REGIONAL STREET AND HIGHWAY COMMISSION
CLARK COUNTY, NEVADA

EAST CHARLESTON BOULEVARD

BRIDGES AND CHANNEL IMPROVEMENTS

VEGAS WASH AT CHARLESTON BLVD. AND NELLIS BLVD.

1971

VOLUME II - DRAWINGS

Geo C Moorhead Nov. 9, 1971
DIRECTOR OF PUBLIC WORKS
CLARK COUNTY

Gordon Phillips 11/9/71
CLARK COUNTY SANITATION DISTRICT

Charles P. Buckles Nov 9 1971
MANAGING ENGINEER
REGIONAL STREET & HIGHWAY COMMISSION
CLARK COUNTY

George Masa Nov. 9, 1971
CENTRAL TELEPHONE COMPANY

11/9/71
SOUTHWEST GAS CORPORATION

W F Blahnn 11-9-71
LAS VEGAS VALLEY WATER DISTRICT

PUBLIC WORKS DIRECTOR
CITY OF LAS VEGAS

D. E. Damon 11/9/71
NEVADA POWER COMPANY

SANITATION DIVISION - CITY OF LAS VEGAS

WALLACE-MONTGOMERY
LAS VEGAS, NEVADA

NOTES

1) THE SOILS BORING LOGS ARE IN ABBREVIATED FORM. THE FOUNDATION INVESTIGATION REPORT PREPARED BY CONVERSE, DAVIS AND ASSOCIATES DATED 11-4-70 & 2-10-71 MAY BE EXAMINED BY THE CONTRACTOR AT THE OFFICE OF WALLACE - MONTGOMERY, CONSULTING ENGINEERS, LAS VEGAS, NEVADA, OR AT THE OFFICE OF THE CLARK COUNTY REGIONAL STREET AND HIGHWAY COMMISSION, LAS VEGAS, NEVADA.

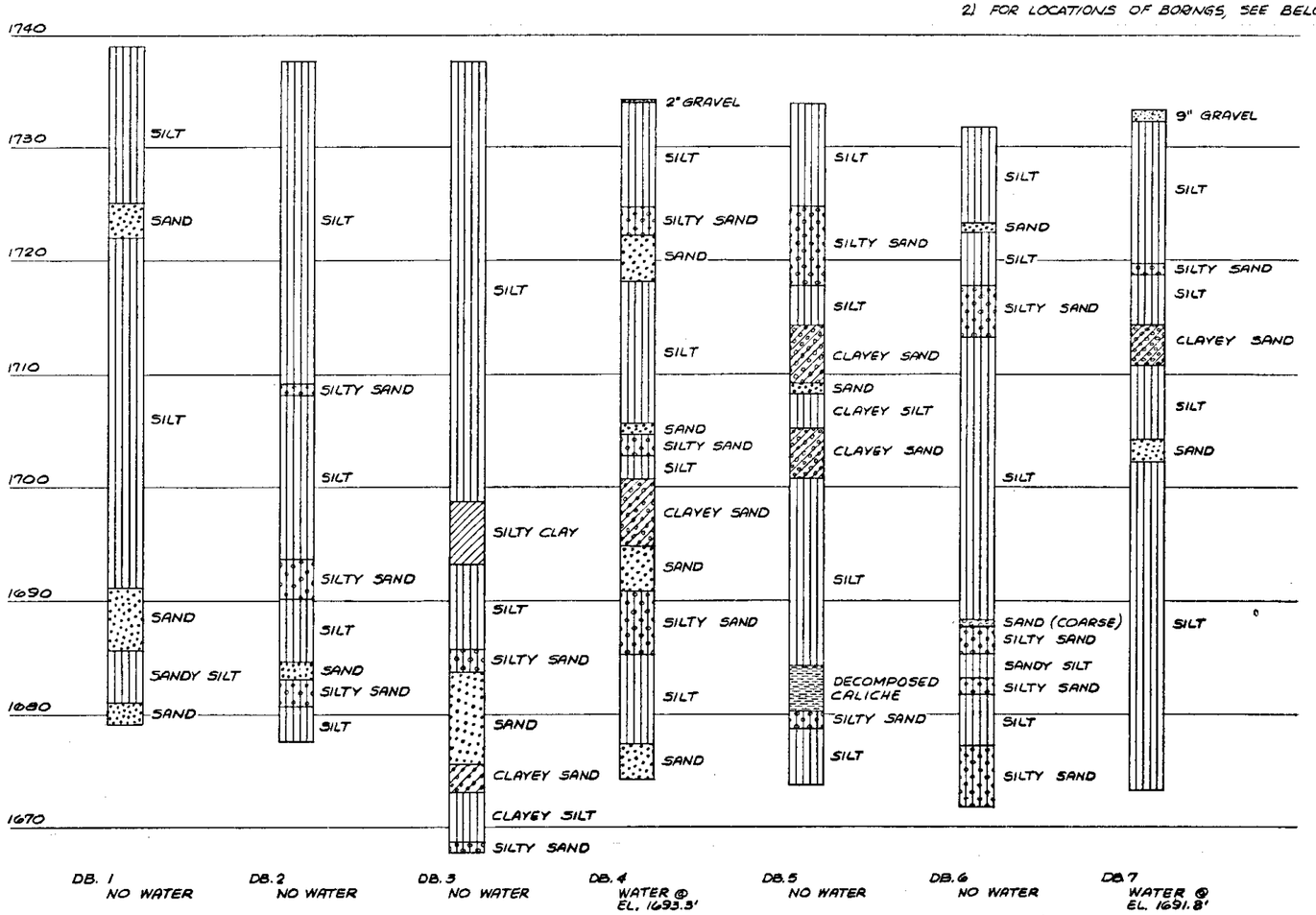
2) FOR LOCATIONS OF BORINGS, SEE BELOW.

BENCH MARK

STA. 167+88 CHARLESTON BLVD., 49' N. OF ℄, SPIKE & TIN ON S. SIDE OF P.P. # 12930-T.
ELEV. = 1741.29 C.L.V. DATUM

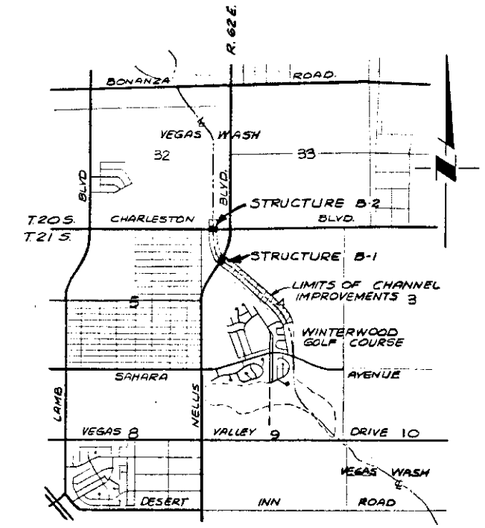
LOG OF BORINGS

VERTICAL SCALE: 1" = 6'-0"



GENERAL NOTES

1. ALL STRUCTUAL CONCRETE SHALL DEVELOP A COMPRESSIVE STRENGTH OF 3000 P.S.I. MIN. IN 28 DAYS.
2. REINFORCEMENT STEEL SHALL BE DEFORMED BARS OF INTERMEDIATE GRADE BILLET STEEL, ASTM DESIGNATION A615, GRADE 40. COLUMN SPIRALS SHALL BE EITHER COLD DRAWN WIRE, ASTM DESIGNATION A82 WITH A MIN YIELD STRENGTH OF 70,000 P.S.I. OR HOT ROLLED BARS, ASTM DESIGNATION A615, GRADE 60.
3. FOR PROVISIONS REGARDING TEMPORARY DETOURS AROUND STRUCTURES, SEE SPECIFICATIONS.
4. DESIGN SPECIFICATIONS - AASHO "STANDARD SPECIFICATION FOR HIGHWAY BRIDGES." H20-S16-44 AND ALTERNATIVE LOADINGS.

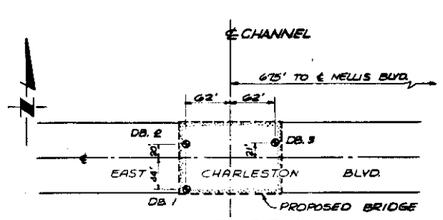


VICINITY MAP

NO SCALE

LIST OF DRAWINGS

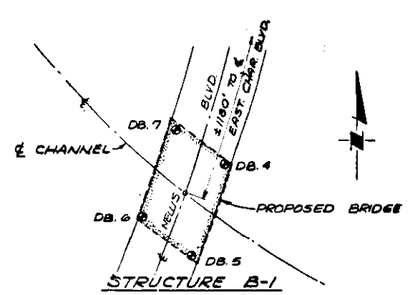
1. LIST OF DRAWINGS, VICINITY MAP, AND LOG OF BORINGS
2. SITE AND FOUNDATION PLAN ; STRUCTURE B-1
3. SLAB AND COLUMN PLAN ; STRUCTURE B-1
4. SITE AND FOUNDATION PLAN ; STRUCTURE B-2
5. SLAB AND COLUMN PLAN ; STRUCTURE B-2
6. SLAB REINFORCEMENT PLAN ; STRUCTURES B-1 AND B-2
7. MISCELLANEOUS DETAILS ; STRUCTURES B-1 AND B-2
8. 51 INCH SEWER SUPPORT DETAILS - I ; STRUCTURE B-2
9. 51 INCH SEWER SUPPORT DETAILS - II ; STRUCTURE B-2
10. CHANNEL PLAN & PROFILE 3+00 TO 13+00
11. CHANNEL PLAN & PROFILE 13+00 TO 24+00
12. CHANNEL PLAN & PROFILE 24+00 TO 36+00
13. CHANNEL PLAN & PROFILE 36+00 TO 47+50
14. CHANNEL PLAN & PROFILE 47+50 TO 59+50
15. CHANNEL PLAN & PROFILE 59+50 TO 63+00
16. 24 INCH WATER MAIN RELOCATION ; PLAN & PROFILE
17. 24 INCH SEWER LINE & 12 INCH WATER LINE RELOCATION ; PLAN & PROFILE
18. 24 INCH SEWER LINE RELOCATION ; DETAILS
19. 51 INCH SEWER LINE RELOCATION ; PLAN & DETAILS
20. WATER & SPRINKLER SYSTEM RELOCATION 24+00 TO 47+50
21. WATER & SPRINKLER SYSTEM RELOCATION 47+50 TO 63+00 ; DETAILS
22. MISCELLANEOUS DETAILS
23. CHANNEL CROSS SECTION 3+00 TO 9+50
24. CHANNEL CROSS SECTION 10+00 TO 15+50
25. CHANNEL CROSS SECTION 16+00 TO 21+50
26. CHANNEL CROSS SECTION 22+00 TO 28+96
27. CHANNEL CROSS SECTION 29+50 TO 38+00
28. CHANNEL CROSS SECTION 38+50 TO 54+00
29. CHANNEL CROSS SECTION 55+00 TO 63+00



STRUCTURE B-2

BORING PLAN

SCALE: 1" = 100'



STRUCTURE B-1

BORING PLAN

SCALE: 1" = 100'

WARNING
THIS DRAWING APPROXIMATELY ONE-HALF ORIGINAL SCALE

REV	DATE	DESCRIPTION

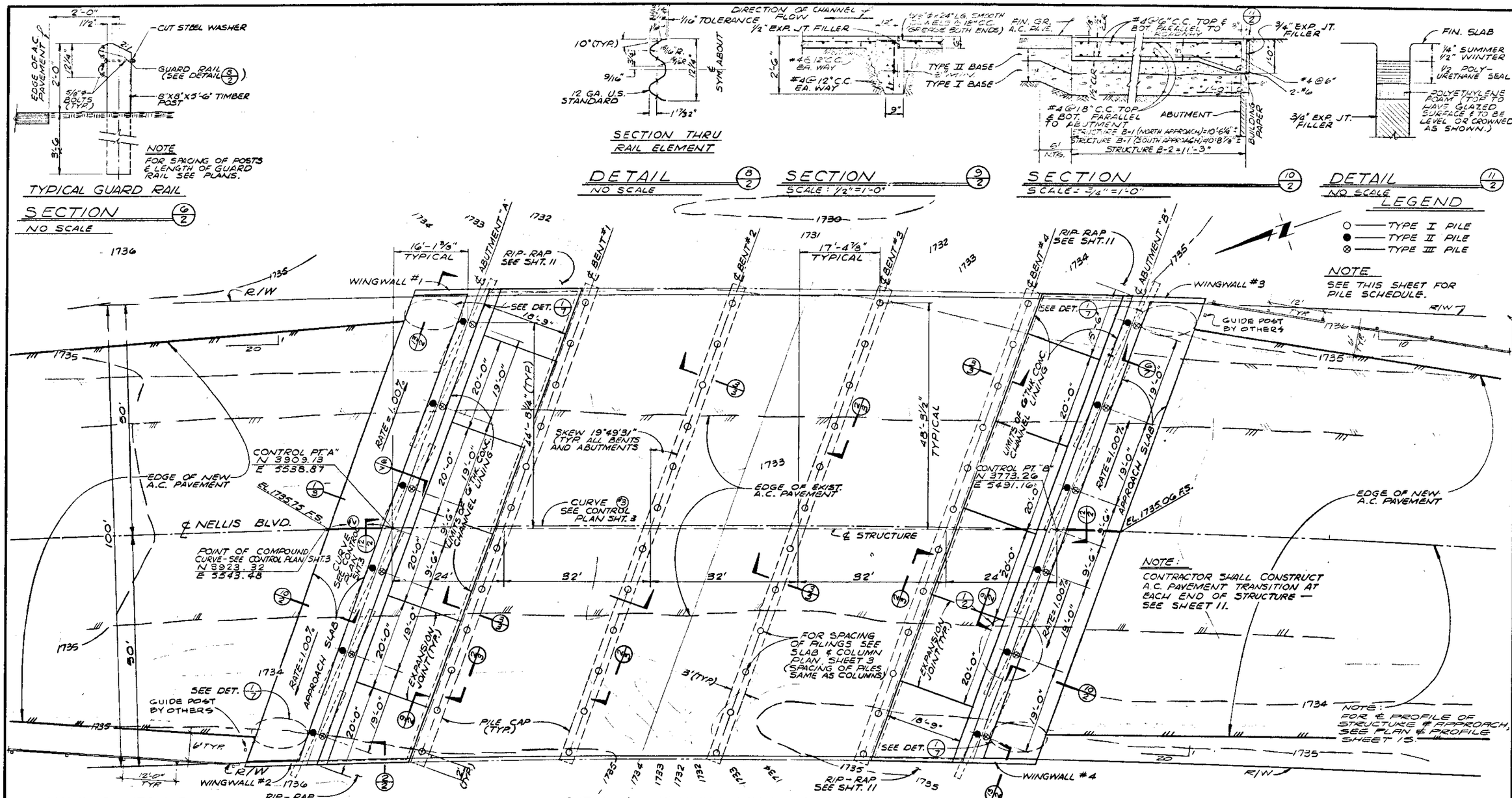
RECOMMENDED G. C. WALLACE — R.E. NO. 1815 — DATE 11-8-71
MONTGOMERY ENGINEERS OF NEVADA — R.E. NO. 2315 — DATE 11-8-71

WALLACE - MONTGOMERY, A JOINT VENTURE
G. C. WALLACE, Consulting Engineer — MONTGOMERY ENGINEERS OF NEVADA
735-5709 — 735-7198
LAS VEGAS, NEVADA

REGIONAL STREET AND HIGHWAY COMMISSION, CLARK CO., NEV.
E. CHARLESTON BLVD. - BRIDGES AND CHANNEL IMPROVEMENTS

LIST OF DRAWINGS, VICINITY MAP AND LOG OF BORINGS

SHEET 1 OF 29 SHEETS



PILE SCHEDULE

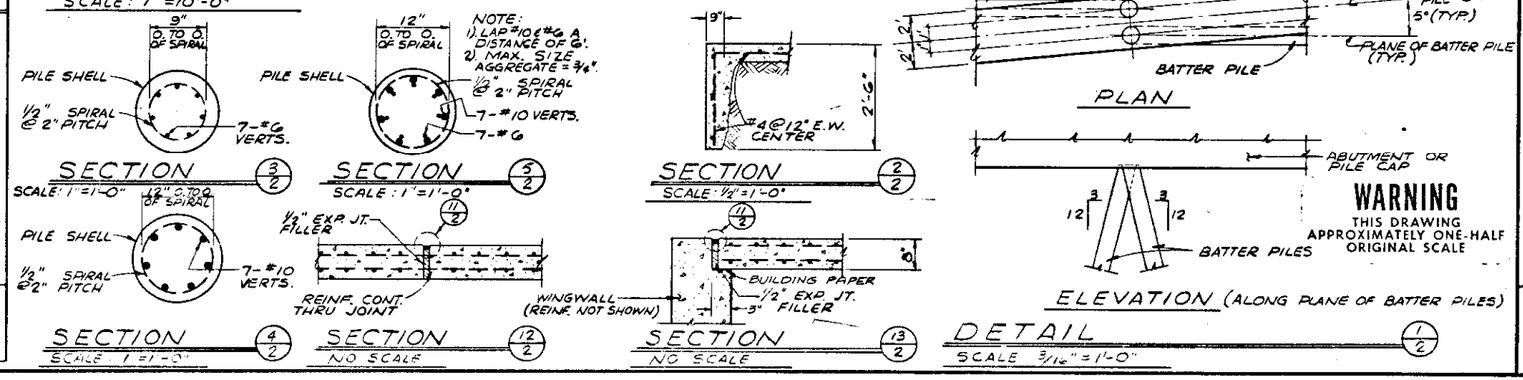
TYPE	LENGTH	BATTER	REINFORCING STEEL PER INDICATED SECTIONS
I	38'	NONE	PILE CUT-OFF
II	34'	3 ON 12	PILE CUT-OFF
III	42'	3 ON 12	PILE CUT-OFF
IV	31'	3 ON 12	PILE CUT-OFF
V	34'	3 ON 12	PILE CUT-OFF
VI	45'	3 ON 12	PILE CUT-OFF
VII	42'	3 ON 12	PILE CUT-OFF

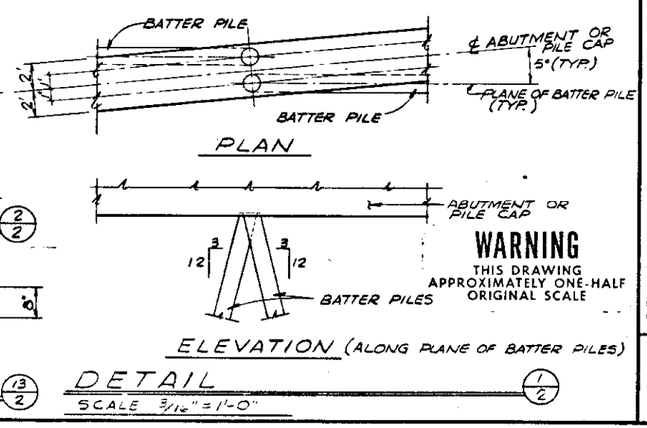
℄ PILE TIP

SHELL DIAMETER	8'	8'	8'	8'	8'	8'
	16 3/8"	15 3/8"	14 3/8"	13 3/8"	12 3/8"	11 3/8"

SITE & FOUNDATION PLAN (STRUCTURE B-1)

SCALE: 1"=10'-0"





WARNING
THIS DRAWING APPROXIMATELY ONE-HALF ORIGINAL SCALE

REV	DATE	DESCRIPTION

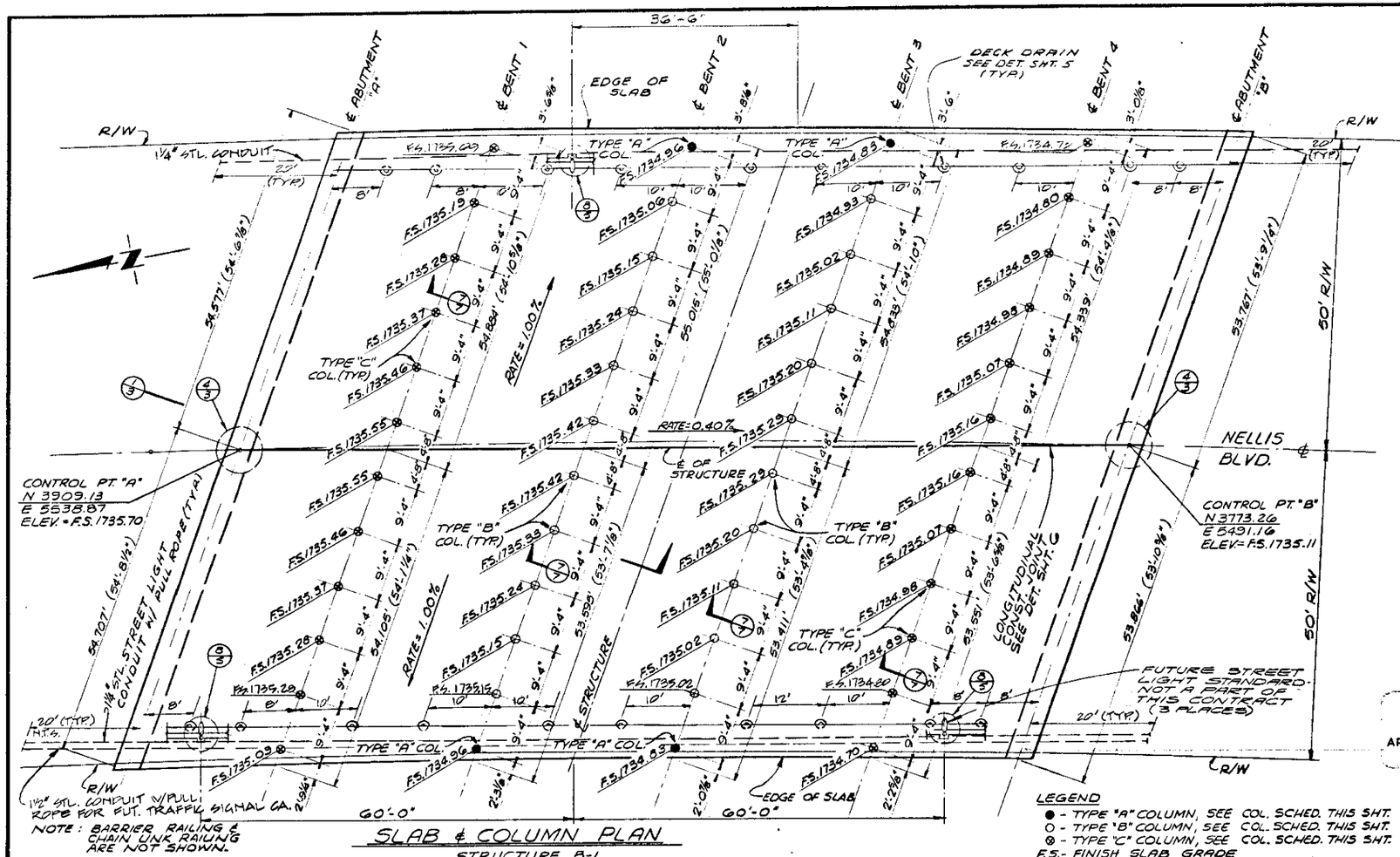
RECOMMENDED G. C. WALLACE R.E. NO. 1815 DATE 11-8-71
APPROVED MONTGOMERY ENGINEERS OF NEVADA R.E. NO. 2915 DATE 11-8-71

WALLACE - MONTGOMERY, A JOINT VENTURE
G. C. WALLACE, Consulting Engineer 735-5709
MONTGOMERY ENGINEERS OF NEVADA 735-7198
LAS VEGAS, NEVADA

REGIONAL STREET AND HIGHWAY COMMISSION, CLARK CO., NEV.
E. CHARLESTON BLVD.-BRIDGES AND CHANNEL IMPROVEMENTS

SITE AND FOUNDATION PLAN
STRUCTURE B-1

SHEET 2 OF 29 SHEETS



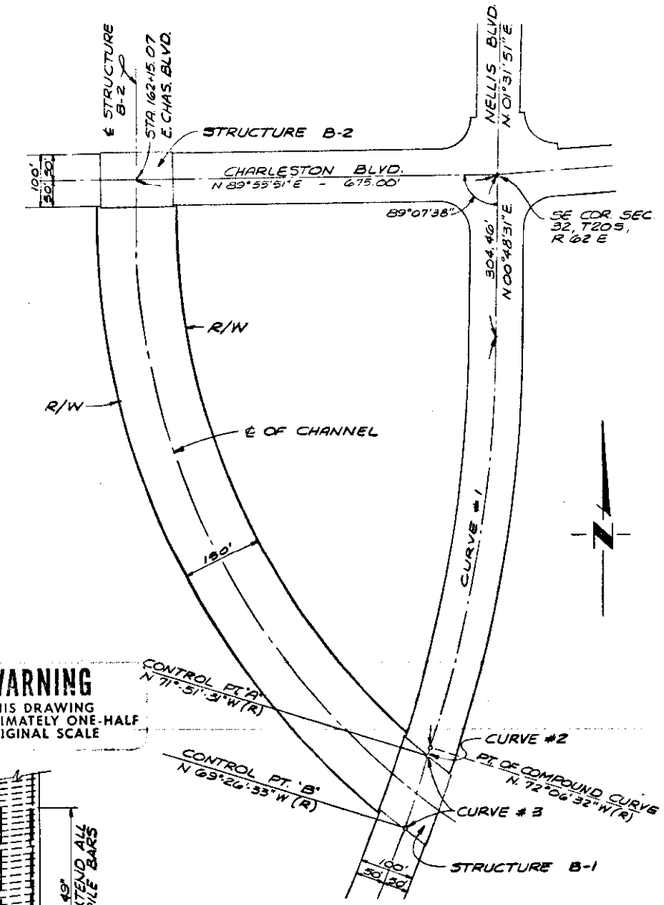
SLAB & COLUMN PLAN

STRUCTURE B-1

SCALE: 1"=10'

CURVE DATA

NO	Δ	R	T	L
1	17°5'15"	2636.91	396.15	786.41
2	0°15'01"	3915.20	7.46	14.92
3	2°24'58"	3415.20	72.02	144.02



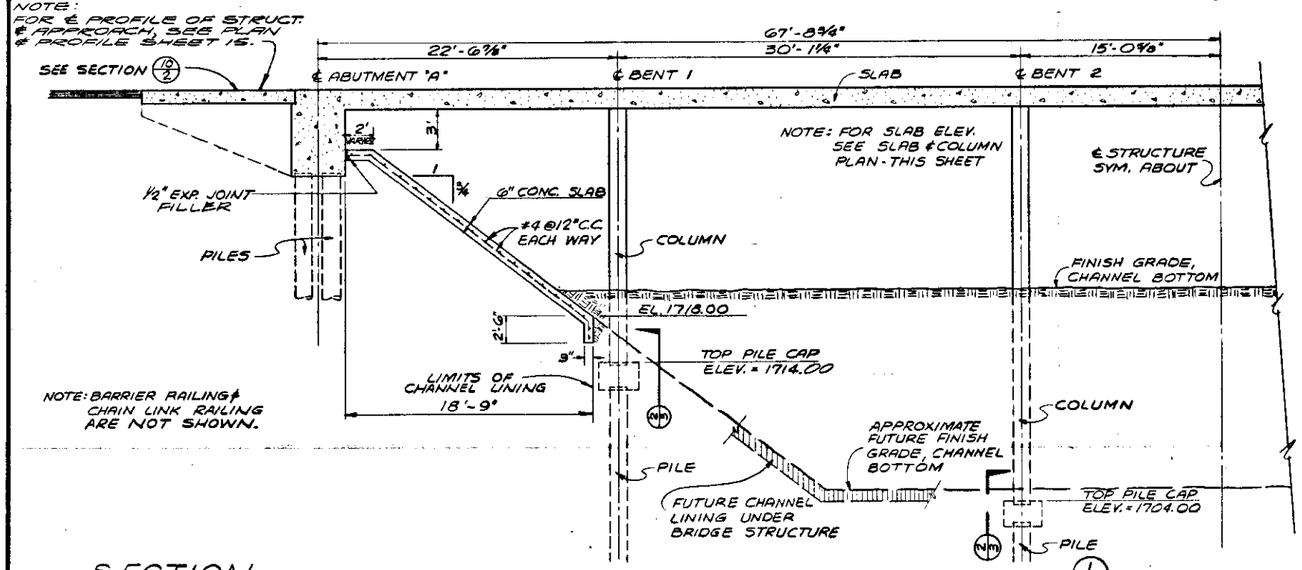
CONTROL PLAN

NO SCALE

WARNING
THIS DRAWING APPROXIMATELY ONE-HALF ORIGINAL SCALE

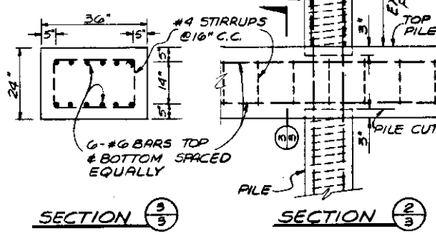
LEGEND
- ● - TYPE "A" COLUMN, SEE COL. SCHED. THIS SHT.
- O - TYPE "B" COLUMN, SEE COL. SCHED. THIS SHT.
- ⊗ - TYPE "C" COLUMN, SEE COL. SCHED. THIS SHT.
- F.S. - FINISH SLAB GRADE
- RATE=0.40% - RATE OF GRADE

NOTE: FOR ℄ PROFILE OF STRUCT. & APPROACH, SEE PLAN & PROFILE SHEET 15.



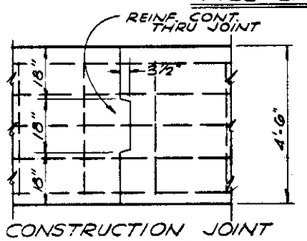
SECTION

SCALE: 3/16"=1'-0"



SECTION 3/3 — SECTION 2/3

PILE CAP



CONSTRUCTION JOINT IN ABUTMENT

DETAIL 4/3

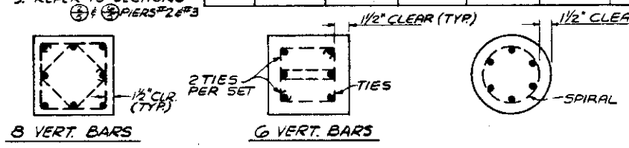
SCALE: ½"=1'-0"

COL. SCHED. NOTES

1. REFER TO SECTIONS 2/3 & 3/3
2. REFER TO SECTIONS 2/3 & 3/3 PIERS #1 & #4
3. REFER TO SECTIONS 2/3 & 3/3 PIERS #2 & #3

COLUMN SCHEDULE

TYPE	SIZE	CORE	VERT. STEEL	SPIRAL	TIES	REMARKS
A	18" DIA.	15"	8-#10	½" @ 2½" PITCH	—	
B	18" DIA.	15"	7-#10	½" @ 2½" PITCH	—	
C	16" DIA.	13"	6-#6	½" @ 2" PITCH	—	
	20" x 20"	—	6-#6	—	#3 @ 12" C.C.	SEE NOTE 1
	20" x 20"	—	8-#8	—	#3 @ 16" C.C.	SEE NOTE 2
	20" x 20"	—	8-#10	—	#3 @ 16" C.C.	SEE NOTE 3



TYPICAL COLUMN SECTIONS

NO SCALE

REV	DATE	DESCRIPTION

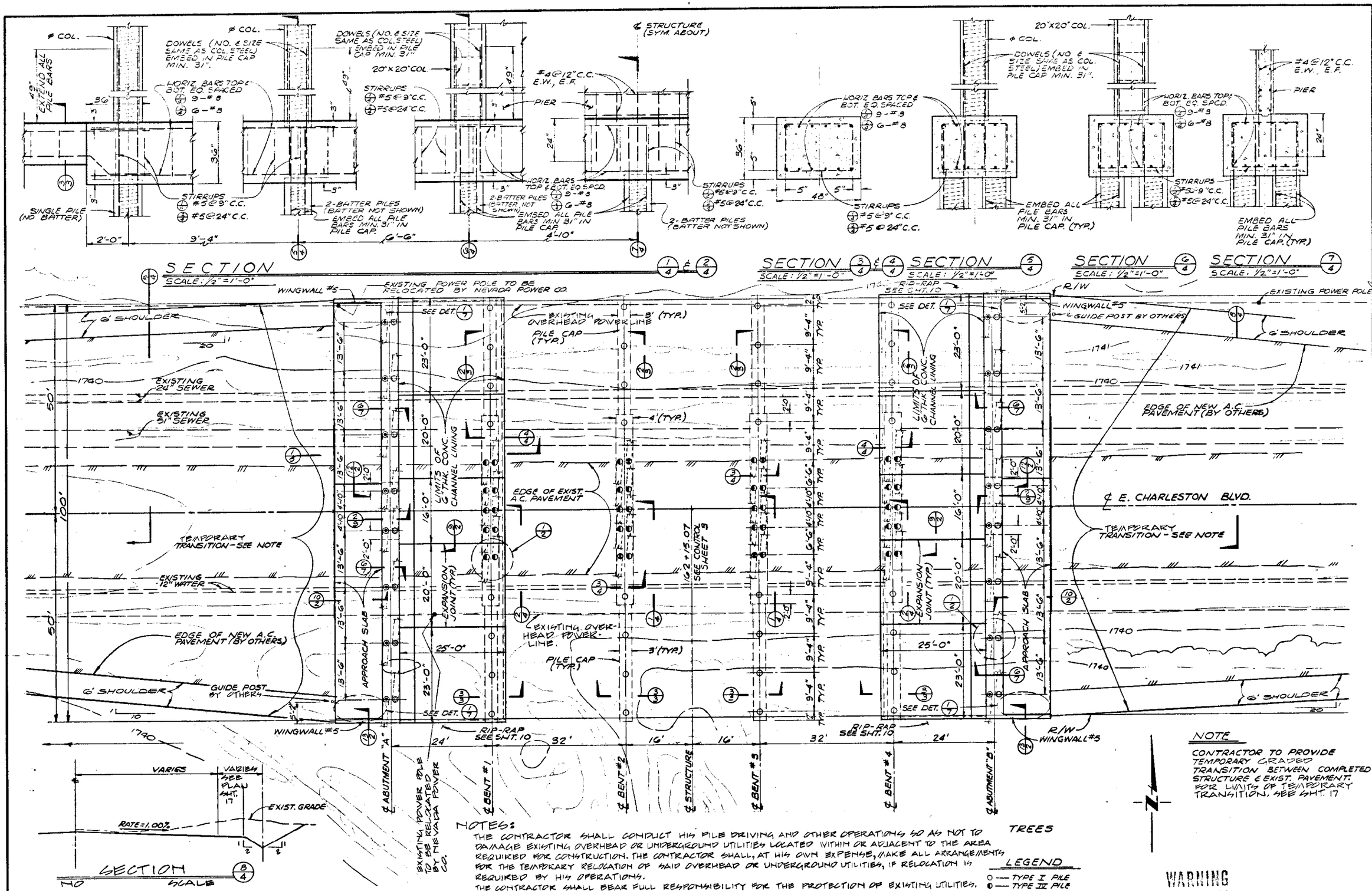
RECOMMENDED: G. C. WALLACE — R.E. NO. 1815 — DATE 1-8-71
APPROVED: MONTGOMERY ENGINEERS OF NEVADA — R.E. NO. 836 — DATE 1-8-71

WALLACE - MONTGOMERY, A JOINT VENTURE
G. C. WALLACE, Consulting Engineer — MONTGOMERY ENGINEERS OF NEVADA
735-7198 — 735-5709
LAS VEGAS, NEVADA

REGIONAL STREET AND HIGHWAY COMMISSION, CLARK CO., NEV.
E. CHARLESTON BLVD. - BRIDGES AND CHANNEL IMPROVEMENTS.

SLAB AND COLUMN PLAN
STRUCTURE B-1

SHEET 3 OF 29 SHEETS



NOTES:
THE CONTRACTOR SHALL CONDUCT HIS PILE DRIVING AND OTHER OPERATIONS SO AS NOT TO DAMAGE EXISTING OVERHEAD OR UNDERGROUND UTILITIES LOCATED WITHIN OR ADJACENT TO THE AREA REQUIRED FOR CONSTRUCTION. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, MAKE ALL ARRANGEMENTS FOR THE TEMPORARY RELOCATION OF SAID OVERHEAD OR UNDERGROUND UTILITIES, IF RELOCATION IS REQUIRED BY HIS OPERATIONS.
THE CONTRACTOR SHALL BEAR FULL RESPONSIBILITY FOR THE PROTECTION OF EXISTING UTILITIES.

SITE & FOUNDATION PLAN (STRUCTURE B-2)

SCALE: 1"=10'-0"

TREES

LEGEND
- TYPE I PILE
- TYPE III PILE
- TYPE IV PILE
- TYPE VI PILE
- TYPE VII PILE

NOTE
SEE SHEET 2 FOR PILE SCHEDULE.

NOTE
CONTRACTOR TO PROVIDE TEMPORARY GRADED TRANSITION BETWEEN COMPLETED STRUCTURE & EXIST. PAVEMENT. FOR LIMITS OF TEMPORARY TRANSITION, SEE SHT. 17

WARNING
THIS LAYOUT IS APPROXIMATELY ONE HALF ORIGINAL SCALE

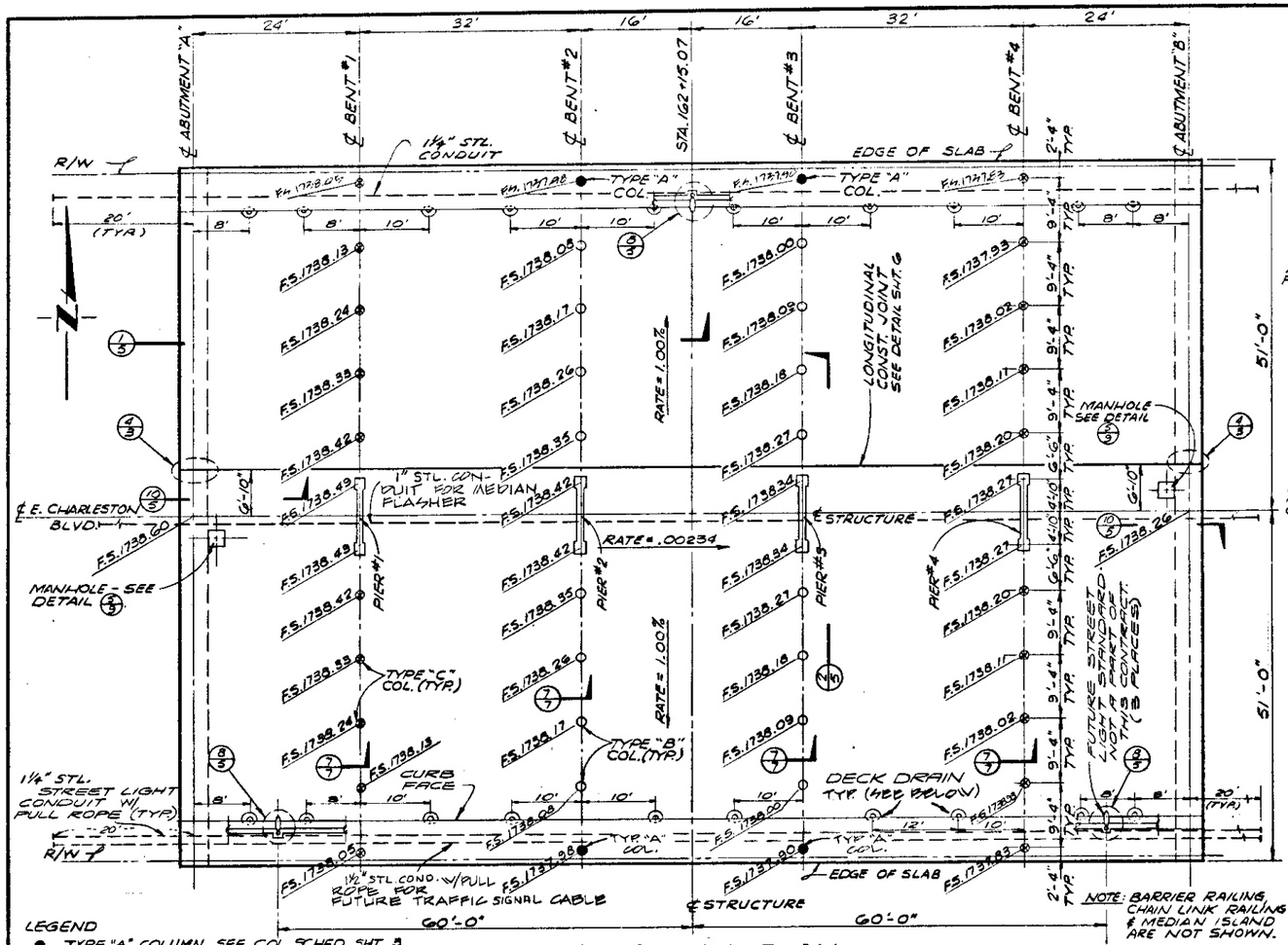
DESCRIPTION	RLV	DATE

RECOMMENDED G. C. WALLACE R.E. NO. 28-5 DATE 11-8-71
MONTGOMERY ENGINEERS OF NEVADA R.E. NO. 27-5 DATE 11-8-71

WALLACE - MONTGOMERY, A JOINT VENTURE
G. C. WALLACE, Consulting Engineer — MONTGOMERY ENGINEERS OF NEVADA
735-5709 — 735-7198
LAS VEGAS, NEVADA

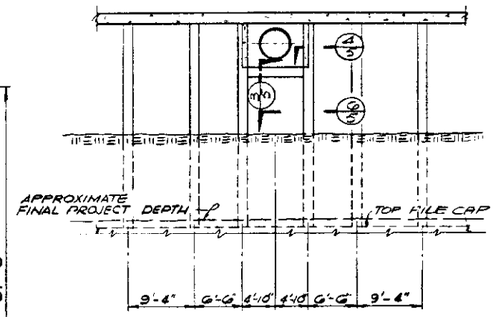
REGIONAL STREET AND HIGHWAY COMMISSION, CLARK CO., NEV.
E. CHARLESTON BLVD.- BRIDGES AND CHANNEL IMPROVEMENTS.
SITE AND FOUNDATION PLAN
STRUCTURE B-2

SHEET 4 OF 29 SHEETS

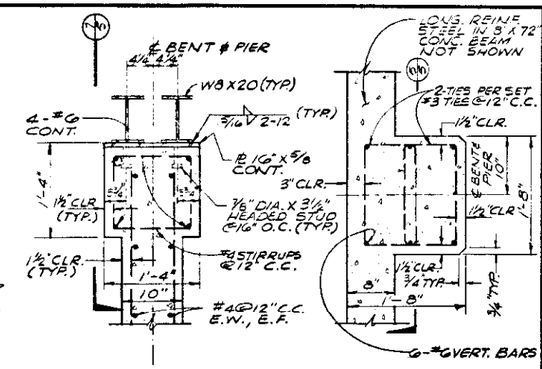


LEGEND
- ● - TYPE "A" COLUMN, SEE COL. SCHED. SHT. 3
- ○ - TYPE "B" COLUMN, SEE COL. SCHED. SHT. 3
- ⊗ - TYPE "C" COLUMN, SEE COL. SCHED. SHT. 3
- F.S. - FINISH SLAB GRADE
- RATE - RATE OF GRADE

SLAB & COLUMN PLAN (STRUCTURE B-2)
SCALE: 1" = 10'-0"

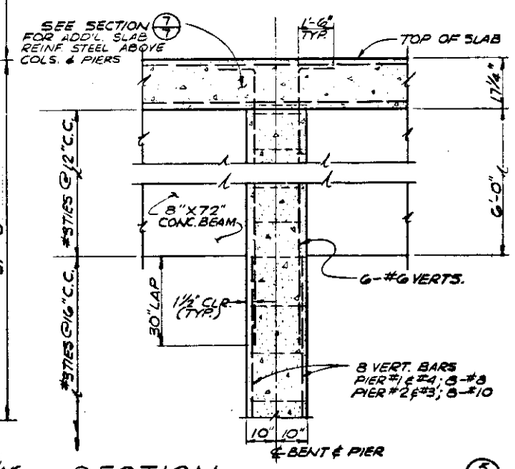


SECTION (2/5)
SCALE: 1" = 10'-0"

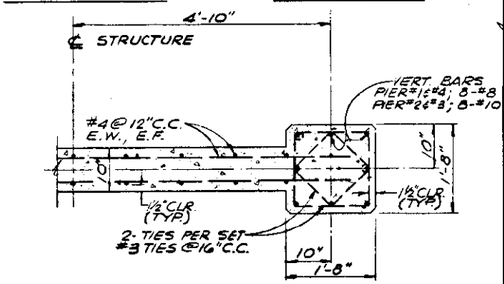


SECTION (3/5)
SCALE: 1" = 1'-0"

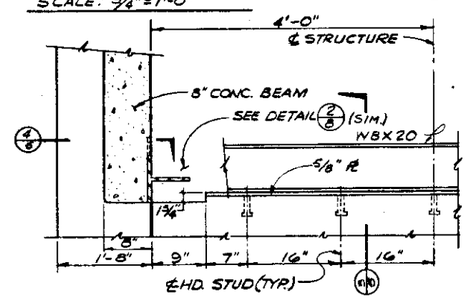
SECTION (4/5)
SCALE: 1" = 1'-0"



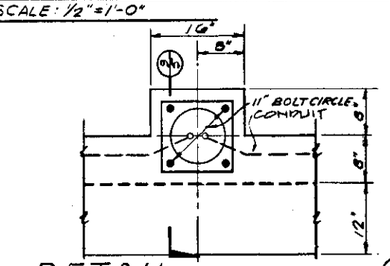
SECTION (5/5)
SCALE: ½" = 1'-0"



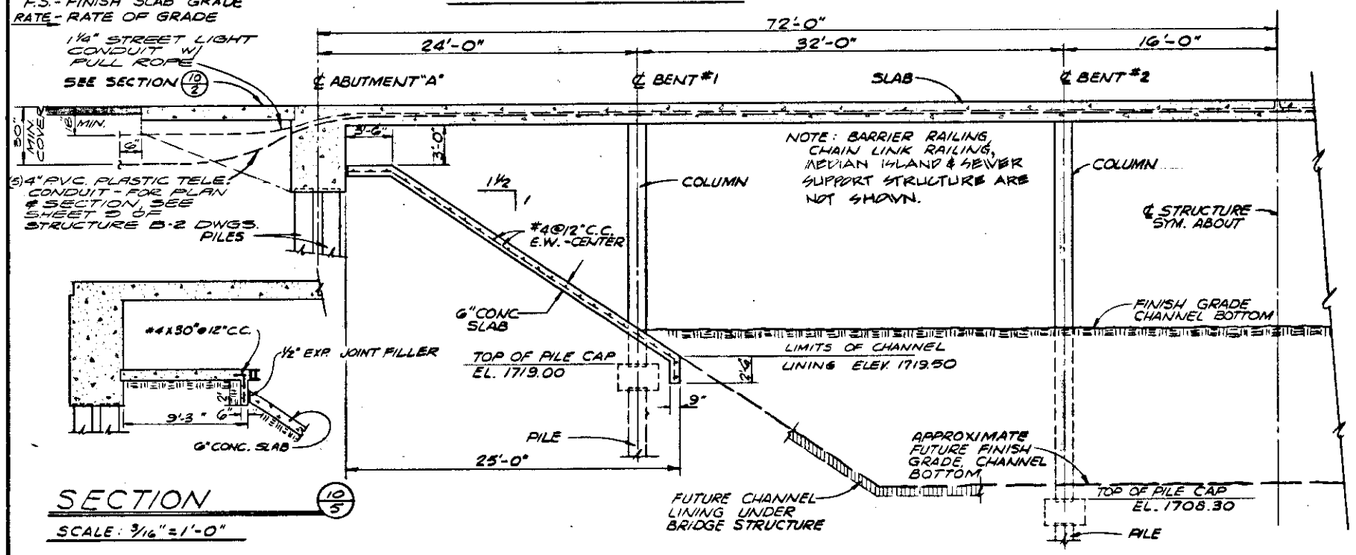
SECTION (6/5)
SCALE: 3/4" = 1'-0"



SECTION (7/5)
SCALE: 1" = 1'-0"

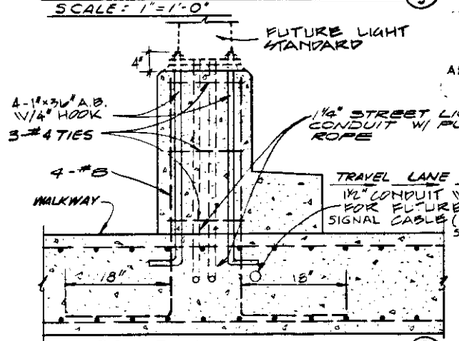


DETAIL (8/5)
SCALE: 1" = 1'-0"



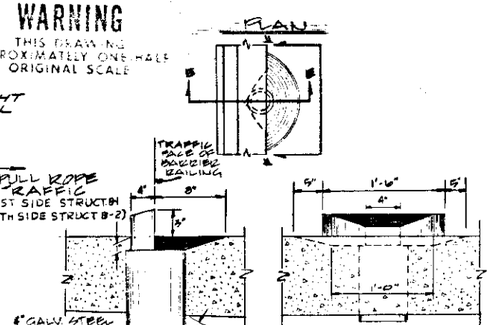
SECTION (10/5)
SCALE: 3/16" = 1'-0"

SECTION (1/5)
SCALE: 3/16" = 1'-0"



SECTION (9/5)
SCALE: 1" = 1'-0"

