APPENDIX E

MITIGATION PLAN

ALAN PLUMMER ASSOCIATES, INC.
ENVIRONMENTAL ENGINEERS · SCIENTISTS

MITIGATION PLAN FOR THE EAST FORK REUSE PROJECT

USACE Project No.: 200400002

SPONSOR:

NORTH TEXAS MUNICIPAL WATER DISTRICT

Revised

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ALAN PLUMMER ASSOCIATES, INC.

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INTRODUCTION

Purpose and Need for Project

Recent long-range water supply planning efforts conducted by the North Texas Municipal Water District (NTMWD) have identified significant increases in water demands that must be met through conservation and increased water supplies. During the past several years, water demand within the NTMWD service area, as well as in much of North Central Texas, has increased significantly. NTMWD investigated a number of options to obtain additional raw water supplies to meet the increasing demand including conservation, reuse, and new reservoirs. One of the more promising technologies is the indirect reuse of wastewater treatment plant effluent discharged to the river by diverting a portion of that river water into a constructed wetland for further treatment and returning the treated water to upstream reservoirs to augment the water supply.

A conclusion of the above-mentioned investigations was that without a significant increase in the indirect reuse of wastewater treatment plant effluent there would inadequate supplies to meet demand beginning as early as 2008. No other alternative could be realized before 2020.

Therefore, an East Fork Reuse Project has been adopted. With construction planned to begin in late 2005, reclaimed water originating from NTMWD sources that are discharged into the East Fork of the Trinity River would be diverted from the river near Crandall in Kaufman County and pumped to a large constructed wetland for nutrient removal and water quality polishing. After passage through the constructed wetland, water would be pumped to Lake Lavon in Collin County for storage, blending, and water supply use. After project completion in 2008, the East Fork Reuse Project would provide a supply of 81,400 acre-feet per year (ac-ft/yr) by 2010, 96,400 ac-ft/yr by 2020, and 102,000 ac-ft/yr by 2030.

As mentioned above, the East Fork Reuse Project is the only Region C-approved supply option that can be implemented that will allow the NTMWD to meet 2008 water demands. Long-range planning indicates that the next feasible water supply source for NTMWD would be the Lower Bois d'Arc Creek Reservoir on Bois d'Arc Creek in the Red River drainage basin. This reservoir

is under study now and could be available for water supply within 15 years (2020) at the earliest. The yield of the Lower Bois d'Arc Creek Reservoir is about 98,000 ac-ft/yr. Based on projected population increases, the Lower Bois d'Arc Creek Reservoir project will still be needed even after implementing the East Fork Reuse Project.

Texas Senate Bill 1 requires the Texas Water Development Board (TWDB) to undertake regional water supply planning to identify projects in Texas that are planned to meet water demands. In January 2005, TWDB approved amending the *Region C Water Plan* to specifically recommend the East Fork Reuse Project as a water management strategy for the NTMWD.

The East Fork Reuse Project consists of an East Fork Trinity River diversion structure and pump station, a constructed wetland with plant nurseries and a nature center, a conveyance pump station, a 43-mile pipeline, and a lake outfall sited on the shores of Lake Lavon. Figure 1 is a vicinity map that shows the location of the diversion pump station and constructed wetland. Figure 2 shows the conveyance pipeline route from the constructed wetland to Lake Lavon. Figure 3 shows the outfall location at Lake Lavon.

Construction of the project components will include unavoidable impacts to jurisdictional waters of the U.S. at the diversion pump intake channel, for development of the wetland cells, along the 43-mile pipeline route and at the lake outfall. Portions of the pipeline route and the lake outfall are located on property owned by the federal government and controlled by the U.S. Army Corps of Engineers (USACE). This mitigation plan addresses both impacts to jurisdictional waters of the U.S. and impacts to terrestrial habitat on USACE property.

Diversion Pump Station

The pump station will be a concrete structure measuring approximately 68 feet by 87 feet by 40 feet high and supported by concrete columns supported on 36-inch augur-drilled concrete piers. The pump station structure will be constructed just outside (east) of an existing agricultural levee. A concrete-lined trapezoidal intake channel about 900 feet in length will be constructed between the pump station and the East Fork Trinity River. The intake channel will have an invert at approximate elevation 330 feet msl at the river and will be sloped to an approximate

elevation of 324 feet msl at the pump station. The sides of the concrete channel will rise at a 1:1 slope to an elevation around 344 msl at which elevation a 15-foot bench will be constructed to serve as a maintenance roadway for the channel. From the bench, the slopes will be continued to the top of original grade at a slope of 3:1 and this slope will be grassed. Figure 4 illustrates a profile section of the proposed diversion pump station. Figure 5 shows the plan view of the proposed diversion pump station.

Constructed Wetland

The constructed wetland will be located on Seagoville Ranch within a levied area west of the East Fork of the Trinity River (Figure 6). The wetland will consist of sedimentation basins; wetland cells; distribution, collection and conveyance canals; a collection pool; wetland plant nurseries and a nature center. The wetland will be located within the footprint of a 2,000-acre easement and will include about 1,840 acres of wetted surface. The balance of the wetland area will include berms, flow distribution and flow control structures, and access ways.

The constructed wetland area is divided into three sections (north, central, and south sections) by both topographic and manmade features (Figure 7). All three sections of the project area are located west of the East Fork and protection from floods is provided by a series of levees along the west bank of the river. The land within the three sections of the wetland project area was previously cleared, graded, subdivided into fields, and ditched for growing agricultural crops. Perimeter canals were constructed around the central and south sections to route drainage from the fields to two pump stations that pumped the collected rainfall runoff to the East Fork. The former pump stations are still located on the site but are no longer functional. Multiple 36-inch diameter culverts convey drainage through the levees to the East Fork. Stop logs in front of the culverts enable varying levels of water to be retained within the collection canals for livestock use.

Multiple stop log flow control structures installed from 1988 through 1991 in the drainage collection ditches were employed to develop and manage waterfowl habitat in various areas of the central and south sections of the project area. Approximately 243.3 acres characterized as

emergent marsh habitat, black willow swamp, sloughs, a hillside seep/bog, and on-channel ponds were identified as jurisdictional features in a preliminary jurisdictional determination conducted by Advanced Ecology, Inc. dated January 2005. Approximately 154.2 acres of identified jurisdictional areas consisting primarily of emergent marsh habitat and black willow swamp lie within the proposed constructed wetland footprint.

Conveyance Pipeline

The conveyance pipeline will be about 43 miles of an 84-inch diameter pipe with a design pressure up to class 300. NTMWD evaluated six pipeline alignments through the use of aerial photography, USGS topographic quadrangle maps, county tax maps, field investigations, and computer aided design (CAD) software. The evaluated routes are shown on Figure 8.

Route Option 4 was determined to be technically feasible and the most economical of the options and, therefore, was selected as the preferred route subject to local adjustments during final design. Option 4 will involve approximately 38.8 miles of rural, open land; 2.9 miles of rural, wooded land; 0.1 miles of urban/congested land; 0.9 miles of creek crossings; 0.4 miles of road crossings using open cut trenching; and 0.3 miles of road crossings using tunneling.

Planned easement widths typically include a 40-foot wide permanent easement plus an 80-foot temporary easement for a total width of 120 feet. Where additional space is required for a future NTMWD pipeline, a 50-foot wide permanent easement is planned.

Specifically, a 50-foot permanent easement is planned for the pipeline between the intersection of FM 548 and US 80, in Forney, TX, and continuing north to about the intersection of FM 2755 and CR 541 in Collin County. A planned 54-inch potable water pipeline will parallel this portion of the pipeline.

A 40-foot wide permanent easement is planned for the segments south of the intersection of FM 548 and US 80, in Forney, TX, and the pipeline segments north of the intersection of FM 2755 and CR 541 in Collin County continuing to the Lake Lavon Outfall.

Narrower easements will likely be required in areas of urban-congestion to protect existing structures and improvements, and at creek crossings to minimize impacts to stream channels and associated riparian areas. These issues will be incorporated into the final design to minimize the impacts to the maximum extent practicable.

Lake Lavon Outfall

The outfall structure will consist of a stilling basin and a rock riprap apron into the lake to prevent erosion. The stilling basin will be based on the United States Bureau of Reclamation (USBR) Type VI impact stilling basin design that has been used successfully for large diameter pipeline outfalls, including NTMWD's Cooper Lake Pipeline outfall into Lake Lavon. Figure 9 shows a plan view of the proposed outfall and Figure 10 shows a typical schematic of the proposed impact stilling basin design. The rock riprap apron into the lake will be placed down to 487.5 feet MSL. This is at the 25th percentile elevation within the flood pool per historical data obtained from USACE. Figure 11 shows a profile section of the outfall structure.

MITIGATION PLAN

1a. Avoidance and Minimization

Due to the scope and complexity of the project, some impacts to jurisdictional waters are unavoidable. However, significant efforts are being made to avoid impacts where possible and to minimize impacts to the extent practicable through the engineering, planning, and design process. The proposed pipeline route follows roadways and existing utility corridors to the extent practicable to minimize impacts at stream crossings and fragmentation of habitat areas. Narrower easements at creek crossings will be incorporated into the final design where practicable to minimize impacts to stream channels and associated riparian areas.

1b. Alternatives Analysis

Detailed information regarding the analysis of alternatives for the water supply project, the location of the diversion pump station, the location of the constructed wetland, pipeline routes evaluated, and outfall locations for the discharge to Lake Lavon was included as an attachment

with the 404 permit application and in the Environmental Information Document submitted for the project impacts to the USACE property.

2. Impacts of the Proposed Project

Diversion Pump Station

The intake section for the diversion pump station begins in the river (jurisdictional waters) and a portion of the intake channel crosses an approximately fifty foot wide section of an abandoned meander of the river (jurisdictional waters). Table 1 provides an estimate of amounts of surface area of jurisdictional area impacted.

TABLE 1 - Impacts at Diversion Pump Station

Material Being Discharged	Location of Discharge	Total Project Sq Ft	Discharge to Jurisdictional Waters Sq Ft
Concrete	Intake Channel	7,200	504
Soil-Cement	Intake Channel	35,000	2,450
Soil Cement	River Erosion Protection	65	65
Total Concrete		**7,200**	**504**
Total Soil Cement		**35,065**	**2,515**

Constructed Wetland

Clay soils from excavation of the sedimentation basins, deepwater zones, and canals will be used for construction of berms and fill of existing ditches. The wetland cells will be graded to achieve appropriate elevation drop across the cells for control of water depth in marsh areas. Topsoil from the emergent marsh areas that require grading will be stripped and stockpiled separately for use in final grading of wetland cells to facilitate establishment of aquatic plant cover. Materials on-site are being incorporated into the design so that no imported materials will be necessary. The following table is a description of construction activities that will occur within jurisdictional areas associated with the Constructed Wetland and the surface area affected by each activity. Reference is made to Figures 2 and 3, Appendix C of *Wetland Delineation & Habitat Evaluation Western Portion of the Proposed Bunker Sands Mitigation Bank Seagoville Ranch, Kaufman*

County, Texas prepared by Advanced Ecology, Inc. for detailed location of areas listed in Table 2.

TABLE 2 - Impacts Within Constructed Wetland Footprint

Material Being Discharged	Location of Discharge	Area Affected (Acres)
None; Re-grade Existing Area	EW1, Figure 2 in above referenced study	46.2
Onsite soil as fill	Re-grading of EW2, Figure 2 in above referenced study	18.3
Onsite soil as fill	Re-grading of EW3, Figure 2 in above referenced study	18.5
None; Re-grade Existing Area	EW4, Figure 3 in above referenced study	44.9
60 LF of Pre-cast RCP Concrete Wing-wall Concrete headwall	EW5, Figure 3 in above referenced study; Replacement of existing flow-control structure	0.1
60 LF of Pre-cast RCP Concrete Wing-wall Concrete headwall	EW6, Figure 3 in above referenced study; Replacement of existing flow-control structure	0.1
60 LF of Pre-cast RCP Concrete Wing-wall Concrete headwall	EW7, Figure 3 in above referenced study	0.1
Onsite soil	Re-grading of Black Willow Swamp. See Figure 2 in above referenced document	26.3
Concrete spillway and drainage structure	Discharge end of pond southwest of EW3. See Figure 2 in above referenced study; Replacement of existing flow-control structure	0.1
Total		**154.6**

Conveyance Pipeline: Stream Crossings and Wetland Areas

A total of about 40,000 cubic yards of existing soil will be excavated for about 80 individually identified jurisdictional areas (streams, open water areas, and identified wetlands). An additional 20 aquatic resources were identified within the proposed 120-foot total easement width for both permanent and temporary, but the proposed efforts to minimize disturbance should allow avoidance of any impacts to these. The material will be excavated from streams and wetlands encountered along the pipeline alignment. The amount of material removed from the jurisdictional areas will be approximately 35,000 cubic yards. Material removed will be disposed offsite and in accordance with applicable environmental requirements and laws. Tables 3 through 5 provide descriptions and quantities of surface area of impacts by pipeline crossings.

TABLE 3: SUMMARY OF STREAMS WITHIN THE PROJECT AREA (EASEMENT AREA OF PROPOSED PIPELINE ROUTE)

Identification #	Aquatic Resource	Classification	Project Vicinity			Proposed Impacts*	
			Width at OHWM (Feet)	Length (L.F.)	Area (Acres)	Length (L.F.)	Area (Acres)
3	East Fork Trinity River	Perennial	167.0	15,750.0	60.400	344.1	0.400
8	Stream 61A - Unnamed Tributary to Mustang Creek	Intermittent	4.0	2,236.9	0.205	18.1	0.002
9	Stream 60 - Mustang Creek (Crossing 1)	Intermittent	8.0	1,012.2	0.186	71.2	0.002
10	Stream 60 - Mustang Creek (Crossing 2)					54.6	0.010
11	Stream 53 - Unnamed Tributary to Mustang Creek	Ephemeral	2.5	199.9	0.011	51.6	0.003
12	Stream 1 - Unnamed Tributary to Mustang Creek (Continuation of Stream 53)	Intermittent	4.5	351.4	0.036	42.1	0.004
14	Stream 62 - (Continuation of Streams 53 and 1)	Ephemeral	1.5	348.2	0.012	21.6	0.001
16	Stream 2 - Unnamed Tributary to Mustang Creek	Ephemeral	2.0	333.0	0.015	50.3	0.002
17	Stream 3 - Unnamed Tributary to Mustang Creek	Ephemeral	2.5	506.4	0.030	59.9	0.003
18	Stream 4 - Unnamed Tributary to Mustang Creek	Ephemeral	1.0	307.0	0.007	188.6	0.004
20	Stream 96 - Unnamed Tributary to Mustang Creek	Ephemeral	1.5	222.0	0.008	29.7	0.001
22	Stream 8 - Unnamed Tributary to Mustang Creek	Intermittent	10.0	188.7	0.043	40.9	0.009
23	Stream 9 - Unnamed Tributary	Ephemeral	3.5	105.3	0.008	105.3	0.008
24	Stream 10 - Unnamed Tributary	Ephemeral	3.5	80.5	0.006	80.5	0.006
26	Stream 82 - Unnamed Tributary	Ephemeral	1.5	194.4	0.007	60.1	0.002
30	Stream 11 - Unnamed Tributary	Ephemeral	1.0	103.9	0.002	66.4	0.002
31	Stream 12 - Unnamed Tributary	Ephemeral	3.0	145.4	0.010	48.4	0.003
32	Stream 14 - Unnamed Tributary	Ephemeral	3.5	157.5	0.013	129.0	0.010
33	Stream 13 - Unnamed Tributary	Ephemeral	2.5	113.6	0.007	44.0	0.004
35	Stream 15 - Unnamed Tributary to Long Branch	Intermittent	8.0	201.0	0.037	42.0	0.008
36	Stream 89 - Unnamed Tributary to Long Branch	Ephemeral	1.5	469.7	0.016	42.3	0.001
37	Stream 67 - Unnamed Tributary to Long Branch	Ephemeral	3.5	431.9	0.035	50.2	0.004
38	Stream 70 - Unnamed Tributary to Stream 67	Ephemeral	2.5	146.6	0.008	43.3	0.002

TABLE 3: SUMMARY OF STREAMS WITHIN THE PROJECT AREA (Cont.)
(EASEMENT AREA OF PROPOSED PIPELINE ROUTE)

Identification #	Aquatic Resource	Classification	Project Vicinity			Proposed Impacts*	
			Width at OHWM (Feet)	Length (L.F.)	Area (Acres)	Length (L.F.)	Area (Acres)
40	Stream 69 - Unnamed Tributary to Stream 68	Ephemeral	2.0	276.6	0.013	62.4	0.003
41	Stream 68 - Unnamed Tributary to Long Branch	Ephemeral	4.0	461.3	0.042	60.4	0.006
42	Stream 16 - Unnamed Tributary to Long Branch	Ephemeral	1.5	190.8	0.007	42.5	0.001
43	Stream 93 - Long Branch (Crossing 1)	Intermittent	9.0	889.9	0.184	149.4	0.031
44	Stream 93 - Long Branch (Crossing 2)					104.5	0.022
45	Stream 94 - Unnamed Tributary to Long Branch	Ephemeral	3.0	203.4	0.014	44.5	0.003
47	Stream 92 - Long Branch	Intermittent	9.0	252.9	0.052	41.0	0.008
49	Stream 85 - Unnamed Tributary to Long Branch	Ephemeral	3.0	136.1	0.009	40.5	0.003
50	Stream 17 - Long Branch	Intermittent	9.0	199.3	0.041	51.4	0.011
51	Stream 19 - Overflow Channel for Long Branch	Ephemeral	2.0	88.6	0.004	42.1	0.002
52	Stream 18 - Long Branch	Intermittent	6.0	115.6	0.016	46.7	0.006
53	Stream 20 - Unnamed Tributary to Long Branch (Crossing 1)	Ephemeral	3.5	671.6	0.054	53.3	0.004
54	Stream 20 - Unnamed Tributary to Long Branch (Crossing 2)					48.5	0.004
56	Stream 21 - Unnamed Tributary to Camp Creek	Ephemeral	3.0	151.5	0.010	60.1	0.004
58	Stream 22 - Unnamed Tributary to Camp Creek	Ephemeral	3.0	123.9	0.009	43.1	0.003
59	Stream 23 - Unnamed Tributary to Camp Creek	Ephemeral	1.5	166.2	0.006	43.0	0.001
60	Stream 54 - Camp Creek	Intermittent	11.0	4,098.8	1.035	42.4	0.011
61	Stream 55 - Unnamed Tributary to Camp Creek	Ephemeral	4.0	393.1	0.036	168.8	0.016
62	Stream 24 - Unnamed Tributary to Camp Creek	Ephemeral	2.0	410.9	0.019	44.2	0.002
63	Stream 25 - Unnamed Tributary to Camp Creek	Ephemeral	4.5	240.7	0.025	44.1	0.004
64	Stream 51 - Unnamed Tributary to Camp Creek	Ephemeral	2.5	208.9	0.012	48.9	0.003

