Final Report Contract #1913582343

Concrete Lining of Franklin Feeder Canal

(Partidor to San Eli Lateral)

Texas Water Development Board

Agricultural Water Conservation System Improvements

El Paso County Water Improvement District No. 1

Table of Contents

1 Executive Summary 1
2 Introduction and Background 2
3 Estimate of the Amount of Water Salvaged by Project 2
4 Construction Methods..... 3
5 Construction Materials..... 3
6 Summary of Project Results …….. 4
7 References …… 4

List of Figures

Figure 1: Project Location ……..... 1
Figure 2: Riverside Canal Seepage Test …….. 3

List of Tables

None

Attached Appendices

A – Construction Photographs

B – Example Materials Testing Results

C – Engineering Drawings Cover Page

1. Executive Summary and Project Location

Texas Water Development Board Contract No. 1913582343 with El Paso Water Improvement District No. 1 (EPCWID) for an Agricultural Water Conservation Project titled "Concrete Lining of Franklin Feeder Canal (Partidor to San Eli Lateral). The Project was completed in March of 2024.

The Project was located in southeast El Paso County, Texas, in El Paso Valley, partially in the City of El Paso and partially in the City of Socorro. Below is an aerial image of the Project location; the Engineering Drawings in Appendix D provide a detailed map.

