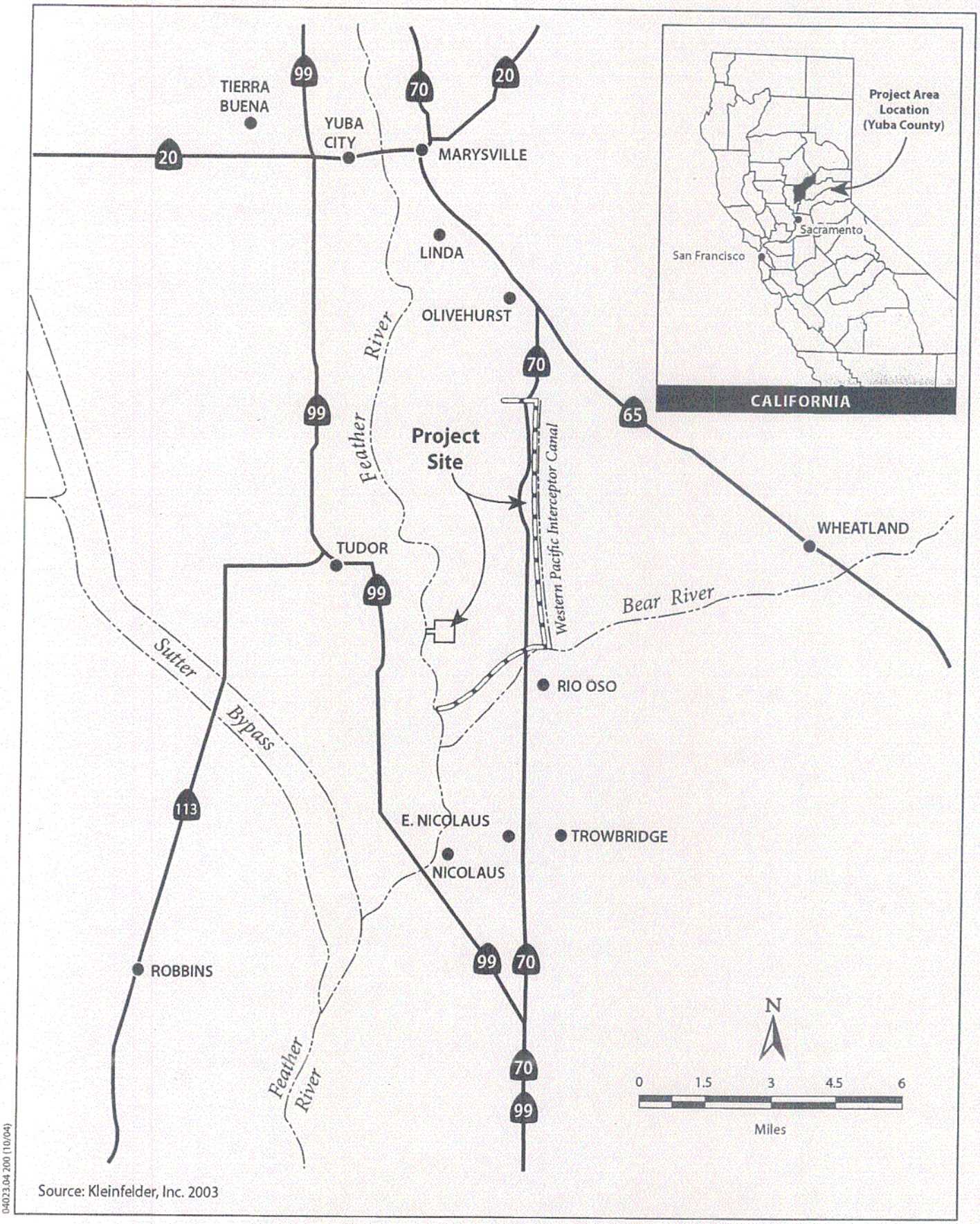
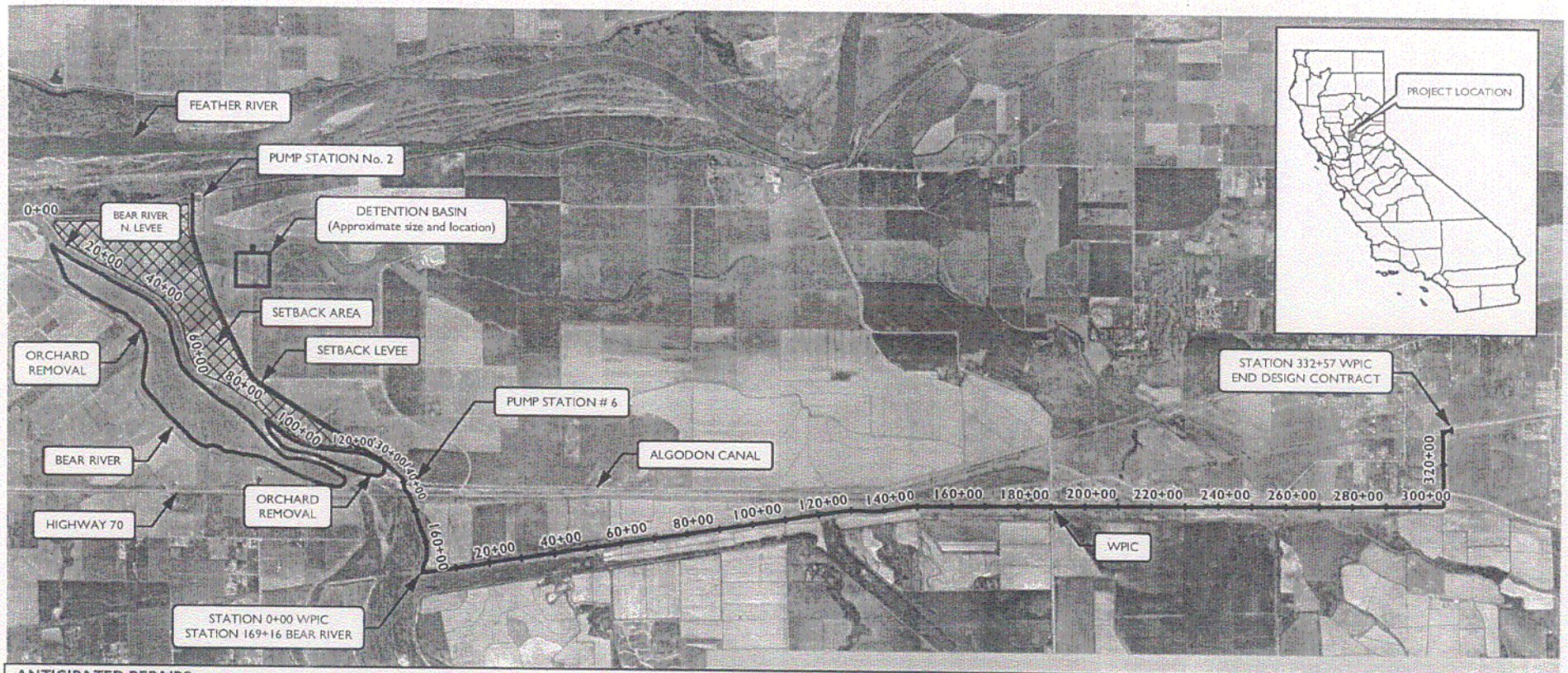


Source: Kleinfelder, Inc. 2003

04023.04 200 (10/04)

Jones & Stokes

Figure 1
Location Map

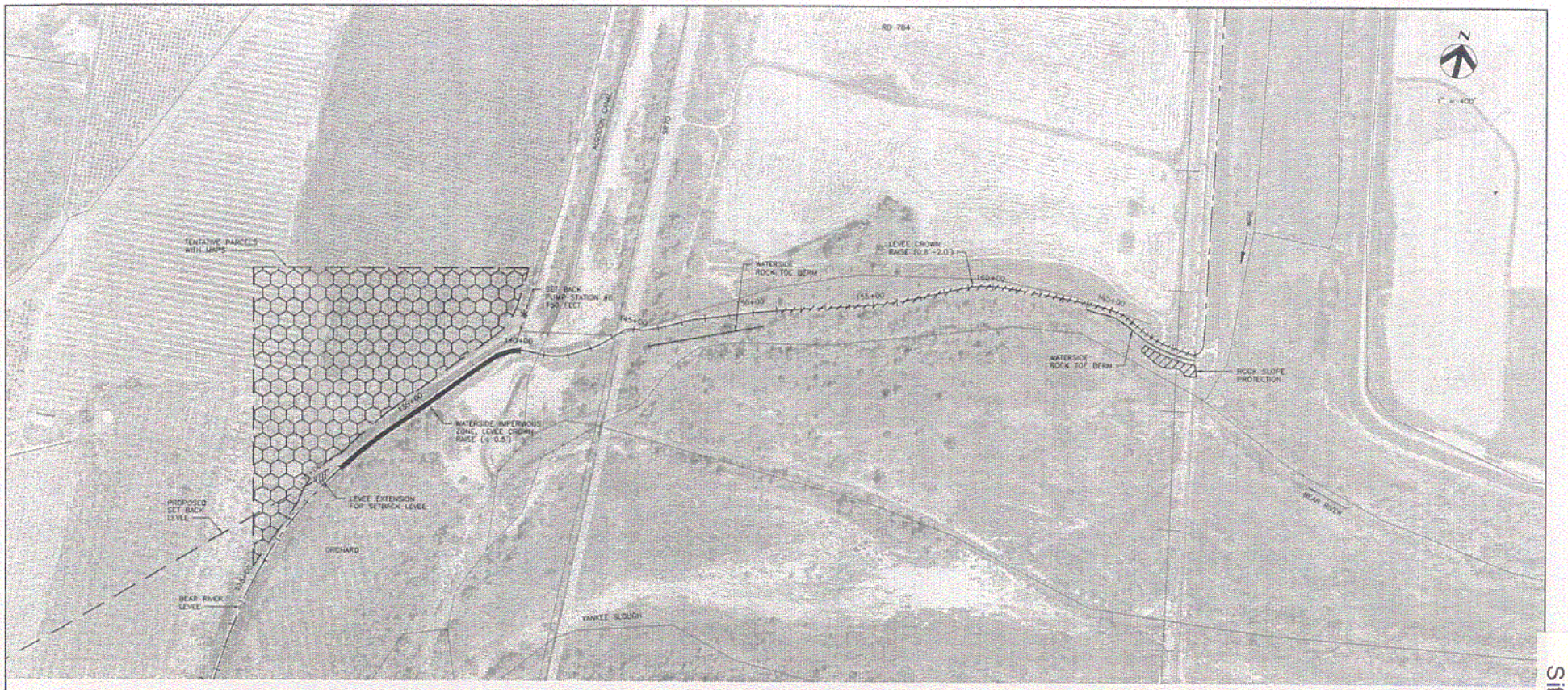


ANTICIPATED REPAIRS

LEVEE	STATION INTERVAL	ISSUE	LEVEE TREATMENT
BEAR	0+00 - 135+00	FLOODWAY CAPACITY	REMOVE ORCHARD; CONVERT TO NATIVE COVER TYPE
BEAR	131+00 - 140+00	THROUGH-SEEPAGE, HEIGHT	FULL LEVEE RECONSTRUCTION, RAISE NEW LEVEE CROWN 0.5 FOOT (AVERAGE)
BEAR	141+00	UNDER-SEEPAGE	SET BACK PUMP STATION No. 6 150 FEET FROM EXISTING LOCATION, BACKFILL SOUTHERNMOST 150 FEET OF ALGODON CANAL
BEAR	145+50 - 150+50	EROSION	EROSION PROTECTION (RIPRAP)
BEAR	151+00 - 169+00	HEIGHT	RAISE CROWN 1.5 FEET (AVERAGE) BY FULL LEVEL RAISE (LANDSIDE)
BEAR	164+00 - 169+00	EROSION	EROSION PROTECTION (RIPRAP)
WPIC	0+00 - 130+00	UNDER-SEEPAGE	FILL BORROW DITCH
WPIC	0+00 - 137+50	HEIGHT	RAISE CROWN 0.8 FOOT (AVERAGE) BY FULL LEVEE RAISE (WATERSIDE)
WPIC	210+00 - 250+00	HEIGHT	RAISE CROWN <0.5 FOOT (AVERAGE); 1200 FEET REQUIRES FULL LEVEE RAISE OF 0.9 FEET (WATERSIDE)
WPIC	251+00 - 270+50	UNDER-SEEPAGE	SLURRY CUTOFF WALL 50 FEET DEEP
WPIC	296+00 - 332+50	HEIGHT	RAISE CROWN 1.2 FEET (AVERAGE) BY FULL LEVEE RAISE (LANDSIDE)

Jones & Stokes

Figure 2
Project and Plan View
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority



LEVEE	STATION	ISSUE	PROPOSED MEASURE(S)
BEAR	131+00 - 140+00	THROUGH SEEPAGE, FREEBOARD	WATERSIDE IMPERVIOUS ZONE, RAISE CROWN <0.5 FEET (AVERAGE) BY FULL LEVEE RAISE (WATERSIDE)
BEAR	141+00	UNDERSEEPAGE	SET BACK PUMP STATION #6 150 FEET FROM EXISTING LOCATION. BACKFILL 150 FEET OF ALGODON CANAL. NEW PUMP STATION.
BEAR	145+50 - 150+50	LEVEE SLOPE SCOUR PROTECTION	LEVEE WATERSIDE TOE ROCK BERM
BEAR	151+00 - 169+00	FREEBOARD	RAISE CROWN 1.5 FOOT (AVERAGE) BY FULL LEVEE RAISE (LANDSIDE), AND CROWN ONLY RAISE
BEAR	164+00 - 169+00	SLOPE EROSION, LEVEE SLOPE SCOUR PROTECTION	RIVERBANK SLOPE EROSION PROTECTION (ROCK), LEVEE WATERSIDE TOE ROCK BERM

