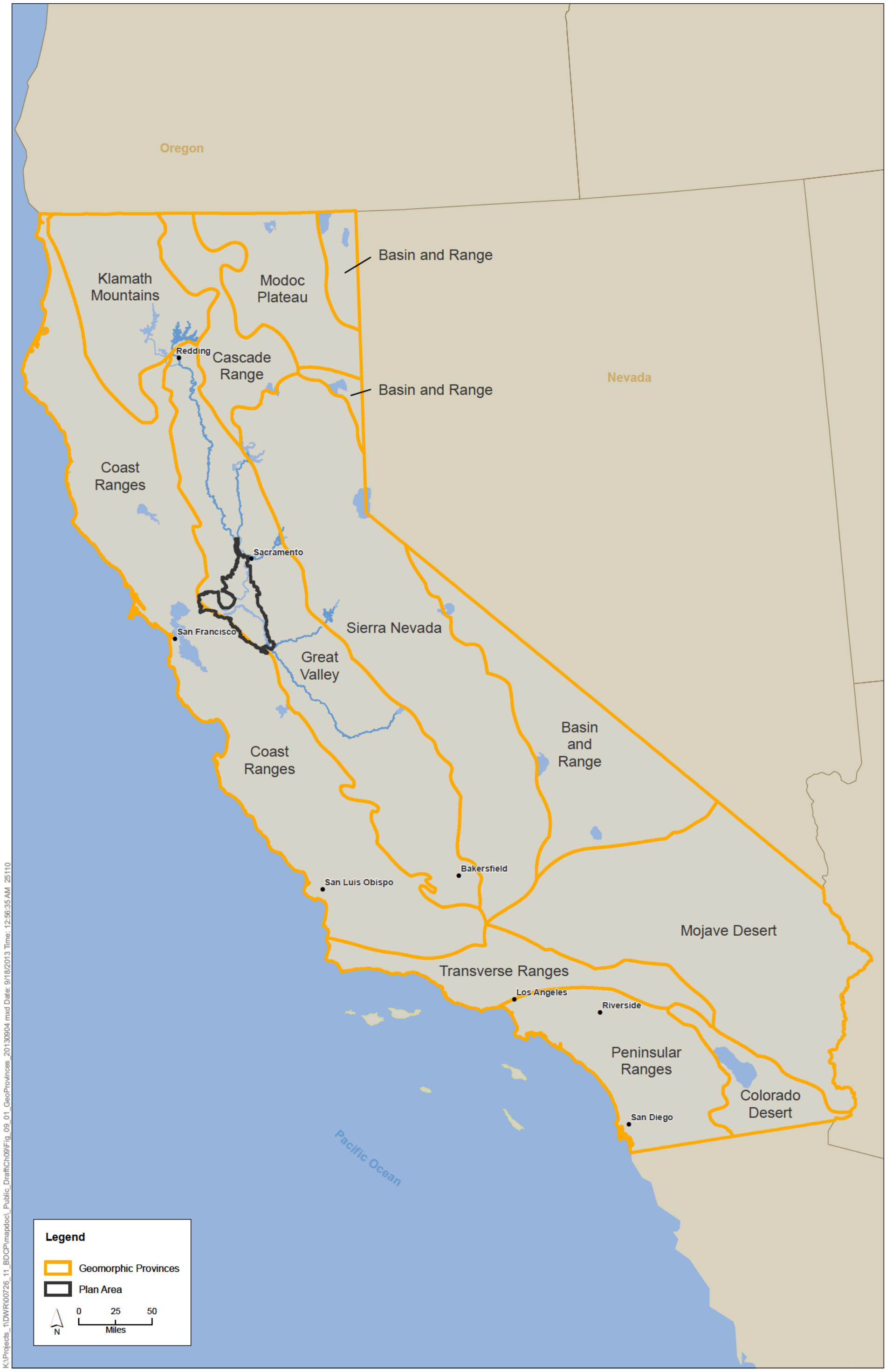

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Sources: Geomorphic Provinces, CGS 2002; Plan Area, ICF 2012

Figure 9-1
Geomorphic Provinces of California

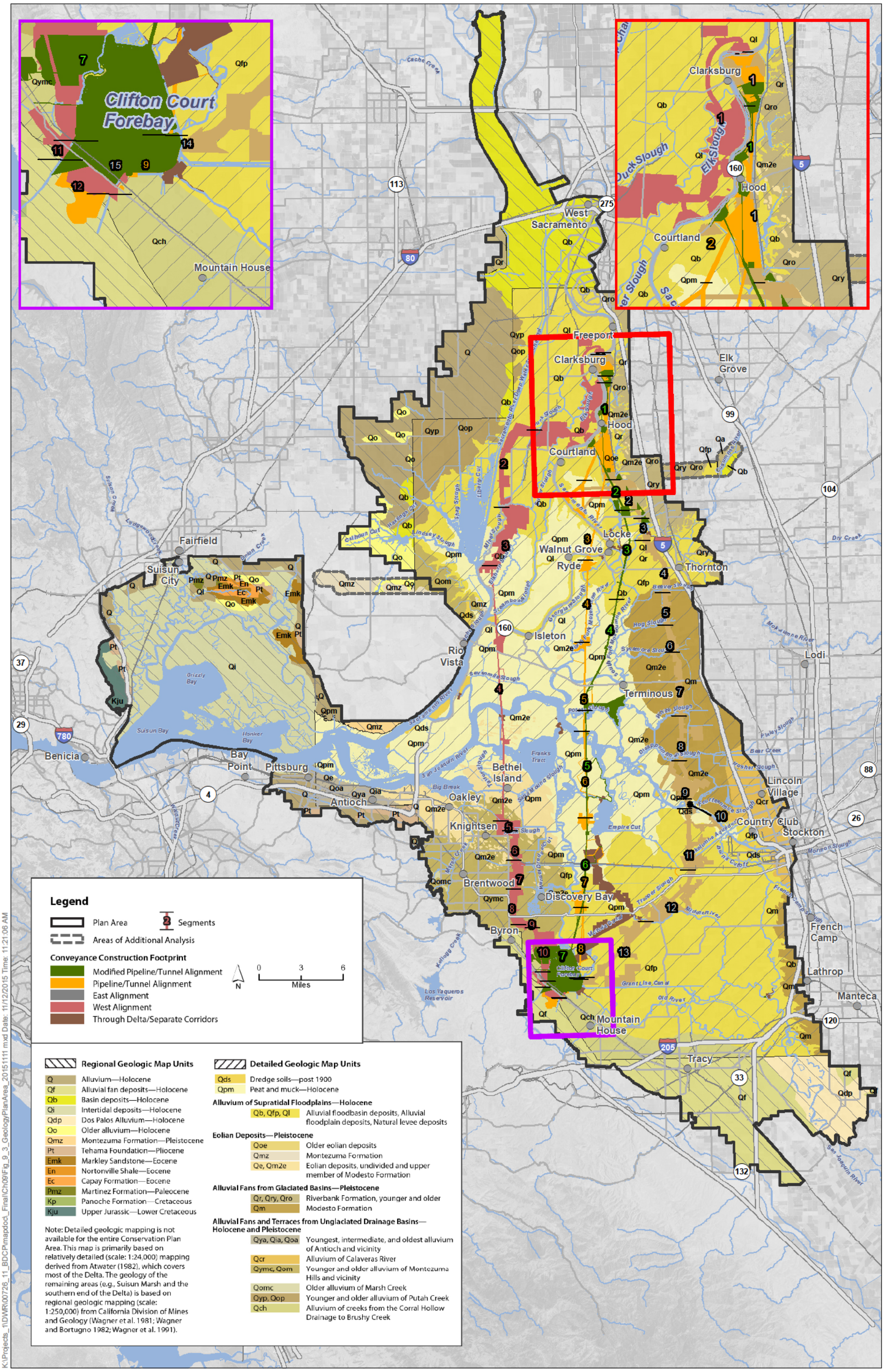
RELATIVE GEOLOGIC TIME			TIME (Million Years before Present)
Era	**Period**	**Epoch**	
CENOZOIC	Quaternary	Holocene	0.011
		Pleistocene	1.6
	Tertiary	Pliocene	5.3
		Miocene	24
		Oligocene	37
		Eocene	58
		Paleocene	65
MESOZOIC	Cretaceous		144
	Jurassic		208
	Triassic		245
PALEOZOIC	Permian		286
	Carbon-iferous: Pennsylvanian		320
	Carbon-iferous: Mississippian		360
	Devonian		408
	Silurian		438
	Ordovician		505
	Cambrian		570
PRECAMBRIAN			

Source: Based on California Department of Conservation, California Geological Survey, Note 17, page 3, 2002.

Note: This geologic timescale is based on the time scale used by the California Geological Survey (CGS) (2002). The more recent U.S. Geological Survey geologic time scale (2010), which has revised age boundaries, is not used because it was published after the publication of the geologic maps used in this report.

Graphics...BDCP EIR/EIS (2-7-12) TM

Figure 9-2
Geologic Time Scale



Sources: Plan Area, ICF 2012; Constructability (Rev 10b), DHCCP DWR 2012; Constructability (Rev 5b), DHCCP DWR 2015 Constructability (Rev 3b), DHCCP DWR 2012; Geology, ICF 2012.

