STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B–4660	UC-1	6

TIP PROJECT: B–4660

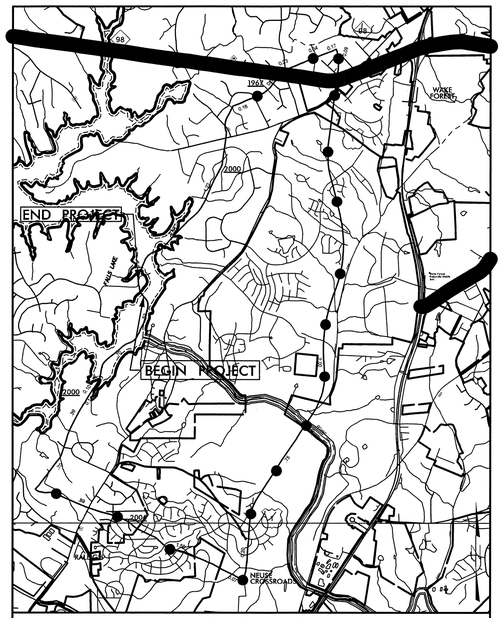
CONTRACT:

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

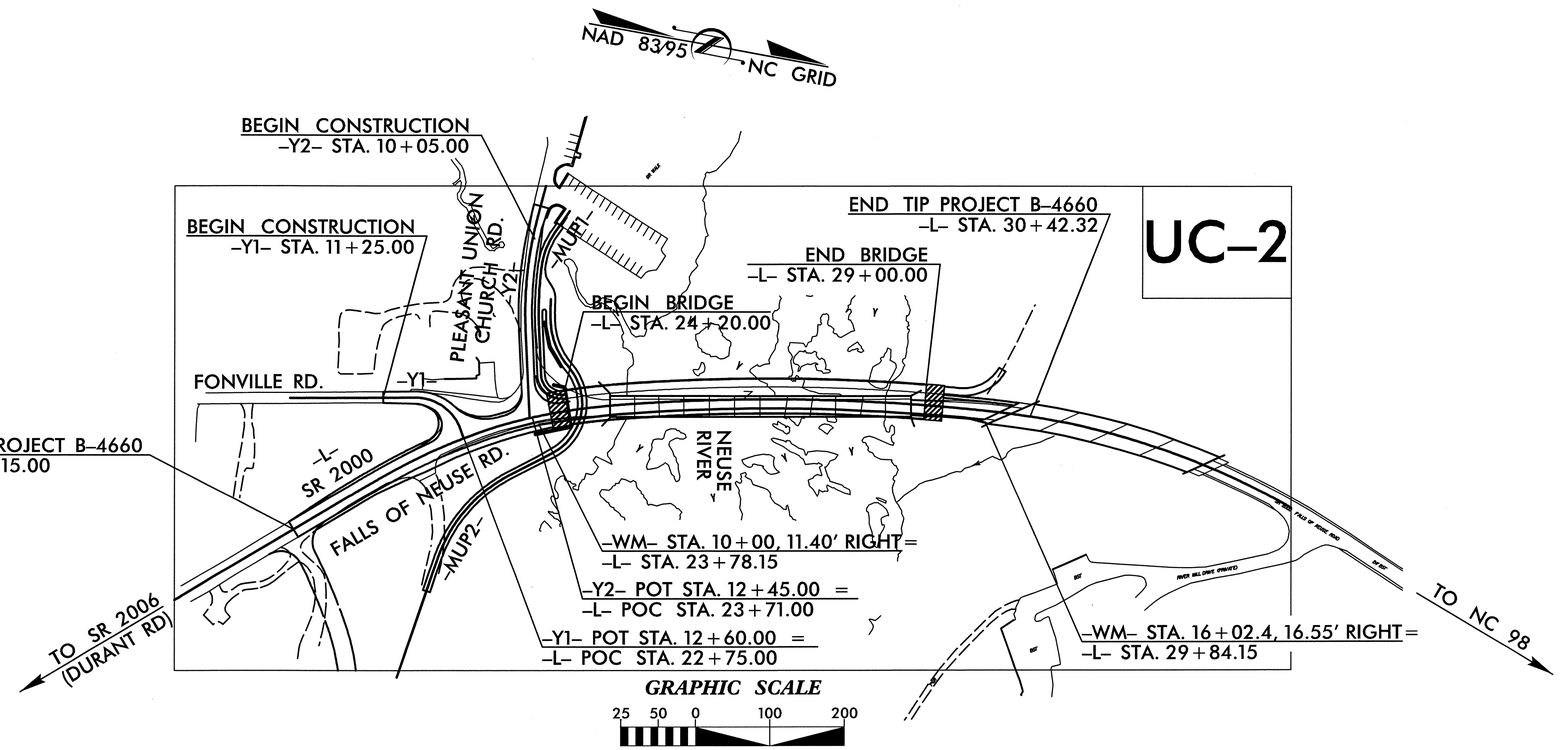
UTILITY CONSTRUCTION PLANS
WAKE COUNTY

LOCATION: ***BRIDGE NO. 19 OVER NEUSE RIVER ON SR 2000***

TYPE OF WORK: ***WATER AND SANITARY SEWER RELOCATION***



VICINITY MAP
OFF–SITE DETOUR



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD __

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

INDEX OF SHEETS

SHEET No.	DESCRIPTION
UC–1	TITLE SHEET
UC–2	PLAN SHEET
UC–3	STRUCTURE DETAIL SHEET
UC–4	DETAIL SHEET
UC–5	PROFILE SHEET
UC–6	DETAIL SHEET
UC–7	DETAIL SHEET
UC–8	DETAIL SHEET

UTILITY OWNERS ON PROJECT

1. WATER	CITY OF RALEIGH
2. SANITARY SEWER	CITY OF RALEIGH

PREPARED BY:

KCI ASSOCIATES OF N.C.

CIVIL ENGINEERS
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(919) 783-9214
WWW.KCI.COM

NORTH CAROLINA PROFESSIONAL SEAL 12300 ENGINEER CHARLES LEE FLOWE

8/9/2011

CHARLES LEE FLOWE, PE
SIGNATURE:

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

ART McMILLAN, PE
STATE HIGHWAY DESIGN ENGINEER

8/17/99

REVISIONS

1 7/21/11 ALIGNMENT REVISIONS FOR WATER AND SEWER

SANITARY SEWER RELOCATION NOTES

1. MANHOLES A AND B ARE TO BE DOGHOUSE STYLE MANHOLES BUILT OVER THE EXISTING SANITARY AS IT REMAINS IN SERVICE.
2. CONTRACTOR TO USE PUMP AROUND OPERATIONS AS NECESSARY TO CONSTRUCT AND BY PASS THE EXISTING SANITARY SEWER SYSTEM.
3. UPON INSTALLATION, THE NEW DIP IS TO BE CONCRETE ENCASED 10' EACH SIDE OF THE PROPOSED 30" RCP, DO NOT ENCASE THE PVC TO DIP COUPLER.

6	HABIBEH GHORBANI	DB 11558 PG 2525 BM 1971 PG 302
7	JUDITH ANN JACKSON	DB 2436 PG 412
10	JOHN T. FONVILLE	DB 9025 PG 933 BM 1924 PG 14
11	PHOEBE O. FONVILLE	DB 8691 PG 2391 BM 1924 PG 14