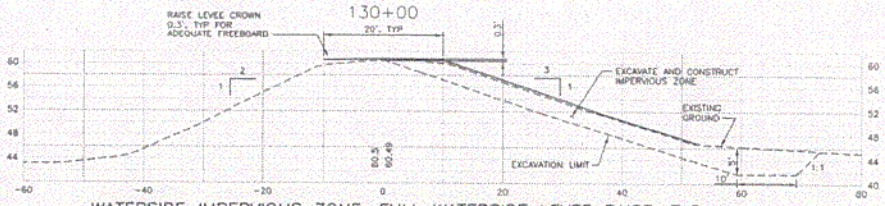
CONCEPTUAL

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
BEAR RIVER, WPIC AND YUBA LEVEE REPAIR PROJECT
PLAN - RECOMMENDED BEAR RIVER LEVEE REPAIRS

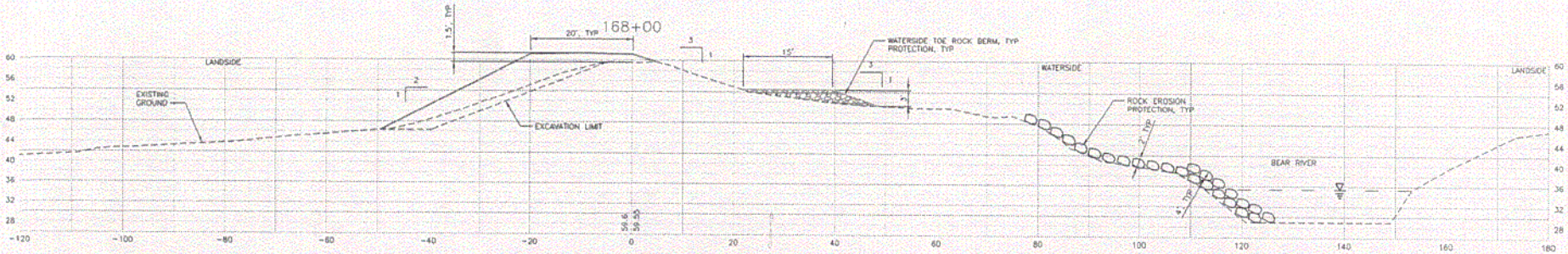
HDR

Plate 1

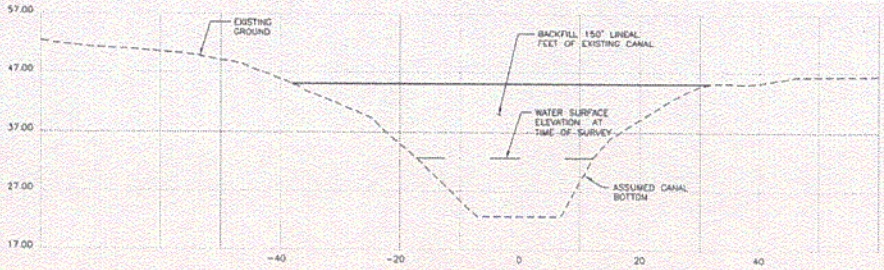
Attachment C - Levee Design and Slurry Wall Cross-Sections, Potential Borrow Sites, and Detention Basin Design



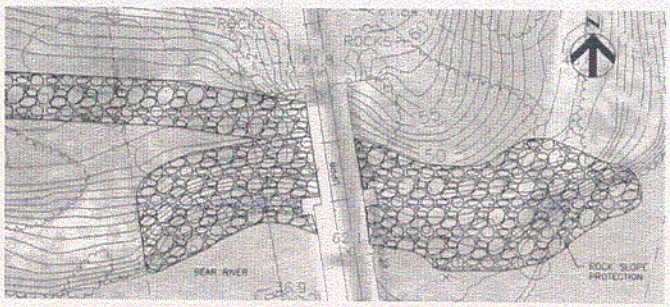
WATERSIDE IMPERVIOUS ZONE, FULL WATERSIDE LEVEE RAISE, TYP



FULL LANDSIDE LEVEE RAISE,
SLOPE EROSION PROTECTION, WATERSIDE TOE BERM, TYP



ALGADON CANAL INFILL, TYP



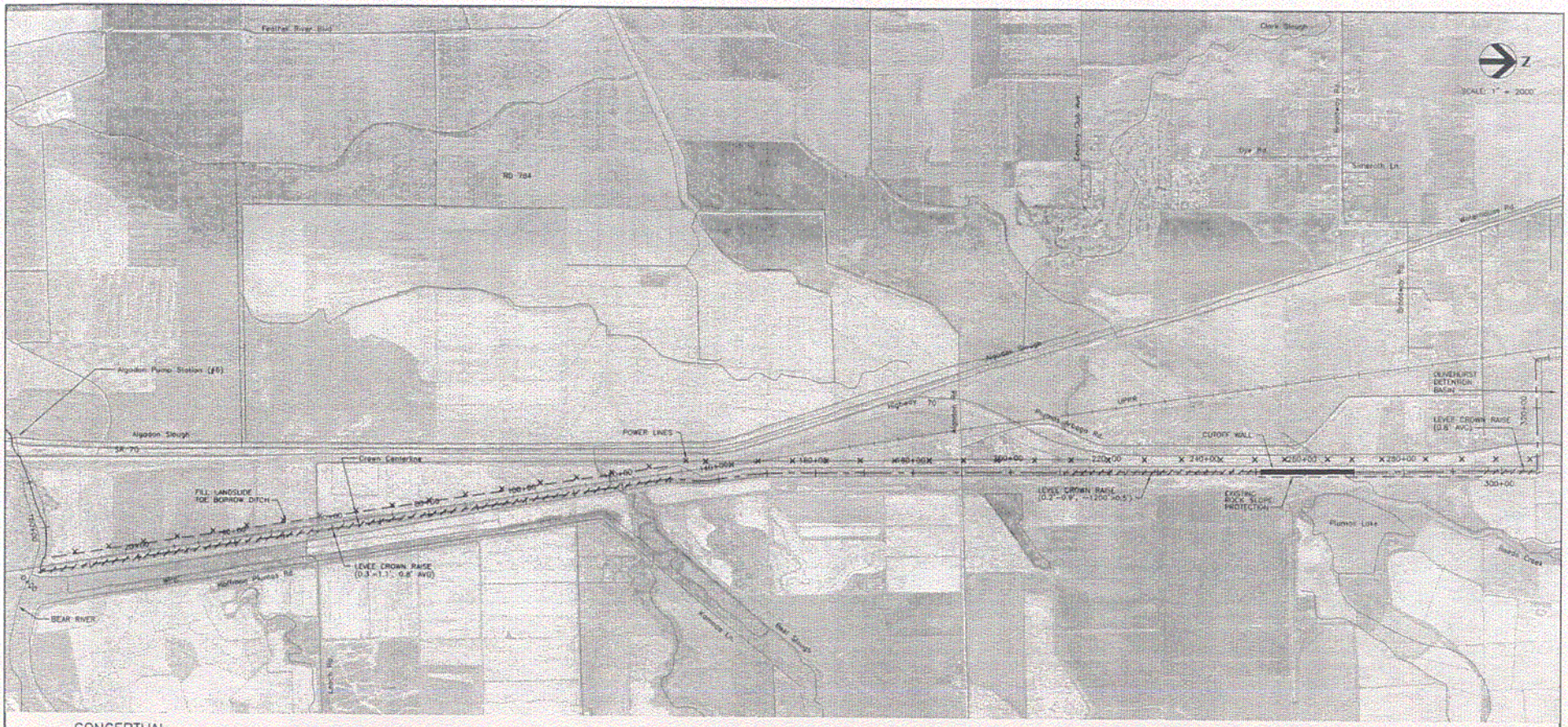
SLOPE EROSION PROTECTION PLAN

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
BEAR RIVER, WPIC AND YUBA LEVEE REPAIR PROJECT
TYPICAL DETAILS – RECOMMENDED BEAR RIVER LEVEE REPAIRS

CONCEPTUAL

HDR

Plate 2



CONCEPTUAL

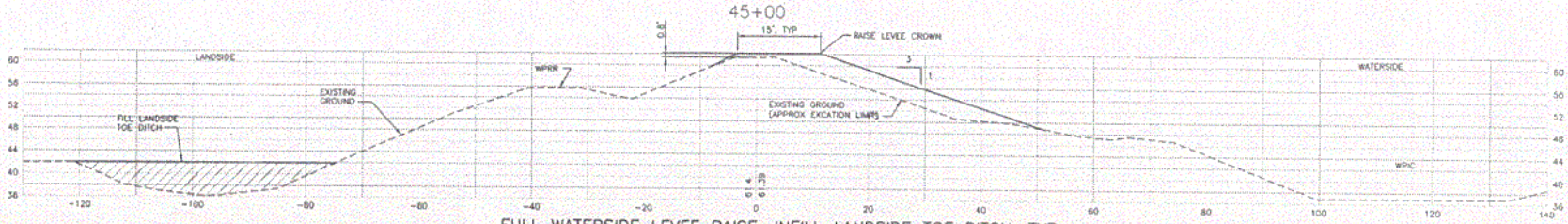
LEVEE	STATION	ISSUE	PROPOSED MEASURE(S)
WPIC	0+00 – 130+00	UNDERSEEPAGE	FILL DITCH AT LANDSIDE TOE
WPIC	0+00 – 137+50	FREEBOARD	RAISE CROWN 0.5 FEET (AVERAGE) FULL LEVEE RAISE (WATERSIDE)
WPIC	210+00 – 250+00	FREEBOARD	RAISE CROWN ONLY BY <0.5 FEET (AVERAGE), (~1200 FEET REQUIRES FULL LEVEE RAISE OF 0.9 FEET (WATERSIDE))
WPIC	251+00 – 270+00	UNDERSEEPAGE	CUTOFF WALL 50 FEET DEEP
WPIC	296+00 – 312+00	FREEBOARD (SR70)	RAISE CROWN 1.2 FEET (AVERAGE) BY FULL LEVEE RAISE (LANDSIDE)

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
BEAR RIVER, WPIC AND YUBA LEVEE REPAIR PROJECT
PLAN – RECOMMENDED WPIC LEVEE REPAIRS

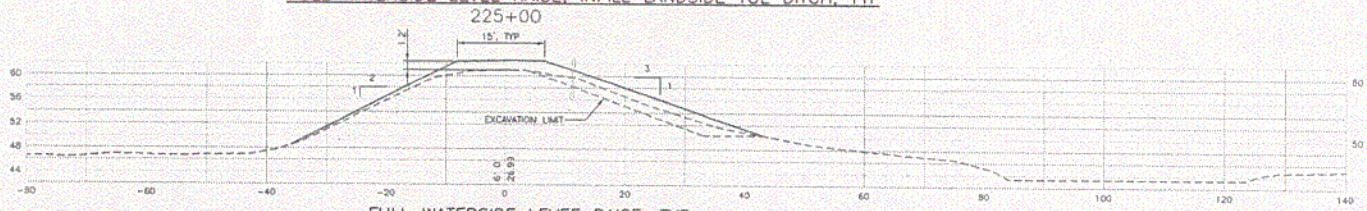
HDR

Plate 3

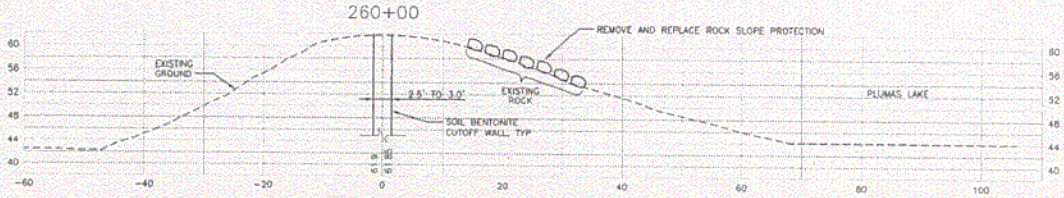
//SAC-FILSRV1/PROJECTS/201064/19703 PHASE 2 LEVEE REPAIRS/PLANS/PLATE-3.DWG
02-16-05 ACOLLINS 13:13:13



FULL WATERSIDE LEVEE RAISE, INFILL LANDSIDE TOE DITCH, TYP



FULL WATERSIDE LEVEE RAISE, TYP



SLOPE EROSION PROTECTION AND CUTOFF WALL, TYP

NOTES:

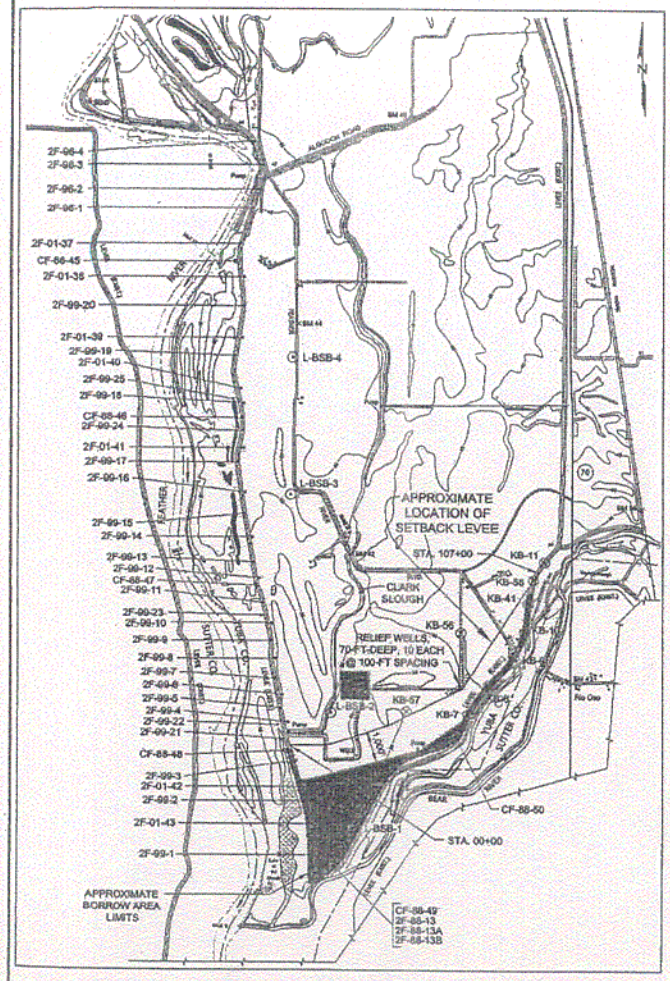
1. WPRR - WESTERN PACIFIC RAILROAD
2. WPIC - WESTERN PACIFIC INTERCEPTOR CANAL

CONCEPTUAL

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
BEAR RIVER, WPIC AND YUBA LEVEE REPAIR PROJECT
TYPICAL DETAILS - RECOMMENDED WPIC LEVEE REPAIRS