Figure 9-3
Geology of the Plan Area

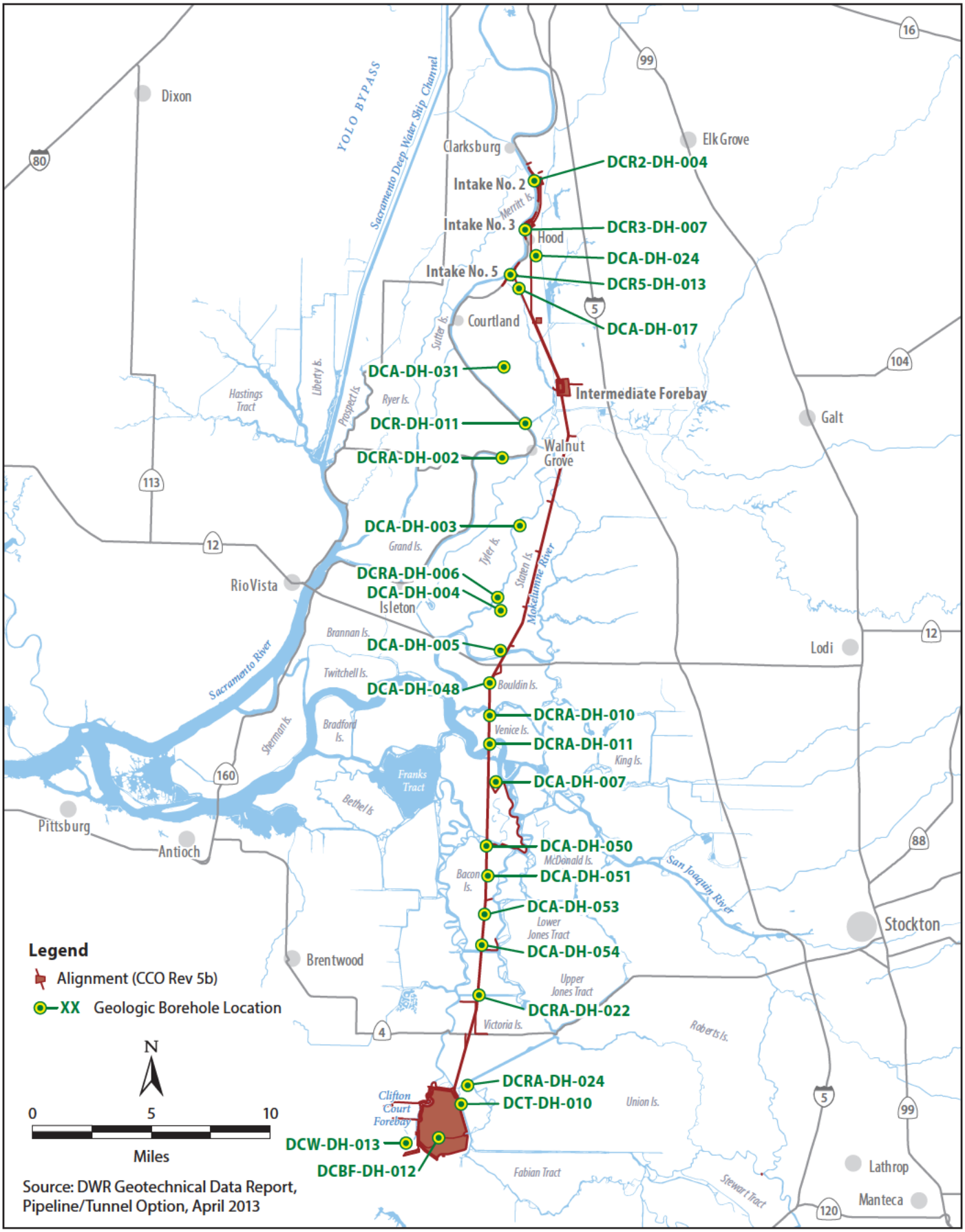


Figure 9-4a
Geologic Borehole Locations

GROUP SYMBOLS AND NAMES

Graphic	Group Names	Graphic	Group Names	Graphic	Group Names	Graphic	Group Names	Graphic	Group Names	Graphic	Group Names
	Lean Clay (CL)		Lean Clay with Sand (CL)s		Lean Clay with Organics (CL)o		Lean Clay with Sand and Organics (CL)s		Sandy Lean Clay s(CL)		Sandy Lean Clay with Gravel s(CL)g
	Sandy Lean Clay with Organics s(CH)o		Lean to Fat Clay (CL/CH)		Fat Clay (CH)		Fat Clay with Sand (CH)s		Fat Clay with Organics (CH)o		Fat Clay with Sand and Organics (CH)s
	Sandy Fat Clay s(CH)		Sandy Fat Clay with Organics s(CL)o		Silty Clay with Sand (CL-ML)s		Clayey Silt (ML/CL)		Silt (ML)		Silt with Sand (ML)s
	Sandy Silt s(ML)		Silt with Organics (ML)o		Elastic Silt (MH)		Elastic Silt with Sand (MH)s		Sandy Elastic Silt s(MH)		Elastic Silt with Organics (MH)o
	Organic Lean Clay (OL)		Organic Lean Clay with Sand (OL)s		Sandy Organic Lean Clay s(OL)		Organic Fat Clay (OH)		Organic Fat Clay with Sand (OH)		Organic Silt (OL)
	Organic Silt with Sand (OL)s		Sandy Organic Silt s(OL)		Organic Elastic Silt (OH)		Peat (PT)		Poorly Graded Sand (SP)		Poorly Graded Sand with Gravel (SP)g
	Poorly Graded Sand with Clay (SP-SC)		Poorly Graded Sand with Organics (SP)o		Poorly Graded Sand with Silt (SP-SM)		Poorly Graded Sand with Silt and Gravel (SP-SM)g		Poorly Graded Sand with Silt and Organics (SP-SM)o		Well-Graded Sand (SW)
	Well-Graded Sand with Gravel (SW)g		Well-Graded Sand with Clay (SW-SC)		Well-Graded Sand with Silt (SW-SM)		Well-Graded Sand with Silt and Gravel (SW-SM)g		Clayey Sand (SC)		Clayey Sand with Gravel (SC)g
	Silty Clayey Sand (SC-SM)		Silty Sand (SM)		Silty Sand with Gravel (SM)g		Silty Sand with Organics (SM)o		Poorly Graded Gravel (GP)		Poorly Graded Gravel with Sand (GP)s
	Poorly Graded Gravel with Silt and Sand (GP-GM)		Well-Graded Gravel (GW)		Well-Graded Gravel with Sand (GW)s		Well-Graded Gravel with Silt and Sand (GW-GM)		Clayey Gravel (GC)		Clayey Gravel with Sand (GC)s
	Silty Gravel with Sand (GM)s		Silty Gravel (GM)		Tephra (vp)						

SAMPLER TYPE AND RETAINED SAMPLE GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Hydropunch
- Piston
- Bag Sample
- Boxed Core
- Modified California (MCS)
- Punch Core (PCore)
- Pitcher Barrel
- Bulk Sample
- No Sample Drilling (NSD)
- Dry Core (DCore)
- Shelby Tube
- Jar Sample

NORMALIZED SOIL BEHAVIOR TYPE (CPT)

1. Sensitive Fine-grained
2. Organic Material
3. Clay to Silty Clay
4. Clayey Silt to Silty Clay
5. Silty Sand to Sandy Silt
6. Clean Sand to Silty Sand
7. Gravelly Sand to Sand
8. Very stiff Sand to Clayey sand
9. Very Stiff Fine-grained

DRILLING METHOD GRAPHIC SYMBOLS

- Bucket Auger (BA)
- Hollow Stem Auger (HSA)
- Solid Stem Auger
- Rotary Wash
- Hand Auger
- Rock Coring
- Sonic

WELL GRAPHIC SYMBOLS

- Blank casing in cement grout
- Blank casing in filter sand
- Native backfill or slough
- Blank casing in bentonite seal
- Slotted casing in filter sand
- Vibrating wire piezometer

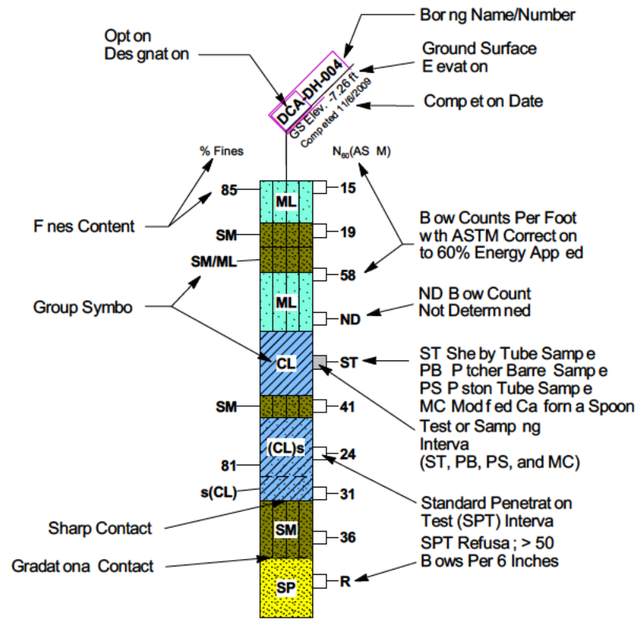
FIELD AND LABORATORY TESTS

AL	Atterberg Limits - Liquid Limit Plastic Limit Plasticity ndex (AS M D4318)	**OC**	Organic Content (AS M D2974)	**TV**	Pocket orvane
CN	Consolidation (AS M D2435)	**PA**	Particle Size Analysis (AS M D422)	**UC**	Uncon ined Compression (AS M D2166)
CR	Corrosion Sul ates Chlorides (C M 643 C M 417 C M 422)	**PD**	Pinhole Dispersion (AS M D4647)	**UU**	Unconsolidated Undrained riaxial (AS M D2850)
CU	Consolidated Undrained riaxial (AS M D4767)	**PM**	Pressure Meter (AS M D4719)	**UW**	Unit Weight (AS M D2937)
DS	Direct Shear (AS M D3080)	**PP**	Pocket Penetrometer	**XD**	XRay Di raction
EI	Expansion ndex (AS M D4829)	**SA**	Soil Abrasivity (N NU 2006)	**XR**	XRay Radiography (AS M D4452)
HD	Hydrometer (AS M D422)	**SG**	Speci ic Gravity (AS M D854)		
		SL	Slury Abrasion (AS M G75)		
		SW	Swell Potential (AS M D4546)		

