....	
	.	
59	LOC6	
	.	
64	LOC7	
	.	
69	LOC8	
	.	
74	LOC9	
	.	
79	LOC10	
	.	

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1

 * FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 * JUN 1998 *
 * VERSION 4.1 *
 * RUN DATE 18APR14 TIME 14:24:52 *
 * *****

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

SLATER HANIFAN GROUP
 CITY OF LAS VEGAS
 BRENT LANE DRAINAGE SYSTEM AND TRAIL
 ULTIMATE CONDITION - LOCAL ANALYSIS

RETURN PERIOD ----- 100 & 10-YEAR
 DISTRIBUTION ----- 6-HOUR SDN3

PROJECT NO. ----- CLV1401-000
 FILENAME ----- ULTLOC.H1
 DATE ----- 04/13/14
 MODELED BY ----- AJH

ULTLOC.OUT

SIX HOUR DEPTH-AREA REDUCTION FACTORS
 DRAINAGE AREA (MI^2) DARF
 100-YR 1.00
 10-YR 0.57

19 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

JP MULTI-PLAN OPTION
 NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
 RATIOS OF PRECIPITATION
 1.00 .57

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION	
					RATIO 1 1.00	RATIO 2 .57
HYDROGRAPH AT	LOC1	.06	1	FLOW	58.	20.
+				TIME	3.58	3.67
HYDROGRAPH AT	LOC2	.02	1	FLOW	21.	7.
+				TIME	3.50	3.50
HYDROGRAPH AT	LOC3	.01	1	FLOW	12.	4.
+				TIME	3.58	3.58
HYDROGRAPH AT	LOC4	.02	1	FLOW	23.	8.
+				TIME	3.58	3.58
HYDROGRAPH AT	LOC5	.05	1	FLOW	53.	19.
+				TIME	3.58	3.67
2 COMBINED AT	CP1	.07	1	FLOW	77.	25.
+				TIME	3.58	3.58
HYDROGRAPH AT	LOC6	.00	1	FLOW	5.	3.
+				TIME	3.58	3.58
HYDROGRAPH AT	LOC7	.00	1	FLOW	6.	4.
+				TIME	3.50	3.50
HYDROGRAPH AT	LOC8	.02	1	FLOW	27.	9.
+				TIME	3.58	3.58
HYDROGRAPH AT	LOC9	.03	1	FLOW	36.	14.
+				TIME	3.58	3.58
HYDROGRAPH AT	LOC10	.02	1	FLOW	34.	14.
+				TIME	3.58	3.58

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

APPENDIX C

Hydraulic Analysis

Mainline Drainage System – Alternative A
& Associated Tule Springs Crossing Collection Options

Mainline - Alternative A - Segment 1&2 - RCB at 2.3%
Worksheet for Rectangular Channel

Project Description

Worksheet	Mainline - Alternative A - Segment 1 & 2 - RCB at 2.3%
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.015
Channel Slope	0.023000 ft/ft
Bottom Width	10.00 ft
Discharge	1,183.00 cfs

Results

Depth	4.45 ft
Flow Area	44.5 ft ²
Wetted Perimeter	18.90 ft
Top Width	10.00 ft
Critical Depth	7.58 ft
Critical Slope	0.005710 ft/ft
Velocity	26.59 ft/s
Velocity Head	10.99 ft
Specific Energy	15.44 ft
Froude Number	2.22
Flow Type	Supercritical

Mainline - Alternative A - Segment 3A - Open Channel at 1.5% **Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	Mainline - Alternative A - Segment 3A - Open Channel at 1.5%
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.015
Channel Slope	0.015000 ft/ft
Left Side Slope	2.00 H : V
Right Side Slope	2.00 H : V
Bottom Width	10.00 ft
Discharge	1,183.00 cfs

Results	
Depth	3.38 ft
Flow Area	56.7 ft ²
Wetted Perimeter	25.12 ft
Top Width	23.53 ft
Critical Depth	5.36 ft
Critical Slope	0.002387 ft/ft
Velocity	20.87 ft/s
Velocity Head	6.77 ft
Specific Energy	10.15 ft
Froude Number	2.37
Flow Type	Supercritical

Mainline - Alternative A - Segment 3B - Open Channel at 1.5% **Worksheet for Trapezoidal Channel**

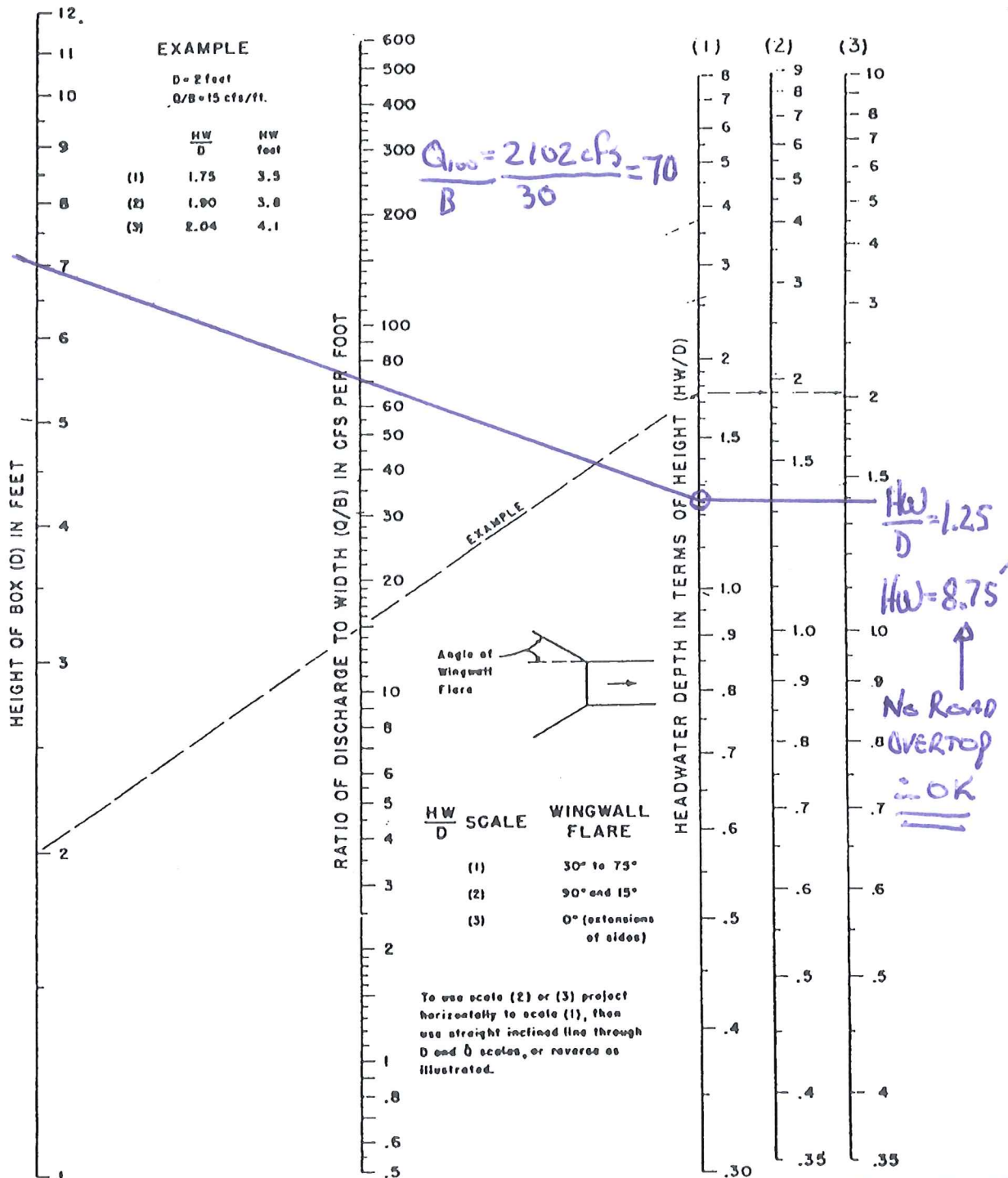
Project Description	
Worksheet	Mainline - Alternative A - Segment 3B - Open Channel at 1.5%
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.015
Channel Slope	0.015000 ft/ft
Left Side Slope	2.00 H : V
Right Side Slope	2.00 H : V
Bottom Width	10.00 ft
Discharge	1,354.00 cfs

Results	
Depth	3.62 ft
Flow Area	62.5 ft ²
Wetted Perimeter	26.21 ft
Top Width	24.50 ft
Critical Depth	5.74 ft
Critical Slope	0.002346 ft/ft
Velocity	21.66 ft/s
Velocity Head	7.29 ft
Specific Energy	10.91 ft
Froude Number	2.39
Flow Type	Supercritical

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

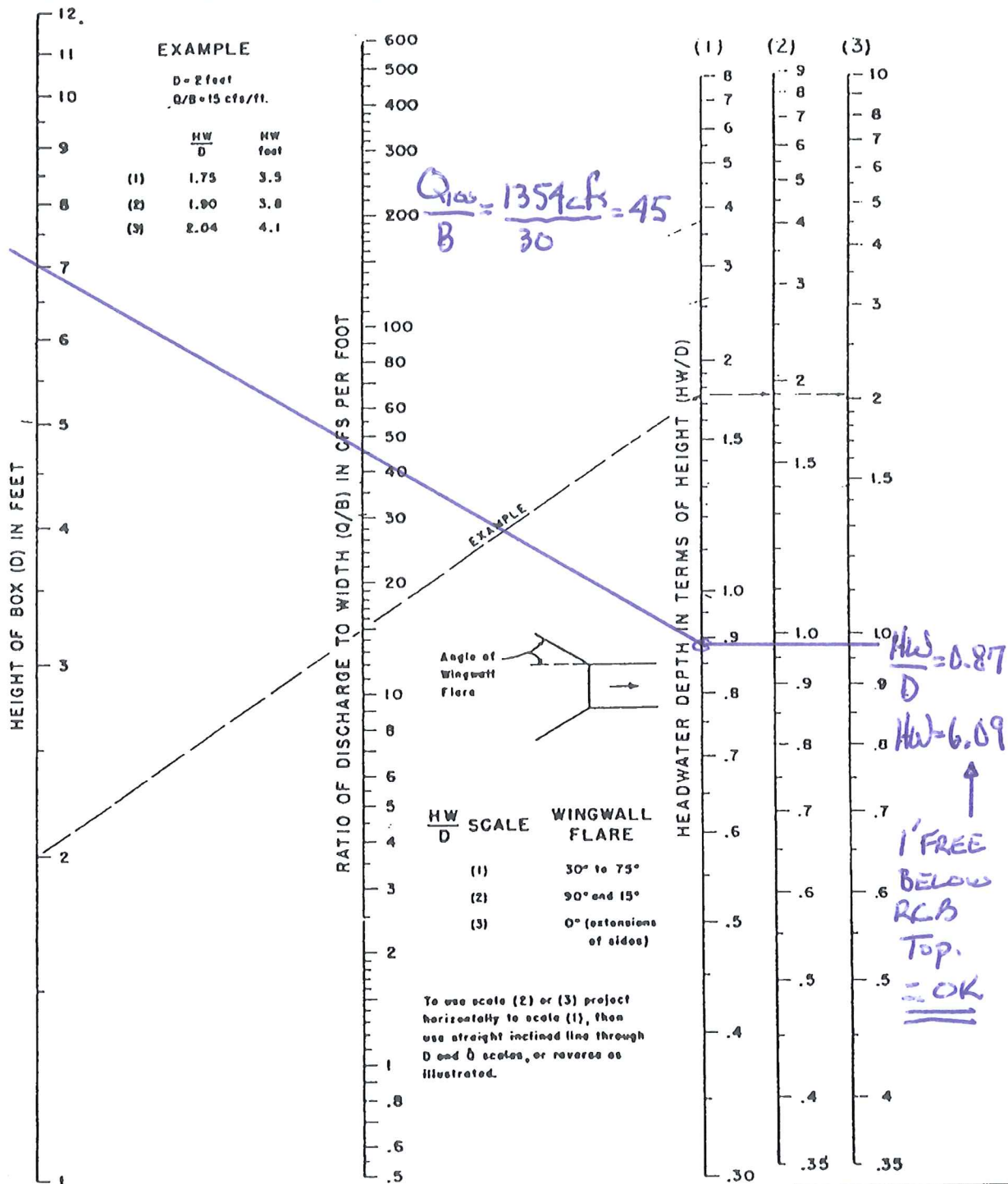
RCB CULVERT - EXISTING FLOW NOMOGRAPH - INLET CONTROL BOX CULVERT



Revision	Date

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RCB CULVERT - ULTIMATE FLOW NOMOGRAPH - INLET CONTROL BOX CULVERT



Revision	Date

Mainline Drainage System – Alternative B
& Associated Tule Springs Crossing Collection Options

Mainline - Alternative B - Segment 1&2 - RCB at 2.3% **Worksheet for Rectangular Channel**

Project Description	
Worksheet	Mainline - Alternative B - Segment 1 & 2 - RCB at 2.3%
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.015
Channel Slope	0.023000 ft/ft
Bottom Width	10.00 ft
Discharge	1,183.00 cfs

Results	
Depth	4.45 ft
Flow Area	44.5 ft ²
Wetted Perimeter	18.90 ft
Top Width	10.00 ft
Critical Depth	7.58 ft
Critical Slope	0.005710 ft/ft
Velocity	26.59 ft/s
Velocity Head	10.99 ft
Specific Energy	15.44 ft
Froude Number	2.22
Flow Type	Supercritical

Mainline - Alternative B - Segment 3A - RCB at 1.5%
Worksheet for Rectangular Channel

Project Description

Worksheet	Mainline - Alternative B - Segment 3A - RCB at 1.5%
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.015
Channel Slope	0.015000 ft/ft
Bottom Width	10.00 ft
Discharge	1,183.00 cfs

Results

Depth	5.22 ft
Flow Area	52.2 ft ²
Wetted Perimeter	20.44 ft
Top Width	10.00 ft
Critical Depth	7.58 ft
Critical Slope	0.005710 ft/ft
Velocity	22.67 ft/s
Velocity Head	7.98 ft
Specific Energy	13.20 ft
Froude Number	1.75
Flow Type	Supercritical

Mainline - Alternative B/Tule Springs Crossing Option 1 - Segment 3B - RCB Open Top at 1.5% Worksheet for Rectangular Channel

Project Description	
Worksheet	Mainline - Alternative B/Tule Springs Crossing Option 1 - Segment 3B - RCB Open Top at 1.5%
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth
Input Data	
Mannings Coefficient	0.015
Channel Slope	0.015000 ft/ft
Bottom Width	15.00 ft
Discharge	1,354.00 cfs
Results	
Depth	3.95 ft
Flow Area	59.2 ft ²
Wetted Perimeter	22.90 ft
Top Width	15.00 ft
Critical Depth	6.33 ft
Critical Slope	0.004007 ft/ft
Velocity	22.86 ft/s
Velocity Head	8.12 ft
Specific Energy	12.07 ft
Froude Number	2.03
Flow Type	Supercritical

Mainline - Alternative B/Tule Springs Crossing Option 1 - Segment 4A&4B - RCB at 1.5% - Existing Worksheet for Rectangular Channel

Project Description	
Worksheet	
Flow Element	
Method	
Solve For	
Input Data	
Mannings Coefficient	0.015
Channel Slope	0.015000 ft/ft
Bottom Width	15.00 ft
Discharge	2,102.00 cfs
Results	
Depth	5.39 ft
Flow Area	80.9 ft ²
Wetted Perimeter	25.78 ft
Top Width	15.00 ft
Critical Depth	8.48 ft
Critical Slope	0.004409 ft/ft
Velocity	26.00 ft/s
Velocity Head	10.50 ft
Specific Energy	15.89 ft
Froude Number	1.97
Flow Type	Supercritical

Mainline - Alternative B/Tule Springs Crossing Option 1 - Segment 4A&4B - RCB at 1.5% - Ultimate Worksheet for Rectangular Channel

Project Description
Worksheet
Flow Element
Method
Solve For

Input Data	
Mannings Coefficient	0.015
Channel Slope	0.015000 ft/ft
Bottom Width	15.00 ft
Discharge	1,354.00 cfs

Results	
Depth	3.95 ft
Flow Area	59.2 ft ²
Wetted Perimeter	22.90 ft
Top Width	15.00 ft
Critical Depth	6.33 ft
Critical Slope	0.004007 ft/ft
Velocity	22.86 ft/s
Velocity Head	8.12 ft
Specific Energy	12.07 ft
Froude Number	2.03
Flow Type	Supercritical

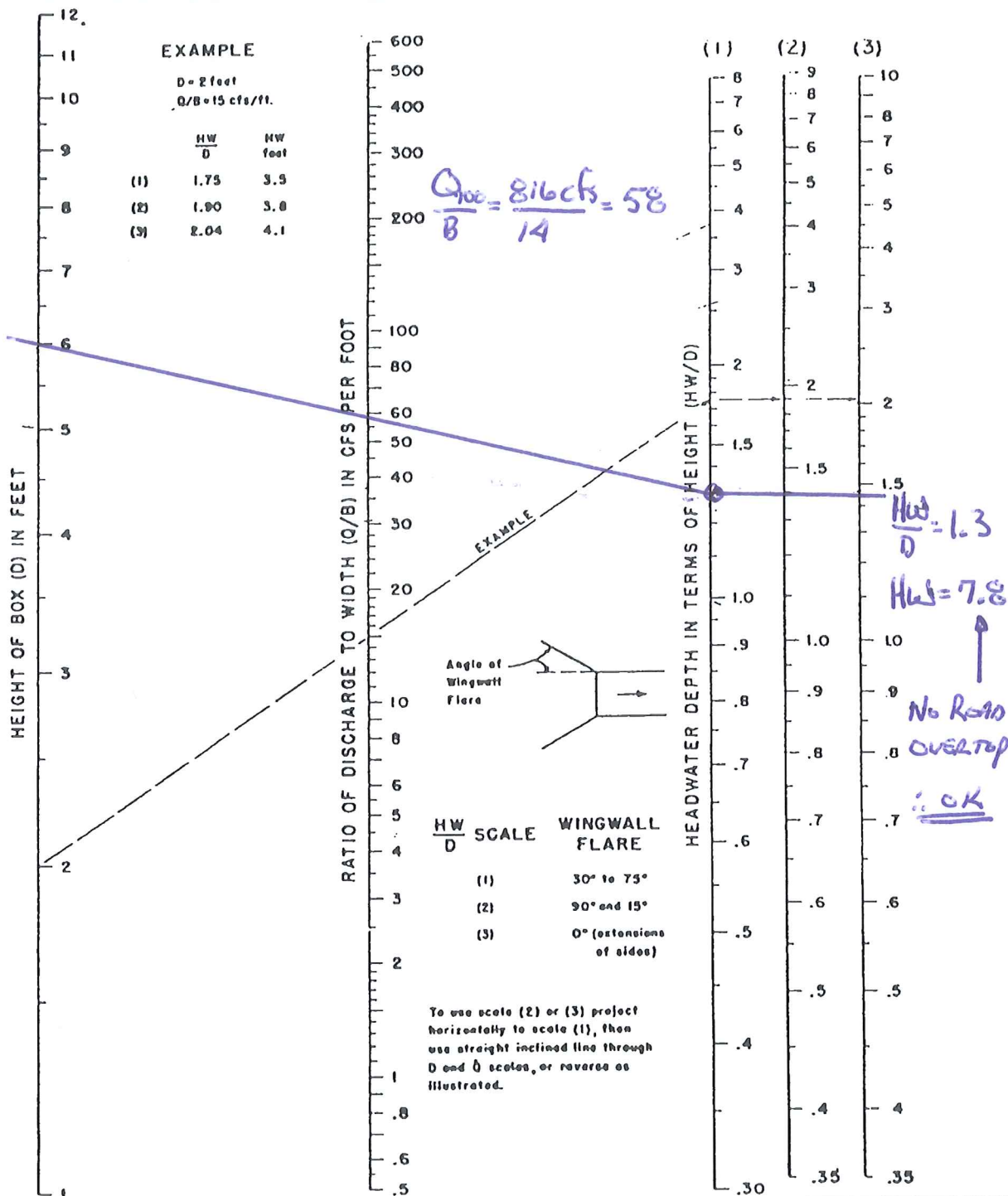
Mainline - Alternative B/Tule Springs Crossing Option 2 - Segment 3B - RCB at 1.5%

Worksheet for Rectangular Channel

Project Description	
Worksheet	Mainline - Alternative B/Tule Springs Crossing Option 2 - Segment 3B - RCB at 1.5%
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth
Input Data	
Mannings Coefficient	0.015
Channel Slope	0.015000 ft/ft
Bottom Width	10.00 ft
Discharge	1,183.00 cfs
Results	
Depth	5.22 ft
Flow Area	52.2 ft ²
Wetted Perimeter	20.44 ft
Top Width	10.00 ft
Critical Depth	7.58 ft
Critical Slope	0.005710 ft/ft
Velocity	22.67 ft/s
Velocity Head	7.98 ft
Specific Energy	13.20 ft
Froude Number	1.75
Flow Type	Supercritical

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

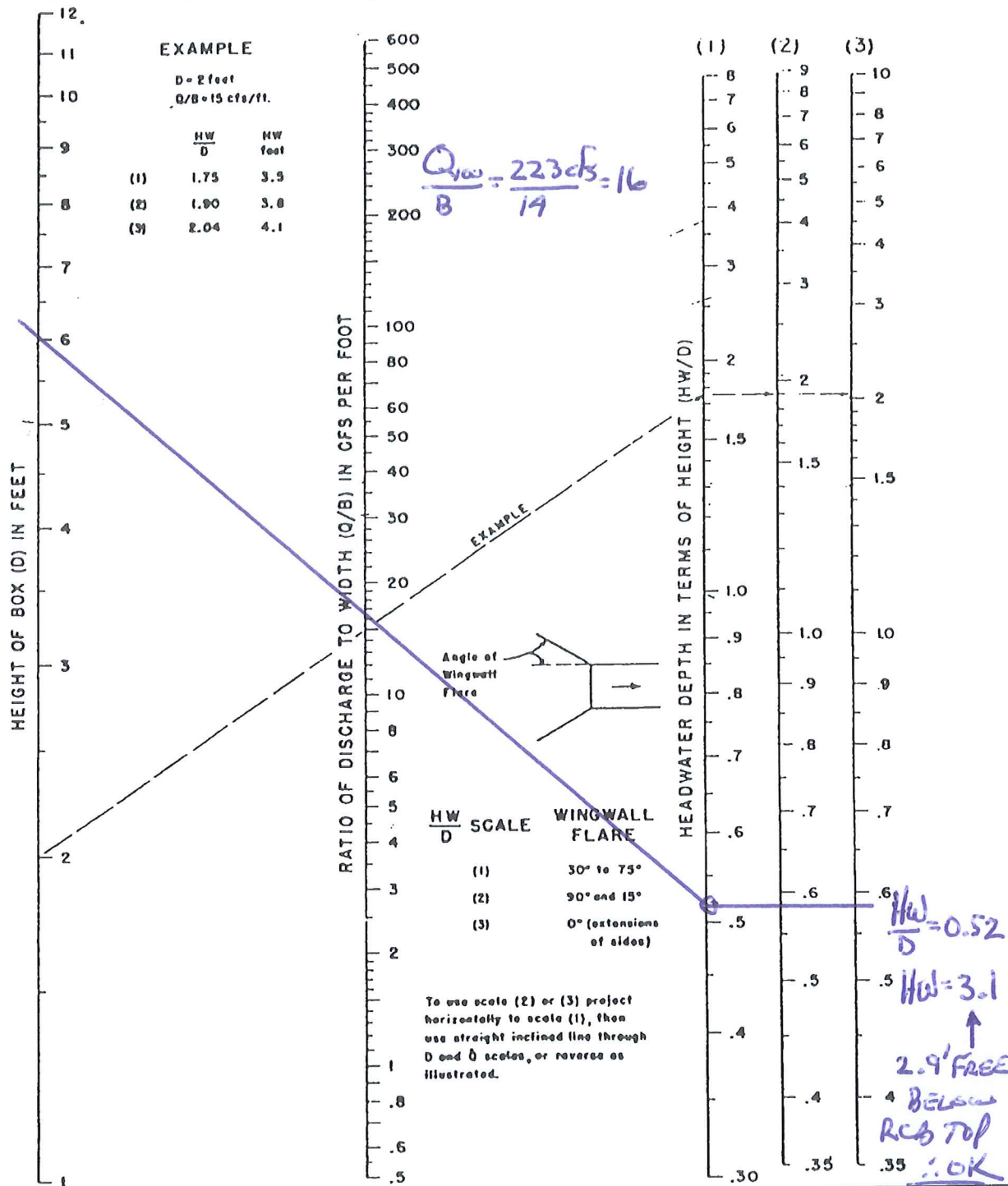
NOMOGRAPH - INLET CONTROL BOX CULVERT



Revision	Date

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RCB CULVERT - ULTIMATE FLOW NOMOGRAPH - INLET CONTROL BOX CULVERT



Revision	Date

Mainline - Alternative B/Tule Springs Crossing Option 2 - Segment 4B - RCB at 1.5%
Worksheet for Rectangular Channel

Project Description

Worksheet	Mainline - Alternative B/Tule Springs Crossing Option 2 - Segment 4B - RCB at 1.5%
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.015
Channel Slope	0.015000 ft/ft
Bottom Width	10.00 ft
Discharge	1,183.00 cfs

Results

Depth	5.22 ft
Flow Area	52.2 ft ²
Wetted Perimeter	20.44 ft
Top Width	10.00 ft
Critical Depth	7.58 ft
Critical Slope	0.005710 ft/ft
Velocity	22.67 ft/s
Velocity Head	7.98 ft
Specific Energy	13.20 ft
Froude Number	1.75
Flow Type	Supercritical

Mainline Drainage System – Alternative C
& Associated Tule Springs Crossing Collection Options

Mainline - Alternative C - Segment 1 - RCB at 2.3%
Worksheet for Rectangular Channel

Project Description	
Worksheet	Mainline - Alternative C - Segment 1 - RCB at 2.3%
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.015
Channel Slope	0.023000 ft/ft
Bottom Width	10.00 ft
Discharge	1,183.00 cfs

Results	
Depth	4.45 ft
Flow Area	44.5 ft ²
Wetted Perimeter	18.90 ft
Top Width	10.00 ft
Critical Depth	7.58 ft
Critical Slope	0.005710 ft/ft
Velocity	26.59 ft/s
Velocity Head	10.99 ft
Specific Energy	15.44 ft
Froude Number	2.22
Flow Type	Supercritical

Mainline - Alternative C - Segment 2 - Open Channel at 2.3% **Worksheet for Trapezoidal Channel**

Project Description	
Worksheet	Mainline - Alternative C - Segment 2 - Open Channel at 2.3%
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.015
Channel Slope	0.023000 ft/ft
Left Side Slope	2.00 H : V
Right Side Slope	2.00 H : V
Bottom Width	10.00 ft
Discharge	1,183.00 cfs

Results	
Depth	3.03 ft
Flow Area	48.6 ft ²
Wetted Perimeter	23.53 ft
Top Width	22.10 ft
Critical Depth	5.36 ft
Critical Slope	0.002387 ft/ft
Velocity	24.35 ft/s
Velocity Head	9.22 ft
Specific Energy	12.24 ft
Froude Number	2.90
Flow Type	Supercritical

Mainline - Alternative C - Segment 3A - Open Channel at 1.5%

Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mainline - Alternative C - Segment 3A - Open Channel at 1.5%
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.015
Channel Slope	0.015000 ft/ft
Left Side Slope	2.00 H : V
Right Side Slope	2.00 H : V
Bottom Width	10.00 ft
Discharge	1,183.00 cfs

Results	
Depth	3.38 ft
Flow Area	56.7 ft ²
Wetted Perimeter	25.12 ft
Top Width	23.53 ft
Critical Depth	5.36 ft
Critical Slope	0.002387 ft/ft
Velocity	20.87 ft/s
Velocity Head	6.77 ft
Specific Energy	10.15 ft
Froude Number	2.37
Flow Type	Supercritical

Mainline - Alternative C - Segment 3B - Open Channel at 1.5%

Worksheet for Trapezoidal Channel

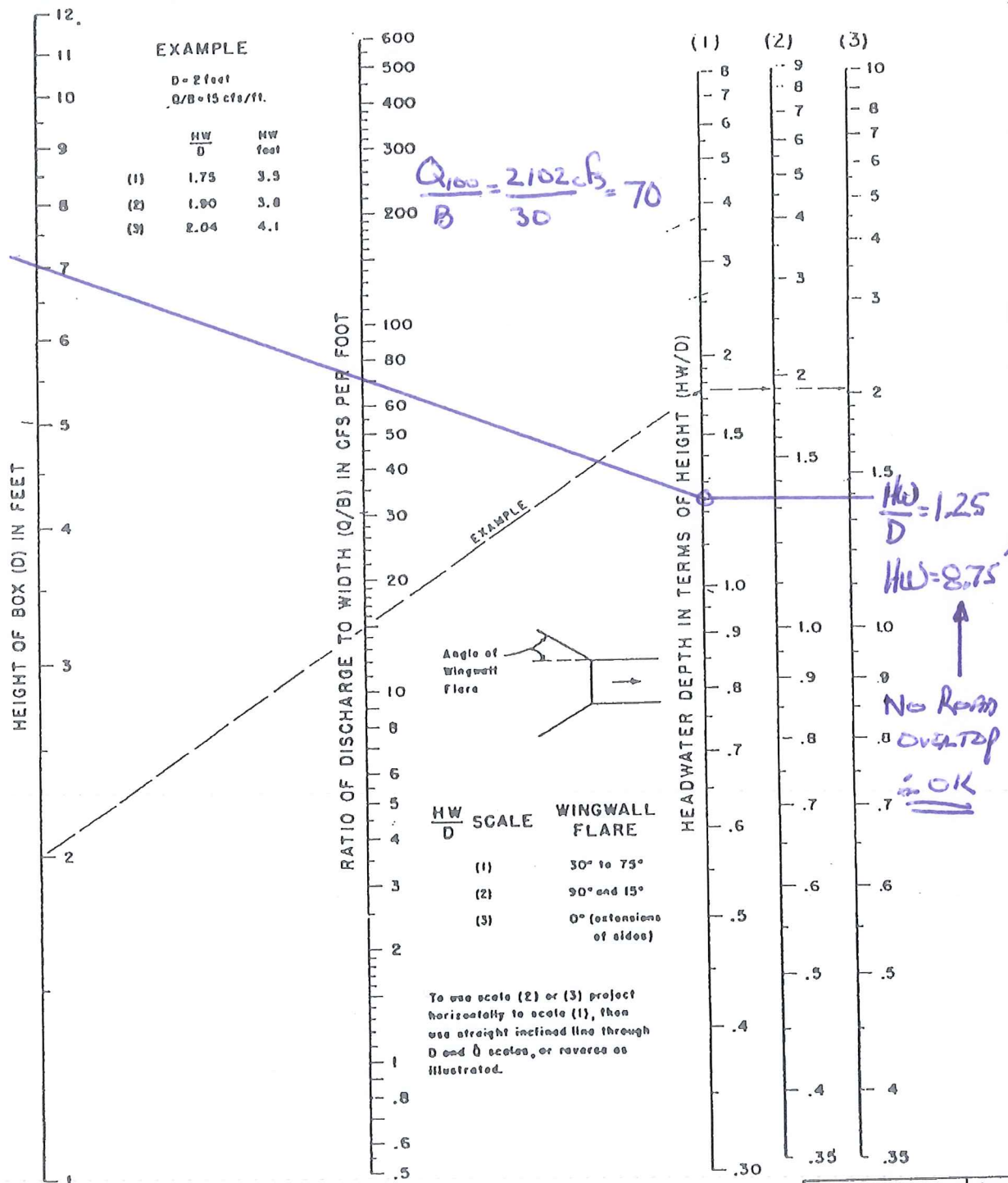
Project Description	
Worksheet	Mainline - Alternative C - Segment 3B - Open Channel at 1.5%
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.015
Channel Slope	0.015000 ft/ft
Left Side Slope	2.00 H : V
Right Side Slope	2.00 H : V
Bottom Width	10.00 ft
Discharge	1,354.00 cfs

Results	
Depth	3.62 ft
Flow Area	62.5 ft ²
Wetted Perimeter	26.21 ft
Top Width	24.50 ft
Critical Depth	5.74 ft
Critical Slope	0.002346 ft/ft
Velocity	21.66 ft/s
Velocity Head	7.29 ft
Specific Energy	10.91 ft
Froude Number	2.39
Flow Type	Supercritical

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL BOX CULVERT



Street Flow Computations

1-E Durango Half-Street Section (100-Year)

Worksheet for Irregular Channel

Project Description	
Worksheet	1-E Durango Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.50 %
Discharge	5.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.37 ft
Elevation Range	0.00 to 1.03
Flow Area	1.5 ft ²
Wetted Perimeter	11.98 ft
Top Width	11.56 ft
Actual Depth	0.37 ft
Critical Elevation	0.43 ft
Critical Slope	0.50 %
Velocity	3.40 ft/s
Velocity Head	0.18 ft
Specific Energy	0.55 ft
Froude Number	1.68
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+50.00	0.016

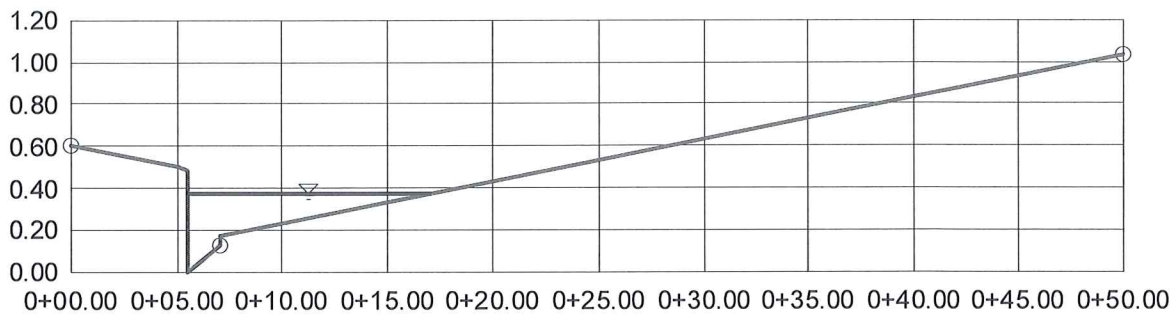
Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.03

Notes:
east half of Durango, north of Brent
Q = 5 cfs (estimated)

1-E Durango Half-Street Section (100-Year) Cross Section for Irregular Channel

Project Description	
Worksheet	1-E Durango Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	1.50 %
Water Surface Elevation	0.37 ft
Elevation Range	0.00 to 1.03
Discharge	5.00 cfs



V:10.0
H:1
NTS

1-W Durango Half-Street Section (10-Year)

Worksheet for Irregular Channel

Project Description	
Worksheet	1-W Durango Half-Street Section (10-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.50 %
Discharge	20.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.58 ft
Elevation Range	0.00 to 1.03
Flow Area	5.1 ft ²
Wetted Perimeter	26.65 ft
Top Width	26.12 ft
Actual Depth	0.58 ft
Critical Elevation	0.65 ft
Critical Slope	0.57 %
Velocity	3.94 ft/s
Velocity Head	0.24 ft
Specific Energy	0.82 ft
Froude Number	1.57
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.016
0+93.00	1+00.00	0.013

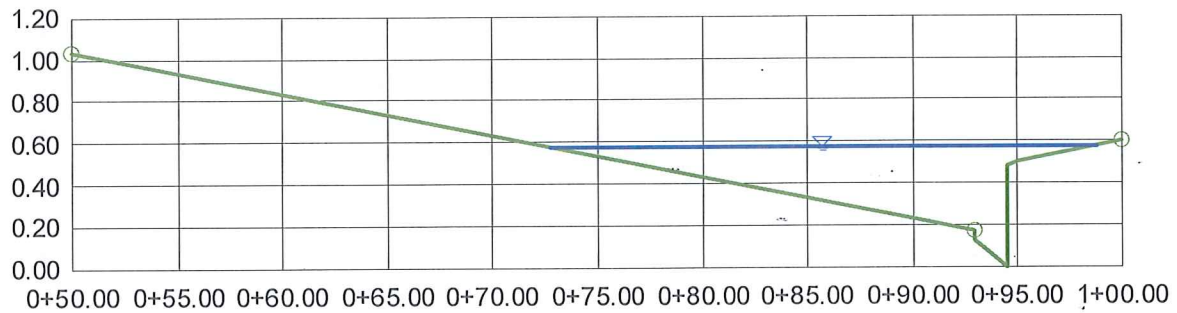
Natural Channel Points	
Station (ft)	Elevation (ft)
0+50.00	1.03
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.48
0+95.00	0.50
1+00.00	0.60

Notes:
west half of Durango, north of Brent
Q = LOC1

1-W Durango Half-Street Section (10-Year) Cross Section for Irregular Channel

Project Description	
Worksheet	1-W Durango Half-Street Section (10-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Channel Slope	1.50 %
Water Surface Elevation	0.58 ft
Elevation Range	0.00 to 1.03
Discharge	20.00 cfs



V:10.0
H:1
NTS

1-W Durango Half-Street Section (100-Year)

Worksheet for Irregular Channel

Project Description	
Worksheet	1-W Durango Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.50 %
Discharge	58.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.76 ft
Elevation Range	0.00 to 1.03
Flow Area	11.0 ft ²
Wetted Perimeter	37.29 ft
Top Width	36.59 ft
Actual Depth	0.76 ft
Critical Elevation	0.90 ft
Critical Slope	0.48 %
Velocity	5.27 ft/s
Velocity Head	0.43 ft
Specific Energy	1.19 ft
Froude Number	1.70
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.16180939 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.016
0+93.00	1+00.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+50.00	1.03
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.48
0+95.00	0.50
1+00.00	0.60

Notes:
west half of Durango, north of Brent
Q = LOC1

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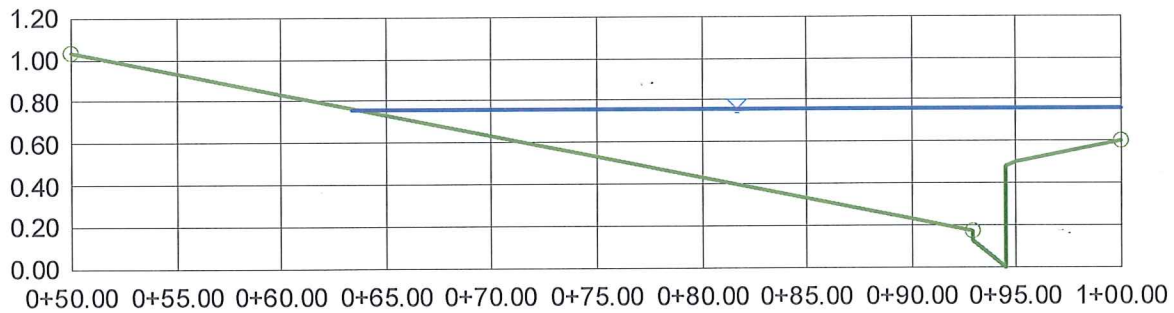
1-W Durango Half-Street Section (100-Year) Cross Section for Irregular Channel

Project Description

Worksheet	1-W Durango Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.015
Channel Slope	1.50 %
Water Surface Elevation	0.76 ft
Elevation Range	0.00 to 1.03
Discharge	58.00 cfs



V:10.0
H:1
NTS

2-E Durango Half-Street Section (100-Year) Worksheet for Irregular Channel

Project Description	
Worksheet	2-E Durango Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.50 %
Discharge	5.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.37 ft
Elevation Range	0.00 to 1.03
Flow Area	1.5 ft ²
Wetted Perimeter	12.01 ft
Top Width	11.59 ft
Actual Depth	0.37 ft
Critical Elevation	0.43 ft
Critical Slope	0.50 %
Velocity	3.38 ft/s
Velocity Head	0.18 ft
Specific Energy	0.55 ft
Froude Number	1.67
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.016
0+93.00	1+00.00	0.013

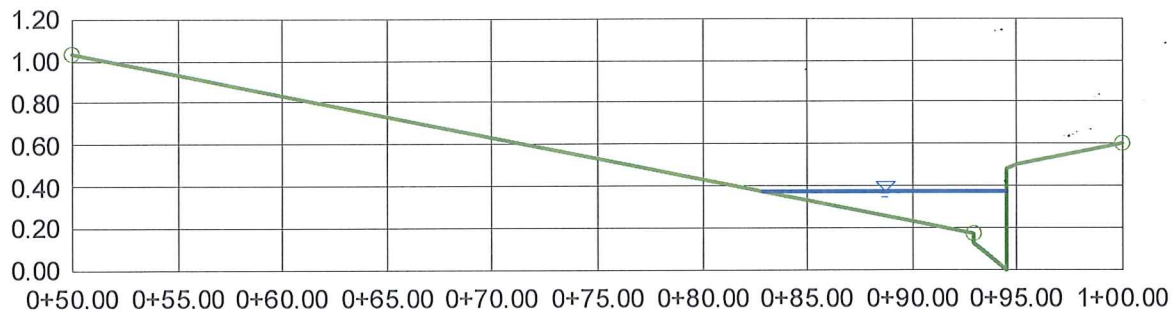
Natural Channel Points	
Station (ft)	Elevation (ft)
0+50.00	1.03
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.48
0+95.00	0.50
1+00.00	0.60

Notes:
east half of Durango, south of Brent
Q = LOC6
*10-Year dry lane passes by inspection

2-E Durango Half-Street Section (100-Year) Cross Section for Irregular Channel

Project Description	
Worksheet	2-E Durango Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	1.50 %
Water Surface Elevation	0.37 ft
Elevation Range	0.00 to 1.03
Discharge	5.00 cfs



V:10.0
H:1
NTS

2-W Durango Half-Street Section (10-Year) Worksheet for Irregular Channel

Project Description	
Worksheet	2-W Durango Half-Street Section (10-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.50 %
Discharge	25.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.61 ft
Elevation Range	0.00 to 1.03
Flow Area	6.0 ft ²
Wetted Perimeter	29.59 ft
Top Width	29.05 ft
Actual Depth	0.61 ft
Critical Elevation	0.69 ft
Critical Slope	0.55 %
Velocity	4.13 ft/s
Velocity Head	0.27 ft
Specific Energy	0.88 ft
Froude Number	1.60
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.1098358e-1 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+50.00	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.03

Notes:
west half of Durango, south of Brent
Q = CP1

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Slater Hanifan Group

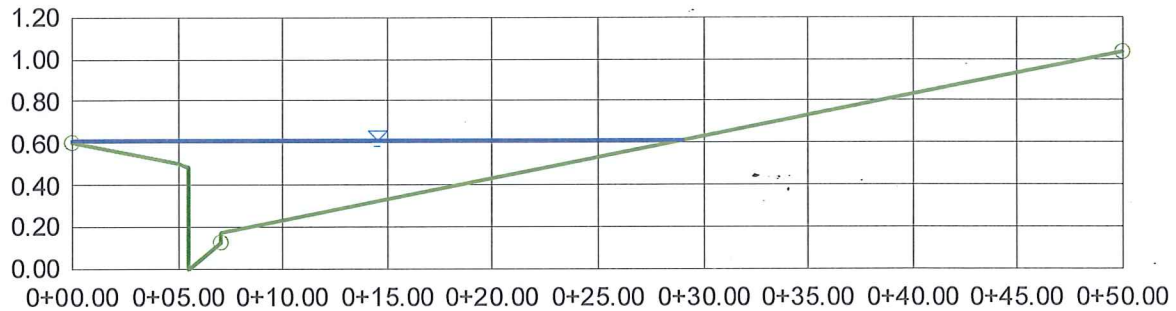
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2-W Durango Half-Street Section (10-Year) Cross Section for Irregular Channel

Project Description	
Worksheet	2-W Durango Half-Street Section (10-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Channel Slope	1.50 %
Water Surface Elevation	0.61 ft
Elevation Range	0.00 to 1.03
Discharge	25.00 cfs



V:10.0
H:1
NTS

2-W Durango Half-Street Section (100-Year)

Worksheet for Irregular Channel

Project Description	
Worksheet	2-W Durango Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.50 %
Discharge	77.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.83 ft
Elevation Range	0.00 to 1.03
Flow Area	13.5 ft ²
Wetted Perimeter	40.59 ft
Top Width	39.83 ft
Actual Depth	0.83 ft
Critical Elevation	0.99 ft
Critical Slope	0.46 %
Velocity	5.71 ft/s
Velocity Head	0.51 ft
Specific Energy	1.33 ft
Froude Number	1.73
Flow Type	Supercritical

Calculation Messages:

Water elevation exceeds lowest end station by 0.22664541 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+50.00	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.03

Notes:

west half of Durango, south of Brent

Q = CP1

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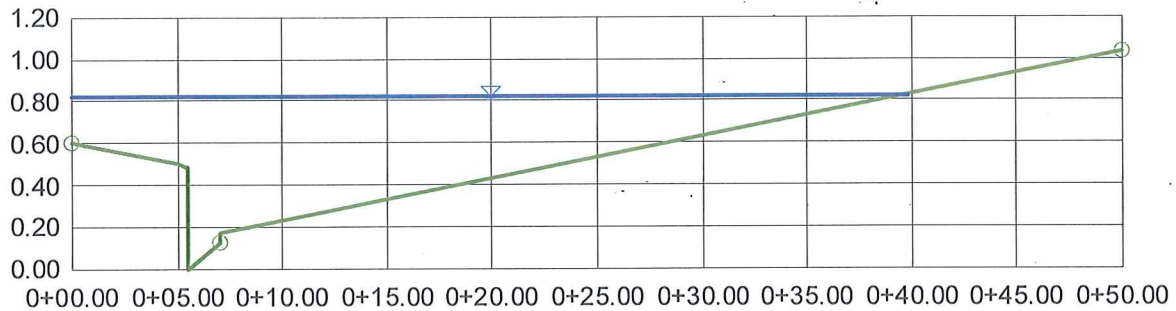
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2-W Durango Half-Street Section (100-Year) Cross Section for Irregular Channel

Project Description	
Worksheet	2-W Durango Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Channel Slope	1.50 %
Water Surface Elevation	0.83 ft
Elevation Range	0.00 to 1.03
Discharge	77.00 cfs



V:10.0
H:1
NTS

3-N Brent Half-Street Section (100-Year) Worksheet for Irregular Channel

Project Description	
Worksheet	3-N Brent Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.98 %
Discharge	21.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.31 ft
Elevation Range	0.00 to 0.43
Flow Area	4.4 ft ²
Wetted Perimeter	24.28 ft
Top Width	24.13 ft
Actual Depth	0.31 ft
Critical Elevation	0.43 ft
Critical Slope	0.45 %
Velocity	4.80 ft/s
Velocity Head	0.36 ft
Specific Energy	0.67 ft
Froude Number	1.99
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.14263274 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+17.00	0.013
0+17.00	0+30.00	0.016

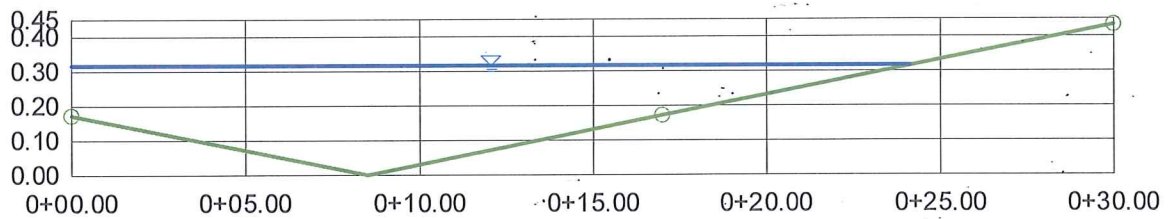
Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.17
0+08.50	0.00
0+17.00	0.17
0+30.00	0.43

Notes:
north half of Brent, west of Durango
Q = LOC2

3-N Brent Half-Street Section (100-Year) Cross Section for Irregular Channel

Project Description	
Worksheet	3-N Brent Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	1.98 %
Water Surface Elevation	0.31 ft
Elevation Range	0.00 to 0.43
Discharge	21.00 cfs



V:10.0
H:1
NTS

3-S Brent Half-Street Section (100-Year) Worksheet for Irregular Channel

Project Description	
Worksheet	3-S Brent Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.98 %
Discharge	12.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.25 ft
Elevation Range	0.00 to 0.43
Flow Area	2.9 ft ²
Wetted Perimeter	20.94 ft
Top Width	20.86 ft
Actual Depth	0.25 ft
Critical Elevation	0.33 ft
Critical Slope	0.47 %
Velocity	4.13 ft/s
Velocity Head	0.26 ft
Specific Energy	0.51 ft
Froude Number	1.95
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.77219767e-1 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+30.00	0+43.00	0.016
0+43.00	0+60.00	0.013

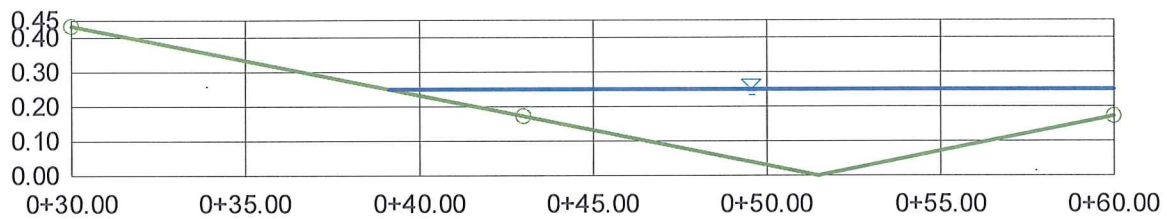
Natural Channel Points	
Station (ft)	Elevation (ft)
0+30.00	0.43
0+43.00	0.17
0+51.50	0.00
0+60.00	0.17

Notes:
south half of Brent, west of Durango
Q = LOC3

3-S Brent Half-Street Section (100-Year) Cross Section for Irregular Channel

Project Description	
Worksheet	3-S Brent Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	1.98 %
Water Surface Elevation	0.25 ft
Elevation Range	0.00 to 0.43
Discharge	12.00 cfs



V:10.0
H:1
NTS

4-N Brent Half-Street Section (100-Year) Worksheet for Irregular Channel

Project Description	
Worksheet	4-N Brent Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	2.00 %
Discharge	27.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.60 ft
Elevation Range	0.00 to 0.63
Flow Area	5.8 ft ²
Wetted Perimeter	29.10 ft
Top Width	28.56 ft
Actual Depth	0.60 ft
Critical Elevation	0.70 ft
Critical Slope	0.53 %
Velocity	4.68 ft/s
Velocity Head	0.34 ft
Specific Energy	0.94 ft
Froude Number	1.84
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12486367e-2 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+30.00	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+30.00	0.63

Notes:
north half of Brent, east of Durango
Q = LOC8

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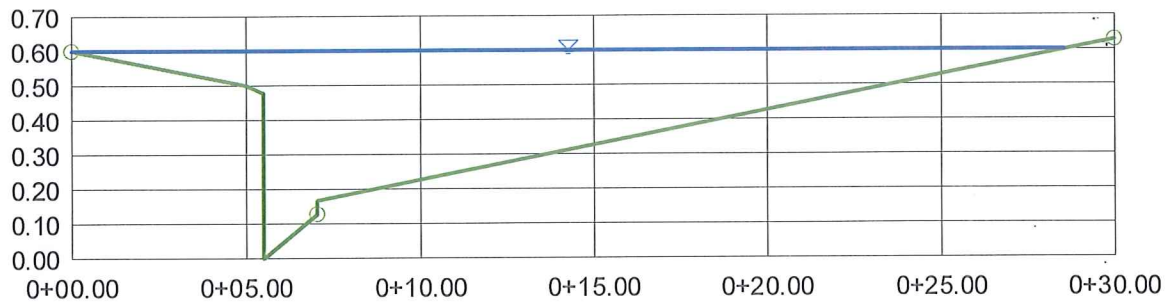
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4-N Brent Half-Street Section (100-Year) **Cross Section for Irregular Channel**

