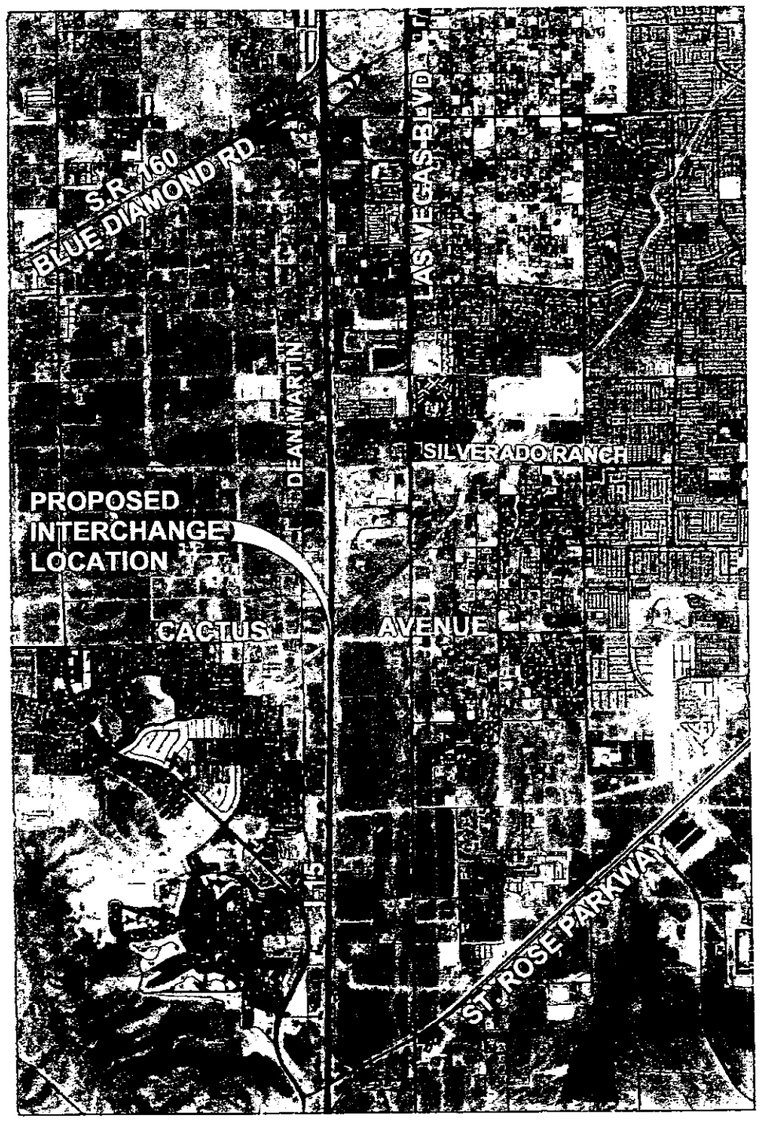

INTERCHANGE TYPE SELECTION STUDY
CACTUS AVENUE / INTERSTATE 15 INTERCHANGE

Prepared for:

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

FEBRUARY 2007

Prepared by:

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INTERCHANGE TYPE STUDY
CACTUS AVENUE WITH INTERSTATE 15

Draft

Introduction

The Clark County Department of Public Works (DPW) in coordination with the Nevada Department of Transportation (NDOT) plans to construct a new interchange at the intersection of Cactus Avenue with Interstate 15. NDOT has conducted a study to improve I-15 from Sloan Road to Tropicana Avenue by adding additional lanes and new service interchanges. NDOT is currently preparing an Environmental Assessment for the Study area. The Cactus Avenue interchange is included in the Study and Environmental Assessment.

The DPW desires to examine the type of interchange to be constructed at Cactus Avenue in more detail considering the data contained in NDOT's study for I-15 and the Draft Environmental Assessment using larger scale topographic mapping. This interchange type study will examine the relative features of a Single Point Urban Interchange with a Tight Urban Diamond Interchange.

Based on the Right of Way (ROW) constraints at the proposed Cactus Avenue – I-15 interchange site, it is apparent that only a Single Point Urban Interchange (SPUI) or a Tight Urban Diamond Interchange (TUDI) is feasible. These types of interchanges are typically utilized in urban areas with limited ROW availability. The two interchanges have different characteristics with respect to roadway geometry, bridge structures, capacity, signal phasing, and construction cost depending on the site conditions. The purpose of this study is to evaluate and compare these characteristics in order to determine which type of interchange is most feasible and prudent and to establish a preferred interchange alternative.
The area of study is basically between Dean Martin Drive on the west and Las Vegas Boulevard on the east. Cactus Ave is an unimproved street with a 100 foot right of way within these limits.

Scope of Study

The objectives of this study are to:

1. Develop horizontal and vertical geometry and related features for the SPUI and the TUDI layouts including Cactus Ave.
2. Compare any differences in major drainage features.
3. Compare bridge layouts for both interchanges.
4. Compare the operational performance of the SPUI and the TUDI using computer simulation modeling.
5. Compare right of way requirements.
6. Compare the relative cost difference.

Interchange Layout

Future I-15

Figure 1 shows the 14 lane configuration proposed by NDOT for the future I-15 widening. It will be necessary to raise the future I-15 profile in order to provide cover over two existing box culverts that will have to be extended with the widening. The horizontal and vertical geometry of SPUI and TUDI and the drainage features were designed based on the future widened and raised I-15.

Cactus Avenue

Cactus Avenue is designed for a 100 ft ROW with three 12 ft. lanes in each direction and a 14 ft. median as shown on Figure 2. Figures 3 through Figure 6 show the proposed horizontal layout with lane configurations for Cactus Avenue between Dean Martin Drive and Las Vegas Blvd for the SPUI and the TUDI respectively. Figures 12 through 14 show the Cactus Avenue profile. The Cactus Avenue profile is the same for both types of interchange.

SPUI

Figures 3 and 4 show the horizontal layout of the Cactus Avenue/I-15 SPUI. The SPUI has a single signalized intersection for Cactus Avenue and all ramp traffic. The SPUI geometry is comprised of dual left turns and single right turns in all directions. It has 800 ft of storage length for left turns from I-15 Southbound to Cactus East bound and from Cactus Eastbound to I-15 Northbound, which will serve the AM peak hour and PM peak hour traffic to and from Las Vegas. Two centered curves (290 ft and 538 ft radii) and three centered curves (200 ft, 290 ft, and 540 ft radii) are used for the horizontal ramp geometry of SPUI. These compound circular curves are used to minimize the structural requirements (structure length) of ramps over the I-15. Factors considered in the design of horizontal and vertical geometry of SPUI ramps are:

1. Stopping sight distance.
2. Horizontal sight distance.
3. Lateral clearance of the opposing left turn traffic.
4. Minimum vertical clearance for ramp structures from I-15.
5. Drainage constraints.
6. Right of way impacts.

Figures 15 through 20 show the SPUI ramp profiles.

TUDI

Figure 5 and 6 shows the horizontal layout of Cactus Avenue/I-15 TUDI. It involves two signalized intersections 400 ft apart for Cactus Avenue and all ramp traffic. The TUDI geometry is comprised of dual left turns in all directions except the left turn lane from Cactus Westbound to I-15 Southbound which has relatively low peak hour volume. This also helps to minimize the structural requirements of Cactus Avenue bridge. The interchange has single right turns in all directions. It has 800 ft of storage length for left turns from I-15 Southbound to Cactus East bound and from Cactus Eastbound to I-15 Northbound, which will serve the AM peak hour and PM peak hour traffic to and from Las Vegas. Factors considered in the design of horizontal and vertical geometry of TUDI ramps are:

1. Stopping sight distance.
2. Horizontal sight distance.
3. Drainage constraints.
4. Right of way impacts.

Figures 21 through 24 show the TUDI ramp profiles.

Drainage

The Cactus Interchange is located within the Duck Creek Watershed, one of nine major watersheds draining the Las Vegas Valley. Figure 7 and 8 are reproductions of Figure F-24 of the Clark County Regional Flood Control District (District) Flood Control Master Plan Update (MPU) Facilities Plan and Inventory as amended in 2004.

The main branch of Duck Creek crosses diagonally through the Interchange via triple 12' x 4' reinforced concrete boxes (RCBs) (Facility DCWA 1430 on Figure 7). Studies have shown the 12' x 4' RCBs lack capacity to convey the entire 100-year flood within the main branch of Duck Creek under existing and future conditions. Flow in excess of the capacity of the triple 12' x 4' RCBs travels south along I-15 to a set of double 12' x 4' RCBs (DCWF 0061) under I-15. Similarly, flow in excess of the capacity of the double 12' x 4' RCBs continues south to a third set of triple 12' x 4' RCBs (DCW4 0057). Recently, three 12' x 4' RCBs were added to Facility DCW4 0057 as part of the Silverado Ranch Boulevard Interchange project for a total of six 12' x 4' RCBs at this location. The MPU shows a proposed concrete channel along the west side of I-15 (DCI1 0000, DCI1 0031, and DCW4 0059) connecting the three sets of culverts.

Under existing conditions, the area on the west side of the freeway is inundated by the 100-year flood as shown on Figure 9 and 10. Figure 9 and 10 are a copy of Federal Emergency Management Agency Flood Insurance Rate Map (FIRM) Panels 32003C2568E and 32003C2910E as revised on August 13, 2003. Areas of inundation by the 100-year flood are indicated on Figure 9 and 10 as Zone A and Zone AE. Since the time that the FIRMs were published, facilities have been built downstream of I-15. DCWA 1360, DCWA 1397, DCWA 1408, DCWF 0000, DCWF 0019, DCW4 0059, DCW4 0054 and DCW4 0016 have been constructed. The downstream facilities were designed to convey the 100-year flow rates as presented in the MPU.

Embankment fill associated with the Cactus Interchange ramps will be placed within the FEMA floodplain Zone A. FEMA regulations require that fill placed in the 100-year floodplain, Zone A, does not increase the flood elevation by more than 1 foot. Both the SPUI and TUDI interchange configurations will encroach into the floodplain requiring flood control measures to ensure that adjacent properties are not adversely impacted.

The existing triple and double 12' x 4' RCBs (DCWA 1429 and DCWF 0061) will be directly affected by the Cactus Interchange improvements. These culverts will need to be extended to accommodate the future I-15 widening and the interchange southbound off-ramp. These RCB's have been extended on the east side of I-15 by others
Bypass flow, in excess of the DCWA 1430 culvert capacity, will need to be perpetuated under the Cactus Avenue west approach and along the southbound off-ramp and as depicted in the MPU (i.e., DCI1 0031). Preliminary hydraulic analysis indicates that triple 12'x 4'RCBs would be sufficient to convey the future flow of 1,599 cfs under the Cactus Avenue west approach. One of those 12' x 4' RCBs under Cactus Avenue will extend along and under the southbound off-ramp and connect to the double 12' x 4' RCBs (DCWF 0061). The other two 12' x 4' RCBs would discharge into a channel along the west side of the off-ramp. A 30 ft wide, 4.5 ft deep concrete-lined, rectangular channel is recommended in lieu of the 20' wide bottom trapezoidal channel proposed in the MPU for facility DCI1 0031.

There will be no significant difference in the triple 12'x4' RCB's in either the SPUI or TUDI layouts. The 30' concrete rectangular channel will require a 2000 square foot retaining wall with the TUDI layout in order to avoid right of way acquisition from an adjacent parcel that is not otherwise affected by the project. The SPUI layout provides sufficient space to accommodate the channel without a wall.

With regard to the channel facility along the west side of I-15, it is important to note that the ground slope adjacent to I-15 between the double 12' x 4' RCBs (DCWF 0061) and the six 12' x 4' RCBs (DCW4 0057) is essentially flat. A channel slope of 0.0020 ft/ft places the invert of the concrete channel (DCW4 0059) approximately 2.7 ft lower than the invert of the six 12' x 4' RCBs. A low flow pipe (e.g., 18" RCP) across I-15 will be necessary to provide positive drainage at the end of the channel. Flood flows would then "pond" to a depth of 2.7 ft before flowing through the six-12' x 4' RCBs.

Bridge Structures

Cactus Avenue is proposed to cross over the existing Interstate 15 in Clark County, Nevada. Two types of interchanges were evaluated as part of this study; a Single Point Urban Interchange (SPUI) and a Tight Urban Diamond Interchange (TUDI). The interchange bridge will carry Cactus Avenue over Interstate 15.

A two span continuous steel bridge structure with closed abutments and an intermediate pier has been studied. An existing reinforced concrete box (RCB) culvert crosses under Interstate 15 within the footprint of the proposed Cactus Avenue Bridge at a skew as shown in Figure 4. The effects of the existing RCB culvert on the configuration of the substructure elements of the bridge structure are explained below.

Single Point Urban Interchange (SPUI)

The configuration of the roadway (including through lanes, and on/off ramps) and the proposed vertical profile of Cactus Avenue require that the abutments be located approximately 140' east and west of the centerline of the Interstate 15, see Figure 4. The existing RCB culvert crosses the proposed location of the east abutment such that this abutment will have to span approximately 65' over the existing RCB. The portion of the abutment that spans over the existing RCB will have to be specially designed and detailed with an expected increase (possibly substantial) in the reinforcing steel required. In addition, the portion of the abutment on each side of the existing RCB will have to be specially designed, specially detailed, and heavily reinforced to carry additional vertical and lateral loads for the portion of the abutment spanning over the existing RCB. This will add cost to the bridge. It is not feasible to lengthen the bridge to avoid this conflict.

Even without the increased abutment cost, the average cost of this type of bridge is generally higher than that used for a diamond interchange. The SPUI requires special framing and construction to form the "hourglass" shape of the bridge superstructure.

Tight Urban Diamond Interchange (TUDI)

This interchange type will also require locating abutments approximately 140' east and west of the centerline of the Interstate 15, This bridge layout creates a situation similar to that of the SPUI in which the East abutment will have to cantilever for approximately 40'+ over the existing RCB or it will have to span over the existing RCB.

As an option to spanning the RCB, it is proposed that the East abutment be moved further east so that it misses the existing RCB. This will require an increasing the east bridge span by 40' resulting in a span of 180' (Figure 6).

Table 1–Bridge Comparison

Interchange Type	Approx. Deck Area (sq ft)	Cost ($ / sq ft)	Typical Cost	Additional Cost	Total Cost
SPUI	41,710	$210	$8,759,100	$ 500,000 1	$9,259,100
TUDI	39,360	$200	$7,872,000		$7,872,000

Note: 1 Additional cost of East abutment spanning over existing RCB

Traffic Operations

The SPUI and TUDI interchange configurations were evaluated based upon projected 2030 traffic volumes. A CORSIM model was developed for Cactus Avenue in the interchange area for the SPUI and calibrated. This model was then revised for the TUDI interchange and an analysis was made comparing the traffic operations of the two interchange configurations.

PROJECTED YEAR 2030 TRAFFIC VOLUMES

The projected year 2030 traffic volumes were taken from the "I-15 South Traffic Report", prepared for the Nevada Department of Transportation, submitted by Parsons, Final June 2006. The traffic volumes forecast were developed using the RTC 2004 Regional Travel Demand Model (Update Package 1) and was based upon land use assumptions, demographic conditions and highway network assumptions for the I-15 South corridor. The traffic volumes used in the report were based upon a SPUI configuration at Cactus Avenue.

Figure 11 shows the projected 2030 AM and PM peak hour traffic volumes of Cactus Avenue from Dean Martin Drive to Las Vegas Boulevard. These include intersection volumes at Dean Martin Drive and Las Vegas Boulevard, as well as the ramp intersection at the interchange.

TRAFFIC ANALYSIS

Cactus Avenue from west of Dean Martin Drive to east of Las Vegas Boulevard was analyzed using CORSIM, a microscopic simulation model that represents movements of individual vehicles and includes the influence of driver behavior. The physical features of the network were first laid out and then traffic volumes were entered. Coordinated actuated traffic signals were coded for the intersections at Dean Martin Drive, the interchange ramps, and Las Vegas Boulevard. This traffic simulation was then verified and calibrated to traffic performance measures that resulted from the CORSIM traffic simulation developed for the "I-15 South Traffic Report" for the year 2030.

The goal for verification and calibration of the traffic simulation was to be within ±10 percent of the previous simulation traffic characteristics. To verify the traffic simulation, the exiting volumes were compared, to verify that the vehicles were traveling through the network and exiting correctly. Table 2 shows the Year 2030 AM and PM exiting volumes for the exiting links and compares them to the results from the "I-15 South Traffic Report".

