

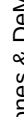
Attachment 6

Designs

VOLUME 2 OF 2

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AMERICAN FORK WATERSHED PLAN		 FRANSON CIVIL ENGINEERS 1276 South 820 East Suite 100 American Fork, UT 84003 T: (801) 756-0309 F (801) 756-0481	 Jones & DeMille Engineering, Inc. CIVIL & STRUCTURAL ENGINEERING - SURVEYING - GIS - ENVIRONMENTAL - MATERIALS TESTING 1.800.748.5275 www.jonesanddemille.com	APPROVAL RECOMM.		PROJECT DESIGN ENGINEER		DATE
AMERICAN FORK AND LEHI				NO.	DATE	REMARKS		
COVER SHEET, LOCATION MAPS				REVISIONS		SCALE:	DWG NAME:	UPDATED:
UTAH COUNTY				NONE		Generals		4/11/2023 4/11/2023
SHEET NO.		A1						

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A1	COVER SHEET, LOCATION MAPS
A2	GENERAL NOTES, SHEET INDEX
A3	LEGEND
A4	LOCATION MAP

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H1	SITE PLAN
H2	DEMOLITION AND EXCAVATION PLAN
H3	CHANNEL IMPROVEMENTS PLAN AND PROFILE

1. ALL UTILITY LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING BLUE STAKES AND FOR LOCATION OF ALL UTILITIES. 1-800-662-4111.
2. TRAFFIC CONTROL IS TO CONFORM WITH MUTCD STANDARDS AND UDOT STANDARDS. CONTRACTOR SHALL MAINTAIN ALL TRAFFIC CONTROL AND SIGNAGE.
3. CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES (WATER AND DRAINAGE SERVICES, DRIVEWAYS, AND ACCESS ROADS, ETC.) DURING CONSTRUCTION AND ENSURE THEY REMAIN IN PLACE AND OPERATIONAL (UNLESS OTHERWISE NOTIFIED BY PROPERTY OWNER).
4. PIPE LENGTHS SHOWN ON PLAN SHEETS ARE HORIZONTAL.
5. SAFE CONSTRUCTION PROCEDURES AND WORKING CLEARANCES ARE TO BE MAINTAINED AT ALL TIMES WHILE WORKING NEAR POWER LINES. CONTRACTOR TO FOLLOW ALL APPLICABLE OSHA STANDARDS.
6. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK AND SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
7. UNLESS DETAILED, SPECIFIED, OR OTHERWISE INDICATED ON THE DRAWINGS, CONSTRUCTION SHALL BE AS INDICATED IN THE APPLICABLE TYPICAL DETAILS AND GENERAL NOTES. TYPICAL DETAILS ARE MEANT TO APPLY EVEN THOUGH NOT REFERENCED AT SPECIFIC LOCATIONS ON THE DRAWINGS.
8. WHERE NO CONSTRUCTION DETAILS ARE SHOWN OR NOTED FOR ANY PART OF WORK, DETAILS SHALL BE THE SAME AS FOR OTHER SIMILAR WORK.
9. ORDER OF PRIORITY: SPECIAL PROVISIONS, SPECS, DETAILS, PLANS, SUMMARY.
10. CONTRACTOR REQUIRED TO VIDEO TAPE PROJECT AREA PRIOR TO CONSTRUCTION BEGINNING.
11. CONTRACTOR TO PRESERVE, PROTECT OR REPLACE ALL SURVEY MONUMENTS. REPLACEMENT SHALL BE BY STANDARD SURVEY QUALITY.
12. CONTRACTOR SHALL NOTIFY ALL AFFECTED RESIDENTS AND BUSINESSES 24 HOURS BEFORE DISCONNECTING WATER LINES. COORDINATE WITH AMERICAN FORK CITY PUBLIC WORKS.
13. CONTRACTOR MUST OBTAIN AMERICAN FORK CITY RIGHT OF WAY EXCAVATION PERMIT BEFORE STARTING WORK AND CONFORM TO ALL AMERICAN FORK CITY ORDINANCES, STANDARDS, AND POLICIES.
14. THE HORIZONTAL DISTANCE BETWEEN PRESSURE WATER MAINS AND SANITARY SEWER LINES SHALL BE AT LEAST 10 FEET. WHERE A WATER MAIN AND SEWER LINE MUST CROSS, THE WATER MAIN SHALL BE AT LEAST 18 INCHES ABOVE THE SEWER LINE. SEPARATION DISTANCE SHALL BE MEASURED EDGE TO EDGE. IF HDPE ALTERNATIVE IS USED THE HORIZONTAL DISTANCE WILL BE DETERMINED IN THE FIELD.
15. BACTERIA TESTING: 2 TESTS A MINIMUM OF 24 HOURS APART
16. CONTRACTOR SHALL MEET ALL AMERICAN FORK CITY STANDARDS AS OUTLINED IN THE AMERICAN FORK CITY STANDARD, DRAWINGS, AND SPECIFICATIONS. IF THERE IS A CONFLICT BETWEEN APWA AND THE CITY'S STANDARDS THE MORE STRINGENT ONE SHALL GOVERN.
17. CONTRACTOR SHALL IMPORT ALL PIPE BEDDING MATERIAL AND ALL ROAD BASE MATERIAL
18. CONTRACTOR IS REQUIRED TO MEET ALL AMERICAN FORK CITY STORM WATER POLLUTION PREVENTION PLAN REQUIREMENTS.

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UTILITY CONTACTS		
COMPANY	CONTACT PERSON	PHONE NUMBER
QUESTAR GAS	DANIELLE WELLS (S.L.C MAPPING DEPT.)	801-324-3970
CENTURY LINK	ARLENE COMSTOCK	801-974-8130
ROCKY MOUNTAIN POWER	JOEL SIMMONS	503-813-6993
AMERICAN FORK (WATER/SEWER)	JAY BREMS (A.F. PUBLIC WORKS)	801-763-3060
AMERICAN FORK (BROADBAND)	GEORGE SCHADE	801-404-6396
COUNTY FIBER	ROBERT HANCOCK	801-851-8665
BLUE STAKES	BLUE STAKES	800-662-4111
COMCAST	GARY GOLDSTEIN	801-401-3041



UTAH COUNTY		AMERICAN FORK WATERSHED PLAN		FRANSON CIVIL ENGINEERS  1276 South 820 East Suite 100 American Fork, UT 84003 T: (801) 756-0309 F (801) 756-0481		 Jones & DeMille Engineering, Inc. CIVIL & STRUCTURAL ENGINEERING - SURVEYING - GIS - ENVIRONMENTAL - MATERIALS TESTING 1.800.748.5275 www.jonesandmille.com		<table><tr><td colspan="2">APPROVAL RECORD:</td><td colspan="2">PROJECT DESIGN ENGINEER</td><td colspan="2">DATE</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>NO.</td><td>DATE</td><td colspan="4">REMARKS</td></tr><tr><td></td><td></td><td colspan="4"></td></tr><tr><td colspan="2"></td><td colspan="4">REVISIONS</td></tr><tr><td>SCALE:</td><td>DWG NAME:</td><td colspan="2">UPDATED:</td><td colspan="2">4/11/2023</td></tr><tr><td>NONE</td><td>Generals</td><td colspan="2">PLOTTED:</td><td colspan="2">4/11/2023</td></tr></table>				APPROVAL RECORD:		PROJECT DESIGN ENGINEER		DATE								NO.	DATE	REMARKS												REVISIONS				SCALE:	DWG NAME:	UPDATED:		4/11/2023		NONE	Generals	PLOTTED:		4/11/2023	
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SHEET NO.		A2																																																			

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LEGEND

SECTION/VIEW/DETAIL TITLE LABELS

SECTION REFERENCES

A REFERS TO THE SECTION DESIGNATION LABEL (TOP)
4 REFERS TO THE SHEET WHERE THE VIEW/SECTION IS SHOWN (BOTTOM)

VIEW/DETAIL REFERENCES

A REFERS TO THE VIEW/DETAIL DESIGNATION LABEL (TOP)
7 REFERS TO THE SHEET WHERE THE DETAIL IS SHOWN (BOTTOM)

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SYMBOL LEGEND

GAS LINE	_____ G _____ G _____ G _____
FIBER OPTICS	_____ FO _____ FO _____ FO _____
BURIED TELEPHONE LINE	_____ TB _____ TB _____
BURIED COMMUNICATION LINE	_____ C _____ C _____ C _____
STORM DRAIN LINE	_____ SD _____ SD _____ SD _____
SEWER LINE	_____ S _____ S _____ S _____
WATER LINE	_____ W _____ W _____ W _____
POWER LINES	_____ OHP _____ OHP _____
TELEPHONE LINES	_____ T _____ T _____ T _____
IRRIGATION LINES	_____ IRR _____ IRR _____

ABBREVIATIONS

AC	ASPHALT CONCRETE PAVEMENT
BV	BUTTERFLY VALVE
BLDG.	BUILDING
CI	CAST IRON
Q	CENTER LINE
CLR	CLEAR
CO	CLEANOUT
COM	COMPRESSION FITTING
CONC	CONCRETE
CONST	CONSTRUCT
CTS	COPPER TUBE STEEL
C.Y.	CUBIC YARD
d	DEPTH OF FLOW
D	DIAMETER OF PIPE
DWG	DRAWING
DIA	DIAMETER
DIM.	DIMENSION
DI	DUCTILE IRON PIPE
E	EAST
EA	EACH
EL, ELEV	ELEVATION
ESMT	EASEMENT
EW	EACH WAY
EXIST OR EX	EXISTING
FIP	FEMALE IRON PIPE FITTING
FM	FORCE MAIN
FRP	FIBERGLASS REINFORCED PLASTIC
F , FL	FLOW LINE
FL, FLG	FLANGE FITTING
FE	FLANGE END
FT	FOOT
FPS	FEET PER SECOND
GV	GATE VALVE
HORIZ	HORIZONTAL
ID	INSIDE DIAMETER
", IN	INCH(ES)
INV	INVERT
LT	LEFT
MAX	MAXIMUM
MGD	MILLION GALLONS PER DAY
MIP	MALE IRON PIPE FITTING
MH	MANHOLE
MFRS	MANUFACTURERS
MJ	MECHANICAL JOINT FITTING
N	NORTH, FRICTION FACTOR
N/A	NOT APPLICABLE
#, NO	NUMBER
NTD	NOTED
NTS	NOT TO SCALE
PERM	PERMANENT
OC	ON CENTER
OD	OUTSIDE DIAMETER
OH	OVERHEAD
Q	PROPERTY LINE
PVC	POLYVINYL CHLORIDE
PWD	PUBLIC WORKS DEPARTMENT
Q	RATE OF FLOW
REINF	REINFORCEMENT, REINFORCING
REQD	REQUIRED
RES	RESERVOIR
REV	REVISION
RT	RIGHT
R/W	RIGHT OF WAY
S	SOUTH, SLOPE
ST STL	STAINLESS STEEL
STD	STANDARD
STA	STATION
T.B.	THRUST BLOCK
TB	TELEPHONE BOX
TEMP	TEMPORARY
TBM	TEMPORARY BENCH MARK
TYP	TYPICAL
UBC	UNTREATED BASE COURSE
UNO	UNLESS NOTED OTHERWISE
UG	UNDERGROUND
V	VELOCITY
VERT	VERTICAL
W	WEST

PIPE ABBREVIATIONS

PVC	POLYVINYL CHLORIDE PLASTIC PIPE
RCP	REINFORCED CONCRETE PIPE
VCP	VITRIFIED CLAY PIPE
CIP	CAST IRON PIPE
HDPE	HIGH DENSITY POLYETHYLENE
DIP	DUCTILE IRON PIPE
CMP	CORRUGATED METAL PIPE
CPP	CORRUGATED POLYETHYLENE PIPE
POLY	POLYETHYLENE PIPE

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AMERICAN FORK AND LEHI
LEGEND

UTAH
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SHEET NO. **A3**

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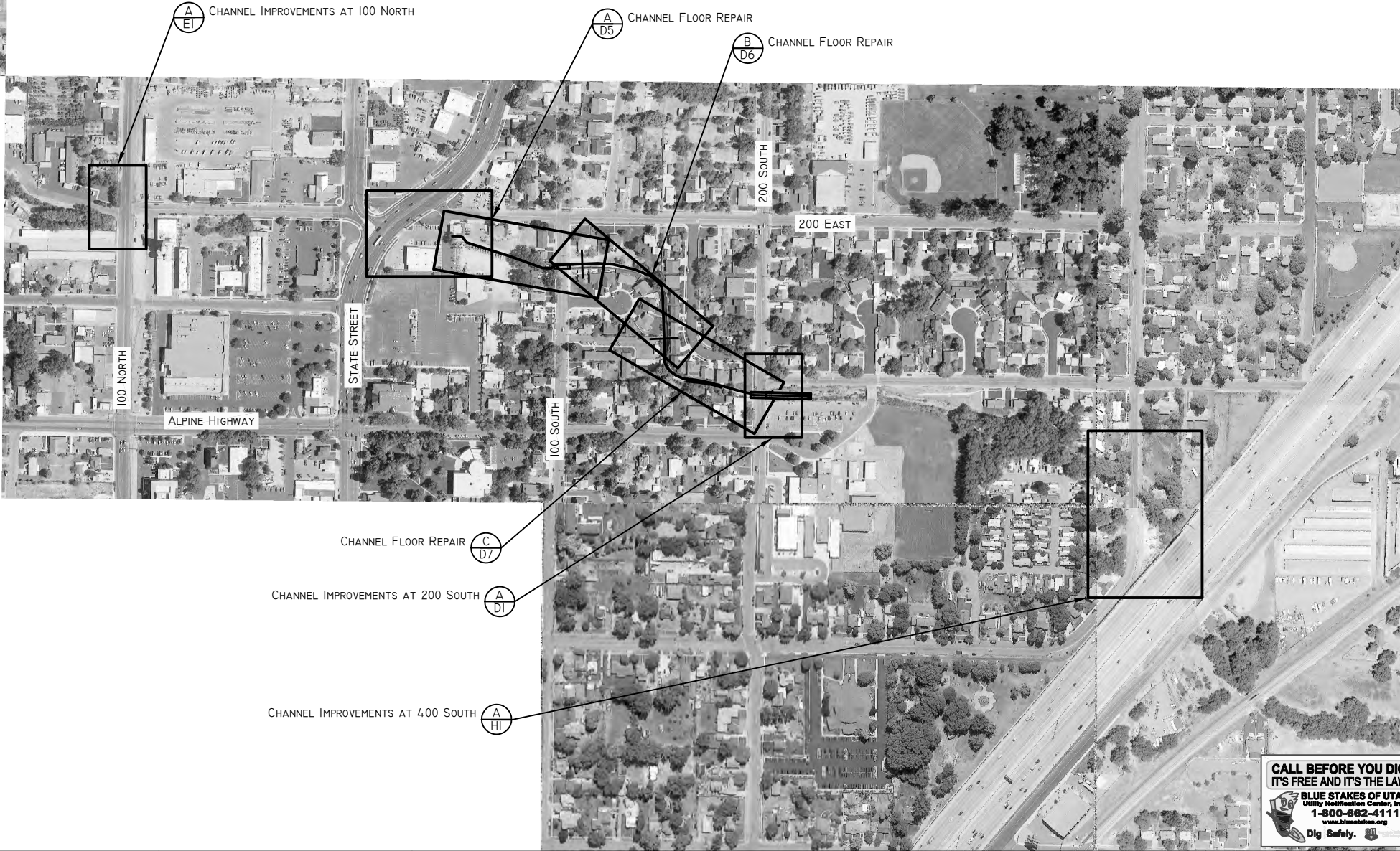
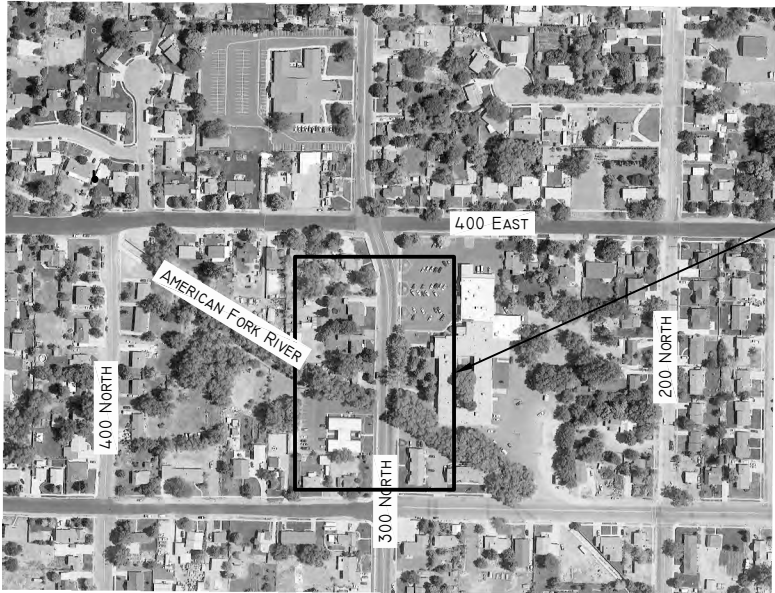
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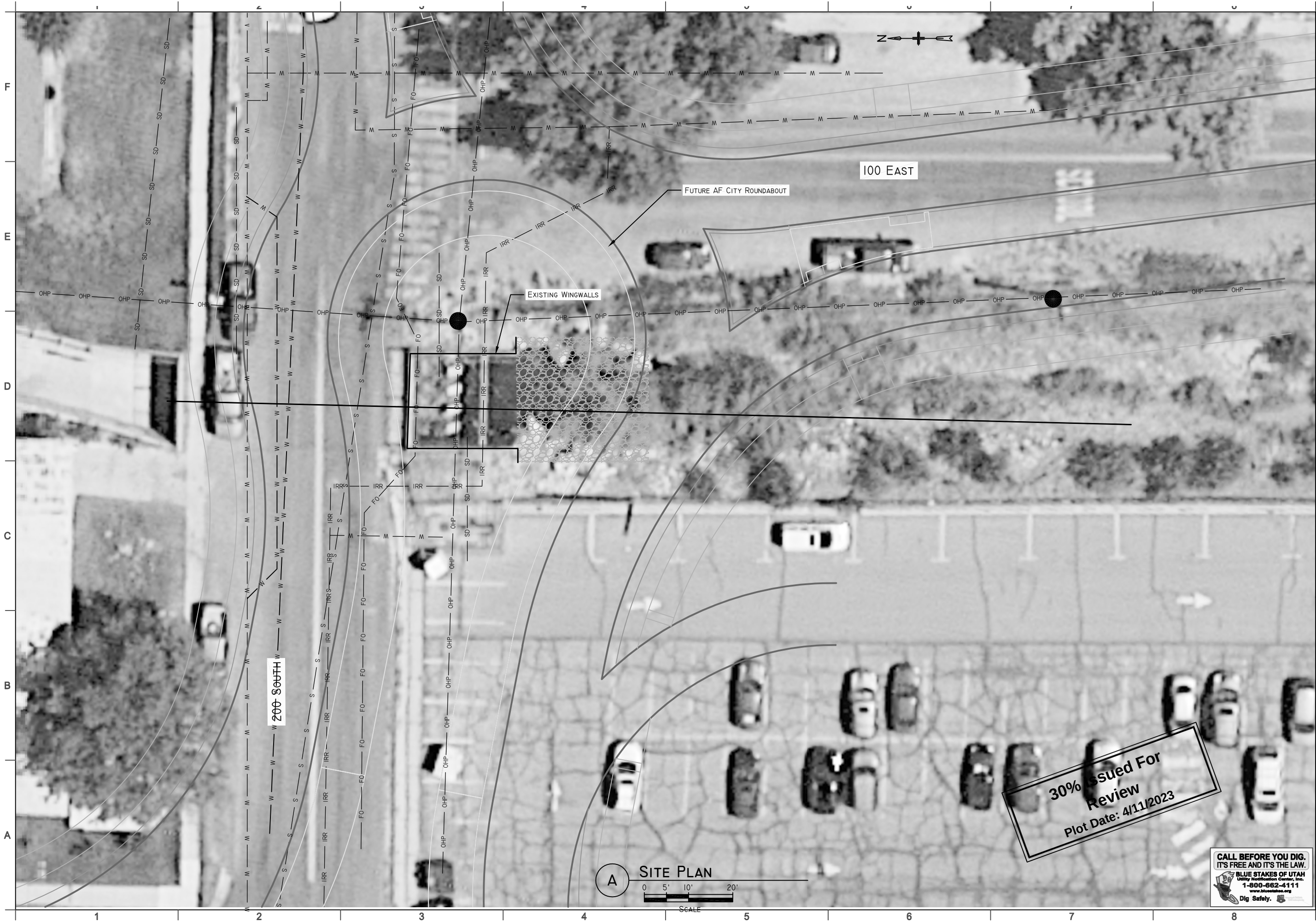
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AMERICAN FORK WATERSHED PLAN AMERICAN FORK AND LEHI LOCATION MAP		UTAH COUNTY		SHEET NO. A4			Jones & DeMille Engineering, Inc. CIVIL & STRUCTURAL ENGINEERING - SURVEYING - GIS - ENVIRONMENTAL - MATERIALS TESTING 1.800.748.5275 www.jonesandmille.com		APPROVAL RECOMM: PROJECT DESIGN ENGINEER DATE		
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						SCALE:		NONE		DWG NAME: Plan Sheets	
										UPDATED: 4/11/2023 PLOTTED: 4/11/2023	



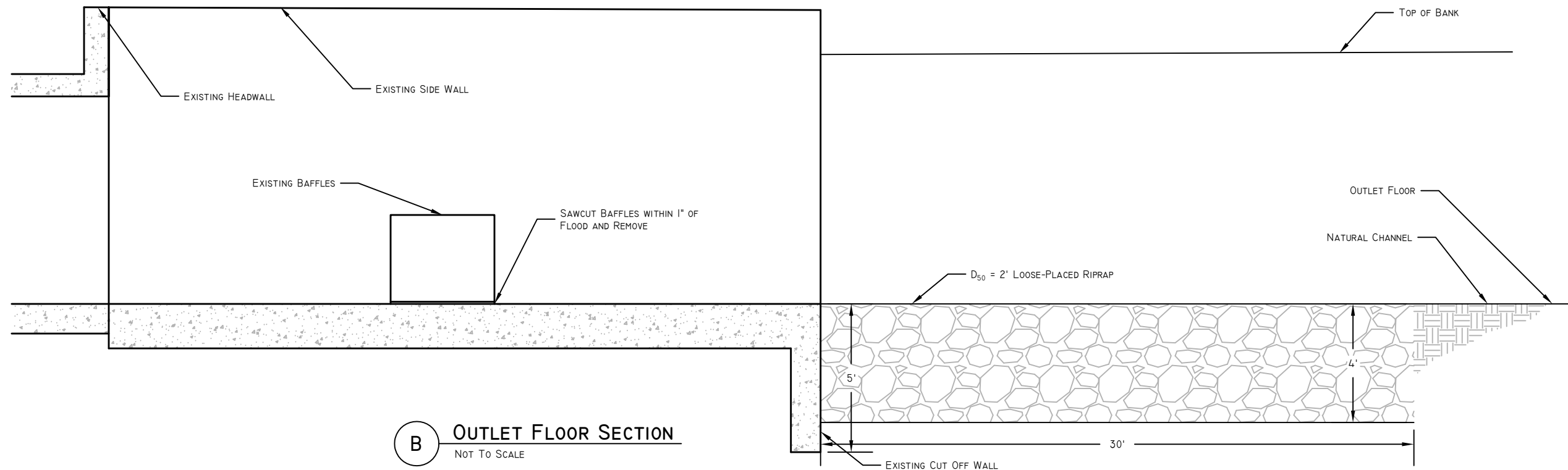
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AMERICAN FORK WATERSHED PLAN		JONES & DEMILLE Engineering, Inc. CIVIL & STRUCTURAL ENGINEERING - SURVEYING - GIS - ENVIRONMENTAL - MATERIALS TESTING www.jonesanddemic.com	
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SITE PLAN		PROJECT DESIGN ENGINEER DATE	
UTAH COUNTY		REMARKS NO. DATE	
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B OUTLET FLOOR SECTION
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		SCALE: NONE		

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AMERICAN FORK WATERSHED PLAN	
AMERICAN FORK AND LEHI	
DETAILS 1	
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BACKFILL TO LEVEL OF
SCHOOL PARKING LOT

EXISTING BOX CULVERT
AND HEADWALL

BACKFILL TO LEVEL OF EDGE
OF ASPHALT

20'

SAWCUT BAFFLES WITHIN
1" OF FLOOR AND REMOVE

D₅₀ = 3' HAND-PLACED RIPRAP
STACK 2 LAYERS OF RIPRAP
AGAINST BACKFILLED BANK

BACKFILL BANKS WITH 6" MINUS
NATIVE MATERIAL OR CLEAN WELL
GRADED GRANULAR BORROW MATERIAL
COMPACT TO 95% STANDARD
PROCTOR DENSITY

