Table 7E-5: Raw Zooplankton Data, 2017

		Station	Mel-05-05		Mel-03-01		Mel-03-02		Mel-03-03		Mel-03-04	
		Replicate	Rep 1		Rep 1		Rep 1		Rep 1		Rep 1	
		Sampling Period	12/08/2017		01/09/2017		01/09/2017		01/09/2017		01/09/2017	
Major Group	Taxon	Stage	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)
Cladocera	Bosminidae indet.	F	3,440	43.51	85	1.27	81	1.21	98	1.46	1,300	19.50
	Chydoridae indet.	F	20	0.90	3	0.06			3	0.06	8	0.19
	Daphnia longiremis	F	1,620	13.32	3	0.02					100	0.85
	Daphnia sp.	F					16	0.15	10	0.10		
	Holopedium gibberum	F	440	12.38	3	0.07	2	0.06	20	0.59	83	2.46
Calanoida	Calanoida indet.	I-V	140	1.25	15	0.12	4	0.03	8	0.06		
	Calanoida indet.	VIf										
	Epischura lacustris	I-V										
	Epischura lacustris	VIf										
	Epischura lacustris	VIm	20	0.81								
	Leptodiaptomus minutus	VIf	240	9.52	98	3.71	39	1.48	115	4.38	117	4.44
	Leptodiaptomus minutus	VIm	220	7.18	93	2.95	40	1.28	43	1.36	75	2.39
	Leptodiaptomus pribilofensis	VIf	20	0.79	3	0.19	1	0.07				
	Leptodiaptomus pribilofensis	VIm			3	0.15	2	0.12				
Cyclopoida	Cyclopoida indet.	I-V	320	3.25	63	0.43	30	0.20	85	0.58	33	0.23
	Cyclops scutifer	VIf	40	1.47			1	0.04				
	Cyclops scutifer	VIm										
	Diacyclops thomasi	VIf	60	1.41	28	0.61	11	0.24	63	1.39	25	0.56
	Diacyclops thomasi	VIm	20	0.35	25	0.44	7	0.12	43	0.75	42	0.73
Copepoda	Copepoda indet.	Nauplius			67	0.00					100	0.01
	Calanoida indet.	Nauplius	1,600	0.31	167	0.04	67	0.02	200	0.05	500	0.13
	Cyclopoida indet.	Nauplius	2,600	0.05	767	0.02	333	0.01	767	0.02	1,000	0.02
Rotifera	*Asplanchna* sp.	n/a			367	7.70	133	2.80	67	1.40	150	3.15
	Collotheca sp.	n/a										
	Conochilus sp.	n/a	2,200	2.15	1,233	1.40	933	1.06	733	0.83	2,250	2.56
	Filinia sp.	n/a										
	Kellicottia sp.	n/a	4,300	0.45	767	0.06	1,400	0.11	1,900	0.14	1,900	0.14
	Keratella sp. 1	n/a	200	0.13	267	0.28	133	0.14	33	0.04	350	0.37
	Keratella sp. 2	n/a										
	Lecane sp.	n/a										
	Monostyla sp.	n/a			67	0.00	33	0.00				
	Notholca sp.	n/a										
	Ploima indet.	n/a										
	Polyarthra sp.	n/a	300	0.14	67	0.03	67	0.03	33	0.02	150	0.07
	Synchaeta sp.	n/a			133	0.19	733	1.03	833	1.17	600	0.84
	Trichocerca sp.	n/a										
		Total	**17,800**	**99.37**	**4,318**	**19.75**	**4,067**	**10.22**	**5,052**	**14.38**	**8,783**	**38.65**

Table 7E-5: Raw Zooplankton Data, 2017

		Station	Mel-03-05		Mel-01-01		Mel-01-01-Rep1		Mel-01-02		Mel-01-03	
		Replicate	Rep 1		Rep 2		Rep 2		Rep 1		Rep 1	
		Sampling Period	01/09/2017		04/09/2017		04/09/2017		04/09/2017		04/09/2017	
Major Group	Taxon	Stage	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)
Cladocera	Bosminidae indet.	F	81	1.21	77	0.56	96	0.71	135	0.99	70	0.51
	Chydoridae indet.	F	1	0.02					4	0.04		
	Daphnia longiremis	F	26	0.22					24	0.11	6	0.03
	Daphnia sp.	F			7	0.02	20	0.07				
	Holopedium gibberum	F	2	0.06								
Calanoida	Calanoida indet.	I-V	4	0.03	3	0.02	2	0.01	4	0.03	6	0.04
	Calanoida indet.	VIf										
	Epischura lacustris	I-V										
	Epischura lacustris	VIf										
	Epischura lacustris	VIm										
	Leptodiaptomus minutus	VIf	12	0.46							1	0.03
	Leptodiaptomus minutus	VIm	19	0.61					2	0.06	2	0.06
	Leptodiaptomus pribilofensis	VIf										
	Leptodiaptomus pribilofensis	VIm										
Cyclopoida	Cyclopoida indet.	I-V	11	0.08	278	1.83	304	2.00	233	1.53	81	0.53
	Cyclops scutifer	VIf									1	0.04
	Cyclops scutifer	VIm										
	Diacyclops thomasi	VIf	6	0.13							1	0.03
	Diacyclops thomasi	VIm	6	0.11	5	0.09						
Copepoda	Copepoda indet.	Nauplius	100	0.01	67	0.00	250	0.01	167	0.01	150	0.01
	Calanoida indet.	Nauplius	100	0.03	567	0.15	250	0.07	300	0.08	400	0.11
	Cyclopoida indet.	Nauplius	300	0.01	700	0.01	900	0.01	400	0.01	550	0.01
Rotifera	*Asplanchna* sp.	n/a	350	7.35	433	8.55	600	11.84	933	18.42	1,250	24.67
	Collotheca sp.	n/a										
	Conochilus sp.	n/a	2,600	2.96	433	0.33	350	0.27	367	0.28	950	0.72
	Filinia sp.	n/a										
	Kellicottia sp.	n/a	1,700	0.13	767	0.07	1,200	0.11	833	0.08	2,650	0.25
	Keratella sp. 1	n/a	250	0.26	567	0.81	950	1.36	367	0.52	1,750	2.50
	Keratella sp. 2	n/a										
	Lecane sp.	n/a										
	Monostyla sp.	n/a									50	0.00
	Notholca sp.	n/a										
	Ploima indet.	n/a										
	Polyarthra sp.	n/a	250	0.12	67	0.03	850	0.36	467	0.20	900	0.38
	Synchaeta sp.	n/a	1,150	1.61							50	0.10
	Trichocerca sp.	n/a										
		Total	**6,968**	**15.40**	**3,970**	**12.48**	**5,772**	**16.80**	**4,233**	**22.34**	**8,868**	**30.02**

Table 7E-5: Raw Zooplankton Data, 2017

		Station	Mel-01-04		Mel-01-05		Mel-02-01		Mel-02-02		Mel-02-03	
		Replicate	Rep 1		Rep 1		Rep 1		Rep 1		Rep 1	
		Sampling Period	04/09/2017		04/09/2017		05/09/2017		05/09/2017		05/09/2017	
Major Group	Taxon	Stage	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)
Cladocera	Bosminidae indet.	F	128	0.94	128	0.94	319	3.39	173	1.85	292	3.11
	Chydoridae indet.	F	3	0.04	7	0.08	13	0.18				
	Daphnia longiremis	F	17	0.08	15	0.07			107	1.02	275	2.62
	Daphnia sp.	F					306	3.14				
	Holopedium gibberum	F					13	0.26			8	0.17
Calanoida	Calanoida indet.	I-V	2	0.01	2	0.01	6	0.04	7	0.05	675	4.60
	Calanoida indet.	VIf										
	Epischura lacustris	I-V										
	Epischura lacustris	VIf							3	0.14		
	Epischura lacustris	VIm										
	Leptodiaptomus minutus	VIf					75	2.83	37	1.38	100	3.77
	Leptodiaptomus minutus	VIm	2	0.05			56	1.76	137	4.27	258	8.08
	Leptodiaptomus pribilofensis	VIf							10	0.72		
	Leptodiaptomus pribilofensis	VIm					19	1.16	20	1.24		
Cyclopoida	Cyclopoida indet.	I-V	170	1.12	200	1.31	469	2.65	183	1.04		
	Cyclops scutifer	VIf										
	Cyclops scutifer	VIm										
	Diacyclops thomasi	VIf					19	0.46	37	0.89	100	2.43
	Diacyclops thomasi	VIm	2	0.03			31	0.55	40	0.70	133	2.34
Copepoda	Copepoda indet.	Nauplius	150	0.01	100	0.00	250	0.02	33	0.00	50	0.00
	Calanoida indet.	Nauplius	100	0.03	600	0.16	850	0.18	200	0.04	350	0.07
	Cyclopoida indet.	Nauplius	450	0.01	450	0.01	1,900	0.04	700	0.01	1,350	0.03
Rotifera	*Asplanchna* sp.	n/a	850	16.77	700	13.81	50	1.27			150	3.82
	Collotheca sp.	n/a										
	Conochilus sp.	n/a	650	0.49	1,250	0.95	450	0.57	1,033	1.30	1,250	1.57
	Filinia sp.	n/a										
	Kellicottia sp.	n/a	1,450	0.14	3,350	0.32	2,750	0.24	833	0.07	2,900	0.25
	Keratella sp. 1	n/a	1,250	1.79	1,100	1.57	200	0.25	67	0.08	400	0.50
	Keratella sp. 2	n/a										
	Lecane sp.	n/a										
	Monostyla sp.	n/a	50	0.00								
	Notholca sp.	n/a										
	Ploima indet.	n/a										
	Polyarthra sp.	n/a	700	0.29	1,050	0.44	200	0.08	267	0.11	900	0.36
	Synchaeta sp.	n/a	50	0.10							150	0.14
	Trichocerca sp.	n/a										
		Total	**6,023**	**21.89**	**8,952**	**19.68**	**7,975**	**19.06**	**3,887**	**14.90**	**9,342**	**33.86**

Table 7E-5: Raw Zooplankton Data, 2017

		Station	Mel-02-04		Mel-02-04-Rep2		Mel-02-05		Mel-01-04-QA		Mel-02-03-QA	
		Replicate	Rep 1		Rep 1		Rep 1		Rep 1		Rep 1	
		Sampling Period	05/09/2017		05/09/2017		05/09/2017		16/07/2017		23/07/2017	
Major Group	Taxon	Stage	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)
Cladocera	Bosminidae indet.	F	1,025	10.91	1,167	12.42	630	6.71	940	6.91	793	8.45
	Chydoridae indet.	F			8	0.12			20	0.24		
	Daphnia longiremis	F	625	5.96	450	4.29	230	2.19	320	1.45	387	3.68
	Daphnia sp.	F										
	Holopedium gibberum	F							520	10.97	53	1.11
Calanoida	Calanoida indet.	I-V			8	0.06	5	0.03	360	2.68	160	1.09
	Calanoida indet.	VIf										
	Epischura lacustris	I-V							40	0.77	13	0.32
	Epischura lacustris	VIf	8	0.34					40	1.73	7	0.28
	Epischura lacustris	VIm			17	0.60			30	1.12	7	0.24
	Leptodiaptomus minutus	VIf	33	1.26	25	0.94	25	0.94	90	3.11	13	0.50
	Leptodiaptomus minutus	VIm	33	1.04	33	1.04	20	0.63	40	1.22	33	1.04
	Leptodiaptomus pribilofensis	VIf							20	1.04		
	Leptodiaptomus pribilofensis	VIm							10	0.63		
Cyclopoida	Cyclopoida indet.	I-V	217	1.22	183	1.04	260	1.47	180	1.18	373	2.11
	Cyclops scutifer	VIf	8	0.27			5	0.16			13	0.43
	Cyclops scutifer	VIm	8	0.22			5	0.13			7	0.17
	Diacyclops thomasi	VIf			8	0.20	15	0.36	110	2.85	20	0.49
	Diacyclops thomasi	VIm			17	0.29	10	0.18	60	1.08	73	1.29
Copepoda	Copepoda indet.	Nauplius			33	0.00	50	0.00			300	0.03
	Calanoida indet.	Nauplius	233	0.05	333	0.07	300	0.06	100	0.03	700	0.15
	Cyclopoida indet.	Nauplius	667	0.01	600	0.01	750	0.01	2,100	0.03	2,300	0.04
Rotifera	*Asplanchna* sp.	n/a	300	7.64	333	8.49	150	3.82	900	17.76	300	7.64
	Collotheca sp.	n/a										
	Conochilus sp.	n/a	633	0.80	633	0.80	500	0.63	7,500	5.70	900	1.13
	Filinia sp.	n/a							100	0.03		
	Kellicottia sp.	n/a	1,200	0.10	1,700	0.15	1,650	0.14	4,500	0.42	1,800	0.15
	Keratella sp. 1	n/a	267	0.33	167	0.21	550	0.69	4,400	6.29	1,600	2.00
	Keratella sp. 2	n/a										
	Lecane sp.	n/a										
	Monostyla sp.	n/a	33	0.00					100	0.00		
	Notholca sp.	n/a										
	Ploima indet.	n/a										
	Polyarthra sp.	n/a	500	0.20	267	0.11	350	0.14	500	0.21	500	0.20
	Synchaeta sp.	n/a	100	0.09	200	0.19	200	0.19	500	0.98	100	0.09
	Trichocerca sp.	n/a					50	0.09				
		Total	**5,892**	**30.45**	**6,183**	**31.02**	**5,755**	**18.58**	**23,480**	**68.40**	**10,453**	**32.63**

Table 7E-5: Raw Zooplankton Data, 2017

		Station	Mel-01-04-QA		Mel-04-05-QA		Mel-05-04-QA		Mel-01-01-QA	
		Replicate	Rep 1		Rep 1		Rep 1		Rep 1	
		Sampling Period	09/08/2017		15/08/2017		12/08/2017		04/09/2017	
Major Group	Taxon	Stage	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)	Abundance (#/sample)	Biomass (mg/sample)
Cladocera	Bosminidae indet.	F	5,360	39.37	1,630	25.76	2,360	29.85	88	0.65
	Chydoridae indet.	F								
	Daphnia longiremis	F	600	2.71	420	4.10	3,460	28.46		
	Daphnia sp.	F							24	0.08
	Holopedium gibberum	F	120	2.53	50	1.09	400	11.25		
Calanoida	Calanoida indet.	I-V			100	0.82	380	3.39	4	0.03
	Calanoida indet.	VIf								
	Epischura lacustris	I-V								
	Epischura lacustris	VIf					20	1.11		
	Epischura lacustris	VIm					40	1.62		
	Leptodiaptomus minutus	VIf	40	1.38	50	1.75	200	7.93		
	Leptodiaptomus minutus	VIm	20	0.61	170	4.74	240	7.83		
	Leptodiaptomus pribilofensis	VIf			10	0.68	20	0.79		
	Leptodiaptomus pribilofensis	VIm								
Cyclopoida	Cyclopoida indet.	I-V	260	1.71	80	0.68	420	4.27	326	2.14
	Cyclops scutifer	VIf								
	Cyclops scutifer	VIm								
	Diacyclops thomasi	VIf	40	1.04	10	0.22	100	2.35		
	Diacyclops thomasi	VIm	20	0.36			20	0.35		
Copepoda	Copepoda indet.	Nauplius			150	0.01	300	0.01	150	0.01
	Calanoida indet.	Nauplius	200	0.05	700	0.17	1,100	0.22	450	0.12
	Cyclopoida indet.	Nauplius	500	0.01	2,250	0.03	3,200	0.06	1,000	0.01
Rotifera	*Asplanchna* sp.	n/a	1,500	29.60	50	1.39	100	2.56	650	12.83
	Collotheca sp.	n/a								
	Conochilus sp.	n/a	1,700	1.29	1,700	1.83	2,000	1.95	350	0.27
	Filinia sp.	n/a								
	Kellicottia sp.	n/a	2,700	0.25	1,100	0.07	2,800	0.29	1,800	0.17
	Keratella sp. 1	n/a	2,200	3.14	200	0.19	100	0.06	950	1.36
	Keratella sp. 2	n/a								
	Lecane sp.	n/a								
	Monostyla sp.	n/a								
	Notholca sp.	n/a	100	0.05	100	0.03				
	Ploima indet.	n/a								
	Polyarthra sp.	n/a	200	0.08	100	0.04	600	0.28	550	0.23
	Synchaeta sp.	n/a	100	0.20	50	0.02				
	Trichocerca sp.	n/a								
		Total	**15,660**	**84.39**	**8,920**	**43.63**	**17,860**	**104.64**	**6,342**	**17.88**

Appendix K

Updated Management Plans

AGNICO EAGLE

MELIADINE GOLD PROJECT

Borrow Pits and Quarries Management Plan

MARCH 2018
VERSION 6
6513-MPS-04

ᓇᐃᓇᖅᓯᒪᔪᖅ

ᐊᑲᓂᔨᑦᓯ ᑕᓯᖏᐊᕐᒥᑦ ᔪᓚᒧᑦ ᐅᓴᖅᑕᕆᐊᕐᒥᑦ ᐱᓂᓪᓕᐊᓂᖅᖃᖅᑐᑦ, 25 ᑭᓯᒥᑕᓪᓚᐊᓂᒃ ᐅᐊᖏᓇᖓᓂᑦ ᑲᖏᖅᓂᓂᕐᒥᑦ ᐅᖏᓱᓄᑎᔪᖅ, ᐊᑐᓚᐃ 80 ᑭᓯᒥᑕᓪᓚᐊᓂᒃ ᓂᒥᖅᑕᓱᔨᐊᓂᑦ ᐱᖏᓖᓇᖅᑕᓱᔨᐅᓂᑦ ᐃᒡᓗᓕᕆᔨᒥᑦ ᐅᖏᓱᓄᑎᔪᖅ ᑭᓂᓪᓕᕐᒥᑦ ᓄᓇᕗᑦᑕ. ᐅᓴᖅᑕᕆᐊᕐᓱᒧᑦ ᕿᖅᓇᐅᑎ ᓄᓇᒥᑦ ᐅᐅᐸᖏᓚᓗᒍ ᐊᑐᓚᓂ ᐅᓴᖅᑕᕆᐊᖅᓂᐅᓂᐊᖅᑐᖅ ᐱᓂᓪᓕᐊᓚᓗᒍ ᑎᕆᔨᓂᐊᖅ ᔫᓚᒃᑐᓂᖅ, ᒪᑦᑭᒋᑦ ᓄᓇᒥᑦ ᐅᐅᐸᖏᓚᓕᖅᑐᓂᐊᖅ (ᑎᕆᔨᓂᐊᖅ ᓄᓇᒥᑦ ᐅᐅᐸᖏᓚᔪᖅ 1 ᐊᑐᓚᓗ ᑎᕆᔨᓂᐊᖅ ᓄᓇᒥᑦ ᐅᐅᐸᖏᓚᔪᖅ 2) ᐊᑐᓚᓗ ᐊᑕᐅᔪᖅ ᓄᓇᐅᑦ ᐃᓗᐊᓂ ᐅᓴᖅᑕᕆᕈᓂᖅ.