HDR

Plate 4



PLAN VIEW

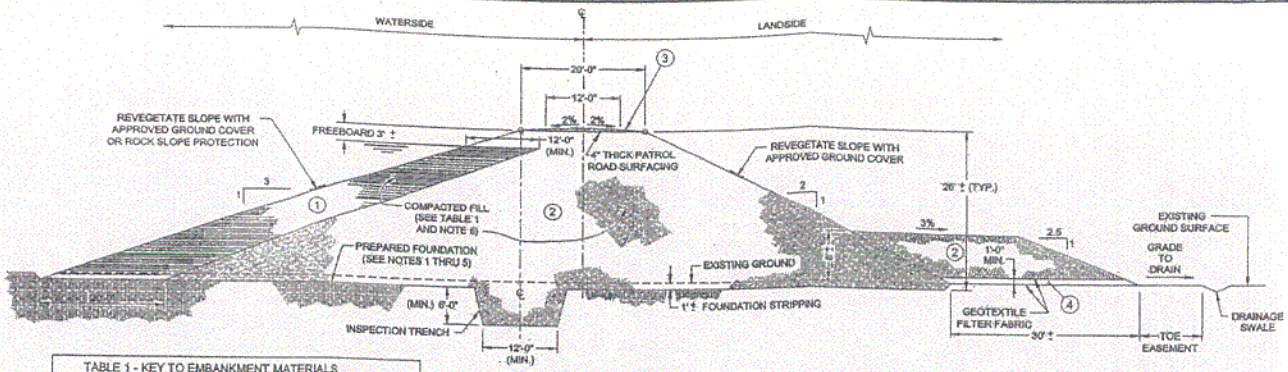
SCALE, FEET

LEGEND

- EXISTING LEVEE
- PROPOSED SETBACK LEVEE
- KB-7 KLEINFELDER BORING LOCATION (2003, 2004)
- L-BSB-1 APPROX. GEI TEST BORING LOCATION (2002)
- 2F-97-7 APPROX. CORPS OF ENGINEERS TEST BORING LOCATION (1997)
- CF-88-39 APPROX. CORPS OF ENGINEERS CONE PENETRATION TEST LOCATION (1988)
- POTENTIAL BORROW AREA LOCATION

NOTE

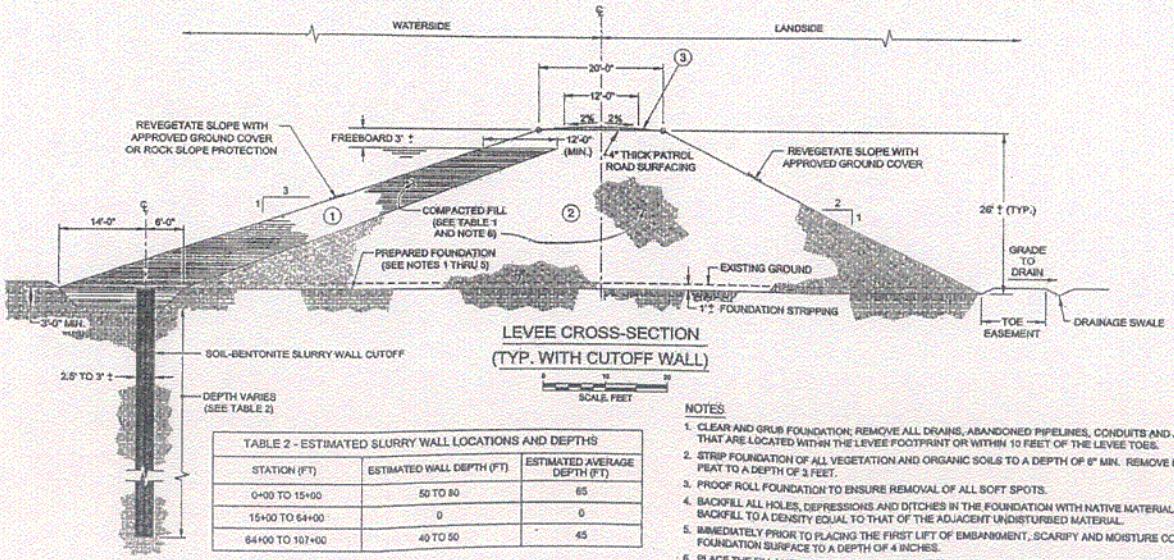
Map is taken from U.S.G.S. Topographic 7.5 Minute Series Map of Nicolaus, California Quadrangle, Photorevised 1973. Datum is National Geodetic Vertical Datum of 1929 (NGVD).



LEVEE CROSS-SECTION (TYP. WITHOUT CUTOFF WALL)

SCALE, FEET

TABLE 1 - KEY TO EMBANKMENT MATERIALS	
1	LOW-PERMEABILITY MATERIAL WITH 20% OR MORE PASSING THE NO. 200 SIEVE, A PLASTICITY INDEX OF 8 OR MORE AND LIQUID LIMIT LESS THAN 50
2	RANDOM MATERIAL FROM LEVEE/BORROW AREA EXCAVATION
3	CALTRANS CLASS 2 AGGREGATE BASE
4	DRAIN ROCK



LEVEE CROSS-SECTION (TYP. WITH CUTOFF WALL)

SCALE, FEET

TABLE 2 - ESTIMATED SLURRY WALL LOCATIONS AND DEPTHS		
STATION (FT)	ESTIMATED WALL DEPTH (FT)	ESTIMATED AVERAGE DEPTH (FT)
0+00 TO 15+00	50 TO 80	65
15+00 TO 64+00	0	0
64+00 TO 107+00	40 TO 50	45

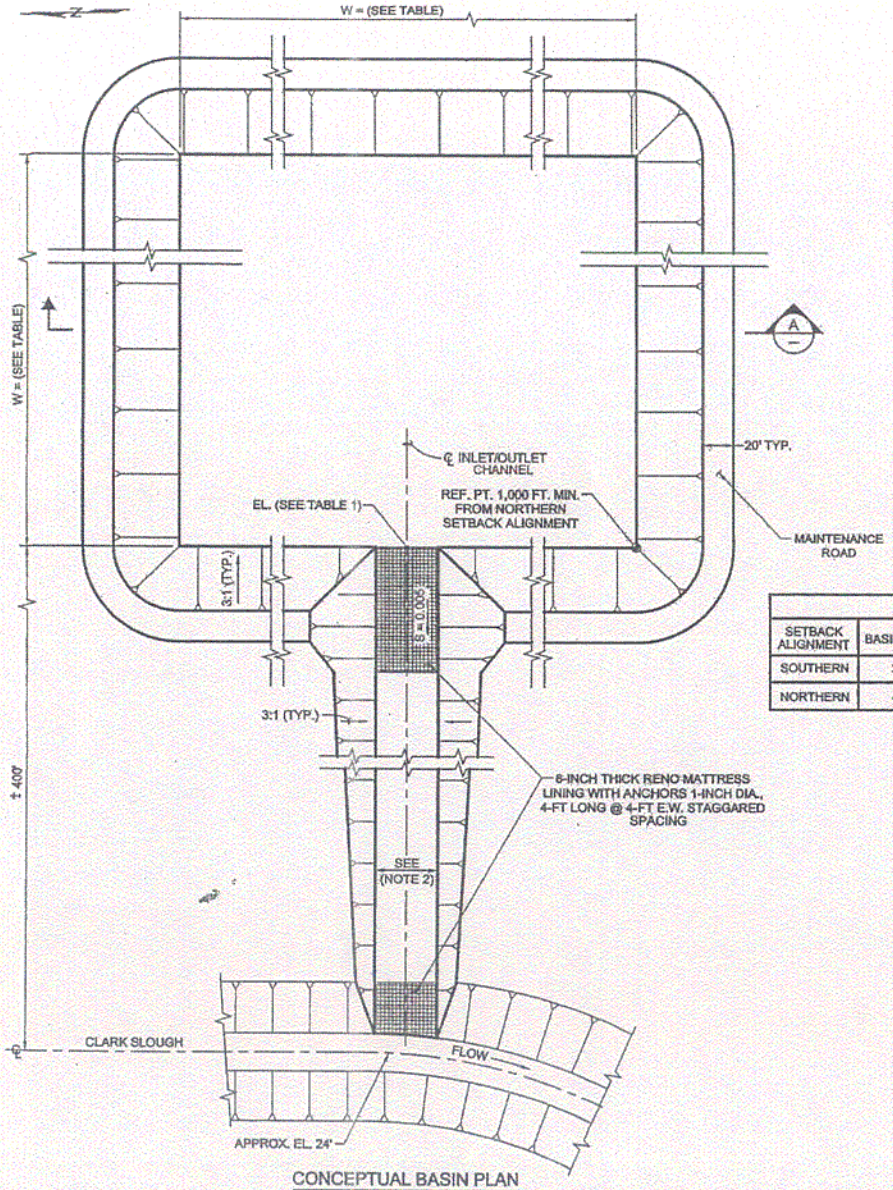
NOTES

1. CLEAR AND GRUB FOUNDATION; REMOVE ALL DRAINS, ABANDONED PIPELINES, CONDUITS AND APPURTENANCES THAT ARE LOCATED WITHIN THE LEVEE FOOTPRINT OR WITHIN 10 FEET OF THE LEVEE TOES.
2. STRIP FOUNDATION OF ALL VEGETATION AND ORGANIC SOILS TO A DEPTH OF 6" MIN. REMOVE LARGE ROOTS AND PEAT TO A DEPTH OF 2 FEET.
3. PROOF ROLL FOUNDATION TO ENSURE REMOVAL OF ALL SOFT SPOTS.
4. BACKFILL ALL HOLES, DEPRESSIONS AND DITCHES IN THE FOUNDATION WITH NATIVE MATERIAL AND COMPACT THE BACKFILL TO A DENSITY EQUAL TO THAT OF THE ADJACENT UNDISTURBED MATERIAL.
5. IMMEDIATELY PRIOR TO PLACING THE FIRST LIFT OF EMBANKMENT, SCARIFY AND MOISTURE CONDITION THE FOUNDATION SURFACE TO A DEPTH OF 4 INCHES.
6. PLACE THE FILL MATERIALS IN 4" TO 6" THICK LIFTS AND COMPACT THE MATERIALS TO A DRY DENSITY NO LESS THAN 90% OF ASTM D1557 OR 97% OF ASTM D698 AND MOISTURE CONTENT AT OR ABOVE OPTIMUM.

GEI Consultants, Inc.
OAKLAND • CALIFORNIA

FEATHER-BEAR RIVERS LEVEE SETBACK PROJECT

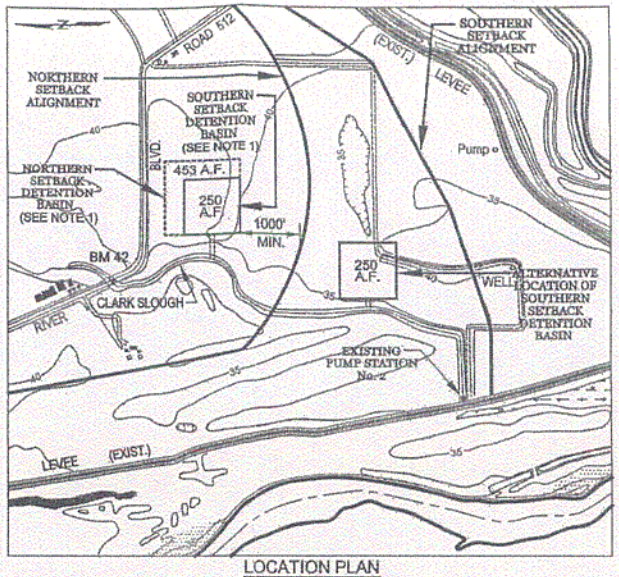
Figure 3 Preliminary Plan View, Typical Cross Sections, and Potential Borrow Areas for the Southern-Alignment Levee Setback



CONCEPTUAL BASIN PLAN

0 40' 80'
SCALE, FEET

TABLE 1			
SETBACK ALIGNMENT	BASIN CAPACITY	INVERT ELEVATION	BASE WIDTH
SOUTHERN	250 A.F.	27.5	1,060-FT.
NORTHERN	453 A.F.	27	1,447-FT.

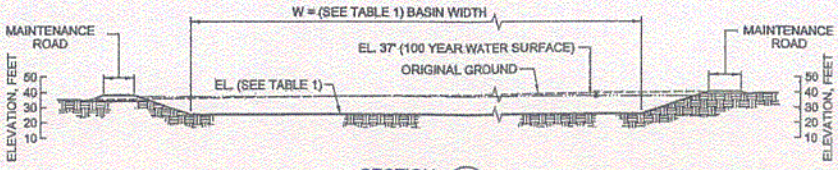


LOCATION PLAN

0 1,000 2,000
SCALE, FEET

NOTES

1. LOCATION OF DETENTION BASIN IS APPROXIMATE. FINAL LOCATION AND CONFIGURATION WILL BE DETERMINED DURING DETAILED DESIGN.
2. WIDTH OF CHANNEL WILL BE DETERMINED DURING DETAILED DESIGN.



SECTION A

0 40' 80'
SCALE, FEET

NOTE:
THE DETENTION BASIN LOCATION, CONFIGURATION, AND DETAILS ARE PRELIMINARY.

