Memorandum

City of Las Vegas
Department of Public Works
Engineering Planning

To: Dennis Moyer, P.E.
Engineering Project Manager

From: Peter Jackson, CFM
Flood Control Section

Date: May 20, 2015

Re: Brent Lane Drainage System and Trail Improvements
90% Design Submittal and Drainage Report
Hansen # 49876, WU8319

We have reviewed the Brent Lane Drainage System and Trail Improvements 90% Design Submittal and Drainage Report for the proposed CCRFCD drainage facility within the Brent Lane alignment at Floyd Lamb Park to the Durango Drive intersection and offer the following comments:

1. Flood Control takes no exception to the updated overall hydraulic analysis.
2. Alternative erosion protection needs to be evaluated and reviewed along the upstream side of the channel in lieu of the 48-inch rip-rap section shown prior to the next submittal. Otherwise, there needs to be a detailed discussion and justification on using the 48-inch rip-rap section next to the channel cut-off wall. It appears that the cut-off wall would have to be extended below the rip-rap section, including the 12-inches of base material. This makes the cut-off wall at least 6-foot deep on a 7-foot deep channel. Update the Cost Estimate based upon the selected alternative. Review and revise plans accordingly.
3. Provide updated details for the concrete channel to incorporate the alternative erosion protection. Extend the depth of the upstream cut-off wall to provide adequate erosion protection for the surface inflow into the channel. The cut-off walls (3-foot minimum) should be at least 1-foot deeper than the proposed erosion protection thickness.
4. The roadway calculations for Durango, north of Brent (Section 1-W), shows a slope of 1.5% while the TC elevations show slopes less than 0.4%. Review and revise the roadway and curb design to match the updated calculations. Provide a minimum slope of 0.4% along the curb-line. Provide a typical section of the roadway.
5. Inlet collection at the northwest corner of the intersection of Brent and Durango must accommodate the existing safe route to schools asphalt walkway. Provide detailed grading of this portion of the intersection showing the safe route and inlet collection. Clearly show the limits of the new curb & gutter and the asphalt safe route to schools walkway.
6. Coordinate the location of a 12-inch sewer sleeve under the RCB near Station 13+00 for the future sewer. Extend the sleeve a minimum of 15-feet each side of the RCB crossing. Include a plan and detail of the sewer sleeve. Contact Mark Potokar @ 229-4979 to coordinate the location.

7. Flood Control recommends that the proposed concrete flume entering the channel near Station 14+00 be adjusted to enter the channel at an angle closer to 90-degrees. Show the flume location on the profile.
8. The collection system at Durango has been revised to improve efficiency. Flood Control recommends that system be further refined to eliminate two additional manholes by straight grading, thereby eliminating the manholes at 39+84 and 39+40. Review and revise accordingly.
9. Provide detailed grading around the area drop inlet including concrete collar, roadway safety markers and grading swale.
10. Include call-outs for the headwalls and cut-off walls on the storm drain profile.
11. Provide details for the RCB construction. The cast in place option needs to modify the NDOT detail referenced to have the construction joint at least 3-inches above the invert. System design needs to accommodate the construction option of pre-cast or cast-in-place improvements. Verify that the Specifications and schedule accommodate the proposed construction methods.
12. Clearly indicate how the rip-rap and grading repair is quantified for the area east of Tule Springs Road as shown on Sheets DR-02, SD-01 and GR-01.
13. Revise the channel section details to better define the rip-rap sections in relation to the concrete sections.
14. Revise the channel sections A, B and C on Sheet SD-11 to show the rip-rap D_{50} size & thickness and include the Type II Base Material.
15. Provide revised inlet calculations as necessary to support the final system design. Review the Type 2B inlet capacity calculations for the special inlets. The two special inlets shown on Sheet SD-04 need to include cross bars like the Type 2B inlet for pedestrian protection.
16. The Horizontal Control Plan (Sheet SC-02) needs to include the offsets to the Trail and Storm Drain from the control centerline.
17. Provide the clearance between storm drain drop inlets and the water main. Provide a minimum of 2-foot between the storm drain pipe and the existing water lines where practical. Provide encasement requirements and/or water stop details as necessary.
18. Provide the horizontal clearance between the trench drain drop inlet wall and the existing water main as shown on Sheet S-7, Elevation A. Provide a minimum of 2-foot between the drop inlet wall and the existing water line. Provide encasement requirements and/or water stop details for the trench drain as necessary for Water District approval.
19. Clearly identify the removal and replacement of the fencing along the east side of Tule Springs Road (see RD-02).
20. Identify where the 6-inch storm drain abandonment is covered in the Specs. This should include cut, cap and fill of the storm drain line. The removal plan only shows the upper segment of the abandonment. Reference the added pipe on SD-5 & SD-6.
21. Show the recently installed existing railroad tie fencing along Durango. Review installed location and verify that this facility does not impact the proposed inlet at the northeast corner of Durango and Brent.

22. Update the Removal Plans to show the pavement removals to the nearest foot increment. Showing the removals to the nearest one-hundredth of a foot is not practical. The information is helpful to determine the quantities for estimating purposes.

23. Provide an updated detailed cost estimate with the next submittal for review. Include the costs by funding source. The cost estimate must be refined prior requesting the construction funding from CCRFCD to assure that the requested and allocated storm drain funds are sufficient for construction.

24. Provide an update on the status of the necessary AEP.

25. The Final Design Report needs to include an electronic copy of the entire report with all of the input and output files for the hydraulics and hydrology.

26. Update the Storm Drain Final Location Map Note (Note 20) as part of the CLV General Notes per the latest specifications.

27. Clearly identify the City/County jurisdictional boundaries. Continue to coordinate the required County Approval of the plans and the inspection process within the County's jurisdiction.

28. See the plans for additional comments.

CC: Oh-Sang Kwon, P.E. – CLV
Kristina Swallow, P.E. – CLV
Tim Parks, P.E. – CLV
Mark Potokar, CLV
Todd Myers, P.E. – CCRFCD
Mark Failla, P.E. – SHG

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Brent Lane Drainage System and Trail
Durango Drive to Floyd Lamb Park
Response to 50% Comments

3/14/2015

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
			50% DRAINAGE REPORT	
1	General	Flood (PJ)	The City takes no exception to the overall hydrologic analysis.	A-Acknowledged.
2	General	Flood (PJ)	Flood Control has received a copy of CCRFCD's acceptance of the Environmental Screening for this project dated July 15, 2014.	A-Acknowledged.
3	General	Flood (PJ)	Review the open channel design to accommodate the required freeboard, super elevation, channel bends and potential wave height impacts to the overall channel section. Provide a revised channel section based upon the updated calculations to support the design channel section.	A-Acknowledged. The design has been revised to accommodate additional freeboard resulting from wave height impacts and to maintain flow depth plus all freeboard within the normal channel section.
4	General	Flood (PJ)	The discharge velocities into the existing channel are excessive (over 20 fps) for the section shown. Provide updated calculations to support the transitions needed to accommodate the design flow.	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
5	General	Flood (PJ)	Provide an updated WSPG analysis of the proposed system with the next submittal.	A-Acknowledged. Updated WSPG hydraulic models have been provided.
6	General	Flood (PJ)	Review and revise the inlet collection system at the intersection of Brent and Durango to improve efficiency and reduce construction impacts.	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly.
7	General	Flood (PJ)	System design needs to accommodate the construction option of pre-cast or cast-in-place improvements. Verify that the Specifications and schedule accommodate the proposed construction methods.	A-Acknowledged. Plans and specifications have been updated to accommodate both pre-cast and cast-in-place construction methods for the 12'x6' RCB.
8	General	Flood (PJ)	Provide revised inlet calculations as necessary to support the system design with the next submittal. Review the Type 2B inlet capacities.	A-Acknowledged. Revised inlet computations have been provided accordingly. Type 2B inlet capacities have been reviewed and revised accordingly.
9	General	Flood (PJ)	Provide the lateral and inlet design information to include water and/or sewer relocations with the next submittal. Provide the clearance between storm drain and the water &sewer lines. Provide encasement requirements and details as necessary.	A-Acknowledged. Additional utility information incorporating pothole data has been provided at storm drain lateral and inlets; including any relocations. Clearance and detail information in accordance with criteria has also been provided; including the necessity of encasements and/or sleeves.
10	General	Flood (PJ)	Provide an updated detailed cost estimate with the next submittal for review. Reduce the contingency to 10% with the 90% submittal. The cost estimate must be refined prior to the 90% submittal and request for construction funding to assure that the requested and allocated storm drain funds are sufficient for construction.	A-Acknowledged.
11	General	Flood (PJ)	The Final Design Report needs to include an electronic copy of the entire report with all of the input and output files for the hydraulics and hydrology.	A-Acknowledged.
12	General	Flood (PJ)	Coordinate the required County Approval of the plans and the inspection process within the County's jurisdiction.	A-Acknowledged. The 90% design documents will be submitted to CCPW for review and comment concurrent with submittal to CLV/CCRFCD.
13	General	Traffic (RS)	Provide a copy of the specs and cost estimate	A-Acknowledged.
14	General	RFCD (TM)	A facility-specific environmental analysis in accordance with Chapter 8 of District's *Supplemental Programmatic Environmental Impact Statement, Clark County Regional Flood Control District, 2002 Master Plan Update, September 2004* has been submitted and accepted. *The District's Policies and Procedures regarding environmental permitting as a pre-requisite for construction funding eligibility have been satisfied.* *Please note that if additional analysis and/or coordination with NVSHPO are required for work relating to the trail project, non-District funds shall be utilized for that effort.*	A-Acknowledged.
15	General	RFCD (TM)	Identify all right-of-way (ROW) and easement acquisition requirements for this project. All ROW/easements must be acquired prior to City's request for construction funding.	A-Acknowledged. No ROW acquisition is required for the project. Authorization to Enter Property (AEP) for construction. AEP exhibits have been provided to CLV with the 90% Submittal for acquisition.
16	General	RFCD (TM)	District concurs with hydrologic analyses presented in the *50% Drainage Report.*	A-Acknowledged.
17	General	RFCD (TM)	Provide additional open channel analysis as discussed in the October 21, 2014 progress meeting.	A-Acknowledged.
18	General	RFCD (TM)	The hydraulic analyses of interim and ultimate conditions indicates velocities over 20 fps discharging from the proposed 20' x 6' RCB into the riprap channel. Per Table 703 of District's *Hydrologic Criteria and Drainage Design Manual,* the maximum permissible velocity for loose riprap is 10 fps, and 15 fps for grouted riprap. Provide recommendations and plan for armoring channel and/or energy dissipation.	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
19	General	RFCD (TM)	Provide Draft Special Provisions and Engineers Cost Estimate with District and SNPLMA breakout, structural drawings and pothole information with next submittal	A-Acknowledged.
			DRAWINGS (50%)	
1	GN-01	Flood (PJ)	Note #20 of CLV General Notes: Add "SD lateral locations"	A-Acknowledged.
2	DR-01	Flood (PJ)	Fill existing 6" SD at SW corner	A-Acknowledged. The existing 6" PVC SD has been identified for removal.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
3	DR-02	Flood (PJ)	Add other lateral crossings of Tule Springs Road	A-Acknowledged. Pavement removal associated with other SD laterals within Tule Springs Road/Brent Lane have been added to the plans.
4	SD-01	Flood (PJ)	Extend Concrete to HP @ Special Inlet #1	A-Acknowledged. The drop inlet at this location has been removed and the ditch has been extended for direct discharge to the mainline concrete channel.
5	SD-01	Flood (PJ)	Recommend 45° angle @ Special Inlet #1 lateral connection	A-Acknowledged. The drop inlet at this location has been removed and the ditch has been extended for direct discharge to the mainline concrete channel.
6	SD-01	Flood (PJ)	Provide a 12-foot wide concrete access ramp for maintenance at the outfall end of the culvert crossing of Tule Springs Road.	A-Acknowledged. A 12-foot wide concrete access ramp has been added for maintenance at the outfall end of the Tule Springs culvert crossing.
7	SD-01	Flood (PJ)	Need detailed grading and headwall information for RCB outlet	A-Acknowledged. Detailed grading and headwall information has been provided.
8	SD-01	Flood (PJ)	Type 2 or Type 2B (recommend 2B near trail)	A-Acknowledged. Drop inlet has been revised to a NDOT Type 2B.
9	SD-01	Flood (PJ)	Provide details for RCB - open channel transition	A-Acknowledged. Details have been provided for the channel transition.
10	SD-01	Flood (PJ)	Provide riprap detail information in downstream channel for velocities >20fps	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
11	SD-01	Flood (PJ)	STA 11+41.34: V=25.21fps = too fast = modify hydraulics	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
12	SD-01	Flood (PJ)	Provide slope on profile of RCB	A-Acknowledged. RCB slope has been added to plans.
13	SD-01	Flood (PJ)	Construction Note #32: should it be Type 2B inlet?	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly.
14	SD-01	Flood (PJ)	Suggest using 6" of Type II base, not 4"	A-Acknowledged. Type II base has been revised to 6" for the maintenance access road.
15	SD-03	Flood (PJ)	Change fence location for ramp access	A-Acknowledged. Per meeting discussion, fencing has been removed from the north side of the channel at this location. Additionally, access ramp has been relocated to south side of channel.
16	SD-03	Flood (PJ)	Detail access ramp	A-Acknowledged. Access ramp details have been provided.
17	SD-03	Flood (PJ)	Suggest moving access ramp to south side of channel	A-Acknowledged. Access ramp has been moved to south side of channel to coincide with 12-foot access road being relocated to south side of channel.
18	SD-03	Flood (PJ)	Check superelevation calcs	A-Acknowledged.Hydraulic computations have been reviewed and updated accordingly.
19	SD-03	Flood (PJ)	Check wave height impact	A-Acknowledged. Wave height impact computations have been performed and additional freeboard has been added accordingly.
20	SD-03	Flood (PJ)	Recommend providing a graded high point downstream of the surface flow entry structures to reduce maintenance impacts in the future.	C- The maintenance access road has been removed from the north/west side of the channel. A concrete flume into the concrete channel has been provided at the surface flow entry to minimize maintenance impacts.
21	SD-03	Flood (PJ)	Add 0.5-ft to flow depth at bend in channel	A-Acknowledged. The overall channel depth has been revised from 6-feet to 7-feet to accommodate freeboard requirements.
22	SD-03	Flood (PJ)	Provide fencing for any proposed open channel sections to secure the channel within this Park facility. Provide appropriate access gates as needed. Recommend that the fencing along the southerly side of the open channel section use rail road ties as posts with the cable fencing. Reference the design from the NEEA and SEEA plans for Floyd Lamb Park (CLV # 327V282). Use standard 3 - wire post and cable fencing on the opposite side of the channel.	Per meeting discussion, it was decided to eliminate post and cable fencing along the north side of the trapezoidal open channel. Railing along the north and south sides of channel have been utilized along headwalls and where channel transitions to rectangular sections for maintenance safety. Fencing along south side runs adjacent to the trail. The posts are railroad ties and the cable is 2-strand. The post and cable fencing matches that used in other parts of Floyd Lamb Park. Controlled access is provided at both ends of channel. Swing gates the same height as the post and cable fencing are used similar to other swing gates utilized within Floyd Lamb Park.
23	SD-04	Flood (PJ)	Add expanded concrete collar for slotted manhole lid	C-Slotted manhole is no longer necessary and has been removed.
24	SD-04	Flood (PJ)	Add pavement removals to drainage sheets at lateral crossings	A-Acknowledged. Pavement removals have been added to removal sheets at SD lateral crossings.
25	SD-04	Flood (PJ)	Provide size of extended CMP culvert	C-The proposed extension is no longer necessary and has been removed from the plans.
26	SD-04	Flood (PJ)	Provide size of existing CMP culvert	A-Acknowledged.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
27	SD-04	Flood (PJ)	Why is slotted manhole lid needed	C-Slotted manhole is no longer necessary and has been removed.
28	SD-04	Flood (PJ)	Suggest using NDOT Type 2B inlets	A-Acknowledged.
29	SD-04	Flood (PJ)	Show 2% crossfall on plan of roadway at bend and provide recommendation on roadway and grading transitions needed to collect interim surface flows into the open channel.	A-Acknowledged. Plans have been revised to accommodate interim flow discharge into channel at this location.
30	SD-04	Flood (PJ)	Suggest concrete trail at flow crossing near bend in road	A-Acknowledged. Trail has been revised to concrete where interim flows are anticipated to cross.
31	SD-04	Flood (PJ)	Detail grading to warp and depress trail for drainage near bend in road	A-Acknowledged. Plans have been revised to accommodate interim flow discharge into channel at this location.
32	SD-04	Flood (PJ)	Show entry gate fencing on profile view.	A-Acknowledged. Entry gate fencing has been added to profile view.
33	SD-04	Flood (PJ)	Construction Note #32: suggest using NDOT Type 2B inlet	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly.
34	SD-05	Flood (PJ)	Show removal and replacement on plan	A-Acknowledged. Pavement removals have been added to removal sheets at SD lateral crossings.
35	SD-06	Flood (PJ)	Add nominal storm drain inlet every 660-ft	A-Acknowledged. Nominal SD inlets and laterals have been added at approximately 660-ft intervals along Brent Lane.
36	SD-06	Flood (PJ)	Extend the 12' x 6' RCB at least two segments (12-feet +/-) past the inlet structure shown on Sheets SD-06 and SD-15 before installing the RCB Plug.	A-Acknowledged. RCB has been extended upstream beyong the inlet connection.
37	SD-06	Flood (PJ)	How do inlets/curb at NW corner of Durango impact safe path to school?	B-Installation of the inlets/curb will maintain/improve the existing path. Additionally, crosswalk striping has been added at the intersection.
38	SD-06	Flood (PJ)	Revise layout of storm drain laterals	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly.
39	SD-06	Flood (PJ)	Abandon and remove existing 6-in PVC storm drain	A-Acknowledged. The existing 6" PVC SD has been identified for removal.
40	SD-06	Flood (PJ)	Suggest eliminating manholes by connecting laterals directly into RCB	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly.
41	SD-06	Flood (PJ)	Is the clearance between the RCB and SS in Durango 18-in? Refer to 307Y-4622-05 for separation requirements	A-Acknowledged. 18-inch minimum separation has been provided from the RCB.
42	SD-06	Flood (PJ)	Construction Note #31: suggest using NDOT Type 2B inlet	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly.
43	SD-06	Flood (PJ)	Remove excess construction notes	A-Acknowledged.
43	SD-06	Flood (PJ)	The existing sanitary sewer in Durango is an 18-inch line while the plans show an 8-inch sewer. Review the existing sewer location and provide appropriate separation between the existing 18-inch sewer and the proposed RCB.	A-Acknowledged. Plans have been revised accordingly.
44	SD-07	Flood (PJ)	Inlets need to be in sump - adjust grades accordingly	A-Acknowledged.
45	SD-10	Flood (PJ)	Provide RCB and channel details	A-Acknowledged.
46	SD-11	Flood (PJ)	If pedestrians have access, use NDOT Type 2B grates. If needed, enlarge inlets for added clogging factor. Example of depth: Grate elev. = 0.0, Location 2A elev. = 0.45, Location 2 elev. = 0.9	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly. Computations have been revised accordingly.
47	SD-14	Flood (PJ)	Revise fencing	A-Acknowledged. See response to comment #22.
48	SD-15	Flood (PJ)	Add 1 RCB segment clear of special inlet structure	A-Acknowledged. See comment #36.
49	SD-15	Flood (PJ)	Show sewer and sewer sleeve extending 10-ft past trench drain	C-The trench drain design has been revised to provide 18-inch separation from the sewer line; therefore steel sleeve is not considered necessary.
50	SD-15	Flood (PJ)	Show separation from sewer in plan	A-Acknowledged.
51	SD-15	Flood (PJ)	Coordinate sewer sleeve with Tim Parks at Sewer Planning 702-229-2178	C-The trench drain design has been revised to provide 18-inch separation from the sewer line; therefore steel sleeve is not considered necessary.
52	GR-01	Flood (PJ)	Show existing riprap west of Tule Springs Road	A-Acknowledged.
53	GR-01	Flood (PJ)	Add riprap embankment protection to proposed embankment extension	A-Acknowledged.
54	GR-01	Flood (PJ)	Suggest grading side channel to grade directly into main channel rather than into 12-ft sump inlet	A-Acknowledged. Since access road has been relocated to south side of channel, side channel has been revised to grade directly into main channel.
55	GR-01	Flood (PJ)	Add high point at top of channel on north side near RCB inlet	A-Acknowledged. Since access road has been relocated to south side of channel, side channel has been revised to grade directly into main channel.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
56	GR-01	Flood (PJ)	Add fencing between end of extended berm to RCB inlet to control access	A-Acknowledged.
57	GR-01	Flood (PJ)	Widen top of extended berm to 12-ft min.	A-Acknowledged.
58	GR-01	Flood (PJ)	Extend headwalls at RCB outlet	A-Acknowledged.
59	GR-01	Flood (PJ)	Extend riprap sections at downstream	A-Acknowledged.
60	GR-01	Flood (PJ)	Provide transitional grading in downstream riprap	A-Acknowledged.
61	GR-03	Flood (PJ)	Show location of access ramp	A-Acknowledged.
62	GR-03	Flood (PJ)	Suggest depressing side entrance to channel embankment	A-Acknowledged. Depressed concrete flumes have been added at concentrated inflow locations to the channel.
63	GR-03	Flood (PJ)	Suggest moving access road to south side of channel to eliminate potential of washout	A-Acknowledged. Access road has been relocated to south side of channel.
64	GR-03	Flood (PJ)	Provide riprap at side entrance to channel embankment	A-Acknowledged. Riprap is provided.
65	GR-05	Flood (PJ)	Provide details for the concrete channel. Extend the depth of the upstream cut-off wall to provide adequate protection for the surface inflow into the channel.	A-Acknowledged. Structural details for the concrete channel have been provided.
66	GR-05	Flood (PJ)	Show erosion protection along extended berm	A-Acknowledged. Riprap erosion protection has been added along the berm slope.
67	GR-05	Flood (PJ)	Show top of extended berm = 12-ft	A-Acknowledged. The top of berm extension has been increased to 12-feet.
68	GR-05	Flood (PJ)	Show RCB in Section D	A-Acknowledged. RCB has been added to appropriate sections.
69	TR-01	Flood (PJ)	Call out existing safe route to school	A-Acknowledged.
70	TR-01	Flood (PJ)	Provide crosswalk and associated signage for trail connection across Brent Lane, just east of Durango	C-A crosswalk has not been added across Brent Lane east of Durango since a roadside ditch is proposed along the north side of Brent Lane at this location and trail connectivity is provided along the equestrian trail on the south side of Brent Lane.
71	TR-05	Flood (PJ)	Provide signage for crosswalk trail connection.	A-Acknowledged. Signage for trail connection has been added.
72	TR-06	Flood (PJ)	Provide signage for crosswalk trail connection.	A-Acknowledged. Signage for trail connection has been added.
73	General	Flood (PJ)	Include detailed grading plans for the transition from the RCB to the existing channel section	A-Acknowledged. Detailed grading has been added.
74	General	Flood (PJ)	Inlet collection at the northwest corner of the intersection of Brent and Durango must accommodate the existing safe route to schools asphalt walkway. Provide detailed grading of this portion of the intersection showing the safe route and inlet collection.	A-Acknowledged.
75	General	Flood (PJ)	Provide detailed grading around the area drop inlet on the north side of Brent, west of Durango, including concrete collar, roadway safety markers and grading swale.	A-Acknowledged. Detailed grading around the area drop inlet has been provided including concrete collar and swale.
76	General	Flood (PJ)	Show the RCB angle points and/or curved segments by station location and angle/degree change. Include the radius information and discuss how the curved sections are to be completed using curved forms or multiple angled segments. This needs to be explained within the Specifications. This information is needed to allow for the use of precast RCB's as well as cast in place construction.	A-Acknowledged. RCB curve data has been added to plans. Curved section construction methods have been added to the specifications.
76	General	Flood (PJ)	Provide details for the RCB construction.	A-Acknowledged. NDOT standard drawings for the 12'x6' RCB have been called out in the construction notes for CIP construction. Precast RCB option is addressed in the specifications. Structural details for the 20'x7' RCB culvert have been added to the plans.
76	General	Flood (PJ)	Provide complete details for the special trench drain and inlet vault structure. Coordinate the sanitary sewer sleeve needed for the protection of the existing sewer at the trench drain crossing with Tim Parks, P.E., Project Manager, Collection System Planning.	A-Acknowledged. Structural details for the trench drain have been provided. The revised trench drain provides 18-inch separation from the trench drain and a steel sleeve is considered not necessary.
77	General	Flood (PJ)	The existing sanitary sewer in Durango is an 18-inch line while the plans show an 8-inch sewer. Review the existing sewer location and provide appropriate separation between the existing 18-inch sewer and the proposed RCB.	A-Acknowledged.
78	General	Flood (PJ)	The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles. Indicate the type of pipe material for water and sewer lines. ACP water lines will require special consideration and handling and must be addressed in the specifications.	A-Acknowledged. Existing and proposed utility crossings are included on plan and profiles. Material type for existing water and sewer have been added to the plans.
79	General	Flood (PJ)	Clearly identify the required utility relocations and which relocations are incidental to and part of the storm drain work.	A-Acknowledged.
80	General	Flood (PJ)	Provide separate plan and profiles for any relocated sewer and/or water lines.	C-No relocations of sewer or water are proposed.
81	General	Flood (PJ)	Provide detail sheets showing typical details needed for the construction, connection and any special transition structure details. Structural details must be submitted with the 90% submittal.	A-Acknowledged. Structural details have been provided.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
82	General	Flood (PJ)	Provide an additional nuisance inlet to the south side of Brent Lane as well as a stub to the north near Station 32+00.	A-Acknowledged. Additional nuisance inlets have been added along Brent Lane in coordination with Comment #35.
83	General	Flood (PJ)	Provide pothole data with the 90% submittal. The pothole information should identify the bottom limits of conduit bank crossings and show the limits of concrete encasement where applicable.	A-Acknowledged. Pothole data sheets have been provided and added to the plans.
84	General	Flood (PJ)	Show the removal and replacement of the roadway landscape improvements and/or cover these items in the Specifications.	A-A landscape plan has been provided as part of the project. Removal and replacement of incidental landscaping has been included in the specifications.
85	General	Flood (PJ)	Expand the Storm Drain Final Location Map Note (Note 20) to include "the storm drain lateral angle points."	A-Acknowledged. Note 20 has been revised to include "the storm drain lateral angle points".
86	General	Planning (CD)	Need to address trail at park entrance gate/wall	A-Acknowledged. The trail at the park entrance has been coordinated with CLV and updated on the plans.
87	GN-02	Planning (CD)	Show limit of residential area in key map	A-Acknowledged.
88	GR-05	Planning (CD)	Revise trail section to show 10-ft decomposed granite trail with 2-ft graded shoulders for consistency with basin trails	A-Acknowledged. Trail section has been revised.
89	LA-03	Planning (CD)	Install monument sign - to be determined by HPC	A-Acknowledged. Note that trail amenities have been removed from the LA sheets and added to the TR sheets.
90	LA-07	Planning (CD)	Change "park" to "trail' in sign plaque language	A-Acknowledged.
91	LA-07	Planning (CD)	Add benches and trash receptacles as shown in provided landscape detail sheet (L5.01)	A-Acknowledged.
92	LA-07	Planning (CD)	Add a doggie bag dispenser on the portion of the trail within the park proper	A-Acknowledged. A doggie bag dispenser has been added to the plans.
93	LA-07	Planning (CD)	Monument sign and sign plaque to be determined by HPC	A-Acknowledged.
94	SD-06	Sewer (KL)	Label SS 18" in profile	A-Acknowledged. 18" SS has been labeled in plan and profile.
95	SD-06	Sewer (KL)	How is 18-in SS in Durango going to be supported during storm drain construction?	B-Support of the 18-inch SS during storm drain construction is considered a means and measures item by the contractor.
96	SD-06	Sewer (KL)	Can typical 10-ft horizontal separation be provided north of Brent?	A-Acknowledged. Storm drain layout has been revised to provide a minimum of 10-feet separation.
97	SD-08	Sewer (KL)	Confirm SS elevations. Separations less than 2-ft will require protection with a minimum separation of 6-in.	A-Acknowledged. Relevant sewer depths were survey field verified at manholes. A minimum of 18-inches is maintained at all locations.
98	SD-15	Sewer (KL)	Is trench drain permanent?	C-Permancy of trench drain will be at the discretion of CLV/CCRFCD. Upon upstream extension of the RCB and additional inlets, the trench drain would likely not be necessary; however the additional capture provided by the trench drain might be preferred to removal.
99	SD-15	Sewer (KL)	Confirm SS elevations. Separations less than 2-ft will require protection with a minimum separation of 6-in.	A-Acknowledged. Relevant sewer depths were survey field verified at manholes. A minimum of 18-inches is maintained at all locations.
100	SD-15	Sewer (KL)	Show sewer in plan view	A-Acknowledged. 18" SS has been labeled in plan and profile.
101	General	Survey (JVT)	Need alignment information on all alignments (DD, BL, TR, and SD)	A-Acknowledged. Horizontal control plan has been updated with all alignments.
102	General	Survey (JVT)	Was there any found monument near 31+50 Brent Lane? See File 114, Page 14 of Parcel Maps. If so, Mark "protect in place"	A-All monuments found have been identified on the plans.
103	GN-01	Survey (JVT)	Add "2008 adjustment" after the benchmark elevation	A-Acknowledged. 2008 Adjustment has been added after the benchmark elevation.
104	SC-01	Survey (JVT)	Add "2008 adjustment" after the benchmark elevation	A-Acknowledged. 2008 Adjustment has been added after the benchmark elevation.
105	SC-01	Survey (JVT)	List the reference map for the referenced distance along Durango	A-Acknowledged.
106	SC-01	Survey (JVT)	Should symbol at Brent/Durango intersection be a square to mean monument?	A-Acknowledged. Monument symbol has been changed to a square.
107	SC-01	Survey (JVT)	What does "(R)" stand for?	A-The "R" symbol has been removed from the plans.
108	SC-01	Survey (JVT)	Show assessor's section information as shown on redlined sheet SC-01	A-Acknowledged. Assessor's section information has been added to the plans.
109	DR-01	Survey (JVT)	Label the survey monument at Brent/Durango as "survey monument, protect in place"	A-Acknowledged. The survey monument at Brent/Durango has been labeld as "survey monument, protect in place".
110	SD-03	Survey (JVT)	What is Construction note #3 for?	A-Acknowledged. Construction note #3 has been removed.
111	SD-06	Survey (JVT)	Label the survey monument at Brent/Durango as "survey monument, protect in place"	A-Acknowledged. The survey monument at Brent/Durango has been labeld as "survey monument, protect in place".
112	General	Traffic (RS)	Provide separate signage & striping plans to ensure the replacement of existing improvements in kind	A-Acknowledged. A separate signage and striping plan has been provided.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
113	General	Traffic (RS)	There is an existing school flasher on Durango that was installed by the County. There should be conduit running along Durango though the intersection for the flasher, but we don't know exactly where. If Call Before Dig shows a north -south conduit not otherwise identified, that is probably it.	A-Acknowledged. Existing conduit has been identified on the plans.
114	DR-01	Traffic (RS)	Install a conduit ring for a future traffic signal per the redlines.	A-Acknolwedged. Conduit for future traffic signals have been added to the SM sheets. Per coordination with CCRFCD, it has been agreed to include within CCRFCD funding.
115	DR-01	Traffic (RS)	Per the provided subdivision improvements (Mystic Valley II), there is traffic signal interconnect conduit on the west side of Durango from the south, capped in the intersection. Extend this conduit to the north end of the project.	A-Acknowledged. Existing conduit has been identified on the plans.
116	TR-01	Traffic (RS)	Install a crosswalk on the east leg of Brent/Durango for the users of the new trail. This will require relocating the existing stop sign and stop bar, as well	C-A crosswalk has not been added across Brent Lane east of Durango since a roadside ditch is proposed along the north side of Brent Lane at this location and trail connectivity is provided along the equestrian trail on the south side of Brent Lane.
117	TR-03	Traffic (RS)	Install appropriate signage and yield lines for all mid-block crosswalks	A-Acknowledged. Appropriate signage and yield lines have been added to the plans for all mid-block crosswalks.
118	TR-03	Traffic (RS)	Move the proposed crosswalk at the park gate 100' to the west to ensure that the driver's sightline of trail users is not obscured by the pilasters at the park entrance	A-Acknowledged. Per meeting coordination it was preferred to move the crosswalk approximately 100' feet east of the park entrance to be within the park limits.
119	TR-05	Traffic (RS)	Install appropriate signage and yield lines for all mid-block crosswalks	A-Acknowledged. Appropriate signage and yield lines have been added to the plans for all mid-block crosswalks.
120	TR-06	Traffic (RS)	Install appropriate signage and yield lines for all mid-block crosswalks	A-Acknowledged. Appropriate signage and yield lines have been added to the plans for all mid-block crosswalks.
121	SD-06	Traffic (RS)	Wherever possible, square off saw cuts	A-Acknowledged. Saw cuts have been squared off where appropriate.
122	GN-01	Civil (DM)	Update CLV traffic notes to current	A-Acknowledged. CLV traffic notes have been updated with the most current notes.
123	GN-01	Civil (DM)	Define PBS	A-PBS stands for Plantmix Bituminous Surface. It has been added to the abbreviations legend on sheet GN-01.
124	DR-01	Civil (DM)	Removal plan does not seem economical and does not include all areas where pavement needs to be removed	A-Acknowledged. Pavement removals have been revised for efficiency and all areas of removal have been added to the plans.
125	DR-01	Civil (DM)	Construction note 2: what is PBS?	A-PBS stands for Plantmix Bituminous Surface. It has been added to the abbreviations legend on sheet GN-01.
126	DR-02	Civil (DM)	Is area shown for removal provide adequate clearance?	B-Acknowledged. Installation of the RCB is expected by use of shoring in order to not impact the existing pavement along Brent Lane.
127	SD-01	Civil (DM)	Clarify special drop inlet #1	C-This DI has been removed.
128	SD-01	Civil (DM)	Provide dimensions and cross section for culvert outlet apron	A-Acknowledged.
129	SD-01	Civil (DM)	Suggest making RCB 8'H but 7'H might be ok	A-Acknowledged. Per meeting discussion, the culvert height has been increased to 7'H to provide additional maintenance clearance.
130	SD-01	Civil (DM)	Slope leader pointing to HGL rather than RCB invert	A-Acknowledged. The leader line has been corrected.
131	SD-01	Civil (DM)	Construction note 4 and 5: what is PBS?	A-PBS stands for Plantmix Bituminous Surface. It has been added to the abbreviations legend on sheet GN-01.
132	SD-01	Civil (DM)	Construction note 16: minimum height of RCB = 8' but 7' might be ok	A-Acknowledged. Per meeting discussion, the culvert height has been increased to 7'H to provide additional maintenance clearance.
133	SD-04	Civil (DM)	Show pavement removal and replacement near park entrance gate	A-Acknowledged. Pavement removals have been revised for efficiency and all areas of removal have been added to the plans.
134	SD-04	Civil (DM)	Replace fencing with railroad tie entrance	A-Acknowledged.
135	SD-04	Civil (DM)	What are dark dashed lines? Edge of pavement?	A-All line types used have been added to the legend.
136	SD-04	Civil (DM)	Clarify construction note 28 (NDOT STD. plan B-20.1.5)	A-Acknowledged. Structural details have ben added to the plans, including any NDOT standard drawings utilized. NDOT STD Plan B-20.1.5 is for CIP option for 12'x6' RCB
137	SD-05	Civil (DM)	Suggest placing laterals and inlets approximately half way between laterals at Durango and park entrance ~650'	A-Acknowledged. See response to Comment#35.
138	SD-06	Civil (DM)	Abandon in place 6" PVC SD	A-Acknowledged. The existing 6" PVC SD has been identified for removal.
139	SD-10	Civil (DM)	Show trail over box sections	A-Acknowledged.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
140	SD-14	Civil (DM)	Discussion is needed for post construction to be similar to what is already in the park	A-Acknowledged.See response to Comment #22.
141	GR-05	Civil (DM)	Show subgrade in sections	A-Acknowledged.
142	GR-05	Civil (DM)	Show channel side slopes	A-Acknowledged.
143	GR-05	Civil (DM)	Show box location in sections	A-Acknowledged.
144	TR-01	Civil (DM)	Conduit future TS at northwest corner	A-Acknowledged. See response to Comment #114.
145	TR-01	Civil (DM)	Crosswalk for trail at northeast corner	A-Acknowledged. A crosswalk has been added.
146	TR-01	Civil (DM)	Provide conduit for future trafic signal across Brent Lane connecting northwest and southwest sides at Durango intersection.	A-Acknowledged. See response to Comment #114.
147	TR-03	Civil (DM)	Show new gates at park entrance	A-Acknowledged.
148	LA-01	Civil (DM)	Provide cross section of trail	A-Acknowledged. Cross section of trail has been provided.
149	LA-07	Civil (DM)	Use new CLV bench and trash receptacle	B-Per meeting coordination, CLV Bench and trash receptacles matching those used in Floyd Lamb Park have been proposed and added to the plans.
150	SD-06	CCPW (AK)	Show special drop inlet #2 to be maintained by CLV	A-Acknowledged. Drop inlet has been identified to be maintained by CLV.
151	SD-06	CCPW (AK)	Add to Lateral Run Profile Index: 6, 7, 8, 9, 10, 11, 12	B-The symbol in the lateral run profile index is typical and applies to every profile run that are included on sheets SD-07 thru SD-09, not just profile 1.
152	General	RFCD (TM)	Identify all right-of-way (ROW) and easement acquisition requirements for this project. All ROW/easements must be acquired prior to City's request for construction funding.	A-Acknowledged. No ROW acquisition is required for the project. Authorization to Enter Property (AEP) for construction. AEP exhibits have been provided to CLV with the 90% Submittal for acquisition.
153	General	RFCD (TM)	Provide utility pothole information with the next submittal.	A-Acknowledged. Utility pothole information has been provided.
154	General	RFCD (TM)	Typically, fall protection (post & cable fencing) is not provided on trapezoidal channels. Investigate limited areas of fencing to discourage public from entering the channel area and provide post and cable fencing at transition and headwall sections for fall protection.	A-Acknowledged.See response to Comment #22.
155	DR-01	RFCD (TM)	Revise the 2" Rotomill sections to removals. The relatively small quantities of rotomilling will not be cost effective.	A-Acknowledged.
156	SD-01	RFCD (TM)	The hydraulic analyses of interim and ultimate conditions indicates velocities over 20 fps discharging from the proposed 20' x 6' RCB into the riprap channel. Per Table 703 of District's *Hydrologic Criteria and Drainage Design Manual,* the maximum permissible velocity for loose riprap is 10 fps, and 15 fps for grouted riprap. Provide recommendations and plan for armoring channel and/or energy dissipation.	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
157	SD-02	RFCD (TM)	Move access road to south side of channel as discussed in September 8, 2014 progress meeting.	A-Acknowledged.
158	SD-04	RFCD (TM)	Provide channel transition details. Note that rectangular section must control through transition from rectangular to trapezoidal, and trapezoidal section must control through transition from trapezoidal to rectangular. See attachment.	A-Acknowledged. Structural details have been provided.
159	SD-04	RFCD (TM)	Provide NDOT Type 2B inlet grates.	A-Acknowledged. NDOT Type 2 inlets have been revised to be NDOT Type 2B inlets.
160	SD-06	RFCD (TM)	Revise design. See attachment for recommendations. Provide pothole information with next submittal.	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly. Pothole information has been provided.
161	SD-07	RFCD (TM)	Verify the type of grates to use on the NDOT drop inlets. Typical all.	A-Acknowledged. NDOT Type 2 inlets have been revised to be NDOT Type 2B inlets.
162	SD-08	RFCD (TM)	Revise profiles based on new lateral layout.	A-Acknowledged.
163	SD-09	RFCD (TM)	Revise profiles based on new lateral layout.	A-Acknowledged.
164	SD-10	RFCD (TM)	Provide construction details for RCB, open channel, and transition sections with next submittal.	A-Acknowledged.
165	SD-15	RFCD (TM)	Provide a design that isolates the trench drain and the special drop inlet from the 12' x 6' RCB. The special drop inlet will likely be replaced with a standard drop inlet once the parcel on the northwest corner of the intersection develops. Isolating the drop inlet will require less destruction and reconstruction of the RCB in the future.	A-Acknowledged.
166	GR-05	RFCD (TM)	Provide transition sections and structural details	A-Acknowledged.
167	LA-01	RFCD (TM)	Only plants with non-invasive root systems shall be planted over RCB. Is irrigation proposed?	A-Acknowledged.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

Work Set

Memorandum

City of Las Vegas
Department of Public Works
Engineering Planning

To: Dennis Moyer, P.E.
Engineering Project Manager

From: Peter Jackson, CFM
Flood Control Section

Date: November 12, 2014

Re: Brent Lane Drainage System and Trail Improvements
50% Design Submittal and Drainage Report
Hansen # 49876, WU8319

We have reviewed the Brent Lane Drainage System and Trail Improvements 50% Design Submittal and Drainage Report for the proposed CCRFCD drainage facility within the Brent Lane alignment at Floyd Lamb Park to the Durango Drive intersection and offer the following comments:

1. The City takes no exception to the overall hydrologic analysis.
2. Flood Control has received a copy of CCRFCD's acceptance of the Environmental Screening for this project dated July 15, 2014.
3. Review the open channel design to accommodate the required freeboard, super elevation, channel bends and potential wave height impacts to the overall channel section. Provide a revised channel section based upon the updated calculations to support the design channel section.
4. The discharge velocities into the existing channel are excessive (over 20 fps) for the section shown. Provide updated calculations to support the transitions needed to accommodate the design flow. Include detailed grading plans for the transition from the RCB to the existing channel section. Provide a maintenance access ramp for this structure (See SD-01).
5. Provide an updated WSPG analysis of the proposed system with the next submittal.
6. Review and revise the inlet collection system at the intersection of Brent and Durango to improve efficiency and reduce construction impacts.
7. Inlet collection at the northwest corner of the intersection of Brent and Durango must accommodate the existing safe route to schools asphalt walkway. Provide detailed grading of this portion of the intersection showing the safe route and inlet collection.
8. Provide recommendation on roadway and grading transitions needed to collect interim surface flows into the open channel. See Sheet SD-04.

9. Recommend providing a graded high point downstream of the surface flow entry structures to reduce maintenance impacts in the future.
10. Revise the berm extension shown on Sheet GR-01 to include a 12-foot top width and provide rip-rap armoring.
11. Provide detailed grading around the area drop inlet including concrete collar, roadway safety markers and grading swale.
12. Show the RCB angle points and/or curved segments by station location and angle/degree change. Include the radius information and discuss how the curved sections are to be completed using curved forms or multiple angled segments. This needs to be explained within the Specifications. This information is needed to allow for the use of precast RCB's as well as cast in place construction.
13. Provide details for the RCB construction. System design needs to accommodate the construction option of pre-cast or cast-in-place improvements. Verify that the Specifications and schedule accommodate the proposed construction methods.
14. Provide details for the concrete channel. Extend the depth of the upstream cut-off wall to provide adequate protection for the surface inflow into the channel.
15. Extend the 12' x 6' RCB at least two segments (12-feet ±) past the inlet structure shown on Sheets SD-06 and SD-15 before installing the RCB Plug.
16. Provide complete details for the special trench drain and inlet vault structure. Coordinate the sanitary sewer sleeve needed for the protection of the existing sewer at the trench drain crossing with Tim Parks, P.E., Project Manager, Collection System Planning.
17. Provide revised inlet calculations as necessary to support the system design with the next submittal. Review the Type 2B inlet capacities.
18. Provide the lateral and inlet design information to include water and/or sewer relocations with the next submittal. Provide the clearance between storm drain and the water & sewer lines. Provide encasement requirements and details as necessary.
19. The existing sanitary sewer in Durango is an 18-inch line while the plans show an 8-inch sewer. Review the existing sewer location and provide appropriate separation between the existing 18-inch sewer and the proposed RCB.
20. The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles. Indicate the type of pipe material for water and sewer lines. ACP water lines will require special consideration and handling and must be addressed in the specifications.
21. Clearly identify the required utility relocations and which relocations are incidental to and part of the storm drain work.
22. Provide separate plan and profiles for any relocated sewer and/or water lines.
23. Provide detail sheets showing typical details needed for the construction, connection and any special transition structure details. Structural details must be submitted with the 90% submittal.
24. Provide an additional nuisance inlet to the south side of Brent Lane as well as a stub to the north near Station 32+00.

25. Provide pothole data with the 90% submittal. The pothole information should identify the bottom limits of conduit bank crossings and show the limits of concrete encasement where applicable.

26. Show the removal and replacement of the roadway landscape improvements and/or cover these items in the Specifications.

27. Relocate the maintenance access to the opposite side of the channel to reduce impacts from surface flow entering the channel.

28. Revise the maintenance access road section to 6-inches of Type II base.

29. Provide fencing for any proposed open channel sections to secure the channel within this Park facility. Provide appropriate access gates as needed. Recommend that the fencing along the southerly side of the open channel section use rail road ties as posts with the cable fencing. Reference the design from the NEEA and SEEA plans for Floyd Lamb Park (CLV # 327V282). Use standard 3 - wire post and cable fencing on the opposite side of the channel.

30. Provide a 12-foot wide concrete access ramp for maintenance at the outfall end of the culvert crossing of Tule Springs Road.

31. Provide an updated detailed cost estimate with the next submittal for review. Reduce the contingency to 10% with the 90% submittal. The cost estimate must be refined prior to the 90% submittal and request for construction funding to assure that the requested and allocated storm drain funds are sufficient for construction.

32. The Final Design Report needs to include an electronic copy of the entire report with all of the input and output files for the hydraulics and hydrology.

33. Expand the Storm Drain Final Location Map Note (Note 20) to include "the storm drain lateral angle points."

34. Coordinate the required County Approval of the plans and the inspection process within the County's jurisdiction.

35. See the plans for additional comments.

CC: Oh-Sang Kwon, P.E. – CLV
Kristina Swallow, P.E. – CLV
Tim Parks, P.E. - CLV
Todd Myers, P.E. – CCRFCD
Mark Failla, P.E. – SHG

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MEETING AGENDA
for
BRENT LANE DRAINAGE SYSTEM & TRAIL
(DURANGO DRIVE TO FLOYD LAMB DETENTION BASIN)
Progress Meeting #8 - May 4, 2015

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1. PROJECT STATUS
   - ❑ Receive and discuss CLV/RFCD comments on 90% Design Submittal
   - ❑ Awaiting CCPW comments
   - ❑ Held Utility Relocation Coordination Meetings with SWG & Cox. Awaiting reply from Centurylink.

2. PROJECT PROGRESSION
   - ❑ Respond to 90% Design Comments (CLV/CCRFCD/CCPW)
   - ❑ Prepare 100% Design Submittal
   - ❑ HPC Coordination/Needs?
   - ❑ CCRFCD Project Presentations

Add 76K ± to Trail Funding
Final Break-out Funding to list all Sources

3. DISCUSSION ITEMS
   - ❑ Additional Potholes at Trench Inlet
   - ❑ Add sewer sleeve at guard gate
   - ❑ Riprap vs solid grouting vs other stabilization methods at channel slope and at interim flow interception location

4. SCHEDULE

❑ Preliminary & General Items	May 5, 2014
❑ 50% Submittal	Sept. 8, 2014
❑ 90% Submittal	Mar. 24, 2015
❑ CCRFCD Project Presentations	TBD
❑ 100% (Pre-final) Submittal	30 days[2]
❑ 100% (Final) Submittal	15 days[2]

[1]Calendar days following kick-off meeting
[2]Calendar days following receipt of City/CCRFCD comments.

Action Items	Assigned	Due

July TAC & Agy. Board

BRENT LANE DRAINAGE SYSTEM AND TRAIL
90% Construction Cost Estimate

3/24/15

Item Number	Description	Unit	Unit Price	CCRFCD FUNDING		SNPLMA FUNDING		Total	Total
				Quantity	Cost	Quantity	Cost	Quantity	Cost
109.01	OWNER INITIATED TIME EXTENSION ALLOWANCE	DAY	$500.00	30	$15,000.00		$0.00	30	$15,000.00
109.02	OWNER INITIATED TIME EXTENSION AMOUNT IN ADDITION TO ALLOWANCE	DAY	$750.00	30	$22,500.00		$0.00	30	$22,500.00
200.01	MOBILIZATION AND DEMOBILIZATION	LS	$152,000.00	1	$152,000.00		$0.00	1	$152,000.00
202.01	REMOVE BITUMINOUS PAVEMENT	SY	$5.00	2750	$13,750.00		$0.00	2750	$13,750.00
202.02	REMOVE DROP INLET	EA	$1,500.00	2	$3,000.00		$0.00	2	$3,000.00
202.03	REMOVE STORM DRAIN PIPE	LF	$40.00	135	$5,400.00		$0.00	135	$5,400.00
202.04	REMOVE CONCRETE CROSS GUTTER	SF	$5.00	375	$1,875.00		$0.00	375	$1,875.00
202.05	REMOVE CONCRETE CUT-OFF WALL	LF	$15.00	85	$1,275.00		$0.00	85	$1,275.00
202.06	REMOVE AND RESET POST AND CABLE FENCE	LF	$30.00	105	$3,150.00		$0.00	105	$3,150.00
202.07	REMOVE AND RESET RIPRAP	SY	$20.00	1950	$39,000.00		$0.00	1950	$39,000.00
202.08	REMOVE WROUGHT IRON FENCE AND BLOCK POSTS	LF	$20.00	110	$2,200.00		$0.00	110	$2,200.00
202.09	REMOVE WIRE FENCE	LF	$15.00	195	$2,925.00		$0.00	195	$2,925.00
202.10	REMOVE GATE	EA	$250.00	2	$500.00		$0.00	2	$500.00
202.11	REMOVE AND RESET SWING GATE	EA	$1,500.00	1	$1,500.00		$0.00	1	$1,500.00
202.12	REMOVE AND RESET SIGN	EA	$250.00	5	$1,250.00	10	$2,500.00	15	$3,750.00
202.13	REMOVE AND SALVAGE SIGN	EA	$75.00	3	$225.00		$0.00	3	$225.00
202.14	REMOVE RIPRAP	SY	$5.00	650	$3,250.00		$0.00	650	$3,250.00
203.01	DRAINAGE EXCAVATION	CY	$15.00	16500	$247,500.00		$0.00	16500	$247,500.00
212.01	10-FOOT DECOMPOSED GRANITE TRAIL	SF	$0.80		$0.00	31920	$25,536.00	31920	$25,536.00
214.01	NATIVE REVEGETATION	SF	$1.20		$0.00	45546	$54,655.20	45546	$54,655.20
214.02	COLOR RESTORATION	SF	$0.40		$0.00	21446	$8,578.40	21446	$8,578.40
214.03	NATIVE PLANT - 15 GAL	EA	$100.00		$0.00	208	$20,800.00	208	$20,800.00
302.01	TYPE II AGGREGATE BASE	CY	$30.00	1750	$52,500.00		$0.00	1750	$52,500.00
402.01	PLANTMIX BITUMINOUS SURFACE (5-INCH)	SY	$25.00	2950	$73,750.00		$0.00	2950	$73,750.00
402.02	PLANTMIX BITUMINOUS SURFACE (2-INCH)	SY	$12.00	140	$1,680.00		$0.00	140	$1,680.00
502.01	12-FOOT X 6-FOOT REINFORCED CONCRETE BOX	LF	$600.00	1690	$1,014,000.00		$0.00	1690	$1,014,000.00
502.02	20-FOOT X 7-FOOT REINFORCED CONCRETE BOX	LF	$1,100.00	140	$154,000.00		$0.00	140	$154,000.00
502.03	TRAPEZOIDAL CONCRETE CHANNEL (12-FOOT WIDE X 7-FOOT DEEP)	LF	$300.00	930	$279,000.00		$0.00	930	$279,000.00
502.04	CONCRETE CHANNEL TRANSITION "SD" 23+20 TO "SD" 23+50	LS	$10,000.00	1	$10,000.00		$0.00	1	$10,000.00
502.05	CONCRETE CHANNEL TRANSITION "SD" 13+67 TO "SD" 13+97	LS	$10,000.00	1	$10,000.00		$0.00	1	$10,000.00
502.06	CONCRETE HEADWALL (20-FOOT X 7-FOOT RCB)	EA	$25,000.00	1	$25,000.00		$0.00	1	$25,000.00
502.07	CONCRETE PAD AND CUT-OFF WALL STRUCTURE	LS	$30,000.00	1	$30,000.00		$0.00	1	$30,000.00
603.01	18-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	$80.00	350	$28,000.00		$0.00	350	$28,000.00
603.02	18-INCH REINFORCED CONCRETE PIPE (CLASS IV)	LF	$100.00	160	$16,000.00		$0.00	160	$16,000.00
603.03	24-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	$90.00	25	$2,250.00		$0.00	25	$2,250.00
603.04	30-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	$125.00	100	$12,500.00		$0.00	100	$12,500.00
603.05	36-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	$135.00	110	$14,850.00		$0.00	110	$14,850.00
603.06	36-INCH REINFORCED CONCRETE PIPE (CLASS IV)	LF	$175.00	95	$16,625.00		$0.00	95	$16,625.00
603.07	42-INCH REINFORCED CONCRETE PIPE (CLASS IV)	LF	$225.00	45	$10,125.00		$0.00	45	$10,125.00
603.08	48-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	$250.00	55	$13,750.00		$0.00	55	$13,750.00
603.09	PLUG AND ABANDON STORM DRAIN PIPE	LF	$50.00	61	$3,050.00		$0.00	61	$3,050.00
609.01	48-INCH RCB ACCESS MANHOLE	EA	$2,500.00	5	$12,500.00		$0.00	5	$12,500.00
609.02	48-INCH TYPE I STORM DRAIN MANHOLE	EA	$5,000.00	1	$5,000.00		$0.00	1	$5,000.00
609.03	60-INCH TYPE III STORM DRAIN MANHOLE	EA	$7,500.00	8	$60,000.00		$0.00	8	$60,000.00
609.04	2.5-FOOT X 15-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	$25,000.00	2	$50,000.00		$0.00	2	$50,000.00
609.05	NDOT TYPE 2B DROP INLET WITH CONCRETE APRON	EA	$6,000.00	4	$24,000.00		$0.00	4	$24,000.00
609.06	20-FOOT TYPE DM2 DROP INLET	EA	$20,000.00	3	$60,000.00		$0.00	3	$60,000.00
609.07	5-FOOT TYPE DM2 DROP INLET	EA	$5,000.00	1	$5,000.00		$0.00	1	$5,000.00
609.08	17.5-FOOT TYPE DM2 DROP INLET	EA	$15,000.00	2	$30,000.00		$0.00	2	$30,000.00
609.09	TRENCH DRAIN	EA	$50,000.00	1	$50,000.00		$0.00	1	$50,000.00
609.10	RCB PLUG	EA	$1,500.00	1	$1,500.00		$0.00	1	$1,500.00
609.11	BRICK AND MORTAR PLUG (RCP)	EA	$750.00	1	$750.00		$0.00	1	$750.00
610.01	RIPRAP (d50=12 INCHES)(24-INCH DEPTH)	SY	$50.00	450	$22,500.00		$0.00	450	$22,500.00
610.02	RIPRAP (d50=24 INCHES)(48-INCH DEPTH)	SY	$100.00	2200	$220,000.00		$0.00	2200	$220,000.00
610.03	SOLID GROUTED RIPRAP REUSE	SY	$40.00	625	$25,000.00		$0.00	625	$25,000.00
613.01	"L" TYPE CURB AND GUTTER	LF	$20.00	260	$5,200.00		$0.00	260	$5,200.00
613.02	CONCRETE CROSS GUTTER	SF	$10.00	375	$3,750.00		$0.00	375	$3,750.00
613.03	MISCELLANEOUS CONCRETE (FLUME/ACCESS RAMP)	SF	$15.00	2100	$31,500.00		$0.00	2100	$31,500.00
613.04	CONCRETE TRAIL (6-INCH) WITH CUT-OFF WALLS	SF	$15.00	0	$0.00	2425	$36,375.00	2425	$36,375.00
616.01	RAILROAD TIE POST AND CABLE RAILING (2-STRAND)	LF	$60.00	1455	$87,300.00	238	$14,280.00	1693	$101,580.00
616.02	RAILROAD TIE EQUESTRIAN ENTRANCE GATE	EA	$500.00		$0.00	1	$500.00	1	$500.00
616.03	16-FOOT SWING GATE	EA	$5,000.00	3	$15,000.00		$0.00	3	$15,000.00
622.01	CONSTRUCTION SURVEYING	LS	$25,000.00	1	$25,000.00		$0.00	1	$25,000.00
623.01	3-INCH PVC CONDUIT	LF	$25.00	875	$21,875.00		$0.00	875	$21,875.00
623.02	NO. 7 PULL BOX	EA	$1,000.00	4	$4,000.00		$0.00	4	$4,000.00
624.01	TRAFFIC CONTROL AND MAINTENANCE	LS	$25,000.00	1	$25,000.00		$0.00	1	$25,000.00
627.01	PERMANENT SIGN (GROUND MOUNTED)	EA	$200.00	0	$0.00	13	$2,600.00	13	$2,600.00
628.01	POLYUREA PAVEMENT MARKING (24-INCH SOLID WHITE)	LF	$8.00	400	$3,200.00	160	$1,280.00	560	$4,480.00
628.02	POLYUREA PAVEMENT MARKING (6-INCH SOLID WHITE)	LF	$5.00	700	$3,500.00		$0.00	700	$3,500.00
628.03	POLYUREA PAVEMENT MARKING (TYPE 1 YELLOW CENTERLINE)	LF	$8.00	280	$2,240.00		$0.00	280	$2,240.00
628.04	PERMANENT PAVEMENT MARKING FILM YIELD LINE	SF	$4.00		$0.00	90	$360.00	90	$360.00
629.01	VERTICALLY ADJUST WATER VALVE COVER	EA	$500.00	2	$1,000.00		$0.00	2	$1,000.00
629.02	RELOCATE 2-INCH BLOWOFF	LS	$2,500.00	1	$2,500.00		$0.00	1	$2,500.00
630.01	VERTICALLY ADJUST SANITARY SEWER MANHOLE	EA	$800.00	1	$800.00		$0.00	1	$800.00
633.01	REFLECTIVE RAISED PAVEMENT MARKER	EA	$2.50	20	$50.00		$0.00	20	$50.00
633.02	NON-REFLECTIVE RAISED PAVEMENT MARKER	EA	$1.50	45	$67.50		$0.00	45	$67.50
637.01	DUST CONTROL	LS	$50,000.00	1	$50,000.00		$0.00	1	$50,000.00
637.02	NPDES DISCHARGE PERMIT	LS	$5,000.00	1	$5,000.00		$0.00	1	$5,000.00
699.01	REMOVABLE BOLLARD	EA	$400.00		$0.00	6	$2,400.00	6	$2,400.00
699.02	BENCH	EA	$1,200.00		$0.00	1	$1,200.00	1	$1,200.00
699.03	TRASH RECEPTACLE	EA	$1,800.00		$0.00	1	$1,800.00	1	$1,800.00
699.04	MONUMENT SIGN	EA	$600.00		$0.00	1	$600.00	1	$600.00
699.05	DOG BAG DISPENSER	EA	$200.00		$0.00	1	$200.00	1	$200.00
	MISCELLANEOUS UTILITY RELOCATIONS	LS	$50,000.00	1	$50,000.00		$0.00	1	$50,000.00
			SUBTOTAL		$3,186,612.50		$173,664.60		$3,360,277.10
			CONTINGENCY (10%)		$318,661.25		$17,366.46		$336,027.71
			SUBTOTAL CONSTRUCTION		$3,505,273.75		$191,031.06		$3,696,304.81
			CONSTRUCTION MANAGEMENT (7%)		$245,369.16		$13,372.17		$258,741.34
			TOTAL		$3,750,642.91		$204,403.23		$3,955,046.15

Word Set

Memorandum

City of Las Vegas
Department of Public Works
Engineering Planning

To: Dennis Moyer, P.E.
Engineering Project Manager

From: Peter Jackson, CFM
Flood Control Section

Date: November 12, 2014

Re: Brent Lane Drainage System and Trail Improvements
50% Design Submittal and Drainage Report
Hansen # 49876, WU8319

We have reviewed the Brent Lane Drainage System and Trail Improvements 50% Design Submittal and Drainage Report for the proposed CCRFCD drainage facility within the Brent Lane alignment at Floyd Lamb Park to the Durango Drive intersection and offer the following comments:

1. The City takes no exception to the overall hydrologic analysis.
2. Flood Control has received a copy of CCRFCD's acceptance of the Environmental Screening for this project dated July 15, 2014.
3. Review the open channel design to accommodate the required freeboard, super elevation, channel bends and potential wave height impacts to the overall channel section. Provide a revised channel section based upon the updated calculations to support the design channel section.
4. The discharge velocities into the existing channel are excessive (over 20 fps) for the section shown. Provide updated calculations to support the transitions needed to accommodate the design flow. Include detailed grading plans for the transition from the RCB to the existing channel section. Provide a maintenance access ramp for this structure (See SD-01).
5. Provide an updated WSPG analysis of the proposed system with the next submittal.
6. Review and revise the inlet collection system at the intersection of Brent and Durango to improve efficiency and reduce construction impacts.
7. Inlet collection at the northwest corner of the intersection of Brent and Durango must accommodate the existing safe route to schools asphalt walkway. Provide detailed grading of this portion of the intersection showing the safe route and inlet collection.
8. Provide recommendation on roadway and grading transitions needed to collect interim surface flows into the open channel. See Sheet SD-04.

9. Recommend providing a graded high point downstream of the surface flow entry structures to reduce maintenance impacts in the future.
10. Revise the berm extension shown on Sheet GR-01 to include a 12-foot top width and provide rip-rap armoring.
11. Provide detailed grading around the area drop inlet including concrete collar, roadway safety markers and grading swale.
12. Show the RCB angle points and/or curved segments by station location and angle/degree change. Include the radius information and discuss how the curved sections are to be completed using curved forms or multiple angled segments. This needs to be explained within the Specifications. This information is needed to allow for the use of precast RCB's as well as cast in place construction.
13. Provide details for the RCB construction. System design needs to accommodate the construction option of pre-cast or cast-in-place improvements. Verify that the Specifications and schedule accommodate the proposed construction methods.
14. Provide details for the concrete channel. Extend the depth of the upstream cut-off wall to provide adequate protection for the surface inflow into the channel.
15. Extend the 12' x 6' RCB at least two segments (12-feet ±) past the inlet structure shown on Sheets SD-06 and SD-15 before installing the RCB Plug.
16. Provide complete details for the special trench drain and inlet vault structure. Coordinate the sanitary sewer sleeve needed for the protection of the existing sewer at the trench drain crossing with Tim Parks, P.E., Project Manager, Collection System Planning.
17. Provide revised inlet calculations as necessary to support the system design with the next submittal. Review the Type 2B inlet capacities.
18. Provide the lateral and inlet design information to include water and/or sewer relocations with the next submittal. Provide the clearance between storm drain and the water & sewer lines. Provide encasement requirements and details as necessary.
19. The existing sanitary sewer in Durango is an 18-inch line while the plans show an 8-inch sewer. Review the existing sewer location and provide appropriate separation between the existing 18-inch sewer and the proposed RCB.
20. The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles. Indicate the type of pipe material for water and sewer lines. ACP water lines will require special consideration and handling and must be addressed in the specifications.
21. Clearly identify the required utility relocations and which relocations are incidental to and part of the storm drain work.
22. Provide separate plan and profiles for any relocated sewer and/or water lines.
23. Provide detail sheets showing typical details needed for the construction, connection and any special transition structure details. Structural details must be submitted with the 90% submittal.
24. Provide an additional nuisance inlet to the south side of Brent Lane as well as a stub to the north near Station 32+00.

25. Provide pothole data with the 90% submittal. The pothole information should identify the bottom limits of conduit bank crossings and show the limits of concrete encasement where applicable.

26. Show the removal and replacement of the roadway landscape improvements and/or cover these items in the Specifications.

27. Relocate the maintenance access to the opposite side of the channel to reduce impacts from surface flow entering the channel.

28. Revise the maintenance access road section to 6-inches of Type II base.

29. Provide fencing for any proposed open channel sections to secure the channel within this Park facility. Provide appropriate access gates as needed. Recommend that the fencing along the southerly side of the open channel section use rail road ties as posts with the cable fencing. Reference the design from the NEEA and SEEA plans for Floyd Lamb Park (CLV # 327V282). Use standard 3 - wire post and cable fencing on the opposite side of the channel.

30. Provide a 12-foot wide concrete access ramp for maintenance at the outfall end of the culvert crossing of Tule Springs Road.

31. Provide an updated detailed cost estimate with the next submittal for review. Reduce the contingency to 10% with the 90% submittal. The cost estimate must be refined prior to the 90% submittal and request for construction funding to assure that the requested and allocated storm drain funds are sufficient for construction.

32. The Final Design Report needs to include an electronic copy of the entire report with all of the input and output files for the hydraulics and hydrology.

33. Expand the Storm Drain Final Location Map Note (Note 20) to include "the storm drain lateral angle points."

34. Coordinate the required County Approval of the plans and the inspection process within the County's jurisdiction.

35. See the plans for additional comments.

CC: Oh-Sang Kwon, P.E. – CLV
Kristina Swallow, P.E. – CLV
Tim Parks, P.E. - CLV
Todd Myers, P.E. – CCRFCD
Mark Failla, P.E. – SHG

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MEETING AGENDA
for
BRENT LANE DRAINAGE SYSTEM & TRAIL
(DURANGO DRIVE TO FLOYD LAMB DETENTION BASIN)
Progress Meeting #8 - May 4, 2015

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1. PROJECT STATUS
   - ❑ Receive and discuss CLV/RFCD comments on 90% Design Submittal
   - ❑ Awaiting CCPW comments
   - ❑ Held Utility Relocation Coordination Meetings with SWG & Cox. Awaiting reply from Centurylink.

2. PROJECT PROGRESSION
   - ❑ Respond to 90% Design Comments (CLV/CCRFCD/CCPW)
   - ❑ Prepare 100% Design Submittal
   - ❑ HPC Coordination/Needs?
   - ❑ CCRFCD Project Presentations

Add 76K ± to Trail Funding
Find Break-out Funding to list all Sources

3. DISCUSSION ITEMS
   - ❑ Additional Potholes at Trench Inlet
   - ❑ Add sewer sleeve at guard gate
   - ❑ Riprap vs solid grouting vs other stabilization methods at channel slope and at interim flow interception location

4. SCHEDULE

❑ Preliminary & General Items	May 5, 2014
❑ 50% Submittal	Sept. 8, 2014
❑ 90% Submittal	Mar. 24, 2015
❑ CCRFCD Project Presentations	TBD
❑ 100% (Pre-final) Submittal	30 days[2]
❑ 100% (Final) Submittal	15 days[2]

[1]Calendar days following kick-off meeting
[2]Calendar days following receipt of City/CCRFCD comments.

Action Items	Assigned	Due

July TAC & Avg. Board

City of Las Vegas
City Engineering
Transmittal

TO: Oh-Sang Kwon - PUBLIC WORKS FLOOD CONTROL

RE: Review#: 686241 - (FLOOD THIRD REVIEW)

Requsted: March 26, 2015 **By**: DMOYER

Meeting Date: April 28, 2015 2:30 pm

Authorization#: WU8319

Complete Distribution:

FIRE & RESCUE FIRE PREVENTION
OPS & MAINT PARKS/OPEN SPACES
OPS & MAINT FAC RIGHT OF WAY
OPS & MAINT STREET STORM DRAIN
PLANNING - ADMIN
PUBLIC WORKS CITY ENGINEER ADM
PUBLIC WORKS CITY ENGINEER ADM
PUBLIC WORKS CITY ENGINEER ADM
PUBLIC WORKS CONSTRUCTION MGMT
PUBLIC WORKS FLOOD CONTROL
B&S LAND DEVELOPMENT
PUBLIC WORKS ROADWAY/PAVE MGMT
PUBLIC WORKS SURVEYING
PUBLIC WORKS SAN SEWER PLAN SE
PUBLIC WORKS TRAFFIC ENG ADMIN
PUBLIC WORKS TEFO
PUBLIC WORKS TRANS PLANNING

Project# **49876**

Project Name: **BRENT LANE DRAINAGE SYSTEM AND TRAIL IMPROVEMENTS**

Project Location: BRENT LANE BETWEEN FLOYD LAMB PARK AND DURANGO DRIVE

Project Description:: Flood Control Improvements in Brent Lane from Floyd Lamb Park to Durango Drive. Includes trail improvements t connect Durango Drive paths to trails in Floyd Lamb Park.

Contacts::	CONTACT	TODD MYERS
	PROJECT MANAGER	DENNIS MOYER
	PROGRAM MANAGER	KRISTINA SWALLOW
Companies:	ENGINEER	SLATER HANIFAN GROUP

Remarks: Please attend the 90% review meeting or send an alternate.

Brent Lane Drainage System and Trail
Durango Drive to Floyd Lamb Park
Response to 50% Comments

3/14/2015

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
			50% DRAINAGE REPORT	
1	General	Flood (PJ)	The City takes no exception to the overall hydrologic analysis.	A-Acknowledged.
2	General	Flood (PJ)	Flood Control has received a copy of CCRFCD's acceptance of the Environmental Screening for this project dated July 15, 2014.	A-Acknowledged.
3	General	Flood (PJ)	Review the open channel design to accommodate the required freeboard, super elevation, channel bends and potential wave height impacts to the overall channel section. Provide a revised channel section based upon the updated calculations to support the design channel section.	A-Acknowledged. The design has been revised to accommodate additional freeboard resulting from wave height impacts and to maintain flow depth plus all freeboard within the normal channel section.
4	General	Flood (PJ)	The discharge velocities into the existing channel are excessive (over 20 fps) for the section shown. Provide updated calculations to support the transitions needed to accommodate the design flow.	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
5	General	Flood (PJ)	Provide an updated WSPG analysis of the proposed system with the next submittal.	A-Acknowledged. Updated WSPG hydraulic models have been provided.
6	General	Flood (PJ)	Review and revise the inlet collection system at the intersection of Brent and Durango to improve efficiency and reduce construction impacts.	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly.
7	General	Flood (PJ)	System design needs to accommodate the construction option of pre-cast or cast-in-place improvements. Verify that the Specifications and schedule accommodate the proposed construction methods.	A-Acknowledged. Plans and specifications have been updated to accommodate both pre-cast and cast-in-place construction methods for the 12'x6' RCB.
8	General	Flood (PJ)	Provide revised inlet calculations as necessary to support the system design with the next submittal. Review the Type 2B inlet capacities.	A-Acknowledged. Revised inlet computations have been provided accordingly. Type 2B inlet capacities have been reviewed and revised accordingly.
9	General	Flood (PJ)	Provide the lateral and inlet design information to include water and/or sewer relocations with the next submittal. Provide the clearance between storm drain and the water &sewer lines. Provide encasement requirements and details as necessary.	A-Acknowledged. Additional utility information incorporating pothole data has been provided at storm drain lateral and inlets; including any relocations. Clearance and detail information in accordance with criteria has also been provided; including the necessity of encasements and/or sleeves.
10	General	Flood (PJ)	Provide an updated detailed cost estimate with the next submittal for review. Reduce the contingency to 10% with the 90% submittal. The cost estimate must be refined prior to the 90% submittal and request for construction funding to assure that the requested and allocated storm drain funds are sufficient for construction.	A-Acknowledged.
11	General	Flood (PJ)	The Final Design Report needs to include an electronic copy of the entire report with all of the input and output files for the hydraulics and hydrology.	A-Acknowledged.
12	General	Flood (PJ)	Coordinate the required County Approval of the plans and the inspection process within the County's jurisdiction.	A-Acknowledged. The 90% design documents will be submitted to CCPW for review and comment concurrent with submittal to CLV/CCRFCD.
13	General	Traffic (RS)	Provide a copy of the specs and cost estimate	A-Acknowledged.
14	General	RFCD (TM)	A facility-specific environmental analysis in accordance with Chapter 8 of District's *Supplemental Programmatic Environmental Impact Statement, Clark County Regional Flood Control District, 2002 Master Plan Update, September 2004* has been submitted and accepted. *The District's Policies and Procedures regarding environmental permitting as a pre-requisite for construction funding eligibility have been satisfied.* *Please note that if additional analysis and/or coordination with NVSHPO are required for work relating to the trail project, non-District funds shall be utilized for that effort.*	A-Acknowledged.
15	General	RFCD (TM)	Identify all right-of-way (ROW) and easement acquisition requirements for this project. All ROW/easements must be acquired prior to City's request for construction funding.	A-Acknowledged. No ROW acquisition is required for the project. Authorization to Enter Property (AEP) for construction. AEP exhibits have been provided to CLV with the 90% Submittal for acquisition.
16	General	RFCD (TM)	District concurs with hydrologic analyses presented in the *50% Drainage Report.*	A-Acknowledged.
17	General	RFCD (TM)	Provide additional open channel analysis as discussed in the October 21, 2014 progress meeting.	A-Acknowledged.
18	General	RFCD (TM)	The hydraulic analyses of interim and ultimate conditions indicates velocities over 20 fps discharging from the proposed 20' x 6' RCB into the riprap channel. Per Table 703 of District's *Hydrologic Criteria and Drainage Design Manual,* the maximum permissible velocity for loose riprap is 10 fps, and 15 fps for grouted riprap. Provide recommendations and plan for armoring channel and/or energy dissipation.	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
19	General	RFCD (TM)	Provide Draft Special Provisions and Engineers Cost Estimate with District and SNPLMA breakout, structural drawings and pothole information with next submittal	A-Acknowledged.
			DRAWINGS (50%)	
1	GN-01	Flood (PJ)	Note #20 of CLV General Notes: Add "SD lateral locations"	A-Acknowledged.
2	DR-01	Flood (PJ)	Fill existing 6" SD at SW corner	A-Acknowledged. The existing 6" PVC SD has been identified for removal.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

Brent Lane Drainage System and Trail
Durango Drive to Floyd Lamb Park
Response to 50% Comments

3/14/2015

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
3	DR-02	Flood (PJ)	Add other lateral crossings of Tule Springs Road	A-Acknowledged. Pavement removal associated with other SD laterals within Tule Springs Road/Brent Lane have been added to the plans.
4	SD-01	Flood (PJ)	Extend Concrete to HP @ Special Inlet #1	A-Acknowledged. The drop inlet at this location has been removed and the ditch has been extended for direct discharge to the mainline concrete channel.
5	SD-01	Flood (PJ)	Recommend 45° angle @ Special Inlet #1 lateral connection	A-Acknowledged. The drop inlet at this location has been removed and the ditch has been extended for direct discharge to the mainline concrete channel.
6	SD-01	Flood (PJ)	Provide a 12-foot wide concrete access ramp for maintenance at the outfall end of the culvert crossing of Tule Springs Road.	A-Acknowledged. A 12-foot wide concrete access ramp has been added for maintenance at the outfall end of the Tule Springs culvert crossing.
7	SD-01	Flood (PJ)	Need detailed grading and headwall information for RCB outlet	A-Acknowledged. Detailed grading and headwall information has been provided.
8	SD-01	Flood (PJ)	Type 2 or Type 2B (recommend 2B near trail)	A-Acknowledged. Drop inlet has been revised to a NDOT Type 2B.
9	SD-01	Flood (PJ)	Provide details for RCB - open channel transition	A-Acknowledged. Details have been provided for the channel transition.
10	SD-01	Flood (PJ)	Provide riprap detail information in downstream channel for velocities >20fps	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
11	SD-01	Flood (PJ)	STA 11+41.34: V=25.21fps = too fast = modify hydraulics	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
12	SD-01	Flood (PJ)	Provide slope on profile of RCB	A-Acknowledged. RCB slope has been added to plans.
13	SD-01	Flood (PJ)	Construction Note #32: should it be Type 2B Inlet?	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly.
14	SD-01	Flood (PJ)	Suggest using 6" of Type II base, not 4"	A-Acknowledged. Type II base has been revised to 6" for the maintenance access road.
15	SD-03	Flood (PJ)	Change fence location for ramp access	A-Acknowledged. Per meeting discussion, fencing has been removed from the north side of the channel at this location. Additionally, access ramp has been relocated to south side of channel.
16	SD-03	Flood (PJ)	Detail access ramp	A-Acknowledged. Access ramp details have been provided.
17	SD-03	Flood (PJ)	Suggest moving access ramp to south side of channel	A-Acknowledged. Access ramp has been moved to south side of channel to coincide with 12-foot access road being relocated to south side of channel.
18	SD-03	Flood (PJ)	Check superelevation calcs	A-Acknowledged.Hydraulic computations have been reviewed and updated accordingly.
19	SD-03	Flood (PJ)	Check wave height impact	A-Acknowledged. Wave height impact computations have been performed and additional freeboard has been added accordingly.
20	SD-03	Flood (PJ)	Recommend providing a graded high point downstream of the surface flow entry structures to reduce maintenance impacts in the future.	C- The maintenance access road has been removed from the north/west side of the channel. A concrete flume into the concrete channel has been provided at the surface flow entry to minimize maintenance impacts.
21	SD-03	Flood (PJ)	Add 0.5-ft to flow depth at bend in channel	A-Acknowledged. The overall channel depth has been revised from 6-feet to 7-feet to accommodate freeboard requirements.
22	SD-03	Flood (PJ)	Provide fencing for any proposed open channel sections to secure the channel within this Park facility. Provide appropriate access gates as needed. Recommend that the fencing along the southerly side of the open channel section use rail road ties as posts with the cable fencing. Reference the design from the NEEA and SEEA plans for Floyd Lamb Park (CLV # 327V282). Use standard 3 - wire post and cable fencing on the opposite side of the channel.	Per meeting discussion, it was decided to eliminate post and cable fencing along the north side of the trapezoidal open channel. Railing along the north and south sides of channel have been utilized along headwalls and where channel transitions to rectangular sections for maintenance safety. Fencing along south side runs adjacent to the trail. The posts are railroad ties and the cable is 2-strand. The post and cable fencing matches that used in other parts of Floyd Lamb Park. Controlled access is provided at both ends of channel. Swing gates the same height as the post and cable fencing are used similar to other swing gates utilized within Floyd Lamb Park.
23	SD-04	Flood (PJ)	Add expanded concrete collar for slotted manhole lid	C-Slotted manhole is no longer necessary and has been removed.
24	SD-04	Flood (PJ)	Add pavement removals to drainage sheets at lateral crossings	A-Acknowledged. Pavement removals have been added to removal sheets at SD lateral crossings.
25	SD-04	Flood (PJ)	Provide size of extended CMP culvert	C-The proposed extension is no longer necessary and has been removed from the plans.
26	SD-04	Flood (PJ)	Provide size of existing CMP culvert	A-Acknowledged.

Actions:
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No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
27	SD-04	Flood (PJ)	Why is slotted manhole lid needed	C-Slotted manhole is no longer necessary and has been removed.
28	SD-04	Flood (PJ)	Suggest using NDOT Type 2B inlets	A-Acknowledged.
29	SD-04	Flood (PJ)	Show 2% crossfall on plan of roadway at bend and provide recommendation on roadway and grading transitions needed to collect interim surface flows into the open channel.	A-Acknowledged. Plans have been revised to accommodate interim flow discharge into channel at this location.
30	SD-04	Flood (PJ)	Suggest concrete trail at flow crossing near bend in road	A-Acknowledged. Trail has been revised to concrete where interim flows are anticipated to cross.
31	SD-04	Flood (PJ)	Detail grading to warp and depress trail for drainage near bend in road	A-Acknowledged. Plans have been revised to accommodate interim flow discharge into channel at this location.
32	SD-04	Flood (PJ)	Show entry gate fencing on profile view.	A-Acknowledged. Entry gate fencing has been added to profile view.
33	SD-04	Flood (PJ)	Construction Note #32: suggest using NDOT Type 2B inlet	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly.
34	SD-05	Flood (PJ)	Show removal and replacement on plan	A-Acknowledged. Pavement removals have been added to removal sheets at SD lateral crossings.
35	SD-06	Flood (PJ)	Add nominal storm drain inlet every 660-ft	A-Acknowledged. Nominal SD inlets and laterals have been added at approximately 660-ft intervals along Brent Lane.
36	SD-06	Flood (PJ)	Extend the 12' x 6' RCB at least two segments (12-feet +/-) past the inlet structure shown on Sheets SD-06 and SD-15 before installing the RCB Plug.	A-Acknowledged. RCB has been extended upstream beyong the inlet connection.
37	SD-06	Flood (PJ)	How do inlets/curb at NW corner of Durango impact safe path to school?	B-Installation of the inlets/curb will maintain/improve the existing path. Additionally, crosswalk striping has been added at the intersection.
38	SD-06	Flood (PJ)	Revise layout of storm drain laterals	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly.
39	SD-06	Flood (PJ)	Abandon and remove existing 6-in PVC storm drain	A-Acknowledged. The existing 6" PVC SD has been identified for removal.
40	SD-06	Flood (PJ)	Suggest eliminating manholes by connecting laterals directly into RCB	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly.
41	SD-06	Flood (PJ)	Is the clearance between the RCB and SS in Durango 18-in? Refer to 307Y-4622-05 for separation requirements	A-Acknowledged. 18-inch minimum separation has been provided from the RCB.
42	SD-06	Flood (PJ)	Construction Note #31: suggest using NDOT Type 2B inlet	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly.
43	SD-06	Flood (PJ)	Remove excess construction notes	A-Acknowledged.
43	SD-06	Flood (PJ)	The existing sanitary sewer in Durango is an 18-inch line while the plans show an 8-inch sewer. Review the existing sewer location and provide appropriate separation between the existing 18-inch sewer and the proposed RCB.	A-Acknowledged. Plans have been revised accordingly.
44	SD-07	Flood (PJ)	Inlets need to be in sump - adjust grades accordingly	A-Acknowledged.
45	SD-10	Flood (PJ)	Provide RCB and channel details	A-Acknowledged.
46	SD-11	Flood (PJ)	If pedestrians have access, use NDOT Type 2B grates. If needed, enlarge inlets for added clogging factor. Example of depth: Grate elev. = 0.0, Location 2A elev. = 0.45, Location 2 elev. = 0.9	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly. Computations have been revised accordingly.
47	SD-14	Flood (PJ)	Revise fencing	A-Acknowledged. See response to comment #22.
48	SD-15	Flood (PJ)	Add 1 RCB segment clear of special inlet structure	A-Acknowledged. See comment #36.
49	SD-15	Flood (PJ)	Show sewer and sewer sleeve extending 10-ft past trench drain	C-The trench drain design has been revised to provide 18-inch separation from the sewer line; therefore steel sleeve is not considered necessary.
50	SD-15	Flood (PJ)	Show separation from sewer in plan	A-Acknowledged.
51	SD-15	Flood (PJ)	Coordinate sewer sleeve with Tim Parks at Sewer Planning 702-229-2178	C-The trench drain design has been revised to provide 18-inch separation from the sewer line; therefore steel sleeve is not considered necessary.
52	GR-01	Flood (PJ)	Show existing riprap west of Tule Springs Road	A-Acknowledged.
53	GR-01	Flood (PJ)	Add riprap embankment protection to proposed embankment extension	A-Acknowledged.
54	GR-01	Flood (PJ)	Suggest grading side channel to grade directly into main channel rather than into 12-ft sump inlet	A-Acknowledged. Since access road has been relocated to south side of channel, side channel has been revised to grade directly into main channel.
55	GR-01	Flood (PJ)	Add high point at top of channel on north side near RCB inlet	A-Acknowledged. Since access road has been relocated to south side of channel, side channel has been revised to grade directly into main channel.

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No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
56	GR-01	Flood (PJ)	Add fencing between end of extended berm to RCB inlet to control access	A-Acknowledged.
57	GR-01	Flood (PJ)	Widen top of extended berm to 12-ft min.	A-Acknowledged.
58	GR-01	Flood (PJ)	Extend headwalls at RCB outlet	A-Acknowledged.
59	GR-01	Flood (PJ)	Extend riprap sections at downstream	A-Acknowledged.
60	GR-01	Flood (PJ)	Provide transitional grading in downstream riprap	A-Acknowledged.
61	GR-03	Flood (PJ)	Show location of access ramp	A-Acknowledged.
62	GR-03	Flood (PJ)	Suggest depressing side entrance to channel embankment	A-Acknowledged. Depressed concrete flumes have been added at concentrated inflow locations to the channel.
63	GR-03	Flood (PJ)	Suggest moving access road to south side of channel to eliminate potential of washout	A-Acknowledged. Access road has been relocated to south side of channel.
64	GR-03	Flood (PJ)	Provide riprap at side entrance to channel embankment	A-Acknowledged. Riprap is provided.
65	GR-05	Flood (PJ)	Provide details for the concrete channel. Extend the depth of the upstream cut-off wall to provide adequate protection for the surface inflow into the channel.	A-Acknowledged. Structural details for the concrete channel have been provided.
66	GR-05	Flood (PJ)	Show erosion protection along extended berm	A-Acknowledged. Riprap erosion protection has been added along the berm slope.
67	GR-05	Flood (PJ)	Show top of extended berm = 12-ft	A-Acknowledged. The top of berm extension has been increased to 12-feet.
68	GR-05	Flood (PJ)	Show RCB in Section D	A-Acknowledged. RCB has been added to appropriate sections.
69	TR-01	Flood (PJ)	Call out existing safe route to school	A-Acknowledged.
70	TR-01	Flood (PJ)	Provide crosswalk and associated signage for trail connection across Brent Lane, just east of Durango	C-A crosswalk has not been added across Brent Lane east of Durango since a roadside ditch is proposed along the north side of Brent Lane at this location and trail connectivity is provided along the equestrian trail on the south side of Brent Lane.
71	TR-05	Flood (PJ)	Provide signage for crosswalk trail connection.	A-Acknowledged. Signage for trail connection has been added.
72	TR-06	Flood (PJ)	Provide signage for crosswalk trail connection.	A-Acknowledged. Signage for trail connection has been added.
73	General	Flood (PJ)	Include detailed grading plans for the transition from the RCB to the existing channel section	A-Acknowledged. Detailed grading has been added.
74	General	Flood (PJ)	Inlet collection at the northwest corner of the intersection of Brent and Durango must accommodate the existing safe route to schools asphalt walkway. Provide detailed grading of this portion of the intersection showing the safe route and inlet collection.	A-Acknowledged.
75	General	Flood (PJ)	Provide detailed grading around the area drop inlet on the north side of Brent, west of Durango, including concrete collar, roadway safety markers and grading swale.	A-Acknowledged. Detailed grading around the area drop inlet has been provided including concrete collar and swale.
76	General	Flood (PJ)	Show the RCB angle points and/or curved segments by station location and angle/degree change. Include the radius information and discuss how the curved sections are to be completed using curved forms or multiple angled segments. This needs to be explained within the Specifications. This information is needed to allow for the use of precast RCB's as well as cast in place construction.	A-Acknowledged. RCB curve data has been added to plans. Curved section construction methods have been added to the specifications.
76	General	Flood (PJ)	Provide details for the RCB construction.	A-Acknowledged. NDOT standard drawings for the 12'x6' RCB have been called out in the construction notes for CIP construction. Precast RCB option is addressed in the specifications. Structural details for the 20'x7' RCB culvert have been added to the plans.
76	General	Flood (PJ)	Provide complete details for the special trench drain and inlet vault structure. Coordinate the sanitary sewer sleeve needed for the protection of the existing sewer at the trench drain crossing with Tim Parks, P.E., Project Manager, Collection System Planning.	A-Acknowledged. Structural details for the trench drain have been provided. The revised trench drain provides 18-inch separation from the trench drain and a steel sleeve is considered not necessary.
77	General	Flood (PJ)	The existing sanitary sewer in Durango is an 18-inch line while the plans show an 8-inch sewer. Review the existing sewer location and provide appropriate separation between the existing 18-inch sewer and the proposed RCB.	A-Acknowledged.
78	General	Flood (PJ)	The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles. Indicate the type of pipe material for water and sewer lines. ACP water lines will require special consideration and handling and must be addressed in the specifications.	A-Acknowledged. Existing and proposed utility crossings are included on plan and profiles. Material type for existing water and sewer have been added to the plans.
79	General	Flood (PJ)	Clearly identify the required utility relocations and which relocations are incidental to and part of the storm drain work.	A-Acknowledged.
80	General	Flood (PJ)	Provide separate plan and profiles for any relocated sewer and/or water lines.	C-No relocations of sewer or water are proposed.
81	General	Flood (PJ)	Provide detail sheets showing typical details needed for the construction, connection and any special transition structure details. Structural details must be submitted with the 90% submittal.	A-Acknowledged. Structural details have been provided.

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No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
82	General	Flood (PJ)	Provide an additional nuisance inlet to the south side of Brent Lane as well as a stub to the north near Station 32+00.	A-Acknowledged. Additional nuisance inlets have been added along Brent Lane in coordination with Comment #35.
83	General	Flood (PJ)	Provide pothole data with the 90% submittal. The pothole information should identify the bottom limits of conduit bank crossings and show the limits of concrete encasement where applicable.	A-Acknowledged. Pothole data sheets have been provided and added to the plans.
84	General	Flood (PJ)	Show the removal and replacement of the roadway landscape improvements and/or cover these items in the Specifications.	A-A landscape plan has been provided as part of the project. Removal and replacement of incidental landscaping has been included in the specifications.
85	General	Flood (PJ)	Expand the Storm Drain Final Location Map Note (Note 20) to include "the storm drain lateral angle points."	A-Acknowledged. Note 20 has been revised to include "the storm drain lateral angle points".
86	General	Planning (CD)	Need to address trail at park entrance gate/wall	A-Acknowledged. The trail at the park entrance has been coordinated with CLV and updated on the plans.
87	GN-02	Planning (CD)	Show limit of residential area in key map	A-Acknowledged.
88	GR-05	Planning (CD)	Revise trail section to show 10-ft decomposed granite trail with 2-ft graded shoulders for consistency with basin trails	A-Acknowledged. Trail section has been revised.
89	LA-03	Planning (CD)	Install monument sign - to be determined by HPC	A-Acknowledged. Note that trail amenities have been removed from the LA sheets and added to the TR sheets.
90	LA-07	Planning (CD)	Change "park" to "trail" in sign plaque language	A-Acknowledged.
91	LA-07	Planning (CD)	Add benches and trash receptacles as shown in provided landscape detail sheet (L5.01)	A-Acknowledged.
92	LA-07	Planning (CD)	Add a doggie bag dispenser on the portion of the trail within the park proper	A-Acknowledged. A doggie bag dispenser has been added to the plans.
93	LA-07	Planning (CD)	Monument sign and sign plaque to be determined by HPC	A-Acknowledged.
94	SD-06	Sewer (KL)	Label SS 18" in profile	A-Acknowledged. 18" SS has been labeled in plan and profile.
95	SD-06	Sewer (KL)	How is 18-in SS in Durango going to be supported during storm drain construction?	B-Support of the 18-inch SS during storm drain construction is considered a means and measures item by the contractor.
96	SD-06	Sewer (KL)	Can typical 10-ft horizontal separation be provided north of Brent?	A-Acknowledged. Storm drain layout has been revised to provide a minimum of 10-feet separation.
97	SD-08	Sewer (KL)	Confirm SS elevations. Separations less than 2-ft will require protection with a minimum separation of 6-in.	A-Acknowledged. Relevant sewer depths were survey field verified at manholes. A minimum of 18-inches is maintained at all locations.
98	SD-15	Sewer (KL)	Is trench drain permanent?	C-Permancy of trench drain will be at the discretion of CLV/CCRFCD. Upon upstream extension of the RCB and additional inlets, the trench drain would likely not be necessary; however the additional capture provided by the trench drain might be preferred to removal.
99	SD-15	Sewer (KL)	Confirm SS elevations. Separations less than 2-ft will require protection with a minimum separation of 6-in.	A-Acknowledged. Relevant sewer depths were survey field verified at manholes. A minimum of 18-inches is maintained at all locations.
100	SD-15	Sewer (KL)	Show sewer in plan view	A-Acknowledged. 18" SS has been labeled in plan and profile.
101	General	Survey (JVT)	Need alignment information on all alignments (DD, BL, TR, and SD)	A-Acknowledged. Horizontal control plan has been updated with all alignments.
102	General	Survey (JVT)	Was there any found monument near 31+50 Brent Lane? See File 114, Page 14 of Parcel Maps. If so, Mark "protect in place"	A-All monuments found have been identified on the plans.
103	GN-01	Survey (JVT)	Add "2008 adjustment" after the benchmark elevation	A-Acknowledged. 2008 Adjustment has been added after the benchmark elevation.
104	SC-01	Survey (JVT)	Add "2008 adjustment" after the benchmark elevation	A-Acknowledged. 2008 Adjustment has been added after the benchmark elevation.
105	SC-01	Survey (JVT)	List the reference map for the referenced distance along Durango	A-Acknowledged.
106	SC-01	Survey (JVT)	Should symbol at Brent/Durango intersection be a square to mean monument?	A-Acknowledged. Monument symbol has been changed to a square.
107	SC-01	Survey (JVT)	What does "(R)" stand for?	A-The "R" symbol has been removed from the plans.
108	SC-01	Survey (JVT)	Show assessor's section information as shown on redlined sheet SC-01	A-Acknowledged. Assessor's section information has been added to the plans.
109	DR-01	Survey (JVT)	Label the survey monument at Brent/Durango as "survey monument, protect in place"	A-Acknowledged. The survey monument at Brent/Durango has been labeld as "survey monument, protect in place".
110	SD-03	Survey (JVT)	What is Construction note #3 for?	A-Acknowledged. Construction note #3 has been removed.
111	SD-06	Survey (JVT)	Label the survey monument at Brent/Durango as "survey monument, protect in place"	A-Acknowledged. The survey monument at Brent/Durango has been labeld as "survey monument, protect in place".
112	General	Traffic (RS)	Provide separate signage & striping plans to ensure the replacement of existing improvements in kind	A-Acknowledged. A separate signage and striping plan has been provided.

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No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
113	General	Traffic (RS)	There is an existing school flasher on Durango that was installed by the County. There should be conduit running along Durango though the intersection for the flasher, but we don't know exactly where. If Call Before Dig shows a north -south conduit not otherwise identified, that is probably it.	A-Acknowledged. Existing conduit has been identified on the plans.
114	DR-01	Traffic (RS)	Install a conduit ring for a future traffic signal per the redlines.	A-Acknolwedged. Conduit for future traffic signals have been added to the SM sheets. Per coordination with CCRFCD, it has been agreed to include within CCRFCD funding.
115	DR-01	Traffic (RS)	Per the provided subdivision improvements (Mystic Valley II), there is traffic signal interconnect conduit on the west side of Durango from the south, capped in the intersection. Extend this conduit to the north end of the project.	A-Acknowledged. Existing conduit has been identified on the plans.
116	TR-01	Traffic (RS)	Install a crosswalk on the east leg of Brent/Durango for the users of the new trail. This will require relocating the existing stop sign and stop bar, as well	C-A crosswalk has not been added across Brent Lane east of Durango since a roadside ditch is proposed along the north side of Brent Lane at this location and trail connectivity is provided along the equestrian trail on the south side of Brent Lane.
117	TR-03	Traffic (RS)	Install appropriate signage and yield lines for all mid-block crosswalks	A-Acknowledged. Appropriate signage and yield lines have been added to the plans for all mid-block crosswalks.
118	TR-03	Traffic (RS)	Move the proposed crosswalk at the park gate 100' to the west to ensure that the driver's sightline of trail users is not obscured by the pilasters at the park entrance	A-Acknowledged. Per meeting coordination it was preferred to move the crosswalk approximately 100' feet east of the park entrance to be within the park limits.
119	TR-05	Traffic (RS)	Install appropriate signage and yield lines for all mid-block crosswalks	A-Acknowledged. Appropriate signage and yield lines have been added to the plans for all mid-block crosswalks.
120	TR-06	Traffic (RS)	Install appropriate signage and yield lines for all mid-block crosswalks	A-Acknowledged. Appropriate signage and yield lines have been added to the plans for all mid-block crosswalks.
121	SD-06	Traffic (RS)	Wherever possible, square off saw cuts	A-Acknowledged. Saw cuts have been squared off where appropriate.
122	GN-01	Civil (DM)	Update CLV traffic notes to current	A-Acknowledged. CLV traffic notes have been updated with the most current notes.
123	GN-01	Civil (DM)	Define PBS	A-PBS stands for Plantmix Bituminous Surface. It has been added to the abbreviations legend on sheet GN-01.
124	DR-01	Civil (DM)	Removal plan does not seem economical and does not include all areas where pavement needs to be removed	A-Acknowledged. Pavement removals have been revised for efficiency and all areas of removal have been added to the plans.
125	DR-01	Civil (DM)	Construction note 2: what is PBS?	A-PBS stands for Plantmix Bituminous Surface. It has been added to the abbreviations legend on sheet GN-01.
126	DR-02	Civil (DM)	Is area shown for removal provide adequate clearance?	B-Acknowledged. Installation of the RCB is expected by use of shoring in order to not impact the existing pavement along Brent Lane.
127	SD-01	Civil (DM)	Clarify special drop inlet #1	C-This DI has been removed.
128	SD-01	Civil (DM)	Provide dimensions and cross section for culvert outlet apron	A-Acknowledged.
129	SD-01	Civil (DM)	Suggest making RCB 8'H but 7'H might be ok	A-Acknowledged. Per meeting discussion, the culvert height has been increased to 7'H to provide additional maintenance clearance.
130	SD-01	Civil (DM)	Slope leader pointing to HGL rather than RCB invert	A-Acknowledged. The leader line has been corrected.
131	SD-01	Civil (DM)	Construction note 4 and 5: what is PBS?	A-PBS stands for Plantmix Bituminous Surface. It has been added to the abbreviations legend on sheet GN-01.
132	SD-01	Civil (DM)	Construction note 16: minimum height of RCB = 8' but 7' might be ok	A-Acknowledged. Per meeting discussion, the culvert height has been increased to 7'H to provide additional maintenance clearance.
133	SD-04	Civil (DM)	Show pavement removal and replacement near park entrance gate	A-Acknowledged. Pavement removals have been revised for efficiency and all areas of removal have been added to the plans.
134	SD-04	Civil (DM)	Replace fencing with railroad tie entrance	A-Acknowledged.
135	SD-04	Civil (DM)	What are dark dashed lines? Edge of pavement?	A-All line types used have been added to the legend.
136	SD-04	Civil (DM)	Clarify construction note 28 (NDOT STD. plan B-20.1.5)	A-Acknowledged. Structural details have ben added to the plans, including any NDOT standard drawings utilized. NDOT STD Plan B-20.1.5 is for CIP option for 12'x6' RCB
137	SD-05	Civil (DM)	Suggest placing laterals and inlets approximately half way between laterals at Durango and park entrance ~650'	A-Acknowledged. See response to Comment#35.
138	SD-06	Civil (DM)	Abandon in place 6" PVC SD	A-Acknowledged. The existing 6" PVC SD has been identified for removal.
139	SD-10	Civil (DM)	Show trail over box sections	A-Acknowledged.

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No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
140	SD-14	Civil (DM)	Discussion is needed for post construction to be similar to what is already in the park	A-Acknowledged.See response to Comment #22.
141	GR-05	Civil (DM)	Show subgrade in sections	A-Acknowledged.
142	GR-05	Civil (DM)	Show channel side slopes	A-Acknowledged.
143	GR-05	Civil (DM)	Show box location in sections	A-Acknowledged.
144	TR-01	Civil (DM)	Conduit future TS at northwest corner	A-Acknowledged. See response to Comment #114.
145	TR-01	Civil (DM)	Crosswalk for trail at northeast corner	A-Acknowledged. A crosswalk has been added.
146	TR-01	Civil (DM)	Provide conduit for future trafic signal across Brent Lane connecting northwest and southwest sides at Durango intersection.	A-Acknowledged. See response to Comment #114.
147	TR-03	Civil (DM)	Show new gates at park entrance	A-Acknowledged.
148	LA-01	Civil (DM)	Provide cross section of trail	A-Acknowledged. Cross section of trail has been provided.
149	LA-07	Civil (DM)	Use new CLV bench and trash receptacle	B-Per meeting coordination, CLV Bench and trash receptacles matching those used in Floyd Lamb Park have been proposed and added to the plans.
150	SD-06	CCPW (AK)	Show special drop inlet #2 to be maintained by CLV	A-Acknowledged. Drop inlet has been identified to be maintained by CLV.
151	SD-06	CCPW (AK)	Add to Lateral Run Profile Index: 6, 7, 8, 9, 10, 11, 12	B-The symbol in the lateral run profile index is typical and applies to every profile run that are included on sheets SD-07 thru SD-09, not just profile 1.
152	General	RFCD (TM)	Identify all right-of-way (ROW) and easement acquisition requirements for this project. All ROW/easements must be acquired prior to City's request for construction funding.	A-Acknowledged. No ROW acquisition is required for the project. Authorization to Enter Property (AEP) for construction. AEP exhibits have been provided to CLV with the 90% Submittal for acquisition.
153	General	RFCD (TM)	Provide utility pothole information with the next submittal.	A-Acknowledged. Utility pothole information has been provided.
154	General	RFCD (TM)	Typically, fall protection (post & cable fencing) is not provided on trapezoidal channels. Investigate limited areas of fencing to discourage public from entering the channel area and provide post and cable fencing at transition and headwall sections for fall protection.	A-Acknowledged.See response to Comment #22.
155	DR-01	RFCD (TM)	Revise the 2" Rotomill sections to removals. The relatively small quantities of rotomilling will not be cost effective.	A-Acknowledged.
156	SD-01	RFCD (TM)	The hydraulic analyses of interim and ultimate conditions indicates velocities over 20 fps discharging from the proposed 20' x 6' RCB into the riprap channel. Per Table 703 of District's *Hydrologic Criteria and Drainage Design Manual,* the maximum permissible velocity for loose riprap is 10 fps, and 15 fps for grouted riprap. Provide recommendations and plan for armoring channel and/or energy dissipation.	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
157	SD-02	RFCD (TM)	Move access road to south side of channel as discussed in September 8, 2014 progress meeting.	A-Acknowledged.
158	SD-04	RFCD (TM)	Provide channel transition details. Note that rectangular section must control through transition from rectangular to trapezoidal, and trapezoidal section must control through transition from trapezoidal to rectangular. See attachment.	A-Acknowledged. Structural details have been provided.
159	SD-04	RFCD (TM)	Provide NDOT Type 2B inlet grates.	A-Acknowledged. NDOT Type 2 inlets have been revised to be NDOT Type 2B inlets.
160	SD-06	RFCD (TM)	Revise design. See attachment for recommendations. Provide pothole information with next submittal.	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly. Pothole information has been provided.
161	SD-07	RFCD (TM)	Verify the type of grates to use on the NDOT drop inlets. Typical all.	A-Acknowledged. NDOT Type 2 inlets have been revised to be NDOT Type 2B inlets.
162	SD-08	RFCD (TM)	Revise profiles based on new lateral layout.	A-Acknowledged.
163	SD-09	RFCD (TM)	Revise profiles based on new lateral layout.	A-Acknowledged.
164	SD-10	RFCD (TM)	Provide construction details for RCB, open channel, and transition sections with next submittal.	A-Acknowledged.
165	SD-15	RFCD (TM)	Provide a design that isolates the trench drain and the special drop inlet from the 12' x 6' RCB. The special drop inlet will likely be replaced with a standard drop inlet once the parcel on the northwest corner of the intersection develops. Isolating the drop inlet will require less destruction and reconstruction of the RCB in the future.	A-Acknowledged.
166	GR-05	RFCD (TM)	Provide transition sections and structural details	A-Acknowledged.
167	LA-01	RFCD (TM)	Only plants with non-invasive root systems shall be planted over RCB. Is irrigation proposed?	A-Acknowledged.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

90% DRAINAGE REPORT
Brent Lane Drainage System & Trail
(Durango Dr. to Floyd Lamb Detention Basin)

City of Las Vegas, Nevada

Job No.: CLV1401.000
Date: March 2015

Prepared By:
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Mark Failla, P.E.
NV Professional Engineer No. 14566

Assisted By: Andrew Howard, P.E.
Pavel Kontchakov, E.I.

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Brent Lane Drainage System and Trail-90% Design Date: March 2015

Location of Development: a) Descriptive (Cross Streets) North/South: Durango Drive

East/West: Brent Lane

b) Section: 9 Township: 19S Range: 60E

c) APN : 125-04-301-005

Name of Owner: City of Las Vegas

Telephone No.: (702) 229-6276 Fax No.: (702) 382-0848 E-Mail Address: dmoyer@lasvegasnevada.gov

Address: 333 N. Rancho Drive, Las Vegas, NV 89106

Contact Person-Name: Mark Failla, P.E. **Telephone No.:** 702-284-5300

* **E-Mail Address:** mfailla@shg-inc.com **Fax No.:** 702-284-5399

Firm: Slater Hanifan Group

Address: 5740 S. Arville Street #216 Las Vegas NV 89118

Type of Land Development/Land Disturbance Process:

☐	Rezoning	☐	Subdivision Map	☐	Clearing and Grading Only
☐	Parcel Map	☐	Planned Unit Development	☒	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit	☐	Flood Control & Trail

1. Total Owned Land Area: At Site: +/-3.3 ac. (ROW/CLV Owned) Being Developed/Disturbed: +/- 3.3 ac.
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ **Yes**** ☒ **No**
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ **Yes**** ☐ **No**
4. Proposed type of development (Residential, Commercial, Etc.): Regional Storm Drain Improvements
5. Approximate upstream land area which drains to the subject site: Approx. 5.8 square miles
6. Has the site drainage been evaluated in the past? ☒ **YES** ☐ **NO** If yes, please identify documentation: (Preliminary Design Report, 50% Drainage Report)
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: CCRFCD Facility BRBD 0045
8. Briefly describe your proposed schedule for the subject project: Pre-Design, 50% Design, 90% Design, and 100% Design

Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

*New Required Field

**Review and concurrence of the Clark County Regional Flood Control District is required.

Local Entity File No.

Revision	Date

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

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1 INTRODUCTION

1.1 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 facility BRDB 0043. The MPU identifies facility BRDB 0043 as an 8'w by 6'h RCB.

This study is submitted subsequent to review by CLV and CCRFCD of the *Pre-Design Report* and *Preliminary Drainage Report, Brent Lane Drainage System & Trail, Durango Dr. to Floyd Lamb Detention Basin* (PDR) that was submitted on May 5, 2014, and the *50% Drainage Report, Brent Lane Drainage System & Trail, Durango Dr. to Floyd Lamb Detention Basin* that was submitted on September 8, 2014 as prepared by Slater Hanifan Group (SHG) for the project. The purpose of this 90% Drainage Report is as follows:

- Address comments provided by CLV and CCRFCD on the PDR and 50% Drainage Report, and incorporate design features as discussed in progress meetings.
- Progress with the selected facility design based on alternatives assessed in the PDR and coordinated with CLV and CCRFCD.
- Utilize the final detailed and comprehensive hydrologic analyses contributing to the facility for the existing/interim and ultimate conditions as accepted in the 50% Drainage Report by CLV and CCRFCD.
- Establish facility design flows based on the final hydrologic analyses and incorporating comments by CLV and CCRFCD.
- Provide facility designs in accordance with CLV and CCRFCD criteria.
- Provide final detailed hydraulic analyses of the selected facility design including the mainline conveyance facility, street flow, storm drain drop inlets, storm drain laterals, ditches and stabilization areas for the interim and ultimate conditions. The hydraulic analyses provide information on the hydraulic grade line, flow velocity, flow depth, flow velocity and other pertinent hydraulic parameters.
- Provide hydrologic/hydraulic support for the 90% Design Plans.

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, landscape architecture 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. Southwick Landscape Architects is providing the landscape architecture. Newfields is conducting the Environmental Screening Analysis.

1.2 Selected Alternative

Alternative A-Option 3, as presented in the PDR was selected as the preferred alternative per coordination with CLV and CCRFCD. The selected alternative generally consists of the following:

- **Selected Alternative**: The selected alternative generally consists of a closed conduit RCB 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 a concrete lined trapezoidal open channel to Tule Springs Road where it transitions to a culvert crossing and terminates as discharge into the existing feeder channel of the Tule Springs Detention Basin. The design 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. The culvert accommodates lower ultimate condition flows for conveyance below the road and meeting CCRFCD Manual criteria, but also accommodates the higher existing/interim condition flows for conveyance below the road, but not necessarily meeting CCRFCD Manual criteria.

1.3 Reference Documents

Various documents, drainage studies and improvement plans for projects in the vicinity of the BLP have been reviewed in preparation of this study. Relevant reference documents utilized in the preparation of this study were itemized and provided in both the PDR and the 50% Drainage Report, and have not been re-included with this report. An electronic copy of the PDR and 50% Drainage Report is included in Appendix H and is inclusive of relevant excerpts from the relevant reference documents.

1.4 Project Coordination

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

- CLV/CCRFCD Kickoff Meeting Minutes – March 6
- CLV Email Correspondence (Trail) – March 11, 2014
- CLV/CCRFCD Progress Meeting #1 Minutes – April 8, 2014
- CLV/CCRFCD Email Correspondence (Hydrology) – April 16, 2014
- CLV/CCRFCD Progress Meeting #2 Minutes – June 23, 2014
- CLV Planning Coordination Meeting – July 9, 2014
- CCRFCD Section 8 Analysis Review – July 15, 2014
- CLV Planning Coordination Meeting – July 17, 2014
- Newfields/CCRFCD Email Correspondence (SHPO/BLM) – July 17, 2014
- CLV/CCRFCD Progress Meeting #3 - July 24, 2014
- CLV Email Correspondence (Sewer) – August 4, 2014
- CLV Email Correspondence (Trail) – August 18, 2014
- Response to Pre-Design CLV/CCRFCD Review Comments – September 8, 2014
- CLV/CCRFCD Progress Meeting #4 – September 8, 2014
- CLV/CCRFCD Progress Meeting #5- October 21, 2014
- CLV/CCRFCD Progress Meeting #6 – January 6, 2015
- CLV/CCRFCD Progress Meeting #7 – January 27, 2015
- Response to 50% Drainage Report CLV/CCRFCD Review Comments – March 23, 2015

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 (CCRFCD Manual, Reference 1).

2.2 Hydrologic Modeling

Hydrologic methodologies performed in the hydrologic analyses to establish facility design flows utilized in this study were discussed in both the PDR and the 50% Drainage report and are not re-included with this report. An electronic copy of the PDR and 50% Drainage Report is included in Appendix H.

2.3 Hydraulic Modeling

Street Flow: Street flow was analyzed utilizing the FlowMaster Version 7.0 software by Haestad Methods. In accordance with Section 300 of 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 for the ultimate condition:

- 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. The trench drain drop inlet was designed based on manufacturer provided rating curves.

Storm Drain (Laterals): Hydraulic analysis for storm drain laterals has been performed utilizing the Water Surface and Pressure Gradient (WSPG-W) Hydraulic Analysis System software by the Los Angeles County Department of Public Works. As outlined in Section 800 of the CCRFCD Manual, storm drain facilities are designed to maintain the hydraulic gradient line (HGL) a minimum 1-ft below drop inlet grate elevations/manhole lids and limit the flow velocities in the facility to less than 25 ft/s for the ultimate condition. A Manning's "n" value of 0.013 was selected for RCP storm drain.

Storm Drain & Open Channel (Mainline): Hydraulic analysis for the RCB mainline storm drain and trapezoidal concrete lined open channel has been performed utilizing the Water Surface and Pressure Gradient (WSPG-W) Hydraulic Analysis System software by the Los Angeles County Department of Public Works. As outlined in Section 800 of the CCRFCD Manual, storm drain facilities are designed to maintain the hydraulic gradient line (HGL) a

minimum 1-ft below drop inlet grate elevations/manhole lids and limit the flow velocities in the facility to less than 25 ft/s for the ultimate condition. Additionally, design criteria per Section 706 of the CCRFCD Manual were adhered to for the open channel. A Manning's "n" value of 0.015 was selected for the RCB storm drain and a Manning's "n" value of 0.015 was selected for the concrete lined open channel.

Open Channels (Other): Hydraulic analyses for open channels, other than the mainline, were performed based on normal depth utilizing the FlowMaster Version 7.0 software by Haestad Methods.

3 HYDROLOGY

3.1 Discussion

Hydrologic analyses to establish facility design flows utilized in this study were discussed in both the PDR and the 50% Drainage report and are not re-included with this report. An electronic copy of the PDR and 50% Drainage Report is included in Appendix H. It is noted that three (3) 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 ultimate condition design flows for the drop inlet and storm drain lateral facilities.

4 HYDRAULICS

4.1 Discussion

This section addresses the hydraulic analyses for the BLP mainline conveyance facility as well as the "local" collection facilities (drop inlets, storm drain laterals & ditches) along the BLP mainline facility. The facilities were assessed for both the interim and ultimate hydrologic conditions.

4.2 Mainline

Approach (Interim & Ultimate):
The selected BLP mainline alternative generally consists of a 12'w x 6'h closed conduit RCB 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 a concrete lined trapezoidal open channel with 12-foot bottom width, 7-foot depth and 2:1 side slopes to Tule Springs Road where it transitions to a 20'w x 7'h culvert crossing and terminates as discharge into the existing feeder channel of the Tule Springs Detention Basin. The design allows for interception of surface flow from the west over the edge of the open channel and conveyance under Tule Springs Road. The culvert accommodates lower ultimate condition flows for conveyance below the road and meeting CCRFCD Manual criteria, but also accommodates the higher interim condition flows for conveyance below the road, but not necessarily meeting CCRFCD Manual criteria.

Summary of Design Flows (Interim & Ultimate):

Design flows established for the BLP mainline are based on the ultimate condition regional analysis. The BLP mainline facility was also assessed for the interim condition based on the existing condition regional analysis. The following table provides a summary of mainline design flows relevant to each facility segment for the interim flow condition.

Table 1: Summary of Mainline Design Flows (Interim Conditions)

Facility Segment[1]	Ultimate HEC-1 Node Q_{100} (cfs)	Interim Design Flow Q_{100} (cfs)
Open Channel Sta. 11+00 to Sta. 23+50	CP-I[2]	2102
RCB Sta. 23+50 to Sta. 23+71.50	(CP-I[2])-Inlet Facility Capture[1]	506
RCB Sta. 23+71.50 Sta. 25+81.76	(CP-I[2])-Inlet Facility Capture[1]	400
RCB Sta. 25+81.76 to Sta. 40+36.61	(CP-I[2])-Inlet Facility Capture[1]	294

1: See Exhibit E.
2: See Exhibit B – Existing Regional Analysis from 50% Drainage Report included in Appendix H.

The following table provides a summary of mainline design flows relevant to each facility segment for the ultimate flow condition.

Table 2: Summary of Mainline Design Flows (Ultimate Conditions)

Facility Segment[1]	Ultimate HEC-1 Node Q_{100} (cfs)	Ultimate Design Flow Q_{100} (cfs)
Open Channel Sta. 11+00 to Sta. 18+30	CP-G[2]	1353
Open Channel Sta. 18+30 to Sta. 23+50	CP-E[2]	1179
RCB Sta. 23+50 to Sta. 38+74.77	CP-E[2]	1179
RCB Sta. 38+74.77 to Sta. 39+21.28	(CP-E[2])-(LOC6[3]+5cfs)	1169
RCB Sta. 39+21.28 Sta. 39+22.42	(CP-E[2])-(LOC6[3]+5cfs)-(CP1[3])	1089
RCB Sta. 39+22.42 to Sta. 39+63.31	(CP-E[2])-(LOC6[3]+5cfs)-(CP1[3])-(LOC1[3])	1034
RCB Sta. 39+63.31 to Sta. 40+14.36	(CP-E[2])-(LOC6[3]+5cfs)-(CP1[3])-(LOC1[3])-(LOC3[3])	1022
RCB Sta. 40+14.36 to Sta. 40+36.61	(CP-E[2])-(LOC6[3]+5cfs)-(CP1[3])-(LOC1[3])-(LOC3[3])-(LOC2[3])	1001

1: See Exhibit E.
2: See Exhibit C – Ultimate Regional Analysis from 50% Drainage Report included in Appendix H.
3: See Exhibit D – Ultimate Local Analysis from 50% Drainage Report included in Appendix H.

Hydraulic Modeling (Interim & Ultimate Condition): Hydraulic analysis for the RCB mainline storm drain and trapezoidal concrete lined open channel has been performed utilizing the Water Surface and Pressure Gradient (WSPG-W) Hydraulic Analysis System software by the Los Angeles County Department of Public Works. The mainline conveyance facilities are designed in accordance with Sections 706 and 800 of the CCRFCD Manual as discussed in Section 2.3 of this report. A Manning's "n" value of 0.015 was selected for the RCB storm drain and a Manning's "n" value of 0.015 was selected for the concrete lined open channel. Starting water surface elevations were established assuming normal depth. The open channel conveys under a supercritical flow regime; therefore computations for freeboard, super-elevation and transitions were performed based on equations from the CCRFCD Manual for supercritical flow.

Two separate WSPG-W hydraulic models were performed. One model was performed for interim condition flow rates and the other for ultimate condition flow rates. As previously discussed, the mainline conveyance facility was designed to be in accordance with CCRFCD Manual criteria for the ultimate flow condition, but only provide conveyance capacity for the 100-year interim flow condition. The ultimate condition WSPG-W hydraulic model is inclusive of the entire reach of the mainline conveyance facility from RCB storm drain to the open channel to the culvert below Tule Springs Road. The interim condition WSPG-W hydraulic model is inclusive of only the open channel and culvert portion of the mainline conveyance facility since the quantity of flow in the RCB portion is well below the ultimate condition design flow. WSPG-W hydraulic models for both conditions are included in Appendix B. The following describes hydraulic design elements incorporated into the open channel portion of the mainline conveyance facility.

- *Super-Elevation*: Super-elevation at bends within the open channel was computed based on equations included in Section 706.2.5 of the CCRFCD Manual. The computed increases in water surface elevation (WSE) due to super-elevation were added to the computed WSE's at affected sections determined by the WSPG-W computer model. The overall channel depth is designed to accommodate the super-elevation. In accordance with Section 706.2.5, in no case does the super-elevation exceed 2-feet. Super-elevation computations are included in Appendix B.

- *Bends*: Bends in the open channel were evaluated based on Section 706.2.2 of the CCRFCD Manual. Equation 740 in Section 706.1.2 of the CCRFCD Manual was utilized to determine the minimum allowable radius; however the minimum radius of curvature is based on the super-elevation of water surface not exceeding 2-feet. Minimum bend computations based on Equation 740 are included in Appendix B.

- *Rollwaves*: Rollwave potential in the open channel was computed based on equations included in Section 706.2.6 of the CCRFCD Manual. The computed increases in WSE due to rollwave potential were added to the computed WSE's at affected sections determined by the WSPG-W computer model. The overall channel depth is designed to accommodate the potential of rollwaves. Rollwave computations are included in Appendix B.

- *Freeboard*: Minimum freeboard within the open channel was computed based on Equation 747 included in Section 706.2.4 of the CCRFCD Manual. The overall channel depth is designed to accommodate the freeboard above the ultimate condition 100-year storm event computed WSE's, super-elevation, and other water surface disturbances such as rollwaves. In accordance with CCRFCD Manual criteria 2-feet of freeboard is maintained below the low chord of the culvert below Tule Springs Road for the ultimate flow condition. Freeboard in accordance with CCRFCD Manual criteria under interim flow conditions is not adhered to. Freeboard computations are included in Appendix B.

- *Transitions*: Minimum transition lengths in the open channel were computed based on Equation 745 included in Section 706.2.1.2 of the CCRFCD Manual. Section 706.2.1.2 is relevant to expanding transitions of water surface top width. The upstream transition from 12'w x 7'h RCB to trapezoidal open channel with 12' bottom width, 7' depth, and 2:1 side slopes is an expanding transition and is accommodated by Section 706.2.1.2. The downstream transition from trapezoidal open channel with 12' bottom width, 7' depth, and 2:1 side slopes open channel to 20'w x 7'h RCB results in a 5-ft contraction of water surface top width; however Equation 745 for expanding transitions resulted in a more reasonable transition length and was therefore utilized to compute the minimum length. Minimum transition length computations are included in Appendix B.

Hydraulic Model Summary (Interim & Ultimate): The BLP mainline was assessed under both interim and ultimate flow conditions. The following table provides a summary of the hydraulic and design characteristics of the BLP mainline under interim conditions. The hydraulic grade line (HGL) is determined as computed WSE plus computed super-elevation plus computed rollwave height. Comprehensive hydraulic summary tables are included in Appendix B. As previously discussed, the facility does not necessarily meet CCRFCD Manual criteria for freeboard under interim flow conditions; however interim condition flows are maintained within the facility without overtopping of Tule Springs Road.

Table 3: Summary of Interim Mainline Hydraulic & Design Characteristics

WSPG-W Station/Location	Q_{100} (cfs)	Flow Depth (ft)	Super-Elev. Depth (ft)	Roll Wave Depth (ft)	Freeboard Req'd. (ft)	Facility Depth Req'd. (ft)	Facility Depth Provided (ft)
Sta. 11+00 Begin Rip Rap Lined 40 BW, Varying SS, Trap Channel, Transition to Existing Rip Rap Lined Channel to Sta. 10+50.	2102	3.46	NA	NA	NA	3.46	NA
Sta. 11+41 Rip Rap Lined 40 BW, Varying SS, Trap	2102	4.15	NA	NA	NA	4.15	6
Sta. 11+46 Solid Grout Riprap Sta. 11+70 to 12+02 Rip Rap Lined 40 BW Varying SS, Trap Channel	2102	4.67	NA	NA	NA	4.67	6
Sta. 12+02 Begin Transition with 40' Concrete BW and Grouted Riprap SS	2102	2.66	NA	NA	NA	2.66	6
Sta. 12+31 End Transition	2102	4.41	NA	NA	NA	4.41	7
Sta. 12+32 Begin Proposed 20'x7' RCB Culvert	2102	4.41	NA	NA	NA	4.41	7
Sta. 13+67 End Proposed 20'x7' RCB Culvert	2102	4.03	NA	NA	NA	4.03	7
Sta. 13+97 End Transition/Begin Proposed Trap Channel	2102	4.02	1.81	0.71	NA	6.54	7
Sta. 13+98 Begin Curved Section	2102	4.02	1.81	0.71	NA	6.54	7
Sta. 16+28.68 End Curved Section	2102	4.16	1.67	0.14	NA	5.97	7
Sta. 18+30 Introduce Surface Flow	2102	4.35	NA	NA	NA	4.35	7
Sta. 18+37.42 Begin Curved Section	2102	4.36	1.50	NA	NA	5.87	7
Sta. 19+00 Grade Break	2102	4.46	1.43	NA	NA	5.89	7
Sta. 21+28.84 End Curved Section/Grade Break	2102	5.22	0.99	NA	NA	6.21	7
Sta. 23+20 Begin Transition	2102	6.82	NA	NA	NA	6.82	7

The flowing table provides a summary of the hydraulic and design characteristics of the BLP mainline under ultimate flow conditions. The hydraulic grade line (HGL) is determined as computed water surface elevation plus computed super-elevation plus computed rollwave height. Comprehensive hydraulic summary tables are included in Appendix B. The table shows that BLP mainline design is in accordance with CCRFCD Manual criteria under ultimate flow conditions.

Table 4: Summary of Ultimate Mainline Hydraulic & Design Characteristics

WSPG-W Station/Location	Q_{100} (cfs)	Flow Depth (ft)	Super-Elev. Depth (ft)	Roll Wave Depth (ft)	Freeboard Req'd. (ft)	Facility Depth Req'd. (ft)	Facility Depth Provided (ft)
Sta. 11+00 Begin Rip Rap Lined 40 BW, Varying SS, Trap Channel, Transition to Existing Rip Rap Lined Channel to Sta. 10+50.	1353	2.77	NA	NA	1.39	4.15	NA
Sta. 11+41 Rip Rap Lined 40 BW, Varying SS, Trap Channel	1353	3.28	NA	NA	1.32	4.60	6
Sta. 11+46 Solid Grout Riprap Sta. 11+70 to 12+02 Rip Rap Lined 40 BW Varying SS, Trap Channel	1353	3.72	NA	NA	1.45	5.16	6
Sta. 12+02 Begin Transition with 40' Concrete BW and Grouted Riprap SS	1353	2.39	NA	NA	1.47	3.87	6
Sta. 12+31 End Transition	1353	3.30	NA	NA	1.76	5.06	7
Sta. 12+32 Begin Proposed 20'x7' RCB Culvert	1353	3.30	NA	NA	1.76	5.06	7
Sta. 13+67 End Proposed 20'x7' RCB Culvert (Min. 2 feet of Freeboard Provided at Culvert)	1353	2.93	NA	NA	2.00	4.93	7
Sta. 13+97 End Transition/Begin Proposed Trap Channel	1353	3.28	1.19	0.40	1.87	6.74	7
Sta. 13+98 Begin Curved Section	1353	3.28	1.19	0.40	1.87	6.74	7
Sta. 16+28.68 End Curved Section	1353	3.59	0.97	NA	1.78	6.35	7
Sta. 18+30 Introduce Surface Flow	1179	3.03	NA	NA	1.82	4.85	7
Sta. 18+37.42 Begin Curved Section	1179	3.03	1.08	0.47	1.82	6.40	7
Sta. 19+00 Grade Break	1179	3.06	1.06	0.38	1.81	6.31	7
Sta. 21+28.84 End Curved Section/Grade Break	1179	3.21	0.95	NA	1.77	5.93	7
Sta. 23+20 Begin Transition	1179	3.03	NA	NA	1.82	4.85	7
Sta. 23+49.9 End Transition	1179	4.73	NA	NA	1.87	6.60	7
Sta. 23+50 Begin Proposed 12'x7' RCB Storm Drain/Grade Break	1179	4.73	NA	NA	NA	NA	NA
Sta. 23+71.5	1179	4.71	NA	NA	NA	NA	NA
Sta. 24+49.65 Grade Break	1179	4.60	NA	NA	NA	NA	NA
Sta. 25+81.76	1179	4.49	NA	NA	NA	NA	NA
Sta. 25+83.58	1179	4.49	NA	NA	NA	NA	NA
Sta. 29+99.65 Grade Break	1179	3.76	NA	NA	NA	NA	NA
Sta. 32+25	1179	3.80	NA	NA	NA	NA	NA
Sta. 38+72.58	1179	5.33	NA	NA	NA	NA	NA
Sta. 38+74.77	1179	5.36	NA	NA	NA	NA	NA
Sta. 38+74.77 (2) 18" RCB Lateral	1169	5.18	NA	NA	NA	NA	NA

Table 4: Summary of Ultimate Mainline Hydraulic & Design Characteristics							
WSPG-W Station/Location	Q_{100} (cfs)	Flow Depth (ft)	Super-Elev. Depth (ft)	Roll Wave Depth (ft)	Freeboard Req'd. (ft)	Facility Depth Req'd. (ft)	Facility Depth Provided (ft)
Sta. 39+21.28	1169	6.00	NA	NA	NA	NA	NA
Sta. 39+21.28 36" RCB Lateral	1089	6.81	NA	NA	NA	NA	NA
Sta. 39+22.42	1089	6.82	NA	NA	NA	NA	NA
Sta. 39+22.42 36" RCB Lateral	1034	7.38	NA	NA	NA	NA	NA
Sta. 39+56.84	1034	6.98	NA	NA	NA	NA	NA
Sta. 39+63.31	1034	6.91	NA	NA	NA	NA	NA
Sta. 39+63.31 48" RCB Lateral	1022	7.05	NA	NA	NA	NA	NA
Sta. 40+14.36	1022	6.44	NA	NA	NA	NA	NA
Sta. 40+14.36 3'H X 3.5'W RCB Lateral	1001	6.69	NA	NA	NA	NA	NA
Sta. 40+36.61	1001	6.43	NA	NA	NA	NA	NA
Sta. 40+36.61 Begin 12'x6' RCB	1001	6.43	NA	NA	NA	NA	NA

Stabilization: Stabilization to minimize the potential of erosion has been provided at the following locations/facilities. Riprap stabilization has been design in accordance with Equation 735 of the CCRFCD Manual.

Drop Inlet Concrete Aprons: Concrete aprons with cutoff walls have been provided around all field drop inlets.

Open Channel Overland Flow Interception at Brent Lane: Prior to the ultimate upstream extension of the BLP mainline, inlet facilities at the terminus of this phase of the project (Brent Lane/Durango Drive intersection) are capable of intercepting only a portion of the interim condition 100-year flows. At the direction of CLV/CCRFCD, a trench drain was added to the project to increase the interception capacity of the system under interim conditions; however a significant amount of storm flow will continue to bypass the Brent Lane/Durango Drive intersection. Under existing conditions, the majority of storm flow that bypasses the intersection is intercepted downstream by the berm/wash near the Brent Lane entrance to the park. Under proposed conditions, a dip in the trail at this location has been provided in order to accommodate interception of interim condition storm flows bypassing the intersection and conveyance to the open channel facility. The section of the trail (Station TR 67+00 To Station TR 68+70) designed to accommodate the interim flows is proposed as concrete with cutoff walls. Additionally, riprap stabilization is proposed on the downstream side of the trail and along the flow path to the concrete open channel. Riprap stabilization is also proposed along the north side of the concrete open channel (Station SD 19+95 to Station SD 23+20) where the flow will drop into the channel. Hydraulic section and riprap computations are included in Appendix C.

Open Channel Overland Concentrated Inflows: Two locations along the BLP mainline open channel are impacted by concentrated overland flow (Station SD 14+11.33 and Station SD 19+73.48). These locations have been designed with a concrete flume in the side of the open channel and an extension of concrete with cutoff wall along the inflow ditch and riprap at the interface between concrete and earth. Hydraulic section and riprap computations are included in Appendix C.

Open Channel Overland Sheet Inflows: The concrete open channel intercepts overland sheet flow between Station SD 14+20 and Station SD 17+30. Riprap stabilization has been provided

along the top of bank between these stations in order to minimize the potential of erosion. Riprap computations have been included in Appendix C.

BLP Mainline Terminus Discharge: The discharge velocity at the terminus of the BLP Mainline from the culvert facility at Tule Springs Road exceeds the allowable velocity for loose riprap. In order to accommodate erosive velocities at this location, the receiving feeder channel geometry between Station SD 11+00 and Station SD 12+32 is designed to be modified at a flatter slope and wider bottom width within the same existing top of banks. This modification results in a hydraulic jump that reduces velocity within the downstream channel. Additionally, at the immediate terminus of the BLP Mainline, a concrete apron along the bottom and solid grouted riprap along the side slopes of the receiving feeder channel is provided between Station SD 12+02 and Station SD 12+32. Between Station SD 11+70 and Station SD 12+02, the modified channel section is solid grouted riprap along the entire channel section. Between Station SD 11+00 and Station SD 11+70, the modified channel section is loose riprap along the entire channel section. Beyond Station SD 11+00, the modified channel section is transitioned back to the existing channel and slope. Hydraulic analysis for the BLP Mainline terminus is included in the mainline WSPG-W hydraulic model. Riprap stabilization computations and associate channel sections are included in Appendix C.

The following table provides a summary of stabilization areas.

Table 5: Summary of Stabilization Areas

Location[1,2]	Q_{100} (cfs)	Weir L or BW (ft)	Velocity (ft/s)	Slope (%)	Stabilization Type	Riprap d_{50} (in)
Open Channel Overland Flow Intercept at Brent Ln.						
Trail (Section 7)	629	170	8.69	2.00	Concrete Trail/Riprap	24
D/S of Trail (Section 8)		18	9.92	4.00	Riprap	24
D/S of Trail (Section 9)		13	11.05	4.00	Riprap	24
Open Channel Overland Concentrated Inflow						
SD 14+11.33 (Facility 31)	34	N/A	11.32	10.00	Riprap/Concrete Flume	6
SD 19+73.48 (Facility 32)	27	N/A	4.41	2.00	Riprap/Concrete Flume	12
Open Channel Overland Sheet Inflow						
SD 14+30 to SD 17+30	816	300	8.80	33	Riprap	24
BLP Mainline Terminus						
SD 12+02 to SD 12+32			14.11-20.52	0.50	Concrete/Grouted Riprap	Reuse
SD 11+70 to SD 12+02	1353	40	7.81-14.11	0.50	Grouted Riprap	Existing
SD 11+41 to SD 11+70			8.62-7.81	0.50	Loose Riprap	Riprap
Sta. 11+00 to Sta. 11+41			11.00-8.62	4.38	Loose Riprap	

1: See Exhibit E
2: See Appendix C for supporting computations

Facility Appurtenances: The following facility appurtenances are incorporated into the proposed BLP design.

- *Access Manholes:* Per Section 802.4.1.2 of the CCRFCD Manual, access manholes are provided at a minimum of 400 foot spacing along the RCB mainline storm drain.

- *Access Roads & Ramps*: Per Section 707.2 of the CCRFCD Manual, maintenance access roads and ramps are provided along the mainline open channel. A 12-foot wide maintenance access road is provided along the south top of channel bank. Per meeting coordination with CLV/CCRFCD, no 5-foot manway on the opposite bank is necessary. The access road is comprised of Type II Aggregate Base material. A 12-foot wide corridor is provided along the channel bottom. Two access ramps to the

bottom of channel are provided. One access ramp is located at the upstream side of the open channel near the termination of the RCB storm drain, and a second access ramp is provided at the downstream end of the channel at the culvert discharge east of Tule Springs Road.

- *Safety Steps*: Per Section 707.3 of the CCRFCD Manual, safety steps along the channel banks are provided.

- *Fencing*: Per coordination with CLV/CCRFCD, railroad tie post and cable railing is provided along the existing top of berm adjacent to the southern top of channel bank and trail. The railroad tie post and cable railing is consistent with that utilized within the Floyd Lamb Park. Swing gates are provided at the eastern and western maintenance road accesses to the channel for control of access. Additionally, post and rail fencing is provided along the concrete channel transition areas and headwalls. No fencing is provided along the northern side of the channel.

4.3 Local Collection Facilities

Approach (Interim & Ultimate): 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 Brent Lane and Tule Springs Road. Drop inlet and storm drain lateral facilities were sized based on the ultimate condition "local" analysis as discussed in Section 3.4. Street flow analysis was performed in order to evaluate compliance with street flow criteria under ultimate conditions 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) for the ultimate condition.

At the request of CLV, a trench drain is provided across Brent Lane just west of Durango Drive. Although not required to accommodate the ultimate condition per analysis and assumptions of this report, the trench drain is provided to alleviate interim condition flows impacting the intersection. Since interim condition flows impacting the intersection are large, the quantity and size of inlets provided was kept within reasonable consideration. The inlets provided are evaluated under interim flow conditions in order to quantify intercepted flow and bypass flow. The inlets provided do not bring the intersection in conformance with CCRFCD Manual criteria for street flow. Additionally, field inlets near the park entrance are provided to alleviate the interim condition surface flow into the BLP Mainline as part of the open channel interim condition flow interception at Brent Lane.

Layout: At the Brent Lane/Durango Drive intersection, drop inlets are generally located at the curb returns of all four corners. Additionally a trench drain is provided across Brent Lane to better alleviate the interim condition. Drop inlets and storm drain laterals are also located along the reach of Brent Lane roadside ditches at approximately 660-ft spacing, near the park entrance to alleviate interim condition surface flows into the BLP Mainline, at the Tule Springs culvert crossing, and along Tule Springs Road to drain an existing low point. Exhibit E provides a depiction of local collection facilities proposed as part of the BLP.

Street Flow: The local storm drain design was initiated by first evaluating ultimate condition 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 where 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. Street flow hydraulic computations are included in Appendix C. The following table provides a summary of ultimate condition 100-year storm event street flow hydraulics.

Table 6: Summary of Street Flow Hydraulics: 100-Year (Ultimate Condition)

Street Section[1]	Slope (%)	Cross Slope (%)	Q_{100} (cfs)	D_{100} (ft)	V_{100} (ft/s)	$D_{100}*V_{100}$
Durango Drive-Half Street Section 1-W	1.50	2.0	58	0.76	5.27	4.01
Durango Drive-Half Street Section 1a-W	1.50	2.0	18	0.56	3.87	2.17
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 E

Review of the table above indicates the proposed design will be in compliance with CCRFCD street flow criteria for the ultimate condition 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 ultimate condition 10-year street flow hydraulics along Durango Drive.

Table 7: Summary of Street Flow Hydraulics: 10-Year (Ultimate)

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	22.5
Durango Drive-Half Street Section 1-E	1.50	2.0	5	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	5	Dry Lane Met By Inspection			

1: See Exhibit E.

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

The following table provides a summary of interim condition 100-year storm event street flow hydraulics as it enters the Brent Lane/Durango Drive intersection and on the south side of Brent Lane near the Park Entrance.

Table 8: Summary of Street Flow Hydraulics: 100-Year (Interim)

Street Section[1]	Slope (%)	Cross Slope (%)	Q_{100} (cfs)	D_{100} (ft)	V_{100} (ft/s)	D_{100}*V_{100}
Brent Lane-Full Street Section 5	1.98	2.0	1146	1.35	16.27	21.96
Brent Lane-Half Street Section 6	2.00	2.0	10.5	0.70	3.02	2.11

1: See Exhibit E.

As previously discussed, the local collection facilities are designed to meet CCRFCD Manual criteria under ultimate conditions. However, the local collection facilities at the Brent Lane/Durango Drive intersection were also evaluated for the interim 100-year storm event to assess the improvement resulting from this phase of the BLP prior to the future upstream extension.

Trench Drain & Drop Inlets: Drop inlets were analyzed based on computational procedures described in Section 2.3 of this report. 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 under ultimate conditions. Note that existing drop inlets were utilized if they were determined to be adequate. Additionally, drop inlets and storm drain laterals are also located along the reach of Brent Lane roadside ditches at approximately 660-ft spacing, near the park entrance to alleviate interim condition surface flows into the BLP Mainline, at the Tule Springs culvert crossing, and along Tule Springs Road to drain an existing low point. Drop inlet computations are included in Appendix C.

Table 9: Summary of Drop Inlets (Ultimate)

Facility ID[1]	Size & Type	Total Inflow Q_{100} (cfs)	Collected Q_{100} (cfs)	Bypass Q_{100} (cfs)
Facility 1[2] DI Sta. 40+08.60 (continuous)	12-ft Neenah R-3295 (4 Grates)	12	12	0
Facility 2 DI Sta. 40+05.50 (continuous)	36-ft Neenah R-4999 (trench)	0	0	0
Facility 3 DI Sta. 40+14.36 (continuous)	20-ft DM2	21	21	0
Facility 5 DI Sta. 39+51.64 (continuous)	20-ft CM2	58	40	18
Facility 6 DI Sta. 39+52.82 (continuous)	20-ft CM2	18	15	3
Facility 9 DI Sta. 38+74.84 (sump)	NDOT Type 2B 2.5' L x 2' W	5	5	0

Table 9: Summary of Drop Inlets (Ultimate)				
Facility ID[1]	**Size & Type**	**Total Inflow Q_{100} (cfs)**	**Collected Q_{100} (cfs)**	**Bypass Q_{100} (cfs)**
Facility 11 DI Sta. 39+55.12 (sump)	17.5-ft CM2	38.5	38.5	0
Facility 12 DI Sta. 39+54.84 (sump)	17.5-ft CM2	41.5	41.5	0
Facility 15 DI Sta. 38+63.85 (sump)	5.0-ft CM2	5	5	0
Facility 18 DI Sta. 32+62.00 (sump)	NDOT Type 2B 2.5' L x 2' W	3	3	0
Facility 21 DI Sta. 26+18.76 (sump)	Special Field Inlet 15' L x 2.5' W	3	3	0
Facility 23 DI Sta. 24+00.83 (sump)	Special Field Inlet 15' L x 2.5' W	6	6	0
Facility 26 DI Sta. 13+86.91 (sump)	NDOT Type 2B 2.5' L x 2' W	5	5	0
Facility 28 DI Sta. 12+61.09 (sump)	NDOT Type 2B 2.5' L x 2' W	5	5	0
1: See Exhibit E. 2: Existing Facility				

Drop inlets at the Brent Lane/Durango Drive intersection and along Brent Lane were also evaluated for the 100-year interim condition. As determined by the Existing Condition Regional Hydrologic Analysis at concentration Point CP-H, 1,286 cfs enters the Brent Lane/Durango Drive intersection. In order to determine how much flow enters the intersection from Brent Lane, Durango Drive North, and Durango Drive South; the ultimate condition local analysis was utilized to quantify flows entering from Durango Drive North and Durango Drive South. These flows were subtracted from the total at CP-H and the remainder was assumed to be entering along Brent Lane. Note that only drop inlets west of Durango Drive were evaluated separately for the interim flow condition. All other inlets at the intersection were assumed to intercept the same quantity of flow as under ultimate conditions. Therefore, for purposes of the interim condition flow interception analysis at the Brent Lane/Durango Drive intersection drop inlets and flows were grouped along Brent Lane, Durango Drive North and Durango Drive South respectively as follows: Facilities 1,2,3 (1,146 cfs = 1,286 cfs – 82 cfs from Durango South – 58 cfs from Durango North); Facilities 5,6,9 (58 cfs = Subbasin LOC1), and Facilities 11,12,15 (82 cfs = Subbasin LOC6+CP-1). This is considered a conservative approach to quantifying the interim condition interception since the quantity of flow bypassing the inlets west of Durango Drive will generate a higher depth of flow over the other inlets than under ultimate conditions. The quantity of flow intercepted under interim conditions will likely be limited by the storm drain laterals. The inlet facilities at the Brent Lane/Durango Drive intersection are conservatively determined to intercept 437 cfs out of the total 1,286 cfs under interim conditions. The following table provides a summary of drop inlets under interim conditions.

Table 10: Summary of Drop Inlets (Interim)				
Facility ID[1]	**Size & Type**	**Total Inflow Q_{100} (cfs)**	**Collected Q_{100} (cfs)**	**Bypass Q_{100} (cfs)**
Facility 1[2] DI Sta. 40+08.60 (continuous)	12-ft Neenah R-3295 (4 Grates)	1146	46	849
Facility 2 DI Sta. 40+05.50 (continuous)	36-ft Neenah R-4999 (trench)		119	
Facility 3 DI Sta. 40+14.36 (continuous)	20-ft DM2		132	
Facility 5 DI Sta. 39+51.64 (continuous)	20-ft CM2	58	58	
Facility 6 DI Sta. 39+52.82 (continuous)	20-ft CM2			
Facility 9 DI Sta. 38+74.84 (sump)	NDOT Type 2B 2.5' L x 2' W			
Facility 11 DI Sta. 39+55.12 (sump)	17.5-ft CM2	82	82	
Facility 12 DI Sta. 39+54.84 (sump)	17.5-ft CM2			
Facility 15 DI Sta. 38+63.85 (sump)	5.0-ft CM2			
Facility 18 DI Sta. 32+62.00 (sump)	NDOT Type 2B 2.5' L x 2' W	3	3	0
Facility 21 DI Sta. 26+18.76 (sump)	Special Field Inlet 15' L x 2.5' W	106	106	0
Facility 23 DI Sta. 24+00.83 (sump)	Special Field Inlet 15' L x 2.5' W	106	106	0
Facility 26 DI Sta. 13+86.91 (sump)	NDOT Type 2B 2.5' L x 2' W	5	5	0
Facility 28 DI Sta. 12+61.09 (sump)	NDOT Type 2B 2.5' L x 2' W	5	5	0
1: See Exhibit E. 2: Existing Facility				

Storm Drain Laterals: Storm drain lateral systems were analyzed utilizing the WSPG-W computer program as described in Section 2.3 of this report. Storm drain laterals are sized in accordance with CCRFCD Manual criteria for the ultimate condition. Starting water surface elevations for each system model was taken from the corresponding station of the BLP mainline WSPG-W model. The following table provides a summary of the proposed lateral storm drain systems. Storm drain lateral system computations are included in Appendix C.

Table 11: Summary of Storm Drain Lateral Facilities (Ultimate)

Facility ID[1]	Facility Description	Design Flow Q_{100} (cfs)
Facility 4 SD Sta. 39+63.31 - 40+05.50	48" RCP SD	12
Facility 7a SD Sta. 39+14.33 - 39+51.64	30" RCP SD	40
Facility 7b SD Sta. 39+21.28 - 39+14.33	36" RCP SD	55
Facility 8 SD Sta. 39+21.10 - 39+52.82	30" RCP SD	15
Facility 10 SD Sta. 38+74.77 - 38+74.81	18" RCP SD	5
Facility 13a SD Sta. 39+33.10 - 39+55.12	36" RCP SD	38.5
Facility 13b SD Sta. 39+22.42 - 39+33.10	36" RCP SD	41.5
Facility 14 SD Sta. 39+33.10 - 39+54.84	36" RCP SD	41.5
Facility 16 SD Sta. 38+76.98 - 38+63.85	18" RCP SD	5
Facility 19 SD Sta. 32+25.00 - 32+62.00	18" RCP SD	3
Facility 20 SD Sta. 25+83.76 + 25+99.44	24" RCP SD	N/A
Facility 22 SD Sta. 25+81.76 - 26+18.76	42" RCP SD	3
Facility 24 SD Sta. 23+71.50 - 24+00.83	42" RCP SD	6
Facility 27 SD Sta. 12+62.22 - 12+61.09	18" RCP SD	5
Facility 29 SD Sta. 12+62.22 - 12+61.09	18" RCP SD	5

1: See Exhibit E.

In addition, storm drain lateral systems conveying flow from the two field inlets near the park entrance were also evaluated for the interim condition flows. These storm drain lateral systems were analyzed utilizing the WSPG-W computer program as described in Section 2.3 of this report. These storm drain laterals are sized in accordance with CCRFCD Manual criteria for the interim condition. Starting water surface elevations for each system model was taken from the corresponding station of the BLP mainline WSPG-W model for the interim condition. The following table provides a summary of these two lateral storm drain systems under interim flow conditions. Storm drain lateral system computations are included in Appendix C.

Table 12: Summary of Storm Drain Lateral Facilities (Interim)		
Facility ID[1]	Facility Description	Design Flow Q_{100} (cfs)
Facility 4 SD Sta. 39+63.31 - 40+05.50	48" RCP SD	165
Facility 22 SD Sta. 25+81.76 - 26+18.76	42" RCP SD	106
Facility 24 SD Sta. 23+71.50 - 24+00.83	42" RCP SD	106
1: See Exhibit E.		

4.4 Other Conveyances

Approach: Various other conveyances are incorporated into the BLP project to enhance positive drainage to the BLP mainline facility.

Side Channel: The side channel is an extension of the existing channel/berm facility located north of the BLP mainline and adjacent to Tule Springs Road. The side channel incorporates a landscape berm utilized to obstruct views of the concrete channel as its eastern bank. The side channel enhances positive drainage to the BLP mainline. The side channel terminates as a direct discharge to the mainline open channel just north of the Tule Springs Road crossing. The ultimate condition results in the "worst case" storm flow to the facility; therefore computations were only performed for the ultimate condition flow. Hydraulic computations for the Side Channel are included in Appendix C.

Table 13: Summary of Side Channel Hydraulic Characteristics (Ultimate)				
Location[1]/Description	Q_{100} (cfs)	Slope (ft/ft)	Velocity (ft/s)	Flow Depth (ft)
Facility 31 / Section 10 Earth Trap. Channel w/ 12'BW, 1'D, 3:1 SS	34	0.005	3.14	0.76
1: See Exhibit E.				

Roadside Ditches: Roadside v-ditches are perpetuated and enhanced along the north side of Brent Lane and along Tule Springs Road. Separate hydraulic computations for the roadside ditches were not performed. Drop inlets and storm drain laterals, as described in Section 4.3 of this report, are located along the reach of roadside ditches. Intercepted flows are conveyed to the BLP mainline.

5 TRAIL COORDINATION

5.1 Discussion

Flood control facilities were designed in conjunction and coordination with the trail component of the project. A segment of the trail is concrete lined near the park entrance where interim condition storm flows are designed to cross. Additionally, per coordination with the Historic Preservation Committee (HPC), landscape berms are provided to obstruct line of sight views from Tule Springs Road of the concrete open channel to the extent feasible.

6 CONCLUSIONS & RECOMMENDATIONS

1. The project site is not located within a FEMA designated SFHA. FEMA acceptance is not required.

2. The flood control portion of project is a planned and funded CCRFCD regional drainage facility, per the CCRFCD 2013 MPU. CCRFCD approval is required. The trail portion of the project is funded by the Southern Nevada Public Lands Management Act.

3. A portion of the project improvements are located within and adjacent to unincorporated Clark County. Clark County approval is required.

4. Based on recommendations of the Preliminary Design Report, the selected alternative generally consists of a closed conduit RCB 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 a concrete lined trapezoidal open channel to Tule Springs Road where it transitions to a culvert crossing and terminates as discharge into the existing feeder channel of the Tule Springs Detention Basin. The design 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. The culvert accommodates lower ultimate condition flows for conveyance below the road and meeting CCRFCD Manual criteria, but also accommodates the higher existing/interim condition flows for conveyance below the road, but not necessarily meeting CCRFCD Manual criteria.

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. Under ultimate conditions, 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. Under interim conditions, the proposed BLP greatly improves interception and conveyance of storm flows at the Brent Lane/Durango Drive intersection and along the mainline reach. The proposed facilities at the intersection of Brent Lane/Durango Drive will not intercept the entire interim condition 100-year storm flows; therefore the intersection may be subject to flooding until such time as the mainline facility is extended upstream. The inlet facilities provided at the Brent Lane/Durango Drive intersection were conservatively determined to intercept 437 cfs of the 1,286 cfs entering the intersection. Mitigation for intercepting and conveying the bypass flow to the BLP mainline has been provided near the park entrance via two field drop inlet lateral systems and surface conveyance thru a dip in the trail and stabilized flow corridor to the open channel. The mainline facility has capacity for conveyance of the entire interim condition 100-year flows although CCRFCD Manual criteria for freeboard are not met under interim conditions. The proposed culvert facility under Tule Springs Road has capacity to pass the entire 100-year storm flows without roadway overtopping under interim conditions.

8. The accompanying documents and technical analyses within this report support the design flows and drainage facilities proposed for the project.

7 REFERENCES

1. *Hydrologic Criteria and Drainage Design Manual.* Clark County Regional Flood Control District, 1990.