ᓄᓇᒥᑦ ᐃᓗᓕᑐᖅᓯᒪᔪᓂᒃ ᐊᐅᓪᓚᑎᓂᓕᒧᑦ ᕿᖅᓇᐅᑎ ᐅᖅᐅᔨᖅᑐᖅ ᐃᓪᓚᑦᓂᓪᓂ, ᐊᐅᓪᓚᑎᓂᓕᒧᑦ ᓄᓇᒥᑦ ᐃᓗᐊᓂᑐᖅᓯᒪᔪᓂᒃ ᐅᐅᐸᖏᓚᓕᖅᑐᓂᐊᖅ ᒪᐅᓴᓗᒍ. ᓄᓇᒥᑦ ᐃᓗᓕᑐᖅᓯᒪᔪᕈᓂᒃ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᖅ ᐃᓗᓕᑐᖅᓯᒪᔪᓂᒃ ᐊᑦᑦᓂᐅᐅᔨᖅ ᑲᖏᖅᓂᓂᕐᒥᑦ, ᐃᑎᕕᐊᓂᒃ ᓄᖅᓱᖅᓂᖅᑐᖅ, ᐊᑐᓚᓗ ᐱᑦᓂᓄᓂᒃ ᑐᖅᑭᖅᑐᖅ ᐅᐱᐅᓗᓴᖅᑐᖅ ᐅᑦᑦᓂᓄᓂᒃ ᐊᐅᓪᓚᑎᓂᓕᒧᑦ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᖅ ᐊᑐᓚᓗ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᖅ ᐊᑦᑦᓂᓄᓂᒃ

ᓄᓇᒥᑦ ᐃᓚᓪᑐᖅᑎᑕᓴᓪᓕᒥᑦ ᐊᑐᕐᓂᐊᖅᑐᑦ “ᐃᑯᑕᕐᒥᑦ, ᖃᖅᑎᖅᑕᓚᑎᑦ, ᐅᓯᓴᖅᑐᐃᓚᓚᑎᑦ, ᐊᓗᓴᖅᑐᐃᓚᓚᑎᑦ, ᐅᓯᓴᐅᔪᓂᑦ ᐲᖅᓯᓚᑎᑦ” ᑕᐃᒪᓐᓇᐃᖓᓴᐅᑯᑦ, ᑭᖓᔪᓴᓪᓕᖅᑐᑯᓂᐊᖅᑐᖅ ᐃᓴᐅᑎᓴᖅᑐᑕᐅᓂᕐᓂᑦ ᐃᓚᓪᑐᖅᓴᖅᑕᐅᓂᕐᓂᑦ ᐅᓴᕋᐃᑦ ᐊᑐᖅᑐᑦ ᗕᐊᑎᓴᕐᒥᑦ. ᐃᓕᓴᐅᑦ ᐅᓴᕋᐃᑦ ᓯᖅᓴᓴᑎᖅᑕᐅᔪᓐᓇᖅᑐᑦ ᑲᑎᑎᑦᑐᖅᑐᑦ ᐊᓐᓴᑕᐅᓂᖅᑐᑦ ᐊᓐᓴᓴᓴᔪᓚᑎᑦ ᐅᓴᕋᐃᑦ. ᐊᔪᖃᓐᓇᑕᒡᓘᓐᓄᑦ, ᓄᓇᒥᑦ ᐃᓚᓪᑐᖅᓯᒪᔪᓴᓄᑦ ᐊᑐᖅᑕᐅᔪᑦ ᐃᓴᖅᑕᐅᓂᖅᑕᑦᓂᐊᖅᑐᑦ ᗕᐊᑎᓴᕐᒥᑦ ᐱᖓᓱᒃᑐᖅᑐᑦ ᐅᓴᕋᐃᑦ. ᐃᑯᑕᐃᓂᖅᑭᓐᓇᖅᑐᑦ ᐊᓚᓚ ᖃᖅᑎᖅᑕᓚᑎᑦ ᐱᓕᐃᓂᖅ ᐊᓴᐃᓂᖅ ᐊᔪᖃᓐᓇᖅᑐᑦ.

ᐊᓐᓯᓚᐊᓐᓯᑎᐊᖅᑎᑎᑎᓂᒃ ᐱᖅᑯᓯᑐᖅᖃᖅᓴᐅᔪᓂᑦ ᑕᐃᔪᓯᒪᓂᑐᖅᖃᖅᓚ ᐃᓂᑎᓴᐅᓂᖅᑕᓚᐅᓂᖅᑐᑦ, ᑕᑯᓴᐅᔪᒋᒪᓚᐅᖅᑐᑦ, ᐊᓚᒪᓚ ᐱᖅᑯᑎᖅᓴᐅᔪᓂᑦ ᑭᓯᑎᔾᓴᓐᓂᑦ ᐃᖅᑲᓚᐅᖅᑐᑦ ᓄᓇᓐᓄ ᒥᖅᓴᐃᖅᑯᓴᐅᒥᑦ, ᐊᓚᒪᓚ ᓂᔪᓱᑎᑦ ᒥᖅᓵᓄᑦ ᐱᓕᓚᐊᓴᓯᓂᐅᖅᑐᑦ ᐊᓚᒪᓚ ᐅᖅᐅᓯᐅᑦᔨᓚᑎᑦ ᔨᖅᓇᑦᓂᖅ. ᗕᔪᖅᑕᒃ, ᓂᐱᖅᓂᖅ, ᐊᓚᒪᓚ ᐃᒪᐅᔨ ᐱᐅᓂᓴᓂᑦ ᖃᐅᔨᓕᐊᖅᑕᒥᔪᖅ ᐱᔪᓱᑎᖅᑐᑦ ᐊᑐᖅᑕᐅᓂᓴᓕᓂᑦ ᓄᓇᒥᑦ ᐃᓚᓪᑐᖅᓯᒪᔪᑦ ᐱᓕᓚᐊᓴᓂᐊᖅᑐᑦ ᓴᓇᓂᓕᐊᑎᓴᓕᓚᓪᓕᒥᑦ, ᐊᐅᔨᖅᑎᓴᓚᓪᓕᒥᑦ, ᐊᓚᒪᓚ ᐅᓱᑯᐊᖅᔨᔪᓚᐅᓂᓴᑦ ᐱᓕᓚᐃᖅ.

ᐅᓚᓗᐊᓇᖅᑐᖅᖃᑯᓇᒍ, ᐅᓴᖅᖃᓄᑦ ᐊᓂᓚᓂᑦ ᐃᓕᓯᓂᐊᖅᑐᑦ 10 ᑭᑕᓂᑦ ᐅᓪᓚᓯᑎᑎᔪᑦ ᑭᓪᓕᕐᓂᓂᑦ ᓄᓇᒥᑦ ᐃᓚᓪᑐᖅᓯᒪᔪᐃᑦ ᐊᓚᒪᓚ ᖃᑯᔨᓂᑦ ᑕᑯᓴᐱᐅᔨᑦ ᓴᓂᕋᐃᑦ 2 ᑭᑕᐃᑦ ᐅᓪᓚᑦᓄᑦ ᑕᑭᓂᓴᐱᓴᑕ ᕿᐊᓵᑕᖅᑐᓄᑦ ᐅᖃᓚᓵᓂᑦ ᓯᑭᑐᖅᑐᓄᑦ ᐱᓂᓗᐊᖅᑐᐃᓄᑦ ᑲᑕᓪᓕᑦ ᑭᓪᓕᑯᓴᐅᓂᖅ.

ᐅᑎᖅᑎᑎᓵᓐᓇᖅᓂᐊᖅᑐᑦ ᐊᔪᖃᓐᓇᑯᑐᑐᐊᖅᓚᑦᓂᑕ. ᐅᓴᕋᖅᑐᑦᑎᐊᖅᓂᓴᑦ ᖃᓄᐃᓪᓚᓴᓪᓕᖅᑐᓴᓂᓴᑦ ᐱᓕᓚᐊᖅᓯᒪᔪᓄᑦᑐᖅᑐᑦ, ᓄᓇᒥᑦ ᐃᓚᓪᑐᖅᓯᒪᔪᓕᕆᓂᐊᖅᓯᐊᔪᓕᑦ ᒥᑭᔪᑦ ᐅᑎᖅᑎᑎᓵᓂᖅᑕᖅᑕᑯᓇᐊᖅᑎᖅᑐᑦ. ᐅᑎᖅᑎᑎᓵᓂᖅ ᓄᓇᒥᑦ ᐃᓚᓪᑐᖅᓯᒪᔪᓕᕆᓂᖅ ᐅᐃᖅᓯᐊᖅᑎᖅᑐᑦ ᐊᓚᒪᓚ ᓄᓇᒥᑦ ᐃᓚᓪᑐᖅᓯᒪᔪᔭᓕᑦ ᐃᑎᑎᓴᐅᓂᖅᑕᖅᑕᑯᓇᐊᖅᑎᖅᑐᑦ, ᐊᔪᖃᓐᓇᖅᑎᑦᑕᕐᓂᑦ ᐃᑎᑎᓴᐅᓂᖅᑕᖅᑕᑯᓇᐊᖅᑎᖅᑐᑦ ᐃᓚᓪᑐᖅᓯᒪᔪᔭᓕᑦ ᐃᑎᑎᓴᐅᓂᖅᑕᖅᑕᑯᓇᐊᖅᑎᖅᑐᑦ ᐃᓕᓴᐅᓂᖅᑕᐅᓚᐅᖅᑐᖅᑐᑦ ᐃᓕᓴᐅᓂᖅᑕᐅᓚᐅᖅᑐᖅᑐᑦ ᐃᓚᓪᑐᖅᓯᒪᔪᓕᕆ

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

This Borrow Pits and Quarries Management Plan describes selection, operations, and closure strategies for the borrow pits and quarries at the proposed Project. Borrow pit and quarry materials will be used for the construction and maintenance of the bypass road in Rankin Inlet, the Itivia laydown, and the infrastructure pad at the proposed mine site. It will also be used in the maintenance of the All-weather Access Road (AWAR) between Rankin Inlet and the Meliadine site.

Borrow pits and quarries on Inuit Owned Lands require a commercial lease and quarry permit issued by the Kivalliq Inuit Association. Quarry permits on municipal land are administered by the Government of Nunavut Department of Community and Government Services on behalf of the Hamlet of Rankin Inlet. Other relevant regulations are mentioned in the Plan.

The following best management practices will be used in the selection, operation and closure of borrow pits and quarries for the proposed Project:

- minimize the surface area of quarries and borrow pits, where possible;
- minimize quarry and borrow pit cuts, where possible;
- maintain the floor of the quarries and borrow pits slightly above the elevation of the surrounding area to promote drainage, to avoid creating quarry lakes, and to prevent permafrost degradation in borrow pits;
- prevent erosion and sedimentation through appropriate control measures;
- carry out ARD/ML testing and water quality monitoring in support of mitigation measures;
- protect archeological resources;
- verify that there are no raptor nests in or near quarries and borrow pits before beginning quarrying operations (see the Terrestrial Environment Management and Monitoring Plan submitted as part of the Final Environmental Impact Statement [Agnico Eagle 2014]);
- maintain air quality through dust control/suppression; and
- use progressive reclamation in closing quarries and borrow pits when no longer needed.
- perform environmental inspections

The quarries and borrow pits selected for building the AWAR showed no potential to generate acid drainage. Visual examinations of materials and additional testing will be conducted during construction to confirm that the best available building materials are being used.

Quarry operations will use a “drill, blast, load, haul, dump” sequence, the final step being placement of quarried rock using a dozer. Some rock could be crushed to produce aggregate of various sizes. Wherever possible, borrow pit material will be ripped using a dozer. Standard drill and blast procedures may be used in instances where ripping is not possible.

Mitigation measures pertaining to archaeological resources and adjacent historical sites, attractions, and facilities within boundaries of Iqalugaajuup Nunanga Territorial Park, and wildlife were developed and are described in the Plan. Dust, noise, and water quality monitoring related to the use of the

quarries and borrow pits will be carried out during the construction, operation, and closure phases of the Project.

As a safety measure, rock berms will be placed 10 metres from the edge of a quarry and above any exposed high walls that are more than 2 metres in height where there is a risk of an all-terrain vehicle or snowmobile accidentally going over the edge.

Progressive reclamation will be carried out as much as practicable. With prudent initial design, the proposed quarries/borrow pits should require little reclamation. Reclaimed quarries and borrow pits will have gently sloping walls and positive drainage, wherever possible. Loose wall rock will be pulled to the quarry floor, and quarry entrances will be blocked with large boulders.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	December 2012			First draft of the Borrow Pits and Quarries Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013	1.2.2	3-4	More detail on Discovery access road	John Witteman, Env. Consultant, Agnico Eagle
3	April 2014			FEIS submission	
4	April 2015			Update document for the Class A Water Licence Application	John Witteman, Env. Consultant, Agnico Eagle
5	March 2017	1.2.1	2	2016 Comprehensive Review following completion of AWAR Construction Addition of Table 1	Manon Turmel, Agnico Eagle Mines Ltd.
6	January 2018			Annual reviewe	Alexandre Gauthier, Env. Tech Meliadine Project

ACRONYMS

INAC	Indigenous and Northern Affairs Canada
Agnico Eagle	Agnico Eagle Mines Limited
ARD/ML	Acid Rock Drainage/Metal Leaching
AWAR	All-weather Access Road
CGS	Department of Community and Government Services, GN
CH	Department of Culture and Heritage, GN
CLEY	Department of Culture, Language, Elders and Youth, GN
IOL	Inuit Owned Lands
KIA	Kivalliq Inuit Association
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
Park	Iqaluqaarjuup Nunanga Territorial Park
Project	Meliadine Gold Project

UNITS

km	kilometre
m	metres
m^3	cubic metre

SECTION 1 • INTRODUCTION

1.1 Overview

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The proposed mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

The Borrow Pits and Quarries Management Plan was prepared in accordance with the Guidelines issued by the Nunavut Impact Review Board and was subsequently updated to meet the needs of the Type A Water Licence application to the Nunavut Water Board (NWB).

Borrow pits and quarries are defined by the type of granular material extracted and the method of extraction. Quarries consist of rock material that is typically extracted by digging, cutting, or blasting and yields large stones that may then need to be crushed (INAC 2009). Borrows pits consist of fine grained fill materials, such as sand or clay, that are normally used at a nearby site (INAC 2009).

1.2 Project Components

1.2.1 All-weather Access Road

The construction of the Phase 1 AWAR was completed in 2013.

The borrow pits and quarries selected for the road construction and maintenance, as shown on Figure 1-1 and Table 1.1, are immediately next to the road route thereby minimizing the haul distances for road maintenance. Of the borrow pits and quarries selected, only R19 (closed and rehabilitated), Site D (Municipal Borrow Pit) and the proposed Itivia Quarry (being reviewed by NIRB) are located on municipal land; the remainder are located on IOL administered by the Kivalliq Inuit Association (KIA).

Other considerations in the selection of the borrow pits and quarries include: the volume of material available, proximity to receiving waters, acid rock drainage/metal leaching (ARD/ML) potential, archaeological resources in the immediate vicinity, surface area to be disturbed, and wildlife and territorial park concerns (Golder 2011). The goal in selecting the quarries/borrow pits is to avoid or minimize, wherever possible, potential negative effects to the environment.

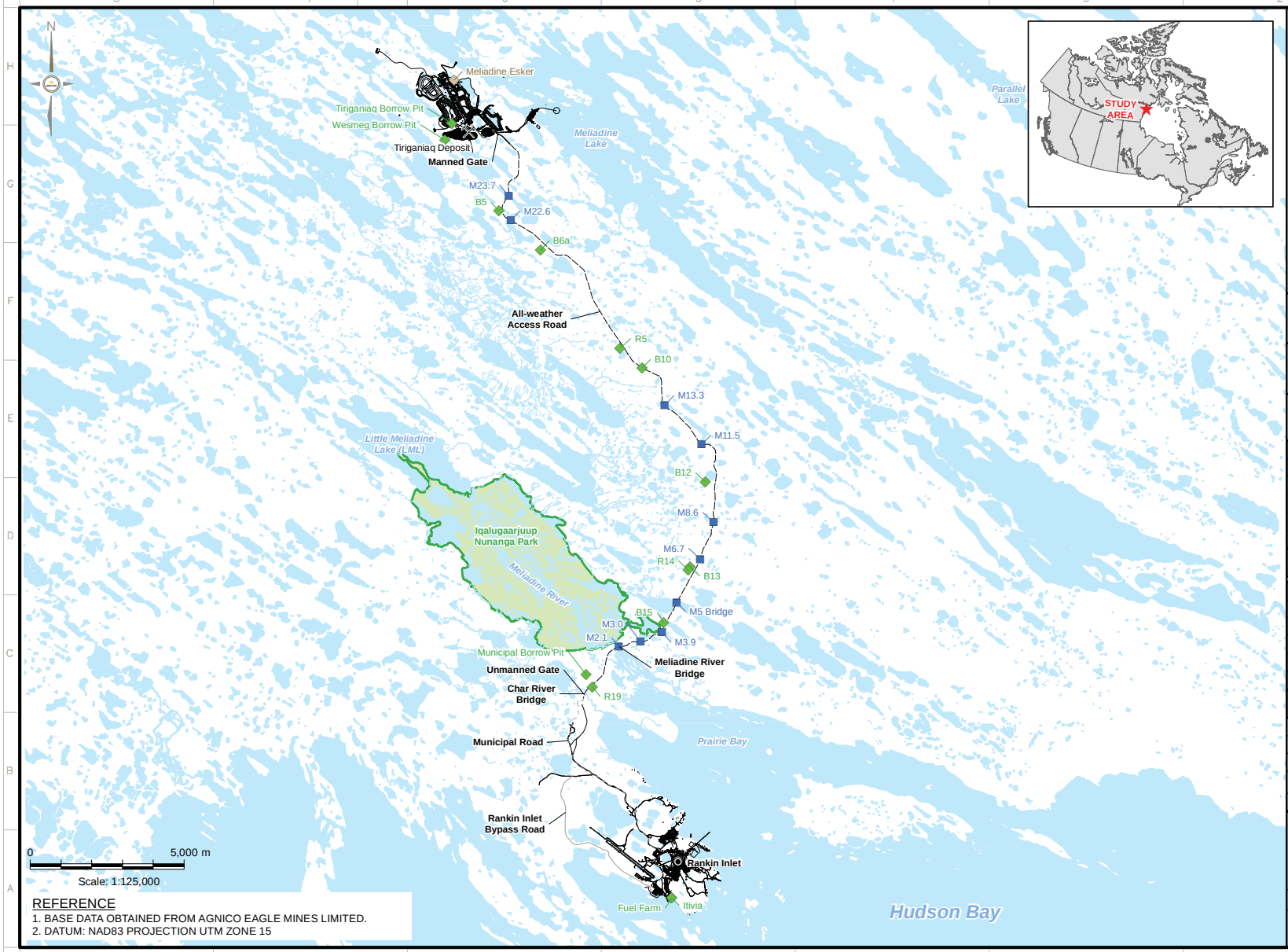
Table 1.1. Approved borrow pits and quarries

Issued By	Quarry permit	Quarries/borrow pits approved	Active (Y/N)
KIA	KVCA11Q01	B5	N
		B5A	N
		B6	N
		R2	N
		R5	N
		B10	N
		B11A	N

Issued By	Quarry permit	Quarries/borrow pits approved	Active (Y/N)
		B12	N
		B13	N
		B15	N
		B15A	N
		R19	N
KIA	KVCA07Q08	Tiriganiaq	N
		Westmeg	N
		Meliadine Esker	Y
		Emulsion Esker	Y
GN	01-600-16	Site D	Y
GN	Ongoing with GN	Fuel farm Quarry	N
GN	Ongoing with NIRB	Itivia Quarry	N

NO. DESSIN
DRAWING NO.