C OUTLET SECTION
NOT TO SCALE

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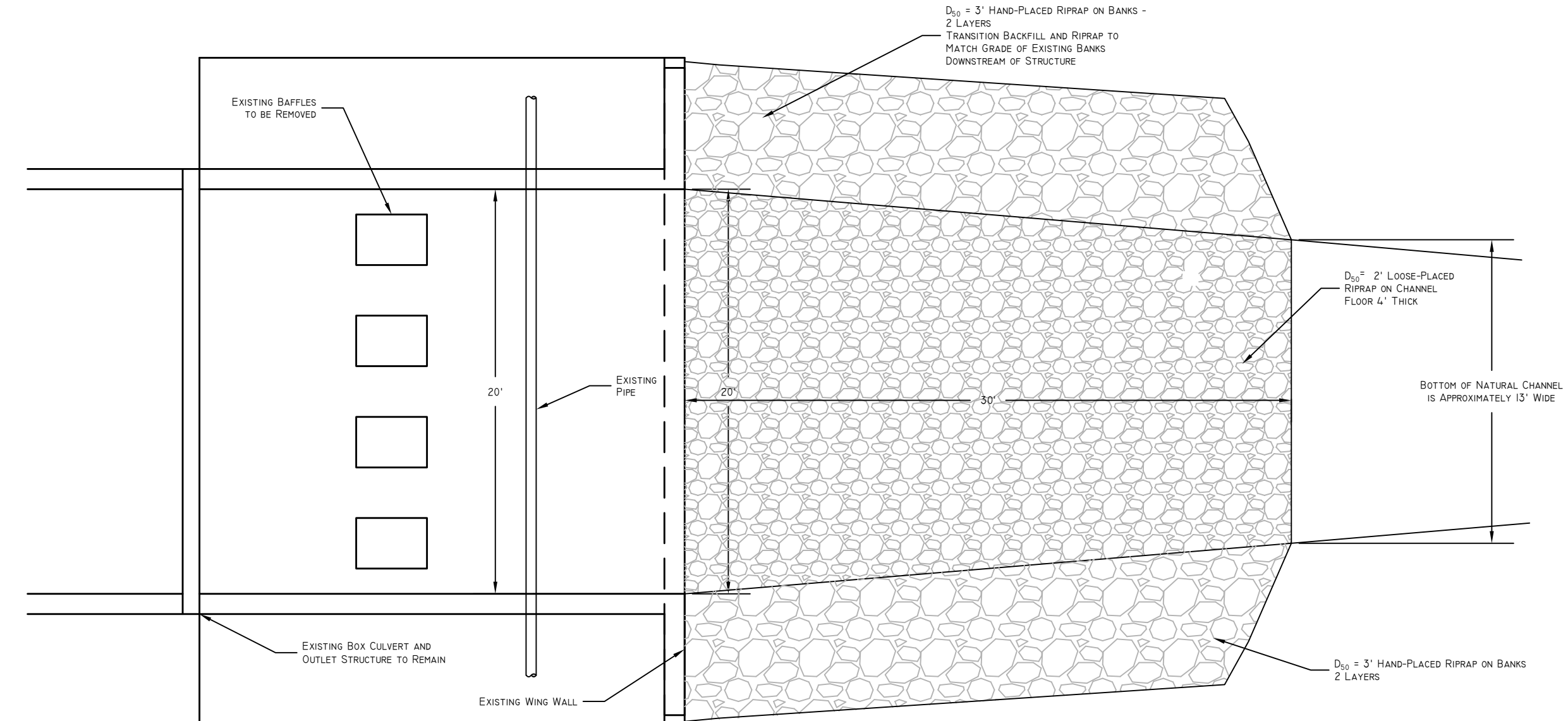
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AMERICAN FORK WATERSHED PLAN
AMERICAN FORK AND LEHI
DETAILS 2

UTAH
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SHEET NO. D3

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		Details		
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D **OUTLET PLAN VIEW**
NOT TO SCALE

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A PLAN VIEW STA. 0+00 - 5+00

0 10' 20' 40'

SCALE

- NOTES:
1. ALONG THE LENGTH OF THE RIVER CHANNEL A TRENCH OF VARYING DEPTH HAS ERODED INTO THE CONCRETE FLOOR.
 2. THE TRENCH ALONG THE ENTIRE LENGTH OF THIS RIVER SECTION IS TO BE REPAIRED.
 3. IT IS THE CONTRACTORS RESPONSIBILITY TO MANAGE THE RIVER FLOWS WITH SANDBAGS OR COFFER DAMS TO PROTECT THE WORK AREA.
 4. REPAIR CAN BE DONE IN SECTIONS AS IS CONVENIENT AND MANAGEABLE FOR THE CONTRACTOR.
 5. ACCESS TO THE CHANNEL FROM 30 SOUTH AND 200 SOUTH IS DIFFICULT. THE EASIEST ACCESS WOULD BE THROUGH SUPERIOR CONCRETES'S YARD.

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AMERICAN FORK WATERSHED PLAN
AMERICAN FORK AND LEHI
PLAN VIEW STA. 0+00 5+00

UTAH
COUNTY

SHEET NO. D5



B PLAN VIEW STA. 5+00 - 10+00

0 10' 20' 40'

SCALE

NOTES:

1. ALONG THE LENGTH OF THE RIVER CHANNEL A TRENCH OF VARYING DEPTH HAS ERODED INTO THE CONCRETE FLOOR.
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AMERICAN FORK AND LEHI	
PLAN VIEW STA. 5+00 10+00	
UTAH COUNTY	
SHEET NO.	D6

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C PLAN VIEW STA. 10+00 - 15+00
0 10' 20' 40'
SCALE

- NOTES:
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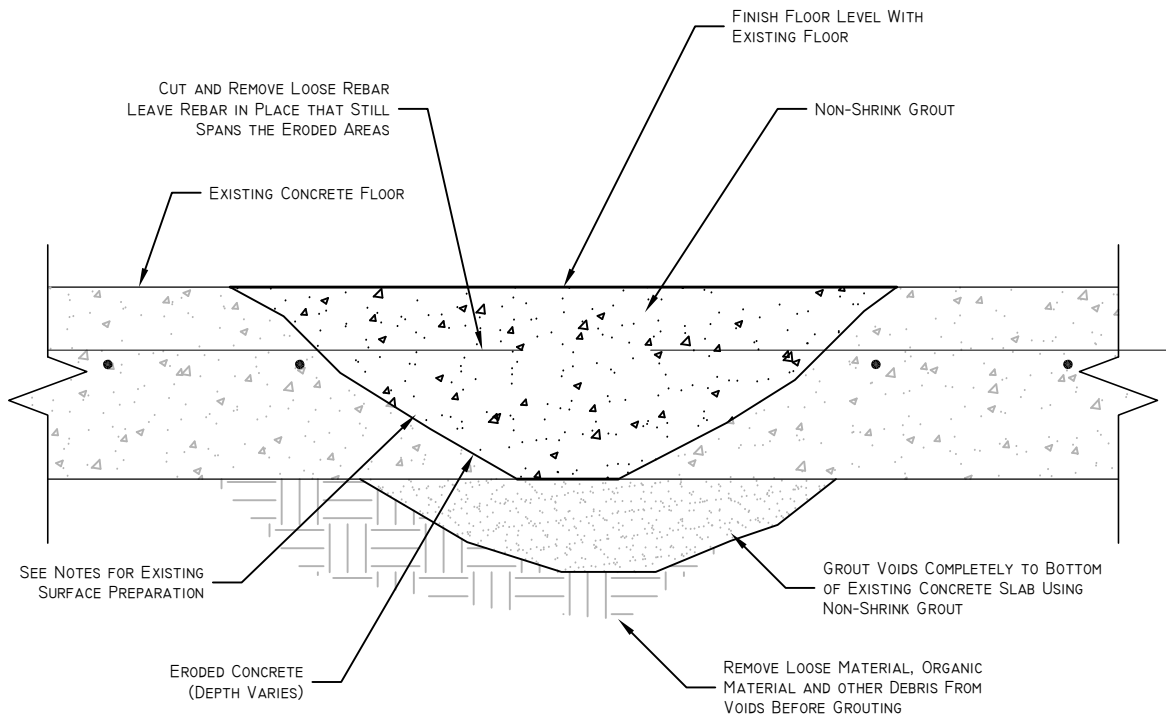
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PLAN VIEW STA. 10+00 15+00	
UTAH COUNTY	
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D **EXISTING FLOOR REPAIR**
NOT TO SCALE

EXISTING FLOOR REPAIR NOTES:

1. PERFORM REPAIR AFTER HIGH FLOW SPRING RUNOFF. CREATE TEMPORARY COFFER DAMS TO DIRECT RIVER FLOW AS NEEDED.
2. STORM WATER RUNOFF ENTERS THE RIVER DURING STORM EVENTS OR AT OTHER UNEXPECTED TIMES. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROTECT WORK SITE.
3. PREPARE EXISTING SURFACE BY REMOVING ALL LOOSE MATERIAL, INCLUDING ANY ORGANIC MATERIAL AND DEBRIS. SANDBLAST REBAR AND ENTIRE CONCRETE SURFACE TO REMOVE ANY LOOSE, FLAKY RUST, MILL SCALE, OIL, GREASE, OR ANY OTHER COATING OR FOREIGN SUBSTANCES. THE REBAR AND CONCRETE SURFACE SHALL BE MAINTAINED IN A CLEAN CONDITION UNTIL IS IS COMPLETELY EMBEDDED AND COVERED IN GROUT.

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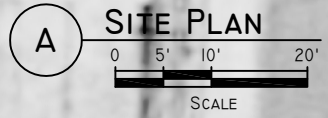
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AMERICAN FORK AND LEHI

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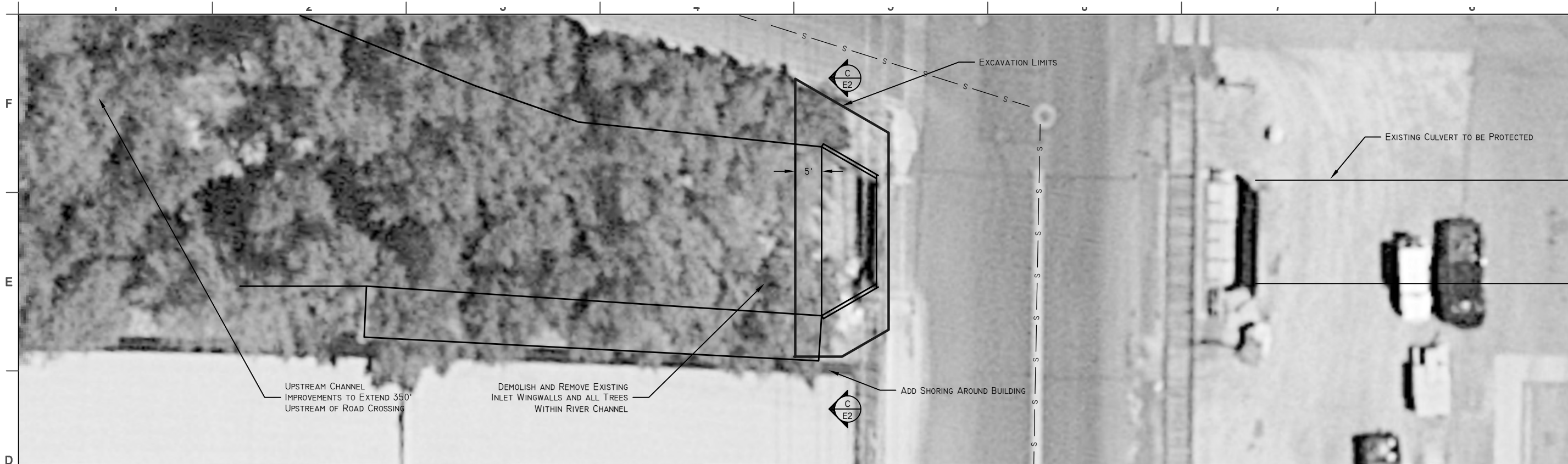
Dig Safely.

APPROVAL RECOMM.	PROJECT DESIGN ENGINEER		DATE
	REMARKS		
	NO.		DATE
SCALE:		DWG NAME:	REVISIONS
NONE		Plan Sheets 100 North	UPDATED: 4/11/2023 PLOTTER: 4/11/2023

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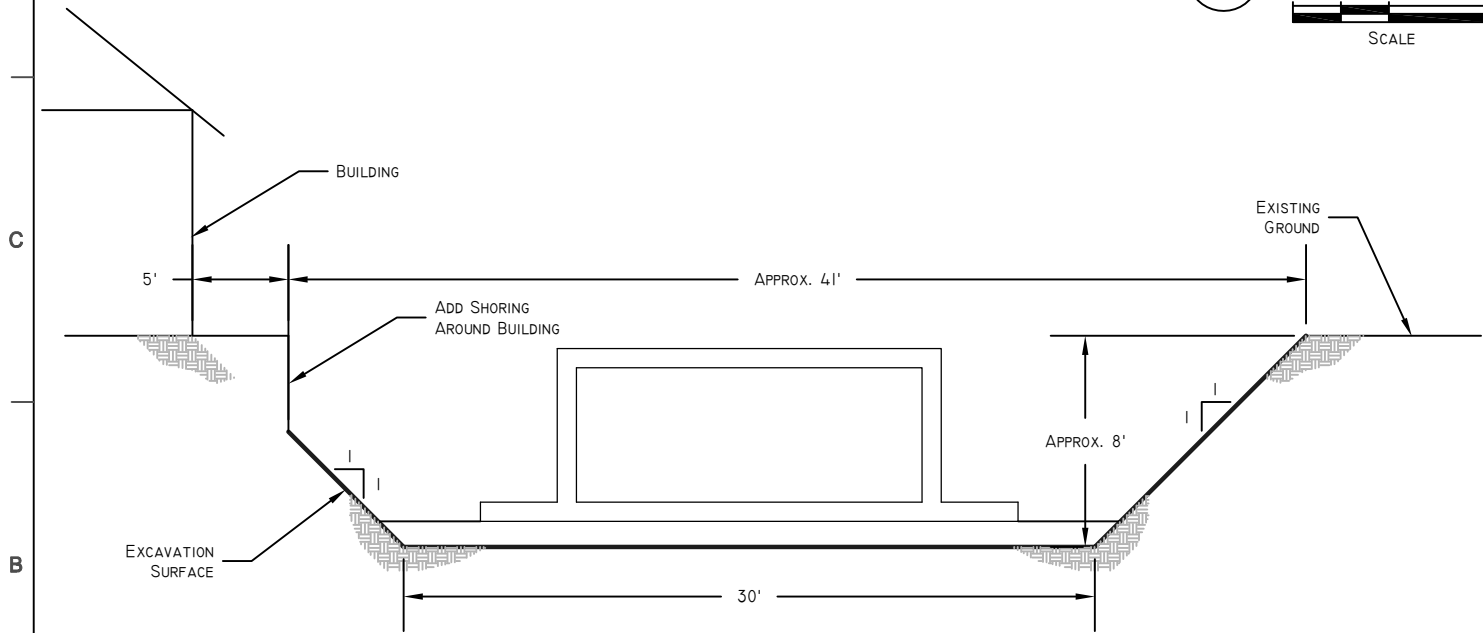
AMERICAN FORK WATERSHED PLAN	
AMERICAN FORK AND LEHI	
SITE PLAN	
UTAH COUNTY	
SHEET NO.	E1



B EXCAVATION

0 5' 10' 20'

SCALE



C EXCAVATION SECTION AT INLET

NOT TO SCALE

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	REMARKS		
SCALE:	DWG NAME:		Plan Sheets 100 North
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REVISED		DATE	
REVISIONS		DATE	
UPDATED:		4/11/2023	
PLOTTER:		4/11/2023	



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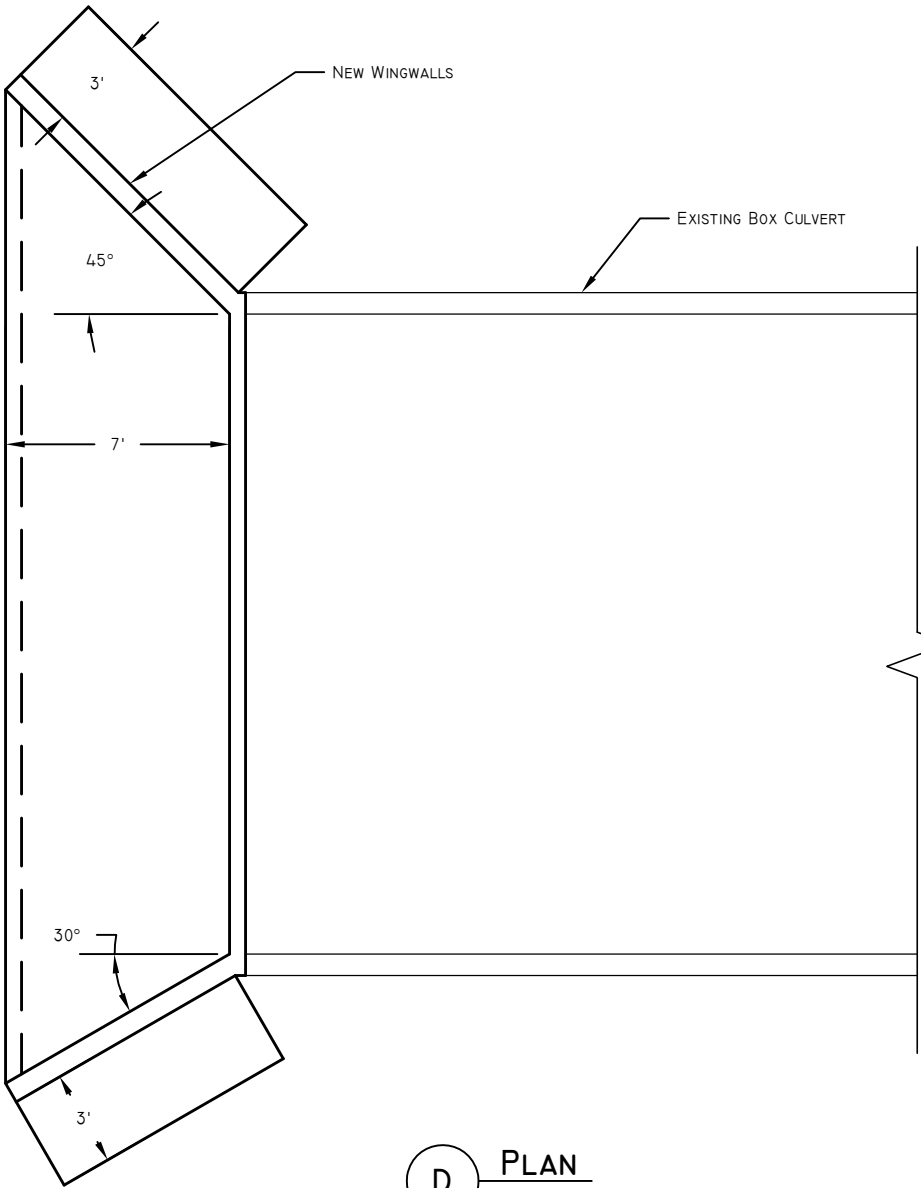
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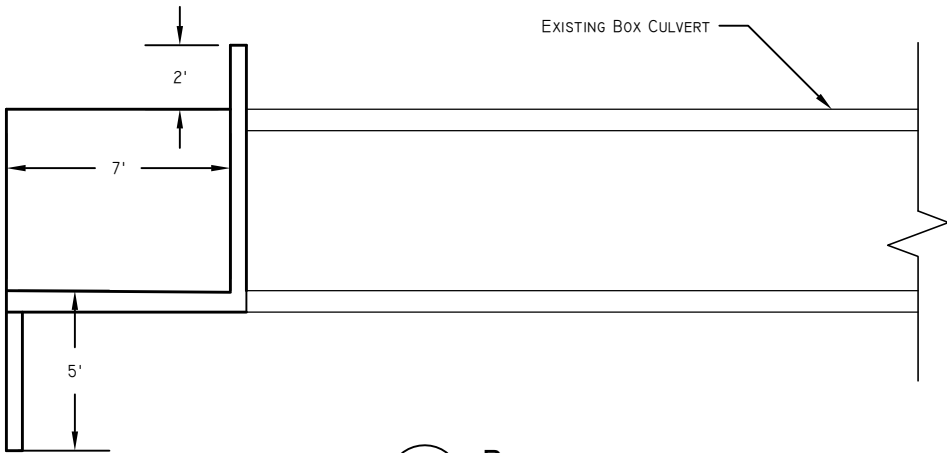
AMERICAN FORK WATERSHED PLAN	
AMERICAN FORK AND LEHI	
INLET EXCAVATION	
UTAH	
COUNTY	
SHEET NO.	E2

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D PLAN
NOT TO SCALE



E PROFILE
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APPROVAL		PROJECT DESIGN ENGINEER		DATE	
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		REMARKS			
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SCALE:		DWG NAME:		UPDATE: 4/11/2023	
NONE		Plan Sheets 100 North		PLOTTER: 4/11/2023	



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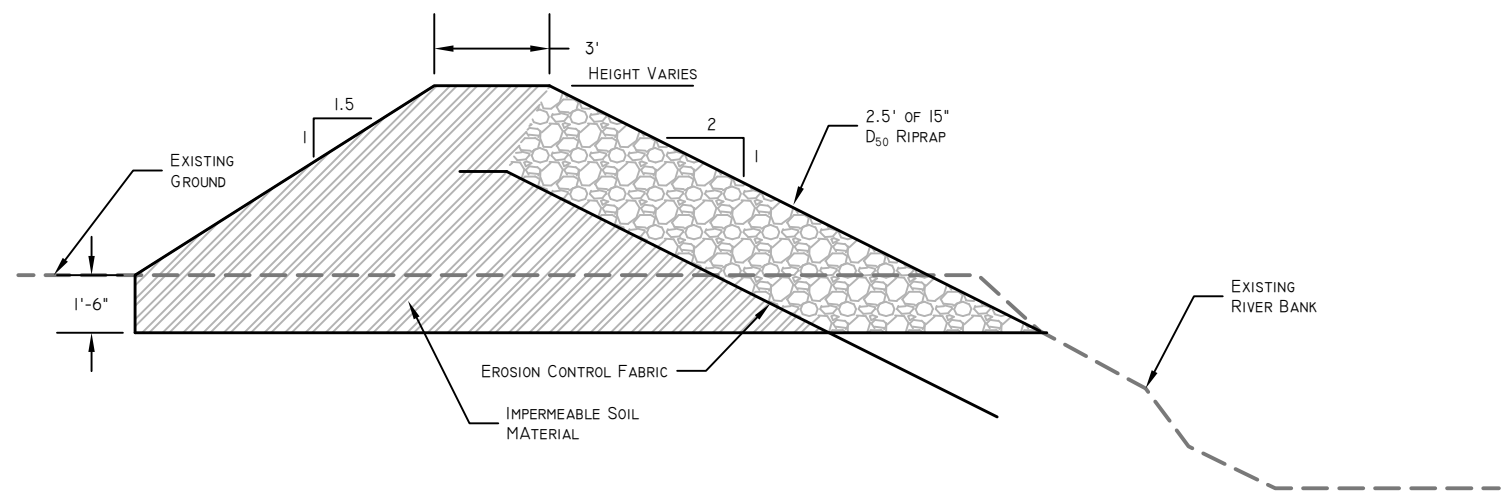
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AMERICAN FORK WATERSHED PLAN	
AMERICAN FORK AND LEHI	
INLET PLAN AND PROFILE	
UTAH COUNTY	
SHEET NO.	E3

