Table 1.1 - Summary of Reviewed Documents

Year	Document No.	File Name	Title	Author	Date	Type	Source
1988	1	N/A	Geotechnical Evaluation of Tailings Impoundment	Klohn Leonoff	17-Jun-88	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1989	2	N/A	Reduction Study	Klohn Leonoff	11-Aug-89	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1990	3	N/A	Summary of 1989 Field Investigations	Klohn Leonoff	31-Jan-90	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1991	4	N/A	Task 2 Supplemental Geotechnical Investigation, Southeast Corner, Existing Tailings Impoundment (technical memorandum)	Woodward-Clyde	Sep-91	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1991	5	N/A	Task 2 Geotechnical Site Characterization - North Tailing Expansion Project - Volume I (Summary)	Woodward-Clyde, 1991	Dec-91	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1993	6	N/A	Tailings Impondment Modernization (Contract No. C-002), 1993 Instrumentation Installation Report	Klohn-Crippen	2-Dec-93	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1995	7	N/A	Tailings Impoundment Modernization Project North Expansion - Volume III (2 of 3), Appendix G, Geotechnical Detailed Design Report (Revision No, 10)	Woodward-Clyde	24-May-95	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1996	8	N/A	Tailings Impoundment Modernization Project, Southeast Corner, Geotechnical Design of Dewatering Measures - Summmary of Geotechnical Data Review	Woodward-Clyde	9-Sep-96	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1997	9	N/A	Tailings Impoundment Modernization Project, Southeast Corner, Southeast Corner Seismic Upgrade Design (contract No. ES-060), Geotechnical Site Characterization, Volume II - Appendices)	Woodward-Clyde	13-Mar-97	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1997	10	N/A	ConeTec Field Report, Resistivity Field and Laboratory Report	ConeTec	6-Mar-97	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1998	11	N/A	Tailings Impoundment Modernization Project, Southeast Corner, Southeast Corner Seismic Upgrade, Alternatives Evaluation Report	Woodward-Clyde	Mar-98	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1998	12a	Run-out Analysis SE Corner	Run-out Analysis, Southeast Corner Area (Final Report)	Woodward-Clyde	24-Apr-98	Technical documents	Kennecott Website
1998	12b	Runout Analysis Section 1 Map	Site Plan of Southeas Corner of Magna Tailings Impoundment	Woodward-Clyde	5-Mar-98	Technical documents	Kennecott Website
1998	13	N/A	Tailings Impondment Modernization Project, Northeast Corner, Investigation / Remediation of Northeast Corner Toe Slide. Volume I - Summary Report	Woodward Clyde	22-Mar-98	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1998	14a	N/A	Tailings Impoundment Modernization Project, Southeast Corner, Southeast Corner Seismic Upgrade Design, Dewatering Design Report (Final Report)	Woodward-Clyde	Apr-98	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
1997	14b	N/A	Tailings Impoundment Modernization Project, Southeast Corner, Southeast Corner Seismic Upgrade Design, Geotechnical Site Characterization - Volume I	Woodward-Clyde	Mar-97	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84045
1998	15	Independent Analysis of Deformations	Independent Analysis of Deformations, Southeast Corner Seismic Upgrade Design, Tailings Impoundment Modernization Project	AGRA Earth & Environmental	12-Jun-98	Technical documents	Kennecott Website
1999	16a	Geotechnical Evaluation Summary Report	Geotechnical Evaluation, Summary Report for December 17, 1999, State Engineer's Meeting	URSGWC	17-Dec-99	Technical documents	Kennecott Website
1998	16b	Geotechnical_Eval_Summary_Report-_Oversize.pdf	Magna and North Expansion Impoundments Run Out Envelopes for Years 1998 and 2004	Woodward-Clyde Consultants	15-Dec-98	Technical documents	Kennecott Website
1999	17	South Slope Seismic Stability Evaluation Report	Tailings and Water Services, South Slope Seismic Stability Evaluation Report	URSGWC	10-Dec-99	Technical documents	Kennecott Website