Project Description	
Worksheet	4-N Brent Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Channel Slope	2.00 %
Water Surface Elevation	0.60 ft
Elevation Range	0.00 to 0.63
Discharge	27.00 cfs



V:10.0
H:1
NTS

4-S Brent Half-Street Section (100-Year) Worksheet for Irregular Channel

Project Description	
Worksheet	4-S Brent Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	2.00 %
Discharge	6.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.38 ft
Elevation Range	0.00 to 0.63
Flow Area	1.5 ft ²
Wetted Perimeter	12.23 ft
Top Width	11.80 ft
Actual Depth	0.38 ft
Critical Elevation	0.45 ft
Critical Slope	0.50 %
Velocity	3.93 ft/s
Velocity Head	0.24 ft
Specific Energy	0.62 ft
Froude Number	1.92
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+30.00	0+53.00	0.016
0+53.00	0+60.00	0.013

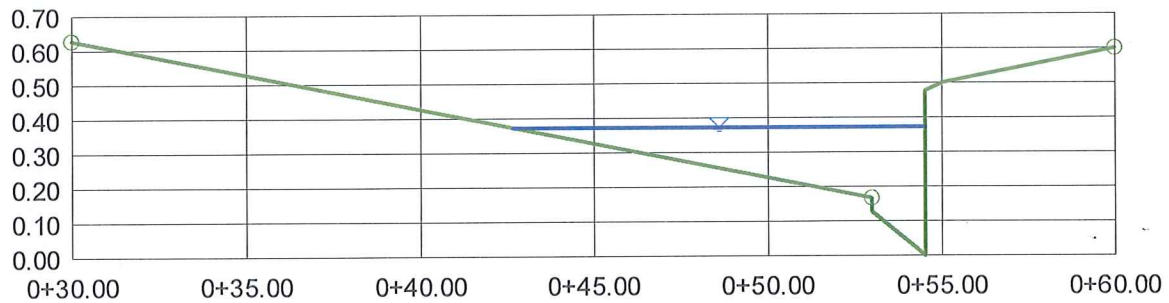
Natural Channel Points	
Station (ft)	Elevation (ft)
0+30.00	0.63
0+53.00	0.17
0+53.00	0.13
0+54.50	0.00
0+54.50	0.48
0+55.00	0.50
0+60.00	0.60

Notes:
south half of Brent, east of Durango
Q = LOC7

4-S Brent Half-Street Section (100-Year) **Cross Section for Irregular Channel**

Project Description	
Worksheet	4-S Brent Half-Street Section (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	2.00 %
Water Surface Elevation	0.38 ft
Elevation Range	0.00 to 0.63
Discharge	6.00 cfs



V:10.0
H:1
NTS

Drop Inlet Computations

Project:	Brent Lane Drainage System & Trail	
Title:	Type CM Drop Inlet (SUMP)	
Subtitle:	40-ft Drop Inlet (Proposed) - DI#2	
By:	MJF	
Date:	4/24/2014	
Input:	Variable:	Input:
Depth at Inlet (ft)	D	0.67
Grate Width (ft)	W	1.50
Length of Grate (ft)	L _g	37.50
Length of Curb Opening (ft)	L _c	40.00
Height of Curb Opening (ft)	H	0.547
Weir Coef. - Curb Opening	W _c	2.3
Weir Coef. - Grate	W _g	3.0
Orifice Coef.	O _c	0.67
Grate Coef.	G _c	0.60
Clogging Factor - Grate (%)	CF _g	50
Clogging Factor - Curb (%)	CF _c	50
Output (Grate):	Equation:	Output (Grate):
Effective Weir Length (ft)	2*W+L _g	40.50
Adjusted Effective Weir Length (ft)	2*(1-CF _g /100)*W+(1-CF _g /100)*L _g	20.25
Grate Open Area (sf)	W*L _g	56.25
Adjusted Grate Open Area (sf)	Grate Open Area * G _c *(1-CF _g /100)	16.88
Controlling Flow Type (weir/orifice)	If D<1.792*(Adj. Grate Open Area/Adj. Eff. Length) use weir, else orifice	weir
Intercepted Flow (cfs)	weir: W _g *(Adj. Eff. Weir Length)*D ^{1.5}	33.3
	orifice: O _c *(Adj. Grate Open Area)*(64.4*D) ^{0.5}	
Output (Curb):	Equation:	Output (Curb):
Effective Weir Length (ft)	L+1.8*W	42.70
Adjusted Effective Weir Length (ft)	L+1.8(1-CF _c /100)*W	41.41
Curb Open Area (sf)	L*H	21.88
Adjusted Curb Open Area (sf)	Curb Open Area * (1-CF _c /100)	10.94
Controlling Flow Type (weir/orifice)	If D<H, weir, else orifice	orifice
Intercepted Flow (cfs)	weir: W _c *(Adj. Eff. Weir Length)*D ^{1.5}	47.99
	orifice: O _c *(Adj. Curb Open Area)*(64.4*(D-H/2)) ^{0.5}	
Output (Combination):		Output (Combination):
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	81.3

Project:	Brent Lane Drainage System & Trail	
Title:	Type CM Drop Inlet (SUMP)	
Subtitle:	5-ft Drop Inlet (Proposed) - DI#3	
By:	MJF	
Date:	4/24/2014	
Input:	Variable:	Input:
Depth at Inlet (ft)	D	0.67
Grate Width (ft)	W	1.50
Length of Grate (ft)	L _g	2.50
Length of Curb Opening (ft)	L _c	5.00
Height of Curb Opening (ft)	H	0.547
Weir Coef. - Curb Opening	W _c	2.3
Weir Coef. - Grate	W _g	3.0
Orifice Coef.	O _c	0.67
Grate Coef.	G _c	0.60
Clogging Factor - Grate (%)	CF _g	50
Clogging Factor - Curb (%)	CF _c	50
Output (Grate):	Equation:	Output (Grate):
Effective Weir Length (ft)	2*W+L _g	5.50
Adjusted Effective Weir Length (ft)	2*(1-CF _g /100)*W+(1-CF _g /100)*L _g	2.75
Grate Open Area (sf)	W*L _g	3.75
Adjusted Grate Open Area (sf)	Grate Open Area * G _c *(1-CF _g /100)	1.13
Controlling Flow Type (weir/orifice)	If D<1.792*(Adj. Grate Open Area/Adj. Eff. Length) use weir, else orifice	weir
Intercepted Flow (cfs)	weir: W _g *(Adj. Eff. Weir Length)*D ^{1.5}	4.5
	orifice: O _c *(Adj. Grate Open Area)*(64.4*D) ^{0.5}	
Output (Curb):	Equation:	Output (Curb):
Effective Weir Length (ft)	L+1.8*W	7.70
Adjusted Effective Weir Length (ft)	L+1.8(1-CF _c /100)*W	6.41
Curb Open Area (sf)	L*H	2.74
Adjusted Curb Open Area (sf)	Curb Open Area * (1-CF _c /100)	1.37
Controlling Flow Type (weir/orifice)	If D<H, weir, else orifice	orifice
Intercepted Flow (cfs)	weir: W _c *(Adj. Eff. Weir Length)*D ^{1.5}	6.00
	orifice: O _c *(Adj. Curb Open Area)*(64.4*(D-H/2)) ^{0.5}	
Output (Combination):		Output (Combination):
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	10.5

Grate Inlet Sizing Computation

FACILITY DESCRIPTION

Project Name: Brent Lane Drainage System & Trail

Date: 4/24/2014

File Name: Special DI#4

By: MJF

Known Information:

Q = Flow (cfs)	21.0	
HW = Available Headwater Depth (ft)	1.00	* 1-ft Minimum Sump Depth
Cf = Clogging factor (%)	50	

Weir Conditions:

$$P = Q / (HW^{3/2} * C_w)$$

Cw = Weir Coefficient	2.70
P = Perimeter of grate (ft)	7.78
Pc = Perimeter (w/clogging) (ft)	15.56
Ar = Area Rectangular grate (ft2)	15.12
Ac = Area of Circular Grate (ft2)	19.26

Orifice Conditions:

$$A_g = Q / (C_o * (HW * 2g)^{1/2})$$

Co = Orifice Coefficient	0.67
Ag = Grate Area (ft2)	3.91
Gf = Grate Opening Factor	0.67
g = Gravity (fps)	32.20
Ac = Area Req (w/clogging) (ft2)	11.66

Worst Case Scenario Occurs Under Weir Conditions

Calculated Square Grate	L =	3.89 ft	* 15.6 LF Perimeter Length Required.
	W =	3.89 ft	

Worst Case Scenario Occurs Under Weir Conditions

Calculated Circular Size	D =	59.4 in
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Recommendations:

Provide one (1) special drop inlet with concrete apron - Grate Dimensions (clear) 3-ft wide by 5-ft long.
Perimeter Length Provided = 15 LF

Grate Inlet Sizing Computation

FACILITY DESCRIPTION

Project Name: **Brent Lane Drainage System & Trail**

Date: **4/24/2014**

File Name: **Special DI#5**

By: **MJF**

Known Information:

Q = Flow (cfs)	58.0	
HW = Available Headwater Depth (ft)	1.20	* 1.2-ft Minimum Sump Depth
Cf = Clogging factor (%)	50	

Weir Conditions:

$$P = Q / (HW^{3/2} * Cw)$$

Cw = Weir Coefficient	2.70
P = Perimeter of grate (ft)	16.34
Pc = Perimeter (w/clogging) (ft)	32.68
Ar = Area Rectangular grate (ft ²)	66.76
Ac = Area of Circular Grate (ft ²)	85.00

Orifice Conditions:

$$Ag = Q / (Co * (HW * 2g)^{1/2})$$

Co = Orifice Coefficient	0.67
Ag = Grate Area (ft ²)	9.85
Gf = Grate Opening Factor	0.67
g = Gravity (fps)	32.20
Ac = Area Req (w/clogging) (ft ²)	29.40

Worst Case Scenario Occurs Under Weir Conditions

Calculated Square Grate	L =	8.17 ft	* 32.7 LF Perimeter Length Required.
	W =	8.17 ft	

Worst Case Scenario Occurs Under Weir Conditions

Calculated Circular Size	D =	124.8 in
--------------------------	-----	----------

Recommendations:

Provide one (1) special drop inlet with concrete apron - Grate Dimensions (clear) 3-ft wide by 14-ft long.
Perimeter Length Provided = 34 LF

Grate Inlet Sizing Computation

FACILITY DESCRIPTION

Project Name: **Brent Lane Drainage System & Trail**

Date: **4/24/2014**

File Name: **Special DI#6**

By: **MJF**

Known Information:

Q = Flow (cfs)	6.0	
HW = Available Headwater Depth (ft)	1.00	* 1-ft Minimum Sump Depth
Cf = Clogging factor (%)	50	

Weir Conditions:

$$P = Q / (HW^{3/2} * Cw)$$

Cw = Weir Coefficient	2.70
P = Perimeter of grate (ft)	2.22
Pc = Perimeter (w/clogging) (ft)	4.44
Ar = Area Rectangular grate (ft2)	1.23
Ac = Area of Circular Grate (ft2)	1.57

Orifice Conditions:

$$Ag = Q / (Co * (HW * 2g)^{1/2})$$

Co = Orifice Coefficient	0.67
Ag = Grate Area (ft2)	1.12
Gf = Grate Opening Factor	0.67
g = Gravity (fps)	32.20
Ac = Area Req (w/clogging) (ft2)	3.33

Worst Case Scenario Occurs Under Orifice Conditions

Calculated Square Grate	L =	1.83 ft	* 7.4 LF Perimeter Length Required.
	W =	1.83 ft	

Worst Case Scenario Occurs Under Orifice Conditions

Calculated Circular Size	D =	24.7 in
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Recommendations:

Provide one (1) special drop inlet with concrete apron - Grate Dimensions (clear) 3-ft wide by 3-ft long.
Perimeter Length Provided = 9 LF

Storm Drain Lateral Computations

Storm Drain Lateral #1

Worksheet for Circular Channel

Project Description	
Worksheet	Storm Drain Lateral #1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data	
Mannings Coefficient	0.013
Channel Slope	0.020000 ft/ft
Diameter	24.0 in

Results	
Depth	2.00 ft
Discharge	31.99 cfs
Flow Area	3.1 ft ²
Wetted Perimeter	6.28 ft
Top Width	0.00 ft
Critical Depth	1.89 ft
Percent Full	100.0 %
Critical Slope	0.017296 ft/ft
Velocity	10.18 ft/s
Velocity Head	1.61 ft
Specific Energy	3.61 ft
Froude Number	0.00
Maximum Discharge	34.41 cfs
Discharge Full	31.99 cfs
Slope Full	0.020000 ft/ft
Flow Type	N/A

Storm Drain Lateral #2

Worksheet for Circular Channel

Project Description	
Worksheet	Storm Drain Lateral #2
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data	
Mannings Coefficient	0.013
Channel Slope	0.020000 ft/ft
Diameter	36.0 in

Results	
Depth	3.00 ft
Discharge	94.32 cfs
Flow Area	7.1 ft ²
Wetted Perimeter	9.42 ft
Top Width	0.00 ft
Critical Depth	2.87 ft
Percent Full	100.0 %
Critical Slope	0.017383 ft/ft
Velocity	13.34 ft/s
Velocity Head	2.77 ft
Specific Energy	5.77 ft
Froude Number	0.00
Maximum Discharge	101.46 cfs
Discharge Full	94.32 cfs
Slope Full	0.020000 ft/ft
Flow Type	N/A

Storm Drain Lateral #3 **Worksheet for Circular Channel**

Project Description	
Worksheet	Storm Drain Lateral #3
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data	
Mannings Coefficient	0.013
Channel Slope	0.020000 ft/ft
Diameter	18.0 in

Results	
Depth	1.50 ft
Discharge	14.85 cfs
Flow Area	1.8 ft ²
Wetted Perimeter	4.71 ft
Top Width	0.00 ft
Critical Depth	1.40 ft
Percent Full	100.0 %
Critical Slope	0.017287 ft/ft
Velocity	8.41 ft/s
Velocity Head	1.10 ft
Specific Energy	2.60 ft
Froude Number	0.00
Maximum Discharge	15.98 cfs
Discharge Full	14.85 cfs
Slope Full	0.020000 ft/ft
Flow Type	N/A

Storm Drain Lateral #4 **Worksheet for Circular Channel**

Project Description	
Worksheet	Storm Drain Lateral #4
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data	
Mannings Coefficient	0.013
Channel Slope	0.020000 ft/ft
Diameter	36.0 in

Results	
Depth	3.00 ft
Discharge	94.32 cfs
Flow Area	7.1 ft ²
Wetted Perimeter	9.42 ft
Top Width	0.00 ft
Critical Depth	2.87 ft
Percent Full	100.0 %
Critical Slope	0.017383 ft/ft
Velocity	13.34 ft/s
Velocity Head	2.77 ft
Specific Energy	5.77 ft
Froude Number	0.00
Maximum Discharge	101.46 cfs
Discharge Full	94.32 cfs
Slope Full	0.020000 ft/ft
Flow Type	N/A

Storm Drain Lateral #5 **Worksheet for Circular Channel**

Project Description	
Worksheet	Storm Drain Lateral #5
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data	
Mannings Coefficient	0.013
Channel Slope	0.020000 ft/ft
Diameter	24.0 in

Results	
Depth	2.00 ft
Discharge	31.99 cfs
Flow Area	3.1 ft ²
Wetted Perimeter	6.28 ft
Top Width	0.00 ft
Critical Depth	1.89 ft
Percent Full	100.0 %
Critical Slope	0.017296 ft/ft
Velocity	10.18 ft/s
Velocity Head	1.61 ft
Specific Energy	3.61 ft
Froude Number	0.00
Maximum Discharge	34.41 cfs
Discharge Full	31.99 cfs
Slope Full	0.020000 ft/ft
Flow Type	N/A

Storm Drain Lateral #6 **Worksheet for Circular Channel**

Project Description	
Worksheet	Storm Drain Lateral #6
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data	
Mannings Coefficient	0.013
Channel Slope	0.020000 ft/ft
Diameter	30.0 in

Results	
Depth	2.50 ft
Discharge	58.00 cfs
Flow Area	4.9 ft ²
Wetted Perimeter	7.85 ft
Top Width	0.00 ft
Critical Depth	2.38 ft
Percent Full	100.0 %
Critical Slope	0.017335 ft/ft
Velocity	11.82 ft/s
Velocity Head	2.17 ft
Specific Energy	4.67 ft
Froude Number	0.00
Maximum Discharge	62.40 cfs
Discharge Full	58.00 cfs
Slope Full	0.020000 ft/ft
Flow Type	N/A

Storm Drain Lateral #7

Worksheet for Circular Channel

Project Description	
Worksheet	Storm Drain Lateral #7
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data	
Mannings Coefficient	0.013
Channel Slope	0.020000 ft/ft
Diameter	18.0 in

Results	
Depth	1.50 ft
Discharge	14.85 cfs
Flow Area	1.8 ft ²
Wetted Perimeter	4.71 ft
Top Width	0.00 ft
Critical Depth	1.40 ft
Percent Full	100.0 %
Critical Slope	0.017287 ft/ft
Velocity	8.41 ft/s
Velocity Head	1.10 ft
Specific Energy	2.60 ft
Froude Number	0.00
Maximum Discharge	15.98 cfs
Discharge Full	14.85 cfs
Slope Full	0.020000 ft/ft
Flow Type	N/A

Storm Drain Lateral #8

Worksheet for Circular Channel

Project Description

Worksheet	Storm Drain Lateral #8
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data

Mannings Coefficient	0.013
Channel Slope	0.020000 ft/ft
Diameter	36.0 in

Results

Depth	3.00 ft
Discharge	94.32 cfs
Flow Area	7.1 ft ²
Wetted Perimeter	9.42 ft
Top Width	0.00 ft
Critical Depth	2.87 ft
Percent Full	100.0 %
Critical Slope	0.017383 ft/ft
Velocity	13.34 ft/s
Velocity Head	2.77 ft
Specific Energy	5.77 ft
Froude Number	0.00
Maximum Discharge	101.46 cfs
Discharge Full	94.32 cfs
Slope Full	0.020000 ft/ft
Flow Type	N/A

Storm Drain Lateral #9 **Worksheet for Circular Channel**

Project Description	
Worksheet	Storm Drain Lateral #9
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data	
Mannings Coefficient	0.013
Channel Slope	0.020000 ft/ft
Diameter	18.0 in

Results	
Depth	1.50 ft
Discharge	14.85 cfs
Flow Area	1.8 ft ²
Wetted Perimeter	4.71 ft
Top Width	0.00 ft
Critical Depth	1.40 ft
Percent Full	100.0 %
Critical Slope	0.017287 ft/ft
Velocity	8.41 ft/s
Velocity Head	1.10 ft
Specific Energy	2.60 ft
Froude Number	0.00
Maximum Discharge	15.98 cfs
Discharge Full	14.85 cfs
Slope Full	0.020000 ft/ft
Flow Type	N/A

Storm Drain Lateral #10 **Worksheet for Circular Channel**

Project Description

Worksheet	Storm Drain Lateral # 10
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data

Mannings Coefficient	0.013
Channel Slope	0.020000 ft/ft
Diameter	24.0 in

Results

Depth	2.00 ft
Discharge	31.99 cfs
Flow Area	3.1 ft ²
Wetted Perimeter	6.28 ft
Top Width	0.00 ft
Critical Depth	1.89 ft
Percent Full	100.0 %
Critical Slope	0.017296 ft/ft
Velocity	10.18 ft/s
Velocity Head	1.61 ft
Specific Energy	3.61 ft
Froude Number	0.00
Maximum Discharge	34.41 cfs
Discharge Full	31.99 cfs
Slope Full	0.020000 ft/ft
Flow Type	N/A

APPENDIX D

Estimates of Probable Cost

Adopted June 13, 2013

[illegible]

**BRENT LANE DRAINAGE SYSTEM AND TRAIL
STORM DRAIN IMPROVEMENTS - ALTERNATE A/CROSSING OPTION 3
30% Construction Cost Estimate**

5/5/14

Item Number	Description	Unit	Unit Price	CCRFCD FUNDING		CITY FUNDING		Total	Total
				Quantity	Cost	Quantity	Cost	Quantity	Cost
109.01	OWNER-CAUSED DELAY ALLOWANCE	DAY	\$500.00	30	\$15,000.00		\$0.00	30	\$15,000.00
109.02	OWNER-CAUSED DELAY AMOUNT IN ADDITION TO ALLOWANCE	DAY	\$750.00	30	\$22,500.00		\$0.00	30	\$22,500.00
200.01	MOBILIZATION AND DEMOBILIZATION	LS	\$106,000.00	1	\$106,000.00		\$0.00	1	\$106,000.00
202.01	REMOVE PLANTMIX BITUMINOUS SURFACE	SY	\$4.00	1000	\$4,000.00		\$0.00	1000	\$4,000.00
302.00	TYPE II AGGREGATE BASE	CY	\$30.00	175	\$5,250.00		\$0.00	175	\$5,250.00
402.01	PLANTMIX BITUMINOUS SURFACE (5-INCH)	SY	\$25.00	1000	\$25,000.00		\$0.00	1000	\$25,000.00
502.01	10-FOOT X 6-FOOT REINFORCED CONCRETE BOX	LF	\$600.00	1700	\$1,020,000.00		\$0.00	1700	\$1,020,000.00
502.02	TRAPEZOIDAL CONCRETE CHANNEL (10-FOOT WIDE X 6-FOOT DEEP)	LF	\$300.00	1060	\$318,000.00		\$0.00	1060	\$318,000.00
502.03	TRIPLE 10-FOOT X 7-FOOT REINFORCED CONCRETE CULVERT	LF	\$2,000.00	100	\$200,000.00		\$0.00	100	\$200,000.00
603.01	18-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$80.00	125	\$10,000.00		\$0.00	125	\$10,000.00
603.02	24-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$90.00	100	\$9,000.00		\$0.00	100	\$9,000.00
603.03	30-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$125.00	75	\$9,375.00		\$0.00	75	\$9,375.00
603.03	36-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$135.00	175	\$23,625.00		\$0.00	175	\$23,625.00
609.01	RCB MANHOLE	EA	\$2,500.00	5	\$12,500.00		\$0.00	5	\$12,500.00
609.02	TYPE III STORM DRAIN MANHOLE	EA	\$5,000.00	2	\$10,000.00		\$0.00	2	\$10,000.00
609.03	3-FOOT X 3-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$5,500.00	1	\$5,500.00		\$0.00	1	\$5,500.00
609.04	3-FOOT X 5-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$7,500.00	1	\$7,500.00		\$0.00	1	\$7,500.00
609.05	3-FOOT X 14-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$20,000.00	1	\$20,000.00		\$0.00	1	\$20,000.00
609.06	40-FOOT MODIFIED TYPE CM2 DROP INLET	EA	\$50,000.00	1	\$50,000.00		\$0.00	1	\$50,000.00
609.07	5-FOOT MODIFIED TYPE CM2 DROP INLET	EA	\$5,000.00	1	\$5,000.00		\$0.00	1	\$5,000.00
609.08	RCB PLUG	EA	\$1,500.00	1	\$1,500.00		\$0.00	1	\$1,500.00
609.09	BRICK AND MORTAR PLUG (RCP)	EA	\$750.00	2	\$1,500.00		\$0.00	2	\$1,500.00
610.01	RIPRAP (d50=16 INCHES)(32-INCH DEPTH)	SY	\$50.00	2500	\$125,000.00		\$0.00	2500	\$125,000.00
622.01	CONSTRUCTION SURVEYING	LS	\$25,000.00	1	\$25,000.00		\$0.00	1	\$25,000.00
624.01	TRAFFIC CONTROL AND MAINTENANCE	LS	\$25,000.00	1	\$25,000.00		\$0.00	1	\$25,000.00
625.01	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	\$80.00	180	\$14,400.00		\$0.00	180	\$14,400.00
625.02	ARROW DISPLAY	DAY	\$60.00	180	\$10,800.00		\$0.00	180	\$10,800.00
629.01	VERTICALLY ADJUST WATER VALVE COVER	EA	\$500.00	2	\$1,000.00		\$0.00	2	\$1,000.00
630.01	VERTICALLY ADJUST SANITARY SEWER MANHOLE	EA	\$800.00	1	\$800.00		\$0.00	1	\$800.00
637.01	DUST CONTROL	LS	\$50,000.00	1	\$50,000.00		\$0.00	1	\$50,000.00
	MISCELLANEOUS UTILITY RELOCATIONS	LS	\$100,000.00	1	\$100,000.00		\$0.00	1	\$100,000.00
SUBTOTAL					\$2,233,250.00		\$0.00		\$2,233,250.00
CONTINGENCY (20%)					\$446,650.00		\$0.00		\$446,650.00
SUBTOTAL CONSTRUCTION					\$2,679,900.00		\$0.00		\$2,679,900.00
CONSTRUCTION MANAGEMENT (7%)					\$187,593.00		\$0.00		\$187,593.00
TOTAL					\$2,867,493.00		\$0.00		\$2,867,493.00

**BRENT LANE DRAINAGE SYSTEM AND TRAIL
STORM DRAIN IMPROVEMENTS - ALTERNATE B/CROSSING OPTION 1
30% Construction Cost Estimate**

5/5/14

Item Number	Description	Unit	Unit Price	CCRFCD FUNDING		CITY FUNDING		Total	Total
				Quantity	Cost	Quantity	Cost	Quantity	Cost
109.01	OWNER-CAUSED DELAY ALLOWANCE	DAY	\$500.00	30	\$15,000.00		\$0.00	30	\$15,000.00
109.02	OWNER-CAUSED DELAY AMOUNT IN ADDITION TO ALLOWANCE	DAY	\$750.00	30	\$22,500.00		\$0.00	30	\$22,500.00
200.01	MOBILIZATION AND DEMOBILIZATION	LS	\$115,000.00	1	\$115,000.00		\$0.00	1	\$115,000.00
202.01	REMOVE PLANTMIX BITUMINOUS SURFACE	SY	\$4.00	1000	\$4,000.00		\$0.00	1000	\$4,000.00
302.00	TYPE II AGGREGATE BASE	CY	\$30.00	175	\$5,250.00		\$0.00	175	\$5,250.00
402.01	PLANTMIX BITUMINOUS SURFACE (5-INCH)	SY	\$25.00	1000	\$25,000.00		\$0.00	1000	\$25,000.00
502.01	10-FOOT X 6-FOOT REINFORCED CONCRETE BOX	LF	\$600.00	2450	\$1,470,000.00		\$0.00	2450	\$1,470,000.00
502.02	RECTANGULAR CONCRETE CHANNEL (15-FOOT WIDE X 6-FOOT DEEP)	LF	\$450.00	350	\$157,500.00		\$0.00	350	\$157,500.00
502.03	15-FOOT X 6-FOOT REINFORCED CONCRETE CULVERT	LF	\$800.00	100	\$80,000.00		\$0.00	100	\$80,000.00
603.01	18-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$80.00	125	\$10,000.00		\$0.00	125	\$10,000.00
603.02	24-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$90.00	100	\$9,000.00		\$0.00	100	\$9,000.00
603.03	30-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$125.00	75	\$9,375.00		\$0.00	75	\$9,375.00
603.03	36-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$135.00	175	\$23,625.00		\$0.00	175	\$23,625.00
609.01	RCB MANHOLE	EA	\$2,500.00	7	\$17,500.00		\$0.00	7	\$17,500.00
609.02	TYPE III STORM DRAIN MANHOLE	EA	\$5,000.00	2	\$10,000.00		\$0.00	2	\$10,000.00
609.03	3-FOOT X 3-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$5,500.00	1	\$5,500.00		\$0.00	1	\$5,500.00
609.04	3-FOOT X 5-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$7,500.00	1	\$7,500.00		\$0.00	1	\$7,500.00
609.05	3-FOOT X 14-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$20,000.00	1	\$20,000.00		\$0.00	1	\$20,000.00
609.06	40-FOOT MODIFIED TYPE CM2 DROP INLET	EA	\$50,000.00	1	\$50,000.00		\$0.00	1	\$50,000.00
609.07	5-FOOT MODIFIED TYPE CM2 DROP INLET	EA	\$5,000.00	1	\$5,000.00		\$0.00	1	\$5,000.00
609.08	RCB PLUG	EA	\$1,500.00	1	\$1,500.00		\$0.00	1	\$1,500.00
609.09	BRICK AND MORTAR PLUG (RCP)	EA	\$750.00	2	\$1,500.00		\$0.00	2	\$1,500.00
610.01	RIPRAP (d50=16 INCHES)(32-INCH DEPTH)	SY	\$50.00	2500	\$125,000.00		\$0.00	2500	\$125,000.00
622.01	CONSTRUCTION SURVEYING	LS	\$25,000.00	1	\$25,000.00		\$0.00	1	\$25,000.00
624.01	TRAFFIC CONTROL AND MAINTENANCE	LS	\$25,000.00	1	\$25,000.00		\$0.00	1	\$25,000.00
625.01	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	\$80.00	180	\$14,400.00		\$0.00	180	\$14,400.00
625.02	ARROW DISPLAY	DAY	\$60.00	180	\$10,800.00		\$0.00	180	\$10,800.00
629.01	VERTICALLY ADJUST WATER VALVE COVER	EA	\$500.00	2	\$1,000.00		\$0.00	2	\$1,000.00
630.01	VERTICALLY ADJUST SANITARY SEWER MANHOLE	EA	\$800.00	1	\$800.00		\$0.00	1	\$800.00
637.01	DUST CONTROL	LS	\$50,000.00	1	\$50,000.00		\$0.00	1	\$50,000.00
	MISCELLANEOUS UTILITY RELOCATIONS	LS	\$100,000.00	1	\$100,000.00		\$0.00	1	\$100,000.00
	SUBTOTAL				\$2,416,750.00		\$0.00		\$2,416,750.00
	CONTINGENCY (20%)				\$483,350.00		\$0.00		\$483,350.00
	SUBTOTAL CONSTRUCTION				\$2,900,100.00		\$0.00		\$2,900,100.00
	CONSTRUCTION MANAGEMENT (7%)				\$203,007.00		\$0.00		\$203,007.00
	TOTAL				\$3,103,107.00		\$0.00		\$3,103,107.00

5/5/14

Item Number	Description	Unit	Unit Price	CCRFCD FUNDING		CITY FUNDING		Total	Total
				Quantity	Cost	Quantity	Cost	Quantity	Cost
109.01	OWNER-CAUSED DELAY ALLOWANCE	DAY	\$500.00	30	\$15,000.00		\$0.00	30	\$15,000.00
109.02	OWNER-CAUSED DELAY AMOUNT IN ADDITION TO ALLOWANCE	DAY	\$750.00	30	\$22,500.00		\$0.00	30	\$22,500.00
200.01	MOBILIZATION AND DEMOBILIZATION	LS	\$119,000.00	1	\$119,000.00		\$0.00	1	\$119,000.00
202.01	REMOVE PLANTMIX BITUMINOUS SURFACE	SY	\$4.00	1000	\$4,000.00		\$0.00	1000	\$4,000.00
302.00	TYPE II AGGREGATE BASE	CY	\$30.00	175	\$5,250.00		\$0.00	175	\$5,250.00
402.01	PLANTMIX BITUMINOUS SURFACE (5-INCH)	SY	\$25.00	1000	\$25,000.00		\$0.00	1000	\$25,000.00
502.01	10-FOOT X 6-FOOT REINFORCED CONCRETE BOX	LF	\$600.00	2860	\$1,716,000.00		\$0.00	2860	\$1,716,000.00
502.02	14-FOOT X 6-FOOT REINFORCED CONCRETE CULVERT	LF	\$750.00	100	\$75,000.00		\$0.00	100	\$75,000.00
603.01	18-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$80.00	125	\$10,000.00		\$0.00	125	\$10,000.00
603.02	24-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$90.00	100	\$9,000.00		\$0.00	100	\$9,000.00
603.03	30-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$125.00	75	\$9,375.00		\$0.00	75	\$9,375.00
603.03	36-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$135.00	175	\$23,625.00		\$0.00	175	\$23,625.00
609.01	RCB MANHOLE	EA	\$2,500.00	8	\$20,000.00		\$0.00	8	\$20,000.00
609.02	TYPE III STORM DRAIN MANHOLE	EA	\$5,000.00	2	\$10,000.00		\$0.00	2	\$10,000.00
609.03	3-FOOT X 3-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$5,500.00	1	\$5,500.00		\$0.00	1	\$5,500.00
609.04	3-FOOT X 5-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$7,500.00	1	\$7,500.00		\$0.00	1	\$7,500.00
609.05	3-FOOT X 14-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$20,000.00	1	\$20,000.00		\$0.00	1	\$20,000.00
609.06	40-FOOT MODIFIED TYPE CM2 DROP INLET	EA	\$50,000.00	1	\$50,000.00		\$0.00	1	\$50,000.00
609.07	5-FOOT MODIFIED TYPE CM2 DROP INLET	EA	\$5,000.00	1	\$5,000.00		\$0.00	1	\$5,000.00
609.08	RCB PLUG	EA	\$1,500.00	1	\$1,500.00		\$0.00	1	\$1,500.00
609.09	BRICK AND MORTAR PLUG (RCP)	EA	\$750.00	2	\$1,500.00		\$0.00	2	\$1,500.00
610.01	RIPRAP (d50=16 INCHES)(32-INCH DEPTH)	SY	\$50.00	2500	\$125,000.00		\$0.00	2500	\$125,000.00
622.01	CONSTRUCTION SURVEYING	LS	\$25,000.00	1	\$25,000.00		\$0.00	1	\$25,000.00
624.01	TRAFFIC CONTROL AND MAINTENANCE	LS	\$25,000.00	1	\$25,000.00		\$0.00	1	\$25,000.00
625.01	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	\$80.00	180	\$14,400.00		\$0.00	180	\$14,400.00
625.02	ARROW DISPLAY	DAY	\$60.00	180	\$10,800.00		\$0.00	180	\$10,800.00
629.01	VERTICALLY ADJUST WATER VALVE COVER	EA	\$500.00	2	\$1,000.00		\$0.00	2	\$1,000.00
630.01	VERTICALLY ADJUST SANITARY SEWER MANHOLE	EA	\$800.00	1	\$800.00		\$0.00	1	\$800.00
637.01	DUST CONTROL	LS	\$50,000.00	1	\$50,000.00		\$0.00	1	\$50,000.00
	MISCELLANEOUS UTILITY RELOCATIONS	LS	\$100,000.00	1	\$100,000.00		\$0.00	1	\$100,000.00
SUBTOTAL				\$2,506,750.00		\$0.00		\$2,506,750.00	
CONTINGENCY (20%)				\$501,350.00		\$0.00		\$501,350.00	
SUBTOTAL CONSTRUCTION				\$3,008,100.00		\$0.00		\$3,008,100.00	
CONSTRUCTION MANAGEMENT (7%)				\$210,567.00		\$0.00		\$210,567.00	
TOTAL				\$3,218,667.00		\$0.00		\$3,218,667.00	

**BRENT LANE DRAINAGE SYSTEM AND TRAIL
STORM DRAIN IMPROVEMENTS - ALTERNATE C/CROSSING OPTION 3
30% Construction Cost Estimate**

5/5/14

Item Number	Description	Unit	Unit Price	CCRFCD FUNDING		CITY FUNDING		Total	Total
				Quantity	Cost	Quantity	Cost	Quantity	Cost
109.01	OWNER-CAUSED DELAY ALLOWANCE	DAY	\$500.00	30	\$15,000.00		\$0.00	30	\$15,000.00
109.02	OWNER-CAUSED DELAY AMOUNT IN ADDITION TO ALLOWANCE	DAY	\$750.00	30	\$22,500.00		\$0.00	30	\$22,500.00
200.01	MOBILIZATION AND DEMOBILIZATION	LS	\$81,000.00	1	\$81,000.00		\$0.00	1	\$81,000.00
202.01	REMOVE PLANTMIX BITUMINOUS SURFACE	SY	\$4.00	1000	\$4,000.00		\$0.00	1000	\$4,000.00
302.00	TYPE II AGGREGATE BASE	CY	\$30.00	175	\$5,250.00		\$0.00	175	\$5,250.00
402.01	PLANTMIX BITUMINOUS SURFACE (5-INCH)	SY	\$25.00	1000	\$25,000.00		\$0.00	1000	\$25,000.00
502.01	10-FOOT X 6-FOOT REINFORCED CONCRETE BOX	LF	\$600.00	170	\$102,000.00		\$0.00	170	\$102,000.00
502.02	TRAPEZOIDAL CONCRETE CHANNEL (10-FOOT WIDE X 6-FOOT DEEP)	LF	\$300.00	1060	\$318,000.00		\$0.00	1060	\$318,000.00
502.03	TRAPEZOIDAL CONCRETE CHANNEL (10-FOOT WIDE X 5-FOOT DEEP)	LF	\$275.00	1530	\$420,750.00		\$0.00	1530	\$420,750.00
502.04	TRIPLE 10-FOOT X 7-FOOT REINFORCED CONCRETE CULVERT	LF	\$2,000.00	100	\$200,000.00		\$0.00	100	\$200,000.00
603.01	18-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$80.00	125	\$10,000.00		\$0.00	125	\$10,000.00
603.02	24-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$90.00	100	\$9,000.00		\$0.00	100	\$9,000.00
603.03	30-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$125.00	75	\$9,375.00		\$0.00	75	\$9,375.00
603.03	36-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	\$135.00	175	\$23,625.00		\$0.00	175	\$23,625.00
609.01	RCB MANHOLE	EA	\$2,500.00	1	\$2,500.00		\$0.00	1	\$2,500.00
609.02	TYPE III STORM DRAIN MANHOLE	EA	\$5,000.00	2	\$10,000.00		\$0.00	2	\$10,000.00
609.03	3-FOOT X 3-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$5,500.00	1	\$5,500.00		\$0.00	1	\$5,500.00
609.04	3-FOOT X 5-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$7,500.00	1	\$7,500.00		\$0.00	1	\$7,500.00
609.05	3-FOOT X 14-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	\$20,000.00	1	\$20,000.00		\$0.00	1	\$20,000.00
609.06	40-FOOT MODIFIED TYPE CM2 DROP INLET	EA	\$50,000.00	1	\$50,000.00		\$0.00	1	\$50,000.00
609.07	5-FOOT MODIFIED TYPE CM2 DROP INLET	EA	\$5,000.00	1	\$5,000.00		\$0.00	1	\$5,000.00
609.08	RCB PLUG	EA	\$1,500.00	1	\$1,500.00		\$0.00	1	\$1,500.00
609.09	BRICK AND MORTAR PLUG (RCP)	EA	\$750.00	2	\$1,500.00		\$0.00	2	\$1,500.00
610.01	RIPRAP (d50=16 INCHES)(32-INCH DEPTH)	SY	\$50.00	2500	\$125,000.00		\$0.00	2500	\$125,000.00
622.01	CONSTRUCTION SURVEYING	LS	\$25,000.00	1	\$25,000.00		\$0.00	1	\$25,000.00
624.01	TRAFFIC CONTROL AND MAINTENANCE	LS	\$25,000.00	1	\$25,000.00		\$0.00	1	\$25,000.00
625.01	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	\$80.00	180	\$14,400.00		\$0.00	180	\$14,400.00
625.02	ARROW DISPLAY	DAY	\$60.00	180	\$10,800.00		\$0.00	180	\$10,800.00
629.01	VERTICALLY ADJUST WATER VALVE COVER	EA	\$500.00	2	\$1,000.00		\$0.00	2	\$1,000.00
630.01	VERTICALLY ADJUST SANITARY SEWER MANHOLE	EA	\$800.00	1	\$800.00		\$0.00	1	\$800.00
637.01	DUST CONTROL	LS	\$50,000.00	1	\$50,000.00		\$0.00	1	\$50,000.00
	MISCELLANEOUS UTILITY RELOCATIONS	LS	\$100,000.00	1	\$100,000.00		\$0.00	1	\$100,000.00
SUBTOTAL					\$1,701,000.00		\$0.00		\$1,701,000.00
CONTINGENCY (20%)					\$340,200.00		\$0.00		\$340,200.00
SUBTOTAL CONSTRUCTION					\$2,041,200.00		\$0.00		\$2,041,200.00
CONSTRUCTION MANAGEMENT (7%)					\$142,884.00		\$0.00		\$142,884.00
TOTAL					\$2,184,084.00		\$0.00		\$2,184,084.00

APPENDIX E

Reference Material

Kyle Canyon Master Drainage Study, G.C. Wallace

CITY OF LAS VEGAS			DATE:
INTER-OFFICE MEMORANDUM			March 29, 2007
TO: Land Development Services Department of Public Works			FROM: Oh Sang Kwon, P.E. <i>OSK</i> Flood Control Department of Public Works
SUBJECT: Drainage Study for:			COPIES TO:
Kyle Canyon Master Drainage Study			G.C. Wallace, Inc.
Cross Streets:	Fort Apache Road & Moccasin Road		Kyle Acquisition Group, LLC.
File Number:	F:\Depot\DSMemos\DS4091B.doc		Jorge Cervantes, P.E., City Eng.
Parcel Number:	125-06-001-001		Bart Anderson, P.E., DevCo
Zoning Action:			Tom Perrigo, Planning
FEMA Flood Zone	YES	NO ☒	CCRFC
Proposed Storm Drain	YES ☒	NO	NDOT

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Transaction #
1 st Submittal	10/6/2006	11/9/2006	Not Approved	\$1000.00	Paid: \$1000
2 nd Submittal	12/15/2006	1/12/2007	Conditional Approval	\$400.00	Paid: \$400
CCRFC	3/13/2007	3/13/2007	Concurrence	N/C	N/C
CCDS	3/28/2007	3/28/2007	Concurrence	N/C	N/C
TOTAL FEES (LDDRS):				\$1400.00	

REMARKS:

The Master Drainage Study for the subject project has been reviewed and:

☒	is approved subject to conformance to all City standards and the following conditions:
	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.

- Please note that any future technical drainage study submittals that differ from the Master Drainage Study (ie. Changes in pods, infrastructure, flows etc.) will require an update to the Master Drainage Study and this update must be approved by the City of Las Vegas Flood Control Section prior to final approval of technical drainage study.
- The proposed interim detention basin will require coordination with the State of Nevada, Division of Water Resources Dam Safety and will require the State's approval prior to permitting.
- Please coordinate the proposed project with the following projects: Mountain Edge Parkway, Horse Interchange, Grand Teton Overpass, Brent & Tule Spring Detention Basins, US95 Widening, and Elkhorn Storm Drain System. These major projects may be impacted by this development and the potential impacts must be addressed from this Master Drainage Study.
- Please obtain necessary 404 permits from Army Corps of Engineers and provide a copy of the permit to Flood Control prior to issuance of the grading permit. The contact information for Army Corps of Engineers is listed below:

Steven W. Roberts
Chief, Regulatory Field Office
US Army Corps of Engineers

321 North Mall Drive
Suite L-101
St. George, UT 84790

(435) 986-3979 (Office)
(435) 986-3981 (FAX)
steven.w.roberts@usace.army.mil

5. Please note that all storm drain facilities and detention basins shown on Figure 9R, "100-year Flood Protection Facilities Map", and Figure EXH1, "Detention Basin Shadow of Protection Exhibit", that are required to reduce and convey the storm flows must be substantially completed prior to any development as depicted in the Master Drainage Study. Each phase of the development must be individually flood protected.
6. Please note that the proposed 100-year flood protection facilities identified on Figure 9R must be constructed by the Master Developer as a part of the master planned infrastructure. Technical drainage studies are required for each phase of the infrastructure improvements. The technical drainage studies for the infrastructure improvements may be submitted with conditional approval of this Master Drainage Study. However, final approval for the Master Drainage Study must be obtained prior to conditional approval of the infrastructure drainage studies.
7. Technical drainage studies are required for each of the POD's. The technical drainage studies for the POD's may not be submitted until the conditional approval of the pertinent infrastructure drainage study is obtained. Final approval for the infrastructure drainage study must be obtained prior to conditional approval of the Impacted POD drainage studies.
8. Building permits for the homes within the individual POD's will not be issued until construction of the street and flood control infrastructure around the POD is substantially complete.
9. As stated in this Master Drainage Study, the proposed developments within ultimate condition Subbasins A-44, A-45, and B-45 cannot be constructed prior to completion of the Horse Drive Interchange storm drain facilities and all pertinent storm drain facilities downstream of the proposed Horse Drive Interchange.
10. Please note that the flows within all non-standard street sections are not allowed to over top the median and overflow onto the lower street. Also, nuisance flows are not allowed to sheet flow across the street. Storm drain facilities must be designed to meet these conditions and these storm drain facilities are the responsibility of the Master Developer.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved master drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For

more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS
osk

T/R/S: T19S/R60E/6 & 7
AREA G-6, 7, & F-12


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*****
1 FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
* RUN DATE 05DEC06 TIME 15:12:13
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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 XXXX X
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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

HEC-1 INPUT

PAGE 1

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

*DIAGRAM

*** FREE ***

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1 ID *****
2 ID *
3 ID *
4 ID * KYLE CANYON
5 ID *
6 ID * EXISTING CONDITIONS
7 ID *
8 ID * RETURN PERIOD 100 & 10 -YEAR
9 ID * DISTRIBUTION 6-HOUR SDN3
10 ID * PROJECT NO 784.016
11 ID * FILENAME EX-RTC.H1
12 ID * DATE MODELED 11/28/06
13 ID * MODELED BY REH/BJK
14 ID *
15 ID *
16 ID *
17 ID *****
18 ID JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
19 ID
20 ID
21 ID
22 ID
23 ID AREA DARF
24 ID SQ.MI.
25 ID 0.0 - 0.5 0.99
26 ID 0.5 - 1.0 0.98
27 ID 1.0 - 2.0 0.95
28 ID 2.0 - 4.0 0.92
29 ID 4.0 - 6.0 0.91
30 ID 6.0 - 8.0 0.89
31 ID
32 ID
33 ID
34 ID
35 ID IT 5 0 0 300
36 ID IO 5
37 ID IN 5 0 0
38 ID JR PREC 1 0.98 0.95 0.92 0.91 0.89 0.57
39 ID *

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39 KK OFFA
40 KM AREA 13.0 AC
41 PB 2.77
42 BA 0.0203
43 PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
44 PC .130 .130 .130 .133 .140 .142 .148 .158 .172 .181
45 PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
46 PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
47 PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
48 PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
49 PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
50 PC .998 .999 1.00
51 LS 0 77.4

