APPENDIX G4

Test Pit Photographs

(Pages G4-1 to G4-80)

TEST PIT PROGRAM PHOTO LOG

PHOTO 1 – TP-CO1-A site pre-excavation

PHOTO 2 – TP-CO1-A pit excavated to depth 3.8 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 3 – TP-CO1-A pit excavated to depth 4.3 ft

PHOTO 4 – TP-CO1-A spoils from excavation to depth 4.3 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 5 – TP-CO1-A pit excavated to final depth 6.1 ft

PHOTO 6 – TP-CO1-A spoils from excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 7 – TP-CO1-A site post-excavation

PHOTO 8 – TP-CO1-B site pre-excavation

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 9 – TP-CO1-B excavated to depth 2.0 ft

PHOTO 10 – TP-CO1-B excavated to depth 4.0 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 11 – TP-CO1-B excavated to depth 6.9 ft

PHOTO 12 – TP-CO1-B spoils from excavation to depth 6.9 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 13 – TP-CO1-B pit excavated to final depth 7.7 ft

PHOTO 14 – TP-CO1-B spoils from excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 15 – TP-CO1-B site post-excavation

PHOTO 16 – TP-CO1-C site pre-excavation

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 17 – TP-CO1-C pit excavated to depth 2.3 ft

PHOTO 18 – TP-CO1-C pit excavated to depth 3.3 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 19 – TP-CO1-C pit excavated to depth 5.3 ft

PHOTO 20 – TP-CO1-C spoils from excavation to depth 5.3 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 21 – TP-CO1-C pit excavated to final depth 5.5 ft

PHOTO 22 – TP-CO1-C spoils from excavation

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 23 – TP-CO1-C site post-excavation

PHOTO 24 – TP-CO1-D site pre-excavation

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 25 – TP-CO1-D pit excavated to depth 2.0 ft

PHOTO 26 – TP-CO1-D pit excavated to depth 3.1 ft

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CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 27 – TP-CO1-D pit excavated to depth 4.8 ft

PHOTO 28 – TP-CO1-D pit excavated to depth 8.2 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 29 – TP-CO1-D pit excavated to final depth approximately 8.8 ft

PHOTO 30 – TP-CO1-D spoils from excavation

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 31 – TP-CO1-D site post-excavation

PHOTO 32 – TP-CO1-E site pre-excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 33 – TP-CO1-E pit excavated to depth 1.4 ft

PHOTO 34 – TP-CO1-E pit excavated to depth 3.4 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 35 – TP-CO1-E pit excavated to depth 4.5 ft

PHOTO 36 – TP-CO1-E pit excavated to final depth 8.0 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 37 – TP-CO1-E site post-excavation

PHOTO 38 – TP-CO2-A site pre-excavation

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 39 – TP-CO2-A pit excavated to depth 3.0 ft

PHOTO 40 – TP-CO2-A spoils from depth 3.0 to 4.0 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 41 – TP-CO2-A pit excavated to final depth 5.8 ft

PHOTO 42 – TP-CO2-A spoils from excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 43 – TP-CO2-A site post-excavation

PHOTO 44 – TP-CO2-B site pre-excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 45 – TP-CO2-B pit excavated to depth 1.4 ft

PHOTO 46 – TP-CO2-B pit excavated to depth 3.3 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 47 – TP-CO2-B spoils from excavation between 0.0 to 3.3 ft

PHOTO 48 – TP-CO2-B pit excavated to depth 5.2 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 49 – TP-CO2-B pit excavated to depth 9.1 ft

PHOTO 50 – TP-CO2-B pit excavated to final depth 11.0 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 51 – TP-CO2-B spoils from excavation

PHOTO 52 – TP-CO2-B site post-excavation

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 53 – TP-IG-A site pre-excavation

PHOTO 54 – TP-IG-A pit excavated to depth 3.1 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 55 – TP-IG-A pit excavated to depth 4.6 ft

PHOTO 56 – TP-IG-A spoils from depth 5.7 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 57 – TP-IG-A pit excavated to final depth 5.9 ft

PHOTO 58 – TP-IG-A spoils form excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 59 – TP-IG-A site post-excavation

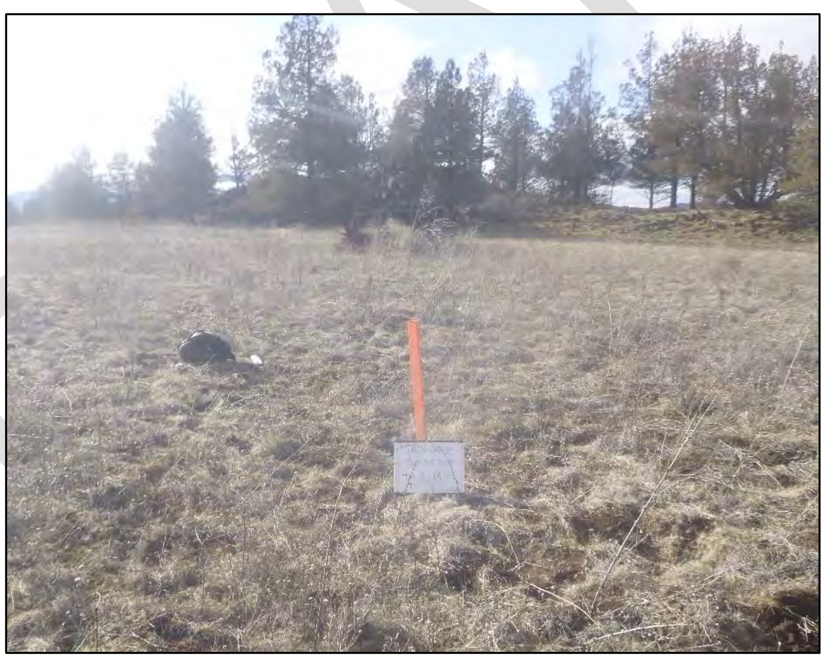


PHOTO 60 – TP-IG-B site pre-excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 61 – TP-IG-B pit excavated to depth 3.0 ft

PHOTO 62 – TP-IG-B pit excavated to depth 4.7 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 63 – TP-IG-B spoils from material at excavated depth 4.7 ft

PHOTO 64 – TP-IG-B pit excavated to depth 10.5 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 65 – TP-IG-B pit excavated to depth 12.0 ft

PHOTO 66 – TP-IG-B pit excavated to final depth 15.0 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 67 – TP-IG-B pit excavated to final depth 15.0 ft

PHOTO 68 – TP-IG-B spoils from excavation

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 69 – TP-IG-B site post-excavation

PHOTO 70 – TP-IG-C site pre-excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 71 – TP-IG-C pit excavated to depth 4.0 ft

PHOTO 72 – TP-IG-C pit excavated to final depth 5.6 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 73 – TP-IG-C spoils from excavation

PHOTO 74 – TP-IG-C site post-excavation

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 75 – TP-IG-D site pre-excavation

PHOTO 76 – TP-IG-D pit excavated to depth 2.3 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 77 – TP-IG-D spoils from excavated depth 0.0 ft to 2.3 ft

PHOTO 78 – TP-IG-D pit excavated to depth 4.0 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 79 – TP-IG-D pit excavated to depth 7.0 ft

PHOTO 80 – TP-IG-D spoils from excavated depth 4.0 ft to 7.0 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 81 – TP-IG-D pit excavated to depth 8.4 ft

PHOTO 82 – TP-IG-D spoils from excavated depth 8.4 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 83 – TP-IG-D pit excavated to final depth 12.7 ft

PHOTO 84 – TP-IG-D spoils from excavation

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 85 – TP-IG-D spoils from excavation

PHOTO 86 – TP-IG-D site post-excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 87 – GRB-01 hand sampling

PHOTO 88 – GRB-01 hand sampling

TEST PIT PROGRAM PHOTO LOG

PHOTO 89 – GRB-02 hand sampling

PHOTO 90 – GRB-02 hand sampling

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 91 – GRB-03 hand sampling

PHOTO 92 – GRB-04 hand sampling

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 93 – GRB-04 hand sampling

PHOTO 94 – GRB-05 hand sampling

TEST PIT PROGRAM PHOTO LOG

PHOTO 95 – TP-JCB-A site pre-excavation

PHOTO 96 – TP-JCB-A pit excavated to depth 3 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 97 – TP-JCB-A spoils from depth 5.25 ft

PHOTO 98 – TP-JCB-A pit excavated to depth 8.9 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 99 – TP-JCB-A pit excavated to depth 12.2 ft

PHOTO 100 – TP-JCB-A soil material from depth 12.2 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 101 – TP-JCB- A pit excavated to depth 14.9 ft

PHOTO 102 – TP-JCB-A soil material from depth 14.9 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 103 – TP-JCB-A site post-excavation

PHOTO 104 – TP-JCB-B site pre-excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 105 – TP-JCB-B pit excavated to depth 2.3 ft

PHOTO 106 – TP-JCB-B spoils from depth 0.0 to 2.3 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 107 – TP-JCB-B pit excavated to depth 4.0 ft

PHOTO 108 – TP-JCB-B pit excavated to depth 6.6 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 109 – TP-JCB-B spoils from depth 6.6 ft

PHOTO 110 – TP-JCB-B pit excavated to depth 12.0 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 111 – TP-JCB-B spoils from depth 12.0 ft

PHOTO 112 – TP-JCB-B pit excavated to depth 14.0 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 113 – TP-JCB-B spoils from depth 12.0 to 14.0 ft

PHOTO 114 – TP-JCB-B site post-excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 115 – TP-JCB-C site pre-excavation

PHOTO 116 – TP-JCB-C pit excavated to depth 2.3 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 117 – TP-JCB-C spoils from 0.0 to 4.8 ft

PHOTO 118 – TP-JCB-C pit excavated to depth 4.8 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 119 – TP-JCB-C pit excavated to depth 7.0 ft

PHOTO 120 – TP-JCB-C spoils from depth 7.0 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 121 – TP-JCB-C pit excavated to depth 8.0 ft

PHOTO 122 – TP-JCB-C spoils from depth 8.0 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 123 – TP-JCB-C pit excavated to depth 13.3 ft

PHOTO 124 – TP-JCB-C site post-excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 125 – TP-JCB-D site pre-excavation

PHOTO 126 – TP-JCB-D pit excavated to depth 1.7 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 127 – TP-JCB-D pit excavated to depth 7.7 ft

PHOTO 128 – TP-JCB-D spoils from depth 7.7 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 129 – TP-JCB-D pit excavated to depth 8.8 ft

PHOTO 130 – TP-JCB-D spoils from depth 8.8 to 9.0 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 131 – TP-JCB-D site post-excavation

PHOTO 132 – TP-JCB-E site pre-excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 133 – TP-JCB-E pit excavated to depth 1.2 ft

PHOTO 134 – TP-JCB-E boulder uncovered approximately 2.0 ft below surface

TEST PIT PROGRAM PHOTO LOG

PHOTO 135 – TP-JCB- E pit excavated to depth 6.0 ft

PHOTO 136 – TP-JCB-E pit excavated to 6.6 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 137 – TP-JCB-E spoils from depth 6.6 ft

PHOTO 138 – TP-JCB-F site pre-excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 139 – TP-JCB-F pit excavated to depth 2.3 ft

PHOTO 140 – TP-JCB-F spoils from depth 2.3 to 6.4 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 141 – TP-JCB-F boulders uncovered from depth 2.3 to 6.4 ft

PHOTO 142 – TP-JCB-F pit excavated to 6.4 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 143 – TP-JCB-F spoils from depth 6.4 ft

PHOTO 144 – TP-JCB-F pit excavated to depth 8.5 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 145 – TP-JCB-F spoils and boulders from depth 6.4 to 8.5 ft

PHOTO 146 – TP-JCB-F boulders from depth 6.4 to 8.5 ft

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 147 – TP-JCB-F site post-excavation

PHOTO 148 – TP-JCB-G site pre-excavation

TEST PIT PROGRAM PHOTO LOG

PHOTO 149 – TP-JCB-G pit excavated to depth 1.8 ft

PHOTO 150 – TP-JCB-G metal bar uncovered from depth 0.0 to 1.8 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 151 – TP-JCB-G pit excavated to depth 4.9 ft

PHOTO 152 – TP-JCB-G boulder uncovered from depth 4.9 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 153 – TP-JCB-G pit excavated to depth 5.3 ft

PHOTO 154 – TP-JCB-G spoils from depth 5.3 ft

TEST PIT PROGRAM PHOTO LOG

PHOTO 155 – TP-JCB-G boulder uncovered from approximate depth 7.0 ft

PHOTO 156 – TP-JCB-G pit excavated to depth 7.4 ft

Knight Piésold
CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 157 – TP-JCB-G pit excavated to depth 9.0 ft

PHOTO 158 – TP-JCB-G final spoils from excavation

Knight Piésold CONSULTING

TEST PIT PROGRAM PHOTO LOG

PHOTO 159 – TP-JCB-G site post-excavation

APPENDIX G5

Test Pit Lab Testing Summary Tables

(Pages G5-1 to G5-2)

Knight Piésold CONSULTING

TABLE G5.1

KIEWIT INFRASTRUCTURE WEST CO.
KLAMATH RIVER RENEWAL PROJECT

GEOTECHNICAL DATA SUMMARY
PRELIMINARY SERVICES TEST PIT SOIL INDEX LABORATORY TESTING

Print Jul/20/20 17:59:04

Drillhole/ Test Pit ID[1,2]	Sample ID	Material[3]	Sample Type	Depth From (ft)	Depth To (ft)	Moisture Content (%)	Particle Size Distribution					Atterberg Limits			USCS Group	Description
							Cobbles %	Gravel %	Sand %	Silt %	Clay %	LL	PL	PI		
TP-CO1-A	TP-CO1-A01	Unspecified	Grab	3.25	3.75	20.4	0.0	41.3	10.9	47.8		55	34	21	GC	Clayey GRAVEL
TP-CO1-B	TP-CO1-B02	Unspecified	Grab	6.67	7.17	29.9	0.0	0.0	68.0	32.0		52	13	39	SM	Silty SAND
TP-CO1-C	TP-CO1-C01	Unspecified	Grab	1.58	2.10	22.6	0.0	33.2	14.2	52.6		38	16	22	GC	Clayey GRAVEL with sand
TP-CO1-C	TP-CO1-C04	Unspecified	Grab	4.75	5.25	5.2	0.0	53.4	38.3	8.3		NP	NP		GP-GM	Poorly graded GRAVEL with silt and sand
TP-CO1-D	TP-CO1-D01	Unspecified	Grab	3.00	3.50		0.0	3.8	5.8	90.4		63	41	22	CH	Fat CLAY
TP-CO1-D	TP-CO1-D02	Unspecified	Grab	4.83	5.00	30.1	0.0	1.2	10.0	88.8		59	18	41	MH	Elastic SILT with sand
TP-CO1-E	TP-CO1-E03	Unspecified	Grab	6.75	7.25	16.9	0.0	50.6	17.9	31.5		30	6	24	GM	Silty GRAVEL with sand
TP-CO2-A	TP-CO2-A01	Unspecified	Grab	2.92	3.42	13.7	0.0	39.9	34.1	26.0		31	6	25	GM	Silty GRAVEL with sand
TP-CO2-A	TP-CO2-B02	Unspecified	Grab	3.92	4.42	7.0	11.7	38.3	21.0	29.0		33	12	21	GC	Clayey GRAVEL with sand
TP-IG-A	TP-IG-A01	Unspecified	Grab	1.83	2.33	28.9	0.0	10.3	14.9	74.8		71	51	20	CH	Fat CLAY with sand
TP-IG-B	TP-IG-B01	Unspecified	Grab	2.83	3.33	25.8	0.0	3.4	10.9	85.7		80	59	21	CH	Fat CLAY with sand
TP-IG-B	TP-IG-B02	Unspecified	Grab	4.50	5.00	7.4	0.0	26.1	22.2	51.7		62	40	22	GC	Clayey GRAVEL with sand
TP-IG-D	TP-IG-D02	Unspecified	Grab	11.92	12.42	19.6	0.0	8.1	29.7	62.2		49	24	25	CL	Sandy lean CLAY
TP-JCB-A	TP-JCB-A02	Unspecified	Grab	4.83	5.25	43.8	0.0	0.0	24.2	75.8		NP	NP		SM	Silty SAND
TP-JCB-A	TP-JCB-A04	Unspecified	Grab	11.00	11.50	54.9	0.0	0.0	3.6	96.4		41	7	34	ML	SILT with sand
TP-JCB-B	TP-JCB-B04	Unspecified	Grab	13.50	14.00	56.0	0.0	4.0	46.6	49.4		48	7	41	SM	Silty SAND
TP-JCB-C	TP-JCB-C02	Unspecified	Grab	8.58	9.00	51.3	0.0	0.0	33.2	66.8		58	24	34	MH	Sandy elastic SILT
TP-JCB-D	TP-JCB-D01	Unspecified	Grab	1.67	2.08	39.3	0.0	11.1	64.1	24.8		49	6	43	SM	Silty SAND
TP-JCB-E	TP-JCB-E01	Unspecified	Grab	6.25	6.67	15.3	9.1	51.0	13.2	26.7		31	7	24	GM	Silty gravel with SAND
TP-JCB-F	TP-JCB-F01	Unspecified	Grab	2.75	3.17	20.3	10.4	43.1	21.4	25.1		NP	NP		GM	Silty gravel with SAND
TP-JCB-G	TP-JCB-G01	Unspecified	Grab	1.83	2.25	14.2	0.0	58.6	30.0	11.4		NP	NP		GP-GM	Poorly graded GRAVEL with silt and sand
TP-JCB-G	TP-JCB-G03	Unspecified	Grab	8.00	8.50	19.8	15.6	31.2	16.3	36.9		31	5	26	GM	Silty GRAVEL with sand
Surface[4]	GRB01	Unspecified	Grab	0.00	1.00	13.0	0.0	33.1	65.0	1.9		NP	NP		SP	Poorly graded SAND with gravel
Surface[4]	GRB02	Unspecified	Grab	0.00	1.00	11.7	0.0	27.8	65.8	6.4		NP	NP		SW	Well-graded SAND with gravel
Surface[4]	GRB03	Unspecified	Grab	0.33	0.83	17.9	0.0	9.2	43.1	47.7		NP	NP		SM	Silty SAND
Surface[4]	GRB04	Unspecified	Grab	0.58	1.00	24.1	0.0	7.9	20.7	71.4		54	29	25	CH	Sandy fat CLAY
Surface[4]	GRB05	Unspecified	Grab	0.67	1.00	30.4	0.0	3.4	25.9	70.7		61	41	20	CH	Sandy fat CLAY

M:\1\03\00640\01\A\Report\2 - Geotechnical Data Report\Rev C\Appendices\[Appendix Tables_rC.xlsx]G5.1 Test Pit Soil Index

NOTES:

1. TEST PIT SAMPLES WERE COLLECTED BY KP AND TESTED AT KNIGHT PIESOLD AND CO. SOILS LABORATORY IN DENVER, CO.
2. SURFACE SOIL SAMPLES THAT ARE NOT ASSOCIATED WITH ANY SPECIFIC TEST PIT OR BOREHOLE. SURFACE SAMPLE COLLECTION LOCATIONS ARE SHOWN IN APPENDIX D2.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
C	20JUL'20	ISSUED WITH REPORT VA103-640/01-2	CYP	SY

Knight Piésold CONSULTING

TABLE G5.2

KIEWIT INFRASTRUCTURE WEST CO.
KLAMATH RIVER RENEWAL PROJECT

GEOTECHNICAL DATA SUMMARY
PRELIMINARY SERVICES TEST PIT SLAKE DURABILITY TESTING

Print Jul/20/20 17:59:04

Sample No.	Pre-Test Specimen Condition							Post-Test (Second Cycle) Specimen Condition					
	No. of Pieces	Wet Wt. + Tare	Dry Wt. + Tare	Tare	Wt. of Water	Wt. of Solids	Moisture Content	Dry Wt. + Tare	Tare	Wt. of Solids	Slake Index	No. of Pieces	Type Descrition
		g	g	g	g	g	%	g	g	g			
TP-CO1-CO4	9	NA	395.8	0.00	NA	395.78	NA	391.5	0.00	391.48	98.90	N.D	I
GRB01/GRB02 Composite	15	NA	311.8	0.00	NA	311.79	NA	306.8	0.00	306.79	98.40	N.D	I

M:\1\03\00640\01\A\Report\2 - Geotechnical Data Report\Rev C\Appendices\[Appendix Tables_rC.xlsx]G5.2 Slake

NOTES:

1. SAMPLES COLLECTED BY KP AND TESTED AT KP DENVER SOILS LABORATORY IN DENVER, CO.
2. THE TEMPERATURE DURING TEST WAS 20.0 - 21.0 DEGREES CELSIUS.
3. DUE TO LACK OF MATERIAL, SAMPLE MASSES DO NOT MEET ASTM REQUIREMENTS

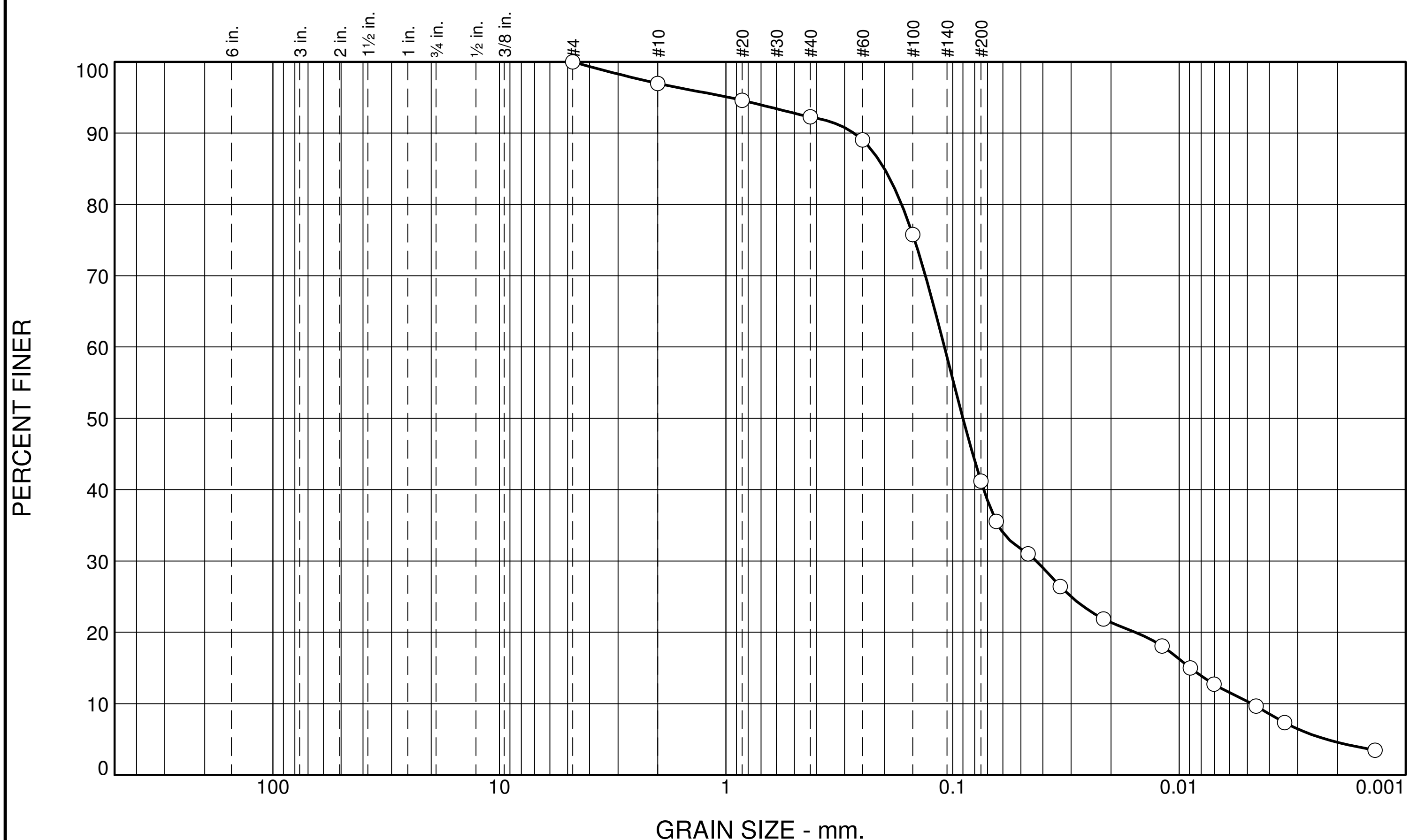
C	20JUL'20	ISSUED WITH REPORT VA103-640/01-2	CYP	SY
REV	DATE	DESCRIPTION	PREP'D	RVW'D

APPENDIX G6

Test Pit Lab Testing Data

(Pages G6-1 to G6-70)

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.0	4.7	51.1	36.6	4.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	97.0		
#20	94.6		
#40	92.3		
#60	89.0		
#100	75.8		
#200	41.2		
0.0642 mm.	35.5		
0.0464 mm.	31.0		
0.0335 mm.	26.4		
0.0216 mm.	21.9		
0.0119 mm.	18.1		
0.0089 mm.	15.0		
0.0070 mm.	12.7		
0.0046 mm.	9.6		
0.0034 mm.	7.3		
0.0014 mm.	3.4		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.2721 D_{85}= 0.2001 D_{60}= 0.1087
D_{50}= 0.0901 D_{30}= 0.0427 D_{15}= 0.0089
D_{10}= 0.0048 C_u= 22.60 C_c= 3.49

Classification

USCS= SM AASHTO= A-4(0)

Remarks

As received moisture content = 43.8%

Sample No.: TP-JCB-A02 **Source of Sample:** J.C. Boyle Disposal Area **Date:** 3/17/20
Location: **Elev./Depth:** 4.83-5.25'

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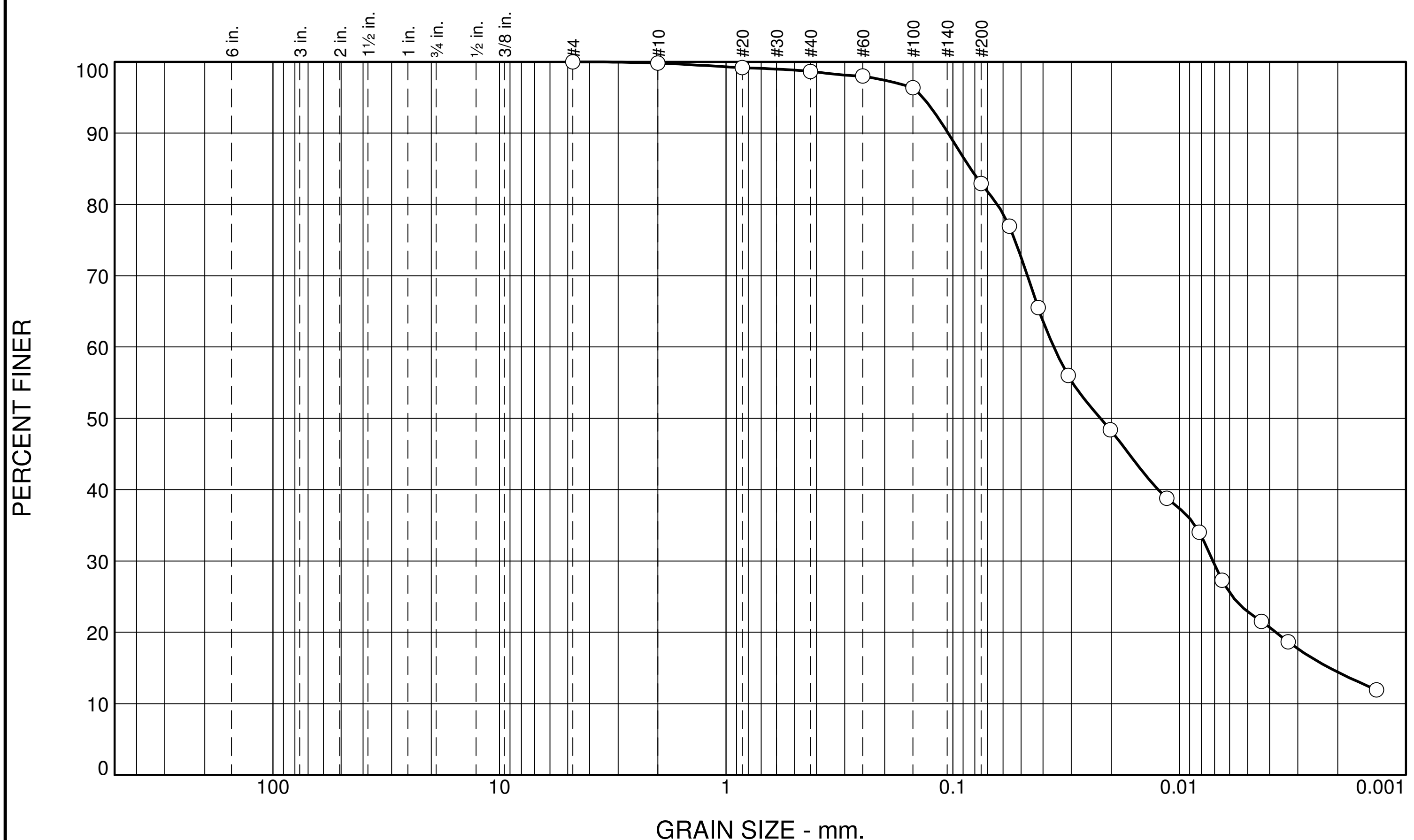
Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: ICloud **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	1.2	15.7	68.5	14.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	99.2		
#40	98.6		
#60	98.0		
#100	96.4		
#200	82.9		
0.0563 mm.	77.0		
0.0420 mm.	65.5		
0.0310 mm.	56.0		
0.0202 mm.	48.4		
0.0114 mm.	38.8		
0.0082 mm.	34.0		
0.0065 mm.	27.3		
0.0043 mm.	21.5		
0.0033 mm.	18.7		
0.0013 mm.	11.9		

* (no specification provided)

Soil Description

silt with sand

Atterberg Limits

PL= 34 LL= 41 PI= 7

Coefficients

D_{90}= 0.1049 D_{85}= 0.0834 D_{60}= 0.0359
D_{50}= 0.0223 D_{30}= 0.0071 D_{15}= 0.0022
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-5(8)

Remarks

As received moisture content = 54.9%

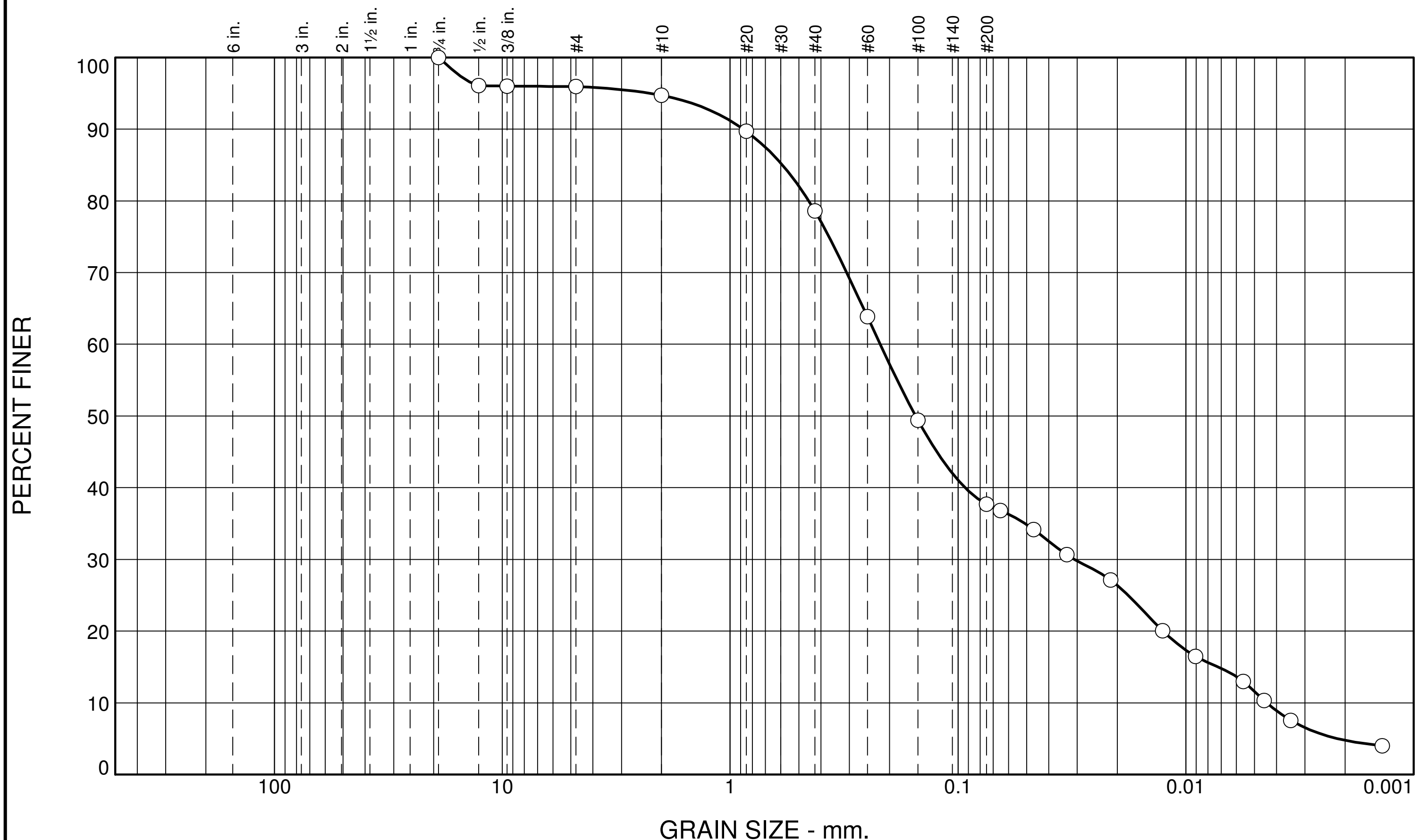
Sample No.: TP-JCB-A04 **Source of Sample:** J.C. Boyle Disposal Area **Date:** 3/17/20
Location: **Elev./Depth:** 11.00-11.50'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: ICloud **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.0	1.3	16.1	40.9	32.9	4.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	96.1		
.375	96.0		
#4	96.0		
#10	94.7		
#20	89.7		
#40	78.6		
#60	63.8		
#100	49.4		
#200	37.7		
0.0651 mm.	36.8		
0.0465 mm.	34.2		
0.0333 mm.	30.7		
0.0213 mm.	27.1		
0.0127 mm.	20.0		
0.0091 mm.	16.5		
0.0056 mm.	13.0		
0.0045 mm.	10.3		
0.0035 mm.	7.6		
0.0014 mm.	4.0		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= 41 LL= 48 PI= 7

Coefficients

D_{90}= 0.8761 D_{85}= 0.5901 D_{60}= 0.2198
D_{50}= 0.1536 D_{30}= 0.0308 D_{15}= 0.0072
D_{10}= 0.0044 C_u= 49.74 C_c= 0.98

Classification

USCS= SM AASHTO= A-5(0)

Remarks

As received moisture content=56.0%. Standing water observed in bucket, not included in moisture content.

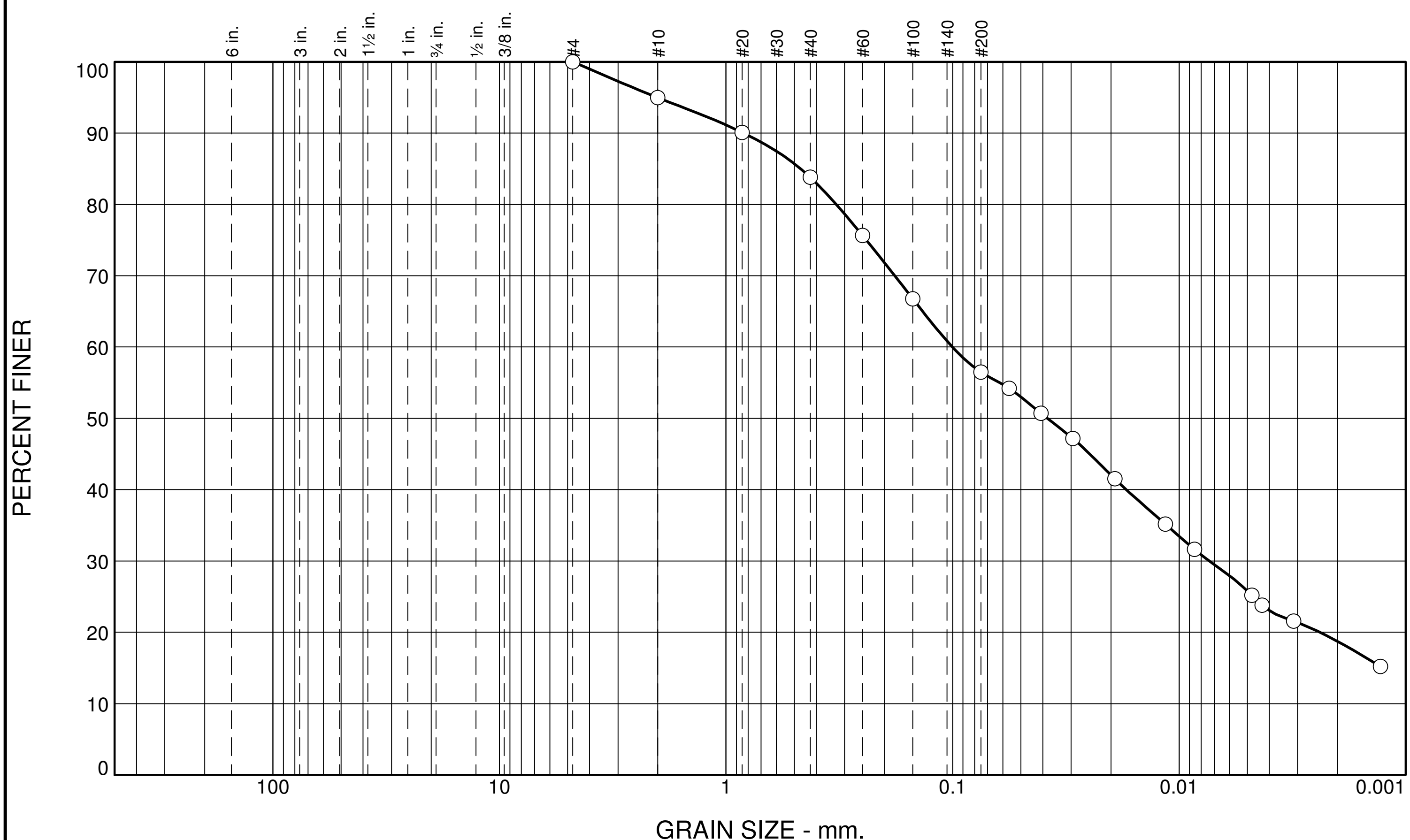
Sample No.: TP-JCB-B04 **Source of Sample:** J.C. Boyle Disposal Area **Date:** 3/19/20
Location: **Elev./Depth:** 13.50-14.00'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: JStaley **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	5.0	11.2	27.3	37.8	18.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	95.0		
#20	90.1		
#40	83.8		
#60	75.7		
#100	66.8		
#200	56.5		
0.0563 mm.	54.2		
0.0407 mm.	50.7		
0.0294 mm.	47.2		
0.0192 mm.	41.5		
0.0115 mm.	35.2		
0.0086 mm.	31.6		
0.0048 mm.	25.2		
0.0043 mm.	23.8		
0.0031 mm.	21.6		
0.0013 mm.	15.2		

* (no specification provided)

Soil Description

sandy elastic silt

Atterberg Limits

PL= 34 LL= 58 PI= 24

Coefficients

D_{90}= 0.8359 D_{85}= 0.4690 D_{60}= 0.1002
D_{50}= 0.0382 D_{30}= 0.0073 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(12)

Remarks

As received moisture content = 51.3%.

