

UPPER TRUCKEE MARSH SEWER FACILITIES ADAPTIVE MANAGEMENT PLAN

2016 ANNUAL REPORT

Prepared for:

South Tahoe Public Utility District

1275 Meadow Crest Drive
South Lake Tahoe, CA 96150
Contact: Ivo Bergsohn, P.G., C. Hg

Prepared by:

Northwest Hydraulic Consultants Inc.

80 S. Lake Avenue, Suite 800
Pasadena, CA 91101
Contact: Edward E. Wallace, P.E.

8 February 2017

NHC Ref No. 6001103

EXECUTIVE SUMMARY

The South Tahoe Public Utility District (District) is implementing an Adaptive Management Plan (AMP) to protect existing sewer facilities in the Upper Truckee Marsh. Two District sewer pipelines are located along the northern margin of the marsh in an easement over property owned by the California Tahoe Conservancy. The need for the plan was initiated by a channel avulsion in the vicinity of the easement following the record snowmelt year of 2011. The objective of the plan is to reduce inundation of the sewer easement and reduce the potential for stream channel development and erosion that would expose or damage the sewer lines and potentially lead to a sewage spill into the marsh and Lake Tahoe. The development of the plan is described in *Upper Truckee Marsh Sewer Facilities Adaptive Management Plan* (NHC, 2014). The plan envisioned up to 5 years of adaptive management activities to reduce risks to the sewer facilities and improve maintenance conditions. An Annual Report summarizing Year 1 construction and post-construction monitoring has previously been prepared (NHC, 2015). This Annual Report summarizes the measures implemented by the District in Year 2 (2015) of construction and describes baseline, construction, and post-construction monitoring. Year 2 post-construction monitoring and conditions observed in the spring and summer of 2016 were used to select measures to be implemented in Year 3, which are also described.

Baseline Information

Baseline information was previously presented in the 2015 Annual Report, and is briefly reviewed in this report for purposes of comparison. Baseline conditions included inundation of the STPUD easement near Bellevue Avenue in all flow conditions, and an imminent threat of new channel formation directly over the two sewer lines installed in the easement. Baseline surveying, water level and turbidity measurements, and vegetation transects provide the basis for project comparisons.

Year 2 Monitoring

Year 2 improvements were designed based on Year 1 monitoring results and focused on increasing capacity on two of the pilot channels constructed in Year 1, constructing a pilot channel and clearing obstructions to increase flows into a secondary channel in the center of the marsh, and adding an additional hummock to increase roughness and vegetation in the sewer easement along the margin of the marsh. In combination, all of the Year 2 improvements are intended to continue to reduce flows in the easement and increase capacity on other flow paths.

Pre-construction monitoring included surveys for avian species, establishment of a buffer for the single nest site identified, and rescue and relocation of fish in the work area. Water level and turbidity monitoring continued through the construction period and showed occasional turbidity in excess of 20 NTUs during the construction period, but no prolonged periods of elevated turbidity. The large deviations of these individual measurements from the trend of the data indicate that they may be local disturbance spikes (e.g., humans or animals crossing the channel) or instrument error. These data indicate that the performance standard for sediment discharge and turbidity was met during construction.

Post-construction monitoring included resurveying established cross sections and topographic mapping, continued water level and turbidity measurements, and revegetation monitoring. The surveying shows little change in topography, although recent deposition is evident in some areas of the project features. Changes in channel geometry were primarily associated with constructed expansion of the pilot channels, indicating that the project area continues to be stable.

Flow measurements in the pilot channels and right overbank indicate an increase in the capacity of the pilot channel system and a reduction in right overbank flows during moderate flow events. Combined flows in the pilot channels near Bellevue were estimated at approximately 25 cfs in April 2016, with approximately 8.5 cfs on the right overbank. Flows in the right overbank are now primarily located along the outboard edge of the hummocks, and little or no flow occurs in the sewer easement in this area at flows up to about 35 cfs. During this site observation, flows in Trout Creek (measured at 42 cfs at USGS Gage 10336780 upstream of the project area) were out of bank both upstream and downstream of the project work area. The total pilot channel capacity of 25 cfs is estimated to be close to the existing Trout Creek channel capacity upstream of the Bellevue work area. In addition to higher flow capacity, active bed load transport and bed form development (scour, ripples, dunes) were evident for bed load material comprised of sand and small gravel. The main pilot channel beds are now observed to have little vegetative growth and are characterized by sand in gradual transport along the bed. The peak flow during WY 2016 at USGS Gage 10336780 was approximately 130 cfs. Deposition of sand in overbanks along the pilot channel system and on the hummocks was noted during site observations conducted in August 2016. Water level and turbidity measurements continued post-construction. Measurements from turbidimeters upstream and downstream of the Bellevue work area showed that that turbidity levels were not substantially affected by the project area, indicating that the work area was not a significant source of fine sediment during higher flow periods.

In spite of increased capacity in the pilot channel system and reduction of overbank flows near Bellevue Avenue, inundation of the sewer easement during relatively low flows persisted upstream of the Bellevue work area. This is primarily attributed to beaver activities in the segment of channel that runs perpendicular to the dominant meadow slope about 1,300 feet upstream of Bellevue Avenue. Stream flows that are pushed overbank by a beaver dam in the main channel are prevented from returning to the channel by a number of auxiliary dams on the return flow paths, and a portion of this flow continues down the right overbank in the District's easement, which is also the location of a pedestrian trail.

Vegetation transects performed in Year 1 on hummocks were repeated in Year 2 (2016). The three transects all showed an increase in total and native vegetation cover. The average of the three transects met the performance standard for establishment of cover at 85% of baseline cover in Year 2. The standard for 90% of cover by native species was not quite achieved in Year 2, but native cover increased for Year 2 and is expected to be achieved in Year 3 without any additional planting. Vigor was rated as good to excellent for the plantings.

Year 3 Plans and Implementation

Post-construction vegetation monitoring and Year 3 planning and design was delayed until fall by inundation upstream of the Bellevue project area. The Year 1 and 2 improvements were generally effective at treating conditions in the Bellevue work area, and only minor work was considered necessary in this area in Year 3, pending further monitoring of pilot channel development and vegetative growth. Year 3 improvements were therefore mostly focused on planting in areas upstream of Bellevue Avenue where increased inundation due to beaver activity presents a problem for access to District manholes. In addition, Year 3 improvements included a measure to address beaver activity at the head of the secondary channel in the center of the marsh, which reduces flows into the secondary channel that was activated in Year 2.

Year 3 plans were developed to include:

- Additional planting of wetland plugs in the right overbank and installation of coir logs near the end of Bellevue Avenue;
- Installation of a hummock near Manholes 18, 19, 21, and 22 upstream of Bellevue Avenue;
- Installation of a pond leveler (beaver dam flow maintenance device) at the head of the secondary channel in the center of the marsh to maintain flows through the channel.

With the exception of use of a low ground pressure excavator to transport materials and assist in placing the pond leveler, Year 3 improvements required no heavy equipment access and did not involve any significant grading activities. Plans were reviewed with the permitting and resource agencies in early October 2016 and construction was implemented in late October through a change order with V&C Construction.

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	1
TABLE OF CONTENTS	4
LIST OF TABLES	5
LIST OF FIGURES	5
1 INTRODUCTION.....	6
1.1 Purpose	6
1.2 Scope of Monitoring	6
1.3 Report Organization.....	9
2 BASELINE CONDITIONS	10
2.1 Topography	10
2.2 Inundation of Easement.....	10
2.3 Water Levels	10
2.4 Wetland Extent	15
2.5 Vegetation.....	15
2.6 Wildlife and Fish.....	19
3 YEAR 2 PRE-CONSTRUCTION AND CONSTRUCTION MONITORING.....	20
3.1 Pre-Construction Bird Surveys	20
3.2 Year 2 Construction.....	20
3.3 Fisheries	21
3.4 Cultural Resources	21
3.5 Sediment Discharge and Trout Creek Turbidity.....	21
3.4 Pilot Channel Width	23
4 YEAR 2 POST-CONSTRUCTION MONITORING	24
4.1 Topography	24
4.2 Right Overbank Flows and Inundation of Easement.....	24
4.3 Water Levels	27
4.4 Planted Vegetation	28
4.5 Turbidity.....	28
4.6 Photo Points.....	29
4.7 Wetland Extent	31
4.8 Final Topography	32
4.9 Beaver Activity	32
5 YEAR 3 PLAN AND CONSTRUCTION	35
5.1 Year 3 Plans.....	35
6 REFERENCES.....	37

APPENDIX A	Pre-Construction and Construction Information, Year 2
APPENDIX B	Post-Construction Information, Year 2
APPENDIX C	Year 3 Plans

LIST OF TABLES

Table 1-1. Monitoring Plan Summary	1
Table 2-1. Cover in Baseline Vegetation Transects	14
Table 4-1. Road Fill Removal Area Cover Summary	23
Table 4-2. Hummock Cover Summary	23

LIST OF FIGURES

Figure 2-1. Project Area Map	11
Figure 2-2. LiDAR-based mapping of Upper Truckee Marsh (TRPA, 2010)	12
Figure 2-3. Inundated area in base map survey, October 2013.....	13
Figure 2-4. Inundation of the sewer easement near Bellevue Avenue at a flow of approximately 40 cfs, looking upstream, 20 May 2013.....	14
Figure 2-5. Inundation of the sewer easement near Bellevue Avenue at a flow of approximately 20 cfs, looking upstream, 1 Apr 2014.....	14
Figure 2-6. Water Level Sensor and Turbidimeter Locations.....	16
.....	17
Figure 2-7. Water levels and flows at USGS Gage 10336780 in prior to Year 1 activities.....	17
Figure 2-8. Wetland Delineation Map.....	18
Figure 3-1. Turbidity upstream and downstream of Bellevue Avenue work area during Year 2 construction period, Oct 2015	22
Figure 4-1. Year 2 mapping in work area near Bellevue Avenue	25
Figure 4-2. Pilot channel flow looking downstream approximately 100 feet upstream of confluence with Trout Creek showing overbank deposition of sand during high flows, 9 Aug 2016.....	26
Figure 4-3. Pilot channel (PC-3) about 150 feet upstream of Trout Creek confluence, looking upstream.....	26
Figure 4-4. Water levels through July 2016.....	27
Figure 4-5. Turbidity upstream and downstream of work area near Bellevue Avenue through August 2016.....	29
Figure 4-6. Photo point locations	30
Figure 4-7. Upstream of Bellevue work area looking west, 14 Nov Apr 2016, with pilot channels diverting flow to left).....	31
Figure 4-8. Easement and avulsed channel area looking west, 14 Nov 2016 (hummocks in easement along fence on right side of photo).....	31
Figure 4-9. Inundation of meadow at low flow (approximately 15 cfs) due to beaver activity, as mapped in October 2016.....	33
Figure 4-10. Beaver dam on return flows near STPUD Manhole BV22, Oct 2016	34
Figure 4-11. Inundation in District easement downstream of Manhole BV22, Aug 2016	34

1 INTRODUCTION

1.1 Purpose

The South Tahoe Public Utility District (District) is implementing an Adaptive Management Plan (AMP) to protect existing sewer facilities in the Upper Truckee Marsh. Two District sewer pipelines are located along the northern margin of the marsh in an easement over property owned by the California Tahoe Conservancy. The need for the plan was initiated by a channel avulsion in the vicinity of the easement following the record snowmelt year of 2011. The objective of the plan is to reduce inundation of the sewer easement and reduce the potential for stream channel development and erosion that would expose or damage the sewer lines and potentially lead to a sewage spill into the marsh and Lake Tahoe. The development of the plan is described in *Upper Truckee Marsh Sewer Facilities Adaptive Management Plan* (NHC, 2014). This annual report summarizes the measures implemented and post-construction monitoring for Year 2 construction (2015), and describes the measures implemented in Year 3 (2016). Post-construction monitoring for Year 1 was previously reported (STPUD, 2015).

1.2 Scope of Monitoring

The scope of the monitoring includes flow conditions and water surface elevations (including flow outside the main channel in the sewer easement area); topographic changes; turbidity; and vegetation. The complete monitoring plan is included in the AMP and is summarized in Table 1-1. The purpose of the Annual Report is to provide permitting agencies and other stakeholders with information related to the success of the project so that they may continue to be engaged in the adaptive management process. The permits for the project cover the entire expected 5-year implementation period and thus there is no specific agency approval or action required in response to the Annual Report. Completion of Year 2 monitoring was delayed in 2016 due to inundation associated with beaver activity, which is described in more detail below.

Table 1-1. Monitoring Plan Summary

Monitoring Component	Performance Standard	Frequency	Duration
Baseline Conditions			
Topography	Baseline 2014	Once	NA
Inundation of Easement	Baseline 2014	Once	NA
Trout Creek Water Levels	Baseline 2014	Continuous recorders installed 3 locations	NA
Groundwater Levels	Baseline 2014	Continuous recorder in well at end of Bellevue Ave	NA

Table 1-1. Monitoring Plan Summary

Monitoring Component	Performance Standard	Frequency	Duration
Wetland Extent	Baseline 2014	Once	NA
Woody Riparian	Baseline 2014	Once	NA
Herbaceous Cover and Natives Composition	Baseline 2014	Once	NA
Pre-Construction and During Construction			
Willow Flycatcher Surveys	Establish buffers or other measures to avoid disturbance, if present	Annually, if construction within nesting season	NA
Yellow Warbler, Long-Eared Owl, Waterfowl, and Northern Harrier Surveys	Establish buffers or other measures to avoid disturbance, if present	Annually, if construction within nesting season	NA
Fisheries	Fish rescue and relocation as needed; reporting if endangered species present	During dewatering and in-channel operations	Years 1-7
Cultural Resources	Observations during ground disturbance; avoidance of unknown cultural resources	Daily during ground disturbance	Years 1-7
Sediment Discharge	Turbidity below 20 NTUs except temporary periods during in channel work and pilot channel activation	Periodic field measurements plus logging turbidimeter at 15 minute intervals	During construction operations
Trout Creek Turbidity	Turbidity below project area shall not exceed turbidity above project area by more than 10 percent except temporary periods during in channel work and pilot channel activation	Periodic field measurements plus logging turbidimeter at 15 minute intervals	During construction operations

Table 1-1. Monitoring Plan Summary

Monitoring Component	Performance Standard	Frequency	Duration
Pilot Channel Width	NA	Twice per week	During construction operations
Post-Construction			
Topography	NA – Repeat of topographic surveys or cross sections for information	Annually	Years 2-7
Right Overbank Flows	No more than 10 percent over right overbank at flows less than bankfull	Up to 3 times during snowmelt season	Years 2-7
Inundation of Easement	No inundation of easement at flows less than 50 cfs	Annually in snowmelt season	Years 2-7
Pilot Channels and Left Bank Pathways	NA – Information on channel development	Annually	Years 2-7
Trout Creek Water Levels	NA – Information for inundation extents and channel behavior	Continuous, reported annually	Years 2-7
Groundwater	NA – Information for vegetation survival	Continuous, reported annually	Years 2-7
Planted Herbaceous Vegetation	70 percent of baseline cover after 2 years; 90 percent of baseline after three years; vigor comparable to surrounding marsh areas	Annually	Years 2-7
Planted Woody Vegetation	80 percent survival and exhibit good vigor	Annually	Years 2-7
Turbidity	Turbidity below project area shall not exceed turbidity above project area by more than 10 percent	Continuous, reported annually	Years 2-7

Table 1-1. Monitoring Plan Summary

Monitoring Component	Performance Standard	Frequency	Duration
Photo Points	NA – Information to support channel and vegetation conditions	Annually	Years 1-7
Wetland Extent	No loss in jurisdictional wetland	Once	At completion
Final Topography	NA – for information	Once	At completion

1.3 Report Organization

This Annual Report is generally organized to follow the monitoring plan categories of baseline, pre-construction/construction and post-construction monitoring in Sections 2, 3, and 4, respectively. Baseline conditions and Year 1 monitoring were previously reported in the Year 1 Annual Report (NHC,2015). Table 1-2 provides a general timeframe for these monitoring categories.

Table 1-2. Schedule of AMP monitoring categories

AMP MONITORING	START	END
Baseline	October 2013	September 2014
Year 1 Construction	September 2014	October 2014
Year 1 Post Construction	November 2014	July 2015
Year 2 Construction	October 2015	November 2015
Year 2 Post Construction	November 2015	September 2016
Year 3 Construction	October 2016	November 2016

Section 5 provides a discussion of results, observations on 2016 conditions, the rationale for adaptive management measures in Year 3, and a summary of Year 3 designs.

2 BASELINE CONDITIONS

Baseline conditions were previously reported in the 2015 Annual Report (NHC, 2015). A brief description is provided here for purposes of comparison.

2.1 Topography

The project area, as described in the AMP, is shown in Figure 2-1. The District retained Tri-State Surveying to set survey control and produce a topographic survey of the area near Bellevue Pump Station where the channel avulsion occurred and where the Year 1 improvements were focused (Tri-State Surveying, 2013). The survey included five cross sections previously surveyed by the California Tahoe Conservancy and nine new transects. The base map and cross section plots from the survey are included in Appendix A. In addition to the field survey, LiDAR-based mapping completed by TRPA (TRPA, 2010) provides general topographic information for the Upper Truckee Marsh. Figure 2-2 shows the LiDAR-based mapping. Note that this figure does not show topographic changes associated with the 2011 channel avulsion due to the date of the mapping.

2.2 Inundation of Easement

Inundation of the sewer easement near Bellevue Avenue was mapped in October 2013 as part of the field survey and observed prior to Year 1 construction operations in the spring and summer of 2013 and 2014. Figure 2-3 shows the area inundated on the baseline survey date, which had a recorded flow of 11 cfs at the USGS Gage 10336780 Trout Creek at Tahoe Valley. In the baseline condition, a section of the main channel was entirely blocked as a result of the 2011 channel avulsion, and most all of the creek flow was passing over the right overbank and sewer easement. Thus, regardless of flows in the creek or season, the sewer easement was continuously inundated in the area near Bellevue Pump Station. Figure 2-4 shows a photo of inundation in the easement near Bellevue Avenue in May 2013 at a flow of approximately 40 cfs. Figure 2-5 shows a photo of inundation during April 2014 at a flow of approximately 20 cfs.

2.3 Water Levels

NHC and the District installed three pressure transducers in the project area near Bellevue Avenue along the Trout Creek channel in November 2013. The pressure transducers record data on a set 30-minute time interval for later download. Figure 2-6 shows the location of the stream water level sensors and Figure 2-7 shows the water level data plotted against flows at the USGS gage. The baseline water level conditions reflect discontinuous channel conditions – the Trout Creek channel between the middle and downstream gages was completely filled with sediment and the entire flow was occurring on the right overbank. In addition to the transducers along the stream channel, the District installed a transducer in an existing monitoring well (MW4) near the end of Bellevue Avenue in July 2014. Groundwater levels prior to September 2014 (beginning of Year 1 construction) are shown in Figure 2-7.



Legend

- Stream Environment Zone
- State of California Property
- Project Area
- Bellevue Pump Station
- Sewer Easement
- Soft Coverage in Project Area

SCALE - 1:12,000

0 500 1,000 1,500 Feet

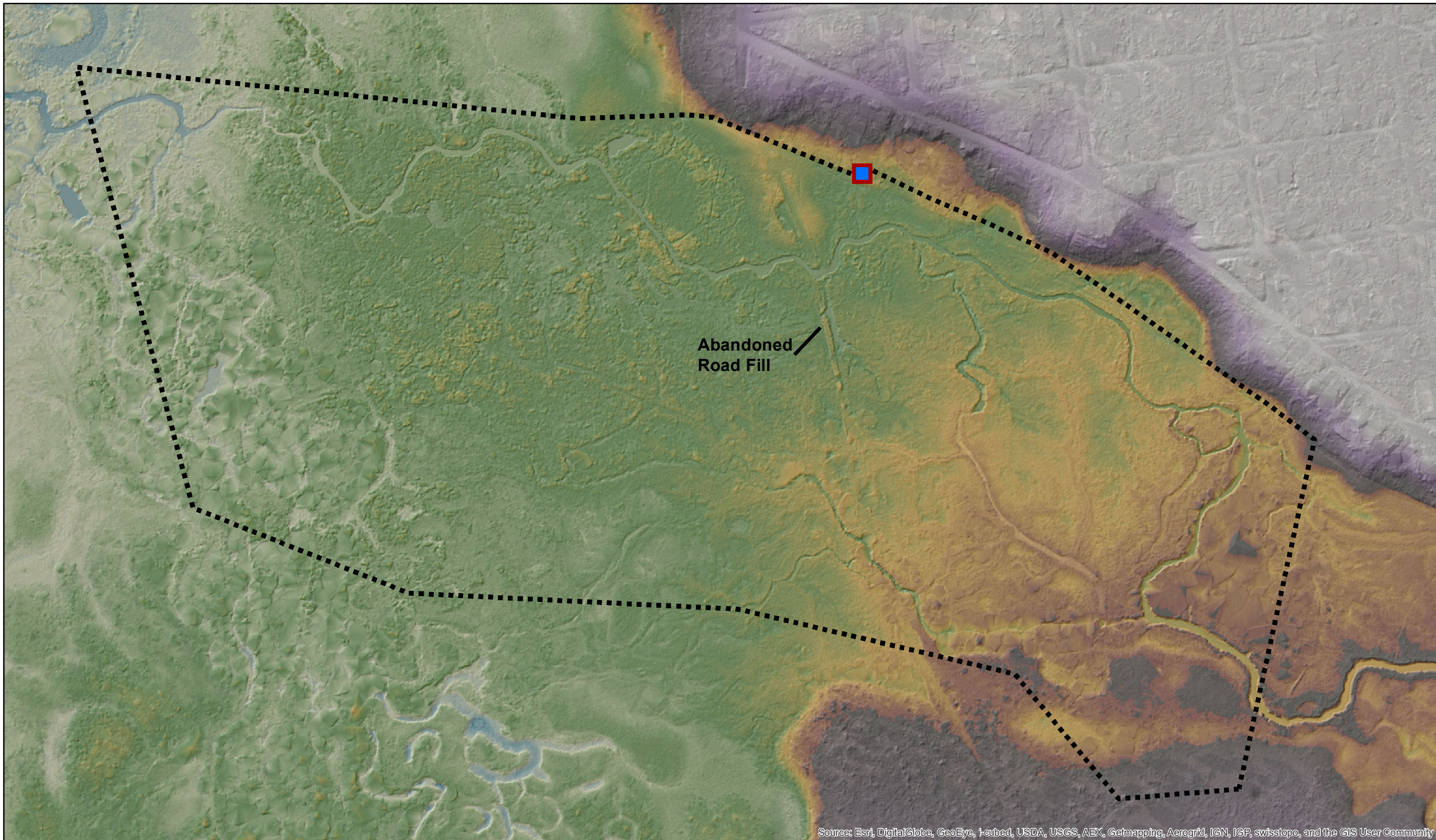
DATA SOURCES:
AECOM, ESRI, CTC

Job: 600035

JANUARY 2014

Figure 2-1
Project Area and SEZ Boundaries

AECOM Project No. 600035 - Tahoe Keys Pump Station GIS/Vector Map Figure 2-1.mxd



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend

- Bellevue Pump Station
- Project Area

UT Marsh Topo [ft]
Value

- High : 6238
- Low : 6230

South Lake Tahoe [ft]
Value

- High : 6260
- Low : 6238

SCALE - 1:3,000

0 100 200 300 Feet

DATA SOURCES: Tahoe Regional Planning Agency

Job: 600035

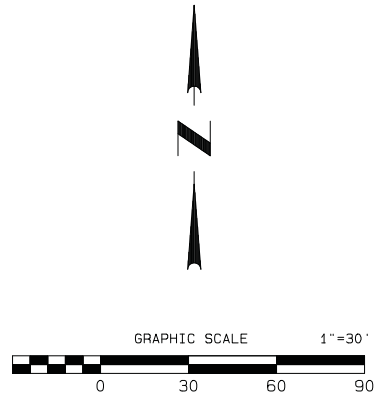
NOVEMBER 2015

FIGURE 2-2

2012 LiDAR Topography

ABC: L:\06Proj\600035_Trou CreekFacilities\GIS\Workmaps\Figure2-2.mxd

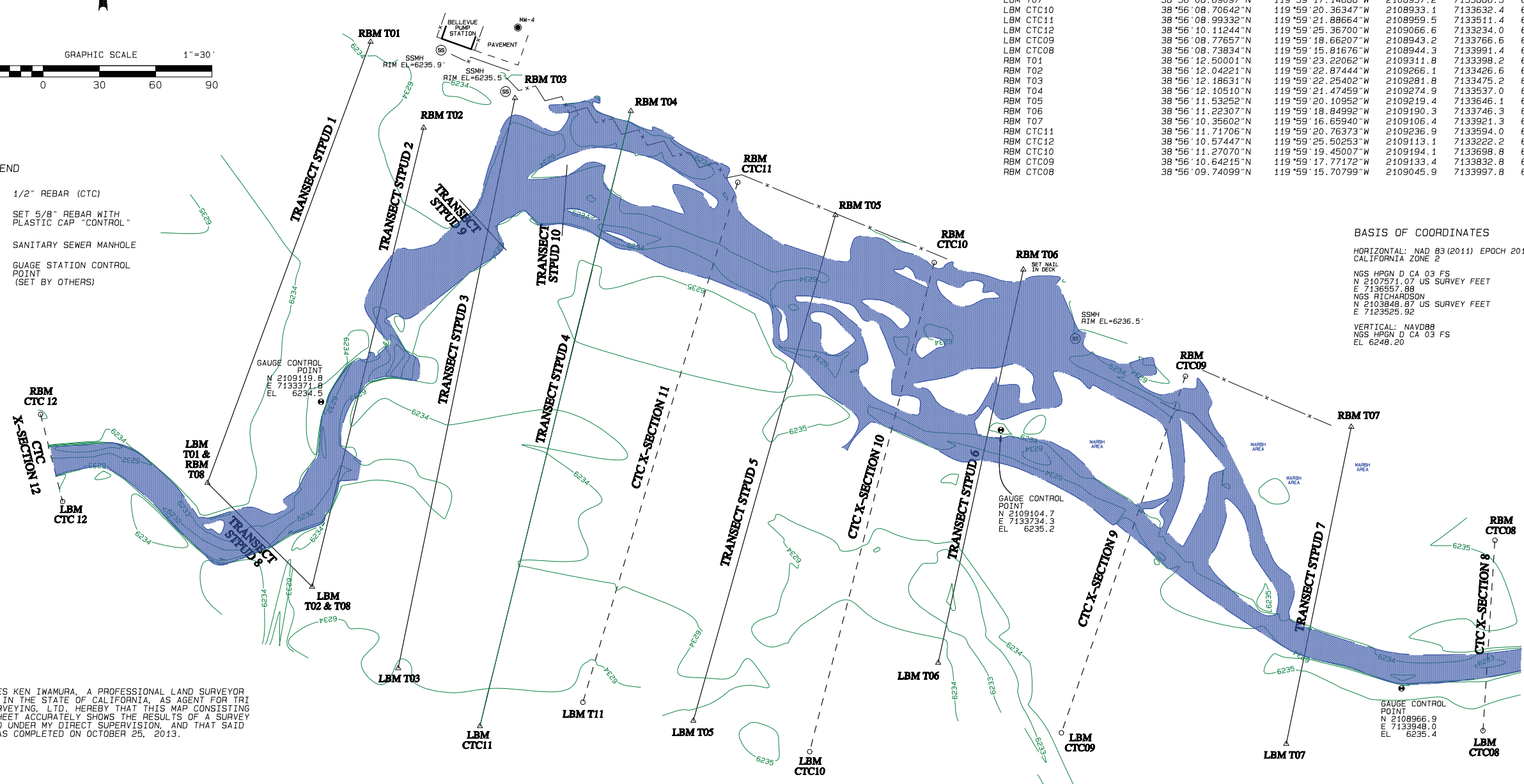
TRUCKEE MARSH SEWER FACILITIES PROTECTION PROJECT FOR SOUTH TAHOE PUBLIC UTILITY DISTRICT



- LEGEND**
- 1/2" REBAR (CTC)
 - △ SET 5/8" REBAR WITH PLASTIC CAP "CONTROL"
 - ⊙ SANITARY SEWER MANHOLE
 - GAUGE STATION CONTROL POINT (SET BY OTHERS)

MONUMENT NAME	LATITUDE (NAD83)	LONGITUDE (NAD83)	NORTHING (GRID)	EASTING (GRID)	ELEV (NAVD88)	ELEV (NGVD29)
LBM T01 & RBM T08	38°56'10.19405"N	119°59'24.38718"W	2109076.5	7133311.2	6234.3	6230.3
LBM T02 & LBM T08	38°56'09.63427"N	119°59'23.69647"W	2109021.1	7133367.0	6233.9	6229.9
LBM T03	38°56'09.19403"N	119°59'23.12797"W	2108977.6	7133412.9	6234.2	6230.2
LBM T04	38°56'08.87901"N	119°59'22.58537"W	2108946.7	7133456.5	6234.4	6230.5
LBM T05	38°56'08.88303"N	119°59'21.14451"W	2108949.6	7133570.3	6234.2	6230.3
LBM T06	38°56'09.15997"N	119°59'19.48238"W	2108980.5	7133700.9	6234.6	6230.6
LBM T07	38°56'08.69097"N	119°59'17.14688"W	2108937.2	7133886.5	6234.5	6230.5
LBM CTC10	38°56'08.70642"N	119°59'20.36347"W	2108933.1	7133632.4	6234.6	6230.6
LBM CTC11	38°56'08.99332"N	119°59'21.88664"W	2108959.5	7133511.4	6234.4	6230.4
LBM CTC12	38°56'10.11244"N	119°59'25.36700"W	2109066.6	7133234.0	6233.9	6229.9
LBM CTC09	38°56'08.77657"N	119°59'18.66207"W	2108943.2	7133766.6	6235.2	6231.2
RBM T01	38°56'08.73834"N	119°59'15.81676"W	2108944.3	7133991.4	6234.9	6231.0
RBM T02	38°56'12.50001"N	119°59'23.22062"W	2109311.8	7133398.2	6234.3	6230.3
RBM T03	38°56'12.04221"N	119°59'22.87444"W	2109266.1	7133426.6	6234.4	6230.4
RBM T04	38°56'12.18631"N	119°59'22.25402"W	2109281.8	7133475.2	6234.4	6230.5
RBM T05	38°56'12.10510"N	119°59'21.47459"W	2109274.9	7133537.0	6234.3	6230.3
RBM T06	38°56'11.53252"N	119°59'20.10952"W	2109219.4	7133646.1	6235.0	6231.0
RBM T07	38°56'11.22307"N	119°59'18.84992"W	2109190.3	7133746.3	6236.5	6232.5
RBM CTC11	38°56'10.35602"N	119°59'16.65940"W	2109106.4	7133921.3	6234.9	6230.9
RBM CTC12	38°56'11.71706"N	119°59'20.75373"W	2109236.9	7133594.0	6235.2	6231.2
RBM CTC10	38°56'10.57447"N	119°59'25.50253"W	2109113.1	7133222.2	6234.3	6230.3
RBM CTC09	38°56'11.27070"N	119°59'19.45007"W	2109194.1	7133698.8	6235.1	6231.1
RBM CTC08	38°56'10.64215"N	119°59'17.77172"W	2109133.4	7133832.8	6235.0	6231.1
RBM CTC07	38°56'09.74099"N	119°59'15.70799"W	2109045.9	7133997.8	6235.6	6231.6

BASIS OF COORDINATES
 HORIZONTAL: NAD 83 (2011) EPOCH 2010.00 CALIFORNIA ZONE 2
 NGS HPGN D CA 03 FS
 N 2107571.07 US SURVEY FEET
 E 7136557.89
 NGS RICHARDSON
 N 2103848.87 US SURVEY FEET
 E 7133235.92
 VERTICAL: NAVD88
 NGS HPGN D CA 03 FS
 EL 6248.20



I, CHARLES KEN IWAMURA, A PROFESSIONAL LAND SURVEYOR LICENSED IN THE STATE OF CALIFORNIA, AS AGENT FOR TRI STATE SURVEYING, LTD. HEREBY THAT THIS MAP CONSISTING OF ONE SHEET ACCURATELY SHOWS THE RESULTS OF A SURVEY PERFORMED UNDER MY DIRECT SUPERVISION, AND THAT SAID SURVEY WAS COMPLETED ON OCTOBER 25, 2013.

CHARLES KEN IWAMURA
 PROFESSIONAL LAND SURVEYOR
 CALIFORNIA CERTIFICATE NO. 8540

Figure 2-3. Baseline Topographic Survey near Bellevue Avenue (source: Tri-State Surveying; full survey in Appendix A)

TRI STATE SURVEYING, LTD
 425 EAST LONG STREET
 CARSON CITY, NEVADA 89706
 (775) 887-9911 * FAX 887-9915

REVISIONS	DATE	MARK	NO.

DESIGNED BY	DRAWN BY	CHECKED BY	DATE SURVEYED	APPROVED BY	NO.

**TRUCKEE MARSH SEWER FACILITIES
PROTECTION PROJECT**
 PORTIONS OF THE N 1/2 OF SECTION 4,
 TOWNSHIP 12 NORTH, RANGE 18 EAST,
 M.D.M.
 EL DORADO COUNTY CALIFORNIA

JOB NO. 13120.01.CM	DATE 11-5-13
SHEET	DATE
1	3



Figure 2-4. Inundation of the sewer easement near Bellevue Avenue at a flow of approximately 40 cfs, looking upstream, 20 May 2013



Figure 2-5. Inundation of the sewer easement near Bellevue Avenue at a flow of approximately 20 cfs, looking upstream, 1 Apr 2014

2.4 Wetland Extent

AECOM (2014) mapped jurisdictional habitat in the project area as shown in Figure 2-8. The area of the avulsed channel is mapped as a habitat and is evident as a gap in the Trout Creek open water habitat component near the center of the map. Nearly the entire project area is mapped as potential jurisdictional area with the exception of some higher ground mapped as Lodgepole Pine Meadow (LPM) along the north and south margins of the delineation area.

2.5 Vegetation

General vegetation characteristics in the study area have been described in environmental documentation for the Upper Truckee River and Marsh Restoration Project (California Department of General Services and California Tahoe Conservancy, 2013).

Woody Riparian Vegetation

Figure 2-8 includes mapping of willow scrub wet meadow habitat that is dominated by mature willows and primarily occurs along channel boundaries. In addition to the areas mapped as willow scrub, the channel avulsion area was colonized by willows. This area had numerous willow saplings that were 2 to 4 feet tall in the baseline condition.

Herbaceous Vegetation

Baseline vegetation surveys were conducted by Western Botanical Services in August 2014 and are summarized in a report provided in Appendix A. Three reference transects were established in the area proposed for abandoned road fill removal and three were established in areas proposed for hummock construction in Year 1. All transects were 100 feet long. Total cover, vegetative cover, and dominance by natives was determined by point-intercept method for the transects. Baseline vegetative cover varied from 84% to 98% (average 90%) in the road fill removal transects and from 58% to 98% (average 80%) in the proposed hummock area transects. Cover by native plants averaged 86% and 80% in the road fill removal and proposed hummock area transects, respectively.








Table 2-1. Cover in Baseline Vegetation Transects

Community at Road Fill	Transect 1	Transect 2	Transect 3	Average
Total Cover (including litter, gravel, rock)	100%	100%	100%	100%
Total Vegetative Cover	88%	98%	84%	90%
Vegetative Cover by Native Species	84%	90%	83%	85.7%
Community at Proposed Hummocks	Transect 1	Transect 2	Transect 3	Average
Total Cover (including litter, gravel, rock)	100%	61%	90%	83.7%
Total Vegetative Cover	95%	58%	88%	80.3%
Vegetative Cover by Native Species	93%	58%	88%	79.7%



TC 001 = Up-Stream Gage
 TC 002 = Mid-Stream Gage
 TC 003 = Down-Stream Gage

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

 	Legend  Crest Stage Gauge  Groundwater Elevation Gage	 Surface Water Elevation Gage  Turbidimeter  Streamflow Measurement Cross Sections	SCALE - 1:1,800 0 50 100 150 200 Feet	Job: 600035 NOVEMBER 2015	Figure 2-6 Streamflow Measurement Sites
			DATA SOURCES: Google Earth		

ABC: L:\OIPProj\600035_Troun\CreekFacilities\GIS\Workmaps\Figure2-6.mxd

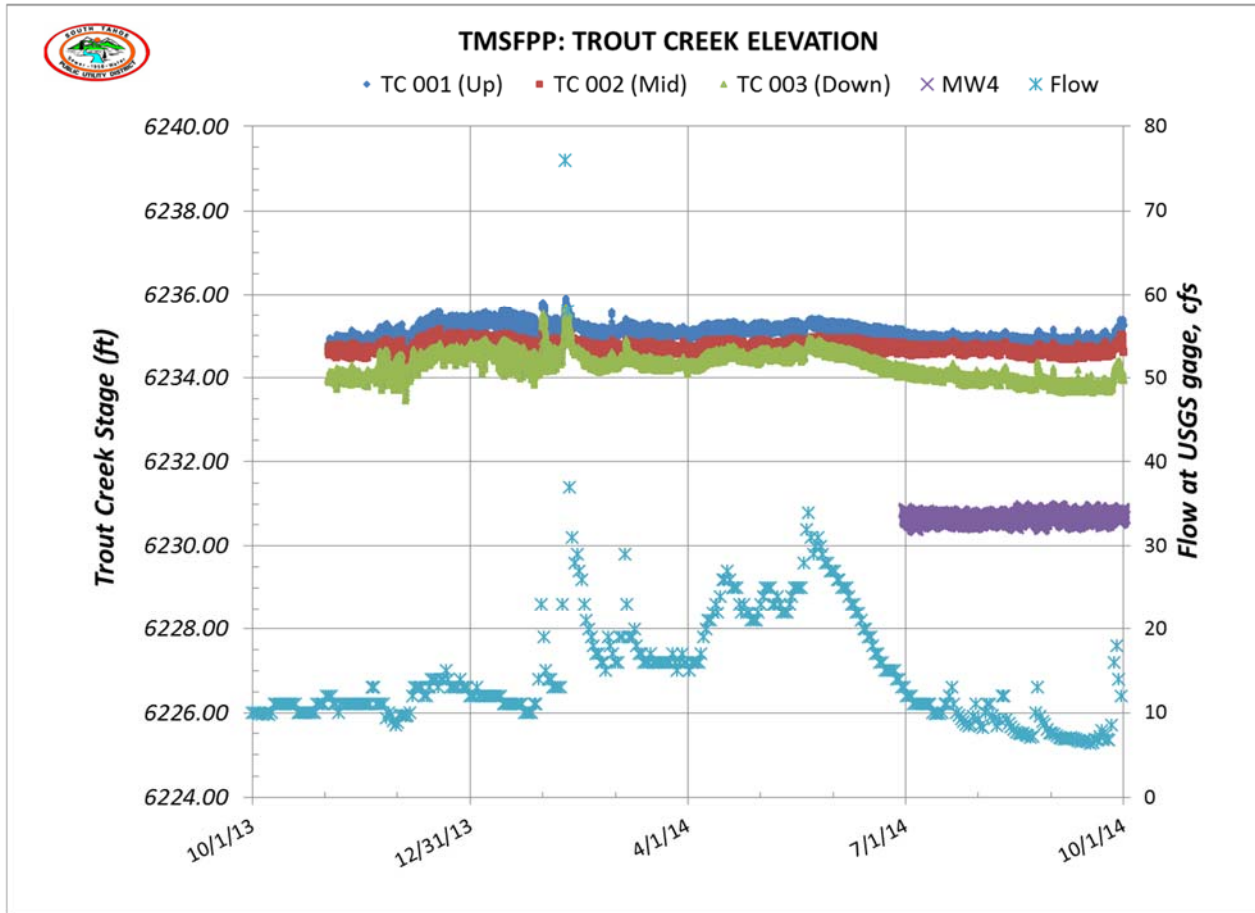


Figure 2-7. Water levels and flows at USGS Gage 10336780 in prior to Year 1 activities

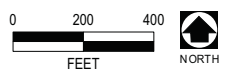
STPUD Trout Creek Upper Truckee Marsh Sewer Protection Project Wetland Delineation Map

LEGEND

- Sample Points
- 1ft Contours
- ▭ Study Area Boundary (233.78 acres)
- ▭ Adaptive Management Action Area (95.99 acres)
- Potentially Jurisdictional Habitats (185.47 acres)**
- Relatively Permanent Waters (RPWs) (6.64 acres)
- ▭ Main Channel (3.41 acres)
- ▭ Secondary Channel (0.69 acre)
- ▭ Distributary Channel (1.83 acres)
- ▭ Avulsed Channel (0.71 acre)
- Wetlands Adjacent to or Abutting RPWs (178.81 acres)
- ▭ Lodgepole Pine Meadow (4.89 acres)
- ▭ Wet Montane Meadow (126.50 acres)
- ▭ Willow Scrub-Wet Meadow (47.43 acres)

Delineated by T. Beyerl and P. Valle
on November 21 and 22, 2013.

Directions to Site:
U.S 50 to Los Angeles Ave
to Bellevue Ave.



Aerial Image: NAIP 2012
X 60311654 002 2/14

Potentially Jurisdictional Features						6.64
Relatively Permanent Waters						
Trout Creek (Main Channel)	3.41	Trout Creek (Secondary Channel)	0.69	Trout Creek (Distributary Channel)	1.83	
Trout Creek (Avulsed Channel)	0.71					
Wetlands Adjacent to or Abutting Relatively Permanent Waters						178.83
Wet Montane Meadow						126.50
WM1	27.34	WM2	0.57	WM3	0.56	
WM4	0.01	WM5	5.45	WM6	0.11	
WM7	1.58	WM8	34.72	WM9	0.85	
WM10	0.01	WM11	0.15	WM12	0.004	
WM13	0.01	WM14	0.02	WM15	0.01	
WM16	0.03	WM17	0.15	WM18	7.52	
WM19	17.87	WM20	1.94	WM21	26.84	
WM22	0.77	WM23	0.002			
Willow Scrub-Wet Meadow						47.43
WSM1	0.18	WSM2	0.06	WSM3	4.45	
WSM4	6.18	WSM5	0.18	WSM6	0.09	
WSM7	0.17	WSM8	4.04	WSM9	0.14	
WSM10	0.76	WSM11	0.04	WSM12	0.04	
WSM13	1.06	WSM14	13.67	WSM15	3.98	
WSM16	0.07	WSM17	0.49	WSM18	0.20	
WSM19	0.34	WSM20	5.24	WSM21	0.27	
WSM22	0.07	WSM23	0.07	WSM24	3.21	
WSM25	1.26	WSM26	0.48	WSM27	0.72	
Lodgepole Pine Meadow						4.89
LPM1	3.95	LPM2	0.93	LPM3	0.01	
Total Potentially Jurisdictional Features:						185.47

Figure 2-8. Wetland Delineation Map (Source: AECOM, 2013)

2.6 Wildlife and Fish

Information on wildlife and fish in the project area was compiled for the Upper Truckee River and Marsh Restoration Project EIS/EIS/EIR (California Department of General Services and California Tahoe Conservancy, 2013). The Upper Truckee River marsh provides habitat for approximately 200 amphibian, reptile, bird, and mammal species.

Trout Creek, because of its lack of riffles and predominance of a uniform coarse sand bed, does not generally provide resident habitat for salmonids or most other species of fish. However, Trout Creek within the project area provides migratory habitat for rainbow and brown trout, and may also provide temporary migratory habitat for Paiute Sculpin, Tahoe sucker, mountain sucker, Lahontan redbreast, Lahontan tui chub, and mountain whitefish. California Department of Fish and Wildlife (CDFW) species of special concern include the Tahoe sucker, Lahontan Lake tui chub, and Lahontan redbreast, which have some potential for occurrence. Additionally, the Lahontan cutthroat trout is a federally listed threatened species which has the potential to use the project reach for migration. In 2011, two hatchery-raised Lahontan cutthroat were observed in the Upper Truckee River during a fisheries survey conducted by the U.S. Forest Service (USFS, 2011).

Monitoring of wildlife and fish populations is not a component of the AMP monitoring. However, mitigation measures were identified in the AMP to minimize construction impacts to wildlife and fish. These measures, and the data from pre-construction and construction monitoring are described in Section 3.

3 YEAR 2 PRE-CONSTRUCTION AND CONSTRUCTION MONITORING

3.1 Pre-Construction Bird Surveys

Willow Flycatcher and Nesting Bird Surveys

Willow flycatcher and nesting bird surveys were identified as measures to avoid potential impacts to bird species in the project area. Construction of Year 2 improvements did not commence until late August, near the end of the nesting season. Pre-construction willow flycatcher and nesting bird surveys were conducted between 13 and 19 August 2015 by AECOM. An active mourning dove nest was identified near the margin of the work area at the secondary channel in the center of the marsh (accessed from Rubicon Trail) and a 50-foot buffer was established. Project work in the area primarily involved hand crews and all work was able to be completed no closer than 95 feet from the nest. AECOM biologists observed the nest after construction and found it to still be active, with the adult occupying the nest to incubate eggs.

3.2 Year 2 Construction

The District awarded the Year 1 work to V&C Construction in 2014, including allowances for work in Years 2 and 3. The District negotiated and executed a change order with V&C Construction for Year 2 work and the contractor mobilized on 24 August 2015. Construction was generally conducted according to plans attached in Appendix B (NHC,2015) and according to the measures identified in the Adaptive Management Plan (NHC, 2014). The District conducted daily inspections of the work. Year 2 work included:

- Excavation of approximately 120 lineal feet of pilot channel at the head of the secondary channel in the center of the marsh;
- Clearing of debris and obstructions from about 500 lineal feet of the secondary channel;
- Enlargement of portions (approximately 400 lineal feet) of two of the pilot channels constructed in Year 1;
- Construction of an additional 600 square feet of fill hummock;
- Construction of one additional right overbank plug;
- Installation of 80 lineal feet of planted coir log and 45 additional wetland plugs.

Changes to the work directed by STPUD in the field included moderate increases in excavation in the secondary and pilot channel areas of work to reach target excavations for the channel invert.

The primary purpose of the Year 2 work was to increase flows in the pilot channels and secondary channel and thereby reduce flows in the sewer easement along the meadow margin. Initial construction

of the pilot channels was intentionally sized for channels much smaller than the anticipated stable creek channel, with the expectation that the channels would enlarge naturally over time. Pilot channel expansion was very slow and in some cases vegetation encroachment reduced capacity from the Year 1 constructed condition. Two pilot channels (referred to as PC-1 and PC-3 in monitoring) were determined in post-construction monitoring to be the most promising for ultimate conveyance of creek flows, and these were selected for expansion in areas where their invert elevations appeared to limit channel capacity, based on post-construction monitoring surveys.

Activation of the secondary channel in the center of the meadow is intended to allow some higher flows to be distributed in the center of the marsh rather than conveyed in the channel near the sewer easement. This secondary channel was active within the past 5 years and was partially blocked by a combination of human debris, natural sediment deposits, and beaver activity.

3.3 Fisheries

An AECOM fisheries biologist was present during construction activities involving dewatering and in-water work. Block nets and electroshocking were used to isolate and relocate fish from the areas of work. Fish were relocated to an upstream reach of Trout Creek southeast of the work area. The fish relocated included speckled dace and brown trout. Approximately 750 speckled dace and 6 brown trout were relocated. Logs of the electrofishing data are provided in Appendix A.

3.4 Cultural Resources

An AECOM specialist in archaeological and historical resources was onsite during ground disturbing activities. Minor artifacts encountered including pieces of timber bridges, nails, one obsidian flake tool, and shards of pottery and glass. No resources were encountered that required stoppage or relocation of the work. Field observations and a photo log are provided in Appendix A; photos are on file at AECOM.

3.5 Sediment Discharge and Trout Creek Turbidity

The District monitored excavation and dewatering work visually to minimize turbidity discharged to the stream. Dewatering methods included pumping to a water disposal area where flows were spread on a dry area of the meadow for infiltration. The District made multiple tests of turbidity daily with a portable (Hach 2100Q turbidimeter). The recording turbidimeters were used to verify portable measurements and provide a record of turbidity during the entire construction period. Turbidity in excess of 20 NTUs was recorded occasionally during the construction period but the large deviations of these individual measurements from the trend of the data indicate that they may be local disturbance spikes (e.g., humans or animals crossing the channel) or instrument error. These data indicate that the performance standard for sediment discharge and turbidity was met during construction.

Figure 3-1 shows the data from the recording turbidimeters upstream and immediately downstream of the Bellevue work area where the pilot channels were expanded.

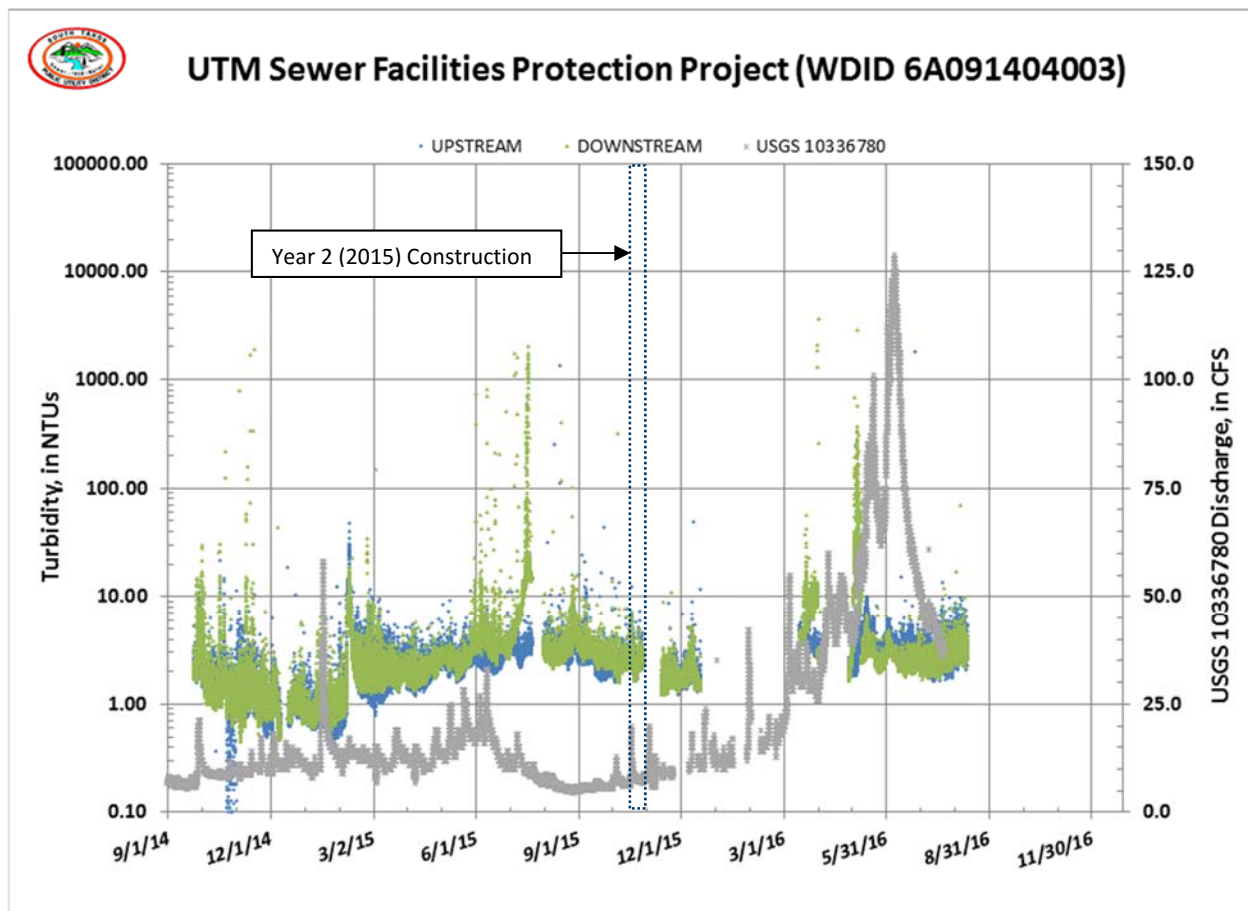


Figure 3-1. Turbidity upstream and downstream of Bellevue Avenue work area during Year 2 construction period, Oct 2015

3.4 Pilot Channel Width

As noted in the Year 1 Annual Report, the pilot channels were monitored visually after Year 1 construction and were found to be very stable in size and vertical profile. The pilot channels were surveyed and monumented in Year 1 post-construction monitoring. Pilot channel flows were measured prior to Year 2 construction on 20 August 2015 with a flow of 8 cfs at USGS Gage 10336780. Approximately 4 cfs was estimated to be passing through the three pilot channels with less than one cfs on the right overbank.

4 YEAR 2 POST-CONSTRUCTION MONITORING

4.1 Topography

Following Year 2 construction, the District re-surveyed the work areas near Bellevue Avenue and the head of the secondary channel in the center of the meadow. The mapping included general topography and mapping of Year 2 hummock and pilot channels near Bellevue Avenue, resurvey of the fourteen cross sections established in the Bellevue Avenue work area by the baseline survey, resurvey of seven monumented cross sections on the pilot channels, and resurvey of eight cross sections along the secondary channel. The survey was conducted in late October 2015, and mapping was completed in December (Lumos & Associates, 2015). Trout Creek mean daily flows at USGS 10336780 for the survey dates was approximately 8 cfs. Figure 4-1 shows the mapping in the Bellevue Avenue work area and the full set of survey products is included in Appendix B. Figure 4-1 shows similar inundation patterns to Year 1 mapping, but flow measurements (see below) indicate significantly reduced flows on the overbank.

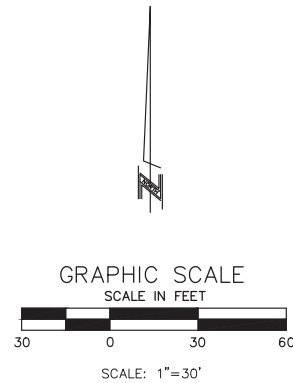
4.2 Right Overbank Flows and Inundation of Easement

Two pilot channels (PC-1 and PC-3) were expanded in Year 2 construction. Pilot channel and overbank flows were measured on 28 April 2016 following Year 2 construction, with a flow of 42 cfs at USGS 10336780. Total pilot channel flow was estimated at 25.4 cfs, with 8.6 cfs on the right overbank. The distribution of flow in the pilot channels was 6.5, 2.4, and 16.5 cfs in PC-1, 2, and 3, respectively. These results indicate an increased capacity in the pilot channels, with total capacity approaching the channel capacity upstream of the avulsion area. Flows in the pilot channels and right overbanks were again estimated in August 2016 at a flow of approximately 23 cfs at USGS Gage 10336780. On this date, flows were estimated at 3.8, <1, and 20 cfs in PC-1,2,and 3 respectively, with less than 2 cfs in the right overbank outside the sewer easement.

In spite of reduced flows in the area of the original channel avulsion, inundation of the easement upstream of Bellevue was more prevalent in the spring of 2016 than in 2015. This inundation is primarily the result of increased beaver activity in the area and is discussed in Section 4.9.

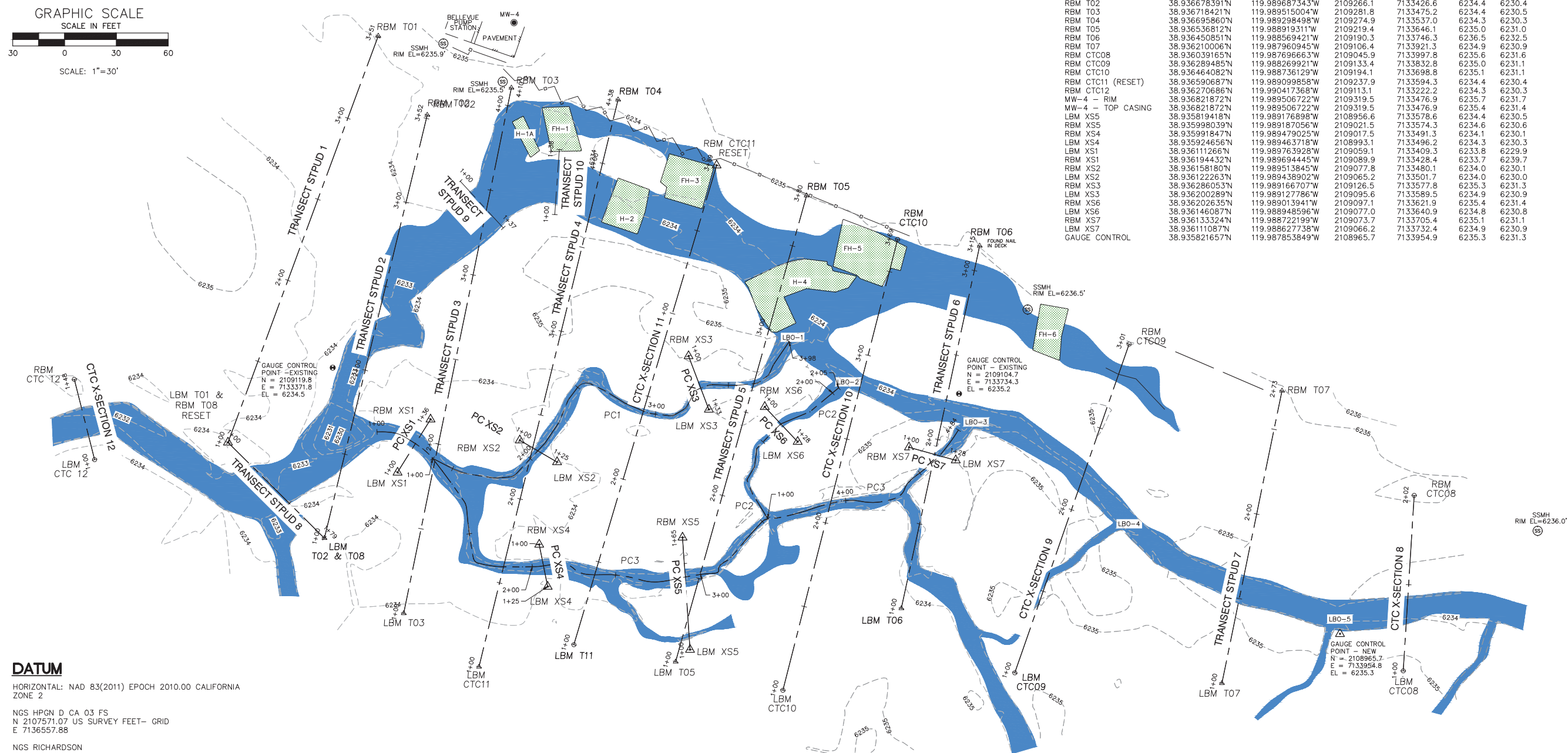
In addition to higher flow capacity, active bed load transport and bed form development (scour, ripples, dunes) were evident for bed load material comprised of sand and small gravel. The main pilot channel beds are now observed to have little vegetative growth and are characterized by sand in gradual transport along the bed. The peak flow during WY 2016 at USGS Gage 10336780 was approximately 130 cfs. Deposition of sand in overbanks along the pilot channel system and on the hummocks was evident site observations conducted in August 2016. Figures 4-2 and 4-3 show pilot channel conditions in April 2016.