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HEC-1 INPUT

PAGE 2

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

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52 UD .149
53 KK 95-1
54 KM AREA 2.7 AC
55 PB 2.77
56 BA 0.0042
57 LS 0 89.1
58 UD .069
59 KK CPMI
60 KM COMBINATION POINT CPMI
61 KM COMBINE OFFA AND 95-1
62 HC 2

```

63 KK OFFB
64 KM AREA 85.6 AC
65 PB 2.93
66 BA 0.1337
67 LS 0 77.4
68 UD .392
*

69 KK 95-2
70 KM AREA 2.8 AC
71 PB 2.77
72 BA 0.0044
73 LS 0 89.1
74 UD .090
*

75 KK CP1
76 KM COMBINATION POINT CP1
77 KM COMBINE OFFB AND 95-2
78 HC 2
*

79 KK RCP1
80 KM ROUTE CP1 THRU OFF2
81 KM N-STEPS K X-FACTOR
82 RM 1 0.078 0.15
*

83 KK OFF2
84 KM AREA 59.4 AC
85 PB 2.77
86 BA 0.0928
87 LS 0 77.4
88 UD .245
*

HEC-1 INPUT

PAGE 3

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

89 KK CP2
90 KM COMBINATION POINT CP2
91 KM COMBINE CP1 AND OFF2
92 HC 2
*

93 KK RCP2
94 KM ROUTE CP2 THRU EX-E1
95 KM N-STEPS K X-FACTOR
96 RM 1 0.094 0.15
*

97 KK EX-E1
98 KM AREA 33.75 AC
99 PB 2.77
100 BA 0.0527
101 LS 0 77.4
102 UD .235
*

103 KK CP3
104 KM COMBINATION POINT CP3
105 KM COMBINE RCP2 AND EX-E1
106 HC 2
*

107 KK OFFC
108 KM AREA 85.3 AC
109 PB 2.79
110 BA 0.1333
111 LS 0 77.4
112 UD .313
*

113 KK 95-3
114 KM AREA 6.1 AC
115 PB 2.77
116 BA 0.0095
117 LS 0 89.1
118 UD .095
*

119 KK CP4
120 KM COMBINATION POINT CP4
121 KM COMBINE OFFC AND 95-3
122 HC 2
*

123 KK OFF4
124 KM AREA 20.4 AC
125 PB 2.77
126 BA 0.0319
127 LS 0 77.4
128 UD .136
*

HEC-1 INPUT

PAGE 4

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

129 KK CP5
130 KM COMBINATION POINT CP5
131 KM COMBINE CP4 AND OFF4
132 HC 2
*

133 KK RCP5
134 KM ROUTE CP5 THRU EX-E2
135 KM N-STEPS K X-FACTOR
136 RM 2 0.162 0.15
*

137 KK EX-E2
138 KM AREA 140.59 AC
139 PB 2.77
140 BA 0.2197
141 LS 0 77.4
142 UD .257
*

143 KK CP6
144 KM COMBINATION POINT CP6
145 KM COMBINE RCP5 AND EX-E2
146 HC 2
*

147 KK OFFD-A
148 KM AREA 411.5 AC
149 PB 3.09
150 BA 0.6430
151 LS 0 77.4
152 UD .530
*

153 KK ROFFD-A
154 KM ROUTE OFFD-A TO CP7
155 KM N-STEPS K X-FACTOR
156 RM 5 0.400 0.15
*

157 KK OFFD-B
158 KM AREA 319.2 AC
159 PB 2.87
160 BA 0.4988
161 LS 0 77.4
162 UD .522
*

163 KK 95-4
164 KM AREA 7.0 AC
165 PB 2.77
166 BA 0.0109
167 LS 0 89.1
168 UD .094
*

HEC-1 INPUT

PAGE 5

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

169 KK CP7
170 KM COMBINATION POINT CP7
171 KM COMBINE OFFD-A, OFFD-B AND 95-4
172 HC 3
*

173 KK OFF5A
174 KM AREA 10.3 AC
175 PB 2.77
176 BA 0.0161
177 LS 0 89.1
178 UD .088
*

179 KK OFF5B
180 KM AREA 7.4 AC
181 PB 2.77
182 BA 0.0116
183 LS 0 89.1
184 UD .097
*

185 KK CP7A
186 KM COMBINATION POINT CP7A
187 KM COMBINE CP7, OFF5A AND OFF5B
188 HC 3
*

189 KK RCP7A
190 KM ROUTE CP7A THRU EX-E3
191 KM N-STEPS K X-FACTOR
192 RM 2 0.132 0.15
*

193 KK EX-E3
194 KM AREA 119.48 AC
195 PB 2.77
196 BA 0.1867
197 LS 0 77.4
198 UD .308
*

199 KK CP8
200 KM COMBINATION POINT CP8
201 KM COMBINE RCP7A AND EX-E3
202 HC 2
*

203 KKCPNE-DUMMY
204 KM COMBINATION POINT CPNE-DUMMY
205 KM COMBINE CPNM, CP3, CP6 AND CP8
206 HC 4
*

HEC-1 INPUT

PAGE 6

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

207 KK OFF10
208 KM AREA 429.5 AC
209 PB 3.39
210 BA 0.6710
211 LS 0 86.2
212 UD .573
*

213 KK ROFF10
214 KM ROUTE OFF10 THRU OFFF-A AND OFFF-B
215 KM N-STEPS K X-FACTOR
216 RM 7 0.583 0.15
*

217 KK OFFF-A
218 KM AREA 636.0 AC
219 PB 3.19
220 BA 0.9938
221 LS 0 83.8
222 UD .441
*

223 KK ROFFF-A
224 KM ROUTE OFFF-A THRU OFFF-B
225 KM N-STEPS K X-FACTOR
226 RM 3 0.238 0.15
*

227 KK OFFF-B
228 KM AREA 391.2 AC
229 PB 2.93
230 BA 0.6112
231 LS 0 84.1
232 UD .490
*

233 KK EX-W1
234 KM AREA 15.36 AC
235 PB 2.77
236 BA 0.0240
237 LS 0 77.4
238 UD .141
*

239 KK OFF11
240 KM AREA 2.9 AC
241 PB 2.77
242 BA 0.0046
243 LS 0 77.4
244 UD .093
*

HEC-1 INPUT

PAGE 7

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

245 KK CP9
246 KM COMBINATION POINT CP9
247 KM COMBINE ROFF10, OFFF-A, OFFF-B, EX-W1 AND OFF11
248 HC 5
*

249 KK DCP9
250 KM FLOW SPLIT AT CULVERT
251 KM DIVERSION TO THE OTHER SIDE OF FRONTAGE ROAD
252 DT DCHD02A
253 DI 0 150 300 450 600 750 900 1050 1100 1350
254 DI 1500
255 DQ 0 122 186 230 261 283 316 353 366 445
256 DQ 497
*

257 KK RCP9
258 KM ROUTE TO BASIN OFF12
259 RD 850 0.0165 0.02 0 TRAP 0 10
*

260 KK OFFG
261 KM AREA 26.0 AC
262 PB 2.79
263 BA 0.0406
264 LS 0 86.5
265 UD .186
*

266 KK EX-W2
267 KM AREA 13.24 AC
268 PB 2.77
269 BA 0.0207
270 LS 0 81.6
271 UD .112
*

272 KK OFF12
273 KM AREA 6.0 AC
274 PB 2.77
275 BA 0.0094
276 LS 0 77.4
277 UD .115
*

278 KK OFF16
279 KM AREA 504.7 AC
280 PB 3.06
281 BA 0.7885
282 LS 0 86.6
283 UD .692
*

HEC-1 INPUT

PAGE 8

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

284 KK ROFF16
285 KM ROUTE OFF16 THRU EX-W3
286 KM N-STEPS K X-FACTOR
287 RM 2 0.198 0.15
*

288 KK EX-W3

289 KM AREA 172.93 AC
 290 PB 2.82
 291 BA 0.2702
 292 LS 0 86.4
 293 UD .295
 *

294 KK CP10
 295 KM COMBINATION POINT CP10
 296 KM COMBINE RCP9, OFFG, EX-W2, OFF12, ROFF16 AND EX-W3
 297 HC 6
 *

298 KK DCP10
 299 KM FLOW SPLIT AT CULVERT
 300 KM DIVERSION TO THE OTHER SIDE OF FRONTAGE ROAD
 301 DT DCHD04A
 302 DI 0 300 600 900 1200 1500 1800 2100 2400 2540
 303 DI 3000
 304 DQ 0 132 316 514 710 907 1115 1252 1399 1468
 305 DQ 1684
 *

306 KKDSPHD04A
 307 KM FLOW SPLIT AT BETWEEN HD04A AND HD05A
 308 KM DIVERSION TO THE OTHER SIDE OF FRONTAGE ROAD
 309 KM BASED ON CHANNEL CAPACITY = 527 CFS
 310 DT DSHD04A
 311 DI 0 527 2000
 312 DQ 0 1 1473
 *

313 KK RDCP10
 314 KM ROUTE TO THE NEXT CULVERT AT BASIN OFF11
 315 RD 1068 0.0160 0.02 0 TRAP 0 10
 *

316 KK EX-W4
 317 KM AREA 67.06 AC
 318 PB 2.78
 319 BA 0.1048
 320 LS 0 86.9
 321 UD .199
 *

HEC-1 INPUT

PAGE 9

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

322 KK CP11
 323 KM COMBINATION POINT CP11
 324 KM COMBINE RDCP10 AND EX-W4
 325 HC 2
 *

326 KK DCP11
 327 KM FLOW SPLIT AT CULVERT
 328 KM DIVERSION TO THE OTHER SIDE OF FRONTAGE ROAD
 329 DT DCHD05A
 330 DI 0 170 340 510 680 850 1020 1190 1360 1372
 331 DI 1700
 332 DQ 0 169 200 244 296 372 459 546 632 637
 333 DQ 807
 *

334 KKDSPHD05A
 335 KM FLOW SPLIT AT BETWEEN HD05A AND HD06A
 336 KM DIVERSION TO THE OTHER SIDE OF FRONTAGE ROAD
 337 KM BASED ON CHANNEL CAPACITY = 605 CFS
 338 DT DSHD05A
 339 DI 0 605 2000
 340 DQ 0 1 1395
 *

341 KK RDCP11
 342 KM ROUTE TO THE NEXT CULVERT AT BASIN OFF12
 343 RD 626 0.0134 0.02 0 TRAP 0 10
 *

344 KK OFF18
 345 KM AREA 351.4 AC
 346 PB 3.05
 347 BA 0.5491
 348 LS 0 86.3
 349 UD .445
 *

350 KK ROFF18
 351 KM ROUTE OFF18 THRU EX-W5
 352 KM N-STEPS K X-FACTOR
 353 RM 2 0.171 0.15
 *

354 KK EX-W5
 355 KM AREA 285.43 AC
 356 PB 2.86
 357 BA 0.4460
 358 LS 0 86.3
 359 UD .308
 *

HEC-1 INPUT

PAGE 10

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

360 KK CP12
 361 KM COMBINATION POINT CP12
 362 KM COMBINE ROFF18 AND EX-W5
 363 HC 2
 *

364 KK OFF14
 365 KM AREA 8.6 AC

366
367
368
369

PB 2.77
BA 0.0134
LS 0 86.9
UD .090
*

370
371
372
373

KK CP13
KM COMBINATION POINT CP13
KM COMBINE RDCP11, CP12 AND OFF14
HC 3
*

374
375
376
377
378
379
380
381

KK DCP13
KM FLOW SPLIT AT CULVERT
KM DIVERSION TO THE OTHER SIDE OF FRONTAGE ROAD
DT DCHD06A
DI 0 200.0 400.0 600 800 1000 1200 1400 1600 1772
DI 2000
DQ 0 199.9 399.9 594 727 802 865 927 1017 1095
DQ 1207
*

382
383
384
385
386
387
388

KKDSPHD06A
KM FLOW SPLIT AT BETWEEN HD06A AND HD07A
KM DIVERSION TO THE OTHER SIDE OF FRONTAGE ROAD
KM BASED ON CHANNEL CAPACITY = 1,692 CFS
DT DSHD06A
DI 0 1692 2000
DQ 0 1 308
*

389
390
391

KKRDCRCOFF18
KM ROUTE TO THE NEXT CULVERT AT BASIN OFFH
RD 1349 0.0186 0.02 0 TRAP 0 10
*

392
393
394
395
396
397

KK EX-W6
KM AREA 9.93 AC
PB 2.77
BA 0.0155
LS 0 86.9
UD .101
*

HEC-1 INPUT

PAGE 11

LINE

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

398
399
400
401
402
403

KK OFF15
KM AREA 23.2 AC
PB 2.77
BA 0.0362
LS 0 86.9
UD .126
*

404
405
406
407

KK CP14
KM COMBINATION POINT CP14
KM COMBINE RDCRCOFF18, EX-W6 AND OFF15
HC 3
*

408
409
410
411
412
413
414
415

KK DCP14
KM FLOW SPLIT AT CULVERT
KM DIVERSION TO THE OTHER SIDE OF FRONTAGE ROAD
DT DCHD07A
DI 0 90 180 270 360 450 540 630 720 771
DI 900
DQ 0 51 55 58 60 61 65 78 93 101
DQ 123
*

416
417
418
419
420
421
422

KKDSPHD07A
KM FLOW SPLIT AT BETWEEN HD07A AND HD08A
KM DIVERSION TO THE OTHER SIDE OF FRONTAGE ROAD
KM BASED ON CHANNEL CAPACITY = 338 CFS
DT DSHD07A
DI 0 338 2000
DQ 0 1 1662
*

423
424
425
426
427
428

KK OFFE
KM AREA 24.5 AC
PB 2.78
BA 0.0383
LS 0 77.4
UD .232
*

429
430
431
432
433
434

KK 95-5
KM AREA 23.6 AC
PB 2.77
BA 0.0369
LS 0 89.1
UD .082
*

HEC-1 INPUT

PAGE 12

LINE

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

435
436
437
438

KK CHD01B
KM COMBINATION POINT CHD01B
KM COMBINE OFFE AND 95-5
HC 2
*

439
440
441
442
443
444

KK DHD01B
KM FLOW SPLIT AT CULVERT 1B
DT DCHD01B
DI 0 15.0 29.0 45.0 60.0 75.0 90.0 105.0 120 135
DI 150
DQ 0 14.9 28.9 44.9 59.9 74.9 89.9 104.9 116 121

445 DQ 125
*
446 KK RDHD01B
447 KM ROUTE TO THE NEXT CULVERT
448 RD 1000 0.0165 0.02 0 TRAP 0 10
*

449 KK OFF8
450 KM AREA 8.5 AC
451 PB 2.77
452 BA 0.0133
453 LS 0 89.1
454 UD .111
*

455 KKRETHD02A
456 KM RETREIVE FLOW FROM CULVERT HD02A
457 DR DCHD02A
*

458 KK CHD02B
459 KM COMBINATION POINT CHD02B
460 KM COMBINE RDHD01B, OFF8 AND RETHD02A
461 HC 3
*

462 KK DHD02B
463 KM FLOW SPLIT AT CULVERT HD02B
464 DT DCHD02B
465 DI 0 50.0 100 150 200 250 300 350 400 450
466 DI 500
467 DQ 0 49.9 82 99 124 149 178 211 241 271
468 DQ 299
*

469 KK RDHD02B
470 KM ROUTE TO THE NEXT CULVERT
471 RD 1320 0.0165 0.02 0 TRAP 0 10
*

HEC-1 INPUT

PAGE 13

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

472 KK 95-6
473 KM AREA 6.7 AC
474 PB 2.77
475 BA 0.0104
476 LS 0 89.9
477 UD .095
*

478 KKRETHD04A
479 KM RETREIVE FLOW FROM CULVERT HD04A
480 DR DCHD04A
*

481 KK CHD04B
482 KM COMBINATION POINT CHD04B
483 KM COMBINE RDHD02B, 95-6 AND RETHD04A
484 HC 3
*

485 KK DHD04B
486 KM SPLIT FLOW AT CULVERT HD04B
487 DT DCHD04B
488 DI 0 200.0 400 600 800 1000 1200 1400 1600 1800
489 DI 2000
490 DQ 0 199.9 287 359 443 529 620 710 800 895
491 DQ 988
*

492 KKRETSHD04A
493 KM RETREIVE FLOW FROM SPILL BETWEEN CULVERT HD04A AND HD05A
494 DR DSHD04A
*

495 KK 95-7A
496 KM AREA 4.4 AC
497 PB 2.77
498 BA 0.0069
499 LS 0 92.6
500 UD .075
*

501 KK CHD04B2
502 KM COMBINE 95-7A WITH BYPASS AND SPILL FLOW
503 HC 3
*

504 KKDSPHD04B
505 KM FLOW SPLIT AT BETWEEN HD04B AND HD05B
506 KM DIVERSION TO THE OTHER SIDE OF US95
507 KM BASED ON CHANNEL CAPACITY = 1004 CFS
508 DT DSHD04B
509 DI 0 1004 2000
510 DQ 0 1 996
*

HEC-1 INPUT

PAGE 14

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

511 KK RDHD04B
512 KM ROUTE TO THE NEXT CULVERT
513 RD 1068 0.0160 0.02 0 TRAP 0 10
*

514 KKRETHD05A
515 KM RETREIVE FLOW FROM CULVERT HD05A
516 DR DCHD05A
*

517 KK CHD05B
518 KM COMBINATION POINT CHD05B
519 KM COMBINE RDHD04B AND RETHD05A
520 HC 2
*

521 KK DHD05B
522 KM SPLIT FLOW AT CULVERT HD05B
523 DT DCHD05B
524 DI 0 200 400 600 800 1000 1200 1400 1600 1800
525 DI 2000
526 DQ 0 164 242 323 397 494 600 703 809 913
527 DQ 1029
*

528 KK 95-8A
529 KM AREA 3.3 AC
530 PB 2.77
531 BA 0.0052
532 LS 0 92.6
533 UD .064
*

534 KKRETHD05A
535 KM RETREIVE FLOW FROM SPILL BETWEEN CULVERT HD05A AND HD06A
536 DR DSHD05A
*

537 KK CHD05B2
538 KM COMBINE 95-8A WITH BYPASS AND SPILL FLOW
539 HC 3
*

540 KKDSPHD05B
541 KM FLOW SPLIT AT BETWEEN HD05B AND HD06B
542 KM DIVERSION TO THE OTHER SIDE OF US95
543 KM BASED ON CHANNEL CAPACITY = 4017 CFS
544 DT DSHD05B
545 DI 0 4017. 5000
546 DQ 0 1 983
*

HEC-1 INPUT

PAGE 15

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

547 KK RDHD05B
548 KM ROUTE TO THE NEXT CULVERT
549 RD 626 0.0134 0.02 0 TRAP 0 10
*

550 KKRETHD06A
551 KM RETREIVE FLOW FROM CULVERT HD06A
552 DR DCHD06A
*

553 KK CHD06B
554 KM COMBINE BYPASS WITH RETREIVED FLOW
555 HC 2
*

556 KK DHD06B
557 KM SPLIT FLOW AT CULVERT HD06B
558 DT DCHD06B
559 DI 0 160.0 480.0 640 800 960 1120 1280 1400 1600
560 DQ 0 159.9 479.9 634 706 757 807 857 899 969
*

561 KK 95-9A
562 KM AREA 7.1 AC
563 PB 2.77
564 BA 0.0110
565 LS 0 92.6
566 UD .098
*

567 KKRETHD06A
568 KM RETREIVE FLOW FROM SPILL BETWEEN CULVERT HD06A AND HD07A
569 DR DSHD06A
*

570 KK CHD06B2
571 KM COMBINE 95-9A WITH BYPASS AND SPILL FLOW
572 HC 3
*

573 KKDSPHD06B
574 KM FLOW SPLIT AT BETWEEN HD06B AND HD07B
575 KM DIVERSION TO THE OTHER SIDE OF US95
576 KM BASED ON CHANNEL CAPACITY = 4876 CFS
577 DT DSHD06B
578 DI 0 4876 5000
579 DQ 0 1 124
*

HEC-1 INPUT

PAGE 16

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

580 KK RDHD06B
581 KM ROUTE TO THE NEXT CULVERT
582 RD 1349 0.0186 0.02 0 TRAP 0 10
*

583 KKRETHD07A
584 KM RETREIVE FLOW FROM CULVERT HD07A
585 DR DCHD07A
*

586 KK CHD07B
587 KM COMBINE BYPASS WITH RETREIVED FLOW
588 HC 2

589 KK DHD07B
 590 KM SPLIT FLOW AT CULVERT HD07B
 591 DT DCHD07B
 592 DI 0 90 180 270 360 450 540 630 700 810
 593 DI 900
 594 DQ 0 53 58 61 63 65 67 69 70 71
 595 DQ 72
 *

596 KKRETSHD07A
 597 KM RETREIVE FLOW FROM SPILL BETWEEN CULVERT HD07A AND HD08A
 598 DR DSHD07A
 *

599 KK CHD07B2
 600 KM COMBINE BYPASS WITH SPILL FLOW
 601 HC 2
 *

602 KKDSPHD07B
 603 KM FLOW SPLIT AT BETWEEN HD07B AND HD08B
 604 KM DIVERSION TO THE OTHER SIDE OF US95
 605 KM BASED ON CHANNEL CAPACITY = 1770 CFS
 606 DT DSHD07B
 607 DI 0 1770 5000
 608 DQ 0 1 3230
 *

609 KK DCHD01B
 610 KM RETREIVE FLOW FROM VTN HD01B CULVERT
 611 DR DCHD01B
 *

612 KK DHD01C
 613 KM SPLIT FLOW AT CULVERT HD01C
 614 DT DCHD01C
 615 DI 0 10.0 50.0
 616 DQ 0 9.9 49.9
 *

HEC-1 INPUT

PAGE 17

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

617 KK RDHD01C
 618 KM ROUTE TO THE NEXT CULVERT
 619 RK 1000 0.0165 0.02 0 TRAP 13 20
 *

620 KKRETHD02B
 621 KM RETREIVE FLOW FROM CULVERT HD02B
 622 DR DCHD02B
 *

623 KK CHD02C
 624 KM COMBINE BYPASS WITH RETREIVED FLOW
 625 HC 2
 *

626 KK DHD02C
 627 KM SPLIT FLOW AT CULVERT HD02C
 628 DT DCHD02C
 629 DI 0 100 200 250 400 500 600 700 800 900
 630 DI 1000
 631 DQ 0 65 100 122 201 258 323 384 447 514
 632 DQ 581
 *

633 KK RDHD02C
 634 KM ROUTE TO THE NEXT CULVERT
 635 RK 1320 0.0165 0.02 0 TRAP 13 20
 *

636 KKRETHD04B
 637 KM RETREIVE FLOW FROM CULVERT HD04B
 638 DR DCHD04B
 *

639 KK CHD04C
 640 KM COMBINE BYPASS WITH RETREIVED FLOW
 641 HC 2
 *

642 KK DHD04C
 643 KM SPLIT FLOW AT CULVERT HD04C
 644 DT DCHD04C
 645 DI 0 200 400 600 800 1000 1200 1400 1600 1800
 646 DI 2000
 647 DQ 0 181 212 262 336 416 503 609 719 823
 648 DQ 933
 *

649 KKRETSHD04B
 650 KM RETREIVE FLOW FROM SPILL BETWEEN CULVERT HD04B AND HD05B
 651 DR DSHD04B
 *

HEC-1 INPUT

PAGE 18

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

652 KK CHD04C2
 653 KM COMBINE BYPASS WITH SPILL FLOW
 654 HC 2
 *

655 KKDSPHD04C
 656 KM FLOW SPLIT AT BETWEEN HD04C AND HD05C
 657 KM DIVERSION TO THE OTHER SIDE OF US95
 658 KM BASED ON CHANNEL CAPACITY = 1079 CFS
 659 DT DSHD04C

```

660      DI      0      1079      2000
661      DQ      0      1      921
        *

662      KK RDHD04C
663      KM      ROUTE TO THE NEXT CULVERT
664      RK      1068 0.0160 0.02      0      TRAP      13      20
        *

665      KKRETHD05B
666      KM      RETREIVE FLOW FROM CULVERT HD05B
667      DR DCHD05B
        *

668      KK CHD05C
669      KM      COMBINE BYPASS WITH RETREIVED FLOW
670      HC      2
        *

671      KK DHD05C
672      KM      SPLIT FLOW AT CULVERT HD05C
673      DT DCHD05C
674      DI      0      150      300      450      600      750      800      1050      1200      1350
675      DI      1500
676      DQ      0      132      171      193      208      232      245      321      380      444
677      DQ      513
        *

678      KKRETSHD05B
679      KM      RETREIVE FLOW FROM SPILL BETWEEN CULVERT HD05B AND HD06B
680      DR DSHD05B
        *

681      KK CHD05C2
682      KM      COMBINE BYPASS WITH SPILL FLOW
683      HC      2
        *

684      KKDSPHD05C
685      KM      FLOW SPLIT AT BETWEEN HD05C AND HD06C
686      KM      DIVERSION TO THE OTHER SIDE OF US95
687      KM      BASED ON CHANNEL CAPACITY = 2744 CFS
688      DT DSHD05C
689      DI      0      2744      5000

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HEC-1 INPUT

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```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
690      DQ      0      1      2256
        *

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691      KK RDHD05C
692      KM      ROUTE TO THE NEXT CULVERT
693      RK      626 0.0134 0.02      0      TRAP      13      20
        *

694      KKRETHD06B
695      KM      RETREIVE FLOW FROM CULVERT HD06B
696      DR DCHD06B
        *

697      KK CHD06C
698      KM      COMBINE BYPASS WITH RETREIVED FLOW
699      HC      2
        *

700      KK DHD06C
701      KM      SPLIT FLOW AT CULVERT HD06C
702      DT DCHD06C
703      DI      0      200.0 400.0      600      800      1000      1200      1400      1600      1680
704      DI      2000
705      DQ      0      199.9 399.9      560      647      713      786      860      948      988
706      DQ      1142
        *

707      KKRETSHD06B
708      KM      RETREIVE FLOW FROM SPILL BETWEEN CULVERT HD06B AND HD07B
709      DR DSHD06B
        *

710      KK CHD06C2
711      KM      COMBINE BYPASS WITH SPILL FLOW
712      HC      2
        *

713      KKDSPHD06C
714      KM      FLOW SPLIT AT BETWEEN HD06C AND HD07C
715      KM      DIVERSION TO THE OTHER SIDE OF US95
716      KM      BASED ON CHANNEL CAPACITY = 2175 CFS
717      DT DSHD06C
718      DI      0      2175      5000
719      DQ      0      1      2825
        *

720      KK RDHD06C
721      KM      ROUTE TO THE NEXT CULVERT
722      RK      1349 0.0186 0.02      0      TRAP      13      20
        *

```

HEC-1 INPUT

PAGE 20

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
723      KKRETHD07B
724      KM      RETREIVE FLOW FROM CULVERT HD07B
725      DR DCHD07B
        *

726      KK CHD07C
727      KM      COMBINE BYPASS WITH RETREIVED FLOW
728      HC      2
        *

```


729 KK DHD07C
 730 KM SPLIT FLOW AT CULVERT HD07C
 731 DT DCHD07C
 732 DI 0 90 180 270 360 450 540 600 720 810
 733 DI 900
 734 DQ 0 51 58 62 66 83 110 130 174 208
 735 DQ 244
 *

736 KKRETSHD07B
 737 KM RETREIVE FLOW FROM SPILL BETWEEN CULVERT HD07B AND HD08B
 738 DR DSHD07B
 *

739 KK CHD07C2
 740 KM COMBINE BYPASS WITH SPILL FLOW
 741 HC 2
 *

742 KKDSPHD07C
 743 KM FLOW SPLIT AT BETWEEN HD07C AND HD08C
 744 KM DIVERSION TO THE OTHER SIDE OF US95
 745 KM BASED ON CHANNEL CAPACITY = 2396 CFS
 746 DT DSHD07C
 747 DI 0 2396 5000
 748 DQ 0 1 2604
 *

749 KKCPW-DUMMY
 750 KM COMBINATION POINT CPW-DUMMY
 751 KM COMBINE DSPHD07A, DSPHD07B, AND DSPHD07C
 752 HC 3
 *

753 KK DCHD01C
 754 KM RETREIVE FLOW FROM VTN HD01B CULVERT
 755 DR DCHD01C
 *

HEC-1 INPUT

PAGE 21

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

756 KKRDCHD01C
 757 KM ROUTE DCHC01B TO CP15
 758 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
 759 RD 905 .025 .025 0 TRAP 20 2
 *

760 KK DCHD02C
 761 KM RETREIVE FLOW FROM VTN HD02C CULVERT
 762 DR DCHD02C
 *

763 KKRDCHD02C
 764 KM ROUTE DCHC02C TO CP15
 765 KM LENGTH SLOPE n-VALUE SHAPE WIDTH S-SLOPE
 766 RD 905 .025 .025 0 TRAP 20 2
 *

767 KK OFF9
 768 KM AREA 29.9 AC
 769 PB 2.77
 770 BA 0.0467
 771 LS 0 89.1
 772 UD .194
 *

773 KK CP15
 774 KM COMBINATION POINT CP15
 775 KM COMBINE RDCHD01C, RDCHD02C AND OFF9
 776 HC 3
 *

777 KK RCP15
 778 KM ROUTE CP15 THRU EX-E4
 779 KM N-STEPS K X-FACTOR
 780 RM 1 0.089 0.15
 *

781 KK EX-E4
 782 KM AREA 140.56 AC
 783 PB 2.77
 784 BA 0.2196
 785 LS 0 77.4
 786 UD .240
 *

787 KK CP16
 788 KM COMBINATION POINT CP16
 789 KM COMBINE RCP9 AND EX-E4
 790 HC 2
 *

HEC-1 INPUT

PAGE 22

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

791 KK DCHD04C
 792 KM RETREIVE FLOW FROM VTN HD04C CULVERT
 793 DR DCHD04C
 *

794 KK OFFH
 795 KM AREA 5.6 AC
 796 PB 2.77
 797 BA 0.0088
 798 LS 0 89.5
 799 UD .082
 *

800 KK CP17
 801 KM COMBINATION POINT CP17

802 KM COMBINE DCHD04C AND OFFH
803 HC 2
*

804 KK RCP17
805 KM ROUTE CP1 THRU EX-E5
806 KM N-STEPS K X-FACTOR
807 RM 1 0.073 0.15
*

808 KK EX-E5
809 KM AREA 63.30 AC
810 PB 2.77
811 BA 0.0989
812 LS 0 79.5
813 UD .202
*

814 KK ES1
815 KM AREA 11.1 AC
816 PB 2.77
817 BA 0.0173
818 LS 0 92.7
819 UD .109
*

820 KK CP18
821 KM COMBINATION POINT CP18
822 KM COMBINE RCP14, EX-E5, AND ES1
823 HC 3
*

824 KK DSHD04C
825 KM RETREIVE FLOW THAT OVERTOPS US 95 CHANNEL
826 KM BETWEEN VTN HD04C AND HD05C CULVERTS
827 DR DSHD04C
*

HEC-1 INPUT

PAGE 23

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

828 KK DCHD05C
829 KM RETREIVE FLOW FROM VTN HD05C CULVERT
830 DR DCHD05C
*

831 KK 95-7B
832 KM AREA 7.2 AC
833 PB 2.77
834 BA 0.0112
835 LS 0 92.6
836 UD .087
*

837 KK CP19
838 KM COMBINATION POINT CP19
839 KM COMBINE DSHD04C, DCHD05C AND 95-7B
840 HC 3
*

841 KK DSHD05C
842 KM RETREIVE FLOW THAT OVERTOPS US 95 CHANNEL
843 KM BETWEEN VTN HD05C AND HD06C CULVERTS
844 DR DSHD05C
*

845 KK DCHD06C
846 KM RETREIVE FLOW FROM VTN HD06C CULVERT
847 DR DCHD06C
*

848 KK 95-8B
849 KM AREA 2.6 AC
850 PB 2.77
851 BA 0.0040
852 LS 0 92.6
853 UD .052
*

854 KK CP20
855 KM COMBINATION POINT CP20
856 KM COMBINE DSHD05C, DCHD06C AND 95-8B
857 HC 3
*

858 KK EX-E6
859 KM AREA 10.26 AC
860 PB 2.77
861 BA 0.0160
862 LS 0 86.9
863 UD .111
*

HEC-1 INPUT

PAGE 24

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

864 KK CP21
865 KM COMBINATION POINT CP21
866 KM COMBINE CP19, CP20, AND EX-E6
867 HC 3
*

868 KK ES2
869 KM AREA 31.4 AC
870 PB 2.77
871 BA 0.0490
872 LS 0 94.7
873 UD .148
*

874 KK EX-E7

875	KM	AREA	21.31 AC
876	PB	2.77	
877	BA	0.0333	
878	LS	0	86.9
879	UD	.111	
	*		
880	KK	EX-E8	
881	KM	AREA	10.67 AC
882	PB	2.77	
883	BA	0.0167	
884	LS	0	86.9
885	UD	.133	
	*		
886	KK	CP22	
887	KM	COMBINATION POINT CP22	
888	KM	COMBINE RCP21, ES2, EX-E7, AND EX-E8	
889	HC	4	
	*		
890	KK	DSHD06C	
891	KM	RETRIEVE FLOW THAT OVERTOPS US 95 CHANNEL	
892	KM	BETWEEN VTN HD06C AND HD07C CULVERTS	
893	DR	DSHD06C	
	*		
894	KK	DCHD07C	
895	KM	RETRIEVE FLOW FROM VTN HD07C CULVERT	
896	DR	DCHD07C	
	*		
897	KK	95-9B	
898	KM	AREA	8.5 AC
899	PB	2.77	
900	BA	0.0133	
901	LS	0	92.6
902	UD	.139	
	*		

HEC-1 INPUT

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LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
903	KK CP23
904	KM COMBINATION POINT CP23
905	KM COMBINE DSHD06C, DCHD07C AND 95-9B
906	HC 3
	*
907	KK RCP23
908	KM ROUTE CP23 THRU EX-E9
909	KM LEN SLOPE N N/A SHAPE BW SS
910	RD 720 .029 .035 0 TRAP 50 5
	*
911	KK EX-E9
912	KM AREA 6.13 AC
913	PB 2.77
914	BA 0.0096
915	LS 0 86.9
916	UD .109
	*
917	KK CP24
918	KM COMBINATION POINT CP24
919	KM COMBINE CP23 AND EX-E9
920	HC 2
	*
921	KKCPSE-DUMMY
922	KM COMBINATION POINT CPSE-DUMMY
923	KM COMBINE CP16, CP18 CP22, AND CP24
924	HC 4
	*
925	KK EX-W7
926	KM AREA 126.63 AC
927	PB 2.84
928	BA 0.1979
929	LS 0 86.2
930	UD .292
	*
931	KK OFF20
932	KM AREA 42.0 AC
933	PB 3.01
934	BA 0.0656
935	LS 0 86.2
936	UD .190
	*
937	KK ROFF20
938	KM ROUTE OFF18 THRU EX-W8
939	KM N-STEPS K X-FACTOR
940	RM 4 0.329 0.15
	*

HEC-1 INPUT

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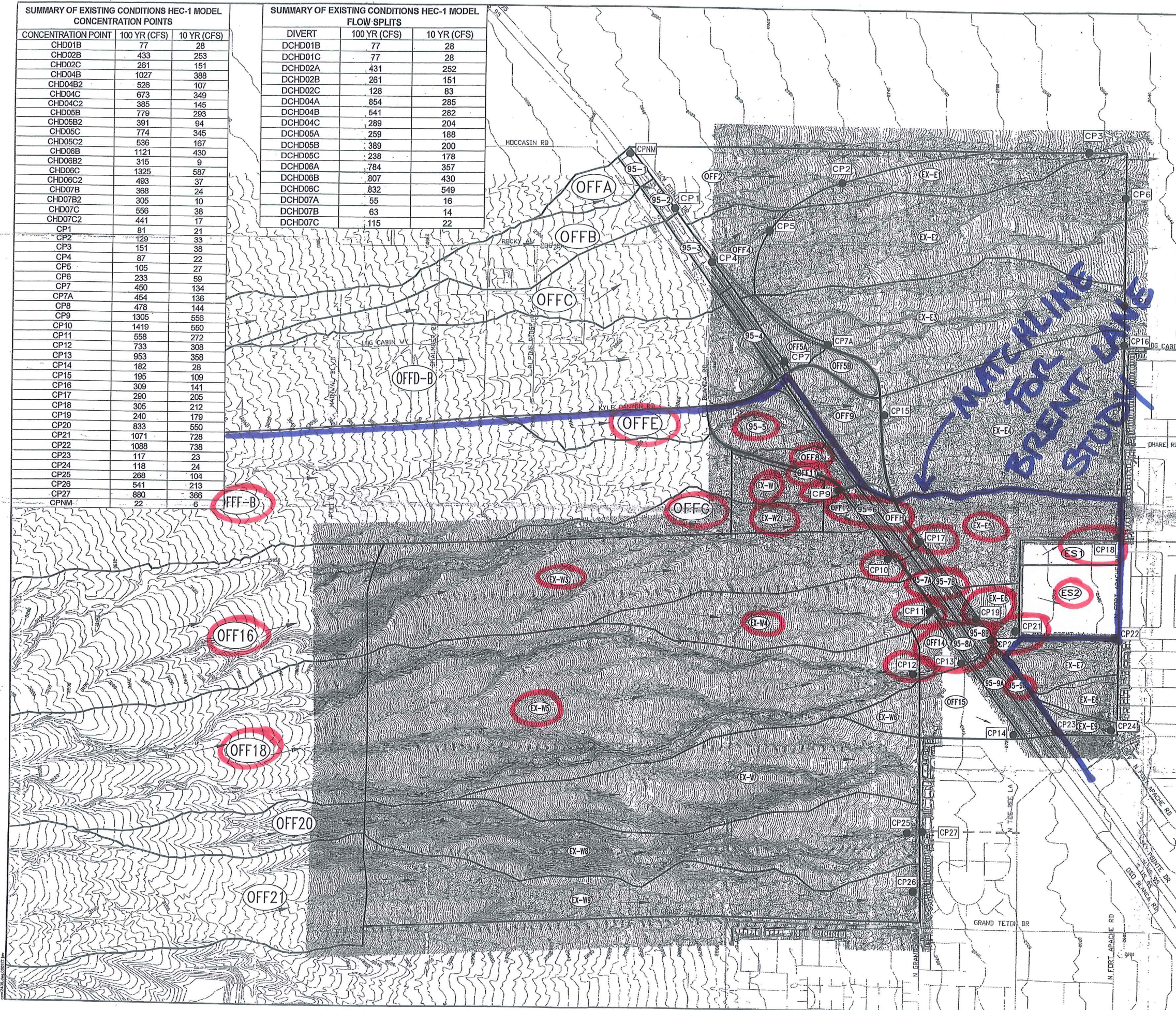
LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
941	KK EX-W8
942	KM AREA 139.52 AC
943	PB 2.88
944	BA 0.2180
945	LS 0 86.2
946	UD .323
	*
947	KK CP25
948	KM COMBINATION POINT CP25
949	KM COMBINE ROFF20 AND EX-W8

SUMMARY OF EXISTING CONDITIONS HEC-1 MODEL CONCENTRATION POINTS

CONCENTRATION POINT	100 YR (CFS)	10 YR (CFS)
CHD01B	77	28
CHD02B	433	263
CHD02C	281	151
CHD04B	1027	388
CHD04B2	526	107
CHD04C	673	349
CHD04C2	385	145
CHD05B	779	293
CHD05B2	391	94
CHD05C	774	345
CHD05C2	536	167
CHD06B	1121	430
CHD06B2	315	9
CHD06C	1325	587
CHD06C2	493	37
CHD07B	368	24
CHD07B2	305	10
CHD07C	556	38
CHD07C2	441	17
CP1	81	21
CP2	129	33
CP3	151	38
CP4	87	22
CP5	105	27
CP6	233	59
CP7	450	134
CP7A	454	136
CP8	478	144
CP9	1305	556
CP10	1419	550
CP11	558	272
CP12	733	308
CP13	953	358
CP14	182	28
CP15	195	109
CP16	309	141
CP17	290	205
CP18	305	212
CP19	240	179
CP20	833	550
CP21	1071	728
CP22	1088	738
CP23	117	23
CP24	118	24
CP25	268	104
CP26	541	213
CP27	880	366
CPNM	22	6

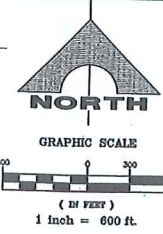
SUMMARY OF EXISTING CONDITIONS HEC-1 MODEL FLOW SPLITS

DIVERT	100 YR (CFS)	10 YR (CFS)
DCHD01B	77	28
DCHD01C	77	28
DCHD02A	431	252
DCHD02B	261	151
DCHD02C	128	83
DCHD04A	854	285
DCHD04B	541	282
DCHD04C	289	204
DCHD05A	259	188
DCHD05B	389	200
DCHD05C	238	178
DCHD06A	784	357
DCHD06B	807	430
DCHD06C	832	549
DCHD07A	55	16
DCHD07B	63	14
DCHD07C	115	22



LEGEND

- SUBBASIN BOUNDARY
- ON2 SUBBASIN NAME
- FLOW DIRECTION
- CP20 COMBINATION POINT



SUMMARY OF EXISTING CONDITIONS HEC-1 MODEL OFFSITE BASINS

BASIN	AREA (AC)	100 YR (CFS)	10 YR (CFS)
OFFA	12.99	17	4
OFFB	85.55	79	21
OFFC	85.34	80	20
OFFD-A	411.49	343	97
OFFD-B	319.21	232	61
OFFE	24.48	26	6
OFFF-A	636.03	843	322
OFFF-B	391.15	433	160
OFFG	25.98	48	18
OFFH	5.60	15	6
OFFI	59.39	61	15
OFFJ	20.39	27	7
OFFK	10.30	26	11
OFFL	7.43	18	8
OFFM	8.50	19	8
OFFN	29.87	60	25
OFFO	429.46	591	248
OFFP	2.92	4	1
OFFQ	6.02	8	2
OFFR	8.56	19	8
OFFS	23.15	49	19
OFFT	504.67	538	220
OFFU	351.44	480	196
OFFV	42.00	85	33
OFFW	337.93	461	186
95-1	2.71	7	3
95-2	2.80	7	3
95-3	6.06	15	6
95-4	6.99	17	7
95-5	23.63	60	26
95-6	6.65	17	7
95-7A	4.41	13	6
95-7B	7.15	20	10
95-8A	3.32	10	5
95-8B	2.56	8	4
95-9A	7.06	19	9
95-9B	8.51	22	10

SUMMARY OF EXISTING CONDITIONS HEC-1 MODEL ONSITE BASINS

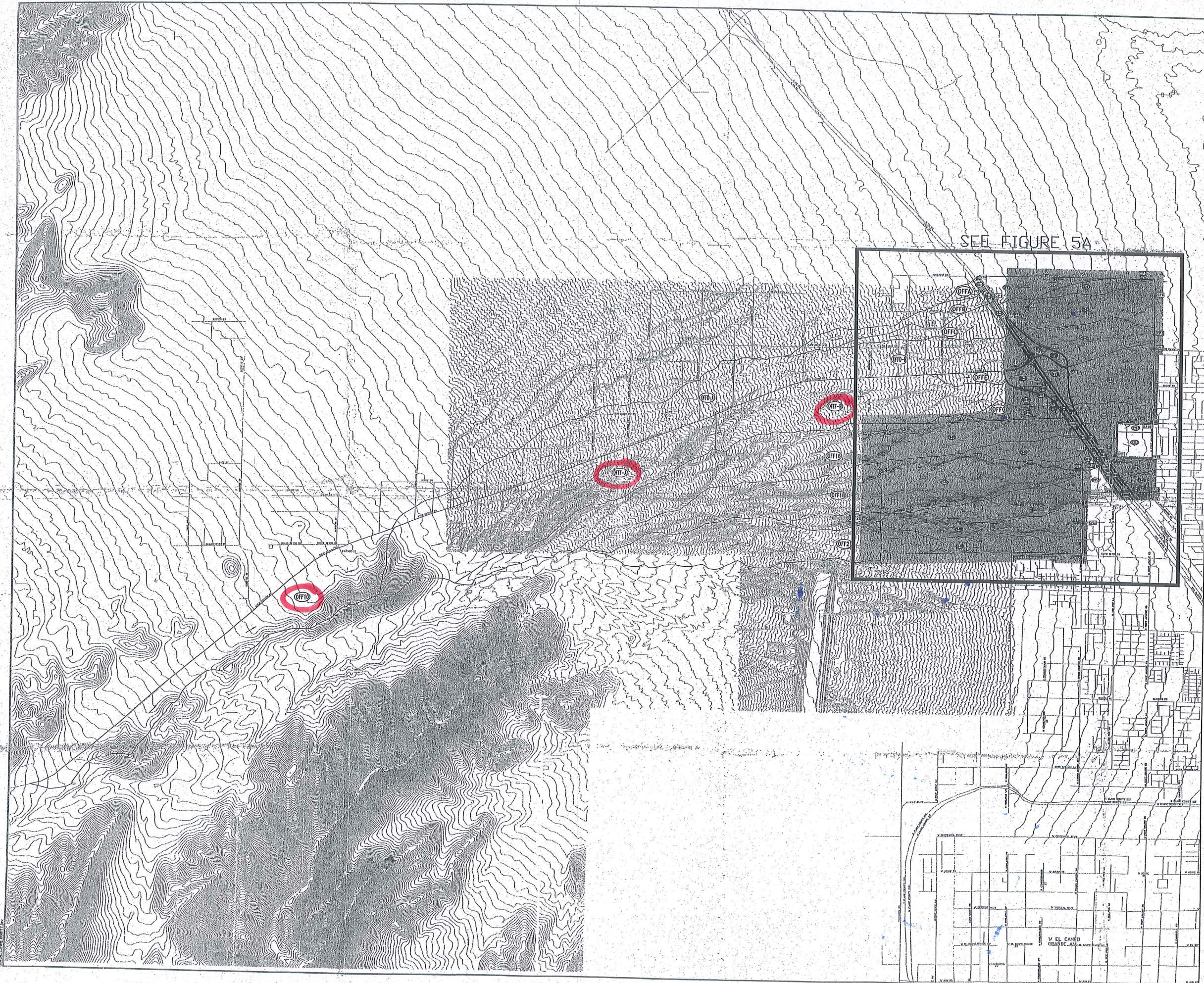
BASIN	AREA (AC)	100 YR (CFS)	10 YR (CFS)
EX-W1	15.36	20	5
EX-W2	13.24	22	7
EX-W3	172.93	268	103
EX-W4	67.06	121	47
EX-W5	285.43	443	170
EX-W6	9.93	21	8
EX-W7	126.63	197	76
EX-W8	139.62	213	81
EX-W9	116.76	173	63
EX-E1	33.75	36	9
EX-E2	140.59	141	35
EX-E3	119.48	112	28
EX-E4	140.66	147	36
EX-E5	63.30	79	22
EX-E6	10.26	21	9
EX-E7	21.31	45	18
EX-E8	10.67	22	9
EX-E9	6.13	13	5
ES1	11.10	29	14
ES2	31.40	84	43

This grading plan is a part of drainage study # 4155 which was received on 4/3/07 and rejected on 5/2/07. Page 54 of 57

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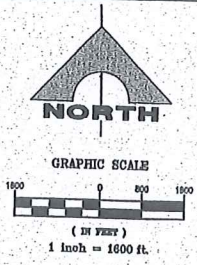
KYLE ACQUISITION GROUP, LLC
KYLE CANYON MASTER DRAINAGE STUDY
FIGURE 5A
EXISTING CONDITIONS ONSITE DRAINAGE MAP

DRAWING
FIG 5A
SHT OF SHTS



LEGEND

- SUBBASIN BOUNDARY
- ON2 SUBBASIN NAME
- FLOW DIRECTION
- CP20 COMBINATION POINT



SEE FIGURE 5A

This grading plan is a part of drainage study # 4155 which was received on 4/3/07 and rejected on 5/2/07. Page 55 of 57

DESIGN:	DATE:	REV:	DATE:	DESCRIPTION:
DRAWN:	DATE:	REV:	DATE:	
CHECK:	DATE:	REV:	DATE:	
ISSUE DATE:	DATE:	REV:	DATE:	
ISSUE EDITOR:	DATE:	REV:	DATE:	
PLOT DATE:	DATE:	REV:	DATE:	
PLOT TIME:	DATE:	REV:	DATE:	

G.C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BOULEVARD, SUITE 200
T: 702.804.2000 F: 702.804.2299 G: WALLACE.COM

HA: 0701784-016 View Where Master Drainage Study Plan is Filed

KYLE ACQUISITION GROUP, LLC
KYLE CANYON MASTER DRAINAGE STUDY
FIGURE 5
EXISTING CONDITIONS DRAINAGE MAP

DRAWING
FIG 5
SHT OF SHTS

Kyle Canyon Master Drainage Study, Addendum #1, SHG

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: May 24, 2012
TO: Land Development Services Department of Public Works		FROM: Oh Sang Kwon, P.E. Flood Control Section Department of Public Works
SUBJECT:	Drainage Study for:	COPIES TO:
Kyle Canyon Master Drainage Study		Slater Hanifan Group
Cross Streets:	Fort Apache Road & Moccasin Road	Wachovia Bank / Carwin Advisors
File Number:	F:\Depot\DSMemos\DS4420E.doc	Bart Anderson, P.E., DevCo
Parcel Number:	125-06-001-001	Randy Fultz
Zoning Action:		CCPW, CCRFCD
FEMA Flood Zone	YES NO X	NDOT; NV Energy
Proposed Storm Drain	YES X NO	PB America, Inc.

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Transaction #
1 st Submittal	6/22/2010	7/13/2010	Not Approved	\$1,000.00	147216: \$1000
2 nd Submittal	9/17/2010	10/4/2010	Not Approved	\$400.00	153788: \$400
3 rd Submittal	10/15/2011	11/14/2011	Not Approved	\$400.00	153788: \$400
4 th Submittal	2/13/2012	3/1/2012	Conditional Approval	\$400.00	274196: \$400
CCRFCD	5/23/2012	5/24/2012	Concurrence Recv'd	N/C	N/C
TOTAL FEES (LDDRS):				\$2,200.00	

REMARKS:

Update to original Kyle Canyon Master Drainage Study (DS4091). Site layout has been changed.

The Master Drainage Study for the subject project has been reviewed and:

	is approved subject to conformance to all City standards and the following conditions:
	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
X	is conditionally approved subject to Clark County Department of Public Works concurrence.
X	is conditionally approved subject to Nevada Department of Transportation concurrence.
X	is conditionally approved subject to BLM concurrence/approval.

- Please note that the traffic study must be approved prior to final approval of the Master Drainage Study. If the street layout does not match the Master Drainage study, an update to the Master Drainage Study must be submitted to address the changes.
- The Kyle Canyon Master Drainage Study is proposing to revise the hydrology and facilities identified in the *Clark County Regional Flood Control District's (CCRFCD) 2008 Las Vegas Valley Flood Control Master Plan Update*. A Master Plan Amendment (MPA) must be submitted to the City of Las Vegas for approval. The City of Las Vegas will coordinate the MPA submittal to CCRFCD for approval. The Master Developer will be responsible for preparing all submittals needed for CCRFCD

along with any and all presentations. The MPU must be approved by CCRFCD prior to the final approval of the Master Drainage Study.

3. Per a meeting held in August 18, 2011 between the developer and the *City of Las Vegas*, it was agreed that NV Energy's approval of any proposed drainage facilities within their access easements (such as the proposed detention basins) must be obtained prior to the final approval of the Master Drainage Study. Please provide documentation for such approval or acknowledgment.
4. Please note that any future technical drainage study submittals that differ from the Master Drainage Study (ie. Changes in pods, infrastructure, flows etc.) will require an update to the Master Drainage Study and this update must be approved by the *City of Las Vegas Flood Control Section* prior to final approval of technical drainage study.
5. The proposed detention basins will require coordination with the State of Nevada, Division of Water Resources Dam Safety and will require the State's approval prior to permitting.
6. Please obtain necessary 404 permits from Army Corps of Engineers and provide a copy of the permit to Flood Control prior to issuance of the grading permit. The contact information for Army Corps of Engineers is listed below:

Patricia L. McQueary
Chief, USACE S. George Regulatory Office
US Army Corps of Engineers
321 North Mall Drive
Suite L-101
St. George, UT 84790

(435) 986-3979 (Office)
(435) 986-3981 (FAX)
Patricia.L.McQueary@usace.army.mil
7. Please note that the proposed 100-year flood protection facilities identified on Exhibit F must be constructed by the Master Developer as a part of the master planned infrastructure. Technical drainage studies are required for each phase of the master planned infrastructure improvements. The technical drainage studies for the infrastructure improvements may be submitted with conditional approval of this Master Drainage Study. However, final approval for the Master Drainage Study must be obtained prior to conditional approval of the infrastructure drainage studies.
8. Technical drainage studies are required for each of the POD's. The technical drainage studies for the POD's may not be submitted until the conditional approval of the pertinent infrastructure drainage study is obtained. Final approval for the infrastructure drainage study must be obtained prior to conditional approval of the impacted POD drainage studies.
9. Building permits for the homes within the individual POD's will not be issued until construction of the street and flood control infrastructure around the POD is substantially complete or interim protection is provided per the approved technical drainage study.
10. The site is adjacent to Clark County jurisdictional boundaries. The engineer must coordinate the Master Drainage Study with *Clark County Public Works Department* (CCPW) and incorporate any concerns for boundary conditions. CCPW concurrence is required prior to final acceptance of the Master Drainage Study.
11. The project proposed to construct facilities and/or increase flows within *Nevada Department of Transportation* (NDOT) right-of-way. Therefore, NDOT concurrence is required prior to final approval of the Master Drainage Study.
12. The project proposed to discharge flows onto and proposed facilities within U.S. Bureau of Land Management (BLM) property. Therefore, BLM concurrence is required prior to final approval of the Master Drainage Study.

13. The proposed berm/levee along Moccasin Road will require approval from *Federal Emergency Management Agency* (FEMA) in the future. The proposed berm/levee must be designed to meet the minimum requirements set by FEMA and CCRFCD by a future technical drainage study.
14. The design of debris basins at all major culvert entrances to limit the amount of sediment and debris entering the storm drain facilities will be required in a future infrastructure study.
15. Please note that all detention basins must be designed per CCRFCD criteria including a low flow facility around the detention basin. Also, include new water quality feature per Storm Water Management Plan.
16. Please note that all proposed interim facilities must be maintained by the master developer.
17. Provide a legal description of the proposed detention basins prior to recordation of the parent final map.
18. Coordinate the proposed drainage facilities with *Sheep Mountain Parkway* project. Please contact Greg McDermott at 702-229-2143 to coordinate the proposed drainage facilities.

NOTE:

In an effort to increase administrative efficiency, the City of Las Vegas Public Works Department requires all soil reports, drainage studies and traffic impact analysis submittals to be accompanied by an electronic copy of the submittal. Electronic documents must be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output replicating your submittal to be used for archival or display purposes. This may be more than one file if necessary. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats, but provided it is a high quality digitized replication of the submittal, other formats may be acceptable. If figures are in color, they must be scanned in color and saved as a separate file. The new submittal requirement is effective on July 1, 2011. If there are any questions regarding these new requirements, please contact Oh Sang Kwon in the Flood Section at (702) 229-2177 or Rick Schroder in Traffic Engineering at (702) 229-6327.