TABLE 3: SUMMARY OF STREAMS WITHIN THE PROJECT AREA (Cont.)
(EASEMENT AREA OF PROPOSED PIPELINE ROUTE)

Identification #	Aquatic Resource	Classification	Project Vicinity			Proposed Impacts*	
			Width at OHWM (Feet)	Length (L.F.)	Area (Acres)	Length (L.F.)	Area (Acres)
65	Stream 81 - Unnamed Tributary to Camp Creek	Ephemeral	6.0	210.9	0.029	53.8	0.007
67	Stream 50 - Unnamed Tributary to Camp Creek	Ephemeral	2.0	354.5	0.016	40.4	0.002
68	Stream 29 - Bluff Creek (below large on-channel impoundment)	Ephemeral	4.0	183.4	0.017	50.3	0.005
69	Stream 28 - Unnamed Tributary to Bluff Creek	Ephemeral	4.0	164.6	0.015	44.8	0.004
71	Stream 31 - Unnamed Tributary to Bear Creek	Ephemeral	4.0	883.9	0.081	N/A	N/A
73	Stream 32 - Bear Creek (Crossing 1)	Intermittent	12.0	1,826.5	0.500	58.0	0.016
74	Stream 32 - Bear Creek (Crossing 2)					49.3	0.014
75	Stream 32 - Bear Creek (Crossing 3)					152.1	0.042
77	Stream 86 - Unnamed Tributary	Ephemeral	1.0	208.7	0.005	27.0	0.001
78	Stream 33/100 - Unnamed Tributary to Price Creek	Ephemeral	4.5	551.6	0.057	41.4	0.004
80	Stream 35 - George Creek	Intermittent	22.0	184.4	0.093	50.9	0.026
81	Stream 36 - Price Creek	Intermittent	8.0	406.3	0.075	71.2	0.013
82	Stream 37 - Unnamed Tributary to Price Creek (2 Crossings)	Ephemeral	1.5	413.8	0.014	85.6	0.003
83	Stream 40 - Unnamed Tributary to Stream 38 (Crossing 1)	Ephemeral	2.0	270.3	0.012	51.9	0.002
84	Stream 40 - Unnamed Tributary to Stream 38 (Crossing 2)					109.5	0.005
85	Stream 38 - Unnamed Tributary to Elm Creek (Crossing 1)	Ephemeral	3.5	945.5	0.076	28.8	0.002
86	Stream 38 - Unnamed Tributary to Elm Creek (Crossing 2)					95.3	0.008
87	Stream 39 - Unnamed Tributary to Elm Creek	Ephemeral	4.0	171.3	0.016	48.5	0.004
88	Stream 87 - Unnamed Tributary to Elm Creek	Ephemeral	4.0	250.0	0.023	40.4	0.004
89	Stream 88 - Unnamed Tributary to Elm Creek	Ephemeral	2.5	169.0	0.010	42.4	0.002
91	Stream 75 - Tom Bean Creek	Intermittent	7.0	244.4	0.039	54.8	0.009
92	Stream 99 - Elm Creek	Intermittent	24.0	350.6	0.193	77.4	0.043

TABLE 3: SUMMARY OF STREAMS WITHIN THE PROJECT AREA (Cont.)
(EASEMENT AREA OF PROPOSED PIPELINE ROUTE)

Identification #	Aquatic Resource	Classification	Project Vicinity			Proposed Impacts*	
			Width at OHWM (Feet)	Length (L.F.)	Area (Acres)	Length (L.F.)	Area (Acres)
93	Stream 77/98 - Unnamed Tributary to Stream 57	Ephemeral	3.0	362.7	0.025	51.1	0.004
94	Stream 43 - Unnamed Tributary to Elm Creek	Ephemeral	3.5	453.8	0.036	78.2	0.006
99	Stream 44 - Unnamed Tributary	Ephemeral	3.5	269.1	0.022	64.2	0.005
Total				41,760.9	64.044	4,433.3	0.870

*Calculation of impacts based on 40-foot wide permanent easement at creek crossings.

TABLE 4: SUMMARY OF WETLANDS WITHIN THE PROJECT AREA (EASEMENT AREA OF PROPOSED PIPELINE ROUTE)

Identification #	Aquatic Resource	Classification	Project Vicinity Area (Acres)	Proposed Impacts* Area (Acres)
4	Wetland 1	Isolated**	0.610	N/A
5	Wetland 4	Isolated**	0.900	N/A
6	Wetland 2 - North of SH 175	Emergent	0.090	0.081
7	Wetland 3 - North of SH 175	Emergent	0.330	0.091
19	Wetland 8	Emergent	0.141	0.053
21	Wetland 9	Emergent	0.225	0.031
27	Wetland 7	Emergent	0.036	0.003
Total			**2.332**	**0.259**

*Calculation of impacts based on 40-foot wide permanent easement at wetland crossings.
**Isolated from the East Fork Trinity River 100-year floodplain by federal and agricultural levees. Determined as non-jurisdictional.

Table5

TABLE 5: SUMMARY OF OPEN WATERS WITHIN THE PROJECT AREA (EASEMENT AREA OF PROPOSED PIPELINE ROUTE)

Identification #	Aquatic Resource	Classification	Project Vicinity Area (Acres)	Proposed Impacts* Area (Acres)
1	Water 16 - Original East Fork Trinity River Channel (Crossing 1)	Open Water	1.250	0.100
2	Water 16 - Original East Fork Trinity River Channel (Crossing 2)	Open Water	1.250	0.040
13	Water 18 - Impoundment (Beaver Pond)	On-Channel	1.500	0.121
15	Water 1 - Impoundment	On-Channel	0.264	0.031
25	Water 27 - Impoundment	On-Channel	0.058	0.035
28	Water 28 - Impoundment	On-Channel	0.760	N/A
29	Water 29 - Impoundment	On-Channel	0.250	0.002
34	Water 32 - Impoundment	On-Channel	0.850	N/A
39	Water 23 - Impoundment	On-Channel	0.055	N/A
46	Water 37 - Open Water	Open Water	0.048	0.026
48	Water 30	Remnant Channel	0.012	0.009
55	Water 33 - Impoundment	Stock Tank	0.078	N/A
57	Water 40 - Impoundment	Isolated	0.444	N/A
66	Water 10 - Plunge Pool Associated with Streams 81 and 30	Plunge Pool	0.083	N/A
70	Water 5 - Impoundment	On-Channel	2.400	0.041
72	Water 6 - Impoundment	On-Channel	0.144	0.070
76	Water 31 - Impoundment	On-Channel	0.300	0.022
79	Water 22 - Price and George Creeks Arm of Lavon Lake	Open Water	0.666	0.109
90	Water 25 - Impoundment	Open Water	0.122	N/A
95	Water 9 - Impoundment	On-Channel	0.031	N/A
96	Water 4 - Impoundment	On-Channel	0.715	0.182
97	Water 7 - Impoundment	On-Channel	0.083	0.001
98	Water 8 - Impoundment	On-Channel	0.016	N/A
Total			**11.379**	**0.789**

***Calculation of impacts based on 40-foot wide permanent easement at open water crossings.**

Lake Lavon Outfall

An outfall channel will be constructed from a stilling basin to Lake Lavon. About 0.457 acres within the jurisdictional area of the lake edge will be affected by work associated with the outfall channel. The lake edge was determined at the conservation pool elevation at 492' msl.

Summary of Impacts to Jurisdictional Waters of the U.S

Table 6 summarizes the impacts for the various components of the project.

Table 6. Summary of Impacts to Jurisdictional Areas

Project Component	Description	Impacts to Jurisdictional Waters of the U.S.		Terrestrial Areas on USACE property (acres)
		Linear Feet	Area (Acres)	
Diversion Pump Station	Intake channel	30	0.06	NA
Constructed Wetland	Regrading for wetland cells and installation of new flow control structures for stormwater system	NA	154.6	NA
Conveyance Pipeline	East Fork River Crossing	344.1	0.4	NA
Conveyance Pipeline	61 Stream Crossings off USACE property	3,707.9	0.372	NA
Conveyance Pipeline	13 Open Water Crossings off USACE property	NA	0.68	NA
Conveyance Pipeline	5 Wetland Crossings off USACE property	NA	0.259	NA
Conveyance Pipeline	6 Stream Crossings on USACE property	381.3	0.098	NA
Conveyance Pipeline	1 Open Water Crossings on USACE property	NA	0.109	NA
Conveyance Pipeline	Terrestrial Habitat - Wooded	NA	NA	13.5
Conveyance Pipeline	Terrestrial Habitat – Open Field/Grassland/Existing Easement	NA	NA	19
Conveyance Pipeline	Terrestrial Habitat – Lake Edge Periodically Flooded	NA	NA	0.36
Outfall	Outfall Channel to Lake Lavon	NA	NA	0.4
Outfall	Terrestrial Habitat – Open Field/Grassland	NA	NA	2.35
Total		**4,463.3**	**156.6**	**35.6**

3. Goals and Objectives of the Mitigation Plan

The goal of the mitigation plan is to provide compensation for impacts to existing functions of the aquatic resources and terrestrial habitats impacted by the proposed construction of the various components of the project. Where possible, the compensatory mitigation will restore the existing functions in the immediate vicinity of the impacts. Where this is not possible, as in the reestablishment of woody vegetation along the pipeline route, compensatory mitigation will be provided in the near vicinity of the project components on the USACE property so that a mosaic of habitats is created to enhance the overall quality of habitat provided in the area.

A list of qualitatively and/or quantitatively measurable outcomes of the proposed mitigation plan that can be used to demonstrate that its goal is being achieved includes, but is not limited to the following:

1. Restore and provide stream bank erosion protection for bank stability along the East Fork Trinity River at the diversion pump station and along the various tributary creeks crossings to protect both private and public properties at the diversion pump station and along the pipeline route; and
2. Increase vegetative species diversity with the mitigation areas to provide high-quality wildlife habitat, aesthetics, erosion control, and water quality improvement.

4. Description of the Mitigation Area

The proposed mitigation plan includes providing reestablishing appropriate vegetative cover at each of the project component areas to restore erosion protection and enhance wildlife habitat. Each of the project component areas is addressed below.

Diversion Pump Station

The diversion pump station structure will be constructed just outside (east) of an existing agricultural levee immediately north of the State Highway (SH) 175 right-of-way. A concrete-lined trapezoidal intake channel approximately 900 feet in length will be constructed between the pump station and the East Fork Trinity River. The agricultural levee has a maintained grass cover on the top and western slope but is wooded along the east slope continuing through the

East Fork floodway to the river channel. Within the wooded floodway lies a remnant of the former river channel currently functioning as an oxbow slough. This wooded bottomland occurs in a habitat area that would have originally comprised the river terrace. However, as with many areas of Seagoville Ranch, the gradient and elevation have been altered significantly by historic channelization and dredging activities associated with the river. In addition, field investigation of this area indicates some additional impacts sustained during construction of the adjacent bridge and roadway of SH 175.

Since this bottomland forest lies within the levee-constrained floodway, it is subjected to flood process associated with the East Fork. However, floods in the East Fork cannot be regarded as entirely natural because of substantial human alterations upstream (Lake Lavon and Lake Ray Hubbard) and various channelization projects. Nevertheless, this forested bottomland indicates exclusion of active land use (except for noncommercial recreational hunting) for approximately the last 50-70 years. No evidence of recent logging is present and the stand is not subject to livestock grazing.

The general aspect of the forested bottomland in the vicinity of the diversion pump station is an open floodplain forest comprised of some large trees with moderate midstory and understory. Downed timber is abundant, possibly the result of drought and ice storm events. Regeneration of midstory and overstory species is also common. The overstory is dominated by green ash (*Fraxinus pennsylvanica*), sugarberry (*Celtis laevigata*), cedar elm (*Ulmus crassifolia*), winged elm (*Ulmus alata*), and boxelder *(Acer negundo)*. Cottonwood (*Populus deltoides*) and pecan (*Carya illinioenses*) are sparse within the stand. Bur oak (*Quercus macrocarpa*) is uncommon in this area but occurs occasionally in stands. Shumard oak (*Quercus shumardii*) is also found occasionally.

The dominant midstory species are possumhaw (*Ilex decidua*) and boxelder. Individual eastern red cedar (*Juniperus virginiana*) are common in heights to about seven feet. The presence of red cedar suggests infrequent prolonged flooding. Red mulberry (*Morus rubra*) saplings and seedlings are commonly encountered as is soapberry (*Sapindus saponaria*). Greenbriar (*Smilax spp.*) is very abundant along with poison ivy (*Toxicondendron radicans*) and trumpet-creeper

(*Campsis radicans*) along the edge where sunlight exposure is more abundant. Other understory species present include violets (*Viola spp.*) and inland sea-oats (*Chasmanthium latifolium*).

Presently, the side slope of the levee exhibits young stands of green ash, winged elm, hawthorn (*Crataegus spp.*) and black willow (*Salix nigra*).

Soils are Trinity clay, occasionally flooded. According to the soil survey for Kaufman and Rockwall Counties (Pringle 1977), these are nearly level, deep calcareous, clayey soils found in bottomlands. They are composed of calcareous alluvium that formed under land cover of mixed hardwoods with tall and mid grasses in openings. These somewhat poorly drained soils have slow permeability and high available water capacity with a perched water table to depths of 15 inches in some areas during winter and spring. Because of the levee system, these soils are not subjected to the natural floods under which they formed.

The hydroperiod in these stands is influenced exclusively by floodwaters of the East Fork. Watermarks on trees and debris piles indicate that overbank floods occur. However, most of these floods are known to be of short duration. The presence of certain upland species (such as eastern red cedar) indicates that prolonged flooding is infrequent.

Constructed Wetland

Based on the preliminary jurisdictional determination conducted by Advanced Ecology, Inc. (AEI) for Wetlands Management, L.P. for the western portion of Seagoville Ranch, Kaufman County Texas, and presented in a report dated January 2005, several jurisdictional wetland areas were identified within the footprint of the proposed constructed wetland for the NTMWD East Fork Reuse Project. These included emergent wetlands (EW1, EW2, EW3, and EW4) and an area identified as a black willow swamp. In addition to the constructed wetland area, modifications and/or replacement of the existing flow control structures for the proposed stormwater routing system to convey runoff from the hillsides west of the project site through the existing on-channel pond, slough, and wetland areas identified as EW5, EW6, and EW7 will also produce some minimal impacts. General description of Seagoville Ranch and the identified jurisdictional areas as described in the AEI report follows.

Seagoville Ranch has been used for agricultural purposes for many decades. The main agricultural areas were established in the flood plain of the East Fork and were protected from flooding by levees constructed for that purpose. This is typical of the agricultural lands along the East Fork below Lake Ray Hubbard extending to the confluence with the Trinity River approximately 10 river miles below the project site. The project area is divided into three sections (north, central, and south sections) by both topographic and manmade features (Figure 2). All three sections of the project area are located west of the East Fork. The north section is located north of U.S. Highway 175 and is approximately 143 acres. The central section is located south of U.S. 175 and north of a topographic ridge containing the ranch headquarters and a former railway roadbed. This section is approximately 1,130 acres. The south section is located south of the topographic ridge and contains approximately 727 acres.

The constructed wetland project area lies within the floodplain of the East Fork of the Trinity River but some protection from floods is provided by a series of levees along the west bank of the river. The land within the three sections of the wetland project area was previously cleared, graded, subdivided into fields, and ditched for growing agricultural crops. Perimeter canals were constructed around the central and south sections to route drainage from the fields to two pump stations that pumped any collected rainfall runoff to the East Fork. The former pump stations are still located on the site but are no longer functional. Collected drainage is currently conveyed by large diameter culverts (36-inches) through the flood levees to the East Fork. Stop logs in front of the culverts enable varying levels of water to be retained within the collection canals for livestock use. Multiple stop log flow control structures installed from 1988 through 1991 in the drainage collection ditches were employed to develop and manage duck habitat in various areas of the central and south sections of the project area. Based on conversations with the ranch manager (Mr. Richard Braddock), for several years annual drawdowns for moist soil management to promote germination of annual species were conducted for the wetland areas. However, the annual drawdowns were discontinued due to the resulting dominance of cocklebur (*Xanthium strumarium*) each year following the drawdowns. For the last 4-5 years, the water levels have been maintained so that the wetland areas have stayed inundated year round resulting in development of a diverse vegetative community dominated by more perennial aquatic species. As described in the AEI report, the dominant perennial species common to the emergent wetland

areas are water pepper (*Polygonum hydropiperoides*), spikerush (*Eleocharis spp.*), grassy arrowhead (*Sagittaria graminea*), soft rush (*Juncus effusus*), and crowfoot sedge (*Carex crus-corvi*).

The following descriptions of the emergent wetland and black willow swamp areas are summarized from the AEI preliminary jurisdictional determination report dated January 2005.