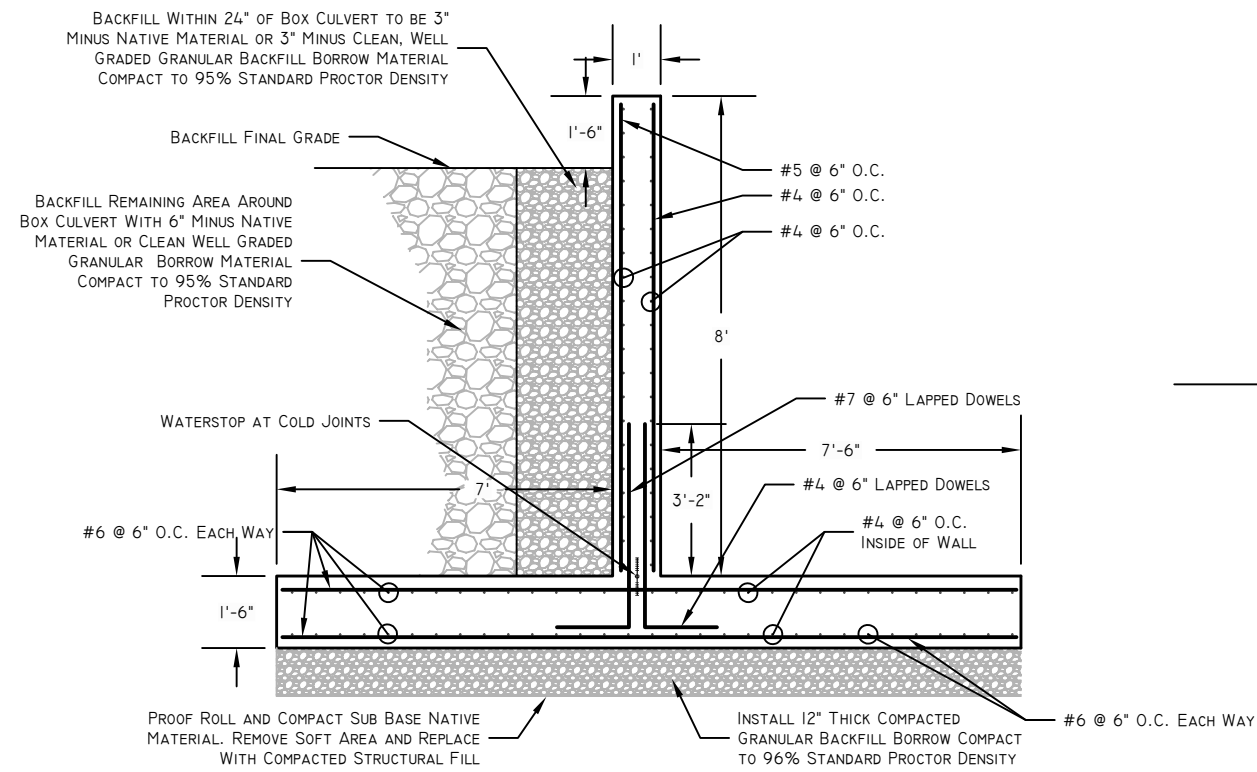
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1 2 3 4 5 6 7 8

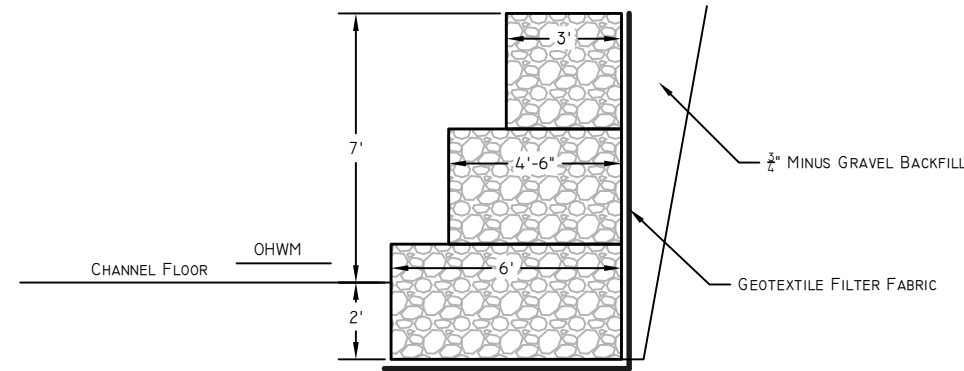
- NOTES:
- 1. FILL GABION BASKET WITH 3" TO 8" ROCK
 - 2. CONSTRUCT PER MANUFACTURER'S RECOMMENDATIONS.
 - 3. GEOTEXTILE FABRIC TO BE MIRAFI 160N OR EQUIVALENT
 - 4. BASKETS TO BE 36" HIGH



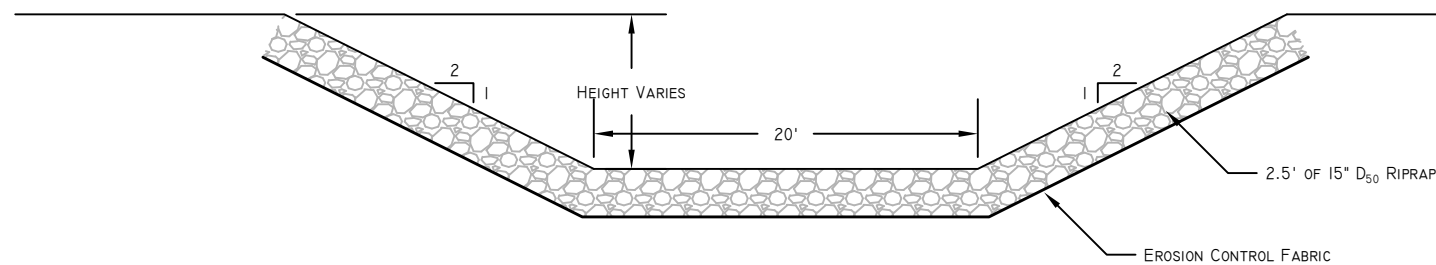
F ELEVATED BANK DETAIL
NOT TO SCALE



H WINGWALL SECTION
NOT TO SCALE



G GABION DETAIL
NOT TO SCALE



J RIVER CHANNEL IMPROVEMENT
NOT TO SCALE

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REMARKS		REVISIONS		DWG NAME: Plan Sheets 100 North	
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UPDATE: 4/11/2023		PLOTTER: 4/11/2023			

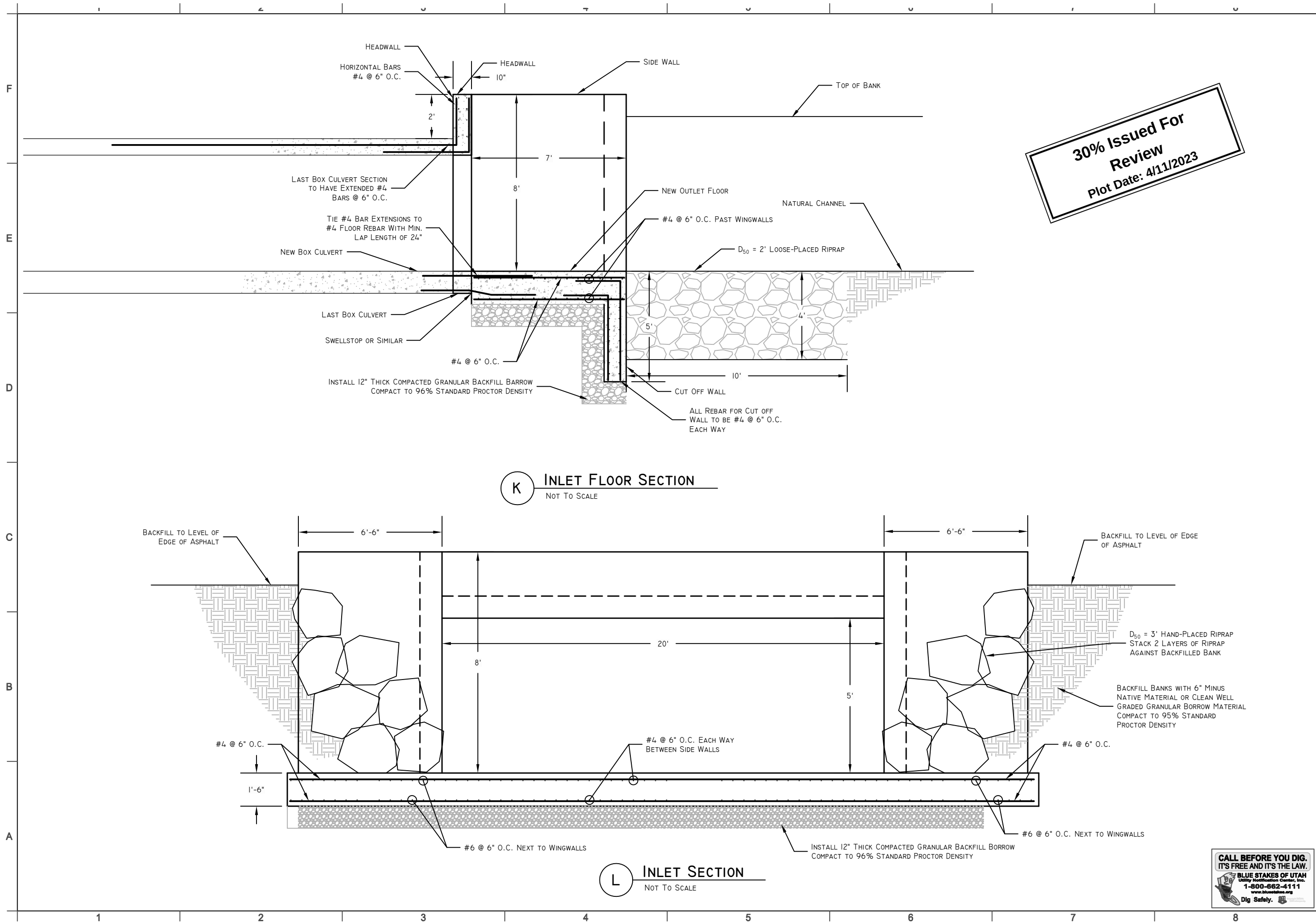
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AMERICAN FORK WATERSHED PLAN
AMERICAN FORK AND LEHI
DETAILS

UTAH
COUNTY

SHEET NO. E4



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Plot Date: 4/11/2023

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AMERICAN FORK AND LEHI					
SECTIONS					
UTAH COUNTY					
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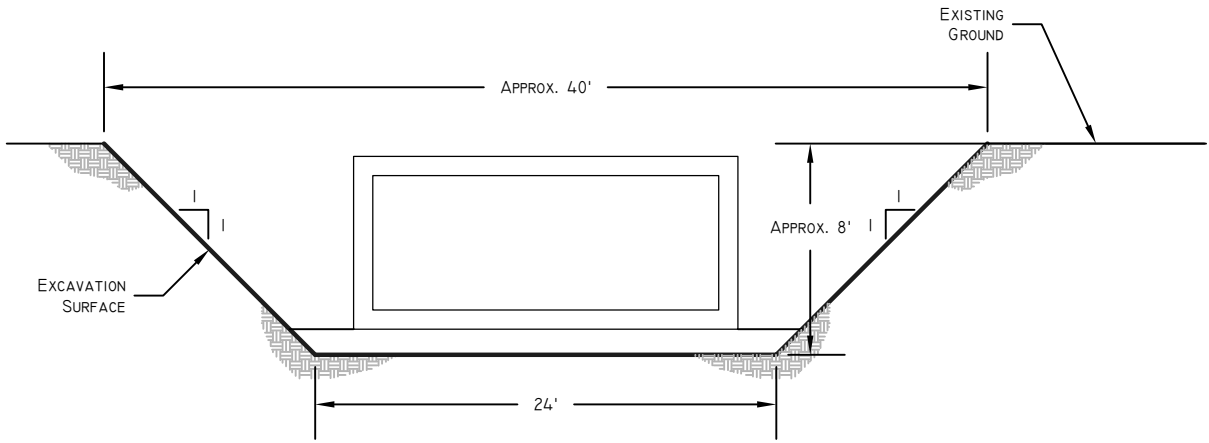
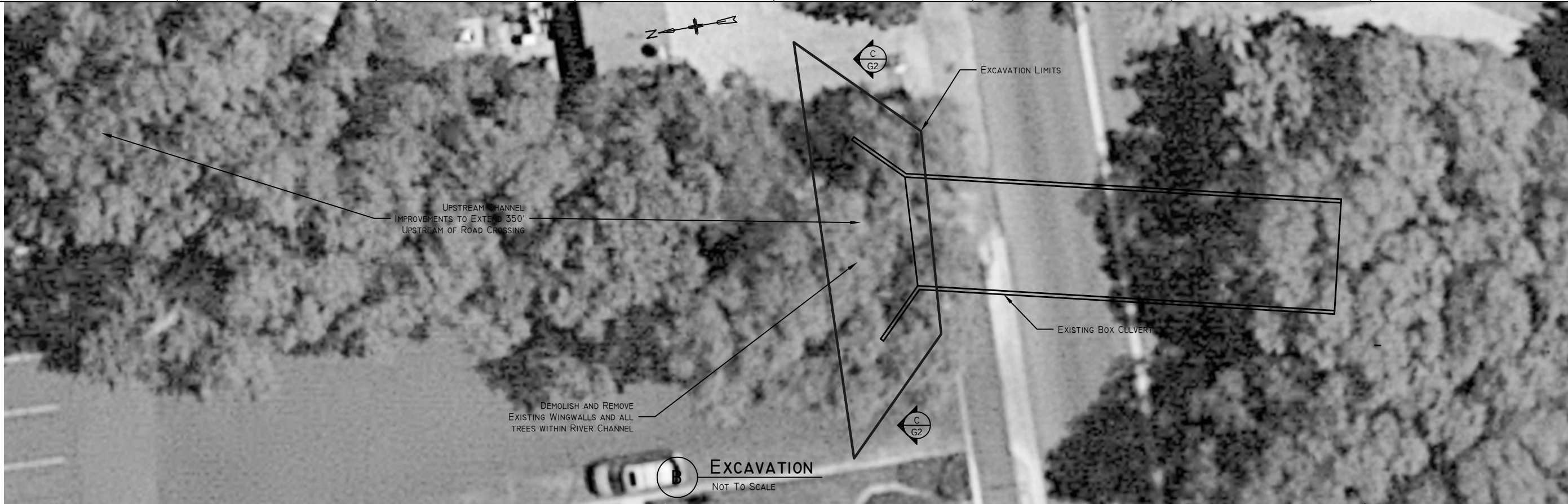
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SCALE:		DWG NAME:		UPDATED: 4/11/2023
NONE		Plan Sheets 300 North G Set		PLOTTED: 4/11/2023

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AMERICAN FORK WATERSHED PLAN	
AMERICAN FORK AND LEHI	
SITE PLAN	
UTAH	
COUNTY	
SHEET NO.	G1

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C EXCAVATION SECTION AT INLET
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		REMARKS			
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SCALE:		DWG NAME:		UPDATER: 4/11/2023	
NONE		Plan Sheets 300 North G Set		PLOTTER: 4/11/2023	

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AMERICAN FORK WATERSHED PLAN	
AMERICAN FORK AND LEHI	
EXCAVATION	
UTAH COUNTY	
SHEET NO.	G2

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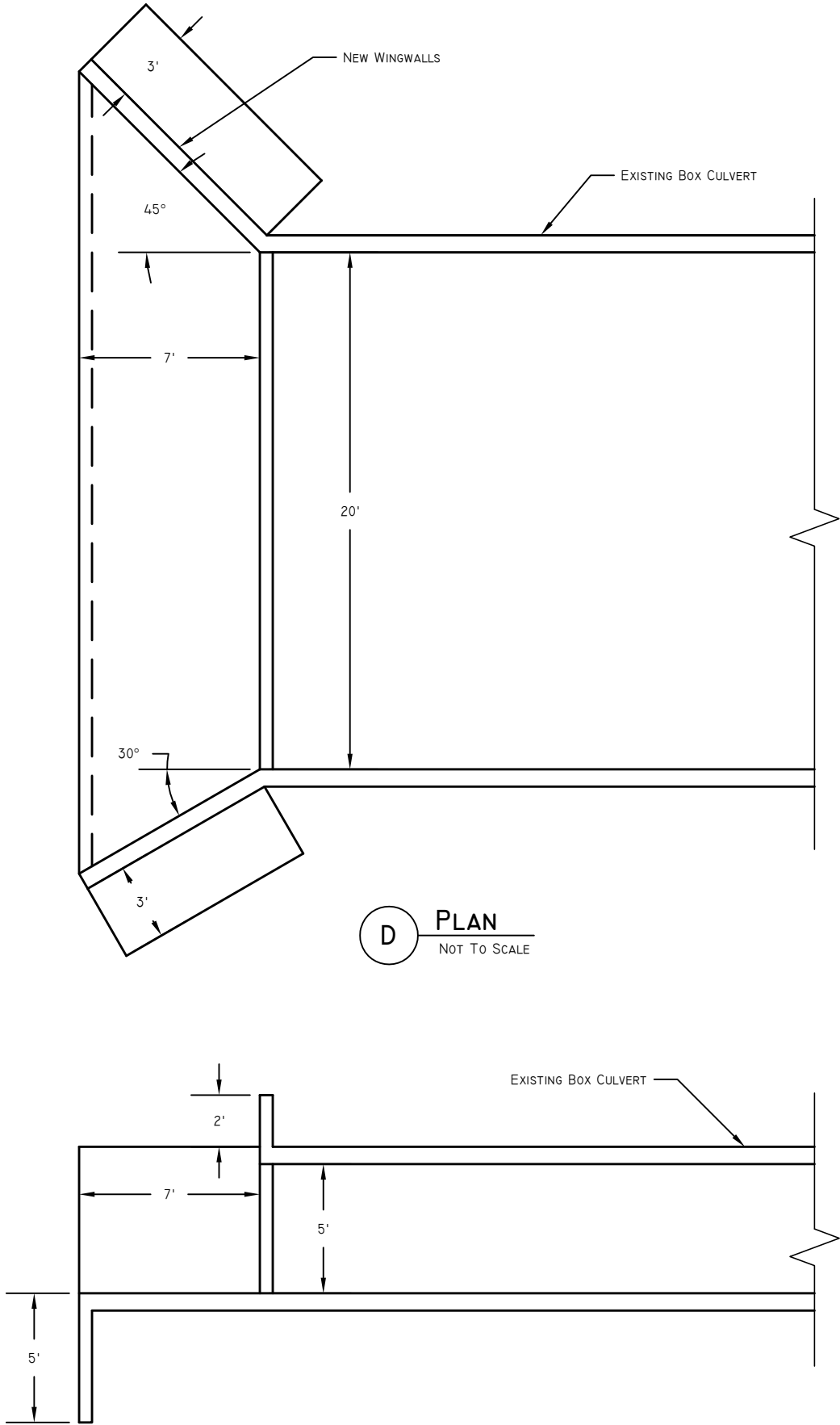
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		SCALE:		NONE	
		UPDATED:		4/11/2023	
		PLOTTER:		4/11/2023	



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AMERICAN FORK WATERSHED PLAN	
AMERICAN FORK AND LEHI	
PLAN AND PROFILE	
UTAH COUNTY	
SHEET NO.	G3

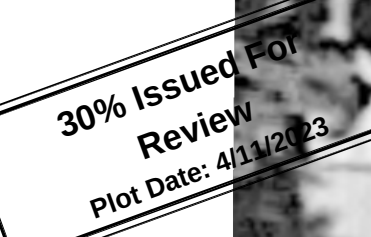
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UTAH COUNTY		AMERICAN FORK WATERSHED PLAN		AMERICAN FORK AND LEHI		SECTIONS		 FRANSON CIVIL ENGINEERS 1276 South 820 East Suite 100 American Fork, UT 84003 T: (801) 756-0309 F (801) 756-0481 www.jonesanddemille.com		 Jones & DeMille Engineering, Inc. CIVIL & STRUCTURAL ENGINEERING - SURVEYING - GIS - ENVIRONMENTAL - MATERIALS TESTING 1.800.748.5275 www.jonesanddemille.com		APPROVAL RECOMM: _____		PROJECT DESIGN ENGINEER _____		DATE _____							
										NO. _____		DATE _____		REMARKS _____		REVISIONS _____		SCALE: NONE		DWG NAME: _____		UPDATED: 4/11/2023 PLOTTED: 4/11/2023 Plan Sheets 300 North G Set	



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Plot Date: 4/11/2023

DEMOLISH AND REMOVE
STEEL TANK RETAINING
WALL AND ALL TREES
WITHIN RIVER CHANNEL

UPSTREAM CHANNEL
IMPROVEMENTS TO EXTEND 500
UPSTREAM OF ROAD CROSSING

DEMOLISH AND REMOVE
EXISTING RETAINING WALL
AND ALL TREES WITHIN
RIVER CHANNEL

PRIVATE DRIVE

400 SOUTH

B

EXCAVATION PLAN

A horizontal scale bar with tick marks at 0, 5', 10', and 20'. The word "SCALE" is centered below the bar.

AMERICAN FORK WATERSHED PLAN

AMERICAN FORK AND LEHI

DEMOLITION & EXCAVATION PLAN

UTAH
COUNTY

SHEET NO. **H2**

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SCALE: NO

PROJECT DESIGN ENGINEER DATE

REMARKS

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400 South
UPDATED: 4/11/2023
PLOTTED: 4/11/2023

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SCALE: NO

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AMERICAN FORK WATERSHED PLAN

AMERICAN FORK AND LEHI

DEMOLITION & EXCAVATION PLAN

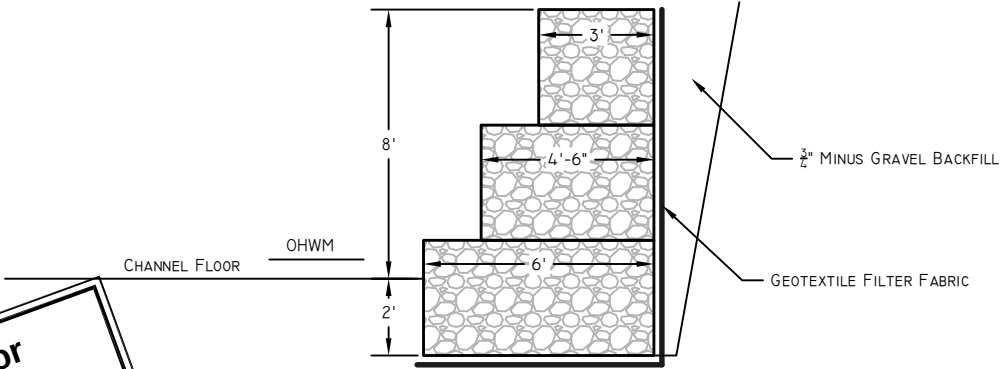
UTAH
COUNTY

SHEET NO. **H2**

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C GABION DETAIL
NOT TO SCALE

- NOTES:
1. FILL GABION BASKET WITH 3" TO 8" ROCK
 2. CONSTRUCT PER MANUFACTURER'S RECOMMENDATIONS.
 3. GEOTEXTILE FABRIC TO BE MIRAFI I60N OR EQUIVALENT
 4. BASKETS TO BE 36" HIGH

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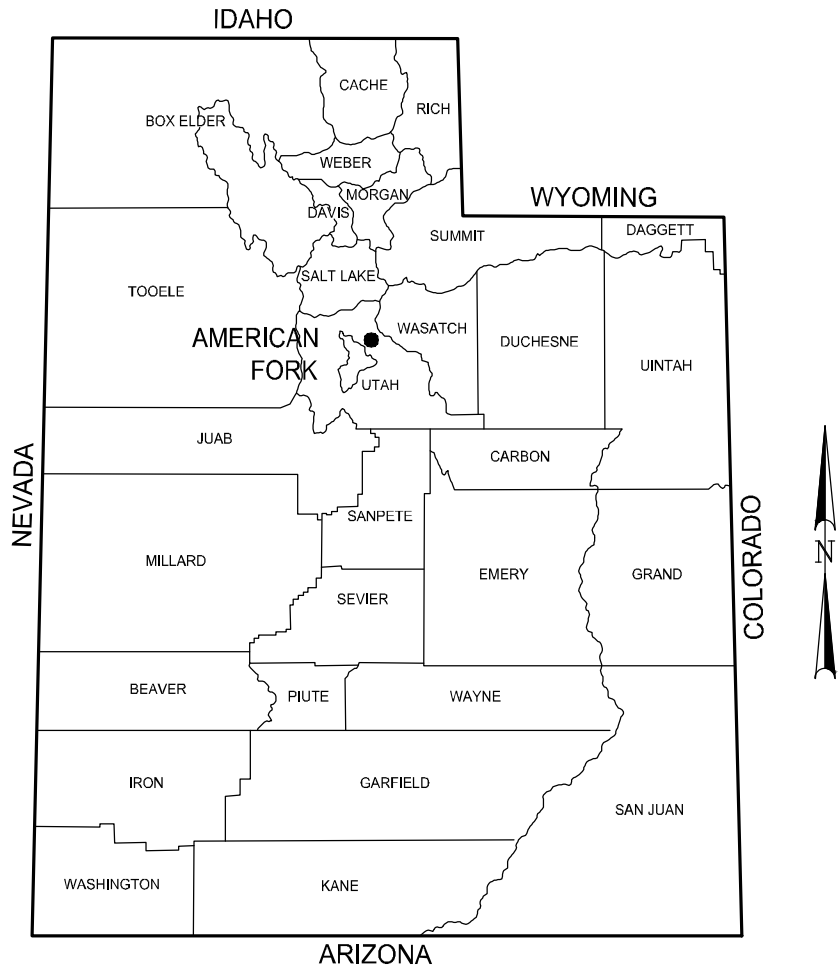
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AMERICAN FORK WATERSHED PLAN
AMERICAN FORK AND LEHI
CHANNEL IMPROVEMENTS PLAN AND PROFILE

UTAH
COUNTY
SHEET NO. H3

APPROVAL	PROJECT DESIGN ENGINEER	DATE
RECOMM.		
	REMARKS	
	REVISIONS	
	DWG NAME:	4/11/2023
	H Set Channel Improvements 400 South	4/11/2023
SCALE:	NONE	