WARNING
THIS DRAWING IS APPROXIMATELY ONE-HALF ORIGINAL SCALE



REV	DATE	DESCRIPTION

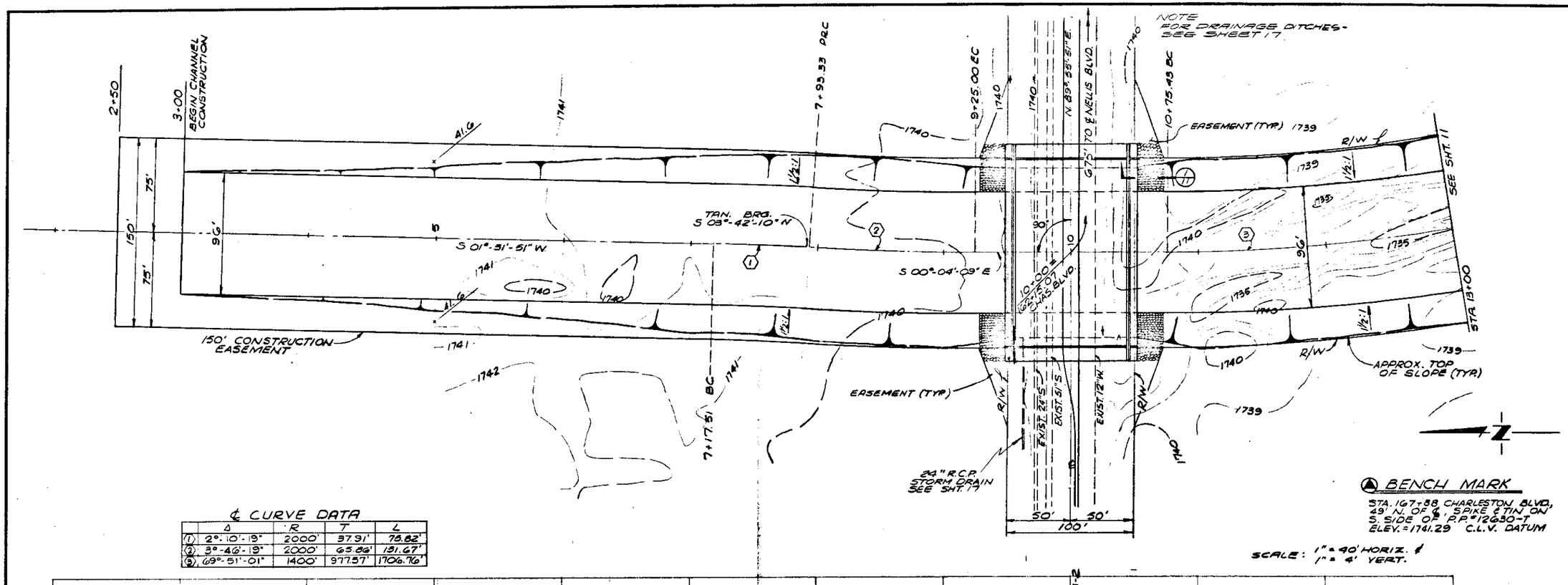
RECOMMENDED: G. C. WALLACE — R.E. NO. 1815 — DATE 11-8-71
MONTGOMERY ENGINEERS OF NEVADA — R.E. NO. 2215 — DATE 11-8-71

WALLACE - MONTGOMERY, A JOINT VENTURE
G. C. WALLACE, Consulting Engineer — 735-5709
MONTGOMERY ENGINEERS OF NEVADA — 735-7198
LAS VEGAS, NEVADA

REGIONAL STREET AND HIGHWAY COMMISSION, CLARK CO., NEV.
E. CHARLESTON BLVD. - BRIDGES AND CHANNEL IMPROVEMENTS

SLAB AND COLUMN PLAN STRUCTURE B-2

SHEET 5 OF 29 SHEETS



℄ CURVE DATA

	Δ	R	T	L
1	2°-10'-19"	2000'	37.91'	75.82'
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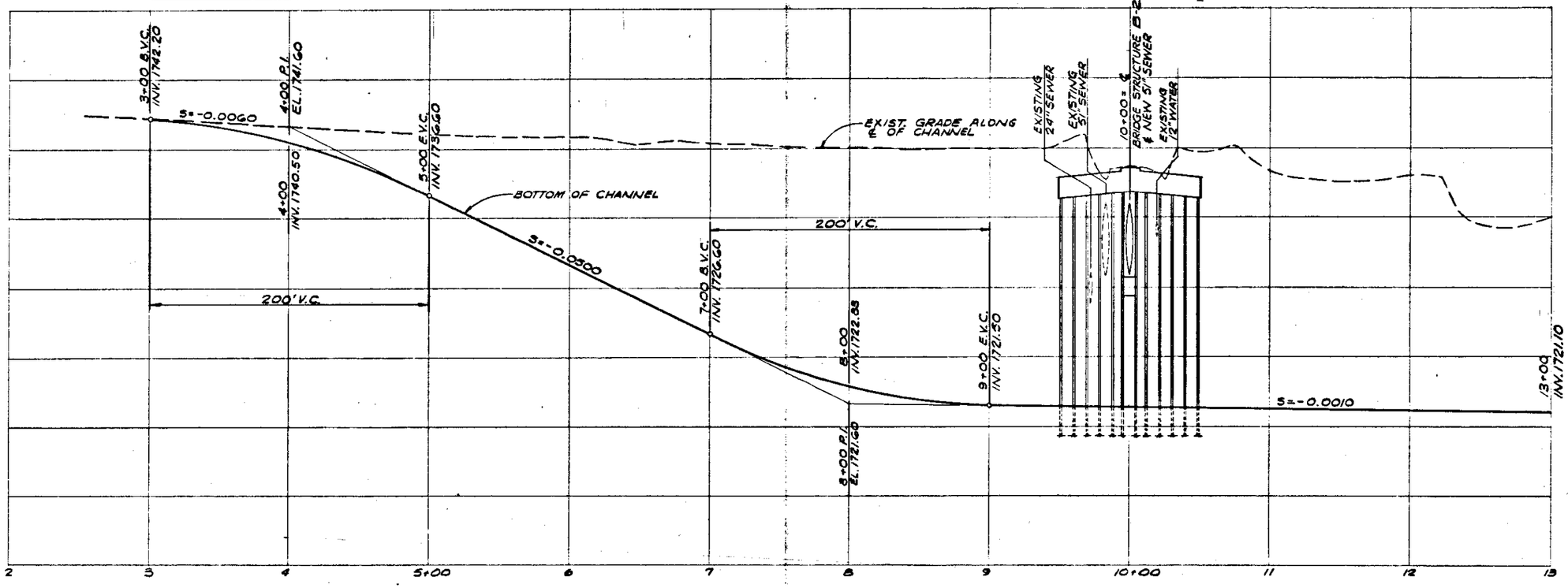
3	69°-51'-01"	1400'	977.57'	1706.76'



WARNING
THIS DRAWING IS AN APPROXIMATION OF THE ORIGINAL

REV	DATE	DESCRIPTION

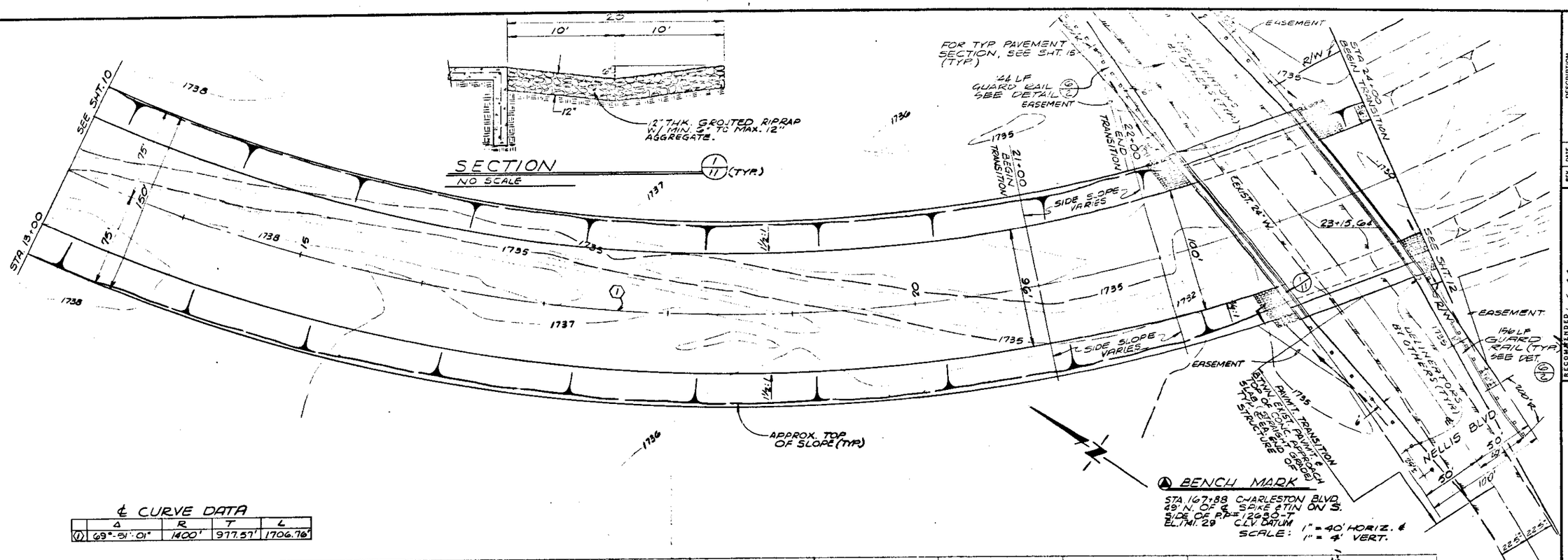
RECOMMENDED: G. C. WALLACE — R.E. NO. 1915 — DATE 11-8-71
APPROVED: MONTGOMERY ENGINEERS OF NEVADA — R.E. NO. 2215 — DATE 11-8-71

WALLACE - MONTGOMERY, A JOINT VENTURE
MONTGOMERY ENGINEERS OF NEVADA
735-7198
G. C. WALLACE, Consulting Engineer
735-5709
LAS VEGAS, NEVADA

REGIONAL STREET AND HIGHWAY COMMISSION, CLARK CO., NEV.
E. CHARLESTON BLVD. - BRIDGES AND CHANNEL IMPROVEMENTS

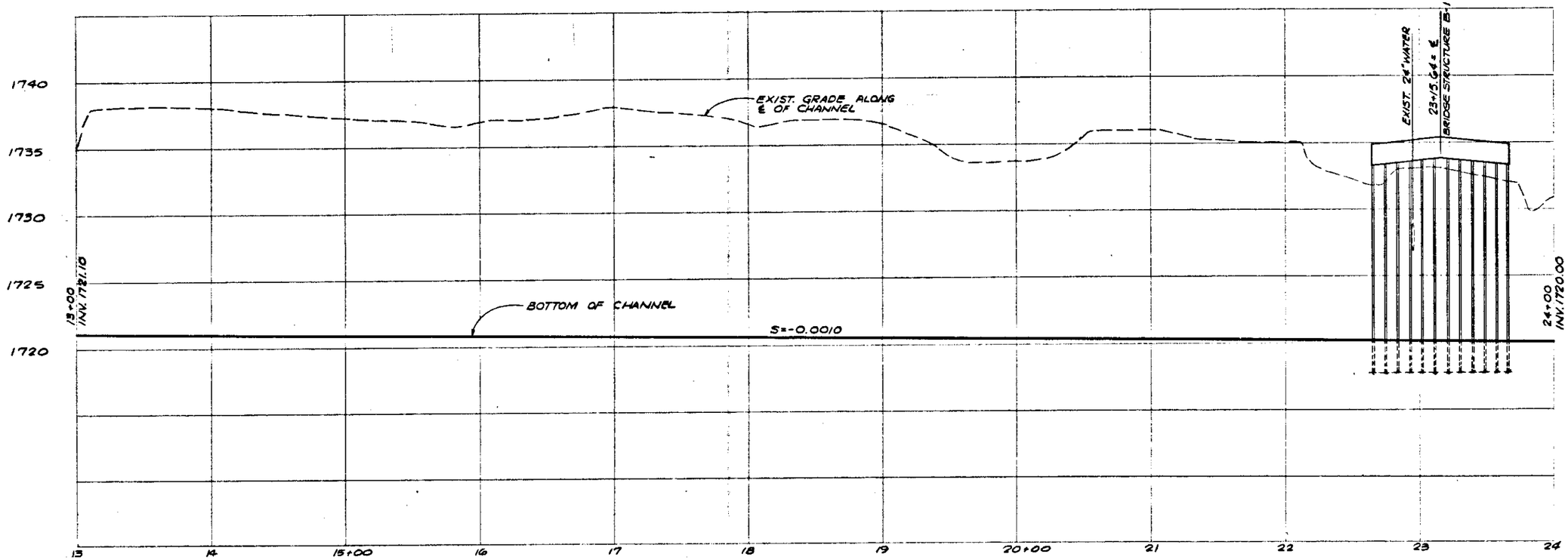
CHANNEL PLAN & PROFILE 3+00 TO 13+00

SHEET 10 OF 29 SHEETS



℄ CURVE DATA

	Δ	R	T	L
(1)	69°-51'-01"	1400'	977.57'	1706.76'



WARNING
THIS DRAWING APPROXIMATELY ONE HALF ORIGINAL SIZE

REV	DATE	DESCRIPTION

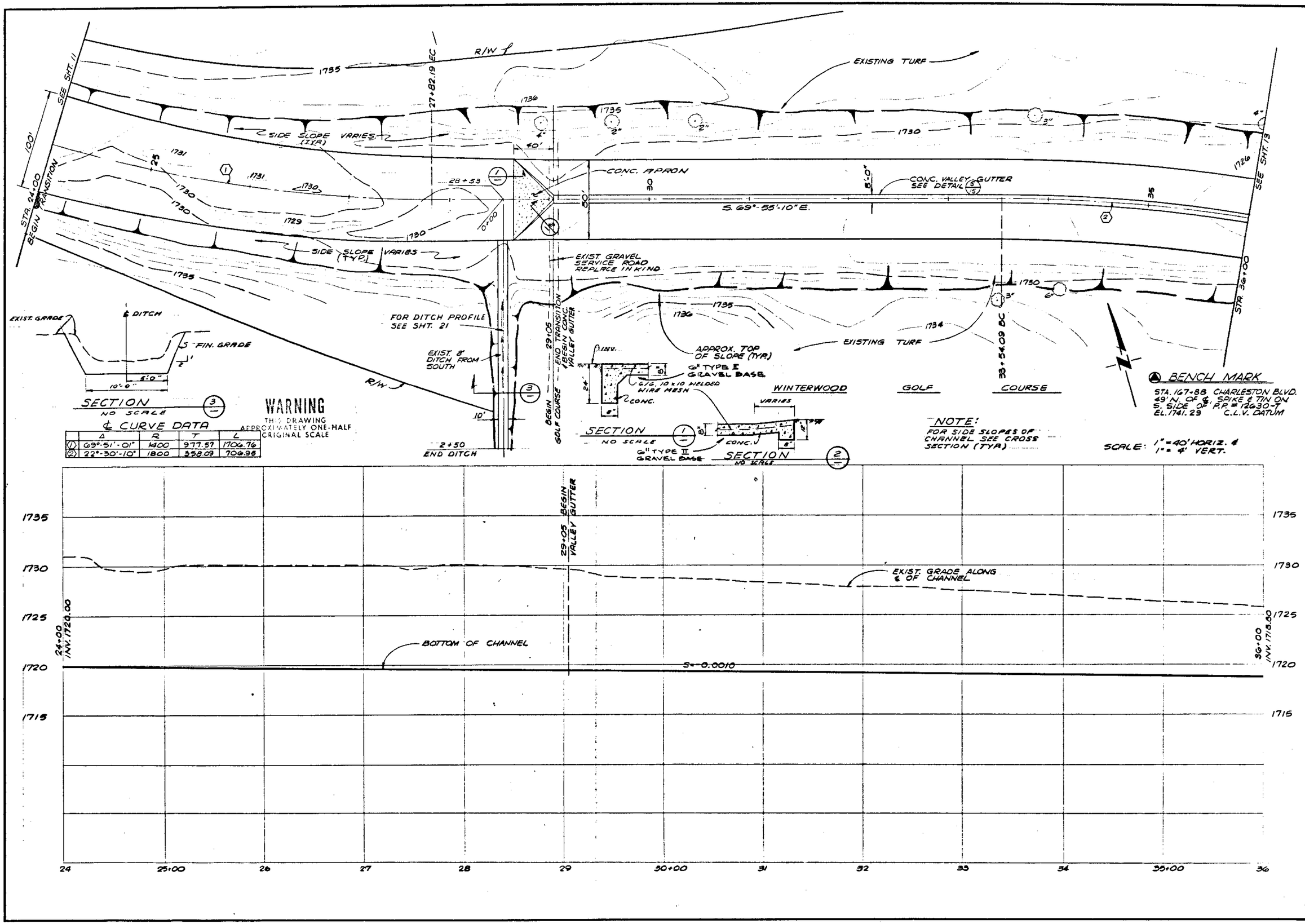
RECOMMENDED G. C. WALLACE R.E. NO. 1815 DATE 11-8-71
MONTGOMERY ENGINEERS OF NEVADA R.E. NO. 2315 DATE 11-8-71

WALLACE - MONTGOMERY, A JOINT VENTURE
MONTGOMERY ENGINEERS OF NEVADA 735-7198
G. C. WALLACE, Consulting Engineer 735-5709
LAS VEGAS, NEVADA

REGIONAL STREET AND HIGHWAY COMMISSION, CLARK CO., NEV.
E. CHARLESTON BLVD. - BRIDGES AND CHANNEL IMPROVEMENTS

CHANNEL PLAN & PROFILE 13+00 TO 24+00

SHEET 11 OF 29 SHEETS



℄ CURVE DATA

	Δ	R	T	L
(1)	69°-51'-01"	1400	977.57	1706.76
(2)	22°-30'-10"	1800	358.09	706.98

REV	DATE	DESCRIPTION

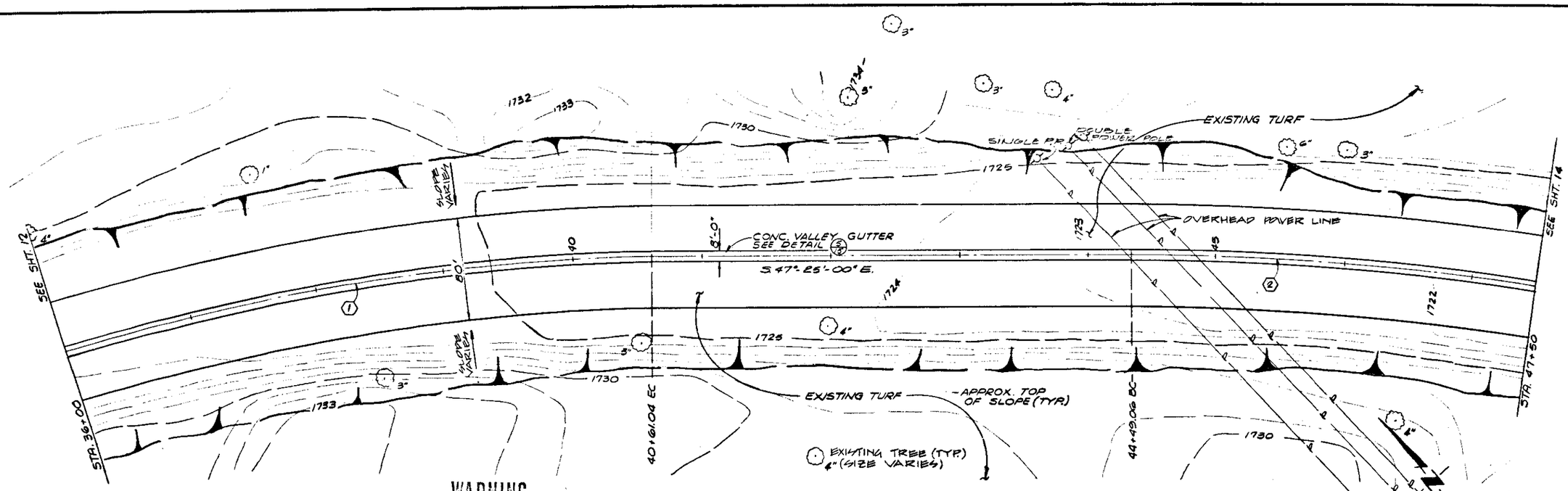
RECOMMENDED G. C. WALLACE 11-8-71 R.E. NO. DATE
APPROVED MONTGOMERY ENGINEERS OF NEVADA 11-8-71 R.E. NO. DATE

WALLACE - MONTGOMERY, A JOINT VENTURE
G. C. WALLACE, Consulting Engineer 735-5709
MONTGOMERY ENGINEERS OF NEVADA 735-7198
LAS VEGAS, NEVADA

REGIONAL STREET AND HIGHWAY COMMISSION, CLARK CO., NEV.
E. CHARLESTON BLVD. - BRIDGES AND CHANNEL IMPROVEMENTS

CHANNEL PLAN & PROFILE 24+00 TO 36+00

SHEET 12 OF 29 SHEETS



WARNING
THIS DRAWING APPROXIMATELY ONE-HALF ORIGINAL SCALE

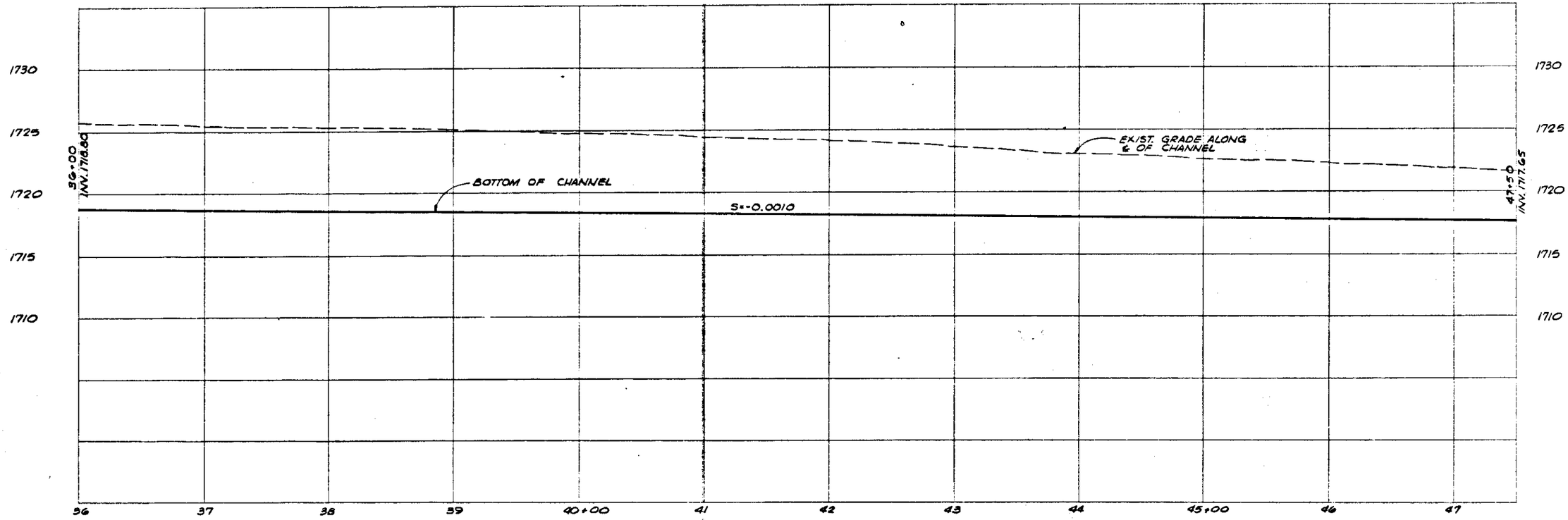
WINTERWOOD GOLF COURSE

BENCH MARK
STA. 167+88 CHARLESTON BLVD. 49' N. OF ℄ SPIKE & TIN ON S. SIDE OF P.P. #12630-T
EL. 1741.29 C.L.V. DATUM

SCALE: 1" = 40' HORIZ. & 1" = 4' VERT.

℄ CURVE DATA

	Δ	R	T	L
(1)	22°-30'-10"	1800'	358.09'	706.95'
(2)	14°-57'-37"	2300'	301.38	600.54'



REV	DATE	DESCRIPTION

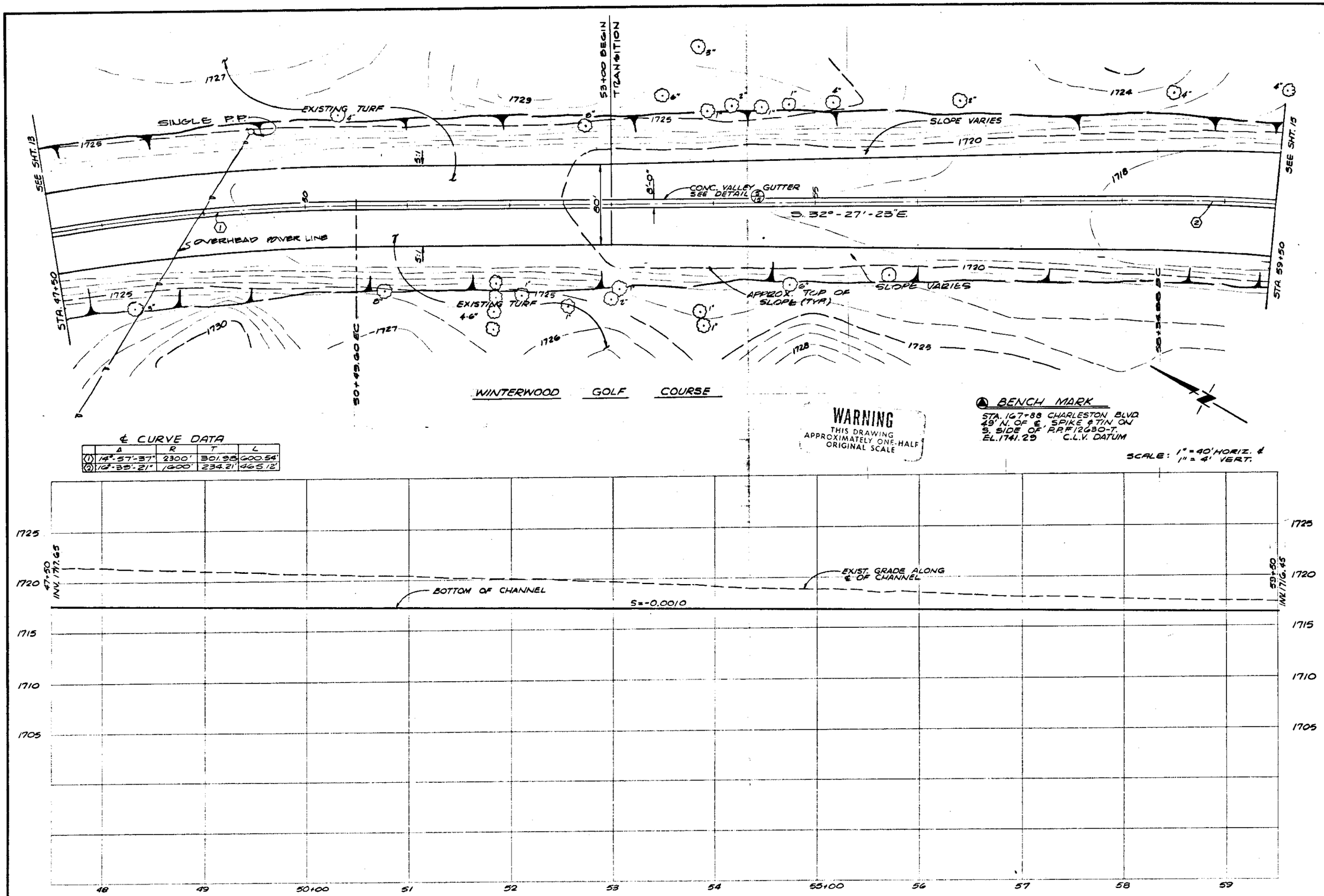
RECOMMENDED G. C. WALLACE — R.E. NO. 4915 — DATE 11-8-71
APPROVED MONTGOMERY ENGINEERS OF NEVADA — R.E. NO. 2315 — DATE 11-8-71

WALLACE - MONTGOMERY, A JOINT VENTURE
G. C. WALLACE, Consulting Engineer 735-5709
MONTGOMERY ENGINEERS OF NEVADA 735-7198
LAS VEGAS, NEVADA

REGIONAL STREET AND HIGHWAY COMMISSION, CLARK CO., NEV.
E. CHARLESTON BLVD. - BRIDGES AND CHANNEL IMPROVEMENTS

CHANNEL PLAN & PROFILE 36+00 TO 47+50

SHEET 13 OF 29 SHEETS



	Δ	R	T	L
(1)	14°-57'-37"	2300'	301.98	600.54'
(2)	16°-39'-21"	1600'	234.21'	465.12'

REV	DATE	DESCRIPTION

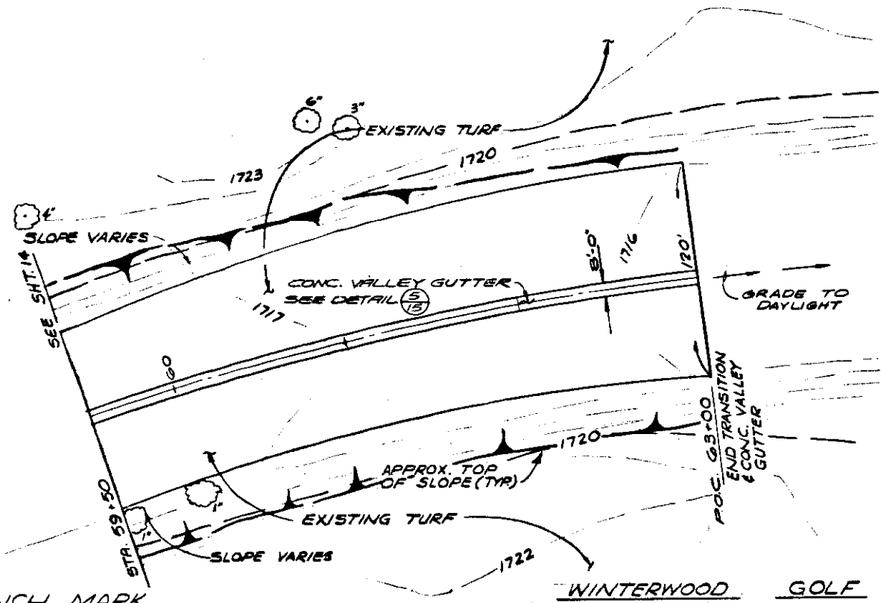
RECOMMENDED G. C. WALLACE R.E. NO. 1895 DATE 1-8-71
APPROVED Edward A. Schwab R.E. NO. 2365 DATE 1-8-71
MONTGOMERY ENGINEERS OF NEVADA

WALLACE - MONTGOMERY, A JOINT VENTURE
G. C. WALLACE, Consulting Engineer 735-5709
MONTGOMERY ENGINEERS OF NEVADA 735-7198
LAS VEGAS, NEVADA

REGIONAL STREET AND HIGHWAY COMMISSION, CLARK CO., NEV.
E. CHARLESTON BLVD. - BRIDGES AND CHANNEL IMPROVEMENTS

CHANNEL PLAN & PROFILE
47+50 TO 59+50

SHEET 14 OF 29 SHEETS



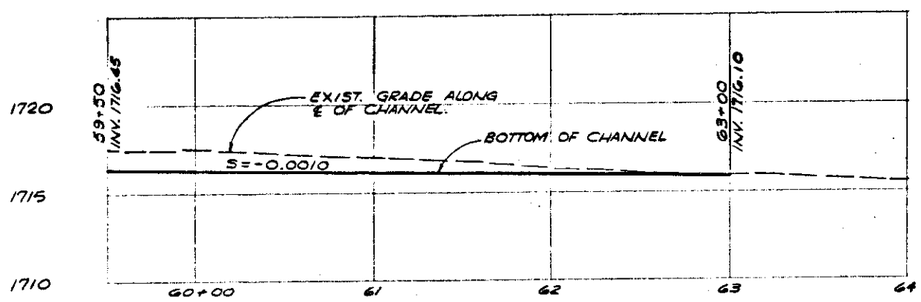
BENCH MARK
STA. 167+88 CHARLESTON BLVD.
49'-N. OF ℄ SPIKE & TIN ON
S. SIDE OF AP #12630-T
EL. 1741.29 C.L.V. DATUM

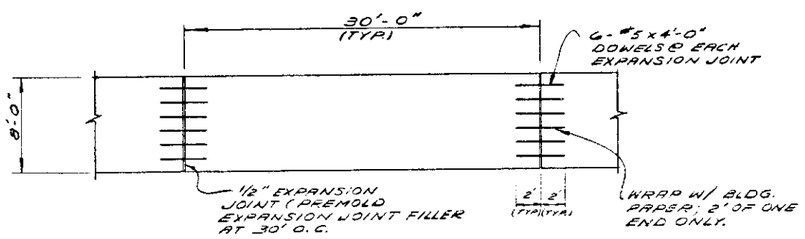
WINTERWOOD GOLF COURSE

SCALE: HORIZ. 1"=40'
VERT. 1"=4'

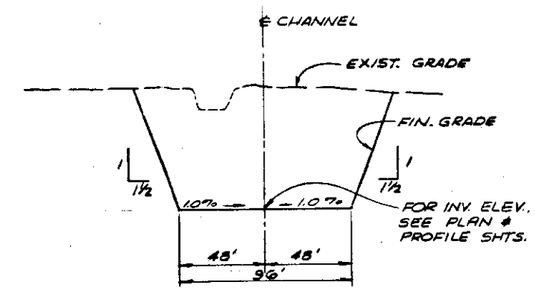
℄ CURVE DATA

	Δ	R.	T.	L.
(1)	16°-39'-21"	1600'	234.21	465.12'

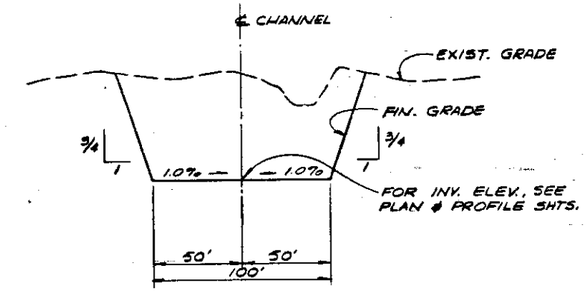




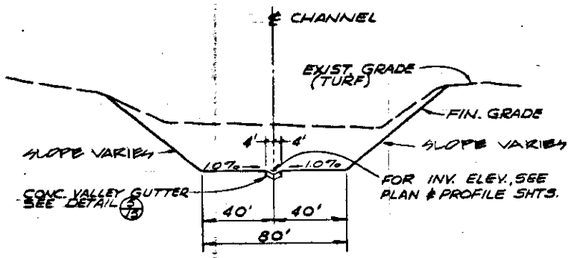
VALLEY GUTTER EXPANSION JOINT DETAIL 6/15
NO SCALE



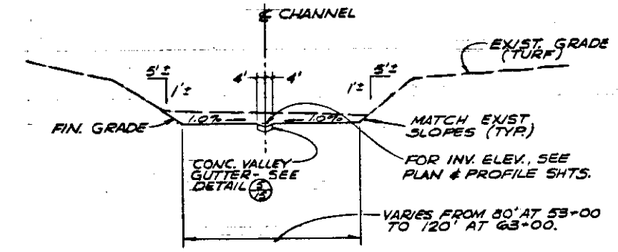
SECTION 1/15
FROM STA. 3+00 TO STA. 21+00



SECTION 2/15
FROM STA. 22+00 TO STA. 24+00



SECTION 3/15
FROM STA. 29+05 TO STA. 53+00

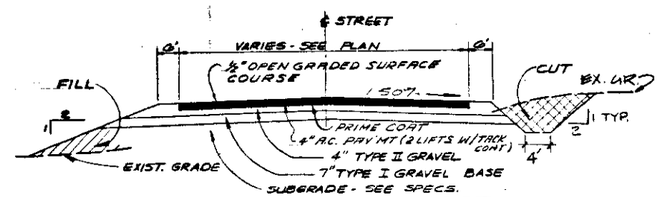


SECTION 4/15
FROM STA. 53+00 TO STA. 63+00

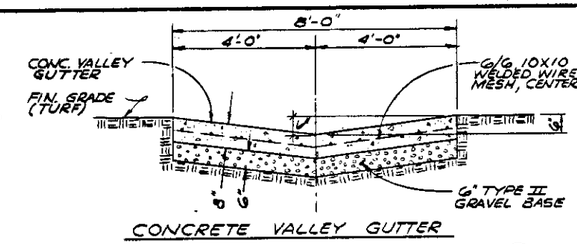
NOTE
FOR TRANSITIONS FROM STA. 21+00 TO STA. 22+00 AND STA. 24+00 TO STA. 29+05 SEE PLANS.

TYPICAL CHANNEL SECTIONS
SCALE: HORIZ. 1"=40'
VERT. 1"=10'

WARNING
THIS DRAWING APPROXIMATELY ONE-HALF ORIGINAL SCALE



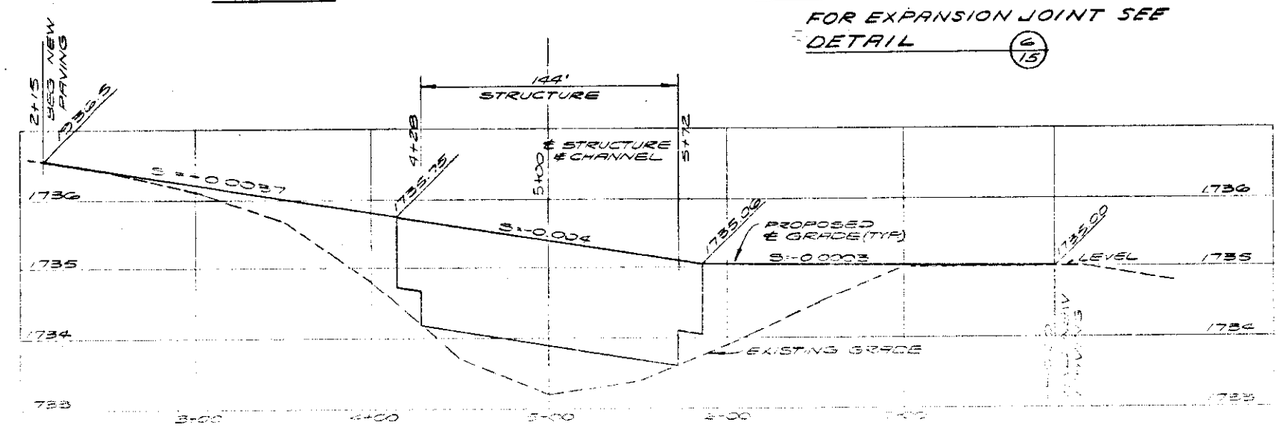
NELLIS BOULEVARD
TYPICAL PAVEMENT SECTION
NO SCALE



CONCRETE VALLEY GUTTER

DETAIL 5/15
SCALE: 1/2"=1'-0"

FOR EXPANSION JOINT SEE DETAIL 6/15



REV	DATE	DESCRIPTION

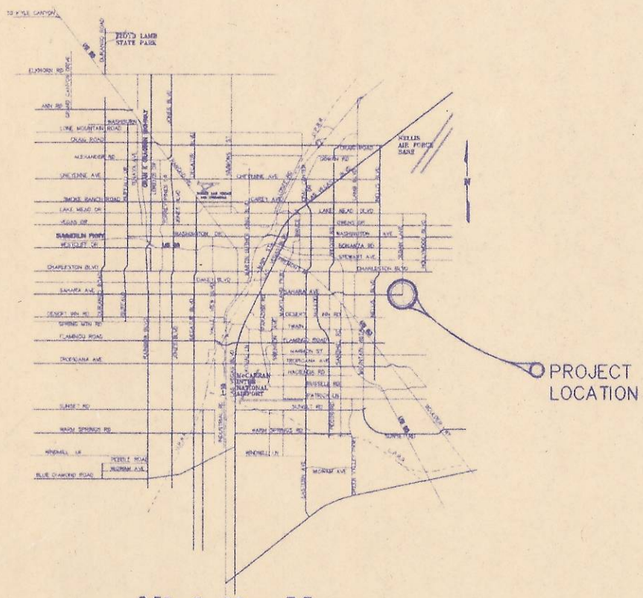
RECOMMENDED G. C. WALLACE R.E. NO. 1815 DATE 11-8-71
APPROVED MONTGOMERY ENGINEERS OF NEVADA R.E. NO. 2315 DATE 11-8-71

WALLACE - MONTGOMERY, A JOINT VENTURE
G. C. WALLACE, Consulting Engineer 735-5709
MONTGOMERY ENGINEERS OF NEVADA 735-7198
LAS VEGAS, NEVADA

REGIONAL STREET AND HIGHWAY COMMISSION, CLARK CO., NEV.
E. CHARLESTON BLVD.-BRIDGES AND CHANNEL IMPROVEMENTS

CHANNEL PLAN & PROFILE
59+50 TO 63+00

DEPARTMENT OF PUBLIC WORKS



Vicinity Map
NOT TO SCALE

CLARK COUNTY NEVADA

"Progress as Promised"

1994
IMPROVEMENT PLANS FOR
S.I.D. 94
SAHARA AVENUE
(ABARTH STREET TO ORCHARD VALLEY DRIVE)

FUNDED BY

CLARK COUNTY 1981 BOND FUNDS
LEWIS PROPERTIES
PACIFIC PROPERTIES/WINTERWOOD LAND DEVELOPMENT
SUNRISE VALLEY ESTATES

County Commissioners

Jay Bingham, Chairman
Don Schlesinger, Vice Chairman
Paul J. Christensen
Thalia M. Dondero
Yvonne Atkinson Gates
Karen Hayes
Bruce L. Woodbury

Director of Public Works

Approved:

M.J. Manning R.P.E. 7299

County Manager

Donald L. Shalmy

AGENCY	PLANS REVIEWED BY	DATE
CENTRAL TELEPHONE COMPANY		
LAS VEGAS VALLEY WATER DISTRICT		
SOUTHWEST GAS COMPANY		
NEVADA POWER COMPANY		
CLARK COUNTY SANITATION DISTRICT		
COMMUNITY CABLE T.V.		
REGIONAL TRANSPORTATION COMMISSION		
C.C. REGIONAL FLOOD CONTROL DISTRICT		

DEPARTMENT OF PUBLIC WORKS	PLANS REVIEWED BY	DATE OF APPROVAL
DEPUTY DIRECTOR FOR PROFESSIONAL SERVICES		
DEPUTY DIRECTOR FOR FIELD OPERATIONS		
COMMUNITY DEVELOPMENT DIVISION		
CONSTRUCTION MANAGEMENT DIVISION		
DESIGN ENGINEERING DIVISION		
MAINTENANCE MANAGEMENT DIVISION		
TRAFFIC MANAGEMENT DIVISION		
COUNTY SURVEYOR'S OFFICE		

REVISIONS

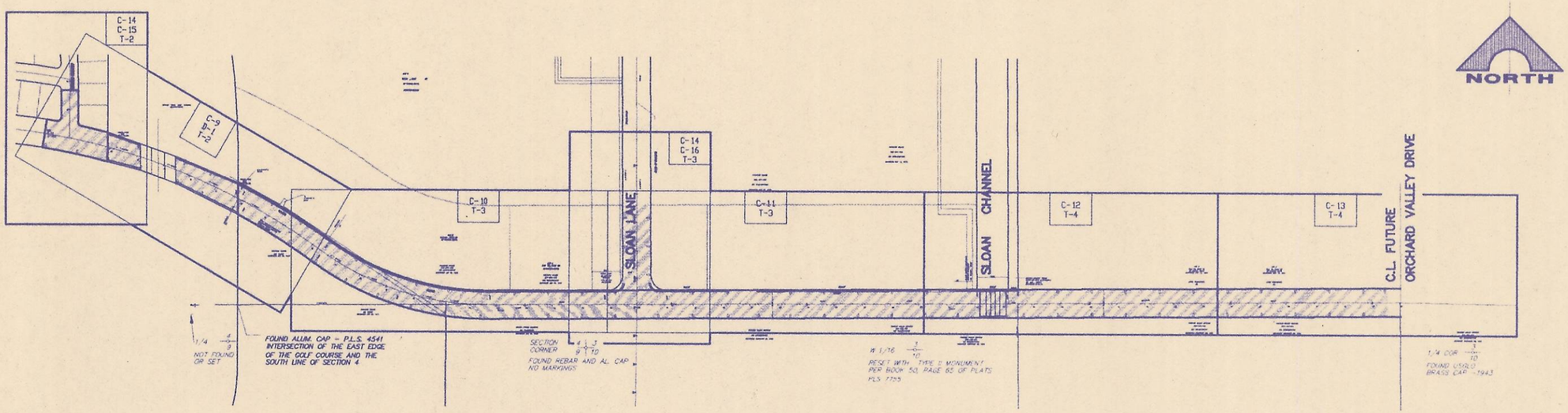
REVISION No.	DESCRIPTION	BY	DATE	APPROVAL	DATE

G.C. WALLACE, INC.
Engineering/Architecture

COVER SHEET

NOTE

C - CIVIL DRAWINGS
D - STORM DRAINAGE DRAWINGS
T - TRAFFIC DRAWINGS



KEY MAP

SCALE: 1"=200'

INDEX OF SHEETS

CIVIL DRAWINGS

SHEET NO.	SHEET DESCRIPTION
C-1	COVER SHEET
C-2	KEY MAP & INDEX OF DRAWINGS
C-3	GENERAL NOTES, LEGEND & ABBREVIATIONS
C-4	ESTIMATE OF QUANTITIES
C-5	MONUMENTATION / CONTROL PLAN
C-6	MONUMENTATION / CONTROL PLAN
C-7	SECTIONS & DETAILS
C-8	DETAILS
C-9	SAHARA AVENUE PLAN & PROFILE (STA. 2+90.00 TO 18+00.00)
C-10	SAHARA AVENUE PLAN & PROFILE (STA. 18+00.00 TO 29+00.00)
C-11	SAHARA AVENUE PLAN & PROFILE (STA. 29+00.00 TO 40+00.00)
C-12	SAHARA AVENUE PLAN & PROFILE (STA. 40+00.00 TO 51+00.00)
C-13	SAHARA AVENUE PLAN & PROFILE (STA. 51+00.00 TO 57+04.06)
C-14	ABARTH STREET & SLOAN LANE PLAN & PROFILE (STA. 5+00 TO 6+66.00 & STA. 29+09.93 TO 32+59.93)
C-15	DETAILED INTERSECTION LAYOUT AND GRADING SAHARA AVENUE ~ ABARTH STREET INTERSECTION
C-16	DETAILED INTERSECTION LAYOUT AND GRADING SAHARA AVENUE ~ SLOAN LANE INTERSECTION
C-17	DESERT ROSE GOLF COURSE CART CROSSING PLAN
C-18	GOLF CART PROFILES

STORM DRAIN DRAWINGS

SHEET NO.	SHEET DESCRIPTION
D-1	ABARTH STREET STORM DRAIN
D-2	LATERALS & PROFILES
D-3	DETAILS

TRAFFIC DRAWINGS

SHEET NO.	SHEET DESCRIPTION
T-1	LIGHTING, SIGNAGE, PAVEMENT MARKINGS, NOTES & LEGEND
T-2	LIGHTING, SIGNAGE & PAVEMENT MARKINGS
T-3	LIGHTING, SIGNAGE & PAVEMENT MARKINGS
T-4	LIGHTING, SIGNAGE & PAVEMENT MARKINGS

BRIDGE DRAWINGS

SHEET NO.	SHEET DESCRIPTION
	LAS VEGAS WASH
B-1	PLAN AND ELEVATION
B-2	GENERAL NOTES, QUANTITIES AND GEOMETRICS
B-3	DECK CONTOURS
B-4	ABUTMENT 1 PLAN AND ELEVATION
B-5	ABUTMENT 2 PLAN AND ELEVATION
B-6	WINGWALL NO.1 AND 2 DETAILS
B-7	WINGWALL NO.3 AND 4 DETAILS
B-8	PIER 1 PLAN AND DETAILS
B-9	PIER 2 PLAN AND DETAILS
B-10	TYPICAL DECK SECTION
B-11	DECK REINFORCING PLAN
B-12	PRESTRESSING AND CAMBER
B-13	APPROACH SLAB PLAN
B-14	CHANNEL LINING DETAILS
B-15	BARRIER RAIL DETAILS

BRIDGE DRAWINGS CONT'D

SHEET NO.	SHEET DESCRIPTION
B-16	PEDESTRIAN RAIL TYPE "V"
B-17	BAR BEND SCHEDULE NO. 1
B-18	BAR BEND SCHEDULE NO. 2
B-19	BAR BEND SCHEDULE NO. 3
B-20	LOG OF BORINGS NO.1
B-21	LOG OF BORINGS NO.2
B-22	RETAINING WALL PLAN
B-23	RETAINING WALL ELEVATION & SECTIONS
	SLOAN CHANNEL
B-24	PLAN AND ELEVATION
B-25	TYPICAL SECTION
B-26	RCB DETAILS NO.1
B-27	RCB DETAILS NO.2 / BAR BEND SCHEDULE
B-28	LOG OF BORINGS
B-29	TUBULAR HAND RAILING

NO. DESCRIPTION DATE
PROGRAMMED P.E. NO. DATE
G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102
CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
SAHARA S.I.D. 94
KEY MAP AND INDEX OF DRAWINGS
SHEET C-2
SHT 2 OF 54
JOB NO. 500.721C
DSK... SA-C2 6/29/94

Avoid cutting underground utility lines. It's costly.

Call before you Dig.

1-800-227-2600

UNDERGROUND SERVICE ALERT (USA)

BENCH MARK

PROJECT BENCH MARK:

SET DRIVE RIVET IN A 2"x2" ALUMINUM PLATE, IN DRILLED HOLE WITH EPOXY GLUE, IN TOP OF CURB, NORTHEAST CORNER OF NELLIS BLVD. & SAHARA AVE. NEAR THE PC OF NELLIS BLVD.

CARK COUNTY B.M. No.	ELEVATION	NAVD 88 ELEVATION
6C124SWS	1728.578 FEET	. METERS

BASIS OF BEARING

SOUTH 89°36'44" WEST BEING THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 3, TOWNSHIP 21 SOUTH, RANGE 62 EAST, M.D.M., AS SHOWN BY A PARCEL MAP ON FILE IN FILE 79, PAGE 9 OF PARCEL MAPS IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA.