NORTH CAROLINA PROFESSIONAL SEAL 12300 ENGINEER CHARLES LEE FLOWE 8/9/2011

PROJECT REFERENCE NO.	SHEET NO.
B-4660	UC-2

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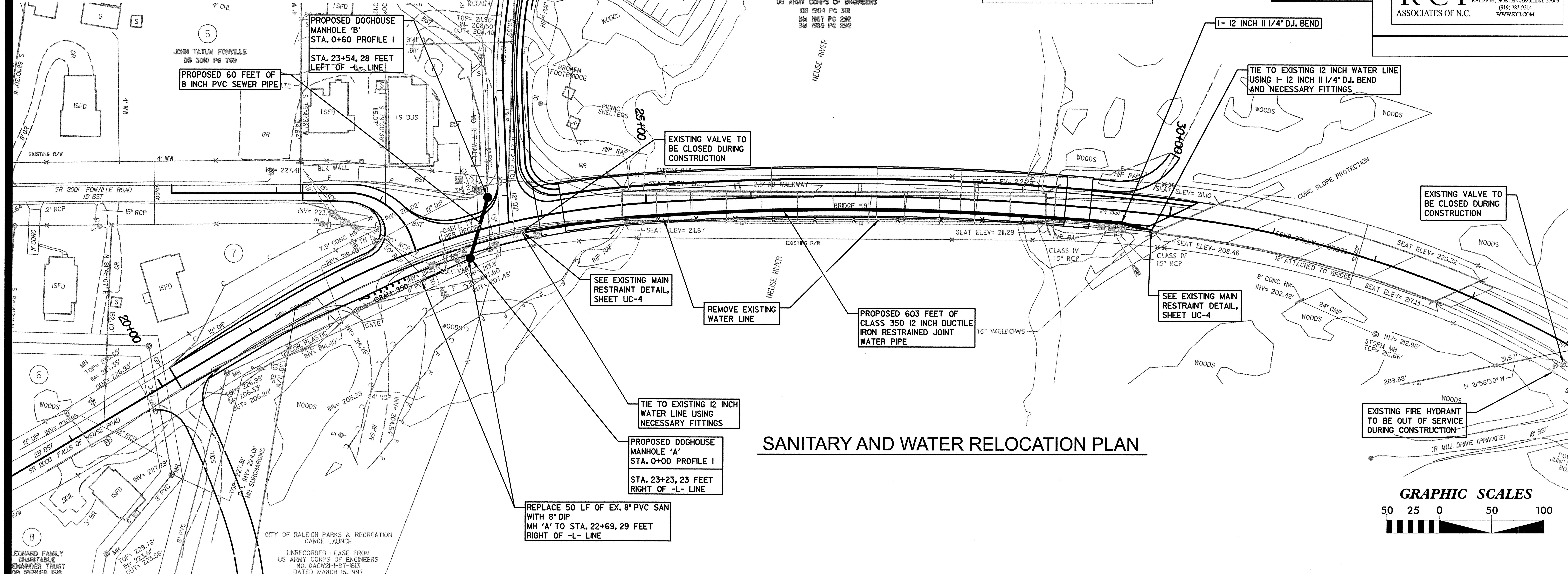
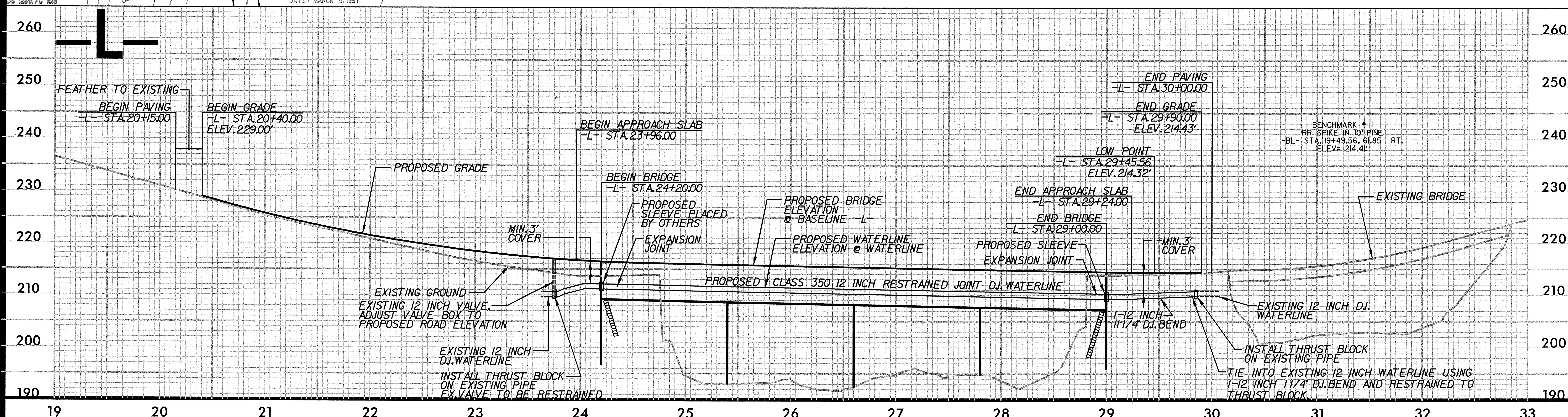


SANITARY AND WATER RELOCATION PLAN



$$$$SYSTIME$$$$ $$$$USERNAME$$$$ $$$$DGN$$$$

PROJECT REFERENCE NO.	SHEET NO.
B-4660	UC-3

NORTH CAROLINA PROFESSIONAL SEAL 12300 ENGINEER CHARLES LEE FLOWE

[illegible] 8/9/2011

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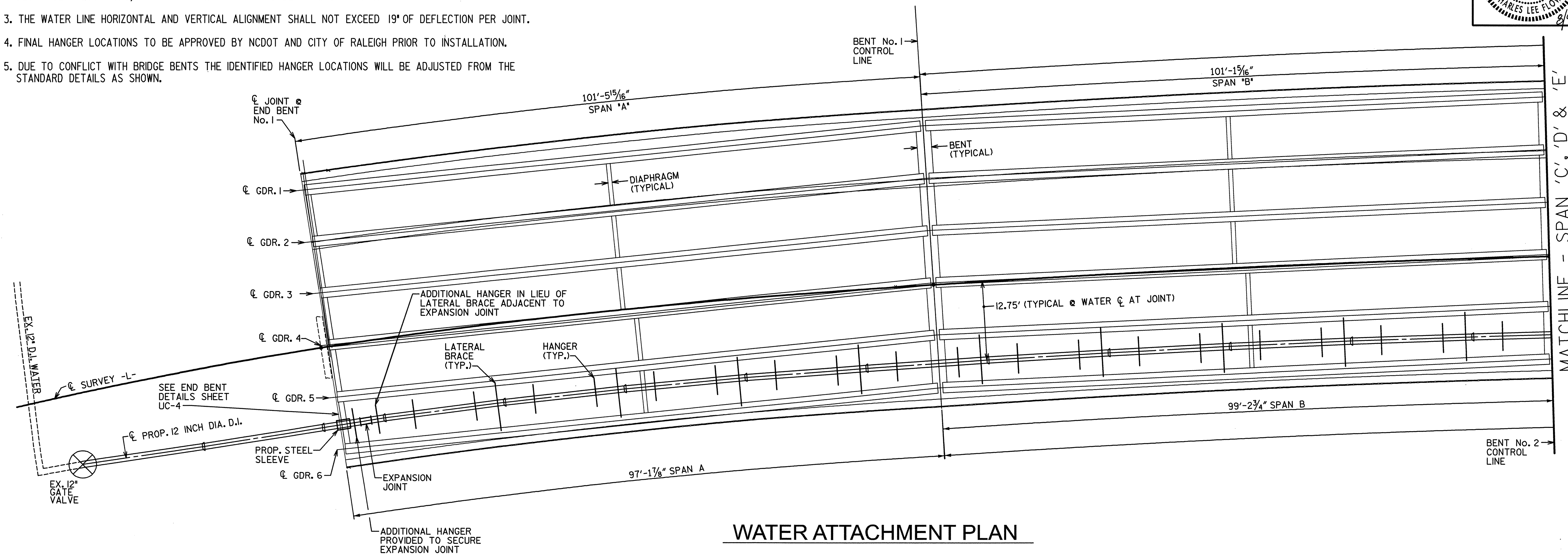
8/17/99

REVISIONS

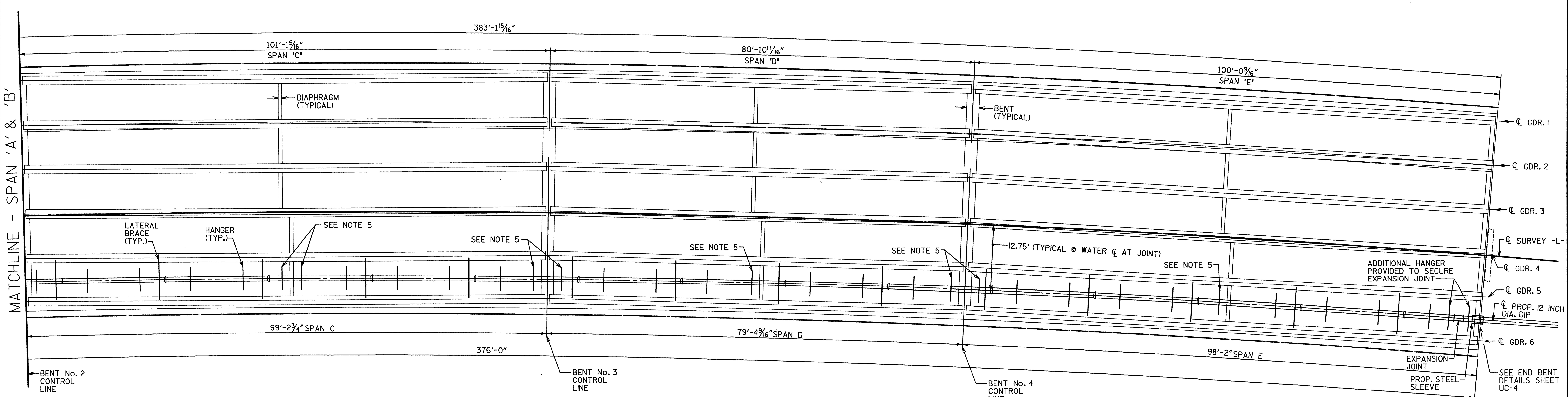
1 7/21/11 REVISED WATER ALIGNMENT

WATER ATTACHMENT NOTES

1. THE PROPOSED WATER ALIGNMENT IS TO BE PARALLEL TO THE CENTERLINE OF SURVEY - L - AT EACH BELL JOINT.
2. THE CONTRACTOR IS RESPONSIBLE TO LAYOUT THE PROPOSED PIPE ALIGNMENT TO LOCATE THE FINAL DECK INSERT LOCATIONS, DIAPHRAM PENETRATIONS AND BENT PENETRATIONS.
3. THE WATER LINE HORIZONTAL AND VERTICAL ALIGNMENT SHALL NOT EXCEED 19° OF DEFLECTION PER JOINT.
4. FINAL HANGER LOCATIONS TO BE APPROVED BY NCDOT AND CITY OF RALEIGH PRIOR TO INSTALLATION.
5. DUE TO CONFLICT WITH BRIDGE BENTS THE IDENTIFIED HANGER LOCATIONS WILL BE ADJUSTED FROM THE STANDARD DETAILS AS SHOWN.