TRUCKEE MARSH SEWER FACILITIES PROTECTION PROJECT - AS BUILT FOR SOUTH TAHOE PUBLIC UTILITY DISTRICT



PROJECT CONTROL

MONUMENT NAME	LATITUDE NAD83	LONGITUDE NAD83	NORTHING SPC GRID	EASTING SPC GRID	ELEV. NAVD88	ELEV. NGVD29
LBM T01 & RBM T08 (RESET)	38.936168894°N	119.990106106°W	2109078.0	7133311.6	6234.3	6230.3
LBM T02 & LBM T08	38.936009520°N	119.989915687°W	2109021.1	7133367.0	6233.9	6229.9
LBM T0	38.935887231°N	119.989757770°W	2108977.6	7133412.9	6234.2	6230.2
LBM T04	38.935799724°N	119.989607047°W	2108946.7	7133456.5	6234.4	6230.5
LBM T05	38.935800843°N	119.989206809°W	2108949.6	7133570.3	6234.2	6230.3
LBM T06	38.935877770°N	119.988745105°W	2108980.5	7133700.9	6234.6	6230.6
LBM T07	38.935747492°N	119.988096356°W	2108937.2	7133886.5	6234.5	6230.5
LBM CTC08	38.935760651°N	119.987726877°W	2108944.3	7133991.4	6234.9	6231.0
LBM CTC09	38.935771271°N	119.988517241°W	2108943.2	7133766.6	6235.2	6231.2
LBM CTC10	38.935751784°N	119.988989853°W	2108933.1	7133632.4	6234.6	6230.6
LBM CTC11	38.935831478°N	119.989412956°W	2108959.5	7133511.4	6234.4	6230.4
LBM CTC12	38.936142345°N	119.990379722°W	2109066.6	7133234.0	6233.9	6229.9
RBM T01	38.936805560°N	119.989783506°W	2109311.8	7133398.2	6234.3	6230.3
RBM T02	38.936678391°N	119.989687343°W	2109266.1	7133426.6	6234.4	6230.4
RBM T03	38.936718421°N	119.989515004°W	2109281.8	7133475.2	6234.4	6230.5
RBM T04	38.936695860°N	119.989298498°W	2109274.9	7133537.0	6234.3	6230.3
RBM T05	38.936536812°N	119.988919311°W	2109219.4	7133646.1	6235.0	6231.0
RBM T06	38.936450851°N	119.988569421°W	2109190.3	7133746.3	6235.5	6232.5
RBM T07	38.936210006°N	119.987960945°W	2109106.4	7133921.3	6234.9	6230.9
RBM CTC08	38.936039165°N	119.987696663°W	2109045.9	7133997.8	6235.6	6231.6
RBM CTC09	38.936289485°N	119.988269921°W	2109133.4	7133832.8	6235.0	6231.1
RBM CTC10	38.936464082°N	119.988736129°W	2109194.1	7133698.8	6235.1	6231.1
RBM CTC11 (RESET)	38.936590687°N	119.989099858°W	2109237.9	7133594.3	6234.4	6230.4
RBM CTC12	38.936270868°N	119.990417388°W	2109133.1	7133222.2	6234.3	6230.3
MW-4 - RIM	38.936821872°N	119.989506722°W	2109319.5	7133476.9	6235.7	6231.7
MW-4 - TOP CASING	38.936821872°N	119.989506722°W	2109319.5	7133476.9	6235.4	6231.4
LBM XS5	38.935819418°N	119.989176898°W	2108956.6	7133578.6	6234.4	6230.5
RBM XS5	38.935998039°N	119.989187056°W	2109021.5	7133574.3	6234.6	6230.6
RBM XS4	38.935991847°N	119.989479025°W	2109017.5	7133491.3	6234.1	6230.1
LBM XS4	38.935924656°N	119.989463718°W	2108993.1	7133496.2	6234.3	6230.3
LBM XS1	38.936111266°N	119.989763928°W	2109059.1	7133409.3	6233.8	6229.9
RBM XS1	38.936194432°N	119.989694445°W	2109089.9	7133428.4	6233.7	6229.7
RBM XS2	38.936158180°N	119.989513845°W	2109077.8	7133480.1	6234.0	6230.1
LBM XS2	38.936122263°N	119.989438902°W	2109065.2	7133501.7	6234.0	6230.0
RBM XS3	38.936286053°N	119.989166707°W	2109126.5	7133577.8	6235.3	6231.3
LBM XS3	38.936200289°N	119.989127786°W	2109095.6	7133589.5	6234.9	6230.9
RBM XS6	38.936202635°N	119.989013941°W	2109097.1	7133621.9	6235.4	6231.4
LBM XS6	38.936146087°N	119.989485967°W	2109077.0	7133640.9	6234.8	6230.8
RBM XS7	38.936133324°N	119.988722199°W	2109073.7	7133705.4	6235.1	6231.1
LBM XS7	38.936111087°N	119.988627738°W	2109066.2	7133732.4	6234.9	6230.9
GAUGE CONTROL	38.935821657°N	119.987853849°W	2108965.7	7133954.9	6235.3	6231.3



DATUM
 HORIZONTAL: NAD 83(2011) EPOCH 2010.00 CALIFORNIA ZONE 2
 NGS HPGN D CA 03 FS
 N 2107571.07 US SURVEY FEET- GRID
 E 7136557.88
 NGS RICHARDSON
 N 2103848.87 US SURVEY FEET - GRID
 E 7123525.92 GRID
 VERTICAL: NAVD88
 NGS HPGN D CA 03 FS
 EL = 6248.20

LEGEND:
 ▲ FOUND 5/8" REBAR AND CAP "LUMOS CONTROL"
 △ FOUND 5/8" REBAR AND CAP "TR-STATE CONTROL" - UNLESS OTHERWISE NOTED
 ○ FOUND 1/2" REBAR W/ NO CAP (CTC)

NOTE:
 FIELD SURVEY CONDUCTED ON OCTOBER 22 & 30, 2015.

Figure 4-1. Topographic Mapping in Bellevue Work Area, 2015



800 E. COLLEGE PARKWAY
 CARSON CITY, NEVADA 89706
 TEL (775) 883-7077
 FAX (775) 883-7114

WWW.LUMOSENGINEERING.COM

CIVIL ENGINEERING
 GEOTECHNICAL ENGINEERING
 PLANNING
 LANDSCAPE ARCHITECTURE
 SURVEYING / GIS
 CONSTRUCTION SERVICES
 MATERIALS TESTING



12/15/15

SOUTH TAHOE PUBLIC UTILITY DISTRICT
UPPER TRUCKEE MARSH - BELLEVUE AREA
 A PORTION OF THE NORTH 1/2 OF
 SECTION 4, T.12N., R.18E., M.D.M. A.P.N. 026-200-11
 CALIFORNIA
 EL DORADO COUNTY

REV	DATE	DESCRIPTION

B1
 DATE: NOVEMBER 2015
 DRAWN BY: KLN
 DESIGNED BY: GP
 CHECKED BY: GP
 JOB NO.: 8688.001

I:\Projects\8688.001 - Upper Truckee Marsh As Built - 2015\Survey\Drawings\8688001 Upper Truckee Marsh profile.dwg:01 OVERALL
 12/15/2015 9:41:14 pm



Figure 4-2. Pilot channel flow looking downstream approximately 100 feet upstream of confluence with Trout Creek showing overbank deposition of sand during high flows, 9 Aug 2016



Figure 4-3. Pilot channel (PC-3) about 150 feet upstream of Trout Creek confluence, looking upstream

4.3 Water Levels

The pressure transducers shown in Figure 2-6 continued to operate following Year 2 construction. Figure 4-4 shows the water level record between October 2014 and July 2016. The water levels are intended to supplement observations on easement inundation and pilot channel performance in conjunction with survey data. Groundwater levels remained relatively constant with a slight increase during the spring that may correlate to precipitation. In the data collected to date, groundwater levels are only loosely correlated to stream stage and are below the stream levels, indicating potential for loss of flow from the stream to groundwater in the local area. The data was downloaded from the loggers on 8 December 2015 and 15 July 2016. Communication difficulty between the datalogger and the computer was noted in the last download, and data from TC 001 after December 2015 appear to be somewhat suspect. The operation of this datalogger will be evaluated in the next download. For reference, flows on Trout Creek varied from about 7 cfs on 1 October to about 130 cfs on 5 June during the WY 2016. Stages recorded at TC 003 varied about 2 feet over this flow range, and about 1.5 feet at TC 002.

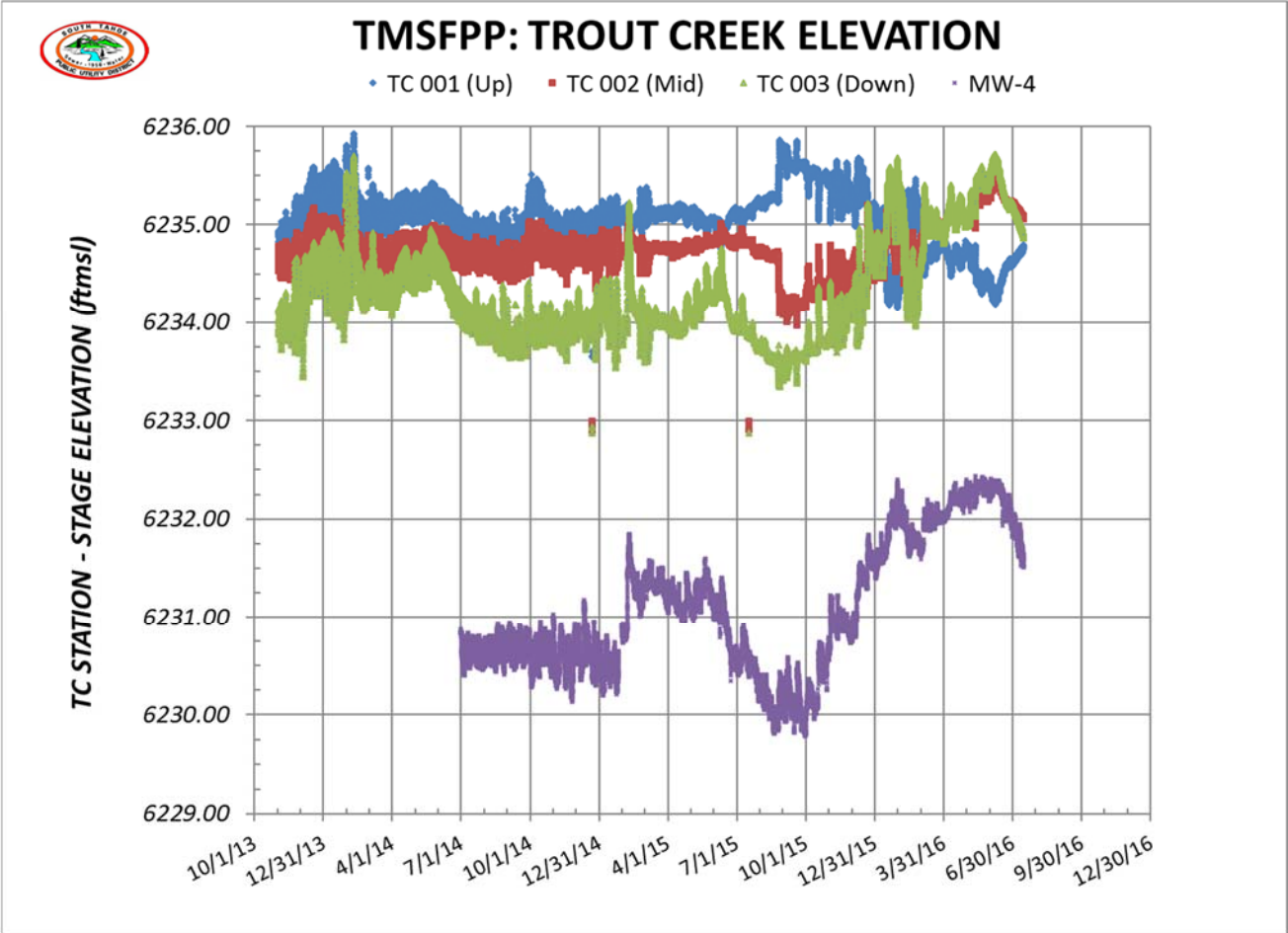


Figure 4-4. Water levels through July 2016

4.4 Planted Vegetation

Herbaceous Vegetation

Vegetation replanted on the road fill removal area and planted in the hummocks was surveyed in September 2015 by Western Botanical Services and results were reported in the 2015 Annual Report (NHC, 2015). Vegetation on the road fill removal met success criteria in the first year and was not resurveyed in 2016, but was observed to be in good condition with nearly 100% cover. An assessment of willow survival and vigor from Year 1 planting was also not conducted in 2016. Hummock transects surveyed in 2015 were resurveyed in 2016, and results are presented in Table 4-1. Percent cover values increased for all three transects. Transect 3 had the lowest cover and was observed to have the most persistent inundation. The performance standard established in the AMP for Year 2 was 85% of baseline cover, which was surveyed at 84% cover (NHC, 2015). Therefore, the performance standard is $0.85 \times 0.84 = 68\%$ cover, which was exceeded by the average cover and average vegetative cover in 2016. The performance standard for native vegetation in the AMP is 95% of baseline native species cover, or 76% cover. This standard was not met in Year 2, but was surveyed at 72% and increased substantially from 2015. The native cover is expected to increase and it is reasonable to expect the standard to be met next year. Vigor for the planted vegetation was rated 4.5-5 (good to excellent).

The complete vegetation monitoring report is provided in Appendix C.

Table 4-1. Hummock Percent Cover Summary (from WBS, 2016)

Cover Type	Transect 1		Transect 2		Transect 3		Average	
	2015	2016	2015	2016	2015	2016	2015	2016
Total Cover (including litter, gravel, and rock)	68	96	85	94	62	62	72	84
Total Vegetative Cover	37	95	35	83	31	52	34	77
Vegetative Cover By Native Species	36	88	35	77	31	52	34	72

4.5 Turbidity

Turbidity measurements in the period following construction and through the subsequent snowmelt season were recorded at the two turbidity monitoring stations.

Figure 4-5 shows the turbidity measurements upstream and downstream of the work area near Bellevue Avenue for the period during and after Year 2 construction through August 2016. Trout Creek flows at USGS 10336780 are also shown in the plot. Although there are outlying data points indicating short duration elevated turbidity levels both upstream and downstream of the work area, the data generally show turbidity levels to be similar at the two stations and to generally be less than about 8 NTUs, and

show that increases in discharge do not result in elevated levels of turbidity at the downstream station, thus indicating that the project area has not been a significant source of fine sediment during high flows.

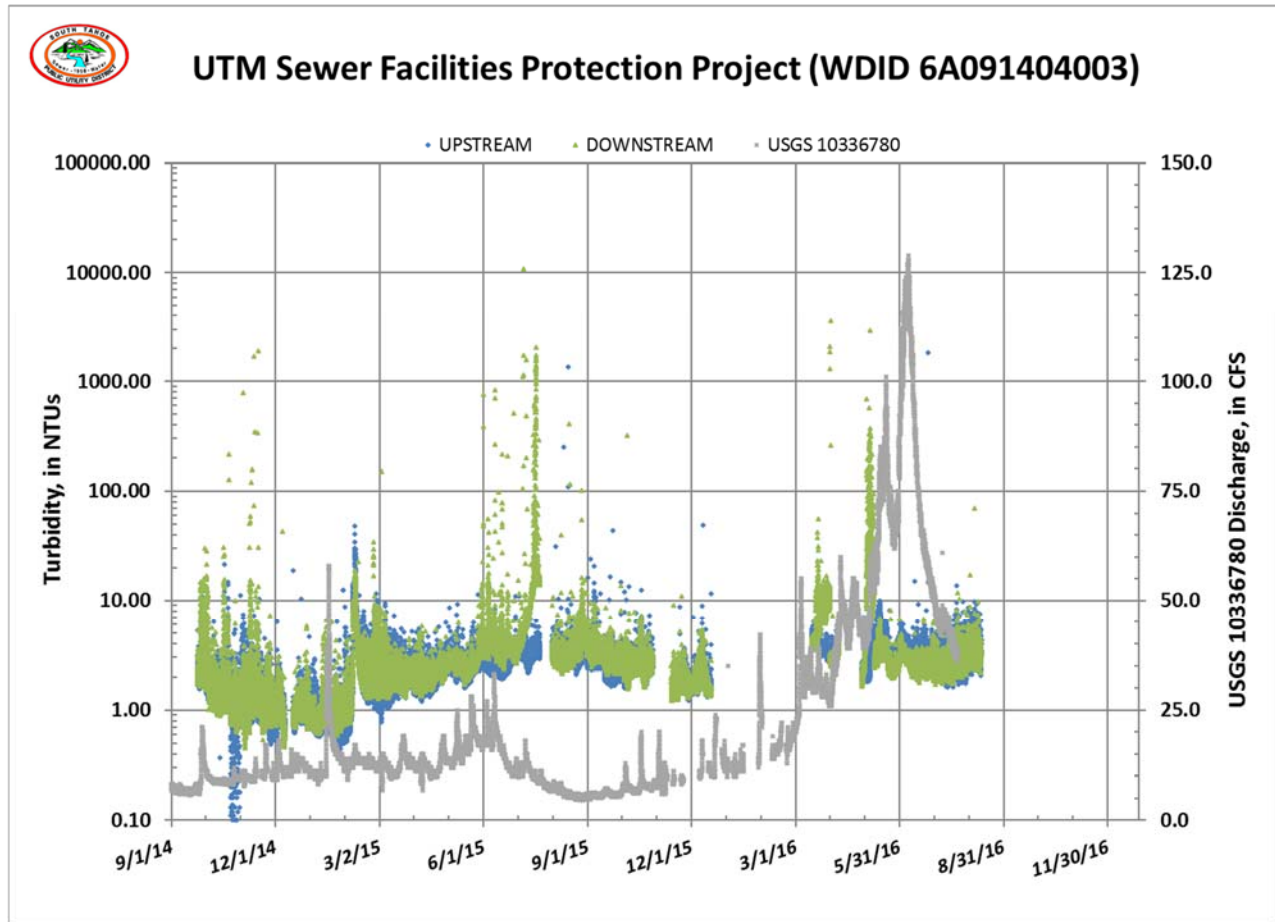


Figure 4-5. Turbidity upstream and downstream of work area near Bellevue Avenue through August 2016

4.6 Photo Points

Photos were collected at photo points indicated in Figure 4-6 on 7 Oct 2015 and 22 Nov 2016, and are included in Appendix B. Additional photos were collected as listed in the photo index in Appendix B, and are available from the District's files on request. In addition to ground photos, the District collected aerial views of the work area on 14 November 2016 using a small unmanned aerial vehicle (UAV). Figures 4-7 and 4-8 show two views collected using this method.



Source: Esri, DigitalGlobe, GeoEye, iSat, GeoEye, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend	
	Photo Monitoring Stations
	Survey Cross Sections

SCALE - 1:800	N
0 25 50 75 100 ft	
DATA SOURCES: Google Earth	

Job: 600035
JANUARY 2014

Figure 4-4
Locations of Photo Points

ABC, L:\Projects\600035_1\Task\Drawings\Monitoring\PhotoPointsLocations.mxd



Figure 4-7. Upstream of Bellevue work area looking west, 14 Nov Apr 2016, with pilot channels diverting flow to left)



Figure 4-8. Easement and avulsed channel area looking west, 14 Nov 2016 (hummocks in easement along fence on right side of photo)

4.7 Wetland Extent

This standard applies at the end of the project to ensure that AMP measures have not converted functional wetland and Stream Environment Zone (SEZ) jurisdictional areas into mesic or upland conditions. As evident in the aerial views, project features are still subject to shallow inundation and were constructed within the range of elevations for adjacent areas of the marsh.

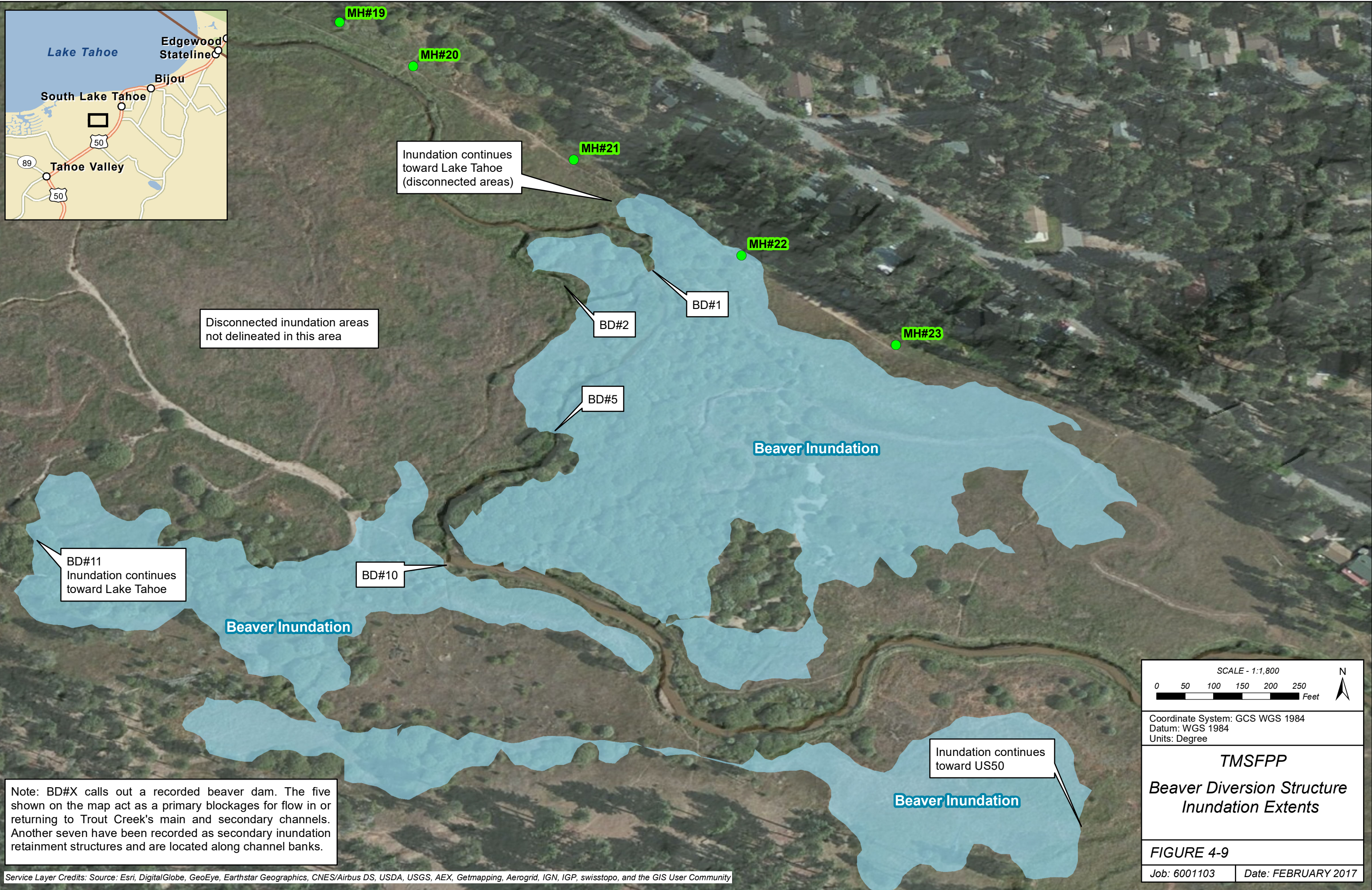
4.8 Final Topography

This data will be compiled at the completion of the project.

4.9 Beaver Activity

Beaver activity upstream of the Bellevue work area increased in 2016, resulting in long duration overbank flooding of the District's easement and several of the manholes on the gravity sewer. The inundation area created by beaver activity is shown in Figure 4-9. The increase in flooding in 2016 appears to be related to construction of an extensive system of auxiliary beaver dams on flow paths that return overbank flows to the main channel. The blockage of these return flows causes overbank flows near the District's Manhole 22 to continue down the right overbank. Several areas of ponded water were evident in this area in August 2016, including areas near Manholes 18, 19, 21, and 22. Beaver activity also closed the head of the secondary channel where the District had constructed a pilot channel in Year 2.

Inundation by beaver activity was the primary cause of flooding in the easement in 2016, and effectively prevents typical maintenance access along the easement. Year 3 improvements (see Section 5 below) were designed to slightly raise ground levels and plant vegetation in areas around the manholes and other low points, but are expected to provide limited benefits against inundation by beaver activity. A more comprehensive solution to inundation caused by beavers should be explored in Year 4.



Disconnected inundation areas not delineated in this area

Inundation continues toward Lake Tahoe (disconnected areas)

BD#2

BD#1

MH#23

Beaver Inundation

BD#11
Inundation continues toward Lake Tahoe

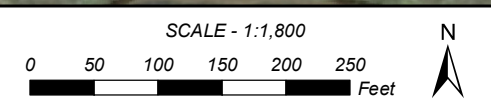
BD#10

Beaver Inundation

Inundation continues toward US50

Beaver Inundation

Note: BD#X calls out a recorded beaver dam. The five shown on the map act as a primary blockages for flow in or returning to Trout Creek's main and secondary channels. Another seven have been recorded as secondary inundation retention structures and are located along channel banks.



Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

TMSFPP
Beaver Diversion Structure
Inundation Extents

FIGURE 4-9

Job: 6001103 Date: FEBRUARY 2017



Figure 4-10. Beaver dam on return flows near STPUD Manhole BV22, Oct 2016



Figure 4-11. Inundation in District easement downstream of Manhole BV22, Aug 2016

5 YEAR 3 PLAN AND CONSTRUCTION

5.1 Year 3 Plans

Post-construction vegetation monitoring and Year 3 planning and design was delayed until fall by inundation upstream of the Bellevue project area. The Year 1 and 2 improvements were generally considered effective at treating conditions in the Bellevue work area, and only minor work was considered necessary in this area in Year 3, pending further monitoring of pilot channel development and vegetative growth. Year 3 improvements were focused on installing hummocks and planting in areas upstream of Bellevue Avenue where increased inundation due to beaver activity presented a problem for access to District manholes. In addition, Year 3 improvements included a measure to address beaver activity at the head of the secondary channel in the center of the marsh, which reduces flows into the secondary channel that was activated in Year 2.

Year 3 plans were developed to include:

- Additional planting of wetland plugs in the right overbank near the end of Bellevue Avenue;
- Reinforcement and extension of an existing coir log at the head of Hummock H4 to encourage flow into Pilot Channel 1;
- Installation of a double marsh mat hummock near Manhole 18, downstream of Hummock H6 in the District's easement;
- Slight modification of coir logs around the south side of Hummock H6 to lower top elevations to the level of the adjacent marsh to allow free drainage of overbank flows and reduce ponding in the easement;
- Installation of a marsh mat and willow mattress hummock and short pilot channel near Manhole 19;
- Installation of a hummock near Manhole 21;
- Installation of a double marsh mat hummock between Manholes 21 and 22 in a low spot within the easement;
- Installation of a double marsh mat hummock near Manhole 22;
- Installation of a pond leveler at the head of the secondary channel in the center of the marsh to maintain an estimated 3 cfs minimum flow through the channel.

With the exception of the pond leveler, Year 3 improvements required no heavy equipment access and no significant grading activities. Plans were reviewed with the permitting and resource agencies in early October 2016 and construction was implemented in late October through a change order with V&C Construction.

During installation of the pond leveler, flooded areas along the left bank of Trout Creek, upstream of the confluence of the secondary channel to Trout Creek, prohibited access to the work site using a compact

4x 4 utility vehicle (Kawasaki Mule). Materials for construction of the pond leveler were then carried from the staging area to the work site at the head of the secondary channel using a New Holland E55 Compact Excavator (NHE55). As the compact excavator was mobilized to the work site, it was also used to assist hand crews set the pond leveler into the secondary channel.

Appendix C includes Year 3 Plans designed to meet the objectives above.

6 REFERENCES

AECOM, 2014. Preliminary Delineation of Waters of the United States, Including Wetlands, Trout Creek Upper Truckee Marsh Sewer Protection project, prepared for South Tahoe Public Utility District, April 2014.

California Department of General Services and California Tahoe Conservancy, 2013. *Upper Truckee River and Marsh Restoration Project Draft EIR/EIS*. South Lake Tahoe and Sacramento, CA. Prepared by AECOM and Cardno ENTRIX.

Lumos & Associates, 2014. Topographic Survey for Truckee Marsh Sewer Facilities Protection Project, survey date 25 and 26 November 2014; January 2015.

NHC, 2014. *Upper Truckee Marsh Sewer Facilities Adaptive Management Plan*, prepared for South Tahoe Public Utility District, April, 2014.

NHC, 2015. *2015 Annual Report, Upper Truckee Marsh Sewer Facilities Protection Plan*, prepared for South Tahoe Public Utilities District, November 2015.

Tri-State Surveying, 2013. Topographic Survey for Truckee Marsh Sewer Facilities Protection Project, survey date 16 October 2013; November, 2013

TRPA, 2010. LiDAR dataset for Lake Tahoe region, prepared by Watershed Sciences, Corvallis OR. August 2010.

USFS, 2011. Basin Native Non-game Fish Assessment, Annual Report. USDA Forest Service, Lake Tahoe Basin Management Unit, South Lake Tahoe, CA.

Western Botanical Services, 2014. *Reference Vegetation Memorandum, Upper Truckee Marsh Sewer Facilities*. Prepared for Northwest Hydraulic Consultants and South Tahoe Public Utility District. September 2014.

Western Botanical Services, 2015. *Revegetation Monitoring Memorandum, Upper Truckee marsh Sewer Facilities*. Prepared for Northwest Hydraulic Consultants and South Tahoe Public Utility District. October 2015.

APPENDIX A

Baseline Information

UTMSFPP ADAPTIVE MANAGEMENT PLAN

2016 ANNUAL REPORT

APPENDIX A – 2015 CONSTRUCTION

ADAPTIVE MANAGEMENT PLAN, YEAR 2 IMPROVEMENTS, FINAL PLANS, NHC, 2015

REDLINES OF FIELD CHANGES - YEAR 2 CONSTRUCTION, NHC, 2015

WILDLIFE SURVEY RESULTS AND COMMUNICATIONS – AECOM, 2015

FISHERIES RESCUE AND RELOCATION, ELECTROFISHING DATA SHEETS - AECOM, 2015

CULTURAL RESOURCES MONITORING SUMMARY - AECOM, 2015

COVER	T1
LEGEND & NOTES	G1
ACCESS & STAGING PLANS	G2-G2
IMPROVEMENTS NEAR BELLEVUE PUMP STATION	C1
SECONDARY CHANNEL IMPROVEMENTS	C2
DETAILS	D1
DETAILS	D2

South Tahoe Public Utility District

CONSTRUCTION PLANS FOR

Upper Truckee Marsh Sewer Facilities

Adaptive Management Plan - Year 2 Improvements

JULY 2015

PROJECT MANAGER

Ivo Bergsohn, Hydrogeologist
 South Tahoe Public Utility District
 1275 Meadow Crest Road
 South Lake Tahoe, California 96150

APPROVED BY:

Shannon Cotulla, PE, Assistant General Manager (date)
 South Tahoe Public Utility District
 1275 Meadow Crest Road
 South Lake Tahoe, California 96150



South Tahoe Public Utility District

1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpud.us



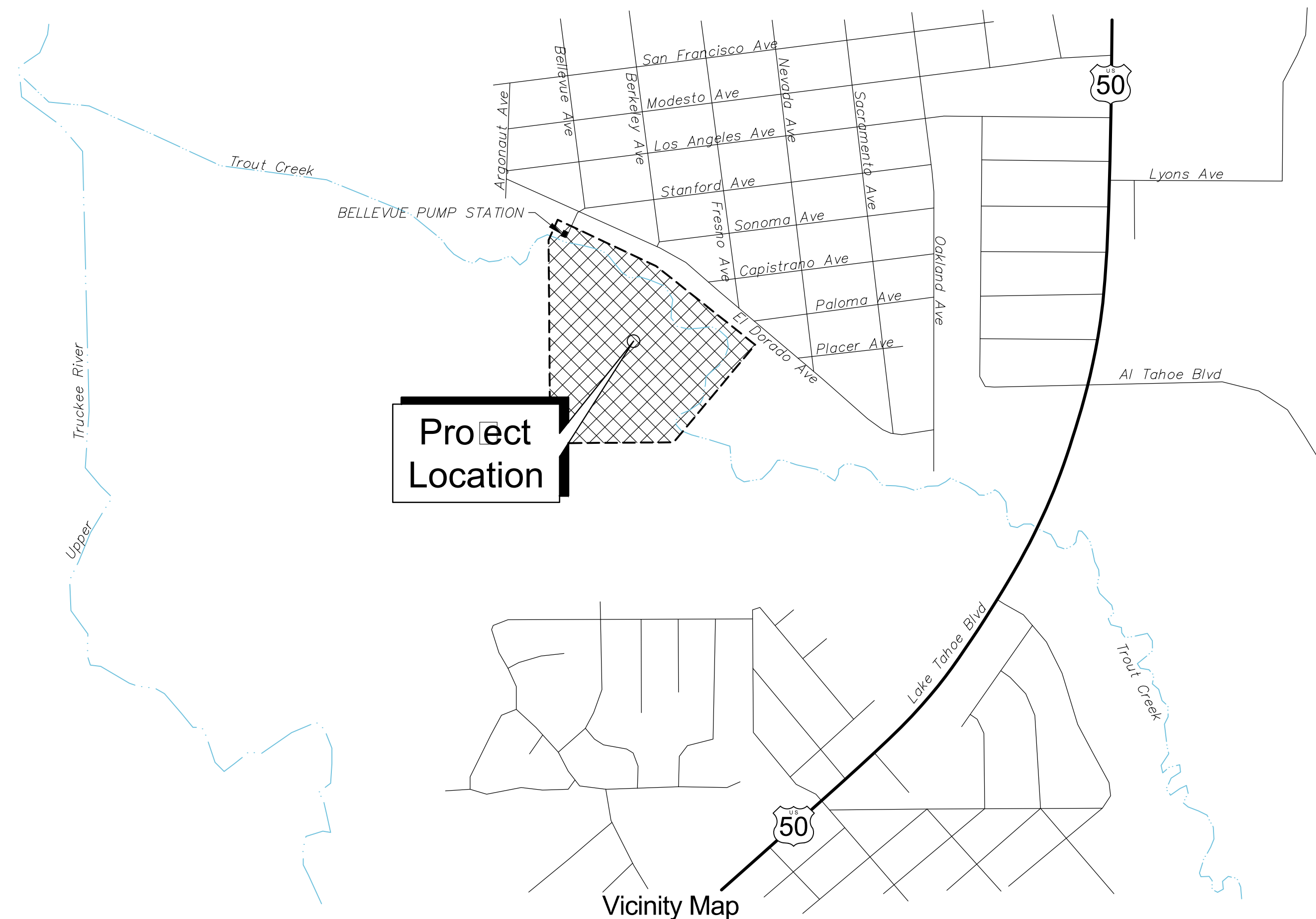
80 south lake avenue, suite 800
 pasadena, california 91101-2585
 phone: (626) 440-0080 fax: (626) 440-1881
 www.nhcweb.com



5859 Mt Rose Highway
 Reno, Nevada 89511
 (775) 849-3223
 www.wbsinc.us



Edward E. Wallace 08 JULY 2015 (date)
 Edward E. Wallace
 CALIFORNIA REGISTERED
 PROFESSIONAL ENGINEER NO. # 32301
 northwest hydraulic consultants



Drawing Name UT MARSH YR2 COVER		Date 8 July 2015 14:03	
Drawing Status Final	Designer tvs	Drafter tvs	Checked eew
			Job Number 6000145
			Sheet Number

Sheet 1 of 8

T1

GENERAL NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING UTILITY COMPANIES TO DETERMINE THE LOCATION OF UNDERGROUND FACILITIES. THE LOCATION OF KNOWN EXISTING FACILITIES IN THE WORK AREA ARE SHOWN, BUT NO GUARANTEE IS MADE AS TO THE ACCURACY OF THIS INFORMATION.
2. THE CONTRACTOR SHALL PROTECT EXISTING SURVEY CONTROL POINTS AND SHALL BE RESPONSIBLE FOR CONSTRUCTION STAKING. IF EXISTING MONUMENT(S) MUST BE DISTURBED TO PERFORM THE WORK, THE CONTRACTOR SHALL NOTIFY THE DISTRICT FOR RELOCATION OF THE MONUMENT PRIOR TO BEGINNING TO WORK.
3. THE ENGINEER MAY MAKE MINOR CHANGES TO THE CONFIGURATION AND DESIGN GRADES OF PROJECT FEATURES AND TO REVEGETATION LAYOUTS TO SUIT FIELD CONDITIONS.
4. THE CONTRACTOR SHALL CONTACT THE DISTRICT IMMEDIATELY IF FIELD CONDITIONS ARE FOUND THAT CONFLICT WITH THESE PLANS. FIELD ADJUSTMENTS MUST BE APPROVED BY THE DISTRICT PRIOR TO CONSTRUCTION.
5. IF ANY ARTIFACTS OR OTHER MATERIALS ARE FOUND INDICATING POTENTIAL ARCHAEOLOGICAL OR HISTORICAL RESOURCES, WORK SHALL BE HALTED IMMEDIATELY AND THE CONTRACTOR SHALL CONTACT THE DISTRICT.
6. NO TREES ARE DESIGNATED FOR REMOVAL. IF FIELD CONDITIONS INDICATE THE NEED FOR TREE REMOVAL, PRIOR APPROVAL FROM THE DISTRICT AND TRPA IS REQUIRED.
7. NO GRADING SHALL OCCUR PRIOR TO INSTALLATION OF CONSTRUCTION BMPs AND APPROVAL BY TRPA AT A PRE-GRADE INSPECTION. BMPs TO BE INSTALLED PRIOR TO EQUIPMENT OR TRUCK USE OF ACCESS ROUTES IN PROJECT AREA.
8. WORK TO BE PERFORMED IS PART OF A MULTI-YEAR ADAPTIVE MANAGEMENT PLAN(AMP). PERMIT CONDITIONS FOR THE AMP APPLY TO THE PROJECT.
9. ON-SITE WORK SHALL BE PERFORMED FROM 8AM TO 6PM, MONDAY THROUGH FRIDAY. WORK OUTSIDE THESE HOURS MUST BE APPROVED BY THE DISTRICT A MINIMUM OF 48 HOURS BEFORE THE ABNORMAL WORKING HOURS ARE SCHEDULED TO BEGIN.
10. EXCESS MATERIAL SHALL BE DISPOSED OF OFFSITE AT A LOCATION APPROVED BY THE DISTRICT.

AREAS & QUANTITIES - YEAR 2 IMPROVEMENTS

DISTURBANCE AREAS AND APPROXIMATE CUT/FILL QUANTITIES		
COMPONENT	SURFACE AREA, SF	CUT (-)/FILL(+) CY
ACCESS ROUTES	28183.0	
PILOT CHANNELS	300.0	-7
PILOT CHANNEL DEEPENING	540.0	-15
HUMMOCKS (FILL)	600.0	10
RIGHT BANK PLUGS	120.0	3
PLANTED COIR LOGS	80.0	-3
WETLAND PLUG PLANTING	180.0	0
TOTALS	30,003	-12

*EXCLUDES AREAS WHERE ONLY PLANTING OCCURS

SEQUENCE OF WORK

1. INSTALL BMPs AND ACCESS ROUTES
2. DEWATER AND CONSTRUCT PILOT CHANNEL ON SECONDARY CHANNEL; INSTALL FLOW CONTROL BARRIER AT HEAD OF CHANNEL; OPEN CHANNEL TO FLOW
3. DEWATER PILOT CHANNEL PC-3 IN BELLEVUE AREA AND DEEPEN PILOT CHANNEL; OPEN TO FLOW
4. IF DETERMINED NEEDED BY DISTRICT, DEWATER PILOT CHANNEL PC-1 AND DEEPEN PILOT CHANNEL; OPEN TO FLOW
5. INSTALL DEWATERING BARRIERS 8 & 9. IF NEEDED TO PREVENT FLOW IN OVERBANK DOWNSTREAM OF PC-1, PUMP, IF NEEDED TO DEWATER FILL HUMMOCK 5A WORK AREA.
6. INSTALL FILL HUMMOCK 5A, PLANTED COIR LOGS, RIGHT OVERBANK PLUG, AND WETLAND PLUG PLANTINGS.
7. MANAGE FLOWS AT SECONDARY CHANNEL TO PROVIDE MAXIMUM FLOW IN PC-1 AND PC-3 WITHOUT OVERBANK FLOW
8. DECOMMISSION ACCESS ROUTES
9. CONDUCT VEGETATION MAINTENANCE AND IRRIGATION

MONUMENT LOCATIONS					
NAME	LATITUDE (NAD83)	LONGITUDE (NAD83)	NORTHING (GRID)	EASTING (GRID)	ELEVATION (NAVD88)
RBM T01	38.936805560°N	119.989783506°W	2109311.8	7133398.2	6234.3
RBM T02	38.936678391°N	119.989687343°W	2109266.1	7133426.6	6234.4
RBM T04	38.936695860°N	119.989298498°W	2109274.9	713537.0	6234.3
RBM T05	38.936536812°N	119.988919311°W	2109219.4	7133646.1	6235.0
RBM T07	38.936210006°N	119.987960945°W	2109106.4	7133921.3	6234.9

LEGEND

- EXISTING TREES
- EXISTING EDGE OF PAVED ROAD
- EXISTING TRAIL
- EXISTING CONTOURS (MAJOR)
- EXISTING CONTOURS (MINOR)
- EXISTING FENCE
- EXISTING EDGE OF WATER (10/25/13)
- EXISTING BUILDINGS & STRUCTURES
- SURVEY CONTROL POINT
- PROPOSED SLOPE
- CONSTRUCTION BASELINE
- SILT BARRIER
- SAFETY PRESERVATION FENCE WITH SILT BARRIER
- PROPOSED CONTOURS (MAJOR)
- PROPOSED CONTOURS (MINOR)
- PROPOSED SPOT ELEVATIONS
- HUMMOCK
- DIVERSION DAM
- STAGING AREA

SURVEY
TOPOGRAPHY BASED ON FIELD SURVEY, 25 & 26 NOVEMBER 2014, BY LUMOS & ASSOCIATES.

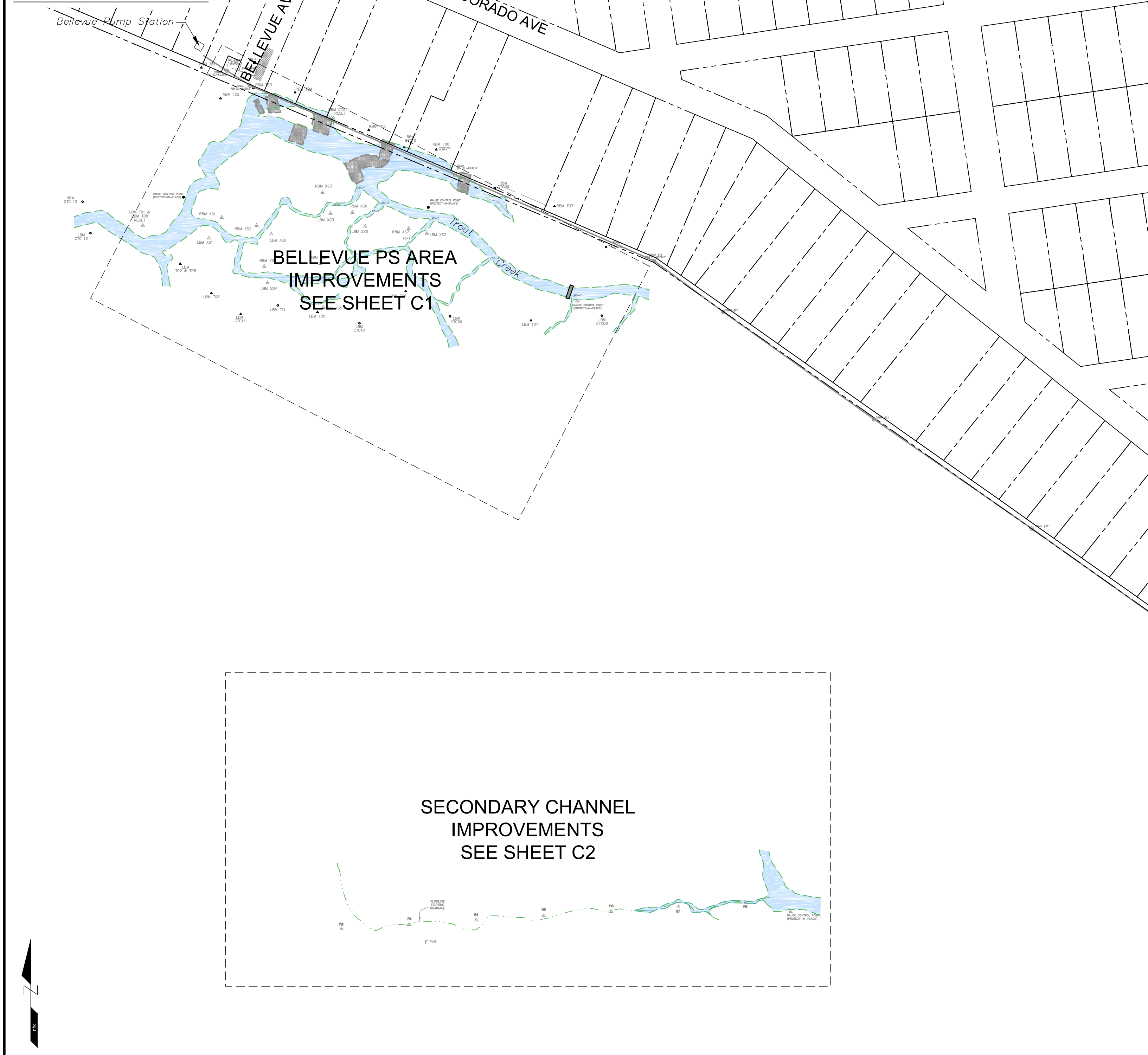
HORIZONTAL: NAD 83(2011) EPOCH 2010.00 CALIFORNIA ZONE 2

NGS HPGN D CA 03 FS
N 2107571.07 US SURVEY FEET- GRID
E 7136557.88

NGS RICHARDSON
N 2103848.87 US SURVEY FEET - GRID
E 7123525.92 GRID

VERTICAL: NAVD88
NGS HPGN D CA 03 FS
EL = 6248.20

PROJECT OVERVIEW

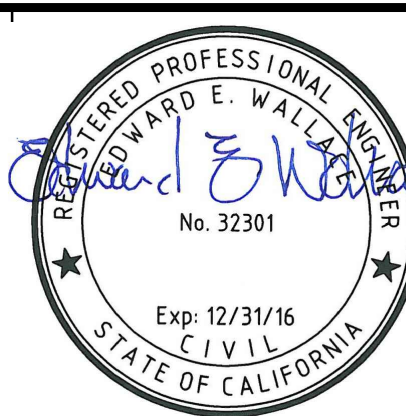


PROJECT OVERVIEW

SCALE: 1"=100'

South Tahoe Public Utility District
1275 Meadow Crest Drive
South Lake Tahoe, California 96150
(530) 544-6474
www.stpud.us

nhc
northwest hydraulic consultants
80 south lake avenue, suite 800
pasadena, california 91101
phone: (626) 440-0080
fax: (626) 440-1881
www.nhcweb.com



Revisions			Drawing Information	
No.	Date	Description	Date	
			8 July 2015 (02:03)	Status
				Final
				Designer
				tvs
				Drafter
				tvs
				Checked
				eew
				File Name
				UT MARSH YR2 COVER
				Plotted Scale
				0 1/2 1

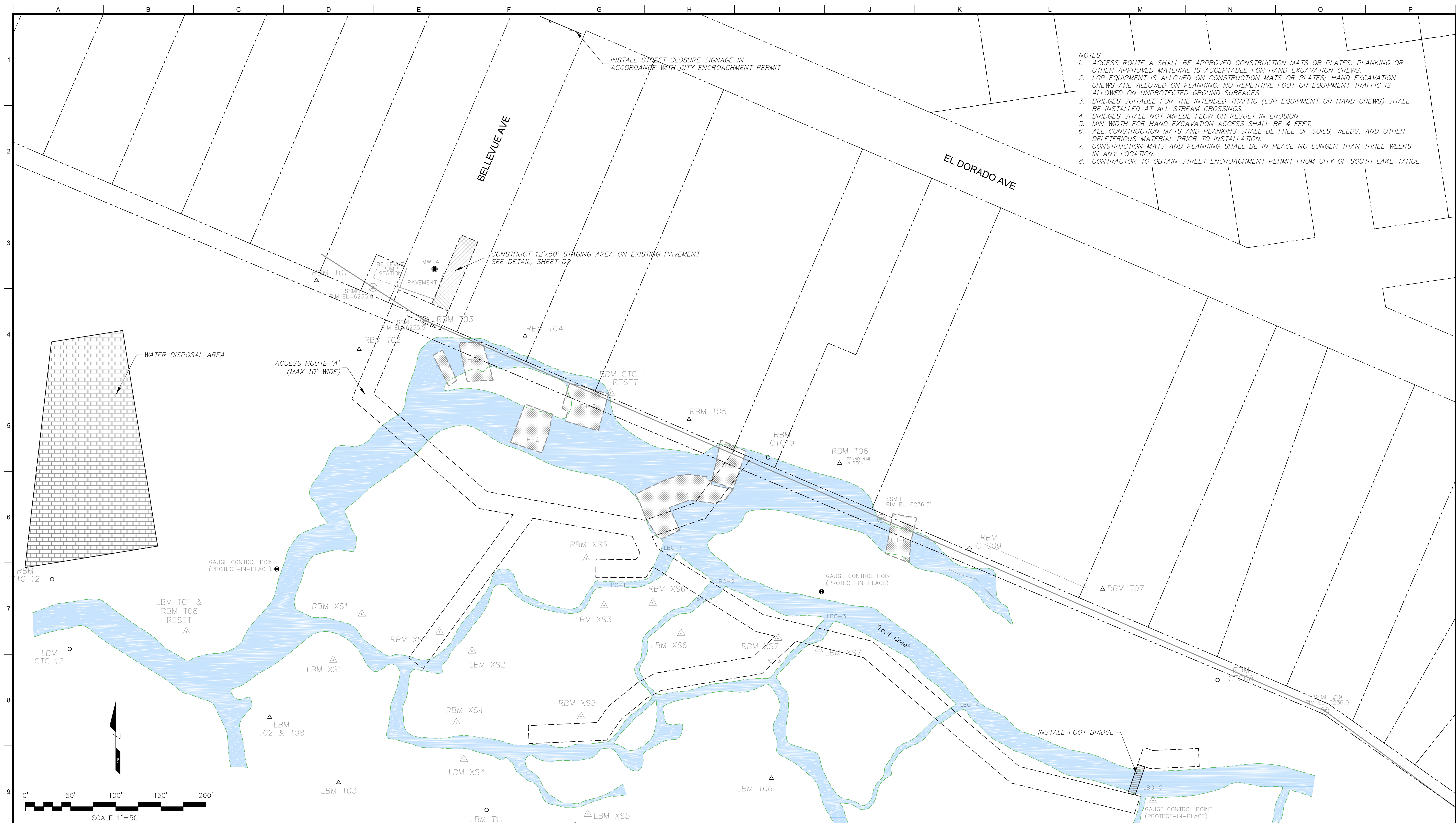
Upper Truckee Marsh Sewer Facilities
Adaptive Management Plan
Year 2 Improvements
Legend □ Notes Sheet

Job Number
6000145

Sheet Number

G1

Sheet 2 of 8



- NOTES
1. ACCESS ROUTE A SHALL BE APPROVED CONSTRUCTION MATS OR PLATES. PLANKING OR OTHER APPROVED MATERIAL IS ACCEPTABLE FOR HAND EXCAVATION CREWS.
 2. LGP EQUIPMENT IS ALLOWED ON CONSTRUCTION MATS OR PLATES; HAND EXCAVATION CREWS ARE ALLOWED ON PLANKING. NO REPETITIVE FOOT OR EQUIPMENT TRAFFIC IS ALLOWED ON UNPROTECTED GROUND SURFACES.
 3. BRIDGES SUITABLE FOR THE INTENDED TRAFFIC (LGP EQUIPMENT OR HAND CREWS) SHALL BE INSTALLED AT ALL STREAM CROSSINGS.
 4. BRIDGES SHALL NOT IMPEDE FLOW OR RESULT IN EROSION.
 5. MIN WIDTH FOR HAND EXCAVATION ACCESS SHALL BE 4 FEET.
 6. ALL CONSTRUCTION MATS AND PLANKING SHALL BE FREE OF SOILS, WEEDS, AND OTHER DELETERIOUS MATERIAL PRIOR TO INSTALLATION.
 7. CONSTRUCTION MATS AND PLANKING SHALL BE IN PLACE NO LONGER THAN THREE WEEKS IN ANY LOCATION.
 8. CONTRACTOR TO OBTAIN STREET ENCROACHMENT PERMIT FROM CITY OF SOUTH LAKE TAHOE.