ROAD DESIGN CONSTRUCTION NOTES

(SHOWN ON CIVIL DRAWINGS ONLY)

1. CONSTRUCT A.C. PAVEMENT (SEE TYP. SECTION SHT. C-7).
2. CONSTRUCT "L" TYPE CURB & GUTTER (STD. DWG NO. 120).
3. CONSTRUCT 4" THICK CONC. SIDEWALK (STD. DWG NO. 119).
4. CONSTRUCT SIDEWALK RAMP CASE II (USDCCA STD. DWG. NO. 235).
5. CONSTRUCT SIDEWALK RAMP CASE III (USDCCA STD. DWG. NO. 235).
6. CONSTRUCT TEMPORARY A.C. RAMP (SEE DETAIL 2/C-7).
7. CONSTRUCT RESIDENTIAL DRIVEWAY (STD. DWG NO. 114).
8. CONSTRUCT INDUSTRIAL DRIVEWAY (STD. DWG NO. 116).
9. SAWCUT & MATCH EXISTING PAVEMENT (SEE DETAIL 1/C-7).
10. ADJUST EXISTING WATER VALVE BOX & CONSTRUCT CONC. COLLAR (LVVWD STD PLATE NO. 7) WHERE REQUIRED.
11. ADJUST EXISTING UTILITY MANHOLE & CONSTRUCT COLLAR. IF LOCK DOWN COVER EXISTS, REPLACE WITH STANDARD MANHOLE COVER. (STD. DWG. NO. 306).
12. CONSTRUCT 6' CHAIN LINK FENCE
13. CONSTRUCT 9" "L" TYPE CURB & GUTTER (SEE DETAIL 3/C-7).
14. ADJUST WATER METER.
15. ADJUST L.V.V.W.D. BLOWOFF ASSEMBLY
16. CONSTRUCT GOLF CART PATH (SEE DETAIL 4/C-8).
17. CONSTRUCT CONC. BARRIER RAIL W/ 6' CHAIN LINK FENCE (SEE DETAIL 2/C-8).
18. SAWCUT (OR REMOVE TO NEAREST JOINT) AND MATCH EXISTING SIDEWALK AND OR CURB & GUTTER.
19. CONSTRUCT 1' CONC. PEDESTRIAN RAIL W/ 6' CHAIN LINK FENCE (SEE DETAIL 3/C-8).
20. CONSTRUCT CONC. BARRIER RAIL TRANSITION TO PEDESTRIAN RAIL (SEE DETAIL 5/C-8).
21. CONSTRUCT CONC. BARRIER RAIL W/ END ANCHOR & 6' CHAIN LINK FENCE (SEE DETAIL 1/C-8).
22. CONSTRUCT GUARD RAIL (SEE DETAIL 6/C-8).

REMOVAL & RELOCATION CONSTRUCTION NOTES

(SHOWN ON CIVIL DRAWINGS ONLY)

1. REMOVE "L" TYPE CURB AND GUTTER.
2. REMOVE CONCRETE SIDEWALK.
3. REMOVE VALLEY GUTTER.
4. ADJUST VAULT TO NEW FINISH GRADE.
5. REMOVE RESIDENTIAL DRIVEWAY.
6. REMOVE FENCE.
7. RELOCATE UTILITY POLE AND APPURTENANCES (BY OTHERS).
8. REMOVE AND MODIFY LANDSCAPING AND IRRIGATION SYSTEM.
9. REMOVE A.C. PAVEMENT AND GRAVEL BASE.
10. REMOVE BITUMINOUS SURFACE (COLD MILLING).
11. REMOVE SIGN AND SALVAGE.
12. RELOCATE TRAFFIC SIGN (UNLESS OTHERWISE NOTED).
13. REMOVE GOLF CART BRIDGE
14. REMOVE AND SALVAGE FLOOD STAGE GAGE
15. REMOVE GOLF CART PATH
16. REMOVE TREE
17. REMOVE AND SALVAGE STEEL POST AND DOUBLE CHAIN FENCE
18. REMOVE CONCRETE LOW FLOW CHANNEL (SEE SHT. B-14 FOR LIMITS)

NOTE

SEE "T" SHEETS FOR TRAFFIC SIGNS, MARKINGS AND SIGNAL MODIFICATIONS.

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS FOR THIS PROJECT SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION", CLARK COUNTY AREA, NEVADA THIRD ADDITION, AND THE DEPARTMENT OF PUBLIC WORKS CLARK COUNTY, NEVADA, "IMPROVEMENT STANDARDS 1983" REVISED MAY 1990, UNLESS OTHERWISE SPECIFIED BY NOTE ON THE PLANS AND/OR SPECIAL PROVISIONS.
2. 48 HOURS PRIOR TO START OF CONSTRUCTION, THE CONTRACTOR SHALL SHALL CONTACT

NEVADA POWER COMPANY	PHONE	1-800-227-2600
CENTRAL TELEPHONE COMPANY	PHONE	1-800-227-2600
SOUTHWEST GAS CORPORATION	PHONE	1-800-227-2600
COMMUNITY CABLE T.V.	PHONE	385-3644
LAS VEGAS VALLEY WATER DIST.	PHONE	870-4194

3. LOCATIONS OF UNDERGROUND UTILITIES SHOWN ON THE DRAWINGS WERE OBTAINED FROM INFORMATION RECEIVED FROM THE APPLICABLE UTILITY CO'S. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBLITY FOR UTILITIES OR STRUCTURES NOT SHOWN, OR FOR UTILITIES OR STRUCTURES NOT SHOWN AT ACTUAL LOCATIONS ON THE DRAWINGS.
CONTRACTOR TO VERIFY THE EXACT LOCATION OF UTILITIES PRIOR TO START OF CONSTRUCTION. THE CONTRACTOR'S RESPONSIBLITY REGARDING UTILITIES SHALL BE AS REQUIRED UNDER SECTION 107.17 OF THE UNIFORM STANDARD SPECIFICATIONS FOR CLARK COUNTY AREA, NEVADA AND AS PROVIDED IN THE SPECIFICATIONS.
4. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING IMPROVEMENTS, WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTORS OPERATIONS SHALL BE REPAIRED OR RECONSTRUCTED TO THE SATISFACTION OF THE ENGINEER AT THE EXPENSE OF THE CONTRACTOR.
5. THE CONTRACTOR SHALL NOT REMOVE TREES, SHRUBS, LAWNS, WALLS, FENCES, SIGNS, STRUCTURES, LIGHTS, OR ANY EXISTING IMPROVEMENTS OUTSIDE OF STREET RIGHT-OF-WAY, EXCEPT WHERE REQUIRED TO DO SO BY THE CONTRACT DRAWINGS OR BY THE ENGINEER.
6. TREES, SHRUBS, LAWNS, WALLS, FENCES, SIGNS, STRUCTURES, LIGHTS AND OTHER EXISTING IMPROVEMENTS WITHIN STREET RIGHT-OF-WAY SHALL BE REMOVED WHERE SHOWN ON THE CONTRACT DRAWINGS, AND AS REQUIRED BY THE ENGINEER.
7. REPLACEMENT, RELOCATION OR RECONSTRUCTION OF ALL EXISTING IMPROVEMENTS INCLUDING SPRINKLER SYSTEMS, LAWNS, FENCES, WALLS, SIGNS, STEPS, SIDEWALKS, DRIVEWAYS, LAWN LIGHTS, AND ALL OTHER ITEMS APPLICABLE TO THIS CONTRACT SHALL BE AS REQUIRED BY THE ENGINEER.
8. THE CONTRACTOR SHALL BACKFILL AND FINE GRADE ALL CUT OR FILL SLOPES TO MATCH EXISTING CONDITIONS TO THE SATISFACTION OF THE ENGINEER, WHERE EXISTING LAWNS ARE DAMAGED BY THE CONTRACTOR'S OPERATIONS, THE CONTRACTOR SHALL RE-SEED AND/OR SOD THE AFFECTED AREA TO A CONDITION EQUAL TO, OR BETTER THAN THAT WHICH EXISTED PRIOR TO CONSTRUCTION.
9. ALL BARRICADING AND TEMPORARY TRAFFIC CONTROL DEVICES OR METHODS USED DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE "NEVADA TRAFFIC CONTROL MANUAL", 1986, PUBLISHED BY THE STATE OF NEVADA, DEPARTMENT OF HIGHWAYS, EXCEPT AS OTHERWISE PROVIDED IN THE CONTRACT SPECIFICATIONS OR AS REQUIRED BY THE ENGINEER.
10. WITHIN 21 DAYS AFTER PROJECT AWARD, THE CONTRACTOR SHALL FURNISH, FOR APPROVAL, A TRAFFIC BARRICADING PLAN AND THE METHOD OF MAINTAINING PUBLIC CONVEYANCE AND SAFETY THROUGHOUT THE CONSTRUCTION AREA. TRAFFIC BARRICADING PLANS SHALL COMPLY WITH APPLICABLE PORTIONS OF SECTIONS 624 AND 625 OF THE STANDARD SPECIFICATIONS, THE TRAFFIC CONTROL MANUAL AND THE CONTRACT SPECIAL PROVISIONS.
11. REMOVAL OR RELOCATIONS OF POWER POLES, TELEPHONE POLES, JOINTLY-OWNED POLES, AND APPURTENANCES WHICH INTERFERE WITH IMPROVEMENTS REQUIRED TO BE CONSTRUCTED UNDER THIS CONTRACT, SHALL BE THE RESPONSIBILITY OF THE RESPECTIVE UTILITY COMPANY.
12. UNLESS OTHERWISE SHOWN ON THE CONTRACT DRAWINGS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OR RELOCATION OF ALL WATER SERVICES AND METERS WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE VERTICAL ADJUSTMENT OF ALL EXISTING SANITARY, WATER AND STORM SEWER MANHOLES TO THE FINAL FINISH GRADES IN ACCORDANCE WITH SECTION 609 OF THE "STARDARD SPECIFICATIONS".
14. SPRINT CENTRAL TELEPHONE COMPANY SHALL BE RESPONSIBLE FOR THE VERTICAL OR HORIZONTAL ADJUSTMENT OF ALL TELEPHONE FACILITIES WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
15. THE SOUTHWEST GAS CORPORATION SHALL BE REPONSIBLE FOR THE REMOVAL OR RELOCATION OF ALL GAS LINES AND APPURTENANCES WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
16. ALL EXISTING TRAFFIC SIGNS, STREET LIGHTS & SIGNS TO BE REMOVED SHALL BE SALVAGED BY THE CONTRACTOR AND DELIVERED TO THE CLARK COUNTY TRAFFIC MANAGEMENT DIVISION LOCATED AT 5821 E. FLAMINGO ROAD, LAS VEGAS, NEVADA.
17. EXACT LOCATION OF ALL SAWCUTS SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.
18. ALL SANITARY SEWER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CLARK COUNTY SANITATION DISTRICT DESIGN AND CONSTRUCTION STANDARDS.
19. THE PLANS DO NOT SHOW ALL SEWER LATERALS, SEWER FORCE MAINS AND WATER SERVICE LATERALS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY REPAIRS OR RELOCATIONS OF LATERALS BROKEN OR IN CONFLICT WITH THE PROPOSED STORM DRAIN OR ROADWAY CONSTRUCTION.

LEGEND

- 10+00 — CONTROL LINE
- CENTERLINE
- EASEMENT LINE
- PROPOSED PROPERTY OR RIGHT-OF-WAY LINE
- EXISTING PROPERTY LINE
- GRADE BREAK
- UT — EXISTING UNDERGROUND TELEPHONE CABLE
- OHT — EXISTING OVERHEAD TELEPHONE CABLE
- S — EXISTING SANITARY SEWER LINE
- W — EXISTING WATER LINE
- PROPOSED STORM DRAIN LINE
- SD — EXISTING STORM DRAIN LINE
- UP — EXISTING UNDERGROUND POWER LINE
- OHP — EXISTING OVERHEAD POWER LINE
- G — EXISTING GAS LINE
- 1875 — EXISTING CONTOUR (CONTOUR INTERVAL 1')
- EXISTING CURB & GUTTER
- EXISTING EDGE OF ASPHALT CONC. PAVING
- EXISTING FENCE (TYPE DELINEATED ON DRAWINGS)
- MH — EXISTING MANHOLE OR VAULT
- EXISTING VALVE (GAS OR WATER)
- FH — EXISTING FIRE HYDRANT-PUBLIC
- FH — PROPOSED FIRE HYDRANT-PUBLIC
- PROPOSED STORM DRAIN INLET
- EXISTING STORM DRAIN INLET
- PP — PROPOSED POWER OR TELEPHONE POLE
- PP — EXISTING POWER OR TELEPHONE POLE
- 10.00 — DESIGN ELEVATION
- (10.00) — EXISTING ELEVATION
- POTHOLE EXCAVATION
- EXISTING STREET LIGHT
- EXISTING WATER METER
- EXISTING STREET SIGN
- (1) — CURVE NUMBER SYMBOL
- PROPOSED ASPHALT SAWCUT LINE

ABBREVIATIONS

AC	ASPHALTIC CONCRETE PAVEMENT	PRC	POINT OF REVERSE CURVE
BC	BACK OF CURB	PVC	POINT OF CURVATURE OF VERTICAL CURVE
BCR	BEGIN CURB RETURN	PVI	POINT OF INTERSECTION OF VERTICAL CURVE
BVC	BEGIN VERTICAL CURVE	PVT	POINT OF TANGENCY OF VERTICAL CURVE
CATV	UNDERGROUND CABLE TV	R	RADIUS OR RADIAL
CG	CURB & GUTTER	RCB	REINFORCED CONCRETE BOX
CONST	CONSTRUCTION	SD	STORM DRAIN
DI	DROP INLET	S	SEWER OR SLOPE
EP	EDGE OF EXISTING PAVEMENT	SMH	SEWER MANHOLE
EVC	END VERTICAL CURVE	SPECS	SPECIFICATIONS
EX OR EXIST	EXISTING	STA	STATION
FG	FINISHED GRADE	SW	SIDEWALK
FL	FLOW LINE	TC	TOP OF CURB
G	GAS	TG	TOP OF GRATE
GB	GRADE BREAK	TMH	TOP OF MANHOLE
GRND	GROUND	TOV	TOP OF VAULT SLAB
GWA	GUY WIRE ANCHOR	TRW	TOP OF RETAINING WALL
INV	INVERT	TV	UNDERGROUND CABLE TV
LOC	LENGTH OF CURVE	UP	UNDERGROUND POWER
MH	MANHOLE	USDCCA	UNIFORM STD. DWGS. CLARK COUNTY AREA
OHP	OVERHEAD POWER	UT	UNDERGROUND TELEPHONE
PAVE	PAVEMENT	VC	VERTICAL CURVE
PB	PULL BOX	VG	VALLEY GUTTER
PCC	POINT OF COMPOUND CURVE OR PORTLAND CEMENT CONCRETE	WV	WATER VALVE
PI	POINT OF INTERSECTION		

JOB NO. 500.721C

DISK... SA_C3 6/29/94

REV | DATE | DESCRIPTION

RECOMMENDED

DAVID P.N. HUCKLE — 5256 P.E. NO. — DATE

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

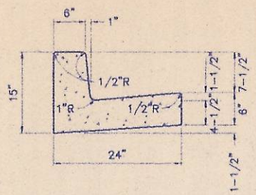
CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

SAHARA AVENUE S.I.D. 94

GENERAL NOTES, LEGEND, & ABBREVIATIONS

SHEET C-3

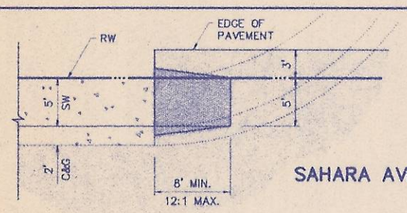
SHT 3 OF 54



9" "L" TYPE CURB & GUTTER DETAIL

NOT TO SCALE

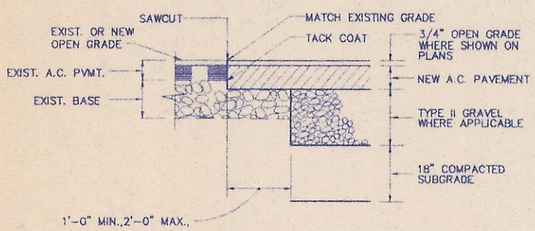
3 / C-7



TEMPORARY A.C. RAMP DETAIL

NOT TO SCALE

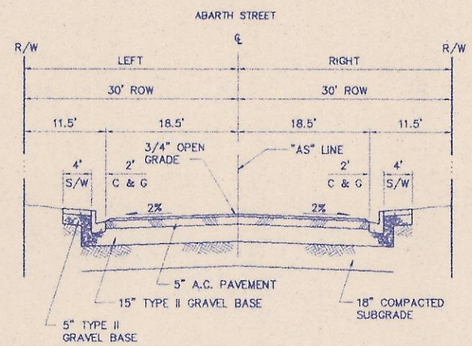
2 / C-7



MATCH EXISTING PAVEMENT DETAIL

NOT TO SCALE

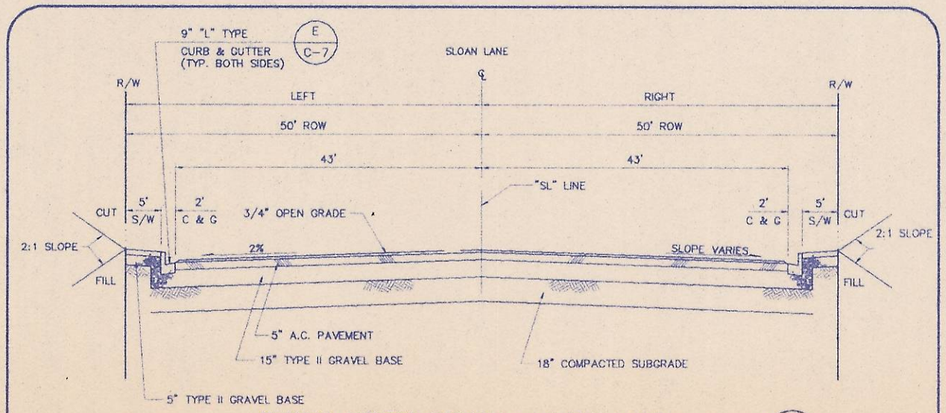
1 / C-7



TYPICAL STREET SECTION ~ ABARTH STREET

NOT TO SCALE

B / C-7



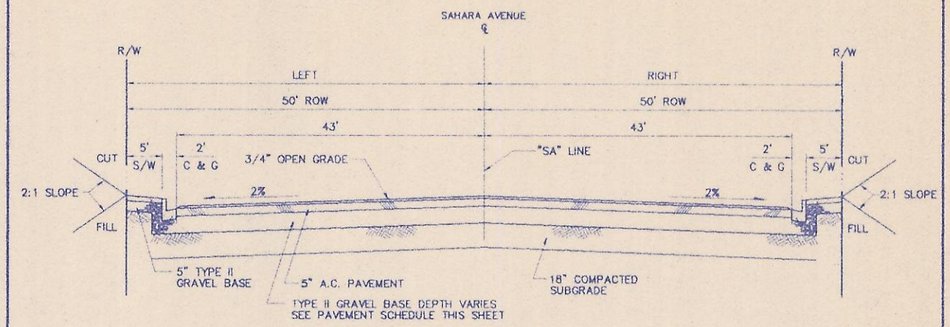
TYPICAL STREET SECTION ~ SLOAN LANE

NOT TO SCALE

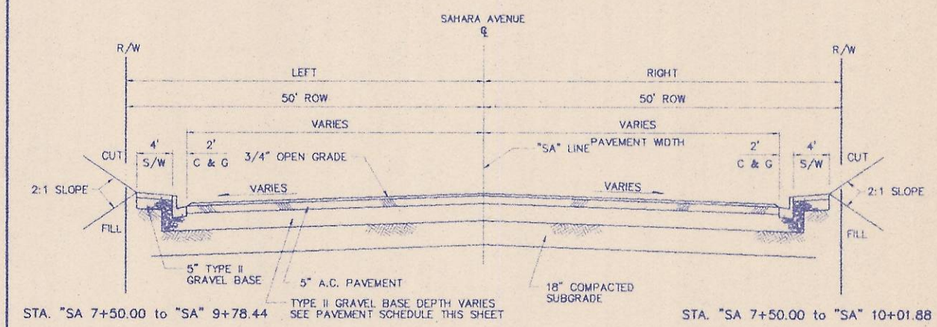
C / C-7

SAHARA AVENUE PAVEMENT SCHEDULE

STATION	LEFT OF PROFILE LINE: OPEN GRADE	AC PAVE.	TYPE II GRAVEL BASE	COMP. SUB-GRADE	RIGHT OF PROFILE LINE: OPEN GRADE	AC PAVE.	TYPE II GRAVEL BASE	COMP. SUB-GRADE
"SA" 2+90 TO "SA" 5+42	–	–	–	–	3/4-INCH	–	–	–
"SA" 5+42 TO "SA" 7+50	3/4-INCH	–	–	–	3/4-INCH	–	–	–
"SA" 7+50 TO "SA" 30+75.10	3/4-INCH	5"	15"	18"	3/4-INCH	5"	15"	18"
"SA" 30+75.10 TO "SA" 42+20.59	3/4-INCH	5"	13"	18"	3/4-INCH	5"	13"	18"
"SA" 43+06.04 TO "SA" 56+59	3/4-INCH	5"	13"	18"	3/4-INCH	5"	13"	18"

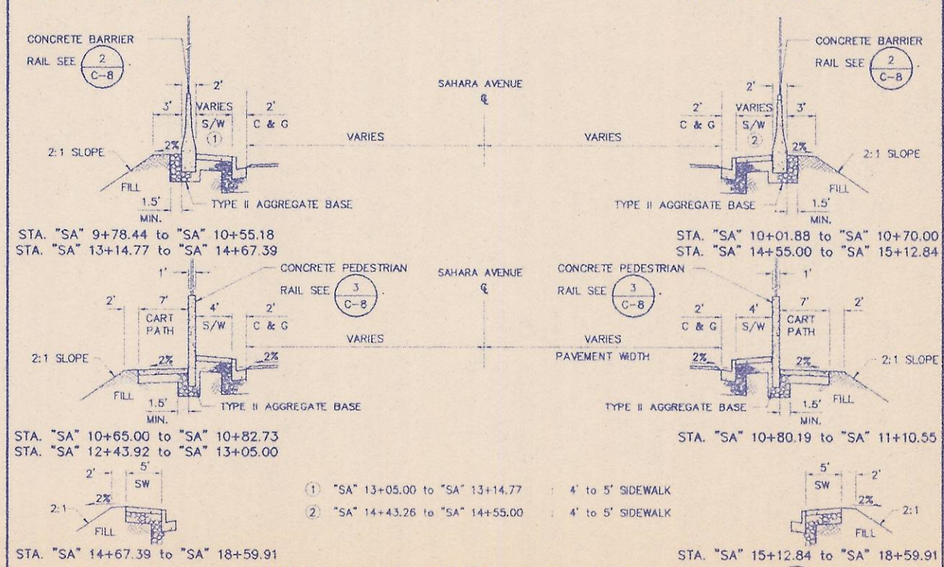


STA. "SA" 18+59.91 to "SA" 56+49.01



STA. "SA 7+50.00 to "SA" 9+78.44

STA. "SA 7+50.00 to "SA" 10+01.88



STA. "SA" 9+78.44 to "SA" 10+55.18
STA. "SA" 13+14.77 to "SA" 14+67.39

STA. "SA" 10+01.88 to "SA" 10+70.00
STA. "SA" 14+55.00 to "SA" 15+12.84

STA. "SA" 10+65.00 to "SA" 10+82.73
STA. "SA" 12+43.92 to "SA" 13+05.00

STA. "SA" 10+80.19 to "SA" 11+10.55

1 "SA" 13+05.00 to "SA" 13+14.77 : 4' to 5' SIDEWALK
2 "SA" 14+43.26 to "SA" 14+55.00 : 4' to 5' SIDEWALK

STA. "SA" 14+67.39 to "SA" 18+59.91

STA. "SA" 15+12.84 to "SA" 18+59.91

TYPICAL STREET SECTION ~ SAHARA AVENUE

STA. "SA" 7+50.00 TO "SA" 56+49.01

NOT TO SCALE

A / C-7

RECOMMENDED: DIRECTOR, PUBLIC WORKS — DATE

REV. | DATE | DESCRIPTION

G.C. WALLACE, INC.
Engineering/Architecture
1551 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

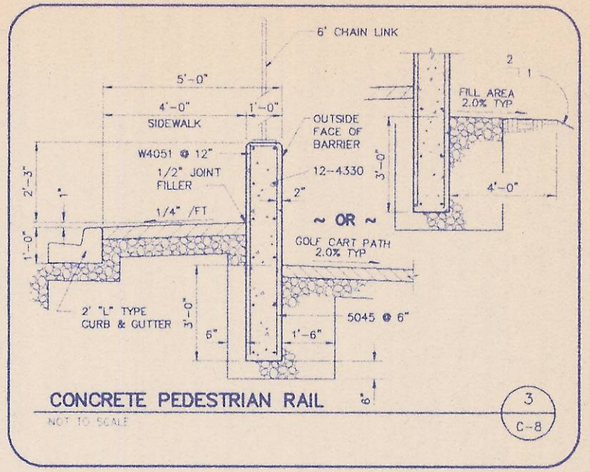
CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
SECTIONS & DETAILS

SHEET C-7

SHT 7 OF 54

JOB NO. 500-721C

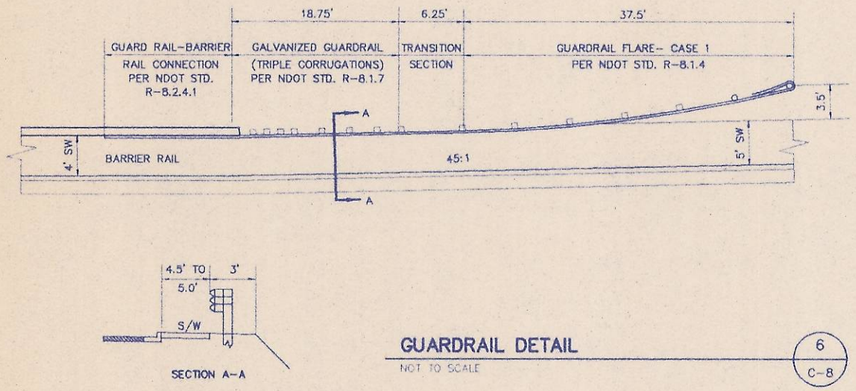
DSK... SA-C7 6/27/94



CONCRETE PEDESTRIAN RAIL

NOT TO SCALE

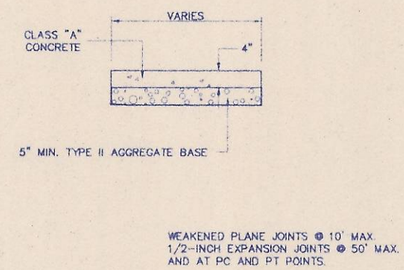
3 / C-8



GUARDRAIL DETAIL

NOT TO SCALE

6 / C-8

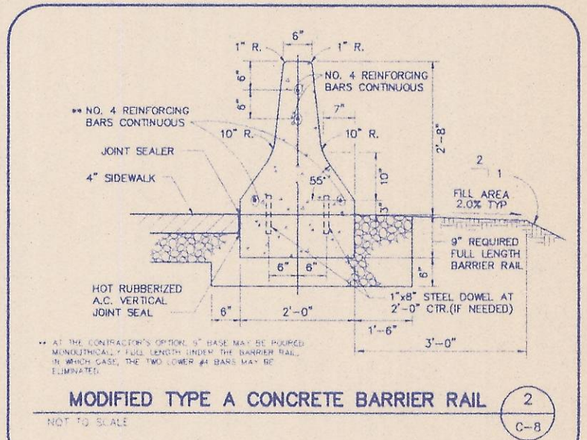


GOLF CART PATH DETAIL

NOT TO SCALE

4 / C-8

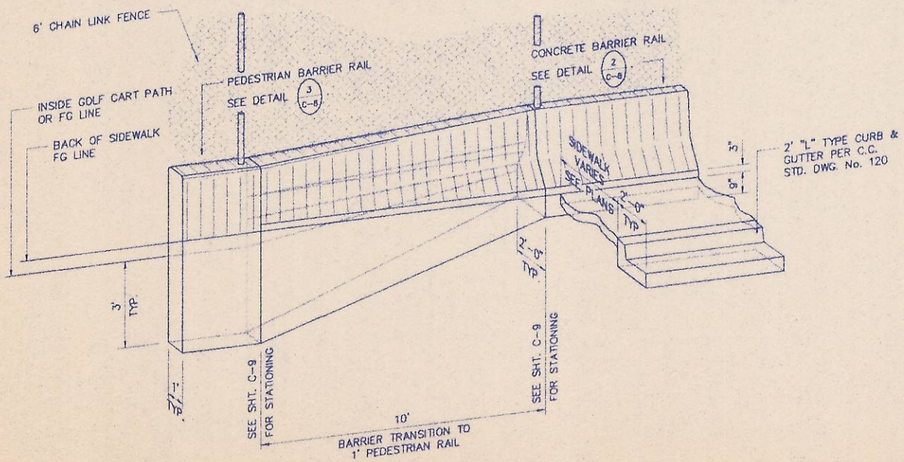
SEE SHEET C-17 & C-18



MODIFIED TYPE A CONCRETE BARRIER RAIL

NOT TO SCALE

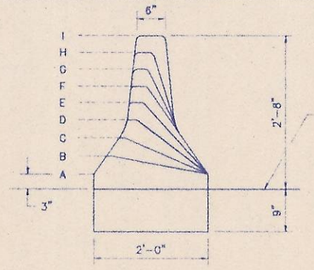
2 / C-8



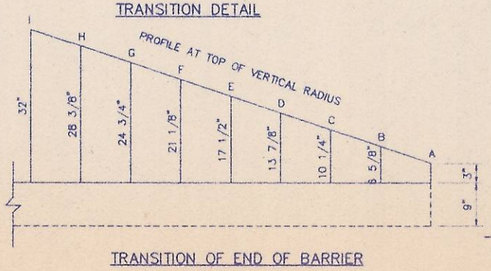
TRANSITION FROM BARRIER RAIL TO PEDESTRIAN WALL

NOT TO SCALE

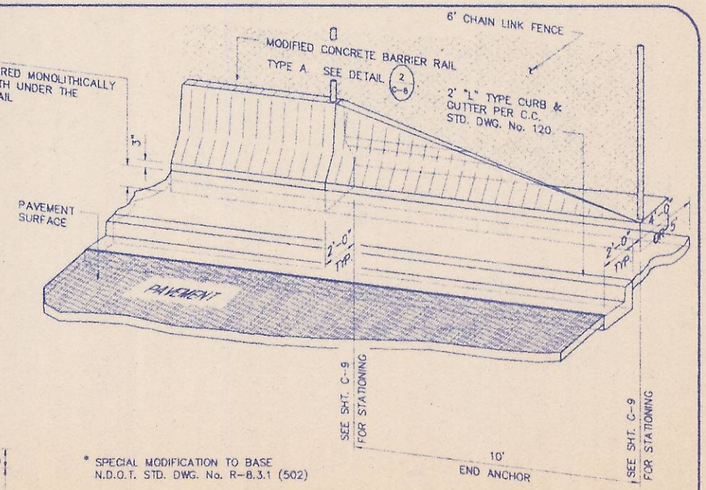
5 / C-8



TRANSITION DETAIL



TRANSITION OF END OF BARRIER



BARRIER RAIL W/ END ANCHOR & 6' CHAIN LINK FENCE

NOT TO SCALE

1 / C-8

RECOMMENDED: DAVID R. N. WALLACE

NO.	DATE	DESCRIPTION

1256 P.E. NO. 3-4-98

G.C. WALLACE, INC.
Engineering/Architecture
555 SOUTH BANNOCK BLVD. LAS VEGAS, NEVADA 89101

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
DETAILS

SHEET C-8

SHT 8 OF 54

JOB NO. 500.721C

DGN.... SA-08 6/27/94

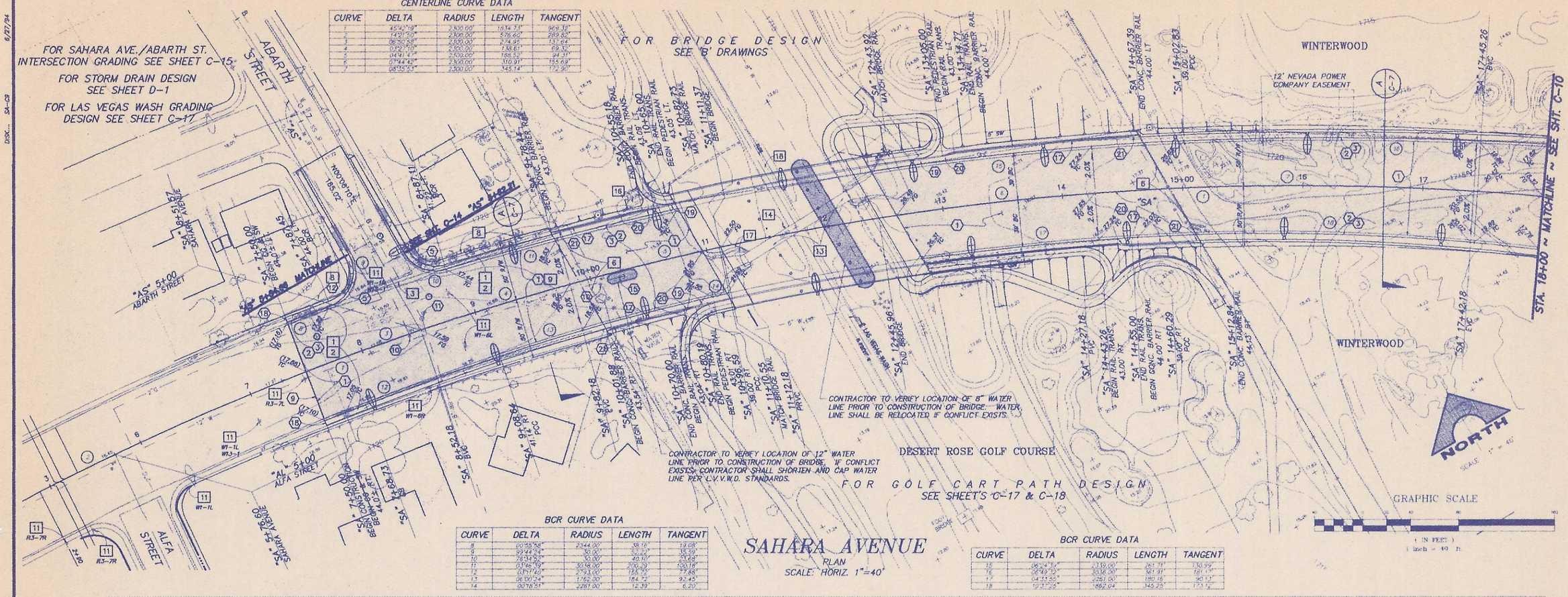
FOR SAHARA AVE./ABARTH ST. INTERSECTION GRADING SEE SHEET C-15

FOR STORM DRAIN DESIGN SEE SHEET D-1

FOR LAS VEGAS WASH GRADING DESIGN SEE SHEET C-17

CENTERLINE CURVE DATA

CURVE	DELTA	RADIUS	LENGTH	TANGENT
1	45°40'19"	2,300.00'	1814.73'	969.32'
2	14°21'09"	2,300.00'	576.60'	289.82'
3	06°50'58"	2,300.00'	274.95'	137.64'
4	03°22'10"	2,300.00'	138.61'	69.32'
5	04°41'41"	2,300.00'	188.32'	94.21'
6	07°44'42"	2,300.00'	310.91'	155.69'
7	08°35'23"	2,300.00'	345.14'	172.90'



BCR CURVE DATA

CURVE	DELTA	RADIUS	LENGTH	TANGENT
8	00°55'58"	2344.00'	38.16'	19.08'
9	99°44'24"	30.00'	52.21'	35.39'
10	76°34'52"	30.00'	40.10'	23.69'
11	03°46'39"	3038.00'	200.29'	100.18'
12	03°11'40"	2793.00'	155.22'	77.68'
13	06°00'24"	1762.00'	184.72'	92.45'
14	00°18'51"	2261.00'	12.39'	6.20'

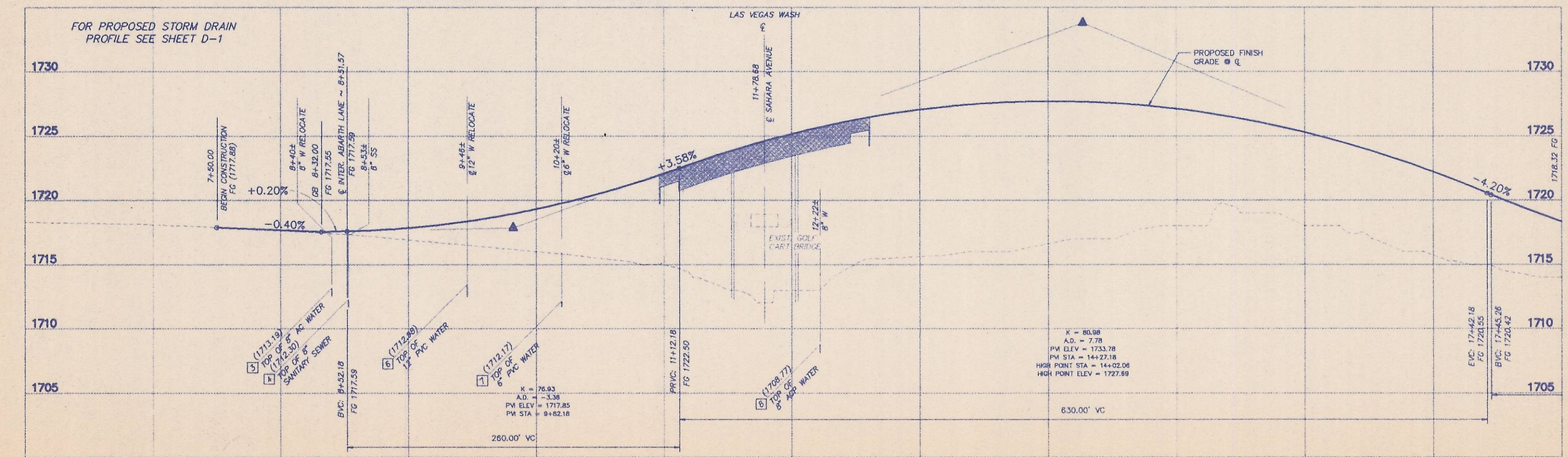
SAHARA AVENUE

PLAN

SCALE: HORIZ. 1"=40'

BCR CURVE DATA

CURVE	DELTA	RADIUS	LENGTH	TANGENT
15	06°24'39"	2339.00'	261.71'	130.99'
16	06°49'13"	3038.00'	361.91'	181.13'
17	04°13'55"	2251.00'	180.16'	90.13'
18	19°17'56"	1862.04'	345.25'	173.12'



PROFILE

SCALE: HORIZ. 1"=40', VERT. 1"=4'

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

SAHARA AVENUE S.I.D. 94

SAHARA AVENUE

STA. 5+50.00 TO STA. 18+00.00

SHEET C-9

SHT 9 OF 54

JOB NO. 500.721C

DISK SA-09 6/27/94

GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

FOR BRIDGE DESIGN
SEE 'B' DRAWINGS

"CP1" 0+70.60
MATCH EXIST. CART PATH

"CP1" 0+59.11
PRC

"CP1" 0+37.57
PRC

"CP2" 0+80.00
MATCH EXIST. CART PATH

"CP2" 0+53.03
PCC

"CP3" 1+51.85
PC

"CP3" 1+51.85 =
"CP3-A" 0+00.00
3.00' RT.

"CP3-A" 0+08.47
3.00' RT.
PCC

"CP3-A" 0+50.39
MATCH EXIST. CART PATH

"CP3-A" 0+31.52
PT

"CP3" 0+92.97
PT

"CP3" 1+82.11
PT

"CP4" 3+49.41
PT

"CP4" 3+32.40
PRC

"CP4" 3+19.84
PC

"CP4" 2+83.84 =
"CP4-B" 0+00.00
3.00' LT.

"CP4" 2+83.84
PT

"CP4" 2+83.84
PT

"CP4" 2+83.84
MATCH EXIST. CART PATH

"CP4" 2+54.95
PC

"CP4" 2+00.52
PT

"CP4" 1+78.96 =
"CP4-A" 0+00.00
3.00' LT.

"CP4-A" 0+22.49
PC

"CP4-A" 1+04.62
PT

"CP4-A" 1+22.10
MATCH EXIST. CART PATH

"SA" 10+80.23 =
"CP2" 0+01.13
17.50' LT.
PRC

"SA" 10+86.22 =
"CP2" 0+00.00
17.50' LT.
PC

"SA" 12+42.18 =
"CP3" 0+00.00
17.50' LT.
PC

"SA" 12+87.84 =
"CP3-A" 0+46.60
17.50' LT.
PRC

"SA" 12+80.63 =
"CP4" 0+00.00
17.50' RT.
PC

"SA" 12+40.34 =
"CP3" 2+47.34 =
"CP4" 4+01.77
INTERSECTION

"SA" 14+13.27 =
"CP4" 1+29.91
17.50' RT.
PT

STA: 2+47.3351
OFFSET: 0.0000' R

NORTH

DESERT ROSE GOLF COURSE

GOLF CART CENTERLINE CURVE DATA

CURVE	DELTA	RADIUS	LENGTH	TANGENT
1	00°01'39"	3147.50'	1.13	0.56
2	9°08'41"	21.50	34.44	24.35
3	15°19'50"	60.00'	31.44	11.12
4	06°14'28"	104.00'	10.89	5.45
5	00°25'10"	3147.50'	16.45	8.24
6	6°48'43"	50.00'	5.94	2.97
7	23°47'17"	50.00'	20.75	10.54
8	11°09'18"	234.50'	45.60	23.30
9	189°01'26"	21.50'	70.94	291.00

GOLF CART CENTERLINE CURVE DATA

CURVE	DELTA	RADIUS	LENGTH	TANGENT
10	115°34'4"	15.00'	30.26	23.81
11	132°51'10"	15.00'	34.79	22.49
12	3°25'41"	2482.50'	148.91	74.47
13	12°37'16"	50.00'	110.17	55.24
14	9°00'00"	50.00'	7.85	3.93
15	3°35'24"	50.00'	3.13	1.57
16	8°54'36"	50.00'	7.78	3.89
17	28°25'0"	50.00'	24.79	12.67
18	62°33'12"	50.00'	55.59	31.12

FOR SAHARA AVENUE DESIGN
THRU DESERT ROSE GOLF COURSE
SEE SHEET C-9

FOR DESERT ROSE GOLF COURSE
CART CROSSING PROFILE AND DETAILS
SEE SHEET C-18

CART PATH CROSSING

PLAN
SCALE: HORIZ. 1"=20'

JOB NO. 500.721C

DSK... SA-017 6/28/94

REV	DATE	DESCRIPTION

RECOMMENDED: DAVID P. N. VIDGILE

DATE: 5/26

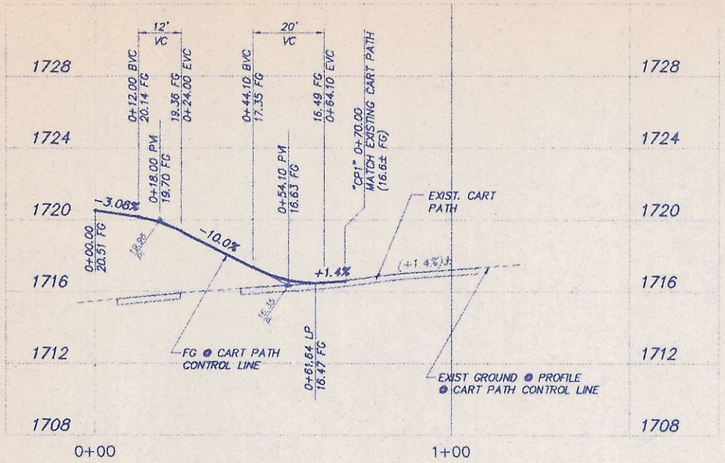
P.E. NO.