LIST OF APPENDICES

Appendix A Drainage Exhibits
- Exhibit E: Facilities Exhibit

Appendix B Hydraulic Analysis – Mainline Drainage System
- Mainline Drainage System WSPG-W: Interim Condition
- Mainline Drainage System WSPG-W: Ultimate Condition
- Open Channel Minimum Bend Computations
- Open Channel Transition Computations
- Open Channel Rollwave Computations
- Open Channel Super-Elevation Computations, Freeboard Computations, & Mainline Hydraulic Summary: Interim & Ultimate Conditions

Appendix C Hydraulic Analysis – Other
- Street Flow Computations
- Drop Inlet Computations
- Storm Drain Lateral Systems WSPG-W Analysis
- Ditch Computations
- Open Channel Interim Flow Interception at Brent Lane Computations
- Open Channel Overland Concentrated Inflow Computations
- Open Channel Overland Sheet Inflow Computations
- Riprap Stabilization Computations

Appendix D Utilities Schedule

Appendix E Estimates of Probable Cost

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
- CLV/CCRFCD Progress Meeting #2 Minutes – June 23, 2014
- CLV Planning Coordination Meeting – July 9, 2014
- CCRFCD Section 8 Analysis Review – July 15, 2014
- CLV Planning Coordination Meeting – July 17, 2014
- Newfields/CCRFCD Email Correspondence (SHPO/BLM) – July 17, 2014
- CLV/CCRFCD Progress Meeting #3 - July 24, 2014
- CLV Email Correspondence (Sewer) – August 4, 2014
- CLV Email Correspondence (Trail) – August 18, 2014
- Response to Pre-Design Review Comments – September 8, 2014
- CLV/CCRFCD Progress Meeting #4 – September 8, 2014
- CLV/CCRFCD Progress Meeting #5- October 21, 2014
- CLV/CCRFCD Progress Meeting #6 – January 6, 2015
- CLV/CCRFCD Progress Meeting #7 – January 27, 2015
- Response to 50% Drainage Report CLV/CCRFCD Review Comments – March 23, 2015

Appendix G 90% Storm Drain Plan & Profile Sheets

Appendix H Electronic Data CD

APPENDIX A

Drainage Exhibits

APPENDIX B

Hydraulic Analysis-Mainline Drainage System

Mainline Drainage System WSPG-W: Interim Conditions

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T1 Brent Lane Drainage System & Trail
T2 CLV1401.000  90% Submittal
T3 MAINLINE - INTERIM CONDITION
SO    1100.00 2464.000 93       .044                    2467.430
R     1141.00 2465.800 93       .044                                .000    .000
R     1146.00 2465.823 92       .044                                .000    .000
R     1202.00 2466.100 92       .044                                .000    .000

TS    1231.00 2466.245  2       .044                                .000    .000
R     1232.00 2466.250  2       .015                                .000    .000
R     1367.00 2466.924  2       .015                                .000    .000
TS    1397.00 2467.070 89       .015                                .000    .000
R     1398.00 2467.094 89       .015                                .000    .000
R     1628.68 2472.520 89       .015                                .000    .000
R     1830.00 2476.937 89       .015
R     1837.42 2477.100 89       .015                                .000    .000
R     1900.00 2478.480 89       .015                                .000    .000
R     2128.84 2483.310 89       .015                                .000    .000
R     2320.00 2485.670 89       .015                                .000    .000
SH    2320.00 2485.670 89       .015
CD    1  3   0     .000    6.000   12.000  .000  .000   .00
CD    2  3   0     .000    7.000   20.000  .000  .000   .00
CD    3  3   0     .000    3.000    3.500  .000  .000   .00
CD    4  2   0     .000    6.000   20.000  .000  .000   .00
CD   18  4   1     .000    1.500     .000  .000  .000   .00
CD   24  4   1     .000    2.000     .000  .000  .000   .00
CD   30  4   1     .000    2.500     .000  .000  .000   .00
CD   36  4   1     .000    3.000     .000  .000  .000   .00
CD   42  4   1     .000    3.500     .000  .000  .000   .00
CD   48  4   1     .000    4.000     .000  .000  .000   .00
CD   89  5   0     .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   92  5   0     .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   93  5   0     .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   94  5   0     .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
PTS  89 5   .000  6.000 12.000   .180 18.000   .000 24.000   .180 36.000  6.000
PTS  92 5   .000  8.900 36.000   .600 56.000   .000 76.000   .600 93.000  5.900
PTS  93 5   .000  4.200 20.000   .600 40.000   .000 60.000   .600 80.000  4.700
PTS  94 5   .000  5.500 20.000   .600 40.000   .000 60.000   .600 80.000  5.000
Q           2102.000   .0
```

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	0	.000	6.000	12.000	.000	.000	.00										
CD	2	3	0	.000	7.000	20.000	.000	.000	.00										
CD	3	3	0	.000	3.000	3.500	.000	.000	.00										
CD	4	2	0	.000	6.000	20.000			.00										
CD	18	4	1		1.500														
CD	24	4	1		2.000														
CD	30	4	1		2.500														
CD	36	4	1		3.000														
CD	42	4	1		3.500														
CD	48	4	1		4.000														
CD	89	5	0	.000															
CD	92	5	0	.000															
CD	93	5	0	.000															
CD	94	5	0	.000															

CARD CODE	SECT NO	NO OF POINTS	X(1) , Y(1) X(8) , Y(8)	X(2) , Y(2) X(9) , Y(9)	X(3) , Y(3) X(10) ,Y(10)	X(4) , Y(4) X(11) ,Y(11)	X(5) , Y(5) X(N) , Y(N)	X(6) , Y(6) X(N+1),Y(N+1)	X(7) , Y(7) X(35) ,Y(35)
PTS	89	5	.000 6.000	12.000 .180	18.000 .000	24.000 .180	36.000 6.000		
PTS	92	5	.000 8.900	36.000 .600	56.000 .000	76.000 .600	93.000 5.900		
PTS	93	5	.000 4.200	20.000 .600	40.000 .000	60.000 .600	80.000 4.700		
PTS	94	5	.000 5.500	20.000 .600	40.000 .000	60.000 .600	80.000 5.000		

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
Brent Lane Drainage System & Trail

HEADING LINE NO 2 IS -
CLV1401.000 90% Submittal

HEADING LINE NO 3 IS -
MAINLINE - INTERIM CONDITION

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET
U/S DATA STATION 1100.000 INVERT 2464.000 SECT 93 — W S ELEV 2467.430

ELEMENT NO 2 IS A REACH
U/S DATA STATION 1141.000 INVERT 2465.800 SECT 93 N .044 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

ELEMENT NO 3 IS A REACH
U/S DATA STATION 1146.000 INVERT 2465.823 SECT 92 N .044 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 4 IS A REACH
U/S DATA STATION 1202.000 INVERT 2466.100 SECT 92 N .044 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 5 IS A TRANSITION
U/S DATA STATION 1231.000 INVERT 2466.245 SECT 2 N .044 — RADIUS .000 ANGLE .000

ELEMENT NO 6 IS A REACH
U/S DATA STATION 1232.000 INVERT 2466.250 SECT 2 N .015 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 7 IS A REACH
U/S DATA STATION 1367.000 INVERT 2466.924 SECT 2 N .015 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 8 IS A TRANSITION
U/S DATA STATION 1397.000 INVERT 2467.070 SECT 89 N .015 — RADIUS .000 ANGLE .000

ELEMENT NO 9 IS A REACH
U/S DATA STATION 1398.000 INVERT 2467.094 SECT 89 N .015 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 10 IS A REACH
U/S DATA STATION 1628.680 INVERT 2472.520 SECT 89 N .015 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 11 IS A REACH
U/S DATA STATION 1830.000 INVERT 2476.937 SECT 89 N .015 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 12 IS A REACH
U/S DATA STATION 1837.420 INVERT 2477.100 SECT 89 N .015 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 13 IS A REACH
U/S DATA STATION 1900.000 INVERT 2478.480 SECT 89 N .015 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 14 IS A REACH
U/S DATA STATION 2128.840 INVERT 2483.310 SECT 89 N .015 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 15 IS A REACH
U/S DATA STATION 2320.000 INVERT 2485.670 SECT 89 N .015 — RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 16 IS A SYSTEM HEADWORKS
U/S DATA STATION 2320.000 INVERT 2485.670 SECT 89 — W S ELEV .000

♀ FILE: INTBL.WSW

W S P G W - CIVILDESIGN Version 14.06
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-12-2015 Time:10:10:14

Brent Lane Drainage System & Trail
CLV1401.000 90% Submittal
MAINLINE - INTERIM CONDITION

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1100.000	2464.000	3.459	2467.459	2102.00	12.44	2.40	2469.86	.00	4.15	69.83		93		0 .0
17.232	.0439					.0409	.70	3.46	1.41	3.425	.044			IR-OPEN
1117.232	2464.757	3.514	2468.271	2102.00	12.16	2.30	2470.57	.00	4.15	70.40		93		0 .0
13.237	.0439					.0371	.49	3.51	1.37	3.425	.044			IR-OPEN
1130.469	2465.338	3.632	2468.970	2102.00	11.59	2.09	2471.06	.00	4.15	71.64		93		0 .0
5.783	.0439					.0324	.19	3.63	1.28	3.425	.044			IR-OPEN
1136.253	2465.592	3.755	2469.347	2102.00	11.05	1.90	2471.24	.00	4.15	72.92		93		0 .0
2.976	.0439					.0283	.08	3.76	1.21	3.425	.044			IR-OPEN
1139.228	2465.722	3.881	2469.604	2102.00	10.54	1.72	2471.33	.00	4.15	74.23		93		0 .0
1.397	.0439					.0247	.03	3.88	1.13	3.425	.044			IR-OPEN
1140.625	2465.784	4.011	2469.795	2102.00	10.05	1.57	2471.36	.00	4.15	75.59		93		0 .0
.375	.0439					.0216	.01	4.01	1.06	3.425	.044			IR-OPEN
1141.000	2465.800	4.146	2469.946	2102.00	9.58	1.42	2471.37	.00	4.15	77.00		93		0 .0
1141.000	2465.800	4.280	2470.080	2102.00	10.00	1.55	2471.63	.00	4.28	67.77		92		0 .0
.646	.0046					.0185	.01	4.28	1.00	6.142	.044			IR-OPEN
1141.646	2465.803	4.430	2470.233	2102.00	9.53	1.41	2471.64	.00	4.28	68.90		92		0 .0
2.323	.0046					.0161	.04	4.43	.94	6.142	.044			IR-OPEN
1143.968	2465.814	4.585	2470.399	2102.00	9.09	1.28	2471.68	.00	4.28	70.07		92		0 .0
2.032	.0046					.0145	.03	4.59	.88	6.142	.044			IR-OPEN

♀ FILE: INTBL.WSW

W S P G W - CIVILDESIGN Version 14.06
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-12-2015 Time:10:10:14

Brent Lane Drainage System & Trail
CLV1401.000 90% Submittal
MAINLINE - INTERIM CONDITION

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1146.000	2465.823	4.667	2470.490	2102.00	8.87	1.22	2471.71	.00	4.28	70.68		92		0 .0
6.166	.0049					.0131	.08	4.67	.85	6.040	.044			IR-OPEN
1152.166	2465.854	4.828	2470.682	2102.00	8.45	1.11	2471.79	.00	4.28	71.90		92		0 .0
10.295	.0049					.0115	.12	4.83	.80	6.040	.044			IR-OPEN
1162.461	2465.905	4.996	2470.901	2102.00	8.06	1.01	2471.91	.00	4.28	73.17		92		0 .0
9.962	.0049					.0102	.10	5.00	.75	6.040	.044			IR-OPEN
1172.423	2465.954	5.108	2471.062	2102.00	7.81	.95	2472.01	.00	4.28	74.01		92		0 .0
HYDRAULIC JUMP														
1172.423	2465.954	3.541	2469.495	2102.00	12.95	2.61	2472.10	.00	4.28	62.19		92		0 .0
.257	.0049					.0419	.01	3.54	1.41	6.040	.044			IR-OPEN
1172.680	2465.955	3.532	2469.487	2102.00	13.00	2.62	2472.11	.00	4.28	62.12		92		0 .0
3.487	.0049					.0452	.16	3.53	1.42	6.040	.044			IR-OPEN
1176.167	2465.972	3.410	2469.383	2102.00	13.63	2.88	2472.27	.00	4.28	61.20		92		0 .0
3.631	.0049					.0519	.19	3.41	1.51	6.040	.044			IR-OPEN
1179.799	2465.990	3.292	2469.282	2102.00	14.30	3.17	2472.46	.00	4.28	60.31		92		0 .0
3.718	.0049					.0596	.22	3.29	1.61	6.040	.044			IR-OPEN
1183.516	2466.009	3.178	2469.187	2102.00	14.99	3.49	2472.68	.00	4.28	59.45		92		0 .0
3.743	.0049					.0686	.26	3.18	1.72	6.040	.044			IR-OPEN

♀ FILE: INTBL.WSW

W S P G W - CIVILDESIGN Version 14.06
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-12-2015 Time:10:10:14

Brent Lane Drainage System & Trail
CLV1401.000 90% Submittal
MAINLINE - INTERIM CONDITION

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1187.259	2466.027	3.067	2469.094	2102.00	15.73	3.84	2472.93	.00	4.28	58.61		92		0 .0
3.748	.0049					.0788	.30	3.07	1.84	6.040	.044			IR-OPEN
1191.007	2466.046	2.960	2469.006	2102.00	16.49	4.22	2473.23	.00	4.28	57.81		92		0 .0
3.724	.0049					.0907	.34	2.96	1.96	6.040	.044			IR-OPEN
1194.732	2466.064	2.857	2468.921	2102.00	17.30	4.65	2473.57	.00	4.28	57.03		92		0 .0
3.667	.0049					.1044	.38	2.86	2.09	6.040	.044			IR-OPEN
1198.398	2466.082	2.757	2468.839	2102.00	18.14	5.11	2473.95	.00	4.28	56.28		92		0 .0
3.602	.0049					.1202	.43	2.76	2.23	6.040	.044			IR-OPEN
1202.000	2466.100	2.661	2468.761	2102.00	19.03	5.62	2474.38	.00	4.28	55.55		92		0 .0
TRANS STR	.0050					.1203	3.49	2.66	2.38		.044			IR-OPEN
1231.000	2466.245	4.410	2470.656	2102.00	23.83	8.82	2479.47	.00	7.00	20.00	7.000	20.000	.00	0 .0
1.000	.0049					.0130	.01	4.41	2.00	6.20	.015	.00	.00	BOX
1232.000	2466.250	4.408	2470.658	2102.00	23.85	8.83	2479.49	.00	7.00	20.00	7.000	20.000	.00	0 .0
64.641	.0050					.0139	.90	4.41	2.00	6.15	.015	.00	.00	BOX
1296.641	2466.573	4.231	2470.804	2102.00	24.84	9.58	2480.38	.00	7.00	20.00	7.000	20.000	.00	0 .0
70.359	.0050					.0158	1.11	4.23	2.13	6.15	.015	.00	.00	BOX
1367.000	2466.924	4.034	2470.958	2102.00	26.05	10.54	2481.50	.00	7.00	20.00	7.000	20.000	.00	0 .0
TRANS STR	.0049					.0188	.56	4.03	2.29		.015	.00	.00	BOX

Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING
Date: 3-12-2015 Time:10:10:14

Brent Lane Drainage System & Trail
CLV1401.000 90% Submittal
MAINLINE - INTERIM CONDITION

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1397.000	2467.070	4.020	2471.090	2102.00	27.10	11.41	2482.50	.00	6.82	27.83		89		0 .0
1.000	.0239					.0207	.02	4.02	2.86	3.877	.015			IR-OPEN
1398.000	2467.094	4.020	2471.114	2102.00	27.10	11.40	2482.52	.00	6.82	27.84		89		0 .0
17.780	.0235					.0206	.37	4.02	2.86	3.894	.015			IR-OPEN
1415.780	2467.512	4.027	2471.539	2102.00	27.03	11.35	2482.89	.00	6.82	27.86		89		0 .0
212.900	.0235					.0193	4.11	4.03	2.85	3.894	.015			IR-OPEN
1628.680	2472.520	4.162	2476.682	2102.00	25.77	10.32	2487.00	.00	6.82	28.42		89		0 .0
68.932	.0219					.0176	1.22	4.16	2.68	3.963	.015			IR-OPEN
1697.613	2474.032	4.211	2478.244	2102.00	25.34	9.97	2488.21	.00	6.82	28.62		89		0 .0
132.387	.0219					.0162	2.14	4.21	2.62	3.963	.015			IR-OPEN
1830.000	2476.937	4.351	2481.288	2102.00	24.16	9.06	2490.35	.00	6.82	29.20		89		0 .0
7.420	.0220					.0150	.11	4.35	2.47	3.961	.015			IR-OPEN
1837.420	2477.100	4.361	2481.461	2102.00	24.08	9.00	2490.46	.00	6.82	29.24		89		0 .0
62.580	.0220					.0143	.90	4.36	2.46	3.958	.015			IR-OPEN
1900.000	2478.480	4.462	2482.942	2102.00	23.28	8.42	2491.36	.00	6.82	29.66		89		0 .0
66.320	.0211					.0129	.86	4.46	2.35	4.001	.015			IR-OPEN
1966.320	2479.880	4.590	2484.470	2102.00	22.33	7.74	2492.21	.00	6.82	30.19		89		0 .0
57.099	.0211					.0114	.65	4.59	2.23	4.001	.015			IR-OPEN

Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING
Date: 3-12-2015 Time:10:10:14

Brent Lane Drainage System & Trail
CLV1401.000 90% Submittal
MAINLINE - INTERIM CONDITION

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
2023.419	2481.085	4.741	2485.826	2102.00	21.29	7.04	2492.87	.00	6.82	30.81		89		0 .0
43.765	.0211					.0100	.44	4.74	2.10	4.001	.015			IR-OPEN

2067.184	2482.009	4.896	2486.905	2102.00	20.30	6.40	2493.30	.00	6.82	31.45			89	0	.0
34.356	.0211					.0088	.30	4.90	1.97	4.001	.015			IR-OPEN	
2101.541	2482.734	5.055	2487.789	2102.00	19.36	5.82	2493.61	.00	6.82	32.10			89	0	.0
27.300	.0211					.0077	.21	5.06	1.85	4.001	.015			IR-OPEN	
2128.840	2483.310	5.219	2488.529	2102.00	18.46	5.29	2493.82	.00	6.82	32.78			89	0	.0
26.869	.0123					.0070	.19	5.22	1.74	4.575	.015			IR-OPEN	
2155.710	2483.642	5.291	2488.933	2102.00	18.08	5.07	2494.01	.00	6.82	33.08			89	0	.0
49.087	.0123					.0064	.31	5.29	1.70	4.575	.015			IR-OPEN	
2204.797	2484.248	5.461	2489.709	2102.00	17.24	4.61	2494.32	.00	6.82	33.78			89	0	.0
36.540	.0123					.0056	.21	5.46	1.60	4.575	.015			IR-OPEN	
2241.337	2484.699	5.635	2490.334	2102.00	16.43	4.19	2494.53	.00	6.82	34.50			89	0	.0
27.330	.0123					.0049	.14	5.64	1.50	4.575	.015			IR-OPEN	
2268.667	2485.036	5.814	2490.851	2102.00	15.67	3.81	2494.66	.00	6.82	35.23			89	0	.0
20.320	.0123					.0043	.09	5.81	1.42	4.575	.015			IR-OPEN	
2288.986	2485.287	5.998	2491.285	2102.00	14.94	3.47	2494.75	.00	6.82	35.99			89	0	.0
14.499	.0123					.0038	.05	6.00	1.33	4.575	.015			IR-OPEN	

Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING

Date: 3-12-2015 Time:10:10:14

Brent Lane Drainage System & Trail
CLV1401.000 90% Submittal
MAINLINE - INTERIM CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2303.485	2485.466	6.189	2491.655	2102.00	14.24	3.15	2494.81	.00	6.82	36.00			89	0	.0
9.529	.0123					.0033	.03	6.19	1.24	4.575	.015			IR-OPEN	
2313.014	2485.584	6.389	2491.973	2102.00	13.58	2.86	2494.84	.00	6.82	36.00			89	0	.0
5.297	.0123					.0028	.02	6.39	1.15	4.575	.015			IR-OPEN	
2318.311	2485.649	6.599	2492.248	2102.00	12.95	2.60	2494.85	.00	6.82	36.00			89	0	.0
1.689	.0123					.0025	.00	6.60	1.07	4.575	.015			IR-OPEN	
2320.000	2485.670	6.820	2492.490	2102.00	12.34	2.37	2494.86	.00	6.82	36.00			89	0	.0

†

STA 11+00 TRAP Channel (Interim Condition)
Worksheet for Irregular Channel

Project Description	
Worksheet	STA 11+00 TRAP Channel (Interim Condition)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	4.38	%
Discharge	2,102	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	0.044	
Water Surface Elevation	3.43	ft
Elevation Range	0.00 to 4.70	
Flow Area	166.9	ft²
Wetted Perimeter	70.07	ft
Top Width	69.51	ft
Actual Depth	3.43	ft
Critical Elevation	4.15	ft
Critical Slope	2.01	%
Velocity	12.60	ft/s
Velocity Head	2.47	ft
Specific Energy	5.89	ft
Froude Number	1.43	
Flow Type	Supercritical	

USED FOR START WSEL

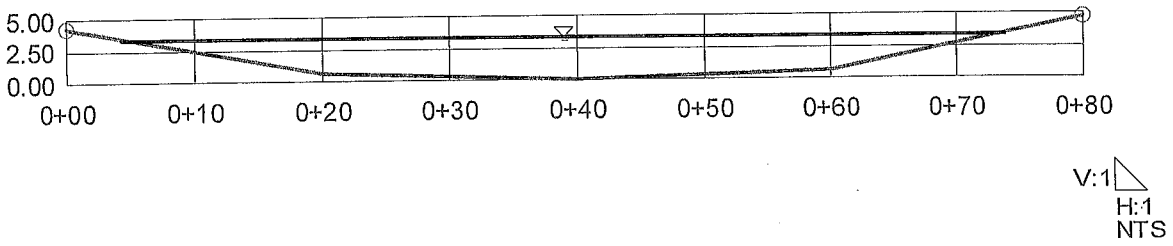
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+80	0.044

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	4.20
0+20	0.60
0+40	0.00
0+60	0.60
0+80	4.70

STA 11+00 TRAP Channel (Interim Condition)
Cross Section for Irregular Channel

Project Description	
Worksheet	STA 11+00 TRAP Channel (Interim Condition)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.044	
Channel Slope	4.38	%
Water Surface Elevation	3.43	ft
Elevation Range	0.00 to 4.70	
Discharge	2,102	cfs



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Slater Hanifan Group
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Mainline Drainage System WSPG-W: Ultimate Conditions

```
T1 Brent Lane Drainage System & Trail
T2 CLV1401.000  90% Submittal
T3 MAINLINE - ULTIMATE CONDITION
SO   1100.00 2464.000 93       .044                    2466.780
R    1141.00 2465.800 93       .044                                          .000    .000
R    1146.00 2465.823 92       .044                                          .000    .000
R    1202.00 2466.100 92       .044                                          .000    .000

TS   1231.00 2466.245  2       .044                                          .000    .000
R    1232.00 2466.250  2       .015                                          .000    .000
R    1367.00 2466.924  2       .015                                          .000    .000
TS   1397.00 2467.070 89       .015                                          .000    .000
R    1398.00 2467.094 89       .015                                          .000    .000
R    1628.68 2472.520 89       .015                                          .000    .000
JX   1830.00 2476.937 89 89    .015  174.0             2476.937              90.0
R    1837.42 2477.100 89       .015                                          .000    .000
R    1900.00 2478.480 89       .015                                          .000    .000
R    2128.84 2483.310 89       .015                                          .000    .000
R    2320.00 2485.670 89       .015                                          .000    .000
TS   2349.90 2486.040  1       .015                                          .000    .000
R    2350.00 2486.050  1       .015                                          .000    .000
R    2371.50 2486.260  1       .015                                          .000    .000
R    2449.65 2487.040  1       .015                                          .000    .000
R    2581.76 2488.560  1       .015                                          .000    .000
R    2583.58 2488.580  1       .015                                          .000    .000
R    2999.65 2493.370  1       .015                                          .000    .000
R    3225.00 2498.600  1       .015                                          .000    .000
R    3872.58 2513.650  1       .015                                          .000    .000
R    3874.77 2513.694  1       .015                                          .000    .000
JX   3874.77 2513.694  1 18 18.013    5.0   5.0      2514.69 2514.73  90.0 -90.0
R    3921.28 2514.640  1       .015                                          .000    .000
JX   3921.28 2514.640  1 36    .015   80.0             2515.640             -45.0
R    3922.42 2514.640  1       .015                                          .000    .000
JX   3922.42 2514.640  1 36    .015   55.0             2515.640              45.0
R    3956.84 2515.330  1       .015                                          .000    .000
R    3963.31 2515.460  1       .015                                          .000    .000
JX   3963.31 2515.460  1 48    .015   12.0             2516.460              45.0
R    4014.36 2516.485  1       .015                                          .000    .000
JX   4014.36 2516.485  1  3    .015   21.0             2519.280              89.0
R    4036.61 2516.930  1       .015                                          .000    .000
SH   4036.61 2516.930  1       .015
CD    1  3   0    .000   6.000   12.000  .000  .000   .00
CD    2  3   0    .000   7.000   20.000  .000  .000   .00
CD    3  3   0    .000   3.000    3.500  .000  .000   .00
CD   18  4   1    .000   1.500     .000  .000  .000   .00
CD   24  4   1    .000   2.000     .000  .000  .000   .00
CD   30  4   1    .000   2.500     .000  .000  .000   .00
CD   36  4   1    .000   3.000     .000  .000  .000   .00
CD   42  4   1    .000   3.500     .000  .000  .000   .00
CD   48  4   1    .000   4.000     .000  .000  .000   .00
CD   89  5   0    .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   92  5   0    .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   93  5   0    .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   94  5   0    .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
PTS 89 5   .000  6.000 12.000   .180 18.000   .000 24.000   .180 36.000  6.000
PTS 92 5   .000  8.900 36.000   .600 56.000   .000 76.000   .600 93.000  5.900
PTS 93 5   .000  4.200 20.000   .600 40.000   .000 60.000   .600 80.000  4.700
PTS 94 5   .000  5.500 20.000   .600 40.000   .000 60.000   .600 80.000  5.000
Q          1001.000   .0
```

FILE: ULTBL.WSW

W S P G W - EDIT LISTING - Version 14.07 Date: 3-17-2015 Time: 5: 2:28

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	0	.000	6.000	12.000	.000	.000	.00										
CD	2	3	0	.000	7.000	20.000	.000	.000	.00										
CD	3	3	0	.000	3.000	3.500	.000	.000	.00										
CD	18	4	1		1.500														
CD	24	4	1		2.000														
CD	30	4	1		2.500														
CD	36	4	1		3.000														
CD	42	4	1		3.500														
CD	48	4	1		4.000														
CD	89	5	0	.000															
CD	92	5	0	.000															
CD	93	5	0	.000															
CD	94	5	0	.000															

FILE:

W S P G W - EDIT LISTING - Version 14.07 Date: 3-17-2015 Time: 5: 2:28

WATER SURFACE PROFILE - CROSS SECTION POINT LISTING

CARD CODE	SECT NO	NO OF POINTS	X(1) , Y(1) X(8) , Y(8)	X(2) , Y(2) X(9) , Y(9)	X(3) , Y(3) X(10) ,Y(10)	X(4) , Y(4) X(11) ,Y(11)	X(5) , Y(5) X(N) , Y(N)	X(6) , Y(6) X(N+1),Y(N+1)	X(7) , Y(7) X(35) ,Y(35)
PTS	89	5	.000 6.000	12.000 .180	18.000 .000	24.000 .180	36.000 6.000		
PTS	92	5	.000 8.900	36.000 .600	56.000 .000	76.000 .600	93.000 5.900		
PTS	93	5	.000 4.200	20.000 .600	40.000 .000	60.000 .600	80.000 4.700		
PTS	94	5	.000 5.500	20.000 .600	40.000 .000	60.000 .600	80.000 5.000		

W S P G W

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS - Brent Lane Drainage System & Trail

HEADING LINE NO 2 IS - CLV1401.000 90% Submittal

HEADING LINE NO 3 IS - MAINLINE - ULTIMATE CONDITION

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET
U/S DATA STATION 1100.000 INVERT 2464.000 SECT 93 W S ELEV 2466.780

ELEMENT NO 2 IS A REACH
U/S DATA STATION 1141.000 INVERT 2465.800 SECT 93 N .044 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

ELEMENT NO 3 IS A REACH
U/S DATA STATION 1146.000 INVERT 2465.823 SECT 92 N .044 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 4 IS A REACH
U/S DATA STATION 1202.000 INVERT 2466.100 SECT 92 N .044 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 5 IS A TRANSITION
U/S DATA STATION 1231.000 INVERT 2466.245 SECT 2 N .044 RADIUS .000 ANGLE .000

ELEMENT NO 6 IS A REACH
U/S DATA STATION 1232.000 INVERT 2466.250 SECT 2 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 7 IS A REACH
U/S DATA STATION 1367.000 INVERT 2466.924 SECT 2 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 8 IS A TRANSITION
U/S DATA STATION 1397.000 INVERT 2467.070 SECT 89 N .015 RADIUS .000 ANGLE .000

ELEMENT NO 9 IS A REACH
U/S DATA STATION 1398.000 INVERT 2467.094 SECT 89 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 10 IS A REACH
U/S DATA STATION 1628.680 INVERT 2472.520 SECT 89 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 11 IS A JUNCTION
U/S DATA STATION 1830.000 INVERT 2476.937 SECT 89 LAT-1 89 LAT-2 0 N .015 Q3 174.000 Q4 .000 INVERT-3 2476.937 INVERT-4 .000 PHI 3 90.000 PHI 4 .000 RADIUS .000 ANGLE .000

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 12 IS A REACH
U/S DATA STATION 1837.420 INVERT 2477.100 SECT 89 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 13 IS A REACH
U/S DATA STATION 1900.000 INVERT 2478.480 SECT 89 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 14 IS A REACH
U/S DATA STATION 2128.840 INVERT 2483.310 SECT 89 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 15 IS A REACH
U/S DATA STATION 2320.000 INVERT 2485.670 SECT 89 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 16 IS A TRANSITION
U/S DATA STATION 2349.900 INVERT 2486.040 SECT 1 N .015 RADIUS .000 ANGLE .000

ELEMENT NO 17 IS A REACH
U/S DATA STATION 2350.000 INVERT 2486.050 SECT 1 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 18 IS A REACH
U/S DATA STATION 2371.500 INVERT 2486.260 SECT 1 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 19 IS A REACH
U/S DATA STATION 2449.650 INVERT 2487.040 SECT 1 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 20 IS A REACH
U/S DATA STATION 2581.760 INVERT 2488.560 SECT 1 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 21 IS A REACH
U/S DATA STATION 2583.580 INVERT 2488.580 SECT 1 N .015 RADIUS .000 ANGLE .000 ANG PT .000 MAN H 0

ELEMENT NO 22 IS A REACH

U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
2999.650 2493.370 1 .015 .000 .000 .000 0

ELEMENT NO 23 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
3225.000 2498.600 1 .015 .000 .000 .000 0

ELEMENT NO 24 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
3872.580 2513.650 1 .015 .000 .000 .000 0

W S P G W
WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 25 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
3874.770 2513.694 1 .015 .000 .000 .000 0

ELEMENT NO 26 IS A JUNCTION
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
3874.770 2513.694 1 18 18 .013 5.000 5.000 2514.690 2514.730 90.000 -90.000
RADIUS ANGLE
.000 .000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 27 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
3921.280 2514.640 1 .015 .000 .000 .000 0

ELEMENT NO 28 IS A JUNCTION
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
3921.280 2514.640 1 36 0 .015 80.000 .000 2515.640 .000 -45.000 .000
RADIUS ANGLE
.000 .000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 29 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
3922.420 2514.640 1 .015 .000 .000 .000 0

ELEMENT NO 30 IS A JUNCTION
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
3922.420 2514.640 1 36 0 .015 55.000 .000 2515.640 .000 45.000 .000
RADIUS ANGLE
.000 .000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 31 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
3956.840 2515.330 1 .015 .000 .000 .000 0

W S P G W
WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 32 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
3963.310 2515.460 1 .015 .000 .000 .000 0

ELEMENT NO 33 IS A JUNCTION
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
3963.310 2515.460 1 48 0 .015 12.000 .000 2516.460 .000 45.000 .000
RADIUS ANGLE
.000 .000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 34 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
4014.360 2516.485 1 .015 .000 .000 .000 0

ELEMENT NO 35 IS A JUNCTION
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
4014.360 2516.485 1 3 0 .015 21.000 .000 2519.280 .000 89.000 .000
RADIUS ANGLE
.000 .000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 36 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
4036.610 2516.930 1 .015 .000 .000 .000 0

ELEMENT NO 37 IS A SYSTEM HEADWORKS
U/S DATA STATION INVERT SECT W S ELEV
4036.610 2516.930 1 .000

F FILE: ULTBL.WSW

W S P G W - CIVILDESIGN Version 14.07
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-17-2015 Time: 5: 2:29

Brent Lane Drainage System & Trail
CLV1401.000 90% Submittal
MAINLINE - ULTIMATE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1100.000	2464.000	2.765	2466.764	1353.00	11.00	1.88	2468.64	.00	3.28	62.59		93		0 .0
11.020	.0439					.0431	.48	2.76	1.38	2.758	.044			IR-OPEN
1111.020	2464.483	2.774	2467.257	1353.00	10.94	1.86	2469.12	.00	3.28	62.68		93		0 .0
19.366	.0439					.0401	.78	2.77	1.37	2.758	.044			IR-OPEN
1130.386	2465.334	2.870	2468.203	1353.00	10.44	1.69	2469.89	.00	3.28	63.68		93		0 .0
6.160	.0439					.0350	.22	2.87	1.29	2.758	.044			IR-OPEN
1136.545	2465.604	2.968	2468.572	1353.00	9.95	1.54	2470.11	.00	3.28	64.71		93		0 .0
2.834	.0439					.0305	.09	2.97	1.21	2.758	.044			IR-OPEN
1139.379	2465.729	3.070	2468.799	1353.00	9.49	1.40	2470.20	.00	3.28	65.77		93		0 .0
1.273	.0439					.0266	.03	3.07	1.14	2.758	.044			IR-OPEN
1140.652	2465.785	3.175	2468.959	1353.00	9.05	1.27	2470.23	.00	3.28	66.86		93		0 .0
.348	.0439					.0232	.01	3.17	1.07	2.758	.044			IR-OPEN
1141.000	2465.800	3.284	2469.084	1353.00	8.62	1.15	2470.24	.00	3.28	68.00		93		0 .0
1141.000	2465.800	3.362	2469.162	1353.00	8.95	1.24	2470.40	.00	3.36	60.84		92		0 .0
.488	.0046					.0198	.01	3.36	1.00	4.952	.044			IR-OPEN
1141.488	2465.802	3.482	2469.284	1353.00	8.53	1.13	2470.41	.00	3.36	61.74		92		0 .0
1.713	.0046					.0172	.03	3.48	.94	4.952	.044			IR-OPEN
1143.201	2465.810	3.606	2469.417	1353.00	8.13	1.03	2470.44	.00	3.36	62.68		92		0 .0
2.799	.0046					.0152	.04	3.61	.88	4.952	.044			IR-OPEN

F FILE: ULTBL.WSW

W S P G W - CIVILDESIGN Version 14.07
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-17-2015 Time: 5: 2:29

Brent Lane Drainage System & Trail
CLV1401.000 90% Submittal
MAINLINE - ULTIMATE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1146.000	2465.823	3.717	2469.540	1353.00	7.81	.95	2470.49	.00	3.36	63.52		92		0 .0
5.501	.0049					.0133	.07	3.72	.83	4.859	.044			IR-OPEN
1151.501	2465.850	3.849	2469.699	1353.00	7.44	.86	2470.56	.00	3.36	64.52		92		0 .0
8.718	.0049					.0116	.10	3.85	.78	4.859	.044			IR-OPEN
1160.219	2465.893	3.986	2469.879	1353.00	7.10	.78	2470.66	.00	3.36	65.54		92		0 .0
13.459	.0049					.0101	.14	3.99	.73	4.859	.044			IR-OPEN
1173.678	2465.960	4.127	2470.087	1353.00	6.77	.71	2470.80	.00	3.36	66.61		92		0 .0
20.732	.0049					.0088	.18	4.13	.69	4.859	.044			IR-OPEN
1194.410	2466.063	4.272	2470.334	1353.00	6.45	.65	2470.98	.00	3.36	67.70		92		0 .0
1.856	.0049					.0082	.02	4.27	.65	4.859	.044			IR-OPEN
1196.266	2466.072	4.280	2470.352	1353.00	6.43	.64	2470.99	.00	3.36	67.77		92		0 .0
HYDRAULIC JUMP														
1196.266	2466.072	2.572	2468.644	1353.00	12.82	2.55	2471.19	.00	3.36	54.88		92		0 .0
.276	.0049					.0610	.02	2.57	1.63	4.859	.044			IR-OPEN
1196.542	2466.073	2.571	2468.644	1353.00	12.82	2.55	2471.20	.00	3.36	54.87		92		0 .0
2.719	.0049					.0657	.18	2.57	1.63	4.859	.044			IR-OPEN
1199.261	2466.086	2.481	2468.568	1353.00	13.45	2.81	2471.38	.00	3.36	54.19		92		0 .0
2.739	.0049					.0758	.21	2.48	1.74	4.859	.044			IR-OPEN

F FILE: ULTBL.WSW

W S P G W - CIVILDESIGN Version 14.07
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-17-2015 Time: 5: 2:29

Brent Lane Drainage System & Trail
CLV1401.000 90% Submittal
MAINLINE - ULTIMATE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1202.000	2466.100	2.394	2468.495	1353.00	14.11	3.09	2471.58	.00	3.36	53.54		92		0 .0
TRANS STR	.0050					.0954	2.77	2.39	1.86		.044			IR-OPEN
1231.000	2466.245	3.301	2469.546	1353.00	20.50	6.52	2476.07	.00	5.22	20.00	7.000	20.000	.00	0 .0
1.000	.0049					.0128	.01	3.30	1.99	4.56	.015	.00	.00	BOX
1232.000	2466.250	3.298	2469.548	1353.00	20.51	6.53	2476.08	.00	5.22	20.00	7.000	20.000	.00	0 .0
29.774	.0050					.0133	.39	3.30	1.99	4.53	.015	.00	.00	BOX
1261.774	2466.399	3.219	2469.618	1353.00	21.02	6.86	2476.48	.00	5.22	20.00	7.000	20.000	.00	0 .0
54.667	.0050					.0148	.81	3.22	2.06	4.53	.015	.00	.00	BOX
1316.441	2466.672	3.069	2469.741	1353.00	22.04	7.54	2477.29	.00	5.22	20.00	7.000	20.000	.00	0 .0
50.559	.0050					.0171	.86	3.07	2.22	4.53	.015	.00	.00	BOX
1367.000	2466.924	2.926	2469.850	1353.00	23.12	8.30	2478.15	.00	5.22	20.00	7.000	20.000	.00	0 .0
TRANS STR	.0049					.0187	.56	2.93	2.38		.015	.00	.00	BOX
1397.000	2467.070	3.279	2470.349	1353.00	23.30	8.43	2478.78	.00	5.54	24.78		89		0 .0
1.000	.0239					.0191	.02	3.28	2.68	3.097	.015			IR-OPEN
1398.000	2467.094	3.280	2470.374	1353.00	23.29	8.42	2478.80	.00	5.54	24.78		89		0 .0
89.479	.0235					.0183	1.64	3.28	2.68	3.110	.015			IR-OPEN
1487.479	2469.199	3.360	2472.558	1353.00	22.52	7.87	2480.43	.00	5.54	25.11		89		0 .0
83.493	.0235					.0163	1.36	3.36	2.57	3.110	.015			IR-OPEN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1570.972	2471.163	3.475	2474.638	1353.00	21.47	7.16	2481.80	.00	5.54	25.59		89		0 .0
57.708	.0235					.0143	.83	3.48	2.41	3.110	.015			IR-OPEN
1628.680	2472.520	3.594	2476.115	1353.00	20.47	6.51	2482.62	.00	5.54	26.08		89		0 .0
JUNCT STR	.0219					.0166	3.33	3.59	2.27		.015			IR-OPEN
		---------- WARNING - Junction Analysis - Irregular Channel----------												
1830.000	2476.937	3.031	2479.968	1179.00	22.65	7.97	2487.94	.00	5.16	23.76		89		0 .0
7.420	.0220					.0197	.15	3.03	2.70	2.948	.015			IR-OPEN
1837.420	2477.100	3.033	2480.134	1179.00	22.63	7.95	2488.08	.00	5.16	23.77		89		0 .0
62.580	.0220					.0193	1.21	3.03	2.69	2.945	.015			IR-OPEN
1900.000	2478.480	3.061	2481.541	1179.00	22.34	7.75	2489.29	.00	5.16	23.88		89		0 .0
92.381	.0211					.0185	1.71	3.06	2.65	2.979	.015			IR-OPEN
1992.381	2480.430	3.102	2483.532	1179.00	21.94	7.47	2491.00	.00	5.16	24.05		89		0 .0
136.459	.0211					.0169	2.31	3.10	2.59	2.979	.015			IR-OPEN
2128.840	2483.310	3.210	2486.520	1179.00	20.92	6.79	2493.31	.00	5.16	24.49		89		0 .0
91.145	.0123					.0165	1.51	3.21	2.43	3.419	.015			IR-OPEN
2219.985	2484.435	3.136	2487.571	1179.00	21.61	7.25	2494.82	.00	5.16	24.19		89		0 .0
100.015	.0123					.0185	1.85	3.14	2.54	3.419	.015			IR-OPEN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2320.000	2485.670	3.030	2488.700	1179.00	22.66	7.98	2496.68	.00	5.16	23.75		89		0 .0
TRANS STR	.0124					.0159	.48	3.03	2.70		.015			IR-OPEN
2349.900	2486.040	4.729	2490.769	1179.00	20.78	6.70	2497.47	.00	6.00	12.00	6.000	12.000	.00	0 .0
.100	.1000					.0120	.00	4.73	1.68	2.26	.015	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL		No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR		Type Ch
2350.000	2486.050	4.733	2490.783	1179.00	20.76	6.69	2497.47	.00	6.00	12.00	6.000	12.000	.00	0	.0
21.500	.0098					.0121	.26	4.73	1.68	5.10	.015	.00	.00	BOX	
2371.500	2486.260	4.706	2490.966	1179.00	20.88	6.77	2497.73	.00	6.00	12.00	6.000	12.000	.00	0	.0
78.150	.0100					.0126	.98	4.71	1.70	5.06	.015	.00	.00	BOX	
2449.650	2487.040	4.603	2491.643	1179.00	21.35	7.07	2498.72	.00	6.00	12.00	6.000	12.000	.00	0	.0
132.110	.0115					.0134	1.77	4.60	1.75	4.81	.015	.00	.00	BOX	
2581.760	2488.560	4.487	2493.047	1179.00	21.90	7.44	2500.49	.00	6.00	12.00	6.000	12.000	.00	0	.0
1.820	.0110					.0139	.03	4.49	1.82	4.89	.015	.00	.00	BOX	
2583.580	2488.580	4.485	2493.065	1179.00	21.91	7.45	2500.52	.00	6.00	12.00	6.000	12.000	.00	0	.0
116.817	.0115					.0146	1.70	4.48	1.82	4.80	.015	.00	.00	BOX	
2700.397	2489.925	4.341	2494.266	1179.00	22.63	7.95	2502.22	.00	6.00	12.00	6.000	12.000	.00	0	.0
123.717	.0115					.0163	2.02	4.34	1.91	4.80	.015	.00	.00	BOX	
2824.114	2491.349	4.139	2495.489	1179.00	23.74	8.75	2504.24	.00	6.00	12.00	6.000	12.000	.00	0	.0
95.898	.0115					.0186	1.79	4.14	2.06	4.80	.015	.00	.00	BOX	

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL		No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR		Type Ch
2920.012	2492.453	3.947	2496.400	1179.00	24.90	9.62	2506.02	.00	6.00	12.00	6.000	12.000	.00	0	.0
79.638	.0115					.0213	1.70	3.95	2.21	4.80	.015	.00	.00	BOX	
2999.650	2493.370	3.763	2497.133	1179.00	26.11	10.59	2507.72	.00	6.00	12.00	6.000	12.000	.00	0	.0
225.350	.0232					.0224	5.04	3.76	2.37	3.73	.015	.00	.00	BOX	
3225.000	2498.600	3.804	2502.404	1179.00	25.83	10.36	2512.76	.00	6.00	12.00	6.000	12.000	.00	0	.0
46.930	.0232					.0219	1.03	3.80	2.33	3.73	.015	.00	.00	BOX	
3271.930	2499.691	3.818	2503.509	1179.00	25.74	10.29	2513.79	.00	6.00	12.00	6.000	12.000	.00	0	.0
267.910	.0232					.0204	5.48	3.82	2.32	3.73	.015	.00	.00	BOX	
3539.841	2505.917	4.004	2509.921	1179.00	24.54	9.35	2519.27	.00	6.00	12.00	6.000	12.000	.00	0	.0
122.386	.0232					.0179	2.19	4.00	2.16	3.73	.015	.00	.00	BOX	
3662.227	2508.761	4.199	2512.961	1179.00	23.40	8.50	2521.46	.00	6.00	12.00	6.000	12.000	.00	0	.0
74.983	.0232					.0157	1.17	4.20	2.01	3.73	.015	.00	.00	BOX	
3737.209	2510.504	4.404	2514.908	1179.00	22.31	7.73	2522.64	.00	6.00	12.00	6.000	12.000	.00	0	.0
51.269	.0232					.0137	.70	4.40	1.87	3.73	.015	.00	.00	BOX	
3788.478	2511.696	4.619	2516.315	1179.00	21.27	7.03	2523.34	.00	6.00	12.00	6.000	12.000	.00	0	.0
36.897	.0232					.0120	.44	4.62	1.74	3.73	.015	.00	.00	BOX	
3825.376	2512.553	4.845	2517.398	1179.00	20.28	6.39	2523.78	.00	6.00	12.00	6.000	12.000	.00	0	.0
27.157	.0232					.0106	.29	4.84	1.62	3.73	.015	.00	.00	BOX	

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL		No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR		Type Ch
3852.533	2513.184	5.081	2518.265	1179.00	19.34	5.81	2524.07	.00	6.00	12.00	6.000	12.000	.00	0	.0
20.047	.0232					.0093	.19	5.08	1.51	3.73	.015	.00	.00	BOX	
3872.580	2513.650	5.329	2518.979	1179.00	18.44	5.28	2524.26	.00	6.00	12.00	6.000	12.000	.00	0	.0
2.190	.0202					.0086	.02	5.33	1.41	3.92	.015	.00	.00	BOX	
3874.770	2513.694	5.355	2519.049	1179.00	18.35	5.23	2524.28	.00	6.00	12.00	6.000	12.000	.00	0	.0
JUNCT STR	.0000					.0067	.00	5.36	1.40		.013	.00	.00	BOX	
3874.770	2513.694	5.179	2518.873	1169.00	18.81	5.49	2524.37	.00	6.00	12.00	6.000	12.000	.00	0	.0
2.062	.0203					.0092	.02	5.18	1.46	3.89	.015	.00	.00	BOX	
3876.832	2513.736	5.200	2518.936	1169.00	18.73	5.45	2524.39	.00	6.00	12.00	6.000	12.000	.00	0	.0

Model C&7

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
20.544	.0203					.0086	.18	5.20	1.45	3.89	.015	.00	.00	BOX
3897.376	2514.154	5.454	2519.607	1169.00	17.86	4.95	2524.56	.00	6.00	12.00	6.000	12.000	.00	0 .0
14.396	.0203					.0075	.11	5.45	1.35	3.89	.015	.00	.00	BOX

---------- WARNING - Flow depth near top of box conduit ----------

3911.771	2514.447	5.720	2520.166	1169.00	17.03	4.50	2524.67	.00	6.00	12.00	6.000	12.000	.00	0 .0
9.509	.0203					.0089	.08	5.72	1.25	3.89	.015	.00	.00	BOX

---------- WARNING - Flow depth near top of box conduit ----------

♀ FILE: ULTBL.WSW W S P G W - CIVILDESIGN Version 14.07

Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING

Date: 3-17-2015 Time: 5: 2:29

Brent Lane Drainage System & Trail
CLV1401.000 90% Submittal
MAINLINE - ULTIMATE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3921.280	2514.640	6.000	2520.640	1169.00	16.24	4.09	2524.73	.00	6.00	12.00	6.000	12.000	.00	0 .0
JUNCT STR	.0000					.0093	.00	6.00	1.17		.015	.00	.00	BOX
3921.280	2514.640	6.806	2521.446	1089.00	15.13	3.55	2525.00	.00	6.00	12.00	6.000	12.000	.00	0 .0
1.140	.0000					.0093	.01	6.81	1.09	.00	.015	.00	.00	BOX
3922.420	2514.640	6.816	2521.456	1089.00	15.13	3.55	2525.01	.00	6.00	12.00	6.000	12.000	.00	0 .0
JUNCT STR	.0000					.0083	.00	6.82	1.09		.015	.00	.00	BOX
3922.420	2514.640	7.385	2522.025	1034.00	14.36	3.20	2525.23	.00	6.00	12.00	6.000	12.000	.00	0 .0
34.420	.0201					.0083	.29	7.39	1.03	3.58	.015	.00	.00	BOX
3956.840	2515.330	6.982	2522.313	1034.00	14.36	3.20	2525.51	.00	6.00	12.00	6.000	12.000	.00	0 .0
6.470	.0201					.0083	.05	6.98	1.03	3.58	.015	.00	.00	BOX
3963.310	2515.460	6.906	2522.366	1034.00	14.36	3.20	2525.57	.00	6.00	12.00	6.000	12.000	.00	0 .0
JUNCT STR	.0000					.0081	.00	6.91	1.03		.015	.00	.00	BOX
3963.310	2515.460	7.051	2522.511	1022.00	14.19	3.13	2525.64	.00	6.00	12.00	6.000	12.000	.00	0 .0
51.050	.0201					.0081	.42	7.05	1.02	3.55	.015	.00	.00	BOX
4014.360	2516.485	6.442	2522.927	1022.00	14.19	3.13	2526.06	.00	6.00	12.00	6.000	12.000	.00	0 .0
JUNCT STR	.0000					.0078	.00	6.44	1.02		.015	.00	.00	BOX
4014.360	2516.485	6.696	2523.181	1001.00	13.90	3.00	2526.18	.00	6.00	12.00	6.000	12.000	.00	0 .0
22.250	.0200					.0078	.17	6.70	1.00	3.51	.015	.00	.00	BOX

♀ FILE: ULTBL.WSW W S P G W - CIVILDESIGN Version 14.07

Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING

Date: 3-17-2015 Time: 5: 2:29

Brent Lane Drainage System & Trail
CLV1401.000 90% Submittal
MAINLINE - ULTIMATE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4036.610	2516.930	6.425	2523.355	1001.00	13.90	3.00	2526.36	.00	6.00	12.00	6.000	12.000	.00	0 .0

♀

STA 11+00 TRAP Channel (Ultimate Condition)
Worksheet for Irregular Channel

Project Description	
Worksheet	STA 11+00 TRAP Channel (Ultimate Condition)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	4.38	%
Discharge	1,353	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	0.044	
Water Surface Elevation	2.78	ft
Elevation Range	0.00 to 4.70	
Flow Area	123.7	ft²
Wetted Perimeter	63.13	ft
Top Width	62.69	ft
Actual Depth	2.78	ft
Critical Elevation	3.29	ft
Critical Slope	2.20	%
Velocity	10.94	ft/s
Velocity Head	1.86	ft
Specific Energy	4.63	ft
Froude Number	1.37	
Flow Type	Supercritical	

USED FOR STARTING WSEL

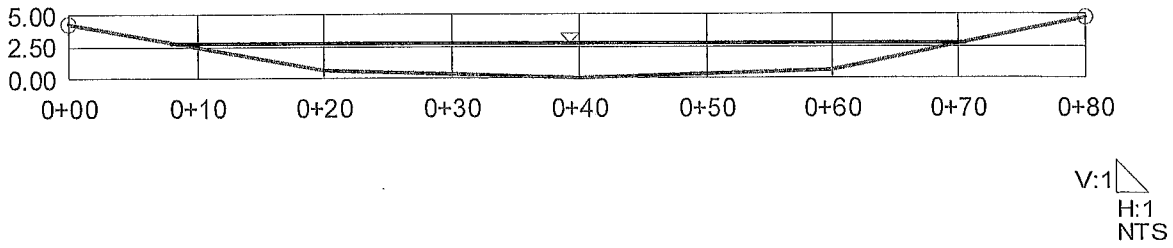
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+80	0.044

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	4.20
0+20	0.60
0+40	0.00
0+60	0.60
0+80	4.70

STA 11+00 TRAP Channel (Ultimate Condition)
Cross Section for Irregular Channel

Project Description	
Worksheet	STA 11+00 TRAP Channel (Ultimate Condition)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.044	
Channel Slope	4.38	%
Water Surface Elevation	2.78	ft
Elevation Range	0.00 to 4.70	
Discharge	1,353	cfs



Open Channel Minimum Bend Computations

SLATER HANIFAN GROUP
CONSULTING ENGINEERS AND PLANNERS

Minimum Bend Computations

FACILITY DESCRIPTION

Project Name: Brent Lane
Date: 3/16/2015 16:52
File Name: Min Bend Calcs 90% v130321.xlsx
By: PSK

Equations:

r = C (V^2 Tw) / Se (g) Equation 740*

Location	Super-Elevation Coefficient	Super-Elevation Water Surface Increase (feet)	Top Width of the Design Water Surface (feet)	Mean Design Velocity (fps)	Calculated Radius of Curvature (feet)	Actual Radius of Curvature (feet)
Sta. 13+97 to Sta. 16+28.68	1	1.19	26.1	22.4	342	350.0
Sta. 18+37.42 to Sta. 21+28.84	1	1.08	24.5	22.0	342	350.0

Notes:

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

5740 S. Arville St., Suite 216 - Las Vegas, NV 89118
Ph. 702-284-5300 - Fx. 702-284-5399

Open Channel Transition Computations

SLATER HANIFAN GROUP
CONSULTING ENGINEERS AND PLANNERS

Expanding Transition Lengths Computation

FACILITY DESCRIPTION

Project Name:	Brent Lane
Date:	3/16/2015 16:52
File Name:	Min Bend Calcs 90% v130321.xlsx
By:	PSK

Equations:

$L_t > 1.5\ (T_w)\ F_{r1}$ Equation 745*

Location	Downstream T_w (feet)	Upstream T_w (feet)	Difference T_w (feet)	F_{r1} #	Min. Transition Length (feet)	Actual Transition Lengths
Sta. 13+67 to Sta. 13+97	25	20	5	2.68	20	30
Sta. 23+20 to Sta. 23+50	24	12	12	1.68	30	30

Notes:

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

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Open Channel Rollwave Computations

Brent Lane Drainage System & Trail - 90% Submittal
PROJECT #: CLV1401.000
Interim Condition

Continue to guess until guess = calc'd

Design Normal Depth Calcs (enter Q, n, S, ss, b, and radius)													Check for Roll Waves				Guess						Calc'd
Station	Q (cfs)	n	S	Side Slope	Bottom Width (ft)	Depth (ft)	Area (ft^2)	Velocity (fps)	Froude Number	Top Width (ft)	Freeboard	Minimum Radius (ft)	Super-elevation (ft)	$k = (1+z^2)^{1/2}$	Y/b Ratio	Limiting Froude Number	Will Roll Waves Occur?	H	Y_2 ($H+Y_1$)	A_2	V_w	V_2	C	H
1397.00	1353	0.015	0.0235	2	12	4.02	80.6	27.10	2.86	27.83	2.08	350	1.81	2.24	0.34	2.62	yes	0.71	4.725	101.35	39.39	29.62	9.78	0.71
1398.00	1353	0.015	0.0235	2	12	4.02	80.6	27.1	2.86	27.84	2.08	350	1.81	2.24	0.34	2.62	yes	0.71	4.725	101.35	39.39	29.62	9.78	0.71
1628.68	1353	0.015	0.0220	2	12	4.16	84.5	25.77	2.68	28.42	2.04	350	1.67	2.24	0.35	2.64	yes	0.14	4.297	88.49	36.75	26.27	10.49	0.14
1837.42	1179	0.015	0.022	2	12	4.36	90.3	24.08	2.46	29.24	1.98	350	1.50	2.24	0.36	2.66	no	0.00	4.361	90.37	32.46	24.09	8.38	-0.43
1900.00	1179	0.015	0.0211	2	12	4.46	93.3	23.28	2.35	29.66	1.96	350	1.43	2.24	0.37	2.67	no	0.00	4.462	93.36	31.76	23.29	8.47	-0.71
2128.84	1179	0.015	0.0124	2	12	5.22	117.1	18.46	1.74	32.78	1.80	350	0.99	2.24	0.43	2.73	no	0.00	5.219	117.10	27.63	18.46	9.17	-2.59

Note: If Design Froude is greater than Limiting Froude, then rollwaves will occur.

Brent Lane Drainage System & Trail - 90% Submittal
PROJECT #: CLV1401.000
Ultimate Condition

Continue to guess until guess = calc'd

Design Normal Depth Calcs (enter Q, n, S, ss, b, and radius)													Check for Roll Waves				Guess						Calc'd
Station	Q (cfs)	n	S	Side Slope	Bottom Width (ft)	Depth (ft)	Area (ft^2)	Velocity (fps)	Froude Number	Top Width (ft)	Freeboard	Minimum Radius (ft)	Super-elevation (ft)	$k = (1+z^2)^{1/2}$	Y/b Ratio	Limiting Froude Number	Will Roll Waves Occur?	H	Y_2 ($H+Y_1$)	A_2	V_w	V_2	C	H
1397.00	1353	0.015	0.0235	2	12	3.28	60.9	23.30	2.68	24.8	1.87	350	1.19	2.24	0.27	2.53	yes	0.40	3.675	71.11	33.95	24.83	9.12	0.40
1398.00	1353	0.015	0.0235	2	12	3.28	60.9	23.29	2.68	24.8	1.86	350	1.19	2.24	0.27	2.53	yes	0.40	3.675	71.11	33.94	24.82	9.12	0.40
1628.68	1353	0.015	0.0220	2	12	3.59	68.9	20.48	2.27	26.1	1.78	350	0.97	2.24	0.30	2.57	no	0	3.59	68.86	28.08	20.48	7.60	-0.54
1837.42	1179	0.015	0.022	2	12	3.03	54.7	22.63	2.69	23.77	1.82	350	1.08	2.24	0.25	2.49	yes	0.47	3.495	66.37	33.16	24.48	8.68	0.47
1900.00	1179	0.015	0.0211	2	12	3.06	55.4	22.35	2.65	23.88	1.81	350	1.06	2.24	0.26	2.49	yes	0.38	3.435	64.82	32.66	23.85	8.81	0.38
2128.84	1179	0.015	0.0124	2	12	3.21	59.1	20.92	2.43	24.49	1.77	350	0.95	2.24	0.27	2.52	no	0	3.21	59.13	28.11	20.92	7.19	-0.14

Note: If Design Froude is greater than Limiting Froude, then rollwaves will occur.

Open Channel Super-Elevation & Freeboard Computations, and Mainline Hydraulic Summary-Interim & Ultimate Conditions

Brent Lane
Freeboard and Superelevation Calculations

3/13/2015

Interim Condition WSPGW Hydraulic Summary

WSPG Station (feet)	Channel Invert Elevation (feet)	Q_{100} (feet)	Water Surface Elevation (WSEL) (feet)	Velocity (fps)	Depth of Flow (feet)	Froude #	Freeboard F_b (feet)	Top Width T_w (feet)	Channel Radius (feet)	Super Elevation S_e (feet)	Roll Wave Depth (feet)	WSEL+S_e + Roll Wave (HGL) (feet)	Total Channel Depth Required (feet)	Minimum Top of Channel (feet)	Total Channel Depth Provided (feet)	Notes
1100.00	2464.00	2102	2467.46	12.44	3.46	1.41	NA	69.8	NA	NA	NA	2467.46	3.46	2467.46	NA	Begin Rip Rap Lined 40 BW, Varying SS, Trap Channel, Transition to Existing Rip Rap Lined Channel to Sta 10+50.
1141.00	2465.80	2102	2469.95	9.58	4.15	1.00	NA	77.0	NA	NA	NA	2469.95	4.15	2469.95	6	Rip Rap Lined 40 BW, Varying SS, Trap Channel
1146.00	2465.82	2102	2470.49	8.87	4.67	0.85	NA	70.7	NA	NA	NA	2470.49	4.67	2470.49	6	Solid Grout Riprap Sta. 11+70 to 12+02 Rip Rap Lined 40 BW Varying SS, Trap Channel
1202.00	2466.10	2102	2468.76	19.03	2.66	2.38	NA	55.6	NA	NA	NA	2468.76	2.66	2468.76	6	Begin Transition with 40' Concrete BW and Grouted Riprap SS
1231.00	2466.25	2102	2470.66	23.83	4.41	2.00	NA	20.0	NA	NA	NA	2470.66	4.41	2470.66	7	End Transition
1232.00	2466.25	2102	2470.66	23.85	4.41	2.00	NA	20.0	NA	NA	NA	2470.66	4.41	2470.66	7	Begin Proposed 20'x7' RCB Culvert
1367.00	2466.92	2102	2470.96	26.05	4.03	2.29	NA	20.0	NA	NA	NA	2470.96	4.03	2470.96	7	End Proposed 20'x7' RCB Culvert (Min. 2 feet of Freeboard Provided at Culvert)
1397.00	2467.07	2102	2471.09	27.10	4.02	2.86	NA	27.8	350	1.81	0.71	2473.61	6.54	2473.61	7	End Transition/Begin Proposed Trap Channel
1398.00	2467.09	2102	2471.11	27.10	4.02	2.86	NA	27.8	350	1.81	0.71	2473.63	6.54	2473.63	7	Begin Curved Section
1628.68	2472.52	2102	2476.68	25.77	4.16	2.68	NA	28.4	350	1.67	0.14	2478.49	5.97	2478.49	7	End Curved Section
1830.00	2476.94	2102	2481.29	24.16	4.35	2.47	NA	29.2	NA	NA	NA	2481.29	4.35	2481.29	7	Introduce Surface Flow
1837.42	2477.10	2102	2481.46	24.08	4.36	2.46	NA	29.2	350	1.50	NA	2482.97	5.87	2482.97	7	Begin Curved Section
1900.00	2478.48	2102	2482.94	23.28	4.46	2.35	NA	29.7	350	1.43	NA	2484.37	5.89	2484.37	7	Grade Break
2128.84	2483.31	2102	2488.53	18.46	5.22	1.74	NA	32.8	350	0.99	NA	2489.52	6.21	2489.52	7	End Curved Section/Grade Break
2320.00	2485.67	2102	2492.49	12.34	6.82	1.07	NA	36.0	NA	NA	NA	2492.49	6.82	2492.49	7	Begin Transition

Equation 741: Fb=0.5+V^2/2g (Sub-critical)
Equation 747: Fb=1.0+.025VD^1/3 (Super-critical)
Note: Per Section 706.1.3 in no case shall the freeboard be less than 1 foot. All channel linings must extent to freeboard height.
hannel bends, 0.5 feet shall be added to the above determined freeboard elevation.
= CV^2Tw / gr

Brent Lane
Freeboard and Superelevation Calculations

Date: 3/17/2015

Ultimate Condition WSPGW Hydraulic Summary

WSPG Station (feet)	Channel Invert Elevation (feet)	Q_{100} (feet)	Water Surface Elevation (WSEL) (feet)	Velocity (fps)	Depth of Flow (feet)	Froude #	Freeboard F_b (feet)	Top Width T_w (feet)	Channel Radius (feet)	Super Elevation S_e (feet)	Roll Wave Depth (feet)	WSEL+S_e + Roll Wave (HGL) (feet)	Total Channel Depth Required (feet)	Minimum Top of Channel (feet)	Total Channel Depth Provided (feet)	Notes
1100.00	2464.00	1353	2466.77	11.00	2.77	1.38	1.39	62.6	NA	NA	NA	2466.77	4.15	2468.15	NA	Begin Rip Rap Lined 40 BW, Varying SS, Trap Channel, Transition to Existing Rip Rap Lined Channel to Sta 10+50.
1141.00	2465.80	1353	2469.08	8.62	3.28	1.00	1.32	68.0	NA	NA	NA	2469.08	4.60	2470.40	6	Rip Rap Lined 40 BW, Varying SS, Trap Channel
1146.00	2465.82	1353	2469.54	7.81	3.72	0.83	1.45	63.5	NA	NA	NA	2469.54	5.16	2470.99	6	Solid Grout Riprap Sta. 11+70 to 12+02 Rip Rap Lined 40 BW Varying SS, Trap Channel
1202.00	2466.10	1353	2468.49	14.11	2.39	1.86	1.47	53.5	NA	NA	NA	2468.49	3.87	2469.97	6	Begin Transition with 40' Concrete BW and Grouted Riprap SS
1231.00	2466.25	1353	2469.55	20.50	3.30	1.99	1.76	20.0	NA	NA	NA	2469.55	5.06	2471.31	7	End Transition
1232.00	2466.25	1353	2469.55	20.52	3.30	1.99	1.76	20.0	NA	NA	NA	2469.55	5.06	2471.31	7	Begin Proposed 20'x7' RCB Culvert
1367.00	2466.92	1353	2469.85	23.13	2.93	2.38	2.00	20.0	NA	NA	NA	2469.85	4.93	2471.85	7	End Proposed 20'x7' RCB Culvert (Min. 2 feet of Freeboard Provided at Culvert)
1397.00	2467.07	1353	2470.35	23.30	3.28	2.68	1.87	24.8	350	1.19	0.40	2471.94	6.74	2473.81	7	End Transition/Begin Proposed Trap Channel
1398.00	2467.09	1353	2470.37	23.29	3.28	2.68	1.87	24.8	350	1.19	0.40	2471.97	6.74	2473.83	7	Begin Curved Section
1628.68	2472.52	1353	2476.11	20.48	3.59	2.27	1.78	26.1	350	0.97	NA	2477.08	6.35	2478.87	7	End Curved Section
1830.00	2476.94	1179	2479.97	22.66	3.03	2.7	1.82	23.8	NA	NA	NA	2479.97	4.85	2481.79	7	Introduce Surface Flow
1837.42	2477.10	1179	2480.13	22.63	3.03	2.69	1.82	23.8	350	1.08	0.47	2481.68	6.40	2483.50	7	Begin Curved Section
1900.00	2478.48	1179	2481.54	22.35	3.06	2.65	1.81	23.9	350	1.06	0.38	2482.98	6.31	2484.79	7	Grade Break
2128.84	2483.31	1179	2486.52	20.92	3.21	2.43	1.77	24.5	350	0.95	NA	2487.47	5.93	2489.24	7	End Curved Section/Grade Break
2320.00	2485.67	1179	2488.70	22.67	3.03	2.70	1.82	23.8	NA	NA	NA	2488.70	4.85	2490.52	7	Begin Transition
2349.90	2486.04	1179	2490.77	20.78	4.73	1.68	1.87	12.0	NA	NA	NA	2490.77	6.60	2492.64	7	End Transition
2350.00	2486.05	1179	2490.78	20.76	4.73	1.68	NA	12.0	NA	NA	NA	2490.78	NA	NA	NA	Begin Proposed 12'x7' RCB Storm Drain/Grade Break
2371.50	2486.26	1179	2490.97	20.88	4.71	1.70	NA	12.0	NA	NA	NA	2490.97	NA	NA	NA	
2449.65	2487.04	1179	2491.64	21.35	4.60	1.75	NA	12.0	NA	NA	NA	2491.64	NA	NA	NA	Grade Break
2581.76	2488.56	1179	2493.05	21.90	4.49	1.82	NA	12.0	NA	NA	NA	2493.05	NA	NA	NA	
2583.58	2488.58	1179	2493.07	21.91	4.49	1.82	NA	12.0	NA	NA	NA	2493.07	NA	NA	NA	
2999.65	2493.37	1179	2497.13	26.11	3.76	2.37	NA	12.0	NA	NA	NA	2497.13	NA	NA	NA	Grade Break
3225.00	2498.60	1179	2502.40	25.83	3.80	2.33	NA	12.0	NA	NA	NA	2502.40	NA	NA	NA	
3872.58	2513.65	1179	2518.98	18.44	5.33	1.41	NA	12.0	NA	NA	NA	2518.98	NA	NA	NA	
3874.77	2513.69	1179	2519.05	18.35	5.36	1.40	NA	12.0	NA	NA	NA	2519.05	NA	NA	NA	
3874.77	2513.69	1169	2518.87	18.81	5.18	1.46	NA	12.0	NA	NA	NA	2518.87	NA	NA	NA	(2) 18" RCB Laterals
3921.28	2514.64	1169	2520.64	16.24	6.00	1.17	NA	12.0	NA	NA	NA	2520.64	NA	NA	NA	
3921.28	2514.64	1089	2521.45	15.13	6.81	1.09	NA	12.0	NA	NA	NA	2521.45	NA	NA	NA	36" RCB Lateral
3922.42	2514.64	1089	2521.46	15.13	6.82	1.09	NA	12.0	NA	NA	NA	2521.46	NA	NA	NA	
3922.42	2514.64	1034	2522.03	14.36	7.38	1.03	NA	12.0	NA	NA	NA	2522.03	NA	NA	NA	36" RCB Lateral
3956.84	2515.33	1034	2522.31	14.36	6.98	1.03	NA	12.0	NA	NA	NA	2522.31	NA	NA	NA	
3963.31	2515.46	1034	2522.37	14.36	6.91	1.03	NA	12.0	NA	NA	NA	2522.37	NA	NA	NA	
3963.31	2515.46	1022	2522.51	14.19	7.05	1.02	NA	12.0	NA	NA	NA	2522.51	NA	NA	NA	48" RCB Lateral
4014.36	2516.49	1022	2522.93	14.19	6.44	1.02	NA	12.0	NA	NA	NA	2522.93	NA	NA	NA	
4014.36	2516.49	1001	2523.18	13.90	6.69	1.00	NA	12.0	NA	NA	NA	2523.18	NA	NA	NA	3'H X 3.5'W RCB Lateral
4036.61	2516.93	1001	2523.36	13.90	6.43	1.00	NA	12.0	NA	NA	NA	2523.36	NA	NA	NA	
4036.61	2516.93	1001	2523.36	13.90	6.43	1.00	NA	12.0	NA	NA	NA	2523.36	NA	NA	NA	Begin 12'x6' RCB

Equation 741: Fb=0.5+V^2/2g (Sub-critical)
Equation 747: Fb=1.0+.025VD^1/3 (Super-critical)
Note: Per Section 706.1.3 in no case shall the freeboard be less than 1 foot. All channel linings must extent to freeboard height.
At channel bends, 0.5 feet shall be added to the above determined freeboard elevation.
Se = CV^2Tw / gr

APPENDIX C

Hydraulic Analysis-Other

Street Flow Computations

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

Project Description	
Worksheet	Section 1-E - Durango Half-Street Section (100-Year) - Ultimate
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	ft²
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

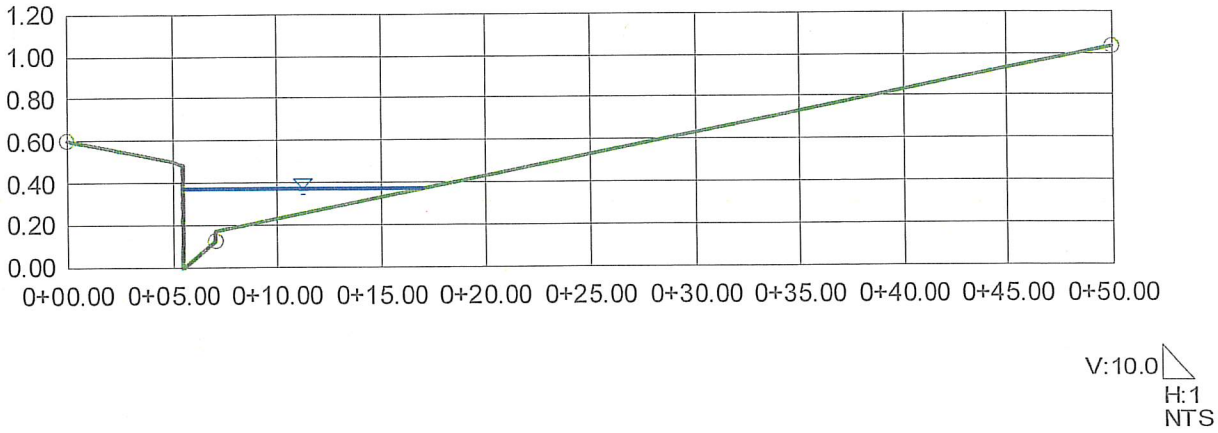
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.03

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

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

Project Description	
Worksheet	Section 1-E - Durango Half-Street Section (100-Year) - Ultimate
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



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Section 1-W - Durango Half-Street Section (10-Year) - Int. & Ult.
Worksheet for Irregular Channel

Project Description	
Worksheet	Section 1-W - Durango Half-Street Section (10-Year) - Int. & Ult.
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	ft²
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

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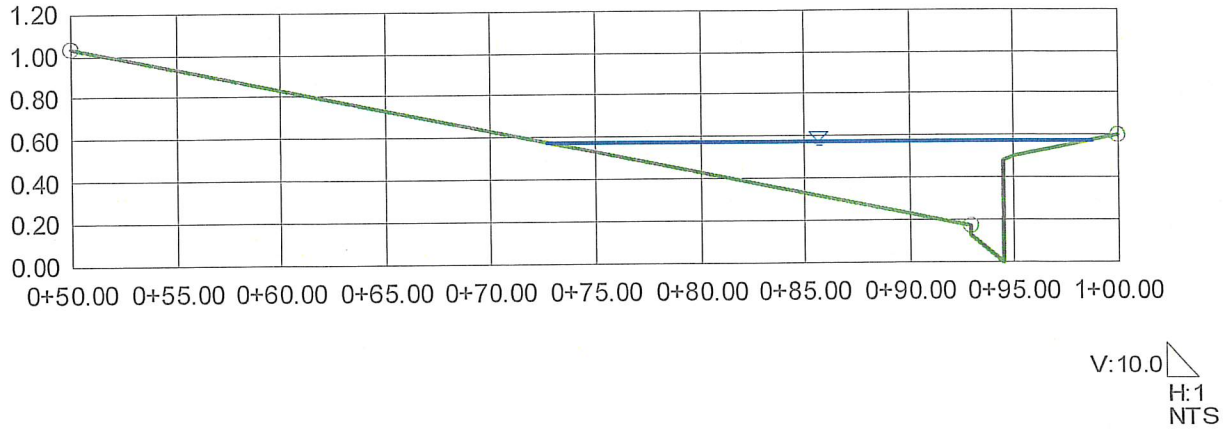
Section 1-W - Durango Half-Street Section (10-Year) - Int. & Ult.
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 1-W - Durango Half-Street Section (10-Year) - Int. & Ult.
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



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Section 1-W - Durango Half-Street Section (100-Year) - Int. & Ult.
Worksheet for Irregular Channel

Project Description	
Worksheet	Section 1-W - Durango Half-Street Section (100-Year) - Int. & Ult.
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	ft²
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

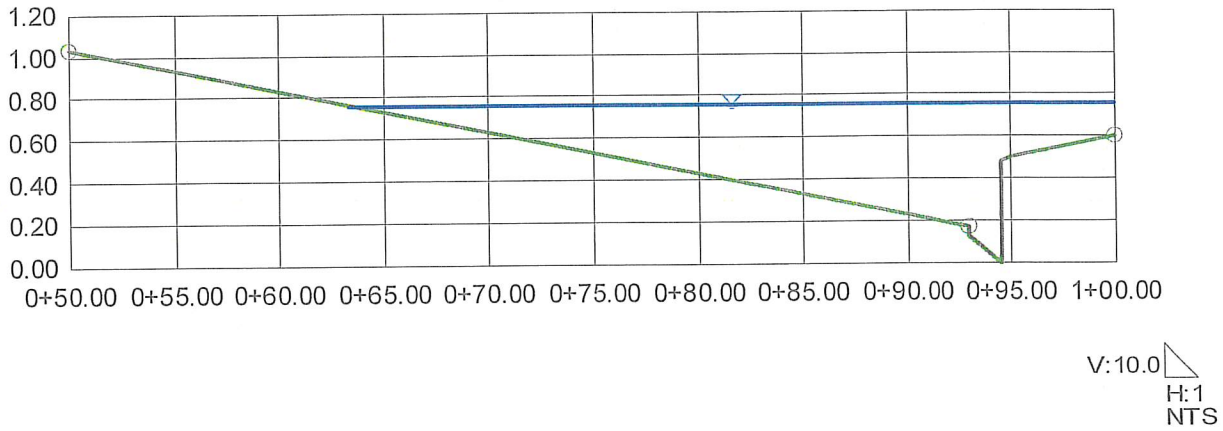
Natural Channel Points	
Station (ft)	Elevation (ft)
0+50.00	1.03
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.48
0+95.00	0.50
1+00.00	0.60

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

Section 1-W - Durango Half-Street Section (100-Year) - Int. & Ult.
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 1-W - Durango Half-Street Section (100-Year) - Int. & Ult.
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



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Section 1a-W - Durango Half-Street Section (100-Year) - Bypass Flow
Worksheet for Irregular Channel

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

Input Data		
Channel Slope	1.50	%
Discharge	18.00	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	0.56	ft
Elevation Range	0.00 to 1.03	
Flow Area	4.7	ft²
Wetted Perimeter	24.96	ft
Top Width	24.43	ft
Actual Depth	0.56	ft
Critical Elevation	0.63	ft
Critical Slope	0.58	%
Velocity	3.87	ft/s
Velocity Head	0.23	ft
Specific Energy	0.79	ft
Froude Number	1.56	
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 = Bypass flow from 20' CM2 Inlet
Q = 18 cfs

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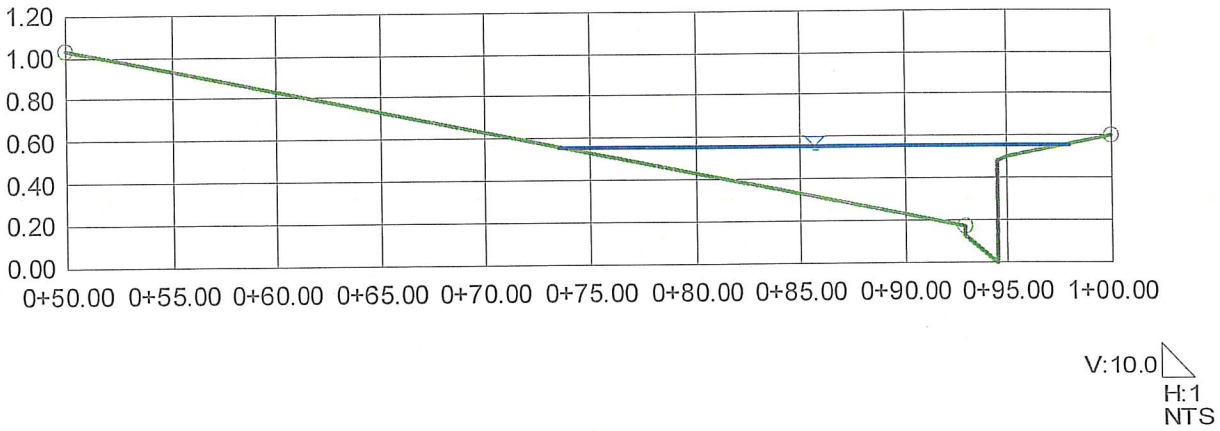
Section 1a-W - Durango Half-Street Section (100-Year) - Bypass Flow
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 1a-W - Durango Half-Street Section (100-Year) - Bypass Flow
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	0.56 ft
Elevation Range	0.00 to 1.03
Discharge	18.00 cfs



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Section 2-E - Durango Half-Street Section (100-Year) - Int. & Ult.
Worksheet for Irregular Channel

Project Description	
Worksheet	Section 2-E - Durango Half-Street Section (100-Year) - Int. & Ult.
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	ft²
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

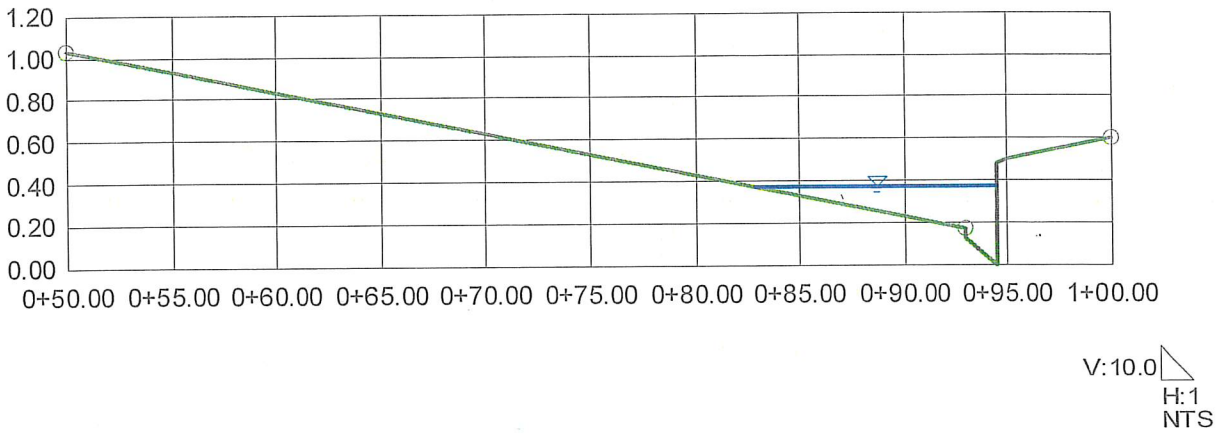
Station (ft)	Elevation (ft)
0+50.00	1.03
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.48
0+95.00	0.50
1+00.00	0.60

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

Section 2-E - Durango Half-Street Section (100-Year) - Int. & Ult.
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 2-E - Durango Half-Street Section (100-Year) - Int. & Ult.
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



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Section 2-W - Durango Half-Street Section (10-Year) - Int. & Ult.
Worksheet for Irregular Channel

Project Description	
Worksheet	Section 2-W - Durango Half-Street Section (10-Year) - Int. & Ult.
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	ft²
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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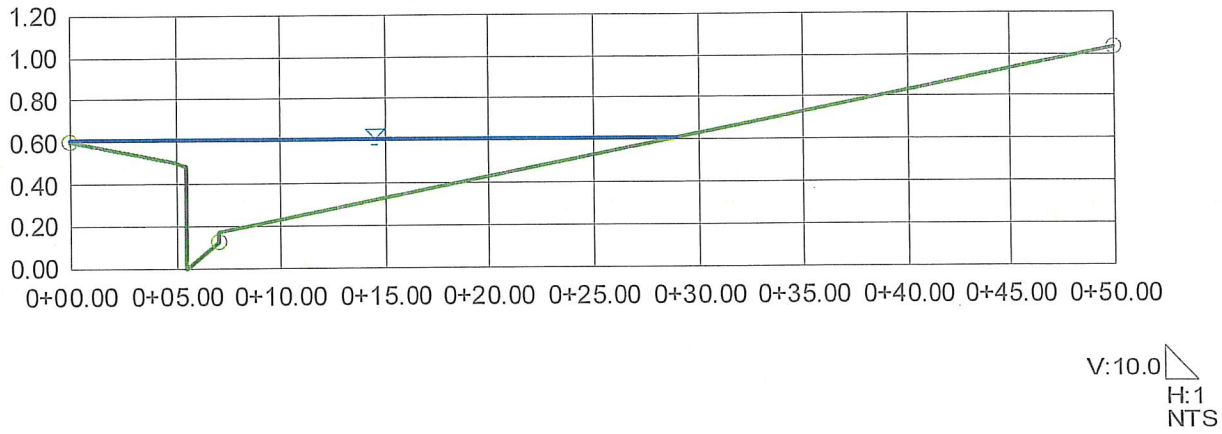
Section 2-W - Durango Half-Street Section (10-Year) - Int. & Ult.
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 2-W - Durango Half-Street Section (10-Year) - Int. & Ult.
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



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Section 2-W - Durango Half-Street Section (100-Year) - Int. & Ult.
Worksheet for Irregular Channel

Project Description	
Worksheet	Section 2-W - Durango Half-Street Section (100-Year) - Int. & Ult.
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	ft²
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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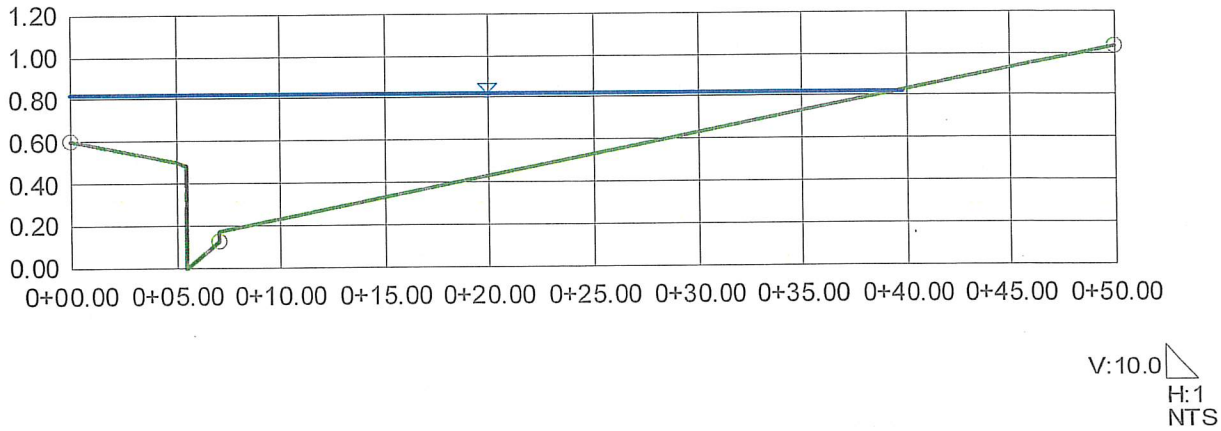
Section 2-W - Durango Half-Street Section (100-Year) - Int. & Ult.
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 2-W - Durango Half-Street Section (100-Year) - Int. & Ult.
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



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

Project Description	
Worksheet	Section 3-N - Brent Half-Street Section (100-Year) - Ultimate
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	ft²
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

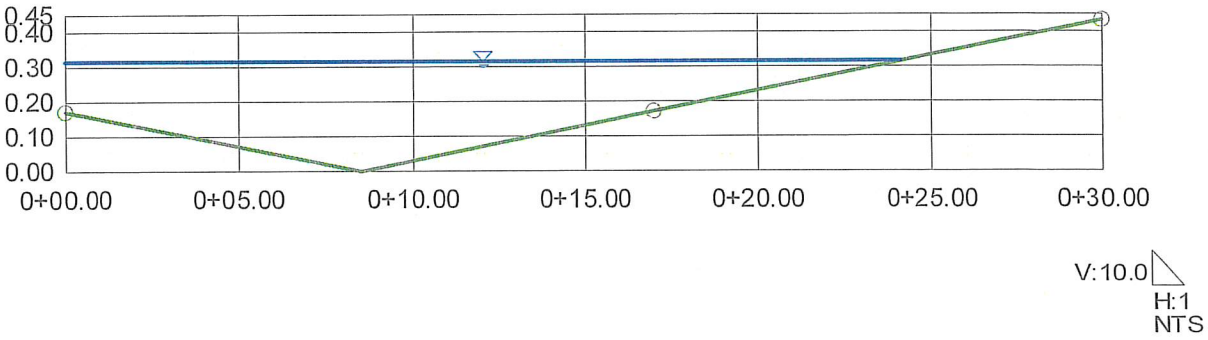
Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.17
0+08.50	0.00
0+17.00	0.17
0+30.00	0.43

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

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

Project Description	
Worksheet	Section 3-N - Brent Half-Street Section (100-Year) - Ultimate
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



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

Project Description	
Worksheet	Section 3-S - Brent Half-Street Section (100-Year) - Ultimate
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	ft²
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

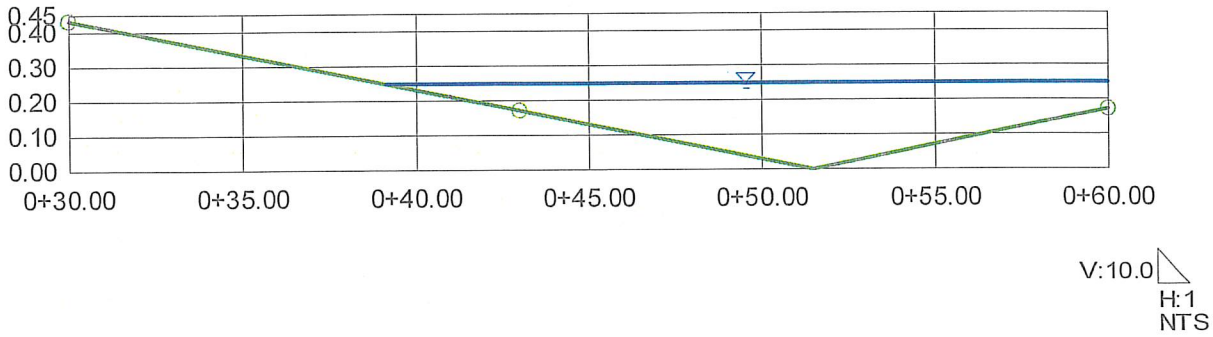
Natural Channel Points	
Station (ft)	Elevation (ft)
0+30.00	0.43
0+43.00	0.17
0+51.50	0.00
0+60.00	0.17

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

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

Project Description	
Worksheet	Section 3-S - Brent Half-Street Section (100-Year) - Ultimate
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



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

Project Description	
Worksheet	Section 4-N - Brent Half-Street Section (100-Year) - Ultimate
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	ft²
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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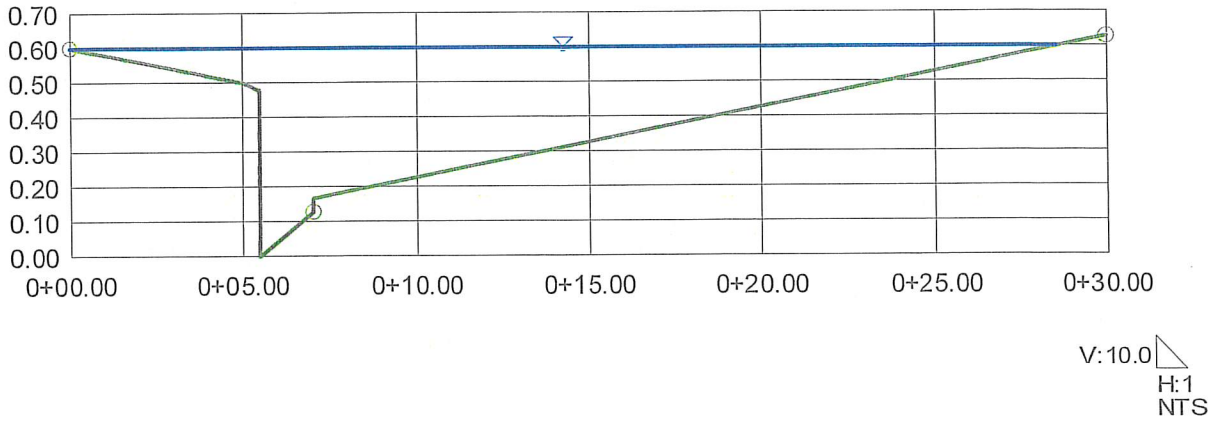
Section 4-N - Brent Half-Street Section (100-Year) - Ultimate
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 4-N - Brent Half-Street Section (100-Year) - Ultimate
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



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

Project Description	
Worksheet	Section 4-S - Brent Half-Street Section (100-Year) - Ultimate
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	ft²
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

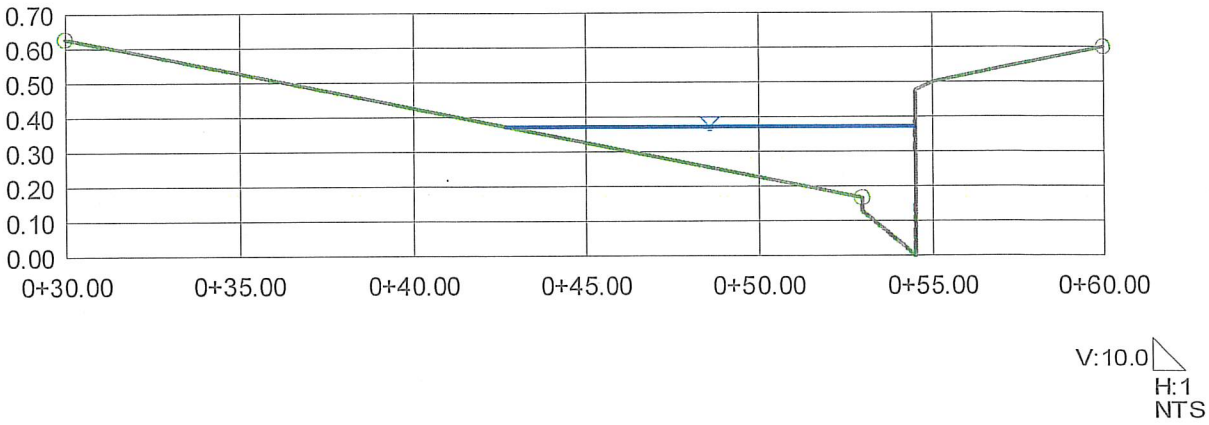
Station (ft)	Elevation (ft)
0+30.00	0.63
0+53.00	0.17
0+53.00	0.13
0+54.50	0.00
0+54.50	0.48
0+55.00	0.50
0+60.00	0.60

Notes:
south half of Brent, east of Durango
Q = LOC7

Section 4-S - Brent Half-Street Section (100-Year) - Ultimate
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 4-S - Brent Half-Street Section (100-Year) - Ultimate
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



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Section 5 - Brent Street Section (100-Year) - Interim
Worksheet for Irregular Channel

Project Description	
Worksheet	Section 5 - Brent Street Section (100-Year) - Interim
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	1.98	%
Discharge	1,146.00	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	0.016	
Water Surface Elevation	1.66	ft
Elevation Range	0.00 to 1.50	
Flow Area	76.0	ft²
Wetted Perimeter	63.55	ft
Top Width	62.00	ft
Actual Depth	1.66	ft
Critical Elevation	2.64	ft
Critical Slope	0.29	%
Velocity	15.09	ft/s
Velocity Head	3.54	ft
Specific Energy	5.20	ft
Froude Number	2.40	
Flow Type	Supercritical	

Calculation Messages:
Water elevation exceeds lowest end station by 0.1635147 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.025
0+07.00	0+09.00	0.013
0+09.00	0+55.00	0.016
0+55.00	0+57.00	0.013
0+57.00	0+62.00	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	1.50
0+07.00	0.50
0+07.50	0.48
0+07.50	0.00
0+09.00	0.13
0+09.00	0.17
0+32.00	0.46

Section 5 - Brent Street Section (100-Year) - Interim
Worksheet for Irregular Channel

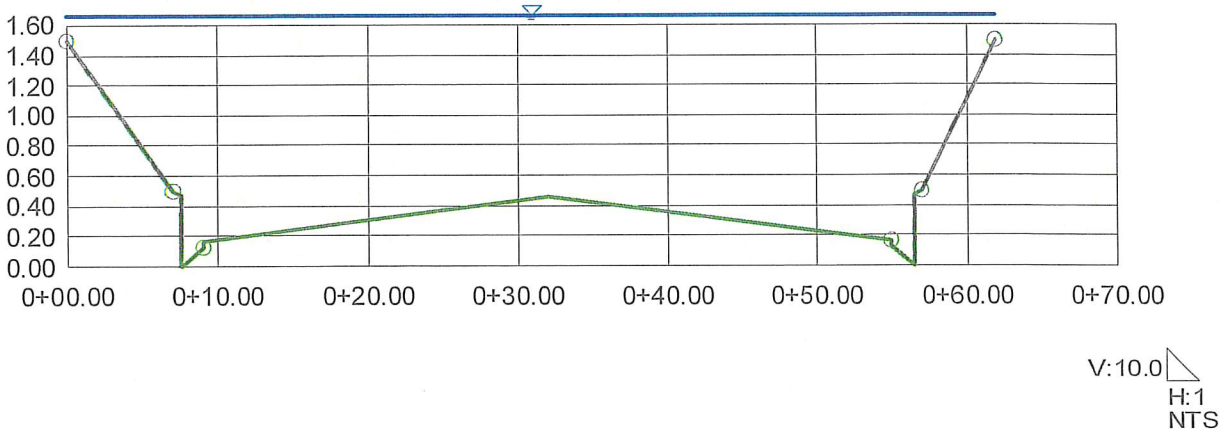
Natural Channel Points	
Station (ft)	Elevation (ft)
0+55.00	0.17
0+55.00	0.13
0+56.50	0.00
0+56.50	0.48
0+57.00	0.50
0+62.00	1.50

Notes:
full width of Brent, west of Durango - Interim Condition
Q = CP-H - LOC1 - CP1 - LOC6
= 1286 - 58 - 77 - 5 CFS
= 1146 CFS

Section 5 - Brent Street Section (100-Year) - Interim
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 5 - Brent Street Section (100-Year) - Interim
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Channel Slope	1.98	%
Water Surface Elevation	1.66	ft
Elevation Range	0.00 to 1.50	
Discharge	1,146.00	cfs



Section 6 - Brent Half-Street Section (100-Year) - Capacity Check
Worksheet for Irregular Channel

Project Description	
Worksheet	Section 6 - Brent Half-Street Section (100-Year) - Capacity Check
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	2.00	%
Water Surface Elevation	2,500.00	ft

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	0.020	
Elevation Range	2,499.30 to 2,500.50	
Discharge	10.57	cfs
Flow Area	3.5	ft²
Wetted Perimeter	22.10	ft
Top Width	22.00	ft
Actual Depth	0.70	ft
Critical Elevation	2,500.04	ft
Critical Slope	1.11	%
Velocity	3.02	ft/s
Velocity Head	0.14	ft
Specific Energy	2,500.14	ft
Froude Number	1.34	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+12.00	0.016
0+12.00	0+43.00	0.025

Natural Channel Points

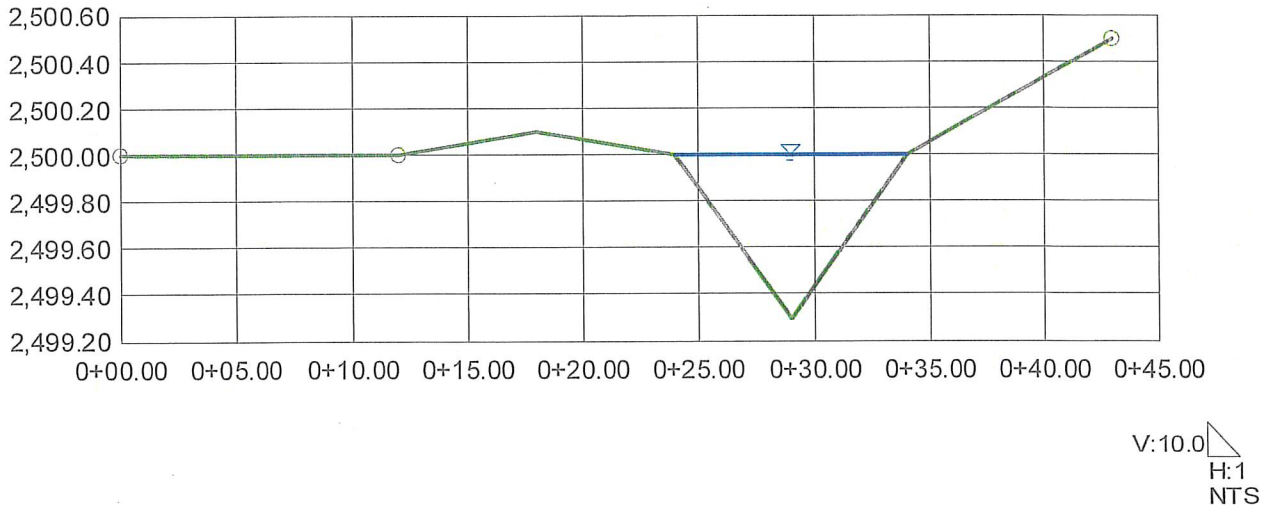
Station (ft)	Elevation (ft)
0+00.00	2,500.00
0+12.00	2,500.00
0+18.00	2,500.10
0+24.00	2,500.00
0+29.00	2,499.30
0+34.00	2,500.00
0+43.00	2,500.50

Notes:
Bypass flow on south side of street = capacity

Section 6 - Brent Half-Street Section (100-Year) - Capacity Check
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 6 - Brent Half-Street Section (100-Year) - Capacity Check
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.020	
Channel Slope	2.00	%
Water Surface Elevation	2,500.00	ft
Elevation Range	2,499.30 to 2,500.50	
Discharge	10.57	cfs



Drop Inlet Computations

Project:	**Brent Lane Drainage System & Trail**
Title:	**Type Neenah R-3295 (Continuous Grade)**
Subtitle:	**12-ft Drop Inlet (4 Grates) - Facility 1 DI Sta. 40+08.60 (Existing)**
By:	**AJH**
Date:	**3/12/2015**

	Input:	**Variable:**	**Input:**
	Street Flow (cfs)	Q	573.0
	Longitudinal Slope (ft/ft)	S_o	0.0198
	Manning's Coefficient	n	0.016
	Street Flow Velocity (fps)	V	16.27
	Street Flow Depth (ft)	D	1.35
	Street Cross Slope (ft/ft)	S_x	0.02
	Grate Width (ft)	W	1.5
	Grate Depression (in)	D_g	2.0
	Length of Grate (ft)	L_g	12.0
	Length of Curb Opening (ft)	L_c	12.00
	Clogging Factor - Grate (%)	CF_g	50%
	Clogging Factor - Curb (%)	CF_c	50%
	Effective Grate Length (ft)	L_{ge}	6.0
	Effective Curb Opening Length (ft)	L_{ce}	6.00
	Output (Grate):	**Equation:**	**Output (Grate):**
[1]	R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else Frontal Flow Factor=1	0.85
[2]	V_o - Splash Over Velocity (fps)	V_x=p+q*Lg-r*L_{ge}^2+sy*L_{ge}^3 ; where p=0.30,q=4.85,r=1.31,sy=0.15 (for Vane Grate)	14.64
[1]	E - Grate Flow Ratio	Frontal Flow/Side Flow	0.07
[2]	Q_w - Frontal Flow (cfs)	$Q_w = Q[1-(1-(W/T))^{2.67}]$	37.97
[1]	Q_s - Side Flow (cfs)	Q_s = Q-Qw	535.0
	T - Side Flow Spread (ft)	$(D-D_g)/S_x$	59.17
[1]	R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.05
[1]	Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	59.9
	Output (Curb):	**Equation:**	**Output (Curb):**
[1]	S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.027
	Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	513.081
	S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.111
[1]	L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*(1/n*S_e)^{0.6}$	263.43
[1]	Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$	20.8
		or Q_{sx} if L_t is less than L_{ce}	
	Output (Combination):		**Output (Combination):**
	Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**80.8**
	Note: Inlet control limits interim condition interception to 46-cfs		

[1] Formula referenced from the CCRFCD Manual

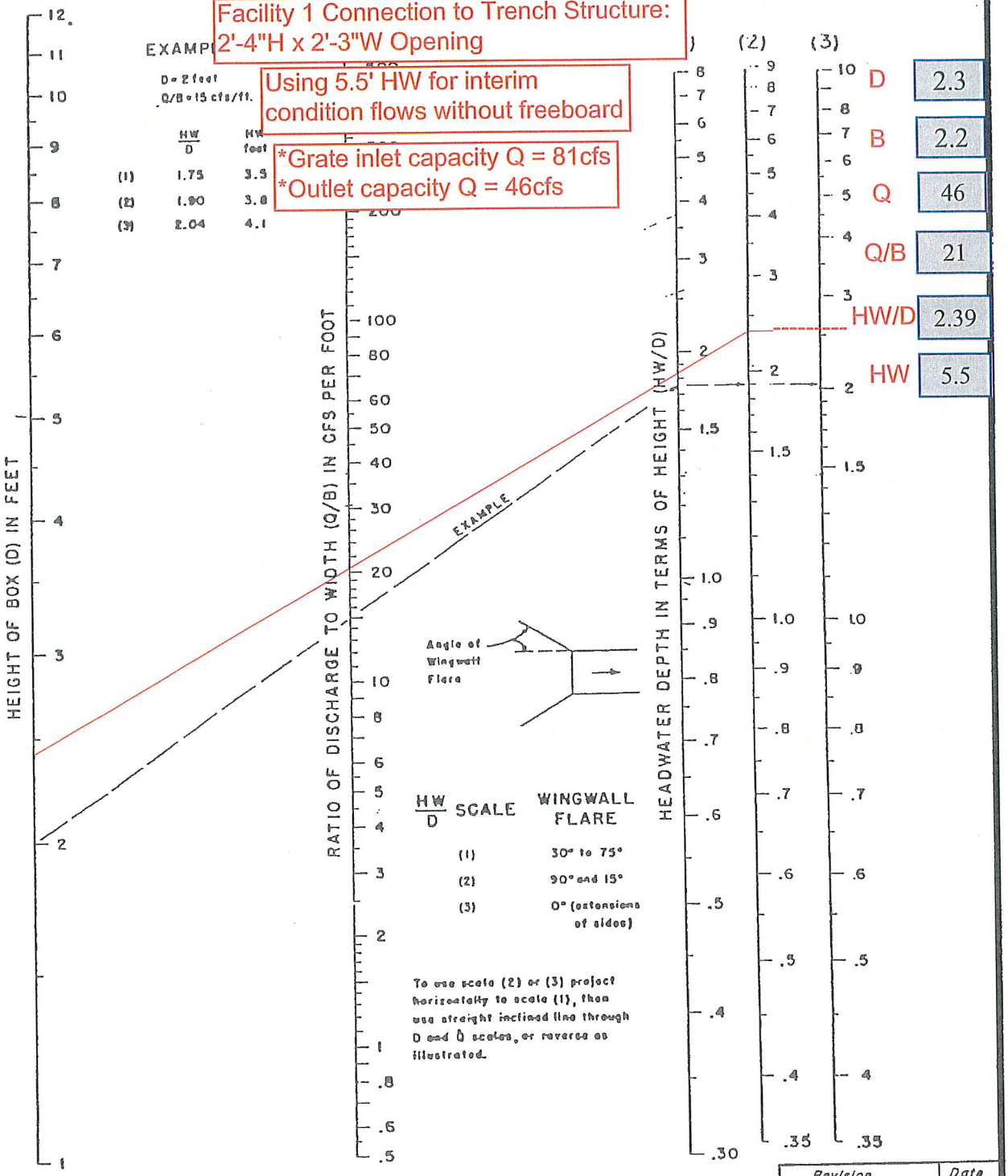
[2] Formula referenced from FHWA Urban Drainage Design Manual (HEC-22)

NOMOGRAPH – INLET CONTROL BOX CULVERT

Facility 1 Connection to Trench Structure:
2'-4"H x 2'-3"W Opening

Using 5.5' HW for interim condition flows without freeboard

*Grate inlet capacity Q = 81cfs
*Outlet capacity Q = 46cfs



D	2.3
B	2.2
Q	46
Q/B	21
HW/D	2.39
HW	5.5

Revision	Date

WRC ENGINEERING

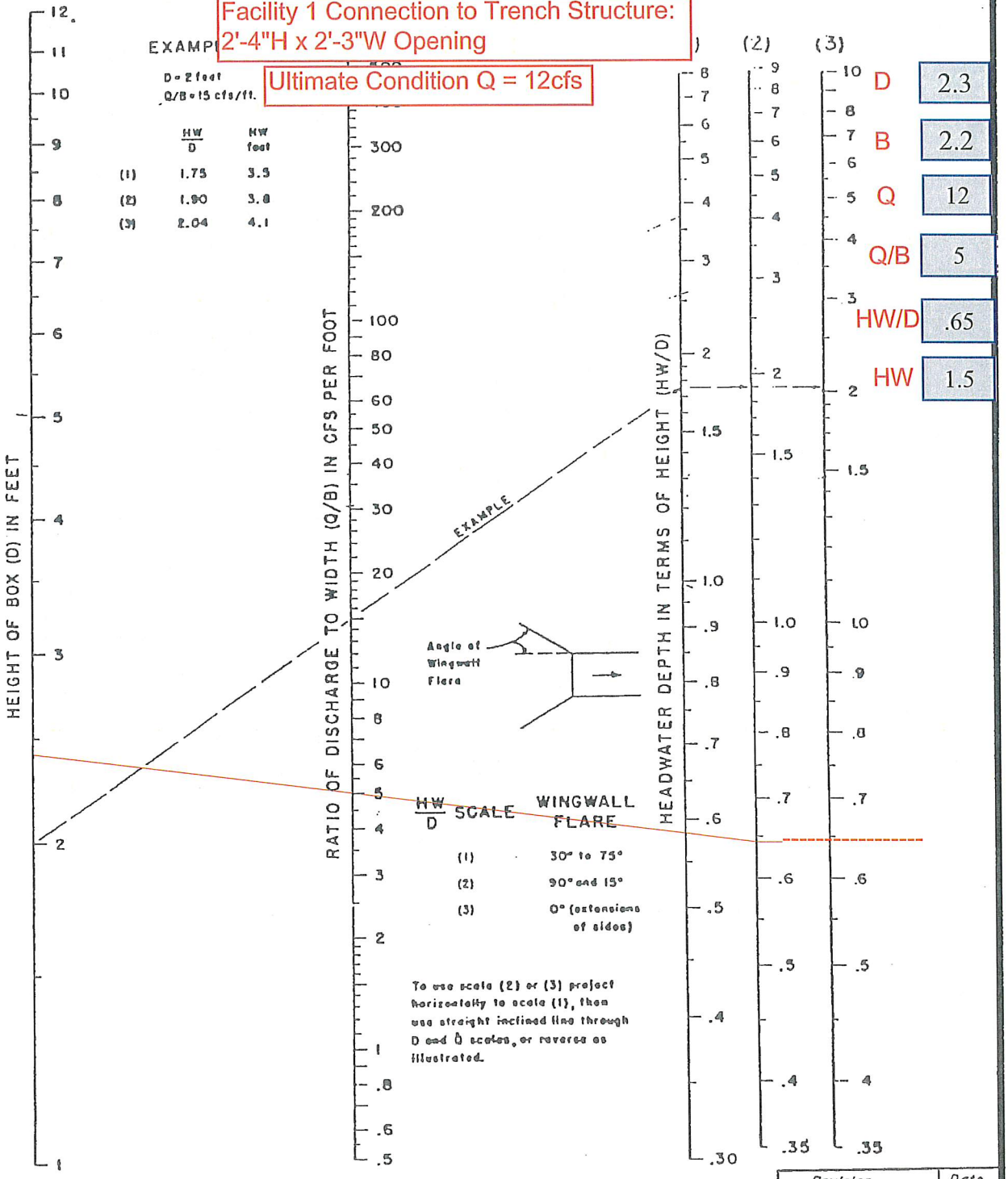
REFERENCE:
USDOT, FHWA, HDS No.5, 1985

FIGURE 1004

NOMOGRAPH – INLET CONTROL BOX CULVERT

Facility 1 Connection to Trench Structure:
2'-4"H x 2'-3"W Opening

Ultimate Condition Q = 12cfs



D	2.3
B	2.2
Q	12
Q/B	5
HW/D	.65
HW	1.5

Revision	Date

WRC ENGINEERING

REFERENCE:
USDOT, FHWA, HDS No.5, 1985

FIGURE 1004

SLATER HANIFAN GROUP
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Grate Inlet Sizing Computation

FACILITY DESCRIPTION

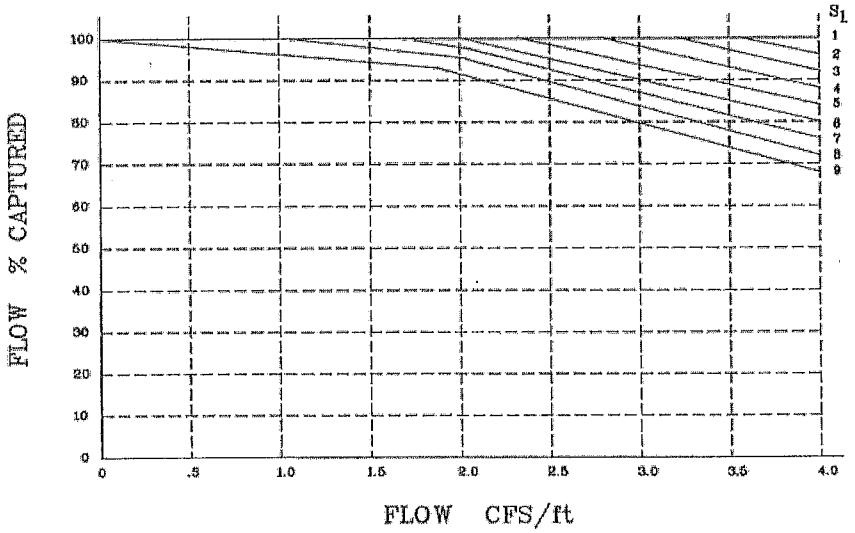
Project Name: Brent Lane Drainage System & Trail
Date: 3/12/2015
File Name: Special (Trench) Facility 2 DI Sta. 40+05.50
By: AJH

Known Information:

Neenah Vaned Type L Series Grate (R-4999-L9)

Q = Flow (CFS)	1146.0	
S = Longitudinal Slope (%)	1.98	* 1-ft Minimum Sump Depth
Cf = Clogging factor (%)	0	
L= Length of Grate (ft)	36	
W= Width of Opening (in)	26.75	
Q/L= Flow (CFS/ft)	32	

R-4999-L9



Actual Flow Captured (Graph Summary):

Q_{graph} = 4.0cfs x 95% x 36ft 137

Recommendations:

Provide trench drop inlet across width of roadway - Grate Dimensions (clear) 26.75-in wide by 15-ft & 21-ft long

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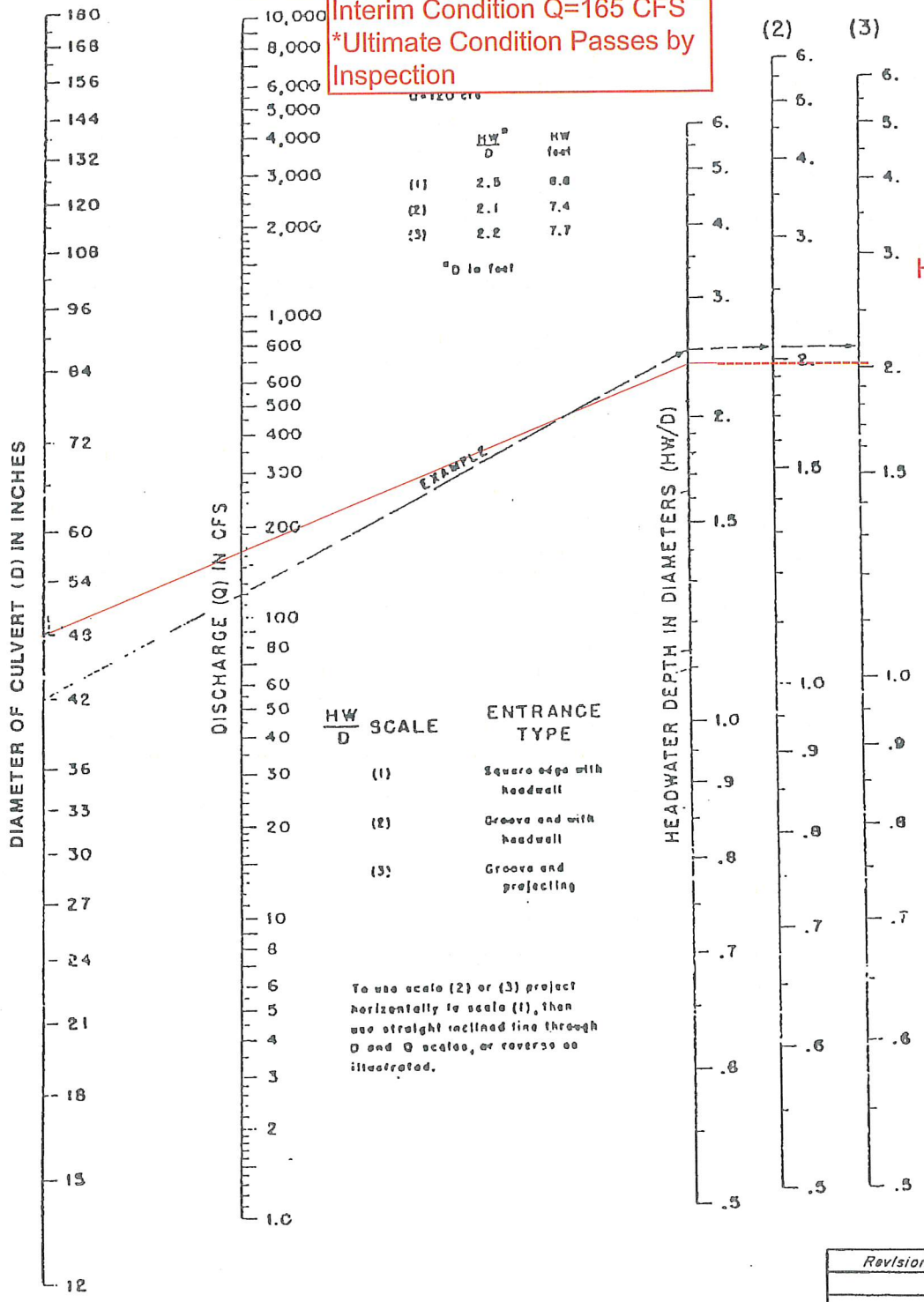
NOMOGRAPH – INLET CONTROL RCP

Facility 4 Trench Structure Outlet to 48" RCP

Interim Condition Q=165 CFS
*Ultimate Condition Passes by Inspection



HW/D	D	HW
(1)	2.5	8.0
(2)	2.1	7.4
(3)	2.2	7.7

*D in feet

Revision	Date

WRC ENGINEERING

REFERENCE:
USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

Project:	**Brent Lane Drainage System & Trail**	
Title:	**Type DM2 Drop Inlet (Continuous Grade)**	
Subtitle:	**20-ft Drop Inlet (7 Grates) - Facility 3 DI Sta. 40+14.36**	
By:	**AJH**	
Date:	**3/12/2015**	

	Input:	**Variable:**	**Input:**
	Street Flow (cfs)	Q	573.0
	Longitudinal Slope (ft/ft)	S_o	0.0198
	Manning's Coefficient	n	0.016
	Street Flow Velocity (fps)	V	16.27
	Street Flow Depth (ft)	D	1.35
	Street Cross Slope (ft/ft)	S_x	0.02
	Grate Width (ft)	W	1.5
	Grate Depression (in)	D_g	2.0
	Length of Grate (ft)	L_g	17.5
	Length of Curb Opening (ft)	L_c	20.00
	Clogging Factor - Grate (%)	CF_g	50%
	Clogging Factor - Curb (%)	CF_c	50%
	Effective Grate Length (ft)	L_{ge}	8.8
	Effective Curb Opening Length (ft)	L_{ce}	10.00
	Output (Grate):	**Equation:**	**Output (Grate):**
[1]	R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else Frontal Flow Factor=1	1.00
[2]	V_o - Splash Over Velocity (fps)	V_x=p+q*Lg-r*L_{ge}^2+sy*L_{ge}^3 ; where p=0.30,q=4.85,r=1.31,sy=0.15 (for Vane Grate)	42.93
[1]	E - Grate Flow Ratio	Frontal Flow/Side Flow	0.07
[2]	Q_w - Frontal Flow (cfs)	$Q_w = Q[1-(1-(W/T))^{2.67}]$	37.97
[1]	Q_s - Side Flow (cfs)	Q_s = Q-Qw	535.0
	T - Side Flow Spread (ft)	$(D-D_g)/S_x$	59.17
[1]	R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.11
[1]	Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	99.2
	Output (Curb):	**Equation:**	**Output (Curb):**
[1]	S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.027
	Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	473.839
	S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.111
[1]	L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*(1/n*S_e)^{0.6}$	254.77
[1]	Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$	33.0
		or Q_{sx} if L_t is less than L_{ce}	
	Output (Combination):		**Output (Combination):**
	Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**132.1**

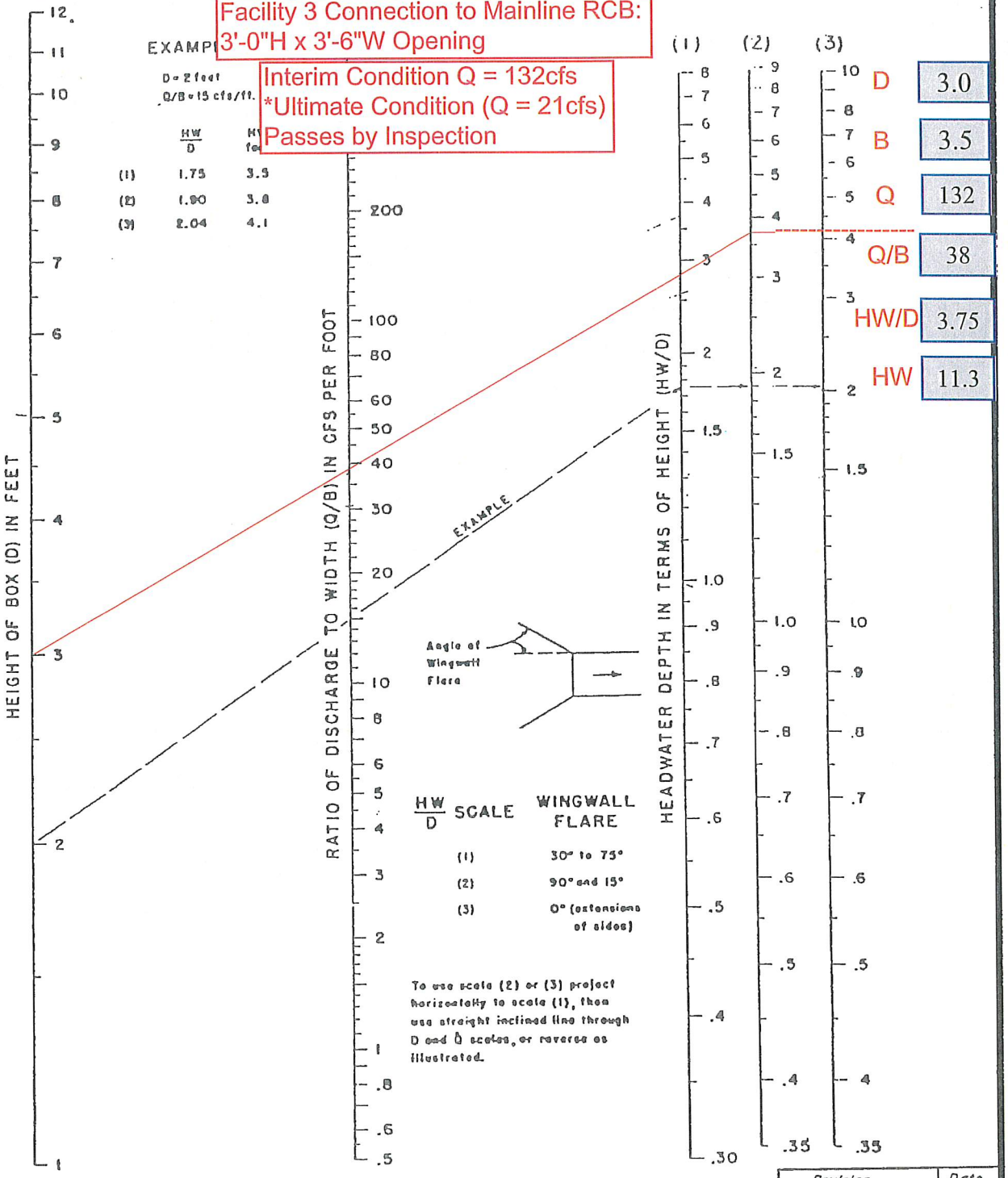
[1] Formula referenced from the CCRFCD Manual

[2] Formula referenced from FHWA Urban Drainage Design Manual (HEC-22)

NOMOGRAPH – INLET CONTROL BOX CULVERT

Facility 3 Connection to Mainline RCB:
3'-0"H x 3'-6"W Opening

Interim Condition Q = 132cfs
*Ultimate Condition (Q = 21cfs)
Passes by Inspection



D	3.0
B	3.5
Q	132
Q/B	38
HW/D	3.75
HW	11.3

Revision	Date

WRC ENGINEERING

REFERENCE:
USDOT, FHWA, HDS No.5, 1985

FIGURE 1004

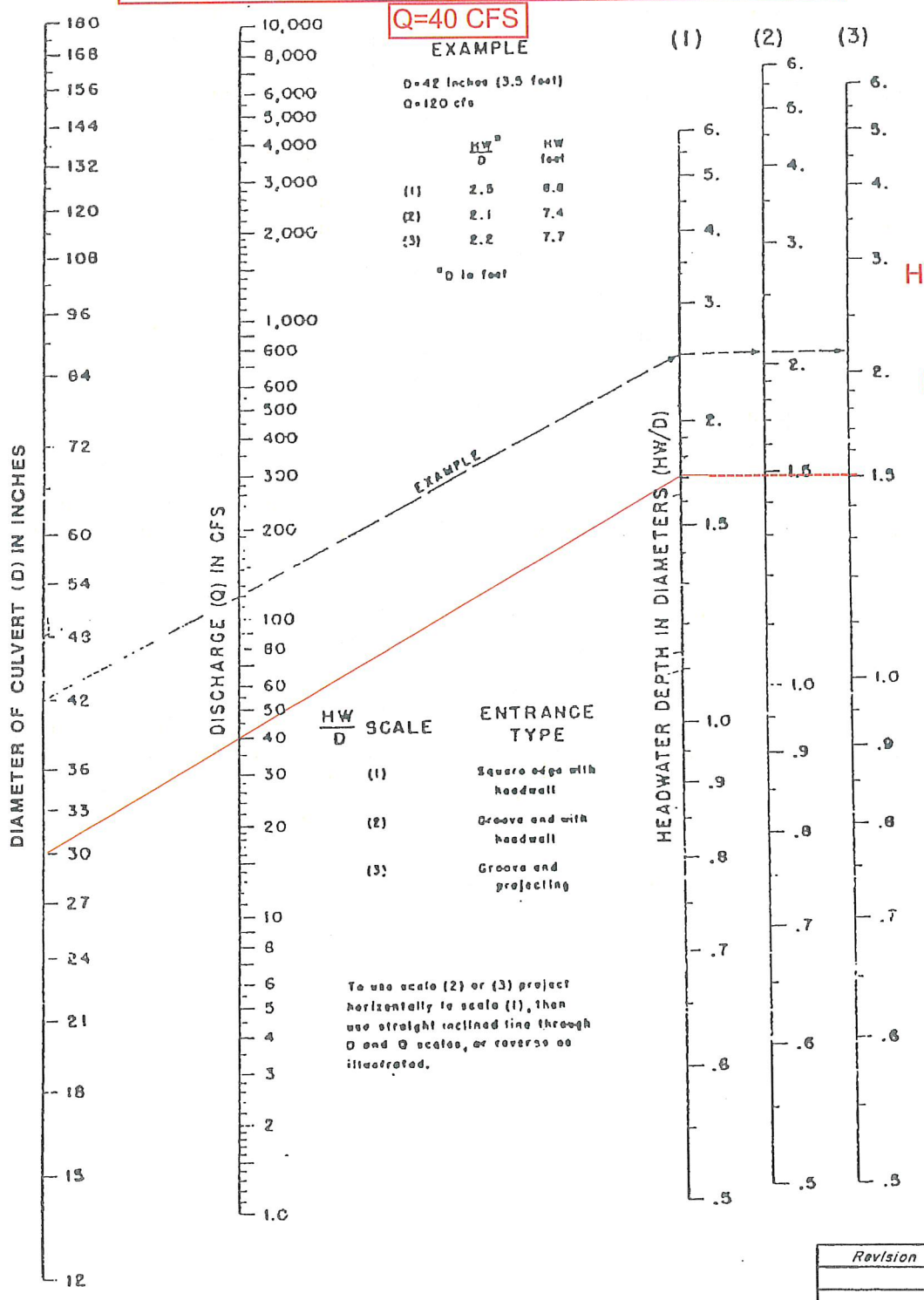
Project:	**Brent Lane Drainage System & Trail**	
Title:	**Type DM2 Drop Inlet (Continuous Grade)**	
Subtitle:	**20-ft Drop Inlet (7 Grates) - Facility 5 DI Sta. 39+51.64**	
By:	**AJH**	
Date:	**3/12/2015**	
Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	58.0
Longitudinal Slope (ft/ft)	S_o	0.0150
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	5.27
Street Flow Depth (ft)	D	0.76
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2.0
Length of Grate (ft)	L_g	17.5
Length of Curb Opening (ft)	L_c	20.00
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	8.8
Effective Curb Opening Length (ft)	L_{ce}	10.00
Output (Grate):	**Equation:**	**Output (Grate):**
[1] R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else Frontal Flow Factor=1	1.00
[2] V_o - Splash Over Velocity (fps)	V_x=p+q*Lg-r*L_{ge}^2+sy*L_{ge}^3 ; where p=0.30,q=4.85,r=1.31,sy=0.15 (for Vane Grate)	42.93
[1] E - Grate Flow Ratio	Frontal Flow/Side Flow	0.13
[2] Q_w - Frontal Flow (cfs)	$Q_w = Q[1-(1-(W/T))^{2.67}]$	7.50
[1] Q_s - Side Flow (cfs)	Q_s = Q-Qw	50.5
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	29.67
[1] R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.50
[1] Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	32.5
Output (Curb):	**Equation:**	**Output (Curb):**
[1] S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.034
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	25.472
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.111
[1] L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*(1/n*S_e)^{0.6}$	59.88
[1] Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$	7.1
	or Q_{sx} if L_t is less than L_{ce}	
Output (Combination):		**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**39.7**
	Bypass Flow	**18.0**

[1] Formula referenced from the CCRFCD Manual

[2] Formula referenced from FHWA Urban Drainage Design Manual (HEC-22)

NOMOGRAPH – INLET CONTROL RCP

Facility 5 Outlet to 30" RCP: (Interim and Ultimate Condition)



Revision	Date

WRC ENGINEERING

REFERENCE: USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

Project:	Brent Lane Drainage System & Trail
Title:	Type DM2 Drop Inlet (Continuous Grade)
Subtitle:	20-ft Drop Inlet (7 Grates) - Facility 6 DI Sta. 39+52.82
By:	AJH
Date:	8/14/2014

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	18.0
Longitudinal Slope (ft/ft)	S_o	0.0150
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	3.87
Street Flow Depth (ft)	D	0.56
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2.0
Length of Grate (ft)	L_g	17.5
Length of Curb Opening (ft)	L_c	20.00
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	8.8
Effective Curb Opening Length (ft)	L_{ce}	10.00

	Output (Grate):	**Equation:**	**Output (Grate):**
[1]	R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else Frontal Flow Factor=1	1.00
[2]	V_o - Splash Over Velocity (fps)	V_x=p+q*Lg-r*L_{ge}^2+sy*L_{ge}^3 ; where p=0.30,q=4.85,r=1.31,sy=0.15 (for Vane Grate)	42.93
[1]	E - Grate Flow Ratio	Frontal Flow/Side Flow	0.19
[2]	Q_w - Frontal Flow (cfs)	$Q_w = Q[1-(1-(W/T))^{2.67}]$	3.44
[1]	Q_s - Side Flow (cfs)	Q_s = Q-Qw	14.6
	T - Side Flow Spread (ft)	$(D-D_g)/S_x$	19.67
[1]	R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.63
[1]	Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	12.6

	Output (Curb):	**Equation:**	**Output (Curb):**
[1]	S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.041
	Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	5.369
	S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.111
[1]	L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*(1/n*S_e)^{0.6}$	27.93
[1]	Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$	3.0
		or Q_{sx} if L_t is less than L_{ce}	

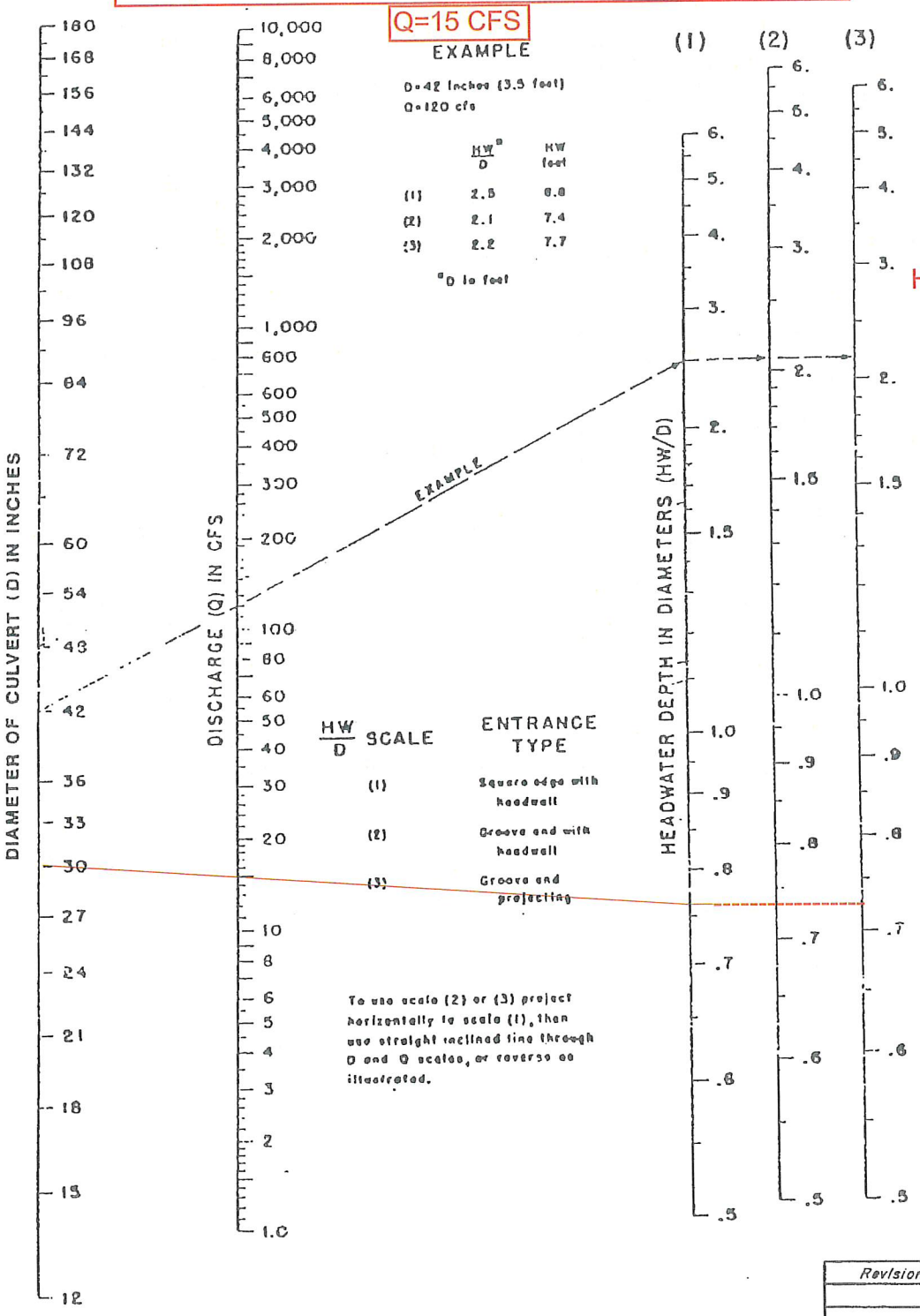
Output (Combination):		**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**15.6**
	Bypass Flow	**3.0**

[1] Formula referenced from the CCRFCD Manual

[2] Formula referenced from FHWA Urban Drainage Design Manual (HEC-22)

NOMOGRAPH – INLET CONTROL RCP

Facility 6 Outlet to 30" RCP: (Interim and Ultimate Condition)



HW/D	.76
D	30
HW	1.9

Revision	Date

WRC ENGINEERING

REFERENCE: USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

SLATER HANIFAN GROUP
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Grate Inlet Sizing Computation

FACILITY DESCRIPTION

Project Name: Brent Lane Drainage System & Trail
Date: 3/12/2015
File Name: NDOT Type 2B Facility 9 DI Sta. 38+74.84
By: AJH

Known Information:

Q = Flow (cfs)	5.0	
HW = Available Headwater Depth (ft)	1.50	* 1.5-ft Minimum Sump Depth
Cf = Clogging factor (%)	50	

Weir Conditions:

$P = Q/(HW^{3/2}*Cw)$

Cw = Weir Coefficient	3.30
P = Perimeter of grate (ft)	0.82
Pc = Perimeter (w/clogging) (ft)	1.65
Ar = Area Rectangular grate (ft2)	0.17
Ac = Area of Circular Grate (ft2)	0.22

Orifice Conditions:

$Ag = Q/(Co*(HW*2g)^{1/2})$

Co = Orifice Coefficient	0.67
Ag = Grate Area (ft2)	0.76
Gf = Grate Opening Factor	0.67
g = Gravity (fps)	32.20
Ac = Area Req (w/clogging) (ft2)	2.27

Worst Case Scenario Occurs Under Orifice Conditions

Calculated Square Grate	L =	1.51 ft	* 6 LF Perimeter Length Required.
	W =	1.51 ft	

Worst Case Scenario Occurs Under Orifice Conditions

Calculated Circular Size	D =	20.4 in

Recommendations:

Provide one (1) NDOT Type 2B drop inlet with concrete apron - Grate Dimensions (clear) 2-ft wide by 2.5-ft long. Perimeter Length Provided = 9 LF

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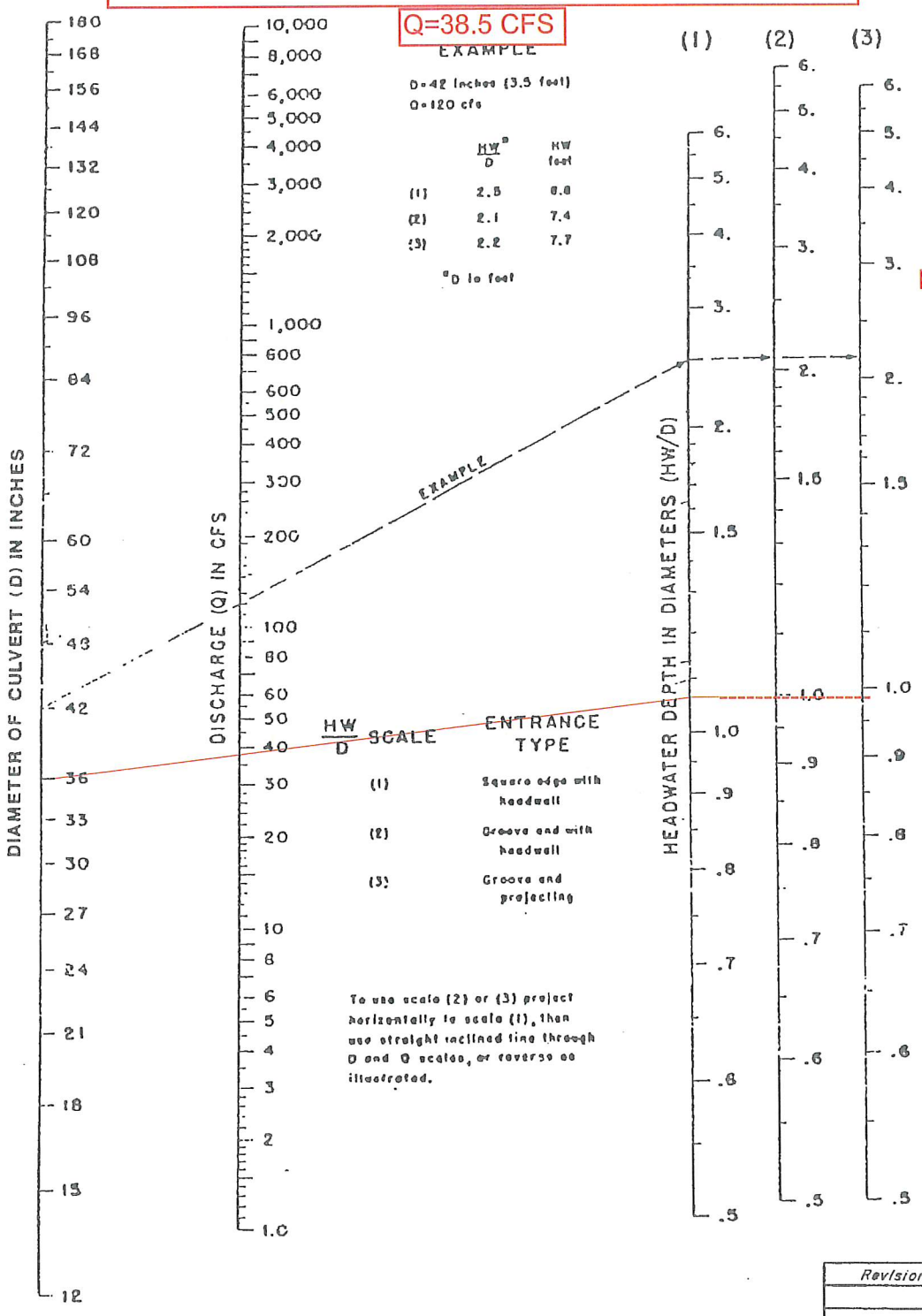
Project:	**Brent Lane Drainage System & Trail**
Title:	**Type CM2 Drop Inlet (SUMP)**
Subtitle:	**17.5-ft Drop Inlet - Facility 11 DI Sta. 39+55.12**
By:	**AJH**
Date:	**3/12/2015**

Input:	**Variable:**	**Input:**
Depth at Inlet (ft)	D	0.83
Grate Width (ft)	W	1.50
Length of Grate (ft)	L_g	15.00
Length of Curb Opening (ft)	L_c	17.50
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)	$2*W+L_g$	18.00
Adjusted Effective Weir Length (ft)	$2*(1-CF_g/100)*W+(1-CF_g/100)*L_g$	9.00
Grate Open Area (sf)	$W*L_g$	22.50
Adjusted Grate Open Area (sf)	Grate Open Area * $G_c*(1-CF_g/100)$	6.75
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)$*D^{1.5}$	20.4
	orifice: O_c*(Adj. Grate Open Area)$*(64.4*D)^{0.5}$	
Output (Curb):	**Equation:**	**Output (Curb):**
Effective Weir Length (ft)	$L+1.8*W$	20.20
Adjusted Effective Weir Length (ft)	$L+1.8(1-CF_c/100)*W$	18.91
Curb Open Area (sf)	$L*H$	9.57
Adjusted Curb Open Area (sf)	Curb Open Area * $(1-CF_c/100)$	4.79
Controlling Flow Type (weir/orifice)	If D<H, weir, else orifice	orifice
Intercepted Flow (cfs)	weir: W_c*(Adj. Eff. Weir Length)$*D^{1.5}$	23.39
	orifice: O_c*(Adj. Curb Open Area)$*(64.4*(D-H/2))^{0.5}$	
Output (Total):		**Output (Total):**
Capacity Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**43.8**
Designed Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**38.5**

NOMOGRAPH – INLET CONTROL RCP

Facility 11 Outlet to 36" RCP: (Interim and Ultimate Condition)



Revision	Date

WRC ENGINEERING

REFERENCE:
USDOT, FHWA, HDS, No. 5, 1985

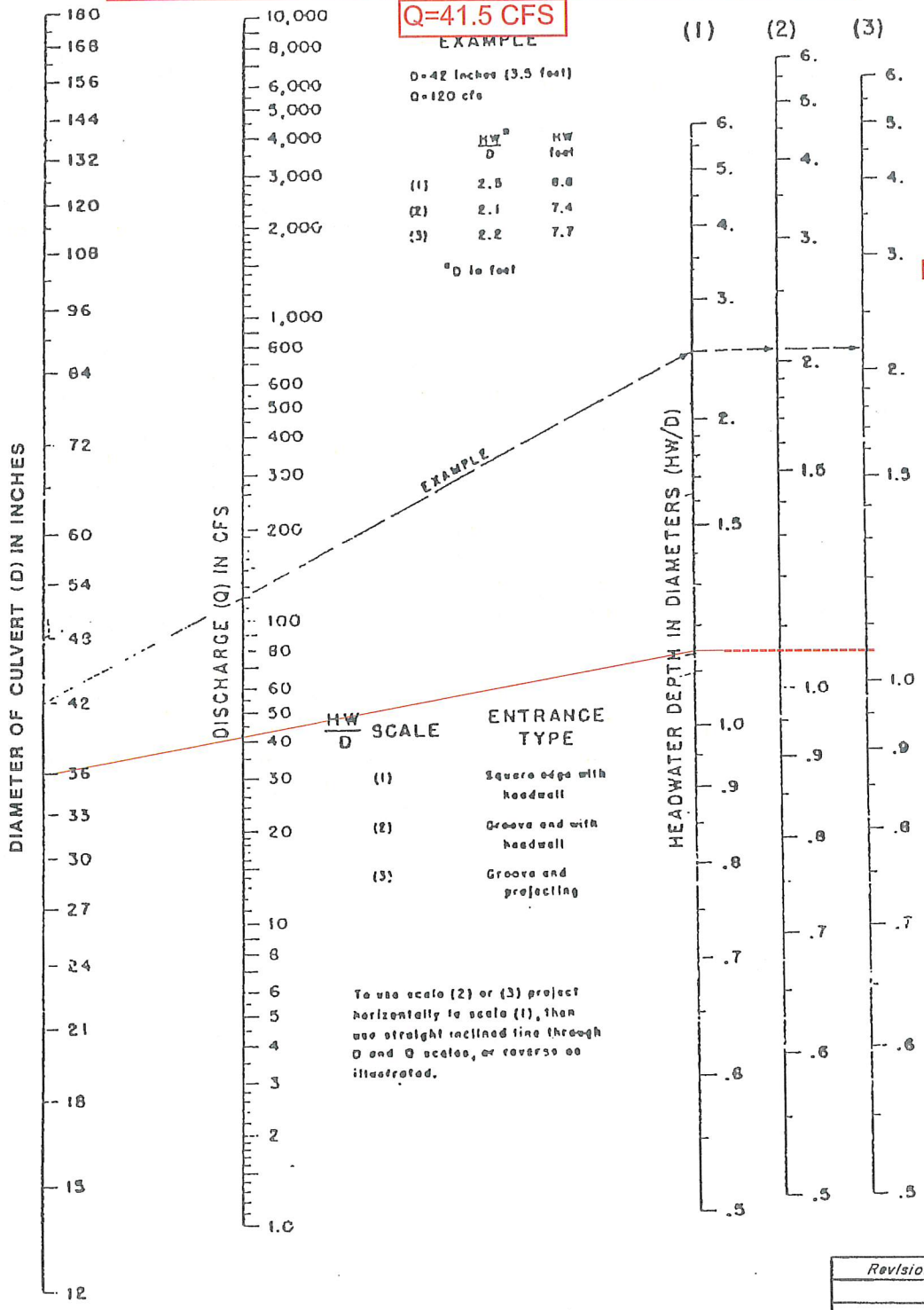
FIGURE 1005

Project:	Brent Lane Drainage System & Trail
Title:	Type CM2 Drop Inlet (SUMP)
Subtitle:	17.5-ft Drop Inlet - Facility 12 DI Sta. 39+54.84
By:	AJH
Date:	3/12/2015

Input:	**Variable:**	**Input:**
Depth at Inlet (ft)	D	0.83
Grate Width (ft)	W	1.50
Length of Grate (ft)	L_g	15.00
Length of Curb Opening (ft)	L_c	17.50
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)	$2*W+L_g$	18.00
Adjusted Effective Weir Length (ft)	$2*(1-CF_g/100)*W+(1-CF_g/100)*L_g$	9.00
Grate Open Area (sf)	$W*L_g$	22.50
Adjusted Grate Open Area (sf)	Grate Open Area * $G_c*(1-CF_g/100)$	6.75
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)$*D^{1.5}$	20.4
	orifice: O_c*(Adj. Grate Open Area)$*(64.4*D)^{0.5}$	
Output (Curb):	**Equation:**	**Output (Curb):**
Effective Weir Length (ft)	$L+1.8*W$	20.20
Adjusted Effective Weir Length (ft)	$L+1.8(1-CF_c/100)*W$	18.91
Curb Open Area (sf)	$L*H$	9.57
Adjusted Curb Open Area (sf)	Curb Open Area * $(1-CF_c/100)$	4.79
Controlling Flow Type (weir/orifice)	If D<H, weir, else orifice	orifice
Intercepted Flow (cfs)	weir: W_c*(Adj. Eff. Weir Length)$*D^{1.5}$	23.39
	orifice: O_c*(Adj. Curb Open Area)$*(64.4*(D-H/2))^{0.5}$	
Output (Total):		**Output (Total):**
Capacity Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**43.8**
Designed Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**41.5**

NOMOGRAPH – INLET CONTROL RCP

Facility 12 Outlet to 36" RCP: (Interim and Ultimate Condition)



Revision	Date

WRC ENGINEERING

REFERENCE: USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

Project:	**Brent Lane Drainage System & Trail**
Title:	**Type DM2 Drop Inlet (SUMP)**
Subtitle:	**5-ft Drop Inlet - Facility 15 DI Sta. 38+63.85**
By:	**AJH**
Date:	**3/12/2015**

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 (Total):		**Output (Total):**
Capacity Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**10.5**
Designed Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**5.0**

SLATER HANIFAN GROUP
CONSULTING ENGINEERS AND PLANNERS

Grate Inlet Sizing Computation

FACILITY DESCRIPTION

Project Name: Brent Lane Drainage System & Trail
Date: 3/12/2015
File Name: NDOT Type 2B Facility 18 DI Sta. 32+62.00
By: AJH

Known Information:

Q = Flow (cfs)	3.0	
HW = Available Headwater Depth (ft)	1.50	* 1.5-ft Minimum Sump Depth
Cf = Clogging factor (%)	50	

Weir Conditions:

$P = Q/(HW^{3/2}*Cw)$

Cw = Weir Coefficient	3.30
P = Perimeter of grate (ft)	0.49
Pc = Perimeter (w/clogging) (ft)	0.99
Ar = Area Rectangular grate (ft2)	0.06
Ac = Area of Circular Grate (ft2)	0.08

Orifice Conditions:

$Ag = Q/(Co*(HW*2g)^{1/2})$

Co = Orifice Coefficient	0.67
Ag = Grate Area (ft2)	0.46
Gf = Grate Opening Factor	0.67
g = Gravity (fps)	32.20
Ac = Area Req (w/clogging) (ft2)	1.36

Worst Case Scenario Occurs Under Orifice Conditions

Calculated Square Grate	L =	1.17 ft	* 4.7 LF Perimeter Length Required.
	W =	1.17 ft	

Worst Case Scenario Occurs Under Orifice Conditions

Calculated Circular Size	D =	15.8 in

Recommendations:

Provide one (1) NDOT Type 2B drop inlet with concrete apron - Grate Dimensions (clear) 2-ft wide by 2.5-ft long. Perimeter Length Provided = 9 LF

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SLATER HANIFAN GROUP
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Grate Inlet Sizing Computation

FACILITY DESCRIPTION

Project Name: Brent Lane Drainage System & Trail
Date: 3/12/2015
File Name: Special Inlet Facility 21 DI Sta. 26+18.76
By: AJH

Known Information:

Q = Flow (cfs)	106.0	
HW = Available Headwater Depth (ft)	1.50	* 1.5-ft Minimum Sump Depth
Cf = Clogging factor (%)	50	

Weir Conditions:

$P = Q/(HW^{3/2}*Cw)$

Cw = Weir Coefficient	3.30
P = Perimeter of grate (ft)	17.48
Pc = Perimeter (w/clogging) (ft)	34.97
Ar = Area Rectangular grate (ft2)	76.43
Ac = Area of Circular Grate (ft2)	97.31

Orifice Conditions:

$Ag = Q/(Co*(HW*2g)^{1/2})$

Co = Orifice Coefficient	0.67
Ag = Grate Area (ft2)	16.10
Gf = Grate Opening Factor	0.67
g = Gravity (fps)	32.20
Ac = Area Req (w/clogging) (ft2)	48.05

Worst Case Scenario Occurs Under Weir Conditions

Calculated Square Grate	L =	8.74 ft	* 35 LF Perimeter Length Required.
	W =	8.74 ft	

Worst Case Scenario Occurs Under Weir Conditions

Calculated Circular Size	D =	133.6 in

Recommendations:

Provide one (1) special drop inlet with concrete apron - Grate Dimensions (clear) 2.5-ft wide by 15-ft long.
Perimeter Length Provided = 35 LF

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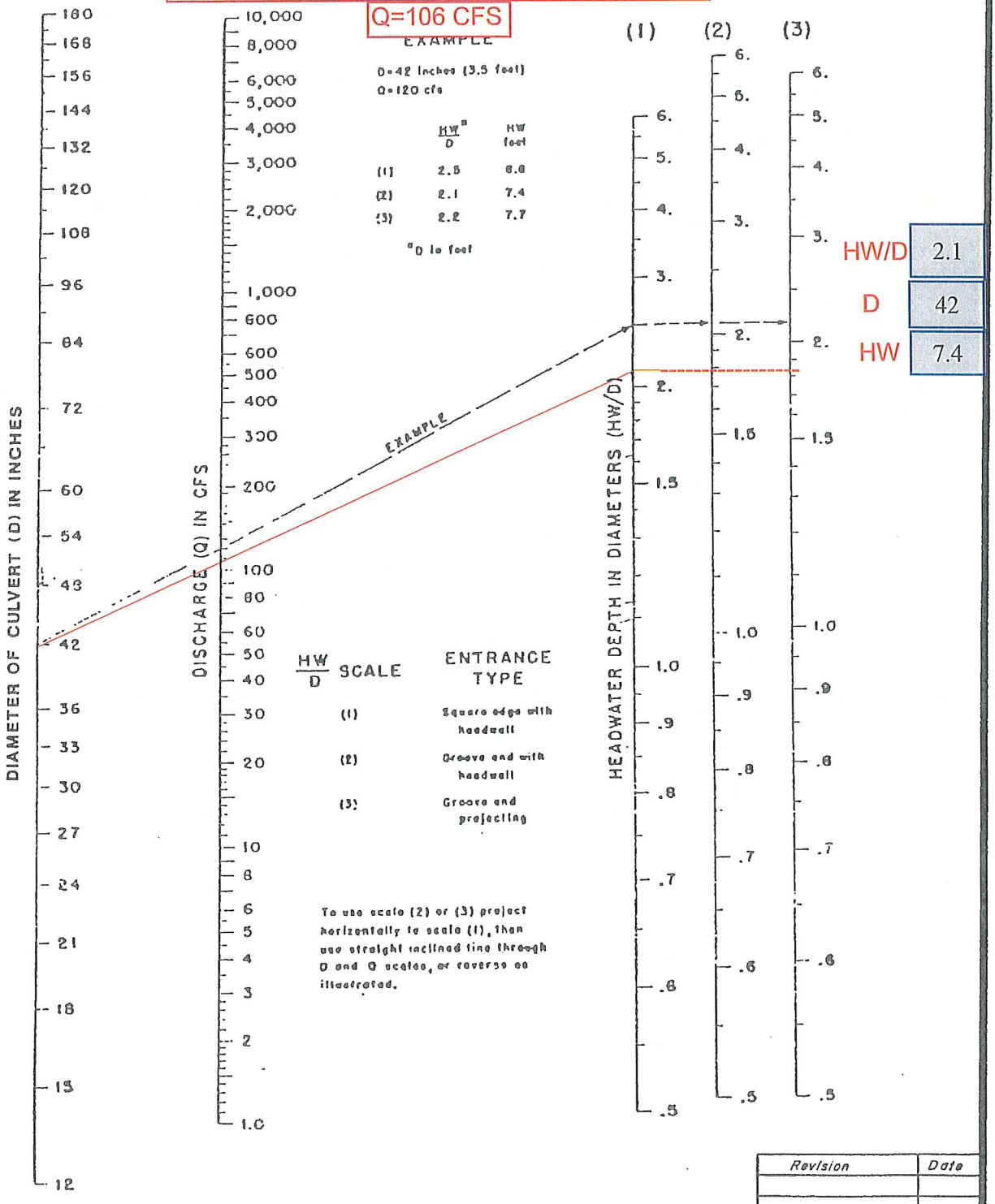
NOMOGRAPH – INLET CONTROL RCP

Facility 21 Outlet to 42" RCP: (Interim Condition)

Q=106 CFS



Revision	Date

WRC ENGINEERING

REFERENCE:
USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

SLATER HANIFAN GROUP
CONSULTING ENGINEERS AND PLANNERS

Grate Inlet Sizing Computation

FACILITY DESCRIPTION

Project Name: Brent Lane Drainage System & Trail
Date: 3/12/2015
File Name: Special Inlet Facility 23 DI Sta. 24+00.83
By: AJH

Known Information:

Q = Flow (cfs)	106.0	
HW = Available Headwater Depth (ft)	1.50	* 1.5-ft Minimum Sump Depth
Cf = Clogging factor (%)	50	

Weir Conditions:

$P = Q/(HW^{3/2}*Cw)$

Cw = Weir Coefficient	3.30
P = Perimeter of grate (ft)	17.48
Pc = Perimeter (w/clogging) (ft)	34.97
Ar = Area Rectangular grate (ft2)	76.43
Ac = Area of Circular Grate (ft2)	97.31

Orifice Conditions:

$Ag = Q/(Co*(HW*2g)^{1/2})$

Co = Orifice Coefficient	0.67
Ag = Grate Area (ft2)	16.10
Gf = Grate Opening Factor	0.67
g = Gravity (fps)	32.20
Ac = Area Req (w/clogging) (ft2)	48.05

Worst Case Scenario Occurs Under Weir Conditions

Calculated Square Grate	L =	8.74 ft	* 35 LF Perimeter Length Required.
	W =	8.74 ft	

Worst Case Scenario Occurs Under Weir Conditions

Calculated Circular Size	D =	133.6 in

Recommendations:

Provide one (1) special drop inlet with concrete apron - Grate Dimensions (clear) 2.5-ft wide by 15-ft long.
Perimeter Length Provided = 35 LF

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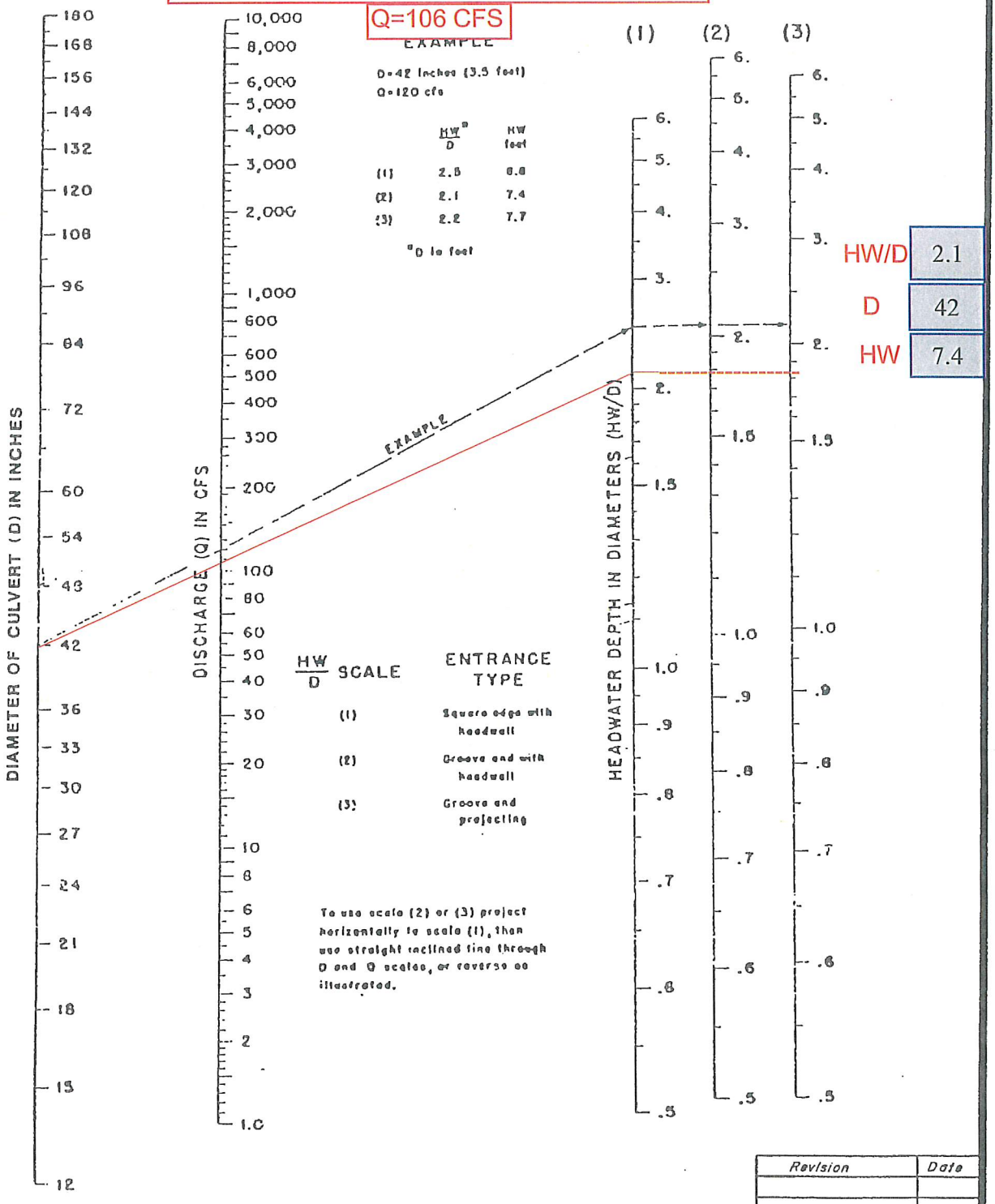
NOMOGRAPH – INLET CONTROL RCP

Facility 23 Outlet to 42" RCP: (Interim Condition)

Q=106 CFS



HW/D 2.1

D 42

HW 7.4

Revision	Date

WRC ENGINEERING

REFERENCE:
USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

SLATER HANIFAN GROUP
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Grate Inlet Sizing Computation

FACILITY DESCRIPTION

Project Name: Brent Lane Drainage System & Trail
Date: 3/12/2015
File Name: NDOT Type 2B Facility 26 DI Sta. 13+86.91
By: AJH

Known Information:

Q = Flow (cfs)	5.0	
HW = Available Headwater Depth (ft)	1.50	* 1.5-ft Minimum Sump Depth
Cf = Clogging factor (%)	50	

Weir Conditions:

$P = Q/(HW^{3/2}*Cw)$

Cw = Weir Coefficient	3.30
P = Perimeter of grate (ft)	0.82
Pc = Perimeter (w/clogging) (ft)	1.65
Ar = Area Rectangular grate (ft2)	0.17
Ac = Area of Circular Grate (ft2)	0.22

Orifice Conditions:

$Ag = Q/(Co*(HW*2g)^{1/2})$

Co = Orifice Coefficient	0.67
Ag = Grate Area (ft2)	0.76
Gf = Grate Opening Factor	0.67
g = Gravity (fps)	32.20
Ac = Area Req (w/clogging) (ft2)	2.27

Worst Case Scenario Occurs Under Orifice Conditions

Calculated Square Grate	L =	1.51 ft	* 6.0 LF Perimeter Length Required.
	W =	1.51 ft	

Worst Case Scenario Occurs Under Orifice Conditions

Calculated Circular Size	D =	20.4 in

Recommendations:

Provide one (1) NDOT Type 2B drop inlet with concrete apron - Grate Dimensions (clear) 2-ft wide by 2.5-ft long. Perimeter Length Provided = 9 LF

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Grate Inlet Sizing Computation

FACILITY DESCRIPTION

Project Name: Brent Lane Drainage System & Trail
Date: 3/12/2015
File Name: NDOT Type 2B Facility 28 DI Sta. 12+61.09
By: AJH

Known Information:

Q = Flow (cfs)	5.0	
HW = Available Headwater Depth (ft)	1.50	* 1.5-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)	1.01
Pc = Perimeter (w/clogging) (ft)	2.02
Ar = Area Rectangular grate (ft2)	0.25
Ac = Area of Circular Grate (ft2)	0.32

Orifice Conditions:

$Ag = Q/(Co*(HW*2g)^{1/2})$

Co = Orifice Coefficient	0.67
Ag = Grate Area (ft2)	0.76
Gf = Grate Opening Factor	0.67
g = Gravity (fps)	32.20
Ac = Area Req (w/clogging) (ft2)	2.27

Worst Case Scenario Occurs Under Orifice Conditions

Calculated Square Grate	L =	1.51 ft	* 6.0 LF Perimeter Length Required.
	W =	1.51 ft	

Worst Case Scenario Occurs Under Orifice Conditions

Calculated Circular Size	D =	20.4 in

Recommendations:

Provide one (1) NDOT Type 2B drop inlet with concrete apron - Grate Dimensions (clear) 2-ft wide by 2.5-ft long. Perimeter Length Provided = 9 LF

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Storm Drain Lateral Systems WSPG-W Analysis