WATER ATTACHMENT PLAN



WATER ATTACHMENT PLAN

GRAPHIC SCALES

PROJECT REFERENCE NO.	SHEET NO.
B-4660	UC-4

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NORTH CAROLINA PROFESSIONAL SEAL 12300 ENGINEER CHARLES LEE FLOWE

8/9/2011

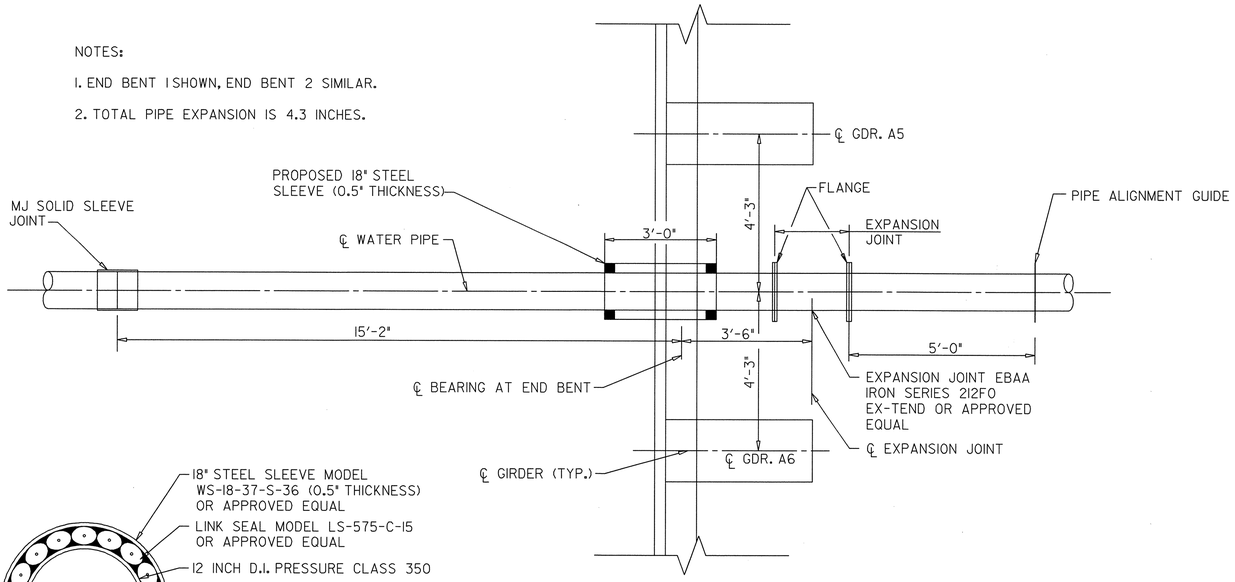
8/17/99

REVISIONS

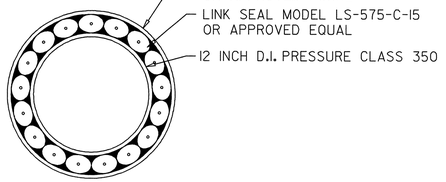
1 7/21/11 DRAFTING AND NOTE REVISIONS

NOTES:

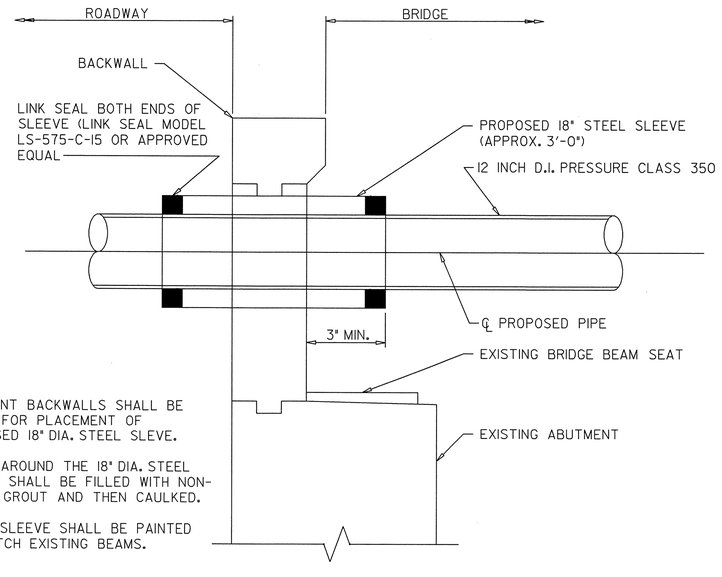
1. END BENT 1 SHOWN, END BENT 2 SIMILAR.
2. TOTAL PIPE EXPANSION IS 4.3 INCHES.



PIPE SLEEVE PLAN
SCALE: 1/2" = 1'-0"



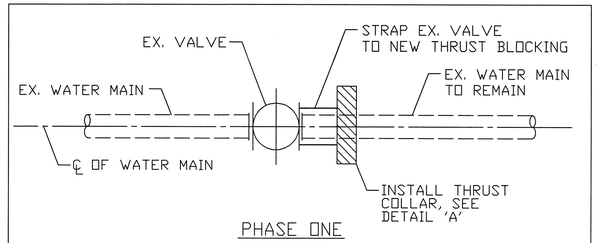
PIPE AND SLEEVE SECTION
SCALE: 11/2" = 1'-0"



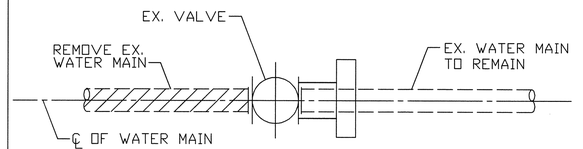
NOTES:

1. END BENT BACKWALLS SHALL BE CORED FOR PLACEMENT OF PROPOSED 18" DIA. STEEL SLEVE.
2. SPACE AROUND THE 18" DIA. STEEL SLEEVE SHALL BE FILLED WITH NON-SHRINK GROUT AND THEN CAULKED.
3. STEEL SLEEVE SHALL BE PAINTED TO MATCH EXISTING BEAMS.

END BENT SECTION
SCALE: 1" = 1'-0"



PHASE ONE

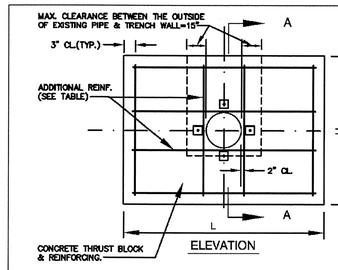


PHASE TWO

SEQUENCE OF CONSTRUCTION

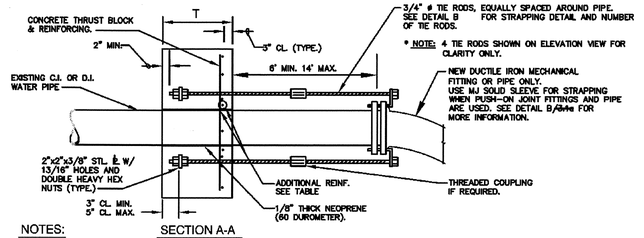
1- EXCAVATE, FORM, POUR CONCRETE TRUSTING BLOCKING.
2- STRAP EXISTING VALVE TO PROPOSED THRUST BLOCKING
3- CLOSE VALVES.
4- REMOVE EXISTING MAIN.

EXISTING MAIN RETRAINT DETAIL



ELEVATION

PIPE DIAMETER INCH	THRUST BLOCK DIMENSIONS T	H	L	THRUST BLOCK REINF.
4 AND 6	1'-2"	2'-6"	3'-6"	#5@ 12" c/c E.W.+4#5 ADD'L REINF.
8	1'-2"	3'-0"	4'-0"	#5@ 12" c/c E.W.+4#5 ADD'L REINF.
10	1'-4"	4'-0"	4'-0"	#5@ 12" c/c E.W.+4#5 ADD'L REINF.
12	1'-4"	5'-0"	5'-0"	#5@ 12" c/c E.W.+4#5 ADD'L REINF.
14	1'-4"	6'-0"	6'-0"	#5@ 10" c/c E.W.+4#5 ADD'L REINF.
16	1'-6"	6'-0"	8'-0"	#5@ 8" c/c E.W.+4#5 ADD'L REINF.
18	1'-6"	6'-0"	11'-0"	#5@ 6" c/c E.W.+4#5 ADD'L REINF.

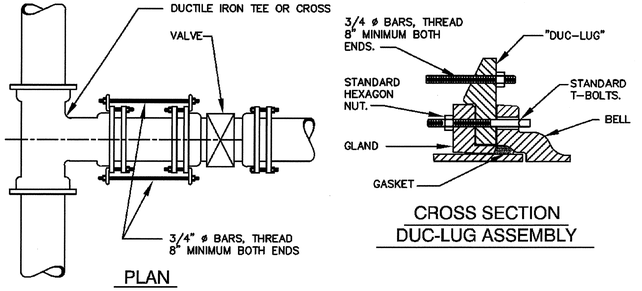


SECTION A-A

NOTES:

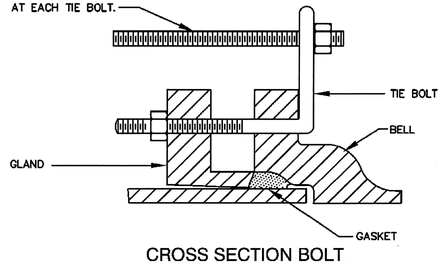
1. ALL CONCRETE SHALL BE f'c=4000 PSI @ 28 DAYS. PIPELINE SHALL NOT BE PRESSURIZED UNTIL CONCRETE STRENGTH REACHES 4000 PSI. AND TRENCH HAS BEEN BACKFILLED.
2. ALL REBARS SHALL BE ASTM A615 GRADE 60.
3. STEEL PLATES SHALL BE ASTM A36.
4. MAINTAIN 2" CLEAR BETWEEN ALL REBARS AND PIPE.
5. COAT ALL EXPOSED STEEL WITH FIELD APPLIED COATING.
6. BOLT CIRCLE FOR 3/4" TIE RODS @ THRUST COLLAR EQUAL BOLT CIRCLE @ TIE BOLTS.
7. TIE RODS SHALL BE PARALLEL TO AXIS OF PIPE.
8. TIE COUPLING, IF NECESSARY, SHALL BE STAR NATIONAL PRODUCTS SUPER STAR TIE COUPLING NO. SS10.
9. IF WORKING PLUS SURGE PRESSURES ARE HIGHER THAN 250 PSI, SPECIAL DESIGN IS REQUIRED.
10. SPECIAL DESIGN IS REQUIRED FOR MAINS LARGER THAN 18 INCH.
11. DEPTH OF FINISHED GRADE TO TOP OF PIPE ASSUMED TO EQUAL 4'-0". IF SHALLOWER, SPECIAL BLOCK DESIGN IS REQUIRED.
12. ELEVATION OF GROUNDWATER TABLE ASSUMED TO BE BELOW BOTTOM OF BLOCK. IF GROUNDWATER IS ABOVE BOTTOM OF BLOCK, SPECIAL BLOCK DESIGN IS REQUIRED.
13. SOFT OR ORGANIC SOIL CONDITIONS REQUIRE SPECIAL BLOCK DESIGN.
14. REPLACE ALL DISTURBED SOIL BETWEEN NEW FITTING AND CONCRETE COLLAR WITH CRUSHED STONE COMPACTED AS STRUCTURAL FILL.