FORMAT ANSI B–11x17



REFERENCE

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

LEGEND

- PROPOSED MINE SITE
- QUARRY/BORROW PIT LOCATION
- ESKER LOCATION
- WATERCOURSE CROSSING
- ALL-WEATHER ACCESS ROAD (AWAR)
- ROAD - NEW
- ROAD - EXISTING
- Road - New Bypass
- WATERCOURSE
- WATERBODY
- TERRITORIAL PARK

AGNICO EAGLE

Golder Associates

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REV	DESCRIPTION	DATE	PAR BY

REVISIONS

DESSINÉ PAR / DRAWN BY	VM	DATE	20–10–2016
VÉRIFIÉ PAR / CHECKED BY	–		–
APPROUVÉ PAR / APPROVED BY	–		–
No. PROJET / PROJECT NO.	1656645		
DATE	–		

TITRE / TITLE

AGNICO EAGLE – MELIADINE DIVISION

FIGURE 1–1 LOCATION OF BORROW PITS AND QUARRIES FOR THE MELIADINE GOLD MINE

ÉCHELLE / SCALE	1:125,000	FICHIER / FILE	.DWG
No. DESSIN / DRAWING NO.	–	REVISION	A
		FEUILLE/SHT	1 / 1

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1.2.2 Hamlet Bypass Road and Itivia Laydown

A bypass road is proposed around the airstrip to Itivia harbour, as shown on Figure 1-1. This will allow traffic from Itivia harbour to bypass the hamlet in delivering dry goods and fuel from Itivia to the proposed mine site. It will also be used in moving air freight and mine personnel between the airport and the proposed mine site.

By building the bypass road, use of municipal roads by Agnico Eagle will be kept to a minimum. The proposed bypass road will be approximately 5.9 km long, and 6.5 metres wide. Road building materials will be sourced from Site D (Municipal Borrow Pit), the Itivia fuel farm area, and the Itivia Quarry once required approvals are received from regulatory bodies. The proposed laydown yard at Itivia harbour will cover 14 hectares. Material will be sourced from rock blasted in the fuel farm area and from the Itivia Quarry once required approvals are received from regulatory bodies.

1.2.3 Traditional All-terrain Vehicle and Snowmobile Trails

The proposed building of roads and the mine infrastructure at Itivia will impact some all-terrain vehicle and snowmobile trails. Where these trails cross a road, a ramp will be constructed to ease road crossing, and signage will be installed to alert road users of the crossing. Similarly, there will be a sign alerting all-terrain vehicles and snowmobiles that they are approaching a road. Maintenance of the roads would see no snow placed on these trails.

In accommodating existing trails rather than building new ones, the area impacted will be minimized. The ramps leading up to the road will be small and require little road building material.

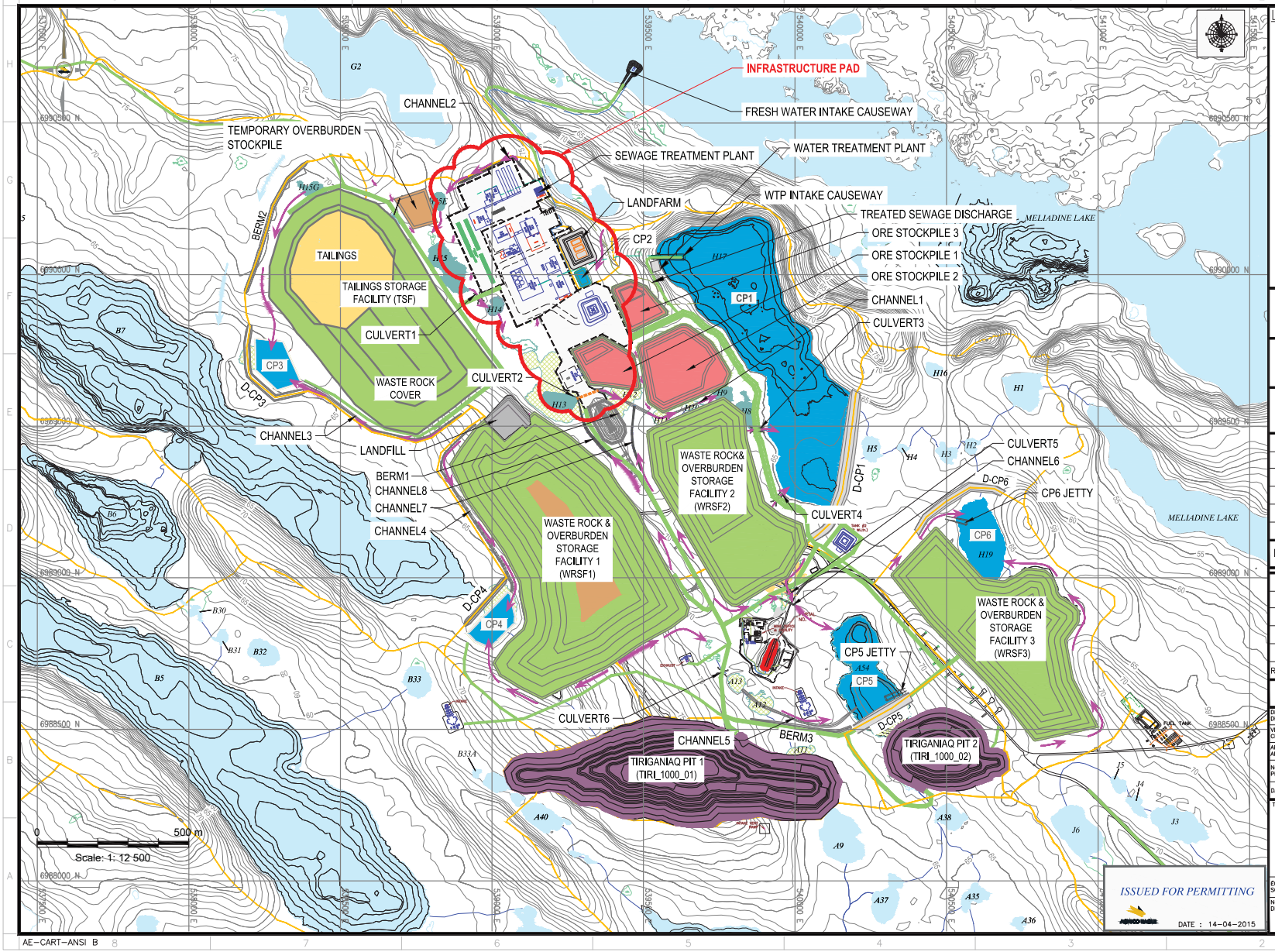
The present ski-doo trail at Itivia harbour to the sea ice is located to the east of the fenced laydown yard. Individuals will be able to readily access the sea ice using the re-located snowmobile trail.

1.2.4 On-Site Infrastructure Pad

The proposed major mine infrastructure, as shown on Figure 1-2, will be located on a pad having an area of approximately 70,000 square metres. The site preparation of the pad involved the spreading of waste rock and borrow pit materials to an average thickness of approximately 3 m over the pad area for a total volume of approximately 200,000 m^3. The material to construct the proposed infrastructure pad came from ramp development waste rock and from borrow pits Tiriganiaq Esker, Meliadine Esker, B5, and B6 (see Figure 1-1 for their location).

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LEGEND

- CATCHMENT BOUNDARY
- SERVICE ROAD
- HAUL ROAD
- NON CONTACT WATERBODY
- CONTACT WATERBODY
- WATER COLLECTION POND
- DRAINED POND AREA
- OPEN PIT
- OVERBURDEN
- WASTE ROCK
- ORE
- TAILINGS
- INDUSTRIAL SITE PAD
- WATER FLOW DIRECTION
- STREAM

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TITRE / TITLE	# DWG

DESSINS EN RÉFÉRENCE/REFERENCE DRAWINGS

REV	DESCRIPTION	DATE	PAR BY

REVISIONS

DESSINÉ PAR DRAWN BY	HX	DATE 14–04–2015
VÉRIFIÉ PAR CHECKED BY	NG	14–04–2015
APPROUVÉ PAR APPROVED BY		
No. PROJET PROJECT NO.		
DATE		

TITRE / TITLE

AGNICO EAGLE – MELIADINE GOLD PROJECT
FIGURE 1–2 MINE INFRASTRUCTURE PAD

ISSUED FOR PERMITTING
AGNICO EAGLE
DATE : 14–04–2015

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1.3 Quarry and Borrow Pit Extraction Methods

Quarry operations will use explosives. The design, size, and shape of the blasts are planned with safety being the foremost consideration. A predetermined pattern of drill holes are drilled to a depth not exceeding the overall depth of the quarry and filled with explosives. Prior to a blast, all personnel and equipment are moved to a safe distance from the blast area. The blast fragments (i.e., the blasted rock) is then loaded into haul or dump trucks using either a loader or an hydraulic shovel. The truck drives to the end of the road (or other construction area) where the rock is dumped. The rock is then pushed into place using a dozer. This sequence is called a “drill, blast, load, haul, dump” sequence.

Some rock can be moved to a crusher to produce aggregate of various sizes. The crusher is located as far from water as possible and where it is best shielded from the prevailing wind, preferably behind a high wall in a quarry so as to reduce the quantity of wind-blown dust and to have as much dust as possible fall within the boundaries of the quarry.

Wherever possible, borrow pit material will be ripped using a dozer. This loosens the material and allows it to be picked up using a loader or an hydraulic shovel. Standard drill and blast procedures may be used in instances where ripping is not possible. The sequence of steps under this circumstance follows that for rock quarries.

1.4 Related Documents

The following documents provided input to the Borrow Pits and Quarries Management Plan submitted as part of the Water Licence Application:

- Environmental Management and Protection Plan;
- Explosives Management Plan;
- Preliminary Closure and Reclamation Plan;
- Roads Management Plan, including the Dust Management Plan; and
- Water Management Plan.

The Borrow Pits and Quarries Management Plan is part of the Environmental Management and Protection Plan for the Project. The Air Quality Monitoring Plan and the Occupational Health and Safety Plan submitted as part of the Final Environmental Impact Statement also provided input to this plan.

1.5 Regulatory Setting

The proposed Project is located on IOL, with some components located within the municipality of Rankin Inlet. This includes all borrow pits and quarries exclusively used in building and maintaining the AWAR. As well, construction of the proposed bypass road and the fuel farm and laydown at Itivia will require granular material. Although federal requirements do not apply, the *Northern Land Use Guidelines, Pits and Quarries* prepared by Indian Affairs and Northern Development Canada (INAC 2009; which in 2017 split into Services Canada and Crown-Indigenous Relations and Northern Affairs) provides useful guidance in establishing and operating borrow pits and quarries in an Arctic setting.

In building the AWAR, borrow pits and rock quarries on IOL required a commercial lease and quarry permit issued by the KIA. Quarry permits from the KIA include terms and conditions specifying how operations are to be conducted.

Quarry permits on municipal land are administered by the Government of Nunavut Department of Community and Government Services (CGS) on behalf of the hamlet of Rankin Inlet. When the hamlet

council passes a resolution approving the quarry and/or borrow pit, the permit is issued by CGS. If Agnico Eagle purchases materials from existing quarries and borrow pits in the hamlet for the construction of the bypass road and the Itivia laydown, permits would not be required in this instance.

The Department of Culture and Heritage (CH) administers the archaeology permitting process for Nunavut. Archaeological surveys are undertaken in advance of borrow pit and quarry selection to ensure all archaeological sites are identified and avoided if possible. If the sites cannot be avoided, they are mitigated with the approval of CH.

The Nunavut *Wildlife Act and Regulations* will apply as raptors nesting close to the AWAR and quarries/borrow pits may be disturbed, or raptors may nest in the quarries and/or borrow pits upon the completion of their use.

Land animals may also be disturbed by the quarrying activities. The quarries and possibly the borrow pits in some instances will require the use of explosives. The activities will have to comply with the *Explosive Use Act and Regulations*, and the *Mine Health and Safety Act and Regulations.* The latter is administered by the Worker's Safety and Compensation Commission.

Use of rock and granular material from the quarries and borrow pits could introduce waste to water, and will require a water licence from the NWB under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and associated water regulations. The federal *Fisheries Act* will apply if runoff water containing deleterious substances flow from the quarries/borrow pits into fish bearing waters.

Use of explosives at quarries could lead to fish destruction or to harmful alteration, disruption or destruction of fish habitat. The federal *Fisheries Act* will apply if this was to occur.

SECTION 2 • QUARRIES AND BORROW PITS MITIGATION MEASURES

The ranking of mitigation options is as follows:

- **Avoidance** – using an alternate site or technology to avoid the adverse effect all together. This is the most desirable;
- **Minimization** – taking actions to minimize and/or contain effects to the maximum extent possible during engineering design, pre-development, construction, operations, and closure;
- **Rectification** – taking actions to rehabilitate or restore the affected environment after the fact; and
- **Compensation** – this is used as a last resort to offset adverse environmental effects. This is the least desirable.

Best management practices will employ the following general mitigation measures for the quarries and borrow pits:

- minimize the surface area of quarries and borrow pits where possible;
- minimize rock and borrow pit cuts where possible;
- maintain the floor of the quarries and borrow pits slightly above the elevation of the surrounding area to promote drainage, to avoid creating quarry lakes, and to prevent permafrost degradation in borrow pits;
- prevent erosion and sedimentation through appropriate control measures;
- carry out ARD/ML testing and water quality monitoring in support of mitigation measures;
- protect archeological resources;
- verify that there are no raptor nests in or near quarries and borrow pits before beginning quarrying operations;
- maintain air, water, and sediment quality through dust control/suppression; and
- use progressive reclamation in closing quarries and borrow pits no longer needed.
- perform environmental inspections

2.1 Acid Rock Drainage and Metal Leaching

Initial testing of potential quarry and borrow pit materials was completed in 2010 (Golder 2010) and in 2016 and 2017 for the Itivia Quarry, Rankin Inlet Fuel Farm Quarry, Emulsion Esker and Meliadine Esker quarries. Static methods were used to assess the chemical composition of the potential building material, its potential to generate acid rock drainage (ARD), and its potential to leach metals into the receiving environment upon exposure to ambient conditions.

Sampling and testing prior to use of any quarry or borrow pit significantly reduces the risk of ARD/ML. The quarries and borrow pits selected for road building and maintenance materials showed no potential to generate acid drainage due to the high buffering capacity and low sulphide content in the bedrock and glacial-fluvial deposits. In early testing, some potential quarries/borrow pits were rejected due to potential metal leaching (Golder 2010). Avoiding the use of undesirable or questionable road building materials ranks this mitigation measure as highly beneficial.

Additional measures will be used while the quarries and borrow pits are operational. Visual examinations of the quarry material for sulphur species and additional testing for ARD/ML will be conducted during construction of the roads and pads. As recommended by Price (2009), for every 100,000 tonnes of material removed from a borrow pit or rock quarry, eight samples will be collected for static testing and analysis (ARD/ML). This will include samples of wall rock (Agnico Eagle 2012). If ARD/ML materials are found, these materials will not be used for construction and the area will be covered with a minimum two metre thick layer of non-acid generating borrow material to encapsulate it below the active layer.

The additional testing will confirm that the best available materials are being used in constructing the infrastructure pad, the bypass road, and Itivia fuel farm and laydown.

The same procedures will be used should any new quarry and/or borrow pit be developed.

2.2 Management of Water Originating from Quarries and Borrow Pits

While ARD/ML testing is a measure to avoid using questionable road and pad building materials, water quality monitoring of seeps from quarries and borrow pits provides information on possible impacts on the environment (e.g., water and sediment quality) should the water reach any nearby waterbodies. A buffer of at least 31 m of undisturbed land will be maintained between quarries/borrow pits and waterbodies when practicable. If not possible, Agnico Eagle will seek approval from the Board. Best management practices will prevent direct drainage of the quarry to watercourses. However, any significant seeps originating from the borrow pits or rock quarries likely to reach receiving waters will be sampled and analysed for a full suite of water quality parameters. Any problematic water will be directed away from waterbodies, or held if possible. If necessary, silt curtains and/or straw logs will be used to control suspended sediments in water seeping from the quarries/borrow pits.

Although erosion is not expected to originate from water flow from the quarries/borrow pits, any evidence of erosion will be repaired by placing rip-rap over the affected area, and measures will be taken to reduce the velocity of the water with, for example, silt curtains, straw logs, or small check dams.

2.3 Archaeological Resources

The quarries and borrow pits were selected to avoid archaeological resources. Archaeological surveys were completed along the AWAR alignment, its buffer zone, over the footprint of selected quarries and borrow pits, and the immediate area. The archaeological site identified at borrow pit B11A will be protected. This borrow area is large in extent allowing Agnico Eagle to develop the borrow pit without disturbing this site. There were sites identified at borrow pit B12 and quarry R14 that could not realistically be avoided and these were mitigated under a permit issued by CLEY[1] to Agnico Eagle.

If any potential archaeological site is identified during the operation of any quarry/borrow pit, work will stop, a professional archaeologist will be consulted, and CH will be informed of the discovery.

All equipment will remain within the boundaries of the quarries/borrow pits to ensure any nearby archaeological site is not inadvertently damaged.

[1] In a recent Nunavut government re-organization Culture, Language, Elders & Youth was renamed Culture and Heritage.

Before any new quarry/borrow pit is selected, it will be surveyed for archaeological resources by a professional archaeologist registered in Nunavut. Sites with archaeological resources present will not be selected if there is a similar site devoid of archaeological resources nearby.

2.4 Iqaluqaarjuup Nunanga Territorial Park

Quarries and borrow pits will not be developed in or near the Iqaluqaarjuup Nunanga Territorial Park (the Park). Rock quarry R19 and borrow pit B15 (Figure 1-1) are the closest to the Park. Both are more than 1 km from the Park boundary and quarry R19 is closed and rehabilitated. All personnel working in the quarries/borrow pits and on the AWAR will not enter the Park during work hours. Noise from construction vehicles will be minimized as part of best management practices by ensuring noise control equipment installed on the vehicles are maintained and operating according to specifications.

Noise related to quarry/borrow pit operations will be of short duration and should be restricted primarily to the predevelopment and construction phases of the Project. While noise can be expected to be heard in a 5 km radius, the majority of the noise should be within 1 km of the activities.

The prevailing wind direction at Rankin Inlet is from the north-northwest. This prevailing wind direction is consistent for all months of the year and would tend to blow dust from the road and quarry/borrow pits away from the Park. All wind directions that could carry dust towards the Park occur on average 25 to 35 % of the time.

2.5 Dust Control

Dust will be generated as part of quarry/borrow pit operations and will be restricted primarily to the predevelopment at the proposed mine, and the construction of the proposed bypass road and Itivia laydown. To limit the creation of dust, any crusher will be located where it is best shielded from the prevailing wind, preferably behind a high wall in the quarry. In addition, crushing that occurs during the summer when dry weather is expected will be controlled through wetting. Both of these measures will minimize dust generation and limit dusting to the bounds of the quarry.