```
T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MAINLINE STA. 39+63.31 TO DI STA. 40+05.50 (FACILITY 4)
SO    1000.0002516.460 48       .013                  2522.511
R     1030.0002519.310 48       .013                             -45.000 1
R     1050.0002521.230 48       .013
SH    1050.0002521.230 48       .013
CD  48  4                 4.000
Q            165.000
```

FILE: MODEL-1.WSW W S P G W - EDIT LISTING - Version 14.07 Date: 3-17-2015 Time: 6:28:18

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	48	4	0		4.000														

W S P G W PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS -

LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS -

MAINLINE STA. 39+63.31 TO DI STA. 40+05.50 (FACILITY 4)

W S P G W PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1000.000	2516.460	48	2522.511

ELEMENT NO 2 IS A REACH

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1030.000	2519.310	48	.013	.000	.000	-45.000	1

ELEMENT NO 3 IS A REACH

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1050.000	2521.230	48	.013	.000	.000	.000	0

ELEMENT NO 4 IS A SYSTEM HEADWORKS

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1050.000	2521.230	48	.000

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 39+63.31 TO DI STA. 40+05.50 (FACILITY 4)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	2516.460	2.263	2518.723	165.00	22.50	7.86	2526.59	.00	3.70	3.97	4.000	.000	.00	0 .0
7.478	.0950					.0336	.25	2.26	2.92	1.69	.013	.00	.00	PIPE
1007.478	2517.170	2.328	2519.498	165.00	21.74	7.34	2526.84	.00	3.70	3.95	4.000	.000	.00	0 .0
8.849	.0950					.0303	.27	2.33	2.76	1.69	.013	.00	.00	PIPE
1016.328	2518.011	2.422	2520.433	165.00	20.73	6.67	2527.11	.00	3.70	3.91	4.000	.000	.00	0 .0
7.426	.0950					.0268	.20	2.42	2.56	1.69	.013	.00	.00	PIPE
1023.754	2518.717	2.522	2521.239	165.00	19.76	6.07	2527.30	.00	3.70	3.86	4.000	.000	.00	0 .0
6.246	.0950					.0238	.15	2.52	2.37	1.69	.013	.00	.00	PIPE
1030.000	2519.311	2.629	2521.939	165.00	18.84	5.51	2527.45	.00	3.70	3.80	4.000	.000	.00	0 .0
4.419	.0960					.0213	.09	2.63	2.19	1.69	.013	.00	.00	PIPE
1034.419	2519.735	2.724	2522.459	165.00	18.10	5.09	2527.55	.00	3.70	3.73	4.000	.000	.00	0 .0
4.446	.0960					.0192	.09	2.72	2.04	1.69	.013	.00	.00	PIPE
1038.864	2520.161	2.845	2523.006	165.00	17.26	4.63	2527.63	.00	3.70	3.63	4.000	.000	.00	0 .0
3.671	.0960					.0171	.06	2.85	1.87	1.69	.013	.00	.00	PIPE
1042.535	2520.514	2.976	2523.490	165.00	16.46	4.21	2527.70	.00	3.70	3.49	4.000	.000	.00	0 .0
2.959	.0960					.0154	.05	2.98	1.71	1.69	.013	.00	.00	PIPE
1045.494	2520.798	3.120	2523.917	165.00	15.69	3.82	2527.74	.00	3.70	3.31	4.000	.000	.00	0 .0
2.277	.0960					.0139	.03	3.12	1.55	1.69	.013	.00	.00	PIPE

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 39+63.31 TO DI STA. 40+05.50 (FACILITY 4)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1047.771	2521.016	3.280	2524.296	165.00	14.96	3.48	2527.77	.00	3.70	3.07	4.000	.000	.00	0 .0
1.567	.0960					.0126	.02	3.28	1.39	1.69	.013	.00	.00	PIPE
1049.338	2521.167	3.466	2524.632	165.00	14.26	3.16	2527.79	.00	3.70	2.72	4.000	.000	.00	0 .0
.662	.0960					.0118	.01	3.47	1.22	1.69	.013	.00	.00	PIPE
1050.000	2521.230	3.698	2524.928	165.00	13.60	2.87	2527.80	.00	3.70	2.11	4.000	.000	.00	0 .0

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T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MAINLINE STA. 39+21.28 TO DI STA. 39+51.64, 98.18'RT (FACILITY 7)
SO    1000.0002515.640 36       .013                2522.025
R     1009.0002516.220 36       .013                                    30.00  1
R     1033.0002517.830 36       .013                                           1
JX    1033.0002518.330 30 30    .013   15.00          2518.33          -70.0
R     1074.0002520.520 30       .013                                   -70.00  1
R     1101.0002522.280 30       .013
SH    1101.0002522.280 30       .013
CD  30  4   1     .000   2.50
CD  36  4   1     .000   3.00
Q              40.00
```

FILE: MODEL-2.WSW W S P G W - EDIT LISTING - Version 14.07 Date: 3-17-2015 Time: 6:17:11

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	30	4	1		2.500														
CD	36	4	1		3.000														

W S P G W

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS -

LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS -

MAINLINE STA. 39+21.28 TO DI STA. 39+51.64, 98.18'RT (FACILITY 7)

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

	STATION	INVERT	SECT																
U/S DATA	1000.000	2515.640	36																

W S ELEV 2522.025

ELEMENT NO 2 IS A REACH

	STATION	INVERT	SECT		N							RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1009.000	2516.220	36		.013							.000	.000	30.000	1

ELEMENT NO 3 IS A REACH

	STATION	INVERT	SECT		N							RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1033.000	2517.830	36		.013							.000	.000	.000	1

ELEMENT NO 4 IS A JUNCTION

	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4			
U/S DATA	1033.000	2518.330	30	30	0	.013	15.000	.000	2518.330	.000	-70.000	.000			
									RADIUS	ANGLE					
									.000	.000					

ELEMENT NO 5 IS A REACH

	STATION	INVERT	SECT		N							RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1074.000	2520.520	30		.013							.000	.000	-70.000	1

ELEMENT NO 6 IS A REACH

	STATION	INVERT	SECT		N							RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1101.000	2522.280	30		.013							.000	.000	.000	0

ELEMENT NO 7 IS A SYSTEM HEADWORKS

	STATION	INVERT	SECT
U/S DATA	1101.000	2522.280	30

W S ELEV .000

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 39+21.28 TO DI STA. 39+51.64, 98.18'RT (FACILITY 7)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2515.640	6.385	2522.025	55.00	7.78	.94	2522.97	.00	2.41	.00	3.000	.000	.00	1 .0
9.000	.0645					.0068	.06	6.39	.00	1.18	.013	.00	.00	PIPE
1009.000	2516.220	6.006	2522.226	55.00	7.78	.94	2523.17	.00	2.41	.00	3.000	.000	.00	1 .0
24.000	.0671					.0068	.16	6.01	.00	1.16	.013	.00	.00	PIPE
1033.000	2517.830	4.606	2522.436	55.00	7.78	.94	2523.38	.00	2.41	.00	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0082	.00	4.61	.00		.013	.00	.00	PIPE
1033.000	2518.330	4.554	2522.884	40.00	8.15	1.03	2523.92	.00	2.13	.00	2.500	.000	.00	1 .0
35.550	.0534					.0095	.34	4.55	.00	1.13	.013	.00	.00	PIPE
1068.550	2520.229	3.243	2523.472	40.00	8.15	1.03	2524.50	.00	2.13	.00	2.500	.000	.00	1 .0
HYDRAULIC JUMP														
1068.550	2520.229	1.352	2521.581	40.00	14.76	3.39	2524.97	.00	2.13	2.49	2.500	.000	.00	1 .0
5.450	.0534					.0284	.15	1.35	2.50	1.13	.013	.00	.00	PIPE
1074.000	2520.520	1.377	2521.897	40.00	14.43	3.23	2525.13	.00	2.13	2.49	2.500	.000	.00	1 .0
5.769	.0652					.0261	.15	1.38	2.41	1.07	.013	.00	.00	PIPE
1079.769	2520.896	1.428	2522.324	40.00	13.80	2.96	2525.28	.00	2.13	2.47	2.500	.000	.00	1 .0
5.024	.0652					.0231	.12	1.43	2.25	1.07	.013	.00	.00	PIPE
1084.793	2521.223	1.486	2522.709	40.00	13.16	2.69	2525.40	.00	2.13	2.46	2.500	.000	.00	1 .0
4.105	.0652					.0204	.08	1.49	2.08	1.07	.013	.00	.00	PIPE

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 39+21.28 TO DI STA. 39+51.64, 98.18'RT (FACILITY 7)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1088.897	2521.491	1.547	2523.037	40.00	12.54	2.44	2525.48	.00	2.13	2.43	2.500	.000	.00	1 .0
3.347	.0652					.0181	.06	1.55	1.93	1.07	.013	.00	.00	PIPE
1092.244	2521.709	1.611	2523.320	40.00	11.96	2.22	2525.54	.00	2.13	2.39	2.500	.000	.00	1 .0
2.711	.0652					.0161	.04	1.61	1.78	1.07	.013	.00	.00	PIPE
1094.956	2521.886	1.680	2523.566	40.00	11.40	2.02	2525.58	.00	2.13	2.35	2.500	.000	.00	1 .0
2.156	.0652					.0143	.03	1.68	1.64	1.07	.013	.00	.00	PIPE
1097.111	2522.026	1.754	2523.780	40.00	10.87	1.84	2525.62	.00	2.13	2.29	2.500	.000	.00	1 .0
1.661	.0652					.0128	.02	1.75	1.51	1.07	.013	.00	.00	PIPE
1098.773	2522.135	1.834	2523.968	40.00	10.37	1.67	2525.64	.00	2.13	2.21	2.500	.000	.00	1 .0
1.202	.0652					.0114	.01	1.83	1.38	1.07	.013	.00	.00	PIPE
1099.975	2522.213	1.921	2524.134	40.00	9.88	1.52	2525.65	.00	2.13	2.11	2.500	.000	.00	1 .0
.753	.0652					.0103	.01	1.92	1.26	1.07	.013	.00	.00	PIPE
1100.728	2522.262	2.017	2524.280	40.00	9.42	1.38	2525.66	.00	2.13	1.97	2.500	.000	.00	1 .0
.272	.0652					.0094	.00	2.02	1.13	1.07	.013	.00	.00	PIPE
1101.000	2522.280	2.129	2524.408	40.00	8.98	1.25	2525.66	.00	2.13	1.78	2.500	.000	.00	1 .0

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T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MH STA. 39+21.10, 38.53'RT TO DI STA. 39+52.82, 57.35'RT (FACILITY 8)
SO   1000.0002518.330 30      .013                2522.884
R    1027.0002521.140 30      .013
SH   1027.0002521.140 30      .013
CD  30  4   1           2.500
Q            15.000
```

MODEL-3.EDT

FILE: MODEL-3.WSW W S P G W - EDIT LISTING - Version 14.07 Date: 3-17-2015 Time: 6:21:53

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	30	4	1		2.500														

W S P G W PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS -

LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS -

MH STA. 39+21.10, 38.53'RT TO DI STA. 39+52.82, 57.35'RT (FACILITY 8)

W S P G W PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	2518.330	30	2522.884

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1027.000	2521.140	30	.013	.000	.000	.000	0

ELEMENT NO 3 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1027.000	2521.140	30	.000

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MH STA. 39+21.10, 38.53'RT TO DI STA. 39+52.82, 57.35'RT (FACILITY 8)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2518.330	4.554	2522.884	15.00	3.06	.14	2523.03	.00	1.31	.00	2.500	.000	.00	1 .0
19.994	.1041					.0013	.03	4.55	.00	.57	.013	.00	.00	PIPE
1019.994	2520.411	2.500	2522.911	15.00	3.06	.14	2523.06	.00	1.31	.00	2.500	.000	.00	1 .0
2.104	.1041					.0012	.00	2.50	.00	.57	.013	.00	.00	PIPE
1022.097	2520.630	2.268	2522.898	15.00	3.20	.16	2523.06	.00	1.31	1.45	2.500	.000	.00	1 .0
1.154	.1041					.0012	.00	2.27	.31	.57	.013	.00	.00	PIPE
1023.251	2520.750	2.134	2522.884	15.00	3.36	.18	2523.06	.00	1.31	1.77	2.500	.000	.00	1 .0
.909	.1041					.0013	.00	2.13	.37	.57	.013	.00	.00	PIPE
1024.160	2520.845	2.023	2522.867	15.00	3.53	.19	2523.06	.00	1.31	1.97	2.500	.000	.00	1 .0
.759	.1041					.0014	.00	2.02	.42	.57	.013	.00	.00	PIPE
1024.919	2520.924	1.925	2522.849	15.00	3.70	.21	2523.06	.00	1.31	2.10	2.500	.000	.00	1 .0
.648	.1041					.0016	.00	1.93	.47	.57	.013	.00	.00	PIPE
1025.567	2520.991	1.838	2522.829	15.00	3.88	.23	2523.06	.00	1.31	2.21	2.500	.000	.00	1 .0
.555	.1041					.0018	.00	1.84	.52	.57	.013	.00	.00	PIPE
1026.122	2521.049	1.758	2522.807	15.00	4.07	.26	2523.06	.00	1.31	2.28	2.500	.000	.00	1 .0
.474	.1041					.0020	.00	1.76	.56	.57	.013	.00	.00	PIPE
1026.596	2521.098	1.684	2522.782	15.00	4.27	.28	2523.06	.00	1.31	2.34	2.500	.000	.00	1 .0
.401	.1041					.0022	.00	1.68	.61	.57	.013	.00	.00	PIPE

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MH STA. 39+21.10, 38.53'RT TO DI STA. 39+52.82, 57.35'RT (FACILITY 8)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1027.000	2521.140	1.614	2522.754	15.00	4.48	.31	2523.07	.00	1.31	2.39	2.500	.000	.00	1 .0

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T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MAINLINE STA. 39+22.42 TO DI STA. 39+55.12, 123.50'LT (FACILITY 13)
SO   1000.0002515.640 36      .013                2521.446
R    1010.0002515.970 36      .013                                    -32.00  1
R    1061.0002517.670 36      .013                                            1
JX   1061.0002517.670 36 36   .013   41.50          2517.67          46.0
R    1103.0002519.060 36      .013                                     61.00  1
R    1131.0002521.830 36      .013
SH   1131.0002521.830 36      .013
CD  36  4   1          3.000
Q           38.500
```

FILE: MODEL-4.WSW W S P G W - EDIT LISTING - Version 14.07 Date: 3-17-2015 Time: 6:11:42

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	36	4	1		3.000														

W S P G W PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS -
LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS -
MAINLINE STA. 39+22.42 TO DI STA. 39+55.12, 123.50'LT (FACILITY 13)

W S P G W PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1000.000	2515.640	36	2521.446

ELEMENT NO 2 IS A REACH

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1010.000	2515.970	36	.013	.000	.000	-32.000	1

ELEMENT NO 3 IS A REACH

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1061.000	2517.670	36	.013	.000	.000	.000	1

ELEMENT NO 4 IS A JUNCTION

	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
U/S DATA	1061.000	2517.670	36	36	0	.013	41.500	.000	2517.670	.000	46.000	.000

RADIUS	ANGLE
.000	.000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 5 IS A REACH

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1103.000	2519.060	36	.013	.000	.000	61.000	1

ELEMENT NO 6 IS A REACH

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1131.000	2521.830	36	.013	.000	.000	.000	0

ELEMENT NO 7 IS A SYSTEM HEADWORKS

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1131.000	2521.830	36	.000

♀ FILE: MODEL-4.WSW W S P G W - CIVILDESIGN Version 14.07

Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING Date: 3-17-2015 Time: 6:11:43

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 39+22.42 TO DI STA. 39+55.12, 123.50'LT (FACILITY 13)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2515.640	5.806	2521.446	80.00	11.32	1.99	2523.44	.00	2.77	.00	3.000	.000	.00	1 .0
10.000	.0330					.0144	.14	5.81	.00	1.78	.013	.00	.00	PIPE
1010.000	2515.970	5.929	2521.899	80.00	11.32	1.99	2523.89	.00	2.77	.00	3.000	.000	.00	1 .0
51.000	.0333					.0144	.73	5.93	.00	1.77	.013	.00	.00	PIPE
1061.000	2517.670	5.063	2522.733	80.00	11.32	1.99	2524.72	.00	2.77	.00	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0089	.00	5.06	.00		.013	.00	.00	PIPE
1061.000	2517.670	7.376	2525.046	38.50	5.45	.46	2525.51	.00	2.02	.00	3.000	.000	.00	1 .0
42.000	.0331					.0033	.14	7.38	.00	1.16	.013	.00	.00	PIPE
1103.000	2519.060	6.241	2525.301	38.50	5.45	.46	2525.76	.00	2.02	.00	3.000	.000	.00	1 .0
28.000	.0989					.0033	.09	6.24	.00	.87	.013	.00	.00	PIPE
1131.000	2521.830	3.564	2525.395	38.50	5.45	.46	2525.86	.00	2.02	.00	3.000	.000	.00	1 .0

♀

Models

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T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MH STA. 39+33.10, 64.95'LT TO DI STA. 39+54.84, 93.04'LT (FACILITY 14)
SO    1000.0002517.670 36       .013                    2525.046
R     1035.0002519.970 36       .013
SH    1035.0002519.970 36       .013
CD  36  4   1             3.000
Q             38.500
```

FILE: MODEL-5.WSW W S P G W - EDIT LISTING - Version 14.07 Date: 3-17-2015 Time: 6:13:24
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	36	4	1		3.000														

W S P G W PAGE NO 1
WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS -
LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS -
MH STA. 39+33.10, 64.95'LT TO DI STA. 39+54.84, 93.04'LT (FACILITY 14)

W S P G W PAGE NO 2
WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1000.000	2517.670	36	2525.046

ELEMENT NO 2 IS A REACH * * *

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1035.000	2519.970	36	.013	.000	.000	.000	0

ELEMENT NO 3 IS A SYSTEM HEADWORKS *

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1035.000	2519.970	36	.000

♀ FILE: MODEL-5.WSW

W S P G W - CIVILDESIGN Version 14.07
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-17-2015 Time: 6:13:25

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MH STA. 39+33.10, 64.95'LT TO DI STA. 39+54.84, 93.04'LT (FACILITY 14)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2517.670	7.376	2525.046	38.50	5.45	.46	2525.51	.00	2.02	.00	3.000	.000	.00	1 .0
35.000	.0657					.0033	.12	7.38	.00	.97	.013	.00	.00	PIPE
1035.000	2519.970	5.193	2525.163	38.50	5.45	.46	2525.62	.00	2.02	.00	3.000	.000	.00	1 .0

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T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MAINLINE STA. 38+76.98 TO DI STA. 38+63.85, 91.81'LT (FACILITY 16)
SO   1000.0002514.730 18      .013                2519.049
R    1076.0002519.280 18      .013                                    -45.00  1
R    1090.0002520.140 18      .013
SH   1090.0002520.140 18      .013
CD  18  4   1          1.500
Q            5.000
```

FILE: MODEL-6.WSW W S P G W - EDIT LISTING - Version 14.07 Date: 3-17-2015 Time: 6: 4: 7
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4	1		1.500														

W S P G W PAGE NO 1
WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS -
LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS -
MAINLINE STA. 38+76.98 TO DI STA. 38+63.85, 91.81'LT (FACILITY 16)

W S P G W PAGE NO 2
WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1000.000	2514.730	18	2519.049

ELEMENT NO 2 IS A REACH * * *

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1076.000	2519.280	18	.013	.000	.000	-45.000	1

ELEMENT NO 3 IS A REACH * * *

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1090.000	2520.140	18	.013	.000	.000	.000	0

ELEMENT NO 4 IS A SYSTEM HEADWORKS * *

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1090.000	2520.140	18	.000

† FILE: MODEL-6.WSW

W S P G W - CIVILDESIGN Version 14.07
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-17-2015 Time: 6: 4: 8

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 38+76.98 TO DI STA. 38+63.85, 91.81'LT (FACILITY 16)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	2514.730	4.319	2519.049	5.00	2.83	.12	2519.17	.00	.86	.00	1.500	.000	.00	1 .0
49.330	.0599					.0022	.11	4.32	.00	.45	.013	.00	.00	PIPE
1049.330	2517.683	1.500	2519.183	5.00	2.83	.12	2519.31	.00	.86	.00	1.500	.000	.00	1 .0
.275	.0599					.0022	.00	1.50	.00	.45	.013	.00	.00	PIPE
1049.605	2517.700	1.500	2519.200	5.00	2.83	.12	2519.32	.00	.86	.00	1.500	.000	.00	1 .0
HYDRAULIC JUMP														
1049.605	2517.700	.461	2518.161	5.00	10.84	1.82	2519.98	.00	.86	1.38	1.500	.000	.00	1 .0
8.202	.0599					.0504	.41	.46	3.31	.45	.013	.00	.00	PIPE
1057.806	2518.191	.477	2518.668	5.00	10.33	1.66	2520.33	.00	.86	1.40	1.500	.000	.00	1 .0
8.481	.0599					.0441	.37	.48	3.09	.45	.013	.00	.00	PIPE
1066.287	2518.698	.494	2519.193	5.00	9.85	1.51	2520.70	.00	.86	1.41	1.500	.000	.00	1 .0
5.630	.0599					.0386	.22	.49	2.89	.45	.013	.00	.00	PIPE
1071.917	2519.036	.512	2519.547	5.00	9.39	1.37	2520.92	.00	.86	1.42	1.500	.000	.00	1 .0
4.083	.0599					.0339	.14	.51	2.71	.45	.013	.00	.00	PIPE
1076.000	2519.280	.530	2519.810	5.00	8.95	1.25	2521.06	.00	.86	1.43	1.500	.000	.00	1 .0
.703	.0614					.0312	.02	.53	2.53	.45	.013	.00	.00	PIPE
1076.703	2519.323	.534	2519.857	5.00	8.87	1.22	2521.08	.00	.86	1.44	1.500	.000	.00	1 .0
2.839	.0614					.0289	.08	.53	2.50	.45	.013	.00	.00	PIPE

† FILE: MODEL-6.WSW

W S P G W - CIVILDESIGN Version 14.07
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-17-2015 Time: 6: 4: 8

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 38+76.98 TO DI STA. 38+63.85, 91.81'LT (FACILITY 16)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1079.541	2519.498	.553	2520.050	5.00	8.46	1.11	2521.16	.00	.86	1.45	1.500	.000	.00	1 .0
2.253	.0614					.0254	.06	.55	2.33	.45	.013	.00	.00	PIPE
1081.794	2519.636	.572	2520.208	5.00	8.07	1.01	2521.22	.00	.86	1.46	1.500	.000	.00	1 .0
1.818	.0614					.0223	.04	.57	2.18	.45	.013	.00	.00	PIPE
1083.612	2519.748	.593	2520.341	5.00	7.69	.92	2521.26	.00	.86	1.47	1.500	.000	.00	1 .0
1.481	.0614					.0195	.03	.59	2.04	.45	.013	.00	.00	PIPE
1085.093	2519.839	.615	2520.453	5.00	7.33	.84	2521.29	.00	.86	1.48	1.500	.000	.00	1 .0
1.207	.0614					.0172	.02	.61	1.90	.45	.013	.00	.00	PIPE
1086.300	2519.913	.637	2520.550	5.00	6.99	.76	2521.31	.00	.86	1.48	1.500	.000	.00	1 .0
.982	.0614					.0151	.01	.64	1.77	.45	.013	.00	.00	PIPE
1087.283	2519.973	.661	2520.634	5.00	6.67	.69	2521.32	.00	.86	1.49	1.500	.000	.00	1 .0
.794	.0614					.0132	.01	.66	1.66	.45	.013	.00	.00	PIPE
1088.077	2520.022	.685	2520.707	5.00	6.36	.63	2521.33	.00	.86	1.49	1.500	.000	.00	1 .0
.630	.0614					.0116	.01	.69	1.54	.45	.013	.00	.00	PIPE
1088.707	2520.061	.711	2520.771	5.00	6.06	.57	2521.34	.00	.86	1.50	1.500	.000	.00	1 .0
.488	.0614					.0102	.00	.71	1.44	.45	.013	.00	.00	PIPE
1089.194	2520.091	.738	2520.828	5.00	5.78	.52	2521.35	.00	.86	1.50	1.500	.000	.00	1 .0
.364	.0614					.0090	.00	.74	1.34	.45	.013	.00	.00	PIPE

† FILE: MODEL-6.WSW

W S P G W - CIVILDESIGN Version 14.07
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-17-2015 Time: 6: 4: 8

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 38+76.98 TO DI STA. 38+63.85, 91.81'LT (FACILITY 16)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip

L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1089.558	2520.113	.766	2520.879	5.00	5.51	.47	2521.35	.00	.86	1.50	1.500	.000	.00	1	.0
.248	.0614					.0079	.00	.77	1.25	.45	.013	.00	.00	PIPE	
1089.806	2520.128	.795	2520.923	5.00	5.25	.43	2521.35	.00	.86	1.50	1.500	.000	.00	1	.0
.146	.0614					.0070	.00	.80	1.16	.45	.013	.00	.00	PIPE	
1089.953	2520.137	.826	2520.963	5.00	5.01	.39	2521.35	.00	.86	1.49	1.500	.000	.00	1	.0
.047	.0614					.0062	.00	.83	1.08	.45	.013	.00	.00	PIPE	
1090.000	2520.140	.860	2521.000	5.00	4.77	.35	2521.35	.00	.86	1.48	1.500	.000	.00	1	.0

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T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MAINLINE STA. 38+74.77 TO DI STA. 38+74.81, 34.55'RT (FACILITY 10)
SO   1000.0002514.690 18       .013                2519.049
R    1028.0002522.880 18       .013
SH   1028.0002522.880 18       .013
CD  18  4   1           1.500
Q             5.00
```

FILE: MODEL-7.WSW

W S P G W - EDIT LISTING - Version 14.07 Date: 3-17-2015 Time: 6: 2:22

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4	1		1.500														

W S P G W

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS -
LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS -
MAINLINE STA. 38+74.77 TO DI STA. 38+74.81, 34.55'RT (FACILITY 10)

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1000.000	2514.690	18	2519.049

ELEMENT NO 2 IS A REACH

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1028.000	2522.880	18	.013	.000	.000	.000	0

ELEMENT NO 3 IS A SYSTEM HEADWORKS

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1028.000	2522.880	18	.000

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 38+74.77 TO DI STA. 38+74.81, 34.55'RT (FACILITY 10)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2514.690	4.359	2519.049	5.00	2.83	.12	2519.17	.00	.86	.00	1.500	.000	.00	1 .0
8.046	.2925					.0023	.02	4.36	.00	.30	.013	.00	.00	PIPE
1008.046	2517.043	2.024	2519.067	5.00	2.83	.12	2519.19	.00	.86	.00	1.500	.000	.00	1 .0
HYDRAULIC JUMP														
1008.046	2517.043	.331	2517.374	5.00	17.30	4.65	2522.02	.00	.86	1.24	1.500	.000	.00	1 .0
2.778	.2925					.1870	.52	.33	6.32	.30	.013	.00	.00	PIPE
1010.824	2517.855	.342	2518.197	5.00	16.49	4.22	2522.42	.00	.86	1.26	1.500	.000	.00	1 .0
2.882	.2925					.1634	.47	.34	5.92	.30	.013	.00	.00	PIPE
1013.707	2518.698	.354	2519.052	5.00	15.72	3.84	2522.89	.00	.86	1.27	1.500	.000	.00	1 .0
2.251	.2925					.1429	.32	.35	5.54	.30	.013	.00	.00	PIPE
1015.958	2519.357	.366	2519.723	5.00	14.99	3.49	2523.21	.00	.86	1.29	1.500	.000	.00	1 .0
1.818	.2925					.1249	.23	.37	5.19	.30	.013	.00	.00	PIPE
1017.775	2519.889	.378	2520.267	5.00	14.29	3.17	2523.44	.00	.86	1.30	1.500	.000	.00	1 .0
1.503	.2925					.1093	.16	.38	4.86	.30	.013	.00	.00	PIPE
1019.278	2520.328	.391	2520.720	5.00	13.63	2.88	2523.60	.00	.86	1.32	1.500	.000	.00	1 .0
1.263	.2925					.0956	.12	.39	4.55	.30	.013	.00	.00	PIPE
1020.541	2520.698	.405	2521.103	5.00	12.99	2.62	2523.72	.00	.86	1.33	1.500	.000	.00	1 .0
1.073	.2925					.0836	.09	.40	4.26	.30	.013	.00	.00	PIPE

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 38+74.77 TO DI STA. 38+74.81, 34.55'RT (FACILITY 10)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1021.614	2521.012	.419	2521.431	5.00	12.39	2.38	2523.81	.00	.86	1.35	1.500	.000	.00	1 .0
.922	.2925					.0732	.07	.42	3.99	.30	.013	.00	.00	PIPE
1022.536	2521.281	.433	2521.715	5.00	11.81	2.17	2523.88	.00	.86	1.36	1.500	.000	.00	1 .0
.796	.2925					.0640	.05	.43	3.73	.30	.013	.00	.00	PIPE
1023.332	2521.514	.449	2521.963	5.00	11.26	1.97	2523.93	.00	.86	1.37	1.500	.000	.00	1 .0
.691	.2925					.0561	.04	.45	3.49	.30	.013	.00	.00	PIPE
1024.023	2521.716	.464	2522.180	5.00	10.74	1.79	2523.97	.00	.86	1.39	1.500	.000	.00	1 .0
.601	.2925					.0491	.03	.46	3.27	.30	.013	.00	.00	PIPE
1024.625	2521.892	.481	2522.373	5.00	10.24	1.63	2524.00	.00	.86	1.40	1.500	.000	.00	1 .0
.525	.2925					.0430	.02	.48	3.05	.30	.013	.00	.00	PIPE
1025.150	2522.046	.498	2522.543	5.00	9.76	1.48	2524.02	.00	.86	1.41	1.500	.000	.00	1 .0
.459	.2925					.0377	.02	.50	2.86	.30	.013	.00	.00	PIPE
1025.609	2522.180	.515	2522.695	5.00	9.31	1.35	2524.04	.00	.86	1.42	1.500	.000	.00	1 .0
.400	.2925					.0330	.01	.52	2.67	.30	.013	.00	.00	PIPE
1026.009	2522.297	.534	2522.831	5.00	8.87	1.22	2524.05	.00	.86	1.44	1.500	.000	.00	1 .0
.350	.2925					.0289	.01	.53	2.50	.30	.013	.00	.00	PIPE
1026.359	2522.400	.553	2522.952	5.00	8.46	1.11	2524.06	.00	.86	1.45	1.500	.000	.00	1 .0
.304	.2925					.0254	.01	.55	2.33	.30	.013	.00	.00	PIPE

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 38+74.77 TO DI STA. 38+74.81, 34.55'RT (FACILITY 10)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip

L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1026.663	2522.489	.572	2523.061	5.00	8.07	1.01	2524.07	.00	.86	1.46	1.500	.000	.00	1 .0
.263	.2925					.0223	.01	.57	2.18	.30	.013	.00	.00	PIPE
1026.926	2522.566	.593	2523.159	5.00	7.69	.92	2524.08	.00	.86	1.47	1.500	.000	.00	1 .0
.227	.2925					.0195	.00	.59	2.04	.30	.013	.00	.00	PIPE
1027.154	2522.632	.615	2523.247	5.00	7.33	.84	2524.08	.00	.86	1.48	1.500	.000	.00	1 .0
.194	.2925					.0172	.00	.61	1.90	.30	.013	.00	.00	PIPE
1027.348	2522.689	.637	2523.326	5.00	6.99	.76	2524.09	.00	.86	1.48	1.500	.000	.00	1 .0
.164	.2925					.0151	.00	.64	1.77	.30	.013	.00	.00	PIPE
1027.512	2522.737	.661	2523.398	5.00	6.67	.69	2524.09	.00	.86	1.49	1.500	.000	.00	1 .0
.137	.2925					.0132	.00	.66	1.66	.30	.013	.00	.00	PIPE
1027.649	2522.777	.685	2523.462	5.00	6.36	.63	2524.09	.00	.86	1.49	1.500	.000	.00	1 .0
.112	.2925					.0116	.00	.69	1.54	.30	.013	.00	.00	PIPE
1027.760	2522.810	.711	2523.521	5.00	6.06	.57	2524.09	.00	.86	1.50	1.500	.000	.00	1 .0
.089	.2925					.0102	.00	.71	1.44	.30	.013	.00	.00	PIPE
1027.849	2522.836	.738	2523.573	5.00	5.78	.52	2524.09	.00	.86	1.50	1.500	.000	.00	1 .0
.067	.2925					.0090	.00	.74	1.34	.30	.013	.00	.00	PIPE
1027.916	2522.855	.766	2523.621	5.00	5.51	.47	2524.09	.00	.86	1.50	1.500	.000	.00	1 .0
.047	.2925					.0079	.00	.77	1.25	.30	.013	.00	.00	PIPE

♀ FILE: MODEL-7.WSW W S P G W - CIVILDESIGN Version 14.07

Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING

Date: 3-17-2015 Time: 6: 2:23

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 38+74.77 TO DI STA. 38+74.81, 34.55'RT (FACILITY 10)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1027.963	2522.869	.795	2523.665	5.00	5.25	.43	2524.09	.00	.86	1.50	1.500	.000	.00	1 .0
.028	.2925					.0070	.00	.80	1.16	.30	.013	.00	.00	PIPE
1027.991	2522.877	.826	2523.704	5.00	5.01	.39	2524.09	.00	.86	1.49	1.500	.000	.00	1 .0
.009	.2925					.0062	.00	.83	1.08	.30	.013	.00	.00	PIPE
1028.000	2522.880	.860	2523.740	5.00	4.77	.35	2524.09	.00	.86	1.48	1.500	.000	.00	1 .0

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T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MAINLINE STA. 32+25.00 TO DI STA. 32+62.00, 43.00'LT (FACILITY 19)
SO   1000.0002499.600 18       .013                  2502.403
R    1051.0002505.650 18       .013
SH   1051.0002505.650 18       .013
CD  18  4   1           1.500
Q             3.000
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CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 / DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4	1		1.500														

W S P G W
WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS -
LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS -
MAINLINE STA. 32+25.00 TO DI STA. 32+62.00, 43.00'LT

W S P G W
WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	2499.600	18	2502.403

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N		RADIUS	ANGLE	ANG PT	MAN H
	1051.000	2505.650	18	.013	*	.000	.000	.000	0

ELEMENT NO 3 IS A SYSTEM HEADWORKS *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1051.000	2505.650	18	.000

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 32+25.00 TO DI STA. 32+62.00, 43.00'LT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	2499.600	2.803	2502.403	3.00	1.70	.04	2502.45	.00	.66	.00	1.500	.000	.00	1 .0
11.060	.1186					.0008	.01	2.80	.00	.29	.013	.00	.00	PIPE
1011.060	2500.912	1.500	2502.412	3.00	1.70	.04	2502.46	.00	.66	.00	1.500	.000	.00	1 .0
1.134	.1186					.0008	.00	1.50	.00	.29	.013	.00	.00	PIPE
1012.194	2501.047	1.361	2502.407	3.00	1.78	.05	2502.46	.00	.66	.87	1.500	.000	.00	1 .0
.493	.1186					.0007	.00	1.36	.23	.29	.013	.00	.00	PIPE
1012.687	2501.105	1.280	2502.385	3.00	1.87	.05	2502.44	.00	.66	1.06	1.500	.000	.00	1 .0
HYDRAULIC JUMP														
1012.687	2501.105	.294	2501.400	3.00	12.25	2.33	2503.73	.00	.66	1.19	1.500	.000	.00	1 .0
1.151	.1186					.1122	.13	.29	4.76	.29	.013	.00	.00	PIPE
1013.838	2501.242	.298	2501.540	3.00	12.05	2.25	2503.79	.00	.66	1.20	1.500	.000	.00	1 .0
12.200	.1186					.1027	1.25	.30	4.66	.29	.013	.00	.00	PIPE
1026.038	2502.689	.308	2502.997	3.00	11.49	2.05	2505.05	.00	.66	1.21	1.500	.000	.00	1 .0
6.082	.1186					.0897	.55	.31	4.36	.29	.013	.00	.00	PIPE
1032.121	2503.411	.318	2503.729	3.00	10.95	1.86	2505.59	.00	.66	1.23	1.500	.000	.00	1 .0
3.941	.1186					.0784	.31	.32	4.09	.29	.013	.00	.00	PIPE
1036.062	2503.878	.329	2504.207	3.00	10.44	1.69	2505.90	.00	.66	1.24	1.500	.000	.00	1 .0
2.848	.1186					.0685	.20	.33	3.83	.29	.013	.00	.00	PIPE

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 32+25.00 TO DI STA. 32+62.00, 43.00'LT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch

1038.910	2504.216	.340	2504.556	3.00	9.96	1.54	2506.10	.00	.66	1.26	1.500	.000	.00	1	.0
2.186	.1186					.0599	.13	.34	3.58	.29	.013	.00	.00	PIPE	
1041.096	2504.475	.352	2504.827	3.00	9.49	1.40	2506.23	.00	.66	1.27	1.500	.000	.00	1	.0
1.738	.1186					.0524	.09	.35	3.36	.29	.013	.00	.00	PIPE	
1042.835	2504.682	.364	2505.046	3.00	9.05	1.27	2506.32	.00	.66	1.29	1.500	.000	.00	1	.0
1.417	.1186					.0458	.06	.36	3.14	.29	.013	.00	.00	PIPE	
1044.252	2504.850	.377	2505.227	3.00	8.63	1.16	2506.38	.00	.66	1.30	1.500	.000	.00	1	.0
1.174	.1186					.0401	.05	.38	2.94	.29	.013	.00	.00	PIPE	
1045.426	2504.989	.390	2505.379	3.00	8.23	1.05	2506.43	.00	.66	1.32	1.500	.000	.00	1	.0
.982	.1186					.0350	.03	.39	2.75	.29	.013	.00	.00	PIPE	
1046.408	2505.106	.403	2505.509	3.00	7.85	.96	2506.46	.00	.66	1.33	1.500	.000	.00	1	.0
.830	.1186					.0307	.03	.40	2.58	.29	.013	.00	.00	PIPE	
1047.238	2505.204	.417	2505.621	3.00	7.48	.87	2506.49	.00	.66	1.34	1.500	.000	.00	1	.0
.703	.1186					.0268	.02	.42	2.41	.29	.013	.00	.00	PIPE	
1047.941	2505.287	.431	2505.719	3.00	7.13	.79	2506.51	.00	.66	1.36	1.500	.000	.00	1	.0
.596	.1186					.0235	.01	.43	2.26	.29	.013	.00	.00	PIPE	
1048.537	2505.358	.447	2505.805	3.00	6.80	.72	2506.52	.00	.66	1.37	1.500	.000	.00	1	.0
.507	.1186					.0206	.01	.45	2.11	.29	.013	.00	.00	PIPE	

♀ FILE: MODEL-8.WSW W S P G W - CIVILDESIGN Version 14.07

Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING

Date: 3-12-2015 Time: 5:28:48

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 32+25.00 TO DI STA. 32+62.00, 43.00'LT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1049.044	2505.418	.462	2505.880	3.00	6.48	.65	2506.53	.00	.66	1.39	1.500	.000	.00	1 .0
.429	.1186					.0180	.01	.46	1.98	.29	.013	.00	.00	PIPE
1049.473	2505.469	.478	2505.947	3.00	6.18	.59	2506.54	.00	.66	1.40	1.500	.000	.00	1 .0
.360	.1186					.0158	.01	.48	1.85	.29	.013	.00	.00	PIPE
1049.834	2505.512	.495	2506.007	3.00	5.90	.54	2506.55	.00	.66	1.41	1.500	.000	.00	1 .0
.301	.1186					.0138	.00	.50	1.73	.29	.013	.00	.00	PIPE
1050.135	2505.547	.513	2506.060	3.00	5.62	.49	2506.55	.00	.66	1.42	1.500	.000	.00	1 .0

						.0121	.00	.51	1.62	.29	.013	.00	.00	PIPE	
.248	.1186														
1050.383	2505.577	.531	2506.108	3.00	5.36	.45	2506.55	.00	.66	1.43	1.500	.000	.00	1	.0
						.0106	.00	.53	1.51	.29	.013	.00	.00	PIPE	
.199	.1186														
1050.582	2505.600	.550	2506.150	3.00	5.11	.41	2506.56	.00	.66	1.45	1.500	.000	.00	1	.0
						.0093	.00	.55	1.41	.29	.013	.00	.00	PIPE	
.157	.1186														
1050.739	2505.619	.570	2506.188	3.00	4.87	.37	2506.56	.00	.66	1.46	1.500	.000	.00	1	.0
						.0082	.00	.57	1.32	.29	.013	.00	.00	PIPE	
.117	.1186														
1050.856	2505.633	.590	2506.223	3.00	4.65	.34	2506.56	.00	.66	1.47	1.500	.000	.00	1	.0
						.0072	.00	.59	1.23	.29	.013	.00	.00	PIPE	
.080	.1186														
1050.936	2505.642	.612	2506.254	3.00	4.43	.30	2506.56	.00	.66	1.47	1.500	.000	.00	1	.0
						.0063	.00	.61	1.15	.29	.013	.00	.00	PIPE	
.048	.1186														

♀ FILE: MODEL-8.WSW W S P G W - CIVILDESIGN Version 14.07

Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING

Date: 3-12-2015 Time: 5:28:48

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 32+25.00 TO DI STA. 32+62.00, 43.00'LT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1050.984	2505.648	.634	2506.282	3.00	4.22	.28	2506.56	.00	.66	1.48	1.500	.000	.00	1 .0
						.0055	.00	.63	1.07	.29	.013	.00	.00	PIPE
.016	.1186													
1051.000	2505.650	.658	2506.308	3.00	4.02	.25	2506.56	.00	.66	1.49	1.500	.000	.00	1 .0

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T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MAINLINE STA. 25+81.76 TO DI STA. 26+18.76, 43.00'LT (FACILITY 22)
SO   1000.0002489.560 42      .013                2493.047
R    1051.0002490.500 42      .013
SH   1051.0002490.500 42      .013
CD  42  4   1          3.500
Q          106.000
```

MODEL-9.EDT

FILE: MODEL-9.WSW

W S P G W - EDIT LISTING - Version 14.07 Date: 3-12-2015 Time: 3:23:40

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	42	4	1		3.500														

W S P G W

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS - BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS - LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS - MAINLINE STA. 25+81.76 TO DI STA. 26+18.76, 43.00'LT

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1000.000	2489.560	42	2493.047

ELEMENT NO 2 IS A REACH

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1051.000	2490.500	42	.013	.000	.000	.000	0

ELEMENT NO 3 IS A SYSTEM HEADWORKS

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1051.000	2490.500	42	.000

♀ FILE: MODEL-9.WSW

W S P G W - CIVILDESIGN Version 14.07
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-12-2015 Time: 5:28:59

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 25+81.76 TO DI STA. 26+18.76, 43.00'LT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2489.560	2.602	2492.162	106.00	13.82	2.97	2495.13	.00	3.13	3.06	3.500	.000	.00	1 .0
15.980	.0184					.0132	.21	2.60	1.54	2.32	.013	.00	.00	PIPE
1015.980	2489.854	2.668	2492.523	106.00	13.47	2.82	2495.34	.00	3.13	2.98	3.500	.000	.00	1 .0
19.891	.0184					.0122	.24	2.67	1.46	2.32	.013	.00	.00	PIPE
1035.871	2490.221	2.801	2493.022	106.00	12.84	2.56	2495.58	.00	3.13	2.80	3.500	.000	.00	1 .0
11.202	.0184					.0111	.12	2.80	1.32	2.32	.013	.00	.00	PIPE
1047.073	2490.428	2.952	2493.379	106.00	12.24	2.33	2495.71	.00	3.13	2.54	3.500	.000	.00	1 .0
3.927	.0184					.0102	.04	2.95	1.17	2.32	.013	.00	.00	PIPE
1051.000	2490.500	3.132	2493.632	106.00	11.67	2.12	2495.75	.00	3.13	2.15	3.500	.000	.00	1 .0

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T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MAINLINE STA. 23+71.50 TO DI STA. 24+00.83, 35.34'LT (FACILITY 24)
SO    1000.0002487.260 42       .013                    2490.966
R     1040.0002488.300 42       .013
SH    1040.0002488.300 42       .013
CD   42   4    1              3.500
Q              106.000
```

FILE: MODEL-10.WSW

W S P G W - EDIT LISTING - Version 14.07 Date: 3-12-2015 Time: 5:22:50

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	42	4	1		3.500														

W S P G W

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS -
LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS -
MAINLINE STA. 23+71.50 TO DI STA. 24+00.83, 35.34'LT

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	2487.260	42	2490.966

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1040.000	2488.300	42	.013	.000	.000	.000	0

ELEMENT NO 3 IS A SYSTEM HEADWORKS *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1040.000	2488.300	42	.000

♀ FILE: MODEL-10.WSW

W S P G W - CIVILDESIGN Version 14.07
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-12-2015 Time: 5:22:53

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 23+71.50 TO DI STA. 24+00.83, 35.34'LT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	2487.260	2.480	2489.740	106.00	14.54	3.28	2493.02	.00	3.13	3.18	3.500	.000	.00	1 .0
10.466	.0260					.0148	.16	2.48	1.69	2.06	.013	.00	.00	PIPE
1010.466	2487.532	2.548	2490.080	106.00	14.13	3.10	2493.18	.00	3.13	3.11	3.500	.000	.00	1 .0
13.023	.0260					.0136	.18	2.55	1.60	2.06	.013	.00	.00	PIPE
1023.489	2487.871	2.668	2490.539	106.00	13.47	2.82	2493.36	.00	3.13	2.98	3.500	.000	.00	1 .0
8.953	.0260					.0122	.11	2.67	1.46	2.06	.013	.00	.00	PIPE
1032.442	2488.104	2.801	2490.905	106.00	12.84	2.56	2493.47	.00	3.13	2.80	3.500	.000	.00	1 .0
5.513	.0260					.0111	.06	2.80	1.32	2.06	.013	.00	.00	PIPE
1037.954	2488.247	2.952	2491.198	106.00	12.24	2.33	2493.53	.00	3.13	2.54	3.500	.000	.00	1 .0
2.046	.0260					.0102	.02	2.95	1.17	2.06	.013	.00	.00	PIPE
1040.000	2488.300	3.132	2491.432	106.00	11.67	2.12	2493.55	.00	3.13	2.15	3.500	.000	.00	1 .0

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T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MAINLINE STA. 13+36.76 TO DI STA. 13+86.91, 56.42'LT (FACILITY 27)
SO   1000.0002469.310 18      .013                  2469.849
R    1065.0002474.450 18      .013
SH   1065.0002474.450 18      .013
CD  18  4   1           1.500
Q             5.000
```

MODEL-11.EDT

FILE: MODEL-11.WSW W S P G W - EDIT LISTING - Version 14.07 Date: 3-12-2015 Time: 3:45:41
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4	1		1.500														

W S P G W PAGE NO 1
WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS -
LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS -
MAINLINE STA. 13+36.76 TO DI STA. 13+86.91, 56.42'LT

W S P G W PAGE NO 2
WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *
U/S DATA STATION INVERT SECT W S ELEV
1000.000 2469.310 18 2469.849

ELEMENT NO 2 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1065.000 2474.450 18 .013 .000 .000 .000 0

ELEMENT NO 3 IS A SYSTEM HEADWORKS *
U/S DATA STATION INVERT SECT W S ELEV
1065.000 2474.450 18 .000

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 13+36.76 TO DI STA. 13+86.91, 56.42'LT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	2469.310	.422	2469.732	5.00	12.26	2.34	2472.07	.00	.86	1.35	1.500	.000	.00	1 .0
22.964	.0791					.0721	1.66	.42	3.93	.42	.013	.00	.00	PIPE
1022.963	2471.126	.433	2471.559	5.00	11.81	2.17	2473.73	.00	.86	1.36	1.500	.000	.00	1 .0
12.103	.0791					.0640	.78	.43	3.73	.42	.013	.00	.00	PIPE
1035.066	2472.083	.449	2472.531	5.00	11.26	1.97	2474.50	.00	.86	1.37	1.500	.000	.00	1 .0
7.101	.0791					.0561	.40	.45	3.49	.42	.013	.00	.00	PIPE
1042.167	2472.644	.464	2473.108	5.00	10.74	1.79	2474.90	.00	.86	1.39	1.500	.000	.00	1 .0
4.884	.0791					.0491	.24	.46	3.27	.42	.013	.00	.00	PIPE
1047.051	2473.031	.481	2473.511	5.00	10.24	1.63	2475.14	.00	.86	1.40	1.500	.000	.00	1 .0
3.635	.0791					.0430	.16	.48	3.05	.42	.013	.00	.00	PIPE
1050.685	2473.318	.498	2473.815	5.00	9.76	1.48	2475.30	.00	.86	1.41	1.500	.000	.00	1 .0
2.825	.0791					.0377	.11	.50	2.86	.42	.013	.00	.00	PIPE
1053.510	2473.541	.515	2474.056	5.00	9.31	1.35	2475.40	.00	.86	1.42	1.500	.000	.00	1 .0
2.256	.0791					.0330	.07	.52	2.67	.42	.013	.00	.00	PIPE
1055.766	2473.720	.534	2474.253	5.00	8.87	1.22	2475.48	.00	.86	1.44	1.500	.000	.00	1 .0
1.839	.0791					.0289	.05	.53	2.50	.42	.013	.00	.00	PIPE
1057.605	2473.865	.553	2474.418	5.00	8.46	1.11	2475.53	.00	.86	1.45	1.500	.000	.00	1 .0
1.512	.0791					.0254	.04	.55	2.33	.42	.013	.00	.00	PIPE

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 13+36.76 TO DI STA. 13+86.91, 56.42'LT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch

1059.117	2473.985	.572	2474.557	5.00	8.07	1.01	2475.57	.00	.86	1.46	1.500	.000	.00	1	.0
1.253	.0791					.0223	.03	.57	2.18	.42	.013	.00	.00	PIPE	
1060.370	2474.084	.593	2474.677	5.00	7.69	.92	2475.60	.00	.86	1.47	1.500	.000	.00	1	.0
1.042	.0791					.0195	.02	.59	2.04	.42	.013	.00	.00	PIPE	
1061.412	2474.166	.615	2474.781	5.00	7.33	.84	2475.62	.00	.86	1.48	1.500	.000	.00	1	.0
.863	.0791					.0172	.01	.61	1.90	.42	.013	.00	.00	PIPE	
1062.275	2474.235	.637	2474.872	5.00	6.99	.76	2475.63	.00	.86	1.48	1.500	.000	.00	1	.0
.711	.0791					.0151	.01	.64	1.77	.42	.013	.00	.00	PIPE	
1062.986	2474.291	.661	2474.951	5.00	6.67	.69	2475.64	.00	.86	1.49	1.500	.000	.00	1	.0
.581	.0791					.0132	.01	.66	1.66	.42	.013	.00	.00	PIPE	
1063.567	2474.337	.685	2475.022	5.00	6.36	.63	2475.65	.00	.86	1.49	1.500	.000	.00	1	.0
.465	.0791					.0116	.01	.69	1.54	.42	.013	.00	.00	PIPE	
1064.032	2474.374	.711	2475.084	5.00	6.06	.57	2475.65	.00	.86	1.50	1.500	.000	.00	1	.0
.363	.0791					.0102	.00	.71	1.44	.42	.013	.00	.00	PIPE	
1064.395	2474.402	.738	2475.140	5.00	5.78	.52	2475.66	.00	.86	1.50	1.500	.000	.00	1	.0
.272	.0791					.0090	.00	.74	1.34	.42	.013	.00	.00	PIPE	
1064.667	2474.424	.766	2475.189	5.00	5.51	.47	2475.66	.00	.86	1.50	1.500	.000	.00	1	.0
.187	.0791					.0079	.00	.77	1.25	.42	.013	.00	.00	PIPE	

♀ FILE: MODEL-11.WSW

W S P G W - CIVILDESIGN Version 14.07
Program Package Serial Number: 1704
WATER SURFACE PROFILE LISTING

Date: 3-12-2015 Time: 5:29:22

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 13+36.76 TO DI STA. 13+86.91, 56.42'LT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1064.853	2474.438	.795	2475.234	5.00	5.25	.43	2475.66	.00	.86	1.50	1.500	.000	.00	1 .0
.111	.0791					.0070	.00	.80	1.16	.42	.013	.00	.00	PIPE
1064.964	2474.447	.826	2475.273	5.00	5.01	.39	2475.66	.00	.86	1.49	1.500	.000	.00	1 .0
.036	.0791					.0062	.00	.83	1.08	.42	.013	.00	.00	PIPE
1065.000	2474.450	.860	2475.310	5.00	4.77	.35	2475.66	.00	.86	1.48	1.500	.000	.00	1 .0