DETAIL 'A'



PLAN

CROSS SECTION DUC-LUG ASSEMBLY



CROSS SECTION BOLT ASSEMBLY

NO. OF TIE BOLTS PER JOINT.

PIPE SIZE	TIE BOLT SIZE	NUMBER OF BOLT REQUIRED
3	5/8"	2
4	3/4"	2
6	3/4"	2
8	3/4"	2
10	3/4"	4
12	3/4"	6
14	3/4"	6
16	3/4"	8
18	3/4"	10
20	3/4"	12
24	3/4"	16
30	3/4"	20

NOTES:

1. USE DUCTILE IRON MECHANICAL JOINT FITTINGS ONLY.
2. COAT BARS AND APPURTENANCES WITH FIELD APPLIED COATING, SEE SPECIFICATIONS.
3. IF WORKING PLUS SURGE PRESSURES ARE HIGHER THAN 250 PSI, SPECIAL DESIGN IS REQUIRED.
4. USE DUC-LUG ONLY WHEN VALVE BODY BELL HAS SLOTTED HOLES. TIGHTEN ALL JOINT T AND TIE BOLTS. THEN CHECK DUC-LUGS. LUGS MUST BE LOOSE, IF TIGHT REPLACE DUC-LUG.

DETAIL 'B'

PROJECT REFERENCE NO.	SHEET NO.
B-4660	UC-05

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 12300 CHARLES LEE FLOWE
8/9/2011

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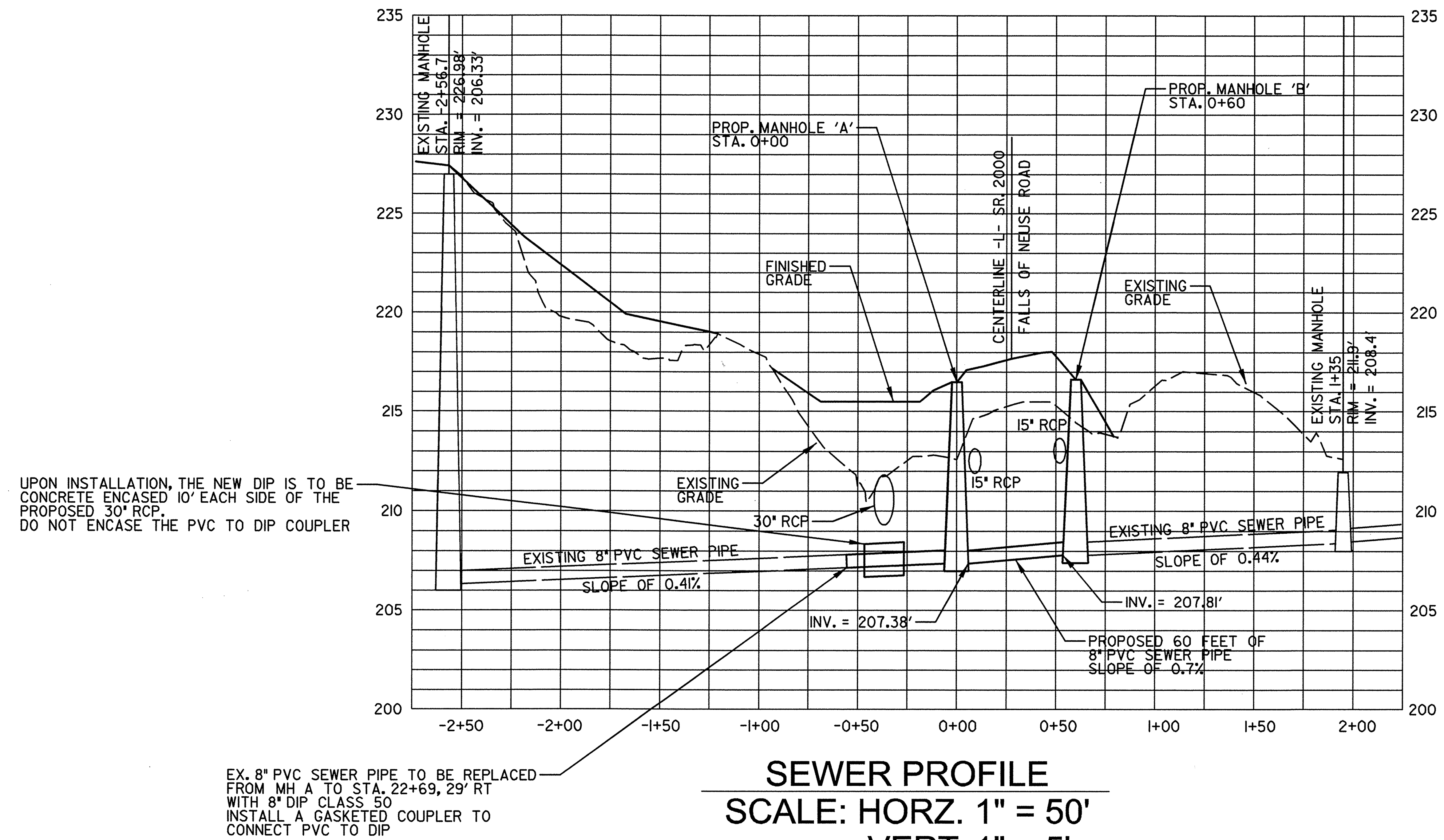
8/17/99

REVISIONS

1 7/21/11 REVISED SEWER ALIGNMENT



SEWER PROFILE

SCALE: HORZ. 1" = 50'
VERT. 1" = 5'

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
B-4660	UC-6

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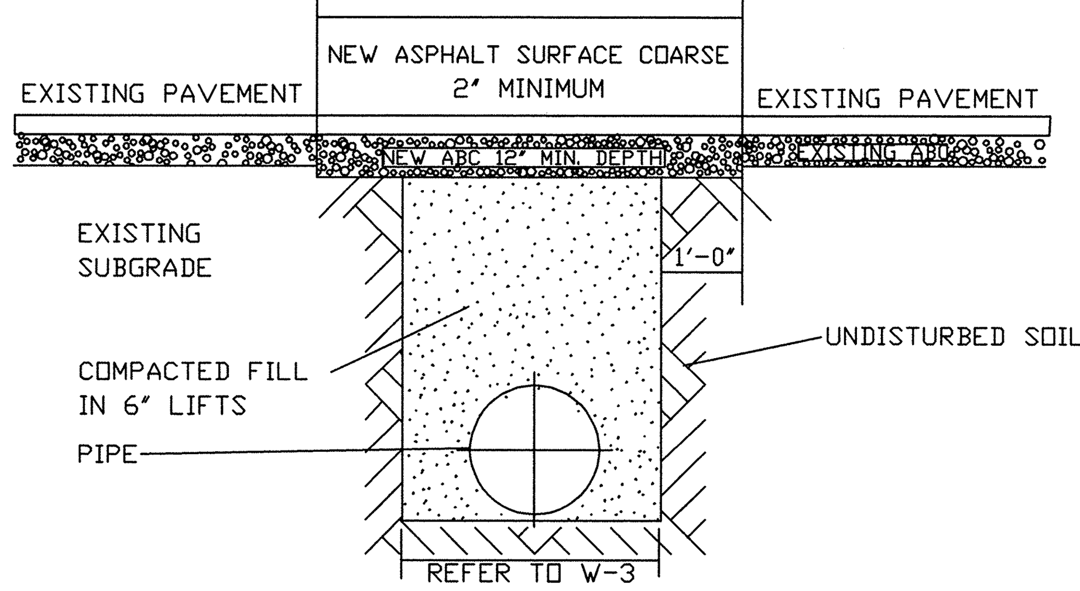
NORTH CAROLINA PROFESSIONAL SEAL 12300 ENGINEER CHARLES LEE FLOWE
8/9/2011