Table 2-Year 2030 AM and PM Exit Volumes (SPUI)

Roadway	Movement	Exiting Volumes (vph)			
		CORSIM	Report	Difference	%
I-15 SB On Ramp from Cactus Ave	SB	107(215)	115(212)	-9(3)	93(101)
I-15 NB On Ramp from Cactus Ave	NB	1299(1026)	1330(1110)	-31(-84)	98(92)
Cactus Ave (West Dean Martin Dr)	WB	1515(2048)	1509(2083)	6(-35)	100(98)
Cactus Ave (East of Las Vegas Blvd)	EB	1302(2092)	1280(1994)	22(98)	102(105)
Dean Martin Dr (North of Cactus Ave)	NB	79(97)	51(94)	28(3)	155(103)
Dean Martin Dr (South of Cactus Ave)	SB	284(507)	305(530)	-22(-23)	93(96)
Las Vegas Blvd (North of Cactus Ave)	NB	575(559)	581(573)	-6(-14)	99(98)
Las Vegas Blvd (South of Cactus Ave)	SB	939(1156)	935(1146)	4(10)	100(101)

AM (PM)

The results show that the differences of the exiting volumes were less than 10 percent, except for NB Dean Martin Drive (AM Peak Volume), however this volume is low compared to the other volumes and changes in low volumes will have greater impact than in larger volumes. On average 102% of the traffic volumes were met, therefore the verification target was met.

The traffic simulation was then calibrated comparing intersection control delay and intersection level of service (LOS). Table 3 shows the results for the year 2030 AM and PM Control Delay and LOS comparisons.

Table 3-Year 2030 AM and PM Control Delay and LOS (SPUI)

Intersection	Control Delay (sec/veh)			Level of Service	
	CORSIM	Report	Difference	CORSIM	Report
Dean Martin Drive	20.0(22.1)	21.5(23.4)	-1.5(-1.3)	C(C)	C(C)
I-15 Ramps	40.0(19.8)	45.8(17.5)	-5.8(2.3)	D(D)	D(D)
Las Vegas Boulevard	28.8(32.5)	26.8(29.3)	2.0(3.2)	C(C)	C(C)

AM(PM)

The difference for the intersection control delay was less than 6 sec/veh for both the AM and the PM traffic simulations. The LOS of each intersection was the same in both CORSIM traffic simulations. The traffic simulation was then calibrated and could then be used to make comparisons between a SPUI interchange and a Diamond interchange.

With the traffic simulation verified and calibrated, the SPUI interchange was replaced with the TUDI configuration, traffic volumes revised and the traffic signals were recoded. The exit volumes were compared to the results from the traffic simulation from the "I-15 South Traffic Report" to verify that traffic volumes were entering the roadway network. Table 4 shows the Year 2030 AM and PM

exiting volumes for the exiting links and compares them to the results from the "I-15 South Traffic Report".

Table 4- Year 2030 AM and PM Exit Volumes (TUDI)

Roadway	Movement	Exiting Volumes (vph)			
		CORSIM	Report	Difference	%
I-15 SB On Ramp from Cactus Ave	SB	114(222)	115(212)	-1(10)	99(105)
I-15 NB On Ramp from Cactus Ave	NB	1241(1077)	1330(1110)	-89(-34)	93(97)
Cactus Ave (West Dean Martin Dr)	WB	1534(2059)	1509(2083)	25(-24)	102(99)
Cactus Ave (East of Las Vegas Blvd)	EB	1310(2004)	1280(1994)	30(10)	102(100)
Dean Martin Dr (North of Cactus Ave)	NB	58(101)	51(94)	7(7)	114(108)
Dean Martin Dr (South of Cactus Ave)	SB	288(507)	305(530)	-17(-23)	95(96)
Las Vegas Blvd (North of Cactus Ave)	NB	580(569)	581(571)	-1(-4)	100(99)
Las Vegas Blvd (South of Cactus Ave)	SB	952(1165)	935(1146)	17(19)	102(102)

AM(PM)

The results show that the percent differences of the entering volumes were less than 10 percent, except for NB Dean Martin Drive (AM Peak Volume), however this again the volume is low compared to the other volumes and changes in low volumes will have greater impact than in larger volumes. On average 101% of the traffic volumes were met and therefore it could be stated that the traffic volumes were entering the simulation model and ran through the roadway network and exited appropriately.

The control delay and LOS of each intersection for the Diamond configuration was compared to the SPUI configuration. Table 5 shows the results for the year 2030 AM and PM Control Delay and LOS comparisons.

Table 5- Year 2030 AM and PM Control Delay and LOS (TUDI)

Intersection	Control Delay (sec/veh)			Level of Service	
	SPUI	TUDI	Difference	SPUI	tudi
Dean Martin Drive	20.0(22.1)	14.1(19.2)	-5.9(-2.9)	C(C)	B(B)
I-15 SB Off Ramp	40.0(19.8)	14.1(10.5)	-10.3(0.9)*	D(B)	B(B)
I-15 NB Off Ramp		15.6(10.2)			B(B)
Las Vegas Boulevard	28.8(32.5)	26.2(34.0)	-2.6(1.5)	C(C)	C(C)

AM(PM)
* Computed from sum of control delays for both ramp intersections

Based upon the CORSIM traffic simulation results for the SPUI and the TUDI, interchange configurations, the TUDI configuration shows less control delay and better LOS at the ramp intersections. In the TUDI configuration the intersection at Dean Martin Drive shows better Control Delay and LOS, while the intersection of Las Vegas Boulevard showed better Control Delay in the AM, but worse in the PM. The overall intersection LOS at Las Vegas Boulevard remained the same.

Right of Way

The property on west side of I-15 to Dean Martin Drive affected by the project is owned by the Bureau of Land Management. Property on the east side of I-15 on both sides of Cactus Ave. is vacant parcels owned by private parties and will likely be commercially developed.

The SPUI will require approximately 210,000 sq ft of land on the east of I-15. Whereas the TUDI will require approximately 166,500 sq ft of land on the east side of I-15. Right of way may be expected to cost $20 per square foot.

Note: these numbers are only for comparison of the interchange features and do not reflect the total right of way and easements required for the other elements of the project.

Costs

Table 6-Relative Cost Comparison

Item	SPUI	TUDI
Pavement	$ 650,000	$ 580,000
Borrow Embankment	$ 3,000,000	$ 2,062,000
Retaining Wall	$ 323,000	$ 271,000
Bridge	$ 9,259,100	$ 7,872,000
Signal	$ 700,000	$ 1,000,000
Right of Way	$ 4,200,000	$ 3,330,000
Total	$18,132,100	$15,115,000

Note: This is a relative cost comparison and does not represent the total cost of the interchange.

Conclusions and Recommendation

Each of the study objectives has been evaluated with the following results. As the first task the horizontal and vertical geometry were developed along with the turning lane configurations for each interchange type. The horizontal and vertical alignments for Cactus Avenue are basically the same for both interchanges.

The major drainage requirements were determined. The conveyance of flows in excess of the capacity of the triple 12'x4' RCB under I-15 at Cactus Avenue will require a triple 12'x4' RCB under Cactus Avenue with one cell connecting to an existing RCB north of the interchange and flows from the other two cells being taken to an RCB at Silverado Ranch Boulevard in a 30' concrete channel. This channel will require a 2,000 sq. ft. retaining wall with the TUDI.

The interchange bridge will be a two span steel structure over I-15. The SPUI structure will be an "hour-glass" shape while the TUDI will be a conventional rectangular shape.

The TUDI structure will require specialized framing due to the four ramps in intersecting the sides of the bridge. An additional complexity with this bridge is the conflict of the east abutment with the existing triple 12'x4' RCB. This conflict will require the abutment to span approximately over the RCB. This will produce additional costs for this structure.

The TUDI structure will not have the framing complexity associated with the SPUI structure. The east abutment of this bridge also conflict with the triple box culvert, but it was possible to lengthen the bridge 40 feet in order to avod the culvert conflict.

The traffic analysis of the interchange was performed using a CORSIM traffic simulation for each of the interchange layouts. The level of service is better with the TUDI. The Control Delay is better for the TUDI intersections in all cases except the PM peak at Las Vegas Boulevard where the SPUI shows a 1.5 second advantage.

The right-of-way required from private properties has been determined for each of the interchange layouts. The SPUI will require 210,000 sq. ft. of right-of-way and the TUDI will require 166,500 sq. ft. of right-of-way.

The relative costs for each of the interchange layouts was calculated using unit cost from the adjacent Silverado Ranch Interchange. An inflation factor was applied to these costs.

The impact of the foot print of each of the interchanges was compared with the impact area shown in the Administrative Draft Environmental Assessment prepared by NDOT. Both interchanges appear to be within the impact area shown in the Document with the exception of the parcel in the northwest corner of the interchange. This parcel, owned by the BLM, will have an additional impact caused by the proposed drainage facilities.

The total relative costs including right-of-way is $18,132,100 for the SPUI and $15,115,000 for the TUDI. Without the right-of-way costs, the SPUI will cost $13,932,100 and the TUDI $11,785,000.

Considering all of the factors evaluated in the report it is recommended that the Tight Urban Diamond Interchange be utilized for the Cactus Avenue Interchange.

References

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2. Qureshi, M., Sugathan, N., Lasod, R., Spring, G., Design of Single Point Urban Interchanges, University of Missouri, Rolla; Missouri Department of Transportation, April 2004.
3. Lee, J. C., Bonneson, J. A., Kidd, B. D., Larwin, T. F., Evaluation Of Operational Efficiencies, Cost, And Accident Experience Of Four Phase Single Point Urban Interchanges, Lee Engineering, LLC; Arizona Department of Transportation; Federal Highway Administration, 2002.