Sample No.: TP-JCB-C02 **Source of Sample:** J.C. Boyle Disposal Area **Date:** 3/17/20
Location: **Elev./Depth:** 8.58-9.00'

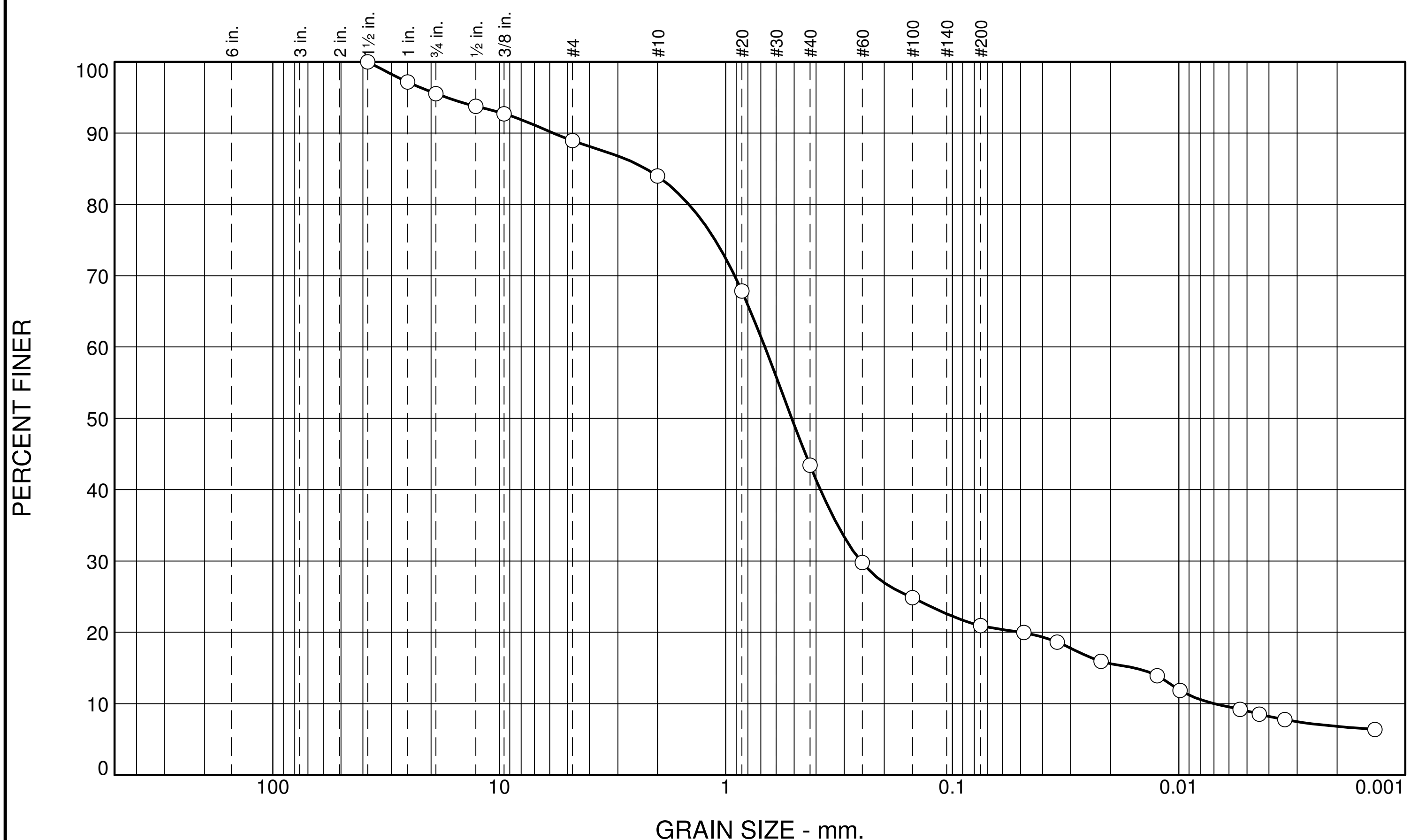
Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal

Project No: VA103-00640/01 **Figure**

Tested By: ICloud **Checked By:** Jbruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.5	6.6	4.9	40.6	22.5	14.1	6.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	97.2		
.75	95.5		
.5	93.8		
.375	92.7		
#4	88.9		
#10	84.0		
#20	67.8		
#40	43.4		
#60	29.8		
#100	24.8		
#200	20.9		
0.0483 mm.	19.9		
0.0344 mm.	18.6		
0.0220 mm.	15.9		
0.0124 mm.	13.9		
0.0099 mm.	11.9		
0.0054 mm.	9.2		
0.0044 mm.	8.5		
0.0034 mm.	7.7		
0.0014 mm.	6.4		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= 43 LL= 49 PI= 6

Coefficients

D_{90}= 5.7686 D_{85}= 2.2531 D_{60}= 0.6726
D_{50}= 0.5122 D_{30}= 0.2536 D_{15}= 0.0157
D_{10}= 0.0070 C_u= 95.98 C_c= 13.65

Classification

USCS= SM AASHTO= A-1-b

Remarks

As received moisture content =39.3%

Sample No.: TP-JCB-D01 **Source of Sample:** J.C. Boyle Disposal Area **Date:** 3/17/20
Location: **Elev./Depth:** 1.67-2.08'

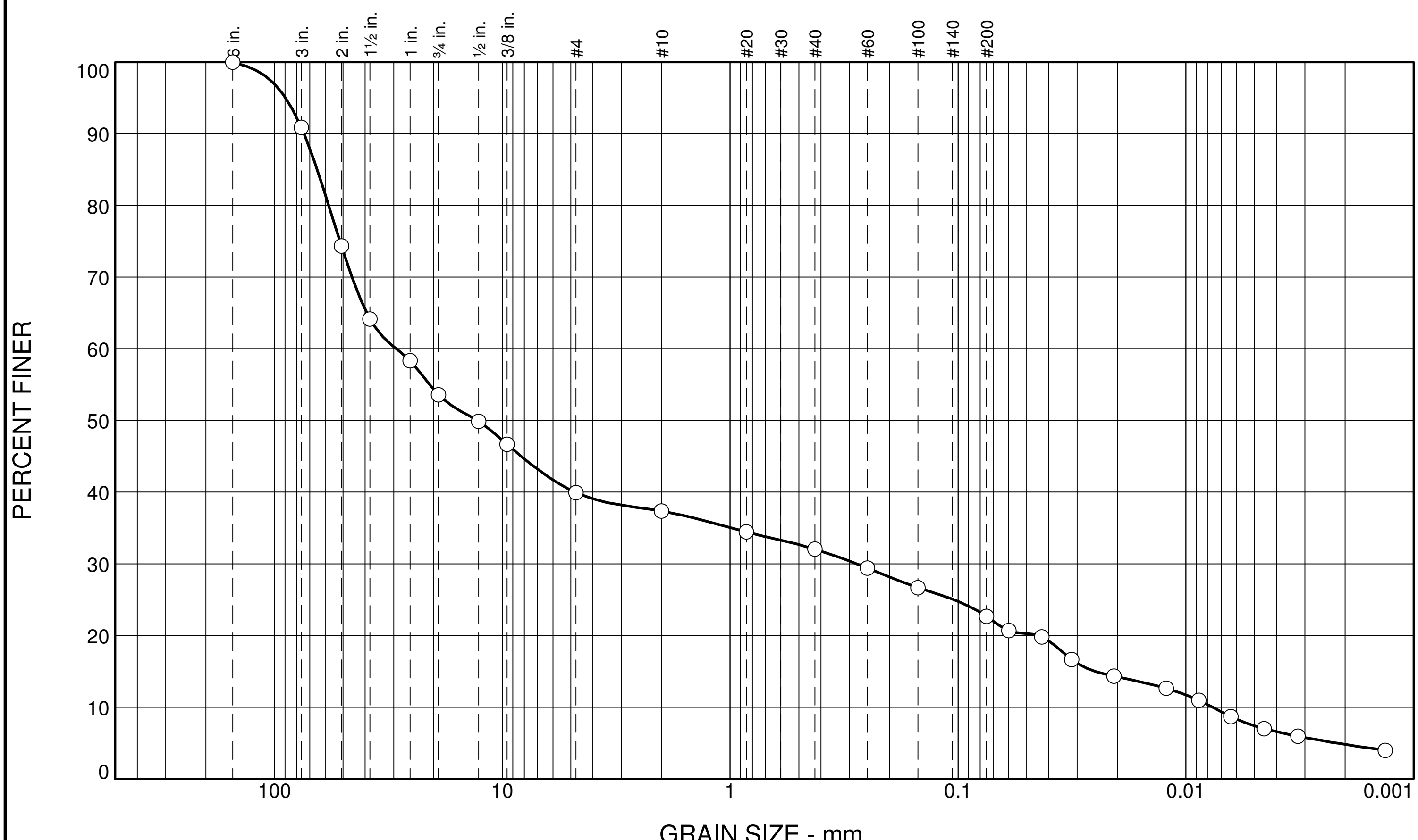
Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal

Project No: VA103-00640/01 **Figure**

Tested By: ICloud **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
9.1	37.3	13.7	2.5	5.4	9.4	17.8	4.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
6	100.0		
3	90.9		
2	74.3		
1.5	64.2		
1	58.3		
.75	53.6		
.5	49.9		
.375	46.7		
#4	39.9		
#10	37.4		
#20	34.4		
#40	32.0		
#60	29.4		
#100	26.7		
#200	22.6		
0.0598 mm.	20.7		
0.0428 mm.	19.8		
0.0317 mm.	16.6		
0.0207 mm.	14.3		
0.0122 mm.	12.6		
0.0088 mm.	10.9		
0.0063 mm.	8.7		
0.0045 mm.	7.0		
0.0032 mm.	5.9		
0.0013 mm.	4.0		

* (no specification provided)

Soil Description

silty gravel with sand

Atterberg Limits

PL= 24 LL= 31 PI= 7

Coefficients

D_{90}= 74.1633 D_{85}= 65.0055 D_{60}= 29.2154
D_{50}= 12.8802 D_{30}= 0.2792 D_{15}= 0.0251
D_{10}= 0.0077 C_u= 3814.71 C_c= 0.35

Classification

USCS= GM AASHTO= A-2-4(0)

Remarks

Plus 3" material may invalidate the classification. As received moisture content =15.3%

Sample No.: TP-JCB-E01 **Source of Sample:** J.C. Boyle Disposal Area **Date:** 3/30/20
Location: **Elev./Depth:** 6.25-6.67'

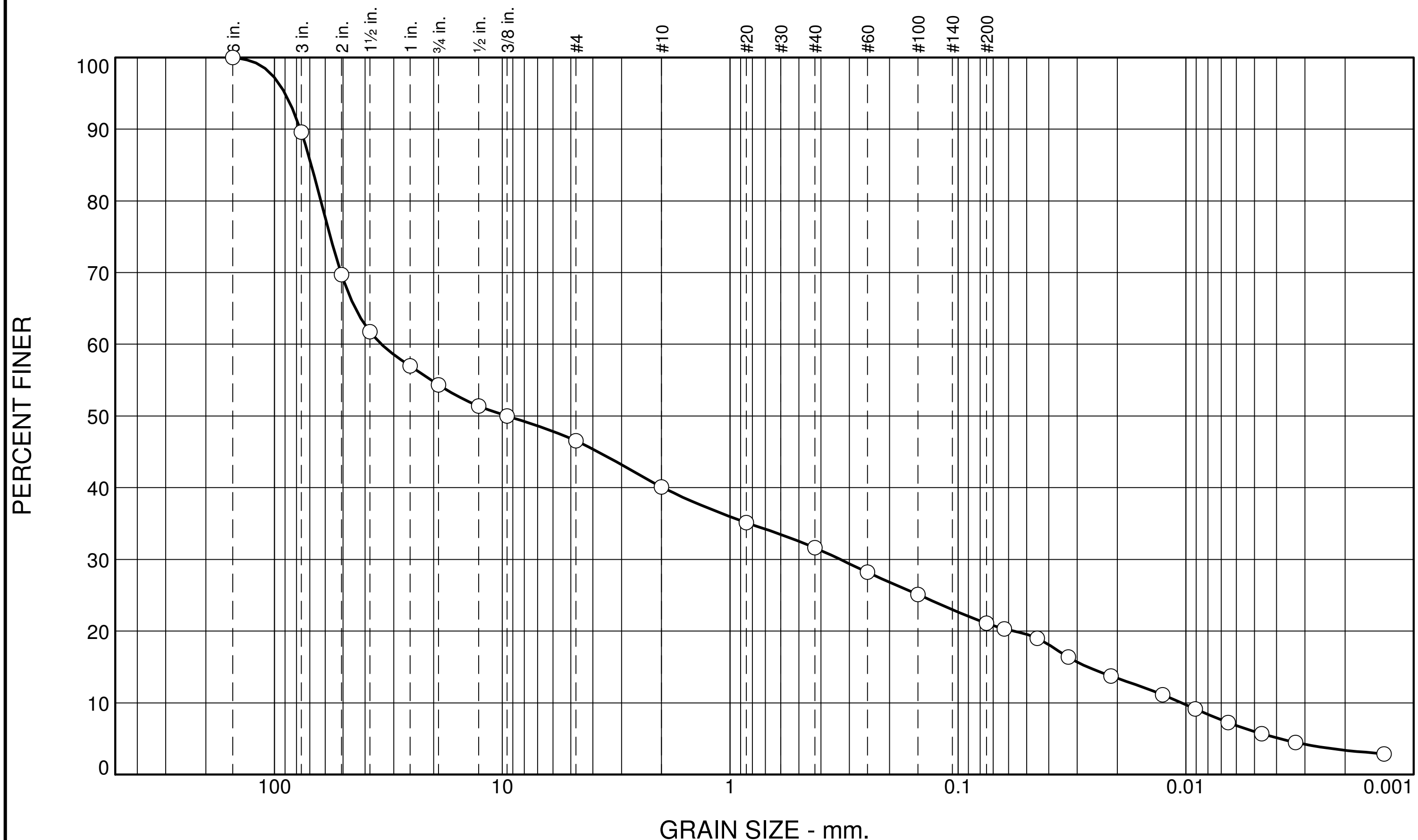
Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal

Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
10.4	35.3	7.8	6.4	8.5	10.5	17.7	3.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
6	100.0		
3	89.6		
2	69.7		
1.5	61.8		
1	57.0		
.75	54.3		
.5	51.4		
.375	50.0		
#4	46.5		
#10	40.1		
#20	35.1		
#40	31.6		
#60	28.2		
#100	25.1		
#200	21.1		
0.0626 mm.	20.3		
0.0449 mm.	19.0		
0.0328 mm.	16.4		
0.0213 mm.	13.7		
0.0126 mm.	11.1		
0.0091 mm.	9.1		
0.0065 mm.	7.2		
0.0046 mm.	5.7		
0.0033 mm.	4.5		
0.0013 mm.	2.9		

* (no specification provided)

Soil Description

silty gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 76.9610 D_{85}= 68.9820 D_{60}= 33.9537
D_{50}= 9.5414 D_{30}= 0.3285 D_{15}= 0.0270
D_{10}= 0.0105 C_u= 3243.52 C_c= 0.30

Classification

USCS= GM AASHTO= A-1-b

Remarks

Plus 3" material may invalidate the classification.
As received moisture content =20.3%

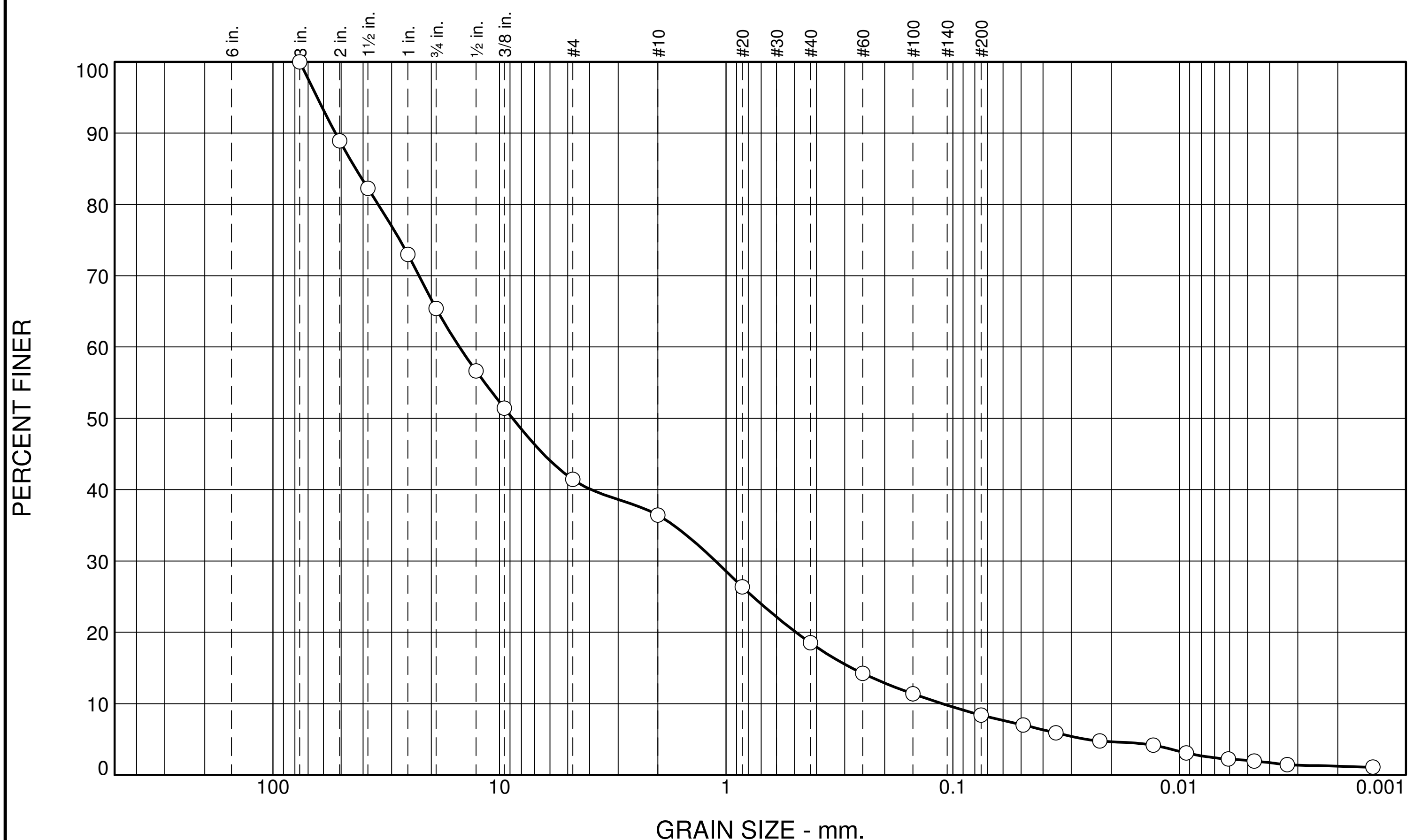
Sample No.: TP-JCB-F01 **Source of Sample:** J.C. Boyle Disposal Area **Date:** 3/24/20
Location: **Elev./Depth:** 2.75-3.17'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	34.6	24.0	5.0	17.9	10.1	7.2	1.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	88.9		
1.5	82.3		
1	73.0		
.75	65.4		
.5	56.7		
.375	51.4		
#4	41.4		
#10	36.4		
#20	26.4		
#40	18.5		
#60	14.2		
#100	11.4		
#200	8.4		
0.0490 mm.	7.0		
0.0350 mm.	5.9		
0.0224 mm.	4.8		
0.0130 mm.	4.2		
0.0093 mm.	3.1		
0.0061 mm.	2.2		
0.0047 mm.	1.9		
0.0033 mm.	1.4		
0.0014 mm.	1.1		

* (no specification provided)

Soil Description

poorly graded gravel with silt and sand

Atterberg Limits

PL= NP   LL= NP   PI= NP

Coefficients

D_{90}= 52.9953 D_{85}= 43.0809 D_{60}= 15.0342
D_{50}= 8.7694 D_{30}= 1.1181 D_{15}= 0.2794
D_{10}= 0.1118 C_u= 134.47 C_c= 0.74

Classification

USCS= GP-GM   AASHTO= A-1-a

Remarks

As received moisture content=14.2%

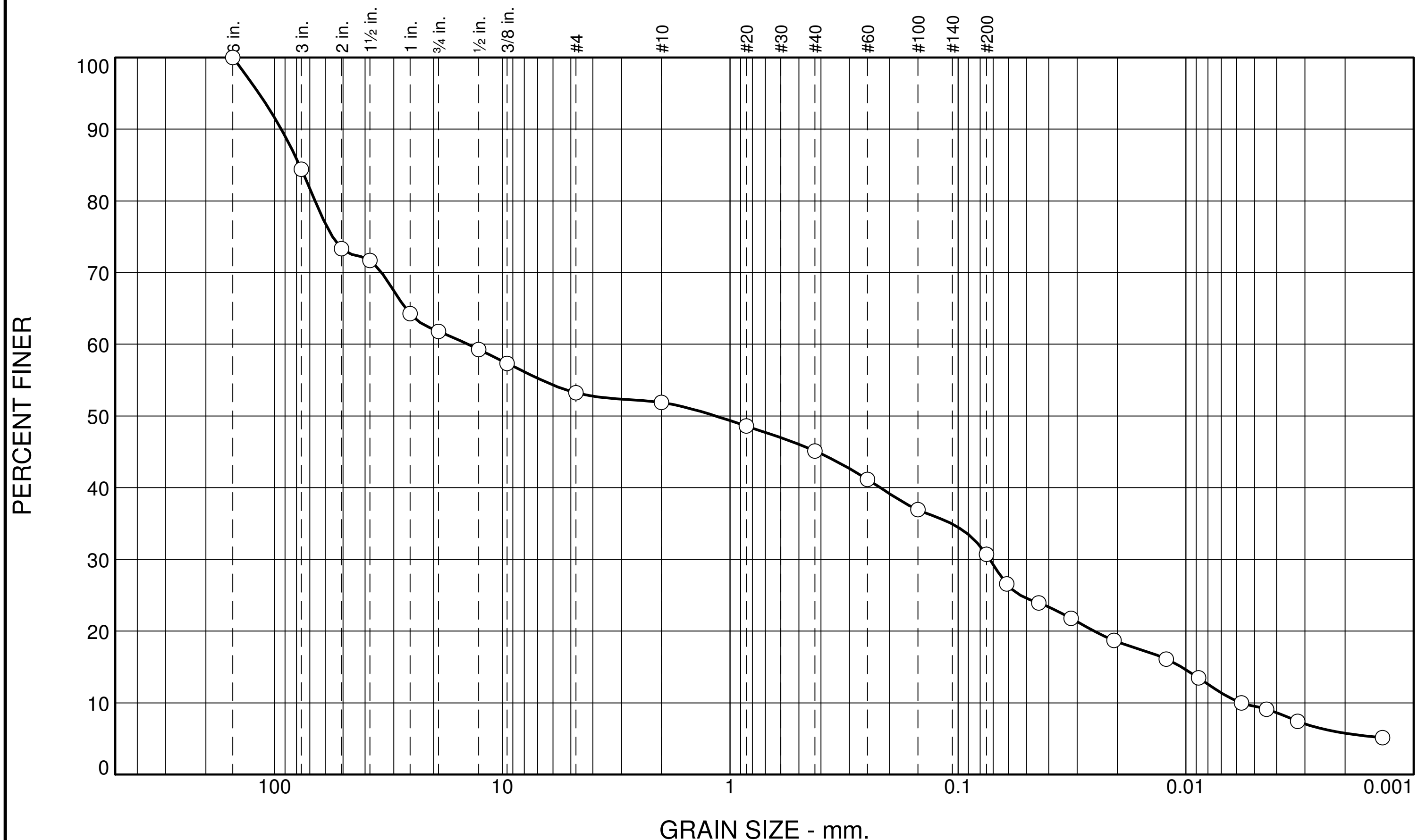
Sample No.: TP-JCB-G01   **Source of Sample:** J.C. Boyle Disposal Area   **Date:** 3/23/20
Location: **Elev./Depth:** 1.83-2.25'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01   **Figure**

Tested By: MFreund   **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
15.6	22.6	8.6	1.3	6.8	14.4	25.0	5.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
6	100.0		
3	84.4		
2	73.3		
1.5	71.7		
1	64.3		
.75	61.8		
.5	59.3		
.375	57.3		
#4	53.2		
#10	51.9		
#20	48.6		
#40	45.1		
#60	41.2		
#100	36.9		
#200	30.7		
0.0611 mm.	26.6		
0.0442 mm.	23.9		
0.0319 mm.	21.8		
0.0207 mm.	18.7		
0.0122 mm.	16.1		
0.0088 mm.	13.5		
0.0057 mm.	10.0		
0.0044 mm.	9.1		
0.0032 mm.	7.4		
0.0014 mm.	5.1		

* (no specification provided)

Soil Description

silty gravel with sand

Atterberg Limits

PL= 26 LL= 31 PI= 5

Coefficients

D_{90}= 93.3773 D_{85}= 77.7026 D_{60}= 14.1850
D_{50}= 1.1592 D_{30}= 0.0725 D_{15}= 0.0105
D_{10}= 0.0057 C_u= 2479.05 C_c= 0.06

Classification

USCS= GM AASHTO= A-4(0)

Remarks

Plus 3" material may invalidate the classification. As received moisture contetn =19.8%

Sample No.: TP-JCB-G03 **Source of Sample:** J.C. Boyle Disposal Area **Date:** 3/22/20
Location: **Elev./Depth:** 8.00-8.50'

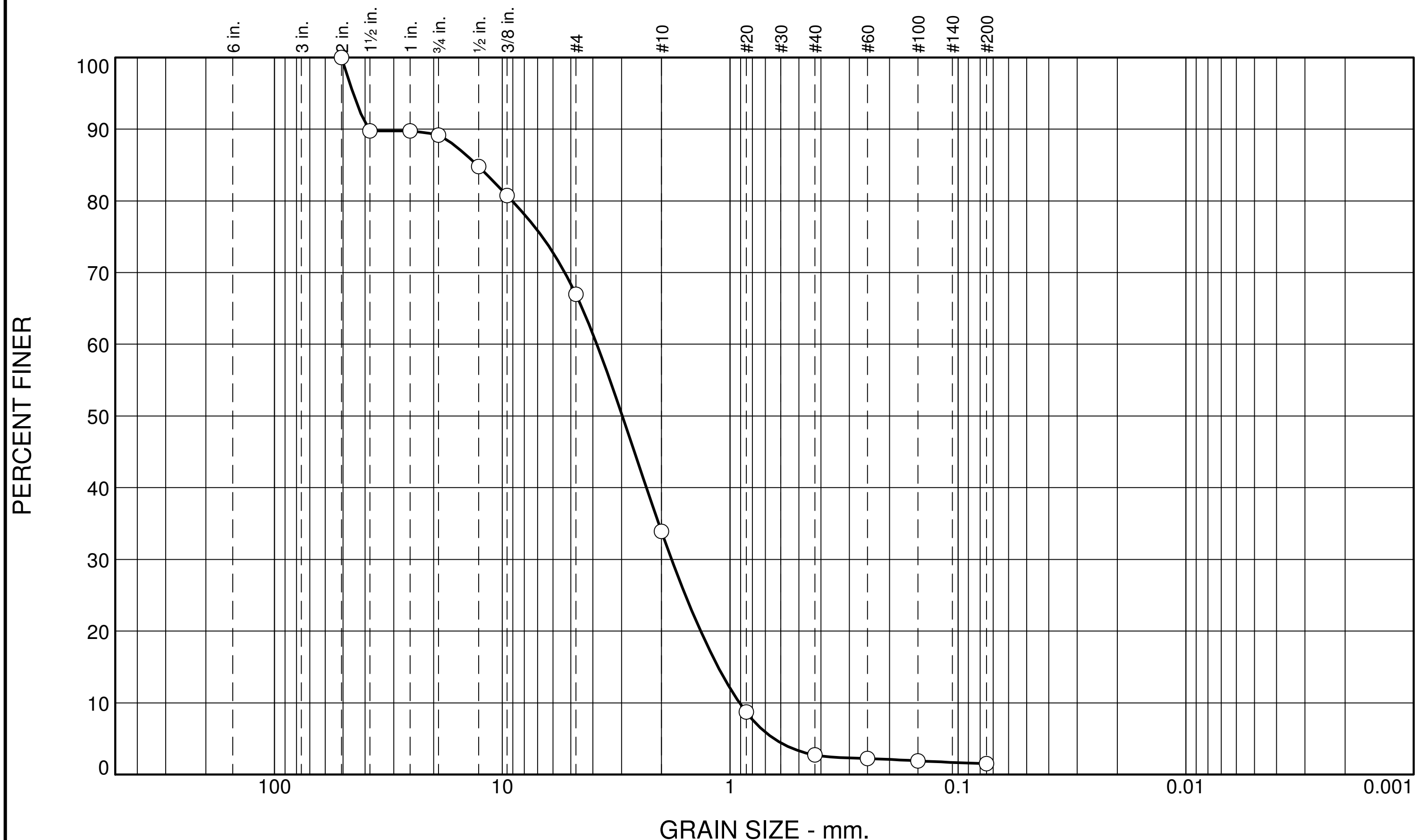
Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal

Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.8	22.3	33.0	31.2	1.2	1.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	89.8		
1	89.8		
.75	89.2		
.5	84.8		
.375	80.7		
#4	66.9		
#10	33.9		
#20	8.7		
#40	2.7		
#60	2.2		
#100	1.9		
#200	1.5		

* (no specification provided)

Soil Description

poorly graded sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 38.5399 D_{85}= 12.9202 D_{60}= 3.8462
D_{50}= 2.9707 D_{30}= 1.8051 D_{15}= 1.1314
D_{10}= 0.9113 C_u= 4.22 C_c= 0.93

Classification

USCS= SP AASHTO= A-1-a

Remarks

As received moisture content = 13.0%

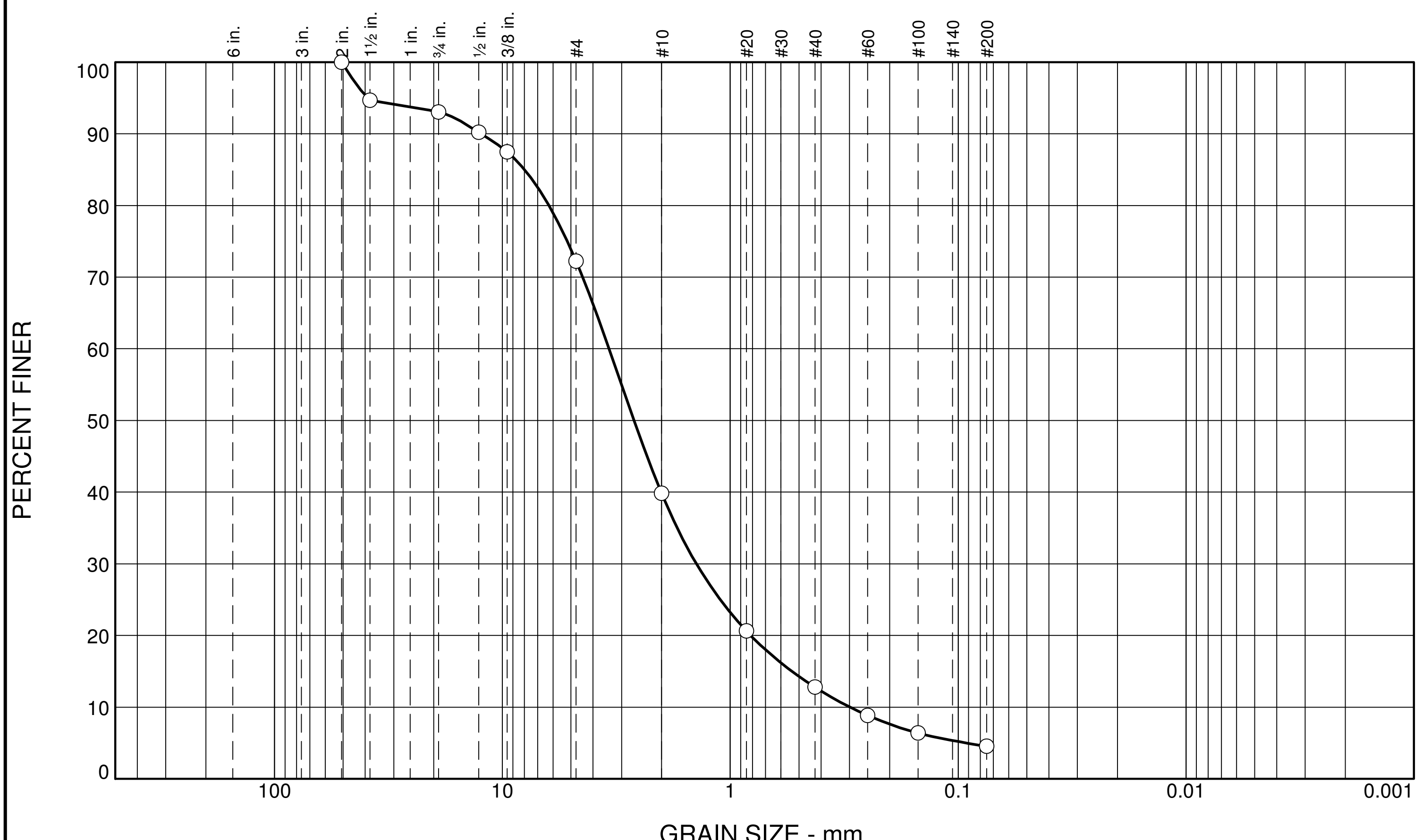
Sample No.: GRB01 **Source of Sample:** Copco No. 1 Borrow Site **Date:** 2/10/20
Location: **Elev./Depth:** 0.00-1.00'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.9	20.9	32.3	27.1	8.3	4.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	94.7		
.75	93.1		
.5	90.2		
.375	87.5		
#4	72.2		
#10	39.9		
#20	20.6		
#40	12.8		
#60	8.8		
#100	6.4		
#200	4.5		

* (no specification provided)

Soil Description

well-graded sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 12.4046 D_{85}= 7.9993 D_{60}= 3.4016
D_{50}= 2.6413 D_{30}= 1.4078 D_{15}= 0.5369
D_{10}= 0.2982 C_u= 11.41 C_c= 1.95

Classification

USCS= SW AASHTO= A-1-a

Remarks

As received moistre content = 11.7%

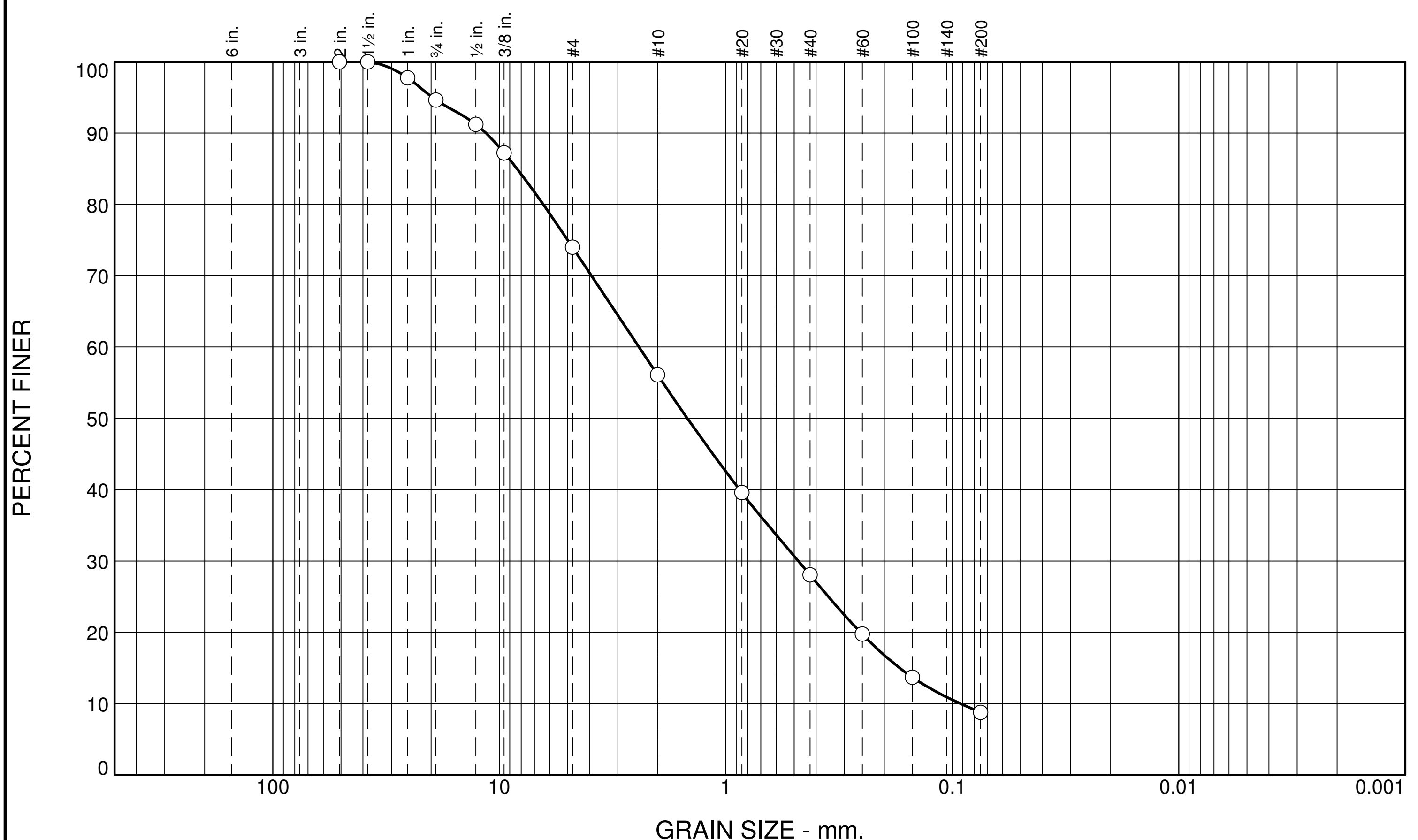
Sample No.: GRB02 **Source of Sample:** Copco No. 1 Borrow Site **Date:** 2/7/20
Location: **Elev./Depth:** 0.00-1.00'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.4	20.6	17.9	28.1	19.2	8.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	100.0		
1	97.8		
.75	94.6		
.5	91.3		
.375	87.2		
#4	74.0		
#10	56.1		
#20	39.6		
#40	28.0		
#60	19.7		
#100	13.7		
#200	8.8		

* (no specification provided)

Soil Description

well-graded sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 11.4468 D_{85}= 8.3532 D_{60}= 2.4171
D_{50}= 1.4771 D_{30}= 0.4794 D_{15}= 0.1712
D_{10}= 0.0923 C_u= 26.20 C_c= 1.03

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Post Proctor

Sample No.: GRB02 **Source of Sample:** Copco No. 1 Borrow Site **Date:** 3/5/20
Location: Post Proctor Compaction **Elev./Depth:** 0.00-1.00'

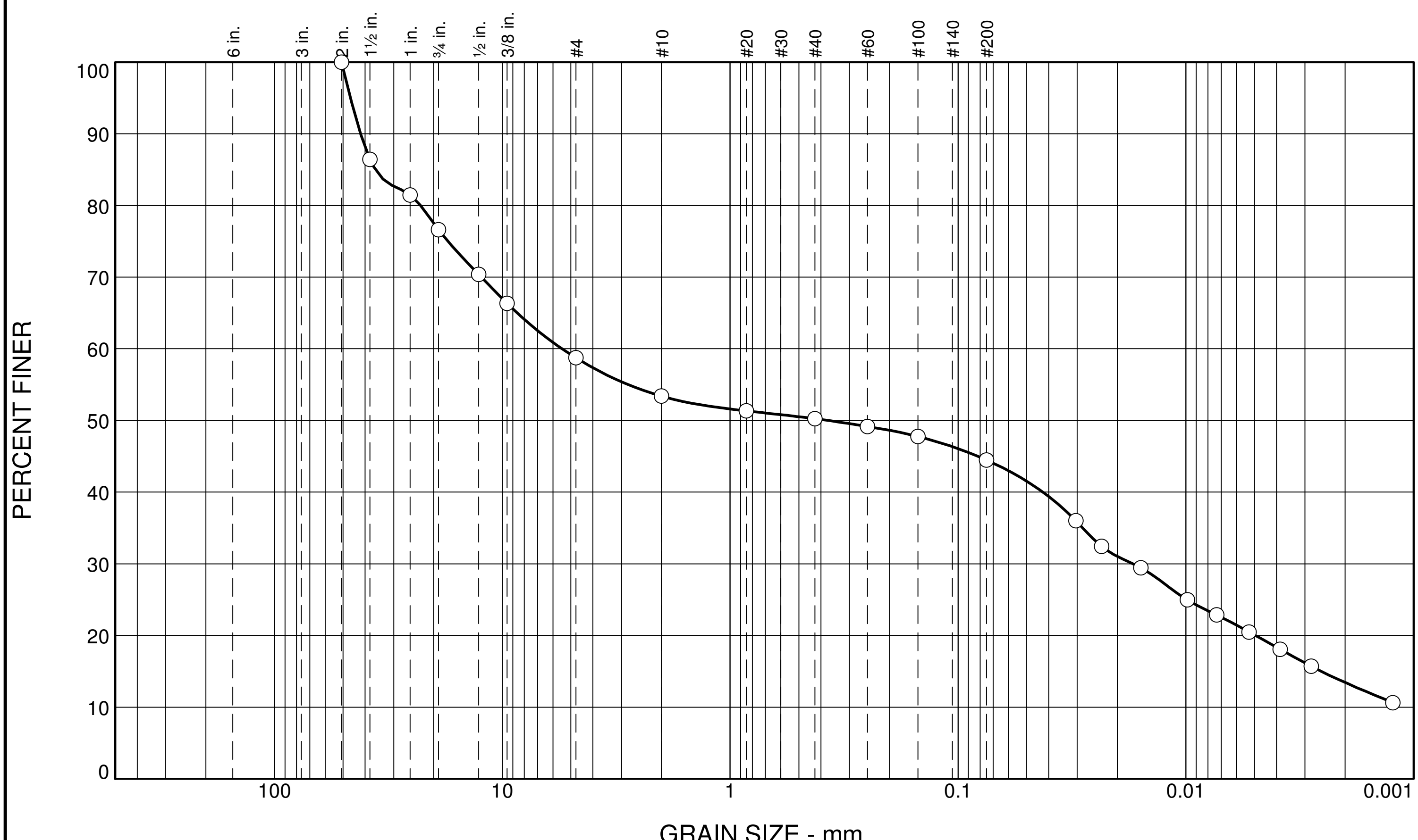
Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal

Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	23.4	17.9	5.3	3.2	5.7	31.1	13.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	86.4		
1	81.5		
.75	76.6		
.5	70.4		
.375	66.3		
#4	58.7		
#10	53.4		
#20	51.3		
#40	50.2		
#60	49.2		
#100	47.8		
#200	44.5		
0.0304 mm.	36.0		
0.0234 mm.	32.4		
0.0157 mm.	29.4		
0.0098 mm.	25.0		
0.0073 mm.	22.9		
0.0053 mm.	20.5		
0.0039 mm.	18.1		
0.0028 mm.	15.7		
0.0012 mm.	10.6		

* (no specification provided)

Soil Description

clayey gravel

Atterberg Limits

PL= 21 LL= 55 PI= 34

Coefficients

D_{90}= 41.8839 D_{85}= 36.0981 D_{60}= 5.4630
D_{50}= 0.3718 D_{30}= 0.0171 D_{15}= 0.0025
D_{10}= C_u= C_c=

Classification

USCS= GC AASHTO= A-7-6(9)

Remarks

As received moisture content = 20.4%

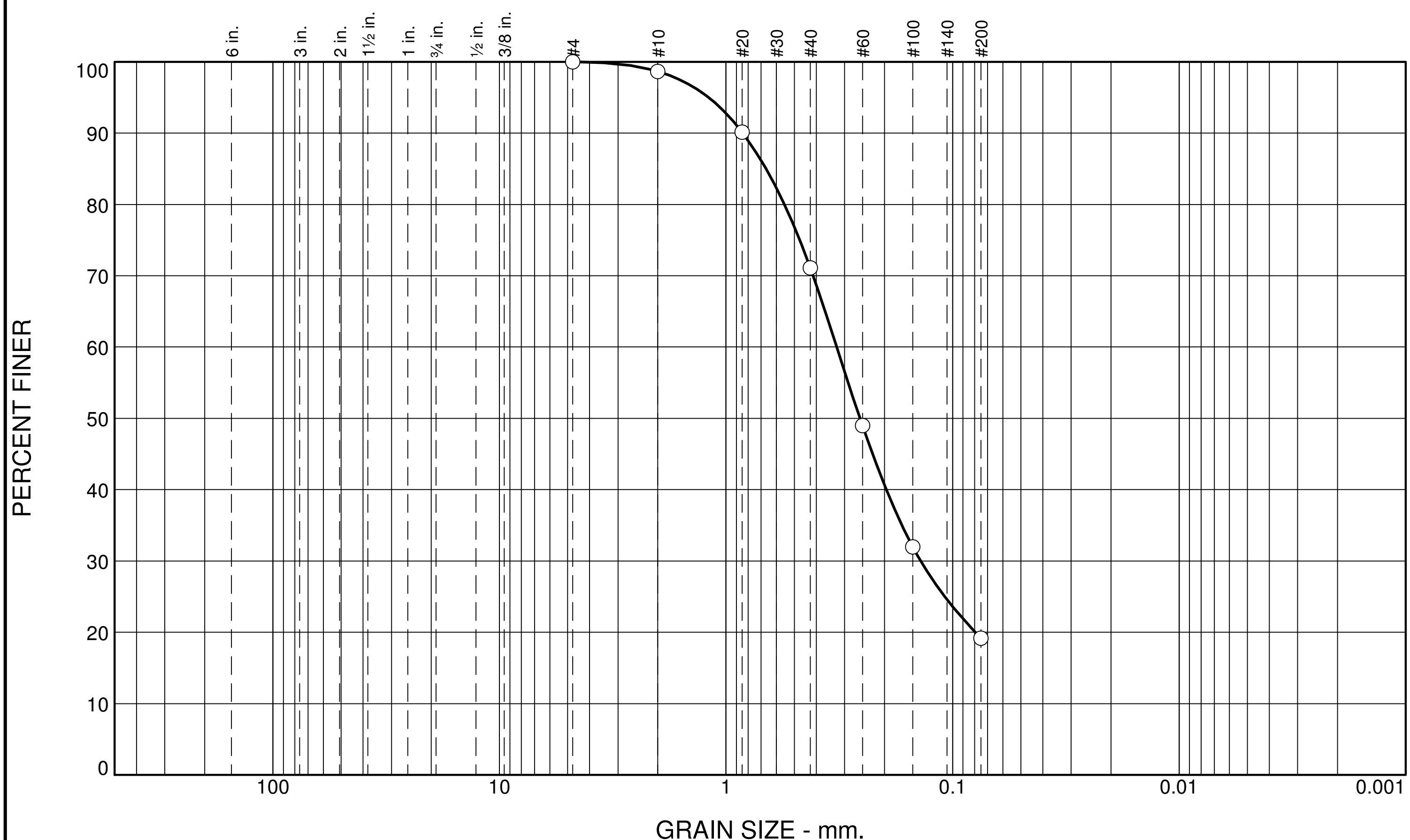
Sample No.: TP-CO1-A01 **Source of Sample:** Copco No. 1 Disposal Site **Date:** 2/7/20
Location: **Elev./Depth:** 3.25-3.75'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.4	27.5	51.9	19.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.6		
#20	90.1		
#40	71.1		
#60	49.0		
#100	32.0		
#200	19.2		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= 39 LL= 52 PI= 13

Coefficients

D_{90}= 0.8435 D_{85}= 0.6662 D_{60}= 0.3244
D_{50}= 0.2563 D_{30}= 0.1385 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-7(0)