8/17/99

REVISIONS

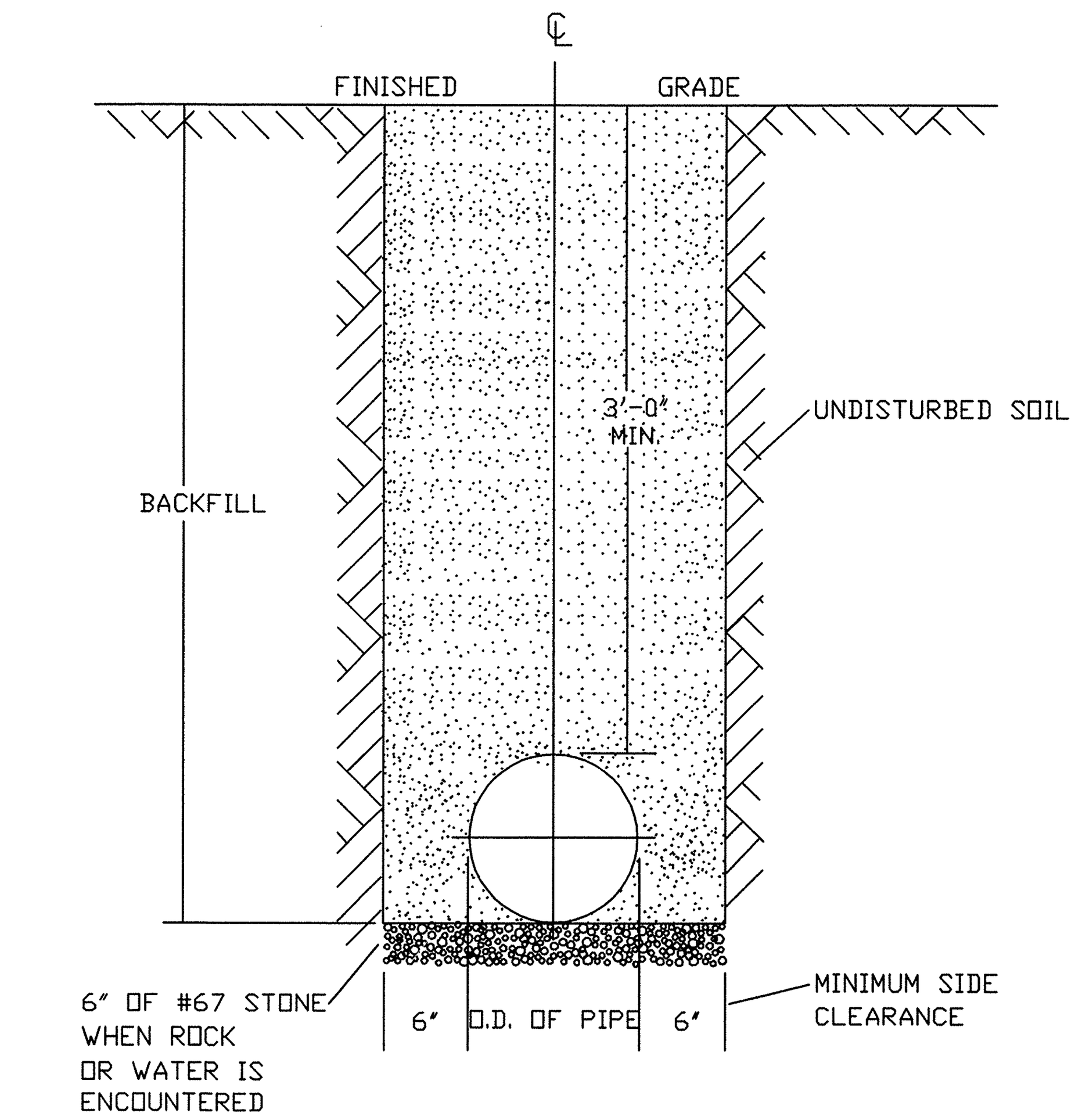


NOTES:

1. The pavement cut shall be defined by a straight edge and cut with an approved saw cut machine.
2. The trench subgrade material shall be backfilled with suitable material and compacted to a density of at least 95% of that obtained by compacting a sample of the material in accordance with AASHTO T-99 as modified by NCDOT.
3. The final 1' of fill shall consist of ABC material compacted to a density equal to 100% of that obtained by compacting a sample of the material in accordance with AASHTO T-80 as modified by NCDOT.
4. The entire thickness/ vertical edge of cut shall be tacked.
5. The same depth of pavement material which exists shall be reinstalled, but in no case shall the asphalt be less than 2" thick.
6. The asphalt pavement material shall be installed and compacted thoroughly with a smooth drum roller to achieve a smooth level patch.
7. Refer to City of Raleigh standards for trenches and pipe bedding, W-3. for additional details.
8. No Hand Patching allowed.
9. Pavement cuts within NCDOT ROW shall conform to the approved on site encroachment permit.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
STANDARD ASPHALT PAVEMENT PATCH DETAIL

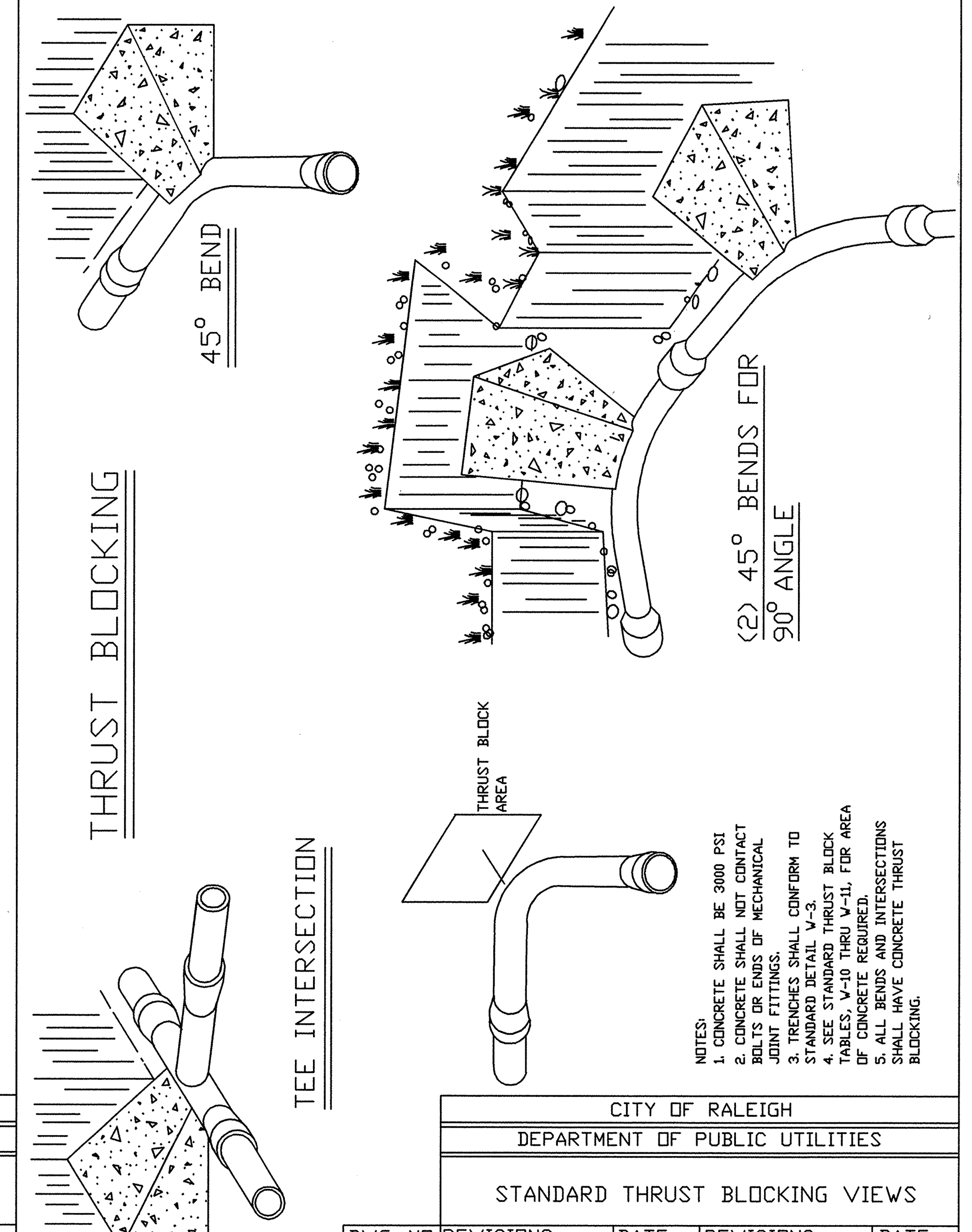
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-2			D.W.C.	11-1-99
	RRH	3-31-00	A.B.B.	4-16-04



NOTES:
1. Trenches requiring shoring and bracing, dimensions shall be taken from the inside face of the shoring and bracing.
2. No rocks or boulders 4" or larger to be used in backfill.
3. All backfill material shall be suitable native material.
4. Backfill shall be tamped in 6" lifts.
5. Achieve 95% compaction in backfill.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
TRENCH BOTTOM DIMENSIONS & BACKFILLING REQUIREMENTS FOR DUCTILE IRON

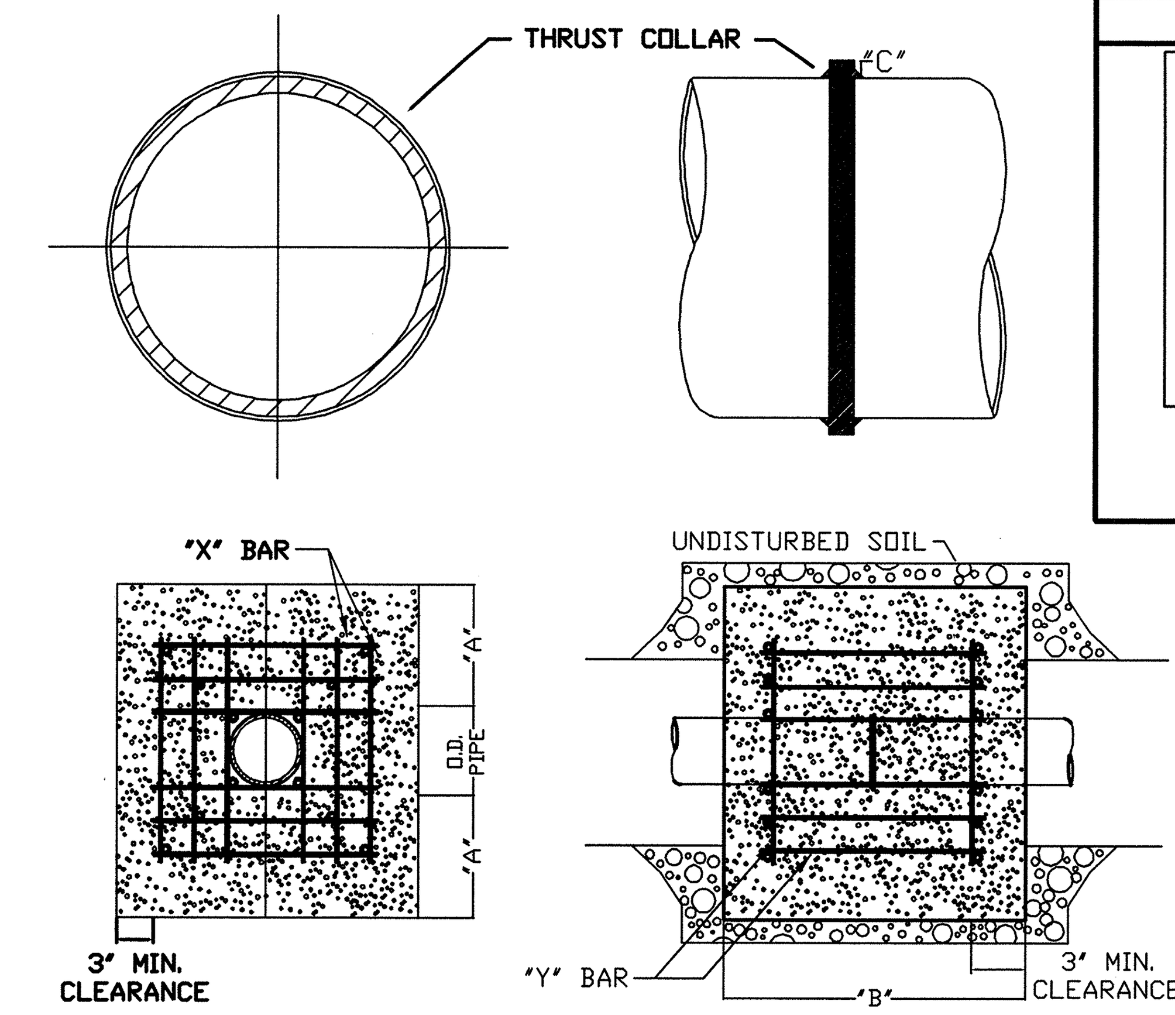
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-3		3-1-87	RRH	3-31-00
	D.W.C.	9-3-99	ABB	2-15-05