WATER LEVEL SYMBOLS

- First water encountered during drilling
- Water level measured at end of drilling
- Static water level reading (short-term)
- Static water leavel reading (long-term)

BORING EXPLANATION



OPTION DESIGNATION

DCA P pe ne/Tunne Opt on	DCN1 Intake 1 Land	DCR1 Intake 1 Overwater
DCE ICF East Opt on	DCN2 Intake 2 Land	DCR2 Intake 2 Overwater
DCW ICF West Opt on	DCN3 Intake 3 Land	DCR3 Intake 3 Overwater
DCT Through De ta Fac ty Opt on	DCN4 Intake 4 Land	DCR4 Intake 4 Overwater
DCR Over Water	DCN5 Intake 5 Land	DCR5 Intake 5 Overwater
DCRA Overwater P pe ne/Tunne		

Notes:

1) So s were c ass f ed n the f e d n genera accordance w th ASTM D2488, Standard Pract ce for Descr pt on and Ident f cat on of So s (V sua Manua Procedure). Where aboratory test ng was performed, c ass f cat ons are presented n the remarks co umn of the og n genera accordance w th ASTM D2487, Standard Pract ce for C ass f cat on of So s for Eng neer ng Purposes (Un f ed So C ass f cat on System).

2) Border ne symbo s, two group symbo s separated by a s ash, may be used n f e d v sua c ass f cat on when (A) percentage of f nes s est mated to be between 45% and 55%, (B) percentages of sand and grave are est mated to be about the same, (C) so cou d be e ther we graded or poor y graded, (D) so cou d be e ther a s t or a c ay, or (E) f ne-gra ned so has propert es nd cat ng that t s at the boundary between ow and h gh p ast c ty.

3) Dashed ne between so types s used when (A) " nferred" boundary between so ayers or tho ogy or, (B) a gradat ona boundary, or (C) f oss n recovery s s gn f cant.

4) So d ne between so types s used where a def n t ve boundary s observed between two mater a s.

Source: DWR Geotechnical Data Report, Pipeline/Tunnel Option, April 2013.

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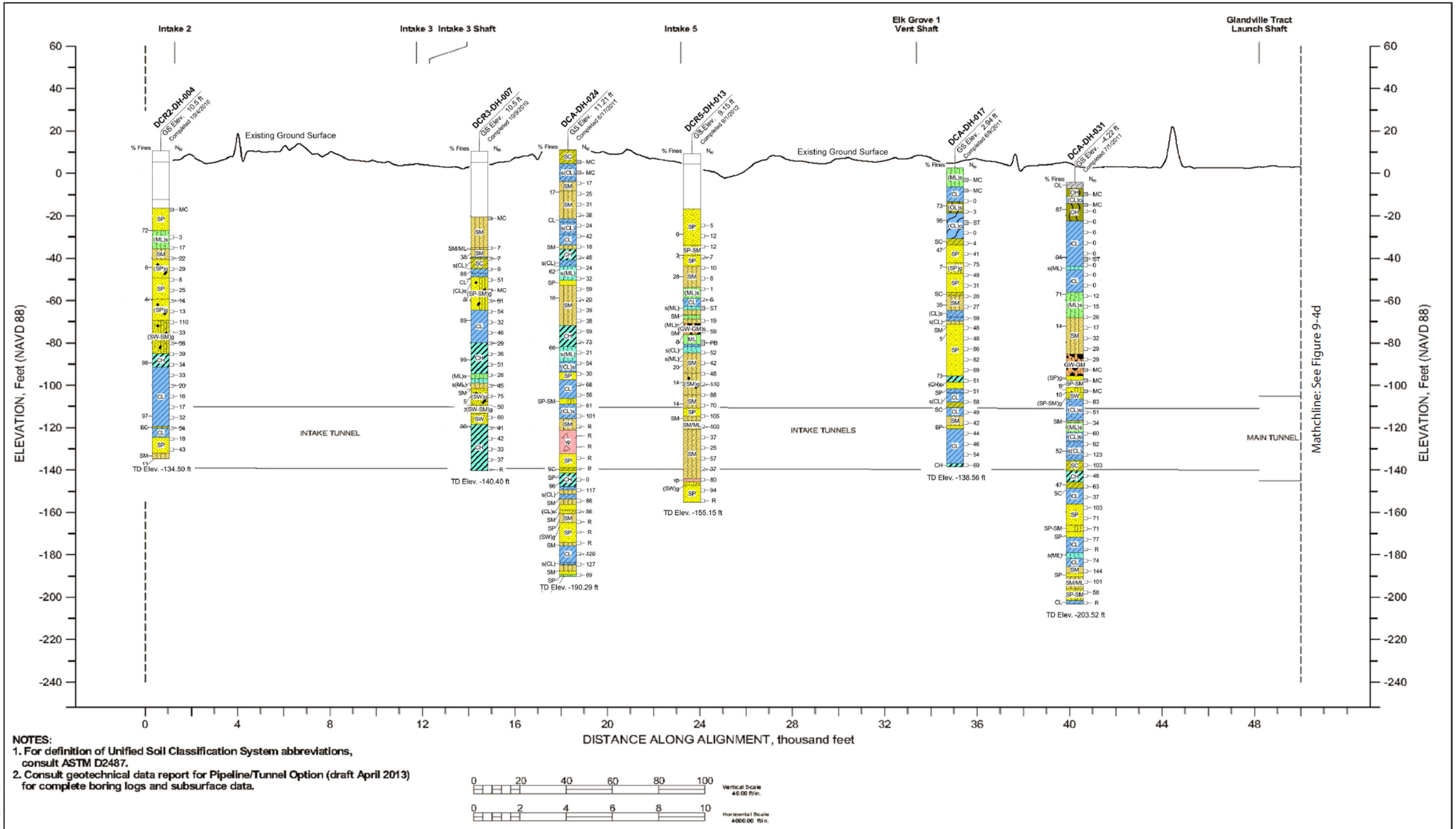
Figure 9-4b
Geologic Borehole Log Explanation



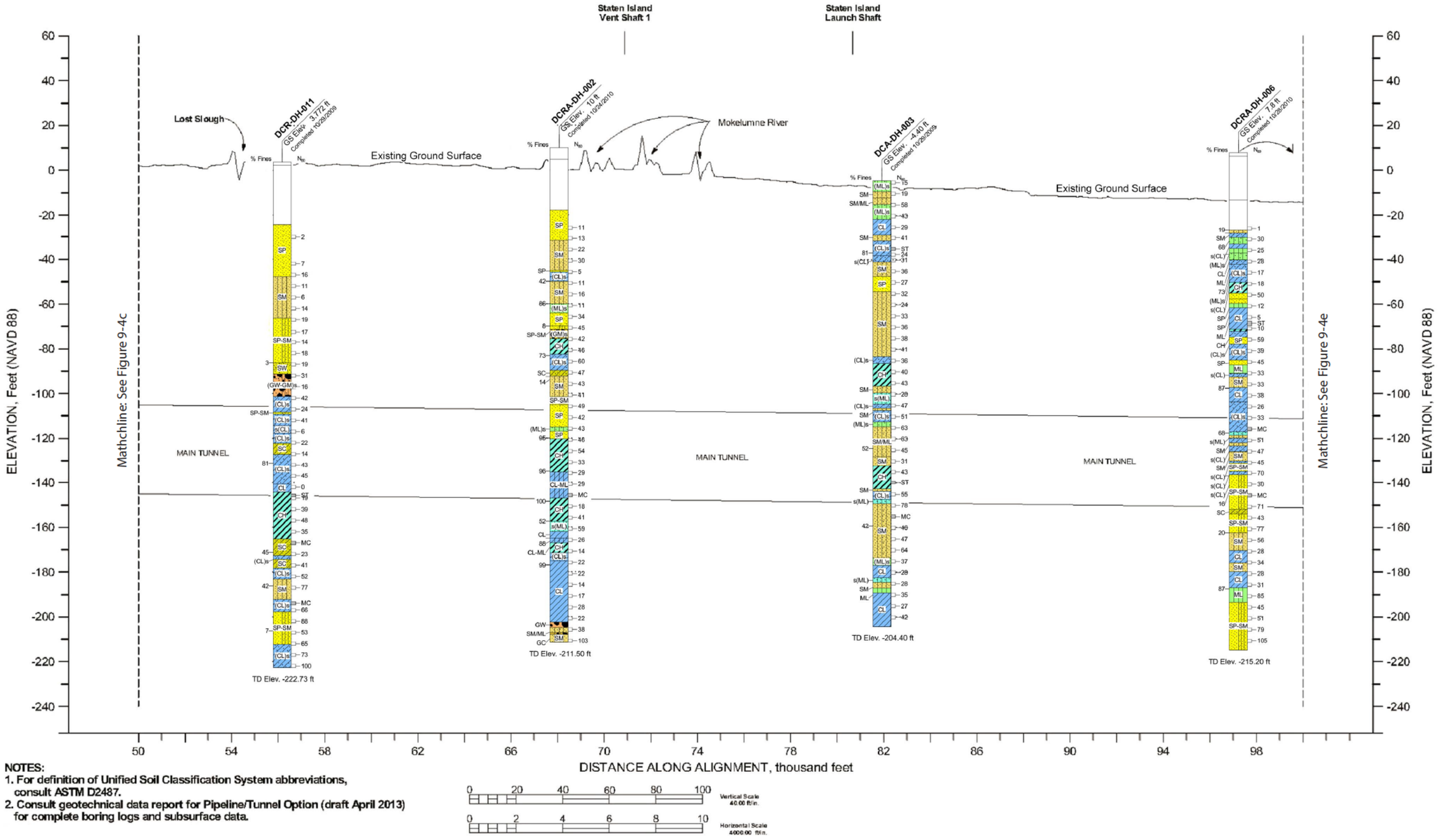
NOTES:

1. For definition of Unified Soil Classification System abbreviations, consult ASTM D2487.
2. Consult geotechnical data report for Pipeline/Tunnel Option (draft April 2013) for complete boring logs and subsurface data.

Sources: DWR 2009-2012 Geotechnical Data Reports; California Department of Water Resources 2015.

BDCP EIR/EIS (12-17-2013) TM

Figure 9-4c
Geologic Borehole Logs in the Vicinity of Proposed Tunnels



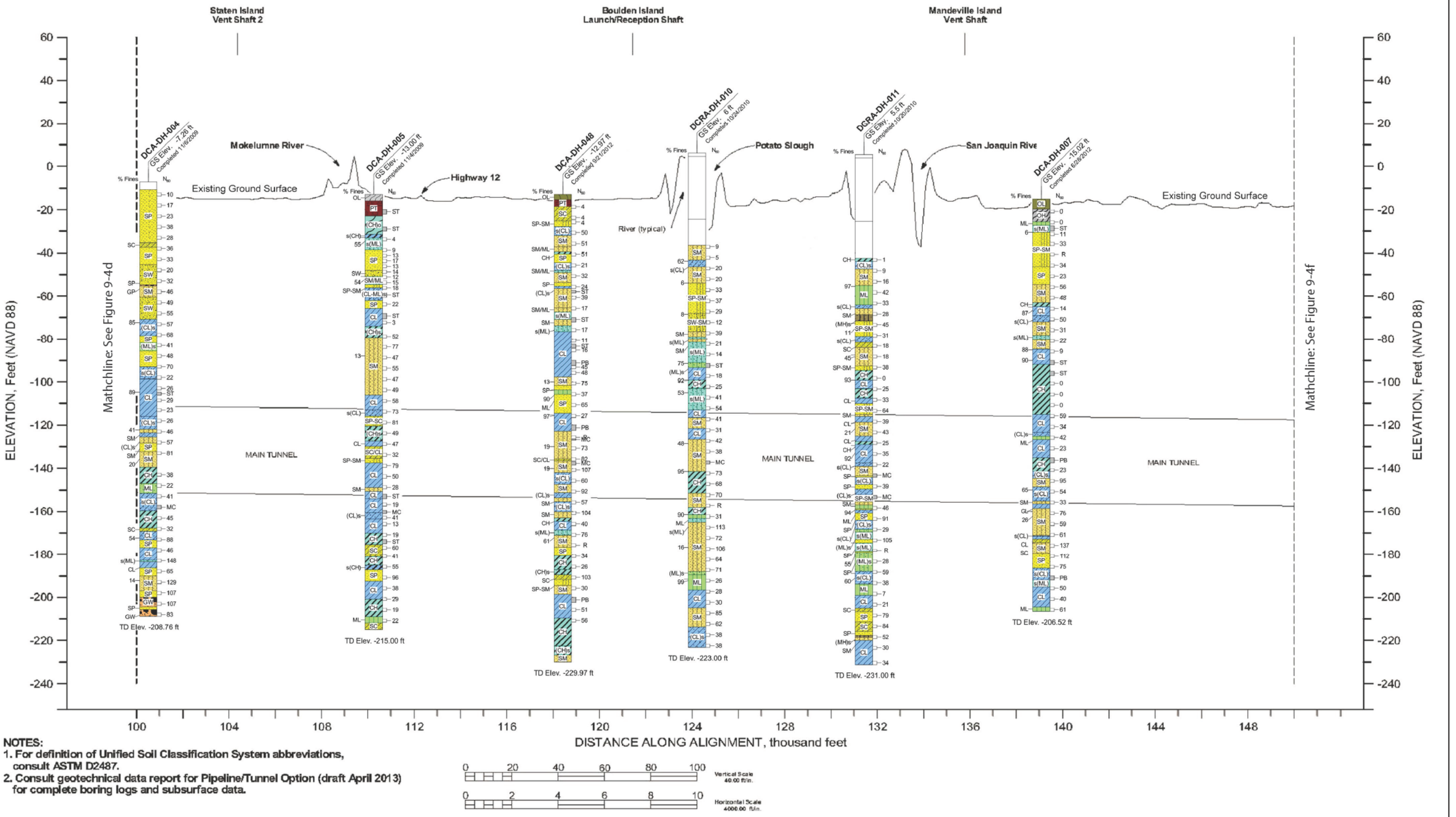
NOTES:

1. For definition of Unified Soil Classification System abbreviations, consult ASTM D2487.
2. Consult geotechnical data report for Pipeline/Tunnel Option (draft April 2013) for complete boring logs and subsurface data.

Sources: DWR 2009-2012 Geotechnical Data Reports; California Department of Water Resources 2015.

BDCP EIR/EIS (12-17-2013) TM

Figure 9-4d
Geologic Borehole Logs in the Vicinity of Proposed Tunnels



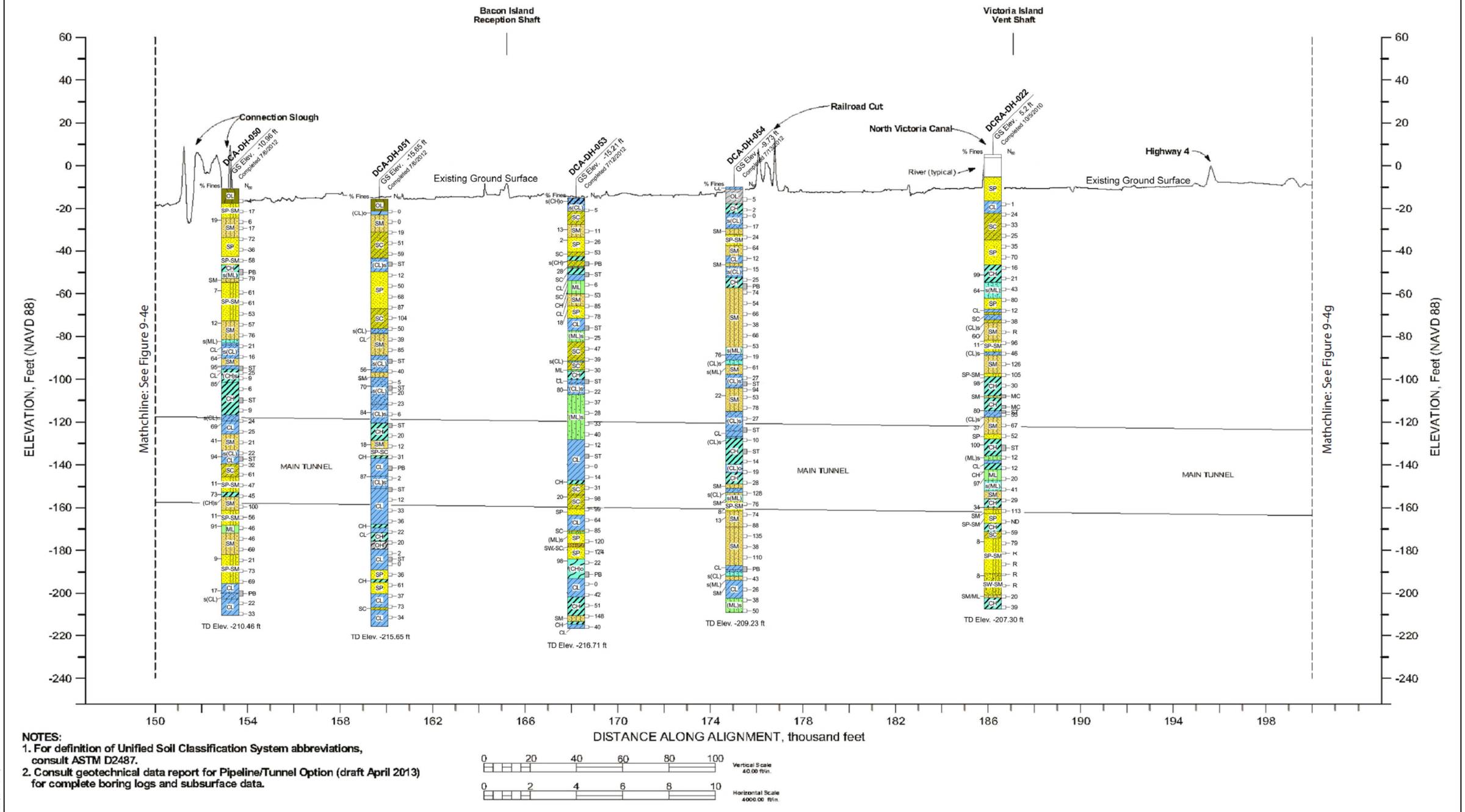
NOTES:

1. For definition of Unified Soil Classification System abbreviations, consult ASTM D2487.
2. Consult geotechnical data report for Pipeline/Tunnel Option (draft April 2013) for complete boring logs and subsurface data.