Remarks

As received moisture content = 29.9

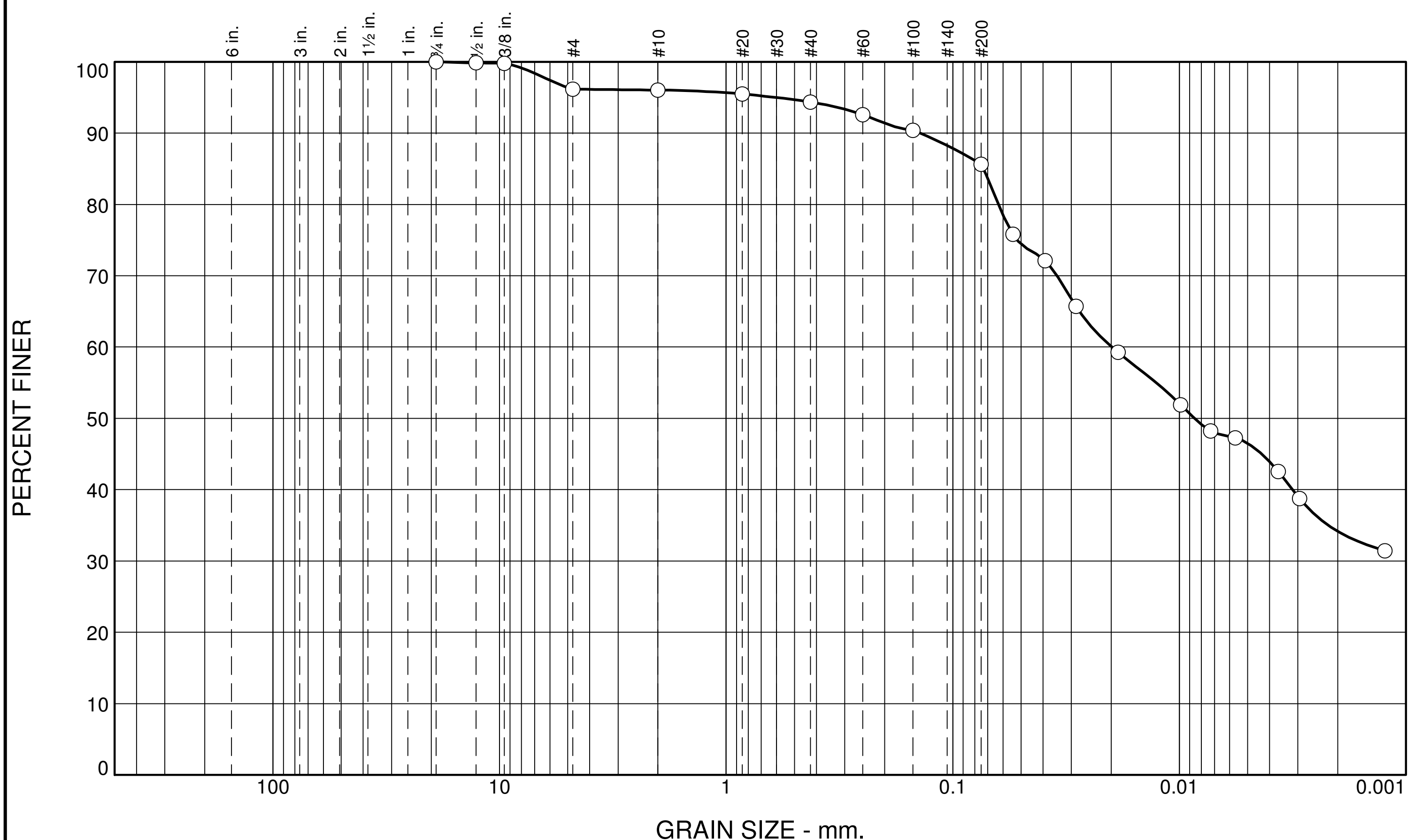
Sample No.: TP-CO1-B02 **Source of Sample:** Copco No. 1 Disposal Site **Date:** 2/7/20
Location: **Elev./Depth:** 6.67-7.17

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.8	0.2	1.6	8.8	51.4	34.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	99.9		
.375	99.8		
#4	96.2		
#10	96.0		
#20	95.5		
#40	94.4		
#60	92.6		
#100	90.4		
#200	85.6		
0.0543 mm.	75.8		
0.0391 mm.	72.1		
0.0286 mm.	65.7		
0.0186 mm.	59.3		
0.0099 mm.	51.9		
0.0073 mm.	48.2		
0.0057 mm.	47.3		
0.0037 mm.	42.6		
0.0029 mm.	38.8		
0.0012 mm.	31.4		

* (no specification provided)

Soil Description

fat clay

Atterberg Limits

PL= 22 LL= 63 PI= 41

Coefficients

D_{90}= 0.1396 D_{85}= 0.0734 D_{60}= 0.0198
D_{50}= 0.0086 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(38)

Remarks

As received moisture content = 27.3%

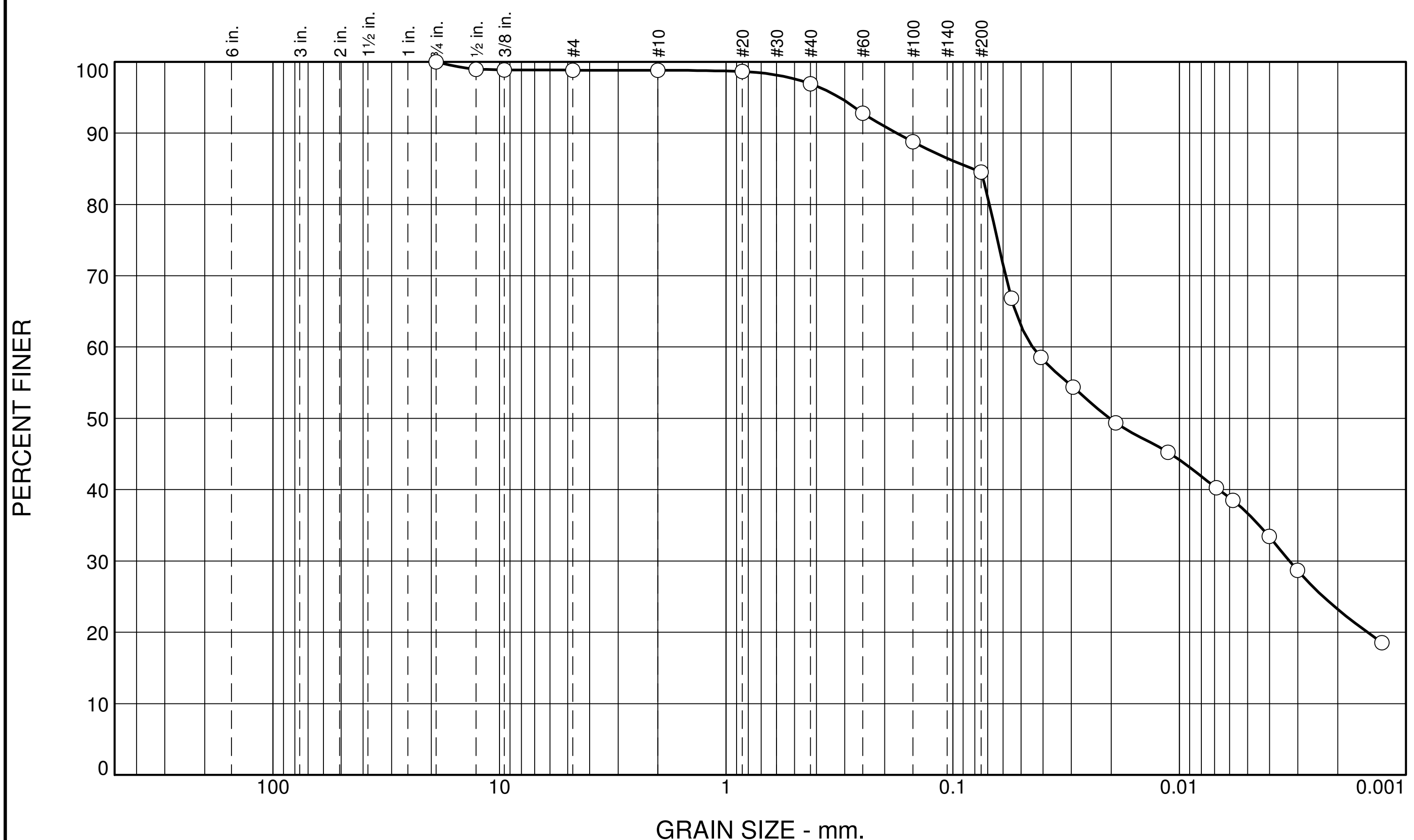
Sample No.: TP-CO1-D01 **Source of Sample:** Copco No. 1 Disposal Site **Date:** 2/11/20
Location: **Elev./Depth:** 3.00-3.50'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.2	0.0	1.9	12.4	61.3	23.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	99.0		
.375	98.9		
#4	98.8		
#10	98.8		
#20	98.7		
#40	96.9		
#60	92.8		
#100	88.8		
#200	84.5		
0.0551 mm.	66.9		
0.0408 mm.	58.5		
0.0295 mm.	54.4		
0.0191 mm.	49.4		
0.0112 mm.	45.2		
0.0069 mm.	40.3		
0.0058 mm.	38.5		
0.0040 mm.	33.4		
0.0030 mm.	28.7		
0.0013 mm.	18.5		

* (no specification provided)

Soil Description

elastic silt with sand

Atterberg Limits

PL= 41 LL= 59 PI= 18

Coefficients

D_{90}= 0.1771 D_{85}= 0.0819 D_{60}= 0.0444
D_{50}= 0.0203 D_{30}= 0.0033 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(20)

Remarks

As received moisture content = 30.1%

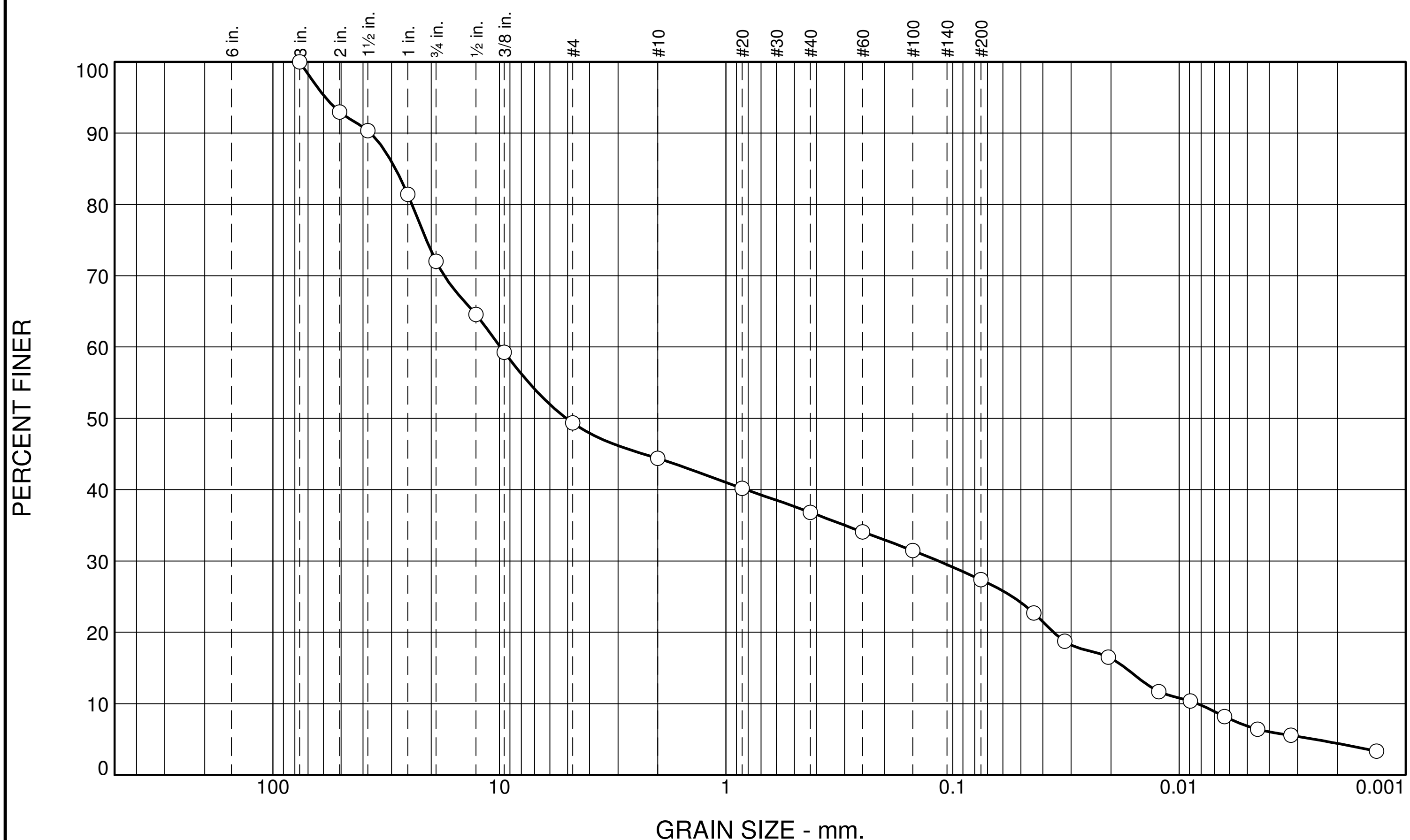
Sample No.: TP-CO1-D02 **Source of Sample:** Copco No. 1 Disposal Site **Date:** 2/7/20
Location: **Elev./Depth:** 4.83-5.00'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	28.0	22.6	5.0	7.6	9.4	23.0	4.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	93.0		
1.5	90.3		
1	81.4		
.75	72.0		
.5	64.6		
.375	59.3		
#4	49.4		
#10	44.4		
#20	40.2		
#40	36.8		
#60	34.1		
#100	31.5		
#200	27.4		
0.0438 mm.	22.7		
0.0320 mm.	18.7		
0.0206 mm.	16.5		
0.0123 mm.	11.7		
0.0089 mm.	10.4		
0.0063 mm.	8.2		
0.0045 mm.	6.4		
0.0032 mm.	5.5		
0.0013 mm.	3.3		

* (no specification provided)

Soil Description

silty gravel with sand

Atterberg Limits

PL= 24 LL= 30 PI= 6

Coefficients

D_{90}= 37.1089 D_{85}= 28.7709 D_{60}= 9.9079
D_{50}= 5.0662 D_{30}= 0.1154 D_{15}= 0.0173
D_{10}= 0.0083 C_u= 1189.72 C_c= 0.16

Classification

USCS= GM AASHTO= A-2-4(0)

Remarks

As received moisture content = 16.9%

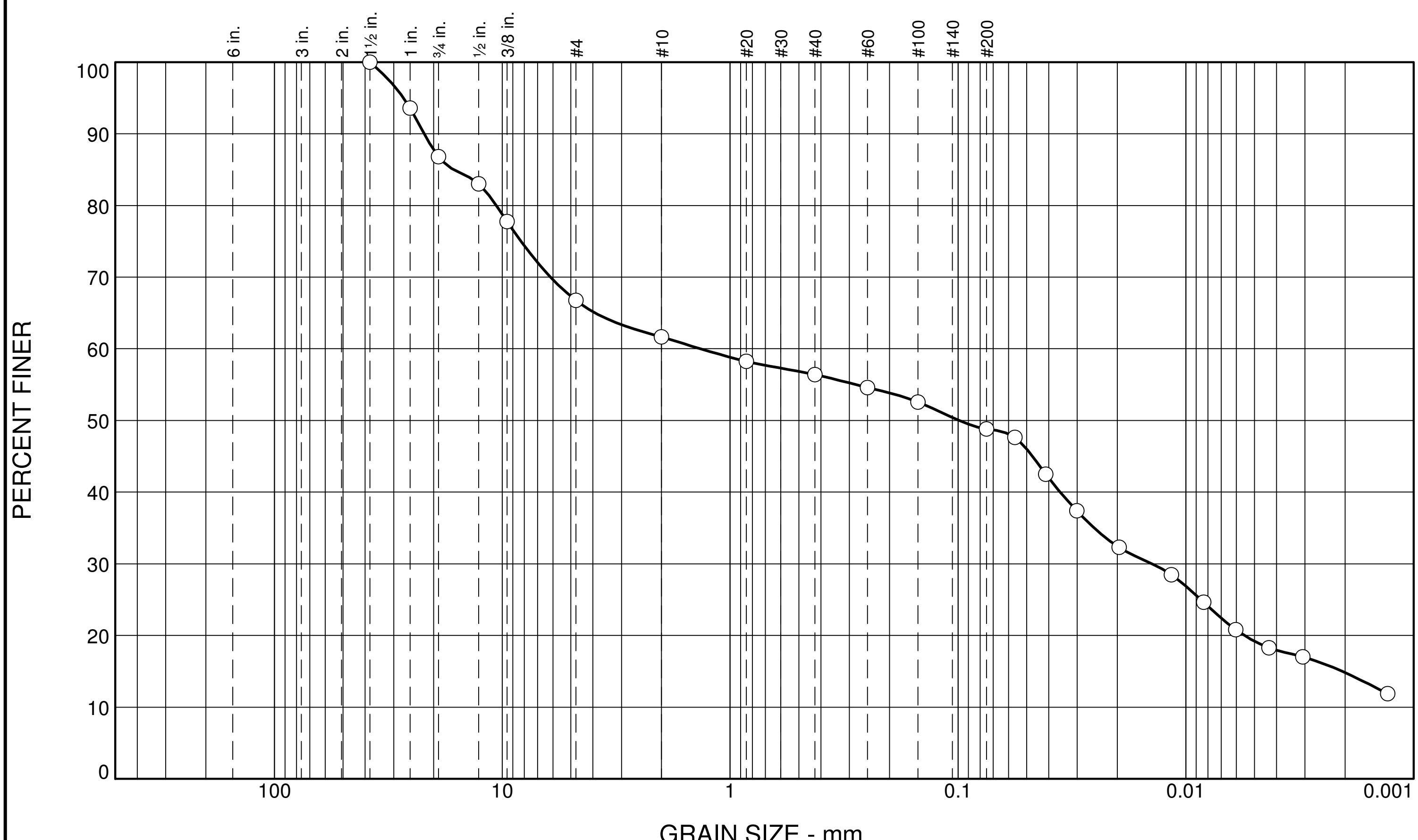
Sample No.: TP-CO1-E03 **Source of Sample:** Copco No. 1 near Borrow Site **Date:** 2/7/20
Location: **Elev./Depth:** 6.75-7.25'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** Jbruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.2	20.0	5.2	5.2	7.6	34.0	14.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	93.6		
.75	86.8		
.5	83.0		
.375	77.7		
#4	66.8		
#10	61.6		
#20	58.3		
#40	56.4		
#60	54.6		
#100	52.6		
#200	48.8		
0.0563 mm.	47.6		
0.0412 mm.	42.5		
0.0301 mm.	37.4		
0.0196 mm.	32.3		
0.0116 mm.	28.5		
0.0084 mm.	24.7		
0.0060 mm.	20.8		
0.0043 mm.	18.3		
0.0031 mm.	17.0		
0.0013 mm.	11.9		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 22 LL= 38 PI= 16

Coefficients

D_{90}= 22.0186 D_{85}= 16.3444 D_{60}= 1.3479
D_{50}= 0.0988 D_{30}= 0.0141 D_{15}= 0.0021
D_{10}= C_u= C_c=

Classification

USCS= GC AASHTO= A-6(5)

Remarks

As received moisture content = 22.6%

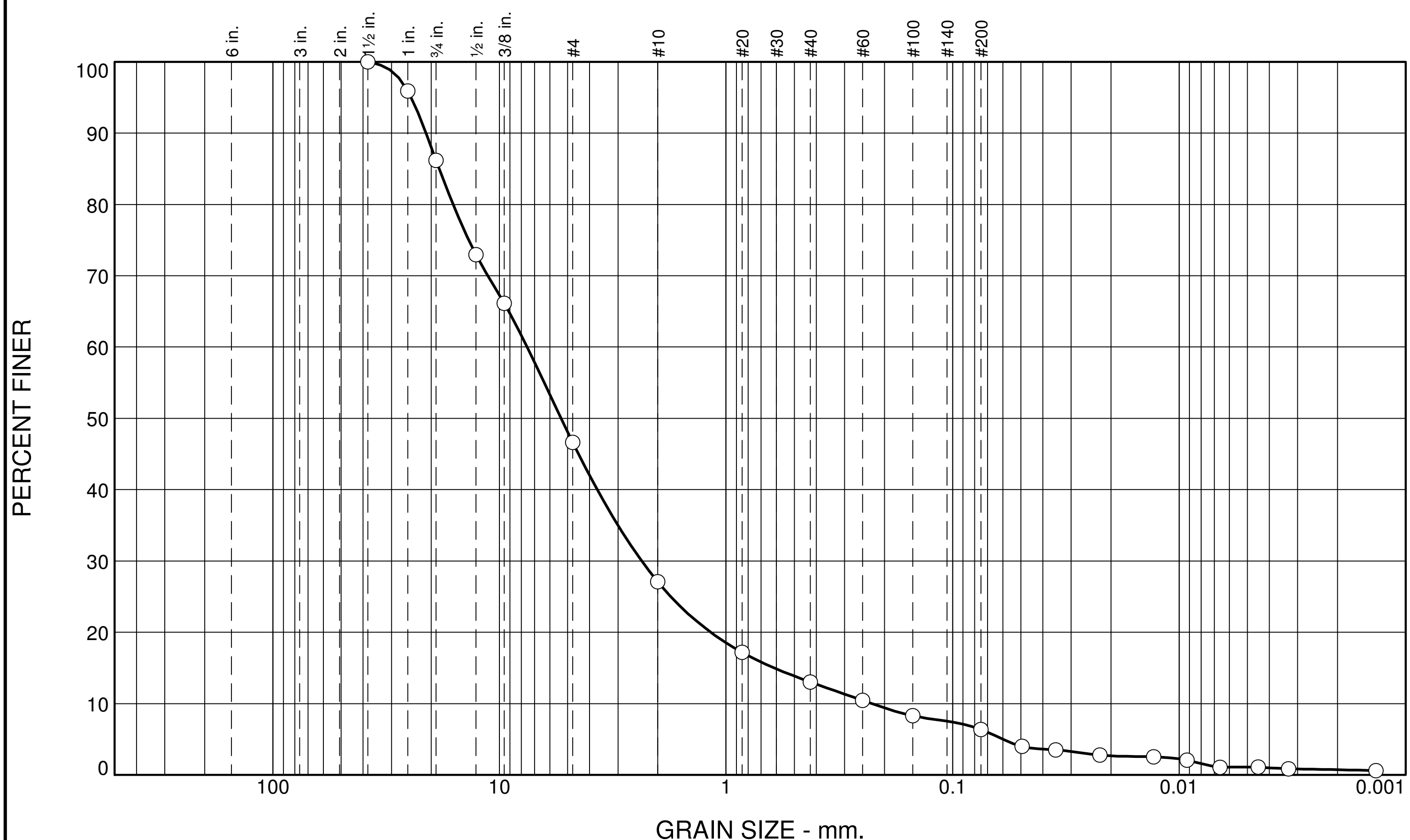
Sample No.: TP-CO1-C01 **Source of Sample:** Copco No. 1 near Switchyard **Date:** 2/7/20
Location: **Elev./Depth:** 1.58-2.10'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.8	39.6	19.5	14.1	6.7	5.6	0.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	95.9		
.75	86.2		
.5	73.0		
.375	66.1		
#4	46.6		
#10	27.1		
#20	17.2		
#40	13.0		
#60	10.5		
#100	8.3		
#200	6.3		
0.0493 mm.	4.0		
0.0351 mm.	3.5		
0.0224 mm.	2.8		
0.0130 mm.	2.5		
0.0092 mm.	2.0		
0.0066 mm.	1.1		
0.0045 mm.	1.1		
0.0033 mm.	0.9		
0.0014 mm.	0.6		

* (no specification provided)

Soil Description

poorly graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 21.0928 D_{85}= 18.4538 D_{60}= 7.5487
D_{50}= 5.3453 D_{30}= 2.3543 D_{15}= 0.6141
D_{10}= 0.2275 C_u= 33.18 C_c= 3.23

Classification

USCS= GP-GM AASHTO= A-1-a

Remarks

As received moisture content = 5.2%

Sample No.: TP-CO1-C04 **Source of Sample:** Copco No. 1 near Switchyard **Date:** 2/7/20
Location: **Elev./Depth:** 4.75-5.25'

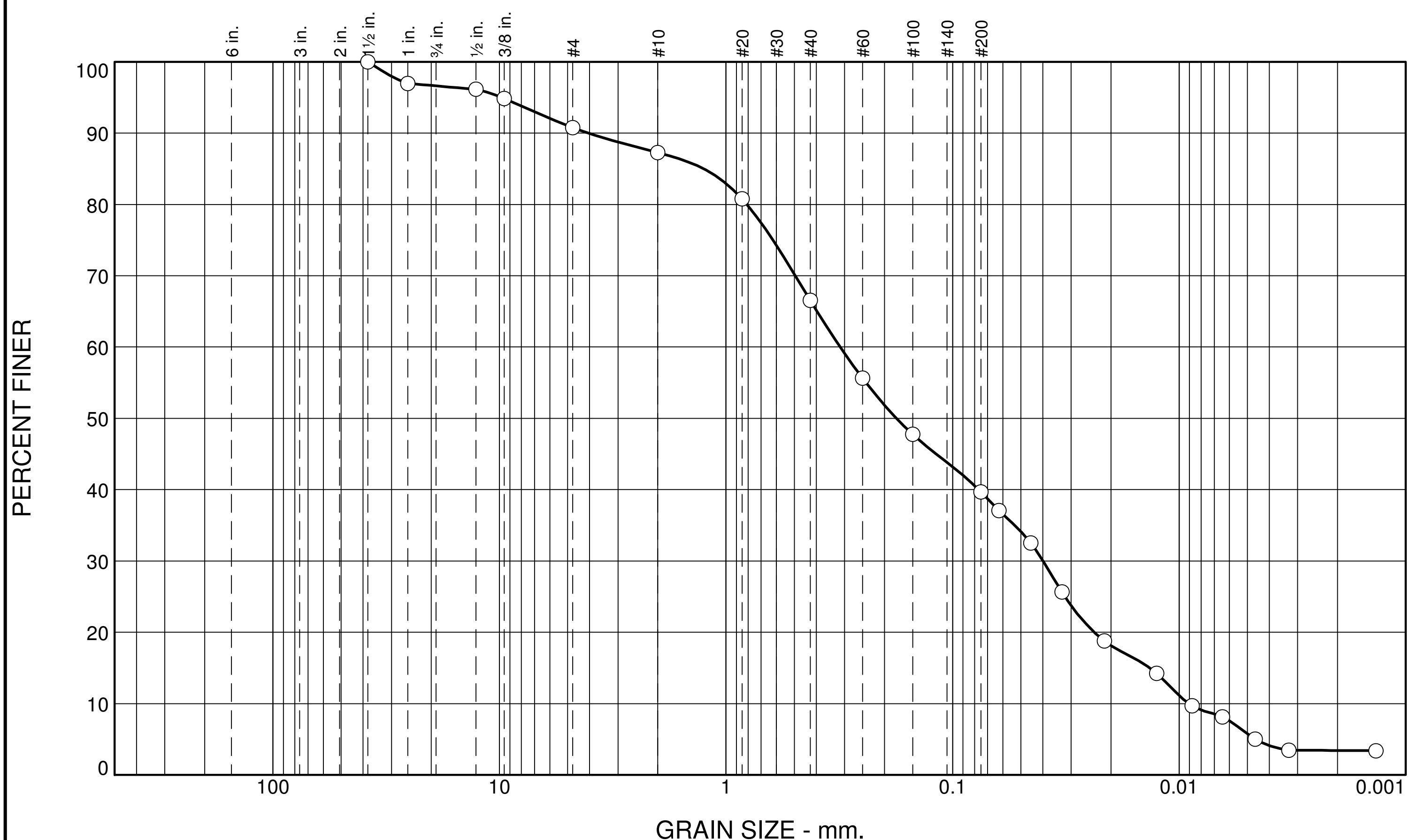
Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal

Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.4	5.8	3.5	20.8	26.8	36.3	3.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	97.0		
.5	96.1		
.375	94.8		
#4	90.8		
#10	87.3		
#20	80.8		
#40	66.5		
#60	55.7		
#100	47.7		
#200	39.7		
0.0624 mm.	37.1		
0.0451 mm.	32.5		
0.0329 mm.	25.6		
0.0214 mm.	18.8		
0.0126 mm.	14.2		
0.0088 mm.	9.7		
0.0064 mm.	8.1		
0.0046 mm.	5.0		
0.0033 mm.	3.5		
0.0014 mm.	3.4		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP   LL= NP   PI= NP

Coefficients

D_{90}= 4.0547 D_{85}= 1.2577 D_{60}= 0.3130
D_{50}= 0.1772 D_{30}= 0.0399 D_{15}= 0.0135
D_{10}= 0.0091 C_u= 34.46 C_c= 0.56

Classification

USCS= SM   AASHTO= A-4(0)

Remarks

As received moisture content = 17.9%

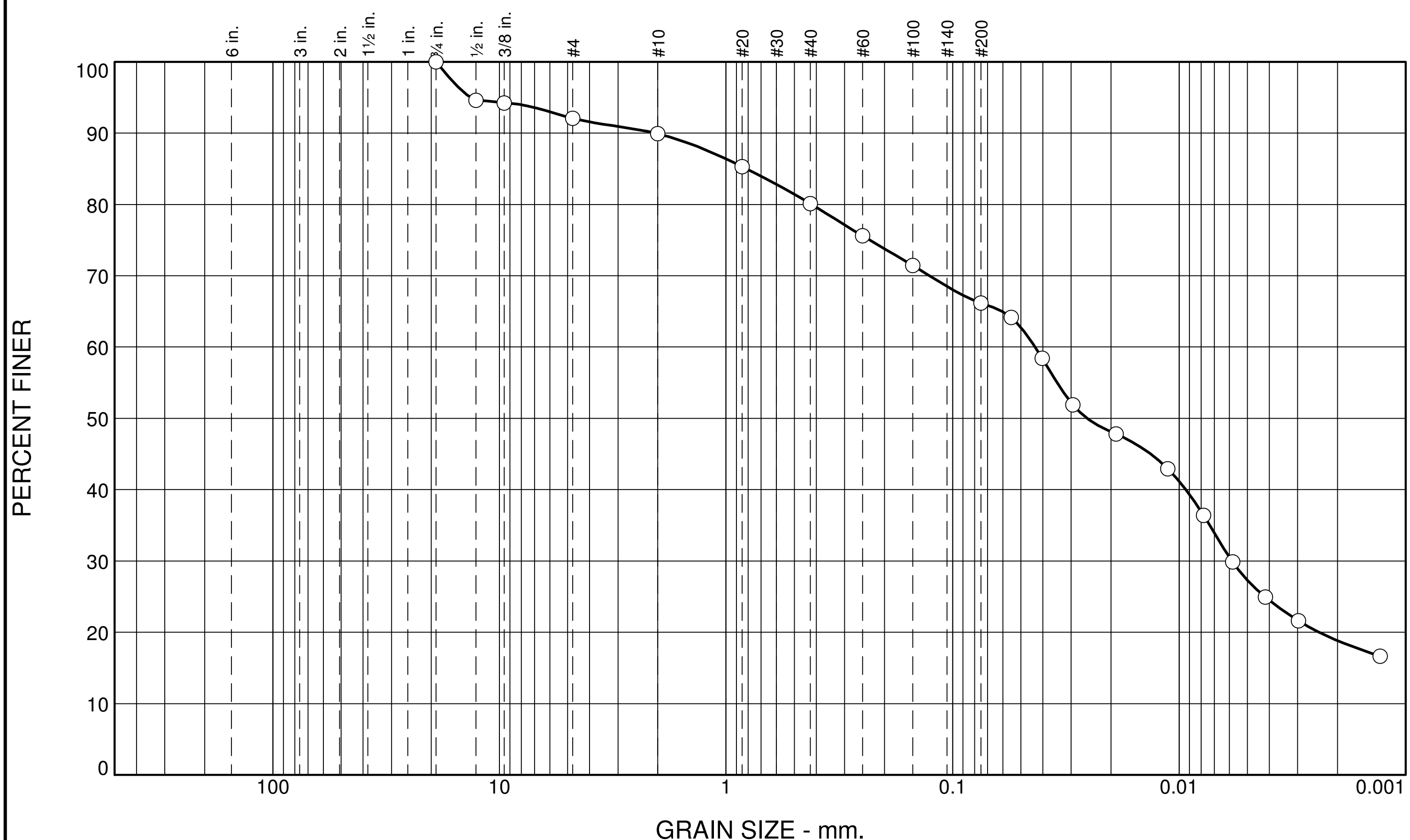
Sample No.: GRB03   **Source of Sample:** Copco No. 2 Penstock   **Date:** 2/10/20
Location: **Elev./Depth:** 0.33-0.83'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01   **Figure**

Tested By: MFreund   **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.9	2.2	9.8	13.9	47.4	18.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	94.6		
.375	94.2		
#4	92.1		
#10	89.9		
#20	85.3		
#40	80.1		
#60	75.6		
#100	71.4		
#200	66.2		
0.0551 mm.	64.1		
0.0402 mm.	58.4		
0.0294 mm.	51.9		
0.0190 mm.	47.8		
0.0112 mm.	42.9		
0.0078 mm.	36.4		
0.0058 mm.	29.8		
0.0042 mm.	24.9		
0.0030 mm.	21.6		
0.0013 mm.	16.6		

* (no specification provided)

Soil Description

sandy fat clay

Atterberg Limits

PL= 25 LL= 54 PI= 29

Coefficients

D_{90}= 2.0524 D_{85}= 0.8140 D_{60}= 0.0433
D_{50}= 0.0254 D_{30}= 0.0059 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(18)

Remarks

As received moisture content = 24.1%

Sample No.: GRB04 **Source of Sample:** Copco No. 2 Penstock **Date:** 2/9/20
Location: **Elev./Depth:** 0.58-1.00'

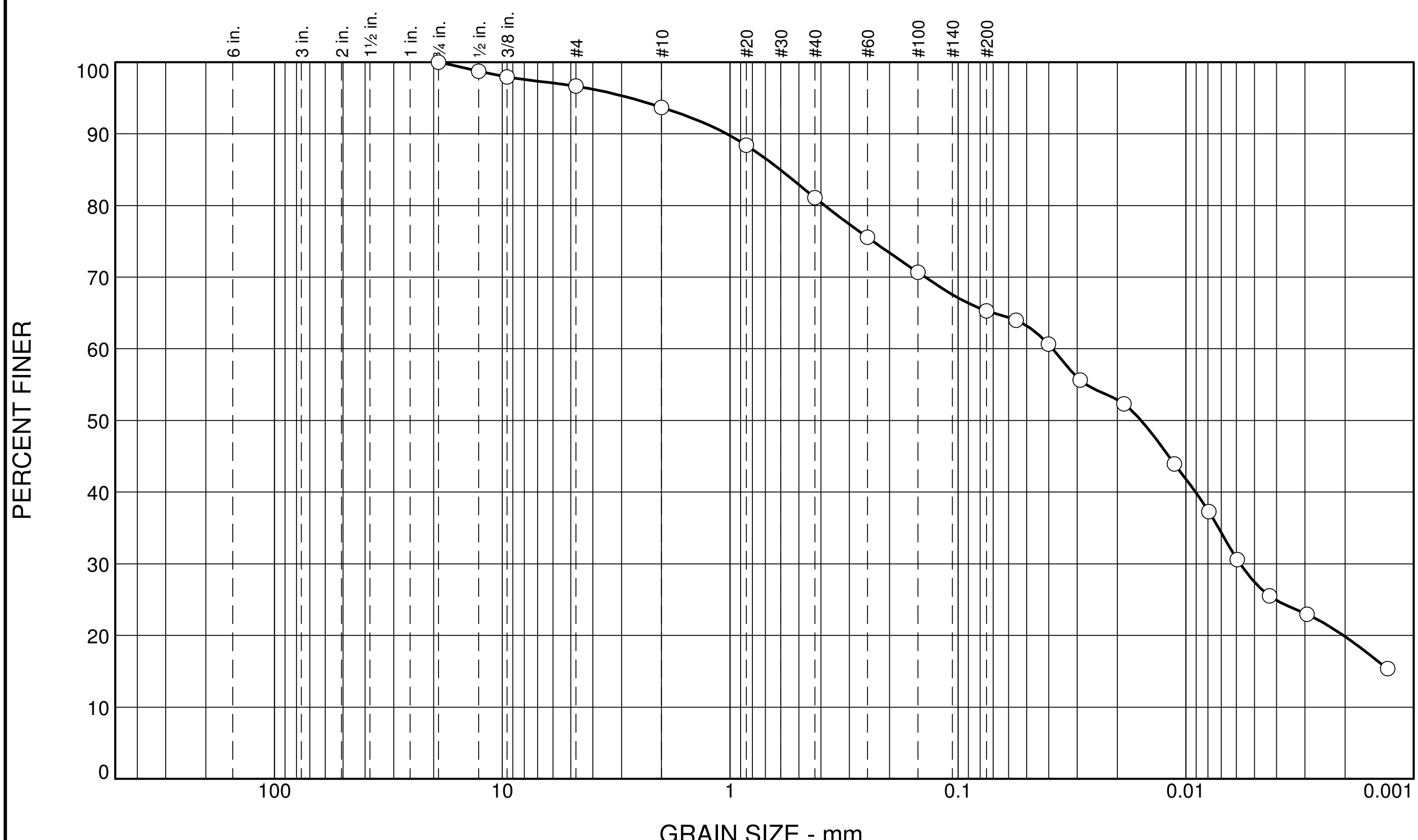
Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal

Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.4	2.9	12.6	15.8	45.5	19.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	98.7		
.375	97.9		
#4	96.6		
#10	93.7		
#20	88.4		
#40	81.1		
#60	75.6		
#100	70.7		
#200	65.3		
0.0557 mm.	64.0		
0.0401 mm.	60.6		
0.0291 mm.	55.6		
0.0187 mm.	52.3		
0.0112 mm.	43.9		
0.0079 mm.	37.3		
0.0059 mm.	30.6		
0.0043 mm.	25.5		
0.0029 mm.	23.0		
0.0013 mm.	15.4		

* (no specification provided)

Soil Description

sandy fat clay

Atterberg Limits

PL= 20 LL= 61 PI= 41

Coefficients

D_{90}= 1.0357 D_{85}= 0.6046 D_{60}= 0.0384
D_{50}= 0.0157 D_{30}= 0.0058 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(25)

Remarks

As received moistture content = 30.4%

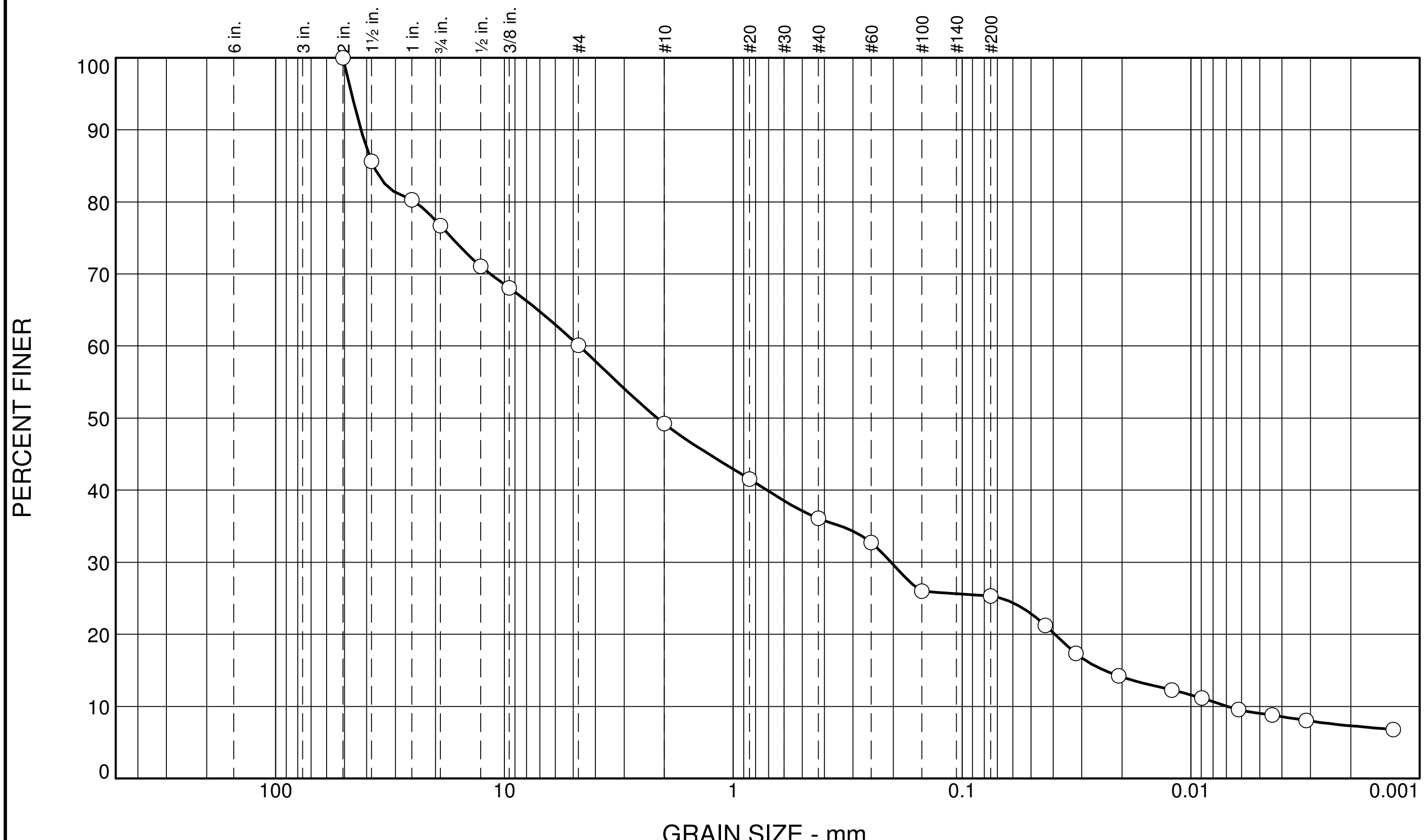
Sample No.: GRB05 **Source of Sample:** Copco No. 2 Penstock **Date:** 2/9/20
Location: **Elev./Depth:** 0.67-1.00'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	23.3	16.6	10.9	13.1	10.8	18.0	7.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	85.6		
1	80.3		
.75	76.7		
.5	71.1		
.375	68.1		
#4	60.1		
#10	49.2		
#20	41.5		
#40	36.1		
#60	32.7		
#100	26.0		
#200	25.3		
0.0433 mm.	21.2		
0.0318 mm.	17.3		
0.0207 mm.	14.2		
0.0121 mm.	12.3		
0.0089 mm.	11.1		
0.0062 mm.	9.6		
0.0044 mm.	8.8		
0.0031 mm.	8.0		
0.0013 mm.	6.8		

* (no specification provided)

Soil Description

silty gravel with sand

Atterberg Limits

PL= 25 LL= 31 PI= 6

Coefficients

D_{90}= 42.3477 D_{85}= 37.3614 D_{60}= 4.7138
D_{50}= 2.1419 D_{30}= 0.2046 D_{15}= 0.0239
D_{10}= 0.0069 C_u= 679.25 C_c= 1.28