Transport of material from the quarries/borrow pits will be subject to speed limit restrictions to help reduce dust.

Dust monitoring is occurring along the AWAR and between the AWAR and the Park.

2.6 Ground Ice and Permafrost Protection

The borrow pits[2] sites selected are from glaciofluvial deposits and weathered bedrock deposits located in well-drained areas. All have positive topography rising above the local setting. These types of granular deposits were selected because they are largely free of ground ice, thereby minimizing possible thaw settlement and melting ground ice, which can result in erosion, slumping of side slopes, and an altered landscape that extends beyond the borrow pit. Should this happen, the area will be monitored and, if necessary, stabilized by covering the affected land with approximately 2 m of rock or other granular material. This reclamation effort would allow the permafrost to move up into the material covering the area and stop any remaining ground ice from melting. Inspections of quarries/borrow pits will continue after their closure at the end of Project predevelopment and construction.

[2] Quarry sites are expected to be free of ground ice and should not release any water should the permafrost melt.

Any significant seeps originating from the borrow pits as a result of ground ice, permafrost melting, or from precipitation events will be monitored if the water is likely to reach receiving waters[3].

[3] Shallow, standing water will not be collected as it poses little risk to the receiving environment.

SECTION 3 • PROGRESSIVE RECLAMATION STRATEGY

The Project's reclamation objective is to avoid or minimize negative environmental effects wherever possible, practice progressive reclamation, and, upon closure, return negatively impacted areas to productive and lasting use by wildlife and humans. Reclaimed areas will be chemically and physically stable, and should ultimately support the same functions as surrounding undisturbed land. Because of the proximity to Rankin Inlet, particular attention will be paid to ensuring that reclaimed areas are safe for future traditional use.

A practical, cost-effective approach will be central to the closure and reclamation of the borrow pits and quarries. The intent is to pursue progressive reclamation to return areas to natural conditions and avoid long-term care and maintenance requirements. Most quarries and borrow pits will no longer be needed following the completion of construction, although several quarries will remain open to support ongoing maintenance and repair of the AWAR[4]. Using best management practices, borrow pits and quarries no longer in use will be reclaimed by stabilizing disturbed land surfaces, which will promote natural re-vegetation.

The reclaimed quarries and borrow pits will have gently sloping walls and positive drainage wherever possible. With prudent initial design, the quarries/borrow pits should require little reclamation. Loose wall rock will be pulled to the floor of the quarry, and the quarry entrance will be blocked with large boulders. For the interim until the quarries and borrow pits are reclaimed, rock berms will be placed 10 m from the edge of the quarry/borrow pits and above any exposed high walls that are more than 2 m in height where there is a risk of an all-terrain vehicle or snowmobile accidentally going over the edge.

Should acid-generating bedrock be exposed in borrow pit/quarry, these areas will be covered with a minimum of a 2 m thick layer of non-acid generating soil or rock. Water will be directed away from the area.

[4] A small number will remain active to store and/or supply crushed rock and/or granular material for ongoing road maintenance.

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AGNICO EAGLE

MELIADINE GOLD PROJECT

Environmental Management and Protection Plan (EMPP)

MARCH 2018
VERSION 7
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ᐊᖏᑭᐅᒪᓂᖅ ᖃᐅᔨᒋᐊᖃᑦᑕᕐᓂᐅᕐᐸ ᐊᒻᒪᓗ ᐊᐅᓪᓕᑎᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᐅᕐᐸ, ᓇᓴᐅᑎᓂᒃ/ᑎᑎᖃᖅᓂᒃ ᖃᐅᔨᓴᐃᓂᖅᑕ, ᐅᓂᐸᑲᓪᓕᐅᓂᖅ, ᐊᒻᒪᓗ ᐃᓪᓕᐅᑎᓂᖅᑭᑦ ᖃᓄᐃᖅᓯᓂᐅᔨᕐᑦ ᐊᐅᓪᓚᖅᑎᓂᕐᒧᑦ ᒪᓕᒃᑕᐅᔨᓴᓴᓄᑦ ᐱᓕᕆᐊᖅᓯᐊᖅᑐᑦ ᐊᓱᓂᔪᓄᓕᒃᓄᑦ. ᐅᖃᖅᖃᑎᖃᑦᑕᐅᑎᓂᖅ ᑕᒪᒃᔪᓄᖅᓱ ᐊᓯᐊᖅᓯᖅᑎᑎᑐᐃᓐᓇᕆᐊᓕᒃ ᑎᑭᐅᑎᓂᐊᓕᖅᑐᓂ ᐱᓕᕆᐊᖃᖅᑐᑦ ᐃᓕᓴᐃᑦᑕᐅᔨᓄᑦ ᐊᓯᖏᓐᓄᑦ ᖃᑐᐃᖅᑎᑦᓄᑦ. ᐊᒻᒪᓗ ᐃᓕᓴᐃᑦᑕᐅᔨᓴᓴᓄᑦ ᐊᓯᖏᓐᓄᑦ ᐃᓄᐃᑦ

EXECUTIVE SUMMARY

The Environmental Management and Protection Plan (EMPP) describes the overarching direction for environmental and socio-economic management for Agnico Eagle Mines Limited (Agnico Eagle) Meliadine Gold Project (Project). It is supported by a suite of Project-specific mitigation, monitoring, and/or management plans that set out the Project's standards and requirements for particular areas of environmental and socio-economic management. Agnico Eagle will manage the conditions in the Project Certificate, Type A Water Licence (2AM-MEL1631), other authorizations, and the requirements pertaining to the relevant laws and regulations. Agnico Eagle has also developed standard operating procedures that reflect legal requirements pertaining to the Project.

A cyclical feedback loop will be employed where operations are planned and implemented, monitoring data collected and analyzed, and practices adjusted to promptly reduce or eliminate any observed negative impacts throughout the life of the Project. Continual use of this feedback loop will allow adaptive management decisions to be made on an ongoing basis, and shall lead to improvements to the environmental and socio-economic management system as necessary over time.

The EMPP will offer flexibility to respond to changes, for example, in the mining development plan, the regulatory regime, the biophysical and socio-economic environments, technology, research results, and the understanding of Inuit Qaugimajatuqangit (IQ). Threshold and indicators to trigger management actions will be provided, where applicable, in the plans embedded in the EMPP, along with a system of accountability.

Monitoring and adaptive management are essential tools for ensuring that a project is implemented as planned, that mitigation measures are successful, that the procedures and practices are effective, that potential adverse impacts are avoided or minimized, and that enhancement measures are effective. Each individual management plan will assess the effectiveness mitigation measures and associated follow-up mechanisms for adaptive management. These plans will outline how results from monitoring will be used to refine or modify the design and implementation of mitigation measures and management plans, and how monitoring results might wind up in work reorientation and potential improvements in the implementation of the various components of the Project.

The design of monitoring and management plans, data analysis, reporting, and integration of results into operational procedures will be carried out by Agnico Eagle. Consultation on the same may lead to changes to meet the needs and concerns of other organizations. Agnico Eagle has incorporated design elements like:

- objectives, applicable laws, and regulations;
- the Valued Ecosystem Components (VECs) and Valued Socio-economic Components (VSECs) to be monitored;

- IQ findings;
- frequency, duration, and geographic extent of monitoring;
- proposed action plans and reporting procedures; and
- quality assurance and quality control programs, etc.

When applicable, monitoring programs will be designed so that the results can be coordinated with ongoing regional initiatives or programs with the relevant government organisations or regional authorities.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	November 2012			First draft of the Environmental Management and Protection Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013	1.2	2-4	Add Project phases to Table 1-1 and details on adaptive management	John Witteman, Env. Consultant, Agnico Eagle
		3.2	11-13	Add details on adaptive management in design of plans	
		4.5	20-21	Independent audits and reviews	
3	April 2014	1.2	5	Monitoring and mitigation plans vs licensing process	John Witteman, Env. Consultant, Agnico Eagle
		1.3	5	Revision throughout life-of-mine	
		1.3	7	Added Table 1-3	
		2.1	8	Updated Sustainable Development Policy	
		4	16 and 18	Added design, practices and procedures; link with VECs and VSECs	
4	April 2015			Update of entire document for Water Licence Application	John Witteman, Env. Consultant, Agnico Eagle
		4.2.2	24	New section on Traditional Knowledge (IQ)	
		4.2.3	25	New section on Inspections	
5	June 2016	Executive Summary		Revised Section to reflect receipt of Water Licence	Golder Associates, Ltd.
		1		Revised Introduction	
		4.2.1		Revised Environmental Monitoring to meet Water Licence	
		4.2.3		Revised Inspections	
		4.4		Revised Table 4-4 to meet Water Licence	
6	March 2017	Table 4-1 Figure 4-2		Revised Table as per approved new sampling location nomenclature	Manon Turmel, Agnico Eagle Mines Ltd.

7	February 2018	All	Revised to reflect current conditions at Site and reduce repetition	Alex Gauthier and Jennifer Brown, Agnico Eagle Mines Ltd.

ACRONYMS

INAC	Indigenous and Northern Affairs Canada
AEMP	Aquatic Effects Monitoring Program
Agnico Eagle	Agnico Eagle Mines Limited
DFO	Fisheries and Oceans Canada
DOE	Department of Environment
EA	Environmental Assessment
EC	Environment Canada
EMPP	Environmental Management and Protection Plan
FEIS	Final Environmental Impact Statement
GN	Government of Nunavut
HTO	Hunting Trapping Organization
IP	Inspection Plan
IQ	Inuit Qaugimajatuqangit
KIA	Kivalliq Inuit Association
NIRB	Nunavut Impact Review Board
NPC	Nunavut Planning Commission
NWB	Nunavut Water Board
PDCA	Plan, Do, Check, Adjust
QA/QC	Quality Assurance and Quality Control
RMMS	Responsible Mining Management System
TC	Transport Canada
VEC	Valued Ecosystem Component
VSEC	Valued Socio-Economic Component

SECTION 1 • INTRODUCTION

1.1 Purpose and Scope

The Environmental Management and Protection Plan (EMPP) provides Agnico Eagle with direction to environmental and socio-economic management for the Project throughout the life of mine. It is a site-specific plan that describes the systematic means by which Agnico Eagle will consistently manage and control potentially adverse impacts, and enhance potential project benefits identified through the Environmental Assessment (EA) process and the subsequent licensing and permitting of the Project.

Activities under the EMPP seek to consistently comply with laws, regulations, and authorizations, and enable the achievement of goals set out in Agnico Eagle's Sustainable Development Policy. This plan applies to pre-development, construction, operations, and closure phases for the Project.

The EMPP defines the sequence of policy, planning, implementation, monitoring, and review processes that will ensure that the Project complies with commitments made throughout the EA process, regulated standards and Agnico Eagle's environmental standards, and implements adaptive management activities for ongoing improvement.

The EMPP encompasses a suite of project specific mitigations and monitoring and/or management plans that set out the Project's standards and requirements for different areas of environmental and socio-economic management. Many of the plans are required by law or by conditions attached to the Project Certificate, Type A Water Licence 2AM-MEL1631 (Type A Water Licence) issued to the Project. The plans and measures are specific to various aspects, components, activities and/or the construction, operation, and closure of the Project.

Figure 1-1 General Site Plan

1.2 Environmental Management Documentation

The structure of the Project's environmental management documentation is shown in Table 1-1. Socio-economic plans are included for completeness. They can have a bearing on the EMPP. For complete details, please consult the individual plans.

Table 1-1 Environmental and Socio-Economic Monitoring, Mitigation, and Management Plans

Environmental Management System						
			Project Phase			
Plan		Purpose	Construction	Operation	Closure	Post-Closure
6513-MPS-01	Incineration Management Plan	To outline the operation of an incinerator located at the site.	√	√	√	
6513-MPS-03	Roads Management Plan	To manage access, service, and haul roads proposed in the Project areas, covering construction, operations, and final closure (the Plan also covers temporary closure).	√	√	√	
6513-MPS-04	Borrow Pits and Quarries Management Plan	To outline environmental aspects of developing, using, and closing the borrow pits and quarries necessary for the overall Project. May be used throughout the Project's life as necessary (when quarries and borrow pits will be required).	√	√	√	
6513-MPS-05	Spill Contingency Plan	To facilitate the efficient cleanup in case of spill incidents related to the Project, and to promote environmental awareness and safety when dealing with spills.	√	√	√	√
6513-MPS-06	Landfill and Waste Management Plan	To describe how non-combustible, non-hazardous, solid industrial wastes will be managed using a landfill, and how remaining non-hazardous waste will be managed.	√	√	√	
6513-MPS-07	Environmental Management and Protection Plan	To provide overarching direction for environmental and socio-economic management for the Project. It is supported by the following suite of Project-specific mitigation, monitoring, and/or management plans.	√	√	√	√
6513-MPS-08	Ore Storage Management Plan	To address the management of ore mined at the Project.		√		
6513-MPS-09	Mine Waste Management Plan [a]	To address the management of all waste rock and overburden generated through all phases of the Project, and all tailings generated during the operational phase of the Project.	√	√	√	√
6513-MPS-10	Mine Plan	Provide a summary of consolidated information on the design, operation, production and environment management of the mining and milling facilities.	√	√	√	
6513-MPS-11	Water Management [a] Plan	To provide a consolidated source of information on the strategies to be applied to intercept, collect,	√	√	√	√

Table 1-1 Environmental and Socio-Economic Monitoring, Mitigation, and Management Plans

Environmental Management System						
			Project Phase			
	Plan	Purpose	Construction	Operation	Closure	Post-Closure
		contain, conserve, and monitor water in the Project's area, thus preventing potential adverse impacts on water.				
6513-MPS-12	Hazardous Materials Management Plan	To describe how solid and liquid hazardous materials, including hazardous waste, will be managed. Includes Fuel Management Plan.	√	√	√	
6513-MPS-14	Explosive Management Plan	To provide information on explosives transport, storage, manufacture, and handling at the Project.	√	√		
6513-MPS-15	Landfarm Management Plan	To outline the storage and remediation of petroleum hydrocarbon contaminated soil, snow, and ice that may be generated at the Project.	√	√	√	
6513-RMM-01	Risk Management and Emergency Response Plan	An assessment of the potential risks from natural hazards, in both aquatic and terrestrial environments, plus a response plan to emergencies. Includes risk assessment and management if incidents and mechanical and procedural malfunctions emergency response plan.	√	√	√	√
6513-CRP-01	Preliminary Closure and Reclamation Plan	To develop a conceptual plan which outlines how the various mine components will be decommissioned, reclaimed and/or closed following temporary closure or final mine closure. Includes care and maintenance.			√	√
6513-QQY-01	Quality Assurance/Quality Control	Provides consolidated information on the quality assurance and quality control measures for the Project.	√	√	√	
6513-REP-03	Aquatic Effects Monitoring Program (AEMP) Design Plan [a]	To provide information on monitoring the aquatic environment and on mitigation measures to protect and minimize potential impacts on the aquatic environment.	√	√	√	√
	Conceptual Fisheries Protection and Offsetting Plan [b]	To discuss measures to be implemented to offset the loss of fish habitat resulting from Project activities and components.	√	√	√	√
	Air Quality Monitoring Plan	To present air quality monitoring and management, and emissions and dust reduction/control strategies.	√	√	√	
	Noise Monitoring Plan [b]	To provide information on monitoring and mitigation of noise.	√	√	√	
	Terrestrial Environment Management and Monitoring Plan (TEMMP) [b]	To include appropriate mitigation and monitoring for selected terrestrial species.	√	√	√	√

Table 1-1 Environmental and Socio-Economic Monitoring, Mitigation, and Management Plans

Environmental Management System						
			Project Phase			
	Plan	Purpose	Construction	Operation	Closure	Post-Closure
	Shipping Management Plan	To present all Project-related shipping of dry cargo and fuel to Rankin Inlet.	√	√	√	
	Oil Pollution Prevention Plan [b]	To present the requirements for emergency procedures, equipment, and resources specific to the Rankin Inlet Oil Handling Facility (tank farm), as well as preventive measures.	√	√	√	
	Socio-Economic Management Plans					
	Cultural and Heritage Resources Protection Plan [b]	To discuss how heritage values will be protected and the management of potential impacts to identified cultural and heritage resources.	√	√		
	Socio-economic Management Plan [b]	To present the approach to socio-economic management and monitoring through the Project development to verify proper mitigation and benefit enhancement measures.	√	√	√	
	Business Development Plan[(a)]	To present strategies for preferential hiring/contracting and for building capacity for local businesses and entrepreneurs.	√	√	√	
	Human Resources Plan [b]	To present recruitment strategies and steps to reduce labour force entry barriers and improve employee retention. This includes information regarding employment/training opportunities, hiring plans, and time schedules.	√	√	√	
	Community Involvement Plan [b]	To provide a clear definition of public and community, and their possible involvement in the Project.	√	√	√	
	Occupational Health and Safety Plan [b]	To present an overview of the occupational health and safety program for the activities and works being proposed.	√	√	√	√

[a] To be updated for submission to the Board for review, within sixty (60) days of issuance of the Water Licence.
[b] Submitted with the Final Environmental Impact Statement, Agnico Eagle (2014a).

The EMPP is not a static document; it will be updated periodically as site and external conditions change and as knowledge is gained. Requirements to refine the EMPP may result from changes in operations, technologies employed, the phase of the Project, the result of research findings commissioned by Agnico Eagle, improvements in safety procedures, and/or greater understanding of traditional knowledge (IQ). Changes to laws and regulations, environmental, and socio-economic conditions, and other external factors can also have a bearing on the EMPP.

SECTION 2 • BACKGROUND

2.1 Sustainable Development Policy

The sustainability policy commits to protecting the environment and forms the basis of the EMPP and defines the framework within which Agnico Eagle and guides actions. The commitments are as follows:

PROTECT THE ENVIRONMENT

We aim to minimize the effects of our operations on the environment and maintain its viability and its diversity. To achieve this we:

- *Minimize the generation of waste and ensure its proper disposal;*
- *Manage tailings, waste rock and overburden to ensure environmental protection;*
- *Implement measures to conserve natural resources such as energy and water;*
- *Implement measures to reduce emissions to air, water and land, and to minimize our footprint;*
- *Implement measures to reduce our greenhouse gas emissions and address climate change;*
- *Integrate biodiversity conservation and land use planning considerations through all stages of business and production activities;*
- *Rehabilitate sites to ensure physical and chemical stability and in consultation with the communities in a timely manner.*

2.2 Regulatory Setting

Appendix A provides a listing of the various territorial and federal laws, regulation, and guidelines applicable to the Project.

The main authorizing agencies participating in the review of the Project's Type A Water Licence are the following:

- Nunavut Impact Review Board (NIRB);
- Indigenous and Northern Affairs Canada (INAC);
- Nunavut Planning Commission (NPC);
- Nunavut Water Board (NWB);
- Kivalliq Inuit Association (KIA);
- Fisheries and Oceans Canada (DFO);
- Environment Canada (EC);
- Hunting Trapping Organization (HTO)
- Transport Canada (TC);
- Nunavut Research Institute;

- Department of Environment (DOE), Government of Nunavut (GN);
- Department of Culture and Heritage, (CH)[1], GN;
- Community and Government Services (CGS), GN; and
- Hamlet of Rankin Inlet.