♀

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T1 BRENT LANE DRAINAGE SYSTEM AND TRAIL
T2 LATERAL FACILITY DESIGN
T3 MAINLINE STA. 12+62.22 TO DI STA. 12+61.09, 221.34'RT (FACILITY 29)
SO   1000.0002467.400 18      .013                2469.617
R    1022.0002467.850 18      .013                                    50.00  1
R    1217.0002471.740 18      .013
SH   1217.0002471.740 18      .013
CD  18  4   1           1.500
Q             5.000
```

FILE: MODEL-12.WSW W S P G W - EDIT LISTING - Version 14.07 Date: 3-12-2015 Time: 5:23: 8
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4	1		1.500														

W S P G W PAGE NO 1
WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
BRENT LANE DRAINAGE SYSTEM AND TRAIL

HEADING LINE NO 2 IS -
LATERAL FACILITY DESIGN

HEADING LINE NO 3 IS -
MAINLINE STA. 12+62.22 TO DI STA. 12+61.09, 221.34'RT

W S P G W PAGE NO 2
WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

	STATION	INVERT	SECT	W S ELEV
U/S DATA	1000.000	2467.400	18	2469.617

ELEMENT NO 2 IS A REACH * * *

	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	1022.000	2467.850	18	.013	.000	.000	50.000	1

ELEMENT NO 3 IS A REACH * * *

	STATION	INVERT	SECT	N
U/S DATA				

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 12+62.22 TO DI STA. 12+61.09, 221.34'RT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	2467.400	2.217	2469.617	5.00	2.83	.12	2469.74	.00	.86	.00	1.500	.000	.00	1 .0
22.000	.0205					.0023	.05	2.22	.00	.60	.013	.00	.00	PIPE
1022.000	2467.850	1.843	2469.694	5.00	2.83	.12	2469.82	.00	.86	.00	1.500	.000	.00	1 .0
19.421	.0199					.0022	.04	1.84	.00	.60	.013	.00	.00	PIPE
1041.421	2468.238	1.500	2469.738	5.00	2.83	.12	2469.86	.00	.86	.00	1.500	.000	.00	1 .0
7.040	.0199					.0021	.01	1.50	.00	.60	.013	.00	.00	PIPE
1048.462	2468.378	1.361	2469.739	5.00	2.97	.14	2469.88	.00	.86	.87	1.500	.000	.00	1 .0
3.751	.0199					.0021	.01	1.36	.38	.60	.013	.00	.00	PIPE
1052.212	2468.453	1.280	2469.733	5.00	3.11	.15	2469.88	.00	.86	1.06	1.500	.000	.00	1 .0
2.908	.0199					.0022	.01	1.28	.45	.60	.013	.00	.00	PIPE
1055.121	2468.511	1.214	2469.724	5.00	3.26	.17	2469.89	.00	.86	1.18	1.500	.000	.00	1 .0
.450	.0199					.0023	.00	1.21	.50	.60	.013	.00	.00	PIPE
1055.570	2468.520	1.214	2469.733	5.00	3.26	.17	2469.90	.00	.86	1.18	1.500	.000	.00	1 .0
HYDRAULIC JUMP														
1055.570	2468.520	.600	2469.120	5.00	7.57	.89	2470.01	.00	.86	1.47	1.500	.000	.00	1 .0
68.584	.0199					.0199	1.37	.60	1.99	.60	.013	.00	.00	PIPE
1124.154	2469.888	.600	2470.488	5.00	7.57	.89	2471.38	.00	.86	1.47	1.500	.000	.00	1 .0
48.703	.0199					.0191	.93	.60	1.99	.60	.013	.00	.00	PIPE

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 12+62.22 TO DI STA. 12+61.09, 221.34'RT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch

1172.858	2470.860	.615	2471.474	5.00	7.33	.84	2472.31	.00	.86	1.48	1.500	.000	.00	1	.0
19.114	.0199					.0172	.33	.61	1.90	.60	.013	.00	.00	PIPE	
1191.972	2471.241	.637	2471.878	5.00	6.99	.76	2472.64	.00	.86	1.48	1.500	.000	.00	1	.0
9.326	.0199					.0151	.14	.64	1.77	.60	.013	.00	.00	PIPE	
1201.298	2471.427	.661	2472.088	5.00	6.67	.69	2472.78	.00	.86	1.49	1.500	.000	.00	1	.0
5.702	.0199					.0132	.08	.66	1.66	.60	.013	.00	.00	PIPE	
1207.000	2471.541	.685	2472.226	5.00	6.36	.63	2472.85	.00	.86	1.49	1.500	.000	.00	1	.0
3.774	.0199					.0116	.04	.69	1.54	.60	.013	.00	.00	PIPE	
1210.774	2471.616	.711	2472.327	5.00	6.06	.57	2472.90	.00	.86	1.50	1.500	.000	.00	1	.0
2.572	.0199					.0102	.03	.71	1.44	.60	.013	.00	.00	PIPE	
1213.346	2471.667	.738	2472.405	5.00	5.78	.52	2472.92	.00	.86	1.50	1.500	.000	.00	1	.0
1.743	.0199					.0090	.02	.74	1.34	.60	.013	.00	.00	PIPE	
1215.089	2471.702	.766	2472.468	5.00	5.51	.47	2472.94	.00	.86	1.50	1.500	.000	.00	1	.0
1.105	.0199					.0079	.01	.77	1.25	.60	.013	.00	.00	PIPE	
1216.194	2471.724	.795	2472.519	5.00	5.25	.43	2472.95	.00	.86	1.50	1.500	.000	.00	1	.0
.616	.0199					.0070	.00	.80	1.16	.60	.013	.00	.00	PIPE	
1216.809	2471.736	.826	2472.563	5.00	5.01	.39	2472.95	.00	.86	1.49	1.500	.000	.00	1	.0
.191	.0199					.0062	.00	.83	1.08	.60	.013	.00	.00	PIPE	

♀ FILE: MODEL-12.WSW W S P G W - CIVILDESIGN Version 14.07

Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING

Date: 3-12-2015 Time: 5:23:11

BRENT LANE DRAINAGE SYSTEM AND TRAIL
LATERAL FACILITY DESIGN
MAINLINE STA. 12+62.22 TO DI STA. 12+61.09, 221.34'RT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1217.000	2471.740	.860	2472.600	5.00	4.77	.35	2472.95	.00	.86	1.48	1.500	.000	.00	1 .0

Ditch Computations

Section 10 - Side Channel (100-Year) - Ultimate
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Section 10 - Side Channel (100-Year) - Ultimate
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

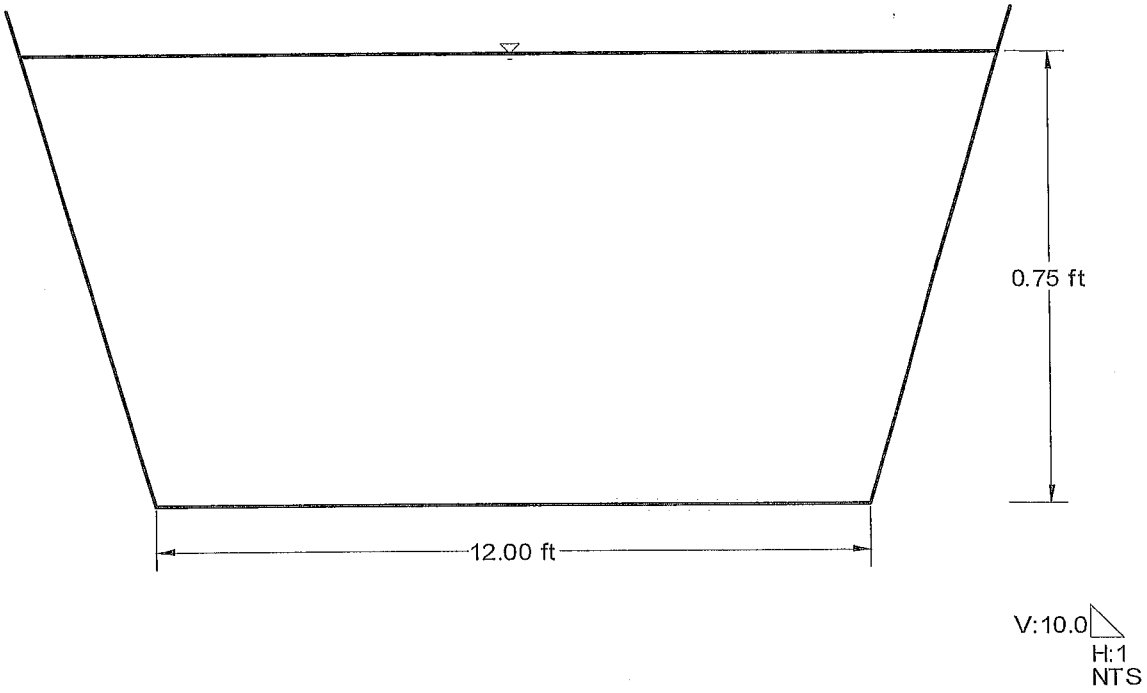
Input Data		
Mannings Coefficient	0.025	
Channel Slope	0.53	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	12.00	ft
Discharge	34.00	cfs

Results		
Depth	0.75	ft
Flow Area	10.6	ft²
Wetted Perimeter	16.72	ft
Top Width	16.48	ft
Critical Depth	0.60	ft
Critical Slope	1.14	%
Velocity	3.20	ft/s
Velocity Head	0.16	ft
Specific Energy	0.91	ft
Froude Number	0.70	
Flow Type	Subcritical	

Section 10 - Side Channel (100-Year) - Ultimate
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	Section 10 - Side Channel (100-Year) - Ultimate
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.025
Channel Slope	0.53 %
Depth	0.75 ft
Left Side Slope	3.00 H : V
Right Side Slope	3.00 H : V
Bottom Width	12.00 ft
Discharge	34.00 cfs



Open Channel Interim Flow Interception at Brent Lane

Section 7 - Superelevated Trail (100-Year) Interim
Worksheet for Irregular Channel

Project Description	
Worksheet	Section 7 - Superelevated Trail (100-Year) Interim
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	2.00	%
Discharge	629.00	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	2,500.89	ft
Elevation Range	2,500.00 to 2,502.00	
Flow Area	72.4	ft²
Wetted Perimeter	148.02	ft
Top Width	147.90	ft
Actual Depth	0.89	ft
Critical Elevation	2,501.24	ft
Critical Slope	0.35	%
Velocity	8.69	ft/s
Velocity Head	1.17	ft
Specific Energy	2,502.07	ft
Froude Number	2.19	
Flow Type	Supercritical.	

Calculation Messages:
Water elevation exceeds lowest end station by 0.94962613e-1 ft.

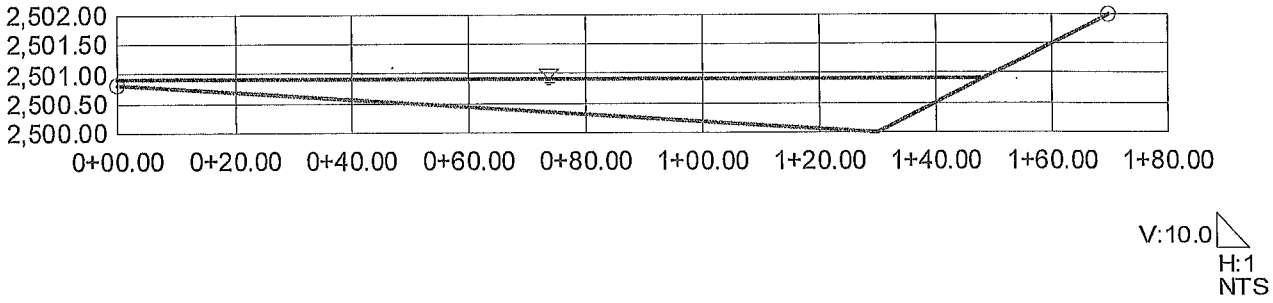
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	1+70.00	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	2,500.80
1+30.00	2,500.00
1+70.00	2,502.00

Section 7 - Superelevated Trail (100-Year) Interim
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 7 - Superelevated Trail (100-Year) Interim
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	2,500.89	ft
Elevation Range	2,500.00 to 2,502.00	
Discharge	629.00	cfs



Section 8 - Overland Flow Interception @ Brent Lane (100-Year) Interim
Worksheet for Irregular Channel

Project Description	
Worksheet	Section 8 - Overland Flow Interception @ Brent Lane (100-Year) Interim
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	4.00	%
Discharge	629.00	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	0.044	
Water Surface Elevation	2,497.75	ft
Elevation Range	2,494.90 to 2,499.00	
Flow Area	63.4	ft²
Wetted Perimeter	35.66	ft
Top Width	35.02	ft
Actual Depth	2.85	ft
Critical Elevation	2,498.13	ft
Critical Slope	2.28	%
Velocity	9.92	ft/s
Velocity Head	1.53	ft
Specific Energy	2,499.28	ft
Froude Number	1.30	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+41.00	0.044

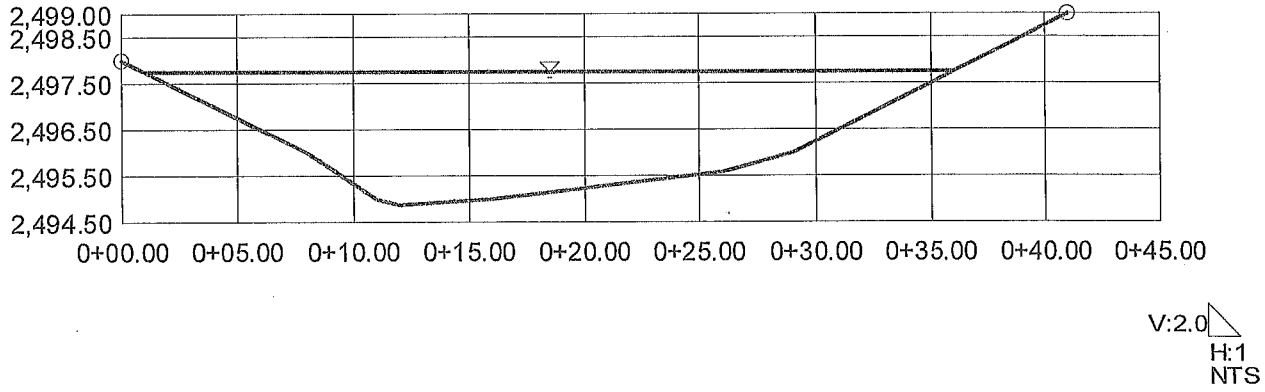
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,498.00
0+04.00	2,497.00
0+08.00	2,496.00
0+11.00	2,495.00
0+12.00	2,494.90
0+16.00	2,495.00
0+26.00	2,495.60
0+29.00	2,496.00
0+33.00	2,497.00
0+37.00	2,498.00
0+41.00	2,499.00

Section 8 - Overland Flow Interception @ Brent Lane (100-Year) Interim
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 8 - Overland Flow Interception @ Brent Lane (100-Year) Interim
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.044	
Channel Slope	4.00	%
Water Surface Elevation	2,497.75	ft
Elevation Range	2,494.90 to 2,499.00	
Discharge	629.00	cfs



Section 9 - Overland Flow Interception @ Brent Lane (100-Year) Interim
Worksheet for Irregular Channel

Project Description	
Worksheet	Section 9 - Overland Flow Interception @ Brent Lane (100-Year) Interim
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	4.00	%
Discharge	629.00	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	0.043	
Water Surface Elevation	2,496.47	ft
Elevation Range	2,493.80 to 2,497.00	
Flow Area	56.9	ft²
Wetted Perimeter	28.45	ft
Top Width	26.42	ft
Actual Depth	2.67	ft
Critical Elevation	2,496.95	ft
Critical Slope	2.20	%
Velocity	11.05	ft/s
Velocity Head	1.90	ft
Specific Energy	2,498.37	ft
Froude Number	1.33	
Flow Type	Supercritical	

Calculation Messages:
Water elevation exceeds lowest end station by 0.47202795 ft.

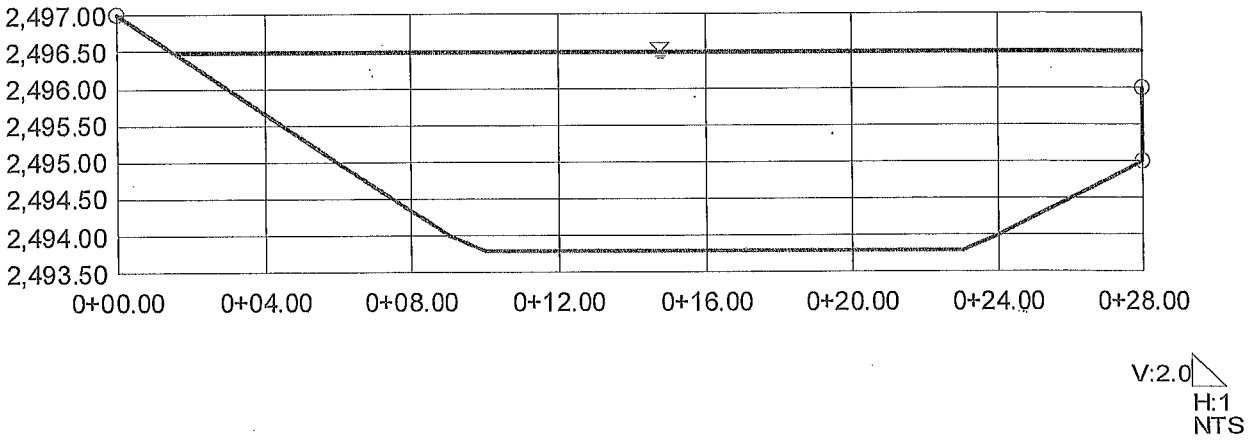
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+28.00	0.044
0+28.00	0+28.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	2,497.00
0+03.00	2,496.00
0+06.00	2,495.00
0+09.00	2,494.00
0+10.00	2,493.80
0+23.00	2,493.80
0+24.00	2,494.00
0+28.00	2,495.00
0+28.00	2,496.00

Section 9 - Overland Flow Interception @ Brent Lane (100-Year) Interim
Cross Section for Irregular Channel

Project Description	
Worksheet	Section 9 - Overland Flow Interception @ Brent Lane (100-Year) Interim
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.043	
Channel Slope	4.00	%
Water Surface Elevation	2,496.47	ft
Elevation Range	2,493.80 to 2,497.00	
Discharge	629.00	cfs



Open Channel Overland Concentrated Inflow Computations

Section 11 - Side Channel (100-Year) - Ultimate
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Section 11 - Side Channel (100-Year) - Ultimate
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

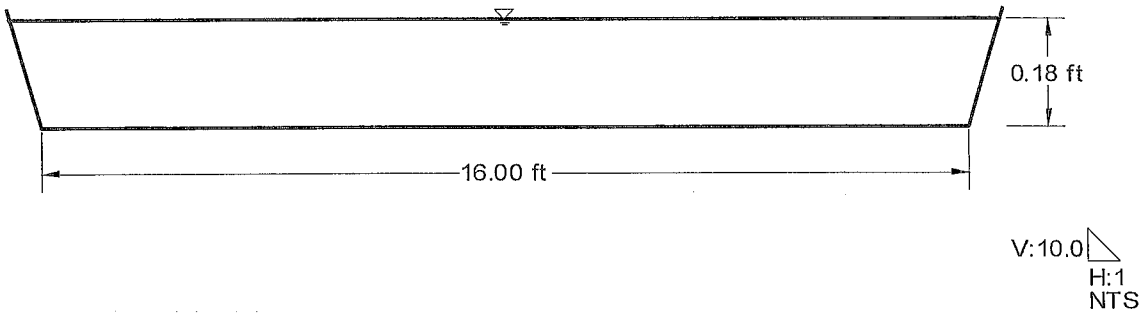
Input Data	
Mannings Coefficient	0.013
Channel Slope	10.00 %
Left Side Slope	3.00 H : V
Right Side Slope	3.00 H : V
Bottom Width	16.00 ft
Discharge	34.00 cfs

Results	
Depth	0.18 ft
Flow Area	3.0 ft²
Wetted Perimeter	17.15 ft
Top Width	17.09 ft
Critical Depth	0.50 ft
Critical Slope	0.32 %
Velocity	11.32 ft/s
Velocity Head	1.99 ft
Specific Energy	2.17 ft
Froude Number	4.76
Flow Type	Supercritical

Section 11 - Side Channel (100-Year) - Ultimate
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	Section 11 - Side Channel (100-Year) - Ultimate
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Channel Slope	10.00	%
Depth	0.18	ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	16.00	ft
Discharge	34.00	cfs



Section 12 - Overland Flow Concentration (100-Year) - Ultimate
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Section 12 - Overland Flow Concentration (100-Year) - Ultimate
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

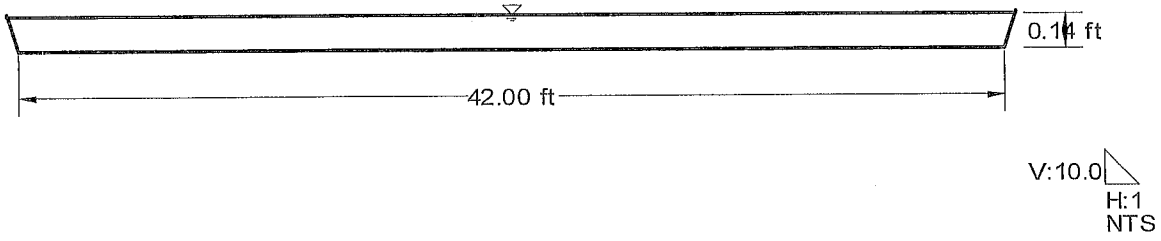
Input Data		
Mannings Coefficient	0.013	
Channel Slope	2.00	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	42.00	ft
Discharge	27.00	cfs

Results		
Depth	0.14	ft
Flow Area	6.1	ft²
Wetted Perimeter	42.91	ft
Top Width	42.87	ft
Critical Depth	0.23	ft
Critical Slope	0.40	%
Velocity	4.41	ft/s
Velocity Head	0.30	ft
Specific Energy	0.45	ft
Froude Number	2.06	
Flow Type	Supercritical	

Section 12 - Overland Flow Concentration (100-Year) - Ultimate
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	Section 12 - Overland Flow Concentration (100-Year) - Ultimate
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Channel Slope	2.00	%
Depth	0.14	ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	42.00	ft
Discharge	27.00	cfs



Open Channel Overland Sheet Inflow Computations

Open Channel - Overland Sheet Inflow: Sta. 14+30 to 17+30
Worksheet for Rectangular Channel

Project Description	
Worksheet	Open Channel - Overland Sheet Inflow: Sta. 14+30 to 17+30
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.044	
Channel Slope	33.00	%
Bottom Width	300.00	ft
Discharge	816.00	cfs

Results		
Depth	0.31	ft
Flow Area	92.3	ft²
Wetted Perimeter	300.62	ft
Top Width	300.00	ft
Critical Depth	0.61	ft
Critical Slope	3.34	%
Velocity	8.84	ft/s
Velocity Head	1.21	ft
Specific Energy	1.52	ft
Froude Number	2.81	
Flow Type	Supercritical	

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Riprap Stabilization Computations

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Rip Rap Sizing Computation

Project Name: Brent Lane Drainage System & Trail
Date: 3/13/2015
File Name: CLV1401 Riprap Sizing Calcs.xlsx
By: AJH

Location: **Mainline Station 11+41**

Known Information: **Reference:**

Rip Rap protection at

V =	Velocity (fps)	8.62	WSPG Hydraulic / Flowmaster Calculations
S_g =	Specific Gravity of Rock (typ=2.5)	2.5	Use Typical
s =	Longitudinal Channel Slope (ft/ft)	0.005	Grading Plan

Solve For:

d_{50} = 0.61 ft - Average Rock Size

d_{50} =	**7**	**in**	**- Average Rock Size**
Thickness =	**14**	**in**	**- Thickness of Rip Rap protection**
Manning's 'n' =	**0.036**		**- Roughness Coefficient**

Equations:

Based upon a Stable Channel Lining

$d_{50} = ((vel*S^{0.17})/(3*(S_g-1)))^2$ Equation 734*

$n = 0.0395(d_{50})^{1/6}$ Equation 732*

Recommendations:

Re-Use Existing 18"-24" d50 loose riprap (Manning's "n" = 0.044)

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

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Rip Rap Sizing Computation

Project Name: Brent Lane Drainage System & Trail
Date: 3/16/2015
File Name: CLV1401 Riprap Sizing Calcs.xlsx
By: MJF

Location: **Sheet Inflow 14+30 to 17+30**

Known Information: **Reference:**

Rip Rap protection at

V =	Velocity (fps)	8.84	WSPG Hydraulic / Flowmaster Calculations

Solve For:

d_{50} = 2.0 ft

d_{50} =	**24**	**in**	**- Average Rock Size**
Thickness =	**48**	**in**	**- Thickness of Rip Rap protection**
Manning's 'n' =	**0.044**		**- Roughness Coefficient**

Equations:

Based upon a Stable Channel Lining

$d_{50} = 0.010 * V^{2.44}$ Equation 735*

$n = 0.0395(d_{50})^{1/6}$ Equation 732*

Recommendations:

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

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Rip Rap Sizing Computation

Project Name: Brent Lane Drainage System & Trail
Date: 3/13/2015
File Name: CLV1401 Riprap Sizing Calcs.xlsx
By: AJH

Location: Section 8

Known Information: **Reference:**

Rip Rap protection at

V =	Velocity (fps)	9.92	WSPG Hydraulic / Flowmaster Calculations
S_g =	Specific Gravity of Rock (typ=2.5)	2.5	Use Typical
s =	Longitudinal Channel Slope (ft/ft)	0.04	Grading Plan

Solve For:

d_{50} = 1.63 ft - Average Rock Size

d_{50} =	**20**	**in**	**- Average Rock Size**
Thickness =	**40**	**in**	**- Thickness of Rip Rap protection**
Manning's 'n' =	**0.043**		**- Roughness Coefficient**

Equations:

Based upon a Stable Channel Lining

$d_{50} = ((vel*S^{0.17})/(3*(S_g-1)))^2$ Equation 734*

$n = 0.0395(d_{50})^{1/6}$ Equation 732*

Recommendations:

Provide 24" d50 loose riprap

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

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Rip Rap Sizing Computation

Project Name: Brent Lane Drainage System & Trail
Date: 3/13/2015
File Name: CLV1401 Riprap Sizing Calcs.xlsx
By: AJH

Location: Section 9

Known Information: **Reference:**

Rip Rap protection at

V =	Velocity (fps)	11.05	WSPG Hydraulic / Flowmaster Calculations
S_g =	Specific Gravity of Rock (typ=2.5)	2.5	Use Typical
s =	Longitudinal Channel Slope (ft/ft)	0.04	Grading Plan

Solve For:

d_{50} = 2.02 ft - Average Rock Size

d_{50} =	**24**	**in**	**- Average Rock Size**
Thickness =	**48**	**in**	**- Thickness of Rip Rap protection**
Manning's 'n' =	**0.044**		**- Roughness Coefficient**

Equations:

Based upon a Stable Channel Lining

$d_{50} = ((vel*S^{0.17})/(3*(S_g-1)))^2$ Equation 734*

$n = 0.0395(d_{50})^{1/6}$ Equation 732*

Recommendations:

Provide 24" d50 loose riprap

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

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APPENDIX D

Utilities Schedule

CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS

UTILITY CONFLICT SCHEDULE - 90% SUBMITTAL

PROJECT: Brent Lane Drainage System & Trail
PROJECT #: CLV1401
PREPARED BY: David Myhre, Slater Hanifan Group
CHECKED BY: Mark Failla, P.E., Slater Hanifan Group
DATE 3/24/2015

UTILITY	SIZE AND TYPE	LOCATION		ELEVATION				SOURCE OF INFO		IMPROVEMENT	CONFLICT	ELEVATION			PROPOSED CLEARANCE		REQUIRED CLEARANCE		RESOLUTION
		STATION	OFFSET	FG	TOP	BOTTOM	COVER	POTHOLE	OTHER			TOP	BOTTOM	COVER	ABOVE	BELOW	HORZ	VERT	
CENTURYLINK	(2) 4" TEL	"BL" 15+98	25.0' LT	2532.6	2528.9	2528.6	3.7'	TH7		DROP INLET	YES								RELOCATE BY CENTURYLINK
CENTURYLINK	(2) 4" TEL	"BL" 16+45	16.0' LT	2530.4	2527.4	2527.1	3.0'		EST	12' x 6' RCB	YES								RELOCATE BY CENTURYLINK
CENTURYLINK	TELEPHONE (ABANDONED)	"BL" 15+75 TO "BL" 17+28	23.0' LT				0.0'			12' x 6' RCB	YES								REMOVE FOR STORM DRAIN INSTALLATION
CENTURYLINK	(2) 4" TEL	"BL" 16+58	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
CENTURYLINK	TELEPHONE (ABANDONED)	"BL" 17+28	22.8' LT	2530.1	2527.1		3.0'		EST	12' x 6' RCB	YES								REMOVE FOR STORM DRAIN INSTALLATION
SWG	2" PE	"BL" 16+07	18.0' RT	2532.1	2528.8	2528.6	3.3'	TH8		TRENCH DRAIN	YES								RELOCATE BY SOUTHWEST GAS
SWG	4" PE	"BL" 16+75	57.0' RT	2530.2	2527.7	2527.4	2.5'	TH9		36" RCP	NO								PROTECT IN PLACE
SWG	4" PE	"BL" 16+75	95.0' RT	2530.8	2528.2	2527.8	2.6'	TH11		36" RCP	NO								PROTECT IN PLACE
SWG	4" PE	"BL" 16+75	16.8' LT	2530.7	2527.7	2527.4	3.0'	TH2		12' x 6' RCB	NO								PROTECT IN PLACE
LVVWD	8" PVC	"BL" 16+07	5.7' LT	2532.2	2527.9	2527.2	4.3'	TH5		TRENCH DRAIN	NO								PROTECT IN PLACE
LVVWD	8" PVC	"BL" 16+44	5.5' LT	2530.8	2525.0	2524.3	5.8'	TH4		48" RCP	NO								PROTECT IN PLACE
LVVWD	12" PVC	"BL" 16+64	67.7' LT	2530.1	2526.8	2525.8	3.2'	TH10		36" RCP	NO								PROTECT IN PLACE
LVVWD	12" PVC	"BL" 16+64	100.3' LT	2530.6	2527.5	2526.5	3.1'	TH12		36" RCP	NO								PROTECT IN PLACE
LVVWD	BLOW-OFF	"BL" 16+65	16.5' LT	2530.5	2524.7	2523.7	5.9'	TH3		12' x 6' RCB	YES								RELOCATE
NVE	(3) 4" ELEC	"BL" 16+54	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
COX	CATV CONDUIT	"BL" 15+98	25.0' LT	2532.6	2528.9	2528.6	3.7'	TH6		DROP INLET	YES								RELOCATE BY COX COMMUNICATIONS
COX	CATV CONDUIT	"BL" 16+58	16.0' LT	2530.5	2528.6	2528.4	1.9'	TH1		12' x 6' RCB	NO								PROTECT IN PLACE
COX	CATV CONDUIT	"BL" 16+58	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
COX	CATV CONDUIT	"BL" 16+54	60.0' TO 128.0' LT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
SEWER	8" PVC	"BL" 16+07	4.1' RT	2532.1	2527.3	2526.7	4.7'		EST	TRENCH DRAIN	NO								PROTECT IN PLACE
SEWER	8" PVC	"BL" 16+35	4.1' RT	2531.0	2526.8	2526.1	4.2'		EST	48" RCP	NO								PROTECT IN PLACE
SEWER	8" PVC	"BL" 16+87	3.9' RT	2530.6	2525.7	2525.0	4.9'		EST	36" RCP	NO								PROTECT IN PLACE
SEWER	18" PVC	"BL" 16+88	3.9' RT	2530.5	2526.2	2524.7	4.3'		EST	12' x 6' RCB	NO								PROTECT IN PLACE

CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS

UTILITY CONFLICT SCHEDULE - 90% SUBMITTAL

PROJECT: Brent Lane Drainage System & Trail

PROJECT #: CLV1401

PREPARED BY: David Myhre, Slater Hanifan Group

CHECKED BY: Mark Failla, P.E., Slater Hanifan Group

DATE 3/24/2015

UTILITY	SIZE AND TYPE	LOCATION		ELEVATION				SOURCE OF INFO		IMPROVEMENT	CONFLICT	ELEVATION			PROPOSED CLEARANCE		REQUIRED CLEARANCE		RESOLUTION
		STATION	OFFSET	FG	TOP	BOTTOM	COVER	POTHOLE	OTHER			TOP	BOTTOM	COVER	ABOVE	BELOW	HORZ	VERT	
TRAFFIC SIGNAL/ITS	TS/ITS CONDUIT	"BL" 16+57	16.0' LT	2530.4	2527.4	2527.1	3.0'		EST	12' x 6' RCB	NO								PROTECT IN PLACE
TRAFFIC SIGNAL/ITS	TS/ITS CONDUIT	"BL" 16+57	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"BL" 16+56	16.0' LT	2530.4	2527.4	2527.1	3.0'		EST	12' x 6' RCB	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"BL" 16+55	60.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"BL" 17+52	68.9' RT	2529.7	2526.7	2524.3	3.0'		EST	DROP INLET	NO								PROTECT IN PLACE

Note: Elevations shown are to outside of pipe.

FINAL DESIGN REPORT FOR

BRENT LANE DRAINAGE SYSTEM & TRAIL

MARCH 2015

PREPARED FOR:

CITY OF LAS VEGAS PUBLIC WORKS
333 NORTH RANCHO DRIVE
LAS VEGAS, NEVADA 89106

PREPARED BY:

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

5740 SOUTH ARVILLE STREET #216
LAS VEGAS, NEVADA 89118

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Section Two:	Utility Conflict Schedule
Section Three:	Cost Estimate
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Section Seven:	Section 8 Initial Environmental Screening
Section Eight:	Final Geotechnical Report
Section Nine:	Pothole Data Sheets
Section Ten:	90% Design Plans

1.0 EXECUTIVE SUMMARY

The Brent Lane Drainage System and Trail project (BLP) is a proposed flood control conveyance facility and recreational trail located in the City of Las Vegas (CLV) along Brent Lane between Durango Drive and Tule Springs Road discharging into the existing South Environmental Enhancement Area Detention Basin located in Floyd Lamb Park as depicted in **Figure 1**. The proposed flood control facility is identified in the Clark County Regional Flood Control District (CCRFCD) Master Plan Update (MPU) as regional facility BRDB 0043. The MPU identifies facility BRDB 0043 as an 8' wide by 6' high RCB. The MPU identifies a 100-year design flow of 957 cfs for facility BRDB 0043. The BLP facility is designed to discharge into the existing South Environment Enhancement Area Detention Basin within the Floyd Lamb Park (regional facility BRDB 0032). 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' wide by 7' high 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. Technical analysis presented with this report and performed specific to the BLP further refines design flow rates and facilities.

In coordination with CLV and CCRFCD and per the recommendations of the Pre-Design Report, the selected alternative generally consists of a closed conduit RCB 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 a concrete lined trapezoidal open channel to Tule Springs Road where it transitions to a culvert crossing and terminates as discharge into the existing feeder channel of the Tule Springs Detention Basin. The design 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. The culvert accommodates lower ultimate condition flows for conveyance below the road and meeting CCRFCD Manual criteria, but also accommodates the

higher existing/interim condition flows for conveyance below the road, but not necessarily meeting CCRFCD Manual criteria.

The project also includes design of appurtenant drop inlet and lateral storm drain facilities necessary to intercept the 100-year frequency design storm under ultimate conditions, pavement and striping replacement, a multi-use decomposed granite pedestrian trail with connections to existing trails within Floyd Lamb Park, and incidental utility relocations.

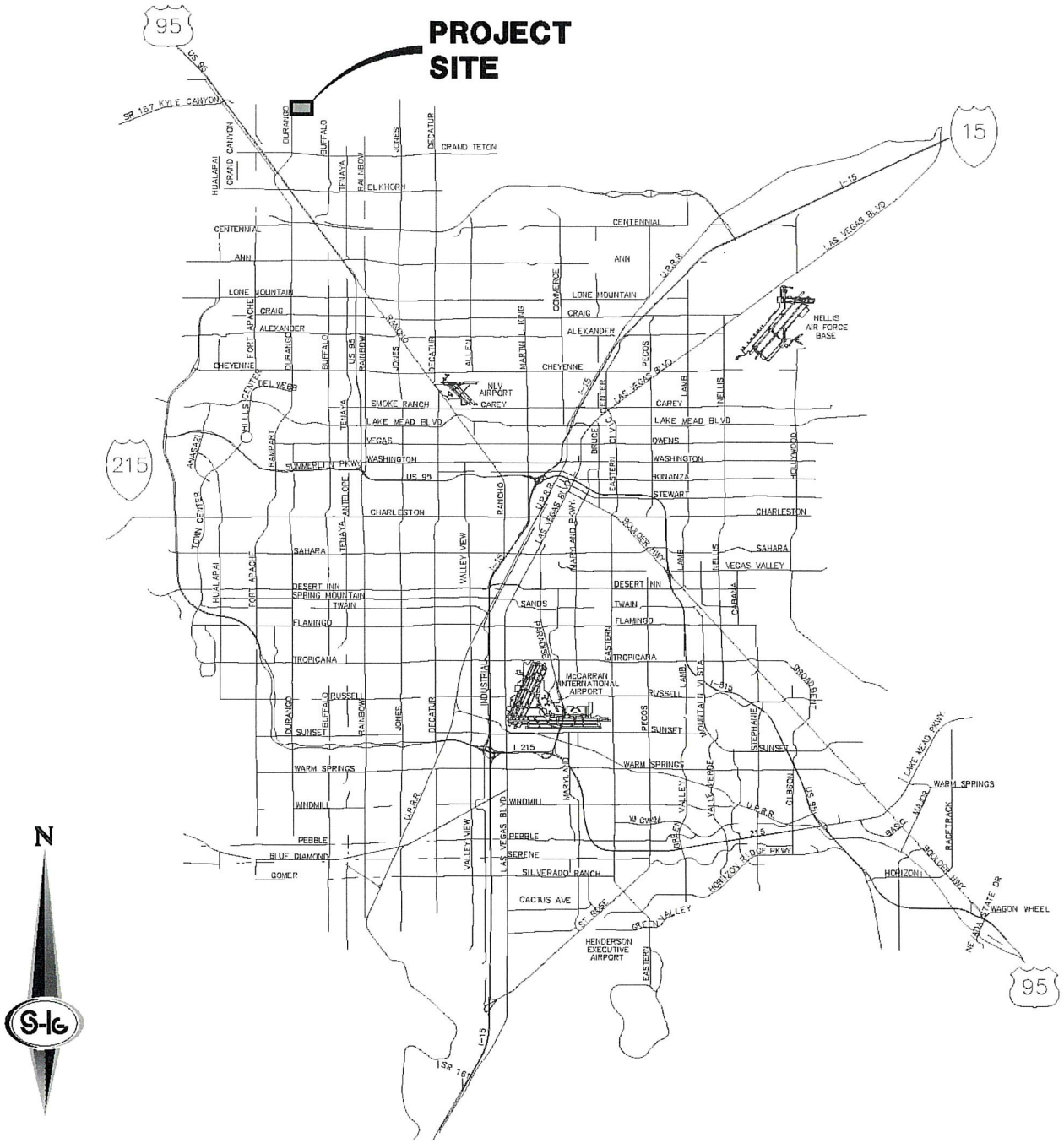
The BLP alignment is primarily proposed within the north half of the roadway alignment within existing native soil to minimize disturbance to existing paved areas. A shift in the alignment is proposed through the Durango Drive intersection so that the box is not located under future curb and gutter and sidewalk, and below existing dry utilities. This alignment does not provide desired horizontal clearance to the existing waterline in Brent Lane so other separation guidelines will be considered.

As a CCRFCD funded project, CCRFCD approval is required. Additionally, since there are proposed improvements on the northwest corner of Brent Lane and Durango Drive within Clark County jurisdiction, Clark County approval will also be required for this project.

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, landscape architecture 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 Engineers is conducting the subsurface utility designation and potholing. Southwick Landscape Architects is providing the landscape architectural design services associated with the multi-use pedestrian trail and Newfields Companies is conducting the Environmental Screening Analysis, Wildlife Survey, Paleontological Survey, and if required, the US Army Corps of Engineers Regional General Permit #7 Application.

Availability of construction funding has tentatively been identified for Fiscal Year 16/17 per the CCRFCD 10-Year Construction Program. Final design will be completed in coordination with the anticipated funding availability.

Figure 1. Vicinity Map



2.0 EXISTING CONDITIONS

2.1 Right-of-Way

Brent Lane is an existing 60-foot right-of-way roadway west of Durango Drive. Brent Lane and the existing equestrian trail along the south side of Brent Lane are constructed within City of Las Vegas owned parcels. A right-of-way exhibit depicting existing right-of-way and easements has been included in Section Four of the Appendix. Right-of-way take is not anticipated to construct the proposed storm drain improvements; however, Authorization to Enter Property (AEP) is required on the northwest corner of the Brent Lane/Durango Drive intersection for construction of drop inlets and roadway curb and gutter. The proposed storm drain improvements east of Durango Drive will be constructed within City of Las Vegas owned parcels and will tie into the existing South Environmental Enhancement Area Detention Basin located in Floyd Lamb Park.

2.2 Utilities

Existing and planned utility information has been requested from utility companies. Information received has been incorporated into the plans and will be shown in each of the milestone submittals. Existing major utilities include the following:

Las Vegas Valley Water District (LVVWD):

- 8-inch water main on the north side of Brent Lane from Homestead Street to Durango Drive.
- 8-inch fire hydrant water lateral extending south from the 8-inch water main on the north side of Brent Lane approximately 250 feet west of Durango Drive.
- 12-inch water main on the west side of Durango Drive from Mystic Valley Drive to Brent Lane.
- Water blow-off in intersection of Brent Lane/Durango Drive.

City of Las Vegas Sewer:

- 8-inch sanitary sewer main 5 feet south of the Brent Lane centerline from Durango Drive continuing to the west.
- 18-inch sanitary sewer main 5 feet east of the Durango Drive centerline from Brent Lane continuing to the north and south.

Southwest Gas:

- 2-inch PE gas line on the south side of Brent line from Homestead Street to Durango Drive.
- 4-inch PE gas line on the west side of Durango Drive from Brent Lane continuing to the south.

Southern Nevada Water Authority (SNWA):

- No SNWA facilities exist within the limits of the project.

NV Energy (Transmission):

- No NV Energy Transmission facilities exist within the limits of the project.

NV Energy (Distribution):

- Three (3) 4-inch electrical conduit along Durango Drive near Brent Lane Station 16+54.

CenturyLink:

- 4-inch underground telephone conduit on the south side of Brent Lane from Homestead Street to Durango Drive.
- Underground telephone conduit on the north side of Brent Lane approximately 200 feet west of the Durango Drive centerline continuing east to the east side of Durango Drive.
- (2) 4-inch underground telephone conduit on the west side of Durango Drive.
- Abandoned underground conduit on the east side of Durango Drive.

Cox Communications:

- Underground conduit and fiber optic cables on the south and north side of Brent Lane and on the west side of Durango Drive.

Storm Drain:

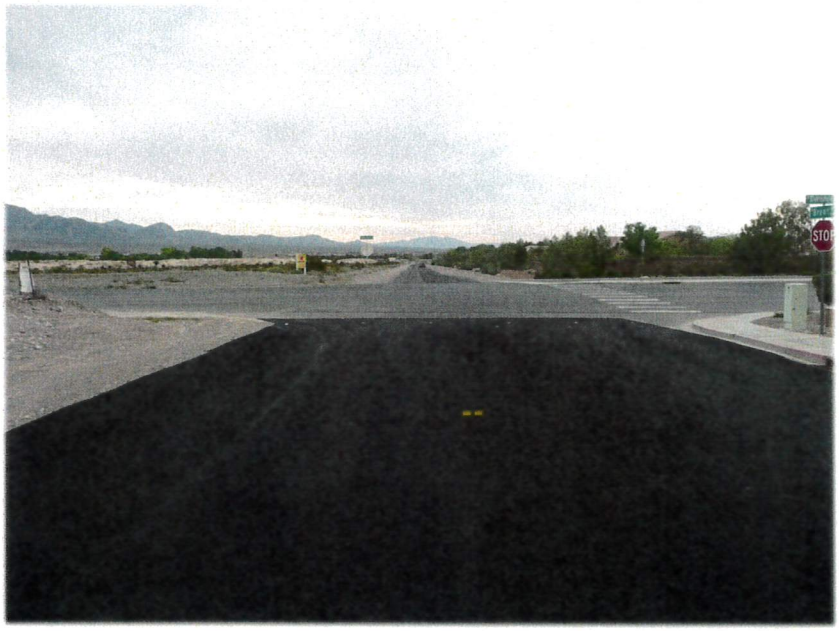
- 12-foot Neenah R-3295 (4 Grates) drop inlet located on the south side of Brent Lane approximately 100 feet west of the Durango Drive centerline with a 24-inch storm drain lateral connecting to a 15-foot Neenah R-3295 (5 Grates) drop inlet located on the west side of Durango Drive approximately 65 feet south of the Brent Lane centerline.
- 15-foot Neenah R-3295 (5 Grates) drop inlet located on the west side of Durango Drive approximately 65 feet south of the Brent Lane centerline with a 36-inch storm drain crossing Durango Drive to a 4-foot Type "A" drop inlet located on the east side of Durango Drive approximately 65 feet south of the Brent Lane centerline.

- 4-foot Type "A" drop inlet located on the east side of Durango Drive approximately 65 feet south of the Brent Lane centerline with a 6-inch bleeder line draining to a roadside swale along the south side of Brent Lane.

2.3 Adjacent Development

The majority of the abutting parcels are developed with residential land-use with the exception of the undeveloped parcels within the Floyd Lamb Park boundary along the proposed storm drain facility alignment. There is an existing equestrian trail along the south side of Brent Lane from Durango Drive to the Floyd Lamb Park entry gate.

2.4 Photo Library



Brent Lane/Durango Drive Intersection (looking east)

Existing Equestrian Trail (looking east)

Proposed Storm Drain Alignment (looking east)

Floyd Lamb Park Entry Gate (looking east)

Existing Wash North of Floyd Lamb Park Access Road (looking east)

Inflow Channel at Existing Detention Basin (looking east)

Existing Wash North of Floyd Lamb Park Access Road (looking west)

Existing Trail Connection Point Inside Floyd Lamb Park (looking east)

Brent Lane/Durango Drive Intersection (looking west)

Existing 6-inch Storm Drain Bubbler East of Durango Drive (looking west)

Inflow Channel at Existing Detention Basin (looking west)

3.0 FLOOD CONTROL FACILITIES AND TRAIL DESIGN

Flood Control Facilities:

Hydrologic analysis and alternative considerations for the BLP have been addressed in detail by the Preliminary Drainage Report, Brent Lane Drainage System & Trail (Durango Dr. to Floyd Lamb Detention Basin), dated May 2014 and prepared by Slater Hanifan Group (PDR). Initial hydraulic analysis of the selected alternative from the PDR was addressed by the 50% Drainage Report, Brent Lane Drainage System & Trail (Durango Drive to Floyd Lamb Detention Basin, dated September 2014 and prepared by Slater Hanifan Group (50% Drainage Report). The drainage design and supporting hydraulic analysis was further refined based on agency feedback and is addressed in detail by the 90% Drainage Report, Brent Lane Drainage System & Tail (Durango Drive to Floyd Lamb Detention Basin), dated March 2015 and prepared by Slater Hanifan Group (90% Drainage Report). A copy of the 90% Drainage Report is included in Section One of the Appendix. The drainage facilities were designed in accordance with criteria outlined in the Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (Manual). Noted exceptions to these criteria contained in the Manual are discussed in the SHG Drainage Study.

Trail:

Three alternative trail alignments were considered for the BLP as part of the PDR. Section Ten provides 90% design plans for the selected trail alignment.

The following subsections describe design criteria and considerations used in the design, identify potential utility impacts, CLV/CCRFCD coordinated recommended flood control facility designs and trail improvements, and estimated construction costs.

3.1 Design Criteria

The following design standards, manuals and procedures have been utilized for design:

1) Uniform Standard Drawings for Public Works' Construction – Off-site Improvements, Clark County Area, Nevada, Volumes I and II.
2) Uniform Standard Specifications for Public Works' Construction – Off-site Improvements, Clark County Area, Nevada.

3) Clark County Regional Flood Control District, Hydrologic Criteria and Drainage Design Manual.
4) Clark County Regional Flood Control District, Policies and Procedures.
5) Design and Construction Standards for Wastewater Collection Systems – Southern Nevada.
6) Local utility standards as required.

Drainage design criteria used to prepare the recommended drainage improvements are provided in **Table 1**.

Table 1: Drainage Design Criteria

Design Criteria	Proposed Value for Design
Design Storm	Flood control facilities are designed to intercept and convey the major (100-year frequency) storm event for the ultimate condition in accordance with CCRFCD Manual criteria. Under interim conditions, flood control facilities were designed to intercept and convey the major (100-year frequency) storm event, but not necessarily meeting CCRFCD criteria for freeboard.
Manning's "n" Value	A Manning's "n" value of 0.013 is utilized for RCP storm drain and a value of 0.015 is utilized for RCB storm drain and concrete open channel. Manning's "n" values for riprap lined channels/ditches vary per the d50 stone size in accordance with Section 700 of the CCRFCD Manual.
100-Yr Street Hydraulics (Ultimate Condition)	• Longitudinal Flow: Flow depth <2', vxd <8 • Thru Intersections: Flow depth <1', vxd <8
10-Yr Street Hydraulics (Ultimate Condition)	• >80' ROW: Longitudinal Flow depth <1', vxd <6, 12-ft dry lane (not including center turn lane); Thru Intersections Flow Depth <6" • <80' ROW, Longitudinal Flow depth <1', vxd <6
Storm Drain Velocity	Per CCRFCD Manual maximum velocity is limited to 25 fps.
Hydraulic Grade Line (Ultimate Condition)	HGL is limited to 1' below drop inlet grate and manhole rim elevations.
Open Channel Design (Ultimate Condition)	Open channel design is in accordance with Section 700 of the CCRFCD Manual.
Culvert Design (Ultimate Condition)	Culvert design is accordance with Section 1000 of the CCRFCD Manual.

3.2 Utility Crossings

Existing utilities were reviewed for possible conflicts with the proposed storm drain improvements. Utility potholes were performed where crossing the proposed storm drain improvements. Utility pothole data sheets are provided in Section Nine of the Appendix. A utility conflict Schedule is provided in Section Two of the Appendix. The following summarizes the existing utility crossings with the proposed storm drain improvements:

Mainline Storm Drain Crossings

- **"BL" 16+45** – Existing (2) 4-inch telephone conduits running north and south crossing the proposed RCB.
- **"BL" 16+58** – Existing fiber optic cable television running north and south crossing the proposed RCB.
- **"BL" 16+65** – Water blow-off assembly at the end of the 12" PVC water main running north and south crossing the proposed RCB.
- **"BL" 16+75** – Existing 4-inch PE gas main running north and south crossing the proposed RCB.
- **"BL" 16+88** – Existing 18-inch sanitary sewer main running north and south crossing the proposed RCB.
- **"BL" 15+75 to 17+28** – Existing abandoned telephone conduit running north and south crossing the proposed RCB.
- **"BL" 16+57** – Existing traffic signal/ITS conduit running north and south crossing the proposed RCB.
- **"BL" 16+56** – Existing street light conduit running north and south crossing the proposed RCB.

Storm Drain Lateral Crossings

- **"BL" 16+35** – Existing 8-inch sanitary sewer main running east and west along the south side of Brent Lane crossing the proposed 48-inch RCP lateral.
- **"BL" 16+87** – Existing 8-inch sanitary sewer main running east and west along the south side of Brent Lane crossing the proposed 36-inch RCP lateral.
- **"BL" 16+44** – Existing 8-inch PVC water main running east and west along the south side of Brent Lane crossing the proposed 48-inch RCP lateral.
- **"BL" 16+64** – Existing 12-inch PVC water main running north and south along the west side of Durango Drive crossing the proposed 36-inch RCP lateral.
- **"BL" 16+75** – Existing 4-inch PE gas main running north and south along the west side of Durango Drive crossing the proposed 36-inch RCP lateral.
- **"BL" 16+07** – Existing 2-inch PE gas main running east and west along the south side of Brent Lane crossing the proposed trench drain.

Table 3: Storm Drain Lateral Recommended Facilities

Location	Description
"SD" Sta. 39+63.31 - 40+05.50	48" RCP SD
"SD" Sta. 39+14.33 - 39+51.64	30" RCP SD
"SD" Sta. 39+21.28 - 39+14.33	36" RCP SD
"SD" Sta. 39+21.10 - 39+52.82	30" RCP SD
"SD" Sta. 38+74.77 - 38+74.81	18" RCP SD
"SD" Sta. 39+33.10 - 39+55.12	36" RCP SD
"SD" Sta. 39+22.42 - 39+33.10	36" RCP SD
"SD" Sta. 39+33.10 - 39+54.84	36" RCP SD
"SD" Sta. 38+76.98 - 38+63.85	18" RCP SD
"SD" Sta. 32+25.00 - 32+62.00	18" RCP SD
"SD" Sta. 25+83.76 + 25+99.44	24" RCP SD
"SD" Sta. 25+81.76 - 26+18.76	42" RCP SD
"SD" Sta. 23+71.50 - 24+00.83	42" RCP SD
"SD" Sta. 12+62.22 - 12+61.09	18" RCP SD
"SD" Sta. 12+62.22 - 12+61.09	18" RCP SD

Table 4: Drop Inlet Recommended Facilities

Location	Description
"SD" 40+08.60	12-ft Neenah R-3295 (4 Grates)
"SD" 40+05.50	36-ft Neenah R-4999 (trench)
"SD" 40+14.36	20-ft DM2
"SD" 39+51.64	20-ft CM2
"SD" 39+52.82	20-ft CM2
"SD" 38+74.84	NDOT Type 2B 2.5' L x 2' W
"SD" 39+55.12	17.5-ft CM2
"SD" 39+54.84	17.5-ft CM2
"SD" 38+63.85	5.0-ft CM2
"SD" 32+62.00	NDOT Type 2B 2.5' L x 2' W
"SD" 26+18.76	Special Field Inlet 15' L x 2.5' W
"SD" 24+00.83	Special Field Inlet 15' L x 2.5' W
"SD" 13+86.91	NDOT Type 2B 2.5' L x 2' W
"SD" 12+61.09	NDOT Type 2B 2.5' L x 2' W

3.4 Project Cost Estimate

Estimates of probable cost comparing the construction costs of flood control facilities and trail alternatives considered by this Final Design Report are detailed in Section Three of the Appendix. Construction costs related to the flood control portion of the project are estimated to be $3,750,643. The cost estimates are inclusive of a 10% contingency and 7% construction management cost. The flood control portion of the project is funded by CCRFCD.

A separate $260,000 budget has been established for the trail portion of the project. Of this budget, $45,000 is allocated for design and $215,000 is allocated for construction. As such, all trail recommendations considered by this Final Design Report attempted to result in a total cost as close to $215,000 as possible. Construction costs related to the trail portion of the project are estimated to be $204,404. The cost estimates are inclusive of a 10% contingency and 7% construction management cost. The trail portion of the project is funded by SNPLMA.

APPENDIX E

Estimates of Probable Cost

APPENDIX F

Coordination Documents

CLV/CCRFCD Kickoff Meeting Minutes – March 6

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

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 Riekki, 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 Riekki; '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/CCRFCD Progress Meeting #1 Minutes – April 8, 2014

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

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 pursed 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.

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/CCRFCD 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

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(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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CLV/CCRFCD Progress Meeting #2 Minutes – June 23, 2014

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Jerrod Ratcliffe

Project Number: CLV1401.01
Date: June 23, 2014

SUBJECT:	Brent Lane Drainage System & Trail Progress Meeting #2
PLACE:	City of Las Vegas Public Works Boulder Room 333 N. Rancho Drive Las Vegas, NV 89106
TIME:	1:00 PM
DATE:	June 23, 2014
ATTENDING:	Mark Failla, SHG Jerrod Ratcliffe, SHG Andrew Howard, SHG Peter Jackson, CLV Flood Connie Diso, CLV PW Kristina Swallow, CLV PW Todd Myers, CCRFCD Oh Sang Kwon, CLV Flood Dennis Moyer, CLV PW Keith Letus, CLV Sewer Greg McDermott, CLV PW

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. Dennis provided Preliminary Design Report (PDR) comments from CLV Sewer and Flood Control. Comments are still anticipated from CCRFCD. Todd will finalize his review and send comments once review is complete. CLV R/W, Public Works, and Environmental did not have comments on the PDR. Dennis will check with CLV Planning for any comments.

2. The group discussed the alternatives presented in the PDR. It was determined that the preferred option is to install RCB from Durango to just past the Floyd Lamb Park entrance gate and to transition to a concrete lined trapezoidal channel to continue to the culvert crossing of Tule Springs Road. The pedestrian trail will be designed above the RCB and will transition next to the trapezoidal channel utilizing the existing berm. The trail will also be used as the maintenance access road for the channel. Access will be provided in accordance with CCRFCD requirements. The existing berm/channel north of the culvert area will be re-graded to better direct flows to the new channel/culvert and to protect the existing roadway from storm flows.

3. The trail design will include providing a connection from the existing equestrian trail to the proposed pedestrian trail across Tule Springs Road. The existing gate at the end of the equestrian trail will need to be unlocked and a crosswalk will be added to Tule Springs Road similar to the proposed crossing next to the security guard house.

4. CLV would like to add a trench drain on the west side of Brent Lane. SHG will add a trench drain and sweeper inlets on both upstream sides. CCRFCD is ok with the interim trench drain being added. The trench drain will be designed to intercept as much interim condition storm flow as reasonable, but not more than ultimate condition facility capacity. Dennis noted that the trench drain should utilize hydraulically efficient vane grates and must be pedestrian and bike friendly.

5. Post and cable fencing will need to be added along the trail when it is adjacent to the concrete open channel. The fencing will include welds rather than bolts to prevent theft. Consider using five strand cables in lieu of typical three strand cables. No chain link fencing is desired for this project.

6. CCRFCD is ok with landscape materials directly over the RCB as long as no trees are planted and root systems are not invasive.

7. Mark noted that preliminary assessment indicates that the ultimate culvert crossing design is adequate to eliminate interim condition flows from topping the roadway; although design criteria is not met under interim conditions. SHG will consider using larger dual boxes or a large single culvert rather than the proposed triple cell culvert in order to reduce hydraulic losses. Todd noted that a 24-foot wide single span RCB is the largest currently available.

8. Peter noted per Comment #2 of his review letter that evaluation of the ability to convey flow from Log Cabin Way south to Brent Lane based on existing El Capitan Way should be provided. It was decided that since the subject project segment of the Brent Lane Facility is designed to accommodate the flow from Log Cabin Way and this phase of the project does not extend to El Capitan Way, the evaluation is considered unnecessary at this point and will be the evaluated at later phases of the project.

9. Additional stabilization will be provided on the west side of Tule Springs Road to fix the existing erosion issues.

10. Dennis will coordinate a meeting with CLV Parks prior to the next regular project progress meeting.

11. Based on 75 calendar days from receipt of CLV comments, the 50% submittal date is scheduled for September 8th, 2014.

Action Items:

SHG

- *Proceed with 50% Design.*
- *Kick-off geotechnical consultant and sub-surface engineering consultant.*

CLV

- *Schedule meeting with CLV Parks (Courtney) to present the project and get feedback.*
- *Check with CLV planning on PDR comments.*

CCRFCD

- *Finalize PDR review and send comments to CLV and SHG.*

cc: Attendees

CLV Planning Coordination Meeting – July 9, 2014

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Mark Failla

Project Number: CLV1401.01
Date: July 9, 2014

SUBJECT:	Brent Lane Drainage System & Trail CLV Planning Coordination Meeting	
PLACE:	City of Las Vegas Public Works Boulder Room 333 N. Rancho Drive Las Vegas, NV 89106	
TIME:	4:30 PM	
DATE:	July 9, 2014	
ATTENDING:	Mark Failla, SHG Jerrod Ratcliffe, SHG Dennis Moyer, CLV Engineering	Fred Solis, CLV Planning Oh Sang Kwon, CLV Flood Courtney Mooney, CLV Planning

The meeting was held to coordinate with CLV Planning Department. The following comments and items were discussed:

1. Trail design to include striping from existing equestrian trail across Brent Lane and connecting to new pedestrian trail alignment.

2. The trail should be decomposed granite surface.

3. The trail alignment will be over the existing berm. The trail will be 10 to 12-feet in width (12-feet if being used as flood control maintenance access). The trail will end at Durango.

4. Per Courtney, the storm drain portion of the project was not included with the State Historic Preservation application for the Floyd Lamb Enhancement Area. This area was added to the historic area register. Courtney thinks that an administrative waiver can be applied for to add the storm drain portion of the project to the application.

5. Planning noted that the design should consider to the greatest extent practical limiting the visibility of any concrete from the road view. This can be accomplished via berms, fencing, landscaping, etc. Concrete that is visible may need to be colored to match native conditions.

6. Courtney noted that the project must be in compliance with Section 106 since it is SNPLMA funded. SHG's environmental consultant Newfields should be aware of this and Mark will confirm. This application should be done sooner than later per Courtney. Courtney said to contact BLM and see what they want.

7. The trail is to include furniture and vegetation. Courtney will check if these items are included in State Historic Area application. Trail design should consider coordination of benches and wildlife markers with Floyd Lamb Park.

8. Dennis requested that SHG prepare a cost comparison between the selected trail alignment over the existing berm and the Alternative C option that is aligned along the south side of the road. The purpose of the assessment is to ensure that Alternative C is not the most

economic option.

Subsequent to the Meeting:

1. Courtney visited Floyd Lamb Park on July 10, 2014 to take a look at the proposed area for the trail and storm drain. She also reviewed the original scope of work submitted for approval by the HPC on 3/28/12. Courtney made a few comments based on her field observations and the original staff report as follows.

2. The HPC approved a slightly different trail alignment, also with the condition that signage, benches, trash receptacles and landscaping along the trail must be considered by the Historic Preservation Commission prior to final design and installation. The new trail alignment and associated signage, gates, etc. will have to go to the HPC for approval.

3. Based on Courtney's field observations, she would like to explore keeping the riprap instead of a concrete liner. The existing environmental enhancement areas are lined with riprap which is more compatible to the desert and historical ranch setting than concrete. The SNPLMA application criteria requires the project to enhance community, cultural, educational, environmental, historical, open space and recreational resources, as well as help protect natural areas or other natural/cultural resources and utilize a sustainable design. The concrete, even if dyed to match the surrounding desert, will be visibly intrusive to the historical area of the park and will not meet this criteria, nor the conditions included in the Floyd Lamb Park Master Plan.

4. If riprap is out of the question Public Works will need to provide a strong justification to the Historic Preservation Commission, or perhaps we can put our heads together to come up with a mitigation plan, such as significant natural/native landscaping, berms, etc. to completely block the concrete from view from the historic area of the park. Courtney provided a link to the HPC meeting schedule with submittal deadlines.

Action Items:

SHG

- *Prepare cost comparison between selected trail alignment and Alternative C alignment.*
- *Contact Newfields and discuss their opinion of State Historic Preservation issues and compliance with Section 106.*

CLV

- *Verify whether administrative waiver is applicable.*
- *Verify limitations of State Historic Preservation application as related to the project.*

cc: Attendees

CCRFCD Section 8 Analysis Review – July 15, 2014

Mark Failla

From: Tim Sutko <TSutko@regionalflood.org>
Sent: Tuesday, July 15, 2014 2:49 PM
To: Todd L. Myers; Andrew Trelease
Cc: Steve Parrish; Ken MacDonald; Mark Failla; Shaun Fisher; Anne Dubarton
Subject: Brent Lane Drainage System Section 8 analysis (BRDB0033-0043)

I have reviewed the Section 8 report prepared by NewFields for the Slater Hanifan Group on behalf of the City of Las Vegas for the Brent Lane Drainage System and find it acceptable. This facility is identified in the current MPU as facilities **BRDB0033-0043.** The proposed project is a storm water conveyance system to be located along the north side of Brent Lane between Durango Drive and the existing South Environmental Enhancement Area. The project includes approximately 2800 linear feet of conveyance system and appurtenant facilities. Various design alternatives are being evaluated; the selected system will be designed to safely convey the 100 year flow which ranges between 1183-1354 cfs.

The following resources may require mitigation:

Geology & Soils – standard engineering design and construction practices are expected to provide adequate mitigation.

Paleontology – the proposed project is located in the Las Vegas formation, an area of high paleontological potential. Monitoring should be conducted during construction activities to identify and remove any subsurface deposits encountered.

Groundwater - standard engineering design and construction practices are expected to provide adequate mitigation.

Biological Resources – **Cacti and yucca** which are protected under NRS 527 occur in the project area. All cactus and yucca should be salvaged and replanted in temporary areas or used as landscape features for the trail portion of the project. The project area is within **desert tortoise and burrowing owl habitat.** Construction activities that require the removal of vegetation should be scheduled outside of the bird breeding season (March – August). If construction is scheduled to occur during the bird breeding season, a biological monitor familiar with the avian breeding habits of the region should inspect the area for active nests. If active nests are found during the breeding season, a 100-250 foot buffer will be established around the nests until the young birds fledge from the nest. There are several man-made burrowing owl nests which may need to be relocated. A fee for disturbance of desert tortoise habitat may be required when the contractor pulls permits for ground disturbing activities.

Cultural Resources – there are several archeological sites recorded in the project vicinity. The proposed project is not anticipated to impact any of those sites.

Air Quality – The construction contractor will be required to comply with all mitigation measures stipulated on ground disturbance/grading permits obtained from the Clark County Department of Air Quality and Environmental Management.

Surface Water – The proposed project does not include the placement of fill material in a "waters of the US" with bed and bank, therefore a 404 Permit (CWA) is not required. Best Management

Practices to control storm water quality exiting the construction site should be developed and included in the construction specifications.

Hazardous Materials – Standard hazardous waste and material management BMPs should be implemented during construction as required by applicable state and federal regulations in order to minimize the generation of hazardous waste and ensure its proper disposal.

The District's Policies and Procedures regarding environmental permitting as a pre-requisite for construction funding eligibility have been satisfied.

If someone would pass this information along to the PM for the City of Las Vegas, I would appreciate it.

Please don't hesitate to contact me if you have any questions or require additional information.

Thanks

Timothy E. Sutko
Senior Hydrologist/Environmental Mitigation Manager
Clark County Regional Flood Control District
600 S. Grand Central Parkway
Suite 300
Las Vegas, NV 89106

702 685-0000
702 685-0001 (FAX)
TSutko@regionalflood.org

CLV Planning Coordination Meeting – July 17, 2014

140717 Brent Lane CLV Planning Coordination Meeting

Thursday, July 17, 2014
7:30 AM

Attendees: see sign in sheet

- Meeting was held to discuss SHPO issues.
- HPC is what is dragging us into this issue of possibly not allowing concrete for our flood conrol facility.
- Rosa recalls attending SHPO meeting with Floyd Lamb, not for approval, but just to present.
- Ken brought up question of jurisdiction. He believes SHPO has no say over channel. Krisitina said it's the local HCP that is requiring this.
- Kristina mentioned putting redering of Key observation points together to present to HPC.
- Oh-sang said to provide engineering justification. Or use composite channel with concrete on bottom and concrete on sides. Life/safety? Riprap collects trash. A ripraqp channel would be wider
- Ken noted that the viewpoint is from the park to the channel, not the other way around. The real question considerd is it compatible with surroundings, not necessarily historic setting per Ken.
- HPC is the City's local historic commision. SHPO is the federal commssion. SHP should not be involved.
- Ken brought up asking BLM per Courtney's statement. Ken said he didn't believe this is necessary, Greg M. agrred. We do not need to get BLM involved.
- Greg noted that we have a draiange problem out here and that is the real issue. We can do things to minizime concrete.
- Krisitna/Dennis will get with Courtney to provide SHG direction on what extent to assess alternatives/exhibits/renderings for presentation to HPC.
- Dennis provided a HPC meeting schedule. Next meeting is 8/27. Pre-app packae to HPC is due on 7/28 to get on agenda for this meeting. We will adjust schedule accordingly was hearing back from Dennis/Kristina after they talk with Courtney.

Newfields/CCRFCD Email Correspondence (SHPO/BLM) – July 17, 2014

Mark Failla

From: Ken MacDonald <kmacdonald@newfields.com>
Sent: Thursday, July 17, 2014 9:19 AM
To: Tim Sutko
Cc: Mark Failla; Anne Dubarton
Subject: RE:

Tim,

No worries. Met with the City and Slater Hanifan this morning and clarified that SNPLMA funding does not trigger any requirements to engage SHPO or BLM beyond the Section 8 process and confirmed the proposed trail alignment was within the area evaluated.

The City has a separate issue in that the City's Historic Preservation Commission (HPC) has their own set of rules and is suggesting riprap rather than concrete for the open channel portion. Public Works will be coordinating with them.

City discussed creating a rendering or visual simulation to communicate with the HPC. Suggested they allow the HPC to participate in choosing the Key Observation Point within the historic park as the concern is the view out, not the view of the facility.

From: Tim Sutko [mailto:TSutko@regionalflood.org]
Sent: Thursday, July 17, 2014 9:04 AM
To: Ken MacDonald
Subject:

Sorry Ken – got your voice message but Gale had grabbed me on another issue and I couldn't pick up your message until a few minutes ago. Call if you still need something.

Thanks
tim

CLV/CCRFCD Progress Meeting #3 Minutes – July 24, 2014

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Mark Failla

Project Number: CLV1401.01
Date: July 24, 2014

SUBJECT:	Brent Lane Drainage System & Trail Progress Meeting #3
PLACE:	City of Las Vegas Public Works Boulder Room 333 N. Rancho Drive Las Vegas, NV 89106
TIME:	10:30 AM
DATE:	July 24, 2014
ATTENDING:	Mark Failla, SHG Andrew Howard, SHG Dennis Moyer, CLV Engineering Rick Schroder, CLV Traffic Greg McDermott, CLV Engineering Fred Solis, CLV Planning Oh Sang Kwon, CLV Flood Kristina Swallow, CLV Engineering Keith Letus, CLV Sewer

The meeting was held to update the project team on project status and review discussion topics. The following items were discussed:

1. Mark noted that SHG was in receipt of Pre-Design Report comments from CLV Flood, CLV Sewer and CCRFCD. Dennis noted that no additional comments should be expected from CLV on the Pre-Design Report.

2. Mark noted that SHG has been working on responding to entity comments. Progression on the 50% conveyance facility design portion of the submittal had been put on-hold based on Historic Preservation Committee (HPC) issues discussed at the 7/17/14 coordination meeting with CLV Planning pending resolution.

3. Mark noted that the "Draft" Geotechnical Report is expected to be completed next week.

4. Mark noted that he recommends potholing to be performed at the 90% design level. It was agreed that it is acceptable to perform potholes at the 90% design level. Dennis noted that the presence of utilities along Tule Springs Road should be verified at the 50% design level based on record drawings. Keith noted that he is fairly certain there are no sewer lines in this location, but that he would verify.

5. Discussion took place with regard to the HPC issues resulting from the 7/17/14 coordination meeting with CLV Planning. CLV provided direction as how to proceed based on in-house discussion with Courtney Mooney. The main concern of the HPC is visibility of the concrete channel. SHG is to proceed with the mainline conveyance facility type and alignment as determined in Progress Meeting #2 (generally a closed storm drain facility from Durango to just pass the curve in Brent Lane and extended as a concrete lined open channel to a culvert crossing below Tule Springs Road) assuming we will be able to satisfactorily mitigate visibility issues with the HPC. SHG is to prepare application forms and Key Observation Point (KOP) exhibits depicting proposed lines of sight with mitigation that would shelter from view the concrete channel. The KOP perspective is from Tule Springs Road looking west

toward the channel. SHG can use judgment in the location of the KOP locations, but should assess at least three locations. The exhibits do not need to be renderings and can be fairly basic incorporating site photos and lines of sight lines with proposed mitigation in-place. Proposed mitigation may be accomplished through use of berms and/or vegetative landscaping. SHG is to proceed first with preparation of the application package and exhibits for HPC and provide to Dennis when complete. Dennis noted that Courtney may be able to approve administratively. Dennis noted general costs for the use of colored concrete ($2.60/sf) and desert varnish ($0.65/sf). Some discussion took place with regard to observation height, whether it was from a seated perspective from a vehicle or from a pedestrian standing position. Fred said he would verify with Courtney. Dennis noted that HPC will require a separate submittal when we get to furnishings.

Subsequent to the Meeting:

1. Fred checked with Courtney as to the observation height to utilize in preparation of the KOP's. Courtney noted that the perspective should be from pedestrian standing height with plantings utilized for mitigation of visibility.

Action Items:

SHG

- *Prepare HPC application forms and KOP exhibits.*
- *Proceed with 50% design submittal.*

CLV

- *Keith-Verify presence of sewer lines in Tule Springs Road.*

cc: Attendees

CLV Email Correspondence (Sewer) – August 4, 2014

Mark Failla

From: Dennis Moyer <dmoyer@LasVegasNevada.GOV>
Sent: Monday, August 04, 2014 7:59 AM
To: Mark Failla
Cc: Kristina Swallow
Subject: FW: Brent Lane Drainage System & Trail Project

FYI

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)

"Building Community to Make Life Better"

From: Keith Letus
Sent: Monday, August 04, 2014 7:49 AM
To: Dennis Moyer
Subject: Brent Lane Drainage System & Trail Project

Dennis,

A field visit conducted last Thursday confirms that there is no Sanitary Sewer between the Floyd Lamb Park at Tule Springs Park Core and the Gate House. The Gate House has some type of septic system, albeit one that probably hasn't been pumped or maintained in several decades.

Keith Letus, P.E.
Project Engineer
Sanitary Sewer Planning

City of Las Vegas, Department of Public Works
333 N Rancho Dr, 7th Floor
Las Vegas, NV 89106
Phone (702)229-2179
Hours M-Th 7:00-5:30, Closed Fri-Sun

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CLV Email Correspondence (Trail) – August 18, 2014

Mark Failla

From: Dennis Moyer <dmoyer@LasVegasNevada.GOV>
Sent: Monday, August 18, 2014 2:33 PM
To: Mark Failla
Subject: FW: Brent Lane Draiange System & Trail
Attachments: new plaques 12-2010-letter 7.pdf

Connie's answers are in red. We will have to ask Rosa about the native.

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)

"Building Community to Make Life Better"

From: Connie Diso
Sent: Monday, August 18, 2014 1:40 PM
To: Dennis Moyer
Cc: Greg McDermott
Subject: RE: Brent Lane Draiange System & Trail

Hi Dennis,

See my comments below in red.

CONNIE L. DISO
engineering planning
PUBLIC WORKS

x2142

From: Greg McDermott
Sent: Monday, August 18, 2014 1:27 PM
To: Connie Diso
Subject: FW: Brent Lane Draiange System & Trail

Connie,

Can you please review the comments below and respond back to Dennis.

Thanks.

From: Dennis Moyer
Sent: Monday, August 18, 2014 1:26 PM
To: Greg McDermott
Subject: FW: Brent Lane Draiange System & Trail

Here is the questions from the contractor

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)

"Building Community to Make Life Better"

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Friday, August 15, 2014 3:45 PM
To: Dennis Moyer
Cc: Jerrod Ratcliffe; 'stantons@southwickla.com'; cassid@southwickla.com
Subject: Brent Lane Draiange System & Trail

Dennis,
We had a coordination meeting with the landscape architect today and a few questions came up that I would like to run by you.

- The Grant & Cooperative Agreement (GCA) for the trail identifies a 14-foot wide decomposed granite trail. We were originally thinking the trail would be 10-feet wide. Does the 14-foot width assume a 2-foot shoulder on each side (10-foot dg trail) or do you think we obligated to the 14-foot width? That would be 10-ft wide DG trail with 2-ft shoulders each side.
- The GCA requires that signage is part of the project. I believe that Courtney said that she didn't think we need signage. Our experience with SNPLMA funds is that if we don't provide everything in the grant the funding could be in jeopardy. Should we provide signage? We could probably have one sign and meet the obligation. If we provide signage is there any sign in particular the City would want? I can answer for one sign. It would need to be the sign that acknowledges SNPLMA funding – see attached. Although the standard shows a medallion or plaque type signage, it can be a standard sign post.
  I've seen signs on other city trails that provide information (trail hours, etc.). I don't know if that is a typical standard for city trails. Perhaps, Parks can answer that one.
- Is revegetation/replanting required for native material disturbed for construction of the flood control facility? I do not have the answer to this question.
- Does the City want benches and trash cans per CLV standards or can we specify something different? My understanding is that CLV standard benches and trash cans should be used.

Let me know what you think.

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

SLATER HANIFAN GROUP
"The Benchmark of Our Profession."

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Response to CLV/CCRFCD Pre-Design Review Comments – September 8, 2014

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
			PRELIMINARY DESIGN & DRAINAGE REPORT	
1	General	Flood (PJ)	The presented Pros & Cons for each Alternative is helpful in determining the best Alternative; however, the Pre-Design Report needs to present the recommended Alternative.	A-The 50% Drainage Study/Detailed Hydraulic Analyses Report presents the recommended alternative as selected per Progress Meeting #2. Note that per the contract documents, the PDR will not be refined at the 50% design phase. A Final Design Report (FDR) will be provided at the 90% design phase which will accomodate the selected design, but will not recount alternatives presented in the PDR.
2	General	Flood (PJ)	The design report needs a discussion on any changes and/or recommendations within the MPU based upon the existing flow conditions. The detailed analysis needs to consider the ability of the proposed system to collect the Ultimate Flow shown by following the MPU. Provide a discussion on the general ability to convey flow from Log Cabin Way south to Brent Lane based upon the existing roadway grades of El Capitan Way.	A-The 50% Drainage Study/Detailed Hydraulic Analyses Report provides additional discussion regarding drainage pattern assumptions and consistency with the MPU. As discussed in the Pre-Design Report, it was assumed that the entire regional subbasin NW115-C will contribute to the Brent Lane Drainage System in accordance with the MPU despite some physical constraints that may make that difficult. This results in a "worst case" flow design for the Brent Lane Drainage System. Per discussion at Progress Meeting #2, this approach was considered acceptable and no additional assessment of the ability for future flow to be routed to the Brent Lane Drainage system is necessary as part of this project.
3	General	Flood (PJ)	Provide Flood Control with CCRFCD's acceptance of the Environmental Screening for this project.	A:A copy of CCRFCD's acceptance of the Environmental Screening is included with the 50% Drainage Study/Detailed Hydraulic Analyses Report.
4	General	Flood (PJ)	The provided HEC-1 analysis uses CN values that do not match the supporting calculation sheets. A detailed review of the revised HEC-1 analysis will be performed with the next submittal.	A:A review of the HEC-1 hydrologic analyses was performed and CN values have been revised accordingly. Updated hydrologic models are provided in the 50% Drainage Study/Detailed Hydraulic Analyses.
5	General	Flood (PJ)	Provide a WSPG analysis of the recommended system with the next submittal based upon the selected storm drain design.	A:The 50% Drainage Study/Detailed Hydraulic Analyses Report includes hydraulic analysis for the selected design.
6	General	Flood (PJ)	Flow Split Calculations need to be provided for the identified flow split locations per the HCDDM criteria. Provide additional Flow Split Calculations based upon HEC-1 routing and physical roadway conditions to verify inlet and system parameters.	B-Per our telephone discussion and Progress Meeting #2, this comment is in regards to the Log Cabin Way/El Capitain intersection. As discussed, the assumption that the entire regional subbasin NW115-C will contribute to the Brent Lane Drainage System is acceptable since it results in a "worst case" flow design for the Brent Lane Drainage System; therefore additional flow split computations are not required.
7	General	Flood (PJ)	Provide a trench drain on the west side of the Brent Lane & Durango Drive intersection.	A:A trench drain is provided in the 50% Design on the west side of the Brent Lane/Durango Drive intersection. Per Progress Meeting #2, the trench drain will be sized to intercept as much interim condition flow as reasonable, but less than the ultimate condition design flow of the mainline storm drain facility.
8	General	Flood (PJ)	Limit the length of the drop inlets to 20-foot increments. Replace the 40-foot inlet at the southwest corner of Durango & Brent with two 20-foot inlets with a minimum of twenty feet between the inlets.	A:Acknowledged.
9	General	Flood (PJ)	Provide detailed grading around the area drop inlet including concrete collar, roadway safety markers and grading swale.	A:Acknowledged.
10	General	Flood (PJ)	Provide the HGL and Q100 on all Profiles with the next submittal.	A:Acknowledged.
11	General	Flood (PJ)	Show the RCB angle points and/or curved segments by station location and angle/degree change. Include the radius information and discuss how the curved sections are to be completed using curved forms or multiple angled segments. This needs to be explained within the Specifications. This information is needed to allow for the use of precast RCB's as well as cast in place construction.	A:Acknowledged. Note that the next submittal phase is 50%. Per the contract documents, specifications will be initiated and provided at the 90% design phase.
12	General	Flood (PJ)	Provide details for the RCB construction. System design needs to accommodate the construction option of pre-cast or cast-in-place improvements. Verify that the Specifications and schedule accommodate the construction methods.	A:Acknowledged. The system design will accommodate both construction methods. Note that the next submittal phase is 50%. Per the contract documents, specifications & structural details will be initiated and provided at the 90% design phase.
13	General	Flood (PJ)	Provide Access Manholes along the RCB at 400-foot spacing. Adjust spacing to include Manholes near the junction structures for maintenance consideration. Consider using Manhole openings that are cast with the RCB's to reduce costs.	A:Acknowledged.
14	General	Flood (PJ)	Provide inlet calculations as necessary to support the system design with the next submittal.	A:Acknowledged.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
15	General	Flood (PJ)	Provide the lateral and inlet design information to include water and/or sewer relocations with the next submittal. Provide the clearance between storm drain and the water & sewer lines. Provide encasement requirements and details.	A:Acknowledged.
16	General	Flood (PJ)	The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles. Indicate the type of pipe material for water and sewer lines. ACP water lines will require special consideration and handling and must be addressed in the specifications.	A:Acknowledged.
17	General	Flood (PJ)	Consider lowering the proposed mainline storm drain to avoid utility relocations at the Durango Drive and Brent Lane intersection. Review the RCB hydraulics and the relocation costs to determine the recommended course of action and system impacts.	A:Acknowledged.
18	General	Flood (PJ)	Clearly identify the required utility relocations and which relocations are incidental to and part of the storm drain work.	A:Acknowledged.
19	General	Flood (PJ)	Provide separate plan and profiles for any relocated sewer and/or water lines.	A:Acknowledged.
20	General	Flood (PJ)	Provide detail sheets showing typical details needed for the construction, connection and any special transition structure details. Structural details, if required, must be submitted by the 90% submittal.	A:Acknowledged.
21	General	Flood (PJ)	Add a note for all storm drain drop inlets that references the newly adopted USDCCA Drawing No. 421 (Stormwater Quality Management Stamp and Sign Detail). Include the USDCCA Drawing No. 421 (Stormwater Quality Management Stamp and Sign Detail) note to the concrete collar detail for the NDOT Type 2B inlets.	A:Acknowledged.
22	General	Flood (PJ)	Provide pothole data with the 70% submittal. The pothole information should identify the bottom limits of conduit bank crossings and show the limits of concrete encasement where applicable.	B:Per discussion at Progress Meeting #3, it was acceptable to perform potholes at the 90% design phase. The potholes will include data on the bottom and top of any concrete encasements.
23	General	Flood (PJ)	Show the removal and replacement of the roadway landscape improvements and/or cover these items in the Specifications.	A:Acknowledged. Per contract documents, the specifications will be provided at the 90% design phase.
24	General	Flood (PJ)	Provide for a separate maintenance access road where the dual use trail and maintenance access are not combined.	A:Acknowledged.
25	General	Flood (PJ)	Provide fencing for any proposed open channel sections to secure the channel within this Park facility. Provide appropriate access gates as needed.	A:Per Progress Meeting #2, post and cable fencing will be provided.
26	General	Flood (PJ)	Provide a 12-foot wide concrete access ramp for maintenance at the upstream end of the culvert crossing options at the Tule Springs Road crossing.	A:Acknowledged.
27	General	Flood (PJ)	Provide an updated detailed cost estimate with the next submittal for review. Reduce the contingency to 10% with the 70% submittal. The cost estimate must be refined prior to the 90% submittal and request for construction funding to assure that the requested and allocated storm drain funds are sufficient for construction.	A:Acknowledged.
28	General	Flood (PJ)	The Final Design Report needs to include an electronic copy of the entire report with the input and output files for the hydraulics and hydrology.	A:Acknowledged. Electronic copies/files of reports/hydrologic & hydraulic models/plans will be provided at each design phase.
29	General	Flood (PJ)	Detailed Improvement Plan comments will be provided with the next submittal. The schematic plans included with the PDR are conceptual in nature and were provided to help set the system location.	A:Acknowledged.
30	General	RFCD (TM)	A facility-specific environmental analysis in accordance with Chapter 8 of District's Supplemental Programmatic Environmental Impact Statement, Clark County Regional Flood Control District, 2002 Master Plan Update, September 2004 was submitted with PDR. The District's Policies and Procedures regarding environmental permitting as a pre-requisite for Construction funding eligibility have been satisfied. Please note that if additional analysis and/or coordination with NVSHPO are required for work relating to the trail project, non-District funds shall be utilized for that effort.	A:Acknowledged.
31	General	RFCD (TM)	Identify all right-of-way (ROW) and easement acquisition requirements for this project. All ROW/easements must be acquired prior to City's request for construction funding.	A:Acknowledged.
32	General	RFCD (TM)	Please provide pothole information for any major utilities within the proposed storm drain alignment with the 70% submittal.	B:Per discussion at Progress Meeting #3, it was acceptable to perform potholes at the 90% design phase. The potholes will include data on the bottom and top of any concrete encasements.
33	General	RFCD (TM)	Per discussions in the June 23, 2014 progress meeting, the recommended design alternative includes reinforced concrete box culvert (RCB) from Durango to just past the Floyd Lamb Park entrance, transitioning to a concrete lined trapezoidal channel to the crossing at Tule Springs Road. District concurs with this alternative.	A:Acknowledged.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
34	General	RFCD (TM)	Remove references and descriptions of MPU facility BROB 0033 from the Executive Summary and Section(s) 1.1 and 1.4, as this is a completed facility. The scope of this project is limited to MPU ID Mile BRDB 0043.	A-The 50% Drainage Study/Detailed Hydraulic Analyses Report provides the revised descriptions. Note that per the contract documents, the PDR will not be refined at the 50% design phase. A Final Design Report (FDR) will be provided at the 90% design phase which will accomodate the selected design, but will not recount alternatives presented in the PDR.
35	General	RFCD (TM)	Revise the description of "temporary drop inlets" (Executive Summary) at the Brent Lane/Durango Drive intersection to "interim drop inlets". The interim area drains proposed at the northwest corner of the intersection will eventually be replaced by permanent drop inlets once the parcel is developed.	A:Acknowledged.
36	General	RFCD (TM)	Section 4 - Tables 8, 9, 10 and 11 indicate that there is a higher maintenance cost associated with concrete open channel versus closed reinforced concrete box culvert. Historically, District has found the opposite to be the case. The easier access to open channel allows for less costly maintenance with a concrete channel. Rip-Rap channels, on the other hand, are very costly to maintain. Revise tables accordingly.	A:Acknowledged. Note that per the contract documents, the PDR will not be refined at the 50% design phase. A Final Design Report (FDR) will be provided at the 90% design phase which will accomodate the selected design, but will not recount alternatives presented in the PDR.
37	General	RFCD (TM)	Provide recommended facility alternative in next submittal.	A:Acknowledged.
38	General	RFCD (TM)	District concurs with the ultimate conditions basin boundaries as shown on Exhibit I. It is noted that the northern boundaries may be revised slightly with the next phase of the storm drain system due to possible topographical constraints that are outside the scope of this project. However, the analysis presented provides a slightly conservative approach that is acceptable to the District.	A:Acknowledged.
39	General	RFCD (TM)	The CN values utilized in the HEC-I analyses do not match the backup calculations provided in the report. Revise accordingly and provide with next submittal.	A:A review of the HEC-1 hydrologic analyses was performed and CN values have been revised accordingly. Updated hydrologic models are provided in the 50% Drainage Study/Detailed Hydraulic Analyses.
40	General	RFCD (TM)	Provide a detailed hydraulic analysis of the recommended alternative facility with the next submittal.	A:Acknowledged.
41	General	RFCD (TM)	Provide plans and specifications to the appropriate design level with next submittal. Include plan and profiles with Q100 HGL, maintenance access locations, grading, details, removals, control...etc.	A:Acknowledged. Per the contract documents, specifications will be initiated and provided at the 90% design phase.
42	General	RFCD (TM)	Show lateral locations and profiles in enough detail to identify second phase pothole requirements.	A:Acknowledged. Per discussion at Progress Meeting #3, it was acceptable to perform potholes at the 90% design phase. The potholes will include data on the bottom and top of any concrete encasements.
43	General	RFCD (TM)	Alternative 3 identifies the Tule Springs crossing as a triple 10' x 7' RCB. Consider dual 15' x _ RCB's or a precast free span arch system similar to the Contech Con/Span arch system.	A:Acknowledged.
44	General	RFCD (TM)	Provide the following information with 70% submittal:	
44a			Draft Special Provisions and Engineers Cost Estimate with District and SNPLMA breakout	A:Per the contract documents, specifications will be initiated and provided at the 90% design phase. A cost estimate with District/SNPLMA breakout will be provided with the next submittal phase which is 50%.
44b			Survey Control Plan	A:Acknowledged.
44c			Trench Sections	A:Acknowledged.
44d			Draft Structural Drawings	B: Structural drawings will be initiated and provided at the 90% design phase.
44e			Lateral Profiles and DI locations/sizes	A:Acknowledged.
44f			First round pothole information	B: Per discussion at Progress Meeting #3, it was acceptable to perform potholes at the 90% design phase. The potholes will include data on the bottom and top of any concrete encasements.
45	General	CLV Sewer	Note on Page 4 of PDR, Section 2.2, CLV Sewer, 1st bullet: replace "continuing to the east" with "... west"	A:Acknowledged. Note that per the contract documents, the PDR will not be refined at the 50% design phase. A Final Design Report (FDR) will be provided at the 90% design phase.
46	General	CLV Sewer	Note on Page 4 of PDR, Section 2.2, CLV Sewer, 2nd bullet: add ", and north." to end of sentence	A:Acknowledged. Note that per the contract documents, the PDR will not be refined at the 50% design phase. A Final Design Report (FDR) will be provided at the 90% design phase.
DRAWINGS (30%) - N/A				

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

CLV/CCRFCD Progress Meeting #4 Minutes – September 8, 2014

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Andrew Howard

Project Number: CLV1401.01
Date: September 8, 2014

SUBJECT:	Brent Lane Drainage System & Trail Progress Meeting #4	
PLACE:	City of Las Vegas Public Works Boulder Room 333 N. Rancho Drive Las Vegas, NV 89106	
TIME:	8:30 AM	
DATE:	September 8, 2014	
ATTENDING:	Mark Failla, SHG Andrew Howard, SHG Dennis Moyer, CLV Engineering Bill Snyder, CLV R/W	Peter Jackson, CLV Flood Todd Myers, CCRFCD Jerrod Ratcliffe, SHG Keith Letus, CLV Sewer

The meeting was held to submit the 50% design package. The following items were discussed:

1. Mark noted that per contract documents, structural, specs and potholes will be performed at 90% design level.

2. Mark discussed the proposed trench drain structure and the anticipated interim condition intercepted flows (+/-496 cfs of the 1149 cfs) at the intersection of Brent Lane and Durango. Pending further information about the exact location of the sewer line, it was acknowledged by Dennis, Todd and Peter that the large trench drain structure, modified to surround the existing sewer line, was an acceptable solution. It was reiterated by Todd and Dennis that design considerations should be made to intercept as much interim flow as possible at this location. It was suggested for consideration that the design be modified to direct all flow to the 48" RCP side and not tie into the top of RCB.

3. Discussion took place about relocating the maintenance access road to the south side of the channel. Dennis and Todd agreed that relocation could be a better option. It was collectively determined that relocation of the access road would eliminate the need for large diameter riprap/channel inflow stabilization and concrete access road along the north side of the channel. Also, it was agreed upon by Mark, Dennis and Todd that relocating the access road may eliminate the need for storm drain conveyance of flow from the side channel into the mainline RCB under Tule Springs. With relocation of the access road, Mark suggested that the side channel could be extended through the currently proposed access road area and allow flow to spill directly into the open channel. It was agreed that surface flow from the side channel to the mainline is preferred. Todd noted that a manway would not be required on the north side of channel.