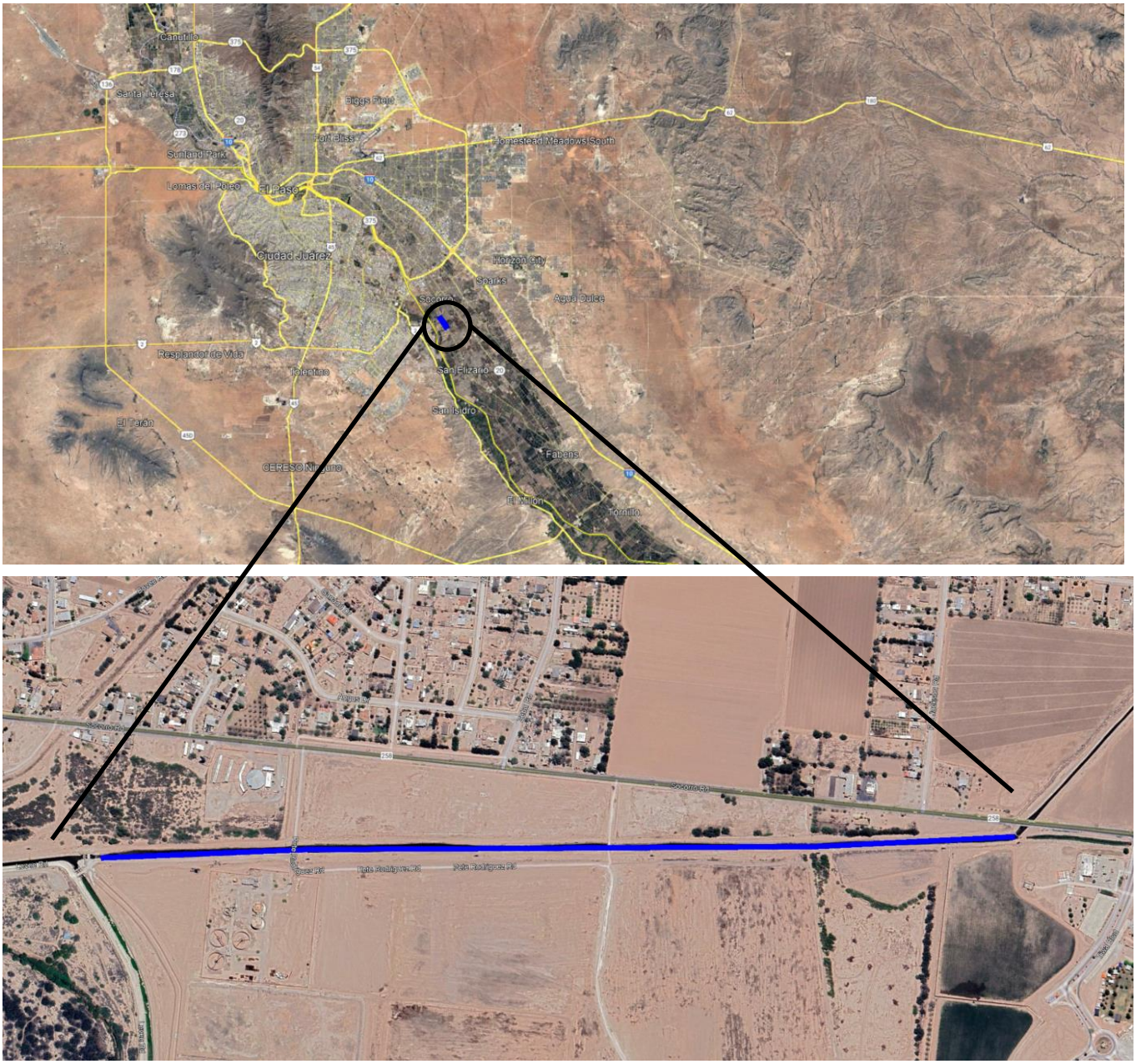


Figure 1: Project Location

2. Introduction and Background

The Project is located in Far West Texas (Region E Water Planning Region) in El Paso County and is adjacent to the United States – Mexico border. El Paso County has an arid climate and receives an average annual rainfall of about 8 inches, with net evaporation exceeding 70 inches. The region faces unique water challenges characterized by an agricultural system that is a century old, prolonged drought conditions, a growing population and a growing sister city in Mexico with shared groundwater and surface water supplies, interstate and international treaties, and interstate litigation that may impact the District's water supply from the Rio Grande.

The El Paso County Water Improvement District (EPCWID) provides water from the Rio Grande for 69,010 acres of water rights lands divided into more than 30,000 water user accounts. Active irrigation users include approximately 325 large farms and 4,500 irrigated tracts of two acres or less (small-tracts). EPCWID delivers water to an average of 49,000 acres of cropland using 350 miles of canals, 269 miles of drains, 60 wells, and over 2,200 turnouts.

The City of El Paso currently has contract rights for approximately 70,000 acre-feet of raw water in years with a full allocation from the federal Rio Grande Project. Rio Grande Project water meets approximately 50% of municipal demand for a population of over 800,000.

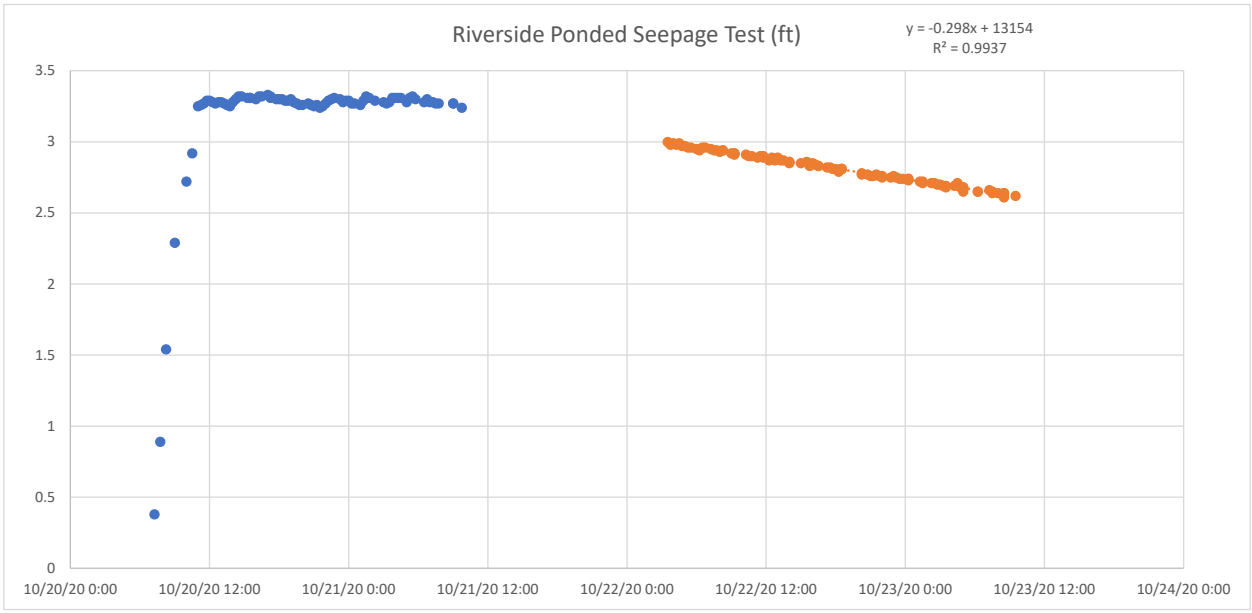
All construction was within the existing canal right-of-way, which was 100% previously disturbed earth. The photographs of the canal prior to construction were submitted to the Texas Historical Commission in accordance with an existing agreement between the Commission and the District.