2.3 Environmental Management and Protection Plan Effectiveness

The effectiveness of the EMPP will be ensured by:

- applying best management practices and using best available information throughout the life of the Project;
- employing adaptive management to address any concerns that may be raised through monitoring;
- seeking continual improvements in environmental and socio-economic management;
- implementing commitments made as part of the Final Environmental Impact Statement (FEIS) (Agnico Eagle 2014a) and Type A Licence;
- consulting with Kivalliq communities and Inuit organizations to obtain their concerns and guidance for environmental and socio-economic management;
- seeking contribution of Inuit Qaujimajatuqangit (IQ) to management decisions;
- complying with laws, regulations, and authorizations, including conditions set out in the Project Certificate and Type A Water Licence;
- managing environmental and socio-economic risks associated with the Project through the use of the Precautionary Principle[2] to prevent risks of serious or irreversible harm to the environment;
- assigning roles and responsibilities in making decisions and responding to environmental and socio-economic impacts; and
- reducing or eliminating potentially adverse impacts while maximizing beneficial effects.

2.4 Flexibility in the Environmental Management and Protection Plan

Adaptive management can improve long run management outcomes. This is possible as the EMPP and decision-making are open to change. Decision-making will simultaneously meet management objectives and accrue information needed to improve future environmental management (Holling 1978). With this in mind, flexibility becomes a necessity as knowledge is gained from operations, IQ, monitoring, and research, and as changes are implemented to the benefit of environmental and social aspects, components, and activities throughout all phases of the Project. Flexibility allows for adjustments to operating procedures and refinement of mitigation measures based on what has been learned through experience, monitoring, and research.

[1] Formerly Department of Culture, Language, Elders and Youth (CLEY)

[2] The *Canadian Environmental Protection Act* (1999) defines the Precautionary Principle as follows: "*…where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*"

SECTION 3 • ENVIRONMENTAL MANAGEMENT SYSTEM

3.1 Responsibilities and Resource Allocation

The Responsible Mining Management System (RMMS) is expected to provide information related to two key questions:

1. *Does the RMMS effectively conserve and protect the environment in which the mine operates and allow traditional pursuits to continue unimpeded?*

2. *Does the RMMS achieve the goals found in Agnico Eagle's Sustainable Development Policy?*

The RMMS is designed to provide adequate protection to the environment while leaving the flexibility for continual improvement over time. Asking the above questions verifies that the assignment of environmental management responsibilities is planned before any activities ensue. Asking the questions also confirms that resource allocation to environmental management, monitoring, and mitigation is adequate. By proactively undertaking the task of keeping the EMPP current, continual improvement in environmental performance will be encouraged.

The use of adaptive environmental management allows scenarios to be tested and mitigation measures to be planned and developed beforehand. This allows for a rapid response to adverse effects and reduces the length of time land and water potential impacts could persist. However, in the event inadequacies are detected in the RMMS, the flexibility afforded by adaptive management allows these to be addressed quickly and in a comprehensive manner.

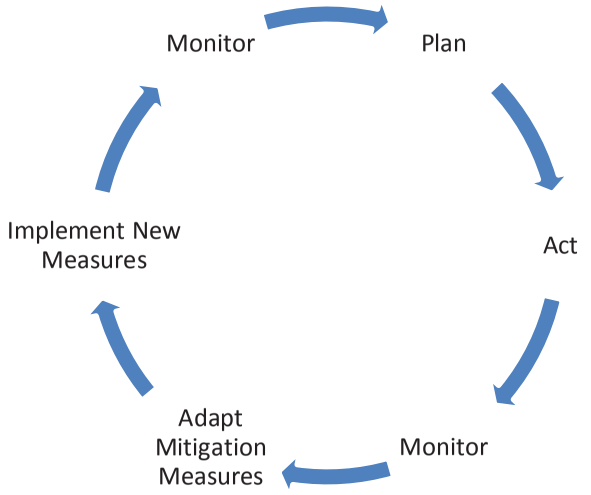
Responsibility for decision-making and providing the resources for the implementation, maintenance, and improvements to the EMPP rests with mine management with input from Agnico Eagle's corporate office. Management responses to potential adverse effects will be based on the analysis of monitoring results and an understanding of the cause and effect, the severity and duration of the adverse effect, and the impact on traditional pursuits. Decisions made using an adaptive management process will improve the EMPP's effectiveness in addressing environmental effects while maintaining the economic viability of the mine. The Environment Superintendent, as a member of the mine management team, will have input to collective decisions.

The response initiated and resources devoted to it would be commensurate with the gravity and duration of the observed effect. The goal is to remove the cause of the adverse effect or reduce the observed effect to an acceptable level. This could include administrative actions, such as adjustments to standard operating procedures, especially if negative effects linger.

3.2 Design of Mitigation and Monitoring Plans

Environmental mitigation and monitoring plans outline specific procedures and actions considered essential in accomplishing defined tasks required by the Project. These plans (e.g., Water Management Plan [Agnico Eagle 2017], Terrestrial Environment Management and Monitoring Plan

[Agnico Eagle 2017], Borrow Pits and Quarries Management Plan [Agnico Eagle 2018], etc.) include various responses (mitigation measures and strategies) designed to be corresponding to the potential adverse effects. The Plans also include monitoring provisions and programs designed with the objective of assessing effectiveness of the planned mitigation measures after such measures have been implemented. These Plans will also assist Agnico Eagle in modifying/reorienting its work activities and in making improvements to its mitigation measures during all phases of the Project. In other words, assist Agnico Eagle to adaptively manage its activities, mitigation measures, and monitoring programs to ensure that its mitigation measures are effective in managing the socio-economic and environmental outcomes. In essence, adaptive management is a cycle that is applicable to all activities under the RMMS.



In this way Agnico Eagle can continue to monitor the effectiveness of its mitigation measures, both against Certificate/Licence/Authorization/Statutory conditions/requirements and against the outcomes predicted through the FEIS process and permitting, and then to adaptively adjust its mitigation measures until the effectiveness of such mitigation measures meet the expected or required outcomes. Agnico Eagle has incorporated initial trigger or threshold levels/points that, when reached or exceeded, would cause Agnico Eagle to initiate further mitigation measures or adaptively adjust its activity/mitigation measure to reverse or arrest unwanted outcomes. These initial threshold points will be the subject of continued assessment and would be reviewed and, where appropriate, revised in subsequent updates to the Monitoring Plans, as appropriate.

In the instance of economic hardship (be it internal project economic hardship or external economic hardship [recession or collapse in the price of gold]), Agnico Eagle will adjust its operational plans to the prevailing economic condition but it will not sacrifice its commitment to operate in accordance with its statutory requirements/obligations nor compromise its internal mandate to operate in a safe, responsible and sustainable manner. It is understood that Agnico Eagle will need to consult the NIRB to determine whether any potential change to the Project would result in a change to the

scope of the Project and potentially require an environmental review. In all such cases, Agnico Eagle will continue to meet its statutory obligations and to meet its internal mandate to operate in a safe, responsible, and sustainable manner.

In the event of a transfer of ownership, Agnico Eagle expects that, as a precedent condition to such a sale or transfer, the new owner would be obligated to continue to meet all of the same obligations under the NIRB Project Certificate/Water Licence/or other authorizations, and to continue to operate in a safe, responsible, sustainable manner under the Project's RMMS/EMPP. Agnico Eagle points out that NIRB, NWB, and other regulatory agencies have the power to require/approve or not allow/approve the transfer of these statutory obligations (Project Certificate/Water Licence, etc.) to any new owner, and that past experience is that such transfer will only occur once the regulatory bodies are confident that the new owner fully understands its responsibility to continue to meet these obligations.

In developing its monitoring and management plans for the Project, Agnico Eagle has included the following elements, where applicable:

- objectives of the monitoring program, applicable laws, and regulations;
- discussion of actions to be taken in case of non-compliance with the law or regulations;
- the Valued Ecosystem Component (VEC) and Valued Socio-Economic Component (VSEC) to be monitored, and applicable criteria/thresholds and regulations, including, if relevant, the obligations imposed on contractors by the environmental provisions of their contracts;
- description of how the efficiency of mitigation measures will be evaluated;
- description of the frequency, duration, and geographic extent of monitoring with justification for each, and identification of personnel who will conduct the collection, analyse and interpretation of data;
- proposed actions in the event that observed results or impacts differ from those predicted;
- proposed reporting scheme for monitoring results, including format, reporting intervals, and responsible territorial and federal authorities;
- identification of organizations to which to communicate results of monitoring efforts: Inuit organizations, institutes of public government, territorial, and federal authorities, etc.;
- plans for integration of monitoring results with other aspects of the Project, including adjustments of procedures and refinement of mitigation measures;
- procedures/mechanisms to assess the effectiveness of monitoring and adaptive management programs; and
- quality assurance and quality control (QA/QC) measures to be applied to monitoring and management programs.

The initial design of monitoring and management plans, data analysis, reporting, and integration of results into operational procedures will be carried out by Agnico Eagle. Consultation on the same may lead to changes to meet the needs and concerns of other organizations.

Monitoring will use a hierarchical sequence of responses when agreed upon threshold or criteria levels and/or compliance limits are exceeded, thereby triggering corrective actions by the appropriate manager. Common triggers are when the mine falls out of compliance with authorizations or when criteria are exceeded. Triggers can lead to increased and focussed monitoring efforts to better understand cause and effect, and to reduce uncertainties, especially if an effect is greater than originally predicted. This will lead to mitigation measures based on the best available information.

Mitigation measures and corrective and preventative actions will be implemented by mine operations and/or contractors with support from the Meliadine Environment Department. This could include the evaluation of mitigation measures in place and updates to operational procedures. Communication will be maintained with Inuit organizations, authorizing agencies, and the general public in describing any adverse effect observed and what corrective action is being used to mitigate it.

3.3 Mitigation of Adverse Environmental Effects

Mitigation is a means of eliminating, reducing, or controlling a potential adverse environmental effect at the Project, including restitution for any damage to the environment caused by such effects through replacement, restoration, compensation, or other means (JRP 2010). The ranking of mitigation options is as follows:

- **Avoidance** – using an alternate site or technology to avoid the adverse effect all together. This is the most desirable.
- **Minimization** – taking actions to minimize and/or contain effects to the maximum extent possible during engineering design, construction, operation and closure.
- **Rectification** – taking actions to rehabilitate or restore the affected environment after the fact.
- **Compensation** – this is used as a last resort to offset adverse environmental effects. This is the least desirable.

Agnico Eagle plans to use adaptive management measures to deal with unanticipated adverse environmental effects.

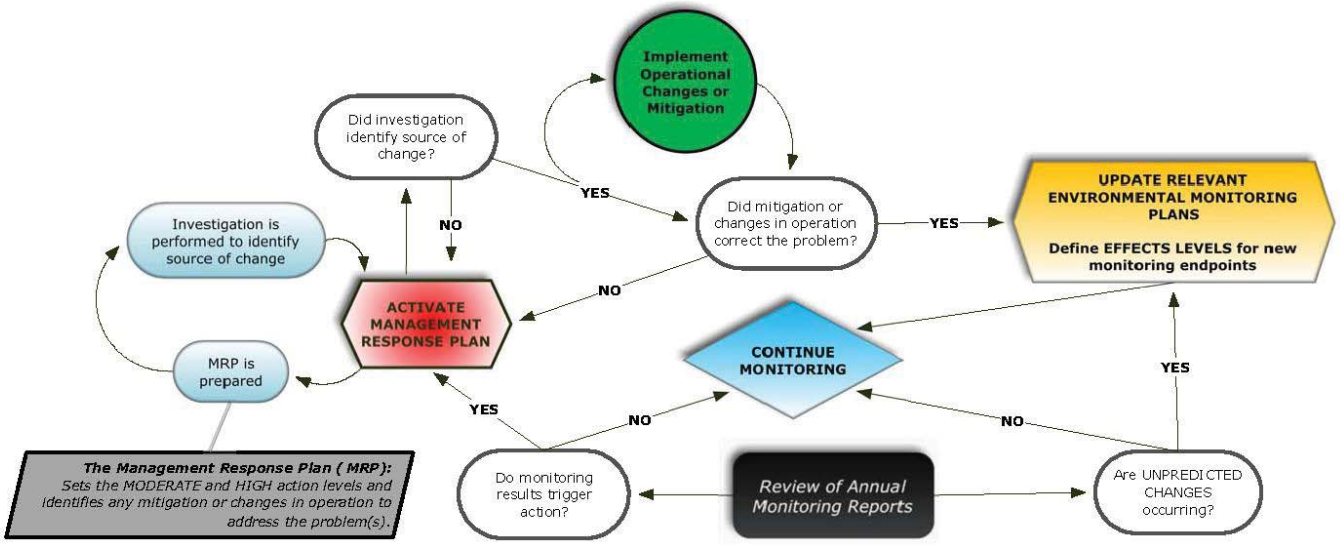
Environmental effects monitoring programs will monitor the effectiveness of mitigation measures. These programs will include a reporting and response system, through adaptive management strategies (see Section 4).

SECTION 4 • FOLLOW-UP AND ADAPTIVE MANAGEMENT PLAN

Each of the management plans developed for the Project include an intrinsic process of continuous improvement that is aimed at evaluating the effectiveness of the design features, mitigation measures, operating practices, and procedures put in place.

Making good use of adaptive management requires the recognition that it is a structured, iterative approach to environmental management decision making (CPR 2011). Many VECs and VSECs applicable to the Project are part of dynamic natural and socio-economic systems where uncertainty can be a significant factor. The goal is to reduce uncertainty over time by incorporating learnings from design, monitoring, mitigation, and changes in operations into environmental management at the proposed mine site. Where applicable, an adaptive management strategy or approach will be used for those VECs and VSECs that will be monitored by Agnico Eagle. The adaptive management process is schematized in Figure 4-1.

Trends will be compiled, followed, and compared to the pre-established goals/thresholds. Any action plan and corrective actions to be taken will also be documented through the RMMS.



Adaptive Management Plan triggered when EFFECT(S) LEVELS exceed pre-determined LOW ACTION LEVELS or UNPREDICTED CHANGES are occuring (i.e., conclusions of monitoring response framework).

Outcome may include engineering/mitigation, changes to Effluent Quality Criteria (EQC), and updated monitoring programs.

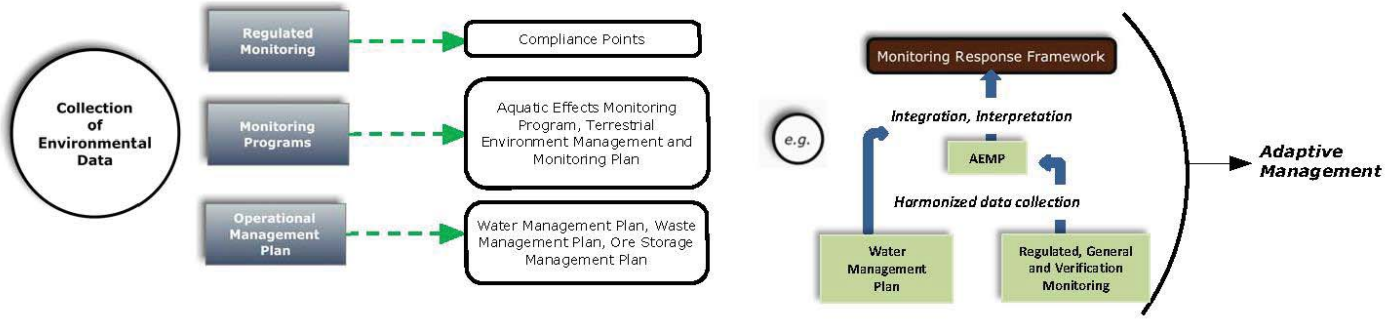


Figure 4-1 Adaptive Management Process

4.1 Adaptive Management and Precautionary Principle

It is through monitoring that any unanticipated adverse environmental impacts can be discovered. Adaptive management is particularly useful in implementing the appropriate remedial measures in these instances. Additionally, the objectives of monitoring and adaptive management are to verify that:

- commitments are fulfilled;
- regulatory and other requirements are met;
- adverse effects are avoided or minimized; and
- benefits are enhanced.

The precautionary principle, in conjunction with adaptive management, will be used in decision-making. In the face of uncertainty, conservative approaches will be used with an aim to reducing uncertainty over time via monitoring and mitigation.

Inspection precedes maintenance. Inspections, combined with monitoring, will signal when adaptive management must be used to mitigate possible negative effects (see Section 4.2.3 Inspections).

4.2 Performance Measurement and Monitoring

To effectively communicate performance, it is important to select the appropriate indicators. As part of the Mining Association of Canada, Agnico Eagle reports its global performance through its annual Corporate Social Responsibility report. This report includes, notably, the indicators of the Global Reporting Initiative and Towards Sustainable Mining Initiative. Those will be incorporated into the Meliadine RMMS. Main indicators to follow will be selected by taking into account:

- the compliance with relevant regulatory requirements and permitting targets;
- activities trends; and
- the progress towards achieving targets.

Regulatory requirements and targets are identified in each of the management plans, as appropriate, or Water Licence. Corrective actions will be triggered when those thresholds are reached. The RMMS will link the thresholds to appropriate corrective actions and establish accountability.

The performance of the management plans will be monitored periodically and the results communicated. Independent researchers or consultants may be engaged to review performance where necessary. The accuracy of the environmental impact predictions and the effectiveness of the mitigation measures will be verified through that process. If unusual or unforeseen adverse environmental impacts are noticed, corrective action will be put in place. Through the adaptive management process, the existing mitigation measures will be adjusted or new mitigation measures implemented if necessary. External reporting will be completed, as required.

A follow-up program will verify the effectiveness of any mitigation measures taken in response to expected and unexpected adverse environmental effects. An environmental effects monitoring program, will monitor the effectiveness of all mitigation measures. This program will include a reporting and response system.

4.2.1 Environmental Monitoring

Environmental monitoring, for the purposes of the EMPP, consists of the following:

- Regulated discharge monitoring occurs at monitoring points specified in the Type A Water Licence, other licences, or regulations. It includes discharge limits that must be achieved to maintain compliance with an authorization (i.e., water licence) or regulation (i.e., Metal Mining Effluent Regulations). Enforcement action may be taken if discharge limits are exceeded for a parameter.
- Verification monitoring is carried out for operational and management purposes by Agnico Eagle. This type of monitoring provides data for decision making and builds confidence in the success of processes being used. There is no obligation to report verification monitoring results, although some monitoring locations and these results can be mentioned in environmental management plans (i.e., sampling to verify soil remediation in the landfarm).
- General monitoring is commonly included in a water licence specifying what is to be monitored according to a schedule[3]. It covers all types of monitoring (i.e., geotechnical, lake levels, etc.). This monitoring is subject to compliance assessment to confirm sampling was carried out using established protocols, included quality assurance/quality control provisions, and addresses identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

All three types of monitoring will be used at the Project. A summary of Water Quality Regulated, General Aquatic, and Verification Monitoring for the Project during Construction, Operations, and Closure is included in the Aquatic Effects Monitoring Program Design Plan (AEMP) (Golder 2016) and the list of parameters for sample analysis is included in the Type A Water Licence.

[3] Referred to in NWT and old NWB licenses as the Surveillance Network Program.