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
DESERT ROSE GOLF COURSE
CART CROSSING PLAN

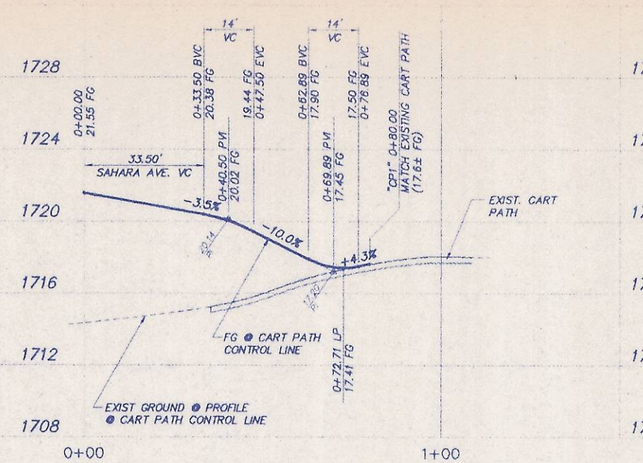
SHEET
C-17

SHT 17 OF 54



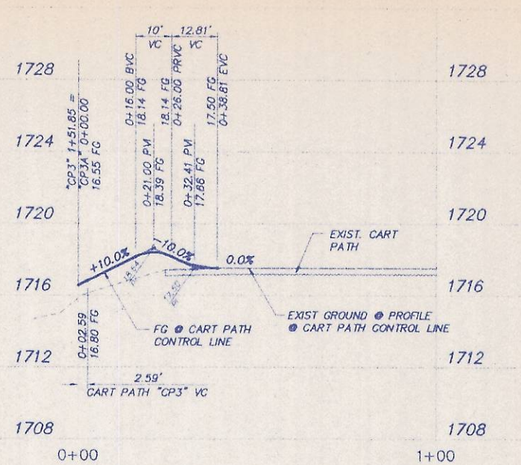
"CP1" PROFILE

SCALE: HORIZ. 1"=20', VERT. 1"=4'



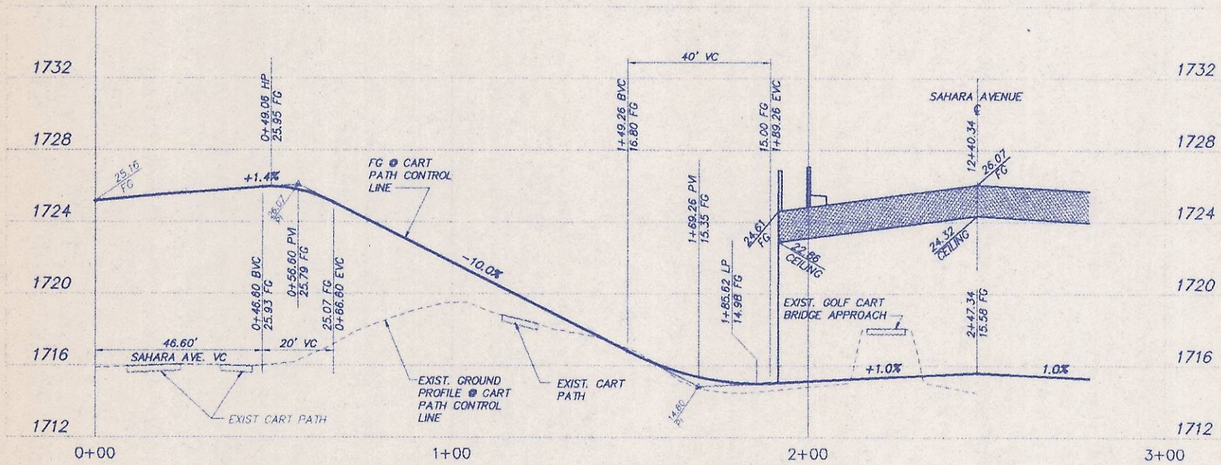
"CP2" PROFILE

SCALE: HORIZ. 1"=20', VERT. 1"=4'



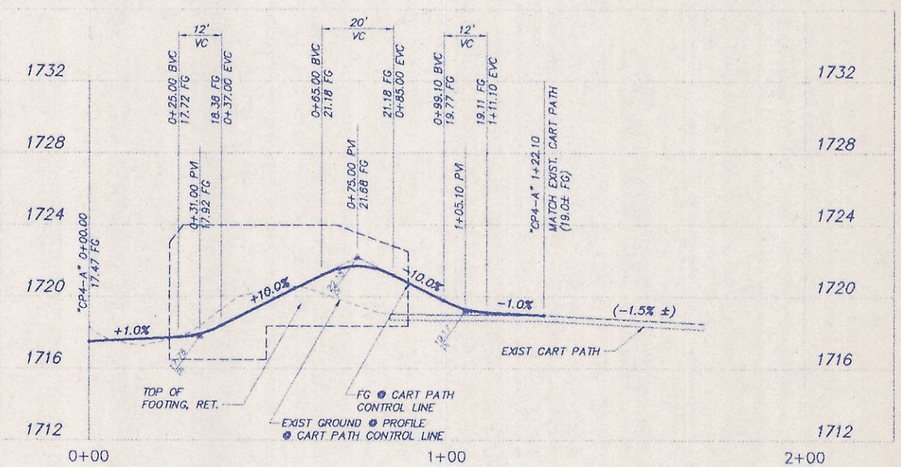
"CP3-A" PROFILE

SCALE: HORIZ. 1"=20', VERT. 1"=4'



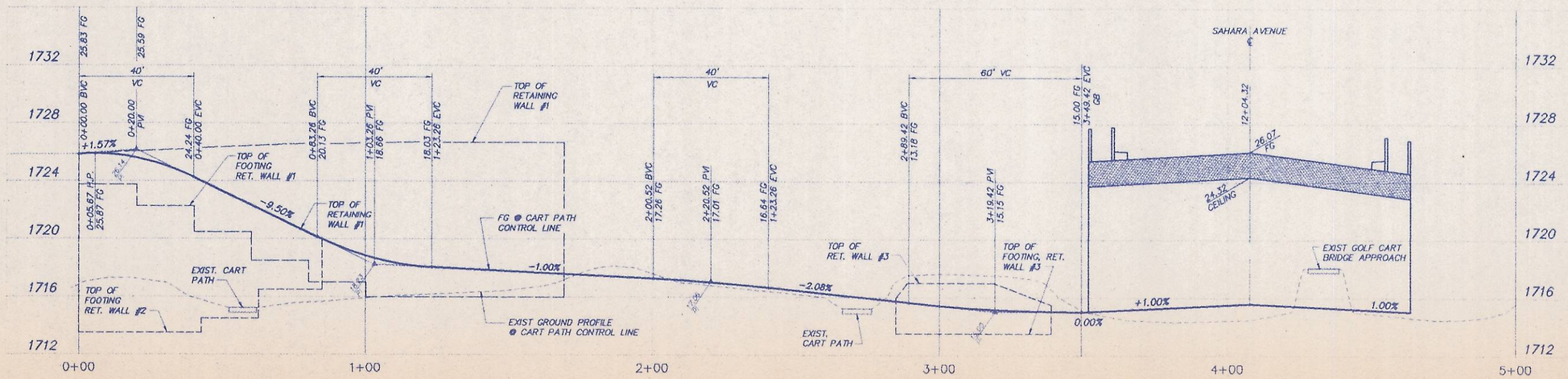
"CP3" PROFILE

SCALE: HORIZ. 1"=20', VERT. 1"=4'



"CP4-A" PROFILE

SCALE: HORIZ. 1"=20', VERT. 1"=4'



"CP4" PROFILE

SCALE: HORIZ. 1"=20', VERT. 1"=4'

NO.	CAT.	DESCRIPTION

RECOMMENDED: DAVID P.N. HUDALE

52561 — PZ. NO. — DATE

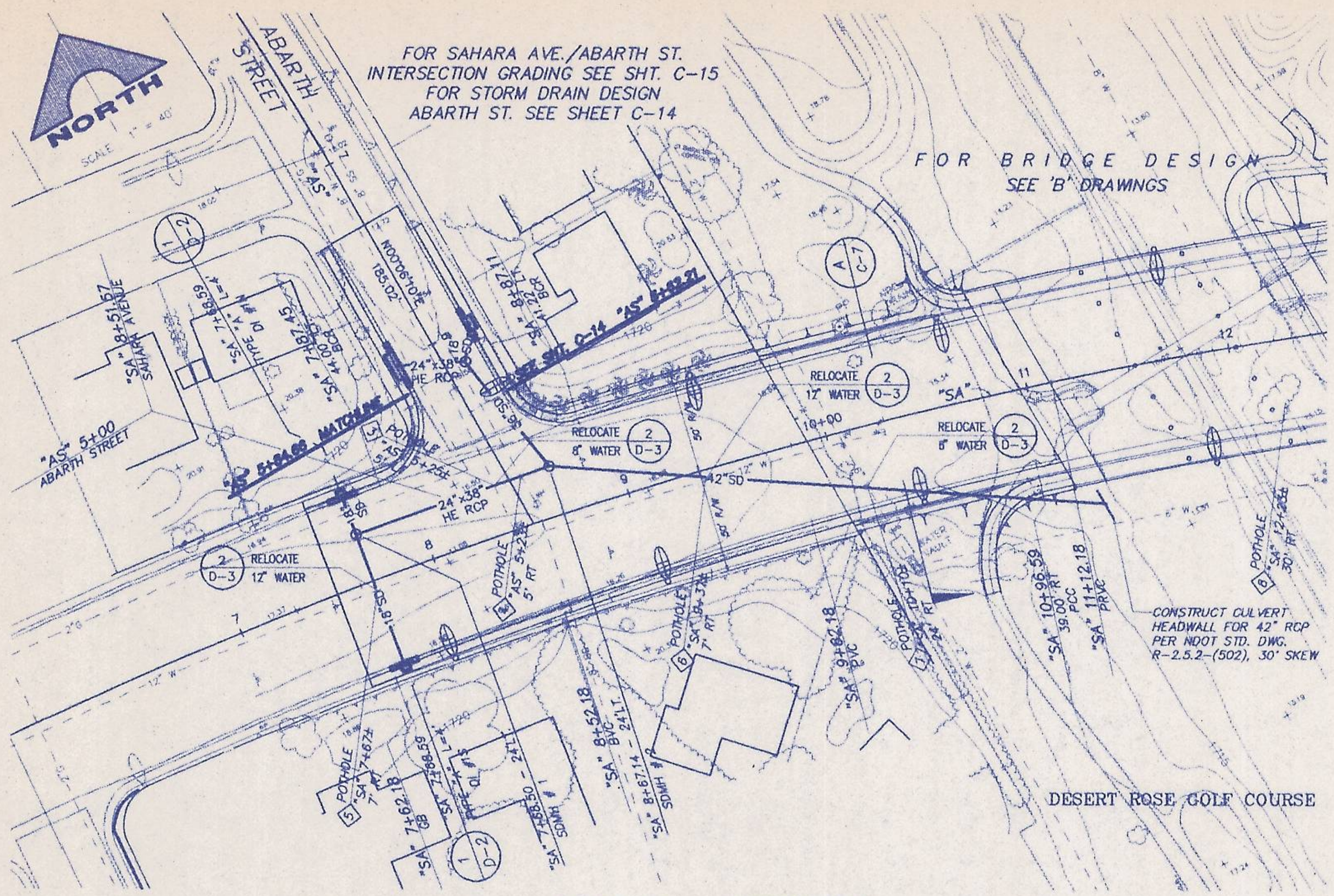
G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD., LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
GOLF CART PROFILES

SHEET C-18
SHT 18 OF 54

JOB NO. 500.721C

DSK.... SA-018 6/29/94



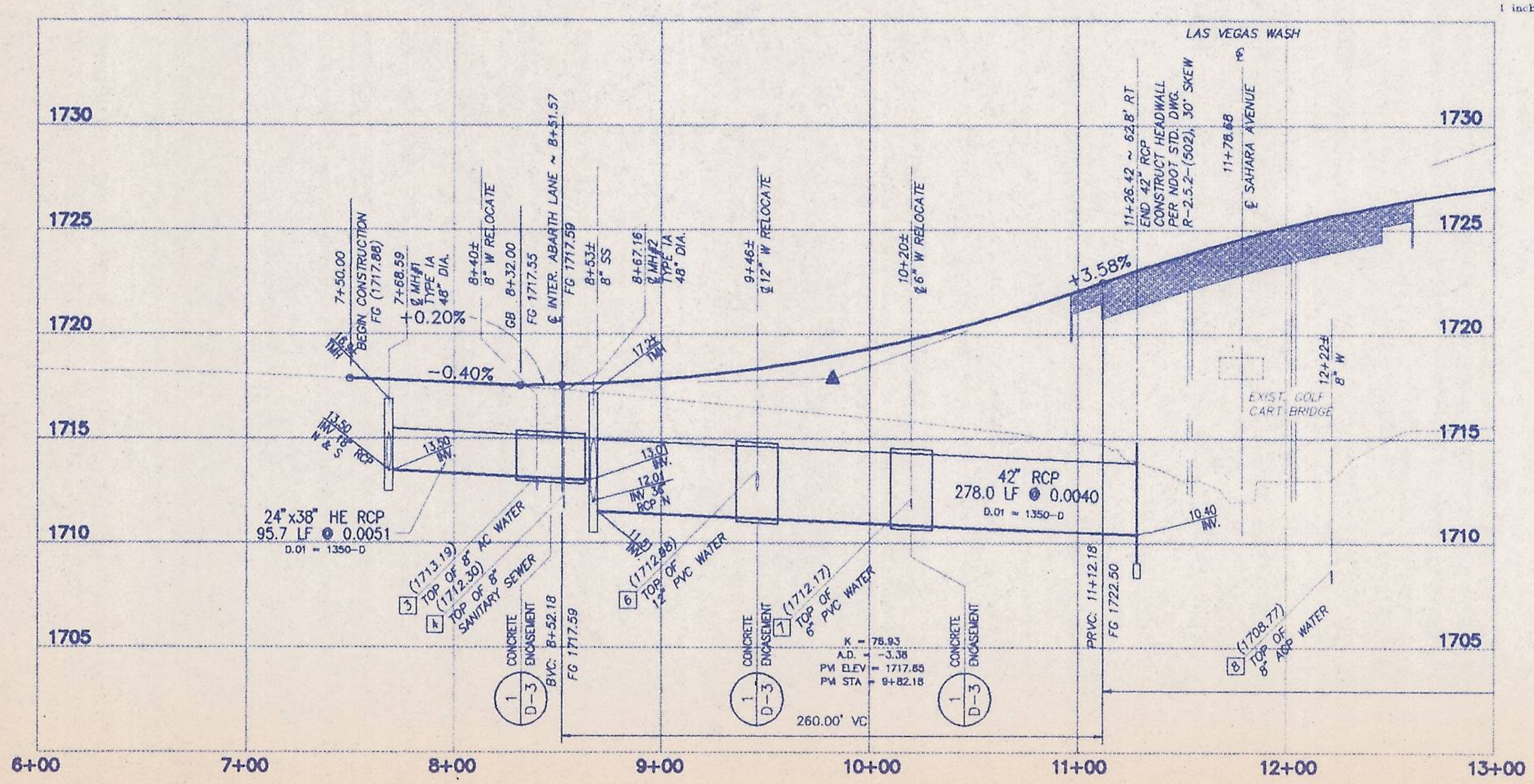
SAHARA AVENUE

PLAN

SCALE: HORIZ. 1"=40'

GRAPHIC SCALE

(IN FEET)
1 inch = 40 ft.



PROFILE

SCALE: HORIZ. 1"=40', VERT. 1"=4'

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

SAHARA AVENUE S.I.D. 94

ABARTH STREET STORM DRAIN

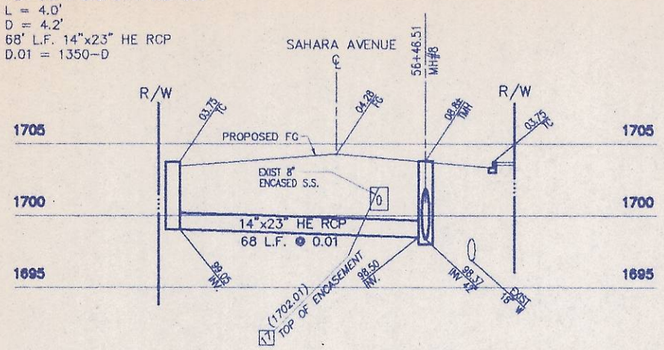
G.C. WALLACE, INC.
Engineering/Architecture

SHEET D-1

SHT 19 OF 54

JOB NO. 500.721C

DI 9N ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L = 4.0'
D = 4.2'
68' L.F. 14"x23" HE RCP
D.01 = 1350-D

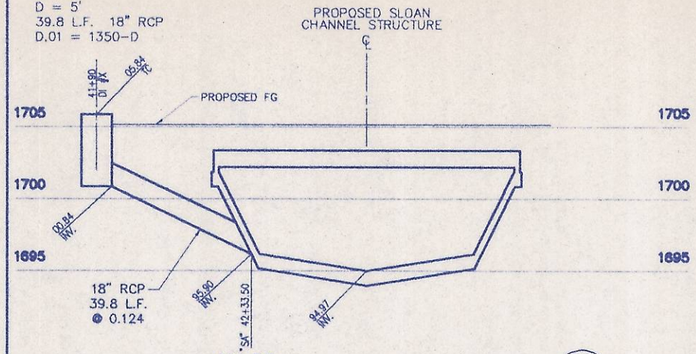


56+46.51 SAHARA AVENUE

DROP INLET 9N
SEE SHEET C-12
SCALE : HORIZ. 1" = 20' VERT. 1" = 5'

9 / D-2

DI 6N ~ TYPE "C" DROP INLET
PER CCPW STD DWG. NO. 311
L=10.0'
D = 5'
39.8 L.F. 18" RCP
D.01 = 1350-D



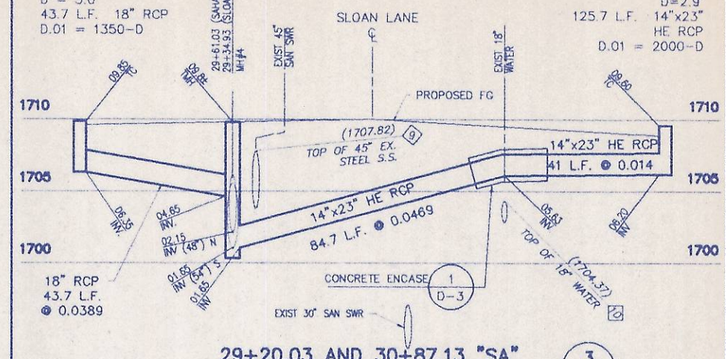
41+90

DROP INLET 6N
SEE SHEET C-11
SCALE : HORIZ. 1" = 20' VERT. 1" = 5'

6 / D-2

DI #3 ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=10.0'
D = 3.0'
43.7 L.F. 18" RCP
D.01 = 1350-D

DI #5 ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=14.0'
D=2.9'
125.7 L.F. 14"x23" HE RCP
D.01 = 2000-D



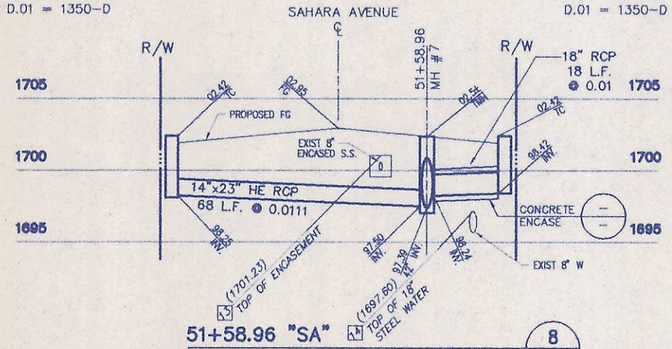
29+20.03 AND 30+87.13 "SA"

DROP INLET 3 & DROP INLET 5
SEE SHEET C-14
SCALE : HORIZ. 1" = 20' VERT. 1" = 5'

3 / D-2

DI 8N ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=10.0'
D = 3.7'
68 L.F. 18" RCP
D.01 = 1350-D

DI 8S ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=4.0'
D=3.5'
18.0 L.F. 18" RCP
D.01 = 1350-D

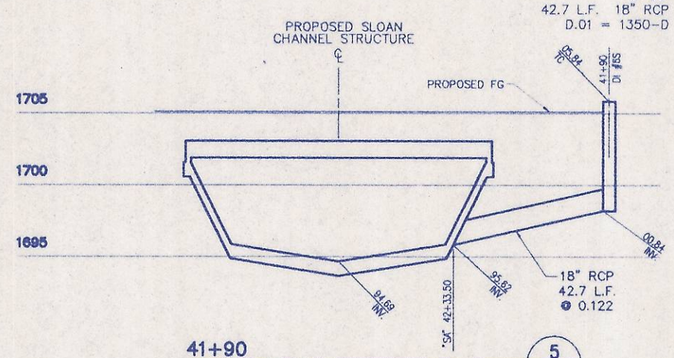


51+58.96 "SA"

DROP INLET 8N & DROP INLET 8S
SEE SHEET C-12
SCALE : HORIZ. 1" = 20' VERT. 1" = 5'

8 / D-2

DI 6S ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=4.0'
D=65'
42.7 L.F. 18" RCP
D.01 = 1350-D



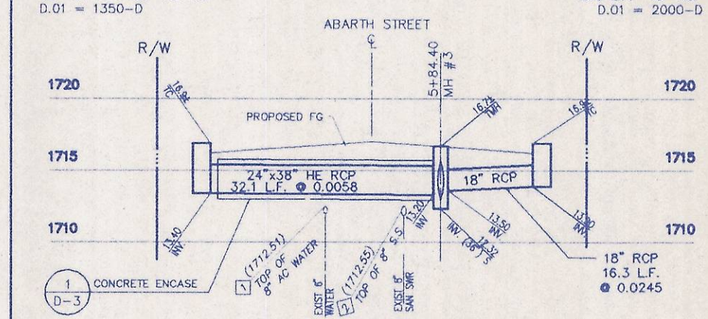
41+90

DROP INLET 6S
SEE SHEET C-11
SCALE : HORIZ. 1" = 20' VERT. 1" = 5'

5 / D-2

DI 2W ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=14.0'
D = 3.0'
32.1 L.F. 24"x38" HE RCP
D.01 = 1350-D

DI 2E ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=7.0'
D=2.5'
16.3 L.F. 18" RCP
D.01 = 2000-D



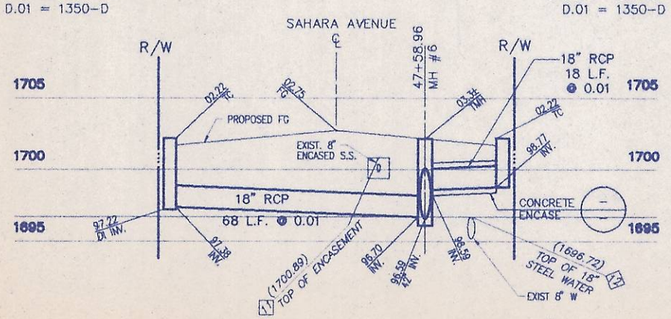
5+99.40 ABARTH STREET

DROP INLET 2W & DROP INLET 2E
SEE SHEET C-14
SCALE : HORIZ. 1" = 10' VERT. 1" = 5'

2 / D-2

DI 7N ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=4.0'
D = 65'
42.7 L.F. 18" RCP
D.01 = 1350-D

DI 7S ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=40'
D=3'
18.0 L.F. 18" RCP
D.01 = 1350-D

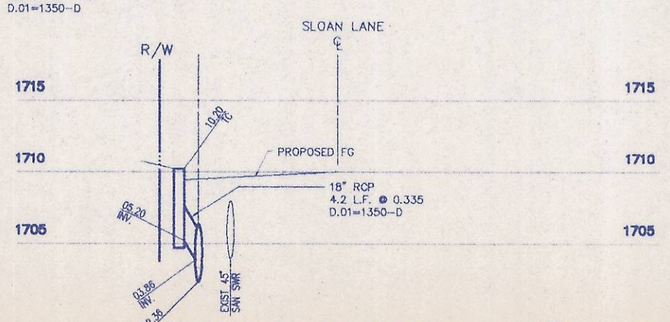


47+58.96 "SA"

DROP INLET 7N & DROP INLET 7S
SEE SHEET C-11
SCALE : HORIZ. 1" = 20' VERT. 1" = 5'

7 / D-2

DI #4 ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=14.0'
D = 4.5'
4.2 L.F. 18" RCP
D.01=1350-D



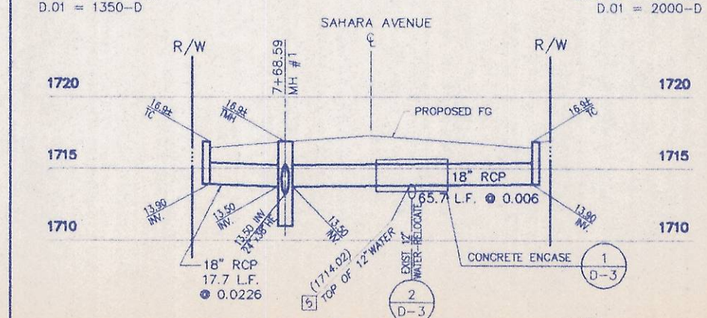
29+91.93 SLOAN LANE

DROP INLET #4
SEE SHEET C-10 & C-13
SCALE : HORIZ. 1" = 20' VERT. 1" = 5'

4 / D-2

DI 1N ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=4.0'
D = 2.5'
17.7 L.F. 18" RCP
D.01 = 1350-D

DI 1S ~ TYPE "A" DROP INLET
PER CCPW STD DWG. NO. 309
L=4.0'
D=2.5'
67.7 L.F. 18" RCP
D.01 = 2000-D



7+68.59 SAHARA AVENUE

DROP INLET 1N & DROP INLET 1S
SEE SHEET D-1
SCALE : HORIZ. 1" = 20' VERT. 1" = 5'

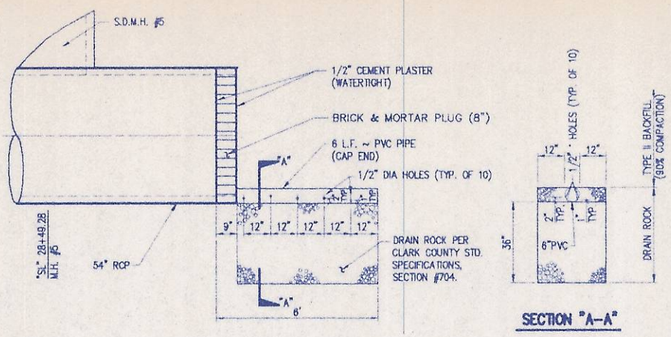
1 / D-2

G.C. WALLACE, INC.
Engineering/Architecture

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
STORM DRAIN LATERALS & PROFILES

SHEET D-2

JOB NO. 500.721C



SECTION "A-A"

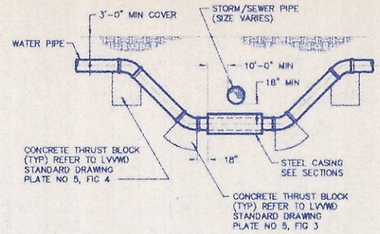
END OF 54" RCP STORM DRAIN

54" RCP PLUG DETAIL

N.T.S.

5 / D-3

STORM/SEWER WATER CROSSING DETAIL



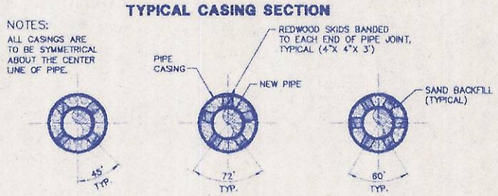
WHERE THE WATER LINE IS LESS THAN 18 INCHES OVER THE SEWER LINE, WHERE THE WATER LINE IS UNDER THE SEWER LINE, AND WHERE THE HORIZONTAL SEPARATION, AS REQUIRED BY THE WATER SUPPLY REGULATIONS, CANNOT BE MAINTAINED BECAUSE OF PHYSICAL OBSTRUCTIONS, THE WATER LINE SHALL BE PROTECTED BY CONSTRUCTION OF THE STORM/SEWER LINE AS FOLLOWS:

1. EXTRA HEAVY CAST IRON PIPE;
2. WATER SUPPLY QUALITY MATERIALS; OR
3. ENCASEMENT WITH FOUR INCHES, MINIMUM, OF CONCRETE OR SLEEVING WITH WATER SUPPLY QUALITY PIPE.

EACH OF THESE PROVISIONS SHALL ALSO BE EXTENDED FOR OTHER THAN 90 DEGREE CROSSINGS TO THE POINT AT WHICH THE TEN FOOT SEPARATION BETWEEN THE WATER AND SEWER LINES IS ACHIEVED (10/Sine of Crossing Angle).

TYPICAL CASING SECTION

NOTES:
ALL CASINGS ARE TO BE SYMMETRICAL ABOUT THE CENTER LINE OF PIPE.



PIPE 4" THRU 12" **PIPE 14" THRU 16"** **PIPE 18" THRU 24"**

1. STEEL PIPE CASING SHALL BE FABRICATED FROM A MINIMUM OF 1/4" THICK STEEL PLATES, CONFORMING TO THE REQUIREMENTS OF ASTM A283, GRADE B, C, OR D. ALL JOINTS SHALL BE WELDED. INTERIOR JOINTS SHALL BE GROUNDED TO A SMOOTH FINISH. ALL WELDING SHALL BE PERFORMED IN ACCORDANCE WITH AWWA C201, "AWWA STANDARD FOR FABRICATED ELECTRICALLY WELDED STEEL WATER PIPE." COATINGS FOR STEEL CASING ARE NOT REQUIRED.
2. PIPE CASING SHALL BE LAID TRUE TO LINE AND GRADE WITH NO BENDS OR CHANGES IN GRADE FOR THE FULL LENGTH OF THE CASING.
3. THE PIPE SHALL BE SUPPORTED AT EACH END OF EACH JOINT WITH SKIDS. THE ANNULAR SPACE BETWEEN THE PIPE AND THE CASING SHALL BE BACKFILLED WITH SAND. AFTER INSTALLATION OF THE PIPE, THE CASING SHALL BE SEALED AT BOTH ENDS WITH MORTARED BRICK OR CEMENT BRICK.

WATER LINE RELOCATION DETAIL

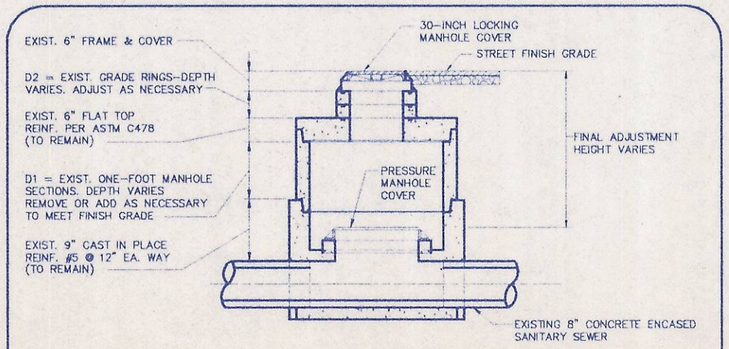
N.T.S.

2 / D-3

X

N.T.S.

4 / D-3

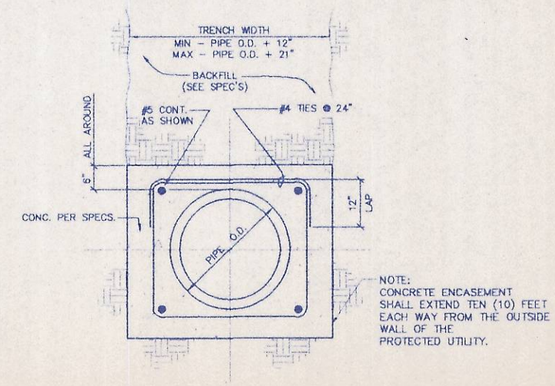


NOTE: CONTRACTOR TO ADJUST EXISTING MANHOLE NOS. 1, 2 & 3 TO FINISH STREET GRADE. VERTICAL AMOUNT WILL VARY AND FINAL ADJUSTMENT WILL BE ACCOMPLISHED BY ADDITION OR REMOVAL OF ONE-FOOT MANHOLE SECTIONS (D1) AND ADJUSTMENT OF GRADE RINGS

EXIST. PRESSURE MANHOLE ADJUSTMENT

N.T.S.

3 / D-3



CONCRETE ENCASEMENT DETAIL

N.T.S.

1 / D-3

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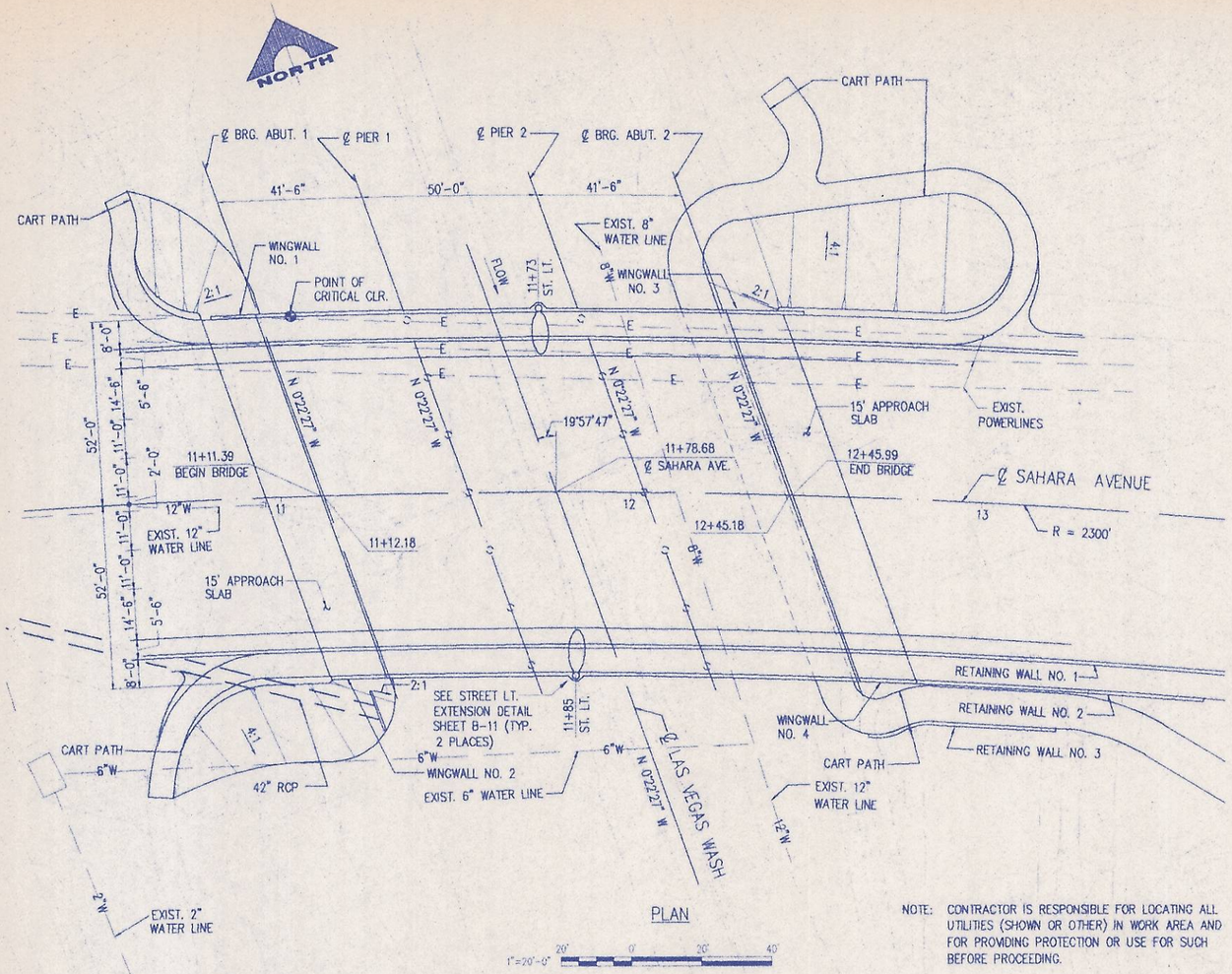
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
STORM DRAIN LATERALS & PROFILES

SHEET D-3

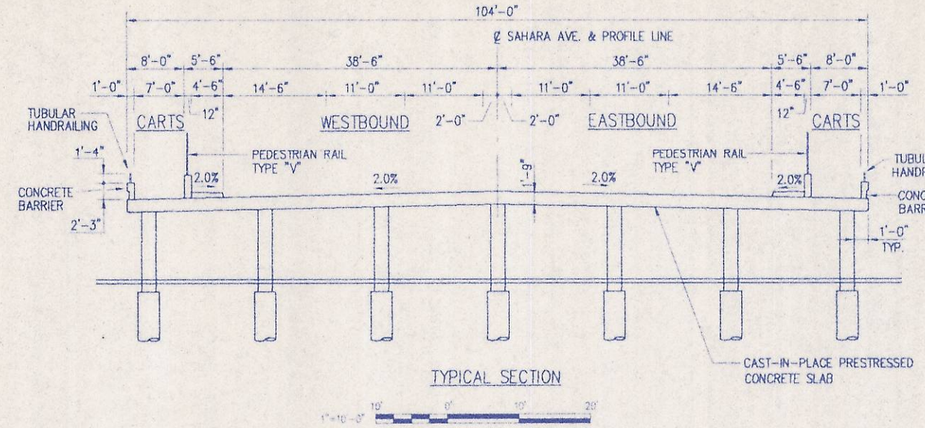
JOB NO. 500.721C

DISK... S4-D3 6/28/94



PLAN

1"=20'-0"

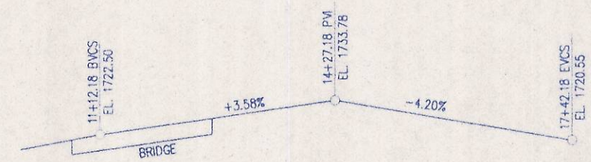


TYPICAL SECTION

1"=10'-0"

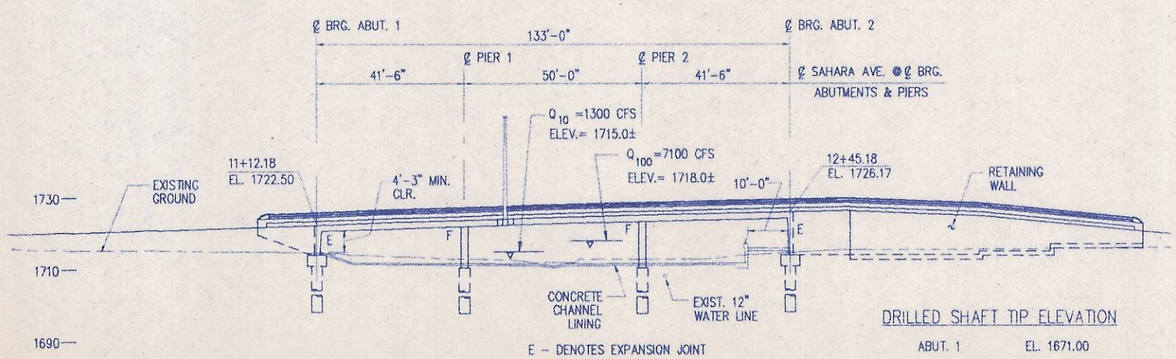
CURVE DATA

PC = 18+34.73
PI = 7+25.43
Δ = 55°16'05"
R = 2300.00'
L = 2218.60'
T = 1204.15'



PROFILE LINE
℄ SAHARA AVE.

NOTE: CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UTILITIES (SHOWN OR OTHER) IN WORK AREA AND FOR PROVIDING PROTECTION OR USE FOR SUCH BEFORE PROCEEDING.



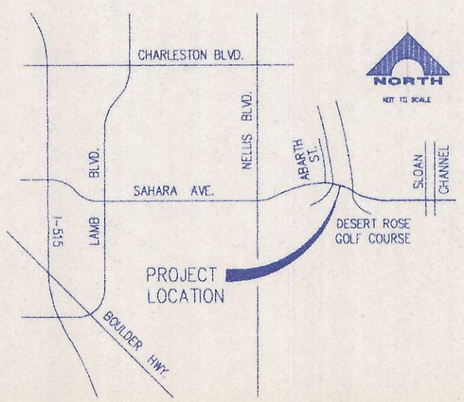
E - DENOTES EXPANSION JOINT
F - DENOTES FIXED PIER

ELEVATION
SHOWN ALONG ℄ SAHARA AVE.

1"=20'-0"

DRILLED SHAFT TIP ELEVATION

ABUT. 1	EL. 1671.00
PIER 1	EL. 1660.50
PIER 2	EL. 1660.50
ABUT. 2	EL. 1671.00



LOCATION MAP

JOB NO. 500.721D

5/21/94

SA_B01

G. C. WALLACE, INC.
Engineering/Architecture
7365 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN T. SCHMIDT
CIVIL
No. 10747

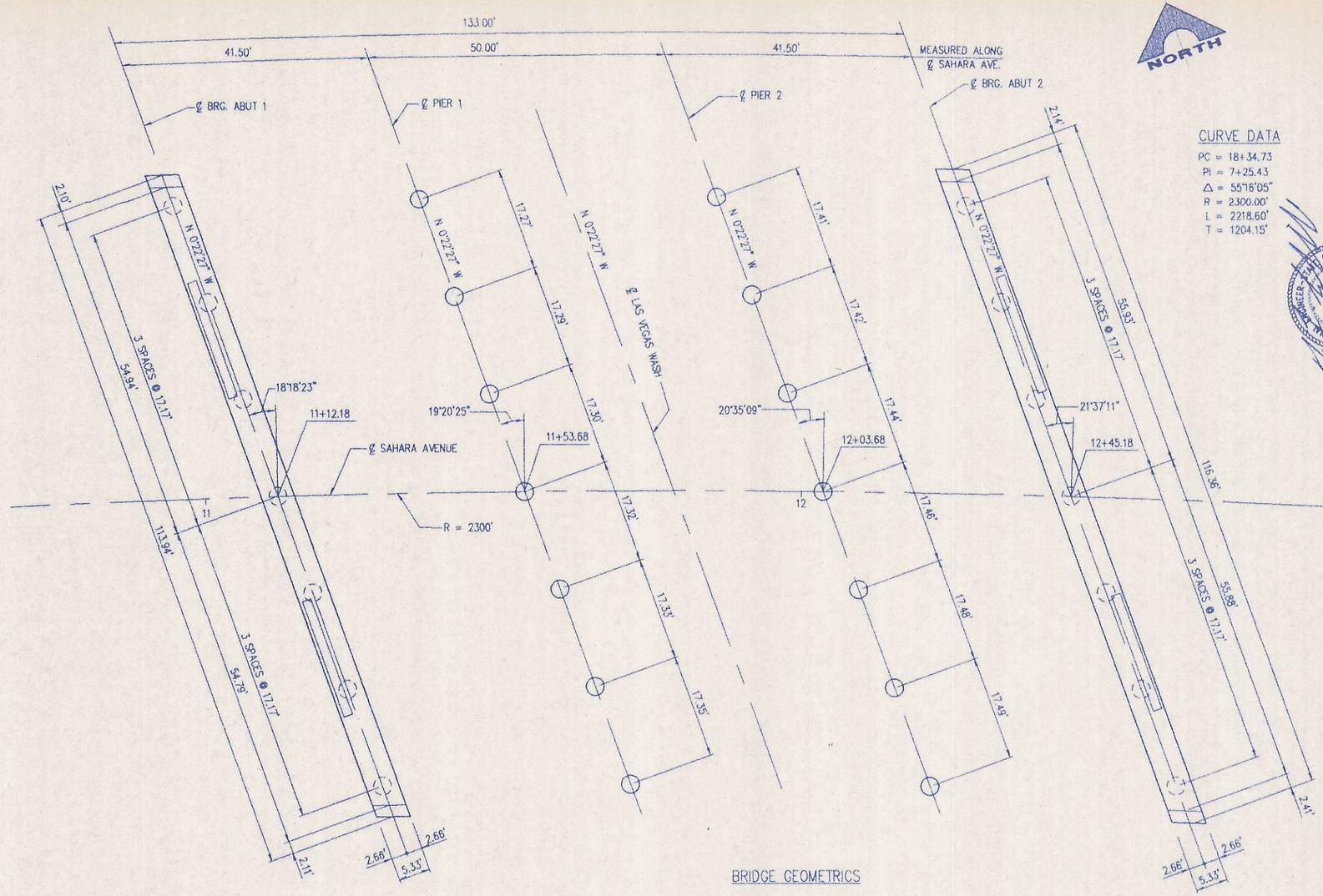
6/30/94

CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
PLAN AND ELEVATION

SHEET
B-1
26 OF 54

GENERAL NOTES

1. DESIGN SPECIFICATIONS: AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES 1992 INTERIMS THROUGH 1993.
2. CONTRACT SPECIFICATIONS: PROJECT MANUAL TITLED "SPECIAL IMPROVEMENT DISTRICT NO. 94"
3. LIVE LOAD: STANDARD HS20-44 PLUS IMPACT LOAD. IMPACT MODIFIED AS APPLICABLE PER "AASHTO GUIDE SPECIFICATIONS FOR HORIZONTALLY CURVED HIGHWAY BRIDGES".
4. SEISMIC LOAD: ACCELLERATION COEFFICIENT 0.15G. ATC-6 RESPONSE SPECTRA WITH TYPE II SOIL.
5. FUTURE OVERLAY: 3" AT 150 pcf ASSUMED.
6. CONCRETE: ALL CONCRETE SHALL BE CLASS A MODIFIED (MAJOR). ONLY TYPE V CEMENT SHALL BE USED FOR CONCRETE IN CONTACT WITH SOIL. SEE PRESTRESSING NOTES AND CONCRETE CLASSIFICATIONS DIAGRAM FOR ULTIMATE COMPRESSIVE CONCRETE STRENGTHS, PLACEMENT LOCATIONS, AND SEQUENCE.
7. REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE AASHTO M31 (ASTM A615) GRADE 60. DIMENSIONS RELATING TO BAR SPACING ARE CENTER TO CENTER. BENDING DIMENSIONS ARE FROM OUT TO OUT OF THE BARS. BAR SIZES THREE(3) TO NINE(9) ARE INDICATED BY THE FIRST DIGIT IN THE MARK; TEN(10) OR LARGER BY THE FIRST TWO DIGITS. THE LENGTH OF THE BAR SIZES FOUR(4) AND FIVE(5), WHEN CONSIDERED AS BARS TO CONTROL TEMPERATURE, SHRINKAGE AND DISTRIBUTION STRESSES BY THE BRIDGE ENGINEER, MAY BE ADJUSTED BY THE CONTRACTOR UPON CONCURRENCE AND APPROVAL OF THE BRIDGE ENGINEER.
8. CAMBER: THE CAMBER SHALL BE AS SHOWN ON THE PLANS.
9. FINE SURFACE FINISH: ALL EXPOSED CONCRETE SURFACES SHALL BE FINE SURFACE FINISHED. ALL SURFACES IN CONTACT WITH THE GROUND SHALL BE FINE SURFACE FINISHED TO A POINT 1'-6" BELOW THE FINISHED GROUND LINE. THE TYPE OF FINE SURFACE FINISH SHALL BE "BONDED GROUT FINISH". THE COLOR OF THE FINISH SHALL BE NATURAL CONCRETE GREY.
10. WALL SURFACE FINISH: ALL EXPOSED WALL PANELS SHALL BE FINE SURFACE FINISHED.
11. FOUNDATIONS: FOUNDATIONS FOR ABUTMENTS AND PIERS ARE SUPPORTED BY DRILLED SHAFTS. MAXIMUM ALLOWABLE BEARING PRESSURES USED ARE 3500 PSF AT SPREAD FOOTINGS FOR RETAINING WALLS.
12. INCIDENTAL ITEMS: ALL ITEMS SHOWN OR NOTED ON THE PLANS WHICH ARE NOT SPECIFICALLY BID ITEMS ARE CONSIDERED INCIDENTAL ITEMS. THE COST OF FURNISHING AND INSTALLING ALL SUCH ITEMS WILL NOT BE PAID FOR DIRECTLY, BUT SHALL BE INCLUDED IN THE UNIT PRICE BID FOR OTHER ITEMS, UNLESS NOTED OTHERWISE.
13. PLAN DIMENSIONS AND ELEVATIONS: ALL PLAN DIMENSIONS SHOWN ARE MEASURED HORIZONTALLY OR VERTICALLY UNLESS OTHERWISE NOTED AND REFLECT THE ULTIMATE GEOMETRIC SHAPE AND LOCATION OF ALL ELEMENTS AT A MEAN TEMPERATURE OF 70°F.
14. CONSTRUCTION TYPE CODE: X080
15. EXCAVATION AND BACKFILL: QUANTITIES ARE CALCULATED USING NDOT STANDARD PLAN R-1.1.3(206,207)



BRIDGE GEOMETRICS

CURVE DATA

PC = 18+34.73
PI = 7+25.43
Δ = 55°16'05"
R = 2300.00'
L = 2218.60'
T = 1204.15'

PILE NOTES

ALL PILES SHALL BE 3.0' DIAMETER CAST-IN-DRILLED-HOLE PILES :

LOCATION	DESIGN TYPE	DESIGN CAPACITY (TONS)	TIP ELEVATION
ABUT. 1	COMBINATION FRICTION AND END BEARING	125	1671.00
PIER 1	COMBINATION FRICTION AND END BEARING	190	1660.50
PIER 2	COMBINATION FRICTION AND END BEARING	190	1660.50
ABUT. 2	COMBINATION FRICTION AND END BEARING	125	1671.00

BENCHMARK

FOUND ALUM. CAP - P.L.S. 4541 INTERSECTION OF THE EAST EDGE OF THE GOLF COURSE AND THE SOUTH LINE OF SECTION 4

BASIS OF BEARINGS

SOUTH 00°18'40" EAST BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 4, TOWNSHIP 21 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, NEVADA AS SHOWN BY MAP THEREOF ON FILE IN FILE 36, PAGE 06 OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA

LIST OF DRAWINGS

SHEET NO.	SHEET TITLE	SHEET No.	SHEET TITLE
B-1	PLAN AND ELEVATION	B-13	APPROACH SLAB PLANS
B-2	GENERAL NOTES, QUANTITIES AND GEOMETRICS	B-14	CHANNEL LINING DETAILS
B-3	DECK CONTOURS	B-15	BARRIER RAIL DETAILS
B-4	ABUTMENT 1 PLAN AND ELEVATION	B-16	PEDESTRIAN RAIL TYPE "V"
B-5	ABUTMENT 2 PLAN AND ELEVATION	B-17	BAR BEND SCHEDULE NO. 1
B-6	WINGWALL NO. 1 AND 2 DETAILS	B-18	BAR BEND SCHEDULE NO. 2
B-7	WINGWALL NO. 3 AND 4 DETAILS	B-19	BAR BEND SCHEDULE NO. 3
B-8	PIER 1 PLAN AND DETAILS	B-20	LOG OF BORINGS NO. 1
B-9	PIER 2 PLAN AND DETAILS	B-21	LOG OF BORINGS NO. 2
B-10	TYPICAL DECK SECTION	B-22	RETAINING WALL PLAN
B-11	DECK REINFORCING PLAN	B-23	RETAINING WALL ELEVATIONS & SECTIONS
B-12	PRESTRESSING AND CAMBER		

ITEM NO.	ITEM DESCRIPTION	UNIT	BRIDGE	RET. WALL	TOTAL
206.01	STRUCTURE EXCAVATION	CU. YD.	284	146	284
207.01	STRUCTURE BACKFILL	CU. YD.	569	550	1119
495.01	PRESTRESSING CAST IN PLACE CONCRETE	L.S.	1	--	1
502.01	CLASS A CONCRETE, MODIFIED (MAJOR)	CU. YD.	1513	184	1697
502.02	ELASTOMERIC CONCRETE	CU. FT.	20	--	20
502.03	FINE SURFACE FINISH	SQ. YD.	2122	230	2352
502.05	6" CONCRETE CHANNEL LINING	L.S.	1	--	1
505.01	REINFORCING STEEL	LBS.	137,947	15,463	153,410
506.01	PEDESTRIAN RAIL, TYPE "V"	L.F.	266	--	266
506.02	TUBULAR HAND RAILING	L.F.	337	84	421
508.01	FURNISH CAST IN DRILLED HOLE CONCRETE SHAFT (3 FT. O.D.)	L.F.	1260	--	1260

PROFESSIONAL ENGINEER STATE OF NEVADA BRIAN L. SCHMIDT C.E. No. 10747

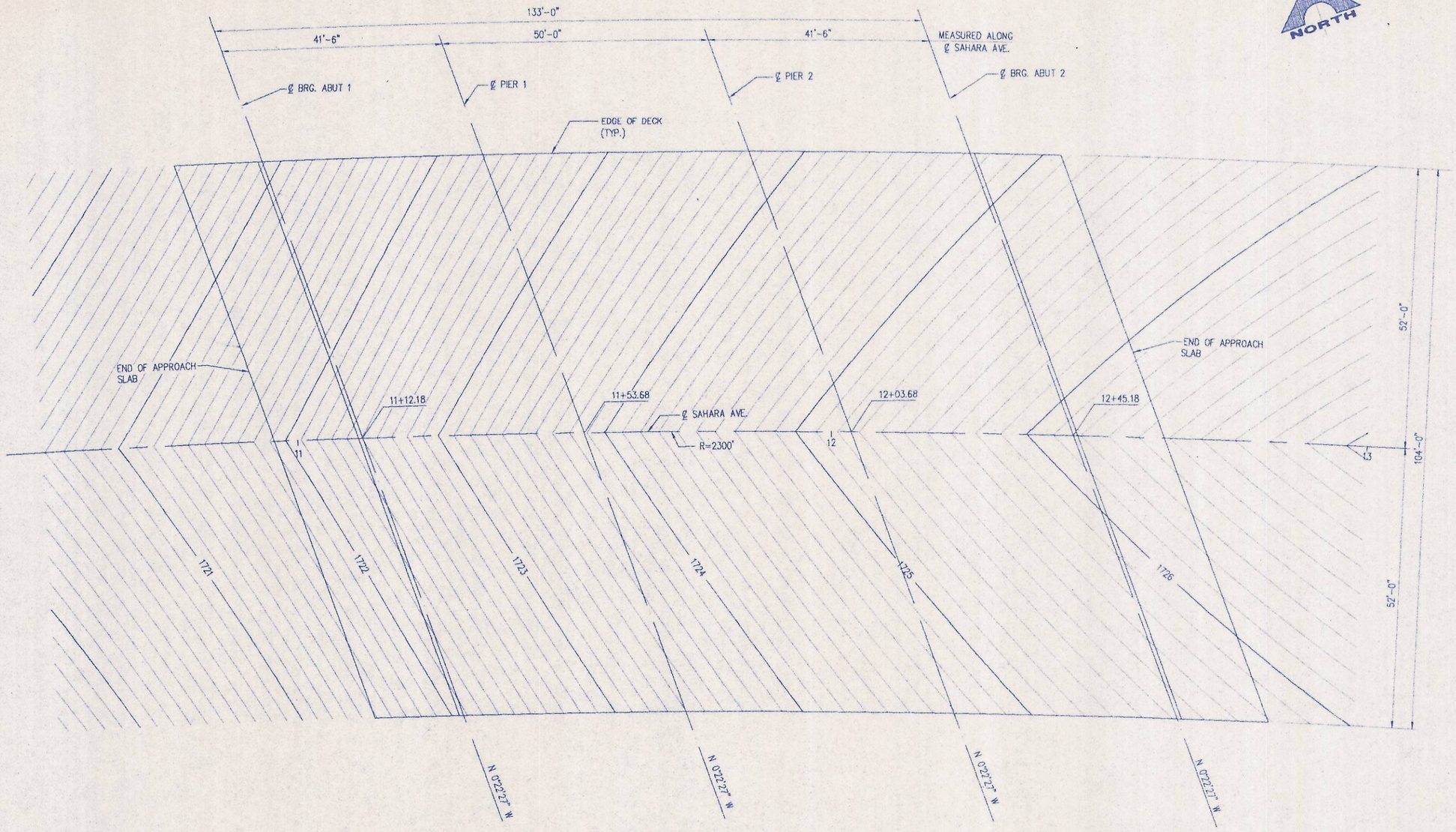
G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
GENERAL NOTES, QUANTITIES AND GEOMETRICS

SHEET B-2 OF 27 OF 54

JOB NO. 500.721D

6/21/94 SA_B02



NORTH

NOTE: CONTOURS SHOWN ARE BASED ON ROADWAY PROFILE GRADES AND ELEVATIONS

DECK CONTOURS PLAN

1"=10'-0" 10' 0' 10' 20'

CURVE DATA

PC = 18+34.73
PI = 7+25.43
Δ = 55°16'05"
R = 2300.00'
L = 2218.60'
T = 1204.15'

JOB NO. 500.721D

6/21/94

SA_B03

REV	DATE	DESCRIPTION

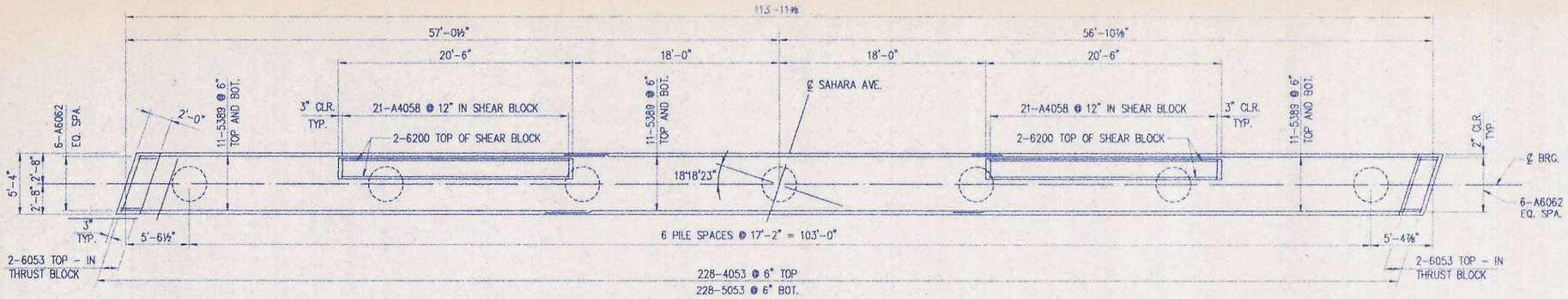
DATE 6/23/94
SCALE
FILE NO.
DRAWN BRIAN L. SCHMIDT
FILE: LDMASTER.D

PROFESSIONAL ENGINEER - STATE OF NEVADA
BRIAN L. SCHMIDT
No. 10747

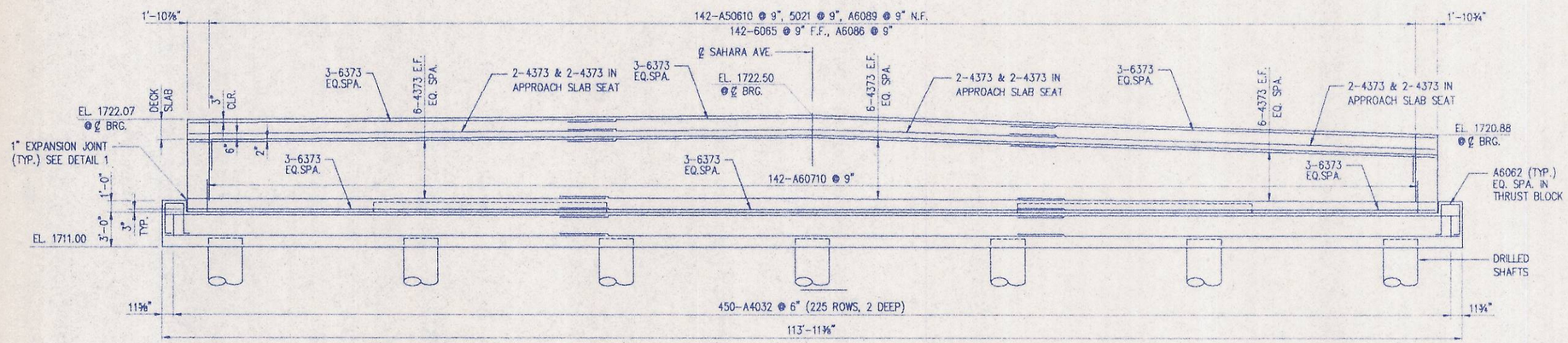
G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
DECK CONTOURS

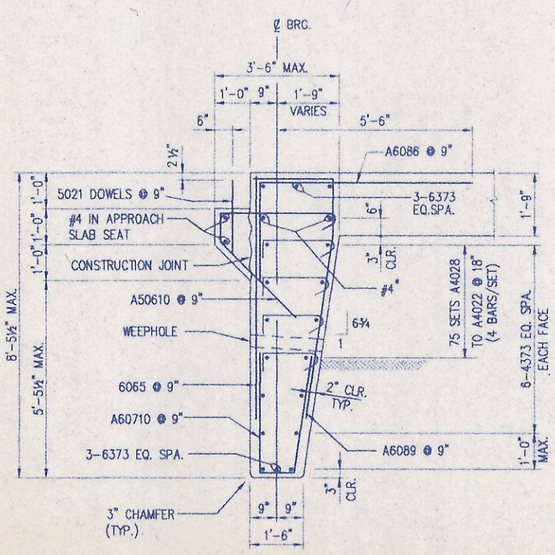
SHEET
B-3
OF 28 OF 54



ABUTMENT 1 PLAN

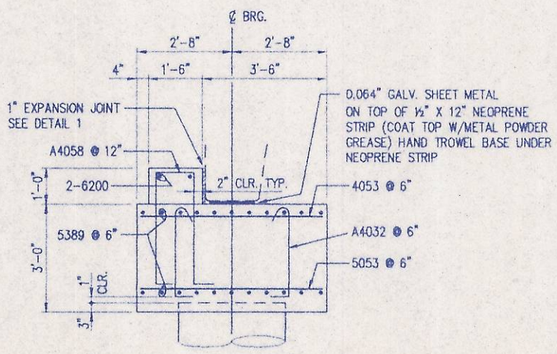


ABUTMENT 1 ELEVATION

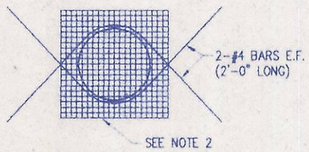


* LOCATION OF THESE BARS MAY BE CHANGED WITH APPROVAL OF THE ENGINEER TO AVOID INTERFERENCE WITH PRESTRESSING STEEL.