EW1 is an emergent marsh area of approximately 46.2 acres. The emergent vegetation in the wetland is estimated to cover about 40 percent of the area. Dominant plant species identified in the AEI report for this area include water pepper, soft rush, crowfoot sedge, other sedges, and spikerushes. Small patches of buttonbush (*Cephalanthus occidentalis*) are scattered throughout the marsh. This woody species occupies less than 5 percent of the wetland. A one-acre stand of black willow occurs on the west margin of the wetland. Much of this area was observed to be too deep for emergent plants, as about 60 percent is open water. No species of submergent plants were observed.

EW2 is a small wet meadow complex associated with the slightly higher elevations of the western portion of the basin. This site is dominated by soft rush, spikerush, and water pepper with occasional stands of crowfoot sedge. Standing water is largely absent, but the soil was observed to appear saturated for long periods. Livestock trampling and grazing for extended periods impact this site heavily.

EW3 is an emergent wetland easternmost in a series of cells that were created by installation of levees and water control structures during the earlier development which was targeted for the management of waterfowl habitat. Cell EW3 retains the herbaceous species of water pepper, soft rush, and spikerush as well as some of the same extensive growth of black willow observed in the cell to the west. Some portions of this cell also contains dense stands of sumpweed (*Iva annua*) an indicator of soil drying during mid-late summer, as well as denuding of vegetative cover by livestock activity.

The black willow swamp is located between the emergent wetlands designated EW2 and EW3. This is a black willow dominated area that developed in the created wetland cells originally

intended for waterfowl habitat in the early 1990s. Low levees fitted with water control devices were constructed to manage water from the storm runoff collection/drainage system for the central section. The stands of black willow are even-aged and uniform in structure and occupy several cells in this wetland complex. The overstory canopy of willow is estimated at 80-90 percent with the trees about 30 feet in height and approximately 6-8 inches in dbh.

EW4 is an emergent wetland located in the south section that is described in the AEI report as having three basic vegetation communities resulting from micro-relief in the terrain of this area. About 50 percent of the area has saturated soil to very shallow water one to four inches in depth with dense growth of spikerushes, sedges, and soft rush. The deeper water of the south end of this wetland is a mixture of emergent aquatic plants and about 30 percent open water.

The emergent wetland areas EW5, EW6, and EW7 are primarily linear wetland pools containing a mixture of emergent and submerged vegetation and open water located adjacent to the western side of the hillside levee. These areas were created by earthen dams constructed with water level control structures in the borrow ditch/diversion canal beside the levee.

Conveyance Pipeline Route

Starting from the conveyance pump station located at the south end of the constructed wetland in Kaufman County, the conveyance pipeline route traverses Kaufman, Rockwall, and Collin Counties for approximately 43 miles prior to the discharge location located along the upper reaches of the eastern side of Lake Lavon. During the preliminary evaluation of route alternatives, the preferred pipeline route was characterized as being 90 percent Rural-Open Field, 7 percent Rural-Wooded, and 3 percent combined for Urban, Creek, Farm Road, and Highway crossing.

Based on the field investigations along the pipeline route, there are approximately 80 projected crossings of jurisdictional waters including stream channel, open water (impoundments), and adjacent wetlands. The proposed pipeline route initially crosses under (via boring) the Kaufman Levee District 5 levee (a federally authorized and USACE constructed levee) between the south section of the constructed wetland and the west side of the East Fork. The route then goes

northward within the maintained floodway of the East Fork between the federally constructed levees. Routinely maintained herbaceous cover characterizes this area with limited woody growth primarily along the cutbank of the East Fork and small discharge drainage feeders. The river channel in this reach was channelized in the 1970s-1980s in conjunction with the construction of the federally authorized flood control project.

Approximately 1/3 of the channel crossings have at least some wooded riparian area associated, but these are typically very limited in width. The riparian areas are typically dominated by relatively young growth with average age of trees less than 50 years old.

The pipeline route traverses the Blackland Prairie soils belt and the Blackland Prairie vegetation region. The Blackland Prairie is an almost treeless rolling prairie of short and bunch grasses. There are, however, hardwoods such as elm, hackberry, pecan, oak, and bois d'arc occurring along streams. Brushy species such as honey mesquite and eastern red cedar have invaded many portions of the grasslands.

The portion of the proposed project crossing USACE-owned property south of County Road 543 includes approximately 2.4 acres of wooded area, 15 acres of open field and cleared existing easement, and 0.36 acres of open land resulting from fluctuations of water level in Lake Lavon totaling approximately 18 acres for the combined proposed 120 feet wide easement (both temporary and permanent).

The portion of the proposed project crossing USACE-owned property north of County Road 543 includes approximately 1.4 acres of wooded area and 1.6 acres of open field totaling approximately 3 acres for the combined proposed 120 feet wide easement (both temporary and permanent).

The portion of the proposed project that crosses USACE-owned property at the Tom Bean-Elm Creek arm of Lake Lavon includes approximately 9.6 acres of wooded area and 2.3 acres of open field totaling approximately 12 acres for the combined proposed 120 feet wide easement (both temporary and permanent).

Lake Lavon Outfall

The outfall area at Lake Lavon includes approximately 2.35 acres of open field/grassland with a mixture of native grasses including switchgrass (*Panicum virgatum*) and 0.4-acre of periodically inundated lake edge totaling approximately 2.75 acres.

5. Preliminary Jurisdictional Determination

A preliminary jurisdictional determination (PJD) report, dated January 2005, was produced by Advanced Ecology, Inc. (AEI) for Wetlands Management, L.P. for the western portion of Seagoville Ranch, Kaufman County Texas. This report was submitted to the USACE previously for verification. A PJD report was produced by Alan Plummer Associates, Inc. (APAI) for North Texas Municipal Water District (NTMWD) for the approximately 43 mile pipeline route to the discharge location along Lake Lavon. This PJD report, revised July 22, 2005 to reflect minor realignments along the pipeline route, was also submitted to the USACE for verification.

6. Compensatory Mitigation Activities

Mitigation activities are proposed at each of the project component areas and a collective mitigation plan is proposed to enhance the USACE property at Lake Lavon to provide compensatory mitigation for impacts that cannot be mitigated at the project component locations. The following describes the mitigation activities proposed at each location.

Diversion Pump Station

Proposed mitigation activities at the diversion pump station location include planting herbaceous species to promote slope stabilization on the East Fork bank at the intake channel location and enhancement of the vegetative diversity of the oxbow slough. Tables 7 and 8 lists the species for seeding along the intake channel. Planting of canopy trees and shrubs in the collective mitigation area on the USACE property at Lake Lavon will provide compensation for impacts to the riparian forest in the area of the diversion pump station intake channel.

TABLE 7 - Herbaceous Species for Slope of East Fork Trinity River

Common Name	Scientific Name	Seeding Rate (lbs/acre)
Lowland Switchgrass	*Panicum virgatum*	4
Prairie Wildrye	*Elymus canadensis*	10
Illinois Bundleflower	*Desmanthus illinoensis*	15

TABLE 8 - Herbaceous Species Along Oxbow Slough at Intake Channel Crossing

Common Name	Scientific Name	Seeding Rate (lbs/acre)
Lowland Switchgrass	*Panicum virgatum*	4
Prairie Wildrye	*Elymus canadensis*	10
Illinois Bundleflower	*Desmanthus illinoensis*	15
Maximillian Sunflower	*Helianthus maximiliani*	4
Cutleaf (Englemann) Daisy	*Engelmannia pinnatifida*	18

Constructed Wetland

The emergent wetland areas (EW1, EW2, and EW3) and black willow swamp delineated by AEI as jurisdictional areas lie within the footprint of the central section of the constructed wetland. Impacts to these areas will be from removal of the constructed levees and the willow growth that has overtaken these areas as well as the water level control structures previously installed during management of these areas for waterfowl habitat. Further impact to these areas will result from grading of the areas as needed to facilitate collection of the design flows from the wetland trains in the central section and conveyance to the treatment trains in the south section. Emergent wetland area EW4 lies within the footprint of the south section of the constructed wetland. Impacts to this area will be similar to those in the central section in that construction of perimeter berms, collection channels, and some grading of the topography within the cells will be necessary to facilitate even distribution of flows across the treatment wetland area. The topography to be developed in the constructed wetland cells will include a mixture of deep water areas (>4 feet deep) and marsh areas varying in water depths from about 6 inches to about 20 inches. The marsh areas will be planted with a variety of emergent and submergent wetland plant species, as listed in Table 9 below, as well as dressed with topsoil from the existing emergent wetland areas. The upper six inches of topsoil from the existing emergent wetland

areas will be stripped and stockpiled separately prior to grading of the areas for the proposed constructed wetland cells. This topsoil will be used for final grading of the marsh areas within the constructed wetland cells to encourage development of a varied and dense emergent vegetative cover within the marsh areas.

TABLE 9 - Wetland Species to be Planted in Marsh Areas of Constructed Wetland Cells

Common Name	Scientific Name	Planting Density
Soft Rush	*Juncus effusus*	3' centers
Spikerushes	*Eleocharis spp.*	3' centers
Sedges	*Carex spp.*	3' centers
Swamp Smartweed	*Polygonum hydropiperoides*	3' centers
Pickerelweed	*Pontederia cordata*	6' centers
Grassy Arrowhead	*Sagittaria graminea*	6' centers
Duck Potato Arrowhead	*Sagittaria latifolia*	3' centers
Delta Arrowhead	*Sagittaria platyphylla*	6' centers
Three Square Bulrush	*Schoenoplectus pungens*	3' centers
Olney's Bulrush	*Schoenoplectus americanus*	4' centers
Softstem Bulrush	*Schoenoplectus tabernaemontani*	4' centers
Hardstem Bulrush	*Schoenoplectus acutus*	4' centers
Giant Bulrush	*Schoenoplectus californicus*	4' centers
American Pondweed	*Potamogeton nodosus*	10' centers
Coontail	*Ceratophyllum demersum*	10' centers
American Wild Celery	*Vallisneria Americana*	10' centers

Approximately 25 acres of nursery area for propagation of wetland plants was established on the Seagoville Ranch in Fall 2004. About 20 acres of the Phase I nursery lie outside the constructed wetland footprint and the other 5 acres lie within the footprint at the southeast end of the central section. About 200 acres will be established as a Phase II nursery in two cells of train 6 within the central section of the constructed wetland. These two cells will be constructed first and wetland plants propagated in the Phase I nursery as well as several species harvested from the existing sources on the site will be transplanted to the Phase II nursery prior to any regrading of the existing areas.

The water source for the Phase I nursery consists of pumped flows from the existing stormwater collection/conveyance system on the ranch. Water will be pumped from the ranch's stormwater collection/conveyance system and/or the East Fork to supply the Phase II nursery using temporary pumps at first then the diversion pump station will be used when it becomes available.

The long term hydrology for the constructed wetland will be provided by the pumped flows diverted from the East Fork of the Trinity River at the diversion pump station. These diverted flows will range from 48 mgd to 165 mgd based on the volume of discharged effluent flows from several wastewater treatment plants upstream of the diversion point. The design life for the constructed wetland is 50 years, similar to the design life used for reservoirs, and the easement purchased by the NTMWD from Caroline Hunt Trust Estates (CHTE) for the Seagoville Ranch reflects this term. However, the terms of the Memorandum of Agreement (MOA) signed by NTMWD and CHTE provides for continuing the East Fork Reuse Project beyond the initial 50-year design term. Based on the projected increases in population in the NTMWD's service area and resulting continuing demand for water supply, the difficulty and expense of developing alternative water supplies for this area, the East Fork Reuse Project is projected to be in service for much longer than the original design life. In the event that the East Fork Reuse Project is ever abandoned as a water supply project, Paragraph 5.3 of Article 5 (Post-Closing Obligations) of the MOA between NTMWD and CHTE includes a provision for NTMWD to "provide an annual average flow 4.5 million gallons of water per day in perpetuity to the Diversion Easement Tract described in the Easement Agreement" to sustain the created marsh areas on Seagoville Ranch. A copy of the MOA between NTMWD and CHTE is included in Appendix B.

Based on the development of more diverse topography and a vegetative community with enhanced diversity within the constructed wetland cells that will overlie the existing emergent wetland areas and black willow swamp, the creation of edge effects adjacent to the existing on-channel ponds, preserved high-quality hard-mast-producing trees, and increased aquatic functions of these areas, it is proposed that the impacts resulting from the construction of the wetland cells will be self-mitigating.

The replacement of existing flow control structures in the stormwater conveyance system along the west edge of the south section will have minimal adverse impact to the existing aquatic areas. The disturbed areas of the levees and adjacent to the installed headwalls of the new flow control structures will be reseeded with a native grass mixture following construction to reestablish vegetative cover and control erosion. Aquatic vegetation adjacent to the structure construction

areas should reestablish rapidly following collection of rainfall in the wetland pools. No additional mitigation is proposed for these areas.

Conveyance Pipeline and Lake Lavon Outfall

The initial leg of the pipeline route across Seagoville Ranch will be seeded with a mixture of native grasses, legumes, and wildflowers to reestablish herbaceous vegetative cover in keeping with the requirements for maintenance of the floodway between the USACE flood protection levees. Table 10 lists the species to the included in the seeding mixture for this section of the route between the USACE flood protection levees. This same seeding mixture will be used to reestablish vegetative cover over the pipeline easement across the USACE property at Lake Lavon.

Where the pipeline route crosses the three small wetland areas, the topsoil excavated from these areas will be used for the backfilling for final grading to restore the original contours. The seedbank within this topsoil should be sufficient to restore aquatic vegetation for these small areas.

Along the pipeline route off of the Seagoville Ranch continuing up to the USACE property at Lake Lavon, the area disturbed during construction will be seeded with grasses matching the adjacent properties along the route. With 90 percent of the route being classified as Rural-Open Field, the majority of this area will probably be seeded with Bermuda grass (*Cynodon dactylon*). Where the pipeline route crosses stream channels, the disturbed banks will be seeded with the same mixture specified in Table 7 for the slopes of the East Fork at the intake channel for the diversion pump station.

TABLE 10 - Seeding Mixture of Native Grasses, Legumes, and Wildflowers

Common Name		Scientific Name	Seeding Rate (Pounds/Acre)
Grasses	Prairie Wildrye	*Elymus canadensis*	3.4
	Virginia Wildrye	*Elymus virginicus*	1.7
	Big Bluestem	*Andropogon gerardii*	1.3
	Eastern Gamagrass	*Tripsacum dactyloides*	2.0
	Little Bluestem	*Schizachyrium scoparium*	1.3
	Indiangrass	*Sorghastrum nutans*	0.8
	Sideoats Grama	*Bouteloua curtipendula*	0.8
Legumes	Illinois Bundleflower	*Desmanthus illinoensis*	8
	Partridge Pea	*Cassia fasciculata*	2
Wildflowers	Scarlet Sage	*Salvia coccinea*	0.6
	Gay Feather	*Liatris mucronata*	0.8
	Maximilian Sunflower	*Helianthus maximiliani*	0.4
	Cutleaf Daisy	*Engelmannia pinnatifida*	1.4
	Greenthread	*Thelesperma filifolium*	0.5
	Plains Coreopsis	*Coreopsis tinctoria*	0.2
	Black-eyed Susan	*Rudbeckia hirta*	0.2
	Pink Evening Primrose	*Oenothera speciosa*	0.1
	Prairie Verbena	*Verbena bipinnatifida*	0.2
	Golden Wave	*Coreopsis basilis*	0.2
	Pitcher Sage	*Salvia azurea*	0.2
	Clasping Coneflower	*Rudbeckia amplexicaulis*	0.2

When the pipeline route crosses onto USACE property, the pipeline easement area up to the Lake Lavon outfall will be seeded with the mixture specified in Table 10. The area within the permanent pipeline easement across USACE property is approximately 12.8 acres. Additionally, approximately 9.7 acres of the temporary construction easement will be seeded with the same native herbaceous species shown in Table 10 resulting in a total of about 22.5 acres of native prairie. Adjacent to the permanent pipeline easement and in nearby tracts as shown on Figures

12, 13, and 14 approximately 31 acres will be planted with woody vegetation at a density of 50 canopy trees per acre (planted as 5-gallon container grown material) and 35 small trees and shrubs per acre (planted as 1 to 3-gallon container grown material). This represents a 2:1 ratio for the impacted wooded area on USACE property (13.5 acres) plus impacts to approximately 2 acres of wooded riparian area off the USACE property totaling 15.5 acres. The plantings of woody vegetation will be used to create a mosaic of vegetative cover intermingling native prairie and enhanced riparian forest. A listing of canopy tree, small tree, and shrub species is included in Table 11. Substitutions for any one species listed shall be with other species included on the list.

TABLE 11 - Woody Vegetative Species for Mitigation Planting on USACE Property

Common Name		Scientific Name	Number
Canopy Trees	Pecan	*Carya illinoensis*	312
	Black Walnut	*Juglans nigra*	313
	Bur Oak	*Quercus macrocarpa*	312
	Chinquapin Oak	*Quercus muhlenbergii*	313
	Shumard Oak	*Quercus shumardii*	312
Common Name		**Scientific Name**	**Number**
Small Trees and Shrubs	Hawthorn	*Crataegus spp.**	50
	Coralberry	*Symphoricarpos orbiculatus*	130
	Deciduous Holly	*Ilex decidua*	75
	Eastern Redbud	*Cercis canadensis var. candensis*	50
	Eve's Necklace	*Sophora affinis*	75
	Mexican Plum	*Prunus mexicana*	75
	Rough-leaf Dogwood	*Cornus drummondii*	60
	Rusty Blackhaw	*Viburnum rubidulum*	50
	Texas Persimmon	*Diospyros texana*	100
	Yaupon Holly	*Ilex vomitoria*	50
	Smoothleaf Elbowbush	*Forestiera pubescens var. glabrifolia*	110
	American Beautyberry	*Callicarpa americana*	130
	Swamp Privet	*Forestiera acuminata*	130

*Appropriate *Crataegus* species include Littlehip Hawthorn (*C. spathulata*), Green Hawthorn (*C. viridis*), Big Hawthorn (*C. berberifolia*), Cockspur Hawthorn (*C. crusgallii*), Reverchon Hawthorn (*C. reverchonii*), or Downy Hawthorn (*C. mollis*).