Sources: DWR 2009-2012 Geotechnical Data Reports; California Department of Water Resources 2015.

BDCP EIR/EIS (12-17-2015) TM

Figure 9-4e
Geologic Borehole Logs in the Vicinity of Proposed Tunnels



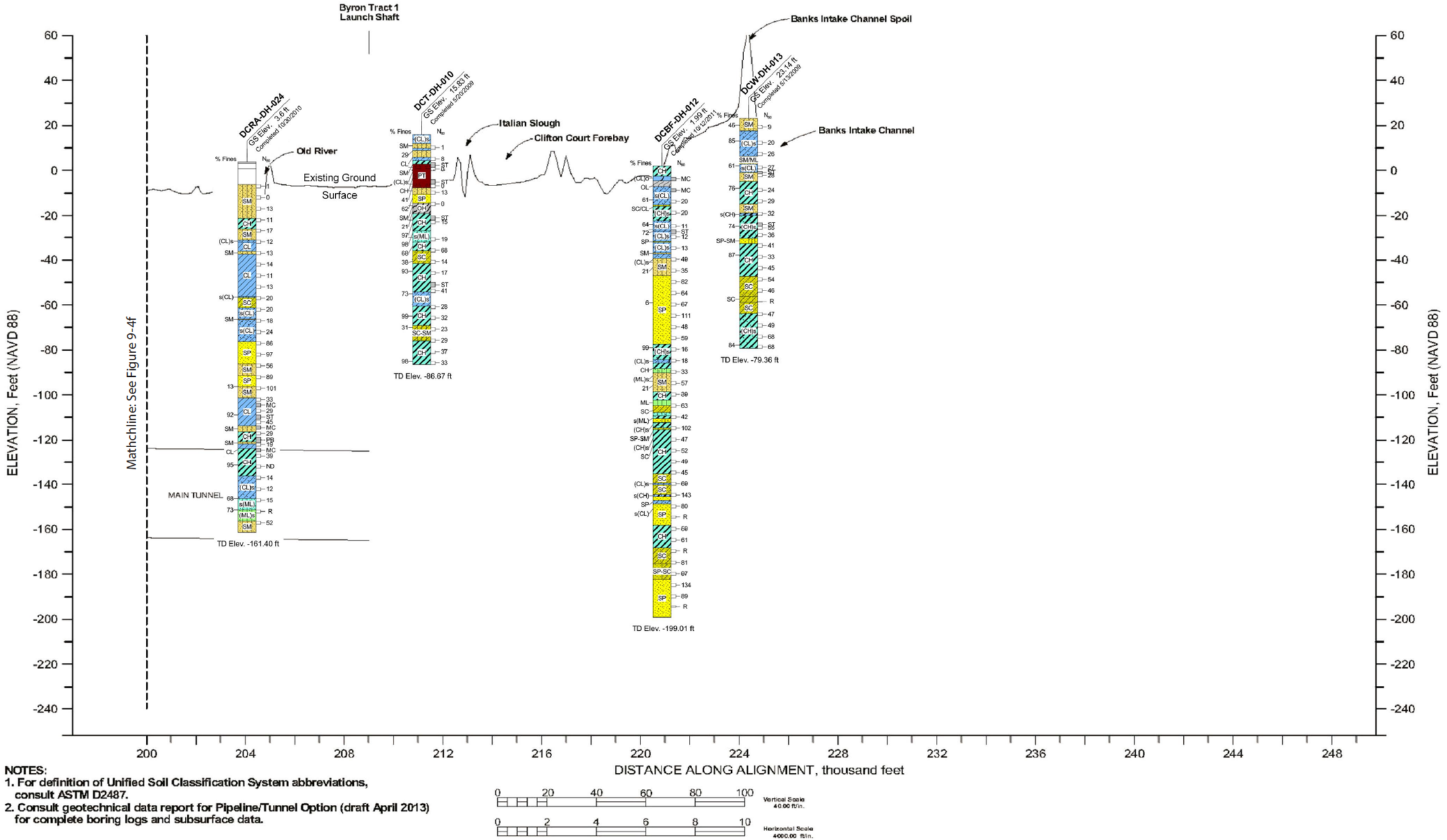
NOTES:

1. **For definition of Unified Soil Classification System abbreviations, consult ASTM D2487.**
2. **Consult geotechnical data report for Pipeline/Tunnel Option (draft April 2013) for complete boring logs and subsurface data.**

Sources: DWR 2009-2012 Geotechnical Data Reports; California Department of Water Resources 2015.

BDCP EIR/EIS (12-17-2013) TM

Figure 9-4f
Geologic Borehole Logs in the Vicinity of Proposed Tunnels



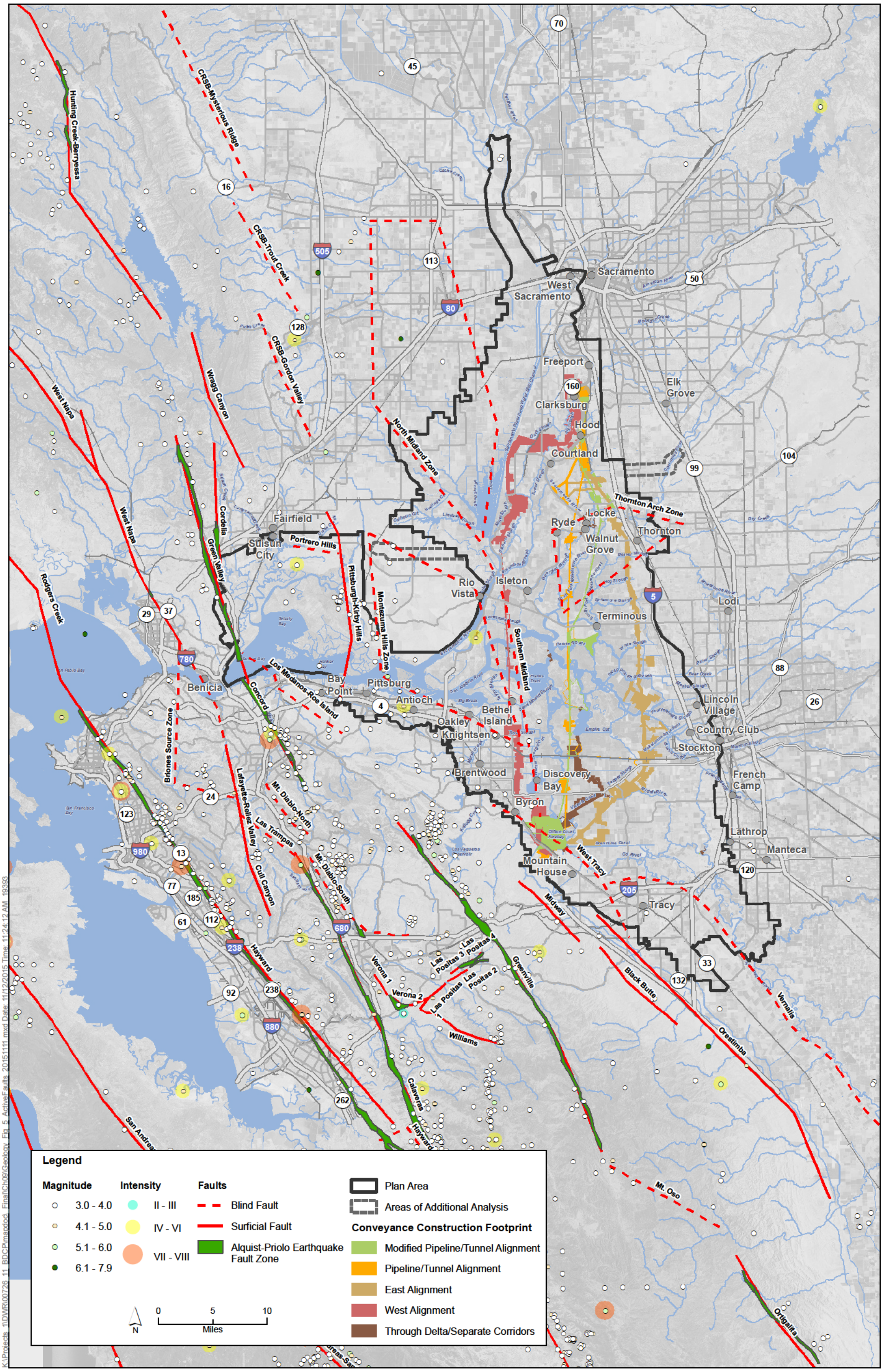
NOTES:

1. For definition of Unified Soil Classification System abbreviations, consult ASTM D2487.
2. Consult geotechnical data report for Pipeline/Tunnel Option (draft April 2013) for complete boring logs and subsurface data.