Any future changes to the proposed design (or design assumptions) as outlined in the approved master drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS

osk

T/R/S: T19S/R60E/6 & 7
AREA G-6, 7, & F-12

Proposed.out

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*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
* RUN DATE 17JUN10 TIME 05:37:13
*****

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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 XXXXXX XXXX X
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X X X X X
X X X X X
X X XXXXXX XXXX XXX

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSK- 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
*DIAGRAM
1 ID SLATER HANIFAN GROUP
2 ID CARWIN ADVISORS
3 ID KYLE CANYON
4 ID MASTER DRAINAGE STUDY
5 ID PROPOSED DRAINAGE CONDITION
6 ID
7 ID RETURN PERIOD ----- 100 & 10-YEAR
8 ID DISTRIBUTION ----- 6-HOUR SDN3
9 ID PROJECT NO. ----- WCP0902.003
10 ID FILENAME ----- Proposed.H1
11 ID DATE ----- 06/11/10
12 ID MODELED BY ----- SMJ
13 ID
14 ID SIX HOUR DEPTH-AREA REDUCTION FACTORS
15 ID DRAINAGE AREA (MI^2) DARF
16 ID 0.0-0.49 1.00
17 ID 0.5-0.99 0.98
18 ID 1.0-1.99 0.97
19 ID 2.0-3.99 0.93
20 ID 4.0-5.99 0.91
21 ID 6.0-7.99 0.90
22 ID 25-YR 0.70
23 ID 10-YR 0.57
24 ID
25 IT 5 0 0 300
26 IO 5 0 0
27 IN 5 0 0
28 JR PREC 1.00 0.98 0.97 0.93 0.91 0.90 0.70 0.57
*
29 KK OFF18
30 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
31 KO 3
32 BA .2799
33 PB 3.00
34 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
35 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
36 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
37 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
38 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
39 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
40 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
41 PC 0.998 0.999 1
42 LS 0 86.2
43 UD 0.332
*
44 KK NVE8
45 BA .0039
46 PB 3.00
47 LS 0 88.0
48 UD 0.100
*

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1

HEC-1 INPUT

PAGE 2

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LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
49 KK WPT19
50 KM COMBINE OFF18, NVE8
51 HC 2
*
52 KK OFF21
53 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
54 KO 3
55 PB 3.10

```


1016 UD 0.106 Proposed.out
 1017 KK WPT49
 1018 KM COMBINE W45, W46
 1019 HC 2
 1020 KK 95-6
 1021 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
 1022 BA .0104
 1023 PB 2.77
 1024 LS 0 89.9
 1025 UD 0.095
 1026 UD 0.095

1 HEC-1 INPUT PAGE 29

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

1026 KK OFFW
 1027 BA .0122
 1028 PB 2.77
 1029 LS 0 77.0
 1030 UD 0.185
 1031 KK CHD04B
 1032 KM COMBINE RDHD2B, WPT49, 95-6, OFFW
 1033 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
 1034 HC 4
 1035 KK DHD04B
 1036 KM FACILITY E-11
 1037 KM FLOW SPLIT AT VTN CULVERT 4
 1038 KM FLOW SPLITS TO BETWEEN NB AND SB ROADS OF US-95
 1039 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
 1040 DT DCHD4B
 1041 DI 0 611 811 1102 1379 1647
 1042 DQ 0 611 733 855 977 1099

1043 KK W34
 1044 BA .0700
 1045 PB 2.93
 1046 LS 0 95.0
 1047 UD 0.121

1048 KK W35
 1049 BA .0139
 1050 PB 2.93
 1051 LS 0 95.0
 1052 UD 0.090

1053 KK GC4
 1054 BA .0097
 1055 PB 2.93
 1056 LS 0 98.0
 1057 UD 0.109

1058 KK WPT47
 1059 KM COMBINE W34, W35, GC4
 1060 HC 3

1 HEC-1 INPUT PAGE 30

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

1061 KK W44
 1062 BA .0142
 1063 PB 2.93
 1064 LS 0 95.0
 1065 UD 0.100

1066 KK WPT48
 1067 KM COMBINE WPT47, W44
 1068 HC 2

1069 KK 95-7A
 1070 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
 1071 BA .0069
 1072 PB 2.77
 1073 LS 0 92.6
 1074 UD 0.075

1075 KK CHD05B
 1076 KM COMBINE RDHD4B, WPT48, 95-7A
 1077 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
 1078 HC 3

1079 KK DHD05B
 1080 KM FACILITY E-12
 1081 KM FLOW SPLIT AT VTN CULVERT 5
 1082 KM FLOW SPLITS TO BETWEEN NB AND SB ROADS OF US-95
 1083 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
 1084 DT DCHD5B
 1085 DI 0 87 209 520 734 928 1120 1292

Proposed.out

1152	BA	.0052	
1153	PB	2.77	
1154	LS	0	92.6
1155	UD	0.064	
	*		
1156	KK	OFF14	
1157	KM	REFERENCED FROM GCW MASTER DRAINAGE STUDY	
1158	BA	.0128	
1159	PB	2.77	
1160	LS	0	86.9
1161	UD	0.090	
	*		
1162	KK	CHD06B	
1163	KM	COMBINE RDHD5B, WPT46, 95-8A, OFF14	
1164	KM	REFERENCED FROM GCW MASTER DRAINAGE STUDY	
1165	HC	4	
	*		
1166	KK	RCHD6B	
1167	KM	FLOW SPLIT INTO US-95 MPU FACILITY	
1168	KM	33% FLOW INTO 8'X6' MPU FACILITY	
1169	DT	DCMPU6	
1170	DI	0	425
1171	DQ	0	142
	*		

HEC-1 INPUT

PAGE 33

1

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

1172	KK	DHD06B					
1173	KM	FACILITY E-13					
1174	KM	FLOW SPLIT AT VTN CULVERT 6					
1175	KM	FLOW SPLITS TO BETWEEN NB AND SB ROADS OF US-95					
1176	KM	REFERENCED FROM GCW MASTER DRAINAGE STUDY					
1177	DT	DCHD6B					
1178	DI	0	580	881	1846	2671	3498
1179	DQ	0	580	725	869	1014	1159
	*						

1180	KK	95-9A	
1181	KM	REFERENCED FROM GCW MASTER DRAINAGE STUDY	
1182	BA	.0110	
1183	PB	2.77	
1184	LS	0	92.6
1185	UD	0.098	
	*		

1186	KK	CHD07B	
1187	KM	COMBINE RDHD6B, 95-9A	
1188	KM	REFERENCED FROM GCW MASTER DRAINAGE STUDY	
1189	HC	2	
	*		

1190	KK	OFF15	
1191	KM	REFERENCED FROM GCW MASTER DRAINAGE STUDY	
1192	BA	.0348	
1193	PB	2.77	
1194	LS	0	86.9
1195	UD	0.126	
	*		

1196	KK	CHD7B2	
1197	KM	COMBINE CHD07B, OFF15	
1198	KM	COMBINE FLOWS IN MPU FACILITY	
1199	KM	REFERENCED FROM GCW MASTER DRAINAGE STUDY	
1200	HC	2	
	*		

1201	KK	CRET8	
1202	KM	RETRIEVE FLOW FROM DVCUL8	
1203	KM	FLOW BETWEEN FRONTAGE AND US-95, NOT IN FACILITY	
1204	KM	REFERENCED FROM GCW MASTER DRAINAGE STUDY	
1205	DR	DVCUL8	
	*		

1206	KK	DCRET8	
1207	KM	FACILITY E-14A	
1208	KM	FLOW SPLIT AT VTN CULVERT 8	
1209	KM	DIVERSION TO BETWEEN NB AND SB ROADS OF US-95	
1210	KM	BECAUSE PROPOSED MPU FACILITY REDUCES FLOW AT CULVERT 8,	
1211	KM	SIDE WEIR RAISED TO MATCH EXISTING DIVERSION AS MUCH AS POSSIBLE	
1212	KM	REFERENCED FROM GCW MASTER DRAINAGE STUDY	
1213	DT	DIV8A	

HEC-1 INPUT

PAGE 34

1

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

1214	DI	0	117	240	431	556	618	1137
1215	DQ	0	117	159	179	207	219	329
	*							

1216	KK	RET9	
1217	KM	RETRIEVE FLOW FROM DVCUL9	
1218	KM	REFERENCED FROM GCW MASTER DRAINAGE STUDY	
1219	DR	DVCUL9	
	*		

1220	KK	CRET9	
1221	KM	COMBINE RET9 AND RET8	
1222	KM	REFERENCED FROM GCW MASTER DRAINAGE STUDY	
1223	HC	2	
	*		

Kyle Canyon Amendment to the 2008 Las Vegas Valley
Master Plan Update, SHG

Steve Jones

From: Peter Jackson <pjackson@LasVegasNevada.GOV>
Sent: Thursday, March 07, 2013 1:32 PM
To: Steve Jones
Cc: Oh-Sang Kwon; Todd L. Myers
Subject: Kyle Canyon MPA submittal

Steve;

This will serve as our formal review of the Kyle Canyon MPA.

Please update Exhibit J to show the US95 MPU facilities (CN95 0259 – 0333) as existing.
Include a full size copy of the Kyle Canyon MPA 24x36 Exhibit within the report.

Please submit 2 copies of the Kyle Canyon MPA to CCRFCD, attn Kevin Eubanks, for their review.

Please provide a listing of both the Category A & B facilities for inclusion within the Agenda item. Separate the info in categories by what is changing;

I.E., Category A Facility size & flow change facilities include: BRDB 0043 – 0157, MOKC 0000 – 0103, CN95 0199
- 0284

Flow change facilities include: CN95 0102 – 0167, LVMO 0000 - 0276

We anticipate submitting the MPA Agenda item to CCRFCD within a few weeks to meet the CCRFCD time line for the TAC Agenda.

The City anticipates that this MPA will be on the May 30, 2013 TAC.

Please give Oh-Sang or myself a call if you have any questions.

Thanks,

Peter Jackson, CFM
Senior Engineering Associate
Department of Public Works
Flood Control Section
333 North Rancho Drive, 7th Floor
Las Vegas, Nevada 89106
(702) - 229 - 5266

pjackson@lasvegasnevada.gov

*DIAGRAM

*FREE

ID MASTER PLAN AMENDMENT PREPARED FOR KYLE CANYON MASTER PLAN
 ID REVISED CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
 ID UPPER AND LOWER NORTHERN LAS VEGAS WASH WATERSHEDS
 ID RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
 ID INPUT FILE = WEST3.DAT
 ID INPUT FILE DATE = NOVEMBER 2012
 ID DESIGN STORM = 100-YEAR 6-HOUR STORM
 ID STORM DISTRIBUTION = SDN3
 ID MPU MODELED BY PBS&J (KRYSTLE PEMBERTON, E.I., CFM)
 ID MPU CHECKED BY PBS&J (HARSHAL B. DESAI, P.E., CFM)
 ID MPA MODELED BY SHG (STEVE JONES, P.E.)
 ID STORM CENTERING = WEST TRIBUTARY
 ID DOWNSTREAM OF THE UPPER LAS VEGAS WASH DETENTION BASIN TO THE MOST
 ID DOWNSTREAM POINT IN THE LOWER NORTHERN LAS VEGAS WASH WATERSHED
 ID

ID REFERENCED HYDROLOGIC MODELS:

ID REVISED FINAL DESIGN REPORT FOR THE RANCHO DETENTION BASIN
 ID PHASE II (VTN 2006)
 ID RESPONSE TO COMMENTS ON THE CONCEPTUAL DRAINAGE STUDY FOR
 ID NORTH LAS VEGAS 600-ACRE SITE (GC WALLACE 2006)
 ID SECOND RESPONSE TO COMMENTS OF THE CONCEPTUAL DRAINAGE STUDY
 ID FOR NORTH LAS VEGAS 2074-ACRE SITE (GC WALLACE 2006)
 ID BASIN MAPS FOR SUPPLEMENT #2 TO ADDENDUM #2 TO THE MASTER
 ID DRAINAGE STUDY FOR CLIFF'S EDGE/ PROVIDENCE (VTN 2004)
 ID MASTER DRAINAGE STUDY FOR KYLE CANYON (GC WALLACE 2006)
 ID TECHNICAL DRAINAGE STUDY FOR GRAND TETON DRIVE STROM DRAIN
 ID AND AREA 1 ROADWAY IMPROVEMENTS (GC WALLACE 2006)
 ID 90% FINAL DESIGN REPORT FOR RANCHO ROAD SYSTEM - EL CAMPO
 ID GRANDE STORM DRAIN PROJECT (PBS&J 2007)
 ID MPA FOR RACEL STREET COLLECTOR (LOUIS BERGER JANUARY 2007)
 ID HYDROLOGIC MODEL FOR FLOYD LAMB NORTH AND SOUTH ENVIRONMENTAL
 ID ENHANCEMENT AREAS (LOUIS BERGER DECEMBER 7, 2007)
 ID KYLE CANYON MASTER DRAINAGE STUDY ADDENDUM #3 (SLATER HANIFAN 2012)
 ID

ID JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA (SQUARE MILES)	DARF
0 - 0.5	0.99
0.5 - 1	0.975
1 - 2	0.95
2 - 3	0.925
3 - 4	0.915
4 - 5	0.908
5 - 6	0.903
6 - 7	0.895
7 - 8	0.885

ID
 IT5 0 0 300
 IO5 0 0
 IN5 0 0
 JRPREC 0.99 0.975 0.95 0.925 0.915 0.908 0.903 0.895 0.885
 *

KKNW62-S

KMREVISED PER KYLE CANYON MPA

BA0.220

PB2.77

PC0.000	0.020	0.057	0.070	0.087	0.108	0.124	0.130	0.130	0.130
PC0.130	0.130	0.130	0.133	0.140	0.142	0.148	0.158	0.172	0.181
PC0.190	0.197	0.199	0.200	0.201	0.204	0.214	0.229	0.241	0.249
PC0.251	0.256	0.270	0.278	0.281	0.283	0.295	0.322	0.352	0.409
PC0.499	0.590	0.710	0.744	0.781	0.812	0.819	0.835	0.851	0.856
PC0.860	0.868	0.876	0.888	0.910	0.926	0.937	0.950	0.970	0.976
PC0.982	0.985	0.987	0.989	0.990	0.993	0.993	0.994	0.995	0.998
PC0.998	0.999	1.000							
LS0	95.9								

UD0.208

*

KKRNW62-S

KMREVISED PER KYLE CANYON MPA

KMROUTE NW62-S TO CNW74-C

KMFACILITY = CENTENNIAL PARKWAY CHANNEL WEST/U.S. 95 FACILITY

KMFACILITY ID-MILE = CN95 0284

KMLINING = RCB

RD670 0.016 0.015 0 TRAP 5 0

*

KKNW74-C

KMREVISED PER KYLE CANYON MPA

BA0.216

PB2.79

LS0 94.3

UD0.211

*

KKCNW74-C

KMCOMBINE NW74-C AND RNW62-C

HC2

*

KKRCNW74-C

KMREVISED PER KYLE CANYON MPA

KMROUTE CNW74-C TO 2CNW72-C

KMFACILITY = CENTENNIAL PARKWAY CHANNEL WEST/U.S. 95 FACILITY

KMFACILITY ID-MILE = CN95 0199,0205,0226,0227,0232,0283

KMLINING = RCB

RD4535 0.019 0.015 0 TRAP 15 0

*

KKNW45-S

KMREVISED PER KYLE CANYON MPA

BA0.288

PB2.91

LS0 91.8

UD0.248

*

KKRNW45-S


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*
KKNW147-E
BA0.182
PB2.77      77.6
LS0
UD0.309
*
KKRCW147E
KMCOMBINE RTULEDB AND NW147-E
KMIRON MOUNTAIN AND BUFFALO
HC2
*
KKRCW147E
KMROUTE CNW147E TO 2CW144E
KMFACILITY = MOUNTAIN SPA/VISTA RANCH
KMFACILITY ID-MILE = MSNV 0125
KMLINING = GRASS
RD1300      0.004  0.03  0      TRAP  100  10
*
KKNW62-N
KMREVISED PER KYLE CANYON MPA
BA0.097
PB2.77
LS0      90.0
UD0.132
*
KKRNW62-N
KMREVISED PER KYLE CANYON MPA
KMROUTE NW62-N TO CNW100-W
KMLOG CABIN WAY
RD4590      0.025  0.016  0      TRAP  0      50
*
KKNW100-W
KMREVISED PER KYLE CANYON MPA
BA0.353
PB2.77
LS0      88.0
UD0.327
*
KKDNW100W
KMREVISED PER KYLE CANYON MPA
KMDIVERT OUT 118 CFS ON IRON MOUNTAIN ROAD
KMREFERENCED FROM "ADDENDUM #3 TO MASTER DRAINAGE STUDY FOR KYLE CANYON"
KM BY SLATER HANIFAN GROUP DATED FEBRUARY 2012
KMREFERENCE NODE: IREAST
DTDNW96-C
DIO      118      1000
DQ0      118      118
*
KKCNW100-W
KMREVISED PER KYLE CANYON MPA
KMCOMBINE DNW100-W AND RNW62-N
KMLOG CABIN AND FORT APACHE
HC2
*
KKDCNW100W
KMREVISED PER KYLE CANYON MPA
KMFLOW ROUTED THRU NW115-C: 47 CFS(OHARE) & 187(LOG CABIN)
KMTOTAL FLOW IS 234 CFS TOWARDS NW115-C
KMREMAINDER OF FLOW ROUTED NORTH TOWARD MOCCASIN IN MOFA STORM DRAIN
KMREFERENCED FROM "ADDENDUM #3 TO MASTER DRAINAGE STUDY FOR KYLE CANYON"
KM BY SLATER HANIFAN GROUP DATED FEBRUARY 2012
KM IN CONFORMANCE WITH CLV NORTHWEST NEIGHBORHOOD STUDY
KMREFERENCE NODE: OHARE & LOGCAB
DTDNW64E
DIO      234      1000
DQ0      0      766
*
KKRDCNW100W
KMROUTE DCNW100-W TO CNW115-C
KMDIVERTED FLOW IN OHARE = 47 CFS
KMDIVERTED FLOW IN LOG CABIN = 187 CFS
KMDIVERSION THROUGH TWO ROADS IS COMBINED
KMROUTING 234 CFS TO THE INTERSECTION BETWEEN EL CAPITAN AND OHARE
RD4300      0.015  0.016  0      TRAP  0      50
*
KKNW115-C
BA0.210
PB2.77
LS0      87.0
UD0.277
*
KKCNW115-C
KMCOMBINE RDW100-W AND NW115-C
KMEL CAPITAN AND OHARE
HC2
*
KKRCW115-C
KMROUTE CNW115-C TO CNW96-C
KMFACILITY = BRENT DRAINAGE SYSTEM
KMFACILITY ID-MILE = BRDB 0157
KMLINING = RCB
RD2300      0.0025  0.015  0      TRAP  12      0
*
KKDNW96-C
KMRETRIEVE DNW96-C
DRDNW96-C
*
KKRDW96-C
KMROUTE DNW96-C TO CNW96-C
KMIRON MOUNTAIN ROAD
RD4050      0.028  0.016  0      TRAP  0      50
*
KKR2DW96-C
KMROUTE DNW96-C TO CNW96-C
KMFACILITY = BRENT DRAINAGE SYSTEM

```

KMFACILITY ID-MILE = BRDB 0157

KMLINING = RCB

RD1260 0.0025 0.015 0 TRAP 12 0

*

KKNW96-C

KMREVISED PER KYLE CANYON MPA

BA0.262

PB2.77

LS0 87.3

UD0.205

*

KKCNW96-C

KMREVISED PER KYLE CANYON MPA

KMCOMBINE RCW115-C, R2DW96-C AND NW96-C

KME1 CAPITAN AND BRENT

HC3

*

KKNW75-C

KMREVISED PER KYLE CANYON MPA

BA0.445

PB2.77

LS0 92.4

UD0.352

*

KKDNW75-C

KMREVISED PER KYLE CANYON MPA

KMROUTE 178 CFS IN BRENT LANE THRU NW96-C

KMREFERENCED FROM "ADDENDUM #3 TO MASTER DRAINAGE STUDY FOR KYLE CANYON"

KMBY SLATER HANIFAN GROUP DATED FEBRUARY 2012

KMREFERENCE NODE: BRENT

KMREMAINING FLOW ENTERS THE RACO STORM DRAIN

DTDNW111S

D10 200 300 500 1000 5000

DQ0 22 122 322 822 4822

*

KKRDW75-C

KMROUTE DNW75-C TO 2CNW96-C

KMBRENT

RD2600 0.028 0.016 0 TRAP 0 50

*

KK2CNW96-C

KMCOMBINE CNW96-C AND DNW75-C

KME1 CAPITAN AND BRENT

HC2

*

KKR2CW96-C

KMROUTE 2CNW96-C TO CNW113-C

KMFACILITY = BRENT DRAINAGE SYSTEM

KMFACILITY ID-MILE = BRDB 0107

KMLINING = RCB

RD2660 0.024 0.015 0 TRAP 8 0

*

KKNW113-C

BA0.189

PB2.77

LS0 86.8

UD0.271

*

KKCNW113-C

KMCOMBINE NW113-C AND R2CW96-C

HC2

*

KKRCW113-C

KMROUTE CNW113-C TO CNW147W

KMFACILITY = BRENT DRAINAGE SYSTEM

KMFACILITY ID-MILE = BRDB 0043

KMLINING = RCB

RD2920 0.021 0.015 0 TRAP 8 0

*

KKNW114-C

BA0.169

PB2.77

LS0 81.9

UD0.249

*

KKRNW114-C

KMROUTE NW114-C TO CNW147W

KM NATURAL CHANNEL

RD2800 0.019 0.03 0 TRAP 50 3

*

KKNW147W

BA0.106

PB2.77

LS0 80.6

UD0.208

*

KKCNW147W

KMCOMBINE RCW113-C, RNW114-C AND NW147W

HC3

*

KKNW144W

BA0.310

PB2.77

LS0 81.3

UD0.257

*

KKCNW144W

KMCOMBINE NW144W AND CNW147W

HC2

*

KKDNW111S

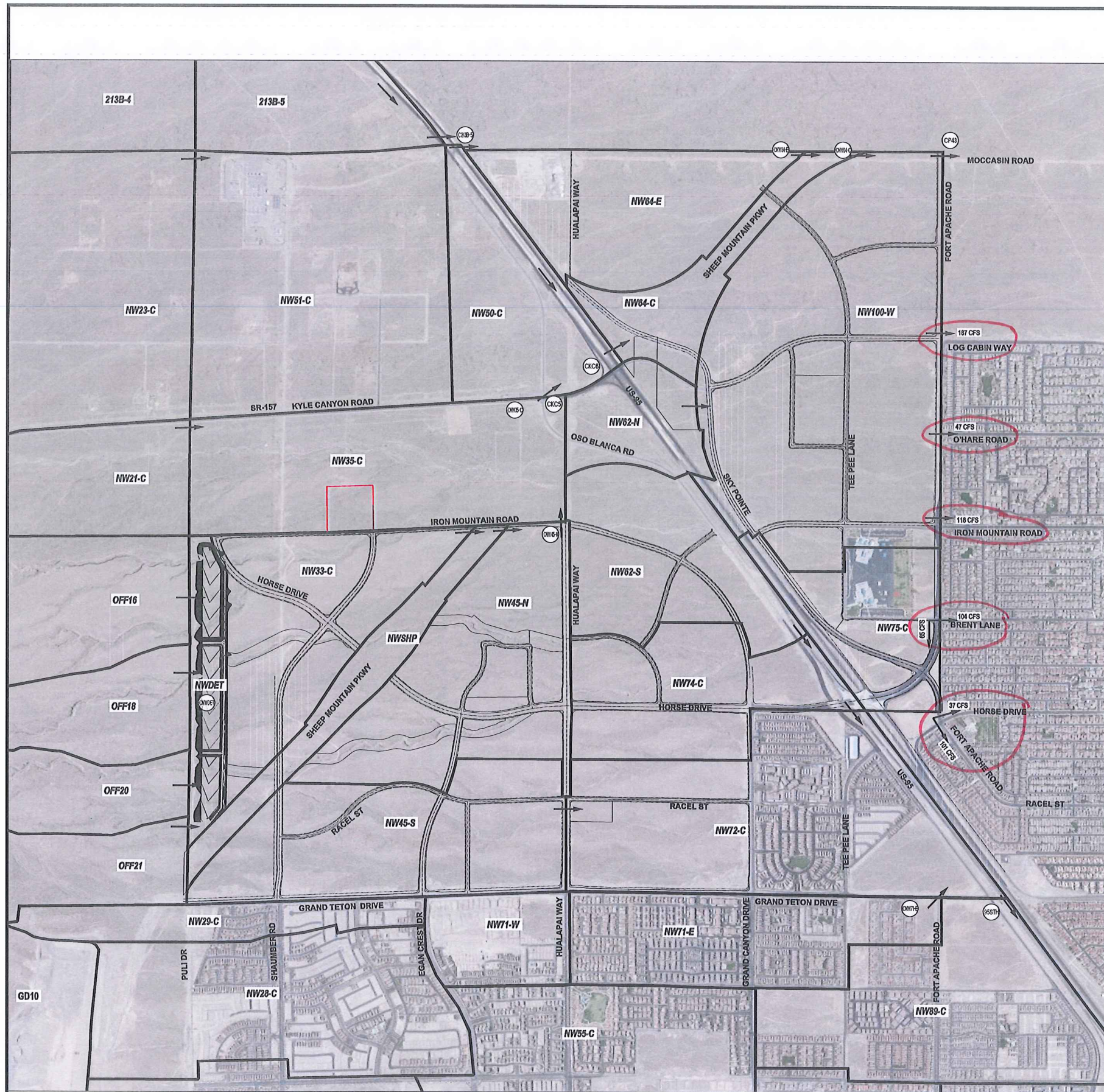
KMRETRIEVE DNW111S

DRDNW111S

*

KKRDW111S

KMROUTE DNW111S TO CNW111S



Storm Flow Summary Kyle Canyon Offsite Basins Ultimate Condition				
Basin ID	Area (ac)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	
OFF16	230.3	372	145	
OFF18	134.3	213	82	
OFF20	214.3	297	117	
OFF21	306.4	473	195	
NW21-C	99.3	242	114	
NW35-C	220.6	423	191	
NW60-C	107.3	228	93	
NW51-C	316.8	485	198	
NW62-N	61.9	122	46	

Note: All Basins have been determined by SDN3 HEC-1 Model.
Note: All Basins have been revised from 2008 CCRFCD MPU, and will be a part of the future MPA.

Storm Flow Summary Kyle Canyon Offsite Concentration Points Ultimate Condition				
Concentration Point	Area (mi ²)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	
CNW71-E ¹	0.47	610	272	
CNW35-C ¹	2.69	2709	1206	
CKG5 ¹	4.81	3521	1674	
= CNW45-N + CNW35-C				
CKG6 ¹	4.98	3665	1733	
= CKG5 + NW50-C				
C213B-5 ²	50.68	10298	N/A	

1 - Flow determined by SDN3 HEC-1 Model.
2 - Flow determined by SDN3 HEC-1 Model.
Note: CNW71-E and C213B-5 have been directly referenced from the 2008 MPU.

Storm Flow Summary Kyle Canyon West Basins Ultimate Condition				
Basin ID	Area (ac)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	
NWDET	49.7	142	72	
NWSHP	64.5	143	71	
NW33-C	161.5	368	174	
NW45-N	195.8	395	188	
NW45-S	195.0	465	231	
NW62-S	140.9	327	161	
NW72-C	281.0	520	235	
NW74-C	138.1	328	161	

Note: All Basins have been determined by SDN3 HEC-1 Model.
Note: All Basins have been revised from 2008 CCRFCD MPU, and will be a part of the future MPA.

Storm Flow Summary Kyle Canyon West Concentration Points Ultimate Condition				
Concentration Point	Area (mi ²)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	
CHWDET	1.48	1343	599	
= CHWDET + OFF16 + OFF20 + OFF21 + NWDET				
CHWDET	1.48	166	119	
(DETENTION ROUTING OUTFALL FROM NWDET)				
CHW45-N	2.12	918	499	
= NWDET + NW33-C + NW45-N + NWSHP				

Note: All Concentration Points have been determined by SDN3 HEC-1 Model.

Storm Flow Summary Kyle Canyon East Basins Ultimate Condition				
Basin ID	Area (ac)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	
NW64-C	67.4	101	35	
NW64-E	145.4	268	101	
NW75-C	99.4	242	123	
NW100-W	402.3	512	224	

Note: All Basins have been determined by SDN3 HEC-1 Model.
Note: All Basins have been revised from 2008 CCRFCD MPU, and will be a part of the future MPA.

Storm Flow Summary Kyle Canyon East Concentration Points Ultimate Condition				
Concentration Point	Area (mi ²)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	
CNW64-E	50.91	10307	N/A	
= C213B-5 + NW64-E				
CHW64-C	56.00	10669	N/A	
= CNW64-E + CKG6 + NW64-C				
CP43	56.72	10872	N/A	
= CHW64-C + NW100-W				

Note: All Concentration Points have been determined by SDN3 HEC-1 Model.

Storm Flow Summary Kyle Canyon East Diversions Ultimate Condition				
Diversion ID	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	Diverted From	Diverted To
DNW100W	118	99	NW100-W	Iron Mountain
DNW100W	47	0	NW100-W	O'Hare
DNW100W	167	73	NW100-W	Log Cabin
BRNT	104	22	NW75-C	Brent
HORSE	37	0	NW75-C	Horse
RACEL	101	101	NW75-C	Racel

Storm Flow Summary Kyle Canyon US-95 Concentration Points Ultimate Condition				
Concentration Point	Area (mi ²)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	
955TH	1.65	2132	1037	
= DNW100W + NW100W + NW62-S + NW72-C + NW74-C				

Note: All Concentration Points have been determined by SDN3 HEC-1 Model.

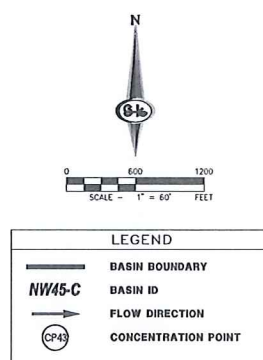


EXHIBIT G

KYLE CANYON MASTER DRAINAGE STUDY (ADD3)
REGIONAL ULTIMATE CONDITION DRAINAGE PATTERNS MAP
WCR0902.004

**SLATER
HANIFAN
GROUP**
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5309

**CARWIN
ADVISORS**

Floyd Lamb Park North and South Environmental
Enhancement Areas, Final Design Report, LBG

FINAL DESIGN REPORT

FLOYD LAMB PARK NORTH AND SOUTH ENVIRONMENTAL ENHANCEMENT AREAS CLV PROJECT: 06-12828

PREPARED FOR:

**CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
400 STEWART AVENUE
LAS VEGAS, NV 89101**

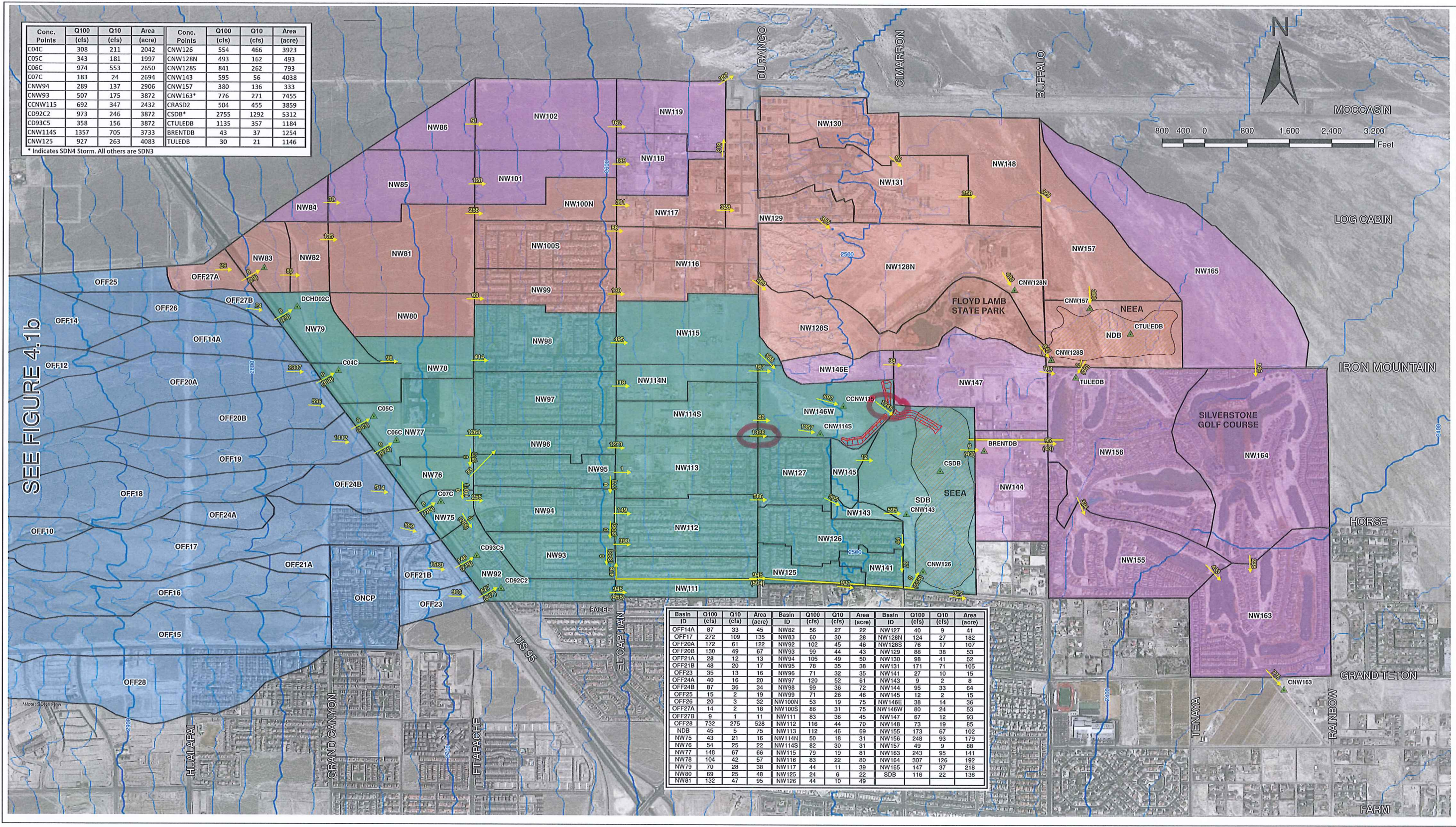


PREPARED BY:

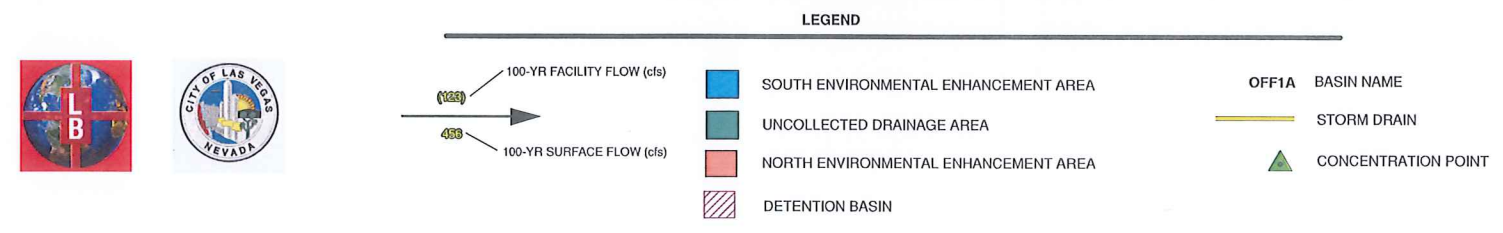
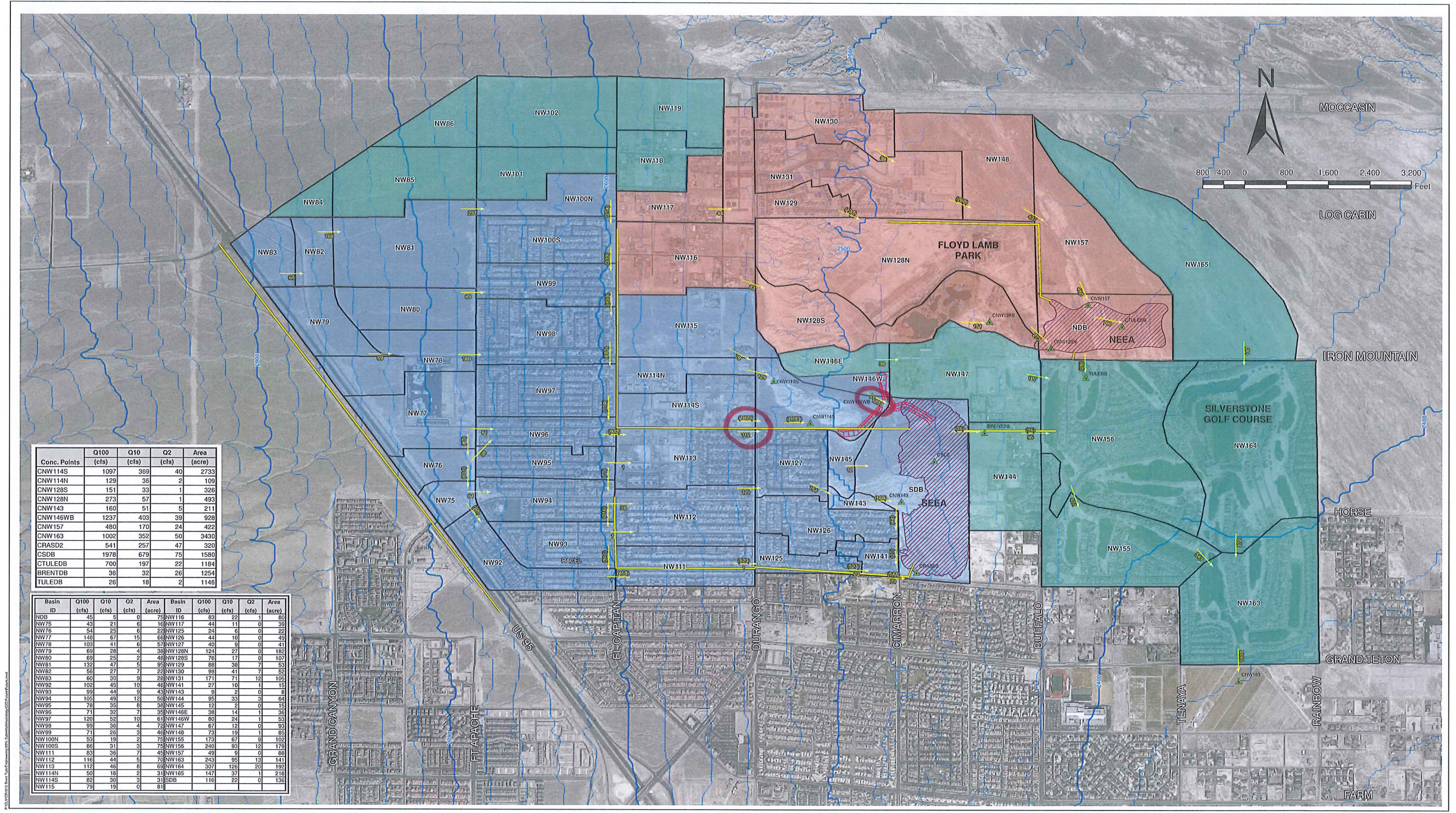
**THE LOUIS BERGER GROUP, INC.
500 E. AMIGO COURT, SUITE 100
LAS VEGAS, NV 89119**



May 2009



**Floyd Lamb Park
North and South
Environmental Enhancement Areas
Interim Conditions Hydrology
Figure 4.1a**



**Floyd Lamb Park
North and South
Environmental Enhancement Areas
Future Conditions Hydrology
Figure 4.2**

San Marino Estates III, GCW

CITY OF LAS VEGAS				DATE: June 18, 2003	
INTER-OFFICE MEMORANDUM					
TO: Land Development Services Department of Public Works				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works	
SUBJECT: Drainage Study for: San Marino Estates III				COPIES TO: G.C. Wallace, Inc.	
Cross Streets: NEC of Horse Drive & El Capitan Way				Distinctive Homes	
FILE NO.: F:\Depot\DSMEMOS\DS3329B.doc				Bart Anderson, P.E., DevCo	
Parcel Number: 125-08-604-001 thru -005				Loni Skaar, Ward 6	
Zoning Action:				Councilman Mack Liaison Office	
FEMA Flood Zone:		YES	No	X	
Proposed Storm Drain:		YES	X	No	
HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID G.R. #
1 st Submittal	4/25/2003	5/13/2003	Not Approved	\$250.00	103285: \$250
2 nd Submittal	5/28 & 6/13/2003	6/18/2003	See Comments Below	\$400.00	105086: \$400
TOTAL FEES (LDDRS):				\$650.00	

REMARKS:

The Drainage Study for the subject project has been reviewed and:

X	Is approved subject to conformance to all City standards and the following conditions.
	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence

1. Revise the section title of J/D-1 and K/D-1 to "PUBLIC Drainage Easement".
2. Revise the 10' drainage easement at the back of Lots 10-13 to "PUBLIC" drainage easement.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the City of Las Vegas Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

END OF REMARKS
B&H/avs

T/R/S: T19S/R60E/08
AREA G-08

Post-It Fax Note	7671	Date	6-18-03	# of pages	1
To	Bill Hunter	From	Albert Sung		
Co./Dept	G.C. Wallace	Co.	CLV		
Phone #		Phone #	827-2041		
Fax #	864-2299	Fax #			



Department of Development Services

Civil Engineering Division

500 S Grand Central Pky 1st Fl • PO Box 551842 • Las Vegas NV 89155-1842
(702) 455-4600 • Fax (702) 388-2550

Phil Rosenquist, Director • Carla J. Pearson, Assistant Director

July 7, 2003

03-29203
LTL

G. C. Wallace, Inc.
1555 South Rainbow Boulevard
Las Vegas, Nevada 89146

CLARK COUNTY CONCURRENCE for San Marino Estates III

Study Dated: April 25, 2003

Addendum # 1 Dated: May 23, 2003

Addendum # 2 Dated: June 30, 2003

Location: Northeast corner of El Capitan Way and Horse Drive

SEC. 8, T. 19 S., R. 60 E.

H.T.E. # 03-29203 Concurrence

The above-referenced project is located in the City of Las Vegas adjacent to Clark County. The drainage study was submitted to the County for concurrence. The County has reviewed the submittal, addendum #1, and addendum #2. In addition, the County has received a copy of the Inter-Office Memo from the City of Las Vegas, dated June 18, 2003

The County concurs with the acceptance of this drainage study by the City of Las Vegas. Please note that the County's review of this development is limited to drainage issues significant to Clark County unincorporated areas.

No liability is assumed by the County for information, data, and conclusions of the consulting engineer.

DEPARTMENT OF DEVELOPMENT SERVICES

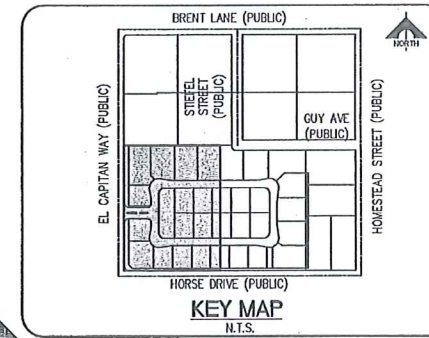
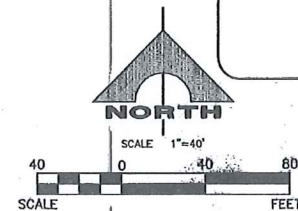
By


Todd L. Myers, P.E.
Senior Engineer
Civil Engineering Division

TLM/wlw

cc: Albert Sung, P.E.
City of Las Vegas Department of Public Works

BOARD OF COUNTY COMMISSIONERS
MARY KINCAID-CHAUNCEY, Chair • CHIP MAXFIELD, Vice-Chairman
YVONNE ATKINSON GATES • MARK A. JAMES • RORY REID • MYRNA WILLIAMS • BRUCE L. WOODBURY
THOM REILLY, County Manager

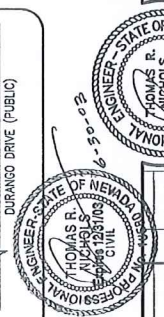


CITY OF LAS VEGAS BENCHMARK BLV90 8C4
LOCATED ON THE SOUTHEAST CORNER OF HORSE AND EL CAPITAN.
ELEVATION - 791.277 METERS / 2596.05 FEET

NORTH 00°15'04"EAST BEING THE LINE BETWEEN CCGS MONUMENT 806 TO CCGS MONUMENT 801. SAID BEARING IS BASED UPON THE NORTH AMERICAN DATUM OF 1983/94, PUBLISHED VALUES AS SHOWN BY THE CLARK COUNTY DEPARTMENT OF PUBLIC WORKS SURVEY TITLED "LAS VEGAS VALLEY GEODETIC CONTROL NETWORK", RECORDED ON FILE IN 88, PAGE 53 OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

LEGEND		
157	LOT NUMBER	— 3000 —
	S.D. PIPE & MANHOLE	<u>3.2%</u>
	DROP INLET	EXIST. CONTOURS
<u>57.57'</u> FG	FUTURE ELEVATION	STREET GRADIENT
<u>57.57'</u> FG	FUTURE ELEVATION	6' HIGH SCREEN WALL
<u>57.57'</u> FG	PROPOSED ELEVATION	RETAINING WALL
	EXISTING AC	RETAINING WALL W/ SCREEN WALL
	PROPOSED AC	GRADE BREAK
		2:1 SCARP
		3:1 SCARP

- ① CONSTRUCT 30" WIDE PRIVATE STREET SECTION PER USCCD DWG. NO. 217A SEE DETAIL "A" ON SHEET D-1.
- ② CONSTRUCT GATED PRIVATE MULTILANED DRIVEWAY ENTRANCE PER USCCD DWG. NO. 222A. SEE DETAIL "B" ON SHEET D-1 FOR PWINT. SECTION.
- ③ CONSTRUCT 60" PUBLIC RIGHT-OF-WAY STREET PER U.S.D.C.C.A. DWG. NO. 205K -- SEE DETAIL "C", "D", OR "E" ON SHEET D-1.
- ④ CONSTRUCT "L" TYPE CURB AND GUTTER PER U.S.D.C.C.A. DWG. NO. 216.
- ⑤ CONSTRUCT 30" ROLL CURB PER U.S.D.C.C.A. DWG. NO. 217A.
- ⑥ CONSTRUCT "A" TYPE CURB PER U.S.D.C.C.A. DWG. NO. 219.
- ⑦ CONSTRUCT 4' WIDE, 4" THICK CONCRETE SIDEWALK PER U.S.D.C.C.A. DWG. NO. 234.
- ⑧ CONSTRUCT 5' WIDE, 4" THICK CONCRETE SIDEWALK PER U.S.D.C.C.A. DWG. NO. 234.
- ⑨ CONSTRUCT 6' WIDE CROSS GUTTER PER U.S.D.C.C.A. DWG. NO. 228.
- ⑩ CONSTRUCT UNDER SIDEWALK DRAIN PER U.S.D.C.C.A. DWG. NO. 236
- ⑪ INSTALL 10' L-CURB TO ROLL CURB X-SITION, SEE DETAIL "F" ON SHEET D-1.
- ⑫ CONSTRUCT 6' DEPRESSED CURB PER DETAIL "Z" ON SHEET D-1
- ⑬ INSTALL HANDICAP RAMP
- ⑭ INSTALL BOLLARDS PER DETAIL "D" ON SHEET D-2
- ⑮ INSTALL WROUGHT IRON GATE PER DETAIL "B" SHEET D-2



G.C. WALLACE, INC.
Engineers/Planners/Surveyors
 1555 SOUTH RAINBOW BLVD., LAS VEGAS, NEVADA 89146
 TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

DISTINCTIVE HOMES
SAN MARINO ESTATES III
GRADING PLAN

SHEET
G-1
1 OF 6 SH

03-29203 APP PLANS

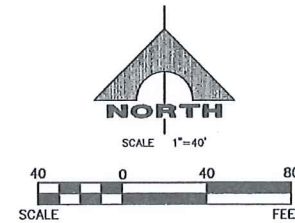
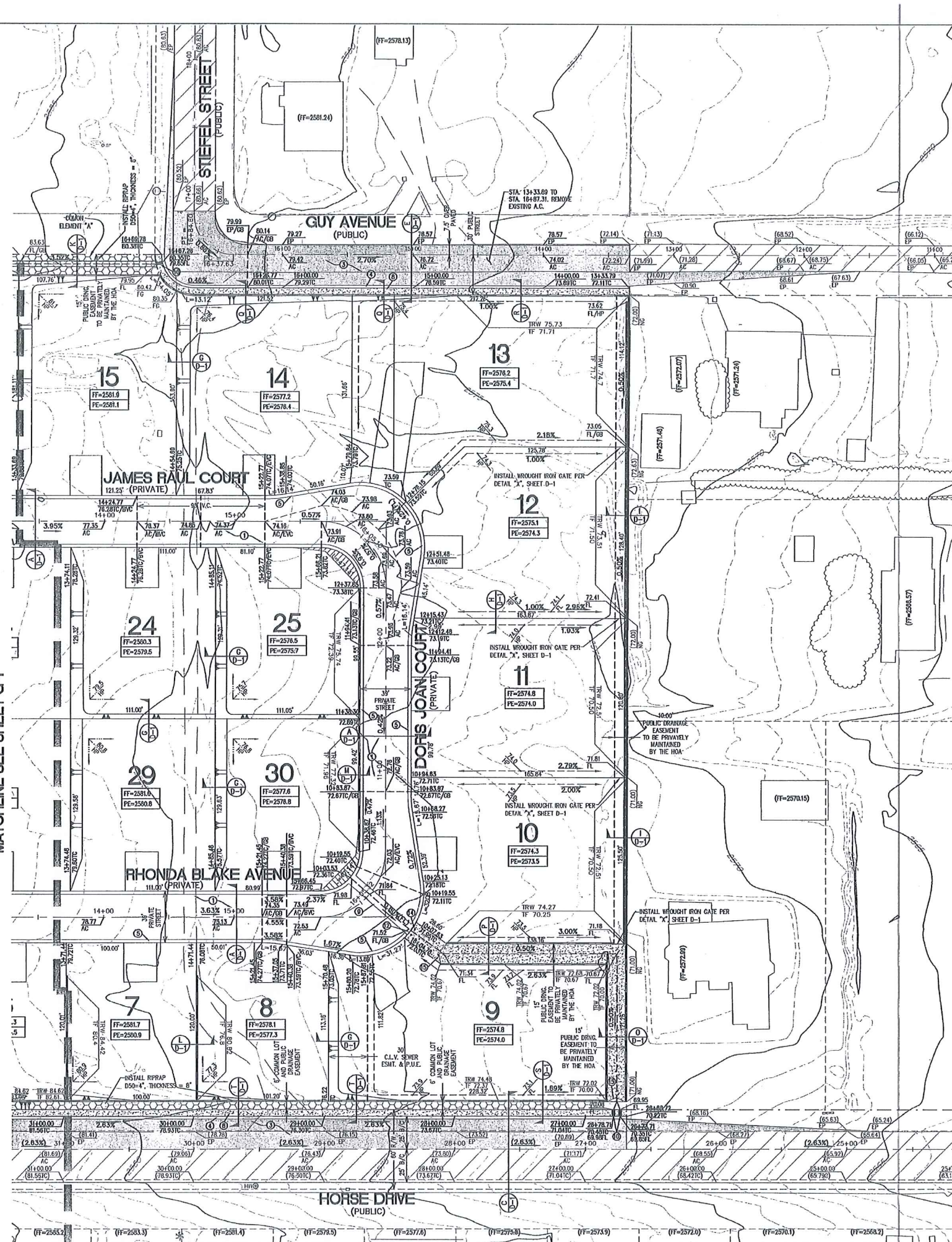


Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

LEGEND			
157	LOT NUMBER	3000	EXIST. CONTOURS
	S.D. PIPE & MANHOLE	3.2%	STREET GRADIENT
	DROP INLET		6' HIGH SCREEN WALL
	FUTURE ELEVATION		RETAINING WALL
	EXIST. ELEVATION		RETAINING WALL W/ SCREEN WALL
	PROPOSED ELEVATION		GRADE BREAK
	EXISTING AC		21 SCARP
	PROPOSED AC		3:1 SCARP

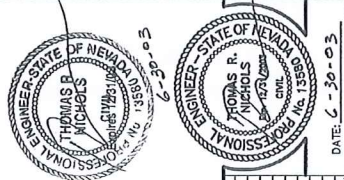
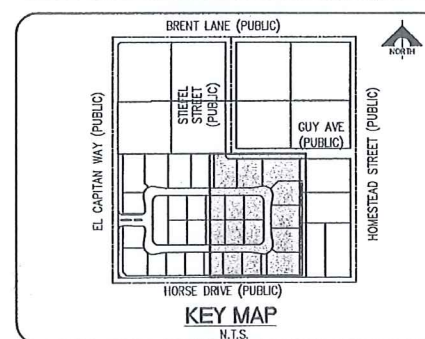
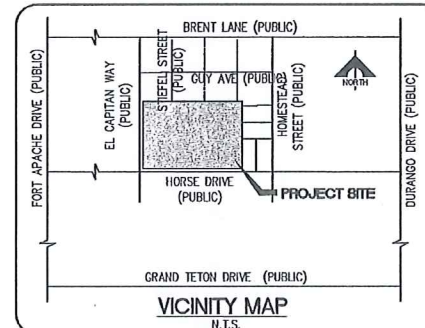
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- CONSTRUCT 39' WIDE PRIVATE STREET SECTION PER USCCD DWG. NO. 210, SEE DETAIL "A" ON SHEET D-1.
 - CONSTRUCT GATED PRIVATE MULTIFAMILY DRIVEWAY ENTRANCE PER USCCD DWG. NO. 222A, SEE DETAIL "B" ON SHEET D-1 FOR PMT. SECTION.
 - CONSTRUCT 60' PUBLIC RIGHT-OF-WAY STREET PER U.S.D.C.C.A. DWG. NO. 205: - SEE DETAIL "C", "D", OR "E" ON SHEET D-1.
 - CONSTRUCT "L" TYPE CURB AND GUTTER PER U.S.D.C.C.A. DWG. NO. 216.
 - CONSTRUCT 30" ROLL CURB PER U.S.D.C.C.A. DWG. NO. 217A.
 - CONSTRUCT "A" TYPE CURB PER U.S.D.C.C.A. DWG. NO. 219.
 - CONSTRUCT 4' WIDE, 4" THICK CONCRETE SIDEWALK PER U.S.D.C.C.A. DWG. NO. 234.
 - CONSTRUCT 5' WIDE, 4" THICK CONCRETE SIDEWALK PER U.S.D.C.C.A. DWG. NO. 234.
 - CONSTRUCT 8' WIDE CROSS GUTTER PER U.S.D.C.C.A. DWG. NO. 228.
 - CONSTRUCT UNDER SIDEWALK DRAIN PER U.S.D.C.C.A. DWG. NO. 236.
 - INSTALL 10" L-CURB TO ROLL CURB X-SITION, SEE DETAIL "F" ON SHEET D-1.
 - CONSTRUCT 6' DEPRESSIONED CURB PER DETAIL "Z" ON SHEET D-1.
 - INSTALL HANDCAP RAMP
 - INSTALL BOLLARDS PER DETAIL "D" ON SHEET D-2
 - INSTALL WROUGHT IRON GATE PER DETAIL "D" SHEET D-2

MATCHLINE SEE SHEET G-1



BENCHMARK
CITY OF LAS VEGAS BENCHMARK BLVD 004
LOCATED ON THE SOUTHEAST CORNER OF HORSE AND EL CAPITAN.
ELEVATION = 791.277 METERS / 2596.05 FEET

BASE OF BEARING
NORTH 00°15'04"EAST BEING THE LINE BETWEEN COGS MONUMENT 806 TO COGS MONUMENT 801. SAID BEARING IS BASED UPON THE NORTH AMERICAN DATUM OF 1983/94, PUBLISHED VALUES AS SHOWN BY THE CLARK COUNTY DEPARTMENT OF PUBLIC WORKS SURVEY TITLED "LAS VEGAS VALLEY GEODETIC CONTROL NETWORK", RECORDED ON FILE IN FILE 88, PAGE 53 OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.