In addition to the native prairie and forested area, where the pipeline route crosses the intermittently flooded edge of Lake Lavon, a mixture of wetland plant species will be established

across this approximately 0.36 acre plus an additional 1.0 acre. This represents roughly a 2:1 ratio of mitigation to acreage of periodically flooded lake edge along the pipeline route and at the lake outfall. Table 12 lists the wetland plants that will be seeded or planted as plugs within this area.

TABLE 12 - Wetland Plant Species for Lake Edge

Common Name	Scientific Name	Planting Material
Switchgrass	*Panicum virgatum*	Seed (4 lbs/acre)
Obedient Plant	*Physostegia intermedia*	Seed (2 lbs/acre)
Crowfoot Sedge	*Carex crus-corvi*	Plugs (3' centers)
Swamp Smartweed	*Polygonum hydropiperoides*	Plugs (3' centers)
Squarestem Spikerush	*Eleocharis quadrangulata*	Plugs (3' centers)
Pickerelweed	*Pontederia cordata*	Plugs (3' centers)
Grassy Arrowhead	*Sagittaria graminea*	Plugs (3' centers)
Three Square Bulrush	*Schoenoplectus pungens*	Plugs (3' centers)
Olney's Bulrush	*Schoenoplectus americanus*	Plugs (4' centers)
Softstem Bulrush	*Schoenoplectus tabernaemontani*	Plugs (4' centers)
Coontail	*Ceratophyllum demersum*	Plugs (6' centers)
American Pondweed	*Potomageton nodosus*	Plugs (6' centers)

As shown on Figure 15, switchgrass will be seeded to restore vegetative cover and provide erosion control along the outfall channel to the lake conservation pool level.

An area of approximately 87 acres located on the north shoreline of the cove at the inflow of Elm and Tom Bean Creeks was selected for a native prairie restoration to provide additional mitigation. This area was previously leased from the USACE for livestock pasture. Overgrazing has resulted in reduction of the native grass community and substantial invasion of eastern red cedar. The USACE will prepare and conduct a burn management program for the area and reseeding with a mixture of native grasses, legumes, and wildflowers, as listed in Table 13, will be conducted in conjunction with the other mitigation plantings.

Table 13 – Seeding Mixture for Additional Native Prairie Mitigation Area

Common Name		Scientific Name	Seeding Rate (Pounds/Acre)
Grasses	Prairie Wildrye	*Elymus canadensis*	8.0
	Big Bluestem	*Andropogon gerardii*	2.0
	Eastern Gamagrass	*Tripsacum dactyloides*	3.0
	Little Bluestem	*Schizachyrium scoparium*	2.0
	Indiangrass	*Sorghastrum nutans*	2.0
	Lowland Switchgrass	*Panicum virgatum*	4.0
Legumes	Illinois Bundleflower	*Desmanthus illinoensis*	8.0
	Partridge Pea	*Cassia fasciculata*	2.0
Wildflowers	Lemon Mint	*Monarda citriodora*	1.5
	Indian Blanket	*Gaillardia pulchella*	2.5
	Maximilian Sunflower	*Helianthus maximiliani*	1.0
	Plains Coreopsis	*Coreopsis tinctoria*	2.0

A summary of the mitigation to be provided on USACE property is presented in Table 14. The resulting overall ratio of mitigation to be provided is 4:1.

Table 14 – Summary of Mitigation for Impacts on USACE Property

Category	Impacted Area (acres)	Mitigation Area (acres)	Mitigation Ratio
Open Field/Existing Easement	21.3	109	5.1:1
Wooded	13.5 (+2.0 acres off USACE property)	31.0	2.3:1 2:1 overall for wooded areas)
Wetland/Lake Edge	0.76	1.36	1.8:1
Overall	35.6	141.36	4:1

7. Liens and Encumbrances

The mitigation provided in conjunction with the project components located on the Seagoville Ranch will be protected under the easement for the East Fork Reuse Project and the MOA between NTMWD and CHTE. No liens or encumbrances exist that will affect these mitigation areas.

The collective mitigation area on the USACE property is on public domain. No liens or encumbrances are known that will affect this mitigation area.

8. Protective Actions

Multiple actions will be taken during construction to protect wetlands, streams, and other aquatic areas including their associated buffer zones for the project component areas. These actions include but are not limited to: confining construction materials and debris to the construction site; stabilizing disturbed areas at the earliest possible date with the use of permanent or temporary vegetation, blankets or matting, mulch, or sod; isolating the project area from adjacent streams and wetlands by using and maintaining coffer dams, sand bag berms, silt fencing, triangular filter dikes, rock berms, or hay bale dikes around the perimeter of the project area; protecting vegetation from unnecessary damage; and performing all proposed construction activities within the reaches of the stream channels during low flow conditions to minimize sediment introduction into downstream reaches of the affected waters.

9. Hydrology

Diversion Pump Station

The East Fork Reuse Project will result in changes in flows of the East Fork Trinity River. A study was conducted to evaluate the impacts on water flows and quality within the East Fork downstream of the diversion point. A summary of the results of this study follows.

Due to significant wastewater discharges to the East Fork Trinity River and its watershed, flows within the East Fork have been steadily increasing as this area has developed. Historical 10-year average 7Q2 flows at the USGS Crandall gage have increased from less than 2 cubic feet per second (cfs) in the 1950s to nearly 65 cfs in the 10-year period from 1994 to 2003. Thus, increased wastewater discharges have significantly altered the natural flow conditions within this portion of the East Fork Trinity River. Two major impoundments have been constructed on the East Fork above the Crandall gage site. Lavon Lake (constructed in the 1950's and modified for additional conservation storage in the early 1970's) provides for water supply and flood control, while Lake Ray Hubbard (constructed in the 1960's) provides water supply. The significant increases in river flows have occurred even as the uncontrolled watershed was preempted by the construction and operation of the two major water supply reservoirs.

The NTMWD intends to divert a significant portion of the wastewater flows that are collected in the East Fork. In order to address downstream water interests, the NTMWD proposed that 30 percent of wastewater plant discharges attributed to waters originating in the Trinity River Basin remain in the East Fork Trinity River. On an annual basis approximately 60 percent of water that is provided to water supply customers is returned to the wastewater treatment plants, or stated another way, the amount of wastewater metered at the wastewater treatment plants approximates 60 percent of the water supplied by water treatment plants in the same service area. The firm yield of Lake Lavon is 104,000 acre-feet/year (ac-ft/yr) for flows originating in the Trinity River Basin. When the maximum firm yield is diverted from the lake for water supply it can be estimated that over 62,000 acre-feet/year (60 percent) would return to area-wide wastewater treatment plants. Based on retaining 30 percent of the effluent for in-stream needs would yield 18,720 ac-ft/yr or an average of 16.7 million gallons per day (MGD) (25.8 cfs).

The water quality model, QUAL-TX, was used to evaluate the impact of the proposed diversion on water quality conditions, specifically dissolved oxygen (DO) concentrations, in the East Fork Trinity River. The Stream Standard for DO in the river segment downstream of the South Mesquite Creek/East Fork Trinity River confluence is 4.0 mg/L. The Texas Commission on Environmental Quality (TCEQ) assumes that Stream Standards will be met if model results for DO are 3.8 mg/L or greater.

The TCEQ recently updated its QUAL-TX water quality model of the East Fork Trinity River (Segment 0819) to account for present and near future permit limits for wastewater dischargers to this segment. As part of the evaluation for the East Fork Reuse Project, this model was utilized to assess the water quality impacts on the East Fork Trinity River of water withdrawals for the following flow conditions:

1. Present and pending permitted WWTP discharges with no releases from Lake Ray Hubbard;
2. Present and pending permitted WWTP discharges, including releases from Lake Ray Hubbard equal to the combined flows from WWTPs that are operated by the NTMWD and that discharge to Lake Ray Hubbard (i.e., Rowlett Creek WWTP, Muddy Creek WWTP, Squabble Creek WWTP, Rush Creek WWTP, Terry Lane WWTP, and Southside WWTP);
3. Future WWTP discharges (for approximately the year 2050), with no releases from Lake Ray Hubbard; and
4. Future WWTP discharges including releases from Lake Ray Hubbard equal to the projected combined flows from Rowlett Creek WWTP and Muddy Creek WWTP.

Results of the QUAL-TX modeling for the conditions listed indicate that the diversion of water from the East Fork Trinity River would cause DO concentrations to increase downstream of the withdrawal point, compared to what they would be without the proposed diversions. As water is withdrawn, the decreasing depth downstream of the withdrawal point would cause the rate of reaeration to increase sufficiently to increase the DO concentration in the stream substantially. Corollary model results for the main stem of the Trinity River downstream of the East Fork Trinity River confluence demonstrate that the DO levels of the river would also increase when water is withdrawn from the East Fork Trinity River. These water quality improvements are caused by the removal of oxygen-demanding pollutant loads from the East Fork Trinity River before they enter the main stem of the Trinity River.

The requested water right to divert flows related to WWTPs would not impact the amount of flow related to natural runoff or spills (in excess of pass-through of wastewater discharges) from Lake Ray Hubbard. Thus naturally occurring flows would continue to provide variability in

stream flow. The proposed diversion location is just upstream of the Crandall gage on the East Fork Trinity River. The drainage area of the Crandall gage is 1,256 square miles, including 185 square miles downstream of Lake Ray Hubbard. With a bypass of treated effluent flows of 25.8 cfs, the flows in the East Fork would exceed 30 cfs 65 percent of the time, exceed 40 cfs 53 percent of the time, exceed 50 cfs 43 percent of the time, exceed 100 cfs 34 percent of the time, exceed 500 cfs 17 percent of the time, and exceed 1,000 cfs 11 percent of the time.

The mitigation plantings adjacent to the intake channel for the diversion pump station would experience comparable hydrology as experienced under the existing conditions within the forested floodway. The moisture levels in the soils should be sufficient to support the native herbaceous species specified for planting in this area.

Constructed Wetland

The diverted flows from the East Fork will flow across the Seagoville Ranch through sedimentation basins, constructed wetland cells, conveyance and distribution channels into a final collection pool of the constructed wetland system where a conveyance pump station will pump the collected treated flows through the conveyance pipeline back to Lake Lavon. Storm runoff from the hillsides west of the constructed wetland areas will be routed around the constructed wetland cells through the existing channels and ponds as well as installed piping and discharged to the East Fork at the three existing outfalls. The diverted flows from the East Fork will be based on the daily discharges of treated effluent from the WWTPs upstream of the diversion point. Therefore, these flows will be variable but will be within the range of 48 MGD to 165 MGD. The normal continuous diversion rate to the wetland (i.e., inflow) will be about 107 MGD. For operational flexibility, the wetland will be designed to treat up to 1.5 times the normal diversion rate for short periods of time.

The constructed wetland has a nominal area of 2,000 acres that will include about 1,840 acres of wetted surface. The balance of the wetland is berms, flow distribution and control structures, and access ways. (The area of wetted surface is subject to change as detail design progresses.) With normal design inflow of 107 MGD diverted and treated, the hydraulic loading rate for the wetland area will be about 5.44 cm/day (2.14 in/day). The design inflow range of 48 to 165

MGD provides a hydraulic loading rate ranging between 2.44 to 8.39 cm/day (0.96 to 3.30 in/day).

The wetland system is designed as a flow-through system with nominal detention times of 7 to 10 days for the diverted design flows to reach the final collection pool. Precipitation falling upon the surface of the constructed wetland area will contribute to the diverted flows. Water losses from the wetland system including evaporation, evapotranspiration, and seepage may account for up to 15 MGD during summer months.

Except for infrequent periods when a wetland cell or train may be taken "off-line" to address maintenance or operational issues, the constructed wetland cells will be perennially flooded with design depths facilitating the establishment of dense emergent wetland vegetation interspersed with areas of open water.

Conveyance Pipeline and Lake Lavon Outfall

For the conveyance pipeline, and Lake Lavon outfall project areas, the hydrology will be the same as existing conditions. The 84-inch conveyance pipeline will transport the treated water from the constructed wetland back to the upper portion of the Pilot and Sister Grove Creeks Arm of Lake Lavon. Along the approximately 43-mile route, the proposed pipeline will cross several major tributaries and many minor tributaries. The notable tributaries to the East Fork Trinity River include Mustang Creek; Long Branch; Camp Creek; Bear Creek; Price Creek; George Creek; Tom Bean Creek; and Elm Creek. The hydrology within this drainage basin is dominated by surface runoff following rain events. A multitude of on-channel and off-channel impoundments of all sizes located within the drainage basin capture this surface runoff and influence downstream flows.

Along the pipeline route, the contours will be restored to preconstruction elevations with final grading, and excess excavated material will be disposed of in upland areas. The river and stream crossings as well as the open water crossings and emergent wetland areas along the route will be restored to preconstruction grades. Therefore, the construction of the pipeline will not affect the hydrology of the areas crossed.

10. Substrate

The proposed project components do not involve the use of any supplemental soils. The soils in the area of the proposed diversion pump station are classified as Trinity Clay, occasionally flooded. The soils of the emergent wetland and black willow swamp areas are Trinity Clay, frequently flooded, Trinity Clay, occasionally flooded, and Wilson silt loam. A total of 20 mapped soil units are traversed by the proposed pipeline as listed in Table 15.

TABLE 15 - Description of Soils Along the Conveyance Pipeline Route

KAUFMAN, ROCKWALL, AND COLLIN COUNTIES		
Map Unit #	**Soil Series**	**Soil Description**
AiD2	Altoga	Altoga silty clay. 5 to 8 percent slopes, eroded
AtD2	Altoga	Altoga silty clay, 3 to 12 percent slopes, eroded
EnC2	Engle	Engle clay loam, 3 to 5 percent slopes, eroded
FeD2	Ferris	Ferris clay, 5 to 12 percent slopes, eroded
FhC	Ferris-Heiden	Ferris-Heiden complex, 2 to 5 percent slopes
FeE3	Ferris-Houston	Ferris-Houston clays, 5 to 12 percent slopes, severely eroded
HeC	Heiden	Heiden clay, 3 to 5 percent slopes
HeD	Heiden	Heiden clay, 5 to 8 percent slopes
HcC2	Houston	Houston clay, 3 to 5 percent slopes, eroded
HcD2	Houston	Houston clay, 5 to 8 percent slopes, eroded
HoA	Houston Black	Houston Black clay, 0 to 1 percent slopes
HoB	Houston Black	Houston Black clay, 1 to 3 percent slopes
HoB2	Houston Black	Houston Black clay, 2 to 4 percent slopes, eroded
HoC	Houston Black	Houston Black clay, 3 to 5 percent slopes
LaD2	Lamar	Lamar clay loam, 5 to 8 percent slopes, eroded
LaE3	Lamar	Lamar clay loam, 5 to 12 percent slopes, severely eroded
LeC2	Lewisville	Lewisville silty clay, 3 to 5 percent slopes, eroded
Tf	Trinity	Trinity clay, frequently flooded (0 to 1 percent slopes)
Te/To	Trinity	Trinity clay, occasionally flooded (0 to 1 percent slopes)
WcB	Wilson	Wilson clay loam, 1 to 3 percent slopes

11. Planting Plan

The specific mitigation planting for each area of the project impacts and the collective mitigation area on the USACE property at Lake Lavon are included in Section 6 – Compensatory Mitigation Activities.

12. Planting Success

The mitigation plantings for the various project component areas and the collective mitigation area on the USACE property at Lake Lavon will exhibit an 80 percent ground cover of herbaceous plants three consecutive years after planting or the areas will be replanted until an 80 percent ground cover is achieved for three consecutive years after the most recent remedial planting and none of the three most dominant species may be non-native, noxious, or invasive species.

The tree and shrub species specified in Section 6 will have a minimum survival of 80 percent of the total number planted for five consecutive years after planting. Eligible trees will be those specified in Section 6 and be at least one-inch diameter at breast height or six feet tall. Eligible shrubs will also be those specified in Section 6 and be at least one foot tall. If the density is less than 80 percent within the designated mitigation areas five years after planting, the NTMWD will replant as necessary to achieve the minimum density for five consecutive years after the most recent remedial planting. Volunteer growth that meets the species and size criteria will be eligible for counting.

13. Performance Standards

The mitigation areas will be maintained until such time as the USACE is satisfied that the wetlands and waters of the U.S. meet the definition of a wetland or water of the U.S. under the Regulatory Program regulations as of the permit's authorization date, waters of the U.S. are functioning as their intended type of waters of the U.S. and at the ecological level described in this mitigation plan, and buffer and riparian zones and other areas integral to the enhancement of the aquatic ecosystem are functioning as the intended type of ecosystem component and at the level of ecological performance described in this mitigation plan.

14. Mitigation Plan Benefits vs. Impacts

TABLE 16 - COMPARISON OF THE ECOLOGICAL BENEFITS OF THE MITIGATION PLAN VS. THE LIKELY ADVERSE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

Function	Existing Tributary Channels/Wetlands	Proposed Mitigation Plan
Flow attenuation	No permanent adverse impacts to flow attenuation functions provided by the existing jurisdictional channels/wetlands are proposed	The project areas will continue to provide flow attenuation for storm runoff
Desynchronization of peak flows	No impacts to the desynchronization of peak flows is anticipated as a result of the project components	The project areas will continue to provide desynchronization of peak flows resulting from storm runoff. Peak flows resulting from WWTP discharges will be attenuated by diversion to the constructed wetland.
Groundwater recharge	There are no significant groundwater sources in the immediate project area.	
Flood capacity	The diversion pump station and conveyance pipeline lie within or cross floodplain areas. No reduction of flood capacity is anticipated in these areas. The constructed wetland lies within the protection of a series of flood control levees. Analysis of the reduction of 18 inches of floodplain storage inside the levees by the construction of the wetland areas indicates that this will have no effect on the flood levels or the translation of the floodwave through the area.	The floodplains along the East Fork Trinity River and major and minor tributaries as well as the floodway along the East Fork Trinity River between the flood protection levees will continue to provide flood capacity for the project areas.
Dissipation of erosive storm flow velocities	A variety of erosive conditions from highly eroded to stable are found at the numerous stream crossings along the pipeline route and along the East Fork Trinity River.	Establishment of native vegetative cover along stream channel crossings, at impact areas on the East Fork, and along the outfall channel to Lake Lavon will provide erosion protection from storm flow velocities.