South Tahoe Public Utility District
 1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpubd.us

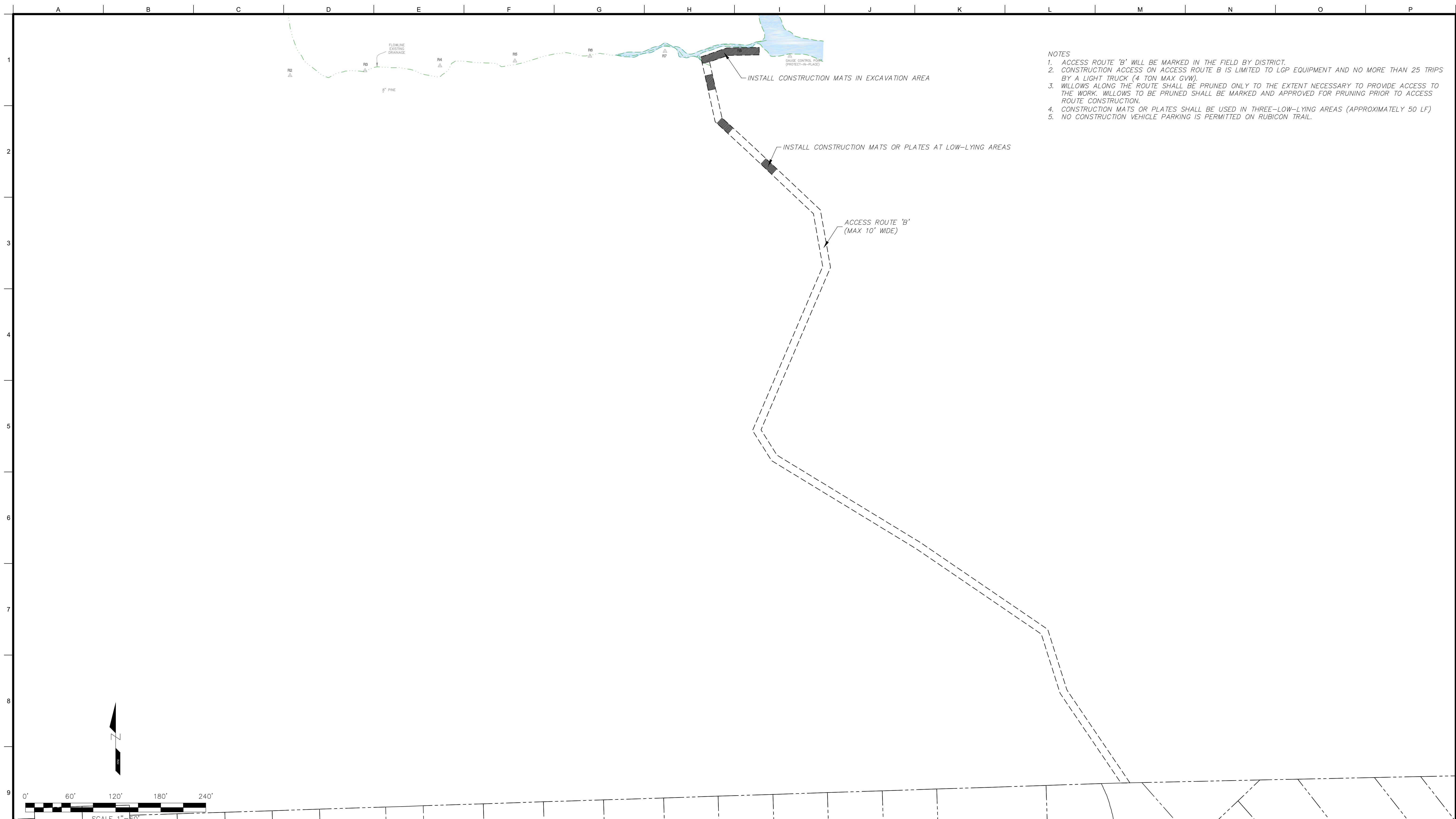
nhc
 northwest hydraulic consultants
 80 south lake avenue, suite 800
 pasadena, california 91101
 phone: (626) 440-0080
 fax: (626) 440-1881
 www.nhcweb.com



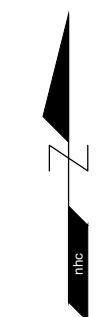
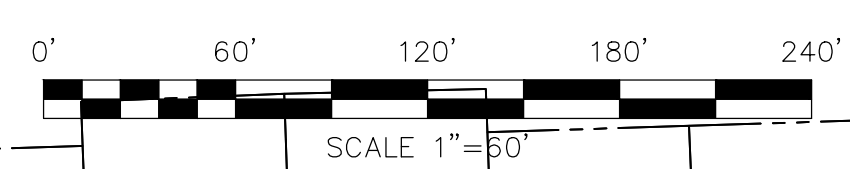
Revisions			Drawing Information	
No.	Date	Description	Date	
			8 July 2015 (02:03)	Status
				Final
				Designer
				tvs
				Drafter
				tvs
				Checked
				eew
				File Name
				UT MARSH YR2 COVER
				Plotted Scale
				0 1/2 1


**Upper Truckee Marsh Sewer Facilities
 Adaptive Management Plan
 Year 2 Improvements
 Bellevue PS Area Improvements
 Access Sheet**


Job Number
6000145
 Sheet Number
G2
 Sheet 3 of 8

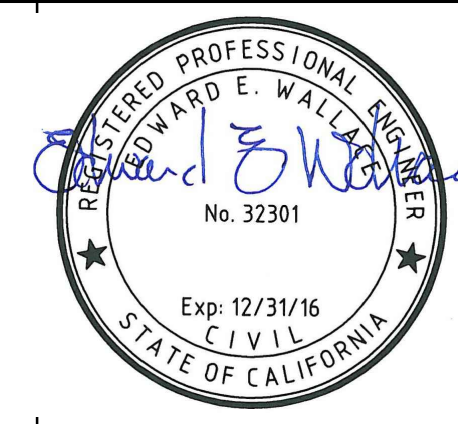


- NOTES
1. ACCESS ROUTE 'B' WILL BE MARKED IN THE FIELD BY DISTRICT.
 2. CONSTRUCTION ACCESS ON ACCESS ROUTE B IS LIMITED TO LGP EQUIPMENT AND NO MORE THAN 25 TRIPS BY A LIGHT TRUCK (4 TON MAX GVW).
 3. WILLOWS ALONG THE ROUTE SHALL BE PRUNED ONLY TO THE EXTENT NECESSARY TO PROVIDE ACCESS TO THE WORK. WILLOWS TO BE PRUNED SHALL BE MARKED AND APPROVED FOR PRUNING PRIOR TO ACCESS ROUTE CONSTRUCTION.
 4. CONSTRUCTION MATS OR PLATES SHALL BE USED IN THREE-LOW-LYING AREAS (APPROXIMATELY 50 LF)
 5. NO CONSTRUCTION VEHICLE PARKING IS PERMITTED ON RUBICON TRAIL.

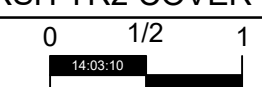



South Tahoe Public Utility District
 1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpud.us


nhc
northwest hydraulic consultants
 80 south lake avenue, suite 800
 pasadena, california 91101
 phone: (626) 440-0080
 fax: (626) 440-1881
 www.nhcweb.com

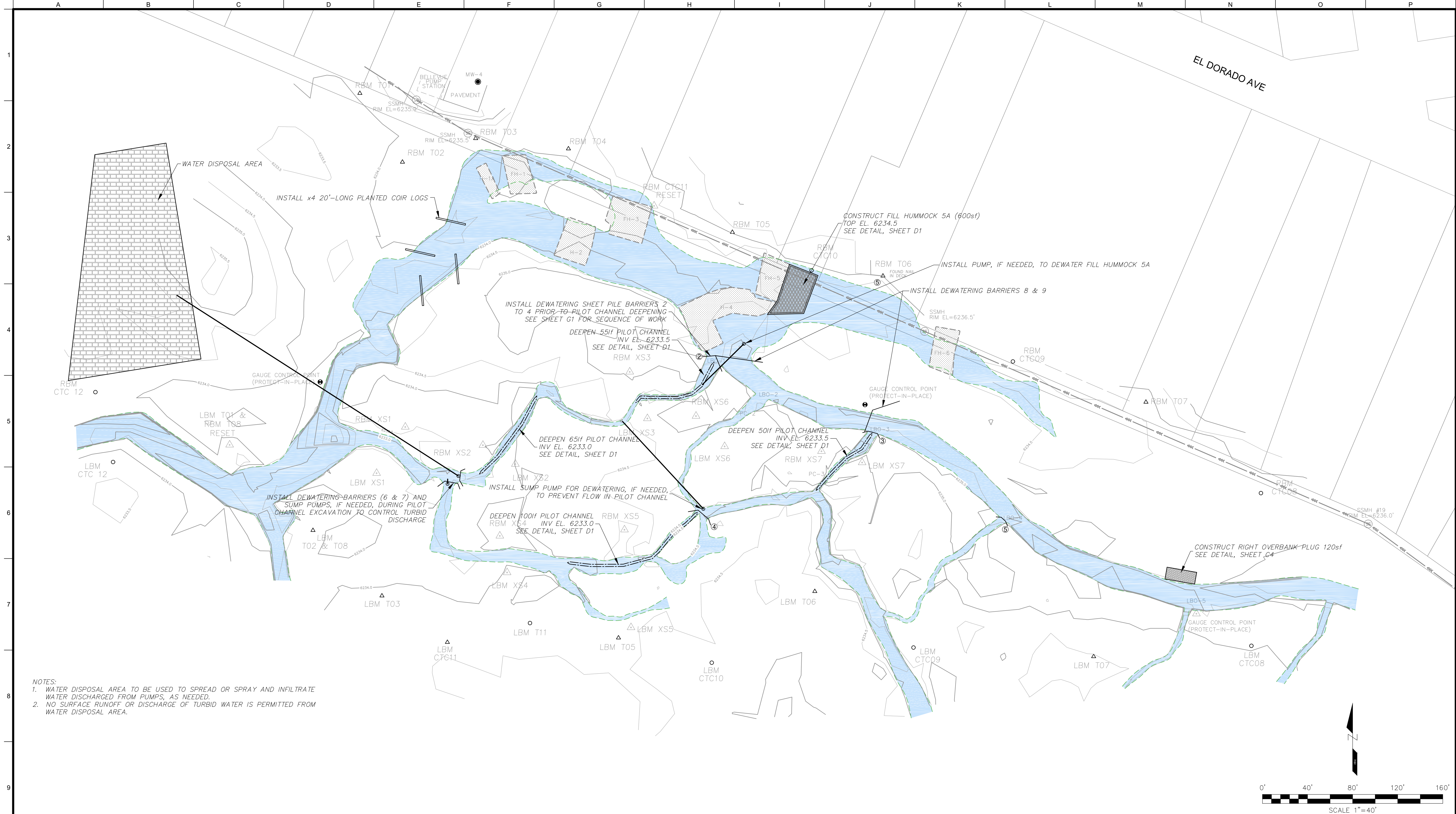


Revisions		
No.	Date	Description

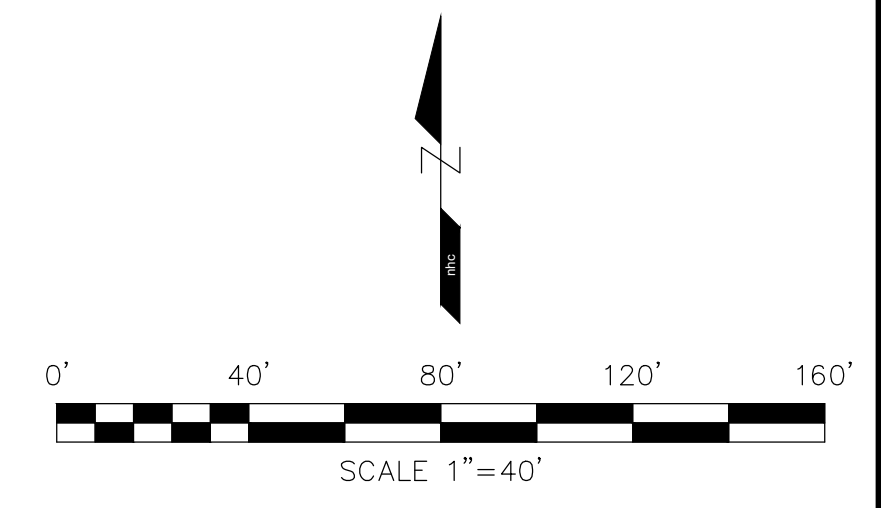
Drawing Information	
Date	8 July 2015 (02:03)
Status	Final
Designer	tvs
Drafter	tvs
Checked	eew
File Name	UT MARSH YR2 COVER
Plotted Scale	

Upper Truckee Marsh Sewer Facilities
Adaptive Management Plan
Year 2 Improvements
Secondary Channel Improvements
Access Sheet

Job Number
 6000145
 Sheet Number
G3
 Sheet 4 of 8

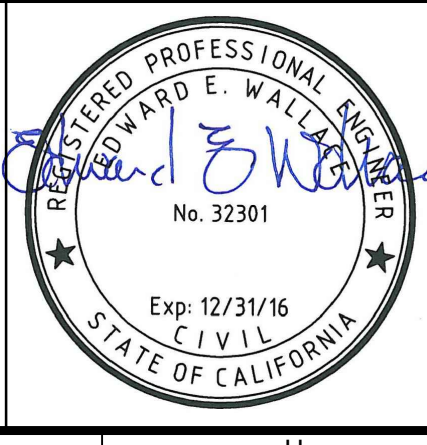


NOTES:
 1. WATER DISPOSAL AREA TO BE USED TO SPREAD OR SPRAY AND INFILTRATE WATER DISCHARGED FROM PUMPS, AS NEEDED.
 2. NO SURFACE RUNOFF OR DISCHARGE OF TURBID WATER IS PERMITTED FROM WATER DISPOSAL AREA.



South Tahoe Public Utility District
 1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpud.us

nhc
 northwest hydraulic consultants
 80 south lake avenue, suite 800
 pasadena, california 91101
 phone: (626) 440-0080
 fax: (626) 440-1881
 www.nhcweb.com

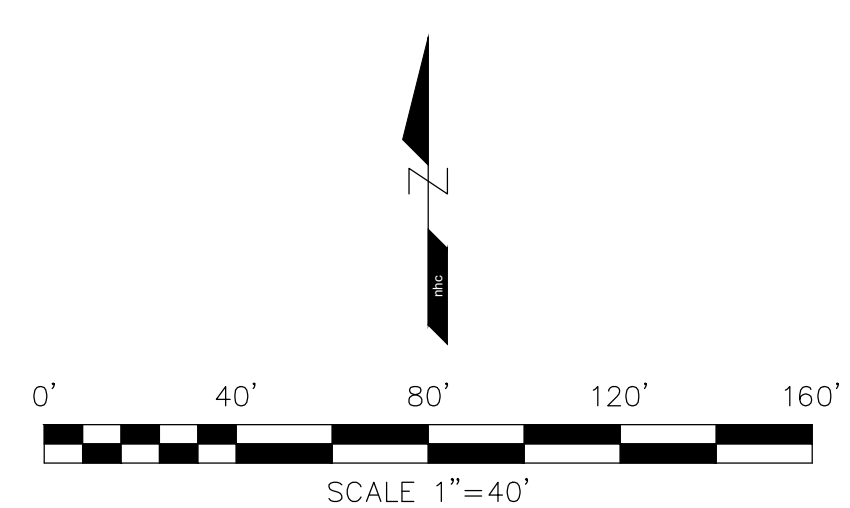
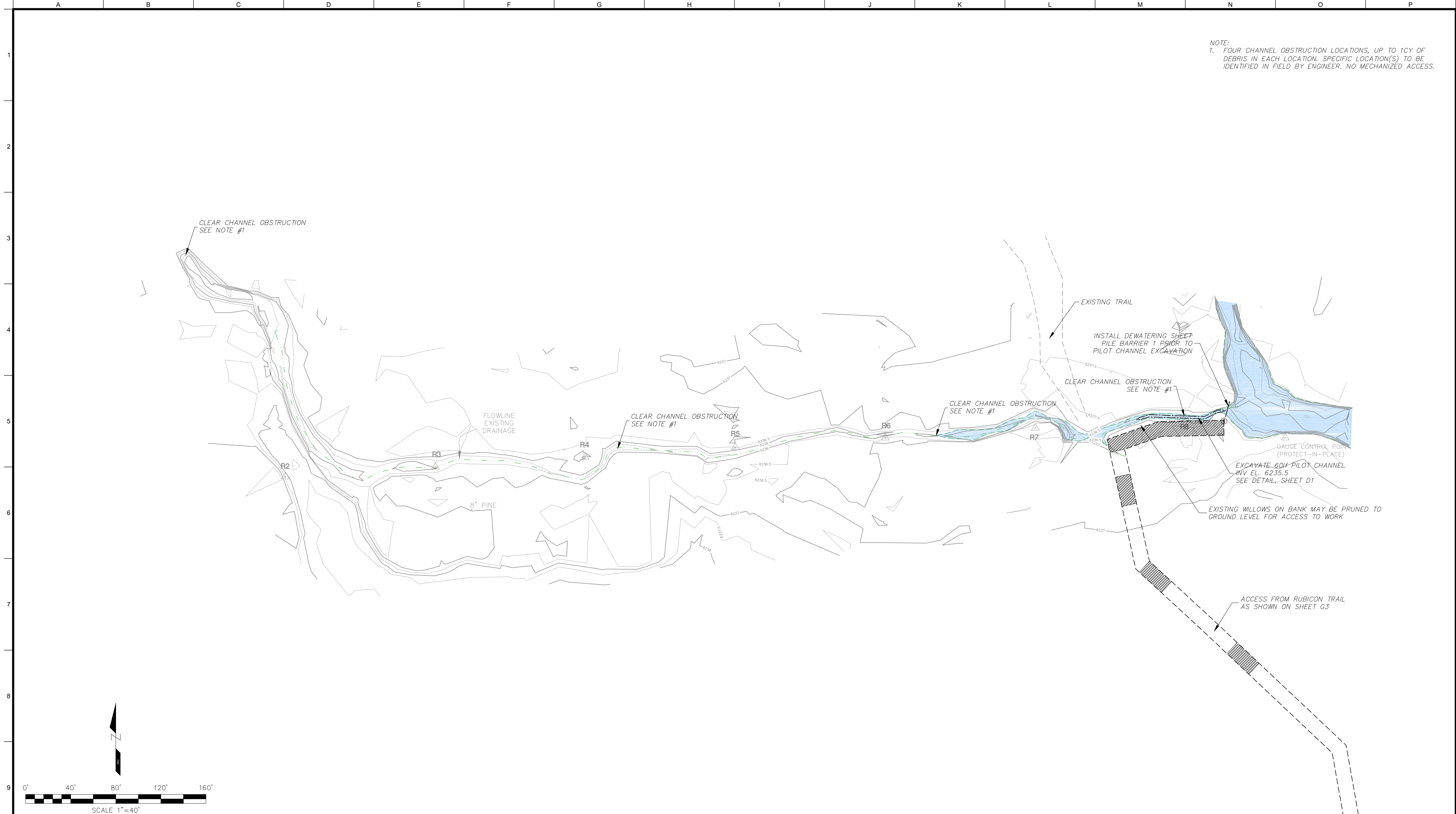


Revisions			Drawing Information	
No.	Date	Description	Date	
			8 July 2015 (01:51)	
			Status	Final
			Designer	tvs
			Drafter	tvs
			Checked	eew
			File Name	UT MARSH YR2
			Plotted Scale	0 1/2 1

**Upper Truckee Marsh Sewer Facilities
 Adaptive Management Plan
 Year 2 Improvements
 Bellevue PS Area Improvements
 Plan Sheet**

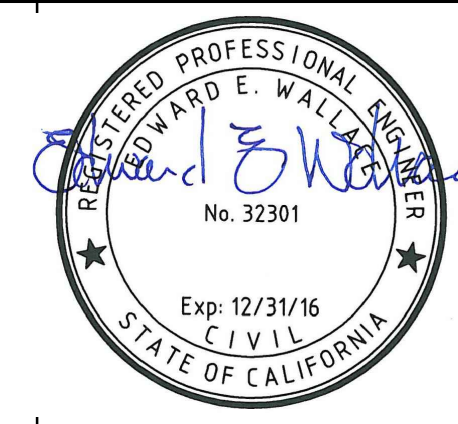
Job Number
6000145
 Sheet Number
C1
 Sheet 5 of 8

NOTE:
 1. FOUR CHANNEL OBSTRUCTION LOCATIONS, UP TO 1CY OF DEBRIS IN EACH LOCATION. SPECIFIC LOCATION(S) TO BE IDENTIFIED IN FIELD BY ENGINEER. NO MECHANIZED ACCESS.



South Tahoe Public Utility District
 1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpud.us

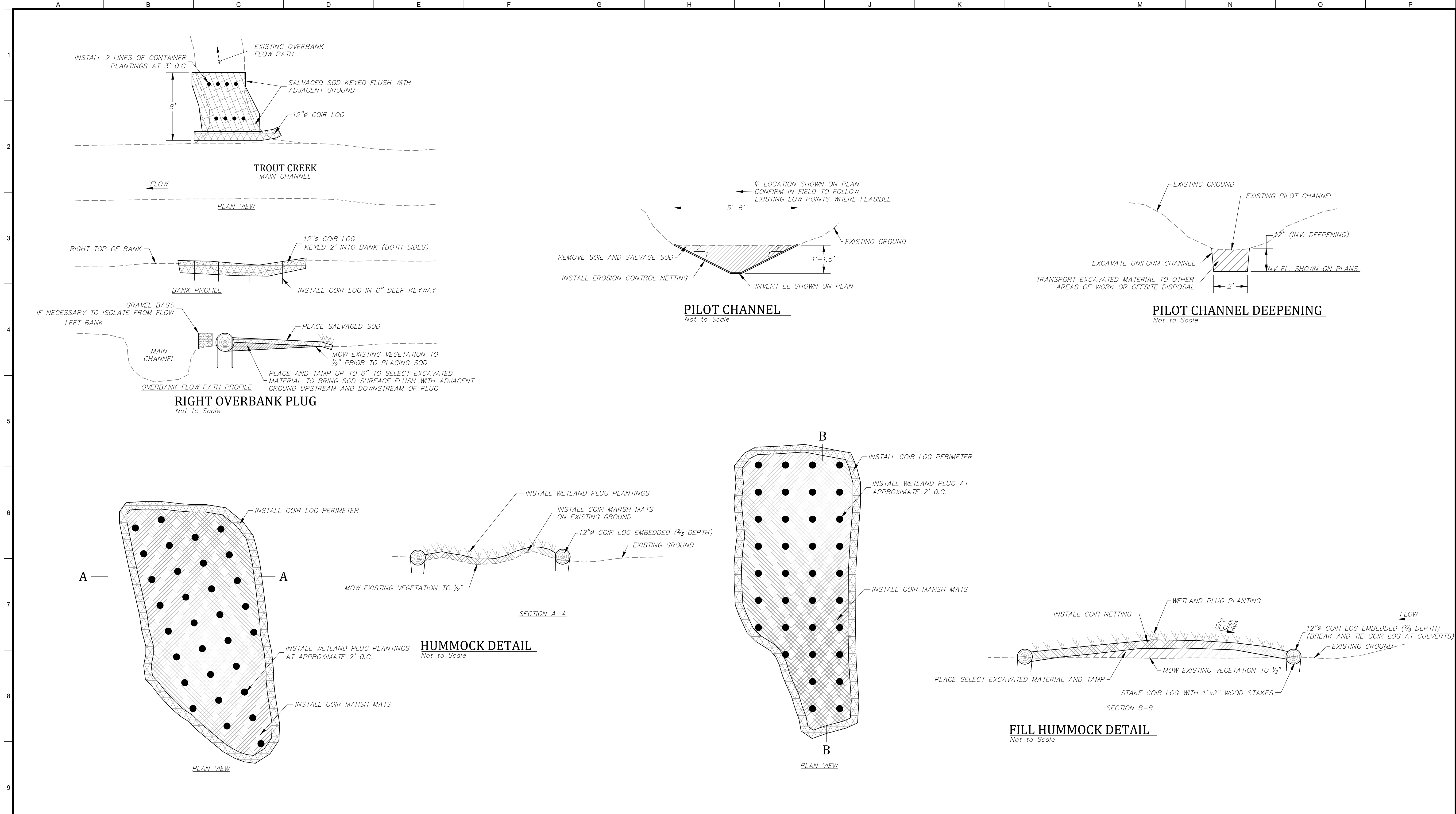
nhc
 northwest hydraulic consultants
 80 south lake avenue, suite 800
 pasadena, california 91101
 phone: (626) 440-0080
 fax: (626) 440-1881
 www.nhcweb.com



Revisions			Drawing Information	
No.	Date	Description	Date	
			8 July 2015 (01:51)	
			Status	Final
			Designer	tvs
			Drafter	tvs
			Checked	eew
			File Name	UT MARSH YR2
			Plotted Scale	0 1/2 1

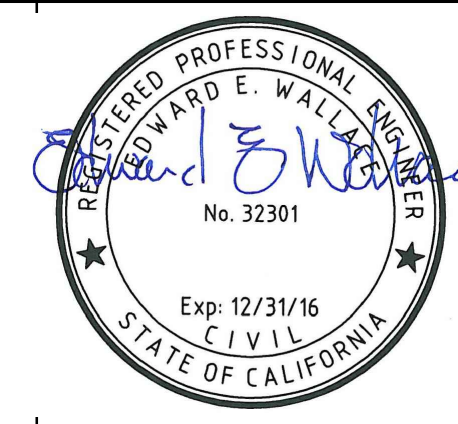
**Upper Truckee Marsh Sewer Facilities
 Adaptive Management Plan
 Year 2 Improvements
 Secondary Channel Improvements
 Plan Sheet**

Job Number
 6000145
 Sheet Number
C2
 Sheet 6 of 8



South Tahoe Public Utility District
 1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpud.us

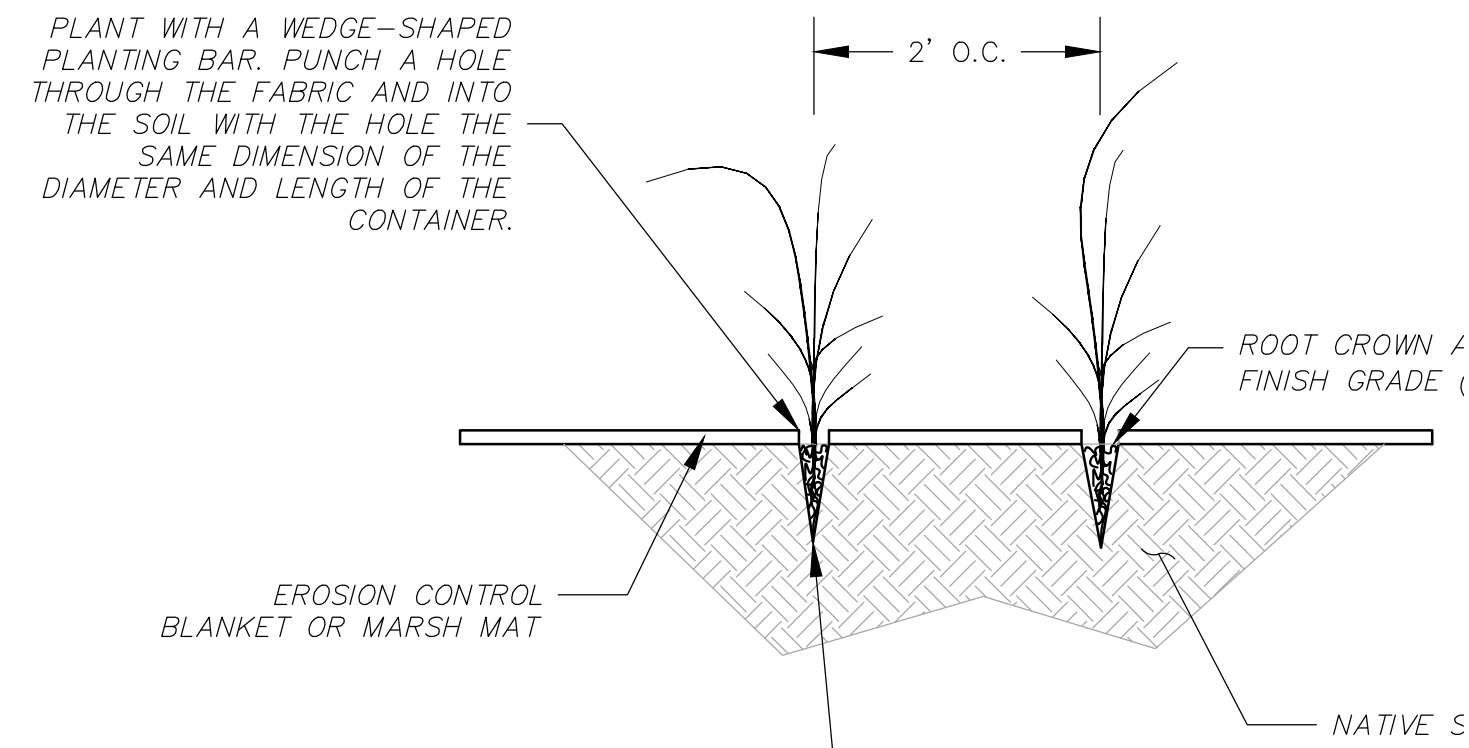
nhc
 northwest hydraulic consultants
 80 south lake avenue, suite 800
 pasadena, california 91101
 phone: (626) 440-0080
 fax: (626) 440-1881
 www.nhcweb.com



Revisions			Drawing Information	
No.	Date	Description	Date	
			8 July 2015 (01:56)	
			Status	Final
			Designer	tvs
			Drafter	tvs
			Checked	eew
			File Name	UT MARSH YR2 DETAILS
			Plotted Scale	0 1/2 1

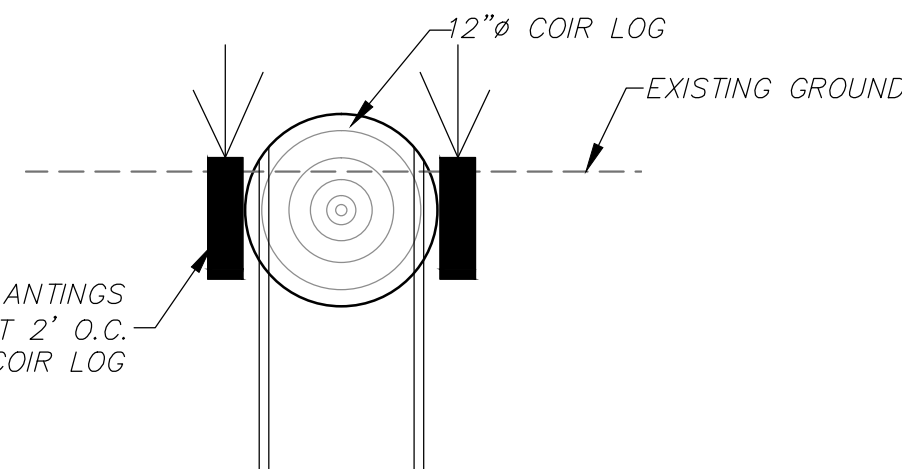
**Upper Truckee Marsh Sewer Facilities
 Adaptive Management Plan
 Year 2 Improvements
 Details Sheet**

Job Number
6000145
 Sheet Number
D1
 Sheet 7 of 8



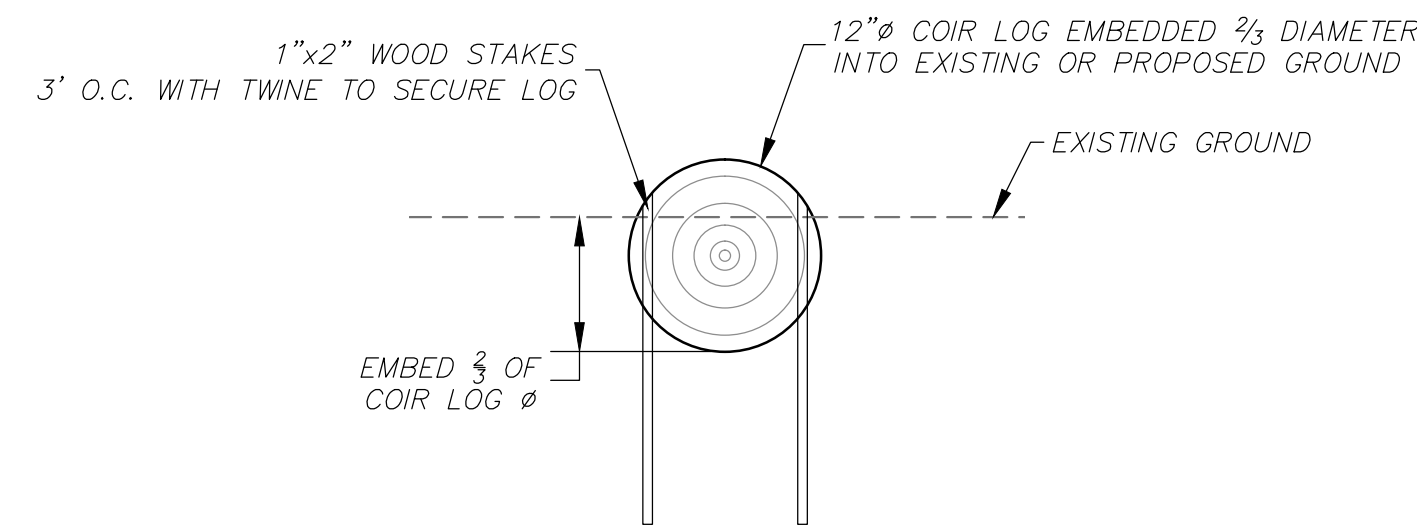
- NOTES:
1. PULL NETTING APART PRIOR TO DIGGING THE PLANTING HOLE TO MINIMIZE THE NEED TO CUT THE FABRIC.
 2. WETLAND PLUGS SHALL BE CAREX NEBRASCENSIS AND JUNCUS BALTICUS.
 3. WETLAND PLUGS SHALL BE SUPERCELL 1.5 INCH WIDE AND 8 INCHES DEEP OR DEEPOTS (10-INCH DEPTH).
 4. UP TO 45 WETLAND PLUGS WILL BE PLANTED AT LOCATIONS DIRECTED BY THE DISTRICT (NOT SHOWN ON PLANS)

WETLAND PLUG PLANTING
Not to Scale

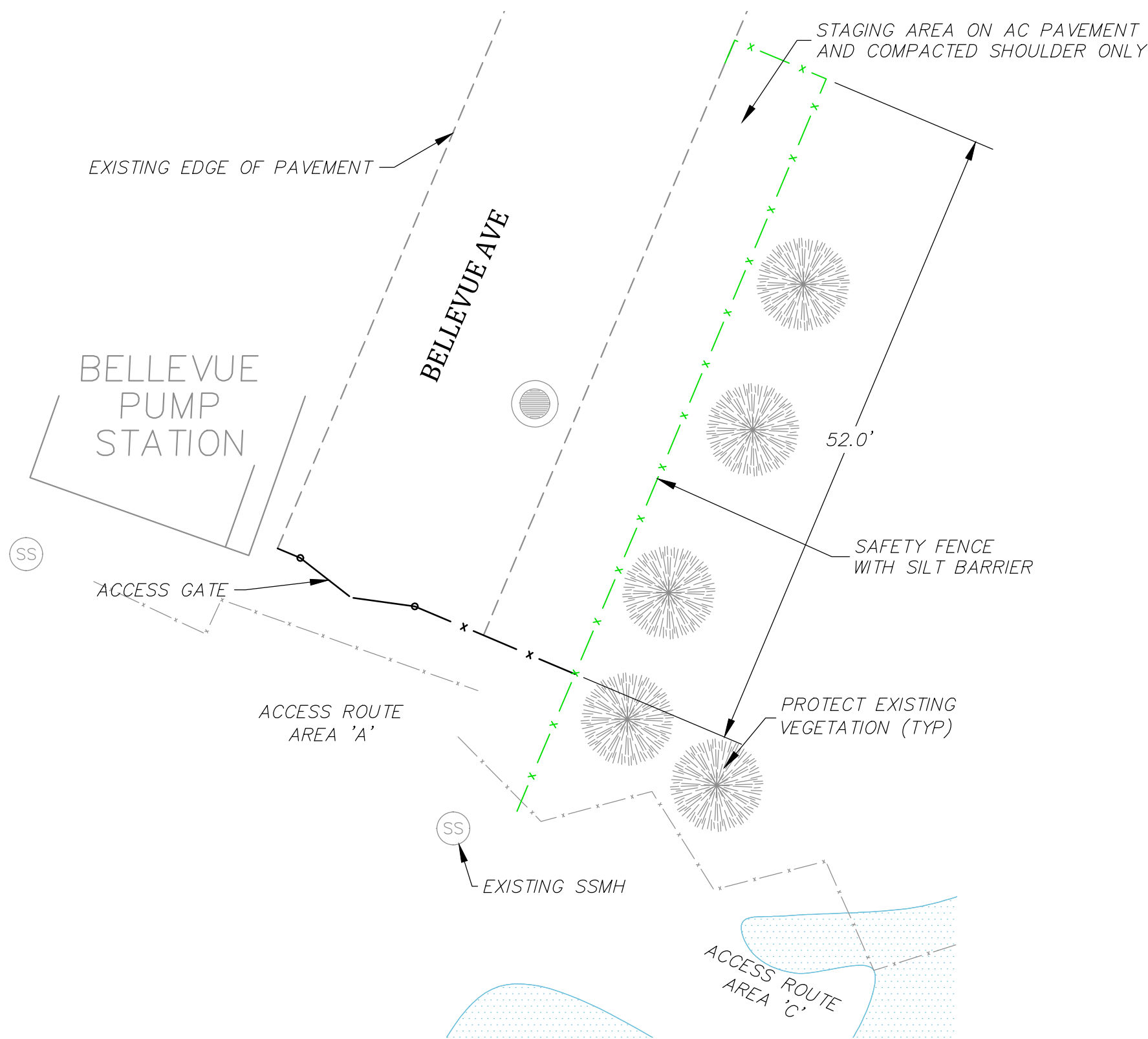


INSTALL WETLAND PLUG PLANTINGS OR SALVAGED SOD PLUG AT 2' O.C. IMMEDIATELY ADJACENT TO COIR LOG

PLANTED COIR LOG
Not to Scale

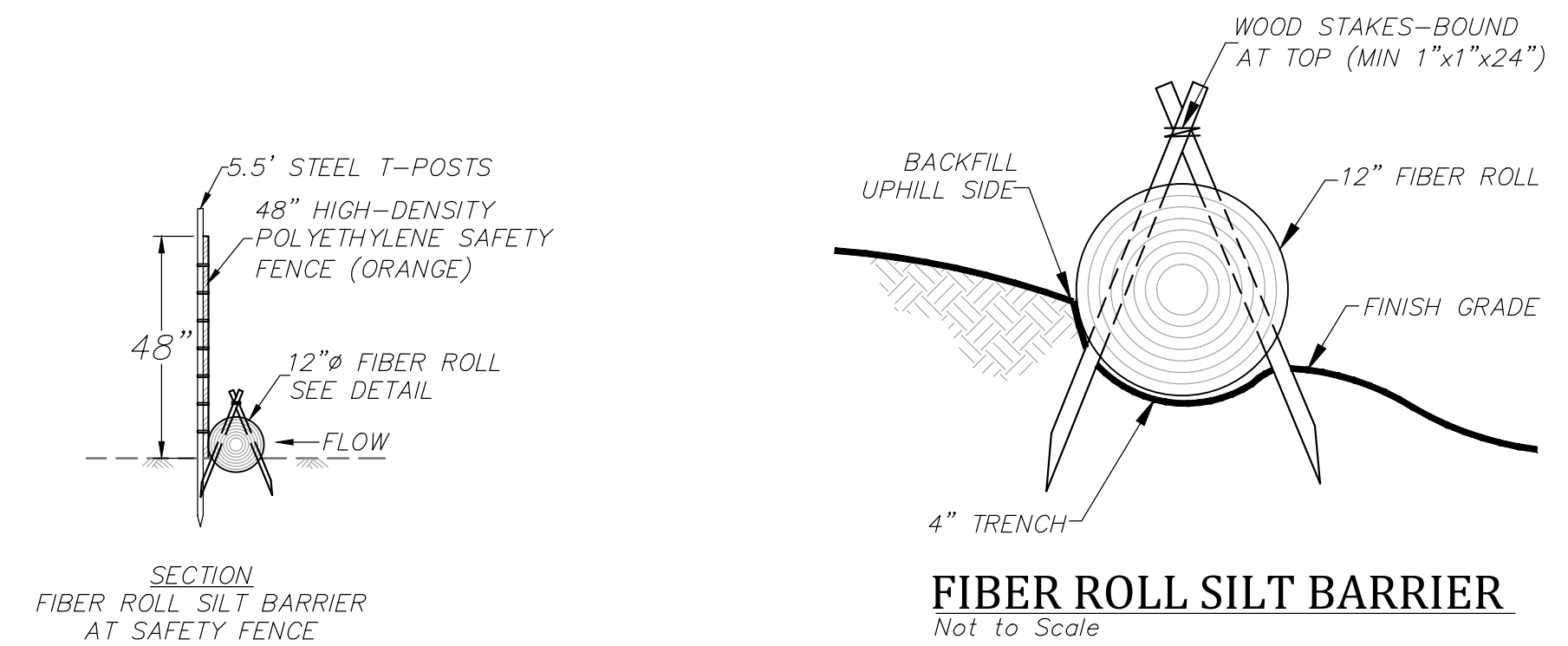


COIR LOG INSTALLATION
Scale: 1"=5'

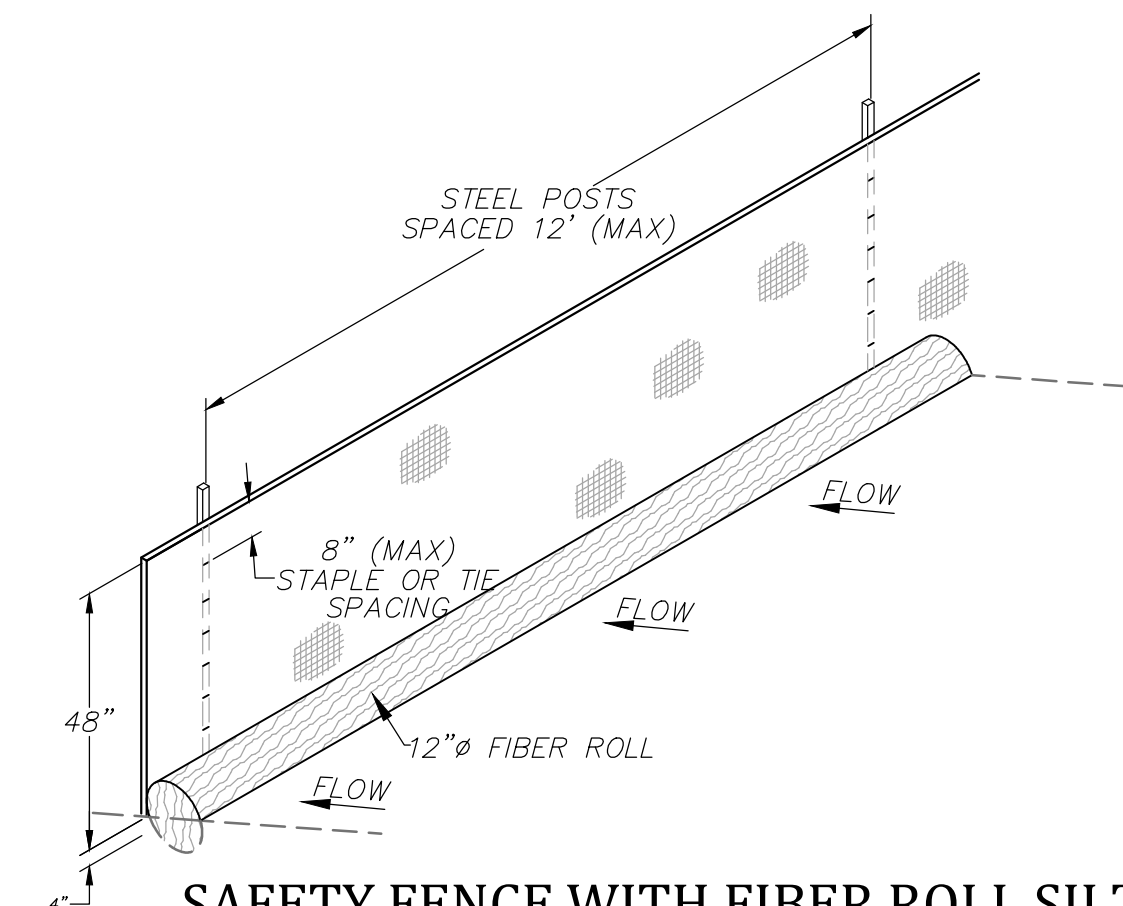


STAGING AREA BMPs
Not to Scale

- STAGING AREA BMP NOTES:
1. STAGING AREA TO BE MAINTAINED IN A CLEAN CONDITION
 2. CONTRACTOR IS RESPONSIBLE TO MAINTAIN OR RESTORE EXISTING AC PAVEMENT TO A PRE-PROJECT CONDITION.



FIBER ROLL SILT BARRIER
Not to Scale

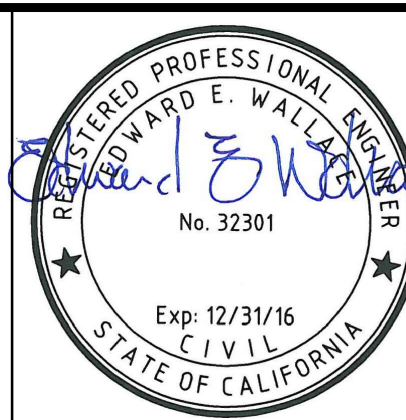


SAFETY FENCE WITH FIBER ROLL SILT BARRIER
Not to Scale

- NOTES:
1. FIBER ROLL SHALL BE MADE FROM 100% MATTRESS GRADE COCONUT FIBER AND BOUND BY HIGH STRENGTH COIR NETTING, AND HAVE A MINIMUM WEIGHT OF 5 LBS PER LINEAL FOOT.
 2. ORANGE SAFETY FENCE SHALL BE HIGH DENSITY POLYETHYLENE WITH A MESH OPENING OF APPROXIMATELY 1 INCH BY 4 INCHES AND A MINIMUM HEIGHT OF 4 FEET.
 3. FIBER ROLL SILT BARRIER SHALL BE INSTALLED ALONG CONTOUR AND ON SLOPES 5H:1V OR FLATTER UNLESS OTHERWISE APPROVED BY TRPA.
 4. THE INSTALLATION CONFIGURATION SHALL PREVENT RUNOFF FROM LEAVING THE SITE OR ENTERING A WATERCOURSE WITHOUT PASSING THROUGH A SILT BARRIER.
 5. THE MAXIMUM LENGTH OF SLOPE DRAINING TO THE SILT BARRIER SHALL BE 100 FEET.
 6. FIBER ROLL SHALL BE INSTALLED BY SHAPING A 4 INCH DEEP FURROW TO MATCH THE SHAPE OF THE LOG, SECURING IN FURROW WITH WOOD STAKES, AND TAMPING THE GROUND AROUND THE FIBER ROLL TO FILL VOIDS BETWEEN THE LOG AND THE GROUND.
 7. TRPA BMP-517

 South Tahoe Public Utility District
1275 Meadow Crest Drive
South Lake Tahoe, California 96150
(530) 544-6474
www.stpud.us

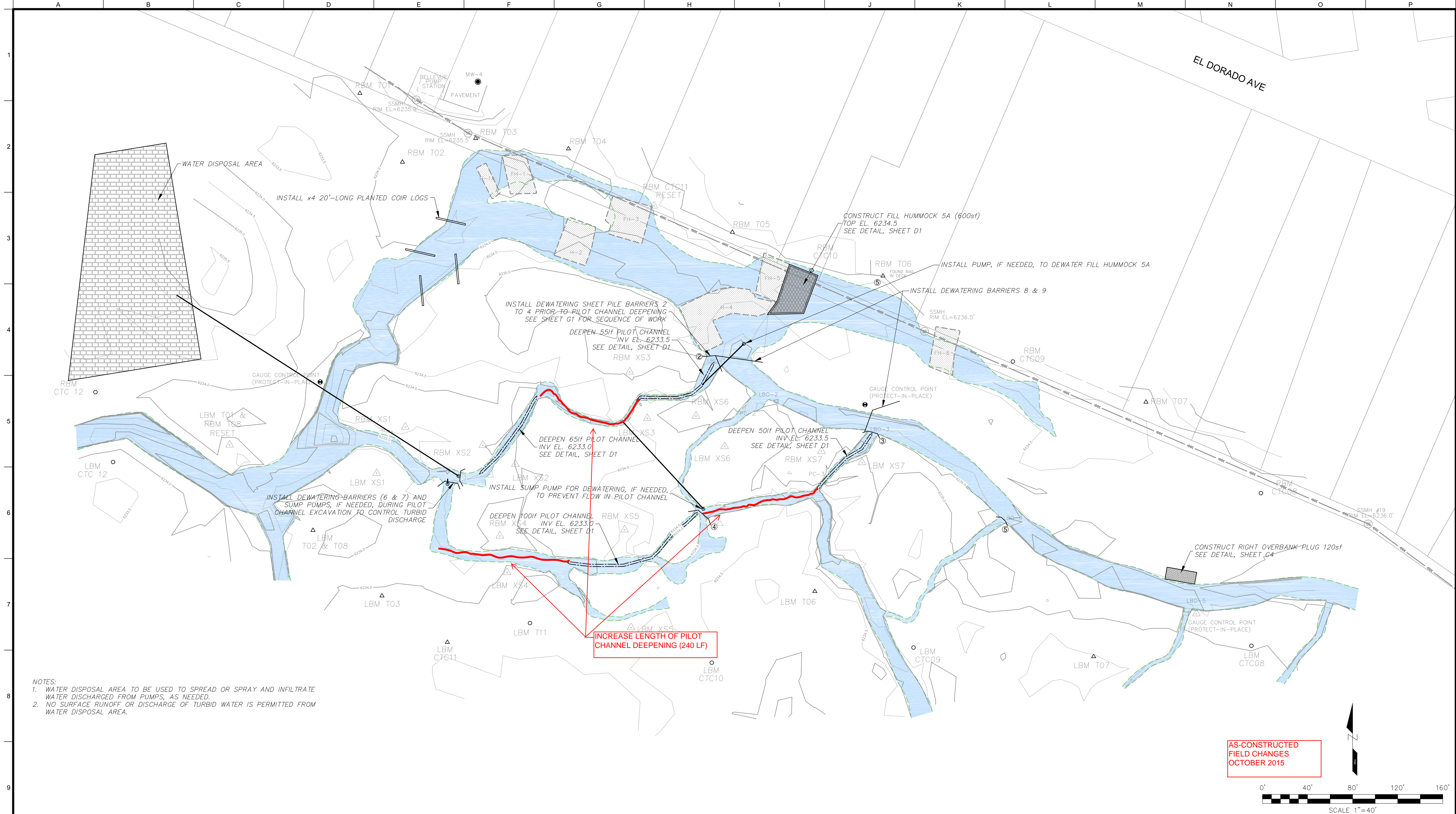
 **nhc**
northwest hydraulic consultants
80 south lake avenue, suite 800
pasadena, california 91101
phone: (626) 440-0080
fax: (626) 440-1881
www.nhcweb.com





Revisions			Drawing Information	
No.	Date	Description	Date	
			8 July 2015 (01:56)	Status
				Final
				Designer
				tvs
				Drafter
				tvs
				Checked
				eew
				File Name
				UT MARSH YR2 DETAILS
				Plotted Scale
				0 1/2 1

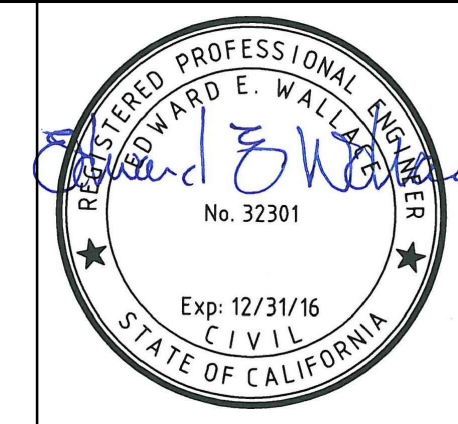
Upper Truckee Marsh Sewer Facilities
Adaptive Management Plan
Year 2 Improvements
Details Sheet

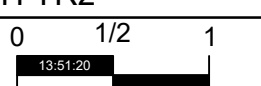
Job Number
6000145
Sheet Number
D2
Sheet 8 of 8




South Tahoe Public Utility District
 1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpud.us


nhc
northwest hydraulic consultants
 80 south lake avenue, suite 800
 pasadena, california 91101
 phone: (626) 440-0080
 fax: (626) 440-1881
 www.nhcweb.com

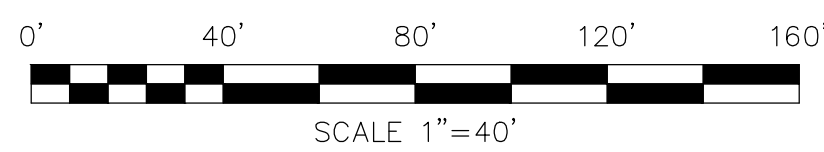
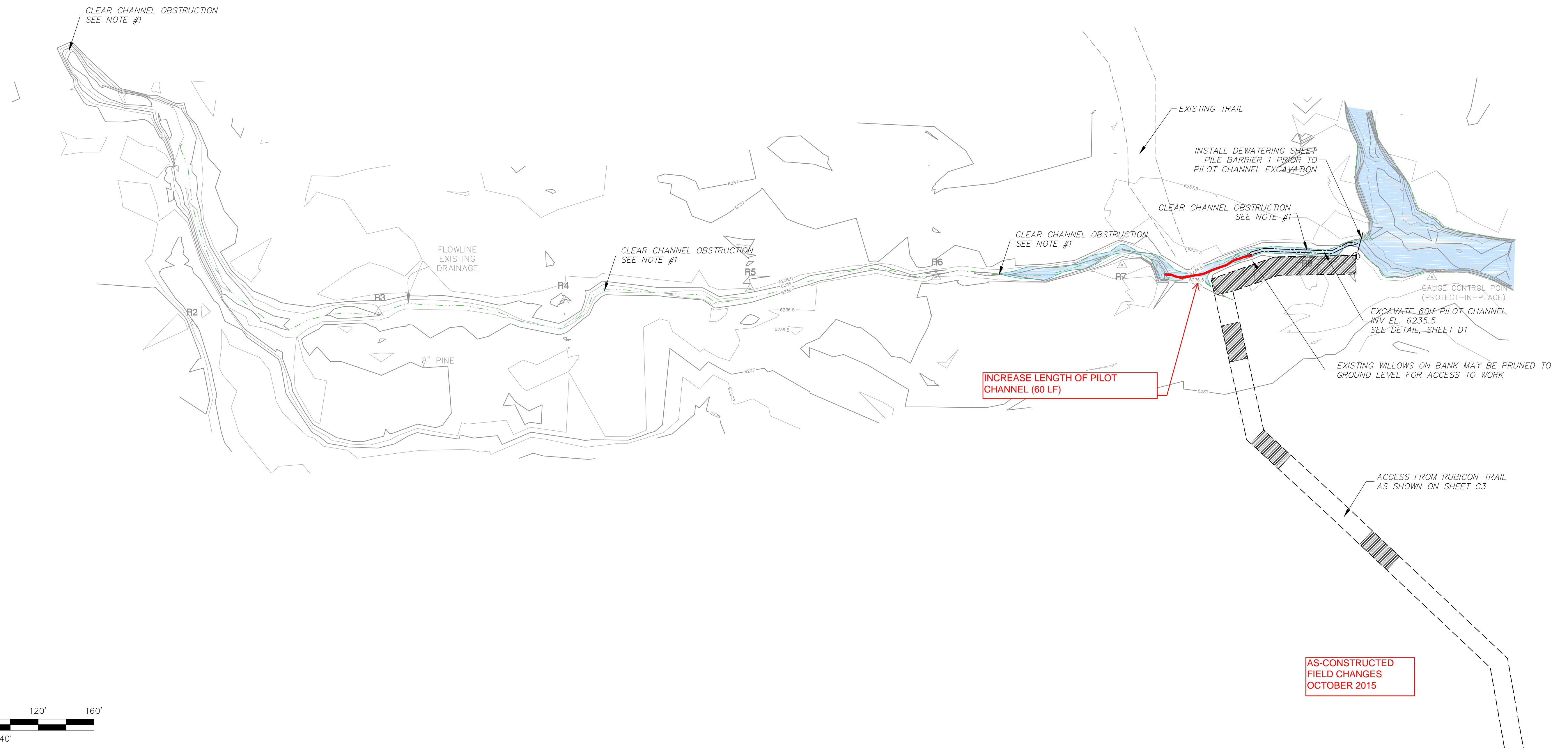



Revisions		Drawing Information	
No.	Date	Description	Date
			8 July 2015 (01:51)
			Status Final
			Designer tvs
			Drafter tvs
			Checked eew
			File Name UT MARSH YR2
			Plotted Scale 

Upper Truckee Marsh Sewer Facilities
Adaptive Management Plan
Year 2 Improvements
Bellevue PS Area Improvements
Plan Sheet

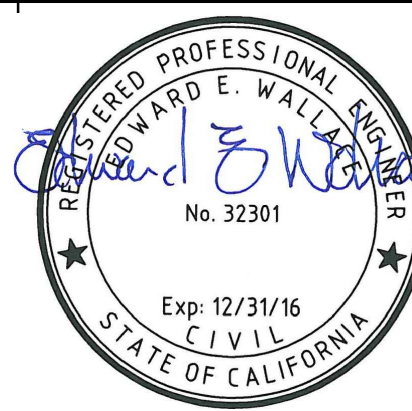
Job Number
 6000145
 Sheet Number
C1
 Sheet 5 of 8

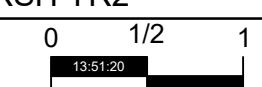
NOTE:
 1. FOUR CHANNEL OBSTRUCTION LOCATIONS, UP TO 1CY OF DEBRIS IN EACH LOCATION. SPECIFIC LOCATION(S) TO BE IDENTIFIED IN FIELD BY ENGINEER. NO MECHANIZED ACCESS.



 South Tahoe Public Utility District
 1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpud.us

 **nhc**
 northwest hydraulic consultants
 80 south lake avenue, suite 800
 pasadena, california 91101
 phone: (626) 440-0080
 fax: (626) 440-1881
 www.nhcweb.com



Revisions			Drawing Information	
No.	Date	Description	Date	
			8 July 2015 (01:51)	
			Status	Final
			Designer	tvs
			Drafter	tvs
			Checked	eew
			File Name	UT MARSH YR2
			Plotted Scale	

Upper Truckee Marsh Sewer Facilities
 Adaptive Management Plan
 Year 2 Improvements
 Secondary Channel Improvements
 Plan Sheet

Job Number
6000145
 Sheet Number
C2
 Sheet 6 of 8



AECOM
1 East First Street
City Hall Tower, 16th Floor
Reno, NV 89501
www.aecom.com

775.870.4918 tel
775.870.4923 tel
916.414.5850 fax

September 23, 2015

Ed Wallace
Northwest Hydraulic Consultants
80 South Lake Avenue, Suite 800
Pasadena, CA 91101

Subject: Trout Creek, Year 2 - Nesting Bird Survey Notes for the North Work Area

Dear Mr. Wallace:

Below is the Year 2 Nesting Bird Survey notes for the South Tahoe Public Utility District, Truckee Marsh Sewer Facilities Protection, Trout Creek Project. These notes provide the date, observer, observations, and summary results for the North Work Area.

Date: 08/13/2015 (North Work Area)

Approximately 10:00 am start, completed by approximately 12:00 pm

Observer: Julie Roth (AECOM)

Survey Area: Year 2 North Work Area and a 100-foot buffer

Observations: Flushed a Mallard from bank along one of the braided channels - searched area along banks and found no nest.

Flushed two likely Virginia rails from the North Work Area, near the south central portion of the work area - searched the area where birds flushed from and found no nest. Planned to return on another visit to further investigate this location for potential nest (see notes for 08/19/2015, below).

Summary Results: No nests found in the North Work Area, need to conduct a follow up visit to further investigate the Virginia rail observation.

Date: 08/19/2015 Follow up (North Work Area)

Approximately 9:00 am start, completed by approximately 9:40 am

Observer: Julie Roth (AECOM)

Survey Area: Focused on area where two likely Virginia rail individuals were observed on 08/13/2015. Observed this area from a distance (with binoculars and naked eye) for 10 minutes, and then searched the detection area again for a nest site.

Additionally surveyed saplings/shrubs at west end and east end of the North Work Area buffer; and along main channel in the North Work Area (willows along main channel were very sparse small willow saplings) for potential bird nests.