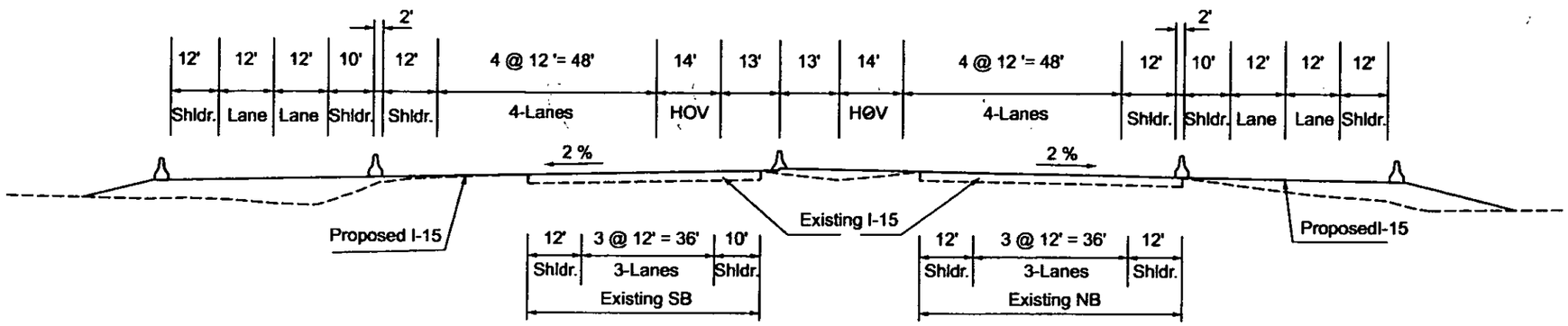

Figure 1 - Future I-15 Lane Configuration

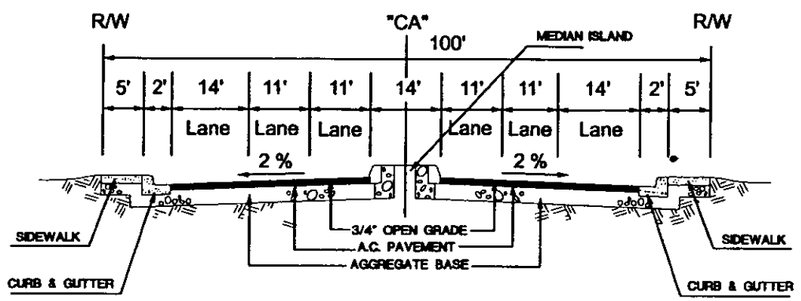

Figure 2 - Typical Section - Cactus Avenue

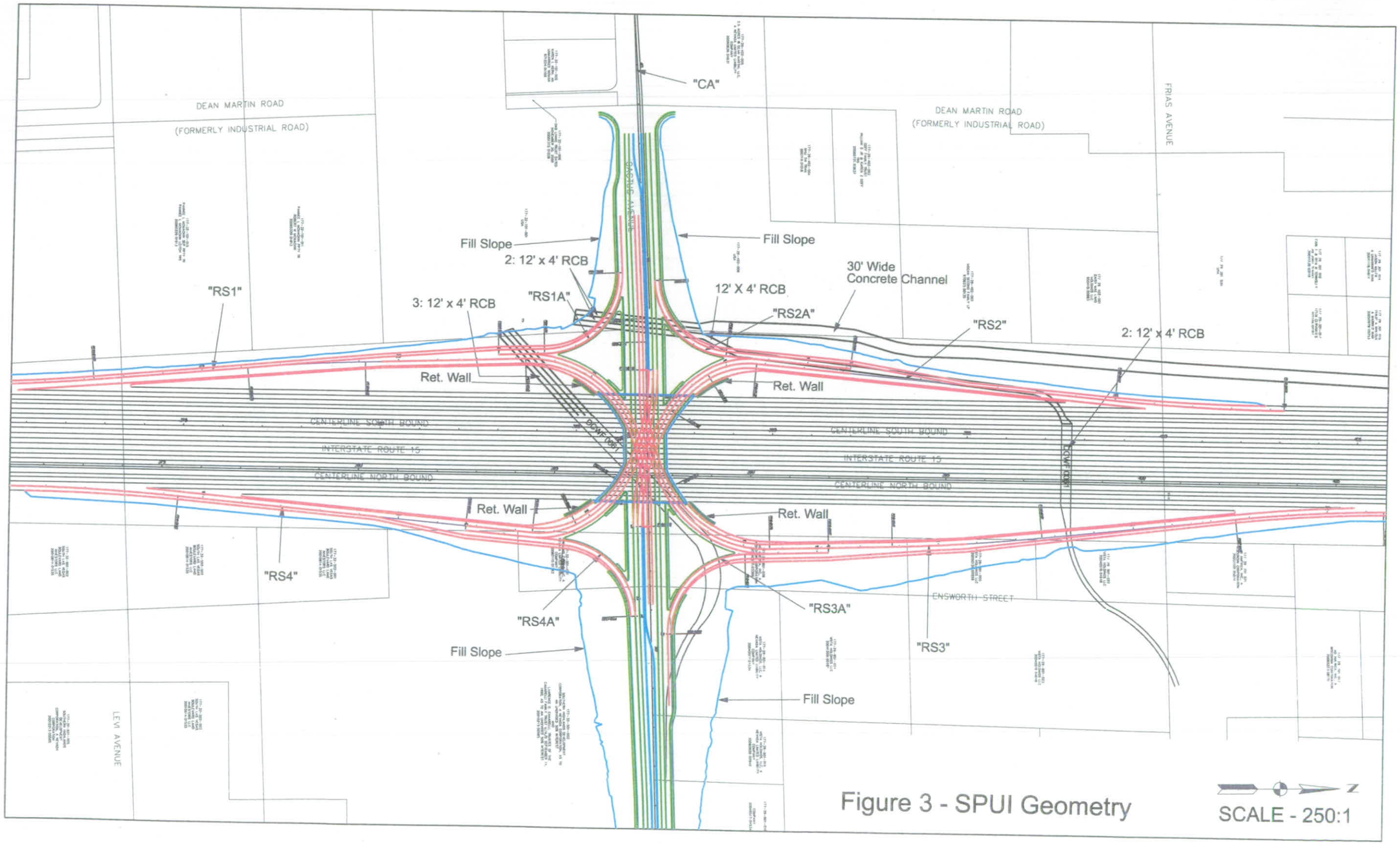

Figure 3 - SPUI Geometry

SCALE - 250:1

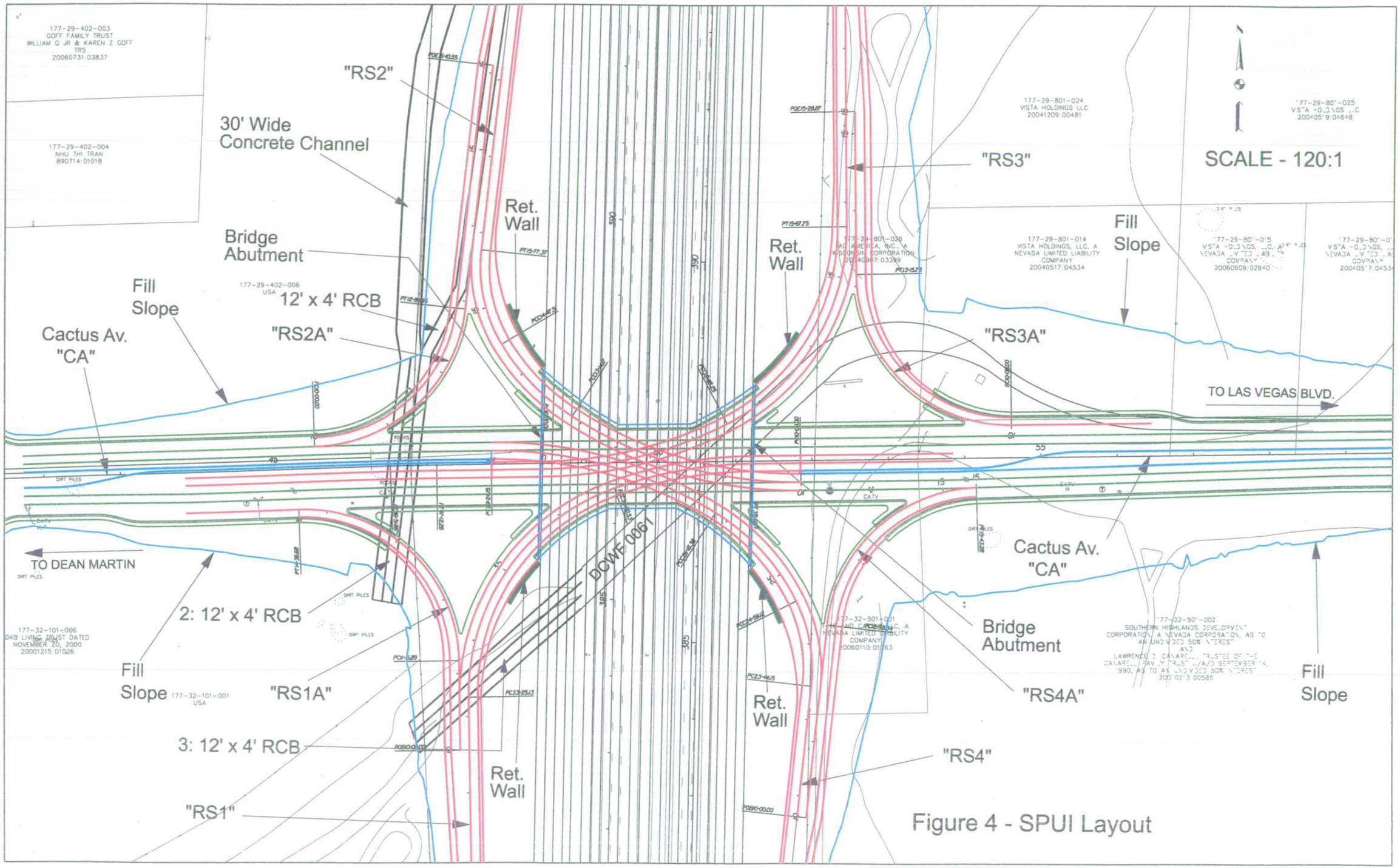

Figure 4 - SPUI Layout

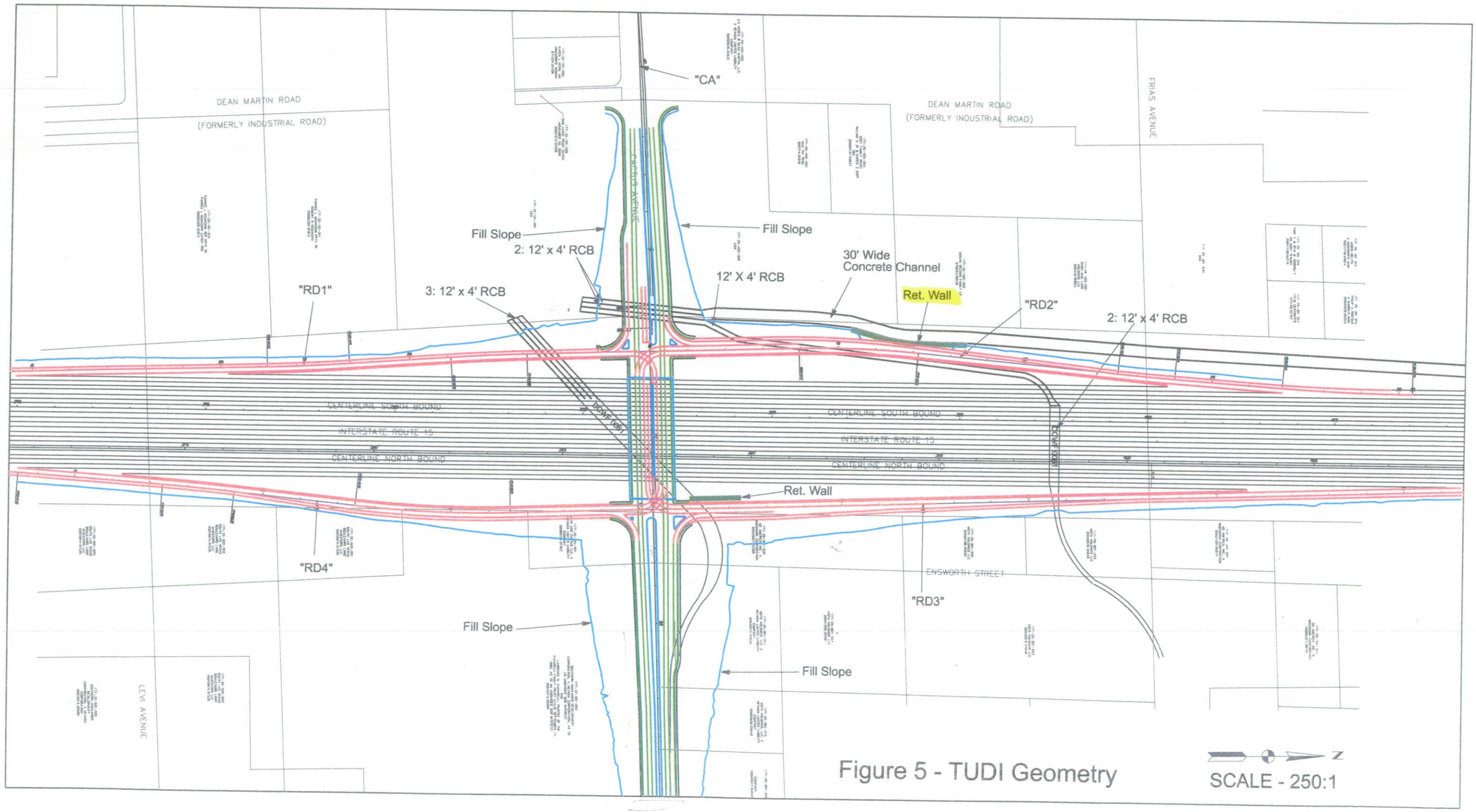

Figure 5 - TUDI Geometry

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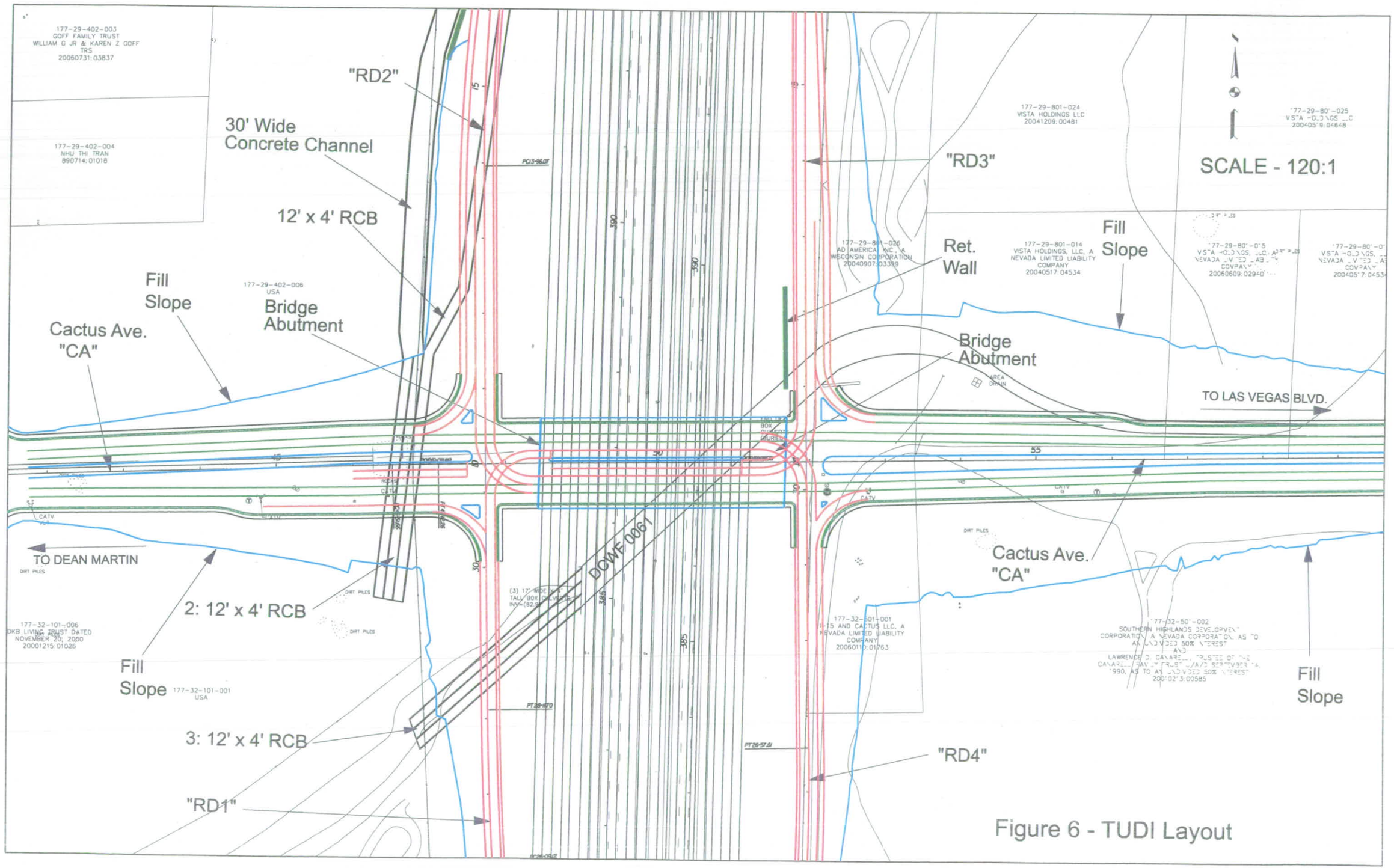
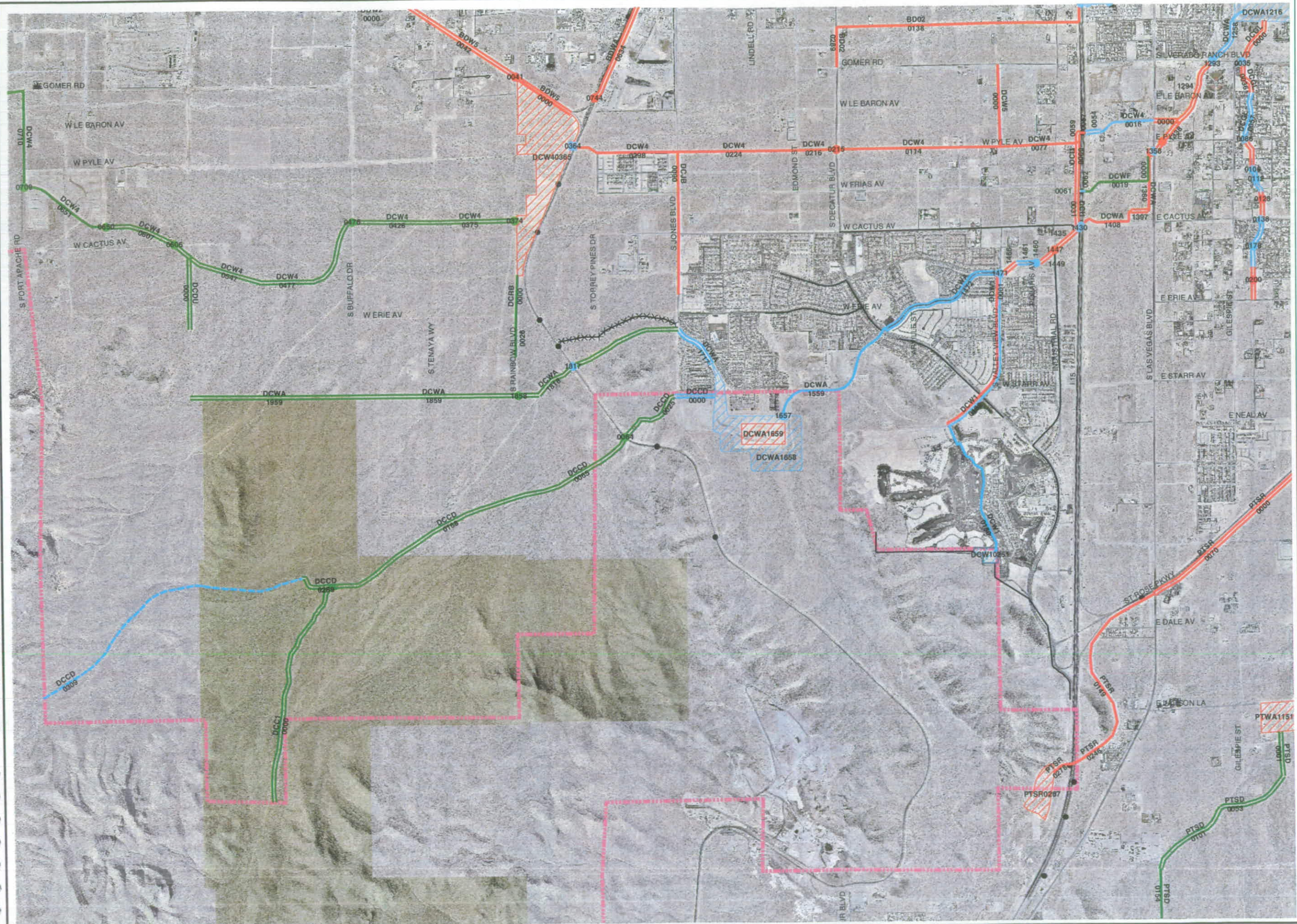


Figure 6 - TUDI Layout



REGIONAL FLOOD CONTROL DISTRICT

2002 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin
- Culvert
- Bridge
- Pipeline
- Lined Channel
- Unlined Channel
- Dike
- Natural Wash
- ID-Mile Separator

N W E S

0 1,000 2,000 3,000 4,000 5,000 Feet

SCALE: 1 inch = 3000 feet

FIGURE 7
FLOOD CONTROL FACILITIES
FIGURE F-24

PBS&J

G.C. WALLACE, INC.