AMERICAN FORK WATERSHED PLAN
AMERICAN FORK AND LEHI
2023

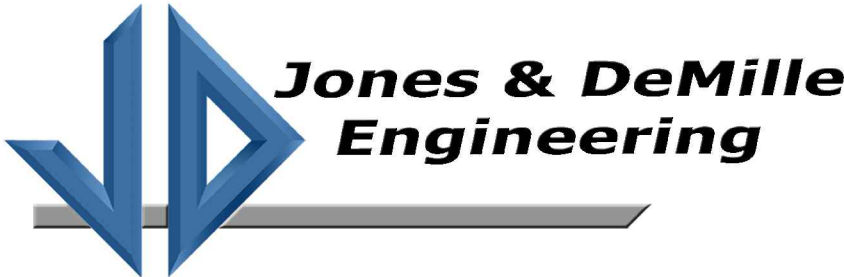


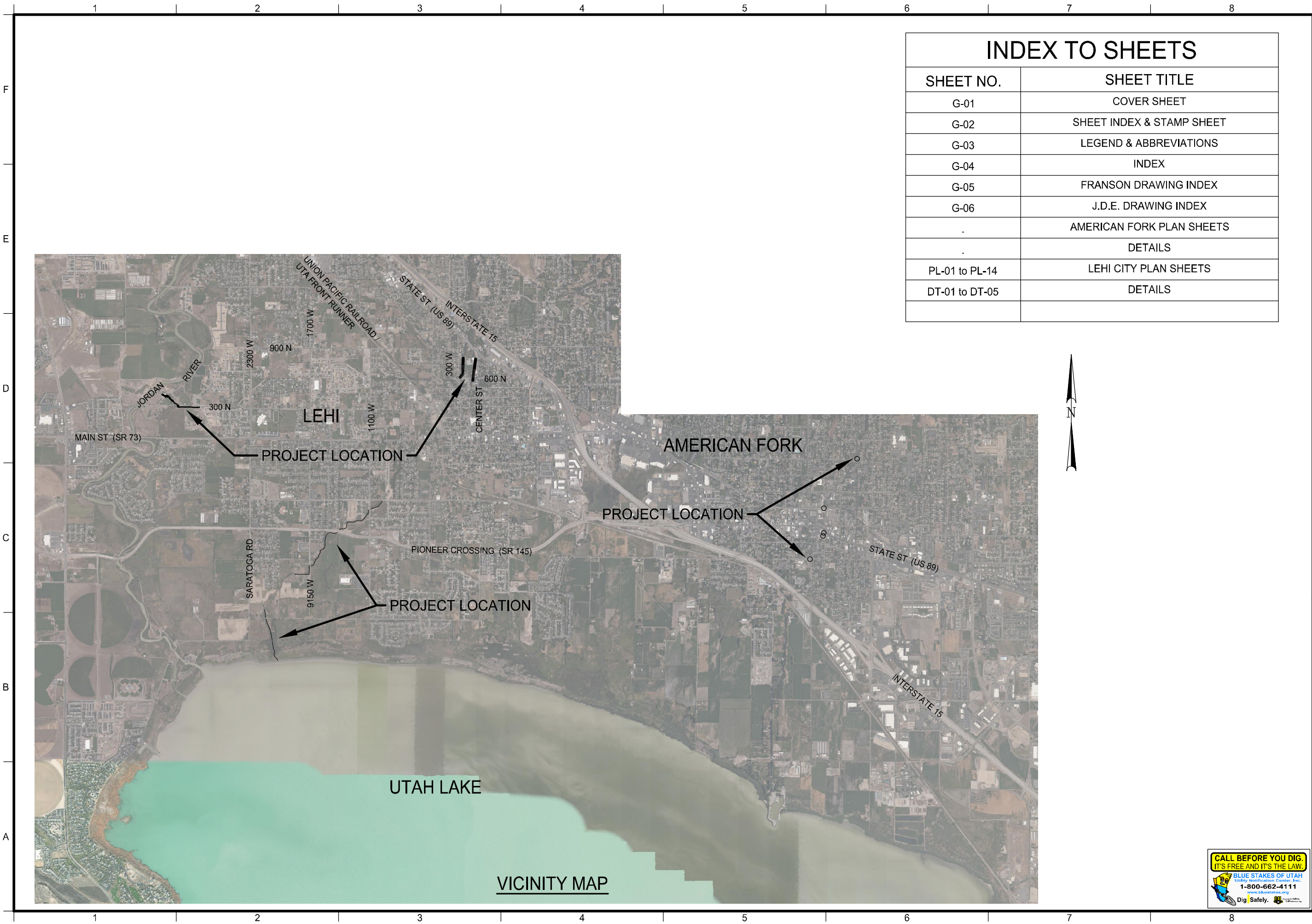
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INDEX TO SHEETS	
SHEET NO.	SHEET TITLE
G-01	COVER SHEET
G-02	SHEET INDEX & STAMP SHEET
G-03	LEGEND & ABBREVIATIONS
G-04	INDEX
G-05	FRANSON DRAWING INDEX
G-06	J.D.E. DRAWING INDEX
.	AMERICAN FORK PLAN SHEETS
.	DETAILS
PL-01 to PL-14	LEHI CITY PLAN SHEETS
DT-01 to DT-05	DETAILS

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DWG NAME:

SCALE:

TITLE

UPDATED: 6/16/2022

PLOTTED: 2/27/2023

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AMERICAN FORK WATERSHED PLAN

AMERICAN FORK AND LEHI

SHEET INDEX

UTAH
COUNTY

SHEET NO. G-02

LEGEND & ABBREVIATIONS

EXISTING FEATURES

	SANITARY SEWER LINE
	SANITARY SEWER MANHOLE
	CULINARY WATER LINE
	CULINARY WATER VALVE
	BURIED POWER LINE
	OVERHEAD POWER LINE
	BURIED TELEPHONE LINE
	OVERHEAD TELEPHONE LINE
	BURIED CABLE TV LINE
	OVERHEAD CABLE TV LINE
	FIBER OPTIC LINE
	NATURAL GAS LINE
	IRRIGATION LINE
	STORM DRAIN
	FENCE LINE (BARBED OR STOCKTIGHT)
	FENCE LINE (CHAIN LINK)
	DRAINAGE CULVERT
	CONCRETE SURFACING (SIDEWALK, CURB, GUTTER, ETC.)
	FLOW LINE OF DITCH
	EDGE OF ASPHALT SURFACING
	EDGE OF GRAVEL SURFACING
	EDGE OF DIRT SURFACING
	FIRE HYDRANT
	WATER METER
	STRUCTURE
	POWER POLE & GUY WIRE
	TREE
	DELINEATOR POST
	STREET SIGN
	TELEPHONE PEDESTAL
	MAILBOX
	WATER MANHOLE
	LIGHT POLE

MISC. FEATURES

	SUBDIVISION BOUNDARY LINE
	LOT LINES
	EXISTING RIGHT OF WAY LINE
	EXISTING N/A LINE
	EXISTING CITY BLOCK LINES
	PROPOSED RIGHT-OF-WAY LINE
	SECTION LINE
	QUARTER SECTION LINE
	(P.U.E.) PUBLIC UTILITY EASEMENT
	DEED LINE
	PROPERTY LINE
	PROPERTY LINE

ABBREVIATIONS

TBC	TOP BACK OF CURB	EPP	POWER POLE
FLG	FLOW LINE OF GUTTER	SMH	SEWER MANHOLE
LOC	LIP OF CURB	CMH	COMMUNICATION MANHOLE
TSW	TOP OF SIDEWALK	R/W	RIGHT-OF-WAY
TOC	TOP OF CONCRETE	T.C.E.	TEMPORARY CONSTRUCTION EASEMENT
EOA	EDGE OF ASPHALT	P.U.E.	PUBLIC UTILITY EASEMENT
TOA	TOP OF ASPHALT		
TOG	TOP OF GRATE		
FLC	FLOW LINE OF CULVERT	STA	STATION
SW	SIDEWALK	L / LT	LEFT
FG	FINISHED GROUND	R / RT	RIGHT

PROPOSED FEATURES

	SANITARY SEWER LINE
	SANITARY SEWER MANHOLE
	SANITARY SEWER SERVICE
	CULINARY WATER LINE
	CULINARY WATER VALVE
	BURIED POWER LINE
	OVERHEAD POWER LINE
	BURIED TELEPHONE LINE
	OVERHEAD TELEPHONE LINE
	BURIED CABLE TV LINE
	OVERHEAD CABLE TV LINE
	FIBER OPTIC LINE
	NATURAL GAS LINE
	IRRIGATION LINE
	STORM DRAIN
	FENCE LINE (BARBED OR STOCKTIGHT)
	FENCE LINE (CHAIN LINK)
	DRAINAGE CULVERT
	EDGE OF ASPHALT
	EDGE OF CONCRETE
	FIRE HYDRANT
	CULINARY WATER METER
	DELINEATOR POST
	STREET SIGN
	POWER POLE
	MAILBOX
	LIGHT POLE
	CONCRETE SURFACING
	ASPHALT SURFACING
	TOP OF CUT LIMITS
	TOE OF FILL LIMITS
	PROPOSED LIMITS OF DISTURBANCE

APPROVAL
RECOMM:

PROJECT DESIGN ENGINEER

DATE

REMARKS

REVISIONS

NO.

DATE

UPDATED: 6/16/2022

PLOTTED: 2/27/2023

DWG NAME: Title.dwg

SCALE: NONE

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AMERICAN FORK WATERSHED PLAN

AMERICAN FORK AND LEHI

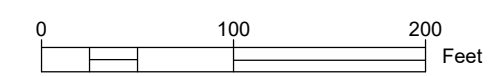
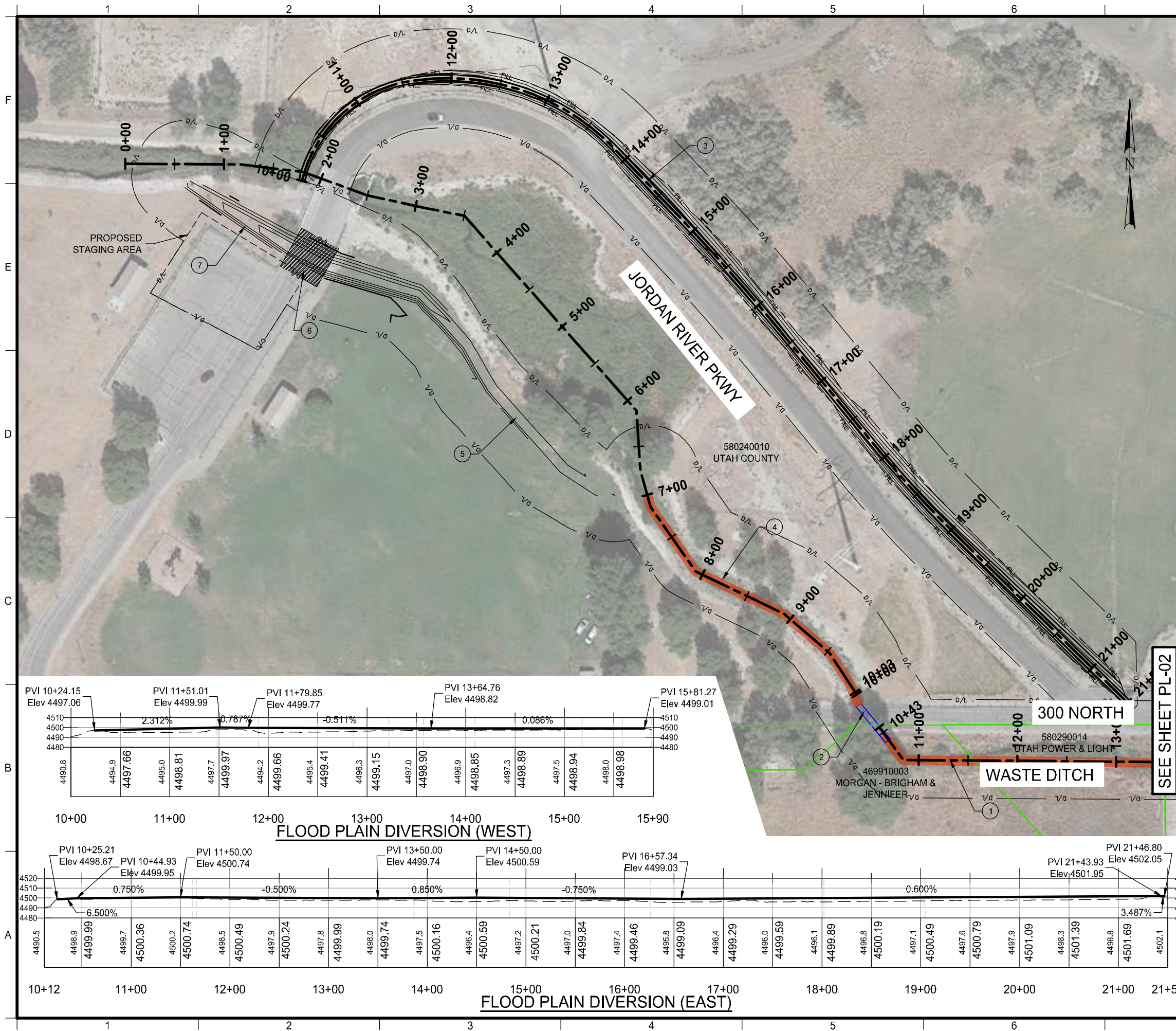
LEGEND & ABBREVIATIONS

2004-028

UTAH

COUNTY

SHEET NO. G-03



- SCOPE OF WORK**
- 930 L.F. TYPE 1 GABION LINED CHANNEL. SEE DETAIL ON DT-04. (STA 10+86 TO STA 20+55) SEE SHEET PL-02.
 - 72 L.F. TYPE 1 BOX CULVERT. (BY OTHERS) SEE DETAIL ON DT-01. (STA 10+43 TO STA 10+86)
 - 756 L.F. FLOOD PLAIN DIVERSION. SEE DETAIL ON DT-04 (STA 10+94 TO STA 18+44)
 - 349 L.F. TYPE 1 GABION LINED CHANNEL. SEE DETAIL ON DT-04. (STA 6+25 TO STA 9+74)
 - 419 L.F. FLOOD PLAIN DIVERSION. SEE DETAIL ON DT-03. (STA 2+37 TO STA 6+57)
 - 50 L.F. ROAD RECONSTRUCT. (BY OTHERS) SEE DETAIL THIS SHEET. (STA 2+01 TO STA 2+43)
 - 145 L.F. FLOOD PLAIN DIVERSION. SEE DETAIL ON DT.03. (STA 0+42 TO STA 2+01)

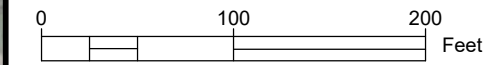
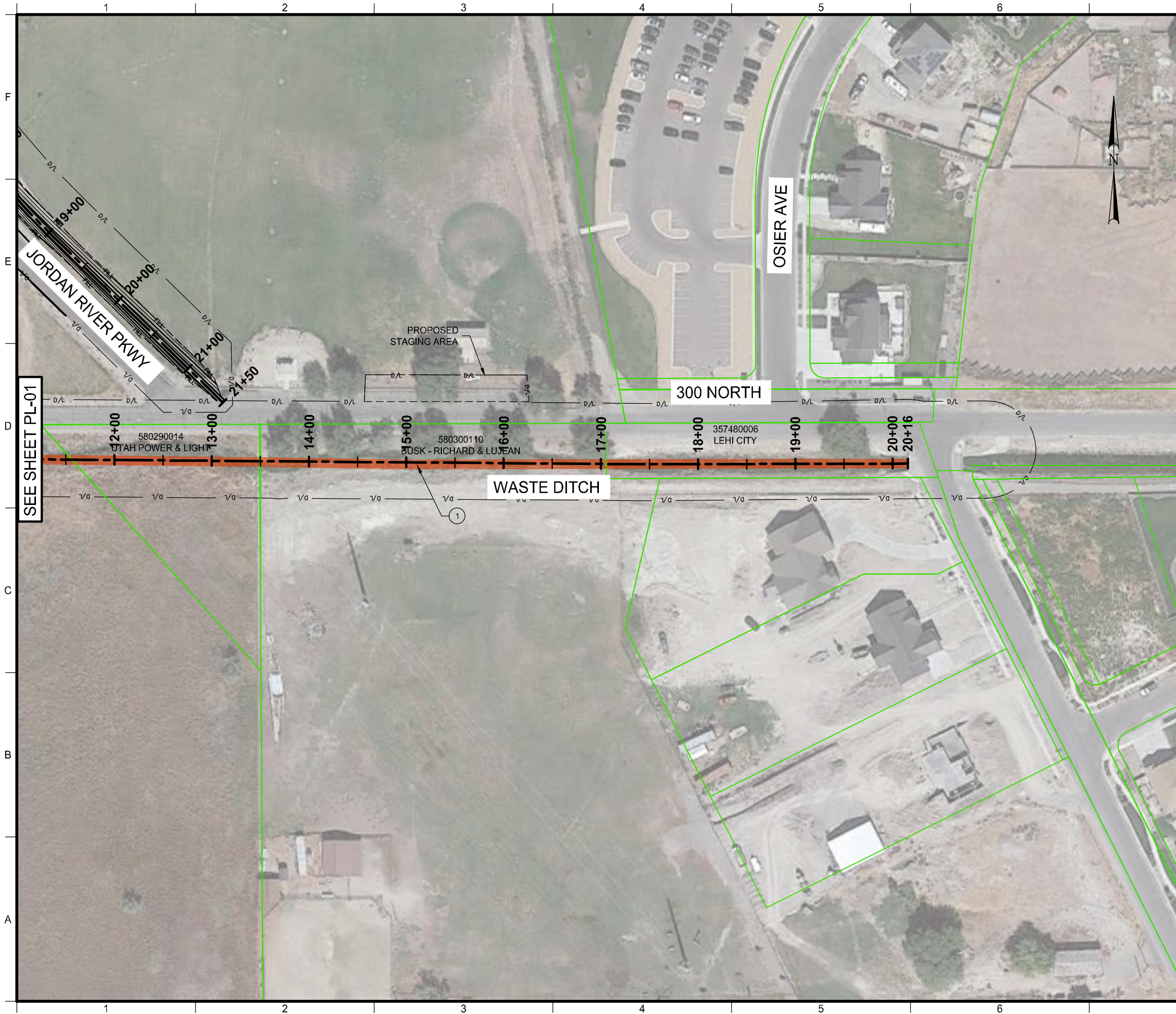
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PLAN SHEET	
UTAH COUNTY	
SHEET NO. PL-01	



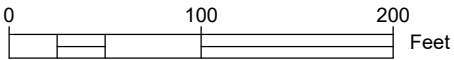
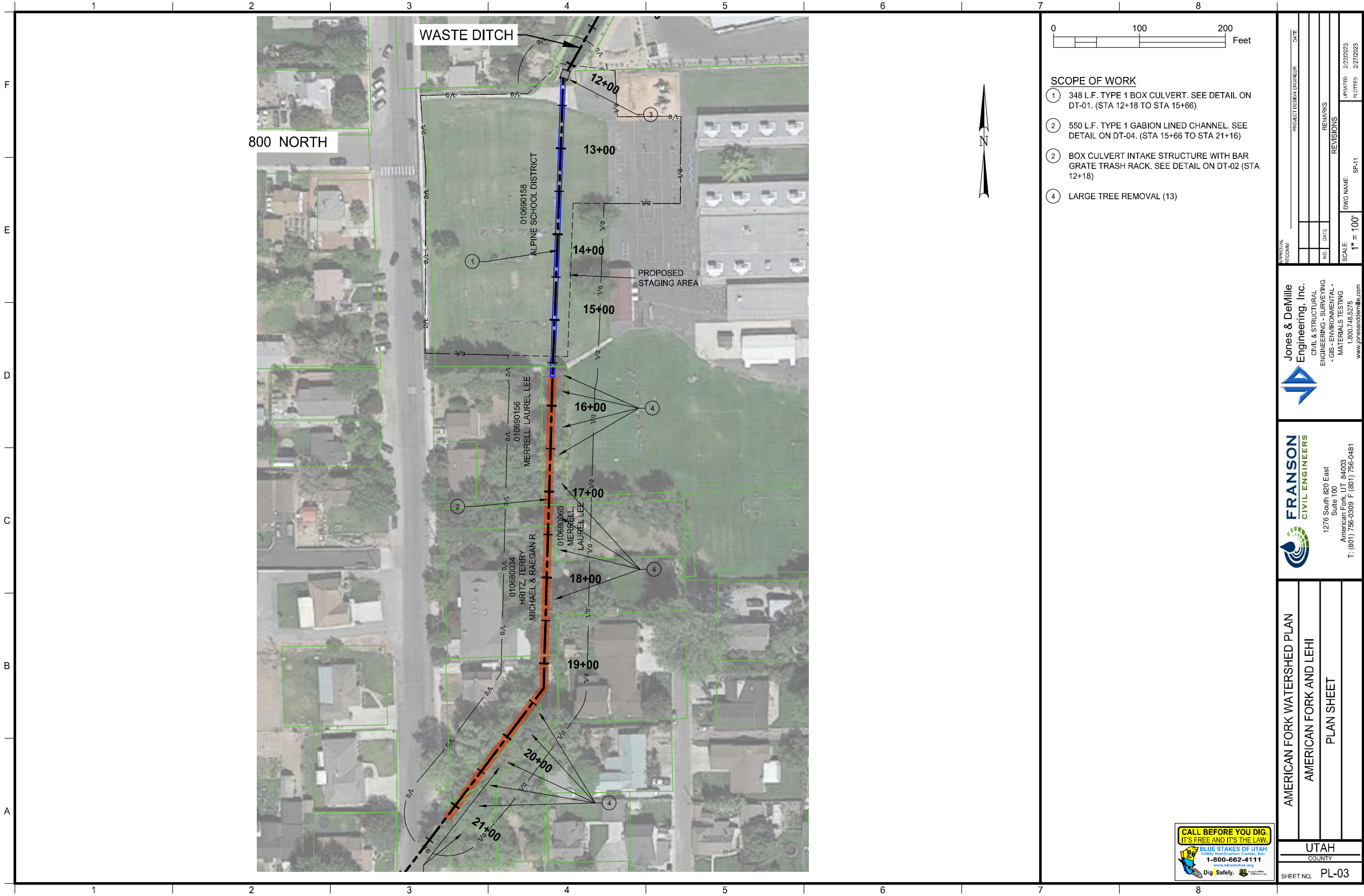


SCOPE OF WORK
1 930 L.F. TYPE 1 GABION LINED CHANNEL. SEE NOTE 1 ON PL-01. SEE DETAIL ON DT-04. (STA 10+86 TO STA 20+16)

SEE SHEET PL-01



APPROVAL RECOMM:		PROJECT DESIGN ENGINEER	DATE
REVISIONS		REMARKS	
NO.		DATE	
SCALE: 1" = 100'		DWG NAME: SP-01	UPDATED: 2/22/2023 PLOTTED: 2/27/2023
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UTAH COUNTY			
SHEET NO.		PL-02	



SCOPE OF WORK

- 1 348 L.F. TYPE 1 BOX CULVERT. SEE DETAIL ON DT-01. (STA 12+18 TO STA 15+66)
- 2 550 L.F. TYPE 1 GABION LINED CHANNEL. SEE DETAIL ON DT-04. (STA 15+66 TO STA 21+16)
- 2 BOX CULVERT INTAKE STRUCTURE WITH BAR GRATE TRASH RACK. SEE DETAIL ON DT-02 (STA 12+18)
- 4 LARGE TREE REMOVAL (13)