Summary Results: No nests found in the North Work Area.

Final Results: No nests (active or inactive) found in North Work Area. Area cleared for work.

Also, no additional (i.e., new) nest sites observed during Willow Flycatcher surveys conducted on August 18, 2015 throughout the North and South Work Areas.

Please contact Julie Roth (cell: 916-213-5935 and Julie.Roth@aecom.com) and/or Debra Lemke (office: 775-870-4918 and Debra.Lemke@aecom.com) with any questions.

Sincerely,



Debra Lemke, PWS, CPESC
Project Manager/Regulatory Specialist

cc: File Path: P:\ENV_EP\2015\60331384_Upper_Truckee\900_WORKING-DOCS\940_Draft-Docs\Bird Surveys

Willow Flycatcher Survey – site observations

Site Name _____ - _____ - STPHD YEAR 2 WORK AREA + 50m buffer

Observer(s) JULIE ROTH

USGS Quad # and Name _____

Site Location T _____, R _____, Sec _____, Qtr. _____ 1/16 _____ ;

Date 08/13/15

County EL DORADO Elev. ~6220 ft

Site Description

Site Type: meadow; riparian system;
 other _____
 Size of Area: <1 ha; 1-2 ha; 2.1-4 ha; 4.1-8 ha; >8 ha.

entire meadow system is 130ha 320acres

work area South: 4.4 acres North: 3.9 acres

Vegetation

Percent of site with **RDS (riparian deciduous shrub)** component north work area: 5% south work area: 25%
 Percent of **RDS component** consisting of: willow 100%, alder trace, other _____
 Average **RDS height**: <1 m; 1 - 2 m; >2 m
 Distribution of RDS: linear (along stream only); patchy clumps; continuous thicket; mostly
 Average **foliar density** in bottom 3 feet of RDS: < 50%; ≥ 50%;
 Percent ground cover **within RDS** mosaic:
 sedge; grasses; juncus; forbs;
 bare soil; gravel or sand river bed;
 Percent ground cover **across entire site**: mostly sedge & grasses with juncus near sedge - see above
 sedge; grasses; juncus; forbs;
 bare soil; gravel or sand river bed;
 Percent overstory canopy closure **within RDS** mosaic: < 10%; 10-20%;
 20-50%; >50%
 overstory species: Jeffrey Pine / Lodgepole Pine - at edge of meadow

North site dominated by Sedges and juncus

South site: dominated by grasses and forbs except at northeast corner (sedges)

Hydrology

Dominant water source for entire site:
 1-2 primary channels; numerous braided channels; spring/seep(s);
 other _____

on east & west side of meadow

Average width of dominant water source:
 < 0.5m; 0.5 - 1m; 1 - 2m; > 2m

Average depth of streambank to top of dominant water source: 0.25 ft

Source of standing water **within RDS mosaic**:
 in-channel pools; oxbows; spring fed ponds(s); lake margin;
 seep/snowmelt; other _____
 NONE

Percent of entire site with surface water or saturated soils 10-20% 90%
Southsite Northsite

Evidence of beaver

activity: YES - Dam and recent cuttings near northeast corner of South work area.

Evidence of livestock

presence: NO

Willow Flycatcher Survey - species observations

Site Name _____ - _____ - STPND YEAR 2 work Area + 50m buffer

Observer(s) JULIE ROTH

USGS Quad # and Name _____

Site Location T _____, R _____, Sec _____, Qtr. _____ 1/16 _____ ;

Date 08 / 13 / 15

Willow Flycatchers Observed : #M _____, #F _____; #unk _____
Brown-headed cowbirds Observed: #M _____; #F _____; #unk _____

present in meadows to east and north of work areas.

Willow Flycatcher detection locations

#	sex *	wifl location	detection type**
		<u>NO WIFL Detections</u>	
		<input type="checkbox"/> UTM (give measurement unit: _____)	
		<input type="checkbox"/> lat/long	
		T _____; R _____; Sec _____; _____ 1/4; _____ 1/16	
		T _____; R _____; Sec _____; _____ 1/4; _____ 1/16	
		T _____; R _____; Sec _____; _____ 1/4; _____ 1/16	
		T _____; R _____; Sec _____; _____ 1/4; _____ 1/16	
		T _____; R _____; Sec _____; _____ 1/4; _____ 1/16	
		T _____; R _____; Sec _____; _____ 1/4; _____ 1/16	
		T _____; R _____; Sec _____; _____ 1/4; _____ 1/16	
		T _____; R _____; Sec _____; _____ 1/4; _____ 1/16	

*male/female/unknown

**fitz-bew/whitt/visual

other bird species observed

<u>Amro, STJA, MALL</u>	<u>BHGR, WEBL, NOFL</u>	
<u>DEJU, PYNU, WENP</u>	<u>WBNU</u>	
<u>DNFL, HOWR, MOCH</u>	<u>MAWR</u>	
<u>WIWA, YXHU, CAVI</u>	<u>COHA - flying high</u>	
<u>BRBL, GBHE, YRNA</u>	<u>NAWA</u>	

Mammals, amphibians, reptiles observed: coyote

Willow Flycatcher Survey - species observations

Site Name _____ - _____ - STPND Year 2 work area 150m buffer

Observer(s) JULIE ROTH - AECOM

USGS Quad # and Name _____

Site Location T _____, R _____, Sec _____, Qtr. _____ 1/16 _____ ;

Date 08 / 19 / 15

Willow Flycatchers Observed : #M _____ ; #F _____ ; #unk _____
Brown-headed cowbirds Observed: #M _____ ; #F _____ ; #unk _____

Willow Flycatcher detection locations

#	sex*	wifl location	detection type**
		<u>NO WIFL Detections</u>	
		<input type="checkbox"/> UTM (give measurement unit: _____)	
		<input type="checkbox"/> lat/long	
		T _____ ; R _____ ; Sec _____ ; _____ 1/4 ; _____ 1/16	
		T _____ ; R _____ ; Sec _____ ; _____ 1/4 ; _____ 1/16	
		T _____ ; R _____ ; Sec _____ ; _____ 1/4 ; _____ 1/16	
		T _____ ; R _____ ; Sec _____ ; _____ 1/4 ; _____ 1/16	
		T _____ ; R _____ ; Sec _____ ; _____ 1/4 ; _____ 1/16	
		T _____ ; R _____ ; Sec _____ ; _____ 1/4 ; _____ 1/16	
		T _____ ; R _____ ; Sec _____ ; _____ 1/4 ; _____ 1/16	
		T _____ ; R _____ ; Sec _____ ; _____ 1/4 ; _____ 1/16	
		T _____ ; R _____ ; Sec _____ ; _____ 1/4 ; _____ 1/16	

*male/female/unknown

**fitz-bew/whitt/visual

other bird species observed

<u>Amro</u>	<u>RuHu</u>	<u>WISA</u>	<u>WENP</u>	<u>NAWA</u>
<u>MALL</u>	<u>WIWA</u>	<u>NOFL</u>	<u>BEKI</u>	
<u>STJA</u>	<u>BLPH</u>	<u>MODD</u>	<u>CORA</u>	
<u>PYNU</u>	<u>SOSP</u>	<u>MOCH</u>	<u>RWBL</u>	
<u>CAVI</u>	<u>YRWA</u>	<u>OSFL</u>	<u>COSN</u>	

Mammals, amphibians, reptiles observed: Coyote

Willow Flycatcher Survey - protocol information & results

Site Name _____ - _____ - STPN0 YEAR 2 WORK AREA + 50m buffer

Observer(s) JULIE ROTH - AECOM

USGS Quad # and Name _____

Site Location T _____, R _____, Sec _____, Qtr. _____ 1/16 _____;

Date 08/13/15

survey visit #	Date (mm/dd/yy)	survey time	WIFL (present/absent/unconf.)	# singing WIFLs
survey: <u>1</u> followup: <u>NO</u>	<u>08/13/15</u>	Start: <u>0526</u> Stop: <u>1000</u>	<u>NONE</u>	<u>NONE</u>
survey: <u>2</u> followup: <u>NO</u>	<u>08/19/15</u>	Start: <u>0544</u> Stop: <u>9:33</u>	<u>NONE</u>	<u>NONE</u>
survey: _____ followup: _____		Start: _____ Stop: _____		
survey: _____ followup: _____		Start: _____ Stop: _____		
<p>Total # of presumed breeding territories after ALL visits completed (no migrants) <u>0</u></p> <p>Total # of presumed migrants after ALL visits completed <u>0</u></p>				

CALL
DTS
S01-S17
N07; N08*

08/13/15

Weather: wind: _____ mph; temp: 40-65 °F; cloud cover <10 %
Survey visit # 1 **Survey start time** 0526 **Survey stop time** 1000

08/19/15 - wind: N/A temp: 42-60° cloud <10%
 visit #2 start 544am, stop 9:33am

* NOTE: in the north survey area points N01 - N06; N09 - N12 were in habitat not suitable for WIFL and none are any where near!

Ed Wallace

From: Roth, Julie <Julie.Roth@aecom.com>
Sent: Thursday, October 01, 2015 3:14 PM
To: bob.hosea@wildlife.ca.gov
Cc: Ed Wallace; Ibergsohn@stpud.dst.ca.us; Lemke, Debra
Subject: re: SAA 1600-2014-0097-R2 Upper Truckee Marsh Sewer Facilities Protection Project

Hi Bob,

I wanted to provide you with the follow-up regarding the STPUD Upper Truckee Marsh Sewer Facilities Protection Project Nest Monitoring in reference to the following project permit: SAA 1600-2014-0097-R2 Upper Truckee Marsh Sewer Facilities Protection Project. The above referenced project was completed on August 28, 2015. This email summarizes the results of the preconstruction nesting bird survey completed as one of the project permit conditions, outlines the nest avoidance and minimization measures (AMMs) developed in coordination with you (at CDFW) prior to construction, and reports on implementation of the AMMs during construction of the project.

A preconstruction nesting bird survey was conducted on August 13, 14, and 19, 2015 within the project footprint (i.e., work area) and a 100-foot buffer (survey area). The survey was conducted within 15 days prior to the start of project construction. The survey resulted in the detection of one active mourning dove nest, and seven additional inactive nest sites (i.e., empty nest structures) within the survey area. The mourning dove nest was discovered on August 14, 2015; two eggs were present at the time the nest was located and the adult was actively incubating the eggs at the time the nest was discovered. The active mourning dove nest site was located near the west end of the southern work area. The active nest site was approximately 55 feet from (east) where the nearest work would occur (e.g., hand clearing of debris from a nearby channel), and 500-600 feet away from the nearest ground disturbing work on the project.

Per our communications about an appropriate avoidance strategy of this nest site, the following nest avoidance approach was identified and approved by CDFW on August 21, 2015:

- To the extent possible, crews will delay work near the nest (hand clearing of debris) as long as possible (most likely a few weeks from now).
- Crews will initiate hand clearing of debris from the channel at locations far from the nest site first, working towards the nest location over time (working east to west along the channel).
- A 50-foot non-disturbance buffer for the project work will be maintained around the nest site until the nest is fledged or confirmed no longer active.
- When crews anticipate they will be getting closest to the nest site (within 55 feet) a biological monitor will be notified to check the nest status prior to work in the area.
- If the nest is still active at the time work will occur nearest the nest, a monitor will be present in the area to periodically check on the nest while crews are working to determine whether the birds are adversely affected by the work (e.g., show signs of agitation or distress).
- When working in the vicinity closest to the nest, hand crews will work from the west/south bank of the channel (farthest from the nest) to further reduce potential impacts on the nest.

The above nest avoidance strategy was successfully implemented by the project work crews. Construction commenced (and was completed) in the south work area on August 25, 2015. A 50-foot non-disturbance buffer was identified around the nest and the boundaries communicated to the construction crews prior to initiating work. Crews initiated hand clearing from east to west along the channel during the morning of August 25, 2015, working from a location approximately 500-600 feet from the nest towards the nest. The project biologist was notified of the date/time when work crews anticipated being close to the nest buffer so the monitor could be on site when and if crews worked within 55 feet of the nest site. When the biological monitor arrived, work crews had completed all necessary work in the channel; none of which required being closer than approximately 95 feet from the nest site. Hence, no work occurred

any closer than 95 feet from the nest site. In addition to being far from the nest site, areas where work occurred were well screened from the nest by dense willow vegetation. The biologist visited and monitored the mourning dove nest for over an hour on the same day after work activities were completed. The nest remained active and the adult continued to incubate the eggs and sit on the nest for over an hour.

Thank you for coordinating on this matter. Please let me know of any questions. I have enjoyed working with you.

Sincerely,
Julie

Julie Roth
Wildlife Biologist
AECOM Environment
M +1 916.213.5935
julie.roth@aecom.com

AECOM
2020 L Street, Suite 400, Sacramento, CA 95811 USA
T +1 916.414.5800 F +1 916.414.5850
www.aecom.com

8/26/15

STREAM DISCHARGE MEASUREMENT			
Distance (feet)	Water Depth (feet)	Water Velocity (fps)	Cell Discharge (cfs)
0 (left bank)	0	0	0
(right bank)	0	0	0
Total Stream Discharge			

ELECTROFISHING DESIGN

UPSTREAM BLOCK: SEINE WATERFALL _____ CULVERT _____ OTHER _____

DOWNSTREAM BLOCK: SEINE OTHER _____

MAKE AND MODEL OF ELECTROFISHER USED: LR-24 SMITH-BOOT

NAME OF UNIT OPERATOR: MATTHEW SILVA

NAME(S) OF NETTERS: DEBRA LEINKE

SALT ADDED (yes/no): NO

UNIT SETTINGS: VOLTS: 350 AMPS: _____ CYCLES: 25 PWIDTH: 15%

Pass Number	Timer Reading at Start (seconds)	Timer Reading at End (seconds)	Total Elapsed Time (seconds)
1			
2			
3			
4			

NOTES ON SAMPLING PROBLEMS/EQUIPMENT PROBLEMS

NONE

* NO WEIGHTS OR LENGTHS TAKEN. ALL FISH CAPTURED WERE IMMEDIATELY RELOCATED ~ 1/2 MILE UPSTREAM.

ELECTROFISHING FIELD DATA

DATE: 08/26/15

STREAM NAME: TRUST CREEK, UPPER TRUCKEE MARSH

REACH/SITE IDENTIFICATION NAME/NUMBER: STUD UPPER TRUCKEE MARSH PILOT CHANNELS

FISH SPECIES TALLY

PASS NUMBER: _____

ALL PASSES

SPECIES	FORK LENGTH (mm)	WEIGHT (g)	NOTES
STICKLE DACE	←	—	EST 500 CAPS *

SPECIES	FORK LENGTH (mm)	WEIGHT (g)	NOTES
BROWN TROUT	—	—	4 TOTAL CAPTURED *

ELECTROFISHING, HYDROLOGIC AND WATER QUALITY FIELD DATA

DATE: 8/27/15
 START FIELD TIME: 0900

END FIELD TIME: 1625

PAGE 1 OF 3

LOCATION
 STREAM NAME: TROUT CREEK, UPPER TRUCKEE MARSH RIVER BASIN: TRUCKEE RIVER
 REACH/SITE IDENTIFICATION NAME/NUMBER: _____
 TOWNSHIP: _____ RANGE: _____ SECTION: _____

ENVIRONMENTAL CONDITIONS
 WEATHER: MOSTLY SUNNY, PATCHY CLOUDS
 AIR TEMPERATURE (F) AND (TIME): 68°F @ 0927 WIND (mph): 0
 WHR HABITAT TYPE OF WLPZ WITHIN REACH/SITE: _____
 CANOPY CLOSURE OVER WETTED SURFACE OF CHANNEL: 0 %

WATER QUALITY
 WATER TEMPERATURE (F) AND (TIME): 14.7 @ 0928 pH: _____ SULFATE (mg/L): _____
 DISSOLVED OXYGEN (mg/L): 9.08 TOTAL ALKALINITY (mg/L): _____
 CONDUCTIVITY (umhos/cm): 90.2 TOTAL DISSOLVED SOLIDS (mg/L): 0.540
9/4

AVERAGE WETTED CHANNEL WIDTH	
Distance (feet)	Channel Width (feet)
0 (downstream)	
30	
60	
90	
120	
150	
180	
210	
240	
270	
300 (upstream)	
Average Wetted Channel Width for 300 Feet = <u> </u>	
Total Reach/Site Length Sampled (feet) = <u> </u>	

ADVERSE LAND USE IMPACTS NOTED
 (livestock, logging, debris jams, bank erosion)

ACTIVE CONSTRUCTION
SITE DEWATERING &
CHANNEL EXCAVATION
ON PROJECT SITE.

STREAM DISCHARGE MEASUREMENT			
Distance (feet)	Water Depth (feet)	Water Velocity (fps)	Cell Discharge (cfs)
0 (left bank)	0	0	0
(right bank)	0	0	0
Total Stream Discharge			

ELECTROFISHING DESIGN
 UPSTREAM BLOCK: SEINE X WATERFALL _____ CULVERT _____ OTHER _____
 DOWNSTREAM BLOCK: SEINE X OTHER _____
 MAKE AND MODEL OF ELECTROFISHER USED: SMITH ROOT LR-24
 NAME OF UNIT OPERATOR: MATTHEW SILVA
 NAME(S) OF NETTERS: DEBRA LEMKE
 SALT ADDED (yes/no): NO
 UNIT SETTINGS: VOLTS: 350 AMPS: - CYCLES: 25 PWIDTH: 15%

Pass Number	Timer Reading at Start (seconds)	Timer Reading at End (seconds)	Total Elapsed Time (seconds)
1			
2			
3			
4			

NOTES ON SAMPLING PROBLEMS/EQUIPMENT PROBLEMS
NONE

* NO WEIGHTS OR LENGTHS TAKEN. ALL FISH WERE RELOCATED
~ 1/2 UPSTREAM AS QUICKLY AS POSSIBLE.

ELECTROFISHING FIELD DATA

DATE: 8/27/15

STREAM NAME:: TROUT CREEK, UPPER TRUCKEE MARSH

REACH/SITE IDENTIFICATION NAME/NUMBER: SPRUG UPPER TRUCKEE MARSH PILOT CHANNEL

FISH SPECIES TALLY

PASS NUMBER: _____

SPECIES	FORK LENGTH (mm)	WEIGHT (g)	NOTES
<u>SPECKLED DACE</u>	<u>—</u>	<u>—</u>	<u>EST 250 CAPS</u>

SPECIES	FORK LENGTH (mm)	WEIGHT (g)	NOTES
<u>BROWN TROUT</u>	<u>—</u>	<u>—</u>	<u>2 TOTAL CAPS</u>

UTMSFPP ADAPTIVE MANAGEMENT PLAN

2016 ANNUAL REPORT

APPENDIX B – POST YEAR 2 (2015) CONSTRUCTION

Post-Construction Topographic Survey near Bellevue Avenue and at head of secondary channel,
Lumos & Associates, 2015

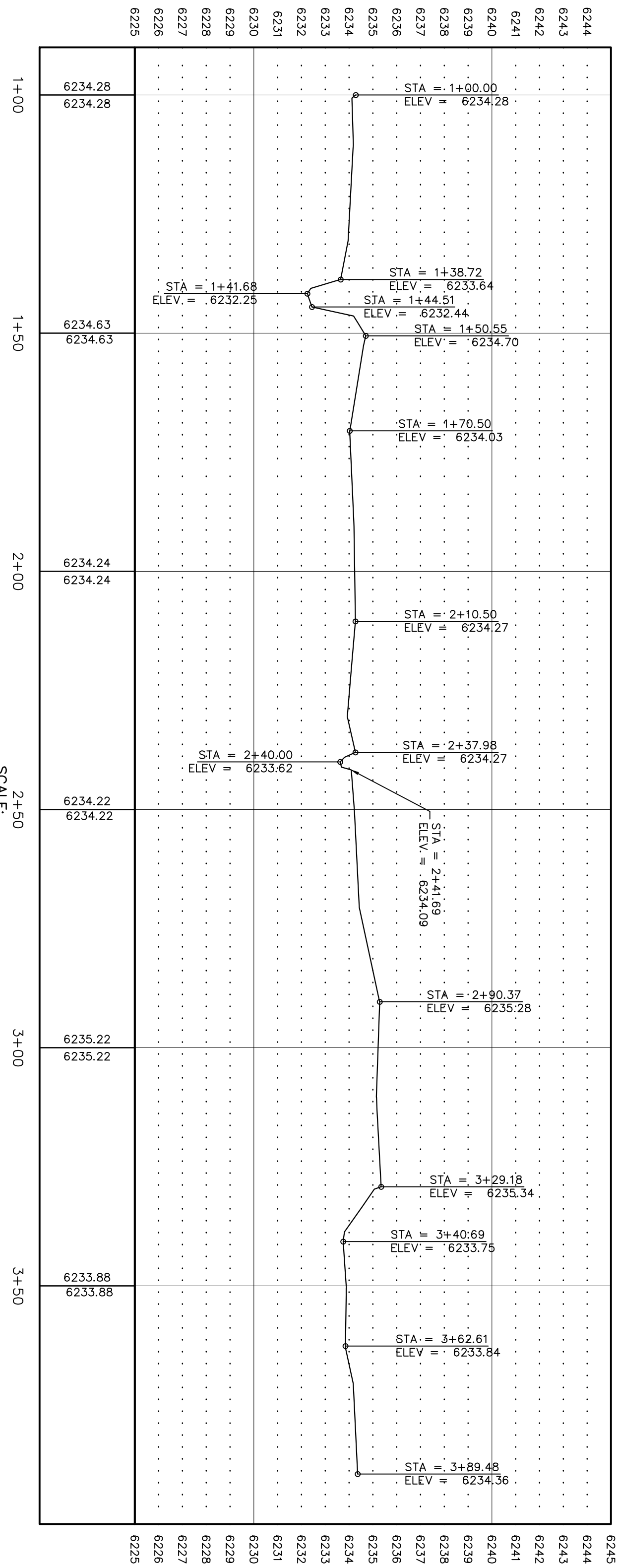
NHC Field Observations, 2016

2016 Revegetation Monitoring Report, Western Botanical Services

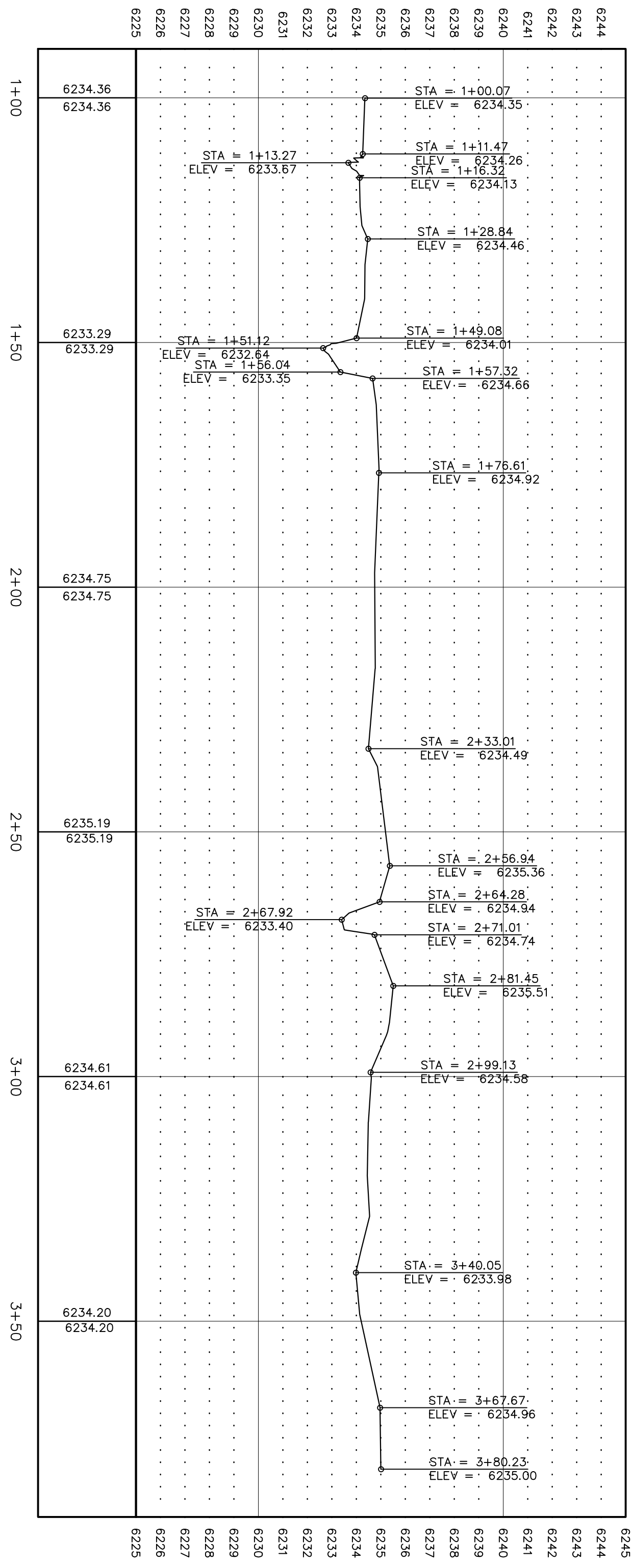
Photo Point Monitoring 2014-2016

Photo Log 2016

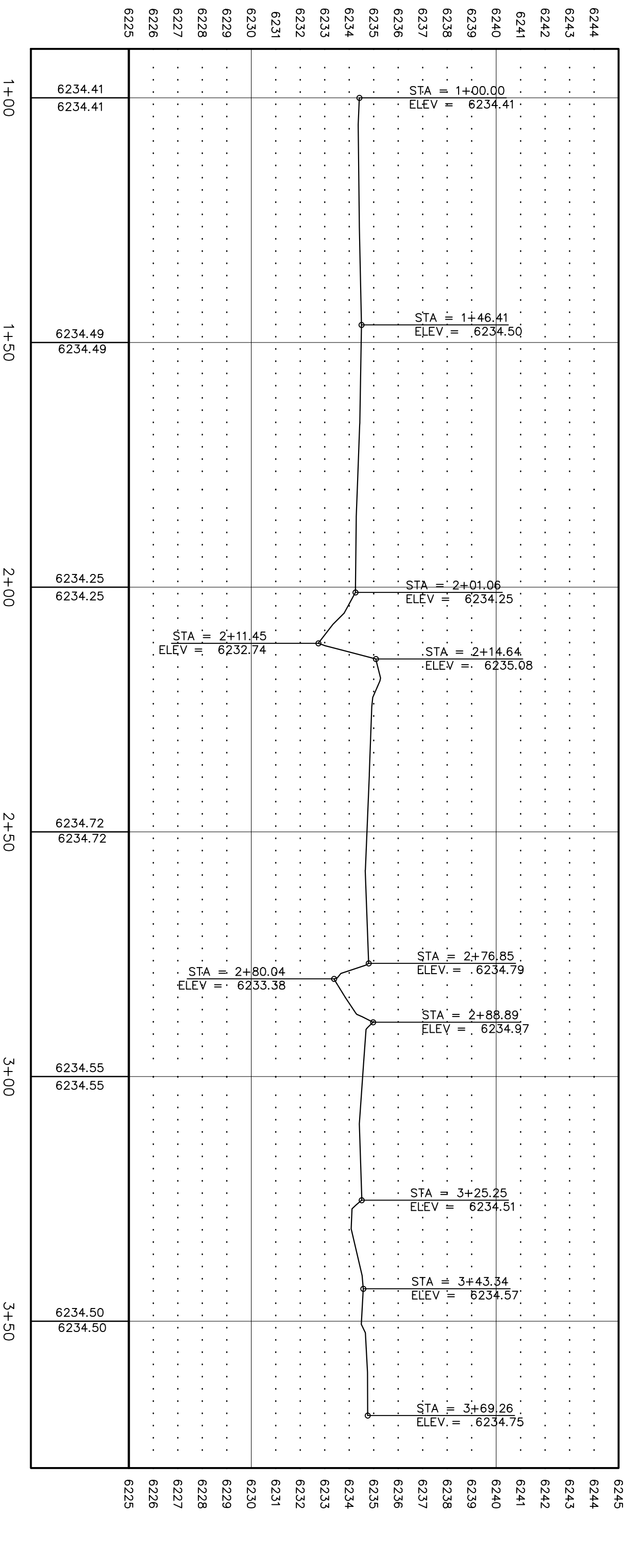
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
CTC X-SECTION 11 - STA:0+90 TO STA:4+00



SCALE:
HORIZ. 1"=20', VERT. 1"=2'
TRANSECT STIPUD 5 - STA:0+90 TO STA:3+90



SCALE:
HORIZ. 1"=20', VERT. 1"=2'
CTC X-SECTION 10 - STA:0+90 TO STA:3+80



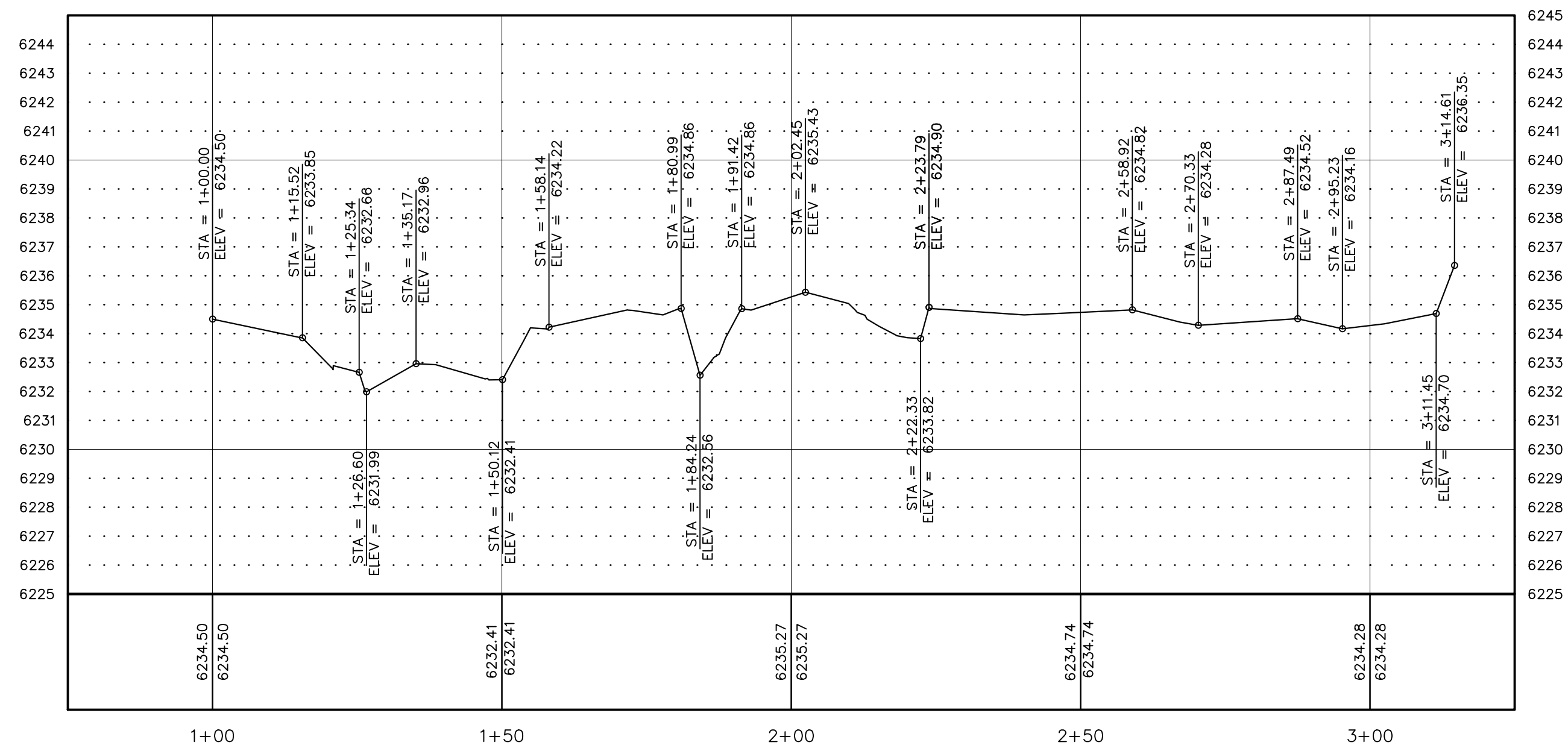
SOUTH TAHOE PUBLIC UTILITY DISTRICT
UPPER TRUCKEE MARSH - BELLEVUE AREA
A PORTION OF THE NORTH 1/2 OF SECTION 4, T.12N., R18E., M.D.M, A.P.N. 026-200-11
EL DORADO COUNTY CALIFORNIA

LUMOS & ASSOCIATES
800 E. COLLEGE PARKWAY
DORADO CITY, NEVADA 89708
FAC. (775) 883-7114
WWW.LUMOSENGINEERING.COM
CIVIL ENGINEERING
GEOTECHNICAL ENGINEERING
PLANNING
LANDSCAPE ARCHITECTURE
SURVEYING / GIS SERVICES
MATERIALS TESTING

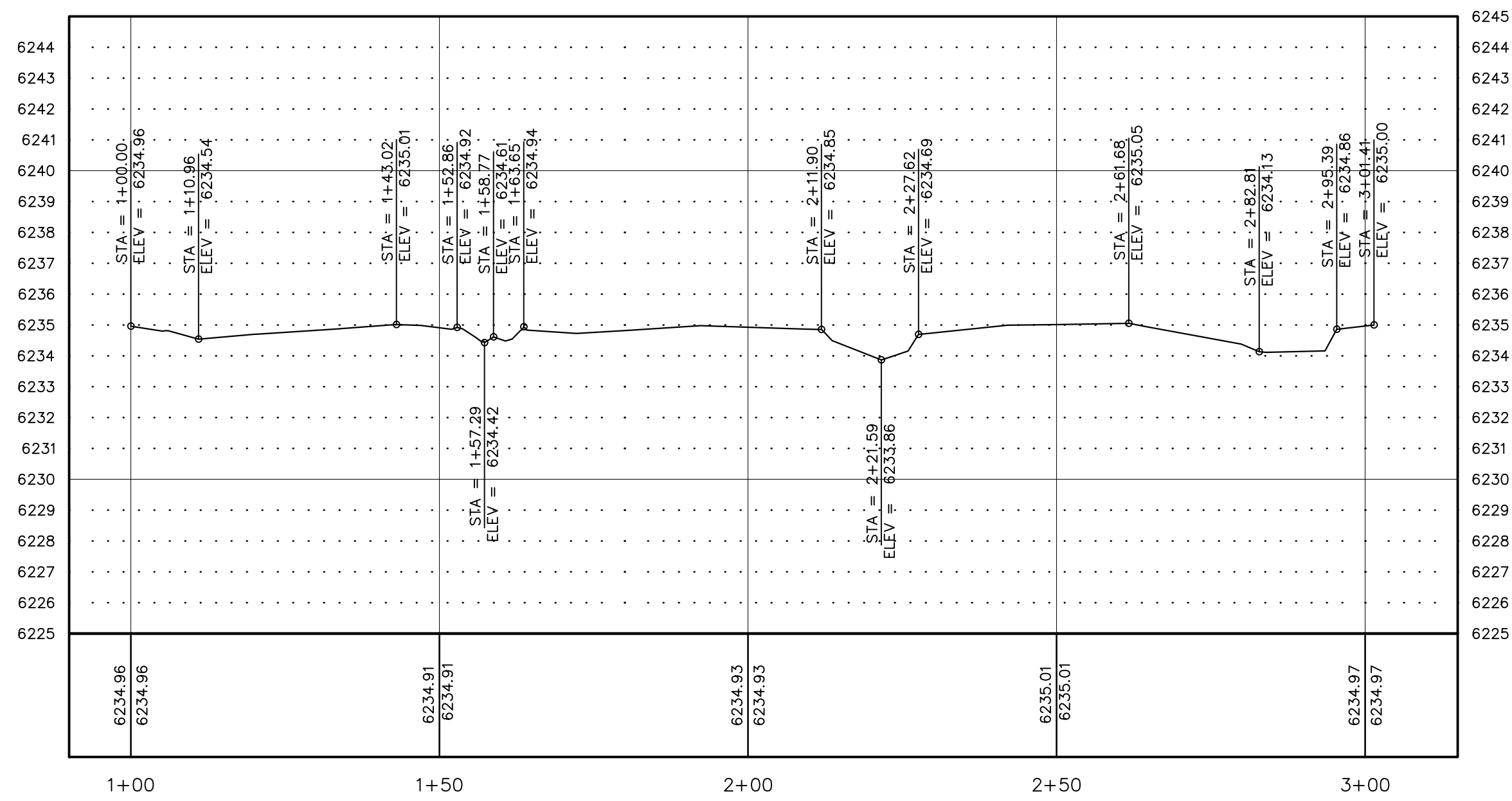
REV	DATE	DESCRIPTION	BY

B3
DATE: NOVEMBER 2015
DRAWN BY: KLN
DESIGNED BY: GP
CHECKED BY: GP
JOB NO.: 8688.001

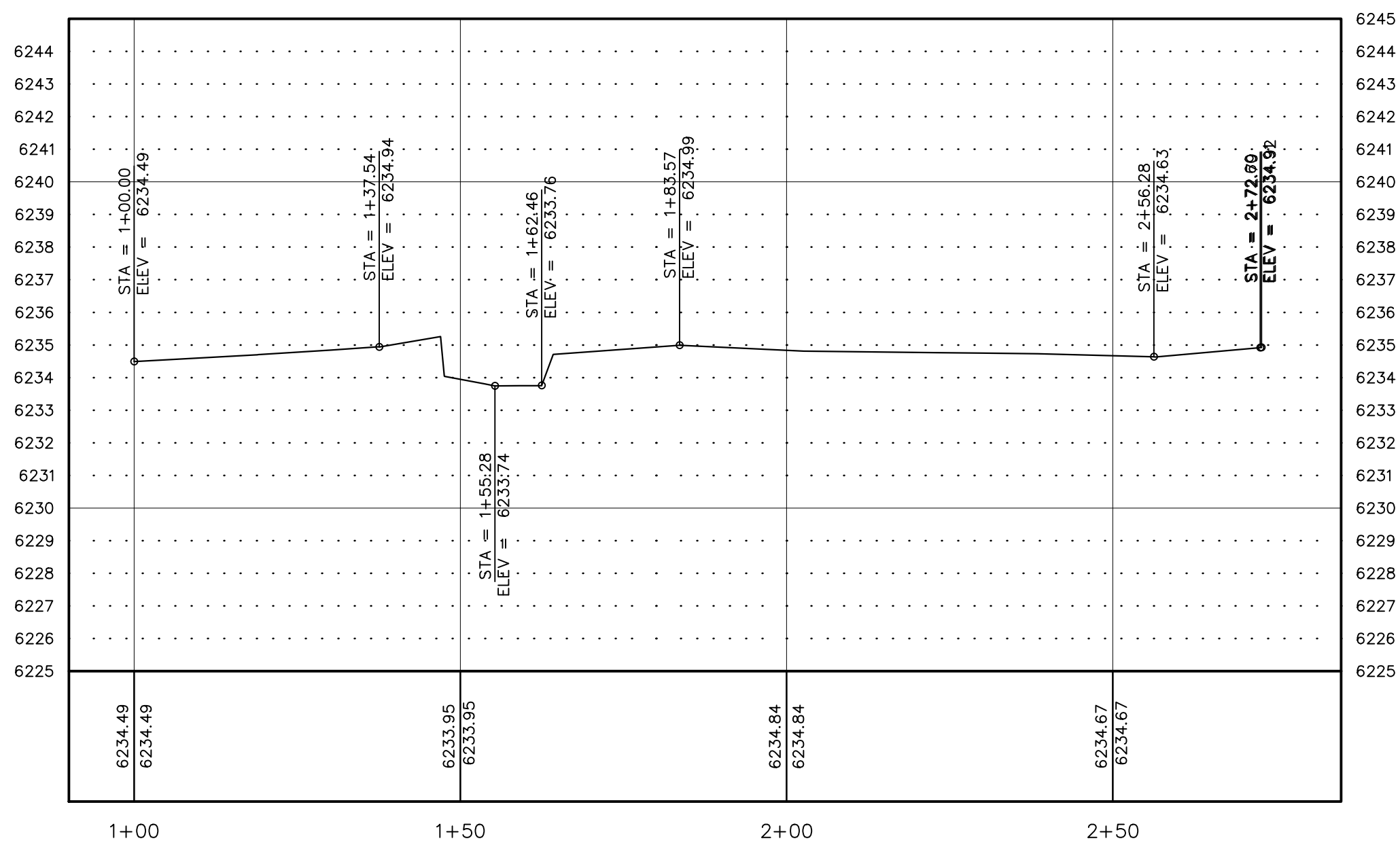
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
TRANSECT STPUD 6 – STA: 0+75 TO STA: 3+25



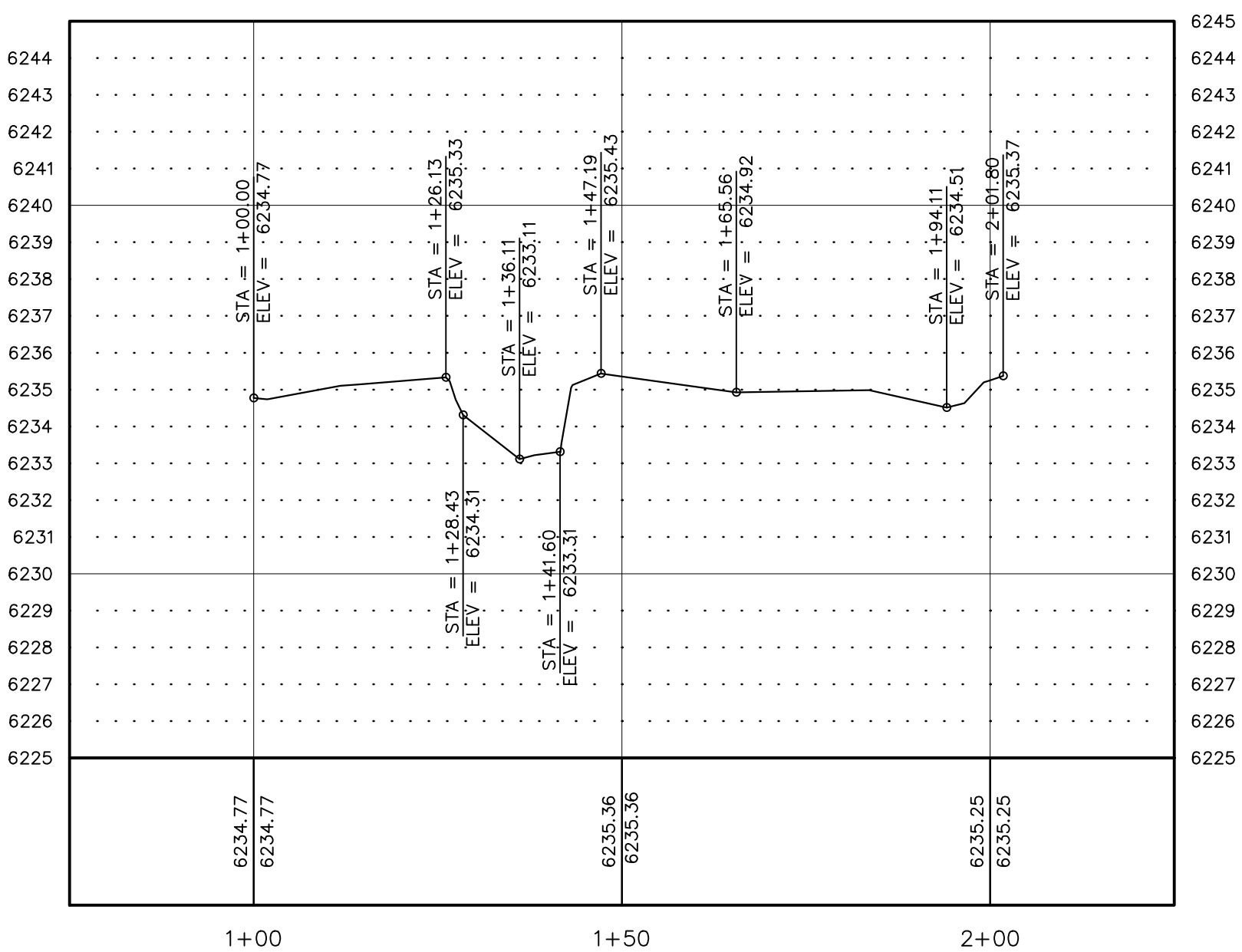
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
CTC X-SECTION 9 – STA: 0+90 TO STA: 3+15



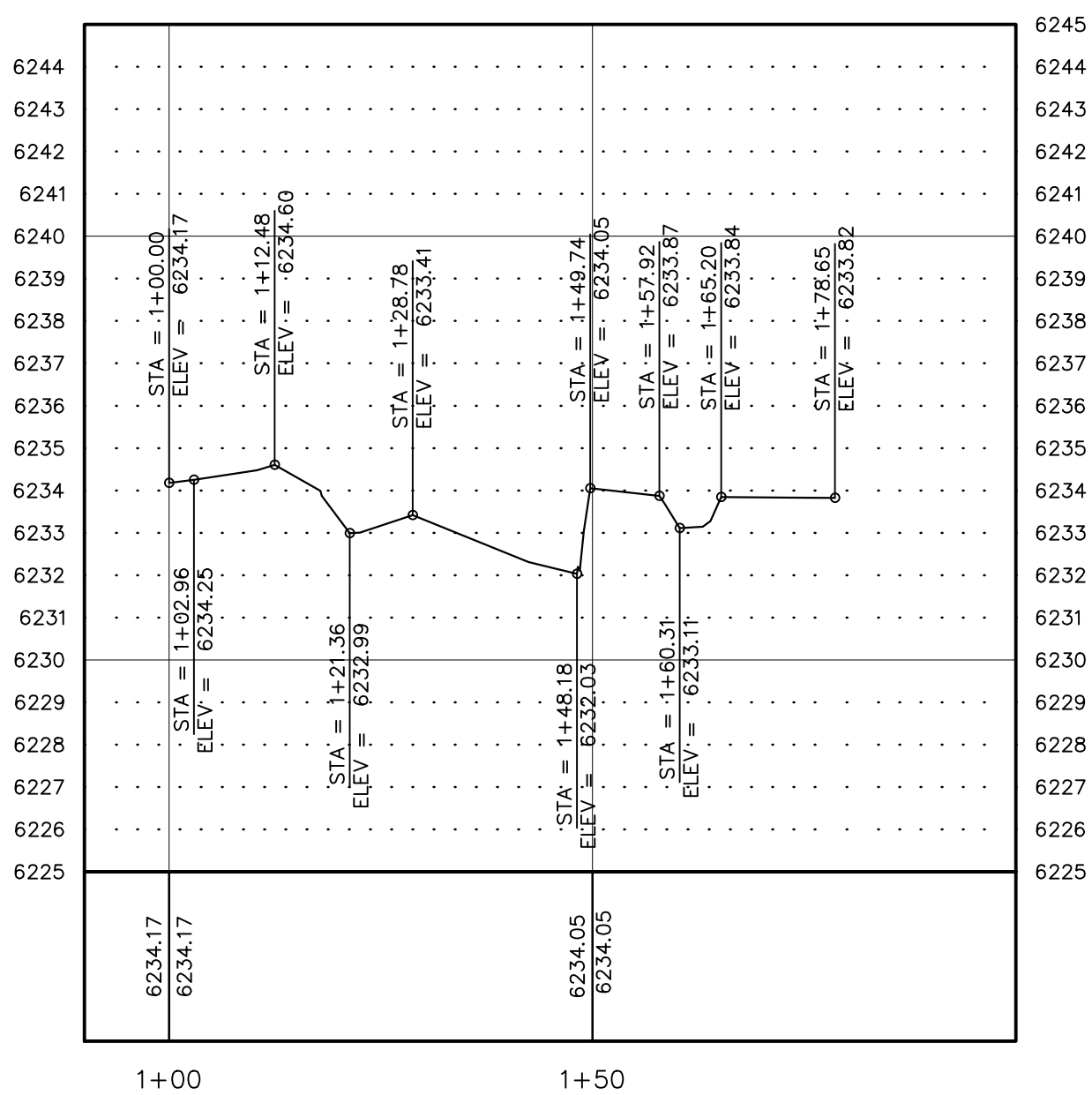
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
TRANSECT STPUD 7 – STA: 0+90 TO STA: 2+85



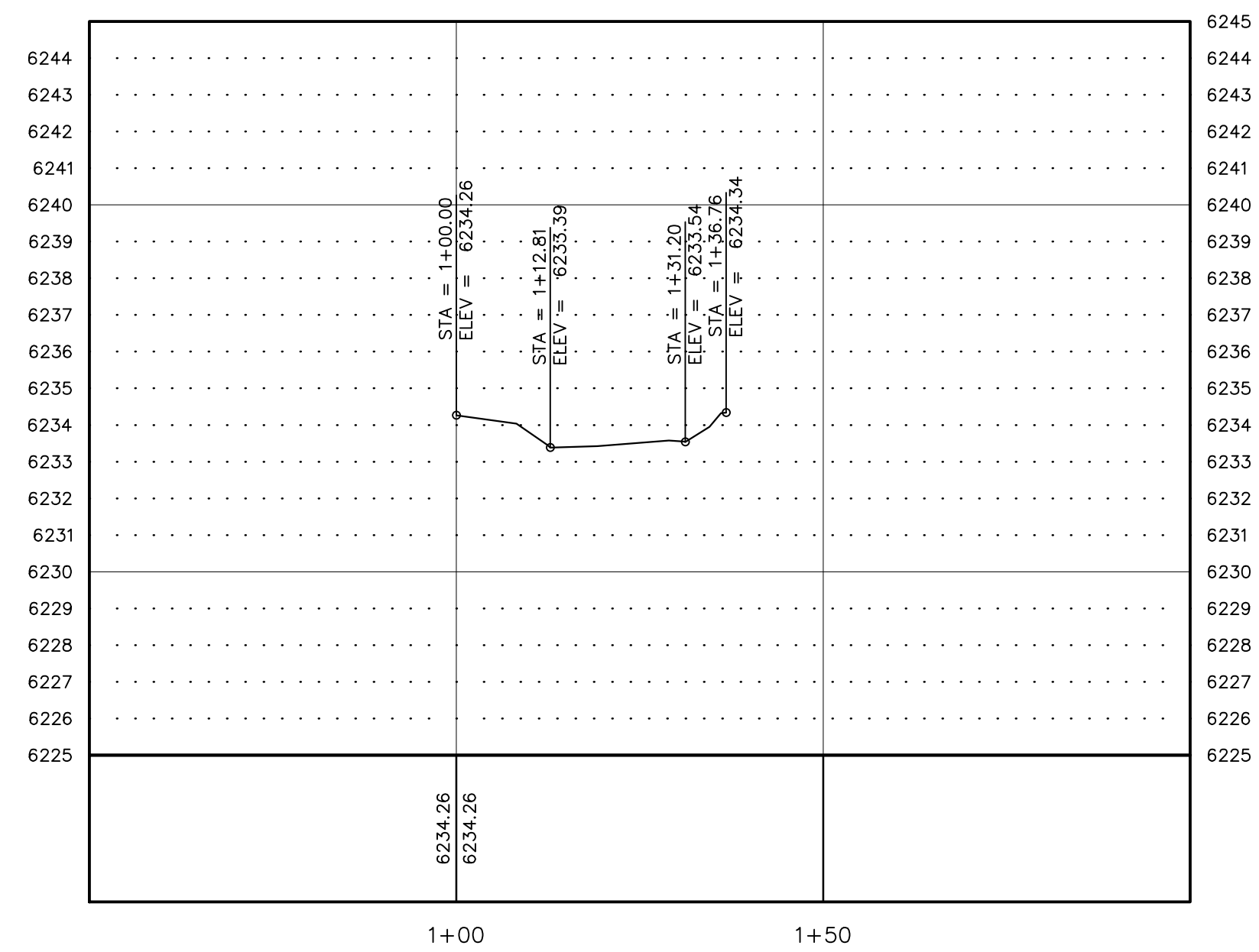
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
CTC X-SECTION 8 – STA: 0+75 TO STA: 2+25



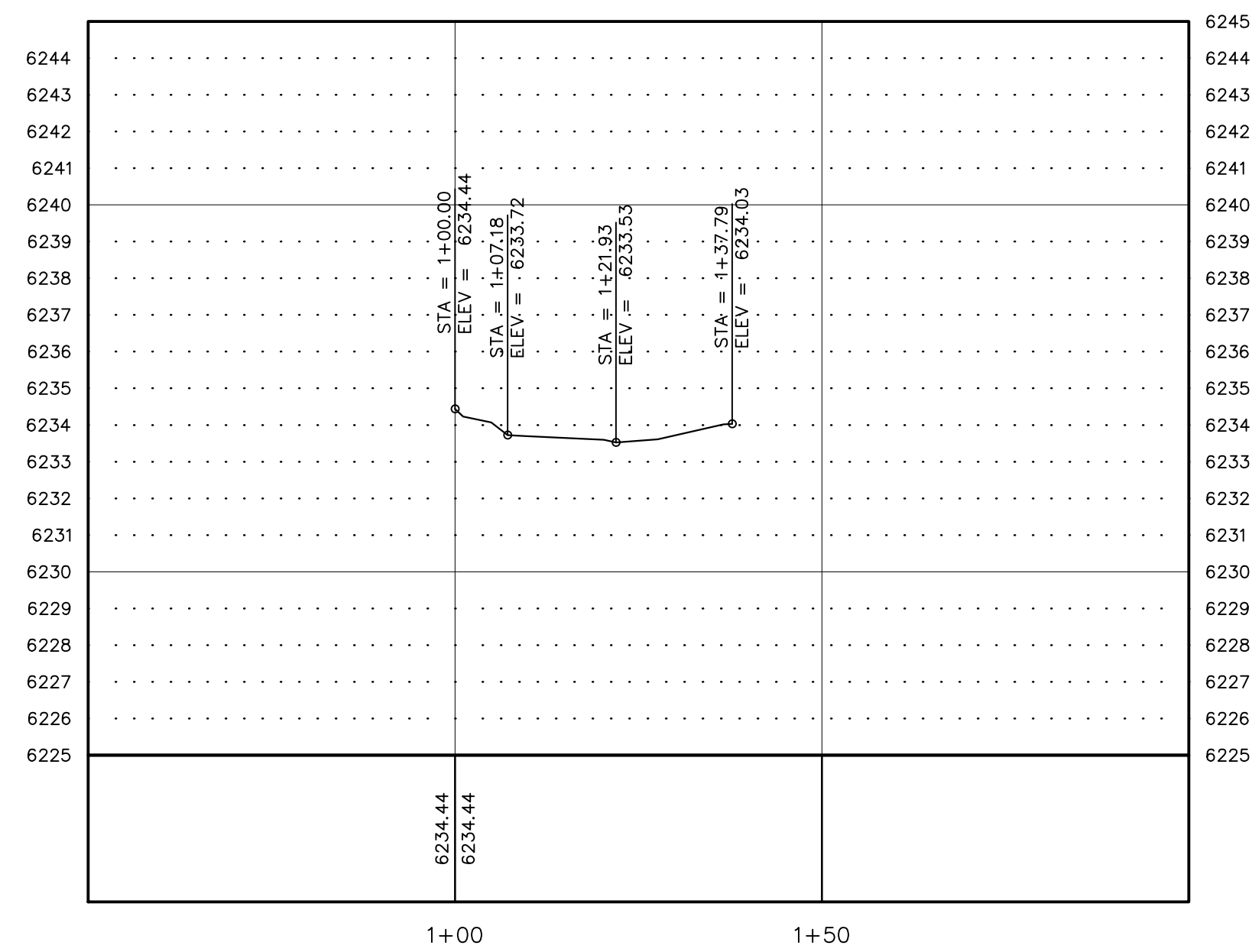
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
TRANSECT STPUD 8 – STA: 0+90 TO STA: 2+00



SCALE:
HORIZ. 1"=20', VERT. 1"=2'
TRANSECT STPUD 9 – STA: 0+50 TO STA: 2+00



SCALE:
HORIZ. 1"=20', VERT. 1"=2'
TRANSECT STPUD 10 – STA: 0+50 TO STA: 2+00



800 E. COLLEGE PARKWAY
CARSON CITY, NEVADA 89706
TEL (775) 883-7077
FA (775) 883-7114

WWW.LUMOSENGINEERING.COM

CIVIL ENGINEERING
GEOTECHNICAL ENGINEERING
PLANNING
LANDSCAPE ARCHITECTURE
SURVEYING / GIS
CONSTRUCTION SERVICES
MATERIALS TESTING

SOUTH TAHOE PUBLIC UTILITY DISTRICT
UPPER TRUCKEE MARSH - BELLEVUE AREA
A PORTION OF THE NORTH 1/2 OF SECTION 4, T.12N., R.18E., M.D.M., A.P.N. 026-200-11
EL DORADO COUNTY CALIFORNIA