G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RANCHO BLVD./LAS VEGAS, NEVADA 89146
PHONE: (702) 344-2550 • FAX: (702) 344-2559
G-159-2003.dwg Thomas Wallace/030703 G-159

DISTINCTIVE HOMES
SAN MARINO ESTATES II

SHEET
G-2
2 OF 6 SHTS

Mystic Valley PH1, CVL Consultants

CITY OF LAS VEGAS		DATE:	
INTER-OFFICE MEMORANDUM		September 10, 1998	
TO: Land Development Services Department of Public Works		FROM: Dennis W. Stransky, P.E. Flood Control Project Manager Department of Public Works	
SUBJECT:	Drainage Study for:		COPIES TO:
	Mystic Valley		CVL Consultants
Cross Streets:	Horse & Durango		Richmond American Homes
FILE NO.:	\\khan\lflood\Depot\DSMEMOS\DS2335B.doc		Cheri Edleman, P.E. DEVCO
Parcel Number:	125-08-603-001		Robert Thompson, P.E. - CCPW
Zoning Action:			
FEMA Flood Zone	YES	No	X
Proposed Storm Drain	YES	No	X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	07/22/96	08/05/98	Not Accepted	\$250.00
2nd Submittal	08/27/98	09/09/98	See Comments Below	\$250.00
TOTAL FEES				\$500.00

REMARKS:**2nd Submittal, Addendum**

The Drainage Study for the subject project has been reviewed and:

	is acceptable in concept subject to conformance to all City standards and the following conditions.
X	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence

1. This project is adjacent to and proposes work within Clark County corporate limits, therefore Clark County concurrence is required prior to final acceptance of the drainage study.
2. The grading plans must be revised to show the proposed improvements for Spring Mountain Ranch to the south. The proposed improvements at the intersection of Horse Drive and Homestead Street must also be clearly shown on the plans. Appropriate flowline and finish grade elevations for the valley gutter and trail must be shown through the vacated area of Horse Drive. Sufficient detail must also be included at the entrance and outlet of the drainage channel.
3. This project is impacted by (2) major washes that cross Homestead Street. The existing wash just north of Horse Drive is being perpetuated through the project. However the wash just south of Brent Lane will be cut off once the Homestead Street is constructed. The homes that face Homestead Street must be protected with a 2 foot high stem wall at the property line. The footing must be a minimum of 2 feet below the adjacent street grade and be a minimum of 12 inches thick.
4. The typical cross section for Brent Lane on sheet DET 1 does not match the grading plan. The stem wall and 'L' curb must be shown on the plan. The stem wall along Brent Lane must be minimum of 2 feet above the back of curb and be solid grouted. An 8 foot valley gutter must be provided across Homestead Street along the south side of Brent Lane.
5. It appears that Homestead Street is to be raised above the existing grade near the high point at Guy Avenue by approximately 1.5 to 2 feet. It does not appear that positive drainage will not be

maintained at this location. The engineer must review and revise accordingly. The design of this street must be coordinated with Land Development prior to resubmitting the drainage study.

6. The low point at station 21+46 in Homestead Street must be made an 8 foot concrete cross gutter. The cross gutter must be flared at a 45° angle as it matches into the entrance of the drainage easement.
7. The engineer must provide centerline and flowline elevations at every 100 feet along the Brent Lane, Homestead Street, and Durango Drive. Drainage swales must be provided adjacent to the half street improvements.
8. A typical cross section must be provided for Homestead Street. Cross Section B on sheet DET 1 is for Brent Lane only.
9. Cross gutters are not accepted across 80 and 100 foot right-of-ways, the cross gutter across Durango Drive must be removed. Nuisance flows will be picked up by the bubbler / drop inlet system at the intersection of Brent Lane and Durango Drive.
10. The engineer must review and revise the finish floor elevation for lot 46.
11. A normal depth calculation was done for Prayer Avenue which revealed that D X V values for street cannot be met for certain reaches during a 100 year storm event. The subdivision must be redesigned to meet CCRFCD criteria. It recommended that the engineer provided a flow split so these flows are not concentrated on one roadway. Solid grouted stem walls must be provided along these major flow paths. The stem walls must provide at least 8 inches of freeboard above the 100 year water surface elevation. It is also recommended that an additional drainage easement be provided at the southeast corner of the project to convey these flows to Durango Drive.
12. An additional modified Type 'C' drop inlet must be provided at the along Brent Lane just west of the sidewalk ramp in order to collect flows on Brent Lane.
13. The interior streets that convey off-site flows must be labeled as Public Drainage Easements to be Privately Maintained and granted as such by the final map.

END OF REMARKS
gam

T/R/S: 19/60/08
AREA G-08

Department of Public Works

Mission Statement As "Partners in Progress" our mission is to construct, improve, and maintain the County infrastructure as well as to provide critically needed community services which promote the health, safety and convenience of the general public."



500 S. Grand Central Parkway
PO Box 554000
Las Vegas, NV 89155-4000
(702) 455-6000
Fax: (702) 455-6040

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E-Mail: mmj@ccclark.nv.us

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Urban C. Livingston, Jr.
(702) 455-6003
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Las Vegas, NV 89122
(702) 455-7340
E-Mail: jnm@ccclark.nv.us

December 16, 1998

CVL Consultants, Inc.
4175 Cameron Street, Suite A
Las Vegas, Nevada 89103

CLARK COUNTY CONCURRENCE: TECHNICAL DRAINAGE STUDY FOR MYSTIC VALLEY - SEC. 8, T. 19 S., R. 60 E. - H.T.E. 98-30302

The above-referenced development is located in the City of Las Vegas adjacent to Clark County unincorporated areas. The drainage study was submitted to the County for concurrence. The County has reviewed the submittal dated July 16, 1998 and addenda dated August 25, 1998, September 28, 1998 and October 20, 1998.

The County concurs with the acceptance of this drainage study by the City of Las Vegas. Please note that the County's review of this development is limited to drainage issues significant to Clark County unincorporated areas.

No liability is assumed by the County for information, data, and conclusions of the consulting engineer.

M. J. MANNING
DIRECTOR OF PUBLIC WORKS

BY Steve Parrish
STEVE PARRISH, P.E.
COMMUNITY DEVELOPMENT

PTS DL

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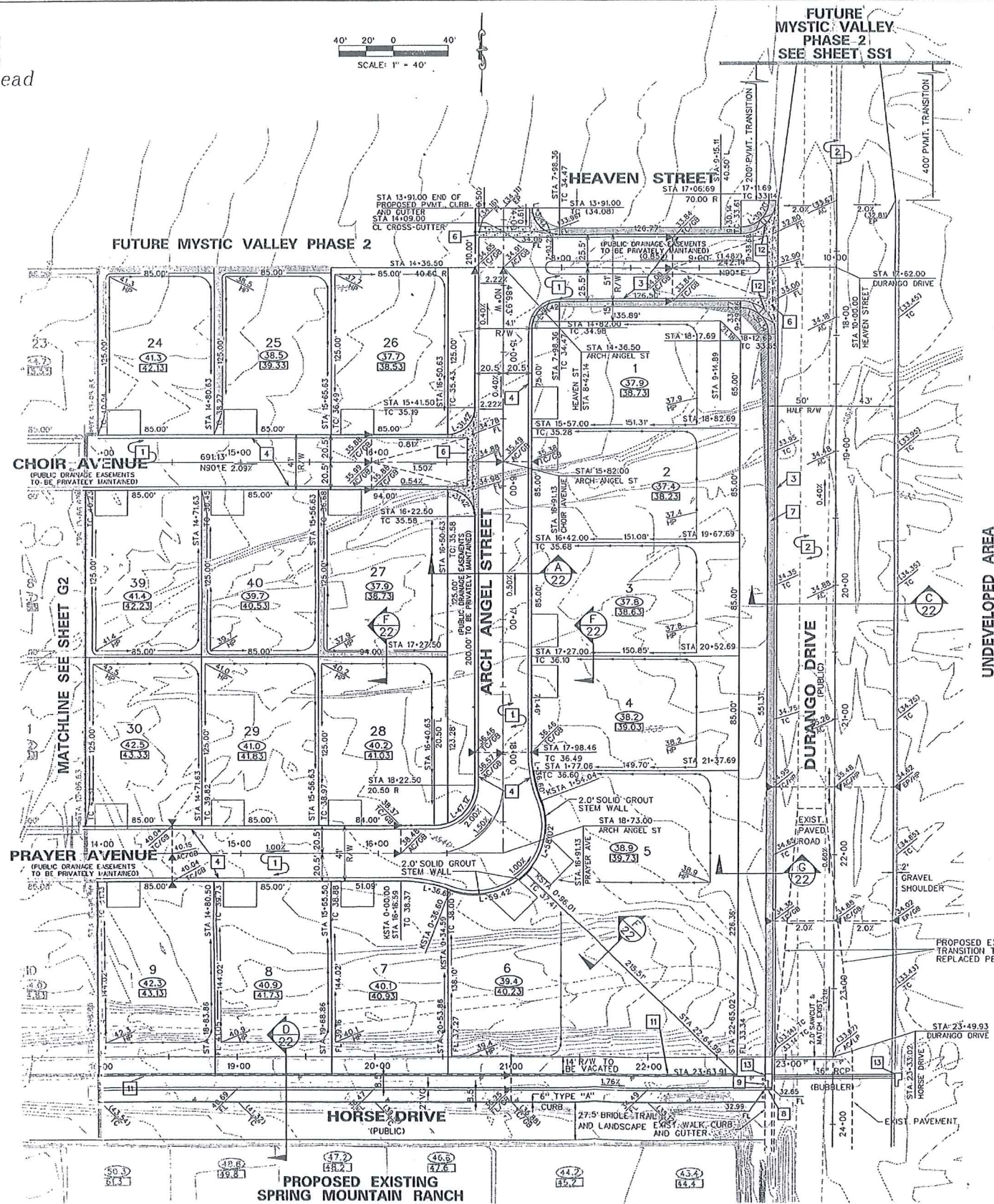
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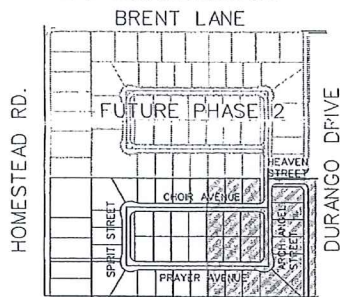


BASIS OF BEARING

NORTH 0015'13" EAST, BEING THE BEARING OF THE EAST LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 8, TOWNSHIP 19 SOUTH, RANGE 60 EAST, W.D.M. CLARK COUNTY, NEVADA AS SHOWN ON THE MAP IN FILE 87, OF SURVEYS, PAGE 83, OFFICIAL RECORDS OF CLARK COUNTY, NEVADA.

BENCHMARK

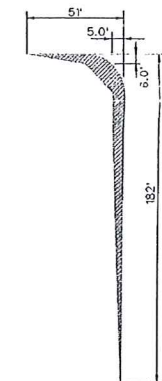
C.L.V. BENCHMARK: 1LV90-BNES
BLM BRASS CAP AT THE INTERSECTION OF
DURANGO DRIVE AND IRON MOUNTAIN ROAD
NAVD 1988 ELEV 7719689 METERS (2532.70 FEET)



HORSE DRIVE
LOCATION MAP

GRADING CONSTRUCTION NOTES

- 1 CONSTRUCT 2" AC PAVING OVER 4" TYPE II BASE ON 5" TYPE IBEASE PER STANDARD DWG. NO. 205.
- 2 REMOVE EXISTING PAVING AND CONSTRUCT 4" AC PAVING OVER 4" TYPE II BASE ON 6" TYPE IBEASE PER C.C. STD. DWG. #206.
- 3 CONSTRUCT "L" TYPE CURB PER CLARK COUNTY AREA STD. DWG. 216
- 4 CONSTRUCT 30" ROLL CURB PER DETAIL
- 5 CONSTRUCT RETAINING WALL PER CITY OF LAS VEGAS DEPT OF BUILDING AND SAFETY STANDARDS
- 6 CONSTRUCT 8" WIDE CROSS GUTTER PER CLARK COUNTY AREA STD. DWG. NO. 228
- 7 CONSTRUCT 4" THICK CONCRETE SIDEWALK PER CLARK COUNTY AREA STD. DWG. NO. 234.
- 8 CONSTRUCT SIDEWALK UNDERDRAN PER CLARK COUNTY AREA STD. DWG. NO. 236.
- 9 INSTALL REMOVABLE BOLLARDS
- 10 INSTALL WROUGHT IRON GATE
- 11 CONSTRUCT FLOOD WALL PER CITY OF LAS VEGAS DEPT. OF BUILDING AND SAFETY STANDARDS
- 12 CONSTRUCT SIDEWALK RAMP PER CLARK COUNTY STD. DWG. NO. 235, CASE II.
- 12 CONSTRUCT MODIFIED TYPE "C" DROP INLET OPENING 1' H, 1' GRATE - 12"



TYPICAL SITE VISIBILITY ZONE

**GRADING PLAN
(EAST HALF)**

4175 Cameron Street
Suite A
Las Vegas, NV 89103
Tel: (702) 368-3006
Fax: (702) 368-0047

EVL
CONSULTANTS, INC.
ENGINEERING PLANNING LAND

GRADING PLAN
(EAST HALF)

MYSTIC VALLEY
PHASE I

SHEET

TITLE

DESIGNED BY:
DRAWN BY:
S. HOWELL, W. KIM

CHECKED BY:
M. SEEBECK

SHEET
G1
7 of 22 SHEET
DRAWING NO.

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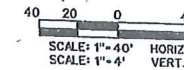
UNDEVELOPED AREA

BASIS OF BEARING

NORTH 00°15'13" EAST, BEING THE BEARING OF THE EAST LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 8, TOWNSHIP 10 SOUTH, RANGE 60 EAST, M.D.M. CLARK COUNTY, NEVADA, AS SHOWN ON THE MAP IN FILE 87, OF SURVEYS, PAGE 83, OFFICIAL RECORDS OF CLARK COUNTY, NEVADA.

BENCHMARK

C.L.V. BENCHMARK: 1190-815
BLM BRASS CAP AT THE INTERSECTION OF
DURANGO DRIVE AND RICH MONTELL ROAD
NAVD 1988 ELEV 771.959 METERS (2532.70 FEET)



GRADING CONSTRUCTION NOTES

1. CONSTRUCT 2" AC PAVING OVER 4" TYPE II BASE ON 6" TYPE I BASE PER STANDARD DWG. NO. 208.
2. CONSTRUCT 2" AC PAVING OVER 4" TYPE II BASE ON 6" TYPE I BASE PER C.C. STD. DWG. *205.
3. CONSTRUCT "L" TYPE CURB PER CLARK COUNTY AREA STD. DWG. 216.
4. CONSTRUCT 30" ROLL CURB PER DETAIL.
5. CONSTRUCT RETAINING WALL PER CITY OF LAS VEGAS DEPT. OF BUILDING AND SAFETY WALL DETAIL MAS-6 AND MAS-7.
6. CONSTRUCT 8" WIDE CROSS GUTTER PER CLARK COUNTY AREA STD. DWG. NO. 228.
7. CONSTRUCT 4" THICK CONCRETE SIDEWALK PER CLARK COUNTY AREA STD. DWG. NO. 234.
8. CONSTRUCT SIDEWALK UNDERDRAIN PER CLARK COUNTY AREA STD. DWG. NO. 236.
9. INSTALL REMOVABLE BOLLARDS.
10. INSTALL WROUGHT IRON GATE.
11. CONSTRUCT FLOOD WALL PER CITY OF LAS VEGAS DEPT. OF BUILDING AND SAFETY STANDARDS.
12. CONSTRUCT MODIFIED TYPE "C" DROP INLET OPENING L = 14', GRATE = 12'.

RICHMOND AMERICAN HOMES OF NEVADA, INC.

4175 Cameron Street
Suite 100
Las Vegas, NV 89103
Tel: (702) 368-3008
Fax: (702) 368-0047

RICHMOND AMERICAN HOMES OF NEVADA, INC.
1250 WEST PACE AVE. STE. 212
LAS VEGAS, NV 89103
(702) 368-3000

GRADING PLAN
(EAST HALF)

MYSTIC VALLEY
PHASE II

SHEET

9/28/98

9/28/98

9/28/98

9/28/98

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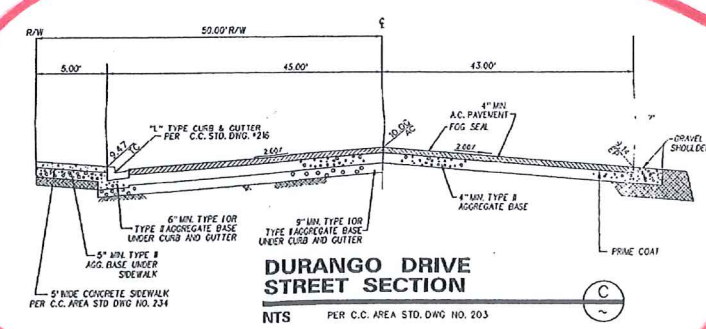
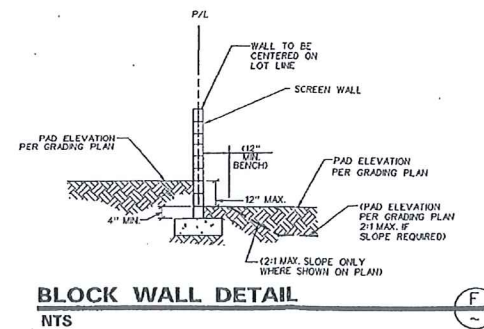
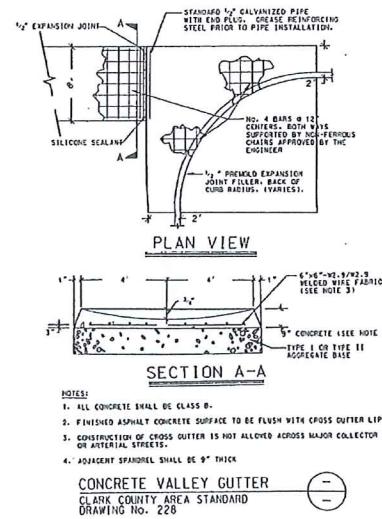
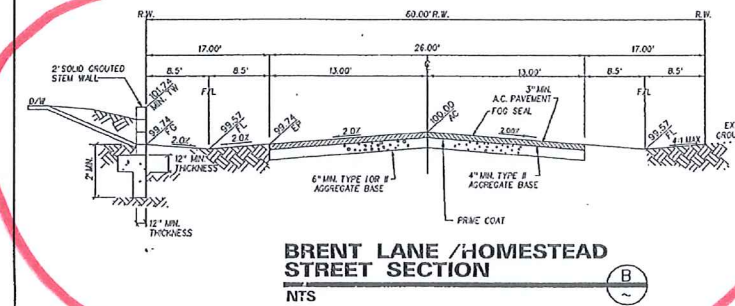
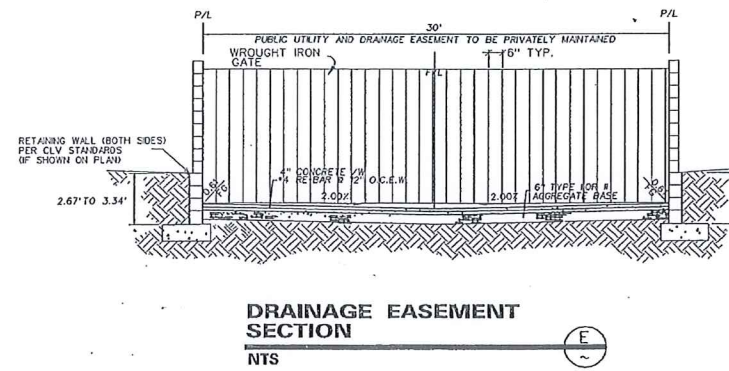
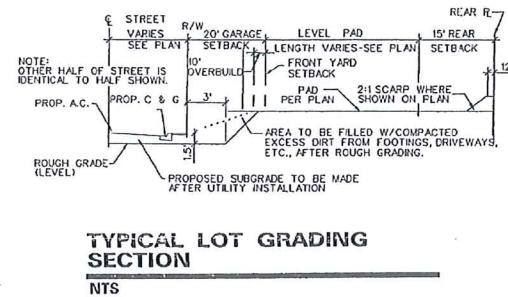
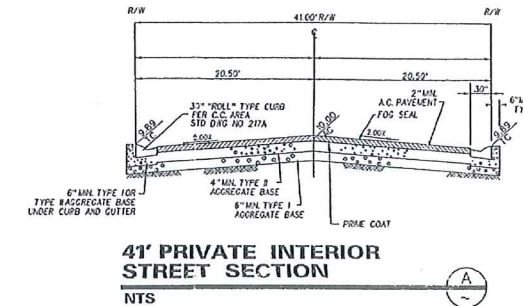
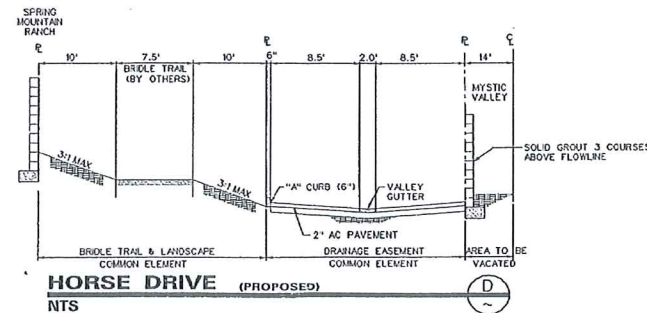
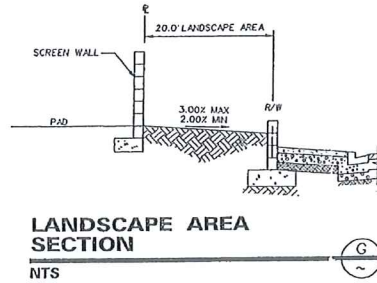
9/28/98

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Fax: (702) 368-0047

CONSULTANTS, INC.

DESIGNING BUILDING

TYPICAL STREET
SECTIONS AND DETAILS

MYSTIC VALLEY
PHASE I

SHEET
D1

22 of 22 SHEETS

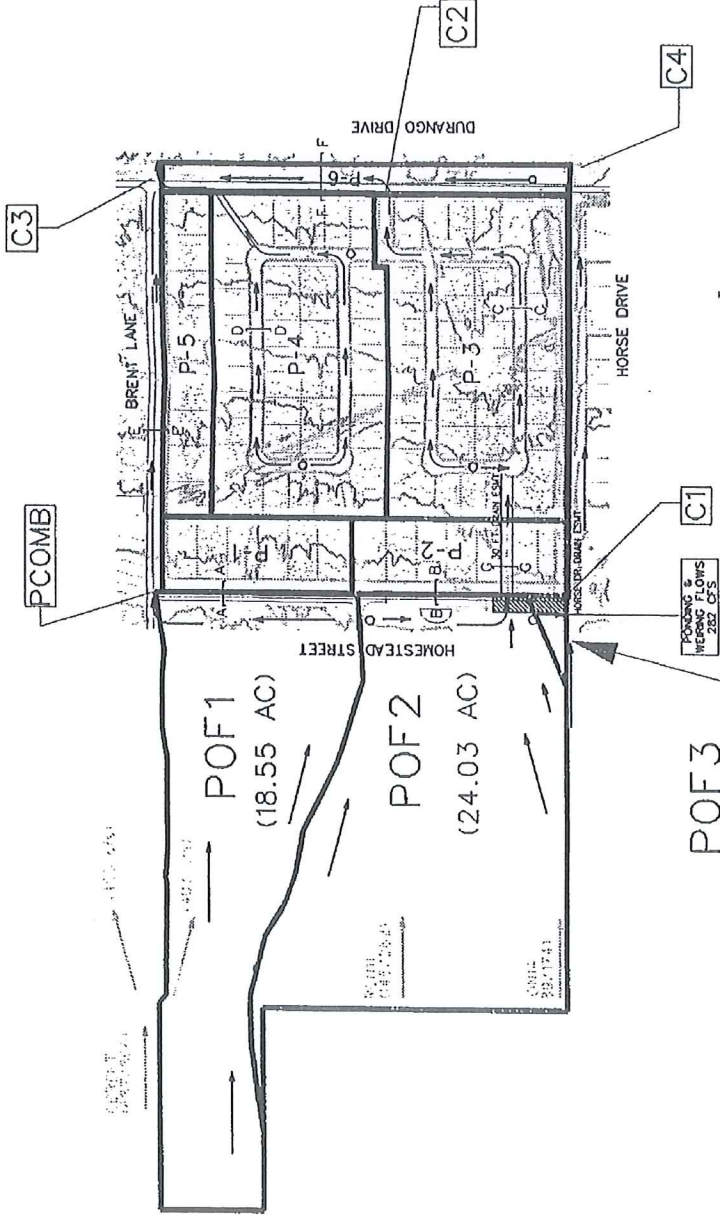
DRAWN BY: J. SERRANO
DESIGNED BY: J. SERRANO
CHECKED BY: M. SEEBECK
PROJECT NO: 98-8031-03
SCALE: 1"=40' HORIZ.
DATE: 9/28/98
9/28/98

SEAL

ENGINEER

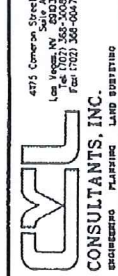
CLARK COUNTY

9/28/98



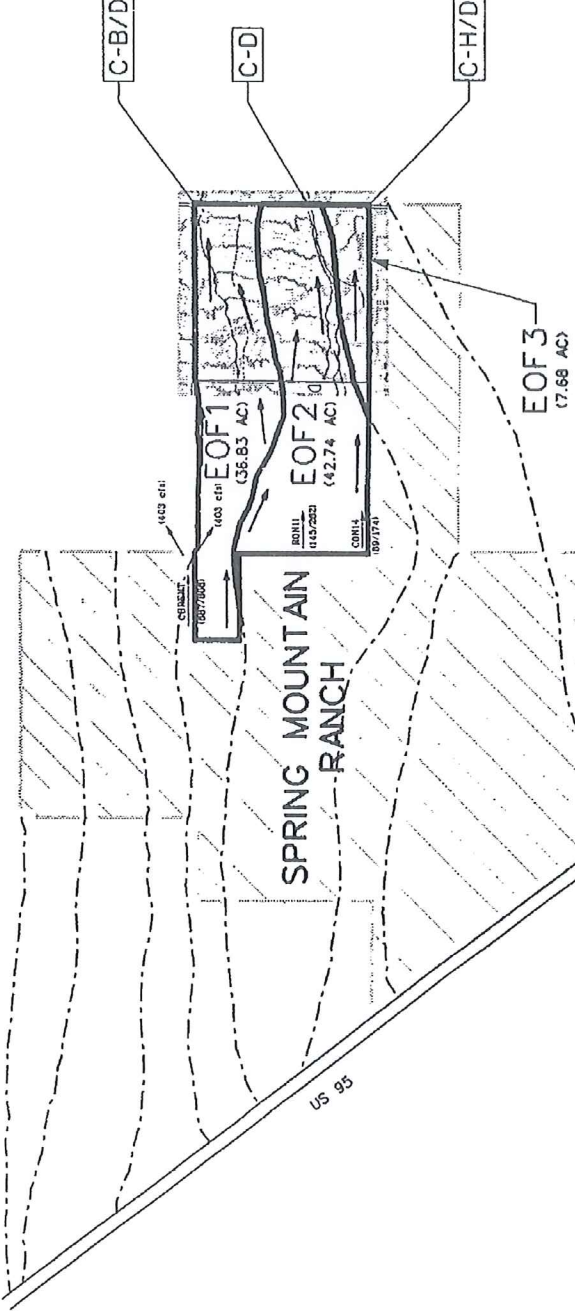
LEGEND:
A—A CROSS SECTION USED FOR STREET FLOW CALC.
C1 CONCENTRATION POINTS
P-1 ONSITE BASIN DESIGNATIONS
— FLOW PATH
— EXISTING RUNOFF PRODUCED BY SPRING MOUNTAIN RANCH
O HIGH POINT LOCATIONS

RESULTANT FLOW (cfs)		
	Q10	Q100
P1	2	7
P2	3	9
P3	11	32
P4	10	31
P5	3	8
P6	4	9
C1	235	502
C2	103	241
C3	448	711
C4	134	283
PCOMB	346	444
POF1	11	35
POF2	14	45
POF3	0	1



PROJECT No. 98-90-3102
SCALE N.T.S.
DATE 6/98
DRAWN BY M.R.B.

MYSTIC VALLEY
PROPOSED (INTERIM)
CONDITIONS
FIGURE 7



LEGEND:
EOF1 OFFSITE BASIN DESIGNATIONS
C-D CONCENTRATION POINTS
— FLOW PATH
— EXISTING RUNOFF PRODUCED BY SPRING MOUNTAIN RANCH

RESULTANT FLOW (cfs)		
	Q10	Q100
EOF1	16	57
EOF2	19	64
EOF3	2	10
C-B/D	345	458
C-D	152	333
C-H/D	91	191



PROJECT No. 98-90-3102
SCALE N.T.S.
DATE 6/98
DRAWN BY M.R.B.

MYSTIC VALLEY
EXISTING CONDITIONS
FIGURE 6

Spring Mountain Ranch, VTN

CITY OF LAS VEGAS		DATE: May 14, 1997
INTER-OFFICE MEMORANDUM		
TO: Dan Bender Land Development Services Department of Public Works		FROM: Dennis W. Spensky, P.E. Flood Control Project Manager Department of Public Works
SUBJECT: Drainage Study for: Spring Mountain Ranch Units 1-49		COPIES TO: VTN Nevada Spring Mountain Ranch LLC John McNellis, PE NDOT CCPW (Robert Thompson, P.E.)
FILE NO.	H:\DEPOT\DS\DS2005D.DOC	
FEMA Flood Zone	YES No X	
Proposed Storm Drain	YES X No	

Not Acceptable	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	01/22/97	02/3/97	Not Acceptable	\$250.00
2nd Submittal	02/27/97	03/14/97	Not Acceptable	\$250.00
3rd Submittal	04/14/97	04/18/97	Not Acceptable	\$250.00
4th Submittal	05/08/97	05/12/97	See Below	\$250.00
			TOTAL FEES	\$1000.00

REMARKS:

The Drainage Study for the subject project has been reviewed and:

X	is acceptable in concept subject to conformance to all City standards and the following conditions.
	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence

1. A maintenance and liability agreement and bond must be provided to Land Development for the diversion berms as shown on sheets 12 and 14. No building permits will be issued for **Reindeer Lake Street** or **lots 986 to 1004 and 1212 to 1213** until a permanent solution is found to divert the flows from the west. Berms 1 and 2 drain to the angle point on lot 1003, this point is in a sump condition (45.37 BF). The top and toe elevations for these berms must be revised so that positive drainage is maintained.
2. The limits of the temporary Public Drainage Easements across the two rough graded commercial lots must be shown on the grading plan. The easement documents must be filed with City of Las Vegas Right-of-Way prior to recording the Final Map.
3. The following private streets convey off-site flow and must be granted by the final maps as Public Drainage Easements to be Privately Maintained: **Reindeer Lake Street, Loggers Mill Street, Wind Warrior Avenue, Wolf Dancer Avenue, Teetering Rock Street, Poplar Ridge Street, Hayloft Street, Silversmith Street, Pine Mission Avenue, Big Plantation Avenue, Red Rain Street, Smoke House Road, Muffled Creek Street, Fetlock Street, Harness Hitch Avenue, SheepHerder Street, Hunting Arrow Avenue, and Wind Duster Street.**
4. Section B of the (3) existing 36" RCP's on sheet 14 must be revised. The existing invert elevations of the culverts are 94.48, but the proposed top of curb elevation is only 96.85 a

difference of only 2.37'. Either the existing culverts must be removed and replaced at a lower elevation or El Capitan must be regraded to accommodate these existing pipes.

5. As previously stated, the valley gutter across Racel Street near El Capitan Way as shown on sheet 4 will not be allowed and must be removed from the plan. An additional drop inlet must be provided at this same intersection on the north side of Racel Street west of El Capitan Way.
6. The drainage easement sections as shown on sheets 9, 10 and 14 must be revised so the first (4) courses of the block walls are solid grouted.
7. As previously requested 6" bleeder lines must be provided for all storm drain bubbler systems. The drop inlets on Horse Avenue and Meisenheimer Avenue west of El Capitan Way on sheet 1 and the drop inlets at Long Rifle Avenue and Brent Lane east of Fort Apache Drive on sheets 7 and 10 must have 6" bleeder lines to drain nuisance flows. The bleeder line near the intersection of Ackerman Avenue and El Capitan Way must be revised so the line discharges into existing right-of-way.
8. The cross section for Meisenheimer Avenue west of El Capitan Way on sheet 4 and Long Rifle Avenue as shown on sheet 11 must be revised. The stem walls at back of sidewalk will not be required as homes will front these streets.
9. The block wall on the west side of Sheepherder Street as shown on sheet 4 must be removed to match the street section as shown on sheet 16. A 16"X48" wall opening may be constructed at this low point to drain water from this low spot.
10. The street sections for Meisenheimer Avenue east of El Capitan Way, Racel Street, El Capitan Way, Horse Avenue west of El Capitan Way, Brent Lane, Fort Apache Drive must be revised so the stem wall is constructed with a minimum of a 12" thick footing.
11. The street section for Long Rifle Avenue as shown on sheet 7 must be revised to a 51 foot public street section to match the plan.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the City of Las Vegas Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction.

PLANS SENT TO LAND DEVELOPMENT

YES

(initial)

END OF REMARKS

gam

T/R/S: 19S/60E/07
AREA G-07

BENCHMARK
CLV BU NO. 2, STATION 1150.71215
BLU BRASS CAP AT DURANGO DRIVE
AND GRAND RIFLE DRIVE
(TYP. SEC. 3 MAX. B-101)
ELEVATION = 2541.292 FEET (NAVD83)

SECTION C

SECTION D

SECTION E

SECTION F

SECTION G

SECTION H

SECTION I

SECTION J

SECTION K

SECTION L

SECTION M

SECTION N

SECTION O

SECTION P

SECTION Q

SECTION R

SECTION S

SECTION T

SECTION U

SECTION V

SECTION W

SECTION X

SECTION Y

SECTION Z

SECTION AA

SECTION AB

SECTION AC

SECTION AD

SECTION AE

SECTION AF

SECTION AG

SECTION AH

SECTION AI

SECTION AJ

SECTION AK

SECTION AL

SECTION AM

SECTION AN

SECTION AO

SECTION AP

SECTION AQ

SECTION AR

SECTION AS

SECTION AT

SECTION AU

SECTION AV

SECTION AW

SECTION AX

SECTION AY

SECTION AZ

SECTION BA

SECTION BB

SECTION BC

SECTION BD

SECTION BE

SECTION BF

SECTION BG

SECTION BH

SECTION BI

SECTION BJ

SECTION BK

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SECTION BM

SECTION BN

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SECTION BQ

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SECTION CH

SECTION CI

SECTION CJ

SECTION CK

SECTION CL

SECTION CM

SECTION CN

SECTION CO

SECTION CP

SECTION CQ

SECTION CR

SECTION CS

SECTION CT

SECTION CU

SECTION CV

SECTION CW

SECTION CX

SECTION CY

SECTION CZ

SECTION DA

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SECTION DG

SECTION DH

SECTION DI

SECTION DJ

SECTION DK

SECTION DL

SECTION DM

SECTION DN

SECTION DO

SECTION DP

SECTION DQ

SECTION DR

SECTION DS

SECTION DT

SECTION DU

SECTION DV

SECTION DW

SECTION DX

SECTION DY

SECTION DZ

SECTION EA

SECTION EB

SECTION EC

SECTION ED

SECTION EE

SECTION EF

SECTION EG

SECTION EH

SECTION EI

SECTION EJ

SECTION EK

SECTION EL

SECTION EM

SECTION EN

SECTION EO

SECTION EP

SECTION EQ

SECTION ER

SECTION ES

SECTION ET

SECTION EU

SECTION EV

SECTION EW

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SECTION EZ

SECTION FA

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SECTION FN

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SECTION FQ

SECTION FR

SECTION FS

SECTION FT

SECTION FU

SECTION FV

SECTION FW

SECTION FX

SECTION FY

SECTION FZ

SECTION GA

SECTION GB

SECTION GC

SECTION GD

SECTION GE

SECTION GF

SECTION GG

SECTION GH

SECTION GI

SECTION GJ

SECTION GK

SECTION GL

SECTION GM

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SECTION HB

SECTION HC

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SECTION IA

SECTION IB

SECTION IC

SECTION ID

SECTION IE

SECTION IF

SECTION IG

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SECTION II

SECTION IJ

SECTION IK

SECTION IL

SECTION IM

SECTION IN

SECTION IO

SECTION IP

SECTION IQ

SECTION IR

SECTION IS

SECTION IT

SECTION IU

SECTION IV

SECTION IW

SECTION IX

SECTION IY

SECTION IZ

SECTION JA

SECTION JB

SECTION JC

SECTION JD

SECTION JE

SECTION JF

SECTION JG

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SECTION JI

SECTION JJ

SECTION JK

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SECTION JO

SECTION JP

SECTION JQ

SECTION JR

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SECTION JZ

SECTION KA

SECTION KB

SECTION KC

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SECTION LB

SECTION LC

SECTION LD

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SECTION LH

SECTION LI

SECTION LJ

SECTION LK

SECTION LL

SECTION LM

SECTION LN

SECTION LO

SECTION LP

SECTION LQ

SECTION LR

SECTION LS

SECTION LT

SECTION LU

SECTION LV

SECTION LW

NOTE: SEE SHEET NO. 6 FOR LEGEND AND GENERAL NOTES.

SEE SHEET 7

SEE SHEET 11

SEC

FILE
DETAIL

DRAINAGE EASEMENT SECTION

UNDEVELOPED

ROUGH GRADING PLAN

SPRING MOUNTAIN RANCH

**PACIFIC COMMUNITIES DEVELOPMENT
CITY OF LAS VEGAS, NEVADA**

vtm
movada

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 562-2597

MAP

GRAPHIC SCALE

1 inch = 50 ft.

[illegible][illegible]

REV	DATE	BY	REVISION
4			
3			
2			
1			

NO NO.	60889
BY	
DATE	1/ / 97
SCALE	HORIZ. 1" = 50'
SHEET	10

762-5

FEDERAL BUREAU OF INVESTIGATION
U. S. DEPARTMENT OF JUSTICE

THOMAS J. LAMONT
CIVIL

MAILED 5

APR 1964

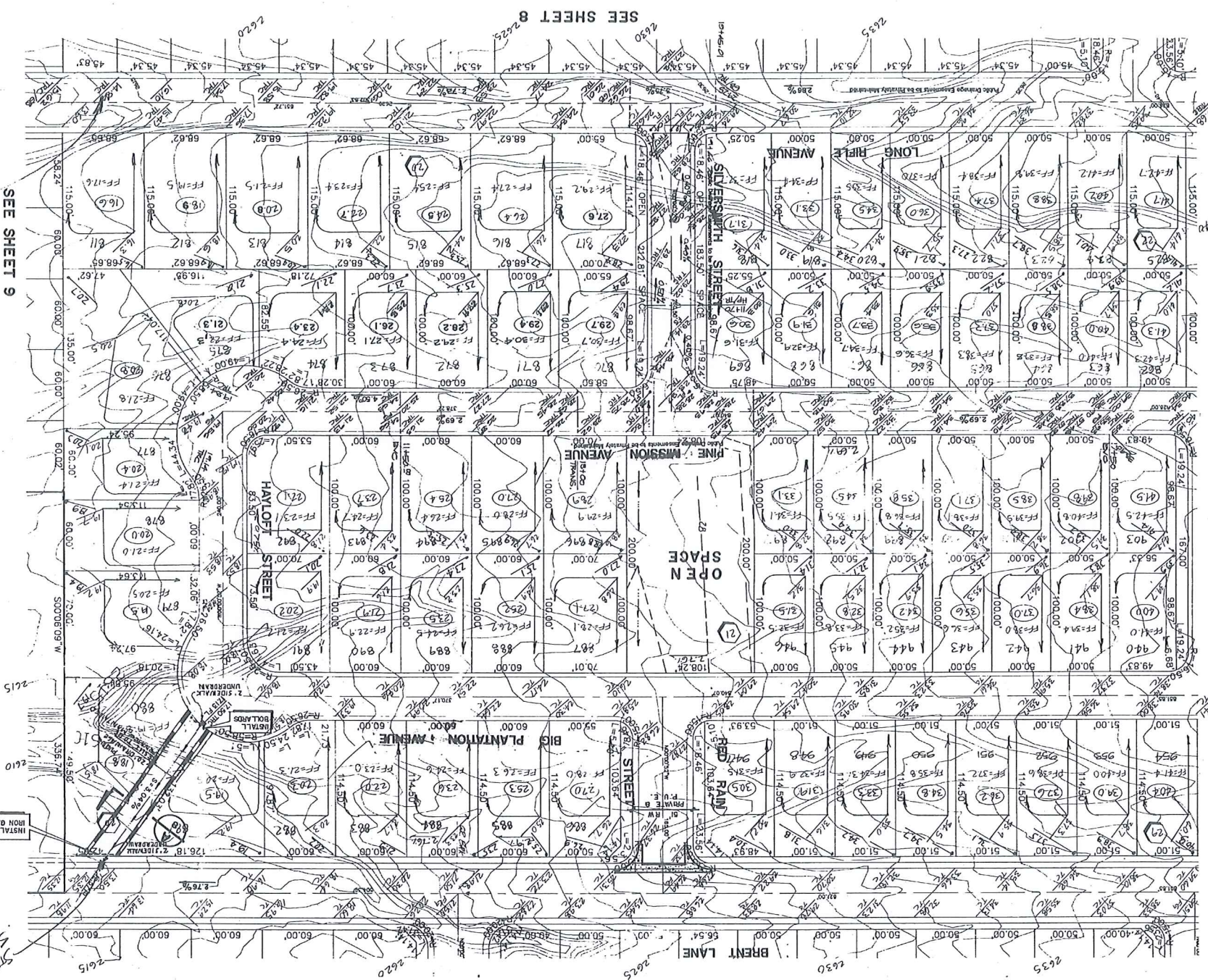
TELETYPE

[illegible]

UNDEVELOPED

W/ 3 GRATES
INV = 64.63
AND CAP
DEPRESSED,
CURB, L=10

BENCHMARK
CLY BLK No. 2, STATION 11+90.72
BLD BRASS CAP AT ORANGE DRIVE
AND GRAND TETON DRIVE
ELEVATION = 2541.392 FEET (NAD83)



NOTE: SEE SHEET NO. 6 FOR LEGEND AND GENERAL NOTES.

This grading plan is a
part of drainage study
#2005 which was received
on 5/8/97 and accepted
5/11/97.