3. Estimate of the Amount of Water Salvaged by Project

The total length of the new concrete lining for this project was approximately 5,500 feet or 1.04 miles. A ponding test was done on the Riverside Canal in 2020, located approximately 1,000 feet upstream of the Project heading. The steady-state seepage rate for the Riverside Canal test was 6.7 af/day/mile for a wetted perimeter of approximately 80 feet. The wetted perimeter of the Franklin Feeder is approximately 47 feet or 59% of the Riverside Canal perimeter. The prorated reduction in seepage rate based on the ratios of the wetted perimeter for the Franklin Feeder Canal is 3.9 af/day/mile. The total seepage rate of the portion of the Franklin Feeder Canal within the Project is 4.1 af/day (3.9 x 1.04).

Franklin Feeder conveys water diverted from the Rio Grande and treated sewage effluent discharge into Riverside Canal approximately 4,000 feet upstream of the Project. This results in the Franklin Feeder having flow for 10 months a year, even in drought years. December and

January are months when the flow is typically removed from the canal for maintenance. The completed concrete canal has a small amount of seepage that is estimated to be less than 0.1



af/day. The annual amount of seepage salvaged by the Project is estimated to be 1,200 af/yr or (4.1 – 0.1) x 303 days/year.

Figure 2: Riverside Canal Seepage Test
(located approximately 1,000 feet upstream of Project heading)

4. Construction Methods

The project consisted of common heavy construction methods used in the United States to concrete line an irrigation canal. The concrete placement uses a shotcrete pump and a specialized concrete mixture reinforced with poly fibers. This method is detailed in the U.S. Bureau of Reclamation report "Canal-lining Demonstration Project Year 10 Final Report" (2002 USBR).

5. Construction Materials

The primary materials used in the project were soil and concrete. The soil was used to narrow the width of the existing earthen canal, and the concrete was used to line the new flow prism. As discussed in Section 2 of this report, the concrete was a special mixture designed for concrete lining irrigation canals using a concrete pump (shotcrete). The specifications for the mixture are:

> Concrete batching and delivery shall meet requirements and specifications ASTM C94 and ACI304R as applicable, and the following specifications:
>
> **Application:** Pumpable mix for shotcrete application of 4" irrigation canal pavement

Cement: 7 sack minimum Type I/II low alkali cement content per cubic yard

Fly Ash: Class F fly ash content of 20% to 30% per cubic yard

Specified Strength: 2,600 P.S.I at 7 days and 4,000 P.S.I. at 28 days

Fiber: 3.0 lbs. per yard of 1.5" fibrillated fiber meeting ASTM C1116 and all specifications of Master Builder Solution Masterfiber F70

Superplasticizer: 1 to 2%, to be added in field as specified by the Construction Supervisor.

Air Entrainment: 6% air, plus or minus 1.5%

Slump: Maximum of 5-inch to be determined in the field by the Construction Supervisor

Aggregate: 3/8" minus

Retarder: Must meet ASTM C-494 Type B and all specifications of Euclid - Retarder 100 in a quantity and added at a location as determined by the Construction Supervisor.