4. Todd and Dennis suggested revising the mainline RCB under Tule Springs to 7-ft high in order to allow full size vehicles to drive through the structure for maintenance access.

5. Mark discussed an option that was presented in the draft HPC application package which proposed extending the berm near the park entrance in order to block the view of the open

channel to vehicles entering the park. However, Mark noted concern that the proposed berm option would also block interim condition bypass flows from the Brent/Durango intersection flows from spilling into the open channel. Dennis and Peter agreed that no berm should be located at this location, thus allowing flow to spill into the channel. It was suggested by Dennis and Peter that without the extended berm option at the site entrance, there would not be a need to show it on the HPC application package, primarily due to the fact that the Courtney did not voice a concern for visibility from the park entrance.

6. Mark noted, with regards to the HPC application package, that visibility of the channel will not be obstructed in the vicinity of the culvert crossing at Tule Springs. Dennis and Peter agreed that given the current physical configuration of the channel alignment and trail, it is inevitable that the channel will be visible at this location.

7. Mark noted that the submitted 50% plans show the trail sign being mounted as a monument rather than attached to a metal sign post. This is for consideration by CLV.

8. Todd noted that only a 2 or 3 strand post and cable railing would be required along the access road. Further consideration by CLV/RFCD with regard to providing additional fencing between the trail and channel will take place during the 50% design review and direction provided to SHG.

Action Items:

SHG

- *Edit HPC application package to exclude visibility at the park entrance.*

CLV

- *Review 50% design package and submit comments at September 29th progress meeting.*

CCRFCD

- *Review 50% design package and submit comments at September 29th progress meeting.*

cc: Attendees

CLV/CCRFCD Progress Meeting #5 Minutes – October 21, 2014

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Mark Failla

Project Number: CLV1401.01
Date: October 21, 2014

SUBJECT:	Brent Lane Drainage System & Trail Progress Meeting #5	
PLACE:	City of Las Vegas Public Works Boulder Room 333 N. Rancho Drive Las Vegas, NV 89106	
TIME:	2:30 PM	
DATE:	October 21, 2014	
ATTENDING:	Mark Failla, SHG Andrew Howard, SHG Dennis Moyer, CLV Engineering Alan Riekki, CLV Survey Rick Schroder, CLV Traffic Oh Sang Kwon, CLV Flood	Peter Jackson, CLV Flood Todd Myers, CCRFCD David Myhre, SHG Keith Letus, CLV Sewer Fred Solis, CLV Planning Connie Diso, CLV Traffic/Trails

The meeting was held to receive and discuss CLV/CCRFCD comments on the 50% design submittal package. The following items were discussed:

1. Mark noted that per contract documents, structural, specs and potholes will be performed at 90% design level. Additionally, a second application package will be submitted to the HPC based on the 90% design submittal. Mark also noted that SHG is still awaiting 50% review comments from CCPW; however per telephone conversation with Ajay Kalra at CCPW the comments are forthcoming.

2. **CLV Traffic**: Rick provided CLV traffic comments. Rick discussed the need for coordination with CCPW for school flashers at Durango/Brent intersection. Rick noted that CLV would like a separate signage and striping plan. Peter mentioned coordination with safe route to schools and any impacts to drop inlet design. Rick suggested moving cross walk +/-100-feet west from park entrance; after meeting discussion it was preferred to move the cross walk +/-100-feet east of park entrance.

3. **CLV Planning/HPC**: Fred and Dennis discussed second submittal to HPC. The second submittal will need to include furniture, landscaping and signage details. We do not need to re-submit line of site exhibits.

4. **CLV Sewer**: Keith provided CLV Sewer comments. Keith noted the option of providing a sleeve for the sewer line at the trench drain location instead of a concrete encasement. Keith also discussed the bathroom facility at the guard house. Currently there is no known sewer pipe extending from the bathroom facility. CLV will check with Daphne Delagarza with CLV Parks to get her opinion on this facility. CLV may decide to provide a sleeve and/or sewer line extension from the bathroom facility. CLV will let SHG known the desired direction.

5. **CLV Planning/Trails**: Connie and Dennis discussed CLV Trail comments. Connie's written comments were unavailable at the time of the meeting; however Connie said she would forward them to SHG subsequent to the meeting. Connie noted to check the impact of the wrought iron fence and pillars at the park entrance. Connie noted that the trail section needs to be consistent with 10-foot wide decomposed granite and 2-foot shoulder on each side. Connie will let SHG know the desired monument signage and plaque language (maybe a metal sign on a railroad tie slightly off the trail). Just one sign is acceptable located near the entrance within the park fenced area. Dennis noted that CLV has a new standard park bench and he will provide to SHG. Dennis noted that he would like additional trail sections and to show RCB in trail sections. Dennis would like to replace the existing park entrance gates with a gate system made from split pole/railroad ties. Dennis noted that what he is thinking of is similar to the BLM Grafton Wilderness facility fencing. Dennis will provide SHG with more information with regard to the desired entrance fencing.

6. **CLV Flood**: Peter and Dennis discussed CLV Flood Control comments. Peter's written comments were unavailable at the time of the meeting; however Peter said he would forward them to SHG subsequent to the meeting. The following items were discussed:
   - Provide roll wave calcs for open channel; mainly concerned with adding more freeboard. If additional freeboard is required, CLV will want it contained in typical channel section instead of adding a vertical curbing.
   - CLV Maintenance prefers an 8-foot high culvert at Tule Springs Road; however Dennis said if this causes extensive issues or does not work a 7-foot high culvert is acceptable.
   - CLV would prefer a larger turn around area at culvert exit.
   - Provide a section at culvert exit and consider expanding concrete section the entire width of channel and further downstream. Need to provide a blow-up of culvert exit area and take a closer look at exit velocities and need for additional energy dissipation.
   - CLV prefers to have an access ramp at the culvert exit area in addition to the one provided at the upstream end.
   - CLV prefers utilizing NDOT Type 2B inlets instead of Type 2A inlets where applicable.
   - For DI#1, CLV prefers no 90 degree angle. Provide manhole to remove 90 degree angle.
   - CLV prefers calling DI's cast-in-place instead of special DI.
   - CLV prefers to provide access road on south/east side of channel. No manway is required on the north/west side, but do provide post and rail fencing with gate at safety steps.
   - Much discussion took place with regard to channel fencing. The 7-strand post and rail cable was considered too extensive with a 3-strand preferred. Also variation of the fencing on the north and south sides was discussed. This issue will have further discussion as the 90% submittal progresses.
   - Access road is typical 6-inches of Type II, not 4-inches.
   - CLV prefers channel depth in 6-inch increments and uniform, even if a little

deeper than necessary.
- If a slotted manhole lid is utilized, provide an expanded concrete collar.
- Provide specs for both CIP RCB and Pre-Cast.
- CLV would prefer to extend RCB one segment west of trench drain structure for definitive future extension.
- Provide a 12-foot wide berm and show existing riprap on existing berm and proposed riprap along extension of berm.
- Consider providing scour computations at channel inflow areas.
- CLV suggested checking storm drain layout efficiency at Durango/Brent intersection.
- The plans need to denote whether to cap the existing 6-inch PVC bleeder storm drain or if shallow, remove.

7. **CLV Engineering**: Dennis discussed CLV Engineering comments. Dennis's written comments were unavailable at the time of the meeting; however Dennis said he would forward them to SHG subsequent to the meeting. Dennis questioned whether we are protecting asphalt in-place along Brent or remove and replace to centerline.

8. **CCRFCD**: Todd was available at the meeting for a short time and provided some discussion on CCRFCD comments; generally consistent with CLV Flood comments discussed in Item #7. Todd's written comments were unavailable at the time of the meeting; however Todd said he would forward them to SHG subsequent to the meeting.

9. SHG received notice that LVVWD comments are available for download.

Action Items:

SHG
- *Proceed with 90% Design.*

CLV
- *Provide CLV Planning/Trails written comments to SHG.*
- *Provide CLV Engineering written comments to SHG.*
- *Provide CLV Flood written comments to SHG.*
- *Provide SHG direction on park guard house bathroom facility sewer extension.*
- *Provide SHG direction with regard to trail signage and monumentation.*
- *Provide SHG new CLV standard park bench detail.*
- *Provide SHG direction and details for the CLV desired park entrance fencing.*

CCRFCD
- *Provide CCRFCD written comments to SHG.*

CCPW
- *Provide CCPW written comments to SHG.*

cc: Attendees

CLV/CCRFCD Progress Meeting #6 Minutes – January 6, 2015

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Mark Failla

Project Number: CLV1401.01
Date: January 6, 2015

SUBJECT:	Brent Lane Drainage System & Trail Progress Meeting #6
PLACE:	City of Las Vegas Public Works Boulder Room 333 N. Rancho Drive Las Vegas, NV 89106
TIME:	2:30 PM
DATE:	January 6, 2015
ATTENDING:	Mark Failla, SHG Jerrod Ratcliffe, SHG Dennis Moyer, CLV Engineering Rick Schroder, CLV Traffic Oh Sang Kwon, CLV Flood Kristina Swallow, CLV Engineering Todd Myers, CCRFCD Bill Snyder, CLV R/W Connie Diso, CLV Traffic/Trails

The meeting was held to provide an update on project status and to clarify specific comments received on the 50% design submittal package. The following items were discussed:

1. Mark noted that all anticipated comments from CLV/CCRFCD/CCPW on the 50% design submittal have been received as of 12/23/14. SHG is proceeding with the 90% design submittal with anticipated submittal date of 3/9/15. Project potholes were completed 12/5/14.

2. Mark noted that per contract documents, structural and specs will be performed at 90% design level. Additionally, a second application package will be submitted to the HPC based on the 90% design submittal.

3. **CLV Traffic**: Per meeting discussion it was confirmed that it is preferred to move the cross walk +/-100-feet east of park entrance. Rick noted that this location could restrict above ground improvements in the future due to sight visibility requirements along curved roads.

4. **CLV Planning/HPC**: It was noted that funding for the trail is based on construction completion 3/31/16. An extension can be obtained if necessary; however we should plan to complete by this deadline. The requirements for the second submittal to HPC were discussed. The second submittal will need to include furniture, landscaping, specific amenities, fencing, signage details, etc. No photos are required although would be helpful if available (especially for items we are matching at Floyd Lamb Park such as trash cans, benches, railroad tie fencing). We do not need to re-submit line of site exhibits. The HPC Submittal will occur at the same time as the 90% Submittal.

5. **CLV Sewer**: Dennis discussed the bathroom facility at the guard house. He noted that he spoke with CLV Parks and determined that any sewer extension to/from this facility will be performed by the Parks Department and is not included as part of this project. Therefore, no consideration to this future sewer is required as part of this project.

6. **CLV Planning/Trails**: The following items were discussed.
   - Bench and trash cans should match the ones currently utilized at Floyd Lamb Park. The Floyd Lamb Park design plans should be looked at for the correct bench and trash cans; however Todd M. cautioned that a field visit should verify the correct ones to utilize and to ensure they match the plans.
   - Dennis will provide SHG photos/video of example railroad tie park entry gate (from Grafton Wilderness Park) that is preferred by the City. SHG will discuss dimensions with Dennis upon receipt of the entry gate example. Mark verified that the entry gate will utilize the SNPLMA funding for the trail improvements and not RFCD funds; and that the entry gate was not included in the 50% cost estimate and may reduce other amenities previously proposed at the 50% design level.
   - It was noted that bollards were used at other access points within Floyd Lamb Park and could be utilized for this project as well at access control points.

7. **CLV Flood/RFCD**: The following items were discussed.
   - It was decided to eliminate post and cable fencing along the north side of the trapezoidal open channel. Post and cable fencing along the north and south sides of channel should be utilized where channel transitions to rectangular sections for maintenance safety. Post and cable fencing in these instances can be standard 3-strand cable with metal posts bolted to top of channel. Fencing along south side should run adjacent to trail along top of "berm". The posts should be railroad ties and the cable should be 3-strand. The post and cable fencing should match that used in other parts of Floyd Lamb Park. Controlled access should be provided at both ends of channel. Swing gates the same height as the post and cable fencing should be used similar to other swing gates utilized within Floyd Lamb Park. No trespassing signs will be added to the fencing and gates with NRS posting.
   - CLV Maintenance prefers an 8' high culvert at Tule Springs Rd; however Dennis said if this causes issues or does not work, a 7' high culvert is acceptable.

8. **CLV Engineering**: The following items were discussed.
   - Dennis will provide SHG the most current CLV special provision specifications.
   - SHG will look at simplifying the pavement patching at Durango/Brent, and will eliminate the mill/overlay operation and consider slurry seal if needed.

Action Items:

SHG

- *Proceed with 90% Design.*

CLV

- *Provide preferred entry gate photos/video to SHG.*
- *Provide current CLV special provisions to SHG.*

cc: Attendees

CLV/CCRFCD Progress Meeting #7 Minutes – January 27, 2015

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Mark Failla

Project Number: CLV1401.01
Date: January 6, 2015

SUBJECT:	Brent Lane Drainage System & Trail Progress Meeting #7	
PLACE:	City of Las Vegas Public Works Boulder Room 333 N. Rancho Drive Las Vegas, NV 89106	
TIME:	4:00 PM	
DATE:	January 27, 2015	
ATTENDING:	Mark Failla, SHG Peter Jackson, CLV Flood Dennis Moyer, CLV Engineering Oh Sang Kwon, CLV Flood	Alan Riekki, CLV Survey Todd Myers, CCRFCD

The meeting was held to obtain clarification/discussion on specific comments received on the 50% design submittal package. The following items were discussed:

1. **Railroad Tie Entry Gate**: Dennis will provide SHG with video/photos of desired railroad tie entry gate. SHG will review and prepare preliminary layout for follow-up discussion with Dennis. The entry gate will not require any structural design and will be of similar detail/installation as railroad tie fencing.

2. **Trail Amenities & Fencing**: CLV will provide SHG confirmation of desired benches, trash cans, dog bag dispenser and signage to be utilized. CLV will provide SHG with PDF/CAD file details of selected bench, trash can, signage and dog bag dispenser. The fencing should utilize the same railroad tie/cable fencing as Floyd Lamb Park. Mark noted that the fencing in Floyd Lamb Park only utilized a two-strand cable; although it was previously discussed to provide a three-strand cable. It was agreed that only a two-strand cable is necessary and that is what should be provided.

3. **Relocated Cross Walk Near Entry**: Per prior meeting discussion it was confirmed that it is preferred to move the cross walk +/-100-feet east of park entrance. An additional length of pedestrian trail will be necessary to connect the existing horse trail to the relocated cross walk. This was acknowledged by all.

4. **Discharge Energy Dissipator**: Mark noted that SHG has performed an initial evaluation for the necessity of an energy dissipator at the culvert discharge per CLV/CCRFCD comment. Mark agreed that per the 50% design velocities exceed that allowed for loose riprap. SHG will first evaluate if an increased section and reduced slope directly downstream of the culvert will satisfactorily accommodate the velocities. Mark noted that the existing downstream riprap channel is at a 4% slope and excessive velocities downstream may not be remedied by the revised outlet design. It was agreed that addressing excessive velocities downstream of the immediate culvert discharge location within the existing riprap channel is not required as part of this project. Mark mentioned that if increasing the section and decreasing the slope does not resolve the excessive velocity issue, then the only option per

the Manual is a USBR Low Froude Number Energy Dissipator which includes a concrete rectangular channel section with chute and end sill (but no baffles). Mark expressed his concern that this energy dissipator may not reduce flow velocity; however would improve erosive turbulence. Todd said he would look into energy dissipator options and types used on other projects and follow-up with SHG.

5. **Sewer Protection at Trench Drain**: CLV prefers use of steel sleeve for protection of sewer line at this location.

6. **Other Discussion**: The following other items were discussed.
   - Peter noted that roll wave depths should be in addition to both freeboard and super-elevation for determining total channel depth.
   - It was agreed that utilizing a concrete lined dip at the inflow location into the channel side is a good idea.
   - Dennis will provide SHG with current CLV special provisions.
   - Peter requested SHG to provide Dennis with offset distance to storm drain east of intersection from Brent Lane Centerline. Additionally, Peter noted that the plans must be revised to include horizontal control for the storm drain.
   - Alan requested that SHG provide CLV electronic pothole data.

Action Items:

SHG

- *Proceed with 90% Design.*
- *Provide CLV with offset distance of Storm Drain east of intersection from Brent Lane centerline.*

CLV

- *Provide preferred entry gate photos/video to SHG.*
- *Provide current CLV special provisions to SHG.*
- *Provide CAD and/or PDF details for desired fencing, trash cans, benches, dog dispensers to SHG.*

CCRFCD

- *Review applicable energy dissipator options and follow-up discussion with SHG.*

cc: Attendees

Response to 50% Drainage Report & Plans Review Comments – March23, 2015

Brent Lane Drainage System and Trail
Durango Drive to Floyd Lamb Park
Response to 50% Comments

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
			50% DRAINAGE REPORT	
1	General	Flood (PJ)	The City takes no exception to the overall hydrologic analysis.	A-Acknowledged.
2	General	Flood (PJ)	Flood Control has received a copy of CCRFCD's acceptance of the Environmental Screening for this project dated July 15, 2014.	A-Acknowledged.
3	General	Flood (PJ)	Review the open channel design to accommodate the required freeboard, super elevation, channel bends and potential wave height impacts to the overall channel section. Provide a revised channel section based upon the updated calculations to support the design channel section.	A-Acknowledged. The design has been revised to accommodate additional freeboard resulting from wave height impacts and to maintain flow depth plus all freeboard within the normal channel section.
4	General	Flood (PJ)	The discharge velocities into the existing channel are excessive (over 20 fps) for the section shown. Provide updated calculations to support the transitions needed to accommodate the design flow.	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
5	General	Flood (PJ)	Provide an updated WSPG analysis of the proposed system with the next submittal.	A-Acknowledged. Updated WSPG hydraulic models have been provided.
6	General	Flood (PJ)	Review and revise the inlet collection system at the intersection of Brent and Durango to improve efficiency and reduce construction impacts.	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly.
7	General	Flood (PJ)	System design needs to accommodate the construction option of pre-cast or cast-in-place improvements. Verify that the Specifications and schedule accommodate the proposed construction methods.	A-Acknowledged. Plans and specifications have been updated to accommodate both pre-cast and cast-in-place construction methods for the 12'x6' RCB.
8	General	Flood (PJ)	Provide revised inlet calculations as necessary to support the system design with the next submittal. Review the Type 2B inlet capacities.	A-Acknowledged. Revised inlet computations have been provided accordingly. Type 2B inlet capacities have been reviewed and revised accordingly.
9	General	Flood (PJ)	Provide the lateral and inlet design information to include water and/or sewer relocations with the next submittal. Provide the clearance between storm drain and the water &sewer lines. Provide encasement requirements and details as necessary.	A-Acknowledged. Additional utility information incorporating pothole data has been provided at storm drain lateral and inlets; including any relocations. Clearance and detail information in accordance with criteria has also been provided; including the necessity of encasements and/or sleeves.
10	General	Flood (PJ)	Provide an updated detailed cost estimate with the next submittal for review. Reduce the contingency to 10% with the 90% submittal. The cost estimate must be refined prior to the 90% submittal and request for construction funding to assure that the requested and allocated storm drain funds are sufficient for construction.	A-Acknowledged.
11	General	Flood (PJ)	The Final Design Report needs to include an electronic copy of the entire report with all of the input and output files for the hydraulics and hydrology.	A-Acknowledged.
12	General	Flood (PJ)	Coordinate the required County Approval of the plans and the inspection process within the County's jurisdiction.	A-Acknowledged. The 90% design documents will be submitted to CCPW for review and comment concurrent with submittal to CLV/CCRFCD.
13	General	Traffic (RS)	Provide a copy of the specs and cost estimate	A-Acknowledged.
14	General	RFCD (TM)	A facility-specific environmental analysis in accordance with Chapter 8 of District's *Supplemental Programmatic Environmental Impact Statement, Clark County Regional Flood Control District, 2002 Master Plan Update, September 2004* has been submitted and accepted. *The District's Policies and Procedures regarding environmental permitting as a pre-requisite for construction funding eligibility have been satisfied.* *Please note that if additional analysis and/or coordination with NVSHPO are required for work relating to the trail project, non-District funds shall be utilized for that effort.*	A-Acknowledged.
15	General	RFCD (TM)	Identify all right-of-way (ROW) and easement acquisition requirements for this project. All ROW/easements must be acquired prior to City's request for construction funding.	A-Acknowledged. No ROW acquisition is required for the project. Authorization to Enter Property (AEP) for construction. AEP exhibits have been provided to CLV with the 90% Submittal for acquisition.
16	General	RFCD (TM)	District concurs with hydrologic analyses presented in the *50% Drainage Report.*	A-Acknowledged.
17	General	RFCD (TM)	Provide additional open channel analysis as discussed in the October 21, 2014 progress meeting.	A-Acknowledged.
18	General	RFCD (TM)	The hydraulic analyses of interim and ultimate conditions indicates velocities over 20 fps discharging from the proposed 20' x 6' RCB into the riprap channel. Per Table 703 of District's *Hydrologic Criteria and Drainage Design Manual,* the maximum permissible velocity for loose riprap is 10 fps, and 15 fps for grouted riprap. Provide recommendations and plan for armoring channel and/or energy dissipation.	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
19	General	RFCD (TM)	Provide Draft Special Provisions and Engineers Cost Estimate with District and SNPLMA breakout, structural drawings and pothole information with next submittal	A-Acknowledged.
			DRAWINGS (50%)	
1	GN-01	Flood (PJ)	Note #20 of CLV General Notes: Add "SD lateral locations"	A-Acknowledged.
2	DR-01	Flood (PJ)	Fill existing 6" SD at SW corner	A-Acknowledged. The existing 6" PVC SD has been identified for removal.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
3	DR-02	Flood (PJ)	Add other lateral crossings of Tule Springs Road	A-Acknowledged. Pavement removal associated with other SD laterals within Tule Springs Road/Brent Lane have been added to the plans.
4	SD-01	Flood (PJ)	Extend Concrete to HP @ Special Inlet #1	A-Acknowledged. The drop inlet at this location has been removed and the ditch has been extended for direct discharge to the mainline concrete channel.
5	SD-01	Flood (PJ)	Recommend 45° angle @ Special Inlet #1 lateral connection	A-Acknowledged. The drop inlet at this location has been removed and the ditch has been extended for direct discharge to the mainline concrete channel.
6	SD-01	Flood (PJ)	Provide a 12-foot wide concrete access ramp for maintenance at the outfall end of the culvert crossing of Tule Springs Road.	A-Acknowledged. A 12-foot wide concrete access ramp has been added for maintenance at the outfall end of the Tule Springs culvert crossing.
7	SD-01	Flood (PJ)	Need detailed grading and headwall information for RCB outlet	A-Acknowledged. Detailed grading and headwall information has been provided.
8	SD-01	Flood (PJ)	Type 2 or Type 2B (recommend 2B near trail)	A-Acknowledged. Drop inlet has been revised to a NDOT Type 2B.
9	SD-01	Flood (PJ)	Provide details for RCB - open channel transition	A-Acknowledged. Details have been provided for the channel transition.
10	SD-01	Flood (PJ)	Provide riprap detail information in downstream channel for velocities >20fps	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
11	SD-01	Flood (PJ)	STA 11+41.34: V=25.21fps = too fast = modify hydraulics	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
12	SD-01	Flood (PJ)	Provide slope on profile of RCB	A-Acknowledged. RCB slope has been added to plans.
13	SD-01	Flood (PJ)	Construction Note #32: should it be Type 2B inlet?	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly.
14	SD-01	Flood (PJ)	Suggest using 6" of Type II base, not 4"	A-Acknowledged. Type II base has been revised to 6" for the maintenance access road.
15	SD-03	Flood (PJ)	Change fence location for ramp access	A-Acknowledged. Per meeting discussion, fencing has been removed from the north side of the channel at this location. Additionally, access ramp has been relocated to south side of channel.
16	SD-03	Flood (PJ)	Detail access ramp	A-Acknowledged. Access ramp details have been provided.
17	SD-03	Flood (PJ)	Suggest moving access ramp to south side of channel	A-Acknowledged. Access ramp has been moved to south side of channel to coincide with 12-foot access road being relocated to south side of channel.
18	SD-03	Flood (PJ)	Check superelevation calcs	A-Acknowledged.Hydraulic computations have been reviewed and updated accordingly.
19	SD-03	Flood (PJ)	Check wave height impact	A-Acknowledged. Wave height impact computations have been performed and additional freeboard has been added accordingly.
20	SD-03	Flood (PJ)	Recommend providing a graded high point downstream of the surface flow entry structures to reduce maintenance impacts in the future.	C- The maintenance access road has been removed from the north/west side of the channel. A concrete flume into the concrete channel has been provided at the surface flow entry to minimize maintenance impacts.
21	SD-03	Flood (PJ)	Add 0.5-ft to flow depth at bend in channel	A-Acknowledged. The overall channel depth has been revised from 6-feet to 7-feet to accommodate freeboard requirements.
22	SD-03	Flood (PJ)	Provide fencing for any proposed open channel sections to secure the channel within this Park facility. Provide appropriate access gates as needed. Recommend that the fencing along the southerly side of the open channel section use rail road ties as posts with the cable fencing. Reference the design from the NEEA and SEEA plans for Floyd Lamb Park (CLV # 327V282). Use standard 3 - wire post and cable fencing on the opposite side of the channel.	Per meeting discussion, it was decided to eliminate post and cable fencing along the north side of the trapezoidal open channel. Railing along the north and south sides of channel have been utilized along headwalls and where channel transitions to rectangular sections for maintenance safety. Fencing along south side runs adjacent to the trail. The posts are railroad ties and the cable is 2-strand. The post and cable fencing matches that used in other parts of Floyd Lamb Park. Controlled access is provided at both ends of channel. Swing gates the same height as the post and cable fencing are used similar to other swing gates utilized within Floyd Lamb Park.
23	SD-04	Flood (PJ)	Add expanded concrete collar for slotted manhole lid	C-Slotted manhole is no longer necessary and has been removed.
24	SD-04	Flood (PJ)	Add pavement removals to drainage sheets at lateral crossings	A-Acknowledged. Pavement removals have been added to removal sheets at SD lateral crossings.
25	SD-04	Flood (PJ)	Provide size of extended CMP culvert	C-The proposed extension is no longer necessary and has been removed from the plans.
26	SD-04	Flood (PJ)	Provide size of existing CMP culvert	A-Acknowledged.

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No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
27	SD-04	Flood (PJ)	Why is slotted manhole lid needed	C-Slotted manhole is no longer necessary and has been removed.
28	SD-04	Flood (PJ)	Suggest using NDOT Type 2B inlets	A-Acknowledged.
29	SD-04	Flood (PJ)	Show 2% crossfall on plan of roadway at bend and provide recommendation on roadway and grading transitions needed to collect interim surface flows into the open channel.	A-Acknowledged. Plans have been revised to accommodate interim flow discharge into channel at this location.
30	SD-04	Flood (PJ)	Suggest concrete trail at flow crossing near bend in road	A-Acknowledged. Trail has been revised to concrete where interim flows are anticipated to cross.
31	SD-04	Flood (PJ)	Detail grading to warp and depress trail for drainage near bend in road	A-Acknowledged. Plans have been revised to accommodate interim flow discharge into channel at this location.
32	SD-04	Flood (PJ)	Show entry gate fencing on profile view.	A-Acknowledged. Entry gate fencing has been added to profile view.
33	SD-04	Flood (PJ)	Construction Note #32: suggest using NDOT Type 2B inlet	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly.
34	SD-05	Flood (PJ)	Show removal and replacement on plan	A-Acknowledged. Pavement removals have been added to removal sheets at SD lateral crossings.
35	SD-06	Flood (PJ)	Add nominal storm drain inlet every 660-ft	A-Acknowledged. Nominal SD inlets and laterals have been added at approximately 660-ft intervals along Brent Lane.
36	SD-06	Flood (PJ)	Extend the 12' x 6' RCB at least two segments (12-feet +/-) past the inlet structure shown on Sheets SD-06 and SD-15 before installing the RCB Plug.	A-Acknowledged. RCB has been extended upstream beyong the inlet connection.
37	SD-06	Flood (PJ)	How do inlets/curb at NW corner of Durango impact safe path to school?	B-Installation of the inlets/curb will maintain/improve the existing path. Additionally, crosswalk striping has been added at the intersection.
38	SD-06	Flood (PJ)	Revise layout of storm drain laterals	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly.
39	SD-06	Flood (PJ)	Abandon and remove existing 6-in PVC storm drain	A-Acknowledged. The existing 6" PVC SD has been identified for removal.
40	SD-06	Flood (PJ)	Suggest eliminating manholes by connecting laterals directly into RCB	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly.
41	SD-06	Flood (PJ)	Is the clearance between the RCB and SS in Durango 18-in? Refer to 307Y-4622-05 for separation requirements	A-Acknowledged. 18-inch minimum separation has been provided from the RCB.
42	SD-06	Flood (PJ)	Construction Note #31: suggest using NDOT Type 2B inlet	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly.
43	SD-06	Flood (PJ)	Remove excess construction notes	A-Acknowledged.
43	SD-06	Flood (PJ)	The existing sanitary sewer in Durango is an 18-inch line while the plans show an 8-inch sewer. Review the existing sewer location and provide appropriate separation between the existing 18-inch sewer and the proposed RCB.	A-Acknowledged. Plans have been revised accordingly.
44	SD-07	Flood (PJ)	Inlets need to be in sump - adjust grades accordingly	A-Acknowledged.
45	SD-10	Flood (PJ)	Provide RCB and channel details	A-Acknowledged.
46	SD-11	Flood (PJ)	If pedestrians have access, use NDOT Type 2B grates. If needed, enlarge inlets for added clogging factor. Example of depth: Grate elev. = 0.0, Location 2A elev. = 0.45, Location 2 elev. = 0.9	A-Acknowledged. The drop inlet has been changed to a NDOT Type 2B and Construction Note 31 has been revised accordingly. Computations have been revised accordingly.
47	SD-14	Flood (PJ)	Revise fencing	A-Acknowledged. See response to comment #22.
48	SD-15	Flood (PJ)	Add 1 RCB segment clear of special inlet structure	A-Acknowledged. See comment #36.
49	SD-15	Flood (PJ)	Show sewer and sewer sleeve extending 10-ft past trench drain	C-The trench drain design has been revised to provide 18-inch separation from the sewer line; therefore steel sleeve is not considered necessary.
50	SD-15	Flood (PJ)	Show separation from sewer in plan	A-Acknowledged.
51	SD-15	Flood (PJ)	Coordinate sewer sleeve with Tim Parks at Sewer Planning 702-229-2178	C-The trench drain design has been revised to provide 18-inch separation from the sewer line; therefore steel sleeve is not considered necessary.
52	GR-01	Flood (PJ)	Show existing riprap west of Tule Springs Road	A-Acknowledged.
53	GR-01	Flood (PJ)	Add riprap embankment protection to proposed embankment extension	A-Acknowledged.
54	GR-01	Flood (PJ)	Suggest grading side channel to grade directly into main channel rather than into 12-ft sump inlet	A-Acknowledged. Since access road has been relocated to south side of channel, side channel has been revised to grade directly into main channel.
55	GR-01	Flood (PJ)	Add high point at top of channel on north side near RCB inlet	A-Acknowledged. Since access road has been relocated to south side of channel, side channel has been revised to grade directly into main channel.

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No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
56	GR-01	Flood (PJ)	Add fencing between end of extended berm to RCB inlet to control access	A-Acknowledged.
57	GR-01	Flood (PJ)	Widen top of extended berm to 12-ft min.	A-Acknowledged.
58	GR-01	Flood (PJ)	Extend headwalls at RCB outlet	A-Acknowledged.
59	GR-01	Flood (PJ)	Extend riprap sections at downstream	A-Acknowledged.
60	GR-01	Flood (PJ)	Provide transitional grading in downstream riprap	A-Acknowledged.
61	GR-03	Flood (PJ)	Show location of access ramp	A-Acknowledged.
62	GR-03	Flood (PJ)	Suggest depressing side entrance to channel embankment	A-Acknowledged. Depressed concrete flumes have been added at concentrated inflow locations to the channel.
63	GR-03	Flood (PJ)	Suggest moving access road to south side of channel to eliminate potential of washout	A-Acknowledged. Access road has been relocated to south side of channel.
64	GR-03	Flood (PJ)	Provide riprap at side entrance to channel embankment	A-Acknowledged. Riprap is provided.
65	GR-05	Flood (PJ)	Provide details for the concrete channel. Extend the depth of the upstream cut-off wall to provide adequate protection for the surface inflow into the channel.	A-Acknowledged. Structural details for the concrete channel have been provided.
66	GR-05	Flood (PJ)	Show erosion protection along extended berm	A-Acknowledged. Riprap erosion protection has been added along the berm slope.
67	GR-05	Flood (PJ)	Show top of extended berm = 12-ft	A-Acknowledged. The top of berm extension has been increased to 12-feet.
68	GR-05	Flood (PJ)	Show RCB in Section D	A-Acknowledged. RCB has been added to appropriate sections.
69	TR-01	Flood (PJ)	Call out existing safe route to school	A-Acknowledged.
70	TR-01	Flood (PJ)	Provide crosswalk and associated signage for trail connection across Brent Lane, just east of Durango	C-A crosswalk has not been added across Brent Lane east of Durango since a roadside ditch is proposed along the north side of Brent Lane at this location and trail connectivity is provided along the equestrian trail on the south side of Brent Lane.
71	TR-05	Flood (PJ)	Provide signage for crosswalk trail connection.	A-Acknowledged. Signage for trail connection has been added.
72	TR-06	Flood (PJ)	Provide signage for crosswalk trail connection.	A-Acknowledged. Signage for trail connection has been added.
73	General	Flood (PJ)	Include detailed grading plans for the transition from the RCB to the existing channel section	A-Acknowledged. Detailed grading has been added.
74	General	Flood (PJ)	Inlet collection at the northwest corner of the intersection of Brent and Durango must accommodate the existing safe route to schools asphalt walkway. Provide detailed grading of this portion of the intersection showing the safe route and inlet collection.	A-Acknowledged.
75	General	Flood (PJ)	Provide detailed grading around the area drop inlet on the north side of Brent, west of Durango, including concrete collar, roadway safety markers and grading swale.	A-Acknowledged. Detailed grading around the area drop inlet has been provided including concrete collar and swale.
76	General	Flood (PJ)	Show the RCB angle points and/or curved segments by station location and angle/degree change. Include the radius information and discuss how the curved sections are to be completed using curved forms or multiple angled segments. This needs to be explained within the Specifications. This information is needed to allow for the use of precast RCB's as well as cast in place construction.	A-Acknowledged. RCB curve data has been added to plans. Curved section construction methods have been added to the specifications.
76	General	Flood (PJ)	Provide details for the RCB construction.	A-Acknowledged. NDOT standard drawings for the 12'x6' RCB have been called out in the construction notes for CIP construction. Precast RCB option is addressed in the specifications. Structural details for the 20'x7' RCB culvert have been added to the plans.
76	General	Flood (PJ)	Provide complete details for the special trench drain and inlet vault structure. Coordinate the sanitary sewer sleeve needed for the protection of the existing sewer at the trench drain crossing with Tim Parks, P.E., Project Manager, Collection System Planning.	A-Acknowledged. Structural details for the trench drain have been provided. The revised trench drain provides 18-inch separation from the trench drain and a steel sleeve is considered not necessary.
77	General	Flood (PJ)	The existing sanitary sewer in Durango is an 18-inch line while the plans show an 8-inch sewer. Review the existing sewer location and provide appropriate separation between the existing 18-inch sewer and the proposed RCB.	A-Acknowledged.
78	General	Flood (PJ)	The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles. Indicate the type of pipe material for water and sewer lines. ACP water lines will require special consideration and handling and must be addressed in the specifications.	A-Acknowledged. Existing and proposed utility crossings are included on plan and profiles. Material type for existing water and sewer have been added to the plans.
79	General	Flood (PJ)	Clearly identify the required utility relocations and which relocations are incidental to and part of the storm drain work.	A-Acknowledged.
80	General	Flood (PJ)	Provide separate plan and profiles for any relocated sewer and/or water lines.	C-No relocations of sewer or water are proposed.
81	General	Flood (PJ)	Provide detail sheets showing typical details needed for the construction, connection and any special transition structure details. Structural details must be submitted with the 90% submittal.	A-Acknowledged. Structural details have been provided.

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No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
82	General	Flood (PJ)	Provide an additional nuisance inlet to the south side of Brent Lane as well as a stub to the north near Station 32+00.	A-Acknowledged. Additional nuisance inlets have been added along Brent Lane in coordination with Comment #35.
83	General	Flood (PJ)	Provide pothole data with the 90% submittal. The pothole information should identify the bottom limits of conduit bank crossings and show the limits of concrete encasement where applicable.	A-Acknowledged. Pothole data sheets have been provided and added to the plans.
84	General	Flood (PJ)	Show the removal and replacement of the roadway landscape improvements and/or cover these items in the Specifications.	A-A landscape plan has been provided as part of the project. Removal and replacement of incidental landscaping has been included in the specifications.
85	General	Flood (PJ)	Expand the Storm Drain Final Location Map Note (Note 20) to include "the storm drain lateral angle points."	A-Acknowledged. Note 20 has been revised to include "the storm drain lateral angle points".
86	General	Planning (CD)	Need to address trail at park entrance gate/wall	A-Acknowledged. The trail at the park entrance has been coordinated with CLV and updated on the plans.
87	GN-02	Planning (CD)	Show limit of residential area in key map	A-Acknowledged.
88	GR-05	Planning (CD)	Revise trail section to show 10-ft decomposed granite trail with 2-ft graded shoulders for consistency with basin trails	A-Acknowledged. Trail section has been revised.
89	LA-03	Planning (CD)	Install monument sign - to be determined by HPC	A-Acknowledged. Note that trail amenities have been removed from the LA sheets and added to the TR sheets.
90	LA-07	Planning (CD)	Change "park" to "trail" in sign plaque language	A-Acknowledged.
91	LA-07	Planning (CD)	Add benches and trash receptacles as shown in provided landscape detail sheet (L5.01)	A-Acknowledged.
92	LA-07	Planning (CD)	Add a doggie bag dispenser on the portion of the trail within the park proper	A-Acknowledged. A doggie bag dispenser has been added to the plans.
93	LA-07	Planning (CD)	Monument sign and sign plaque to be determined by HPC	A-Acknowledged.
94	SD-06	Sewer (KL)	Label SS 18" in profile	A-Acknowledged. 18" SS has been labeled in plan and profile.
95	SD-06	Sewer (KL)	How is 18-in SS in Durango going to be supported during storm drain construction?	B-Support of the 18-inch SS during storm drain construction is considered a means and measures item by the contractor.
96	SD-06	Sewer (KL)	Can typical 10-ft horizontal separation be provided north of Brent?	A-Acknowledged. Storm drain layout has been revised to provide a minimum of 10-feet separation.
97	SD-08	Sewer (KL)	Confirm SS elevations. Separations less than 2-ft will require protection with a minimum separation of 6-in.	A-Acknowledged. Relevant sewer depths were survey field verified at manholes. A minimum of 18-inches is maintained at all locations.
98	SD-15	Sewer (KL)	Is trench drain permanent?	C-Permancy of trench drain will be at the discretion of CLV/CCRFCD. Upon upstream extension of the RCB and additional inlets, the trench drain would likely not be necessary; however the additional capture provided by the trench drain might be preferred to removal.
99	SD-15	Sewer (KL)	Confirm SS elevations. Separations less than 2-ft will require protection with a minimum separation of 6-in.	A-Acknowledged. Relevant sewer depths were survey field verified at manholes. A minimum of 18-inches is maintained at all locations.
100	SD-15	Sewer (KL)	Show sewer in plan view	A-Acknowledged. 18" SS has been labeled in plan and profile.
101	General	Survey (JVT)	Need alignment information on all alignments (DD, BL, TR, and SD)	A-Acknowledged. Horizontal control plan has been updated with all alignments.
102	General	Survey (JVT)	Was there any found monument near 31+50 Brent Lane? See File 114, Page 14 of Parcel Maps. If so, Mark "protect in place"	A-All monuments found have been identified on the plans.
103	GN-01	Survey (JVT)	Add "2008 adjustment" after the benchmark elevation	A-Acknowledged. 2008 Adjustment has been added after the benchmark elevation.
104	SC-01	Survey (JVT)	Add "2008 adjustment" after the benchmark elevation	A-Acknowledged. 2008 Adjustment has been added after the benchmark elevation.
105	SC-01	Survey (JVT)	List the reference map for the referenced distance along Durango	A-Acknowledged.
106	SC-01	Survey (JVT)	Should symbol at Brent/Durango intersection be a square to mean monument?	A-Acknowledged. Monument symbol has been changed to a square.
107	SC-01	Survey (JVT)	What does "(R)" stand for?	A-The "R" symbol has been removed from the plans.
108	SC-01	Survey (JVT)	Show assessor's section information as shown on redlined sheet SC-01	A-Acknowledged. Assessor's section information has been added to the plans.
109	DR-01	Survey (JVT)	Label the survey monument at Brent/Durango as "survey monument, protect in place"	A-Acknowledged. The survey monument at Brent/Durango has been labeld as "survey monument, protect in place".
110	SD-03	Survey (JVT)	What is Construction note #3 for?	A-Acknowledged. Construction note #3 has been removed.
111	SD-06	Survey (JVT)	Label the survey monument at Brent/Durango as "survey monument, protect in place"	A-Acknowledged. The survey monument at Brent/Durango has been labeld as "survey monument, protect in place".
112	General	Traffic (RS)	Provide separate signage & striping plans to ensure the replacement of existing improvements in kind	A-Acknowledged. A separate signage and striping plan has been provided.

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No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
113	General	Traffic (RS)	There is an existing school flasher on Durango that was installed by the County. There should be conduit running along Durango though the intersection for the flasher, but we don't know exactly where..If Call Before Dig shows a north -south conduit not otherwise identified, that is probably it.	A-Acknowledged. Existing conduit has been identified on the plans.
114	DR-01	Traffic (RS)	Install a conduit ring for a future traffic signal per the redlines.	A-Acknolwedged. Conduit for future traffic signals have been added to the SM sheets. Per coordination with CCRFCD, it has been agreed to include within CCRFCD funding.
115	DR-01	Traffic (RS)	Per the provided subdivision improvements (Mystic Valley II), there is traffic signal interconnect conduit on the west side of Durango from the south, capped in the intersection. Extend this conduit to the north end of the project.	A-Acknowledged. Existing conduit has been identified on the plans.
116	TR-01	Traffic (RS)	Install a crosswalk on the east leg of Brent/Durango for the users of the new trail. This will require relocating the existing stop sign and stop bar, as well	C-A crosswalk has not been added across Brent Lane east of Durango since a roadside ditch is proposed along the north side of Brent Lane at this location and trail connectivity is provided along the equestrian trail on the south side of Brent Lane.
117	TR-03	Traffic (RS)	Install appropriate signage and yield lines for all mid-block crosswalks	A-Acknowledged. Appropriate signage and yield lines have been added to the plans for all mid-block crosswalks.
118	TR-03	Traffic (RS)	Move the proposed crosswalk at the park gate 100' to the west to ensure that the driver's sightline of trail users is not obscured by the pilasters at the park entrance	A-Acknowledged. Per meeting coordination it was preferred to move the crosswalk approximately 100' feet east of the park entrance to be within the park limits.
119	TR-05	Traffic (RS)	Install appropriate signage and yield lines for all mid-block crosswalks	A-Acknowledged. Appropriate signage and yield lines have been added to the plans for all mid-block crosswalks.
120	TR-06	Traffic (RS)	Install appropriate signage and yield lines for all mid-block crosswalks	A-Acknowledged. Appropriate signage and yield lines have been added to the plans for all mid-block crosswalks.
121	SD-06	Traffic (RS)	Wherever possible, square off saw cuts	A-Acknowledged. Saw cuts have been squared off where appropriate.
122	GN-01	Civil (DM)	Update CLV traffic notes to current	A-Acknowledged. CLV traffic notes have been updated with the most current notes.
123	GN-01	Civil (DM)	Define PBS	A-PBS stands for Plantmix Bituminous Surface. It has been added to the abbreviations legend on sheet GN-01.
124	DR-01	Civil (DM)	Removal plan does not seem economical and does not include all areas where pavement needs to be removed	A-Acknowledged. Pavement removals have been revised for efficiency and all areas of removal have been added to the plans.
125	DR-01	Civil (DM)	Construction note 2: what is PBS?	A-PBS stands for Plantmix Bituminous Surface. It has been added to the abbreviations legend on sheet GN-01.
126	DR-02	Civil (DM)	Is area shown for removal provide adequate clearance?	B-Acknowledged. Installation of the RCB is expected by use of shoring in order to not impact the existing pavement along Brent Lane.
127	SD-01	Civil (DM)	Clarify special drop inlet #1	C-This DI has been removed.
128	SD-01	Civil (DM)	Provide dimensions and cross section for culvert outlet apron	A-Acknowledged.
129	SD-01	Civil (DM)	Suggest making RCB 8'H but 7'H might be ok	A-Acknowledged. Per meeting discussion, the culvert height has been increased to 7'H to provide additional maintenance clearance.
130	SD-01	Civil (DM)	Slope leader pointing to HGL rather than RCB invert	A-Acknowledged. The leader line has been corrected.
131	SD-01	Civil (DM)	Construction note 4 and 5: what is PBS?	A-PBS stands for Plantmix Bituminous Surface. It has been added to the abbreviations legend on sheet GN-01.
132	SD-01	Civil (DM)	Construction note 16: minimum height of RCB = 8' but 7' might be ok	A-Acknowledged. Per meeting discussion, the culvert height has been increased to 7'H to provide additional maintenance clearance.
133	SD-04	Civil (DM)	Show pavement removal and replacement near park entrance gate	A-Acknowledged. Pavement removals have been revised for efficiency and all areas of removal have been added to the plans.
134	SD-04	Civil (DM)	Replace fencing with railroad tie entrance	A-Acknowledged.
135	SD-04	Civil (DM)	What are dark dashed lines? Edge of pavement?	A-All line types used have been added to the legend.
136	SD-04	Civil (DM)	Clarify construction note 28 (NDOT STD. plan B-20.1.5)	A-Acknowledged. Structural details have ben added to the plans, including any NDOT standard drawings utilized. NDOT STD Plan B-20.1.5 is for CIP option for 12'x6' RCB
137	SD-05	Civil (DM)	Suggest placing laterals and inlets approximately half way between laterals at Durango and park entrance ~650'	A-Acknowledged. See response to Comment#35.
138	SD-06	Civil (DM)	Abandon in place 6" PVC SD	A-Acknowledged. The existing 6" PVC SD has been identified for removal.
139	SD-10	Civil (DM)	Show trail over box sections	A-Acknowledged.

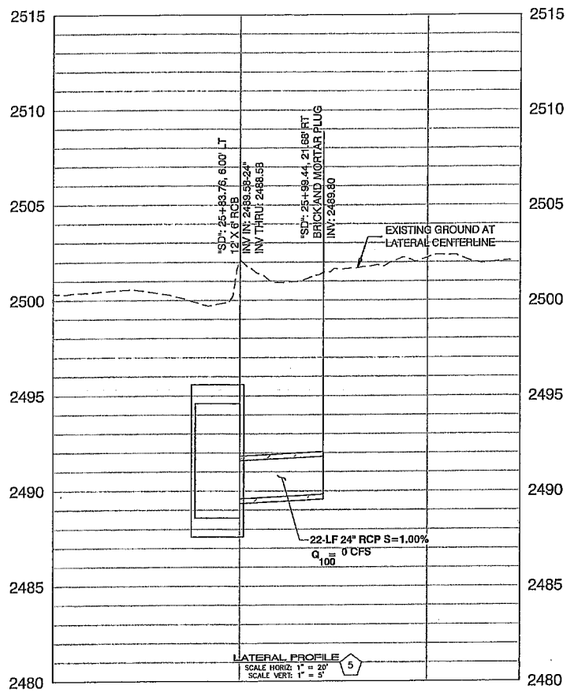
Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

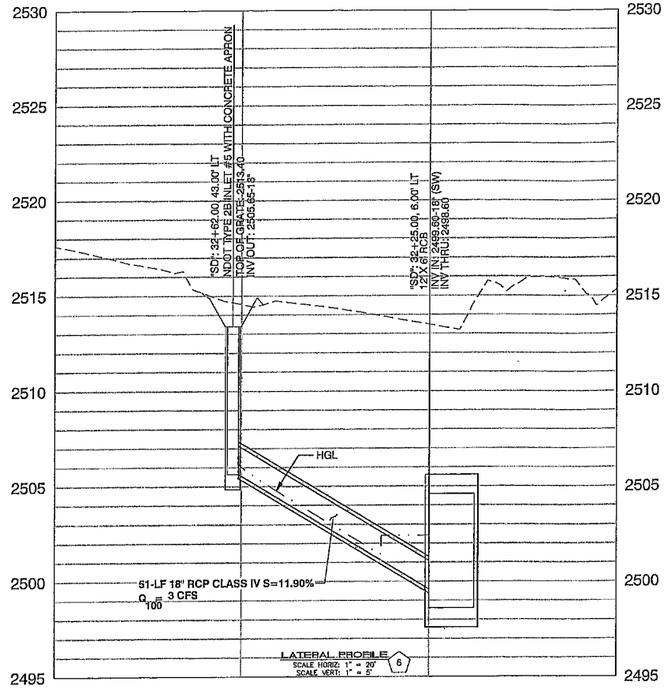
No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
140	SD-14	Civil (DM)	Discussion is needed for post construction to be similar to what is already in the park	A-Acknowledged.See response to Comment #22.
141	GR-05	Civil (DM)	Show subgrade in sections	A-Acknowledged.
142	GR-05	Civil (DM)	Show channel side slopes	A-Acknowledged.
143	GR-05	Civil (DM)	Show box location in sections	A-Acknowledged.
144	TR-01	Civil (DM)	Conduit future TS at northwest corner	A-Acknowledged. See response to Comment #114.
145	TR-01	Civil (DM)	Crosswalk for trail at northeast corner	A-Acknowledged. A crosswalk has been added.
146	TR-01	Civil (DM)	Provide conduit for future trafic signal across Brent Lane connecting northwest and southwest sides at Durango intersection.	A-Acknowledged. See response to Comment #114.
147	TR-03	Civil (DM)	Show new gates at park entrance	A-Acknowledged.
148	LA-01	Civil (DM)	Provide cross section of trail	A-Acknowledged. Cross section of trail has been provided.
149	LA-07	Civil (DM)	Use new CLV bench and trash receptacle	B-Per meeting coordination, CLV Bench and trash receptacles matching those used in Floyd Lamb Park have been proposed and added to the plans.
150	SD-06	CCPW (AK)	Show special drop inlet #2 to be maintained by CLV	A-Acknowledged. Drop inlet has been identified to be maintained by CLV.
151	SD-06	CCPW (AK)	Add to Lateral Run Profile Index: 6, 7, 8, 9, 10, 11, 12	B-The symbol in the lateral run profile index is typical and applies to every profile run that are included on sheets SD-07 thru SD-09, not just profile 1.
152	General	RFCD (TM)	Identify all right-of-way (ROW) and easement acquisition requirements for this project. All ROW/easements must be acquired prior to City's request for construction funding.	A-Acknowledged. No ROW acquisition is required for the project. Authorization to Enter Property (AEP) for construction. AEP exhibits have been provided to CLV with the 90% Submittal for acquisition.
153	General	RFCD (TM)	Provide utility pothole information with the next submittal.	A-Acknowledged. Utility pothole information has been provided.
154	General	RFCD (TM)	Typically, fall protection (post & cable fencing) is not provided on trapezoidal channels. Investigate limited areas of fencing to discourage public from entering the channel area and provide post and cable fencing at transition and headwall sections for fall protection.	A-Acknowledged.See response to Comment #22.
155	DR-01	RFCD (TM)	Revise the 2" Rotomill sections to removals. The relatively small quantities of rotomilling will not be cost effective.	A-Acknowledged.
156	SD-01	RFCD (TM)	The hydraulic analyses of interim and ultimate conditions indicates velocities over 20 fps discharging from the proposed 20' x 6' RCB into the riprap channel. Per Table 703 of District's *Hydrologic Criteria and Drainage Design Manual,* the maximum permissible velocity for loose riprap is 10 fps, and 15 fps for grouted riprap. Provide recommendations and plan for armoring channel and/or energy dissipation.	A-Acknowledged. The channel outlet has been reviewed and revised accordingly to accommodate adequate outlet protection. Hydraulic models have been updaed accordingly.
157	SD-02	RFCD (TM)	Move access road to south side of channel as discussed in September 8, 2014 progress meeting.	A-Acknowledged.
158	SD-04	RFCD (TM)	Provide channel transition details. Note that rectangular section must control through transition from rectangular to trapezoidal, and trapezoidal section must control through transition from trapezoidal to rectangular. See attachment.	A-Acknowledged. Structural details have been provided.
159	SD-04	RFCD (TM)	Provide NDOT Type 2B inlet grates.	A-Acknowledged. NDOT Type 2 inlets have been revised to be NDOT Type 2B inlets.
160	SD-06	RFCD (TM)	Revise design. See attachment for recommendations. Provide pothole information with next submittal.	A-Acknowledged. The inlet collection system at the Durango/Brent intersection has been revised to improve efficiency. Hydraulic models have been revised accordingly. Pothole information has been provided.
161	SD-07	RFCD (TM)	Verify the type of grates to use on the NDOT drop inlets. Typical all.	A-Acknowledged. NDOT Type 2 inlets have been revised to be NDOT Type 2B inlets.
162	SD-08	RFCD (TM)	Revise profiles based on new lateral layout.	A-Acknowledged.
163	SD-09	RFCD (TM)	Revise profiles based on new lateral layout.	A-Acknowledged.
164	SD-10	RFCD (TM)	Provide construction details for RCB, open channel, and transition sections with next submittal.	A-Acknowledged.
165	SD-15	RFCD (TM)	Provide a design that isolates the trench drain and the special drop inlet from the 12' x 6' RCB. The special drop inlet will likely be replaced with a standard drop inlet once the parcel on the northwest corner of the intersection develops. Isolating the drop inlet will require less destruction and reconstruction of the RCB in the future.	A-Acknowledged.
166	GR-05	RFCD (TM)	Provide transition sections and structural details	A-Acknowledged.
167	LA-01	RFCD (TM)	Only plants with non-invasive root systems shall be planted over RCB. Is irrigation proposed?	A-Acknowledged.

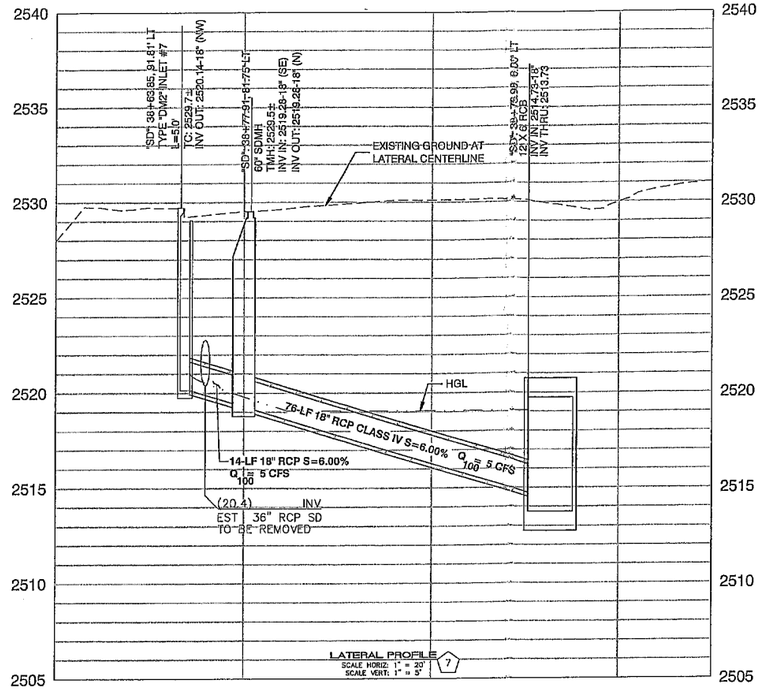
Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

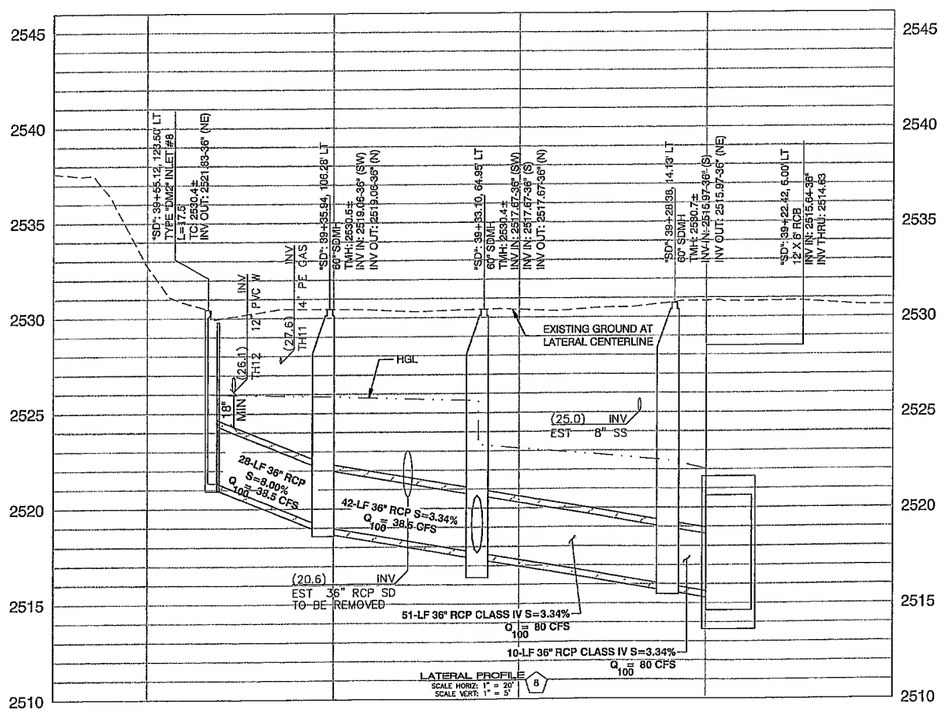
APPENDIX G

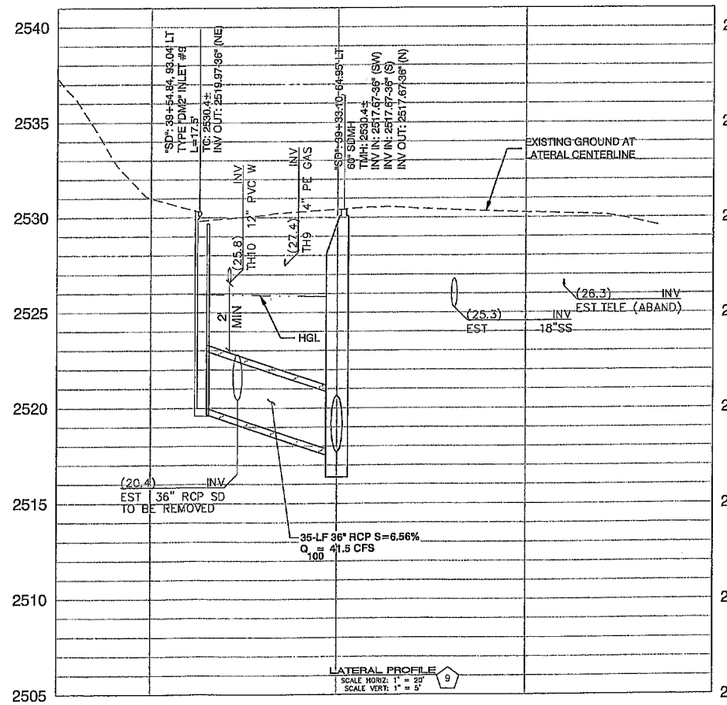
90% Storm Drain Plan & Profile Sheets











APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

FOR TRENCHES SIX (6) FEET WIDE AND GREATER:

IF THE PIPE MATERIAL IS ACP, THE EXPOSED PIPE MUST BE REPLACED WITH DUCTILE IRON PIPE.

CONTRACTOR MUST SUBMIT PIPE SUPPORT DETAIL PREPARED BY A NEVADA LICENSED ENGINEER TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINE(S) WILL BE SUPPORTED DURING EXCAVATION AND BACK FILL.

SUPPORTED PIPE MAY BE EXPOSED FOR NO LONGER THAN 90 DAYS MAXIMUM. IF THE PIPE WILL BE EXPOSED FOR MORE THAN 90 DAYS PLANS MUST BE SUBMITTED AND APPROVED BY THE LVVWD TO RELOCATE PIPE.

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
6745 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

NO.	DATE	REVISIONS

PREPARED FOR
CITY OF LAS VEGAS

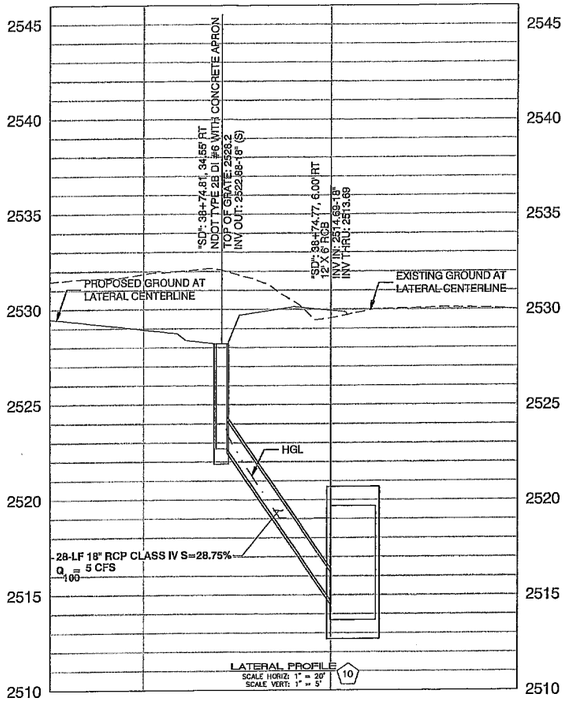
H# 49876	BID# -
DATE: MARCH 24, 2015	DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

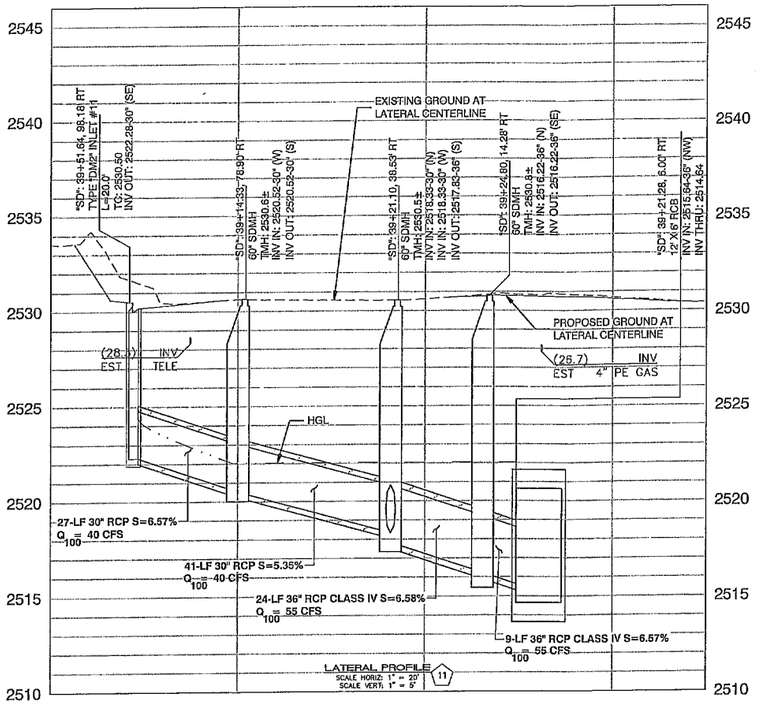
TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

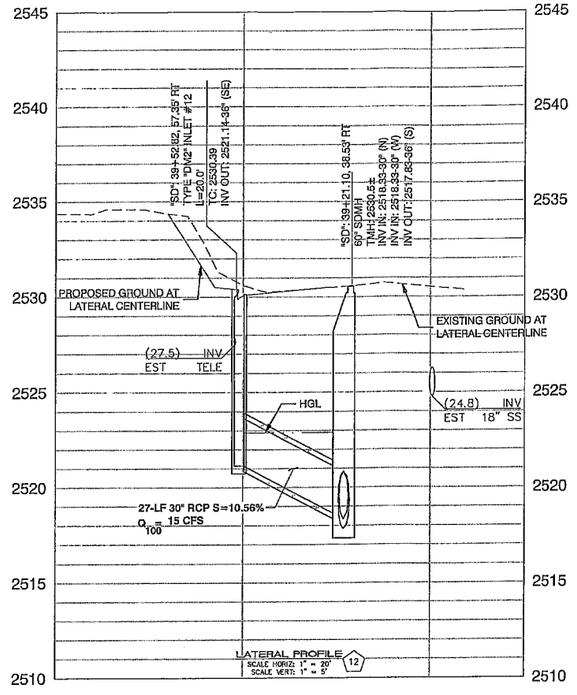
SHEET
STORM DRAIN LATERAL PROFILES

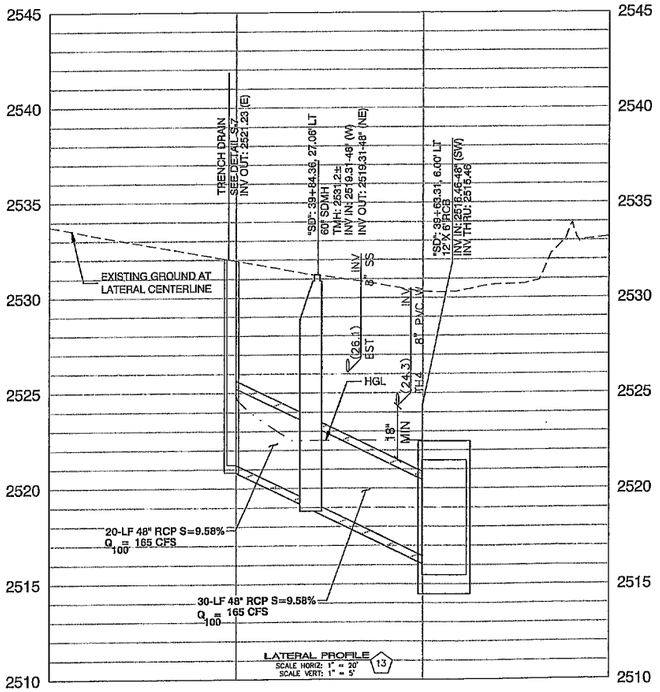
PROFESSIONAL ENGINEER STATE OF NEVADA MARK J. FRANKLIN No. 14566 CIVIL 6/30/2015 PRELIMINARY NOT FOR CONSTRUCTION

SHEET
SD-08
17 OF 56
DRAWING NO.
-









APPROVED FOR CONSTRUCTION

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NO.	DATE	REVISIONS

PREPARED BY
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PREPARED FOR
CITY OF LAS VEGAS

BID# -
H# 49878
DESIGNED BY: DAM
DRAWN BY: SPC/DAM
CHECKED BY: JSR/MJF
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM LATERAL DRAIN PROFILES

PROFESSIONAL ENGINEER
MARK J. FELIX
CIVIL
No. 14566
STATE OF NEVADA
EXPIRES 12/31/2015

SHEET
SD-09
18 OF 56
DRAWING NO.
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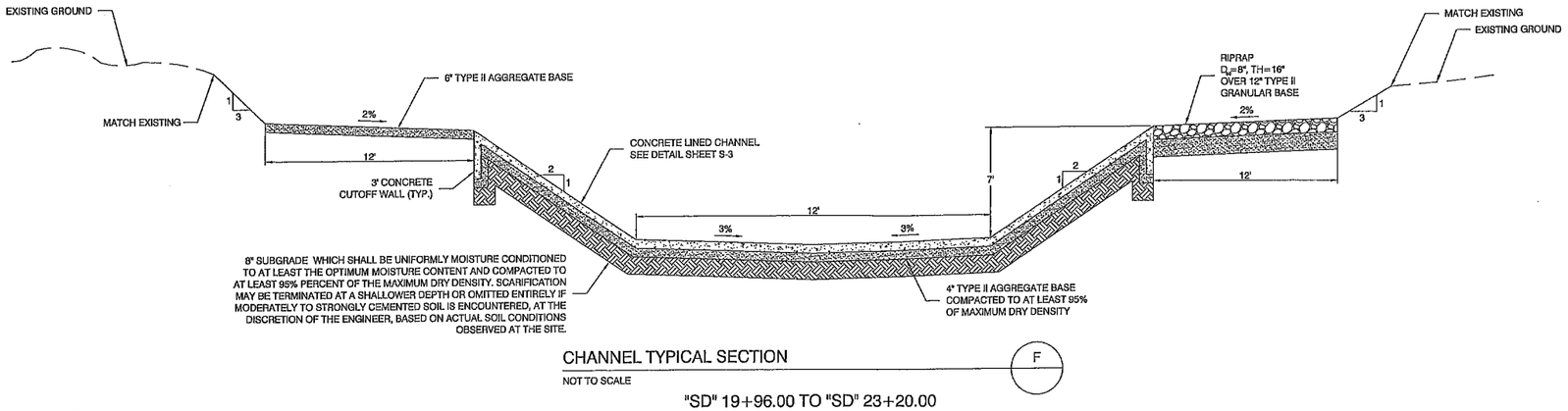

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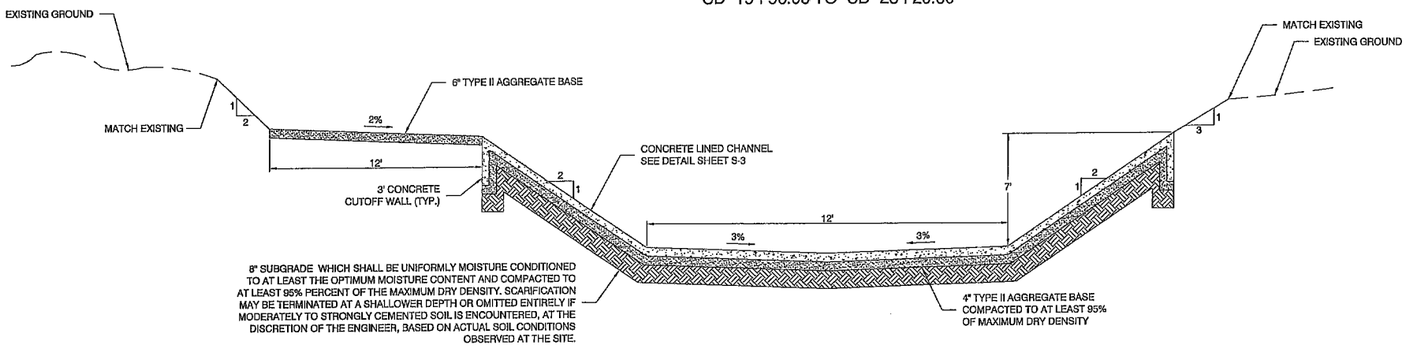

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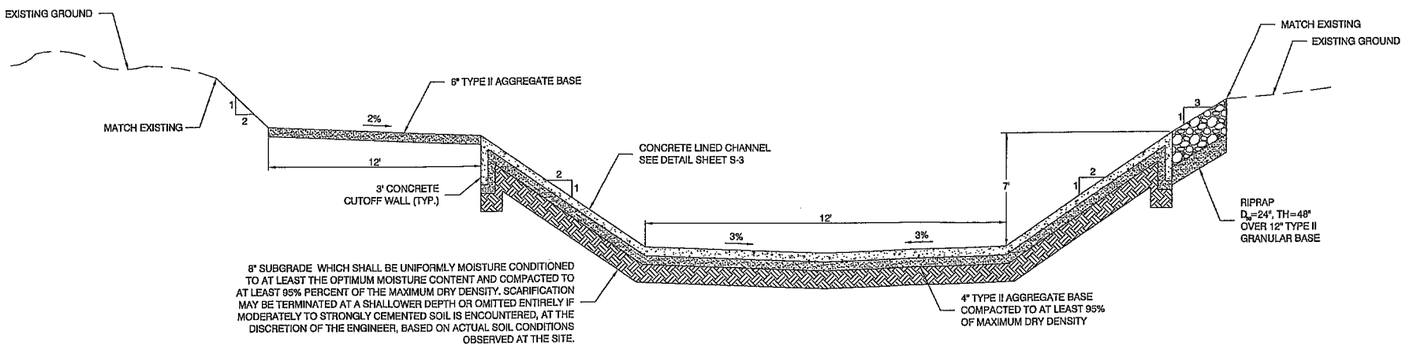

CHANNEL TYPICAL SECTION — D

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NO.	DATE	REVISIONS

PREPARED BY

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNERS

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PREPARED FOR

CITY OF LAS VEGAS

H# 49976

DATE: MARCH 24, 2015

SUBMITTAL STAGE: 90% SUBMITTAL

BID# -

DESIGNED BY: JSR

DRAWN BY: SPC/DAM

CHECKED BY: JSR/MJF

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

STORM DRAIN TYPICAL SECTIONS

PROFESSIONAL ENGINEER — STATE OF NEVADA — MARK J. FIALA — No. 14566 — CIVIL — PRELIMINARY — 12/30/2015

SHEET

SD-10

19 OF 56

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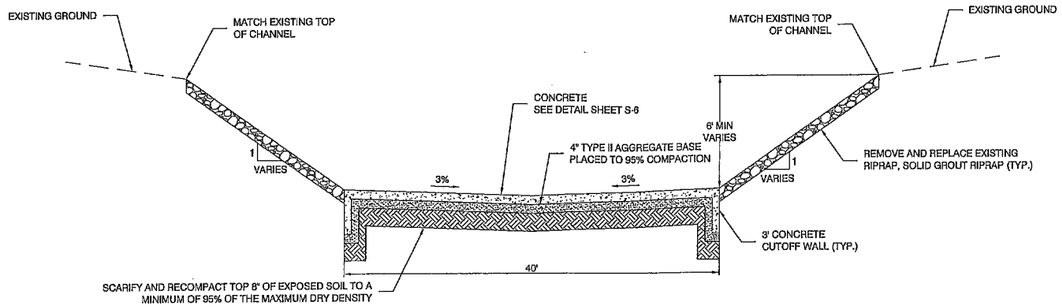

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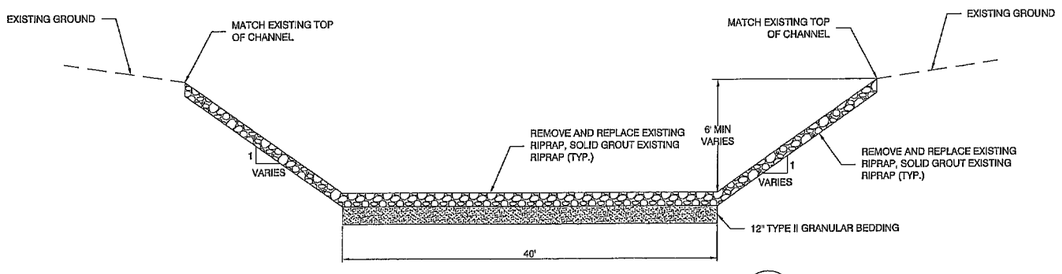

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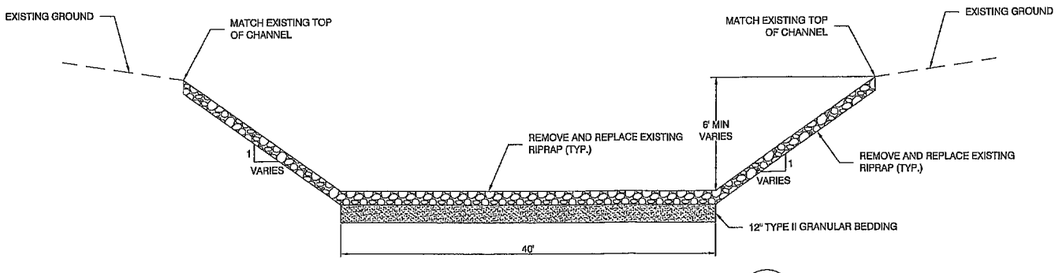

CHANNEL TYPICAL SECTION A

NOT TO SCALE

"SD" 11+00.00 TO "SD" 11+70.00

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NO.	DATE	REVISIONS

PREPARED FOR
CITY OF LAS VEGAS

H# 49876
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL
BID# -
DESIGNED BY: JSR
DRAWN BY: SPC/DAM
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TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN TYPICAL SECTIONS

PROFESSIONAL ENGINEER — MARK J. FINNIGAN — STATE OF NEVADA — No. 14566 — CIVIL — EXP. 12/31/2015

SHEET
SD-11
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DRAWING NO.
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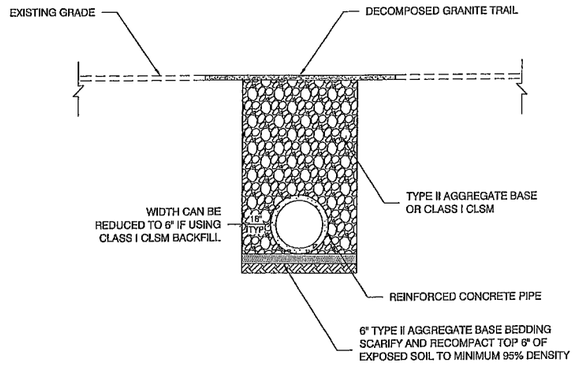
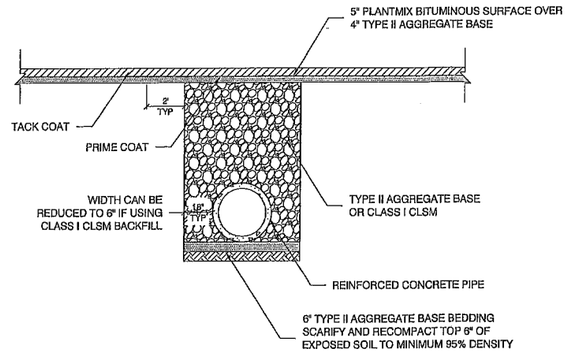


REINFORCED CONCRETE PIPE SECTION (UNPAVED AREAS)



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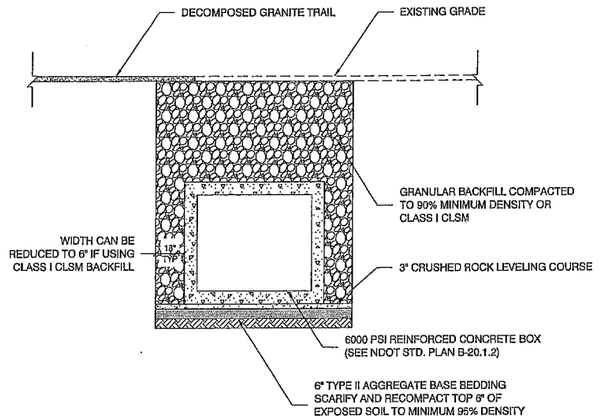

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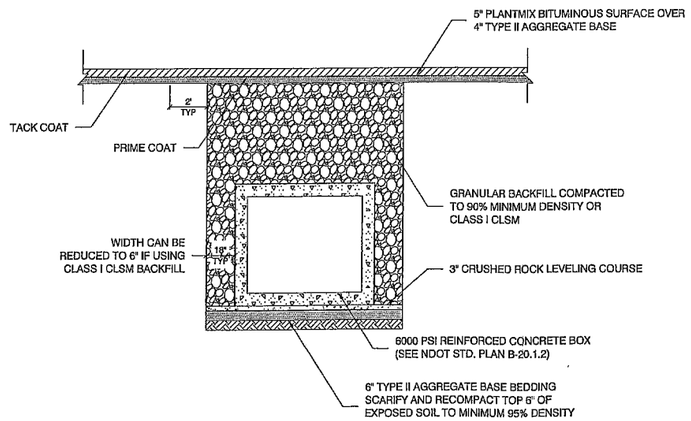

REINFORCED CONCRETE BOX SECTION (PAVED AREAS)

NOTES:

1. SEE REMOVAL PLANS FOR LIMITS OF PAVEMENT REPLACEMENT AND MILL/OVERLAY.
2. THE SAWCUT AND PAVEMENT RESTORATION LIMITS SHOWN ARE BASED ON VERTICAL WALL TRENCHES. NO ADDITIONAL PAYMENT WILL BE MADE FOR DAMAGED PAVEMENT OR PAVEMENT REMOVED TO LAY BACK TRENCH SLOPES. FINAL SAWCUT LIMITS SHALL BE APPROVED BY FIELD INSPECTOR.
3. TRENCH WALLS SHALL BE SHORED PER OSHA REQUIREMENTS.

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
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PREPARED FOR
CITY OF LAS VEGAS

H# 49876	BID# -
DATE: MARCH 24, 2015	DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN DETAILS

PROFESSIONAL ENGINEER — STATE OF NEVADA — MARK J. FINNAN — No. 14566 — 6/30/2015 — CIVIL — PREPARED BY

SHEET
SD-12
21 OF 56
DRAWING NO.
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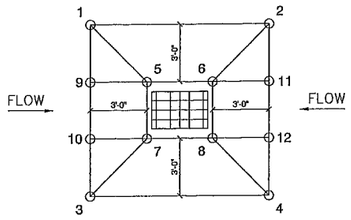
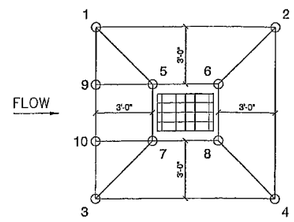


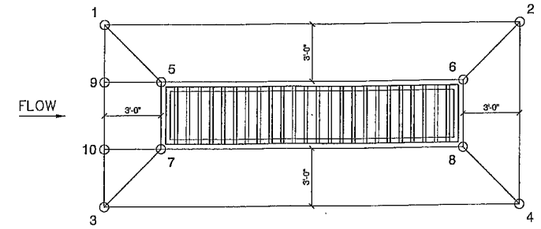
APRON ELEVATION TABLE NDOT 2B DROP INLET #1	
POINT	ELEVATION
1	2477.02
2	2477.07
3	2477.02
4	2477.06
5	2475.40
6	2475.40
7	2475.40
8	2475.40
9	2475.59
10	2475.59
11	2476.06
12	2476.06

NORTH



APRON ELEVATION TABLE NDOT 2B DROP INLET #2	
POINT	ELEVATION
1	2479.20
2	2478.90
3	2479.20
4	2479.00
5	2477.70
6	2477.70
7	2477.70
8	2477.70
9	2478.52
10	2478.52

NORTH



APRON ELEVATION TABLE SPECIAL DROP INLET #3	
POINT	ELEVATION
1	2499.13
2	2499.30
3	2498.50
4	2498.30
5	2496.80
6	2496.80
7	2496.80
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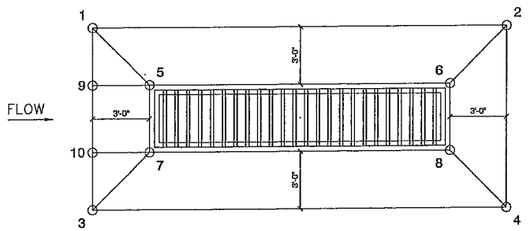
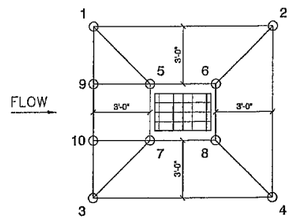
9	2496.84
10	2496.85

NORTH



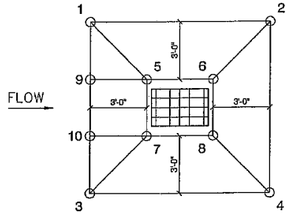
APRON ELEVATION TABLE SPECIAL DROP INLET #4	
POINT	ELEVATION
1	2500.50
2	2500.50
3	2500.50
4	2500.50
5	2499.00
6	2499.00
7	2499.00
8	2499.00
9	2499.17
10	2499.17

NORTH



APRON ELEVATION TABLE NDOT 2B DROP INLET #5	
POINT	ELEVATION
1	2514.90
2	2514.90
3	2514.90
4	2514.90
5	2513.40
6	2513.40
7	2513.40
8	2513.40
9	2513.61
10	2513.61

NORTH



APRON ELEVATION TABLE NDOT 2B DROP INLET #6	
POINT	ELEVATION
1	2529.70
2	2529.70
3	2529.70
4	2529.70
5	2528.20
6	2528.20
7	2528.20
8	2529.20
9	2528.27
10	2528.27

DROP INLET CONCRETE APRONS

NOT TO SCALE

NO.	DATE	REVISIONS

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

PREPARED FOR
CITY OF LAS VEGAS

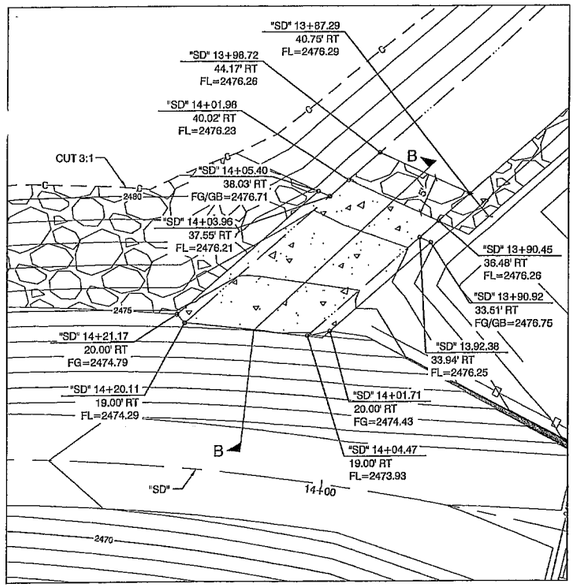
BID# -	
DESIGNED BY:	DAM
DRAWN BY:	SPC/DAM
CHECKED BY:	JSR/MJF
DATE: MARCH 24, 2015	
SUBMITTAL STAGE:	90% SUBMITTAL

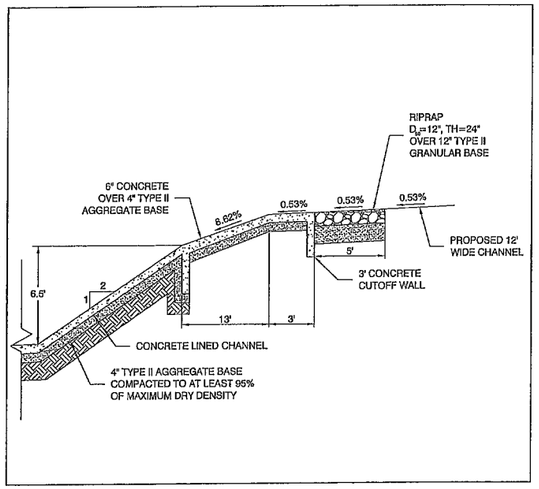
TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN DETAILS

PROFESSIONAL ENGINEER - STATE OF NEVADA
MARK J. FIALA
12/30/2015
CIVIL
No. 14565
PRELIMINARY

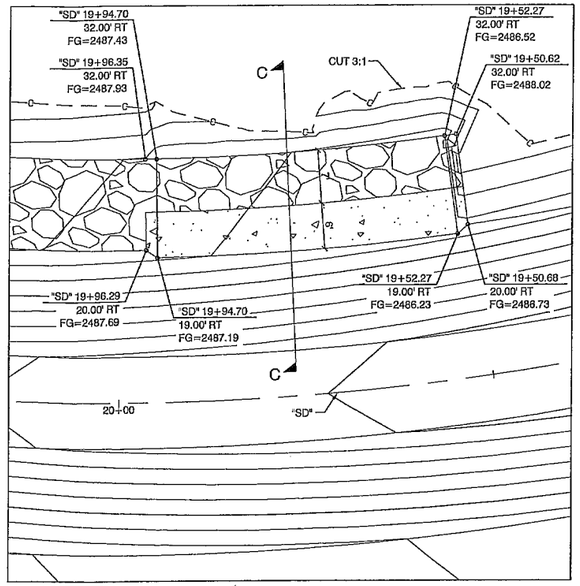
SHEET
SD-13
22 OF 56
DRAWING NO.
-

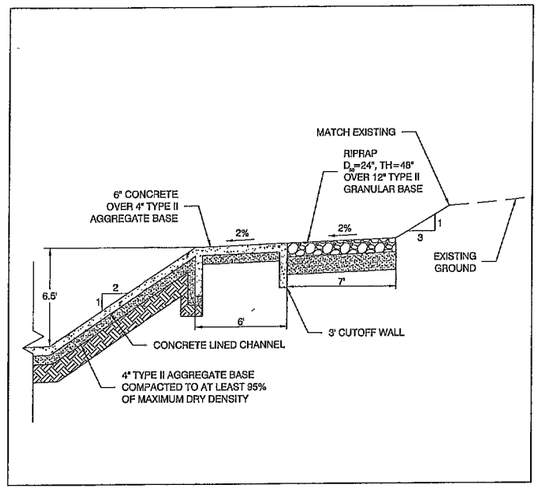




SECTION B–B
NOT TO SCALE

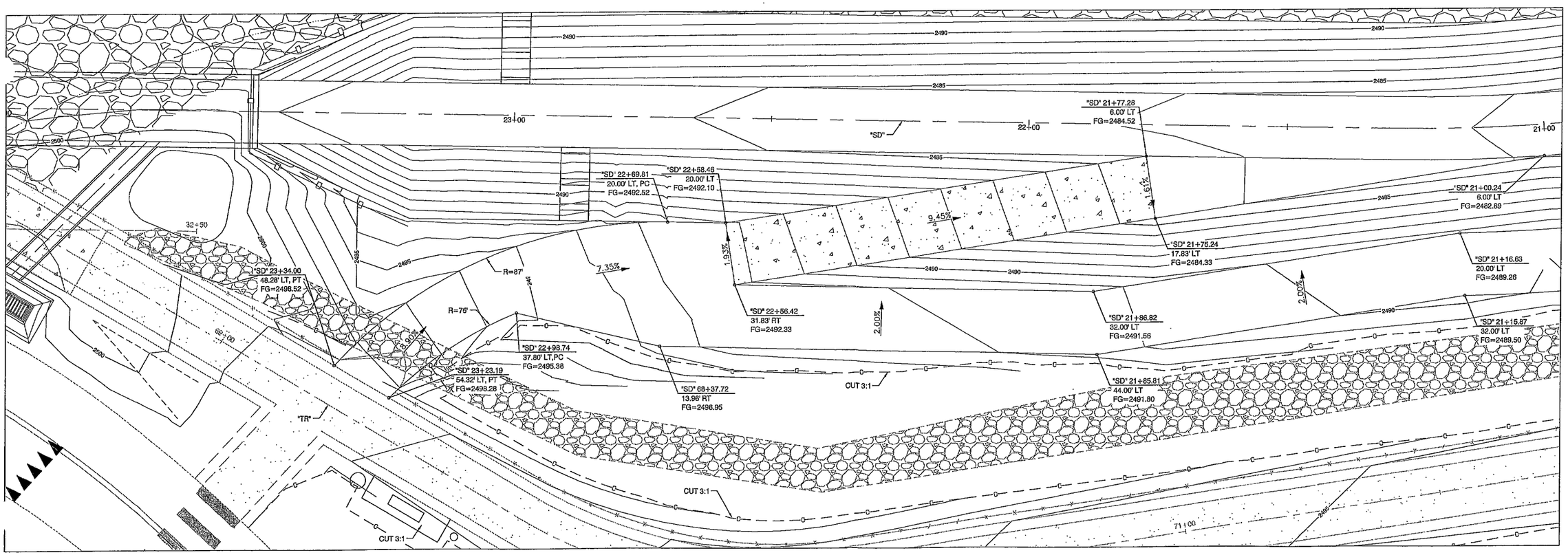
CONCRETE FLUME DETAIL–"SD" 14+11.33 (1)
SCALE: 1" = 10'–0"





SECTION C–C
NOT TO SCALE

CONCRETE FLUME DETAIL–"SD" 19+73.48 (2)
SCALE: 1" = 10'–0"



CONCRETE CHANNEL ACCESS RAMP DETAIL (3)
SCALE: 1" = 10'–0"

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
8740 S. ARVILLE STREET #216, LAS VEGAS, NV 89115
PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR
CITY OF LAS VEGAS

BID# -
DESIGNED BY: DAM
DRAWN BY: SPC/DAM
CHECKED BY: JSR/MJF

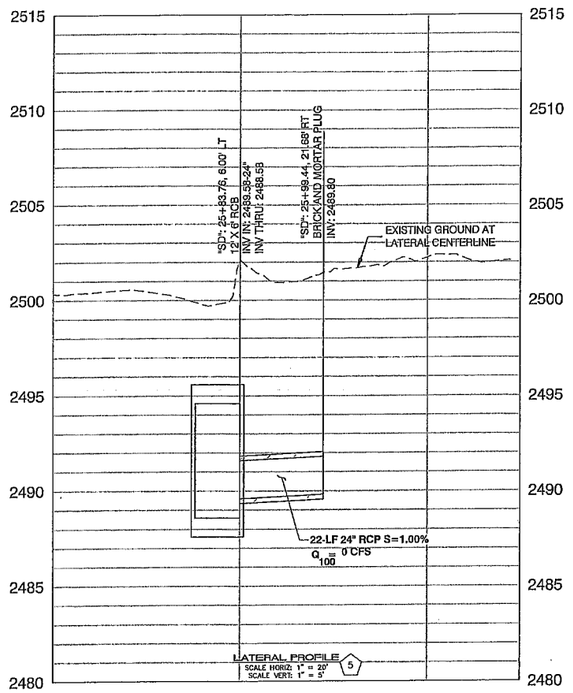
DATE: MARCH 24, 2015
SUBMITTAL STAGE:
90% SUBMITTAL

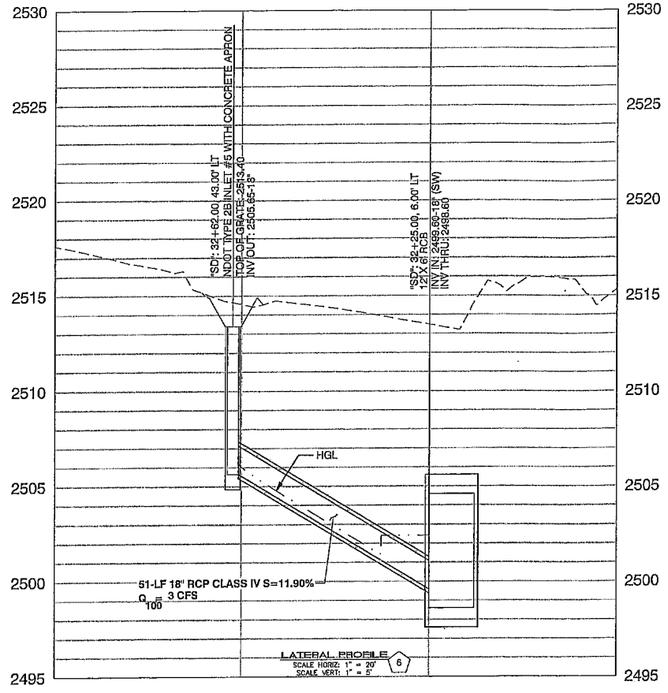
TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

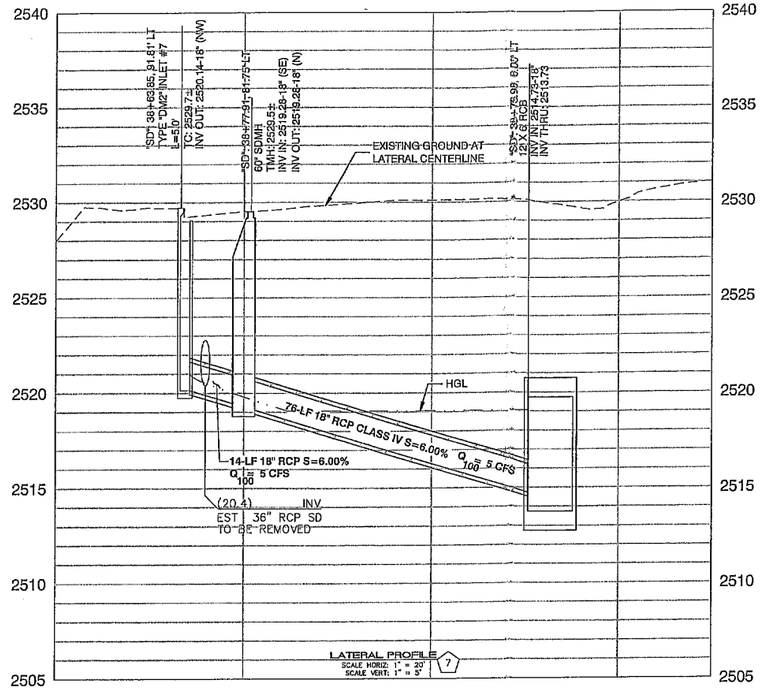
SHEET
STORM DRAIN DETAILS

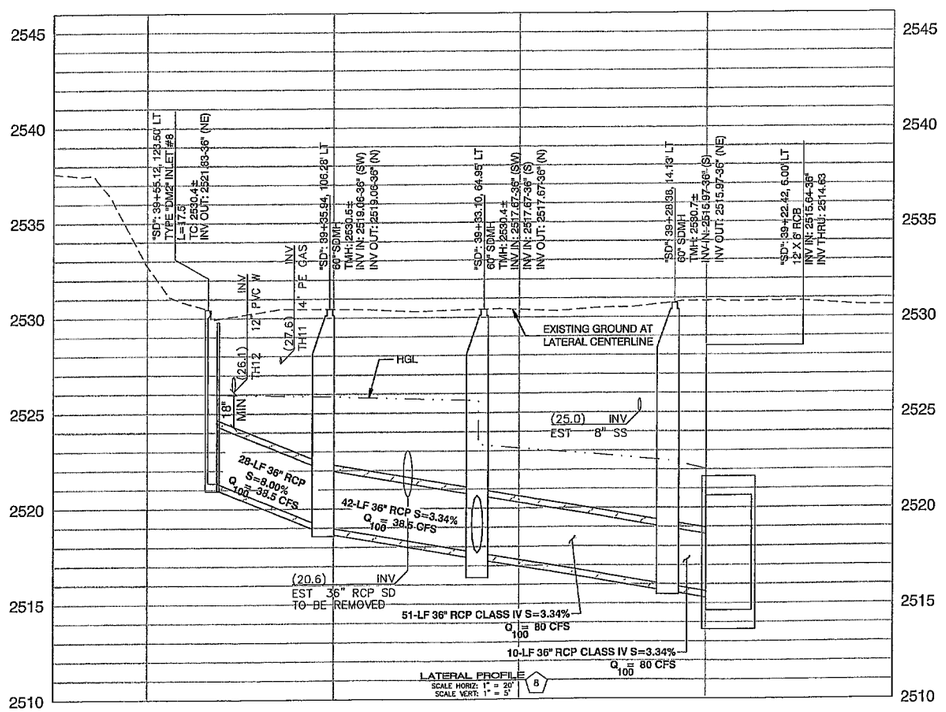
PROFESSIONAL ENGINEER
STATE OF NEVADA
MARK J. ALA
8/30/2015
CIVIL
No. 14566
PRELIMINARY

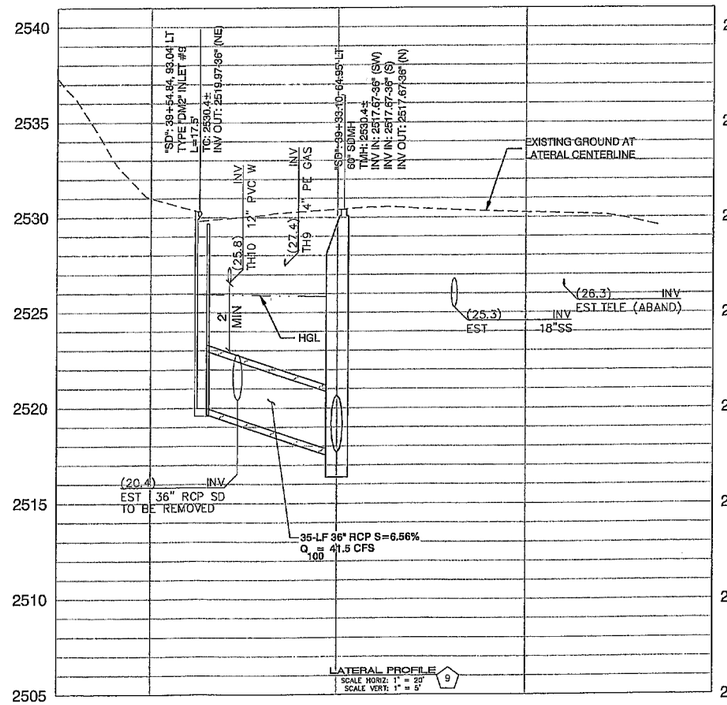
SHEET
SD-14
23 OF 56
DRAWING NO.
-











APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

FOR TRENCHES SIX (6) FEET WIDE AND GREATER:

IF THE PIPE MATERIAL IS ACP, THE EXPOSED PIPE MUST BE REPLACED WITH DUCTILE IRON PIPE.

CONTRACTOR MUST SUBMIT PIPE SUPPORT DETAIL PREPARED BY A NEVADA LICENSED ENGINEER TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINE(S) WILL BE SUPPORTED DURING EXCAVATION AND BACK FILL.

SUPPORTED PIPE MAY BE EXPOSED FOR NO LONGER THAN 90 DAYS MAXIMUM. IF THE PIPE WILL BE EXPOSED FOR MORE THAN 90 DAYS PLANS MUST BE SUBMITTED AND APPROVED BY THE LVVWD TO RELOCATE PIPE.

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
6745 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

NO.	DATE	REVISIONS

PREPARED FOR
CITY OF LAS VEGAS

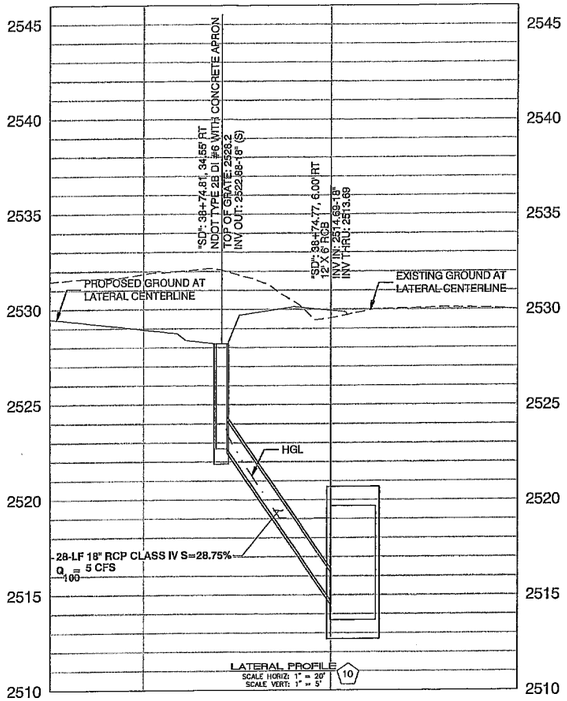
H# 49876	BID# -
DATE: MARCH 24, 2015	DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

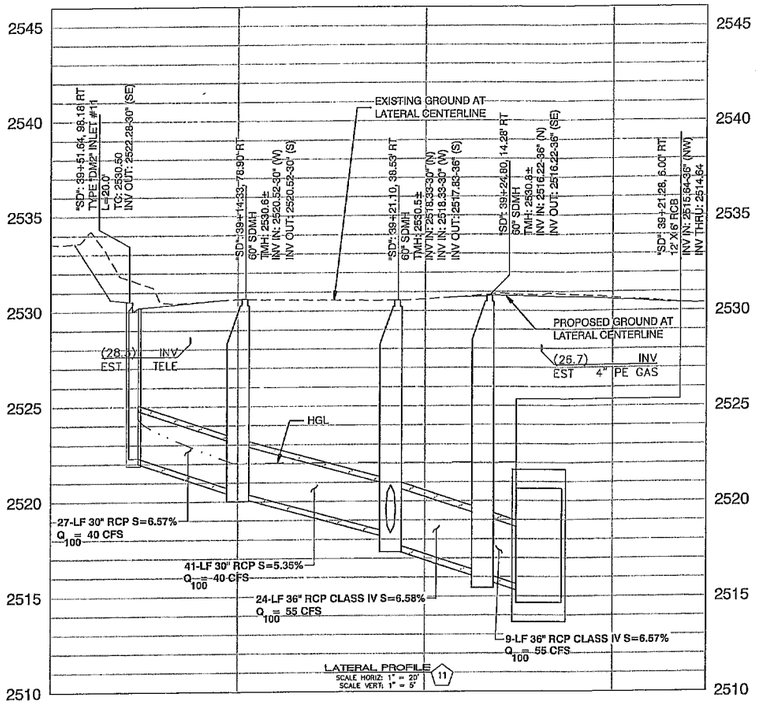
TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

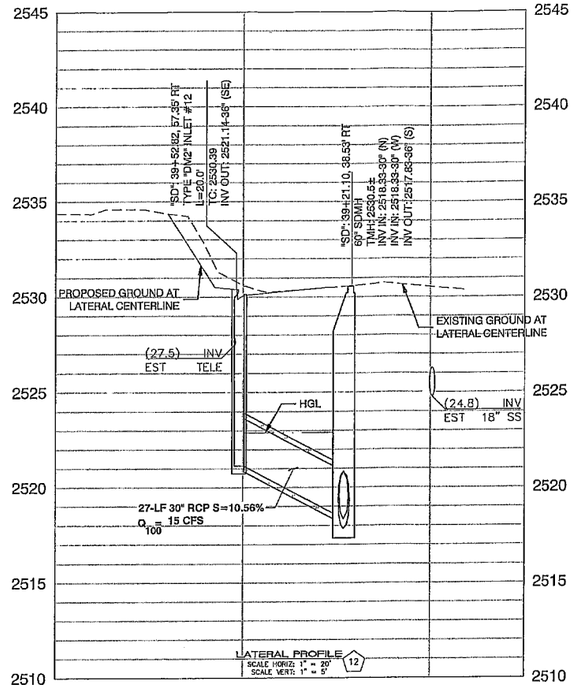
SHEET
STORM DRAIN LATERAL PROFILES

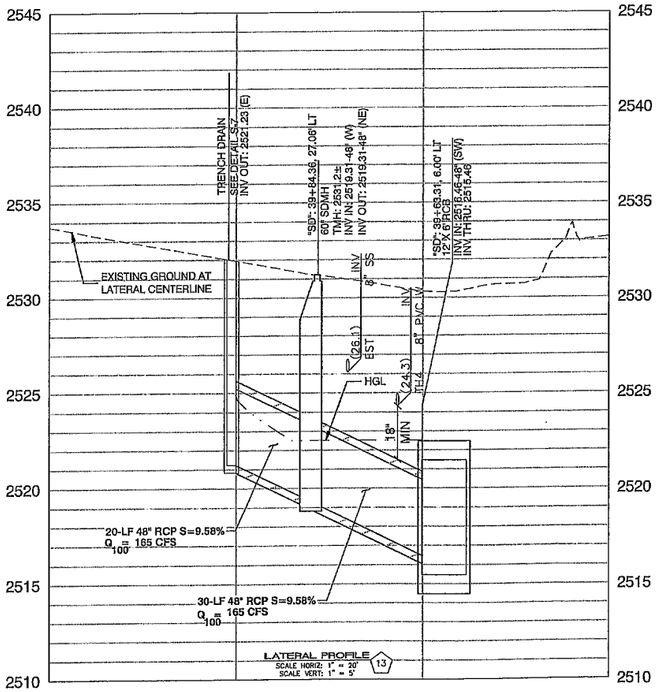
PROFESSIONAL ENGINEER STATE OF NEVADA MARK J. FRANKLIN No. 14566 CIVIL 6/30/2015 PRELIMINARY NOT FOR CONSTRUCTION

SHEET
SD-08
17 OF 56
DRAWING NO.
-









APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 123165

FOR TRENCHES SIX (6) FEET WIDE AND GREATER:

IF THE PIPE MATERIAL IS ACP, THE EXPOSED PIPE MUST BE REPLACED WITH DUCTILE IRON PIPE.

CONTRACTOR MUST SUBMIT PIPE SUPPORT DETAIL PREPARED BY A NEVADA LICENSED ENGINEER TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINE(S) WILL BE SUPPORTED DURING EXCAVATION AND BACK FILL.

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NO.	DATE	REVISIONS

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

PREPARED FOR
CITY OF LAS VEGAS

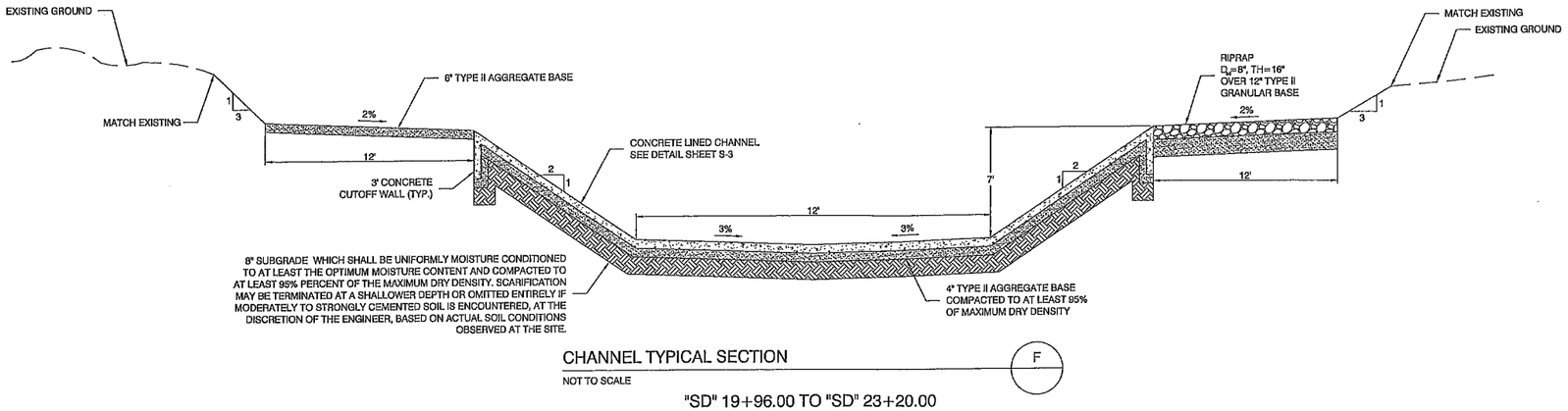
BID# -
H# 49878
DESIGNED BY: DAM
DRAWN BY: SPC/DAM
CHECKED BY: JSR/MJF
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM LATERAL DRAIN PROFILES

PROFESSIONAL ENGINEER
MARK J. FELIX
CIVIL
No. 14566
STATE OF NEVADA
EXPIRES 12/31/2015

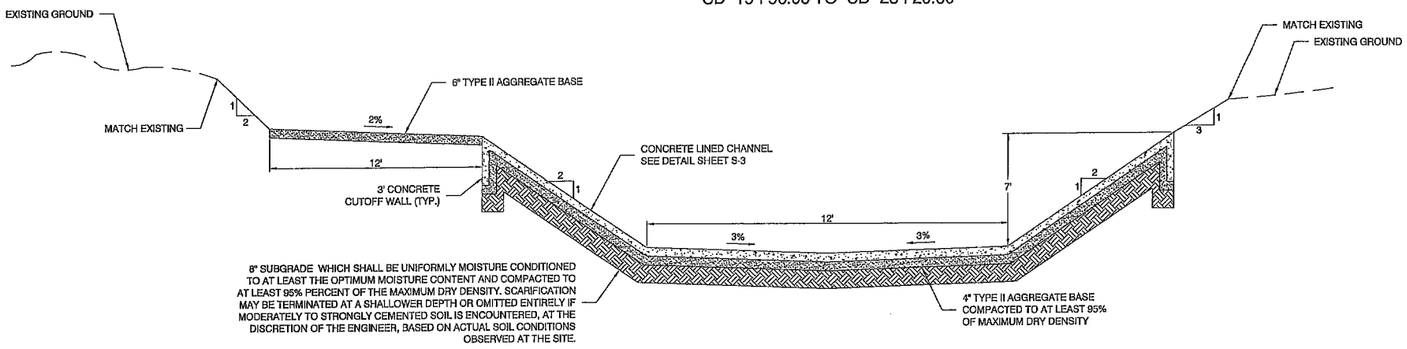
SHEET
SD-09
18 OF 56
DRAWING NO.
-



CHANNEL TYPICAL SECTION — F

NOT TO SCALE

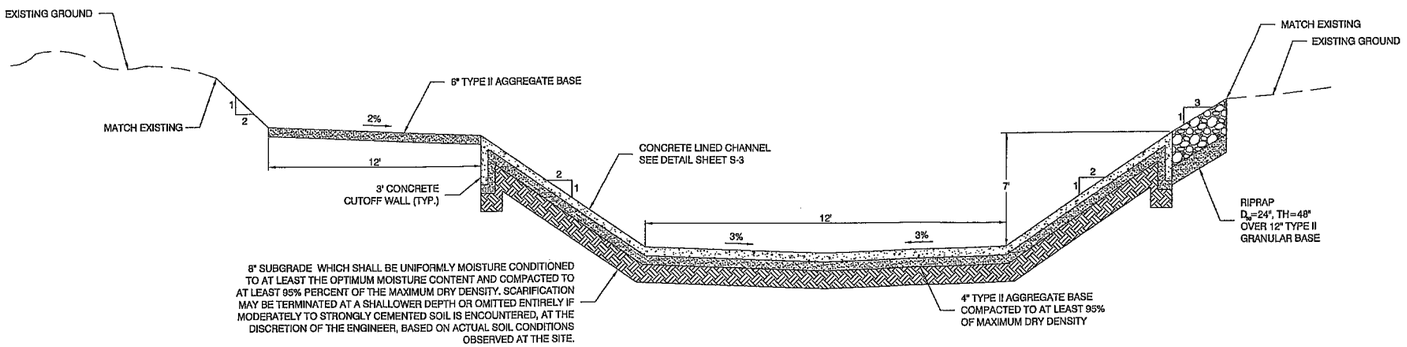
"SD" 19+96.00 TO "SD" 23+20.00



CHANNEL TYPICAL SECTION — E

NOT TO SCALE

"SD" 17+30.00 TO "SD" 19+50.00



CHANNEL TYPICAL SECTION — D

NOT TO SCALE

"SD" 13+97.00 TO "SD" 17+30.00

NO.	DATE	REVISIONS

PREPARED BY

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNERS

5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-3500 FAX (702) 284-3599

PREPARED FOR

CITY OF LAS VEGAS

H# 49976

DATE: MARCH 24, 2015

SUBMITTAL STAGE: 90% SUBMITTAL

BID# -

DESIGNED BY: JSR

DRAWN BY: SPC/DAM

CHECKED BY: JSR/MJF

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

STORM DRAIN TYPICAL SECTIONS

PROFESSIONAL ENGINEER — STATE OF NEVADA — MARK J. FIALA — No. 14566 — CIVIL — PRELIMINARY — 12/30/2015

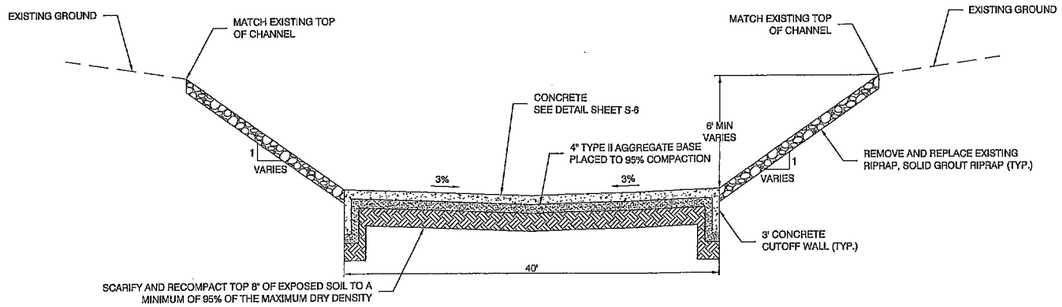
SHEET

SD-10

19 OF 56

DRAWING NO.

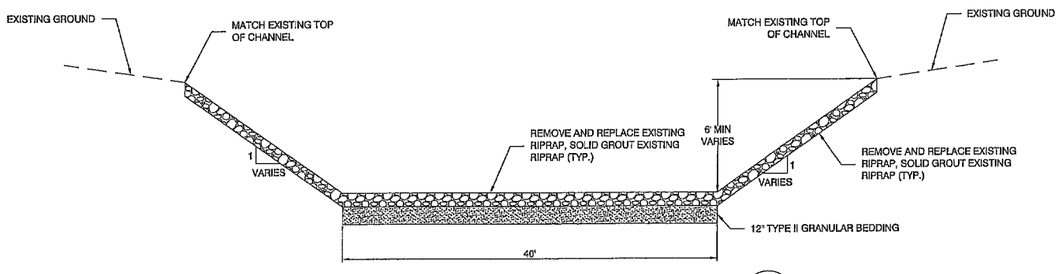
-



CHANNEL TYPICAL SECTION C

NOT TO SCALE

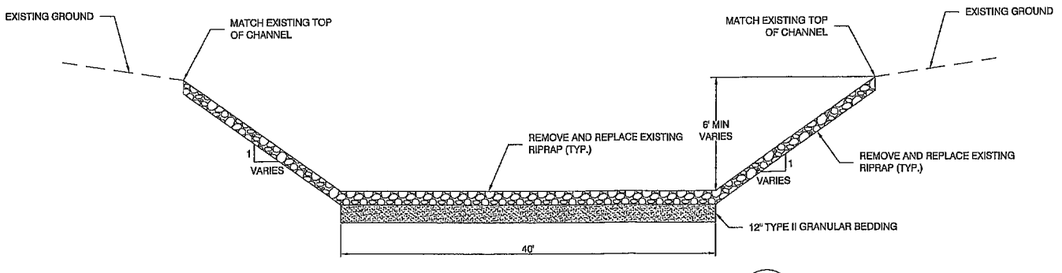
"SD" 12+02.00 TO "SD" 12+32.00



CHANNEL TYPICAL SECTION B

NOT TO SCALE

"SD" 11+70.00 TO "SD" 12+02.00



CHANNEL TYPICAL SECTION A

NOT TO SCALE

"SD" 11+00.00 TO "SD" 11+70.00

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

NO.	DATE	REVISIONS

PREPARED FOR
CITY OF LAS VEGAS

H# 49876
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL
BID# -
DESIGNED BY: JSR
DRAWN BY: SPC/DAM
CHECKED BY: JSR/MJF

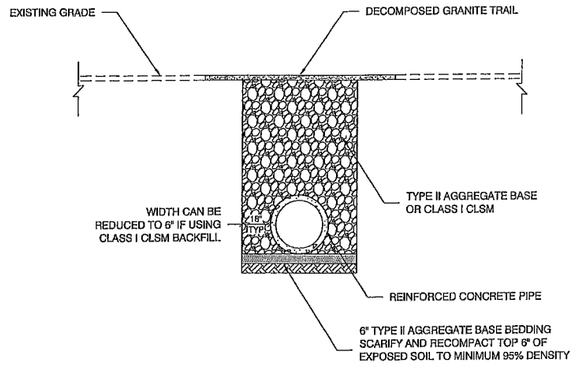
TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN TYPICAL SECTIONS

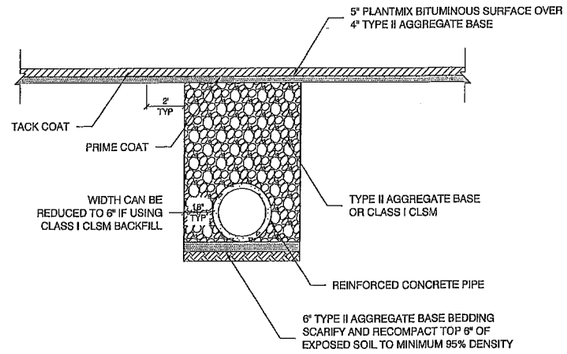
PROFESSIONAL ENGINEER — MARK J. FINNIGAN — STATE OF NEVADA — No. 14566 — CIVIL — EXP. 12/31/2015

SHEET
SD-11
20 OF 56
DRAWING NO.
-

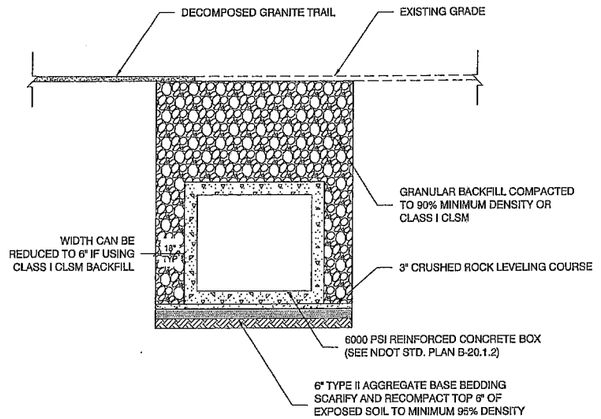
Autodesk Docs://Brent Lane Drainage System & Trail/Brent Lane Drainage System & Trail.rvt 3/24/2015 10:46:05 AM



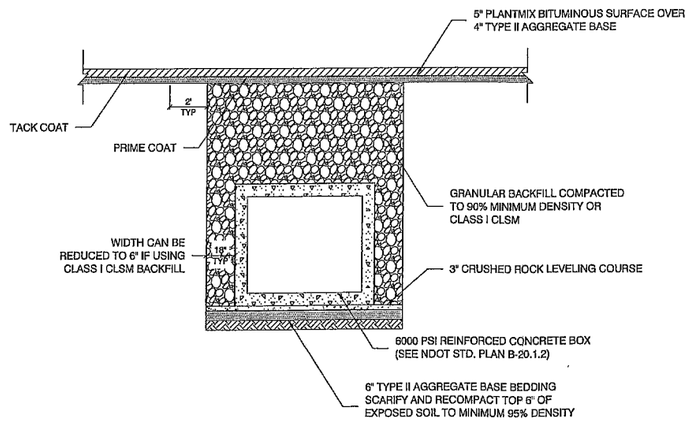
REINFORCED CONCRETE PIPE SECTION (UNPAVED AREAS)



REINFORCED CONCRETE PIPE SECTION (PAVED AREAS)



REINFORCED CONCRETE BOX SECTION (UNPAVED AREAS)



REINFORCED CONCRETE BOX SECTION (PAVED AREAS)

NOTES:

1. SEE REMOVAL PLANS FOR LIMITS OF PAVEMENT REPLACEMENT AND MILL/OVERLAY.
2. THE SAWCUT AND PAVEMENT RESTORATION LIMITS SHOWN ARE BASED ON VERTICAL WALL TRENCHES. NO ADDITIONAL PAYMENT WILL BE MADE FOR DAMAGED PAVEMENT OR PAVEMENT REMOVED TO LAY BACK TRENCH SLOPES. FINAL SAWCUT LIMITS SHALL BE APPROVED BY FIELD INSPECTOR.
3. TRENCH WALLS SHALL BE SHORED PER OSHA REQUIREMENTS.

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
6740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR
CITY OF LAS VEGAS

H# 49876	BID# -
DATE: MARCH 24, 2015	DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

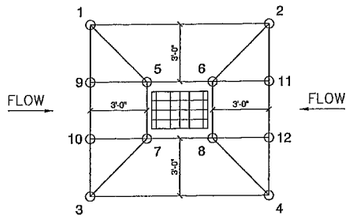
SHEET
STORM DRAIN DETAILS

PROFESSIONAL ENGINEER — STATE OF NEVADA — MARK J. FINNAN — No. 14566 — 6/30/2015 — CIVIL — PREPARED BY

SHEET
SD-12
21 OF 56
DRAWING NO.
-

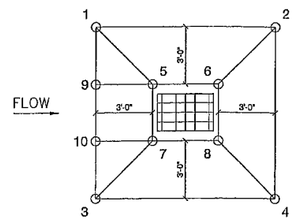
C:\Users\Mark\Documents\Projects\Brent Lane\Drawings\SD-12, Wed Jun 03 08:42:47 PM, dmyrtle

NORTH



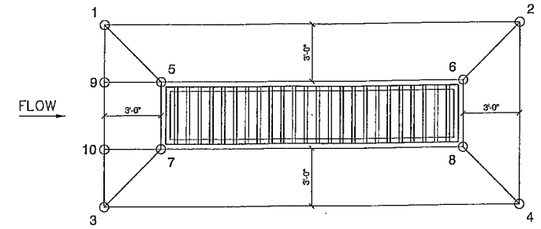
APRON ELEVATION TABLE NDOT 2B DROP INLET #1	
POINT	ELEVATION
1	2477.02
2	2477.07
3	2477.02
4	2477.06
5	2475.40
6	2475.40
7	2475.40
8	2475.40
9	2475.59
10	2475.59
11	2476.06
12	2476.06

NORTH



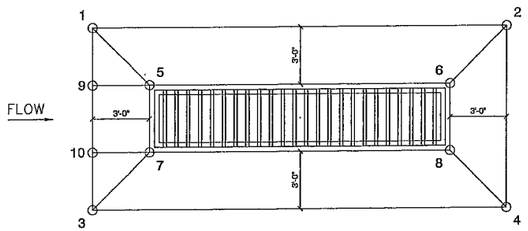
APRON ELEVATION TABLE NDOT 2B DROP INLET #2	
POINT	ELEVATION
1	2479.20
2	2478.90
3	2479.20
4	2479.00
5	2477.70
6	2477.70
7	2477.70
8	2477.70
9	2478.52
10	2478.52

NORTH



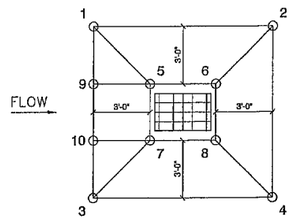
APRON ELEVATION TABLE SPECIAL DROP INLET #3	
POINT	ELEVATION
1	2499.13
2	2499.30
3	2498.50
4	2498.30
5	2496.80
6	2496.80
7	2496.80
8	2496.80
9	2496.84
10	2496.85

NORTH



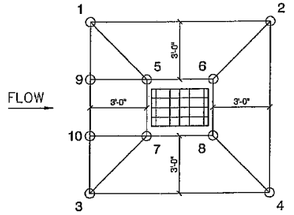
APRON ELEVATION TABLE SPECIAL DROP INLET #4	
POINT	ELEVATION
1	2500.50
2	2500.50
3	2500.50
4	2500.50
5	2499.00
6	2499.00
7	2499.00
8	2499.00
9	2499.17
10	2499.17

NORTH



APRON ELEVATION TABLE NDOT 2B DROP INLET #5	
POINT	ELEVATION
1	2514.90
2	2514.90
3	2514.90
4	2514.90
5	2513.40
6	2513.40
7	2513.40
8	2513.40
9	2513.61
10	2513.61

NORTH



APRON ELEVATION TABLE NDOT 2B DROP INLET #6	
POINT	ELEVATION
1	2529.70
2	2529.70
3	2529.70
4	2529.70
5	2528.20
6	2528.20
7	2528.20
8	2529.20
9	2528.27
10	2528.27

DROP INLET CONCRETE APRONS

NOT TO SCALE

NO.	DATE	REVISIONS

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

PREPARED FOR
CITY OF LAS VEGAS

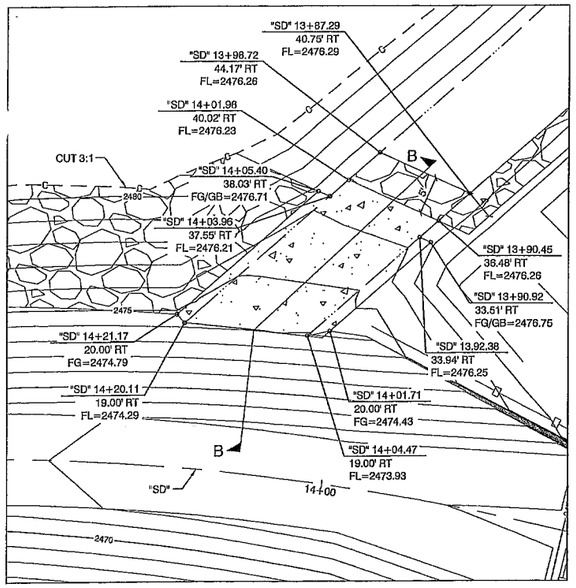
BID# -	
DESIGNED BY:	DAM
DRAWN BY:	SPC/DAM
CHECKED BY:	JSR/MJF
DATE: MARCH 24, 2015	
SUBMITTAL STAGE:	90% SUBMITTAL

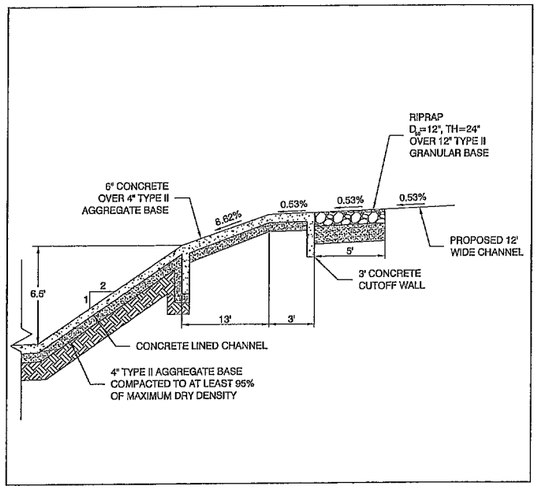
TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN DETAILS

PROFESSIONAL ENGINEER - STATE OF NEVADA
MARK J. FIALA
12/30/2015
CIVIL
No. 14565
PRELIMINARY

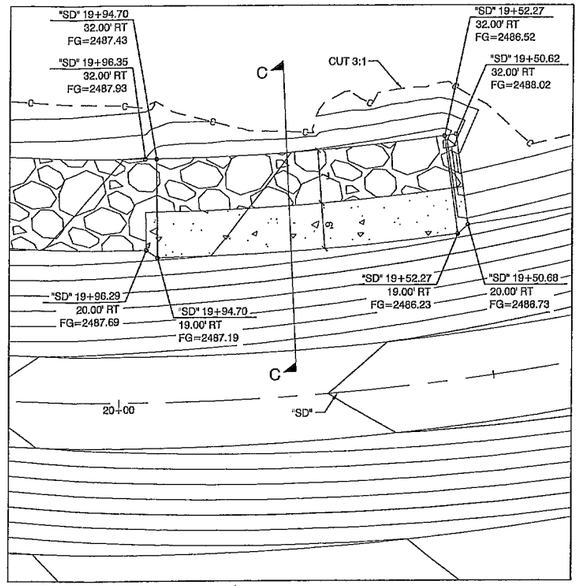
SHEET
SD-13
22 OF 56
DRAWING NO.
-

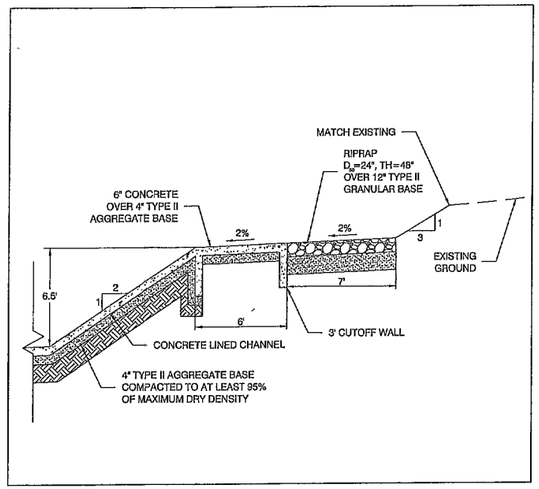




SECTION B–B
NOT TO SCALE

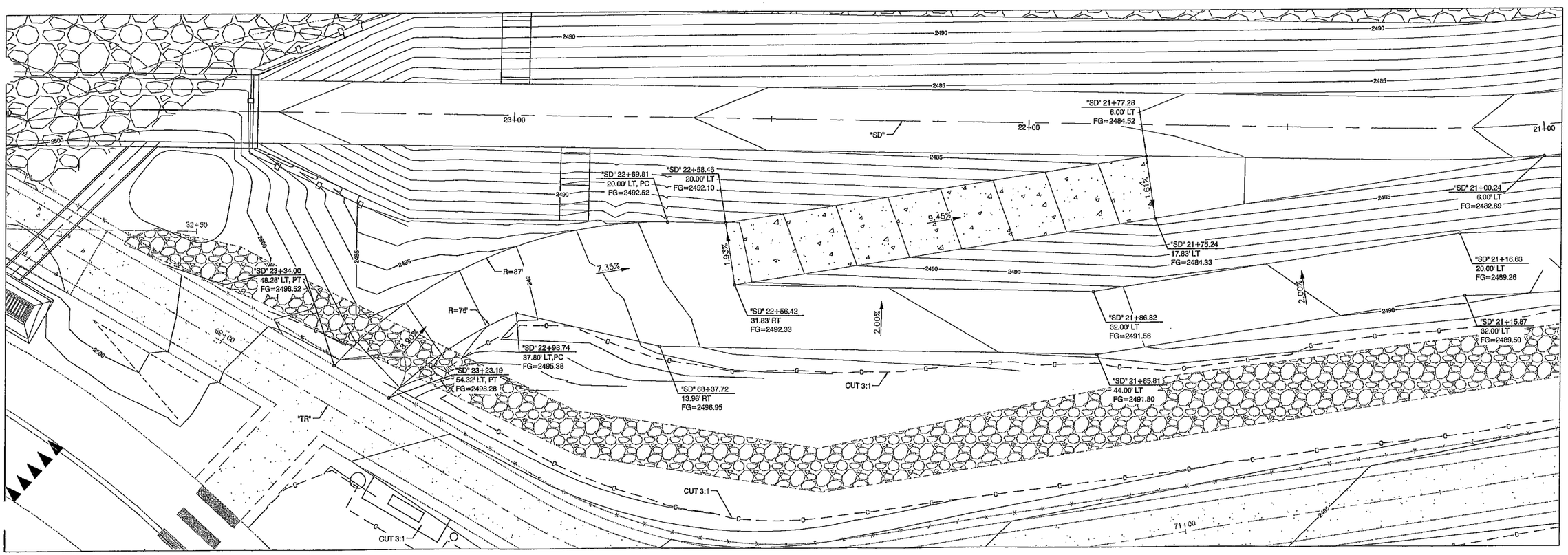
CONCRETE FLUME DETAIL–"SD" 14+11.33 (1)
SCALE: 1" = 10'–0"





SECTION C–C
NOT TO SCALE

CONCRETE FLUME DETAIL–"SD" 19+73.48 (2)
SCALE: 1" = 10'–0"



CONCRETE CHANNEL ACCESS RAMP DETAIL (3)
SCALE: 1" = 10'–0"

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
8740 S. ARVILLE STREET #216, LAS VEGAS, NV 89115
PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR
CITY OF LAS VEGAS

BID# -
DESIGNED BY: DAM
DRAWN BY: SPC/DAM
CHECKED BY: JSR/MJF

DATE: MARCH 24, 2015
SUBMITTAL STAGE:
90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN DETAILS

PROFESSIONAL ENGINEER
STATE OF NEVADA
MARK J. ALA
8/30/2015
CIVIL
No. 14566
PRELIMINARY

SHEET
SD-14
23 OF 56
DRAWING NO.
-

CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS

UTILITY CONFLICT SCHEDULE - 90% SUBMITTAL

PROJECT: Brent Lane Drainage System & Trail

PROJECT #: CLV1401

PREPARED BY: David Myhre, Slater Hanifan Group

CHECKED BY: Mark Failla, P.E., Slater Hanifan Group

DATE 3/24/2015

UTILITY	SIZE AND TYPE	LOCATION		ELEVATION				SOURCE OF INFO		IMPROVEMENT	CONFLICT	ELEVATION			PROPOSED CLEARANCE		REQUIRED CLEARANCE		RESOLUTION
		STATION	OFFSET	FG	TOP	BOTTOM	COVER	POTHOLE	OTHER			TOP	BOTTOM	COVER	ABOVE	BELOW	HORZ	VERT	
CENTURYLINK	(2) 4" TEL	"BL" 15+98	25.0' LT	2532.6	2528.9	2528.6	3.7'	TH7		DROP INLET	YES								RELOCATE BY CENTURYLINK
CENTURYLINK	(2) 4" TEL	"BL" 16+45	16.0' LT	2530.4	2527.4	2527.1	3.0'		EST	12' x 6' RCB	YES								RELOCATE BY CENTURYLINK
CENTURYLINK	TELEPHONE (ABANDONED)	"BL" 15+75 TO "BL" 17+28	23.0' LT				0.0'			12' x 6' RCB	YES								REMOVE FOR STORM DRAIN INSTALLATION
CENTURYLINK	(2) 4" TEL	"BL" 16+58	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
CENTURYLINK	TELEPHONE (ABANDONED)	"BL" 17+28	22.8' LT	2530.1	2527.1		3.0'		EST	12' x 6' RCB	YES								REMOVE FOR STORM DRAIN INSTALLATION
SWG	2" PE	"BL" 16+07	18.0' RT	2532.1	2528.8	2528.6	3.3'	TH8		TRENCH DRAIN	YES								RELOCATE BY SOUTHWEST GAS
SWG	4" PE	"BL" 16+75	57.0' RT	2530.2	2527.7	2527.4	2.5'	TH9		36" RCP	NO								PROTECT IN PLACE
SWG	4" PE	"BL" 16+75	95.0' RT	2530.8	2528.2	2527.8	2.6'	TH11		36" RCP	NO								PROTECT IN PLACE
SWG	4" PE	"BL" 16+75	16.8' LT	2530.7	2527.7	2527.4	3.0'	TH2		12' x 6' RCB	NO								PROTECT IN PLACE
LVVWD	8" PVC	"BL" 16+07	5.7' LT	2532.2	2527.9	2527.2	4.3'	TH5		TRENCH DRAIN	NO								PROTECT IN PLACE
LVVWD	8" PVC	"BL" 16+44	5.5' LT	2530.8	2525.0	2524.3	5.8'	TH4		48" RCP	NO								PROTECT IN PLACE
LVVWD	12" PVC	"BL" 16+64	67.7' LT	2530.1	2526.8	2525.8	3.2'	TH10		36" RCP	NO								PROTECT IN PLACE
LVVWD	12" PVC	"BL" 16+64	100.3' LT	2530.6	2527.5	2526.5	3.1'	TH12		36" RCP	NO								PROTECT IN PLACE
LVVWD	BLOW-OFF	"BL" 16+65	16.5' LT	2530.5	2524.7	2523.7	5.9'	TH3		12' x 6' RCB	YES								RELOCATE
NVE	(3) 4" ELEC	"BL" 16+54	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
COX	CATV CONDUIT	"BL" 15+98	25.0' LT	2532.6	2528.9	2528.6	3.7'	TH6		DROP INLET	YES								RELOCATE BY COX COMMUNICATIONS
COX	CATV CONDUIT	"BL" 16+58	16.0' LT	2530.5	2528.6	2528.4	1.9'	TH1		12' x 6' RCB	NO								PROTECT IN PLACE
COX	CATV CONDUIT	"BL" 16+58	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
COX	CATV CONDUIT	"BL" 16+54	60.0' TO 128.0' LT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
SEWER	8" PVC	"BL" 16+07	4.1' RT	2532.1	2527.3	2526.7	4.7'		EST	TRENCH DRAIN	NO								PROTECT IN PLACE
SEWER	8" PVC	"BL" 16+35	4.1' RT	2531.0	2526.8	2526.1	4.2'		EST	48" RCP	NO								PROTECT IN PLACE
SEWER	8" PVC	"BL" 16+87	3.9' RT	2530.6	2525.7	2525.0	4.9'		EST	36" RCP	NO								PROTECT IN PLACE
SEWER	18" PVC	"BL" 16+88	3.9' RT	2530.5	2526.2	2524.7	4.3'		EST	12' x 6' RCB	NO								PROTECT IN PLACE

CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS

UTILITY CONFLICT SCHEDULE - 90% SUBMITTAL

PROJECT: Brent Lane Drainage System & Trail

PROJECT #: CLV1401

PREPARED BY: David Myhre, Slater Hanifan Group

CHECKED BY: Mark Failla, P.E., Slater Hanifan Group

DATE 3/24/2015

UTILITY	SIZE AND TYPE	LOCATION		ELEVATION				SOURCE OF INFO		IMPROVEMENT	CONFLICT	ELEVATION			PROPOSED CLEARANCE		REQUIRED CLEARANCE		RESOLUTION
		STATION	OFFSET	FG	TOP	BOTTOM	COVER	POTHOLE	OTHER			TOP	BOTTOM	COVER	ABOVE	BELOW	HORZ	VERT	
TRAFFIC SIGNAL/ITS	TS/ITS CONDUIT	"BL" 16+57	16.0' LT	2530.4	2527.4	2527.1	3.0'		EST	12' x 6' RCB	NO								PROTECT IN PLACE
TRAFFIC SIGNAL/ITS	TS/ITS CONDUIT	"BL" 16+57	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"BL" 16+56	16.0' LT	2530.4	2527.4	2527.1	3.0'		EST	12' x 6' RCB	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"BL" 16+55	60.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"BL" 17+52	68.9' RT	2529.7	2526.7	2524.3	3.0'		EST	DROP INLET	NO								PROTECT IN PLACE

Note: Elevations shown are to outside of pipe.

CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS

UTILITY CONFLICT SCHEDULE - 90% SUBMITTAL

PROJECT: Brent Lane Drainage System & Trail

PROJECT #: CLV1401

PREPARED BY: David Myhre, Slater Hanifan Group

CHECKED BY: Mark Failla, P.E., Slater Hanifan Group

DATE 3/24/2015

UTILITY	SIZE AND TYPE	LOCATION		ELEVATION				SOURCE OF INFO		IMPROVEMENT	CONFLICT	ELEVATION			PROPOSED CLEARANCE		REQUIRED CLEARANCE		RESOLUTION
		STATION	OFFSET	FG	TOP	BOTTOM	COVER	POTHOLE	OTHER			TOP	BOTTOM	COVER	ABOVE	BELOW	HORZ	VERT	
CENTURYLINK	(2) 4" TEL	"BL" 15+98	25.0' LT	2532.6	2528.9	2528.6	3.7'	TH7		DROP INLET	YES								RELOCATE BY CENTURYLINK
CENTURYLINK	(2) 4" TEL	"BL" 16+45	16.0' LT	2530.4	2527.4	2527.1	3.0'		EST	12' x 6' RCB	YES								RELOCATE BY CENTURYLINK
CENTURYLINK	TELEPHONE (ABANDONED)	"BL" 15+75 TO "BL" 17+28	23.0' LT				0.0'			12' x 6' RCB	YES								REMOVE FOR STORM DRAIN INSTALLATION
CENTURYLINK	(2) 4" TEL	"BL" 16+58	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
CENTURYLINK	TELEPHONE (ABANDONED)	"BL" 17+28	22.8' LT	2530.1	2527.1		3.0'		EST	12' x 6' RCB	YES								REMOVE FOR STORM DRAIN INSTALLATION
SWG	2" PE	"BL" 16+07	18.0' RT	2532.1	2528.8	2528.6	3.3'	TH8		TRENCH DRAIN	YES								RELOCATE BY SOUTHWEST GAS
SWG	4" PE	"BL" 16+75	57.0' RT	2530.2	2527.7	2527.4	2.5'	TH9		36" RCP	NO								PROTECT IN PLACE
SWG	4" PE	"BL" 16+75	95.0' RT	2530.8	2528.2	2527.8	2.6'	TH11		36" RCP	NO								PROTECT IN PLACE
SWG	4" PE	"BL" 16+75	16.8' LT	2530.7	2527.7	2527.4	3.0'	TH2		12' x 6' RCB	NO								PROTECT IN PLACE
LVVWD	8" PVC	"BL" 16+07	5.7' LT	2532.2	2527.9	2527.2	4.3'	TH5		TRENCH DRAIN	NO								PROTECT IN PLACE
LVVWD	8" PVC	"BL" 16+44	5.5' LT	2530.8	2525.0	2524.3	5.8'	TH4		48" RCP	NO								PROTECT IN PLACE
LVVWD	12" PVC	"BL" 16+64	67.7' LT	2530.1	2526.8	2525.8	3.2'	TH10		36" RCP	NO								PROTECT IN PLACE
LVVWD	12" PVC	"BL" 16+64	100.3' LT	2530.6	2527.5	2526.5	3.1'	TH12		36" RCP	NO								PROTECT IN PLACE
LVVWD	BLOW-OFF	"BL" 16+65	16.5' LT	2530.5	2524.7	2523.7	5.9'	TH3		12' x 6' RCB	YES								RELOCATE
NVE	(3) 4" ELEC	"BL" 16+54	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
COX	CATV CONDUIT	"BL" 15+98	25.0' LT	2532.6	2528.9	2528.6	3.7'	TH6		DROP INLET	YES								RELOCATE BY COX COMMUNICATIONS
COX	CATV CONDUIT	"BL" 16+58	16.0' LT	2530.5	2528.6	2528.4	1.9'	TH1		12' x 6' RCB	NO								PROTECT IN PLACE
COX	CATV CONDUIT	"BL" 16+58	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
COX	CATV CONDUIT	"BL" 16+54	60.0' TO 128.0' LT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
SEWER	8" PVC	"BL" 16+07	4.1' RT	2532.1	2527.3	2526.7	4.7'		EST	TRENCH DRAIN	NO								PROTECT IN PLACE
SEWER	8" PVC	"BL" 16+35	4.1' RT	2531.0	2526.8	2526.1	4.2'		EST	48" RCP	NO								PROTECT IN PLACE
SEWER	8" PVC	"BL" 16+87	3.9' RT	2530.6	2525.7	2525.0	4.9'		EST	36" RCP	NO								PROTECT IN PLACE
SEWER	18" PVC	"BL" 16+88	3.9' RT	2530.5	2526.2	2524.7	4.3'		EST	12' x 6' RCB	NO								PROTECT IN PLACE

CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS

UTILITY CONFLICT SCHEDULE - 90% SUBMITTAL

PROJECT: Brent Lane Drainage System & Trail

PROJECT #: CLV1401

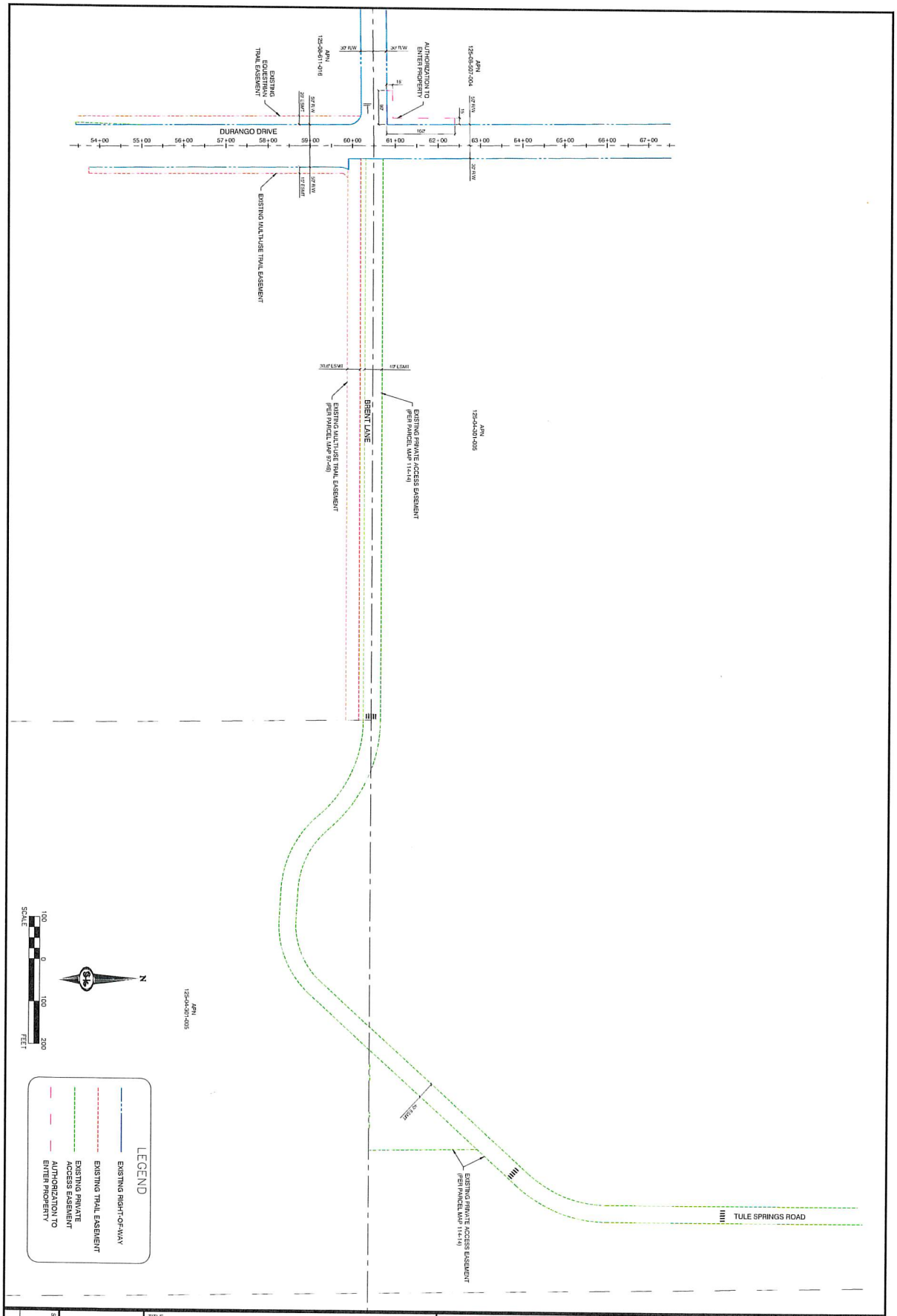
PREPARED BY: David Myhre, Slater Hanifan Group

CHECKED BY: Mark Failla, P.E., Slater Hanifan Group

DATE 3/24/2015

UTILITY	SIZE AND TYPE	LOCATION		ELEVATION				SOURCE OF INFO		IMPROVEMENT	CONFLICT	ELEVATION			PROPOSED CLEARANCE		REQUIRED CLEARANCE		RESOLUTION
		STATION	OFFSET	FG	TOP	BOTTOM	COVER	POTHOLE	OTHER			TOP	BOTTOM	COVER	ABOVE	BELOW	HORZ	VERT	
TRAFFIC SIGNAL/ITS	TS/ITS CONDUIT	"BL" 16+57	16.0' LT	2530.4	2527.4	2527.1	3.0'		EST	12' x 6' RCB	NO								PROTECT IN PLACE
TRAFFIC SIGNAL/ITS	TS/ITS CONDUIT	"BL" 16+57	65.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"BL" 16+56	16.0' LT	2530.4	2527.4	2527.1	3.0'		EST	12' x 6' RCB	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"BL" 16+55	60.0' TO 120.0' RT				0.0'			DROP INLETS	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"BL" 17+52	68.9' RT	2529.7	2526.7	2524.3	3.0'		EST	DROP INLET	NO								PROTECT IN PLACE

Note: Elevations shown are to outside of pipe.



SHEET EX-1 1 OF 1 DRAWING NO. -	TITLE: BRENT LANE DRAINAGE SYSTEM & TRAIL	PREPARED FOR: CITY OF LAS VEGAS		PREPARED BY: SLATER HANIFAN GROUP	NO. / DATE / REVISIONS
	SHEET: RIGHT-OF-WAY EXHIBIT	H# -	BID# -	CONSULTING ENGINEERS & PLANNERS	
		DATE: SEPTEMBER 8, 2014	DESIGNED BY: JSR	5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118	
		SUBMITTAL STAGE: 50% SUBMITTAL	DRAWN BY: JAS	PHONE (702) 284-5300 FAX (702) 284-5399	
			CHECKED BY: MJF		

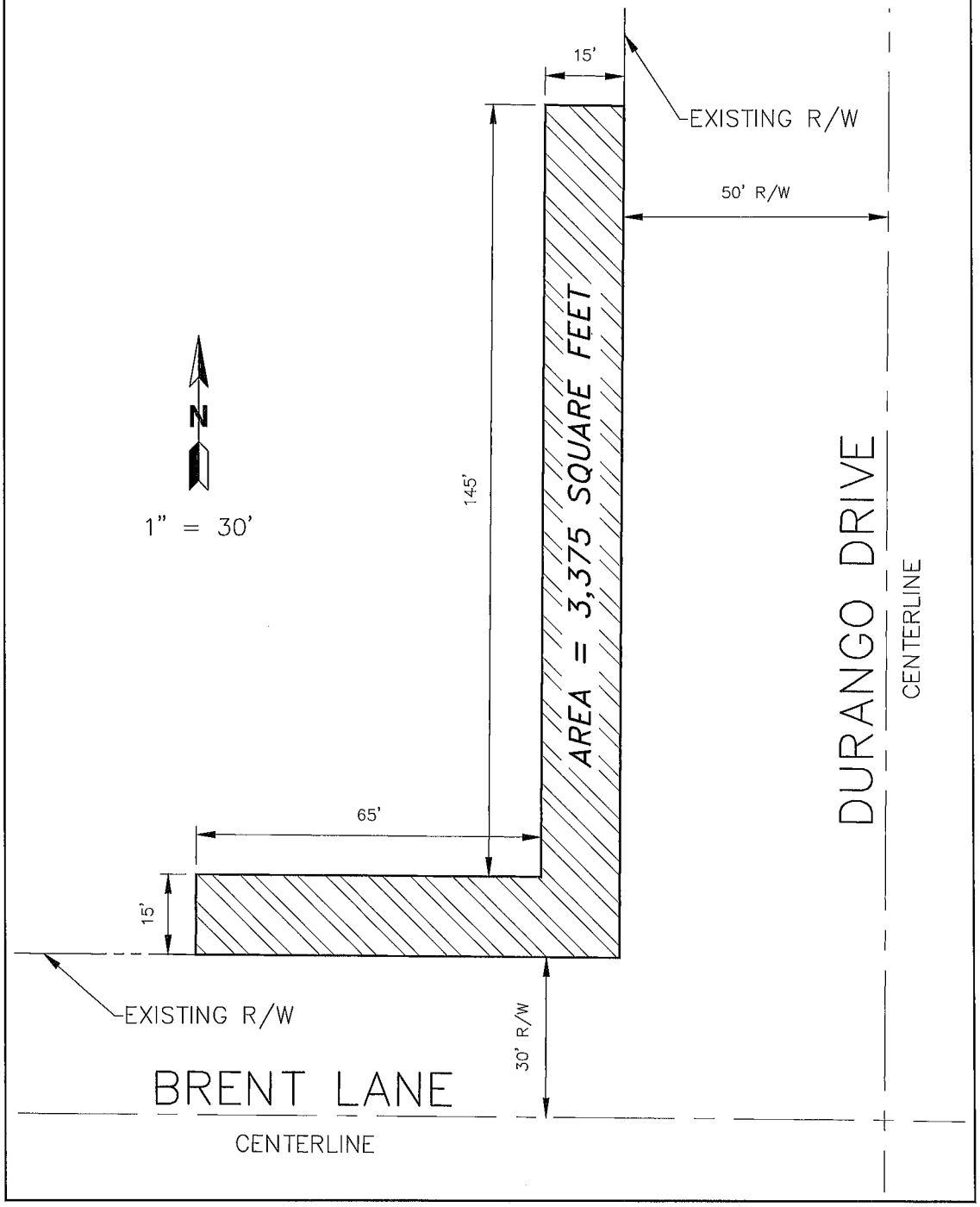
APN: 125-08-507-004