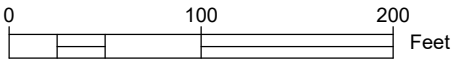
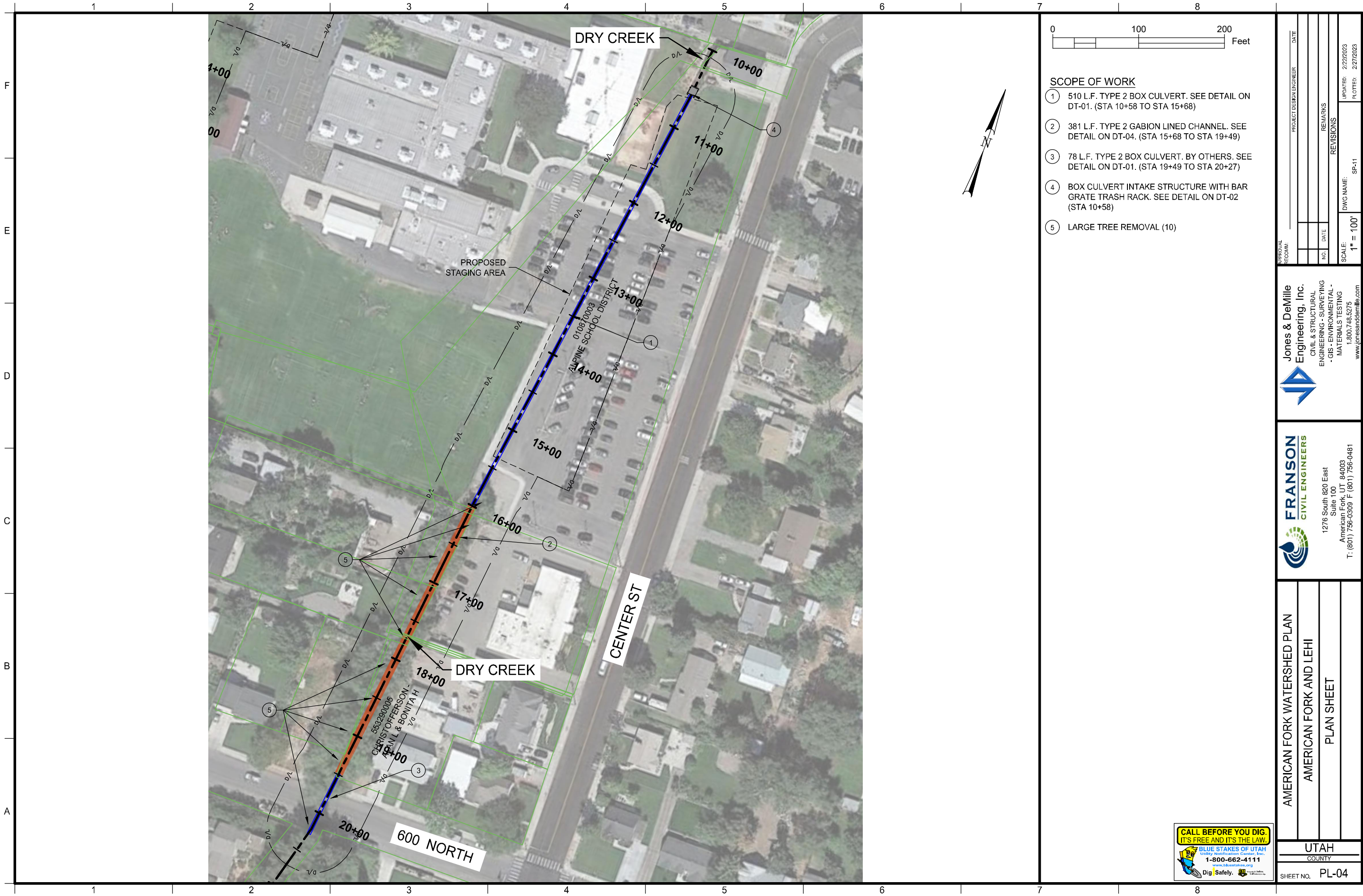
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SCOPE OF WORK

- 1 510 L.F. TYPE 2 BOX CULVERT. SEE DETAIL ON DT-01. (STA 10+58 TO STA 15+68)
- 2 381 L.F. TYPE 2 GABION LINED CHANNEL. SEE DETAIL ON DT-04. (STA 15+68 TO STA 19+49)
- 3 78 L.F. TYPE 2 BOX CULVERT. BY OTHERS. SEE DETAIL ON DT-01. (STA 19+49 TO STA 20+27)
- 4 BOX CULVERT INTAKE STRUCTURE WITH BAR GRATE TRASH RACK. SEE DETAIL ON DT-02 (STA 10+58)
- 5 LARGE TREE REMOVAL (10)

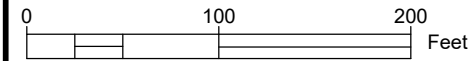
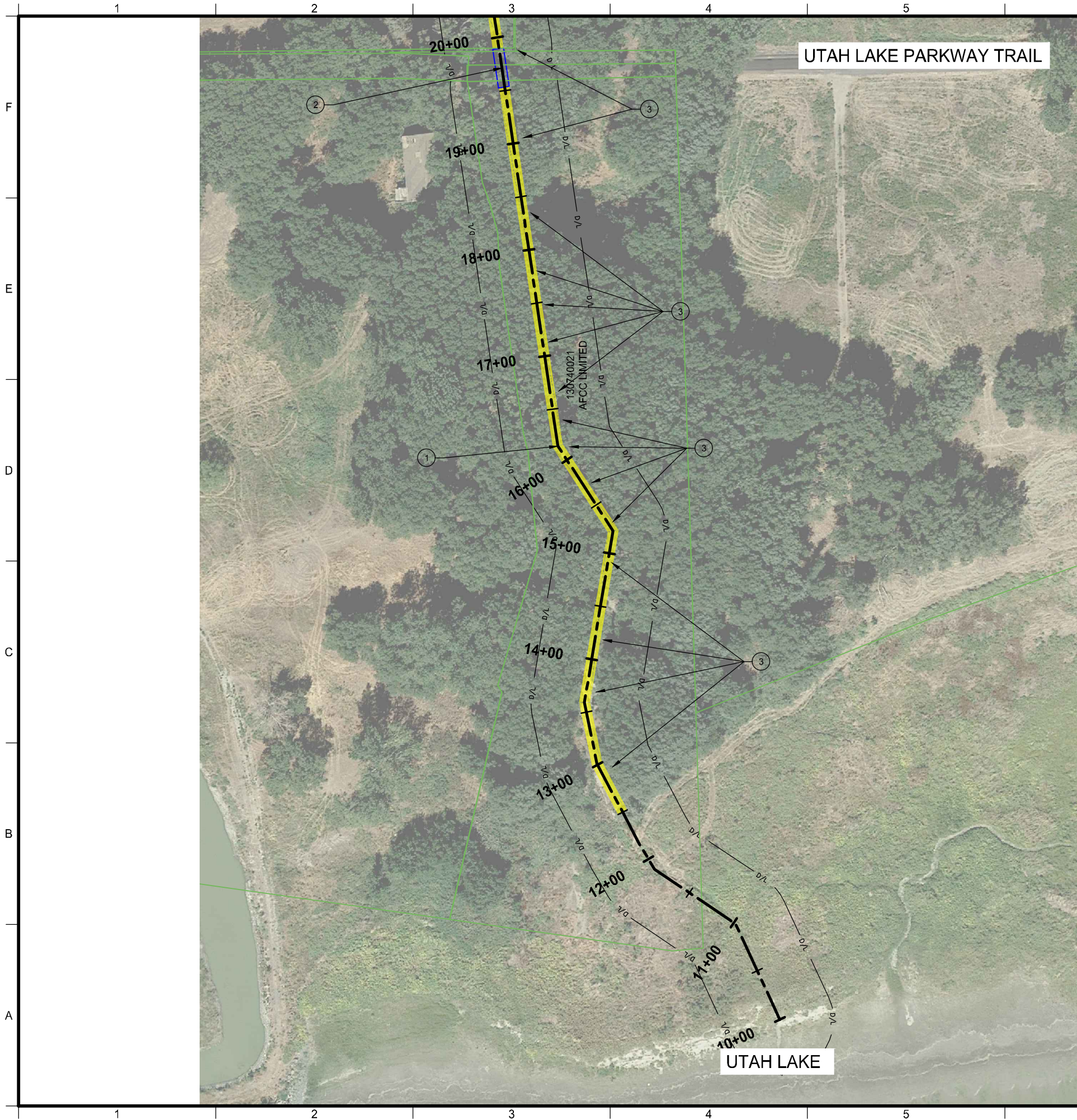
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SCOPE OF WORK

- 1 953 L.F. TYPE 1 CHANNEL CLEARING. SEE DETAIL ON DT-05. (STA 12+50 TO STA 19+53)
- 2 EXISTING CULVERT TO REMAIN
- 3 LARGE TREE REMOVAL (15)

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		NO.		DATE	
		REVISIONS		REMARKS	
		DWG NAME:		SP-10	
		SCALE:		1" = 100'	
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		PLOTTED:		2/27/2023	

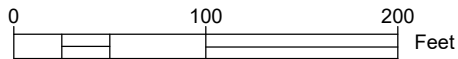
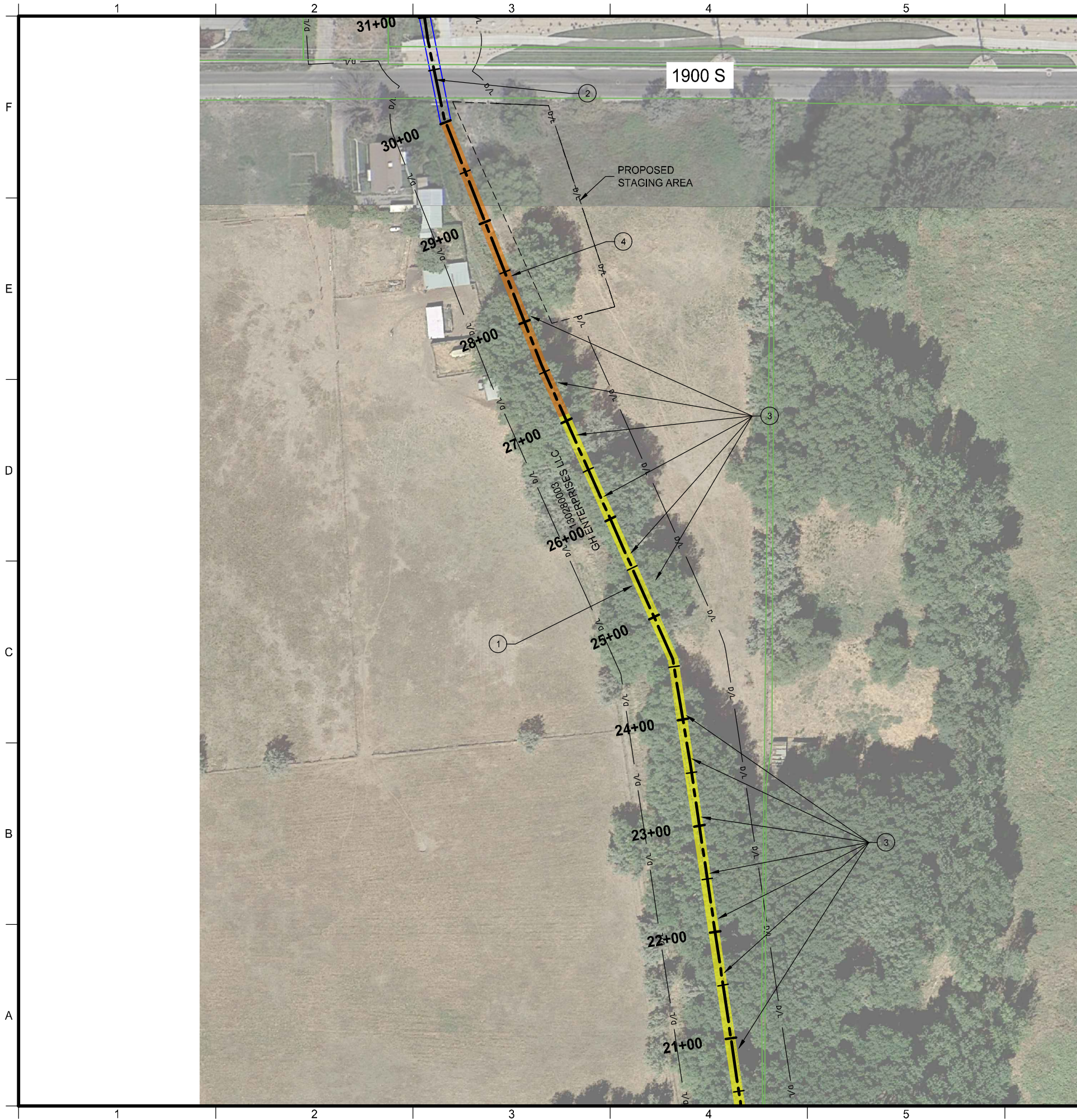
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SCOPE OF WORK

- 1 717 L.F. CHANNEL CLEARING. SEE DETAIL ON DT-05. (STA 19+89 TO STA 27+06)
- 2 108 L.F. TYPE 3 BOX CULVERT. BY OTHERS. SEE DETAIL ON DT-01. (STA 30+00 TO STA 31+08)
- 3 LARGE TREE REMOVAL (13)
- 4 294 L.F. TYPE 2 GABION LINED CHANNEL. SEE DETAIL ON DT-05. (STA 27+06 TO STA 30+00)

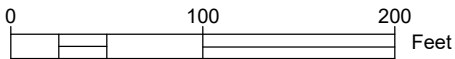
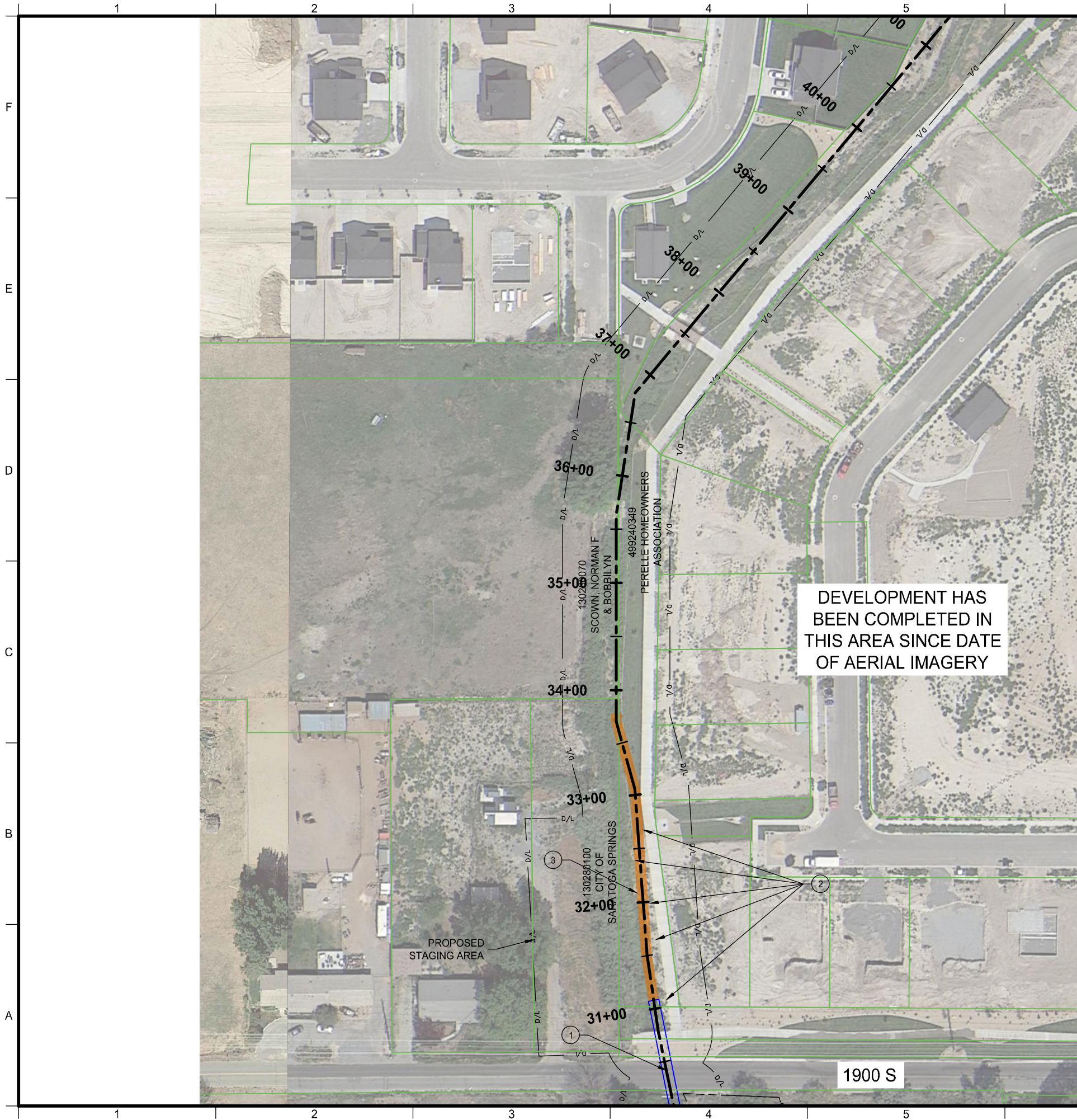
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SCOPE OF WORK

- 1 TYPE 3 BOX CULVERT. IMPROVEMENTS BY OTHERS. SEE NOTE 2 ON SHEET PL-06. SEE DETAIL ON DT-01. (STA 30+00 TO STA 31+08)
- 2 LARGE TREE REMOVAL (5)
- 3 300 L.F. TYPE 3 GABION LINED CHANNEL. SEE DETAIL ON DT-05. (STA 30+78 TO STA 33+78)

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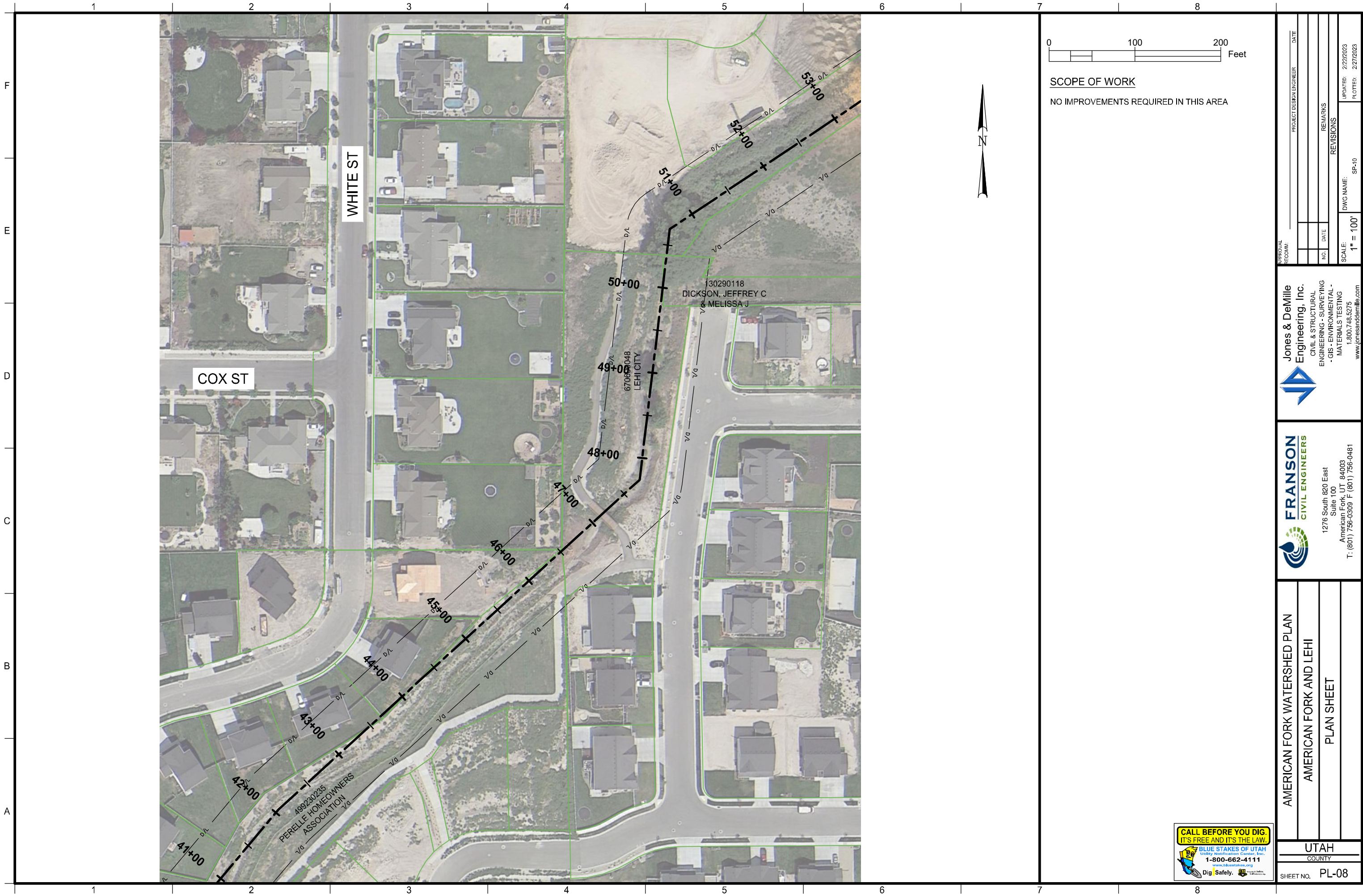
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AMERICAN FORK AND LEHI
PLAN SHEET

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SCOPE OF WORK
NO IMPROVEMENTS REQUIRED IN THIS AREA

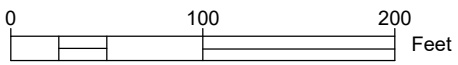
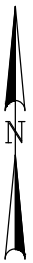
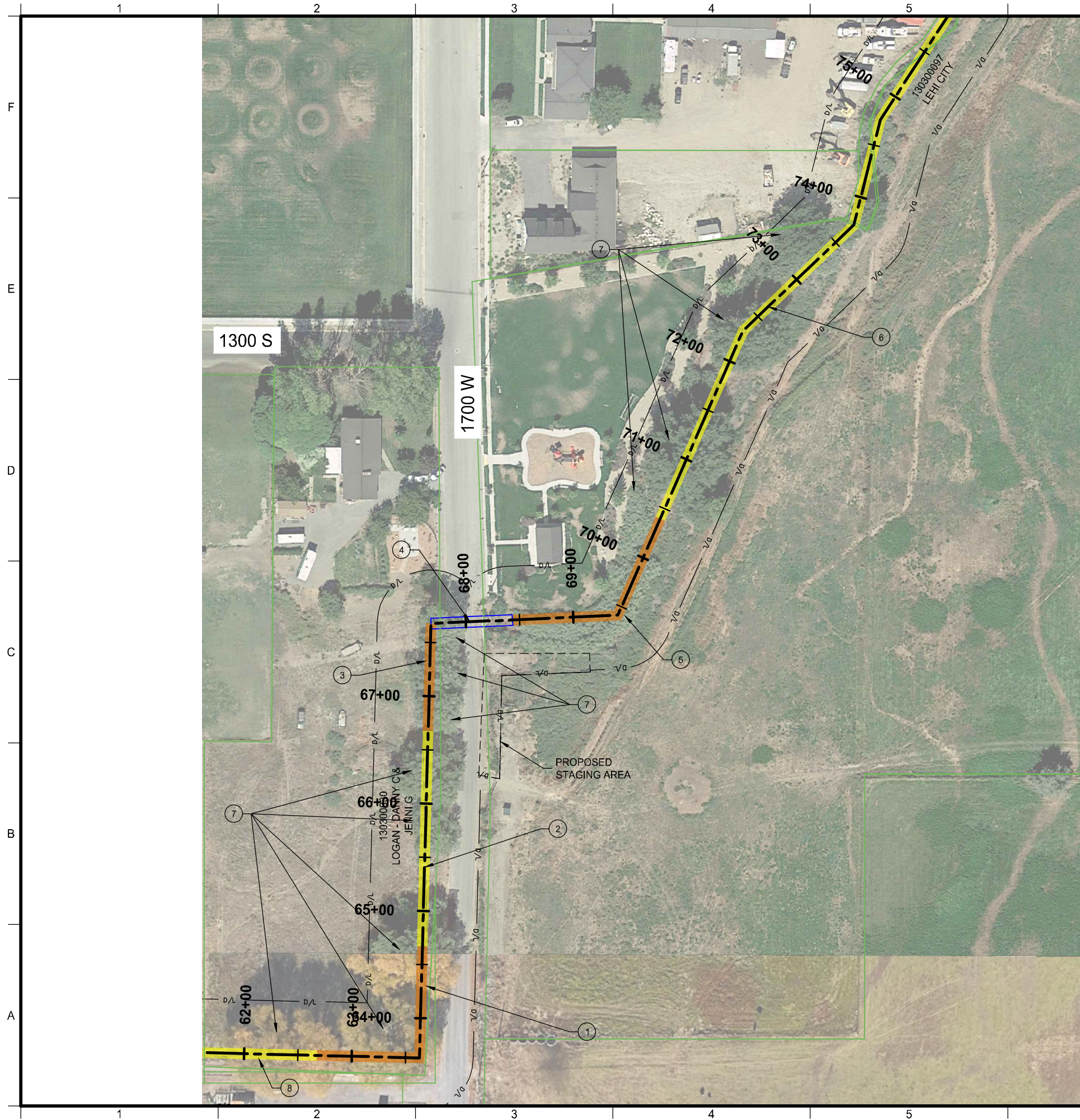
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1" = 100'	SP-10	PLOTTED: 2/27/2023

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SCOPE OF WORK

- 1 200 L.F. TYPE 2 GABION LINED CHANNEL. SEE DETAIL ON DT-05. (STA 62+67 TO STA 64+67)
- 2 200 L.F. CHANNEL CLEARING. SEE DETAIL ON DT-05. (STA 64+67 TO STA 66+67)
- 3 100 L.F. TYPE 2 GABION LINED CHANNEL. SEE DETAIL ON DT-05. (STA 66+67 TO STA 67+67)
- 4 78 L.F. TYPE 2 BOX CULVERT. SEE DETAIL ON DT-01. (STA 67+68 TO STA 68+46)
- 5 200 L.F. TYPE 2 GABION LINED CHANNEL. SEE DETAIL ON DT-05. (STA 68+40 TO STA 70+40)
- 6 600 L.F. CHANNEL CLEARING. SEE DETAIL ON DT-05. (STA 70+40 TO STA 76+40)
- 7 LARGE TREE REMOVAL (12)
- 8 CHANNEL CLEARING. SEE NOTE 4 ON PL-09. (STA 56+92 TO STA 62+67)