Classification

USCS= GM AASHTO= A-1-b

Remarks

As received moisture content = 13.7%

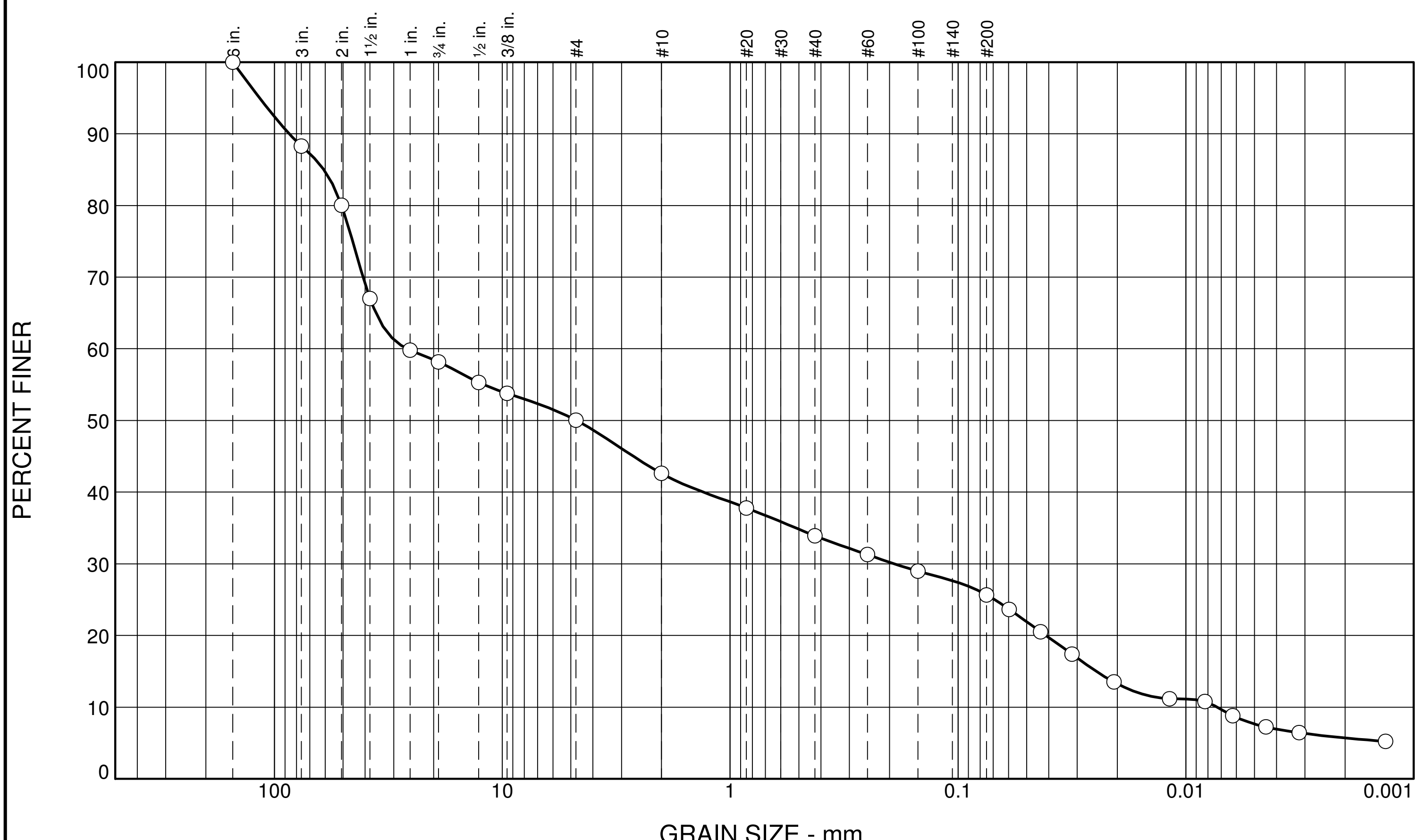
Sample No.: TP-CO2-A01 **Source of Sample:** Copco No. 2 Penstock **Date:** 2/7/20
Location: **Elev./Depth:** 2.92-3.42'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
11.7	30.1	8.2	7.4	8.7	8.2	20.0	5.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
6	100.0		
3	88.3		
2	80.0		
1.5	67.0		
1	59.8		
.75	58.2		
.5	55.3		
.375	53.8		
#4	50.0		
#10	42.6		
#20	37.8		
#40	33.9		
#60	31.3		
#100	29.0		
#200	25.7		
0.0595 mm.	23.6		
0.0434 mm.	20.5		
0.0316 mm.	17.4		
0.0207 mm.	13.5		
0.0118 mm.	11.2		
0.0083 mm.	10.8		
0.0062 mm.	8.8		
0.0045 mm.	7.2		
0.0032 mm.	6.4		
0.0013 mm.	5.2		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 21 LL= 33 PI= 12

Coefficients

D_{90}= 86.0227 D_{85}= 60.7321 D_{60}= 26.1026
D_{50}= 4.7246 D_{30}= 0.1906 D_{15}= 0.0247
D_{10}= 0.0073 C_u= 3582.61 C_c= 0.19

Classification

USCS= GC AASHTO= A-2-6(0)

Remarks

As received moisture content = 7.0%

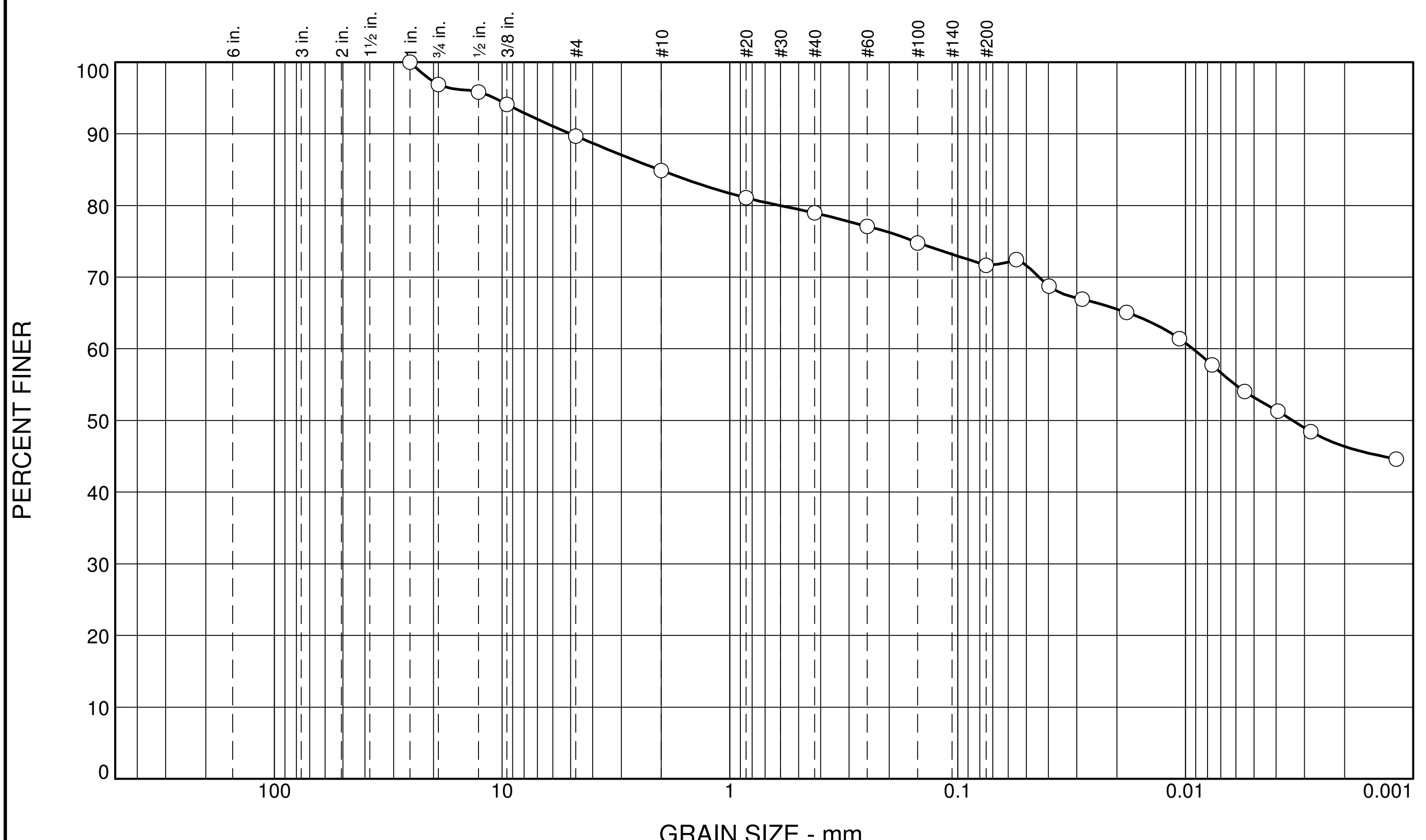
Sample No.: TP-CO2-B02 **Source of Sample:** Copco No. 2 Penstock **Date:** 2/9/20
Location: **Elev./Depth:** 3.92-4.42'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.1	7.2	4.8	5.9	7.3	25.3	46.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	96.9		
.5	95.8		
.375	94.1		
#4	89.7		
#10	84.9		
#20	81.1		
#40	79.0		
#60	77.1		
#100	74.8		
#200	71.7		
0.0552 mm.	72.4		
0.0398 mm.	68.8		
0.0284 mm.	66.9		
0.0181 mm.	65.1		
0.0106 mm.	61.4		
0.0076 mm.	57.7		
0.0055 mm.	54.0		
0.0039 mm.	51.3		
0.0028 mm.	48.4		
0.0012 mm.	44.6		

* (no specification provided)

Soil Description

fat clay with sand

Atterberg Limits

PL= 20 LL= 71 PI= 51

Coefficients

D_{90}= 5.0153 D_{85}= 2.0435 D_{60}= 0.0093
D_{50}= 0.0034 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(37)

Remarks

As received moisture content = 28.9%

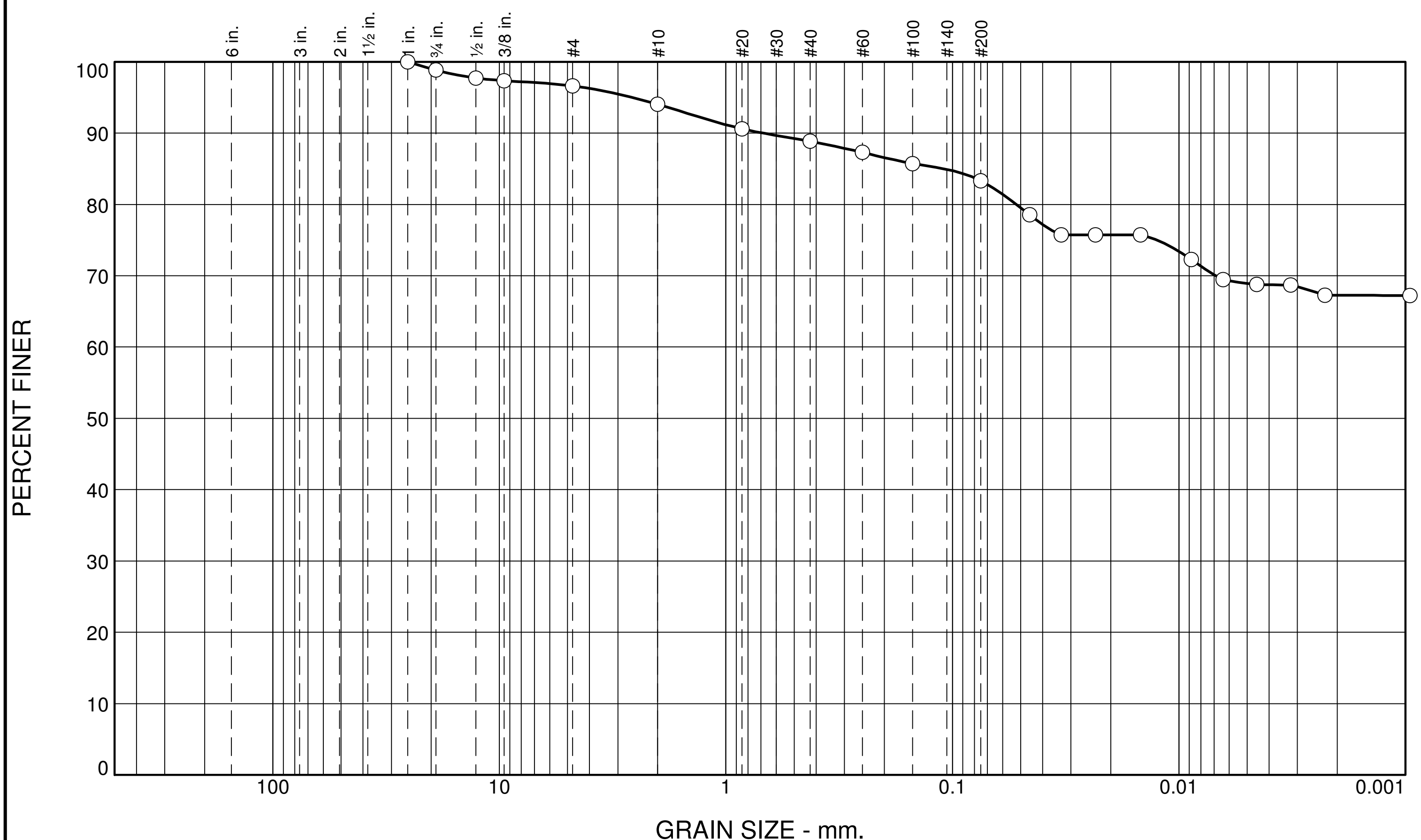
Sample No.: TP-IG-A01 **Source of Sample:** Iron Gate Disposal Site **Date:** 2/10/20
Location: **Elev./Depth:** 1.83-2.33'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.2	2.2	2.6	5.1	5.6	16.0	67.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	98.8		
.5	97.7		
.375	97.4		
#4	96.6		
#10	94.0		
#20	90.6		
#40	88.9		
#60	87.3		
#100	85.7		
#200	83.3		
0.0455 mm.	78.5		
0.0331 mm.	75.7		
0.0234 mm.	75.7		
0.0148 mm.	75.7		
0.0088 mm.	72.3		
0.0064 mm.	69.5		
0.0045 mm.	68.8		
0.0032 mm.	68.7		
0.0023 mm.	67.3		
0.0010 mm.	67.2		

* (no specification provided)

Soil Description

fat clay with sand

Atterberg Limits

PL= 21 LL= 80 PI= 59

Coefficients

D_{90}= 0.6850 D_{85}= 0.1097 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(53)

Remarks

As received moisture content = 25.8%

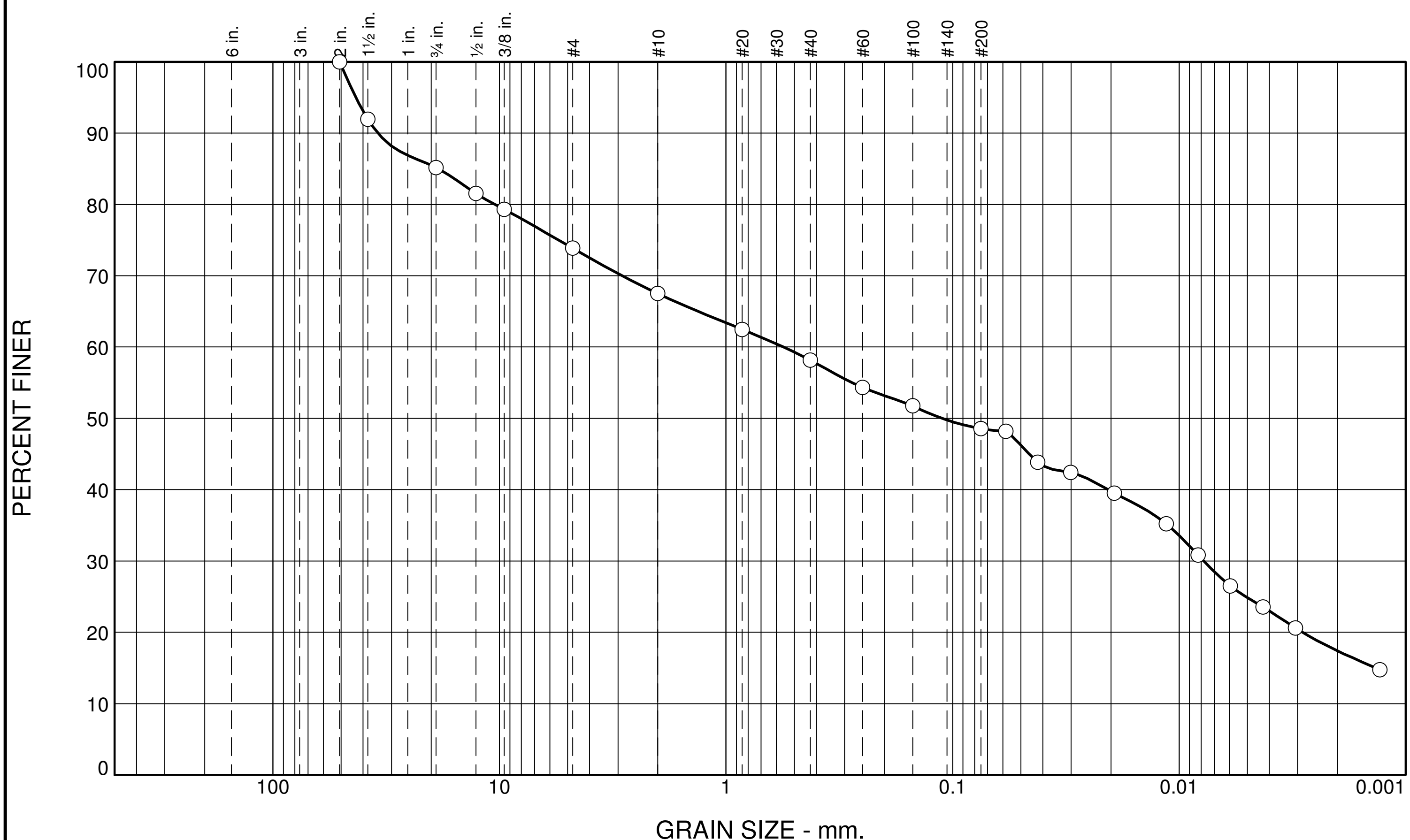
Sample No.: TP-IG-B01 **Source of Sample:** Iron Gate Disposal Site **Date:** 2/10/20
Location: **Elev./Depth:** 2.83-3.33'

Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal
Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.8	11.3	6.4	9.3	9.6	31.2	17.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	91.9		
.75	85.2		
.5	81.5		
.375	79.3		
#4	73.9		
#10	67.5		
#20	62.5		
#40	58.2		
#60	54.3		
#100	51.7		
#200	48.6		
0.0582 mm.	48.2		
0.0422 mm.	43.8		
0.0300 mm.	42.4		
0.0193 mm.	39.5		
0.0114 mm.	35.2		
0.0082 mm.	30.8		
0.0059 mm.	26.5		
0.0043 mm.	23.6		
0.0031 mm.	20.6		
0.0013 mm.	14.7		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 22 LL= 62 PI= 40

Coefficients

D_{90}= 34.4072 D_{85}= 18.5921 D_{60}= 0.5579

D_{50}= 0.1117 D_{30}= 0.0078 D_{15}= 0.0014

D_{10}= C_u= C_c=

Classification

USCS= GC AASHTO= A-7-6(15)

Remarks

As received moisture content = 7.4%

Sample No.: TP-IG-B02 **Source of Sample:** Iron Gate Disposal Site **Date:** 2/10/20

Location: **Elev./Depth:** 4.50-5.00'

Knight Piésold CONSULTING

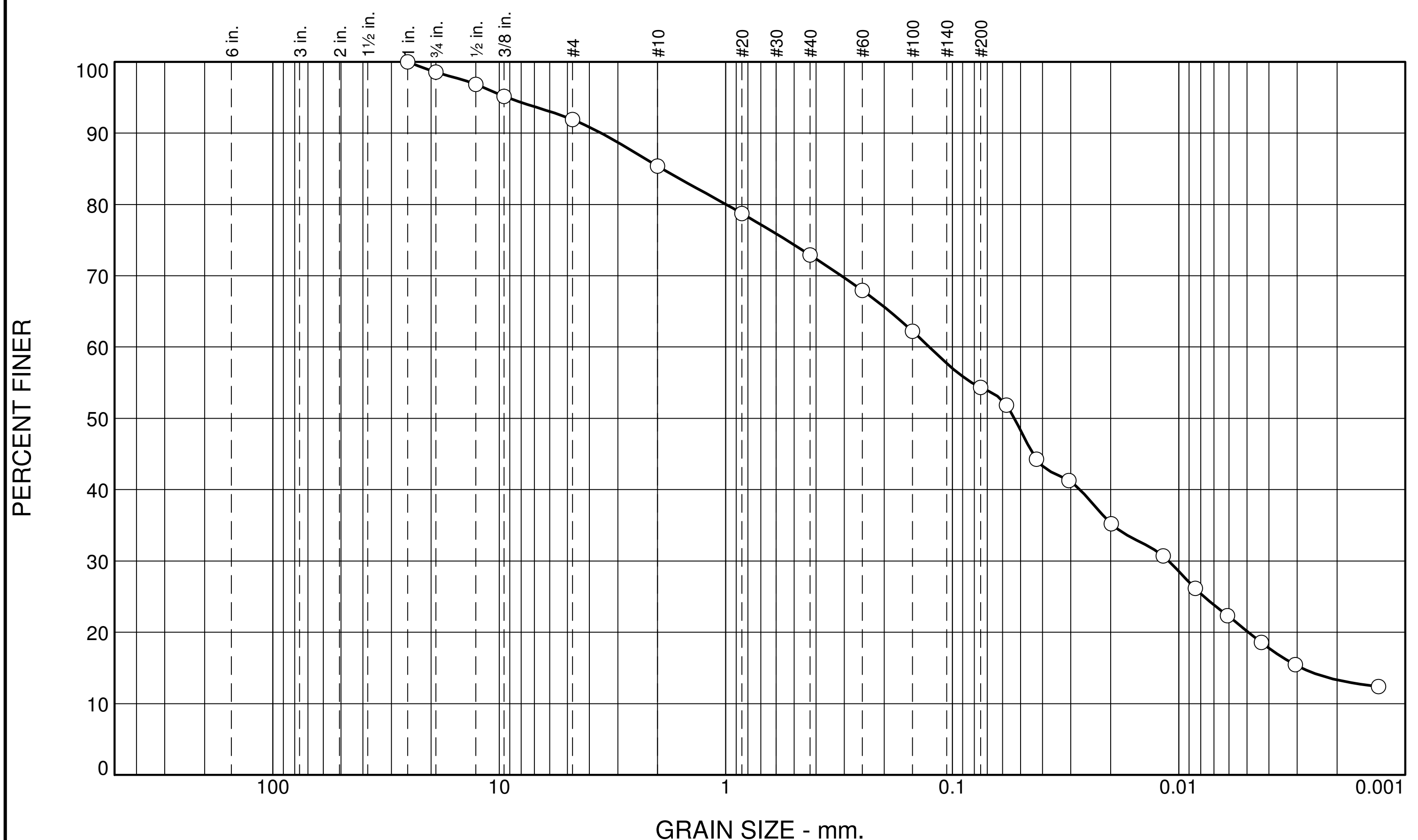
Client: Kiewit Infrastructure West Co.

Project: Klamath River Renewal

Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.5	6.6	6.5	12.5	18.6	41.0	13.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	98.5		
.5	96.8		
.375	95.2		
#4	91.9		
#10	85.4		
#20	78.7		
#40	72.9		
#60	68.0		
#100	62.2		
#200	54.3		
0.0577 mm.	51.8		
0.0425 mm.	44.3		
0.0305 mm.	41.3		
0.0199 mm.	35.2		
0.0117 mm.	30.7		
0.0085 mm.	26.2		
0.0061 mm.	22.3		
0.0043 mm.	18.6		
0.0031 mm.	15.4		
0.0013 mm.	12.4		

* (no specification provided)

Soil Description

sandy lean clay

Atterberg Limits

PL= 25 LL= 49 PI= 24

Coefficients

D_{90}= 3.5517 D_{85}= 1.9071 D_{60}= 0.1265
D_{50}= 0.0532 D_{30}= 0.0111 D_{15}= 0.0029
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(10)

Remarks

As received moisture content = 19.6%

Sample No.: TP-IG-D02 **Source of Sample:** Iron Gate Disposal Site **Date:**
Location: **Elev./Depth:** 11.92-12.42'

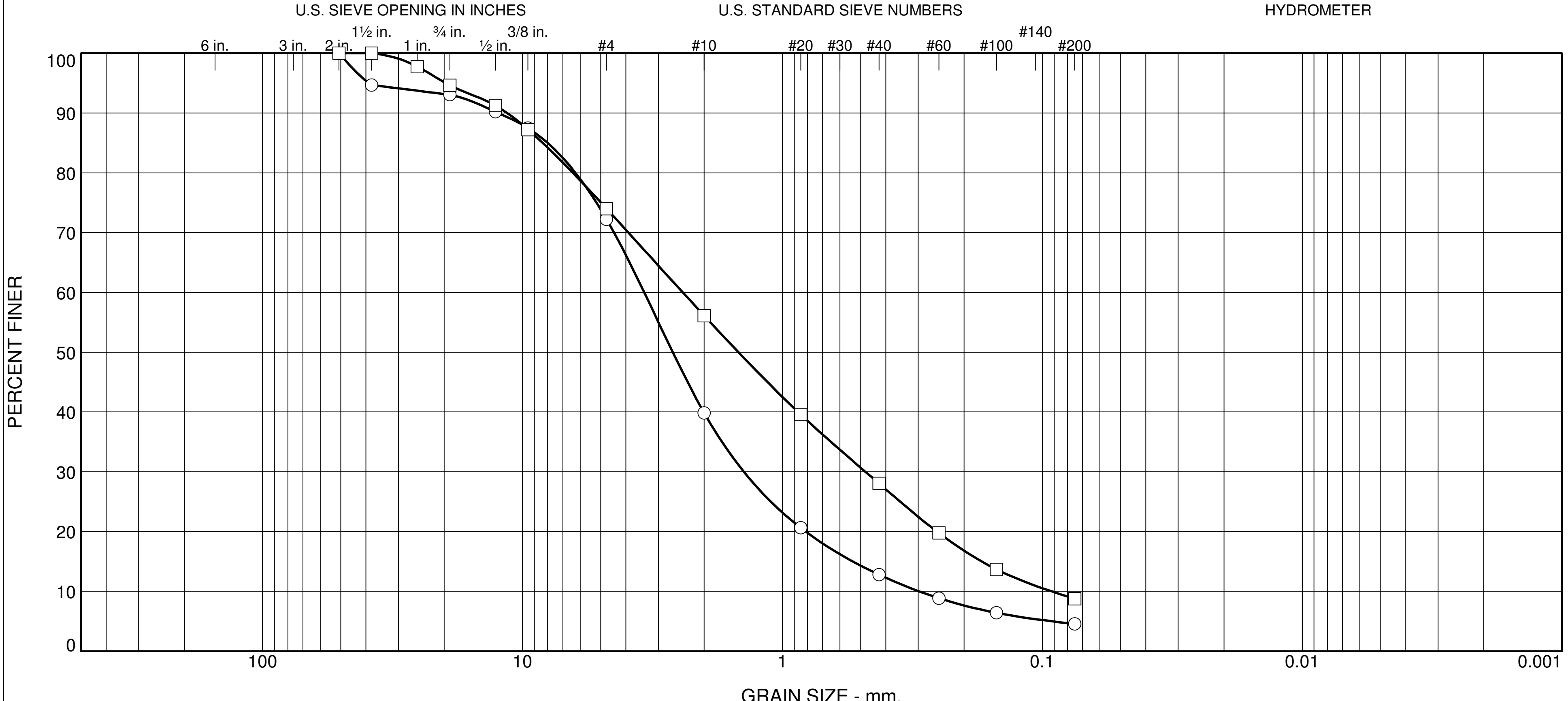
Knight Piésold CONSULTING

Client: Kiewit Infrastructure West Co.
Project: Klamath River Renewal

Project No: VA103-00640/01 **Figure**

Tested By: MFreund **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/D7913



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	6.9	20.9	32.3	27.1	8.3	4.5	
□	0.0	5.4	20.6	17.9	28.1	19.2	8.8	

	Identification	Date Sampled	Date Received	Date Tested
○	Source of Sample: Copco No. 1 Borrow Site Depth: 0.00-1.00' Sample Number: GRB02	2/7/20		
□	Location: Post Proctor Compaction Depth: 0.00-1.00' Sample Number: GRB02	3/5/20		

Client Kiewit Infrastructure West Co.

Project Klamath River Renewal

Project No. VA103-00640/01 Figure

Knight Piésold CONSULTING

○ As received moistre content = 11.7%
□ Post Proctor

Tested By: MFreund **Checked By:** JBruce

Specific Gravity - Soil
ASTM D 854

Project	Klamath River Renewal Project	**Project No.**	VA103-00640/01
Date Staged	3/4/2020		
Date Completed	4/7/2020	**Lab No.**	L2020-010
Tested By	ICloud	**Checked By**	JStaley

Sample No.	TP-JCB-A02 @ 4.83-5.25'		TP-JCB-A04 @ 11.00-11.50'		TP-JCB-B04 @ 13.50--14.00'		TP-JCB-E01 @ 6.25-6.67'			
Sample Prep. (Wet or Dry)	wet		wet		wet		wet			
Flask No.										
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	29.41	29.52	29.55	29.61	27.70	27.20	30.36	30.42		
4) Calibrated Wt. of Flask + Water	339.03	366.03	337.48	337.92	337.91	338.90	335.87	338.95		
5) #3 + #4	368.44	395.55	367.03	367.53	365.61	366.10	366.23	369.37		
6) Wt. of Flask + Water + Soil	357.20	384.29	355.64	356.08	354.90	355.92	354.86	358.04		
7) Volume of Soil (5 - 6)	11.24	11.26	11.39	11.45	10.71	10.18	11.37	11.33		
8) Test Temperature, deg. C	21	21	21.6	21.6	21.5	21.5	20.4	20.4		
9) Temperature Correction, k	0.999790	0.999790	0.999657	0.999657	0.999679	0.999679	0.999912	0.999912		
10) Specific Gravity ((3 / 7) * k)	2.616	2.621	2.593	2.585	2.586	2.671	2.670	2.685		
Reported Average, G_s @ 20 deg.C	2.619		2.589		2.628		2.677			
Tare										
Dry Soil + tare, g	422.9	424.53	404.58	422.44	422.09	430.04	424.74	406.26		
Tare, g	393.49	395.01	375.03	392.83	394.39	402.84	394.38	375.84		

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded, by the density of water at 20 deg. C.

Knight Piésold CONSULTING

Specific Gravity - Soil
ASTM D 854

Project	Klamath River Renewal Project	**Project No.**	VA103-00640/01
Date Staged	2/24/2020		
Date Completed	3/3/2020	**Lab No.**	L2020-010
Tested By	ICloud	**Checked By**	JStaley

Sample No.	C01-A01 @ 3.25-3.75'		C01-D01 @ 3.00-3.50'		C01-C04 @ 4.75-5.25'		GRB01 @ 0.00-1.00		GRB02 @ 0.00-1.00'	
Sample Prep. (Wet or Dry)	wet		wet		wet		wet		wet	
Flask No.										
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	28.97	28.97	26.90	26.97	30.46	30.42	29.78	29.95	31.09	30.95
4) Calibrated Wt. of Flask + Water	338.40	338.73	335.83	337.48	338.38	338.72	337.92	337.50	339.01	338.39
5) #3 + #4	367.37	367.70	362.73	364.45	368.84	369.14	367.70	367.45	370.10	369.34
6) Wt. of Flask + Water + Soil	355.74	356.15	351.81	353.53	357.93	357.53	356.25	355.81	358.17	357.54
7) Volume of Soil (5 - 6)	11.63	11.55	10.92	10.92	10.91	11.61	11.45	11.64	11.93	11.80
8) Test Temperature, deg. C	20.9	21.1	21.1	21.2	21.3	21.3	21.3	21.3	21.4	21.4
9) Temperature Correction, k	0.999810	0.999768	0.999768	0.999746	0.999724	0.999724	0.999724	0.999724	0.999701	0.999701
10) Specific Gravity ((3 / 7) * k)	2.490	2.508	2.463	2.469	2.791	2.619	2.600	2.572	2.605	2.622
Reported Average, G_s @ 20 deg.C	2.499		2.466		2.705		2.586		2.614	
Tare										
Dry Soil + tare, g	423.35	404.76	401.88	419.81	424.83	423.26	422.63	404.83	424.55	433.39
Tare, g	394.38	375.79	374.98	392.84	394.37	392.84	392.85	374.88	393.46	402.44

General Notes: *Line 9, k, is determined by dividing the density of water at test temperature recorded, by the density of water at 20 deg. C.*

Knight Piésold CONSULTING

Specific Gravity - Coarse Aggregate

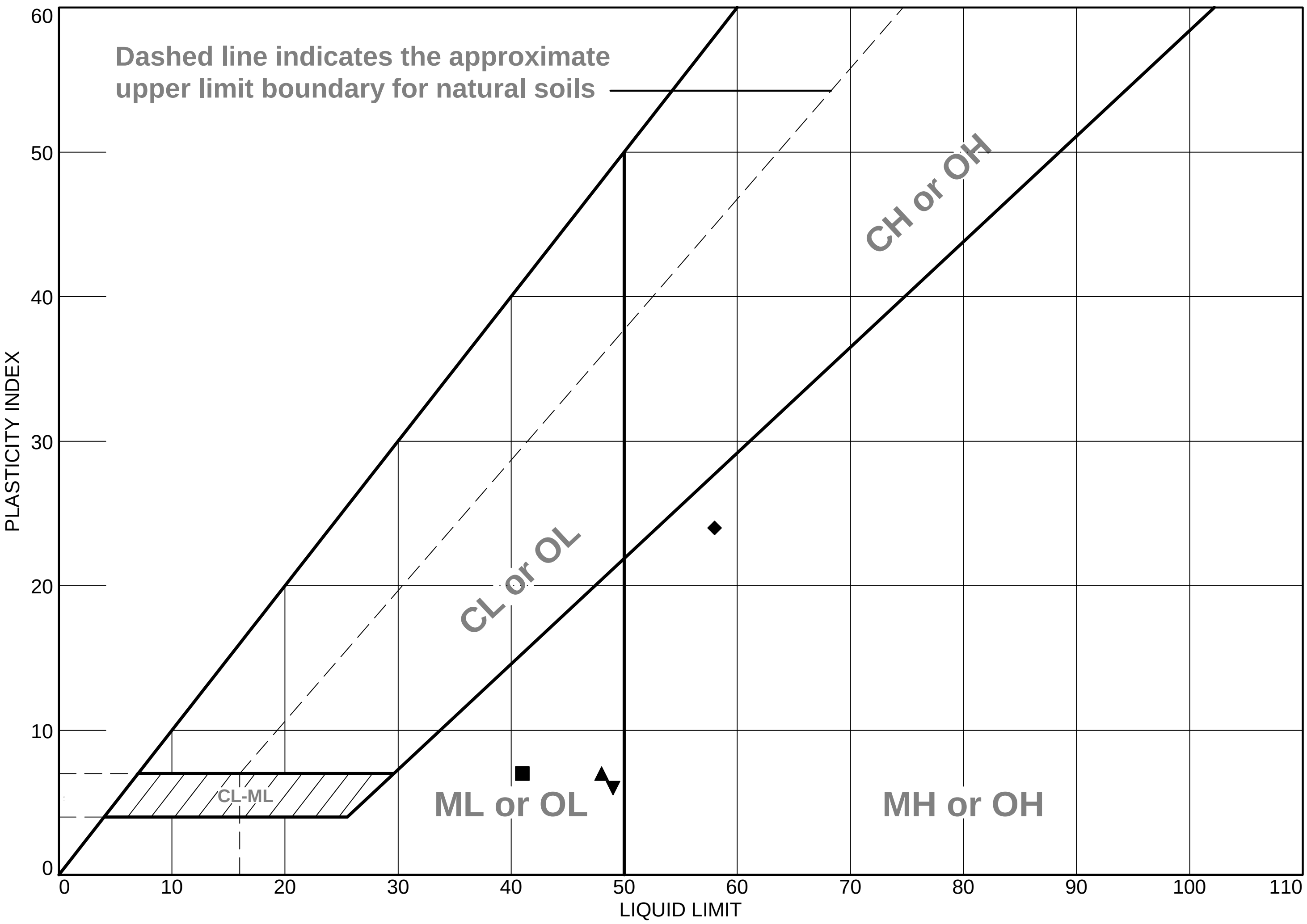
ASTM C 127

Project	Klamath River Renewal Project	Project No.	VA103-00640/01
Lab No.	L2020-010	Date of Test	3/31/2020
Tested By	Lbozett	Checked By	Jbruce

Sample No./ Depth	TP-CO1-A01 @ 3.25-3.75'	TP-CO1-C04 @ 4.75-5.25'	GRB01 @ 0.00-1.00'	GRB02 @ 0.00-1.00'	
Sample Description					
No. of +3 in. pcs.	0	0	0	0	
Tare No.	CC5	C7	1	Bowl	
Saturated Surface Dry Aggregate + Tare	1237.49	1007.89	571.06	508.8	
Dry Aggregate + Tare	1212.25	980.7	547.5	492.37	
Tare	383.7	383.73	307.55	284.05	
Saturated Surface Dry Aggregate (B)	853.79	624.16	263.51	224.75	
Dry Aggregate (A)	828.55	596.97	239.95	208.32	
Basket Submerged					
Saturated Aggregate Submerged (C)	504.37	373	132.65	116.27	
Temperature of Water	23	23	23	23	
Correction Factor	1	1	1	1	
Apparent Specific Gravity (A / (A-C))	2.556	2.665	2.236	2.263	
Bulk Specific Gravity , SSD (B / (B-C))	2.443	2.485	2.014	2.072	
Bulk Specific Gravity (A / (B-C))	2.371	2.377	1.834	1.920	
Absorption (%)	3.046	4.555	9.819	7.887	
Percent Retained #4	41.3	53.4	33.1	27.8	
Percent Passing #4	58.7	46.6	66.9	72.2	
Gs of Aggregate Passing #4	2.499	2.705	2.586	2.614	
Weighted Average Specific Gravity	2.522	2.684	2.470	2.516	

Remarks:

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	silty sand	NP	NP	NP	92.3	41.2	SM
■	silt with sand	41	34	7	98.6	82.9	ML
▲	silty sand	48	41	7	78.6	37.7	SM
◆	sandy elastic silt	58	34	24	83.8	56.5	MH
▼	silty sand	49	43	6	43.4	20.9	SM

Project No. VA103- **Client:** Kiewit Infrastructure West Co.

Project: Klamath River Renewal

Remarks:

● **Source of Sample:** J.C. Boyle Disposal Area **Depth:** 4.83-5.25' **Sample Number:** TP-JCB-A02

■ **Source of Sample:** J.C. Boyle Disposal Area **Depth:** 11.00-11.50' **Sample Number:** TP-JCB-A04

▲ **Source of Sample:** J.C. Boyle Disposal Area **Depth:** 13.50-14.00' **Sample Number:** TP-JCB-B04

◆ **Source of Sample:** J.C. Boyle Disposal Area **Depth:** 8.58-9.00' **Sample Number:** TP-JCB-C02

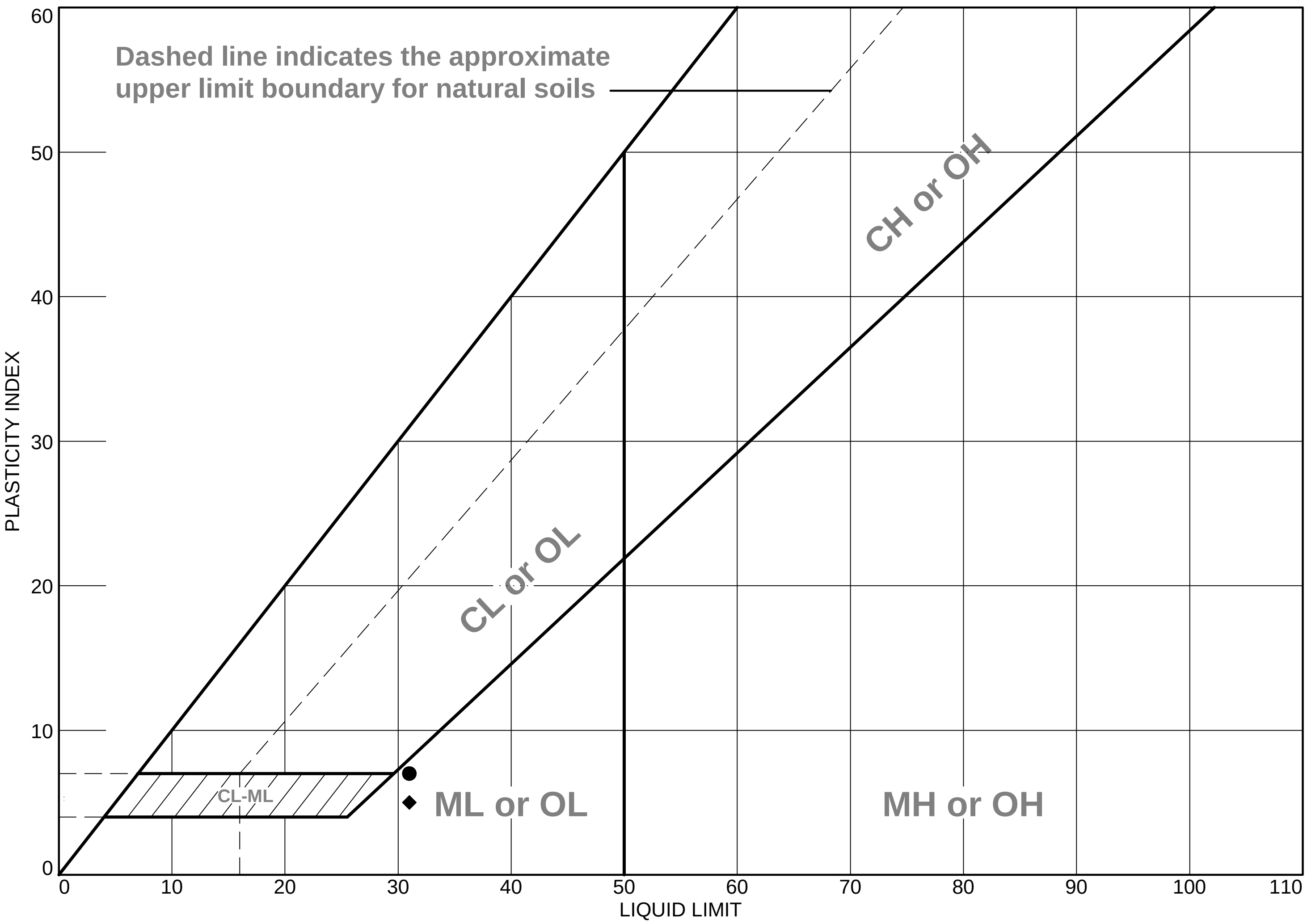
▼ **Source of Sample:** J.C. Boyle Disposal Area **Depth:** 1.67-2.08' **Sample Number:** TP-JCB-D01

Knight Piésold CONSULTING

Figure

Tested By: MFreund **Checked By:** JBruce

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	silty gravel with sand	31	24	7	32.0	22.6	GM
■	silty gravel with sand	NP	NP	NP	31.6	21.1	GM
▲	poorly graded gravel with silt and sand	NP	NP	NP	18.5	8.4	GP-GM
◆	silty gravel with sand	31	26	5	45.1	30.7	GM

Project No. VA103- **Client:** Kiewit Infrastructure West Co.