TABLE 16 - COMPARISON OF THE ECOLOGICAL BENEFITS OF THE MITIGATION PLAN VS. THE LIKELY ADVERSE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT (Cont.)

Water Quality Improvement • trapping of sediment/ filtration • assimilation of nutrients • degradation of organics • transformation of heavy metals	The existing emergent wetlands and black willow swamp provide some water quality improvement functions for the storm runoff from the areas west of the flood protection levee. The herbaceous vegetation and narrow riparian corridors found along about 1/3 of the stream channels provide filtering of storm flows and stabilization of soils.	The proposed constructed wetland will provide substantial water quality improvement for the effluent-dominated flows diverted from the East Fork prior to transport of this water to Lake Lavon for raw water supply. The flows diverted from the East Fork will result in a reduction of the oxygen-demanding compounds in the river flow as well as better aeration of the remaining flows so that the dissolved oxygen content of the river flows will increase. The proposed mitigation plantings will enhance riparian buffers and provide filtration of storm runoff and assimilation of nutrients from the watersheds. The establishment of wetland plants along the lake edge and bordering the cove area will provide multiple water quality improvement functions for inflows from the watershed as well as stabilize lake sediments in this shallow cove area.
Habitat functions • contribution of allochthonous materials • perennial habitat required for fish • production of autochthonous material • diversity of ecosystem	The existing riparian forests and herbaceous vegetation provide allochthonous material to the stream channels as well as shading of the stream flows. These edge areas provide valuable habitat for a variety of wildlife.	The proposed mitigation plantings will enhance the diversity of both herbaceous and woody vegetation and provide high quality habitat for a variety of wildlife. The mitigation plantings along the lake edge in the cove area will provide shelter for small fish as well as production of authochthonous material. The overall mitigation planting plan will improve diversity of both structural aspects of the ecosystem and food sources.

15. T&E Species

The proposed project is not expected to affect any listed threatened or endangered species.

16. Other Impacts

APAI has subcontracted with AR Consultants, Inc. to conduct a cultural resources investigation of the East Fork Reuse Project pipeline. The conclusions of the AR Consultants' investigation are summarized in Appendix C.

There are no ecologically sensitive areas identified within the vicinity of the project area. Finally as presented in Section 9, the proposed project is not expected to adversely impact either the local or regional hydrology.

17. Long Term Operation and Management Plan

It is intended that the mitigation plantings for slope stabilization at the diversion pump station intake channel and crossing areas along the conveyance pipeline route develop as natural herbaceous areas with no routine maintenance. The collective mitigation area associated with the pipeline easement on USACE property at Lake Lavon is intended to be self-sustaining with no routine maintenance required. The native prairie established within the pipeline easement and planted trees and shrubs are intended to establish natural habitat areas that will enhance the existing natural areas on the USACE property. Occasional mowing may be used to control the invasion of undesirable woody vegetation within the prairie areas or, if needed, to control weedy herbaceous species during the establishment of the native grasses, legumes, and wildflowers within the planting mix. Any maintenance efforts needed would be coordinated with the USACE Operations staff prior to implementation.

18. Monitoring

The progress of the mitigation areas towards achieving the goals stated in the mitigation plan will be monitored by measuring the development of hydrology, vegetation, soils, and habitat for

aquatic and terrestrial wildlife. Monitoring may include but not be limited to standard sampling methods, conducting wetland delineations, collecting hydrologic data, and developing a photographic record of the progress of the mitigation area. Monitoring techniques may include but not limited to: mapping the vegetative communities, conducting plant inventories, noting problem species, establishing and using transects or permanent sampling stations, measuring species and the stratum, and determining the total number of species importance value. Monitoring techniques may also include but not be limited to monitoring changes in the soil profile and development of hydric soil characteristics by digging and collecting data from representative soil pits for each vegetative community type.

19. Compliance Monitoring

The NTMWD, acting through its agent Alan Plummer Associates, Inc. (APAI), will report to the USACE monitoring results, mitigation success, and general compliance with the terms and conditions of the permit. The USACE will be notified of the schedule of activities for each phase of the mitigation plan at least 30 days prior to the start of soil-disturbing activities. Additionally, the USACE will be notified regarding the date of the pre-construction meeting held by the NTMWD for appropriate contractor(s) to explain the terms and conditions of the permit, provisions of the mitigation plan, and the contractor's responsibility in ensuring compliance with the permit. Within two weeks following the meeting, the USACE will receive confirmation that the meeting was held.

In addition to the above-mentioned notifications, the NTMWD will submit annual written compliance reports, due October 1 each year beginning October 1, 2006. These reports will be submitted to the USACE even if no work is conducted during the reporting period until the USACE verifies that the County has successfully completed all mitigation plan components, the mitigation areas have met the performance standards, including planting success requirements as previously outlined in Section 12 of this mitigation plan and all authorized construction activities have either been completed or deleted from the project. Each report will contain at least a description of construction or mitigation plan schedule changes, a summary of activities that occurred during the reporting period, documentation that the NTMWD is in compliance with all permit conditions, documentation of the progress and/or completion of all authorized work

including mitigation plan activities in meeting performance standards and planting success, a description of the project's actual impacts to waters of the United States, documentation that disturbed areas are revegetating and not suffering erosion damage, documentation that adjacent aquatic areas are adequately protected from construction activities, and photographs, maps and drawings to support the written components of the mitigation plan. In addition to these components, the first annual report will also contain a written description of the pre-construction conditions of the project area, including the mitigation area.

20. Mitigation Specialist Info

A qualified biologist from Alan Plummer Associates, Inc., 1320 South University, Suite 300, Fort Worth, TX 76107, (817) 806-1700, shall be retained to oversee project construction and mitigation plan implementation, including planting, monitoring, and reporting provisions.

21. Mitigation Plan Schedule

The approximate schedule for the proposed project is as follows:

- August 2004 — Easement purchased for Seagoville Ranch and MOA signed between NTMWD and CHTE
- August 2004 — Water rights permits submitted to TCEQ
- March 4, 2005 — Section 404 permit application submitted to USACE
- July 22, 2005: — Begin implementation of SWPPP plan and BMP installation
- August 22, 2005: — Begin earthwork and grading operations for construction of Phase II nursery
- September 15, 2005: — Begin planting of Phase II nursery
- December 1, 2005 — Section 404 Permit Received
- February 6, 2006: — Begin earthwork and grading operations for full-scale wetland system
- August 10, 2006: — Begin planting full-scale wetland
- May 11, 2007 — Begin period of plant maturation for full-scale wetland
- June 2, 2008 — Full-scale wetland in operation

• April 15, 2006	Begin construction of diversion pump station
• June 1, 2007	Jockey pump online or other pump for wetland water
• April 30, 2008	Diversion pump station substantially completed
• April 15, 2006	Begin construction of conveyance pump station
• April 1, 2007	Conveyance pump station substantially completed
• March 1, 2005	Begin conveyance pipeline ROW acquisition
• March 31, 2006	Begin construction of conveyance pipeline
• May 31, 2008	Conveyance pipeline substantially completed

22. Deed Restriction

The location of the collective mitigation area on the USACE property at Lake Lavon, which is public land, will provide protection in perpetuity for this mitigation area without requiring deed restriction.

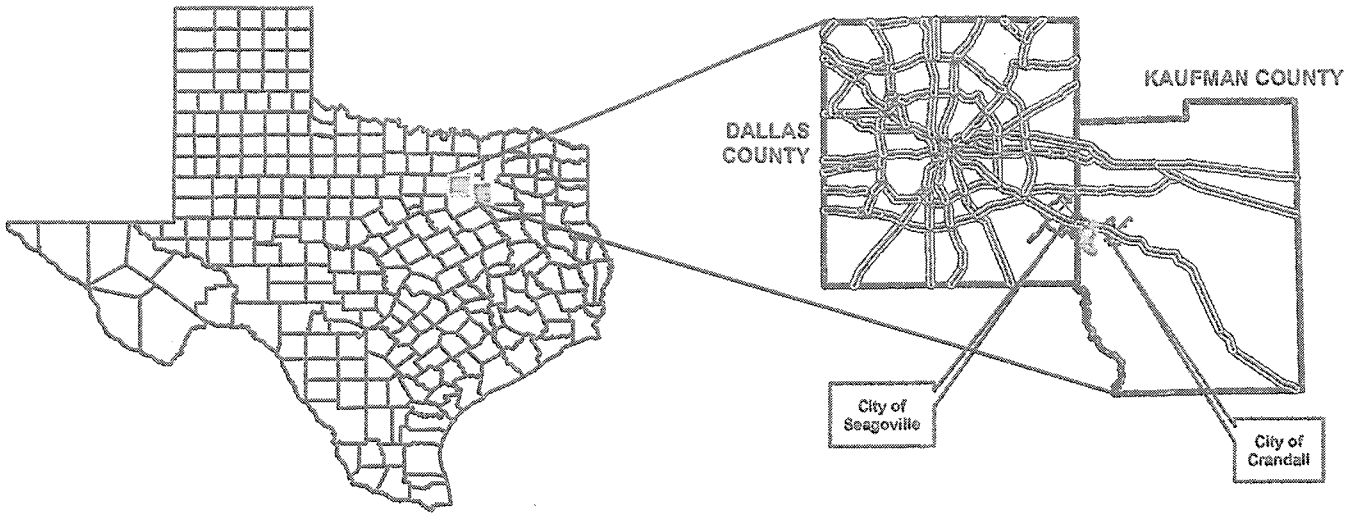
The utility easement for the conveyance pipeline will provide a measure of protection for the revegetation efforts along the pipeline route. However, since these areas are on multiple private properties, they will not be deed restricted.

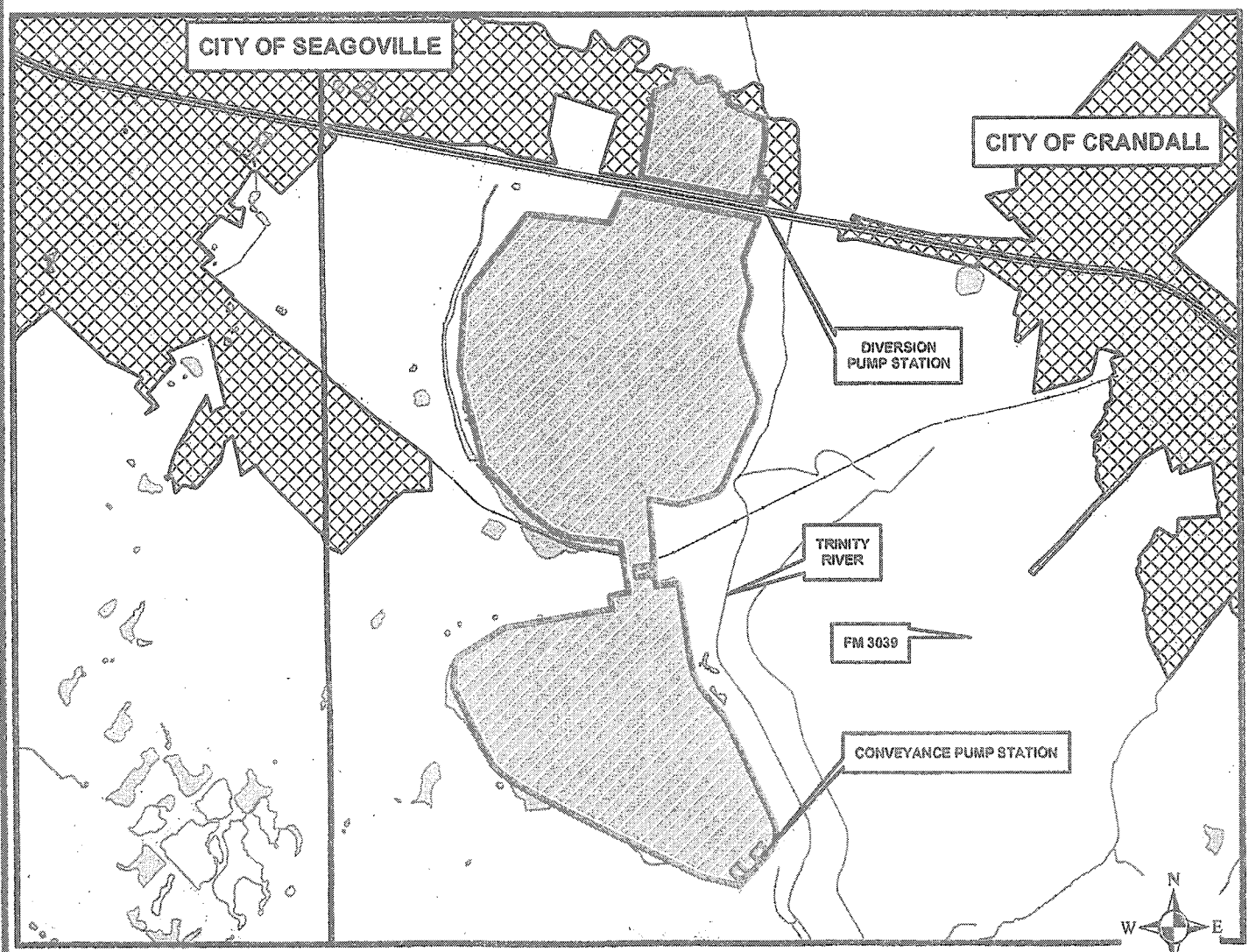
The MOA between NTMWD and CHTE provides protection for the diversion pump station area and constructed wetland. If the mitigation bank proposed by Wetlands Management, L.P. is approved by the Fort Worth District, Regulatory Branch of the USACE, the habitat areas developed on the Seagoville Ranch will be protected in perpetuity by both the banking instrument and conservation easement.