Sources: DWR 2009-2012 Geotechnical Data Reports; California Department of Water Resources 2015.

BDCP EIR/EIS (12-17-2013) TM

Figure 9-4g
Geologic Borehole Logs in the Vicinity of Proposed Tunnels



Sources: Plan Area, ICF 2012; Alquist-Priolo Earthquake Fault Zones (EFZ), California Geological Survey 2001; Faults, DRMS 2008; Seismicity/Magnitude, URS 2010, Constructability (Rev 5b), DHCCP DWR 2015 Constructability (Rev 10b), DHCCP DWR 2012; Constructability (Rev 3b), DHCCP DWR 2012

Figure 9-5
Active Faults and Historical Seismicity of the Bay and Delta Region, 1800–2010

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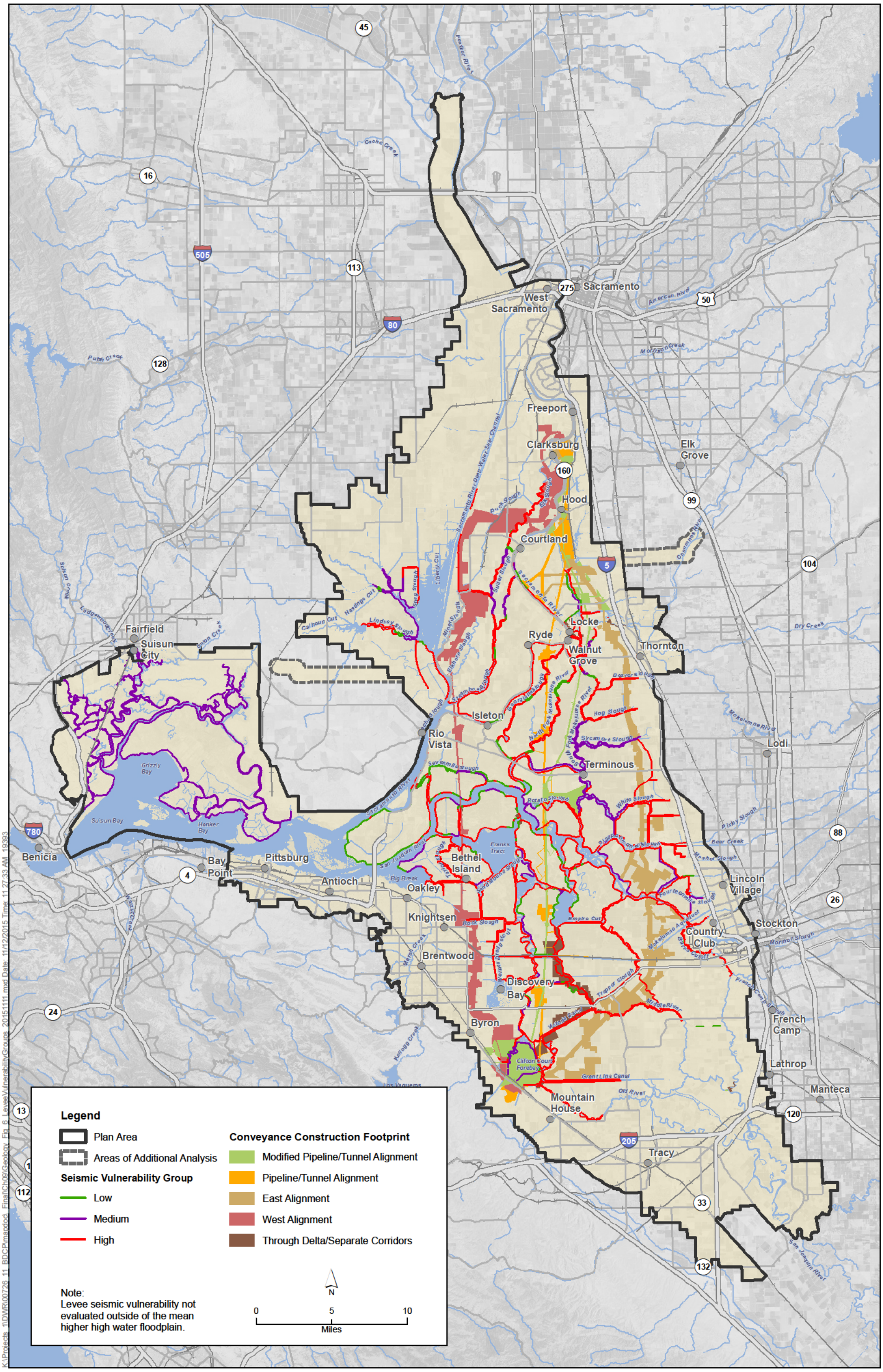
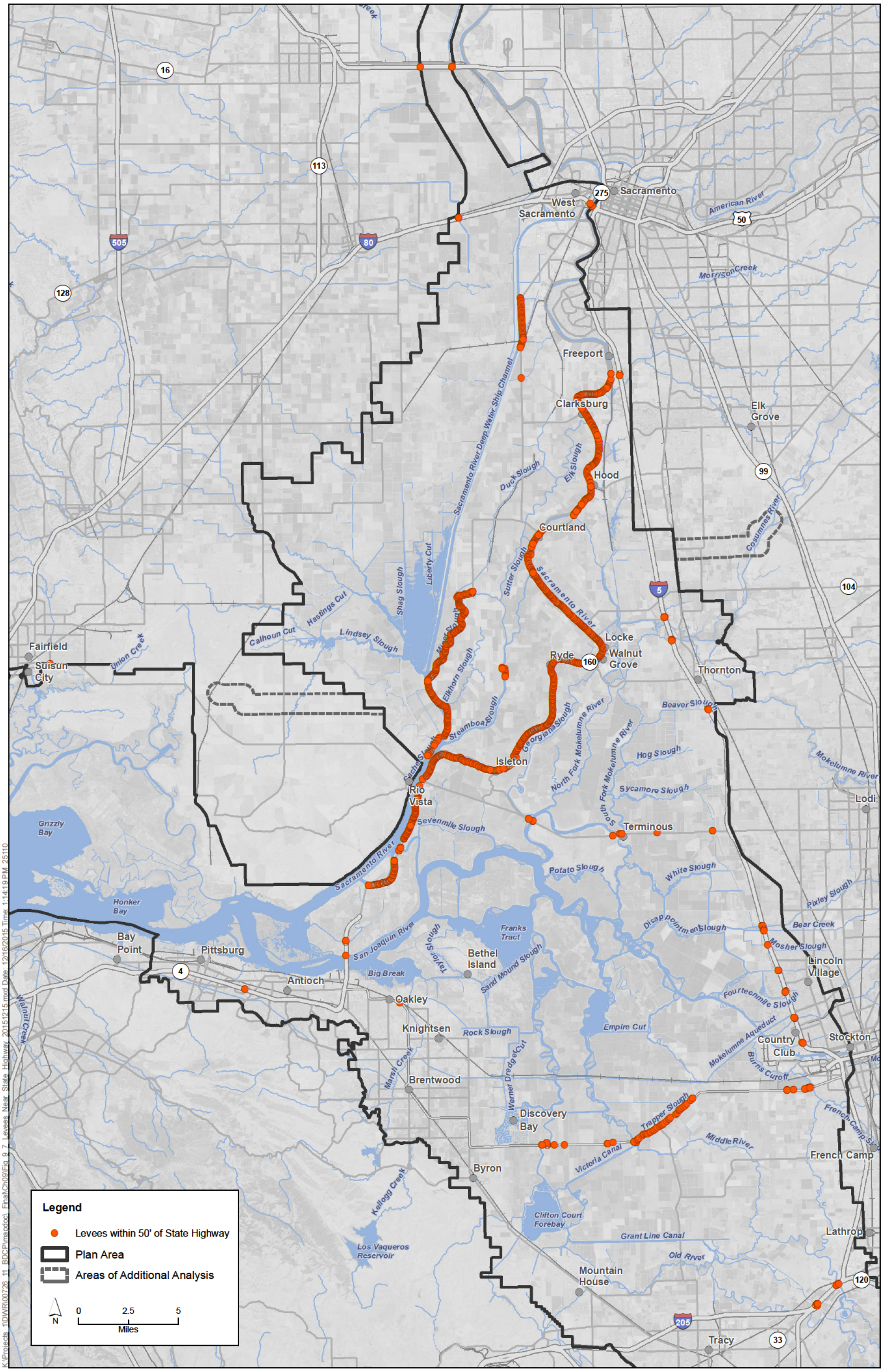


Sources: Plan Area, ICF 2012; Levee Seismic Vulnerability Groups, California DWR 2008b; Constructability (Rev 10b), DHCCP DWR 2012; Constructability (Rev 3b), DHCCP DWR 2012, Constructability (Rev 5b), DHCCP DWR 2015

Figure 9-6
Levee Seismic Vulnerability Groups



Sources: Plan Area, ICF 2012; Constructability (Rev 10b), DHCCP DWR 2012;