Project: Klamath River Renewal

● **Source of Sample:** J.C. Boyle Disposal Area **Depth:** 6.25-6.67' **Sample Number:** TP-JCB-E01
■ **Source of Sample:** J.C. Boyle Disposal Area **Depth:** 2.75-3.17' **Sample Number:** TP-JCB-F01
▲ **Source of Sample:** J.C. Boyle Disposal Area **Depth:** 1.83-2.25' **Sample Number:** TP-JCB-G01
◆ **Source of Sample:** J.C. Boyle Disposal Area **Depth:** 8.00-8.50' **Sample Number:** TP-JCB-G03

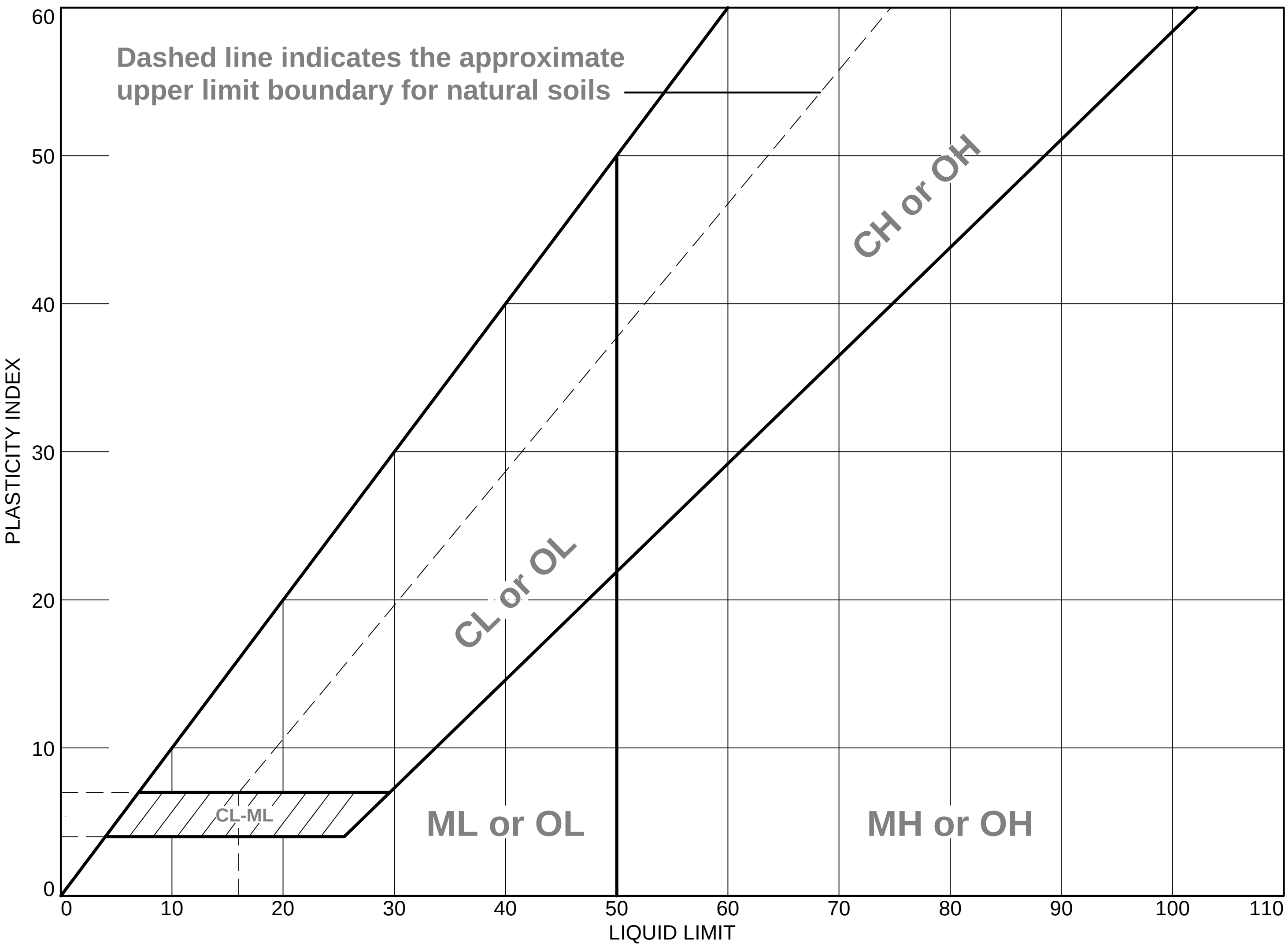
Remarks:

Knight Piésold CONSULTING

Figure

Tested By: ▲ MFreund ◆ MFruend **Checked By:** JBruce

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	poorly graded sand with gravel	NP	NP	NP	2.7	1.5	SP
■	well-graded sand with gravel	NP	NP	NP	12.8	4.5	SW
▲	well-graded sand with gravel	NP	NP	NP	28.0	8.8	SW-SM

Project No. VA103- **Client:** Kiewit Infrastructure West Co.

Project: Klamath River Renewal

● **Source of Sample:** Copco No. 1 Borrow Site **Depth:** 0.00-1.00' **Sample Number:** GRB01

■ **Source of Sample:** Copco No. 1 Borrow Site **Depth:** 0.00-1.00' **Sample Number:** GRB02

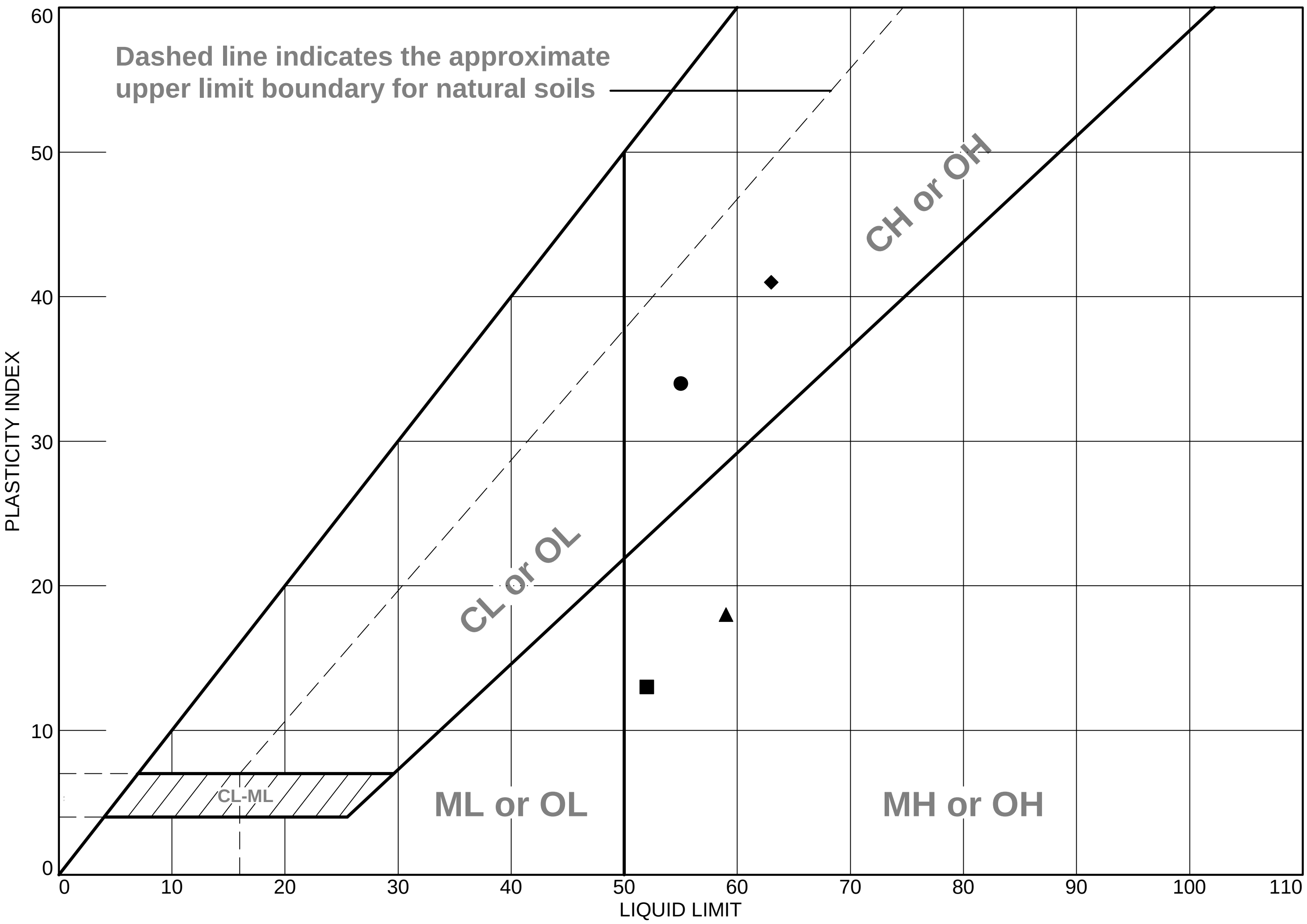
▲ **Location:** Post Proctor Compaction **Depth:** 0.00-1.00' **Sample Number:** GRB02

Knight Piésold CONSULTING

Remarks:

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	clayey gravel	55	21	34	50.2	44.5	GC
■	silty sand	52	39	13	71.1	19.2	SM
▲	elastic silt with sand	59	41	18	96.9	84.5	MH
◆	fat clay	63	22	41	94.4	85.6	CH

Project No. VA103- **Client:** Kiewit Infrastructure West Co.

Project: Klamath River Renewal

● **Source of Sample:** Copco No. 1 Disposal Site **Depth:** 3.25-3.75' **Sample Number:** TP-CO1-A01

■ **Source of Sample:** Copco No. 1 Disposal Site **Depth:** 6.67-7.17 **Sample Number:** TP-CO1-B02

▲ **Source of Sample:** Copco No. 1 Disposal Site **Depth:** 4.83-5.00' **Sample Number:** TP-CO1-D02

◆ **Source of Sample:** Copco No. 1 Disposal Site **Depth:** 3.00-3.50' **Sample Number:** TP-CO1-D01

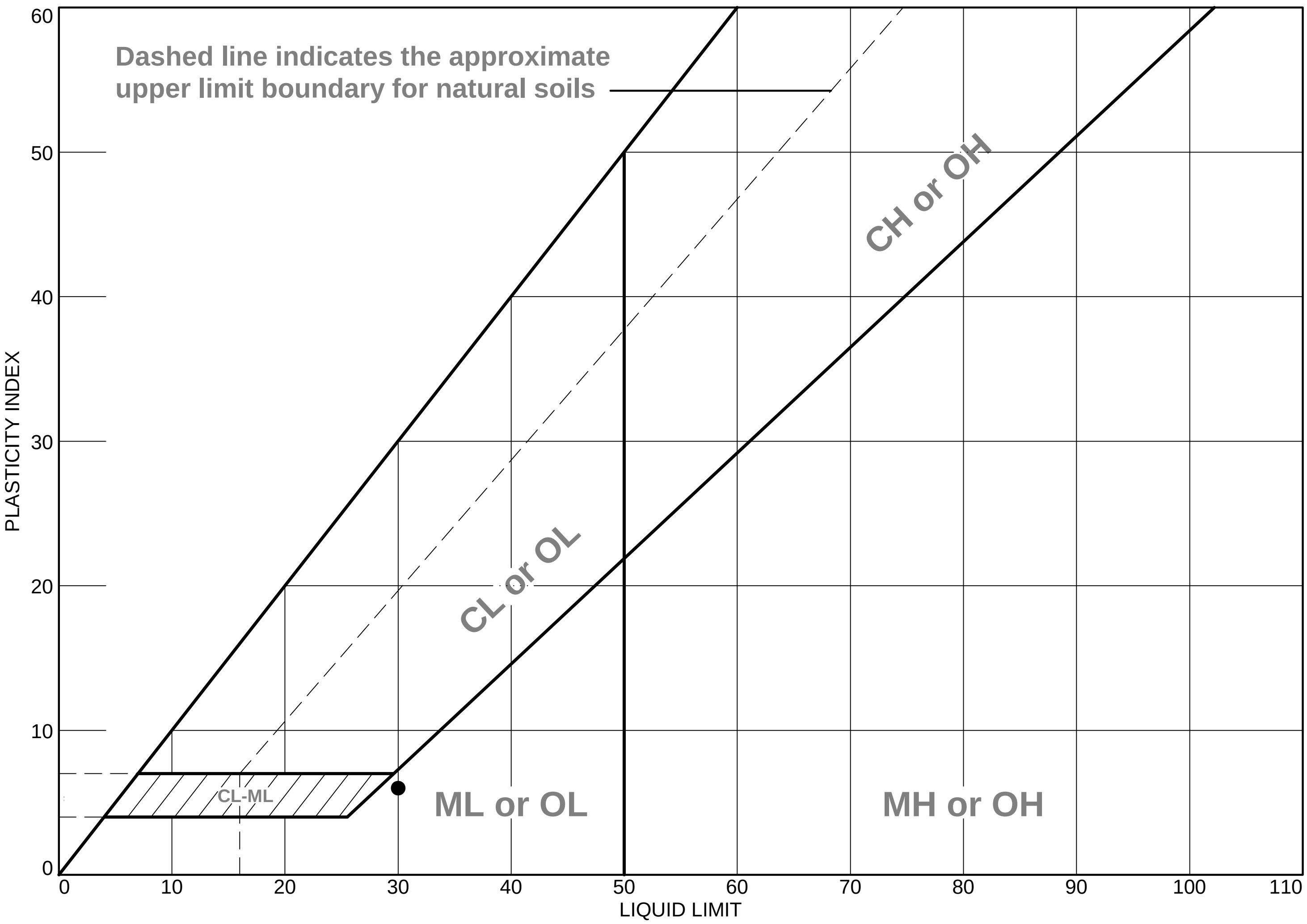
Remarks:

Knight Piésold CONSULTING

Figure

Tested By: ● MFreund ◆ M Freund **Checked By:** JBruce

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	silty gravel with sand	30	24	6	36.8	27.4	GM

Project No. VA103- **Client:** Kiewit Infrastructure West Co.

Project: Klamath River Renewal

● **Source of Sample:** Copco No. 1 near Borrow Site **Depth:** 6.75-7.25' **Sample Number:** TP-CO1-E03

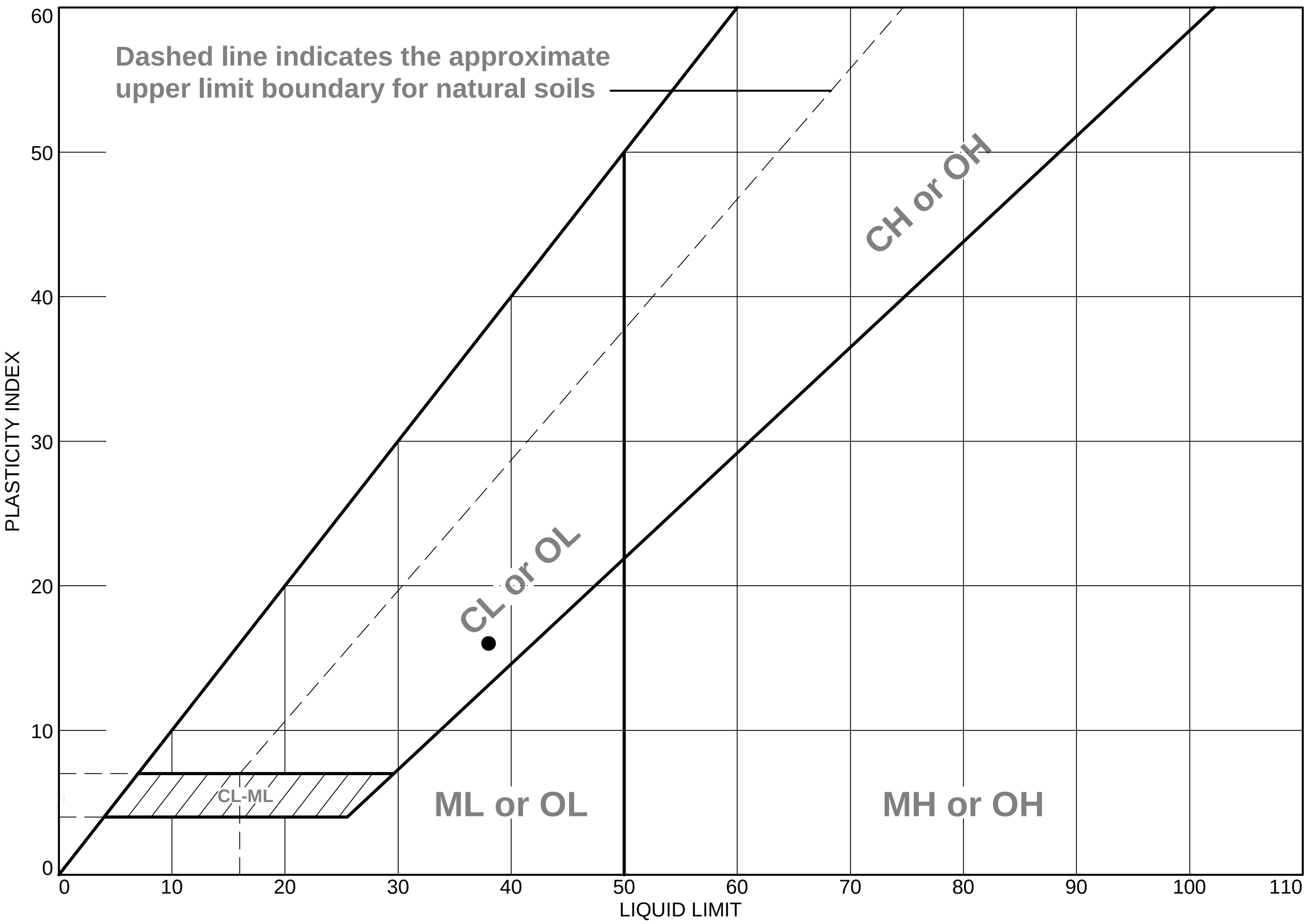
Remarks:

Knight Piésold CONSULTING

Figure

Tested By: MFreund **Checked By:** JBruce

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	clayey gravel with sand	38	22	16	56.4	48.8	GC
■	poorly graded gravel with silt and sand	NP	NP	NP	13.0	6.3	GP-GM

Project No. VA103- **Client:** Kiewit Infrastructure West Co.

Project: Klamath River Renewal

● **Source of Sample:** Copco No. 1 near Switchyard **Depth:** 1.58-2.10' **Sample Number:** TP-CO1-C01

■ **Source of Sample:** Copco No. 1 near Switchyard **Depth:** 4.75-5.25' **Sample Number:** TP-CO1-C04

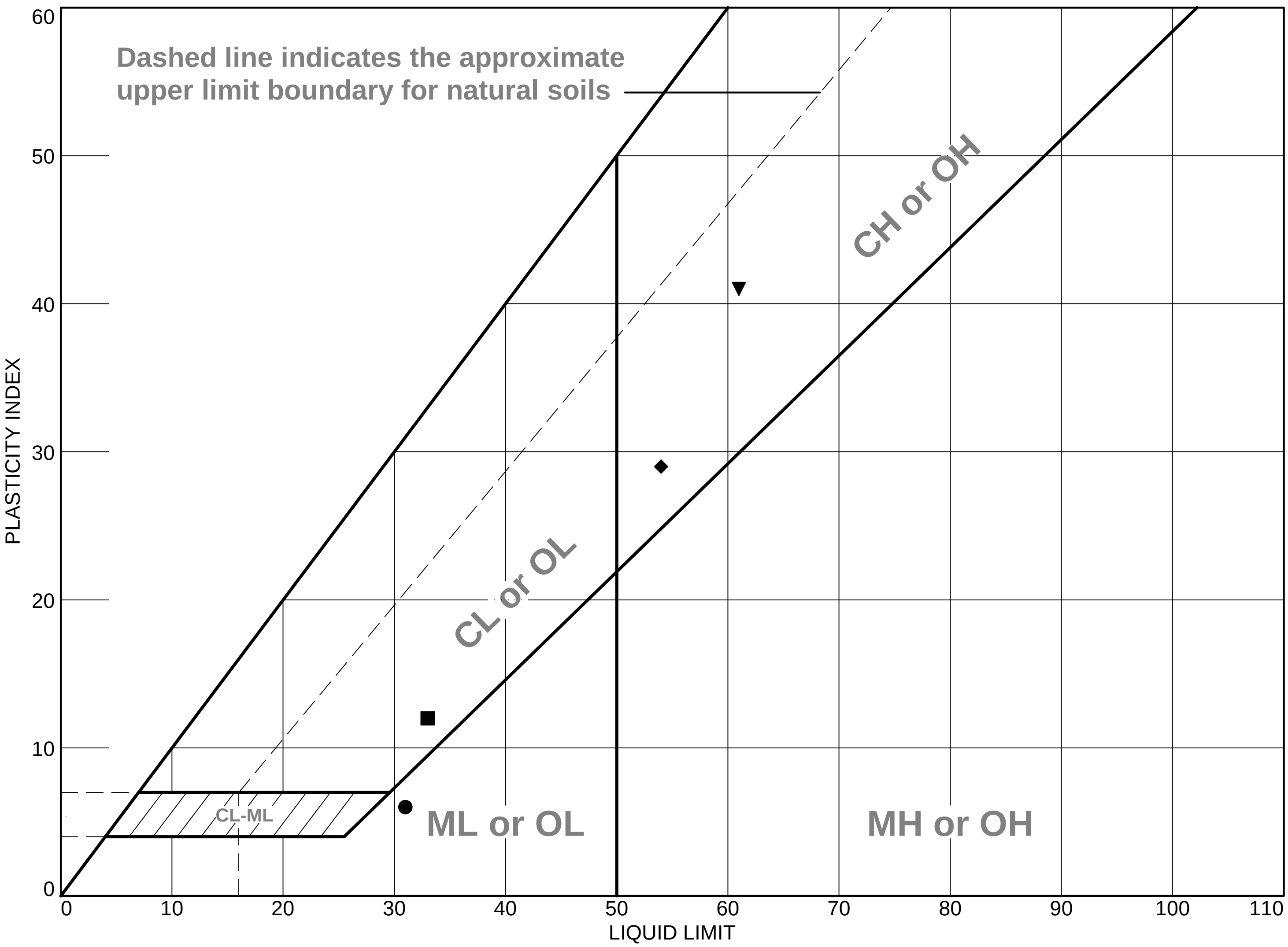
Remarks:

Knight Piésold CONSULTING

Figure

Tested By: MFreund **Checked By:** JBruce

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	silty gravel with sand	31	25	6	36.1	25.3	GM
■	clayey gravel with sand	33	21	12	33.9	25.7	GC
▲	silty sand	NP	NP	NP	66.5	39.7	SM
◆	sandy fat clay	54	25	29	80.1	66.2	CH
▼	sandy fat clay	61	20	41	81.1	65.3	CH

Project No. VA103- **Client:** Kiewit Infrastructure West Co.

Project: Klamath River Renewal

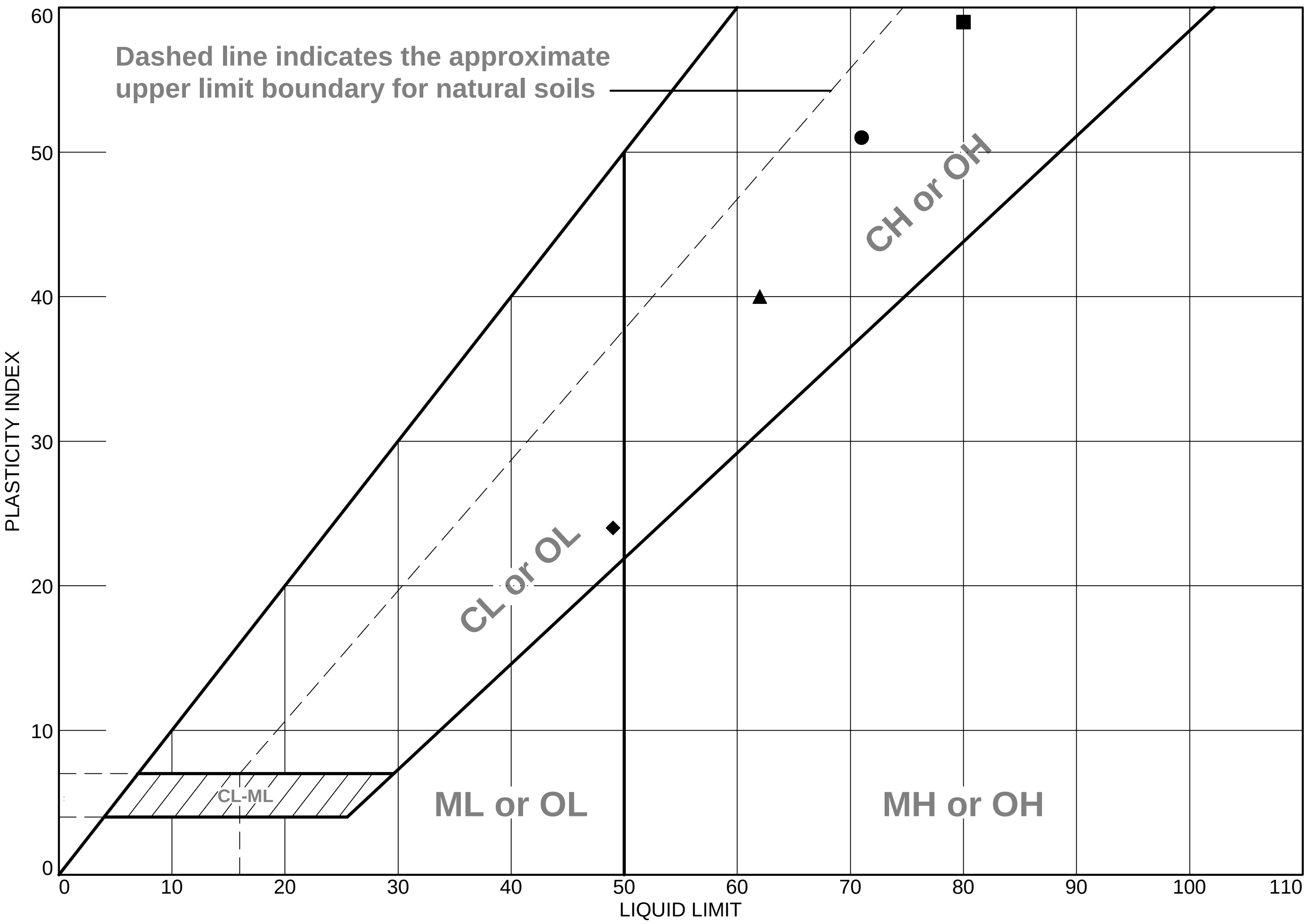
Remarks:

● **Source of Sample:** Copco No. 2 Penstock **Depth:** 2.92-3.42' **Sample Number:** TP-CO2-A01
■ **Source of Sample:** Copco No. 2 Penstock **Depth:** 3.92-4.42' **Sample Number:** TP-CO2-B02
▲ **Source of Sample:** Copco No. 2 Penstock **Depth:** 0.33-0.83' **Sample Number:** GRB03
◆ **Source of Sample:** Copco No. 2 Penstock **Depth:** 0.58-1.00' **Sample Number:** GRB04
▼ **Source of Sample:** Copco No. 2 Penstock **Depth:** 0.67-1.00' **Sample Number:** GRB05

Knight Piésold CONSULTING

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	fat clay with sand	71	20	51	79.0	71.7	CH
■	fat clay with sand	80	21	59	88.9	83.3	CH
▲	clayey gravel with sand	62	22	40	58.2	48.6	GC
◆	sandy lean clay	49	25	24	72.9	54.3	CL

Project No. VA103- **Client:** Kiewit Infrastructure West Co.

Project: Klamath River Renewal

● **Source of Sample:** Iron Gate Disposal Site **Depth:** 1.83-2.33' **Sample Number:** TP-IG-A01

■ **Source of Sample:** Iron Gate Disposal Site **Depth:** 2.83-3.33' **Sample Number:** TP-IG-B01

▲ **Source of Sample:** Iron Gate Disposal Site **Depth:** 4.50-5.00' **Sample Number:** TP-IG-B02

◆ **Source of Sample:** Iron Gate Disposal Site **Depth:** 11.92-12.42' **Sample Number:** TP-IG-D02

Remarks:

Knight Piésold CONSULTING

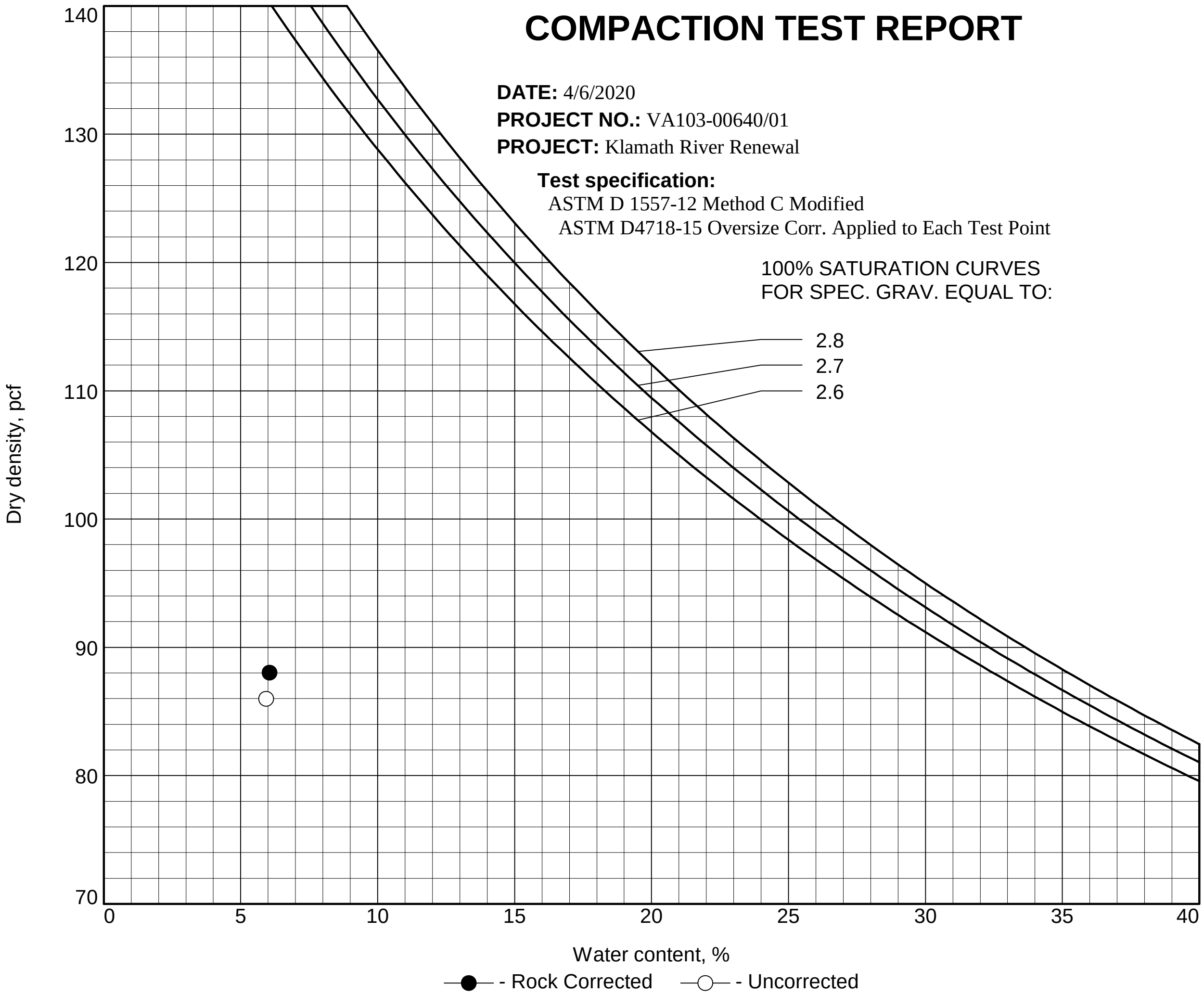
Figure

Tested By: MFreund **Checked By:** JBruce

COMPACTION TEST REPORT

DATE: 4/6/2020
PROJECT NO.: VA103-00640/01
PROJECT: Klamath River Renewal

Test specification:
ASTM D 1557-12 Method C Modified
ASTM D4718-15 Oversize Corr. Applied to Each Test Point



	Sample No.	Elev. or Depth	Material Description	Specific Gravity	LL	PL	Oversize	% < #200
○	GRB02	0.00-1.00'	well-graded sand with gravel	2.5	NP	NP	%>3/4 in.=6.9	4.5

Sample No.	GRB02			
Natural water content, percent	11.7			
Optimum water content, percent				
Max dry density, pcf				

Remarks: Single point test.

Project: Klamath River Renewal
Project No.: VA103-00640/01

Location:

Source: Copco No. 1 Borrow Site

Figure

Knight Piésold CONSULTING

Tested By: MFreund **Checked By:** JBruce

PRIVILEGED AND CONFIDENTIAL

Kumar & Associates, Inc.
Geotechnical and Materials Engineers
and Environmental Scientists

ACEC
MEMBER

2390 South Lipan Street
Denver, CO 80223
phone: (303) 742-9700
fax: (303) 742-9666
e-mail: kadenver@kumarusa.com
www.kumarusa.com

Office Locations: Denver (HQ), Parker, Colorado Springs, Fort Collins, Glenwood Springs and Summit County, Colorado

SUMMARY OF LABORATORY TEST RESULTS

PROJECT NO.: 20-1-212
PROJECT NAME: Knight Piesold
DATE RECEIVED: 04-02-2020
SAMPLE LOCATION: GRB01-GRB02

LOS ANGELES ABRASION MODIFIED GRADING WITH 9 SPHERES		
Sieve Size	Grading of Sample (g)	Percentage Loss (%)
1" to 3/4"	282	
3/4" to 1/2"	566	
1/2" to 3/8"	536	
3/8" to 1/4"	1323	
1/4" to No. 4	1443	
No. 4 to No. 8	811	
Totals	4961	42.9

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SUMMARY OF LABORATORY TEST RESULTS

PROJECT NO.: 20-1-212
PROJECT NAME: Knight Piesold
DATE RECEIVED: 04-02-2020
SAMPLE LOCATION: C01-C04

LOS ANGELES ABRASION MODIFIED GRADING WITH 9 SPHERES

Sieve Size	Grading of Sample (g)	Percentage Loss (%)
1" to 3/4"	504	
3/4" to 1/2"	856	
1/2" to 3/8"	603	
3/8" to 1/4"	890	
1/4" to No. 4	556	
No. 4 to No. 8	1114	
Totals	4523	36.9

TABLE I

KLAMATH RIVER RENEWAL
KIEWIT INFRASTRUCTURE WEST CO.
VA103-00640/01

SUMMARY OF LABORATORY TEST RESULTS
SLAKE DURABILITY - ASTM D 4644

	Pre-Test Specimen Condition							Post-Test (Second Cycle) Specimen Condition					
Sample No.	No. of Pieces	Wet Wt. + Tare	Dry Wt. + Tare	Tare	Wt. of Water	Wt. of Solids	Moisture Content	Dry Wt. + Tare	Tare	Wt. of Solids	Slake Index	No. of Pieces	Type Description
		g	g	g	g	g	%	g	g	g			
TP-CO1-C04	9	NA	395.78	0.00	NA	395.78	NA	391.48	0.00	391.48	98.9	9	I
GRB01/02 Composite	15	NA	311.79	0.00	NA	311.79	NA	306.79	0.00	306.79	98.4	15	1

General Notes:
The temperature range during test was 20.0-21.0 C.
Due to lack of material, sample masses do not meet ASTM requirements.


Laboratory Test Data
Knight Piésold and Co.
Geotechnical Laboratory
VA103-00640/01
Klamath
C01-C04 @ 4.75-5.25'
Slake Durability
Post Test


Laboratory Test Data
VA103-00640/01
Klamath
C01-C04 @ 4.75-5.25'
Slake Durability
Pretest
Knight Piésold and Co.
Geotechnical Laboratory


Laboratory Test Data
Knight Piésold and Co.
Geotechnical Laboratory
VA103-00640/01
Klamath
GRB01/GRB02 Comp
Slake Durability
Pretest


Laboratory Test Data
VA103-00640/01
Klamath
GRB01/GRB02 Comp
Slake Durability
Post Test
Knight Piésold and Co.
Geotechnical Laboratory

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

March 25, 2020

Report to:	Bill to:
Cory Vos	Stuart Flett
Knight Piesold and Co.	Knight Piesold and Co.
#1400-750 West Pender Street	1999 Broadway
	Suite 900
Vancouver, BC Canada V6C 2T8,	Denver, CO 80202

cc: Cynthia Parnow

Project ID: DV103-00640/01 Task 200
ACZ Project ID: L57868

Cory Vos:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 11, 2020. This project has been assigned to ACZ’s project number, L57868. Please reference this number in all future inquiries.

All analyses were performed according to ACZ’s Quality Assurance Plan. The enclosed results relate only to the samples received under L57868. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ’s current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after April 24, 2020. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ’s stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Max Janicek has reviewed and approved this report.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Knight Piesold and Co.
Project ID: DV103-00640/01 Task 200
Sample ID: TP-CO1-CO4 @ 4.75-5.25M

ACZ Sample ID: ***L57868-01***
Date Sampled: *03/10/20 12:00*
Date Received: *03/11/20*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP								03/20/20 11:15	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Arsenic (1312)	M6010D ICP	1		U	*	mg/L	0.04	0.2	03/23/20 23:54	kja
Barium (1312)	M6010D ICP	1	0.021	B	*	mg/L	0.007	0.04	03/23/20 23:54	kja
Cadmium (1312)	M6010D ICP	1	0.009	B	*	mg/L	0.008	0.03	03/23/20 23:54	kja
Chromium (1312)	M6010D ICP	1		U	*	mg/L	0.01	0.05	03/25/20 3:31	kja
Lead (1312)	M6010D ICP	1	0.05	B	*	mg/L	0.03	0.2	03/23/20 23:54	kja
Mercury (1312)	M7470A CVAA	1		U	*	mg/L	0.0002	0.001	03/20/20 17:24	slm
Selenium (1312)	M6010D ICP	1		U	*	mg/L	0.05	0.3	03/23/20 23:54	kja
Silver (1312)	M6010D ICP	1		U	*	mg/L	0.01	0.03	03/23/20 23:54	kja

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 3.2.4			U		t CaCO3/Kt	0.31	3.1	03/25/20 0:00	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3		11.0			t CaCO3/Kt	1	5	03/25/20 0:00	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3		11.0			t CaCO3/Kt			03/25/20 0:00	calc
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	1	1.1		*	%	0.1	0.5	03/20/20 13:59	nnk
Sulfur Forms	M600/2-78-054 3.2.4-MOD									
Sulfur HCl Residue		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur HNO3 Residue		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Organic Residual		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Pyritic Sulfide		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Sulfate		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Total		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Total Sulfur minus Sulfate		1		U	*	%	0.01	0.1	03/20/20 0:00	llr

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								03/16/20 10:45	llr
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								03/17/20 17:41	jms
Synthetic Precip. Leaching Procedure	M1312								03/18/20 23:08	llr

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Knight Piesold and Co.
Project ID: DV103-00640/01 Task 200
Sample ID: GRB01 @ 0.00-1.00M

ACZ Sample ID: ***L57868-02***
Date Sampled: *03/10/20 12:00*
Date Received: *03/11/20*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP								03/20/20 13:08	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Arsenic (1312)	M6010D ICP	1		U	*	mg/L	0.04	0.2	03/24/20 0:05	kja
Barium (1312)	M6010D ICP	1	0.018	B	*	mg/L	0.007	0.04	03/24/20 0:05	kja
Cadmium (1312)	M6010D ICP	1	0.008	B	*	mg/L	0.008	0.03	03/24/20 0:05	kja
Chromium (1312)	M6010D ICP	1		U	*	mg/L	0.01	0.05	03/25/20 3:43	kja
Lead (1312)	M6010D ICP	1	0.04	B	*	mg/L	0.03	0.2	03/24/20 0:05	kja
Mercury (1312)	M7470A CVAA	1		U	*	mg/L	0.0002	0.001	03/20/20 17:27	slm
Selenium (1312)	M6010D ICP	1	0.05	B	*	mg/L	0.05	0.3	03/24/20 0:05	kja
Silver (1312)	M6010D ICP	1		U	*	mg/L	0.01	0.03	03/24/20 0:05	kja

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 3.2.4			U		t CaCO3/Kt	0.31	3.1	03/25/20 0:00	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3		18.0			t CaCO3/Kt	1	5	03/25/20 0:00	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3		18.0			t CaCO3/Kt			03/25/20 0:00	calc
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	1	1.8		*	%	0.1	0.5	03/20/20 14:12	nnk
Sulfur Forms	M600/2-78-054 3.2.4-MOD									
Sulfur HCl Residue		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur HNO3 Residue		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Organic Residual		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Pyritic Sulfide		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Sulfate		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Total		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Total Sulfur minus Sulfate		1		U	*	%	0.01	0.1	03/20/20 0:00	llr

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								03/16/20 10:49	llr
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								03/17/20 18:12	jms
Synthetic Precip. Leaching Procedure	M1312								03/19/20 4:12	llr

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Knight Piesold and Co.