4.2.2 Use of Inuit Qaugimajatuqangit in Environmental Management and Monitoring

IQ consists of Inuit values, preferences and what they consider significant; it is about the relationships between humans, animals, and the environment. It is location specific and reflects the particular conditions in specific geographic locations. IQ, although normally undocumented, is shared information within the community, and maintains the means and knowledge of living off the land, continues traditional land use activities, and promotes a cultural life style, all of which sustained Inuit for generations.

IQ is the most successful and oldest monitoring practice in Nunavut, where the resource users do the observing or monitoring. As such, IQ represents a valid and essential source of information in the design and implementation of environmental management and monitoring programs. Improvements have been incorporated based stakeholder review, and through the inclusion of traditional knowledge from communities and Inuit organizations throughout the Kivalliq region. Agnico Eagle expects to continue active engagement with communities and Inuit organizations, which should lead to further inclusion of traditional knowledge in periodic updates to the design and implementation of environmental programs. Agnico Eagle has and will continue to engage with the KIA to advance the use of IQ. This will ensure that the combination of science and IQ leads to environmental management and monitoring that meets the expectations of government, communities, and Inuit organizations.

4.2.3 Inspections

Agnico Eagle has sole responsibility for inspection and maintenance of all mine components, and the inspection and monitoring of mine activities. A regular inspection program will lead to the early identification of areas where improvements are needed. The early resolution of any deficiencies will result in less ongoing maintenance and repair of mine components, and a reduction in the risk of adverse environmental effects.

Inspections will ensure that Project mine components are constructed, operated, maintained, managed, and closed in an environmentally sound, safe, and efficient manner. Further, inspections will assist in obtaining better environmental outcomes for all activities and more timely maintenance of mine components throughout the mine life.

Mine personnel having knowledge and experience with the mine components and activities will carry out the inspections. Training will be provided by Agnico Eagle to effectively and efficiently complete inspections. Inspections will result in month-end summary reports that will be distributed to mine management. This will allow action to be taken to address any deficiencies in components or activities. Inspection reports will be retained on site by the respective inspecting departments.

4.2.3.1 Scope of the Inspection Plan

The Inspection Plan (IP) is relevant to all phases of the mine life, including pre-development, construction, operation, closure, and any periods of care and maintenance. The geographical area

the IP encompasses is the entire proposed mine site, Agnico Eagle's mine components at Itivia in Rankin Inlet, and all Agnico Eagle mine components in between. This includes, but is not limited to, such mine components such as, open pits, quarries, borrow pits, roads, storage pads, waste rock storage facilities, diversion channels, dikes, sumps, berms, tailings storage facility, landfill, incinerator, landfarm, explosives plant, and pipelines. It includes such activities as the pumping of water and waste, discharge of waste to the receiving environment, spill clean-up, and fuel transport on Agnico Eagle's roads.

4.2.3.2 Inspection Priority and Risk Analysis

Inspection priorities are based on analyzing all mine components / activities and their respective risks. Installations and activities are qualitatively[4] ranked as "high risk", "medium risk" and "low risk" with those posing a "high risk" receiving more frequent inspections[5]. If needed, the inspection schedule will be adjusted to accommodate an increased inspection frequency of mine components and/or activities requiring more attention.

The criteria used in determining risk arising from the use of water or discharging waste to water include the following:

- potential effect on the environment (e.g., due to the location of mine components and sensitivity of the nearby receiving environment);
- potential effect on public health (e.g., potable water treatment or sewage treatment);
- safety risks (e.g., the integrity of roads throughout freshet or following a major rain event);
- potential social impacts (e.g., dust from Agnico Eagle's roads); and,
- potential financial or economic impact resulting from an accident, malfunction, or spill (e.g., tanker truck leaving the all–weather access road, spilling fuel, and requiring significant resources for the cleanup).

4.2.3.3 Routine and Non-routine Inspections

Routine inspections are planned and scheduled on a reoccurring basis and cover the following:

- inspections required under authorizations;
- inspections of mine components where the management of water and waste takes place; and,
- activities that could affect water and waste management.

Non-routine, event, or unplanned inspections cover the following:

[4] If there is a disagreement on the level of risk based on a qualitative determination, a quantitative determination will be undertaken using accepted methods found in the literature (IMPEL 2012).

[5] Agnico Eagle has the capacity to carry out inspection plans. All activities and mine components identified in this inspection plan affecting the use of water or the discharge of waste to water will be inspected, irrespective of the level of risk.

- environmental complaints or concerns raised by the public;
- accidents, malfunctions and spills;
- after major rain events;
- instances when the quality or quantity of water on the mine site is not meeting expectations; and
- instances where discharge criteria to the receiving environment approach, but do not exceed, Water Licence limits or the Metal Mining Effluent Regulations.

Inspections will have a strong seasonal component with some inspections suspended over the winter and others reduced. Agnico Eagle foresees a high frequency of inspections of engineered structures occurring just before and during freshet, followed by less frequent inspections over the remainder of the open water season. For example, inspections of culverts, bridges, ditches, and sumps will be suspended over the winter, and would resume before freshet and continue over the summer until freeze-up. Further, within the open water season, the greatest risk is at freshet, which would necessitate a higher frequency of inspections at that time to ensure mitigation measures employed to manage the higher spring flows prove effective, and that the integrity of bridges and culverts are not compromised.

Year-round inspections at a set frequency will occur for mine components such as the potable water treatment plant, the sewage treatment plant and the landfill. These are not directly influenced by the changing weather experienced at the mine site over the year.

Table 4-1 below provides a summary of proposed inspections of mine components and mine activities; this includes some unrelated to the use or water or the discharge of waste to water. Specific details are included in the respective management plans and/or procedures and indicate inspection methods or procedures, and frequency. It also tentatively identifies the department responsible for the inspection. Ultimately the environmental department at Agnico Eagle will be responsible for ensuring that all monitoring and inspections are completed.

Table 4-1 Summary of Proposed Inspections

Mine Components / Activities Inspected	Inspection Methods/Procedures/ Department Responsible	Qualitative Risk Level - High, Medium, or Low	Department Responsible	Frequency
Dikes	Visual inspection for erosion of or seepage through or under the dikes, including movement of crests and slopes. The environment department would collect samples of any seepage.	High. Failure of a dike could have significant adverse effects on the downstream environment	Engineering	Weekly prior to freshet when the dikes are clear of snow, and weekly over the open water season. Monthly during the winter to check for seepage
Open Pits	Visual inspection for seepage and collection of samples, if it safe to do so	Low. Water seeping into open pits will be controlled and directed to CP1	Open Pits Mining Superintendent	Weekly at freshet and monthly thereafter over the open water season
Waste Rock Storage Facilities	Visual Inspection for seepage and collection of samples, if it safe to do so. Thermistor Installation	Low. Ditches will intercept any seepage from the waste rock and direct the water to CP1. Thermistors monitor the rate of freeze back and permafrost development progress	Open Pits Mining Superintendent	Visual inspection, monthly over the open water season and thermistors monitored four times per year.
Ore Stockpiles	Visual Inspection for seepage and collection of samples, if it safe to do so.	Low. Ditches will intercept any seepage from the ore stockpiles and direct the water to CP1.	Engineering	Visual inspection, monthly over the open water season
Tailings Storage Facility	Thermistor Installation	Low. Thermistor cables will be installed in the TSF to monitor the permafrost development progress within the facility during the operations stage	Engineering	Four times per year
Berms	Visual inspection for erosion of or seepage through or under the berms, including movement of crests and slopes.	High. Failure of berms upstream from pits could pose a safety hazard.	Engineering	Weekly inspection just before, during and just after freshet; Monthly after freshet is over in the open water season
Culverts	Visual inspection for snow and/or debris blockage of culverts.	Medium. Snow can be removed from the front and back of the culverts before freshet	Road Superintendent	Just prior to freshet and daily during the first days of freshet; also following major rain events. Weekly during period of flow. Monthly after freshet is over in the open water season

Table 4-1 Summary of Proposed Inspections (continued)

Mine Components / Activities Inspected	Inspection Methods/Procedures/ Department Responsible	Qualitative Risk Level - High, Medium, or Low	Department Responsible	Frequency
Roads	Visual inspection for evidence of seasonal freeze and thaw adjacent to the toe of the road embankment	Low. Affected area will be repaired using granular material and/or crushed rock.	Road Superintendent	Weekly over the summer (approximately mid-May , from the start of the freshet period to October, prior to the fall freeze-up)
Water ponding against roads	Visual inspection of roads after freshet and major rain events.	Low. Ponding can be dealt with by pumping the water or by installing a culvert in the road where water is ponding.	Road Superintendent	Weekly over the open water season and following freshet and major rain events
Bridges	Visual inspection for snow dams prior to freshet	High. Snow dams could lead to the bridge being overwhelmed at freshet with resultant damage. Snow dams may also result in flooding upstream from the bridge, potentially impacting existing heritage resources.	Road Superintendent	Prior to freshet to allow time for any snow dams to be removed and weekly during freshet to confirm that snow dams were breeched.
Snow removal from roads	Visual inspections to ensure skidoo trails are not being blocked by snow removed from the roads	Low. Pushing snow onto skidoos trails that cross Agnico Eagle's roads will make it difficult for trail users to cross the roads.	Road Superintendent	Following each major winter storm and clearing of snow off the roads.
Road dust	Visual inspection of the road for excessive dust generation and deposition.	High. Dust can impact on the environment along the roads, and be a safety risk due to limited visibility.	Road Superintendent	Weekly when roads are very dry and/or when road traffic is heavy. Inspections will be suspended during rainy days and over the winter.
Caribou near or on roads	Visual inspection of hunting activities along the road when large numbers of caribou are near-by.	High. Hunters should observe the 1 km no shooting zone along the road	Environment	Weekly, year round, and more frequently when during caribou migration periods.

Table 4-1 Summary of Proposed Inspections (continued)

Mine Components / Activities Inspected	Inspection Methods/Procedures/ Department Responsible	Qualitative Risk Level - High, Medium, or Low	Department Responsible	Frequency
Watercourses and watercourse crossings	Visual inspection of infrastructure to identify defects, cracks or any other risks to structural integrity, sediment or other debris accumulation, or bed erosion or scour	Low. Infrastructure will be repaired after deficiencies are noted, when it is safe to do so.	Road Superintendent	Weekly during the open water, during the freshet period, and unscheduled inspections following a major rain event.
Sumps	Visual inspection of sumps and the measurement of freeboard.	Medium. Sumps need to be pumped down prior to freeze-up to accommodate the coming year's freshet.	Engineering	One inspection before freeze-up to ensure the water level in the sumps is low to allow for inflow during freshet. Weekly during freshet, immediately after a major rain event and weekly otherwise over the open water season. Monthly after freshet is over in the open water season
Collection Ponds	Visual inspection and measurement of freeboard in contact ponds	Medium. The storage capacity of the pond needs to be increased before freeze-up to accommodate next year's freshet.	Engineering	One inspection before freeze-up to ensure the water level in the sumps is low to allow for inflow during freshet. Weekly during freshet, immediately after a major rain event and weekly otherwise over the open water season; Monthly after freshet is over in the open water season
Diversion Channels	Visual inspection of the channel for permafrost degradation and excess snow and ice accumulation leading to potential blockages.	Medium. Permafrost degradation may result in bank slumping and channel instability. Diversion channels need to be clear of snow prior to freshet to allow for water flow.	Engineering	(1) Prior to and at freshet; (2) Immediately after a major rain event; and (3) Weekly for the remainder of the ice-free season
Potable Water Treatment Plant	Visual inspection for cleanliness and that the plant is operating as required. Water samples for testing will be collected.	High. Plant provides potable water to the camp and its proper operation is necessary for human health.	Site Services	Ongoing as prescribed by the Dep't of Health or Public Health Authorities. Daily inspections are expected

Table 4-1 Summary of Proposed Inspections (continued)

Mine Components / Activities Inspected	Inspection Methods/Procedures/ Department Responsible	Qualitative Risk Level - High, Medium, or Low	Department Responsible	Frequency
Sewage Treatment Plant	Visual inspection for cleanliness and collection of samples for testing	Medium. The sewage treatment plant discharges to CP1, which has a dike to control flow to Meliadine Lake. The water in CP1 is reclaimed for use in processing ore, or receives additional treatment if necessary before release to Meliadine Lake.	Site Services	Weekly
Tank farms at the mine site and at Itivia	Visual inspection of water level within the secondary containment structure, and evidence of any spills or leaks. A geotechnical consultant performs a geotechnical inspection annually (between the months of July and September) of the bulk fuel secondary containment structures.	Low. Due to snow accumulation, melting and precipitation, contact water will unavoidably collect inside the secondary containment area. This water will be sampled and tested before discharge to CP1 Water from the Itivia tank farm will be returned to site, if necessary Spills and leaks will be cleaned up.	Site Services	Weekly by Site Services Supervisor Weekly manual or electronic dip tests are conducted for inventory reconciliation of fuel in the tanks by sites services The geotechnical consultant inspects the tank farms annually.
Diesel Power Generating Plant	Visual inspection. Locate leak(s) and report promptly.	Low. All spills in Generating Plant will be held within the building.	Site Services	Weekly by powerhouse operator
Other Fuelling Stations	Visual Inspection for leaks or spills and keep a written log of inspections to be made available to an Inspector upon request	Low. Fuelling stations will have an impermeable liner to capture spills or leaks	Site Services	Weekly by Site Services Supervisor
Hazardous Material Storage Areas	Visual inspection for proper storage of hazardous wastes	Low. Hazardous waste will be stored in areas having containment or in sea cans	Site Services	Weekly by Site Services Supervisor
Waste Shipments	Inspect shipping forms to ensure they meet regulatory requirements	Low. Employees or contractor preparing waste for transport will be trained in the transportation of dangerous goods.	Warehouse/ Logistics	Waste will be shipped south during the latter part of the shipping season. The shipping forms will be inspected monthly year round for sea cans that are full and have been sealed for shipment.

Table 4-1 Summary of Proposed Inspections (continued)

Mine Components / Activities Inspected	Inspection Methods/Procedures/ Department Responsible	Qualitative Risk Level - High, Medium, or Low	Department Responsible	Frequency
Landfarm	Visual inspection for water ponding outside the perimeter berm and water accumulating within the landfarm.	Low. The landfarm will have an impermeable liner and an oil:water separator will be used to remove excess water from the landfarm.	Environment	At freshet and weekly for the remainder of the summer.
Landfill	Visual inspection for orderly use of the landfill, absence of blowing debris, and leachate at the base of the landfill during the summer.	Low. The landfill has a berm to reduce blowing debris, and a ditch will intercept any leachate coming from the landfill.	Site Services	Weekly over the entire year for the orderly use of the landfill and for evidence of blowing debris. Inspections for leachate following freshet and weekly thereafter over the open water season.
Incinerator	Visual inspection for cleanliness and the proper management of all waste delivered to the facility.	Low. All waste delivered to the facility will either be incinerated or managed for future off site recycling or disposal.	Site Services	Weekly to ensure wastes generated at the mine are being properly managed.
Emulsion Plant	Visual inspection for spillage of NH_4NO_3 outside the explosives factory and at storage locations. All Plant components inspected as per regulations	High. If NH_4NO_3 gets into water, it can negatively affect fish.	Emulsion Plant Manager	Weekly, year round, or at a frequency required by regulation.
Quarries / Borrow Pits	Visual inspection for slumping and seepage from the quarries/borrow pits.	Low. Loose rock will be pulled down from the quarry face. Seepage sampled.	Environment	Weekly at freshet and monthly thereafter over the open water period. Also, after major rain events.
Freshwater Jetty	Visual inspection for erosion and settlement of the jetty	Low. If there is settlement of the jetty, additional clean waste rock will be added.	Engineering	Annually following Meliadine Lake becoming ice free
Pipelines	Visual inspection for leakage or damage to the pipeline	Low. If the freshwater pipeline were to fail, the pumps in Meliadine Lake can be remotely turned off. Other pipelines discharge to or from CP1.	Site Services	Weekly, year round

Table 4-1 Summary of Proposed Inspections (continued)

Mine Components / Activities Inspected	Inspection Methods/Procedures/ Department Responsible	Qualitative Risk Level - High, Medium, or Low	Department Responsible	Frequency
Spills	Document the recovery of spilled material and clean-up of any remaining residuals	This could range from low to high risk depending on what was spilled, where it occurred, and success of spill recovery efforts.	All departments; Environment to follow-up	Inspections begin when a spill is reported and continues on a regular basis until the spill is cleaned up. The frequency of inspections will be dependent on what was spilled, where it occurred, and success of spill recovery efforts.
Spill Kits	Inventory of spills response equipment and materials in each spill kit	Low. Spills kits will be restocked after use.	Environment	Quarterly by Environment Technician
Archaeological Sites	Inspect archaeological sites and report annually	Low	Environment	The location of archaeological sites has been identified and Agnico Eagle will take photos of the sites inspected and when new construction is planned in these locations.

4.2.3.7 Periodic Revisions of the Inspection Plan

The effectiveness of the IP will be evaluated annually to determine the extent to which it achieved the desired environmental and maintenance outcomes. Updates to the IP may be prompted by changes in policies or legislation, changes in operations and/or technology at the mine, or as part of corrective action.

4.3 Incident Investigations and Corrective Actions

One of the most important aspects in investigating incidents, accidents, and non-conformities is to analyse situations and try to find root cause(s). Through this process, actions taken to address those incidents, accidents, and non-conformity could result in permanent and positive changes to the RMMS and affirm continuous improvement. It is important that employees with responsibilities with regards to a situation under investigation be part of the process in identifying and assessing causes.

The following standard steps will be followed when conducting an investigation:

- identify the cause(s);
- prepare a report on the findings;
- develop a plan for corrective, mitigation, and preventive action(s)[6];
- implement the plan;
- evaluate the appropriateness and effectiveness of the corrective action(s);
- incorporate changes for continuous improvement; and,
- record and communicate changes arising from the continuous improvement.

Additional detail is provided in the Risk Management and Emergency Response Plan.

4.4 Communication and Reporting

The sharing and communication of information is an important part of the EMPP. Internal communications will be recorded and distributed to managers before being filed for future reference. Agnico Eagle will maintain and preserve internal and external records.

External reporting will detail the activities at the mine site (including accidents and incidents), the monitoring being carried out, how it complies with authorizations and meets environmental goals. Communications will use all available modern means of presenting information on environmental performance to interested parties through community liaison meetings, Agnico Eagle Nunavut website (http://www.aemnunavut.ca/), training initiatives, public notices, compliance reports, annual reports, community presentations, formal correspondence, updates to management and mitigation plans, radio announcements, etc. All efforts will be made to keep Inuit organizations, communities, authorizing agencies, the business community, and the general public informed of environmental performance of the Project. As a member of the Mining Association of Canada,

[6] In the case of spills this would include the verification of its cleanup through inspections and, if necessary, the collection of samples.

Agnico Eagle is committed to "Towards Sustainable Mining" Guiding Principles, one of which is to be "proactively seeking, engaging, and supporting dialogue regarding our operations." The "Towards Sustainable Mining" Guiding Principles are part of Agnico Eagle's RMMS. Agnico Eagle's communication initiatives support this guiding principle.