11 OF 25 SHEETS

SCALE: HORIZ. 1" = 50'

DATE: 1/07

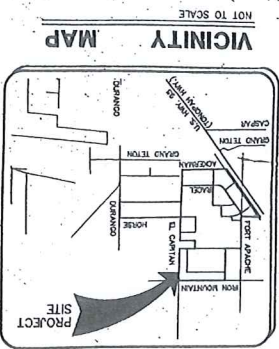
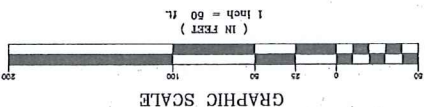
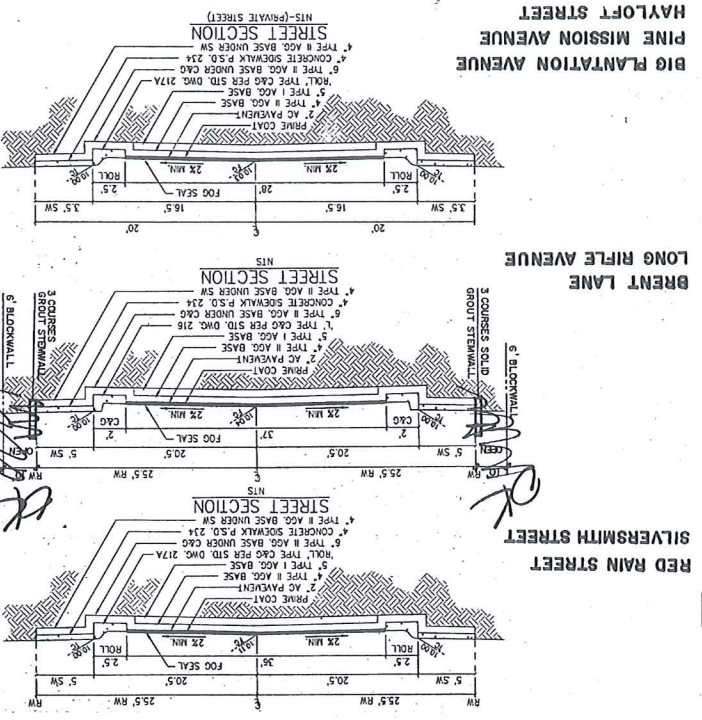
BY: [Signature]

NO. 5089

SEAL: [Professional Engineer Seal]

ROUGH GRADING PLAN

PROJECT: SPRING MOUNTAIN RANCH



PACIFIC COMMUNITIES DEVELOPMENT
CITY OF LAS VEGAS, NEVADA

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 382-2597

WTH nevada

REV	DATE	BY	REVISION

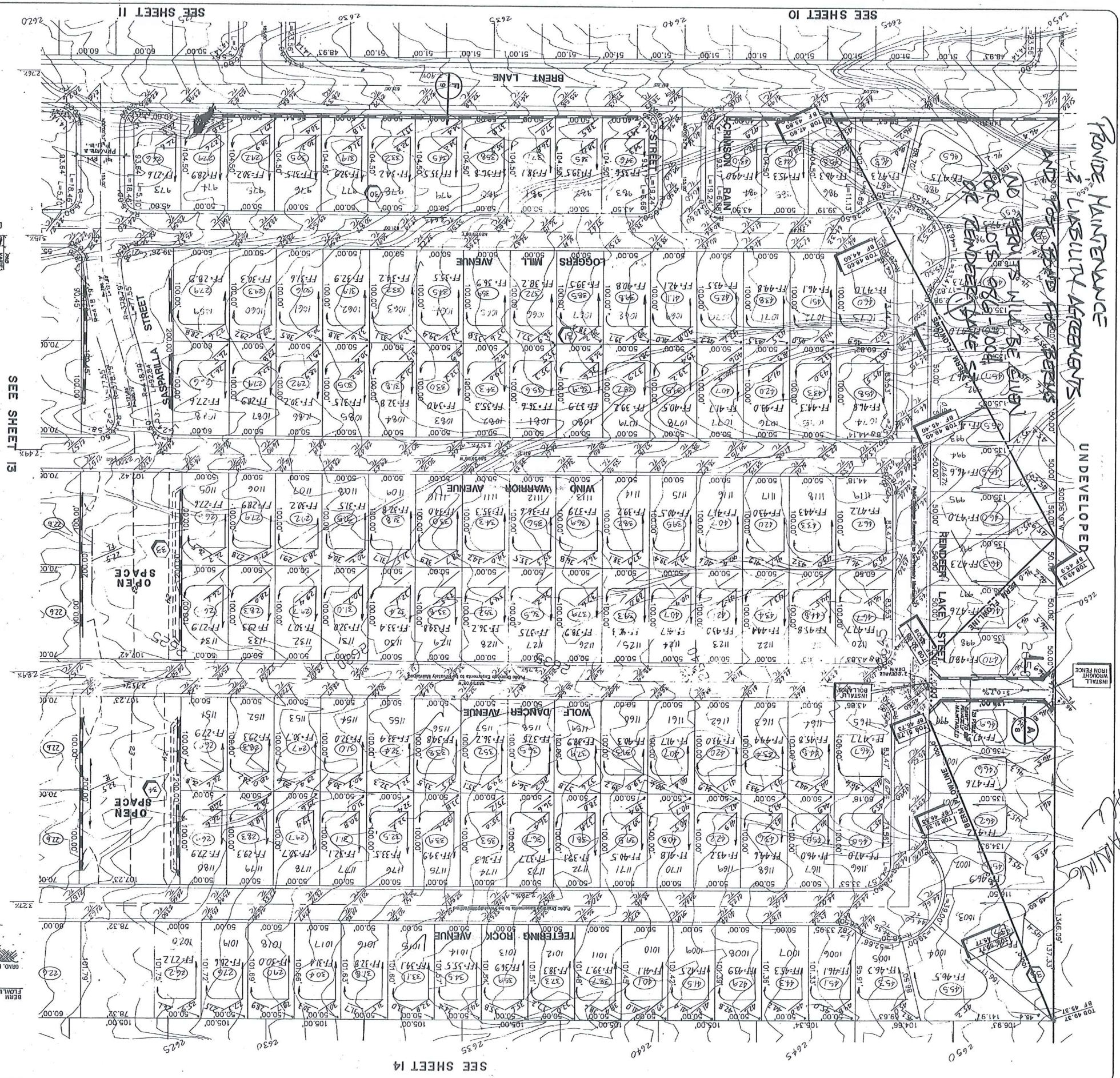
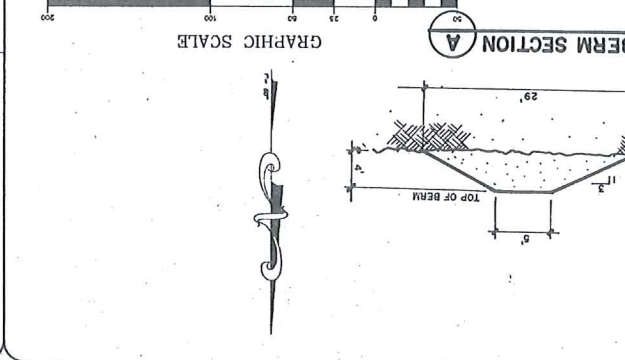
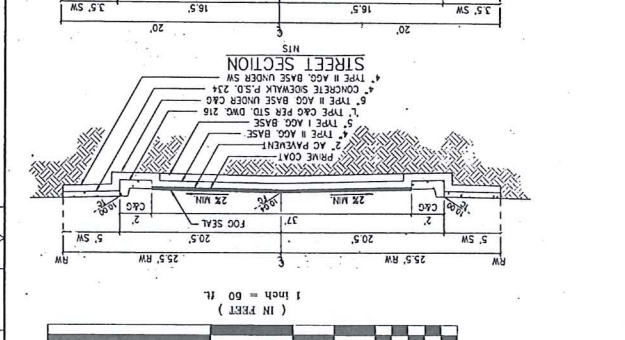
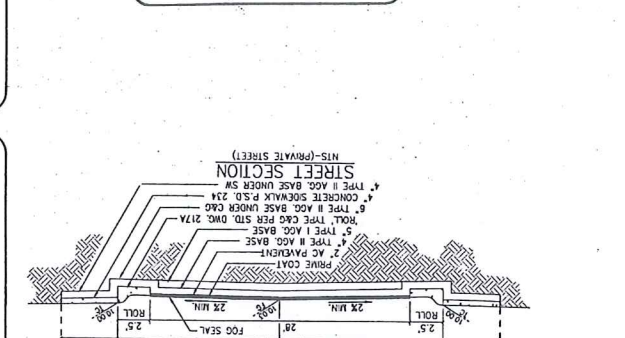
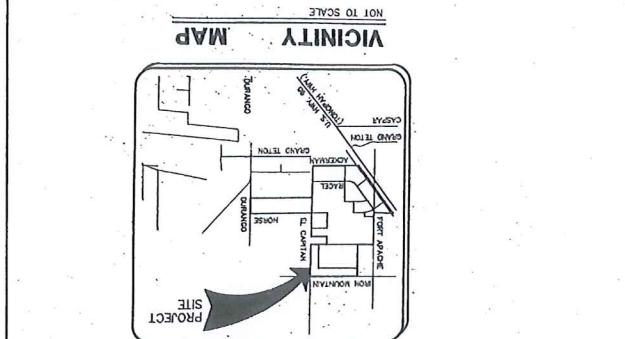
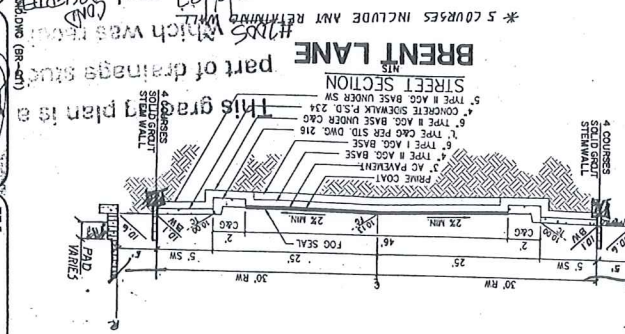
NO. 5009
DATE 1/07
SCALE 1"=50'
SHEET 12 OF 25



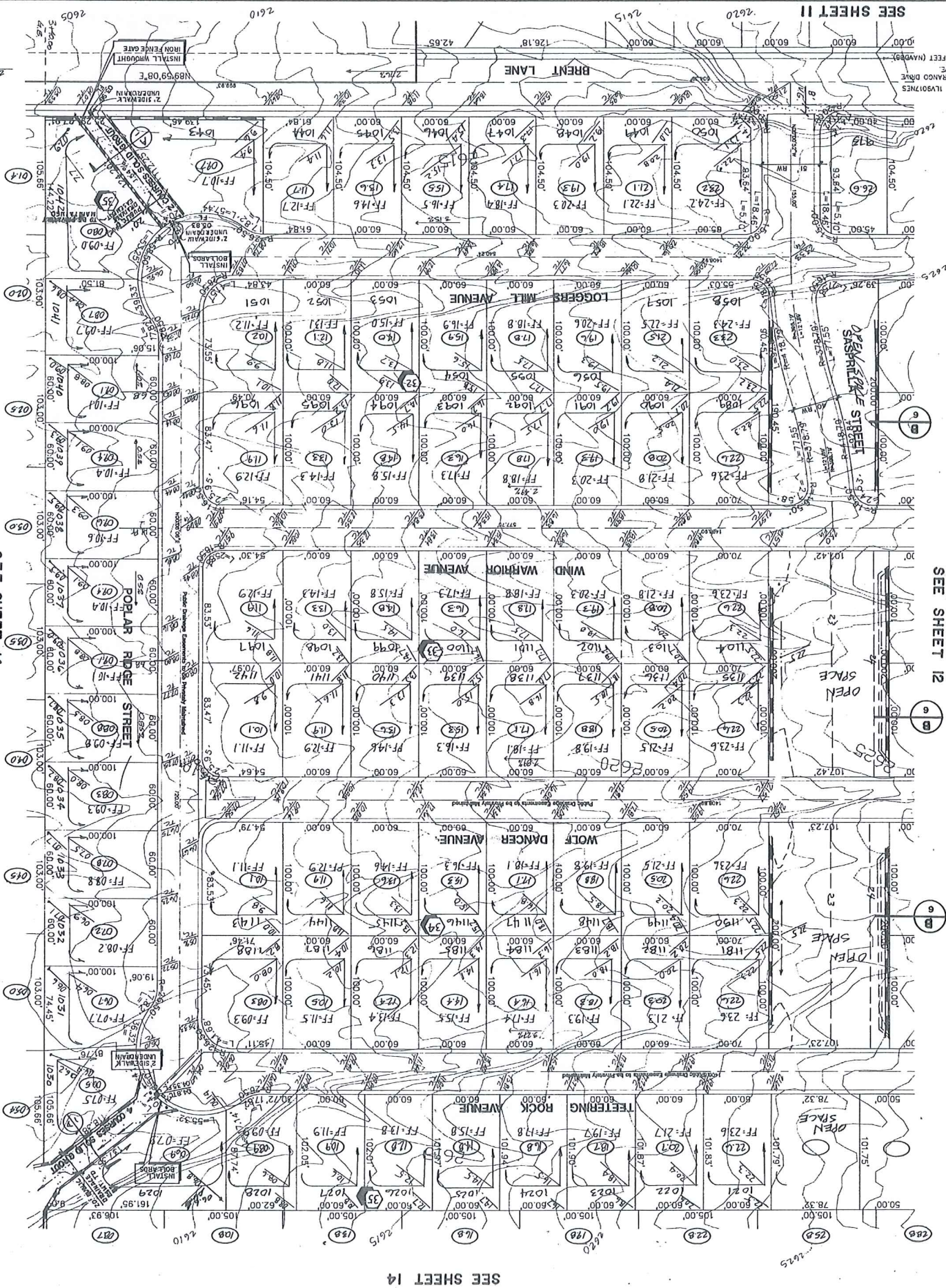
PROJECT TITLE
ROUGH GRADING PLAN
SPRING MOUNTAIN RANCH

PACIFIC COMMUNITIES DEVELOPMENT
CITY OF LAS VEGAS, NEVADA
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
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LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 352-2587

NOTE: SEE SHEET NO. 6 FOR LEGEND AND GENERAL NOTES.
#125 which was located on 5881 and 5882
#125 which was located on 5881 and 5882

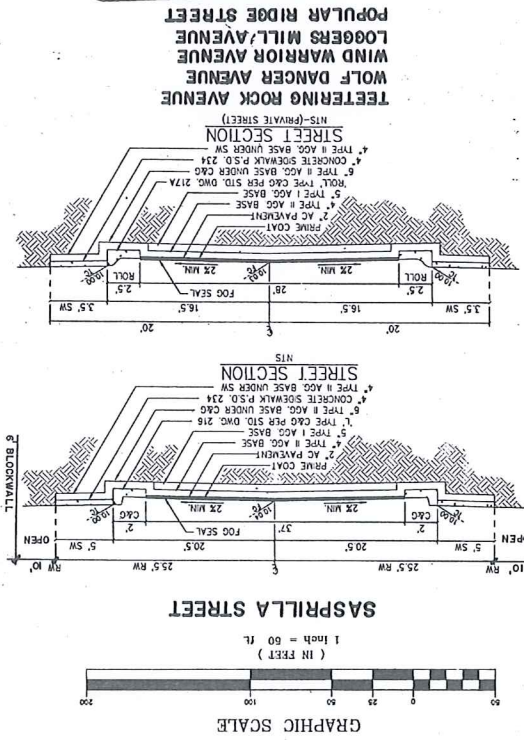
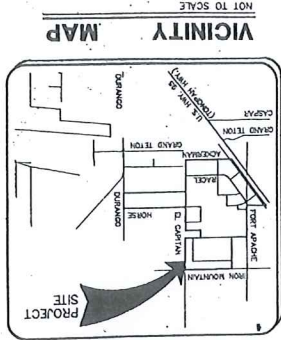
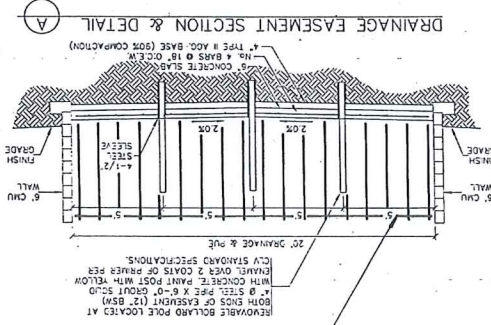


PROVIDE MAINTENANCE
UNDEVELOPED
RETHINKING
CITY



SEE SHEET 12

SEE SHEET 14



GRAPHIC SCALE
(1 INCH = 60 FT.)

NOTE: SEE SHEET NO. 6 FOR LEGEND AND GENERAL NOTES.

This grading plan is for the part of drainage easement on 5/14/97 Page 13 of 25 on 5/14/97 and accepted

NO. 6088
DATE 1/97
SCALE HORIZ. 1"=50'
VERT. 1"=10'
SHEET 13 OF 25



PROJECT
ROUGH GRADING PLAN
SPRING MOUNTAIN RANCH

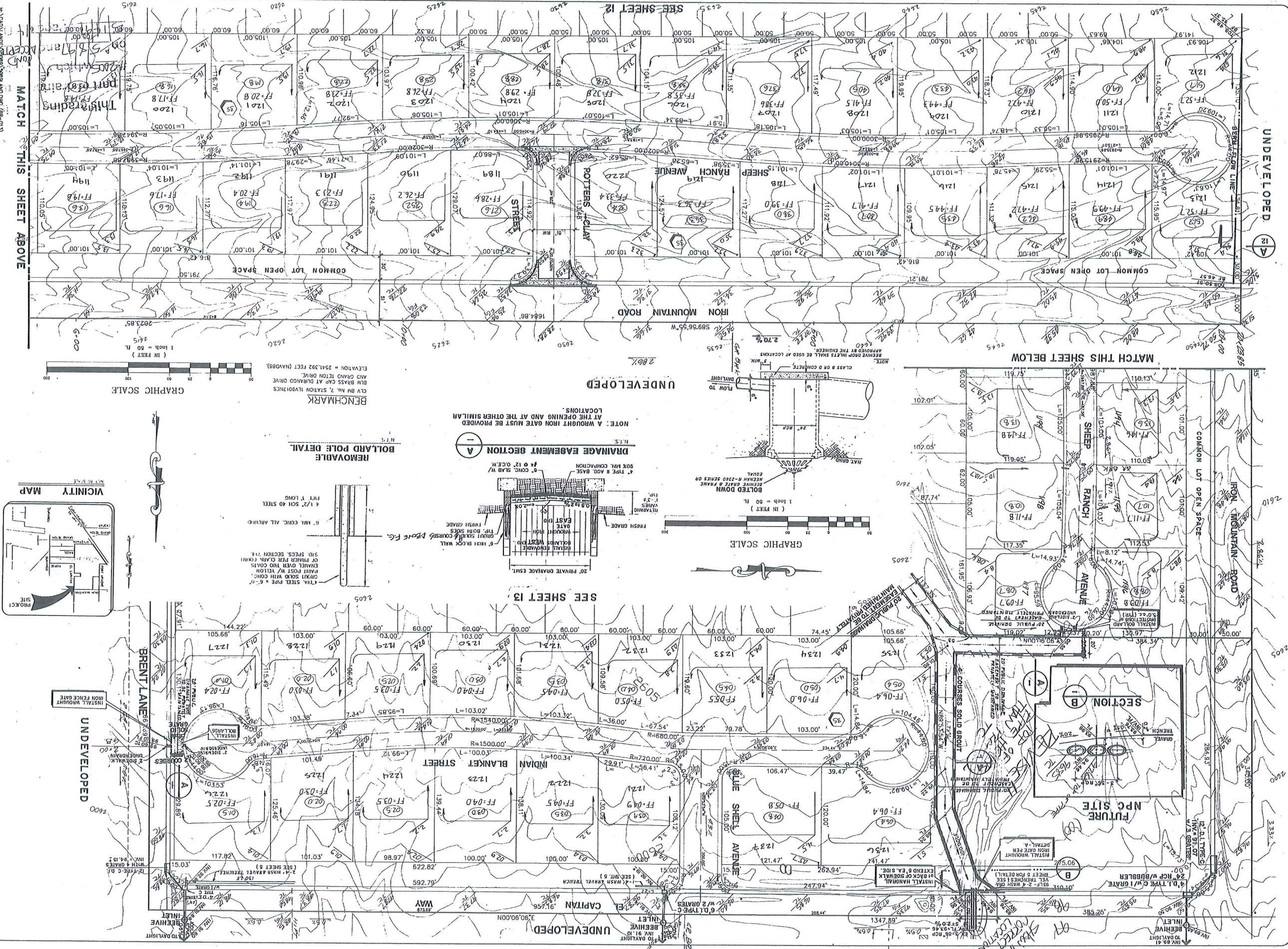
PACIFIC COMMUNITIES DEVELOPMENT
CITY OF LAS VEGAS, NEVADA
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597

SHEET
 OF 25 SHEETS
 DATE 1/07
 BY
 NO. 5086


PROJECT
 SPRING MOUNTAIN RANCH
 TITLE
 ROUGH GRADING PLAN

PACIFIC COMMUNITIES DEVELOPMENT
 CITY OF LAS VEGAS, NEVADA

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 2727 SOUTH RAINBOW BOULEVARD
 LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2997



Iron Mountain Estates by VTN

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM

DATE:

July 7, 1999

TO:

Land Development Services
Department of Public Works

FROM:

Dennis W. Bransky, P.E.
Flood Control Project Manager
Department of Public Works

SUBJECT:

Drainage Study for:
Iron Mountain Estates

Cross Streets: NW of Iron Mountain Rd. & El Capitan Way.

FILE NO. \\khan\lood\Depot\DSMEMOS\DS2476C.doc

Parcel Number: 125-05-401-001, 125-05-402-002,
125-05-403-001 & 002, 125-05-404-001

Zoning Action: Z-1440-98

FEMA Flood Zone YES No X

Proposed Storm Drain YES X No

COPIES TO:

VTN Nevada
Astoria Homes
Cheri Edelman, P.E., DevCo
Clark County Public Works
(Robert Thompson)

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1 st Submittal	04/12/99	04/26/99	Not Accepted	\$250.00
2 nd Submittal	05/26/99	06/02/99	Not Accepted	\$250.00
3 rd Submittal	06/25/99	07/01/99	See Comments Below	\$250.00
			TOTAL FEES:	\$750.00

REMARKS:

3rd Submittal (Addendum 2)

The Drainage Study for the subject project has been reviewed and:

X	is acceptable in concept subject to conformance to all City standards and the following conditions:
	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence

- The 36-inch storm drain has been provided in Iron Mountain Road as agreed, however no drop inlets are provided. As a minimum, a 20-foot type C inlet must be provided at the west end of the pipe and at the northwest corner of the intersection of Iron Mountain Road and El Capitan. Another minimum 6-foot Type C inlet must be provided west of the entrance at Shayla Falls Street. The valley gutter at Shayla Falls Street will not be necessary.
- The study identifies a high point in Fort Apache at the entrance between Lots 99 and 100 and indicates that no off-site flows will enter the site at this location. The grading in this area indicates that the high point is south of the entrance and there is a potential for off-site flows to enter the site. The flow line elevations in the valley gutter must be shown so that the flow line is the low point and the flow line grades at the entrance are higher.
- Headwall detail (15/11), shows the top of the headwall as 19.68 in the Headwall section and as 21.7 in the Front View. These elevations must be verified and revised accordingly.
- Locations for Sections 11/11 and 12/11 must be identified on the grading plans. Section 11 detail shows the flow-line for the 20-foot drainage easement offsetting from the center, while the grading plan shows the flow-line at the center of the only 20-foot wide drainage easement on Sheet G2.

5. Street names for all interior streets must be labeled on Sheet G1, G2 and G4. The match line note to the left end of Sheet G4 incorrectly states as "see Sheet G5" instead of "see Sheet G6".
6. The sidewalk under-drain at the southeast corner of Lot 47 must be labeled on the grading plan.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the City of Las Vegas Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction.

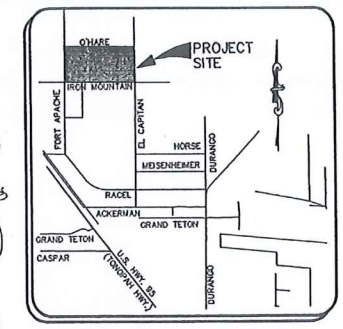
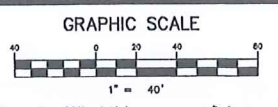
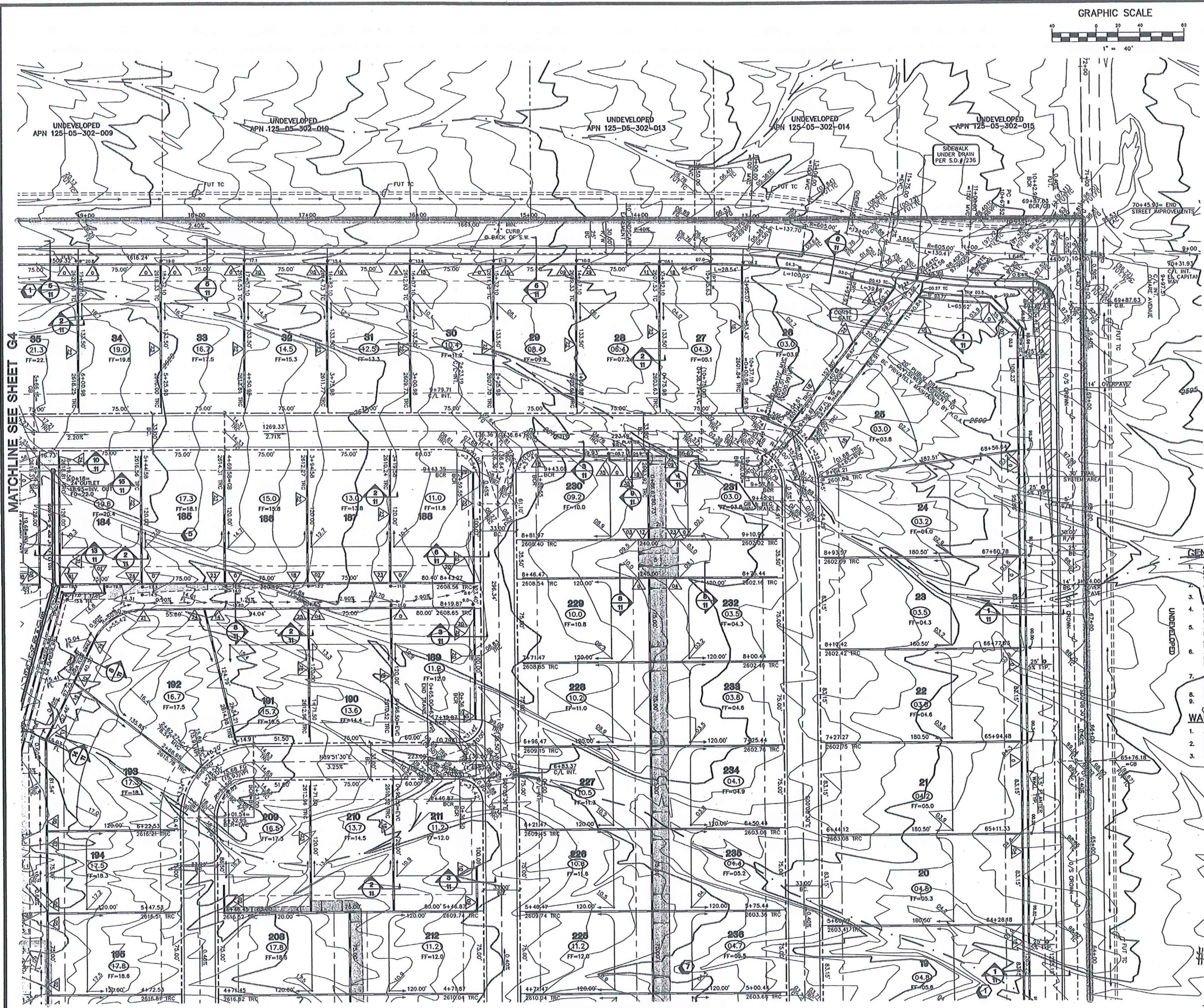
PLANS SENT TO LAND DEVELOPMENT yes (initial)

END OF REMARKS

ssn

T/R/S: 19S/60E/05

AREA G-05



NOT TO SCALE

BENCHMARK
PROJECT DATUM NAVD83
CLARK COUNTY BENCHMARK USG&S V-169
ELEVATION: 791.316 METERS (2596.17 FEET)

BASIS OF BEARING
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS
DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83),
EAST ZONE (270), DETERMINED BY CLARK COUNTY GIS CONTROL
POINTS 802,803,804, AND 805, AS SHOWN ON A RECORD OF
SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S
OFFICE, IN BOOK 88 OF SURVEYS, AT PAGE 53.

Call before you Dig
1-800-227-2600

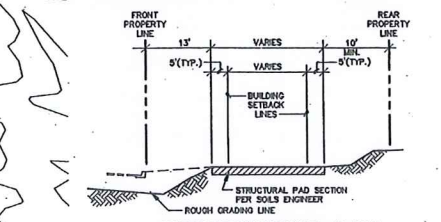
Call before you OVERHEAD
1-702-593-6111

**FOR ALL GRADING & STREET
SECTIONS SEE SHEET 12**

NOTE:
CONTRACTOR SHALL VERIFY HORIZONTAL AND
VERTICAL LOCATION OF EXISTING UTILITIES AND
NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF
ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

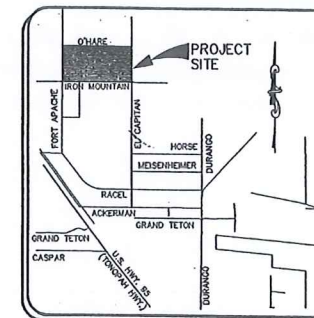
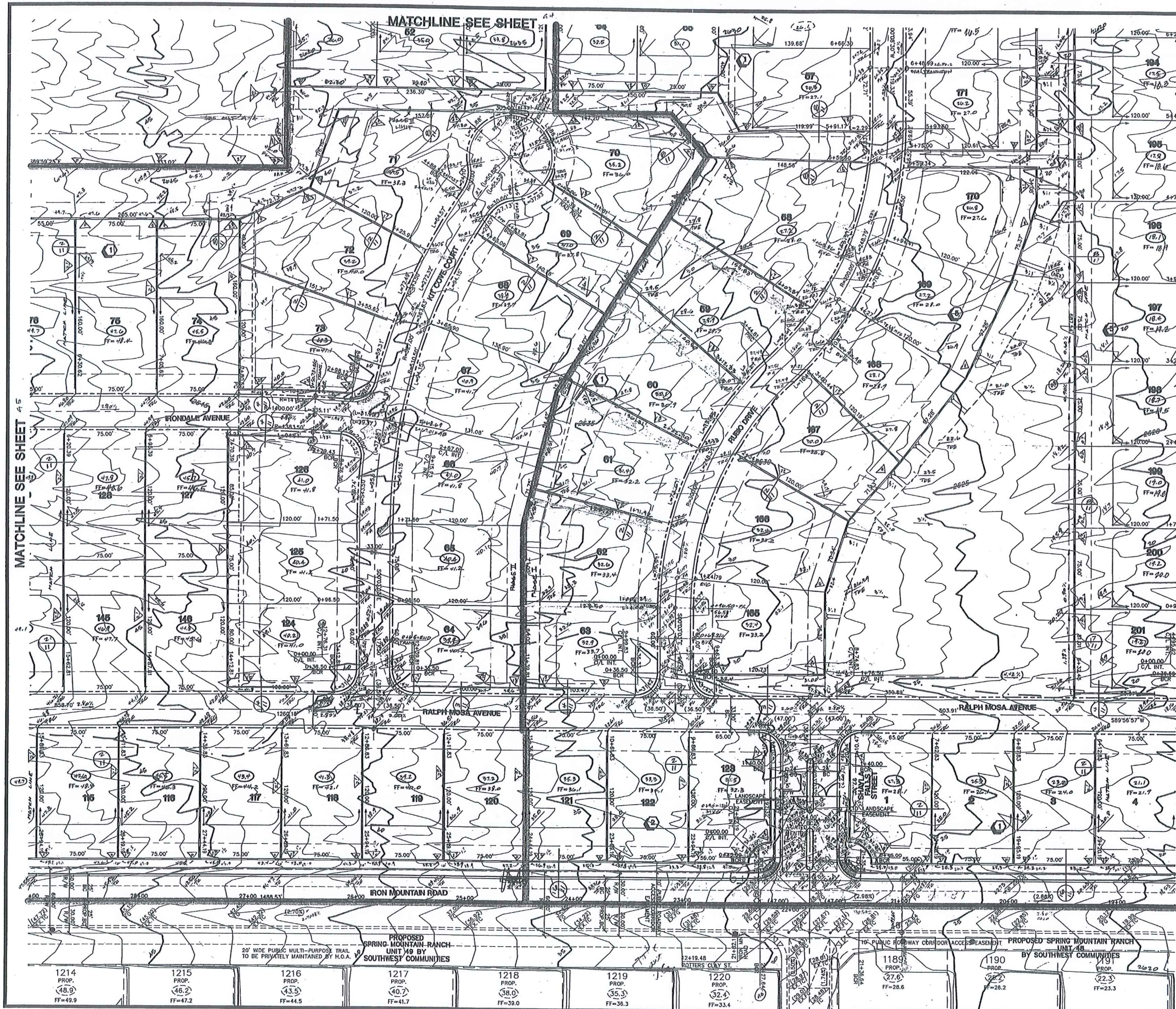
NOTE: ALL ONSITE DRIVES
ARE PRIVATELY OWNED
AND MAINTAINED.

- GENERAL NOTES**
1. ALL GRADES SHOWN HEREON ARE TO ROUGH GRADE ONLY AND ARE 0.30 FEET LOW TO ALLOW FOR LANDSCAPING EXCEPT T.C., F.L., AND F.G. WHICH ARE TO FINISH GRADES.
 2. ALL LOTS ARE TO BE F.H.A. TYPE "A" DRAINAGE UNLESS OTHERWISE NOTED.
 3. SEE IMPROVEMENT PLANS FOR STREET SECTIONS AND DETAILS. SEE FINAL MAP FOR EXACT BEARINGS AND DISTANCES.
 4. CONTRACTORS SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND SHALL REPORT ALL DISCREPANCIES TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF WORK.
 5. ALL GRADING AND SITE PREPARATION SHALL CONFORM TO THE REQUIREMENTS OF THE GEOTECHNICAL INVESTIGATION PREPARED BY: DATED: _____
 6. ALL WORK PERFORMED OUTSIDE OF THE PROJECT BOUNDARY AND ON PRIVATE PROPERTY SHALL NOT BE PERFORMED UNTIL WRITTEN PERMISSION AND EASEMENT HAVE BEEN OBTAINED FROM THE OFFSITE OWNER.
 7. ALL WORK PERFORMED WITHIN PUBLIC RIGHT-OF-WAY AND OUTSIDE OF THE PROJECT BOUNDARY SHALL BE PERFORMED UNDER A SEPARATE ENCROACHMENT PERMIT ISSUED BY THE CONTROLLING AUTHORITY.
 8. FINISH FLOOR ELEVATION = PAD ELEVATION + 0.8'
 9. ALL STATIONING ON GRADING PLAN IS CENTERLINE STATIONING UNLESS OTHERWISE NOTED.



This grading plan is a
part of drainage study
6254 which was received
on 6/25/99 and **COND.**
APPROVED on
7/7/99. Page 2 Of 11.

MATCHLINE SEE SHEET G1



LOCATION MAP
NOT TO SCALE

BENCHMARK

PROJECT DATUM HANDB

CLARK COUNTY BENCHMARK USGCS V-169
ELEVATION: 791.316 METERS (2598.17 FEET)

USGCS BRASS CAP 400 FT. SOUTH OF LAG CABIN WAY
AND 100 FT. EAST OF EL CAPITAN WAY JUST EAST OF
A BARBED WIRE FENCE.

BASIS OF BEARING

THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS
DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83),
EAST ZONE, (2701), DETERMINED BY CLARK COUNTY GIS CONTROL
POINTS 802,803,804, AND 805, AS SHOWN ON A RECORD OF
SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S
OFFICE, IN BOOK 88 OF SURVEYS, AT PAGE 53.

Avoid cutting underground
utility lines. No entry.

Avoid overhead power
line contact.

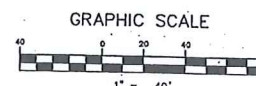
Call before you Dig
1-800-227-2800

Call before you OVERHEAD
1-702-593-6111

FOR ALL GRADING & STREET
SECTIONS SEE SHEET

NOTE:
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VERTICAL LOCATION OF EXISTING UTILITIES AND
NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF
ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

NOTE: ALL ONSITE DRIVES
ARE PRIVATELY OWNED
AND MAINTAINED.



MATCHLINE SEE SHEET

MATCHLINE SEE SHEET

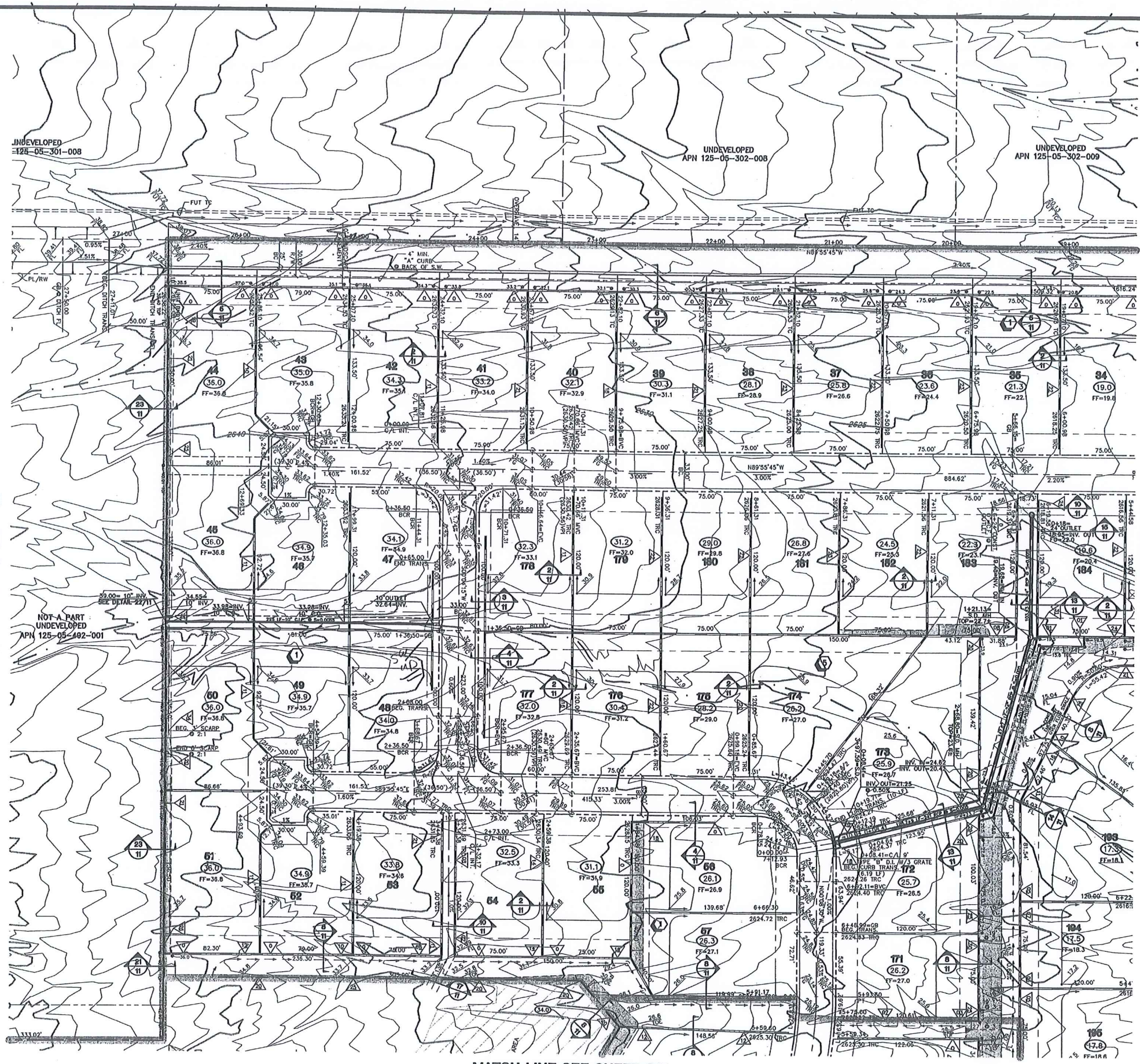
This grading plan is a
part of drainage study
2176 which was received
on 6/25/99 and ACCEPTED on
7-7-99. Page 3 Of 11.

ASTORIA LUMBER

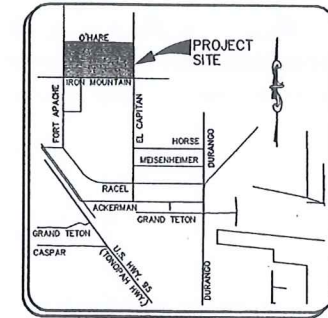
SHEET

DRAWN BY:

66
MATCHLINE SEE SHEET G5-



MATCH LINE SEE SHEET G3A



LOCATION MAP
NOT TO SCALE

BENCHMARK

PROJECT DATUM NAVD83

CLARK COUNTY BENCHMARK USCGS V-169
ELEVATION: 791.316 METERS (2596.17 FEET)

BASIS OF BEARING

THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS
DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83),
EAST ZONE, (2701), DETERMINED BY CLARK COUNTY GIS CONTROL
POINTS 802, 803, 804, AND 805, AS SHOWN ON A RECORD OF
SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S
OFFICE, IN BOOK 88 OF SURVEYS, AT PAGE 53.

Avoid cutting underground
utility lines. No contact.

Avoid overhead power
line contact.

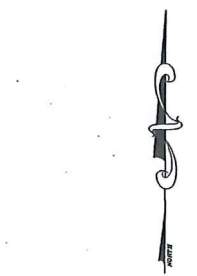
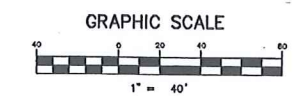
Call before you Dig
1-800-227-2600

Call before you Overhead
1-702-593-5111

FOR ALL GRADING & STREET
SECTIONS SEE SHEET 12

NOTE:
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VERTICAL LOCATION OF EXISTING UTILITIES AND
NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF
ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

NOTE: ALL ONSITE DRIVES
ARE PRIVATELY OWNED
AND MAINTAINED.



MATCHLINE SEE SHEET G2

This grading plan is a
part of drainage study
2476 which was received
on 1/25/99 and accepted on
7/7/99. Page 4 Of 11.

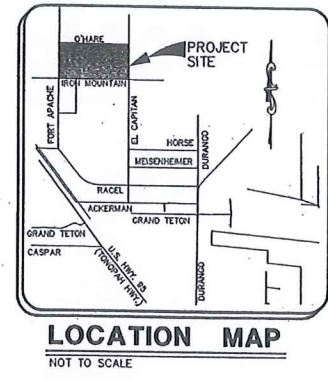
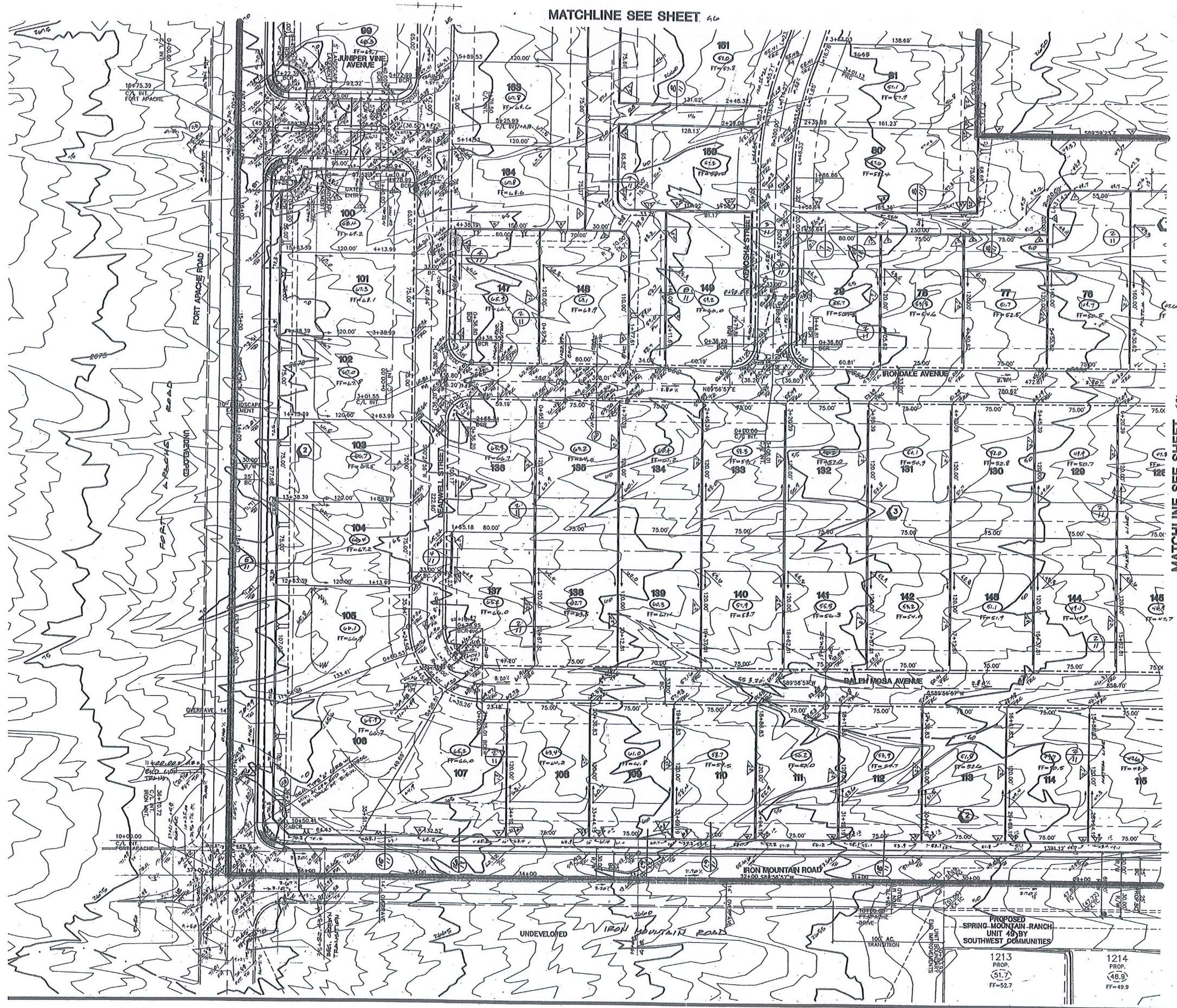
ASTORIA HOMES
2500 W. SAHARA AVENUE, SUITE 200
LAS VEGAS, NEVADA 89115

GRADING PLAN

SHEET
APRIL 99

DRAWN BY:
DESIGNED BY:

4
DS



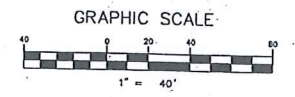
BENCHMARK
PROJECT DATUM NAVD83
CLARK COUNTY BENCHMARK USCGS V-169
ELEVATION: 791.316 METERS (2596.17 FEET)
USCGS BRASS CAP 400 FT. SOUTH OF LAG CABIN WAY
AND 100 FT. EAST OF EL CAPITAN WAY JUST EAST OF
OF A BARBED WIRE FENCE.
BASIS OF BEARING
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EAST ZONE, (2701), DETERMINED BY CLARK COUNTY GIS CONTROL
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Call before you Dig
1-800-227-2600
Call before you OVERHEAD
1-702-593-6111

**FOR ALL GRADING & STREET
SECTIONS SEE SHEET**

NOTE:
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AND MAINTAINED.

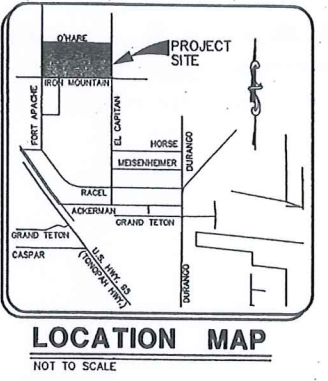
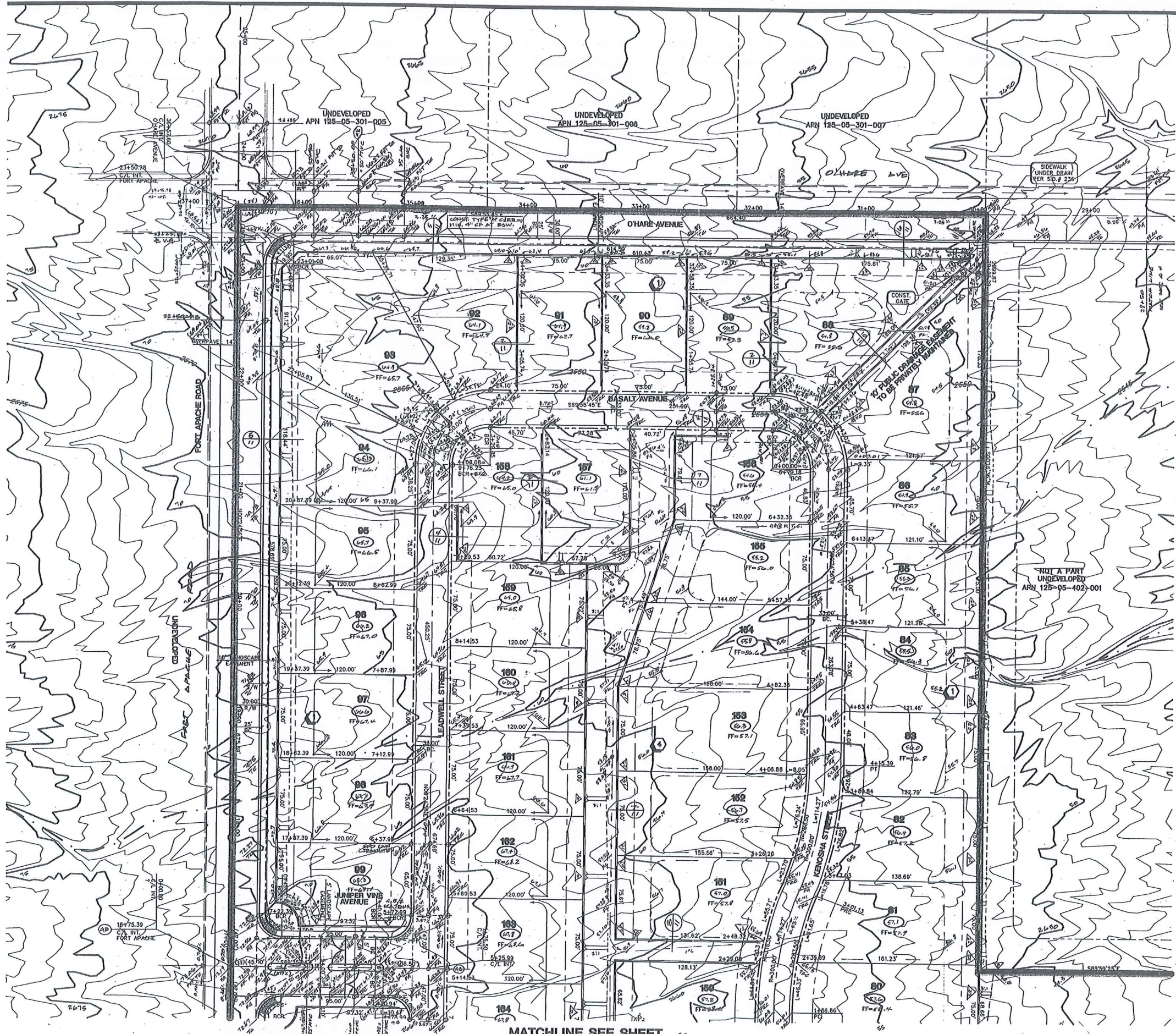


MATCHLINE SEE SHEET 459

MATCHLINE SEE SHEET 459

This grading plan is a
part of drainage study
#2476 which was received
on 6/25/99 and accepted on
7/7/99. Page 5 Of 11.

ASTORIA HOMES
2500 W. SAGARA AVENUE, SUITE 200
GRADING PLAN
SHEET
DRAWN BY: DESIGNED BY:
3/20/99
3/20/99
REV. 01/01/99
REV. 01/01/99



BENCHMARK
PROJECT DATUM NAVD83
CLARK COUNTY BENCHMARK USC&GS V-169
ELEVATION: 791.316 METERS (2596.17 FEET)
USC&GS BRASS CAP 400 FT. SOUTH OF LAG CABIN WAY
AND 100 FT. EAST OF EL CAPITAN WAY JUST EAST OF
OF A BARBED WIRE FENCE.

BASIS OF BEARING
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS
DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83),
EAST ZONE, (2701), DETERMINED BY CLARK COUNTY GIS CONTROL
POINTS 802,803,804 AND 805, AS SHOWN ON A RECORD OF
SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S
OFFICE, IN BOOK 68 OF SURVEYS, AT PAGE 53.

Avoid existing underground
utility lines. We verify.

Avoid overhead power
line contact.

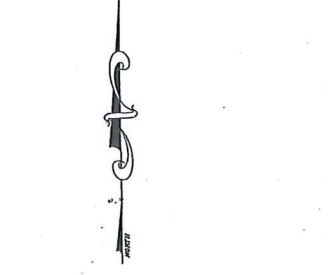
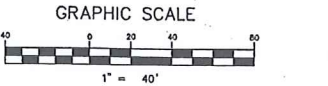
Call before you Dig
1-800-227-2600

Call before you OVERHEAD
1-702-593-6111

FOR ALL GRADING & STREET
SECTIONS SEE SHEET

NOTE:
CONTRACTOR SHALL VERIFY HORIZONTAL AND
VERTICAL LOCATION OF EXISTING UTILITIES AND
NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF
ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

NOTE: ALL ONSITE DRIVES
ARE PRIVATELY OWNED
AND MAINTAINED.



This grading plan is a
part of drainage study
425 which was received
on 6/25 and accepted on
7/7/19. Page 6 Of 11.

MATCHLINE SEE SHEET 4

MATCHLINE SEE SHEET 45

ASTORIA HOMES
200 S. SHAW AVENUE SUITE 200
LAS VEGAS, NEVADA 89102

GRADING PLAN

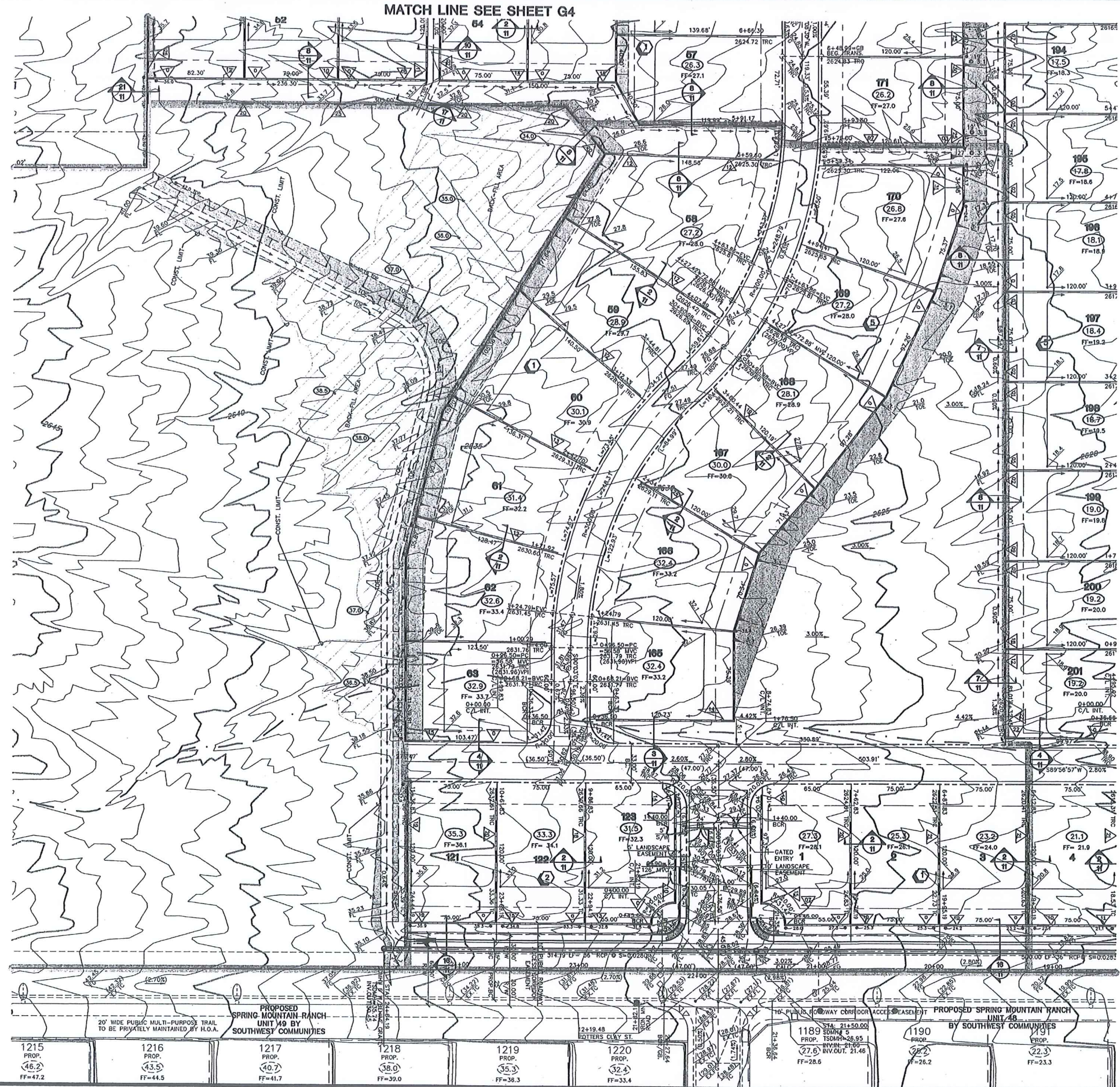
SHEET

DRAWN BY:
DESIGNED BY:
PAUL J. JENSEN

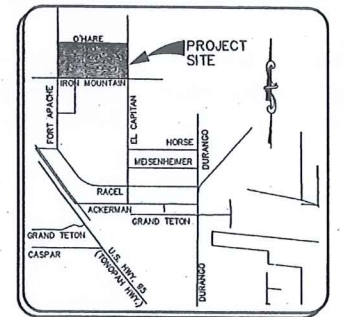
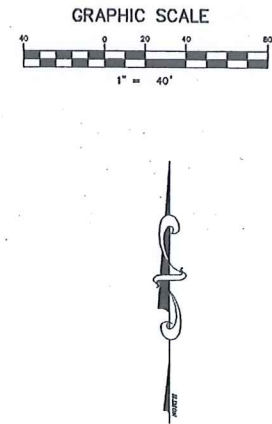


1/10/19
REV. 4/10/19
REV. 6/10/19

FUTURE UNIT 3



MATCH LINE SEE SHEET G1



LOCATION MAP
NOT TO SCALE

BENCHMARK
PROJECT DATUM NAVD83
CLARK COUNTY BENCHMARK USC&GS V-189
ELEVATION: 791.316 METERS (2596.17 FEET)
USC&GS BRASS CAP 400 FT. SOUTH OF LAG CABIN WAY
AND 100 FT. EAST OF EL CAPITAN WAY JUST EAST OF
OF A BARBED WIRE FENCE.
BASIS OF BEARING
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS
DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83),
EAST ZONE, (2701), DETERMINED BY CLARK COUNTY GS CONTROL
POINTS 802, 803, 804, AND 805, AS SHOWN ON A RECORD OF
SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S
OFFICE, IN BOOK 88 OF SURVEYS, AT PAGE 53.