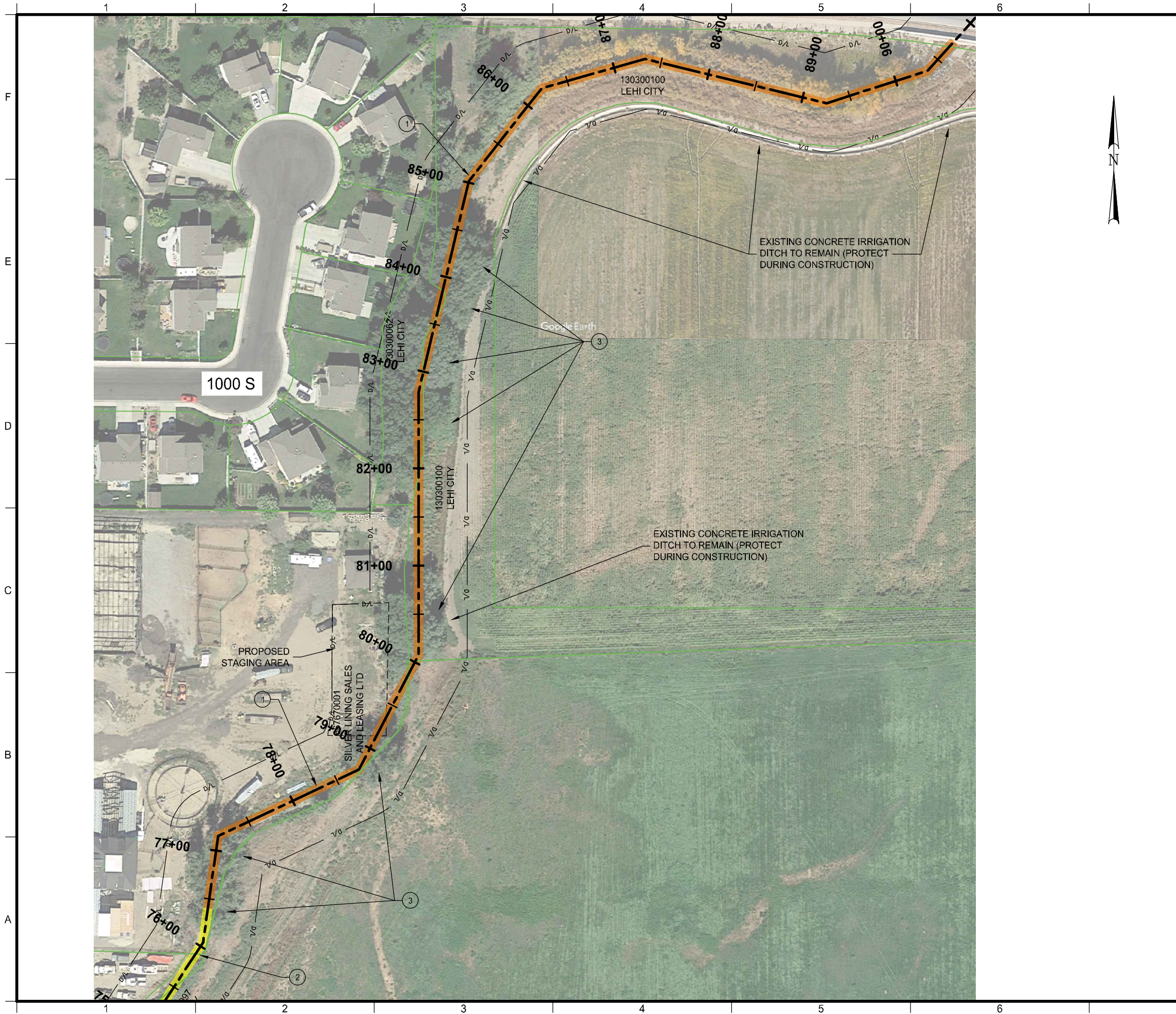


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		PLOTTED:		2/27/2023	

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0100200Feet

SCOPE OF WORK

1

1750 L.F. TYPE 2 GABION LINED CHANNEL. SEE
DETAIL ON DT-05. (STA 76+40 TO STA 78+40)

2

CHANNEL CLEARING. SEE NOTE 6 ON PL-10.
SEE DETAIL ON DT-05.
(STA 70+40 TO STA 76+40)

3

LARGE TREE REMOVAL (8)

APPROVAL
RECOMM:

PROJECT DESIGN ENGINEER

DATE

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DATE

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SCALE:
1" = 100'

DWG NAME:
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PLAN SHEET

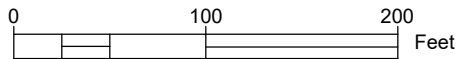
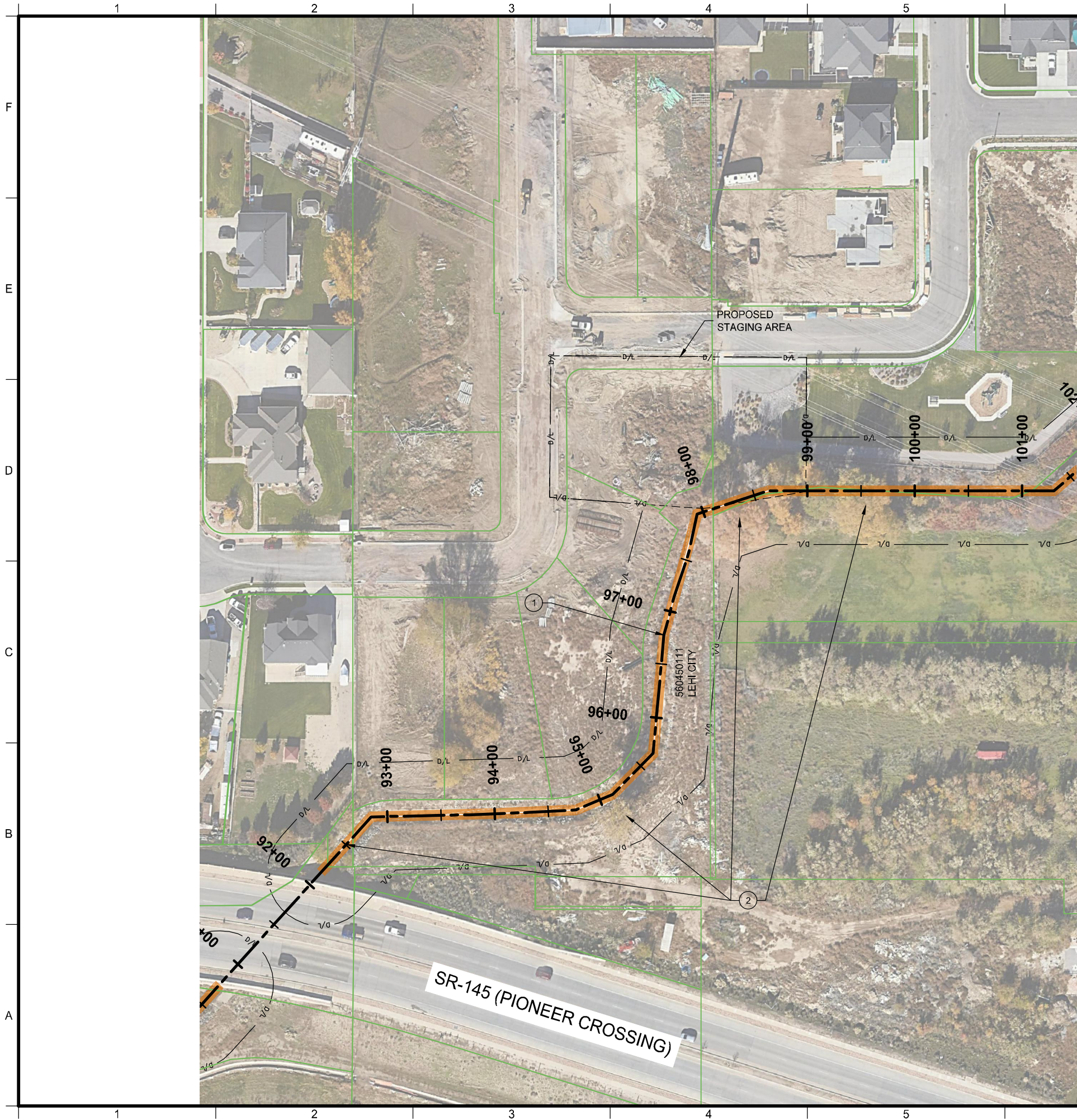
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- SCOPE OF WORK**
- 1890 L.F. TYPE 2 GABION LINED CHANNEL. SEE DETAIL ON DT-05. (STA 92+15 TO STA 111+05)
 - LARGE TREE REMOVAL (4)





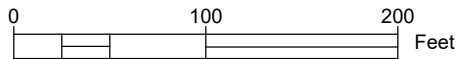
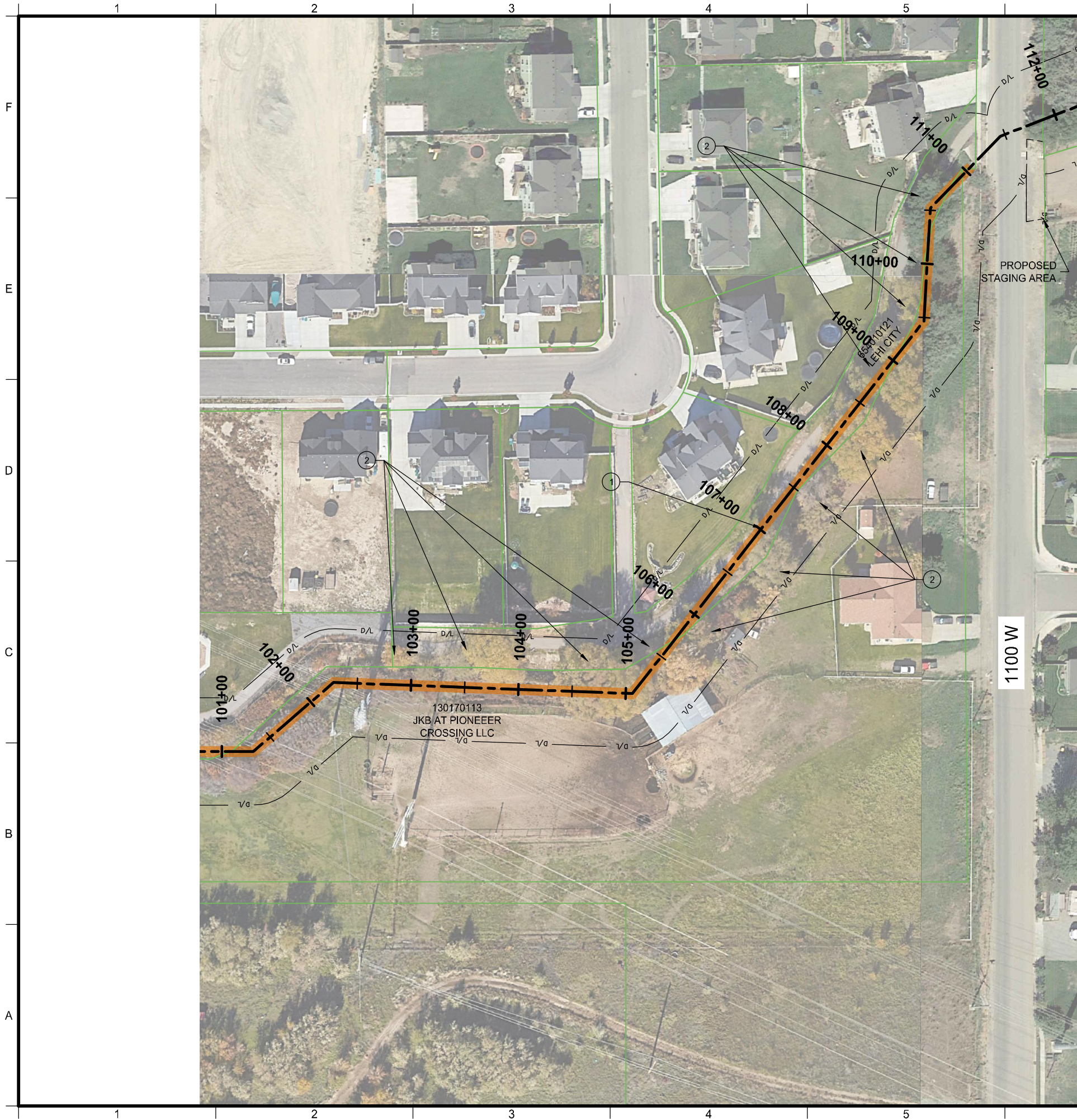
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	REVISIONS	
	REMARKS	
SCALE:	DWG NAME:	UPDATED: 2/22/2023
1" = 100'	SP-10	PLOTTED: 2/27/2023

AMERICAN FORK WATERSHED PLAN
AMERICAN FORK AND LEHI
PLAN SHEET
UTAH
COUNTY
SHEET NO. PL-12



- SCOPE OF WORK**
- 1 TYPE 2 GABION LINED CHANNEL. SEE NOTE 1 ON PL-20. SEE DETAIL ON DT-05. (STA 92+15 TO STA 111+05)
 - 2 LARGE TREE REMOVAL (12)



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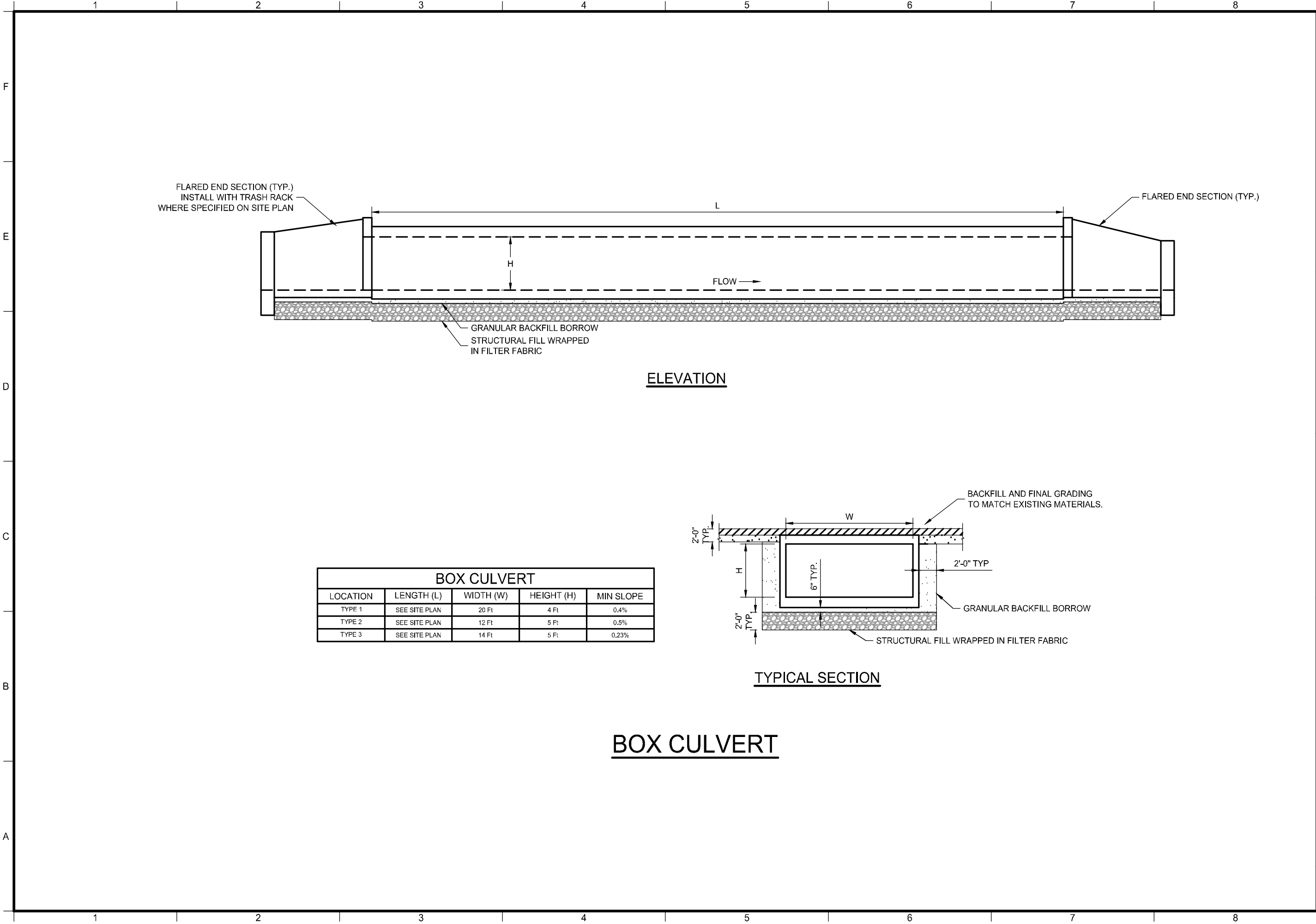
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SCALE: NONE

UPDATED: 2/27/2023

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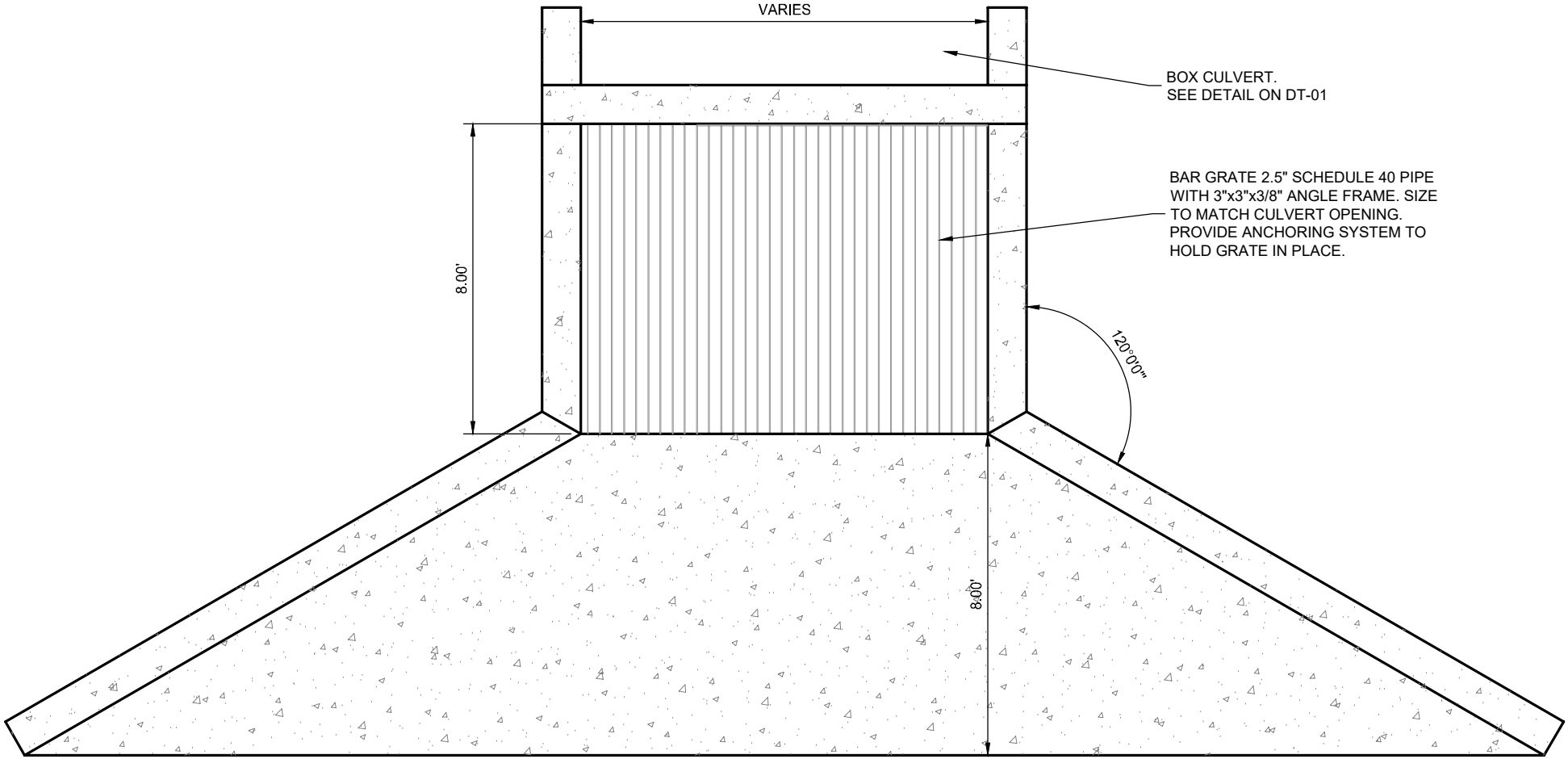
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DETAILS

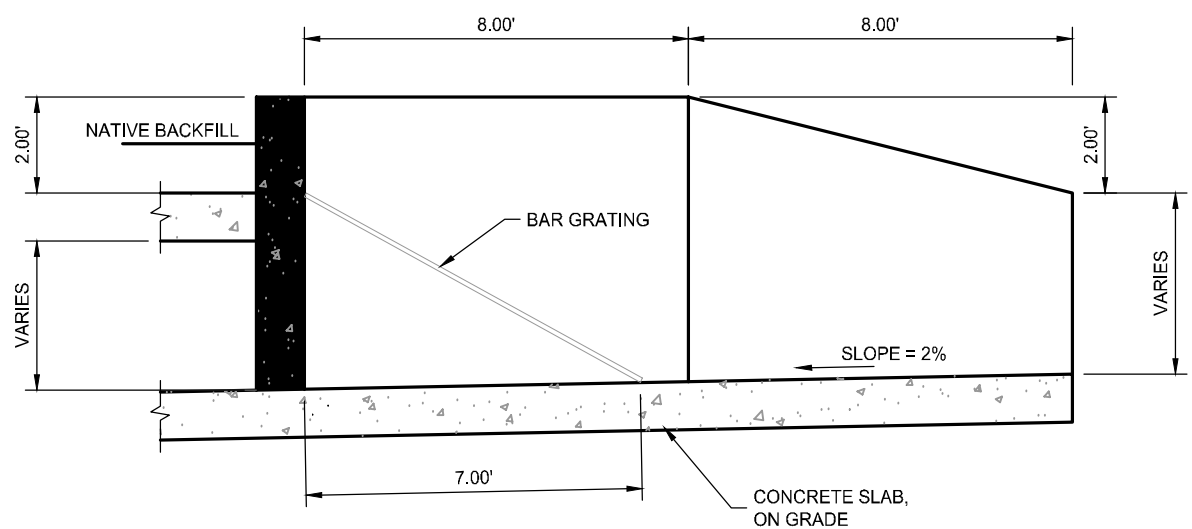
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SHEET NO. DT-01



PLAN VIEW



SECTION VIEW

**BOX CULVERT INTAKE STRUCTURE
w/BAR GRATE TRASH RACK**

NOTES: INSTALL ON BOX CULVERTS AS CALLED OUT ON SITE PLAN.