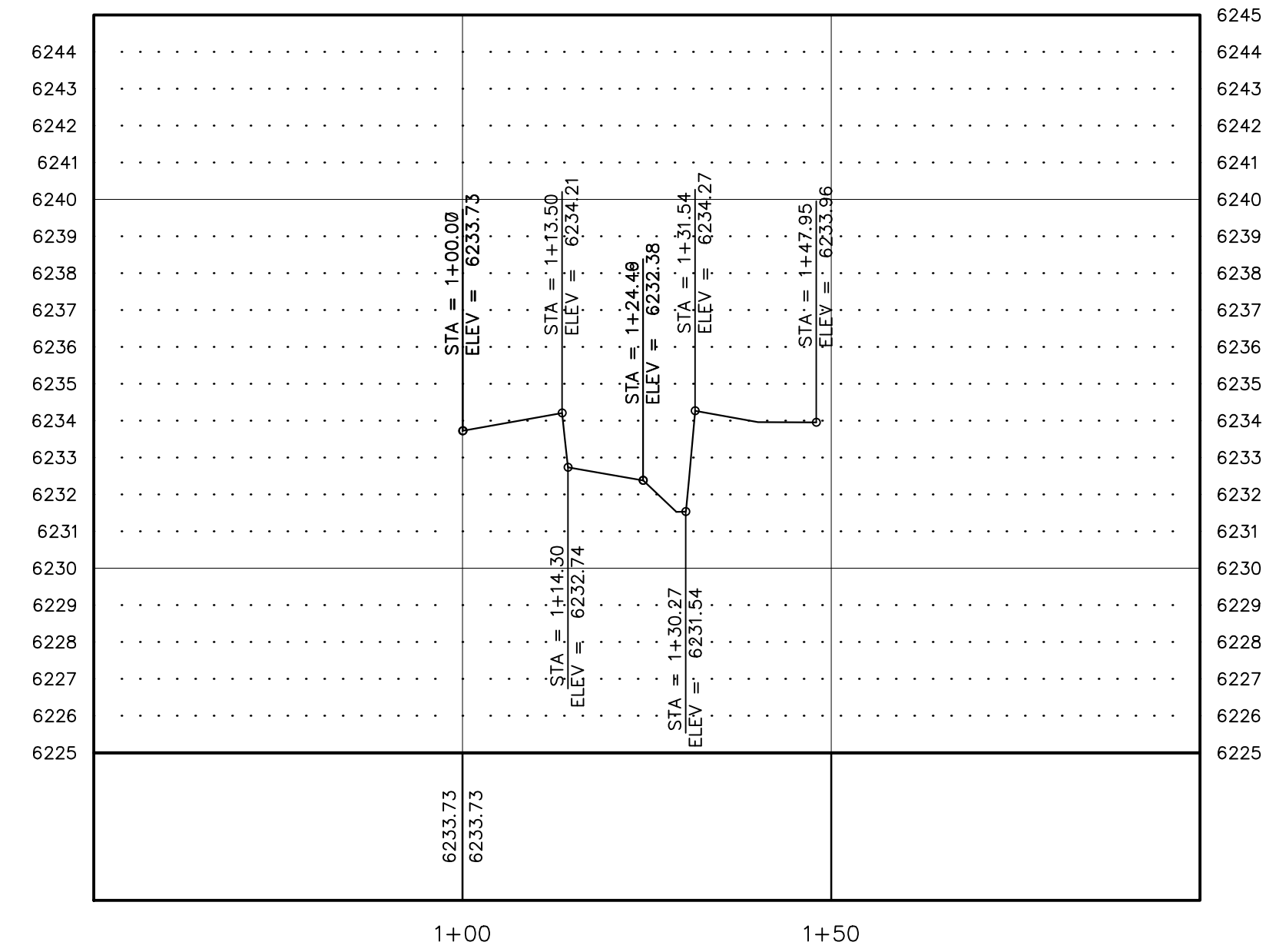
REV	DATE	DESCRIPTION

B4
DATE: NOVEMBER 2015
DRAWN BY: KLN
DESIGNED BY: GP
CHECKED BY: GP
JOB NO.: 8688.001

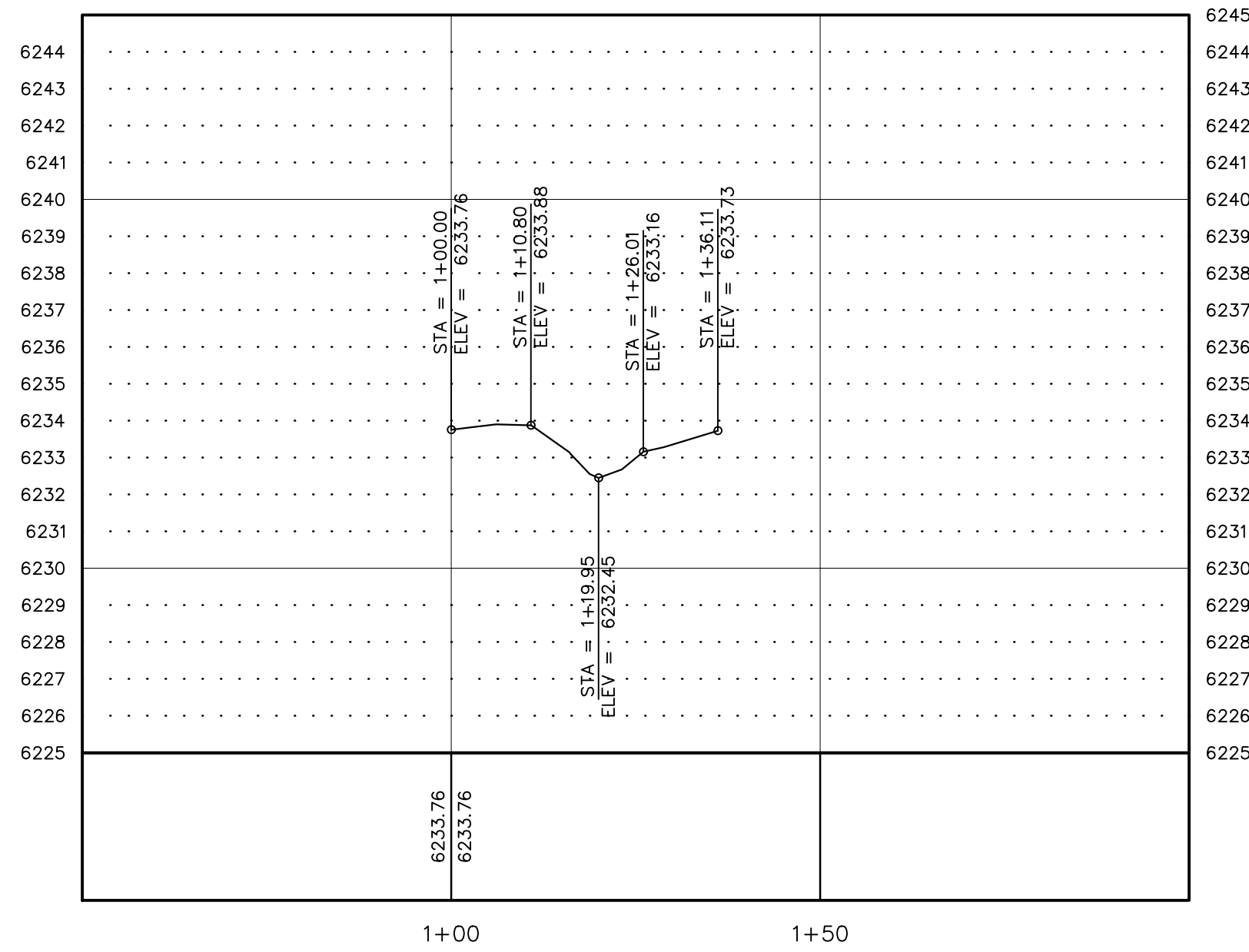
L:\AProj\8688.001 - Upper Truckee Marsh As Built - 2015\Survey\Draw\8688001 Upper Truckee Marsh profiles.dwg, B4 PROFILES, 12/15/2015 10:14 pm ghillips

L:\AProj\8688.001 - Upper Truckee Marsh As Built - 2015\SURVEY\Draw\8688001 Upper Truckee Marsh profiles.dwg; B5 PROFILES;
12/15/2015 04:14 pm ghillips

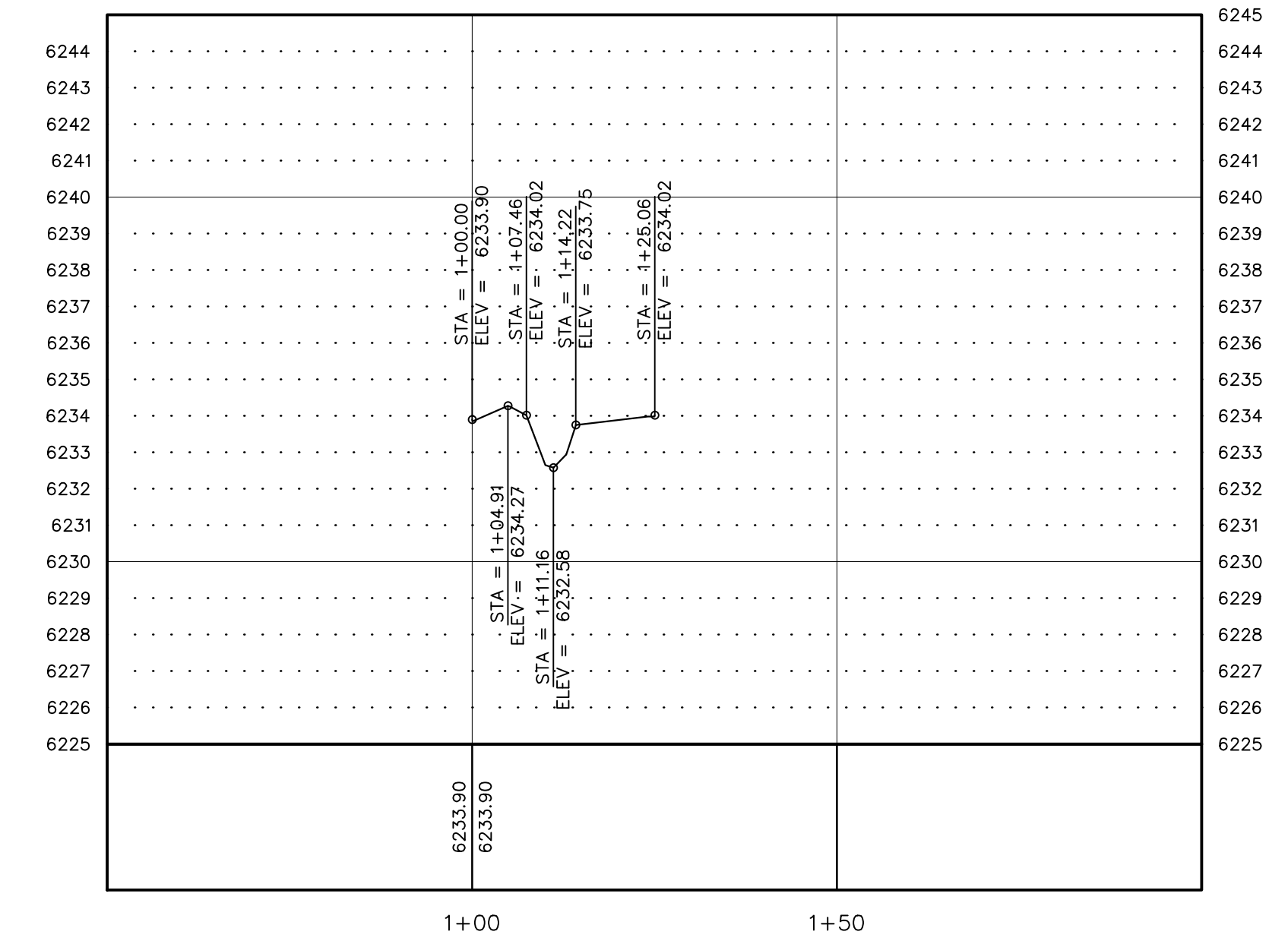
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
CTC X-SECTION 12 - STA:0+50 TO STA:2+00



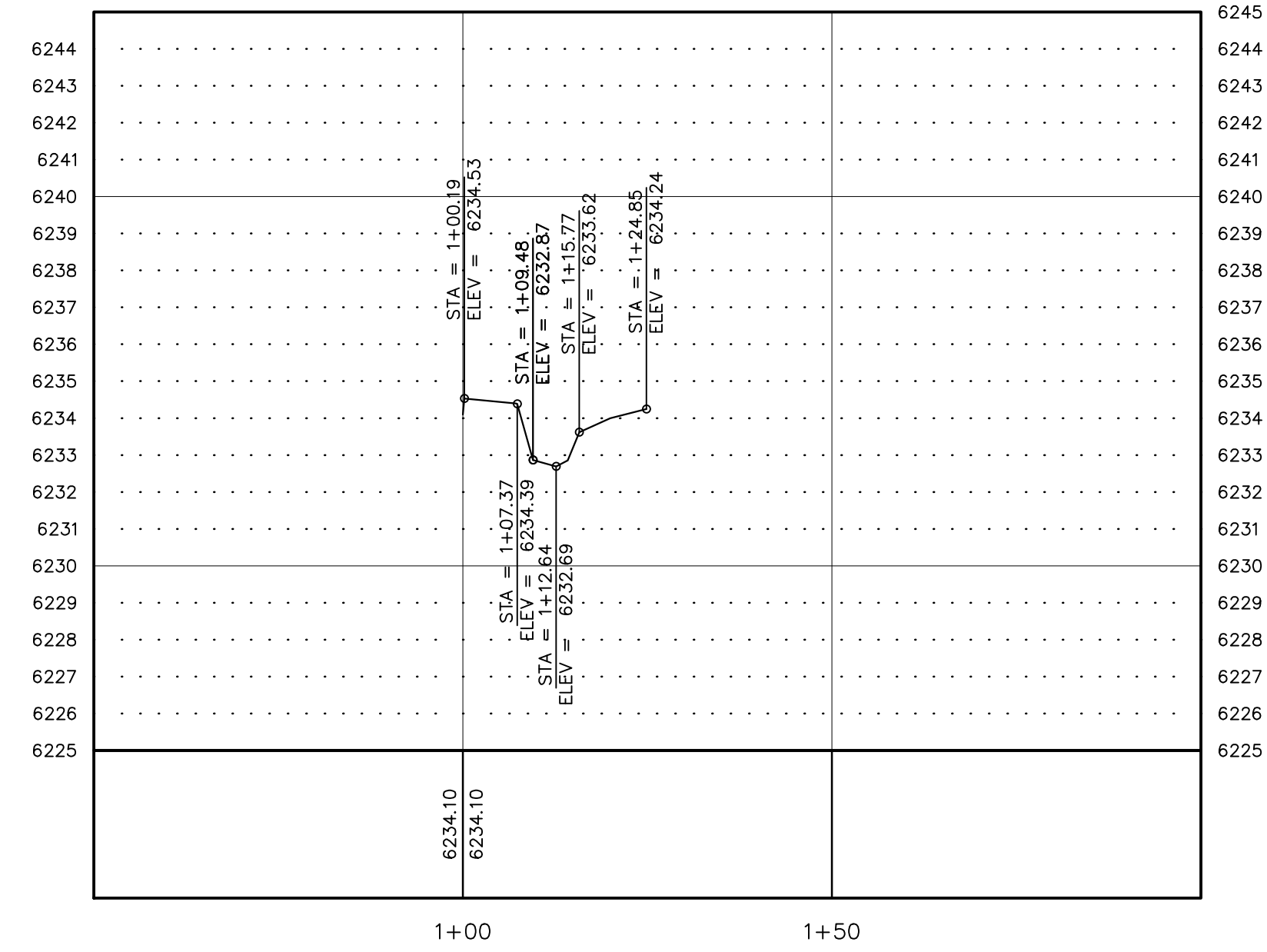
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
PC XS1 - STA:0+50 TO STA:2+00



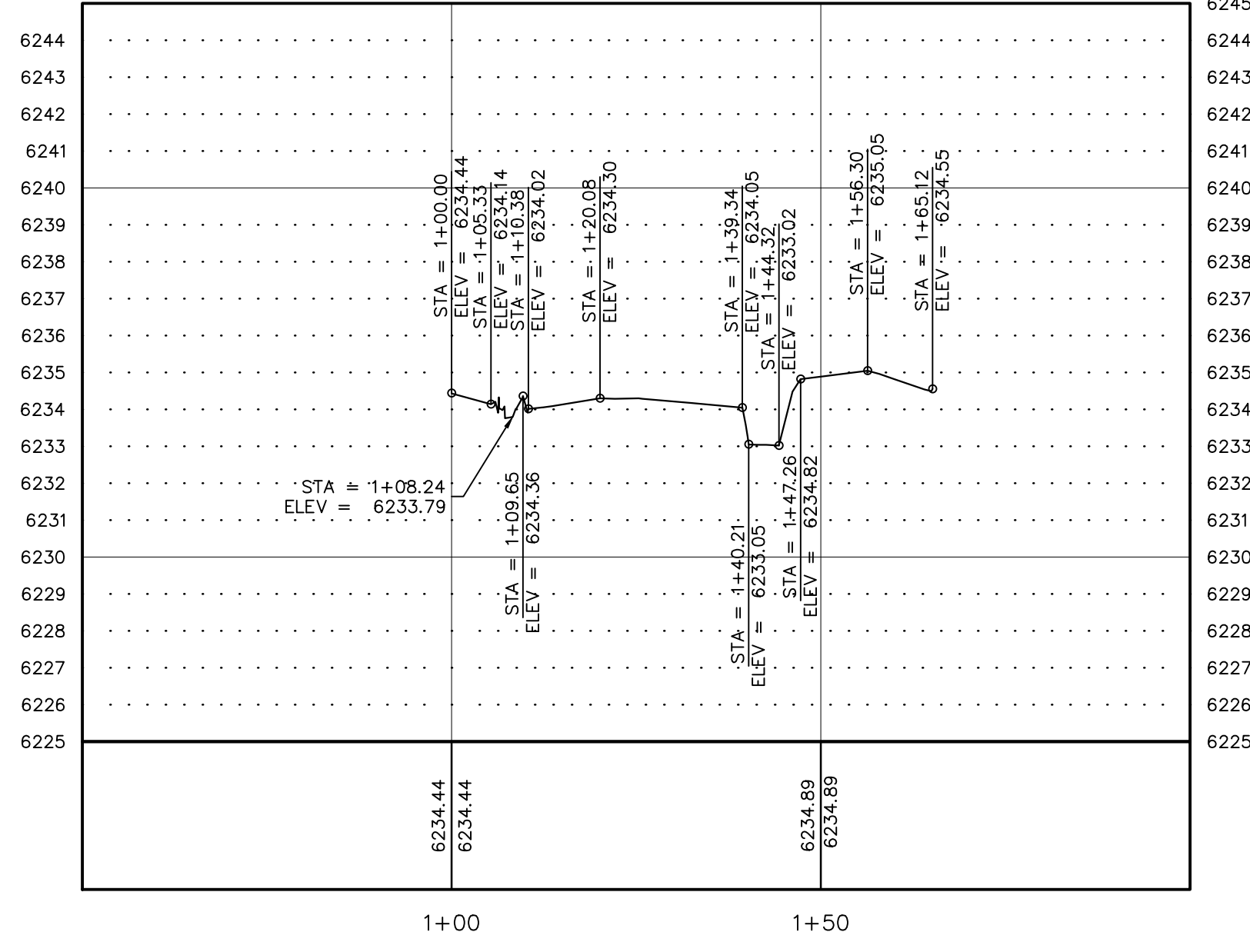
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
PC XS2 - STA:0+50 TO STA:2+00



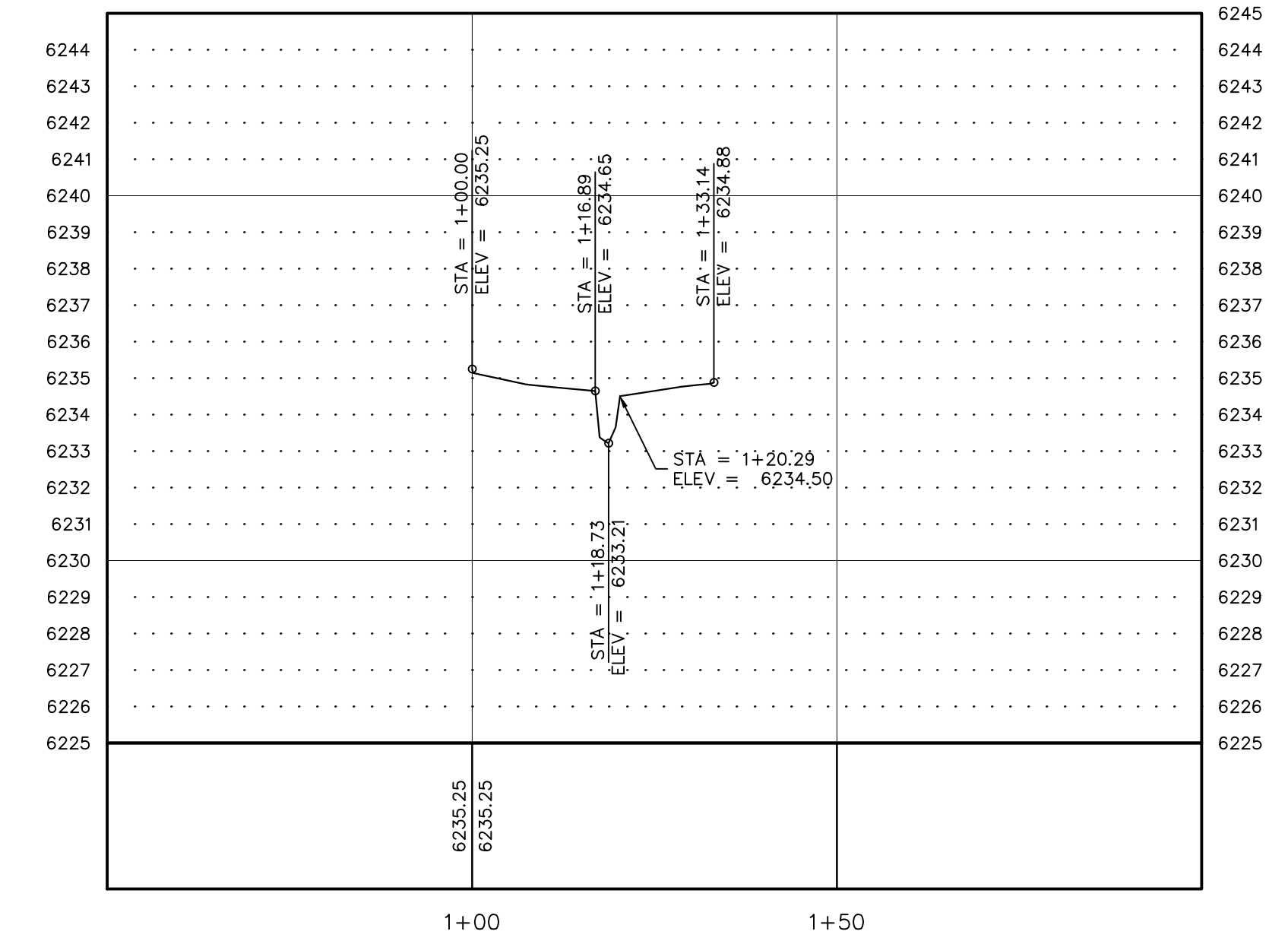
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
PC XS4 - STA:0+50 TO STA:2+00



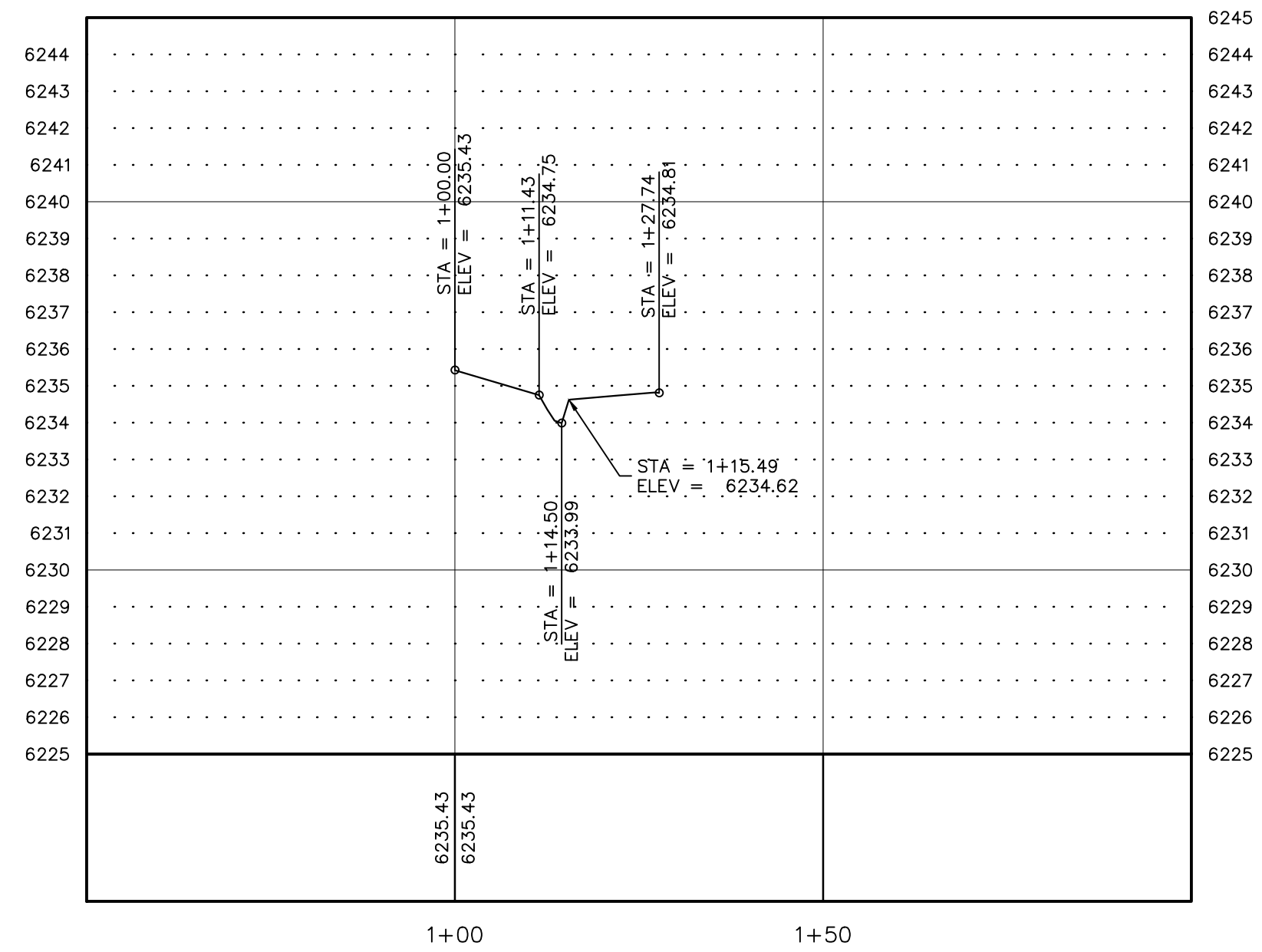
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
PC XS5 - STA:0+50 TO STA:2+00



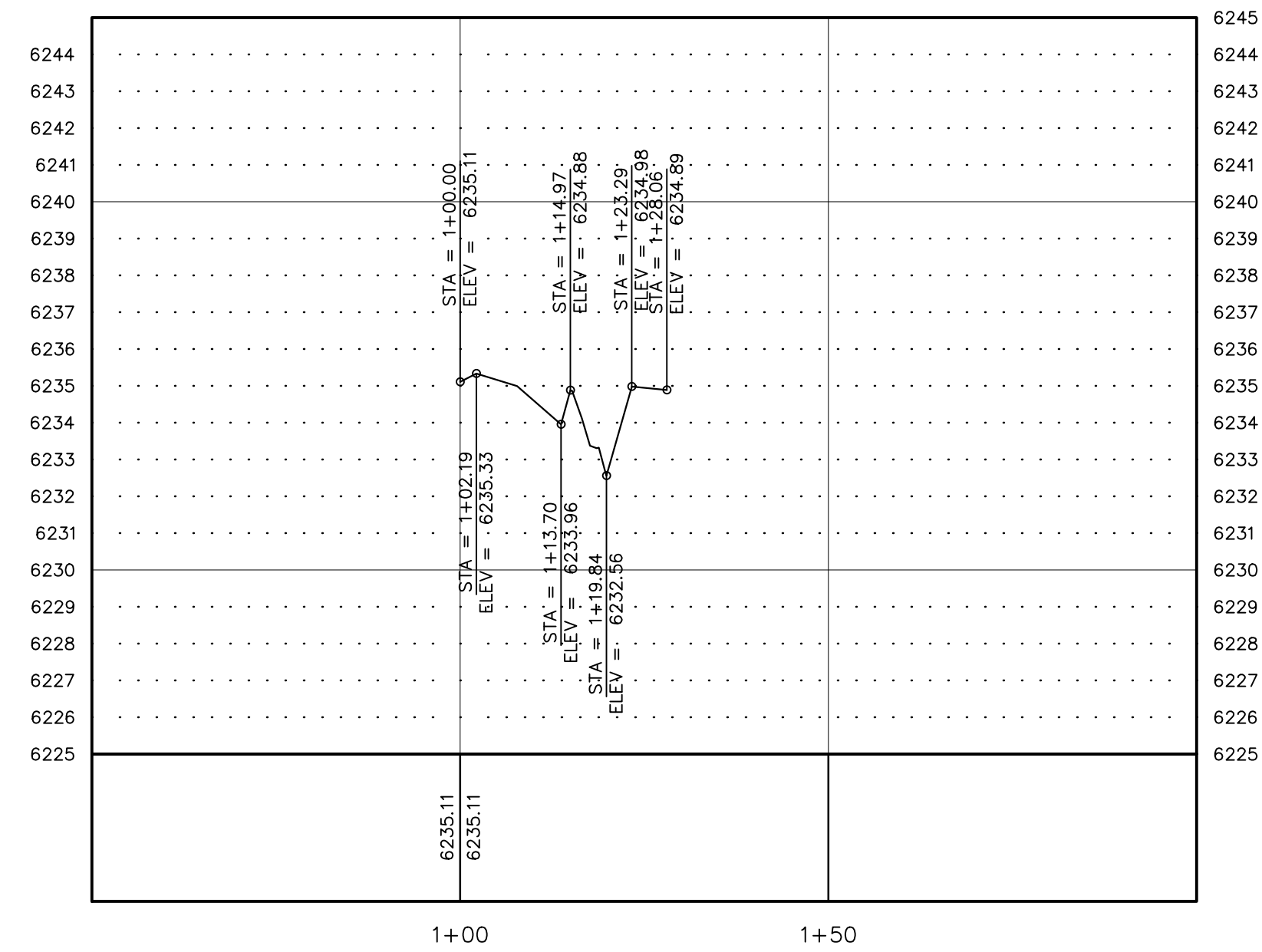
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
PC XS3 - STA:0+50 TO STA:2+00



SCALE:
HORIZ. 1"=20', VERT. 1"=2'
PC XS6 - STA:0+50 TO STA:2+00



SCALE:
HORIZ. 1"=20', VERT. 1"=2'
PC XS7 - STA:0+50 TO STA:2+00



800 E. COLLEGE PARKWAY
CARSON CITY, NEVADA 89706
TEL (775) 883-7077
FA: (775) 883-7114

WWW.LUMOSENGINEERING.COM

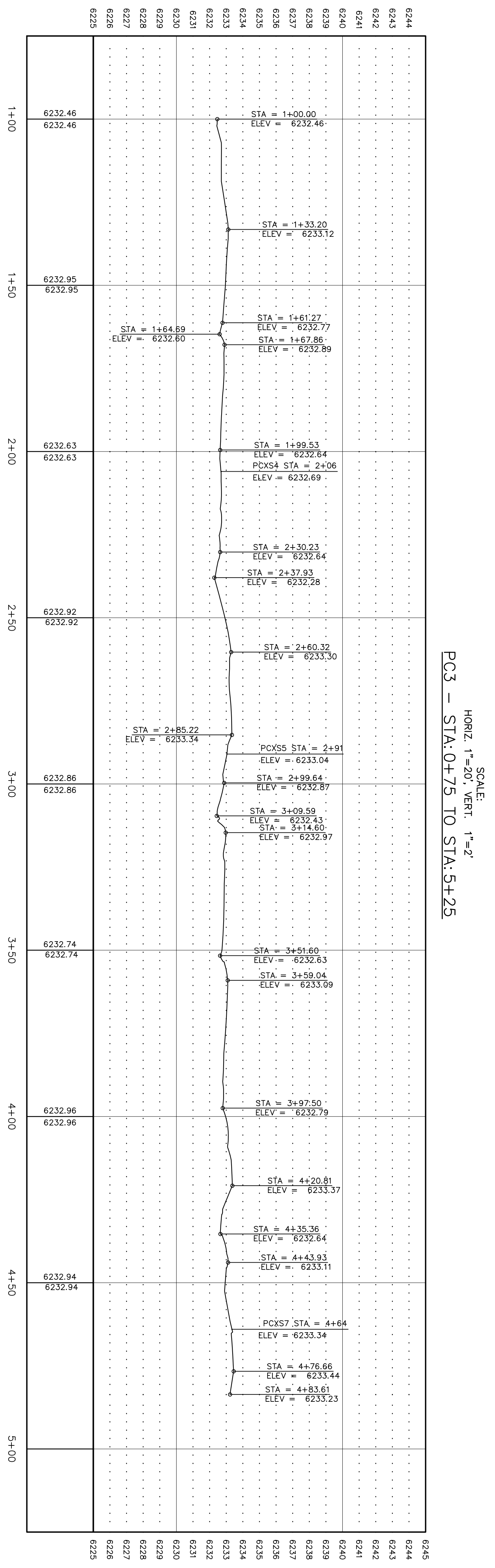
CIVIL ENGINEERING
GEOTECHNICAL ENGINEERING
PLANNING
LANDSCAPE ARCHITECTURE
SURVEYING / GIS
CONSTRUCTION SERVICES
MATERIALS TESTING

SOUTH TAHOE PUBLIC UTILITY DISTRICT
 UPPER TRUCKEE MARSH - BELLEVUE AREA
 A PORTION OF THE NORTH 1/2 OF
 SECTION 4, T.12N., R.18E., M.D.M., A.P.N. 026-200-11
 EL DORADO COUNTY CALIFORNIA

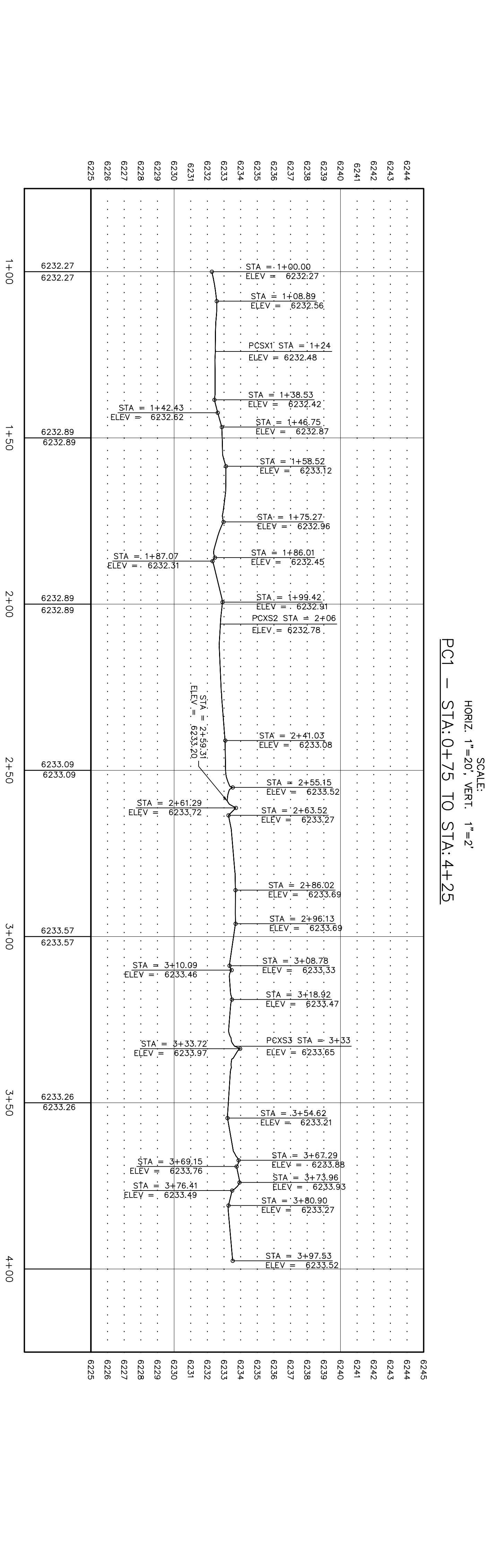
REV	DATE	DESCRIPTION

B5

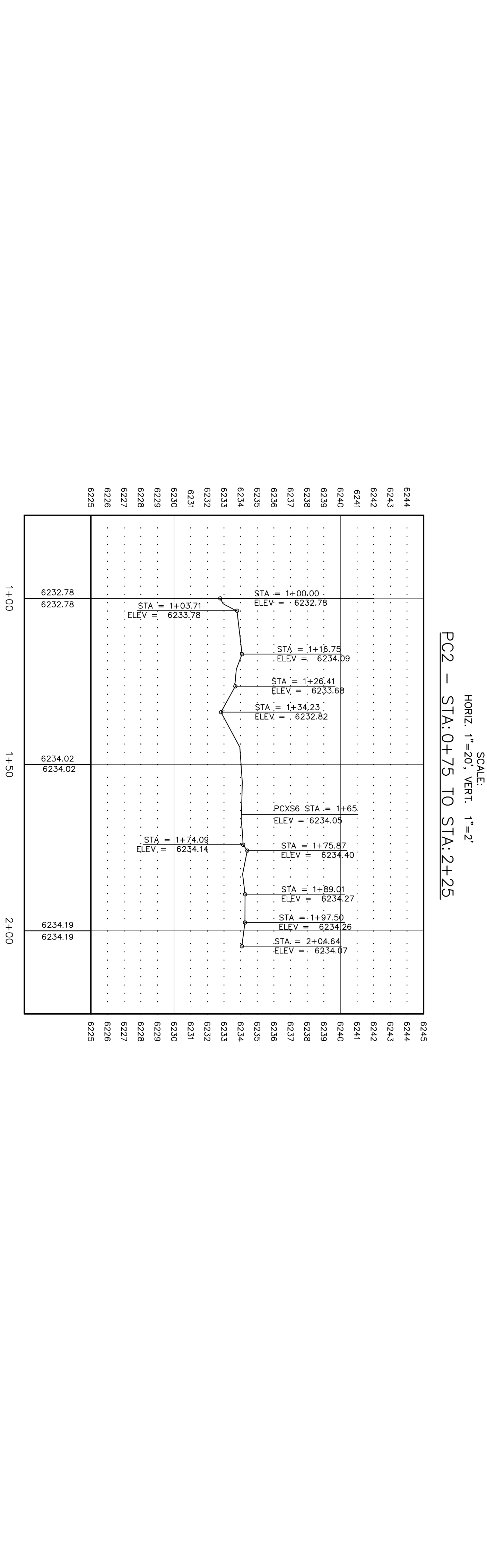
DATE: NOVEMBER 2015
DRAWN BY: KLN
DESIGNED BY: GP
CHECKED BY: GP
JOB NO.: 8688.001



SCALE: HORIZ. 1"=20', VERT. 1"=2'
PC3 - STA:0+75 TO STA:5+25



SCALE: HORIZ. 1"=20', VERT. 1"=2'
PC1 - STA:0+75 TO STA:4+25



SCALE: HORIZ. 1"=20', VERT. 1"=2'
PC2 - STA:0+75 TO STA:2+25

SOUTH TAHOE PUBLIC UTILITY DISTRICT

UPPER TRUCKEE MARSH - BELLEVUE AREA
A PORTION OF THE NORTH 1/2 OF
SECTION 4, T.12N., R18E., M.D.M, A.P.N. 026-200-11

EL DORADO COUNTY CALIFORNIA

800 E. COLLEGE PARKWAY
DORADO CITY, NEVADA 89708
FACILITY (775) 983-7114
WWW.LUMOSENGINEERING.COM

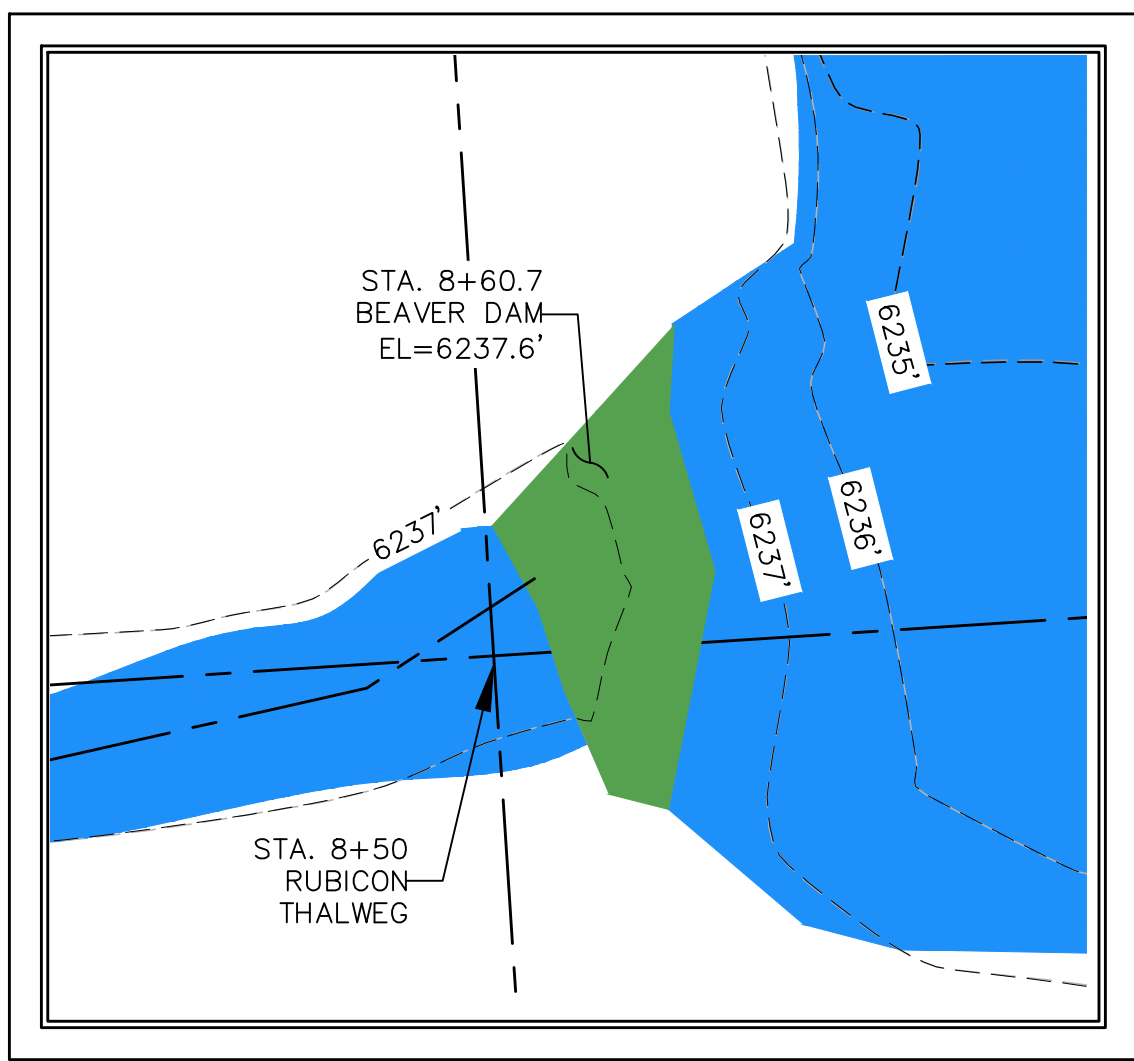
CIVIL ENGINEERING
GEOTECHNICAL ENGINEERING
PLANNING
LANDSCAPE ARCHITECTURE
SURVEYING / GIS
CONSTRUCTION SERVICES
MATERIALS TESTING

REV	DATE	DESCRIPTION	BY

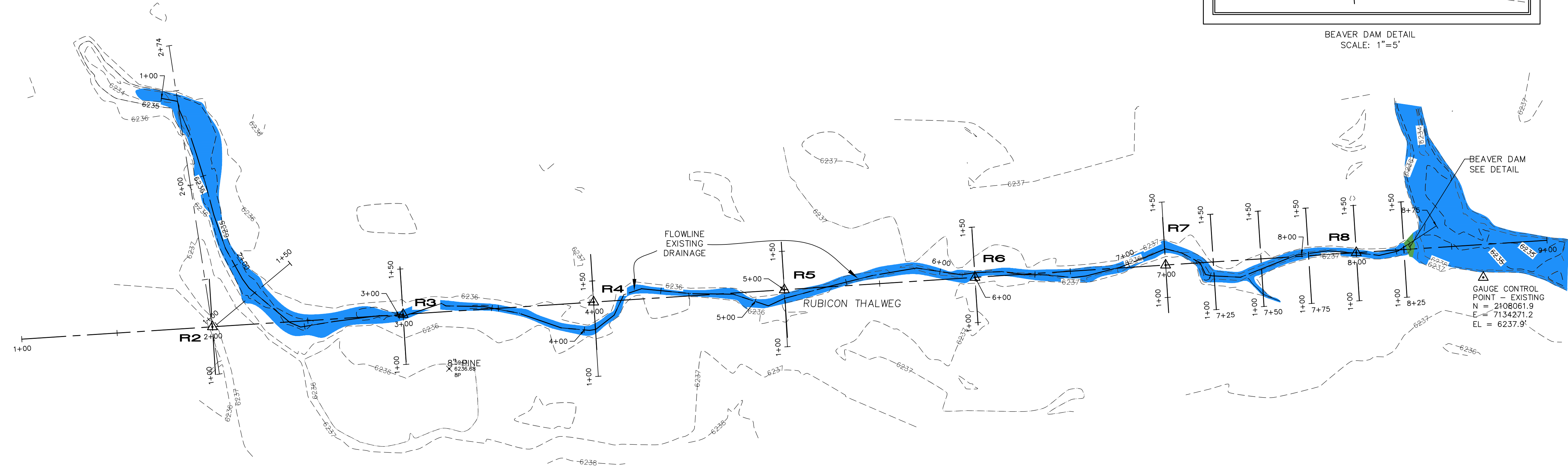
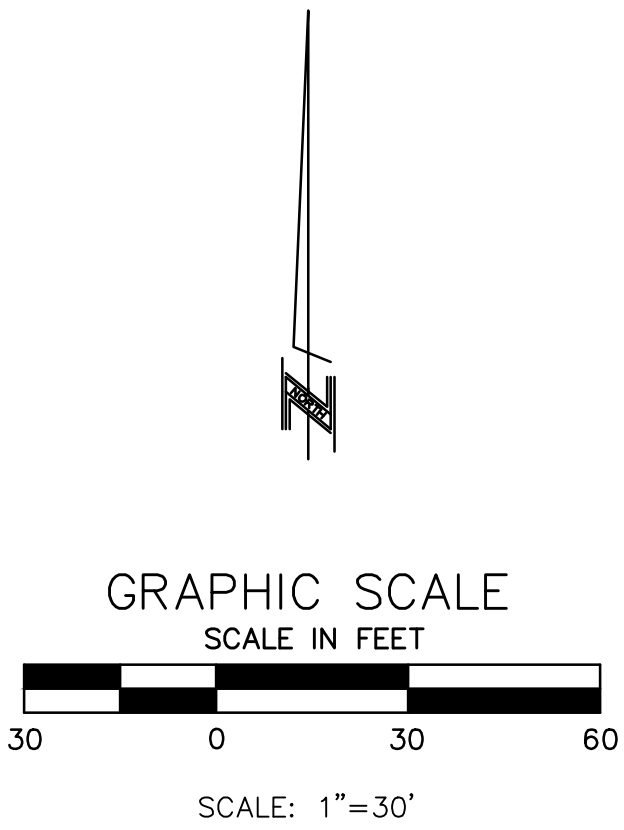
B6

DATE: NOVEMBER 2015
DRAWN BY: KLN
DESIGNED BY: GP
CHECKED BY: GP
JOB NO.: 8688.001

TRUCKEE MARSH SEWER FACILITIES PROTECTION PROJECT FOR SOUTH TAHOE PUBLIC UTILITY DISTRICT



BEAVER DAM DETAIL
SCALE: 1"=5'



PROJECT CONTROL

MONUMENT NAME	LATITUDE NAD83	LONGITUDE NAD83	NORTHING SPC GRID	EASTING SPC GRID	ELEV. NAVD88	ELEV. NGVD29
R2	38.933290737°N	119.989152495°W	2108036.0	7133605.9	6236.7	6232.7
R3	38.933302389°N	119.988801138°W	2108042.5	7133705.8	6235.1	6231.1
R4	38.933314115°N	119.988450170°W	2108049.0	7133805.5	6236.2	6232.3
R5	38.933325686°N	119.988098854°W	2108055.4	7133905.3	6236.4	6232.4
R6	38.933337426°N	119.987747632°W	2108061.9	7134005.1	6236.5	6232.5
R7	38.933349104°N	119.987396289°W	2108068.3	7134104.9	6237.6	6233.8
R8	38.933360888°N	119.987045069°W	2108074.8	7134204.7	6236.7	6232.7
RUBICON GAUGE	38.933321287°N	119.986812431°W	2108061.9	7134271.2	6237.9	6234.0

LEGEND:

- △ FOUND 5/8" REBAR AND CAP "LUMOS CONTROL"
- △ FOUND 5/8" REBAR AND CAP "TR-STATE CONTROL" - UNLESS OTHERWISE NOTED
- FOUND 1/2" REBAR W/ NO CAP (CTC)

NOTE:

FIELD SURVEY CONDUCTED BETWEEN OCTOBER 22 & 30, 2015

DATUM

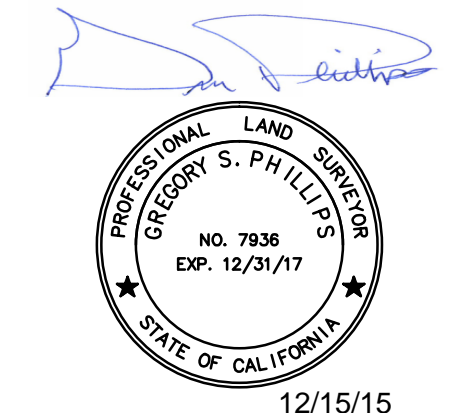
HORIZONTAL: NAD 83(2011) EPOCH 2010.00 CALIFORNIA ZONE 2
 NGS HPGN D CA 03 FS
 N 2107571.07 US SURVEY FEET- GRID
 E 7136557.88
 NGS RICHARDSON
 N 2103848.87 US SURVEY FEET - GRID
 E 7123525.92 GRID
 VERTICAL: NAVD88
 NGS HPGN D CA 03 FS
 EL = 6248.20
 PER CONTROL SURVEY PROVIDED BY S.T.P.U.D., PREPARED BY TRI STATE SURVEYING, LTD., DATED 11-05-13



800 E. COLLEGE PARKWAY
 CARSON CITY, NEVADA 89706
 TEL (775) 883-7077
 FAX (775) 883-7114

WWW.LUMOSENGINEERING.COM

CIVIL ENGINEERING
 GEOTECHNICAL ENGINEERING
 PLANNING
 LANDSCAPE ARCHITECTURE
 SURVEYING / GIS
 CONSTRUCTION SERVICES
 MATERIALS TESTING



SOUTH TAHOE PUBLIC UTILITY DISTRICT
 UPPER TRUCKEE MARSH - RUBICON TRAIL AREA
 A PORTION OF THE NORTH 1/2 OF
 SECTION 4, T.12N., R18E., M.D.M., A.P.N. 026-200-11
 EL DORADO COUNTY
 CALIFORNIA

REV	DATE	DESCRIPTION

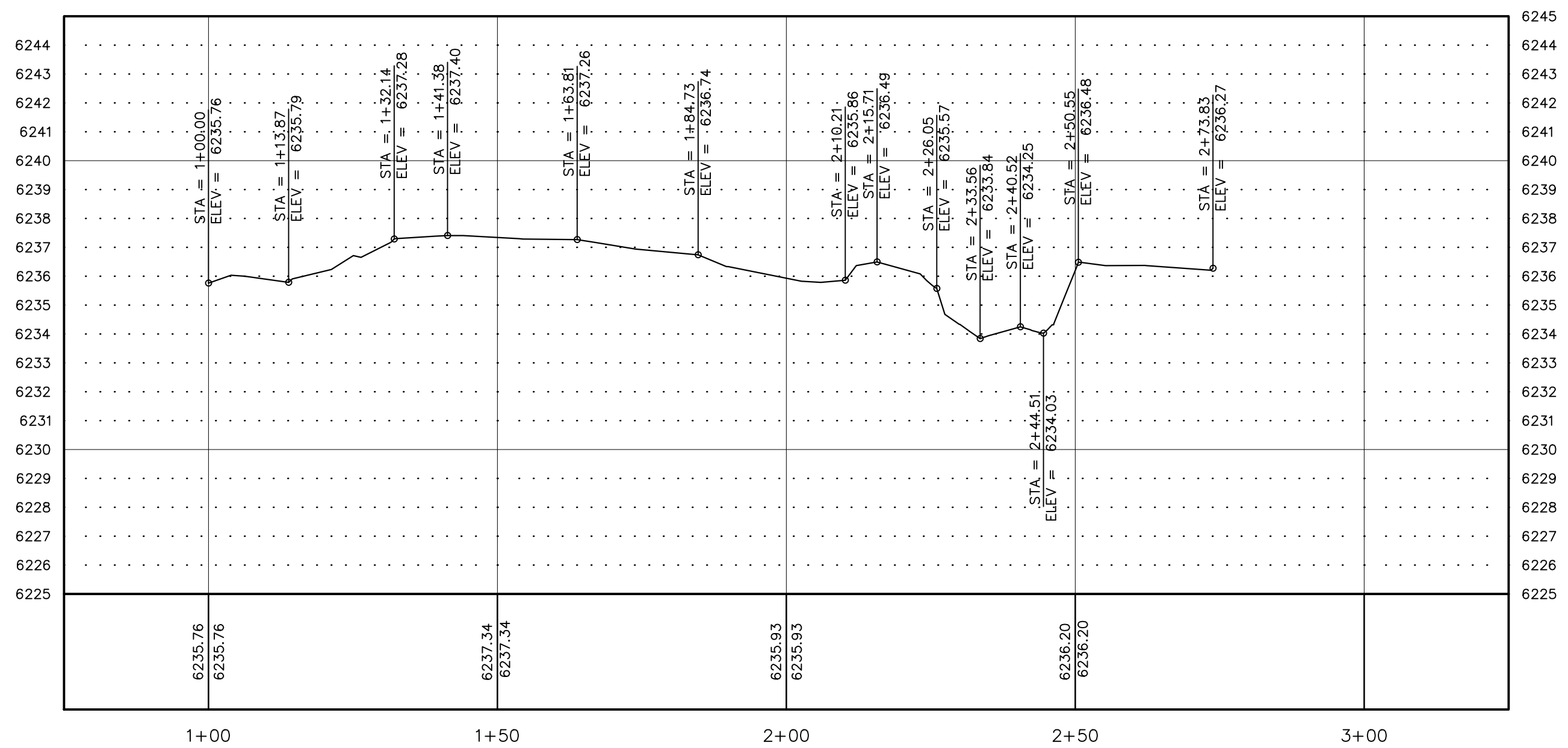
R1

DATE: NOVEMBER 2015
 DRAWN BY: KLN
 DESIGNED BY: GP
 CHECKED BY: GP
 JOB NO.: 8688.001

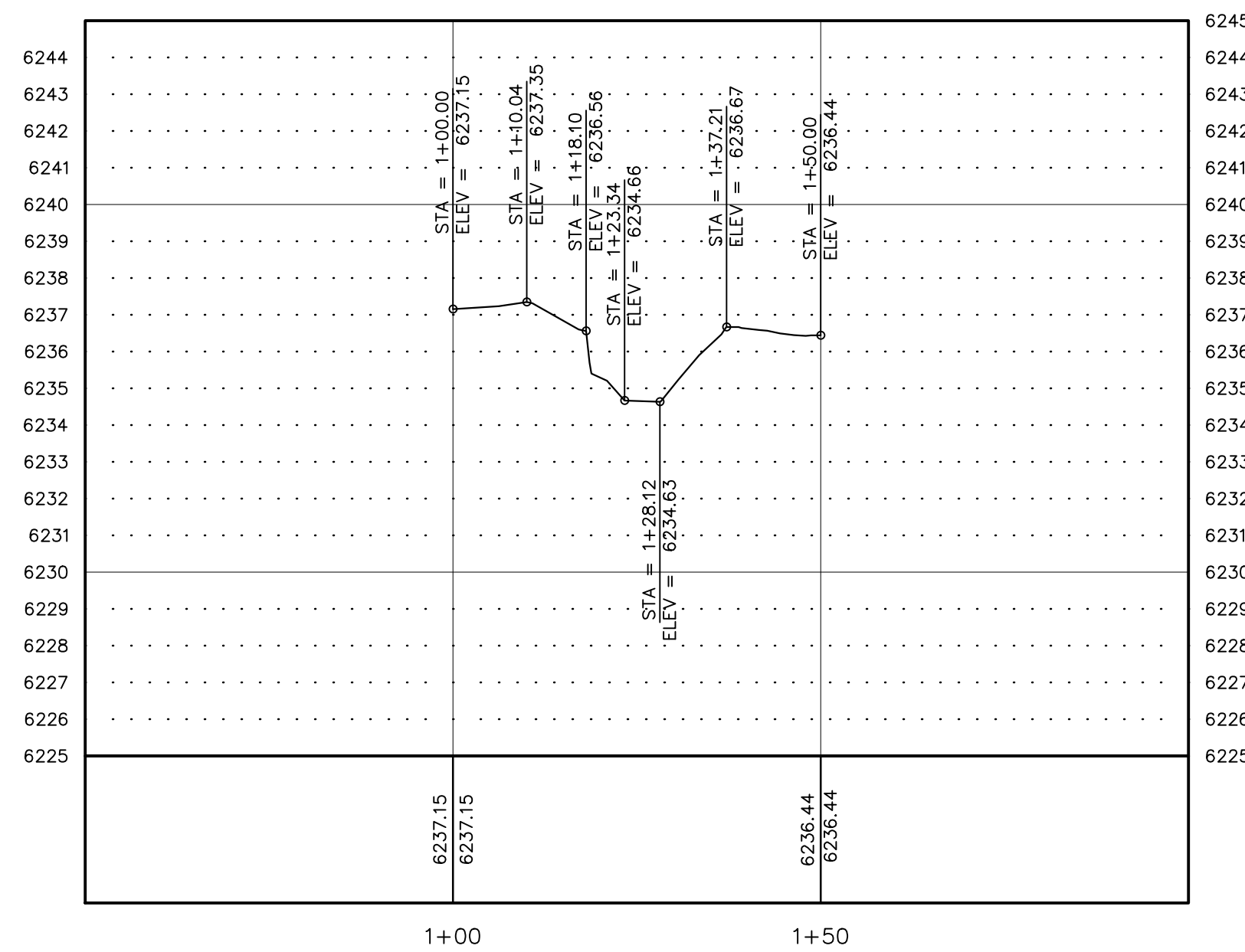
L:_AProj\8688.001 - Upper Truckee Marsh As Built - 2015\Survey\Draw\8688001 Upper Truckee Marsh profiles.dwg, R1 OVERALL, 12/15/2015 04:14 pm, gphillips