APPENDIX A

FIGURES AND EXHIBITS

ALAN PLUMMER ASSOCIATES, INC.
ENVIRONMENTAL ENGINEERS · DESIGNERS · SCIENTISTS





Proposed Project Components

4,000 2,000 Feet

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FIGURE 1
VICINITY MAP - PROPOSED CONSTRUCTED WETLAND

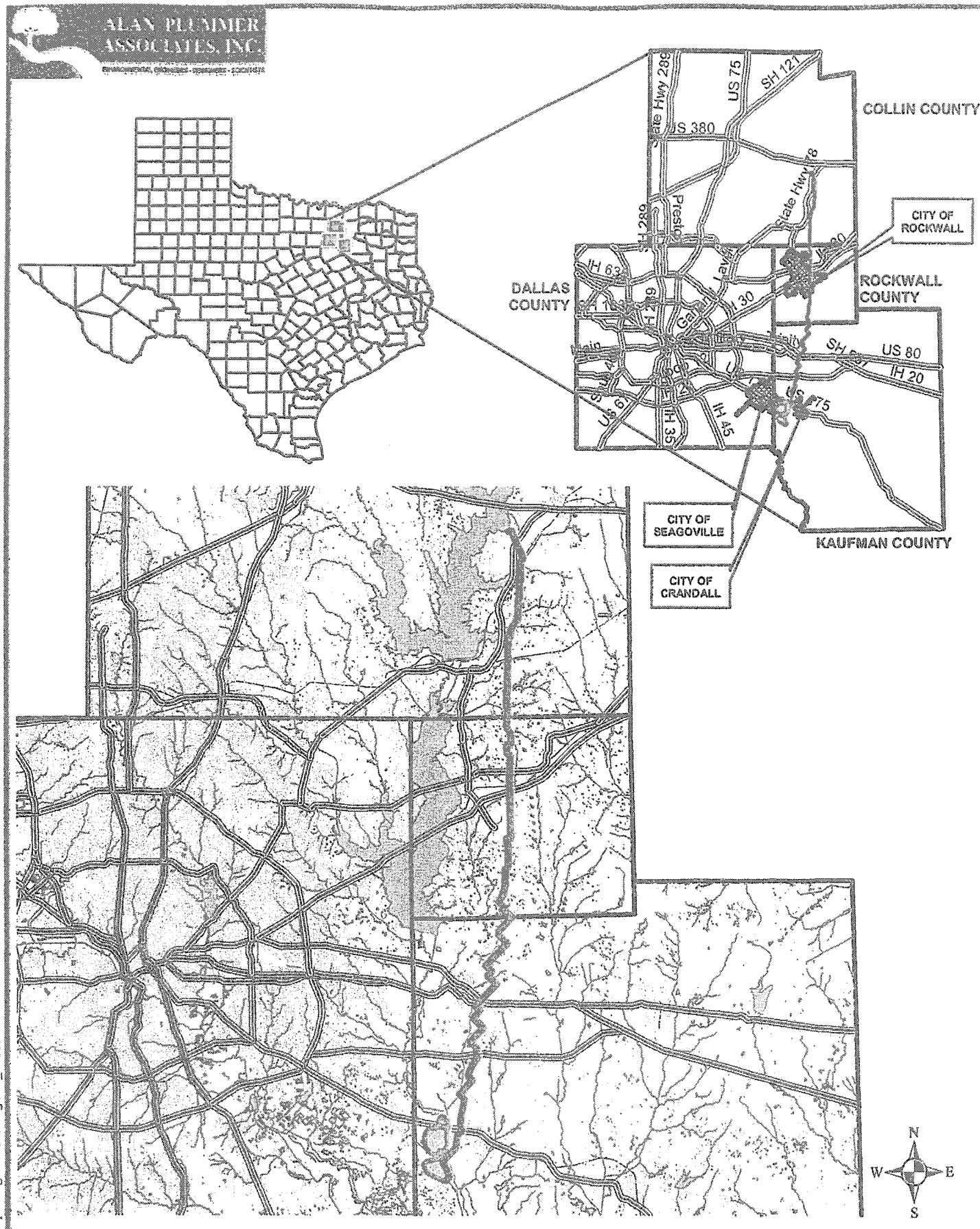

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FIGURE 2
VICINITY MAP - PROPOSED PIPELINE ROUTE

FIGURE 3
LAKE LAVON OUTFALL LOCATION

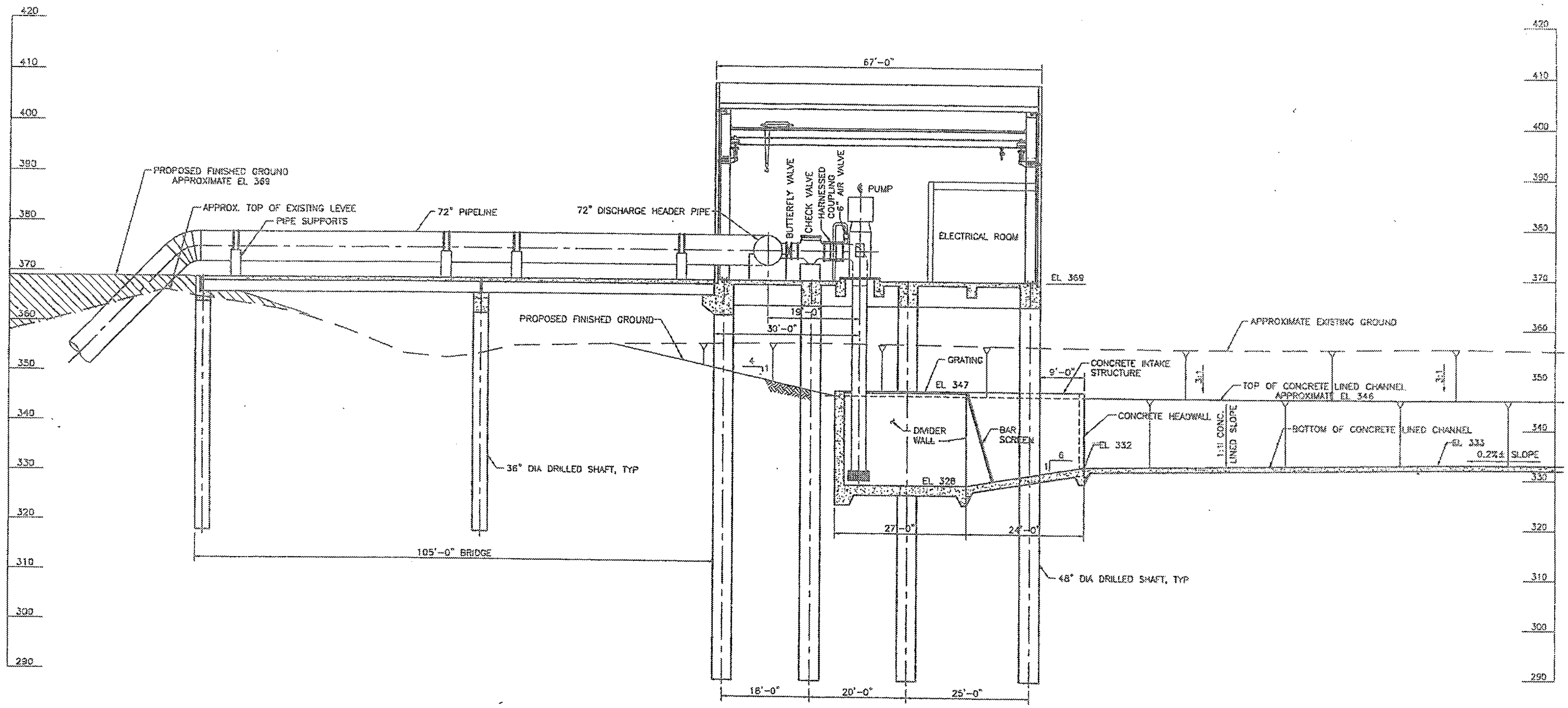


FIGURE 4

PROFILE SECTION OF PROPOSED DIVERSION PUMP STATION

0 10' 20'
SCALE IN FEET

NOT FOR CONSTRUCTION

BAR IS ONE INCH IN LENGTH ON ORIGINAL DRAWING. CHECK SCALE AND ADJUST ACCORDINGLY.
ONE INCH

DESIGNED BY ACH
DRAWN BY MDC
CHECKED BY ACH
REVIEWED BY FLO

ALAN PLUMMER ASSOCIATES, INC.

Alan Plummer Associates, Inc.
1349 Empire Central Suite 702
Dallas, Texas

Freese and Nichols, Inc.
4055 International Plaza Suite 200
Fort Worth, Texas 76109-7100

NORTH TEXAS MUNICIPAL WATER DISTRICT
EAST FORK REUSE PROJECT (WCF 04-5)
DIVERSION PUMP STATION

DIVERSION PUMP STATION
PRELIMINARY
PUMP STATION SECTION – OPTION 1

Dwg. No. 5.1

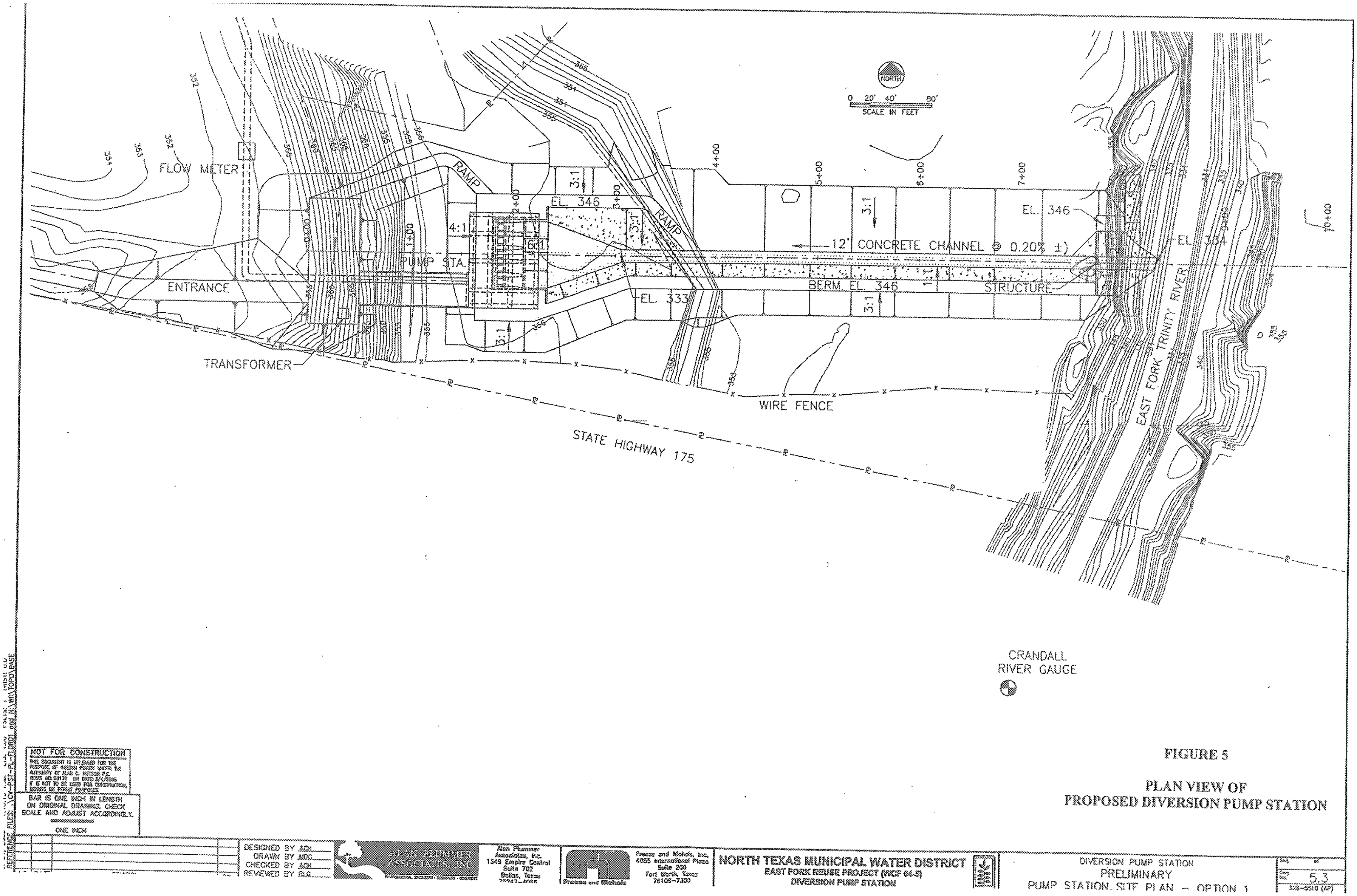


FIGURE 5

PLAN VIEW OF PROPOSED DIVERSION PUMP STATION

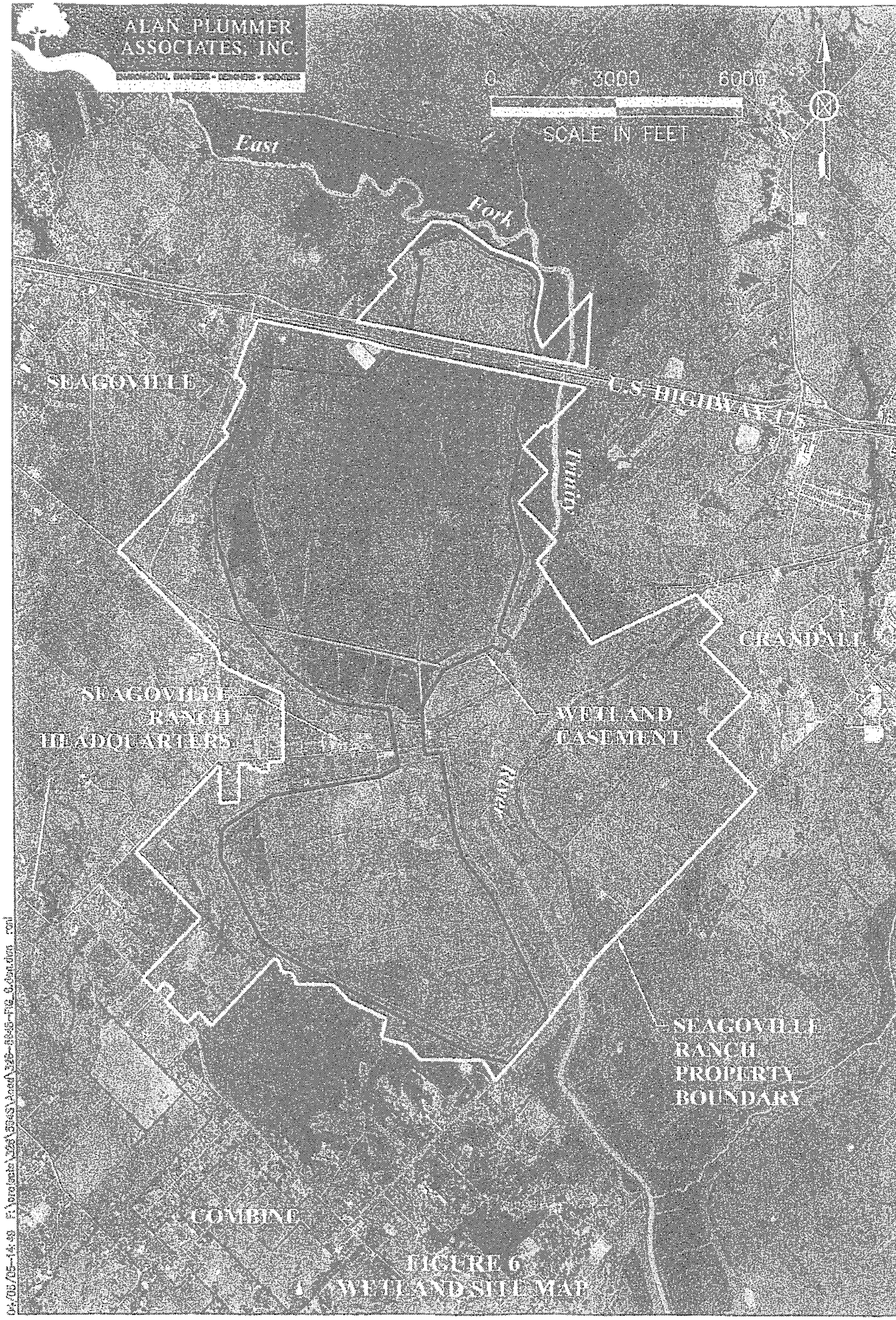


FIGURE 6
WETLAND SITE MAP

ALAN PLUMMER ASSOCIATES, INC.
ENVIRONMENTAL ENGINEERS • DESIGNERS • SCIENTISTS

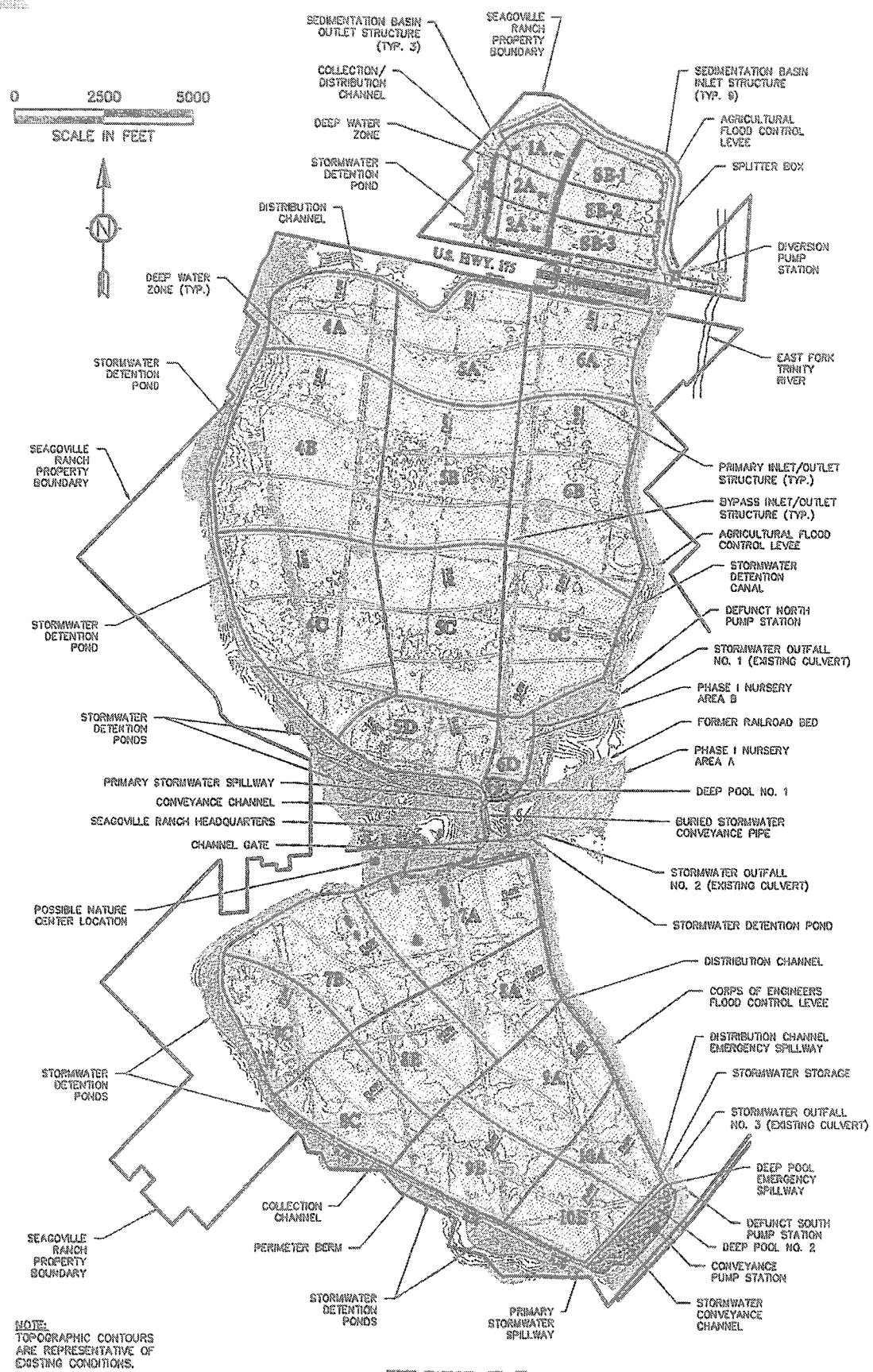
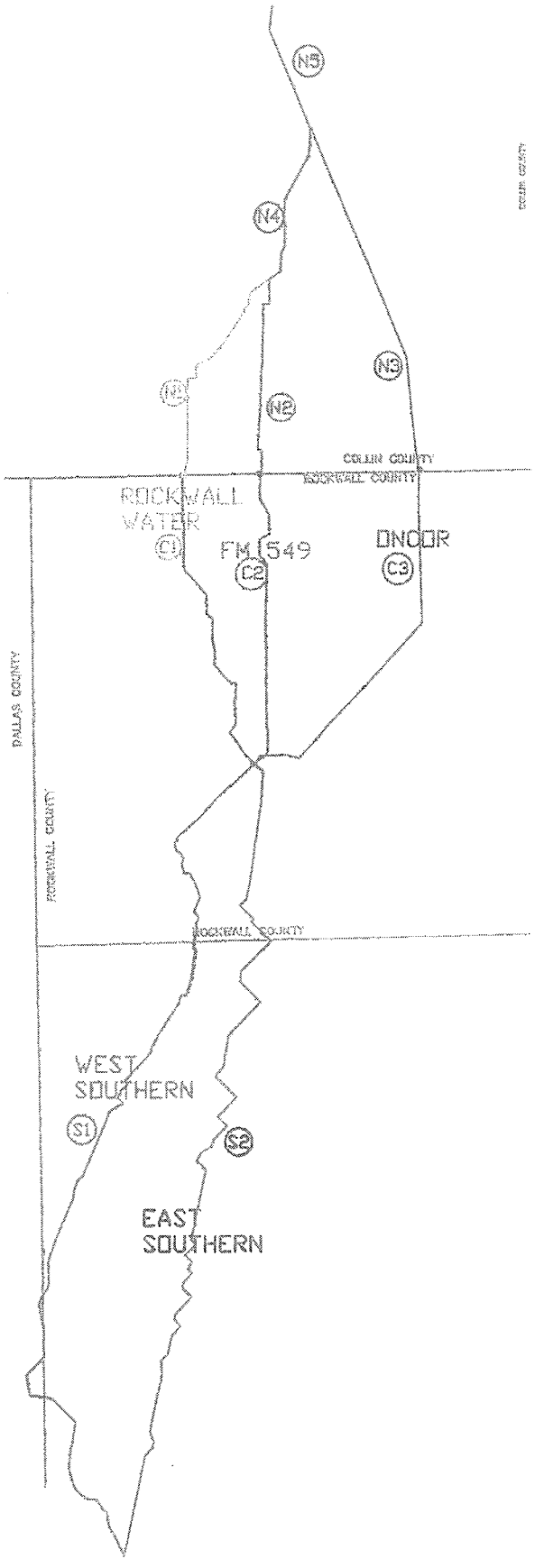