Table 1.1 - Summary of Reviewed Documents

1999	18	N/A	Tailings and Water Services, East Slope Stability Evaluation Report	URSGWC, 1999	10-Dec-99	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
2000	19	N/A	Seismic Hazard Analyses for Kennecott	URSGWC, 2000	2000	Technical documents	Mail: Tailings and Water Services, 11984 West Hwy 202, Magna, UT - 84044
2002	20	South Tailings Embankment Southeast Corner Dewatering Review	Report, South Tailings Embankment, Southeast Corner Dewatering Review, Magna, Utah	AMEC Earth & Environmental	19-Jul-02	Technical documents	Kennecott Website
2006	21	Dewatering and Seismic Stability Evaluation	Dewatering and Seismic Stability Evaluation, Southeast Corner of Kennecott Utah Copper, South Impoundment	URS	Jan-06	Technical documents	Kennecott Website
1998	22	SE Task Force Recommendation Report 1998	SE Corner Task Force Recommendations	Kennecott Utah Copper	28-May-98	Statements and letters	Kennecott Website
2008	23	Southeast Corner Seismic Stability -capsules table-6-19-08	Capsule Summaries of Geotechnical Documents		19-Jun-08	Statements and letters	Kennecott Website
2008	24	Studies_Reports Timeline 6-24-08	Timeline		24-Jun-08	Statements and letters	Kennecott Website
2008	25	AH Memo To Magna Assemessment March 28	Third-party tailings assessment	Kennecott Utah Copper	28-Mar-08	Statements and letters	Kennecott Website
2008	26	Seismic Upgrades General Statement March 23, 2008	Kennecott Utah Copper Tailings Impoundment Seismic Upgrades	Kennecott Utah Copper	23-Mar-08	Statements and letters	Kennecott Website
2008	27	Tailings RFP Response Final	Kennecot Tailings Impondment Committee	Rio Tinto	19-Aug-08	Statements and letters	Kennecott Website
1998	28	Community Notification Materials from 1998	Southeast Corner Seismic Risk Reduction Notification Plan	Kennecott Utah Copper	25-Jun-98	Community material	Kennecott Website
2008	29	April 1 Letter to the Meadow Green Community	Kennecott Utah Copper - Fax Sheet, South Tailings Impoundment	Kennecott Utah Copper	1-Apr-08	Community material	Kennecott Website
2008	30	Runout Map Southeast Corner 2008 Conditions	Post Seismic Runout Envelopes South Slope of Magna Impoundment 1998 and 2008 Conditions	URS	2008	Community material	Kennecott Website
	31	Tailings Q&A	Tailings Impoundment Q&A	Kennecott Utah Copper		Community material	Kennecott Website

Table 2.1 - Summary of Field Investigations

Document #	Report	Consultant	Date	CPT	SPT	Pressuremeter	Instrumentation
1	Geotechnical Evaluation of Tailings Impoundment	Klohn Leonoff	17-Jun-88	Yes	Yes	No	Yes
3	Summary of 1989 Field Investigations	Klohn Leonoff	31-Jan-90	Yes	Yes	No	Yes
4	Task 2 Supplemental Geotechnical Investigation, Southeast Corner, Existing Tailings Impoundment	Woodward Clyde	Sep-91	Yes	Yes	Yes	Yes
6	Tailings Impoundment Modernization (Contract No. C-002), 1993 Instrumentation Installation Report	Klohn-Crippen	2-Dec-93	Yes	No	No	Yes
9	Tailings Impoundment Modernization Project, Southeast Corner, Southeast Corner Seismic Upgrade Design (contract No. ES-060), Geotechnical Site Characterization, Volume II	Woodward Clyde	13-Mar-97	Yes	No	No	No
12a	Run-out Analysis, Southeast Corner Area	Woodward Clyde	24-Apr-98	Yes	No	No	No
20	Report, South Tailings Embankment, Southeast Corner Dewatering Review, Magna, Utah	AMEC	19-Jul-02	Yes	No	No	Yes
21	Dewatering and Seismic Stability Evaluation, Southeast Corner of Kennecott Utah Copper, South Impoundment	URS	6-Jan	Yes	No	No	No