L:\AProj\8688.001 - Upper Truckee Marsh As Built - 2015\Survey\Draw\8688001 Upper Truckee Marsh profiles.dwg P2 PROFILES, 12/15/2015 04:14 pm ghillips

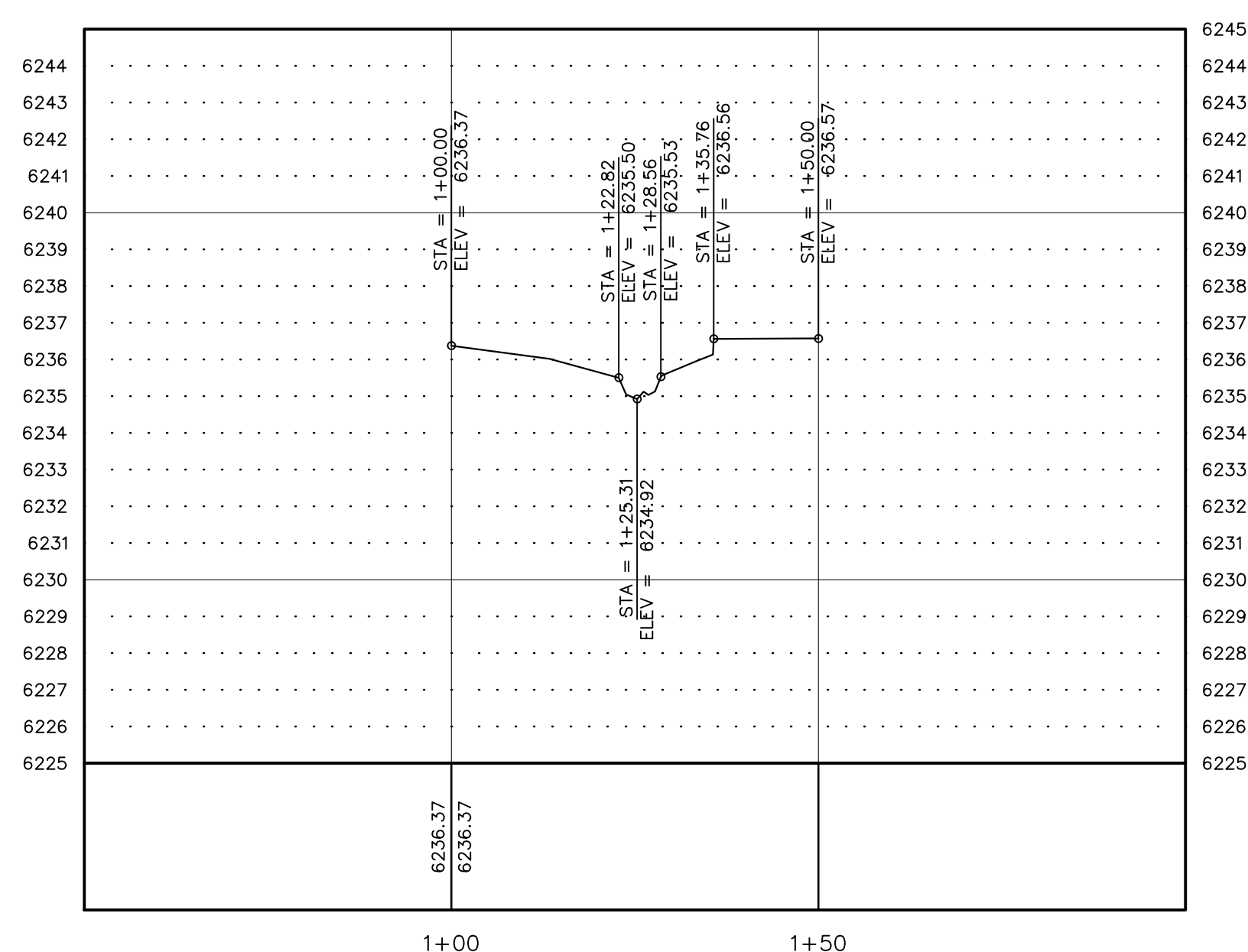
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
RUBICON 2+00 - STA: 0+75 TO STA: 3+25



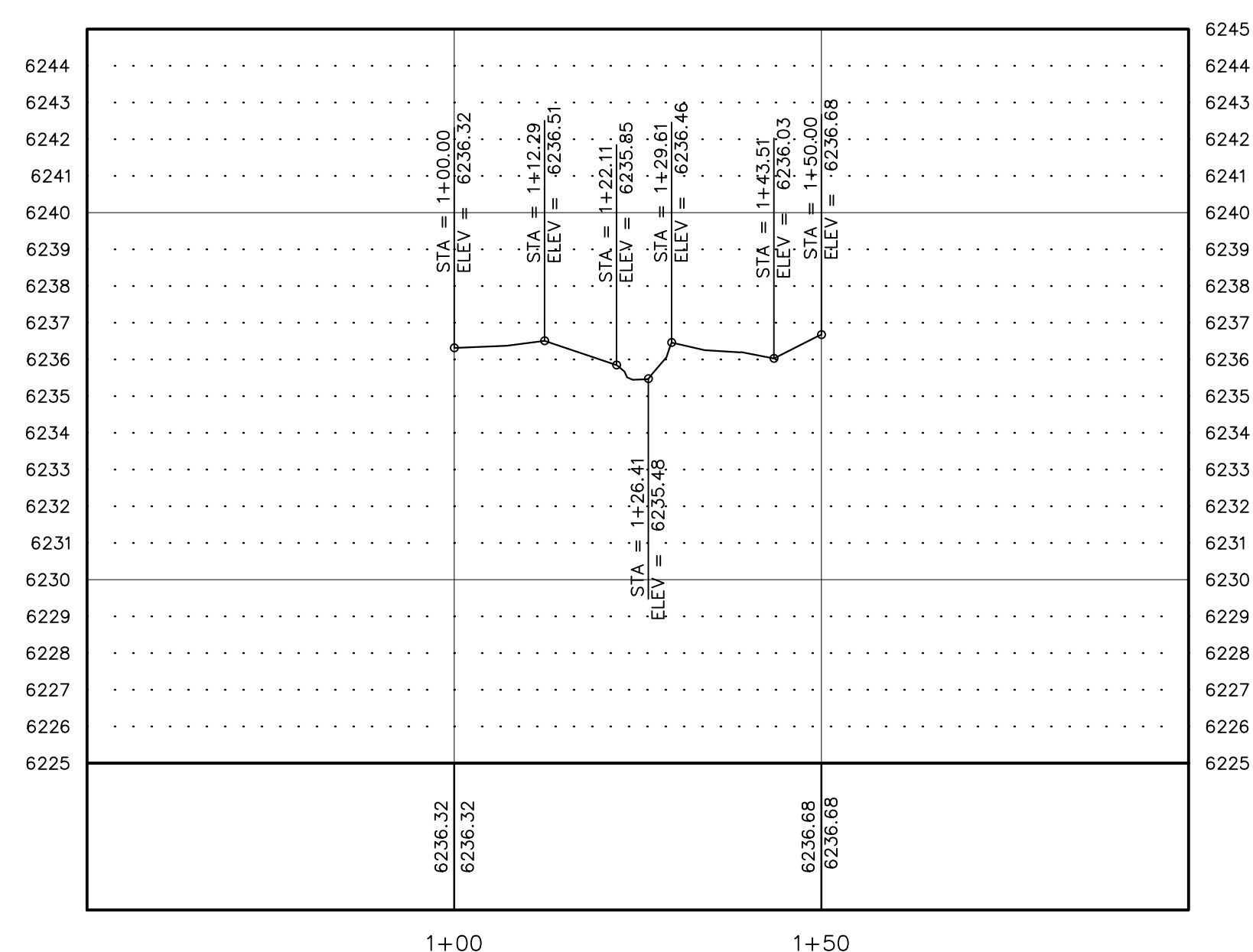
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
RUBICON 2+25 - STA: 0+50 TO STA: 2+00



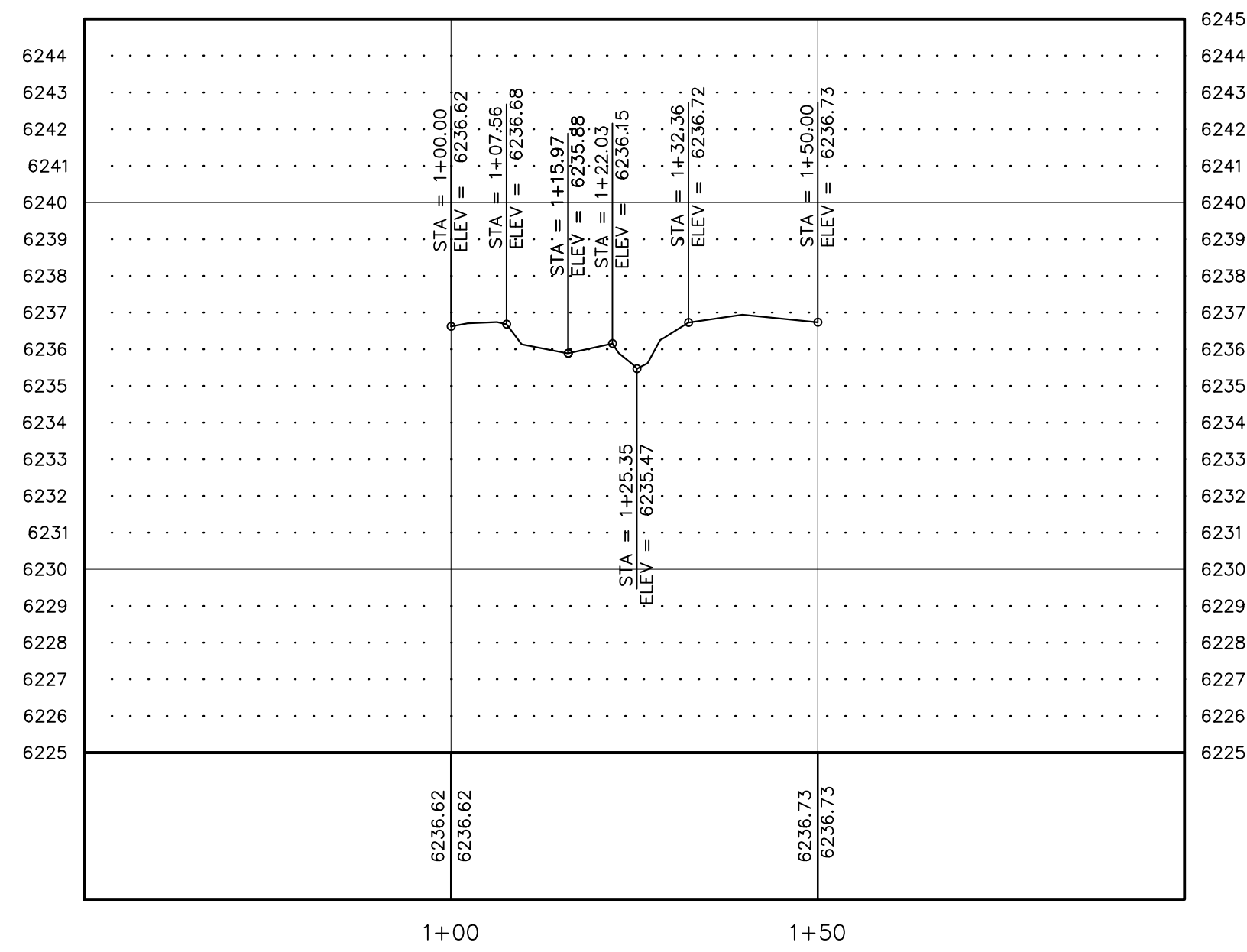
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
RUBICON 3+00 - STA: 0+50 TO STA: 2+00



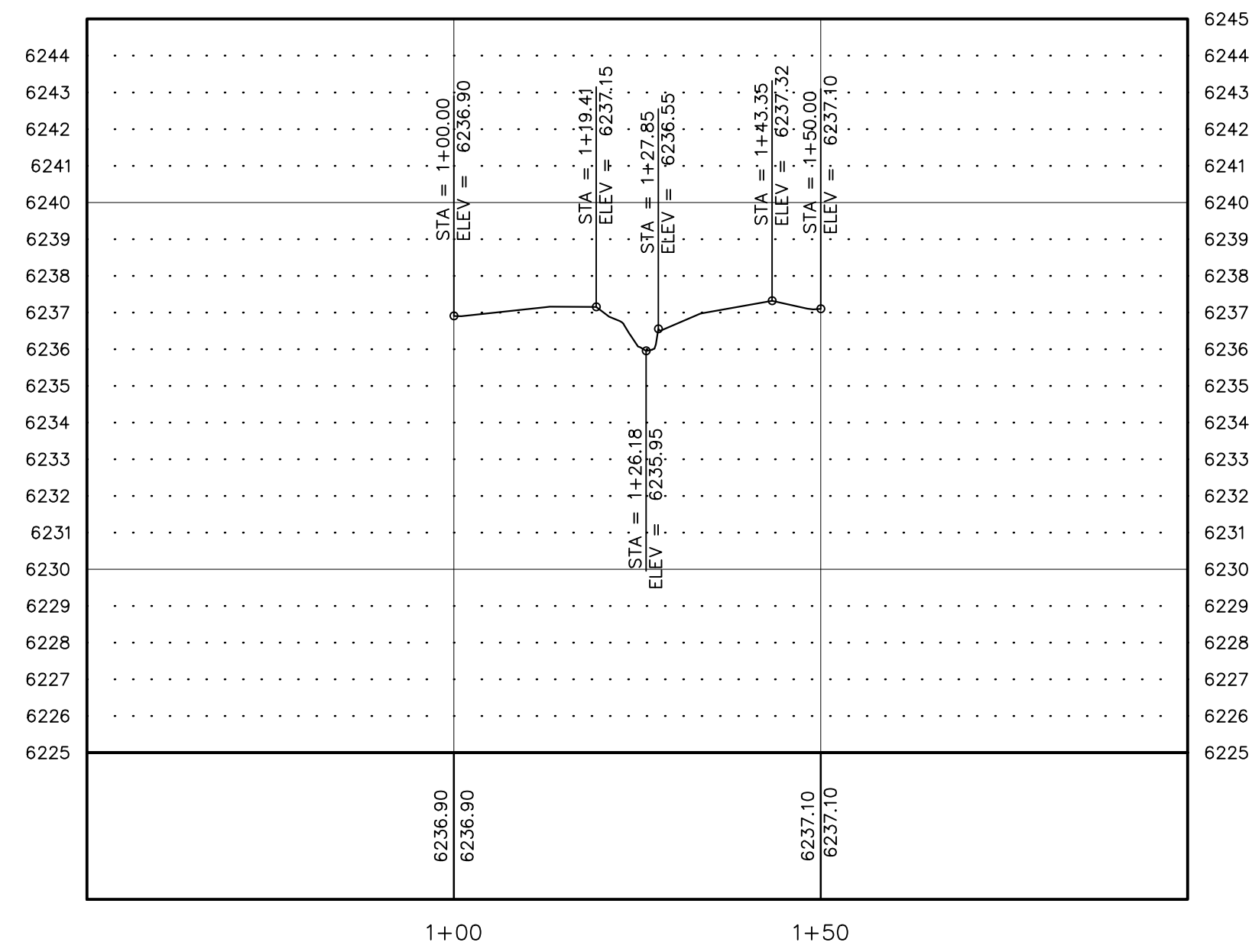
SCALE:
HORIZ. 1"=20', VERT. 1"=2'
RUBICON 4+00 - STA: 0+50 TO STA: 2+00



SCALE:
HORIZ. 1"=20', VERT. 1"=2'
RUBICON 5+00 - STA: 0+50 TO STA: 2+00



SCALE:
HORIZ. 1"=20', VERT. 1"=2'
RUBICON 6+00 - STA: 0+50 TO STA: 2+00



800 E. COLLEGE PARKWAY
CARSON CITY, NEVADA 89706
TEL (775) 883-7077
FA (775) 883-7114

WWW.LUMOSENGINEERING.COM

CIVIL ENGINEERING
GEOTECHNICAL ENGINEERING
PLANNING
LANDSCAPE ARCHITECTURE
SURVEYING / GIS
CONSTRUCTION SERVICES
MATERIALS TESTING

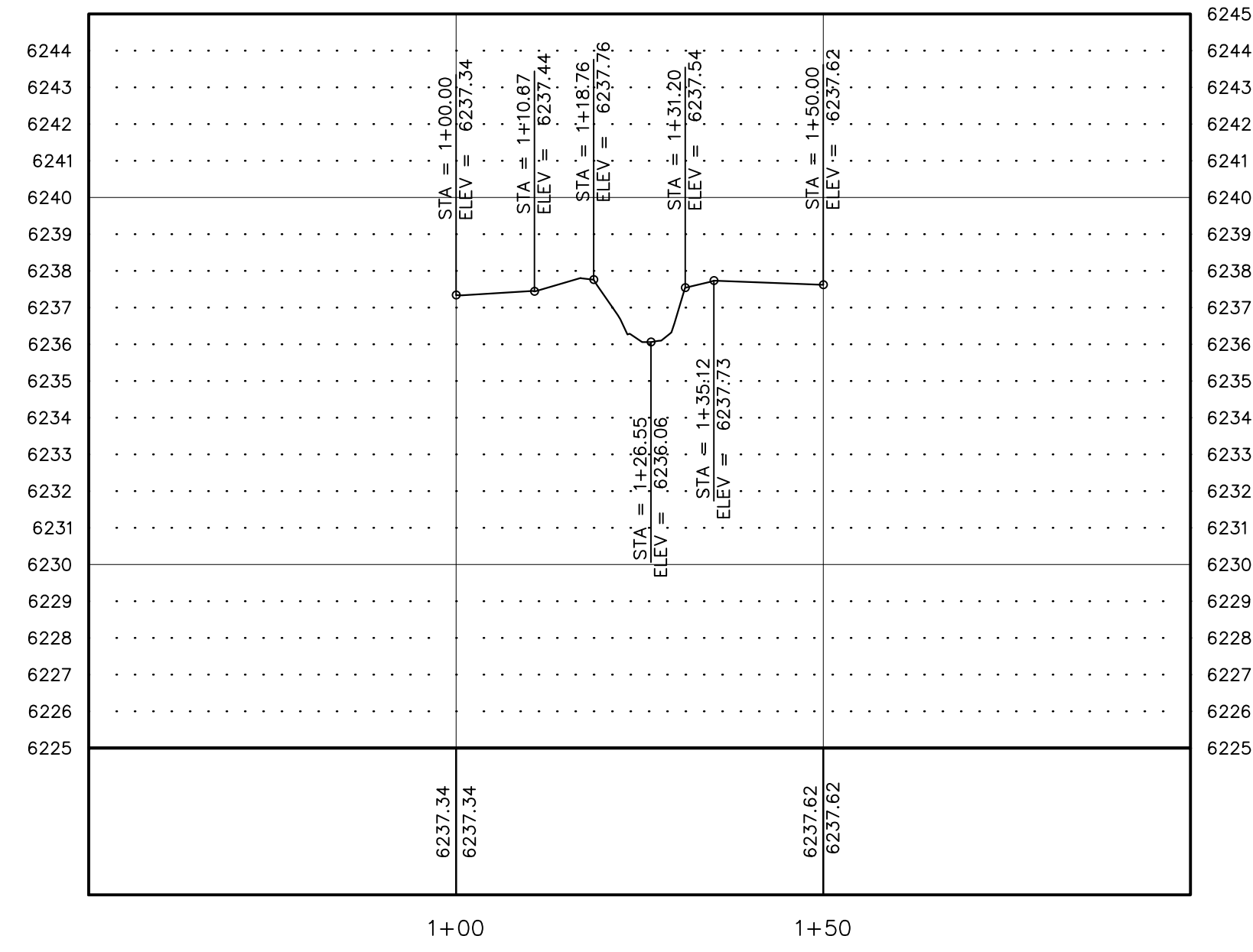
SOUTH TAHOE PUBLIC UTILITY DISTRICT
 UPPER TRUCKEE MARSH - RUBICON TRAIL AREA
 A PORTION OF THE NORTH 1/2 OF
 SECTION 4, T.12N., R.18E., M.D.M., A.P.N. 026-200-11
 EL DORADO COUNTY CALIFORNIA

REV	DATE	DESCRIPTION	BY

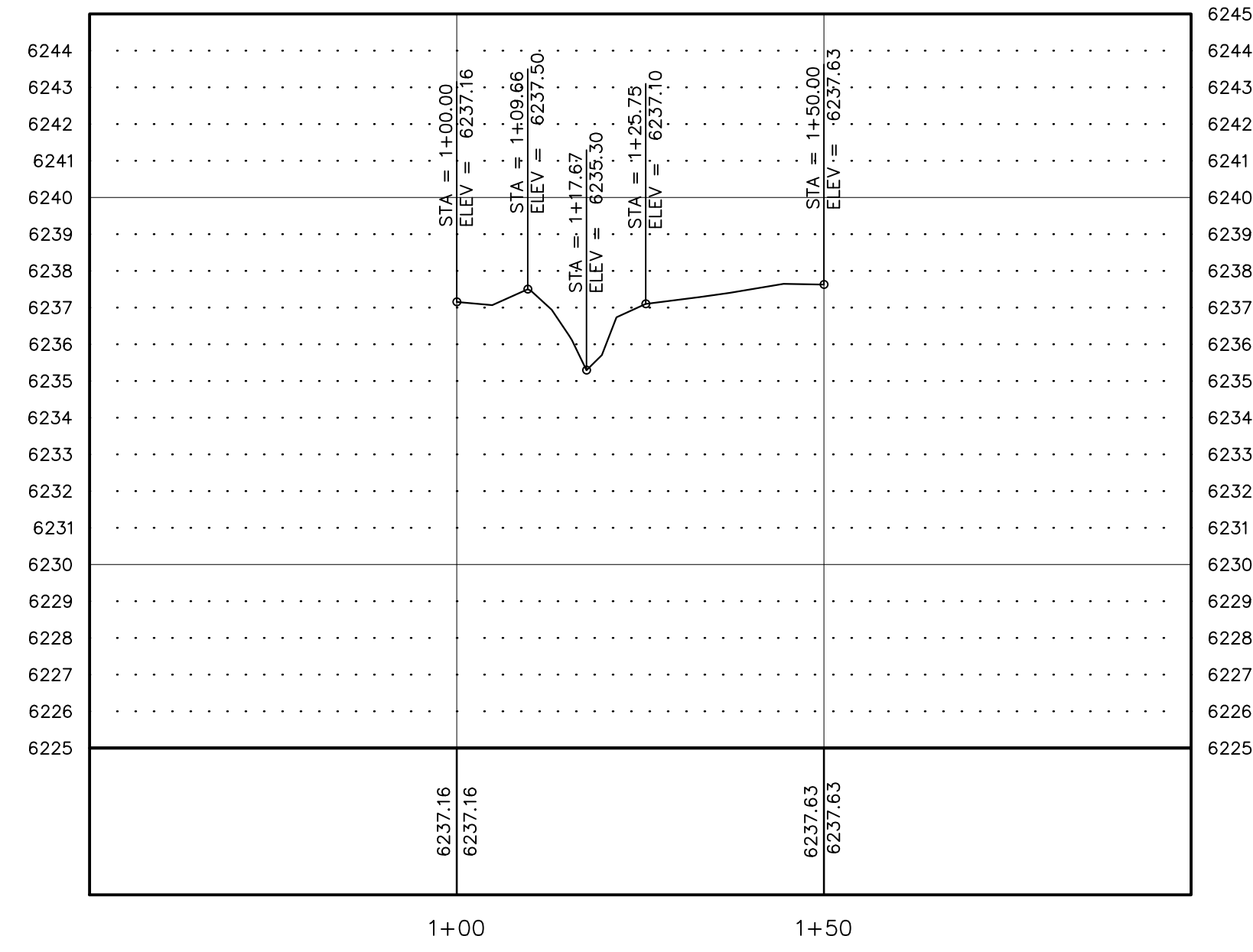
R2

DATE: NOVEMBER 2015
DRAWN BY: KLN
DESIGNED BY: GP
CHECKED BY: GP
JOB NO.: 8688.001

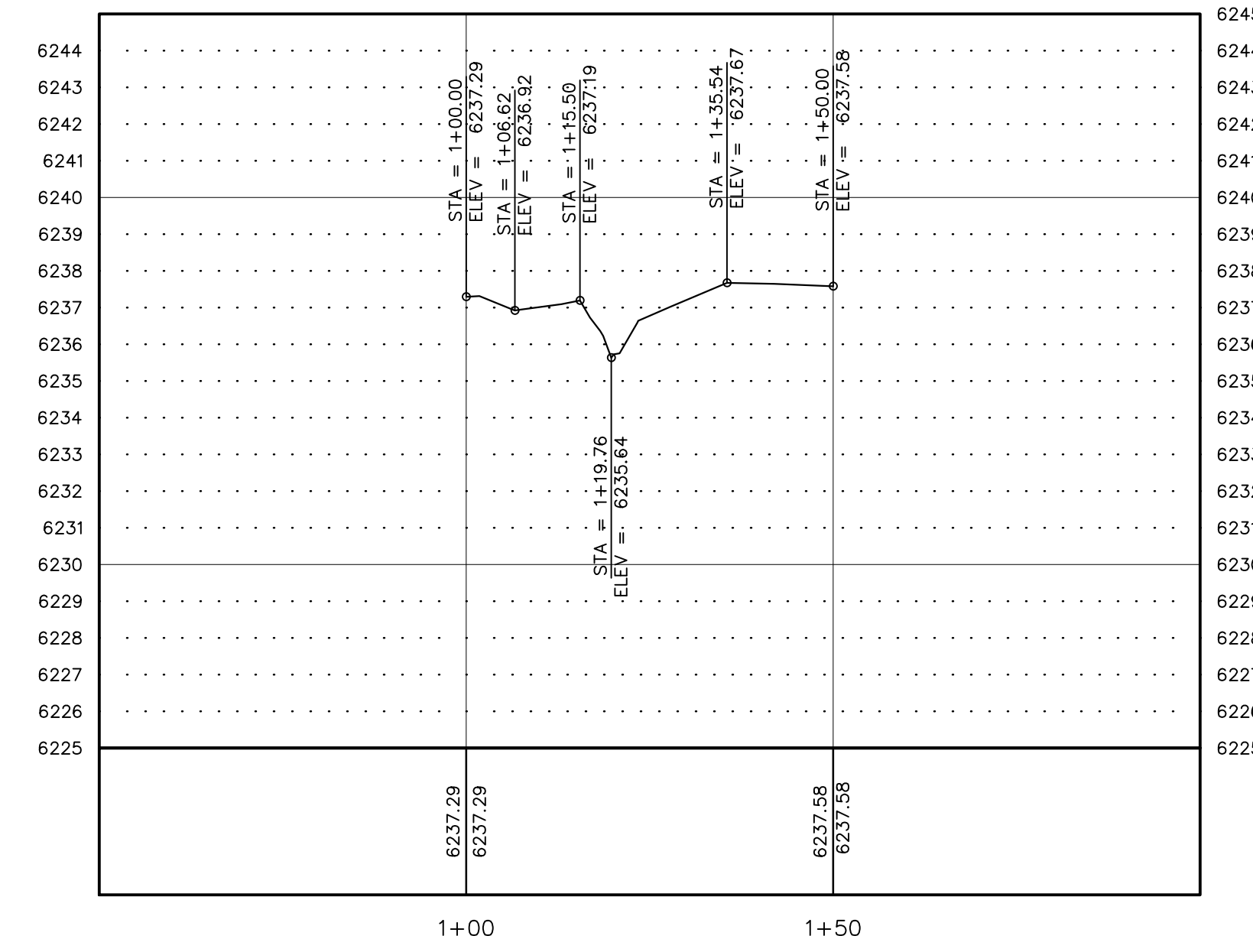
SCALE:
 HORIZ. 1"=20', VERT. 1"=2'
 RUBICON 7+00 - STA:0+50 TO STA:2+00



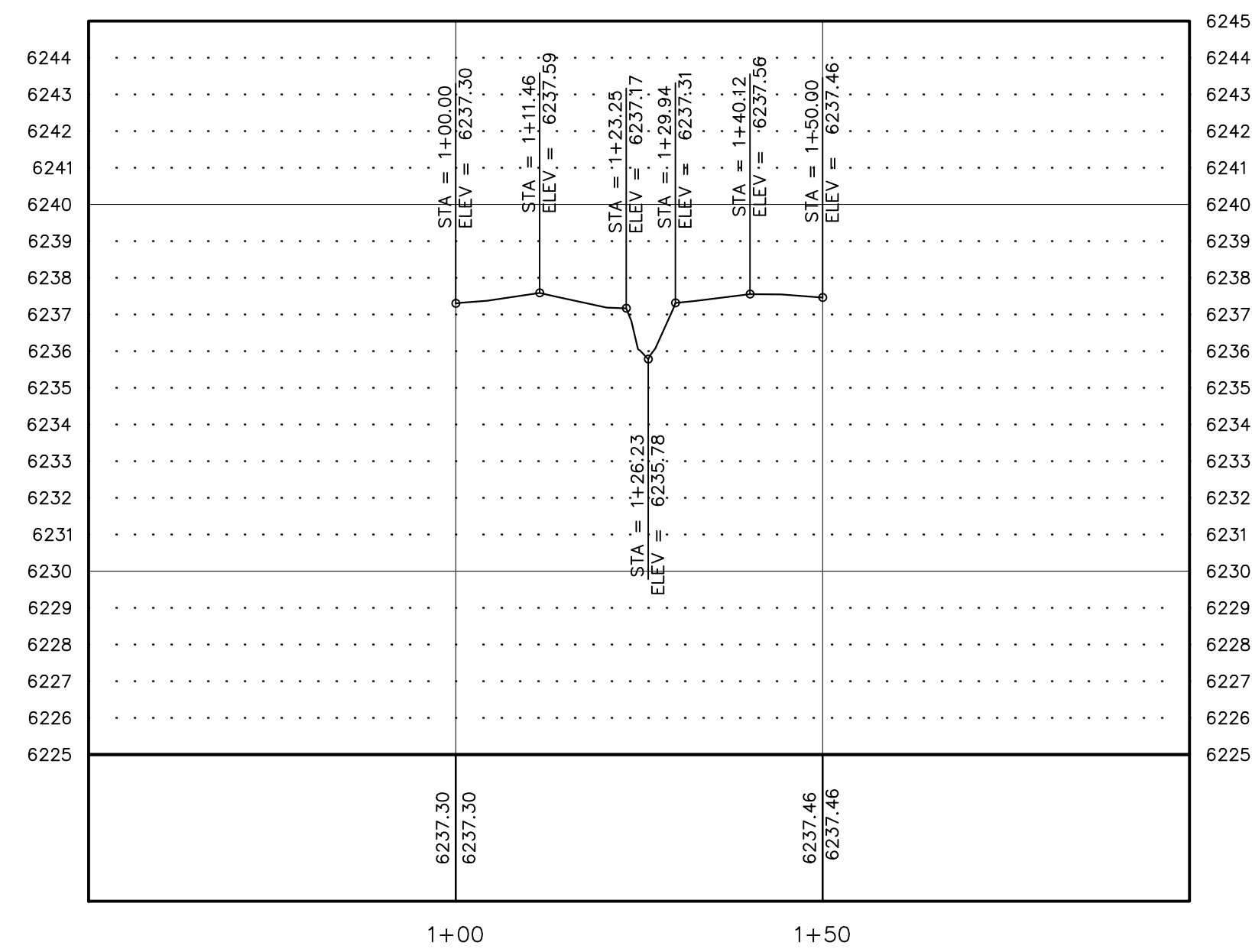
SCALE:
 HORIZ. 1"=20', VERT. 1"=2'
 RUBICON 7+25 - STA:0+50 TO STA:2+00



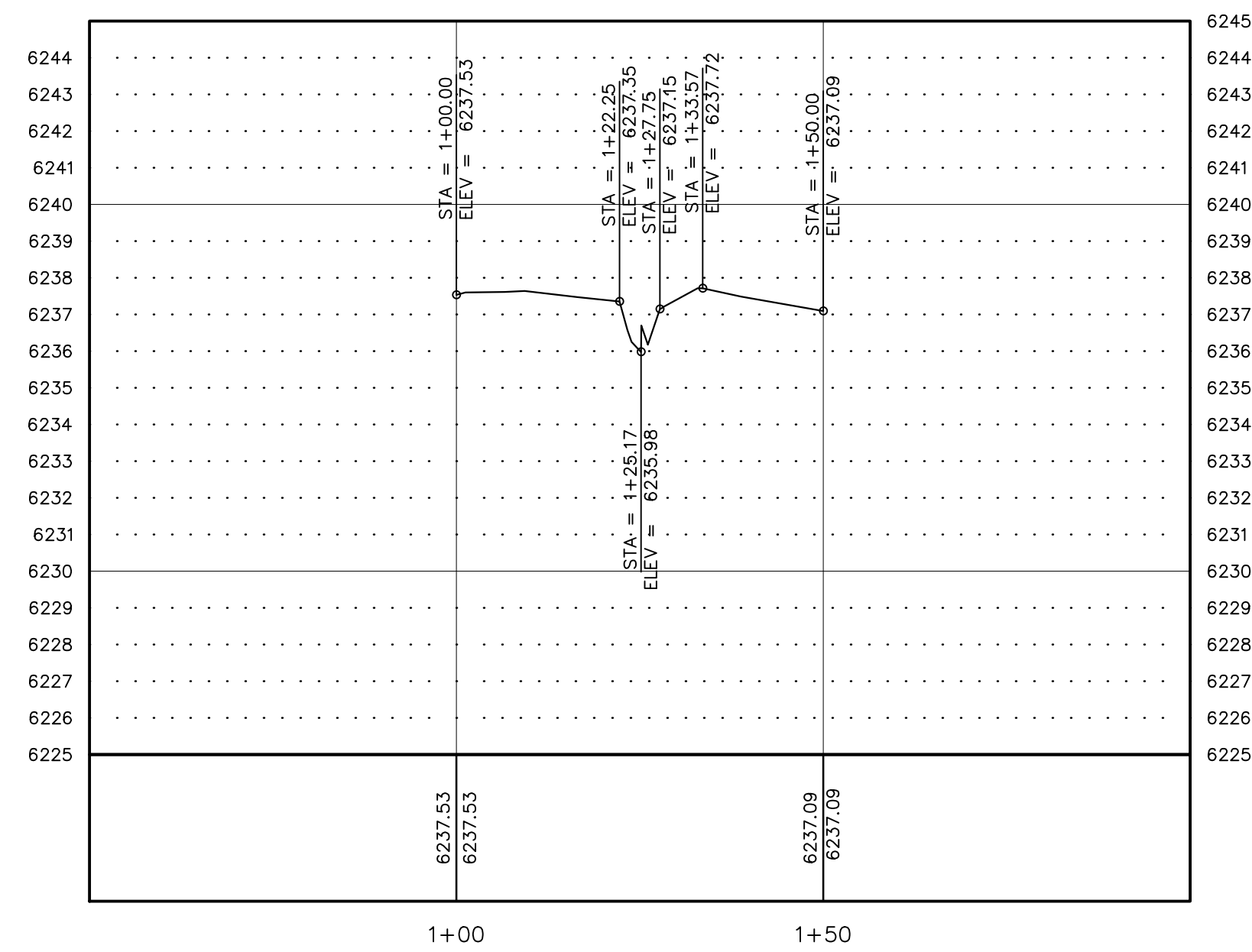
SCALE:
 HORIZ. 1"=20', VERT. 1"=2'
 RUBICON 7+50 - STA:0+50 TO STA:2+00



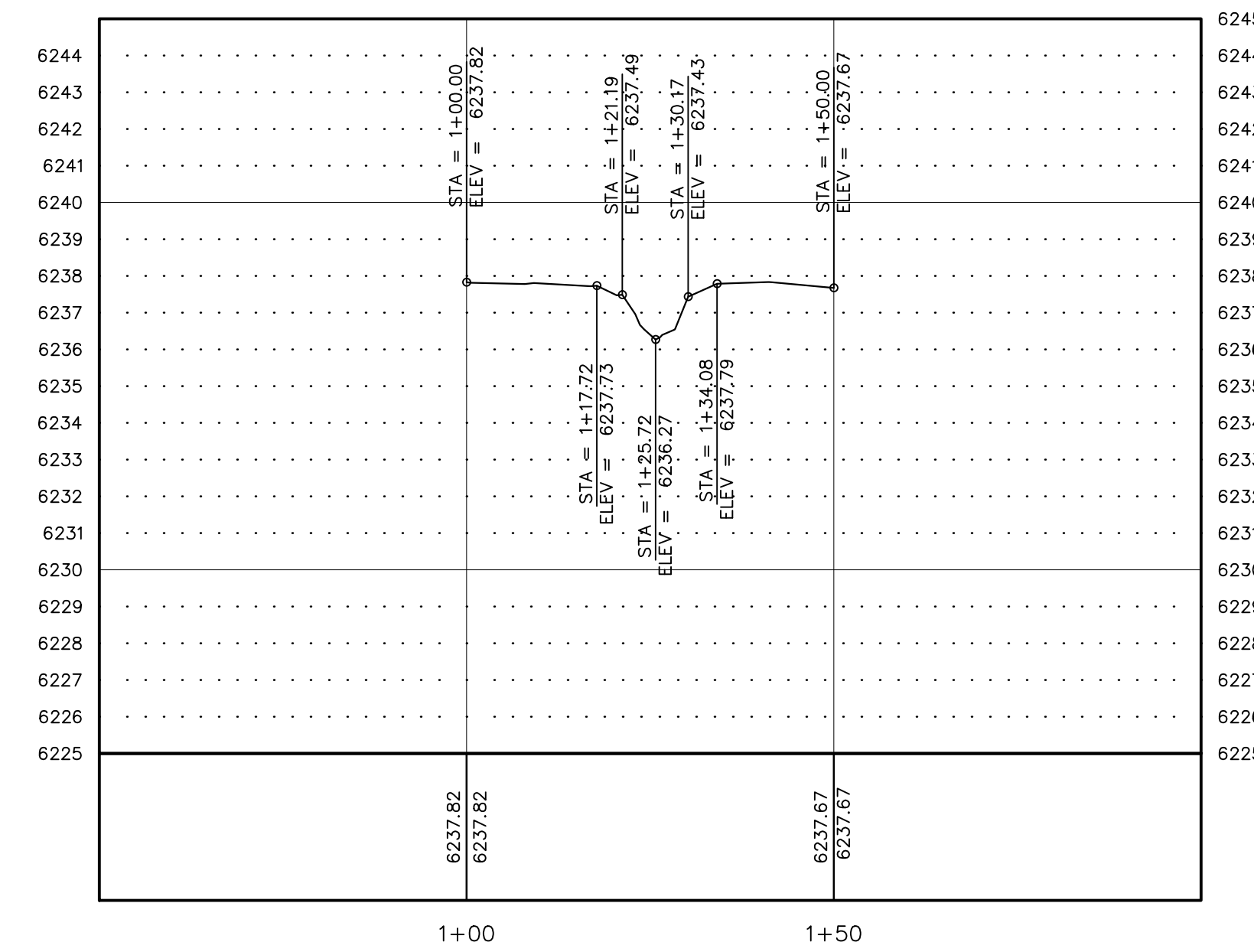
SCALE:
 HORIZ. 1"=20', VERT. 1"=2'
 RUBICON 7+75 - STA:0+50 TO STA:2+00



SCALE:
 HORIZ. 1"=20', VERT. 1"=2'
 RUBICON 8+00 - STA:0+50 TO STA:2+00

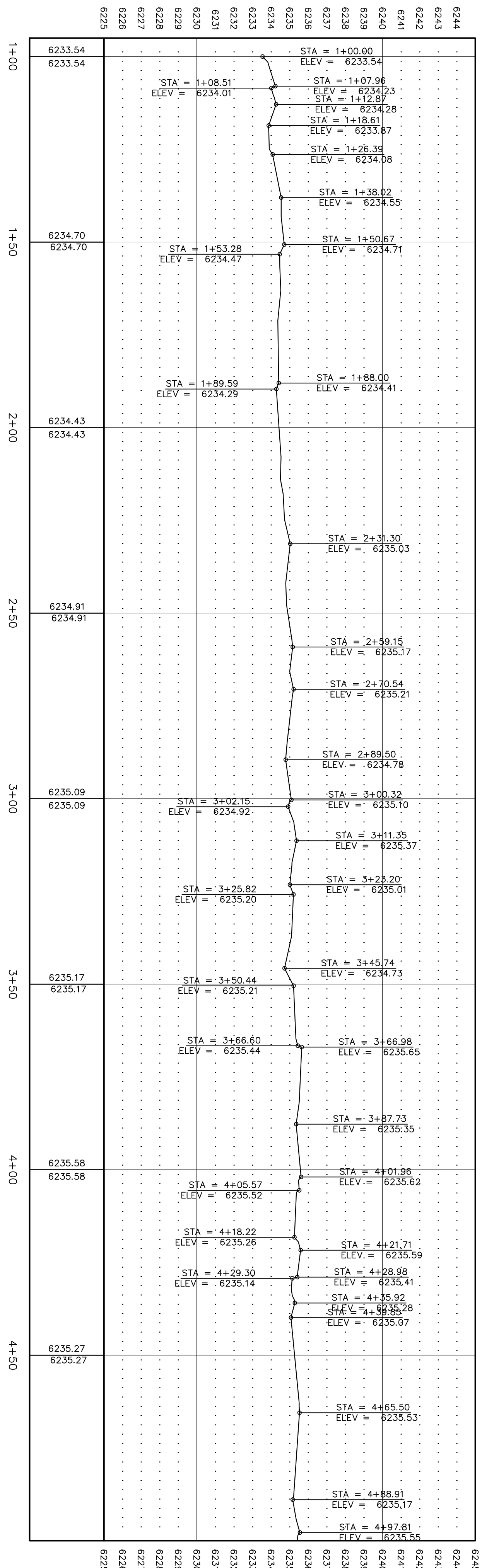
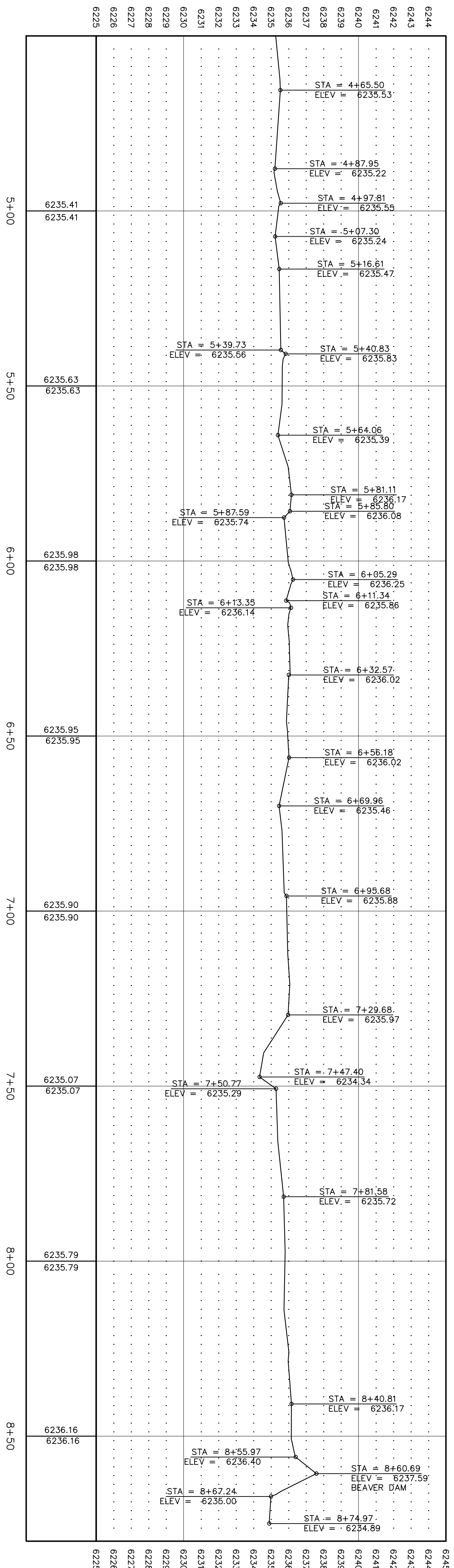


SCALE:
 HORIZ. 1"=20', VERT. 1"=2'
 RUBICON 8+25 - STA:0+50 TO STA:2+00



L:\AProj\8688.001 - Upper Truckee Marsh As Built - 2015\Survey\Draw\8688001 Upper Truckee Marsh Profiles.dwg, P.33 PROFILES, 12/15/2015 04:14 pm Sphills

REV	DATE	DESCRIPTION	BY



Rubicon Trailweg - STA: 4+50 TO STA: 8+80

Rubicon Trailweg - STA: 0+95 TO STA: 5+00

REV	DATE	DESCRIPTION	BY

SOUTH TAHOE PUBLIC UTILITY DISTRICT

UPPER TRUCKEE MARSH - RUBICON TRAIL AREA
 A PORTION OF THE NORTH 1/2 OF
 SECTION 4, T.12N., R18E., M.D.M., A.P.N. 026-200-11

DATE: NOVEMBER 21
 DRAWN BY: K
 DESIGNED BY:
 CHECKED BY:
 JOB NO.: 88881

800 E. COLLEGE PARKWAY
 CARSON CITY, NEVADA 89708
 FAX: (775) 883-7114
 WWW.LUMOSENGINEERING.COM

LUMOS
 & ASSOCIATES

CIVIL ENGINEERING
 GEOTECHNICAL ENGINEERING
 PLANNING
 LANDSCAPE ARCHITECTURE
 SURVEYING / GIS
 CONSTRUCTION SERVICES
 MATERIALS TESTING

UTMSFPP

Adaptive Management Plan

Field Observations

28 April 2016

USGS 10336780 – 42 cfs

Pilot Channel Outlet to Trout Creek – Pilot Channel outlet is dominant flow into Trout Creek, with overbank flow on both north and south sides of pilot channel outlet. Little head loss from PC outlet to Trout Creek (no drop). PC outlet has sand bed, no vegetation evident, sediment in transport in bed – sand and small (<1/4 inch) gravel. Scour potential evident when object placed in bed, velocity about 2 fps. PC 1 flowing in channel in upper portion and then overbanking in lower portion. PC 2 little flow. PC 3 largest of three, dominant flow.

Flow estimates

Location	Top Width, ft	Max Depth, ft	Max Velocity, fps	Q est, cfs
Overbank area near Bellevue	19	0.85	1.3	4.7
Pilot Channel Outlet at TC PCXS1	14	2.0	2.2	24.6
PC1 – Head	9	1.6	1.3	6.7
PC2 – Head	7	1.0	1.0	2.4
PC3 - Head	9	2.3	2.2	15.5

Trout Creek was flowing out of bank both downstream and upstream of the project area. The flow on this date (42 cfs) exceeds estimates of bankfull capacity of about 35 cfs. Beaver activity upstream of the project area was contributing to overbank flows.



Photo 1. Return flow from pilot channels to Trout Creek. PC1 is entering from left side of photo. Overbank flooding on both sides of pilot channel, but velocities are near zero. Pilot channel return is dominant flow. Trout Creek was also flowing overbank downstream of site.



Photo 2. Near pilot channel return (in foreground) looking towards Bellevue PS. Overbank flow shallow, low velocity. PC return flow velocity about 2 fps (foreground).



Photo 3. Pilot channel combined flow at bend upstream of PC 1 outlet. Scour evident around stump that was transported in and deposited by pilot channel flows.



Photo 4. Pilot Channel 3 flow, about midway between head and outlet. Right overbank (left side of photo) revegetating after use for construction access and spreading of excavated material in 2015.



Photo 5. Head of Pilot Channel 3, looking upstream on Trout Creek; velocities at channel entrance higher than Trout Creek.



Photo 6. Flow over Hummocks 4 and 5, looking north. Flow passing over hummocks is carried in right overbank downstream, but little flow occurs along fence in easement area.



Photo 7. Looking upstream from Hummock 4 and 5 in right overbank. Flooding occurs upstream of avulsion area for several hundred feet at this flow (42 cfs at USGS 10336780).

9 August 2016

USGS 10336780 – 23 cfs

Pilot channels were observed to be functioning similar to 28 April 2016 observation and were carrying most of the flow. Combined pilot channel flow was greater than 90% of total flow, with only about 2 cfs in right overbank and virtually no flow in easement. Pilot channel 2 head had a sand deposit and little flow.

Flow estimates

Location	Top Width, ft	Max Depth, ft	Max Velocity, fps	Q est, cfs
Overbank area near Bellevue	12	0.3	0.5	2
Pilot Channel Outlet at TC PCXS1	10	2.0	2.2	22
PC1 – Head	5	1.0	2.5	2.5
PC2 – Head				<1
PC3 - Head	7	2	2.9	20

Although flows were lower than in April and Trout Creek was flowig approximately at bank full, inundation persisted in right overbank upstream of Bellevue in the area of District MHs BV18 to BV22. Source of flow is beaver dam in main channel. Return flows from beaver dam inundation were blocked by auxiliary beaver dams at return points and therefore continue down right overbank in District easement. Easement is slightly lower than adjacent ground in several areas, perhaps partly due to compaction from use as a trail.



Photo 8. Flooding in right overbank downstream of BV22 due to beaver dam inundation



Photo 9. Flows spilling back into Trout Creek at two beaver dams on return flow channels along right bank of Trout Creek near BV22. Main beaver dam is about 150 feet upstream.



Photo 10. Inundation on right overbank at BV 18.



Photo 11. Deposition from overbank flow on pilot channels, approximately 100 feet upstream of outlet. Pilot channel flow at about 2 fps.



Pilot channel flow near outlet, looking downstream.

REVEGETATION MONITORING MEMORANDUM

UPPER TRUCKEE MARSH SEWER FACILITIES

SOUTH LAKE TAHOE, CA



Prepared for:

nhc

80 South Lake Avenue, Suite 800
Pasadena, California 91101

September 13, 2016



Western Botanical Services, Inc.
5859 Mt. Rose Highway / Reno, NV 89511

Table of Contents

1	Introduction	1
2	Methodology	1
2.1	Vegetation Cover	1
2.2	Willow Survival and Vigor	2
2.3	Vigor of Herbaceous Vegetation.....	2
3	Results and Discussion	2
4	Recommendations	3
5	References	4

Appendices

Appendix A - Species List

Appendix B - Transect Photos

Appendix C - Point Intercept Data Cover Calculations

1 Introduction

This report evaluates revegetation conditions at the Upper Truckee Marsh Sewer Facilities site in South Lake Tahoe, CA. It also presents the results of the revegetation monitoring surveys conducted by Western Botanical Services, Inc. (WBS) within the hummock plant communities. The survey was conducted on August 9, 2016.

The survey results compare revegetation success to reference conditions in 2014 to measure progress toward meeting performance criteria goals in the constructed hummocks. The embankment restoration met the goals in 2015 and measurements were not repeated in 2016.

The goals for herbaceous vegetation were established in the “Upper Truckee Marsh Sewer Facilities Adaptive Management Plan” (Plan), (Section 32 90 00 Restoration, Revegetation, and Erosion Control 3.03), and are as follows:

“Planted wetland herbaceous vegetation and sod established at 80 percent of baseline cover after 1 year and 85 percent of baseline cover after 2 years and exhibiting good vigor. Native species established at 90 percent of baseline after 1 year and 95 percent of baseline after 2 years. Wetland species, combining obligate and facultative species, established equal to or exceeding baseline after 2 years. Planted woody vegetation established at 80 percent survival and exhibit good vigor.”

2 Methodology

2.1 Vegetation Cover

The methodology employed in 2016 was identical to what was conducted in 2014 and 2015. Cover was determined using the point-intercept sampling method. All plants intercepted along transects were identified to the lowest possible taxonomic level. All plant species and non-plant elements (bare ground, rock, litter) intercepted by the projected laser ‘dot’ were recorded. A broader species list was developed for the project area to identify those species not intercepted by transects (Appendix A).

Percent litter, rock, water, erosion control mat, and bare areas are calculated separately. Total cover includes vegetation, standing dead, fine gravel (4–8 mm), coarse gravel (8-32 mm), rock (>32 mm) and litter. Litter refers to material detached from growing vegetation older than one year and includes decomposing vegetation, animal waste, and garbage. Total vegetative cover refers only to live vegetation. Frequency was calculated by determining the number transects in which a species was intercepted.

The three hummocks surveyed in 2015 were re-surveyed with transects of varying lengths, but totaling 100 ft. per hummock. The Theodolite iPad app was used to record the location of each transect (Appendix B).

2.2 Willow Survival and Vigor

An assessment of willow survival and vigor was not conducted in 2016. Although 2015 data indicated that the willow work was not in compliance with specified goals, it was agreed that the net results none-the-less achieved the desired effect.

2.3 Vigor of Herbaceous Vegetation

Vigor is a qualitative observation that can vary among observers but should be consistent on a project basis. It refers to the relative size and health of the individual without reference to its reproductive success (vitality). It is usually determined in a scale of 1-5 plant and as a function of both typical growth for the species in question as well as favorableness and suitability of the environment with 1=poor, 2=fair, 3=good, 4=very good, and 5=excellent.

3 Results and Discussion

2014 reference data for total cover, vegetative cover, and dominance by natives are presented in Table 1. 2015 revegetation cover data for the same transects are presented in Table 2. The results of the 2016 survey are presented in Table 3. Detailed cover calculations for 2016 are included in Appendix C.

Total cover in 2016 in the hummock community averaged 84%, versus 83.7% in 2015, while total vegetative cover averaged 76.6% in 2016 as opposed to 34% in 2015, with a range from 95% (Transect 1) to 52% (Transect 3). Transect 3 was largely under water (L-shaped hummock #4). Relative cover by native species averaged 72.3% with a range between 88% (Transect 1) and 52% (Transect 3).

The performance criteria established in the Plan for year 2 was 85% of baseline vegetative, which would be 68%. Since the average vegetative cover was 76.6% the performance criteria was met for year two post construction, in spite of transect #3. The performance criteria established in the Plan was 95% of native species baseline cover after one year, which would be 76%. The average cover by native species was 72.3% therefore the performance criteria was not met for year two post construction, albeit close.

The hummocks, (with perhaps the exception of the L-shaped hummock #4 which was largely under water), are performing as designed. Although the hummocks were installed late in the season of 2015 and were mostly inundated by water throughout the summer of 2016, by early August they were for the creating surface roughness leading to sediment deposition by sand. They are expected to continue to perform as designed, assuming there are no radical unanticipated changes in hydrology.

Vigor for these plants was rated 4.5 - 5, based on a comparison to the vigorous growth of the surrounding mature plant community.

Table 1. 2014 Hummock Reference Cover Summary

Cover Type	Transect 1	Transect 2	Transect 3	Average
Total Cover (including litter, gravel, and rock)	100%	61%	90%	84%
Total Vegetative Cover	95%	58%	88%	80%
Vegetative Cover By Native Species	93%	58%	88%	80%

Table 2. 2015 Hummock Revegetation Cover Summary

Cover Type	Transect 1	Transect 2	Transect 3	Average
Total Cover (including litter, gravel, and rock)	68%	85%	62%	72%
Total Vegetative Cover	37%	35%	31%	34%
Vegetative Cover By Native Species	36%	35%	31%	34%

Table 3. 2016 Hummock Revegetation Cover Summary

Cover Type	Transect 1	Transect 2	Transect 3	Average
Total Cover (including litter, gravel, and rock)	96%	94%	62%	84%
Total Vegetative Cover	95%	83%	52%	76.6%
Vegetative Cover By Native Species	88%	77%	52%	72.3%

It is anticipated that species composition and cover will change with the changing dynamics of a natural ecosystem. The current species diversity can accommodate changes in hydrology, the dominant factor in vegetation community structure. Whatever responses occur within the project area should also be manifest in the adjacent vegetation community.

4 Recommendations

The performance criteria for vegetation cover on the hummocks was achieved in 2016. The performance criteria for cover by native species was not achieved by a narrow margin (-3.7%). However, cover by natives is expected to increase and it is reasonable to assume that the performance criteria will be met next year.

Although the design has been for the most part very effective, there are still some areas along the right of way that were inundated during the growing season (due to beaver activity) and would benefit from additional biotechnical installations to effectively raise elevations and further protect infrastructure.