NOTES:
1. CONCRETE SHALL BE 3000 PSI
2. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITTINGS.
3. TRENCHES SHALL CONFORM TO STANDARD DETAIL W-3.
4. SEE STANDARD THRUST BLOCK TABLES, W-10 THRU W-11, FOR AREA OF CONCRETE REQUIRED.
5. ALL BENDS AND INTERSECTIONS SHALL HAVE CONCRETE THRUST BLOCKING.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
STANDARD THRUST BLOCKING VIEWS

DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-9		3-1-87	RRH	3-31-00
	D.W.C.	9-7-99		



REINFORCING REQUIREMENTS

I.D. PIPE	REBAR SIZE	'X' BAR LENGTH	'X' BAR WEIGHT	'Y' BAR LENGTH	'Y' BAR WEIGHT	NO. REQUIRED
6" - 36"	#5	2'-2"+ O.D. PIPE	1.043 LBS/FT	1'-1"	1.1 LBS. EACH	X-24, Y-12
48" & greater	#6	3'-0"+ O.D. PIPE	1.502 LBS/FT	1'-3"	1.9 LBS. EACH	X-24, Y-12

THRUST COLLAR, AND THRUST SCHEDULE

I.D. PIPE	'A'	'B'	"C-6"-16",	20"-24",	30"-36",	48"
6" - 36"	1'-4"	1'-7"	2"	3"	4"	
48" & greater	1'-8"	1'-9"				6"

NOTES:
1. SEE STANDARD DETAIL W-9 FOR THRUST BLOCK LOCATIONS.
2. CONCRETE SHALL BE 3000 PSI AND TRANSIT MIXED.
3. REINFORCING BARS SHALL BE DEFORMED AND TIED TOGETHER.
4. TRENCH BOTTOM WIDTH IN VICINITY OF THRUST BLOCK INSTALLATION SHALL BE THE MINIMUM WIDTH AS SHOWN ON STANDARD DETAIL W-3.
5. BACKFILL TAMPED IN 6" LIFTS PER STANDARD DETAIL W-3.
6. THRUST COLLAR MUST BE FACTORY WELDED ON BOTH SIDES ALONG BOTH EDGES OF COLLAR AROUND CIRCUMFERENCE.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
THRUST BLOCKING DESIGN DATA FOR WATER MAINS

DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-7	RRH	1-21-00		

REACTION BEARING AREAS FOR HORIZONTAL WATER PIPE BENDS
BASED ON TEST PRESSURE OF 200 P.S.I.
ALL AREAS GIVEN IN SQUARE FEET.

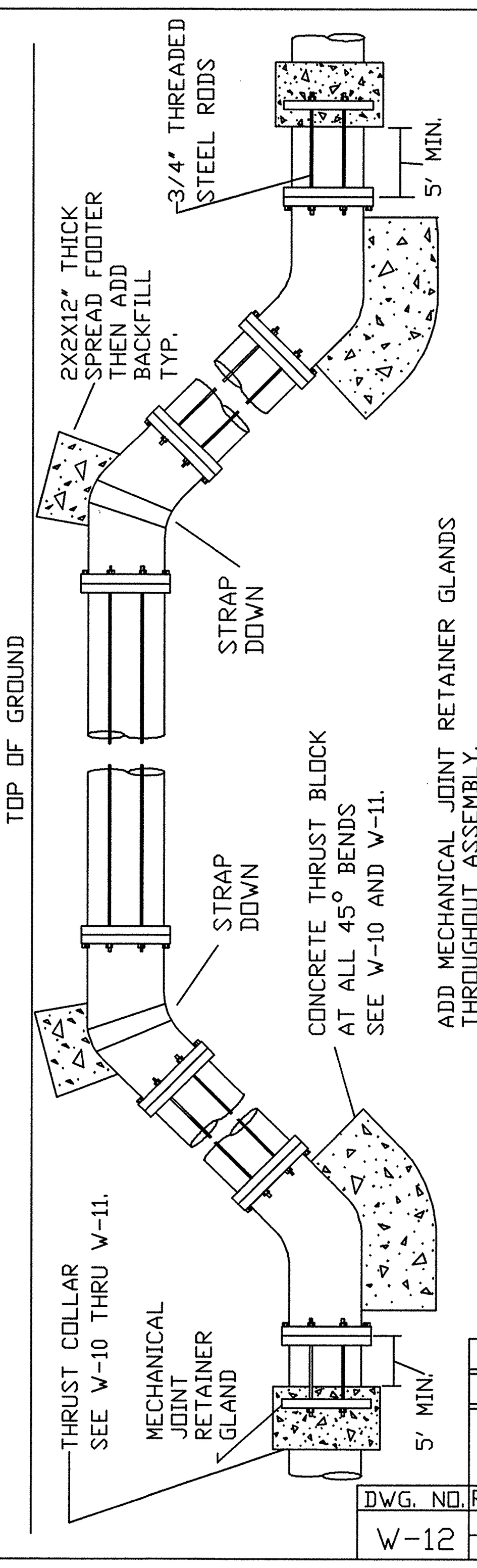
SIZE AND DEGREE OF BEND	STATIC THRUST IN POUNDS	MODERATELY DRY CLAY 4000 LBS/FT²	SOFT CLAY 2000 LBS/FT²	GRAVEL / COARSE SAND 1600 LBS/FT²	DRY CLAY - ALWAYS DRY 8000 LBS/FT²	SAND, COMPACT FIRM 8000 LBS/FT²	SAND -CLEAN DRY 4000 LBS/FT²	QUICKSAND - VERY POOR SOIL 1000 LBS/FT²	ROCK - POOR 10,000 LBS/FT²
6"									
11 1/4°	1,108	1	1	1	1	1	1	2	1
22 1/2°	2,207	1	2	2	1	1	1	3	1
45°	4,328	2	3	3	1	1	2	5	1
90°	7,996	2	4	5	1	1	2	8	1
PLUG	5,655	2	3	4	1	1	2	6	1
8"									
11 1/4°	1,970	1	1	2	1	1	1	2	1
22 1/2°	3,922	1	2	3	1	1	1	4	1
45°	7,694	2	4	5	1	1	2	8	1
90°	14,215	4	8	9	2	2	4	15	2
PLUG	10,053	3	5	6	2	2	3	10	1
12"									
11 1/4°	4,433	2	3	3	1	1	2	5	1
22 1/2°	8,826	3	5	6	2	2	3	9	1
45°	17,312	5	9	11	3	3	5	18	2
90°	31,983	8	16	19	4	4	8	32	4
PLUG	22,619	6	12	14	3	3	6	23	3
16"									
11 1/4°	7,881	2	4	5	1	1	2	8	1
22 1/2°	15,691	4	8	10	2	2	4	16	2
45°	30,779	8	16	19	4	4	8	31	4
90°	56,861	15	29	35	8	8	15	57	6
PLUG	40,213	10	21	25	5	5	10	41	5

REACTION BEARING AREAS ARE IN SQUARE FEET MEASURED IN A VERTICAL PLANE IN THE TRENCH SIDE AT AN ANGLE OF 90° TO THE THRUST VECTOR.

USE 6" - 90° BEND VALUE FOR HYDRANTS FOR ADDITIONAL SAFETY FACTOR.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
THRUST BLOCKING DESIGN QUANTITY TABLE

DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-10	D.W.C.	6-23-99		



ADD MECHANICAL JOINT RETAINER GLANDS THROUGHOUT ASSEMBLY.