TYPICAL SECTION



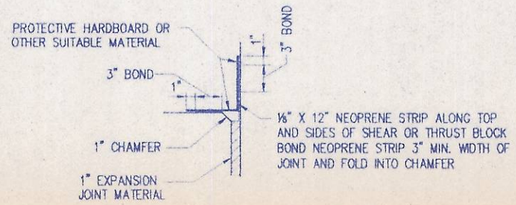
SECTION AT FOOTING



NOTES FOR WEEPHOLE:

1. 4" DIA. DRAINS AT 15'-0"± CTRS. LOCATED 3"± ABOVE FINISHED GRADE
2. 6" SQ. ALUMINUM OR GALVANIZED STEEL WIRE MESH HARDWARE CLOTH.(MIN WIRE DIA. 0.03")
3. PLACE 1 CU. FT. OF PERVIOUS BACKFILL MATERIAL IN A GEOTEXTILE FABRIC SACK SECURELY TIED, AT BACK FACE OF ABUTMENT
4. COST OF WEEPHOLES COMPLETE AND IN PLACE SHALL BE CONSIDERED INCIDENTAL TO CONSTR. AND NO DIRECT PAYMENT WILL BE MADE THEREFORE.

WEEPHOLE DETAIL



DETAIL 1

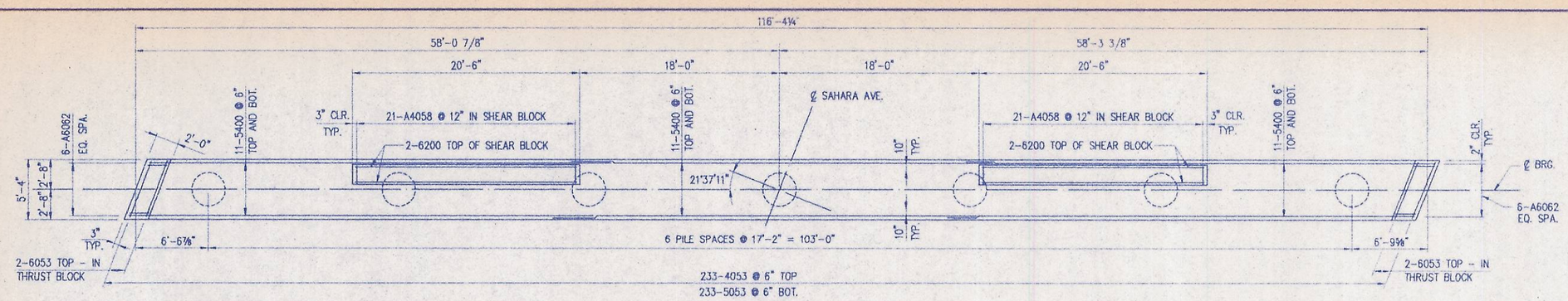
NORTH

G.C. WALLACE, INC.
Engineering/Architecture
1556 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

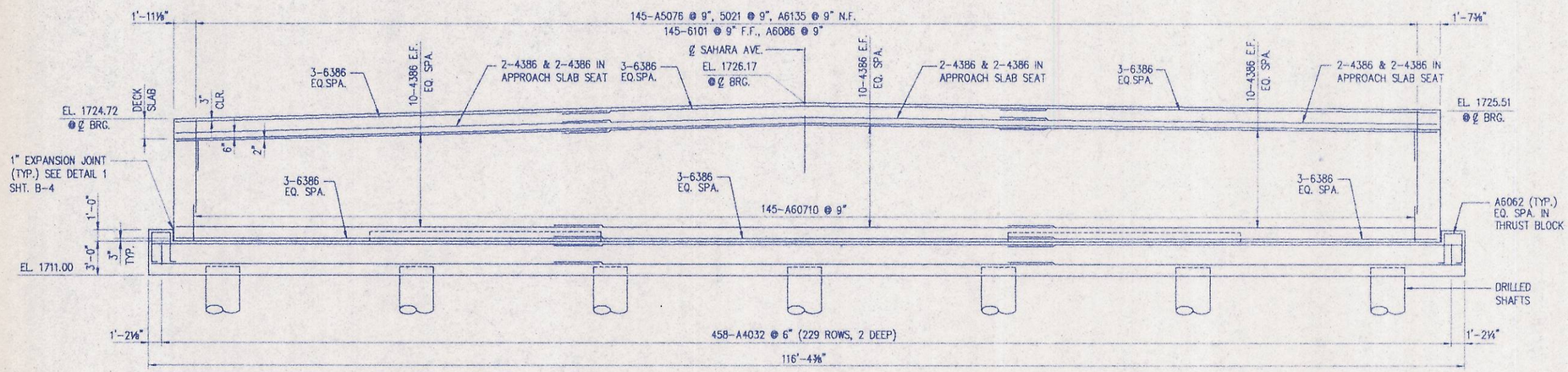
CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
ABUTMENT 1 PLAN AND ELEVATION

SHEET B-4
SH 29 OF 54

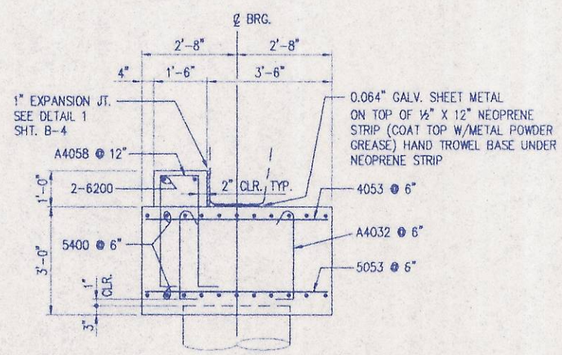
JOB NO. 500.721D



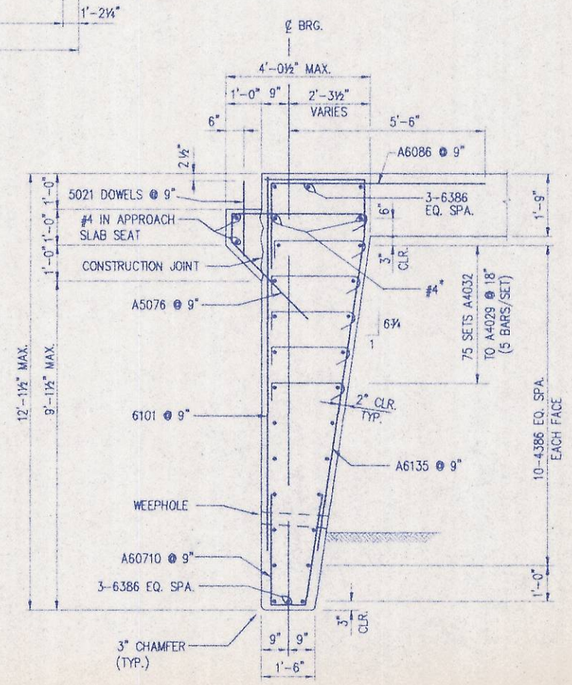
ABUTMENT 2 PLAN



ABUTMENT 2 ELEVATION



SECTION AT FOOTING



* LOCATION OF THESE BARS MAY BE CHANGED WITH APPROVAL OF THE ENGINEER TO AVOID INTERFERENCE WITH PRESTRESSING STEEL.

TYPICAL SECTION

NORTH

REV.	DATE	DESCRIPTION

RECOMMENDED: BRIAN L. SCHMIDT

PROFESSIONAL ENGINEER - STATE OF NEVADA BRIAN L. SCHMIDT No. 10747

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD., LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
ABUTMENT 2 PLAN AND ELEVATION

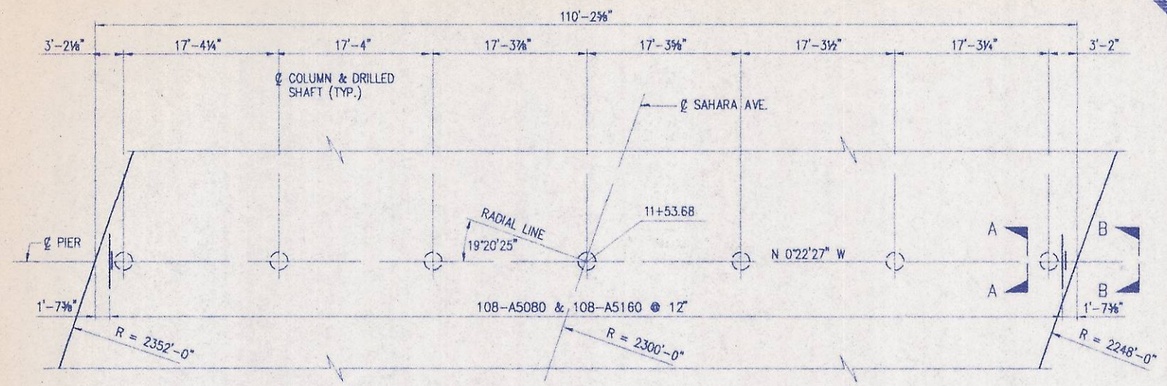
SHEET B-5

SHT 30 OF 54

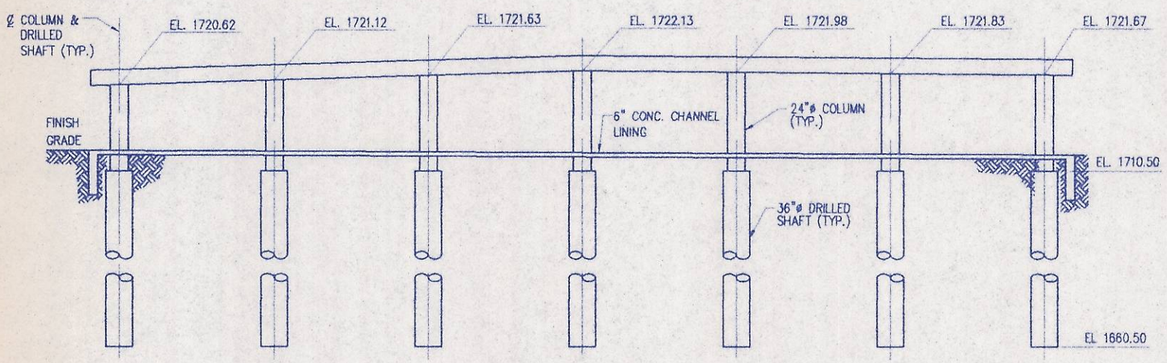
JOB NO. 500.721D

6/21/94

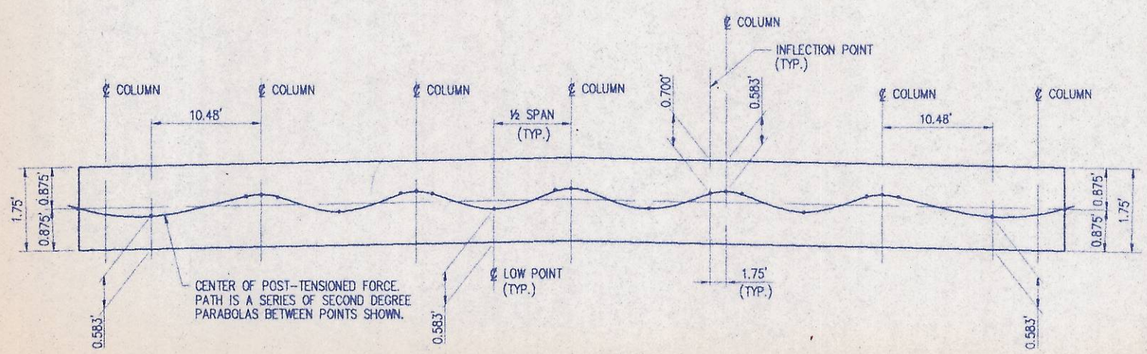
SA_B05



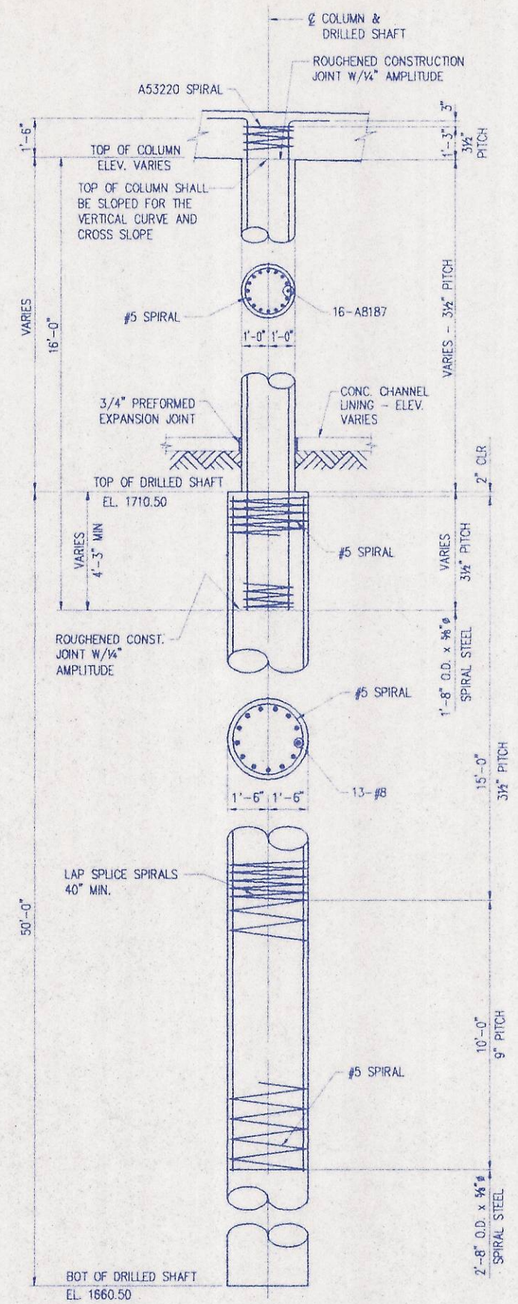
PIER 1 PLAN



PIER 1 ELEVATION



PIER 1 PRESTRESSING ELEVATION



TYPICAL COLUMN SECTION

PRESTRESSING NOTES:

1. POST-TENSIONING FORCES AND CONCRETE STRENGTHS FOR THE PIER ARE:

Pjack(K)	Pfinal(K)	F'ci(PSI)	F'c(PSI)
1,440	905	3,500	4,000

   Pjack IS THE JACKING FORCE AT JACKING ENDS. Pfinal IS THE WORKING FORCE AT THE CENTERLINE OF SECOND COLUMN FROM THE EXTERIOR EDGE OF THE SLAB AFTER ALL LOSSES. F'ci IS THE CONCRETE COMPRESSIVE STRENGTH AT THE TIME OF POST-TENSIONING. F'c IS THE ULTIMATE CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS.

2. DESIGN IS BASED ON U=0.25 AND K=0.0002. Pjack SPECIFIED INCLUDES FRICTION LOSSES AND PROVISIONS FOR LOSS OF STRESS DUE TO CREEP AND SHRINKAGE OF CONCRETE, RELAXATION AND ELASTIC SHORTENING OF STEEL, AND SEQUENCE OF STRESSING. LOSSES ARE AS FOLLOWS:

   20,000 PSI

3. DESIGN IS BASED ON 0.60"ø, 7 WIRE, 270 ksi LOW-RELAXATION PRESTRESSING STRAND JACKED TO 0.75F's WITH AN EQUIVALENT ANCHOR SET OF 1/8".

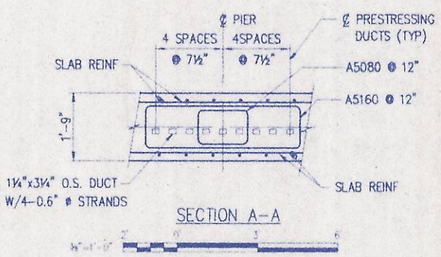
4. THE PIER IS TO BE STRESSED FROM BOTH ENDS.

5. CONTRACTOR TO SUBMIT ELONGATION AND JACKING CALCULATIONS BASED ON AN INITIAL STRESS AT THE CENTERLINE OF SECOND COLUMN FROM THE EXTERIOR EDGE OF THE SLAB = 0.727 TIMES JACKING STRESS.

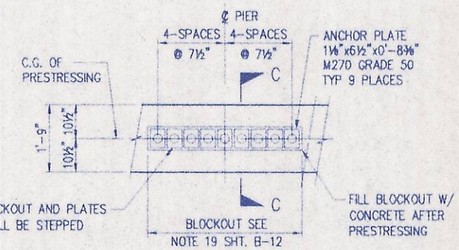
6. UNLESS OTHERWISE NOTED, THE PRESTRESSING FORCE SHALL BE DISTRIBUTED WITH AN APPROXIMATELY EQUAL AMOUNT ACROSS SIX FEET OF SLAB AND SHALL BE PLACED SYMMETRCALLY ABOUT THE CENTERLINE OF THE PIER.

7. AT NO TIME DURING THE STRESSING OPERATIONS SHALL MORE THAN 1/6 OF THE TOTAL PRESTRESSING FORCE BE APPLIED ECCENTRICALLY ABOUT THE CENTERLINE OF THE STRUCTURE.

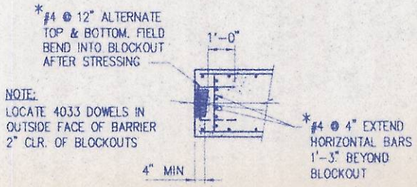
8. SEE PRESTRESSING NOTES 8 THRU 19 ON SHEET B-12 FOR ADDITIONAL REQUIREMENTS.



SECTION A-A



SECTION B-B



SECTION C-C

JOB NO. 500.721D

6/21/94

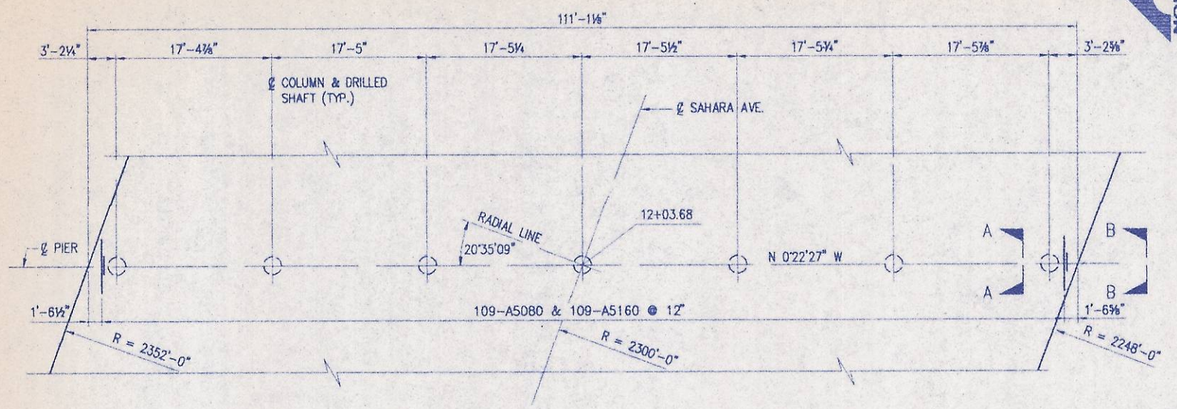
SA_B08

G.C. WALLACE, INC.
Engineering/Architecture
1556 SOUTH RAINBOW BLVD., LAS VEGAS, NEVADA 89102

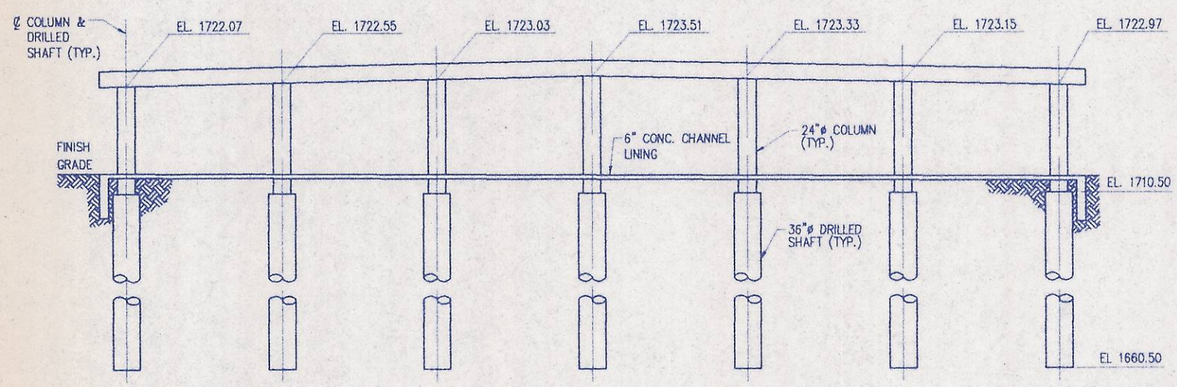
CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
PIER 1 PLAN & DETAILS

SHEET B-8

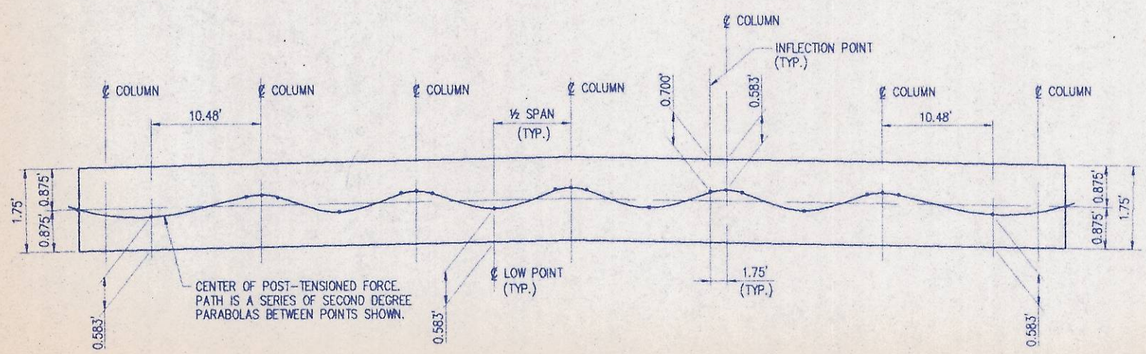
34 33 of 54



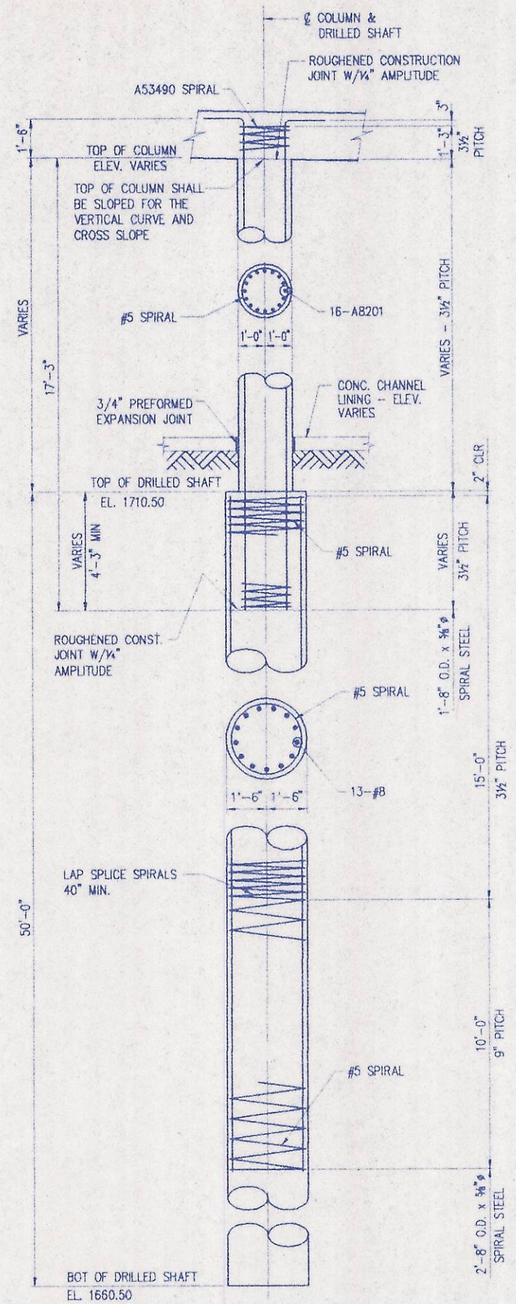
PIER 2 PLAN



PIER 2 ELEVATION



PIER 2 PRESTRESSING ELEVATION



TYPICAL COLUMN SECTION

PRESTRESSING NOTES:

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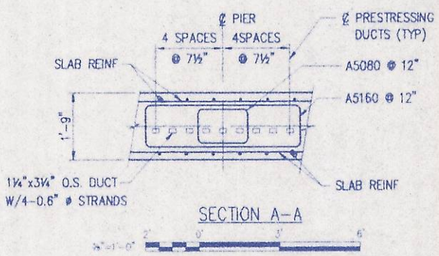
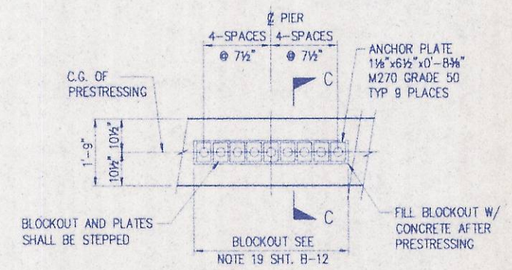
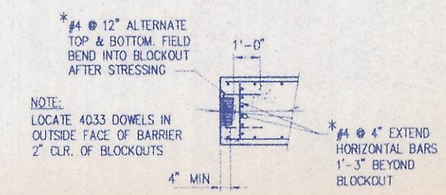
8. SEE PRESTRESSING NOTES 8 THRU 19 ON SHEET B-12 FOR ADDITIONAL REQUIREMENTS.



SECTION A-A



SECTION B-B



SECTION C-C

JOB NO. 500.721D

6/21/94

SA_809

DESCRIPTION | DATE | REV.

RECOMMENDED: BRIAN L. SCHMIDT

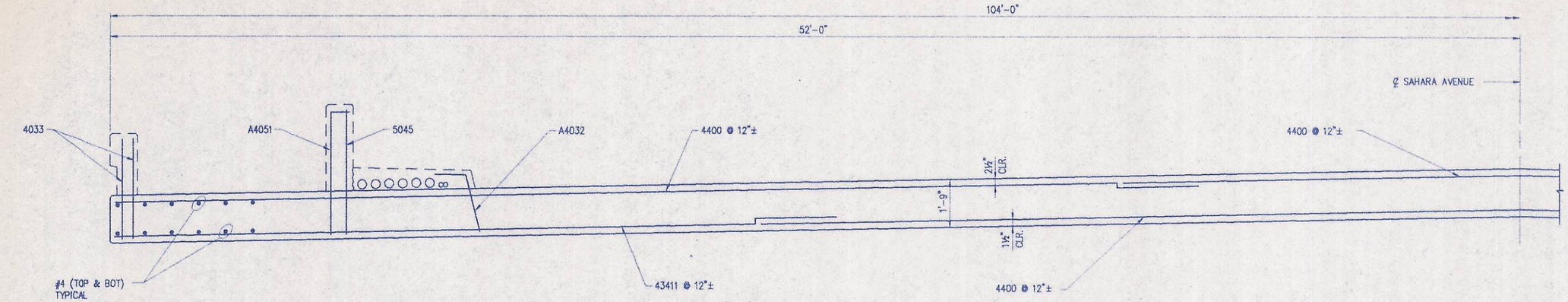
PROFESSIONAL ENGINEER STATE OF NEVADA BRIAN L. SCHMIDT No. 10747

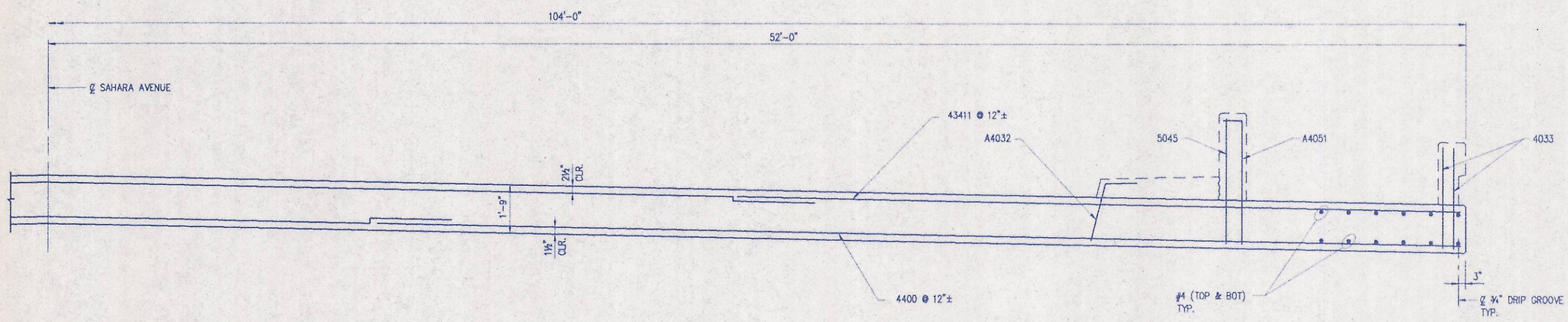
G.C. WALLACE, INC. Engineering/Architecture 1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
PIER 2 PLAN & DETAILS

SHEET B-9

SHT. 34 OF 54





TYPICAL DECK SECTION

½" = 1'-0" 1' 6" 0' 2' 4'

RECOMMENDED: BRIAN L. SCHMIDT

BRIAN L. SCHMIDT ONE No. 10174 PROFESSIONAL ENGINEER STATE OF NEVADA

6/16/94

REV. | DATE | DESCRIPTION

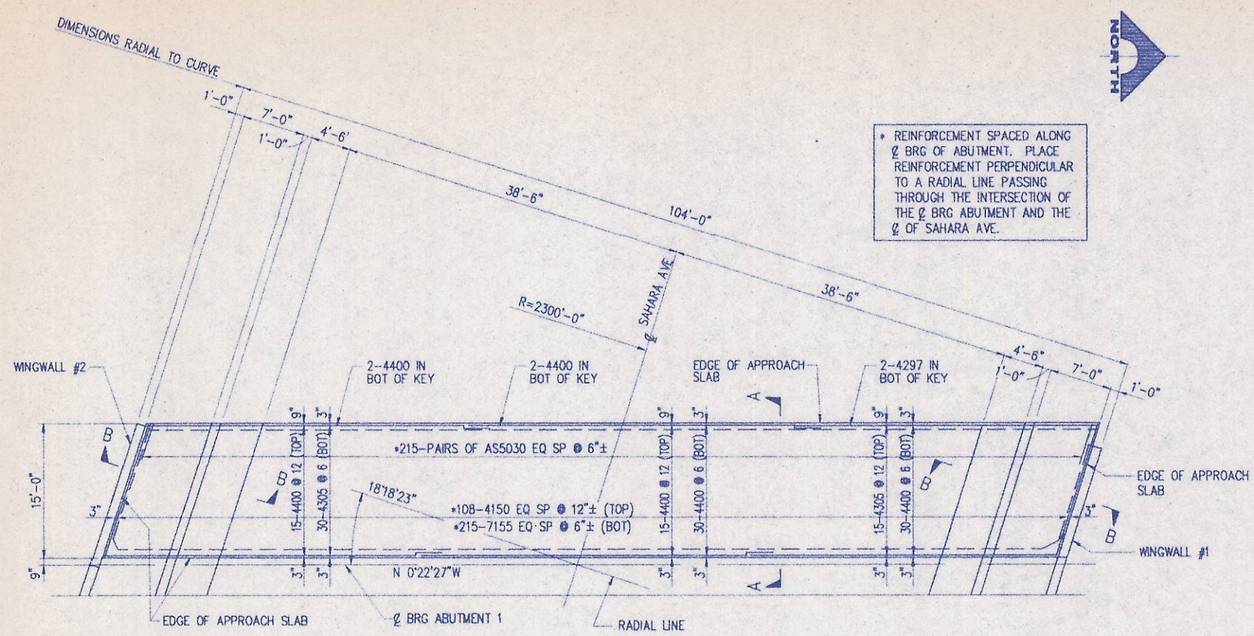
G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
TYPICAL DECK SECTION

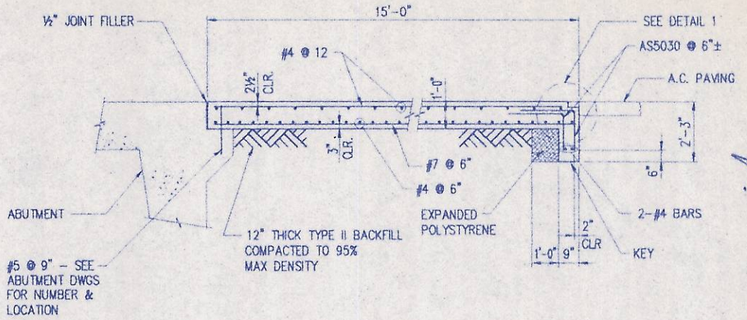
SHEET
B-10
SHT 35 OF 54

JOB NO. 500.721D

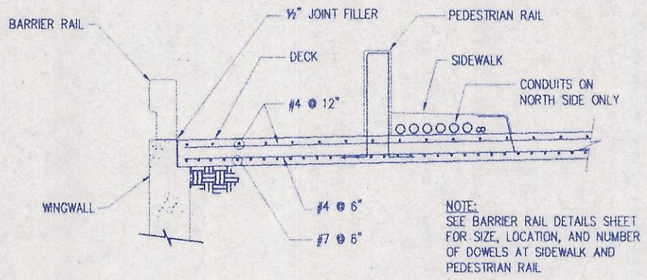
SA_B10 6/28/94



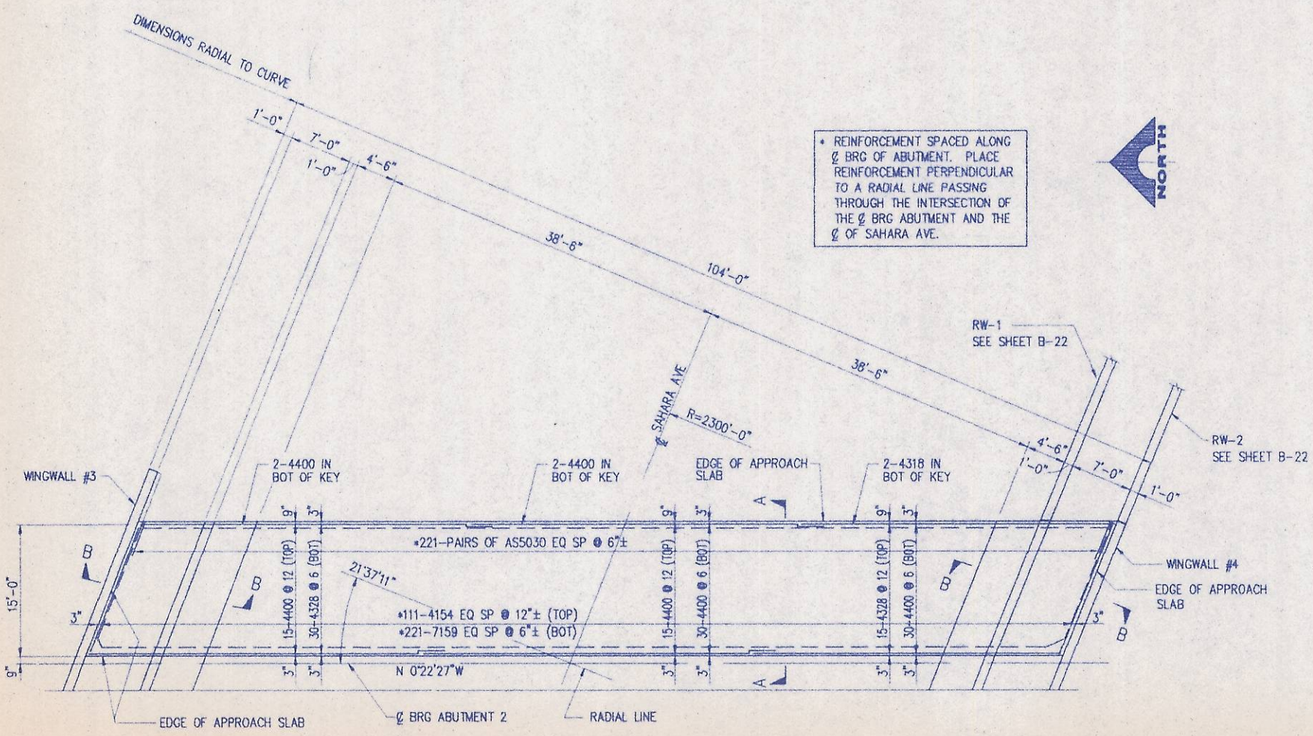
APPROACH SLAB 1 PLAN



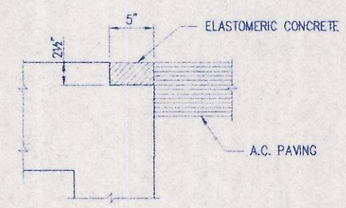
SECTION A-A



SECTION B-B



APPROACH SLAB 2 PLAN



DETAIL 1

JOB NO. 500.721D

8/21/94

SA_B13

REVISIONS			
DESCRIPTION	KEY	DATE	

RECOMMENDED: ISSUED: 6/30/94

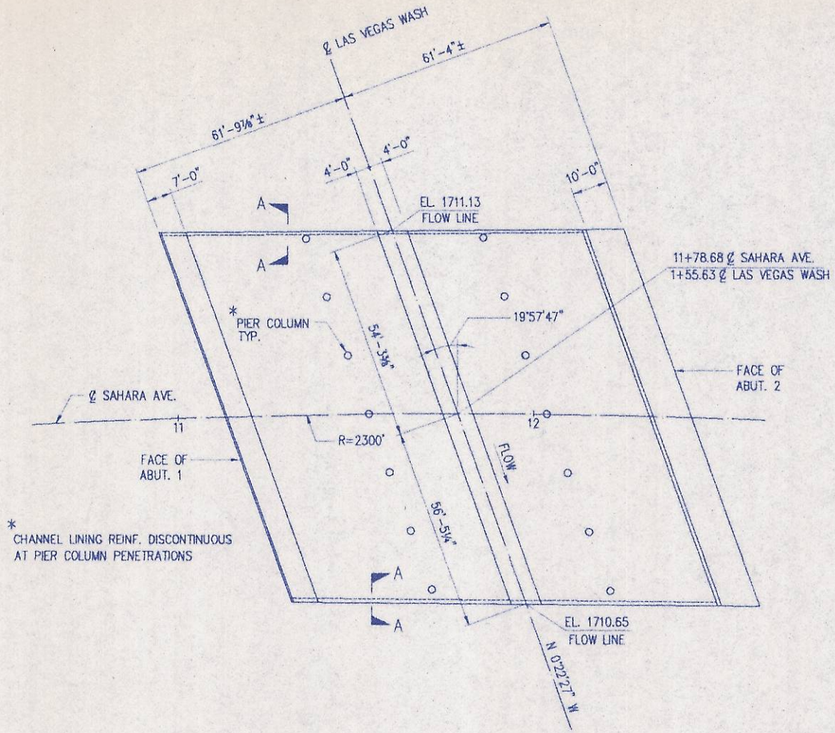
PROFESSIONAL ENGINEER STATE OF NEVADA BRIAN L. SCHMIDT No. 10747

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
APPROACH SLAB PLANS

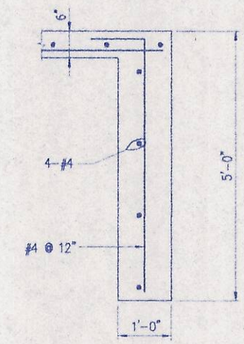
SHEET B-13

SHT 38 OF 54

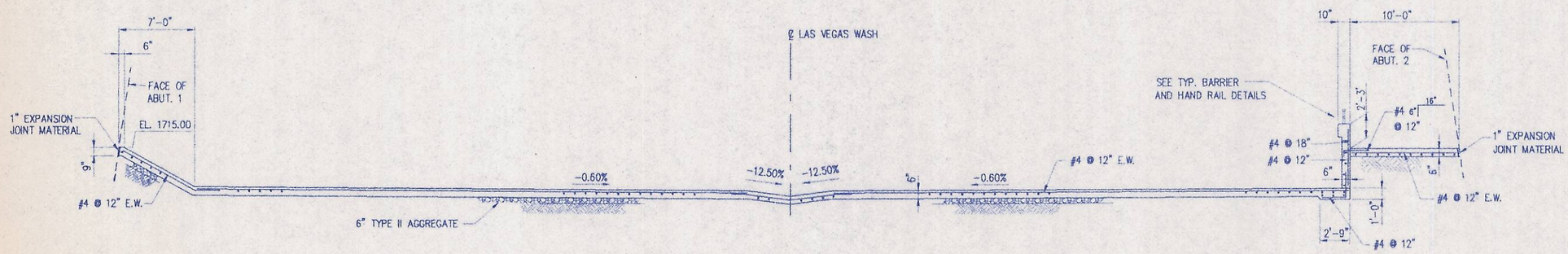


PLAN

1"=20'-0"



SECTION A-A



TYPICAL SECTION

1"=1'-0"