Table 2.2 - Field Testing and Instrumentation Summary

Report	Test Type	Test Name	Location	Data type
Report (1) Geotechnical Evaluation of Tailings Impoundment	CPT	CP87-1001	Around perimeter of the tailings (Pong and Magna)	Tip bearing (resistance to penetration), friction, pore pressure
		CP87-1002		
		CP87-1003		
		CP87-1004		
		CP87-1005		
		CP87-1006		
		CP87-1007		
		CP87-1008		
		CP87-1009		
		CP87-1010		
		CP87-1011		
		CP87-1012		
		CP87-1013		
		CP87-1014		
	SPT	DH87-1001	Tailings	Vertical Effective Stress, N_{60}, $(N1)_{60}$
		DH87-1002	Foundation	
		DH87-1003	Tailings	
	Piezometer	P87-5001	Foundation clay	Phreatic Surface
		P87-5003	Tailings	
		P87-5002	Foundation soil, toe	
Report (3) Summary of 1989 Field Investigations	Piezometer	DH89-1004	Sections A through I	Phreatic Surface
		DH89-1005		
		DH89-1006		
		DH89-1007		
		DH89-1008		
		DH89-1009		
		DH89-1010		
		DH89-1011		
		DH89-1012		
		DH89-1013		
		DH89-1014		
		DH89-1015		
		DH89-1016		
		DH89-1017		
		DH89-1018		
		DH89-1019		
		DH89-1020		
		DH89-1021		
		DH89-1022		
		DH89-1023		
		DH89-1024		
		DH89-1025		
		DH89-1026		
	CPT	CP89-1015		Bearing, sleeve friction, friction, pore pressure
		CP89-1016		
		SCP89-1017		
		SCP89-1018		
		SCP89-1019		
		SCP89-1020		
		SCP89-1021		
		CP89-1026		
		SCP89-1028		
	Dewatering Piezometer	DH89-E5A		Phreatic Surface
		DH89-E5B		
		DH89-E5C		
		DH89-N(-25)A		
		DH89-N(-25)B-1		
		DH89-N(-25)C-1		
		DH89-W2025A		
		DH89-W2025B		
		DH89-W2025C		
		DH89-W4000A		
		DH89-W4000B		

Table 2.2 - Field Testing and Instrumentation Summary

Report (4) Task 2 Supplemental Geotechnical Investigation, Southeast Corner Existing Tailing Impoundment	CPT	CP-WC-130	Southeast Corner	Tip stress, sleeve stress, Pore pressure, friction ratio
		CP-WC-131		
		CP-WC-132		
		CP-WC-300		
		CP-WC-301		
		CP-WC-302		
	Piezometer	PN-WC--113A		Phreatic Surface
		PN-WC-113B		
Report (6) Tailings Impoundment Modernization	Piezometer	DH93-100	Southeast Corner	Phreatic Surface
		DH93-101		
		DH93-102		
		DH93-105		
		DH93-103	Northeast Corner	
		DH93-104		
		DH93-106		
		P93-1102	Southeast Corner	
		P93-1103		
		P93-1104		
		P93-1105		
		P93-1106		
		P93-1107		
		P93-1108		
		P93-1109		
		P93-1110		
	CPT	93-CP100	Southeast Corner	Tip resistance, Sleeve friction, dynamic pore pressure, bulk resistivity, temperature, cone inclination
		93-CP101		
		93-CP102		
		93-CP103		
		93-CP104		
		93-CP105		
		93-CP106		
		93-CP107		
	VW Piezos	PE93-100	Southeast Corner	Pore water pressures
		PE93-101		
		PE93-102		
		PE93-103		
		PE93-104		
		PE93-105		
		PE93-106		
		PE93-107		
		PE93-108		
		PE93-109		
		PE93-110		
		PE93-111		
		PE93-112		
		PE93-113		
		PE93-114		
		PE93-115		
		PE93-116		
		PE93-117		
		PE93-118		
		PE93-119		
		PE93-120		
		PE93-121		
		PE93-122		
		PE93-123		
		PE93-124		
	Inclinometers	I93-103	Northeast Corner	Movement
		I93-104		
		I93-105		

Table 2.2 - Field Testing and Instrumentation Summary

Report (9) Tailings Impoundment Modernization Project Southeast Corner	CPT	96-750	Southeast Corner	Qt, Fs, Rf, Hpres
		96-751		
		96-752		
		96-754		
		96-755		
		96-755R		
		96-756		
		96-757 (S)		
		96-758		
		96-759 (S)		
		96-760 (S)		
		96-761		
		96-761R		
		96-762 (S)		
		96-763		
		96-765		
		96-765R		
		96-766		
		96-766R		
		96-767R		
		96-768 (S)		
		96-769		
		96-770		
		96-771		
		96-772		
		96-773		
		96-774		
		96-775		
		96-776		
		96-777		
		96-755A		These CPT tests are the same as report (10)
		96-755A2		
		96-761A1		
		96-761A2		
		96-765A		
		96-766A		
		96-766A		
		96-767A		
Report (12a) Run-out Analysis Southeast Corner Area (Woodward-Clyde, 1998)	CPT	CP98-234	X-section SE2	dissipation
		CP98-235		
		CP98-236		
		CP98-237		
		CP98-239	X-section KLC	
		CP98-240		
		CP98-241		
		CP98-219	X-section SEC	
		CP98-220		
		CP98-221		
		CP98-222		