ROD REQUIREMENTS

SIZE OF 45 BEND	STATIC THRUST IN POUNDS	NO. OF RODS REQUIRED
6"	4,328	2
8"	7,694	4
12"	17,312	4
16"	30,779	8
24"	69,252	8

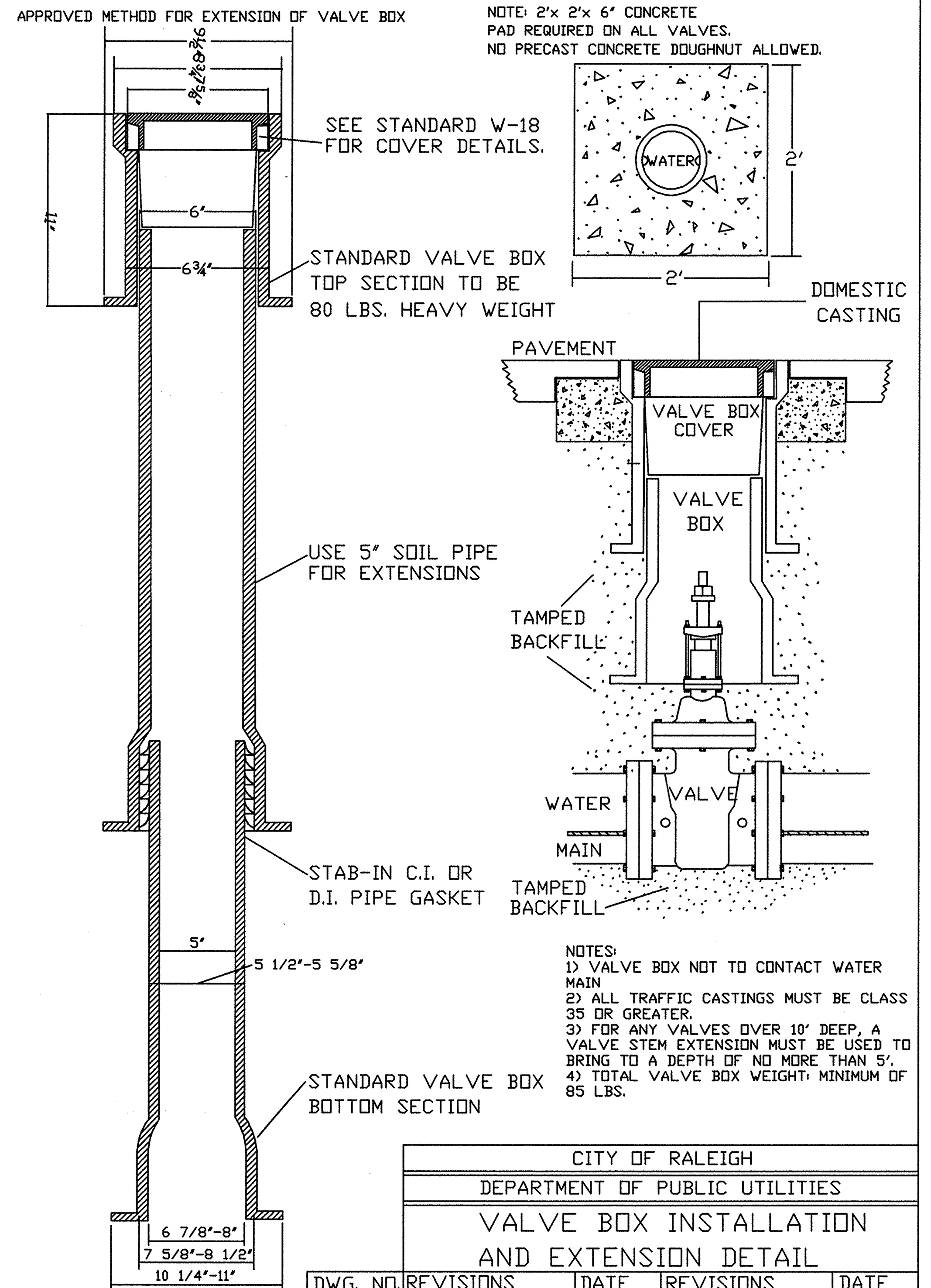
GENERAL NOTES:
1. STEEL RODS AND BOLTS SHALL BE 3/4" HOT DIPPED GALVANIZED.
2. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT BENDS.
3. RESTRAINED MECHANICAL GLANDS TO BE USED AT ALL FITTINGS.
4. MUST USE DUCTILE IRON EYE BOLTS WHERE NECESSARY.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
STANDARD VERTICAL BEND

DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-12	ABB	4-6-04		

APPROVED METHOD FOR EXTENSION OF VALVE BOX

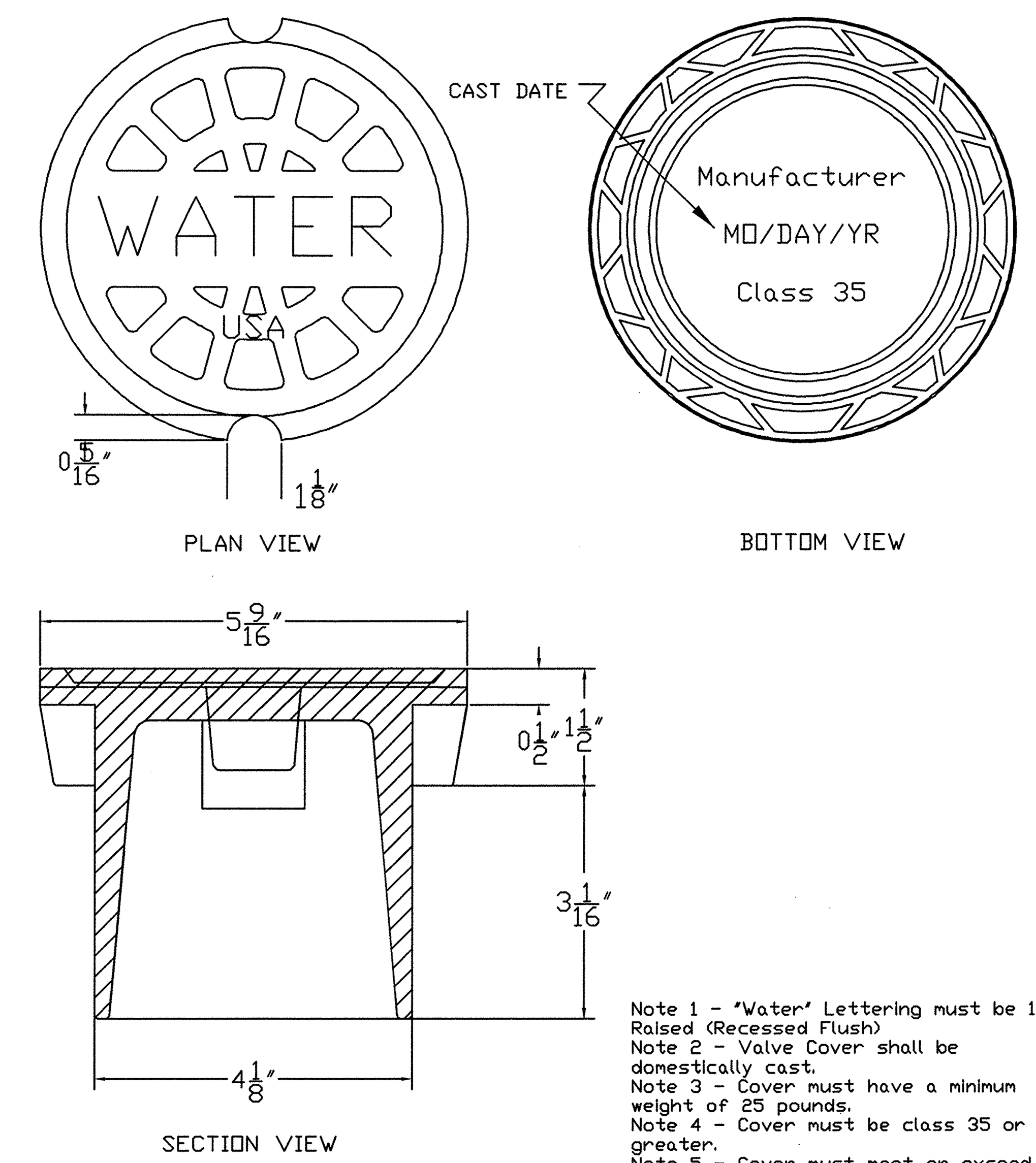
NOTE: 2'x 2'x 6" CONCRETE PAD REQUIRED ON ALL VALVES. NO PRECAST CONCRETE DOUGHNUT ALLOWED.



NOTES:
1) VALVE BOX NOT TO CONTACT WATER MAIN
2) ALL TRAFFIC CASTINGS MUST BE CLASS 35 OR GREATER.
3) FOR ANY VALVES OVER 10' DEEP, A VALVE STEM EXTENSION MUST BE USED TO BRING TO A DEPTH OF NO MORE THAN 5'.
4) TOTAL VALVE BOX WEIGHT: MINIMUM OF 85 LBS.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
VALVE BOX INSTALLATION AND EXTENSION DETAIL

DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-17	Y.C.A.	12-31-91	RRH	3-31-00
	D.W.C.	9-7-99	A.B.B.	4-15-04



Note 1 - 'Water' Lettering must be 1" Raised (Recessed Flush)
Note 2 - Valve Cover shall be domestically cast.
Note 3 - Cover must have a minimum weight of 25 pounds.
Note 4 - Cover must be class 35 or greater.
Note 5 - Cover must meet or exceed AASHTO H-20 load requirements.