Call before you Dig
1-800-227-2600
Call before you OVERHEAD
1-702-593-6111

**FOR ALL GRADING & STREET
SECTIONS SEE SHEET 12**

NOTE:
CONTRACTOR SHALL VERIFY HORIZONTAL AND
VERTICAL LOCATION OF EXISTING UTILITIES AND
NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF
ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

NOTE: ALL ONSITE DRIVES
ARE PRIVATELY OWNED
AND MAINTAINED.

16

This grading plan is a
part of drainage study
#2476 which was received
on 6/25/99 and COND. on
7/7/99. Page 7 Of 11.

ASTORIA LUMBER
SHEET
DRAWN BY: [signature]

Iron Mountain Estates West, VTN

CITY OF LAS VEGAS		DATE:	
INTER-OFFICE MEMORANDUM		December 3, 2001	
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. <i>AS</i> Flood Control Project Engineer Department of Public Works	
SUBJECT:	Technical Drainage Study for:		COPIES TO:
	Iron Mountain Estates West		Astoria Homes
Cross Streets:	NEC Iron Mountain Rd. & Fort Apache Rd.		VTN Nevada
FILE NO.	DS2984B.doc		Cheri Edleman, P.E. DEVCO
Parcel Number:	125-05-401-001, 402-001, 403-001, & 404-001		
Zoning Action:	Z-0097-00		
FEMA Flood Zone	YES	No	X
Proposed Storm Drain	YES	X	No

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1 st Submittal	9/27/2001	10/12/2001	Not Accepted	\$250.00
2 nd Submittal	11/15/2001	11/28/2001	Filed	NC
3 rd Submittal	11/30/2001	12/03/2001	See Comments Below	\$250.00
TOTAL FEES (LDDRS):				\$500.00

REMARKS:

The Drainage Study for the subject project has been reviewed and:

X	is acceptable in concept subject to conformance to all City standards and the following conditions.
	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence

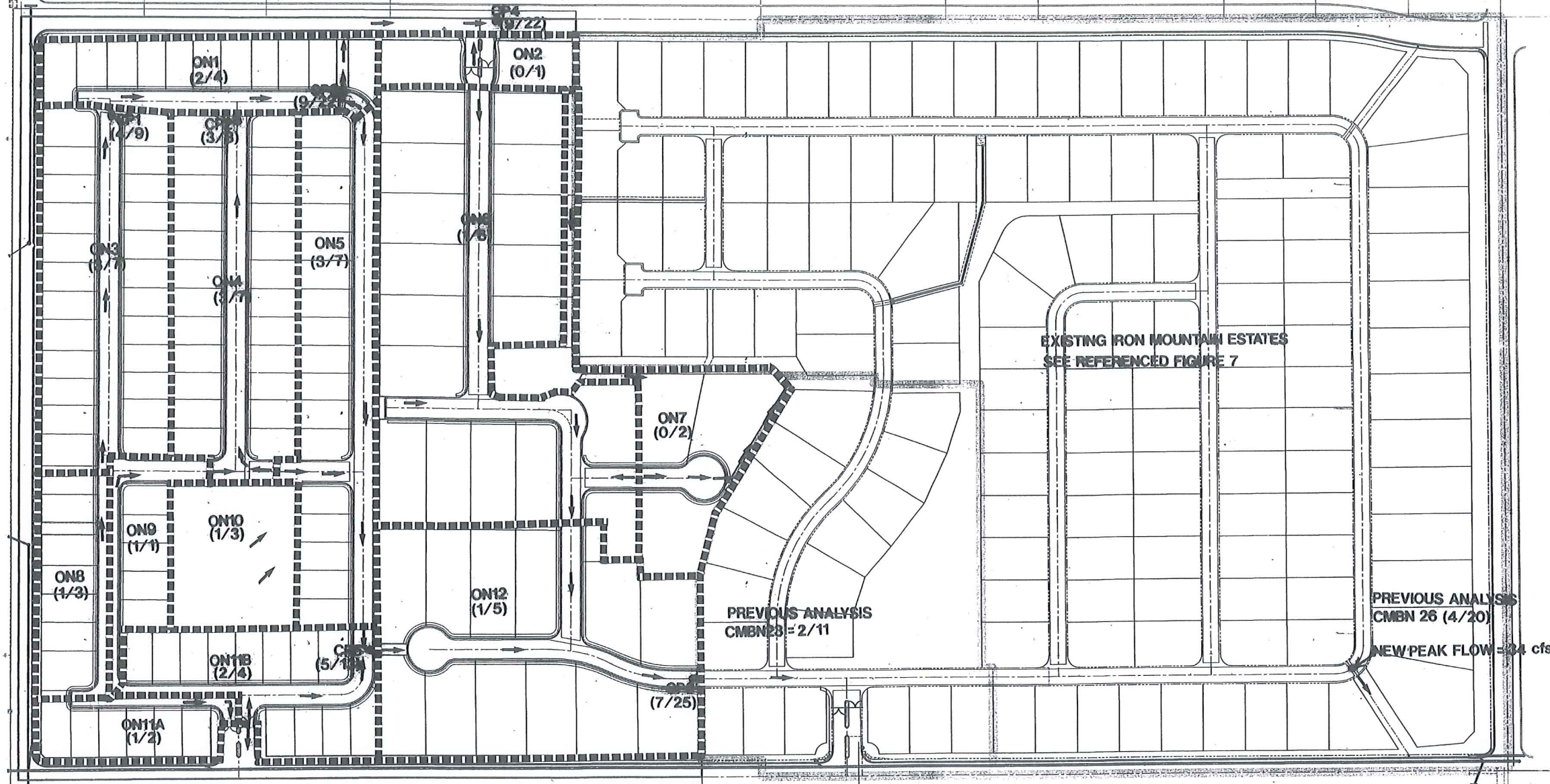
1. An offsite basin will impact Fort Apache Road from the west. Provide an edge of road ditch to capture storm water from this offsite basin and allow it to drain freely. Provide flow line grades on the grading plan for the edge of road ditch at a regular interval to show positive drainage.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the City of Las Vegas Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

END OF REMARKS
B&H/jwb

T/R/S: T19S/R60E/05
AREA G-05

H:\AS\Drawings\Hydro\Hydro.dwg, 09/18/2001 11:38:57 AM, Plotted by: jdb



LEGEND:
■■■■■ BASIN BOUNDARY
ON# BASIN NAME
● CP# CONCENTRATION POINT
→ FLOW DIRECTION
(3/7) Q10-YR/Q100-YR flow (cfs)

This drawing is for the project of Iron Mountain Estates West. It is a preliminary drawing and should not be used for construction. The drawing is dated 10/13/01 and is the property of the City of Las Vegas. It is to be used for the project of Iron Mountain Estates West. The drawing is a preliminary drawing and should not be used for construction. The drawing is dated 10/13/01 and is the property of the City of Las Vegas. It is to be used for the project of Iron Mountain Estates West.

FIGURE 6

ASTORIA HOMES		CITY OF LAS VEGAS	
9655 DEL WEBB AVENUE LAS VEGAS, NEVADA 89134 (702) 257-1188		2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 873-7550 FAX (702) 362-2597 nevada CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS	
ON-SITE DRAINAGE BASIN MAP		IRON MOUNTAIN ESTATES WEST	
DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
			SCALE: 1"=100' HORIZ. N/A VERT.
OF SHEETS		DRAWING NO.	
1		H	

El Capitan/O'Hare, VTN

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		July 10, 2002 <i>AYS</i>
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Technical Drainage Study for:	COPIES TO:
	El Capitan / O'Hare	Sterling S. Development
Cross Streets:	NWC El Capitan Way & O'Hare Avenue	VTN Nevada
FILE NO.	F:\Depot\DSMEMOS\DS3110C.doc	Cheri Edleman, P.E. DEVCO
Parcel Number:	125-05-302-002 to -011; -013 to -014	CCPW
Zoning Action:	Z-0104-01	
FEMA Flood Zone	YES No X	
Proposed Storm Drain	YES X No	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1 st Submittal	4/4/2002	4/18/2002	Not Acceptable	\$250.00
2 nd Submittal	5/23/2002	6/6/2002	Conditional Acceptance	\$250.00
CCPW	7/10/2002	7/10/2002	Concurrence	N/C
			TOTAL FEES (LDDRS):	\$500.00

REMARKS:

The Drainage Study for the subject project has been reviewed and:

X	is acceptable in concept subject to conformance to all City standards and the following conditions.
	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence
	must have Clark County Public Works Department concurrence

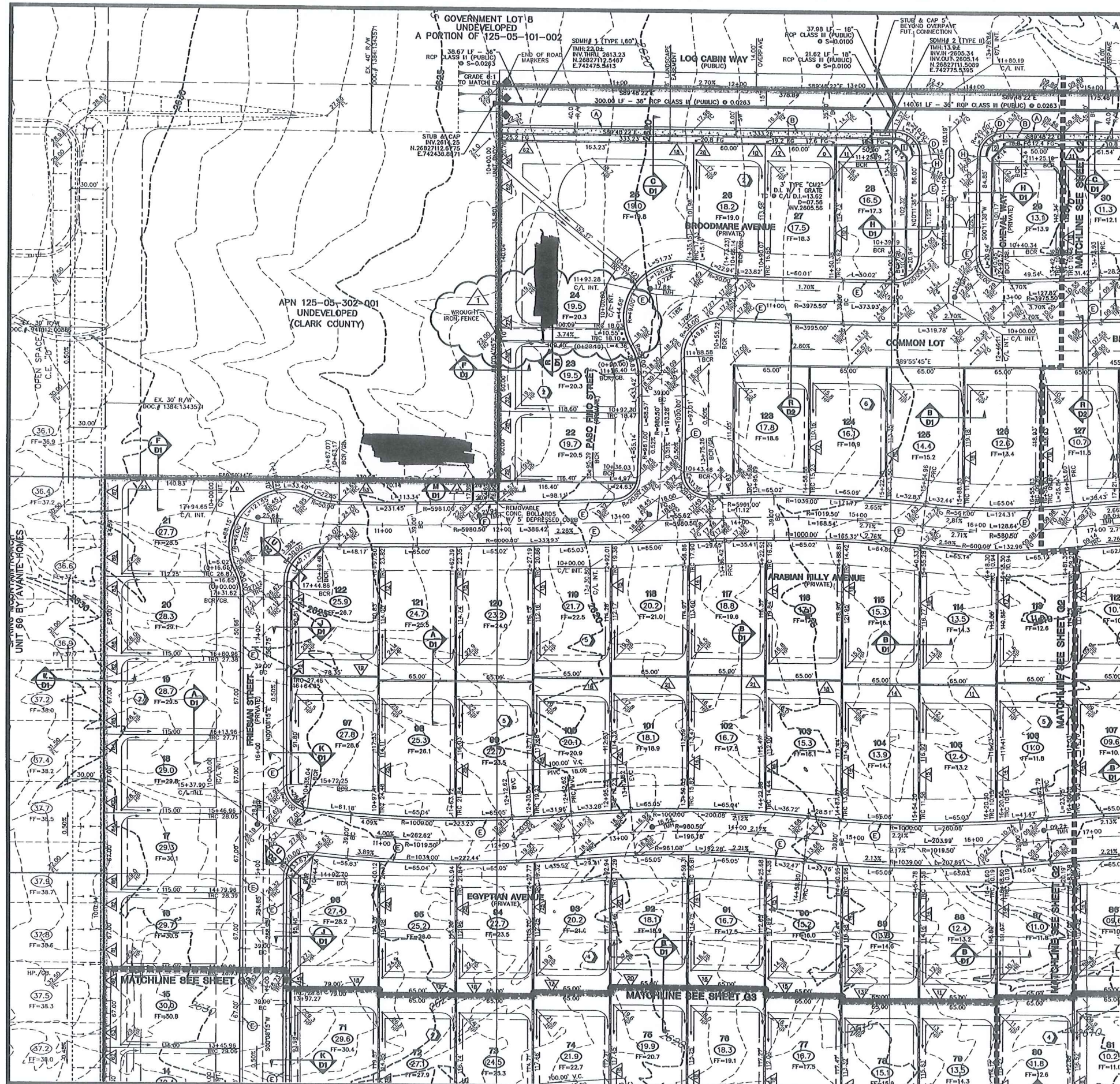
1. Per previous Comment #5, a notarized letter of permission for offsite grading still must be obtained prior to final approval of the improvement plans.
2. Revise detail O/DT1 to show "30'-PUBLIC drainage easement to be privately maintained by the H.O.A".
3. All proposed drainage easements and interior private streets must be dedicated as "Common Lot and Public Drainage Easement to be Privately Maintained". Label as such in the grading plan and the dedication must be recorded in the final map.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the City of Las Vegas Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

END OF REMARKS
B&H/ays

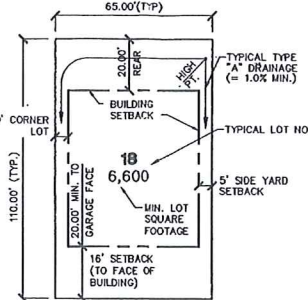
T/R/S: T19S/R60E/05
AREA G-05

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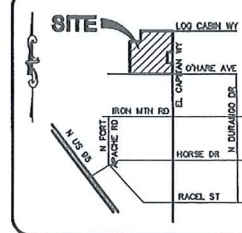


LEGEND

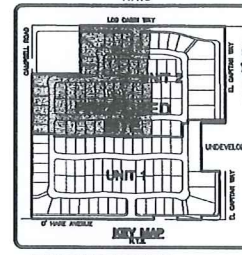
- FG FINISH GRADE
- FL FLOW LINE
- TC TOP OF CURB
- ETC EDGE OF ASPHALT PAVEMENT
- FUT FUTURE
- VG VALLEY CUTTER
- NG NATURAL GROUND
- HP HIGH POINT
- LP LOW POINT
- C/L CENTER LINE
- O/C OFFSET CROWN
- BCR BACK OF CURB
- BCR BEGIN CURB RETURN
- IF TOP OF FOOTING
- IF GRADE BREAK
- PC POINT OF CURVATURE
- PT POINT OF TANGENCY
- PRC POINT OF REVERSE CURVATURE
- PCC POINT OF COMPOUND CURVATURE
- BVC BEGIN VERTICAL CURVE
- MID-MID-POINT OF VERTICAL CURVE
- EVC END VERTICAL CURVE
- PRVC POINT OF REVERSE VERTICAL CURVE
- VI VERTICAL POINT OF INTERSECTION
- TPW TOP OF PLANTER WALL
- TRW TOP OF RETAINMENT WALL
- TOE TOP OF CHANNEL/SCARP
- TOE TOP OF BOX
- NP POWER POLE
- TRANS. TRANSITION
- RET. RETAINMENT
- INT. INTERSECTION
- D.S. DESIGN GRADE
- TSW TOP OF SIDEWALK
- FF FINISH FLOOR
- OFF OFF-FINISH FLOOR
- BFE BASE FLOOD ELEVATION
- R/W RIGHT-OF-WAY
- S/W SIDEWALK
- EX. EXISTING (5' INTERVAL)
- EX. EXISTING (1' INTERVAL)
- PROPOSED CONTOUR
- PROPOSED PAD GRADE
- FUT./EXIST. PAD GRADE
- SLOPE AND FLOW DIRECTION
- EDGE OF EXIST. A.C.
- SAW CUT & MATCH A.C.
- SIDEWALK RAMP
- PAD SWALE SLOPES
- SCARP AREA
- LOT NUMBER
- BLOCK NUMBER
- RETAINING HEIGHT (FEET)
- SIGHT VISIBILITY ZONES
- PROJECT BOUNDARY LINE
- SETBACK LINE
- R/W OR P.A.
- EXIST. IMPROVEMENTS
- FUTURE IMPROVEMENTS
- CENTER LINE
- RETAINING WALL
- CONC. BLOCK WALL
- EXST/CONC. BLOCK WALL
- EXIST. DIRT ROAD
- EXIST. AC
- CONSTRUCTION PHASE LINE
- OR UNIT BOUNDARY LINE
- MATCHLINE



TYPICAL LOT DETAIL
N.T.S.



LOCATION MAP
N.T.S.



GRAPHIC SCALE
1" = 40'

BASIS OF BEARING

NORTH 89°42'22" WEST - BEING THE BEARING OF THE NORTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 5, TOWNSHIP 19 SOUTH, RANGE 60 EAST, N.M.S., CLARK COUNTY, NEVADA, AS SHOWN BY THAT PLAT ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA, IN BOOK 92 OF PLATS, AT PAGE 17.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 1LV90-BNCS
NAD83 ELEV. 771.989 METERS (2532.70 FEET)
BLM BRASS CAP LOCATED AT DURANGO DRIVE AND IRON MOUNTAIN ROAD.

FOR ALL GRADING & STREET SECTIONS SEE SHEET D1

CONTRACTOR NOTE:

CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

NOTE:

ALL PRIVATE STREETS ARE PUBLIC DRAINAGE EASEMENTS TO BE PRIVATELY MAINTAINED BY HOA.

PRIVATE STREET NOTE:

PRIVATE STREETS ARE P.U.E.S. C.L.V. PUBLIC SEWER EASEMENTS, AND PUBLIC DRAINAGE EASEMENT ARE TO BE PRIVATELY MAINTAINED.

CONSTRUCTION NOTES:

- (A) CONSTRUCT "L" CURB & GUTTER PER STD. # 216
- (B) CONSTRUCT 5' SIDEWALK PER STD. # 234
- (C) CONSTRUCT 8" CROSS GUTTER PER STD. # 228
- (D) CONSTRUCT SIDEWALK RAMP PER STD. # 235
- (E) CONSTRUCT "ROLL" CURB & GUTTER PER STD. # 217A
- (F) CONSTRUCT DEPRESSION CURB PER DETAIL SHEET D1
- (G) CONSTRUCT SIDEWALK UNDERDRAIN PER STD. # 236
- (H) CONSTRUCT 10' CURB TRANSITION "ROLL" TO "L"

Call before you Dig
1-800-227-2600

Call before you Overhead
1-702-593-6111

DRAINAGE BOND TABLE	
PRIVATE FLOOD CONTROL IMPROVEMENTS	QUANTITY
30" DRAINAGE EASEMENT	3,115 S.F.
20" DRAINAGE EASEMENT	2,271 S.F.
BLOCK WALL WITH 2 COURSES OF SOLID GROUT	2,004 L.F.
BLOCK WALL WITH 3 COURSES OF SOLID GROUT	900 L.F.
1 COURSE STEM WALL	1,288 L.F.
2 COURSE STEM WALL	939 L.F.

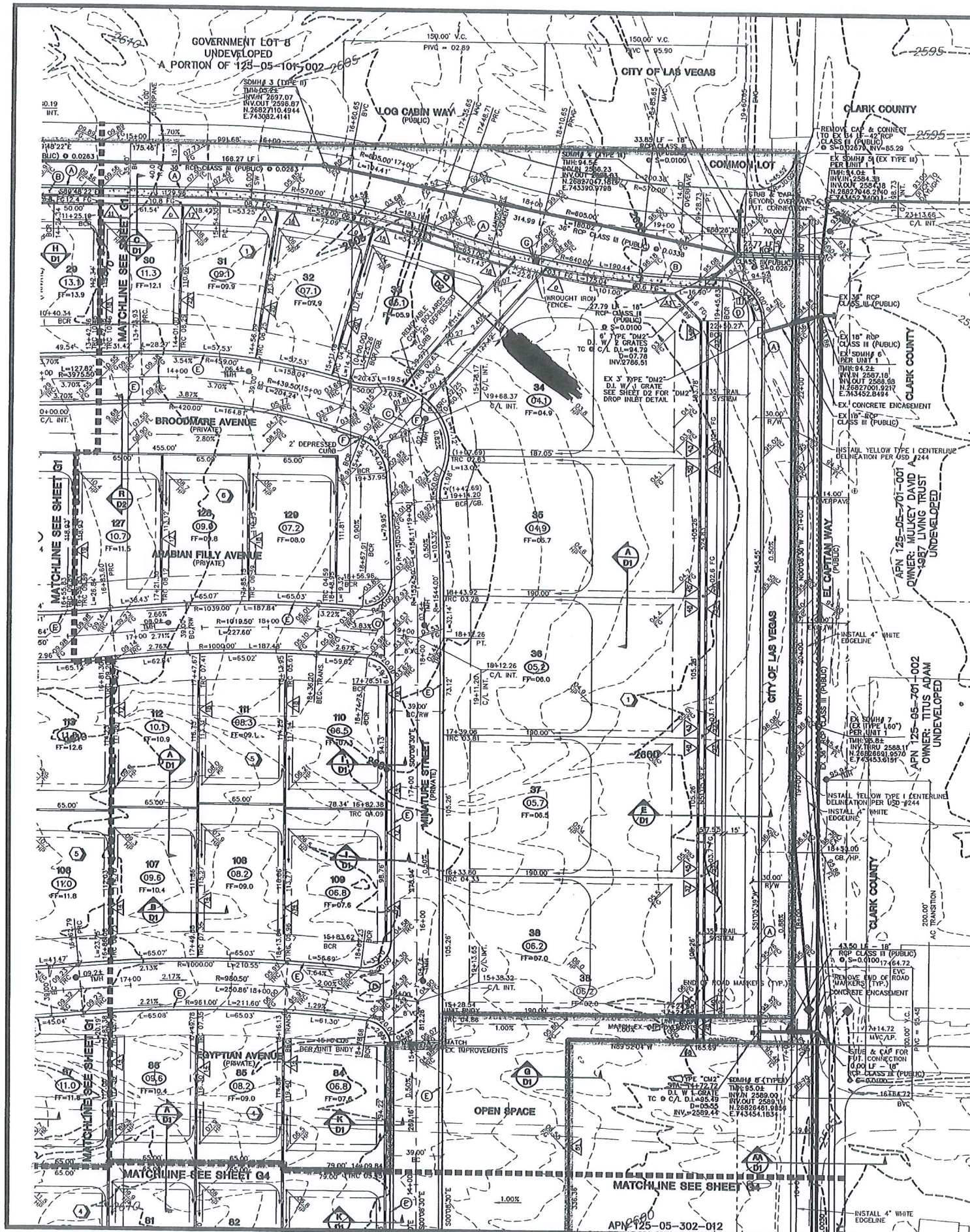
I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT CITY OF LAS VEGAS, NEVADA FOR THIS PROJECT.
CHRISTOPHER R. GRUBBS NO. 13956 DATE

STERLING S. DEVELOPMENT
200 S. LAS VEGAS BLVD., SUITE 200
LAS VEGAS, NEVADA 89101
(702) 871-0555

GRADING PLAN

EL CAPITAN / O'HARE

DESIGNED BY: [Signature]
CHECKED BY: [Signature]
DATE: [Date]
SCALE: 1" = 40' HORIZ. VERT.
SHEET 1 OF 4 SHEETS
DRAWING NO.



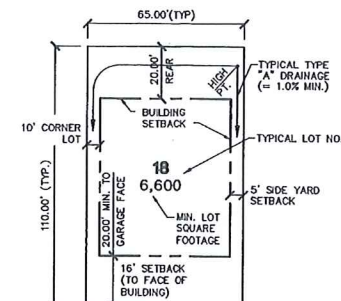
CITY OF LAS VEGAS GRADING NOTES

- IN THE EVENT THAT ANY UNFORSEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.
 - IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SURFACE, FINISH GRADES AND SLOPES SHOWN ON THESE DRAWINGS.
 - CONTRACTOR SHALL TAKE RESPONSIBILITY FOR ALL EXCAVATION, ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.
 - THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. IF ANY ADDITIONAL MATERIAL REQUIRED OR LEFTOVER MATERIAL FOLLOWING EARTHWORK OPERATIONS BECOMES THE RESPONSIBILITY OF THE CONTRACTOR.
 - THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED.
 - CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITHIN THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED:
- HORIZONTAL VERTICAL COMPACTION**
A. PAVEMENT AREA SUBGRADE 0.1" ± +0.010 to -0.1" See Soils Report
B. ENGINEERING FILL 0.5" ± +0.110 to -0.1" See Soils Report
COMPACTION TESTING WILL BE PERFORMED BY THE OWNER OR HIS REPRESENTATIVE.
- ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.
 - THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL, IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.
 - THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT-OF-WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOIL, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM ALL PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.
 - IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, THE OWNER AGREES TO PROVIDE AND INSTALL SUCH ITEM AT HIS OWN EXPENSE AND AT THE DIRECTION OF THE CITY ENGINEER. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

DRAINAGE BOND TABLE	
PRIVATE FLOOD CONTROL IMPROVEMENTS	QUANTITY
30' DRAINAGE EASEMENT	3,113 S.F.
20' DRAINAGE EASEMENT	2,471 S.F.
BLOCK WALL WITH 2 COURSES OF SOLID GROUT	2,064 L.F.
BLOCK WALL WITH 3 COURSES OF SOLID GROUT	960 L.F.
1 COURSE STEM WALL	1,268 L.F.
2 COURSE STEM WALL	939 L.F.

LEGEND

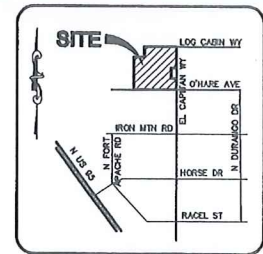
- FG FINISH GRADE
FL FLOW LINE
TC TOP OF CURB
TRC TOP OF ROLL CURB
EAC EDGE OF ASPHALT PAVEMENT
FUT FUTURE
EXIST EXISTING (EX)
VAL VALLEY OUTER
NAT NATURAL GROUND
H.P. HIGH POINT
L.P. LOW POINT
C/L CENTER LINE
O/C OFFSET CROWN
BC BACK OF CURB
BCU BEGIN CURB RETURN
TF TOP OF FOOTING
CB GRADE BREAK
PC POINT OF CURVATURE
PT POINT OF TANGENCY
PRC POINT OF REVERSE CURVATURE
EVC END VERTICAL CURVE
BVC BEGIN VERTICAL CURVE
MVC MID-POINT OF VERTICAL CURVE
EVC END VERTICAL CURVE
PRVC POINT OF REVERSE CURVATURE
VPI TOP OF PLANTER WALL
TRW TOP OF RETAINMENT WALL
TOP OF CHANNEL/SCARP
TOE TOE OF CHANNEL/SCARP
TOB TOP OF BOX
PP POWER POLE
TRANS. TRANSITION
RET. RETAINMENT
INT. INTERSECTION
D.G. DESIGN GRADE
TSW TOP OF SIDEWALK
FF FINISH FLOOR
GFF GARAGE FINISH FLOOR
BFE BASE FLOOD ELEVATION
R/W RIGHT-OF-WAY
S/W SIDEWALK
EX. EXISTING (EX)
EX. EXISTING (EX) INTERVAL
EX. EXISTING (EX) INTERVAL
PROPOSED CONTOUR
PROPOSED PAD GRADE
FUT./EXIST. PAD GRADE
SLOPE AND FLOW DIRECTION
EDGE OF EXIST. A.C.
SAW CUT & MATCH A.C.
SIDEWALK RAMP
PAD SWALE SLOPES
SCARP AREA
LOT NUMBER
BLOCK NUMBER
RETAINING HEIGHT (FEET)
SIGHT VISIBILITY ZONES
PROJECT BOUNDARY LINE
SETBACK LINE
R/W OR P/L
EXIST. IMPROVEMENTS
FUTURE IMPROVEMENTS
CENTER LINE
RETAINING WALL
CONC. BLOCK WALL
EXIST. CONC. BLOCK WALL
EXIST. DIRT ROAD
EXIST. AD
CONSTRUCTION PHASE LINE
OR UNIT BOUNDARY LINE
MATCHLINE



TYPICAL LOT DETAIL
N.T.S.

APN 125-05-605-007
OWNERS: JOHNSON DANIEL J.
& MOYNIHAN JOHNSON CAROLE P.
UNDEVELOPED

APN 125-05-701-001
OWNER: MULKEY DAVID A
1987 LIVING TRUST
UNDEVELOPED



BASIS OF BEARING

NORTH 89°46'22" WEST - BEING THE BEARING OF THE NORTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 5, TOWNSHIP 19 SOUTH, RANGE 60 EAST, N.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY THAT PLAT ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA, IN BOOK 02 OF PLATS, AT PAGE 17.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 11V80-BVES
HANDON ELEV. 771.9889 METERS (2532.70 FEET)
BLM BRASS CAP LOCATED AT DURANGO DRIVE AND IRON MOUNTAIN ROAD.

FOR ALL GRADING & STREET SECTIONS SEE SHEET D1

CONTRACTOR NOTE

CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

NOTE

ALL PRIVATE STREETS ARE PUBLIC DRAINAGE EASEMENTS TO BE PRIVATELY MAINTAINED BY HOA.

PRIVATE STREET NOTE

PRIVATE STREETS ARE P.U.E.S. C.L.V. PUBLIC SEWER EASEMENTS, AND PUBLIC DRAINAGE EASEMENT ARE TO BE PRIVATELY MAINTAINED.

CONSTRUCTION NOTES

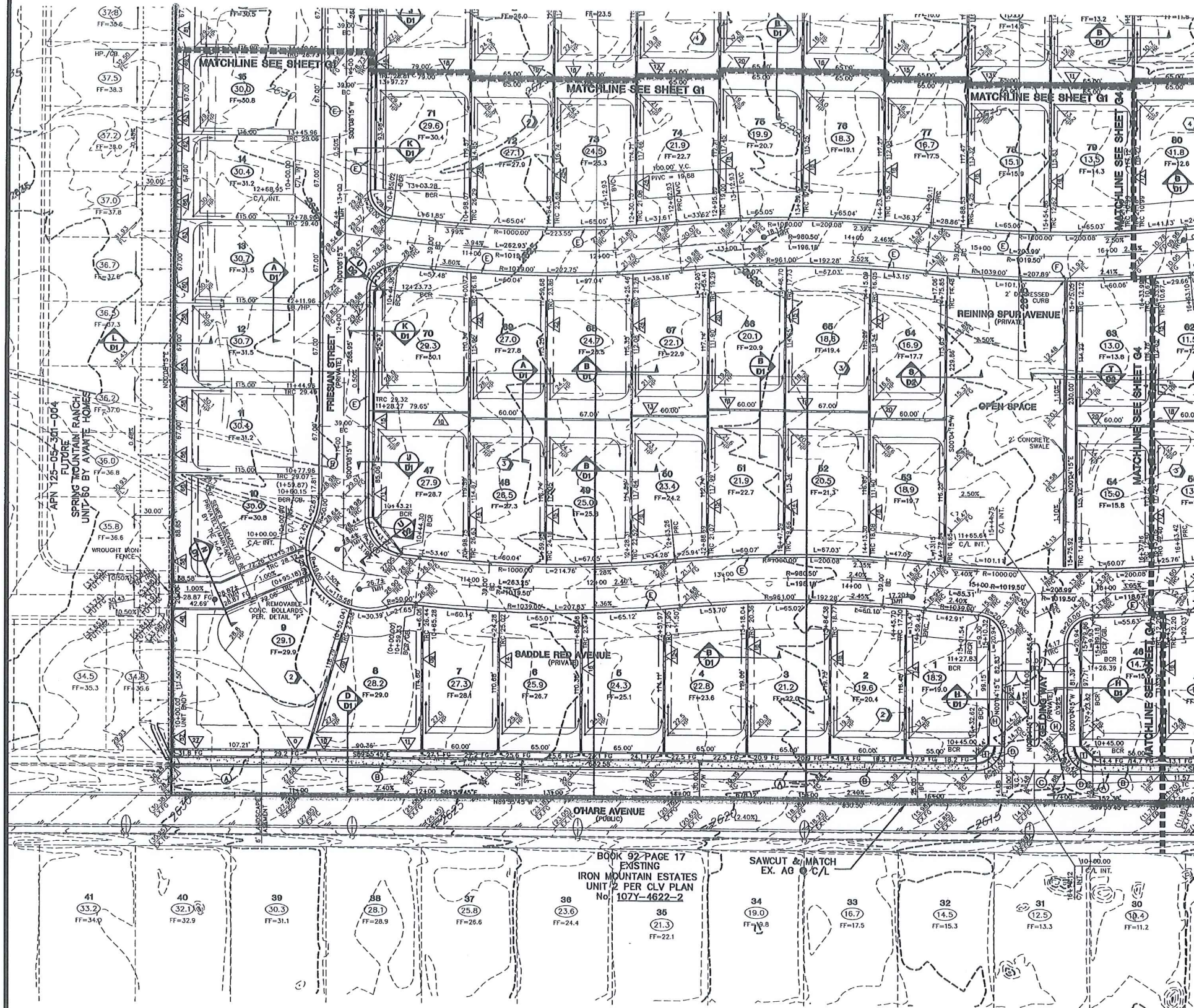
- CONSTRUCT "L" CURB & GUTTER PER STD. # 216
- CONSTRUCT 5' SIDEWALK PER STD. # 234
- CONSTRUCT 6" CROSS GUTTER PER STD. # 228
- CONSTRUCT SIDEWALK RAMP PER STD. # 235
- CONSTRUCT "ROLL" CURB & GUTTER PER STD. # 217A
- CONSTRUCT DEPRESSURED CURB PER DETAIL SHEET D1
- CONSTRUCT SIDEWALK UNDERDRAIN PER STD. # 236
- CONSTRUCT 10' CURB TRANSITION "ROLL" TO "L"

Call before you Dig
1-800-227-2600

Call before you Overhead
1-702-593-6111

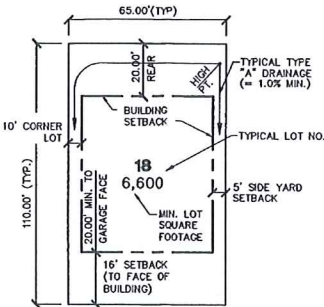
This grading plan is a part of drainage study # 3110, which was received on 12/13/02 and was on 12/13/02. Page 2 of 5.

STERLING S. DEVELOPMENT		CITY OF LAS VEGAS	
3545 S. CAMERON ST. # 200 LAS VEGAS, NEVADA 89119 (702) 871-5555		2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 878-7550 FAX (702) 382-2897 nevada CONSULTING ENGINEERS & PLANNERS & LAND SURVEYORS	
DRAWN BY: JAL		DESIGNED BY: JAL	
CHECKED BY: JAL		PROJECT NO: 0018	
SCALE: 1" = 40' HORIZ. VERT.		SHEET 5 OF 4 SHEETS	
DRAWING NO.		DATE: 12/23/02	

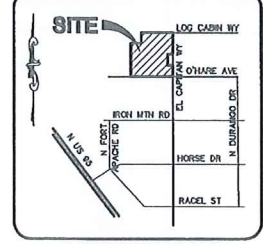


LEGEND

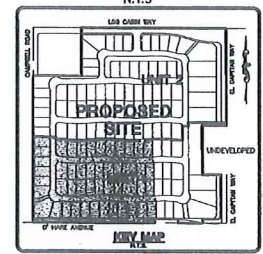
- FG FINISH GRADE
- FL FLOW LINE
- TC TOP OF CURB
- TRC TOP OF ROLL CURB
- EAC EDGE OF ASPHALT PAVEMENT
- FUT FUTURE
- EXIST EXISTING (EX.)
- VG VALLEY GUTTER
- NG NATURAL GRADE
- H.P. HIGH POINT
- L.P. LOW POINT
- C/L CENTER LINE
- O/C OFFSET CROWN
- BC BACK OF CURB
- BCR BEGIN CURB RETURN
- TCR TOP OF CURB
- PC POINT OF CURVATURE
- PT POINT OF TANGENCY
- PRC POINT OF REVERSE CURVATURE
- BVC BEGIN VERTICAL CURVE
- END VERTICAL CURVE
- PRVC POINT OF REVERSE VERTICAL CURVE
- END VERTICAL CURVE
- VI POINT OF INTERSECTION
- TRW TOP OF RETAINMENT WALL
- TOP OF CHANNEL/SCARP
- TOE TOP OF CHANNEL/SCARP
- TOB TOP OF BOX
- TRANS. TRANSITION
- RET. RETAINMENT
- INT. INTERSECTION
- D.G. DESIGN GRADE
- TOP OF SIDEWALK
- TSW TOP OF SIDEWALK
- FF FINISH FLOOR
- GF GARAGE FINISH FLOOR
- BEF BASE FLOOR ELEVATION
- R/W RIGHT-OF-WAY
- S/W SIDEWALK
- EX. CONTOUR (5' INTERVAL)
- EX. CONTOUR (1' INTERVAL)
- PROPOSED CONTOUR
- PROPOSED PAD GRADE
- FUT./EXIST. PAD GRADE
- SLOPE AND FLOW DIRECTION
- EDGE OF EXIST. A.C.
- SAW CUT & MATCH A.C.
- SIDEWALK RAMP
- PAD SWALE SLOPES
- SCARP AREA
- LOT NUMBER
- BLOCK NUMBER
- RETAINING HEIGHT (FEET)
- SIGHT VISIBILITY ZONES
- PROJECT BOUNDARY LINE
- SETBACK LINE
- R/W OR P/L
- EXIST. IMPROVEMENTS
- FUTURE IMPROVEMENTS
- CENTER LINE
- RETAINING WALL
- CONC. BLOCK WALL
- EXIST. CONC. BLOCK WALL
- EXIST. DRY ROAD
- EXIST. AC
- CONSTRUCTION PHASE LINE
- OR UNIT BOUNDARY LINE
- MATCHLINE



TYPICAL LOT DETAIL
N.T.S.



LOCATION MAP
N.T.S.



GRAPHIC SCALE
1" = 40'

BASIS OF BEARING

NORTH 89°48'22" WEST - BEING THE BEARING OF THE NORTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 5, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY THAT PLAT ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA, IN BOOK 92 OF PLATS, AT PAGE 17.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 11900-BIES
NAD83 ELEV. 771.6889 METERS (2532.70 FEET)
BLM BRASS CAP LOCATED AT DURANGO DRIVE AND IRON MOUNTAIN ROAD.

FOR ALL GRADING & STREET SECTIONS SEE SHEET D1

CONTRACTOR NOTE

CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

NOTE

ALL PRIVATE STREETS ARE PUBLIC DRAINAGE EASEMENTS TO BE PRIVATELY MAINTAINED BY HOA.

PRIVATE STREET NOTE

PRIVATE STREETS ARE P.U.E.S. C.L.V. PUBLIC SEWER EASEMENTS, AND PUBLIC DRAINAGE EASEMENT ARE TO BE PRIVATELY MAINTAINED.

CONSTRUCTION NOTES

- CONSTRUCT "L" CURB & GUTTER PER STD. # 216
- CONSTRUCT 5' SIDEWALK PER STD. # 234
- CONSTRUCT 8' CROSS GUTTER PER STD. # 228
- CONSTRUCT SIDEWALK RAMP PER STD. # 235
- CONSTRUCT "ROLL" CURB & GUTTER PER STD. # 217A
- CONSTRUCT DEPRESSURED CURB PER DETAIL SHEET D1
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- CONSTRUCT 10' CURB TRANSITION "ROLL" TO "L"

Call before you Dig
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Call before you Overhead
1-702-593-6111

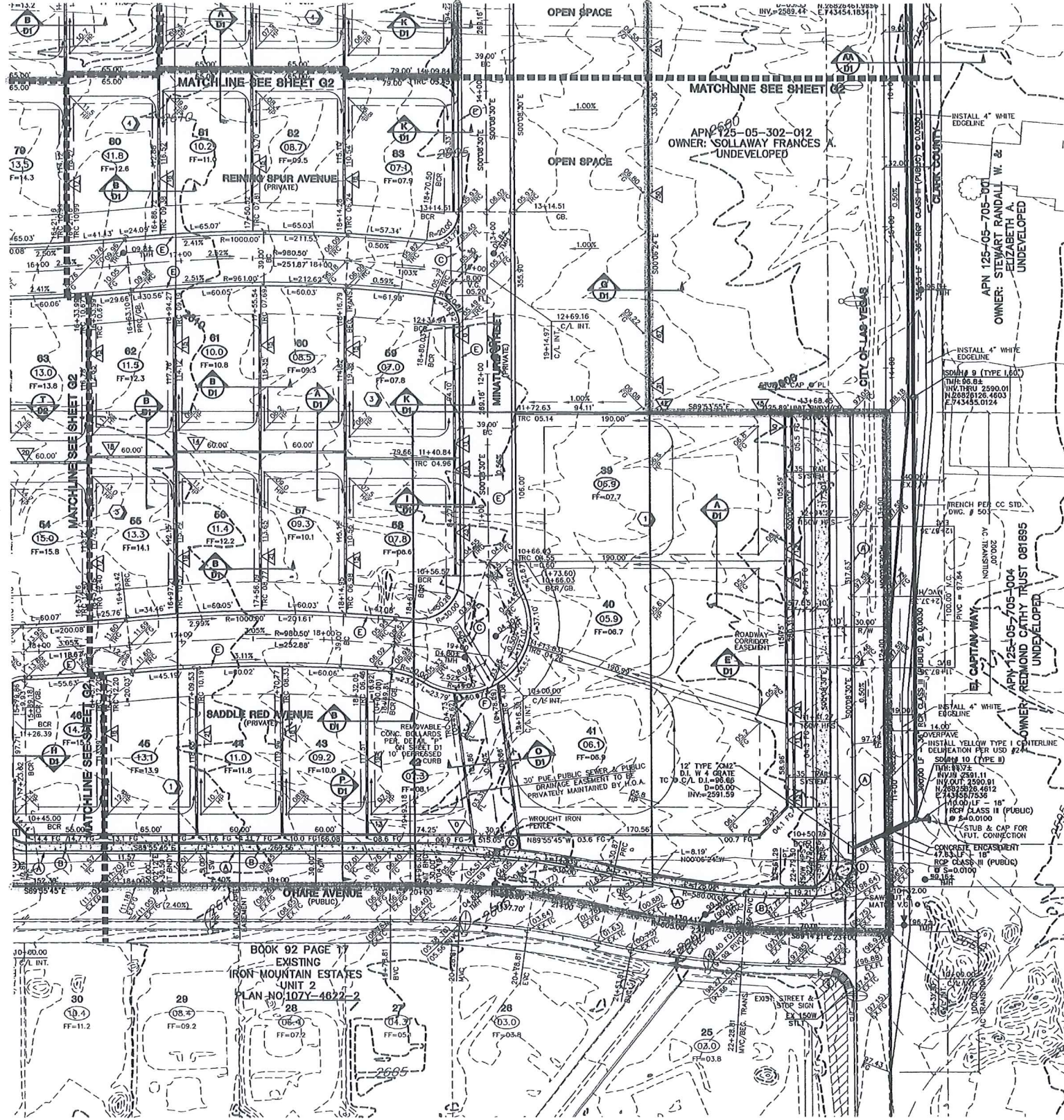
DRAINAGE BOND TABLE	
PRIVATE FLOOD CONTROL IMPROVEMENTS	THAT THE CITY OF LAS VEGAS HAS PROVIDED
30' DRAINAGE EASEMENT	1.00
20' DRAINAGE EASEMENT	0.67
BLOCK WALL WITH 2 COURSES OF SOLID GROUT	0.04 L.F.
BLOCK WALL WITH 3 COURSES OF SOLID GROUT	0.04 L.F.
1 COURSE STEM WALL	1.00 L.F.
2 COURSE STEM WALL	1.00 L.F.

STERLING S. DEVELOPMENT CITY OF LAS VEGAS GRADING PLAN EL CAPITAN / OHARE

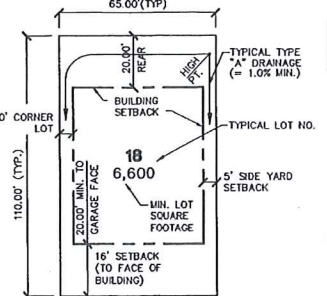
DRAWN BY: JAL
DESIGNED BY: JAL
CHECKED BY: JAL
PROJECT NO. 6018
SCALE: 1" = 40' HORIZ. VERT. N/A
DATE: FEB. 2000
DATE: FEB. 2000
DATE: FEB. 2000



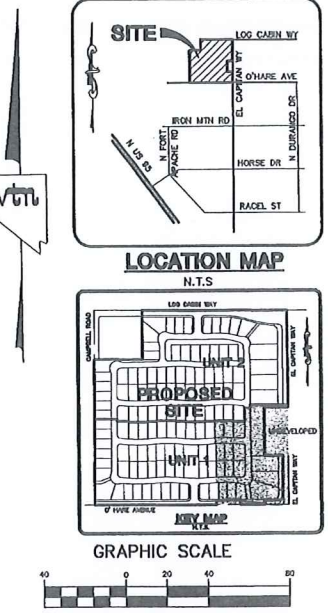
This grading plan is a part of the drainage plan which was prepared on 12/31/2002 and accepted by the City of Las Vegas on 1/13/2003. Page 3 of 3 SHEETS



- LEGEND**
- FG FINISH GRADE
 - FL FLOW LINE
 - TC TOP OF CURB
 - TRC TOP OF ROLL CURB
 - EAC EDGE OF ASPHALT PAVEMENT
 - FUT FUTURE
 - EXIST EXISTING (EX)
 - VO VALLEY CUTTER
 - NG NATURAL GROUND
 - H.P. HIGH POINT
 - L.P. LOW POINT
 - C/L CENTER LINE
 - O/G OFFSET GROUND
 - BC BACK OF CURB
 - BCR BEGIN CURB RETURN
 - TF TOP OF FOOTING
 - GB GRADE BREAK
 - PC POINT OF CURVATURE
 - PT POINT OF TANGENCY
 - PRC POINT OF REVERSE CURVATURE
 - POC POINT OF COMPOUND CURVATURE
 - BVC BEGIN VERTICAL CURVE
 - END END VERTICAL CURVE
 - PT POINT OF TANGENCY
 - PRC POINT OF REVERSE CURVATURE
 - POC POINT OF COMPOUND CURVATURE
 - TOP OF PLANTER WALL
 - TOP OF RETAINMENT WALL
 - TOP OF CHANNEL/SCARP
 - TOP OF BOX
 - PP POWER POLE
 - TRANS TRANSITION
 - RET. RETAINMENT
 - INT. INTERSECTION
 - D.O. DESIGN GRADE
 - TSW TOP OF SIDEWALK
 - FF FINISH FLOOR
 - GF GARAGE FINISH FLOOR
 - BASE BASE FLOOD ELEVATION
 - R/W RIGHT-OF-WAY
 - S/W SIDEWALK
 - EX. EXISTING (5' INTERVAL)
 - EX. EXISTING (1' INTERVAL)
 - PROPOSED CONTOUR
 - PROPOSED PAD GRADE
 - FUT/EXIST. PAD GRADE
 - SLOPE AND FLOW DIRECTION
 - EDGE OF EXIST. A.C.
 - SAW CUT & MATCH A.C.
 - SIDEWALK RAMP
 - PAD SWALE SLOPES
 - SCARP AREA
 - LOT NUMBER
 - BLOCK NUMBER
 - RETAINING HEIGHT (FEET)
 - SIGHT VISIBILITY ZONES
 - PROJECT BOUNDARY LINE
 - SETBACK LINE
 - R/W OR P/L
 - EXIST. IMPROVEMENTS
 - FUTURE IMPROVEMENTS
 - CENTER LINE
 - RETAINING WALL
 - CONC. BLOCK WALL
 - EXIST. CONC. BLOCK WALL
 - EXIST. DIRT ROAD
 - EXIST. AC
 - CONSTRUCTION PHASE LINE
 - OR UNIT BOUNDARY LINE
 - MATCHLINE



TYPICAL LOT DETAIL
N.T.S.



BASIS OF BEARING
NORTH 89°46'22" WEST - BEING THE BEARING OF THE NORTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 5, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY THAT PLAT ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA, IN BOOK 92 OF PLATS, AT PAGE 17.

BENCHMARK
CITY OF LAS VEGAS BENCHMARK 11Y90-SNES
NAVD88 ELEV. 771.9869 METERS (2532.70 FEET)
BLM BRASS CAP LOCATED AT DURANGO DRIVE AND IRON MOUNTAIN ROAD.

FOR ALL GRADING & STREET SECTIONS SEE SHEET D1

CONTRACTOR NOTE
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NOTE
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PRIVATE STREET NOTE:
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- CONSTRUCTION NOTES:**
- (A) CONSTRUCT "L" CURB & GUTTER PER STD. # 216
 - (B) CONSTRUCT 5' SIDEWALK PER STD. # 234
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 - (G) CONSTRUCT SIDEWALK UNDERDRAIN PER STD. # 236
 - (H) CONSTRUCT 10' CURB TRANSITION "ROLL" TO "L"

Call before you Dig
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Call before you Overhead
1-702-593-6111

DRAINAGE BOND TABLE	
PRIVATE FLOOD CONTROL IMPROVEMENTS	QUANTITY
30' DRAINAGE EASEMENT	3,313 S.F.
20' DRAINAGE EASEMENT	2,471 S.F.
BLOCK WALL WITH 3 COURSES OF SOLID GROUT	960 L.F.
1 COURSE SIDEWALK	1,169 L.F.
2 COURSE SIDEWALK	1,169 L.F.

This grading plan is a
3110 which was received
on 10/10/02 and approved on
10/10/02. Page 4 of 5.

STERLING S. DEVELOPMENT

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-9146
PH. (702) 873-7550 FAX (702) 362-2557
9345 S. CAMERON STE. # 200
LAS VEGAS NEVADA, 89119
(702) 871-0555

GRADING PLAN

EL CAPITAN / OHARE

DRAWN BY: JVL FEB. 2000

DESIGNED BY: BF FEB. 2000

CHECKED BY: CHG/DP FEB. 2000

PROJECT NO: 5015

SCALE: 1" = 40' HORIZ.
N/A VERT.

SHEET 04
4 OF 4 SHEETS
DRAWING NO.