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
BDW5		BLUE DIAMOND WASH RAILROAD .						
0000	P1	Gabion Chnl 20'W 6'D 2:1 SS	2200	947	CBUB080	DC3	1.18	1.22
0041	P1	2: 8' X 6' RCBC @ Rainbow	50	947	CBUB080	DC3	1.18	1.50
0042	P1	Conc Chnl 12'W 4.5'D 2:1 SS	4862	947	CBUB080	DC3	1.18	1.81
0105	P1	2: 8' X 6' RCBC @ Blue Diamond	100	947	CBUB080	DC3	1.18	1.20
0106	P1	Gabion Chnl 20'W 6'D 2:1 SS	3402	947	CBUB080	DC3	1.18	0.59
DCC1		DUCK CREEK - CENTRAL DUCK CHANNEL 1						
0000	P1	Gabion Chnl 35'W 5.5'D 2:1 SS	7848	2431	CDCD360	DC3	3.14	2.99
DCCD		DUCK CREEK - CENTRAL DUCK CHANNEL						
0000	P1	Gabion Chnl 35'W 5.5'D 2:1 SS	7848	5846	CDCD450	DC5	13.28	2.99
0000	E1	Gabion Chnl 85'W 6.5'D 2:1 SS	1327	5846	CDCD450	DC5	13.28	1.70
0025	P1	Gabion Chnl 85'W 5.5'D 2:1 SS	2292	5846	CDCD450	DC5	13.28	3.15
0064	P1	ADD 1: 12' X 12' RCBC	50	5846	CDCD450	DC5	13.28	1.00
0064	E1	12' X 12' RCBC	50	5846	CDCD450	DC5	13.28	1.00
0065	P1	Gabion Chnl 85'W 6'D 2.1 SS	4253	5487	CDCD430W	DC4	10.90	1.69
0168	P1	Gabion Chnl 85'W 6'D 2:1 SS	6588	5487	CDCD430W	DC4	10.90	2.00
0289	P1	Gabion Chnl 45'W 6'D 2:1 SS	11370	3310	CDCD370W	DC3	6.47	2.10
0309	E1	Natural Wash	10053	3196	CDCD340	DC3	6.06	2.38
DCDU		DUCK CREEK DURANGO DRIVE						
0000	P1	Conc Chnl 15'W 6'D 2:1 SS	2400	1669	CDMD210	DC3	1.51	0.94
DCGL		DUCK CREEK GILESPIE CHANNEL						
0000	E1	Natural Wash	1900	831	CDCD550	DC3	1.31	
0000	P2	Conc Chnl 32'W 6'D 0:1 SS	1900	831	CDCD550	DC3	1.31	0.76
0035	P2	2: 16' X 4' RCBC @ Silverado Ranch	60	831	CDCD550	DC3	1.31	0.90
0036	E1	Natural Wash	1111	831	CDCD550	DC3	1.31	
0036	P2	Conc Chnl 35'W 4'D 0:1 SS	1111	831	CDCD550	DC3	1.31	0.80
0057	E1	Conc Chnl 32'W 9.0'D 3:1 SS	1580	831	CDCD550	DC3	1.31	0.20
0086	E1	4: 8' X 5' RCBC @ E Pyle Ave	60	831	CDCD550	DC3	1.31	1.20
0087	E1	Natural Wash	1080	831	CDCD550	DC3	1.31	
0087	P1	Conc Chnl 32'W 3.5'D 3:1 SS	1080	831	CDCD550	DC3	1.31	0.90
0106	E1	3: 8' X 4' RCBC @ La Cienega	80	831	CDCD550	DC3	1.31	0.50
0107	E1	Conc Chnl 12'W 7'D 2:1 SS	310	831	CDCD550	DC3	1.31	1.30
0112	E1	2: 10' X 4' RCBC @ E Frias Ave	60	831	CDCD550	DC3	1.31	0.50
0113	E1	Conc Chnl 12'W 7'D 2:1 SS	490	831	CDCD550	DC3	1.31	2.40
0123	E1	Natural Wash	230	831	CDLD550	DC3	1.31	
0123	P1	Conc Chnl 12'W 4'D 2:1 SS	230	831	CDLD550	DC3	1.31	0.80
0128	P1	2: 14' X 4' RCBC @ E Rush Ave	50	831	CDLD550	DC3	1.31	0.80
0129	E1	Natural Wash	690	831	CDLD550	DC3	1.31	
0129	P1	Conc Chnl 12'W 4'D 2:1 SS	690	831	CDLD550	DC3	1.31	0.80
0138	E1	2: 18' X 4' RCAC @ E Cactus Ave	100	1007	CDLD450	DC3	2.57	0.30
0139	E1	Conc Chnl 10'W 7'D 2:1 SS	940	1007	CDLD450	DC3	2.57	0.40
0178	E1	2: 18' X 4' RCAC @ Great Gable Dr	90	1007	CDLD450	DC3	2.57	0.40
0179	E1	Conc Chnl 10'W 7'D 2:1 SS	700	1007	CDLD450	DC3	2.57	1.85
0192	E1	Natural Wash	420	1007	CDLD450	DC3	2.57	
0192	P1	Conc Chnl 12'W 4'D 2:1 SS	420	1007	CDLD450	DC3	2.57	1.20
0200	P1	2: 12' X 4' RCBC @ E Irvin Ave	40	1007	CDLD450	DC3	2.57	1.20
0201	E1	Natural Wash	660	1007	CDLD450	DC3	2.57	
0201	P1	Conc Chnl 10'W 4'D 2:1 SS	660	1007	CDLD450	DC3	2.57	1.20
DCRB		DUCK CREEK RAINBOW BLVD						
0000	P1	8' X 6' RCB	1354	866	CDMD300	DC3	1.03	1.80
0026	P1	8' X 6' RCB	1316	866	CDMD300	DC3	1.03	1.80
DCW1		DUCK CREEK - TRIBUTARY 1						
0000	E1	96" RCP	1030	2003	CDLD320S	DC3	2.06	0.21
0001	P1	Add 2: 12' X 7' RCB	1030	2003	CDLD320S	DC3	2.06	0.45
0062	E1	84" RCP	3250	2003	CDLD320S	DC3	2.06	0.73
0063	P1	Add 2: 10' X 8' RCB	3250	2003	CDLD320S	DC3	2.06	0.66
0132	E1	60" HDPE	1450	1784	CDLD310	DC3	1.78	1.03
0133	P1	Add 2: 12' X 5' RCB	1450	1784	CDLD310	DC3	1.78	0.99
0150	E1	48" HDPE Outlet Bruner DB	4800	76	CDBDB	DC3	1.23	1.26
0251	E1	109 acre-ft Bruner DB		1603	CDBDB	DC3	1.23	1.40

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
DCW4		DUCK CREEK - TRIBUTARY 4						
0000	P1	Conc Chnl 20'W 7.5'D 0:1 SS	829	2201	CDLD380	DC3	6.39	0.89
0016	E1	2: 24 X 7.5' ARCH	1843	2201	CDLD380	DC3	6.39	1.09
0051	E1	Conc Chnl 15'W 8.5'D 2:1 SS	187	2201	CDLD380	DC3	6.39	1.38
0054	P1	Conc Chnl 14'W 6'D 2:1 SS	337	2201	CDLD380	DC3	6.39	1.81
0057	P1	ADD 3: 12' X 4' RCBC @ I 15	192	2201	CDLD380	DC3	6.39	1.28
0057	E1	3: 12' X 4' RCBC @ I 15	192	2201	CDLD380	DC3	6.39	1.28
0059	P1	Conc Chnl 10'W 7'D 2:1 SS	324	2201	CDLD380	DC3	6.39	1.10
0065	P1	12' x 6' RCB	750	1357	CDMD380	DC3	3.06	1.31
0077	P1	12' x 6' RCB	1820	1357	CDMD380	DC3	3.06	1.31
0114	P1	12' x 6' RCB	5400	1154	CDMD350	DC3	1.76	1.36
0215	P1	10' X 6' RCBC @ DECATUR	100	1154	CDMD350	DC3	1.76	1.30
0216	P1	10' x 6' RCB	1300	1078	CDMD340	DC3	1.51	1.31
0224	P1	8' X 6' RCB	3891	758	CDMD320	DC3	1.00	1.34
0298	P1	8' x 5' RCB	3500	758	CDMD320	DC3	1.00	1.67
0364	E1	BRIDGE AT RAILROAD	100	180	RRDB	RRDB5	60.45	1.70
0366	P1	68,600 cfs PMF Spillway		68600	RRDB	RRDB5	60.45	
0365	P1	1750 ac-ft DUCK CREEK RAILROAD DB		6855	CDWD200	DC5	60.45	
0374	P1	3: 10' X 9' RCBC @ RAINBOW		4645	CDMD310	DC3	5.66	1.70
0375	P1	Conc Chnl 20'W 7.5'D 2:1 SS	2696	4645	CDMD310	DC3	5.66	1.68
0426	P1	Conc Chnl 20'W 7.5'D 2:1 SS	2701	3814	CDMD180	DC3	4.29	1.82
0476	P1	3: 10' X 8' RCBC @ BUFFALO	100	3814	CDMD180	DC3	4.29	1.40
0477	P1	Gabion Chnl 70'W 6'D 2:1 SS	4206	2957	CDMD160	DC3	2.82	0.85
0547	P1	Conc Chnl 20'W 6.5'D 2:1 SS	2549	2957	CDMD160	DC3	2.82	1.54
0599	P1	Conc Chnl 10'W 5'D 2:1 SS	600	1428	CDMD160W	DC3	1.30	1.10
0606	P1	12' x 6' RCBC @ W CACTUS	100	1428	CDMD160W	DC3	1.30	1.50
0607	P1	Conc Chnl 10'W X 5'D 2:1 ss	2350	916	CDMD150	DC3	0.87	1.60
0650	P1	6' X 20'X 90' ARCH	100	916	CDMD150	DC3	0.87	1.00
0651	P1	16' X 5' ARCH	3116	916	CDMD150	DC3	0.87	1.34
0709	P1	16' X 6' ARCH	70	541	CDMD130	DC3	0.42	1.00
0710	P1	Gabion Chnl 10'W 5.5'D 2:1 SS	3152	541	DMD130	DC3	0.42	1.40
0779	P1	72" RCP	4802	365	CDUDCDB	DC5	0.66	1.80
0870	E1	134,700 cfs PMF Spillway		365	CDUDCDB	DC5	29.63	
0871	E1	42" RCP Outlet Upper Duck Creek Detention Basin						
0872	E1	2,040 ac-ft Upper Duck Creek Detention Basin		13312	CDUDCDB	DC5	29.63	
0875	E1	Gabion Chnl 20'W X 5.5'D 2:1 ss	2598	1566	DUD410	DC3	2.36	1.02
DCW5		DUCK CREEK - TRIBUTARY5						
0000	P1	8' X 6' RCB	2681	443	CDMD380N	DC3	1.29	0.30
BD02		BLUE DIAMOND CHANNEL 02						
0125	P1	11' X 6' RCB	680	1007	CDLD450	DC3	2.57	1.10
0138	P1	10' X 6' RCB	8000	903	CDLD440	DC3	2.18	1.10
0289	P1	10' X 4' RCB	1300	381	CDMD370	DC3	0.08	1.10
DCJB		DUCK CREEK JONES BLVD						
0000	P1	12' X 5' RCB	2670	758	CDMD320	DC3	1.00	1.00
0043	P1	8' X 5' RCB	2014	506	CDMD320	DC3	0.61	1.00
DCWA		DUCK CREEK WASH						
1212	E1	Conc Chnl 80'W 8'D 0:1 SS	488	360	LDCDB	DC5	16.23	0.86
1214	E1	121,300 cfs PMF Spillway		121300	CDLDCDB	DC5	16.23	
1215	E1	54" RCP Outlet Lower Duck Creek Detention Basin	20	360	LDCDB	DC5	16.23	
1216	E1	Lower Duck Creek Detention Basin - 1,235 ac ft		5835	CDLDCDB	DC5	16.23	
1241	E1	Natural Wash	539	5497	CDLD420	DC4	9.84	
1241	P2	2: 20' X 6' RCB	540	5497	CDLD420	DC4	9.84	1.94
1258	E1	Natural Wash	1537	5497	CDLD420	DC4	9.84	
1258	P2	Conc Chnl 42'W 8'D 0:1 SS	1475	5497	CDLD420	DC4	9.84	0.70
1293	E1	2: 20' X 7' RCBC @ Silverado	150	5497	CDLD420	DC4	9.84	0.60
1294	E1	Natural Wash	2322	5497	CDLD420	DC4	9.84	
1294	P2	Conc Chnl 42'W 8'D 0:1 SS	2175	5497	CDLD420	DC4	9.84	0.80
1338	E1	Natural Wash	863	3271	CDLD370E	DC3	5.87	
1338	P1	Conc Chnl 40'W 6'D 2:1 SS	825	3271	CDLD370E	DC3	5.87	0.70
1350	P1	5: 14' X 6' RCBC @ W Pyle Ave	70	3271	CDLD370E	DC3	5.87	0.80
1351	E1	Natural Wash	456	3271	CDLD370E	DC3	5.87	

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
DCWA		DUCK CREEK WASH - continued						
1351	P1	Conc Chnl 30'W 6.5'D 2:1 SS	365	3271	CDLD370E	DC3	5.87	0.70
1358	E1	1: 12' X 6' RCBC @ LV Blvd	120	2793	CDLD370E	DC3	5.87	1.00
1359	E1	Add 4: 14' X 6' RCBC @ LV Blvd	120	2793	CDLD370E	DC3	5.87	1.12
1360	P1	24' X 7' ARCH	2037	2793	CDLD360N	DC3	5.48	1.12
1397	P1	Conc Chnl 20'W 8'D 0:1 SS	551	2793	CDLD360N	DC3	5.48	1.00
1408	P1	16' X 7' ARCH	1916	1320	DV1	DC3	4.04	1.00
1429	E1	3: 12' X 4' RCBC @ I-15	200	1320	DV1	DC3	4.04	1.41
1435	E1	Natural Wash	1000	2917	CDLD230	DC3	4.04	
1435	P1	Gabion Chnl 40'W 8'D 2:1 SS	1000	2917	CDLD230	DC3	4.04	0.90
1447	P1	3: 14' X 6' RCBC @ Industrial Rd	300	2917	CDLD230	DC3	4.04	1.40
1449	E1	Gabion Chnl 40'W 6.5'D 2:1 SS	725	2917	CDLD230	DC3	4.04	1.26
1449	P1	Conc Chnl 22'W 6.5'D 2:1 SS	725	2917	CDLD230	DC3	4.04	1.26
1460	E1	3: 6' X 12' RCBC @ Polaris	50	2917	CDLD230	DC3	4.04	1.26
1461	E1	Conc Chnl 20'W 6.5'D 3:1 SS	650	2917	CDLD230	DC3	4.04	1.26
1466	E1	Earth Channel 40'W 6'D 2:1 SS	600	2917	CDLD230	DC3	4.04	1.26
1466	P1	Conc Chnl 22'W 6.5'D 2:1 SS	600	2917	CDLD230	DC3	4.04	1.26
1471	E1	4: 10' X 4' RCBC @ Valley View	100	2432	CDLD320	DC3	3.07	1.40
1472	E1	Grass lined chnl 60'W 8.0'D 3:1 SS	4488	677	CDLD320W	DC3	1.01	1.47
1556	E1	96" RCP	212	584	CDLD210	DC3	0.76	1.45
1559	E1	78" RCP	4849	190	CDCDCDB	DC5	20.80	1.86
1657	E1	36" RCP Outlet Central Duck Creek Detention Basin		190	CDCDCDB	DC5	20.80	
1658	E1	Central Duck Detention Basin - 1,700 ac ft		8435	CDCDCDB	DC5	20.80	
1659	P1	Central Duck Detention Basin - EXPANSION		8435	CDCDCDB	DC5	20.80	
1717	E1	Riprap Chnl 20'W 9.0'D 3:1 SS	1638	4020	CDCD310	DC3	4.38	0.71
1748	P1	Conc Chnl 30' X 6' 2:1 ss	3752	4020	CDCD310	DC3	4.38	2.10
1817	E1	1 Span Bridge 50'W 8.5'D @ Railroad	50	3967	CDCD290	DC3	4.03	1.70
1818	P1	Conc Chnl 30' X 6.5' 2:1 ss	1475	3861	CDCD270	DC3	3.64	1.39
1846	P1	Conc Chnl 30' X 6.5' 2:1 ss	650	3861	CDCD270	DC3	3.64	1.31
1858	P1	4: 10' X 7' RCBC @ Rainbow	100	3861	CDCD270	DC3	3.64	1.30
1859	P1	Conc Chnl 30' X 6.5' 2:1 ss	5275	3861	CDCD270	DC3	3.64	1.35
1959	P1	Conc Chnl 20' X 6.5' 2:1 ss	5527	3279	CDCD240	DC3	2.81	1.98
DCWF		DUCK CREEK FRIAS AVE						
0000	P2	24' X 7' ARCH	1035	480	DV2	DC3	4.43	0.97
0019	P2	11' X 5' ARCH	2222	480	DV2	DC3	4.43	0.68
0061	E1	20' X 6' RCBC	253	480	DV2	DC3	4.43	1.97
DCI1		DUCK CREEK - INDUSTRIAL 1						
0000	P1	Conc Chnl 20' X 5' 2:1 ss	1637	1209	DV2	DC3	4.43	0.50
0031	P1	Conc Chnl 20' X 6' 1:1 ss	1250	1599	BYPASS	DC3	4.04	0.50
PTSD		PITTMAN WASH - SOUTH						
0000	P0	2: 12' X 6' RCBC	200	2187	CPND195	PIT3SC	2.26	2.10
0001	P0	Conc Chnl 25'W 5'D 2:1 SS	1450	2187	CPND195	PIT3SC	2.26	1.60
0052	P0	2: 14' X 6' RCBC	100	2187	CPND195	PIT3SC	2.26	1.60
0053	P0	Conc Chnl 12'W 5'D 2:1 SS	2400	1258	CPND145	PIT3SC	0.99	1.60
0100	P0	2: 12' X 4' RCBC	100	596	CPND125	PIT3SC	0.45	1.60
0101	P0	Conc Chnl 12'W 4'D 2:1 SS	2800	596	CPND125	PIT3SC	0.45	1.60
0154	P0	54" RCP	2850	181	PTSD0240	PIT4	9.97	2.10
PTSR		PITTMAN WASH ST ROSE						
0000	P1	Conc Chnl 20'W 5'D 0:1 SS	3690	1267	CPCD040	PIT3SC	1.38	1.30
0070	P1	Conc Chnl 16'W 6'D 0:1 SS	3520	1267	CPCD040	PIT3SC	1.38	1.30
0149	P1	96" RCP	5510	860	CPCD030	PIT3SC	0.91	1.70
0248	P1	60" RCP	2080	247	PTSR0287	PIT5	32.97	1.70
0274	E	4: 12' X 5' RCBC @ I-15	210	247	PTSR0287	PIT5	32.97	1.60
0278	P1	60" RCP	720	247	PTSR0287	PIT5	32.97	1.60
0285	P1	107,800 cfs PMF Spillway		107800	CPWD260	PIT5	32.97	
0286	P1	36" RCP Outlet	200	247	PTSR0287	PIT5	32.97	
0287	P1	2,160 ac-ft Pittman West Detention Basin		10777	CPWD260	PIT5	32.97	
PTWA		PITTMAN WASH						
1149	P1	36" RCP Outlet	200	201	PTWA1151	PIT3SC	5.65	
1150	P1	51,900 cfs PMF Spillway		51900	CPND190	PIT3SC	5.65	
1151	P1	425 ac-ft Pittman North Detention Basin		5192	CPND190	PIT3SC	5.65	

*The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.