FIGURE 7
PRELIMINARY WETLAND SYSTEM LAYOUT

Figure 8: Route Definition Map



Route Name & Definition

Option	Route Name	Route Definition
1	Rockwall w/ WS	S1+C1+N1+N4+N5
2	Rockwall w/ ES	S2+C1+N1+N4+N5
3	FM 549 w/ WS	S1+C2+N2+N4+N5
4	**FM 549 w/ ES**	**S2+C2+N2+N4+N5**
5	Oncor w/ WS	S1+C3+N3+N5
6	Oncor w/ ES	S2+C3+N3+N5

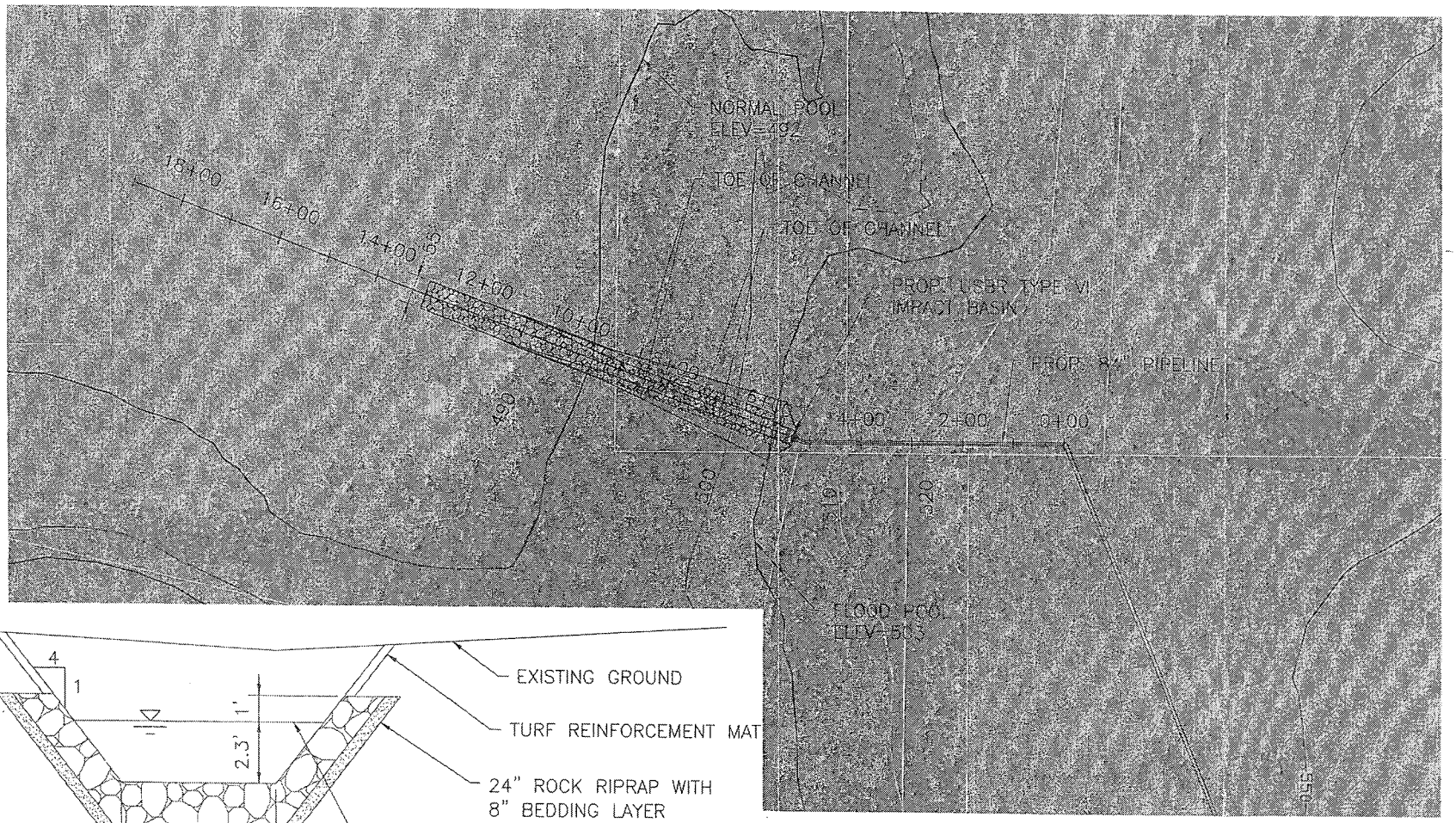


FIGURE 9

PROPOSED OUTFALL TO LAKE LAVON

NORTH TEXAS MUNICIPAL WATER DISTRICT
EAST FORK REUSE PROJECT
PIPELINE ALIGNMENT STUDY

LAKE LAVON OUTFALL STRUCTURE
PLAN AND TYPICAL CHANNEL SECTION

FIGURE 1

Freese and Nichols

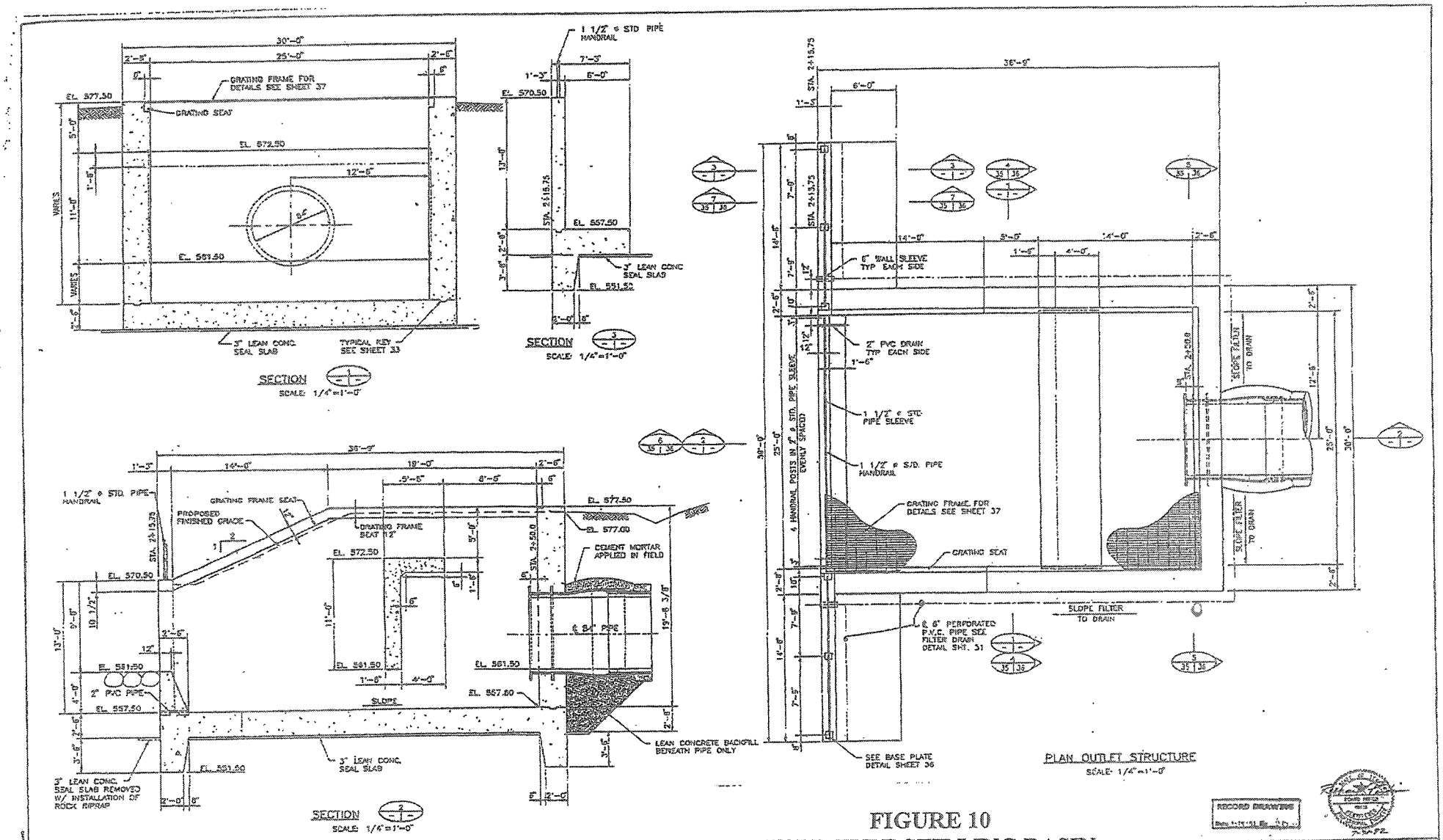


FIGURE 10
USBR TYPE STILLING BASIN

FREESE AND NICHOLS, INC
CONSULTING ENGINEERS
FORT WORTH – ARLINGTON – AUSTIN, TEXAS

RECORD DRAWING

OUTLET STRUCTURE
LAYOUT PLAN

SHEET
35 OF 38

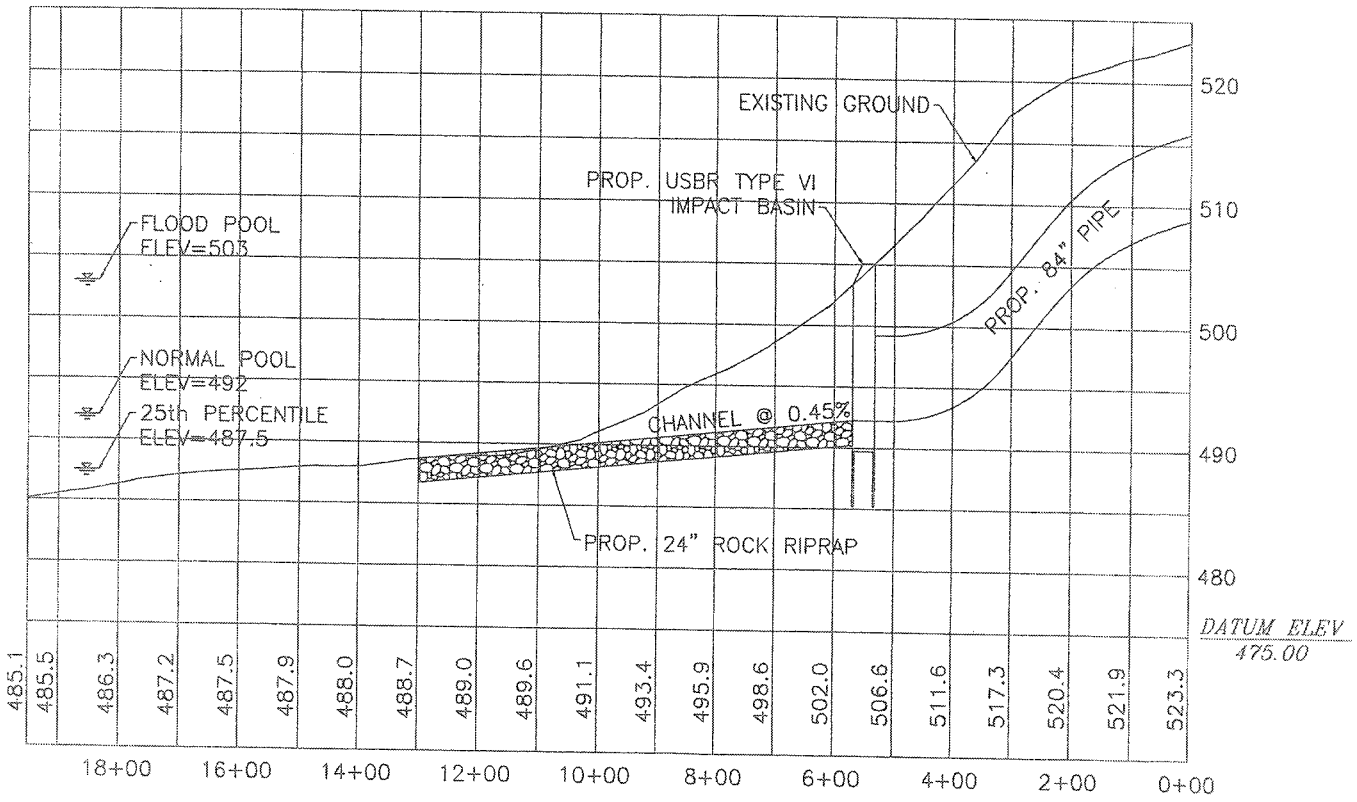
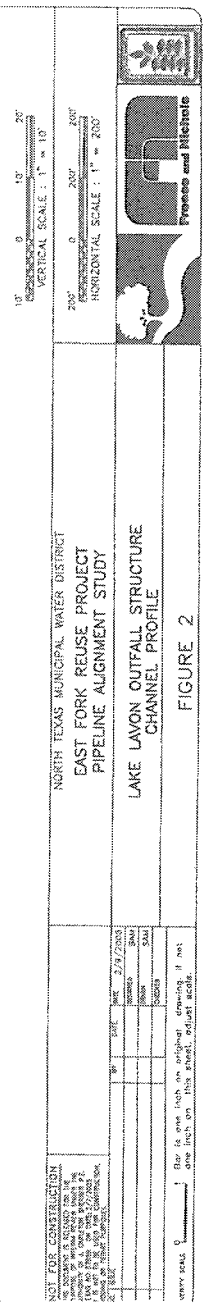