5 References

- Buckner, D.L. 1985. Point-intercept sampling in revegetation: maximizing objectivity and repeatability. Proc. Amer. Soc. Surf. Min. & Recl. 1985 Annual Mtg., Denver, CO.
- Calflora, 2012. *Species Information*. <http://www.calflora.org/>
- Common Weeds of the United States, 1971. U.S. Department of Agriculture in conjunction with Dover Publications, Inc, New York.
- Cronquist, M.L., A.H. Holmgren, N.H. Holmgren, and J. Reveal, 1977. *Intermountain flora: vascular plants of the intermountain west, U.S.A.* Vol. 6. Hafner Publishing Company, Inc, New York.
- Daumenbire, R., 1968. *Plant Communities, A Textbook of Synecology*. Harper and Row, Publishers, New York, Evanston, and London. 300 p.
- Hickman, J.C. Editor, 1993. *The Jepson Manual: Higher Plants of California*. University of California Press, Berkeley California.
- United States Department of Agriculture, Natural Resource Conservation Service, 2012. *Plants Database*. <http://plants.usda.gov/>
- Whitson, T.D., et. al. 1996. *Weeds of the West*. University of Wyoming. Printed by Pioneer of Jackson Hole, Jackson, Wyoming. 630 p.

Appendix A

Species List

2016 Upper Truckee Marsh Species List

FAMILY	SCIENTIFIC NAME	COMMON NAME	HYD STATUS ¹
ASTERACEAE	<i>Achillea millefolium</i>	Yarrow	FACU
	<i>Arnica chamissonis</i>	Chamisso arnica	FACW
	<i>Solidago Canadensis</i>	Canada goldenrod	FACU
	<i>Symphotrichum spathulatum</i> var <i>yosemitanum</i>	Western aster	FAC
CYPERACEAE	<i>Carex aqualtilis</i>	Water sedge	OBL
	<i>Carex athrostachya</i>	Slenderbeak sedge	FACW
	<i>Carex lanuginosa</i>	Wooly sedge	OBL
	<i>Carex nebrascensis</i>	Nebraska sedge	OBL
	<i>Carex utriculata</i>	Beaked sedge	OBL
	<i>Scirpus microcarpus</i>	Panicled bulrush	OBL
FABACEAE	<i>Lupinus polyphyllus</i>	Tahoe lupine	FAC
HIPPURIDACEAE	<i>Hippuris vulgaris</i>	Mare's tail	OBL
IRIDACEAE	<i>Iris missouriensis</i>	Rocky mtn. Iris	FACW
JUNCACEAE	<i>Juncus balticus</i>	Baltic rush	FACW
	<i>Juncus ensifolius</i>	Equitant rush	OBL
	<i>Juncus nevadensis</i>	Nevada rush	FACW
LAMIACEAE	<i>Mentha arvensis</i>	Wild mint	FACW
MALVACEAE	<i>Sidalcea oregana</i>	Oregon checkerbloom	FACW
ONAGRACEAE	<i>Epilobium ciliatum</i>	Fringed willowherb	FACW
POACEAE	<i>Alopecurus aequalis</i>	Shortawn foxtail	OBL
	<i>Alopecurus pratensis</i> *	Meadow foxtail	FAC

FAMILY	SCIENTIFIC NAME	COMMON NAME	HYD STATUS ¹
	<i>Agrostis exarata</i>	Spike bentgrass	FACW
	<i>Agrostis scabra</i>	Rough bentgrass	FAC
	<i>Agrosits stolonifera</i> *	Creeping bentgrass	FAC
	<i>Deschampsia danthonoides</i>	Annual hairgrass	FACW
	<i>Phleum pratense</i>	Timothy	FAC
	<i>Poa palustris</i> *	Fowl bluegrass	FAC
	<i>Poa pratensis</i>	Kentucky bluegrass	FAC
	<i>Torreyochloa pallida</i>	Pale false mannagrass	OBL
POLYGONACEAE	<i>Rumex acetosella</i>	Common sheep sorrel	FACU
	<i>Rumex crispus</i> *	Curly dock	FAC
ROSACEAE	<i>Fragaria virginiana</i>	Strawberry	FACU
	<i>Geum macrophyllum</i>	Big-leaved avens	FAC
	<i>Potentilla glandulosa</i>	Sticky cinquefoil	FACU
	<i>Potentilla gracilis</i>	Cinquefoil	FAC
RUBIACEAE	<i>Galium trifidum</i>	Bedstraw	FACW
SALICACEAE	<i>Salix exigua</i>	Sandbar willow	OBL
	<i>Salix lemmonii</i>	Lemmon's willow	OBL
	<i>Salix lucida ssp lasiandra</i>	Pacific willow	FACW
SCROPHULAREACEAE	<i>Veronica anagallis-aquatica</i>	Water speedwell	OBL
	<i>Mimulus guttatus</i>	Seep monkeyflower	OBL
	<i>Mimulus primuloides</i>	Primrose monkeyflower	OBL
	<i>Veronica americana</i>	America brooklime	OBL

FAMILY	SCIENTIFIC NAME	COMMON NAME	HYD STATUS ¹
SPARGANIACEAE	<i>Sparganium angustifolium</i>	Bur-reed	OBL

¹ Army Corps of Engineers 2012; Western Mountains, Valleys, and Coast

N/A = Not Applicable

OBL = Obligate

FACW = Facultative Wetland

FAC = Facultative

FACU = Facultative Upland

* = Non-native species

Appendix B

Transect Photos



TRANSECT 1: BEGIN

Date & Time: Tue Aug 9 10:23:32 PDT 2016
 Position: +038.93660° / -119.98914°
 Altitude: 6200ft
 Datum: WGS-84
 Azimuth/Bearing: 088° N88E 1564mils (True)
 Elevation Angle: -04.4°
 Horizon Angle: +01.5°
 Zoom: 1X



TRANSECT 1: END

Date & Time: Tue Aug 9 10:56:10 PDT 2016
 Position: +038.93650° / -119.98884°
 Altitude: 6193ft
 Datum: WGS-84
 Azimuth/Bearing: 320° N40W 5689mils (True)
 Elevation Angle: -03.4°
 Horizon Angle: -00.4°
 Zoom: 1X



TRANSECT 2: BEGIN

Date & Time: Tue Aug 9 11:15:23 PDT 2016
 Position: +038.93661° / -119.98936°
 Altitude: 6207ft
 Datum: WGS-84
 Azimuth/Bearing: 347° N13W 6169mils (True)
 Elevation Angle: -04.8°
 Horizon Angle: -00.1°
 Zoom: 1X



TRANSECT 2: END

Date & Time: Tue Aug 9 11:29:07 PDT 2016
 Position: +038.93673° / -119.98945°
 Altitude: 6192ft
 Datum: WGS-84
 Azimuth/Bearing: 147° S33E 2613mils (True)
 Elevation Angle: -02.6°
 Horizon Angle: +02.2°
 Zoom: 1X



TRANSECT 3: BEGIN

Date & Time: Tue Aug 9 11:56:34 PDT 2016
 Position: +038.93639° / -119.98906°
 Altitude: 6202ft
 Datum: WGS-84
 Azimuth/Bearing: 043° N43E 0764mils (True)
 Elevation Angle: -06.6°
 Horizon Angle: -02.1°
 Zoom: 1X



TRANSECT 3: END

Date & Time: Tue Aug 9 12:19:49 PDT 2016
 Position: +038.93658° / -119.98887°
 Altitude: 6252ft
 Datum: WGS-84
 Azimuth/Bearing: 090° N90E 1600mils (True)
 Elevation Angle: -05.2°
 Horizon Angle: -01.2°
 Zoom: 1X

Appendix C

Point-Intercept Cover Data Calculations

SAMPLING AREA: Hummock Transects 2016

COVER TYPE	POINT HITS (#) BY TRANSECT NUMBER			FREQUENCY	VEGETATIVE COVER	TOTAL COVER
	1	2	3			
Native Perennial Forbs						
<i>Epilobium ciliatum</i> (fringed willowherb)	5	0	1	67%	2.6%	2.4%
<i>Galium trifidum</i> (bedstraw)	1	0	0	33%	0.4%	0.4%
<i>Veronica anagallis-aquatica</i> (water speedwell)	1	0	1	67%	0.9%	0.8%
<i>Arnica chamissonis</i> (Chamiso amica)	2	0	0	33%	0.9%	0.8%
Total Native Perennial Forbs	9	0	2	67%	4.8%	4.4%
Native Shrubs						
<i>Rosa woodsii</i> (Wood's rose)	2	0	0	33%	0.9%	0.8%
Total Native Shrubs	2	0	0	33%	0.9%	0.8%
Introduced Perennial Grasses						
<i>Poa palustris</i> (fowl bluegrass)	1	0	0	33%	0.4%	0.4%
<i>Agrostis stolonifera</i> (creeping bentgrass)	6	6	0	66%	5.2%	4.8%
Total Intro. Perennial Grasses	7	6	0	33%	5.7%	5.2%
Native Perennial Graminoids						
<i>Carex nebrascensis</i> (Nebraska sedge)	32	37	9	100%	33.9%	31.0%
<i>Juncus balticus</i> (Baltic rush)	6	9	0	67%	6.5%	6.0%
<i>Juncus nevadensis</i> (Sierra rush)	7	0	0	33%	3.0%	2.8%
<i>Scirpus microcarpus</i> (panicled bulrush)	7	14	15	100%	15.7%	14.3%
<i>Eleocharis palustris</i> (common spikerush)	11	9	2	100%	9.6%	8.7%
<i>Glyceria elata</i> (fowl mannagrass)	6	4	23	100%	14.3%	13.1%
<i>Phalaris arundinacea</i> (reed canarygrass)	4	3	1	100%	3.5%	3.2%
<i>Carex athrostachya</i> (beaked sedge)	4	1	0	67%	2.2%	2.0%
Total Native Perennial Grasses	77	77	50	100%	88.7%	81.0%
NATIVE VEGETATIVE COVER	88	77	52	n/a	94.3%	86.1%
NON-NATIVE VEGETATIVE COVER	7	6	0	n/a	5.7%	5.2%
TOTAL VEGETATIVE COVER	95	83	52	n/a	100.0%	91.3%
Coarse gravel (> 5mm)	0	0	3	33%	n/a	1.2%
Fine gravel (< 5mm)	0	0	7	33%	n/a	2.8%
Litter	0	1	0	33%	n/a	0.4%
Erosion control mat	0	10	0	33%	n/a	4.0%
Moss	1	0	0	33%	n/a	0.4%
Water	3	6	36	100%	n/a	n/a
Bare	1	0	2	67%	n/a	n/a
TOTAL COVER	96	94	62	n/a	n/a	100.0%
TOTAL OVER ALL (300) SAMPLING POINTS	ALL COVER: 84.0%			NON-NATIVE: 4.3%		
	VEGETATIVE COVER: 76.7%			NATIVE: 72.3%		

UPPPER TRUCKEE MARSH SEWER FACILITIES

ADAPTIVE MANAGEMENT PLAN

2016 ANNUAL REPORT

APPENDIX B

2014-2016 PHOTO MONITORING



UTMSFPP Adaptive Management Plan

Photo Point 1 – Looking SW across right overbank

Upper Left – Nov 2016

Upper Right – Oct 2015

Lower Left – Oct 2014



UTMSFPP Adaptive Management Plan

Photo Point 2 – Looking SW across right overbank

Upper Left – Nov 2016

Upper Right – Oct 2015

Lower Left – Oct 2014



UTMSFPP Adaptive Management Plan

Photo Point 3 – Looking SW across right overbank in avulsion area;
LBO-1 at middle far right of view, FH-5A in foreground

Upper Left – Nov 2016

Upper Right – Oct 2015

Lower Left – Oct 2014



UTMSFPP Adaptive Management Plan

Photo Point 4 – Looking SW across right overbank in avulsion area; FH-3 at lower right

Upper Left – Nov 2016

Upper Right – Oct 2015

Lower Left – Oct 2014



UTMSFPP Adaptive Management Plan

Photo Point 5 – Looking SW across right overbank at downstream end of avulsion area

Upper Left – Nov 2016

Upper Right – Oct 2015

Lower Left – Oct 2014



UTMSFPP Adaptive Management Plan

Photo Point 6 – Looking SW across marsh towards Trout Creek, near downstream end of project area near Bellevue Avenue

Upper Left – Nov 2016

Upper Right – Oct 2015

Lower Left – Oct 2014

UTMSFPP Photo Monitoring
 Updated: 28-Nov-16
 Folder location: \6001103_TroutCreek_Year2\Images\2016.11.26

Abbreviations
 PP#x
 H-x
 FH-x
 PC-x
 LBO-x
 PCL-x
 RBP-x

Photo Point
 Hummock
 Fill Hummock
 Pilot Channel
 Left Bank Opening
 Planted Coir Log
 Right Bank Plug

Left and Right are referenced looking downstream

Number	2016 Photo	Description	2015 Photo	Description	2014 Photos
1	IMG_20161126_144325.jpg	PP1	IMG_2320.JPG	Photo Point #1, looking SW across right overbank; LBO-5 center left.	PP#1_10 24 2014.JPG
2	IMG_20161126_144327.jpg	PP1	IMG_2321.JPG	same as above	
3	IMG_20161126_144329.jpg	PP1	IMG_2322.JPG	same as above	
4	IMG_20161126_144331.jpg	PP1			
5	IMG_20161126_144333.jpg	PP1			
6	IMG_20161126_144334.jpg	PP1			
7	IMG_20161126_144131.jpg	PP2	IMG_2323.JPG	Photo Point #2, View looking SW across right overbank.	PP#2_10 24 2014.JPG
8	IMG_20161126_144133.jpg	PP2	IMG_2324.JPG	same as above	
9	IMG_20161126_144134.jpg	PP2	IMG_2325.JPG	same as above	
10	IMG_20161126_144136.jpg	PP2	IMG_2326.JPG	same as above	
11	IMG_20161126_144139.jpg	PP2			
12	IMG_20161126_143744.jpg	PP3	IMG_2327.JPG	Photo Point #3, looking SW across right overbank in avulsion area; LBO-1 at middle far right of view.	PP#3_10 24 2014.JPG
13	IMG_20161126_143745.jpg	PP3	IMG_2328.JPG	same as above	
14	IMG_20161126_143746.jpg	PP3	IMG_2329.JPG	same as above	
15	IMG_20161126_143747.jpg	PP3	IMG_2330.JPG	same as above	
16	IMG_20161126_143748.jpg	PP3	IMG_2331.JPG	same as above	
17	IMG_20161126_143749.jpg	PP3			
18	IMG_20161126_143551.jpg	PP4	IMG_2332.JPG	Photo Point #4, looking looking SW across right overbank in avulsion area; FH-3 at lower right of view	PP#4_10 24 2014.JPG
19	IMG_20161126_143553.jpg	PP4	IMG_2333.JPG	same as above	
20	IMG_20161126_143554.jpg	PP4	IMG_2334.JPG	same as above	
21	IMG_20161126_143555.jpg	PP4	IMG_2335.JPG	same as above	
22	IMG_20161126_143557.jpg	PP4			
23	IMG_20161126_143558.jpg	PP4			
24	IMG_20161126_142814.jpg	PP5	IMG_2336.JPG	Photo Point #5, looking SW across right overbank at downstream end of avulsion area	PP#5_10 24 2014.JPG
25	IMG_20161126_142816.jpg	PP5	IMG_2337.JPG	same as above	
26	IMG_20161126_142817.jpg	PP5	IMG_2338.JPG	same as above	
27	IMG_20161126_142819.jpg	PP5	IMG_2339.JPG	same as above	
28	IMG_20161126_142821.jpg	PP5			
29	IMG_20161126_142822.jpg	PP5			
30	IMG_20161126_142424.jpg	PP6	IMG_2340.JPG	Photo Point #6, looking SW across marsh toward Trout Creek, near downstream end of project area near Bellevue Avenue .	PP#6_10 24 2014.JPG
31	IMG_20161126_142426.jpg	PP6	IMG_2341.JPG	same as above	
32	IMG_20161126_142433.jpg	PP6	IMG_2342.JPG	same as above	
33			IMG_2343.JPG	same as above	
34			IMG_2344.JPG	same as above	
35			IMG_2345.JPG	same as above	
36			IMG_2346.JPG	same as above	
37			IMG_2350.JPG	Planted coir log downstream of Hummock 1A	TMSFPP_027.JPG
38			IMG_2351.JPG	Fill Hummock 1; Wood Rose, Hummock 1A, planted coir log	TMSFPP_028.JPG
39			IMG_2352.JPG	same as above	
40			IMG_2353.JPG	same as above	
41			IMG_2354.JPG	same as above	TMSFPP_029.JPG
42			IMG_2355.JPG	same as above	
43			IMG_2356.JPG	Hummock 1A	TMSFPP_030.JPG
44			IMG_2357.JPG	same as above	
45			IMG_2358.JPG	Hummock 1A and Fill Hummock 1	TMSFPP_031.JPG
46			IMG_2359.JPG	Hummock 1A and Fill Hummock1	TMSFPP_032.JPG
47			IMG_2360.JPG	Fill Hummock 1	TMSFPP_033.JPG
48			IMG_2361.JPG	Fill Hummock 1	TMSFPP_034.JPG
49			IMG_2362.JPG	Wood rose planting upstream of Fill Hummock 1	TMSFPP_035.JPG
50			IMG_2363.JPG	Wood rose planting, avulsed channel bar	TMSFPP_036.JPG
51			IMG_2364.JPG	Hummock 2; avulsed channel	TMSFPP_037.JPG
52			IMG_2365.JPG	Hummock 2; coir log perimeter	TMSFPP_038.JPG
53			IMG_2366.JPG	same as above	
54			IMG_2367.JPG	same as above	
55			IMG_2368.JPG	Fill Hummock 3	TMSFPP_039.JPG
56			IMG_2369.JPG	same as above	
57			IMG_2370.JPG	Avulsed channel; Fill Hummock 3	TMSFPP_040.JPG
58			IMG_2371.JPG	Avulsed channel	TMSFPP_041.JPG
59			IMG_2372.JPG	Wood rose plantings south of Fill Hummock 3	TMSFPP_042.JPG
60			IMG_2373.JPG	same as above	
61			IMG_2374.JPG	Wood rose, coir log near Hummock 4	TMSFPP_043.JPG
62			IMG_2375.JPG	Coir log; Hummock 4	TMSFPP_044.JPG
63			IMG_2376.JPG	Coir log; Hummock 4	TMSFPP_045.JPG
64			IMG_2377.JPG	same as above	
65			IMG_2378.JPG	same as above	
66			IMG_2379.JPG	same as above	
67			IMG_2380.JPG	Hummock 4	TMSFPP_046.JPG
68			IMG_2381.JPG	Hummock 4	TMSFPP_047.JPG
69			IMG_2382.JPG	Hummock 4	TMSFPP_048.JPG
70			IMG_2383.JPG	Hummock 4	TMSFPP_049.JPG
71			not visible	Planted Coir Log (PCL) - 1	TMSFPP_050.JPG
72	IMG_20161126_144940.jpg	LBO-1 from H-4A			
73	IMG_20161126_144943.jpg	LBO-1 from H-4A			
74	IMG_20161126_144959.jpg	LBO-1 from U/S end of 40LF coir log fence			
75	IMG_20161126_145002.jpg				
76	IMG_20161126_145004.jpg				
77			IMG_2384.JPG	Left Bank Opening (LBO)-1	TMSFPP_051.JPG
78			IMG_2385.JPG	LBO-1	TMSFPP_052.JPG
79			IMG_2387.JPG	PCL-2; LBO-2	TMSFPP_053.JPG
80	IMG_20161126_144904.jpg	LBO-2 from right bank of Trout Creek			
81	IMG_20161126_144908.jpg	LBO-2 from right bank of Trout Creek			
82	IMG_20161126_144913.jpg	LBO-2 from right bank of Trout Creek			
83			IMG_2388.JPG	LBO-2; Pilot Channel (PC)-2	TMSFPP_054.JPG
84			IMG_2386.JPG	LBO-2; LBO-1; Trout Creek	TMSFPP_055.JPG
85			IMG_2389.JPG	LBO-2; PC-2	TMSFPP_057.JPG
86			IMG_2390.JPG	LBO-2; Trout Creek	TMSFPP_056.JPG
87	IMG_20161126_145415.jpg	Looking U/S from confluence of PCs and PC-1			
88	IMG_20161126_145438.jpg	Looking U/S along combined PC-2, PC-3, PC-4 flowpath			
89			IMG_2391.JPG	PC-2	TMSFPP_058.JPG
90			IMG_2392.JPG	PCL-3	TMSFPP_059.JPG
91			IMG_2394.JPG	PCL-3	TMSFPP_060.JPG
92	IMG_20161126_144757.jpg	RB of Trout Creek at LBO-3 looking D/S on Trout Creek			
93	IMG_20161126_144802.jpg	RB of Trout Creek at LBO-3 looking D/S on Trout Creek			
94	IMG_20161126_144823.jpg	RB of Trout Creek at LBO-3 looking D/S on Trout Creek			
95	IMG_20161126_144843.jpg	RB of Trout Creek looking toward PC-3 (D/S of LBO-3)			
96	IMG_20161126_144814.jpg	LBO-3; Trout Creek			
97	IMG_20161126_144817.jpg	LBO-3; Trout Creek			
98	IMG_20161126_144731.jpg	LBO-3 from right bank of Trout Creek			
99	IMG_20161126_144734.jpg	LBO-3 from right bank of Trout Creek			
100	IMG_20161126_144738.jpg	LBO-3 from right bank of Trout Creek			
101	IMG_20161126_144744.jpg	LBO-3 from right bank of Trout Creek			
102	IMG_20161126_144746.jpg	LBO-3 from right bank of Trout Creek			
103	IMG_20161126_144749.jpg	LBO-3 from right bank of Trout Creek			
104			IMG_2393.JPG	LBO-3; Trout Creek	TMSFPP_061.JPG
105			IMG_2395.JPG	LBO-3	TMSFPP_062.JPG
106			IMG_2396.JPG	LBO-3	TMSFPP_063.JPG
107			IMG_2398.JPG	PC-3	TMSFPP_065.JPG
108			IMG_2399.JPG	PC-3	TMSFPP_066.JPG
109			IMG_2400.JPG	PC-3	TMSFPP_067.JPG
110			IMG_2401.JPG	same as above	
111			IMG_2402.JPG	same as above	
112			IMG_2403.JPG	same as above	
113			IMG_2404.JPG	same as above	
114			IMG_2405.JPG	same as above	
115			IMG_2406.JPG	same as above	
116			IMG_2407.JPG	same as above	
117	IMG_20161126_145511.jpg		IMG_2408.JPG	same as above	
118			IMG_2409.JPG	same as above	

Number	2016 Photo	Description	2015 Photo	Description	2014 Photos
119			IMG_2410.JPG	PCL-4	TMSFPP_068.JPG
120	IMG_20161126_144626.jpg	LBO-4 from right bank of Trout Creek			
121	IMG_20161126_144634.jpg	LBO-4 from right bank of Trout Creek			
122	IMG_20161126_144637.jpg	LBO-4 from right bank of Trout Creek			
123	IMG_20161126_144642.jpg	LBO-4 from right bank of Trout Creek			
124	IMG_20161126_144645.jpg	LBO-4 from right bank of Trout Creek			
125	IMG_20161126_144648.jpg	LBO-4 from right bank of Trout Creek			
126			IMG_2411.JPG	LBO-4	TMSFPP_069.JPG
127			IMG_2412.JPG	PCL-4	TMSFPP_070.JPG
128			IMG_2413.JPG	LBO-4; Trout Creek	TMSFPP_071.JPG
129				LBO-4	TMSFPP_072.JPG
130				LBO-4; PCL-4	TMSFPP_073.JPG
131			IMG_2414.JPG	PC-4	TMSFPP_074.JPG
132				PC-4	TMSFPP_075.JPG
133				PC-4	TMSFPP_076.JPG
134	IMG_20161126_144526.jpg	LBO-5 from right bank of Trout Creek			
135	IMG_20161126_144531.jpg	LBO-5 from right bank of Trout Creek			
136			IMG_2415.JPG	LBO-5	TMSFPP_077.JPG
137			IMG_2416.JPG	LBO-5	TMSFPP_078.JPG
138				LBO-5	TMSFPP_079.JPG
139			IMG_2417.JPG	LBO-5; Trout Creek	TMSFPP_080.JPG
140				Trout Creek	TMSFPP_081.JPG
141			IMG_2428.JPG	Trout Creek	TMSFPP_082.JPG
142				LBO-5; Trout Creek	TMSFPP_083.JPG
143				LBO-5	TMSFPP_084.JPG
144				LBO-5	TMSFPP_085.JPG
145	IMG_20161126_144526.jpg	LBO-6 from right bank of Trout Creek			
146	IMG_20161126_144531.jpg	LBO-6 from right bank of Trout Creek			
147			IMG_2418.JPG	LBO-6	TMSFPP_086.JPG
148			IMG_2419.JPG	LBO-6	TMSFPP_087.JPG
149				LBO-6; Trout Creek	TMSFPP_088.JPG
150			IMG_2425.JPG	LBO-6; Trout Creek	TMSFPP_089.JPG
151			IMG_2422.JPG	LBO-6	TMSFPP_090.JPG
152			IMG_2423.JPG	LBO-6 Channel	TMSFPP_091.JPG
153			IMG_2424.JPG	LBO-6 Channel	TMSFPP_092.JPG
154			IMG_2420.JPG	same as above Y1	
155			IMG_2421.JPG	same as above	
156			IMG_2426.JPG	LBO-6; Trout Creek	TMSFPP_093.JPG
157				LBO-6 Channel	TMSFPP_094.JPG
158			IMG_2427.JPG	LBO-6; Trout Creek	TMSFPP_095.JPG
159			IMG_2429.JPG	New right bank plug Y2	
160			IMG_2430.JPG	New right bank plug Y2	
161			IMG_2431.JPG	Right bank plug Y1	
162			IMG_2432.JPG	Right bank plug Y1	
163			IMG_2433.JPG	Right bank plug Y1 across from LBO-4	
164			IMG_2434.JPG	Right bank plug Y1 across from LBO-4	
165			IMG_2435.JPG	LBO-3	
166			IMG_2436.JPG	LBO-3	
167			IMG_2437.JPG	PC-3	
168			IMG_2438.JPG	PC-3	
169			IMG_2439.JPG	PC-3 overbank	
170			IMG_2440.JPG	PC-3 overbank	
171			IMG_2441.JPG	LBO-1, planted coir log, H-4	TMSFPP_098.JPG
172					TMSFPP_097.JPG
173			IMG_2442.JPG	PC-1	
174			IMG_2443.JPG	PC-1	
175			IMG_2444.JPG	PC-1	
176			IMG_2445.JPG	PC-1	
177			IMG_2446.JPG	Access Route A	
178			IMG_2447.JPG	Access Route A	
179			IMG_2448.JPG	LBO-1 and LBO-2, Trout Creek	
180			IMG_2449.JPG	H-4, H-5, H-5A	
181			IMG_2450.JPG	H-5A	
182			IMG_2451.JPG	H-5 and H-5A	
183			IMG_2452.JPG	H-5 and H-5A	
184			IMG_2453.JPG	H-5 and H-5A	
185			IMG_2454.JPG	H-5A	
186			IMG_2455.JPG	H-5A	
187	IMG_20161126_143818.jpg	H-5A with 2016 added H-6A	IMG_2456.JPG	H-5A	
188			IMG_2457.JPG	Right overbank dewatered and H-6	
189	IMG_20161126_144418.jpg	LBO near U/S turbidity sampler			
190	IMG_20161126_144448.jpg	LBO near U/S turbidity sampler			
191			IMG_2458.JPG	Right overbank near BPS	
192			IMG_2459.JPG	Right overbank near BPS	
193			IMG_2460.JPG	Right overbank near BPS	
194			IMG_2461.JPG	Right overbank near BPS	
195			IMG_2462.JPG	Y1 deposition in right overbank near BPS	
196			IMG_2463.JPG	Y1 deposition in right overbank near BPS	
197			IMG_2464.JPG	Right overbank near BPS	
198			IMG_2465.JPG	Right overbank near BPS	
199			IMG_2466.JPG	Right overbank near BPS	
200			IMG_2467.JPG	Right overbank near BPS	
201			IMG_2468.JPG	Right overbank near BPS	
202			IMG_2469.JPG	Y2 coir logs in overbank channel near BPS	
203			IMG_2470.JPG	Y2 coir logs in overbank channel near BPS	
204			IMG_2471.JPG	Y2 coir logs in overbank channel near BPS	
205			IMG_2472.JPG	Y2 coir logs in overbank channel near BPS	
206			IMG_2473.JPG	Y2 coir logs in overbank channel near BPS	
207			IMG_2474.JPG	Y2 coir logs in overbank channel near BPS	
208			IMG_2475.JPG	Remnant Trout Creek channel downstream of avulsion area	
209			IMG_2476.JPG	Remnant Trout Creek channel downstream of avulsion area	
210	IMG_20161126_145246.jpg	Convergence of new flowpath with avulsed channel (looking D/S)			
211	IMG_20161126_145905.jpg	Convergence of new flowpath with avulsed channel (looking U/S)			
212	IMG_20161126_145907.jpg	Convergence of new flowpath with avulsed channel (looking U/S)			
213	IMG_20161126_145253.jpg	View looking U/S of new flowpath			
214	IMG_20161126_145256.jpg	View looking U/S of new flowpath			
215			IMG_2477.JPG	Pilot channel exit to Trout Creek	
216			IMG_2478.JPG	Pilot channel exit to Trout Creek	
217			IMG_2479.JPG	Pilot channel exit to Trout Creek	
218			IMG_2480.JPG	Pilot channel exit to Trout Creek	
219			IMG_2481.JPG	Trout creek downstream of pilot channel exit	
220			IMG_2482.JPG	Road fill removal area from Trout Creek	
221			IMG_2483.JPG	Road fill removal area	
222			IMG_2484.JPG	Road fill removal area	
223			IMG_2485.JPG	Pilot channel exit to Trout Creek	
224			IMG_2486.JPG	Access road off Rubicon Trail	
225			IMG_2487.JPG	Access road off Rubicon Trail	
226			IMG_2488.JPG	Access road off Rubicon Trail	
227			IMG_2489.JPG	Access road off Rubicon Trail	
228			IMG_2490.JPG	Access route in meadow	
229			IMG_2491.JPG	Access route in meadow	
230			IMG_2492.JPG	Access route in meadow	
231			IMG_2493.JPG	Access route in meadow	
232			IMG_2494.JPG	Access route in meadow	
233			IMG_2495.JPG	Access route in meadow	
234			IMG_2496.JPG	Access route in meadow	
235			IMG_2497.JPG	Access route in meadow	
236			IMG_2498.JPG	Access route along secondary channel looking downstream	
237			IMG_2499.JPG	Access route along secondary channel looking downstream	
238			IMG_2501.JPG	Access route along secondary channel looking downstream	
239			IMG_2502.JPG	Beaver dam at head of secondary channel	
240			IMG_2503.JPG	Beaver dam at head of secondary channel	
241			IMG_2504.JPG	Access route along secondary channel looking downstream	
242			IMG_2505.JPG	Secondary channel	
243			IMG_2506.JPG	Secondary channel looking upstream towards Trout Creek	
244			IMG_2507.JPG	Secondary channel looking upstream towards Trout Creek	
245			IMG_2508.JPG	Access route in meadow	
246			IMG_2509.JPG	Access route in meadow	
247	IMG_20161126_144250.jpg	50LF PC excavated adjacent to H-7			

UTMSFPP ADAPTIVE MANAGEMENT PLAN

2016 ANNUAL REPORT

APPENDIX C – YEAR 3 PLANS (2016)

ADAPTIVE MANAMENT PLAN – YEAR 3 IMPROVEMENTS, NHC, 2016

COVER
 LEGEND & NOTES
 PLAN SHEETS
 DETAILS SHEET

T1
 G1
 C1-C2
 D1-D3

South Tahoe Public Utility District

CONSTRUCTION PLANS FOR

Upper Truckee Marsh Sewer Facilities Adaptive Management Plan - Year 3 Improvements

OCTOBER 2016

PROJECT MANAGER

Ivo Bergsohn, Hydrogeologist
 South Tahoe Public Utility District
 1275 Meadow Crest Road
 South Lake Tahoe, California 96150

APPROVED BY:

Shannon Catulla, Assistant General Manager
 South Tahoe Public Utility District
 1275 Meadow Crest Road
 South Lake Tahoe, California 96150

(date)



South Tahoe Public Utility District

1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpud.us



80 south lake avenue, suite 800
 pasadena, california 91101-2585
 phone: (626) 440-0080 fax: (626) 440-1881
 www.nhcweb.com



5859 Mt Rose Highway
 Reno, Nevada 89511
 (775) 849-3223
 www.wbsinc.us



Edward E. Wallace 4 Oct 2016
 (date)

Edward E. Wallace
 CALIFORNIA REGISTERED
 PROFESSIONAL ENGINEER NO. # 32301
 northwest hydraulic consultants



Drawing Name UT MARSH COVER YR3	Date 4 OCTOBER 2016
Drawing Status Final Construction Documents	Designer eew
	Drafter tvs
	Checked eew
	Job Number 6001103
	Sheet Number

Sheet 1 of 7

T1

GENERAL NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING UTILITY COMPANIES TO DETERMINE THE LOCATION OF UNDERGROUND FACILITIES. THE LOCATION OF KNOWN EXISTING FACILITIES IN THE WORK AREA ARE SHOWN, BUT NO GUARANTEE IS MADE AS TO THE ACCURACY OF THIS INFORMATION.
2. THE CONTRACTOR SHALL PROTECT EXISTING SURVEY CONTROL POINTS AND SHALL BE RESPONSIBLE FOR CONSTRUCTION STAKING. IF EXISTING MONUMENT(S) MUST BE DISTURBED TO PERFORM THE WORK, THE CONTRACTOR SHALL NOTIFY THE DISTRICT FOR RELOCATION OF THE MONUMENT PRIOR TO BEGINNING TO WORK.
3. EXCESS MATERIAL IS TO BE REMOVED FROM THE SITE AND DISPOSED OF AT AN APPROVED SITE.
4. THE ENGINEER MAY MAKE MINOR CHANGES TO THE CONFIGURATION AND DESIGN GRADES OF PROJECT FEATURES AND TO REVEGETATION LAYOUTS TO SUIT FIELD CONDITIONS.
5. THE CONTRACTOR SHALL CONTACT THE DISTRICT IMMEDIATELY IF FIELD CONDITIONS ARE FOUND THAT CONFLICT WITH THESE PLANS. FIELD ADJUSTMENTS MUST BE APPROVED BY THE DISTRICT PRIOR TO CONSTRUCTION.
6. IF ANY ARTIFACTS OR OTHER MATERIALS ARE FOUND INDICATING POTENTIAL ARCHAEOLOGICAL OR HISTORICAL RESOURCES, WORK SHALL BE HALTED IMMEDIATELY AND THE CONTRACTOR SHALL CONTACT THE DISTRICT.
7. NO TREES ARE DESIGNATED FOR REMOVAL. IF FIELD CONDITIONS INDICATE THE NEED FOR TREE REMOVAL, PRIOR APPROVAL FROM THE DISTRICT AND TRPA IS REQUIRED.
8. NO GRADING SHALL OCCUR PRIOR TO INSTALLATION OF CONSTRUCTION BMPs AND APPROVAL BY TRPA AT A PRE-GRADE INSPECTION. BMPs TO BE INSTALLED PRIOR TO EQUIPMENT OR TRUCK USE OF ACCESS ROUTES IN PROJECT AREA.
9. WORK TO BE PERFORMED IS PART OF A MULTI-YEAR ADAPTIVE MANAGEMENT PLAN(AMP). PERMIT CONDITIONS FOR THE AMP APPLY TO THE PROJECT.
10. ON-SITE WORK SHALL BE PERFORMED FROM 8AM TO 6PM, MONDAY THROUGH FRIDAY. WORK OUTSIDE THESE HOURS MUST BE APPROVED BY THE DISTRICT A MINIMUM OF 48 HOURS BEFORE THE ABNORMAL WORKING HOURS ARE SCHEDULED TO BEGIN.
11. VEHICLE ACCESS RESTRICTED TO LOW GROUND PRESSURE UTILITY ATV (E.G., MULE), MAX WEIGHT 2000 LBS. ACCESS RESTRICTED TO MINIMUM NUMBER OF TRIPS REQUIRED FOR DELIVERY OF MATERIALS. AREAS OF WET GROUND TO BE PROTECTED, IF NEEDED TO AVOID RUTS OR OTHER DISTURBANCE OF THE MEADOW SURFACE.
12. CONTRACTOR TO PROVIDE SERVICES AS DIRECTED BY DISTRICT TO REMOVE DEBRIS AND MAINTAIN DRAINAGE IN EXISTING SECONDARY FLOW ROUTES FOR DEWATERING AND WATER MANAGEMENT AT THE SITE. CONTRACTOR TO DOCUMENT SERVICES PERFORMED ON A DAILY BASIS AND PROVIDE REPORTS TO THE DISTRICT WEEKLY.

AREAS & QUANTITIES - YEAR 3 IMPROVEMENTS

DISTURBANCE AREAS AND APPROXIMATE CUT/FILL QUANTITIES		
COMPONENT	SURFACE AREA, SF	CUT (-)/FILL(+) CY
ACCESS ROUTES	14,200	0
PILOT CHANNELS	200	-5
DOUBLE MARSH MAT HUMMOCKS	1968	+5
MARSH MAT HUMMOCKS WITH WILLOW MATTRESS	352	0
PLANTED COIR LOGS	40	0
WETLAND PLUG PLANTINGS	200	0
HUMMOCKS	304	0
TOTALS	3078.2	0

*EXCLUDES AREAS WHERE ONLY PLANTING OCCURS

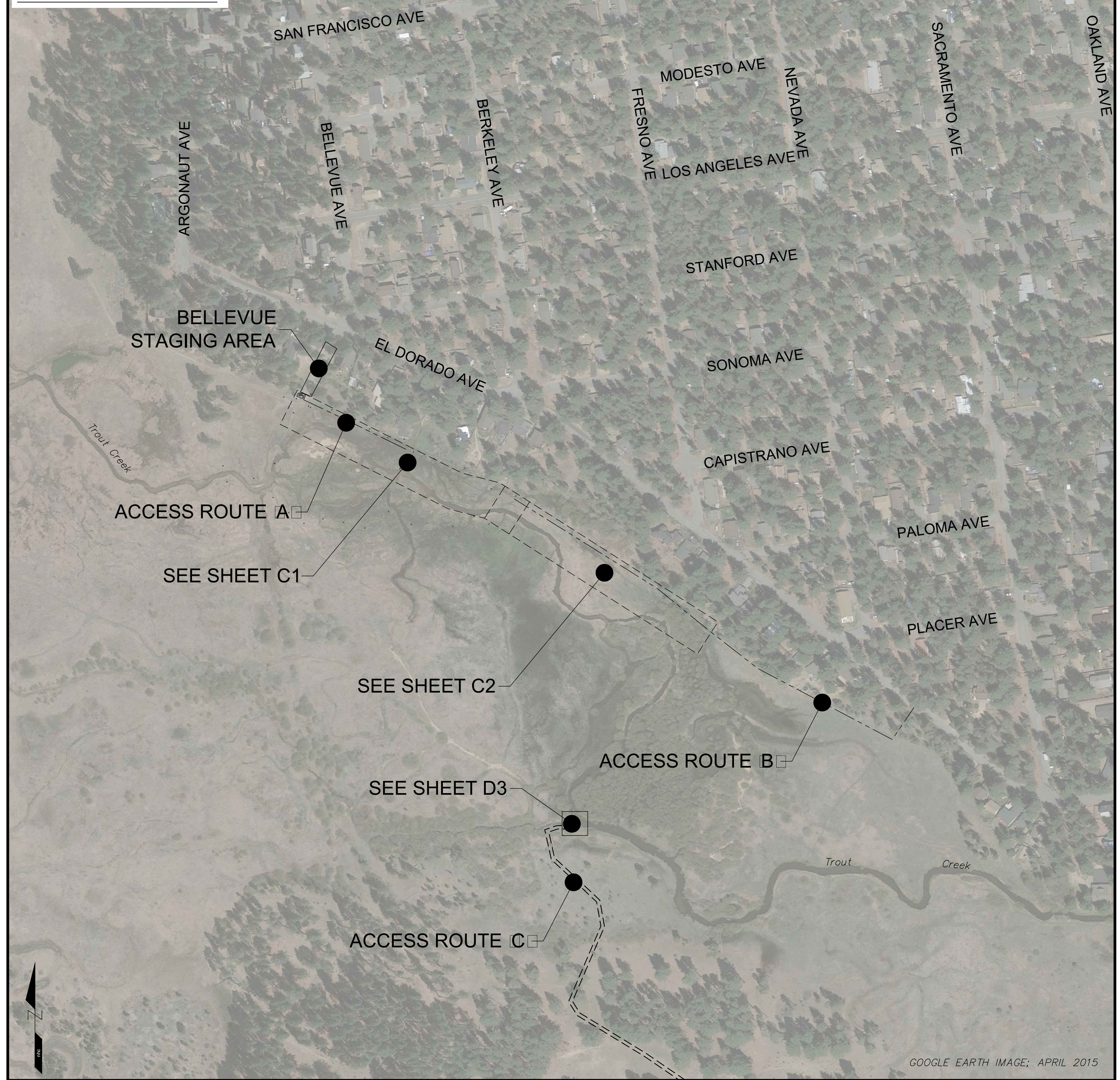
MONUMENT LOCATIONS					
NAME	LATITUDE (NAD83)	LONGITUDE (NAD83)	NORTHING (GRID)	EASTING (GRID)	ELEVATION (NAVD88)
RBM T01	38.936805560°N	119.989783506°W	2109311.8	7133398.2	6234.3
RBM T02	38.936678391°N	119.989687343°W	2109266.1	7133426.6	6234.4
RBM T04	38.936695860°N	119.989298498°W	2109274.9	713537.0	6234.3
RBM T05	38.936536812°N	119.988919311°W	2109219.4	7133646.1	6235.0
RBM T07	38.936210006°N	119.987960945°W	2109106.4	7133921.3	6234.9

LEGEND

- EXISTING TREES
- EXISTING EDGE OF PAVED ROAD
- EXISTING TRAIL
- EXISTING CONTOURS (MAJOR)
- EXISTING CONTOURS (MINOR)
- EXISTING FENCE
- EXISTING EDGE OF WATER (10/25/13)
- EXISTING BUILDINGS & STRUCTURES
- SURVEY CONTROL POINT
- PROPOSED SLOPE
- CONSTRUCTION BASELINE
- SILT BARRIER
- SAFETY PRESERVATION FENCE WITH SILT BARRIER
- PROPOSED CONTOURS (MAJOR)
- PROPOSED CONTOURS (MINOR)
- PROPOSED SPOT ELEVATIONS
- HUMMOCK
- DIVERSION DAM
- STAGING AREA

SURVEY
 TOPOGRAPHY BASED ON FIELD SURVEY, 3 NOVEMBER 2013, BY TRI-STATE SURVEYING, LTD., AND 20 JANUARY 2015 AND NOVEMBER 2015 LUMOS & ASSOCIATES.
 HORIZONTAL: NAD 83(2011) EPOCH 2010.00 CALIFORNIA STATE PLANE ZONE II, US SURVEY FEET
 NGS HPGN D CA 03 FS
 N 2107571.07 US SURVEY FEET-GRID
 E 7136557.88
 NGS RICHARDSON
 N 2103848.87 US SURVEY FEET - GRID
 E 7123525.92 GRID
 VERTICAL: NAVD88
 NGS HPGN D CA 03 FS
 EL 6248.20

PROJECT OVERVIEW

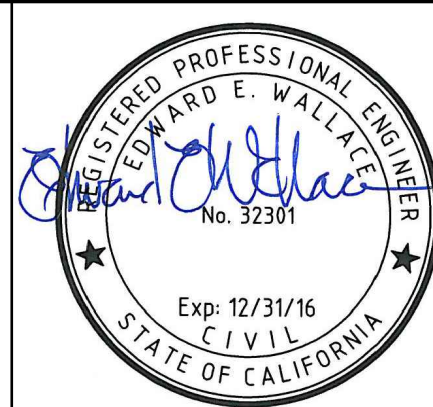


PROJECT OVERVIEW

SCALE: 1"=200'

South Tahoe Public Utility District
 1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpud.us

nhc
 northwest hydraulic consultants
 80 south lake avenue, suite 800
 pasadena, california 91101
 phone: (626) 440-0080
 fax: (626) 440-1881
 www.nhcweb.com



Revisions			Drawing Information	
No.	Date	Description	Date	
			4 October 2016 (09:13)	Status
				Final Construction Documents
				Designer
				Drafter
				Checked
				File Name
				UT MARSH COVER YR3
				Plotted Scale
				0 1/2 1

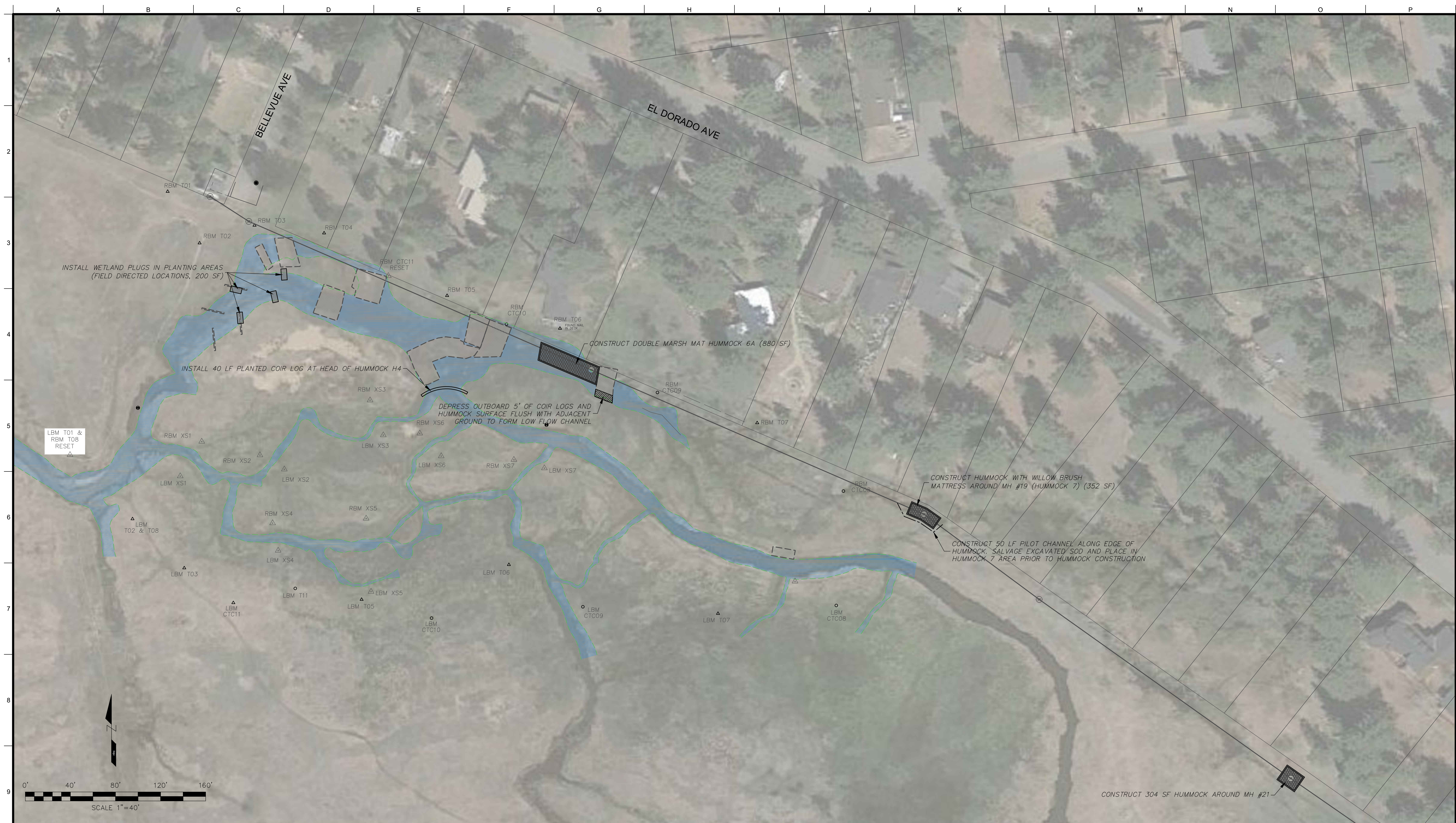
**Upper Truckee Marsh Sewer Facilities
 Adaptive Management Plan
 Years 2-5 Improvements
 General Notes**

Job Number
6001103

Sheet Number

G1

Sheet 2 of 7



INSTALL WETLAND PLUGS IN PLANTING AREAS
(FIELD DIRECTED LOCATIONS, 200 SF)

INSTALL 40 LF PLANTED COIR LOG AT HEAD OF HUMMOCK H4

DEPRESS OUTBOARD 5' OF COIR LOGS AND
HUMMOCK SURFACE FLUSH WITH ADJACENT
GROUND TO FORM LOW FLOW CHANNEL

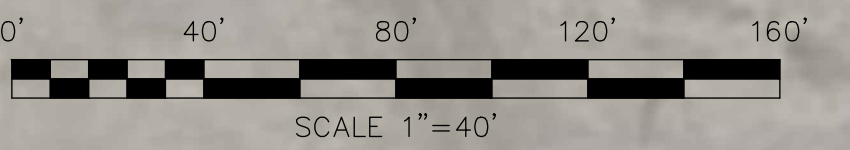
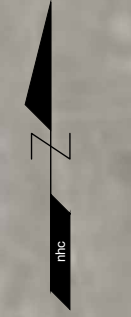
CONSTRUCT DOUBLE MARSH MAT HUMMOCK 6A (880 SF)

CONSTRUCT HUMMOCK WITH WILLOW BRUSH
MATTRESS AROUND MH #19 (HUMMOCK 7) (352 SF)

CONSTRUCT 50 LF PILOT CHANNEL ALONG EDGE OF
HUMMOCK. SALVAGE EXCAVATED SOD AND PLACE IN
HUMMOCK 7 AREA PRIOR TO HUMMOCK CONSTRUCTION

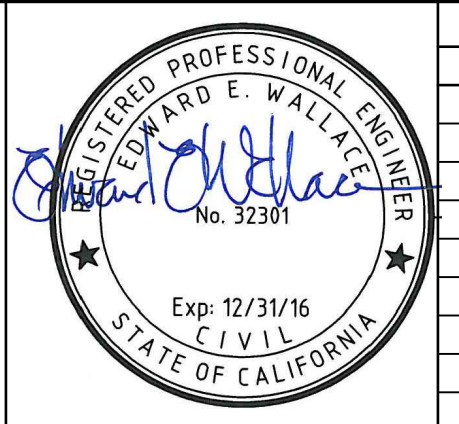
CONSTRUCT 304 SF HUMMOCK AROUND MH #21

LBM T01 &
RBM T08
RESET



South Tahoe Public Utility District
1275 Meadow Crest Drive
South Lake Tahoe, California 96150
(530) 544-6474
www.stpubd.us

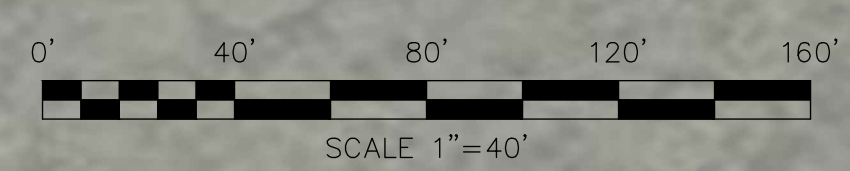
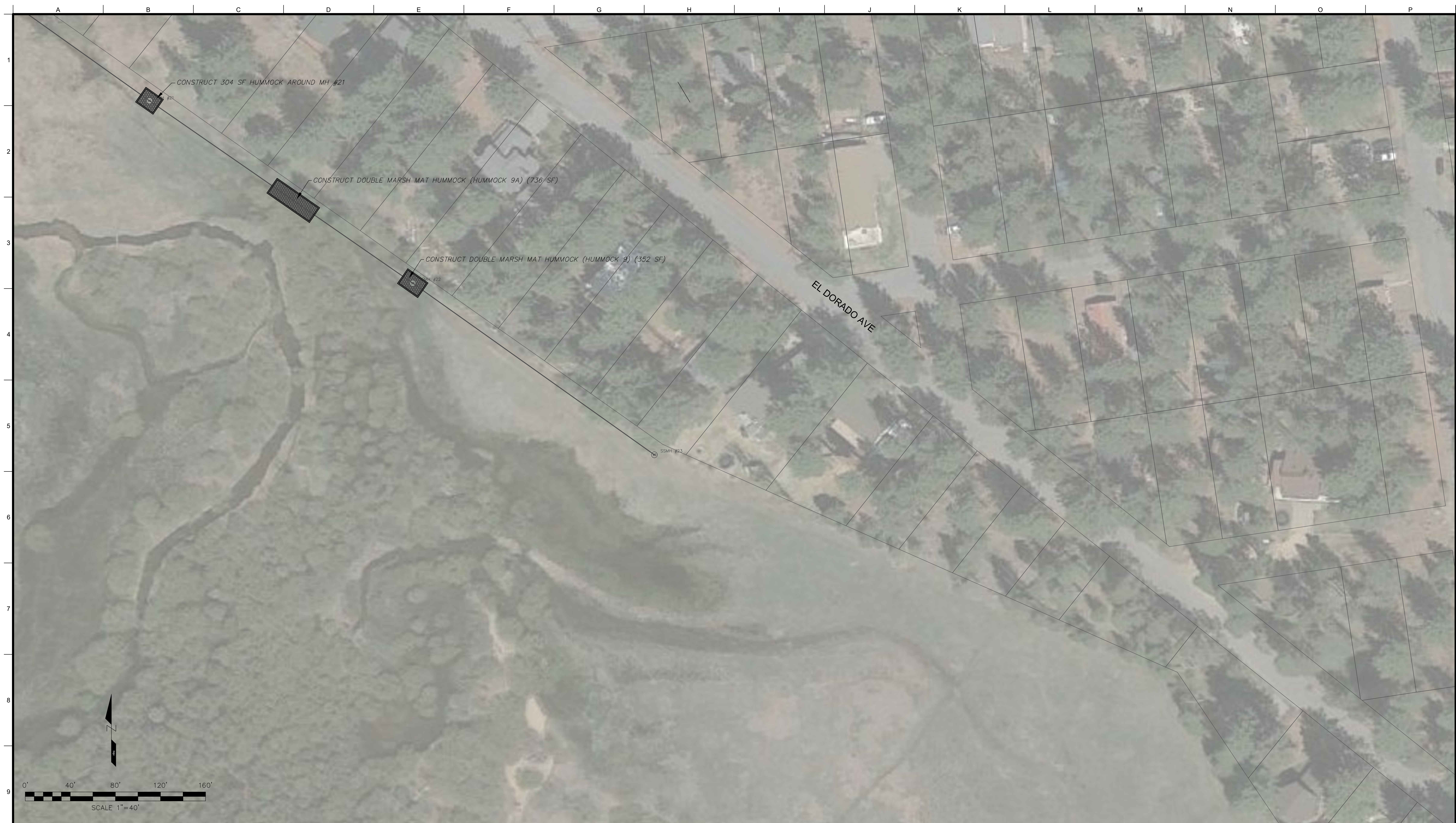
nhc
northwest hydraulic consultants
80 south lake avenue, suite 800
pasadena, california 91101
phone: (626) 440-0080
fax: (626) 440-1881
www.nhcweb.com




Revisions			Drawing Information	
No.	Date	Description	Date	
			4 October 2016 (09:12)	Status
				Final Construction Documents
				Designer
				eew/tvs
				Drafter
				tvs
				Checked
				eew
				File Name
				UT MARSH YR3
				Plotted Scale
				0 1/2 1

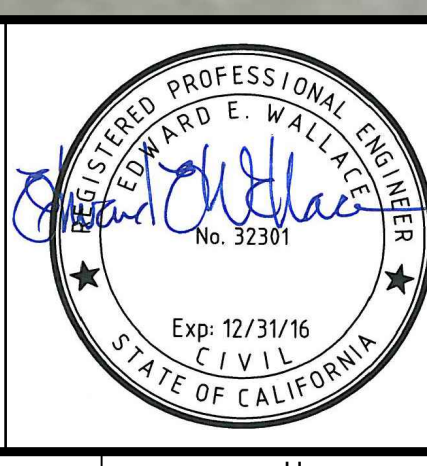
**Upper Truckee Marsh Sewer Facilities
Adaptive Management Plan
Years 2-5 Improvements
Plan Sheet**

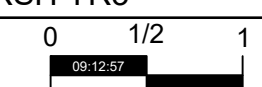
Job Number
6001103
Sheet Number
C1
Sheet 3 of 7




South Tahoe Public Utility District
 1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpud.us