Table 2.2 - Field Testing and Instrumentation Summary

Report (20) South Tailings Embankment Southeast Corner Dewatering Review (AMEC, 2002)	Piezometer	PE98-241A	X-section KLC	pore pressure
		PE98-241B		
		PE-99-016	X-section SE2	
		PE-99-015		
		PE-99-014		
		PE-99-013		
		PE-99-012		
		PE-99-011		
		PE-99-010		
		PE-99-009		
		PE-98-237A		
		PE-98-237B		
		PE-99-S301	X-section SE3	
		PE-99-S302		
		PE-99-S303		
		PE-99-S304		
		PE-99-S305		
		PE-99-S306		
	CPT	CP02-08	X-section SE2	dissipation, resistivity
		CP02-09		
		CP02-10		
		CP02-11		
		CP01-A25		
		CP01-A24		
		CP01-A22	X-section KLC	
		CP01-A20		
		CP01-R01	X-section SE2	
		CP94-111		
		CP94-109B		
		CP94-108		
		CP96-755R2	X-section KLC	resistivity
		CP96-761R1		
		CP96-765R1		
		CP96-766R1		
		CP96-767R1	X-section SE2	
Report (21) Dewatering and Seismic Stability Evaluation Southeast Corner of Kennecott Utah Copper South Impoundment (URS, 2006)	CPT	CP05-01	X-section KLC	dissipation, resistivity, tip resistance, sleeve friction
		CP05-02		
		CP05-03		
		CP05-04		
		CP05-05		
		CP05-06	X-section SE2	
		CP05-07		
		CP05-08		
		CP05-09		
		CP05-10		
		CP05-11		
		CP05-12	X-section SE3	
		CP05-13		
		CP05-14		
		CP05-15		
		CP05-16		
		CP05-17	X-section SE4	
		CP05-18		
		CP05-19		
		CP05-20	X-section SE6	
		CP05-21		
		CP05-23		
		CP05-24		

Table 2.3 - Summary of CPT Test Methods

Document #	Report	Contractor	Cone Penetrometer Tests (CPTU)	Seismic Cone Penetrometer Tests (SCPTU)	Resistivity Cone Penetrometer Tests (RCPTU)	PPD Tests
1	Geotechnical Evaluation of Tailings Impoundment	Western Geosystems	Yes	No	No	No
3	Summary of 1989 Field Investigations	ConeTec	Yes	No	No	No
4	Task 2 Supplemental Geotechnical Investigation, Southeast Corner, Existing Tailings Impoundment	Hughes Insitu Engineering	Yes	Yes	No	No
6	Tailings Impoundment Modernization (Contract No. C-002), 1993 Instrumentation Installation Report	ConeTec	Yes	No	Yes	No
9	Tailings Impoundment Modernization Project, Southeast Corner, Southeast Corner Seismic Upgrade Design (contract No. ES-060), Geotechnical Site Characterization, Volume II	ConeTec	Yes	No	No	No
12a	Run-out Analysis, Southeast Corner Area	Unknown	Yes	No	No	Yes
20	Report, South Tailings Embankment, Southeast Corner Dewatering Review, Magna, Utah	ConeTec	Yes	No	Yes	Yes
21	Dewatering and Seismic Stability Evaluation, Southeast Corner of Kennecott Utah Copper, South Impoundment	ConeTec	Yes	No	Yes	Yes

Table 2.4 - Summary of CPT Locations

Document #	Report	No. of CPTU Locations	No. of SCPTU Locations	No. of RCPTU Locations	No. of PPD Tests
1	Geotechnical Evaluation of Tailings Impoundment	14	0	0	0
3	Summary of 1989 Field Investigations	9	0	0	0
4	Task 2 Supplemental Geotechnical Investigation, Southeast Corner, Existing Tailings Impoundment	5	1	0	0
6	Tailings Impoundment Modernization (Contract No. C-002), 1993 Instrumentation Installation Report	0	0	8	0
9	Tailings Impoundment Modernization Project, Southeast Corner, Southeast Corner Seismic Upgrade Design (contract No. ES-060), Geotechnical Site Characterization, Volume II	28	5*	5**	0
12a	Run-out Analysis, Southeast Corner Area	11	0	0	Unknown
20	Report, South Tailings Embankment, Southeast Corner Dewatering Review, Magna, Utah	0	0	17	Unknown
21	Dewatering and Seismic Stability Evaluation, Southeast Corner of Kennecott Utah Copper, South Impoundment	0	0	26	97

*   5 CPT tests have a ‘S’ designation, possibly indicating a SCPTU test.
** 5 CPT tests have a ‘R’ designation, possibly indicating a RCPTU test.