Project ID: DV103-00640/01 Task 200

Sample ID: GRB02 @ 0.00-1.00M

ACZ Sample ID: ***L57868-03***

Date Sampled: *03/10/20 12:00*

Date Received: *03/11/20*

Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP								03/20/20 13:46	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Arsenic (1312)	M6010D ICP	1		U	*	mg/L	0.04	0.2	03/24/20 0:09	kja
Barium (1312)	M6010D ICP	1	0.018	B	*	mg/L	0.007	0.04	03/24/20 0:09	kja
Cadmium (1312)	M6010D ICP	1	0.009	B	*	mg/L	0.008	0.03	03/24/20 0:09	kja
Chromium (1312)	M6010D ICP	1		U	*	mg/L	0.01	0.05	03/25/20 3:47	kja
Lead (1312)	M6010D ICP	1	0.04	B	*	mg/L	0.03	0.2	03/24/20 0:09	kja
Mercury (1312)	M7470A CVAA	1		U	*	mg/L	0.0002	0.001	03/20/20 17:28	slm
Selenium (1312)	M6010D ICP	1		U	*	mg/L	0.05	0.3	03/24/20 0:09	kja
Silver (1312)	M6010D ICP	1		U	*	mg/L	0.01	0.03	03/24/20 0:09	kja

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 3.2.4			U		t CaCO3/Kt	0.31	3.1	03/25/20 0:00	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3		17.0			t CaCO3/Kt	1	5	03/25/20 0:00	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3		17.0			t CaCO3/Kt			03/25/20 0:00	calc
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	1	1.7		*	%	0.1	0.5	03/20/20 14:25	nnk
Sulfur Forms	M600/2-78-054 3.2.4-MOD									
Sulfur HCl Residue		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur HNO3 Residue		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Organic Residual		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Pyritic Sulfide		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Sulfate		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Total		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Total Sulfur minus Sulfate		1		U	*	%	0.01	0.1	03/20/20 0:00	llr

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								03/16/20 10:52	llr
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								03/17/20 18:43	jms
Synthetic Precip. Leaching Procedure	M1312								03/19/20 5:54	llr

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Knight Piesold and Co.
Project ID: DV103-00640/01 Task 200
Sample ID: TP-CO2-A01 @ 2.92-3.42M

ACZ Sample ID: ***L57868-04***
Date Sampled: *03/10/20 12:00*
Date Received: *03/11/20*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP								03/20/20 14:24	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Arsenic (1312)	M6010D ICP	1		U	*	mg/L	0.04	0.2	03/24/20 0:13	kja
Barium (1312)	M6010D ICP	1	0.018	B	*	mg/L	0.007	0.04	03/24/20 0:13	kja
Cadmium (1312)	M6010D ICP	1	0.009	B	*	mg/L	0.008	0.03	03/24/20 0:13	kja
Chromium (1312)	M6010D ICP	1		U	*	mg/L	0.01	0.05	03/25/20 3:51	kja
Lead (1312)	M6010D ICP	1	0.04	B	*	mg/L	0.03	0.2	03/24/20 0:13	kja
Mercury (1312)	M7470A CVAA	1		U	*	mg/L	0.0002	0.001	03/20/20 17:29	slm
Selenium (1312)	M6010D ICP	1		U	*	mg/L	0.05	0.3	03/24/20 0:13	kja
Silver (1312)	M6010D ICP	1		U	*	mg/L	0.01	0.03	03/24/20 0:13	kja

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 3.2.4			U		t CaCO3/Kt	0.31	3.1	03/25/20 0:00	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3		11.0			t CaCO3/Kt	1	5	03/25/20 0:00	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3		11.0			t CaCO3/Kt			03/25/20 0:00	calc
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	1	1.1		*	%	0.1	0.5	03/20/20 14:38	nnk
Sulfur Forms	M600/2-78-054 3.2.4-MOD									
Sulfur HCl Residue		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur HNO3 Residue		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Organic Residual		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Pyritic Sulfide		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Sulfate		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Total		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Total Sulfur minus Sulfate		1		U	*	%	0.01	0.1	03/20/20 0:00	llr

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								03/16/20 10:56	llr
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								03/17/20 19:14	jms
Synthetic Precip. Leaching Procedure	M1312								03/19/20 7:35	llr

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Knight Piesold and Co.
Project ID: DV103-00640/01 Task 200
Sample ID: GRB004 @ 0.58-1.00M

ACZ Sample ID: ***L57868-05***
Date Sampled: *03/10/20 12:00*
Date Received: *03/11/20*
Sample Matrix: *Soil*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M3010A ICP								03/20/20 15:40	kja

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Arsenic (1312)	M6010D ICP	1		U	*	mg/L	0.04	0.2	03/24/20 0:21	kja
Barium (1312)	M6010D ICP	1	0.020	B	*	mg/L	0.007	0.04	03/24/20 0:21	kja
Cadmium (1312)	M6010D ICP	1	0.009	B	*	mg/L	0.008	0.03	03/24/20 0:21	kja
Chromium (1312)	M6010D ICP	1		U	*	mg/L	0.01	0.05	03/25/20 3:59	kja
Lead (1312)	M6010D ICP	1	0.05	B	*	mg/L	0.03	0.2	03/24/20 0:21	kja
Mercury (1312)	M7470A CVAA	1		U	*	mg/L	0.0002	0.001	03/20/20 17:33	slm
Selenium (1312)	M6010D ICP	1	0.06	B	*	mg/L	0.05	0.3	03/24/20 0:21	kja
Silver (1312)	M6010D ICP	1		U	*	mg/L	0.01	0.03	03/24/20 0:21	kja

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 3.2.4		0.31	B		t CaCO3/Kt	0.31	3.1	03/25/20 0:00	calc
Acid Neutralization Potential (calc)	M600/2-78-054 1.3		14.0			t CaCO3/Kt	1	5	03/25/20 0:00	calc
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3		13.7			t CaCO3/Kt			03/25/20 0:00	calc
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	1	1.4		*	%	0.1	0.5	03/20/20 14:50	nnk
Sulfur Forms	M600/2-78-054 3.2.4-MOD									
Sulfur HCl Residue		1	0.02	B	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur HNO3 Residue		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Organic Residual		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Pyritic Sulfide		1	0.02	B	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Sulfate		1		U	*	%	0.01	0.1	03/20/20 0:00	llr
Sulfur Total		1	0.01	B	*	%	0.01	0.1	03/20/20 0:00	llr
Total Sulfur minus Sulfate		1	0.02	B	*	%	0.01	0.1	03/20/20 0:00	llr

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								03/16/20 10:59	llr
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3								03/17/20 19:45	jms
Synthetic Precip. Leaching Procedure	M1312								03/19/20 10:58	llr

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Inorganic Reference

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer s certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ s Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

REP001.03.15.02

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Inorganic QC Summary

Knight Piesold and Co. ACZ Project ID: ***L57868***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Arsenic (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG494130													
WG494130ICV	ICV	03/23/20 23:18	II200318-6	4		3.808	mg/L	95	90	110			
WG494130ICB	ICB	03/23/20 23:22				U	mg/L		-0.12	0.12			
WG493804PBS	PBS	03/23/20 23:46				U	mg/L		-0.12	0.12			
WG493804LFB	LFB	03/23/20 23:50	II200302-4	1.0008		1.031	mg/L	103	80	120			
L57868-01MS	MS	03/23/20 23:58	II200302-4	1.0008	U	1.066	mg/L	107	75	125			
L57868-01MSD	MSD	03/24/20 0:01	II200302-4	1.0008	U	1.071	mg/L	107	75	125	0	20	
L57868-04DUP	DUP	03/24/20 0:17			U	U	mg/L				0	20	RA

Barium (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG494130													
WG494130ICV	ICV	03/23/20 23:18	II200318-6	2		1.919	mg/L	96	90	110			
WG494130ICB	ICB	03/23/20 23:22				.0138	mg/L		-0.021	0.021			
WG493804PBS	PBS	03/23/20 23:46				.0144	mg/L		-0.021	0.021			
WG493804LFB	LFB	03/23/20 23:50	II200302-4	.5005		.4941	mg/L	99	80	120			
L57868-01MS	MS	03/23/20 23:58	II200302-4	.5005	.021	.5113	mg/L	98	75	125			
L57868-01MSD	MSD	03/24/20 0:01	II200302-4	.5005	.021	.5106	mg/L	98	75	125	0	20	
L57868-04DUP	DUP	03/24/20 0:17			.018	.0177	mg/L				2	20	RA

Cadmium (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG494130													
WG494130ICV	ICV	03/23/20 23:18	II200318-6	2		1.877	mg/L	94	90	110			
WG494130ICB	ICB	03/23/20 23:22				.0092	mg/L		-0.024	0.024			
WG493804PBS	PBS	03/23/20 23:46				.0108	mg/L		-0.024	0.024			
WG493804LFB	LFB	03/23/20 23:50	II200302-4	.5005		.5005	mg/L	100	80	120			
L57868-01MS	MS	03/23/20 23:58	II200302-4	.5005	.009	.5098	mg/L	100	75	125			
L57868-01MSD	MSD	03/24/20 0:01	II200302-4	.5005	.009	.5057	mg/L	99	75	125	1	20	
L57868-04DUP	DUP	03/24/20 0:17			.009	.0094	mg/L				4	20	RA

Chromium (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG494204													
WG494204ICV	ICV	03/25/20 2:56	II200318-6	2		1.931	mg/L	97	90	110			
WG494204ICB	ICB	03/25/20 2:59				U	mg/L		-0.03	0.03			
WG493804PBS	PBS	03/25/20 3:23				U	mg/L		-0.03	0.03			
WG493804LFB	LFB	03/25/20 3:27	II200302-4	.501		.515	mg/L	103	80	120			
L57868-01MS	MS	03/25/20 3:35	II200302-4	.501	U	.508	mg/L	101	75	125			
L57868-01MSD	MSD	03/25/20 3:39	II200302-4	.501	U	.512	mg/L	102	75	125	1	20	
L57868-04DUP	DUP	03/25/20 3:55			U	U	mg/L				0	20	RA

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Inorganic QC Summary

Knight Piesold and Co. ACZ Project ID: ***L57868***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Lead (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG494130													
WG494130ICV	ICV	03/23/20 23:18	II200318-6	4		3.857	mg/L	96	90	110			
WG494130ICB	ICB	03/23/20 23:22				U	mg/L		-0.09	0.09			
WG493804PBS	PBS	03/23/20 23:46				.031	mg/L		-0.09	0.09			
WG493804LFB	LFB	03/23/20 23:50	II200302-4	1.0017		1.06	mg/L	106	80	120			
L57868-01MS	MS	03/23/20 23:58	II200302-4	1.0017	.05	1.124	mg/L	107	75	125			
L57868-01MSD	MSD	03/24/20 0:01	II200302-4	1.0017	.05	1.112	mg/L	106	75	125	1	20	
L57868-04DUP	DUP	03/24/20 0:17			.04	.06	mg/L				40	20	RA

Mercury (1312) M7470A CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG493962													
WG493962ICV	ICV	03/20/20 16:24	HG200224-3	.004995		.00512	mg/L	103	95	105			
WG493962ICB	ICB	03/20/20 16:25				U	mg/L		-0.0002	0.0002			
WG493964													
WG493804PBS	PBS	03/20/20 17:22				U	mg/L		-0.0006	0.0006			
WG493804LFB	LFB	03/20/20 17:23	HG200313-3	.002002		.00188	mg/L	94	85	115			
L57868-01MS	MS	03/20/20 17:25	HG200313-3	.002002	U	.00192	mg/L	96	85	115			
L57868-01MSD	MSD	03/20/20 17:26	HG200313-3	.002002	U	.00191	mg/L	95	85	115	1	20	
L57868-04DUP	DUP	03/20/20 17:30			U	U	mg/L				0	20	RA

Neutralization Potential as CaCO3 M600/2-78-054 3.2.3

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG493971													
L57826-01DUP	DUP	03/20/20 12:55			1	1	%				0	20	
L57826-01MS	MS	03/20/20 13:08	SI190303-1	1	1	1.9	%	90	70	130			
WG493971LCSS	LCSS	03/20/20 16:20	PCN59683	4.96		5.15	%	104	80	120			
WG493971PBS	PBS	03/20/20 16:32				U	%		-0.2	0.2			

Selenium (1312) M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG494130													
WG494130ICV	ICV	03/23/20 23:18	II200318-6	4		3.874	mg/L	97	90	110			
WG494130ICB	ICB	03/23/20 23:22				U	mg/L		-0.15	0.15			
WG493804PBS	PBS	03/23/20 23:46				U	mg/L		-0.15	0.15			
WG493804LFB	LFB	03/23/20 23:50	II200302-4	1.0017		1.003	mg/L	100	80	120			
L57868-01MS	MS	03/23/20 23:58	II200302-4	1.0017	U	1.031	mg/L	103	75	125			
L57868-01MSD	MSD	03/24/20 0:01	II200302-4	1.0017	U	1.044	mg/L	104	75	125	1	20	
L57868-04DUP	DUP	03/24/20 0:17			U	U	mg/L				0	20	RA

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Inorganic QC Summary

Knight Piesold and Co.   ACZ Project ID: ***L57868***

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Silver (1312)   M6010D ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG494130													
WG494130ICV	ICV	03/23/20 23:18	II200318-6	1		.974	mg/L	97	90	110			
WG494130ICB	ICB	03/23/20 23:22				U	mg/L		-0.03	0.03			
WG493804PBS	PBS	03/23/20 23:46				U	mg/L		-0.03	0.03			
WG493804LFB	LFB	03/23/20 23:50	II200302-4	.5005		.48	mg/L	96	80	120			
L57868-01MS	MS	03/23/20 23:58	II200302-4	.5005	U	.492	mg/L	98	75	125			
L57868-01MSD	MSD	03/24/20 0:01	II200302-4	.5005	U	.488	mg/L	98	75	125	1	20	
L57868-04DUP	DUP	03/24/20 0:17			U	U	mg/L				0	20	RA

Sulfur Organic Residual   M600/2-78-054 3.2.4-MOD

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG493760													
L57954-01DUP	DUP	03/20/20 12:59			U	.01	%				200	20	RA

Sulfur Pyritic Sulfide   M600/2-78-054 3.2.4-MOD

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG493760													
L57954-01DUP	DUP	03/20/20 12:59			.03	.02	%				40	20	RA

Sulfur Sulfate   M600/2-78-054 3.2.4-MOD

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG493760													
WG493760PBS	PBS	03/20/20 12:27				U	%		-0.03	0.03			
L57954-01DUP	DUP	03/20/20 12:59			U	U	%				0	20	RA

Sulfur Total   M600/2-78-054 3.2.4-MOD

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG493760													
WG493760PBS	PBS	03/20/20 10:05				U	%		-0.03	0.03			
WG493760LCSS	LCSS	03/20/20 10:08	PCN60872	4.01		4.59	%	114	80	120			
L57954-01MS	MS	03/20/20 10:30	PCN60251	1.32	.03	1.38	%	102	80	120			
L57954-01DUP	DUP	03/20/20 10:33			.03	.03	%				0	20	RA
WG493760LCSS	LCSS	03/20/20 11:11	PCN60872	4.01		3.36	%	84	80	120			
WG493760PBS	PBS	03/20/20 11:13				U	%		-0.03	0.03			

Total Sulfur Minus Sulfate   M600/2-78-054 3.2.4-MOD

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG493760													
WG493760PBS	PBS	03/20/20 12:27				U	%		-0.03	0.03			
L57954-01DUP	DUP	03/20/20 12:59			.03	.03	%				0	20	RA

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Inorganic Extended Qualifier Report

Knight Piesold and Co. ACZ Project ID: ***L57868***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L57868-01	WG494130	Arsenic (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Cadmium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG494204	Chromium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG494130	Lead (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG493964	Mercury (1312)	M7470A CVAA	Q6	Sample was received above recommended temperature.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG494130	Selenium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Silver (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG493760	Sulfur Organic Residual	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

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Inorganic Extended Qualifier Report

Knight Piesold and Co. ACZ Project ID: ***L57868***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L57868-02	WG494130	Arsenic (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Cadmium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG494204	Chromium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG494130	Lead (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG493964	Mercury (1312)	M7470A CVAA	Q6	Sample was received above recommended temperature.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG494130	Selenium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Silver (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG493760	Sulfur Organic Residual	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

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Inorganic Extended Qualifier Report

Knight Piesold and Co. ACZ Project ID: ***L57868***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L57868-03	WG494130	Arsenic (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Cadmium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG494204	Chromium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG494130	Lead (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG493964	Mercury (1312)	M7470A CVAA	Q6	Sample was received above recommended temperature.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG494130	Selenium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Silver (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG493760	Sulfur Organic Residual	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

Knight Piesold and Co.

ACZ Project ID: ***L57868***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L57868-04	WG494130	Arsenic (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Cadmium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG494204	Chromium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG494130	Lead (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG493964	Mercury (1312)	M7470A CVAA	Q6	Sample was received above recommended temperature.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG494130	Selenium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Silver (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG493760	Sulfur Organic Residual	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

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Inorganic Extended Qualifier Report

Knight Piesold and Co. ACZ Project ID: ***L57868***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L57868-05	WG494130	Arsenic (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Barium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
		Cadmium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M6010D ICP	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.
	WG494204	Chromium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG494130	Lead (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG493964	Mercury (1312)	M7470A CVAA	Q6	Sample was received above recommended temperature.
			M7470A CVAA	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG494130	Selenium (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Silver (1312)	M6010D ICP	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG493760	Sulfur Organic Residual	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Pyritic Sulfide	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Sulfur Total	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Total Sulfur minus Sulfate	M600/2-78-054 3.2.4-MOD	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

ACZ Laboratories, Inc.
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Certification Qualifiers

Knight Piesold and Co. ACZ Project ID: ***L57868***

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.	
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3
Sulfur HCl Residue	M600/2-78-054 3.2.4-MOD
Sulfur HNO3 Residue	M600/2-78-054 3.2.4-MOD
Sulfur Total	M600/2-78-054 3.2.4-MOD

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Sample Receipt

Knight Piesold and Co.

ACZ Project ID:	L57868
Date Received:	03/11/2020 11:33
Received By:	mjj
Date Printed:	3/12/2020

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
NA32501	16.6	NA	15	N/A

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Knight Piesold and Co.

ACZ Project ID:	L57868
Date Received:	03/11/2020 11:33
Received By:	mjj
Date Printed:	3/12/2020

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

ACZ Laboratories, Inc. L 57868
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Cory Vos	Address: #1400-750 West Pender Street
Company: KP	Vancouver, B.C. Canada V6C 2T8
E-mail: cvos@knightpiesold.com	Telephone: 604-685-0543

Copy of Report to:

Name: Cynthia Parnow	E-mail: cparnow@knightpiesold.com
Company: KP	Telephone: 303-629-8788

Invoice to:

Name: Cory Vos	Address:
Company: Same as above	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☒ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ☒

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: JBruce **Sampler's Site Information State** CO **Zip code** 80239 **Time Zone** MST

***Sampler's Signature:** [signature]

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION — ANALYSES REQUESTED *(attach list or use quote number)*

Quote #: ABA-1312

PO#: Cory Vos

Reporting state for compliance testing:

Check box if samples include NRC licensed material? ☐

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Modified ABA	SPLP						
TP-CO1-C04 @ 4.75-5.2[illegible]	3/10/20: 12:00	SO	1	☒	☒	☐	☐	☐	☐	☐	☐
GRB01 @ 0.00-1.00m	3/10/20: 12:00	SO	1	☒	☒	☐	☐	☐	☐	☐	☐
GRB02 @ 0.00-1.00m	3/10/20: 12:00	SO	1	☒	☒	☐	☐	☐	☐	☐	☐
TP-CO2-A01 @ 2.92-3.4[illegible]	3/10/20: 12:00	SO	1	☒	☒	☐	☐	☐	☐	☐	☐
GRB04 @ 0.58-1.00m	3/10/20: 12:00	SO	1	☒	☒	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
J BRUCE	3/10 13:00	gme	3-11-20

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

L57868 Chain of Custod

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Cynthia Parnow
Knight Piesold and Co.
1999 Broadway, Suite 900
Denver, CO 80202

3/9/2020

Quote Number: ABA-1312

Matrix: Soil — Modified ABA and SPLP West of Mississippi Extraction on 1 soil sample

Parameter	Method	Detection Limit	Cost/Sample
Diskette/QC Summary			
Quality Control Summary			$0.00
Inorganic Prep			
Total Hot Plate Digestion	M3010A ICP		$0.00
Login Review			
Labor Charges for Sample Prep			$28.00
Metals Analysis			
Arsenic (1312)	M6010D ICP	0.04 mg/L	$10.25
Barium (1312)	M6010D ICP	0.007 mg/L	$10.25
Cadmium (1312)	M6010D ICP	0.008 mg/L	$10.25
Chromium (1312)	M6010D ICP	0.01 mg/L	$10.25
Lead (1312)	M6010D ICP	0.03 mg/L	$10.25
Mercury (1312)	M7470A CVAA	0.0002 mg/L	$26.75
Selenium (1312)	M6010D ICP	0.05 mg/L	$10.25
Silver (1312)	M6010D ICP	0.01 mg/L	$10.25
Misc.			
Electronic Data Deliverable			$0.00
Sample Preparation			
Air Dry at 34 Degrees C	USDA No. 1, 1972		$8.25
Crush and Pulverize (Ring & Puck)	EPA-600/2-78-054 3.1.3		$18.50
Synthetic Precip. Leaching Procedure	M1312		$77.25
Soil Analysis			
Acid Generation Potential (calc on Sulfur total)	M600/2-78-054 3.2.4	Calculation	$0.00
Acid Neutralization Potential (calc)	M600/2-78-054 1.3	Calculation	$0.00
Acid-Base Potential (calc on Sulfur total)	M600/2-78-054 1.3	Calculation	$0.00
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	0.1 %	$16.50
Sulfur Forms	M600/2-78-054 3.2.4-MOD	0.01 %	$76.25

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Cynthia Parnow
Knight Piesold and Co.
1999 Broadway, Suite 900
Denver, CO 80202

3/9/2020

Cost/Sample: **$323.25**

This quote is based on a Standard Turn Around Time of approximately 21 days for soil and solid matrices (15 business days). TAT may vary with seasonal heavy workload. Please contact your PM if rush TAT is required. Rush TAT needs to be pre-approved prior to sample shipment to assure that due dates can be met. Pricing includes standard reporting formats and standard ACZ EDDs. All projects received are subject to a $125.00 Minimum Charge. Please note that method detection limits are estimates and may be elevated depending on sample matrix that require dilution. Pricing includes coolers, soil jars or bags, labels, COCs and ice-packs (if needed for your analysis), shipped to your site or office via UPS ground. Return shipping is the responsibility of the client. Please allow ample time for your bottles to arrive. Please note that soil preparation charges may change based on the condition and volume of sample(s) upon receipt. Wet samples may increase the TAT if air-drying is needed required. ACZ assigns a Project Manager to all of our clients. Your Project Manager is Max Janicek. Max will serve as your main point of contact for all bottle orders, report statuses, questions on your data and changes to your account, and can be reached at maxj@acz.com or 970-879-6590 ext 128.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Cynthia Parnow
Knight Piesold and Co.
1999 Broadway, Suite 900
Denver, CO 80202

3/9/2020

Quote Number: ABA-1312

CONTRACT DETAILS
Pricing includes coolers, bottles pre-preserved as needed, labels, COCs and ice-packs shipped to your site or office via UPS ground. Return shipping is the responsibility of the client. Please allow three to five days for delivery when ordering containers. ACZ must be notified prior to receiving samples of all special requests such as electronic data deliverables or special reporting requirements. The client will be charged for special sample containers or express shipping and additional charges may apply for non-standard requests.

This quotation is valid for six months from the bid date unless specified otherwise in the bid. All bids must be signed and returned to ACZ before the project(s) is received. The authorized signature represents acceptance of the pricing as well as the general terms and conditions of ACZ Laboratories, Inc. which may be downloaded from our web site at http://www.acz.com/wp-content/uploads/2015/10/ACZ_Terms_Conditions.pdf. Please note that MDL's in this quote may possibly increase due to sample matrix or samples with high TDS.

All orders that require shipping of coolers are subject to a minimum charge of $200.00. Local orders without shipping are subject to a minimum charge of $125.00. Samples may incur a $11.00/sample disposal fee for any samples deemed to be hazardous.

ACZ Representative (Authorized signature and date) ______________________

Client Representative (Authorized signature and date) [signature] 3/10/20

APPENDIX H

Preliminary Services Rock Slopes Hazards Terrain Hazards and Site Reconnaissance

(Pages H-1 to H-74)

APPENDIX H
ROCK SLOPE HAZARDS

1.0 INTRODUCTION

Rock slopes occur adjacent to various components of the J.C. Boyle, Copco No. 1, Copco No. 2 and Iron Gate Hydropower Facilities. These include slopes that were cut to construct the facilities and cut slopes along roads as well as natural terrain slopes upslope from the facilities. These rock slopes are potential sources zones for rock falls and rock slides. Rock fall and rock slide hazards in these areas pose a possible impact to the safety of workers engaged in decommissioning the facilities. A basic rock fall hazard can be reasonably made with respect to potential source zones, block sizes and impact energies; however, it can become extremely challenging to reliably identify all potential source zone. Rock fall events notoriously occur with little or no warning.

The rock slope hazards have been identified by undertaking terrain analysis and site reconnaissance. The terrain analysis comprised geomorphic interpretation of the Bare Earth Digital Elevation Models (DEM), contour maps, the project orthorectified imagery and Google Earth imagery. Mapping was undertaken with the aid of the Geographic Information System (GIS) program Global Mapper. Terrain hazard maps have been developed. The maps distinguish recent and relict landslides and rock falls. Recent events are interpreted to have occurred within the last 100 years whereas relict events are interpreted to be greater than 100 years old and therefore to pre-date construction of the facilities.

A preliminary site reconnaissance was undertaken on July 8, 2019 by Mr. James Haley and Ms. Jessica Galavan of KP. Field truthing was undertaken on December 17, 2019, by Mr. Carlos Chaparro and Ms. Gwen James of KP. The weather was warm and dry during the July 8, 2019 preliminary site reconnaissance. During the December 2019 fieldwork, the weather was dry with temperatures mainly between 32 and 40° F, and the slopes were free of snow.

2.0 J.C. BOYLE POWER CANAL

There are man-made cut slopes adjacent to most of the J.C. Boyle Power Canal alignment. Natural slopes present an additional potential source zone for rock fall between approximately STA. 85+00 and 97+00.

2.1 TERRAIN ANALYSIS

The terrain analysis study area for the J.C. Boyle Power Canal extends upslope on both sides of the Klamath River to a major break in slope where there is a large reduction in the natural slope angle. Terrain hazards mapping is presented on Figure H1.1 (Sheet 1 to 4).

Rock fall talus is abundant on the natural slopes between the canal alignment and the Klamath River. Rock fall paths were mapped in areas where large angular talus blocks occur down slope from a dissected portion of the cliff line. The rock fall paths were assigned to one of three categories based upon a basic assessment of the age of past slope instability. The talus generally comprises weathered blocks, which are interpreted to have been mainly generated by rock falls that pre-date the construction of the canal (i.e. events more than 100 years old). These paths are mapped as ‘relict rock fall’.

There is evidence that the power canal has locally been affected by rock falls. PacifiCorp provided photographic records of a rock fall incident that affected the power canal. These paths are identified as 'recent rock fall'. Other rock fall paths were identified where rock blocks with fresh surfaces were identified but it was uncertain whether the rock fall activity occurred during the past 100 years. These are mapped as 'rock fall' paths.

A copy of one of the photos supplied by PacifiCorp showing damage caused to the canal by a rock fall is included as Figure H2.1. It is interpreted from the photos supplied that the incident occurred at approximately Sta. 90+50, the rock fall initiated on a natural rock cliff upslope from the powerhouse access road (Figure H2.2) and the rock fall damaged the outer concrete wall of the canal resulting in water exiting down slope. It seems from the photos that the incident caused gully erosion on the slope between the canal and the Klamath River and that rock fill was placed over the affected area as a remedial measure. The date of the incident is not known. The interpreted runout path of the rock fall is shown on Figure H1.1 (Sheet 4). Figure H2.1 shows the canal was possibly affected by another rock fall or a rock slide at approximately Sta. 95+00.

There has possibly been recent rock fall activity on the upslope side of the canal between Sta. 28+00 and 32+00, Sta. 59+00 and 63+00 and Sta. 66.50 and Sta. 67.00. Possible recent rock fall activity was mapped on the down slope side of the canal between Sta. 45.50 and Sta. 47.50.

A recent rock slide was mapped on a cliff upslope from Sta. 94+50 of the canal alignment. The source zone is upslope from the powerhouse access road and the maximum extent of the runout is interpreted to be in the vicinity of the road. A recent rock slide was mapped on the down slope side of the power canal at Sta. 45+00 and a relict rock slide was mapped on the down slope side at Sta. 71+00. The source zone of a possible relict rock slide was mapped upslope from the canal at Sta. 59+00. The source zone is approximately 100 ft. wide, 165 ft. long and 23 ft. deep. Talus extends down slope from the source zone to the Klamath River. Another possible rock slide source zone was mapped on the opposite side of the valley to this. There is a concentration of large boulder-size talus blocks along the reach of the Klamath River downstream from Sta. 59+00. It is possible these talus blocks are part of the deposit from one or both the relict rock slides mapped on the valley side slopes at Sta. 59+00. Convex slope breaks were mapped on the left bank of the river at Sta. 62+00. It is possible that the river was temporarily blocked by rock slide debris at this location and that the debris dam was subsequently breached at the left bank.

Fill was mapped locally between the canal alignment and the Klamath River. The fill is generally interpreted to be relatively thin comprising side-cast material. Shallow debris slides were mapped in side cast fill at Sta. 37+00 to Sta. 43+00. A broader and thicker fill platform was mapped from approximately Sta. 8+00 to 12+00 (Figure H1.1, Sheet 1). A recent debris slide and an area of gully erosion were mapped on the outer slope of the fill platform at Sta. 9+00 and Sta. 10+00, respectively.

KP was not permitted to access the slopes behind the power canal in both the July 2019 and the December 2019 fieldwork. All observations were made from the road that follows the power canal. This restriction limited the level of data and mapping that could be undertaken.

2.1.1 JULY 2019 FIELDWORK

Figure H2.3 shows the rock slopes adjacent to the downstream portion of the power canal. The discontinuities within the rock mass are generally moderately closely spaced with a tabular pattern. There are sub-vertical joints with moderately wide to wide apertures (Figure H2.4). It is interpreted the discontinuities have been opened by frost jacking and/or disturbance from the blasting used to form the cut slopes. The jointing pattern and large apertures mean there is potential for toppling.

A possible impact mark from a recent rock fall was observed at approximately Sta. 92+00. A recent rock slide was mapped on the upslope side of the canal at Sta. 63+00 (Figure H2.5). It is interpreted the runout path of the landslide just reached the upslope concrete wall of the power canal.

A rock fall fence has been installed along the powerhouse access road (Figures H2.2 and H2.6). The approximate extent of the rock fall fence is shown on Figure H1.1.

2.1.2 DECEMBER 2019 FIELDWORK

Selected photos from the December 2019 fieldwork are presented in Figures H2.7 to H2.12.

The discontinuities in the rock mass in the cut slopes show columnar structure where cooling joints predominate and blocky structure where tectonic joints predominate. The joints often have wide or very wide apertures and are closely to moderately closely spaced. In general, the rock mass was judged to have a Poor to Fair Rock Mass Rating (RMR) according to the classification system developed by Bieniawski, 1989. The cut slope faces are highly irregular. No 'half barrels' from the formation of the cuts were seen on the slope faces and it is interpreted the formation of the cuts was accompanied by significant overbreak. Considering these observations and the age of the slopes, it is interpreted they were not formed with controlled blasting and this had the effect of opening the discontinuities, creating micro cracks in the rock and producing a 'loose' rock mass that is highly susceptible to rock fall. The rock slopes have been subject to repeated freeze-thaw cycles over many years. This process will have progressively opened the discontinuities exacerbating the rock fall hazard. At Sta. 63+00, tree roots were observed at the back of the source zone of a recent rockfall (Figure H2.10) and it is interpreted the rock fall hazard has been further exacerbated by the expansive growth of tree roots in subvertical discontinuities.

In the portion of the alignment in the vicinity of Sta. 24+00, the lower portion of the cut slope comprises highly fractured red brown volcanic bedrock that is interpreted to comprise the baked contact between two lava flows. The bedrock in the upper part of the cut slope comprises basalt with prominent subvertical cooling joints. The basalt in the upper part of the cut slope is more competent and overhangs have developed at the contact with the underlying material. The combined presence of overhangs and wide subvertical joints in the upper part of the cut slope results in an enhanced rock fall hazard in this area. The source zones of several previous rockfalls were identified in this area as shown on Figure H2.7.

Several rock fall source zones were identified between Sta. 58+00 and 62+00 as shown on Figure H2.9. The occurrence of rock falls in this area seems to be controlled by the intersection of two sub-vertical joint sets with a low angle joint set that provides a release surface.

Rock fall hazards were identified at the following chainage intervals along the canal in the December 2019 fieldwork:

- Sta. 6+00 to 10+00
- Sta. 22+00 to 25+00
- Sta. 30+00 to 54+00
- Sta. 57+00 to 70+00
- Sta. 75+00 to 85+00
- Sta. 88+00 to 97+00

This shows rock fall hazards occur along at least 60 % of the alignment. It is likely, however, that rock fall hazards are also present at additional intervals that could not be inspected.

Several 6 ft to 8 ft-size rock blocks were observed alongside the road adjacent to the power canal in the vicinity of Sta. 43+00 to 48+00, as shown on Figure H2.8. It is uncertain if these are talus blocks from past rock fall events or large blocks of bedrock that were excavated when the cut slopes were formed.

The terrain above the power canal cut slopes is general moderately steep (≥60%) to steep (>70%) with a thin cover of colluvium or rock outcrops. Cobble and boulder size rock blocks occur locally on the natural slopes. There is local potential for boulder fall where the slope surface is covered with rock blocks and is steeper than approximately 30 to 35°. Loose rock blocks may have potential to roll down the slope and reach the power canal corridor.

KP inspected the rock fall attenuator system on the section of the J.C. Boyle Powerhouse Access Road located upslope from approximately Sta. 85+00 to Sta. 90+00 of the power canal. The attenuator was found to be in good functional condition, as shown on Photo H2.13, and no rock fall debris had accumulated. It consists of 10 to 13 ft. high I-Beam posts and two types of mesh (cable mesh and gabion mesh). The attenuator system extends approximately 160 ft. along the slope. It is constructed below a sub-vertical cliff as shown on Figure H2.13 and it is interpreted that the system was designed to protect the road and power canal from rock falls initiating on this cliff.

2.2 RECOMMENDATIONS

As discussed above, KP was not permitted to access the slopes behind the power canal in the July 2019 and December 2019 fieldwork and this restriction limited the level of data that could be collected and mapping that could be undertaken. It is recommended that once the slope can be accessed, more detailed mapping of the rock mass and the rock slope hazards be undertaken to characterize the varying rock fall hazard along the alignment for worker safety. Key data that needs to be collected includes the identification of the key source zones, and the determination of block sizes and impact energies for the design of any mitigation measures.

3.0 J.C. BOYLE POWERHOSE ACCESS ROAD

Rock cut slopes occur locally along the J.C. Boyle Powerhouse Access Road. Rock cliffs upslope from the road present possible additional source zones for rock fall.

3.1 TERRAIN ANALYSIS

The terrain analysis Study Area for the J.C. Boyle Powerhouse Access Road extends upslope on both sides of the Klamath River to a major break in slope where there is a large reduction in the natural slope angle. Terrain hazards mapping is presented on Figure H1.2. The mapping distinguishes between recent and relict landslides and rock falls.

There are rock cliffs on the natural slopes above the road and on the natural slopes on the opposite side of the Klamath River valley. Rock fall talus is present on the lower portions of the natural slopes especially those on the opposite side of the river to the road. Rock fall paths were mapped in areas where large angular talus blocks occur down slope from a dissected portion of cliff line. The rock fall paths were assigned to one of three categories based upon a basic assessment of the age of past slope instability. The talus slopes generally comprise weathered blocks and are interpreted to more than 100 years old. These paths are mapped as 'relict rock fall'. There is evidence the road has locally been affected by rock falls. These paths are identified as 'recent rock fall'. Other rock fall paths were identified where rock blocks with fresh surfaces were identified but it was uncertain whether the rock fall activity occurred during the past 100 years. These are mapped as 'rock fall' paths.

PacifiCorp provided photographic records of a rock fall incident that affected the road and power canal. It is interpreted from photos supplied by PacifiCorp that the rock fall occurred at Location 1 on Figure H1.2, and that the rock fall initiated on a natural rock cliff upslope from the powerhouse access road, as shown on Figure H3.5. The rock fall damaged the outer concrete wall of the canal resulting in water exiting down slope. The date of the incident is not known. The interpreted runout path of the rock fall is shown on Figure H1.2.

A recent rock slide was mapped on a cliff upslope from the road at Location 2 (Figure H1.2). The maximum extent of the runout is interpreted to be in the vicinity of the road.

Two recent debris slides were mapped on a natural slope above the road at Location 5 (Figure H1.2). The maximum extent of the debris runout is interpreted to be in the vicinity of the road. A recent debris slide was mapped on a slope on the down slope side of the road at Location 6 (Figure H1.2). This landslide possibly occurred in fill material. Gully erosion extends down slope from the landslide scar to the Klamath River.

3.2 SITE RECONNAISSANCE

3.2.1 JULY 2019 FIELDWORK

The bedrock geology along the road alignment generally comprises medium strong, fine-grained volcanic rock with closely to moderately closely spaced joints; lenses of very weak, white diatomite with very closely spaced discontinuities are exposed in the road cut at Location A (Figure H3.1).

The presence of angular cobble and boulder size blocks at the toe of the cut slopes provide evidence of past rock falls from the cut slopes. At Location A, there is an approximately 6 ft. to 12 ft. high sub-vertical slope section of highly fractured rock at the crest of the cut slope that presents additional evidence of a rock fall hazard zone (Figure H3.1).

A recent rock slide was mapped in a cut slope at Location 3 as shown on Figure H1.2 and Figure H3.2. The source zone of the landslide is approximately 33 ft. long, 23 ft. wide and up to 6 ft. deep. A recent rock slide in a cut slope was also mapped at Location 4, as shown on Figure H1.2 and Figure H3.3. The source zone of this landslide is approximately 33 ft. long, 16 ft. wide and up to 6 ft. deep. The geology at Locations 3 and 4 comprises moderately to highly weathered and highly fractured volcanic rock. There is also a rock fall hazard at a cliff located upslope from the cut slope at Location 4.

A rock fall fence has been installed locally along the powerhouse access road (Figure H3.4). The rock fall hazard zone upslope from the fence is shown on Figure H3.5.

3.3 RECOMMENDATIONS

The recommendations described above for the power canal also applies to the J.C. Boyle Powerhouse Access Road.

4.0 J.C. BOYLE SURFACE PENSTOCK

Figure H4.1 presents an excerpt of the project orthorectified imagery showing the surface penstock of the J.C. Boyle Hydropower Facility.

4.1 TERRAIN ANALYSIS

The terrain analysis did not identify any hazards in the vicinity of the surface penstock.

4.2 SITE RECONNAISSANCE

4.2.1 DECEMBER 2019 FIELDWORK

The terrain adjacent to and upslope from the surface penstock was inspected in the December 2019 fieldwork. The penstock follows an approximately 5 to 10 ft deep excavation, as shown on Figure H4.1. The angle of the side slopes is generally less than 30°. The side slopes comprise overburden soil with occasional loose rock blocks. Bedrock was observed locally on the floor of the excavation.

No landslides, tension cracks or other signs of slope instability were observed along or in the vicinity of the penstock corridor. Immediately above the penstock corridor (i.e. above the exit tunnel portal) the topography consists of vegetated slopes with numerous cobble and boulder size rock blocks. Rock blocks were observed in close vicinity to the penstock tunnel portal and it is interpreted the portal and the penstock trench are affected by a boulder fall hazard.

4.3 RECOMMENDATIONS

Further field assessment of the boulder fall hazard affecting the surface penstock corridor is recommended for worker safety.

5.0 ROCK SLOPES AT WEST ABUTMENT OF COPCO NO.1 DAM

There is an approximately 30 ft. high, very steep cliff at the west abutment of the Copco No. 1 Dam.

5.1 TERRAIN ANALYSIS

Rock fall paths with possible recent activity were mapped in the west part of the cliff line at the west abutment of the Copco No. 1 Dam as shown on Figure H1.3.

5.2 SITE RECONNAISSANCE

5.2.1 JULY 2019 FIELDWORK

It was identified in the July 2019 fieldwork that draped mesh has been installed locally on the cliff face at the west abutment of the Copco No. 1 Dam as shown on Figure H1.3 and Figure H5.1. It is interpreted the mesh was installed as a mitigation measure although it is not known if this work was undertaken in response to a recent rock fall event. There is a rock cut slope below the access road to the right abutment and above the powerhouse as shown on Figure H5.2.

5.3 RECOMMENDATIONS

It is recommended that more detailed mapping of the slopes adjacent to the west abutment of the Copco No. 1 Dam be undertaken to characterize the varying rock fall hazards for worker safety.

6.0 SLOPES ABOVE THE RIGHT RIM OF THE COPCO NO. 2 RESERVOIR

The slopes above the right rim of the Copco No. 2 Reservoir are shown on Figure H6.1.

6.1 COPCO NO. 1 POWERHOUSE ACCESS ROAD

The Copco No. 1 Powerhouse Access Road is in an incised reach of the Klamath River Valley with steep side slopes. This road extends from Sta. 0+00 to Sta. 18+70 (i.e. a total length of 1870 ft). The proposed widening of the Copco No. 1 Powerhouse Access Road consists of enlarging the existing side hill cuts (mainly from Sta. 1+00 to 4+00, Sta. 5+50 to 7+50, and Sta. 8+50 to 12+00) and locally placing fill on the down slope side of the road (mainly from Sta. 13+00 to Sta. 17+00).

6.1.1 TERRAIN ANALYSIS

The terrain analysis study area for the Copco No.1 Powerhouse Access Road extends upslope on both sides of the Klamath River to a major break in slope where there is a large reduction in the natural slope angle. The valley side slopes include rock cliffs with talus slopes at their toes. There are rock cut slopes along the road alignment. Fill has been placed down slope from the road on the lower slopes. It is interpreted this material comprises side-cast fill.

Rock fall paths were mapped in areas where large angular talus blocks occur down slope from a dissected portion of cliff line. The local presence of angular cobble and boulder size blocks at the toe of the cut slopes provides evidence of past rock falls from the cut slopes The rock fall paths were assigned to one of three categories based upon a basic assessment of the age of past slope instability. The talus at the toe of the rock fall paths generally comprises weathered blocks that are interpreted to more than 100 years old. These paths are mapped as ‘relict rock fall’. Any events that could be confidently interpreted as being less than 100 years old were identified as ‘recent rock fall’. Other rock fall paths were identified where rock blocks with fresh surfaces were identified and it is possible that rock fall activity occurred during the past 100 years. These are mapped as ‘rock fall’ paths. The relict rock fall paths are interpreted to cross the road alignment locally, as shown on Figure H1.3.

A relict rock slide was mapped on a very steep cliff at the west abutment of the Copco No. 1 Dam. The landslide scar is located approximately 350 ft. north from the abutment, as shown on Figure H1.3.

A recent debris slide was mapped at a switch-back of the road as shown on Figure H1.3. An historic air photo interpretation, undertaken as part of the rim stability study (KP, 2019) showed the landslide developed before 1991 and there was no significant change between 1991 and 2016. A recent debris slide was mapped on an access track in the north part of the Study Area.

A boulder fall hazard was mapped on some natural slopes in the northeast part of the Study Area, as shown on Figure H1.3. The runout paths of these hazards do not extend to the Copco No. 1 Dam Access Road.

6.1.2 SITE RECONNAISSANCE

6.1.2.1 JULY 2019 FIELDWORK

The valley side slopes include rock cliffs with talus slopes at their toes (Figure H6.2). The rock cliffs on the valley sides comprise basalt bedrock. The cliffs have high persistence sub-vertical columnar joints (Figure H6.3), which renders them prone to topping failure due to ongoing frost jacking during the winter months.

There are rock cut slopes along the road alignment. Fill has been placed down slope from the road on the lower slopes. It is interpreted this material comprises side-cast fill. Figure H6.4 shows a roadside fill slope adjacent to the Copco No. 2 Dam. This road extends from Sta. 0+00 to Sta. 18+70 (i.e. a total length of 1,870 ft).

A crib wall has been constructed at the toe of a rock cliff upslope from the South Abutment of the Copco No. 2 Dam (Figure H1.3 and Figure H6.5). It is inferred that the crib wall was constructed as a mitigation measure in response to a recent rock fall event. The hazard zone extends laterally beyond the limits of the crib wall and it should therefore be assumed that the development of a construction access road to the South Abutment of the Copco No. 2 Dam would be affected by a rock fall hazard.

The recent debris slide at a switch-back of the road is shown on Figure H6.6. It is approximately 50 ft. wide, 50 ft. long, and up to 8 ft. deep with a volume of approximately 20,000 ft^3. There has been recent rock fall activity from a cliff at the west margin of the landslide scar as shown on Figure 5. The surficial geology at the site of this landslide comprises an unwelded pyroclastic deposit comprising sand and gravel size particles. The material is bedded and locally has coarser particles intermixed with finer ones as shown on Figure H6.7. It is interpreted the deposit was reworked by fluvial processes. An approximately 3 ft. gabion wall has been constructed at the slope toe. The wire mesh of the gabion wall is damaged locally.

6.1.2.2 DECEMBER 2019 FIELDWORK

<u>Slopes above the existing road from Sta. 1+00 to Sta. 4+00 (switch back at the road):</u>

The slope directly above Sta. 1+00 to 4+00 of the road consists of an approximately 65°, 25 to 40-ft. high cut slope, as shown on Figure H6.8. An abandoned road (approximately 5 to 10-ft. wide) is present above the cut slope along the initial part of the alignment. The cut slope above Sta. 1+00 to 4+00 consists mainly of interbedded sand layers and sandy gravel layers (unwelded pyroclastic deposits), and localized outcrops of weathered bedrock. The steep slope angle is an indication the slope material has some cohesion. Cut slope instability has occurred across an approximately 20-ft. wide zone in the vicinity of Sta. 4+00 (Figure H6.9). The failure is possibly 10 to 15 ft. deep). The failure surface shows scarp zones in the upper third of the cut slope, and landslide debris has accumulated at the toe (road level). One row of gabion baskets is in-place at the edge of the road below the failed zone. The gabion baskets are retaining soil from slope instability that occurred after its installation, and slow and continuous erosion seems to be occurring at this location.

The area upslope from the cut slope consists of a vegetated natural 20 to 25° slope. No tension cracks, or other signs of slope distress were observed in this area.

Slopes above the existing road from Sta. 5+00 to 5+50:

The slope above the section of the road from Sta. 5+00 to 5+50 is up to 20 ft. high with a slope angle of approximately 30° (Figure H6.10). The slope consists of a mix of overburden and rock outcrops comprising medium strong, moderately weathered volcanic rock. The surface of the slope seems to be experiencing erosion.

Slopes above the existing road from Sta. 5+50 to 7+30:

The slope above the section of the road from Sta. 5+50 to 7+30 consists of a semi-vertical rock cut and is up to about 30 ft. in height, as shown on Figure H6.11 and H6.12. Above this slope, the slope consists of a vegetated natural slope.

The bedrock along the rock cut consists mainly of moderately weathered to highly altered, medium strong, blocky, fine-grained volcanic rock, with no distinct discontinuity pattern. Layers of completely weathered material are embedded in between blocks of rock. There are local fresh surface and overhangs that mark locations where rock blocks have detached from the cut face. The environmental conditions prevalent at the site (rain, freeze-thaw conditions, surface run off) likely contributed to the occurrence of past rock falls.

The condition of the natural slope above the cut was obscured by vegetation making visual observations difficult. There were no obvious tension cracks or other signs of slope distress.

Slopes above the existing road from Sta. 7+30 to 9+50:

The lower slope immediately above the section of the road from Sta. 7+30 to 9+50 is approximately 40 ft. in height and slopes at 45°. The slope is blanketed talus blocks 15 to 35 ft^3 in size with intermittent outcrops of moderately weathered volcanic bedrock with blocky and columnar jointing. The slope is partially covered by vegetation (Figure H6.13). There is potential for local rock falls and boulder falls with relatively short run-out.