**As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.

REGIONAL FLOOD CONTROL DISTRICT

2002 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE
FACILITY INVENTORY
FIGURE F-24

LEGEND

Street Name Designator	AA BB	Existing Facility	E			Cast in Place Concrete Pipe	CIPCP
Parent Stream Name		Proposed or Modified Facility	P	Bottom Width	W	Corrugated Metal Arch Pipe Culvert	CMAP
Stream Name		Contingency Level				Corrugated Metal Pipe Culvert	CMP
ID / River Mile	00.00	Category B	P0	Depth	D	High Density Polyethylene	HDPE
Distance above confluence		Master Plan	P1			Helical Elliptical Reinforced Concrete Pipe	HERCP
With parent stream ____		Preliminary Design	P2	Side Slope: H:V	SS	Reinforced Concrete Arch Pipe	RCAC
Miles in tenths ____		Design	P3				

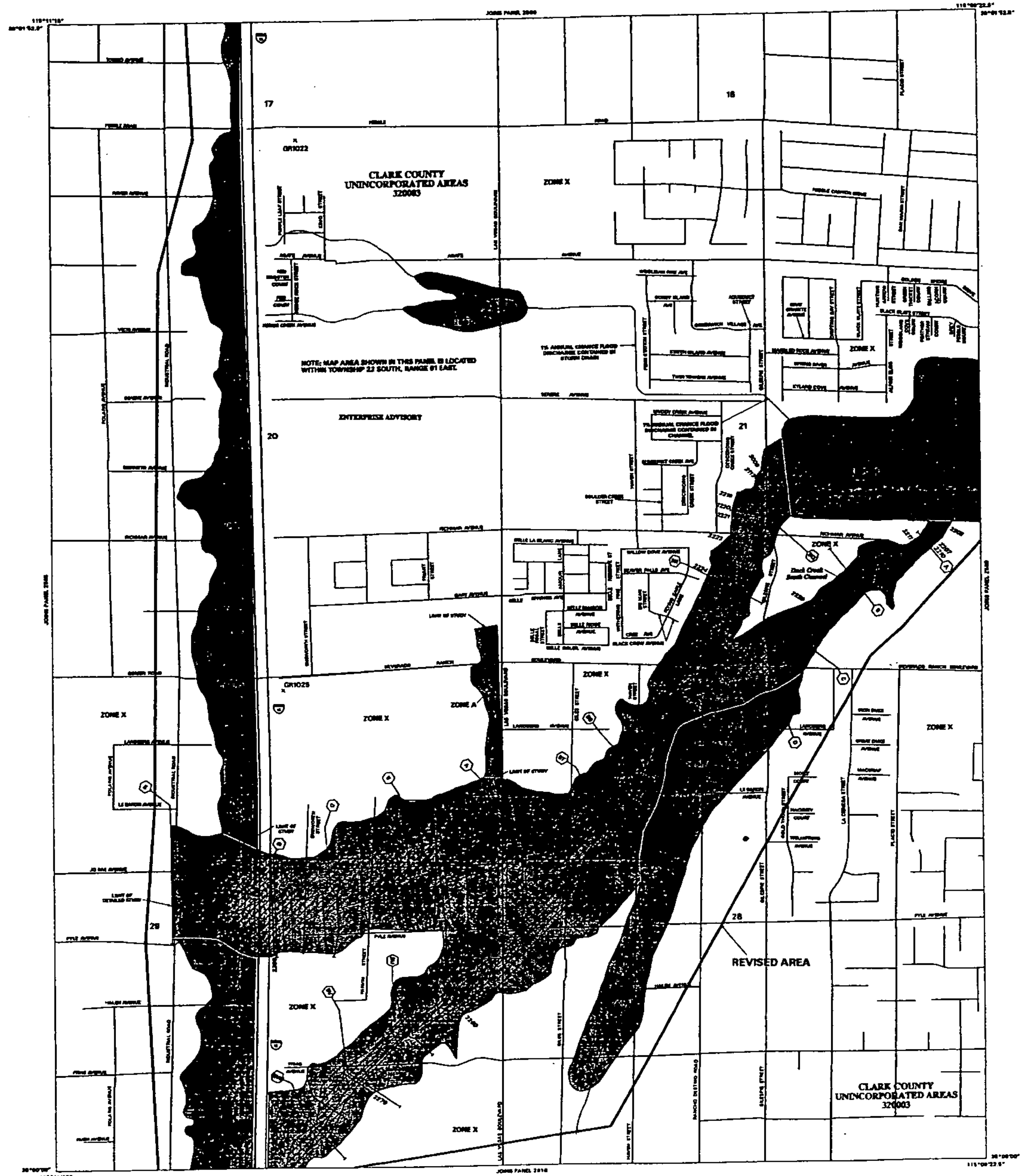
Construction Features	
Reinforced Concrete Box	RCB
Reinforced Concrete Box Culvert	RCBC
Reinforced Concrete Pipe	RCP
Reinforced Concrete Pipe Culvert	RCPC
Storm Sewer Pipe	SSP

PBS&J

G.C. WALLACE, INC.

FIGURE 8

NOTES TO USERS



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

OTHER AREAS

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

MAP SCALE 1" = 500'

PANEL 2568E

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

PANEL 2568 OF 4090

AUG 13 2003

MAP NUMBER 32003C2568E

MAP REVISED: SEPTEMBER 27, 2002

FIGURE 9

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum (NAVD). Users of this FIRM should be aware that coastal flood elevations may also be provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The projection used in the preparation of this map is Universal Transverse Mercator (UTM) zone 11. The horizontal datum is NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by Clark County Regional Flood Control District. This information was converted using Orthophotography, dated 1998 or newer, and GRF/DIME data. Segments were digitized off of the orthophotography based on center of pavement.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed Map Index for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the FEMA Map Service Center at the following phone numbers and Internet address for information on all related products available from FEMA:

Phone: 800-358-9616
FAX: 800-358-9620
www.fema.gov/msc

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at www.fema.gov.

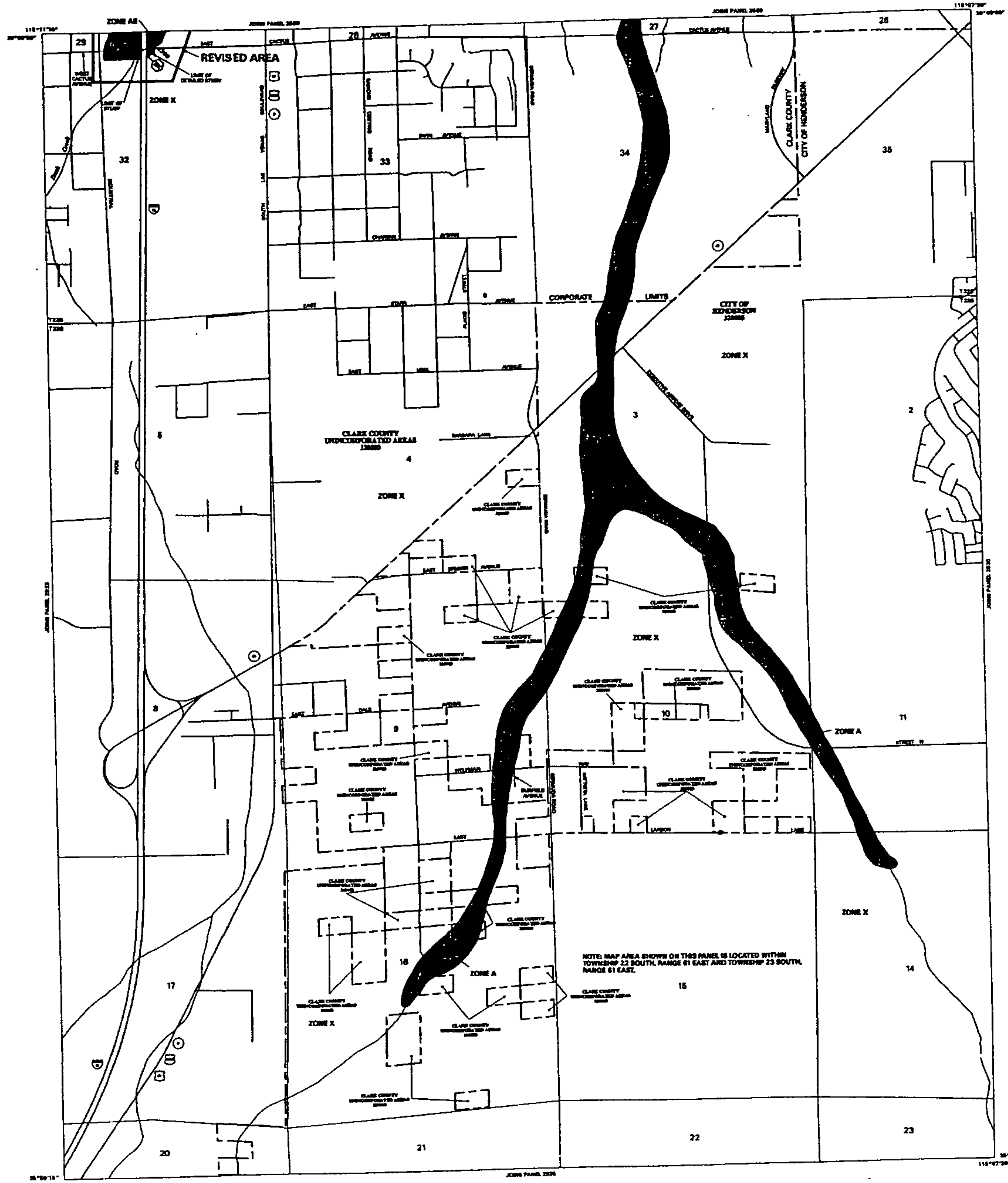
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report may reflect stream channel distances that differ from what is shown on this map.

This Digital Flood Insurance Rate Map (DFIRM) was produced through a unique partnership between Clark County and the Federal Emergency Management Agency (FEMA). Clark County has developed a long-term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the Clark County commitment to share and maintain floodplain layers within their Geographic Information System Management Office (GISMO).

This DFIRM reflects several innovative features. These include:
+ Southern Nevada GIS – Cooperation among local governmental agencies throughout Clark County. The foundation of cooperation is the GIS Interlocal Agreements formed between fourteen regional participants. In part, the agreements specify that the Clark County GIS Management Office (GISMO) will be responsible for maintaining a GIS data warehouse and associated Southern Nevada GIS Metadata.

+ The GISMO's responsibilities go beyond maintaining the GIS data warehouse. GISMO also maintains the Street Centerline Database used by 911 dispatch services. This centerline database serves as the base map for this DFIRM.

DIGITAL DATA AVAILABILITY: http://www.co.clark.nv.us/cait/gismo/gismo.htm



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.
ZONE A99	Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
~~513~~~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross Section Line
(23)- - - -(23)	Transect Line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276000M	1000-meter Universal Transverse Mercator grid values, zone 11
600000 FT	5000-foot grid ticks
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
AUGUST 16, 1995

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

September 27, 2002: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to delete special flood hazard areas, to change zone designations, to add roads and road names, to incorporate previously issued letters of map revision, to incorporate previously issued letters of map amendment, and to change floodway.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2910E

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

PANEL 2910 OF 4090
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

AUG 13 2003

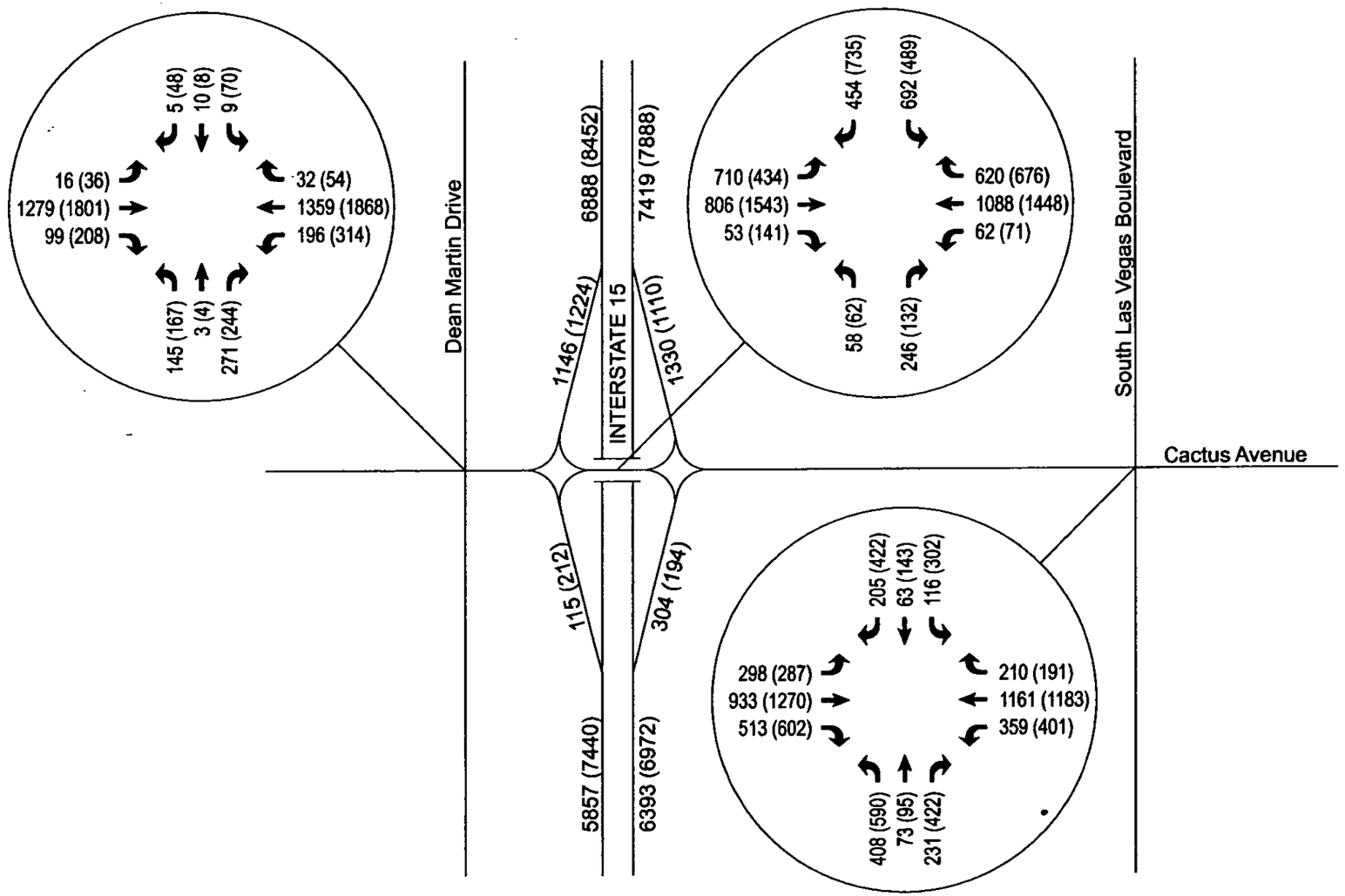
MAP NUMBER
32003C2910E

MAP REVISED:
SEPTEMBER 27, 2002

FIGURE 10

Federal Emergency Management Agency

P:\CCPW\CB1014-Cactus\Exhibit\Traffic Volumes\2030am_pm Peak Hour.dwg - 11:11:00 am PST - RTM