GEI Consultants, Inc.
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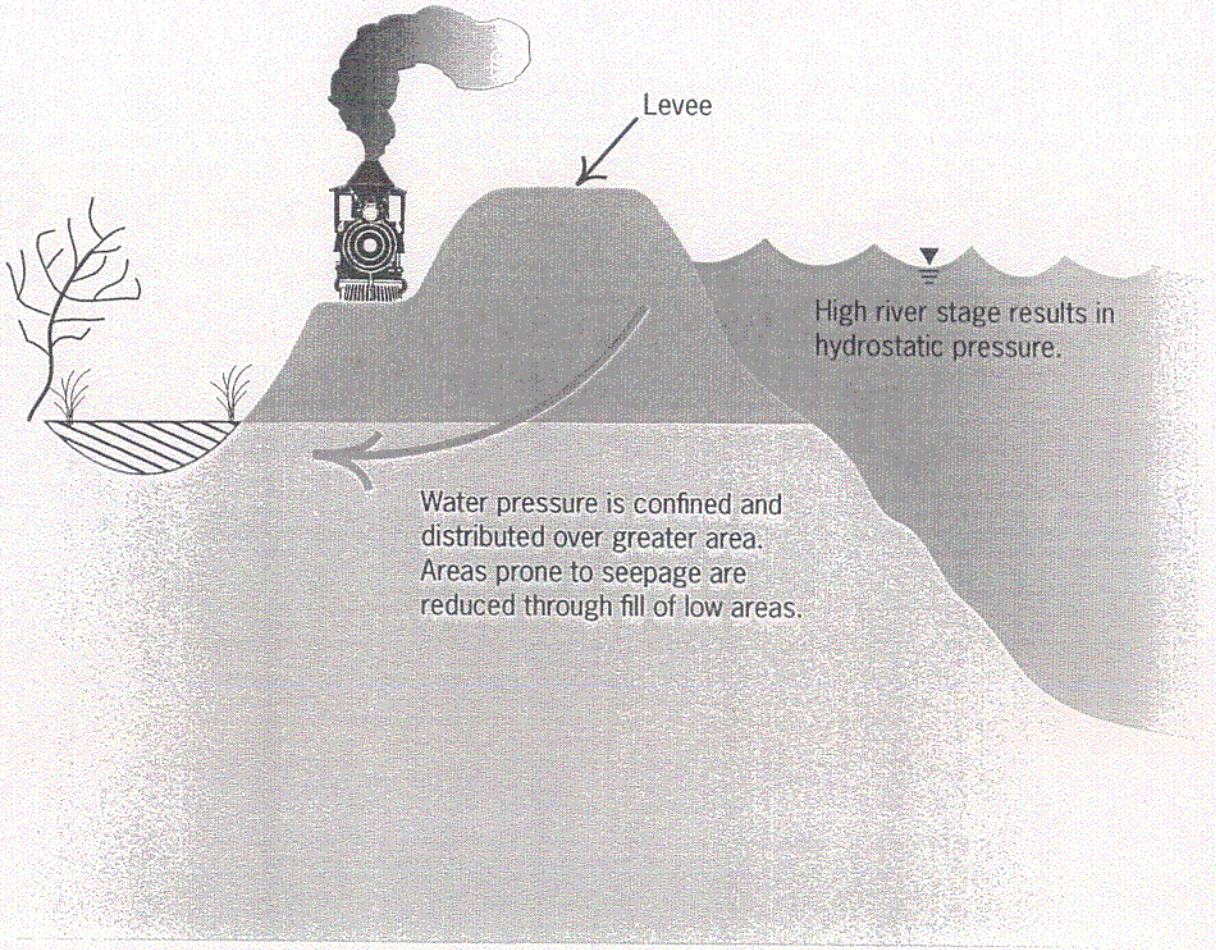
FEATHER-BEAR RIVERS LEVEE SETBACK PROJECT

Figure 4 Detention Basins with the Northern-Alignment and Southern-Alignment Levee Setbacks

FILL BORROW DITCH

Concept: Potential seepage paths are blocked by fill of low areas on land side of levee.



Not to Scale

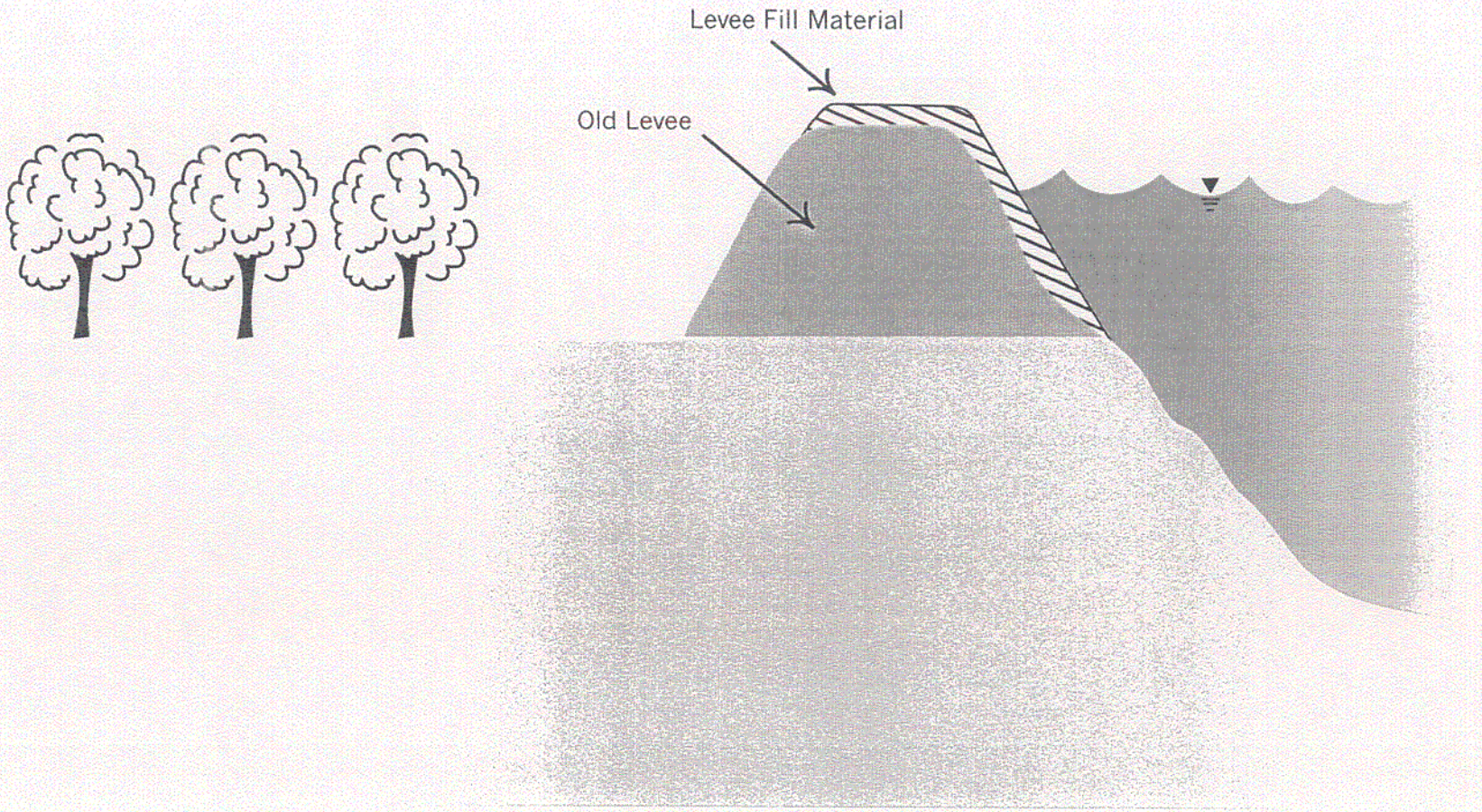
04023.04 100

Jones & Stokes

Figure 5
Borrow Ditch Fill
Feather-Bear-WPIC Levee Project, Three Rivers Levee Improvement Authority

LEVEE RAISE

Concept: Flood protection is increased by adding material to crown and levee slopes (landside or waterside).



Not to Scale

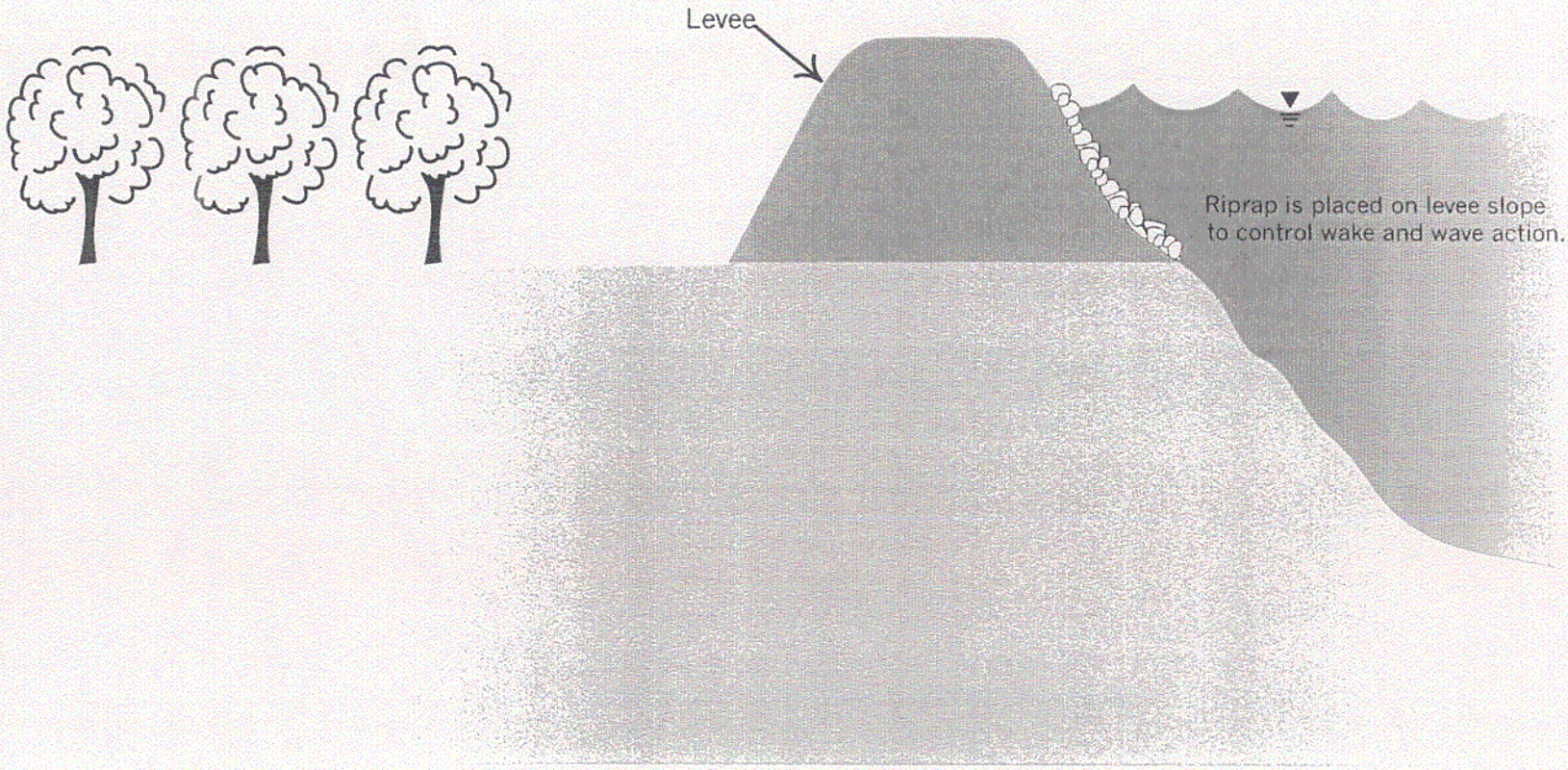
04023.04 100

Jones & Stokes

Figure 6
Levee Raise
Feather-Bear-WPIC Levee Project, Three Rivers Levee Improvement Authority

RIPRAP PLACEMENT

Concept: Waterside erosion is prevented by placement of engineered rock.

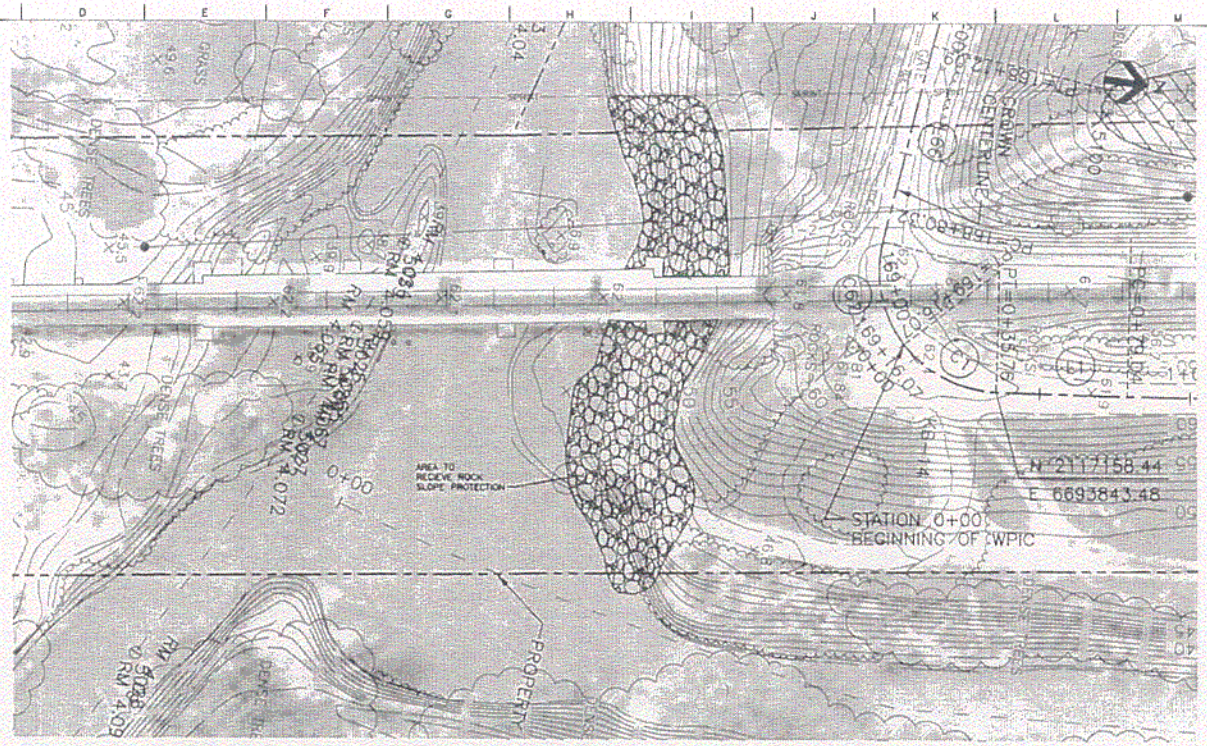


Not to Scale

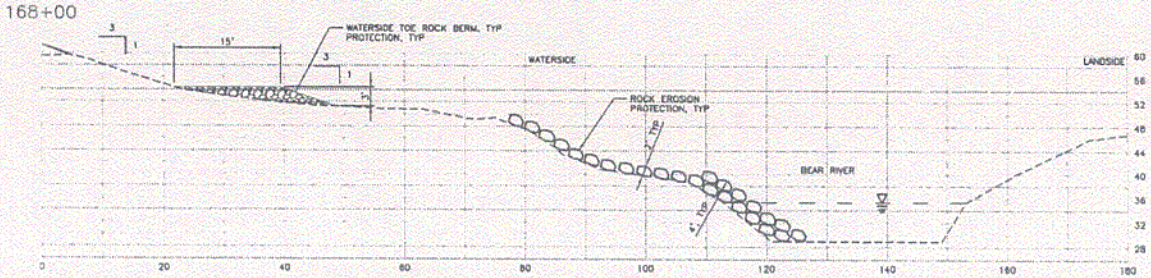
04023.04 100

Jones & Stokes

Figure 7
Riprap Placement
Feather-Bear-WPIC Levee Project, Three Rivers Levee Improvement Authority



PLAN
SCALE: 1" = 20'



FULL LANDSIDE LEVEE RAISE,
SLOPE EROSION PROTECTION, WATERSIDE TOE BERM, TYP
SCALE: 1" = 10'

HDR Engineering, Inc.