Table 2.4 - Summary of CPT Locations

Table 2.5 - Summary of Laboratory Testing Results

REPORT	MATERIAL	UNIT WEIGHT (PCF)	EFFECTIVE STRESS SHEAR STRENGTH		PEAK UNDRAINED SHEAR STRENGTH		POST-EARTHQUAKE (MCE) SHEAR STRENGTH (DEGREE/PSF)	
			FRICTIONAL ANGLE (DEGREES)	COHESION (PSF)	DIRECT SIMPLE SHEAR (DSS)	TRIAXIAL COMPRESSION SHEAR (TXL)	FRICTIONAL ANGLE (DEGREES)	UNDRAINED STRENGTH (PSF)
(1) Geotechnical Evaluation of Tailings Impoundment (Klohn Leonoff, 1988)	Liquefied tailings clay	---	---	---	---	---	---	300
	Liquefied tailings silt	---	---	---	---	---	---	300
	Tailings clay	100	35	0	---	---	32	---
	Tailings Silt	100	32	0	---	---	35	---
	New grind	105*	35	0	---	---	---	---
	Foundation clay	120	30	0	---	---	---	---
	All other materials	---	---	---	---	---	---	drained strength parameters used for static stability analyses
(2) Reduction Study	Berm	110	35	---	---	---	---	---
	Tailings	100	35	---	---	---	---	---
	Liquefied Tailings	---	---	---	---	---	---	300
	Mine Waste	130	37	---	---	---	---	---
(5) Task 2 Geotechnical Site Characterization, North Tailing Expansion Project	Bonneville clay	---	29	---	---	---	---	---
	Interbedded Sand and Clay	---	29	---	---	---	---	---
	Sand beds	---	38	---	---	---	---	---
(8) Summary of Geotechnical Data Review	Lake Bonneville Unit 1	118	29	---	$0.26(OCR)^{0.79}\sigma_{vo'}$		$(OCR_{cyc})^{0.79}S_u$	
	Clutler Dam Unit 2	124	29	---	$0.26(OCR)^{0.79}\sigma_{vo'}$		(OCRcyc)0.79Su	
	Interglacial Unit 3	128	29	---	$0.26(OCR)^{0.79}\sigma_{vo'}$		(OCRcyc)0.79Su	
	Interglacial Unit 4	132	34	---	---		---	
	Interglacial Unit 5	128	29	---	$0.26(OCR)^{0.79}\sigma_{vo'}$		$(OCR_{cyc})^{0.79}S_u$	
(11) Tailings Impoundment Modernization Project, Southeast Corner, Southeast Corner Seismic Upgrade, Alternatives Evaluation Report (Woodward-Clyde, 1998)	Unsaturated tailings	115	34	---	---	---	34	---
	Saturated tailings	119	---	---	---	---	---	$0.12\sigma_{v,c}$
	Dikes (starter, 1950 and 1952)	125	38	---	---	---	38	---
	Foundation sand	125	38	---	---	---	38	---
	Upper Bonneville clay	118	---	---	---	---	---	$0.26\sigma_{v,c}(OCR)^{0.79}$
	Interbedded sediments	129	---	---	---	---	---	$0.26\sigma_{v,c}(OCR)^{0.79}$
	Stabilization berm (compacted UF)	126	35	---	---	---	35	---
	Shear key	118	---	---	---	---	---	$C_U = 3600$
(12a) Run-out analysis southeast corner area (Woodward-Clyde, 1998)	Unsaturated tailings	115	---	---	---	---	34	---
	Saturated tailings	119	---	---	---	---	---	$0.12\sigma_{v,c}$
	Upper Bonneville clay	118	---	---	---	---	---	$0.26\sigma_{v,c}(OCR)^{0.79}(OCR_{cyc})^{-0.21}$