ALMALGAMATED FINANCIAL TRUST
AND HOLLOWAY JEFFREY K TRS

EXHIBIT "A"

PAGE 1 OF 1

AUTHORIZATION TO ENTER PROPERTY

A PORTION OF APN 125-08-507-004 LYING WITHIN SECTION 8, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M. CITY OF LAS VEGAS, CLARK COUNTY, NEVADA



LV1401 - Brent Lane\Administrative Design Report\Appendix\Section 5 - Example Legal_AUTHVAUEP.dwg, Layout1, 3 10/7/2015 8:50:05 AM, dmynre
JRS Transport

APN 125-29-601-021

Stanley Consultants INC.
A Stanley Group Company
Engineering, Environmental and Construction Services - Worldwide

PROJECT No.: 21776
OCTOBER 2009
BY: CDK
CKD: AWD

PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
ALAN W. DILL
Exp: 12/30/10
No. 7808
10-20-09

EXHIBIT "A"

EXPLANATION

THIS DESCRIPTION DESCRIBES A PARCEL OF LAND GENERALLY LOCATED NORTH OF TROPICAL PARKWAY AND APPROXIMATELY 690.00 FEET WEST OF GRAND MONTECITO PARKWAY, FOR THE PURPOSE OF A BUREAU OF LAND MANAGEMENT, RIGHT-OF-WAY GRANT, AND TO ESTABLISH RIGHTS-OF-WAY FOR THE EAST HALF (E 1/2) OF BONITA VISTA STREET, BETWEEN TROPICAL PARKWAY AND BRIGHT ANGEL WAY.

DESCRIPTION
BONITA VISTA STREET

BEING A PORTION OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 29, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHWEST CORNER OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SAID SECTION 29, ALSO BEING THE INTERSECTION OF TROPICAL PARKWAY AND BONITA VISTA STREET; THENCE NORTH 00°08'17" EAST, ALONG THE WEST LINE OF SAID SOUTHEAST QUARTER (SE 1/4) AND THE WESTERLY LINE OF THAT CITY OF LAS VEGAS RIGHT-OF-WAY GRANT, PER BLM PERMIT No. N-74262, A DISTANCE OF 40.01 FEET TO THE NORTHERLY LINE OF SAID RIGHT-OF-WAY GRANT AND THE **POINT OF BEGINNING**;

THENCE CONTINUING NORTH 00°08'17" EAST, ALONG THE WEST LINE OF SAID SOUTHEAST QUARTER (SE 1/4), A DISTANCE OF 614.03 TO THE NORTHWEST CORNER OF SAID SOUTHEAST QUARTER (SE 1/4) AND THE INTERSECTION OF BONITA VISTA STREET AND BRIGHT ANGEL WAY; THENCE NORTH 89°10'30" EAST ALONG THE NORTH LINE OF SAID SOUTHEAST QUARTER (SE 1/4), A DISTANCE OF 38.32 FEET TO THE SOUTHEAST CORNER OF THAT

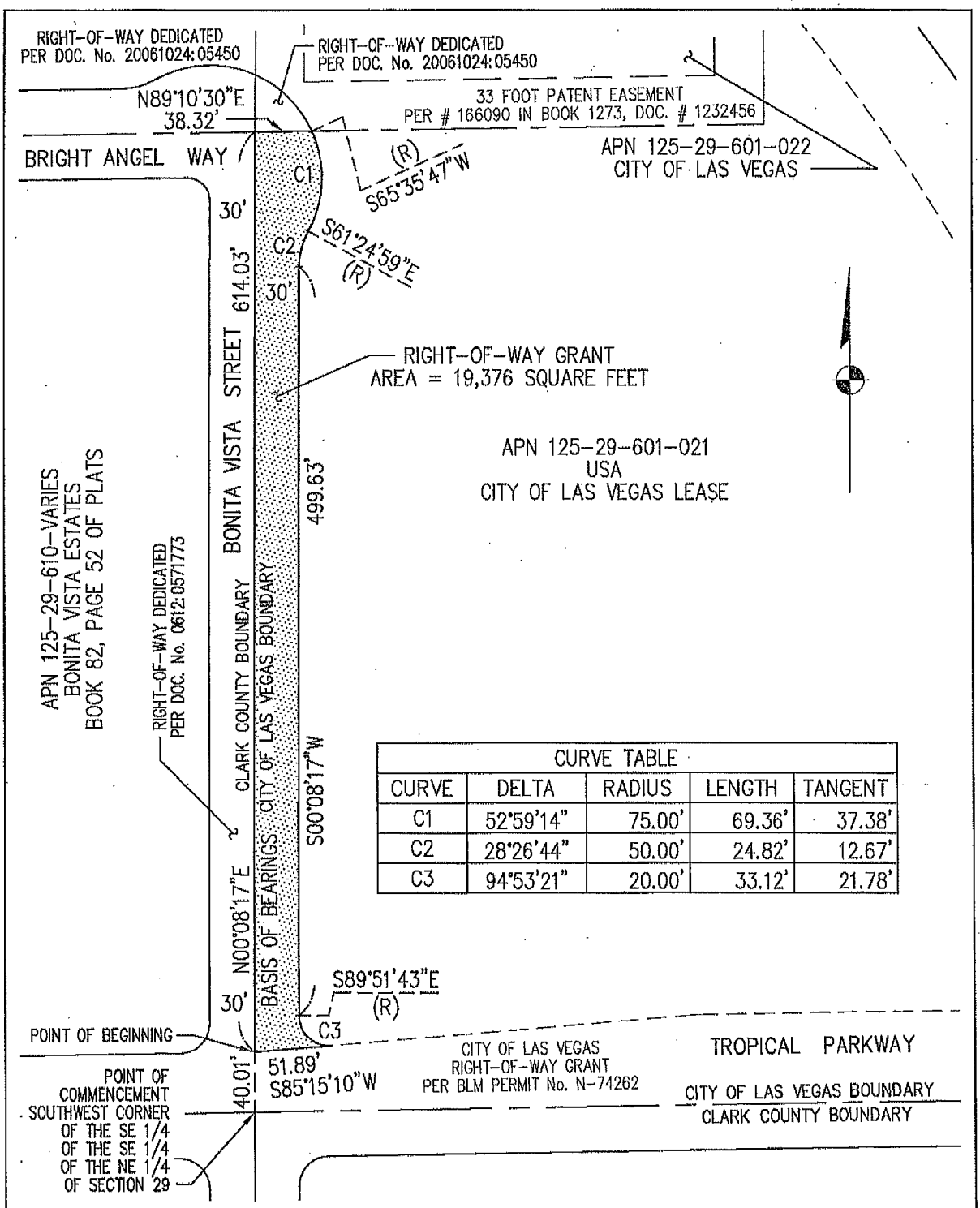
CERTAIN RIGHT-OF-WAY, DEDICATED PER DOCUMENT NO. 20061024:05450, AND THE BEGINNING OF A NON-TANGENT CURVE, CONCAVE WESTERLY, HAVING A RADIUS OF 75.00 FEET, A CENTRAL ANGLE OF 52°59'14", AND FROM WHICH A RADIAL LINE BEARS SOUTH 65°35'47" WEST; THENCE SOUTHERLY ALONG SAID CURVE, 69.36 FEET TO THE BEGINNING OF A REVERSE CURVE, CONCAVE SOUTHEASTERLY, HAVING A RADIUS OF 50.00 FEET AND A CENTRAL ANGLE OF 28°26'44"; THENCE SOUTHERLY ALONG SAID CURVE, 24.82 FEET; THENCE SOUTH 00°08'17" WEST, ALONG A LINE BEING PARALLEL TO, AND 30.00 FEET DISTANT FROM, THE WEST LINE OF SAID SOUTHEAST QUARTER (SE 1/4), A DISTANCE OF 499.63 FEET TO THE BEGINNING OF A CURVE, CONCAVE NORTHEASTERLY, HAVING A RADIUS OF 20.00 FEET AND A CENTRAL ANGLE OF 94°53'21"; THENCE SOUTHEASTERLY ALONG SAID CURVE, 33.12 FEET TO A POINT OF THE NORTHERLY LINE OF THE AFOREMENTIONED CITY OF LAS VEGAS RIGHT-OF-WAY GRANT; THENCE SOUTH 85°15'10" WEST, ALONG SAID NORTHERLY LINE, 51.89 FEET TO THE **POINT OF BEGINNING**.

CONTAINING 19,376 SQUARE FEET / 0.44 ACRES, MORE OR LESS.

BASIS OF BEARINGS

NORTH 00°08'17" EAST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 29, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AND THE CENTERLINE OF BONITA VISTA STREET, AS SHOWN BY BOOK 139, PAGE 48 OF PLATS, ON FILE IN THE COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

END OF DESCRIPTION



CURVE TABLE				
CURVE	DELTA	RADIUS	LENGTH	TANGENT
C1	52°59'14"	75.00'	69.36'	37.38'
C2	28°26'44"	50.00'	24.82'	12.67'
C3	94°53'21"	20.00'	33.12'	21.78'

H:\dataproject\21776\CLV-Tropical Durango Park_Mapping\dwg\Right-of-Way Grant.dwg Oct 20, 2009 - 10:58

PROJECT No.: 21776	EXHIBIT "A" RIGHT-OF-WAY GRANT	DRAWN BY: CDK
Stanley Consultants INC	SECTION 29, TOWNSHIP 19 SOUTH, RANGE 60 EAST, MDM CITY OF LAS VEGAS, CLARK COUNTY, NEVADA	CHECKED BY: AWD SCALE: N/A DATE: OCT 2009 PAGE: 3 of 3

Project: CLV-Tropical Durango Park_Mapping Tue October 20 10:52:57 2009
Parcel Map Check

Parcel name: Right-of-Way Grant

North: 5029.0093 East : 4308.4791
Line Course: N 00-08-17 E Length: 614.03
North: 5643.0375 East : 4309.9586
Line Course: N 89-10-30 E Length: 38.32
North: 5643.5892 East : 4348.2747
Curve Length: 69.36 Radius: 75.00
Delta: 52-59-14 Tangent: 37.38
Chord: 66.91 Course: S 02-05-24 W
Course In: S 65-35-47 W Course Out: S 61-24-59 E
RP North: 5612.6021 East : 4279.9753
End North: 5576.7237 East : 4345.8345
Curve Length: 24.82 Radius: 50.00
Delta: 28-26-44 Tangent: 12.67
Chord: 24.57 Course: S 14-21-39 W
Course In: S 61-24-59 E Course Out: N 89-51-43 W
RP North: 5552.8017 East : 4389.7405
End North: 5552.9215 East : 4339.7405
Line Course: S 00-08-17 W Length: 499.63
North: 5053.2929 East : 4338.5366
Curve Length: 33.12 Radius: 20.00
Delta: 94-53-21 Tangent: 21.78
Chord: 29.46 Course: S 47-18-23 E
Course In: S 89-51-43 E Course Out: S 04-45-04 E
RP North: 5053.2447 East : 4358.5365
End North: 5033.3168 East : 4360.1894
Line Course: S 85-15-10 W Length: 51.89
North: 5029.0223 East : 4308.4774

Perimeter: 1331.18 Area: 19,376 S.F. 0.44 ACRES

Mapcheck Closure - (Uses listed courses and chords)
Error Closure: 0.0132 Course: N 07-25-22 W
Error North: 0.01309 East : -0.00171
Precision 1: 100,364.39

Brent Lane Drainage System & Trail
Permit Matrix

Permit Type	Issuing Agency	Address/ Phone Number	Regulated Activity	Application Schedule	Responsible Party	Approximate Processing Time
City of Las Vegas Construction Permit	City of Las Vegas Development Services Center	333 N. Rancho Road Las Vegas, NV 89106 (702) 229-6371	Required for construction, excavation, installation within City of Las Vegas Right-of-way	After Conditional Notice-to-Proceed	Contractor	2 to 3 business working days
Clark County Encroachment Permit	Clark County Public Works	500 S. Grand Central Parkway PO Box 554000 Las Vegas, NV 89155 (702) 455-4615	Required for construction, excavation, installation within Clark County Right-of-way	After Conditional Notice-to-Proceed	Contractor	2 to 3 business working days
Dust Control Permit	Department of Air Quality	4701 W. Russell Road Las Vegas, NV 89118 (702) 455-5942	Required for dust emissions from construction, grading, and trenching for any soil disturbance of 1/4 acre or more	After Conditional Notice-to-Proceed	Contractor	1 to 3 business working days
NPDES Stormwater Discharge Permit for Construction Activities	Nevada Division of Environmental Protection	2030 E. Flamingo Rd. St. 230 Las Vegas, NV, 89119 (702) 486-2850	Required for storm water diversion / control from work site on any construction project 1 acre or more	Prior to Discharge	CLV Project Manager	7 to 14 business working days
Temporary Authority to Discharge	Nevada Division of Environmental Protection – Bureau of Water Pollution Control	2030 E. Flamingo Rd. St. 230 Las Vegas, NV, 89119 (702) 486-2850	Temporary (1 year) point-source discharge of Waters of the US	Prior to Discharge	CLV Project Manager	1 to 6 months
Drainage Review	Clark County Regional Flood Control District	600 S. Grand Central Pkwy Suite 300 Las Vegas NV, 89106-4511 (702) 685-0000		Design Phase	Consultant	2 weeks
Groundwater Discharge Permit	Nevada Division of Environmental Protection – Bureau of Water Pollution Control	2030 E. Flamingo Rd, Ste 230 Las Vegas, NV 89119-0837 (702) 486-2850	Long term (greater than 1 year) point-source discharge of Waters of the US	Prior to Discharge	CLV Project Manager	1 to 6 months
Traffic Control Plan	City of Las Vegas – Department of Public Works, Traffic Engineering Division	333 N. Rancho Dr Las Vegas, NV 89106 (702) 229-6327	Required for traffic control in public right-of-way	After Conditional Notice-to-Proceed	Contractor	2 weeks
Temporary Stock Pile Permit	City of Las Vegas – Development Services Center, Dept. of Building and Safety	333 N. Rancho Dr Las Vegas, NV 89106 (702) 229-6251	Required for temporary stock pile of excavated materials	Construction Phase	Contractor	2 weeks

Contractor is responsible for confirming fees.

Mark Failla

From: Tim Sutko <TSutko@regionalflood.org>
Sent: Tuesday, July 15, 2014 2:49 PM
To: Todd L. Myers; Andrew Trelease
Cc: Steve Parrish; Ken MacDonald; Mark Failla; Shaun Fisher; Anne Dubarton

Subject: Brent Lane Drainage System Section 8 analysis (BRDB0033-0043)

I have reviewed the Section 8 report prepared by NewFields for the Slater Hanifan Group on behalf of the City of Las Vegas for the Brent Lane Drainage System and find it acceptable. This facility is identified in the current MPU as facilities **BRDB0033-0043.** The proposed project is a storm water conveyance system to be located along the north side of Brent Lane between Durango Drive and the existing South Environmental Enhancement Area. The project includes approximately 2800 linear feet of conveyance system and appurtenant facilities. Various design alternatives are being evaluated; the selected system will be designed to safely convey the 100 year flow which ranges between 1183-1354 cfs.

The following resources may require mitigation:

Geology & Soils – standard engineering design and construction practices are expected to provide adequate mitigation.

Paleontology – the proposed project is located in the Las Vegas formation, an area of high paleontological potential. Monitoring should be conducted during construction activities to identify and remove any subsurface deposits encountered.

Groundwater - standard engineering design and construction practices are expected to provide adequate mitigation.

Biological Resources – **Cacti and yucca** which are protected under NRS 527 occur in the project area. All cactus and yucca should be salvaged and replanted in temporary areas or used as landscape features for the trail portion of the project. The project area is within **desert tortoise and burrowing owl habitat**. Construction activities that require the removal of vegetation should be scheduled outside of the bird breeding season (March – August). If construction is scheduled to occur during the bird breeding season, a biological monitor familiar with the avian breeding habits of the region should inspect the area for active nests. If active nests are found during the breeding season, a 100-250 foot buffer will be established around the nests until the young birds fledge from the nest. There are several man-made burrowing owl nests which may need to be relocated. A fee for disturbance of desert tortoise habitat may be required when the contractor pulls permits for ground disturbing activities.

Cultural Resources – there are several archeological sites recorded in the project vicinity. The proposed project is not anticipated to impact any of those sites.

Air Quality – The construction contractor will be required to comply with all mitigation measures stipulated on ground disturbance/grading permits obtained from the Clark County Department of Air Quality and Environmental Management.

Surface Water – The proposed project does not include the placement of fill material in a "waters of the US" with bed and bank, therefore a 404 Permit (CWA) is not required. Best Management

Practices to control storm water quality exiting the construction site should be developed and included in the construction specifications.

Hazardous Materials – Standard hazardous waste and material management BMPs should be implemented during construction as required by applicable state and federal regulations in order to minimize the generation of hazardous waste and ensure its proper disposal.

The District's Policies and Procedures regarding environmental permitting as a pre-requisite for construction funding eligibility have been satisfied.

If someone would pass this information along to the PM for the City of Las Vegas, I would appreciate it.

Please don't hesitate to contact me if you have any questions or require additional information.

Thanks

Timothy E. Sutko
Senior Hydrologist/Environmental Mitigation Manager
Clark County Regional Flood Control District
600 S. Grand Central Parkway
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Las Vegas, NV 89106

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TSutko@regionalflood.org

NewFields
Perspective. Vision. Solutions.

April 30, 2014

Mr. Mark J. Failla
Slater Hanifan Group, Inc.
5740 Arville, Suite 206
Las Vegas, Nevada 89118

RE: BRENT LANE DRAINAGE SYSTEM AND TRAIL SECTION 8 FACILITY SPECIFIC ENVIRONMENTAL ASSESSMENT

Dear Mr. Failla:

INTRODUCTION

This document provides an analysis of the potential environmental impacts related to the construction of the proposed Brent Lane Drainage System and Trail. The proposed project is located in Las Vegas, Nevada (Figure 1). Master Plan Update (MPU) identification numbers for the proposed project include BRDB0033 and BRDB0043.

This facility specific environmental analysis was conducted pursuant to Chapter 8 of the *Supplemental Programmatic Environmental Impact Statement, Clark County Regional Flood Control District 2002 Master Plan Update, Final September 2004* (BLM 2004), hereafter referred to as the SEIS, which outlines the process necessary to determine the appropriate level of National Environmental Policy Act (NEPA) documentation for a particular facility.

PROJECT LOCATION

The project is located in Section 9 of Township 19 South, Range 60 East, Clark County, Nevada, Nevada. The project is located along the north side of Brent Lane beginning at Durango Drive and continuing east to the Floyd Lamb Detention Basin. (Figure 1).

PROJECT DESCRIPTION

The proposed project includes construction of a reinforced concrete box (RCB) storm drain/open channel/culvert stormwater conveyance facility and collection system including, but not limited to: drop inlets, manholes, laterals, and other necessary appurtenances. The facility would include approximately 2,800 linear feet of combined conveyance facility. Various conveyance alternatives are being evaluated (RCB, open channel). An alternative will be selected as the project progresses beyond the pre-design phase These facilities will be designed to safely convey a 100-year flood event at a rate of 1,183 to 1,354 cubic feet per second.

Project Area and Resource Map

Brent Lane Drainage System

0 0.075 0.15 0.3 Kilometers

0 0.075 0.15 0.3 Miles

NewFields

Figure 1. Brent Lane Drainage System and Trail Project Area.

The project also entails design and construction of a pedestrian/equestrian/maintenance trail along Brent Road and connecting to the existing trail system located on the west side of Tule Springs Road within Floyd Lamb Park. The trail would be constructed using decomposed granite and would be from 10-12 feet wide. It may include portions for pedestrian use or portions for both pedestrian and equestrian use and maintenance access. The proposed project area is within the jurisdiction of the City of Las Vegas.

SECTION 8 SCREENING

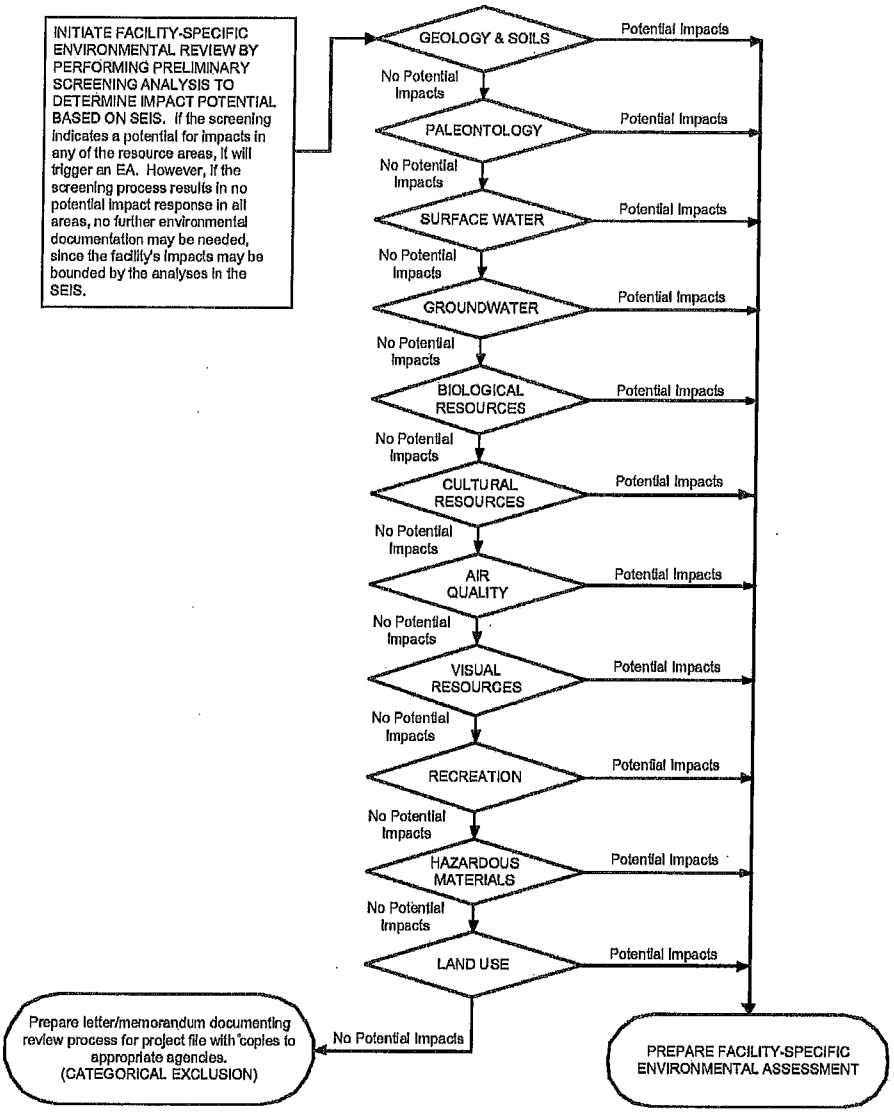
The preliminary project-specific analysis process shown in Figure 2 specifies that preliminary screening analyses be conducted for a series of potentially impacted resources. If no potential impacts are documented, the SEIS and associated Decision Record directs that a letter or memorandum documenting the review process should be prepared and submitted to the appropriate agencies. The project can then proceed without further analysis. This level of documentation conforms to the Bureau of Land Management Categorical Exclusion level of NEPA documentation.

NewFields conducted such screenings utilizing existing documents and other resources such as the SEIS and the Clark County Regional Flood Control District (CCRFCD) Flood Zone Advanced web site.

Field inspection, the SEIS, aerial photographs, and the CCRFCD web site indicate the project area consists mainly of the existing Floyd Lamb Detention Basin appurtenances and previously developed residential neighborhoods adjacent to the proposed storm channel south of Brent Lane. The area north of Brent Lane consists of undeveloped desert that is potential habitat for desert tortoise and burrowing owls (Figure 3).

VEGETATION

Plants noted in the project area are provided in Table 1 below. Cacti and yucca are protected under NRS 527.260-300 and should be avoided to the extent possible (Figure 4). To further reduce impacts to cacti that cannot be avoided, all cactus and yucca within permanent and temporary impact areas should be salvaged and replanted in temporary storage areas until they can be used to landscape the trail portion of the project area.



Source: BLM 2004, Figure 8.1-1

Figure 2. Preliminary Project-specific Analysis Screening Process.

Figure 3. Brent Lane Drainage System and Trail Overview Photo.

Table 1. Plant Noted During Field Reconnaissance for the Brent Lane Project.

Common Name	Scientific Name	Comments
Creosote bush	*Larrea tridentata*	In bloom
Mormon Tea	*Ephedra nevidensis*	
Wild Marigold	*Baileya multiradiata*	In bloom
Cats Claw	*Acacia greggii*	Appear dead, covered in mistletoe
Hoary Saltbush	*Atriplex canescens*	
Desert Trumpet	*Eriogonam inflatum*	
Desert Mallow	*Sphaeralcea ambigua*	
Cheese Bush	*Hymonoclea salsola*	
Beavertail cactus	*Optuntia basilaris*	In bloom
Thorny fruited cactus	*Optunia echinocarpa*	
Mohave Mound cactus	*Echinocereus mohavensis*	
Mohave Yucca	*Yucca schidigera*	
Desert Mistletoe	*Phoradendron californicum*	Infesting Cats Claw

Figure 4. Optunia Blooming Profusely in the Project Area.

WILDLIFE

The project area contains habitat for desert tortoise and burrowing owls (see Figure 3). They prefer alluvial fans, washes, and canyons where soils suitable for den construction can be found. In particular, the white deposits of the Las Vegas Formation seen in Figure 3 contain numerous holes that may be suitable for tortoise and burrowing owls. Reconnaissance for desert tortoise and burrowing owls was conducted on April 9, 2014. Transects were spaced approximately 10 meters apart to locate burrows within the project area. Three burrows possibly constructed by U.S. Fish and Wildlife Service were located near Brent Lane within the project area right-of-way (Figure 1). These include a hollow concrete block entrance and a corrugated plastic tunnel. It is likely that these burrows will be impacted by the proposed project. A qualified biologist should examine the interior of these man-made dens with an inspection scope to determine if any animals are utilizing them. While numerous other holes suitable for burrowing owls were located in the project area, none were occupied. Most of these were found in the badlands formed by the Las Vegas Formation (see paleontology section below).

CULTURAL RESOURCES

The project area is an area of high cultural resources potential. The facility-specific procedure for the proposed Brent Lane Drainage System and Trail involved a file search and literature review of previous archaeological research in or near the proposed facility location, and pedestrian survey to locate previously unrecorded cultural resources within the proposed right-of-way. The literature review indicates that 16 archaeological sites have been recorded in the project vicinity (Table 2), and 7 cultural resources surveys have been conducted in the project area vicinity (Table 3).

Table 2. Archaeological Sites Recorded in the Project Vicinity.

Site #	Site Type	NRHP Eligible?
26CK1496	Lithic and Ceramic Debris Scatter	Unevaluated
26CK1497	Lithic and Ceramic Debris Scatter	Unevaluated
26CK1498	Lithic Scatter with Rock Circles	Unevaluated
26CK1543	Prehistoric/Historic Debris Scatter at Spring	Unevaluated
26CK1638	Isolate Scraper and 1 flake	Not eligible
26CK1639	Core Reduction Station	Unevaluated
26CK1648	Historic Road Remnant	Unevaluated
26CK1649	Las Vegas & Tonopah RR Grade	Portions eligible
26CK3918	Floyd Lamb Park	Eligible
26CK4370	Spring Mound	Unevaluated
26CK5049	Lithic Scatter	Not eligible
26CK5050	Campsite at Spring Mound	Eligible
26CK5596	Tule Siding – LV&T RR (RR Side/Construction Camp)	Eligible
26CK5597	Segment of Kiel Sawmill Road	Portions eligible
26CK5600	Segment of Bullfrog/Tonopah Road	Eligible
26CK6904	Historic Debris Scatter	Not eligible

These investigations suggest that prehistoric sites related to exploitation of the once abundant spring habitat are likely to occur in the area. In addition, historic use of the project area includes the Las Vegas and Tonopah Railroad, several historic roads, and the Tule Springs Ranch, now known as Floyd Lamb Park at Tule Springs, operated by the City of Las Vegas. The Tule Springs Ranch and its associated buildings were listed on the National Register of Historic Places in 1981.

Table 3. Archaeological Projects Conducted in the Vicinity of the Proposed Project.

Report #	Report Title	Authors	Date
5-418	Archaeological, Historical, and Paleontological Survey of Floyd R. Lamb State Park	J. King et al.	1978
5-831	NDOT F-095-2(6) EA# 70904	R. Leavitt	1979
5-1136	Nevada State Park R&PP N-36876, Request for 1,360 Acres of Land for Expansion of Floyd Lamb State Park	K. Rafferty	1983
2-2-6	A Cultural Resource Investigation of Improvements at the Floyd R. Lamb State Park, Clark County, Nevada	Lynda Blair	1993
5-2370	A Cultural Resources Investigation of Two Volkmar Exchange Parcels in the Las Vegas Valley, Clark County, Nevada	G. Seymour et al.	1998
5-2108	A Cultural Resource Inventory of the Proposed Wycal Pipeline Through Southern Nevada	Richard Talbot et al.	1999
5-2467	An Archaeological Survey for the Las Vegas Valley Disposal Boundary Environmental Impact Statement, Clark County, Nevada	Ahlstrom, Eskenazi & Roberts	2004

Field reconnaissance to locate any cultural resources included pedestrian survey by NewFields scientists walking along the north side of Brent Road. Transects were spaced approximately 10 meters apart to locate all prehistoric or historic resources. No cultural resources were found as a result of this survey.

PALEONTOLOGICAL RESOURCES

The Brent Lane project area is located in an area of high paleontological potential because this area contains sedimentary rock units known to contain a high density of recorded vertebrate fossil sites (SBCM 2004). The Las Vegas formation has yielded an assemblage of invertebrate and vertebrate fossil remains that comprise the most noteworthy late Pleistocene assemblage known from the Mojave Desert. Numerous researchers have reported Pleistocene vertebrate fossils including ground sloth, North American lion, camels, large and small horses, bison, and the Columbian mammoth (Quade 1986). Geological mapping (Longwell et al. 1965; Haynes 1967; Donovan 1996) demonstrates that exposures of the Las Vegas formation are present in the project area (SBCM 2004). An intensive pedestrian reconnaissance of the Brent Lane project area was conducted to verify the extent of the previously mapped fossiliferous deposits and to locate surface exposures of vertebrate fossils. These intensive surveys documented the extent of these formations as mapped, but did not reveal any vertebrate fossils visible on the soil surface or in the eroded channels. Despite the fact that no surface fossils were identified during field reconnaissance, excavation of the proposed flood control channels may adversely affect buried deposits of the Las Vegas formation known to occur in the project area. Therefore, appropriate mitigation measures such as monitoring during construction are recommended (Table 4).

JURISDICTIONAL WATERS

The project is designed to improve surface water flows in the area, so there would be a beneficial impact to this resource. Screening for compliance with Section 404 of the Clean Water Act was conducted. Field investigation indicated that no wetlands or jurisdictional waters are found in the

project area. Therefore, a permit from the U.S. Army Corps of Engineers would not likely be required for this project.

LAND USE AND RECREATION

The proposed project would not change the existing land use and construction of a trail would increase recreational opportunities in the neighborhood, so there would be no threat to these resources. The visual character of the area would not be changed by the proposed project as the residential and open desert character would remain the same. Potential spills of hazardous materials during construction would be minimized through Best Management Practices such that potential impacts would be reduced to insignificant levels.

AIR QUALITY

The project area is located in Hydrographic Basin 212 (Las Vegas Valley) where emissions of concern include PM10, CO emissions, ozone precursors (nitrogen oxides [NOx], and volatile organic compounds [VOC]). The Clark County Department of Air Quality and Environmental Management (CCDAQM), regulates and permits construction activities that generate air pollutants and fugitive dust within Clark County. In fulfilling this responsibility, the CCDAQM often requires implementation of mitigation measures, such as application of water combined with other dust suppressants. The construction contractor will be required to comply with all mitigation measures stipulated in the construction permits.

Other resources were considered at the programmatic level in the SEIS. That document indicates there would be either short-term, minor, or no impacts to socioeconomics, transportation, noise, and environmental justice. Therefore, no facility-specific evaluations to these resources are necessary. Results of the facility-specific screening, BMPs and recommended mitigation measures for this project are summarized in Table 4.

HAZARDOUS MATERIALS

A Phase I Hazardous Materials investigation was conducted to determine if any hazardous materials are likely to be found in the project area (Ninyo and Moore 2014). The investigation revealed that three facilities in the vicinity, not adjoining the project area, have handled hazardous materials or petroleum products. Based on distance from the subject site, regulatory status of these facilities, and assumed groundwater flow direction in the vicinity of the site, there is a low likelihood that these facilities represent an environmental concern to the proposed project area.

Table 4. Recommended Mitigation Measures for the Brent Lane Drainage System and Trail Project.

Resource	Potential Impact	Mitigation
Geology and Soils	Based on review of the CCRFCD SEIS, no faults cross the proposed alignment. Also, review of the Clark County Soils Guidelines Map (1998) indicates that soils in the project area are within a moderate to low special geotechnical consideration area.	Potential impacts will be mitigated to insignificant through engineering design and construction practices.
Paleontology	The SEIS (BLM 2004), indicates that the proposed project is in an area of high paleontological potential. Field inspections and geologic mapping indicate the project area contains deposits of the Las Vegas Formation.	Monitoring should be conducted during construction to identify subsurface deposits and remove them to mitigate impacts to paleontological resources.
Surface Water	The project is designed to improve surface water flows in the area, so there would be a beneficial impact to this resource. No adverse impacts to surface water are expected to occur, since the proposed project will not divert water from downstream habitat that depends upon that water Screening for compliance with Section 404 of the Clean Water Act was conducted by NewFields in April 2014. The proposed project does not include work within Waters of the U.S. and a Corps permit is therefore not required.	None required
Groundwater	The SEIS (BLM 2004), indicates that the proposed project is in an area of shallow groundwater (i.e., less than about 30 feet). Construction activities may affect, and be affected by, the shallow groundwater system (BLM 2004). It is unlikely that the proposed project would impact deeper groundwater aquifers, since seepage rates from shallow groundwater into these aquifers would be very low due to existing fine-grained geologic formations (BLM 2004).	Potential impacts will be mitigated to insignificant through engineering design and construction practices.
Vegetation	Field reconnaissance indicates that cacti and yucca protected under NRS 527.260-300 occur in the project area.	All cactus and yucca within permanent and temporary impact areas should be salvaged and replanted in temporary areas or used to landscape the trail portion of the project area.
Biological Resources	The SEIS (BLM 2004), indicates that some sensitive wildlife occur in the project area. Biologists surveyed the project area and found desert tortoise and burrowing owl habitat, but no active burrows or nests were located. Three man-made burrowing owl nests are within the right-of-way. Construction activities will be short-term, temporary, and will occur only during daylight hours.	Construction activities that require removal of vegetation will take place outside of the bird breeding season (March through August). If construction activities are to occur during the bird breeding season, a biological monitor familiar with avian breeding habits of the region will inspect breeding habitat for active nests. The man-made nests will be investigated using an inspection scope to determine if they are in use. If an active nest is discovered, a 100-250 foot radius no work buffer zone will be established until the young fledge from the nest. The nests constructed by the USFWS may need to be relocated.
Cultural Resources	Field surveys resulted in no observations of cultural resources.	None required.
Transportation	The programmatic analysis in the SEIS (BLM 2004) indicate that there would be either short-term, minor, or no impacts to this resource, and that screening evaluations are not necessary at the project-specific level.	Consult with local transportation planning authorities as required and develop alternative traffic flow patterns or construction schedules if necessary, to minimize the potential for congestion and delays during construction.
Air Quality	The project area is located in Hydrographic Basin 212 (Las Vegas Valley) where emissions of concern include particulate matter of 10	The construction contractor will be required to comply with all mitigation measures stipulated in the construction permits.

Mark Failla

From: Tim Sutko <TSutko@regionalflood.org>
Sent: Tuesday, July 15, 2014 2:49 PM
To: Todd L. Myers; Andrew Trelease
Cc: Steve Parrish; Ken MacDonald; Mark Failla; Shaun Fisher; Anne Dubarton

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Timothy E. Sutko
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Perspective. Vision. Solutions.

April 30, 2014

Mr. Mark J. Failla
Slater Hanifan Group, Inc.
5740 Arville, Suite 206
Las Vegas, Nevada 89118

RE: BRENT LANE DRAINAGE SYSTEM AND TRAIL SECTION 8 FACILITY SPECIFIC ENVIRONMENTAL ASSESSMENT

Dear Mr. Failla:

INTRODUCTION

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PROJECT LOCATION

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Project Area and Resource Map

Brent Lane Drainage System

0 0.075 0.15 0.3 Kilometers

0 0.075 0.15 0.3 Miles

NewFields

Figure 1. Brent Lane Drainage System and Trail Project Area.

The project also entails design and construction of a pedestrian/equestrian/maintenance trail along Brent Road and connecting to the existing trail system located on the west side of Tule Springs Road within Floyd Lamb Park. The trail would be constructed using decomposed granite and would be from 10-12 feet wide. It may include portions for pedestrian use or portions for both pedestrian and equestrian use and maintenance access. The proposed project area is within the jurisdiction of the City of Las Vegas.

SECTION 8 SCREENING

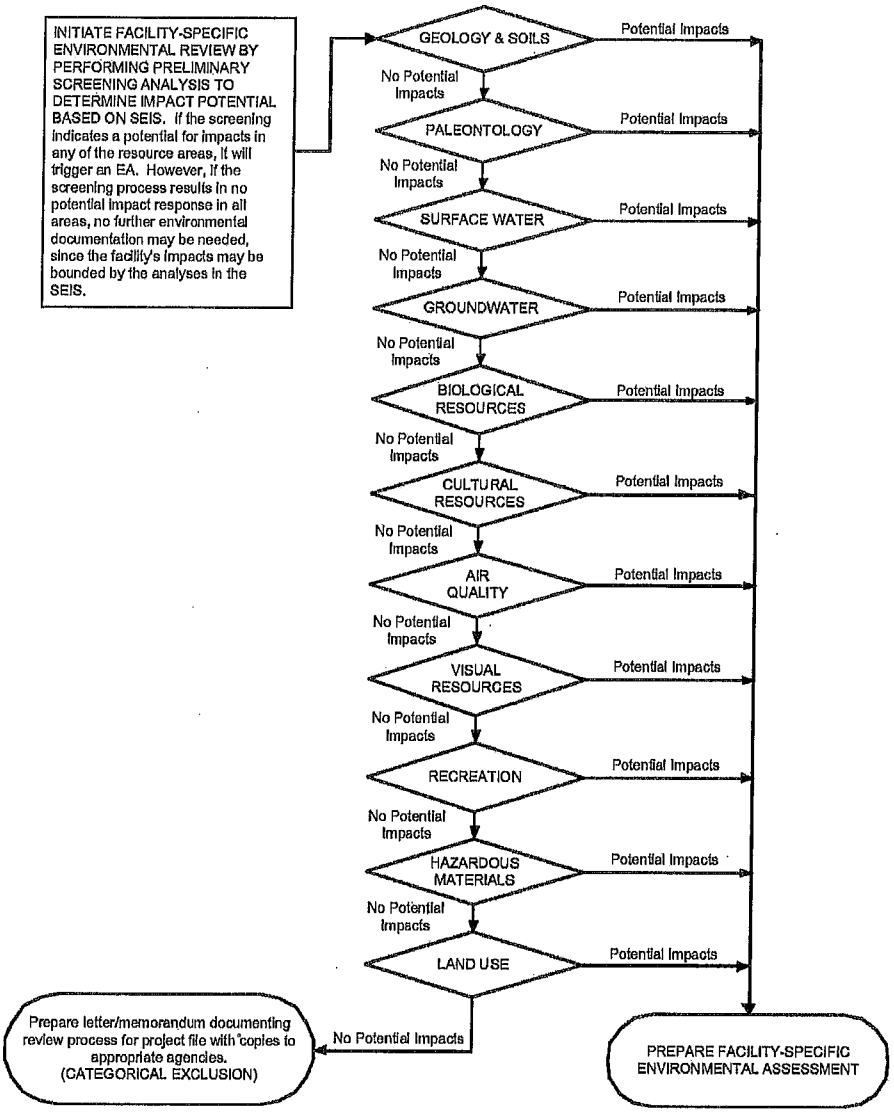
The preliminary project-specific analysis process shown in Figure 2 specifies that preliminary screening analyses be conducted for a series of potentially impacted resources. If no potential impacts are documented, the SEIS and associated Decision Record directs that a letter or memorandum documenting the review process should be prepared and submitted to the appropriate agencies. The project can then proceed without further analysis. This level of documentation conforms to the Bureau of Land Management Categorical Exclusion level of NEPA documentation.

NewFields conducted such screenings utilizing existing documents and other resources such as the SEIS and the Clark County Regional Flood Control District (CCRFCD) Flood Zone Advanced web site.

Field inspection, the SEIS, aerial photographs, and the CCRFCD web site indicate the project area consists mainly of the existing Floyd Lamb Detention Basin appurtenances and previously developed residential neighborhoods adjacent to the proposed storm channel south of Brent Lane. The area north of Brent Lane consists of undeveloped desert that is potential habitat for desert tortoise and burrowing owls (Figure 3).

VEGETATION

Plants noted in the project area are provided in Table 1 below. Cacti and yucca are protected under NRS 527.260-300 and should be avoided to the extent possible (Figure 4). To further reduce impacts to cacti that cannot be avoided, all cactus and yucca within permanent and temporary impact areas should be salvaged and replanted in temporary storage areas until they can be used to landscape the trail portion of the project area.



Source: BLM 2004, Figure 8.1-1

Figure 2. Preliminary Project-specific Analysis Screening Process.

Figure 3. Brent Lane Drainage System and Trail Overview Photo.

Table 1. Plant Noted During Field Reconnaissance for the Brent Lane Project.

Common Name	Scientific Name	Comments
Creosote bush	*Larrea tridentata*	In bloom
Mormon Tea	*Ephedra nevidensis*	
Wild Marigold	*Baileya multiradiata*	In bloom
Cats Claw	*Acacia greggii*	Appear dead, covered in mistletoe
Hoary Saltbush	*Atriplex canescens*	
Desert Trumpet	*Eriogonam inflatum*	
Desert Mallow	*Sphaeralcea ambigua*	
Cheese Bush	*Hymonoclea salsola*	
Beavertail cactus	*Optuntia basilaris*	In bloom
Thorny fruited cactus	*Optunia echinocarpa*	
Mohave Mound cactus	*Echinocereus mohavensis*	
Mohave Yucca	*Yucca schidigera*	
Desert Mistletoe	*Phoradendron californicum*	Infesting Cats Claw

Figure 4. Optunia Blooming Profusely in the Project Area.

WILDLIFE

The project area contains habitat for desert tortoise and burrowing owls (see Figure 3). They prefer alluvial fans, washes, and canyons where soils suitable for den construction can be found. In particular, the white deposits of the Las Vegas Formation seen in Figure 3 contain numerous holes that may be suitable for tortoise and burrowing owls. Reconnaissance for desert tortoise and burrowing owls was conducted on April 9, 2014. Transects were spaced approximately 10 meters apart to locate burrows within the project area. Three burrows possibly constructed by U.S. Fish and Wildlife Service were located near Brent Lane within the project area right-of-way (Figure 1). These include a hollow concrete block entrance and a corrugated plastic tunnel. It is likely that these burrows will be impacted by the proposed project. A qualified biologist should examine the interior of these man-made dens with an inspection scope to determine if any animals are utilizing them. While numerous other holes suitable for burrowing owls were located in the project area, none were occupied. Most of these were found in the badlands formed by the Las Vegas Formation (see paleontology section below).

CULTURAL RESOURCES

The project area is an area of high cultural resources potential. The facility-specific procedure for the proposed Brent Lane Drainage System and Trail involved a file search and literature review of previous archaeological research in or near the proposed facility location, and pedestrian survey to locate previously unrecorded cultural resources within the proposed right-of-way. The literature review indicates that 16 archaeological sites have been recorded in the project vicinity (Table 2), and 7 cultural resources surveys have been conducted in the project area vicinity (Table 3).

Table 2. Archaeological Sites Recorded in the Project Vicinity.

Site #	Site Type	NRHP Eligible?
26CK1496	Lithic and Ceramic Debris Scatter	Unevaluated
26CK1497	Lithic and Ceramic Debris Scatter	Unevaluated
26CK1498	Lithic Scatter with Rock Circles	Unevaluated
26CK1543	Prehistoric/Historic Debris Scatter at Spring	Unevaluated
26CK1638	Isolate Scraper and 1 flake	Not eligible
26CK1639	Core Reduction Station	Unevaluated
26CK1648	Historic Road Remnant	Unevaluated
26CK1649	Las Vegas & Tonopah RR Grade	Portions eligible
26CK3918	Floyd Lamb Park	Eligible
26CK4370	Spring Mound	Unevaluated
26CK5049	Lithic Scatter	Not eligible
26CK5050	Campsite at Spring Mound	Eligible
26CK5596	Tule Siding – LV&T RR (RR Side/Construction Camp)	Eligible
26CK5597	Segment of Kiel Sawmill Road	Portions eligible
26CK5600	Segment of Bullfrog/Tonopah Road	Eligible
26CK6904	Historic Debris Scatter	Not eligible

These investigations suggest that prehistoric sites related to exploitation of the once abundant spring habitat are likely to occur in the area. In addition, historic use of the project area includes the Las Vegas and Tonopah Railroad, several historic roads, and the Tule Springs Ranch, now known as Floyd Lamb Park at Tule Springs, operated by the City of Las Vegas. The Tule Springs Ranch and its associated buildings were listed on the National Register of Historic Places in 1981.

Table 3. Archaeological Projects Conducted in the Vicinity of the Proposed Project.

Report #	Report Title	Authors	Date
5-418	Archaeological, Historical, and Paleontological Survey of Floyd R. Lamb State Park	J. King et al.	1978
5-831	NDOT F-095-2(6) EA# 70904	R. Leavitt	1979
5-1136	Nevada State Park R&PP N-36876, Request for 1,360 Acres of Land for Expansion of Floyd Lamb State Park	K. Rafferty	1983
2-2-6	A Cultural Resource Investigation of Improvements at the Floyd R. Lamb State Park, Clark County, Nevada	Lynda Blair	1993
5-2370	A Cultural Resources Investigation of Two Volkmar Exchange Parcels in the Las Vegas Valley, Clark County, Nevada	G. Seymour et al.	1998
5-2108	A Cultural Resource Inventory of the Proposed Wycal Pipeline Through Southern Nevada	Richard Talbot et al.	1999
5-2467	An Archaeological Survey for the Las Vegas Valley Disposal Boundary Environmental Impact Statement, Clark County, Nevada	Ahlstrom, Eskenazi & Roberts	2004

Field reconnaissance to locate any cultural resources included pedestrian survey by NewFields scientists walking along the north side of Brent Road. Transects were spaced approximately 10 meters apart to locate all prehistoric or historic resources. No cultural resources were found as a result of this survey.

PALEONTOLOGICAL RESOURCES

The Brent Lane project area is located in an area of high paleontological potential because this area contains sedimentary rock units known to contain a high density of recorded vertebrate fossil sites (SBCM 2004). The Las Vegas formation has yielded an assemblage of invertebrate and vertebrate fossil remains that comprise the most noteworthy late Pleistocene assemblage known from the Mojave Desert. Numerous researchers have reported Pleistocene vertebrate fossils including ground sloth, North American lion, camels, large and small horses, bison, and the Columbian mammoth (Quade 1986). Geological mapping (Longwell et al. 1965; Haynes 1967; Donovan 1996) demonstrates that exposures of the Las Vegas formation are present in the project area (SBCM 2004). An intensive pedestrian reconnaissance of the Brent Lane project area was conducted to verify the extent of the previously mapped fossiliferous deposits and to locate surface exposures of vertebrate fossils. These intensive surveys documented the extent of these formations as mapped, but did not reveal any vertebrate fossils visible on the soil surface or in the eroded channels. Despite the fact that no surface fossils were identified during field reconnaissance, excavation of the proposed flood control channels may adversely affect buried deposits of the Las Vegas formation known to occur in the project area. Therefore, appropriate mitigation measures such as monitoring during construction are recommended (Table 4).

JURISDICTIONAL WATERS

The project is designed to improve surface water flows in the area, so there would be a beneficial impact to this resource. Screening for compliance with Section 404 of the Clean Water Act was conducted. Field investigation indicated that no wetlands or jurisdictional waters are found in the

project area. Therefore, a permit from the U.S. Army Corps of Engineers would not likely be required for this project.

LAND USE AND RECREATION

The proposed project would not change the existing land use and construction of a trail would increase recreational opportunities in the neighborhood, so there would be no threat to these resources. The visual character of the area would not be changed by the proposed project as the residential and open desert character would remain the same. Potential spills of hazardous materials during construction would be minimized through Best Management Practices such that potential impacts would be reduced to insignificant levels.

AIR QUALITY

The project area is located in Hydrographic Basin 212 (Las Vegas Valley) where emissions of concern include PM10, CO emissions, ozone precursors (nitrogen oxides [NOx], and volatile organic compounds [VOC]). The Clark County Department of Air Quality and Environmental Management (CCDAQM), regulates and permits construction activities that generate air pollutants and fugitive dust within Clark County. In fulfilling this responsibility, the CCDAQM often requires implementation of mitigation measures, such as application of water combined with other dust suppressants. The construction contractor will be required to comply with all mitigation measures stipulated in the construction permits.

Other resources were considered at the programmatic level in the SEIS. That document indicates there would be either short-term, minor, or no impacts to socioeconomics, transportation, noise, and environmental justice. Therefore, no facility-specific evaluations to these resources are necessary. Results of the facility-specific screening, BMPs and recommended mitigation measures for this project are summarized in Table 4.

HAZARDOUS MATERIALS

A Phase I Hazardous Materials investigation was conducted to determine if any hazardous materials are likely to be found in the project area (Ninyo and Moore 2014). The investigation revealed that three facilities in the vicinity, not adjoining the project area, have handled hazardous materials or petroleum products. Based on distance from the subject site, regulatory status of these facilities, and assumed groundwater flow direction in the vicinity of the site, there is a low likelihood that these facilities represent an environmental concern to the proposed project area.

Table 4. Recommended Mitigation Measures for the Brent Lane Drainage System and Trail Project.

Resource	Potential Impact	Mitigation
Geology and Soils	Based on review of the CCRFCD SEIS, no faults cross the proposed alignment. Also, review of the Clark County Soils Guidelines Map (1998) indicates that soils in the project area are within a moderate to low special geotechnical consideration area.	Potential impacts will be mitigated to insignificant through engineering design and construction practices.
Paleontology	The SEIS (BLM 2004), indicates that the proposed project is in an area of high paleontological potential. Field inspections and geologic mapping indicate the project area contains deposits of the Las Vegas Formation.	Monitoring should be conducted during construction to identify subsurface deposits and remove them to mitigate impacts to paleontological resources.
Surface Water	The project is designed to improve surface water flows in the area, so there would be a beneficial impact to this resource. No adverse impacts to surface water are expected to occur, since the proposed project will not divert water from downstream habitat that depends upon that water Screening for compliance with Section 404 of the Clean Water Act was conducted by NewFields in April 2014. The proposed project does not include work within Waters of the U.S. and a Corps permit is therefore not required.	None required
Groundwater	The SEIS (BLM 2004), indicates that the proposed project is in an area of shallow groundwater (i.e., less than about 30 feet). Construction activities may affect, and be affected by, the shallow groundwater system (BLM 2004). It is unlikely that the proposed project would impact deeper groundwater aquifers, since seepage rates from shallow groundwater into these aquifers would be very low due to existing fine-grained geologic formations (BLM 2004).	Potential impacts will be mitigated to insignificant through engineering design and construction practices.
Vegetation	Field reconnaissance indicates that cacti and yucca protected under NRS 527.260-300 occur in the project area.	All cactus and yucca within permanent and temporary impact areas should be salvaged and replanted in temporary areas or used to landscape the trail portion of the project area.
Biological Resources	The SEIS (BLM 2004), indicates that some sensitive wildlife occur in the project area. Biologists surveyed the project area and found desert tortoise and burrowing owl habitat, but no active burrows or nests were located. Three man-made burrowing owl nests are within the right-of-way. Construction activities will be short-term, temporary, and will occur only during daylight hours.	Construction activities that require removal of vegetation will take place outside of the bird breeding season (March through August). If construction activities are to occur during the bird breeding season, a biological monitor familiar with avian breeding habits of the region will inspect breeding habitat for active nests. The man-made nests will be investigated using an inspection scope to determine if they are in use. If an active nest is discovered, a 100-250 foot radius no work buffer zone will be established until the young fledge from the nest. The nests constructed by the USFWS may need to be relocated.
Cultural Resources	Field surveys resulted in no observations of cultural resources.	None required.
Transportation	The programmatic analysis in the SEIS (BLM 2004) indicate that there would be either short-term, minor, or no impacts to this resource, and that screening evaluations are not necessary at the project-specific level.	Consult with local transportation planning authorities as required and develop alternative traffic flow patterns or construction schedules if necessary, to minimize the potential for congestion and delays during construction.
Air Quality	The project area is located in Hydrographic Basin 212 (Las Vegas Valley) where emissions of concern include particulate matter of 10	The construction contractor will be required to comply with all mitigation measures stipulated in the construction permits.

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GEOTECHNICAL EVALUATION
BRENT LANE DRAINAGE SYSTEM & TRAIL
BRENT LANE DURANGO DRIVE TO TULE SPRINGS ROAD
LAS VEGAS, NEVADA

Project No. 20133321E1
January 29, 2015

Prepared for:

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

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January 29, 2015
Project No. 20133321E1

Mr. Mark Failla, P.E., CFM
Slater Hanifan Group
5740 South Arville Street, Suite 216
Las Vegas, Nevada 89118

RE: Geotechnical Evaluation for the Brent Lane Drainage System & Trails, Durango Drive to Tule Springs Road, Las Vegas, Nevada

Dear Mr. Failla:

Geotechnical & Environmental Services, Inc. (GES) is pleased to present the Geotechnical Evaluation report for Brent Lane Drainage System & Trails from Durango Drive to Tule Springs Road in Las Vegas, Nevada.

The Geotechnical Evaluation report includes the findings of the geologic review, the results of the field exploration and laboratory testing programs, and recommendations for improvement and development.

We appreciate this opportunity to provide our professional services. If you have any questions or comments regarding this information, please feel free to contact our office.

Sincerely,

Geotechnical & Environmental Services, Inc.

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL E. SIMPSON
Exp. 06/30/16
CIVIL
No. 18070
1/29/2015

Borhan Moradi, E.I.
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GEOTECHNICAL EVALUATION
BRENT LANE DRAINAGE SYSTEM & TRAIL
BRENT LANE DURANGO DRIVE TO TULE SPRINGS ROAD
LAS VEGAS, NEVADA

1. INTRODUCTION

This report presents the results of a geotechnical evaluation performed by Geotechnical & Environmental Services, Inc. (GES) for the Brent Lane Drainage System & Trail, located along Brent Lane from Durango Drive to Tule Springs Road in Las Vegas, Nevada. Figure A-1 presents a vicinity map showing the approximate location of the project alignment within the Las Vegas Valley. The following sections present the purpose and scope of our geotechnical evaluation, project and site descriptions, and the results of the field exploration and laboratory testing.

1.1. PURPOSE AND SCOPE

The purpose of this geotechnical evaluation was to provide general subsurface information and recommendations to aid in the design and construction of the proposed project improvements. The scope of this study included a review of referenced geologic literature and maps, a subsurface exploration, soil sampling, laboratory testing of selected soil samples, engineering evaluations and preparation of this report.

1.2 PROJECT DESCRIPTION

Our understanding of the project is based on a review of aerial photographs, information received from Slater Hanifan Group, and our past experience with projects in the vicinity of the subject site. Our design recommendations are based on the Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual (HCDDM) (CCRFCD, 1999) and the Uniform Standard Specifications for Public Works' Construction, Off-Site Improvements (USS), Clark County Area (Clark County).

The proposed project will consist of the design and construction of a new storm drain designated by Clark County Regional Flood Control District (CCRFCD) as Brent Drainage System facility BRDB 0043. The facility will include a 12-foot by 6-foot reinforced box culvert (RCB) along Brent Lane from the intersection with Durango Drive extending approximately 1,600 feet to the east where the enclosed storm drain transitions to a 12-foot by 6-foot open concrete lined trapezoidal channel. A 20-foot by 6 foot RCB will cross under Tule Springs Road to a concrete apron outfall transitioning into a rip-rap lined drainage feature. The enclosed portion of the storm drain will have an anticipated invert depth of 8 to 12 feet beneath the

existing surface. The total length of the storm drain will be approximately 2,800 feet. We anticipate that the RCB will be constructed using cut-and-cover techniques.

The improvements will include drop inlets, reinforced concrete pipe (RCP) laterals and a trench drain near the western terminus of the improvements. Approximately 350 feet of an earthen berm at the north side of the channel, just west of the Tule Springs Road, will be extended and protected with a riprap side slope. A trail with a decomposed granite or aggregate base surface will be constructed along the alignment.

1.3. SITE DESCRIPTION

Based on the Clark County info-web mapper the alignment is located within land owned by the City of Las Vegas; Brent Lane and Tule Springs Road are not shown as dedicated right-of-ways. Brent Lane and Tule Springs Road are two lane roads without paved shoulders. Residential developments are located south and west of the alignment, a detention basin is located east of the alignment, and vacant desert with bluffs are located to the north. The east portion of the alignment follows an existing apparent flood control feature consisting of a soil berm 4 to 5 feet high. The north side of the berm is nearly vertical with riprap lining and the south side of the berm slopes to Tule Springs Road. Information regarding the construction of the existing soil berm is unknown at this time. Evaluations of the berm were beyond the scope of this study.

1.4. FIELD EXPLORATION

GES evaluated the subsurface conditions along the alignment on July 3, 2014 by drilling five exploratory borings (B-1 through B-5). Borings B-1 through B-3 were drilled to depths of approximately 20 feet below the existing ground surface, while Borings B-4 and B-5 were drilled to depths of approximately 15 feet below the existing ground surface. The total footage drilled was approximately 90 lineal feet. Figure A-2 presents a site plan showing the approximate exploration locations. The exploration location coordinates and elevations were recorded by GES staff using a Trimble R-8 survey unit once borings were completed, and are provided on the exploration logs (NAD 83) in Appendix A.

A GES representative directed and supervised the subsurface exploration, maintaining a detailed log of the subsurface conditions, classifying the soils encountered, and obtaining soil samples. The soils encountered were classified in general accordance with the Unified Soil

Classification System (USCS). A Key to Symbols and Terms utilized on the exploration logs is presented on Figure A-3.

The borings were drilled with a truck-mounted Diedrich D-120 drill rig using 6-inch nominal outside diameter hollow stem augers. Soil samples and penetration blow counts were obtained with a 3-inch outside diameter ring-lined drive sampler (California sampler) in general accordance with ASTM D 3550. The samplers were driven with a 140-pound automatic trip hammer falling about 30 inches. The penetration resistance (hammer blows) measured by driving the sampler was used to evaluate the consistency of the in-place soil. The borings were then backfilled with soil cuttings. Pocket penetrometer tests were also performed in the field on selected fine-grained, clayey specimens as an indication of soil strength. The results of the pocket penetrometer tests are shown on the exploration logs (Appendix A) at their respective sampling depths.

1.5. GROUNDWATER

Groundwater was not encountered during our field explorations. A review of water wells listed on the State of Nevada Department of Conservation & Natural Resources, Division of Water Resources website indicates that historical groundwater levels in 1999 in the area were previously measured at an elevation approximately 160 feet below the ground surface at a parcel approximately one mile northwest of the alignment (Well Log No: 75040). Therefore, groundwater is not expected to affect the construction of the proposed improvements.

Groundwater levels can fluctuate due to seasonal precipitation, groundwater withdrawal and recharge, and irrigation practices within and/or near the subject site. Evaluation of factors associated with fluctuations in groundwater levels was beyond the scope of this study.

1.6. LABORATORY TESTING

The laboratory testing program consisted of tests to classify the on-site soils and to evaluate engineering and physical properties. The test results are presented in Appendix A on the boring logs and on test reports presented in Appendix B.

2. DISCUSSION

The following sections describe the geology and seismicity of the site and the encountered subsurface materials and conditions.

2.1. GEOLOGY AND SEISMICITY

The subject site is located in the Las Vegas Valley, a fault-bounded graben structure surrounded by mountain ranges. The Las Vegas Valley is physiographically characteristic of the Basin and Range Province with generally northwest-trending parallel mountain ranges and an intervening basin. Unlike many basins within the Basin and Range Province which are internally draining, the Las Vegas Valley is unique in that the basin drains through the Las Vegas Wash to Lake Mead and the Colorado River.

Tertiary and Quaternary unconsolidated alluvial deposits, derived from the surrounding mountain ranges, fill the valley. These deposits may be up to 4,000 feet thick near the center of the valley. The surrounding mountain ranges are comprised of sedimentary and igneous rocks. Alluvial fan deposits, consisting of sand and gravel, slope down from the mountain fronts towards the valley floor. Sediments are typically less coarse, grading from fine sand and silt to clay near the valley bottom. Beds of amorphous and crystalline gypsum are common. Zones of calcareous cemented deposits (caliche) are present at various locations and depths throughout the valley.

The U.S. National Oceanic and Atmospheric Administration Earthquake Catalog lists about 800 events of magnitude greater than or equal to 4 with epicenters within about 120 miles of Las Vegas. Only 19 events greater than or equal to magnitude 4 are estimated to have occurred during the 1881 through 1938 period in the southern Nevada region.

After about 1947, nuclear testing began at the Nevada Test Site. Therefore, many of the recorded earthquakes after about 1947 may be due to nuclear blasts occurring more than about 60 miles from the subject site. Several hundred earthquakes occurred from 1936 to 1965 near Hoover Dam, presumably due to filling of the Lake Mead reservoir, with 24 of these events reportedly greater than or equal to magnitude 4.

Based on review of the Clark County Soil Guidelines Map, the proposed improvements are located in a previously mapped Standard Geotechnical Consideration Area with mixed alluvial sand and gravel. Based on review of the Clark County Expansive Soil Guidelines Map, the project site is located in a previously mapped Special Geotechnical Consideration Area having moderate swell potential (4 to 8 percent).

The subject site is located on the referenced Geologic Map of Tule Springs Park Quadrangle, Clark County, Nevada within an area of mapped geologic units of Qa and Qts_d. The Qa geological unit is composed of thin alluvium of active washes mainly consisting of pebble to cobble sandy gravels with layers and lenses of reworked silt deposits. This unit is subject to intermittent flooding. The Qts_d geological unit is mostly composed of light-gray to gray organic mud with inclusion of very light brown, yellowish-brown, and light green sandy silt, fine sand, and locally clay. The unit is characterized by a 30- to 50-cm-thick layer of massive, cemented calcium carbonate.

Based on a review of referenced geologic maps and literature, the nearest Quaternary-age fault is located approximately 5-½ miles southeast of the alignment near Lone Mountain Road and Torrey Pines Drive. Other mapped Quaternary-age tectonic faults are the Frenchman Mountain fault, located approximately 16-½ miles southeast of the alignment, the Eglington fault, which geologists have debated, may be potentially active, located approximately 4-½ miles south of the alignment, and the Sheep-East Desert Ranges fault located approximately 9 miles north of the alignment. The nearest mapped Holocene active fault (i.e., a fault that has moved within the last 10,000 years) is the Black Hills Fault, located approximately 33 miles southeast of the alignment (USGS). The nearest mapped fissure zone is located about 9 miles southeast of the alignment near Simmons Street and Carey Avenue (dePolo and Bell, 2000). Based on the results of our review of available literature, it is our opinion that the potential for fault-related surface rupture at the site is negligible.

2.2. SUBSURFACE MATERIALS AND CONDITIONS

The following sections describe the fill and native soils encountered at the site. Detailed information regarding subsurface materials and conditions is presented on the boring logs, Figures A-4 through A-8.

2.2.1. FILL

Fill was not recorded in our explorations; however, as previously described the site appears to have been previously sheet-graded near the boring locations, the existing soil berm and near the existing riprap drainage feature. The soil observed at the surface of these locations generally consisted primarily of dry granular soils with sand and gravel sized materials and scattered cobbles.

Fill placed without documentation to indicate that the fill soils were placed under the supervision of a Geotechnical Engineer are considered uncontrolled. The term uncontrolled fill soils refers to artificial fill which was placed without engineering observation, testing, or documentation and is considered unsuitable for the support of the proposed improvements. Our scope did not include an evaluation of the existing fill soils or certification of the existing fill or improvements.

2.2.2. NATIVE SOIL

The native subsurface soils encountered in the borings were generally observed as layers of dry to moist, medium dense to very dense poorly and well-graded gravel with silt and sand, clayey gravel with sand, well-graded gravel with sand, silty gravel with sand, silty sand with gravel, clayey sand with gravel, and moist and firm to very stiff lean clay and sandy lean clay in various depths of the borings. Trace amounts of gypsum was observed in explorations B-1, B-3, and B-5 at depths of approximately 9, 17-½, and 10 feet below the existing ground surface, respectively. Cobbles were encountered within some of the borings, generally within 10 feet of the surface, as indicated on the boring logs in Appendix A.

Cemented soils were not encountered in the borings, however, due to the inconsistent nature of cemented soils, hard to very hard and difficult-to-excavate cemented soils could be encountered beyond or between the boring locations at varying depths. A detailed excavatability or rippability evaluation is beyond the scope of this study. The contractor should perform the independent investigations necessary to determine the type of equipment required to perform the work. If the contractor(s) have any questions regarding site conditions, site preparation, or the recommendations provided, they should contact a representative of GES for any needed clarifications prior to submitting earthwork bids.

2.3. TRENCH BACKFILL SUITABILITY

GES evaluated the suitability of soils collected from the borings for use as Selected Backfill and Granular Backfill, as specified in Section 207.02.01 and Section 207.02.02, respectively, of the USS. Specifications for gradation and plasticity, results of laboratory tests, and an evaluation of suitability are provided in the following tables.

Table 2.3-1. Trench Backfill Suitability

Sieve Size	Specified Percent of Weight Passing		Percent Passing by Weight				
	Selected Backfill	Granular Backfill	B-1	B-2	B-2	B-4	B-5
			10'-11.5'	0'-3'	15'-16.5'	0'-2'	2.5'-4'
6-inch	100	--	100	100	100	100	100
3-inch	80-100	100	100	100	100	100	100
No. 4	35-100	35-100	33	21	100	36	43
No. 16	--	25-100	25	9	100	28	28
No. 200	--	5-15	9.8	4.7	62	14	9.5
Plasticity Index	Table 2.3-2	Table 2.3-3	NP	8	20	NP	NP
Liquid Limit	50 max.	--	NV	20	45	NV	NV
Meets Selected Backfill Requirements?			**NO**	**NO**	**NO**	**YES**	**YES**
Meets Granular Backfill Requirements?			**NO**	**NO**	**NO**	**YES**	**YES**
USCS			GP-GM	GW	CL	GM	GP-GM

Table 2.3-2. Maximum Plasticity Index for Select Backfill

Percent by Weight Passing No. 200 Sieve	Maximum Plasticity Index
0-10.0	15
10.1-20.0	12
20.1-50.0	10
50.1-80.0	8
81.1-100.0	6

Table 2.3-3. Maximum Plasticity Index for Granular Backfill

Percent by Weight Passing No. 200 Sieve	Maximum Plasticity Index
0.1 to 3.0	15
3.1 to 4.0	12
4.1 to 5.0	9
5.1 to 8.0	6
8.1 to 11.0	4
11.1 to 15.0	3

3. CONCLUSIONS

Based on the results of our field exploration and laboratory testing programs, it is our opinion that there are no known geologic or geotechnical conditions that would prevent development of the site. It is also our opinion that there are some geotechnical considerations that will affect site development including existence of fill soils and cobbles as described below.

- Fill materials were logged in our explorations, however, the site around the boring locations appeared to have been previously rough graded. In addition, fill materials were observed at the location of the existing berm and near the riprap drainage feature. Documentation indicating placement and compaction of these materials was not available for review as part of our study. These materials should be considered uncontrolled fill unless documentation of their placement and compaction is provided. The term uncontrolled fill refers to man-made fill which was placed without engineering observation, testing, or documentation and is considered unsuitable in its present condition. An evaluation of on-site fill soils is beyond the scope of services of this evaluation.
- Cobbles were encountered in some of the borings. Materials greater than 3-inches in nominal dimension should be screened from excavated soils proposed for backfill, embankment or structural fill prior to placement.
- Based on the results of laboratory testing, the tested native soils collected from borings B-4 and B-5 generally meet the USS requirements for Selected Backfill. Soils proposed for trench backfill should be sampled and evaluated by the geotechnical engineer before backfilling.
- Based on the results of laboratory testing, the tested native soils collected from the borings B-4 and B-5 generally meet the USS requirements for Granular Backfill. Soils proposed for trench backfill should be sampled and evaluated by the geotechnical engineer before backfilling.
- Cemented soils were not encountered in the borings, however, due to the inconsistent nature of cemented soils, hard to very hard and difficult-to-excavate cemented soils could be encountered beyond or between the boring locations at varying depths. A detailed excavatability or rippability evaluation is beyond the scope of this study. The contractor should perform the independent investigations necessary to determine the type of equipment required to perform the work. If the contractor(s) have any questions regarding site conditions, site preparation, or the recommendations provided, they should contact a representative of GES for any needed clarifications prior to submitting earthwork bids.
- Based on the laboratory test results, and in accordance with Table 1804.3.1 of the SNA to the 2012 IBC (SNBO, 2013), the solubility of the tested on-site soils is considered low. In addition, the tested native on-site soils have a negligible concrete sulfate exposure, and a negligible chemical-induced heave potential as determined by AWWA Standard Test Method 4500 E and ASTM D 2791.
- The on-site subsurface clayey soils were determined to be moderately expansive as tested and defined according to subsections 1803.5.3.2 and Table 1808.6.1.1, respectively, of the SNA to the 2012 IBC.
- Based on review of the Clark County Seismic Shear Wave Velocity Map, the project alignment is located in two areas previously mapped by Clark County as Seismic Site Class

C and D (GISMO, 2008) since deep subsurface information was not obtained as part of this study a Seismic Site Class D may be used for the project.

- Based on the historic groundwater depths in the area and the consistency of the on-site soils, it is our opinion that the potential for liquefaction at the site is low.

4. RECOMMENDATIONS

The following sections present conclusions and recommendations concerning the proposed facilities at the subject site. These recommendations are based upon our understanding of the project, the engineering properties of the tested on-site soils, the geologic conditions that are presented in this report, and the assumption that an adequate number of tests and observations will be made during construction to evaluate compliance with these recommendations. Earthwork and site preparation along the proposed alignment should be performed in general accordance with the recommendations presented in this report, the DDM and USS.

4.1. EXCAVATION

Any landscaping, deleterious material, boulders and cobbles, and existing improvements should be removed from within the RCB and channel alignments and other improvement areas and removed from the site. Exposed existing uncontrolled fill, and loose or disturbed native soils should be removed from within the RCB and channel alignments, trench bottoms and other improvement areas and either be removed from the site or processed for use as trench backfill or embankment fill as outlined in this report.

Soils overexcavated from trench bottoms, including uncontrolled fill, and loose or disturbed native soils, should be replaced with compacted embankment material as described in this report prior to placement of bedding. Cobbles protruding more than 4-inches from the bottom of the excavation should be removed and the resulting void filled with compacted final trench backfill material prior to placement of pipe bedding.

Cobbles were encountered in some of the borings drilled and were observed at the surface. Cemented soils, cobbles and boulders, if encountered, may be difficult to penetrate. The project contractors should anticipate that where cemented soils, cobbles, or boulders are encountered, difficulty in excavating and maintaining the desired pipe alignment during excavation operations will occur.

4.2. EMBANKMENT AND STRUCTURAL FILL

After the recommended excavations are performed the native soils should be scarified to a depth of at least 6-inches, moisture conditioned to at least the optimum moisture content and compacted to at least 95 percent of the maximum dry density, as determined by AASHTO T180. The excavation depths may be terminated on moderately or strongly cemented soil at the discretion of the geotechnical engineer.

If both cemented soils and uncemented materials are present at the bottom of improvements, the cemented material and/or bedrock should be removed to a depth of at least 12 inches below bottom of footing and replaced with compacted structural fill. As an alternative, the uncemented material may be removed to expose underlying cemented material and/or bedrock throughout the improvement areas, if any, and replaced with lean mix concrete.

Excavated on-site soils and imported soils may be used as embankment and structural fill after processing in areas underlying improvements provided that the soils satisfy the following recommendations. Materials should be evaluated during construction by the Geotechnical Engineer prior to their placement as embankment and structural fill.

- Embankment and structural fill should meet the gradation and plasticity specifications for either "Selected Backfill" or "Granular Backfill" as described in the USS
- Embankment and structural fill should be processed to remove materials larger than 3 inches in nominal dimension and all organic and other deleterious materials
- Embankment and structural fill should have a remolded swell potential of less than 4 percent as determined per the procedure outlined in Section 1803.5.3.2 of the SNA to 2012 IBC
- Embankment and structural fill should contain less than 2.00 percent by dry weight soluble solids as determined by American Water Works Associated (AWWA) standard test method 2540 C
- Embankment and structural fill should contain less than 0.10 percent by dry weight soluble sulfate as determined by AWWA standard test method 4500 E

Where fill material is to be placed where the existing ground surface is steeper that 5:1 (horizontal to vertical), the surface on which fill is to be placed should be benched. Benches should be excavated into competent material removing organics, slope wash, loose, soft, disturbed or other unsuitable materials as evaluated by the geotechnical consultant. Benches should be at least 8 feet wide, or be of sufficient width to permit operation by compaction equipment. Benches should include approximately 2-foot high vertical or near vertical intervening steps, cut to expose suitable soil as evaluated in the field by the geotechnical

consultant during earthwork operations. Preparation of the benching surface in areas to receive fill should be scarified to a depth of at least 6-inches moisture conditioned to at least the optimum moisture content and compacted to at least 95 percent of the maximum dry density, as determined by AASHTO T180.

Overbuilding of fill slopes should be considered to facilitate compaction of the slope surface. The actual amount of overbuilding may vary as field conditions dictate. The degree of overbuilding may be increased until the desired compacted slope surface condition is achieved. Care should be taken by the contractor to provide compaction as close to the outer edge of the overbuilt slope surface as practical.

Embankment and structural fill should be placed in loose lifts up to 8 inches thick, uniformly moisture conditioned to at least the optimum moisture content, and compacted to at least 95 percent of the maximum dry density as determined by AASHTO T 180.

In-place density and moisture tests should be performed in accordance with AASHTO T310. The test frequency should be at least one test per 200 cubic feet of fill material placed or at least 2 tests per lift of fill material placed, whichever is greater.

4.3. PIPE BEDDING AND PIPE ZONE

Backfill placed within the pipe zone and pipe bedding, haunch zone and initial backfill should be placed as described in the USS. Pipe zone should extend to a height of at least 12 inches above the top of RCBs and pipes. Pipe zone materials will need to be imported.

4.4. BEDDING

Based on the findings of our subsurface exploration, it is recommended that RCBs, RCPs, pipes, manholes and drain inlets be supported on a minimum of 6 inches of bedding placed as wide as the trench. Pipe bedding should consist of Type II Aggregate Base or Type III Aggregate Base as described in the USS. As an alternative, controlled low strength material (CLSM) meeting the specifications presented in Section 704.03.07 of the USS may be used for pipe bedding. Cobbles protruding more than 4-inches from the bottom of the excavation should be removed and the resulting void filled with compacted structural fill as described in this report, prior to placement of bedding.

4.5. INITIAL BACKFILL

Initial backfill consists of the fill above bedding on either side of pipes and pipes extending to at least 1 foot above the top of the RCBs, RCPs, and pipes. Initial backfill for RCPs and pipes excluding RCBs should consist of Type II Aggregate Base or Type III Aggregate Base as described in the USS or alternatively, controlled low strength material (CLSM) meeting the specifications presented in Section 704.03.07 of the USS may be used for pipe bedding and pipe zone.

Initial backfill at the sides of RCBs, should be materials meeting the specifications for "Selected Backfill" or "Granular Backfill" as described in the USS. Initial backfill placed along the sides of the RCBs should be placed equally in uniform layers such that the top of the backfill at either side does not differ by more than 6-inches in elevation at any given time.

Backfill for initial backfill and at the sides of the RCBs should be placed in loose lifts up to 8 inches thick; moisture conditioned to within 2 percent of optimum and compacted to at least 90 percent of the maximum laboratory dry density. As an alternative, controlled low strength material (CLSM) meeting the specifications presented in Section 704.03.07 of the USS may be used for pipe bedding and pipe zone.

4.6. FINAL TRENCH BACKFILL

Final trench backfill placed above the initial backfill should be free of organic material and debris and be free of material greater than 3 inches in nominal dimension. Material placed as trench backfill should meet the specifications for Selected Backfill or Granular Backfill presented in Sections 207.02.01 and 207.02.02 of the USS. Based on the results of laboratory test results, it is anticipated that excavated materials along the proposed alignments may not meet the Selected Backfill and Granular Backfill specifications based on gradation and may need to be blended with other soils such that the blended soils meets the Selected Backfill and Granular Backfill specifications. Soils proposed for trench backfill should be sampled and evaluated by the Geotechnical Engineer, and approved by the governing agency before placing.

Trench backfill should be placed in loose lifts up to 8 inches thick, moisture conditioned to within 2 percent of the optimum moisture content, and compacted to a minimum of 90 percent of the soils maximum dry density (AASHTO T180). The contractor should take care not to damage the pipe during backfilling. As an alternative, CLSM meeting the specifications presented in Section 704.03.07 of the USS may be used for trench backfill. Pipe bedding, pipe zone, and

trench backfill should be compacted by mechanical means only; ponding or jetting should not be used to compact pipe bedding, pipe zone, or trench backfill. In areas to receive pavement, the upper 12 inches of backfill below the Type II Aggregate Base supporting the asphalt pavement should be backfilled with CLSM.

In-place density and moisture tests should be performed in accordance with AASHTO T310. The test frequency should be at least one test per 100 linear feet of fill material placed per lift.

4.7 CONCRETE LINED CHANNEL

Concrete lining for the channel and the concrete pad at the discharge should be designed in accordance with Section 705 of the HCDDM (CCRFCD, 1999). We understand the flow velocities in the channel will be less than 30 feet per second; accordingly the concrete lining should be at least 6 inches thick. Concrete lining should contain Type V sulfate resistant cement, have a maximum water-to-cement ratio of 0.50, and have a minimum unconfined compressive strength at 28 days of 4,000 pounds per square inch (psi). Reinforcing of the concrete lining should be designed as specified in the HCDDM (CCRFCD, 1999). Curing of the concrete lining should be performed as specified in the HCDDM (CCRFCD, 1999)

The inverts should be cross-sloped to concentrate nuisance flows away from longitudinal joints and side slopes. The side slopes of the channel should be not steeper than 2:1 (horizontal to vertical). To prevent the buildup of hydrostatic pressure, the concrete channel lining should include weep holes 15 to 20 feet on center. Aluminum or galvanized steel wire mesh should be placed behind each weep hole.

Transverse concrete cut-off walls extending at least 3 feet below the bottom of the concrete lining and extending the entire width of the lining should be provided at the upstream and downstream ends and at each expansion joint for continuously reinforced concrete channels. Additional cut-off walls may be required at the discretion of the Structural Engineer.

The concrete lining should be supported on bedding consisting of at least 4 inches of Type II Aggregate Base. Prior to placing the supportive Type II Aggregate Base at least the upper 8 inches of subgrade soils should be uniformly moisture conditioned to at least the optimum moisture content and compacted to at least 95 percent of the maximum dry density. Scarification may be terminated at a shallower depth or omitted entirely if moderately to strongly

cemented soil is encountered, at the discretion of the Engineer, based on actual soil conditions observed at the site.

Type II Aggregate Base should be placed in accordance with Section 302 of the USS and should be compacted to at least 95 percent of the maximum dry density. Aggregate base and asphalt pavement materials and construction methods should meet the requirements set forth in the USS.

4.8. SUBTERANEAN STRUCTURES

Subsurface structures, such as manholes, vaults, drop inlets, and trench drain inlets associated with the proposed alignment should be founded on a zone of dense to very dense native soils that have been scarified, moisture conditioned and recompacted, as previously described. The bottoms of structures should be underlain by at least 6 inches of Type II Aggregate Base compacted to at least 95 percent of the maximum dry density. For structures embedded a minimum depth of 12 inches having a footing width of 12 inches, an allowable net bearing capacity of 2,000 psf should be used for design of foundations. This allowable net bearing capacity may be increased by 1,500 psf for each additional foot of embedment and/or by 500 psf for each additional foot of width up to a maximum value of 4,000 psf. RCBs having a minimum width of 12 feet and a buried depth of at least 8 feet to the bottom of the RCB may be designed using an allowable net bearing capacity of 4,000 psf. The allowable bearing pressure presented above includes a factor of safety against general bearing capacity failure of 3.

Foundations supporting these structures should not be founded partially on uncemented soil and partially on cemented soils. If both cemented and uncemented materials are present at the bottom of the foundation excavation, the cemented material should be removed to a depth of at least 12 inches below bottom of footing and replaced with compacted structural fill. As an alternative, the uncemented material may be removed to expose underlying cemented material throughout the foundation area, if any, and replaced with lean mix concrete.

Resistance to lateral loads may be calculated using both passive lateral earth support and friction developing between the foundations and underlying soil. Passive resistance may be used if foundation backfill soils in front of the foundation are compacted to at least 90 percent of the maximum laboratory dry density (AASHTO T180) or if the foundation is cast against undisturbed native soils, and if the ground surface in front of the footing is level. The passive