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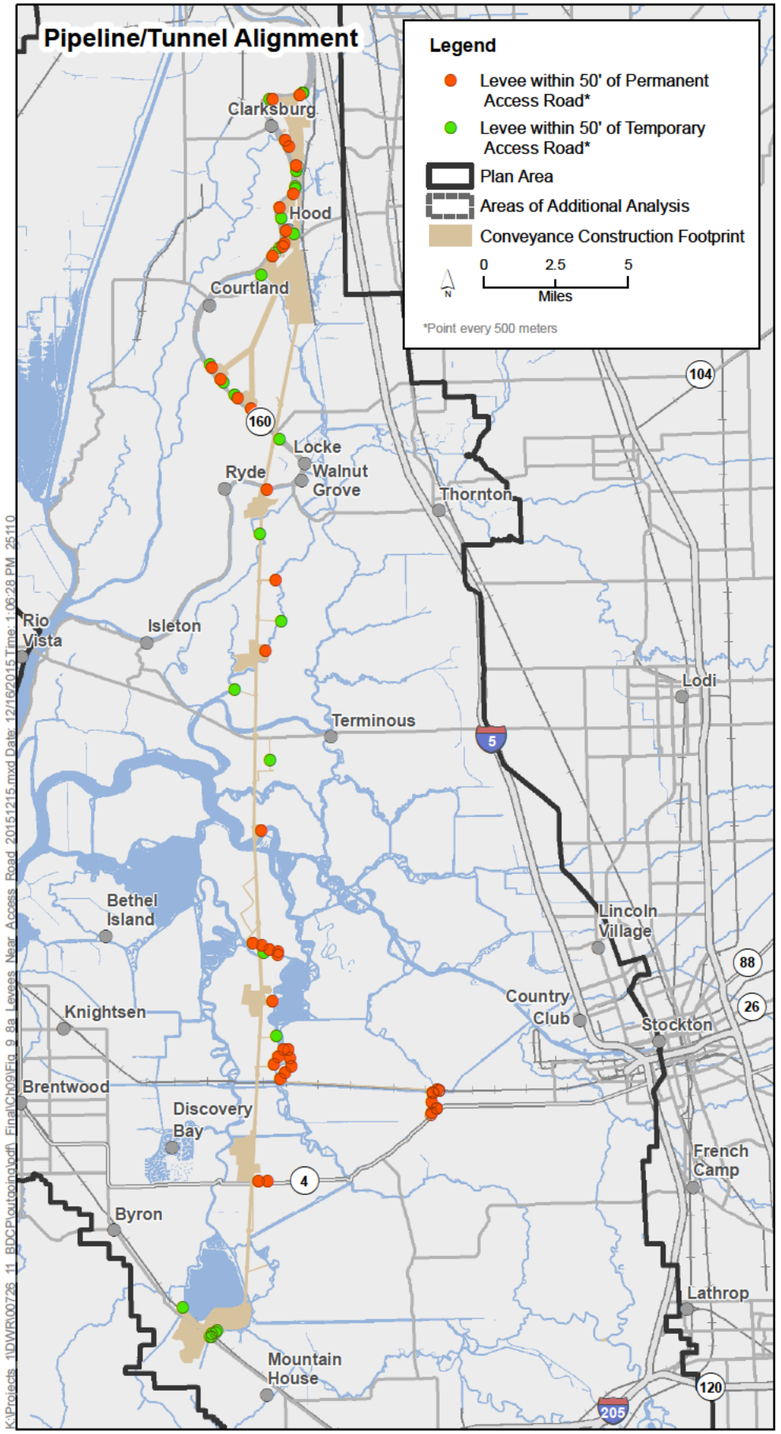
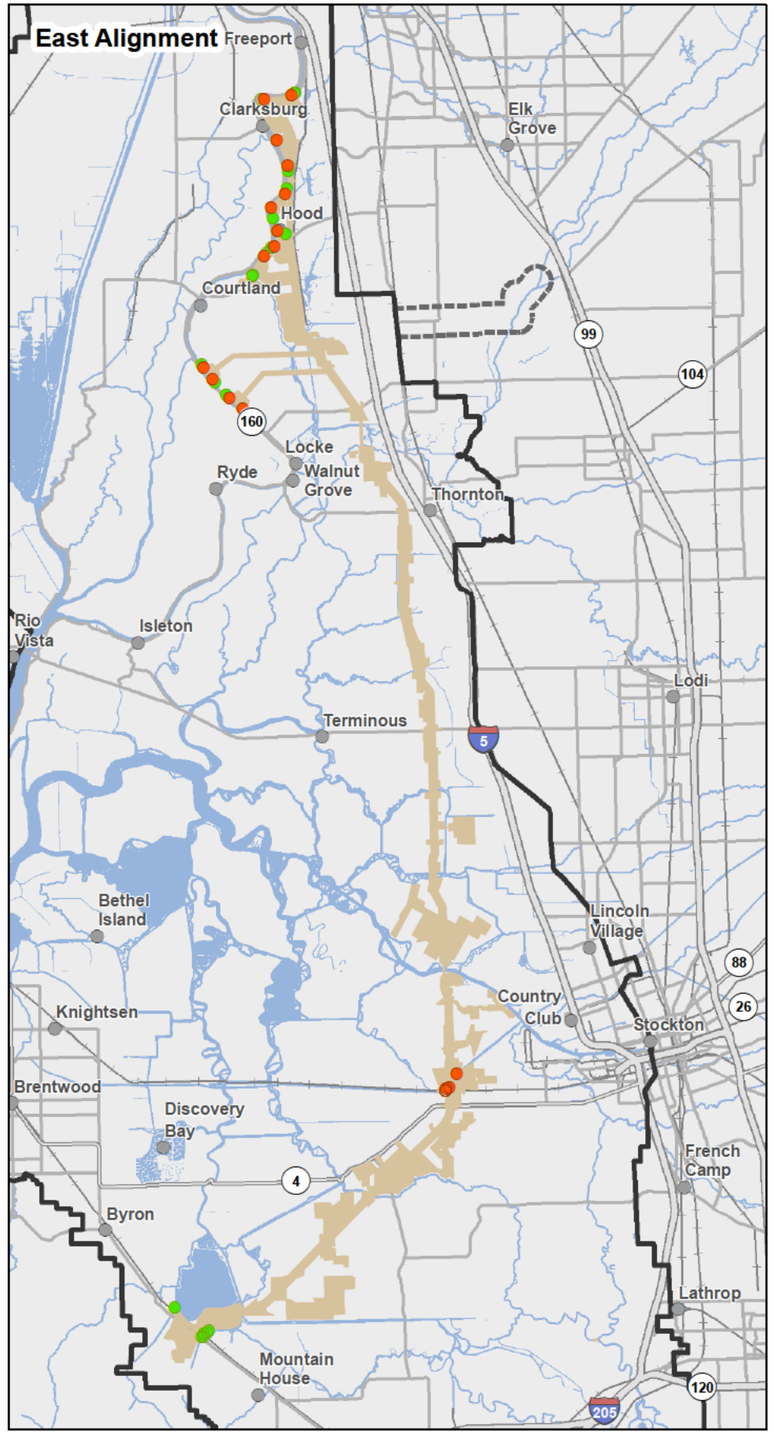
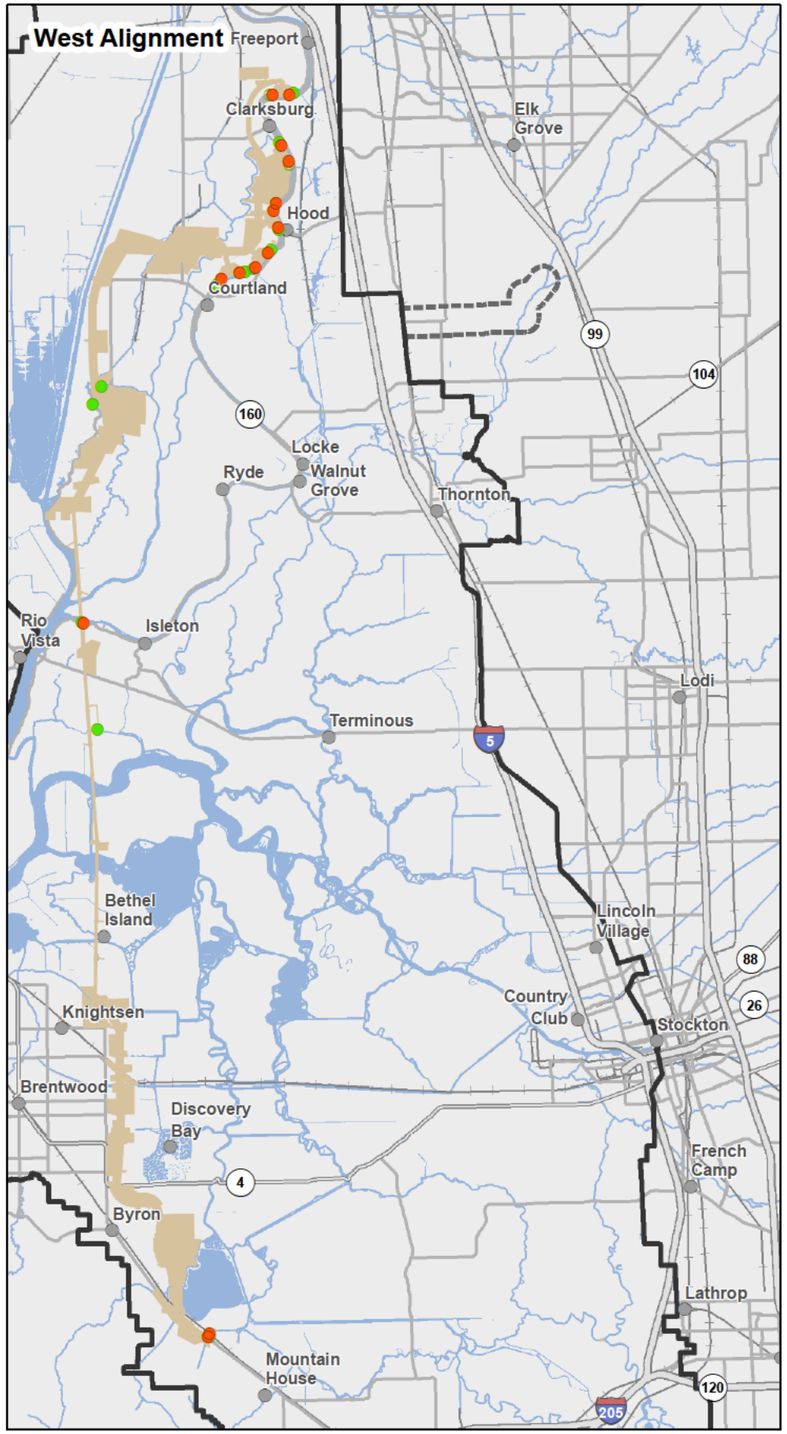
Figure 9-7
Levees Near State Highway