REPORT	MATERIAL	UNIT WEIGHT (PCF)	EFFECTIVE STRESS SHEAR STRENGTH		PEAK UNDRAINED SHEAR STRENGTH		POST-EARTHQUAKE (MCE) SHEAR STRENGTH (DEGREE/PSF)	
			FRICTIONAL ANGLE (DEGREES)	COHESION (PSF)	DIRECT SIMPLE SHEAR (DSS)	TRIAXIAL COMPRESSION SHEAR (TXL)	FRICTIONAL ANGLE (DEGREES)	UNDRAINED STRENGTH (PSF)
(13) Tailings Impondment Modernization Project, Northeast Corner, Investigation / Remediation of Northeast Corner Toe Slide. Volume I - Summary Report	Whole spigoted tailings	119	---	---	$C_U/\sigma_{v,c} = 0.23$	$C_U/\sigma_{v,c} = 0.35$	---	---
	Decant pond clay	107	---	---	$C_U/\sigma_{v,c} = 0.23$	CU/sv,c = 0.32 (OCR)0.8 Estimated OCR = 1.0	---	---
	Deep whole tailings (zone 1)	116	---	---	$C_U/\sigma_{v,c} = 0.23\ (OCR)^{0.8}$; Assumed OCR = 1.2 beneath 1952 dike. Assumed OCR = 1.0 elsewhere		---	---
	Flowed tailings	100	---	---	CU/sv,c = 0.23 (OCR)0.8; Minimum value = 300 psf		---	---
	Upper Bonneville clay	118	---	---	$0.26\sigma_{v,c}(OCR)^{0.79}$; Max OCR = 4		---	---
	Upper interbedded sediments	129	---	---	$0.26\sigma_{v,c}(OCR)^{0.79}$; Max OCR = 4		---	---
	Dikes (starter, 1950 and 1952)	115	---	---	$\phi' = 35°$		---	---
	Underflow sand	105	---	---	$\phi' = 35°$		---	---
	Slag	135	---	---	$\phi' = 45°$		---	---
(14a) Tailings Impoundment Modernization Project, Southeast Corner, Southeast Corner Seismic Upgrade Design, Dewatering Design Report (Final Report) (Woodward-Clyde, 1998)	Unsaturated Tailings	115	34	0	$\phi = 34°$, c = 0		34	0
	Saturated Cohesive Tailings - Triaxial Loading	119	34	0	$0.32\ \sigma'_v$		---	$0.20\ \sigma'_v$
	Saturated Cohesive Tailings - Direct Simple Shear	119	34	0	$0.23\ \sigma'_v$		---	$0.20\ \sigma'_v$
	Saturated Cohesionless Tailings - Triaxial Loading $\sigma'_v \leq 8$ ksf	119	34	0	$0.35\ \sigma'_v$		---	$0.12\ \sigma'_v$
	Saturated Cohesionless Tailings - Triaxial Loading $\sigma'_v > 8$ ksf	119	34	0	$0.18\ \sigma'_v + 1350$		---	$0.12\ \sigma'_v$
	Saturated Cohesionless Tailings - Direct Simple Shear	119	34	0	$0.23\ \sigma'_v$		---	$0.12\ \sigma'_v$
	Upper Bonneville Clay	118	29	0	$0.26\sigma_{v,c}(OCR)^{0.79}$		---	$0.26\sigma_{v,c}(OCR)^{0.79}(OCR_{cyc})^{-0.21}$
	Interbedded Sediments	129	31	0	$0.26\sigma_{v,c}(OCR)^{0.79}$		---	$0.26\sigma_{v,c}(OCR)^{0.79}(OCR_{cyc})^{-0.21}$
	Sand Beds	125	38	0	$\phi = 38°$, c = 0		38	0
(15) Independent analysis of deformations, southeast corner seismic upgrade design, Tailings impoundment modernization project (AGRA, 1998)	Unsaturated tailings	110	---	---	---	---	---	---
	Saturated tailings	119	34	---	---	---	---	---
	Liquefied tailings	119	---	---	240		---	---
	Clay	118	---	---	$0.12\sigma_{v,c}$		---	---
	Interbedded	129	35	---	---	---	---	---
	Sand	125	38	---	---	---	---	---
	Dikes (starter, 1950 and 1952)	115	35	---	---	---	---	---
(16a) Geotechnical evaluation summary report for December 17,1999 state engineer's meeting (URSGWC, 1999)	Whole spigoted tailings (saturated)	119	34	0	$C_U/\sigma_{v,c} = 0.23$	$C_U/\sigma_{v,c} = 0.35$	$S_U/\sigma_{v,c} = 0.12$	
	Whole spigoted tailings (unsaturated)	117	34	0	$\phi = 34°$, c = 0		$\phi = 34°$, c = 0	
	Soft tailings clay	107	28	0	$C_U/\sigma_{v,c} = 0.23\ (OCR)^{0.8}$ Estimated OCR = 1.5	$C_U/\sigma_{v,c} = 0.29\ (OCR)^{0.8}$ Estimated OCR = 1.5	$S_U/\sigma_{v,c} = 0.20$	
	Decant pond clay	107	28	0	$C_U/\sigma_{v,c} = 0.23\ (OCR)^{0.8}$ Estimated OCR = 1.0	$C_U/\sigma_{v,c} = 0.32\ (OCR)^{0.8}$ Estimated OCR = 1.0	$S_U/\sigma_{v,c} = 0.20$	
	Deep whole tailings (zone 1)	116	34	0	$C_U/\sigma_{v,c} = 0.23\ (OCR)^{0.8}$ Estimated OCR = 1.0	$C_U/\sigma_{v,c} = 0.35\ (OCR)^{0.8}$ Estimated OCR = 1.0	$S_U/\sigma_{v,c} = 0.12$	