LEGEND

XXXX AM PEAK HOUR
(XXXX) PM PEAK HOUR

N

FIGURE 11

VOLUMES FROM "I-15 SOUTH TRAFFIC REPORT"
SUBMITTED BY PARSONS, FINAL JUNE 2006

CACTUS AVENUE
YEAR 2030
AM & PM PEAK HOUR
VOLUMES

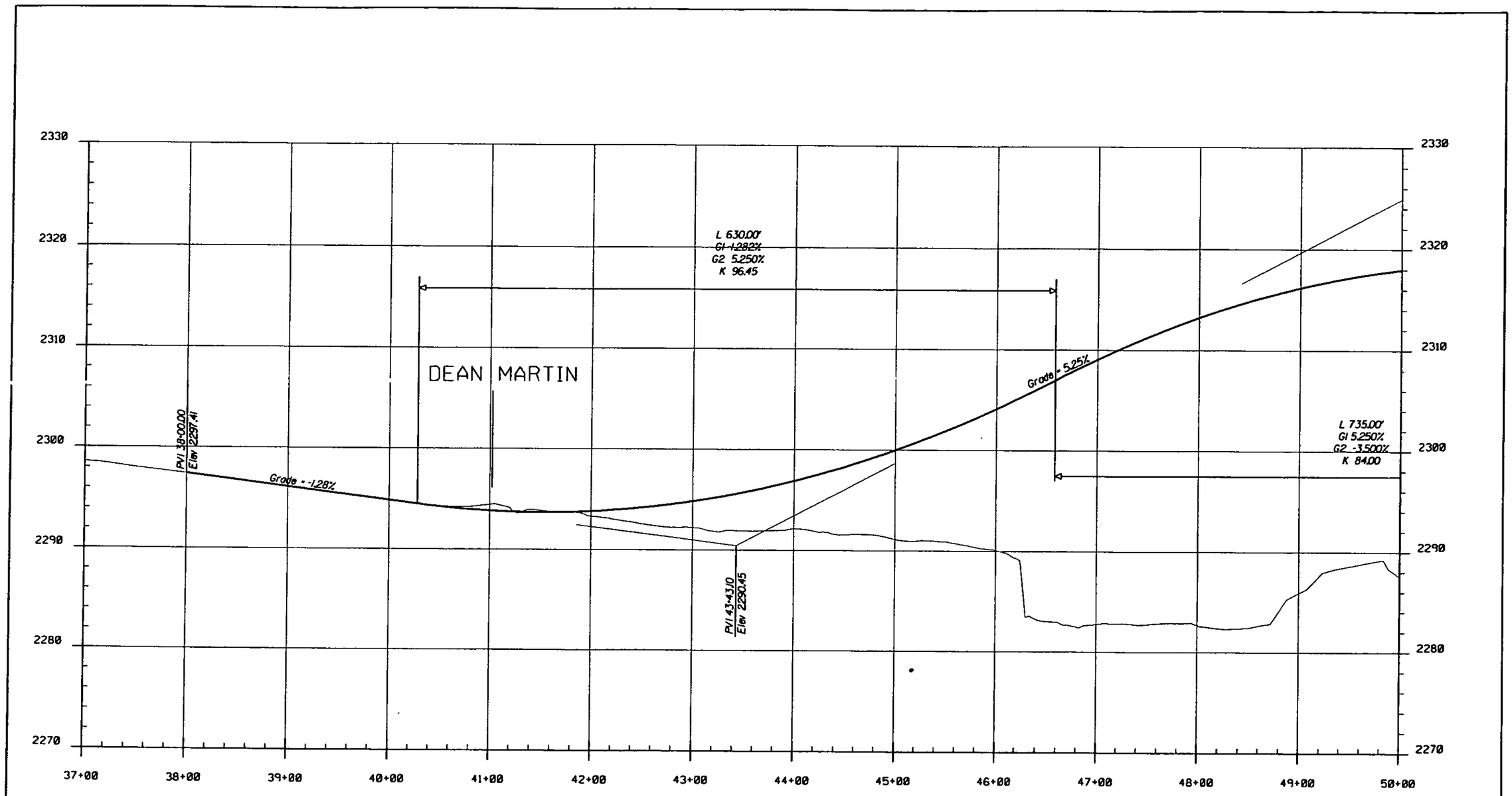


Figure 12 - Cactus Avenue Profile

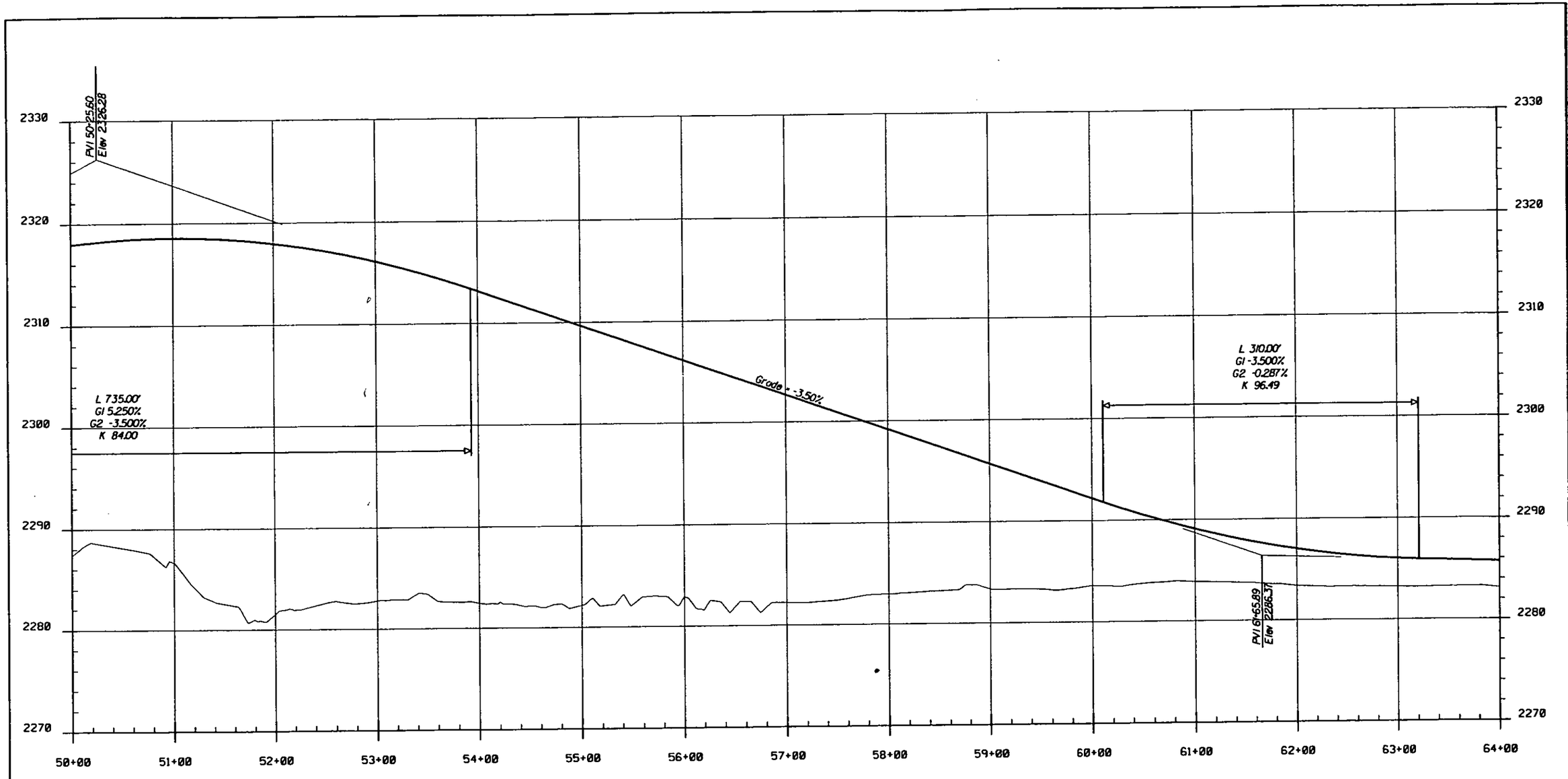


Figure 13 - Cactus Avenue Profile

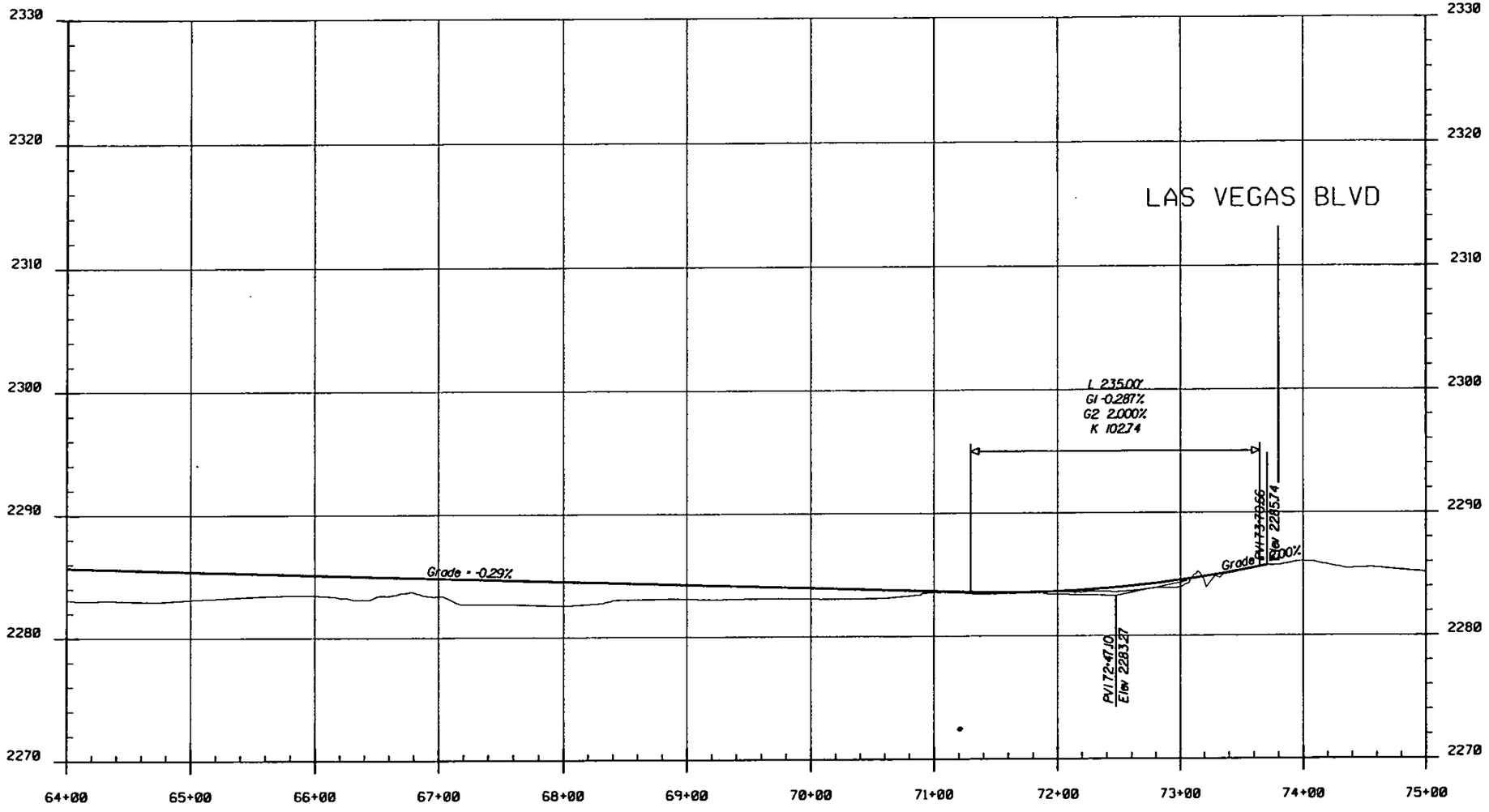


Figure 14 - Cactus Avenue Profile