Project Manager	K. MYERS
Designed	C. KRIVANEC
Checked	P. HRADILEK
Drawn	A. COLLINS

Phase II Levee Repairs
Upper Bear River, WP Interceptor Canal and Yuba River
Reclamation District No. 784
Marysville, California

Three Rivers Levee Improvement Authority

BEAR RIVER LEVEE
SLOPE PROTECTION

Date	FEBRUARY, 2005
Project No.	201064-19703
Scale	AS NOTED
File Name	BEAR-SLP-PROT.DWG

Figure 7-1

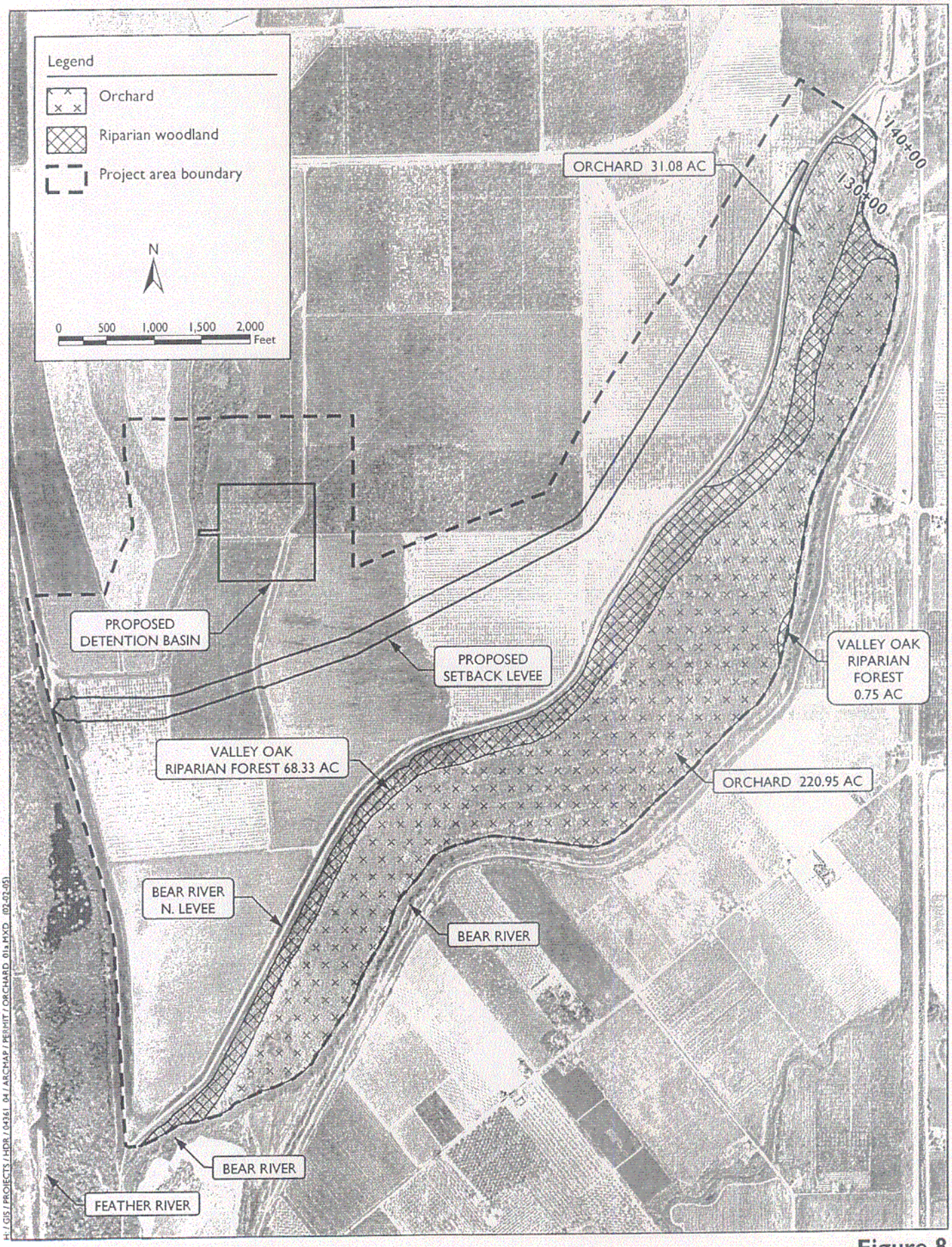
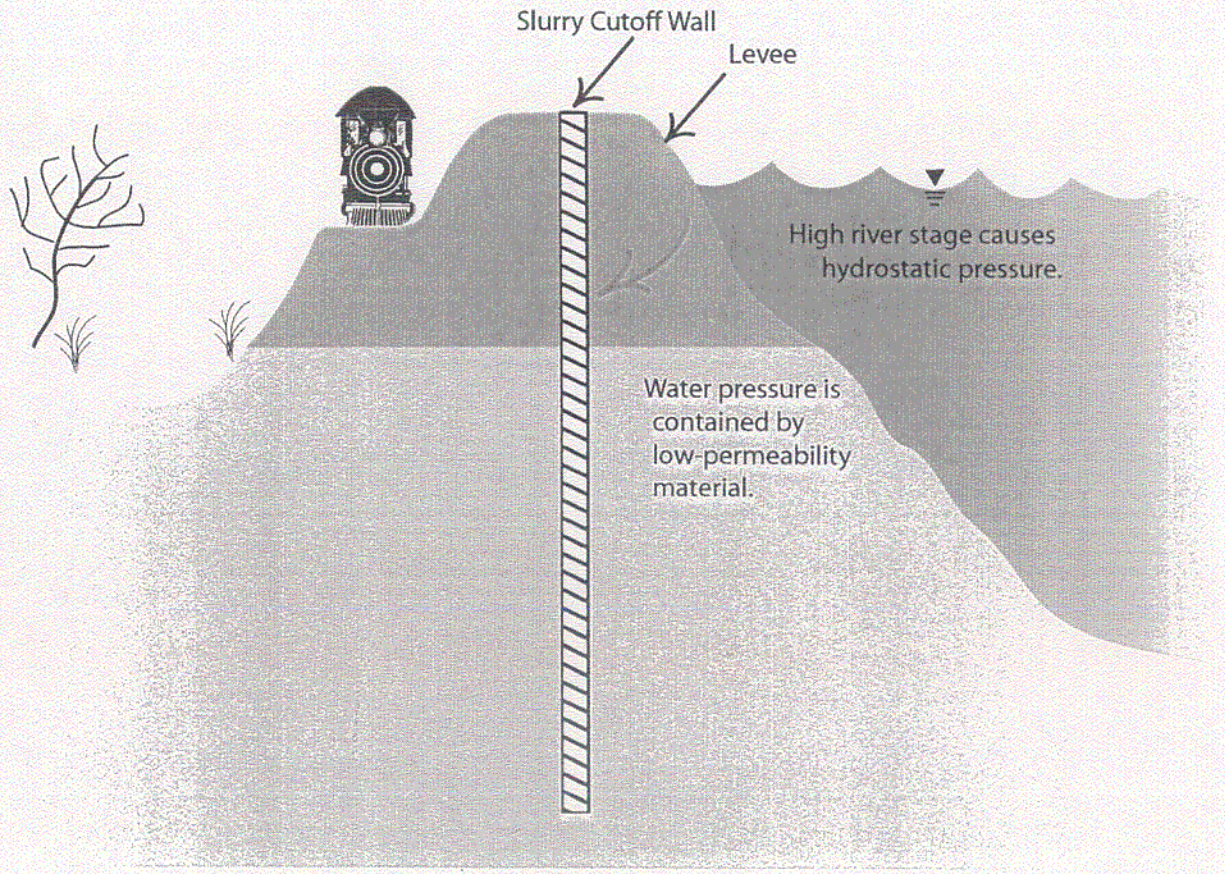


Figure 8
Feather-Bear-WPIC Levee Project
Three Rivers Levee Imptovement Authority
Orchard Removal Areas

SLURRY CUTOFF WALL

Concept: Water pressure is contained and dispersed by a low-permeability wall constructed in the levee cross section.



Not to Scale

04023.04 100

Jones & Stokes

Figure 9
Slurry Cutoff Wall
Feather-Bear-WPIC Levee Project, Three Rivers Levee Improvement Authority

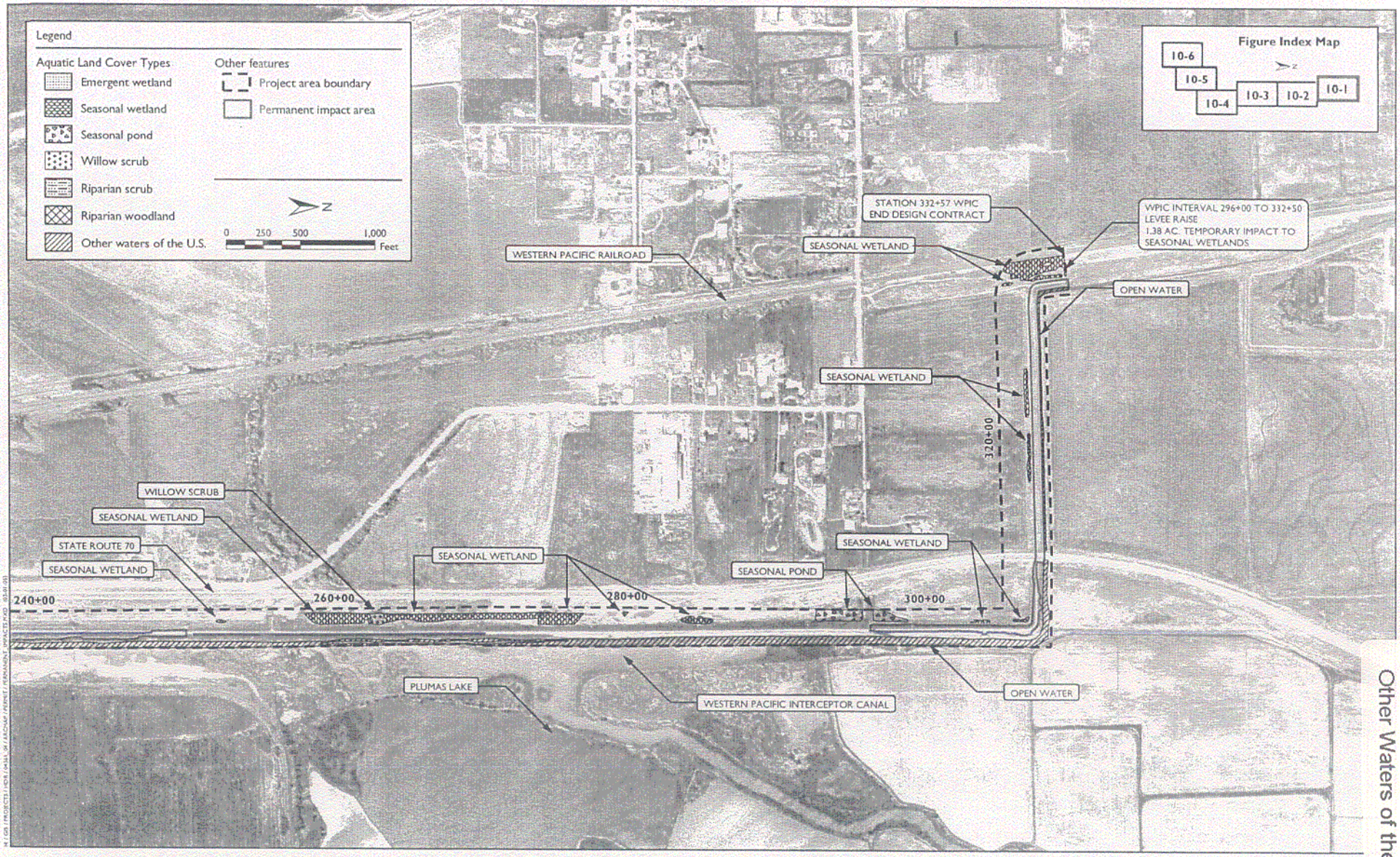


Figure
Feather-Bear-WPIC Levee Pro
Three Rivers Levee Improvement Autho
Permanent Impact A