REPORT	MATERIAL	UNIT WEIGHT (PCF)	EFFECTIVE STRESS SHEAR STRENGTH		PEAK UNDRAINED SHEAR STRENGTH		POST-EARTHQUAKE (MCE) SHEAR STRENGTH (DEGREE/PSF)	
			FRICTIONAL ANGLE (DEGREES)	COHESION (PSF)	DIRECT SIMPLE SHEAR (DSS)	TRIAXIAL COMPRESSION SHEAR (TXL)	FRICTIONAL ANGLE (DEGREES)	UNDRAINED STRENGTH (PSF)
	Deep whole tailings (zone 2)	116	34	0	$C_U/\sigma_{v,c}$ = 0.23 $(OCR)^{0.8}$ Estimated OCR = 1.5	$C_U/\sigma_{v,c}$ = 0.35 $(OCR)^{0.8}$ Estimated OCR = 1.5	$S_U/\sigma_{v,c}$ = 0.12	
	Dikes (starter, 1950 and 1952)	115	35	0	ϕ =35°, c = 0		ϕ =35°, c = 0	
	Upper Bonneville clay	118	29	0	$C_U/\sigma_{v,c}$ = 0.26 $(OCR)^{0.8}$ Max OCR = 4, Min C_u = 625psf		$S_U/\sigma_{v,c}$ = 0.208; Min S_{ur} = 500 psf	
	Upper interbedded sediments	129	31	0	$C_U/\sigma_{v,c}$ = 0.26 $(OCR)^{0.8}$ Max OCR = 4, Min C_u = 625psf		$S_U/\sigma_{v,c}$ = 0.208; Min S_{ur} = 500 psf	
(17) South slope seismic stability evaluation report (URSGWC, 1999)	Whole spigoted tailings (saturated)	117	34	0	ϕ =34°, c = 0		ϕ =34°, c = 0	
	Whole spigoted tailings (unsaturated)	119	34	0	$C_U/\sigma_{v,c}$ = 0.23 $(OCR)^{0.8}$	$C_U/\sigma_{v,c}$ = 0.35 $(OCR)^{0.8}$	$S_U/\sigma_{v,c}$ = 0.12	
	Dikes (starter, 1950 and 1952)	115	35	0	ϕ =35°, c = 0		ϕ =35°, c = 0	
	Upper Bonneville clay	118	29	0	$C_U/\sigma_{v,c}$ = 0.26 $(OCR)^{0.8}$ Max OCR = 4, Min C_u = 625psf		$S_U/\sigma_{v,c}$ = 0.208; Min S_{ur} = 500 psf	
	Upper interbedded sediments	129	31	0	$C_U/\sigma_{v,c}$ = 0.26 $(OCR)^{0.8}$ Max OCR = 4, Min C_u = 625psf		$S_U/\sigma_{v,c}$ = 0.208; Min S_{ur} = 500 psf	
(18) Tailings and Water Services, East Slope Stability Evaluation Report (ursgwc, 1999)	Whole spigoted tailings (saturated)	119	34	0	$C_U/\sigma_{v,c}$ = 0.23	$C_U/\sigma_{v,c}$ = 0.35	$S_U/\sigma_{v,c}$ = 0.12	
	Whole spigoted tailings (unsaturated)	117	34	0	ϕ =34°, c = 0		ϕ =34°, c = 0	
	Soft tailings clay	107	28	0	$C_U/\sigma_{v,c}$ = 0.23 $(OCR)^{0.8}$ Estimated OCR = 1.5	$C_U/\sigma_{v,c}$ = 0.29 $(OCR)^{0.8}$ Estimated OCR = 1.5	$S_U/\sigma_{v,c}$ = 0.20	
	Decant pond clay	107	28	0	$C_U/\sigma_{v,c}$ = 0.23 $(OCR)^{0.8}$ Estimated OCR = 1.0	$C_U/\sigma_{v,c}$ = 0.32 $(OCR)^{0.8}$ Estimated OCR = 1.0	$S_U/\sigma_{v,c}$ = 0.20	