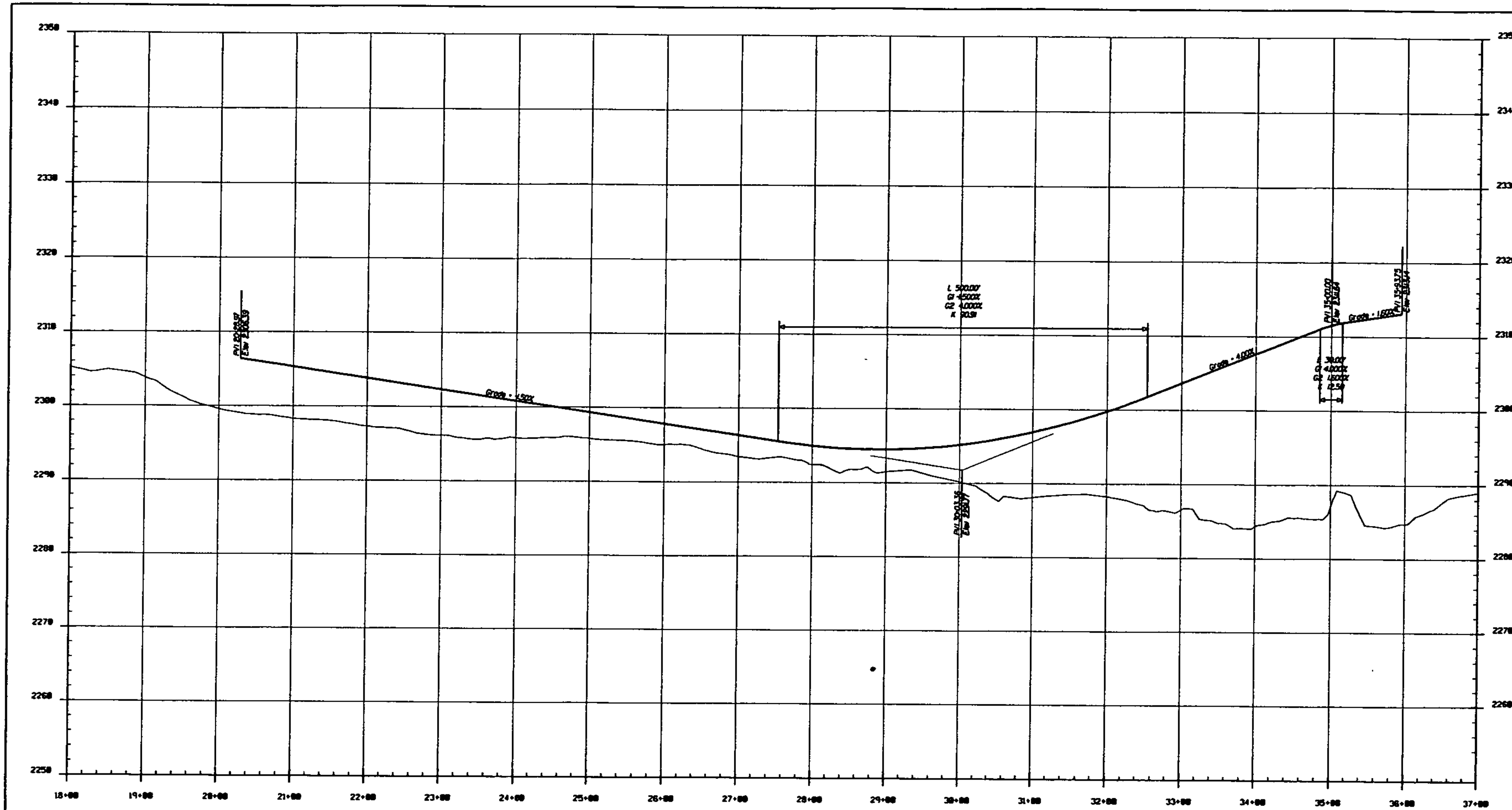


Figure 15 - SPUI Ramp "RS1" - Profile

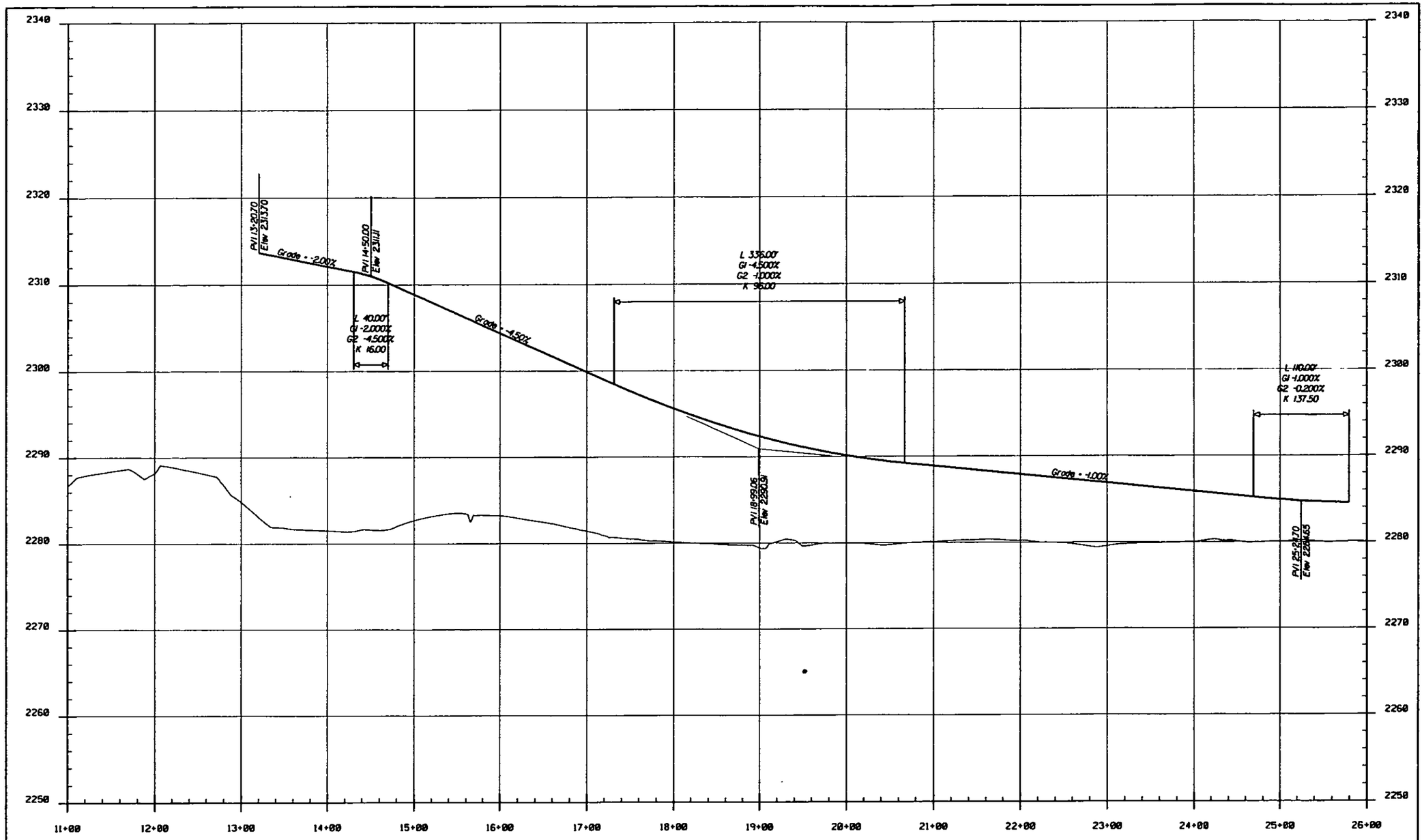


Figure 16 - SPUI Ramp "RS2" - Profile

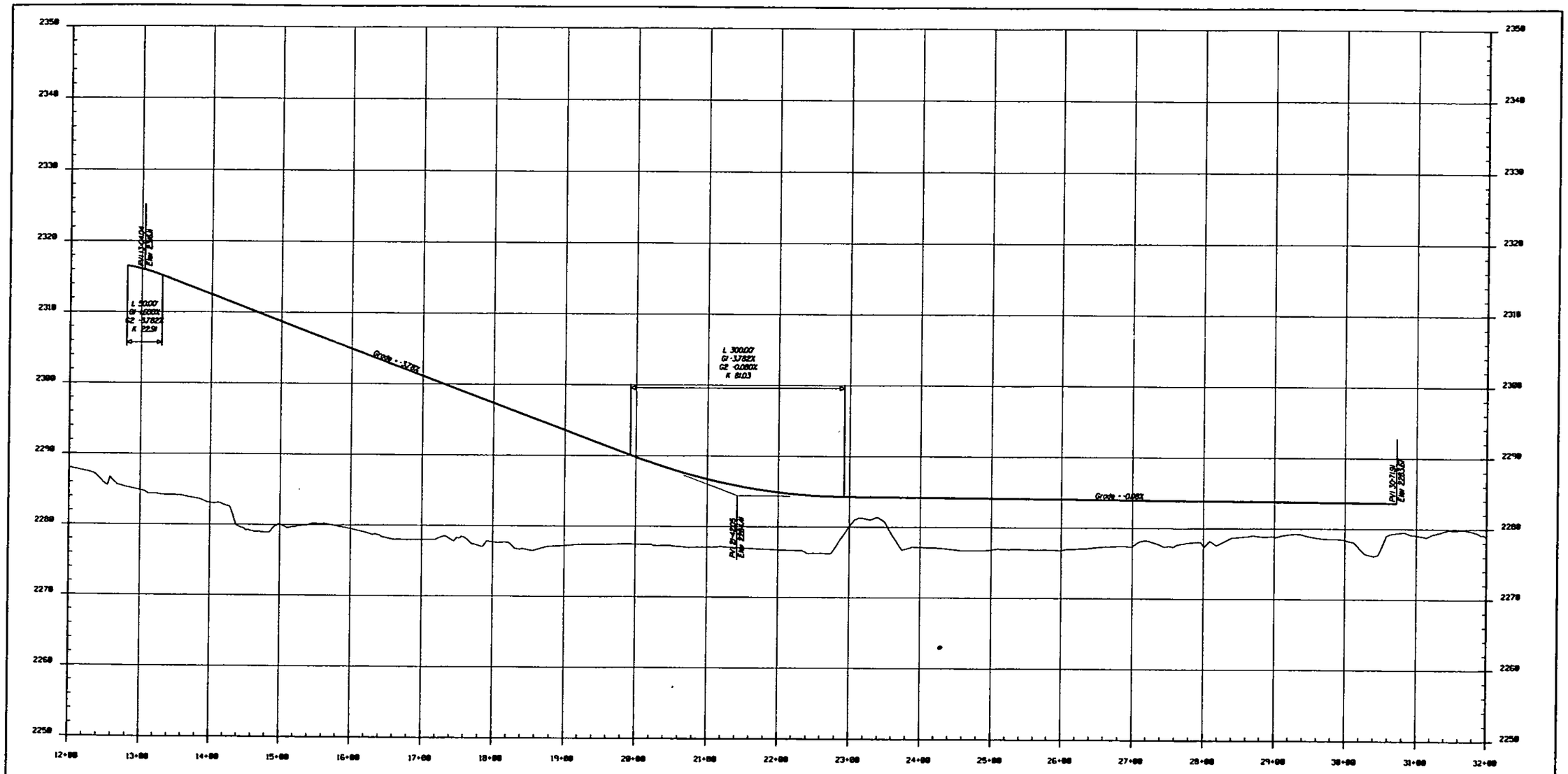


Figure 17 - SPUI Ramp "RS3" - Profile

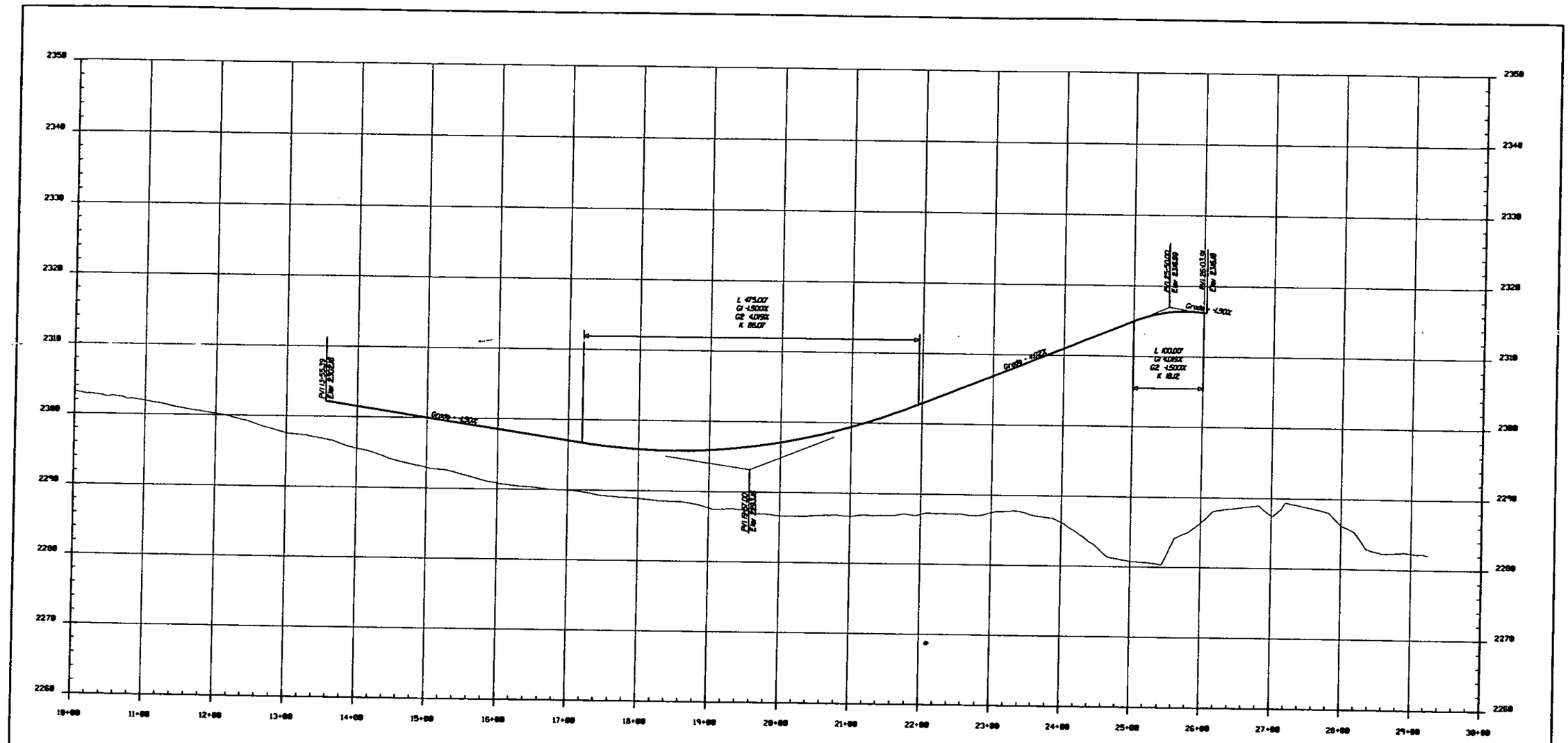
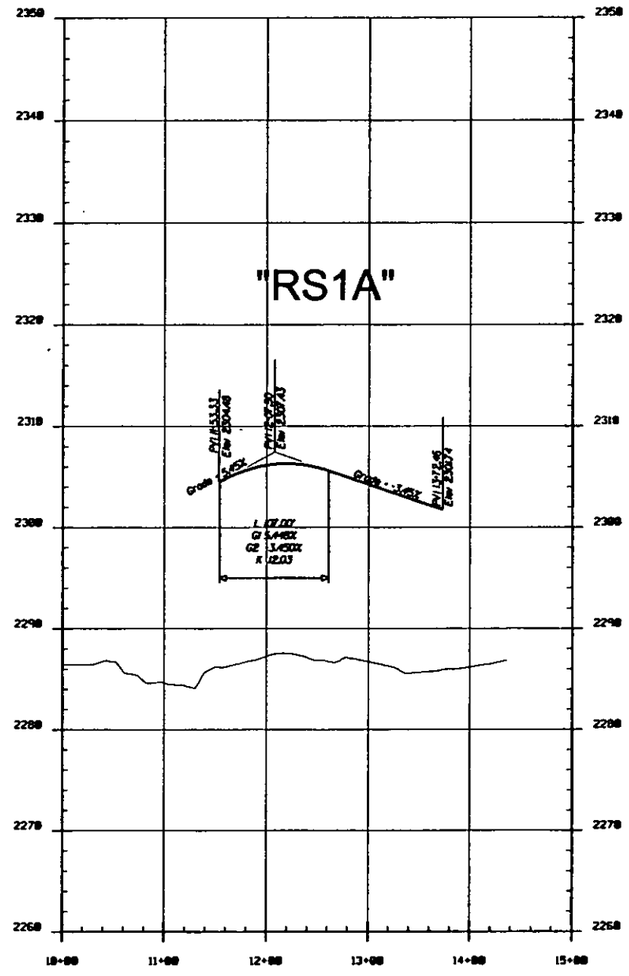


Figure 18 - SPUI Ramp "RS4" - Profile



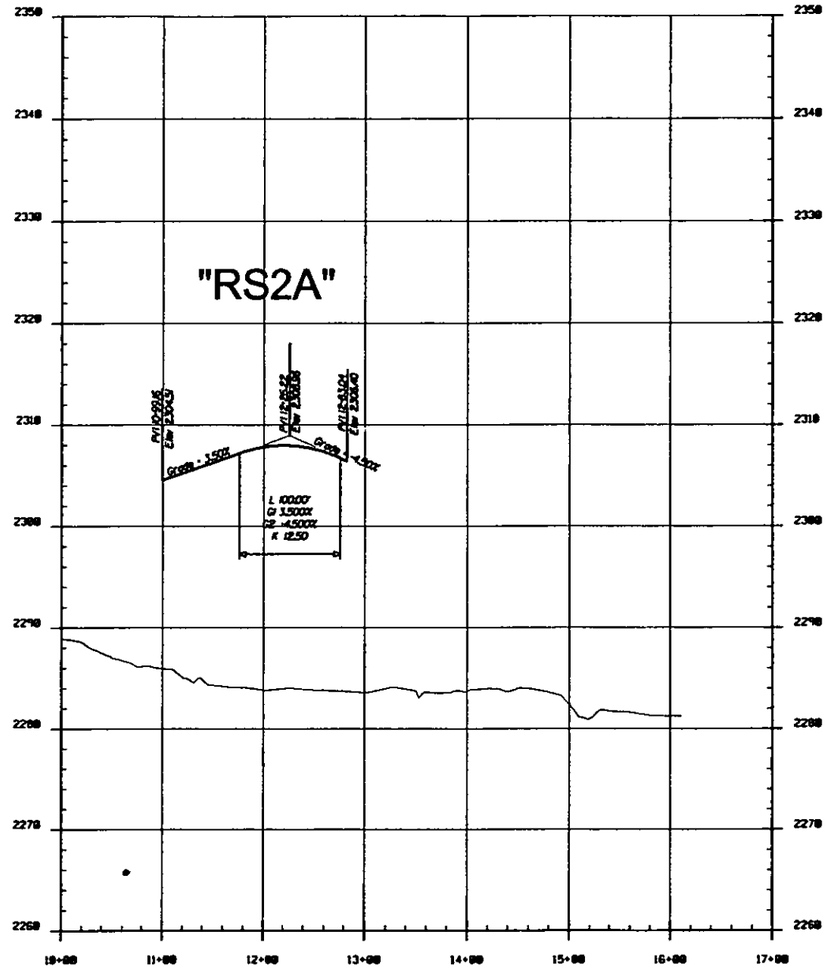
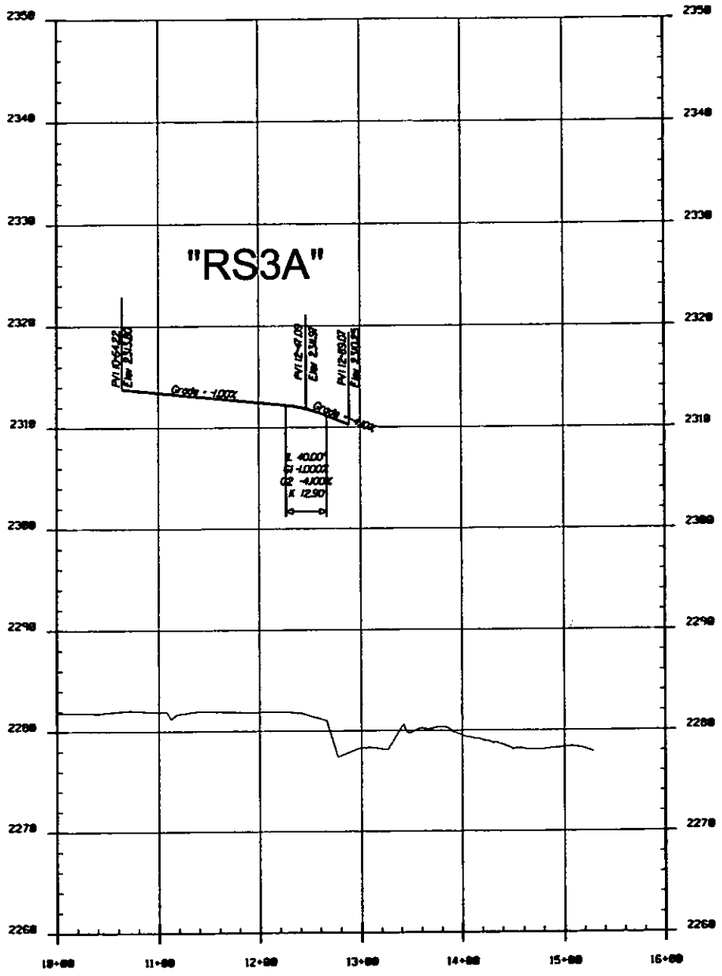