REVISIONS

NO.	DATE	BY	REVISION
1	12/23/02	JVL	10' EASEMENT FROM PILE TO PUBLIC DRAINAGE EASEMENT

STAMP

REGISTERED PROFESSIONAL ENGINEER - CIVIL
STATE OF NEVADA
No. 11015
J. V. L. JVL

Spring Mountain Ranch Unit 60, VTN

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: July 31, 2002 <i>AMS</i>
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT: Drainage Study for: Spring Mountain Ranch Unit 60		COPIES TO: Avante Homes
Cross Streets:	Log Cabin, Fort Apache & O'Hare Way	VTN Nevada
File Number:	F:\Depot\DSMemos\DS3136B.doc	Cheri Edelman, P.E., DEVCO
Parcel Number:	125-05-301-001 thru -008	
Zoning Action:	Z-0095-01	
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES X NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1 st Submittal	5/24/2002	6/7/2002	Not Acceptable	\$250.00
2 nd Submittal	6/28 & 7/24/2002	7/31/2002	See Comments Below	\$250.00
TOTAL FEES (LDDRS):				\$500.00

REMARKS:

2nd Submittal (Addendum & Supplement)

The Drainage Study for the subject project has been reviewed and:

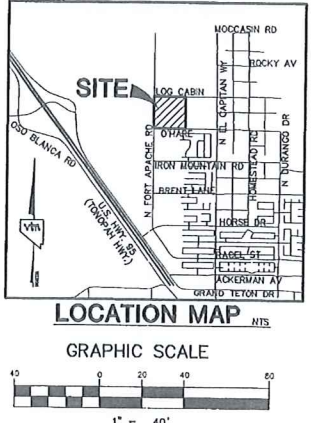
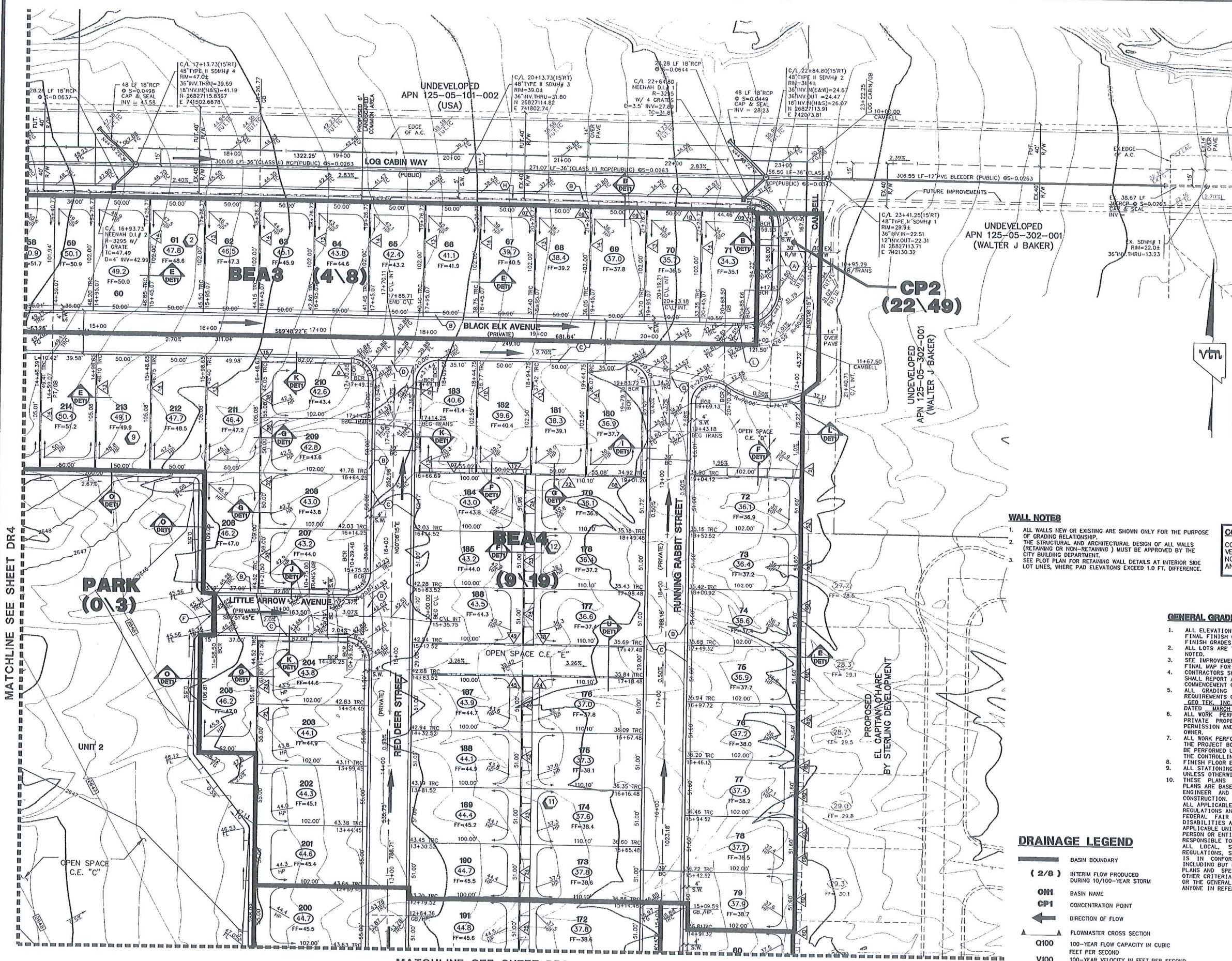
X	is approved subject to conformance to all City standards and the following conditions:
	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence.

- Private streets must be public drainage easements. Provide a note on the grading plans "Note: All private streets are P.U.E., Public Sewer Easements, and Public Drainage Easements to be privately maintained by HOA."
- All drainage easements must be common lots and labeled as "Public Drainage Easement to be privately maintained by the Homeowners Association" in the grading plan and recorded as such on the final map.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the CLV Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

END OF REMARKS
B&H, ssn

T/R/S: T19S/R60E/05
AREA G-05



LEGAL DESCRIPTION
A PORTION OF THE NORTH WEST QUARTER (NW 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 5, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

BENCHMARK
CITY OF LAS VEGAS BENCHMARK 11950-BHES
NAVD88 ELEV. 771.9689 METERS (2532.70 FEET)
ELEV. BRASS CAP LOCATED AT DURANGO DRIVE AND IRON MOUNTAIN ROAD.
CLARK COUNTY BENCHMARK 2C90-6W6
NAVD88 ELEV. 858.854 METERS (2817.755 FEET)
USDA BRASS CAP ON AN IRON PIPE, 140 FEET SOUTHWEST OF TELEPHONE POLE #269941, AT THE SOUTHWEST CORNER OF THE U.S. 95/KYLE CANYON TURNOFF.

BASIS OF BEARINGS
NORTH 89°48'22" WEST, BEING THE BEARING OF THE NORTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 5, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON AN OFFICIAL PLAT ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE IN BOOK 82 OF PLATS, AT PAGE 17.

Call before you Dig
1-800-227-2600

Call before you Overhead
1-702-593-6111

WALL NOTES

- ALL WALLS NEW OR EXISTING ARE SHOWN ONLY FOR THE PURPOSE OF GRADING RELATIONSHIP.
- THE STRUCTURAL AND ARCHITECTURAL DESIGN OF ALL WALLS (RETAINING OR NON-RETAINING) MUST BE APPROVED BY THE CITY BUILDING DEPARTMENT.
- SEE LOT PLAN FOR RETAINING WALL DETAILS AT INTERIOR SIDE LOT LINES, WHERE PAD ELEVATIONS EXCEED 1.0 FT. DIFFERENCE.

CONTRACTOR NOTE:
CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

FOR ALL GRADING & STREET SECTIONS SEE SHEET # DET 1

GENERAL GRADING NOTES

- ALL ELEVATIONS SHOWN HEREON WITHIN LANDSCAPED AREAS ARE FINAL FINISH GRADES. ROUGH GRADES SHALL BE 0.30' BELOW FINISH GRADES INDICATED ON PLAN.
- ALL LOTS ARE TO BE F.H.A. TYPE "A" DRAINAGE UNLESS OTHERWISE NOTED.
- SEE IMPROVEMENT PLANS FOR STREET SECTIONS AND DETAILS. SEE FINAL MAP FOR EXACT BEARINGS AND DISTANCES.
- CONTRACTORS SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND SHALL REPORT ALL DISCREPANCIES TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF WORK.
- ALL GRADING AND SITE PREPARATION SHALL CONFORM TO THE REQUIREMENTS OF THE GEOTECHNICAL INVESTIGATION PREPARED BY: GEO TEK, INC., # 0. NO. 3823-LV8 DATED MARCH 19, 2002.
- ALL WORK PERFORMED OUTSIDE OF THE PROJECT BOUNDARY AND ON PRIVATE PROPERTY SHALL NOT BE PERFORMED UNTIL WRITTEN PERMISSION AND EASEMENT HAVE BEEN OBTAINED FROM THE OFF SITE OWNER.
- ALL WORK PERFORMED WITHIN PUBLIC RIGHT-OF-WAY AND OUTSIDE OF THE PROJECT BOUNDARY THAT IS NOT SHOWN ON THESE PLANS SHALL BE PERFORMED UNDER A SEPARATE ENCROACHMENT PERMIT ISSUED BY THE CONTROLLING AUTHORITY.
- FINISH FLOOR ELEVATION = PAD ELEVATION +0.70'.
- ALL STATIONING ON GRADING PLAN IS CENTERLINE STATIONING UNLESS OTHERWISE NOTED.
- THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY ALL APPLICABLE LOCAL, STATE AND FEDERAL STATUTES, LAWS, CODES, REGULATIONS AND ORDINANCES, INCLUDING BUT NOT LIMITED TO THE FEDERAL FAIR HOUSING AMENDMENTS ACT, AMERICANS WITH DISABILITIES ACT, THE ARCHITECTURAL BARRIERS ACT AND ANY DISABILITIES ACT, FEDERAL STATUTES, LAWS, CODES, REGULATIONS, STANDARDS, GUIDELINES AND ORDINANCES AND FURTHER, IS IN CONFORMANCE WITH ANY APPLICABLE DESIGN CRITERIA, PLANS AND SPECIFICATIONS, DRAINAGE PLANS, STUDIES AND ANY OTHER CRITERIA, STANDARDS OR REQUIREMENTS LISTED IN THE PLANS OR THE GENERAL NOTES RELATED TO THESE PLANS OR PROVIDED BY ANYONE IN REFERENCE TO THIS PROJECT.

DRAINAGE LEGEND

- BASIN BOUNDARY
- (2/8) INTERIM FLOW PRODUCED DURING 10/100-YEAR STORM
- ON1 BASIN NAME
- CP1 CONCENTRATION POINT
- DIRECTION OF FLOW
- FLOWMASTER CROSS SECTION
- Q100 100-YEAR FLOW CAPACITY IN CUBIC FEET PER SECOND
- V100 100-YEAR VELOCITY IN FEET PER SECOND
- D100 DEPTH OF FLOW DURING 100 YEAR STORM

AVANTE HOMES
2325 A RENAISSANCE DR.
LAS VEGAS, NEVADA 89119
(702) 798-8800

SPRING MOUNTAIN RANCH UNIT 60

DRAINAGE PLAN

DR3
3 OF 4 SHEETS
DRAWING NO.

DESIGNED BY: DEBORAH KALEIKINI-JOHNSON
CHECKED BY: [Signature]
DATE: MAY 2002

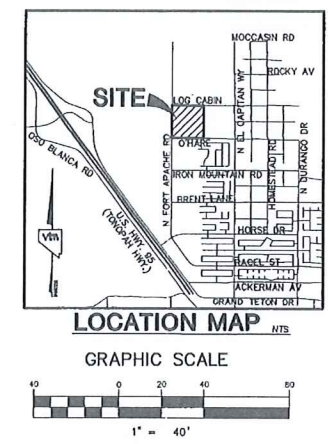
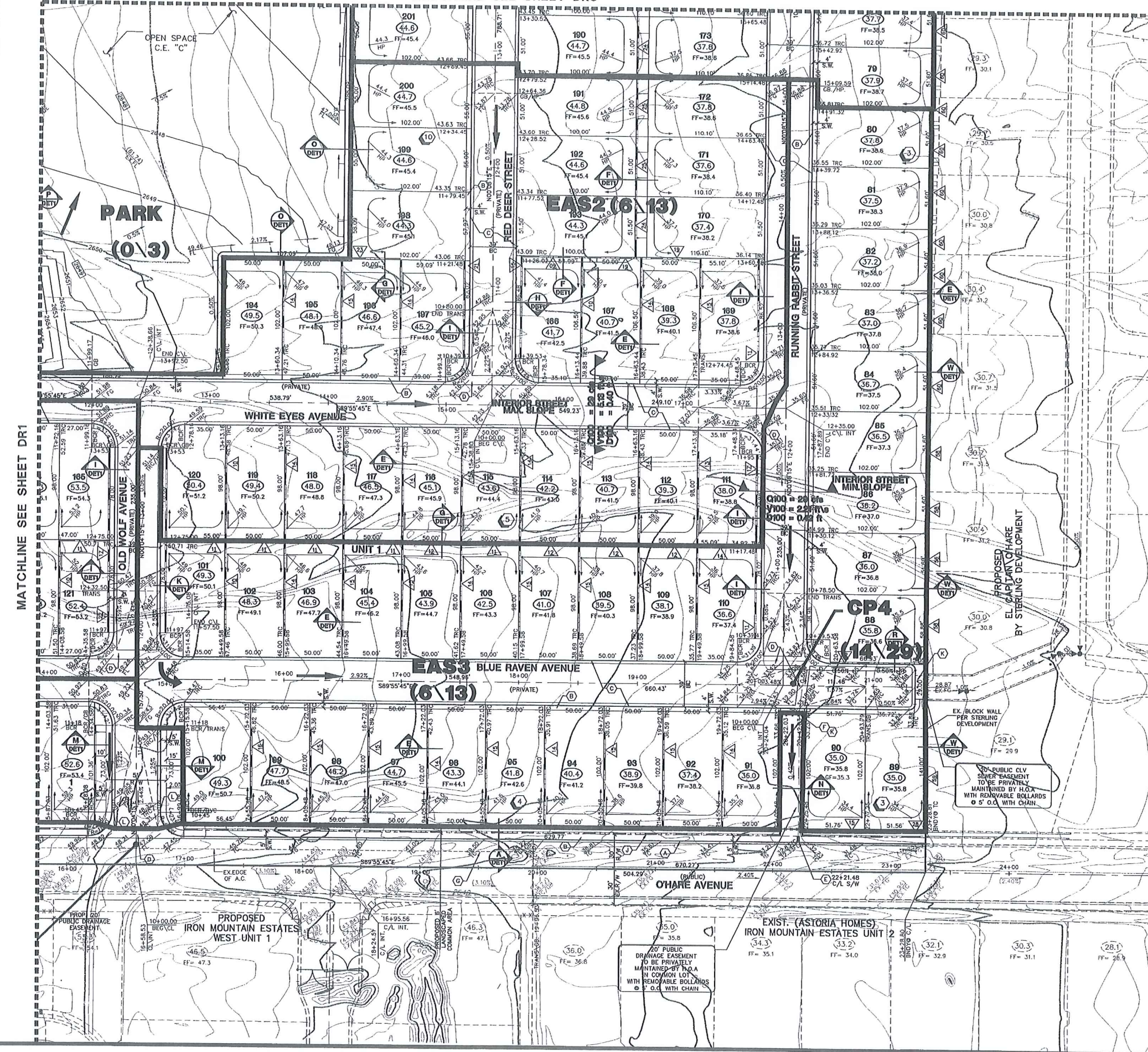
PROJECT NO: 3802
SCALE: 1"=40' HORIZ. N/A VERT.

REVISION

NO.	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

MATCHLINE SEE SHEET DR1

MATCHLINE SEE SHEET DR3



LEGAL DESCRIPTION
A PORTION OF THE NORTH WEST QUARTER (NW 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 5, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

BENCHMARK
CITY OF LAS VEGAS BENCHMARK 1LV90-BNES
NAVD88 ELEV. 771.9689 METERS (2532.70 FEET)
BLM BRASS CAP LOCATED AT DURANGO DRIVE AND IRON MOUNTAIN ROAD
CLARK COUNTY BENCHMARK 2C90-6W6
NAVD88 ELEV. 858.854 METERS (2817.756 FEET)
USDA BRASS CAP ON AN IRON PIPE, 140 FEET SOUTHWEST OF TELEPHONE POLE #269941, AT THE SOUTHWEST CORNER OF THE U.S. 95/KYLE CANYON TURNOFF.

BASIS OF BEARINGS
NORTH 89°48'22" WEST, BEING THE BEARING OF THE NORTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 5, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON AN OFFICIAL PLAT ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE IN BOOK 92 OF PLATS, AT PAGE 17.

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1-800-227-2600

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FOR ALL GRADING & STREET SECTIONS SEE SHEET # DET 1

DRAINAGE LEGEND

(2/8) BASIN BOUNDARY
INTERIM FLOW PRODUCED DURING 10/100-YEAR STORM

OWI BASIN NAME
CPI CONCENTRATION POINT
DIRECTION OF FLOW

FLOWMASTER CROSS SECTION
100-YEAR FLOW CAPACITY IN CUBIC FEET PER SECOND
100-YEAR VELOCITY IN FEET PER SECOND
DEPTH OF FLOW DURING 100-YEAR STORM

AVANTE HOMES
2335 S. RENAISSANCE DR.
LAS VEGAS, NEVADA 89119
(702) 796-6800

CITY OF LAS VEGAS
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2587

SPRING MOUNTAIN RANCH UNIT 60

DRAINAGE PLAN

DR2

2 OF 4 SHEETS

DRAWING NO.

ENGINEER
DEBORAH JOHNSON
CIVIL
14571 JENNY
14571 JENNY

SCALE: 1"=40' HORIZ. N/A VERT.

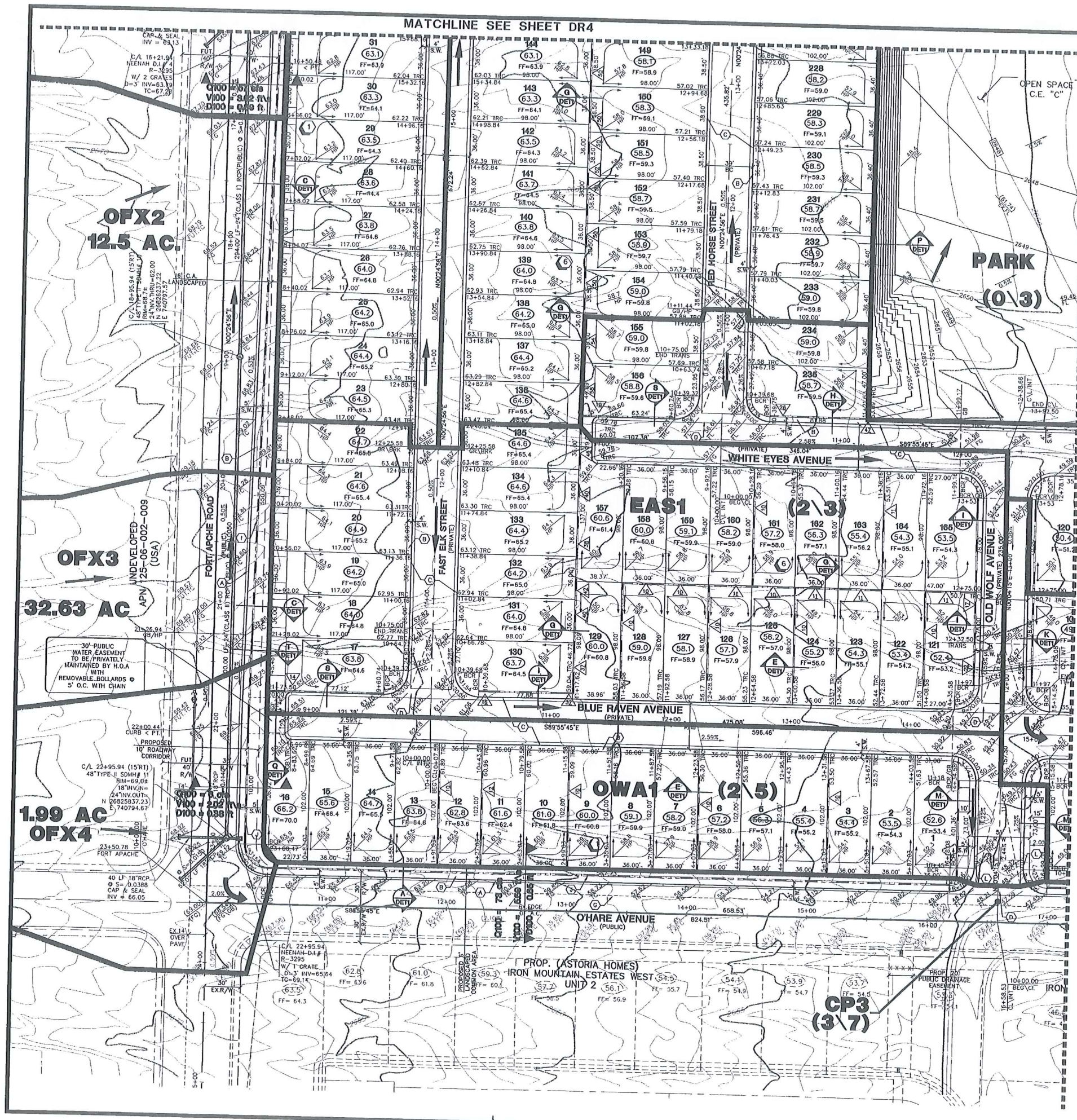
PROJECT NO: 5882

DESIGNED BY:

CHECKED BY:

DRAWN BY: DAYMA

MAY, 2002



LEGAL DESCRIPTION
A PORTION OF THE NORTH WEST QUARTER (NW 1/4) OF SECTION 5, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

BENCHMARK
CITY OF LAS VEGAS BENCHMARK 1LV90-BHIES
NAVD88 ELEV. 771.9589 METERS (2532.70 FEET)
BLM BRASS CAP LOCATED AT DURANGO DRIVE AND IRON MOUNTAIN ROAD.
CLARK COUNTY BENCHMARK 2090-6W6
NAVD88 ELEV. 858.854 METERS (2817.756 FEET)
USDA BRASS CAP ON AN IRON PIPE, 140 FEET SOUTHWEST OF TELEPHONE POLE #269947, AT THE SOUTHWEST CORNER OF THE U.S. 95/KYLE CANYON TURNOFF.

BASIS OF BEARINGS
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CONTRACTOR NOTE:
CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

FOR ALL GRADING & STREET SECTIONS SEE SHEET # DET 1

LEGEND	
FG	FINISH GRADE
FL	FLOW LINE
TC	TOP OF CURB
TRC	TOP OF ROLL CURB
EAC	EDGE OF ASPHALT PAVEMENT
FUT.	FUTURE
EXIST	EXISTING (EX.)
VG	VALLEY GUTTER
NG	NATURAL GROUND
HP	HIGH POINT
L.P.	LOW POINT
C/L	CENTER LINE
O/C	OFFSET CROWN
BC	BACK OF CURB
BCR	BEGIN CURB RETURN
TF	TOP OF FOOTING
GB	GRADE BREAK
PC	POINT OF CURVATURE
PT	POINT OF TANGENCY
PRC	POINT OF REVERSE CURVATURE
PCC	POINT OF COMPOUND CURVATURE
BVC	BEGIN VERTICAL CURVE
MVC	MID-POINT OF VERTICAL CURVE
EVC	END VERTICAL CURVE
PRVC	POINT OF REVERSE VERTICAL CURVE
VPI	VERTICAL POINT OF INTERSECTION
TPW	TOP OF PLANTER WALL
TRW	TOP OF RETAINMENT WALL
STBAP	TOP OF CHANNEL/SCARP
TOE	TOE OF CHANNEL/SCARP
TOB	TOP OF BOX
PP	POWER POLE
TRANS.	TRANSITION
RET.	RETAINMENT
INT.	INTERSECTION
D.G.	DESIGN GRADE
TSW	TOP OF SIDEWALK
FF	FINISH FLOOR
GF	GARAGE FINISH FLOOR
BE	BASE FLOOD ELEVATION
RF	REINFORCED CONCRETE PIPE
SD	STORM DRAIN
DI	DROP INLET
R/W	RIGHT-OF-WAY
S/W	SIDEWALK
BCL	BACK OF CURB LENGTH
EX. CONTOUR(5' INTERVAL)	
EX. CONTOUR(1' INTERVAL)	
PROPOSED CONTOUR	
PROPOSED PAD GRADE	
FUT./EXIST. PAD GRADE	
SLOPE AND FLOW DIRECTION	
EDGE OF EXIST. A.C.	
SAW CUT & MATCH A.C.	
SIDEWALK RAMP	
PAD SWALE SLOPES	
SCARP AREA	
LOT NUMBER	
BLOCK NUMBER	
RETAINING HEIGHT (FEET)	
SIGHT VISIBILITY ZONES	
PROJECT BOUNDARY LINE	
SETBACK LINE	
R/W OR P/L	
CENTER LINE	
BACK OF CURB	
LIP OF GUTTER	
EXIST. IMPROVEMENTS	
FUTURE IMPROVEMENTS	
RETAINING WALL	
CONC. BLOCK WALL	
EXISTING CONC. BLOCK WALL	
EXISTING PORT ROAD	
EXISTING SIDEWALK	

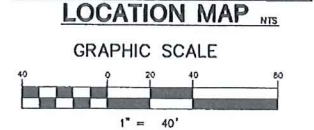
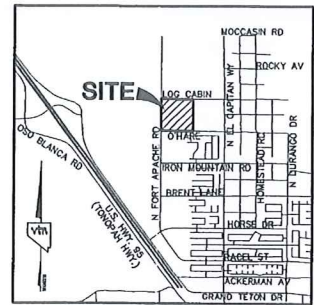
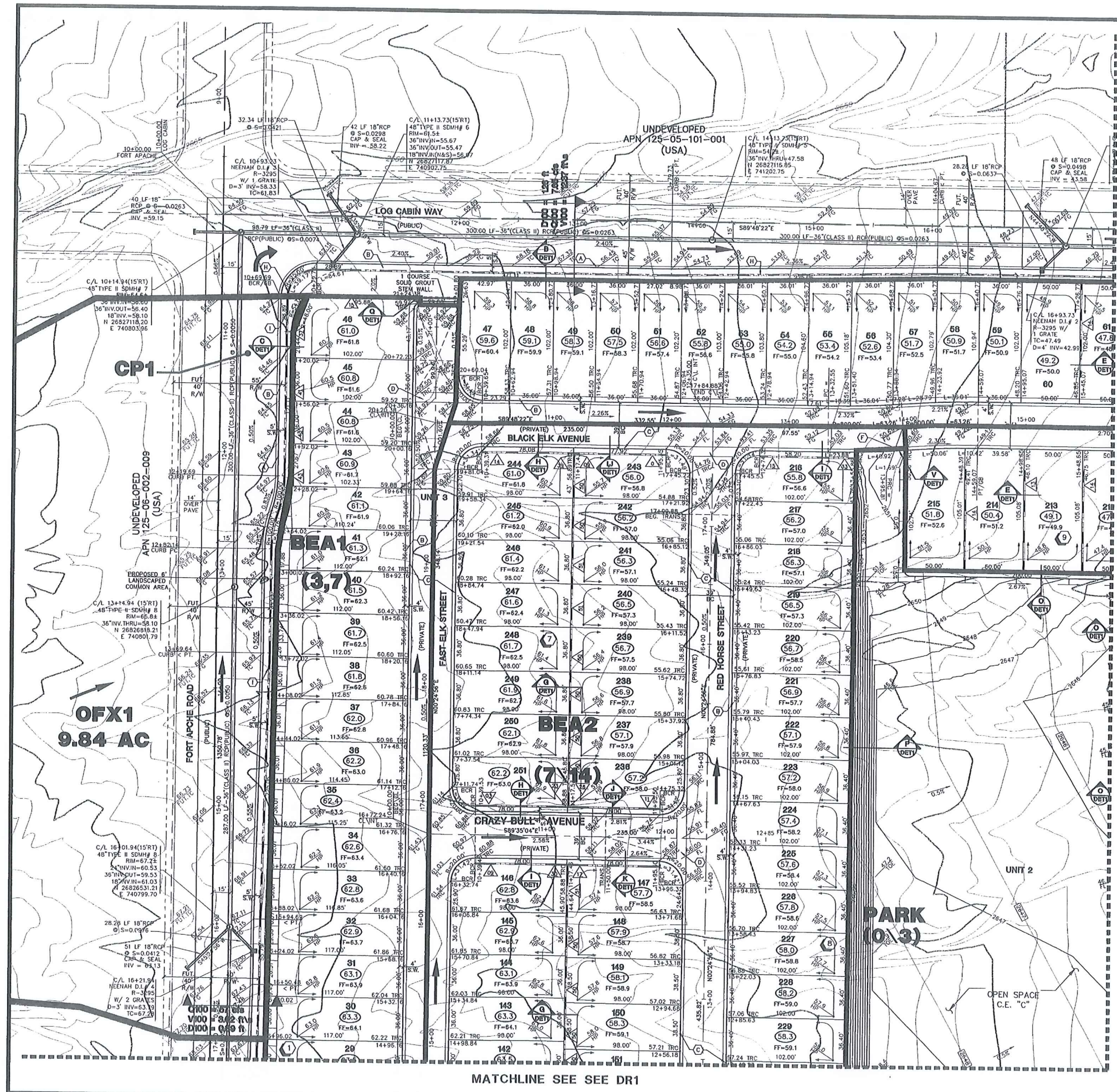
DRAINAGE LEGEND

(2/8) BASIN BOUNDARY
ON1 INTERIM FLOW PRODUCED DURING 10/100-YEAR STORM
CP1 BASIN NAME
CONCENTRATION POINT
DIRECTION OF FLOW
FLOWMASTER CROSS SECTION
Q100 100-YEAR FLOW CAPACITY IN CUBIC FEET PER SECOND
V100 100-YEAR VELOCITY IN FEET PER SECOND
D100 DEPTH OF FLOW DURING 100 YEAR STORM

AVANTE HOMES
2325 A RENAISSANCE DR.
LAS VEGAS, NEVADA 89119
(702) 799-6800

SPRING MOUNTAIN RANCH UNIT 60

DESIGNER: MAY 2022
CHECKED BY:
PROJECT NO: 5802
SCALE: 1"=40' HORIZ. N/A VERT.
SHEET: 1 OF 4 SHEETS
DR1



LEGAL DESCRIPTION
A PORTION OF THE NORTH WEST QUARTER (NW 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 5, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

BENCHMARK
CITY OF LAS VEGAS BENCHMARK 1LV90-BNES
NAVD88 ELEV. 771.9689 METERS (2532.70 FEET)
BLM BRASS CAP LOCATED AT DURANGO DRIVE AND IRON MOUNTAIN ROAD.
CLARK COUNTY BENCHMARK 2C90-BWS
NAVD88 ELEV. 858.854 METERS (2817.75 FEET)
USDA BRASS CAP ON AN IRON PIPE, 140 FEET SOUTHWEST OF TELEPHONE POLE #269847, AT THE SOUTHWEST CORNER OF THE U.S. 95/KYLE CANYON TURNOFF.

BASIS OF BEARINGS
NORTH 89°48'22" WEST, BEING THE BEARING OF THE NORTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 5, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON AN OFFICIAL PLAT ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE IN BOOK 92 OF PLATS, AT PAGE 17.

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FOR ALL GRADING & STREET SECTIONS SEE SHEET # DET 1

CONSTRUCTION KEY NOTES:

(PER U.S.D.C.C.A. STANDARD DRAWINGS)

- (A) CONSTRUCT "1" CURB & GUTTER PER STD. # 216
- (B) CONSTRUCT SIDEWALK PER STD. # 234
- (C) CONSTRUCT "ROLL" CURB & GUTTER PER STD. # 217A
- (D) CONSTRUCT "B" CROSS GUTTER PER STD. # 228
- (E) CONSTRUCT SIDEWALK UNDER DRAIN PER STD. # 236
- (F) CONSTRUCT DEPRESSED CURB PER DETAIL SHEET 2
- (G) CUT & MATCH 2' BEYOND EXIST. A.C.
- (H) CONSTRUCT 3 COURSES SOLID GROUTED STEM WALL ABOVE SIDEWALK.
- (I) CONSTRUCT 2 COURSES SOLID GROUTED STEM WALL ABOVE SIDEWALK.
- (J) CONSTRUCT 1 COURSE SOLID GROUTED STEM WALL ABOVE SIDEWALK.
- (K) CONSTRUCT REMOVABLE BOLLARDS PER DETAIL SHEET
- (L) CONSTRUCT 10" CURB TYPE TRANSITION

DRAINAGE LEGEND

- (A) BASIN BOUNDARY
- (B) INTERIM FLOW PRODUCTION DURING 10/100-YEAR STORM
- (C) BASIN FLOW CONCENTRATION POINT
- (D) DIRECTION OF FLOW
- (E) FLOWMASTER CROSS SECTION
- (F) 100-YEAR FLOW CAPACITY
- (G) 100-YEAR VELOCITY IN FEET PER SECOND
- (H) DEPTH OF FLOW DURING 100 YEAR STORM

AVANTE HOMES
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 365-2597

SPRING MOUNTAIN RANCH UNIT 60

DRAINAGE PLAN

DR4
4 OF 4 SHEETS
DRAWING NO.

ENGINEER'S SEAL
DEBORAH JOHNSON
14571 N.W. 14TH AVE.
MIAMI, FL 33187

REVISION

REV	DATE	BY

APPENDIX F

Coordination Documents

CLV/CCRFCFCD Kickoff Meeting Minutes – March 6



MEETING NOTES

By: Jerrod Ratcliffe

Project Number: CLV1401.01

Date: March 6, 2014

SUBJECT:	Brent Lane Drainage System & Trail Kick-off Meeting	
PLACE:	City of Las Vegas Public Works Boulder Room 333 N. Rancho Drive Las Vegas, NV 89106	
TIME:	3:00 PM	
DATE:	March 6, 2014	
ATTENDING:	Mark Failla, SHG Jerrod Ratcliffe, SHG Rick Schroder, CLV Traffic Alan Riecki, CLV Survey Fred Solis, CLV Planning Connie Diso, CLV Planning Rosa Cortez, CLV PW	Todd Myers, CCRFCD Oh Sang Kwon, CLV Flood Bill Snyder, CLV R/W Keith Letus, CLV Sewer Dennis Moyer, CLV PW Greg McDermott, CLV PW Kristina Swallow, CLV PW

The Kick-off meeting was held to introduce the project team and discuss the scope of the project. The following comments and items were discussed:

1. Rosa mentioned that she will be transferring the CLV Project Manager role to Dennis.
2. Mark introduced the SHG project team:
 - Project Manager – Mark Failla
 - Assistant Project Manager – Jerrod Ratcliffe
 - Drainage Engineer – Kellin Collins/Andrew Howard
 - Designer – David Myhre
 - GES – Geotechnical
 - Stanley Consultants – Surveying
 - AeroTech Mapping – Aerial Mapping
 - Newfields – (Environmental Analysis, Section 8, Wildlife and Paleontological Survey)
 - Horrocks – Potholing
 - Southwick – Landscape Architect
3. Mark said that monthly progress meetings will be held. Once progress has been made on field survey and aerial topography, Mark and Dennis will coordinate a day and time with the project team for the first progress meeting and subsequent monthly progress meetings.
4. Mark said that utility coordination will be performed throughout the project.
5. Todd said that Newfields should begin coordination with Tim Sutko as soon as possible as he has significant experience within the project limits.

6. Mark explained the scope of the project. The following items were discussed.
 - a) The group determined that the proposed culvert crossing of Tule Springs Road will need to convey 100-year storm flows.
 - b) Connie said that the SNPLMA funding nomination requires extension of the proposed trail to the north to tie into the existing trail adjacent to the parking area. The trail will also cross Tule Springs Road and tie into the existing trail just north of the guard house. The trail will be a 10-foot wide decomposed granite surface along the north side of Brent Lane with no lighting, irrigation or landscaping. The decomposed granite trail does not need to be stabilized for ADA accessibility. Minimal site furnishings, native re-vegetation or hardscape features will be considered if funding permits. After some discussion, it was decided that the trail alignment should NOT be considered along the existing equestrian trail on the south side of Brent Lane. The preferred location is either on top of the storm drain or just to the north of it and it can also serve as the maintenance access road for the drainage system. Dennis mentioned that the construction budget available for the trail is \$200,000. Connie said that the SNPLMA funding expiration date is March 31, 2016. After the meeting, Dennis clarified that the nomination states that trail signage, benches, trash receptacles and landscaping are included in the design elements of the trail. Dennis also said that the available construction budget for the trail is \$216,000. Discussion with CCRFCD will be added to the next meeting agenda to address the trail landscaping adjacent to the RCB.
 - c) Todd mentioned that CONTECH may have an alternate erosion control solution (other than riprap) around the proposed drop inlets within Clark County jurisdiction. Todd will forward some information to the group.
 - d) Mark mentioned that there is some significant erosion occurring along the north side of the existing channel as it approaches the pedestrian bridge west of the detention basin. This project will include some preventative measure to fix the issues.
7. Mark informed the group of some upcoming changes being proposed as part of the redevelopment of the Skye Canyon (formerly Kyle Canyon) with new developers. It is expected that the changes will NOT impact peak ultimate condition flow rates contributing to the Brent Lane project as previously established by the Kyle Canyon Master Drainage Study. SHG will utilize the Kyle Canyon Master Drainage Study as reference for this portion of the contributing watershed. An existing condition hydrologic model will also be prepared. Todd noted that the conveyance portion of the facility is to be designed for the ultimate condition flow, even if the existing/interim condition flow is higher.
8. Oh-Sang noted that the collection facility should extend west of the Durango Drive intersection. In general, the collection system will consist of area inlets and ditching. The project does not include intersection roadway improvements.
9. Alan asked if the contract addressed the latest set of SUE requirements. Rosa said that the contract does match the current SUE requirements.
10. The group decided to hold off on the geotechnical investigation until an alignment has been

determined. The geotechnical investigation will commence at the 50% Design Level.

11. Rosa said that CLV has established a new mapping projection that now includes a horizontal tie and that Stanley will need to provide the project mapping on this projection.
12. Rosa asked SHG to prepare an overall project schedule in Microsoft Project format. Mark will prepare the schedule and send to CLV when complete.
13. The group discussed including Layne Weber from Clark County in the monthly progress meetings. Dennis will add Layne to the list of invited attendees once the monthly progress meetings are established.
14. Mark presented the following estimated schedule:

➤ Preliminary and General Items	60 days (May 5, 2014)
➤ 50% Submittal	75 days*
➤ 90% Submittal	90 days*
➤ CCRFCD Project Presentations	TBD
➤ 100% (Pre-final) Submittal	30 days*
➤ 100% (Final) Submittal	15 days*

*Calendar days following receipt of City/CCRFCD comments.

Action Items:

SHG

- *Provide CLV with list of required plans and studies.*
- *Prepare MS Project schedule.*
- *Provide Dennis with first progress meeting date.*

CLV

- *Dennis to invite Layne Weber to monthly progress meetings.*
- *Dennis to establish and send invitations to monthly progress meetings once SHG has made progress on survey and aerial mapping tasks.*

CCRFCD

- *Todd to send CONTECH erosion control information to the team.*

cc: Attendees

CLV Email Correspondence (Trail) – March 11, 2014

Mark Failla

From: Dennis Moyer <dmoyer@LasVegasNevada.GOV>
Sent: Tuesday, March 11, 2014 8:13 AM
To: Jerrod Ratcliffe
Cc: Mark Failla
Subject: RE: Brent Lane Drainage System & Trail - Kickoff Meeting Notes _DRAFT

Jerrod,

Reviewing the note are accurate however upon reviewing the funding documents for the trail funds states that the trail will include signage, benches, trash receptacles and landscaping.

When we do the design we will need to keep this in mind and see if the available \$216,000 construction funding will accommodate this and if RFCD will allow landscaping adjacent to the box.

Dennis B. Moyer, P.E.
Engineering Project Manager
Engineering Design Division
Department of Public Work
City of Las Vegas
(702) 229-6018 (Office)
(702) 303-0483 (Cell)

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From: Jerrod Ratcliffe [<mailto:jratcliffe@shg-inc.com>]
Sent: Monday, March 10, 2014 10:10 AM
To: Rick Schroder; Fred Solis; Bill L. Snyder; Kristina Swallow; Keith Letus; Greg McDermott; Oh-Sang Kwon; Dennis Moyer; Connie Diso; Alan Riecki; 'tmyers@regionalflood.org'; Rosa Cortez
Cc: Mark Failla
Subject: Brent Lane Drainage System & Trail - Kickoff Meeting Notes _DRAFT

Attached are draft meeting notes from the March 6th Brent Lane Drainage System & Trail kickoff meeting. Please let me know by the end of day March 17th if you have any comments to incorporate into the final notes.

Thank you,

Jerrod Ratcliffe
Project Manager

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CLV/CCRFC D Progress Meeting #1 Minutes – April 8, 2014



MEETING NOTES

By: Mark Failla

Project Number: CLV1401.01

Date: April 8, 2014

SUBJECT:	Brent Lane Drainage System & Trail Progress Meeting #1	
PLACE:	City of Las Vegas Public Works Boulder Room 333 N. Rancho Drive Las Vegas, NV 89106	
TIME:	2:30 PM	
DATE:	April 8, 2014	
ATTENDING:	Mark Failla, SHG Peter Jackson, CLV Flood Bill Snyder, CLV R/W Keith Letus, CLV Sewer Fred Solis, CLV Planning	Todd Myers, CCRFCD Dennis Moyer, CLV PW Greg McDermott, CLV PW Mike Kinney-CLV Survey Layne Weber-CCPW

The progress meeting was held to update the project team on project status and review discussion topics. The following comments and items were discussed:

1. Mark presented project status & coordination efforts as follows:
 - Aerial Mapping – Received Topo File 3/24
 - Preparing Hydrologic Models: Existing, Ultimate & Local
 - Preparing Alternatives Assessment
 - Preparing Preliminary Drainage Study
 - Preparing Preliminary Design Report
 - Requested & received record info back from Utilities: Century Link, Cox, SWG, LVVWD, NVE Transmission (still need NVE Distribution)
 - Completed & Submitted NV Energy Information Sheet & Contact Authorization Form to NVE Distribution
 - Obtained relevant drainage studies from CLV & CC
 - Project discussion for this meeting: hydrologic models & CN methodology approach, facility alignment, trail alignment, open channel lining material, drainage improvement consideration north of culvert, trail landscaping irrigation
2. Mark presented hydrologic approach. SHG is preparing existing, ultimate and local hydrologic analyses. Local hydrology will be performed for ultimate condition only and will be utilized for sizing laterals and drop inlets. These analyses were considered what was necessary and acceptable to the team. Peter noted that facilities should be designed based on ultimate condition flow even if existing condition flow is greater. Mark noted that SHG will be utilizing the CCRFCD Manual CN methodology approach as opposed to the CCRFCD MPU CN approach. Mark noted that the Manual approach is preferred by Clark County and typically results in slightly more conservative peak flows. The Manual approach was considered acceptable to the team. Todd noted that results of the analyses need to be compared to flows determined by other studies/sources for the area as a calibration. Dennis noted that SHG needs to obtain the Floyd Lamb Park North and South Environmental Enhancement Area Study, dated May 2009 and prepared by LBG. This study

included hydrologic analysis to the detention basin and should be used for comparison. SHG will prepare a summary of flows table comparing the determined flows from the three analyses to other determined flows. The summary table will be submitted to CLV/RFCD prior to submittal for review and comment.

3. The mainline facility alignment was discussed. Mark noted that a single alignment was being pursued which generally runs parallel to Brent Lane and curves along the existing channel alignment to the road crossing. The alignment extends west thru the Durango/Brent intersection and east to the road crossing. The design will include an underground conveyance at the road crossing for the 100-year event. Mark proposed the alignment thru the Durango/Brent intersection will have a slight shift to the south in order to align it between the dry utilities on the north and the water line on the south. Mark noted this proposed alignment result in slightly deficient separation from the water line. The team noted that we need to minimize the deficiency in the separation to the furthest extent possible due to the fact that LVVWD has been holding fairly firm on this matter. However it was agreed that the proposed alignment is preferred and what we should pursue. Mark also noted that the alignment north of Brent and east of the intersection was based on a 4-foot offset from the existing pavement. This would eliminate the need to remove/replace existing pavement in this location as part of this project. The team agreed that this is the preferred alignment.
4. Storm drain at the intersection of Durango/Brent was discussed. Mark presented the preliminary layout plan which generally included reconfiguration of existing storm drain laterals connecting from existing drop inlets, modification to existing drop inlet sizes, addition of a field drop inlet on the northwest corner and providing a storm drain stub to the north along Durango. The team decided that the design should consider whether the ultimate extension of storm drain along Durango should be constructed with this project or if it should remain a stub. RFCD would fund up to a quarter mile of this facility. Mark said SHG will look into this consideration. The team also decided that a field drop inlet should be provided in the northwest corner along Brent Lane as well in the northwest corner along Durango. Peter noted that SHG should check the ultimate width of Durango north of Brent.
5. Dennis noted that the vacant land north of Brent Lane is currently planned to be a BMX Bike park.
6. Todd noted that a closed conduit facility the entire length is preferred. The Pre-Design report should still consider open channel options; however accommodating the interim condition flows is not the main concern. For open channel options, only concrete lined should be considered.
7. RFCD has no problem with utilizing the facility maintenance access road for the trail system as well (even if the trail requires irrigation). It would need to be a minimum of 12-feet wide.
8. It was discussed whether drainage improvements north of the road crossing should be considered. Peter and Todd said if SHG determines they are necessary they should be considered.

April 8, 2014

CLV1401.01

9. Dennis would like trail consideration along the south side of Brent Lane. Dennis provided Mark copies of typical trail sections (multi-use equestrian/pedestrian, pedestrian only and equestrian only) as well as the multi-use master trails plan and a copy of the Floyd Lamb Trail Estimated expense report. Dennis wants cost estimates for the trail and regional facility separate. Dennis noted that the trail budget is \$200K for construction and \$60 for design.
10. Mark noted that the Pre-Design Report submittal will be to CLV, RFCD and CCPW concurrently. Layne said that there is no review fee for CCPW review and that a submittal meeting with himself and Joe Yatson should occur for receipt of the study.
11. Mark presented the following estimated schedule:

➤ Preliminary and General Items	60 days (May 5, 2014)
➤ 50% Submittal	75 days*
➤ 90% Submittal	90 days*
➤ CCRFCD Project Presentations	TBD
➤ 100% (Pre-final) Submittal	30 days*
➤ 100% (Final) Submittal	15 days*

*Calendar days following receipt of City/CCRFCD/CCPW comments.

Action Items:

SHG

- *Submit flow rate summary table to CLV/RFCD prior to Pre-Design submittal for review and comment.*
- *Obtain electronic copy of Floyd Lamb Park North and South Environmental Enhancement Area Study from LBG.*
- *Check on ultimate width of Durango north of the Brent Lane intersection.*
- *Continue with Preliminary Drainage Study and Pre-Design Report for May 5, 2014 submittal.*

cc: Attendees

CLV/CCRFC D Email Correspondence (Hydrology) – April 16, 2014

Mark Failla

From: Mark Failla
Sent: Wednesday, April 16, 2014 4:01 PM
To: 'Dennis Moyer'; tmyers@regionalflood.org; Peter Jackson
Cc: Kellin Collins; Andrew Howard
Subject: RE: Brent Lane Drainage System & Trail - Hydrologic Analysis

Will do... Thanks Dennis!

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Dennis Moyer [mailto:dmoyer@LasVegasNevada.GOV]
Sent: Wednesday, April 16, 2014 3:29 PM
To: Mark Failla; tmyers@regionalflood.org; Peter Jackson
Cc: Kellin Collins; Andrew Howard
Subject: RE: Brent Lane Drainage System & Trail - Hydrologic Analysis

We should that the more conservative route and assume the entire NW115C is routed to the Brent Lane facility.

Dennis B. Moyer, P.E.
Engineering Project Manager
Engineering Design Division
Department of Public Work
City of Las Vegas
(702) 229-6018 (Office)
(702) 303-0483 (Cell)

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From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Wednesday, April 16, 2014 3:18 PM
To: Dennis Moyer; tmyers@regionalflood.org; Peter Jackson
Cc: Kellin Collins; Andrew Howard
Subject: RE: Brent Lane Drainage System & Trail - Hydrologic Analysis

Thanks Dennis.

My opinion is that the planned drainage pattern in the MPU for a portion of Basin NW115C is no longer valid due to actual constructed improvements. Since 1.) the flow to that location is not a qualifying flow for an MPU facility to be extended to that point, 2.) there is already existing/planned local storm drain in Log Cabin Way perpetuating the flow east along Log Cabin, and 3.) I don't anticipate any private developer installing a facility to force the remaining portion of the basin to the south toward the Brent Lane facility; it doesn't make sense to include flow from this portion of the basin in our design flow for Brent Lane. I recommend that Basin NW115C be amended in the MPU for the northern portion to drain east along

Log Cabin, away from the Brent Lane facility and to the North Enhancement Area. The LBG study assessed the Northern Enhancement Area with a larger interim flow (1135 cfs) than results under ultimate conditions (700 cfs).

The easier route would be to just assume that ultimately the entire basin NW115C is routed to the Brent Lane facility in conformance with the MPU. We currently have estimated that inclusion of the entire basin results in about 200 cfs difference than excluding the northern portion.

I will follow up with a phone call.

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Dennis Moyer [<mailto:dmoyer@LasVegasNevada.GOV>]
Sent: Wednesday, April 16, 2014 2:15 PM
To: Mark Failla; tmyers@regionalflood.org; Peter Jackson
Cc: Kellin Collins; Andrew Howard
Subject: RE: Brent Lane Drainage System & Trail - Hydrologic Analysis

Mark,

We do have a response.

The MPU is your planning tool for recommended facilities. Through you hydraulic analysis you have come up with some discrepancies between the MPU, the North and South Environmental Enhancement Study and your study for Brent Lane.

Flood control offered this:

If your detailed analysis shows something different from the MPU, what do you recommend be done to provide the best facility?

If the MPU System will not function as shown in the MPU, what are the system impacts to the existing facilities and basins?

If the MPU System will not function as shown in the MPU, what are the system impacts if we change the flow locations?

What is your recommended MPU solution to collect the flows?

Call me so we can discuss

Dennis B. Moyer, P.E.
Engineering Project Manager
Engineering Design Division

Department of Public Work
City of Las Vegas
(702) 229-6018 (Office)
(702) 303-0483 (Cell)

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From: Mark Failla [<mailto:mfailla@shg-inc.com>]
Sent: Wednesday, April 16, 2014 2:09 PM
To: Dennis Moyer; tmyers@regionalflood.org; Peter Jackson
Cc: Kellin Collins; Andrew Howard
Subject: RE: Brent Lane Drainage System & Trail - Hydrologic Analysis

All:
I haven't heard back from anyone on this issue. Does anyone have any input or need any clarification of the issue? Let me know.

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Mark Failla
Sent: Monday, April 14, 2014 4:24 PM
To: dmoyer@lasvegasnevada.gov; tmyers@regionalflood.org; Peter Jackson (pjackson@LasVegasNevada.GOV)
Cc: 'Kellin Collins' (kcollins@shg-inc.com); Andrew Howard
Subject: Brent Lane Drainage System & Trail - Hydrologic Analysis

Dennis, Todd and Peter:

We are finishing up the hydrologic analysis for the above subject project and would like all of your opinions on a specific issue.

The attached Exhibit I our ultimate condition drainage map. The black lines on the exhibit depict the MPU basins and the yellow lines depict SHG basins that modify the MPU basin based on field conditions, record drawings, topo, etc. Based on physical features constructed, we have modified MPU basin NW115C to partially drain away from the Brent Lane System and the South Environmental Enhancement Area (there is a constructed high point in El Capitan where we have our basin cut as well as a local storm drain system in Log Cabin Way and topo runs from west to east); however the MPU has the entire NW115-C basin contributing to the Brent Lane Storm Drain facility.

The other attached exhibits are the interim and ultimate drainage map exhibits from the LBG study for the enhancement areas. Notice that there study subdivides MPU Basin NW115-C into three basins identified as NW100N, MW100S, and NW99. Under interim conditions the LBG study has all three basins/NW115C draining to the north enhancement area and away from the Brent Lane System and south enhancement area. Under ultimate conditions the LBG study has all three basins/NW115C draining to the Brent Lane System and south enhancement area per the MPU.

The question: I don't believe that the portion of basin NW115C, as depicted on our Exhibit I, that we have draining away from the Brent Lane System should be assumed to go there under ultimate conditions because of the physical constructed features and since there is no planned regional facility that extends to that point to bring it to the south. Please provide your thoughts/direction with regard to this issue?

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Kellin Collins
Sent: Monday, April 14, 2014 3:34 PM
To: Mark Failla
Subject: Brent Lane: Ultimate Condition

Please see attached

Kellin Collins, P.E.
Project Engineer

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