	Deep whole tailings (zone 1)	116	34	0	$C_U/\sigma_{v,c}$ = 0.23 $(OCR)^{0.8}$ Estimated OCR = 1.0	$C_U/\sigma_{v,c}$ = 0.35 $(OCR)^{0.8}$ Estimated OCR = 1.0	$S_U/\sigma_{v,c}$ = 0.12	
	Deep whole tailings (zone 2)	116	34	0	$C_U/\sigma_{v,c}$ = 0.23 $(OCR)^{0.8}$ Estimated OCR = 1.5	$C_U/\sigma_{v,c}$ = 0.35 $(OCR)^{0.8}$ Estimated OCR = 1.5	$S_U/\sigma_{v,c}$ = 0.12	
	Dikes (starter, 1950 and 1952)	115	35	0	ϕ =35°, c = 0		ϕ =35°, c = 0	
	Upper Bonneville clay	118	29	0	$C_U/\sigma_{v,c}$ = 0.26 $(OCR)^{0.8}$ Max OCR = 4, Min C_u = 625psf		$S_U/\sigma_{v,c}$ = 0.208; Min S_{ur} = 500 psf	
	Upper interbedded sediments	129	31	0	$C_U/\sigma_{v,c}$ = 0.26 $(OCR)^{0.8}$ Max OCR = 4, Min C_u = 625psf		$S_U/\sigma_{v,c}$ = 0.208; Min S_{ur} = 500 psf	
(21) Dewatering and seismic stability evaluation southeast corner of Kennecott Utah copper south impoundment (URS, 2006)	Unsaturated whole tailings spigoted tailings	117	---	---	ϕ =34°, c = 0		---	---
	Liquefiable whole spigoted tailings	119	---	---	$S_U/\sigma_{v,c}$ = 0.12		---	---
	Saturated whole spigoted tailings	119	---	---	$C_U/\sigma_{v,c}$ = 0.8 * 0.23	$C_U/\sigma_{v,c}$ = 0.8 * 0.35	---	---
	Unsaturated soft tailings clay	107	---	---	ϕ =28°, c = 0		---	---
	Saturated soft tailings clay	116	---	---	$C_U/\sigma_{v,c}$ = 0.23 $(OCR)^{0.8}$ Estimated OCR = 1.5	$C_U/\sigma_{v,c}$ = 0.35 $(OCR)^{0.8}$ Estimated OCR = 1.5	---	---
	Liquefiable deep whole tailings (zone 1 and 2)	116	---	---	$S_U/\sigma_{v,c}$ = 0.12		---	---
	Saturated deep whole tailings (zone 1)	116	---	---	$C_U/\sigma_{v,c}$ = 0.23 $(OCR)^{0.8}$ Estimated OCR = 1.0	$C_U/\sigma_{v,c}$ = 0.35 $(OCR)^{0.8}$ Estimated OCR = 1.0	---	---
	Saturated deep whole tailings (zone 2)	---	---	---	$C_U/\sigma_{v,c}$ = 0.23 $(OCR)^{0.8}$ Estimated OCR = 1.5	$C_U/\sigma_{v,c}$ = 0.35 $(OCR)^{0.8}$ Estimated OCR = 1.5	---	---
	Dikes (starter, 1950 and 1952)	115	---	---	ϕ =35°, c = 0		---	---
	Upper Bonneville clay	118	---	---	$S_U/\sigma_{v,c}$ = 0.208; Min S_{ur} = 500 psf		---	---
	Upper interbedded sediments	129	---	---	$S_U/\sigma_{v,c}$ = 0.208; Min S_{ur} = 500 psf		---	---