JOB NO. 500.721D

5/21/94

SL_B14

REV	DATE	DESCRIPTION

RECOMMENDED: 6/23/94

PROFESSIONAL ENGINEER STATE OF NEVADA BRIAN L. SCHMIDT No. 10747

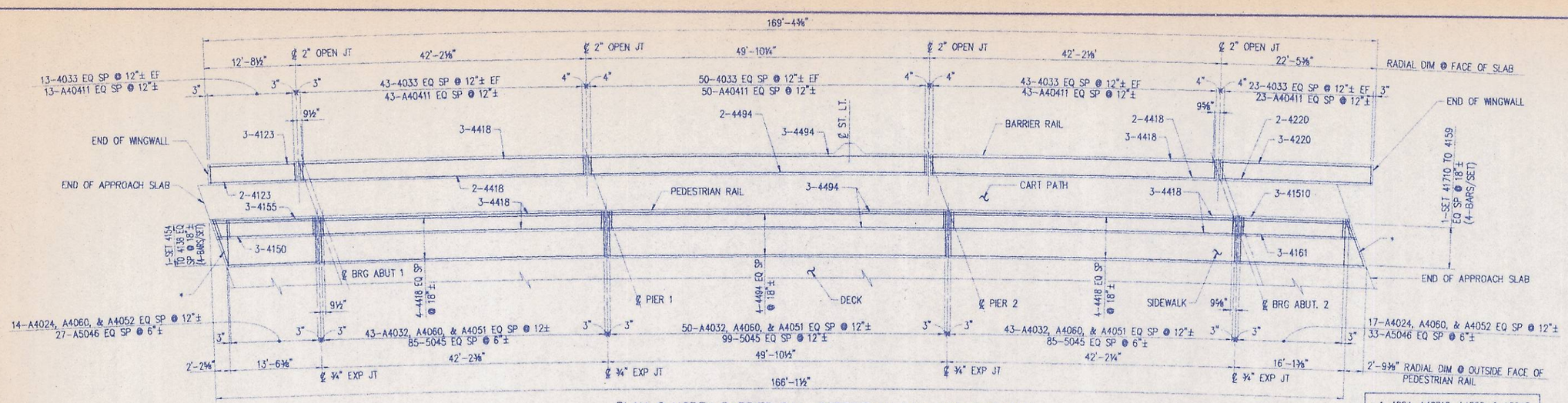
SIGNATURE: 10747 DATE: 6/23/94

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
CHANNEL LINING DETAILS

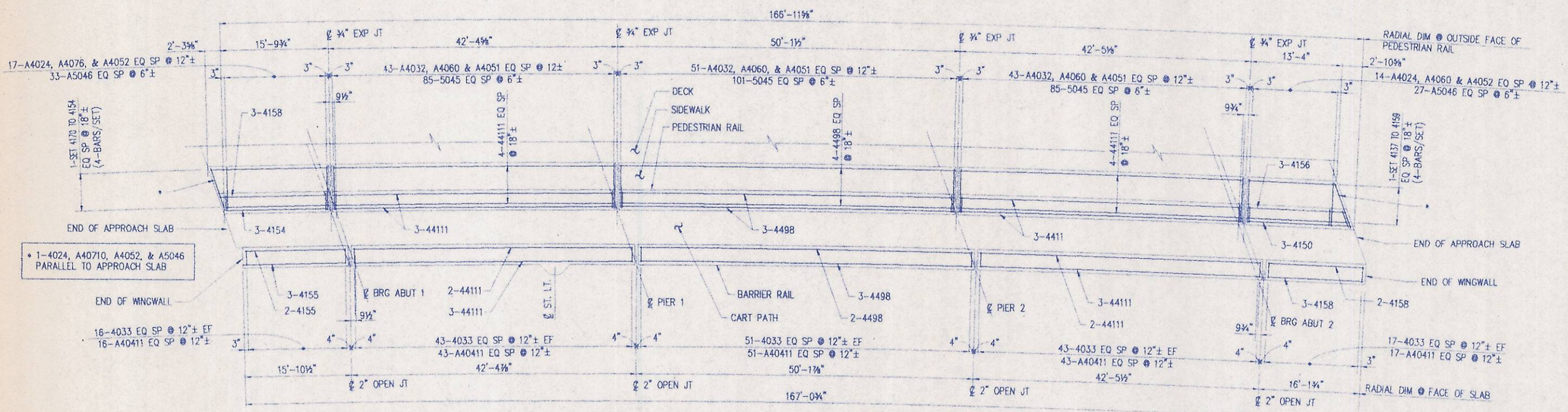
SHEET
B-14

SHT 39 OF 54



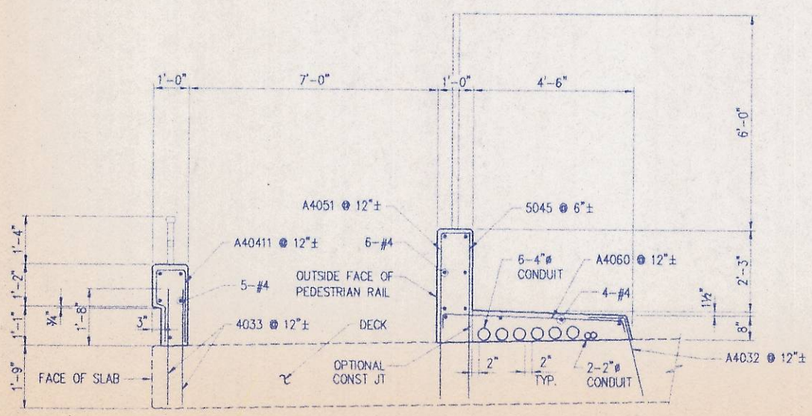
PLAN @ NORTH BARRIER RAIL, PEDESTRIAN RAIL, AND SIDEWALK

NO SCALE

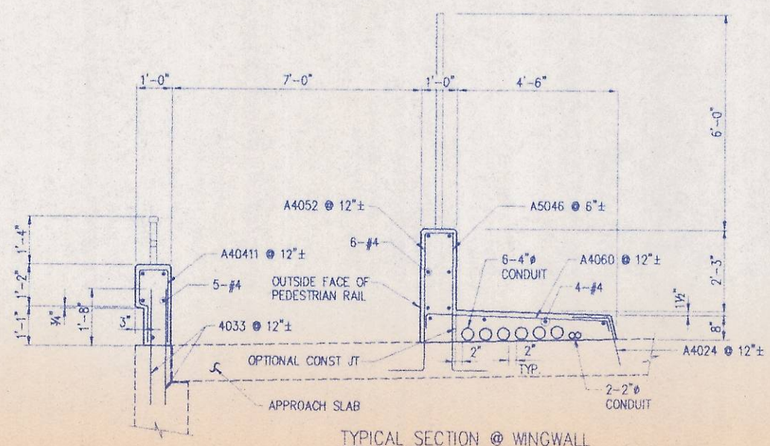


PLAN @ SOUTH BARRIER RAIL, PEDESTRIAN RAIL, AND SIDEWALK

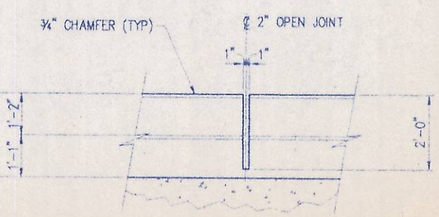
NO SCALE



TYPICAL SECTION @ BRIDGE



TYPICAL SECTION @ WINGWALL



OPEN JOINT DETAIL

JOB NO. 500.721D

6/21/94

SK_B15

NORTH

NORTH

REVISIONS

NO.	DATE	DESCRIPTION

RECOMMENDED: DESIGN ENGINEER

APPROVED: DESIGNER

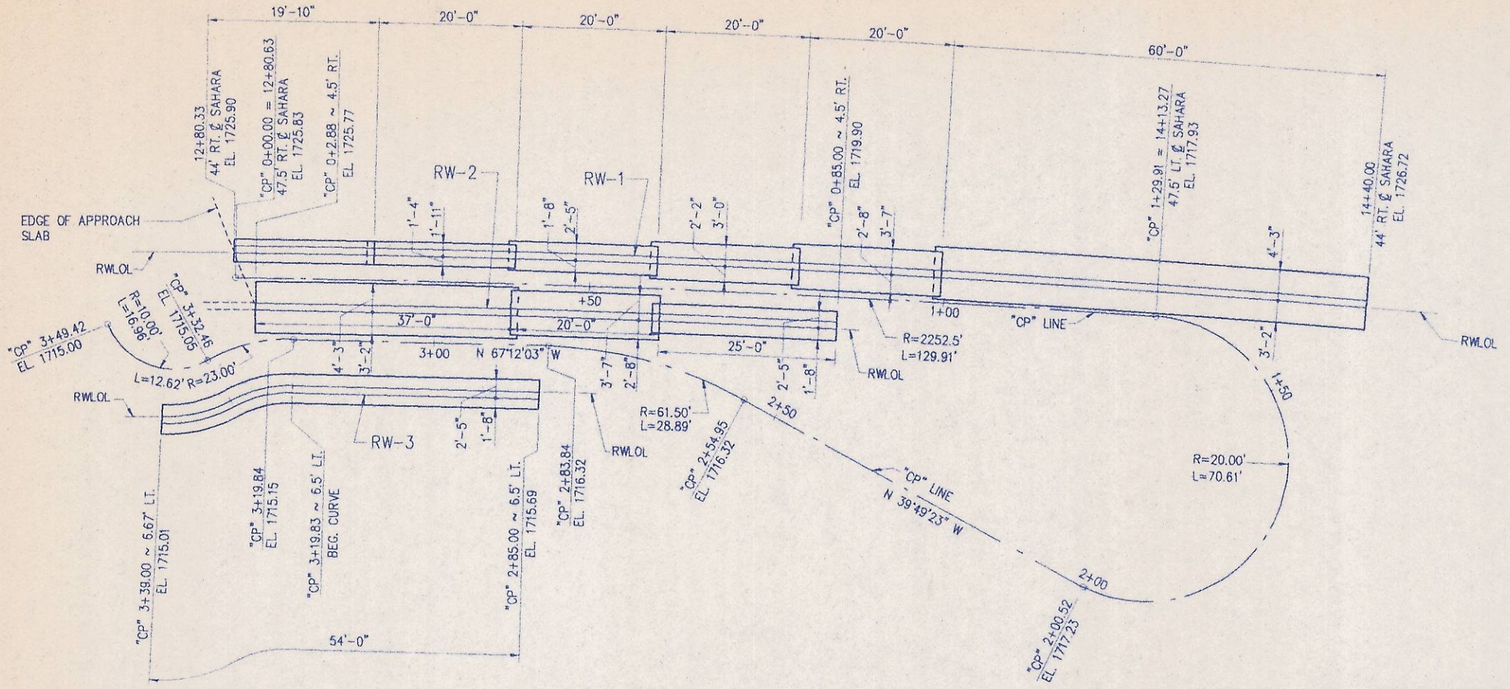
DATE 6/20/94

PROFESSIONAL ENGINEER - STATE OF NEVADA
BRIAN L. SCHMIDT
CIVIL
No. 10144

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
BARRIER RAIL DETAILS

SHEET
B-15

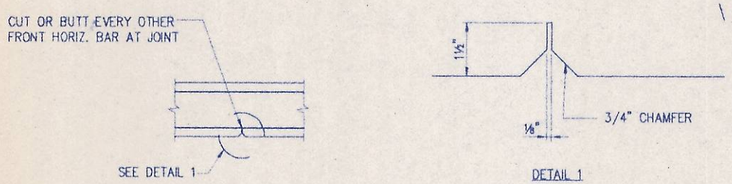


RETAINING WALL PLAN

1"=10'-0"

NOTES:

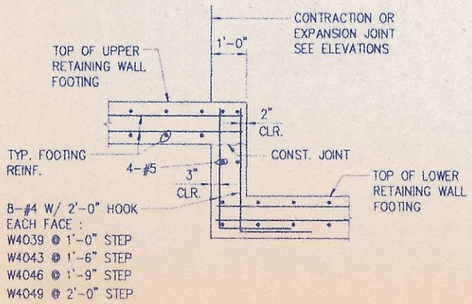
1. DIMENSIONS SHOWN ON THIS SHEET ARE TAKEN ALONG THE OUTSIDE FACE OF THE WALL.
2. SEE SHEET B-23 FOR SECTIONS AND ELEVATIONS
3. CONCRETE SHALL BE CLASS A, MODIFIED F'c = 3000 PSI.
4. ALL JOINTS SHOWN ARE CONTRACTION JOINTS PER DETAIL UNLESS NOTED AS EXPANSION JOINTS.



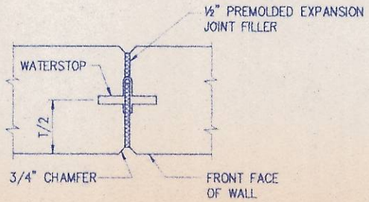
DETAIL 1

CONTRACTION JOINT

KEY JOINT



FOOTING STEP DETAIL



EXPANSION JOINT DETAIL

JOB NO. 500.721D

6/21/94

SA_B21

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

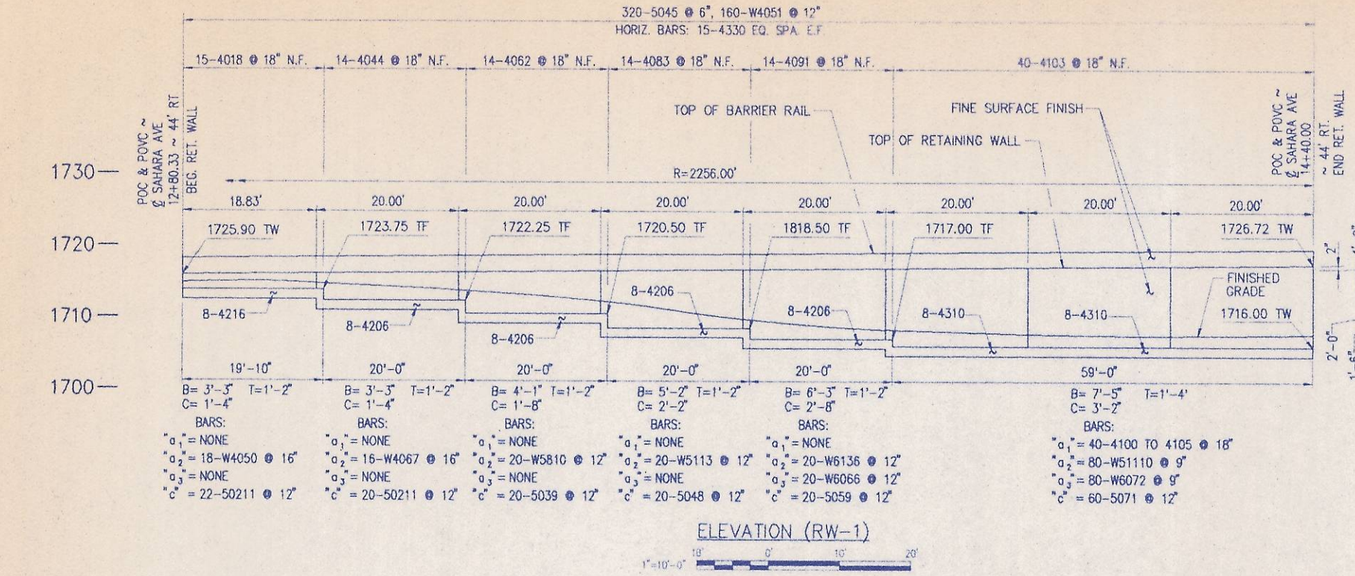
CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
RETAINING WALL PLAN

SHEET
B-22
OF 47 TO 54

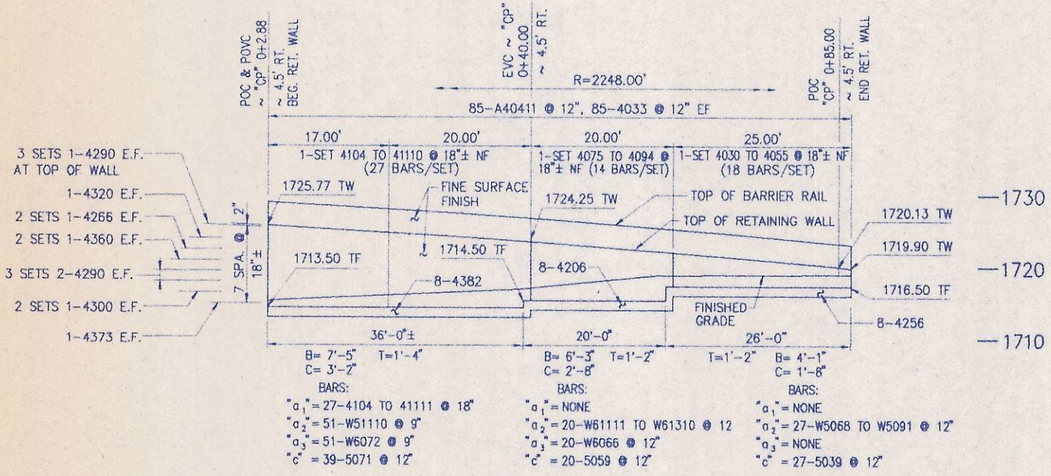
REVISIONS
NO. DATE DESCRIPTION

DESIGNED BRIAN L. SCHMIDT
DRAWN
CHECKED
DATE 6/21/94

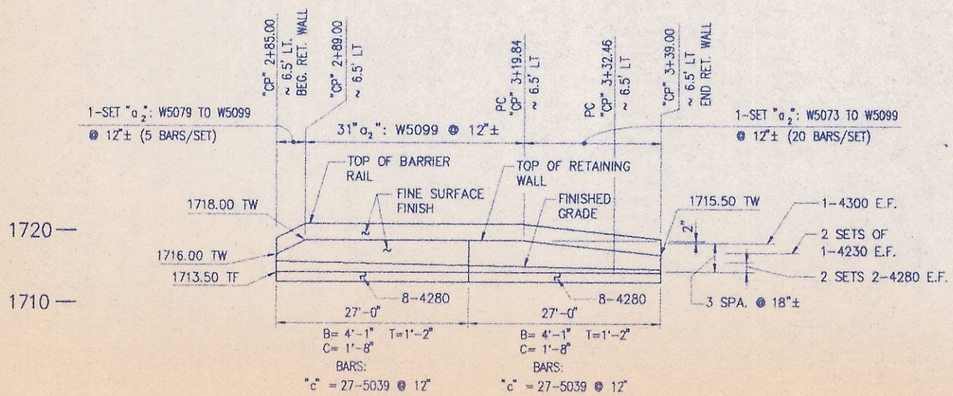
PROFESSIONAL ENGINEER - STATE OF NEVADA
BRIAN L. SCHMIDT
No. 10747



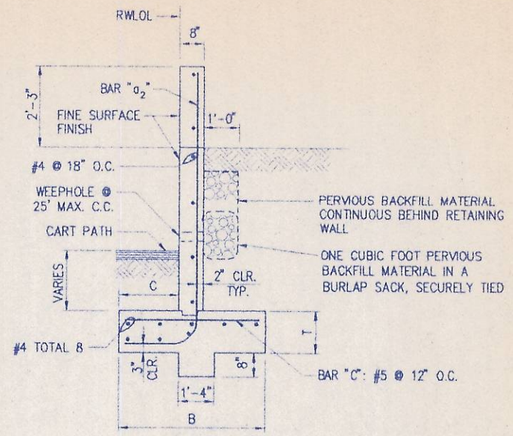
ELEVATION (RW-1)



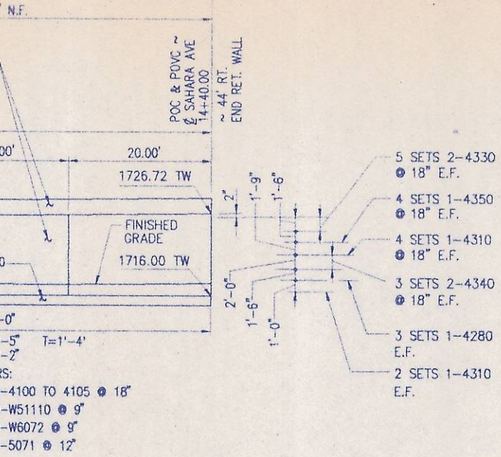
ELEVATION (RW-2)

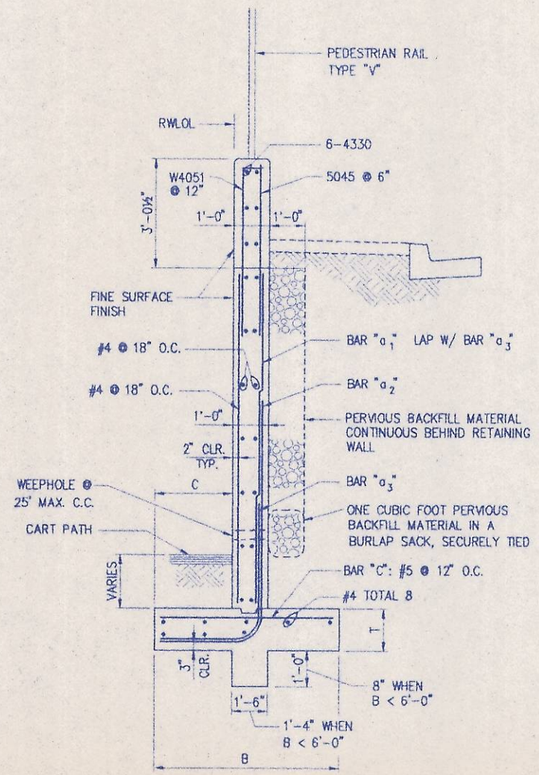


ELEVATION (RW-3)

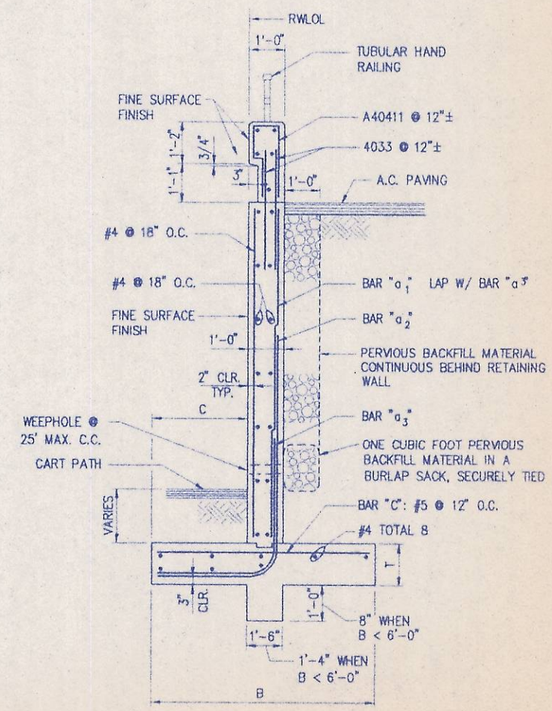


TYPICAL SECTION (RW-3)





TYPICAL SECTION (RW-1)



TYPICAL SECTION (RW-2)

JOB NO. 500.721D

6/21/94

SA_B22

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

CLARK COUNTY DEPT OF PUBLIC WORKS
SAHARA AVENUE S.I.D. 94
LAS VEGAS WASH BRIDGE
RETAINING WALL ELEVATIONS & SECTIONS

SHEET B-23

SHT 48 OF 54

Add 4/ 00-33700

Direct from L.B.

RESPONSE TO COMMENTS FOR THE DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE HYDRAULIC ANALYSIS

398.631

November 2000

Prepared for:

American Golf Corporation
27943 Via Del Agua
Laguna Niguel, California 92677
Phone: (916) 715-1494
FAX: (949) 362-1327

G. C. WALLACE, INC.
Engineers/Planners/Surveyors

RESPONSE TO COMMENTS FOR THE DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE HYDRAULIC ANALYSIS

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G. C. WALLACE, INC.
Engineers / Planners / Surveyors

G. C. WALLACE, PE/SE, PLS
JAMES A. DUDDLESTEN, PE
MICHAEL D. ROSS, PE
CHRISTOPHER W. ANDERSON, PE
CALVIN L. BLACK, PE, PLS
BENJAMIN C. SMITH, PE
SCOTT R. PLUMMER, PE
E. ROBERT PETERSON

PAUL BURN, PLS, WRS
MICHAEL J. CSIZMADIA, PE
C. RUSSELL DAVIS, PE/SE
DOUGLAS M. HANKEL
DONALD A. HASELHOFF, PE, CEM
RICKEY D. HUNSAKER, PE
NOEL C. LAUGHLIN, PE
MARVIN W. MAIZE
GREGORY J. PATCH, PE
JOHN R. TOBIN, PE
HOWARD K. VANDER MEER, PE
EUGENE W. WRIGHT, PE

JOSEPH A. BODROG, PLS
THOMAS P. DYSON, PE
KENNETH M. HANIFAN, PE
DONALD L. HOTCHKISS JR., PE
BERT A. HUGHES, PE
JERRY D. JOHNSTON
TIMOTHY A. McCOY, PE, PTOE
DANNY S. McFADDEN, PE
THOMAS R. NICHOLS, PE
JERRY E. PRUITT, PE
BRIAN L. SCHMIDT, PE
JEFF W. STAYTON, PE
RICHARD W. STEUBING, PLS, WRS
SAUNDRA L. VANCE, CCS, CCCA
JOHN M. WALKER, PE
G. IRA WALLACE, PE

JIM B. BAKKEDAHL, PE
THOMAS S. BARNES, PLS
DENNIS R. BROWN, PE
ROY D. CLARK, PE
RICHARD G. CLARKE
TODD G. CORMIER, PE
JOHN L. ELTSCHLAGER, PE
ALLAN P. FAJARDO, PE
ERIC G. GILES, PE
RANDALL K. GREMLICH, PE
PASCAL HAYES, PE
J. P. HIGGINS, PLS, WRS
DANNY E. HILL, PLS
GERALD L. HOLTON, PLS
KAYANN JONGSMA, PE
FARHAD KHANBOLOUKI, PE
WILLIAM METCALF
RANDY W. MROWICKI, PLS
RIMAH I. NAZZAL, PE
D. G. NEEL, PLS
JOHNNIE R. PATE JR., PE
BRIAN K. REED, PE
LUDVIG I. SMEETS, PE
DENNIS W. SOLANO, PLS
RICHARD A. E. STRUTZ
ROBERT J. WOODSON, PE
KENNETH T. YAMADA
CHRISTOPHER R. ZRINYI, PE

AFFILIATE OFFICE IN
SACRAMENTO, CA

398.631

November 30, 2000

Phu Simpson
Associate Engineer
Clark County Department of Public Works
Community Development Division
500 South Grand Central Parkway
Las Vegas, Nevada 89155-4000

Subject: Response to Comments for the Desert Rose Golf Course Pedestrian Bridge Hydraulic Analysis – (HTE #00-33700)

Dear Ms. Simpson:

This letter responds to comments made in a letter from the Louis Berger Group dated November 14, 2000. Our responses are as follows:

Comment: "1. Clark County Regional Flood Control District (CCRFCD) concurrence is required because the project is bordered by a master planned drainage facility and lies within a FEMA Zone A. It is the responsibility of the applicant to submit a copy of the drainage study and any addenda to the CCRFCD."

Response: A copy of the approved hydraulic analysis will be sent to the CCRFCD for concurrence.

Comment: "2. Please submit a copy of the improvement plans for the proposed bridge."

Response: A copy of the improvement plans are attached.

Comment: "3. The FIRM map with a panel number 32003C2200 D has been reissued based on a LOMR dated March 21, 2000. Resubmit Figure 3 based on the effective FIRM."

Response: The attached Figure 3 has been revised to reflect the LOMR dated March 21, 2000.

1555 SOUTH RAINBOW BLVD. / LAS VEGAS, NEVADA 89146 / TELEPHONE: (702) 804-2000 / FAX: (702) 804-2299
SUMMERLIN OFFICE FAX: (702) 804-2295

G. C. WALLACE, INC.
Engineers/Planners/Surveyors

398.631

Please note that a few minor additions have been made to the grading plan to ensure proper installation of the reinforcement mat. The grading plan is attached.

Please do not hesitate to contact us at 804-2000 if you have any questions or require additional information.

Very truly yours,

G. C. WALLACE, INC.

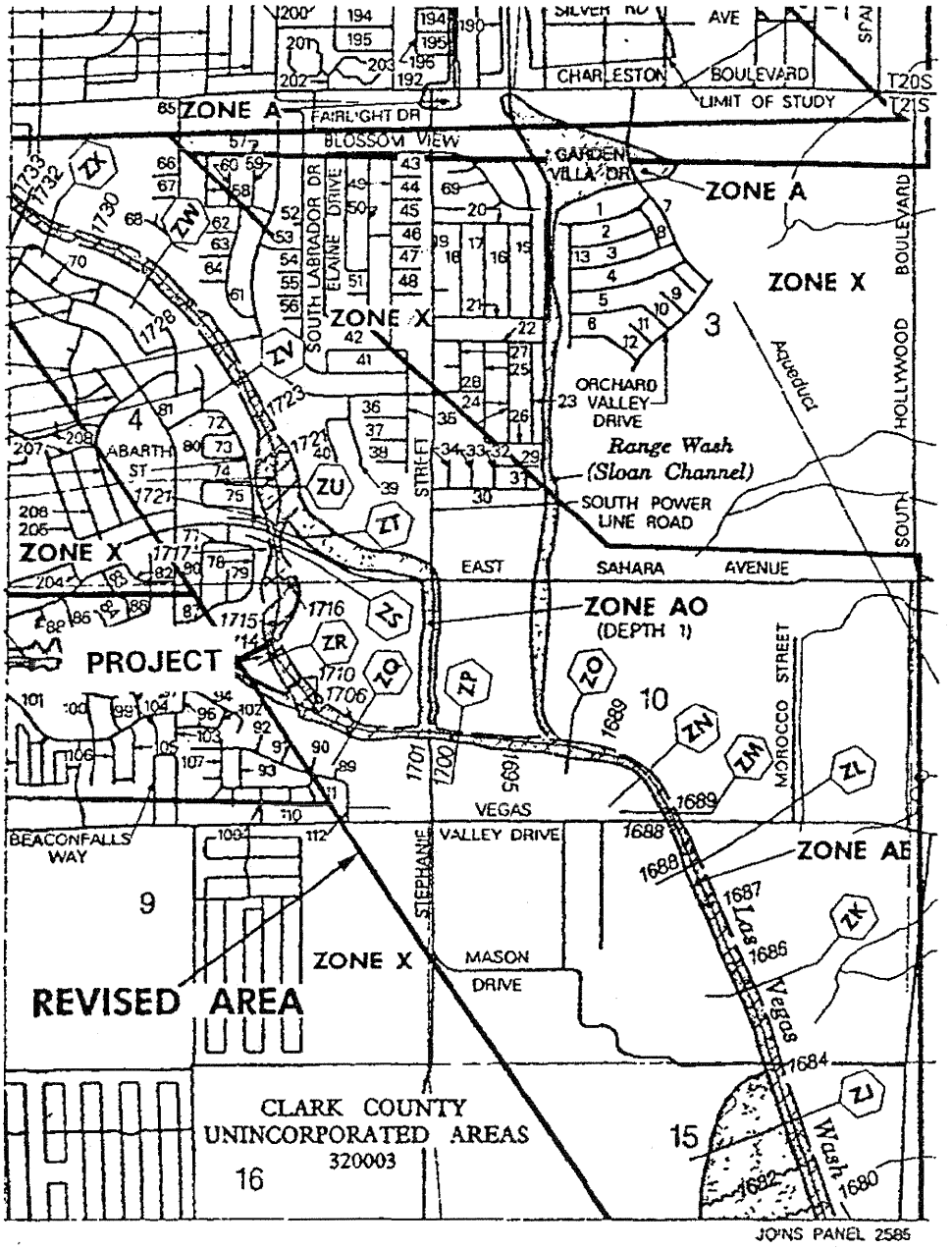
Michael J. Ludwig, E.I.
Designer

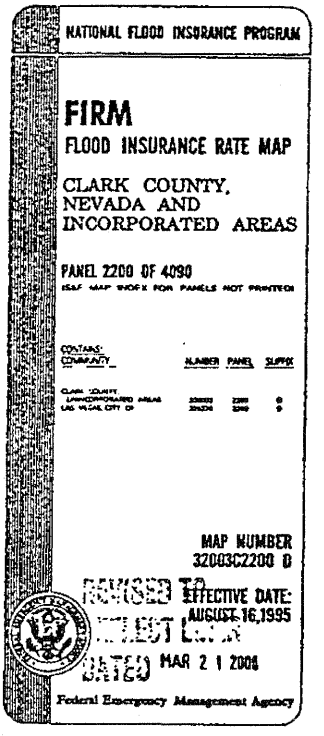
Calvin L. Black, P.E.
Executive Vice President

CLB:MJL:jj

Encl.

\\Gcw2\data\398-631\admin\ltr\ccpw-cdd-RTC-DesertRoseGolfCrse-mjl.wpd





APPROXIMATE SCALE IN FEET

2000 0 2000

DESERT ROSE GOLF COURSE BRIDGE

HYDRAULIC ANALYSIS

FIGURE 3

F.I.R.M.

G.C. WALLACE, INC.

Engineers/Planners/Surveyors 1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146

C:\MyFiles\tools\misc\8x11.dwg 11-28-00 17:00:01 mludwig

THE Louis Berger Group, INC.
500 Amigo Court, Suite 100, Las Vegas, Nevada 89119
Tel 702 736 6632 Fax 702 736 0704 www.louisberger.com

November 14, 2000

Calvin L. Black, P.E.
G. C. Wallace, Inc.
1555 South Rainbow Boulevard
Las Vegas, NV 89102

Re: **TECHNICAL DRAINAGE STUDY FOR DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE**
Study Dated: October 5, 2000
Location: Crossing the Las Vegas Wash within the Desert Rose Golf Course
Section 09, T. 21 S., R. 62 E.
NFM-0178-99
HTE# 00-33700

Dear Mr. Black:

This facsimile is being forwarded in lieu of a typical mailed comment letter in order to expedite the review process. The following items are required in order to produce an approval letter for the above referenced **Technical Drainage Study**:

1. Clark County Regional Flood Control District (CCRFCD) concurrence is required because the project is bordered by a master planned drainage facility and lies within a FEMA Zone A. It is the responsibility of the applicant to submit a copy of the drainage study and any addenda to the CCRFCD.

2. Please submit a copy of the improvement plans for the proposed bridge.

3. The FIRM map with a panel number 32003C2200 D has been reissued based on a LOMR dated March 21, 2000. Resubmit Figure 3 based on the effective FIRM.

Additional items may be required by Clark County Public Works at a later date.

Two copies of the supplemental information must be submitted directly to The Louis Berger Group, Inc. The items listed herein must be thoroughly addressed and submitted for review within 5 days of the above date.

Calvin L. Black, P.E.
Desert Rose Golf Course Pedestrian Bridge
November 14, 2000
Page 2 of 2

If you have any questions concerning the comments, please contact The Louis Berger Group, Inc. to schedule a study review meeting.

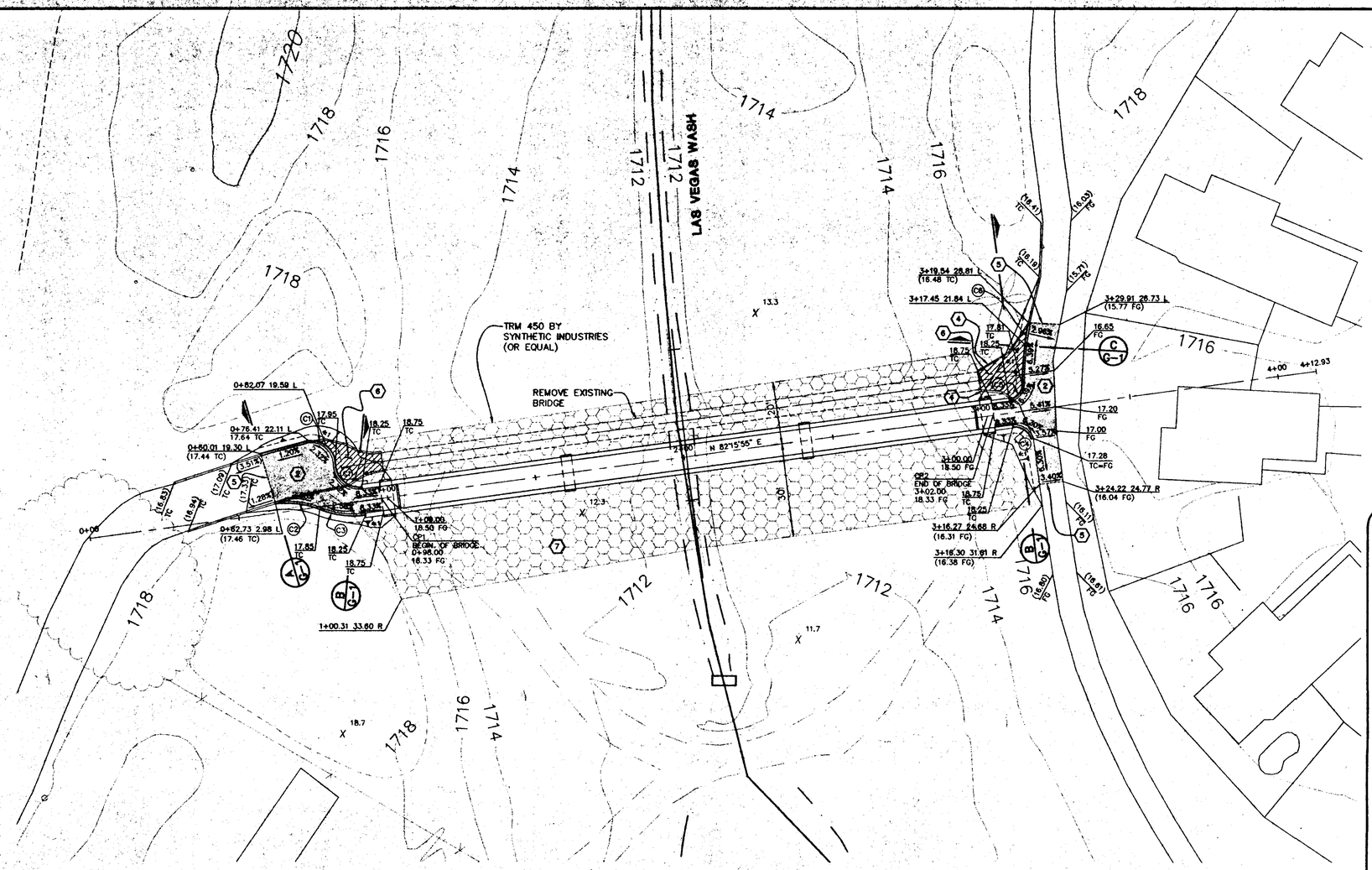
Sincerely,

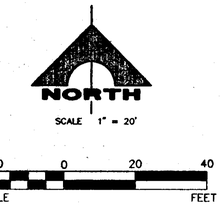
THE LOUIS BERGER GROUP, INC.

Danny D. Barrows, E.I.
Hydrologist

Syndi J. Dudley, Ph.D., P.E.
Director of Water Resources

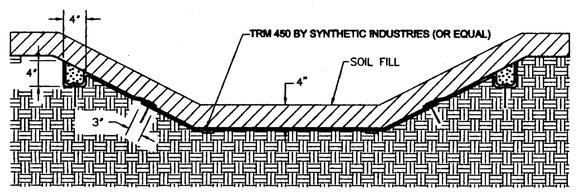
cc: Clark County Public Works Department





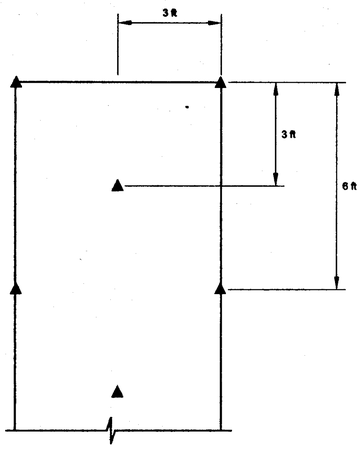
CONSTRUCTION NOTES

1. ALL DIMENSIONS AND ELEVATIONS TO BE FIELD VERIFIED
2. SLOPE NEW PAVING TO DRAIN
3. FOR VERTICAL GEOMETRY OF PROFILE "A" (PEDESTRIAN BRIDGE) SEE SHEET B-1
4. REMOVE EXISTING "A"CURB (WHERE REQUIRED) ALONG EXISTING HORIZONTAL LAYOUT.
5. CONTRACTOR TO SAWCUT EXISTING PAVEMENT AND CURB AND MATCH EXISTING.
6. CONTRACTOR TO REMOVE EXISTING CONCRETE AND BASE MATERIAL IF ANY. REGRADE AREA TO DRAIN TO CHANNEL.
7. INSTALL TRM 450 TURF REINFORCEMENT MAT (OR EQUAL), SOIL FILL AND SEEDING PER MANUFACTURER'S RECOMMENDATIONS.



NOTES:
1. INSTALL TRM 450 TURF REINFORCEMENT MAT (OR EQUAL), SOIL FILL AND SEEDING PER MANUFACTURER'S RECOMMENDATIONS.
2. SECURE LONGITUDINAL ANCHOR TRENCH AT 1 FT INTERVALS, BACKFILL AND COMPACT SOIL.

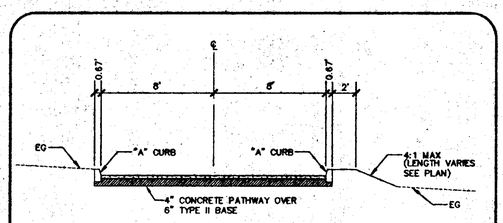
TYPICAL SECTION ANCHOR PLACEMENT



NOTES:
1. PLACE 1 ANCHOR/SY FOR SLOPES FLATTER THAN 3H:1V
2. U - SHAPED WIRE STAPLES, METAL GEOTEXTILE PINS, TRIANGULAR WOODEN OR PLASTIC STAKES CAN BE USED TO ANCHOR TRMs TO THE GROUND SURFACE

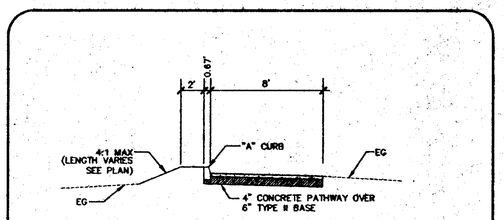
TYPICAL SECTION ANCHOR PATTERN

Please note that the information presented herein is general information only. It is for conceptual use only and not intended to be used for construction. While every effort has been made to ensure its accuracy, this information should not be used for a specific application without independent professional examination and verification of its suitability, applicability and accuracy.



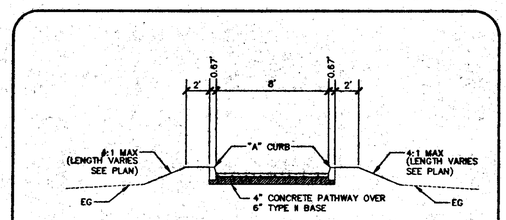
GOLF CART PATH (A / G-1)

STRUCTURAL SECTION AND PATHWAY TO BE VERIFIED BY SOILS ENGINEER



GOLF CART PATH (C / G-1)

STRUCTURAL SECTION AND PATHWAY TO BE VERIFIED BY SOILS ENGINEER



GOLF CART PATH (B / G-1)

STRUCTURAL SECTION AND PATHWAY TO BE VERIFIED BY SOILS ENGINEER

LEGEND

- 4510 — EXISTING CONTOUR (10' INTERVAL)
- 4506 — EXISTING CONTOUR (2' INTERVAL)
- 50.00 TC or FG — PROPOSED ELEVATION

QUANTITIES		
4" CONC. PATHWAY W/ 6" TYPE II BASE	1,134	SF
"A" TYPE CURB	110	LF
TRM 450 (OR EQUAL)	1,260	SY
SOIL FILL	140	CY

BASIS OF BEARINGS

SOUTH 43°19'38" EAST-TAKEN FOR THE LINE FROM CLARK COUNTY G.I.S. MONUMENT 827 TO CLARK COUNTY G.I.S. MONUMENT 834 PER STATE PLAN COORDINATE SYSTEM (U.S. STATE PLANE 1983: NEVADA EAST 2701) LISTED BY RECORD OF SURVEY ON FILE, IN FILE 88, PAGE 53 OF SURVEYS, OFFICIAL RECORDS OF CLARK COUNTY, NEVADA

BENCHMARK

CITY OF NORTH LAS VEGAS BENCHMARK NO. 7C0219W4, BEING A RIVET AND SQUARE ALUMINUM PLATE IN THE TOP OF CURB, IN THE NORTHEAST RETURN AT THE INTERSECTION OF PECOS ROAD AND LAKE MEAD BOULEVARD.
ELEVATION: 556.503 METERS
1825.79 FEET

Curve Table				
No.	Delta	Radius	Length	Tangent
(C1)	93°58'31"	8.00'	13.12'	8.58'
(C2)	28°32'17"	30.00'	14.94'	7.63'
(C3)	29°52'17"	30.00'	15.64'	8.00'
(C4)	74°37'28"	6.00'	7.81'	4.57'
(C5)	77°07'28"	5.00'	6.73'	3.99'
(C6)	11°21'40"	105.00'	20.82'	10.44'

CONSTRUCTION CONTROL AND SURVEY DATA					
MARK NO.	NORTH	EAST	ELEV.	DESCRIPTION	STATION
CP1	193973.12	102632.11	1718.33	BEGINNING OF BRIDGE	0+98.00
CP2	194000.84	102836.24	1718.33	END OF BRIDGE	3+02.00

STATE OF NEVADA PROFESSIONAL ENGINEER CIVIL No. 4525

REV	DATE	DESCRIPTION	DATE	AGEN.	APP.	DATE	GCW.	APP.

X COMPLETE

ISSUE DATE

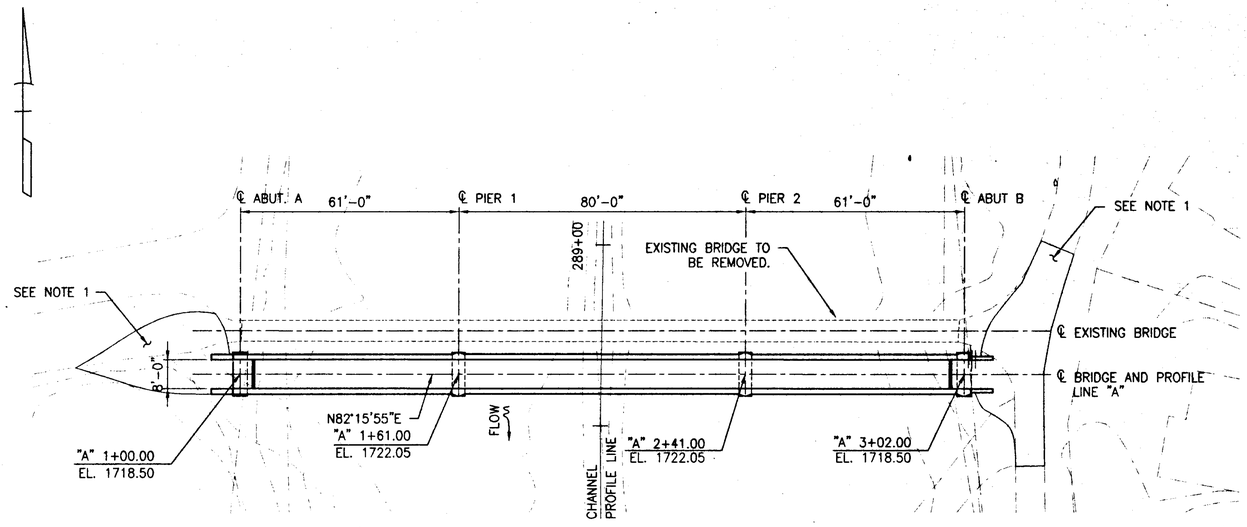
DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 11-29-00
PLOT TIME: 10:08:28
IMCDR16

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000• FAX: (702) 804-2299
F:\398-631\dwg\mpcrc\631C001.dwg

DESERT ROSE GOLF COURSE
PEDESTRIAN BRIDGE
CLARK COUNTY, NEVADA

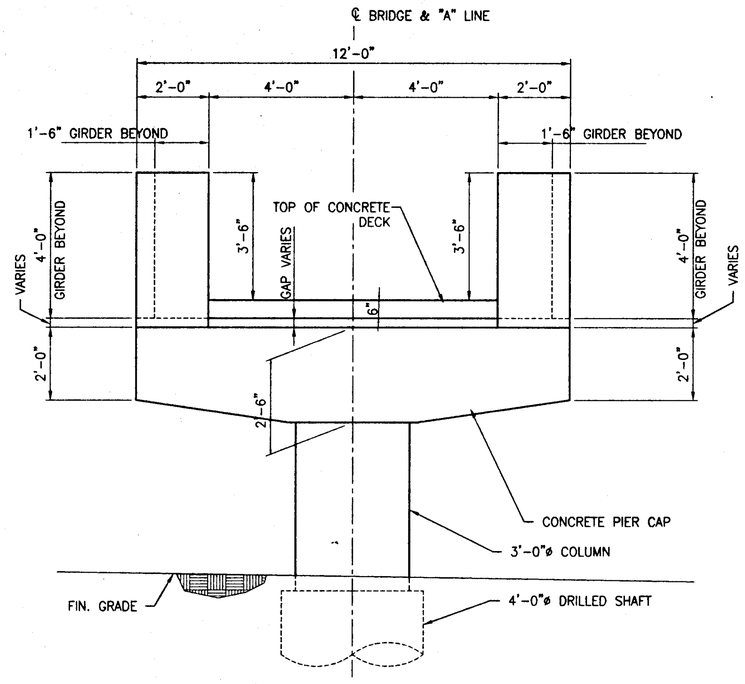
GRADING PLAN

SHEET
G-1
1 OF 1 SHTS



PLAN

1" = 20'



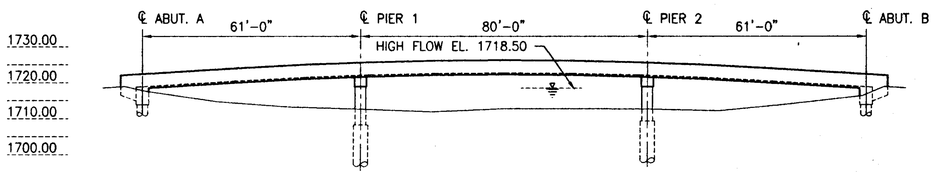
TYPICAL SECTION

1/2" = 1'-0"

NOTES:

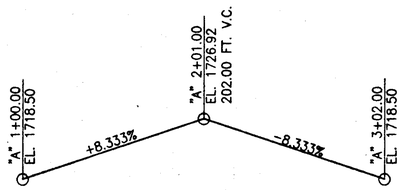
1. FOR GRADING REQUIREMENTS AT BRIDGE APPROACHES, SEE GRADING PLAN.

2. FOR ARCHITECTURAL TREATMENTS OF WINGWALLS AND GIRDERS, SEE SHEETS B-4 AND B-8, RESPECTIVELY.



ELEVATION

1" = 20'



PROFILE LINE "A"

GENERAL NOTES:

1. DESIGN SPECIFICATIONS: AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES", 1996, AND INTERIMS THRU 1998, AND AASHTO "GUIDE SPECIFICATIONS FOR DESIGN OF PEDESTRIAN BRIDGES", AUGUST 1997. LOAD FACTOR DESIGN METHODS USED.

2. CONTRACT SPECIFICATIONS: "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", JUNE 1997 EXCEPT AS NOTED BELOW AND IN SPECIAL PROVISIONS FOR THIS CONTRACT.

3. LIVE LOAD: AASHTO HS-5 TRUCK OR 85 PSF (REDUCIBLE TO 65 PSF) UNIFORM LOAD.

4. SEISMIC LOAD: ACCELERATION COEFFICIENT 0.15G. ATC-6 RESPONSE SPECTRA WITH TYPE III SOIL. DETAILED TO SEISMIC PERFORMANCE CATEGORY B REQUIREMENTS.

5. CONCRETE: ALL CONCRETE SHALL BE CLASS A MODIFIED (MAJOR) EXCEPT CONCRETE FOR DRILLED SHAFTS SHALL BE CLASS D MODIFIED. TYPE V CEMENT SHALL BE USED FOR CONCRETE IN CONTACT WITH SOIL. SEE CONCRETE CLASSIFICATION DIAGRAM FOR ULTIMATE COMPRESSIVE CONCRETE STRENGTHS, AND PLACEMENT LOCATIONS AND SEQUENCE. USE 2" CHAMFER AT ALL ACUTE EDGES UNLESS OTHERWISE NOTED (INCLUDING ANGLES LESS THAN 60').

6. REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE ASTM A706. DIMENSIONS RELATING TO BAR SPACING ARE CENTER TO CENTER. BENDING DIMISIONS ARE FROM OUT TO OUT OF THE BARS.

7. CAMBER: THE CAMBER SHALL BE AS SHOWN ON THE PLANS.

8. HYDRAULICS: DESIGN BASED ON RECOMMENDATIONS PER "DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE HYDRAULICS ANALYSIS" REPORT PREPARED BY G.C. WALLACE.

9. GEOTECHNICAL: FOUNDATION DESIGN BASED ON RECOMMENDATIONS PER "SOILS AND FOUNDATION INVESTIGATION, DESERT ROSE GOLF COURSE BRIDGE NEAR EAST SAHARA AVENUE AND SOUTH NELLIS BOULEVARD, CLARK COUNTY, NEVADA" PREPARED BY CONVERSE CONSULTANTS (CONVERSE PROJECT NO. 99-33550-01), DATED SEPTEMBER 19, 2000.

10. CONTRACTOR MAY SUBMIT ALTERNATE STEEL SUPERSTRUCTURE (WITH CONCRETE DECK) OPTION. ACCEPTANCE OF ALTERNATE OPTION IS SUBJECT TO APPROVAL BY THE ENGINEER.