lateral earth support for footings may be based upon an allowable equivalent fluid density of 290 pounds per cubic foot up to a maximum allowable passive lateral pressure of up to 2,900 pounds per square foot. A coefficient of friction of 0.28 may be used for the interface between the foundation and underlying properly compacted structural fill Type II or Type III Aggregate Base, or CLSM. The values for passive equivalent fluid density and base coefficient of friction include a factor of safety of 1.5.

4.9. VERTICAL LOADS

Vertical loads on pipes and RCBs will be influenced by the type and dimensions of pipe, the method of pipe installation, subsurface conditions, the width of the trench, the height of backfill above the pipe, and the method of backfill placement. Vertical soil loads may be estimated using an average unit weight of 135 pounds per cubic foot (pcf) for soil compacted to 90 percent of the maximum dry density (AASHTO T310) and 140 pcf for CLSM backfill.

4.10. PIPE STABILITY

Provided that the earthwork recommendations presented are followed, total and differential settlements, at the exploration locations, are not anticipated to exceed 1 and ½ inch, respectively. Based upon the depth to groundwater, the depth to the pipeline inverts, and the consistency of the explored soils, the potential for liquefaction is low. If any of these conditions change, GES should be provided the opportunity to re-evaluate our settlement estimates.

4.11. MATERIAL VOLUME CHANGES

It is our opinion that there will be a reduction in volume if the in-place native soils are excavated and compacted. Shrinkage of the in-place native soils not containing oversized materials is estimated to be in the range of 10 to 20 percent when compacted to at least 90 percent of the maximum dry density (AASHTO T180). Accordingly, with shrinkage of 10 to 20 percent, one cubic yard of excavated native soils compacted to 90 percent relative compaction (AASHTO T180) would generate approximately 0.90 to 0.80 cubic yards of compacted fill, respectively.

4.12. LATERAL EARTH PRESSURES

Lateral active earth pressures induced by adjacent uniform surface surcharge loads should be estimated as a uniformly distributed lateral load with a magnitude equal to the magnitude of the surface surcharge load multiplied by the earth pressure coefficient. The RCB and associated subterranean structures such as man-holes and drain inlets are rigid and will not deflect to

relieve stresses from the backfill and should be designed to resist the lateral earth pressures presented in Figure C-1.

GES is also presenting earth pressure coefficients for "Active" and "At-Rest" wall conditions. In the "Active" condition the wall is able to deflect enough to lessen stresses from the adjacent soils. In the "At-Rest" condition the wall is rigid and deflection does not occur to relieve the stress from the wall backfill and adjacent soils. Walls with level backfill should be designed to resist the lateral earth pressures for the appropriate conditions presented in Figure C-2.

The values presented in Figures C-1 and C-2 assume that the buildup of hydrostatic pressure will be prevented. To reduce the buildup of hydrostatic pressure, a wall drainage system, including weep holes or a footing drainage system, day lighting to an appropriate outlet should be installed behind retaining walls. The wall drainage system should consist of a non-woven geotextile fabric have a maximum average Apparent Opening Size less than 0.43 mm (US sieve #40) by ASTM D4751 and a minimum grab tensile strength of 120 pounds or more by ASTM D4632 wrapped around drain rock. Alternately, the wall drainage system may include should a drain board (e.g., DrainStar Drain Board or equivalent) used in conjunction with a strip drain (e.g., DrainStar Stripdrain by Tremco Barrier Solutions, Inc., or equivalent). The strip drain should be a minimum of 12 inches in height and placed continuously along the bottom of the retaining wall.

Resistance to lateral loads may be calculated using passive lateral support based upon an equivalent fluid density of 290 pounds per cubic foot (with an allowable passive pressure of up to 2,900 pounds per square foot) and a base coefficient of friction of 0.28. The value for the maximum passive lateral earth pressure and base coefficient of friction presented above includes a factor of safety of 1.5. Backfill against retaining walls should be moisture conditioned to within 2 percent of the optimum moisture content and compacted to between 90 and 95 percent of the maximum dry density (AASHTO T180) using light hand operated equipment. The use of heavy compaction equipment could cause loads exceeding the design lateral pressures and result in distress or failure.

Backfill placed behind retaining walls or subsurface walls should consist of embankment fill meeting the criteria presented in this report. Backfill placed behind retaining walls should be placed in 8-inch maximum vertical lifts and should be compacted to between 90 and 95 percent

of the maximum laboratory dry density. Over-compaction adjacent to retaining walls should be avoided. The lateral earth pressures shown on Figures C-1 and C-2 assume that compaction behind retaining walls or subsurface walls will be accomplished with relatively light compaction equipment

4.13. SEISMIC SITE CLASS

Based on review of the Clark County Seismic Shear Wave Velocity Map, the project site is located in areas previously mapped by Clark County as having an average soil shear wave velocity associated with Seismic Site Class C or D (GISMO, 2008). However, confirmation testing of the Seismic Site Class by GES via an independent geophysical study or subsurface exploration was not included in the scope of the geotechnical evaluation presented in this report. Therefore, in accordance with Section 1613 of the 2012 IBC, a Seismic Site Class D may be used for this project and the following seismic design parameters may be utilized. The parameters were developed using representative coordinates of 36.3176 degrees latitude and -115.2754 degrees longitude for the project site.

Table 4.13. Spectral Response Accelerations and Site Coefficients – Site Class D

Spectral Response Acceleration at Short Periods, S_s	Spectral Response Acceleration at 1-Second Period, S_1	Spectral Response Coefficient at Short Periods, S_{Ds}	Spectral Response Coefficient at 1-Second Period, S_{D1}
0.467g	0.161g	0.444g	0.232g

4.14. RECOMMENDED DEDICATED ASPHALT PAVEMENT SECTION

Where existing pavement sections are removed to facilitate the installation of the storm drain, the replacement pavement section should at least be equal to that removed or the minimum section specified for the right-of-way width per Standard Drawing 200 or 200.1 of the Uniform Standard Drawings for Public Work Construction (USS).

Asphalt concrete material and placement procedures should conform to appropriate sections of the USS. Aggregate materials for asphalt concrete should conform to the requirements for Plant Mix Bituminous Pavements in Section 401 and in Section 703 of the USS.

Prior to placing supportive Type II Aggregate Base, the underlying 8 inches of soil should be scarified; uniformly moisture conditioned to within 2 percent of the optimum moisture content and compacted to at least 95 percent of the maximum dry density. Scarification may be terminated at a shallower depth or omitted entirely on moderately to strongly cemented soil, at the discretion of the engineer, based on actual soil conditions observed.

Aggregate base materials underlying asphalt concrete pavement should consist of Type II Aggregate Base meeting the requirements presented in Subsection 704.03.04 of the USS. Aggregate base should be placed in loose layers up to 6 inches thick, moisture conditioned to within 2 percent of the optimum moisture content and compacted to at least 95 percent of the maximum dry density (AASHTO T180). Compacted thickness of aggregate base materials should be observed under the direction of the geotechnical consultant prior to its incorporation into the pavement structure.

To form a basis for design of new asphalt concrete pavement for Brent Lane, we have assumed the following:

- Brent Lane functions as a minor collector
- 80 percent reliability
- 0.45 standard deviation
- 4.2 initial serviceability
- 2.5 terminal serviceability
- R-value of 60 (estimated from soil type)
- Traffic Index of 6.5

Using these values, a structural number associated with the proposed roadway improvements was calculated using design procedures in accordance with the American Association of State Highway and Transportation Officials method of designing flexible pavement (AASHTO, 1993) requirements. The following table presents the recommended structural pavement section:

Table 4.14. Recommended Minimum Asphalt Concrete Pavement Section

Road Name	Traffic Index	R-Value	Asphalt Thickness (Inches)	Type II Aggregate Base Thickness (Inches)
Brent Lane (Minor Collector)	6.5	60	3.0	4.0

The recommended section is limited by the assumptions used. If soils with R-values less than 60 are placed as subgrade beneath pavement sections, or if our other design assumptions are not applicable, the recommended pavement section will need to be re-evaluated. Verification of the subgrade soils and pavement design verification will need to be provided by the geotechnical consultant during construction.

Existing pavement that will remain in-place will need to be saw-cut to accommodate new street improvements. Sawcutting of existing pavement should provide relatively flat, vertical surfaces for adjacent new pavement sections. A tack coat should be applied to the existing pavement surface prior to placement of the adjacent new pavement.

Adequate surface drainage should be provided to reduce ponding and infiltration of water into the pavement and subgrade materials.

4.15. RIPRAP

Riprap lining the earthen berm at the north side of the channel, west of the Tule Springs Road crossing, should be designed in accordance with Section 705 of the HCDDM (CCRFCD, 1999). Riprap materials should meet the specifications of Section 610 of the USS (Clark County) and 705 of the HCDDM (CCRFCD, 1999).

Riprap materials should be placed in accordance with specifications presented in Section 610 of the USS (Clark County) and Section 705 of the HCDDM (CCRFCD, 1999). Riprap should be supported on at least 12-inches of Type II Aggregate Base (709.03.04 of the USS) bedding compacted to at least 90 percent of the maximum laboratory dry density.

4.16. SOIL CORROSIVITY

Based on the results of chemical testing, the on-site soils have a negligible sulfate exposure as defined in Tables 4.2.1 and 4.3.1 of American Concrete Institute (ACI) Publication 318-11. Concrete that may directly or indirectly contact the on-site soils should be designed for a negligible sulfate exposure and contain Type V sulfate resistant cement, have a minimum 28-day compressive strength of 2,500 psi, and have a maximum water to cement ratio of 0.5.

5. LIMITATIONS

The recommendations contained in this report are based on field exploration, laboratory testing, research of pertinent maps and literature, and our understanding of the proposed construction. The soil data used in the preparation of this report were obtained from five borings at the site. It is possible that variation in the soil conditions will exist between the locations explored. Therefore, if any soil conditions are encountered at the site that are different from those outlined in this report, Geotechnical & Environmental Services, Inc. should be immediately notified so that we may review the situation that exists and make supplementary recommendations as needed. In addition, if the scope of the proposed construction, including the types of structures, anticipated loads and maximum cut and fill depths, changes from what is described in this report, our firm should be notified. A detailed excavatability or rippability evaluation is beyond the scope of this study.

The recommendations presented in this report are based on the assumption that an adequate number of tests and observations will be made during site construction to evaluate compliance with the recommendations. These tests and observations should be provided under the direction of a qualified geotechnical engineer. Such testing and observations should include but not be limited to the following:

- Review of site construction plans for conformance with the soils investigation.
- Observation and testing during site preparation, grading, footing and other excavations, and placement of fill, aggregate base, and concrete.
- Consultation as may be required during construction.

Our services were performed using that degree of care and skill ordinarily exercised under similar circumstances by reputable engineering firms in this or similar localities. No other warranties, either expressed or implied, are included or intended in this report.

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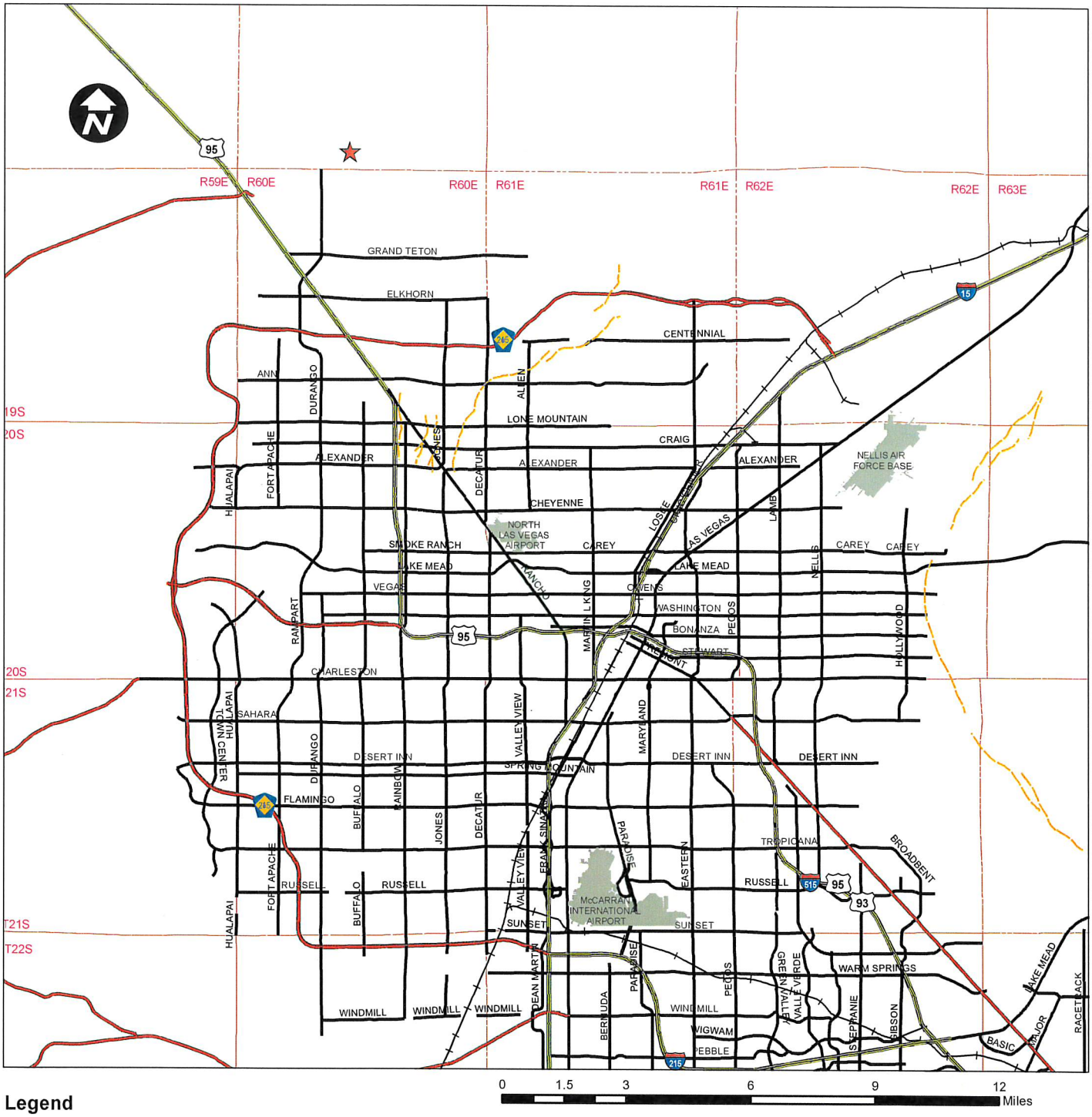
APPENDIX A
SUBSURFACE STUDY



0 1.5 3 6 9 12 Miles

Legend

- Approximate Project Location
- Airports
- Township & Range
- Interstate
- Major Streets
- Railroad
- State Highway

Linear Faults (USGS, 2010)
- Less than 1,600,000 years
- Less than 130,000 years
- Less than 15,000 years

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www.gesnevada.com

NOTE: Data presented on this map is a compilation of GIS Metadata extracted from a variety of sources. Major Streets, Airports, and Railroads is data obtained from the Southern Nevada GIS Management Office. This data is downloaded by GES for incorporation into drawings generated by GES. Data contained within this page is to be used for informational purposes only. GES has not modified the data contained herein and uses it as it is acquired from the respective agency.

VICINITY MAP
BRENT LANE DRAINAGE SYSTEM & TRAIL
LAS VEGAS, NEVADA

Drawn By:	Date Drawn:
BM	7/8/2014
Project No.	Figure No.
20133321E1	A-1

J:\Jobs\2013_Jobs\20133321\E1\GIS\Figure A-1.mxd

Legend

B-5 $_{D=xx'}$ Approximate Boring Locations with Nominal Depth of Boring in Feet

Proposed Alignment

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.
7150 Placid St.
Las Vegas, NV 89119
702-365-1001
www.gesnevada.com

NOTE: Data presented on this map is a compilation of GIS Metadata extracted from a variety of sources. Major Streets, Airports, and Railroads is data obtained from the Southern Nevada GIS Management Office. This data is downloaded by GES for incorporation into drawings generated by GES. Data contained within this page is to be used for informational purposes only. GES has not modified the data contained herein and uses it as it is acquired from the respective agency.

EXPLORATION LOCATION MAP
BRENT LANE DRAINAGE SYSTEM AND TRAIL
LAS VEGAS, NEVADA

Drawn By:	Date Drawn:
BM	6/25/2014
Project No.	Figure No.
20133321E1	A-2

J:\Jobs\2013_Jobs\20133321\E1\GIS\Figure A-2.mxd

KEY TO SYMBOLS AND TERMS

Terms used according to the Unified Soil Classification System

Consistency or Condition of Soils

Fine-Grained Soils (Silt and Clay): Major portion passing #200 sieve

California Sampler* (blows/foot)	SPT** (blows/foot)	Estimated Consistency	Unconfined Compressive Strength (tsf)	Manual Manipulation
< 2	< 2	Very Soft	< 0.25	Thumb will penetrate soil more than 1 in.
2-5	2-4	Soft	0.25-0.50	Thumb will penetrate soil about 1 in.
5-10	4-8	Firm	0.50-1.00	Thumb will penetrate soil about $\frac{1}{4}$ in.
10-20	8-15	Stiff	1.00-2.00	Thumb will not indent soil but readily indented with thumbnail.
>20	>15	Very Stiff	>2.00	Thumbnail will not indent soil.

*ASTM D 3550 using a 140-pound hammer falling 30 inches.
**ASTM D 1586

Coarse-Grained Soils (Sand and Gravel): Major portion retained on #200 sieve

California Sampler* (blows/foot)	SPT** (blows/foot)	Estimated Consistency	Behavior of $\frac{1}{2}$-inch Diameter Probe Rod
0-7	0-4	Very Loose	Easily penetrated when pushed by hand.
7-18	4-10	Loose	Firmly penetrated when pushed by hand.
18-50	10-30	Medium Dense	Easily penetrated when driven by 1 lb. hammer.
50-90	30-50	Dense	Penetrated less than 1 inch when driven with a 1 lb. hammer.
>90	>50	Very Dense	Penetrated less than $\frac{1}{4}$ inch when driven with a 1 lb. hammer.

*ASTM D 3550 using a 140-pound hammer falling 30 inches.
**ASTM D 1586

Cementation	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

Caliche and Cemented Sand and Gravel: Materials classified as medium hard, hard, or very hard caliche or cemented sand and gravel should be treated as rock per Appendix K of the Southern Nevada Amendments to the 2000 International Building Code, published February 11, 2003.

Misc. Symbols

- Exploration continues
- Initial groundwater depth
- Final groundwater depth

Constituent Percentages

Trace - < 5%

Few - 5 to 10%

Little - 15-25%

Some - 30-45%

Mostly - 50-100%

Moisture Condition

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp but no visible water

Wet - Visible free water, usually soil is below water table

Notes

1. Subsurface explorations were performed using the equipment listed on the exploration logs.
2. Subsurface explorations were performed on the date(s) shown on the exploration logs.
3. Soil sampler(s) were driven with a 140 pound hammer falling 30 inches (unless otherwise noted in the text of this report).
4. The transitions between soil types shown on the exploration logs as occuring abruptly at particular depths may in actuality be a gradual progression from one soil type to the next.
5. Exploration logs are subject to the limitations, conclusions, and recomendations presented in this report.

Strata Group Symbols

- Fill
- CL- Low plasticity clay
- CH - High plasticity clay
- CL-ML - Silty low plasticity clay
- ML - Silt
- MH - Elastic silt
- SC - Clayey sand
- SM - Silty sand
- SP-SM - Poorly graded sand with silt
- SP - Poorly graded sand
- SW - Well - graded sand
- GM - Silty gravel
- GP - Poorly graded gravel
- GW - Well - graded gravel
- CG - Cemented sand and gravel
- Caliche

Soil Sampler Symbols

- Bulk sample
- Sample from auger cutting
- California sampler
- Standard Penetration Test
- Shelby tube
- Air Knife

GES

Disclaimer

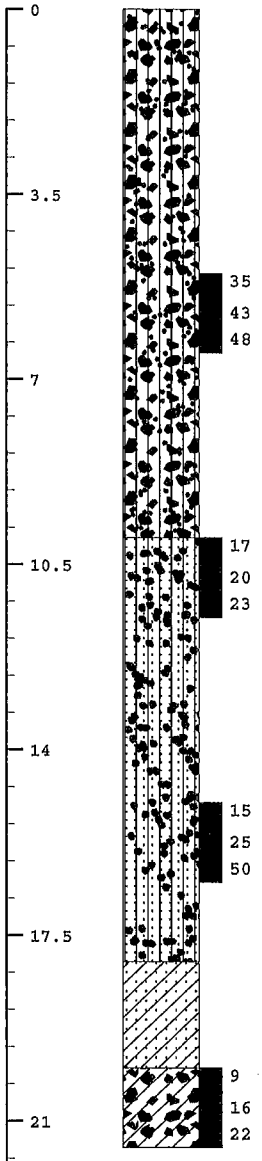
This Key to Symbols is part of a report prepared by Geotechnical & Environmental Services, Inc. and should be used with the report. The descriptions on the exploration logs apply only at the specific exploration locations and at the time the explorations were made. They are not warranted to be representative of subsurface conditions at other locations or times.

Figure No. A-3

BORING LOG
B-1

PROJECT: Brent Lane Drainage System & Trail
PROJECT NO.: 20133321E1
BORING LOCATION: N: 36.3176 W: -115.2778
EXPLORATION DATE: 7/3/2014
EXPLORATION SIZE (dia.): 6-inch O.D. H.S.A.
EQUIPMENT: Truck-Mounted D-120
ELEVATION: Approximately 2,524 Feet
LOGGER/DRILLER: Moradi/Luis-Sanchez

INITIAL DEPTH TO WATER: Not Encountered
DATE MEASURED: N/A
FINAL DEPTH TO WATER: N/A
DATE MEASURED: N/A



ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	STRATA GROUP	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
		GW-GM	Gray to light brown well-graded GRAVEL with silt, sand, and cobbles, dry and medium dense to dense.						
			...airknifed to approximately 5 feet. ...moist and very dense.			4.4	123.8		
			...trace gypsum.						
		GP-GM	White to light brown poorly graded GRAVEL with silt and sand, moist and medium dense.	NP	NV	3.1	121.8		
			...dark brown and dense.			6.8	118.6		
		SC	Dark brown clayey SAND with gravel, moist and medium dense.						
		GC	Dark brown clayey GRAVEL, moist and medium dense with trace gypsum.			14.2	88.9		
			END OF BORING AT 21.5 FEET						

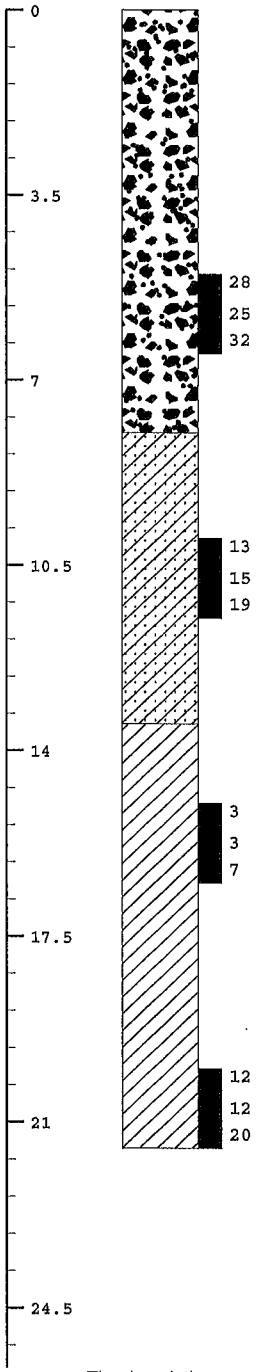
The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC. **Figure No.** A-4

BORING LOG
B-2

PROJECT: Brent Lane Drainage System & Trail
PROJECT NO.: 20133321E1
BORING LOCATION: N: 36.3176 W: -115.2754
EXPLORATION DATE: 7/3/2014
EXPLORATION SIZE (dia.): 6-inch O.D. H.S.A.
EQUIPMENT: Truck-Mounted D-120
ELEVATION: Approximately 2,507 Feet
LOGGER/DRILLER: Moradi/Luis-Sanchez

INITIAL DEPTH TO WATER: Not Encountered
DATE MEASURED: N/A
FINAL DEPTH TO WATER: N/A
DATE MEASURED: N/A



ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	STRATA GROUP	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
		GW	Gray to white well-graded GRAVEL with sand and cobbles, dry and medium dense to dense .	8	20				
			...airknifed to approximately 5 feet. ...moist and dense.			5.3	100.8		
		SC	Light brown clayey SAND with gravel, moist and medium dense.						
			...dark brown.	29	42	7.3	106.9		
		CL	Brown sandy lean CLAY, moist and firm to stiff.						
			...reddish brown.	20	45	26.0	88.0	5	3
			...very stiff.			24.5	91.2		4
			END OF BORING AT 21.5 FEET						

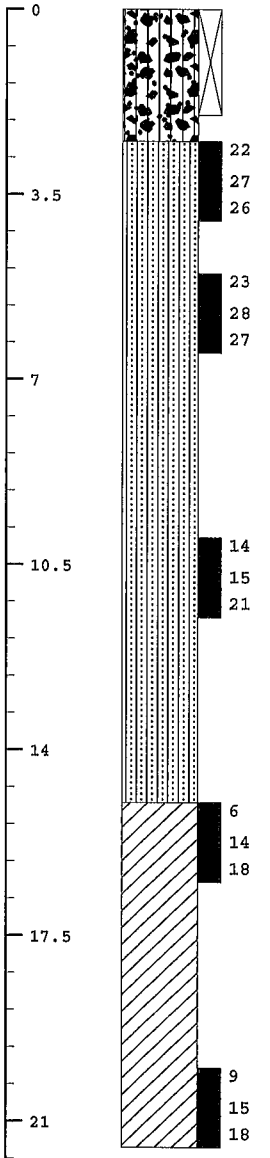
The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC. **Figure No.** A-5

BORING LOG
B-3

PROJECT: Brent Lane Drainage System & Trail
PROJECT NO.: 20133321E1
BORING LOCATION: N: 36.3175 W: -115.2731
EXPLORATION DATE: 7/3/2014
EXPLORATION SIZE (dia.): 6-inch O.D. H.S.A.
EQUIPMENT: Truck-Mounted D-120
ELEVATION: Approximately 2,495 Feet
LOGGER/DRILLER: Moradi/Luis-Sanchez

INITIAL DEPTH TO WATER: Not Encountered
DATE MEASURED: N/A
FINAL DEPTH TO WATER: N/A
DATE MEASURED: N/A



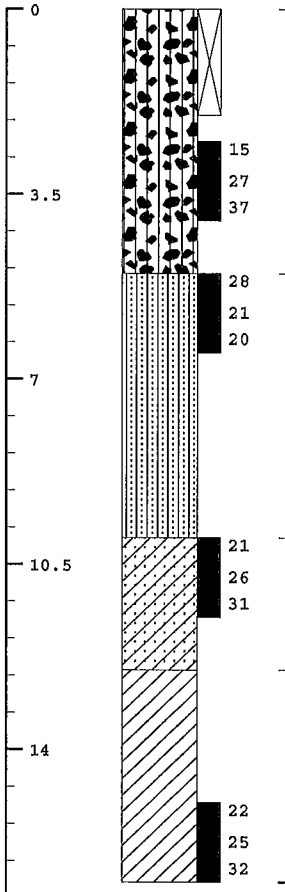
ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	STRATA GROUP	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
0		GW-GM	Gray to white well-graded GRAVEL with silt and cobbles, dry and dense.						
3.5	22 27 26	SM	White to light brown silty SAND with gravel, dry and dense.			1.0	126.7		
7	23 28 27		...reddish brown and moist.			1.8	125.5		
10.5	14 15 21		...medium dense, trace gypsum.			12.5	106.6		
14	6 14 18	CL	Dark brown lean CLAY, moist and very stiff.			24.6	95.9		4
17.5			...trace gypsum.						
21	9 15 18		...reddish brown.			21.7	98.5		4
24.5			**END OF BORING AT 21.5 FEET**						

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

BORING LOG
B-4

PROJECT: Brent Lane Drainage System & Trail
PROJECT NO.: 20133321E1
BORING LOCATION: N: 36.3179 W: -115.2716
EXPLORATION DATE: 7/3/2014
EXPLORATION SIZE (dia.): 6-inch O.D. H.S.A.
EQUIPMENT: Truck-Mounted D-120
ELEVATION: Approximately 2,486 Feet
LOGGER/DRILLER: Moradi/Luis-Sanchez

INITIAL DEPTH TO WATER: Not Encountered
DATE MEASURED: N/A
FINAL DEPTH TO WATER: N/A
DATE MEASURED: N/A



ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	STRATA GROUP	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
0		GM	Light brown silty GRAVEL with sand, dry and medium dense.	NP	NV				
3.5	15 27 37		...dense.			0.9	129.1		
	28 21 20	SM	Light brown silty SAND with gravel, dry and medium dense.			3.7	123.0		
7									
10.5	21 26 31	SC	Reddish brown clayey SAND with gravel, dry and dense.			7.3	99.7		
14		CL	Reddish brown lean CLAY, dry and stiff.						
	22 25 32		...very stiff.			8.3	109.9		4
17.5			**END OF BORING AT 16.5 FEET**						
21									
24.5									

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

BORING LOG
B-5

PROJECT: Brent Lane Drainage System & Trail
PROJECT NO.: 20133321E1
BORING LOCATION: N: 36.3189 W: -115.2705
EXPLORATION DATE: 7/3/2014
EXPLORATION SIZE (dia.): 6-inch O.D. H.S.A.
EQUIPMENT: Truck-Mounted D-120
ELEVATION: Approximately 2,479 Feet
LOGGER/DRILLER: Moradi/Luis-Sanchez

INITIAL DEPTH TO WATER: Not Encountered
DATE MEASURED: N/A
FINAL DEPTH TO WATER: N/A
DATE MEASURED: N/A

ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	STRATA GROUP	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
0		GW-GM	Light brown well-graded GRAVEL with silt and sand, dry and medium dense.						
3.5	17 31 48	GP-GM	Light brown to white poorly graded GRAVEL with silt and sand, dry and dense.	NP	NV	0.4			
	24 38 44					0.7	119.0		
7									
10.5	16 26 29	SC	Brown clayey SAND with gravel, moist and dense with trace gypsum.			10.3	92.6		
14	16 27 40	CL	Yellow to brown lean CLAY, dry and very stiff.			10.8	99.1		4
17.5			**END OF BORING AT 16.5 FEET**						
21									
24.5									

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

APPENDIX B
LABORATORY TEST RESULTS

1. IN-PLACE MOISTURE CONTENT AND DENSITY

The in-place moisture content and density of relatively undisturbed soil samples obtained from the borings were measured in general accordance with ASTM D 5397. The in-place moisture content and density are a qualitative indication of soil consistency and compressibility. The results of these tests are presented on the exploration logs (Figures A-4 through A-8) at the respective sampling depths.

2. GRAIN SIZE DISTRIBUTION

Five grain size distribution tests were performed by sieve analysis in general accordance with AASHTO T27. Soil samples are oven dried to a constant weight and sorted by a number of different sized sieves. The amount of material retained on each sieve is measured and the percent of material passing each sieve is computed. The test results are presented as particle size distribution curves in Appendix B.

3. ATTERBERG LIMITS

Five Atterberg limit tests were performed by sieve analysis in general accordance with AASHTO T89 and T90. The liquid limit test is performed by placing a soil pat in a cup and making a standard-sized groove in the pat. The cup is then dropped onto a hard surface from a height of 10 mm. The liquid limit is defined as the water content when the groove closes on 13 mm at 25 blows. The lowest water content at which the soil is in a liquid state is called the liquid limit (LL). The lowest water content at which a soil is considered to be in a plastic state is the plastic limit (PL). The plastic limit is determined by rolling a pat of soil into a thread. When the thread begins to crumble at a diameter of 3.2 mm, the water content is the plastic limit. The difference between the liquid limit and the plastic limit is the plasticity index (PI) and represents the range of water content over which the soil behaves in a plastic state. The term NP refers to non-plastic and the term NV refers to no value. The test results are presented in Appendix B and on the boring logs in Appendix A.

4. SWELL POTENTIAL

One swell test was performed on an in-situ sample in general accordance with Section 1803.5.3.2 of the SNA to the 2012 IBC. A vertical confining pressure of approximately 60

pounds per square foot was applied to the oven-dried sample and then the sample was inundated with water. The deformation of the sample was recorded until 3 consecutive readings were the same. The results of the swell tests are presented in Appendix B.

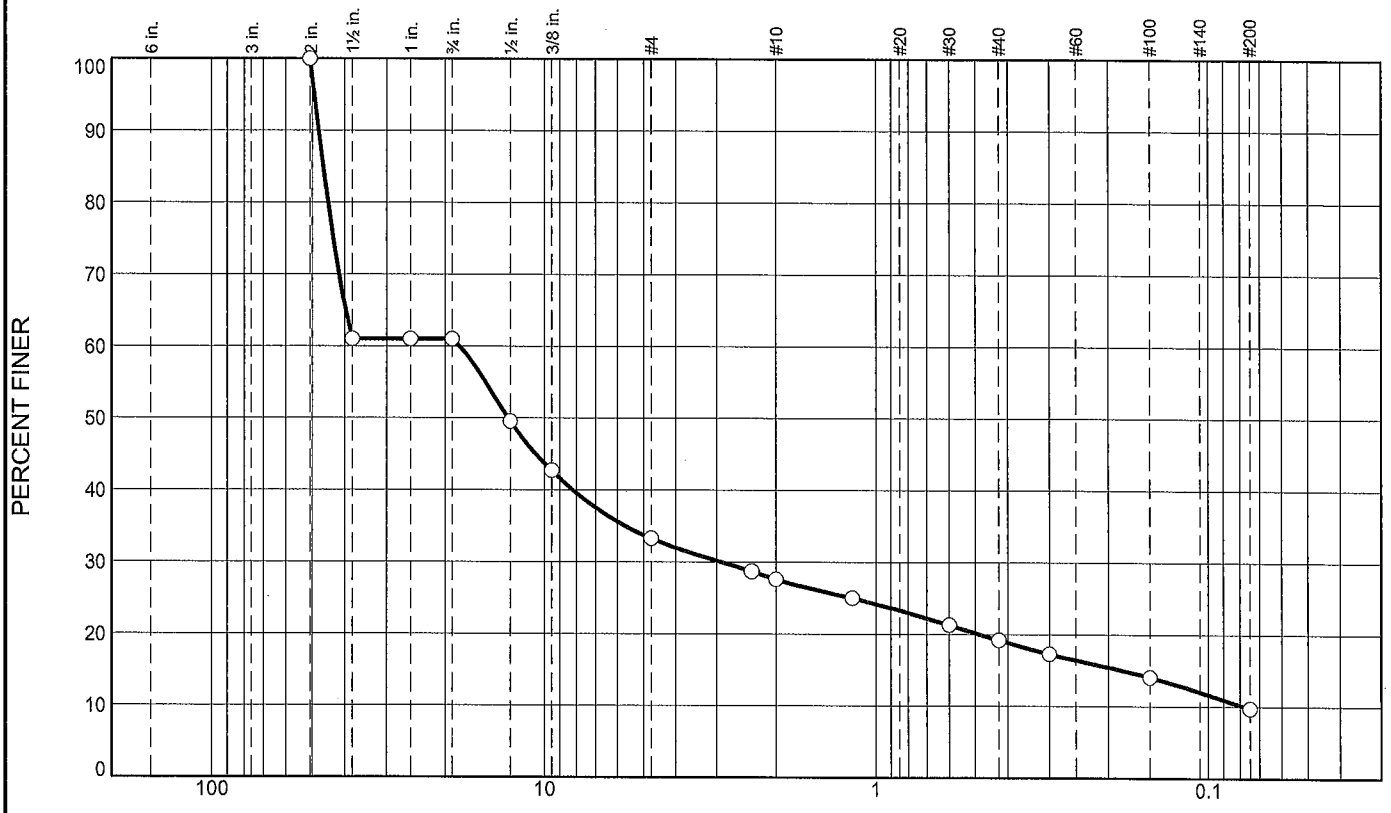
5. DIRECT SHEAR TEST

Two direct shear strength tests were performed on ring samples using a constant strain rate direct shear machine in general accordance with AASHTO T 236. In the shear machine, the samples were saturated, loaded to successive normal pressures, and then sheared beyond the peak shear strength until the residual shear strength was obtained. The results of the tests are presented graphically as Mohr-Coulomb failure surfaces and stress-strain diagrams on Figure B-8 and Figure B-9.

6. WATER SOLUBLE SALT AND SOLUBILITY

Five tests were performed on selected soil samples to determine the contents of soluble sulfate, total available sodium sulfate, and total soluble solids (i.e. solubility). The tests were performed by Silver State Analytical, Inc. The results of the tests are shown in Appendix B.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0	39	28	5	9	9	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	61		
1	61		
.75	61		
.5	50		
.375	43		
#4	33		
#8	29		
#10	28		
#16	25		
#30	21		
#40	19		
#50	17		
#100	14		
#200	9.8		

* (no specification provided)

Material Description

Poorly graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 47.8062 D_{85}= 46.3304 D_{60}= 18.1119
D_{50}= 12.8795 D_{30}= 2.9131 D_{15}= 0.1807
D_{10}= 0.0776 C_u= 233.36 C_c= 6.04

Classification

USCS= GP-GM AASHTO= A-1-a

Remarks

AASHTO T27

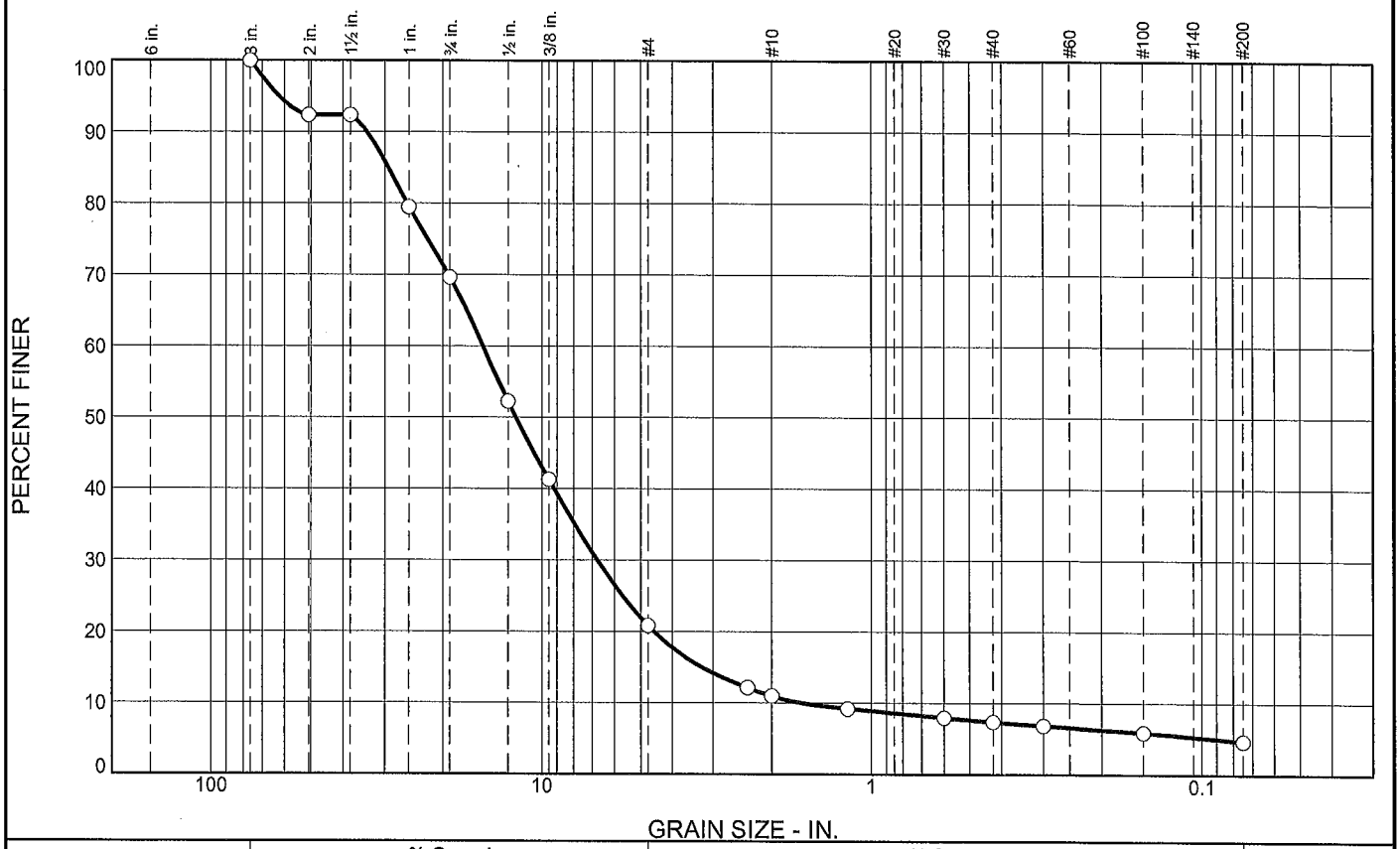
Location: BORING B-1 @ 10.0'-11.5'
Sample Number: B-1 **Depth:** 10.0'-11.5' **Date:** 07/18/14

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: BRENT LANE DRAINAGE SYSTEM & TRAIL
Project No: 20133321E1 **Figure** B-1

Tested By: M. JANOFF

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0	30	49	10	4	2	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	92		
1.5	92		
1	79		
.75	70		
.5	52		
.375	41		
#4	21		
#8	12		
#10	11		
#16	9		
#30	8		
#40	7		
#50	7		
#100	6		
#200	4.7		

* (no specification provided)

Material Description

Well-graded gravel with sand

Atterberg Limits

PL= 12 LL= 20 PI= 8

Coefficients

D_{90}= 33.9160 D_{85}= 29.3293 D_{60}= 15.1503
D_{50}= 12.0265 D_{30}= 6.7788 D_{15}= 3.2402
D_{10}= 1.6238 C_u= 9.33 C_c= 1.87

Classification

USCS= GW AASHTO= A-2-4(0)

Remarks

AASHTO T27

Location: BORING B-2 @ 0.0'-3.0'
Sample Number: B-2 **Depth:** 0.0'-3.0'

Date: 07/18/14

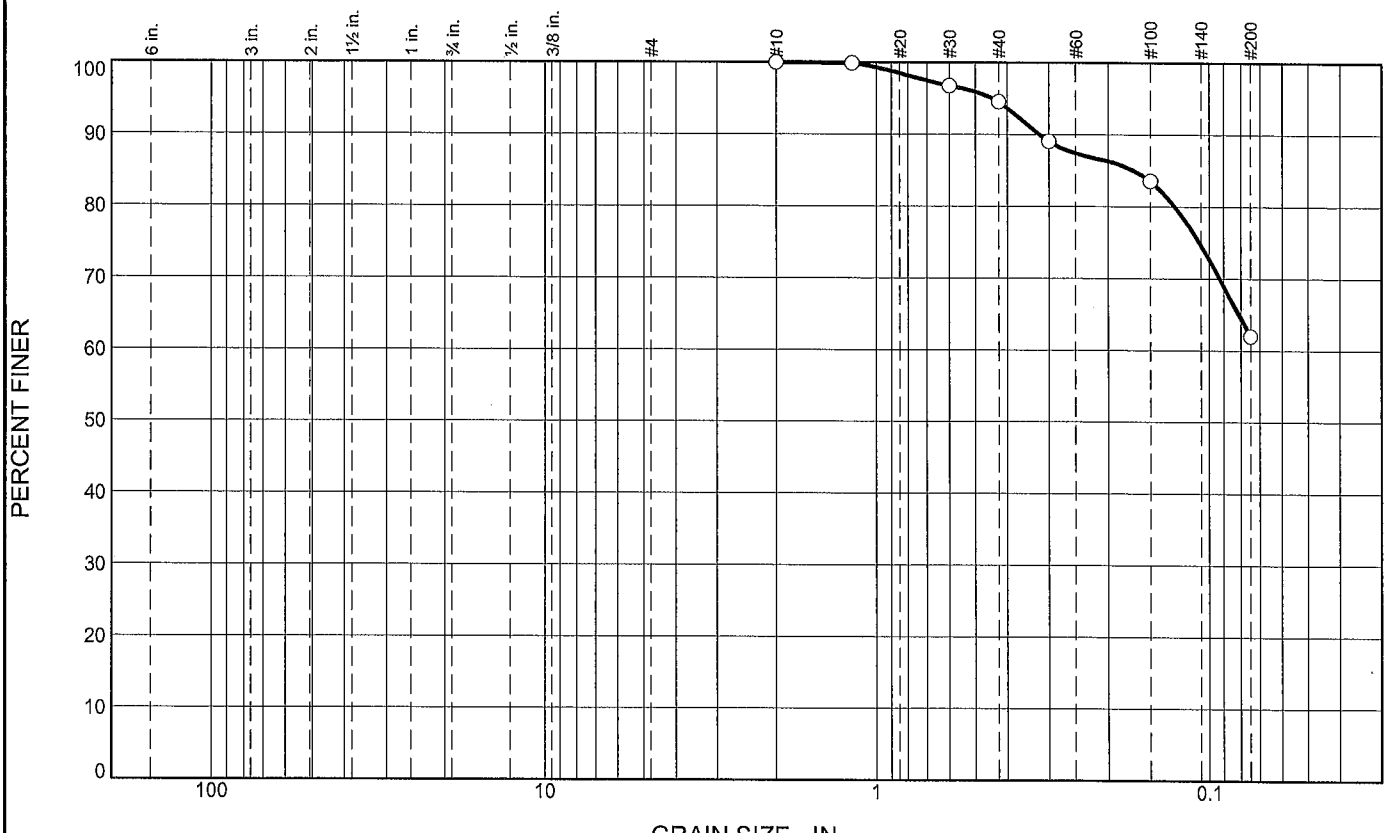
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: BRENT LANE DRAINAGE SYSTEM & TRAIL

Project No: 20133321E1 **Figure** B-2

Tested By: M. JANOFF

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0	0	0	0	5	33	62

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100		
#16	100		
#30	97		
#40	95		
#50	89		
#100	84		
#200	62		

* (no specification provided)

Material Description

Sandy lean clay

Atterberg Limits

PL= 25 LL= 45 PI= 20

Coefficients

D_{90}= 0.3204 D_{85}= 0.1670 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(11)

Remarks

AASHTO T27

Location: BORING B-2 @ 15.0'-16.5'
Sample Number: B-2 **Depth:** 15.0'-16.5'

Date: 07/18/14

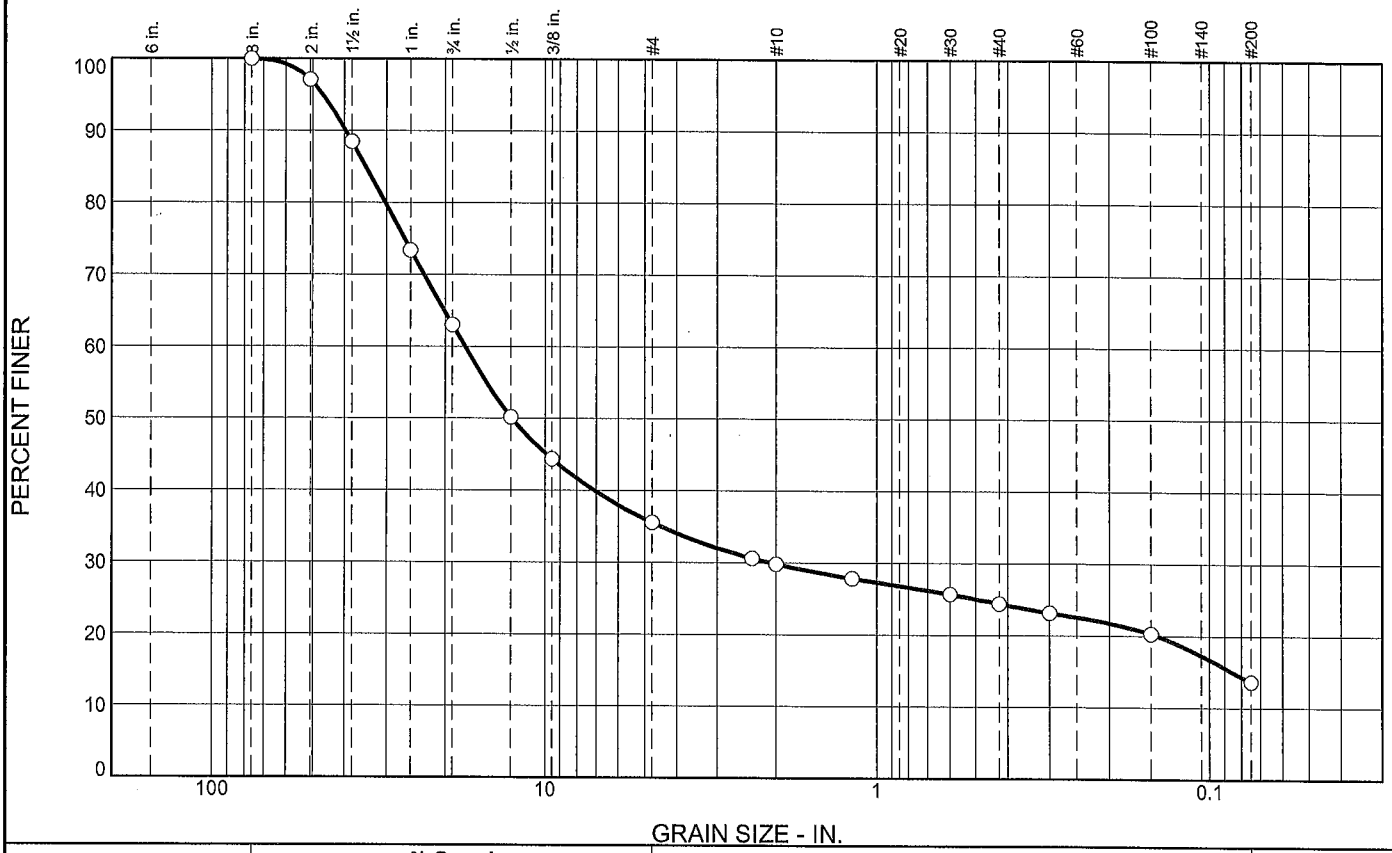
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: BRENT LANE DRAINAGE SYSTEM & TRAIL

Project No: 20133321E1 **Figure** B-3

Tested By: M. JANOFF

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0	37	27	6	6	10	14

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	97		
1.5	88		
1	73		
.75	63		
.5	50		
.375	44		
#4	36		
#8	31		
#10	30		
#16	28		
#30	26		
#40	24		
#50	23		
#100	20		
#200	14		

* (no specification provided)

Material Description

Silty gravel with sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 39.7627 D_{85}= 34.6296 D_{60}= 17.4708
D_{50}= 12.6014 D_{30}= 2.0796 D_{15}= 0.0850
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-a

Remarks

AASHTO T27

Location: BORING B-4 @ 0.0'-2.0'
Sample Number: B-4 **Depth:** 0.0'-2.0'

Date: 07/18/14

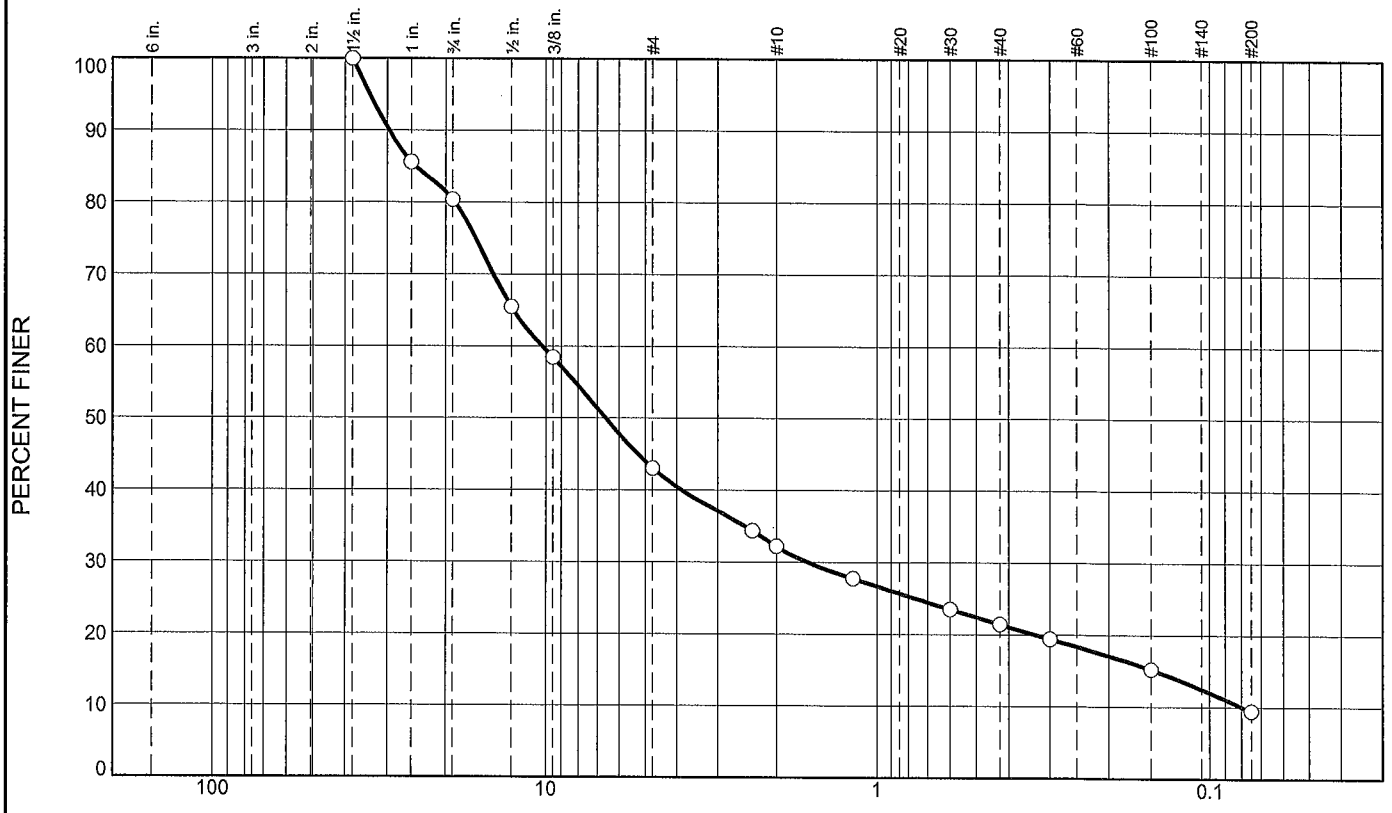
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: BRENT LANE DRAINAGE SYSTEM & TRAIL

Project No: 20133321E1 **Figure** B-4

Tested By: M. JANOFF

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0	20	37	11	11	12	9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	86		
.75	80		
.5	65		
.375	58		
#4	43		
#8	34		
#10	32		
#16	28		
#30	24		
#40	21		
#50	19		
#100	15		
#200	9.5		

* (no specification provided)

Material Description

Poorly graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 29.6395 D_{85}= 24.6663 D_{60}= 10.2492
D_{50}= 6.6134 D_{30}= 1.6097 D_{15}= 0.1450
D_{10}= 0.0795 C_u= 128.85 C_c= 3.18

Classification

USCS= GP-GM AASHTO= A-1-a

Remarks

AASHTO T27

Location: BORING B-5 @ 2.5'-4.0'
Sample Number: B-5 **Depth:** 2.5'-4.0'

Date: 07/18/14

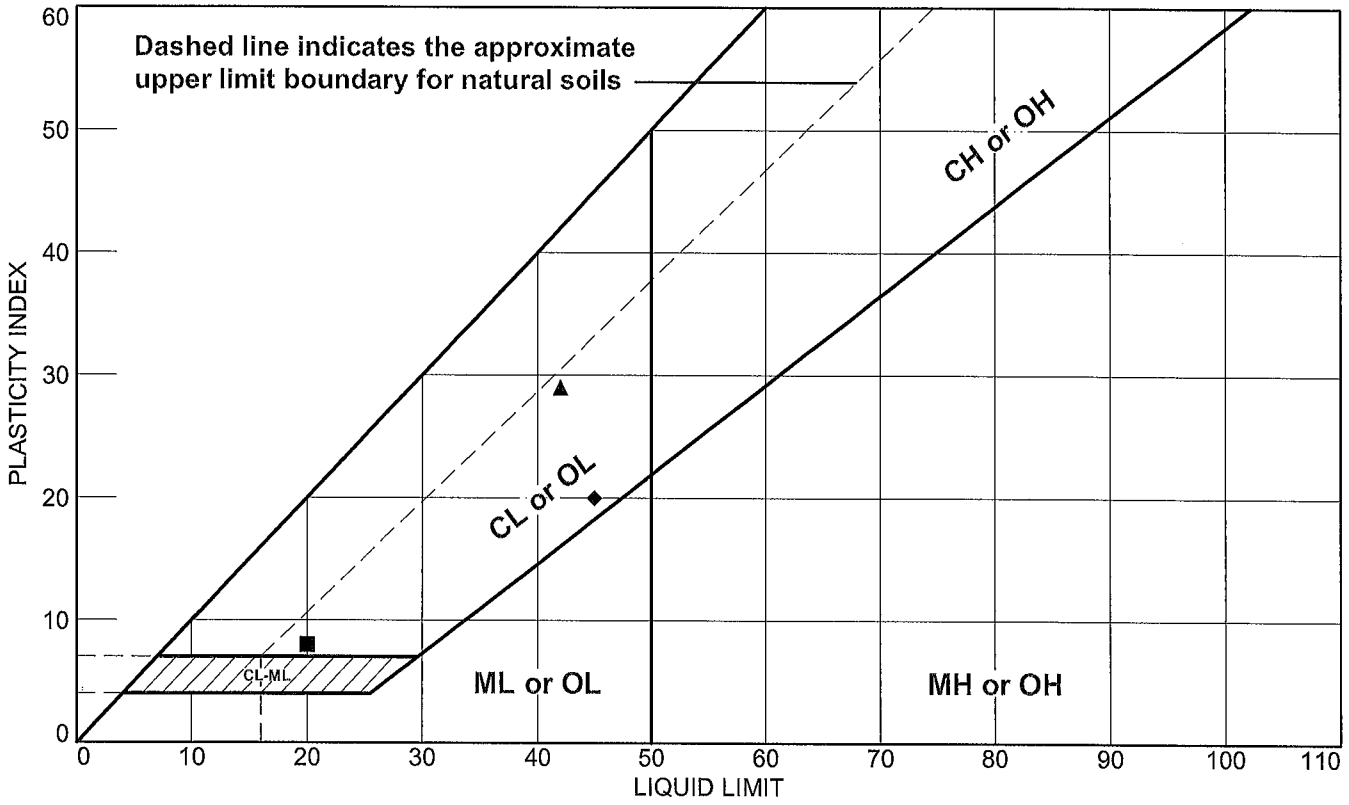
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: BRENT LANE DRAINAGE SYSTEM & TRAIL

Project No: 20133321E1 **Figure** B-5

Tested By: M. JANOFF

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	LAB#14-169	B-1	10.0'-11.5'		NP	NV	NP	GP-GM
■	LAB#14-169	B-2	0.0'-3.0'		12	20	8	GW
▲	LAB#14-169	B-2	10.0'-11.5'		13	42	29	SC
◆	LAB#14-169	B-2	15.0'-16.5'		25	45	20	CL
▼	LAB#14-169	B-4	0.0'-2.0'		NP	NV	NP	GM
✱	LAB#14-169	B-5	2.5'-4.0'		NP	NV	NP	GP-GM

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP

Project: BRENT LANE DRAINAGE SYSTEM & TRAIL

Project No.: 20133321E1 **Figure** B-6

Tested By: ● R. THOMPSON ■ M. JANOFF ▲ M. JANOFF ◆ R. THOMPSON

GEOTECHNICAL &
ENVIRONMENTAL
SERVICES, INC.

7150 PLACID STREET
LAS VEGAS NV, 89119
1-702-365-1001

SWELL TEST SUMMARY

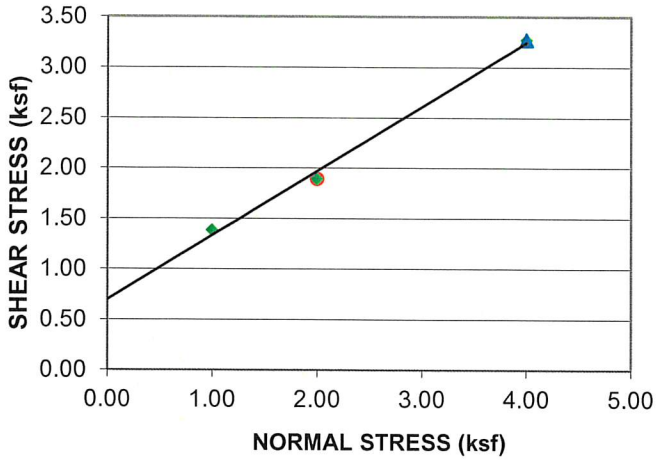
Project Name: BRENT LANE DRAINAGE SYSTEM & TRAIL
Project No.: 20133321E1
Sample Dates: 7/3/2014
Client: SLATER HANIFAN GROUP
Test Method: SNA1803.5.3.2
Report Date: 7/18/2014

LAB NUMBER	SAMPLE LOCATION	SAMPLE DEPTH (feet)	SOIL TYPE (USCS)	TEST CONDITION	SURCHARGE LOAD (psf)	INITIAL DRY DENSITY[1] (pcf)	INITIAL MOISTURE CONTENT[2] (%)	FINAL MOISTURE CONTENT (%)	EXPANSION[3] (%)
14-169	BORING B-2	15.0'-16.5'	CL	IN-SITU	60	85.1	25.8	30.7	5

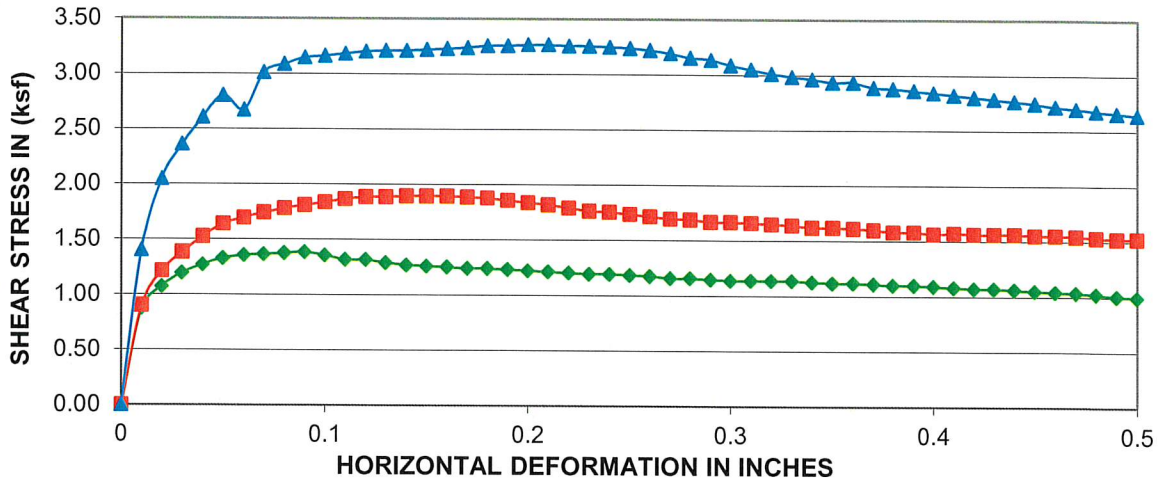
1 Remolded samples were remolded to approximately 90% of the estimated soil maximum dry density (AASHTO T27).
2 Moisture content prior to oven drying.
3 Positive values refer to swell. Negative values refer to collapse.

Figure B-7

DIRECT SHEAR TEST



STRENGTH INTERCEPT:	0.70 KSF
FRICTION ANGLE (PHI)	32.5 DEG.



SYMBOL	MOISTURE CONTENT %	DRY DENSITY (pcf)	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
1.0 ksf	7.3	105.9	1.00	1.38	0.99
2.0 ksf	7.3	102.3	2.00	1.89	1.52
4.0 ksf	7.3	109.3	4.00	3.27	2.64

SAMPLED BY: BM TESTED BY: AS LAB NO: 14-169

SOIL DESCRIPTION: CLAYEY SAND WITH GRAVEL DATE OF TEST: 7/17/2014

LOCATION OF SAMPLE: BORING B-2 @ 10.0'-11.5'

REMARKS:

GES
GEOTECHNICAL & ENVIRONMENTAL SERVICES INC
(702) 365 1001
7150 PLACID STREET
LAS VEGAS, NV 89119

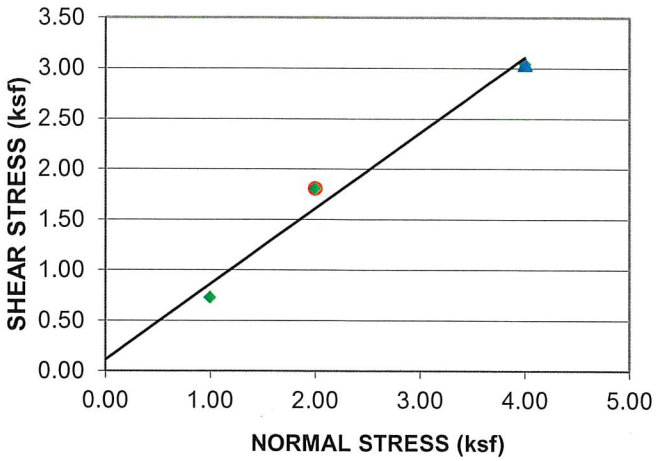
PROJECT NAME: BRENT LANE DRAINAGE

CLIENT NAME: SLATER HANIFAN GROUP

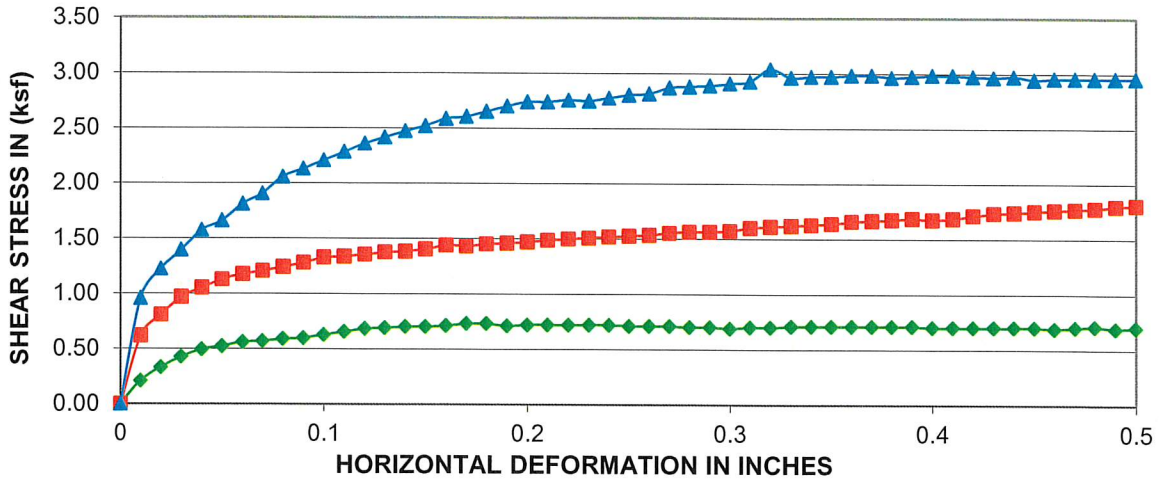
PROJECT NO. 20133321E1

Figure B-8

DIRECT SHEAR TEST



STRENGTH INTERCEPT:	0.11 KSF
FRICTION ANGLE (PHI)	36.8 DEG.



SYMBOL	MOISTURE CONTENT %	DRY DENSITY (pcf)	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
1.0 ksf	7.3	92.3	1.00	0.73	0.70
2.0 ksf	7.3	91.8	2.00	1.81	1.81
4.0 ksf	7.3	95.6	4.00	3.04	2.95

SAMPLED BY: BM TESTED BY: R. T. LAB NO: 14-169

SOIL DESCRIPTION: SILTY SAND WITH GRAVEL DATE OF TEST: 7/18/2014

LOCATION OF SAMPLE: BORING B-4 @ 5.0'-6.5'

REMARKS:

GES
GEOTECHNICAL & ENVIRONMENTAL SERVICES INC
(702) 365 1001
7150 PLACID STREET
LAS VEGAS, NV 89119

PROJECT NAME: BRENT LANE DRAINAGE SYSTEM & TRAIL

CLIENT NAME: SLATER HANIFAN GROUP

PROJECT NO. 20133321E1

Figure B-9

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: July 14, 2014

LABORATORY NO: 14-3174-1

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20133321E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 07/14/14
Time Received: 1030

Sample ID: 14-169, B-1 @ 0.0'-2.0'

Analysis	Result	Unit	Method
Total Salts (Solubility)	0.05	%	SM2540C

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director
EPA: NV00930

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Figure No. B-10

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: July 14, 2014

LABORATORY NO: 14-3174-2

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20133321E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 07/14/14
Time Received: 1030

Sample ID: 14-169, B-1 @ 10.0'-11.5'

Analysis	Result	Unit	Method
Total Salts (Solubility)	0.00	%	SM2540C
Water Soluble Sulfate (SO_4)	0.00	%	SM 4500 E
Total Available Water Soluble Sodium Sulfate (Na_2SO_4)	0.00	%	Calculation
Total Salts (Solubility)	0.04	%	SM2540C

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director
EPA: NV00930

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Figure No. B-11

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: July 14, 2014

LABORATORY NO: 14-3174-3

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20133321E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 07/14/14
Time Received: 1030

Sample ID: 14-169, B-2 @ 0.0'-3.0'

Analysis	Result	Unit	Method
Total Salts (Solubility)	0.00	%	SM2540C
Water Soluble Sulfate (SO_4)	0.01	%	SM 4500 E
Total Available Water Soluble Sodium Sulfate (Na_2SO_4)	0.00	%	Calculation
Total Salts (Solubility)	0.08	%	SM2540C

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director
EPA: NV00930

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Figure No. B-12

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: July 14, 2014

LABORATORY NO: 14-3174-4

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20133321E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 07/14/14
Time Received: 1030

Sample ID: 14-169, B-4 @ 0.0'-2.0'

Analysis	Result	Unit	Method
Total Salts (Solubility)	0.00	%	SM2540C
Water Soluble Sulfate (SO_4)	0.00	%	SM 4500 E
Total Available Water Soluble Sodium Sulfate (Na_2SO_4)	0.00	%	Calculation
Total Salts (Solubility)	0.17	%	SM2540C

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director
EPA: NV00930

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Figure No. B-13

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: July 14, 2014

LABORATORY NO: 14-3174-5

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20133321E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 07/14/14
Time Received: 1030

Sample ID: 14-169, B-5 @ 5.0'-6.5'

Analysis	Result	Unit	Method
Total Salts (Solubility)	0.00	%	SM2540C
Water Soluble Sulfate (SO_4)	0.01	%	SM 4500 E
Total Available Water Soluble Sodium Sulfate (Na_2SO_4)	0.00	%	Calculation
Total Salts (Solubility)	0.06	%	SM2540C

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

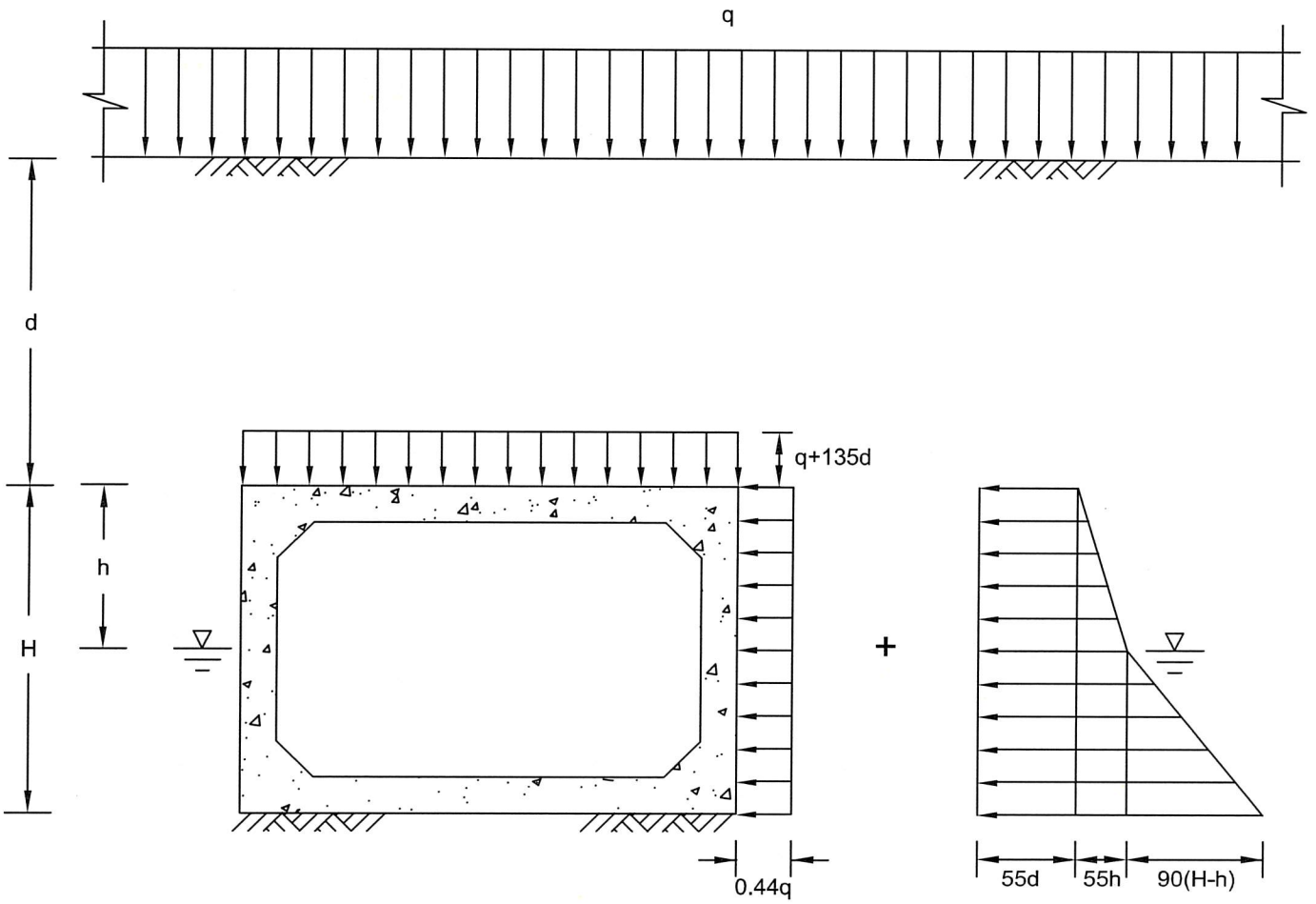
REVIEWED BY:

John Sloan
Laboratory Director
EPA: NV00930

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Figure No. B-14

APPENDIX C
DESIGN FIGURES



Notes:
H is height of vault structure in feet.
h is depth to groundwater in feet from top of vault structure.
d is depth to top of vault structure in feet.
q is magnitude of uniform surcharge load in pounds per square foot (psf).
Earth pressures are in psf.

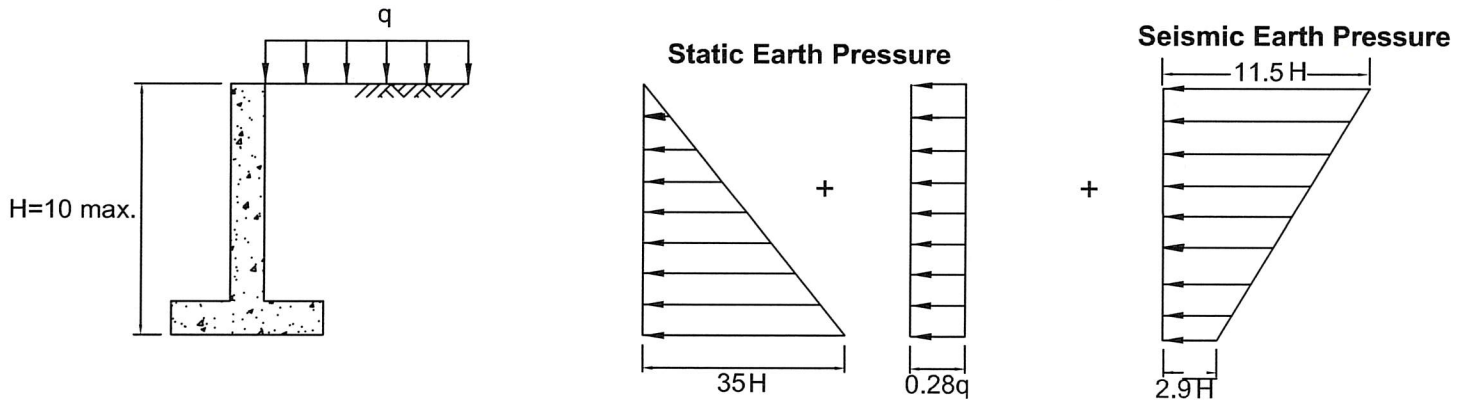
NOT TO SCALE

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.
(702) 365-1001
7150 Placid Street
Las Vegas, NV 89119
www.gesnevada.com

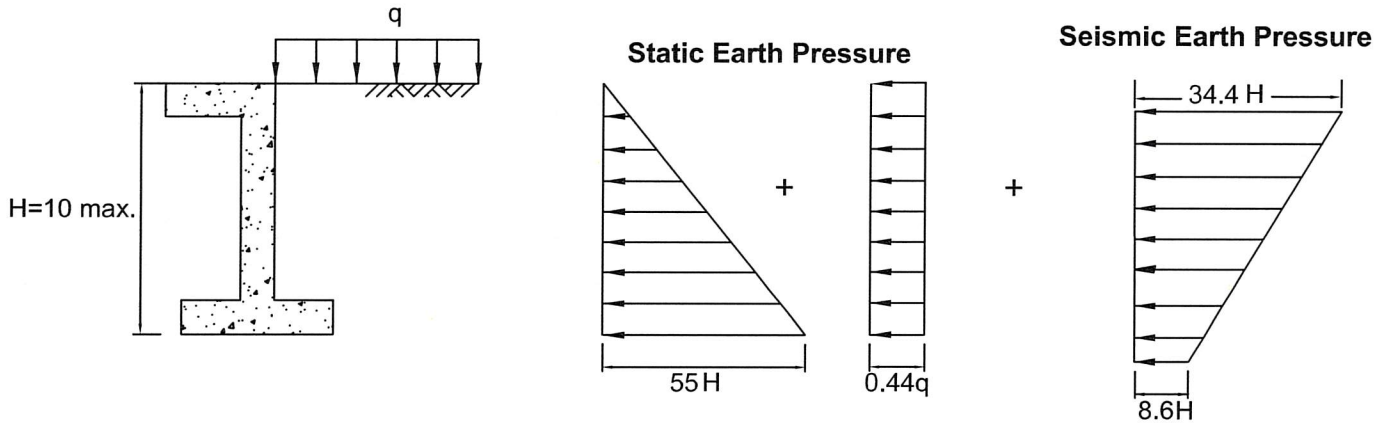
EARTH PRESSURE DIAGRAM FOR RCBS AND RIGID SUBSURFACE STRUCTURES
BRENT LANE DRAINAGE SYSTEM & TRAIL
DURANGO DRIVE TO TULE SPRINGS ROAD
LAS VEGAS, NEVADA

DRAWN BY:	REVIEWED BY:	DATE DRAWN:
BM	PES	7/24/2014
PROJECT NO. 20133321E1		FIGURE NO. C-1

j:\jobs\2013_jobs\20133321\e1\autocad\figure c-1.dwg



Active Condition



At-Rest Condition

Notes:
H is height of wall in feet.
q is magnitude of uniform surcharge load in pounds per square foot (psf).
Earth pressures are in psf.
Earth pressures shown assume that no hydrostatic pressure is exerted on the wall

NOT TO SCALE

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.
(702) 365-1001
7150 Placid Street
Las Vegas, NV 89119
www.gesnevada.com

LATERAL EARTH PRESSURE DIAGRAM
BRENT LANE DRAINAGE SYSTEM & TRAIL
DURANGO DRIVE TO TULE SPRINGS ROAD
LAS VEGAS, NEVADA

DRAWN BY:	REVIEWED BY:	DATE DRAWN:
BM	PES	7/24/2014
PROJECT NO. 20133321E1		FIGURE NO. C-2

j:\jobs\2013_jobs\20133321\e1\autocad\figure no c-2.dwg

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	1	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	4-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

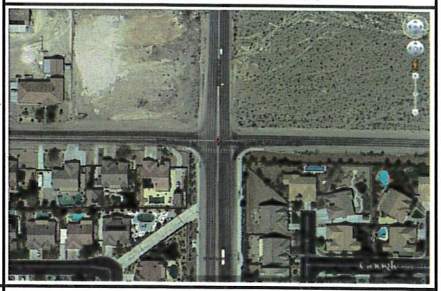
1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

Test Hole Data

Utility Type:	Cable Television	Utility Size:	2-inch	Utility Material:	PVC
Utility Company:	Cox	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Asphalt	Thickness:	3 inches	Marker Type:	PK Nail
Depth to Top:	1.90	Top Ref. Level:	6.72	Hand Meas. Top:	1.90
Depth to Bottom:	2.07	Bot. Ref. Level:	6.89	Hand Meas. Bot:	N/A
Top Elevation:	2528.551	Mkr. Ref. Level:	4.82	Ref. Elevation:	2530.451
Bottom Elevation:	2528.381	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	3.0 LT

N

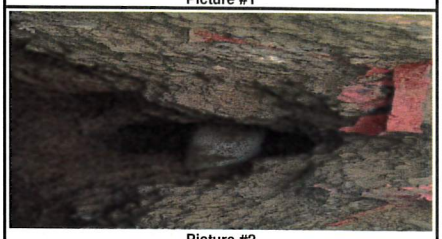
Overall Location of Test Hole



TEST HOLE LOCATION PLAN

TEST HOLE PICTURES

Picture #1



Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Warning Sign	63.40
B	Stop Sign	100.00
C	Street Light	76.10

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Utility covered with 10 inches of flowable fill starting at 1.05 feet down.

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	2	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	2-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

Test Hole Data

Utility Type:	Gas	Utility Size:	4-inch	Utility Material:	Plastic
Utility Company:	Southwest Gas	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Asphalt	Thickness:	6 inches	Marker Type:	PK Nail
Depth to Top:	2.97	Top Ref. Level:	8.06	Hand Meas. Top:	2.97
Depth to Bottom:	3.30	Bot. Ref. Level:	8.39	Hand Meas. Bot:	N/A
Top Elevation:	2527.685	Mkr. Ref. Level:	5.09	Ref. Elevation:	2530.655
Bottom Elevation:	2527.355	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	15.2 RT

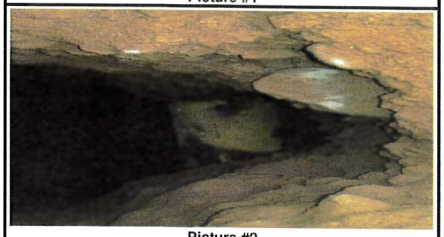
N

Overall Location of Test Hole

TEST HOLE LOCATION PLAN

TEST HOLE PICTURES

Picture #1



Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Warning Sign	64.60
B	Stop Sign	73.90
C	Street Light	81.00

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	3	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	2-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

Test Hole Data

Utility Type:	Water	Utility Size:	12-inch	Utility Material:	PVC
Utility Company:	City of North Las Vegas	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Asphalt	Thickness:	6 inches	Marker Type:	PK Nail
Depth to Top:	5.86	Top Ref. Level:	10.85	Hand Meas. Top:	5.86
Depth to Bottom:	6.86	Bot. Ref. Level:	11.85	Hand Meas. Bot:	N/A
Top Elevation:	2524.655	Mkr. Ref. Level:	4.99	Ref. Elevation:	2530.515
Bottom Elevation:	2523.655	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	5.2 RT

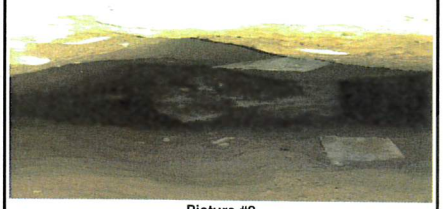
N

Overall Location of Test Hole

TEST HOLE LOCATION PLAN

TEST HOLE PICTURES

Picture #1



Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Warning Sign	65.30
B	Stop Sign	84.10
C	Street Light	75.40

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	4	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	5-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

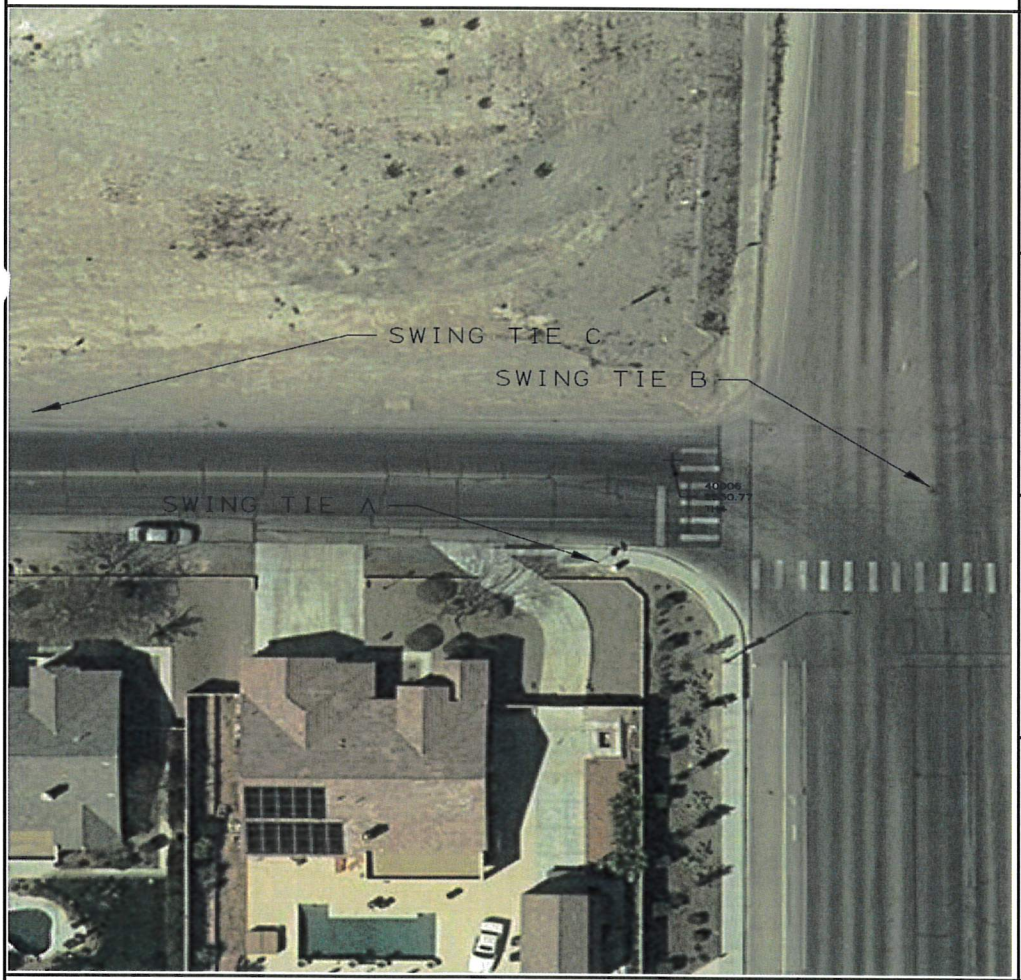
Test Hole Data

Utility Type:	Water	Utility Size:	8-inch	Utility Material:	PVC
Utility Company:	City of North Las Vegas	English/Metric:	English	Soil Conditions:	Dirt / Rocks
Surface Type:	Asphalt	Thickness:	6 inches	Marker Type:	PK Nail
Depth to Top:	5.80	Top Ref. Level:	10.97	Hand Meas. Top:	5.80
Depth to Bottom:	6.47	Bot. Ref. Level:	11.64	Hand Meas. Bot:	N/A
Top Elevation:	2524.973	Mkr. Ref. Level:	5.17	Ref. Elevation:	2530.773
Bottom Elevation:	2524.303	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	13.1 LT

N

Overall Location of Test Hole

TEST HOLE LOCATION PLAN



TEST HOLE PICTURES

Picture #1

Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Stop Sign	41.50
B	Sewer Manhole	69.00
C	Speed Limit Sign	157.10

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Offset Facing North

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	5	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	5-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

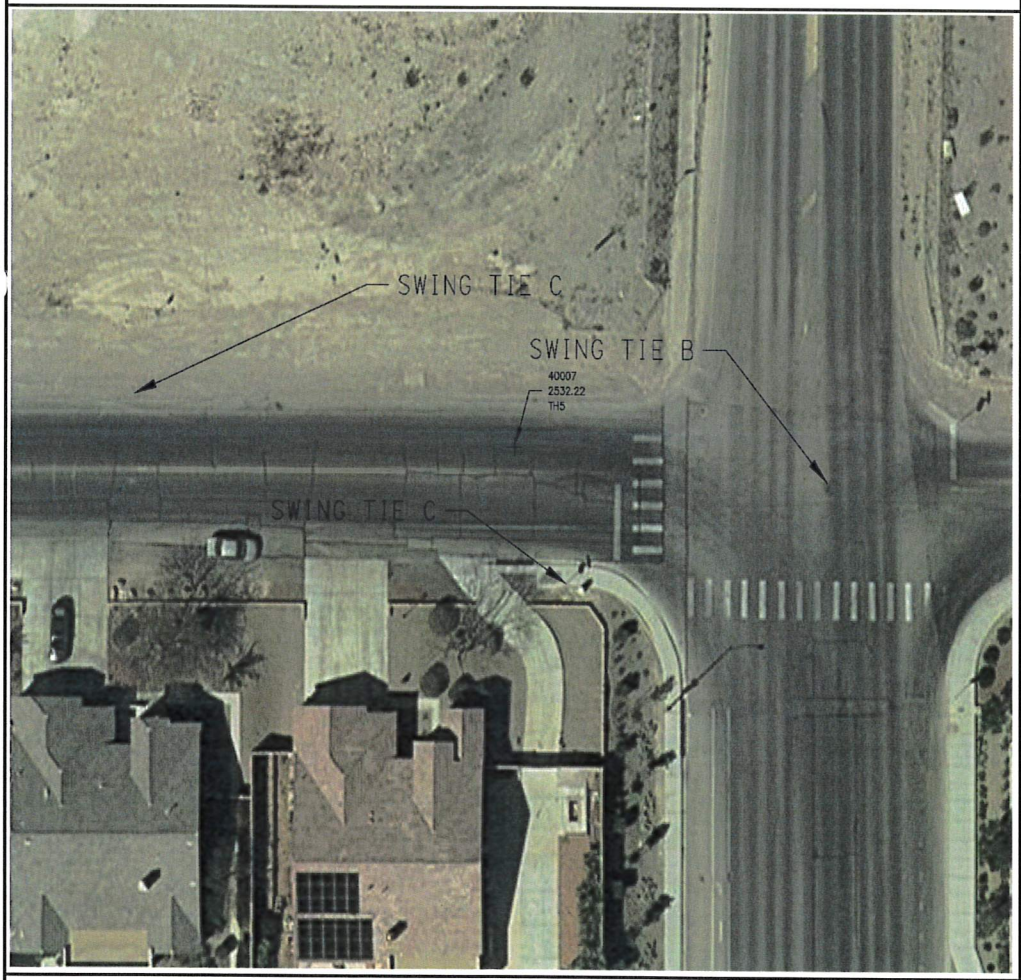
Test Hole Data

Utility Type:	Water	Utility Size:	8-inch	Utility Material:	PVC
Utility Company:	City of North Las Vegas	English/Metric:	English	Soil Conditions:	Dirt / Rocks
Surface Type:	Asphalt	Thickness:	3 inches	Marker Type:	PK Nail
Depth to Top:	4.32	Top Ref. Level:	9.53	Hand Meas. Top:	4.32
Depth to Bottom:	4.99	Bot. Ref. Level:	10.20	Hand Meas. Bot:	N/A
Top Elevation:	2527.900	Mkr. Ref. Level:	5.21	Ref. Elevation:	2532.220
Bottom Elevation:	2527.230	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	13.0 RT

N

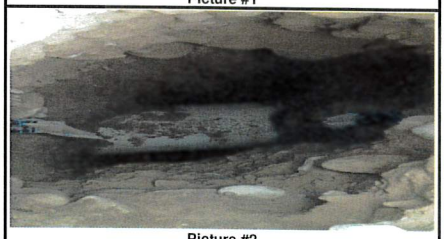
Overall Location of Test Hole

TEST HOLE LOCATION PLAN



TEST HOLE PICTURES

Picture #1



Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Stop Sign	39.50
B	Sewer Manhole	103.20
C	Speed Limit Sign	124.60

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Offset Facing East

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	6	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	5-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

Test Hole Data

Utility Type:	Cable Television	Utility Size:	4-inch	Utility Material:	PVC
Utility Company:	Cox	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Natural Ground	Thickness:	N/A	Marker Type:	5/8" Rebar & Cap
Depth to Top:	3.70	Top Ref. Level:	8.79	Hand Meas. Top:	3.70
Depth to Bottom:	4.04	Bot. Ref. Level:	9.13	Hand Meas. Bot:	N/A
Top Elevation:	2528.899	Mkr. Ref. Level:	5.09	Ref. Elevation:	2532.599
Bottom Elevation:	2528.559	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	2.3 LT

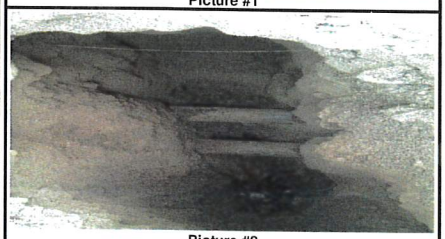
N

Overall Location of Test Hole

TEST HOLE LOCATION PLAN

TEST HOLE PICTURES

Picture #1



Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Stop Sign	63.70
B	Sewer Manhole	127.70
C	Speed Limit Sign	98.80

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	7	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	5-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

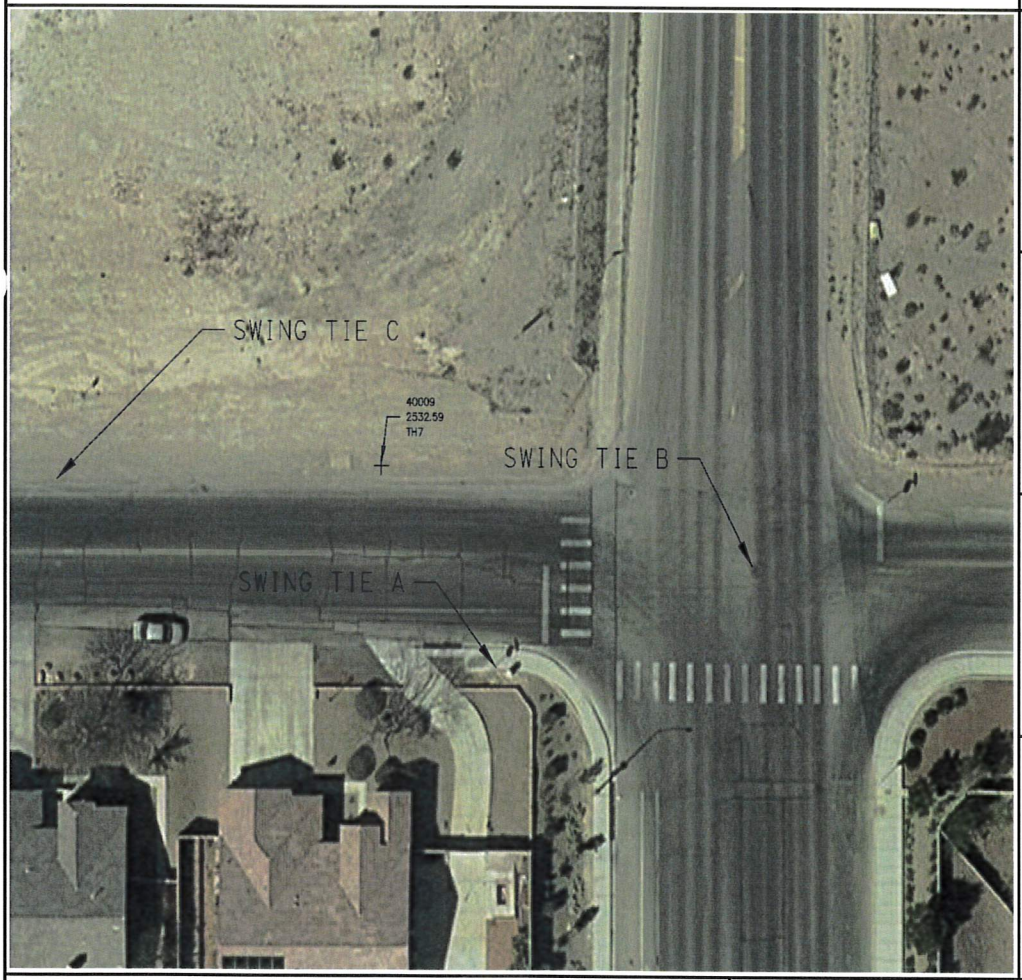
Test Hole Data

Utility Type:	Telephone	Utility Size:	4-inch	Utility Material:	PVC
Utility Company:	Century Link	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Natural Ground	Thickness:	N/A	Marker Type:	5/8" Rebar & Cap
Depth to Top:	3.70	Top Ref. Level:	8.79	Hand Meas. Top:	3.70
Depth to Bottom:	4.04	Bot. Ref. Level:	9.13	Hand Meas. Bot:	N/A
Top Elevation:	2528.893	Mkr. Ref. Level:	5.09	Ref. Elevation:	2532.593
Bottom Elevation:	2528.553	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	3.1 LT

N

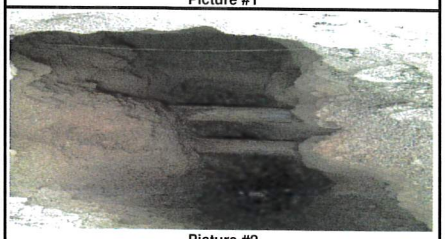
Overall Location of Test Hole

TEST HOLE LOCATION PLAN



TEST HOLE PICTURES

Picture #1



Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Stop Sign	64.20
B	Sewer Manhole	127.10
C	Speed Limit Sign	99.10

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	8	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	5-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

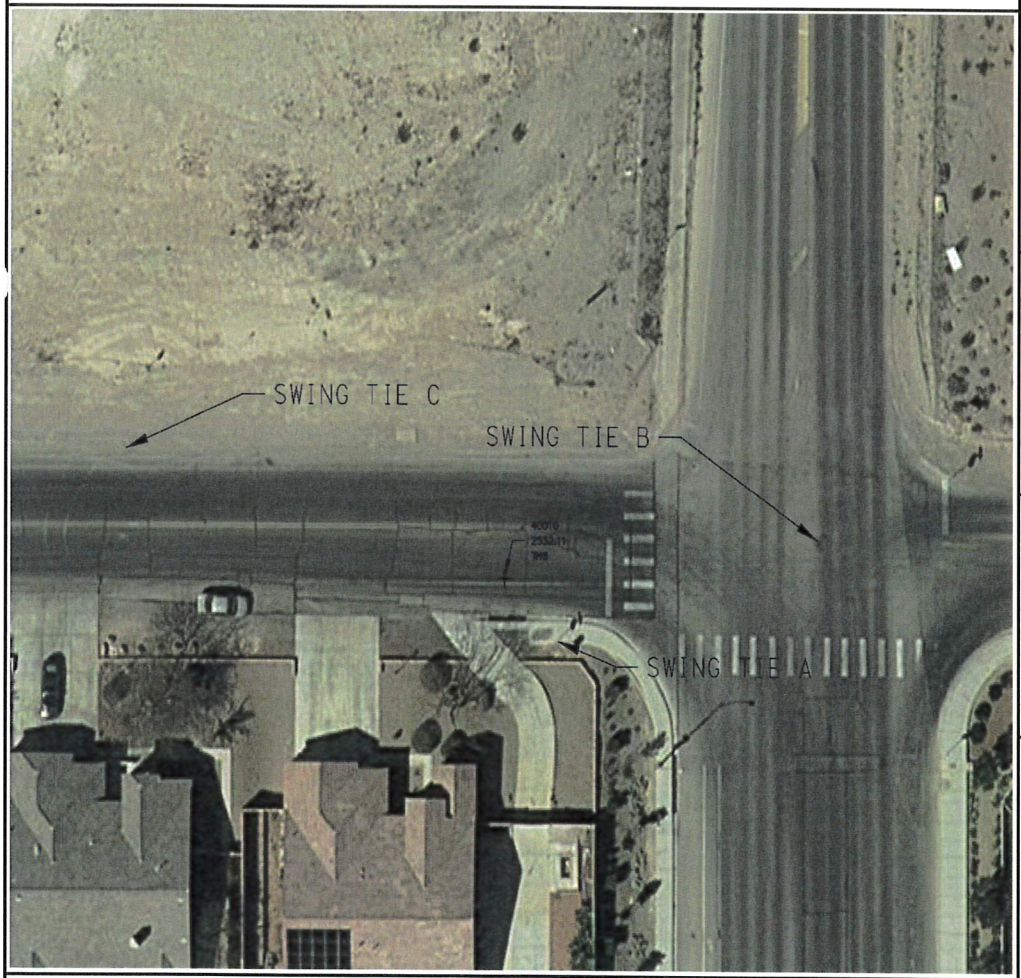
Test Hole Data

Utility Type:	Gas	Utility Size:	2-inch	Utility Material:	Plastic
Utility Company:	Southwest Gas	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Asphalt	Thickness:	6 inches	Marker Type:	PK Nail
Depth to Top:	3.30	Top Ref. Level:	8.37	Hand Meas. Top:	3.30
Depth to Bottom:	3.47	Bot. Ref. Level:	8.54	Hand Meas. Bot:	N/A
Top Elevation:	2528.809	Mkr. Ref. Level:	5.07	Ref. Elevation:	2532.109
Bottom Elevation:	2528.639	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	8.1 RT

N

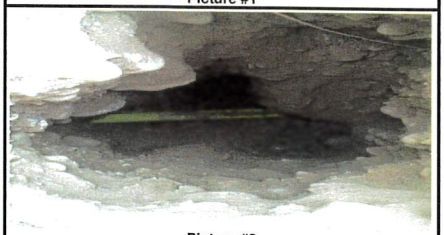
Overall Location of Test Hole

TEST HOLE LOCATION PLAN



TEST HOLE PICTURES

Picture #1



Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Stop Sign	22.00
B	Sewer Manhole	104.40
C	Speed Limit Sign	132.30

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Offset Facing East

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	9	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	3-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

Test Hole Data

Utility Type:	Gas	Utility Size:	4-inch	Utility Material:	Plastic
Utility Company:	Southwest Gas	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Asphalt	Thickness:	6 inches	Marker Type:	PK Nail
Depth to Top:	2.44	Top Ref. Level:	7.51	Hand Meas. Top:	2.44
Depth to Bottom:	2.77	Bot. Ref. Level:	7.84	Hand Meas. Bot:	N/A
Top Elevation:	2527.772	Mkr. Ref. Level:	5.07	Ref. Elevation:	2530.212
Bottom Elevation:	2527.442	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	13.9 RT

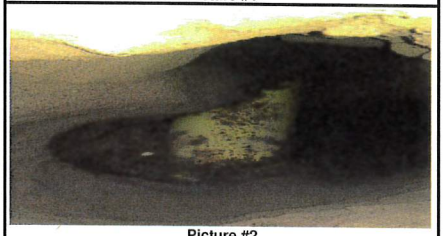
N

Overall Location of Test Hole

TEST HOLE LOCATION PLAN

TEST HOLE PICTURES

Picture #1



Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Warning Sign	138.10
B	Stop Sign	105.40
C	Street Light	19.90

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	10	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	3-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

Test Hole Data

Utility Type:	Water	Utility Size:	12-inch	Utility Material:	PVC
Utility Company:	City Of North Las Vegas	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Asphalt	Thickness:	5 inches	Marker Type:	PK Nail
Depth to Top:	3.22	Top Ref. Level:	8.29	Hand Meas. Top:	3.22
Depth to Bottom:	4.22	Bot. Ref. Level:	9.29	Hand Meas. Bot:	N/A
Top Elevation:	2526.832	Mkr. Ref. Level:	5.07	Ref. Elevation:	2530.052
Bottom Elevation:	2525.832	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	4.1 RT

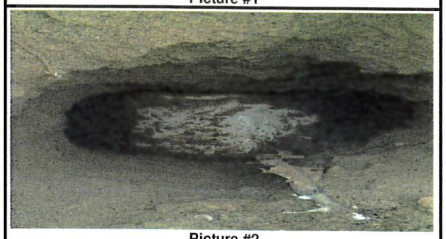
N

Overall Location of Test Hole

TEST HOLE LOCATION PLAN

TEST HOLE PICTURES

Picture #1



Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Warning Sign	143.30
B	Stop Sign	116.50
C	Street Light	10.30

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	11	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	3-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

Test Hole Data

Utility Type:	Gas	Utility Size:	4-inch	Utility Material:	Plastic
Utility Company:	Southwest Gas	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Asphalt	Thickness:	6 inches	Marker Type:	PK Nail
Depth to Top:	2.60	Top Ref. Level:	7.79	Hand Meas. Top:	2.60
Depth to Bottom:	2.93	Bot. Ref. Level:	8.12	Hand Meas. Bot:	N/A
Top Elevation:	2528.158	Mkr. Ref. Level:	5.19	Ref. Elevation:	2530.758
Bottom Elevation:	2527.828	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	14.0 RT

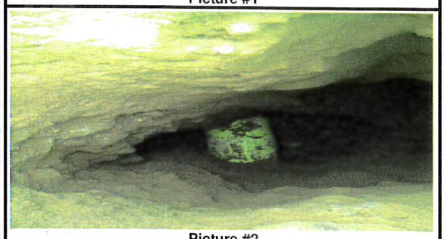
N

Overall Location of Test Hole

TEST HOLE LOCATION PLAN

TEST HOLE PICTURES

Picture #1



Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Water Valve	47.80
B	Street Light	72.40
C	Crosswalk Sign	105.70

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	11A	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	23-Feb-15	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

Test Hole Data

Utility Type:	Gas	Utility Size:	4-inch	Utility Material:	Plastic
Utility Company:	Southwest Gas	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Asphalt	Thickness:	4 inches	Marker Type:	PK Nail
Depth to Top:	2.50	Top Ref. Level:	7.61	Hand Meas. Top:	2.50
Depth to Bottom:	2.84	Bot. Ref. Level:	7.95	Hand Meas. Bot:	N/A
Top Elevation:	-2.500	Mkr. Ref. Level:	5.11	Ref. Elevation:	
Bottom Elevation:	-2.840	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	15.3 RT

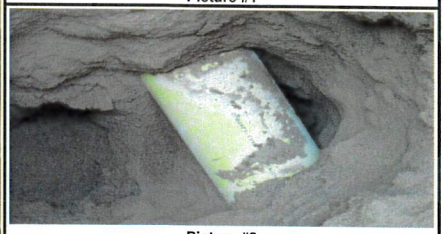
N

Overall Location of Test Hole

TEST HOLE LOCATION PLAN

TEST HOLE PICTURES

Picture #1



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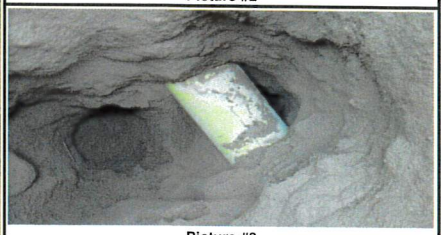


Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Street Light	39.70
B	Crosswalk Sign	83.20
C	East Edge Of Oil	70.00

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	12	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	3-Dec-14	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

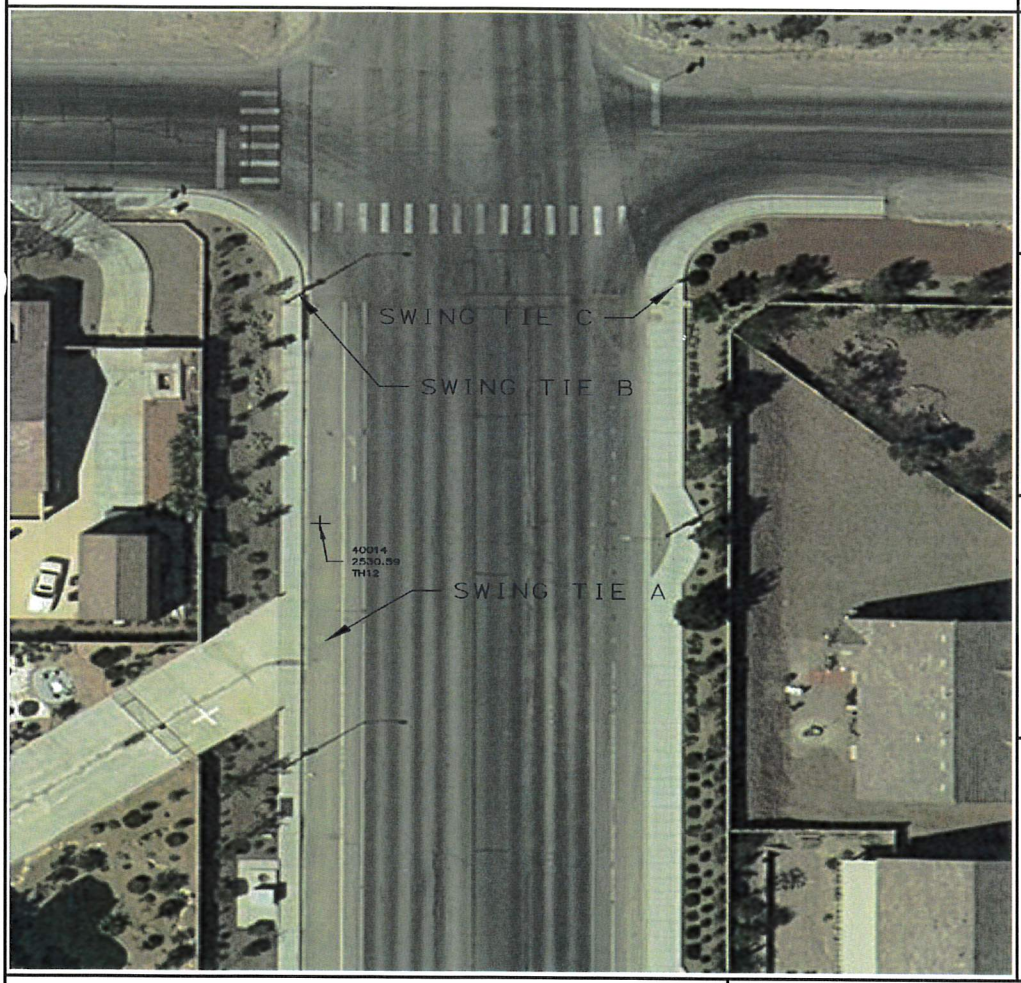
Test Hole Data

Utility Type:	Water	Utility Size:	12-inch	Utility Material:	PVC
Utility Company:	City Of North Las Vegas	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Asphalt	Thickness:	6 inches	Marker Type:	PK Nail
Depth to Top:	3.10	Top Ref. Level:	8.29	Hand Meas. Top:	3.10
Depth to Bottom:	4.10	Bot. Ref. Level:	9.29	Hand Meas. Bot:	N/A
Top Elevation:	2527.493	Mkr. Ref. Level:	5.19	Ref. Elevation:	2530.593
Bottom Elevation:	2526.493	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	4.4 RT

N

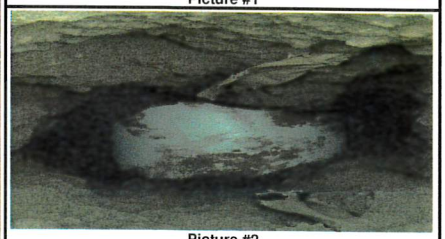
Overall Location of Test Hole

TEST HOLE LOCATION PLAN



TEST HOLE PICTURES

Picture #1



Picture #2

Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Water Valve	41.00
B	Street Light	75.40
C	Crosswalk Sign	116.30

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

Test Hole Summary Sheet

HORROCKS ENGINEERS

TH #:	12A	Completed By:	Justin Conlin
Utility ID #:		QA/QC By:	Shawn Conlin
Date:	23-Feb-15	HE Project #:	LV-823-1412
Project City:	North Las Vegas	Client Project #:	Brent Lane Drainage System & Trail
Project County:	Clark	Sheet:	Pothole Exhibit

1349 Galleria Drive. Suite 110
Henderson, Nevada 89014
Phone: 702.966.4063 Fax: 702.395.1408

Test Hole Data

Utility Type:	Water	Utility Size:	12-inch	Utility Material:	PVC
Utility Company:	City Of North Las Vegas	English/Metric:	English	Soil Conditions:	Dirt
Surface Type:	Asphalt	Thickness:	4 inches	Marker Type:	PK Nail
Depth to Top:	3.10	Top Ref. Level:	8.07	Hand Meas. Top:	3.10
Depth to Bottom:	4.10	Bot. Ref. Level:	9.07	Hand Meas. Bot:	N/A
Top Elevation:	-3.100	Mkr. Ref. Level:	4.97	Ref. Elevation:	
Bottom Elevation:	-4.100	Mkr. Offset From:	Edge Of Oil	Marker Offset (ft):	4.7 RT

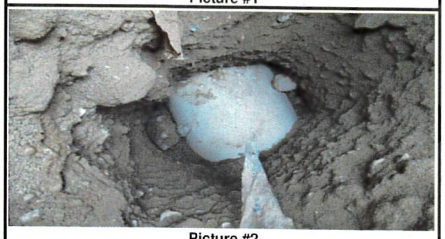
N

Overall Location of Test Hole

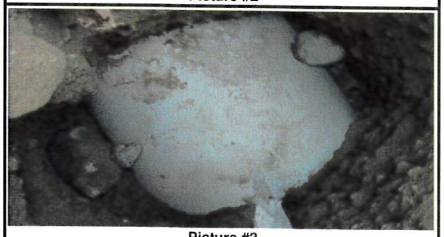
TEST HOLE LOCATION PLAN

TEST HOLE PICTURES

Picture #1



Picture #2



Picture #3

Picture #4

Swing Ties - 3 per Test Hole

Swing Tie	Structure Pulled From	Distance (FT)
A	Street Light	38.40
B	Crosswalk Sign	94.80
C	East Edge Of Oil	80.80

General Notes About This Test Hole

Bottom Depth was determined by calculation of pipe diameter.

DEPARTMENT OF PUBLIC WORKS

Mayor:
CAROLYN G. GOODMAN

City Council:
STAVROS S. ANTHONY (Mayor Pro-Tem)
LOIS TARKANIAN
STEVEN D. ROSS
RICKI Y. BARLOW
BOB COFFIN
BOB BEERS

City Manager:
ELIZABETH N. FRETWELL

Director of Public Works:
DAVID N. BOWERS, P.E., P.T.O.E.

City Engineer:
ALLEN E. PAVELKA, P.E.

BRENT LANE DRAINAGE SYSTEM & TRAIL

Funded By:
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
SOUTHERN NEVADA PUBLIC LAND MANAGEMENT ACT

Reviewed By:

CLV CITY ENGINEER — DATE

CLV PROJECT MANAGER — DATE

CLV CITY TRAFFIC ENGINEER — DATE

CLV CONSTRUCTION MANAGER — DATE

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT — DATE

CLARK COUNTY PUBLIC WORKS — DATE

SOUTHWEST GAS CORPORATION — DATE

CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK — DATE
THE AFFIXED CENTURYLINK NEVADA APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION STANDARD REGULATIONS.

COX COMMUNICATIONS LAS VEGAS, INC. — DATE

NV ENERGY – DISTRIBUTION — DATE
NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

NV ENERGY - TRANSMISSION — DATE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 123165
SHEETS: CV, GN-01, GN-02, RD-01, RD-02, SD-01 THRU SD-09, GR-01 THRU GR-04

THE SIGNATURE ABOVE ACKNOWLEDGES THAT THE UTILITY COMPANY REPRESENTATIVE HAS REVIEWED THE PLANS, AND THAT TO THE BEST OF HIS OR HER KNOWLEDGE THE UTILITY LINES ARE SHOWN IN THE CORRECT LOCATIONS AND ARE THE CORRECT SIZES. WHILE SUCH DATA HAS BEEN COLLECTED WITH REASONABLE CARE, THERE IS NO EXPRESSED OR IMPLIED GUARANTEE THAT THE LOCATIONS ARE EXACT. THE CONTRACTOR SHALL BEAR THE RESPONSIBILITY OF OBTAINING THE ACTUAL FIELD LOCATIONS.

THE SIGNATURE ABOVE FURTHER ACKNOWLEDGES THAT THE UTILITY COMPANY DOES NOT ANTICIPATE CONSTRUCTION OR MAINTENANCE IN THE PROJECT AREA FOR FIVE (5) YEARS IN CONFORMANCE WITH THE CLV NO-CUT POLICY.

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

NO.	DATE	REVISIONS

PREPARED FOR: CITY OF LAS VEGAS
H# 49976 | BID# - | DESIGNED BY: DAM | DRAWN BY: DAM | CHECKED BY: JSR
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE: BRENT LANE DRAINAGE SYSTEM & TRAIL
SHEET: COVER SHEET

PROFESSIONAL ENGINEER — STATE OF NEVADA — MARK FINNAN — 6/30/2015 — CIVIL — No. 14566

SHEET CV
1 OF 56
DRAWING NO. -

F:\CLV1401 - Brent Lane\Sheet Sets\DWG\G.dwg, CV, 3/20/2015 3:09:06 PM, dmyhre

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".

2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCE WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.

3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER OR OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.

4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.

5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGN TO BE APPROVED BY THE QUALITY CONTROL DIVISION, PRIOR TO THE USE ON THE PROJECT.

6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.

7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.

8. AC PAVEMENT TO BE 1/2" ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS.

9. CURB AND GUTTER WITH A GRADE OF LESS THAN FOUR-TENTHS OF ONE PERCENT SHALL BE WATER-TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION. ANY CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY SHALL BE REMOVED AND REPLACED PER USD 216.

10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER USD 235, CASE I. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY PROJECT REPRESENTATIVE.

11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF TRANSITIONS TO BE AS SHOWN ON PLANS, OR AS DESIGNATED IN THE FIELD BY CITY PROJECT REPRESENTATIVE.

    EXACT LOCATION OF ALL SAWCUT LINES MAY BE DETERMINED IN THE FIELD BY A CITY PROJECT REPRESENTATIVE IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.

13. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED, AND SHALL BE DONE ONLY BY A NEVADA PROFESSIONAL LAND SURVEYOR IN ACCORDANCE WITH THE UNIFORM STANDARD DRAWINGS - CLARK COUNTY AREA. A RECORD-OF-SURVEY FOR REPLACEMENT OF PERMANENT SURVEY MONUMENTS SHALL BE SUBMITTED TO THE CITY ENGINEER FOR APPROVAL PRIOR TO RECORDING. THE RECORD-OF-SURVEY SHALL BE PREPARED IN ACCORDANCE WITH NEVADA REVISED STATUTES 625.350.

14. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE AFFECTED UTILITY COMPANY AND THE CITY ENGINEER.

15. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE CLV BUILDING DEPARTMENT.

16. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHTS OF WAY.

17. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, SEWER CLEANOUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.

18. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT AND CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.

19. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO THE ENGINEER CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.

20. SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S) SHALL BE PROVIDED TO THE ENGINEER PRIOR TO PROJECT ACCEPTANCE. THE MAP(S) SHALL INCLUDE THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES, STORM DRAIN LATERAL LOCATIONS, STORM DRAIN LATERAL ANGLE POINTS, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, AND THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXITS THE PUBLIC RIGHT-OF-WAY. THE LOCATION SHALL BE DESCRIBED BY COORDINATES WHICH SHALL BE BASED ON THE OFFICIAL HORIZONTAL AND VERTICAL CONTROL NETWORKS OF THE CITY OF LAS VEGAS. FINAL LOCATION MAPS MUST BE SEALED AND CERTIFIED BY A NEVADA PROFESSIONAL LAND SURVEYOR TO HAVE POSITIONAL CERTAINTIES OF ± 0.09 METERS (± 0.3 FEET) HORIZONTALLY AND VERTICALLY. A SEPARATE ELECTRONIC COMMA DELIMITED FILE FOR THE SANITARY SEWER AND STORM DRAIN COORDINATES SHALL ALSO ACCOMPANY THE SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S).

21. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST ADDITION.

22. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

REVISED MARCH 13, 2013 (CPM VERSION)

ABBREVIATIONS

@	AT	MLCP	MULTI-LAYER COMPOSITE PIPE
AC	ASPHALTIC CONCRETE	MUT	MULTI-USE TRAIL
ACP	ASBESTOS CEMENT PIPE	NTS	NOT TO SCALE
AEP	AUTHORIZATION TO ENTER PROPERTY	NVE	NV ENERGY
APPROX.	APPROXIMATE	OHP	OVERHEAD POWER LINE
B/C, BC	BACK OF CURB	PAE	PEDESTRIAN ACCESS EASEMENT
BCR	BACK OF CURB RADIUS	PB	PULLBOX
BM	BENCHMARK	PBS	PLANT MIX BITUMINOUS SURFACE
BOT	BOTTOM	PC	POINT OF CURVE
B.R.	BACK OF RAMP	PGL	PROPOSED GRADE LINE
℄, CL	CENTERLINE	P., PL	PROPERTY LINE
CATV	CABLE T.V.	P.I.P.	PROTECT IN PLACE
CIPP	CURED-IN-PLACE PIPE	PP	POWER POLE
CLV	CITY OF LAS VEGAS	PT	POINT OF TANGENCY
CONC.	CONCRETE	PRC	POINT OF REVERSE CURVE
COND.	CONDUCTOR	R	RADIUS
CLSM	CONTROLLED LOW STRENGTH MATERIAL	RT	RIGHT
C & G	CURB AND GUTTER	R/W, R.O.W.	RIGHT OF WAY
D/W	DRIVEWAY	SCCP	STEEL CYLINDER CONCRETE PIPE
DWG.	DRAWING	SD	STORM DRAIN
ECR	END OF CURB RETURN (AT B/C)	SF	SQUARE FOOT
ELEC.	ELECTRIC	SS	SANITARY SEWER
EOP, EP	EDGE OF PAVEMENT	STA.	STATION
ELEV.	ELEVATION	STD	STANDARD
EXIST., EX.	EXISTING	SY	SQUARE YARD
EXOH	EXISTING OVERHEAD UTILITY	S/W	SIDEWALK
FD	FOUND	T	TELEPHONE LINE
FL	FLOWLINE	TC	TOP OF CURB
FG	FINISHED GRADE	TEL	TELEPHONE
FH	FIRE HYDRANT	TRANS.	TRANSITION
FT.	FOOT/FEET	T.R.C.	TOP OF RAMP CURB
FC	FACE OF CURB	TS	TRAFFIC SIGNAL
G	GAS	TYP.	TYPICAL
GV	GAS VALVE	USD	UNIFORM STD DRAWING
GW	GUY WIRE	USS	UNIFORM STD SPECIFICATIONS
INT.	INTERSECTION	W	WATER LINE
IRR	IRRIGATION	WC	WHEEL CHAIR
L	LENGTH	WM	WATER METER
LF	LINEAL FOOT, LINEAR FEET	WV	WATER VALVE
LT	LEFT	W/	WITH
MH	MANHOLE	△	INCLUDED DELTA ANGLE

RTC NOTES

1. THE CONTRACTOR SHALL NOT BE ALLOWED TO CLOSE MORE THAN ONE CONSECUTIVE BUS STOP ON THE SAME SIDE OF THE STREET. TEMPORARY CLOSURES SHALL BE PWD (PERSONS WITH DISABILITY) ACCESSIBLE BEFORE ANY BUS STOP CAN BE CLOSED. THE CONTRACTOR SHALL NOTIFY CARL SCARBROUGH AT (702) 676-1608 OR ERIC TRAASDAHL AT (702) 676-1633, AT LEAST SEVEN WORKING DAYS IN ADVANCE.

2. THE CONTRACTOR SHALL SUBMIT A BUS STOP CLOSURES SCHEDULE WITH THE TRAFFIC CONTROL PLAN. THE BUS STOP CLOSURE SCHEDULE SHALL IDENTIFY SPECIFIC DURATIONS AND TIMES OF THE DAY FOR ALL PROPOSED BUS STOP CLOSURES. BUS STOP CLOSURES ARE NOT TO EXCEED TWO CONSECUTIVE STOPS AT ONE TIME, OR MORE THAN 1,000 FEET AT A TIME. PERSONS WITH DISABILITIES SHALL HAVE ACCESS TO BUS STOPS. THE CONTRACTOR SHALL PROVIDE A 100 FOOT LONG BY 10 FEET WIDE GRAVELED TURN OUT AT TEMPORARY BUS STOPS.

REVISED FEBRUARY 14, 2013

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS AND LAS VEGAS HIGH ELEVATION ZONES, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN. THE REFERENCE FRAME BEING NAD 83 (2011) EPOCH 2010

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 5LV908NEE6, BEING A RIVET AND PLATE IN THE TOP OF CURB AT THE SOUTHWEST CORNER OF BRENT LANE AND DURANGO DRIVE.

ELEVATION (NAVD88) = 771.278 METERS = 2530.43 FEET (2008 ADJUSTMENT)

CITY OF LAS VEGAS GRADING NOTES

1. IN THE EVENT THAT ANY UNFORESEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.

2. 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 SUBGRADE, FINISH GRADES AND SLOPES SHOWN.

3. CONTRACTOR SHALL TAKE FULL 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.

4. 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 PERMIT.

5. 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
A. PAVEMENT AREA SUBGRADE	0.1'±	+0.0' TO -0.1'
B. ENGINEERED FILL	0.5'±	+0.1' TO -0.1'

COMPACTION TESTING WILL BE PERFORMED BY THE OWNER OR HIS REPRESENTATIVE. COMPACTION SHALL COMPLY WITH THE REQUIREMENTS OF THE ENGINEER.

6. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.

7. 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.

8. 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 THE 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.

9. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, SUCH ITEM SHALL BE PROVIDED, AS DIRECTED BY THE CITY ENGINEER, AT NO EXPENSE TO THE CITY OF LAS VEGAS. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

REVISED JULY 2008 (CPM VERSION)

CITY OF LAS VEGAS TRAFFIC NOTES

1. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.

2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.

3. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.

4. WHEN A DESIGNATED "SAFE ROUTE TO SCHOOL" IS ENCROACHED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFIES A NEED FOR STUDENTS TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.

5. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.

6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. ALL NEW TRAFFIC SIGNS SHALL BE FABRICATED WITH DIAMOND GRADE VIP CLASS 6 REFLECTIVE SHEETING OR APPROVED EQUAL. ALL NEW TRAFFIC SIGNS, EXCEPT STREET NAME AND SCHOOL SPEED LIMIT SIGNS, SHALL HAVE 3M SERIES 1160 OR APPROVED EQUIVALENT ANTI-GRAFFITI PROTECTIVE OVERLAY FILM; SCHOOL ZONE SIGNS SHALL HAVE 3M SERIES 1150 ANTI-GRAFFITI PROTECTIVE OVERLAY FILM. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.

7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.

8. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.

9. STREET SIGNS AND STOP SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.

10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK AREA. THE CONTRACTOR SHALL HAVE A CERTIFIED ATSSA TRAFFIC CONTROL TECHNICIAN OR IMSA WORK ZONE SAFETY SPECIALIST SET UP, MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHT OF WAY.

11. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.

12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING CITIZENS AREA TRANSIT (C.A.T.) IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.

13. GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE # 828-3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMENTS WITH METRO.

14. ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.

15. THE CONTRACTOR SHALL CONTACT THE TRAFFIC ENGINEERING DIVISION (TRANSPORTATION SECTION) THROUGH THE PROJECT'S OFFSITE INSPECTOR PRIOR TO INITIATING PAVING TO RECEIVE DIRECTION FOR ANY PERMANENT OR TEMPORARY MODIFICATIONS TO THE APPROVED DRAWINGS REGARDING FINAL PAVEMENT TRANSITIONS, MARKINGS AND SIGNING THAT ARE REQUIRED TO MATCH ADJACENT ROADWAY SEGMENTS. THE CONTRACTOR SHALL PROVIDE A DRAWING FOR APPROVAL BY THE TRAFFIC ENGINEERING DIVISION DEPICTING ANY ADJUSTMENTS TO THE FINAL PAVEMENT MARKINGS AND SIGNAGE, WHICH MAY INCLUDE OMITTING, ADDING OR MODIFYING PAVEMENT MARKINGS AND TRAFFIC CONTROL SIGNS SUCH THAT ADEQUATE TRANSITIONS AND LANE TERMINATIONS BETWEEN ADJACENT ROADWAY SEGMENTS ARE CONSTRUCTED.

REVISED 04/15/10

CITY OF LAS VEGAS SEWER NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENTS OF THE ABOVE SPECIFICATIONS.

2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY PLANNING ENGINEER.

3. CHISEL "S" OR "G" IN CURBS WHERE SEWER OR GAS LATERALS PASS UNDER THE CURB.

4. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D-3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACKFILL OF TYPE II AGGREGATE BASE.

5. ALL MANHOLES PAVED IN STREETS EIGHTY (80') FOOT R/W AND LARGER SHALL HAVE CONCRETE COLLARS. STREETS LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.

6. TEE SADDLES SHALL BE USED TO CONNECT SEWER LATERALS TO EXISTING MAIN LINES UP TO TWELVE INCH (12") DIAMETER. CONNECTIONS TO FIFTEEN INCH (15 ") OR LARGER MAINS SHALL REQUIRE SPECIAL PROCEDURES. IN LINE "Y" 'S SHALL BE USED ON LINES TWELVE INCHES (12 ") OR ABOVE.

7. WATER MAINS SHALL BE PROTECTED IN ACCORDANCE WITH LVVWD STANDARDS WHENEVER A SEWER MAIN CROSSES OVER A WATER MAIN OR THE SEWER IS LESS THAN EIGHTEEN INCH (18 ") UNDER A WATER MAIN.

8. ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CITY OF LAS VEGAS MUST BE STATE OF NEVADA CLASS "A" CONTRACTORS.

9. THE CITY OF LAS VEGAS WILL NOT ACCEPT ANY SEWER MAINS WHICH HAVE A VERTICAL DEFLECTION OF MORE THAN ONE TENTH (0.1) OF A FOOT FROM THE APPROVED CONSTRUCTION PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY PLANNING ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.

10. INSTALLATION OF CURVED SEWERS REQUIRES THE USE OF C-900 PVC PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

REVISED JANUARY 2008

LVVWD STANDARD NOTES

LVVWD PROJECT # 123165

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LVVWD. FOLLOWING WATER PLAN APPROVAL, NOTICE SHALL BE GIVEN TO THE LVVWD COMMUNICATION SUPPORT CENTER (258-7171) TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. FOR FUTURE INSPECTIONS, NOTICE MUST BE GIVEN BY 2:00 P.M. THE BUSINESS DAY PRIOR TO THE REQUESTED LVVWD INSPECTION. WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT# IDENTIFIED ABOVE.

2. ALL WORK SHALL CONFORM TO LVVWD STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS, AND TO THE 2010 EDITION OF THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS). THE LATEST EDITION OF UDACS SHALL SUPERSEDE ANY CONFLICTS CONTAINED IN THE APPROVED DRAWINGS AND/OR SPECIFICATIONS.

3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2 ABOVE, SHALL BE DONE IN ACCORDANCE WITH THE MOST RECENT DRAFT OR EDITION OF THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENT, CLARK COUNTY AREA.

4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY THE LVVWD.

5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE TYPE K COPPER TUBING WITH LVVWD APPROVED SERVICE SADDLES.

6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.

7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.

8. ALL WATER AND STORM DRAIN OR SANITARY SEWER CROSSINGS SHALL CONFORM TO SECTION 2.22 OF THE 2010 EDITION OF THE UDACS.

9. ALL WATER FACILITIES SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD DISTRIBUTION SYSTEM.

10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND SMALLER FROM LVVWD CENTRAL STORES. TELEPHONE 258-3152 OR 258-3602, TWO (2) WORKING DAYS PRIOR TO METER PICKUP.

11. ANY INTERRUPTION OF SERVICE MUST BE PERFORMED IN ACCORDANCE WITH UDACS SECTION 3.14.01, AND APPROVED BY THE LVVWD INSPECTION DIVISION PRIOR TO SHUTDOWN. PROPER WRITTEN NOTIFICATION MUST BE GIVEN TO ALL AFFECTED CUSTOMERS.

12. ALL WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE AS LISTED ON THE LVVWD PRE-APPROVED MATERIALS AND MANUFACTURER'S LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.

13. TELEPHONE "CALL BEFORE YOU DIG" AT "811" OR 1-800-227-2600

14. THE INSTALLATION OF LAS VEGAS VALLEY WATER DISTRICT (LVVWD) MUNICIPAL WATER FACILITIES WITHIN ALL STREETS IS ASSUMED TO BE IN COMPLIANCE WITH THE UNIFORM STANDARDS, INCLUDING THE PLACEMENT OF ASPHALT PAVING STREET SURFACES. ANY REPAIR WORK DONE BY THE LVVWD TO THE MUNICIPAL FACILITIES WILL INCLUDE THE PLACEMENT OF ANY APPROPRIATELY SIZED ASPHALT REPAIR PATCH ON THE STREET SURFACE.

    ANY DECORATIVE PAVING SURFACE WITHIN THE STREET IS THE RESPONSIBILITY OF THE OWNER'S ASSOCIATION, OR THE INDIVIDUAL PROPERTY OWNERS IF NO OWNER'S ASSOCIATION IS IN EXISTENCE, OR THE AGENCY HAVING JURISDICTION. DECORATIVE SURFACE MATERIALS PLACED WITHIN THE TEN FOOT EASEMENT ABUTTING A PUBLIC OR PRIVATE STREET, IF DISTURBED BY THE LVVWD DURING THE REPAIR OR OPERATION OF ITS FACILITIES, WILL BE REPLACED BY LVVWD WITH AN APPROPRIATELY SIZED PLAIN FINISH CONCRETE PATCH. THE LVVWD WILL NOT RESTORE, AND WILL NOT BE RESPONSIBLE FOR THE RESTORATION OF, ANY DECORATIVE PAVING SURFACE WITHIN THE STREET. THE LVVWD WILL NOT ATTEMPT TO MATCH COLOR OR FINISH OF ANY ADJACENT MATERIALS.

APPROVED FOR CONSTRUCTION	
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER	
DATE:	PROJECT# 123165

CITY OF LAS VEGAS STREET LIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION, AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION.

2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS (ETC.) LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE TRAFFIC AND CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623 OF THE SPECIFICATIONS.

3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.

4. ALL EMPTY CONDUIT SHALL HAVE PULL STRINGS AND A #8 AWG TRACER WIRE INSTALLED PER SECTION 623 G.02.01 OF THE SPECIFICATIONS PRIOR TO BACKFILLING AND FINAL INSPECTION.

5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN COMPLIANCE WITH USD NO. 320A WHEN POLE IS INSTALLED BEHIND SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENC

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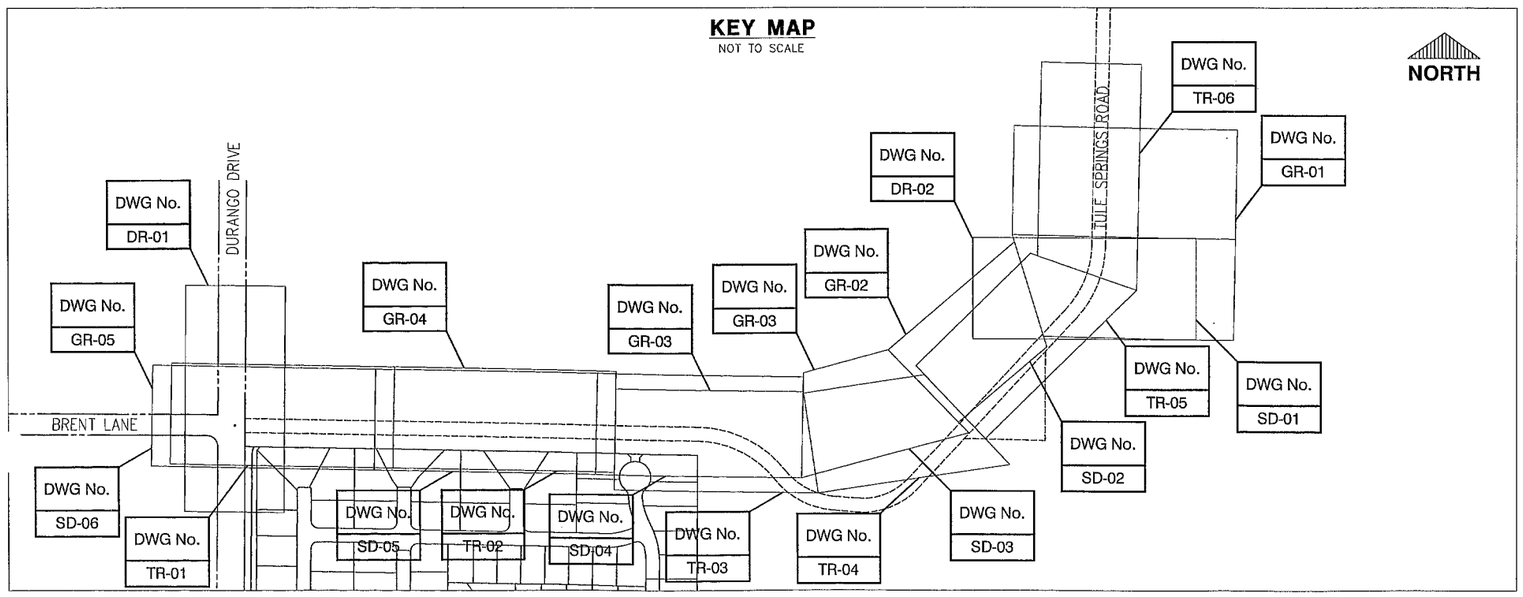
24	GR-01	GRADING PLAN "SD" 10+00.00 TO "SD" 14+50.00			
25	GR-02	GRADING PLAN "SD" 14+50.00 TO "SD" 18+50.00			
26	GR-03	GRADING PLAN "SD" 18+50.00 TO "SD" 28+50.00			
27	GR-04	GRADING PLAN "SD" 28+50.00 TO "SD" 40+55.00			
28	TR-01	TRAIL PLAN AND PROFILE "TR" 51+50.00 TO "TR" 58+00.00			
29	TR-02	TRAIL PLAN AND PROFILE "TR" 58+00.00 TO "TR" 64+50.00			
	TR-03	TRAIL PLAN AND PROFILE "TR" 64+50.00 TO "TR" 70+50.00			
31	TR-04	TRAIL PLAN AND PROFILE "TR" 70+50.00 TO "TR" 75+00.00			
32	TR-05	TRAIL PLAN AND PROFILE "TR" 75+00.00 TO "TR" 80+50.00			
33	TR-06	TRAIL PLAN AND PROFILE "TR" 80+50.00 TO "TR" 85+51.69			
34	TR-07	TRAIL TYPICAL SECTIONS			
35	TR-08	TRAIL DETAILS			
36	TR-09	TRAIL DETAILS			
37	TR-10	TRAIL DETAILS			

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 123165

KEY MAP
NOT TO SCALE



CLARK COUNTY GENERAL NOTES (CLARK COUNTY JURSDICTION ONLY)

1. ALL REFERENCES TO STANDARD DRAWINGS ARE TO STATE OF NEVADA STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION LATEST ENGLISH EDITION, "THE UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA" OR "THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA" AS NOTED.
2. THE CONTRACTOR SHALL NOTIFY ALL AFFECTED PUBLIC ENTITIES, THE PROJECT ENGINEER, CLARK COUNTY AT LEAST 48 HOURS PRIOR TO THE COMMENCEMENT OF WORK.
3. LOCATIONS OF UNDERGROUND UTILITIES SHOWN ON THE DRAWINGS WERE OBTAINED FROM INFORMATION RECEIVED FROM THE APPLICABLE UTILITY COMPANIES. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES OR STRUCTURES NOT SHOWN, OR FOR UTILITIES OR STRUCTURES NOT SHOWN AT ACTUAL LOCATIONS ON THE DRAWINGS. EXISTING SERVICE LATERALS ARE NOT SHOWN ON THESE DRAWINGS. CONTRACTOR TO VERIFY THE EXACT LOCATION OF UTILITIES PRIOR TO START OF CONSTRUCTION. THE CONTRACTORS RESPONSIBILITY REGARDING UTILITIES SHALL BE AS REQUIRED UNDER SECTION 107.17 OF THE UNIFORM STANDARD SPECIFICATIONS FOR CLARK COUNTY AREA, NEVADA AND AS PROVIDED IN THE SPECIFICATIONS.
4. THE CONTRACTOR SHALL NOT REMOVE TREES, SHRUBS, LAWNS, WALLS, FENCES, SIGNS, STRUCTURES, LIGHTS, OR ANY EXISTING IMPROVEMENTS OUTSIDE OF STREET RIGHT-OF-WAY, EXCEPT WHERE REQUIRED TO DO SO BY THE CONTRACT DRAWINGS OR BY THE ENGINEER. REPLACEMENT, RELOCATION OR RECONSTRUCTION OF ALL EXISTING IMPROVEMENTS INCLUDING SPRINKLER SYSTEMS, LAWNS, FENCES, WALLS, SIGNS, STEPS, SIDEWALK, DRIVEWAYS, LAWN LIGHTS, AND ALL OTHER ITEMS APPLICABLE TO THIS CONTRACT SHALL BE AS REQUIRED BY THE ENGINEER.
5. THE CONTRACTOR SHALL BACKFILL AND FINE GRADE ALL CUT OR FILL SLOPES TO MATCH EXISTING CONDITIONS TO THE SATISFACTION OF THE ENGINEER. WHERE EXISTING LAWNS ARE DAMAGED BY THE CONTRACTOR'S OPERATIONS, THE CONTRACTOR SHALL SOD THE AFFECTED AREA TO A CONDITION EQUAL TO OR BETTER THAN THAT WHICH EXISTED PRIOR TO CONSTRUCTION.
6. ALL BARRICADING AND TEMPORARY TRAFFIC CONTROL DEVICES OR METHODS USED DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA, NEVADA" LATEST EDITION.
7. REMOVAL OR RELOCATIONS OF POWER POLES, TELEPHONE POLES, JOINTLY-OWNED POLES, AND APPURTENANCES WHICH INTERFERE WITH IMPROVEMENTS REQUIRED TO BE CONSTRUCTED UNDER THIS CONTRACT, SHALL BE THE RESPONSIBILITY OF THE RESPECTIVE UTILITY COMPANY. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE UTILITY COMPANIES FAR ENOUGH IN ADVANCE AS TO NOT IMPACT THE SCHEDULE.
8. NV ENERGY SHALL BE RESPONSIBLE FOR THE RELOCATION OF UNDERGROUND OR OVERHEAD POWER LINES THAT INTERFERE WITH THE REQUIRED IMPROVEMENTS AS SHOWN ON THE PLANS.
9. POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENT SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.
10. CENTURYLINK SHALL BE RESPONSIBLE FOR THE VERTICAL OR HORIZONTAL ADJUSTMENT OF ALL TELEPHONE FACILITIES WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
11. COX COMMUNICATIONS SHALL BE RESPONSIBLE FOR THE VERTICAL OR HORIZONTAL ADJUSTMENT OF ALL CATV FACILITIES WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
12. SOUTHWEST GAS CORPORATION SHALL PERFORM ANY NECESSARY WORK ON THE EXISTING AND PROPOSED GAS FACILITIES SHOWN ON THE DRAWINGS.
13. UNLESS OTHERWISE SHOWN ON THE CONTRACT DRAWINGS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OR RELOCATION OF ALL WATER SERVICES AND METERS WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE VERTICAL ADJUSTMENT OF ALL EXISTING SANITARY, WATER AND STORM SEWER MANHOLES TO THE FINAL FINISH GRADES IN ACCORDANCE WITH SECTION 600 OF THE "STANDARD SPECIFICATIONS".
15. ALL SANITARY SEWER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CLARK COUNTY WATER RECLAMATION DISTRICT DESIGN AND CONSTRUCTION STANDARDS AND THE CITY OF LAS VEGAS AND CITY OF NORTH LAS VEGAS CONSTRUCTION STANDARDS.
16. THE PLANS DO NOT SHOW ALL SEWER LATERALS. SEWER FORCE MAINS AND WATER SERVICE LATERALS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY REPAIRS OR RELOCATIONS OF LATERALS BROKEN OR IN CONFLICT WITH THE PROPOSED STORM DRAIN OR ROADWAY CONSTRUCTION.
17. CONTRACTOR SHALL MAINTAIN CONTINUOUS SEWER SERVICE TO ALL CUSTOMERS. SEWER LATERALS CUT DURING CONSTRUCTION SHALL BE REPAIRED BY CONTRACTOR PER CCRWD DESIGN AND CONSTRUCTION STANDARDS. CONTRACTOR SHALL IMMEDIATELY REPORT ANY SANITARY SEWER OR SEWER LATERALS THAT CANNOT BE RECONNECTED TO SEWER MAIN DUE TO STORM DRAIN CONFLICT. CLARK COUNTY SHALL BE RESPONSIBLE FOR PROVIDING RESUBMITTED APPROVED MAIN LINE SEWER EXTENSION PLANS TO PROVIDE NEW MAIN TO REROUTE ANY SEWERS THAT CANNOT BE RECONNECTED.
18. EXACT LOCATIONS OF ALL SAWCUT LINES SHALL BE DETERMINED IN THE FIELD BY THE CLARK COUNTY INSPECTOR.
19. CURB AND GUTTER OF A GRADE OF LESS THAN 4/10 OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING. EACH JOINT SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TEST AS SOON AS POSSIBLE AFTER CONSTRUCTION.
20. OFFSET DIMENSIONS TO CURB AND GUTTER ARE MEASURED TO BACK OF CURB. OFFSET DIMENSIONS TO GLUE DOWN MEDIAN ARE MEASURED TO FACE OF CURB/MEDIAN.
21. THE CONTRACTOR SHALL VERIFY IN THE FIELD ALL DIMENSIONS, EXISTING CONDITIONS AND POINTS OF CONNECTION WITH ADJOINING PROPERTY (PUBLIC AND PRIVATE). ANY DISCREPANCIES SHALL BE CALLED TO THE ATTENTION OF THE PROJECT ENGINEER PRIOR TO PROCEEDING WITH THE WORK.
22. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE PROPER DRAINAGE, INGRESS AND EGRESS TO THE PROJECT.
23. FINAL PLANTMIX BITUMINOUS SURFACE (PBS) PAVEMENT SHALL BE ONE-HALF INCH ABOVE THE LIP OF GUTTER (INCLUDING OPEN GRADE) EXCEPT AT SIDEWALK RAMPS WHERE PBS PAVEMENT SHALL BE FLUSH WITH CONCRETE RAMP. PAVEMENT SURFACES SHALL BE FLUSH WITH EDGES OF CROSS GUTTERS.
24. PORTLAND CEMENT CONCRETE PAVING JOINTS SHALL CONFORM TO NDOT STD. PLAN R-10.1.2.
25. THE CONTRACTOR SHALL MAINTAIN AN ONGOING REMOVAL PROCESS OF ALL SPILLAGE OF EXCAVATION MATERIAL ON ALL PAVED STREETS.
26. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE NO. 625.550.
27. ALL EXISTING TRAFFIC SIGNS, STREET LIGHTS & SIGNS TO BE REMOVED SHALL BE SALVAGED BY THE CONTRACTOR AND DELIVERED TO THE CLARK COUNTY TRAFFIC OPERATIONS DIVISION LOCATED AT 5621 E. FLAMINGO ROAD., LAS VEGAS, NEVADA WITHIN 48 HOURS OF THEIR REMOVAL.
28. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL EXISTING TRAFFIC SIGNS, NOT SPECIFICALLY NOTED ON THE DRAWINGS, WHICH ARE TO BE RELOCATED OR REMOVED.
29. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED THEREUNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR.
30. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL, OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE COUNTY TRAFFIC MANAGER.
31. F.A.S.T. INTELLIGENT TRANSPORTATION SYSTEM (ITS) POLICY IS IN EFFECT. COMMUNICATIONS FACILITIES, INCLUDING BUT NOT LIMITED TO, COPPER WIRE, FIBER OPTIC, MICROWAVE, AND RADIO SYSTEMS SHALL BE MAINTAINED AT ALL TIMES. ANY DAMAGE TO THE ITS SYSTEM OF COMMUNICATION CABLE IS CONSIDERED TO BE AN EMERGENCY AND LIQUIDATED DAMAGES OF $2,500 PER DAY FOR COPPER CABLE AND $7,500 PER DAY FOR FIBER OPTIC BREAKS SHALL BE ASSESSED TO THE CONTRACTOR BEGINNING 24 HOURS AFTER THE CONDUIT OR CABLE DAMAGE. DEVELOPER OR CONTRACTOR SHALL PROVIDE TEMPORARY OVERHEAD INTERCONNECT CABLE WHILE PERMANENT CABLE IS BEING RELOCATED OR REPAIRED. THE TEMPORARY AERIAL INSTALLATION MUST BE ACCEPTABLE TO CLARK COUNTY TRAFFIC MANAGEMENT, F.A.S.T., CITY OF LAS VEGAS, CITY OF NORTH LAS VEGAS AND NDOT AND MUST BE REPORTED AND REPAIRED IMMEDIATELY TO F.A.S.T. ACCEPTANCE. IMMEDIATELY CONTACT JESUS MARMOLEGIO (702-432-5300) TO REPORT ANY DAMAGE OF EXISTING FACILITIES.
32. ALL NEW OR REPLACEMENT TRAFFIC SIGNAL LOOPS SHALL BE INSTALLED USING CABLE-IN-DUCT WIRING, SHALL HAVE INDEPENDENT LEAD-IN WIRES FOR EACH LOOP FROM THE CONTROLLER TO THE PULL-BOX, AND EACH LEAD-IN SHALL BE INDIVIDUALLY TAGGED.
33. THE CONTRACTOR SHALL DETERMINE THE LOCATION AND DEPTH OF SUSPECTED UTILITY INTERFERENCES, AND SHALL FURNISH INFORMATION ON THE SAME TO THE ENGINEER, NOT LESS THAN TEN (10) DAY PRIOR TO THE ANTICIPATED IMPACT OF THESE SUSPECTED INTERFERENCES ON HIS WORK. IF CONFLICTS EXIST, THE CONTRACTOR WILL IMMEDIATELY CONTACT THE ENGINEER AND PROVIDE THE ENGINEER WITH ALL THE NECESSARY DATA SUCH AS ELEVATIONS, HORIZONTAL LOCATIONS, ETC., AND PROVIDE THE ENGINEER WITH SKETCHES INDICATING THE PROPOSED IMPROVEMENT AND THE UTILITY CONFLICT. THE ENGINEER WILL EXAMINE AND REVIEW ALL THE DATA AND SKETCHES PROVIDED, AND WILL PROVIDE THE CONTRACTOR WITH AN ALTERNATIVE DESIGN WITHIN FIVE (5) DAYS AFTER RECEIPT OF DATA AND SKETCHES.
34. PRIOR TO BEGINNING OF CONSTRUCTION, OR RELOCATION OF ANY TRAFFIC SIGNAL SYSTEM, WRITTEN NOTICE SHALL BE SUBMITTED TO THE CLARK COUNTY TRAFFIC MANAGEMENT DIVISION INFORMING OF THE DATE WORK WILL BEGIN.
35. THREE (3) WORKING DAYS PRIOR TO TURN-ON OR COMPLETION OF MODIFICATION(S) TO A TRAFFIC SIGNAL SYSTEM, WRITTEN NOTICE SHALL BE SUBMITTED TO THE CLARK COUNTY TRAFFIC MANAGEMENT DIVISION THAT WORK IS BEING COMPLETED AND SHALL INCLUDE THE PROPOSED DATE OF COMPLETION.
36. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY GROUND MOUNTED STOP SIGNS AT ALL STREET ENCROACHMENTS INTO EXISTING COUNTY STREETS IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED. STOP SIGNS SHALL BE INSTALLED IN GROUND. NO TEMPORARY MOUNTINGS WILL BE ALLOWED.

CLARK COUNTY MARKER BALL NOTE

1. STORM DRAIN LATERALS AND RCB IN CLARK COUNTY JURISDICTION SHALL INCLUDE PASSIVE 4-INCH 3M GENERAL PURPOSE BALL MARKER MODEL 1407-XR EMS EXTENDED RANGE AT ENDS OF STORM DRAIN PIPE AND/OR RCB AND AT EACH CHANGE IN HORIZONTAL ALIGNMENT WITH 200' MAXIMUM INTERVAL.
2. BALL MARKERS SHALL NOT BE INSTALLED LESS THAN 3' OR MORE THAN 5' BELOW FINISH GRADE.

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 384-3500 FAX (702) 384-5399

PREPARED FOR
CITY OF LAS VEGAS

H# 49576 | BID# - | DESIGNED BY: DAM
DATE: MARCH 24, 2015 | DRAWN BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL | CHECKED BY: JSR

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
GENERAL NOTES, LEGEND, KEY MAP AND SHEET INDEX

PROFESSIONAL ENGINEER — STATE OF NEVADA — MARK FINE — No. 14566 — CIVIL — 6/30/2015 — FREE MINAE

SHEET
GN-02