D - Locations of Wetlands and Other Waters of the United States

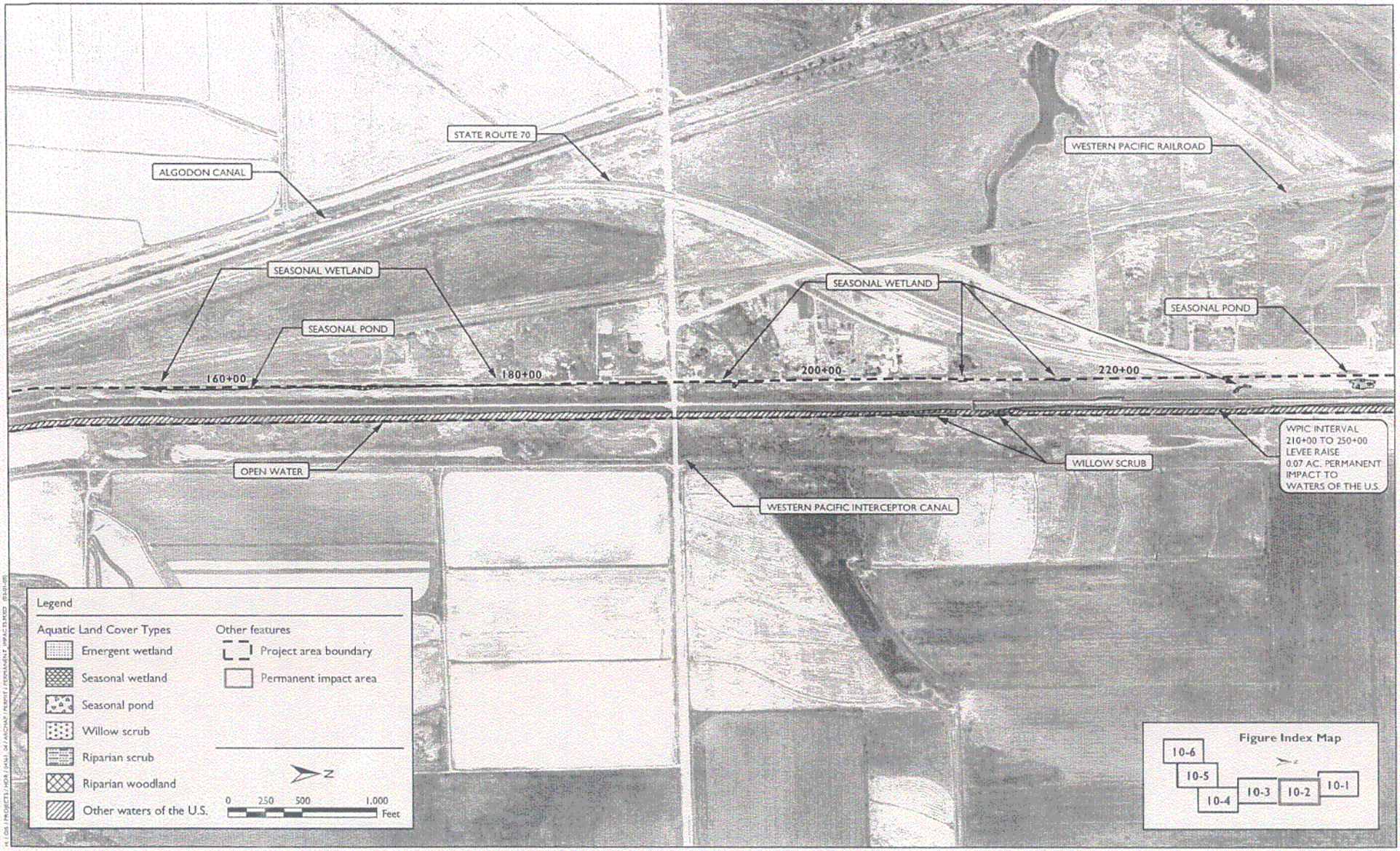


Figure 10-2
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority
Permanent Impact Areas

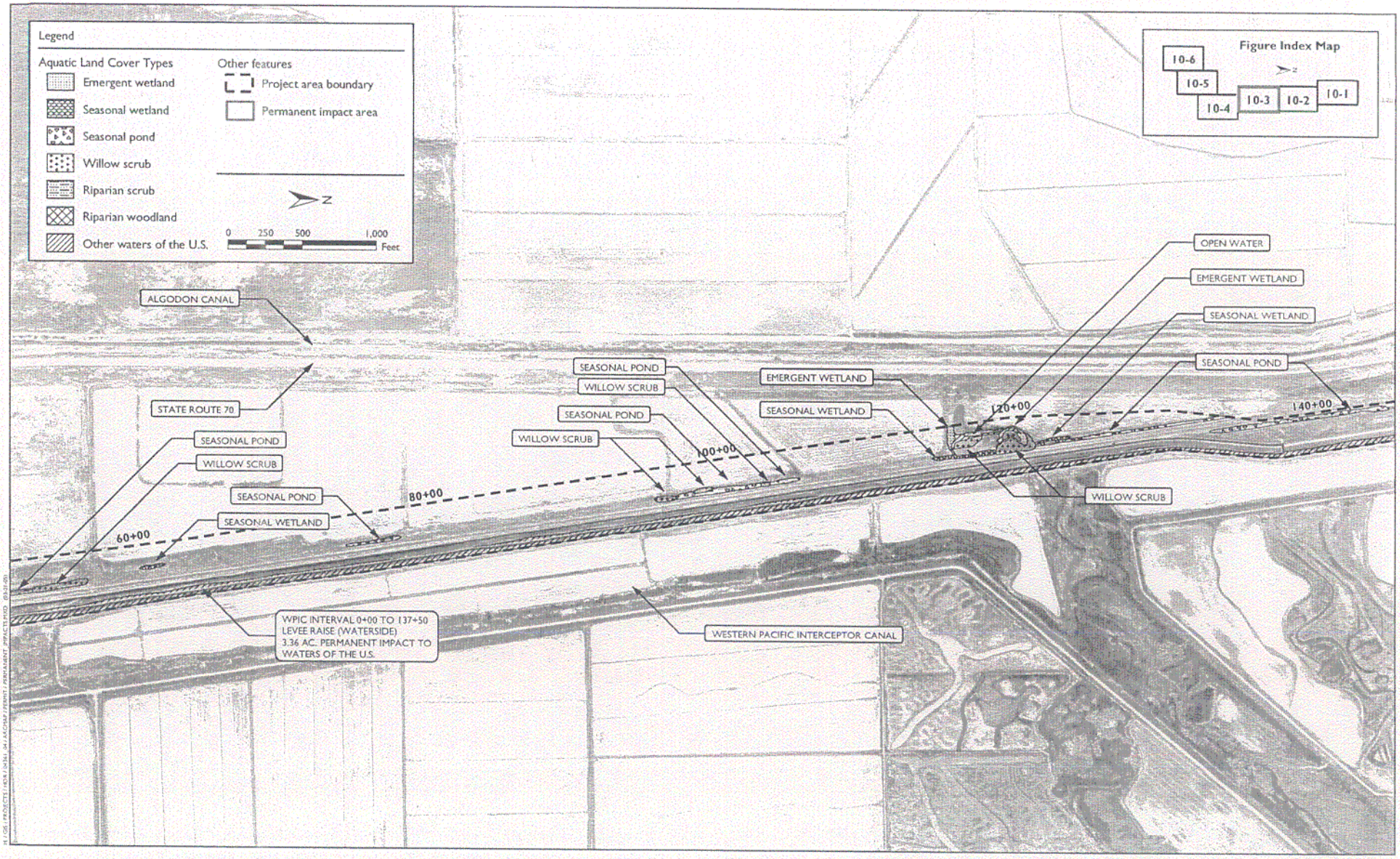


Figure 10-3
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority
Permanent Impact Areas

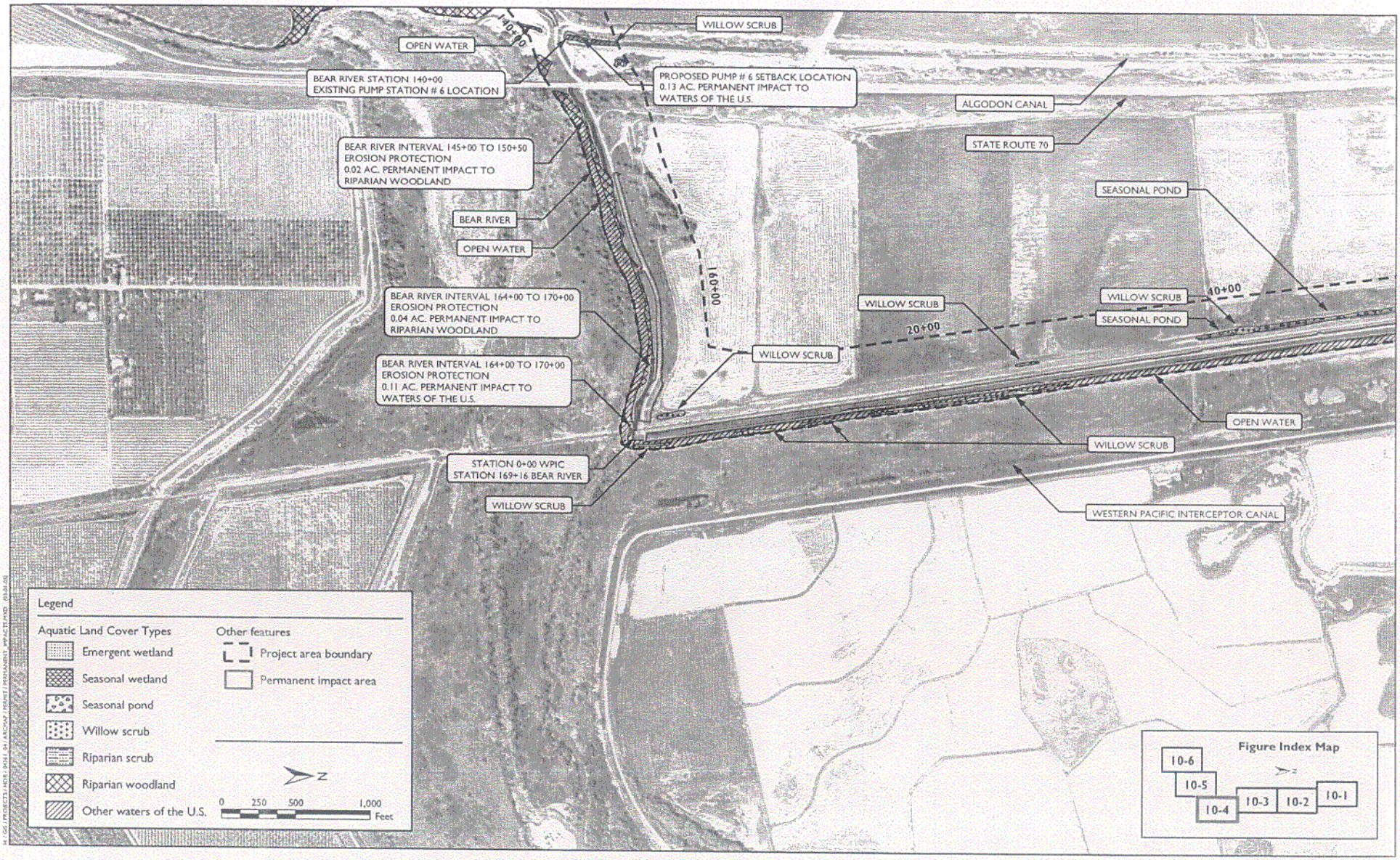


Figure 10-4
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority
Permanent Impact Areas

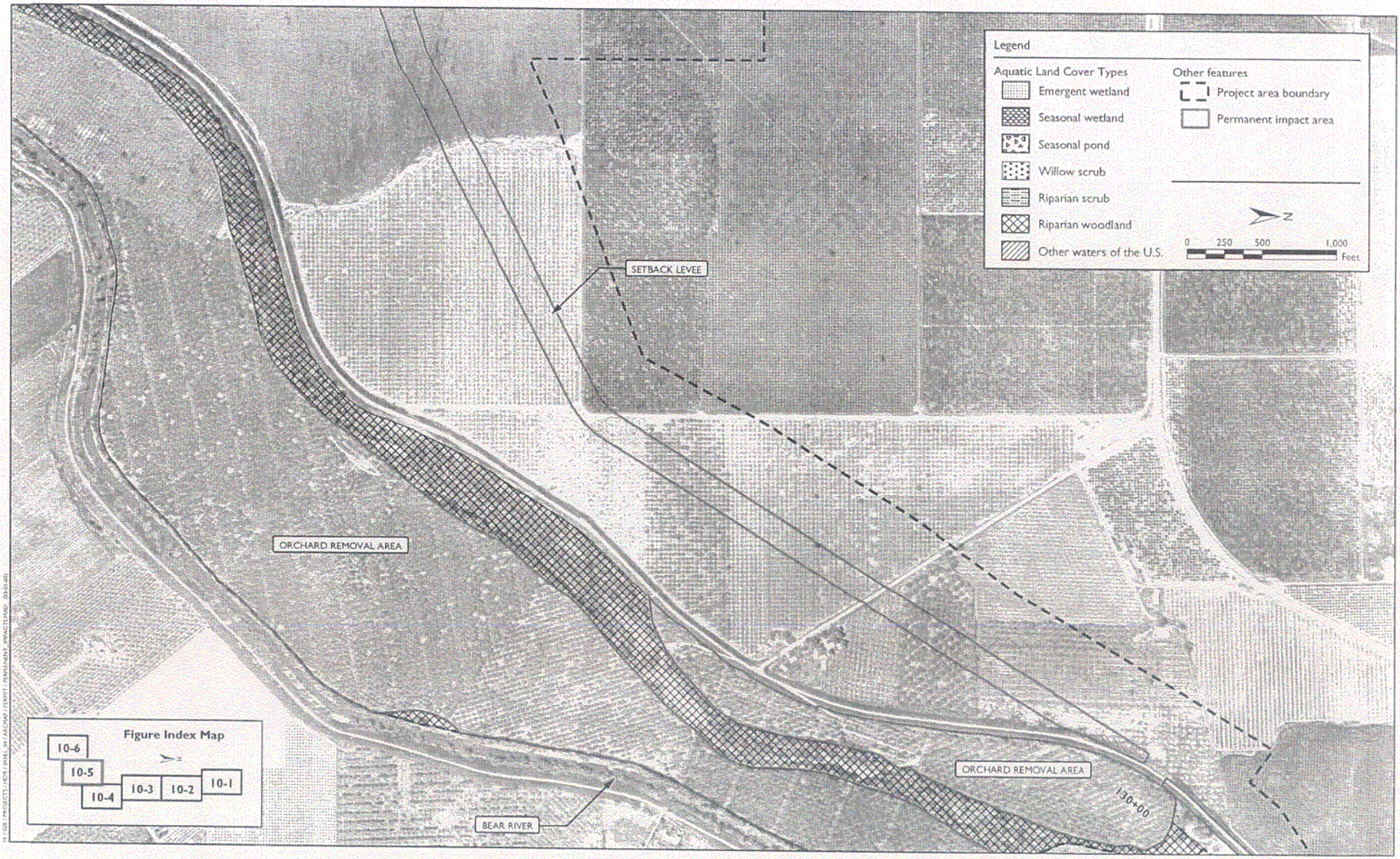


Figure 10-5
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority
Permanent Impact Areas