REV. NO.	DATE	DESCRIPTION	APPROVED

DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE

PLAN, ELEVATION, SECTION & GENERAL NOTES

CLARK COUNTY, NEVADA

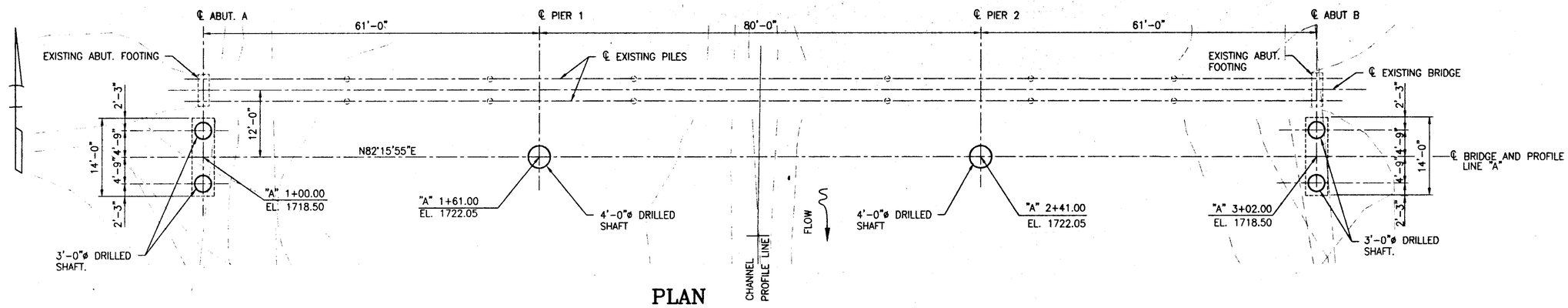
PROFESSIONAL ENGINEER — STATE OF NEVADA — JOHN G. WILSON — CIVIL — No. 13137 — 11-30-00

PROJECT NO: 99162 DRAWN BY: ELY
DESIGNED BY: JW CHECKED BY: JW
APPROVED BY: JW

R&H•CB&L ENGINEERING
CONSULTING STRUCTURAL ENGINEERS
940 SOUTH HOWARD STREET, SUITE 200
LAS VEGAS, NEVADA 89101
PHONE (702) 385-7999
FAX (702) 385-7979

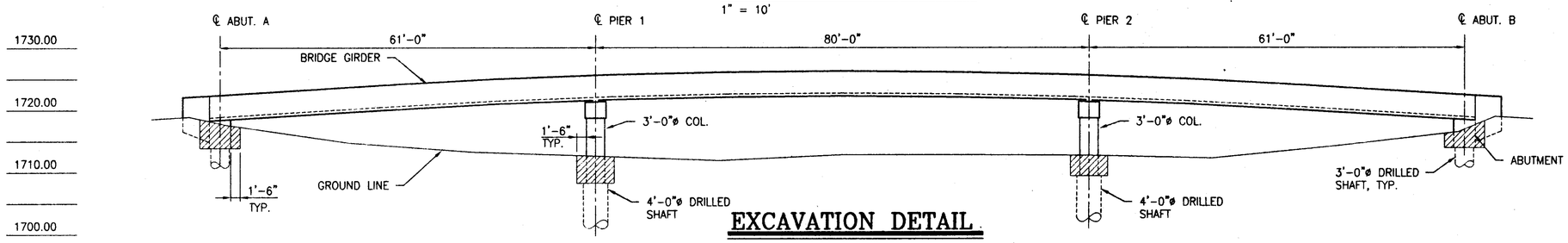
SCALE
HORIZ: –
VERT: –
FIELD BOOK

DRAWING NO.
B-1
OF
–



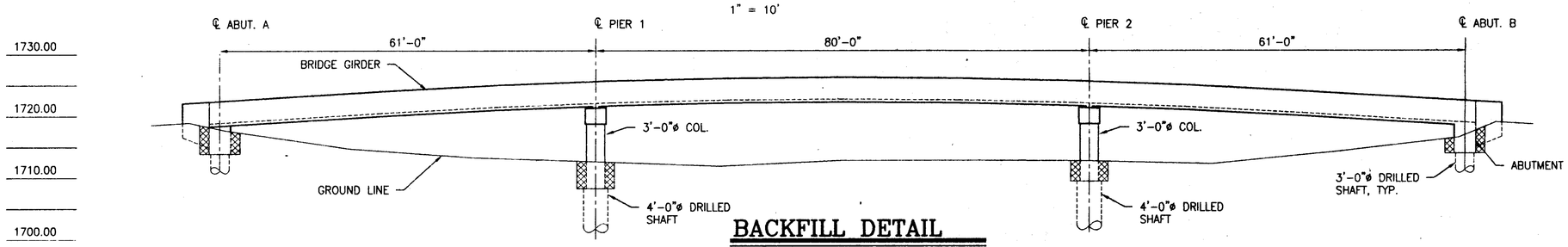
PLAN

1" = 10'



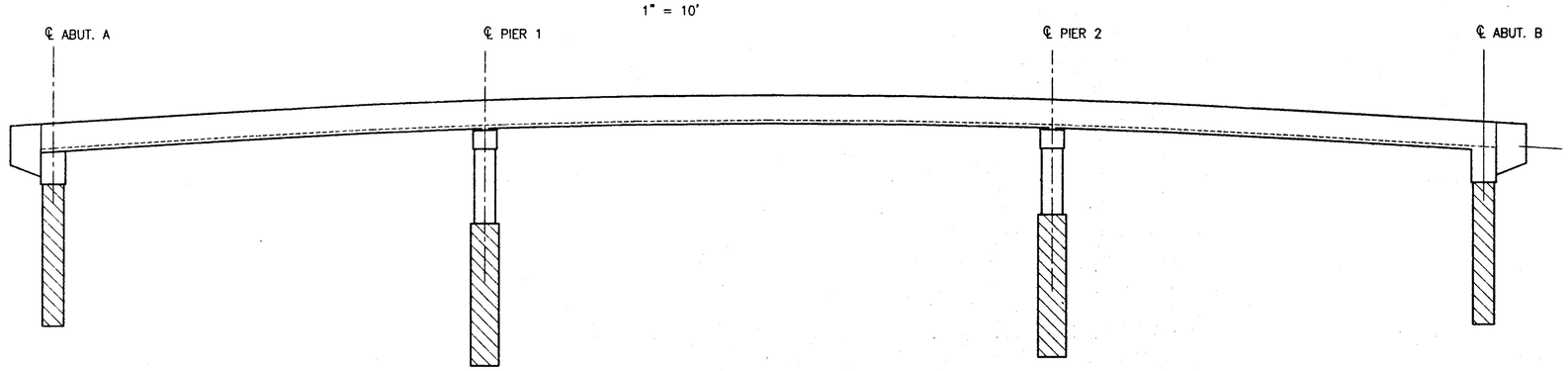
EXCAVATION DETAIL

1" = 10'



BACKFILL DETAIL

1" = 10'



CONCRETE CLASSIFICATION DIAGRAM

NOTES:

1. FOR CONTROL POINT AND SURVEY DATA, SEE GRADING PLAN
2. FOR ARCHITECTURAL TREATMENT OF WINGWALLS AND GIRDERS, SEE DRAWINGS B-4 & B-8, RESPECTIVELY.

LEGEND:

- STRUCTURAL EXCAVATION
- STRUCTURAL BACKFILL
- CLASS A MODIFIED (MAJOR) CONCRETE f'c = 4000 PSI @ 28 DAYS
- CLASS D MODIFIED (MAJOR) CONCRETE f'c = 4000 PSI @ 28 DAYS

DRAWING INDEX:

G-1 GRADING PLAN
B-1 PLAN, ELEVATION, SECTION & GENERAL NOTES
B-2 GEOMETRICS, DWG. LIST, EXCAVATION & BACKFILL AND CONCRETE CLASSIFICATION DIAGRAM
B-3 ABUTMENTS A & B PLAN, ELEVATION, SECTIONS AND DETAILS
B-4 WINGWALL DETAILS
B-5 PIER 1 & 2 DETAILS
B-6 DECK PLAN, DECK REINFORCEMENT & GIRDER DETAILS
B-7 GIRDER REINFORCEMENT AND CAMBER
B-8 GIRDER PLAN AND ELEVATION
B-9 SECTIONS AND DETAILS

REV. NO.	DATE	DESCRIPTION	APPROVED

DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE

GEOMETRICS, DWG. LIST, EXCAVATION & BACKFILL AND CONCRETE CLASSIFICATION DIAGRAM

CLARK COUNTY, NEVADA

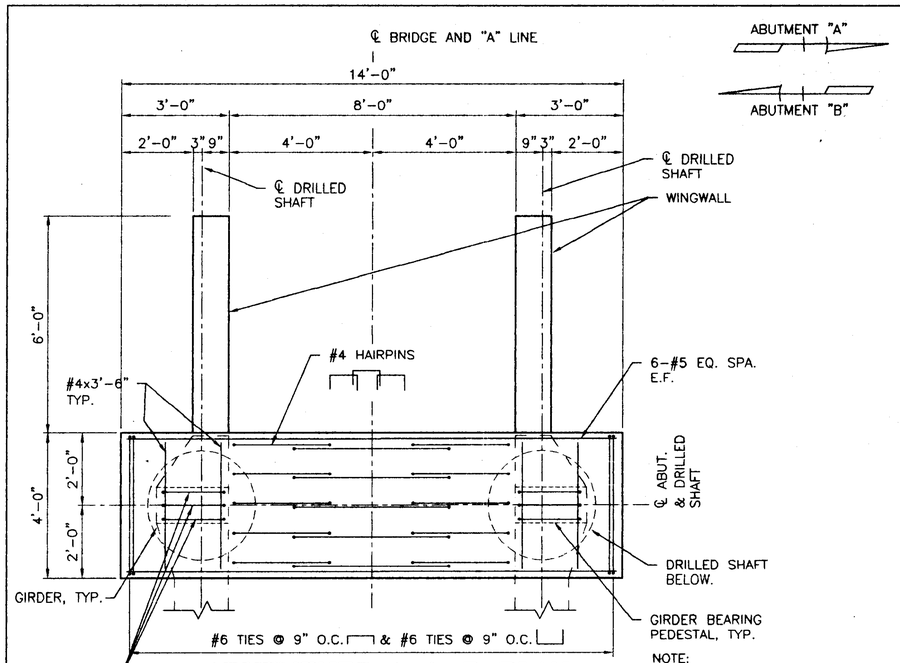
PROFESSIONAL ENGINEER - STATE OF NEVADA
JOHN G. WILSON
CIVIL
No. 13137
11-30-00

PROJECT NO: 99162 DRAWN BY: ELY
DESIGNED BY: JW CHECKED BY: JW
APPROVED BY JW

R&H•GB&L ENGINEERING
CONSULTING STRUCTURAL ENGINEERS
5145 SIMMS STREET, SUITE 200
LAS VEGAS, NEVADA 89118
PHONE (702) 895-7000
FAX (702) 895-7070

SCALE
HORIZ:
VERT:
FIELD BOOK

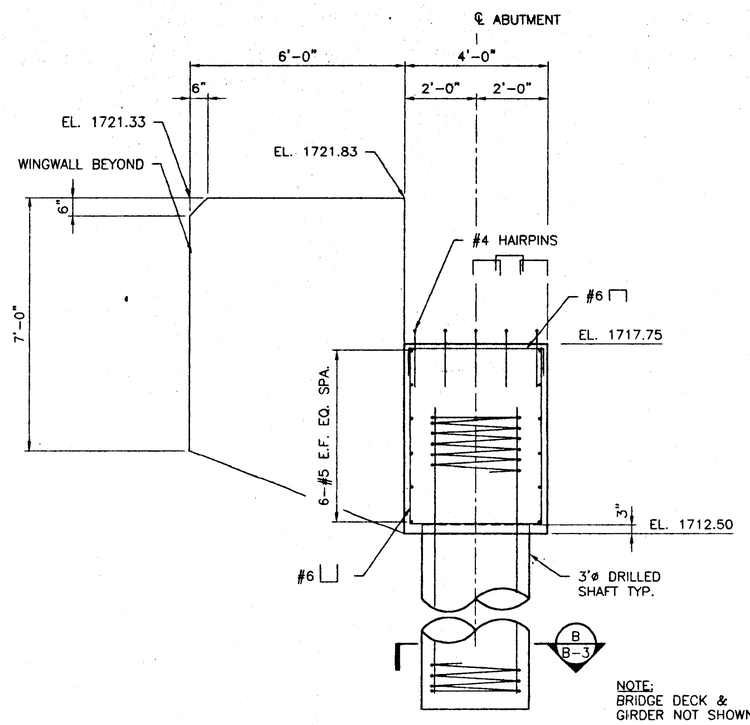
DRAWING NO.
B-2
OF



NOTE:
BRIDGE DECK NOT SHOWN.

ABUTMENTS A & B PLAN

1/2" = 1'-0"

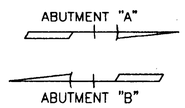


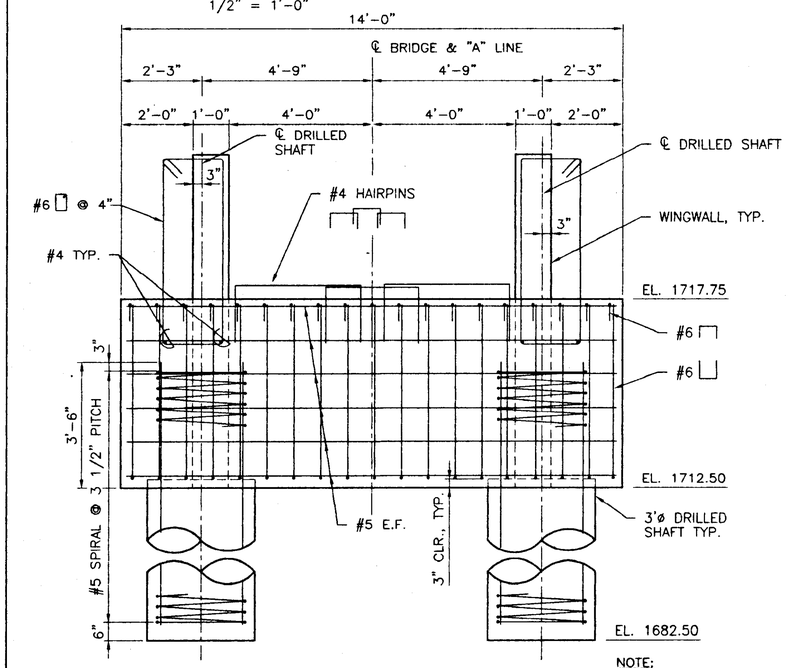
NOTE:
BRIDGE DECK & GIRDER NOT SHOWN.

SECTION

A
B-3

1/2" = 1'-0"

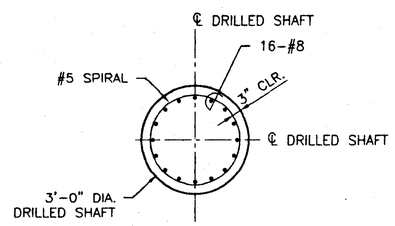




NOTE:
BRIDGE DECK & GIRDER NOT SHOWN.

ABUTMENTS A & B ELEVATION

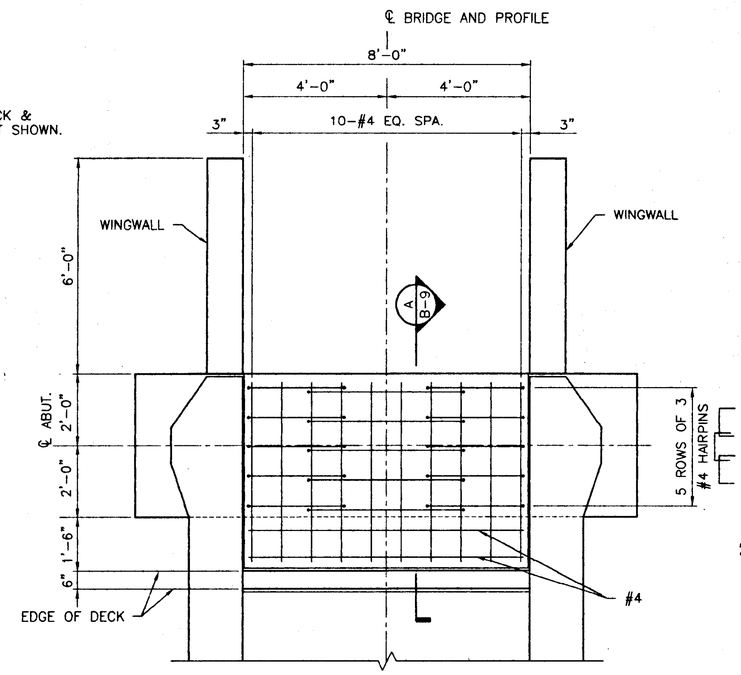
1/2" = 1'-0"



SECTION

B
B-3

1/2" = 1'-0"



BRIDGE DECK (OVER ABUTMENT) PLAN

1
B-3

1/2" = 1'-0"

REV. NO.	DATE	DESCRIPTION	APPROVED

DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE

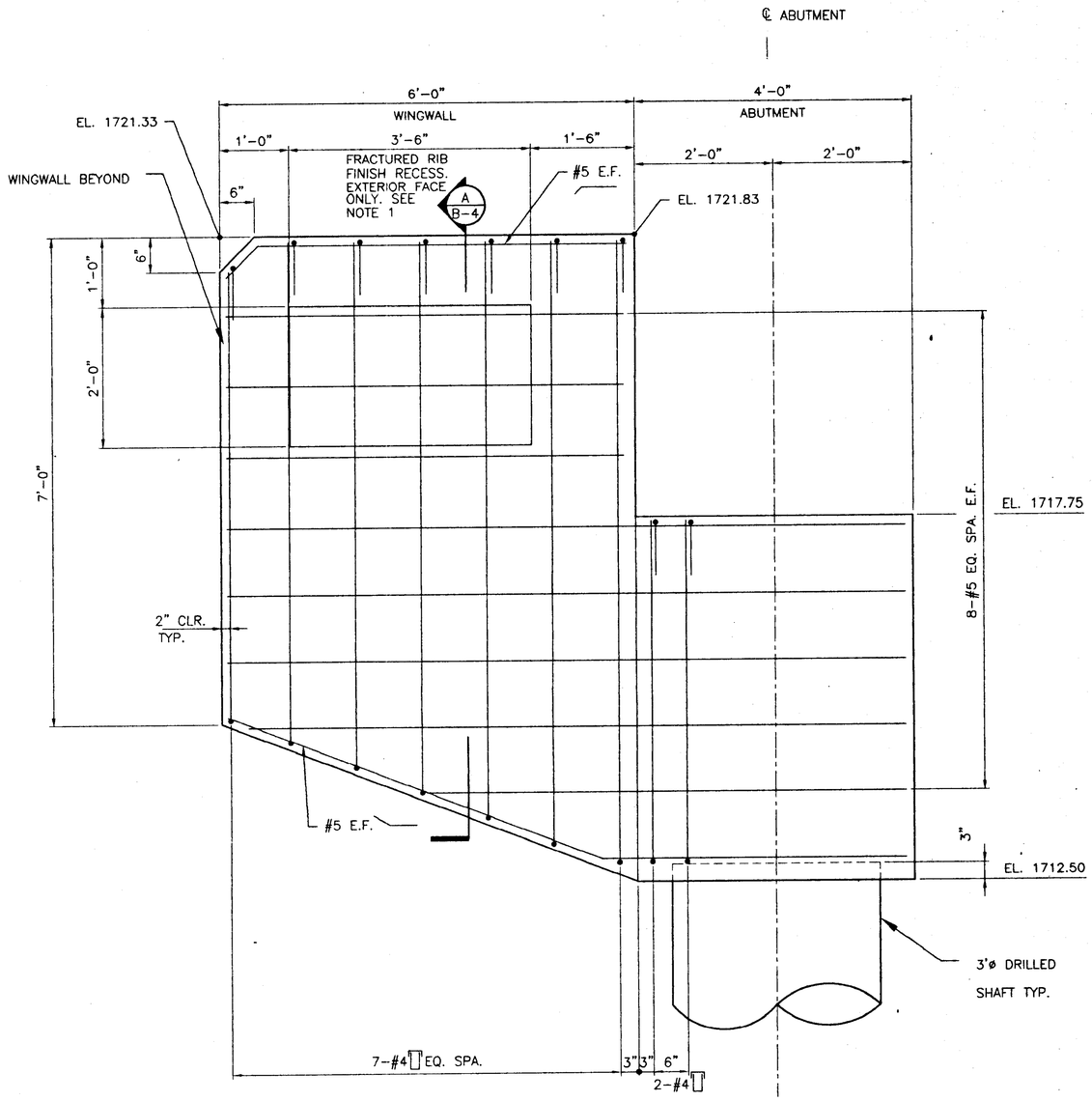
ABUTMENTS A & B PLAN, ELEVATION, SECTIONS AND DETAILS

CLARK COUNTY, NEVADA

PROFESSIONAL ENGINEER - STATE OF NEVADA
JOHN G. WILSON
CIVIL
No. 13137
11-30-00

PROJECT NO: 99162	DRAWN BY: ELY	SCALE	DRAWING NO.
DESIGNED BY: JW	CHECKED BY: JW	HORIZ:	B-3
APPROVED BY JW		VERT:	OF
		FIELD BOOK	

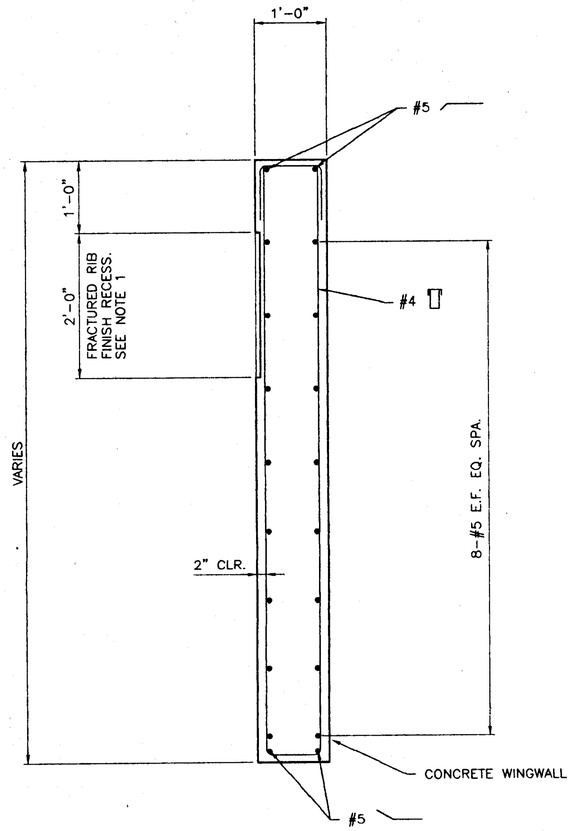
R2H•CB&L ENGINEERING



ELEVATION

B / B-4

1" = 1'-0"



SECTION

A / B-4

1" = 1'-0"

NOTES:

FRACTURED RIB FINISH SHALL HAVE A MAXIUM DEPTH OF 0.75 INCHES AND BE EQUIVALENT TO THE FINISH PRODUCED BY "FITZGERALD FORMLINERS, PATTERN NO. 16950" OR APPROVED EQUAL.

REV. NO.	DATE	DESCRIPTION	APPROVED

DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE

WINGWALL DETAILS

CLARK COUNTY, NEVADA

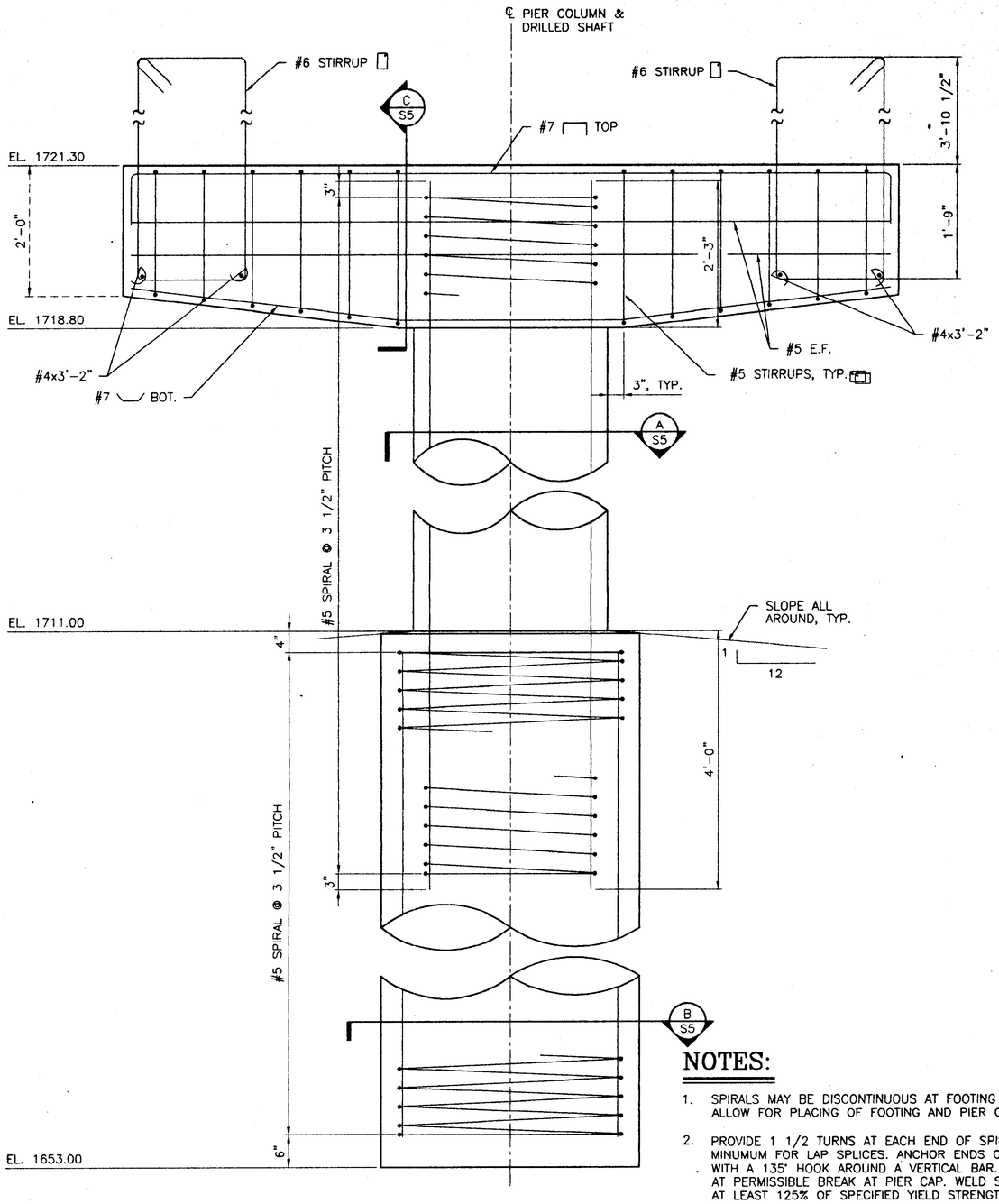
PROFESSIONAL ENGINEER - STATE OF NEVADA
JOHN G. WILSON
CIVIL
No. 13137
(1-30-04)

PROJECT NO: 99162 DRAWN BY: ELY
DESIGNED BY: JW CHECKED BY: JW
APPROVED BY JW

R2H • CB&L ENGINEERING
CONSULTING ENGINEERS, GEOLOGISTS
6345 WEST ARVILLE, SUITE 200
LAS VEGAS, NEVADA 89118
PHONE (702) 260-7000
FAX (702) 260-7070

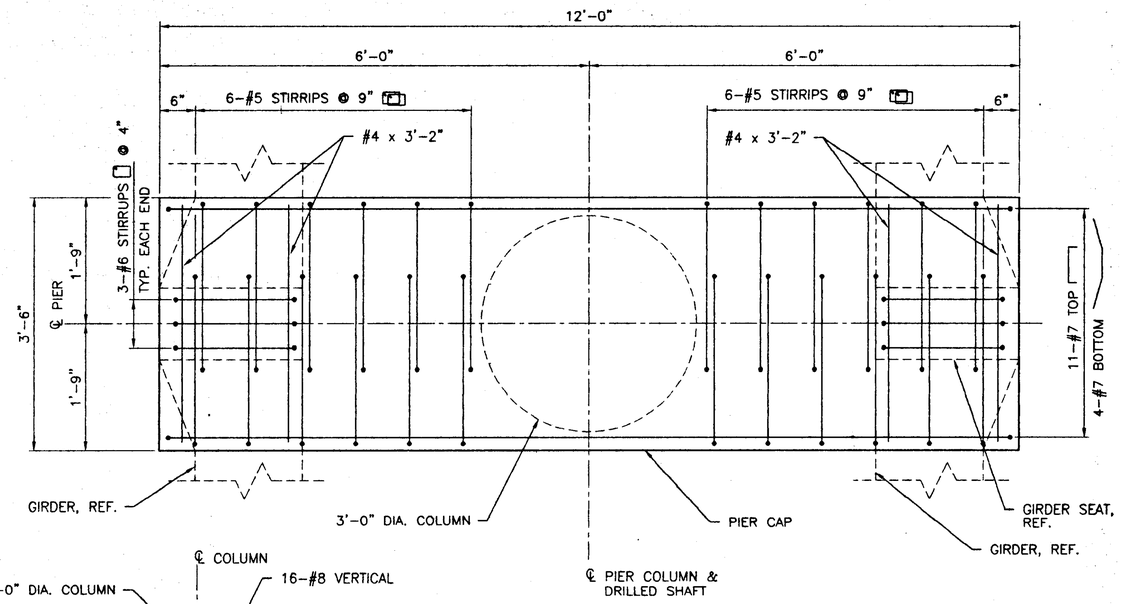
SCALE
HORIZ:
VERT:
FIELD BOOK

DRAWING NO.
B-4
OF



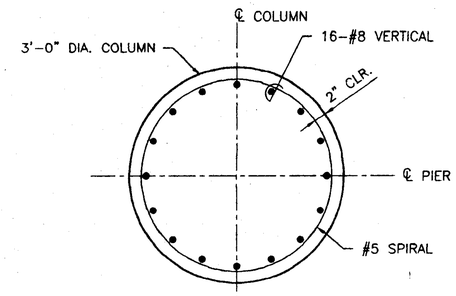
PIER 1 & 2 PLAN

1" = 1'-0"



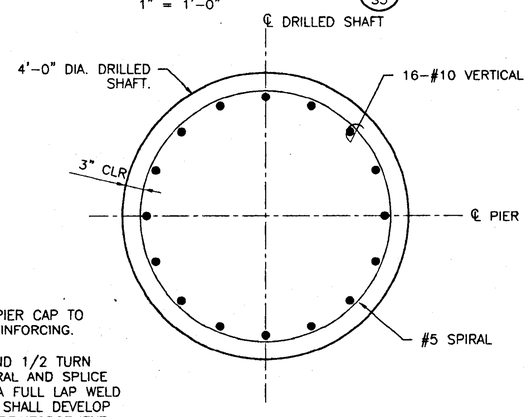
PIER 1 & 2 PLAN

1" = 1'-0"



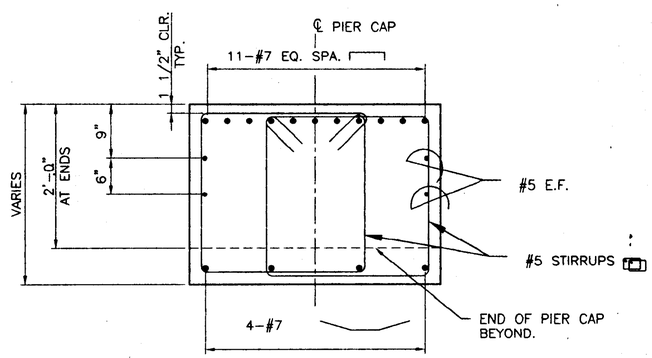
SECTION

1" = 1'-0" A S5



SECTION

1" = 1'-0" B S5



SECTION

1" = 1'-0" C S5

NOTES:

1. SPIRALS MAY BE DISCONTINUOUS AT FOOTING AND PIER CAP TO ALLOW FOR PLACING OF FOOTING AND PIER CAP REINFORCING.
2. PROVIDE 1 1/2 TURNS AT EACH END OF SPIRAL AND 1/2 TURN MINUMUM FOR LAP SPLICES. ANCHOR ENDS OF SPIRAL AND SPLICE WITH A 135' HOOK AROUND A VERTICAL BAR. ADD A FULL LAP WELD AT PERMISSIBLE BREAK AT PIER CAP. WELD SPLICE SHALL DEVELOP AT LEAST 125% OF SPECIFIED YIELD STRENGTH OF REINFORCEMENT.
3. LAP SPLICES IN LONGITUDINAL REINFORCING ARE NOT ALLOWED.

REV. NO.	DATE	DESCRIPTION	APPROVED

DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE

PIER 1 & 2 DETAILS

CLARK COUNTY, NEVADA

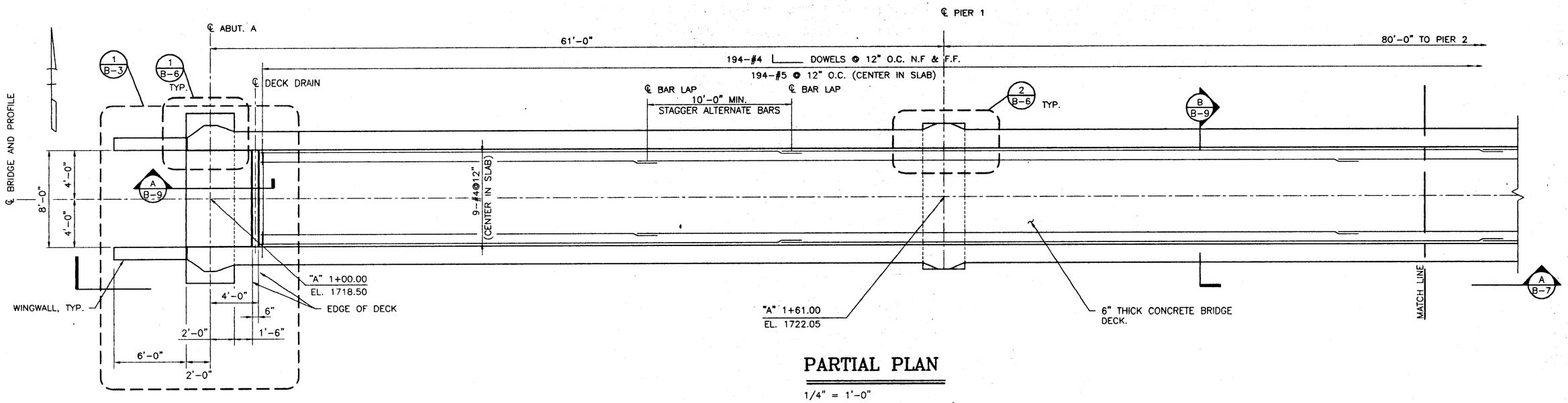
PROFESSIONAL ENGINEER - STATE OF NEVADA
JOHN G. WILSON
CIVIL
No. 13137
11-30-00

PROJECT NO: 99162 DRAWN BY: ELY
DESIGNED BY: JW CHECKED BY: JW
APPROVED BY: JW

R&H•CB&L ENGINEERING
CONSULTING STRUCTURAL ENGINEERS
5150 SOUTH STATE, SUITE 200
LAS VEGAS, NEVADA 89115
PHONE (702) 220-7090
FAX (702) 220-7070

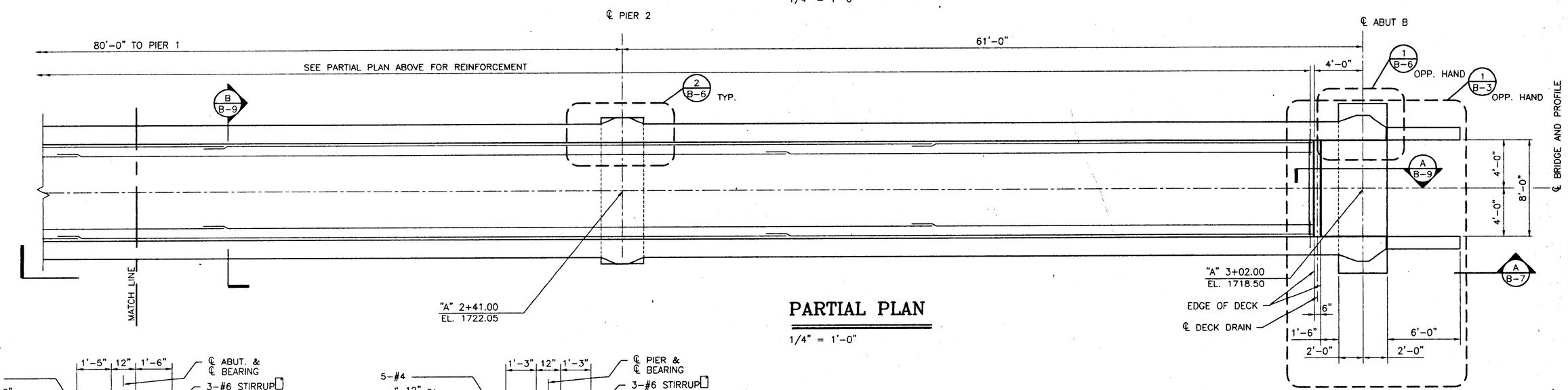
SCALE
HORIZ:
VERT:
FIELD BOOK

DRAWING NO. B-5
OF



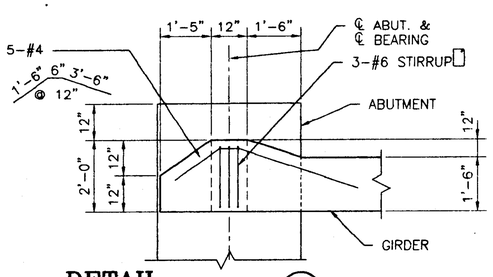
PARTIAL PLAN

1/4" = 1'-0"



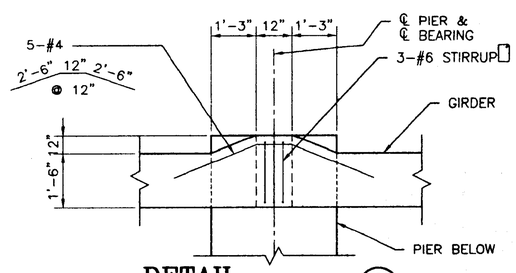
PARTIAL PLAN

1/4" = 1'-0"



DETAIL 1/B-6

1/2" = 1'-0"



DETAIL 2/B-6

1/2" = 1'-0"

REV. NO.	DATE	DESCRIPTION	APPROVED

DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE

DECK PLAN, DECK REINFORCEMENT AND GIRDER DETAILS

CLARK COUNTY, NEVADA

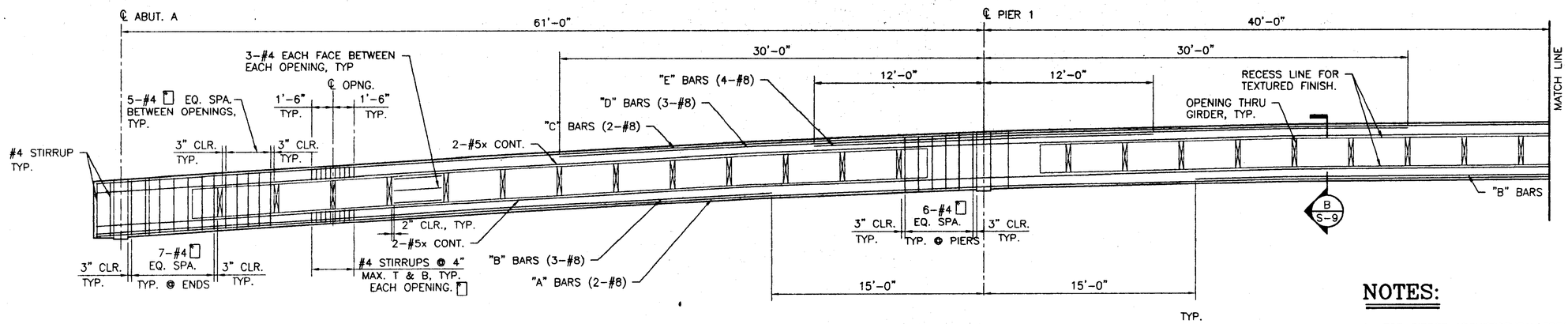
PROFESSIONAL ENGINEER - STATE OF NEVADA
JOHN G. WILSON
CIVIL
No. 13137
11-30-00

PROJECT NO: 99162 DRAWN BY: ELY
DESIGNED BY: JW CHECKED BY: JW
APPROVED BY: JW

R2H•CB&L ENGINEERING
CONSULTING STRUCTURAL ENGINEERS
LAS VEGAS, NEVADA 89110
PHONE (702) 382-7000
FAX (702) 382-7000

SCALE
HORIZ:
VERT:
FIELD BOOK

DRAWING NO.
B-6
OF



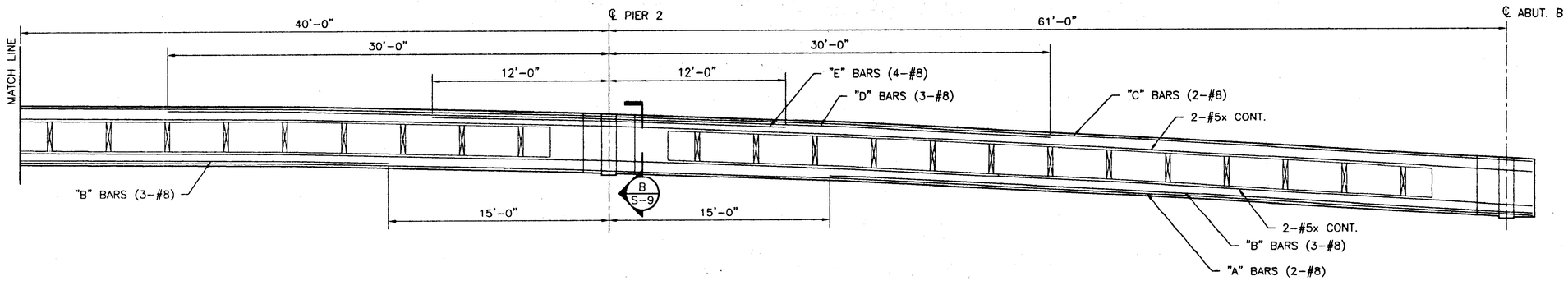
PARTIAL ELEVATION

A B-7

1/4" = 1'-0"

NOTES:

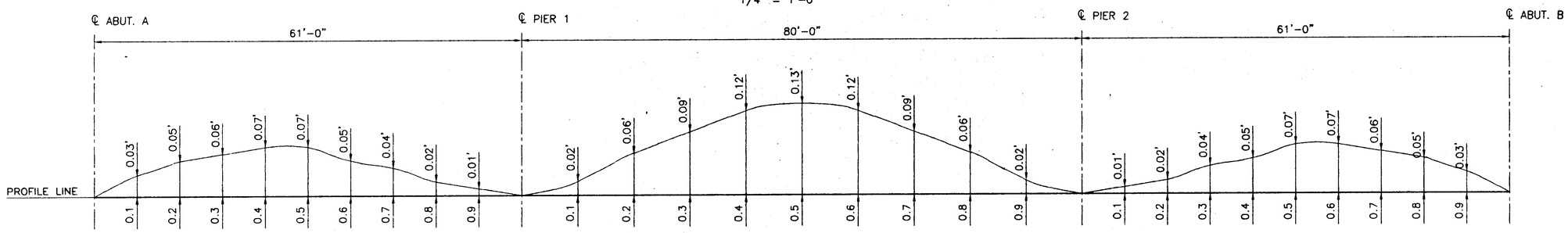
1. FOR GIRDER ARCHITECTURAL TREATMENT SEE SHEET B-8.
2. FOR ADDITIONAL GIRDER REINFORCEMENT AT ABUTMENTS AND PIERS SEE DETAILS 1 AND 2 ON SHEET B-6.