FIGURE 11

PROFILE OF PROPOSED OUTFALL TO LAKE LAVON



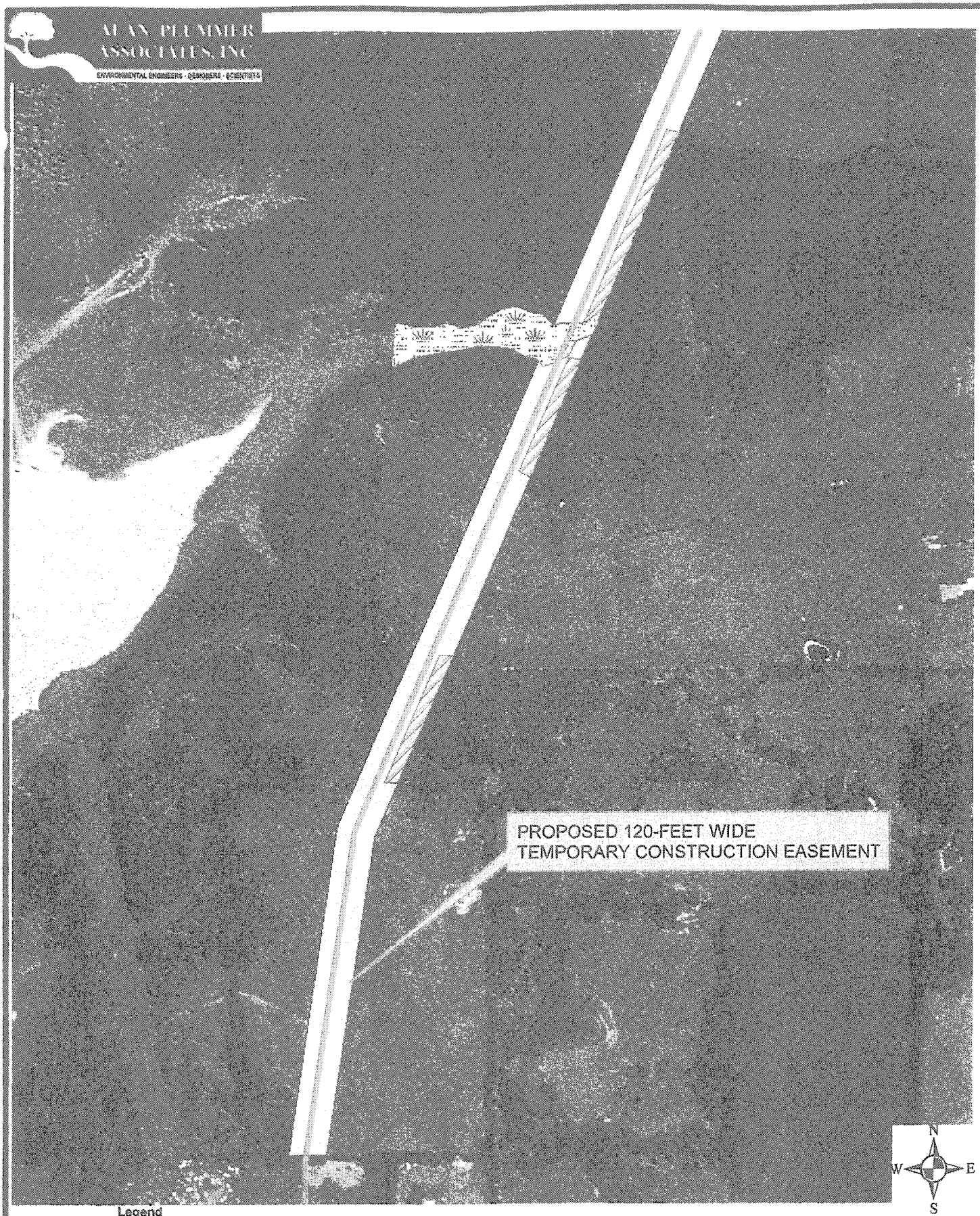


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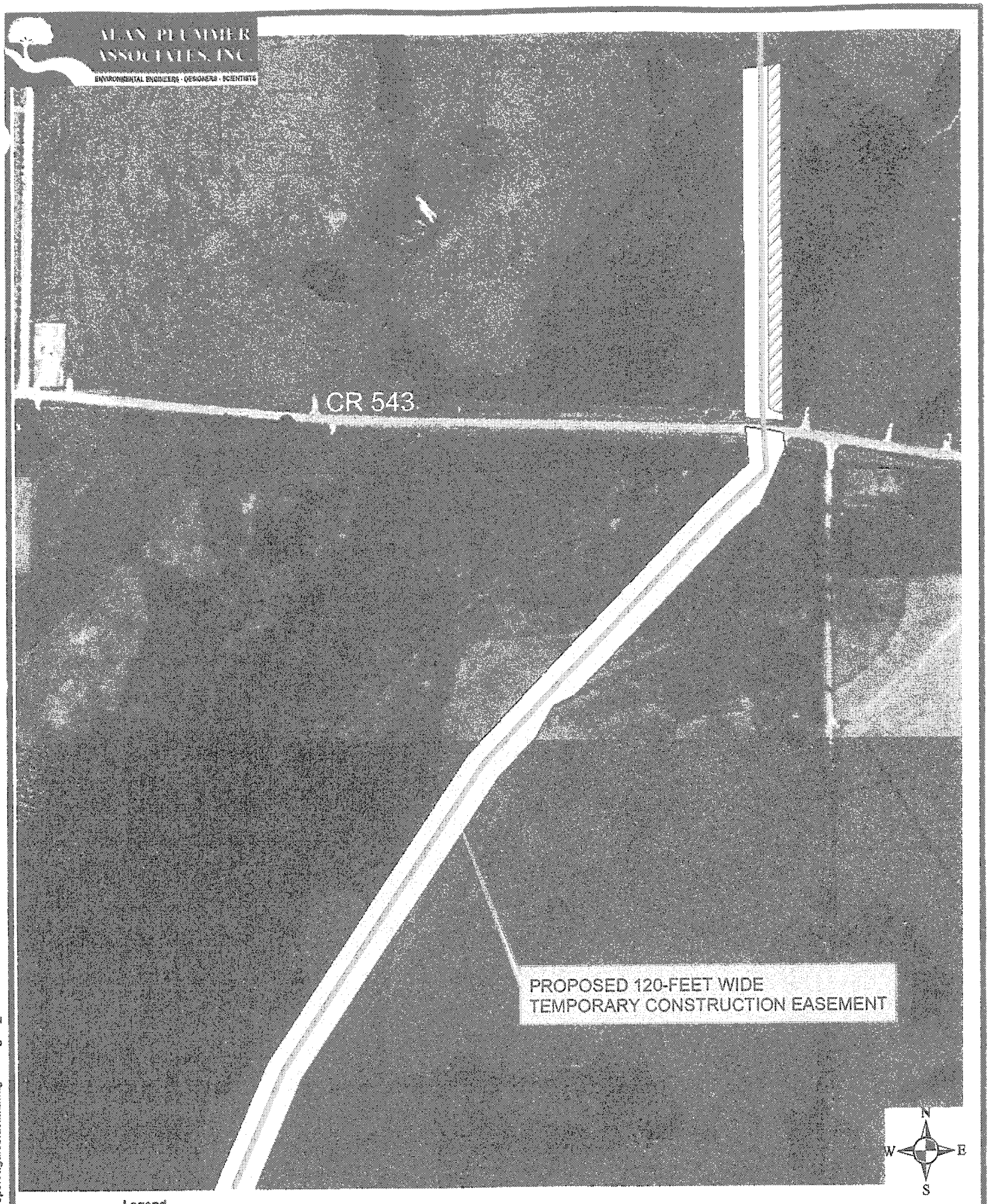
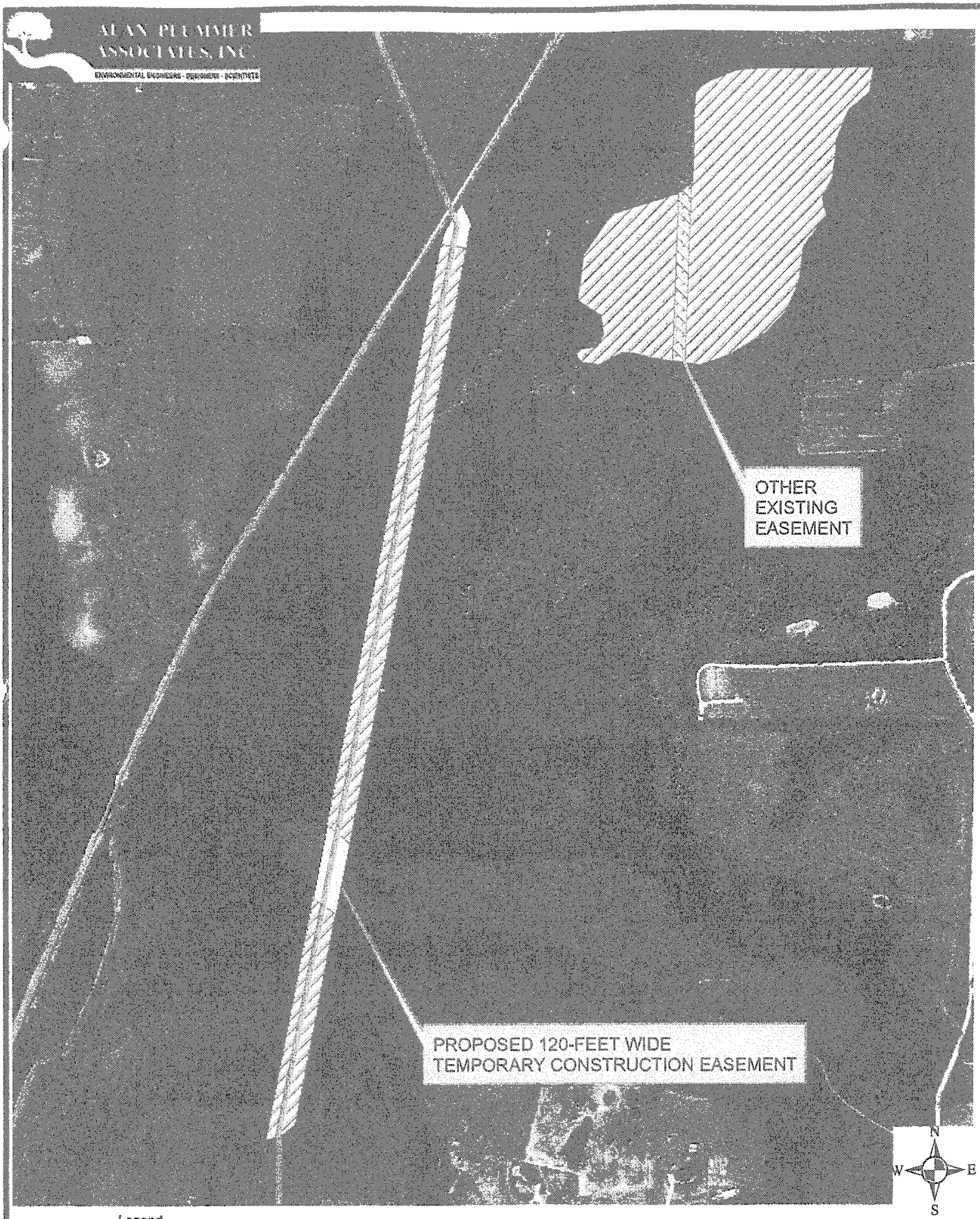
FIGURE 12
PROPOSED MITIGATION AREAS WITHIN US ARMY CORPS OF ENGINEERS' PROPERTY SOUTH OF CR 543



f:projects:326:6545 report figures:delin:mitigation:figure_13.mxd

FIGURE 13
PROPOSED MITIGATION AREAS WITHIN US ARMY CORPS OF ENGINEERS' PROPERTY NORTH AND SOUTH OF CR 543



.eport figures:dwln:mitigation:figure_14.mxd

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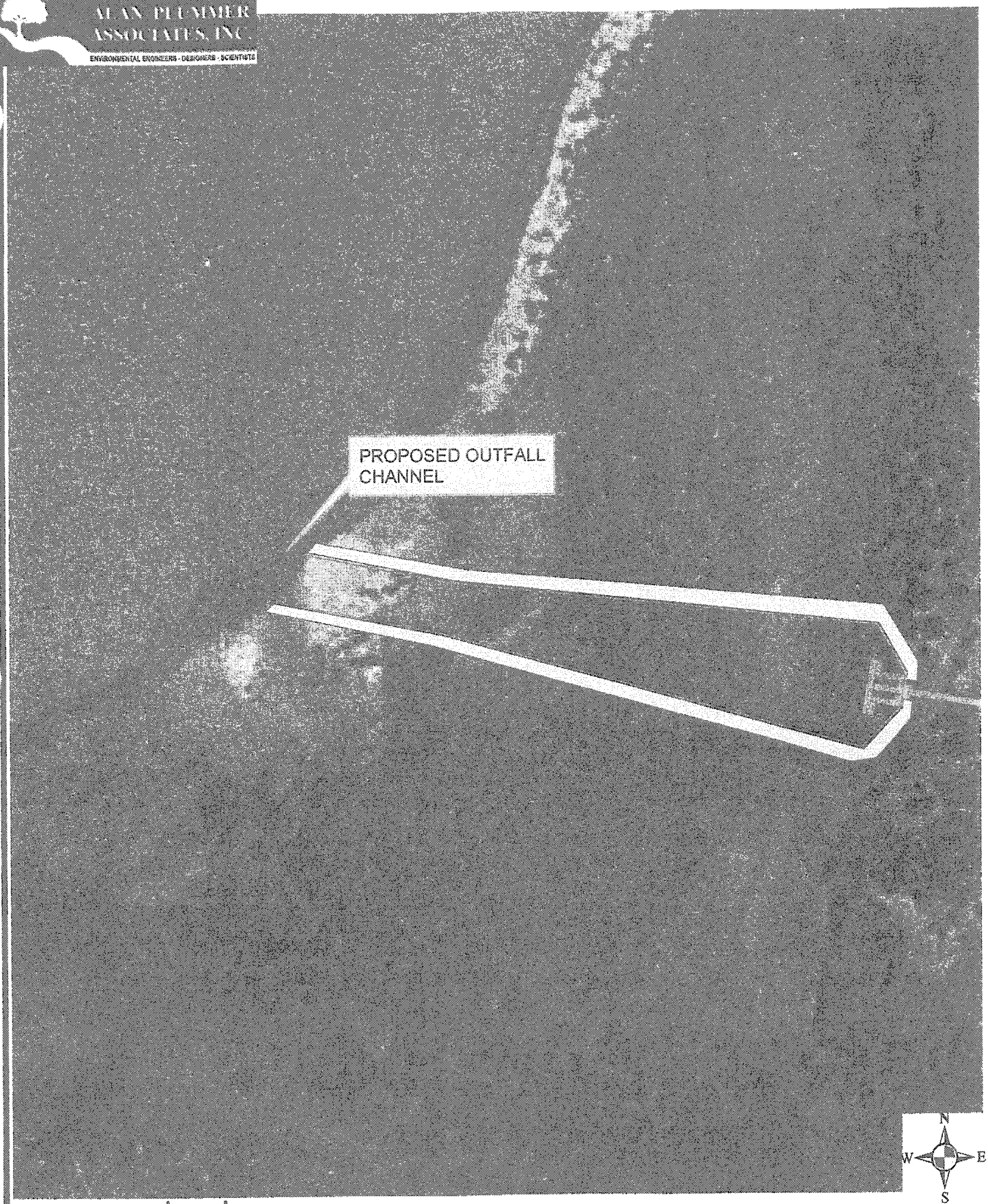
FIGURE 14
PROPOSED MITIGATION AREAS WITHIN US ARMY CORPS OF ENGINEERS' PROPERTY - ELM AND TOM BEAN CREEKS

ALAN PLUMMER ASSOCIATES, INC.
ENVIRONMENTAL ENGINEERS - DESIGNERS - SCIENTISTS



Legend

PROPOSED PROJECT COMPONENTS

SWITCHGRASS AREA

200 100 0 Feet

FIGURE 15
PROPOSED MITIGATION AREAS WITHIN US ARMY CORPS OF ENGINEERS' PROPERTY - OUTFALL AREA ALONG LAKE LAVON

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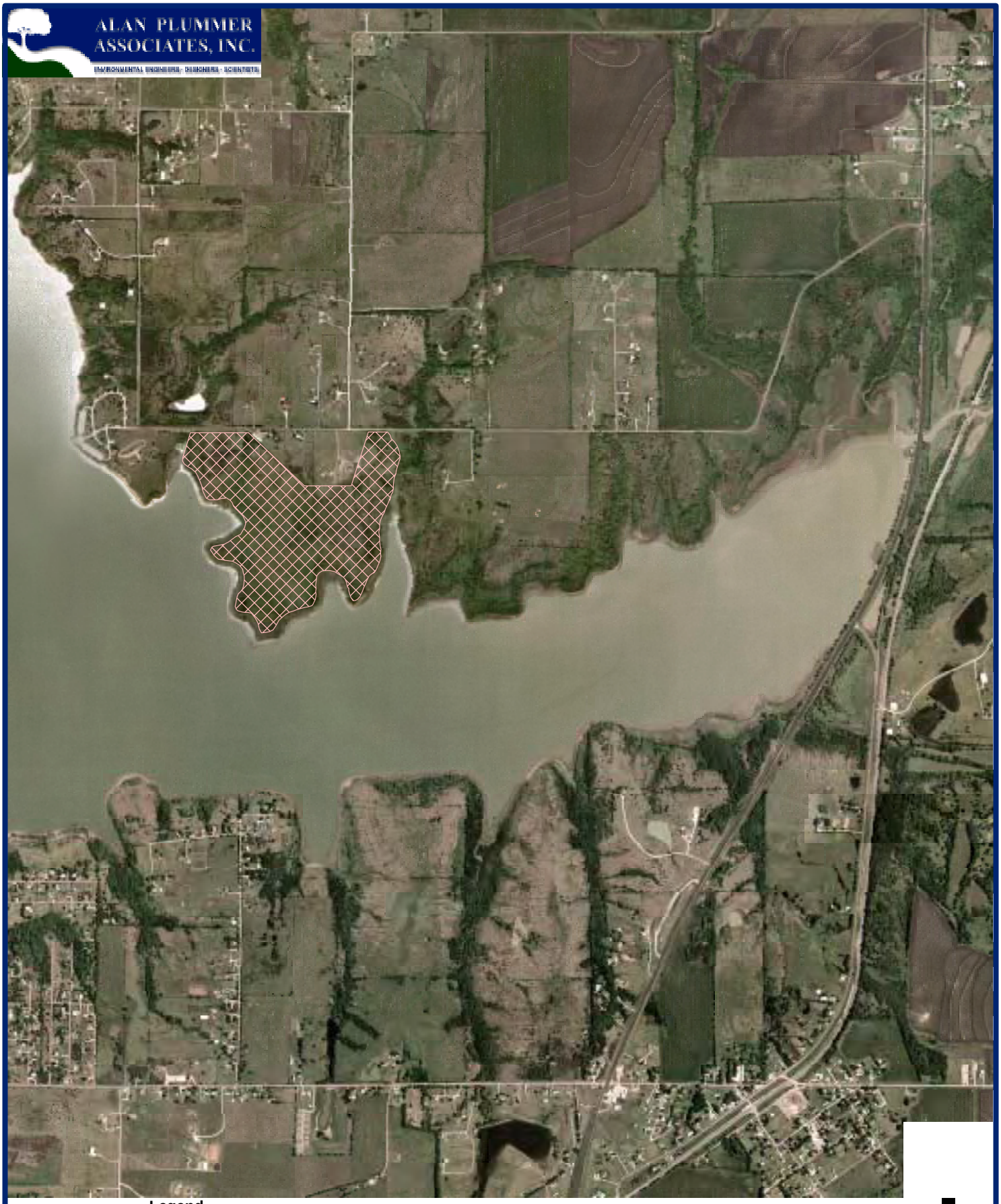

FIGURE 16
PROPOSED ADDITIONAL NATIVE PRAIRIE MITIGATION AREA WITHIN US ARMY CORPS OF ENGINEERS' PROPERTY - ELM AND TOM BEAN CREEKS

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APPENDIX B

MEMORANDUM OF AGREEMENT BETWEEN NTMWD AND CHTE

EXHIBIT B

MEMORANDUM OF AGREEMENT

regarding the

SEAGOVILLE RANCH

between

NORTH TEXAS MUNICIPAL WATER DISTRICT

and

CAROLINE HUNT TRUST ESTATE

August 11, 2004

APPENDIX C

ARCHAEOLOGICAL REPORT BY AR CONSULTANTS, INC.

See Appendix C of the Main Report for the Archeological Report