Other materials used in the project include concrete curing compound, lumber and staking for concrete curbs, forms and turnouts valves for irrigation turnouts that had to be relocated, and miscellaneous construction supplies.

6. Summary of Project Results

The project completed the concrete lining of 5,500 linear feet of the Franklin Feeder Canal in El Paso County, Texas. The estimated annual water savings are 1,200 acre-feet per year. The project was documented in a video prepared by the Texas Water Development Board in August 2024 (https://www.youtube.com/watch?v=J_bwUUc2gEI). The video includes interviews with two of the District's farmers (stakeholders) serviced by the Franklin Feeder Canal.

7. References

2002 USBR, Swihart, Jay. Canal-lining Demonstration Project Year 10 Final Report. Denver, Colo.: Boise, Idaho: U.S. Dept. of the Interior, Bureau of Reclamation, Denver Technical Service Center, Civil Engineering Services, Materials Engineering Research Laboratory; Pacific Northwest Region, Water Conservation Center.

APPENDIX A – Project Photographs

Earthwork and narrowing of the existing canal looking downstream from the starting location of the project

Completed earthwork and narrowing of the existing canal looking downstream from the starting location of the project

Placement of geotextile fabric canal looking downstream from the starting location of the project

Completed replacement turnout structure

Placement and finishing of shotcrete liner on the right bank of the canal

Canal in operation after construction completed

B – Example Materials Testing Results

construction quality control
testing and engineering

SHOTCRETE COMPRESSIVE STRENGTH TEST RESULTS REPORT

ASTM C 42, C 1140

4606 Titanic Avenue
El Paso, TX 79904
Ph. 915-771-7766
Fax 915-771-7786

CQC PROJECT NO: ATCQC23-001-16.3

PROJECT NAME: **Franklin Feeder Canal Project**
Pete Rodriguez Road west of Socorro Road
City of Socorro, El Paso County, Texas

REPORT DATE: 1/29/2024

CLIENT: El Paso County Water Improvement District #1
13247 Alameda Avenue
Clint, Texas 79938

PCN No.: 24-0210

TEST INFORMATION:

SAMPLE DATE: 1/24/2024 **CQC TECH:** MV

TECH ARRIVAL TIME: 11:45 AM **STAND-BY TIME:**
TECH DEPARTURE TIME: 3:00 PM 2.25 hrs.

Material Information

Specified Strength: 3,000 psi ☑ Per Batch Ticket ☐ AMD
Batch Time: 1:00 PM Plant: 410
Supplier: G.C.C.
Truck No.: 9908 Ticket No.: 41051756
Mix I.D. No.: 1546379, 3,000 PSI, SHOTCRETE
Water Added Onsite Before Sample: None Observed
Water Added Onsite After Sample: None Observed
Per Batch Ticket Water Withheld: Not Reported

Sample Information

Sample Time: 2:00 PM
Load: 10 cy
Accumulative: 10 cy
Ordered: 20 cy

Sample Type: Wood Forms (Panels)
Placement Method: Pump Placement
Weather Conditions: Overcast
Curing Method: Per ASTM

Test Location: Franklin Feeder Canal, inside canal slope on left bank, from 0 to 317'

Field Test Data

TEST	Results	Specification	Compliant / Non-Compliant	Truck Rejected / Accepted	Test Method
Slump	2 "	3" ± 1" ☑ Per Batch Ticket ☐ AMD	Compliant	Accepted by Client.	ASTM C-143
Air Content	4.0 %	--	--		ASTM C-231
Shotcrete Temperature	69 °F	40°F Min.-95°F Max. (ACI)	Compliant		ASTM C-1064
Ambient Temperature	56 °F	35°F Min.-100°F Max. (ACI)	Compliant		---
Initial Field Curing Temperature	-- High	-- Low			ASTM C-1064