APPROVAL		PROJECT DESIGN ENGINEER		DATE	
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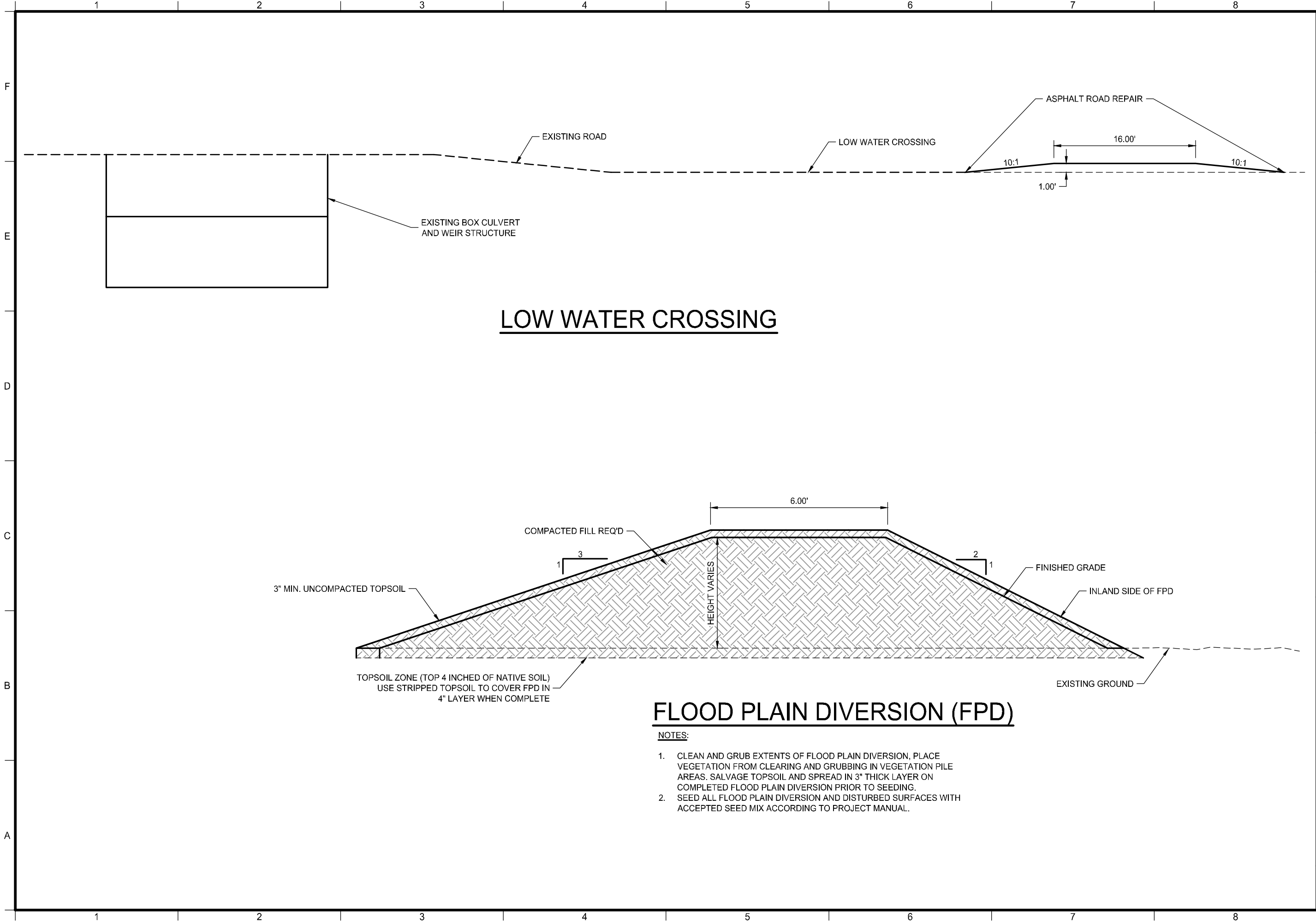


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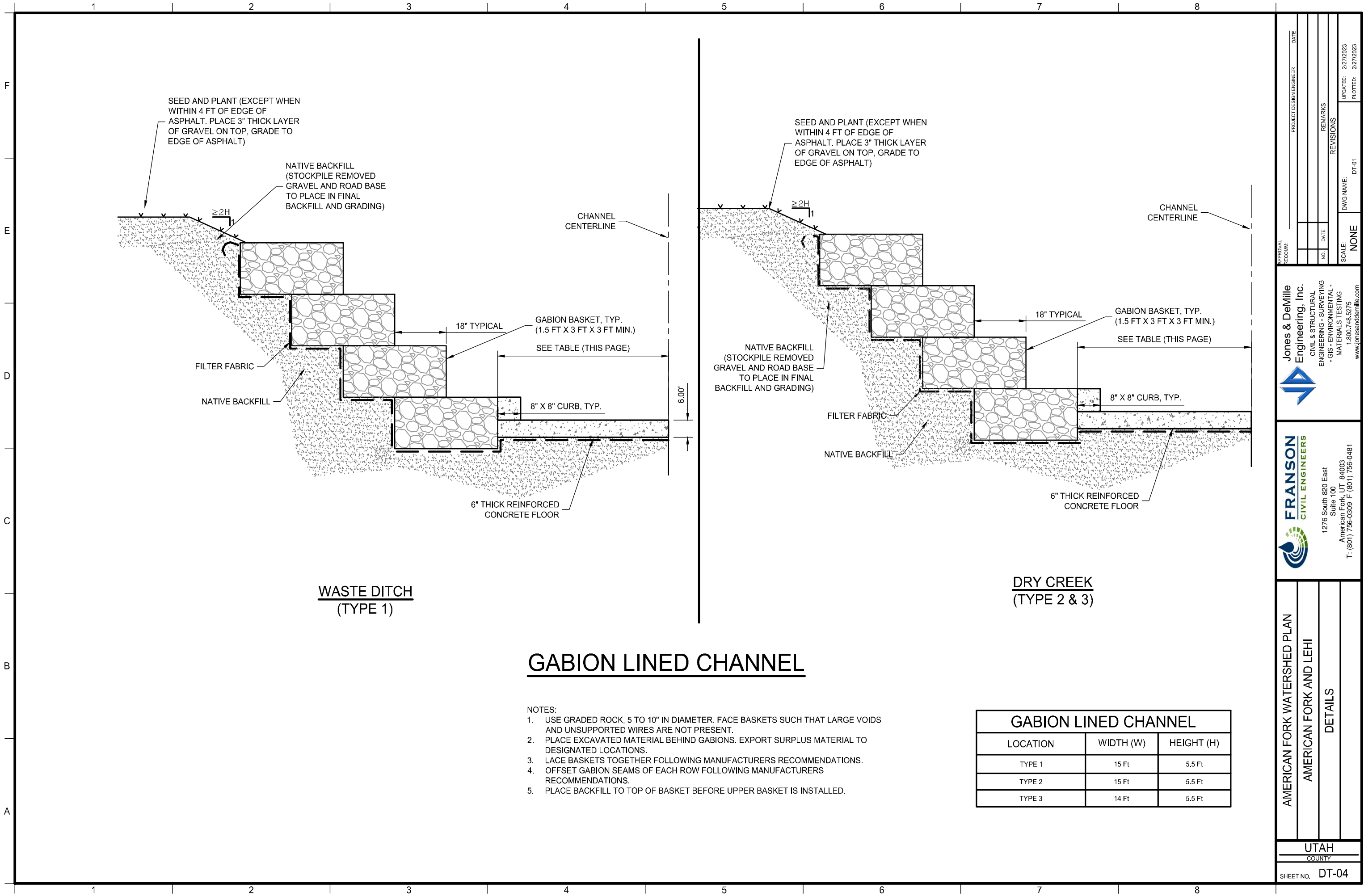


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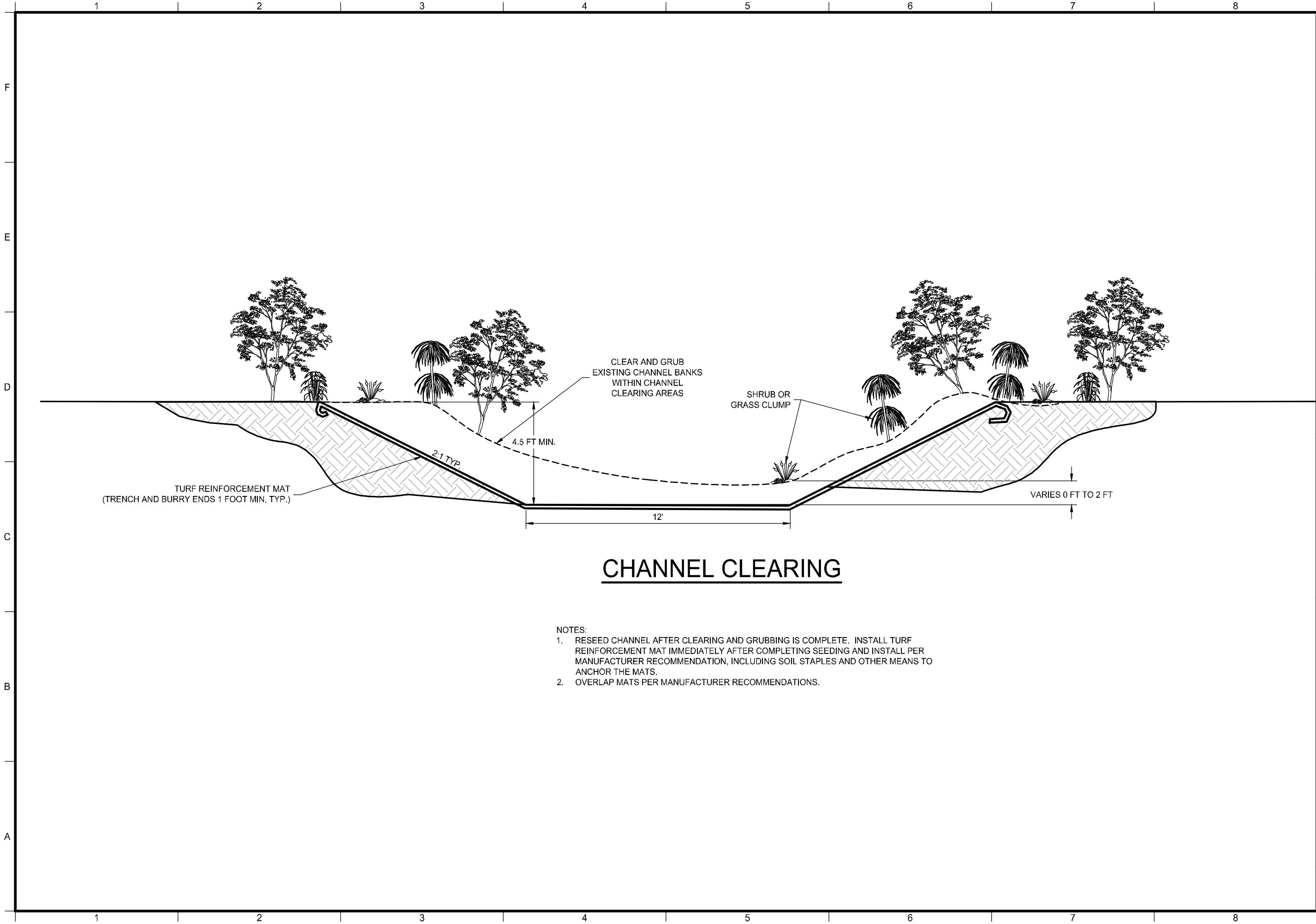


APPROVAL		PROJECT DESIGN ENGINEER		DATE	
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Attachment 6
Economic Investigations & Analysis Report

Economic Investigation and Analysis Report

**American Fork—Dry Creek Supplemental
Watershed Plan-Environmental
Assessment**

Proposed Floodwater Retarding Structures

Utah County, Utah

Prepared for:



January 2025

Prepared by:

Hal Gordon, Economist

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1.0 SUMMARY OF REQUIREMENTS AND GUIDELINES

The NRCS National Watershed Program Manual (NWPM) was used as a reference for the economic analysis along with three other documents: the National Resource Economics Handbook, Part 611 Water Resources Handbook for Economics, USDA/Natural Resources Conservation Service, July 1998; Principles and Guidelines for Water and Land Related Resources Implementation Studies (P&G), December 1983; and Guidance for Conducting Analyses Under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments (PR&G), DM 9500-013. The latter includes requirements set forth in the Council on Environmental Quality (CEQ) Principles and Requirements for Federal Investments in Water Resources (P&R) and Interagency Guidelines (IAG). DM 9500-013 provides guidance on completing a PR&G analysis, including steps in the planning and evaluation process, differences between project- and programmatic-level evaluations, direction on incorporating an ecosystem services framework, and techniques for economic analysis. NRCS's Nine Steps of Conservation Planning were broadly followed while developing the watershed plan, as described in the National Planning Procedures Handbook (180-VI-NPPH, Amend. 4, March 2003).

According to the P&G, the alternative that maximizes net economic benefits is referred to as the National Efficiency Evaluation (NEE) alternative and will be the preferred alternative. In addition to P&G requirements, PR&G requires that public benefits (monetary and non-monetary) be maximized relative to cost. Furthermore, there is no hierarchal relationship among the economic, social, or environmental goals, regardless of whether they can be monetized. Agency policy allows for the use of social effect goals to make the case for flood control activities, even if the associated benefit-cost (B/C) ratio is less than 1:1. This is due to the difficulty in monetizing the value of life and quality of life, which is laden with subjective value judgments. Therefore, threats to human life and quality factors can be used to outweigh purely economic considerations when appropriate. PR&G allows a wide range of alternatives to illustrate the range of potential tradeoffs among environmental, economic, and social goals.

The Federal Objective, as set forth in the Water Resources Development Act of 2007, specifies that Federal water resources investments shall reflect national priorities, encourage economic development, and protect the environment by: (1) seeking to maximize sustainable economic development; (2) seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used; and (3) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.

The guiding principles in P&G and PR&G constitute the concepts that should be considered when analyzing Federal investments in water resources, and the P&G and PR&G General Requirements are topics that agencies must consider when analyzing Federal investments in water resources. The following Principles constitute the overarching concepts the Federal government seeks to promote through Federal investments in water resources now and into the foreseeable future.

A. Healthy and Resilient Ecosystems. Federal investments in water resources should protect and restore the functions of ecosystems and mitigate any unavoidable damage to these natural systems.

B. Sustainable Economic Development. Federal investments in water resources should encourage sustainable economic development.

C. Floodplains. Federal investments in water resources should avoid the unwise use of floodplains and flood-prone areas and minimize adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used.

D. Public Safety. Threats to people, including loss of life and injury from natural events, should be assessed in determining existing and future conditions and, ultimately, in the decision-making process.

E. Environmental Justice. Environmental justice is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Agencies should ensure that Federal actions identify any disproportionately high and adverse public safety, human health, or environmental burdens of projects on minority, Tribal, and low-income populations.

F. Watershed Approach. A watershed approach to analysis and decision-making facilitates evaluating a more complete range of potential solutions. It is more likely to identify the best means to achieve multiple goals over the entire watershed.

The project sponsors include American Fork City, Lehi City, and Saratoga Springs City. The Project incorporates waterway improvements along the American Fork River in American Fork City, Upper Dry Creek and Waste Ditch in Lehi City, and Lower Dry Creek in Lehi and Saratoga Springs Cities for flood protection. The proposed improvements for the American Fork City area include four

sections of channel improvements, totaling approximately 1,000 feet, at locations of insufficiently sized under crossings to improve the channel capacity. The proposed improvements for the area would reconstruct approximately 12,000 feet of the existing channel to improve the channel capacity and hydraulics through Lehi Elementary School's property, public transportation corridors, private property, and parks. The Project is anticipated to cost approximately \$16,207,000, which includes construction (\$11,542,000), engineering (\$1,721,000), and real property (\$2,944,000).

The installation costs of the Preferred Alternative equate to an average annual cost of \$656,800. PL-566 funds would cover \$13,263,000. The sponsors and/or other nonfederal funds would contribute \$2,944,000 of the total project cost. While flood prevention measures are covered at 100%, improvements to existing culverts are considered "real property" and not covered by PL-566.

2.0 ALTERNATIVES EVALUATED

According to the P&G and the NWPM, "Flood Prevention" was the purpose analyzed for the American Fork Watershed Plan-EA. Table 7, Comparison of NED Benefits and Costs, contains a summary of the average annual project costs and benefits. The Excel Workbook "DryCreekBenefitsCosts.xml," with associated sheets within the workbook, provides the details for the complete economic analysis.

In accordance with the NRCS and PR&G step processes, the formulation of alternatives seeks to achieve the sponsor's objectives, solve identified concerns, take advantage of opportunities to improve or protect resource conditions (NRCS Nine-Step Conservation Planning Process), identify tradeoffs between environmental, economic, and social goals and objectives (DM 9500-013, page 16). To facilitate these processes, the following considerations have been developed to help emphasize specific goals to illustrate the potential tradeoffs as part of the ecosystem services framework.

- No Action Alternative (FWOFI): This is the baseline against which all other alternatives are compared and evaluated. NEPA requires this and it should always be included as part of PR&G.
- Nonstructural Alternative (FWFI): These are alternatives that alter the use of existing infrastructure or human activities to avoid or minimize adverse changes to existing hydrologic, geomorphic, and ecological processes. They usually include modifications to public policy,

regulatory policy, pricing policy, management practices, land cover practices, or the use of green infrastructure.

- Additional Alternatives (FWFI): These are alternatives that are needed to address additional Federal, State, or local concerns not addressed by the alternatives above.

During the process of alternative formulation, it is very common for alternatives to meet more than one of the definitions described above. As stated in the PR&G guidance, “the alternatives listed above, and any other alternatives included in the PR&G analysis may overlap in whole or in part. (USDA-NRCS, DM9500-013, pg.17, 2017).” As an example, when the PR&G process is fully implemented, it is very common for the Environmentally Preferable Alternative (LEDPA) and the Locally Preferred Alternative to be the same. Additionally, this is often the alternative with the highest National benefit/cost ratio due to the desire of the local sponsors to minimize their own capital investment while maximizing their own returns.

For this Plan-EA, the alternatives evaluated during formulation included the following:

- Alternative 1 -- No Action Alternative (FWOFI): The No Action Alternative (FWOFI) is the most likely future condition without any developed Federal alternative or changes in law or public policy. It is what could be expected if NRCS takes no action.
- Alternative 2 – Proposed Action – Flood Reduction Alternative (FWFI): The Flood Reduction Alternative is the Action Alternative that structurally addresses the flooding issues along the waterways while providing channel improvements at specific locations. It includes four locations in American Fork, three locations in Lehi City, and one location along lower Dry Creek that stretches between Lehi City and Saratoga Springs City. See Map B-2 in Appendix B. The design improvements for American Fork City are based on the 100-year storm, and for Lehi City/Saratoga Springs City are based on the 50-year storm, as per each city’s design standards.
- Alternative 3 – Proposed Action – Property Buyouts Alternative (Nonstructural) (FWFI): The Nonstructural Alternative includes acquiring easements for property located within the 50-year recurrence interval floodplain that would otherwise be protected by channel improvements.
- Alternative 4 – Proposed Action – 500-year Storm Event Alternative (FWFI): This alternative included measures to address the flooding issues associated with the 500-year storm event along the waterways.

The project area contained three sub-basins: American Fork, Lehi Upstream, and Lehi Downstream. These areas have been flooded or are at risk of flooding. This analysis identified that the enlargement of some of the structures and channel improvements are needed to reduce the risk of flooding. Incremental analysis was conducted considering each sub-basin. There were no increments within each sub-basin. There are eight project areas: Four in American Fork and four total in Lehi/Saratoga Springs Cities, comprised of the Upstream and Downstream Lehi sub-basins. The project areas work in conjunction with each other in the sub-basin and the omission of any project area within any sub-basin would render the remaining project areas ineffective. As such, the project areas for American Fork, Lehi Upstream, and Lehi Downstream sub-basins are inclusive as a single alternative increment for each sub-basin. The first increment was American Fork, the second increment was Lehi Upstream, and the third increment was Lehi Downstream:

The American Fork Alternative includes five project locations:

- Location 1 Channel Improvements at 300 North
- Location 2 Channel Improvements at 100 North and 200 East
- Location 3 Channel Improvements at 200 South
- Location 4 Channel Improvements at 400 South

The Lehi Upstream Alternative includes three project locations:

- Location 5 Upper Dry Creek
- Location 6: Upper Waste Ditch
- Location 7 Waste Ditch at Willow Park

The Lehi/Saratoga Springs Downstream Alternative includes one project location:

- Location 8: Lower Dry Creek

As described in the Plan-EA, the main purpose of the watershed plan is to reduce the average annual flood damage within the watershed. While only flood-damage related benefits were quantified, other types of benefits serving the project purposes were still considered qualitatively when evaluating the costs and benefits of project alternatives.

According to PR&G, after preliminary consideration, agencies may remove from detailed study those alternatives that do not achieve the Federal Objective and Guiding Principles. In addition, alternatives that may at first appear reasonable but clearly become unreasonable because of cost, logistics, existing technology, and social or environmental reasons may also be eliminated from further analysis. These

alternatives should be briefly discussed to indicate that they were considered, and the analysis should document the reason(s) why they were eliminated (e.g., they do not achieve the Federal Objective and Guiding Principles).

In general, the NEE alternative was developed in accordance with PR&G by evaluating the economic, social, and environmental impacts of flood damage reduction in the rural community. Given the emphasis placed on the construction of flood protection structures by the local steering committee to provide flood mitigation, the geographic extents of evaluated alternatives are limited to the area where one or more of the proposed structural alternatives would have an estimated impact to the 500-year flood depth. The annual benefits of the project alternatives are based on the estimated reduction in average annual floodwater damages with proposed flood control measures in place compared to future conditions without mitigative action (No Action Alternative).

Alternatives considered included the No-Action Alternative, nonstructural alternatives, the locally preferred alternative, and the NEE Alternative. Alternatives were compared against the No-Action Alternative, which involved projecting existing resources and conditions into the future to establish a benchmark against which alternatives were evaluated. Tradeoffs between alternatives with respect to environmental, economic, and social goals were identified.

This planning study evaluated both structural and nonstructural alternatives. However, the planning team eliminated nonstructural alternatives from the detailed study due to their exorbitant costs compared to the potential benefits. One structural alternative was eliminated because the monetary benefits were well below the costs. The following are summaries of eliminated alternatives, which propose to mitigate damages from the 100-year flood.

- **Alternative 3.** Property Buyouts Alternative- The alternative to relocate the residences, improvements, structures, and other land value uses to a location outside of the floodplain has been analyzed. There are 994 residences, 91 commercial businesses, and 4 public properties in the 100-year floodplain. Costs for such relocation include the purchase of new property for the relocated items, the logistical, labor, and material costs associated with relocating and constructing new facilities, and the demolition and cleanup of the existing improvements and structures. Costs to complete this have been estimated at two times the current assessed value of the properties. Relocating the affected properties in all three sub-basins would require costs of almost \$394,346,259. Further, the demolition and cleanup of the existing properties and the development

of properties elsewhere create a larger impact on the environment and communities. This alternative is economically and culturally unreasonable and does not provide any additional flood protection benefit. The table below summarizes the average annual costs and benefits of the Property Buyouts Alternative:

Costs and Benefits of Alternative 3 – Proposed Action – Property Buyouts Alternative (Nonstructural)

Costs/Benefits	Value
Total Project Investment	\$394,346,259
Annual Project Investment	\$14,606,948
Annual OM&R Costs	\$0
Flood Damage Reduction Benefit (Monetized Regulating Service)	\$7,396,733
Total Annual Project Costs	\$14,606,948
Total Annual Project Benefits	\$7,396,733
Benefit-Cost Ratio	0.51
Annual Monetized Net Benefit	-\$7,210,215

Alternative 5. Floodproofing - To protect areas that would be affected by flooding, individual properties could be floodproofed, or floodwalls could be constructed within the floodplain boundary. The area protected includes portions of the communities of American Fork and Lehi. Floodproofed structures would include 994 residences, 91 commercial businesses, and 4 public properties in the 100-year floodplain. Floodwalls would be required along roadways and developed areas throughout the floodplain. This alternative is unreasonable because the community and environmental impacts are significantly greater than in other alternatives. Additionally, floodproofing structures is not feasible given the sheer amount of structures that would have to be floodproofed. It is not acceptable to the NRCS or the sponsor.

Alternative 2. Flood Protection. Along with the No Action Alternative, one alternative proposing the construction of several flood protection improvements for three sub-basin project areas was identified and evaluated in detail. The project consists of eight project areas across waterways within the three sub-basins. The three sub-basins are: 1. American Fork City (along the American Fork River), 2. Lehi City (along

Dry Creek and Waste Ditch) and 3. Lehi City and Saratoga Springs City (along lower Dry Creek). The project improvements were designed to convey flood waters offsite safely.

In all three sub-basins, each flood protection structure works in conjunction with each other, and omitting any item within the alternative would render the remaining options ineffective. As such, the project locations include all items as a single alternative for each sub-basin.

The project measures address flooding issues along the waterways. Project measures for channel improvements include two methods, an earthen channel or gabion baskets, to address flooding concerns and improve public safety along the waterways. It is less expensive to construct earthen channel improvements. However, each location was evaluated to select the most feasible solution that meets all the functionality and needs based on location and the space available for the necessary improvements to meet each city's design standards.

The design standards for each city were used to determine which storm event to design for and to assess the extent of project measures required. Project measures proposed for each of the three sub-basins are described below.

Location 1: Channel Improvements at 300 North in American Fork City

At this location, the upstream channel needs improvements to contain the flows and direct water to the existing box culvert under 300 North. The proposed measures at this location include improving the channel by raising the riverbanks by 1.5 feet for approximately 350 feet upstream of 300 North and constructing new upstream and downstream wingwalls. A new concrete apron would be placed on the downstream side at the outlet to protect against erosion. The embankments would be armored with gabions or riprap to protect against erosion. Other channel improvements could include modifications to the channel slope and channel width for up to 680 feet. Trees and vegetation would be removed within the flow area. The total area of disturbance would be up to 0.9 acres. These channel improvements would allow the 100-year flood to pass without any flooding upstream.

Location 2: Channel Improvements at 100 North and 200 East in American Fork City

The proposed measures at this location include improving the channel by raising the riverbanks by 2.5 feet for approximately 350 feet upstream of 100 North and creating a new transition into the existing box culvert. The embankments would be armored with gabions or riprap to protect against erosion. Other channel improvements could include modifications to the channel slope and channel width for up to 700

feet. Trees and vegetation would be removed within the flow area. The total area of disturbance would be up to 1.2 acres. These channel improvements would allow the 100-year flood to pass without any flooding upstream.