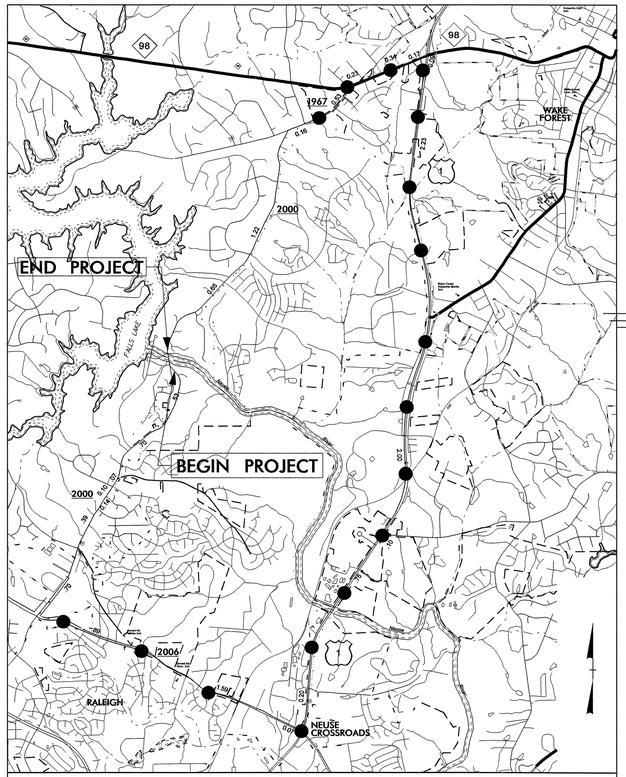
CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
5 1/4" Valve Box Drop Lid
4" Skirt

DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-18			ABB	2-12-04

$$$$SYSTIME$$$$ $$$$DGN$$$$ $$$$USERNAME$$$$

09/08/99

TIP PROJECT: B–4660



VICINITY MAP

OFF–SITE DETOUR

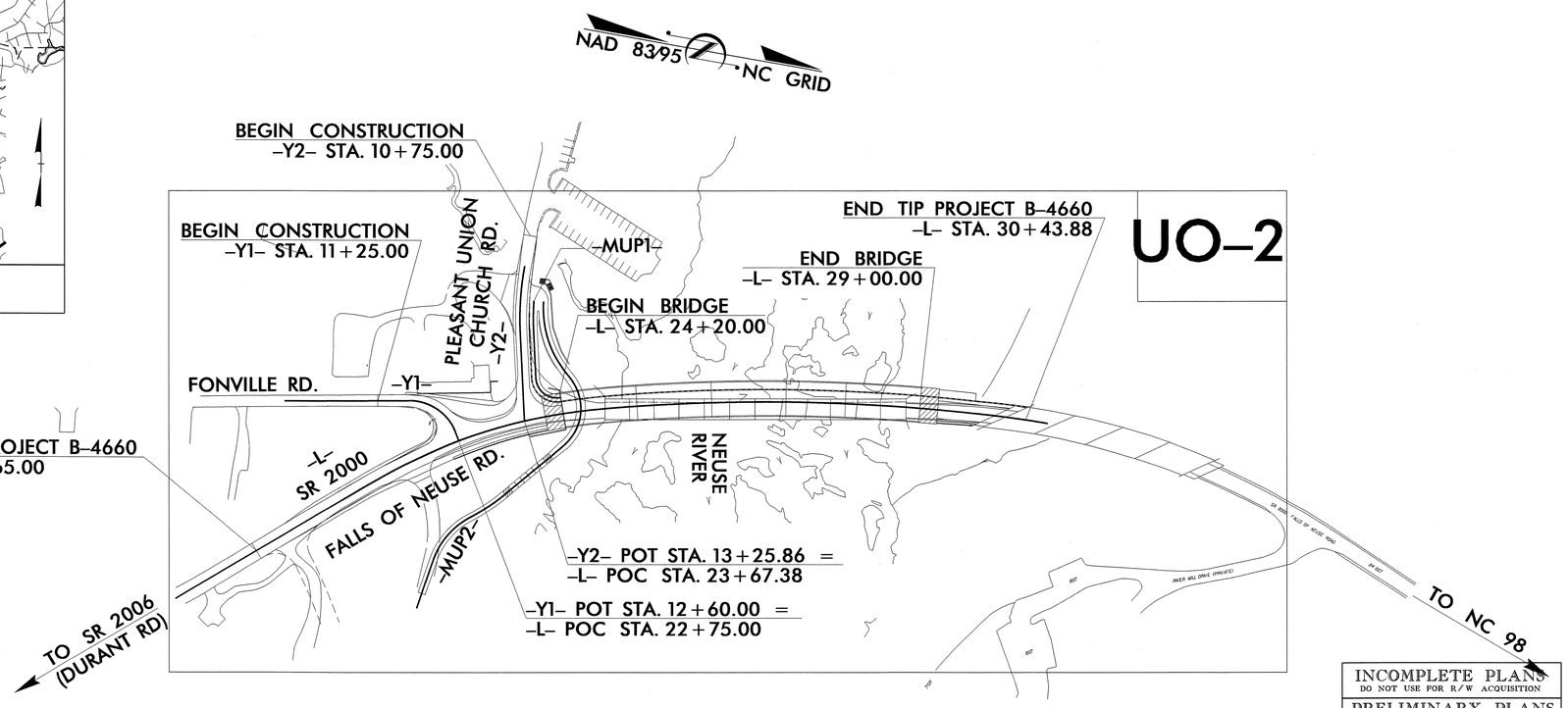
T.I.P. NO.	SHEET NO.
B–4660	UO–1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

UTILITIES BY OTHERS PLANS
WAKE COUNTY

LOCATION: BRIDGE NO.19 OVER NEUSE RIVER ON SR 2000

TYPE OF WORK: GRADING, PAVING, DRAINAGE, AND STRUCTURE



UO–2

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

INDEX OF SHEETS

SHEET NO.	*DESCRIPTION*
UO–1	*TITLE SHEET*
UO–2	*UTILITY BY OTHERS PLAN SHEETS*

UTILITY OWNERS ON PROJECT

(1) PROGRESS ENERGY – POWER (DISTRIBUTION)
(2) AT&T – TELEPHONE
(3) TIME WARNER CABLE – CATV

PREPARED IN THE OFFICE OF:
DIVISION OF HIGHWAYS
UTILITIES ENGINEERING SECTION
1591 MAIL SERVICES CENTER
RALEIGH NC 27699-1591
PHONE (919) 250-4128
FAX (919) 250-4119

Roger Worthington, P.E.	*UTILITIES SECTION ENGINEER*
R.B.Wilkins, P.E.	*UTILITIES SQUAD LEADER PROJECT ENGINEER*
Jong–Tae Yoon	*UTILITIES PROJECT DESIGNER*

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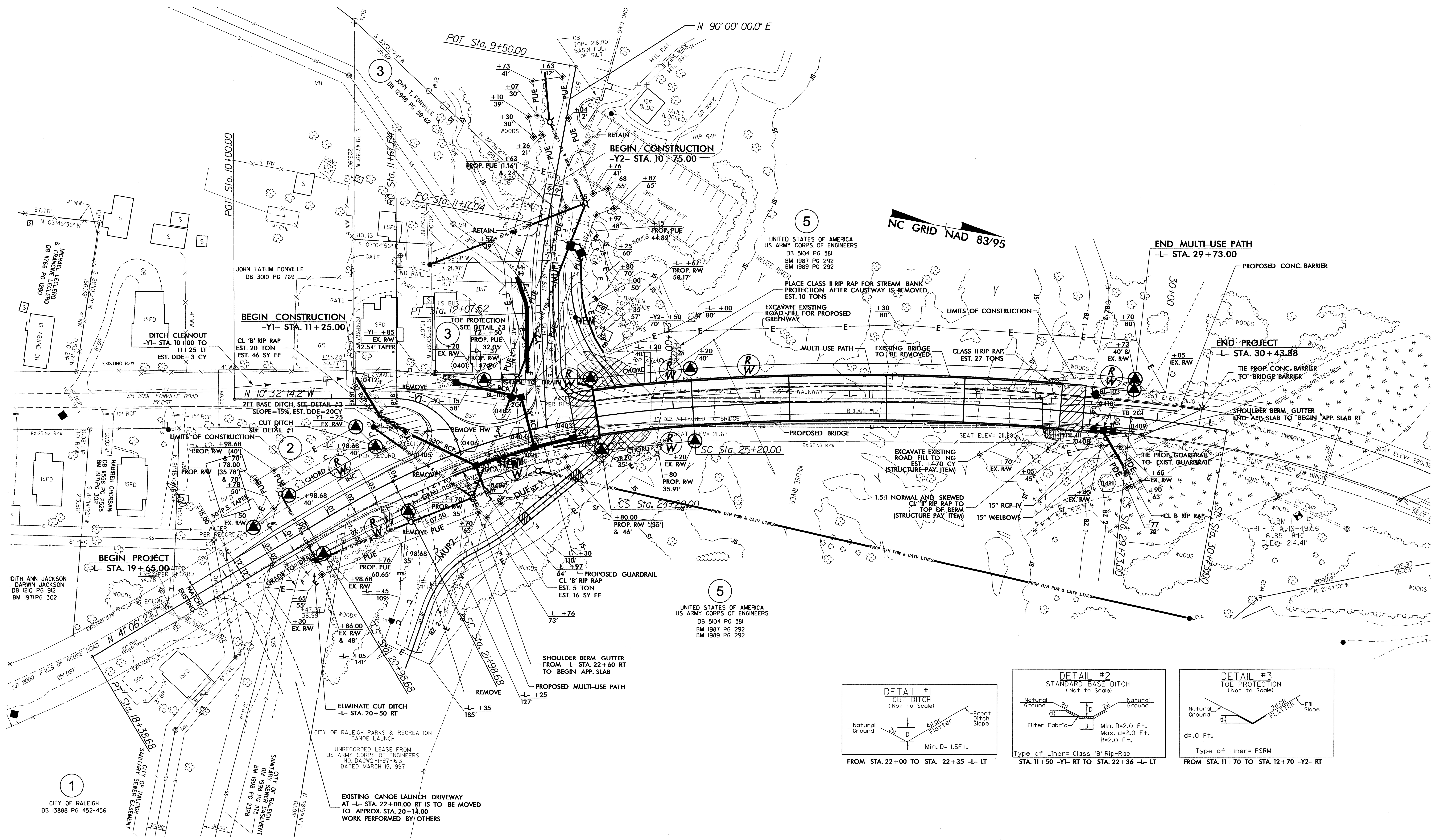
5/14/99

PROJECT REFERENCE NO.	SHEET NO.
B-4660	U0-2

UTILITIES BY OTHERS

NOTE:
ALL PROPOSED UTILITY WORK SHOWN ON THIS SHEET WILL BE DONE BY OTHERS



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