N/A - Non Applicable / NS - Not Specified / AMD - Approved Mix Design

Remarks: --

Core Laboratory Test Data

Core No.	Panel No.	Diameter (in)	Area (sq.in.)	Core Length (in) Cored	Core Length (in) Capped	Length to Diameter Ratio L/D	Test Date	Age at Test (days)	Ultimate Load (lbs)	Correction Factor	Corrected Compressive Strength (psi)	% of Required Strength
1 A	Test Panel No. 1	3.75	11.04	5.25	5.70	1.52	1/27/2024	3	28,300	0.9616	2,460	82
1 B	Position ☑ Horizontal ☐ Vertical	3.75	11.04	5.50			1/31/2024	7				
1 C		3.75	11.04	5.50			2/21/2024	28				
1 D		3.75	11.04	5.25			2/21/2024	28				
1 E		3.75	11.04	5.25			3/20/2024	56				

NOTE:

TEST REMARKS: **Standby time due to shotcrete late arrival.**

TEST NOTIFICATIONS: Field Test Results were reported on-site to Mr. Rene Carmona of EPCWID#1 on 01/24/2024.

REMARKS:
[1] The compressive strength testing of these cores were conducted in general accordance with ASTM C42 test procedures.
[2] All test cores were loaded perpendicular to the horizontal plane of material placement.
[3] All test cores were capped with a high-strength sulphur compound.

REPORT DISTRIBUTION

1.) El Paso County Water Imp. District #1
jornelas@epcwid1.org
satilano@epcwid1.org
prodriguez@epcwid1.org

Supervised and Reviewed By:

Jaime Rojas, P.E.
Principal Engineer
TX License No. 89944
TBPE Firm Registration No. F-10632

FILE COPY

:/sf/bl/cs/jr

4606 Titanic Avenue
El Paso, TX 79904
Phone: (915) 771-7766
Fax: (915) 771-7786
E-mail: jrojas@cqceng.com
jrojascqc@sbcglobal.net

CQC Testing and Engineering, L.L.C.
"Call-Out"
Compaction Density Test Field Report

CQC Project No.: 2300116.3 Date: 1/25/2021 Relates to PCN No.: 21 0218-1

Project Name: FRANKLIN FEEDER CANAL IMPROVEMENTS

Client / Contractor: EPCWID#1

CQC Technician: LV

Gauge No.: 201530 DS: 1652 MS: 6416

AMBIENT TEMP (°F): Below 40 / 40 - 60 / (60 - 80) / Above 90

GROUND TEMP (°F): 60°

WEATHER: (Sunny) / Clear / Overcast / Rain / Snow / Freezing

WIND: Still / (Moderate) / High

HUMIDITY: Low / (Moderate) / High

Proctor / Moisture Values

	No.	(pcf)	(%)	No.	(pcf)	(%)
Existing Subgrade Soil Material		117.3	13.0			
Fill / Backfill Soil Material						
Aggregate Base Course						

Density Test No. / Proctor No.	General Test Location (A) Curb & Gutter B) Building Pad C) Trench Backfill D) Spot Footing E) Continuous Footing F) Manhole / Inlet G) Retaining Wall H) Road/Steel I) Driveway J) Sidewalk K) Pipeline)	STAND D-Count / M-Count	Test Depth from Grade	Probe Depth (in.)	ACHIEVED Wet Density (pcf) / Dry Density (pcf)	MEASURED % Comp / Moist Content %	SPECIFIED % Comp / Moist Content %	REMARKS Pass / Fail	Retests Required (Yes / No) / Retest No /PCN
	CANAL IMPROVEMENTS INSIDE CANAL RIGHT BANK, FROM RODRIGUEZ RD. APPROX 1500 FT EAST	D-	5"-6"	6"	125.8	96.6	95%	P	NO
		M-			113.3	11.1	+3		
	CANAL IMPROVEMENTS INSIDE CANAL RIGHT BANK, FROM RODRIGUEZ RD. APPROX 1500 FT EAST	D-	1	1	117.3	97.0	1	P	NO
		M-	↓	↓	104	12.3	↓		
	TOP OF BANK ACCESS RD. RIGHT BANK, FROM RODRIGUEZ RD. APPROX 1500 FT EAST	D-	1	1	124.2	95.5	95%	P	NO
		M-	↓	↓	112.0	10.9	+3		
	TOP OF BANK ACCESS RD. RIGHT BANK, FROM RODRIGUEZ RD. APPROX 1700 FT EAST	D-	1	1	123.5	95.1	1	P	NO
		M-	↓	↓	111.6	10.7	↓		
	TOP OF BANK ACCESS RD. RIGHT BANK, FROM RODRIGUEZ RD. APPROX 1900 FT EAST	D-	1	1	127.6	98.0	1	P	NO
		M-	↓	↓	114.9	11.0	↓		
		D-							
		M-							