PARTIAL ELEVATION

A B-7

1/4" = 1'-0"



CAMBER DIAGRAM

REV. NO.	DATE	DESCRIPTION	APPROVED

DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE

GIRDER REINFORCEMENT AND CAMBER

CLARK COUNTY, NEVADA

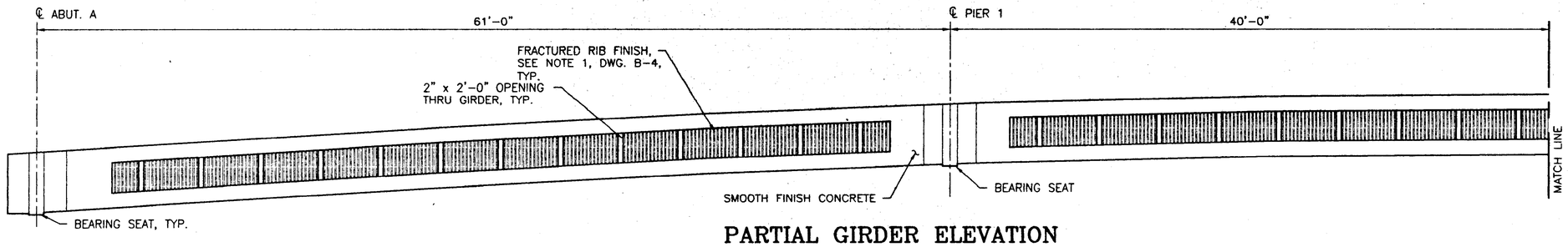
PROFESSIONAL ENGINEER STATE OF NEVADA JOHN G. WILSON CIVIL No. 13137 11-30-00

PROJECT NO: 99162 DRAWN BY: ELY
DESIGNED BY: JW CHECKED BY: JW
APPROVED BY: JW

R&H•CB&L ENGINEERING

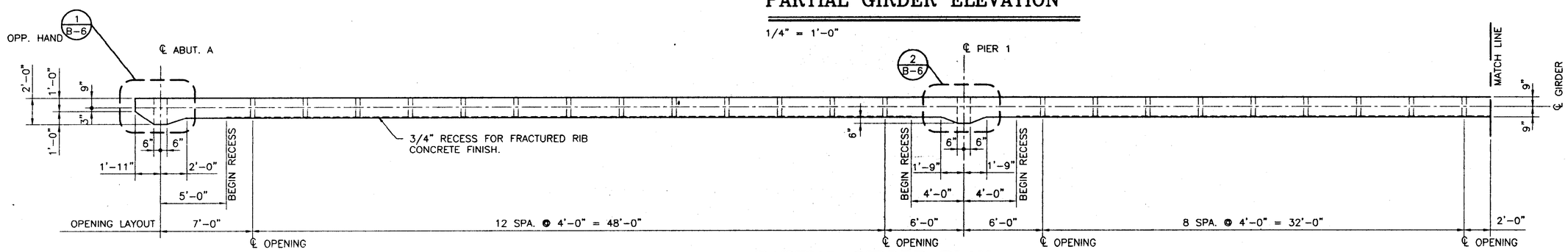
SCALE
HORIZ:
VERT:
FIELD BOOK

DRAWING NO. B-7 OF



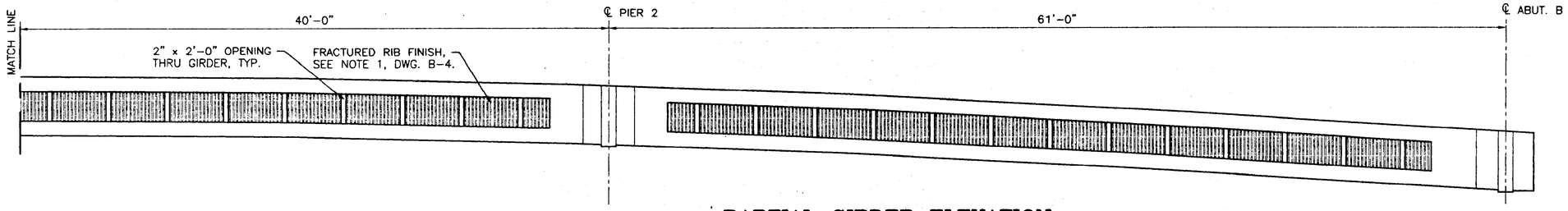
PARTIAL GIRDER ELEVATION

1/4" = 1'-0"



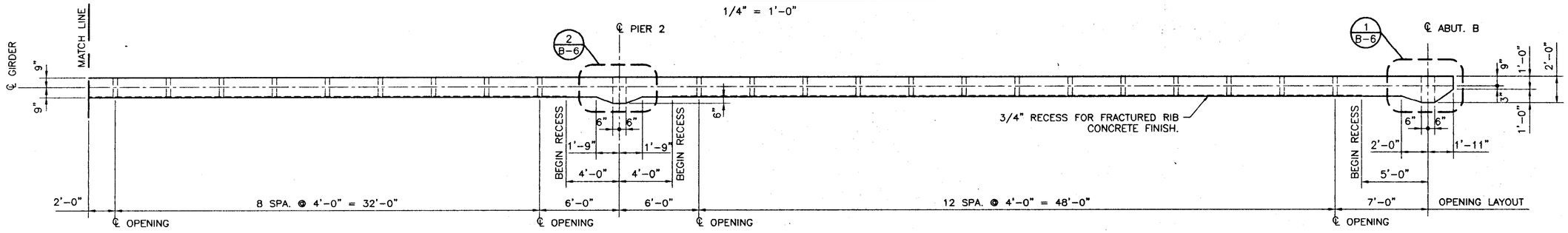
PARTIAL GIRDER PLAN

1/4" = 1'-0"



PARTIAL GIRDER ELEVATION

1/4" = 1'-0"



PARTIAL GIRDER PLAN

1/4" = 1'-0"

REV. NO.	DATE	DESCRIPTION	APPROVED

DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE

GIRDER PLAN AND ELEVATION

CLARK COUNTY, NEVADA

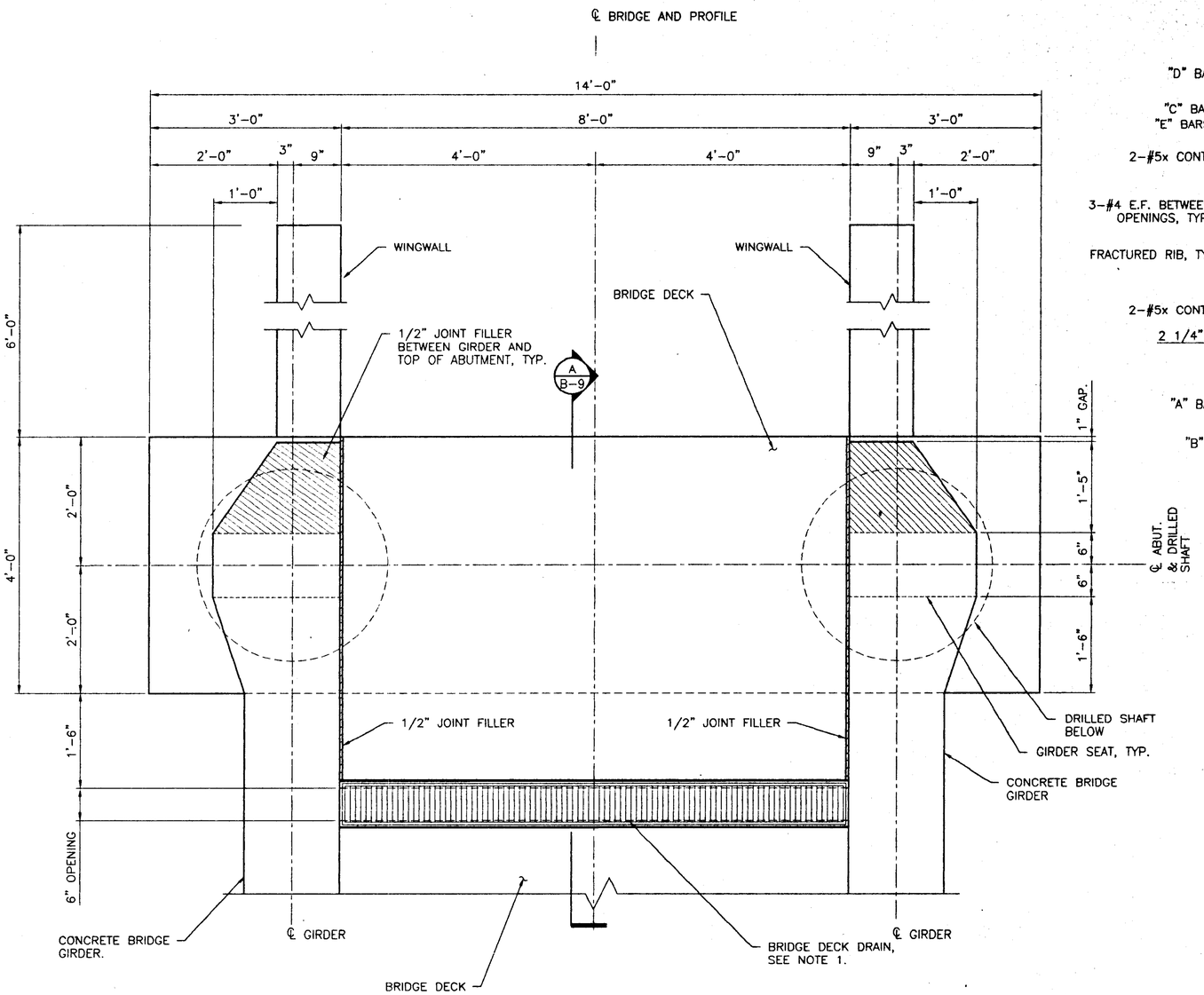
PROFESSIONAL ENGINEER - STATE OF NEVADA
JOHN G. WILSON
CIVIL
No. 13137
11-30-00

PROJECT NO: 99162 DRAWN BY: ELY
DESIGNED BY: JW CHECKED BY: JW
APPROVED BY: JW

R2H • CB&L ENGINEERING
CONSULTING ENGINEERS, ENGINEERS
6150 WINDY WAY, SUITE 200
LAS VEGAS, NEVADA 89118
PHONE: (702) 260-7000
FAX: (702) 260-7070

SCALE
HORIZ:
VERT:
FIELD BOOK

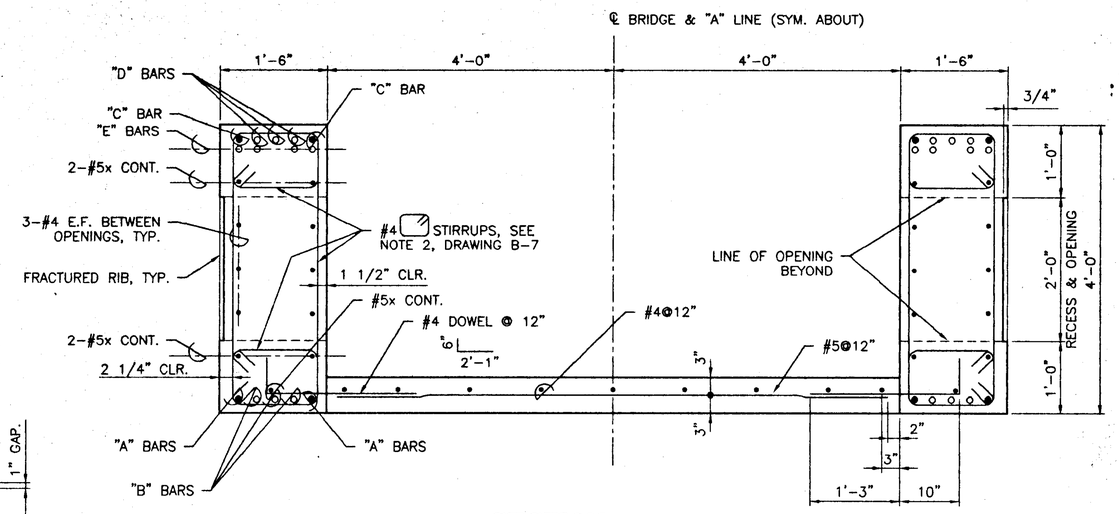
DRAWING NO.
B-8
OF



PLAN AT ABUTMENT

1" = 1'-0"

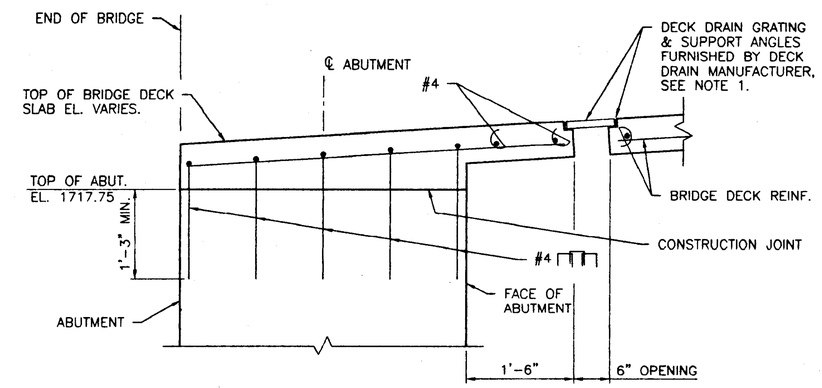
B / B-9



SECTION

1" = 1'-0"

B / B-9



SECTION

1" = 1'-0"

A / B-9

NOTES:

1. DECK DRAIN "R-4999-AX (TYPE P)" BY NEENAH FOUNDRY CO., OR EQUAL.
2. FOR GIRDER REINFORCING LAYOUT, SEE DRAWING B-7.
3. FOR LOCATION OF GIRDER OPENINGS & LAYOUT OF GIRDER ARCHITECTURL TREATMENT SEE DRAWING B-8.

REV. NO.	DATE	DESCRIPTION	APPROVED

DESERT ROSE GOLF COURSE PEDESTRIAN BRIDGE

SECTIONS AND DETAILS

CLARK COUNTY, NEVADA

PROFESSIONAL ENGINEER - STATE OF NEVADA JOHN G. WILSON CIVIL No. 13137 (1-30-00)

PROJECT NO: 99162	DRAWN BY: ELY	SCALE	DRAWING NO.
DESIGNED BY: JW	CHECKED BY: JW	HORIZ:	B-9
APPROVED BY JW		VERT:	OF
		FIELD BOOK	

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PERMISSIBLE SHEAR STRESS IN GRASS LINED CHANNELS

By David B. Parkinson,[1] William H. Longenecker, Jr.,[2]
Sheng T. Hsu,[3] and William Schriek[4]

INTRODUCTION

During the 1970's, flash floods became a very significant disaster problem within the United States with annual damages from all types of flooding exceeding $1 billion (11). The arid desert southwest is one of the areas within the United States which is experiencing ever-increasing problems due to flash floods. Flash floods in 1976, 1977, and 1979 caused millions of dollars in property damage, disruption of major transportation and communication corridors, and death within the Coachella Valley of Southern California, Figure 1.

Generally, flood control facilities within a flash-flood-prone region convey water only during a storm. In Coachella Valley, golf courses have been built within flood control channels and maintained by golf course personnel, thus fulfilling the dual purpose of both flood control and recreation. The same design concept was adopted for Deep Canyon Stormwater Channel through the development of Vintage Country Club in the City of

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Indian Wells. The Bermuda Grass channel consists of two reaches, the upper reach, a composite section with a channel slope of 1.7%, typical base width of 100 ft (30.5m), side slope of 1:8 extending for 40 ft (12.2m) measured horizontally, side slope of 1:50 extending to the freeboard elevation and the lower reach, a trapezoidal section with a channel slope of 1.1%, typical base width of 80 ft (24.4m), side slope of 1:5 extending to the freeboard elevation. The channel was designed for a Standard Project Flood (SPF). Figure 2 depicts the expected hydrograph which is short in duration and has a markedly spiked peak. The maximum discharge of 25,000 cfs (708 m^3/s) will result in a flow velocity of approximately 23 ft/s (7 m/s) in the composite channel and 20 ft/s (6.1 m/s) in the trapezoidal channel.

The pioneer experimental work on hydraulic characteristics of vegetated channels was performed by United States Soil Conservation Service (SCS).Several types of grass-lined channels with varying grass lengths were tested. Soil Conservation Service recommended that velocities should be limited to 8 and 6 fps (2.4 and 1.8 m/s) for erosion resistant soils and easily eroded soils respectively. These data were reported by Cox (3), Cox and Palmer (4,), Ree (12), and Ree and Palmer (13), and were summarized in a design manual prepared by SCS (7).

The work by SCS has been expanded by various researchers, including Chen (1), Fenzl and Davis (4), Gourlay (6), Kao and Barfield (8), Eastgate (4), Kouwen and Unny (9 and 10), and Temple (15). None of the above researchers, however, yielded new design data and the 6-8 ft/s (1.8-2.4 m/s) design guidelines established by SCS remained the only available criterion for Bermuda Grass.

The above design velocities are quite low in comparison with those experienced by Coachella Valley Water District (CVWD) during the 1976, 1977, and 1979 storms. From data gathered following the 1976 Kathleen storm, peak flow velocity in a lower reach of Deep Canyon Stormwater Channel, which was

lined with Bermuda Grass, was estimated to be at least 15 ft/s (4.5 m/s) with a corresponding shear stress of about 4.2 psf (0.2 KPa). The channel did not experience any significant damage. Several factors may be responsible for the discrepancy between the CVWD experience and the SCS recommendation. First, the SCS data may be quite conservative. Second, the SCS tests were for vegetated channels in their natural state and the condition of the grass would not be as good as for a well maintained channel. Third, the SCS tests were of long flow duration rather than relatively short duration flash flood events. Finally, the 1976 flood carried a large amount of sediment. The bed-load may act as a buffer and reduce the exposure of the grass to flow shear and turbulence even at high velocities.

The purpose of the testing was to define the ability of a well maintained Bermuda Grass channel to withstand a short duration storm above and beyond the criteria established by SCS. The objective was to obtain data which could result in the most cost- effective design of the dual purpose Deep Canyon Stormwater Channel through Vintage Country Club.

This paper presents an excerpt of the tests to determine the maximum permissible shear stresses on Bermuda sods with and without the reinforcement of an underlayer plastic mat (ENKAMAT Type 7020). The application of the test data to the design of the storm channel is also described.

A more detailed description of the testing program can be found in a report by Schriek and Hay (14).

TEST APPROACH

During a Standard Project Flood of 25,000 cfs (708 m^3/s), the flow in the channel will be supercritical. The flow velocity in the composite section was established to be approximately 23 ft/s (7 m/s) with a

corresponding maximum shear stress of approximately 8.7 psf (0.42 KPa). At this high velocity and stress level, it was impractical to test Bermuda Grass under open channel conditions. Since shear stress and the associated turbulence level at the grass surface characterize the overall effects of flow on the grass, it was decided that testing be done in a closed conduit lined on the bottom with sod samples and that measurements be made to correlate the sod condition with shear stress.

Prior to the testing, it was thought that the critical shear stress could depend upon the flow duration. In view of the duration of the SPF hydrograph, it was decided that a sod sample would be classified as having failed whenever it experienced erosion depth in excess of 3 inches (7.6 cm) within a flow duration of 2 hours. Three inch (7.6 cm) depth was considered to represent appreciable erosion. Two hour duration represents the typical period of significant flow during the design storm.

TESTING FACILITY AND SOD SAMPLES

Figure 3 depicts plan and elevation views of the testing facility and Figure 4 shows the details of the test section. The flow was provided by two 12-inch (30 cm) diameter lines connected to a 54-inch (1.37 m) diameter main of Greater Vancouver Water District. The two 12-inch (30 cm) diameter pipes merged into a single 24-inch (60 cm) diameter pipe. An orifice was located near the downstream end of the 24-inch (30 cm) diameter pipe for metering the flow discharge. A 4 ft (1.2 m) long transition section was provided between the 24-inch (60 cm) diameter pipe and a 24-inch (60 cm) wide x 20-inch (51 cm) high rectangular conduit. The rectangular conduit consisted of a 28 ft (8.5 m) long approach section, a 15 ft (4.6 m) long test section, and a 10 ft (3 m) long exit section. The bottom of the approach section required roughness similar to the sod sample; otherwise, the flow could not be properly developed at the upstream end of the test section. Approach flow conditions were therefore adjusted by varying the

size and density of nails in a plywood bottom. The required roughness was obtained by analyzing the recorded velocity profile at the downstream end of the approach section and comparing it with that obtained at the downstream end of the test section when a sod sample was in place. The exit section was inclined upward in order to maintain positive pressures in the test section. The flow was discharged into Vancouver's Burrard Inlet via a 75 ft (22.8 m) long timber chute.

The test section was provided with: six viewing ports for flow observations (4 on one side and 2 on the other side); a velocity measuring station near the downstream end; and six small ports along the top of the conduit for measuring the depth of erosion. Velocities were measured by a pitot cylinder. Care was taken to prevent local erosion which could be caused by the presence of the cylinder at the sod surface. The amount of erosion in each sample was determined through the small ports by means of a rod which located the sod surface prior to and following a test.

A 3 ft (0.9 m) wide x 11 ft-2 inch (3.4 m) long steel chamber was constructed beneath the rectangular conduit in the test section, as shown in Figure 4. The chamber had a removable side section providing access for the sample box, which was jacked against the conduit so that the sod surface was nearly flush with the conduit floor. The chamber was completely pressurized and filled with water during testing.

A total of 12 Bermuda Grass samples were tested, six unreinforced samples from the lower reach of existing Deep Canyon Stormwater Channel and six ENKAMAT reinforced samples supplied by Turf-Fiber Products, from Florida. The mat was placed approximately 1- inch (2.5 cm) beneath the sod surface. The unreinforced samples were 10 ft (3 m) long, 28 inch (0.7m) wide and 12 inch (30 cm) deep. The dimensions of the reinforced samples were the same except that the depth was 4 inches (10 cm) rather than 12 inches (30 cm). The samples were maintained in good condition and the grass

was cut to about 1.5 to 2.0 inches (3.8 to 5 cm) prior to testing. They are identified as 1U-6U for the unreinforced samples and 1R-6R for the reinforced samples.

TEST PROCEDURES

Preliminary testing was completed to establish proper artificial roughness in the approach section. As indicated earlier, such testing was necessary in order to provide a properly established flow entering the grass test section. For this purpose, vertical velocity traverses were taken in the test section and at the downstream end of the approach section. At a selected discharge, the velocity patterns at the two locations were compared and analyzed to determine the friction factor. If found necessary, the artificial roughness was adjusted prior to further testing.

Once the proper upstream roughness was achieved, the critical shear testing was conducted in accordance with the following procedures:

1. Load the sample box into the test conduit and measure the sod surface at six locations with a rod.
2. Establish the flow rate gradually. The flow rate was measured by the orifice.
3. Take velocity traverses in the approach section and the test section with the pitot cylinder.
4. Record visual observations made through the observation ports.
5. Shutdown the flow gradually after the sample has been subjected to the flow for about 2 hours.
6. Measure and record the sod surface at the six locations with a rod. Compare the data with the original levels for determining the depth of erosion.
7. Increase the flow and repeat Steps 2 to 6 if erosion was less than approximately 3 inches (7.5 cm) at any location.

8. Remove the sample from the testing facility and make thorough inspection of the sample to determine and record the nature and extent of the erosion.

The above procedures allowed for a determination of a critical shear stress beyond which substantial erosion to the sample occurred.

The hydrograph simulation testing was undertaken to evaluate the performance of the sod samples under a simulated hydrograph representing the SPF, Figure 2, in the channel. One each of the reinforced and unreinforced samples were used and the tests were conducted at the conclusion of the critical shear testing. Prior to these tests, computations were performed to determine water depth vs. discharge relationship for the prototype channel. The computed water depth, y_o, was then used in conjunction with the channel slope, s, to estimate the shear stress along the centerline of the channel, τ_o as follows:

$$\tau_o = \gamma y_o s \quad \ldots \quad (1)$$

where γ is the specific weight of the water.

The computations were made for both the upstream composite channel and downstream trapezoidal channel for a Manning's n = 0.028. The results showed that the composite channel would be subjected to a maximum shear stress of approximately 8.7 psf (0.42 KPa) which is approximately 2.0 psf (96 Pa) higher than that in the trapezoidal section. The same type of discharge-shear stress relationship was determined experimentally, for the sod samples in the course of defining the critical shear stress. These two relationships permitted the determination of a discharge in the test facility producing the same shear stress as the simulated prototype flow in the composite channel. Table 1 shows the step-wise hydrograph that was used to simulate the ability of the proposed composite sections of the grass channel to withstand the SPF.

In these tests, the velocity profile was measured during each time increment. The amount of erosion was determined only at the end of each test because the sensing of the grass surface could not be done during a test.

DATA ANALYSES AND TEST RESULTS

The shear stress experienced by the grass surface was determined from the following flow-velocity distribution-shear stress relationship for fully developed turbulent flow.

$$\frac{u-\overline{v}}{\sqrt{\frac{\tau_o}{\rho}}} = 5.75 \log \frac{y}{y_o} + B \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \quad (2)$$

where u is the velocity at depth y

y is the distance above the grass boundary

y_o is the distance from the boundary to the point of maximum conduit velocity

$\overline{v}$ is the average velocity from $y = o$ to y_o

τ_o is the shear stress on the grass

ρ is the density of water

B is a constant

Figure 5 shows the velocity profile measured for sample 6U at a discharge of 39.9 cfs (1.1 m^3/s) at the test section. Note that the point of maximum velocity is shifted upward due to the presence of the sod along the floor. Figure 6 shows that the corresponding plot of u-v vs log $\frac{y}{}$. The data follows the relationship given by Equation (2) reasonably well. The shear stress was determined to be 6 psf (0.29 KPa).

Similar analyses were also made for other test data, including those from the hydrograph simulation tests.

Tables 2 and 3 summarize the results of testing for unreinforced and plastic mat reinforced sods, respectively. The results are plotted on Figures 7 and 8. These figures show correlations of discharges in the conduit with the measured shear stress and identify the discharge at which

failure occurred. From these results it was determined that the maximum permissible shear stresses for the unreinforced and reinforced Bermuda Grass samples are 7 psf (0.34 kPa) and 8.5 psf (0.41 kPa), respectively. The behavior of the grass was observed during the tests. At low flows, approximately 15 to 25 cfs (0.43 to 0.71 m^3/s), the grass blades were partially deflected by the current, waving and whipping back and forth. At a larger discharge, approximately 35 to 40 cfs (1 to 1.13 m^3/s), the blades were substantially bent over and formed an apparent protective layer over the surface of the subsoil. At flows higher than approximately 45 cfs (1.28 m^3/s) soil erosion began to occur. The erosion process was signified by an increase in the length of the blade, resulting from plucking of subsoil due to shear stress and associated turbulence generated by the flow. The process, however, was slow in comparison with typical sedimentation erosion at a streambed and the loss of subsoil was only partially visible. Though the rate of erosion was not determined, it was evident that the same degree of erosion can occur from a high flow of short duration or from a lower flow of longer duration. As indicated earlier, the critical shear stresses presented herein are for 2-hour flows producing an erosion depth of 3 inches (7.5 cm). For shorter duration flows the shear stress would be increased and for longer duration flows the shear stress would be decreased.

It should be noted that even when the subsoil was eroded substantially the root structure in the grass remained interwoven, forming a carpet-like grass mat for both types of samples tested.

A comparison of Figures 7 and 8 reveals that at a given discharge the shear stress of the unreinforced samples, was somewhat larger than that of the reinforced samples. This is probably because the samples were from different sources and the grass was slightly different. In addition, the plastic-mat reinforced sods were more erosion resistant and the data were

more consistent. It is interpreted that the mat reinforced sod had a more uniform quality and also that the mat retarded the rate of subsoil erosion.

Results of hydrograph testing of Samples 5U and 2R, Tables 2 and 3, show that erosion may have begun to occur at or near the peak discharge. The same phenomena can be expected to occur in an actual grass lined channel.

Test results of Samples 3U, 3R, and 4R are not included in this report. Sample 3U was used to establish the experimental procedures and measurement techniques. Samples 3R and 4R were tested prior to the samples having reached their full mature growth. The results were not considered characteristic of a typical sod sample.

DATA APPLICATION

For the purpose of the design, the maximum permissible shear stresses obtained through the testing were decreased by 25%, as a safety factor to account for possible lower grass quality in the field. The shear stresses used for design were then 5.25 psf (0.25 KPa) and 6.38 psf (0.31 KPa) for the unreinforced and reinforced samples respectively. These values were less than the expected stresses of 8.7 psf (0.42 KPa) and 6.7 psf (0.32 KPa) during a SPF for the composite and the trapezoidal sections of the channel, respectively. The hydrograph simulation tests also revealed that during a SPF event, erosion of the grass channel can be expected. Therefore, it was concluded that the channel must have further protection in addition to lining with Bermuda Grass because of an unknown rate of erosion once failure occurs. After considering several alternatives, a 4-inch (10 cm) thick buried slab formed by air-blown mortar was selected to provide the protection.

The design shear stress of unreinforced sod was used to determine the extent of the channel which should be protected by the buried slab. In general, the slab, with 1:1 slope, was constructed along the channel embankments and was buried from an elevation 3 to 5 ft (0.92 to 1.53 m) beneath the channel bottom to an elevation where the expected shear stress is

less than 5.25 psf (0.25 KPa) and at selected locations where flow obstruction will cause high levels of turbulence.

The ENKAMAT reinforcement was also used, but only at areas where discontinuities existed, e.g., where roads crossed the channel, the ENKAMAT was installed both upstream and downstream from the road. The material was not used more extensively because of the unavailability of data on its useful life.

SUMMARY AND CONCLUSIONS

The testing showed that well maintained Bermuda Grass lining can withstand a shear stress of 7 psf (0.34 KPa). If the grass lining is provided with an underlayer plastic mat (ENKAMAT Type 7020), the maximum permissible shear stress can increase to 8.5 psf (0.41 KPa) as the plastic mat yields a more uniform quality of grass surface and reduces the rate of subsoil erosion. These shear stresses correspond to a flow velocity in most channels in excess of 20 ft/s (6.1 m/s).

For the design of the Vintage Country Club sections of Deep Canyon Stormwater Channel, only 75% of the permissible shear stress determined from the tests was used, to allow for the fact that overall, the grass condition of a large channel probably will not be as good as the test samples. The design shear stresses were then 5.25 psf (0.25 KPa) and 6.38 psf (0.31 KPa), respectively, for unreinforced and reinforced Bermuda Grass. In addition, hydrograph simulation testing showed that erosion of the grass lined channel can be expected during the occurrence of a SPF. Buried concrete slab was used to provide addition protection to the channel where needed.

ACKNOWLEDGEMENTS

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The permission by Vintage Properties of Menlo Park, California for the use of the test data in preparation of this paper is appreciated.

APPENDIX I - REFERENCES

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APPENDIX II - NOTATIONS

The following symbols are used in this paper:

B = a constant

n = Manning's coefficient

R = hydraulic radius

S = Slope of the channel

u = local velocity at y in the test conduit

v = mean velocity in the test conduit

V = mean channel velocity

y = distance from the floor in the test conduit

y_o = depth of water in the channel or distance from the floor to the point of maximum velocity in the test conduit

γ = specific weight of fluid

ρ = mass density of fluid

τ_o = bed shear stress

Table 1 - Step-wise Hydrograph for Standard Project Flood

Discharge in cubic feet per second (1)	Test duration in hours (2)
8000	1.0
10 000	1.0
15 000	0.75
21 000	0.75
25 000	0.75
21 000	0.75
15 000	0.75
10 000	1.0
8000	1.0

NOTE: 1 cfs = 0.028 m^3/s

TABLE 2 - Grass Test Results, Unreinforced Samples

Sample (1)	Type of Testing* (2)	Discharge in Cubic Feet Per Second (3)	Test Duration in Hours (4)	Shear Stress in Pounds Per Square Foot (5)	Sample Condition After Testing (6)
1U	E	34.6	2.0	6.1	No erosion
		44.5	2.0	7.6	No erosion
		49.5	2.0	7.8	No erosion soil surface firm.
		61.9	1.0	10.2	A 4 in deep hole 2.5 ft from the U/S end.
2U	E	33.0	1.5	4.3	No erosion
		49.5	1.0	6.2	Some erosion
		61.0	0.5	-	Failure at D/S end of sample. Grass and soil washed out over 2.5 ft length
4U	E	51.5	4.0	7.5	General failure
5U	H	32.0	1.0	4.8	Erosion at U/S end following the series of testing. Erosion may have begun at the maximum flow of 54.8 cfs.
		37.0	1.0	5.1	
		43.0	0.75	7.0	
		50.2	0.75	9.5	
		54.8	0.75	10.2	
		51.8	0.75	8.5	
		45.5	0.75	6.0	
		40.6	1.0	5.7	
		31.9	1.0	3.0	
6U	E	39.9	2.0	6.0	Small holes along length of sample.
		44.7	2.0	-	Holes grew with time but less than 3 in deep.

NOTE: 1 cfs = 0.028 m^3/s; 1 psf = 47.9 Pa
*: E = Erosion Test

TABLE 3 - Grass Test Results, Reinforced Samples

Sample (1)	Type of Testing* (2)	Discharge in Cubic Feet Per Second (3)	Test Duration in Hours (4)	Shear Stress in pounds per Square Foot (5)	Sample Condition After Testing (6)
1R	E	40.8	2.0	4.3	No erosion.
		48.5	2.0	6.6	No erosion.
		55.2	2.0	-	Erosion at D/S end of sample.
2R	E	30.2	3.0	5.1	No erosion
		39.3	1.0	7.1	No erosion.
2R	H	39.3	1.0	5.1	Erosion 3 in at both U/S and D/S of the sample at end of the test. Erosion may have occurred at or immediately after the peak flow.
		45.3	1.0	6.1	
		52.7	0.75	7.0	
		54.8	0.75	9.4	
		58.8	0.75	11.6	
		54.8	0.75	8.4	
		50.0	0.75	7.0	
		45.3	1.0	-	
		39.5	1.0	-	
5R	E	37.0	2.0	-	No erosion.
		48.3	2.0	6.3	Some minor erosion.
		55.3	2.0	8.9	Erosion about 1 in depth.
		62.8	2.0	9.6	Erosion exceeded 3 in at U/S end.
6R	E	34.9	2.0	3.5	No erosion.
		40.7	2.0	4.4	No erosion.
		48.0	2.0	6.4	No erosion.
		55.2	2.0	8.2	Minimal erosion.
		61.1	2.0	10.4	Hardly any subsoil under the mat.

NOTE: 1 cfs = 0.028 m^3/s; 1 psf = 47.9 Pa

*: E = Erosion Test
: H = Hydrograph Simulation Test

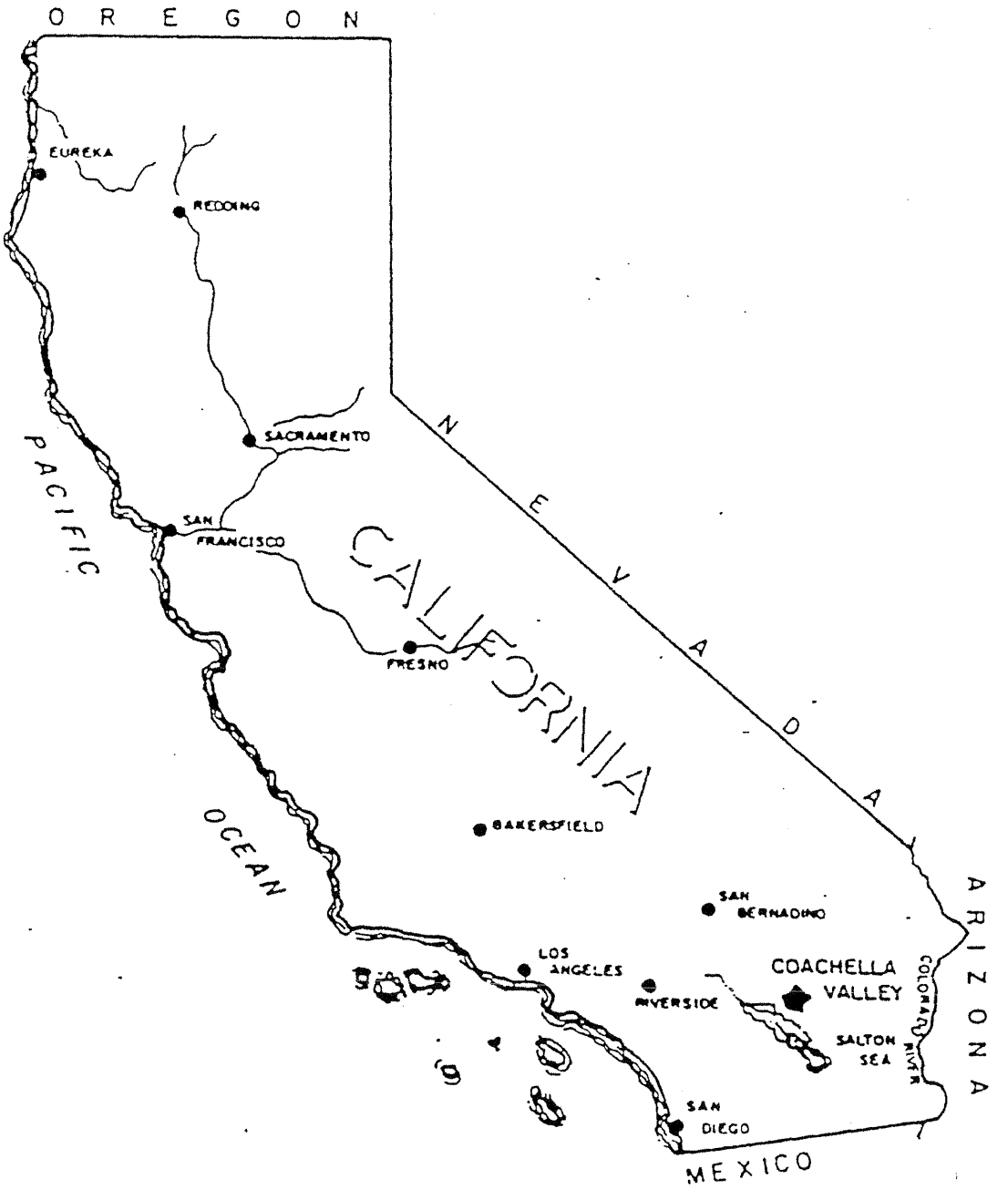


FIGURE 1 – COACHELLA VALLEY VICINITY MAP

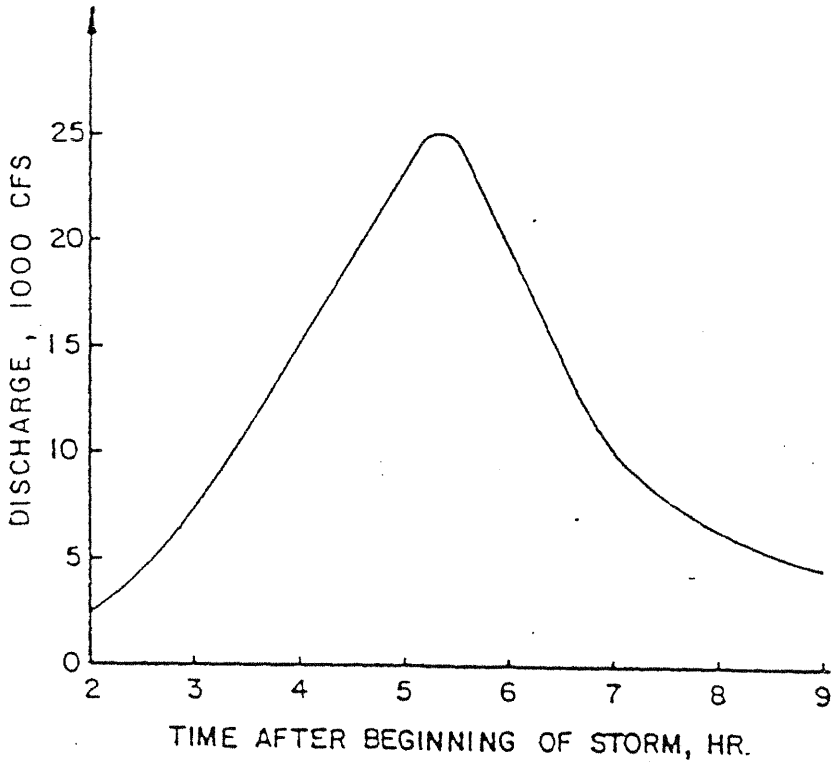


FIG. 2 STANDARD PROJECT FLOOD HYDROGRAPH, DEEP CANYON STORMWATER CHANNEL

Note : 1 cfs = 0.028 m^3/s

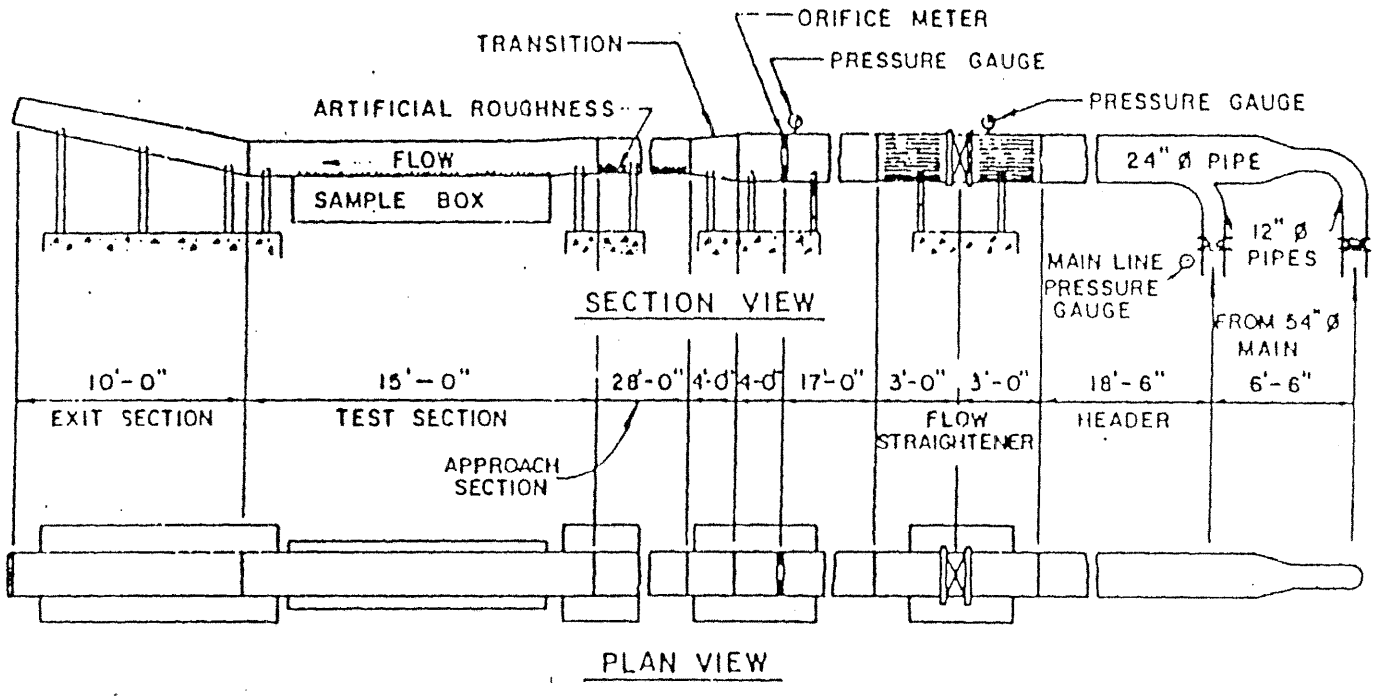


FIGURE 3 – LAYOUT OF TEST FACILITY

Note: 1 ft. = 0.305 m

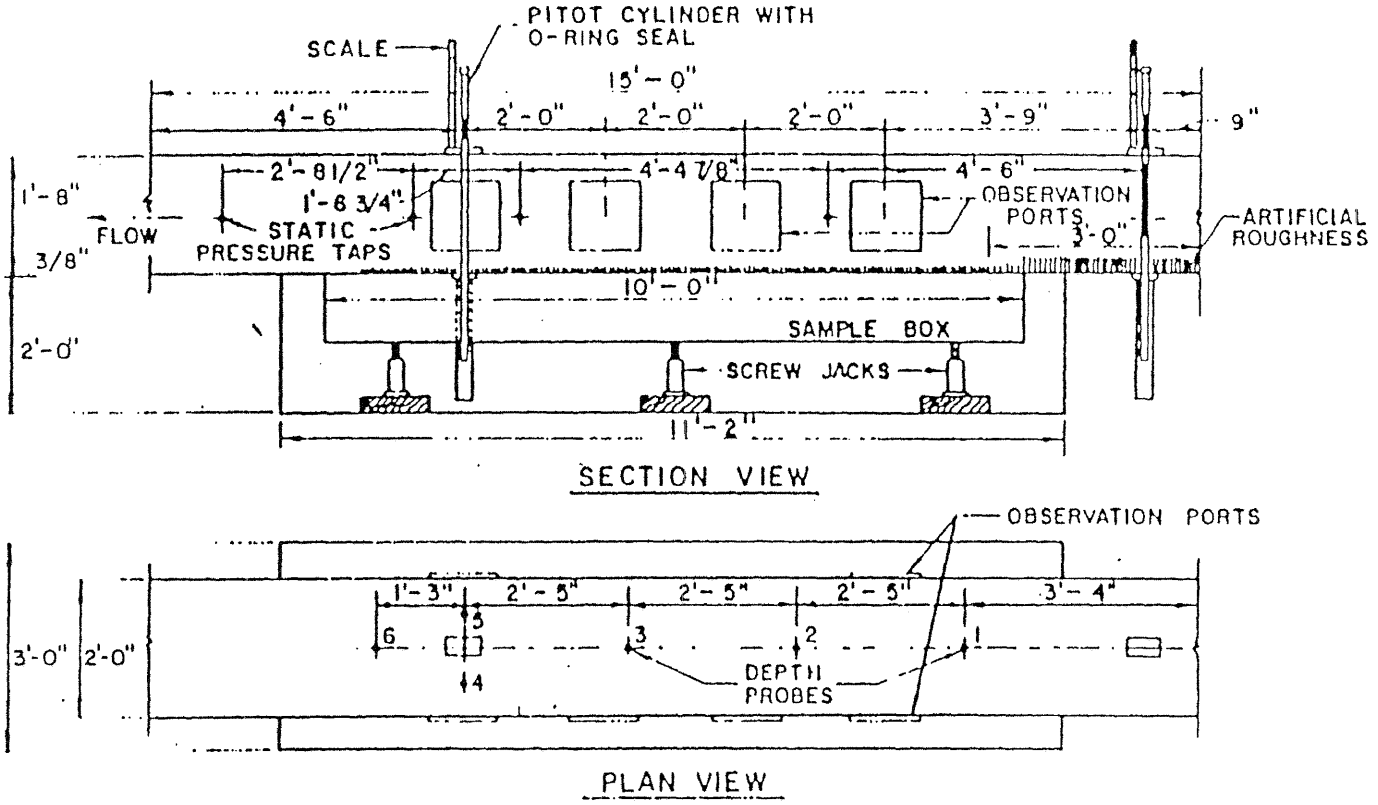
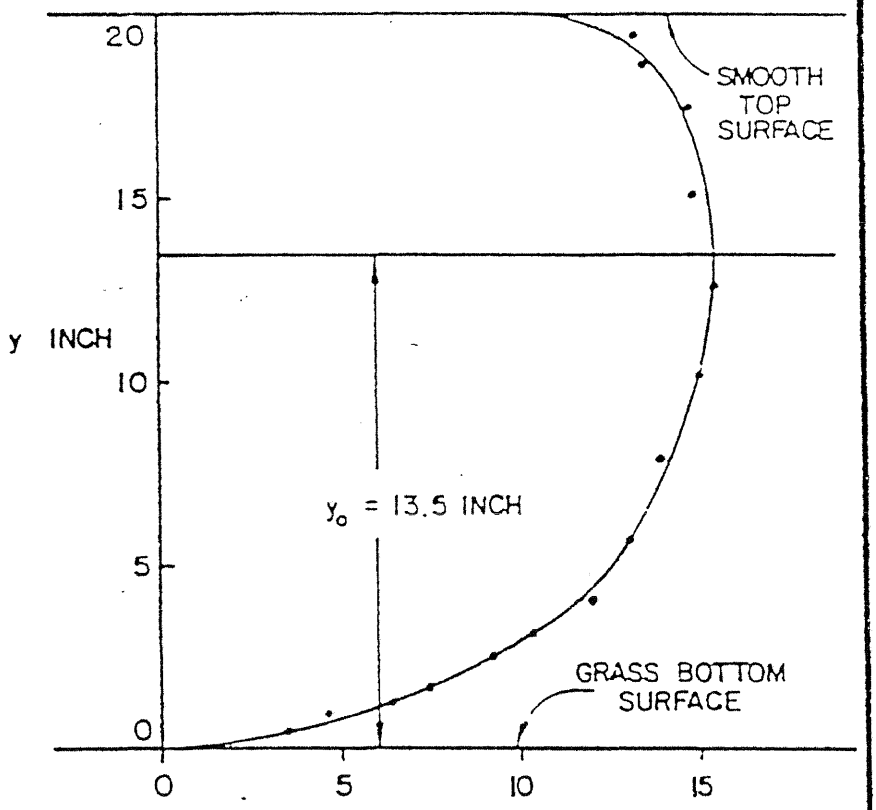


FIGURE 4 – TEST SECTION

Note: 1 ft = 0.305 m



Note: 1 ft./sec. = 0.305 m/sec.
1 inch = 2.5 cm
1 cfs = 0.028 m^3/s

FIG. 5 TYPICAL VELOCITY DISTRIBUTION
Sample 6 U Q = 39.9 CFS

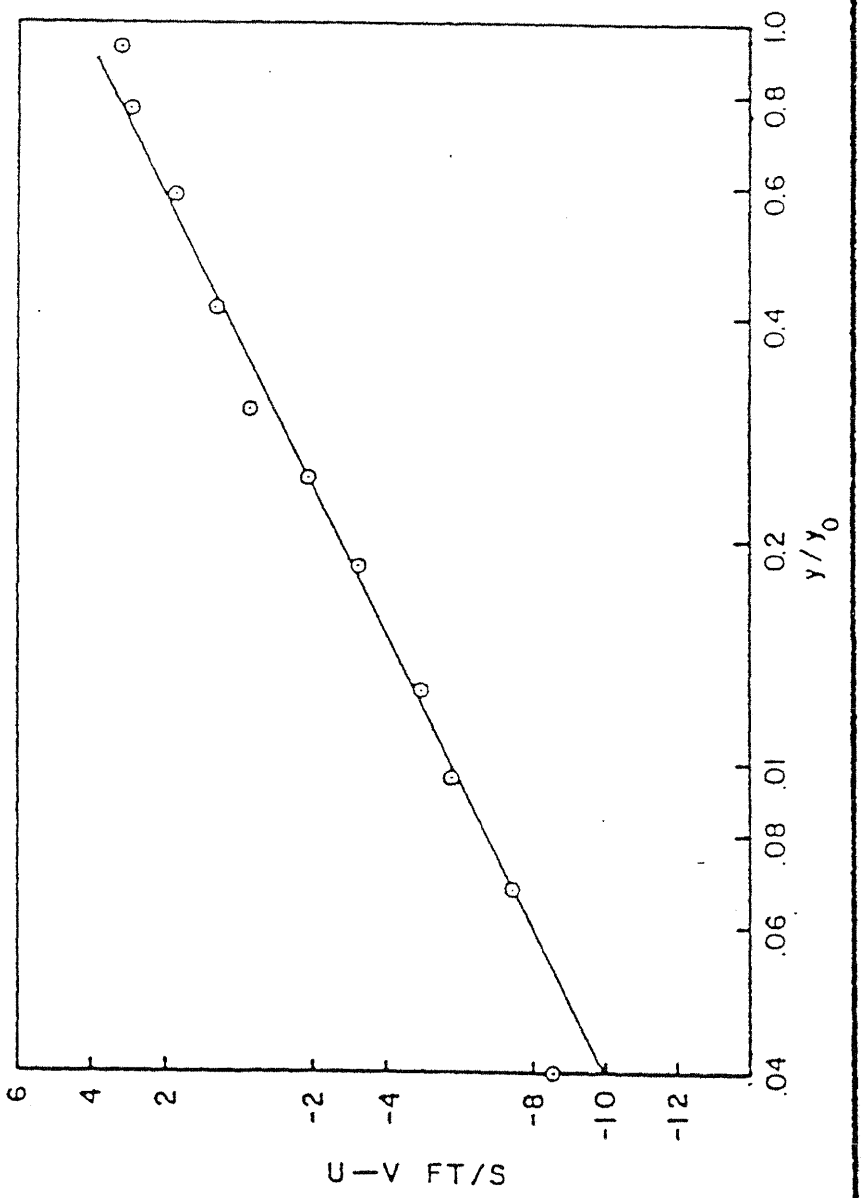


FIG. 6 DIMENSIONLESS FLOW DISTRIBUTION
Sample 6U Q = 39.9 CFS
Note: 1 ft/s = 0.31 m/s
1 cfs = 0.028 m^3/s

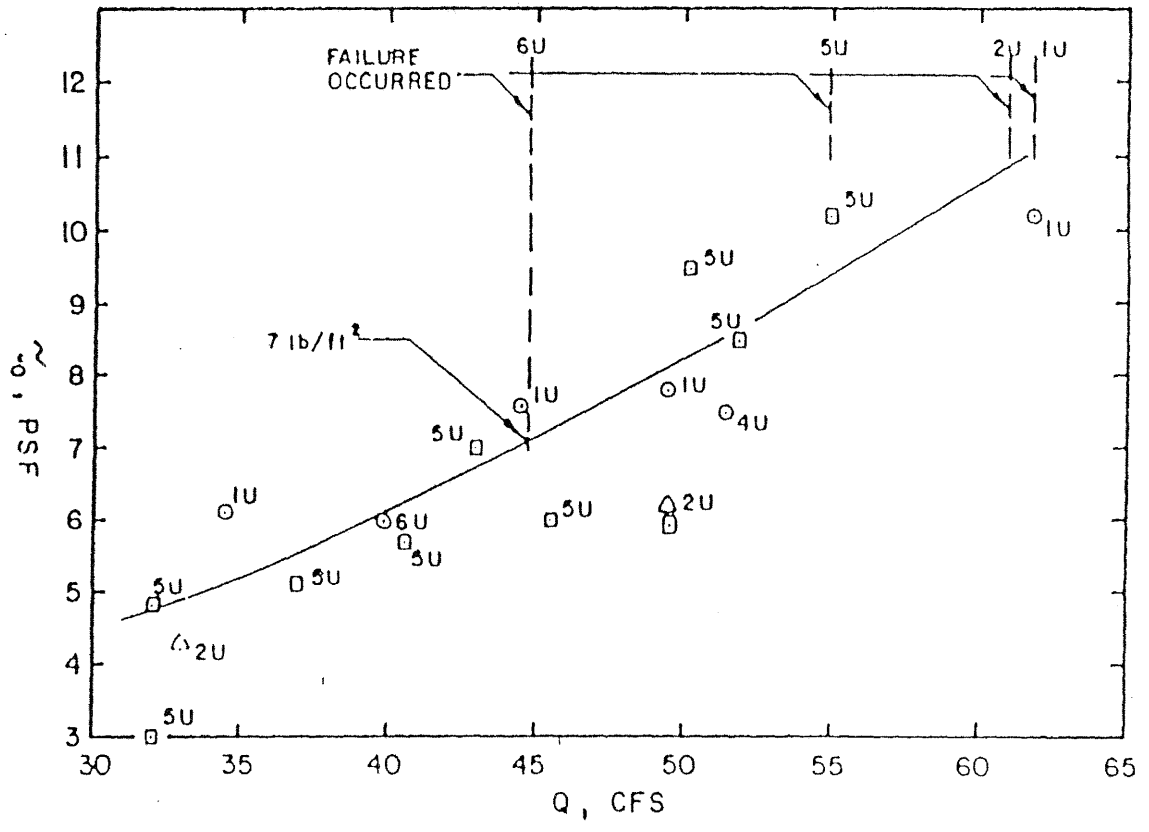


FIG. 7 TEST RESULTS OF UNREINFORCED SAMPLES

Note: 1 cfs = 0.028 m^3/s
1 psf = 47.9 Pa