4.5 Audit, Review, and Update

It is expected that regulatory agencies will inspect the Project over its life for compliance with permits, regulations, and licences. Audits will also be conducted internally; however, independent researchers or consultants may also be engaged to complete the audits. Management reviews will also be conducted to determine the continued suitability, adequacy and effectiveness of the RMMS. Outputs of the audits and management reviews could include:

- recommendations to revise the Environmental, Health, and Safety Policies and Management Plans;
- revision to established objectives and targets; and,
- specifications for corrective actions for individual management plans.

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APPENDIX A • FEDERAL AND TERRITORIES LAWS, REGULATIONS AND GUIDELINES

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (SOR/2008-197) *Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301) *Release and Environmental Emergency Notification Regulations* (SOR/2011-90)	Canadian Council of the Ministers of Environment - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil
Canada Wildlife Act (1985 w9)		
Species at Risk Act (2002 c.29)		Species at Risk Policies
Migratory Birds Convention Act (1994 c.22)	*Migratory Birds Regulations* (C.R.C., c. 1035)	
Canada Water Act (1985 c.11)		
Oceans Act (S.C. 1996, c. 31)		
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c. A-12)	*Arctic Waters Pollution Prevention Regulations* (C.R.C., c. 354) *Arctic Shipping Pollution Prevention Regulations* (C.R.C., c. 353)	
Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)	*Transportation Safety Board Regulations* (SOR/92-446)	
Canada Shipping Act, 2001 (S.C. 2001, c. 26)	*Response Organizations and Oil Handling Facilities Regulations* (SOR/95-405) *Pollutant Discharge Reporting Regulations*, 1995 (SOR/95-351) *Environmental Response Arrangements Regulations* (SOR/2008-275) *Ballast Water Control and Management Regulations* (SOR/2006-129) *Vessel Pollution and Dangerous Chemicals Regulations* (SOR/2012-69)	Oil Handling Facilities Standards – TP12402 Environmental Prevention and Response National Preparedness Plan 2008 – TP13585 Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants – TP9834E 2009 Arctic Waters Oil Transfer Guidelines, 1997 - TP10783E Response Organizations Standards – TP 12401E 1995

Acts	Regulations	Guidelines
		Guidelines for the Control of Ballast Water Discharge from Ships in Waters under Canadian Jurisdiction (TP 13617)
Navigation Protection Act		
Marine Liability Act (A.C. 2001, c.6)	*Marine Liability Regulations* (SOR/2002-307)	
Fisheries Act (R.S.C. c. F-14)	*Metal Mining Effluent Regulations* (SOR/ 2002-2222) *Marine Mammal Regulations* (SOR/93-56)	The Policy for the Management of Fish Habitat Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters Freshwater Intake End-of-Pipe Fish Screen Guideline Standard Operating Procedure – Clear Span Bridges
Safe Containers Convention Act (R.C.C. 1985, c. S-1)		
Transport of Dangerous Goods Act (1992, c.34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	
Explosives Act (1985 c.E-17)	*Explosives Regulations* (C.R.C., c. 599) *Ammonium Nitrate and Fuel Oil Order* (C.R.C., c. 598)	
National Fire Code of Canada (2010)		
Nuclear Safety and Control Act (s.c. 1997, c.9)	*General Nuclear Safety and Control Regulations* (SOR/2000-202)	
Canadian Human Rights Act (R.S.C., 1985, c. H-6)	Canadian Charter of Rights and Freedom	
Canada Labour Code (R.S.C., 1985, c. L-2)	*Canada Labour Standards Regulations* (C.R.C., c. 986) *Canada Occupational Health and Safety Regulations* (SOR/86 304)	
Territorial Lands Act (R.S. 1985, c. T-7)	*Northwest Territories and Nunavut Mining Regulations* (C.R.C., c. 1516) *Territorial Land Use Regulations* (C.R.C. 1524) *Territorial Quarrying Regulations* (C.R.C. c. 1527)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act	*Northwest Territories Waters Regulations* (SOR/93/303)	

Acts	Regulations	Guidelines
(2002, c. 10)		
Nunavut Act (1993 c.28)	*Nunavut Archaeological and Paleontological Sites Regulations* (SOR/2001-220)	
Nunavut Land Claims Agreement Act (1993, c. 29)		
Territorial – Nunavut		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations* (NWT Reg (Nu) 068-93) *Used Oil and Waste Fuel Management Regulations* (NWT Reg 064-2003) [The removal of hazardous materials requires the registration with the Government of Nunavut, Department of Environment as a waste generator as well as carrier (if applicable) prior to transport. The Meliadine Project and the Meadowbank Mine are registered under a single permit for Agnico Eagle Mines Limited - Waste Generator Number - NUG100031]	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for Air Quality – Sulphur Dioxide and Suspended Particulates Guideline for the Management of Waste Antifreeze Guideline for the Management of Waste Batteries Guideline for the Management of Waste Paint Guideline for the Management of Waste Solvents Guideline for Industrial Projects on Commissioner's Land Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil
Scientists Act (RSNWT (Nu) 1988, c S-4)	*Scientists Act Administration Regulations* (NWT Reg (Nu) 174-96)	
Historical Resources Act (RSNWT (Nu) 1988, c H-3)		
Territorial Parks Act (RSNWT (Nu) 1988, c T-4)	*Territorial Parks Regulations* (RRNWT (Nu) 1990 c T-13)	
Wildlife Act (RSNWT (Nu) 1988, c W-4)	*Wildlife General Regulations* (NWT Reg (Nu) 026-92) *Wildlife Licences and Permits Regulations* (NWT Reg (Nu) 027-92) *Wildlife Management Barren-Ground*	

Acts	Regulations	Guidelines
	Caribou Areas Regulations (NWT Reg (Nu) 099-98)	
	Wildlife Management Grizzly Bear Areas Regulations (NWT Reg (Nu) 155-96)	
	Wildlife Management Zones Regulations (RRNWT (Nu) 1990 c W-17)	
	Wildlife Regions Regulations (NWT Reg (Nu) 108-98)	
Commissioner's Land Act (RSNWT 1988, c C-11)	*Commissioner's Airport Lands Regulations* (NWT Reg (Nu) 067-97)	
	Commissioner's Land Regulations (RRNWT 1990, c C-13)	
Safety Act (RSNWT 1988, c.S-1)	*General Safety Regulations* (RRNWT (Nu) 1990 c S-1)	
	Work Site Hazardous Materials Information System Regulations (RSNWT 1988, C 81 (Supp))	
Mine Health and Safety Act (SNWT (Nu) 1994, c 25)	*Mine Health and Safety Regulations* (NWT Reg (Nu) 125-95)	
Workers' Compensation Act (RSNWT, 1988, c. W-6)	*Workers' Compensation General Regulations* (Nu Reg 017-2010)	
Apprenticeship, Trade and Occupations Certification Act (RSNWT (Nu) 1988, c A-4)	*Apprenticeship, Trade and Occupations Certification Regulations* (RRNWT (Nu) 1990 c A-8)	
Labour Standards Act (RSNWT (Nu) 1988, c L-1)	*Annual Vacations Regulations* (RRNWT 1990, c.L-1)	
	Educational Work Experience Regulations (RRNWT 1990, c.L-2)	
	Employment of Young Persons Regulations (RRNWT 1990, c.L-3)	
	Labour Standards Meal Regulations (RRNWT 1990, c.L-4)	
	Notice of Termination Exemption Regulations (RRNWT 1990 c.L-5)	
	Pregnancy and Parental Leave Regulations (RRNWT 1990, c.8(Supp.))	
	Reciprocating Jurisdiction Order (RRNWT 1990, c.L-6)	

Acts	Regulations	Guidelines
	Wages Regulations (RRNWT 1990, c.L-7)	
Electrical Protection Act (RSNWT (Nu) 1988, c E-3)	*Electrical Protection Regulations* (RRNWT 1990 c. E-21)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	*Explosives Regulations* (RRNWT (Nu) 1990 c E-27)	
Petroleum Products Tax Act (RSNWT (Nu) 1988, c P-5)	*Petroleum Products Tax Regulations* (RRNWT (Nu) 1990 c P-3)	
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	*Fire Prevention Regulations* (RRNWT (Nu) 1990 c F-12)	
Hospital Insurance and Health and Social Services Administration Act (RSNWT 1988, c T-3)	*Territorial Hospital Insurance Services Regulations* (RRNWT (Nu) 1990 c T-12)	
Public Health Act (RSNWT (Nu) 1988, c P-12)	*Camp Sanitation Regulations* (RRNWT (Nu) 1990 c P-12) *General Sanitation Regulations* (RRNWT (Nu) 1990 c P-16)	
All-terrain Vehicles Act (RSNWT (Nu) 1988, c A-3)	*All-terrain Vehicles Regulations* (RRNWT (Nu) 1990 c A-1)	
Motor Vehicles Act (RSNWT (Nu) 1988, c M-16)	*Large Vehicle Control Regulations* (RRNWT (Nu) 1990 c M-30) *Motor Vehicle Registration and Licence Plate Regulations* (NWT Reg (Nu) 054-94)	
Public Highways Act (RSNWT (Nu) 1988, c P-13)	*Highway Designation and Classification Regulations* (NWT Reg (Nu) 047-92)	
Transportation of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c 81 (Supp))	*Transportation of Dangerous Goods Regulations* (1991, NWT Reg (Nu) 095-91)	



AGNICO EAGLE

MELIADINE GOLD PROJECT

Explosives Management Plan

MARCH 2018
VERSION 5
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ᓴᐅᓕᖅᑕᓄᑦ ᐊᐅᓪᓚᑎᓂᖓᓕᒃ ᐸᖏᓐᓄᐊᑎ (ᐸᖏᓐᓄᐊᑎ) ᑐᑭᓯᐅᒪᓱᐊᑎᑕᕆᐊᖅᑐᑦᓴᐅᓕᖅᑕᓄᑦᑐᐅᖅᑐᑦᓴᐅᓂᖅ, ᐃᖅᑑᕐᕕᐊᖅᑐᓪᓗᓂᖅ, ᑐᓄᔪᖅᓯᒪᓕᖅᖅᓂᑦ, ᐱᓪᓚᐊᖓᓂᖅᑎᓂᖅ, ᐊᒪᓗ ᐊᑐᓄᑕᐅᓂᖅᑎᓂ ᓴᐅᓕᖅᑕᓄᑐᐃᓂ ᐊᓚᓂᔪᖅᔪᓂᖅ. ᑕᒪᑐᒧᖓᓚ ᐱᓱᐊᑎᓄᖅᓄᑦ ᑕᓚᐅᔪᓂ ᐊᐅᓪᓄᑎᑎᓄᖅᑕᕆᓂᕐᓗᑦ ᐊᒪᓗ ᑕᓚᐅᕐᒥᐅᑕᓂᖅ ᐊᓚᓂᔪᖅᓄᑎᑎᓄᖅᑕᕆᓂᕐᓗᑦ ᐊᐅᓪᓚᑎᓂᖅ ᐸᖏᓐᓄᐊᑎ-ᖃᓚᓐᓂᑐᓄᖅ (Agnico Eagle 2014a)-ᒥᑦ. ᑲᓇᑕᐅᑦ ᐊᒪᓗ ᓄᓇᕗᑦ ᒪᓕᓚᑐᐊᖃᓚᑦ, ᐅᓄᐅᔪᓄᖅᑐᓄᖅ ᐊᐅᓪᓚᑎᓂᕐᒥᒃ ᐊᒪᓗ ᐊᑐᓄᕐᒥᒃ ᓴᐅᓕᖅᑕᓄᑐᐃᓂ: ᑲᓇᑕ – *ᓴᐅᓕᖅᑕᓄᑐᐃᓂᑦ ᐱᓄᔪᖅᓄ ᐊᒪᓗ ᒪᓕᓚᐃᑦ: ᐊᓚᔪᖅᑐᐃᐅᓂᖅ ᐅᓪᓚᐊᓇᖅᑐᓄᒃ ᐱᓄᔪᓐᓄᒃ ᐱᓄᔪᖅᓄ ᐊᒪᓗ ᒪᓕᓚᐃᑦ; ᑲᓇᑕᒥᑦ ᐃᑯᐊᑦᓕᑐᓪᓗᓂᖅᑐᑦ ᓇᓪᓇᐃᑯᑕᖅ ᐊᒪᓗ ᑲᓇᑕ; ᓄᓇᕗᑦ – ᓴᐅᓕᖅᑕᓄᑐᐅᒃ ᐊᑐᓄᖅᑐᑦ ᐱᓄᔪᖅᓄ ᐊᒪᓗ ᐊᓚᔪᖅᑐᐃᐅᓂᖅ ᐅᓪᓚᐊᓇᖅᑐᓄᒃ ᐱᓄᔪᓐᓄᒃ ᐱᓄᔪᖅᓄ ᐊᒪᓗ ᒪᓕᓚᐃᑦ; ᐅᔨᕆᔪᓂᐊᓇᖅᓂᒥᑦ ᐋᓐᓂᐊᖅᑎᖅᑕᐃᓕᒥᓂᖅ ᐊᒪᓗ ᐊᕐᕋᖅᑐᑎᓇᑕᐃᓕᒥᓂᖅᑐᑦ ᐱᓄᔪᖅᓄ ᒪᓕᓚᐃᑦ; ᐊᒪᓗ ᐊᕐᕋᖅᑐᑎᓇᑕᐃᓕᒥᓂᖅᑐᑦ ᐱᓄᔪᖅᓄ ᐊᒪᓗ ᒪᓕᓚᐃᑦ.*

ᐊᑲᓂᔪᖅᔪᓂ ᐊᑐᓂᐊᖅᑕᖏᓚᑦ ᒥᑭᑐᒥᐅ ᐃᒪᓕᖅᑎᑐᓂ ᓴᐅᓕᖅᑕᓄᑐᐃᓂ, ᐊᒪᓗ Ammonium Nitrate / ᐅᖅᓯᐊᓗᓐᖅ, ᐊᐅᓪᓕᑐᖏᓐᓇᖅᑎᓗᒍ ᓴᐅᓕᖅᑎᑌᓂᖅᓗᑦ ᐅᖏᓚᐅᑦᑎᓯᒪᓗᐊᖅᑐᑦᓴᐃᓂᑦ ᐅᓴᖅᑲᓄᑦ, ᐊᐳᑯᔪᖅᑕᐅᔨᓄᑦ ᐅᓴᖅᑲᓄᑦ, ᐅᓴᖅᖏᓂᐊᖅᑕᐅᔨᓄᑦ, ᓴᓇᔨᓕᑎᒥᓴᐅᔨᓄᑦ ᐅᓴᖅᑲᓄᑦ, ᖃᔪᐊᖅᓯᒪᔨᑦ ᐅᓴᖅᖏᓂᐊᖅᑕᐅᔨᓄᑦ ᑲᑎᓯᒪᔨᑦ, ᐊᒪᓗ ᓯᐅᖅᖏᖅᑎᓯᒪᔨᓄᑦ ᓄᓇᒥᑦ ᐊᒪᓗ ᓄᓇᐅᑦ ᐃᓗᐊᓂᑦ ᓴᓇᓕᓐᓂᓗᒍ ᐊᒪᓗ ᐊᐅᓪᓚᖅᑎᓂᓗᒍ ᐱᓕᕆᓂᖅ.

ᑕᒪᐃᓂᓗᐊᒃᑯᖅ ᐱᓯᔪᖏᑦ ᐊᑐᖅᑕᐅᔭᓚᐊᖅᑲᖅᑐᑦ ᓴᐅᓕᖅᑎᑌᓂᖅᓗᑦ ᐊᐅᓪᓚᖅᑎᑕᐅᖅᑲᑕᓂᕆᓂᐊᖅᑐᑦ ᐅᒥᐊᒃᔪᓂ ᖃᐅᔨᓗᐃᓂᓂ ᑲᖏᕐᖅᓯᓂᓗᑦ, ᓯᑲᐅᓄᐊᖅᑕᐅᓗᑎᒃ ᐅᒥᐊᖅᓯᐊᖅ ᑭᓴᖅᓯᒪᓚᐃᓂᓂ, ᐃᑎᑲᓂᐊᓄᐅᔭᐃᓗᑎᒃ. ᓯᑲᐅᑦ ᐅᓯᖏᑭᖅᑕᐅᕃᓂᒃᐸᑕ, ᑐᖅᔪᖅᓯᓯᒪᓕᑦ ᐃᓗᓕᖅᑲᖅᑐᑦ ᑕᐠᔪᓂᖅᓯᒪᓂ ᑐᖅᔪᖅᑕᐅᓯᒪᓕᒫᓕᓯᒪᔪᖅᑕᐅᔨᓄᑦᑐᐊᖅᑐᑦ ᐊᓕᓗᓕᖅᑐᑦ ᐃᑎᑎᓂᖅᑐᑦ ᐊᐅᓪᓚᖅᑎᑕᐅᖅᑲᑕᓂᕆᓂᐊᖅᑐᑦᓴᐅᓂᖅᑐᑦ ᐅᒥᐊᒃᔪᓂ ᐅᓴᖅᑲᓄᑦ, boosters, ᐊᒪᓗ ᒪᑐᐃᓂ, ᐅᓴᖅᑎᑌᓂᖅᓗᑦᓴᐃᓗᐊᖅᑐᓴᐅᓕᖅᑕᐃᓕᓐᓂᖅᑐᑦ ᐅᓯᖏᑭᖅᑕᐅᖅᑲᑕᓂᕆᓂᐊᖅᑐᑦ ᓯᑲᐅᑦ ᐃᑎᑎᓂᖅᑐᑦ. ᑕᒪᑲᔪᐊ ᑐᖅᔪᖅᑕᐅᔭᓚᐊᖅᑎᓂᒪᓕᒫᖅᑕᐅᖅᑲᑕᓂᕆᓂᐊᖅᑐᑦ ᑲᖏᕐᖅᓯᒪᓂᖅ ᑐᖅᔪᖅᑕᐅᓯᒪᓕᒫᖅᑐᑦ ᑐᖅᔪᖅᓯᒪᓚᐃᓂᓂᖅᑐᑦ ᒪᓕᓚᑐᒥᑦ ᑲᖏᕐᖅᓯᒪᓂᖅ ᓄᓇᕗᑦ *ᓴᐅᓕᖅᑕᓄᑐᐃᓂᑦ ᐱᓄᔪᖅᓄ ᐊᒪᓗ ᒪᓕᓚᐃᑦ:* ᑐᑭᓯᐅᒪᓱᐊᑎᑕᕆᐊᖅᑐᑦᓴᐅᓕᖅᑕᓄᑐᐃᓂ ᐊᐅᓪᓚᑎᓂᖅ ᐊᒪᓗ ᐊᑐᓄᖅᑐᑦ ᓴᐅᓕᖅᑕᓄᑐᐃᓂ ᐱᓕᕆᓂᖅ ᐊᒪᓗ ᐊᑐᓄᖅᑐᑦ ᓴᐅᓕᖅᑕᓄᑐᐃᓂ (ᓴᐅᖓᓂᑦ ᐊᒪᓗ ᓄᓇᕗᑦ ᐊᒡᓂ), iii) ᒪᓕᐃᓂ (ᓴᐅᖓᓂᑦ ᐊᒪᓗ ᓄᓇᕗᑦ ᐃᓗᐊᓂᑦ), ᐊᒪᓗ iv) ᑐᖅᔪᖅᓯᒪᓂᖅᑐᑦ ᐱᓯᔪᖏᑦ ᐊᑐᖅᑕᐅᔨᑦ ᑕᒪᑭᓂᖅ ᐃᒪᓕᐅᖅᓴᓕᓪᓚᑎᓂᓗᑦ. A 3T ᓄᓇᕗᑦᑕᑎ ᐊᑲᓂᔪᖅᑐᐃᓚᐅᑎ ᓴᐅᓕᖅᑕᓄᑐᓂ ᐊᑐᖅᑕᐅᓂᖅᑎᑕᐅᖅᑐᑦ ᐃᓂᐅᔨᒥᑦ ᐊᑲᓂᔪᖅᓯᓂᓗᑦ ᑕᒪᑭᓂ ᐃᒪᓕᖅ (ᐅᖅᓯᒪᔨᑦ 1.2 t-ᒥᑦ ᐃᓂᓕᑦ) ᑕᒪᑲᓂ ᐃᒪᓕᓪᓚᖏᑦ ᓄᓇᕗᑦ ᐊᒡᓄᑦ ᐅᓂᖅᑐᑎᓇᐅᔨᒪᓗᑦ. ᐃᓗᓕᖅᑭᖅᑕᐅᖅᑐᑦ 10T-ᓂᑦ ᓴᐅᓕᖅᑕᓄᑐᓂ ᓄᓇᕗᑦᑕᑎ ᑕᐃᓂᐅᔨᖅ