Comments _____

Arrived at Site: 12:15PM Travel Time: 1.0 Stand by Time: 0

Departed from Site: 2:15PM Total Site Tech Time: 2.0 Bill Failures and Stand-by Time To: _____

Acknowledgement of Field Tests and Report, please print and date:

RPR: _____ Contractor Rep: _____

Company Name: _____ Company Name: _____

Date: _____ Date: _____

1) Client - White 2) File - Yellow

4606 Titanic Avenue
El Paso, TX 79904
Phone: (915) 771-7766
Fax: (915) 771-7786
E-mail: jrojas@cqceng.com

CQC Testing and Engineering, L.L.C.
"Call-Out"
Concrete, Flexural, Mortar and Grout Testing Field Report

Page 1 of ___

Project Name: FRANKLIN EAST CANAL IMPROVEMENTS **Date:** 1/26/2024

CQC Project No.: 73001163 **Relates to PCN No.:** 24 02733

Client: EPCWID#1 **CQC Technician:** JPV

WEATHER	Sunny	Clear	Overcast
	Rain	Snow	Freezing

HUMIDITY	Low	Moderate	High
WIND	Still	Moderate	High

Material Information

Specified Strength: _____ psi ☐ Per Batch Ticket ☐ AMD

Batch Time: _____ Plant:: _____

Supplier: _____

Truck No.: _____

Ticket No.: _____

Mix I.D. No.: _____

Water Added Onsite Before Sample: _____

Water Added Onsite After Sample: _____

Per Batch Ticket Water Withheld: _____

Placement Method: _____

Sample Information

Sample Time: _____

Load: _____ cy

Accumulative: _____ cy

Ordered: _____ cy

A) Curb & Gutter B) Slab-on-Grade C) Spot Footing D) Continuous Footing
F) Manhole / Inlet G) Retaining Wall H) Pavement I) Driveway J) Sidewalk

Sample Location:

Sample Collected In (Mold): Cylinders ☐ 4x8 ☐ 6x12 Beams ☐ Rainhart Steel Mortar ☐ 2x2x2 Grout Prism ☐ Cardboard Box ☐ Blocks

Field Test Data

TEST	Results	Specification	Compliant / Non-Compliant	Truck Accepted (A) / Rejected (R)
Slump:	"	☐ Per Batch Ticket ☐ AMD		
Air Content:	%			
Concrete Temperature:	°F	40°F Min.-95°F Max. (Per ACI)		
Ambient Temperature:	°F	35°F Min.-100°F Max. (Per ACI)		
Unit Weight:	pcf			
Initial Field Curing Temp.	°F High	°F Low (ASTM C-1064)		
Ground Temperature:	°F			

N/A - Non Applicable / NS - Not Specified / AMD - Approve Mix Design

"LAB. INFORMATION ONLY, STRENGTH RESULTS WILL FOLLOW"

Specimen No.	Dimensions (In.)	Avg. Area (in.)	Age at Test (days)	Date Tested	Maximum Load (lbs.)	Compressive / Flexural Strength (psi)	Fracture / Type	% of Spec.
A								
B								
C								
D								
E								
F								

Comments: * CANCELLED ONSITE / TRUCK LEFT

Arrived at Site: 8:00AM Travel Time: 1.0 Stand by Time: 0

Departed from Site: 8:00AM Total Tech Time: 0 Bill Failures and Stand-by Time To: _____

Acknowledgement of Field Tests and Report, please print and date:

RPR: _____ Contractor Rep.: _____

Company Name: _____ Company Name: _____

Date: _____ Date: _____

1) Client - White 2) File - Yellow

C – Engineering Drawings Cover Page

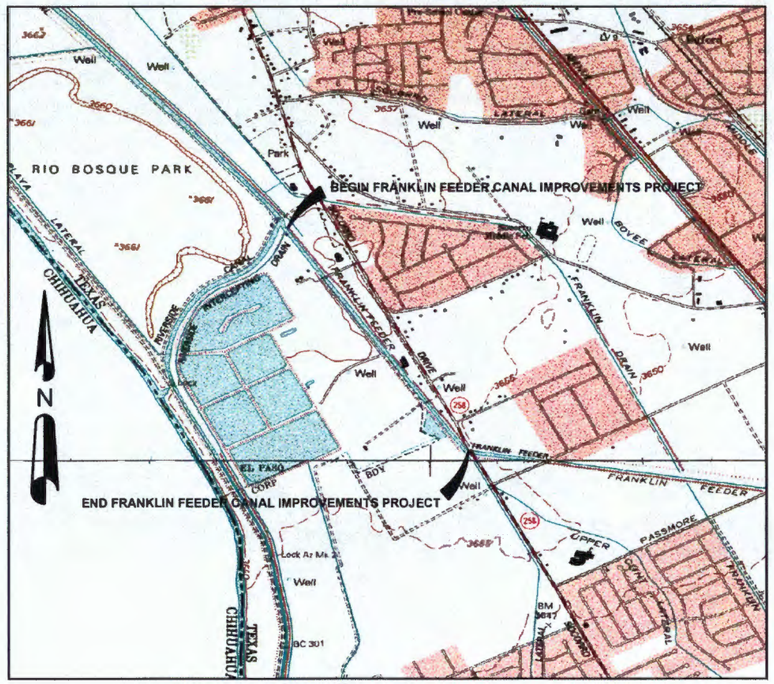
DRAWINGS FOR CONSTRUCTION OF

Franklin Feeder Canal Improvements

PREPARED FOR

EL PASO COUNTY WATER IMPROVEMENT DISTRICT NO. 1

NO.	SHEET TITLE
1.	COVER SHEET
2.	GENERAL NOTES
3.	OVERALL LAYOUT
4.	PLAN AND PROFILE STA 0+00 TO STA 6+00
5.	PLAN AND PROFILE STA 6+00 TO STA 12+00
6.	PLAN AND PROFILE STA 12+00 TO STA 18+00
7.	PLAN AND PROFILE STA 18+00 TO STA 24+00
8.	PLAN AND PROFILE STA 24+00 TO STA 30+00
9.	PLAN AND PROFILE STA 30+00 TO STA 36+00
10.	PLAN AND PROFILE STA 36+00 TO STA 42+00
11.	PLAN AND PROFILE STA 42+00 TO STA 48+00
12.	PLAN AND PROFILE STA 48+00 TO STA 54+00
13.	PLAN AND PROFILE STA 54+00 TO END
14.	TYPICAL CANAL CROSS SECTION
15.	CANAL DETAILS - EXISTING STRUCTURES
16.	MISCELANEOUS DETAILS



PROJECT LOCATION MAP
NTS

APPROVED BY:

for El Paso County Water Improvement District No. 1 — Date: 9/21/2023

SUBMITTED BY:

STATE OF TEXAS
ALLIE W. BLAIR
63707
REGISTERED PROFESSIONAL ENGINEER

A.W. Blair, P.E., Ph.D.
EPCWID District Engineer — Date: 9/21/2023

NO.	DATE	REVISION	APPV'D
1	9/21/23	REMOVED DUPLICATED NOTES ON SHEET 2	AWB
1	8/17/23	REVISED SHEET 2 FOR NOTES	AWB

El Paso County Water Improvement District No. 1

P.O. Box 749 | 13247 Alameda Ave. Clint, Texas 79836-0749

(915) 872-4000 | Fax (915) 851-0091 | www.epcwid.org

9/21/2023