Location 3: Channel Improvements at 200 South in American Fork City

At this location, project measures would consist of removing energy dissipation baffle blocks that catch debris and cause backups in the channel. Riprap would be placed as erosion protection on the downstream banks instead of the baffle blocks. The existing culvert is anticipated to be replaced in the future under a separate action. Other channel improvements could include modifications to the channel slope and channel width for up to 150 feet. Trees and vegetation would be removed within the flow area. The total area of disturbance would be up to 0.3 acres. These improvements would allow the 100-year flood to pass without any flooding.

Location 4: Channel Improvements at 400 South in American Fork City

The proposed measures at this location include widening the upstream channel and raising the riverbanks from 5 feet to 8 feet for approximately 300 feet using gabion baskets. Other channel improvements could include modifications to the channel slope and channel width for up to 900 feet. Trees and vegetation would be removed within the flow area. The total area of disturbance would be up to 0.9 acres. These improvements would allow the passage of the 100-year flood and would prevent flooding the houses near the river.

Location 5: Channel Improvements along Upper Dry Creek in Lehi City

As Dry Creek passes Lehi Elementary School, the existing 510-foot-long culvert would be replaced with a 12-foot-wide by 5-foot-tall concrete box culvert. The box culvert would have a trash rack and intake structure to prevent plugging.

The channel downstream of the box culvert would be improved to handle the design flow and the next box culvert downstream at 600 North (12-foot-wide by 5-foot-tall concrete box culvert). Channel improvements are proposed to include a 15-foot-wide concrete-lined channel bottom with 5.5-foot-tall gabion basket channel banks for approximately 381 feet. Channel slopes would match the existing channel slope with a minimum of 0.3 percent. Trees and vegetation would be removed within the flow area. The total area of disturbance would be up to 2.6 acres. Proposed improvements provide near 100% flood

reduction of the 50-year flood and would prevent flooding of houses, roadways, and other critical infrastructure.

Location 6: Channel Improvements along Upper Waste Ditch in Lehi City

As the Waste Ditch passes the school, it enters a 42-inch-diameter corrugated metal pipe, is conveyed under a portion of lawn for approximately 348 feet, and discharges back into the open channel. To provide more capacity, the existing pipe would be replaced with a 20-foot-wide by 4-foot-tall concrete box culvert. The box culvert would also have a trash rack and intake structure to prevent plugging.

The downstream channel would be improved to handle the design flow. Channel improvements would include a 15-foot-wide concrete-lined channel bottom with 5.5-foot-tall gabion basket channel banks for approximately 550 feet. Channel slopes would match the existing channel slope, with a minimum of minimum of 0.3 percent. Trees and vegetation would be removed within the flow area. The total area of disturbance would be up to 3.2 acres. Proposed improvements provide near 100% flood reduction of the 50-year flood and would prevent flooding of houses, roadways, and other critical infrastructure.

Location 7: Channel Improvements along Waste Ditch at Willow Park in Lehi City

Approximately 1,279 feet of unimproved sections of the Waste Ditch channel would be excavated and expanded to match the upstream capacity. An undersized box culvert at 300 North in Willow Park would be replaced. The new box culvert would be a 20-foot-wide by 4-foot-tall concrete box culvert. The channel improvements would be the same as those at the elementary school, including a 15-foot-wide concrete-lined channel bottom with 5.5-foot-tall gabion basket channel banks. Channel slopes would match the existing channel slope with a minimum of 0.3 percent.

Floodplain diversions would also be constructed along the lower portion of the channel. Fill material would be imported and compacted into berms to contain flows adjacent to the channel. The total area of disturbance would be up to 8.1 acres. Proposed improvements provide near 100% flood reduction of the 50-year flood and would prevent flooding of houses, roadways, and other critical infrastructure.

Location 8: Channel Improvements along Lower Dry Creek in Lehi City and Saratoga Springs City

Approximately 4,150 feet of the Dry Creek channel between 1100 West and Utah Lake would be improved with a combination of channel clearing (dredging channel and restoring natural channel capacity) and gabion-lined channel sections. The minimum slope of this channel would be 0.3 percent. Several large

trees would be removed from the channel to restore hydraulic capacity. Channel dredging would extend up to 2 feet below the existing channel flow line. Culverts would be upsized at 1700 West (12-foot-wide by 5-foot-tall) and 1900 South (14-foot-wide by 5-foot-tall). The total area of disturbance would be up to 19.4 acres. Proposed improvements provide near 100% flood reduction of the 50-year flood and would prevent flooding of houses, roadways, and other critical infrastructure.

The preferred alternative will allow the Sponsors to protect property and infrastructure while maximizing public benefits. This alternative's average annual monetary benefits are estimated to be \$2,670,190, while its estimated average annual cost is \$656,800, resulting in an annual net benefit of \$2,013,390.

3.0 ENVIRONMENTAL AND SOCIAL BENEFITS

Environmental and social benefits were not monetized, but they are explained in detail for each alternative studied in the Environmental Consequences Section of the Plan/EA.

Environmentally adverse impacts will be minimized during construction. In the long term, there would only be negligible adverse impacts anticipated from any of the evaluated alternatives. The region is developed urban land with intermittently dry waterways.

Socially, the threat of loss of life or property will be minimized with reduced flood depths at buildings and roads. The annual average daily traffic on county major collector and rural roads near the project area near American Fork was about 2,500 to 8,000 vehicles per day, and near Lehi, 1,000 to 200,000 vehicles per day (Utah Department of Transportation, 2023). However, road and bridge damages were deemed insignificant in the project area and were not evaluated. Incidental recreation and wildlife use after construction will continue and will not be affected by the project improvements. No waterbodies will be developed from the project improvements.

This project was initiated in 2019, prior to the 2020 census. While the project area may be considered urban, the sponsor cities met the rural definition by having populations under 50,000 people in the 2010 census, which was used for the applications. Since then, Lehi City's population has grown to over 50,000 people in the 2020 census. NRCS-Utah has moved the project forward due to meeting the 20% agricultural benefits/population less than 50,000 for the whole project, as defined in Section 2 (16 U.S.C. Section 1002, "Definitions". (See Appendix B for email correspondence from Sonya Keith, National Watershed and Flood Prevention Operations Program Coordinator, NRCS – Lexington, KY.)

4.0 PERIOD OF ANALYSIS

The Period of Analysis used was 52 years (including 2 years for design and construction). Floods from the 2, 5, 10, 25, 50, 100, 200, and 500-year storm events were analyzed to estimate average annual flood-related damages.

A net present value analysis was conducted to compare the costs of project alternatives. Average annual values were also estimated. All costs of installation, operation and maintenance were based on 2024 prices. The costs associated with designing and implementing all structural measures were assumed to be implemented over a one-year period immediately preceding operation. The alternative with a 51-year period of analysis yielded the highest net benefits using the mandated 2.75% discount rate for all federal water resource projects for FY24 to discount and amortize the anticipated streams of costs and benefits.

5.0 ECONOMIC ANALYSIS AND DOCUMENTATION

A customized Excel worksheet using Federal Emergency Management Agency (FEMA) depth-damage curves and locally obtained data was used to evaluate the benefits and costs of alternatives. Each project alternative, storm event, and flood damage category was included in the worksheet to estimate average annual damages. Alternative cost estimates provided by the project engineers were also included in the worksheet. Economic data and results were linked in the worksheet to create the required P&G tables for the final project report.

6.0 RURAL COMMUNITY AND AGRICULTURAL DAMAGES

The stream of monetary benefits was described in average annual equivalent terms. The average annual expected benefits were the difference between the No Action Alternative and each project Alternative. The expected average annual damages for each alternative, storm event (8-events), and damage category below were estimated with the following equation:

$$\sum_{i=1}^8 (PFED_{i-1} + FED_i) / 2 * (PPFE_{i-1} - PFE_i)$$

PFED_{i-1} - Previous Flood Event Damages

FED_i - Flood Event Damages

PPFE_{i-1} - Probability of Previous Flood Event

PFE_i - Probability of Flood Event

6.1 STRUCTURE, CONTENT & VEHICLE DAMAGES

Structure, building content, and vehicle damages for each storm event and project alternative were estimated based on structures identified from aerial imagery and property data provided by the Utah County, Utah tax assessor. Local tax appraisal district records were utilized in order to obtain the structural values of residences, commercial and public properties, and outbuildings that would be affected by project activities. The structure damages were estimated using the methodology described in the Structural Damages Calculations Template (Tim Goody, NWMC). The value of the structures was calculated by subtracting the depreciated replacement value (DRV) from the Tax Assessor's structure value. The structures in the project area that are affected by flooding are located in a small rural town. The year structures were built varied significantly, as did the DRV:

<u>Structure Built</u>	<u>Approx. Age</u>	<u>DRV</u>
2000 – 2024	25 Years	.20
1980 -1997	40 Years	.18
1960 – 1979	65 Years	.28
1936 – 1958	82 Years	.10
1911 – 1935	100 Years	.25
1895 – 1910	120 Years	.30

Based on the Life Cycle Chart (Swiftestimator.com, building cost reports online 2/2007) the Depreciated Multiplier ranged from 18% to 30%. The structure value used in the flood damage analysis was estimated as: The County Tax Accessed Value * (1- Depreciated Replacement Value Factor) (see: DelaneyFloodDamagesBenefitsData.xls for calculations). For vehicles, local project managers estimated the typical vehicle replacement dollar value.

This estimated Depreciated Replacement Value is also consistent with the USACE National Structure Inventory documentation: "Structure Valuation - These replacement values for structures are then depreciated in order to obtain depreciated replacement value; each structure is depreciated by 1% per year for the first 20 years, after which it is assumed that routine maintenance would keep structure values at 80% of their replacement values".

(<https://www.hec.usace.army.mil/confluence/nsi/technicalreferences/latest/technical-documentation>).

Areas flooded and flood depths with and without project were estimated for the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year storm events. The water depths for the 10- through 500-year storm events were obtained from the hydraulic simulation performed by Jones & DeMille Engineering, Inc., Richfield, Utah. The 2- and 5-year storm events were included in the economic analysis but were not modeled. Instead, a conservative assumption was made that the flood depths were zero during the 2- and 5-year storm events. Building types, contents, and the typical number of vehicles and vehicle values associated with impacted buildings were estimated using interpolation of flood depth-damage curves developed by FEMA. The percent damage factor was multiplied by each building structure and vehicle dollar value to estimate flood damages. The total value of structures on impacted properties is shown below. This value does not include land values, only structure values.

Watershed Planning Area 500 yr Flooded Structures (W/O Project)

	Total Structures	Residences & Apartments	Commercial Properties	Public Properties
Number	1,336	1,209	125	2
Value	\$241,673,943	\$179,568,556	\$61,917,707	\$187,680

Structure and content values were estimated as a percentage (about 75% structure and 60% content damages at 10-feet flood depth in a 1-story, no basement home) of assessed property values. Estimated floodwater depths (where damage occurs) for various storms (including the 500-year storm) for each structure were based on the results of the hydrology and hydraulics (H&H) simulation modeling. Floodwater data was then used with water depth to damage functions to estimate structural and content damages based on the ground elevation of each structure. A similar analysis was conducted for vehicles located at the property within the floodplain area. Damages to vehicles were estimated to begin at 0.5 feet of flood depth. Each affected property was estimated to have a minimum of two vehicles. The vehicle value was estimated to be \$7,500/vehicle.

6.2 ROAD DAMAGES

Road damages caused by storms up to and including the 500-year storm event would be insignificant, so they were not evaluated.

6.3 BRIDGE & CULVERT DAMAGES

For the economic analysis, no identified culverts and bridges (stream crossings) were affected by storms up to and including the 500-year event.

6.4 OTHER DAMAGES

Local county officials provided or estimated no additional "Other Damages" (emergency aid, clean-up, sewer, debris removal, etc.).

6.5 AGRICULTURAL OR CROP DAMAGES

No pasture, range, livestock, or confined animal feeding operation damages were identified within the project area affected by storms up to and including the 500-year event.

6.6 RECREATION

Based on evidence found at the site and information from local residents, the waterways are not used for recreational purposes. The flood protection measures are not intended to store water for recreation. Incidental recreational activities such as walking are expected to be minimal. Since there is no official or unofficial usage count, estimated annual visitor days are unavailable. Therefore, incidental recreation impacts were not evaluated.

6.7 SCOUR & SEDIMENT DAMAGES

Erosion and sedimentation were not identified as a project resource concern. Flood erosion, scour, and sediment deposition damages are assumed to be minimal and not evaluated with and without the project.

The table below shows that the current average annual floodwater damages without project (present condition) are \$7,396,773. Floodwater damages with project (Alternative 1) were estimated at \$4,726,583.

Table 6-1: Summary of Annual Expected Damages

Plan Annual Expected Damages		
Category	Present Condition	Alt 1
Structure, Contents & Vehicles		

American Fork	\$781,766	\$246,810
Lehi Upstream	\$5,419,884	\$4,445,151
Lehi Downstream	\$1,195,123	\$34,622
Total:	\$7,396,773	\$4,726,583

1 Price base: 2024. Calculated using FY 20242 Water Resources Discount Rate (2.75%), annualized over 50 years, and 52-year period of analysis.

The number of structures that could be flooded and their total structural value are displayed below for each of the three sub-basins:

American Fork 500 yr Flooded Structures (W/O Project)

	Total Structures	Residences & Apartments	Commercial Properties	Public Properties
Number	328	254	72	2
Value	\$73,574,967	\$22,064,487	\$51,322,800	\$187,680

American Fork 500 yr Flooded Structures (Alt 1)

	Total Structures	Residences & Apartments	Commercial Properties	Public Properties
Number	210	163	45	2
Value	\$30,957,510	\$13,059,120	\$17,710,710	\$187,680

Lehi Upstream 500 yr Flooded Structures (W/O Project)

	Total Structures	Residences & Apartments	Commercial Properties	Public Properties
Number	858	809	49	0
Value	\$141,607,320	\$131,471,373	\$10,135,947	\$0

Lehi Upstream 500 yr Flooded Structures (Alt 1)

	Total Structures	Residences & Apartments	Commercial Properties	Public Properties
Number	793	750	43	0
Value	\$136,686,467	\$126,658,187	\$10,028,280	\$0

Lehi Downstream 500 yr Flooded Structures (W/O Project))

	Total Structures	Residences & Apartments	Commercial Properties	Public Properties

Number	150	146	4	0
Value	\$26,491,656	\$26,032,696	\$458,960	\$0

Lehi Downstream 500 yr Flooded Structures (Alt 1)

	Total Structures	Residences & Apartments	Commercial Properties	Public Properties
Number	80	76	4	0
Value	\$15,987,075	\$15,528,115	\$458,960	\$0

Structures Flooded in the Dry Fork Watershed Project Area Without Project

Event	Home			Commercial			Public		
	< 1 ft	1 to 3 ft	> 3 ft	< 1 ft	1 to 3 ft	> 3 ft	< 1 ft	1 to 3 ft	> 3 ft
2-yr	0	0	2	0	0	2	0	0	2
5-yr	0	0	2	0	0	2	0	0	2
10-yr	258	57	4	11	3	2	2	0	2
25-yr	556	159	12	44	9	2	1	1	2
50-yr	649	208	18	54	16	6	1	1	4
100-yr	732	246	16	56	27	8	1	1	2
200-yr	809	275	18	68	33	10	1	1	2
500-yr	884	305	21	79	35	13	1	1	2

7.0 WATERSHED PROJECT COSTS

Project costs for flood control measures and channel work were estimated by Franson Civil Engineers, Jones & DeMille Engineering, and Horrocks Engineers. Installation and operation & maintenance costs for each activity are described in detail in the cost tabs in the economic analysis Excel worksheet.

All costs were allocated to the flood prevention purpose according to the procedure in the National Resource Economics Handbook, Part 611 Water Resources Handbook for Economics, Chapter 6 Costs and Cost Allocation (NRCS 2014b). Work Plan-EA tables were constructed based on the calculated cost allocated to flood prevention. Within this purpose, the costs were shared between NRCS and the local and state entities as specified in the NWPM; in this case, the cost share for flood prevention is 100 percent federal and 0 percent local. Within these guidelines, engineering is 100 percent federal, and operation,

maintenance, and replacement are 100 percent local. See Work Plan Table 2 in the Plan-EA for the cost allocation/cost-sharing process results.

All costs were amortized at the Fiscal Year 2024 Federal Water Resource Discount of 2.75 percent for 52 years. Average Annual Costs are computed as the sum of the amortized construction and annual operation and maintenance costs. Engineers estimate that each structure would last 50 years, the project's life.

Project engineers estimated all project costs and converted them to Present Values by discounting each cost at the beginning of the period of analysis using the applicable project discount rate. Installation expenditures before the project was installed were brought forward to the end of the installation period by charging compound interest at the project discount rate from the date the costs were incurred. Finally, the project discount rate converted the present values to average annual equivalent terms. All estimated values and damages were assessed within a customized Excel template.

Watershed Project Annual Cost Summary

	Amortization of Installation Cost	Operation, Maintenance, and Replacement Cost ²	Total
American Fork	\$104,000	\$8,600	\$112,600
Lehi Upstream	\$251,400	\$14,200	\$265,600
Lehi Downstream	\$263,900	\$14,700	\$278,600
Total	\$619,300	\$37,500	\$656,800

1/ Discount rate 2.75% with a 52 year period of analysis. Price base 2024

8.0 WATERSHED PROJECT BENEFITS AND COSTS

The table below shows that the current average annual benefits are \$2,670,190, and the average annual costs are \$656,800. The net annual benefits between with and without project that the project would provide to downstream properties are \$2,013,390.

As reflected below, all three project areas had a B/C ratio greater than 1.0. Under Alternative 1, all three geographic areas produce a B/C ratio of 4.07.

Watershed Project Benefit-Cost Summary

Alternative 1	Average Annual Benefits ^{2/}	Average Annual Costs ^{3/}	Benefit Cost Ratio	Net Benefits
American Fork	\$534,956	\$112,600	4.75	\$422,356

Lehi Upstream	\$974,733	\$265,600	3.67	\$709,133
Lehi Downstream	\$1,160,501	\$278,600	4.17	\$881,901
Grand Total	\$2,670,190	\$656,800	4.07	\$2,013,390

1/ Discount rate 2.75% with a 52 year period of analysis. Price base 2024

9.0 FINAL TABLES

Below are all tables for all project increments and alternatives.

Table 6-1											
Estimated Installation Cost American Fork-Dry Creek Watershed, Utah [2024 Dollars] ¹											
Works of Improvement	Unit	Number			Estimated Cost (2024 Dollars) ¹						
		Federal Land	Non-Federal Land	Total	Public Law 83-566 Funds			Other Funds			Total
					Federal Land	Non-Federal Land	Total	Federal Land	Non-Federal Land	Total	
Structural Measures											
Flood Protection											
American Fork	Acres	0	1,305	1,305	\$0	\$2,728,000	\$2,728,000	\$0	\$0	\$0	\$2,728,000
Lehi Upstream	Acres	0	2,323	2,323	\$0	\$5,718,000	\$5,718,000	\$0	\$865,000	\$865,000	\$6,583,000
Lehi Downstream	Acres	0	284	284	\$0	\$4,817,000	\$4,817,000	\$0	\$2,079,000	\$2,079,000	\$6,896,000
Total Project					\$0	\$13,263,000	\$13,263,000	\$0	\$2,944,000	\$2,944,000	\$16,207,000
¹ Price base: 2024											

Table 6-2															
Estimated Cost Distribution—Water Resource Project Measures American Fork—Dry Creek Watershed, Utah [2024 Dollars] ¹															
Works of Improvement	Installation Cost—Public Law 83-566						Installation Cost—Other Funds							Total	
	Construction ³	Engineering ⁶	Real Property Rights ^{4,5}	Relocation Payments	Project Admin.	Total Public Law 566	Construction ³	Engineering ⁶	Real Property Rights ^{4,5}	Water Rights	Relocation Payments	Project Admin. ²	Total Other	Installation Costs	
American Fork	\$2,387,000	\$341,000	\$0	\$0	\$0	\$2,728,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,728,000	
Lehi Upstream	\$4,968,000	\$750,000	\$0	\$0	\$0	\$5,718,000	\$0	\$0	\$865,000	\$0	\$0	\$0	\$865,000	\$6,583,000	
Lehi Downstream	\$4,187,000	\$630,000	\$0	\$0	\$0	\$4,817,000	\$0	\$0	\$2,079,000	\$0	\$0	\$0	\$2,079,000	\$6,896,000	
Total	\$11,542,000	\$1,721,000	\$0	\$0	\$0	\$13,263,000	\$0	\$0	\$2,944,000	\$0	\$0	\$0	\$2,944,000	\$16,207,000	
1 Price base: 2024 2 Includes \$0 for relocation assistance advisory service. 3 Includes \$___ of Public Law 83-566 funds and \$___ of other funds for cultural resource protection and mitigation measures. 4 Includes \$0 of real property cost for mitigation. 5 Includes \$___ or surveys, legal fees, other costs. 6 Engineering services contract cost to be borne: \$3,066,477 by Public Law 83-566 funds and \$0 by other funds.															

Table 6-3 Cost Allocation and Cost Sharing Summary for Multi-Purpose Watershed Project Plans American Fork—Dry Creek Watershed, Utah [2024 Dollars]¹						
	PL-566 Funds		Other Funds		Total Funds	
	Flood Protection	Total	Flood Protection	Total	Flood Protection	Total
<i>Structural Measures</i>						
Construction	\$11,542,000	\$11,542,000	\$0	\$0	\$11,542,000	\$11,542,000
Engineering	\$1,721,000	\$1,721,000	\$0	\$0	\$1,721,000	\$1,721,000
Real property rights	\$0	\$0	\$2,944,000	\$2,944,000	\$2,944,000	\$2,944,000
Relocation Payments	\$0	\$0	\$0	\$0	\$0	\$0
Project admin.	\$0	\$0	\$0	\$0	\$0	\$0
Total		\$13,263,000		\$2,944,000		\$16,207,000
¹ Price base: 2024 ² Method of cost allocation:						

Table 5c: Estimated Average Annual Flood Damage Reduction Benefits
Alternative 1 – Shiviwits

Table 6-4 Estimated Average Preferred Alternative Annual Costs, American Fork—Dry Creek Watershed, Utah (2024 Dollars)¹				
Works of Improvement	Amortization of Installation Cost	Operation, Maintenance and Replacement Cost ²	Other Direct Costs	Total
American Fork	\$104,000	\$8,600	\$0	\$112,600
Lehi Upstream	\$251,400	\$14,200	\$0	\$265,600
Lehi Downstream	\$263,900	\$14,700	\$0	\$278,600
Total	\$619,300	\$37,500	\$0	\$656,800
¹ Price base: 2024, amortized over 52-years at a discount rate of 2.75 percent. ² Includes \$0 for operation, maintenance, and replacement for recreational development. ³ Costs for technical assistance to install measures in this evaluation unit are included.				

Table 6-5 Estimated Average Annual Flood Damage Reduction Benefits American Fork—Dry Creek Watershed, Utah [2024 Dollars]						
Item	Estimated Average Annual Damage				Damage Reduction Benefit ^{3,4}	
	Without Project		With Project			
	Agriculture -related ²	Non-agriculture -related	Agriculture -related ²	Non-agriculture -related	Agriculture -related ²	Non-agriculture -related
Flood Protection Improvements						
Structure, Contents & Vehicles						
American Fork	\$781,766		\$246,810		\$534,956	
Lehi Upstream	\$5,419,884		\$4,445,151		\$974,733	
Lehi Downstream	\$1,195,123		\$34,622		\$1,160,501	
Grand Total	\$7,396,773		\$4,726,583		\$2,670,190	
¹ Price base: 2024						
² Agriculture-related damage includes damage to rural communities.						
³ Includes effects of land-treatment measures.						
⁴ Costs and benefits for on-farmland treatment have been netted out.						

Table 6-6 Estimated Average Annual Watershed Protection Damage Reduction Benefits American Fork—Dry Creek Watershed, Utah [2024 Dollars]¹		
Item	Damage Reduction Benefit, Average Annual	
	Agriculture-related	Non-agriculture-related
<i>Onsite</i>		
Structure, Contents & Vehicles	\$2,670,190	
Total	\$2,670,190	\$0
¹ Price base: 2024		

Table 6-7 Comparison of Preferred Alternative Benefits and Costs American Fork—Dry Creek Watershed, Utah [2024 Dollars]¹					
Works of Improvement	Agricultural	Non-Agricultural	Average Annual Benefits	Average Annual Costs²	Benefit Cost Ratio
	Damage Reduction				
	Flood Reduction	Other			
Land Treatment—acres					
American Fork	\$534,956	\$0	\$534,956	\$112,600	4.75
Lehi Upstream	\$974,733	\$0	\$974,733	\$265,600	3.67
Lehi Downstream	\$1,160,501	\$0	\$1,160,501	\$278,600	4.17
Total	\$2,670,190	\$0	\$2,670,190	\$656,800	4.07
¹ Price base: 2024					
² From Table 2					