The upper slope comprises an approximately 50 ft. high, sub-vertical cliff. The cliff consists of medium strong to very strong bedrock with curved columnar structures 10 to 20 ft. high. The columns become disordered and distorted in the upper part of the slope. It is evident that the columns have experienced a gradual process of crack propagation and detachment and talus has accumulated at the toe of the cliff. The discontinuity pattern of the bedrock makes the cliff a clear source for rock fall. The rock fall potential is exacerbated by the development of 3 to 8 ft. overhangs at the toe of the columns as shown on Figure H6.13. Environmental factors prevalent at the site including rain, freeze-thaw conditions and surface run off also contribute to the rock fall hazard.

Rock falls may consist of a single rock fragment or a group of rock fragments detaching off the cliff. Rock fall blocks can vary from very small to boulder size.

Slopes above the existing road from Sta. 9+50 to 11+00:

The slope immediately above this section of the road is approximately 40 to 60 ft. in height, and consist of moderately to highly weathered, medium strong, very blocky to blocky, fractured volcanic rock with randomly oriented discontinuities (Figure H6.14 and H6.15). The overall slope angle is approximately 45°. Rock fall hazards are evident on the slope face. Rock blocks up to approximately 100 ft^3 in size were identified, which have potential to detach due to adverse discontinuity orientations in relation to the rock face. In addition to the loose fractured nature of the rock mass, other factors contributing to the rock fall hazard are the rain, freeze-thaw conditions, and surface run off.

Slopes above the existing road from Sta. 11+00 to 12+00:

The lower slope in this slope segment has an overall angle of approximately 45° and is approximately 50 ft. high. The surficial material is a combination of overburden and intermittent bedrock outcrops, as shown on Figure H6.16. There are no obvious signs of slope instability.

There is an approximately 60° cliff above the lower slope. The cliff consists of a combination of medium strong to very strong, moderately weathered volcanic rock with columnar joints of 5 to 10 ft persistence and very blocky volcanic bedrock.

The cliff generally has wide discontinuities creating a 'loose' rock mass with a rock fall hazard. Rock block sizes are generally in the order of 35 ft.^{3} but locally larger. Factor contributing to the rock fall hazard are the 'loose' nature of the rock mass, adversely oriented discontinuities and environmental factors prevalent at the site including rainfall, freeze-thaw conditions and surface run off.

Slopes above the existing road from Sta. 12+00 to 13+00:

The slope immediately above this section of the road is approximately 35 to 40° and consists mostly of talus. The talus blocks are mainly 15 to 35 ft^3 in size (Figure H6.17). The slope angle approximates to the angle of repose of the talus material.

There is an approximately 30 ft. high sub-vertical cliff above the talus slope. The cliff consists of a combination of medium strong to very strong, moderately weathered volcanic rock with columnar joints of 5 to 10 ft persistence and very blocky volcanic bedrock

It is evident that the columns have experienced a gradual process of crack propagation and block detachment as talus blocks are present at the toe of the cliff. The cliff therefore is a source of potential rock fall. The coarse angular nature of the talus slope may impede the movement of some rock fragments detaching off the cliff. Rock falls may consist of single or multiple block detachments. Rock fall sizes can vary from very small to boulder size.

Slopes above the existing road from Sta. 13+00 to 18+00

There is a vegetated slope dipping at approximately 35 to 40° above this section of the road (Figure H6.18). The surface of the slope comprises dense sandy gravel soil with some organics. No bedrock outcrops were observed on this slope, and the thickness of the overburden material could not be identified in the site reconnaissance. No tension cracks or other possible indicators of slope distress were identified.

6.2 COPCO DISPOSAL SITE ACCESS ROAD

This proposed Copco Disposal Site Access Road extends from Sta. 0+00 to Sta. 10+50 (i.e. a total length of 1050 ft). The road will be formed by widening an existing track by enlarging existing cut slopes (mainly from Sta. 1+00 to 2+50 and Sta. 5+50 to 10+50) and placing fill on the lower side of the road (mainly from Sta. 1+80 to Sta. 4+50).

6.2.1 SITE RECONNAISSANCE

6.2.1.1 DECEMBER 2019 FIELDWORK

Slopes above the proposed road alignment from Sta.0 to Sta. 3+50

Up to about Sta. 3+050, the lower slope above the proposed Copco Disposal Site Access Road alignment consists mostly of a combination of talus blocks and bedrock outcrops (Figure H6.19). The lower slope is approximately 30 ft. high with a slope angle of approximately 45°. No obvious indicators of slope instability were observed.

The upper slope comprises a 10 to 20-ft-high cliff. The cliff consists of strong blocky volcanic rock with horizontal and vertical fractures. In general, the fractures are rough and stepped, very close to moderately spaced (0.75 inch to 2 ft.) and exhibit low persistence (3 to 10 ft.). The fracture pattern does not indicate clear potential for kinematic failure. Nonetheless, there are local rock blocks with potential to detach as rock falls. The rock fall hazard is exacerbated by environmental factors, including rainfall, freeze-thaw conditions and surface runoff.

Slopes above the proposed road alignment from Sta. 3+50 to 4+50:

The slope above this section of the proposed road alignment consists an approximately 60 to 80-ft. high cliff (Figure H6.20). The cliff consists of a combination of medium strong to very strong volcanic bedrock with vertical and inclined, columnar structures (in the order of 10 to 20 ft. in length), and strong, blocky volcanic rock with an interlocked rock mass. No signs of potential large-scale slope instability were observed. However, local areas on the cliff face present rock fall hazards. These include overhangs beneath columnar structures that create potential for toppling failure and potential sliding surfaces in the blocky bedrock. The rock fall hazard is exacerbated by environmental factors, including rainfall, freeze-thaw conditions and surface runoff. Rock fall may consist of single blocks or a group of rock blocks detaching off the cliff. Rock fall block sizes can vary from very small to boulder size.

Slopes above the existing road from Sta. 5+50 to 11+00

The lower slope immediately above this section of the road is approximately 40° (Figure H6.21). The slope surface is vegetated and consists of a combination of dense sandy gravel soil with some organics, and some bedrock outcrops. No obvious indicators of slope instability were observed.

The upper slope is a sub-vertical cliff consisting of a medium strong to very strong volcanic bedrock with columnar structures that are approximately 20 to 30 ft. high. The columns are prone to toppling, and therefore this cliff is a source of potential rock fall. The rock fall hazard is exacerbated by environmental factors, including rainfall, freeze-thaw conditions and surface runoff.

6.3 HAIRPIN TURN

The proposed Hairpin Turn comprises an approximately 50 ft. 'push back' of the existing slope.

6.3.1 SITE RECONNAISSANCE

6.3.1.1 DECEMBER 2019 FIELDWORK

The proposed Harpin Turn footprint is at the site of an approximately 50 ft. high 35 to 40° uniform slope, as shown on Figure H6.22. The slope surface comprises dense sandy gravel soil with some organics. No bedrock outcrops were observed. The thickness of the overburden material could not be identified in the site reconnaissance. No obvious indicators of slope instability were observed.

There is an approximately 30 to 50 ft. high sub-vertical cliff located upslope from the 40° slope. The cliff consists of a combination of medium strong to very strong volcanic bedrock with sub-vertical, columnar structures, which are approximately 5 to 10 ft. long, and, strong blocky volcanic rock. No signs of large-scale slope instability were observed. However, there are local rock fall hazards related to overhangs at the base of columnar structures and to discontinuities with potential for planar failure in the blocky rocks. Rock fall potential is exacerbated by environmental conditions prevalent at the site including rainfall, freeze-thaw conditions and surface runoff.

6.4 RECOMMENDATIONS

It is recommended that more detailed mapping of the rock mass and the rock slope hazards be undertaken for additional characterization of the rock fall hazards for worker safety. Key data that needs to be collected includes the identification of the key source zones, and the determination of block sizes and impact energies for any mitigation measures.

7.0 SLOPES ABOVE THE LEFT ABUTMENT OF THE COPCO NO. 2 DAM

There is a subvertical rock cliff above the left abutment of the Copco No. 2 Diversion Dam, as shown on Figure H7.1.

7.1.1 SITE RECONNAISSANCE

7.1.1.1 DECEMBER 2019 FIELDWORK

The rock cliff above the left abutment of the Copco No. 2 Diversion Dam was inspected from its toe as well as from the right abutment of Copco No. 2 Dam in the December 2019 fieldwork. There are four sub-cliffs. A timber crib wall has been constructed below the upper cliff (Figure H7.1). In general, the cliff consists of medium strong to very strong volcanic bedrock with curved columnar structures that are in the order of 30 ft. in height (Figure H7.2). The columnar jointing is less obvious in the vicinity of the crest of the cliff. The slopes between the sub-cliffs are vegetated with moss, grass and small trees.

No obvious indicators of large-scale slope instability were observed. However, rock fall hazards were identified from the local presence of overhangs, and the local presence of fresh surfaces. The rock cliff extends in a southwest direction downstream of the dam. Rock fall talus was observed at the toe of the cliff in this area as shown on Figure H7.3, showing that the rock fall hazard extends to this area. Factors contributing to the rock fall hazard are the wide and persistent nature of the discontinuities, the presence of overhangs and the expansive growth of tree roots. The hazard is exacerbated by environmental factors including rainfall, freeze-thaw conditions, and surface runoff. The vegetation cover on the slope limited the ability to observe the slope hazards.

The slope area immediately above the intake structure was inspected. Several rock blocks (approximately 35 ft^3 in size) were observed as shown in Figure H7.4, showing that some rock falls have potential to reach this area.

A timber crib is located at the left bank upstream of the diversion dam centerline (Figure H7.1). It is understood the structure was constructed to protect the crusher from possible rocks falls during construction of the dam. The timber crib location is outside the area of influence of the intake structure. i.e. it will not provide rock fall protection to workers stationed in the area of the intake structure, and in the unlikely event of its failure, debris from the structure would not be expected to affect the work area at the intake.

7.2 RECOMMENDATIONS

It is recommended that more detailed mapping of the rock mass and the rock slope hazards be undertaken for additional characterization of the rock fall hazards for worker safety. Key data that needs to be collected includes the identification of the key source zones, and the determination of block sizes and impact energies for any mitigation measures.

8.0 COPCO NO. 2 DAM ACCESS ROAD AND WOOD STAVE PENSTOCK

Rock and soil cut slopes occur adjacent to the access road to the Copco No. 2 Dam and adjacent to the wood stave penstock of the Copco No. 2 Hydropower Facility. Rock cliffs upslope from the road are possible additional source zones for rock fall.

8.1 TERRAIN ANALYSIS

The terrain analysis study area includes the upslope and downslope areas of natural terrain. The Copco No. 2 Dam Access Road and Copco No. 2 Wood-Stave Penstock are located on the south side of an incised reach of the Klamath River Valley, as shown on Figure H1.4. The natural slopes on the south side of the river valley are generally moderate to moderately steep and mainly planar or convex. There are moderately steep natural slopes directly upslope from the proposed road alignment between approximately Sta. 4+00 and 7+00. The road alignment traverses several ephemeral drainage lines/minor gullies and there is a gulch approximately midway along the alignment. The upper slopes of the valley comprise a lava flow escarpment in the vicinity of the Copco No. 2 Dam. A lava flow escarpment extends along the full length of the adjacent (north) side of the valley and there are no cross-cutting gulley's or gulches.

The terrain analysis did not identify obvious large-sized areas of recent natural slope instability in the vicinity of the road and penstock alignments. A semi-circle-shaped convex slope break was identified down slope from the road alignment in the vicinity of Sta. 10+00. This feature is possibly the back scarp of a relict landslide. If this feature is a landslide it is likely very old since there is no obvious accumulation of debris down slope from the convex slope break.

The lava flow escarpment in the vicinity of the Copco No. 2 Dam has high persistence sub-vertical columnar joints, which render the escarpment prone to topping failure. A primary cause of toppling is likely to be frost jacking during the winter months. Rock fall paths were mapped in areas where large angular talus blocks occur down slope from a dissected portion of the cliff line. The rock fall paths were assigned to one of three categories based upon a basic assessment of the age of past slope instability. The talus slopes generally comprise weathered blocks and are interpreted to more than 100 years old. These paths are mapped as 'relict rock fall'. Any events that could be confidently interpreted as being less than 100 years old were identified as 'recent rock fall'. Other rock fall paths were identified where rock blocks with fresh surfaces were identified and it is possible that rock fall activity occurred during the past 100 years. These are mapped as 'rock fall' paths. The east part of the proposed road alignment extending from approximately Sta. 31+00 to Sta. 35+00 crosses the rock fall hazard zone in the vicinity of the Copco No. 2 Dam as shown on Figure H1.4. In addition, there are other possible local rock fall hazards where smaller rock cliffs occur upslope from the alignment, for example in the vicinity of Sta. 10+50.

Several relatively small-sized back scarps were mapped in the existing roadside cut and fill slopes. These scarps are possible evidence of previous slope instability.

The east-facing natural slope at the west end of the wood stave penstock alignment shows evidence of erosion, as shown on Figure H1.4. An irregular back scarp was identified, and areas of possible sheet erosion/raveling were mapped down slope from the back scarp. A possible boulder fall hazard affects the toe of this slope.

There are rock cut slopes and natural rock slopes above the wood stave penstock. Workers engaged in decommissioning the penstock will therefore possibly be affected by a rockfall hazard. Fill has been placed in the vicinity of the tunnel portals at both ends of the wood stave penstock. The terrain analysis did not identify obvious past instability of the fill slopes.

8.2 SITE RECONNAISSANCE

KP traversed the alignment of the proposed Copco No.2 access road alignment on December 28. 2020. The road starts close to the wood-stave penstock (Sta. 00+00) and extends eastwards for approximately 4000 ft. to the site of the Copco No. 2 Dam. The proposed alignment follows an existing access road alignment to about Sta. 29+00. Figures H8.1 through H8.5 present photos of the proposed road alignment at approximately 100 to 200 ft. intervals.

From Sta. 0+00 to 17+00 the slopes immediately above the proposed access road alignment generally consist of a thin layer of organic sand overlying a sandy soil with some clay. There are local bedrock outcrops in the vicinity of the road alignment. In general, there are no obvious signs of slope distress although there are some local scarps immediately above the proposed road alignment, as shown on Figure H8.1. No rock falls were observed although local rock fall potential was identified above an approximately 100 ft long portion of the alignment in the vicinity of Sta.10+00 where there is a rock cliff consisting of blocky, medium strong to strong rock. Some 'loose' rock blocks were identified as well as local fresh surfaces on the cliff face that might have resulted from past rock falls.

From Sta. 17+00 to 31+00 the terrain above and below the proposed road alignment generally slopes at less than 20°. No geohazards were observed along this interval.

From Sta. 31+00 to Sta. 40+00 the slopes immediately above the proposed alignment consist of either a thin layer of organic sand overlying sandy soil or a combination of bedrock outcrop and boulders. In general, the immediate slope above the road alignment is less than 10 ft high. The same cliff that was described in Section 7.1.1 occurs above these slopes. The cliff consists of medium strong to very strong volcanic bedrock generally with curved columnar jointing. No obvious indicators of large-scale slope instability were observed. However, boulder sized talus has accumulated on the slope below the cliff as shown on Figure H8.4 and extends below the road alignment and therefore there is a potential of rock falls affecting this portion of the road. In addition, overhangs and some possible 'loose' rock fragments were observed on the slope that provide additional evidence of a rock fall hazard. The talus material on the slope might limit the run-out of some rock falls. Talus was not observed on the slope above the road between approximately STA. 38+00 to 39+00.

Factors contributing to the rock fall hazard are the wide and persistent nature of the discontinuities, adverse joint orientations, the presence of overhangs and the expansive growth of tree roots. The hazard is exacerbated by environmental factors including rainfall, freeze-thaw conditions, and surface runoff. The vegetation cover on the slope limited the ability to observe the slope hazards.

8.3 RECOMMENDATIONS

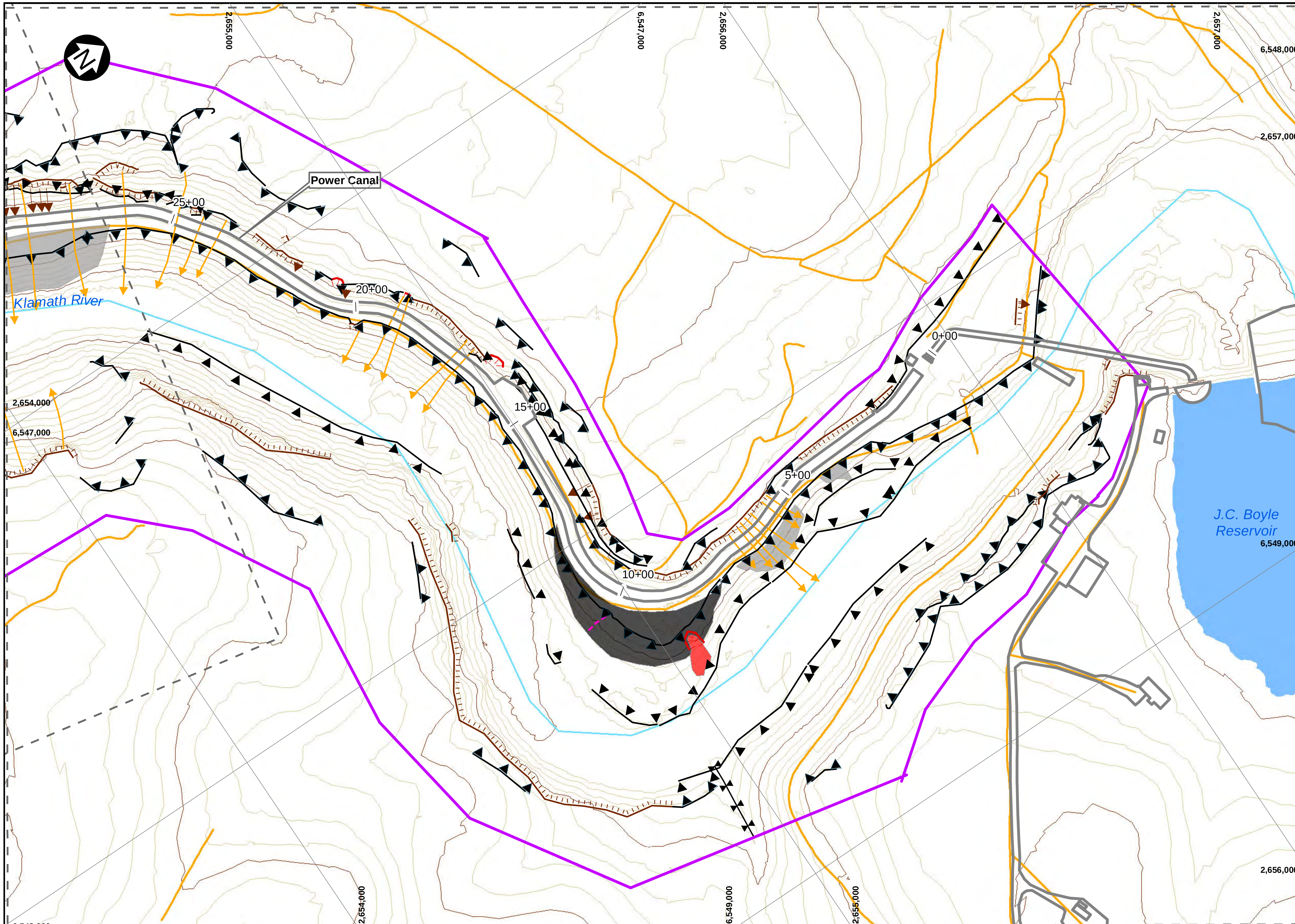
It is recommended that site reconnaissance be undertaken of the slopes adjacent to the wood stave penstock.

9.0 ROCK SLOPES AT ABUTMENTS OF IRON GATE DAM

There are rock slopes at both abutments of the Iron Gate Dam. The rock slope at the Right Bank is adjacent to the spillway and the rock slope at the Left Bank is adjacent to the surface penstock. These rock cut slopes were not inspected in the July 2019 or the December 2019 fieldwork.

9.1 RECOMMENDATIONS

It is recommended that more detailed mapping of the rock mass and the rock slope hazards be undertaken to characterize the varying rock fall hazard for worker safety. Key data that needs to be collected includes the identification of the key source zones, and the determination of block sizes and impact energies for the design of any mitigation measures.



LEGEND:

GENERAL
- CONTOUR 100 FT
- CONTOUR 10 FT
- RIVER/STREAM
- LAKE
- ROAD
- EXISTING INFRASTRUCTURE
- CHAINAGE MARKER (FEET)
- STUDY AREA
- MAP SHEET EXTENT

TERRAIN FEATURES
- CONVEX SLOPE BREAK
- CONCAVE SLOPE BREAK
- RIDGELINE
- EPHEMERAL DRAINAGE LINE
- CLIFF
- BACK SCARP
- SIDE-CAST FILL
- FILL PLATFORM

TERRAIN HAZARDS
- RECENT ROCK FALL
- ROCK FALL
- RELICT ROCK FALL
- RECENT DEBRIS SLIDE
- RECENT ROCK SLIDE
- RELICT ROCK SLIDE
- GULLY EROSION

DRAFT

NOTES:

1. BASE MAP: PROJECT LiDAR TOPOGRAPHY.
2. COORDINATE SYSTEM IS IN FEET. COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE CALIFORNIA I FIPS 0401 FEET.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:3,250,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. RECENT LANDSLIDES/ROCK FALLS ARE THOSE INTERPRETED TO HAVE OCCURED WITHIN THE LAST 100 YEARS. RELICT LANDSLIDES/ROCK FALLS ARE INTERPRETED TO BE GREATER THAN 100 YEAR OLD. THOSE ROCKFALLS THAT ARE NOT CATERORIZED AS 'RECENT' OR 'RELICT' COULD NOT BE CLEARLY CHARACTERIZED AS BEING GREATER OR LESS THAN 100 YEARS OLD.

100 50 0 100 200 300 400 500 Feet

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TERRAIN HAZARDS MAP
JC BOYLE POWER CANAL
SHEET 1 OF 4

P/A NO.	FIGURE NO.	REF NO.	REVISION
VA103-640/1	H1.1	2	B

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
B	02DEC'20	ISSUED WITH REPORT	JEH	KK	JEH

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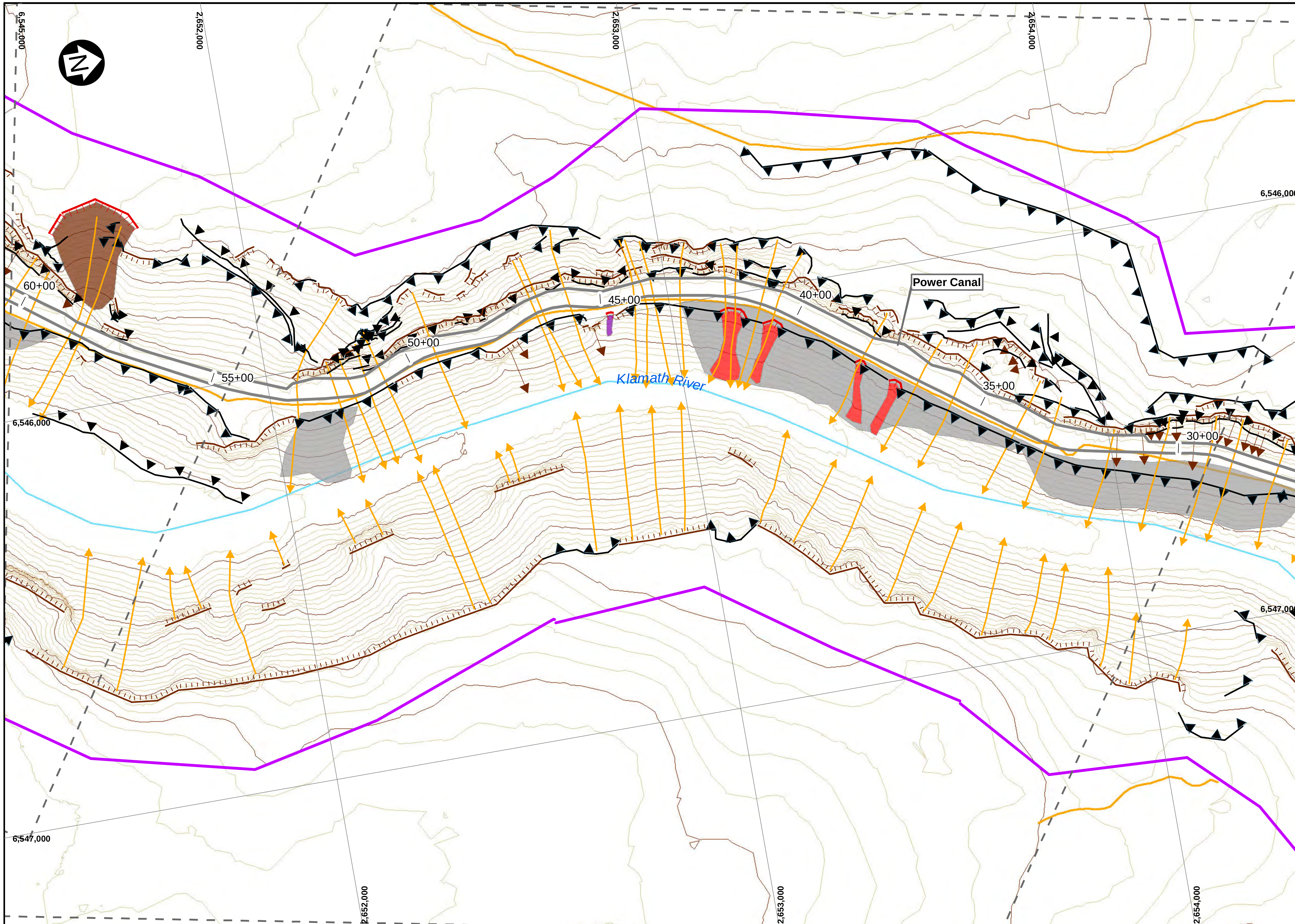

LEGEND:

GENERAL	TERRAIN FEATURES
CONTOUR 100 FT	CONVEX SLOPE BREAK
CONTOUR 10 FT	CONCAVE SLOPE BREAK
RIVER/STREAM	RIDGELINE
LAKE	EPHEMERAL DRAINAGE LINE
ROAD	CLIFF
EXISTING INFRASTRUCTURE	BACK SCARP
CHAINAGE MARKER (FEET)	SIDE-CAST FILL
STUDY AREA	FILL PLATFORM
MAP SHEET EXTENT	**TERRAIN HAZARDS**
	RECENT ROCK FALL
	ROCK FALL
	RELICT ROCK FALL
	RECENT DEBRIS SLIDE
	RECENT ROCK SLIDE
	RELICT ROCK SLIDE
	GULLY EROSION

DRAFT

NOTES:

1. BASE MAP: PROJECT LiDAR TOPOGRAPHY.

2. COORDINATE SYSTEM IS IN FEET.
COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE CALIFORNIA I FIPS 0401 FEET.

3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:3,250,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

4. RECENT LANDSLIDES/ROCK FALLS ARE THOSE INTERPRETED TO HAVE OCCURED WITHIN THE LAST 100 YEARS. RELICT LANDSLIDES/ROCK FALLS ARE INTERPRETED TO BE GREATER THAN 100 YEAR OLD. THOSE ROCKFALLS THAT ARE NOT CATERORIZED AS 'RECENT' OR 'RELICT' COULD NOT BE CLEARLY CHARACTERIZED AS BEING GREATER OR LESS THAN 100 YEARS OLD.

100 50 0 100 200 300 400 500 Feet

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TERRAIN HAZARDS MAP
JC BOYLE POWER CANAL
SHEET 2 OF 4

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
B	02DEC'20	ISSUED WITH REPORT	JEH	KK	JEH

P/A NO.	FIGURE NO.	REF NO.	REVISION
VA103-640/1	H1.1	2	B

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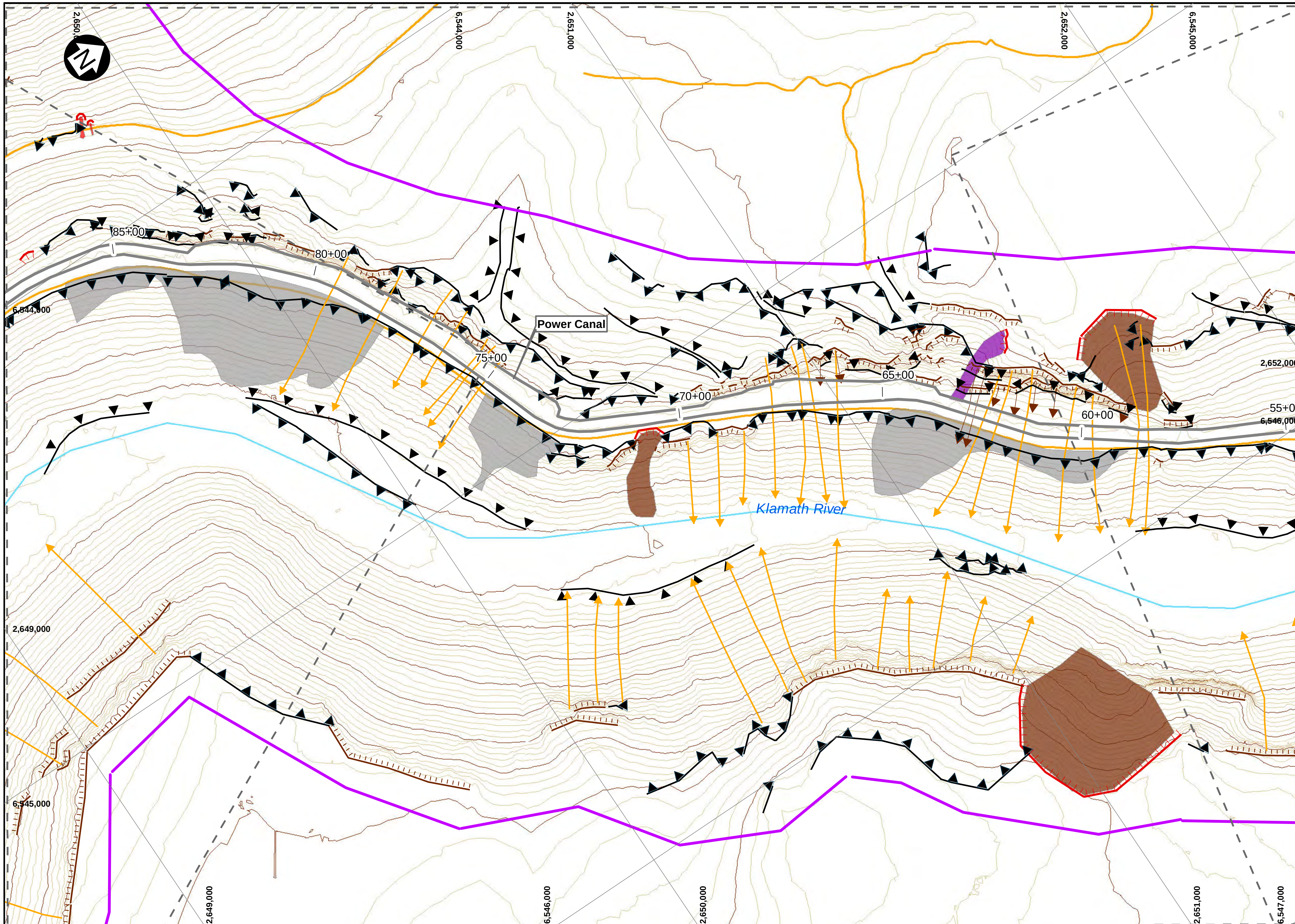

LEGEND:

GENERAL

- CONTOUR 100 FT
- CONTOUR 10 FT
- RIVER/STREAM
- LAKE
- ROAD
- EXISTING INFRASTRUCTURE
- CHAINAGE MARKER (FEET)
- STUDY AREA
- MAP SHEET EXTENT

TERRAIN FEATURES

- CONVEX SLOPE BREAK
- CONCAVE SLOPE BREAK
- RIDGELINE
- EPHEMERAL DRAINAGE LINE
- CLIFF
- BACK SCARP
- SIDE-CAST FILL
- FILL PLATFORM

TERRAIN HAZARDS

- RECENT ROCK FALL
- ROCK FALL
- RELICT ROCK FALL
- RECENT DEBRIS SLIDE
- RECENT ROCK SLIDE
- RELICT ROCK SLIDE
- GULLY EROSION

DRAFT

NOTES:

1. BASE MAP: PROJECT LiDAR TOPOGRAPHY.
2. COORDINATE SYSTEM IS IN FEET. COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE CALIFORNIA I FIPS 0401 FEET.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:3,250,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
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100 50 0 100 200 300 400 500 Feet

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TERRAIN HAZARDS MAP
JC BOYLE POWER CANAL
SHEET 3 OF 4

P/A NO.	FIGURE NO.	REF NO.	REVISION
VA103-640/1	H1.1	2	B

B	02DEC'20	ISSUED WITH REPORT	JEH	KK	JEH
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED

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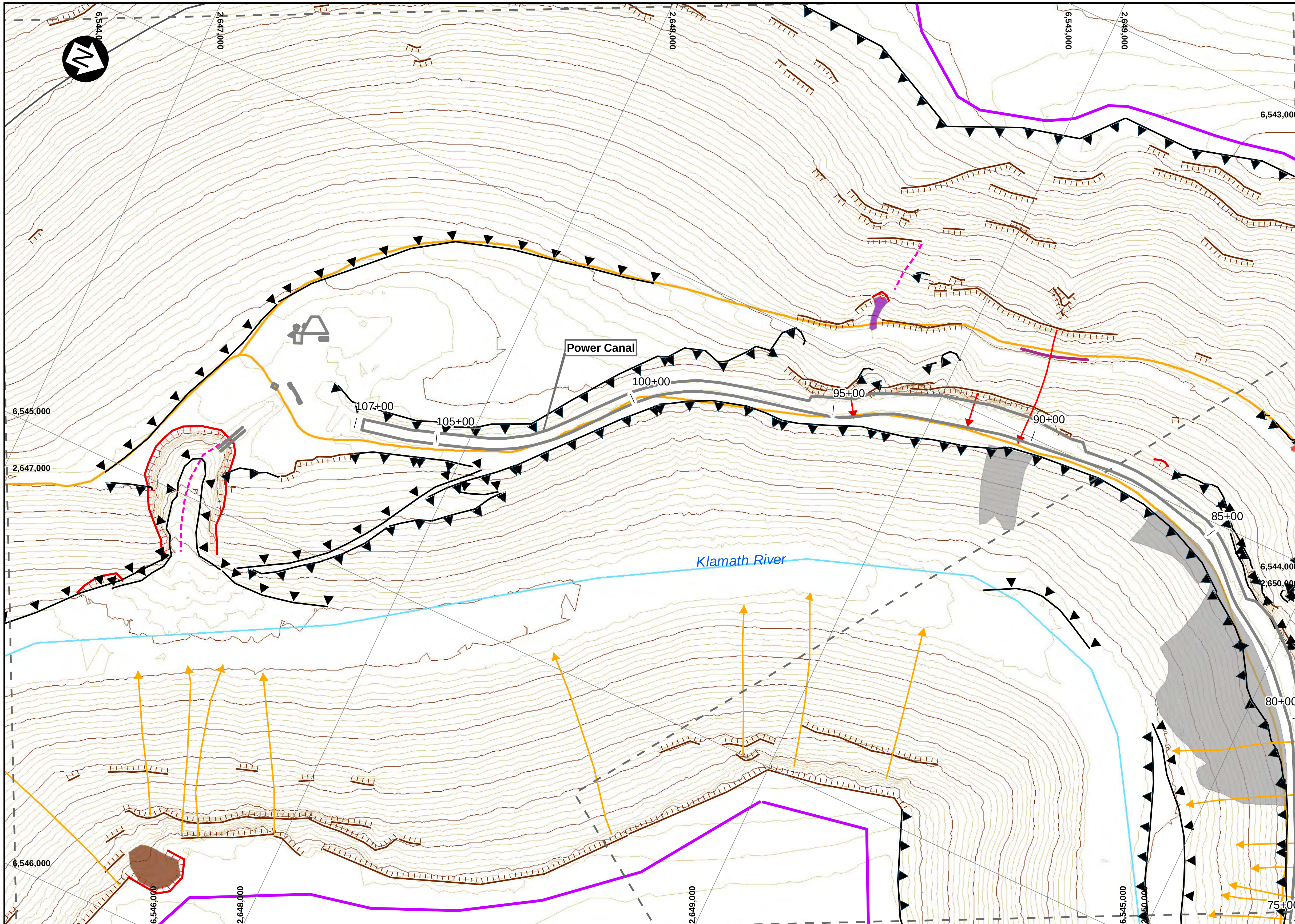

LEGEND:

GENERAL	TERRAIN FEATURES
CONTOUR 100 FT	CONVEX SLOPE BREAK
CONTOUR 10 FT	CONCAVE SLOPE BREAK
RIVER/STREAM	RIDGELINE
LAKE	EPHEMERAL DRAINAGE LINE
ROAD	CLIFF
EXISTING INFRASTRUCTURE	BACK SCARP
CHAINAGE MARKER (FEET)	SIDE-CAST FILL
STUDY AREA	FILL PLATFORM
MAP SHEET EXTENT	**TERRAIN HAZARDS**
	RECENT ROCK FALL
	ROCK FALL
	RELICT ROCK FALL
	RECENT DEBRIS SLIDE
	RECENT ROCK SLIDE
	RELICT ROCK SLIDE
	GULLY EROSION

DRAFT

NOTES:

1. BASE MAP: PROJECT LIDAR TOPOGRAPHY.
2. COORDINATE SYSTEM IS IN FEET. COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE CALIFORNIA I FIPS 0401 FEET.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:3,250,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
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100 50 0 100 200 300 400 500 Feet

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TERRAIN HAZARDS MAP
JC BOYLE POWER CANAL
SHEET 4 OF 4

P/A NO.	FIGURE NO.	REF NO.	REVISION
VA103-640/1	H1.1	2	B

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
B	02DEC'20	ISSUED WITH REPORT	JEH	KK	JEH

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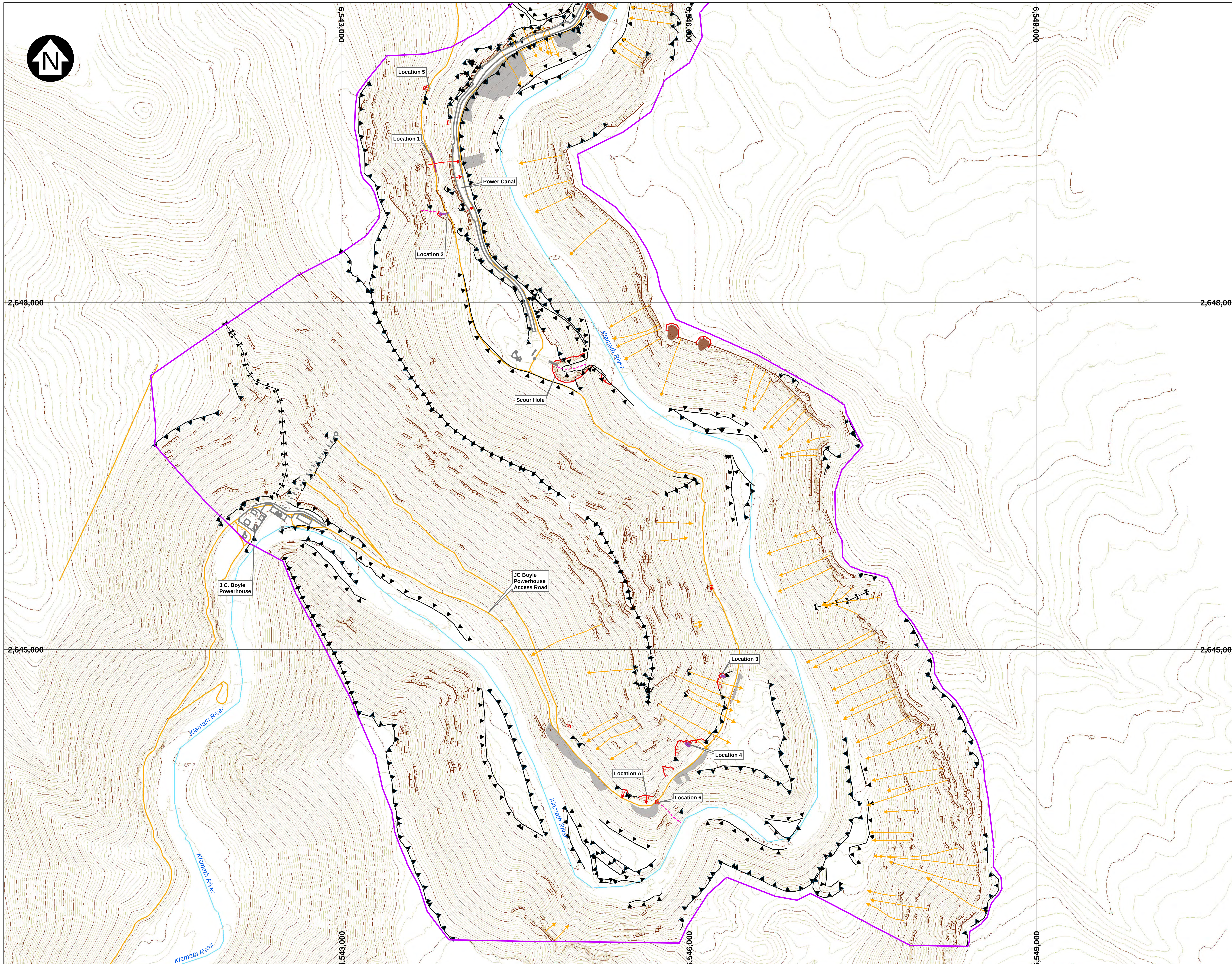

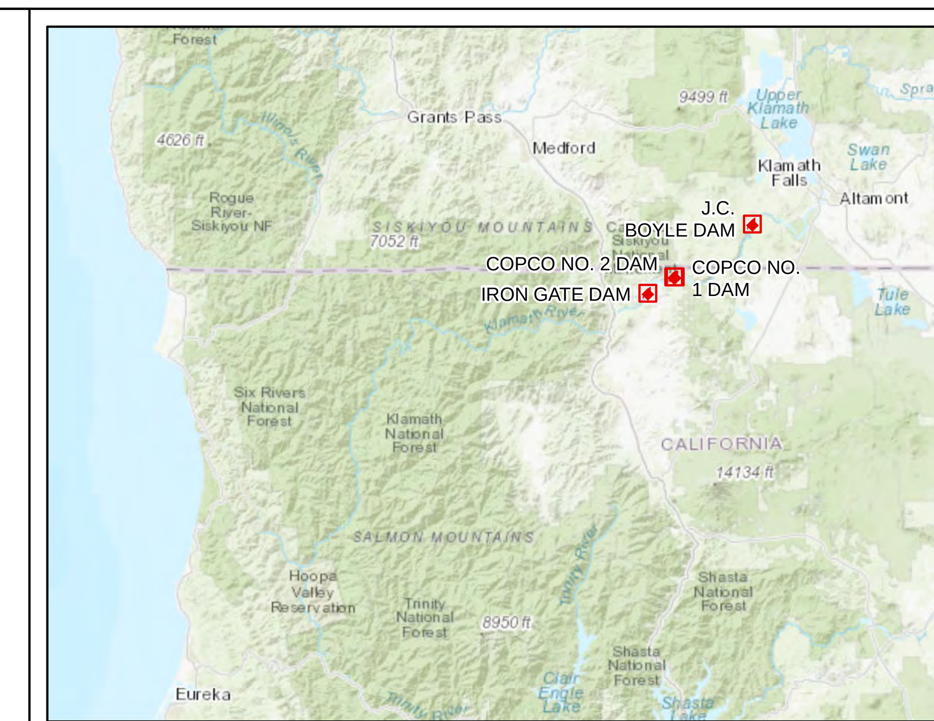

LEGEND:

GENERAL

- CONTOUR 100 FT
- CONTOUR 10 FT
- RIVER/STREAM
- LAKE
- ROAD
- EXISTING INFRASTRUCTURE
- CHAINAGE MARKER (FEET)
- STUDY AREA

TERRAIN FEATURES

- CONVEX SLOPE BREAK
- CONCAVE SLOPE BREAK
- RIDGELINE
- EPHEMERAL DRAINAGE LINE
- CLIFF
- BACK SCARP
- SIDE-CAST FILL
- FILL PLATFORM

TERRAIN HAZARDS

- RECENT ROCK FALL
- ROCK FALL
- RELICT ROCK FALL
- RECENT DEBRIS SLIDE
- RECENT ROCK SLIDE
- RELICT ROCK SLIDE
- GULLY EROSION

DRAFT

NOTES:

1. COORDINATE GRID IS IN FEET. COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE CALIFORNIA I FIPS 0401 FEET.
2. THE CONTOUR INTERVAL IS 10 FEET; SOURCE: PROJECT LiDAR.
3. THIS MAP IS PRODUCED AT A NOMINAL SCALE OF 1:5,000 FOR 24x36 ("D" SIZE) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. RECENT LANDSLIDES/ROCK FALLS ARE THOSE INTERPRETED TO HAVE OCCURED WITHIN THE LAST 100 YEARS. RELICT LANDSLIDES/ROCK FALLS ARE INTERPRETED TO BE GREATER THAN 100 YEAR OLD. THOSE ROCKFALLS THAT ARE NOT CATERORIZED AS 'RECENT' OR 'RELICT' COULD NOT BE CLEARLY CHARACTERIZED AS BEING GREATER OR LESS THAN 100 YEARS OLD.