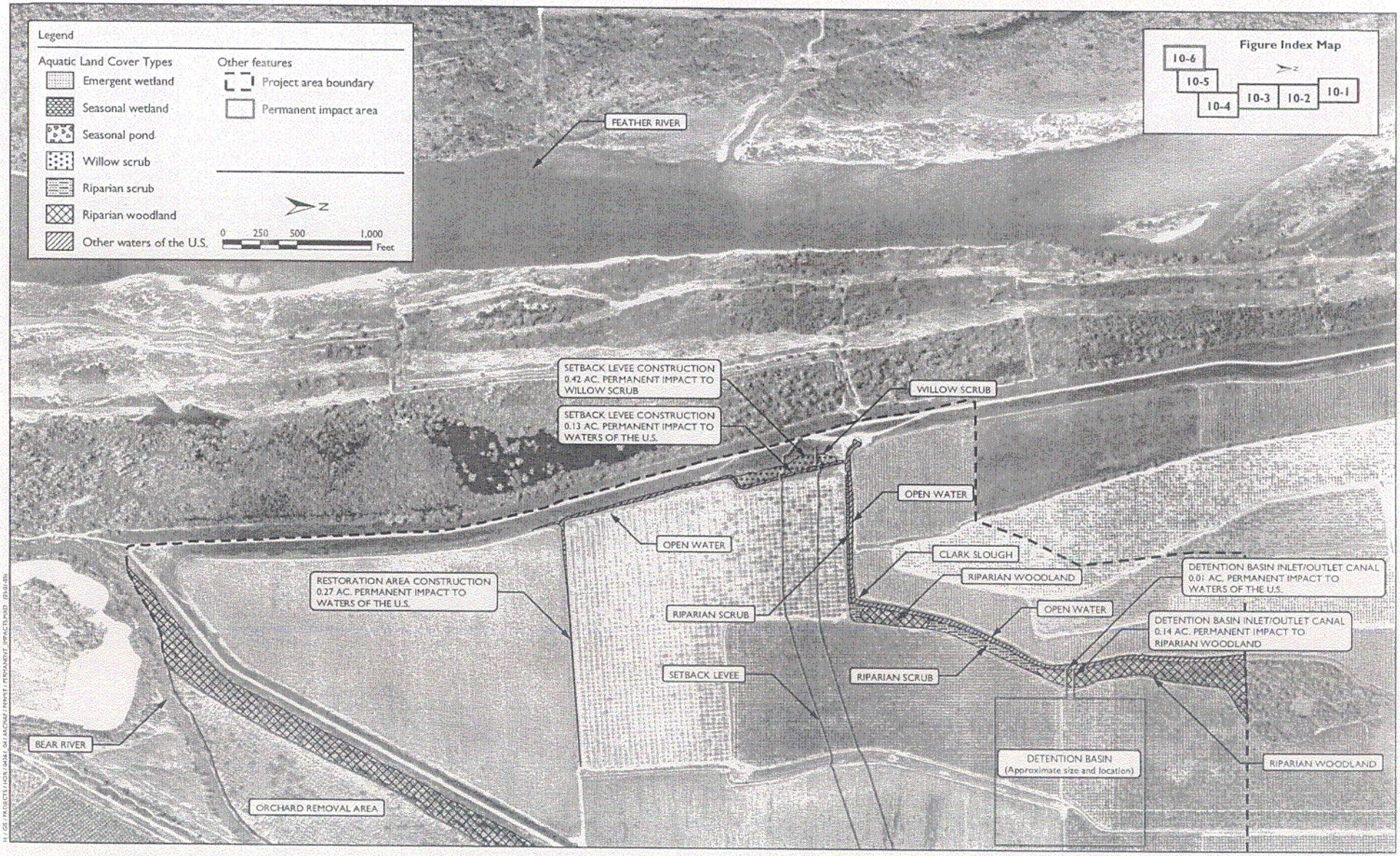


Figure 10-6
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority
Permanent Impact Areas

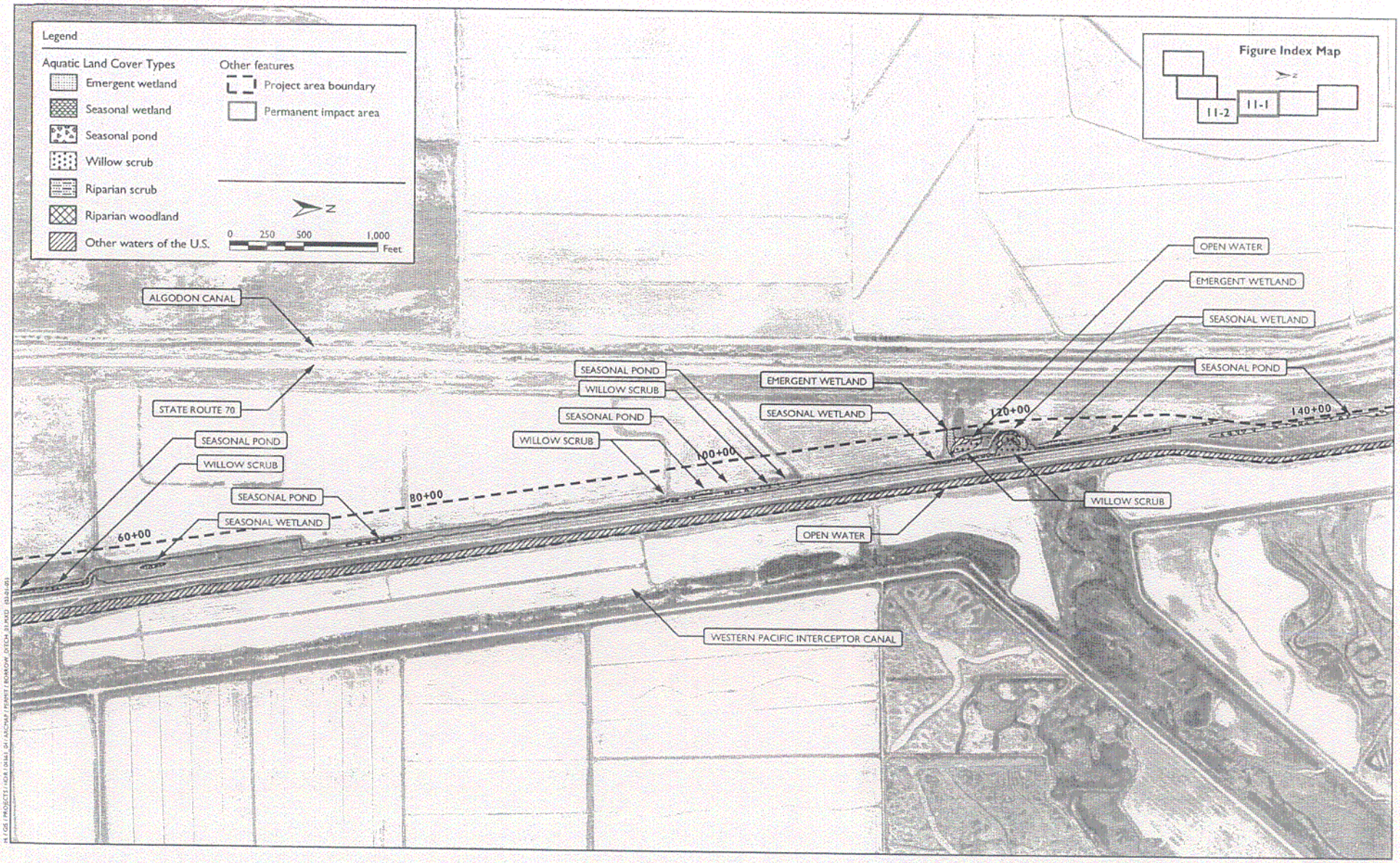


Figure 11-1
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority
Permanent Impact Areas Resulting from the Filling of the Borrow Ditch

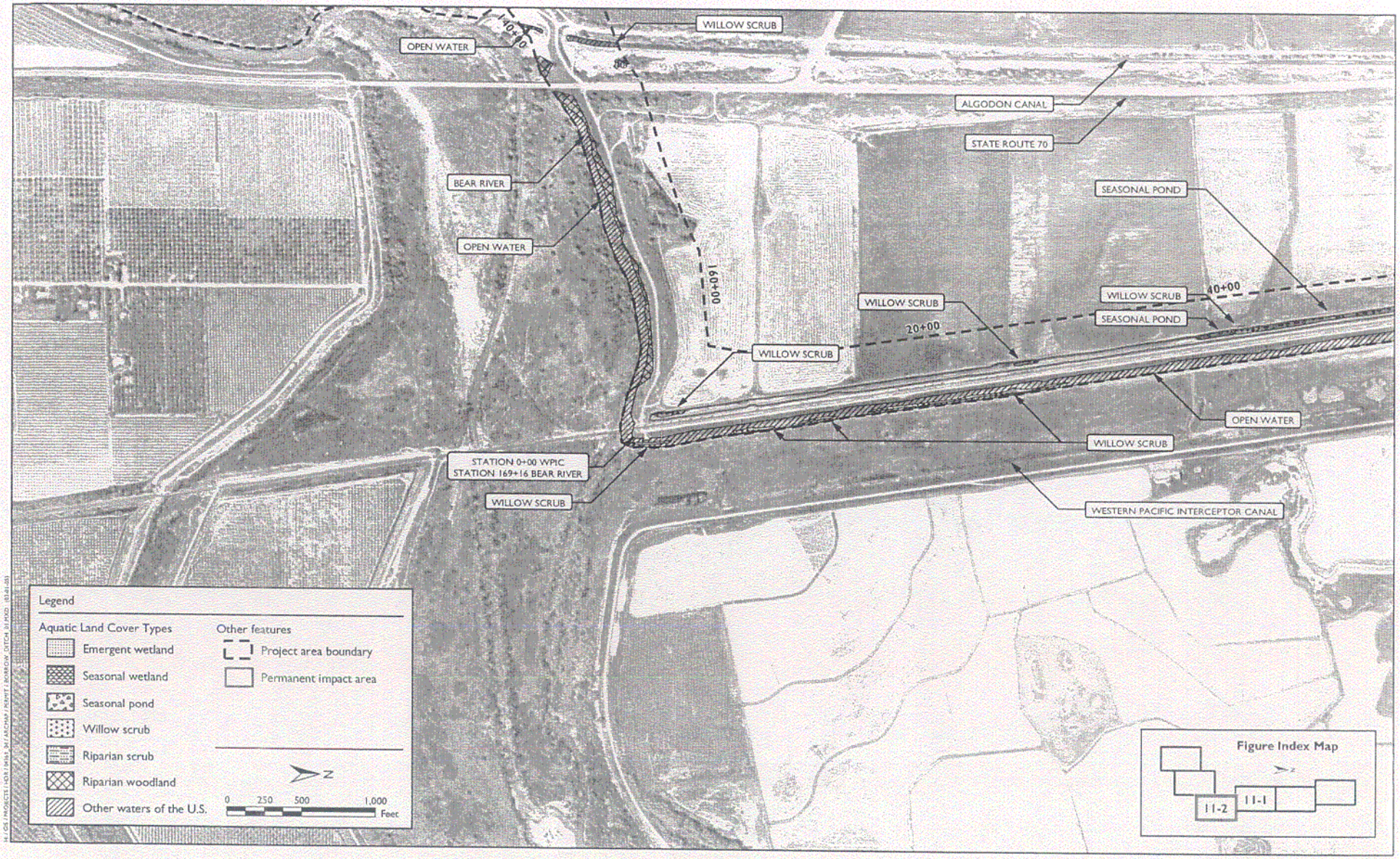


Figure 11-2
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority
Permanent Impact Areas Resulting from the Filling of the Borrow Ditch