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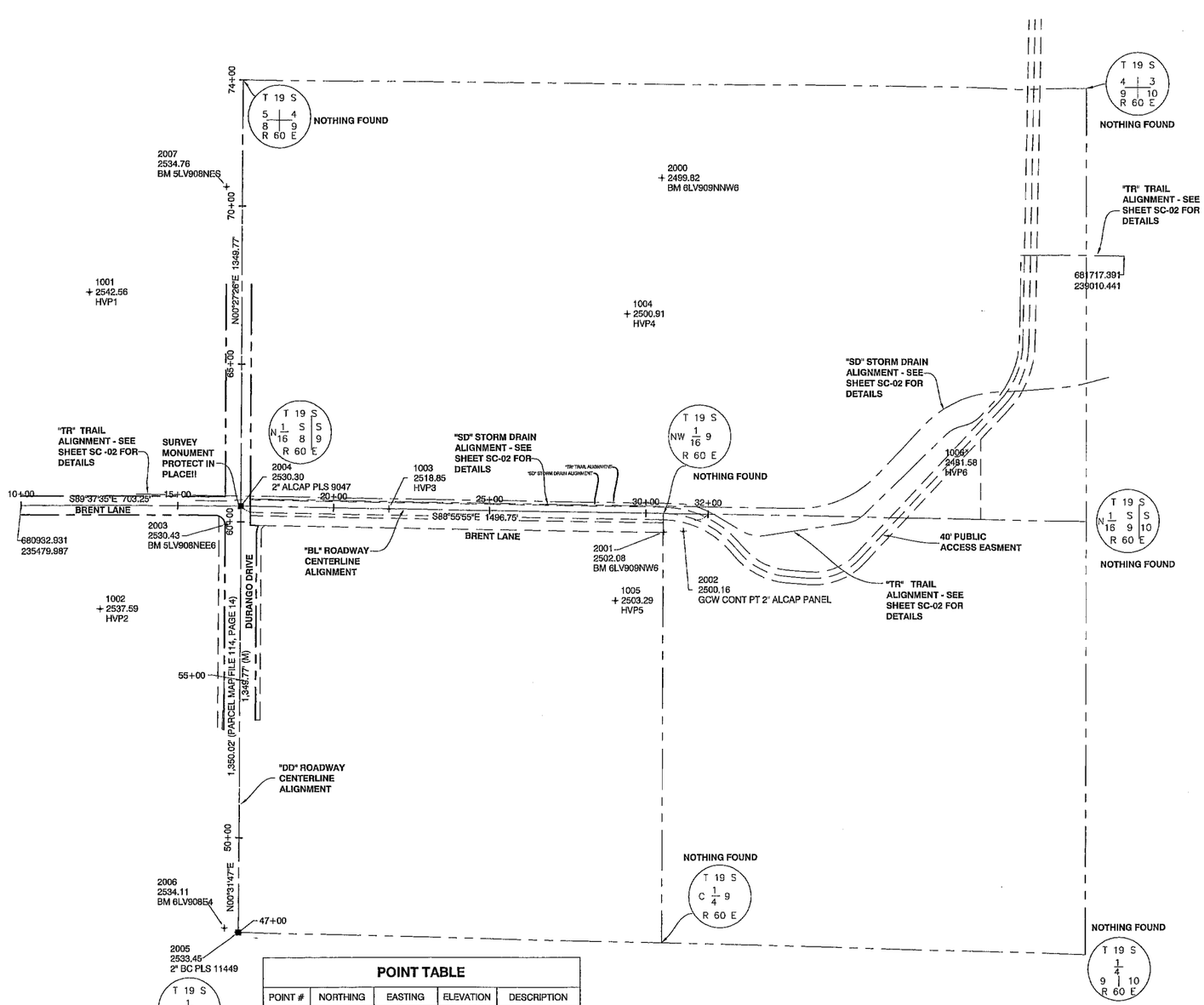

1" = 200'

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS AND LAS VEGAS HIGH ELEVATION ZONES, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN. THE REFERENCE FRAME BEING NAD 83 (2011) EPOCH 2010

NEVADA COORDINATE REFERENCE SYSTEM
LAS VEGAS ZONE – NAD83 (2011) EPOC 2010.0
COORDINATE SYSTEM DEFINITION STATEMENT

COORDINATE SYSTEM DEFINITION
DATUM/REFERENCE FRAME: NAD83 (2011) EPOCH 2010.0
MAPPING PROJECTION PARAMETERS:
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)
ZONE: LAS VEGAS ZONE
PROJECTION TYPE: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF ORIGIN): 36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W
LINEAR UNIT: US SURVEY FOOT (SFT)
FALSE NORTHING: 656,166.6667 SFT (200,000.000 M)
FALSE EASTING: 328,083.3333 SFT (100,000.000 M)
SCALE FACTOR AT CENTRAL MERIDIAN: 1.0001 (EXACT)

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 5LV908NEE6, BEING A RIVET AND PLATE IN THE TOP OF CURB AT THE SOUTHWEST CORNER OF BRENT LANE AND DURANGO DRIVE.

ELEVATION (NAVD88) = 771.278 METERS = 2530.43 FEET (NAVD88) 2008 ADJUSTMENT

REFERENCE MAPS:

PARCEL MAP FILE 114, PAGE 14
PLAT BOOK 92, PAGE 95
PLAT BOOK 96, PAGE 21

POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1001	681606.9810	235700.7760	2542.56'	HVP1
1002	680604.4560	235730.8580	2537.59'	HVP2
1003	680919.6050	236657.3460	2518.85'	HVP3
1004	681536.5250	237421.7300	2500.91'	HVP4
1005	680628.4420	237381.4380	2503.29'	HVP5
1006	681101.8020	238506.8640	2481.58'	HVP6
1007	681690.6310	239654.4260	2459.55'	HVP7
1008	680606.8710	239711.0930	2442.27'	HVP8
2000	681966.3330	237532.9390	2499.82'	BM 6LV909NNW6

POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
2001	680844.2760	237537.1860	2502.08'	BM 6LV909NW6
2002	680846.7740	237600.3980	2500.16'	GCW CONT PT 2" ALCAP PANEL
2003	680870.7290	236137.6820	2530.43'	BM 5LV908NEE6
2004	680928.1510	236183.1040	2530.30'	2" ALCAP PLS 9047
2005	679578.4420	236170.6280	2533.45'	2" BC PLS 11449
2006	679592.8030	236126.0970	2534.11'	BM 6LV908E4
2007	681939.5550	236140.5270	2534.76'	BM 5LV908NES

LEGEND

- SECTION LINE/CENTERLINE
- EASEMENT LINE
- RIGHT -OF-WAY LINE
- 4 / 2530.43 / BM 5LV908NEE6 — BENCHMARK OR AERIAL PANEL POINT
- 6 / 2533.45 / 2" BC PLS 11449 — MONUMENT AS DESCRIBED

NO.	DATE	SHEET	REVISIONS

PREPARED BY
Stanley Consultants INC.
5820 S. Eastern Avenue, Suite 200
Las Vegas, Nevada 89119
(702) 309-3395 Fax (702) 309-9793
www.stanleygroup.com

PREPARED FOR
CITY OF LAS VEGAS

BID#	DESIGNED BY:	DRAWN BY:	CHECKED BY:
H# 49876	AWD	AWD	MAC
DATE: MARCH 24, 2015			
SUBMITTAL STAGE: 90% SUMBMITTAL			

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
HORIZONTAL CONTROL PLAN

PRELIMINARY — NOT FOR CONSTRUCTION — PROFESSIONAL LAND SURVEYOR — STATE OF NEVADA — ALAN M. WILLIAMS — EXP. 12/31/16 — No. 7808

SHEET
SC-01
4 OF 56
DRAWING NO.

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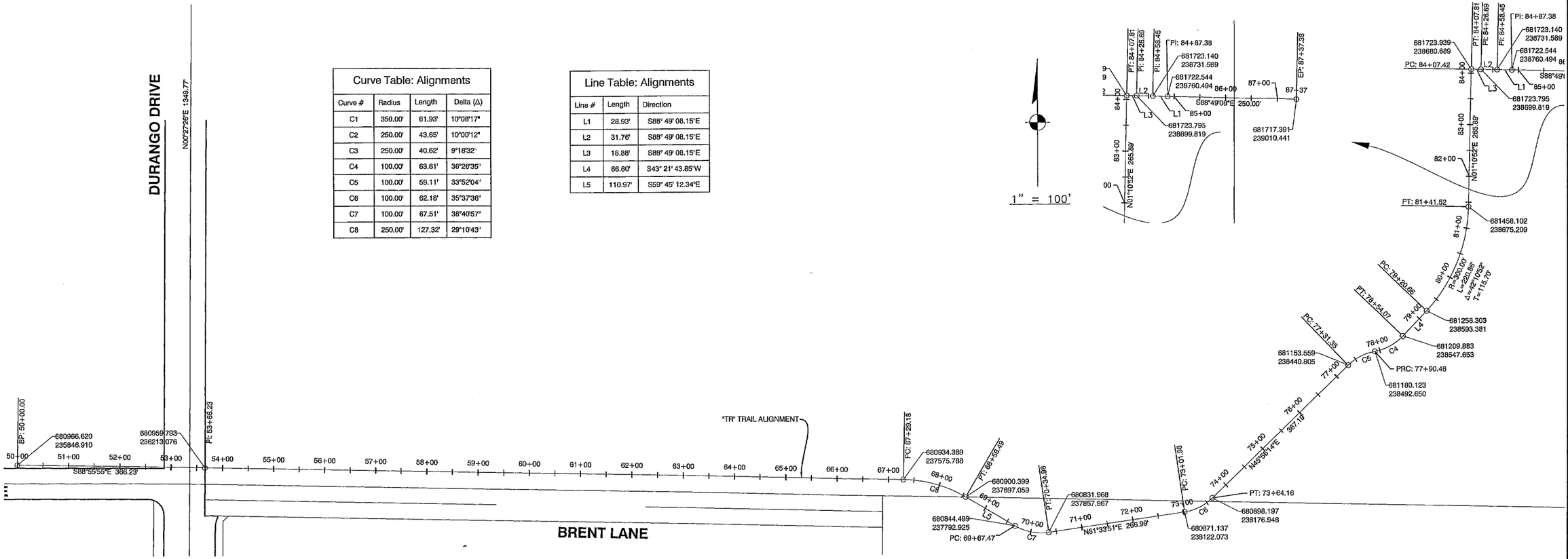
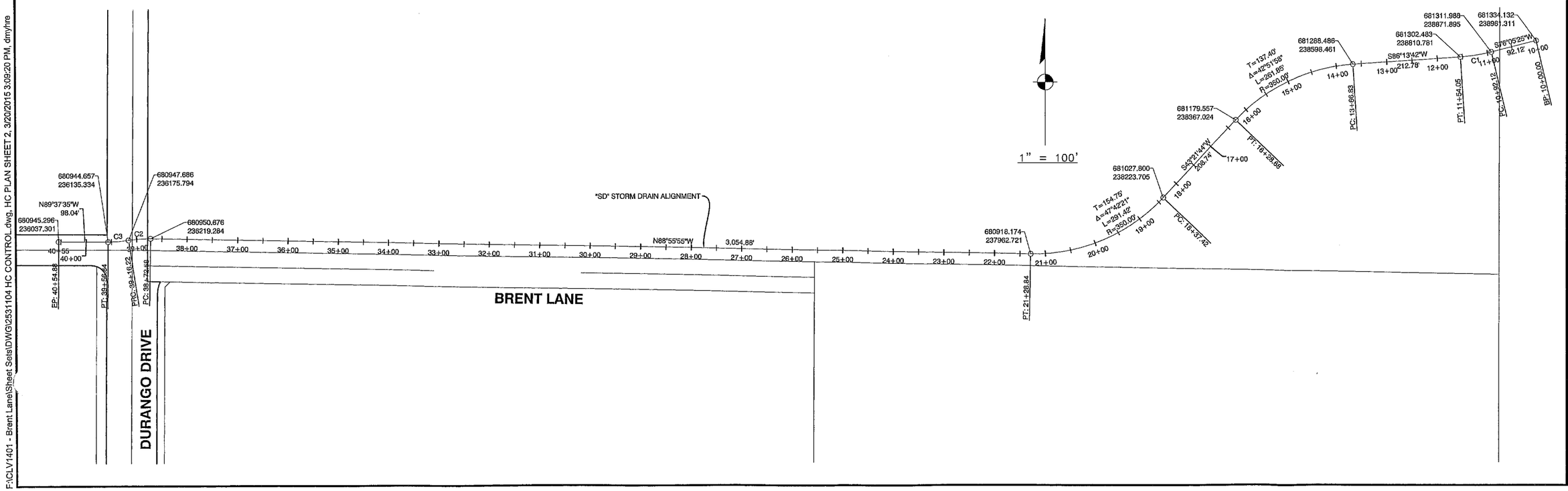
Curve Table: Alignments			
Curve #	Radius	Length	Delta (Δ)
C1	350.00'	61.93'	10°08'17"
C2	250.00'	43.65'	10°00'12"
C3	250.00'	40.62'	9°18'32"
C4	100.00'	63.61'	36°26'35"
C5	100.00'	59.11'	33°52'04"
C6	100.00'	62.16'	35°37'36"
C7	100.00'	67.51'	38°40'57"
C8	250.00'	127.32'	29°10'43"

Line Table: Alignments		
Line #	Length	Direction
L1	28.93'	S88° 49' 08.15"E
L2	31.76'	S88° 49' 08.15"E
L3	16.88'	S88° 49' 08.15"E
L4	66.60'	S43° 21' 43.85"W
L5	110.97'	S59° 45' 12.34"E



1" = 100'



1" = 100'

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NO.	DATE	SHEET	REVISIONS

PREPARED FOR
CITY OF LAS VEGAS

H# 49876

BID#

DATE: MARCH 24TH, 2015

SUBMITTAL STAGE:
90% - SUBMITTAL

DESIGNED BY: AWD
DRAWN BY: AWD
CHECKED BY: MAC

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
HORIZONTAL CONTROL PLAN

PRELIMINARY
PROFESSIONAL LAND SURVEYOR
ALAN D. HILL
STATE OF NEVADA
EXP. 12/31/16
No. 7808

SHEET
SC-02
5 OF 56
DRAWING NO.

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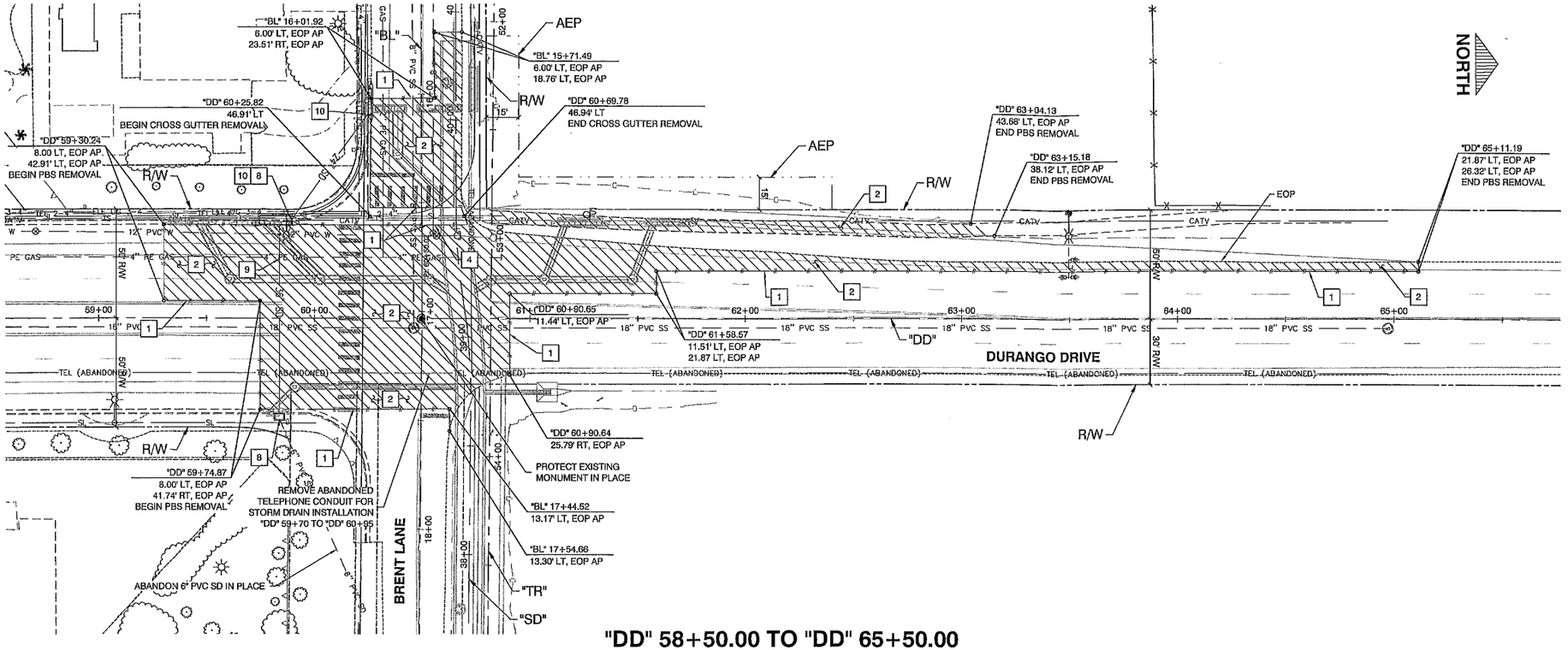

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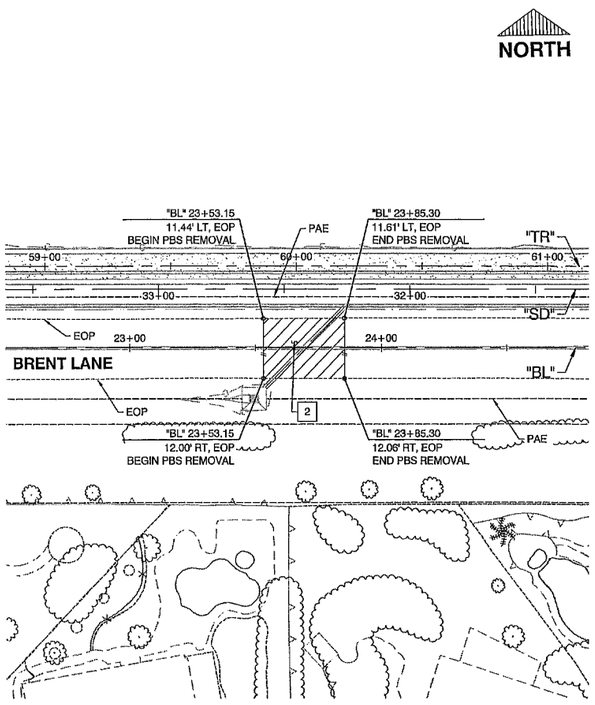

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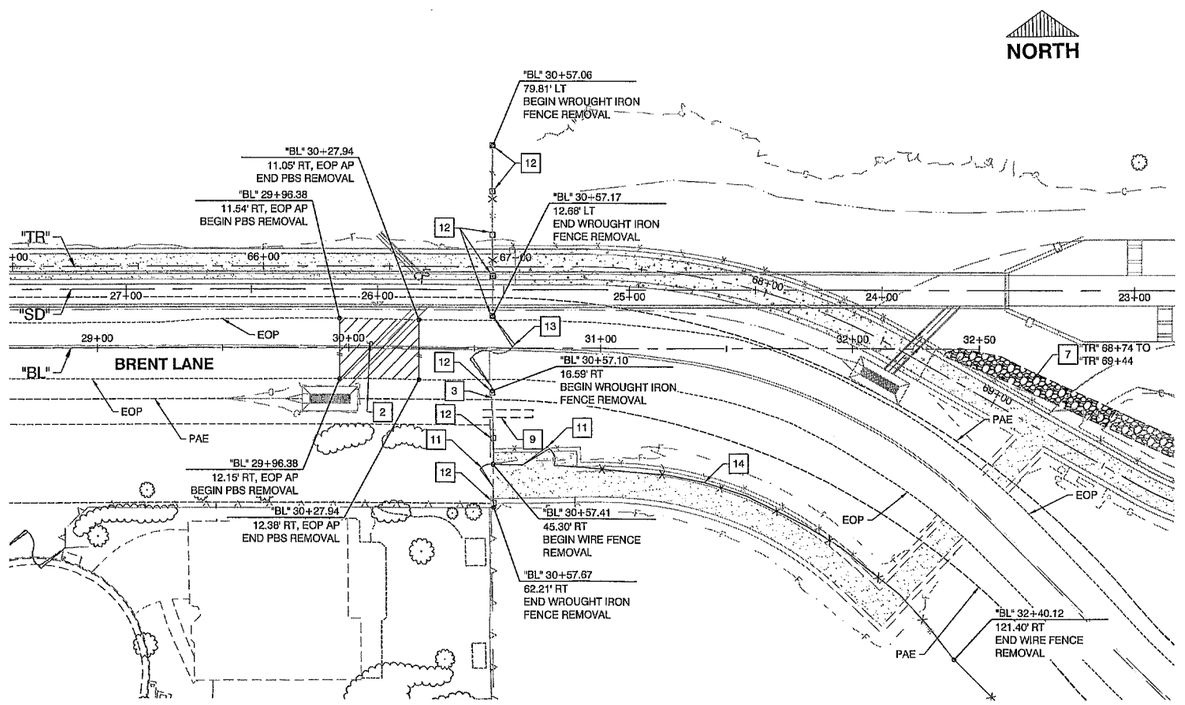

"BL" 28+75.00 TO "BL" 32+50.00

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5500
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6811
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2523

REMOVAL NOTES

1. SAWCUT AND MATCH EXISTING
2. REMOVE PBS SURFACE
3. REMOVE AND RESET SIGN
4. REMOVE CONCRETE CROSS GUTTER
5. REMOVE CONCRETE CUT-OFF WALL
6. REMOVE AND RESET POST & CABLE FENCE
7. REMOVE RIPRAP
8. REMOVE DROP INLET
9. REMOVE STORM DRAIN PIPE
10. CONSTRUCT 3000 PSI CONCRETE PLUG IN STORM DRAIN MANHOLE AND ABANDON STORM DRAIN PIPE WITH CLSM CLASS I FLOWABLE FILL TO BRICK AND MORTAR RCP PLUG
11. REMOVE GATE
12. REMOVE WROUGHT IRON FENCE AND BLOCK POSTS
13. REMOVE AND RESET SWING GATE
14. REMOVE WIRE FENCING
15. REMOVE AND RESET RIPRAP

LEGEND

REMOVE PBS SURFACE

STOCKPILE EXISTING RIPRAP FOR REUSE

NOTES

1. NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS SHOWN FOR INFORMATIONAL ONLY. REFERENCE NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS DRAWINGS FOR CONSTRUCTION DETAILS. CONTRACTOR TO COORDINATE WITH UTILITIES FOR REMOVAL AND INSTALLATION OF FACILITIES.
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3. ALL EXISTING UTILITIES SHALL BE PROTECTED IN PLACE UNLESS OTHERWISE NOTED.

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5745 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR
CITY OF LAS VEGAS

H# 49876	BID# #####		
DATE: MARCH 24, 2015	DESIGNED BY:	DAM	
	DRAWN BY:	SPC/DAM	
SUBMITTAL STAGE: 90% SUBMITTAL	CHECKED BY:	JSR/MJF	

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
REMOVAL PLAN

PROFESSIONAL ENGINEER
MARK J. FINNAMORE
No. 14566
CIVIL
STATE OF NEVADA
EXPIRES 11/30/2015

SHEET
DR-01
6 OF 56
DRAWING NO.
-

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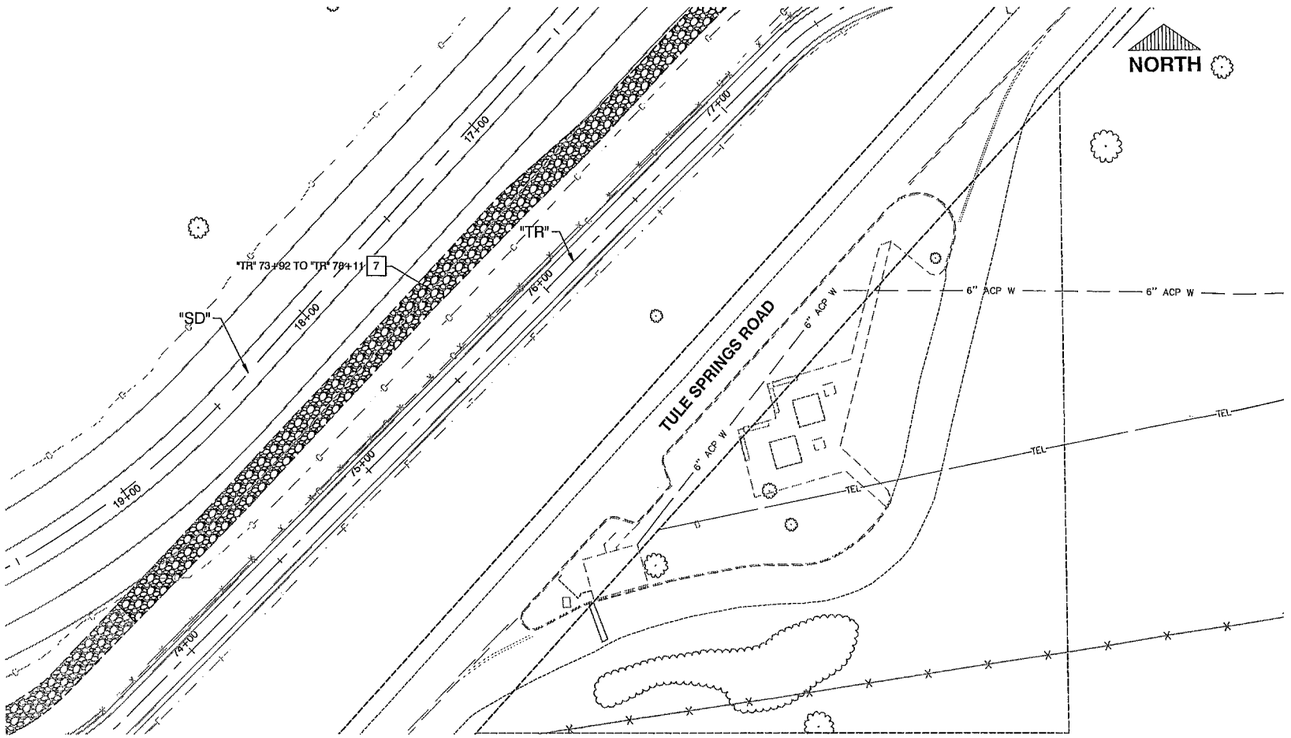
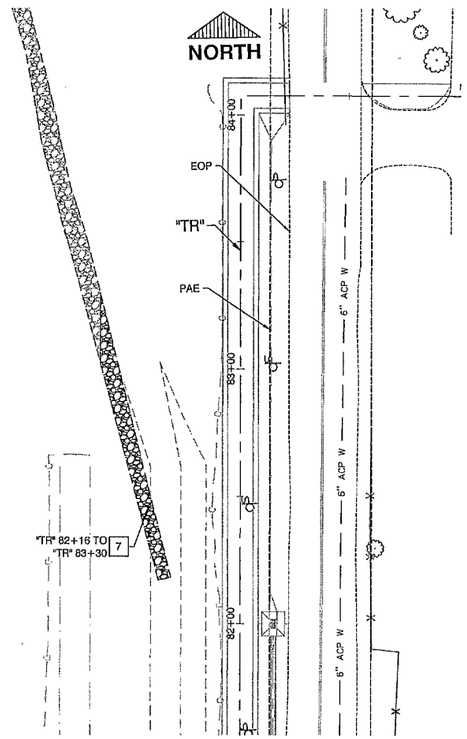


"TR" 73+50.00 TO "TR" 77+50.00



"TR" 81+50.00 TO "TR" 85+00.00

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

REMOVAL NOTES

1	SAWCUT AND MATCH EXISTING
2	REMOVE PBS SURFACE
3	REMOVE AND RESET SIGN
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5	REMOVE CONCRETE CUT-OFF WALL
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14	REMOVE WIRE FENCING
15	REMOVE AND RESET RIPRAP

LEGEND

REMOVE PBS SURFACE

STOCKPILE EXISTING RIPRAP FOR REUSE

NOTES

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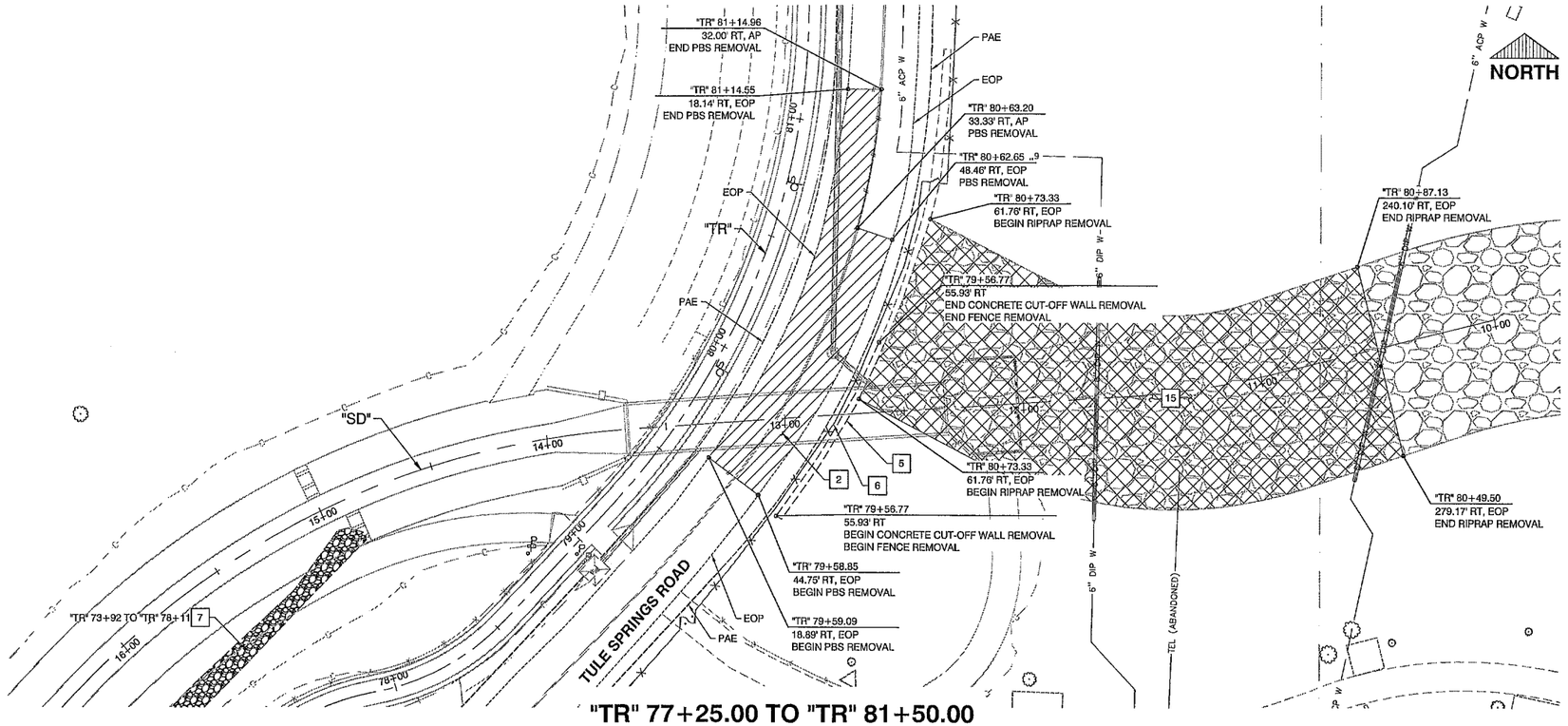

"TR" 77+25.00 TO "TR" 81+50.00

PREPARED BY

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNERS

5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118

PHONE (702) 284-5300 FAX (702) 284-5399

NO.	DATE	REVISIONS

PREPARED FOR

CITY OF LAS VEGAS

H# 49876	BID# ######
DATE: MARCH 24, 2015	DESIGNED BY: DAM
	DRAWN BY: SPC/DAM
SUBMITTAL STAGE: 90% SUBMITTAL	CHECKED BY: JSR/MJF

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

REMOVAL PLAN

PROFESSIONAL ENGINEER - STATE OF NEVADA
MARK J. FIA
EXPIRES 6/30/2015
CIVIL
No. 14566
PRELIMINARY

SHEET

DR-02

7 OF 56

DRAWING NO.

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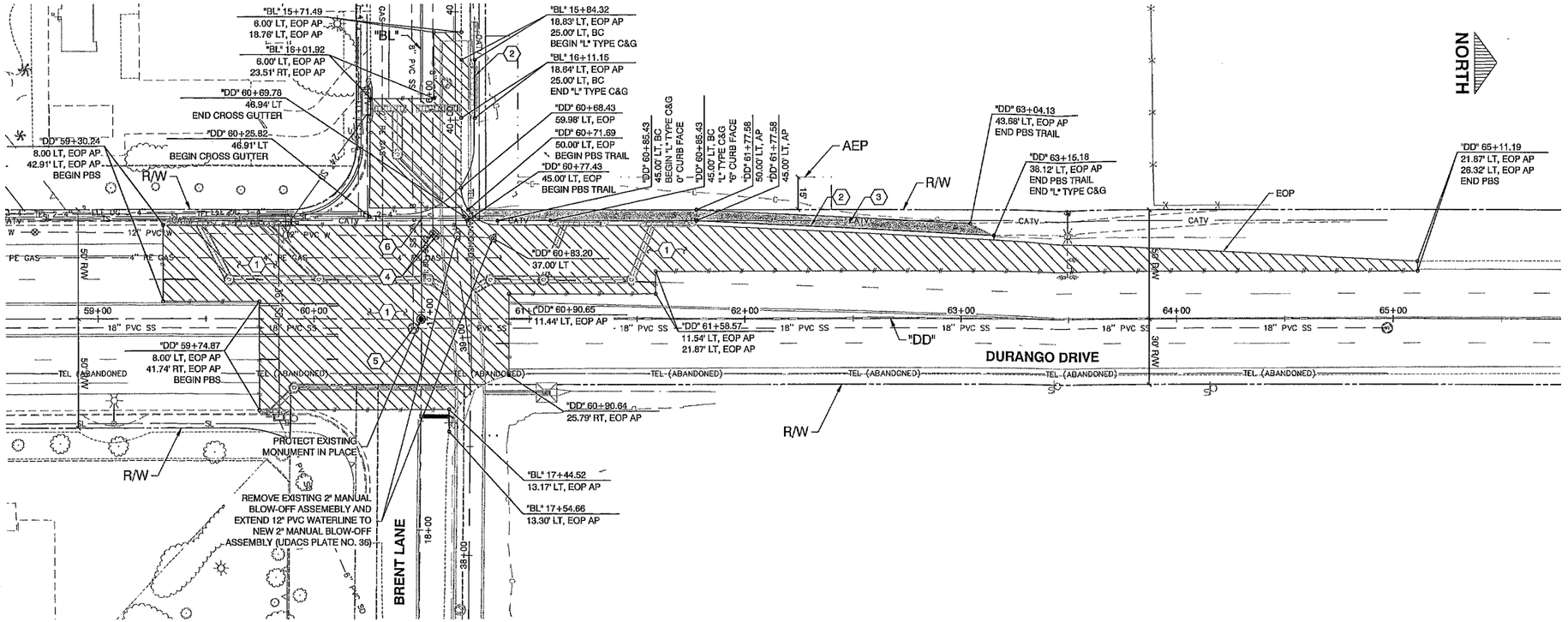
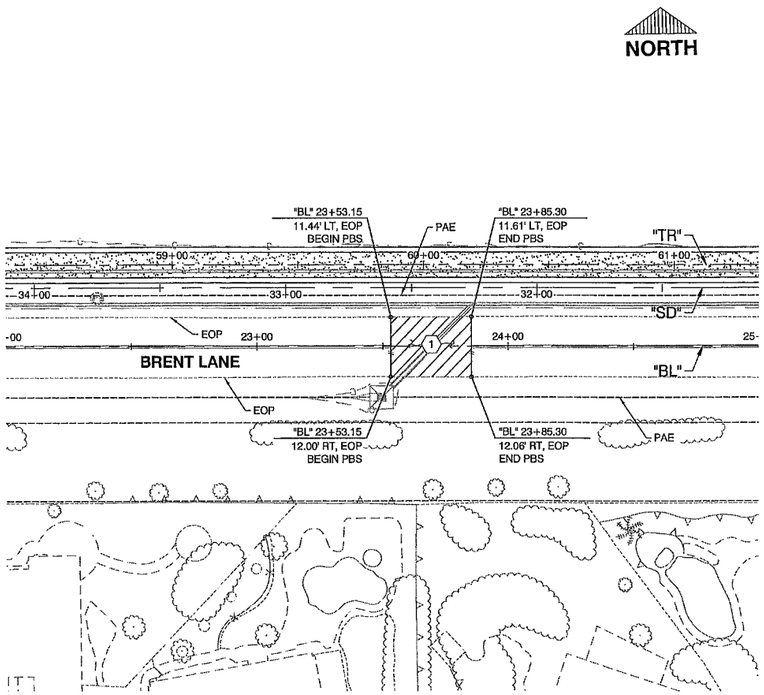


"DD" 58+50.00 TO "DD" 65+50.00



"BL" 22+00.00 TO "BL" 25+00.00

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

1. CONSTRUCT 5" PBS OVER 4" TYPE II AGGREGATE BASE
2. CONSTRUCT "L" TYPE CURB AND GUTTER (USDCCA DWG. NO. 216)
3. CONSTRUCT 2" PBS OVER 4" TYPE II AGGREGATE BASE
4. ADJUST WATER VALVE BOX TO FINISHED GRADE (UDACS PLATE NO. 39) VALVE SHALL BE ACCESSIBLE AT ALL TIMES
5. ADJUST SANITARY SEWER MANHOLE TO FINISHED GRADE (DCSWCS STD. DWG. SD-5)
6. CONSTRUCT CROSS GUTTER (USDCCA DWG. NO. 228)

LEGEND

5" PBS OVER 4" TYPE II AGGREGATE BASE

2" PBS OVER 4" TYPE II AGGREGATE BASE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

NO.	DATE	REVISIONS

PREPARED BY

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNERS

5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118

PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR

CITY OF LAS VEGAS

H# 49676

DATE: MARCH 24, 2015

BID# ####

DESIGNED BY: DAM

DRAWN BY: SPC/DAM

CHECKED BY: JSR/MJF

SUBMITTAL STAGE:

90% SUBMITTAL

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

ROADWAY PLAN

PROFESSIONAL ENGINEER STATE OF NEVADA MARK J. FIA 11/30/2015 CIVIL No. 14566 PRELIMINARY

SHEET

RD-01

8 OF 56

DRAWING NO.

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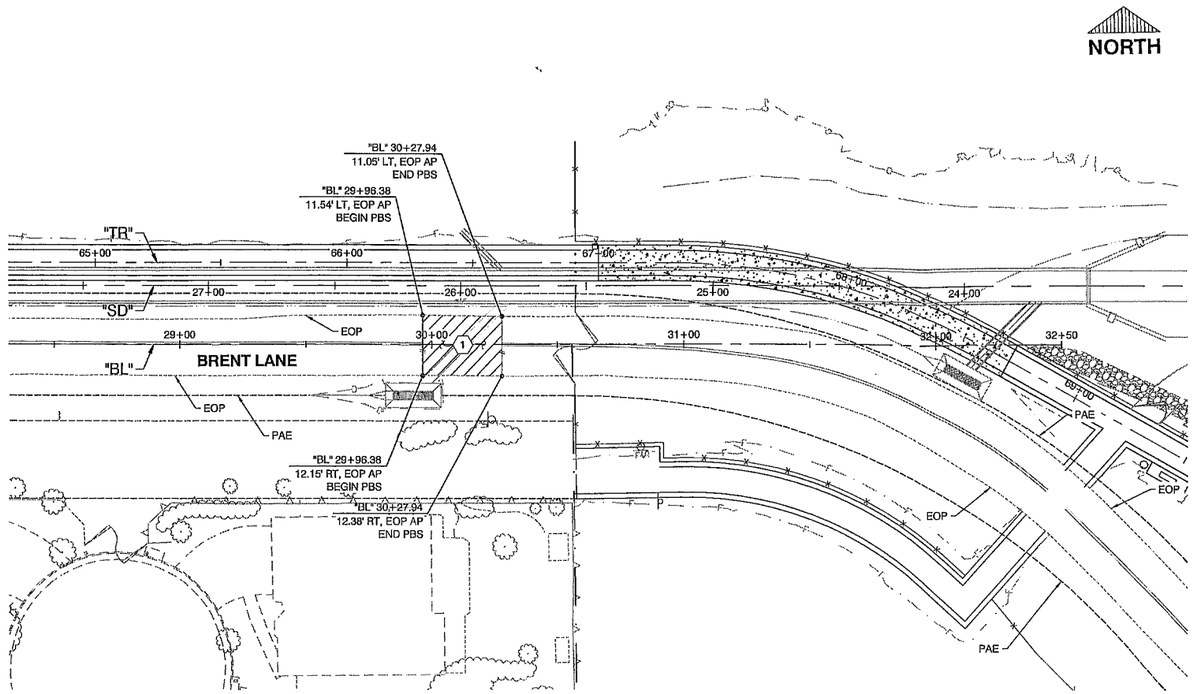
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END PBS
"BL" 29+96.38
11.54' LT, EOP AP
BEGIN PBS
"TR"
"SD"
"BL"
BRENT LANE
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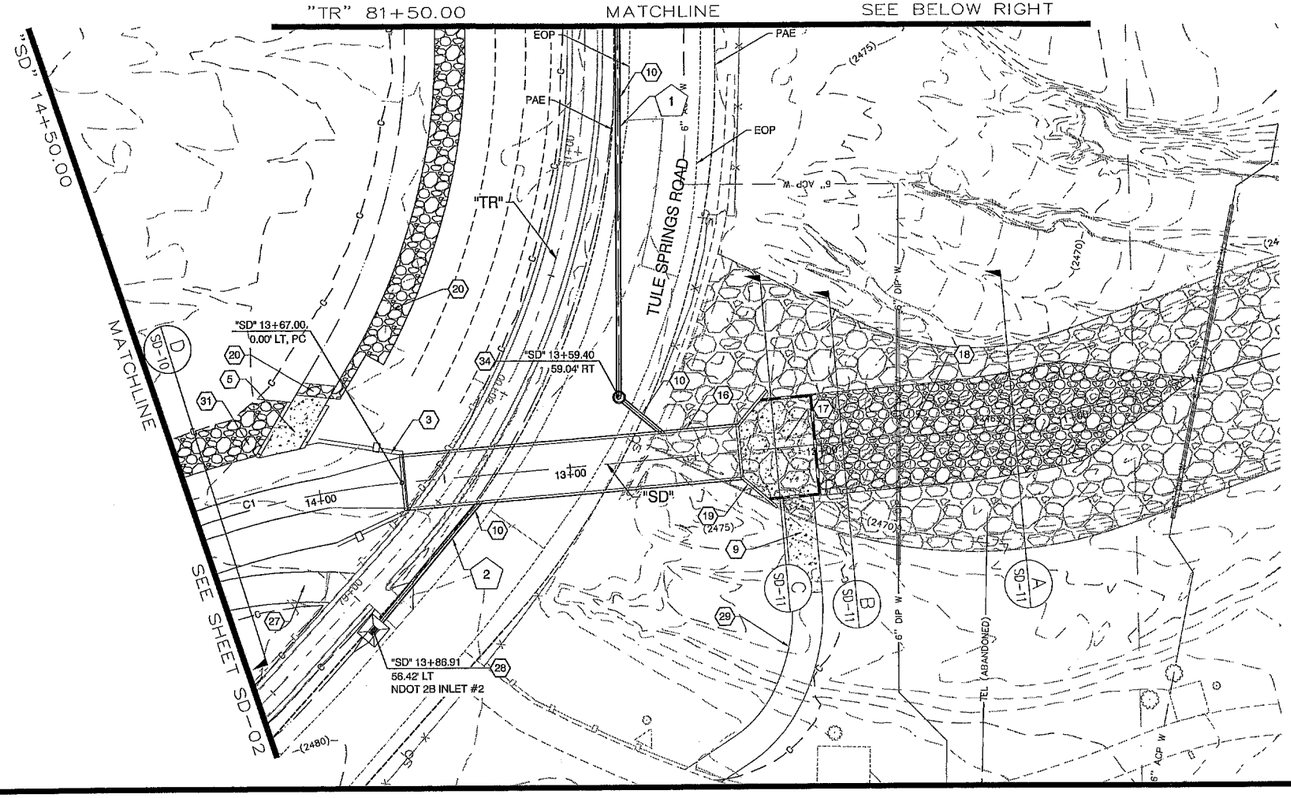

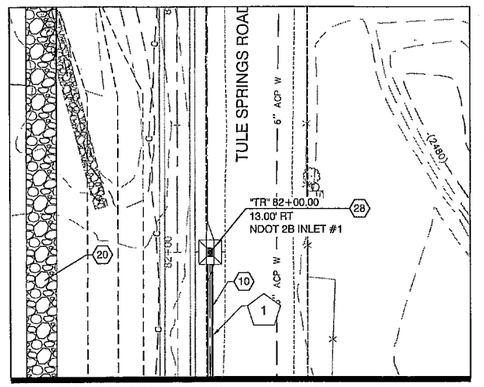

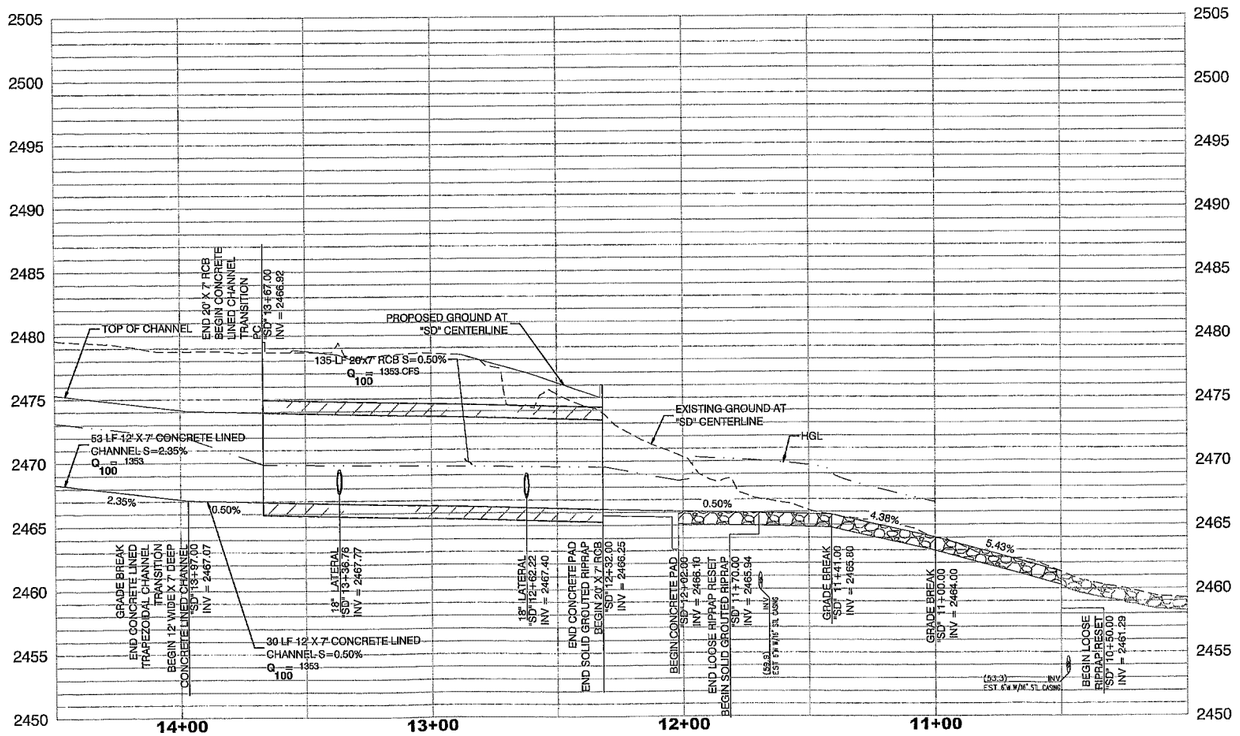

GRAPHIC SCALE

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(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6811
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

1. CONSTRUCT RCB PLUG (SEE DETAIL 3, SHEET S-1)
2. CONSTRUCT BRICK AND MORTAR PLUG (SEE DETAIL 4, SHEET S-1)
3. CONSTRUCT CHANNEL TRANSITION AND HEADWALL (SEE DETAIL SHEET S-5)
4. CONSTRUCT 12' WIDE CHANNEL ACCESS RAMP (SEE DETAIL 3, SHEET SD-14 AND DETAIL 1, SHEET S-5)
5. CONSTRUCT CONCRETE FLUME (SEE DETAIL 1, SHEET SD-14)
6. CONSTRUCT 48" RCB ACCESS MANHOLE (SEE DETAIL 6, SHEET S-1)
7. INSTALL 42" RCP
8. CONSTRUCT 60" TYPE III MANHOLE (USDCCA STD. DWG. NO. 406.1)
9. CONSTRUCT 12' WIDE 6" CONCRETE OVER 6" TYPE II AGGREGATE BASE CHANNEL ACCESS RAMP (SEE SHEET GR-1) "SD" 12+11.00, 20.00' LT TO "SD" 12+11.00, 57.60' LT)
10. INSTALL 18" RCP
11. INSTALL 24" RCP
12. INSTALL 30" RCP
13. INSTALL 36" RCP
14. INSTALL 48" RCP
15. CONSTRUCT 12' X 6' RCB (NDOT STD B 20.1.2)
16. CONSTRUCT 20' X 7' RCB (SEE DETAILS SHEET S-5)
17. CONSTRUCT 6" CONCRETE PAD OVER 4" TYPE II AGGREGATE BASE WITH CUTOFF WALLS SEE DETAIL SHEET S-6)
18. CONSTRUCT RIPRAP LINED TRAPEZOIDAL CHANNEL W/40' BW, EXISTING TOPS OF BANK TO REMAIN.
19. CONSTRUCT CONCRETE HEADWALL SEE SHEET S-6
20. INSTALL RIPRAP, D50=12", TH=24" OVER 12" TYPE II GRANULAR BEDDING
21. INSTALL ACCESS LADDER (SEE DETAIL 4, SHEET S-2)
22. CONSTRUCT CONCRETE FLUME (SEE DETAIL 2, SHEET SD-14)
23. CONSTRUCT SPECIAL DROP INLET W/ CONCRETE APRON (SEE DETAILS ON SHEET SD-13, SHEET S-9)
24. CONSTRUCT TYPE "DM/2" DROP INLET (USDCCA STD. DWG. NO. 412.1)
25. CONSTRUCT TRENCH DRAIN (SEE DETAIL SHEET S-7)
26. CONSTRUCT 12' WIDE x 7' DEEP CONCRETE LINED TRAPEZOIDAL CHANNEL (SEE DETAIL SHEET S-9)
27. INSTALL 12' WIDE 6" TYPE II MAINTENANCE ROAD
28. CONSTRUCT NDOT TYPE 2B DROP INLET (NDOT STD. PLAN R-4.2.2) W/ CONCRETE APRON (NDOT STD R-4.2.7) (SEE DETAIL SHEET SD-13)
29. CONSTRUCT 12' WIDE 6" TYPE II CHANNEL ACCESS RAMP (SEE SHEET GR-1) ("SD" 12+11.00, 57.90' LT TO "SD" 12+58.41, 122.26' LT)
30. NOT USED
31. INSTALL RIPRAP, D50=24", TH=48", OVER 12" TYPE II GRANULAR BEDDING
32. NOT USED
33. CONSTRUCT CHANNEL TRANSITION AND HEADWALL (SEE DETAIL SHEET S-4)
34. CONSTRUCT 48" TYPE I MANHOLE (USDCCA STD. DWG. NO. 403.1)

NOTES

1. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR GRADE BREAK OR TO INSIDE EDGE OF DI, RCB, OR STRUCTURE.
2. ALL DROP INLETS AND CONCRETE APRONS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDCCA STD. DWG. NO. 421.
3. ALL STORM DRAIN SHALL BE CLASS III UNLESS OTHERWISE NOTED.
4. NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS SHOWN FOR INFORMATIONAL ONLY. REFERENCE NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS DRAWINGS FOR CONSTRUCTION DETAILS. CONTRACTOR TO COORDINATE WITH UTILITIES FOR REMOVAL AND INSTALLATION OF FACILITIES.
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6. ALL EXISTING UTILITIES SHALL BE PROTECTED IN PLACE UNLESS OTHERWISE NOTED.
7. SEE SC-01 FOR RCB AND CHANNEL GEOMETRY.

LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEETS
1	SD-07 THRU SD-09

APPROVED FOR CONSTRUCTION	
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER	
DATE:	PROJECT# 123165

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
6740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR
CITY OF LAS VEGAS

1# 49876	BID# ####
DATE: MARCH 24, 2015	DESIGNED BY: DAM
	DRAWN BY: SPO/DAM
SUBMITTAL STAGE: 90% SUBMITTAL	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN PLAN AND PROFILE "SD" 10+00.00 TO "SD" 14+50.00

PROFESSIONAL ENGINEER - STATE OF NEVADA - MARK J. FAIN - 12/30/2015 - CIVIL - No. 14566 - PRELIMINARY

SHEET
SD-01
10 OF 56
DRAWING NO.
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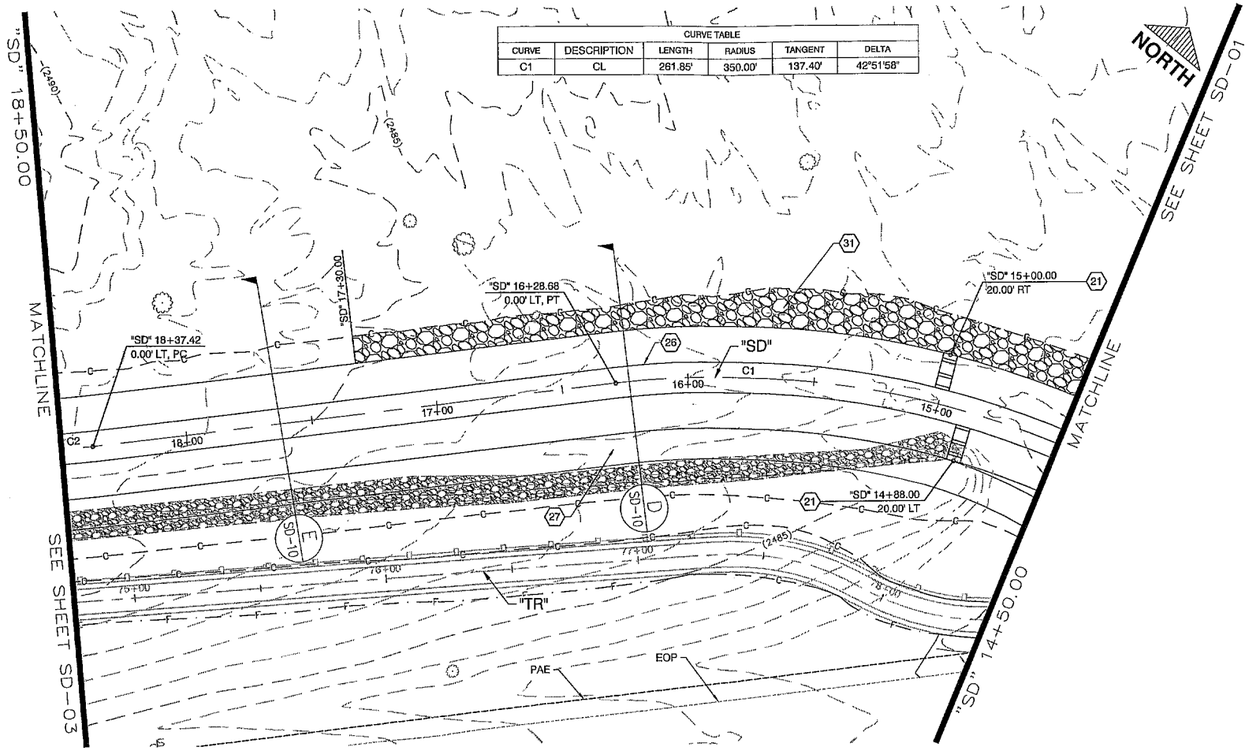

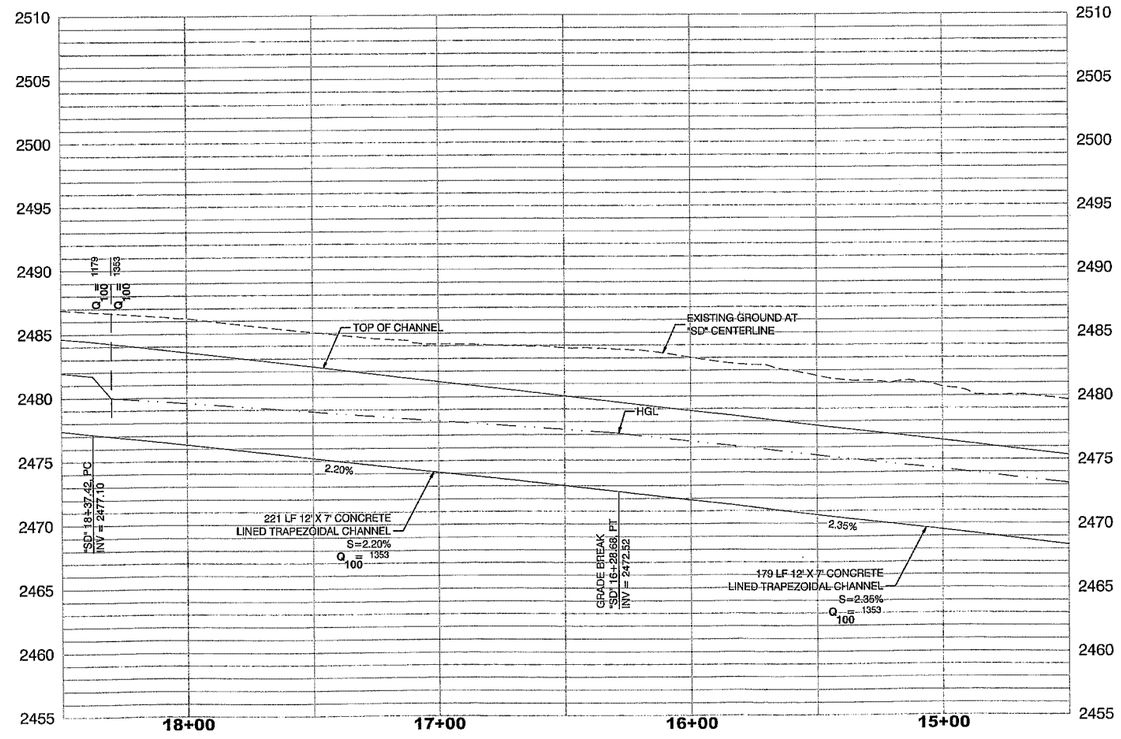

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

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BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
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	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

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27. INSTALL 12' WIDE 6" TYPE II MAINTENANCE ROAD
28. CONSTRUCT NDOT TYPE 2B DROP INLET (NDOT STD. PLAN R-4.2.2) W/ CONCRETE APRON (NDOT STD R-4.2.7) (SEE DETAIL SHEET SD-13)
29. CONSTRUCT 12' WIDE 6" TYPE II CHANNEL ACCESS RAMP (SEE SHEET GR-1) ("SD" 12+11.00, 57.50' LT TO "SD" 12+56.41, 122.28' LT)
30. NOT USED
31. INSTALL RIPRAP, D50=24", TH=48", OVER 12" TYPE II GRANULAR BEDDING
32. NOT USED
33. CONSTRUCT CHANNEL TRANSITION AND HEADWALL (SEE DETAIL SHEET S-4)
34. CONSTRUCT 48" TYPE I MANHOLE (USDCCA STD. DWG. NO. 403.1)

NOTES

1. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR GRADE BREAK OR TO INSIDE EDGE OF DI, RCB, OR STRUCTURE.
2. ALL DROP INLETS AND CONCRETE APRONS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDCCA STD. DWG. NO. 421.
3. ALL STORM DRAIN SHALL BE CLASS III UNLESS OTHERWISE NOTED.
4. NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS SHOWN FOR INFORMATIONAL ONLY. REFERENCE NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS DRAWINGS FOR CONSTRUCTION DETAILS. CONTRACTOR TO COORDINATE WITH UTILITIES FOR REMOVAL AND INSTALLATION OF FACILITIES.
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6. ALL EXISTING UTILITIES SHALL BE PROTECTED IN PLACE UNLESS OTHERWISE NOTED.
7. SEE SC-01 FOR RCB AND CHANNEL GEOMETRY.

LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEETS
1	SD-07 THRU SD-09

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
6740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR
CITY OF LAS VEGAS

H# 49876	BID# ####
DATE: MARCH 24, 2015	DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN PLAN AND PROFILE "SD" 14+50.00 TO "SD" 18+50.00

PRELIMINARY
PROFESSIONAL ENGINEER STATE OF NEVADA MARK J. FOLEY No. 14566 6/30/2015 CIVIL

SHEET
SD-02
11 OF 56
DRAWING NO.
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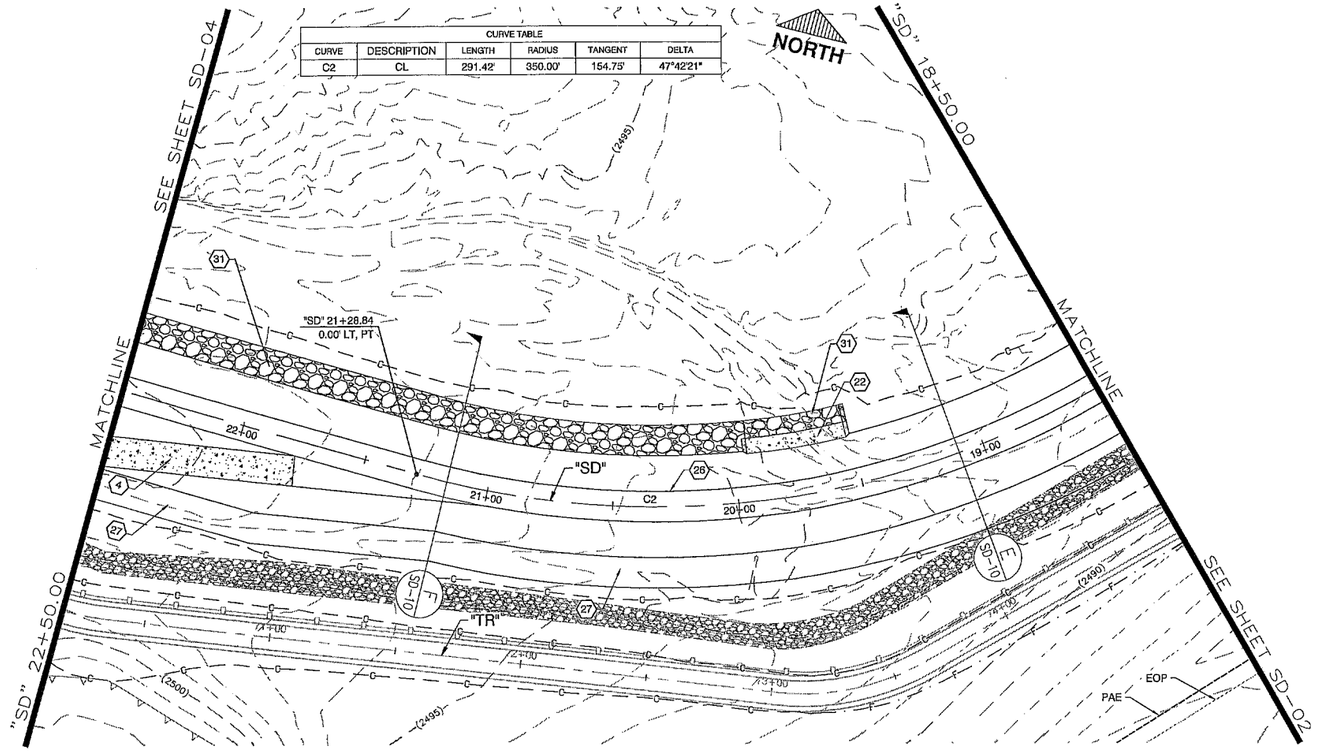

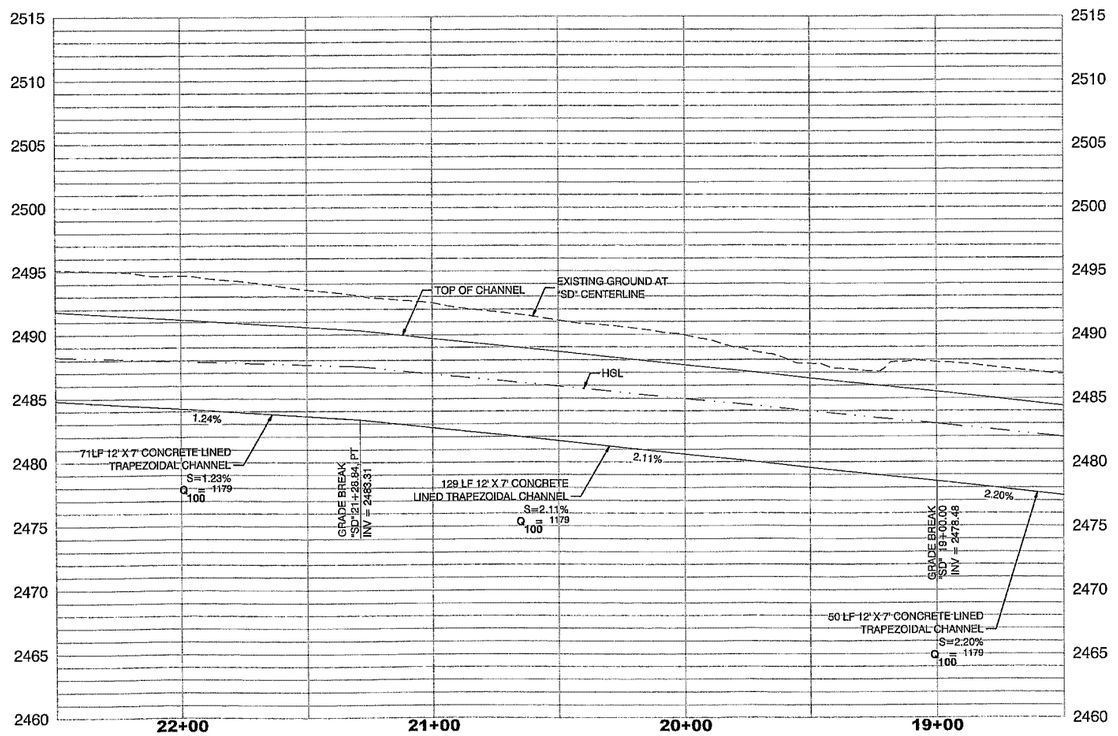

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

1. CONSTRUCT RCB PLUG (SEE DETAIL 3, SHEET S-1)
2. CONSTRUCT BRICK AND MORTAR PLUG (SEE DETAIL 4, SHEET S-1)
3. CONSTRUCT CHANNEL TRANSITION AND HEADWALL (SEE DETAIL SHEET S-5)
4. CONSTRUCT 12' WIDE CHANNEL ACCESS RAMP (SEE DETAIL 3, SHEET SD-14 AND DETAIL 1, SHEET S-8)
5. CONSTRUCT CONCRETE FLUME (SEE DETAIL 1, SHEET SD-14)
6. CONSTRUCT 48" RCB ACCESS MANHOLE (SEE DETAIL 6, SHEET S-1)
7. INSTALL 42" RCP
8. CONSTRUCT 60" TYPE III MANHOLE (USDCCA STD. DWG. NO. 406.1)
9. CONSTRUCT 12' WIDE 6" CONCRETE OVER 6" TYPE II AGGREGATE BASE CHANNEL ACCESS RAMP (SEE SHEET GR-1) "SD" 12+11.00, 20.00' LT TO "SD" 12+11.00, 57.90' LT)
10. INSTALL 18" RCP
11. INSTALL 24" RCP
12. INSTALL 30" RCP
13. INSTALL 36" RCP
14. INSTALL 48" RCP
15. CONSTRUCT 12' X 6' RCB (NDOT STD B 20.1.2)
16. CONSTRUCT 20' X 7' RCB (SEE DETAILS SHEET S-9)
17. CONSTRUCT 6" CONCRETE PAD OVER 4" TYPE II AGGREGATE BASE WITH CUTOFF WALLS SEE DETAIL SHEET S-6)
18. CONSTRUCT RIPRAP LINED TRAPEZOIDAL CHANNEL W/40' BW, EXISTING TOPS OF BANK TO REMAIN.
19. CONSTRUCT CONCRETE HEADWALL SEE SHEET S-6
20. INSTALL RIPRAP, D50=12", TH=24" OVER 12" TYPE II GRANULAR BEDDING
21. INSTALL ACCESS LADDER (SEE DETAIL 4, SHEET S-2)
22. CONSTRUCT CONCRETE FLUME (SEE DETAIL 2, SHEET SD-14)
23. CONSTRUCT SPECIAL DROP INLET W/ CONCRETE APRON (SEE DETAILS ON SHEET SD-13, SHEET S-9)
24. CONSTRUCT TYPE "DM2" DROP INLET (USDCCA STD. DWG. NO. 412.1)
25. CONSTRUCT TRENCH DRAIN (SEE DETAIL SHEET S-7)
26. CONSTRUCT 12' WIDE x 7' DEEP CONCRETE LINED TRAPEZOIDAL CHANNEL (SEE DETAIL SHEET S-3)
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28. CONSTRUCT NDOT TYPE 2B DROP INLET (NDOT STD. PLAN R-4.2.2) W/ CONCRETE APRON (NDOT STD R-4.2.7) (SEE DETAIL SHEET SD-13)
29. CONSTRUCT 12' WIDE 6" TYPE II CHANNEL ACCESS RAMP (SEE SHEET GR-1) ("SD" 12+11.00, 57.90' LT TO "SD" 12+58.41, 122.28' LT)
30. NOT USED
31. INSTALL RIPRAP, D50=24", TH=46", OVER 12" TYPE II GRANULAR BEDDING
32. NOT USED
33. CONSTRUCT CHANNEL TRANSITION AND HEADWALL (SEE DETAIL SHEET S-4)
34. CONSTRUCT 48" TYPE I MANHOLE (USDCCA STD. DWG. NO. 403.1)

NOTES

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LATERAL RUN PROFILE INDEX

LATERAL RUN NO	SEE SHEETS
1	SD-07 THRU SD-09

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

NO.	DATE	REVISIONS

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

PREPARED FOR
CITY OF LAS VEGAS

H# 49876 | BID# ####

DATE: MARCH 24, 2015 | DESIGNED BY: DAM

SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: SPC/DAM | CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN PLAN AND PROFILE "SD" 18+50.00 TO "SD" 22+50.00

PRELIMINARY NOT FOR CONSTRUCTION
PROFESSIONAL ENGINEER MARK J. FINNAN STATE OF NEVADA 3/30/2015 CIVIL No. 14566

SHEET
SD-03
12 OF 56
DRAWING NO.
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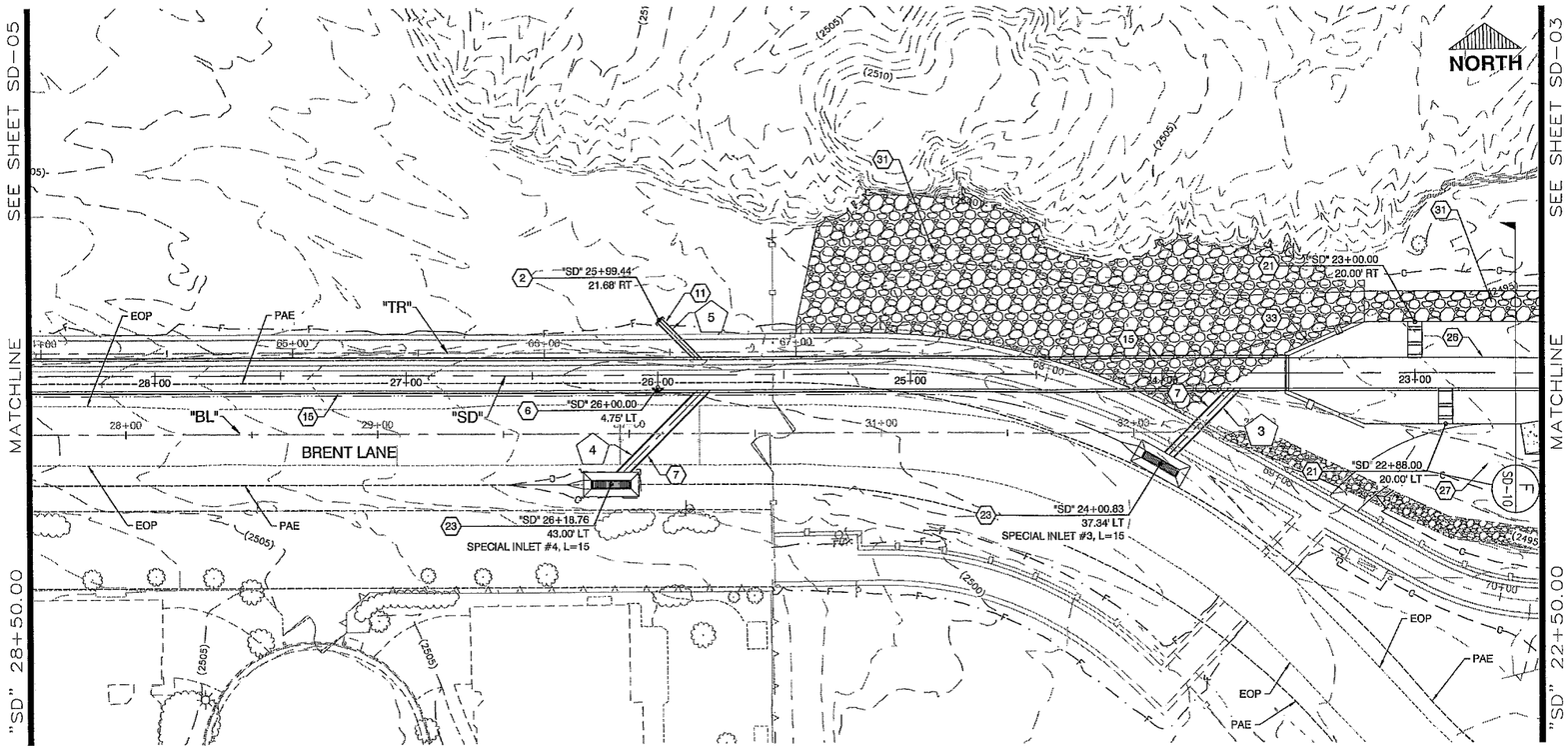

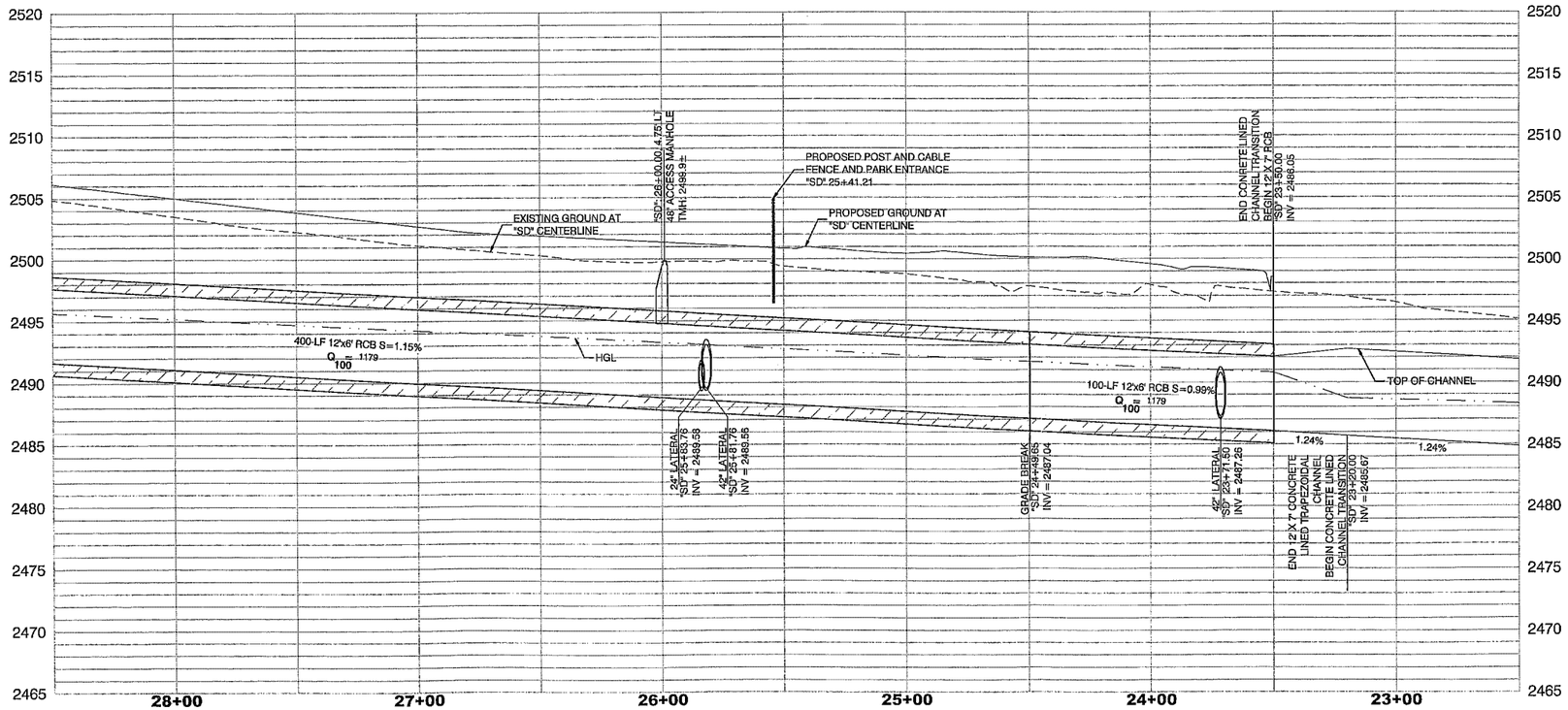

GRAPHIC SCALE

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(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6811
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

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1. CONSTRUCT RCB PLUG (SEE DETAIL 3, SHEET S-1)
2. CONSTRUCT BRICK AND MORTAR PLUG (SEE DETAIL 4, SHEET S-1)
3. CONSTRUCT CHANNEL TRANSITION AND HEADWALL (SEE DETAIL SHEET S-5)
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34. CONSTRUCT 48" TYPE I MANHOLE (USDCCA STD. DWG. NO. 403.1)

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LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEETS
1	SD-07 THRU SD-09

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-8390 FAX (702) 284-8399

PREPARED FOR
CITY OF LAS VEGAS

BID# ####	
H# 49876	DESIGNED BY: DAM
DATE: MARCH 24, 2015	DRAWN BY: SPC/DAM
SUBMITTAL STAGE: 90% SUBMITTAL	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN PLAN AND PROFILE "SD" 22+50.00 TO "SD" 28+50.00

PRELIMINARY
PROFESSIONAL ENGINEER STATE OF NEVADA MARK J. FALA 6/30/2015 CIVIL No. 14566

SHEET
SD-04
13 OF 56
DRAWING NO.
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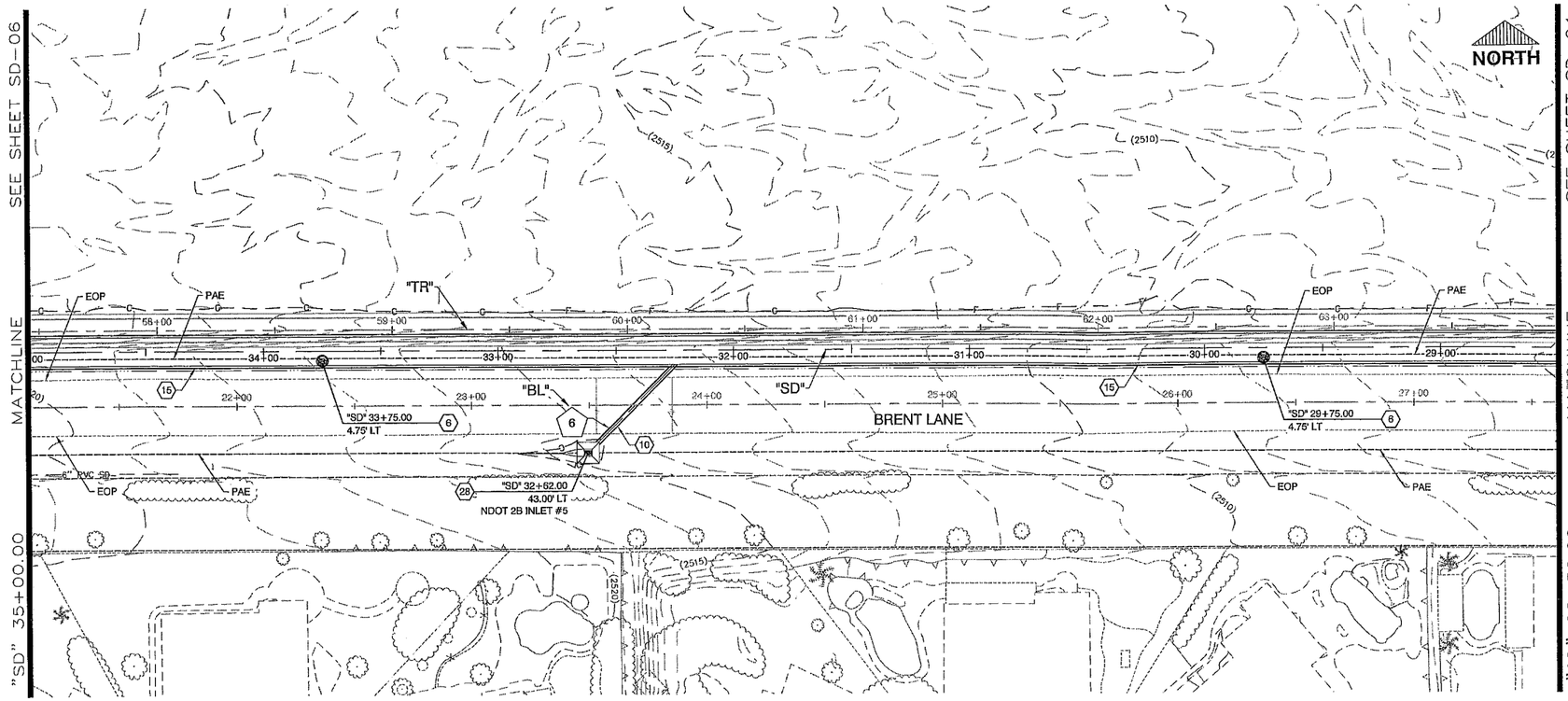

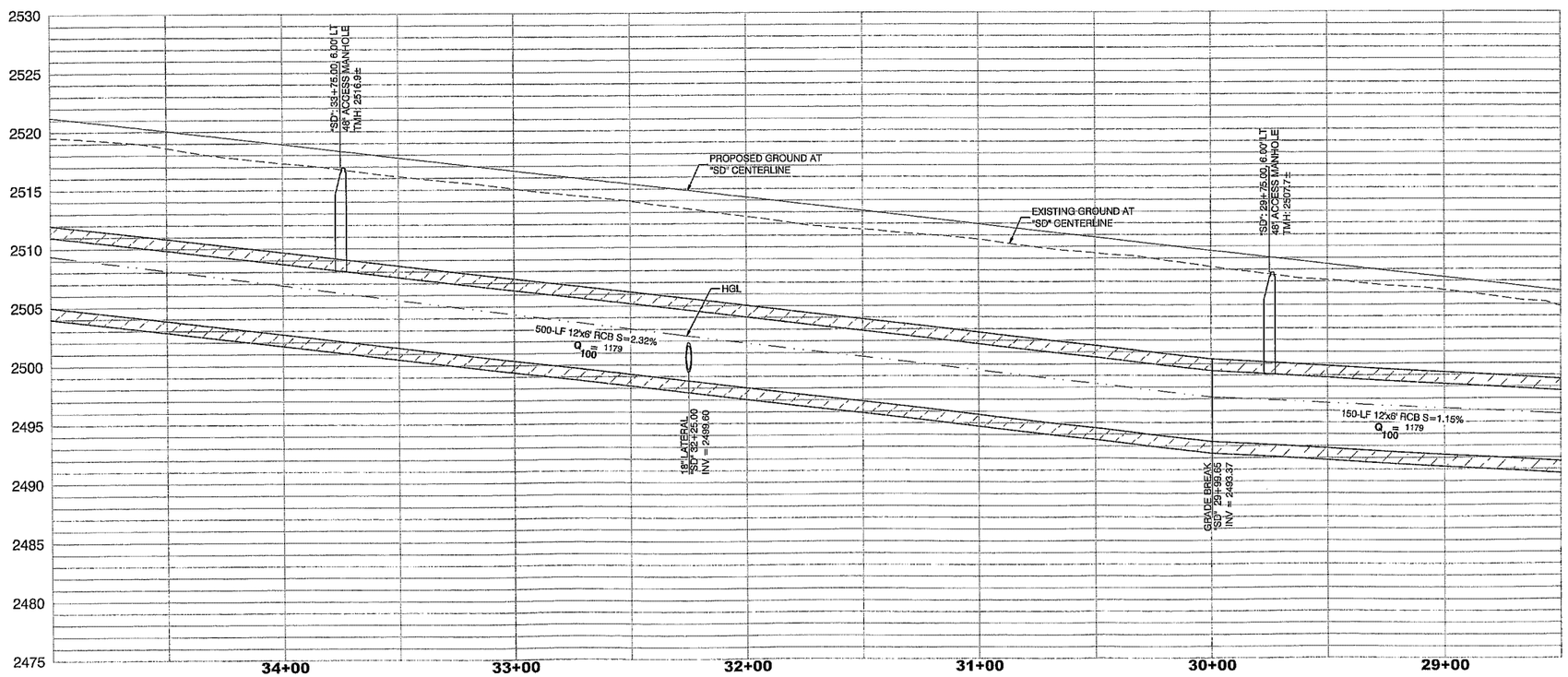

GRAPHIC SCALE

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(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

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LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEETS
1	SD-07 THRU SD-09

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

NO.	DATE	REVISIONS

PREPARED BY

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNERS

6740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118

PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR

CITY OF LAS VEGAS

H# 49876	BID# ####
DATE: MARCH 24, 2015	DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

STORM DRAIN PLAN AND PROFILE "SD" 28+50.00 TO "SD" 35+00.00

PROFESSIONAL ENGINEER STATE OF NEVADA MARK J. FIMIANI No. 14565 CIVIL 6/30/2015 PRELIMINARY

SHEET

SD-05

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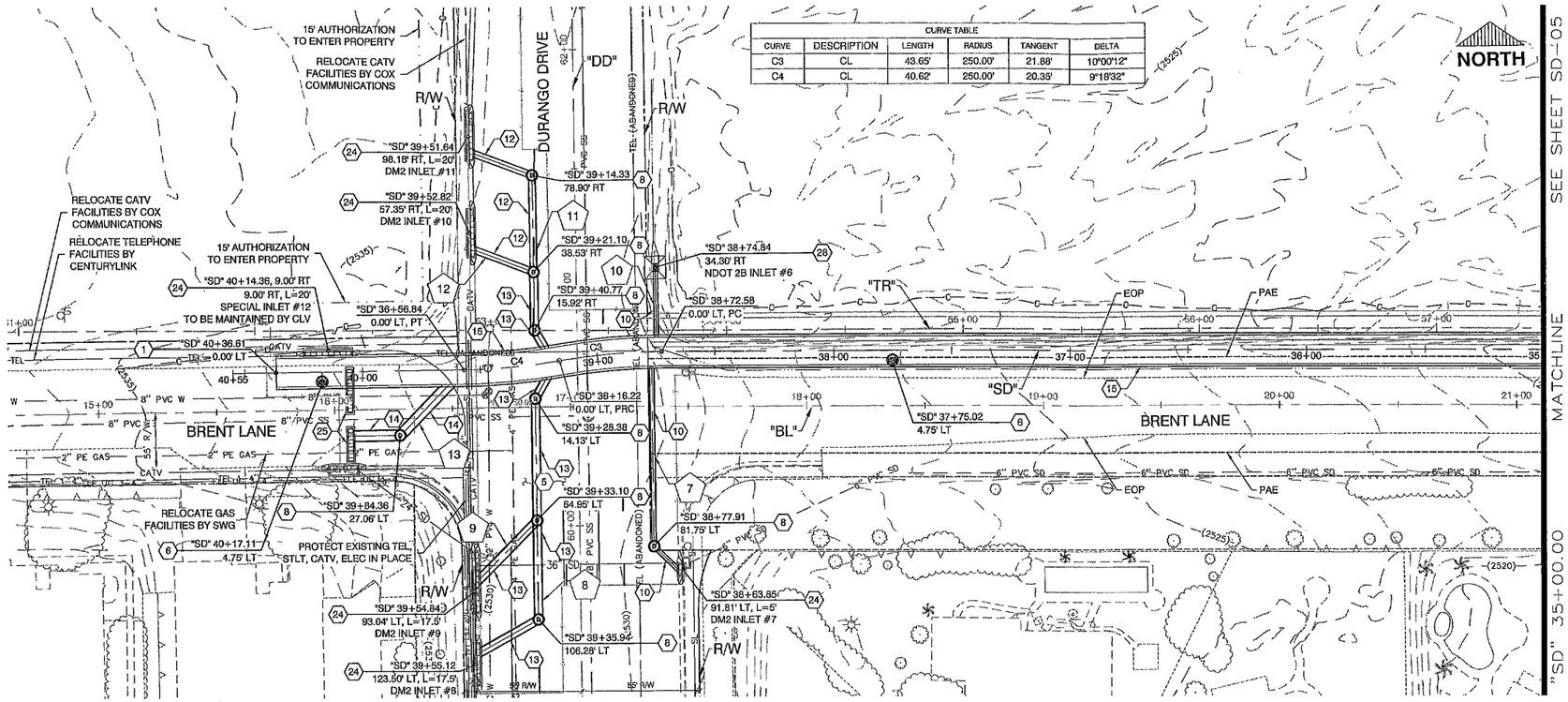

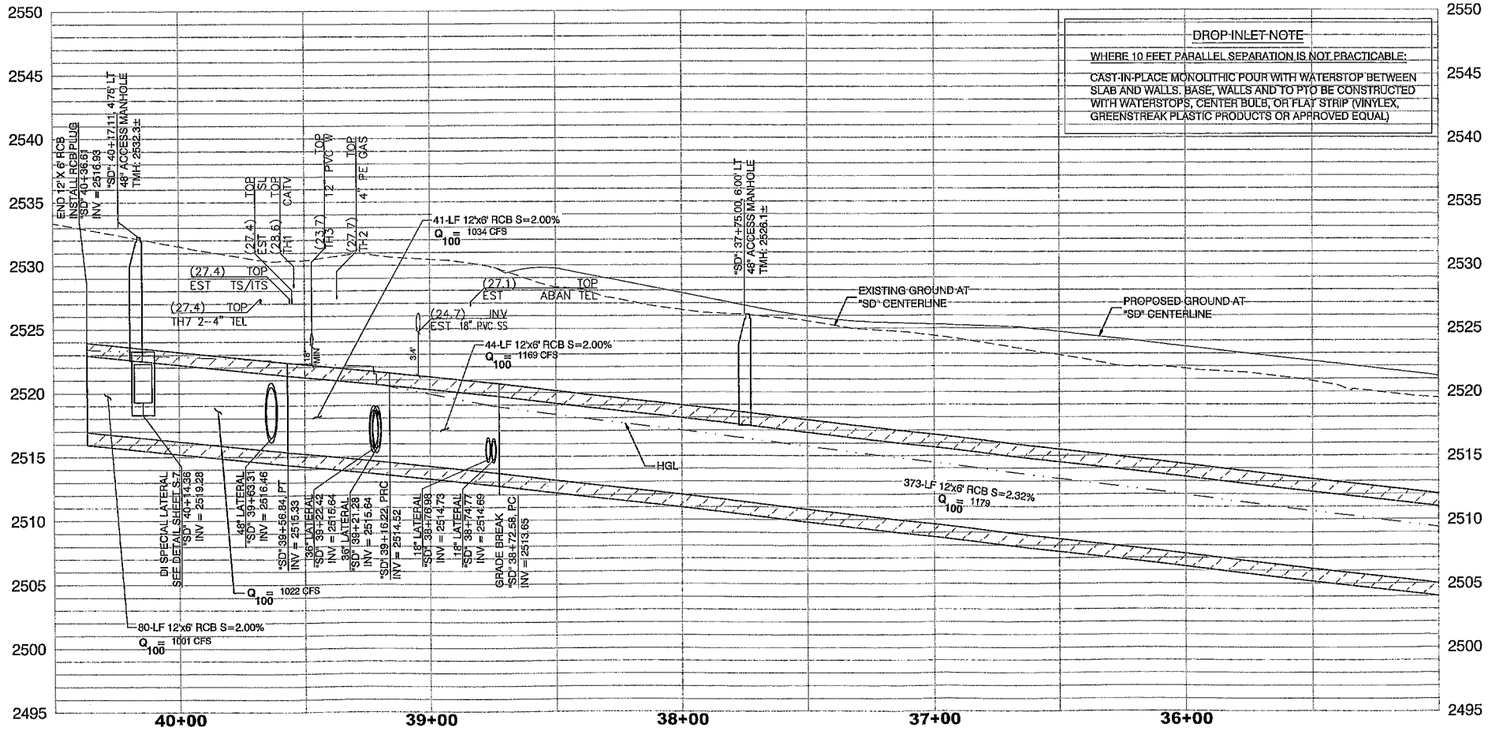

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

1. CONSTRUCT RCB PLUG (SEE DETAIL 3, SHEET S-1)
2. CONSTRUCT BRICK AND MORTAR PLUG (SEE DETAIL 4, SHEET S-1)
3. CONSTRUCT CHANNEL TRANSITION AND HEADWALL (SEE DETAIL SHEET S-5)
4. CONSTRUCT 12' WIDE CHANNEL ACCESS RAMP (SEE DETAIL 3, SHEET SD-14 AND DETAIL 1, SHEET S-8)
5. CONSTRUCT CONCRETE FLUME (SEE DETAIL 1, SHEET SD-14)
6. CONSTRUCT 48" RCB ACCESS MANHOLE (SEE DETAIL 6, SHEET S-1)
7. INSTALL 42" RCP
8. CONSTRUCT 60" TYPE III MANHOLE (USDCCA STD. DWG. NO. 406.1)
9. CONSTRUCT 12' WIDE 6" CONCRETE OVER 6" TYPE II AGGREGATE BASE CHANNEL ACCESS RAMP (SEE SHEET GR-1) "SD" 12+11.00, 20.00' LT TO "SD" 12+11.00, 57.90' LT)
10. INSTALL 18" RCP
11. INSTALL 24" RCP
12. INSTALL 30" RCP
13. INSTALL 36" RCP
14. INSTALL 48" RCP
15. CONSTRUCT 12' X 6' RCB (NDOT STD B 20.1.2)
16. CONSTRUCT 20' X 7' RCB (SEE DETAILS SHEET S-3)
17. CONSTRUCT 6' CONCRETE PAD OVER 4" TYPE II AGGREGATE BASE WITH CUTOFF WALLS SEE DETAIL SHEET S-6)
18. CONSTRUCT RIPRAP LINED TRAPEZOIDAL CHANNEL W/40' BW, EXISTING TOPS OF BANK TO REMAIN.
19. CONSTRUCT CONCRETE HEADWALL SEE SHEET S-6
20. INSTALL RIPRAP, D50=12", TH=24" OVER 12" TYPE II GRANULAR BEDDING
21. INSTALL ACCESS LADDER (SEE DETAIL 4, SHEET S-2)
22. CONSTRUCT CONCRETE FLUME (SEE DETAIL 2, SHEET SD-14)
23. CONSTRUCT SPECIAL DROP INLET W/ CONCRETE APRON (SEE DETAILS ON SHEET SD-13, SHEET S-9)
24. CONSTRUCT TYPE "DM2" DROP INLET (USDCCA STD. DWG. NO. 412.1)
25. CONSTRUCT TRENCH DRAIN (SEE DETAIL SHEET S-7)
26. CONSTRUCT 12' WIDE x 7' DEEP CONCRETE LINED TRAPEZOIDAL CHANNEL (SEE DETAIL SHEET S-3)
27. INSTALL 12' WIDE 6" TYPE II MAINTENANCE ROAD
28. CONSTRUCT NDOT TYPE 2B DROP INLET (NDOT STD. PLAN R-4.2.2) W/ CONCRETE APRON (NDOT STD R-4.2.7) (SEE DETAIL SHEET SD-13)
29. CONSTRUCT 12' WIDE 6" TYPE II CHANNEL ACCESS RAMP (SEE SHEET GR-1) ("SD" 12+11.00, 57.90' LT TO "SD" 12+56.41, 122.28' LT)
30. NOT USED
31. INSTALL RIPRAP, D50=24", TH=48", OVER 12" TYPE II GRANULAR BEDDING
32. NOT USED
33. CONSTRUCT CHANNEL TRANSITION AND HEADWALL (SEE DETAIL SHEET S-4)
34. CONSTRUCT 48" TYPE I MANHOLE (USDCCA STD. DWG. NO. 403.1)

NOTES

1. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR GRADE BREAK OR TO INSIDE EDGE OF DI, RCB, OR STRUCTURE.
2. ALL DROP INLETS AND CONCRETE APRONS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDCCA STD. DWG. NO. 421.
3. ALL STORM DRAIN SHALL BE CLASS III UNLESS OTHERWISE NOTED.
4. NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS SHOWN FOR INFORMATIONAL ONLY. REFERENCE NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS DRAWINGS FOR CONSTRUCTION DETAILS. CONTRACTOR TO COORDINATE WITH UTILITIES FOR REMOVAL AND INSTALLATION OF FACILITIES.
5. ALL EXISTING UTILITY LOCATIONS SHOW HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. THE DEPTH BELOW GRADE OF THE VARIOUS UTILITIES DEPICTED ON THE PLANS VARIES THROUGHOUT THE PROJECT AREA. THE CONTRACTOR SHALL EXERCISE EXTREME CARE WHERE EXCAVATING AND GRADING THE SUBBASE IN THE VICINITY OF UTILITIES TO AVOID DAMAGE TO THE LATTER.
6. ALL EXISTING UTILITIES SHALL BE PROTECTED IN PLACE UNLESS OTHERWISE NOTED.
7. SEE SC-01 FOR RCB AND CHANNEL GEOMETRY.

LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEETS
1	SD-07 THRU SD-09

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

NO.	DATE	REVISIONS

PREPARED BY:
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 384-5300 FAX (702) 384-5399

PREPARED FOR
CITY OF LAS VEGAS

H# 49876	BID# ######
DATE: MARCH 24, 2015	DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN PLAN AND PROFILE "SD" 35+00.00 TO "SD" 40+55.00

PROFESSIONAL ENGINEER STATE OF NEVADA MARK J. FALA Exp. 12/30/2015 CIVIL No. 14566 PRELIMINARY

SHEET
SD-06
15 OF 56
DRAWING NO.
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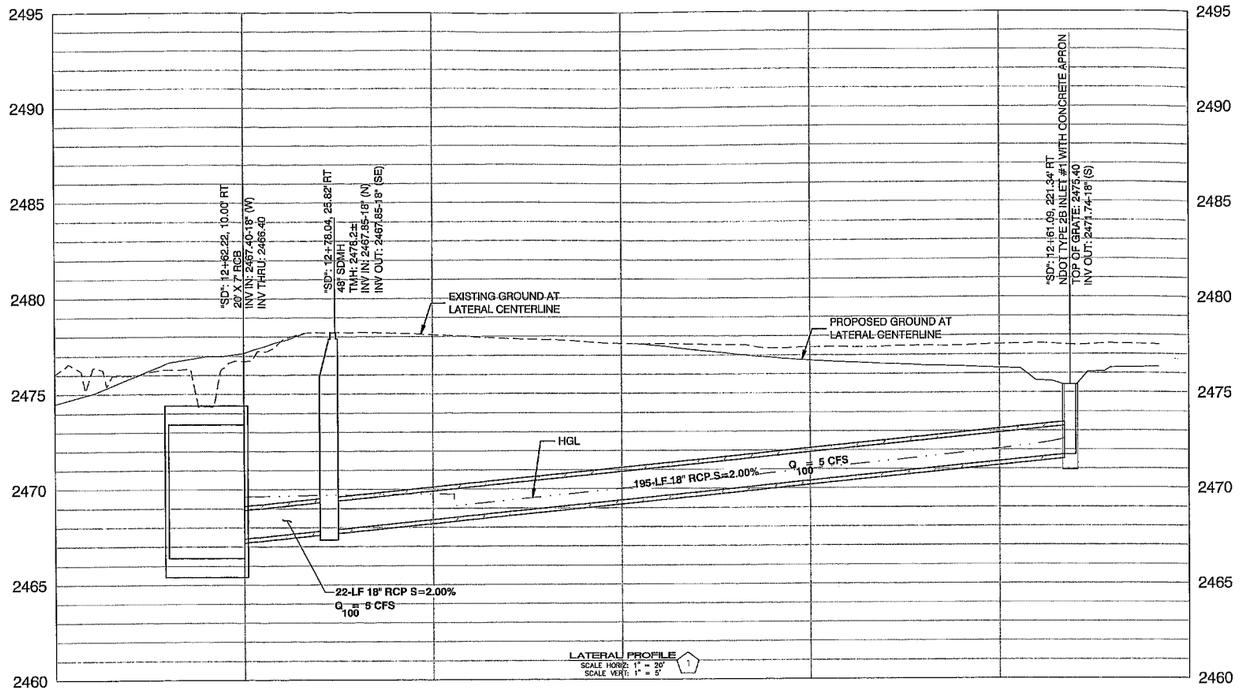

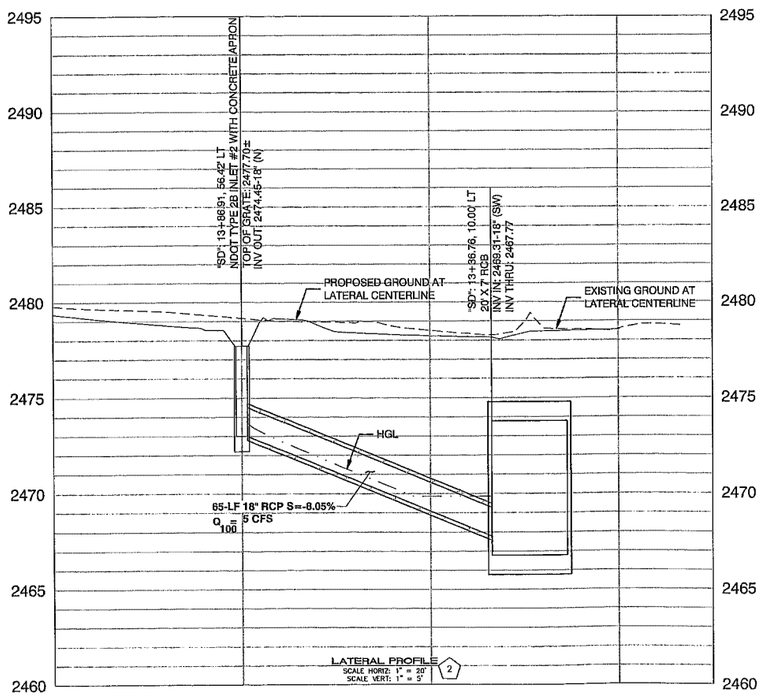

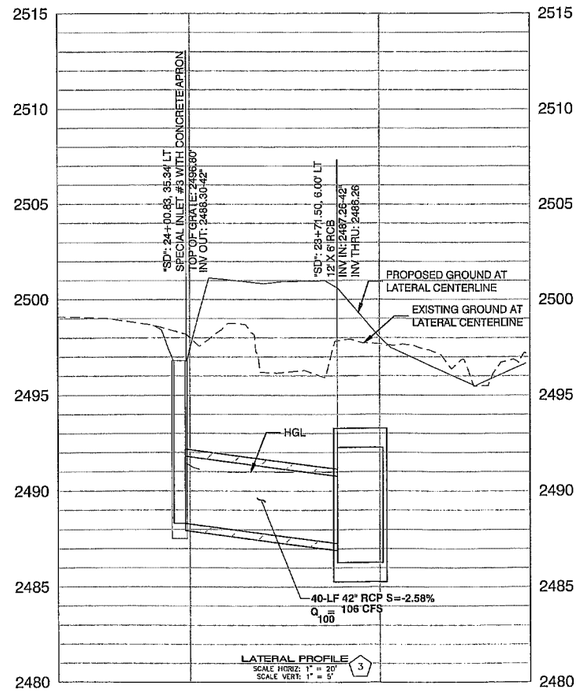

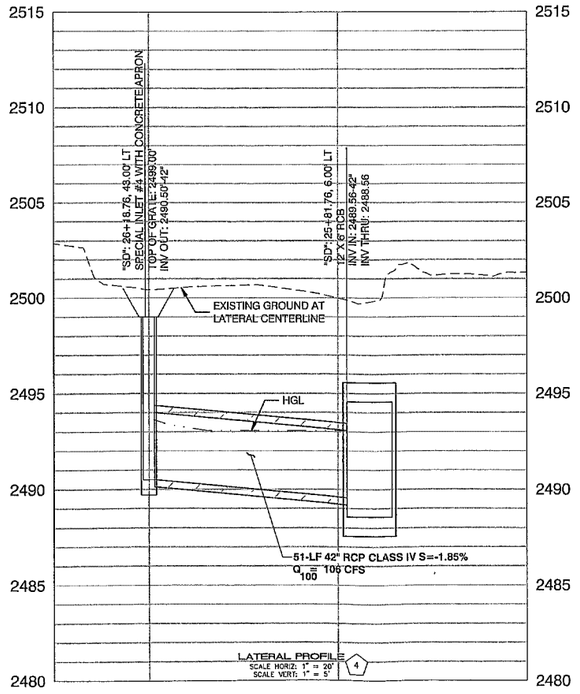

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

FOR TRENCHES SIX (6) FEET WIDE AND GREATER:

IF THE PIPE MATERIAL IS ACP, THE EXPOSED PIPE MUST BE REPLACED WITH DUCTILE IRON PIPE.

CONTRACTOR MUST SUBMIT PIPE SUPPORT DETAIL PREPARED BY A NEVADA LICENSED ENGINEER TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINE(S) WILL BE SUPPORTED DURING EXCAVATION AND BACK FILL.

SUPPORTED PIPE MAY BE EXPOSED FOR NO LONGER THAN 90 DAYS MAXIMUM. IF THE PIPE WILL BE EXPOSED FOR MORE THAN 90 DAYS PLANS MUST BE SUBMITTED AND APPROVED BY THE LVVWD TO RELOCATE PIPE.

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5500 FAX (702) 284-5599

PREPARED FOR
CITY OF LAS VEGAS

BID# -
DESIGNED BY: DAM
DRAWN BY: SPC/DAM
CHECKED BY: JSR/MJF

H# 49676
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN LATERAL PROFILES

PROFESSIONAL ENGINEER – STATE OF NEVADA
MARK J. FIALA
No. 14566
CIVIL
6/30/2015
PRELIMINARY

SHEET
SD-07
16 OF 56
DRAWING NO.
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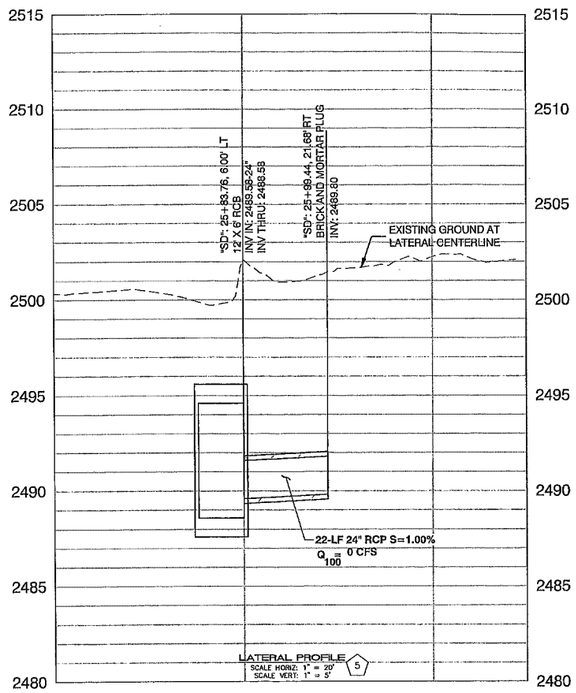

LATERAL PROFILE
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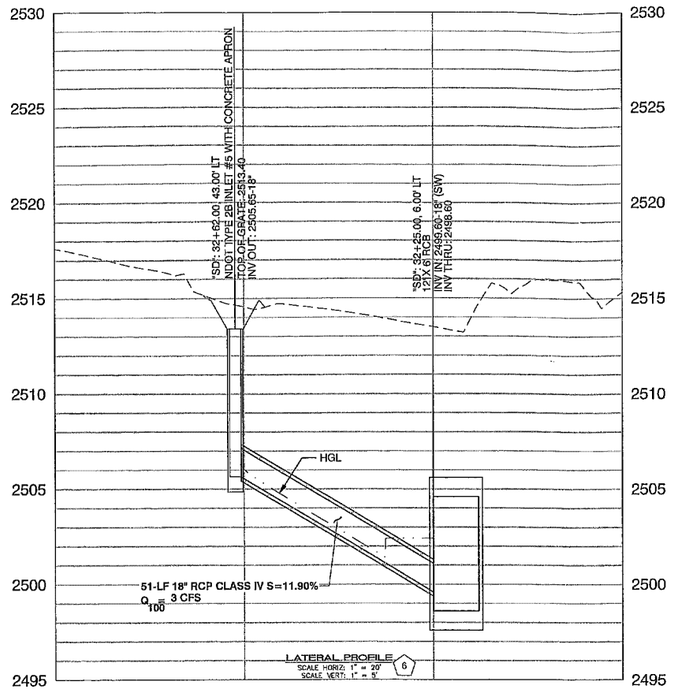
SCALE VERT: 1" = 5'
5



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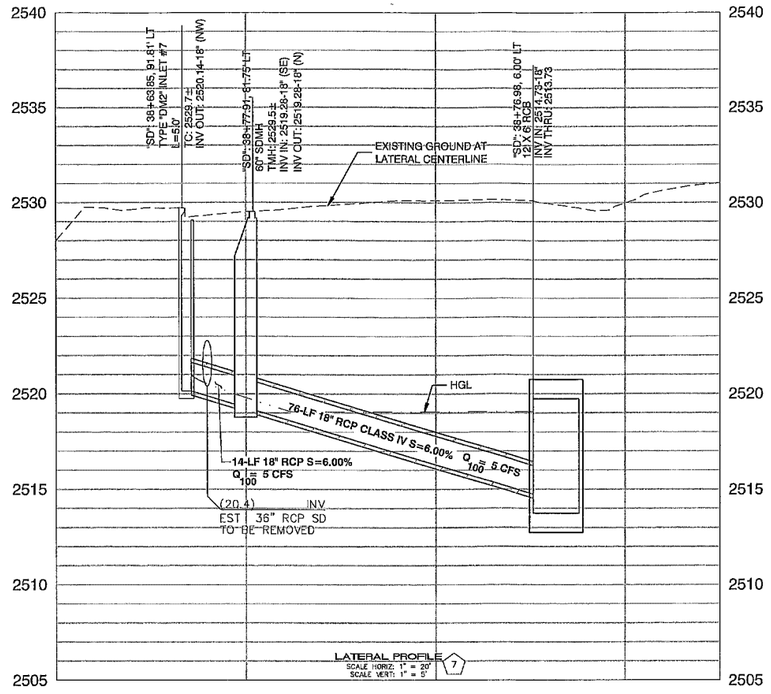

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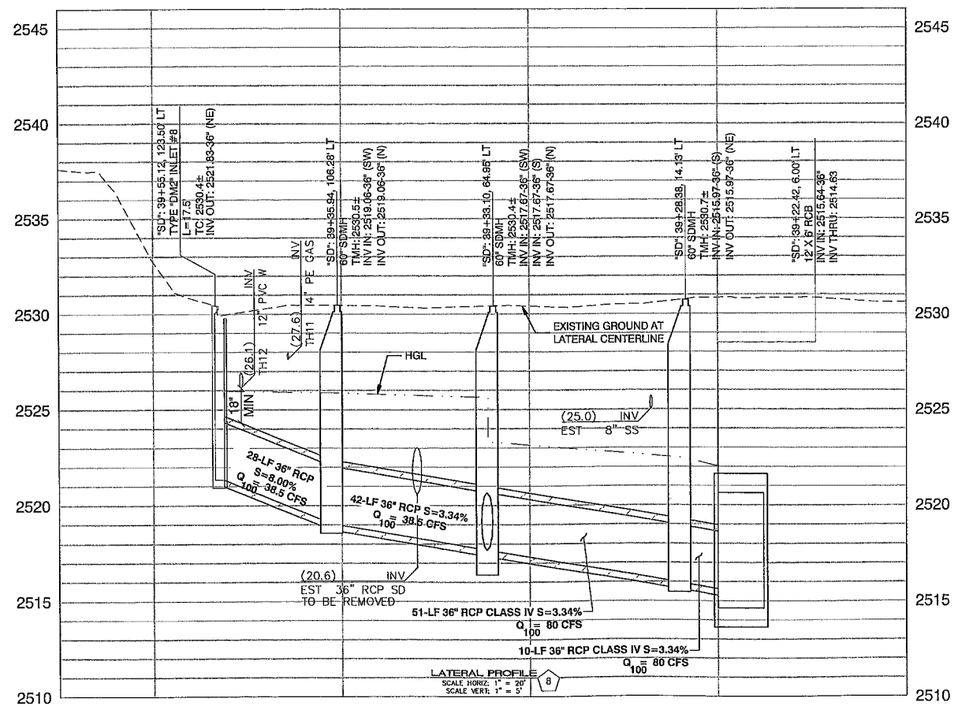

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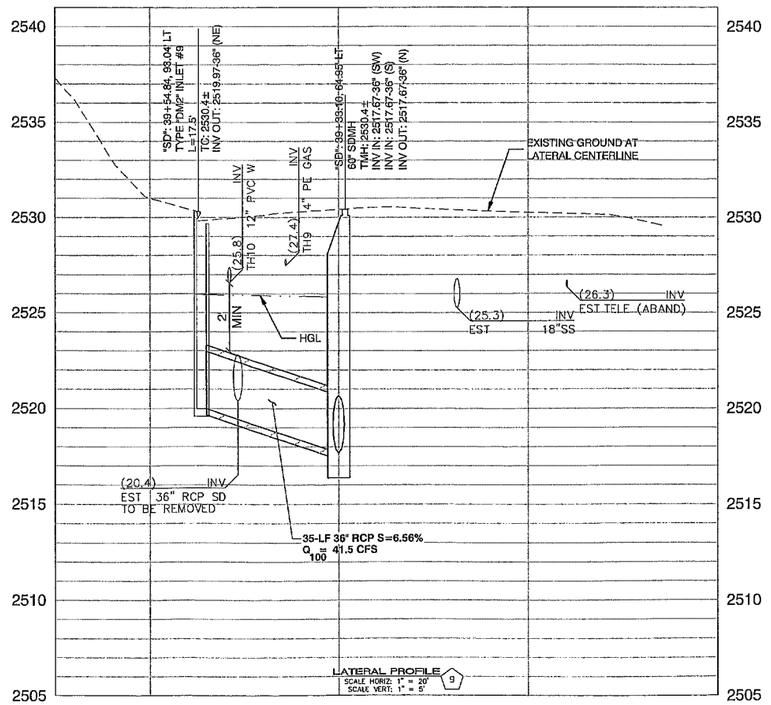

LATERAL PROFILE
SCALE HORIZ: 1" = 20'
SCALE VERT: 1" = 5'
9

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 123165

FOR TRENCHES SIX (6) FEET WIDE AND GREATER:

IF THE PIPE MATERIAL IS ACP, THE EXPOSED PIPE MUST BE REPLACED WITH DUCTILE IRON PIPE.

CONTRACTOR MUST SUBMIT PIPE SUPPORT DETAIL PREPARED BY A NEVADA LICENSED ENGINEER TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINE(S) WILL BE SUPPORTED DURING EXCAVATION AND BACK FILL.

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PREPARED FOR
CITY OF LAS VEGAS

H# 49876
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL
BID# -
DESIGNED BY: DAM
DRAWN BY: SPC/DAM
CHECKED BY: JSR/MJF

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
6740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

NO.	DATE	REVISIONS

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN LATERAL PROFILES

PROFESSIONAL ENGINEER
MARK J. FRICKE
10/30/2015
CIVIL
No. 14566
STATE OF NEVADA
PRELIMINARY

SHEET
SD-08
17 OF 56
DRAWING NO.
-

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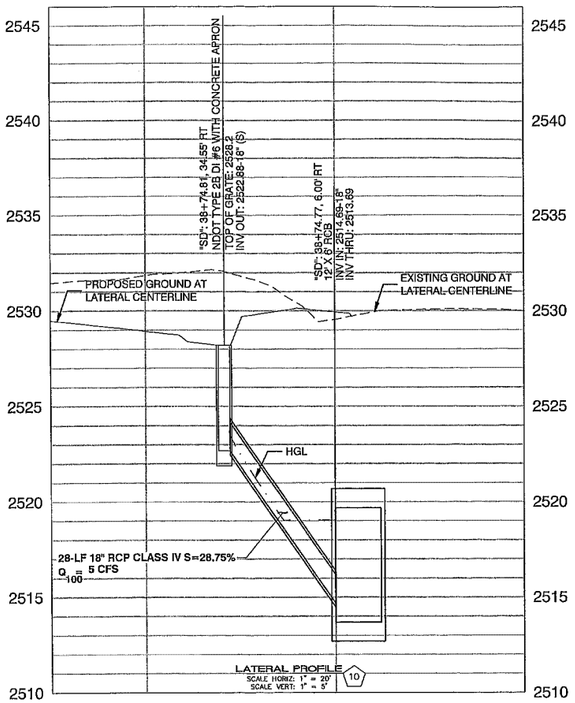

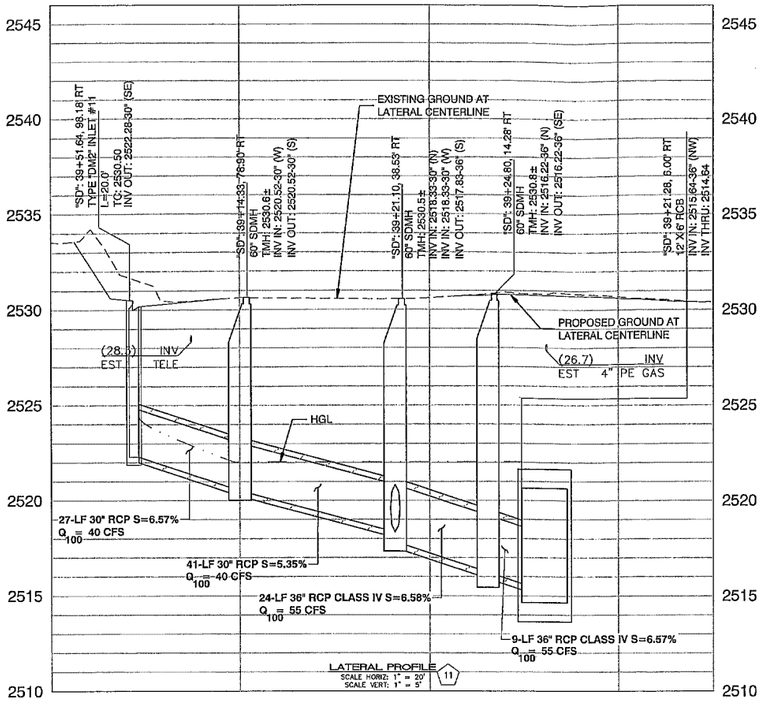

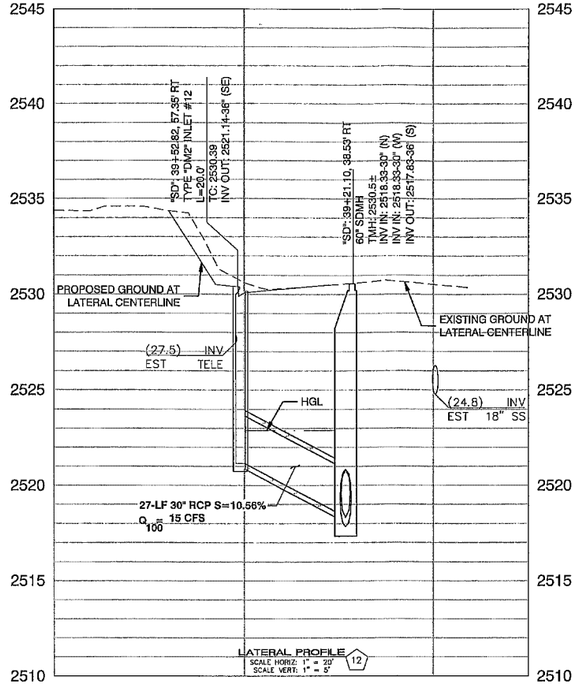

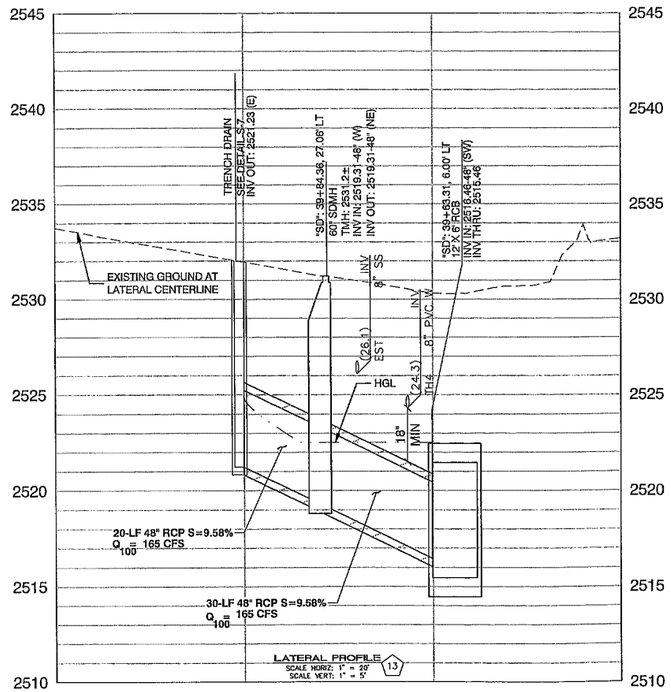

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

FOR TRENCHES SIX (6) FEET WIDE AND GREATER:

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

NO.	DATE	REVISIONS

PREPARED FOR
CITY OF LAS VEGAS

H# 49876	BID# -
DATE: MARCH 24, 2015	DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM LATERAL DRAIN PROFILES

PRELIMINARY
PROFESSIONAL ENGINEER — STATE OF NEVADA
MARK J. FIA
03/30/2015
CIVIL
No. 14566

SHEET
SD-09
18 OF 56
DRAWING NO.
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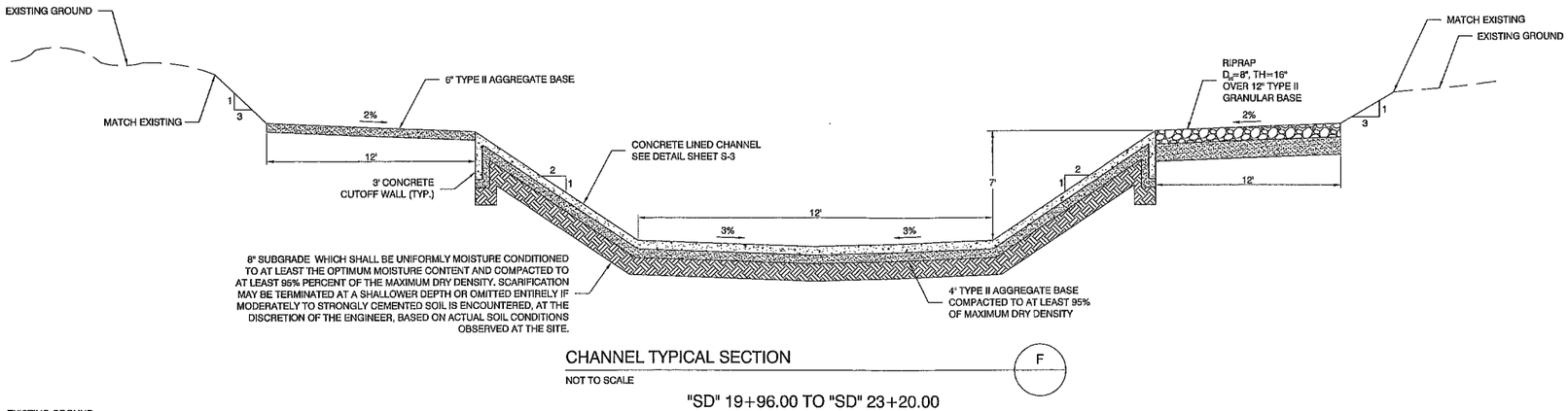

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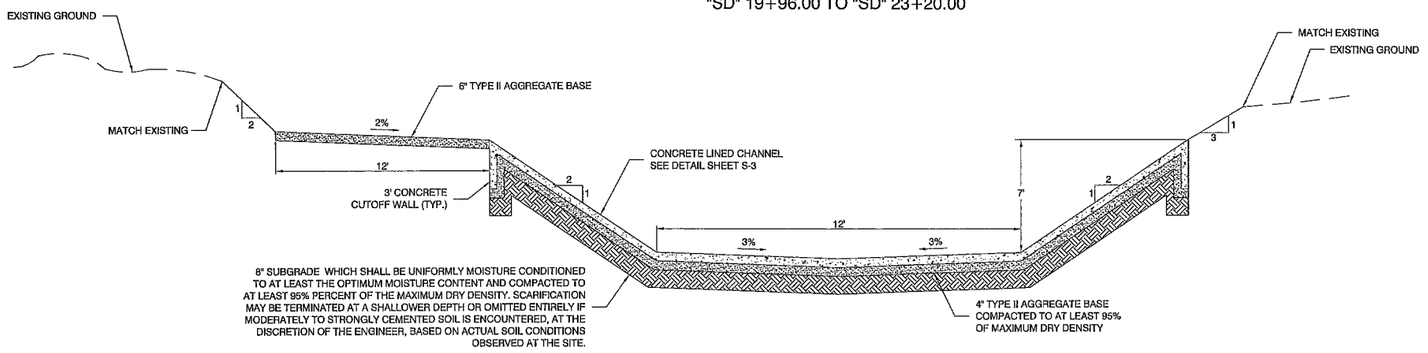

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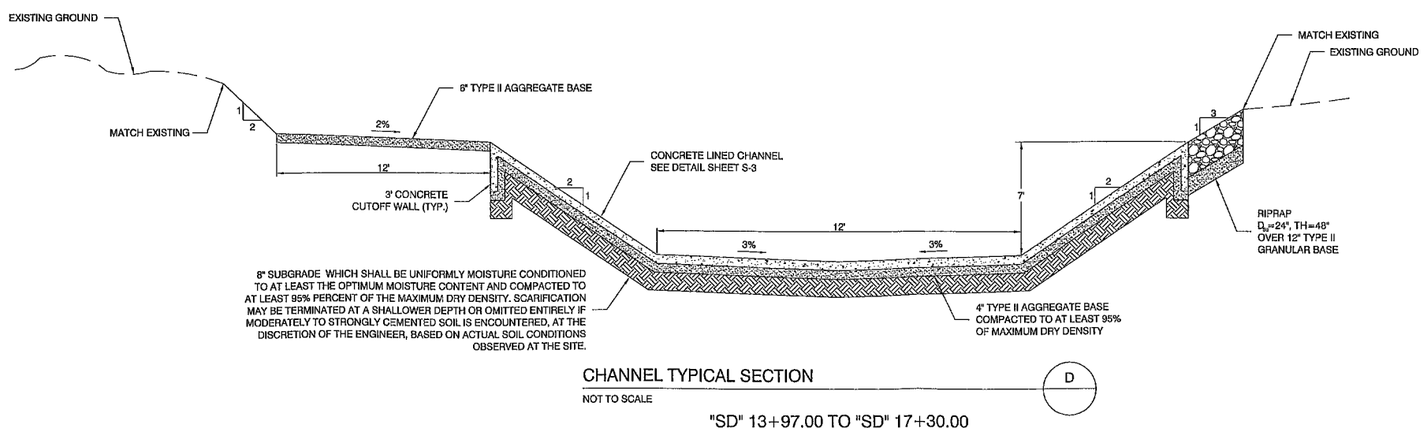

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SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

NO.	DATE	REVISIONS

PREPARED FOR
CITY OF LAS VEGAS

H# 49876 | BID# -

DATE: MARCH 24, 2015 | DESIGNED BY: JSR

SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: SPC/DAM | CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN TYPICAL SECTIONS

PROFESSIONAL ENGINEER STATE OF NEVADA MARK J. FIALA 3/30/2015 CIVIL No. 14566 PRELIMINARY

SHEET
SD-10
19 OF 56
DRAWING NO.
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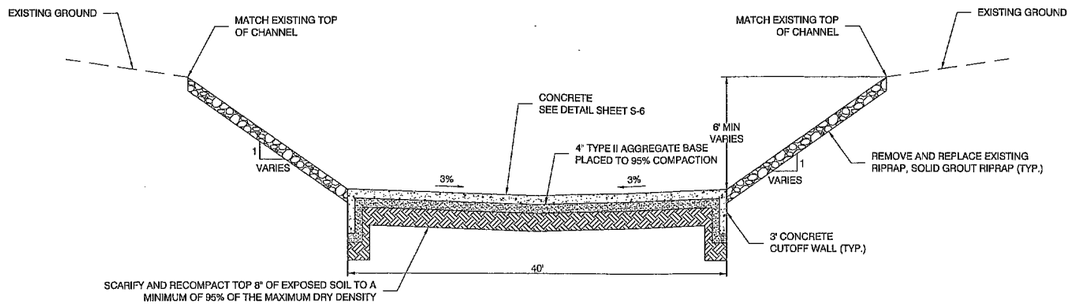

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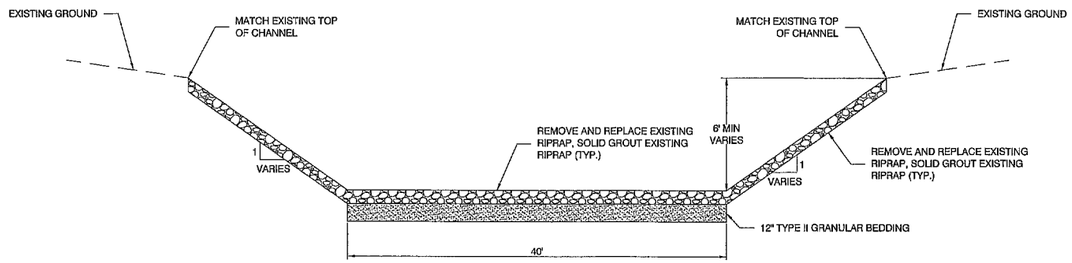

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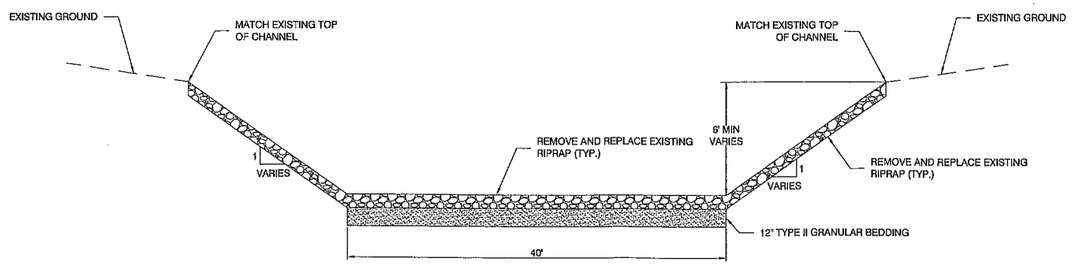

CHANNEL TYPICAL SECTION — A

NOT TO SCALE

"SD" 11+00.00 TO "SD" 11+70.00

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
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NO.	DATE	REVISIONS

PREPARED FOR
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H# 49876	BID# -
DATE: MARCH 24, 2015	DESIGNED BY: JSR
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN TYPICAL SECTIONS

PROFESSIONAL ENGINEER — STATE OF NEVADA — MARK J. FIALA — 3/30/2015 — CIVIL — No. 14566 — PRELIMINARY

SHEET
SD-11
20 OF 56
DRAWING NO.
-

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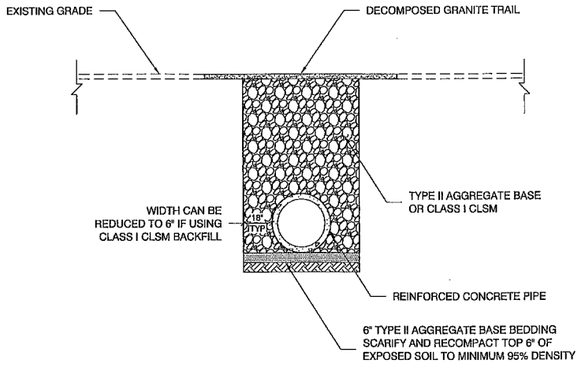
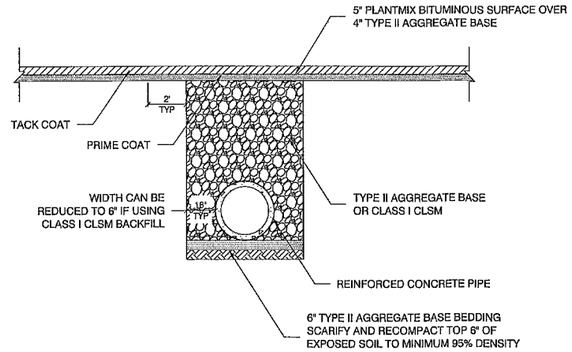
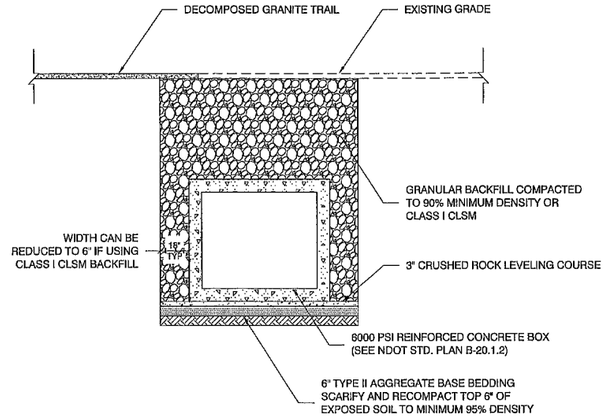


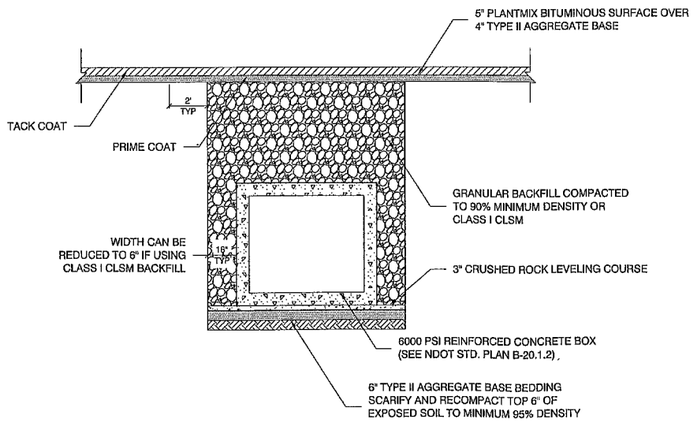
REINFORCED CONCRETE PIPE SECTION (UNPAVED AREAS)



REINFORCED CONCRETE PIPE SECTION (PAVED AREAS)



REINFORCED CONCRETE BOX SECTION (UNPAVED AREAS)



REINFORCED CONCRETE BOX SECTION (PAVED AREAS)

NOTES:

1. SEE REMOVAL PLANS FOR LIMITS OF PAVEMENT REPLACEMENT AND MILL/OVERLAY.
2. THE SAWCUT AND PAVEMENT RESTORATION LIMITS SHOWN ARE BASED ON VERTICAL WALL TRENCHES. NO ADDITIONAL PAYMENT WILL BE MADE FOR DAMAGED PAVEMENT OR PAVEMENT REMOVED TO LAY BACK TRENCH SLOPES. FINAL SAWCUT LIMITS SHALL BE APPROVED BY FIELD INSPECTOR.
3. TRENCH WALLS SHALL BE SHORED PER OSHA REQUIREMENTS.

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PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
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NO.	DATE	REVISIONS

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BID# -
DESIGNED BY: DAM
DRAWN BY: QPC/DAM
CHECKED BY: JSR/MJF
SUBMITTAL STAGE: 90% SUBMITTAL

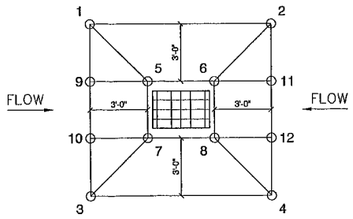
TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN DETAILS

PROFESSIONAL ENGINEER - STATE OF NEVADA
MARK J. FOLEY
3/30/2015
CIVIL
No. 14566
PRELIMINARY

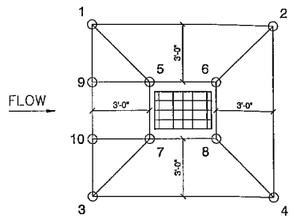
SHEET
SD-12
21 OF 56
DRAWING NO.
-

NORTH



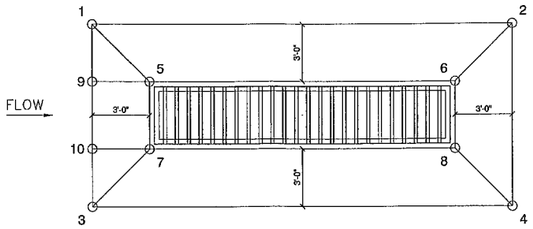
APRON ELEVATION TABLE NDOT 2B DROP INLET #1	
POINT	ELEVATION
1	2477.02
2	2477.07
3	2477.02
4	2477.06
5	2475.40
6	2475.40
7	2475.40
8	2475.40
9	2475.59
10	2475.59
11	2476.06
12	2476.06

NORTH



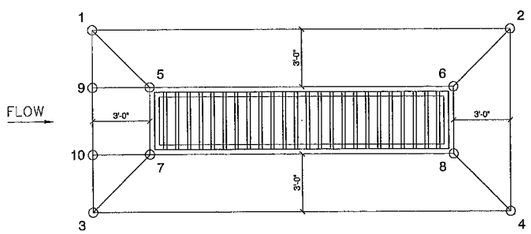
APRON ELEVATION TABLE NDOT 2B DROP INLET #2	
POINT	ELEVATION
1	2479.20
2	2478.90
3	2479.20
4	2479.00
5	2477.70
6	2477.70
7	2477.70
8	2477.70
9	2478.52
10	2478.52

NORTH



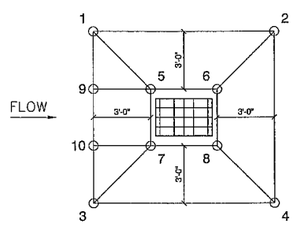
APRON ELEVATION TABLE SPECIAL DROP INLET #3	
POINT	ELEVATION
1	2499.13
2	2499.30
3	2498.50
4	2498.30
5	2496.80
6	2496.80
7	2496.80
8	2496.80
9	2496.84
10	2496.85

NORTH



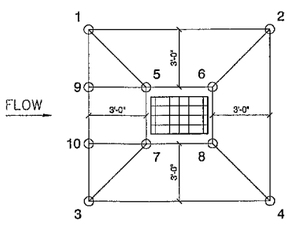
APRON ELEVATION TABLE SPECIAL DROP INLET #4	
POINT	ELEVATION
1	2500.50
2	2500.50
3	2500.50
4	2500.50
5	2499.00
6	2499.00
7	2499.00
8	2499.00
9	2499.17
10	2499.17

NORTH



APRON ELEVATION TABLE NDOT 2B DROP INLET #5	
POINT	ELEVATION
1	2514.90
2	2514.90
3	2514.90
4	2514.90
5	2513.40
6	2513.40
7	2513.40
8	2513.40
9	2513.61
10	2513.61

NORTH



APRON ELEVATION TABLE NDOT 2B DROP INLET #6	
POINT	ELEVATION
1	2529.70
2	2529.70
3	2529.70
4	2529.70
5	2528.20
6	2528.20
7	2528.20
8	2529.20
9	2528.27
10	2528.27

DROP INLET CONCRETE APRONS

NOT TO SCALE

NO.	DATE	REVISIONS

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

PREPARED FOR
CITY OF LAS VEGAS

H# 49876	BID# -
DATE: MARCH 24, 2015	DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN DETAILS

PROFESSIONAL ENGINEER - STATE OF NEVADA
MARK J. FAHA
Exp. 06/30/2015
CIVIL
No. 14566
PRELIMINARY

SHEET
SD-13
22 OF 56
DRAWING NO.
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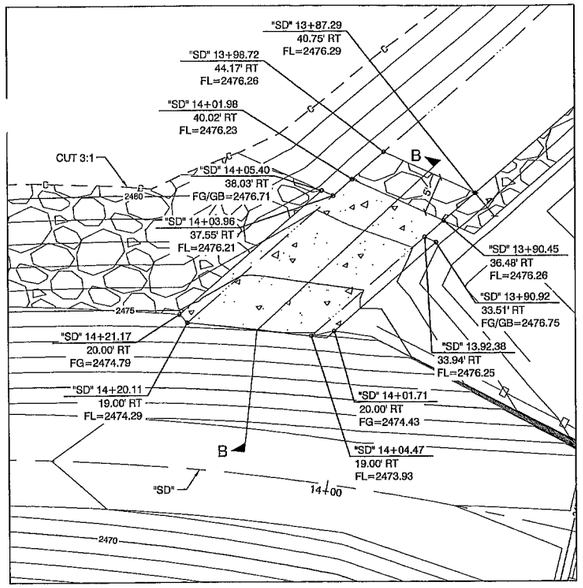

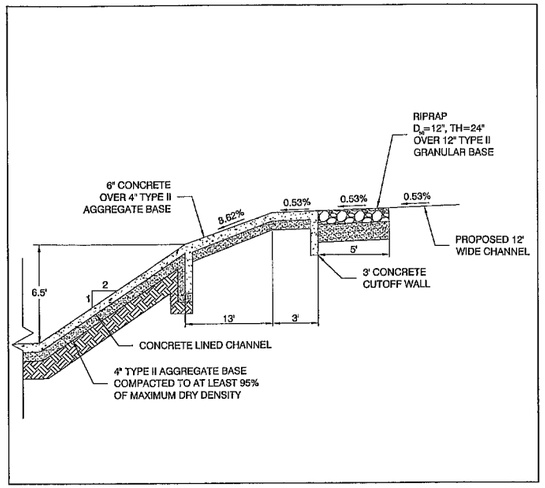

SECTION B–B
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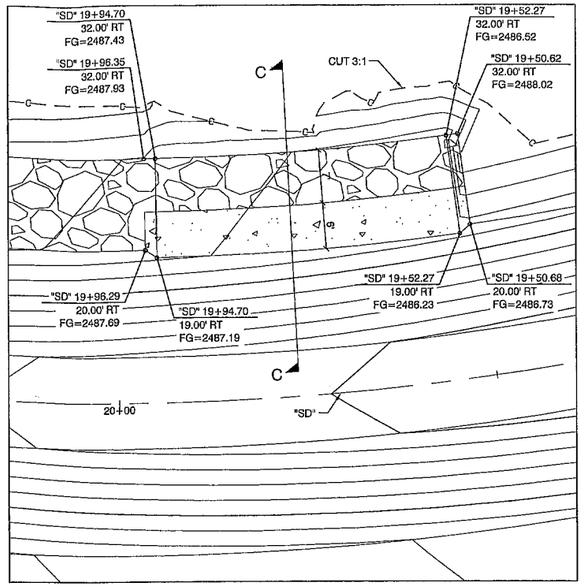
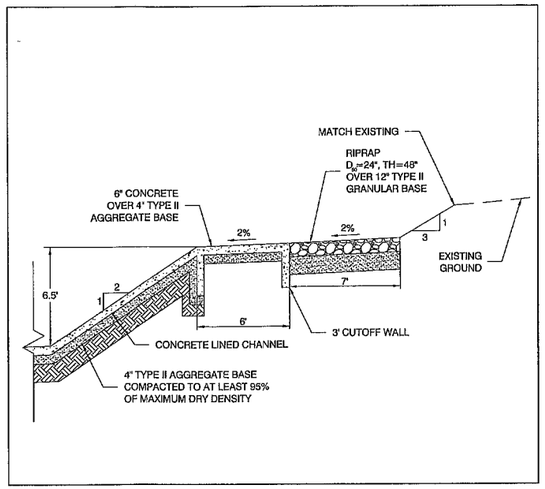


CONCRETE FLUME DETAIL–"SD" 14+11.33 (1)
SCALE: 1" = 10'–0"



SECTION C–C
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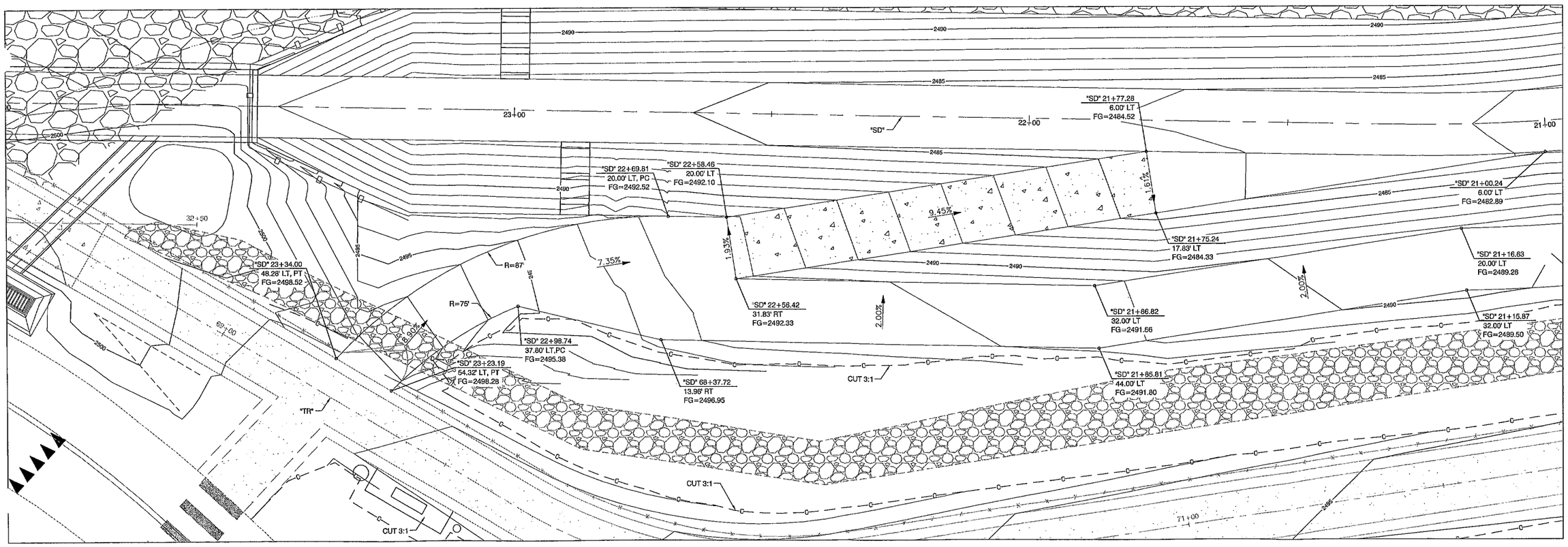
CONCRETE FLUME DETAIL–"SD" 19+73.48 (2)
SCALE: 1" = 10'–0"



CONCRETE CHANNEL ACCESS RAMP DETAIL (3)
SCALE: 1" = 10'–0"

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NO.	DATE	REVISIONS

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

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CITY OF LAS VEGAS

H# 49876	BID# -
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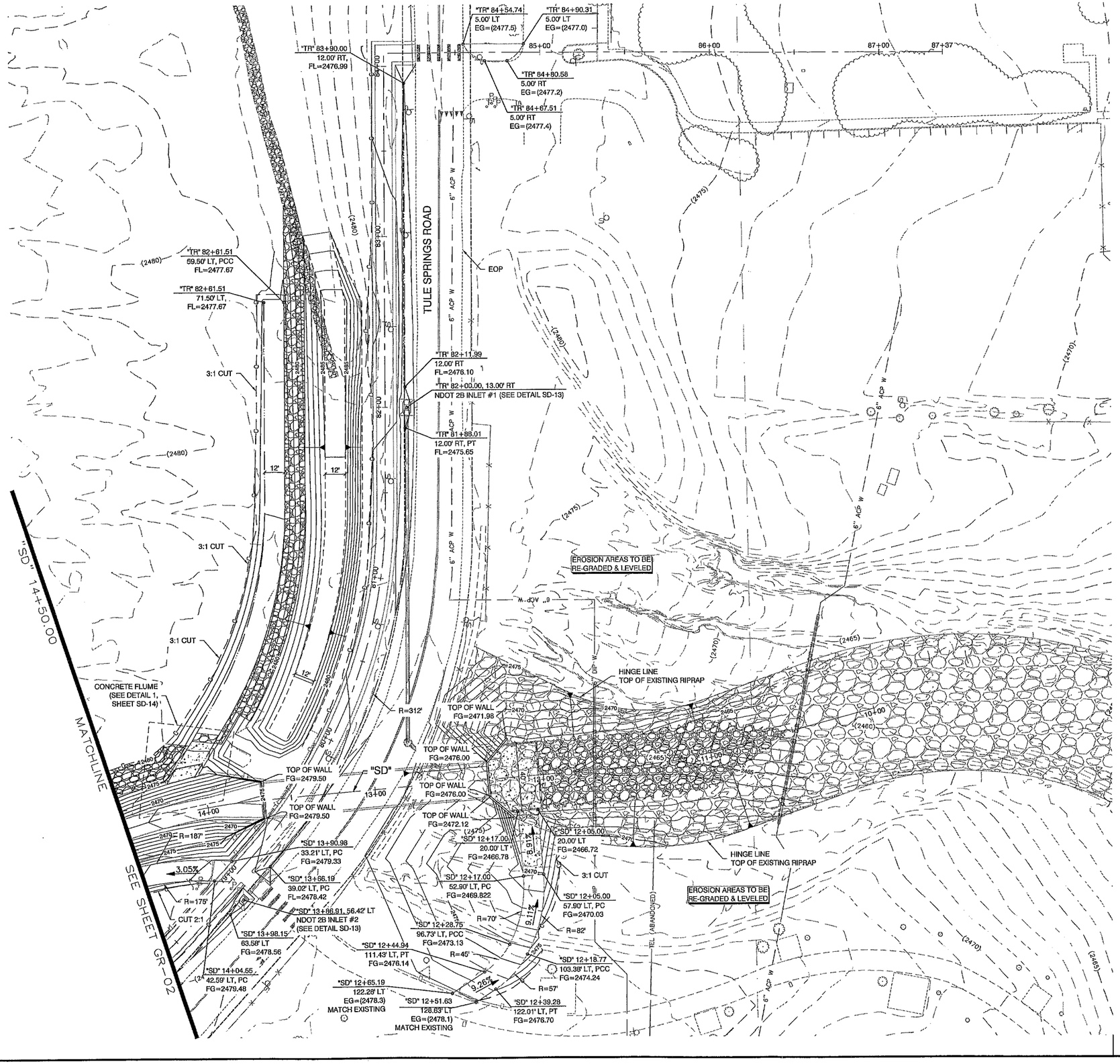
TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STORM DRAIN DETAILS

PROFESSIONAL ENGINEER
MARK J. FIA
3/30/2015
CIVIL
No. 14566
STATE OF NEVADA
PRELIMINARY

SHEET
SD-14
23 OF 56
DRAWING NO.
-



GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

CONCRETE

RIPRAP

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

NO.	DATE	REVISIONS

PREPARED BY

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNERS

6740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118

PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR

CITY OF LAS VEGAS

H# 49876

DATE: MARCH 24, 2015

BID# ####

DESIGNED BY: DAM

DRAWN BY: SPC/DAM

CHECKED BY: JSR/MJF

SUBMITTAL STAGE:

90% SUBMITTAL

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

GRADING PLAN

"SD" 10+00.00 TO "SD" 14+50.00

PROFESSIONAL ENGINEER MARK J. FIORENZA STATE OF NEVADA 7/30/2015 CIVIL No. 14566 PRELIMINARY NOT FOR CONSTRUCTION

SHEET

GR-01

24 OF 56

DRAWING NO.

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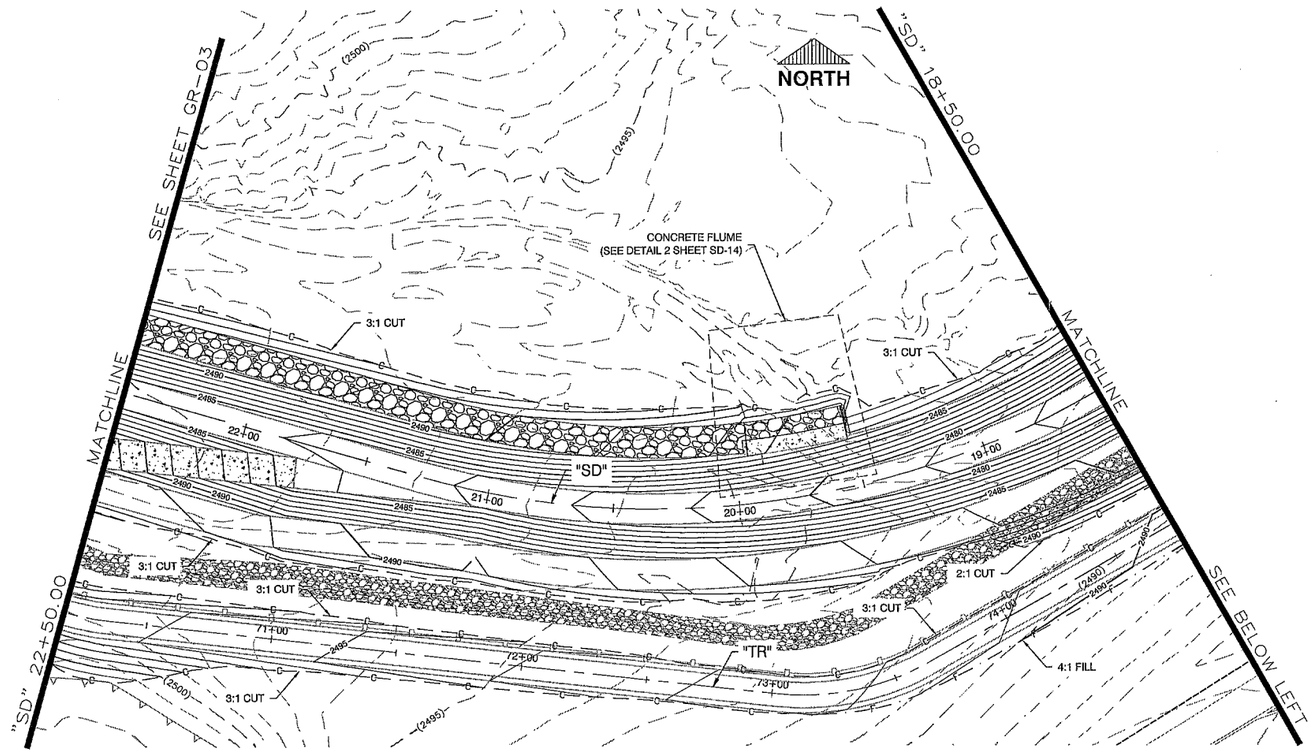

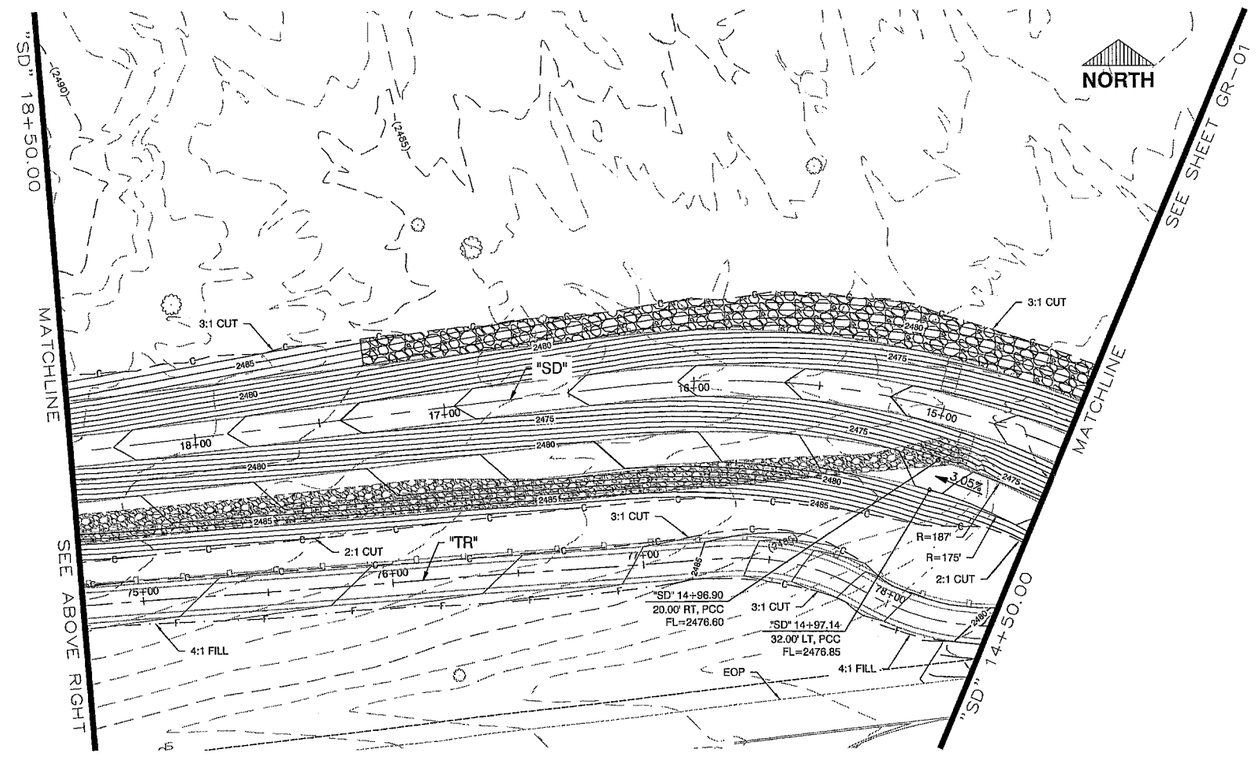

GRAPHIC SCALE

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(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6811
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

CONCRETE

RIPRAP

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

NO.	DATE	REVISIONS

PREPARED BY

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNERS

5748 S. ARVILLE STREET #216, LAS VEGAS, NV 89118

PHONE (702) 284-0200 FAX (702) 284-0399

PREPARED FOR

CITY OF LAS VEGAS

H# 49876

DATE: MARCH 24, 2015

BID# ####

DESIGNED BY: DAM

DRAWN BY: SPC/DAM

CHECKED BY: JSR/MJF

SUBMITTAL STAGE:

90% SUBMITTAL

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

GRADING PLANE

"SD" 14+50.00 TO "SD" 18+50.00

PRELIMINARY NOT FOR CONSTRUCTION

MARK J. FIGUEROA — STATE OF NEVADA — PROFESSIONAL ENGINEER — 6/30/2015 — CIVIL — No. 14566

SHEET

GR-02

25 OF 56

DRAWING NO.

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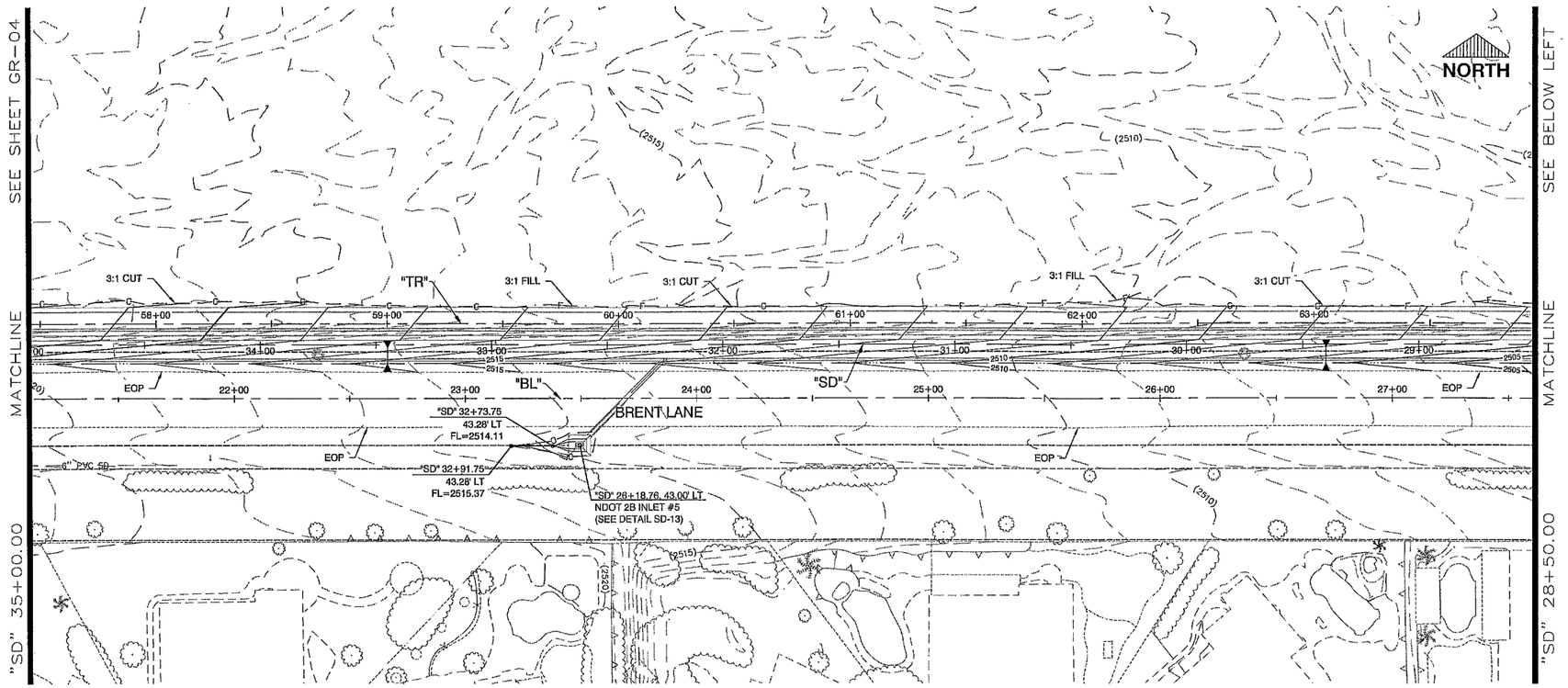

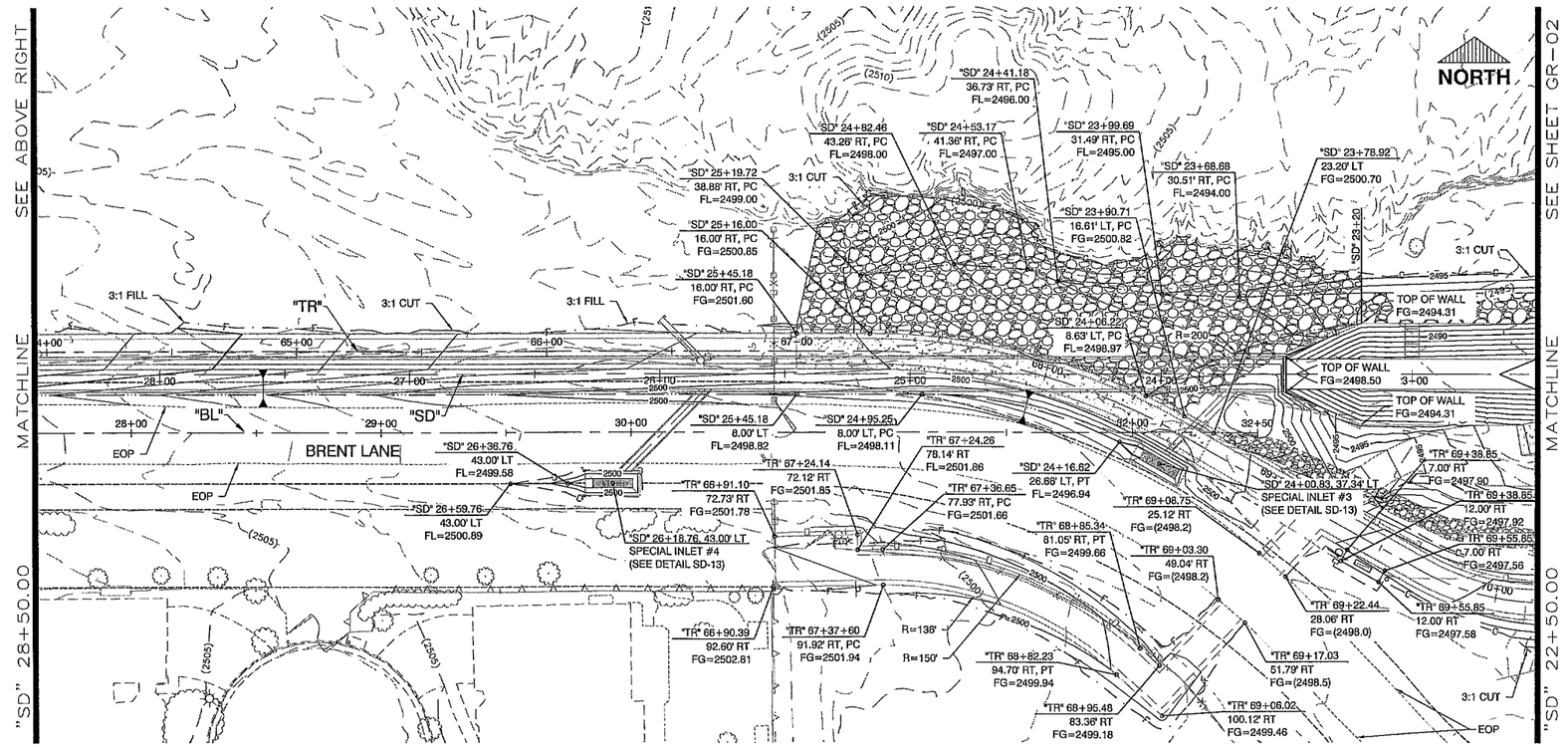

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

CONCRETE

RIPRAP

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

NO.	DATE	REVISIONS

PREPARED BY

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNERS

5740 S. ARVILLE STREET #215, LAS VEGAS, NV 89118

PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR

CITY OF LAS VEGAS

I# 49876 BID# ####

DATE: MARCH 24, 2015 DESIGNED BY: DAM

SUBMITTAL STAGE: DRAWN BY: SPC/DAM

90% SUBMITTAL CHECKED BY: JSR/MJF

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

GRADING PLAN

"SD" 18+50.00 TO "SD" 28+50.00

PROFESSIONAL ENGINEER STATE OF NEVADA MARK J. FIELDING No. 14566 CIVIL 6/30/2015

SHEET

GR-03

26 OF 56

DRAWING NO.

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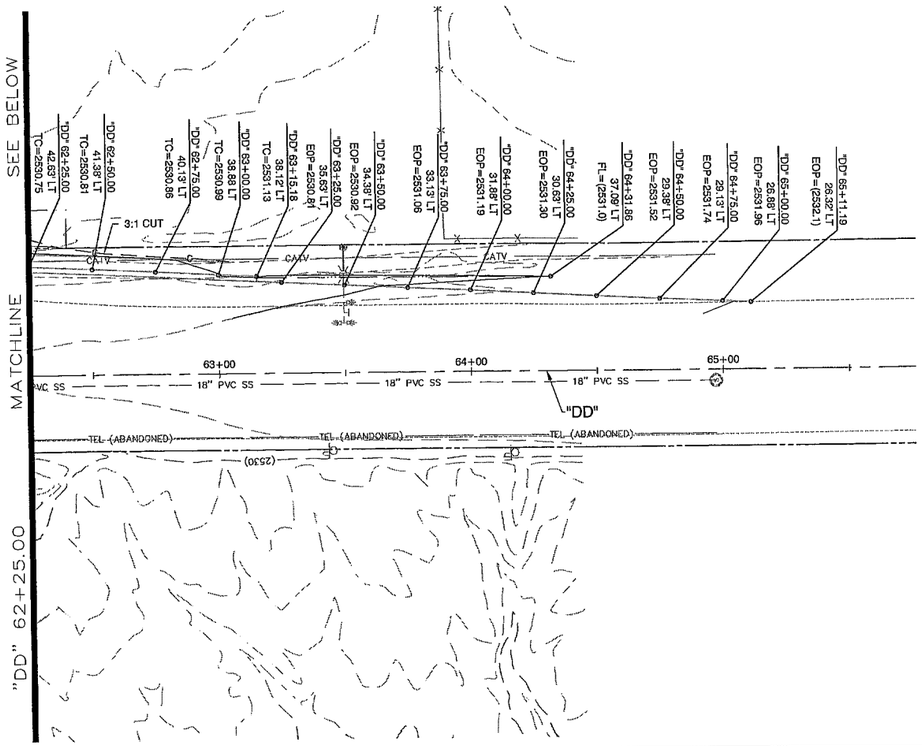

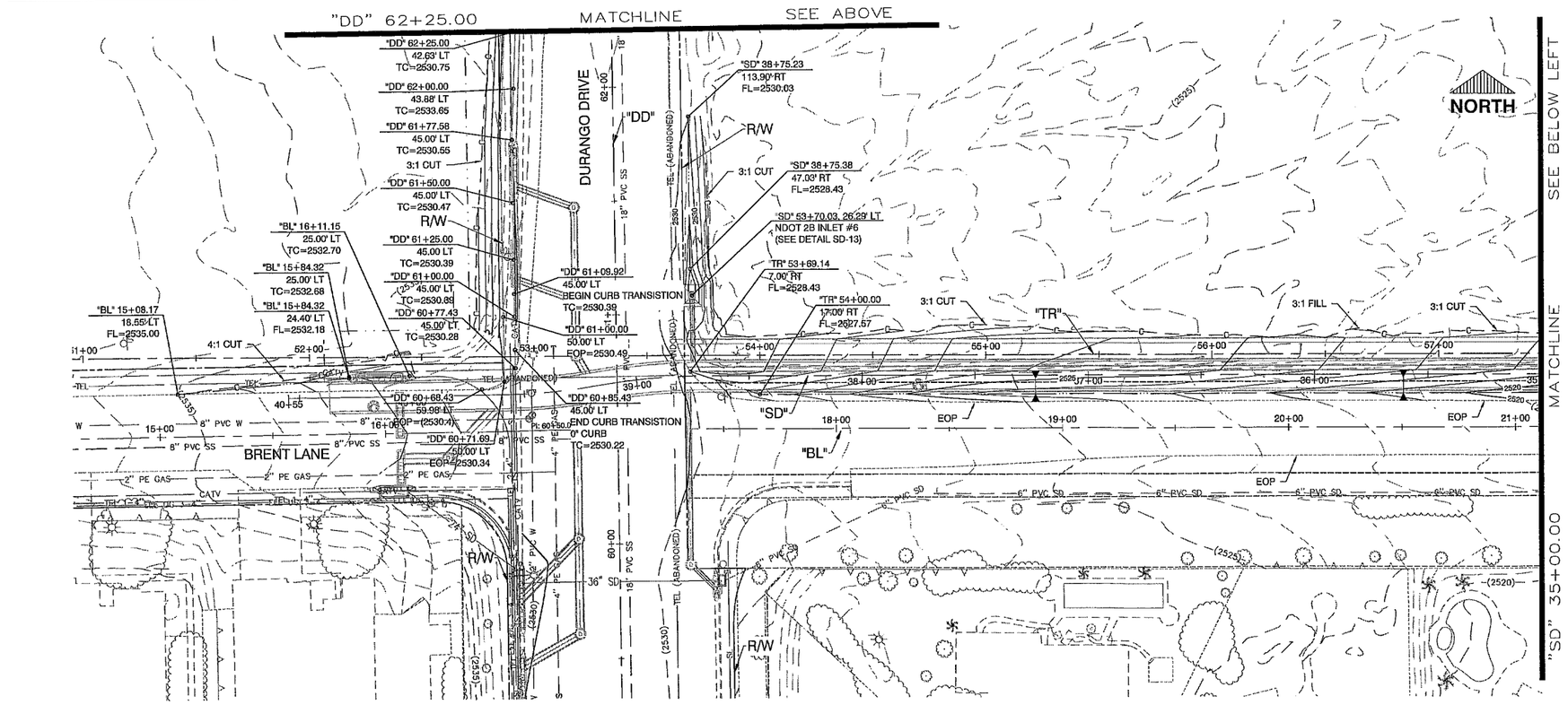

GRAPHIC SCALE

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(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6811
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

CONCRETE

RIPRAP

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 123165

NO.	DATE	REVISIONS

PREPARED BY:
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
8740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR
CITY OF LAS VEGAS

H# 49876 | BID# ####
DATE: MARCH 24, 2015 | DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: SPC/DAM | CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
GRADING PLAN
"SD" 35+00.00 TO "DD" 65+11.19

PROFESSIONAL ENGINEER
MARK J. FALK
STATE OF NEVADA
PRELIMINARY
NOT FOR CONSTRUCTION
3/30/2015
CIVIL
No. 14566

SHEET
GR-04
27 OF 56
DRAWING NO.
-

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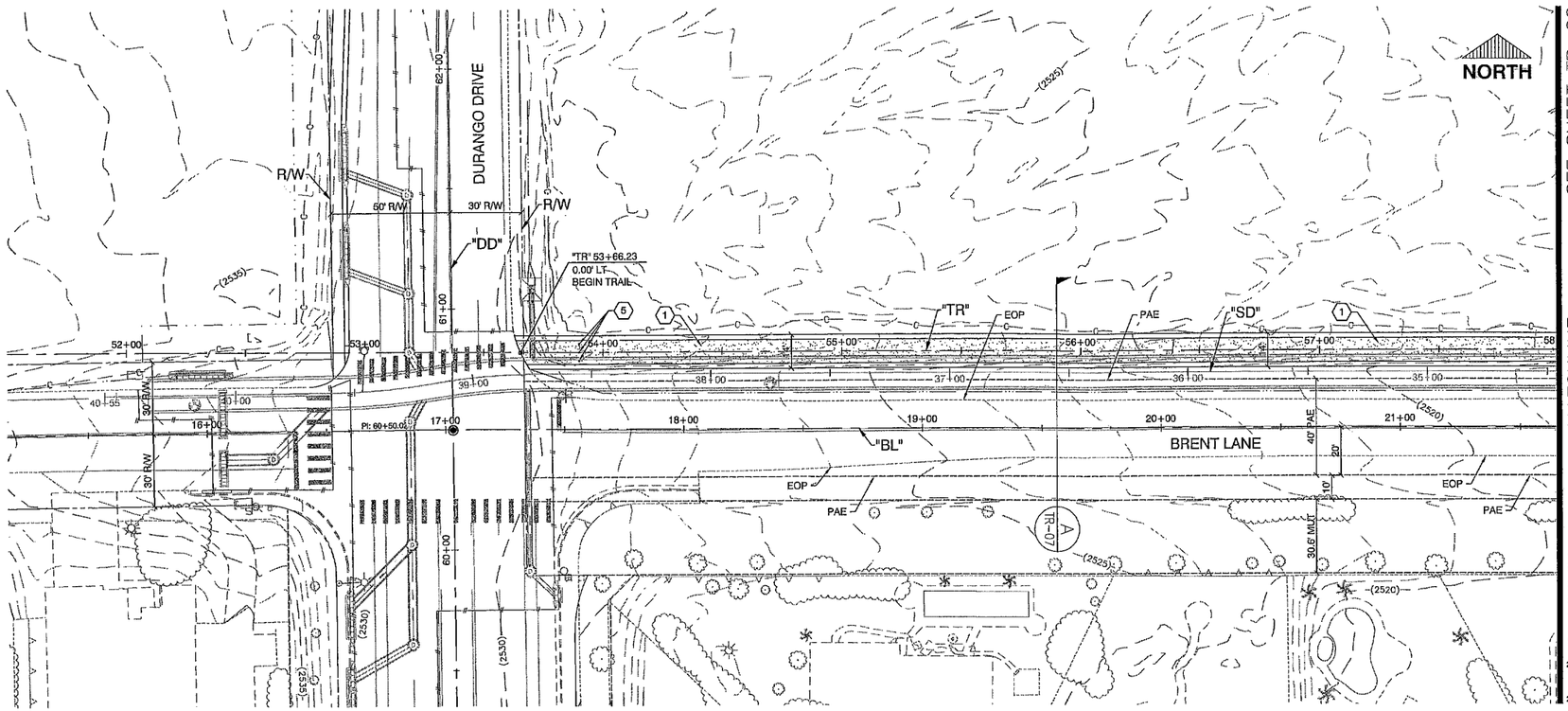

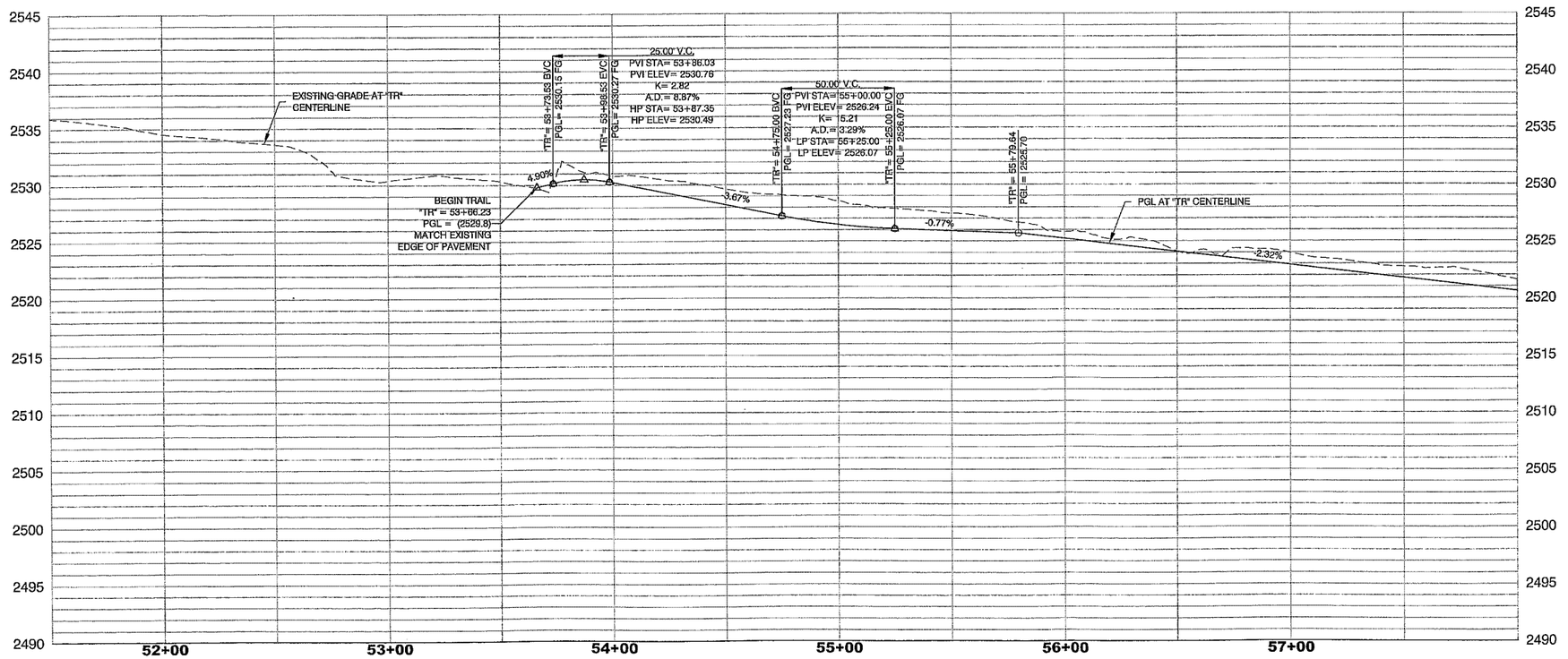

GRAPHIC SCALE

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BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

1. CONSTRUCT DECOMPOSED GRANITE TRAIL SURFACE (SEE DETAIL SHEET TR-07))
2. INSTALL DIRECTION SIGN (SEE DETAIL C SHEET TR-09)
3. INSTALL POST AND CABLE FENCE (SEE DETAIL A SHEET TR-08)
4. INSTALL EQUESTRIAN ENTRANCE (SEE DETAIL B SHEET TR-09)
5. INSTALL REMOVABLE BOLLARD(S) (SEE DETAIL B ON SHEET TR-08)
6. INSTALL SALVAGED SWING GATE
7. INSTALL 16' SWING GATE (SEE DETAIL A SHEET TR-09)
8. CONSTRUCT CONCRETE TRAIL SURFACE (SEE DETAIL B SHEET TR-07)
9. INSTALL MONUMENT PLAQUE (SEE DETAIL A AND D SHEET TR-10)
10. INSTALL TRASH RECEPTACLE (SEE DETAIL C SHEET TR-10)
11. INSTALL BENCH (SEE DETAIL B SHEET TR-10)
12. INSTALL DOG BAG DISPENSER (SEE DETAIL D SHEET TR-09)

LEGEND

DECOMPOSED GRANITE TRAIL SURFACE

CONCRETE TRAIL SURFACE

NO.	DATE	REVISIONS

PREPARED BY

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNERS

8740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118

PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR

CITY OF LAS VEGAS

H# 49876 | BID# ####

DATE: MARCH 24, 2015 | DESIGNED BY: DAM

SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: SPC/DAM | CHECKED BY: JSR/MJF

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

TRAIL PLAN AND PROFILE
"TR" 51+50.00 TO "TR" 58+00.00

PRELIMINARY NOT FOR CONSTRUCTION

MARK J. FIGUEIRA
PROFESSIONAL ENGINEER
STATE OF NEVADA
No. 14566
CIVIL
9/30/2015

SHEET

TR-01

28 OF 56

DRAWING NO.

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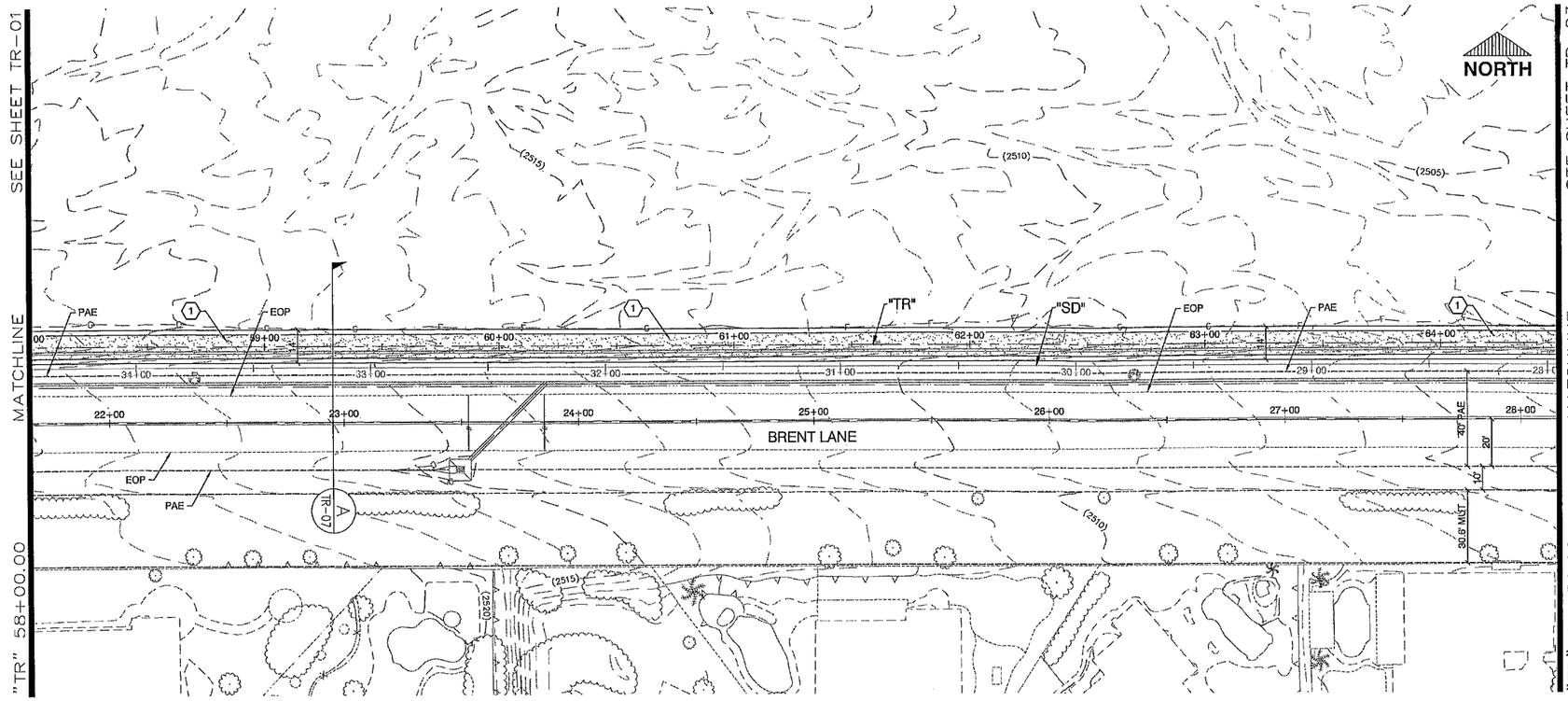

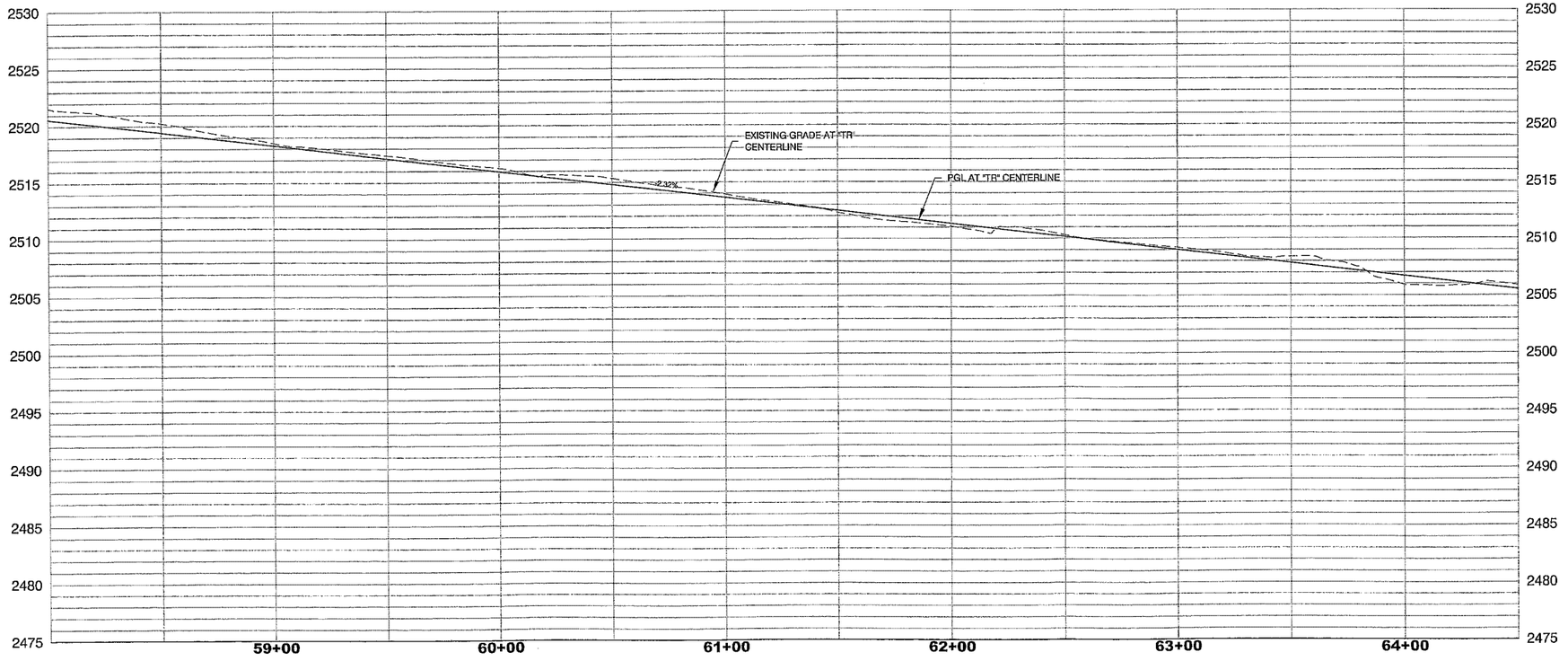

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

1. CONSTRUCT DECOMPOSED GRANITE TRAIL SURFACE (SEE DETAIL SHEET TR-07))
2. INSTALL DIRECTION SIGN (SEE DETAIL C SHEET TR-09)
3. INSTALL POST AND CABLE FENCE (SEE DETAIL A SHEET TR-08)
4. INSTALL EQUESTRIAN ENTRANCE (SEE DETAIL B SHEET TR-09)
5. INSTALL REMOVABLE BOLLARD(S) (SEE DETAIL B ON SHEET TR-08)
6. INSTALL SALVAGED SWING GATE
7. INSTALL 16' SWING GATE (SEE DETAIL A SHEET TR-09)
8. CONSTRUCT CONCRETE TRAIL SURFACE (SEE DETAIL B SHEET TR-07)
9. INSTALL MONUMENT PLAQUE (SEE DETAIL A AND D SHEET TR-10)
10. INSTALL TRASH RECEPTACLE (SEE DETAIL C SHEET TR-10)
11. INSTALL BENCH (SEE DETAIL B SHEET TR-10)
12. INSTALL DOG BAG DISPENSER (SEE DETAIL D SHEET TR-09)

LEGEND

DECOMPOSED GRANITE TRAIL SURFACE

CONCRETE TRAIL SURFACE

NO.	DATE	REVISIONS

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

PREPARED FOR:
CITY OF LAS VEGAS

H# 49876 | BID# ####
DATE: MARCH 24, 2015 | DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: SPC/DAM
CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TRAIL PLAN AND PROFILE
"TR" 58+00.00 TO "TR" 64+50.00

PROFESSIONAL ENGINEER STATE OF NEVADA
MARK J. FINNEGAN
Date: 03/30/2015
CIVIL
No. 14568
PRELIMINARY

SHEET
TR-02
29 OF 56
DRAWING NO.
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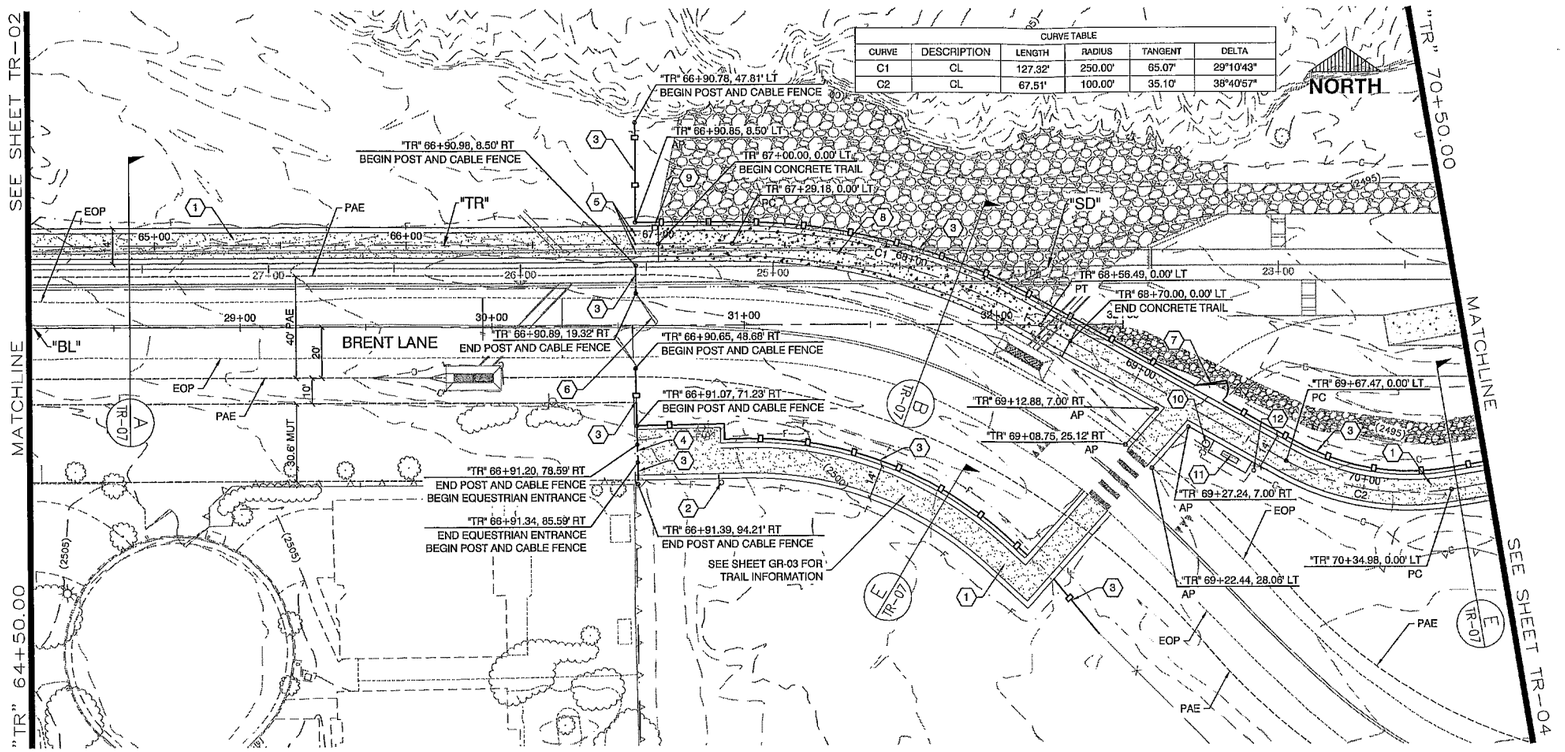

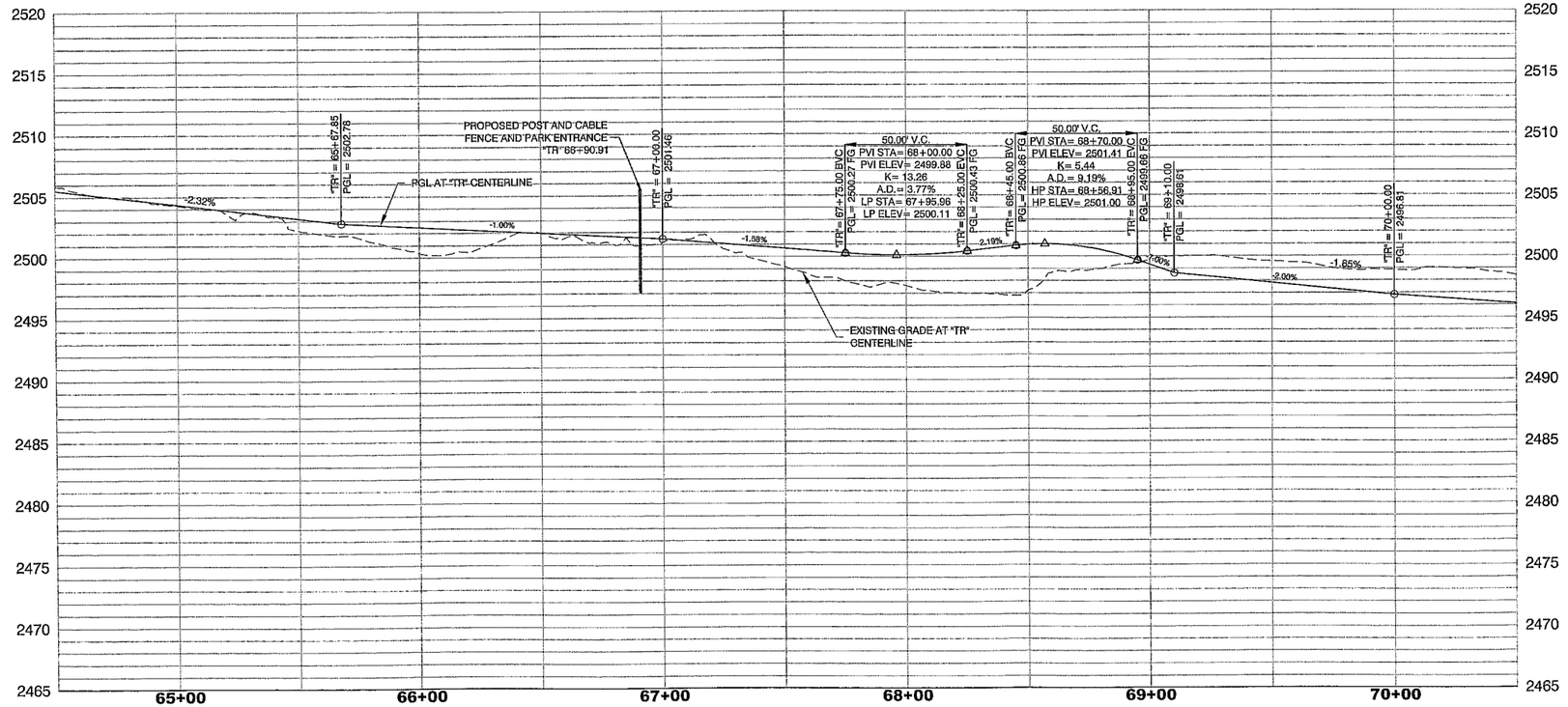

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

1. CONSTRUCT DECOMPOSED GRANITE TRAIL SURFACE (SEE DETAIL SHEET TR-07))
2. INSTALL DIRECTION SIGN (SEE DETAIL C SHEET TR-09)
3. INSTALL POST AND CABLE FENCE (SEE DETAIL A SHEET TR-06)
4. INSTALL EQUESTRIAN ENTRANCE (SEE DETAIL B SHEET TR-09)
5. INSTALL REMOVABLE BOLLARD(S) (SEE DETAIL B ON SHEET TR-08)
6. INSTALL SALVAGED SWING GATE
7. INSTALL 16' SWING GATE (SEE DETAIL A SHEET TR-09)
8. CONSTRUCT CONCRETE TRAIL SURFACE (SEE DETAIL B SHEET TR-07)
9. INSTALL MONUMENT PLAQUE (SEE DETAIL A AND D SHEET TR-10)
10. INSTALL TRASH RECEPTACLE (SEE DETAIL C SHEET TR-10)
11. INSTALL BENCH (SEE DETAIL B SHEET TR-10)
12. INSTALL DOG BAG DISPENSER (SEE DETAIL D SHEET TR-09)

LEGEND

- DECOMPOSED GRANITE TRAIL SURFACE
- CONCRETE TRAIL SURFACE

NO.	DATE	REVISIONS

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

PREPARED FOR
CITY OF LAS VEGAS

H# 49876 | BID# ####
DATE: MARCH 24, 2015 | DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: SPC/DAM
CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TRAIL PLAN AND PROFILE
"TR" 64+50.00 TO "TR" 70+50.00

PRELIMINARY
NOT FOR CONSTRUCTION
PROFESSIONAL ENGINEER
STATE OF NEVADA
MARK J. FARINA
3/30/2015
CIVIL
No. 14566

SHEET
TR-03
30 OF 56
DRAWING NO.

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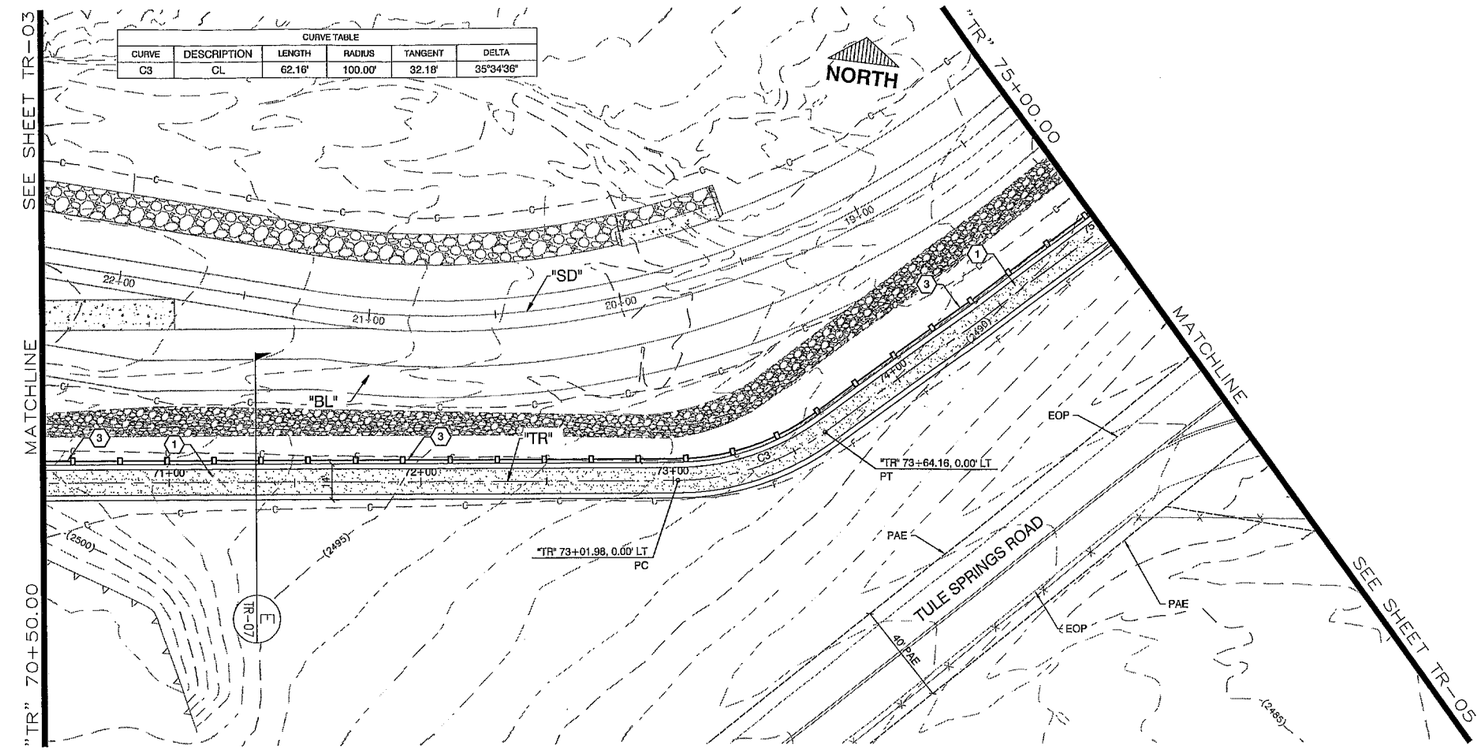

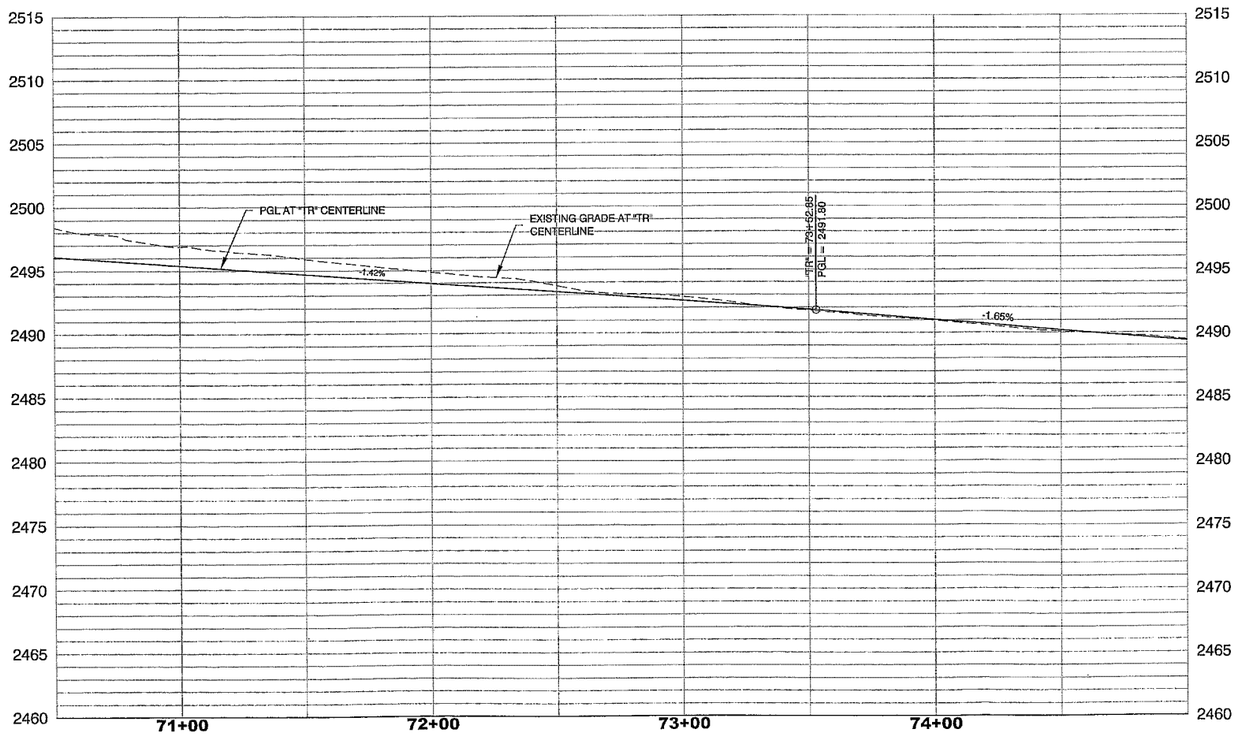

GRAPHIC SCALE

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CALL BEFORE CONSTRUCTION

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BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

1. CONSTRUCT DECOMPOSED GRANITE TRAIL SURFACE (SEE DETAIL SHEET TR-07))
2. INSTALL DIRECTION SIGN (SEE DETAIL C SHEET TR-09)
3. INSTALL POST AND CABLE FENCE (SEE DETAIL A SHEET TR-06)
4. INSTALL EQUESTRIAN ENTRANCE (SEE DETAIL B SHEET TR-09)
5. INSTALL REMOVABLE BOLLARD(S) (SEE DETAIL B ON SHEET TR-08)
6. INSTALL SALVAGED SWING GATE
7. INSTALL 16' SWING GATE (SEE DETAIL A SHEET TR-09)
8. CONSTRUCT CONCRETE TRAIL SURFACE (SEE DETAIL B SHEET TR-07)
9. INSTALL MONUMENT PLAQUE (SEE DETAIL A AND D SHEET TR-10)
10. INSTALL TRASH RECEPTACLE (SEE DETAIL C SHEET TR-10)
11. INSTALL BENCH (SEE DETAIL B SHEET TR-10)
12. INSTALL DOG BAG DISPENSER (SEE DETAIL D SHEET TR-09)

LEGEND

DECOMPOSED GRANITE TRAIL SURFACE

CONCRETE TRAIL SURFACE

NO.	DATE	REVISIONS

PREPARED BY

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

PREPARED FOR
CITY OF LAS VEGAS

H# 49876
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL

BID# ####
DESIGNED BY: DAM
DRAWN BY: SPC/DAM
CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TRAIL PLAN AND PROFILE
"TR" 70+50.00 TO "TR" 75+00.00

PROFESSIONAL ENGINEER — STATE OF NEVADA — MARK J. FIORENTINO — 3/30/2015 — CIVIL — No. 14568 — PRELIMINARY

SHEET
TR-04
31 OF 56
DRAWING NO.
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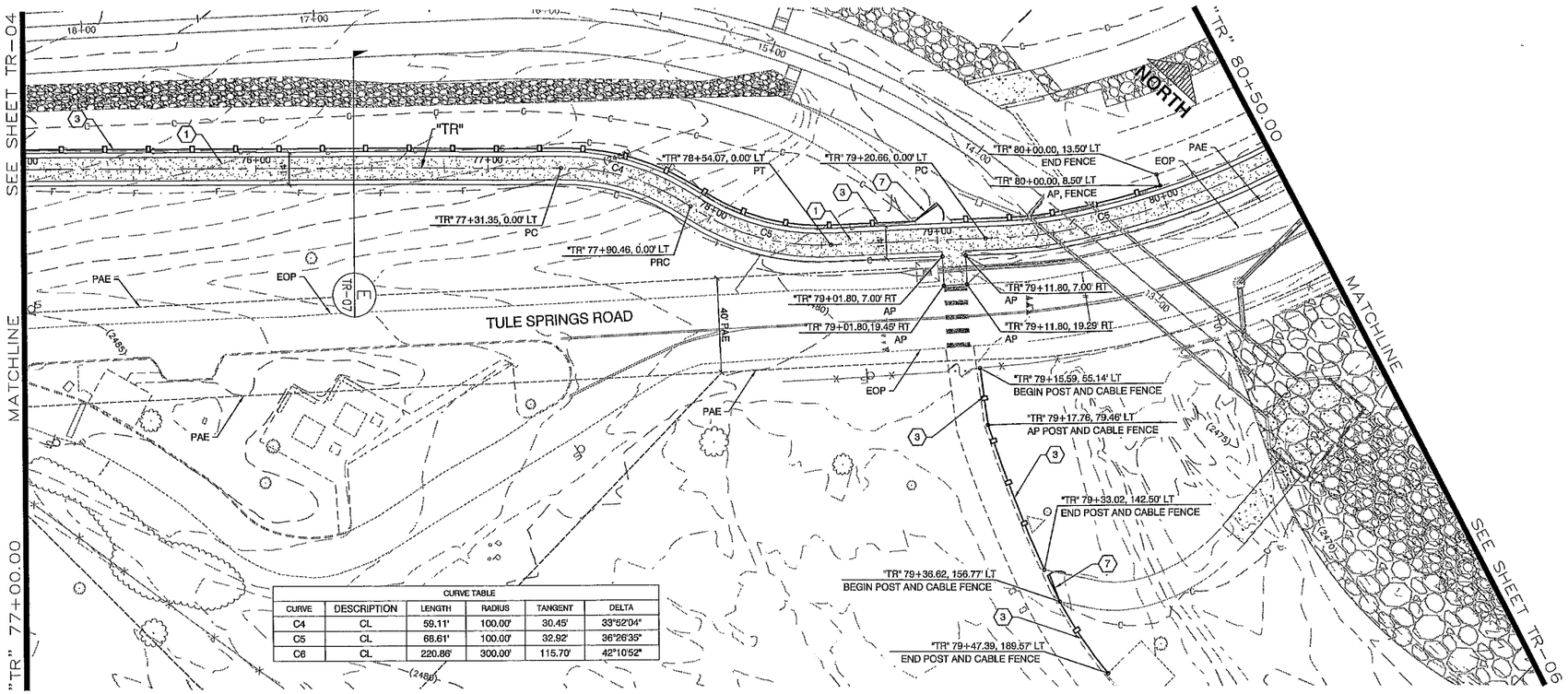
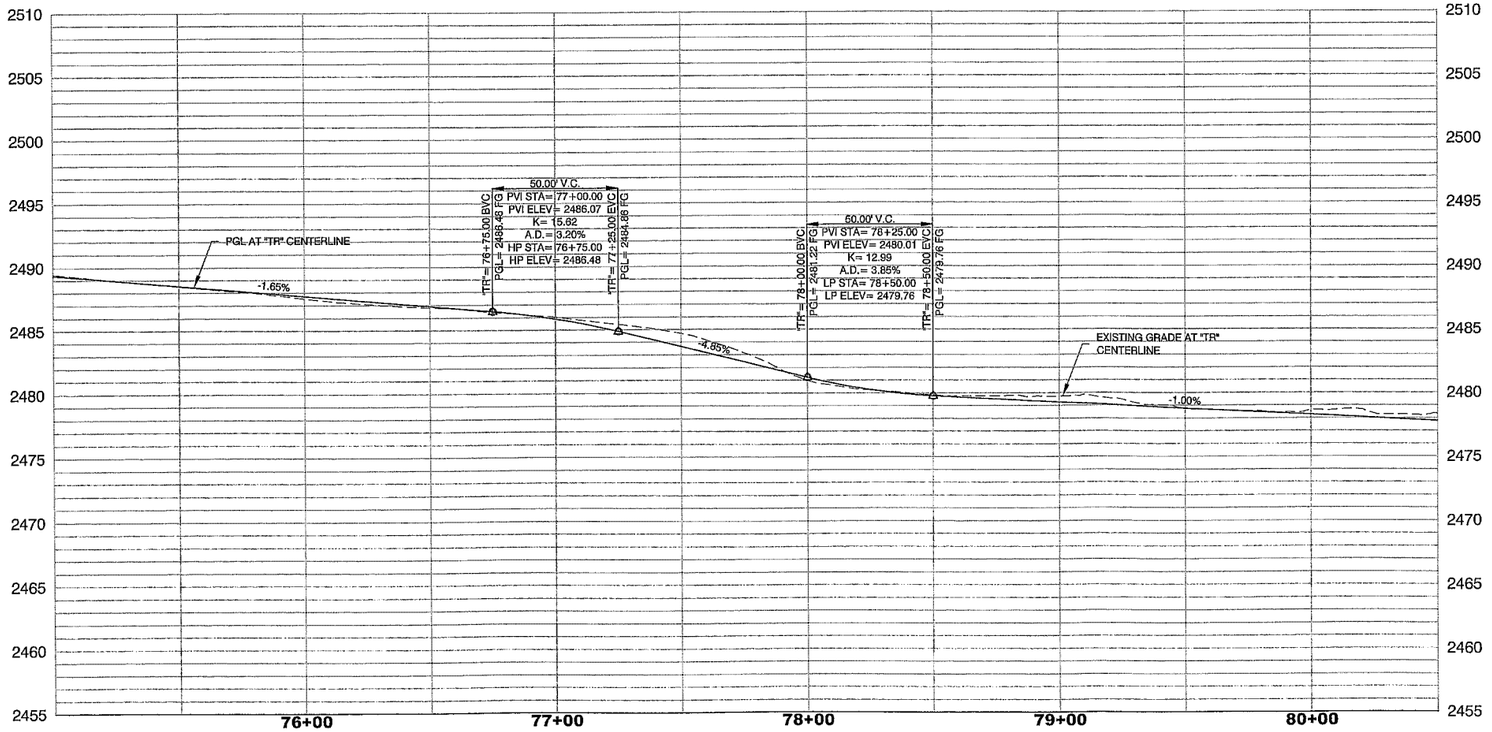


CURVE TABLE					
CURVE	DESCRIPTION	LENGTH	RADIUS	TANGENT	DELTA
C4	CL	59.11'	100.00'	30.45'	33°52'04"
C5	CL	68.61'	100.00'	32.92'	36°26'35"
C6	CL	220.86'	300.00'	115.70'	42°10'52"



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CALL BEFORE CONSTRUCTION

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	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

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2. INSTALL DIRECTION SIGN (SEE DETAIL C SHEET TR-09)
3. INSTALL POST AND CABLE FENCE (SEE DETAIL A SHEET TR-08)
4. INSTALL EQUESTRIAN ENTRANCE (SEE DETAIL B SHEET TR-09)
5. INSTALL REMOVABLE BOLLARD(S) (SEE DETAIL B ON SHEET TR-08)
6. INSTALL SALVAGED SWING GATE
7. INSTALL 18' SWING GATE (SEE DETAIL A SHEET TR-09)
8. CONSTRUCT CONCRETE TRAIL SURFACE (SEE DETAIL B SHEET TR-07)
9. INSTALL MONUMENT PLAQUE (SEE DETAIL A AND D SHEET TR-10)
10. INSTALL TRASH RECEPTACLE (SEE DETAIL C SHEET TR-10)
11. INSTALL BENCH (SEE DETAIL B SHEET TR-10)
12. INSTALL DOG BAG DISPENSER (SEE DETAIL D SHEET TR-09)

LEGEND

DECOMPOSED GRANITE TRAIL SURFACE

CONCRETE TRAIL SURFACE

NO.	DATE	REVISIONS

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

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DATE: MARCH 24, 2015	DESIGNED BY: DAM
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	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TRAIL PLAN AND PROFILE
"TR" 77+00.00 TO "TR" 80+50.00

PROFESSIONAL ENGINEER
MARK J. FINNEY
STATE OF NEVADA
No. 14566
CIVIL
3/30/2015
PRELIMINARY

SHEET
TR-05
32 OF 56
DRAWING NO.
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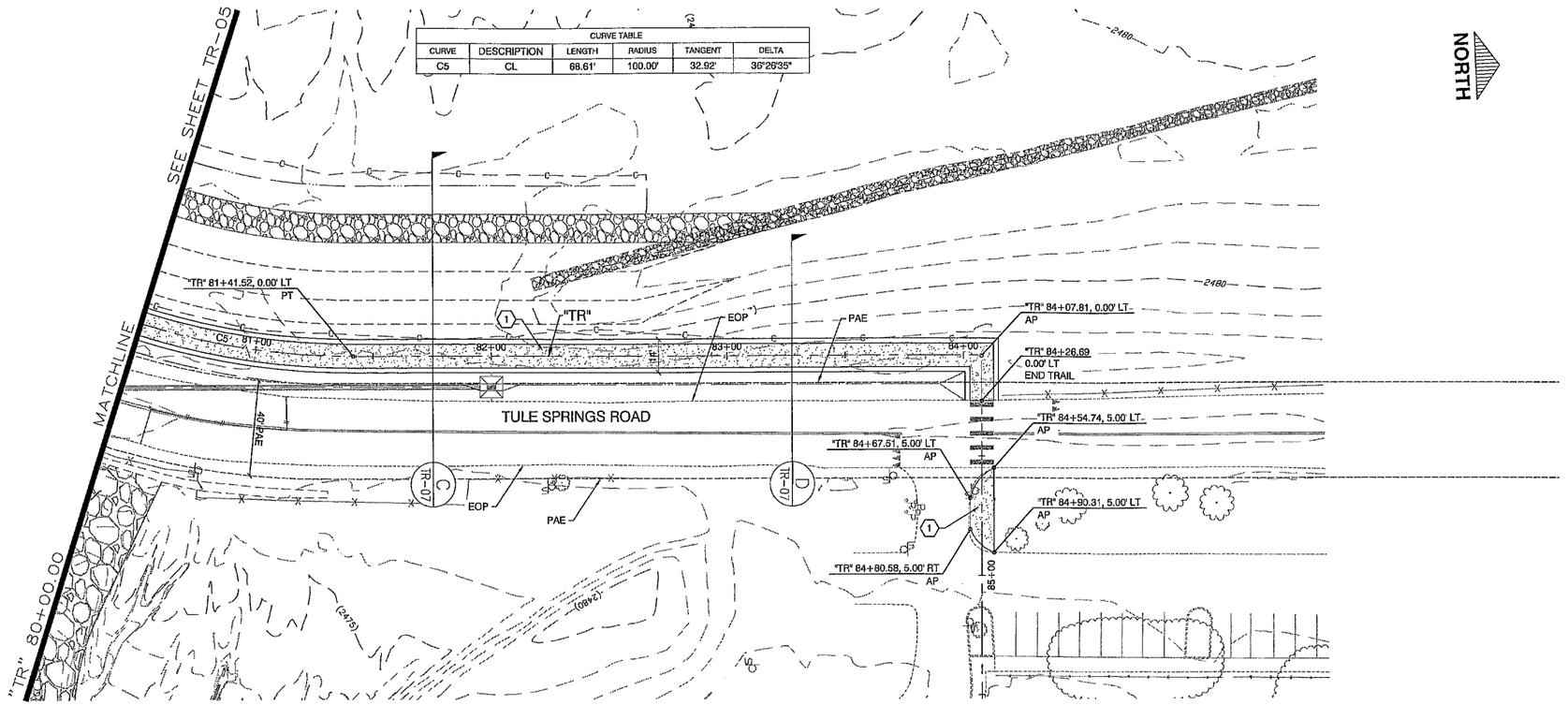

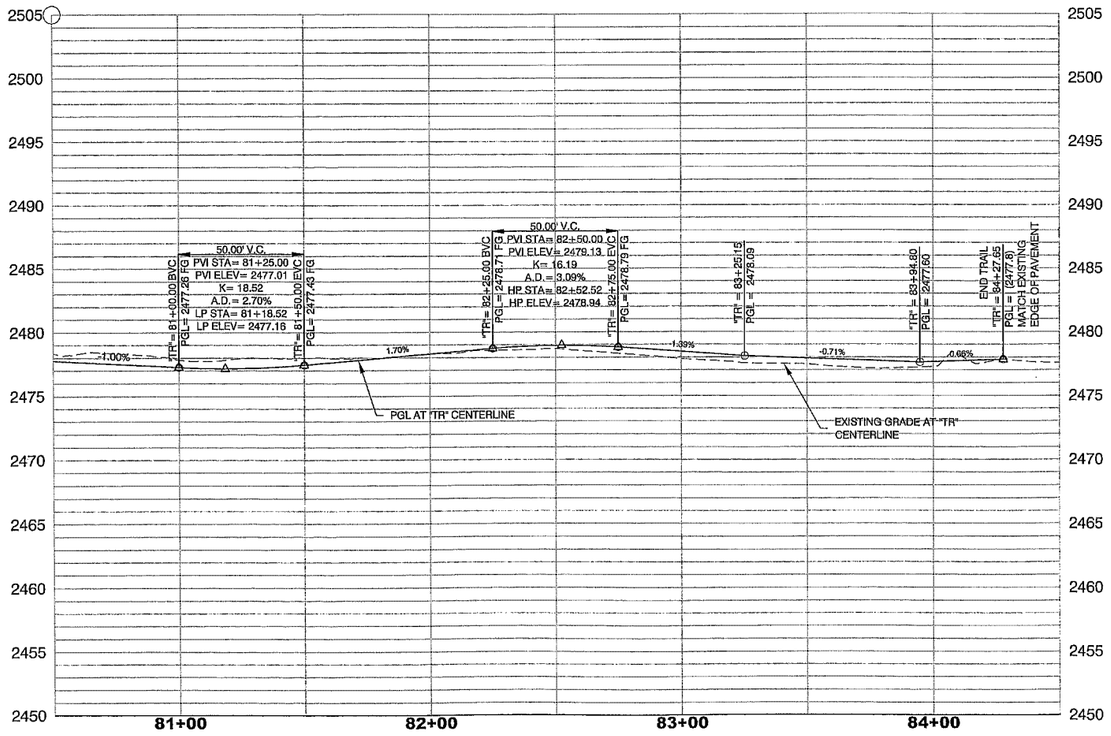

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BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

1. CONSTRUCT DECOMPOSED GRANITE TRAIL SURFACE (SEE DETAIL SHEET TR-07))
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11. INSTALL BENCH (SEE DETAIL B SHEET TR-10)
12. INSTALL DOG BAG DISPENSER (SEE DETAIL D SHEET TR-09)

LEGEND

- DECOMPOSED GRANITE TRAIL SURFACE
- CONCRETE TRAIL SURFACE

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-3500 FAX (702) 284-3509

PREPARED FOR
CITY OF LAS VEGAS

H# 49876	BID# ####
DATE: MARCH 24, 2015	DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TRAIL PLAN AND PROFILE
"TR" 80+50.00 TO "TR" 85+51.69

PRELIMINARY
NOT FOR CONSTRUCTION
MARK J. FIA
PROFESSIONAL ENGINEER
STATE OF NEVADA
No. 14566
CIVIL
6/30/2015

SHEET
TR-06
33 OF 56
DRAWING NO.
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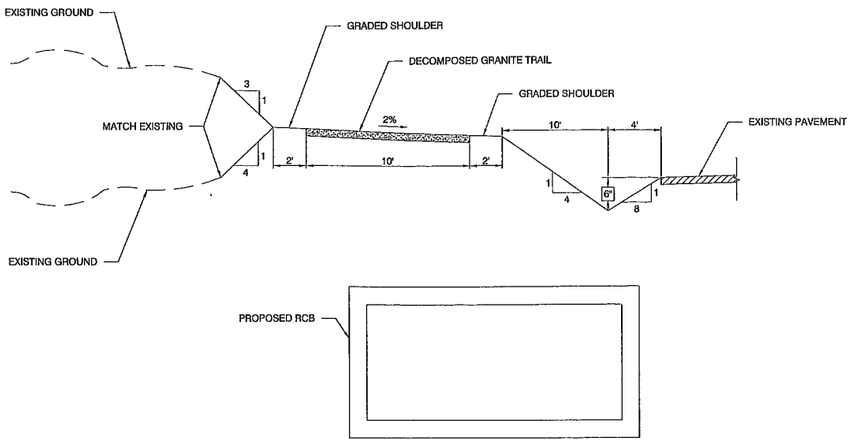
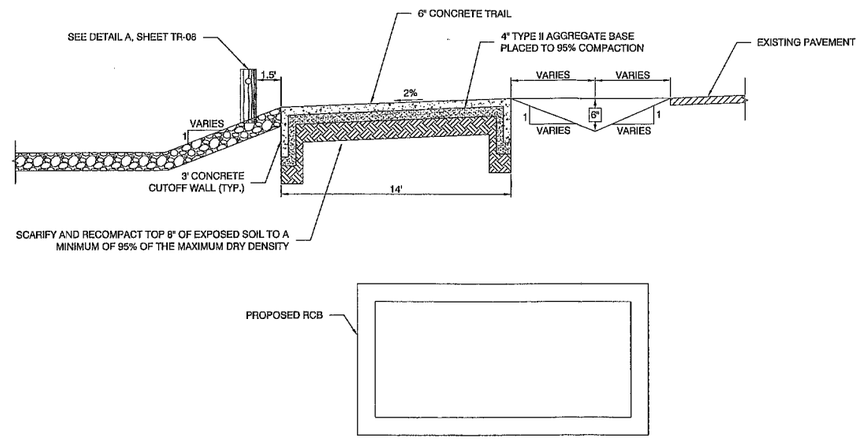


TRAIL SECTION — A

NOT TO SCALE

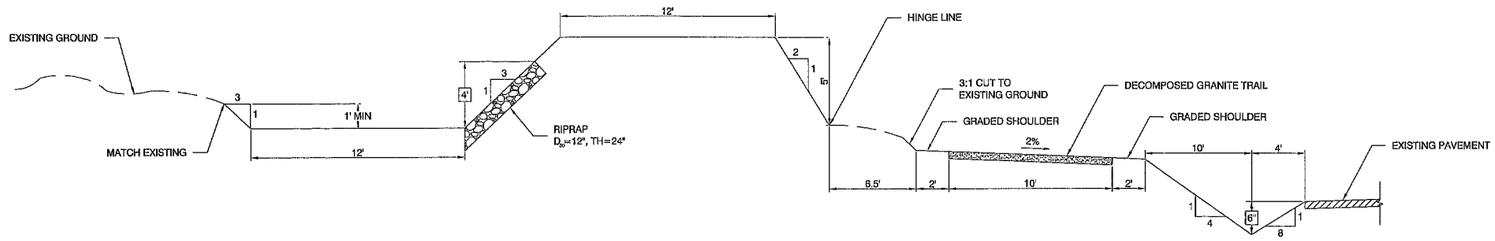
"TR" 53+66.23 TO "TR" 67+00.00



CONCRETE TRAIL SECTION — B

NOT TO SCALE

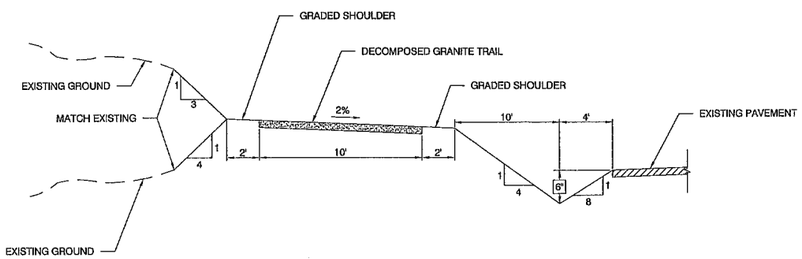
"TR" 67+00.00 TO "TR" 68+70.00



BERM SECTION — C

NOT TO SCALE

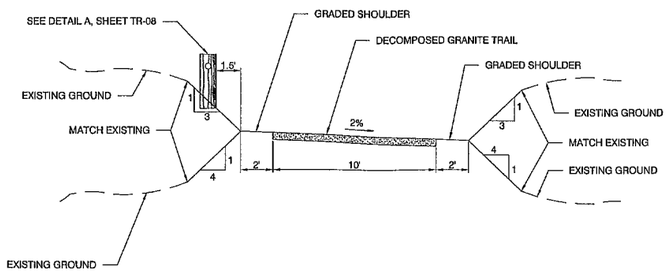
"TR" 79+90.00 TO "TR" 82+61.51



TRAIL SECTION — D

NOT TO SCALE

"TR" 82+61.51 TO "TR" 84+26.69



TRAIL SECTION — E

NOT TO SCALE

"TR" 68+70.00 TO "TR" 79+90.00

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NO.	DATE	REVISIONS

PREPARED BY

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNERS

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

PREPARED FOR

CITY OF LAS VEGAS

BID# -	DESIGNED BY:	DAM	
DATE: MARCH 24, 2015	DRAWN BY:	DAM	
SUBMITTAL STAGE: 90% SUBMITTAL	CHECKED BY:	JBR/MJF	

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

TRAIL TYPICAL SECTIONS

PROFESSIONAL ENGINEER — STATE OF NEVADA — MARK J. FIMIA — No. 14566 — CIVIL — 3/30/2015 — PRELIMINARY

SHEET

TR-07

34 OF 56

DRAWING NO.

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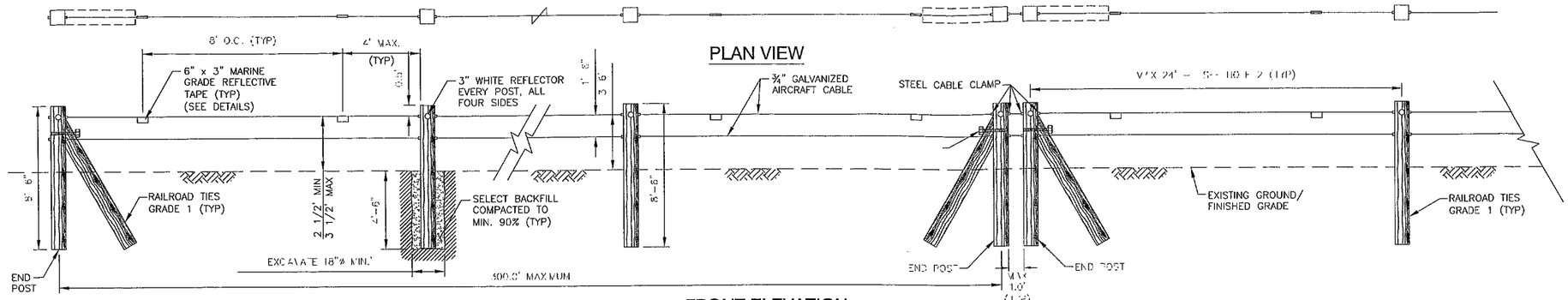
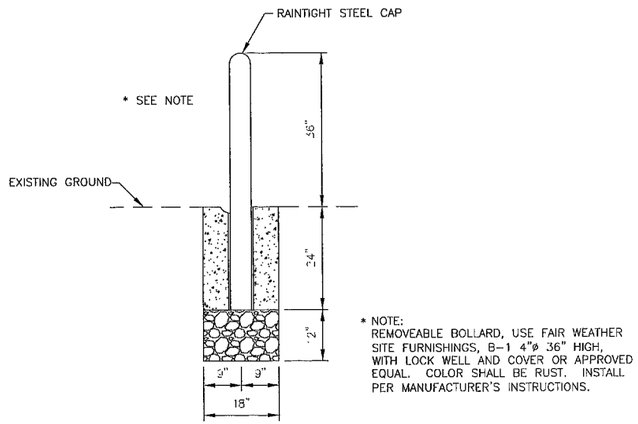


PLAN VIEW

FRONT ELEVATION

POST AND CABLE FENCE — A

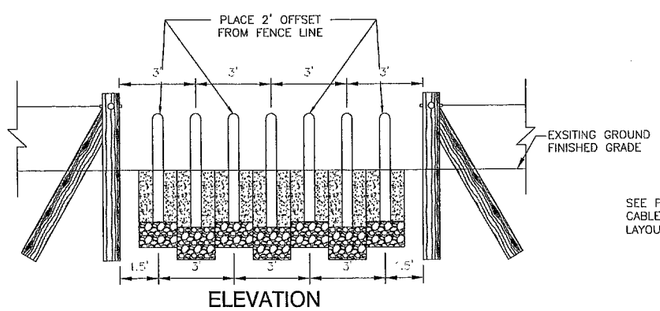
NOT TO SCALE



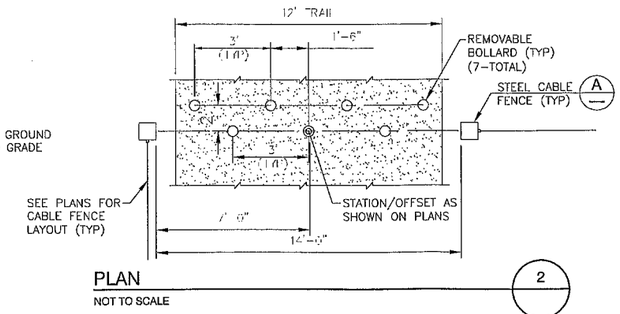
* NOTE:
REMOVEABLE BOLLARD, USE FAIR WEATHER SITE FURNISHINGS, B-1 4"ø 36" HIGH, WITH LOCK WELL AND COVER OR APPROVED EQUAL. COLOR SHALL BE RUST. INSTALL PER MANUFACTURER'S INSTRUCTIONS.

REMOVAL BOLLARD DETAIL — 1

NOT TO SCALE



ELEVATION

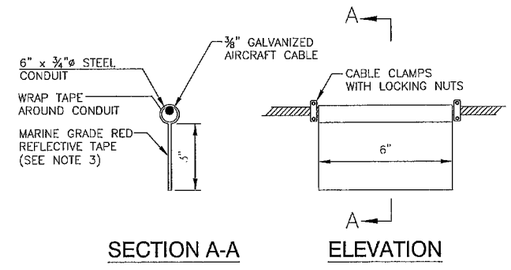


PLAN — 2

NOT TO SCALE

TRAIL ACCESS WITH BOLLARDS DETAIL — B

NOT TO SCALE



SECTION A-A ELEVATION

REFLECTIVE TAPE — 3

NOT TO SCALE

NOTES:

1. PLACE END POST AT BEGINNING AND END OF EACH FENCE SECTION. EACH FENCE SECTION SHALL BE A MAXIMUM OF 300 FEET LONG. THERE SHALL BE A MAXIMUM SPACING OF 1 FOOT BETWEEN EACH FENCE SECTION AND ALSO BETWEEN FENCE END POST AND EXISTING FENCES ADJACENT TO PROPOSED FENCE.
2. THE LOCATION AND WIDTH BETWEEN POSTS SHALL VARY (MAXIMUM 24 FEET) SO THAT THE ENTIRE TOP CABLE IS A MINIMUM 2 1/2 FEET AND MAXIMUM 3 1/2 FEET ABOVE GROUND.
3. USE 6 INCH WIDE MARINE GRADE RED REFLECTIVE TAPE (3M 5872S OR APPROVED EQUAL).
4. EACH SECTION SHALL BE ON A CONSTANT BEARING. A NEW FENCE SECTION AND END POST SHALL BE PLACED AT ALL ANGLE POINTS.
5. AT END POST, RACING AND INTERIOR POST, PROVIDE 18 INCH MINIMUM DIAMETER BY 4'-6" FOOT DEEP HOLE. FILL WITH MECHANICAL COMPACTED SOIL AFTER POST AND BRACING ARE IN PLACE.
6. ALL CONNECTION HARDWARE SHALL BE GALVANIZED.
7. AT EACH POST USE 2 CABLE CLAMPS AND 2 WASHERS AT CABLE PASSING THRU 3/4 INCH DIAMETER HOLE IN POST. CABLE CLAMPS SHALL HAVE LOCKING NUTS, TYPICAL AT ALL CLAMPS.
8. 5/8 INCH BOLT AND NUT SHALL HAVE WASHERS AT EACH END. WASHER SHALL BE SET INTO WOOD AT ALL SLOPING SURFACES.
9. BRACING AT END POST SHALL BE SET INTO THE END POST MINIMUM 1.2 INCH AND MAXIMUM 1 INCH.

NO.	DATE	REVISIONS

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

PREPARED FOR
CITY OF LAS VEGAS

DATE: MARCH 24, 2015
H# 49976
BID# -
DESIGNED BY: DAM
DRAWN BY: DAM
CHECKED BY: JSR/MJF
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TRAIL DETAILS

PRELIMINARY
PROFESSIONAL ENGINEER STATE OF NEVADA
MARK J. FRANCA
EXP. 12/31/2015
CIVIL
No. 14566

SHEET
TR-08
35 OF 56
DRAWING NO.
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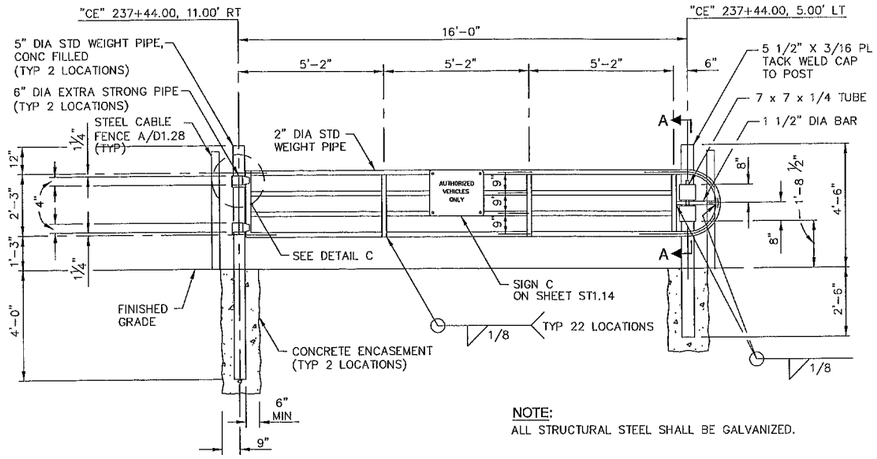
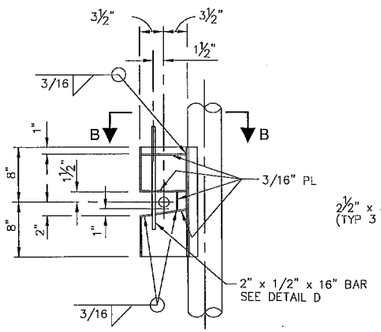


NOTE:
ALL STRUCTURAL STEEL SHALL BE GALVANIZED.

16' SWING GATE
NOT TO SCALE

A
-



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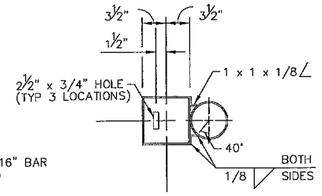

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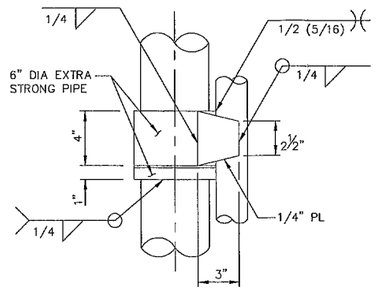
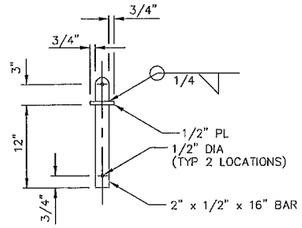


DETAIL C



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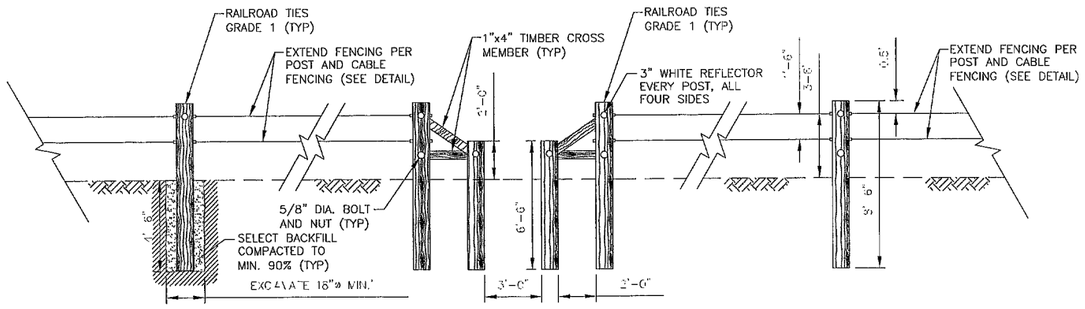

EQUESTRIAN ENTRANCE
NOT TO SCALE

B
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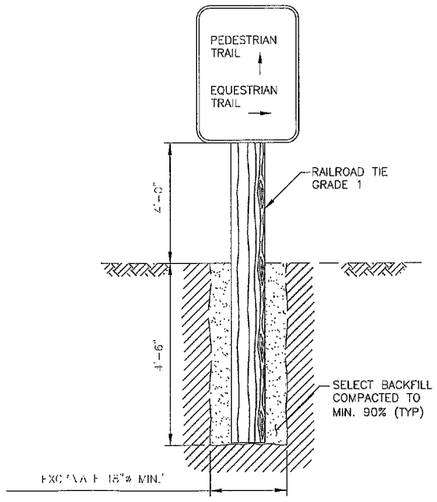

DIRECTIONAL SIGN
NOT TO SCALE

C
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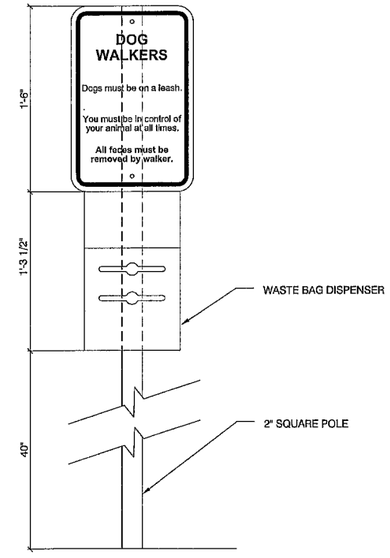

SIGN W/WASTE BAG DISP MOUNTING
NOT TO SCALE

D
-

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

NO.	DATE	REVISIONS

PREPARED FOR
CITY OF LAS VEGAS

BID# -
DESIGNED BY: DAM
DRAWN BY: DAM
CHECKED BY: JSR/MJF

H# 49876
DATE: MARCH 24, 2015
SUBMITTAL STAGE:
90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TRAIL DETAILS

PRELIMINARY
NOT FOR CONSTRUCTION
MARK J. FIGLIUZZI
STATE OF NEVADA
PROFESSIONAL ENGINEER
CIVIL
No. 14566
6/30/2015

SHEET
TR-09
36 OF 56
DRAWING NO.
-

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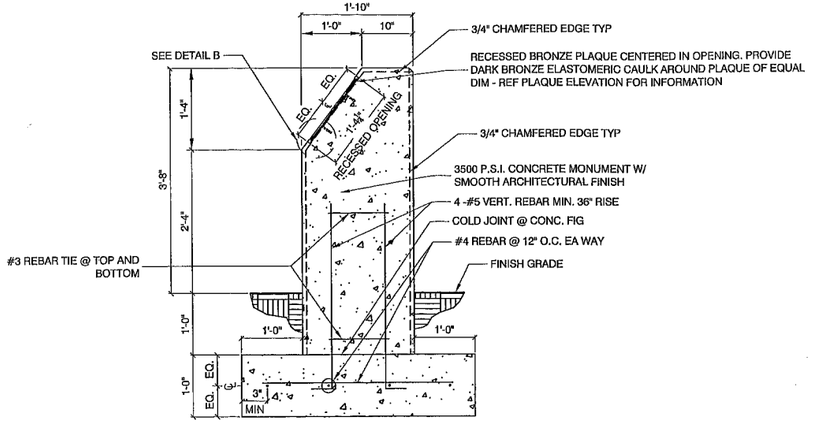
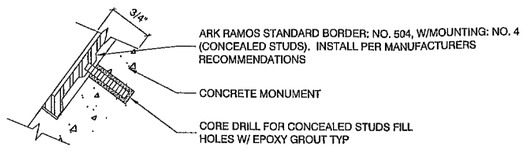


SECTION A--A

NOTES:

1. VERIFY PLAQUE THICKNESS PRIOR TO CONSTRUCTION
2. SEE DETAIL D ON THIS SHEET FOR DEDICATION PLAQUE DETAILS



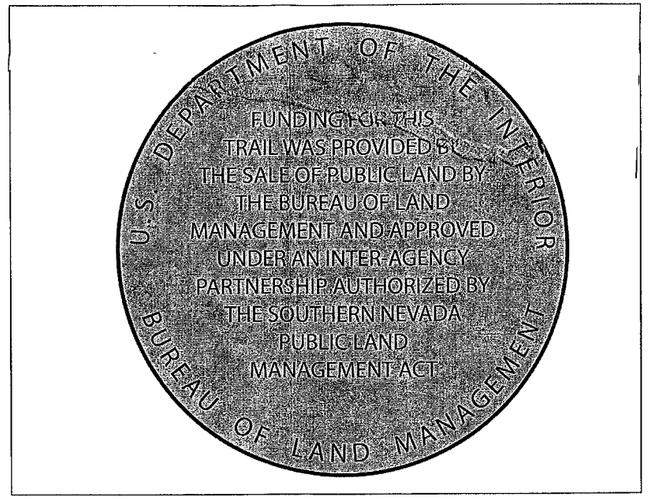
NOTES:

1. THE PLAQUE IS NOT A PART OF THIS CONTRACT, THE MONUMENT PEDESTAL IS TO BE INSTALLED. THE PLAQUE WILL BE INSTALLED AT A LATER DATE BY THE CITY OF LAS VEGAS.
2. VERIFY PLAQUE THICKNESS PRIOR TO CONSTRUCTION

DETAIL B

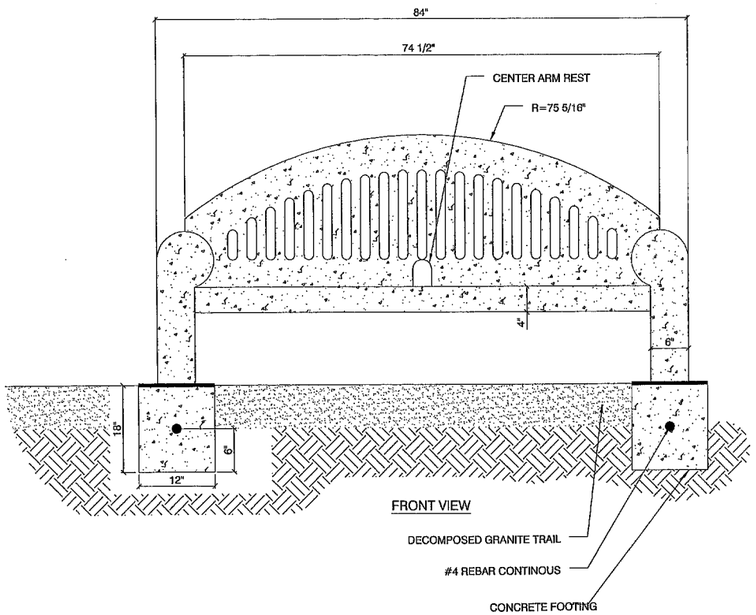
MONUMENT DETAIL

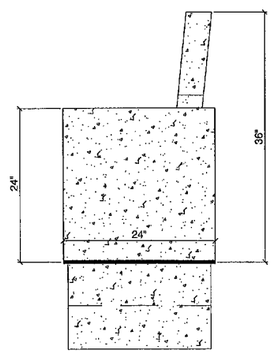
NOT TO SCALE — A -



SIGN PLAQUE

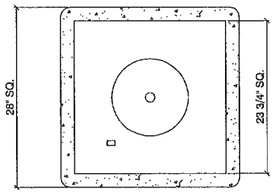
NOT TO SCALE — D -





CONCRETE BENCH WITH BACK DETAIL

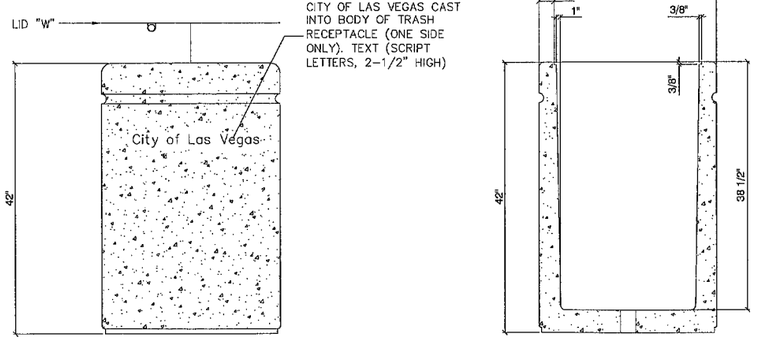
NOT TO SCALE — B -



TOP VIEW

MANUFACTURER/SUPPLIER:
QUICK CRETE PRODUCTS CORPORATION
731 W. PARKRIDGE AVENUE
P.O. BOX 639
NORCO, CA 92860
ATTN: SCOTT ULRICH
TELEPHONE (909) 549-1144 (OR EQUAL)

MANUFACTURER, QUICK CRETE (OR EQUAL)
MODEL: QS-PS2842W-W
SIZE: 28"L X 28"W X 42"H
CONCRETE COLOR: L.M. SCOFIELD 'SUMMER BEIGE' #5234
CONCRETE TEXTURE: TI SMOOTH
FINISH SEALER: STANDARD GLOSS SEALER
WEIGHT: 1,017 LBS



ELEVATION

SECTION

CONCRETE TRASH RECEPTACLE

NOT TO SCALE — C -

NO.	DATE	REVISIONS

PREPARED BY
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
8740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5500 FAX (702) 284-5399

PREPARED FOR
CITY OF LAS VEGAS

H# 49876 | BID# -
DATE: MARCH 24, 2015 | DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: DAM | CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TRAIL DETAILS

PROFESSIONAL ENGINEER — STATE OF NEVADA — MARK J. FIMIANI — No. 14566 — 4/30/2015 — CIVIL — PRELIMINARY

SHEET
TR-10
37 OF 56
DRAWING NO.
-

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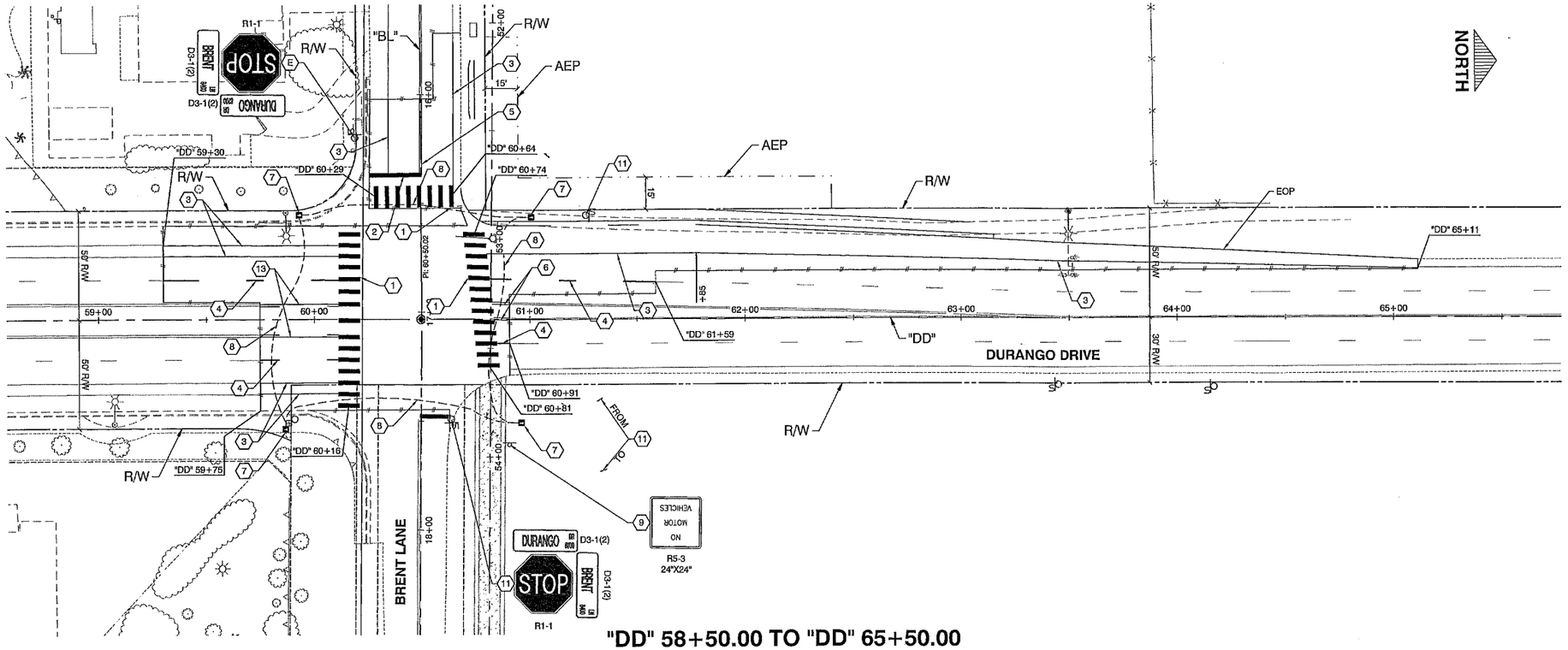
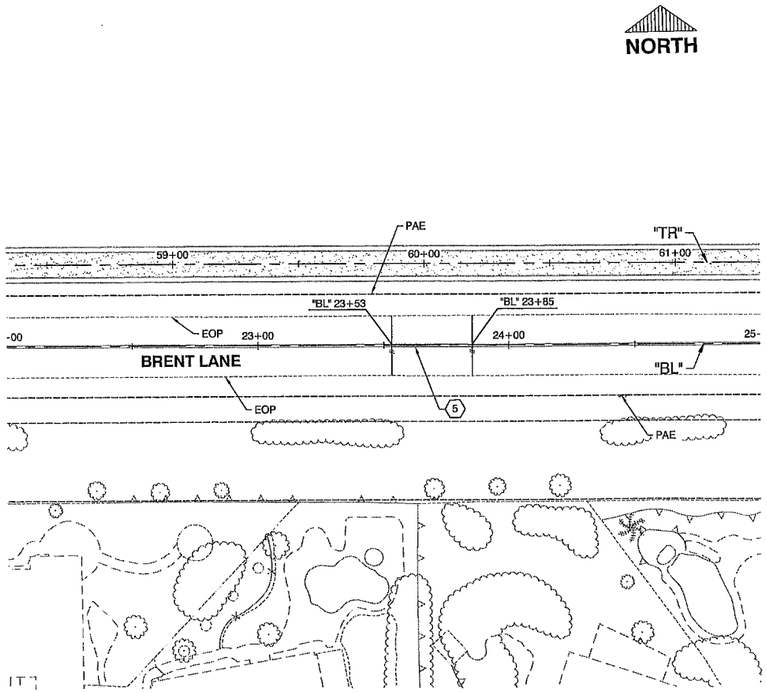


"DD" 58+50.00 TO "DD" 65+50.00



"BL" 22+00.00 TO "BL" 25+00.00

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

CONSTRUCTION NOTES

1. INSTALL 24-INCH WHITE CROSSWALK (PPM) (USDCCA STD. DWG. NO. 254)
2. INSTALL 24-INCH WHITE STOP LINE (PPM) (USDCCA STD. DWG. NO. 254)
3. INSTALL 6-INCH SOLID WHITE LINE (PPM)
4. INSTALL TYPE 4 LANE LINE (RPM) (USDCCA STD. DWG. NO. 244.1)
5. INSTALL TYPE I CENTERLINE (PPM) (USDCCA STD. DWG. NO. 244)
6. INSTALL TYPE I CENTERLINE (RPM) (USDCCA STD. DWG. NO. 244)
7. INSTALL NO. 7 PULL BOX (USDCCA STD. DWG. NO. 707)
8. INSTALL 2-3" CONDUIT WITH 1-#8 TRACER WIRE
9. INSTALL NEW GROUND MOUNTED SIGN(S)
10. INSTALL YIELD BAR (PPM)(MUTCD FIGURE 3B-17 AND NDOT STD. DWG. T-3B.1.3)
11. REMOVE AND RESET EXISTING SIGN(S)
12. RESET EXISTING PARK SIGN(S) ADJACENT TO TRAIL
13. INSTALL TYPE 2 CENTERLINE (RPM) (USDCCA STD. DWG. NO. 244)
14. REMOVE EXISTING SIGN(S)

(E) EXISTING SIGN(S) TO REMAIN

NO.	DATE	REVISIONS

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

PREPARED FOR
CITY OF LAS VEGAS

H# 49876 | BID# ####
DATE: MARCH 24, 2015 | DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: SPC/DAM | CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STRIPING AND TRAFFIC PLAN

PRELIMINARY
PROFESSIONAL ENGINEER
MARK J. FINNEY
STATE OF NEVADA
3/30/2015
CIVIL
No. 14566

SHEET
SM-01
38 OF 56
DRAWING NO.
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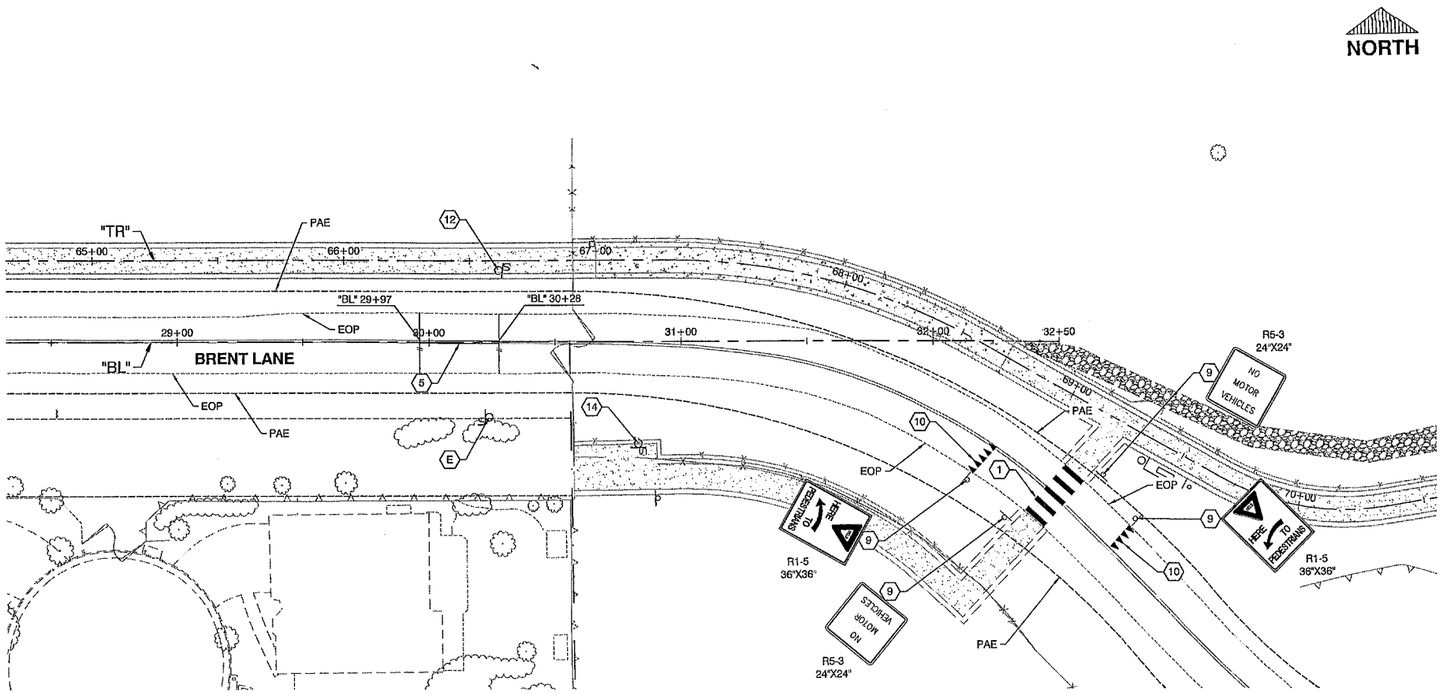

"BL" 28+50.00 TO "BL" 32+50.00

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
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	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
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10. INSTALL YIELD BAR (PPM)(MUTCD FIGURE 3B-17 AND NDOT STD. DWG. T-38.1.3)
11. REMOVE AND RESET EXISTING SIGN(S)
12. RESET EXISTING PARK SIGN(S) ADJACENT TO TRAIL
13. INSTALL TYPE 2 CENTERLINE (RPM) (USDCCA STD. DWG. NO. 244)
14. REMOVE EXISTING SIGN(S)

(E) EXISTING SIGN(S) TO REMAIN

NO.	DATE	REVISIONS

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

PREPARED FOR:
CITY OF LAS VEGAS

H# 49876	BID# ####
DATE: MARCH 24, 2015	DESIGNED BY: DAM
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: SPC/DAM
	CHECKED BY: JSR/MJF

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
STRIPING AND TRAFFIC PLAN

PROFESSIONAL ENGINEER STATE OF NEVADA MARK J. FIALKOWSKI No. 14566 CIVIL 3/30/2015 PRELIMINARIES

SHEET
SM-02
39 OF 56
DRAWING NO.
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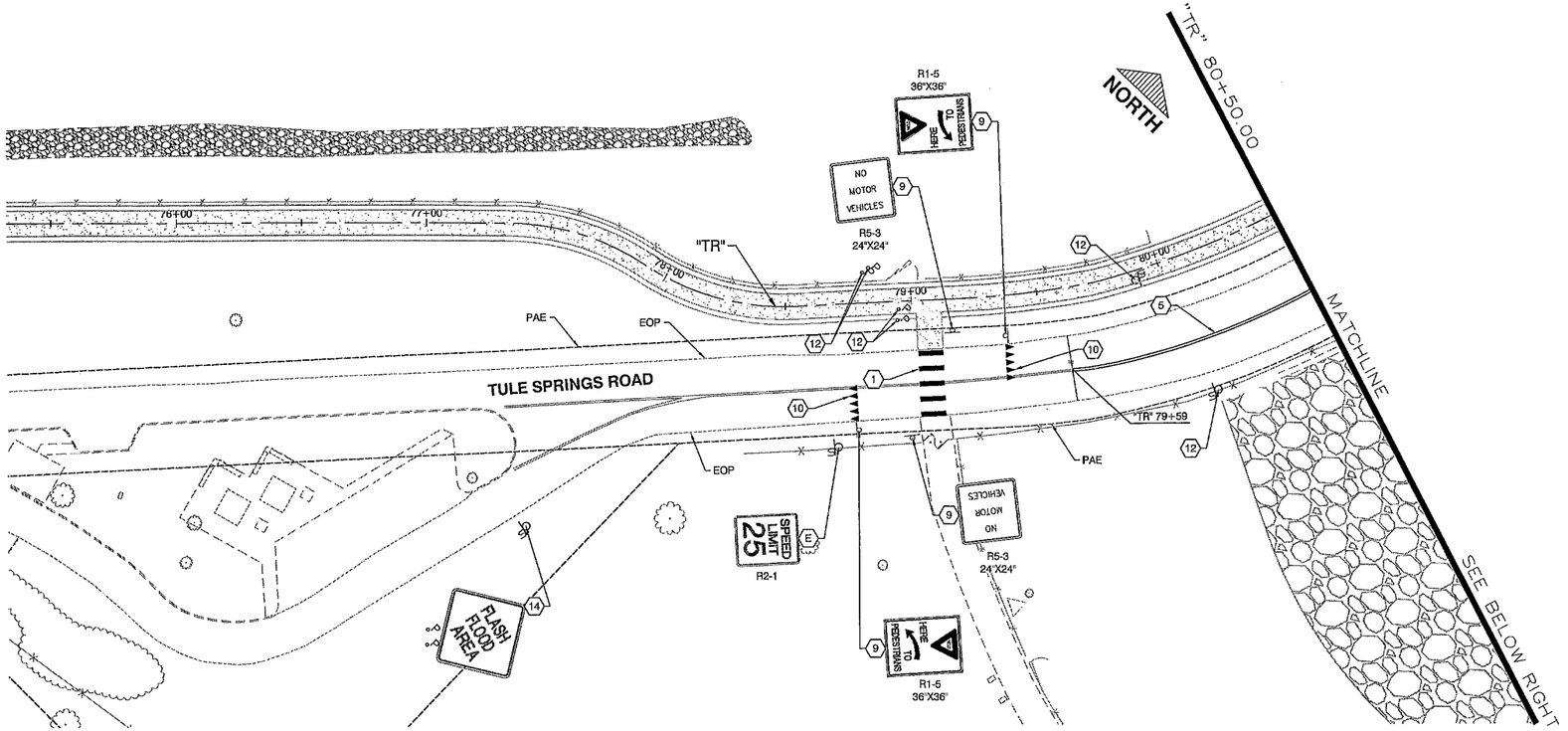
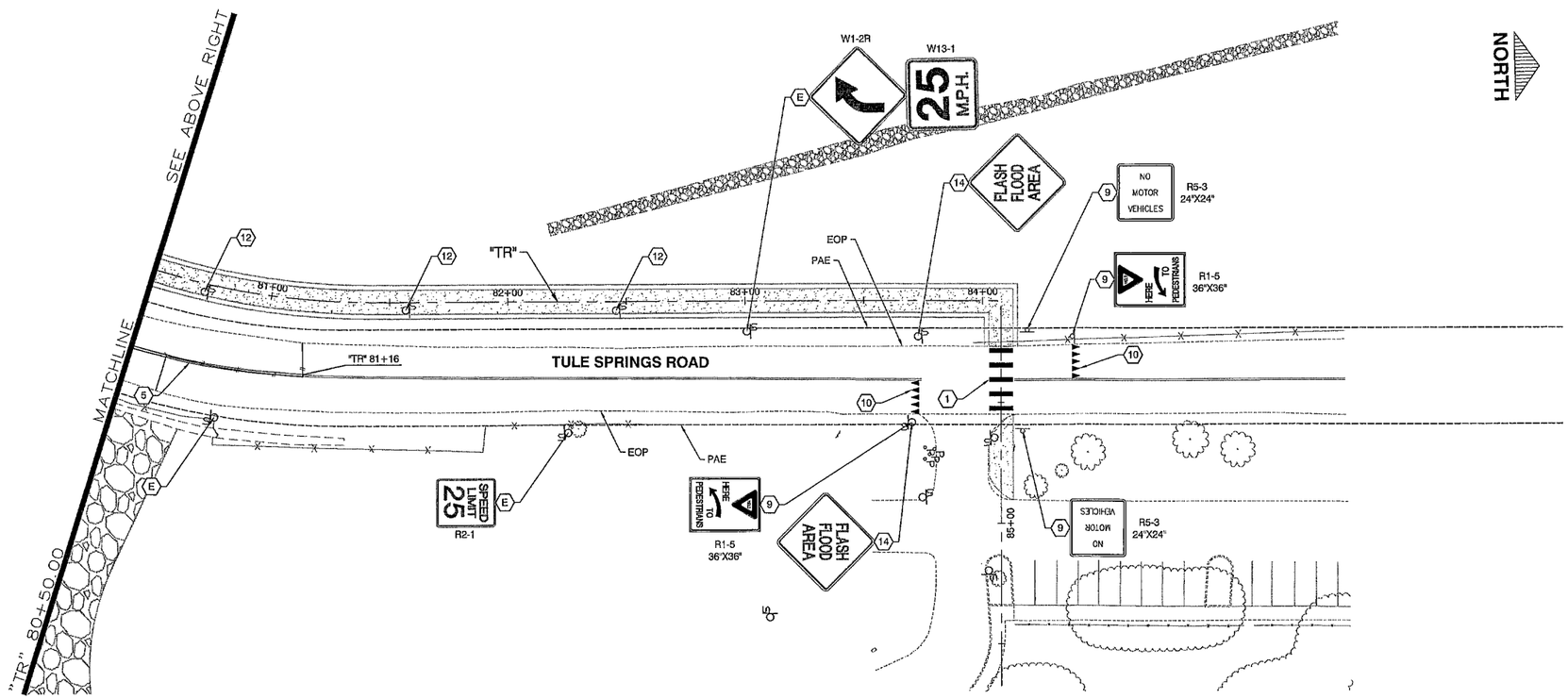


"TR" 75+50.00 TO "TR" 80+50.00



"TR" 80+50.00 TO "TR" 85+00.00

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

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9. INSTALL NEW GROUND MOUNTED SIGN(S)
10. INSTALL YIELD BAR (PPM)(MUTCD FIGURE 3B-17 AND NDOT STD. DWG. T-36.1.3)
11. REMOVE AND RESET EXISTING SIGN(S)
12. RESET EXISTING PARK SIGN(S) ADJACENT TO TRAIL
13. INSTALL TYPE 2 CENTERLINE (RPM) (USDCCA STD. DWG. NO. 244)
14. REMOVE EXISTING SIGN(S)

(E) EXISTING SIGN(S) TO REMAIN

NO.	DATE	REVISIONS

PREPARED BY

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNERS

5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118

PHONE (702) 284-5300 FAX (702) 284-5399

PREPARED FOR

CITY OF LAS VEGAS

H#	49876
DATE:	MARCH 24, 2015
SUBMITTAL STAGE:	90% SUBMITTAL
BID#	####
DESIGNED BY:	DAM
DRAWN BY:	DAM
CHECKED BY:	JSR/MJF

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

STRIPING AND TRAFFIC PLAN

PROFESSIONAL ENGINEER STATE OF NEVADA MARK J. FINE Exp. 6/30/2015 CIVIL No. 14566 PRELIMINARY NOT FOR CONSTRUCTION

SHEET

SM-03

40 OF 56

DRAWING NO.

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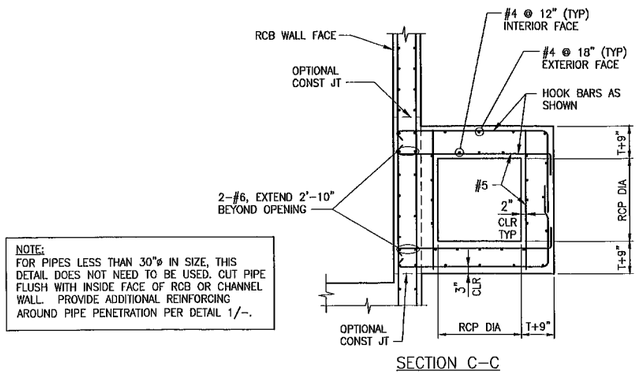

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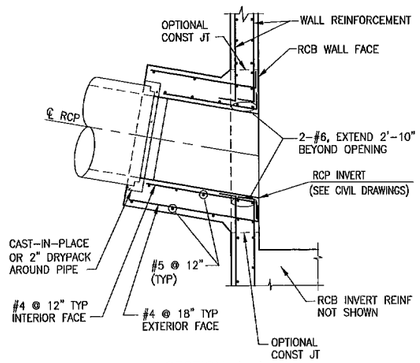
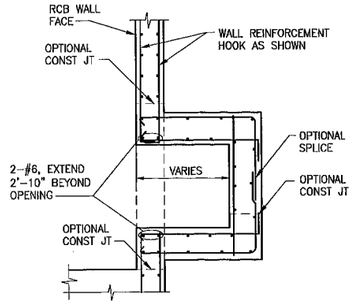


SECTION A–A



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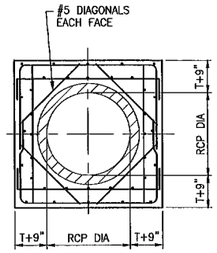

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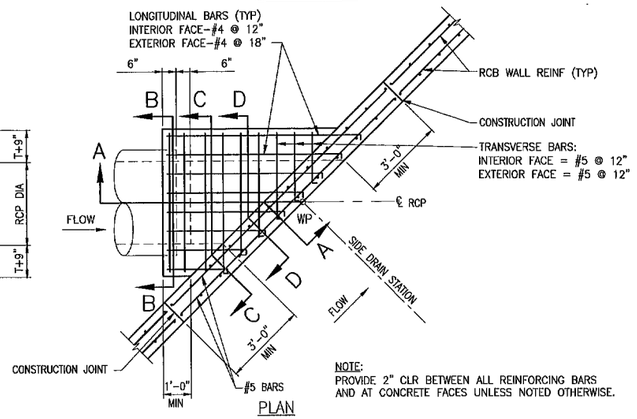
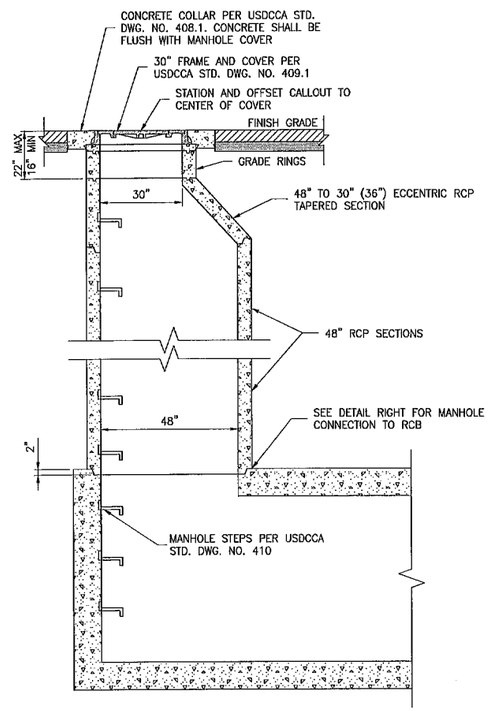


PLAN

NOTE:
PROVIDE 2" CLR BETWEEN ALL REINFORCING BARS AND AT CONCRETE FACES UNLESS NOTED OTHERWISE.

5 TYPICAL PIPE PENETRATION DETAIL INTO CAST-IN-PLACE CONCRETE WALL

SCALE: NTS



NOTES:

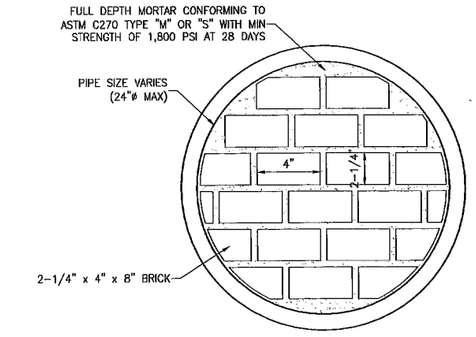
1. SEE USDCCA STD. DWG. NO. 403.1 FOR ADDITIONAL MANHOLE CONSTRUCTION NOTES AND DETAILS.

6 48" RCB ACCESS MANHOLE

SCALE: NTS

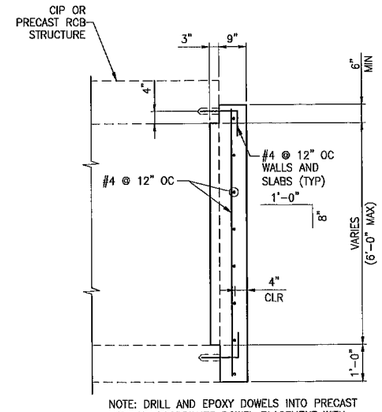
GENERAL STRUCTURAL NOTES

1. DESIGN SPECIFICATIONS: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, FIFTH EDITION, 2010.
2. CONSTRUCTION SPECIFICATIONS: UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA.
3. EXISTING UTILITIES: THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES WITHIN THE WORK AREA, AND PROVIDING PROTECTION FOR THE VARIOUS UTILITIES AFFECTED PRIOR TO PROCEEDING WITH THE WORK.
4. CONCRETE: CONCRETE SHALL BE CLASS D MODIFIED AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF f'c=4,500 PSI AND A MAXIMUM WATER TO CEMENT RATIO, BY WEIGHT, OF 0.45. USE TYPE V CEMENT PER ASTM C-150. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS NOTED OTHERWISE.
5. REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE ASTM A615 GRADE 60. DIMENSIONS ARE FROM OUT TO OUT OF BARS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 2" UNLESS NOTED OTHERWISE. HOOKS MAY BE ROTATED OR TILTED AS NECESSARY TO PROVIDE THE PROPER CLEARANCES.
6. IN CURVED SECTIONS, TRANSVERSE REINFORCING SHALL BE PLACED NORMAL TO THE CENTERLINE. THE MAXIMUM SPACING OF BARS SHALL NOT EXCEED THAT FOR TYPICAL SECTIONS. REINFORCING SHALL BE PLACED RADIALLY FROM THE MAXIMUM SPACING.
7. BEDDING MATERIAL: BEDDING MATERIAL SHALL BE 6-INCHES OF CLARK COUNTY TYPE II AGGREGATE BASE COMPACTED TO 95% OF THE MAXIMUM DRY DENSITY AS ESTABLISHED BY ASTM TEST METHOD D-1557. EXPOSED NATIVE SOILS IN BOTTOMS OF EXCAVATIONS SHALL BE SCARIFIED TO A DEPTH OF 8-INCHES, MOISTURE-CONDITIONED TO WITHIN 2% OF OPTIMUM MOISTURE CONTENT AND COMPACTED TO 95% PER ASTM D-1557.
8. EPOXY: EPOXY SHALL BE SIMPSON STRONG-TIE "SET-XP EPOXY-TIE ADHESIVE" PER ICC REPORT ESR-2508 OR APPROVED EQUAL. INSTALL IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.
9. STRUCTURAL STEEL: ALL MISCELLANEOUS STEEL SHALL CONFORM TO ASTM A36 UNLESS NOTED OTHERWISE. ALL HSS TUBE SHAPE SHALL BE ASTM A500, GRADE B.
10. GALVANIZING: ALL EXPOSED METAL PARTS SHALL BE GALVANIZED. GALVANIZING DAMAGED BY FABRICATION SHALL RECEIVE TWO COATS OF ZINC RICH PAINT (GALVANOX OR EQUAL).
11. INVERTS, SLOPES, BEARINGS, ALIGNMENTS, AND ELEVATIONS SHOWN ARE FOR "REFERENCE ONLY". INFORMATION ON CIVIL DRAWINGS SHALL GOVERN.
12. CONTRACTOR SHALL PROVIDE SLOPE STABILIZATION, SHEETING, BRACING, AND/OR SHORING AS REQUIRED TO PROTECT EXISTING EMBANKMENTS, STRUCTURES, AND UNDERGROUND ITEMS.



4 BRICK AND MORTAR PLUG

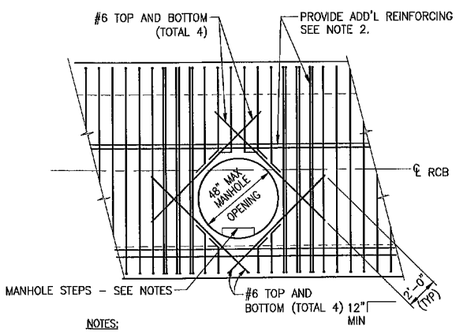
SCALE: NTS



NOTE: DRILL AND EPOXY DOWELS INTO PRECAST RCB OR COORDINATE DOWEL PLACEMENT WITH PRECAST MANUFACTURER.

3 CONCRETE RCB PLUG DETAIL

SCALE: NTS

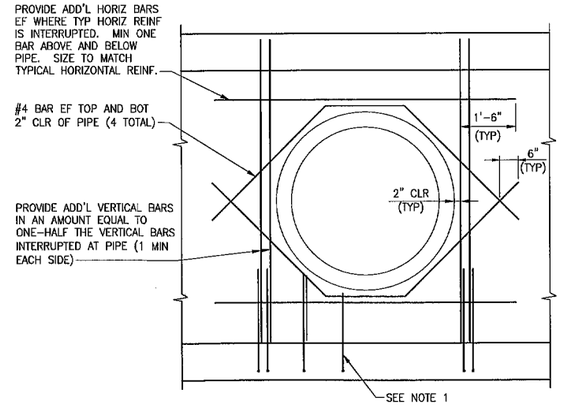


NOTES:

1. FIELD BEND OR CUT ALL REINFORCING 2" CLR OF OPENINGS.
2. EVERY REBAR DISCONTINUED AT OPENING SHALL BE REPLACED BY AN EXTRA REBAR PLACED AT THE SIDE OF THE OPENING AS SHOWN. THE LENGTH OF THE EXTRA REBARS SHALL EQUAL THE LENGTH OF THE SCHEDULE REBARS THAT ARE NOT DISCONTINUED AT THE OPENING.
3. PROVIDE MINIMUM 2" CLR BETWEEN ALL REINFORCING BARS.
4. MANHOLE STEPS SHALL BE PER CLARK COUNTY STANDARD DRAWING NO. 410 WITH A MAXIMUM SPACING BETWEEN STEPS OF 12" AND A MAXIMUM OF 16" BETWEEN THE LAST STEP AND BOTTOM OF STRUCTURE.

2 RCB ACCESS MANHOLE OPENING REINF.

SCALE: NTS



NOTES:

1. FIELD CUT TYPICAL WALL REINFORCING 2" CLR OF PIPE.
2. WHEN WALL IS LESS THAN 9" THICK REINFORCING DOES NOT NEED TO BE PLACED IN EACH FACE AS STATED ABOVE.
3. IF BARS CANNOT EXTEND BEYOND PIPE AS SHOWN, EXTEND AS FAR AS POSSIBLE AND PROVIDE STANDARD HOOK.

1 PIPE PENETRATION DETAIL

SCALE: NTS

REVISIONS

NO.	DATE

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CITY OF LAS VEGAS

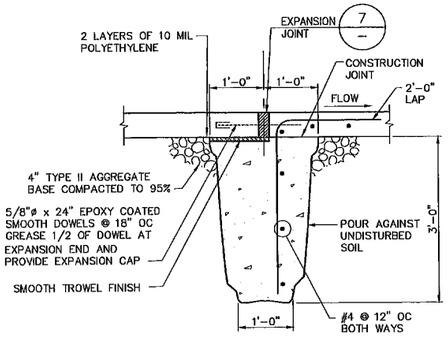
BID# -	DESIGNED BY: EGG
DATE: MARCH 24, 2015	DRAWN BY: EGG
SUBMITTAL STAGE: 90% SUBMITTAL	CHECKED BY: DAT

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS

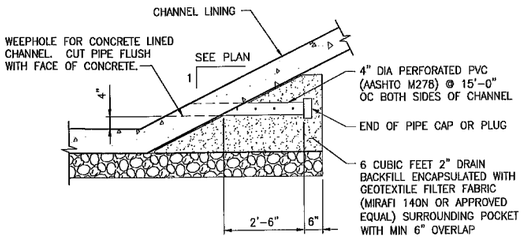
ERIN L. DAVIS — STATE OF NEVADA — No. 14570 — PROFESSIONAL ENGINEER — STRUCTURAL — 6/30/2015

SHEET
S-1
41 OF 56
DRAWING NO.
-



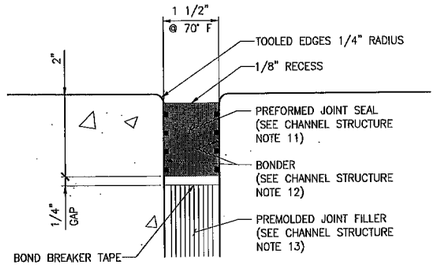
11 TYP. TRANSVERSE CUTOFF WALL

SCALE: NTS



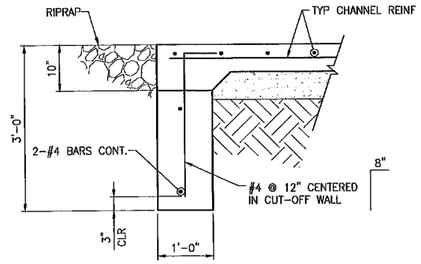
8 TRAP. CHANNEL WEEPHOLE

SCALE: NTS



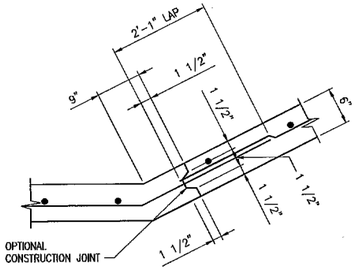
7 SLAB EXPANSION JOINT

SCALE: NTS



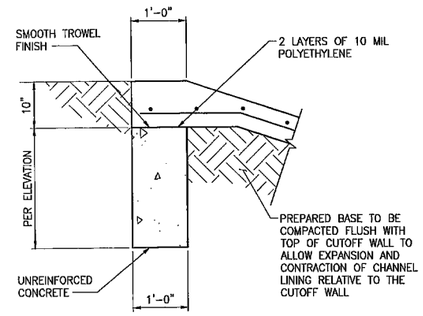
10 CUTOFF WALL AT CHANNEL END

SCALE: NTS



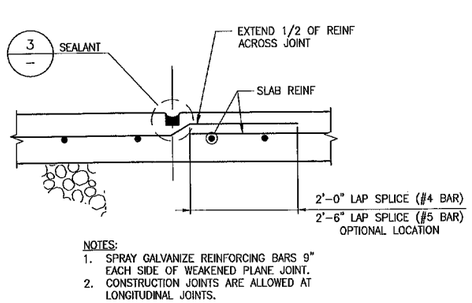
6 KEYED JOINT DETAIL

SCALE: NTS



9 LONGITUDINAL CUTOFF WALL

SCALE: NTS



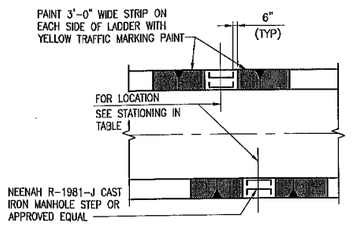
NOTES:
1. SPRAY GALVANIZE REINFORCING BARS 9" EACH SIDE OF WEAKENED PLANE JOINT.
2. CONSTRUCTION JOINTS ARE ALLOWED AT LONGITUDINAL JOINTS.

5 WEAKENED PLAN JOINT

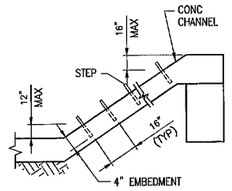
SCALE: NTS

STEP LOCATION TABLE

STATIONS	
LT	RT
"SD" 14+88.00	"SD" 15+00.00
"SD" 22+88.00	"SD" 23+00.00



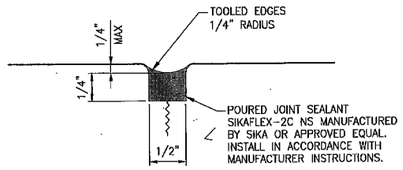
TRAPEZOIDAL CHANNEL



SECTION

4 TYPICAL CHANNEL STEPS

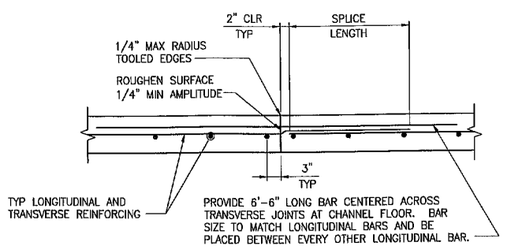
SCALE: NTS



NOTE:
JOINT MUST BE TOOLED, SAW-CUTTING IS NOT ALLOWED.

3 SEALANT DETAIL

SCALE: NTS

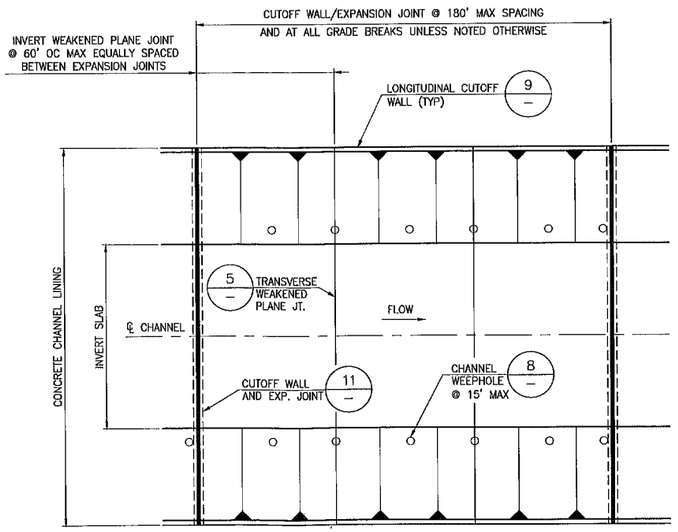


2 CONSTRUCTION JOINT DETAIL

SCALE: NTS

TRAPEZOIDAL CHANNEL STRUCTURE NOTES

1. TRANSVERSE AND LONGITUDINAL JOINTS IN INVERT SLAB AND SIDE SLOPE OF PAVED TRAPEZOIDAL CHANNELS AND WALLS FOR RECTANGULAR CHANNELS WILL BE REQUIRED AT THE END OF EACH CONTINUOUS POURING OPERATION. SEE TYPICAL CONSTRUCTION JOINT DETAIL. TRANSVERSE CONSTRUCTION JOINTS SHALL NOT BE PLACED WITHIN 3-FEET OF A MANHOLE, WITHIN 10-FEET OF JUNCTION STRUCTURE OPENINGS, OR WITHIN 50 FEET OF AN EXPANSION JOINT.
2. ALL TRANSVERSE JOINTS IN WALLS AND SLABS (CONSTRUCTION, WEAKENED, CONTRACTION AND EXPANSION) SHALL BE IN THE SAME PLANE. NO STAGGERING OF JOINTS WILL BE PERMITTED UNLESS SHOWN OTHERWISE. TRANSVERSE CONSTRUCTION JOINTS SHALL BE NORMAL OR RADIAL TO CENTERLINE OF CONSTRUCTION.
3. ALL SINGLE LAYER REINFORCEMENT SHALL BE PLACED IN THE CENTER OF CONCRETE UNLESS NOTED OTHERWISE.
4. IN CURVED CHANNEL SECTIONS, TRANSVERSE BARS SHALL BE PLACED NORMAL TO THE CHANNEL CENTERLINE.
5. IN CURVED CHANNEL SECTIONS, THE MAXIMUM SPACING OF BARS SHALL NOT EXCEED THAT SHOWN FOR TYPICAL SECTIONS. STEEL SHALL BE PLACED RADIALLY FROM THE MAXIMUM SPACING.
6. IN CURVED CHANNEL SECTIONS, TRANSVERSE JOINTS SHALL BE NORMAL TO CENTERLINE AND SHALL NOT EXCEED 60' MAX SPACING.
7. AT THE BEGINNING AND ENDING OF ALL POURS, A COMPLETE CURTAIN OF MAIN REINFORCEMENT SHALL BE PLACED 3-INCHES FROM THE TRANSVERSE CONSTRUCTION, CONTRACTION AND EXPANSION JOINTS.
8. WEEPHOLES ARE REQUIRED AT 15-FEET OC ON EACH SIDE OF CHANNEL PER THE TYPICAL WEEPHOLE DETAIL FOR ALL OPEN CHANNEL STRUCTURES.
9. WEAKENED PLANE JOINTS TO BE CENTERED WITH WEEPHOLES WHEN JOINTS OCCUR.
10. DO NOT LOCATE CUTOFF WALLS WHERE A CONFLICT WITH EXISTING UTILITIES WILL OCCUR.
11. PREFORMED EXPANSION JOINT SEAL: PHYZITE 380 WITH H.A.L.S. MANUFACTURED BY CHASE CONSTRUCTION PRODUCTS OR APPROVED EQUAL. SIZE AND INSTALL SEAL IN ACCORDANCE WITH MANUFACTURER INSTRUCTIONS. THE WIDTH OF THE SEAL SHALL BE 25% GREATER THAN THE WIDTH OF THE JOINT AT THE TIME OF INSTALLATION. MEASURE WIDTH OF JOINT AFTER INITIAL SHRINKAGE AND THERMAL MOVEMENT HAS OCCURRED. ALL JOINTS IN THE COMPRESSION SEAL SHALL BE HEAT WELDED. THE JOINT MATERIAL SHALL HAVE E.S.P. (ENGINEERED SURFACE PREPARATION) GROOVES PER MANUFACTURER RECOMMENDATIONS.
12. BONDER: EVA-POX BONDER NO. 1 MANUFACTURED BY CHASE CONSTRUCTION PRODUCTS OR APPROVED EQUAL. APPLY TO BOTH SIDES OF SEAL AND CONCRETE. BONDER SHALL FILL THE GROOVES OF THE SEAL.
13. PREMOLDED JOINT FILLER: EVA-SEAL 30 WITH 2" TERRA-STRIP MANUFACTURED BY CHASE CONSTRUCTION PRODUCTS OR EQUAL. INSTALL IN ACCORDANCE WITH MANUFACTURER INSTRUCTIONS.
14. PROVIDE ACCESS STEPS INTO CHANNEL PER TYPICAL DETAIL.



1 PLAN - CONCRETE LINED TRAP CHANNEL

SCALE: NTS

NO.	DATE	REVISIONS

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PREPARED FOR
CITY OF LAS VEGAS

BID# -
DESIGNED BY: EGG
DRAWN BY: EGG
CHECKED BY: DAT
H# 49876
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TRAPEZOIDAL CHANNEL STRUCTURAL NOTES AND TYPICAL DETAILS

PROFESSIONAL ENGINEER ERIK A. SUNDBERG STATE OF NEVADA No. 14570 STRUCTURAL NOT FOR CONSTRUCTION

SHEET
S-2
42 OF 56
DRAWING NO.
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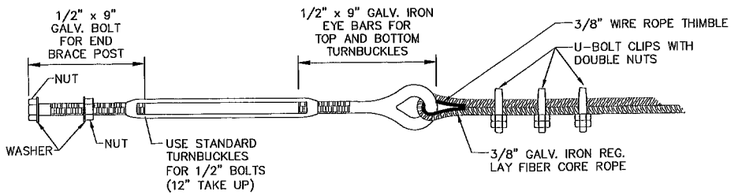
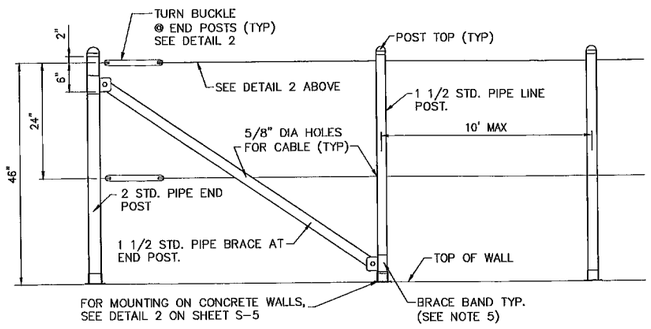


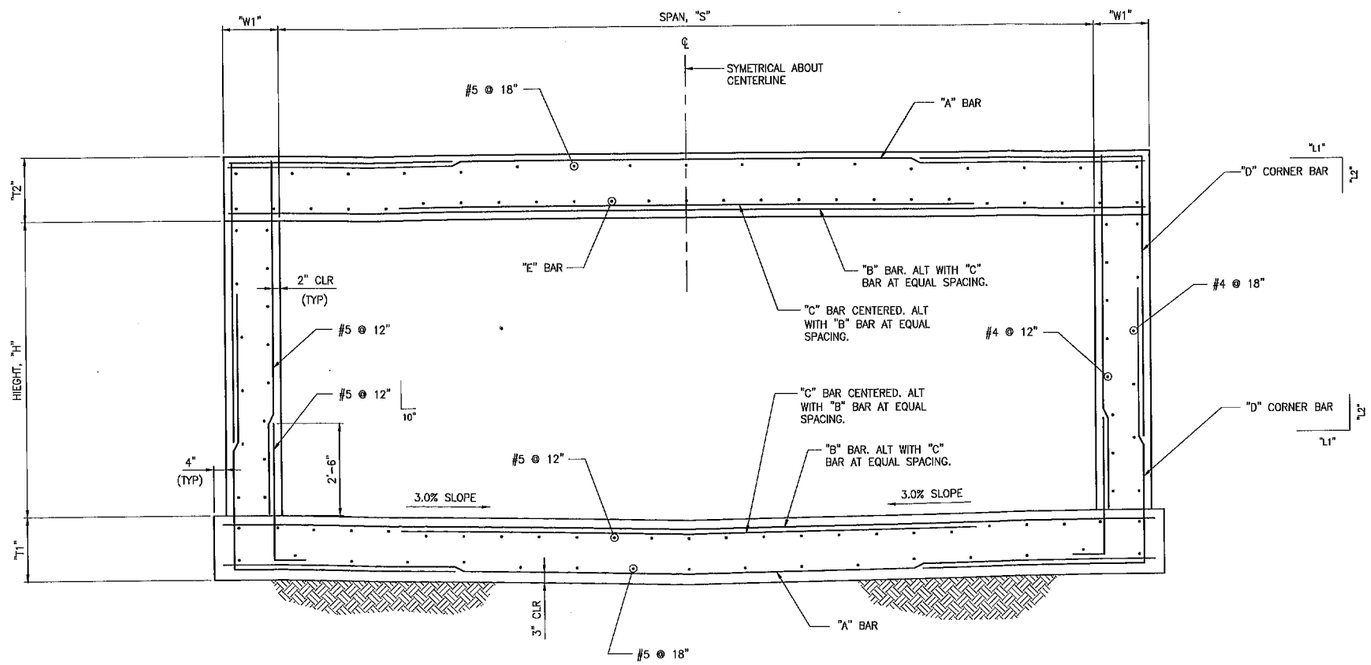
2 TURNBUCKLE DETAIL
SCALE: NTS



NOTES:

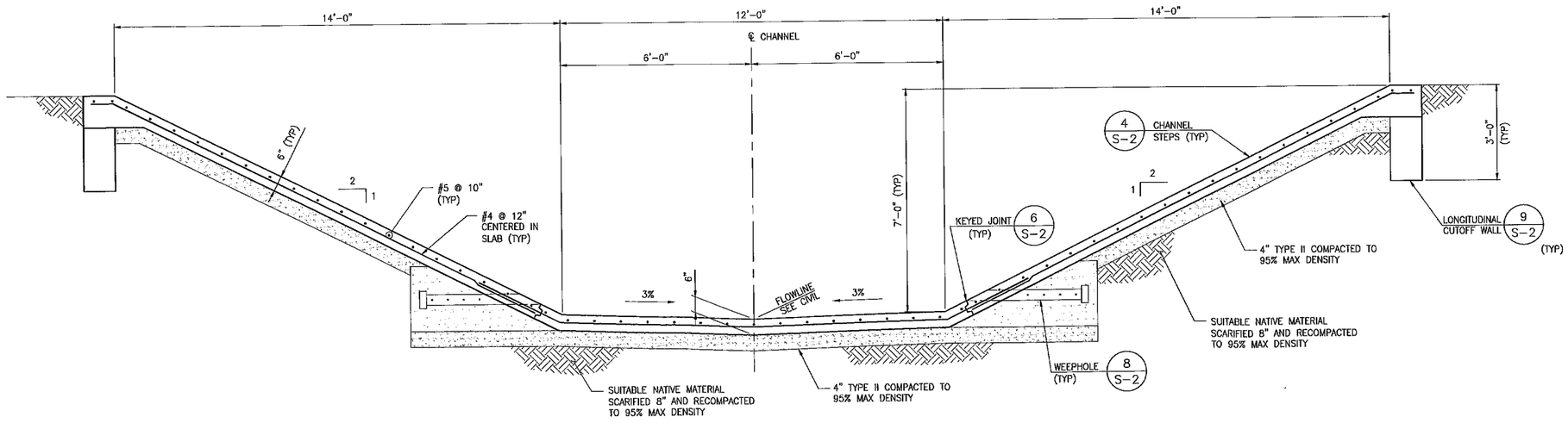
1. ALL POSTS SHALL BE A53 STEEL.
2. ALL POSTS SHALL BE SET PLUMB.
3. RAILING POSTS AND FITTINGS SHALL BE HOT OR DIPPED GALVANIZED MALLEABLE CAST IRON, PRESSED STEEL.
4. GALVANIZE COMPONENTS AFTER FABRICATION.
5. BRACE BANDS SIZED FOR 2000 LBS. (WORKING LOAD).
6. 2 GROUNDING RODS MIN. PER POWER EASEMENT. 100' O.C. MAX SPACING.
7. BRACING SHALL NOT CROSS OVER EXPANSION JOINT

1 POST AND CABLE RAILING
SCALE: NTS



RCB SIZE	MAXIMUM EARTH COVER ALLOWED	SPAN "S"	HEIGHT "H"	"T1"	"T2"	"W1"	"A" BAR	"B" BAR	"C" BAR	"D" BAR	"L1"	"L2"	"E" BAR
20' x 7' RCB	< 6'-0"	20'-0"	7'-0"	16"	16"	14"	#5 @ 12"	#7 @ 12"	#7 x 14'-0" @ 12"	#7 @ 6"	8'-0"	6'-3"	#5 @ 12"

B TYPICAL CAST-IN-PLACE CONCRETE RCB SECTION
SCALE: 1/2" = 1'-0"



A TYPICAL CONCRETE TRAPEZOIDAL CHANNEL SECTION
SCALE: 1/2" = 1'-0"

NO.	DATE	REVISIONS

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DESIGNED BY: EGG
DRAWN BY: EGG
CHECKED BY: DAT
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TYPICAL TRAPEZOIDAL CHANNEL AND CAST-IN-PLACE RCB SECTIONS

SHEET
S-3
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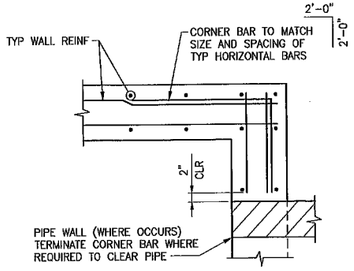
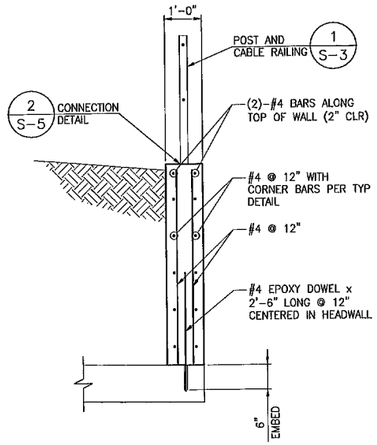
DRAWING NO.
-



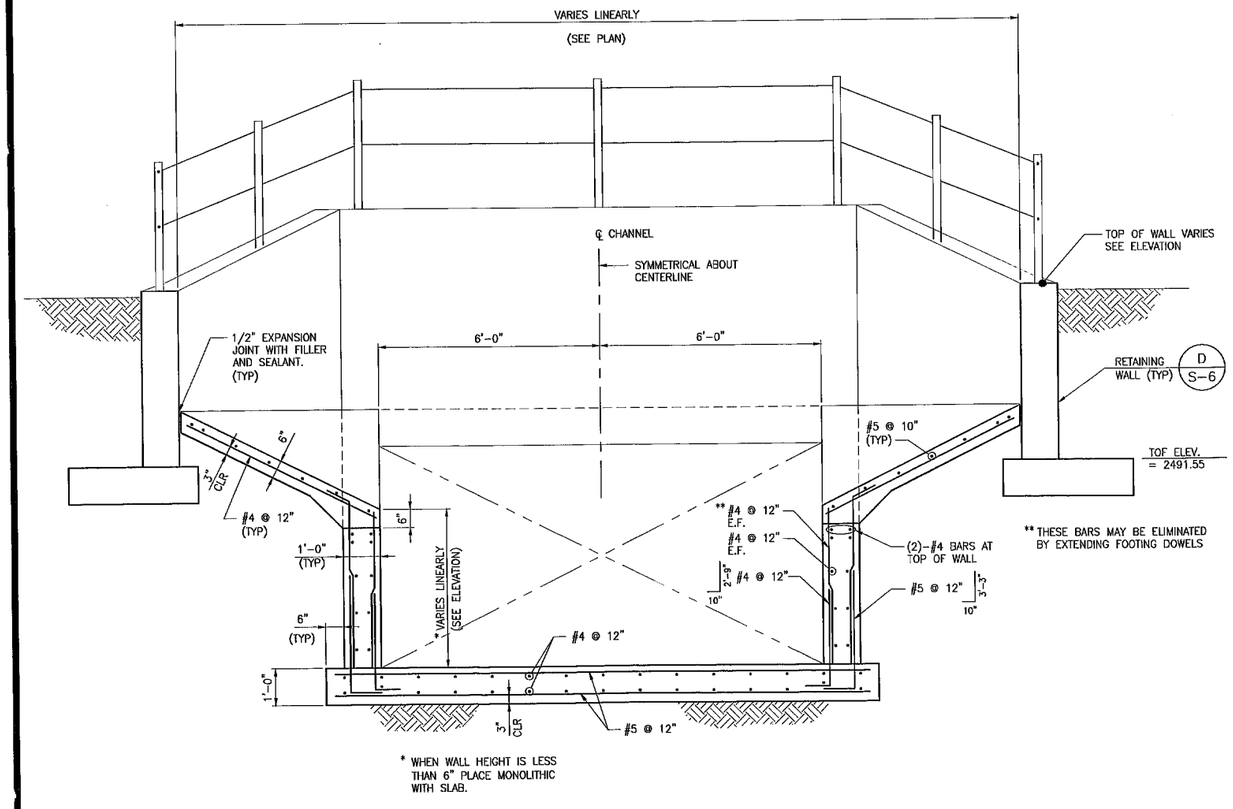
3 / - TYP CORNER REINF DETAIL

SCALE: NTS



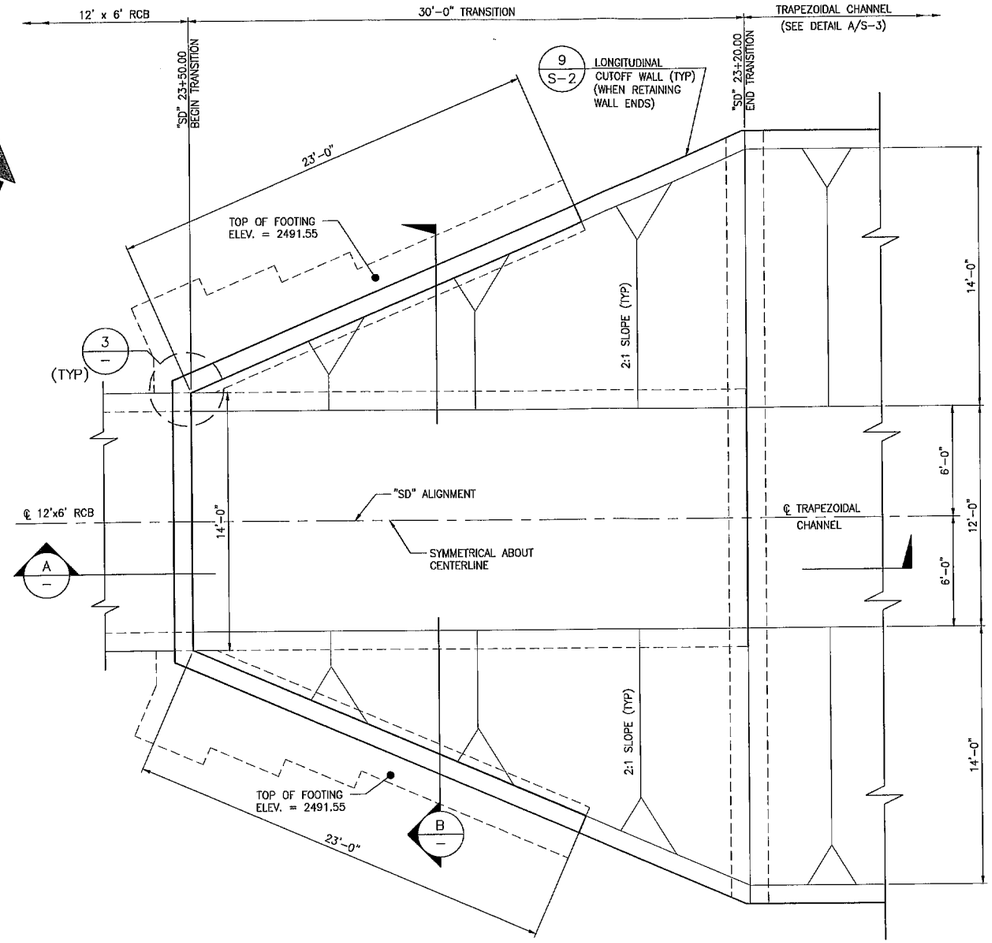
2 / - DETAIL

SCALE: 1/2" = 1'-0"



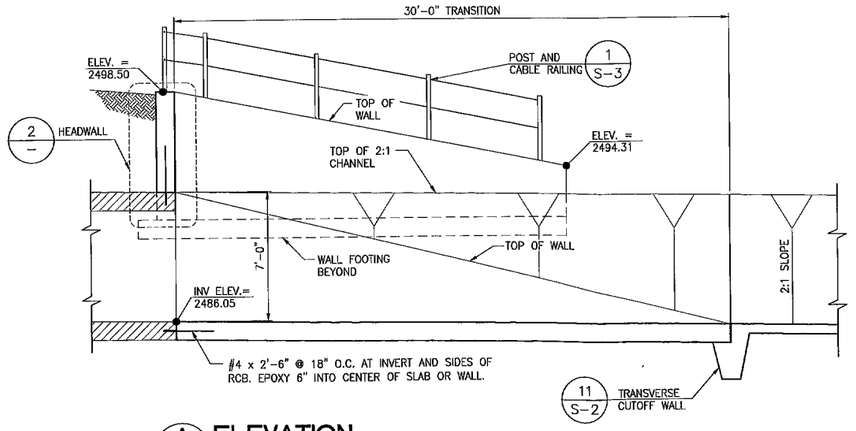
B / - SECTION

SCALE: 1/4" = 1'-0"



1 / - PLAN - TRANSITION #1

SCALE: 1/4" = 1'-0"



A / - ELEVATION

SCALE: 1/4" = 1'-0"

NO.	DATE	REVISIONS

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SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TRANSITION #1

PROFESSIONAL ENGINEER - STATE OF NEVADA - No. 14570 - EXPIRES 12/31/2015 - CIVIL - STRUCTURAL - NOTHING FOLLOWS THIS LINE

SHEET
S-4
44 OF 56
DRAWING NO.
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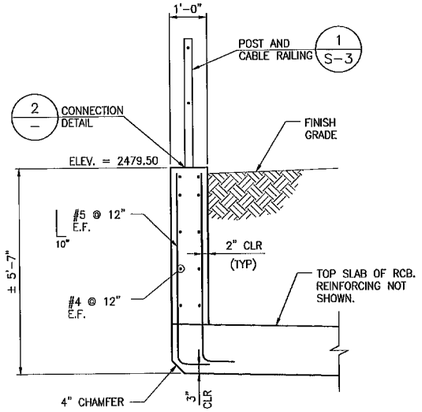

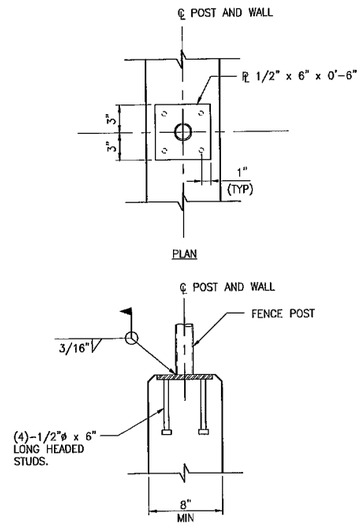

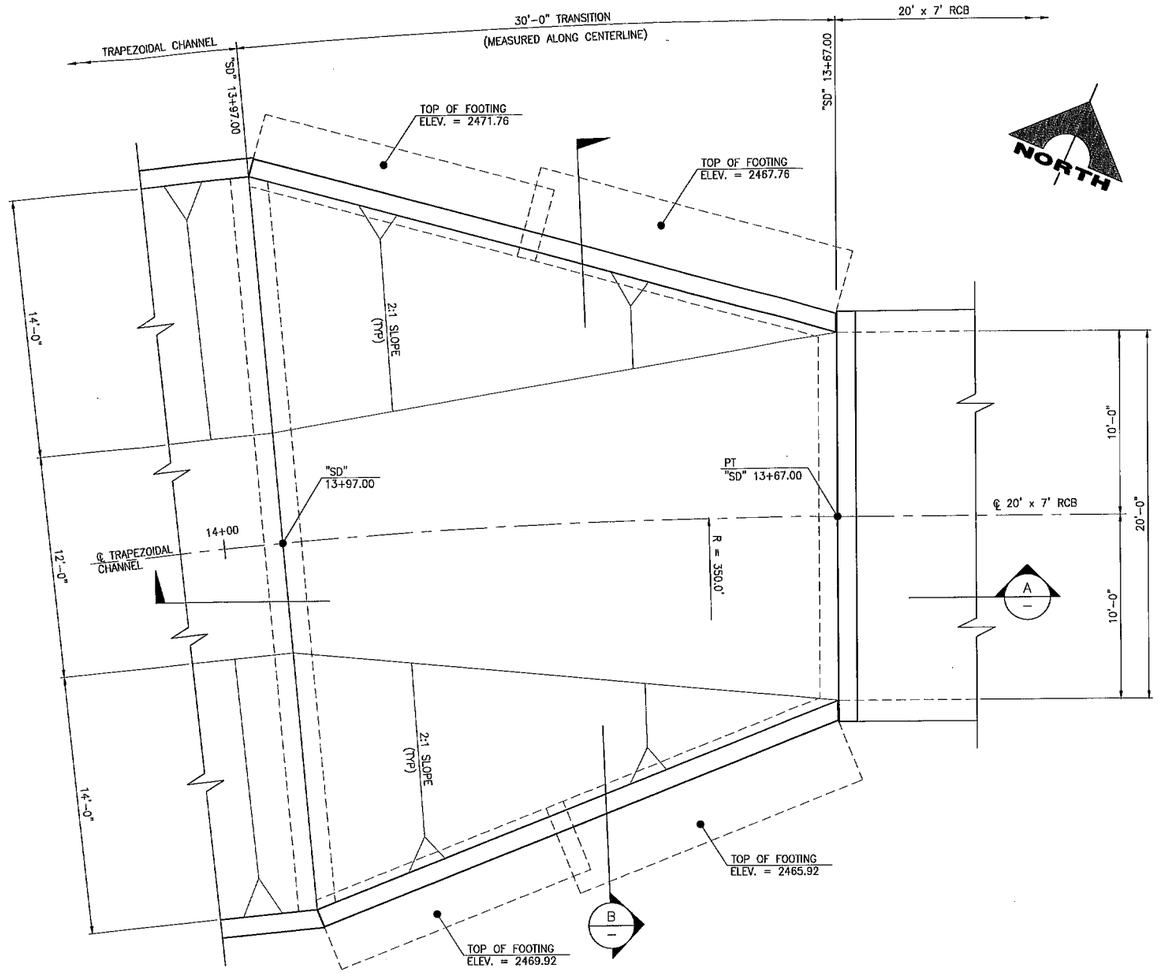

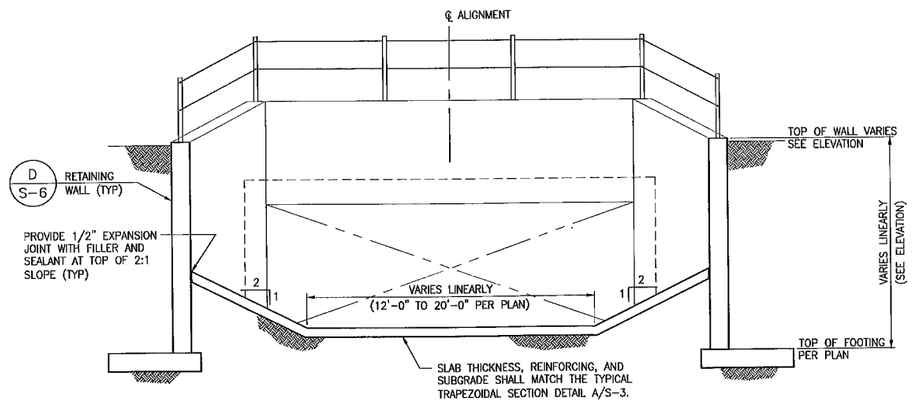

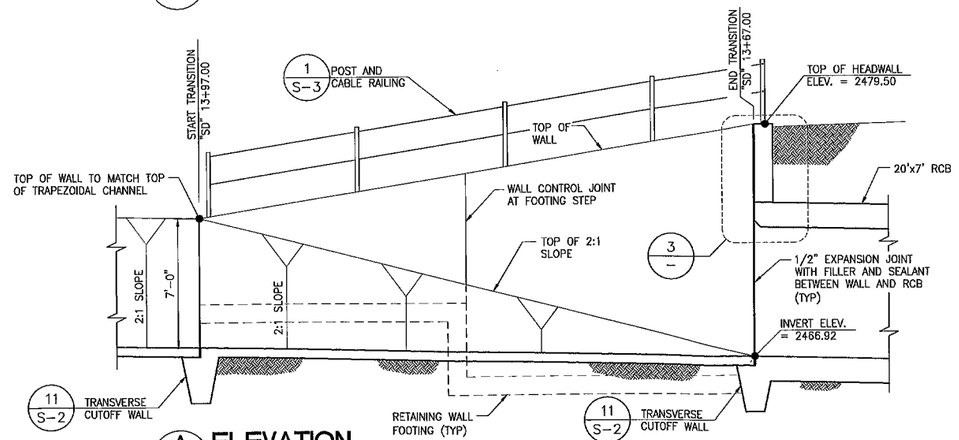

3 SECTION
SCALE: 1/2" = 1'-0"

2 DETAIL
SCALE: 1 1/2" = 1'-0"

1 PLAN - TRANSITION #2
SCALE: 1/4" = 1'-0"

B SECTION
SCALE: 1/4" = 1'-0"

A ELEVATION
SCALE: 1/4" = 1'-0"

NO.	DATE	REVISIONS

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PREPARED FOR
CITY OF LAS VEGAS

BID# -
DESIGNED BY: EGG
DRAWN BY: EGG
CHECKED BY: DAT
H# 49876
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TRANSITION #2

PROFESSIONAL ENGINEER — ERIC J. GUTIERREZ — No. 14570 — STATE OF NEVADA — NOT VALID UNLESS SIGNED AND DATED

SHEET
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45 OF 56
DRAWING NO.
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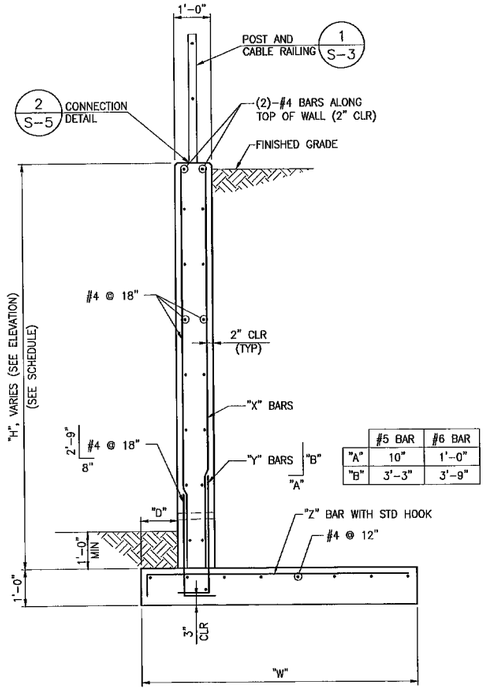
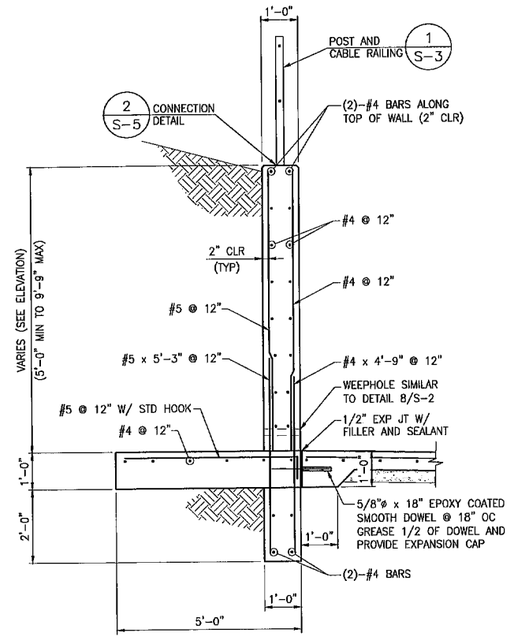


	#5 BAR	#6 BAR
"A"	10"	1'-0"
"B"	3'-3"	3'-9"

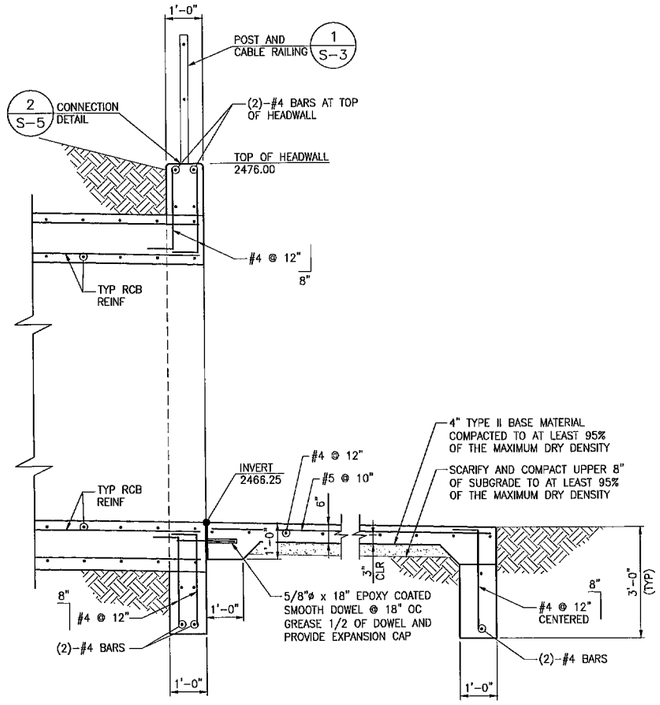
DIMENSIONS			"X"**	"Y"	"Z"
H*	W	D	BARS	BARS	BARS
4'-0"	3'-0"	6"	#4 @ 12"	#5 @ 12"	#4 @ 12"
6'-0"	4'-0"	6"	#5 @ 12"	#5 @ 12"	#4 @ 12"
8'-0"	5'-6"	6"	#5 @ 10"	#5 @ 10"	#5 @ 10"
10'-0"	7'-6"	1'-0"	#5 @ 8"	#5 @ 8"	#5 @ 8"
12'-0"	9'-0"	1'-0"	#5 @ 6"	#6 @ 6"	#5 @ 6"
13'-0"	10'-0"	1'-0"	#5 @ 6"	#6 @ 6"	#5 @ 6"

*WHERE ACTUAL WALL HEIGHT IS NOT LISTED IN SCHEDULE, USE VALUES FOR NEXT HIGHEST WALL CASE.

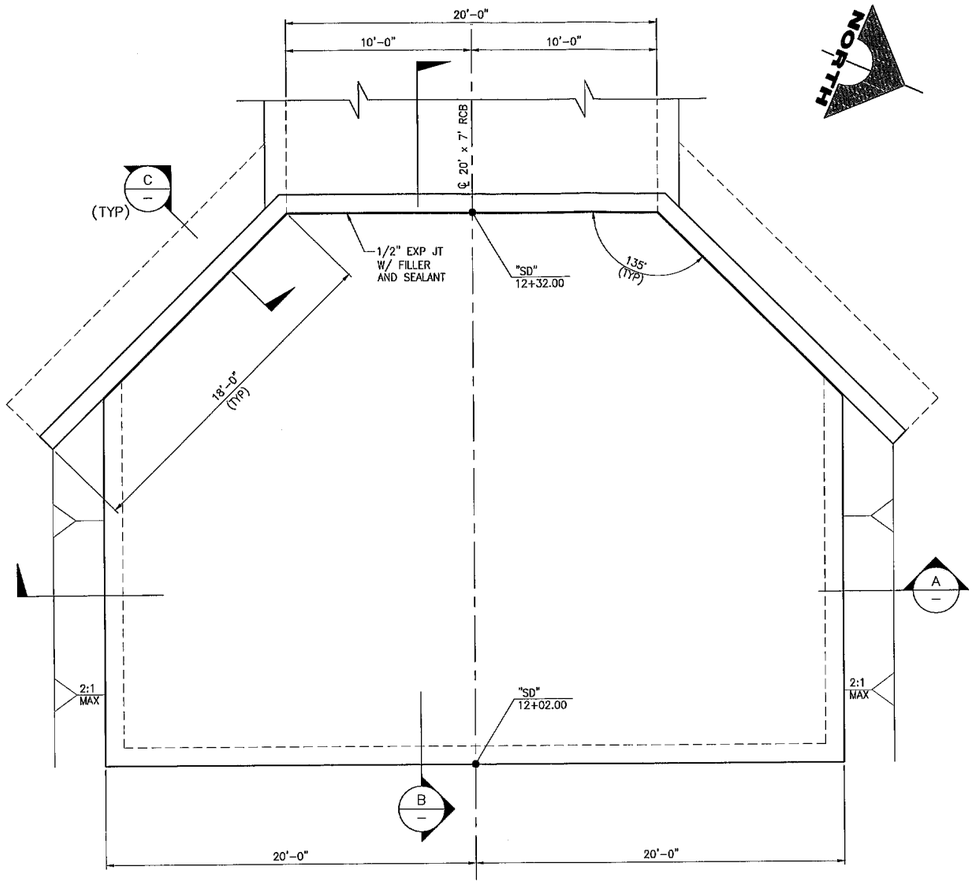
D WINGWALL SECTION
SCALE: 1/2" = 1'-0"



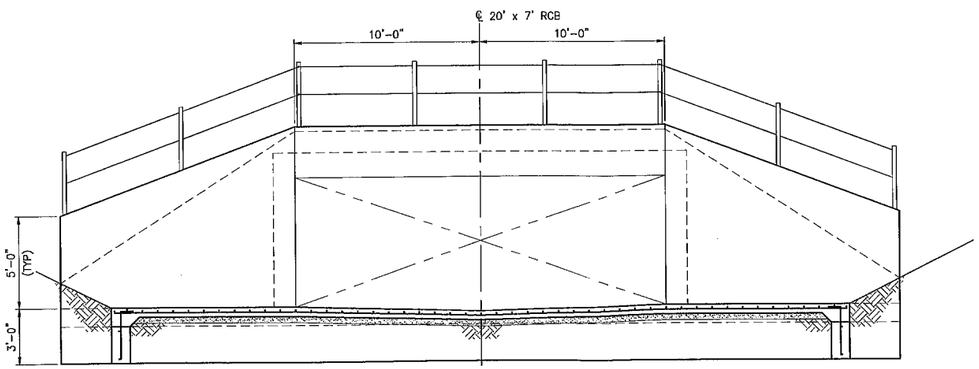
C WINGWALL SECTION
SCALE: 1/2" = 1'-0"



B HEADWALL SECTION
SCALE: 1/2" = 1'-0"



1 PLAN - HEADWALL #3
SCALE: 1/4" = 1'-0"



A ELEVATION - HEADWALL #3
SCALE: 1/4" = 1'-0"

PREPARED FOR
CITY OF LAS VEGAS

PREPARED BY
G.C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS
1555 S. RAINBOW BLVD. - LAS VEGAS, NV 89146
T: 702.804.2000 - F: 702.804.2299 - GCWALLACE.COM

NO.	DATE	REVISIONS

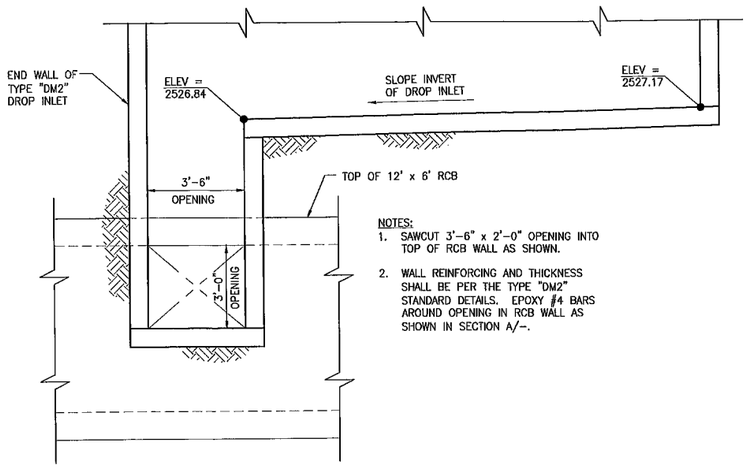
BID# -
H# 46976
DATE: MARCH 24, 2015
SUBMITTAL STAGE: 90% SUBMITTAL
DESIGNED BY: EGG
DRAWN BY: EGG
CHECKED BY: DAT

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
HEADWALL #3 AND CONCRETE PAD

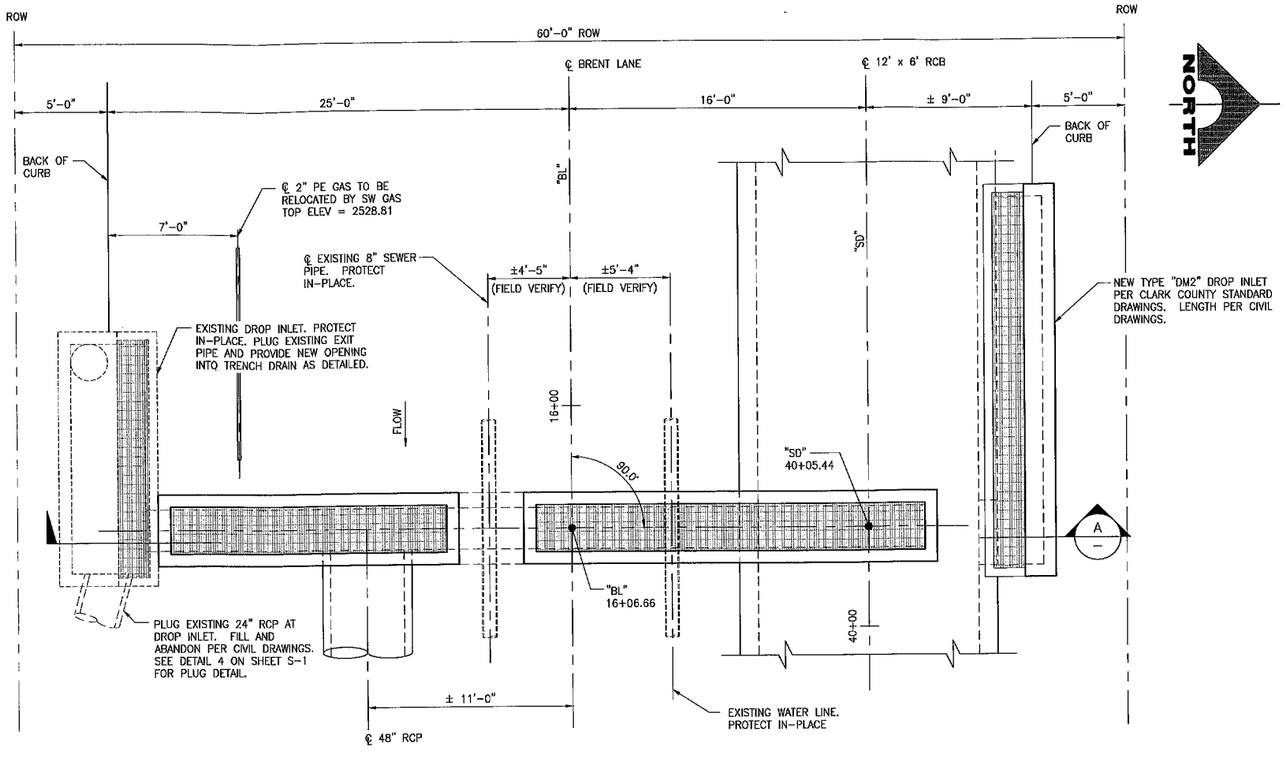
PROFESSIONAL ENGINEER - ERIC G. CRISMON - No. 14570 - STATE OF NEVADA - 06-30-2015 - CIVIL STRUCTURAL

SHEET
S-6
46 OF 56
DRAWING NO.
-

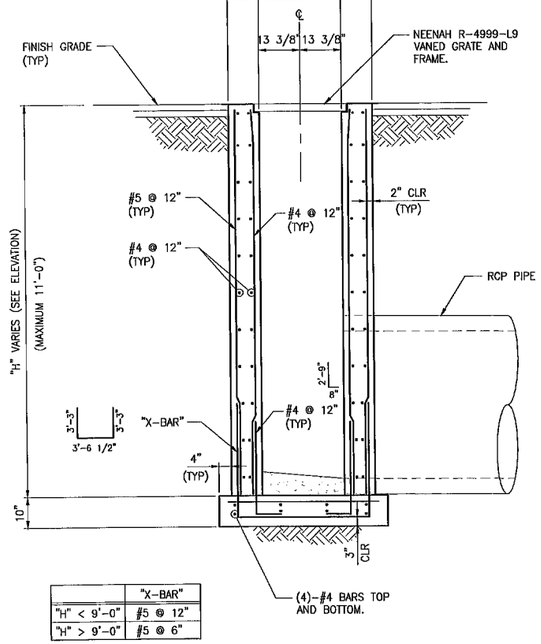


NOTES:
1. SAWCUT 3'-6" x 2'-0" OPENING INTO TOP OF RCB WALL AS SHOWN.
2. WALL REINFORCING AND THICKNESS SHALL BE PER THE TYPE "DM2" STANDARD DETAILS. EPOXY #4 BARS AROUND OPENING IN RCB WALL AS SHOWN IN SECTION A/-.

C / - SECTION
SCALE: 3/8" = 1'-0"

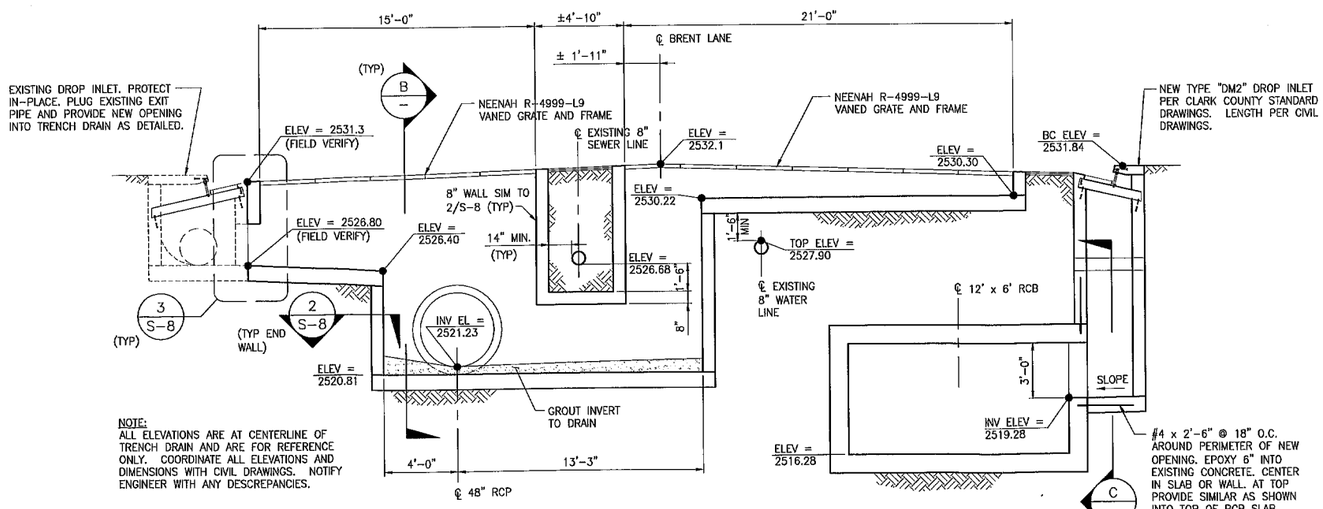


1 / - PLAN - TRENCH DRAIN JUNCTION STRUCTURE
SCALE: 1/4" = 1'-0"



	"X-BAR"
"H" < 9'-0"	#5 @ 12"
"H" > 9'-0"	#5 @ 6"

B / - SECTION
SCALE: 1/2" = 1'-0"



NOTE:
ALL ELEVATIONS ARE AT CENTERLINE OF TRENCH DRAIN AND ARE FOR REFERENCE ONLY. COORDINATE ALL ELEVATIONS AND DIMENSIONS WITH CIVIL DRAWINGS. NOTIFY ENGINEER WITH ANY DESCREPANCIES.

#4 x 2'-6" @ 18" O.C. AROUND PERIMETER OF NEW OPENING. EPOXY 6" INTO EXISTING CONCRETE. CENTER IN SLAB OR WALL. AT TOP PROVIDE SIMILAR AS SHOWN INTO TOP OF RCB SLAB.

A / - ELEVATION
SCALE: 1/4" = 1'-0"

NO.	DATE	REVISIONS

PREPARED BY:
G.C. WALLACE COMPANIES
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1555 S. RAINBOW BLVD. - LAS VEGAS, NV 89146
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PREPARED FOR:
CITY OF LAS VEGAS

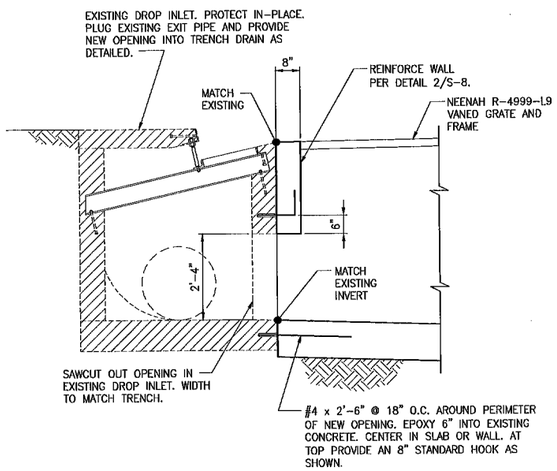
H# 49878 | BID# -
DATE: MARCH 24, 2015 | DESIGNED BY: EGG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: EGG
CHECKED BY: DAT

TITLE:
BRENT LANE DRAINAGE SYSTEM & TRAIL

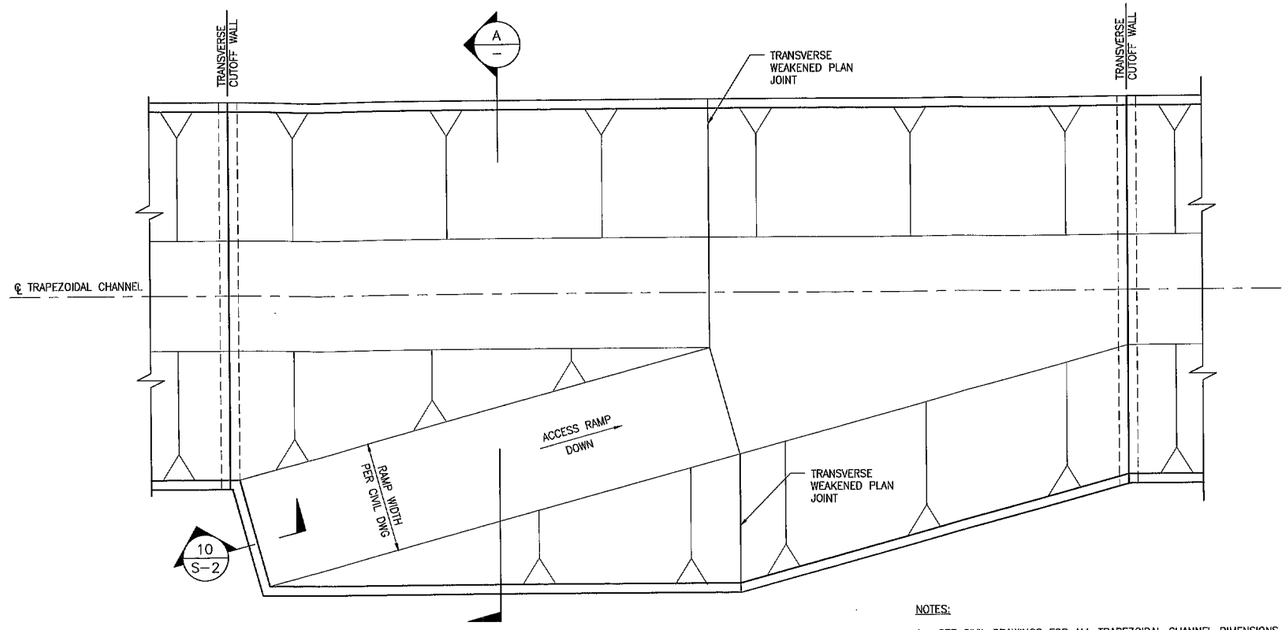
SHEET:
TRENCH DRAIN JUNCTION STRUCTURE

PROFESSIONAL ENGINEER — ERIC G. GIBBS — STATE OF NEVADA — No. 14579 — 03/24/2015 — CIVIL — STRUCTURAL — NOT VALID WITHOUT SIGNATURE AND SEAL

SHEET
S-7
47 OF 56
DRAWING NO.
-



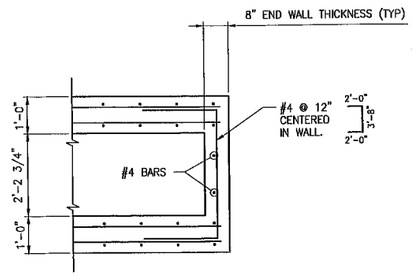
3 DETAIL
SCALE: 1/2" = 1'-0"



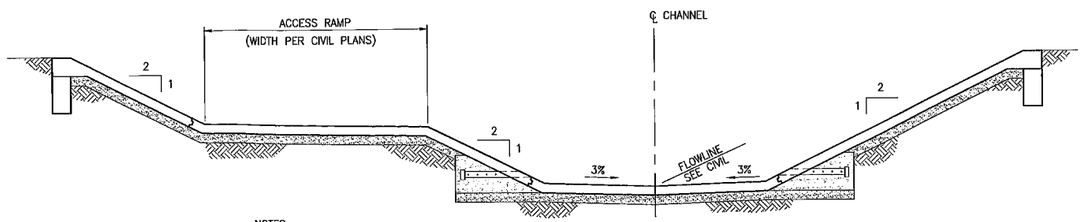
NOTES:

1. SEE CIVIL DRAWINGS FOR ALL TRAPEZOIDAL CHANNEL DIMENSIONS, ACCESS RAMP SLOPE, RAMP ELEVATIONS AND AND RAMP WIDTH.
2. ALIGNMENT OF TYPICAL DETAIL SHOWN ABOVE IS ON A STRAIGHT TANGENT. MODIFY DETAIL ACCORDINGLY FOR RAMPS ON A CURVED ALIGNMENT.
3. CHAIN LINK FENCE, POST AND CABLE RAILING, OR GATE IN FRONT OF ACCESS RAMP NOT SHOWN. IF REQUIRED BY CIVIL DRAWINGS, USE DETAIL 2/S-5 TO CONNECT GATE/FENCE TO CUTOFF WALL AT TOP OF ACCESS RAMP.

1 TYPICAL TRAPEZOIDAL CHANNEL ACCESS RAMP
SCALE: 1/8" = 1'-0"



2 DETAIL
SCALE: 1/2" = 1'-0"



NOTES:

1. SEE TYPICAL TRAPEZOIDAL CHANNEL STRUCTURAL NOTES ON DRAWING S-2 ALONG WITH TYPICAL TRAPEZOIDAL CHANNEL DETAILS.
2. REINFORCE AND CONSTRUCT TRAPEZOIDAL CHANNEL ACCESS RAMP SIMILAR TO TYPICAL TRAPEZOIDAL CHANNEL SECTION A ON SHEET S-3.

A SECTION
SCALE: 1/4" = 1'-0"

NO.	DATE	REVISIONS

PREPARED BY

G.C. WALLACE COMPANIES
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3555 S. RAINBOW BLVD. | LAS VEGAS, NV 89146
PHONE: 702.263.2600 | FAX: 702.263.2699 | GCWALLACE.COM

PREPARED FOR
CITY OF LAS VEGAS

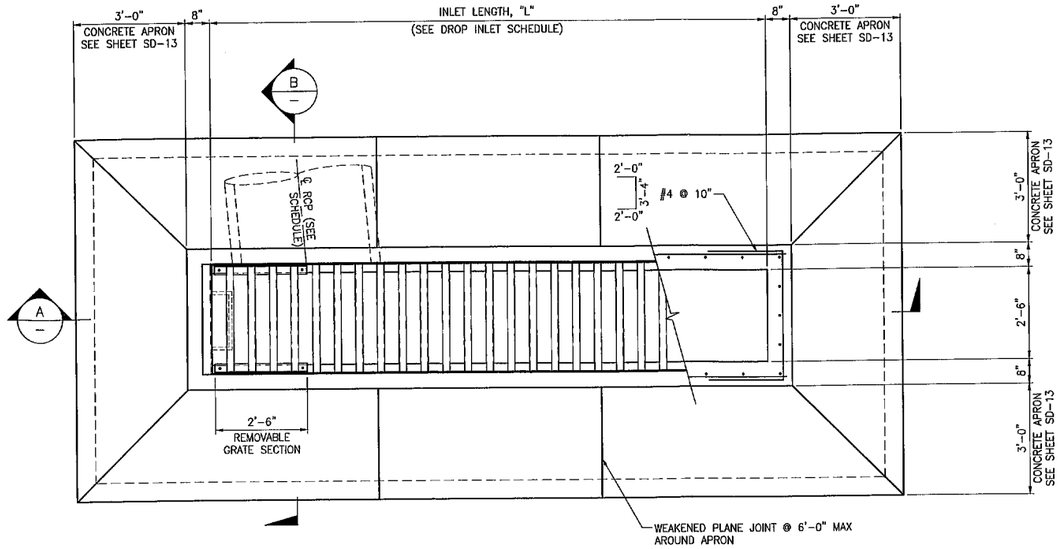
BID# -
DESIGNED BY: EGG
DRAWN BY: EGG
CHECKED BY: DAT
DATE: MARCH 24, 2015
SUBMITTAL STAGE:
90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
TYPICAL ACCESS RAMP INTO TRAPEZOIDAL CHANNEL

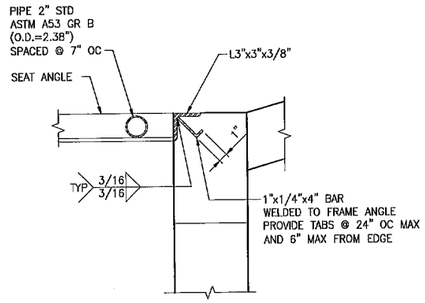
PROFESSIONAL ENGINEER
ERIK G. LARSEN
STATE OF NEVADA
No. 14570
EXPIRES: 12/31/2015
STRUCTURAL
NOTHING FOLLOWS THIS LINE

SHEET
S-8
48 OF 56
DRAWING NO.
-

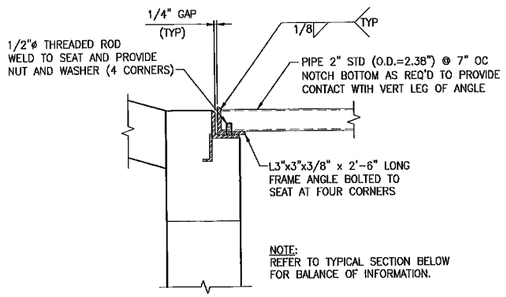


DROP INLET SCHEDULE				
DROP INLET	RCP INVERT	TOP OF GRATE	INLET LENGTH, "L"	RCP SIZE
SPECIAL DI #3	2488.30	2496.80	15'-0"	42"ø
SPECIAL DI #4	2490.50	2499.00	15'-0"	42"ø

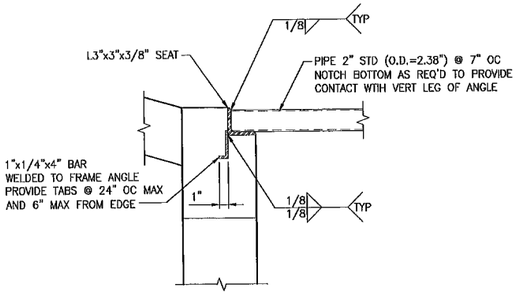
1 TYPICAL DROP INLET
SCALE: 1/2" = 1'-0"



2 SECTION
SCALE: 1.5" = 1'-0"

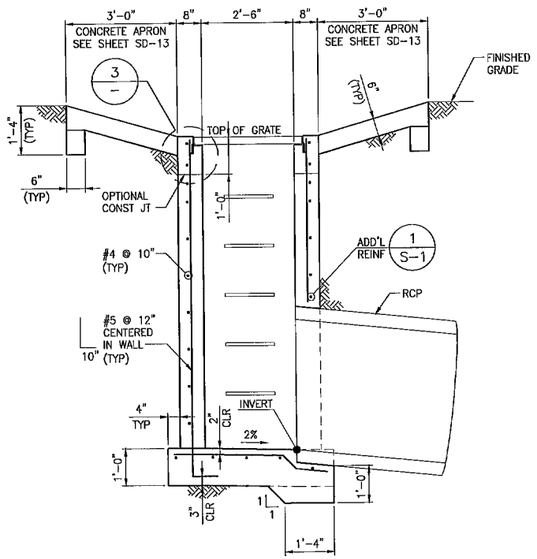


SECTION AT REMOVABLE GRATE SECTION

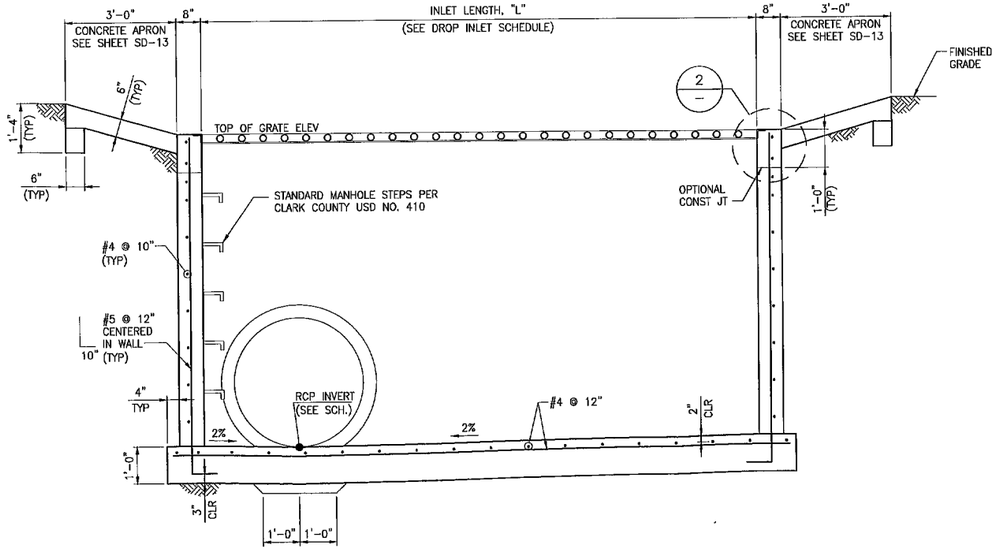


TYPICAL SECTION

3 SECTION
SCALE: 1.5" = 1'-0"



B SECTION
SCALE: 1/4" = 1'-0"



A SECTION
SCALE: 1/4" = 1'-0"

PREPARED BY

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NO.	DATE	REVISIONS

PREPARED FOR
CITY OF LAS VEGAS

H# 49875 | BID# -

DATE: MARCH 24, 2015

SUBMITTAL STAGE:
90% SUBMITTAL

DESIGNED BY: EGG
DRAWN BY: EGG
CHECKED BY: DAT

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
DROP INLET DETAIL

PROFESSIONAL ENGINEER
STATE OF NEVADA
ERIC G. OTTO
No. 14570
10/31/2015
CIVIL
STRUCTURAL
NOT VALID UNLESS SIGNED, DATED AND SEALED

SHEET
S-9
49 OF 56
DRAWING NO.
-

LANDSCAPE LEGEND

LANDSCAPE ELEMENTS

SYMBOL	ITEM	DESCRIPTION	DETAIL(S)
"TR"	TRAIL	10' WIDE DECOMPOSED GRANITE TRAIL. TRAIL TO HAVE 2' WIDE CLEAR ON BOTH SIDES OF TRAIL.	SEE CIVIL PLANS

PLANTING

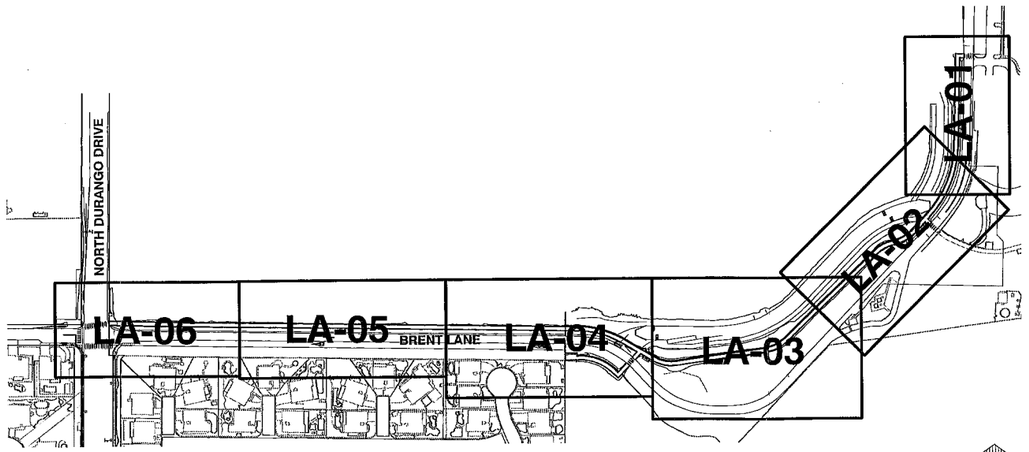
SYMBOL	ITEM	QTY	DESCRIPTION
	NATIVE REVEGETATION, INCLUDING COLOR RESTORATION AND SEEDING.	45,546 SF	NATIVE REVEGETATION IS TO INCLUDE THE FOLLOWING. 1. EXISTING TOPSOIL SHALL BE SALVAGED AND STOCKPILED WHERE EXISTING SOIL AND LANDSCAPE IS TO BE DISTURBED. 2. EXISTING YUCCAS AND CACTI SHALL BE SALVAGED FOR RE-USE. 3. ROUGH GRADE BY THE GENERAL CONTRACTOR SHALL BE WITHIN 0.1" OF FINISH GRADE. NATIVE REVEGETATION CONTRACTOR SHALL PROVIDE FINE GRADING AND CONTOURING TO FINAL APPEARANCE. 4. NATIVE REVEGETATION AREA IS TO RECEIVE SEED MIX AND NON-TRAFFIC RATED SOIL STABILIZER. SEE SPECIFICATIONS FOR SEED MIX. 5. INSTALLATION OF NATIVE PLANTS. SEE PLANTING LEGEND BELOW. 6. NO CRUSHED ROCK GROUND COVER OR DECORATIVE ROCK IS TO BE USED. NATIVE AND COLOR RESTORED ROCKS AND BOULDERS ARE TO BE USED. 7. NO TEMPORARY OR PERMANENT IRRIGATION IS TO BE PROVIDED. 8. PLANT ESTABLISHMENT. 9. COLOR RESTORATION TO NATIVE ROCKS, BOULDERS AND DISTURBED EARTH. SEE SPECIFICATIONS. 9. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.
	COLOR RESTORATION ONLY	21,446 SF	COLOR RESTORATION TO NATIVE ROCKS, BOULDERS AND DISTURBED EARTH AS NEEDED TO MATCH ADJACENT, EXISTING DESERT. SEE SPECIFICATIONS.
	GRADED SOIL	23,798 SF	SEE CIVIL ENGINEERING PLANS FOR FINAL GRADE TREATMENTS.

PLANTING

SYMBOL	BOTANICAL NAME COMMON NAME	QTY	SIZE
⊕	AMBROSIA DUMOSA WHITE BURSAGE	106	15 GAL
✲	CYLINDROPUNTIA BIGELOVII TEDDY BEAR CHOLLA	7	15 GAL
⊙	ECHINOCEREUS ENGELMANII STRAWBERRY HEDGEHOG	6	15 GAL
❂	FEROCACTUS CYLINDRACEUS RED COMPASS BARREL CACTUS	10	15 GAL
✇	HYMENOCLEA SALSOLA WHITE BURROBRUSH	9	15 GAL
✳	LARREA TRIDENTATA CREOSOTE BUSH	43	15 GAL
✾	OPUNTIA BASILARIS BEAVERTAIL PRICKLY PEAR	7	15 GAL
✶	YUCCA SCHIDIGERA MOJAVE YUCCA	20	15 GAL

LANDSCAPE NOTES

1. CONTRACTOR SHALL OBTAIN AND COORDINATE ALL NECESSARY PERMITS, INSPECTIONS AND APPROVALS REQUIRED FOR THIS WORK. ALL CONSTRUCTION SHALL BE PERFORMED ACCORDING TO LOCAL CODES AND ORDINANCES.
2. CONTRACTOR TO PROTECT IN PLACE EXISTING UTILITIES. VERIFY ALL LOCATIONS ALL UTILITIES AND SERVICES, INCLUDING UNDERGROUND, PRIOR TO ANY WORK. CONTRACTOR SHALL COORDINATE WITH EXISTING AND NEW OFF-SITE IMPROVEMENTS AND UTILITIES.
3. CONTRACTOR SHALL PRESERVE AND PROTECT LANDSCAPE OUTSIDE LIMIT OF WORK. CONTRACTOR SHALL REPLACE EXISTING LANDSCAPE THAT IS DAMAGED TO ITS ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE. DAMAGED PLANTS SHALL BE REPLACES WITH PLANTS OF THE SAME GENUS, SPECIES, VARIETY, FORM AND SIZE OR WITH NATIVE REVEGETATION AS AGREED UPON BY THE OWNER'S REPRESENTATIVE.
4. THE EXISTING TOP 3" OF EXISTING TOPSOIL AND ROCKS SHALL BE SALVAGED AND STOCKPILED ON SITE PRIOR TO ANY CONSTRUCTION, INCLUDING DEMOLITION, GRADING OR EXCAVATION. THE STOCKPILED SOL IS TO BE USED IN THE NATIVE REVEGETATION PROCESS. NATIVE REVEGETATION CONTRACTOR SHALL SCREEN AND COLOR LARGER ROCKS (AS NEEDED) FOUND ON THE EXISTING SURFACE AND WITHIN THE STOCKPILED SOIL TO BE PLACED IN THE NATIVE REVEGETATED AREAS.
5. NATIVE REVEGETATIVE CONTRACTOR SHALL PROVIDE A 10' X 10' ON-SITE MOCK-UP OF THE NATIVE REVEGETATIVE TREATMENT, INCLUDING COLOR RESTORATION, FOR OWNER APPROVAL PRIOR TO REVEGETATION OF ALL AREAS.
6. NO SEED MIX, PLANTS OR ROCKS SHALL BE LOCATED WITHIN THE 2' CLEAR AREA ADJACENT TO THE TRAIL. COLOR RESTORATION SHALL BE DONE WITHIN THE 2' CLEAR AREA WHERE NECESSARY WHERE NATIVE REVEGETATION IS SHOWN.
7. THE PLANT MATERIAL SHOWN ON THE PLANS SHALL BE INSTALLED IN THE NATIVE REVEGETATED AREA AS PART OF THE NATIVE REVEGETATION PROCESS BY THE NATIVE REVEGETATION CONTRACTOR IN NATIVE SOIL.
8. SEE CIVIL PLANS FOR TRAIL AND SITE FURNITURE LOCATIONS AND DETAILS.
9. BRING ANY DISCREPANCIES TO THE IMMEDIATE ATTENTION OF THE OWNER'S REPRESENTATIVE.



KEY MAP
NTS

NORTH

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

southwick LANDSCAPE ARCHITECTS
1700 W Horizon Ridge Pkwy, Suite 203 702.597.3108
Henderson NV 89012 www.southwicklla.com

NO.	DATE	REVISIONS

PREPARED BY:
southwick LANDSCAPE ARCHITECTS
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Henderson NV 89012 www.southwicklla.com

PREPARED FOR
CITY OF LAS VEGAS

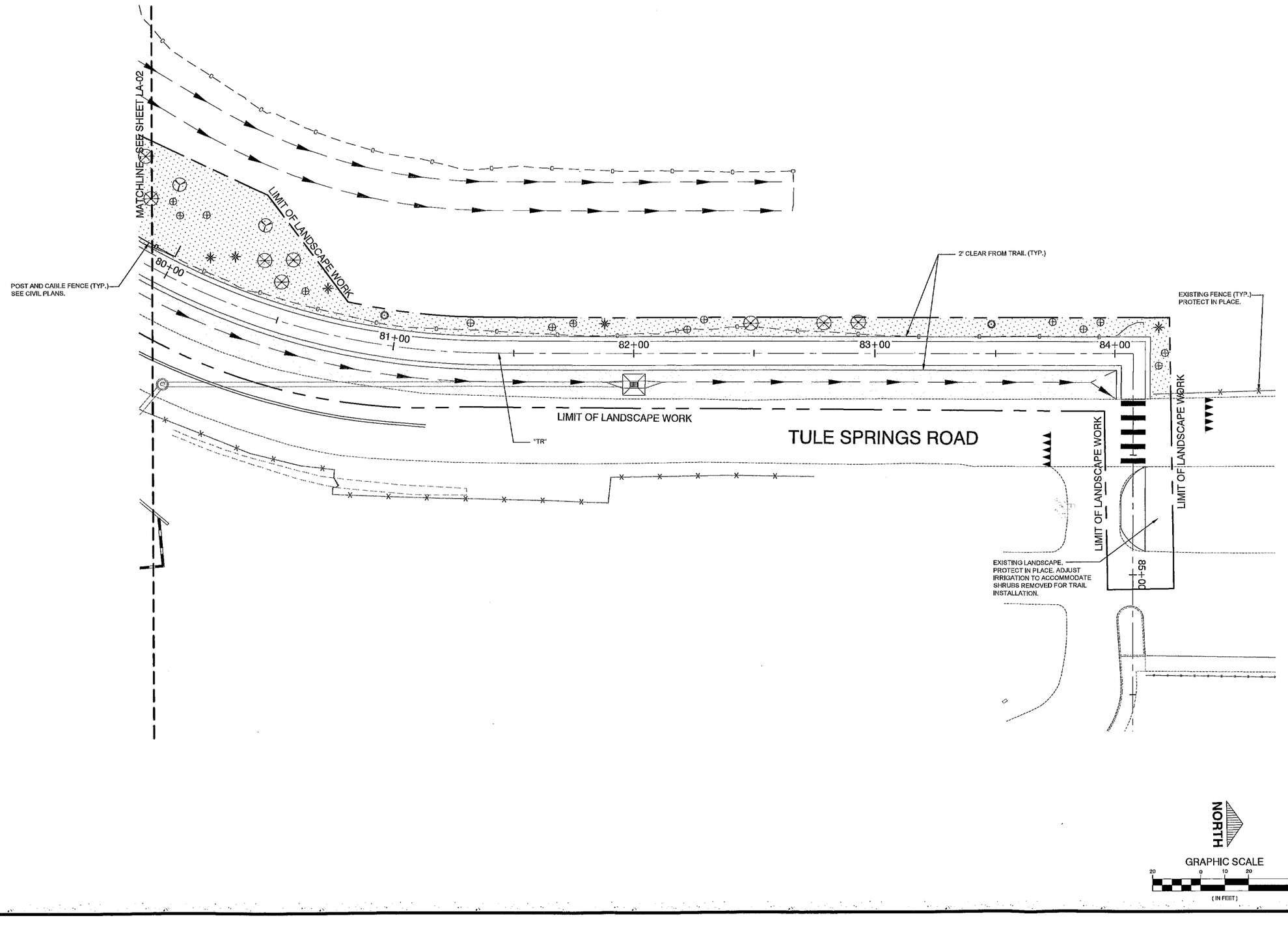
H# 49578 | BID# -
DATE: MARCH 24, 2015 | DESIGNED BY: CD
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: CD/CLG | CHECKED BY: SWS

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
LANDSCAPE LEGEND AND NOTES

REGISTERED LANDSCAPE ARCHITECT
CASSANDRA SIMES
PRELIMINARY
STATE OF NEVADA

SHEET
LA-00
50 OF 56
DRAWING NO.



NO.	DATE	REVISIONS

PREPARED BY
southwick LANDSCAPE ARCHITECTS
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Henderson NV 89012 www.southwickla.com

PREPARED FOR
CITY OF LAS VEGAS

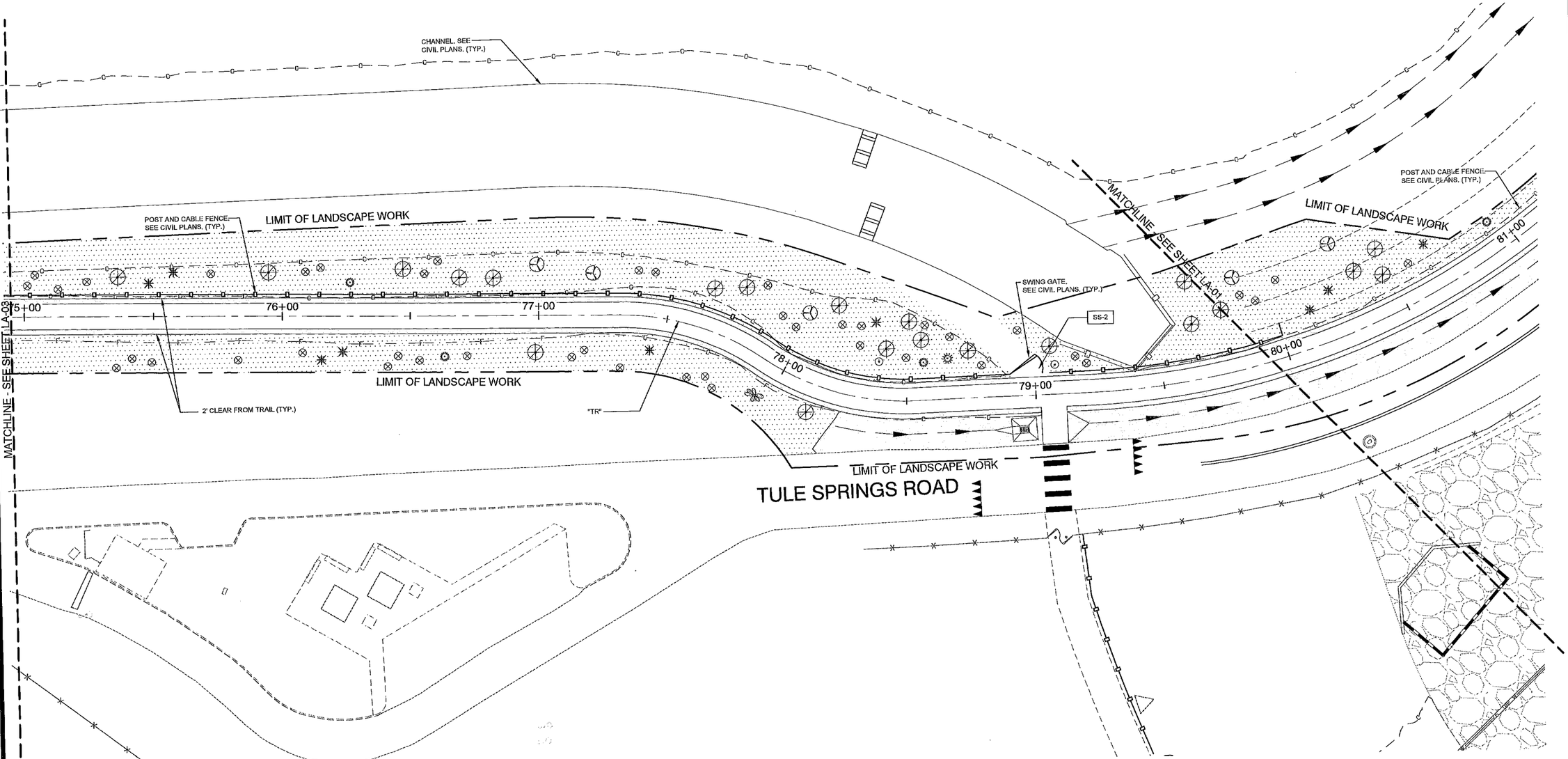
I.H# 49878	BID# -
DATE: MARCH 24, 2015	DESIGNED BY: CD
SUBMITTAL STAGE: **90% SUBMITTAL**	DRAWN BY: CD/CLG
	CHECKED BY: SWS

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
LANDSCAPE PLAN

REGISTERED LANDSCAPE ARCHITECT
CASSANDRA LYNN PAYNE
STATE OF NEVADA
PRELIMINARY

SHEET
LA-01
51 OF 56
DRAWING NO.
-



NORTH

GRAPHIC SCALE
20 0 10 20 40
(IN FEET)

NO.	DATE	REVISIONS

PREPARED BY
southwick
LANDSCAPE ARCHITECTS
1700 W Horizon Ridge Pkwy, Suite 203 Henderson, NV 89012
702.597.3108
www.southwickla.com

PREPARED FOR
CITY OF LAS VEGAS

BID# -
DESIGNED BY: CD
DRAWN BY: CD/CLG
CHECKED BY: SWS

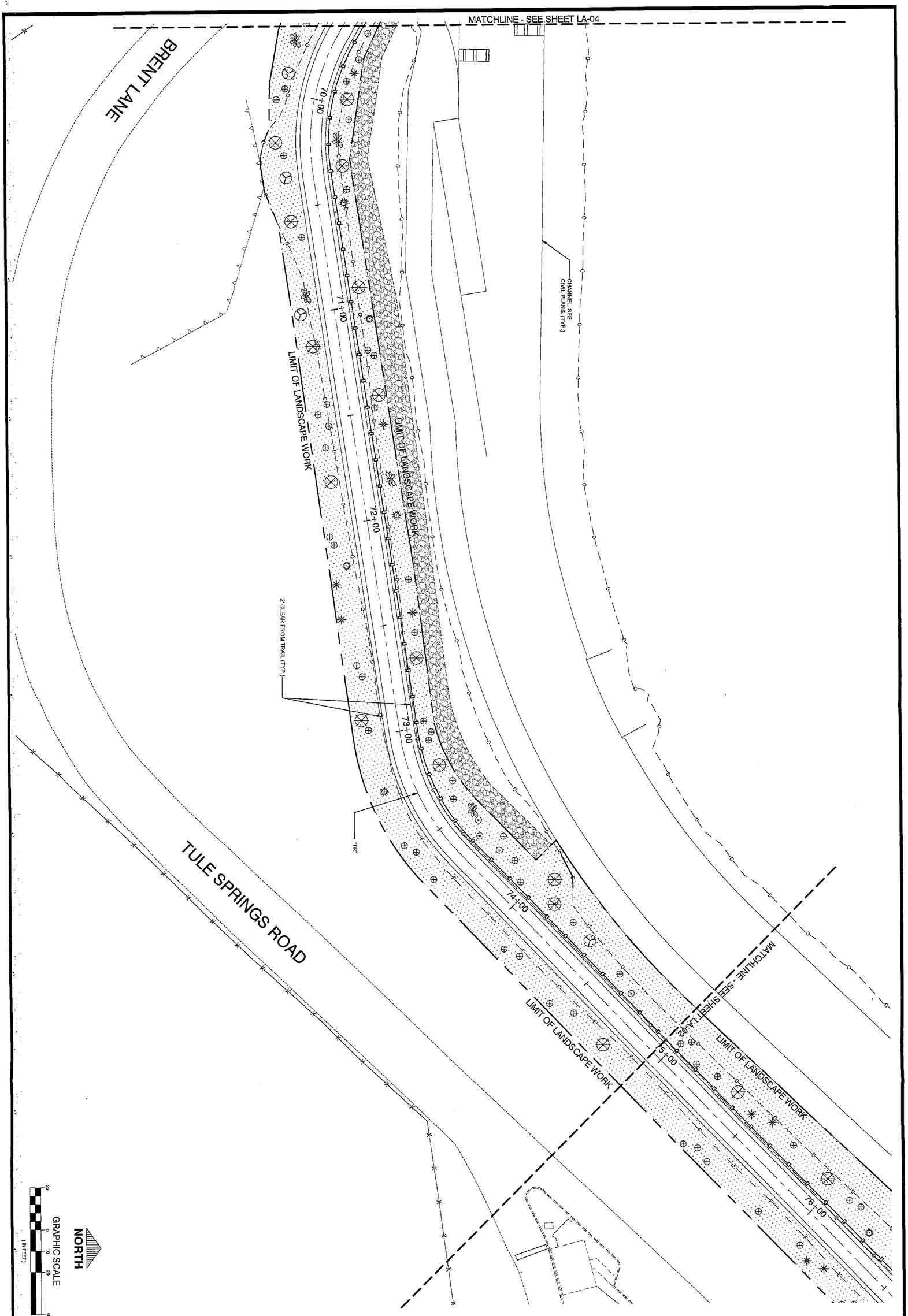
H# 49879
DATE: MARCH 24, 2015
SUBMITTAL STAGE:
90% SUBMITTAL

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
LANDSCAPE PLAN

REGISTERED LANDSCAPE ARCHITECT
CASSAUNDRA DAVIES
No. 51
STATE OF NEVADA
PRELIMINARY

SHEET
LA-02
52 OF 56
DRAWING NO.



SHEET LA-03
53 OF 56
DRAWING NO. -

REGISTERED LANDSCAPE ARCHITECT
CASS AURORA JONES
STATE OF NEVADA
PRELIMINARY
5/1/2015

TITLE
BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET
LANDSCAPE PLAN

PREPARED FOR
CITY OF LAS VEGAS

H# 49876	BID# -
DATE: MARCH 24, 2015	DESIGNED BY: CD
SUBMITTAL STAGE: **90% SUBMITTAL**	DRAWN BY: CD/CLG
	CHECKED BY: SWS

PREPARED BY
southwick
LANDSCAPE ARCHITECTS
1700 W Horizon Ridge Pkwy, Suite 203 702.597.3103
Henderson NV 89012 www.southwicklla.com

NO.	DATE	REVISIONS

MATCHLINE - SEE SHEET LA-05

MATCHLINE - SEE SHEET LA-03

"TR"

"BL"

LIMIT OF LANDSCAPE WORK

64+00

65+00

66+00

67+00

68+00

69+00

28+00

29+00

30+00

31+00

32+00

32+50

2' CLEAR FROM TRAIL (TYP.)

BOLLARD (TYP.)
SEE CIVIL PLANS

DEDICATION PLAQUE
SEE CIVIL PLANS

POST AND CABLE FENCE (TYP).
SEE CIVIL PLANS.

CHANNEL. SEE
CIVIL PLANS. (TYP.)

SALVAGED SWING GATE.
SEE CIVIL PLANS.

SWING GATE.
SEE CIVIL PLANS.

BRENT LANE

POST AND CABLE FENCE.
SEE CIVIL PLANS.

EXISTING TRAIL AND LANDSCAPE.
PROTECT IN PLACE.

LIMIT OF LANDSCAPE WORK

2' CLEAR FROM TRAIL (TYP.)

POST AND CABLE FENCE (TYP).
SEE CIVIL PLANS.

TRASH RECEPTACLE
SEE CIVIL PLANS

BENCH
SEE CIVIL PLANS

DOG WASTE BAG DISPENSER
SEE CIVIL PLANS

NORTH

GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

NO.	DATE	REVISIONS

PREPARED BY

southwick

LANDSCAPE ARCHITECTS

1700 W Horizon Ridge Pkwy, Suite 203 702.597.3100
Henderson NV 89012 www.southwicklas.com

PREPARED FOR

CITY OF LAS VEGAS

H# 49876

BID# -

DATE: MARCH 24, 2015

DESIGNED BY: CBD

DRAWN BY: CD/CLG

CHECKED BY: SWS

SUBMITTAL STAGE:

90% SUBMITTAL

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

LANDSCAPE PLAN

REGISTERED LANDSCAPE ARCHITECT
CASSAUNDRA OWENS
5
PRELIMINARY
STATE OF NEVADA

SHEET

LA-04

54 OF 56

DRAWING NO.

MATCHLINE - SEE SHEET LA-06

MATCHLINE - SEE SHEET LA-04

LIMIT OF LANDSCAPE WORK

58+00 59+00 60+00 61+00 62+00 63+00

"TR"

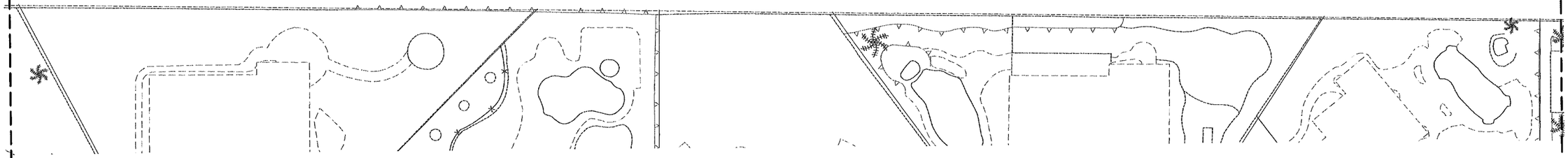
2' CLEAR FROM TRAIL (TYP.)

22+00 23+00 24+00 25+00 26+00 27+00

LIMIT OF LANDSCAPE WORK

BRENT LANE

"BL"



NORTH

GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

NO.	DATE	REVISIONS			

PREPARED BY

southwick
LANDSCAPE ARCHITECTS
1700 W Horizon Ridge Pkwy, Suite 203 702.597.3105
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PREPARED FOR

CITY OF LAS VEGAS

H# 49876	BID# -
DATE: MARCH 24, 2015	DESIGNED BY: CD
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: CD/CLG
	CHECKED BY: SNS

TITLE

BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

LANDSCAPE PLAN

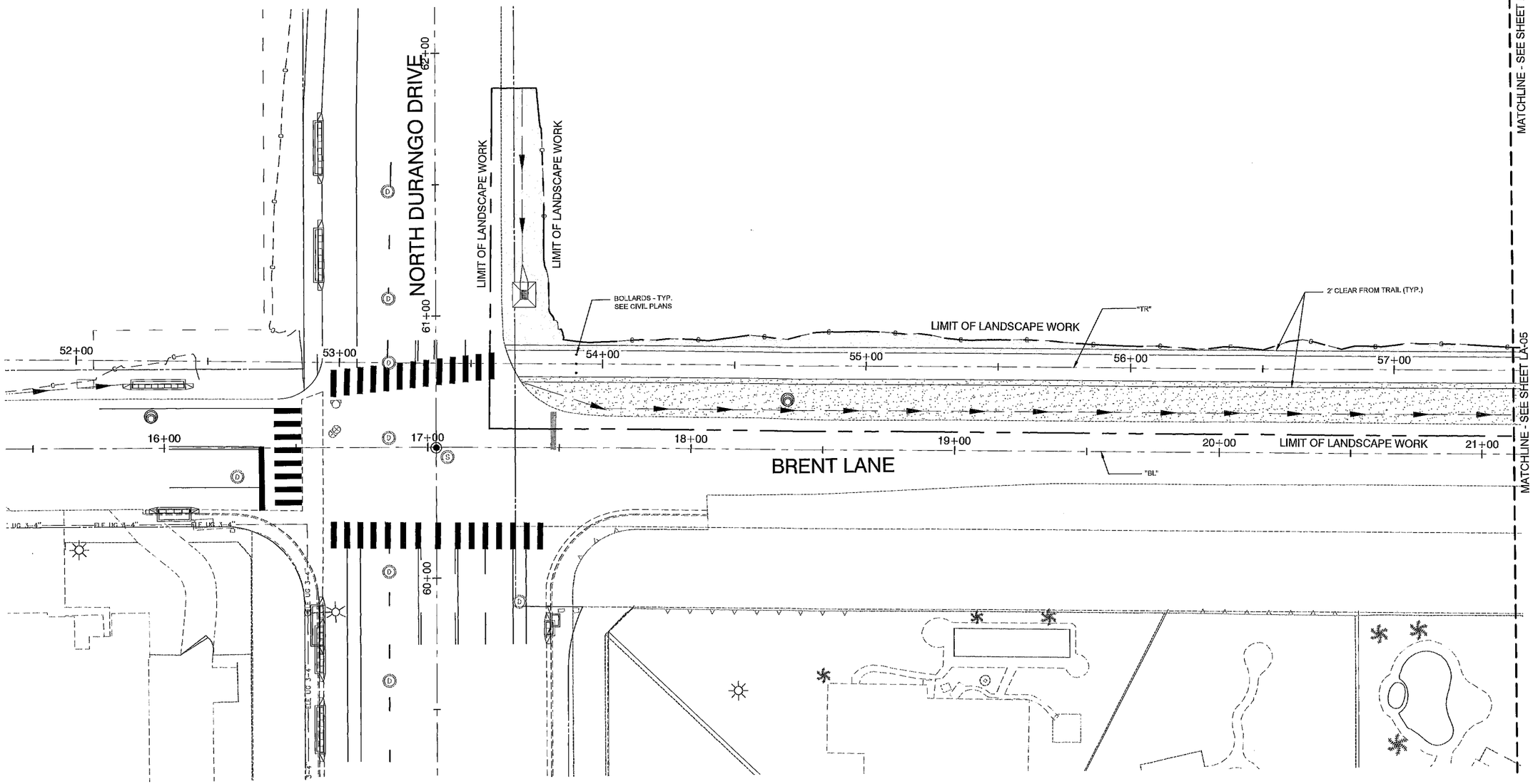
REGISTERED LANDSCAPE ARCHITECT
CASSAUNDRA GUYER
STATE OF NEVADA
PRELIMINARY

SHEET

LA-05

55 OF 56

DRAWING NO.



NORTH

GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

NO.	DATE	REVISIONS

PREPARED BY

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LANDSCAPE ARCHITECTS

1700 W Horizon Ridge Pkwy, Suite 203 Henderson, NV 89012
702.597.3105
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BRENT LANE DRAINAGE SYSTEM & TRAIL

SHEET

LANDSCAPE PLAN

REGISTERED LANDSCAPE ARCHITECT
CASSAUNDRA
5
PRELIMINARY
STATE OF NEVADA

SHEET

LA-06

56 OF 56

DRAWING NO.

-