400 200 0 400 800 1,200 Feet

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TERRAIN HAZARDS MAP
JC BOYLE POWERHOUSE ACCESS ROAD

P/A NO.	FIGURE NO.	REF NO.	REVISION
VA103-640/1	H1.2	2	B

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B	02DEC'20	ISSUED WITH REPORT	JEH	KK	JEH

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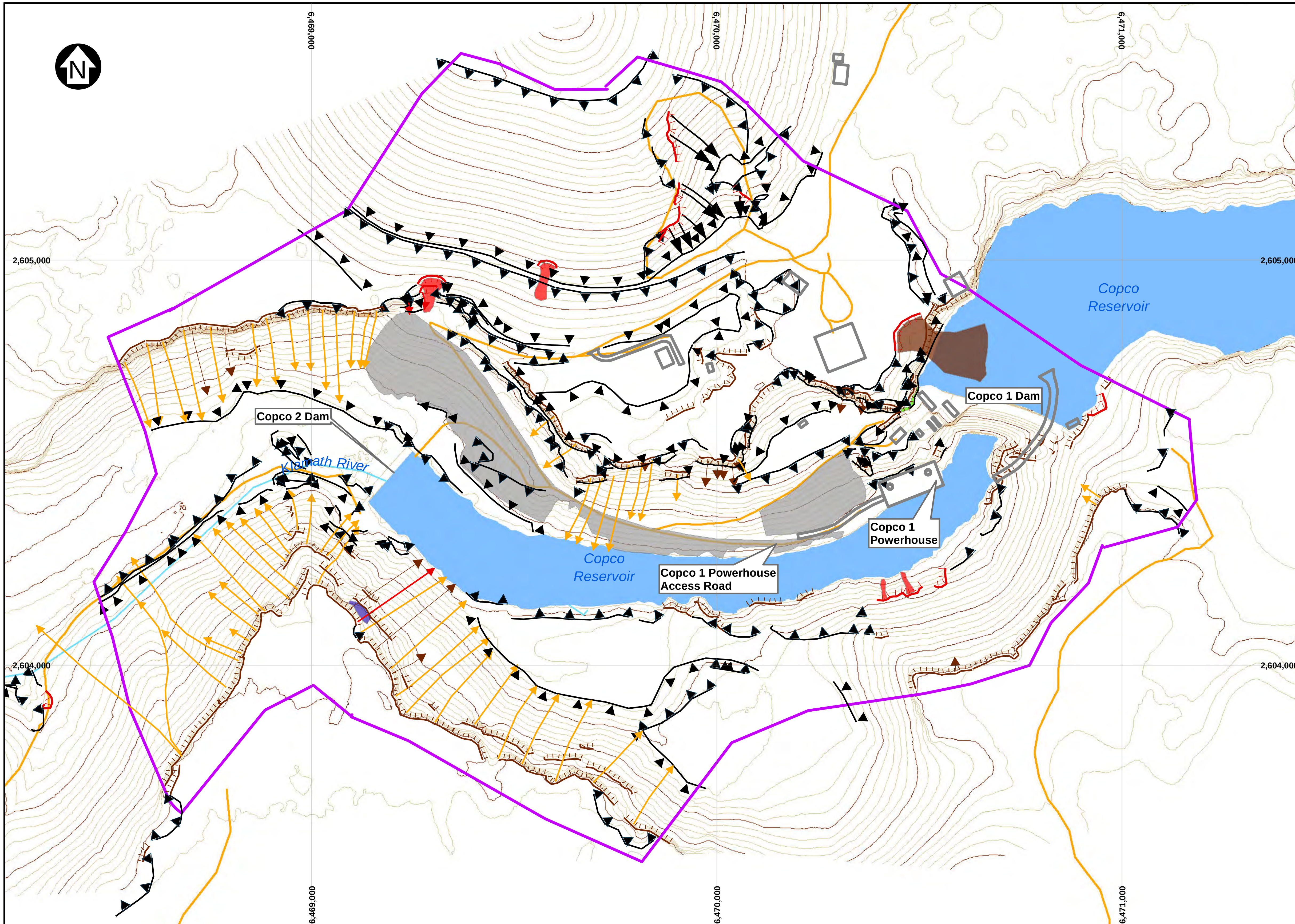

LEGEND:

GENERAL
- CONTOUR 100 FT
- CONTOUR 10 FT
- RIVER/STREAM
- LAKE
- ROAD
- EXISTING INFRASTRUCTURE
- DRAPED MESH
- CRIB WALL
- STUDY AREA

TERRAIN FEATURES
- CONVEX SLOPE BREAK
- CONCAVE SLOPE BREAK
- CLIFF
- BACK SCARP
- SIDE-CAST FILL

TERRAIN HAZARDS
- RECENT ROCK FALL
- ROCK FALL
- RELICT ROCK FALL
- BOULDER FALL
- RECENT DEBRIS SLIDE
- RELICT ROCK SLIDE

DRAFT

NOTES:

1. BASE MAP: PROJECT LIDAR TOPOGRAPHY.
2. COORDINATE SYSTEM IS IN FEET. COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE CALIFORNIA I FIPS 0401 FEET.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:3,035 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
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100 50 0 100 200 300 400 500 Feet

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KLAMATH RIVER RENEWAL PROJECT

TERRAIN HAZARDS MAP
COPCO 1 POWERHOUSE ACCESS ROAD

P/A NO.	FIGURE NO.	REF NO.	REVISION
VA103-640/1	H1.3	2	B

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
B	02DEC'20	ISSUED WITH REPORT	JEH	KK	JEH

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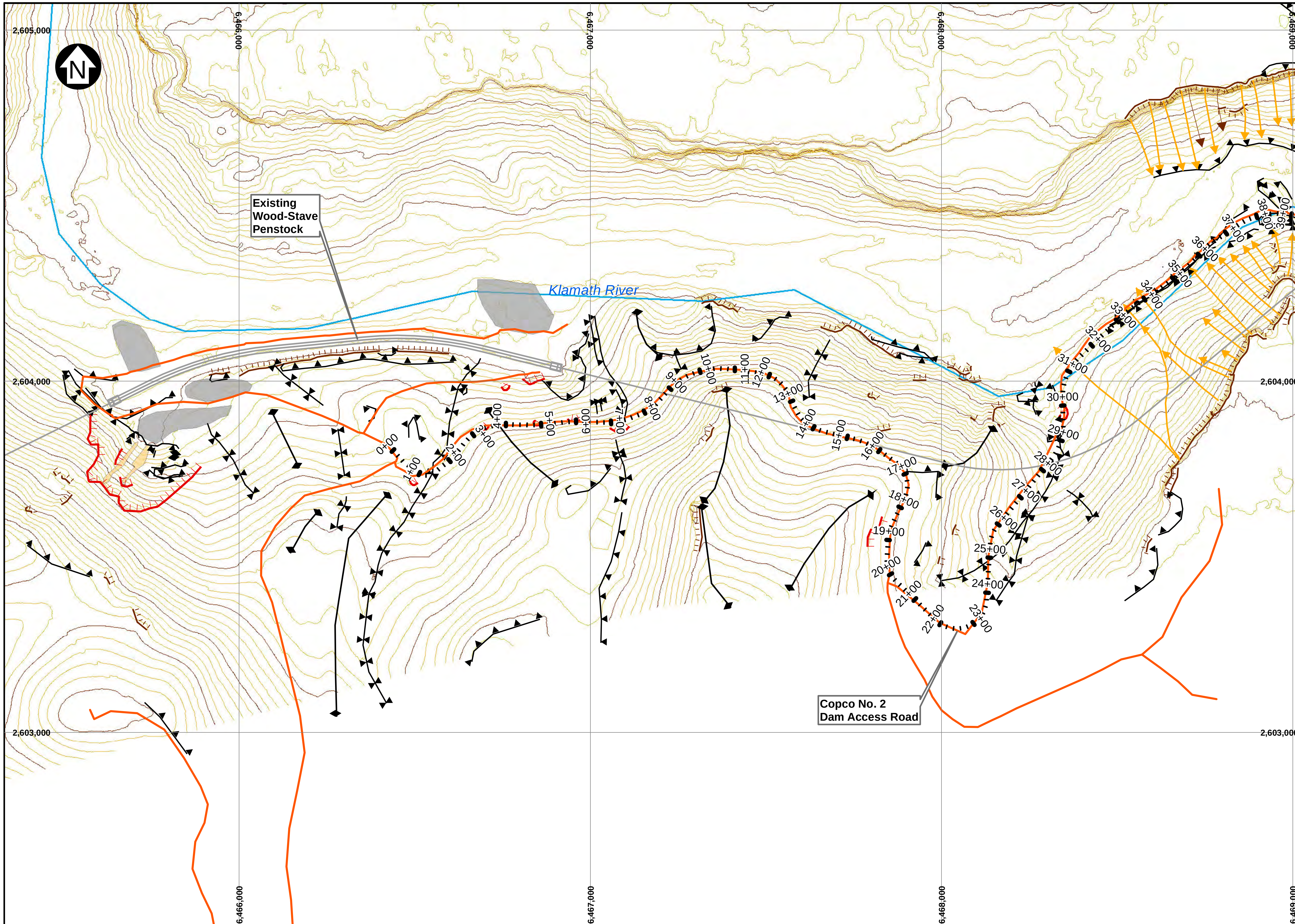

LEGEND:

GENERAL
- CONTOUR 10 FT
- CONTOUR 100 FT
- RIVER/STREAM
- ACCESS ROAD

TERRAIN FEATURES
- CONVEX SLOPE BREAK
- CONCAVE SLOPE BREAK
- RIDGELINE
- EPHEMERAL DRAINAGE LINE
- CLIFF
- BACK SCARP
- FILL

TERRAIN HAZARDS
- ROCK FALL
- RELICT ROCK FALL
- SHEET EROSION

DRAFT

NOTES:

1. BASE MAP: PROJECT LiDAR TOPOGRAPHY.
2. COORDINATE SYSTEM IS IN FEET. COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE CALIFORNIA I FIPS 0401 FEET.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:3,500 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. RECENT LANDSLIDES/ROCK FALLS ARE THOSE INTERPRETED TO HAVE OCCURED WITHIN THE LAST 100 YEARS. RELICT LANDSLIDES/ROCK FALLS ARE INTERPRETED TO BE GREATER THAN 100 YEAR OLD. THOSE ROCKFALLS THAT ARE NOT CATERORIZED AS 'RECENT' OR 'RELICT' COULD NOT BE CLEARLY CHARACTERIZED AS BEING GREATER OR LESS THAN 100 YEARS OLD.

100 50 0 100 200 300 400 500 Feet

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TERRAIN HAZARDS MAP
COPCO NO. 2 DAM ACCESS ROAD
AND EXISTING WOOD-STAVE PENSTOCK

P/A NO.	FIGURE NO.	REF NO.	REVISION
VA103-640/1	H1.4	2	B

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
B	02DEC'20	ISSUED WITH REPORT	JEH	KK	JEH

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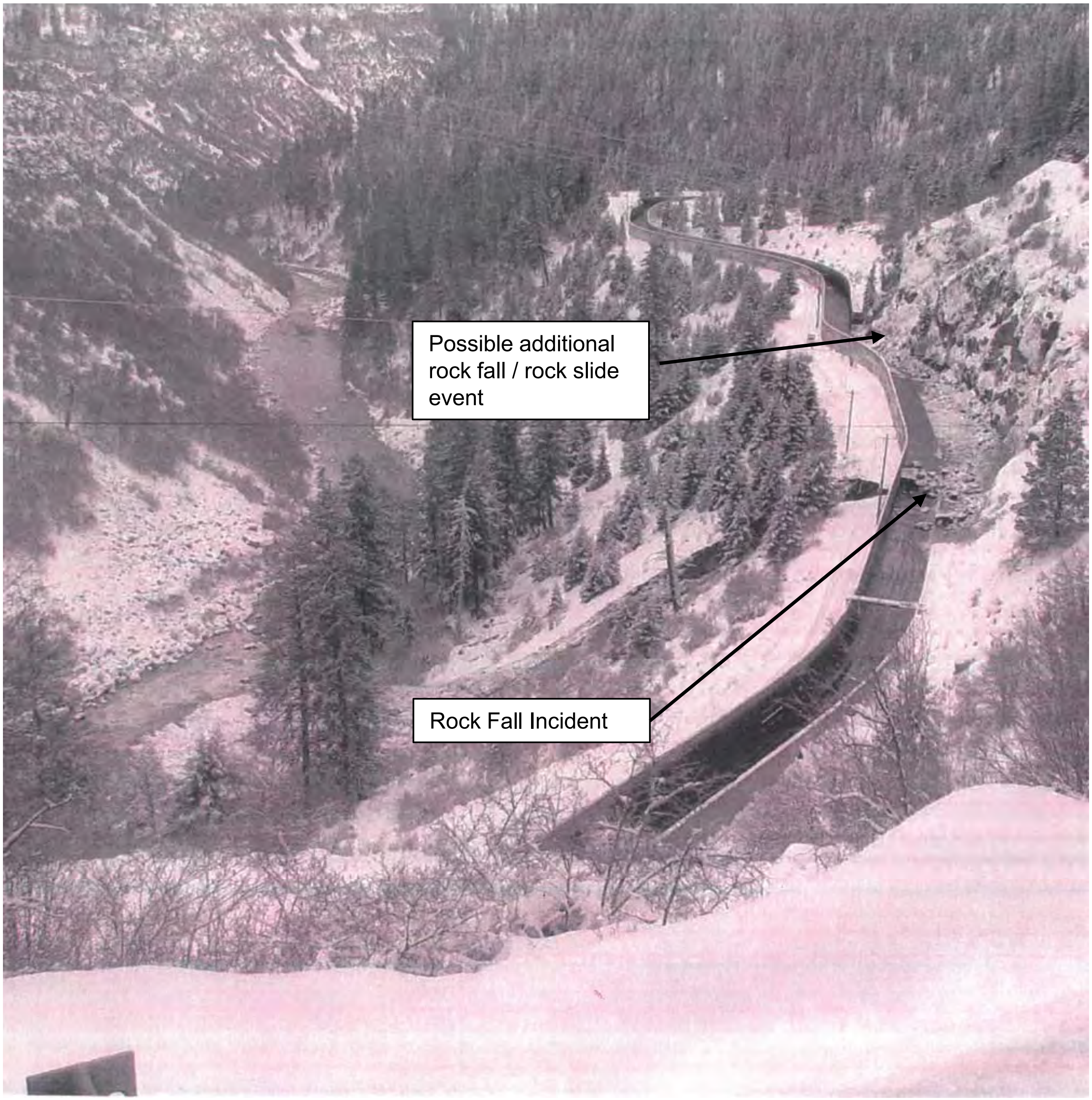

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KLAMATH RIVER RENEWAL PROJECT

JC BOYLE POWER CANAL
PHOTO OF ROCK FALL INCIDENT SUPPLIED BY PACIFIC CORP.

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H2.1 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

JC BOYLE POWER CANAL
INTERPRETED SOURCE ZONE OF ROCK FALL INCIDENT

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P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H2.2 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

JC BOYLE POWER CANAL
ROCK SLOPES ADJACENT TO THE DOWNSTREAM PART OF THE ALIGNMENT

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H2.3 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

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KLAMATH RIVER RENEWAL PROJECT

JC BOYLE POWER CANAL
SUB-VERTICAL JOINTS GIVE RISE TO POTENTIAL FOR TOPPLING FAILURE

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P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H2.4 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

A	03DEC'19	ISSUED WITH REPORT	JEH	SY
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

JC BOYLE POWER CANAL
RECENT ROCK SLIDE AT CH. 63+00

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P/A NO. VA103-640/1

REF. NO. 2

FIGURE H2.5

REV A

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

JC BOYLE POWER CANAL
WESTERN LIMIT OF ROCK FALL FENCE ALONG POWERHOUSE ACCESS ROAD

Knight Piésold CONSULTING

A	03DEC'19	ISSUED WITH REPORT	JEH	SY
REV	DATE	DESCRIPTION	PREP'D	RVW'D

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H2.6 REV A

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A	29APR'19	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

SITE RECONNAISSANCE
J.C. BOYLE POWER CANAL ROAD
ROCK OUTCROP AT APPROXIMATELY STA 24+00

Knight Piésold CONSULTING

P/A NO. VA103-640/01

REF. NO. 2

FIGURE H2.7

REV A

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KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

SITE RECONNAISSANCE
J.C. BOYLE POWER CANAL ROAD
(APPROXIMATELY STA 43+00 – 48+00)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/01	2

FIGURE H2.8 REV A

A	29APR'19	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

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Landslide at approx. STA 54+00

Approx. STA 62+00 → Approx. STA 58+00

A	29APR'19	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

SITE RECONNAISSANCE
J.C. BOYLE POWER CANAL ROAD
(APPROXIMATELY STA 59+00 – 62+00)

Knight Piésold CONSULTING

P/A NO. VA103-640/01

REF. NO. 2

FIGURE H2.9

REV A

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KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

SITE RECONNAISSANCE
J.C. BOYLE POWER CANAL ROAD
(APPROXIMATELY STA 63+00 – 66+00)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/01	2
FIGURE H2.10	REV A

A	29APR'19	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

SITE RECONNAISSANCE
J.C. BOYLE POWER CANAL ROAD
(APPROXIMATELY STA 75+00 – 78+00)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/01	2

FIGURE H2.11 REV A

A	29APR'19	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

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Approx. STA 96+00 → Approx. STA 91+00

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

SITE RECONNAISSANCE
J.C. BOYLE POWER CANAL ROAD
(APPROXIMATELY STA 91+00 – 96+00)

Knight Piésold CONSULTING

P/A NO. VA103-640/01

REF. NO. 2

FIGURE H2.12

REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	29APR'19	ISSUED WITH REPORT	GOJ	CC

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KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

SITE RECONNAISSANCE
J.C. BOYLE POWER CANAL
(APPROXIMATELY STA 85+00)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/01	2

FIGURE H2.13 REV A

A	29APR'19	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

JC BOYLE POWERHOUSE ACCESS ROAD
LOCATION A: ROCK FALL HAZARD IN CUT SLOPE

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H3.1 REV A

A	03DEC'19	ISSUED WITH REPORT	JEH	SY
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

JC BOYLE POWERHOUSE ACCESS ROAD
SLOPE INSTABILITY IN CUT SLOPE AT LOCATION 3

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H3.2 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

JC BOYLE POWERHOUSE ACCESS ROAD
SLOPE INSTABILITY IN CUT SLOPE AT LOCATION 4

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE 3.3 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

JC BOYLE POWERHOUSE ACCESS ROAD WESTERN LIMIT OF ROCK FALL FENCE ALONG POWERHOUSE ACCESS ROAD (LOCATION 1)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H3.4 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

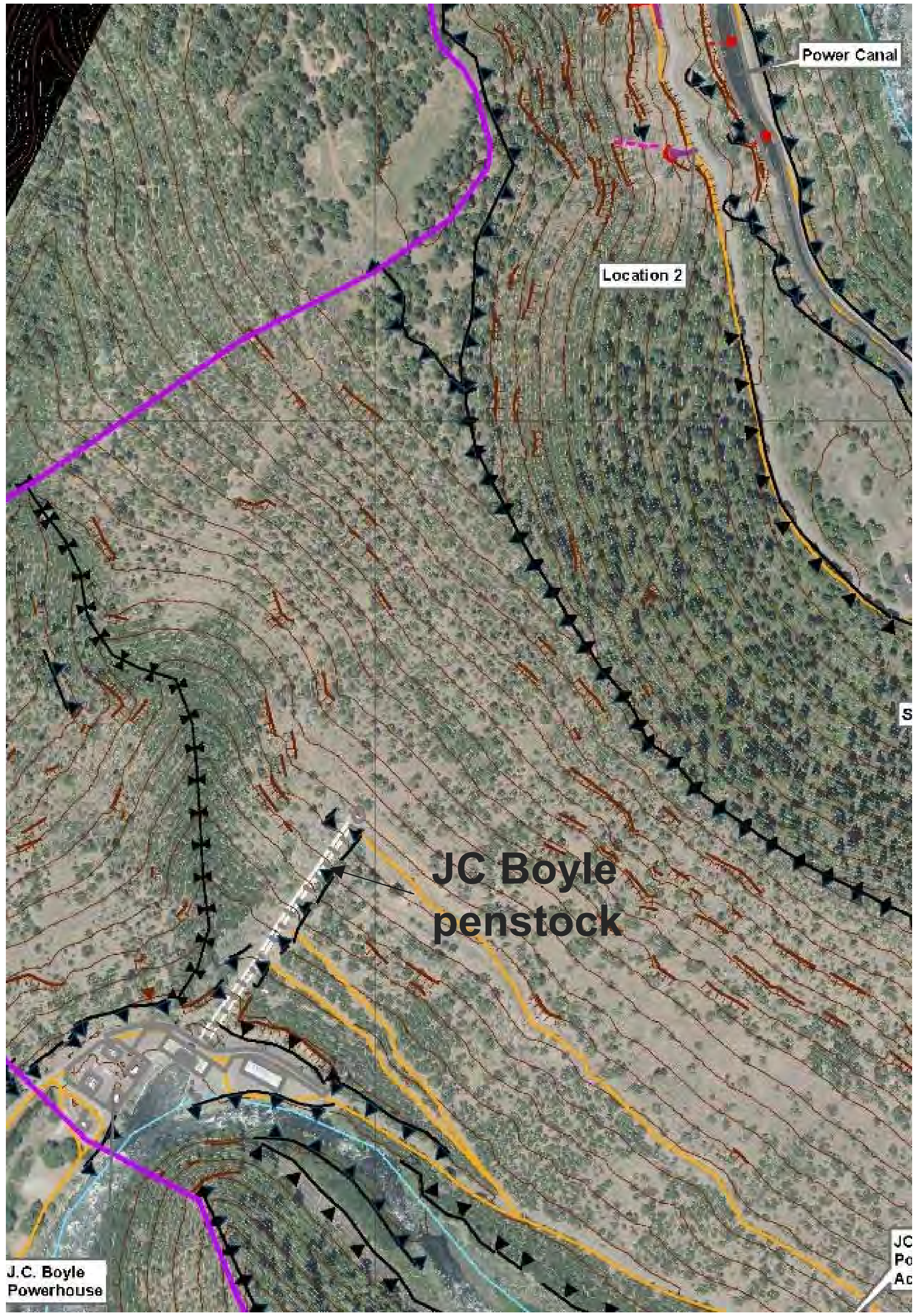
JC BOYLE POWERHOUSE ACCESS ROAD INTERPRETED SOURCE ZONE OF ROCK FALL INCIDENT (LOCATION 1)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H3.5 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY



View of JC Boyle Penstock from the Powerhouse.

View of natural slope above JC Boyle Surface Penstock

View of natural slope above JC Boyle Surface Penstock

NOTES:
1. PHOTOS TAKEN DURING SITE RECONNAISSANCE IN DECEMBER 2019.

A	2FEB'19	ISSUED WITH REPORT VA103-640/1-2	CC	JH
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

SITE RECONNAISSANCE
JC BOYLE PENSTOCK

Knight Piésold CONSULTING

P/A NO.	REF. NO.	
VA103-640/02	2	
FIGURE H4.1		REV A

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

ROCK CLIFF AT THE WEST ABUTMENT OF THE COPCO 1 DAM

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H5.1 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

ROCK CLIFF AT THE WEST ABUTMENT OF THE COPCO 1 DAM

Knight Piésold CONSULTING

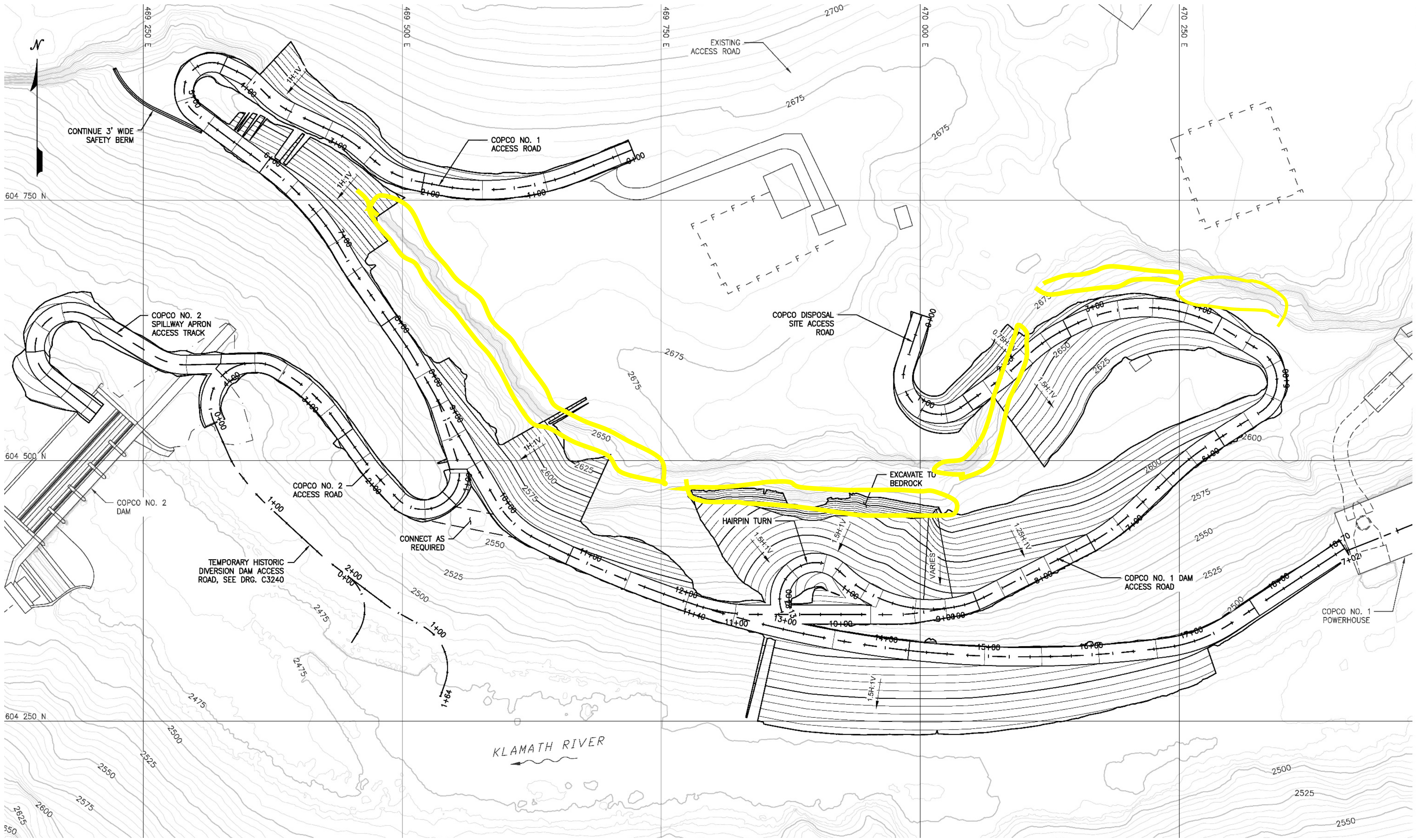
P/A NO. VA103-640/1

REF. NO. 2

FIGURE H5.2

REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY



LEGEND:

ROCK FALL SOURCE IDENTIFIED DURING DECEMBER 2019 FIELDWORK

A	26FEB'19	ISSUED WITH REPORT	CC	JH
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

SLOPES ABOVE RIGHT RIM OF COPCO NO. 2 RESERVOIR

Knight Piésold CONSULTING

P/A NO. VA103-640/02

REF. NO. 2

FIGURE H6.1

REV A

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

ROCK CLIFFS AMD TALUS SLOPES ON THE UPSLOPE SIDE OF THE ROAD

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H6.2 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

ROCK CLIFF WITH SUBVERTICAL COLUMNAR JOINTS

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.3

REV A

A	03DEC'19	ISSUED WITH REPORT	JEH	SY
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

FILL SLOPE ADJACENT TO THE COPCO 2 DAM

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H6.4 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

A	03DEC'19	ISSUED WITH REPORT	JEH	SY
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

CRIB WALL LOCATED UPSLOPE FROM SOUTH ABUTMENT OF THE COPCO 2 DAM

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.5

REV A

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

RECENT DEBRIS SLIDE AT SWITCH BAVK

Knight Piésold CONSULTING

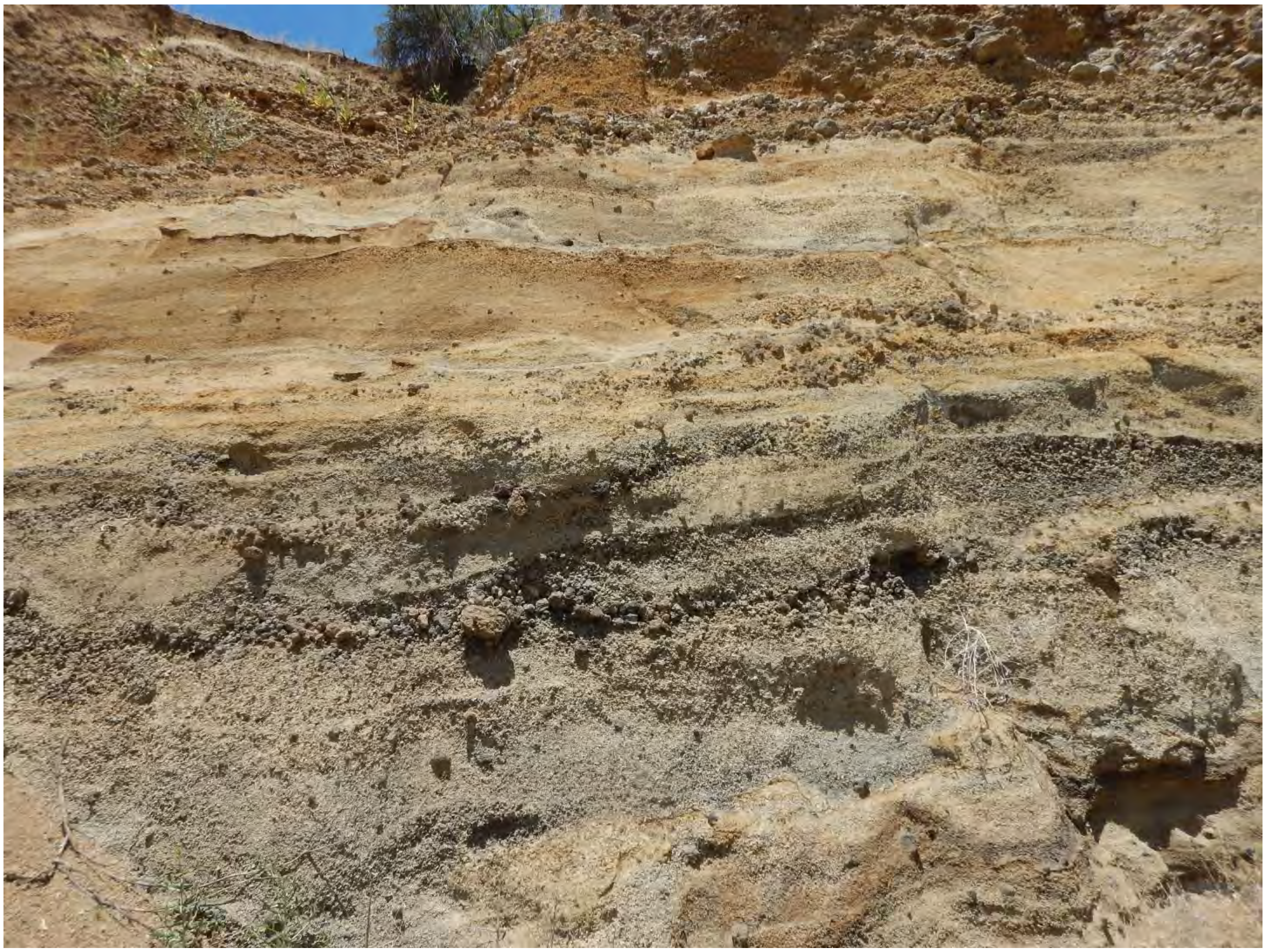
P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.6

REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY



KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

SURFICIAL GEOLOGY AT THE SITE OF THE RECENT DEBRIS SLIDE AT A SWITCH BACK

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.7

REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

COPCO NO. 1 POWERHOUSE ACCESS ROAD - STA. 4+00

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	2FEB'20	ISSUED WITH REPORT	GOJ	CC

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

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P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.8

REV A

View of the Cut Slope Immediately above the Existing Road at Approximately Sta. 4+00

A	2FEB'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.9

REV A

View of the Slope Immediately above the Existing Road at Approximately Sta. 5+00

A	2FEB'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.10

REV A

COPCO NO. 1 ACCESS ROAD - STA. 5+50 TO 8+00

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H6.11 REV A

A	2FEB'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

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View of the Slope Immediately above the Existing Road from approximately Sta. 5+50 to 7+30

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H6.12 REV A

A	2FEB'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

View of the Slope Immediately above the Existing Road, from approximately Sta. 7+30 to 8+50

A	2FEB'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.13

REV A

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COPCO NO. 1 ACCESS ROAD - STA. 9+50

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	2FEB'20	ISSUED WITH REPORT	GOJ	CC

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.14

REV A

View of the Slope Immediately above the Existing Road, Approximately from Sta. 9+50 to 11+00

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H6.15 REV A

A	2FEB'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

View of the Slope Immediately above the Existing Road, Approximately from Sta. 11+00 to 12+00

A	2FEB'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.16

REV A

View of the Slope Immediately above the Existing Road from Sta. 12+00 to 13+00

A	2FEB'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.17

REV A

View of the Slope Immediately above the existing road from Sta. 13+00 to 18+00

A	2FEB'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.18

REV A

View of the Slope above the Proposed Copco Disposal Site Access Road Alignment at approximately Sta. 3+00

A	2FEB'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.19

REV A

View of the Slope above the Proposed Copco Disposal Site Access Road Alignment at approximately Sta. 4+00

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H6.20 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	2FEB'20	ISSUED WITH REPORT	GOJ	CC

View of the Slope above the Proposed Copco Disposal Site Access Road Alignment at approximately Sta. 5+50 to 11+00

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	2FEB'20	ISSUED WITH REPORT	GOJ	CC

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

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P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.21

REV A

View of the Slope at the Footprint area of the Proposed Hairpin Turn

A	2FEB'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Right Rim of Copco No. 2 Reservoir (December 2019)

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P/A NO. VA103-640/1

REF. NO. 2

FIGURE H6.22

REV A

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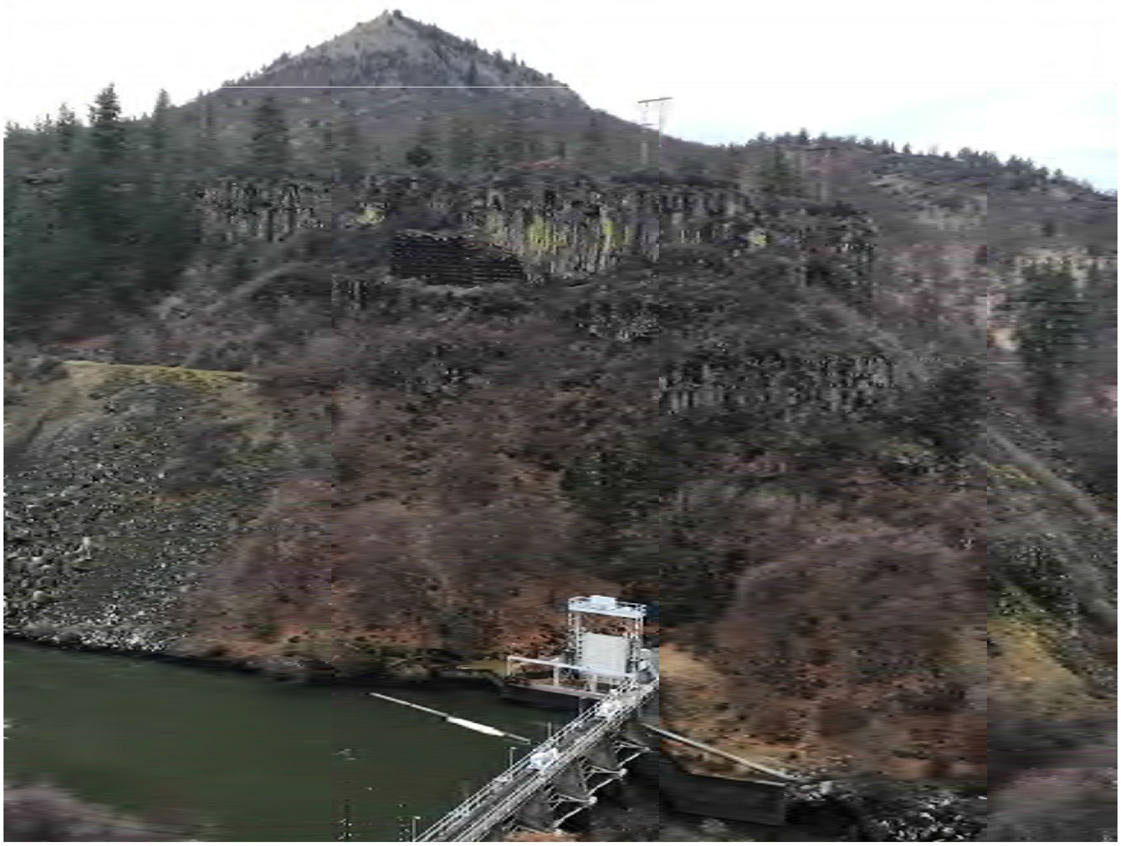

Panoramic Views of Cliff Above Left Abutment of Copco No. 2 Dam

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above the Left Abutment of the Copco No. 2 Dam (December 2019)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H7.1 REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

Close Up Photo of Columnar Structures and overhangs in Cliff above Left Abutment of Copco No. 2 Dam

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above the Left Abutment of the Copco No. 2 Dam (December 2019)

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H7.2 REV A

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Rock fall talus at toe of the Cliff South West of the Copco No. 2 Dam

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above the Left Abutment of the Copco No. 2 Dam (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H7.3

REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	03DEC'19	ISSUED WITH REPORT	JEH	SY

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View of the Slope Immediately above the Intake Structure at the Left Abutment of the Copco No. 2 Dam

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above the Left Abutment of the Copco No. 2 Dam (December 2019)

Knight Piésold CONSULTING

A	03DEC'19	ISSUED WITH REPORT	JEH	SY
REV	DATE	DESCRIPTION	PREP'D	RVW'D

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H7.4

REV A

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Sta. 03+50. Looking Up the Chainage

Sta. 05+00. Looking Up the Chainage

Sta. 07+50. Looking Up the Chainage

Sta. 10+00 Looking Up the Chainage

Sta. 12+50. Looking Up the Chainage

Views of Slopes Above the Proposed Copco No. 2 Access Road (Photos Taken on December 18, 2020)

A	2MAR'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Proposed Copco No. 2 Access Road (December 2019)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA/103-640/1	2
FIGURE H8.1	REV A

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Sta. 15+00. Looking Up the Chainage

Sta. 18+00. Looking Up the Chainage

Sta. 20+00. Looking Up the Chainage

Sta. 22+00. Looking Up the Chainage

Sta. 25+00. Looking Up the Chainage

Sta. 27+00. Looking Up the Chainage

Views of Slopes Above the Proposed Copco No. 2 Access Road (Photos Taken on December 18, 2020)

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Proposed Copco No. 2 Access Road (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1	REF. NO. 2
FIGURE H8.2	REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	2MAR'20	ISSUED WITH REPORT	GOJ	CC

Sta. 29+00. Looking Up the Chainage

Sta. 29+20. Looking Up the Chainage

Sta. 31+00. Looking Up the Chainage

Sta. 32+50. Looking Up the Chainage

Sta. 34+00. Looking Up the Chainage

Sta. 35+00. Looking Up the Chainage

Views of Slopes Above the Proposed Copco No. 2 Access Road (Photos Taken on December 18, 2020)

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	2MAR'20	ISSUED WITH REPORT	GOJ	CC

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Proposed Copco No. 2 Access Road (December 2019)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA103-640/1	2

FIGURE H8.3 REV A

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Sta. 36+00. Looking Up the Chainage

Sta. 37+00. Looking Up the Chainage

Sta. 37+00. Looking Up the Chainage

Sta. 38+00. Looking Up the Chainage

Sta. 38+00. Looking Up the Chainage

Views of Slopes Above the Proposed Copco No. 2 Access Road (Photos Taken on December 18, 2020)

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Proposed Copco No. 2 Access Road (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H8.4

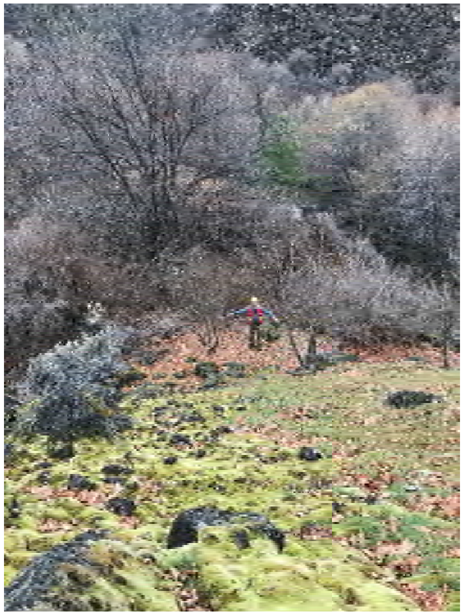
REV A

REV	DATE	DESCRIPTION	PREP'D	RVW'D
A	2MAR'20	ISSUED WITH REPORT	GOJ	CC

Sta. 39+00. Looking Up the Chainage

Sta. 39+00. Looking Up the Chainage

Sta. 39+00. Looking Up the Chainage



Sta. 39+00. Looking Up the Chainage

Sta. 40+00. Looking Up the Chainage

Sta. 40+00. Looking Up the Chainage

Views of Slopes Above the Proposed Copco No. 2 Access Road (Photos Taken on December 18, 2020)

A	2MAR'20	ISSUED WITH REPORT	GOJ	CC
REV	DATE	DESCRIPTION	PREP'D	RVW'D

KIEWIT INFRASTRUCTURE WEST CO.

KLAMATH RIVER RENEWAL PROJECT

Site Reconnaissance of Slopes above Proposed Copco No. 2 Access Road (December 2019)

Knight Piésold CONSULTING

P/A NO. VA103-640/1

REF. NO. 2

FIGURE H8.5

REV A

APPENDIX I

Preliminary Services Construction Access Infrastructure

Appendix I1 Copco Road Geotechnical Survey Technical Memorandum (by GeoServ, Inc.)

Appendix I2 Transportation Geotechnical Data Report (by GeoServ, Inc.)