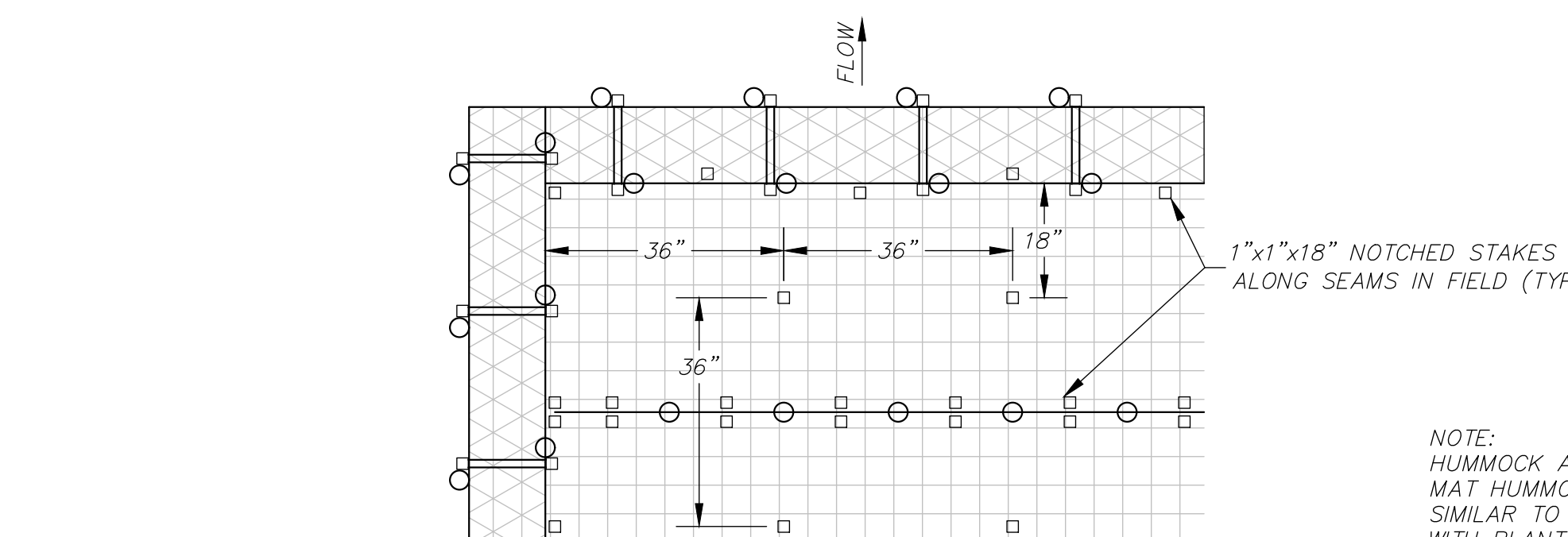
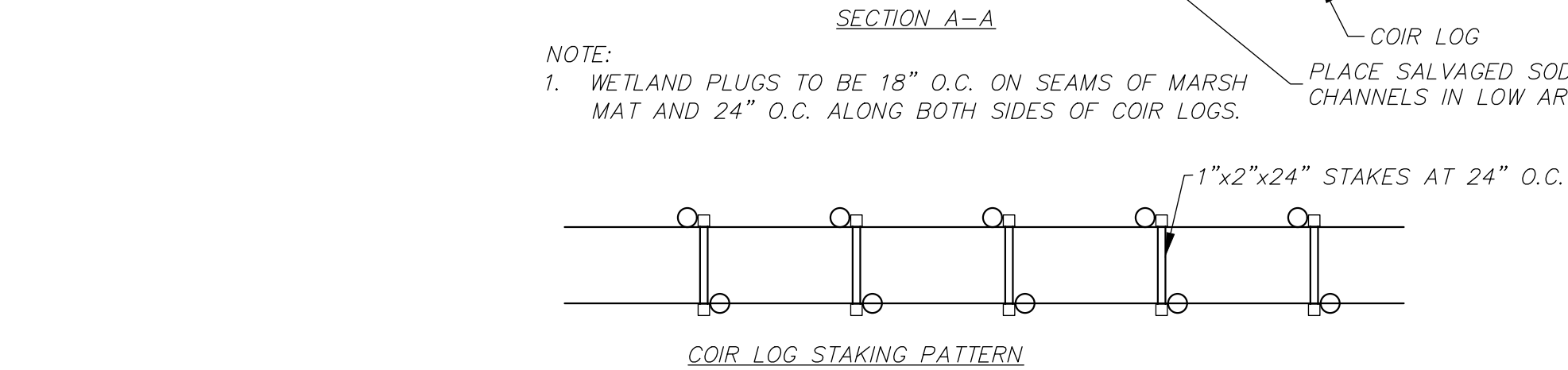
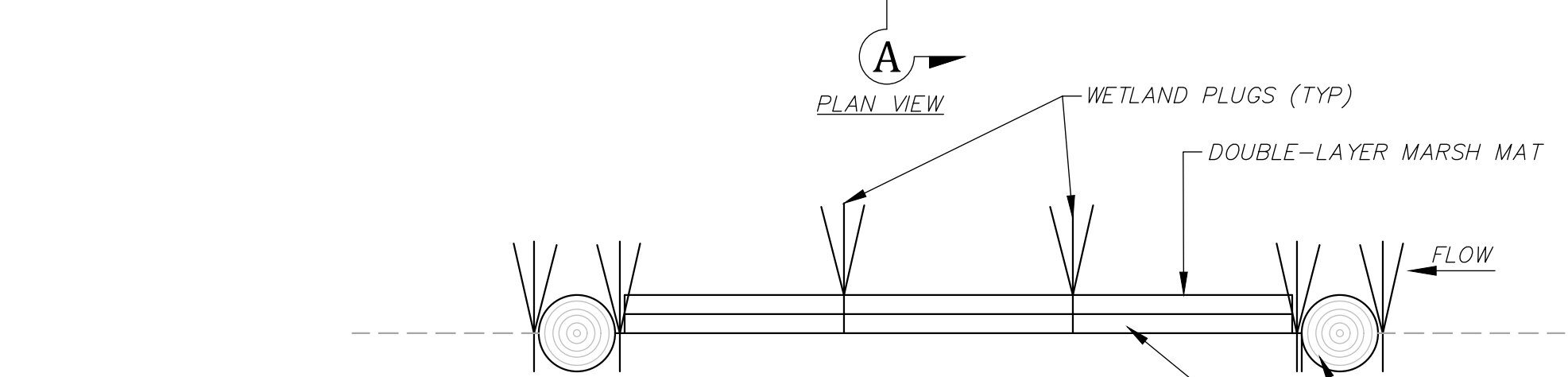
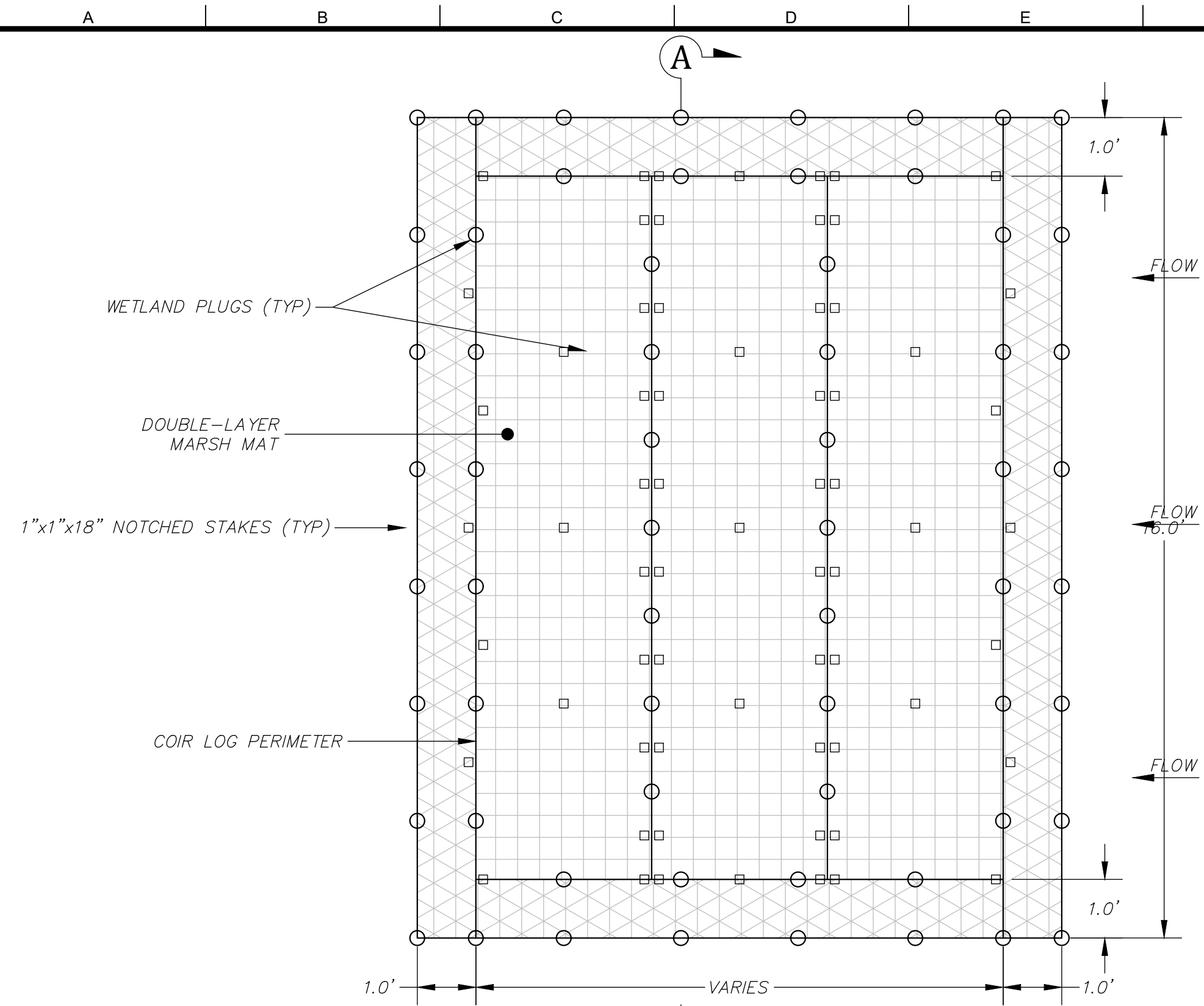

northwest hydraulic consultants
 80 south lake avenue, suite 800
 pasadena, california 91101
 phone: (626) 440-0080
 fax: (626) 440-1881
 www.nhcweb.com



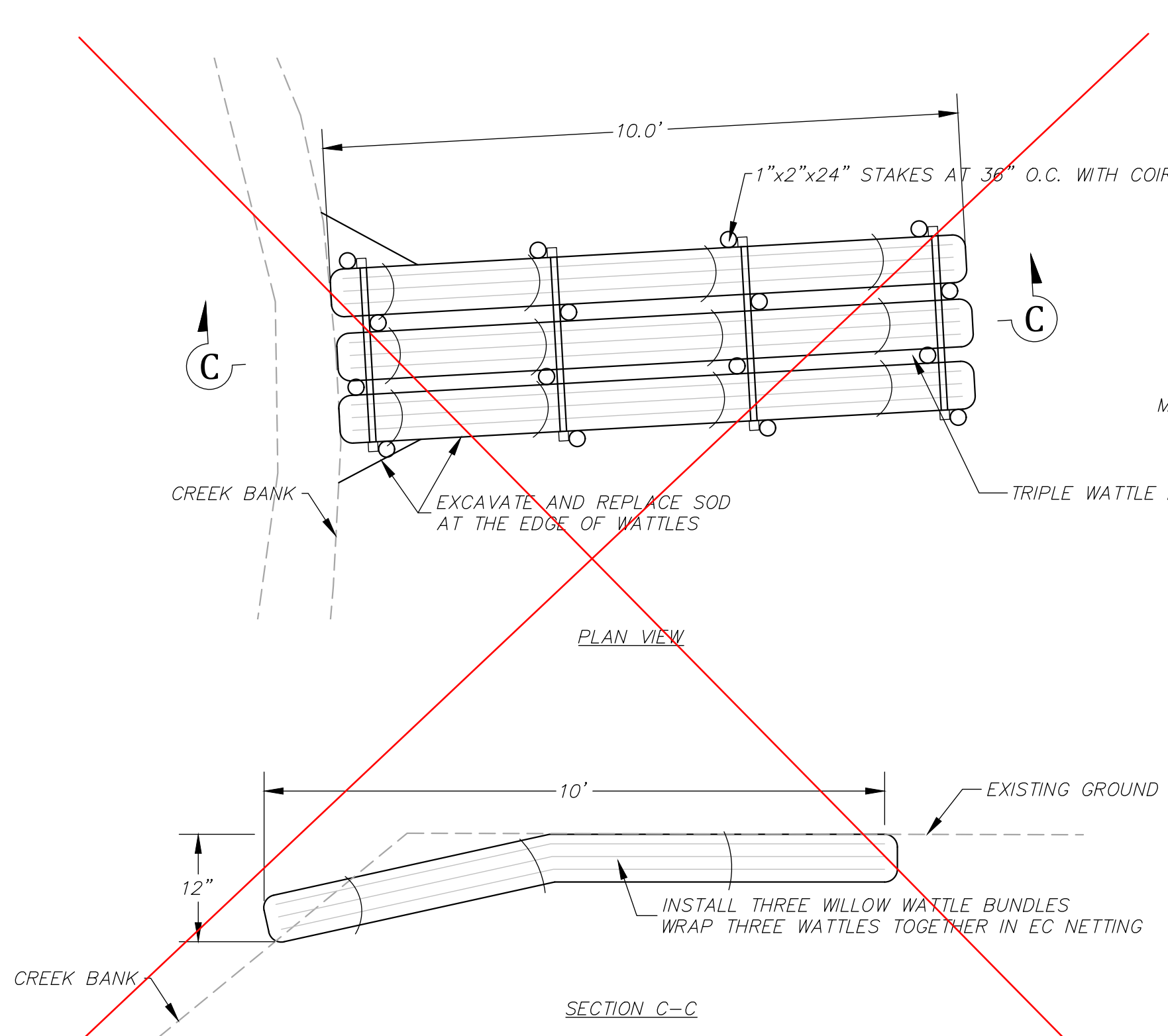
Revisions			Drawing Information	
No.	Date	Description	Date	
			4 October 2016 (09:12)	Status
				Final Construction Documents
				Designer
				eew/tvs
				Drafter
				tvs
				Checked
				eew
				File Name
				UT MARSH YR3
				Plotted Scale
				

Upper Truckee Marsh Sewer Facilities
Adaptive Management Plan
Years 2-5 Improvements
Plan Sheet

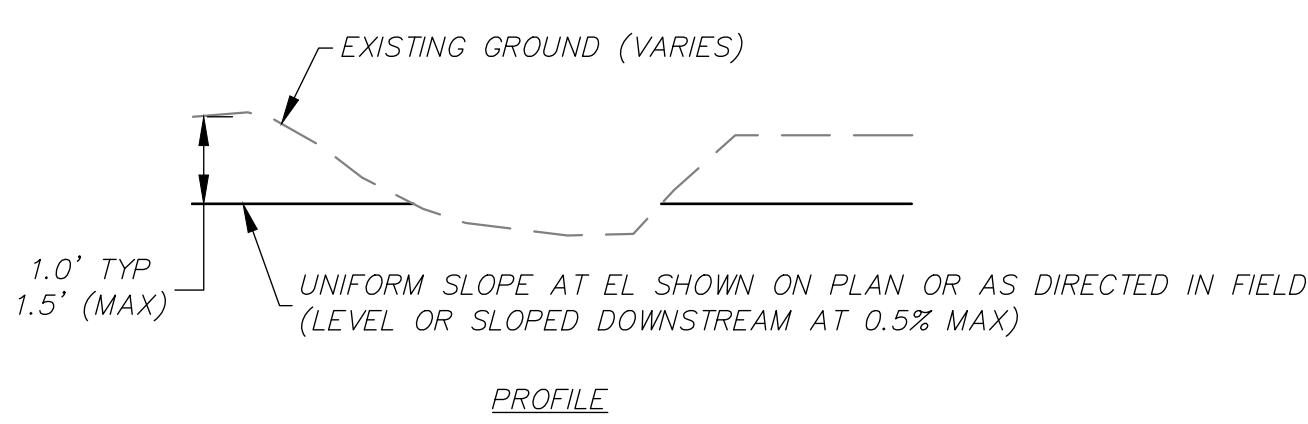
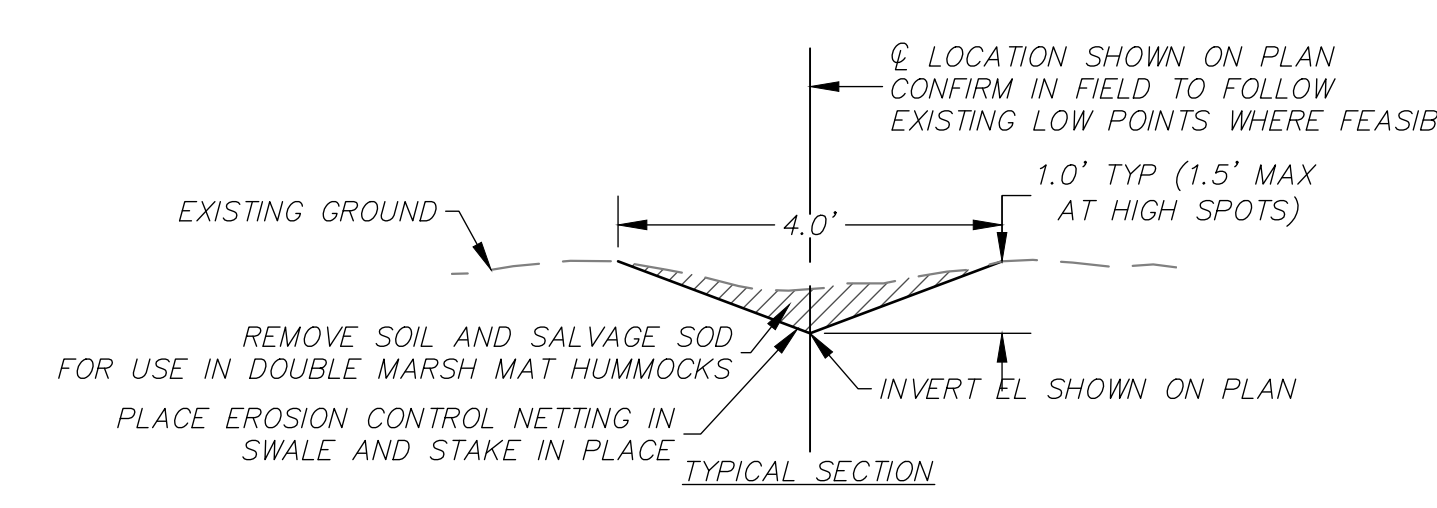
Job Number
 6001103
 Sheet Number
C2
 Sheet 4 of 7



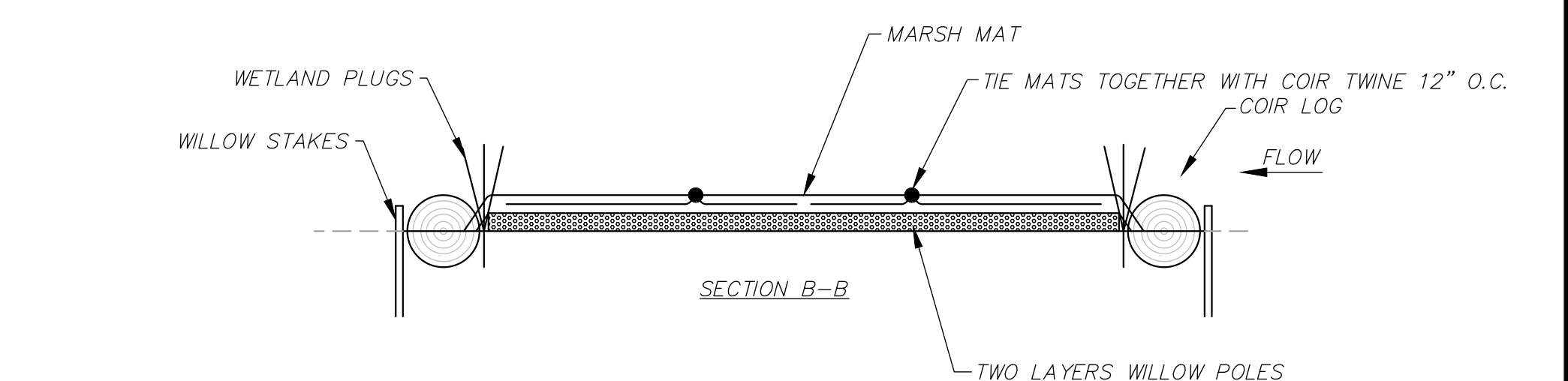
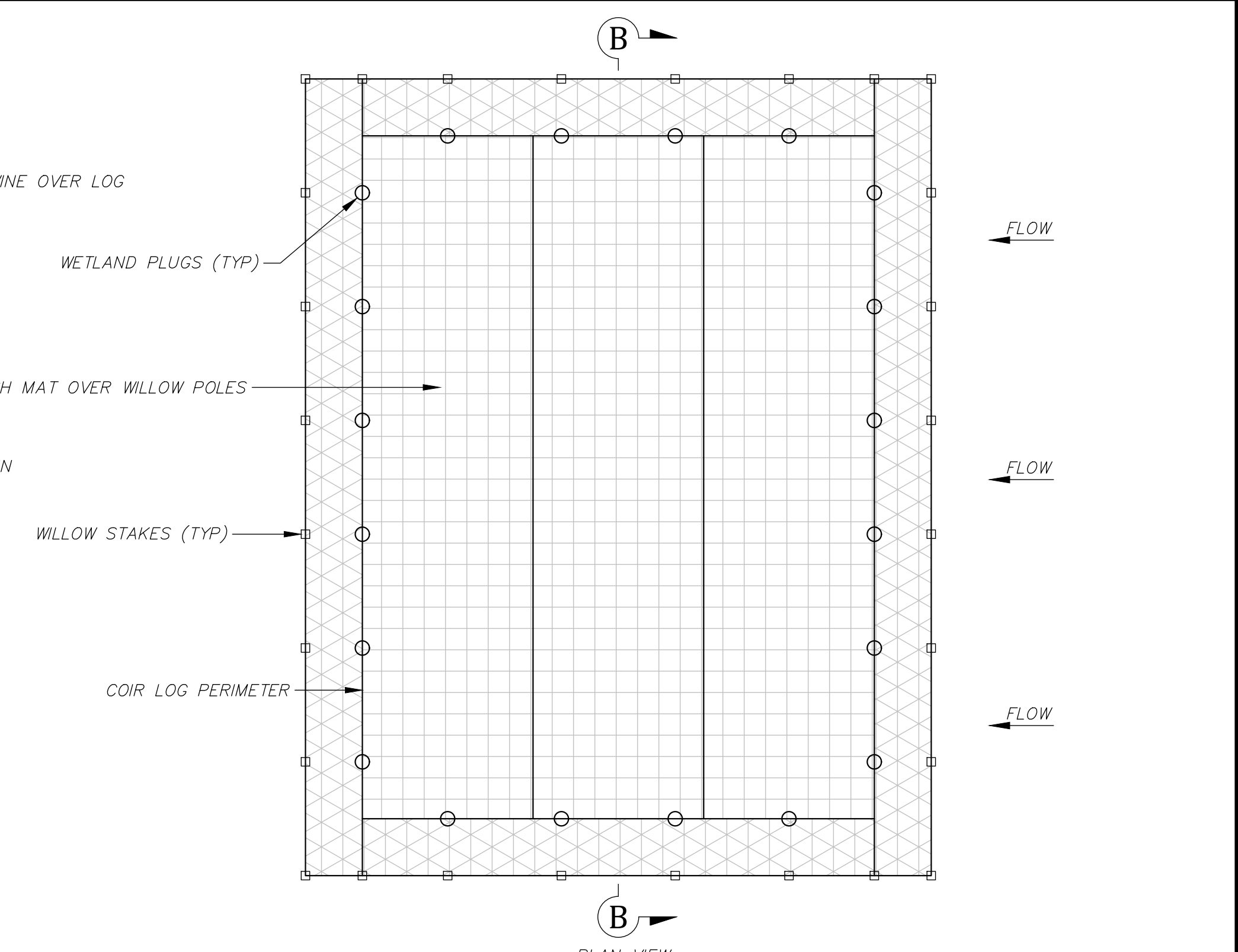
DOUBLE MARSH MAT
Scale: 1"=6"



TRIPLE WATTLE DRAIN (NOT IN CONTRACT)
Scale: 1"=6"



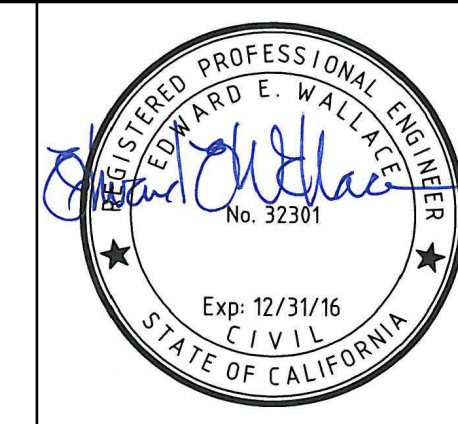
PILOT CHANNEL
Not to Scale



HUMMOCK WITH WILLOW BRUSH MATTRESS
Scale: 1"=6"

South Tahoe Public Utility District
1275 Meadow Crest Drive
South Lake Tahoe, California 96150
(530) 544-6474
www.stpud.us

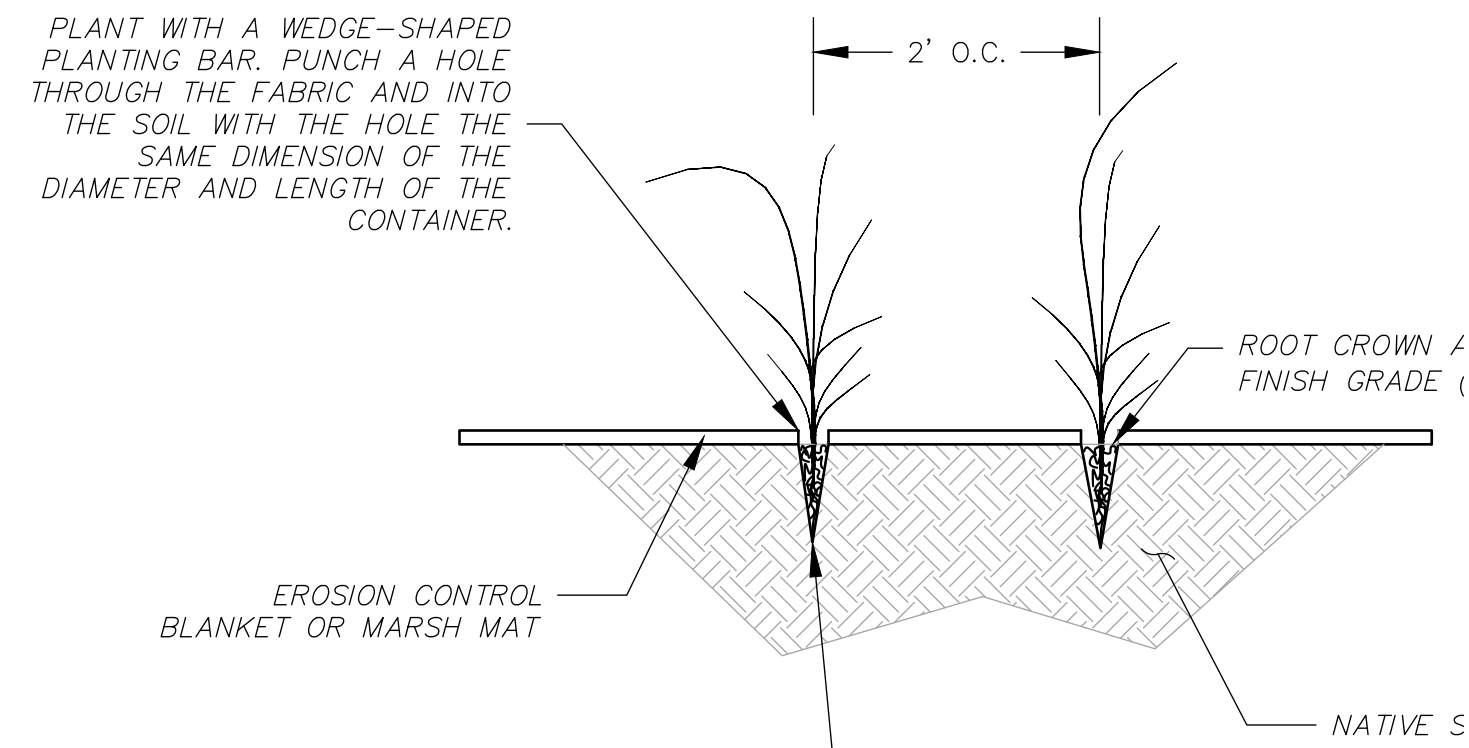
nhc
northwest hydraulic consultants
80 south lake avenue, suite 800
pasadena, california 91101
phone: (626) 440-0080
fax: (626) 440-1881
www.nhcweb.com



Revisions		Drawing Information	
No.	Date	Date	Description
		4 October 2016 (09:11)	
			Status: Final Construction Documents
			Designer: eew
			Drafter: tvs
			Checked: eew
			File Name: UT MARSH DETAIL YR3
			Plotted Scale: 0 1/2 1

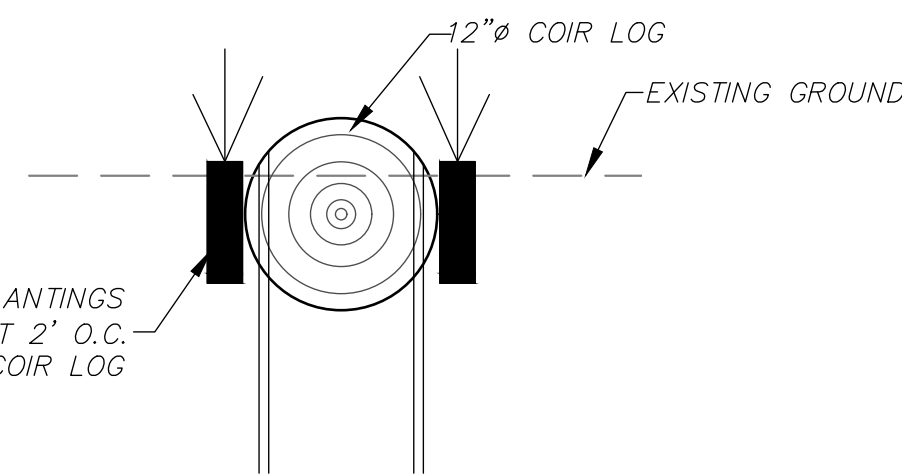
**Upper Truckee Marsh Sewer Facilities
Adaptive Management Plan
Years 2-5 Improvements
Details Sheet**

Job Number: 6001103
Sheet Number: **D1**
Sheet 5 of 7



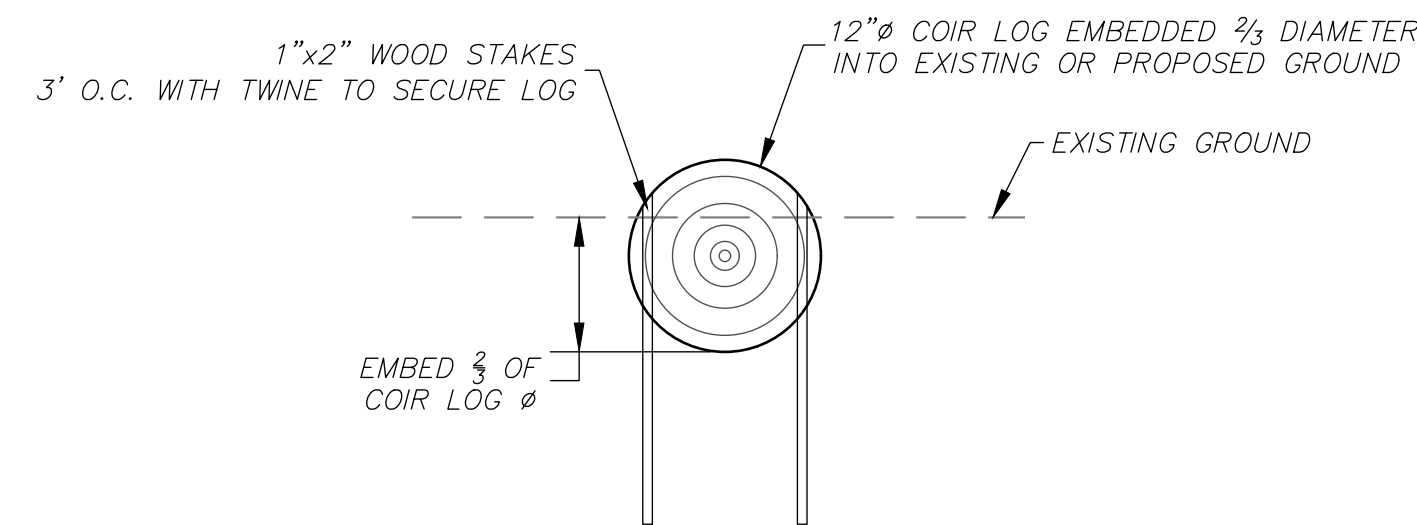
- PLANT WITH A WEDGE-SHAPED PLANTING BAR, PUNCH A HOLE THROUGH THE FABRIC AND INTO THE SOIL WITH THE HOLE THE SAME DIMENSION OF THE DIAMETER AND LENGTH OF THE CONTAINER.
- EROSION CONTROL BLANKET OR MARSH MAT
- ROOT CROWN / FINISH GRADE
- NATIVE S
- ENSURE THAT ROOTS ARE PLANTED STRAIGHT TO THE BOTTOM OF THE HOLE
- NOTES:
- PULL NETTING APART PRIOR TO DIGGING THE PLANTING HOLE TO MINIMIZE THE NEED TO CUT THE FABRIC.
 - WETLAND PLUGS SHALL BE CAREX NEBRASCENSIS AND JUNCUS BAL TICUS.
 - WETLAND PLUGS SHALL BE SUPERCELL 1.5 INCH WIDE AND 8 INCHES DEEP OR DEEPOTS (10-INCH DEPTH).
 - UP TO 45 WETLAND PLUGS WILL BE PLANTED AT LOCATIONS DIRECTED BY THE DISTRICT (NOT SHOWN ON PLANS)

WETLAND PLUG PLANTING
Not to Scale

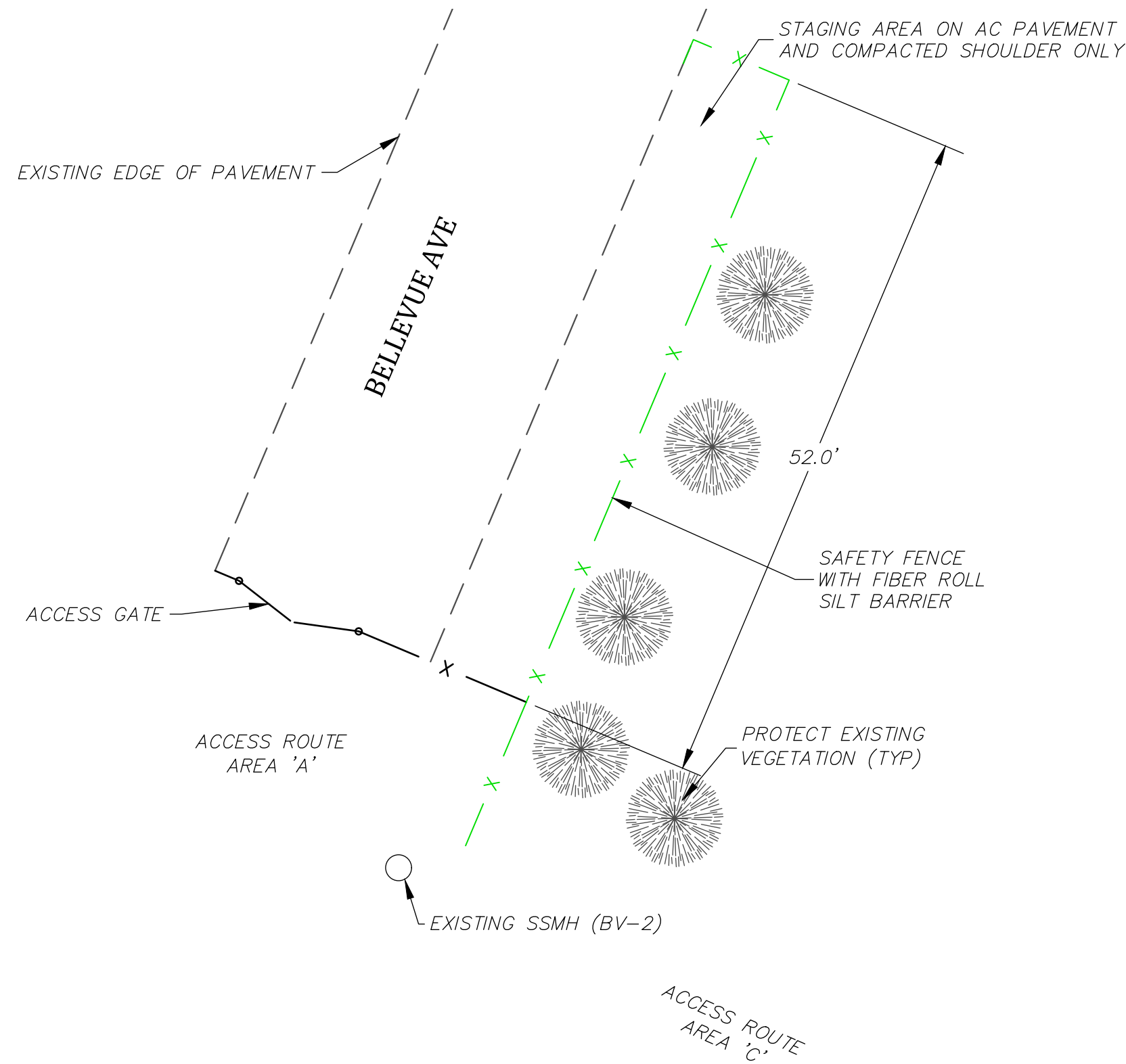


INSTALL WETLAND PLUG PLANTINGS OR SALVAGED SOD PLUG AT 2' O.C. IMMEDIATELY ADJACENT TO COIR LOG

PLANTED COIR LOG
Not to Scale

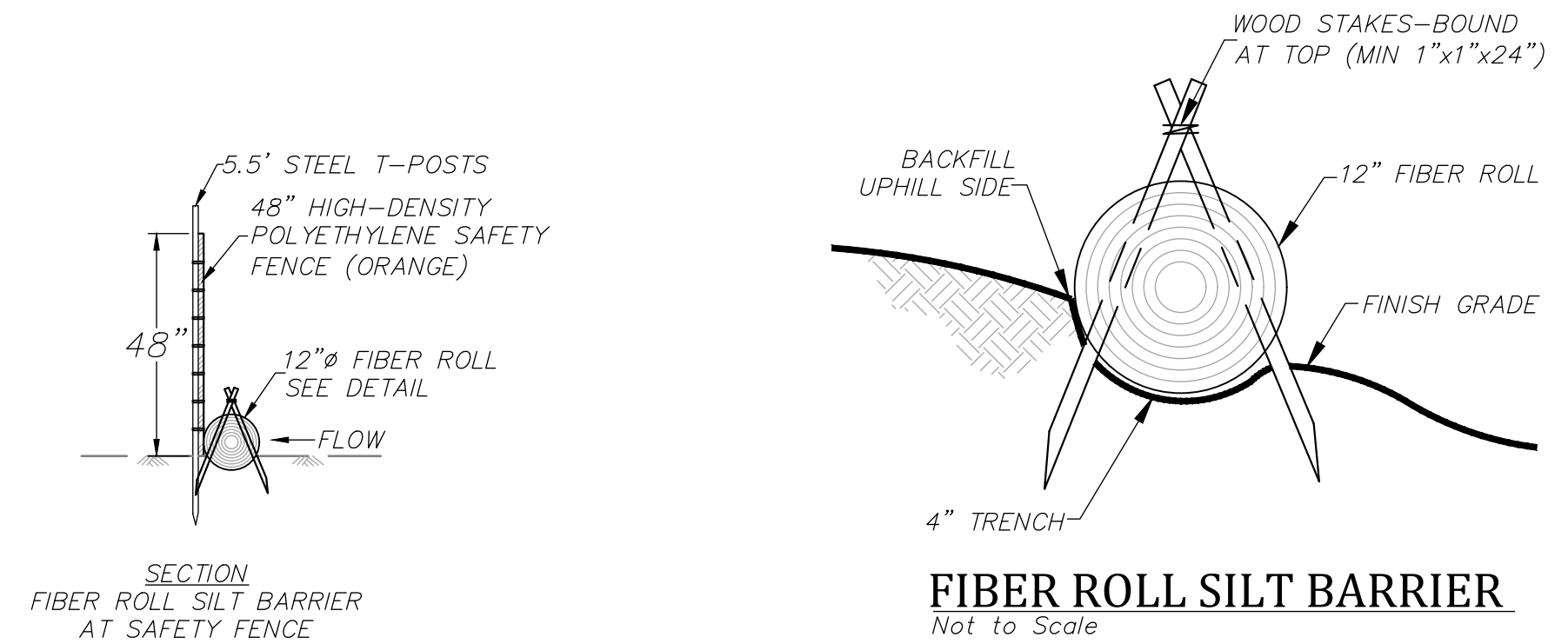


COIR LOG INSTALLATION
Scale: 1"=5'



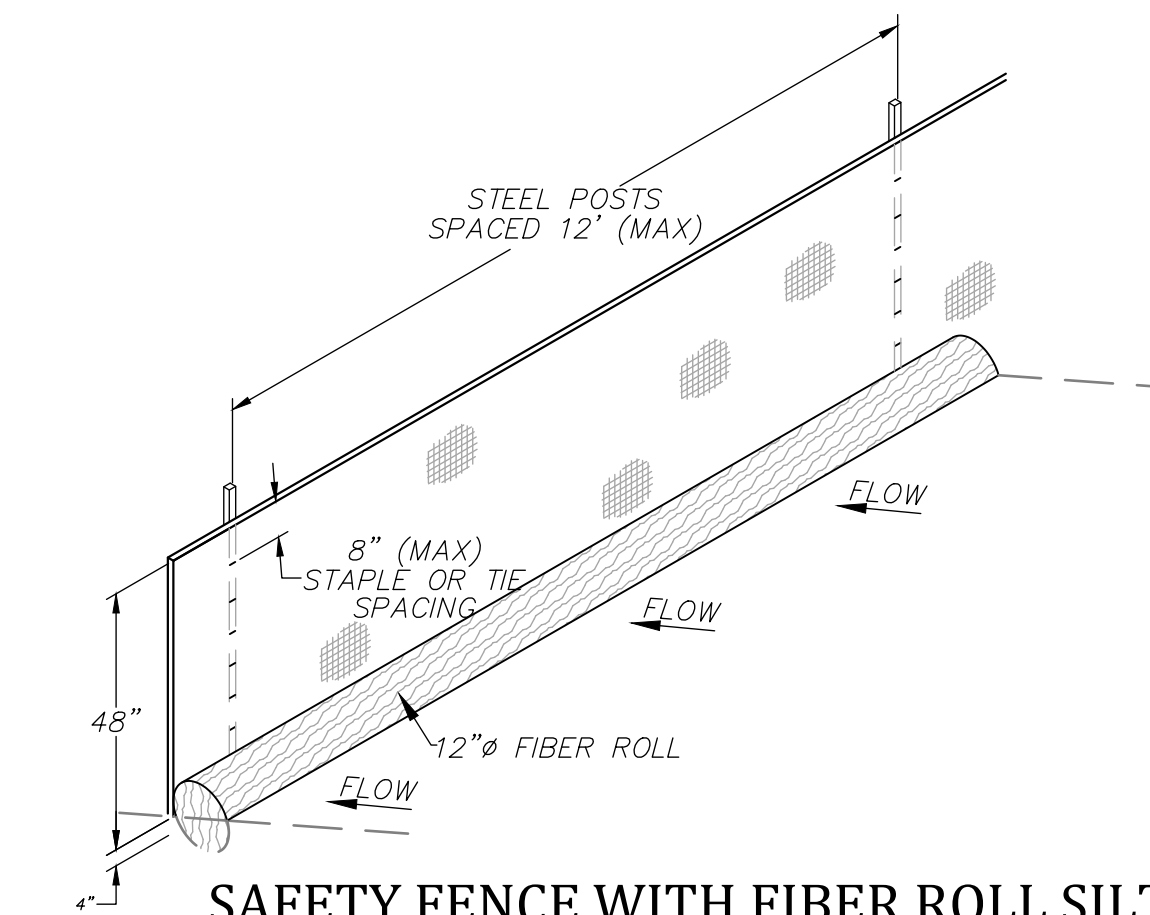
STAGING AREA BMPs
Not to Scale

- STAGING AREA BMP NOTES:
- STAGING AREA TO BE MAINTAINED IN A CLEAN CONDITION
 - CONTRACTOR IS RESPONSIBLE TO MAINTAIN OR RESTORE EXISTING AC PAVEMENT TO A PRE-PROJECT CONDITION.



SECTION FIBER ROLL SILT BARRIER AT SAFETY FENCE

FIBER ROLL SILT BARRIER
Not to Scale

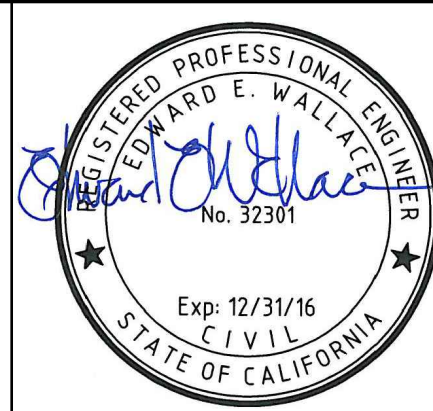


SAFETY FENCE WITH FIBER ROLL SILT BARRIER
Not to Scale

- NOTES:
- FIBER ROLL SHALL BE MADE FROM 100% MATTRESS GRADE COCONUT FIBER AND BOUND BY HIGH STRENGTH COIR NETTING, AND HAVE A MINIMUM WEIGHT OF 5 LBS PER LINEAL FOOT.
 - ORANGE SAFETY FENCE SHALL BE HIGH DENSITY POLYETHYLENE WITH A MESH OPENING OF APPROXIMATELY 1 INCH BY 4 INCHES AND A MINIMUM HEIGHT OF 4 FEET.
 - FIBER ROLL SILT BARRIER SHALL BE INSTALLED ALONG CONTOUR AND ON SLOPES 5H:1V OR FLATTER UNLESS OTHERWISE APPROVED BY TRPA.
 - THE INSTALLATION CONFIGURATION SHALL PREVENT RUNOFF FROM LEAVING THE SITE OR ENTERING A WATERCOURSE WITHOUT PASSING THROUGH A SILT BARRIER.
 - THE MAXIMUM LENGTH OF SLOPE DRAINING TO THE SILT BARRIER SHALL BE 100 FEET.
 - FIBER ROLL SHALL BE INSTALLED BY SHAPING A 4 INCH DEEP FURROW TO MATCH THE SHAPE OF THE LOG, SECURING IN FURROW WITH WOOD STAKES, AND TAMPING THE GROUND AROUND THE FIBER ROLL TO FILL VOIDS BETWEEN THE LOG AND THE GROUND.
 - TRPA BMP-517

South Tahoe Public Utility District
1275 Meadow Crest Drive
South Lake Tahoe, California 96150
(530) 544-6474
www.stpud.us

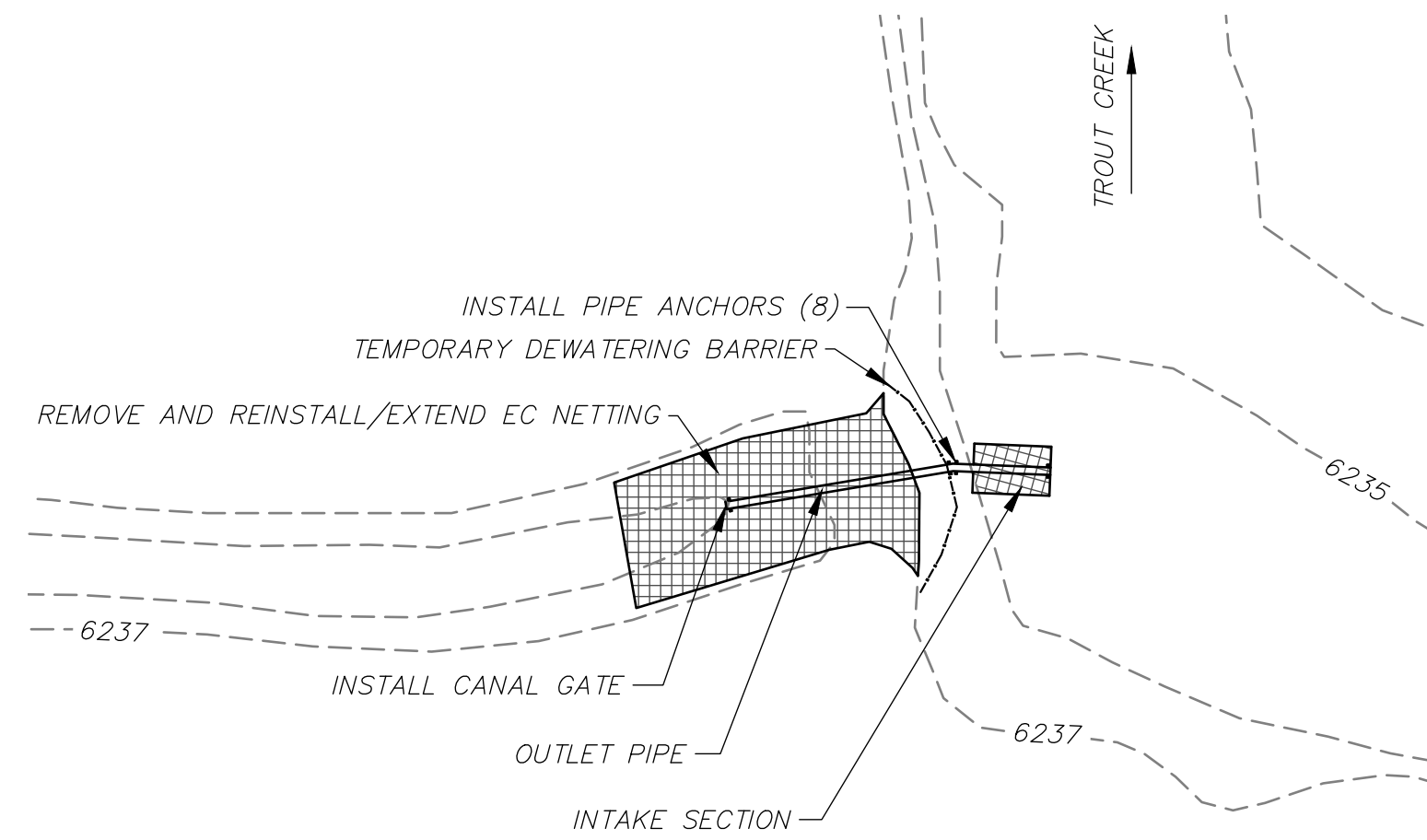
nhc
northwest hydraulic consultants
80 south lake avenue, suite 800
pasadena, california 91101
phone: (626) 440-0080
fax: (626) 440-1881
www.nhcweb.com



Revisions			Drawing Information	
No.	Date	Description	Date	
			4 October 2016 (09:11)	Status
				Final Construction Documents
				Designer
				eew
				Drafter
				tvS
				Checked
				eew
				File Name
				UT MARSH DETAIL YR3
				Plotted Scale
				0 1/2 1

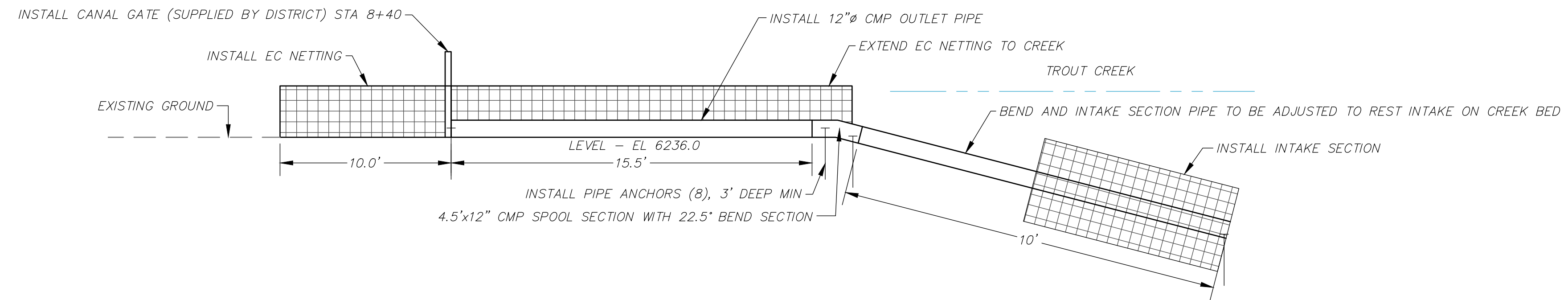
**Upper Truckee Marsh Sewer Facilities
Adaptive Management Plan
Years 2-5 Improvements
Details Sheet**

Job Number
6001103
Sheet Number
D2
Sheet 6 of 7

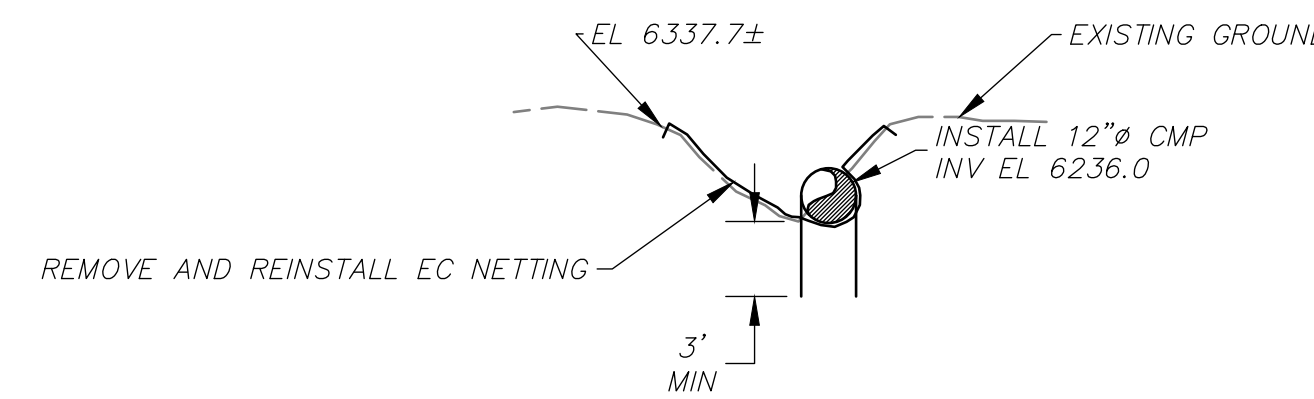


- NOTES:
 POND LEVELER TO BE INSTALLED IN THE FOLLOWING STEPS:
 1. INSTALL TEMPORARY DEWATERING BARRIER AT HEAD OF SECONDARY CHANNEL TO STOP FLOW INTO SECONDARY CHANNEL
 2. REMOVE EXISTING EROSION CONTROL FABRIC
 3. EXCAVATE FOR PIPE BEDDING
 4. REINSTALL AND EXTEND EROSION CONTROL FABRIC
 5. INSTALL OUTLET PIPE AND CANAL GATE
 6. REMOVE TEMPORARY DEWATERING BARRIER
 7. INSTALL INTAKE SECTION IN TROUT CREEK

PIPE ANCHORS TO BE 3/4" GALVANIZED PIPE WITH A TEE FITTING AT TOP AND 3/8" POLYESTER ROPE STRAPS, TIGHTENED TO HOLD PIPE TO GROUND.




- NOTES:
 1. CONTRACTOR TO SCHEDULE DELIVERY OF POND LEVELER TO PROJECT SITE BY DISTRICT.
 2. SECONDARY CHANNEL TO BE DEWATERED FOR INSTALLATION OF OUTLET PIPE. INSTALLATION AND CONNECTION OF INTAKE SECTION SHALL BE MADE IN THE WATER (TROUT CREEK).
 3. OUTLET PIPE TO BE INSTALLED LEVEL AT EL 6236.0
 4. BEND CONNECTION BETWEEN OUTLET PIPE AND INTAKE SECTION TO BE ADJUSTED TO REST INTAKE SECTION ON BED OF CREEK CHANNEL
 5. EROSION CONTROL NETTING TO BE 0.3" 100% COIR NETTING WITH 50% OPEN AREA (70 OR 700 SERIES PRODUCT)
 6. OUTLET PIPE TO BE INSTALLED ALONG RIGHT BANK (LOOKING DOWNSTREAM) OF SECONDARY CHANNEL AND BACKFILLED ALONG THE BANK WITH SOD SALVAGED AT LOCATIONS IDENTIFIED IN THE FIELD BY ENGINEER

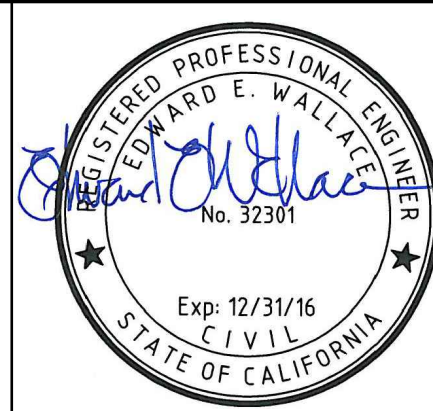


LONGITUDINAL SECTION

POND LEVELER
 Not to Scale

 South Tahoe Public Utility District
 1275 Meadow Crest Drive
 South Lake Tahoe, California 96150
 (530) 544-6474
 www.stpod.us

 **nhc**
 northwest hydraulic consultants
 80 south lake avenue, suite 800
 pasadena, california 91101
 phone: (626) 440-0080
 fax: (626) 440-1881
 www.nhcweb.com



Revisions			Drawing Information	
No.	Date	Description	Date	
			4 October 2016 (09:11)	Status
				Final Construction Documents
				Designer
				eew
				Drafter
				tvs
				Checked
				eew
				File Name
				UT MARSH DETAIL YR3
				Plotted Scale
				0 1/2 1

Upper Truckee Marsh Sewer Facilities
 Adaptive Management Plan
 Years 2-5 Improvements
 Details Sheet

Job Number
 6001103
 Sheet Number
D3
 Sheet 7 of 7