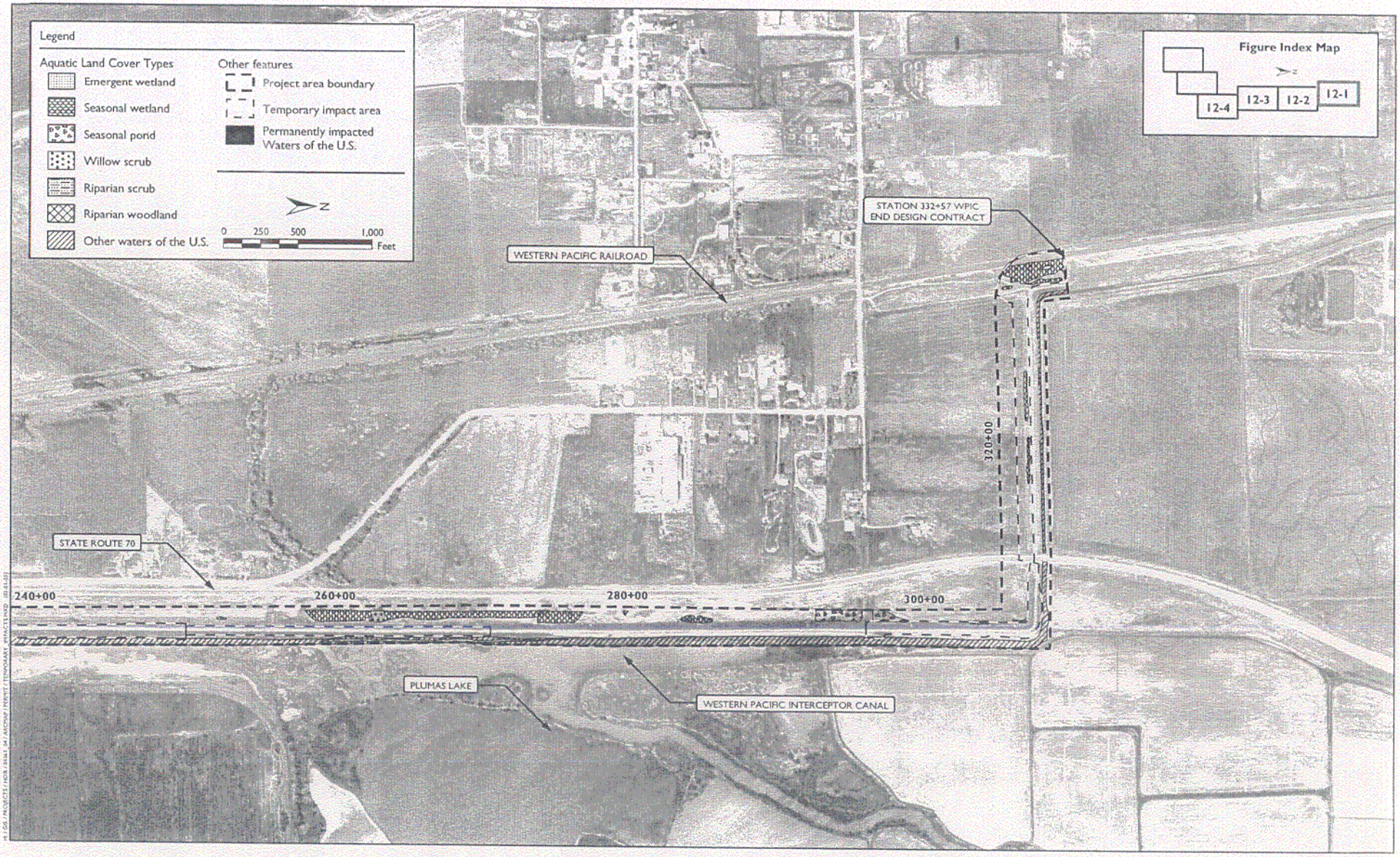


Figure 12-1
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority
Levee Improvement Temporary Impact Area

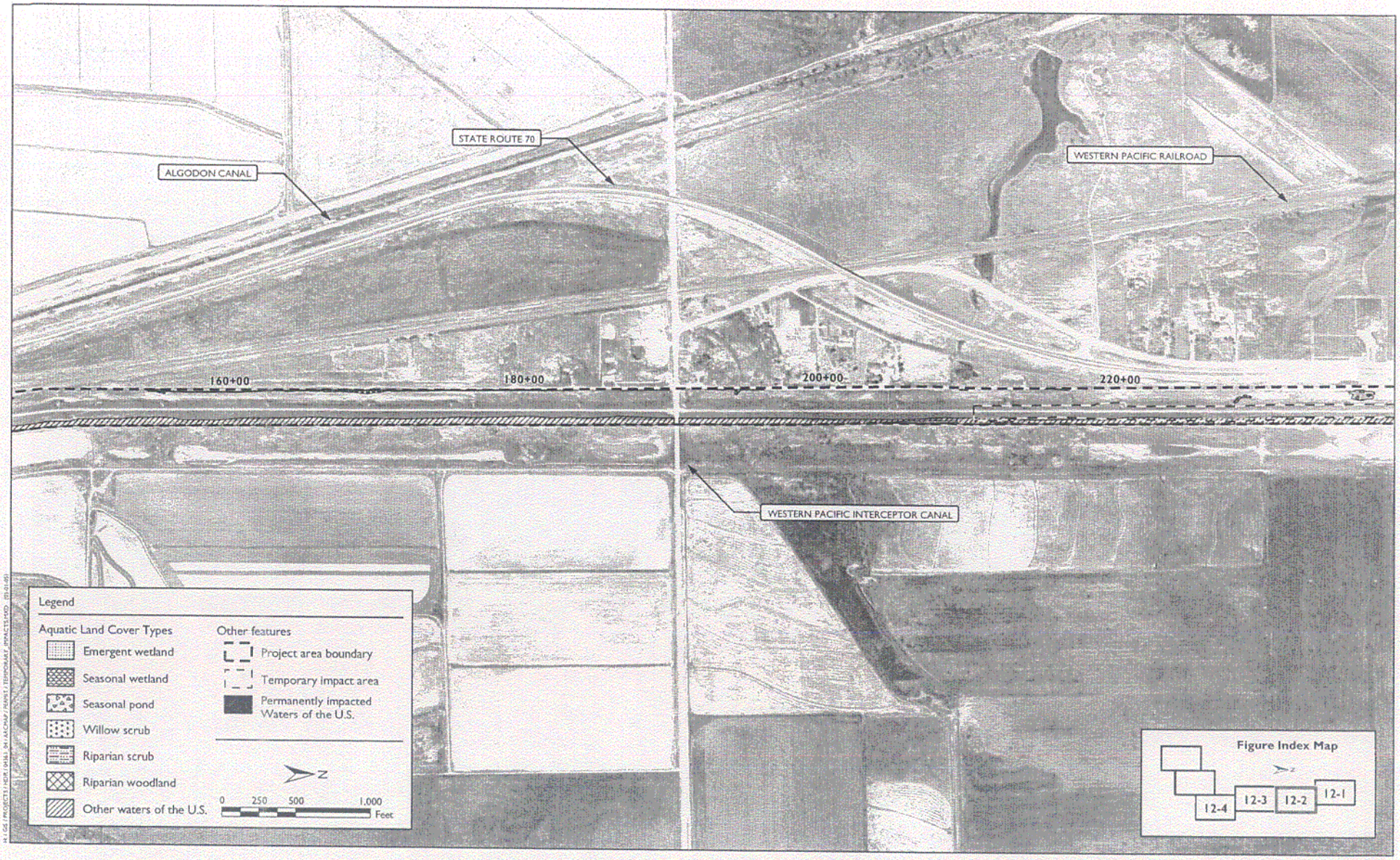


Figure 12-2
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority
Levee Improvement Temporary Impact Area

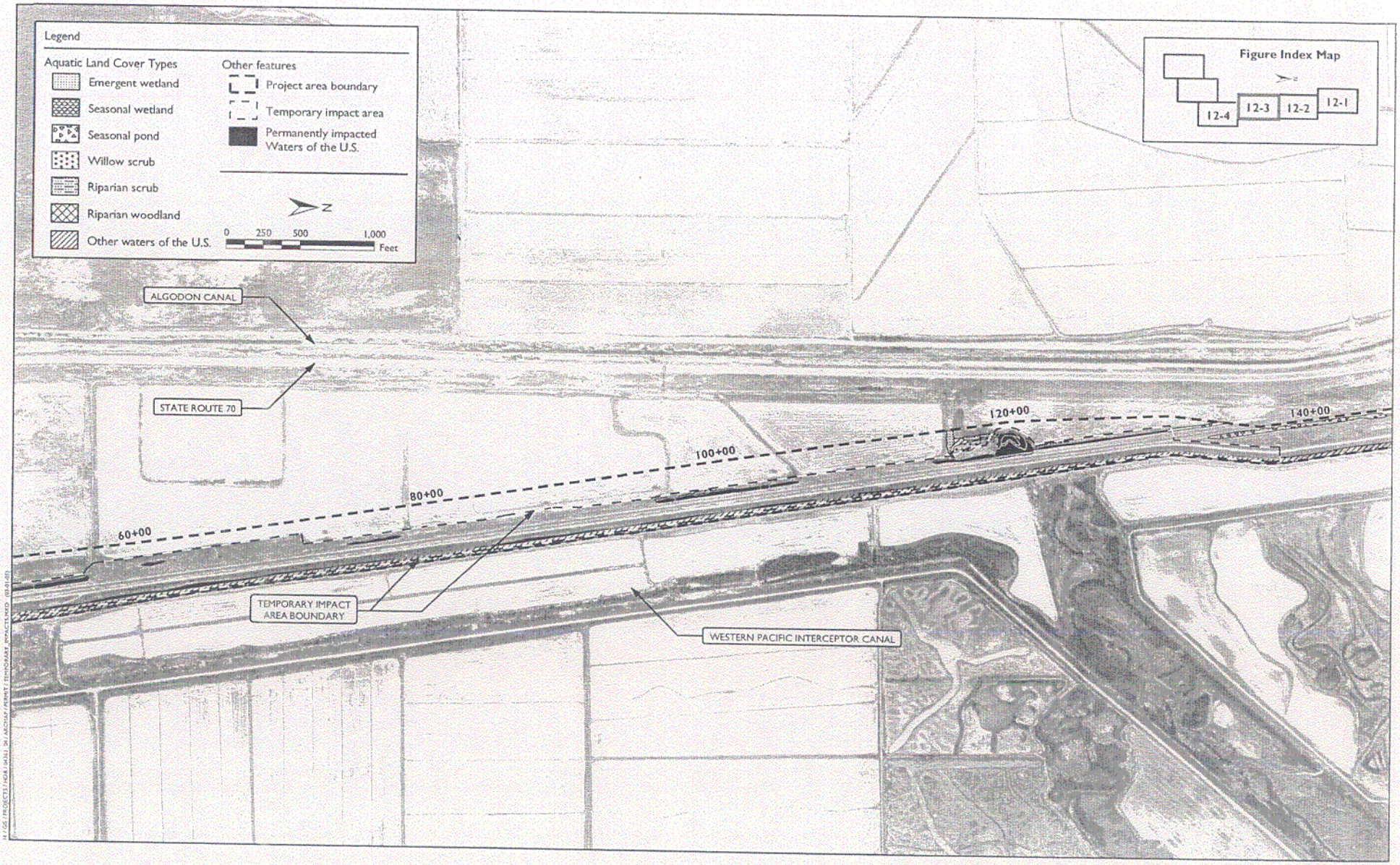


Figure 12-3
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority
Levee Improvement Temporary Impact Area

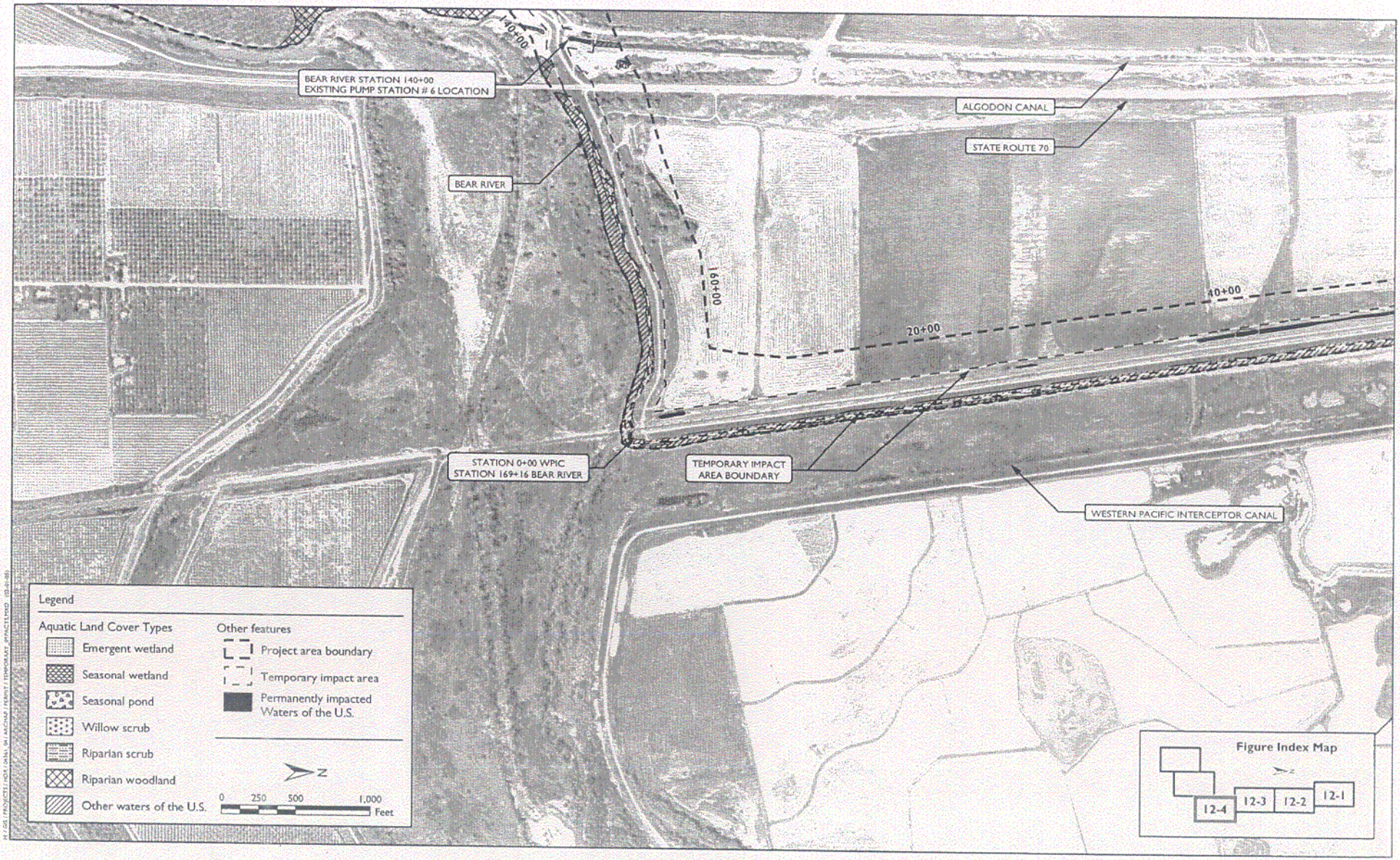


Figure 12-4
Feather-Bear-WPIC Levee Project
Three Rivers Levee Improvement Authority
Levee Improvement Temporary Impact Area