Figure 19 - SPUI Ramps "RS1A" & "RS2A" - Profiles



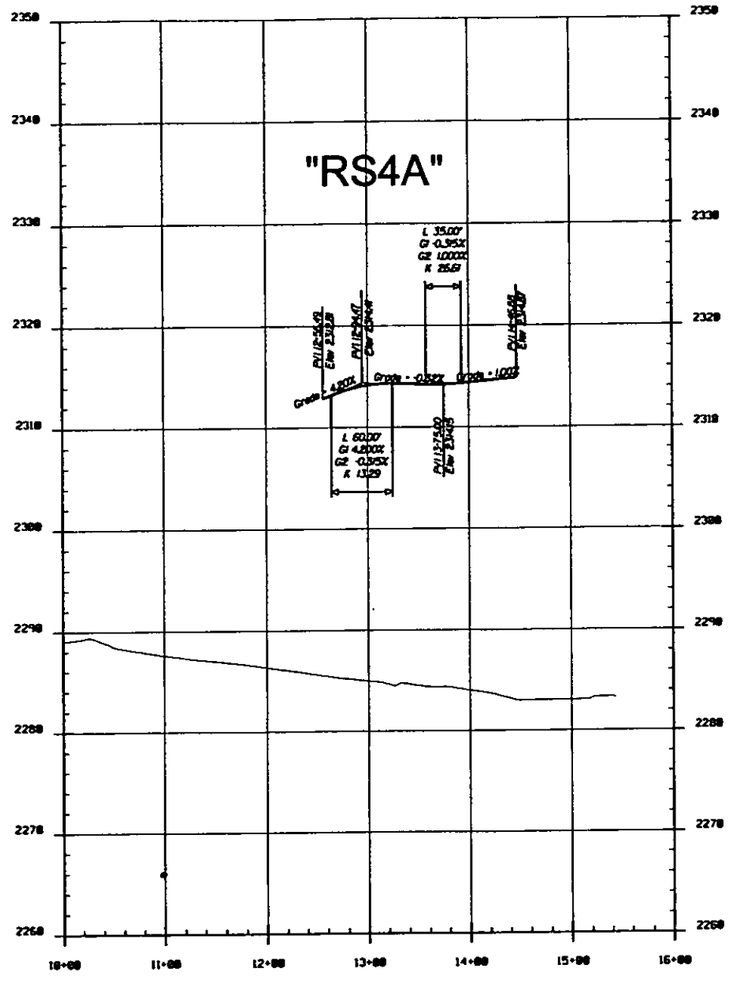


Figure 20 - SPUI Ramps "RS3A" & "RS4A" - Profiles

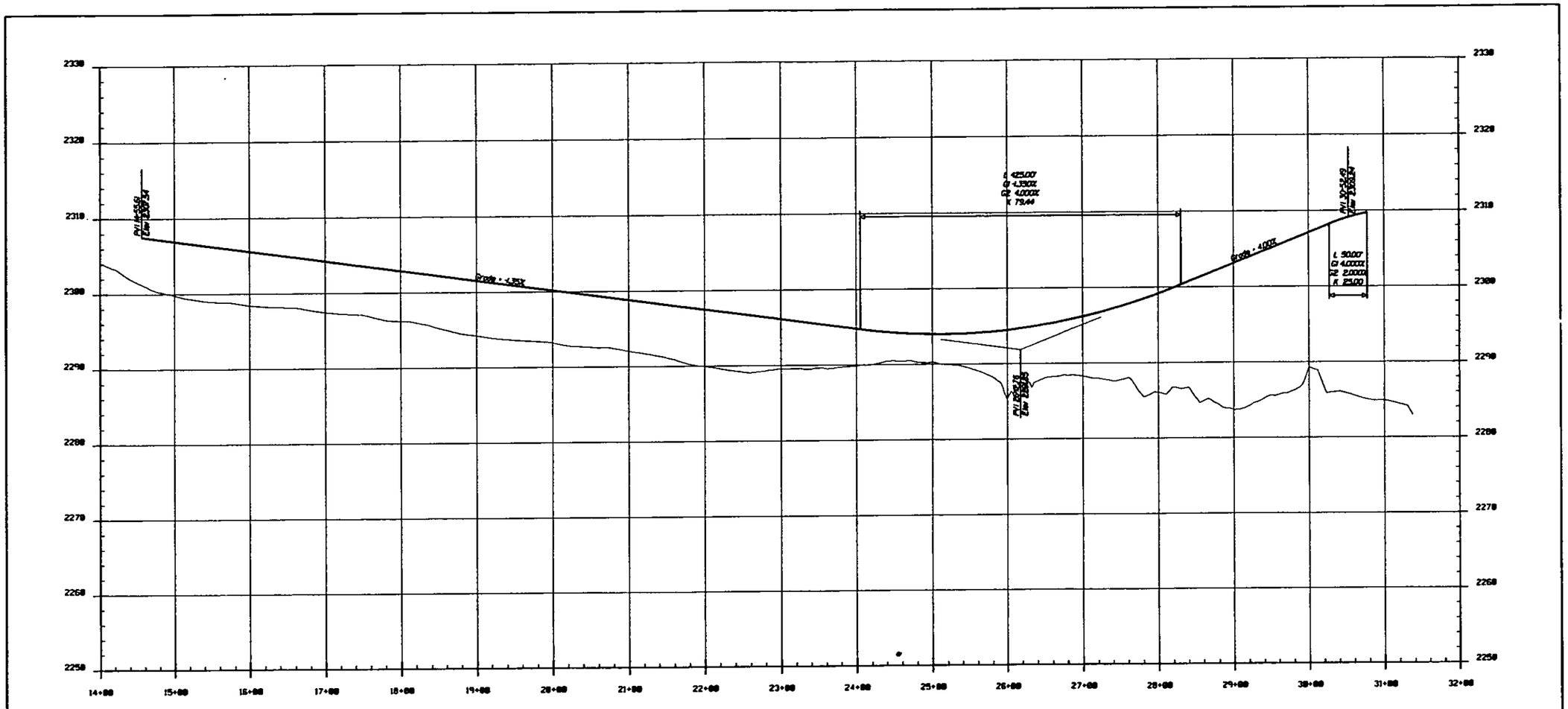


Figure 21 - TUDI Ramp "RD1" - Profile

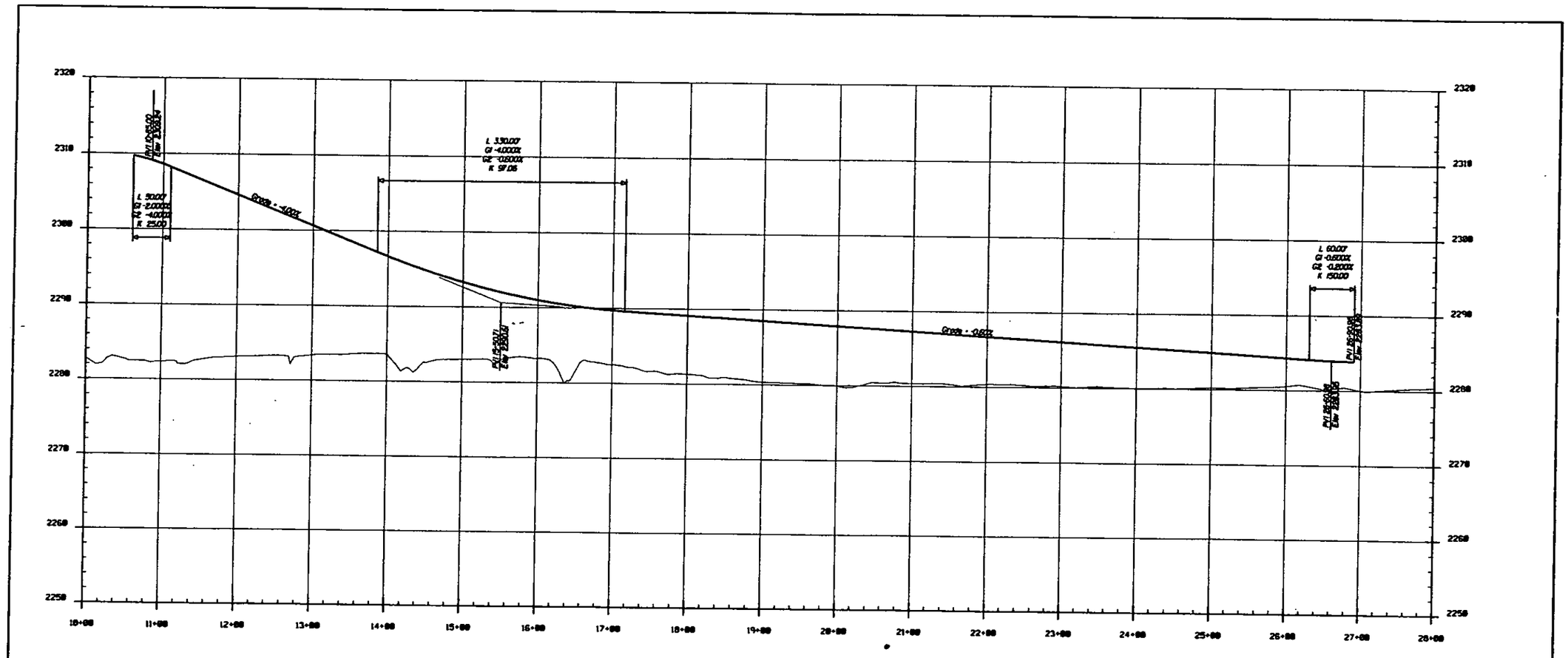


Figure 22 - TUDI Ramp "RD2" - Profile

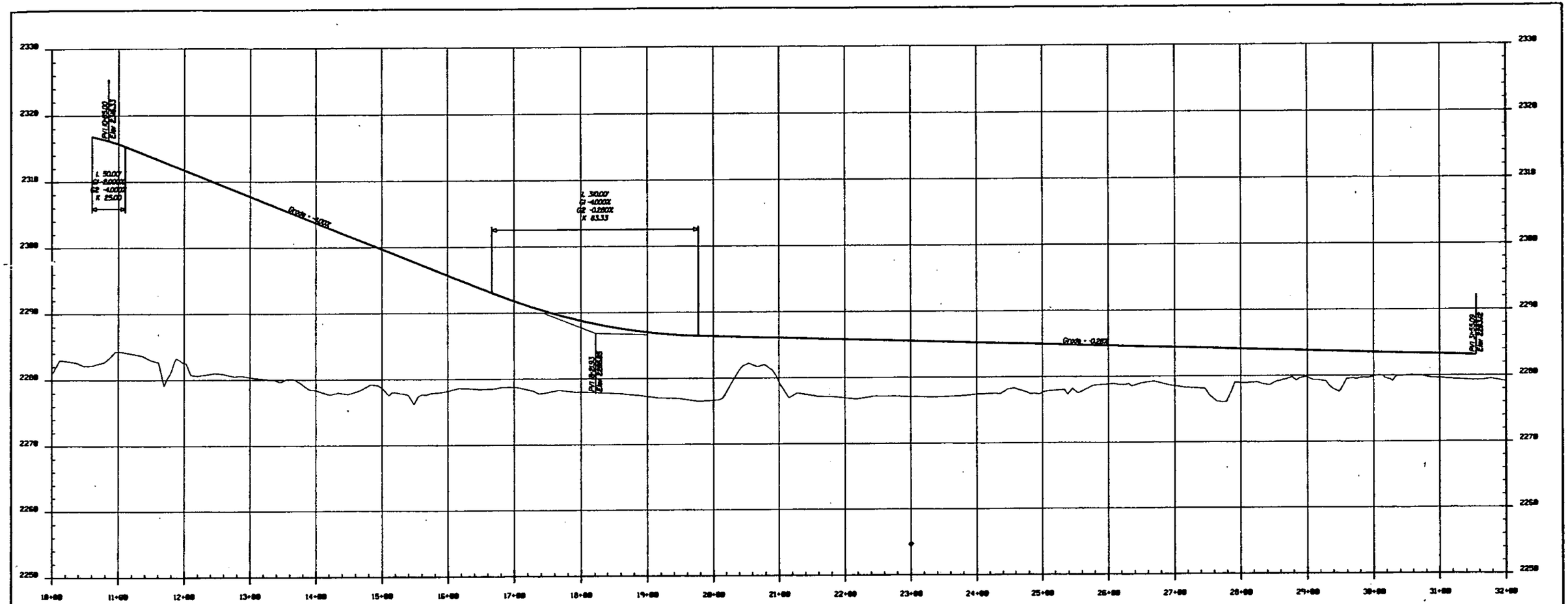


Figure 23 - TUDI Ramp "RD3" - Profile

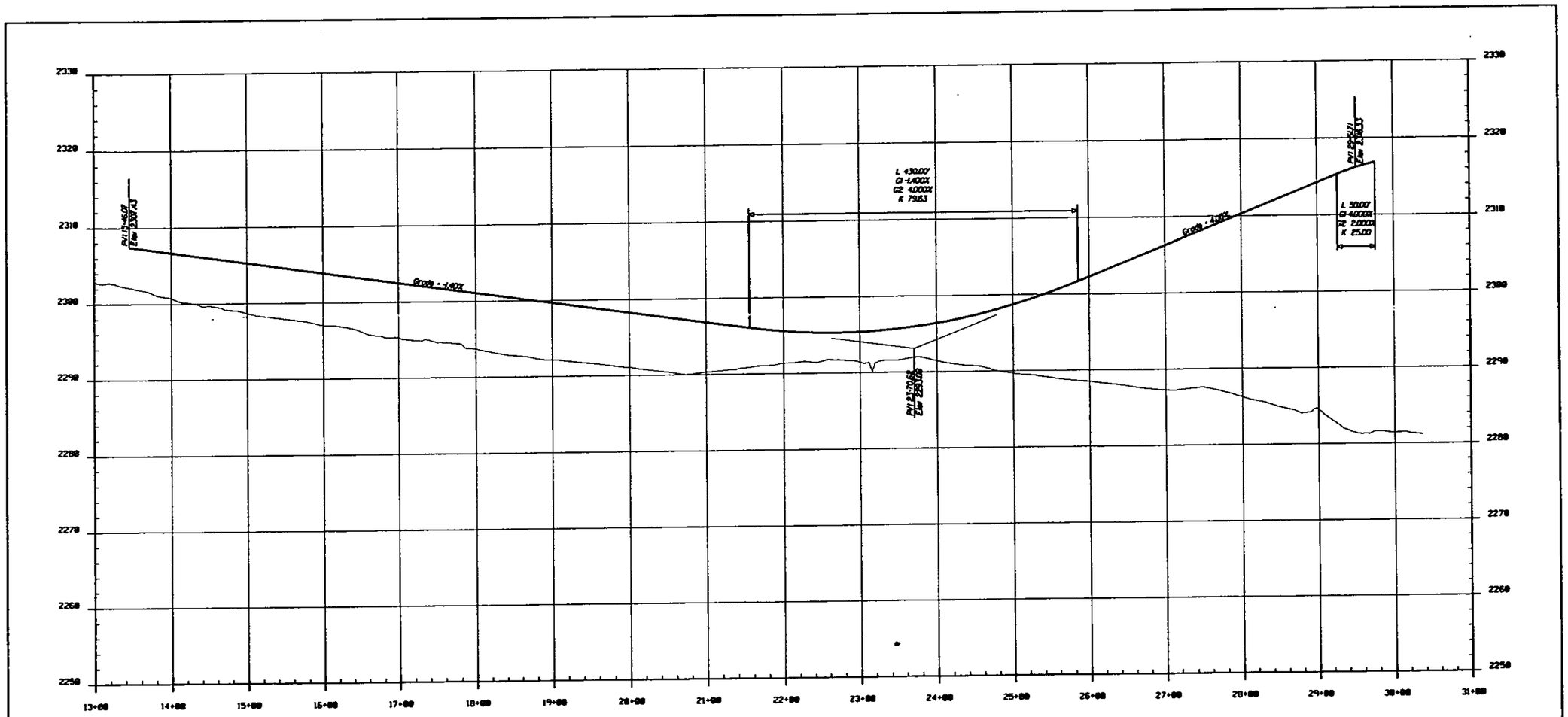


Figure 24 - TUDI Ramp "RD4" - Profile