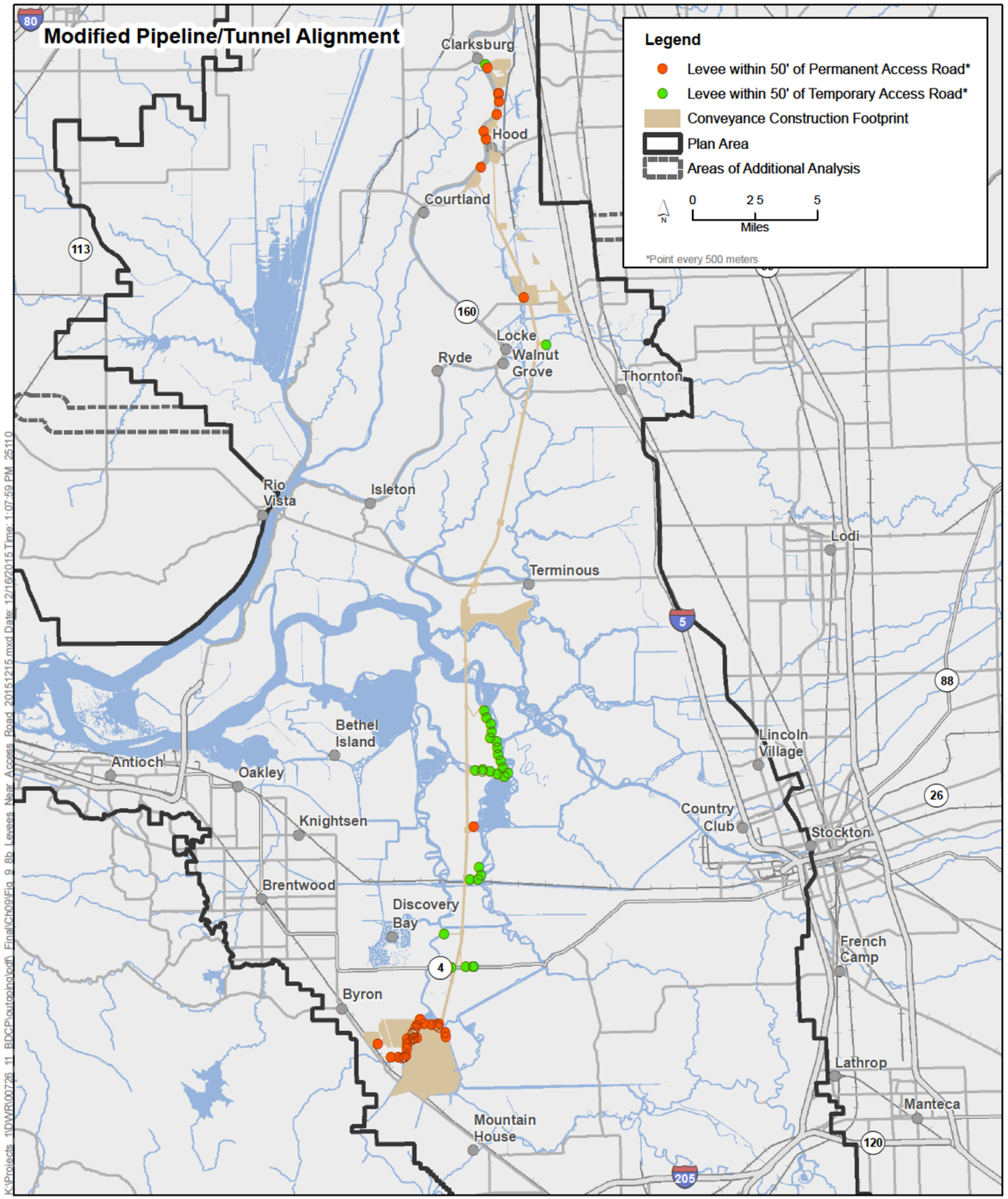


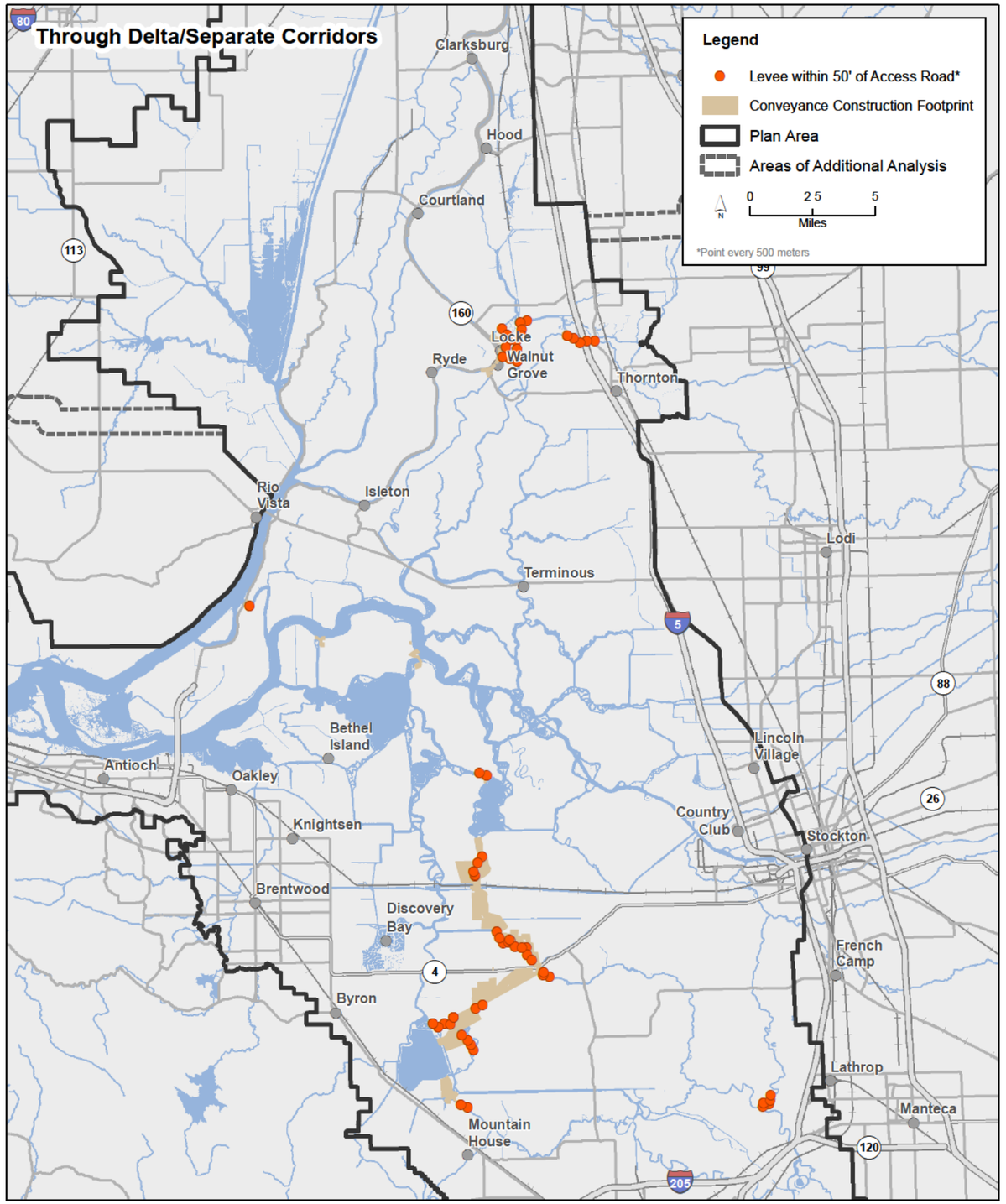




Sources: Plan Area, ICF 2012; Area of Additional Analysis, ICF 2012

Figure 9-8a
Levees Near Access Roads





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Sources: Plan Area, ICF 2012; Area of Additional Analysis, ICF 2012

Figure 9-8b
Levees Near Access Roads