Mobile Manufacturing Unit-ᒥᒃ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᖅ ᐊᓴᖅᓯᓂᖓᑦ ᒥᑭᔾᓂ ᐃᒪᖅᓂ ᓄᓇᒥᓂ ᐅᐱᐊᓐᓴᓕᔾᔪᑦ ᖃᐱᖅᑕᖅᓯᐅᔾᔪᑦ. ᒥᐱᓕᐊᖅᑎᓐᓂᖓᑦ ᐊᓯᐊᔨᓐᓪᓕᐊᓂᖅ ᐊᒪᓗ ᐱᐅᓯᕈᐊᖅᑎᓐᓂᖓᑦ ᐊᑐᖅᓂᖅ ᖃᐱᖅᑕᖅᑐᓂ, ᒥᑭᔾᓂ ᐃᒪᖅ ᐊᑐᖅᑕᐅᓗᐊᖅᓂᐊᖅᑐᖅ ᐊᔪᖓᒪᒪᑕ ᐃᒪᖅᑕᖅᕿᓗᐊᖅᑎᓯᓗᒍ ᐊᓐᓕᔾᓂ. ᐊᑐᖅᑕᐅᓐᓂᑦ ᖃᐱᖅᑕᖅᑐᐃᑦ ᐊᑐᖅᑕᐅᔪᓐᓇᖅᑐᑎᓗᐊᑦ ᐊᔨᔅᓂᓐᓂᑎᐃᓐᓇᓐᓂᖅᑐᖅ, ᒥᐱᓕᐊᖅᑎᓂᑎᓗᑐ ᓴᓐᓂᓐᓄᑦᑐᖅ ᐱᔨᐅᐊᒥᒃ ᓯᖅᑲᓕᑎᕆᓂᖓᑦ ᓯᖅᑲᓕᑎᕆᓕᖅᓂᒥᑦ ᑕᐃᓕᓐᓇᑦ ᐱᐅᓯᕈᐊᖅᑎᓐᓂᖓᑦ ᐃᒪᖅᑕᐅᓂᐊᖅᑐᖅ.

ᐃᑲᔪᐃᓂᖓᑦ ᐊᓱᑕᓇᖅᑐᑦᑕᖅᓄᓕᓕᒫᑐᓗᒍ ᑐᖅᑯᖅᑕᐅᓯᒪᓱᑎᐊᖓᓗᓂᑐᓗ ᐅᖅᓯᐊᓗᐃᑦ, ᐅᓗᓚᐊᓇᖅᑐᑦ, ᐊᒪᓗ ᐅᓗᓚᐊᓇᖅᑐᑦ ᐊᐳᑕᐊᐃᑦ, ᖃᑲᓇᐃᓕᓂᐅᓄᓕᒫᑦ ᐊᔨᔅᓂᓐᓂᑎᐃᓐᓇᓐᓂᖅᑐᖅ ᒪᑕᐅᑐᐊᖅᑐᑦ ᐃᓚᖓᑕᐅᑦᑐᖅ ᒪᑕᑕᐅᑐᖅ ᑲᑎᒪᔨᖅ. ᒥᐱᓕᐊᖅᑎᓐᓂᑦ ᖃᐱᖅᑕᖅᑐᑦ ᐊᑐᖅᑕᐅᓗᐊᖅᓂᐊᖅᑐᖅ ᐊᒪᓗ ᐱᐅᓯᕈᐊᖅᑎᓐᓂᖓᑦ ᐊᑐᖅᑕᐅᓗᐊᖅᓂᐊᖅᑐᖅ ᐊᒪᓗ ᓴᓂᔾᔪᐊᓇᖅᑐᑦ ᐃᓚᖓᑕᐅᑦᑐᖅ ᐊᑐᖅᑕᐅᓗᐊᖅᓂᐊᖅᑐᖅ ᐊᒪᓗ ᓴᓂᔾᔪᐊᓇᖅᑐᑦ ᐃᓚᖓᑕᐅᑦᑐᖅ ᐊᑐᖅᑕᐅᓗᐊᖅᓂᐊᖅᑐᖅ ᐊᒪᓗ

EXECUTIVE SUMMARY

This Explosives Management Plan (the Plan) provides information on the manufacture, transport, storage, handling, and use of explosives at the Agnico Eagle Mines Limited (Agnico Eagle) Meliadine Gold Project (Project). Aspects related to marine shipping and marine mammals are presented in Agnico Eagle's Shipping Management Plan (Agnico Eagle 2018). The main federal and territorial legislation, which cover the control and use of explosives are: Canada - *Explosives Act* and *Regulations; Transport of Dangerous Goods Act and Regulations; National Fire Code of Canada;* Nunavut - *Explosives Use Act* and *Regulations, Transportation of Dangerous Goods Act* and *Regulations*; *Mine Health and Safety Act* and *Regulations*; *Fire Prevention Act* and *Regulations;* and *Safety Act* and *Regulations*.

Agnico Eagle intends to use emulsion-based explosives, as well as Ammonium Nitrate / Fuel Oil, for controlled blasting of overburden rock, waste rock, ore, construction rock, frozen ore stockpile, and granular material on surface and underground during the construction and operation phases of the Project.

All products required for blasting activities will be shipped by vessel from the south to Rankin Inlet, loaded onto barges at the vessel anchoring location, and transported to Itivia. After the barges are unloaded, sea cans holding the raw products will be temporarily stored in a fenced laydown area at Itivia before being trucked to the mine site, with the only exceptions being explosives, boosters, and caps, which will be transported directly to the mine site after being unloaded from the barge. In the event that these products require temporary storage in Rankin Inlet, they will be stored in appropriate storage magazines meeting federal *Explosives Act* and *Regulations*. The temporary storage magazines will remain under constant surveillance by Agnico Eagle personnel.

Mine infrastructure related to explosives will include an i) Emulsion Plant (surface), ii) Powder Magazines for storage of explosives such as boosters, detonating cord, Ammonium Nitrate / Fuel Oil, and presplitting explosives (surface and underground), iii) Cap Magazines (surface and underground), and iv) storage of raw materials used in the preparation of emulsion. A 3T capacity explosive delivery truck will be used on-site to transport emulsion (in totes of 1.2 t of capacity) from the Emulsion Plant to the underground mining operations. A 10 t capacity explosive truck called Mobile Manufacturing Unit will be used to deliver emulsion in the open pit production blastholes. To minimize loss rate and optimize usage of explosives, emulsion will be mostly used since it is efficient regardless the presence of water in boreholes. Unused explosives that are still usable will be returned to storage. The blasting patterns will favor communition, which will reduce energy consumption related to the crushing at the mill therefore optimizing use of explosives.

To assist in the safe and secure storage of fuels, hazardous materials, and hazardous wastes, design criteria of the infrastructure will follow the various guidelines set by regulatory bodies. The Emulsion Plant is equipped with a concrete floor and walls so that all spills can be wholly contained within the

building. Products entering the composition of explosives will be stored in accordance with regulation. In the event of a spill, the Spill Contingency Plan will be put into operation and appropriate equipment will be used to contain spilled materials. All preventive and breakdown maintenance will be carried out and recorded in accordance with standard operating procedures. An Emergency Response Plan is currently undergoing revision and approval by Dyno Nobel. It addresses worst case scenarios, such as an accidental explosion.

Blasting safety procedures on breaking rock are described in this Plan for surface, as well as underground operations. Only trained and certified persons will work with explosives. The explosives personnel will undertake formal training and on-the-job training to ensure compliance with legislation. Internal audits and inspections of all components related to explosives management will be conducted on a regular basis by qualified personnel, and the results recorded according to quality and safety standard operating procedures. All recommendations and orders made by regulators and inspectors will be responded to and acted upon accordingly.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	October 2012			First draft of the Explosives Management Plan	Blandine Arseneault, Env. Superintendent, Agnico Eagle Ryan Vanengen, Biologist, Agnico Eagle
2	March 2013			DEIS re-submission	No change; rebranding
3	April 2014	3.3-3.4	8-9	Added details on best practices and types of explosives	Josée Noël, Env. Coord. Agnico Eagle
		3.5	10	Reduced instantaneous pressure change from 100 to 50 kPa	John Witteman, Env. Consultant, Agnico Eagle
4	April 2015			Update of entire document for submission for Type A Water Licence	François Petrucci, Agnico Eagle
5	March 2018			General revision	Stephen David, Mine Department, Agnico Eagle

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ANFO	Ammonium Nitrate / Fuel Oil
CCME	Canadian Council of Ministers of the Environment
MMU	Mobile Manufacturing Unit
NIRB	Nunavut Impact Review Board
NWT	Northwest Territories
Nu	Nunavut
PHC	Petroleum Hydrocarbons
Plan	Explosives Management Plan
PVS	Peak Vector Sum
WHMIS	Workplace Hazardous Materials Information System

SECTION 1 • INTRODUCTION

1.1 Overview

Agnico Eagle Mines Limited (Agnico Eagle) intends to use explosives for controlled blasting of overburden rock, waste rock, ore, construction rock, frozen ore stockpile, and granular material on surface and underground during the construction and operations phases of the Meliadine Gold Project (Project).

1.2 Purpose and Scope

This Explosives Management Plan (the Plan) provides information on explosives manufacture, transport, storage, handling, and use at the Project and its conformity with Section 9.4.13 of the *NIRB Guidelines for the Preparation of an Environmental Impact Statement for Agnico Eagle Mines Ltd.'s Meliadine Project (NIRB File No. 11MN034),* and with the Nunavut Water Board's *Mining and Milling: Supplemental Information Guideline for Mine Development*.

1.3 Related Documents

Documents containing information related to this Plan include the following:

- Environmental Management and Protection Plan;
- Risk Management and Emergency Response Plan;
- Spill Contingency Plan;
- Landfill and Waste Management Plan;
- Hazardous Materials Management Plan;
- Borrow Pits and Quarries Management Plan;
- Water Management Plan;
- Occupational Health and Safety Plan (Agnico Eagle 2014b); and
- Oil Pollution Emergency Plan (Agnico Eagle 2014c).

1.4 Applicable Legislation

The control and use of explosives within Canada and Nunavut is covered by existing federal and territorial Acts and Regulations. The Project will put in place operational policies and procedures, which meet or exceed applicable legislation. Applicable Acts, Regulations, and Guidelines are listed in Table 1-1.

Table 1-1 Applicable Legislation to Explosives Management

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197)* *Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301)	*Canadian Council of the Ministers of Environment - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products* Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil
Fisheries Act (R.S.C. c. F-14)	*Metal Mining Effluent Regulations* (SOR/ 2002-2222)	Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters
Explosives Act (1985 c.E-17)	*Explosives Regulations* (C.R.C., c. 599) *Ammonium Nitrate and Fuel Oil Order* (C.R.C., c. 598)	Blasting Explosives and Initiation Systems: Storage, Possession, Transportation, Destruction and Sale
National Fire Code of Canada (2010)		
Transport of Dangerous Goods Act (1992, c.34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	
Territorial – Nunavut		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations* (NWT Reg (Nu) 068-93) *Used Oil and Waste Fuel Management Regulations* (NWT Reg 064-2003)	Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for the Management of Waste
Mine Health And Safety Act (SNWT (Nu) 1994, c 25)	*Mine Health And Safety Regulations* (NWT Reg (Nu) 125-95)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	*Explosives Regulations* (RRNWT (Nu) 1990 c E-27)	
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	*Fire Prevention Regulations* (RRNWT (Nu) 1990 c F-12)	
Safety Act (RSNWT 1988, c.S-1)	*General Safety Regulations* (RRNWT (Nu) 1990 c S-1) *Work Site Hazardous Materials Information System Regulations* (RSNWT 1988, C 81 (Supp))	
Transportation Of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c 81 (Supp))	*Transportation Of Dangerous Goods Regulations* (1991, NWT Reg (Nu) 095-91)	

SECTION 2 • MANUFACTURE OF EXPLOSIVES

2.1 Infrastructure

The construction and operation of the Project will require the use of ammonium nitrate/fuel oil (ANFO) and emulsion based explosives. ANFO will be used during construction until the Emulsion Plant begins manufacturing emulsion-based explosives, planned for end of Q1 2018. Presplit explosives will also be used to control the final pit walls, where required. General infrastructure for the management of explosives at the mine site includes the following:

- Emulsion Plant;
- Storage of raw materials used in the manufacturing of emulsion;
- Powder Magazines for storage of explosives such as boosters, detonating cord, presplit explosives, and ANFO (surface and underground mining); and
- Cap Magazines (surface and underground).

The Emulsion Plant will operate 7-days a week on a 12-hour per day basis. The explosives truck(s) will be based at the Emulsion Plant. A garage will be included in the building for the maintenance and washing of trucks and equipment used to handle the explosives. The water used for the manufacturing of emulsion will be supplied by truck from the proposed mine site's fresh water tank. Waste water generated inside the Emulsion Plant will be collected and disposed in an appropriate method (remaining solids will be disposed in the same manner as unusable emulsion as described in Section 3.6).

2.2 Location

The Emulsion Plant, raw material storage, and magazines will be safely located away from vulnerable facilities, as stipulated by the federal and territorial *Explosives Use Act* and *Regulations*.

The Emulsion Plant will be located approximately 1.36 kilometres north-west of the mine site as shown on Figure 2-1. The Surface Powder Magazine area and the Cap Magazines will be located along the road providing access to the Emulsion Plant.

Underground facilities will include Powder Magazines and Cap Magazines. These facilities will be constructed as stipulated in the applicable regulations.

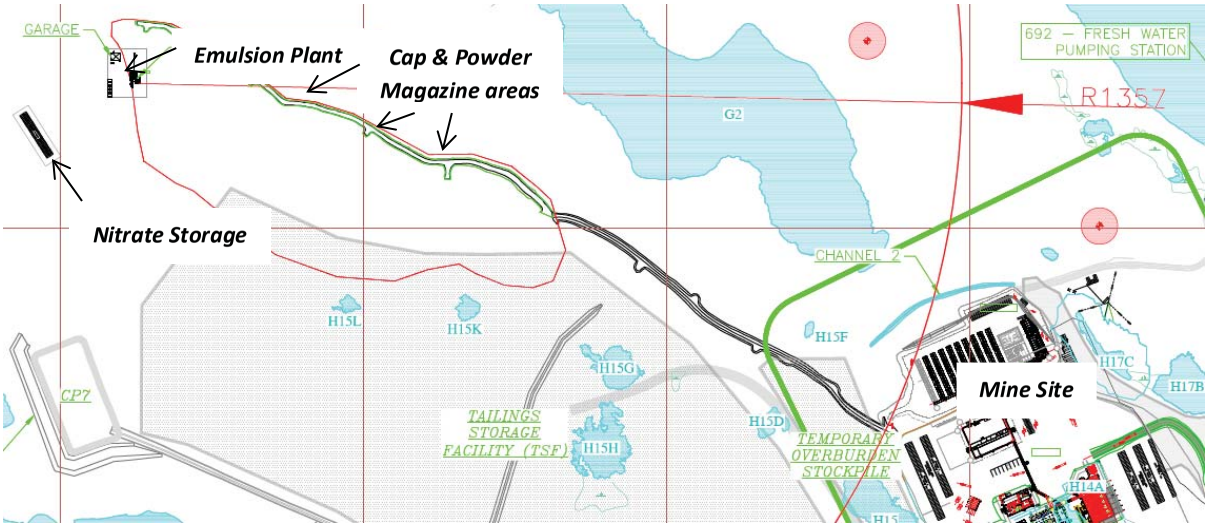


Figure 2-1 Location of Cap Magazine, Powder Magazine, and Emulsion Plant

2.3 Products

The following products will be required for manufacturing emulsion:

- surfactant (highly reacted oil mixture);
- ammonium nitrate;
- sodium nitrate;
- water; and
- microballoons.

The explosive truck (Mobile Manufacturing Unit or MMU) used to deliver emulsion at surface operations (i.e., open pit, quarry, or frozen stockpiles blasting) will use either water or a mixture of water and glycol during freezing conditions to allow for the pumping of the emulsion into the blastholes.

The following products will be required to achieve blasting activities:

- explosives;
- caps;
- boosters;
- detonating cords; and
- glycol (during freezing conditions).

2.4 Emulsion Plant Flow Sheet

The flow sheet of the Emulsion Plant is presented in Appendix B.

2.5 Design Criteria

To assist in the safe and secure storage of fuels, hazardous materials, and hazardous wastes, general design criteria for storage areas and facilities related to explosives will be followed as listed below:

- Design will be in compliance with the *National Fire Code*, where appropriate.
- Compliance with the Canadian Council of Ministers of the Environment (CCME), *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (2003)* will be followed. This CCME code deals with inventory control, inspections, corrosion protection, records, and monitoring. Environment Canada's *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* outlines registration and documentation requirements for storage tanks.
- Emulsion Plant will be adequately signed indicating that hazardous materials/wastes are stored therein.
- Storage locations will be clearly defined and marked to prevent damage to storage drums and containers in the event they are covered by snow.
- Incompatible materials will be segregated by chemical compatibility within the storage area to prevent contact between materials in the event of a release.
- Emulsion Plant will be located at least 31 metres from surface waters.
- Emulsion Plant will be readily accessible for firefighting and other emergency procedures.
- Emulsion Plant will be adequately ventilated to prevent the build-up of noxious or toxic vapors.
- Secondary containment will be installed to allow for the containment of at least 110 % of the largest container or tank volume of any chemical within the contained area.
- Emulsion Plant will be constructed, or provided with barriers, to protect containers from physical damage.
- Adequate spill and emergency response equipment will be installed in each storage area (i.e., spill control, fire protection, etc.).

SECTION 3 • HANDLING OF EXPLOSIVES

3.1 Transport

All products required for blasting activities will be shipped by vessel from the south to Rankin Inlet, loaded onto barges at the vessel anchoring location, and transported to Itivia. The bypass road and All-weather Access Road will be used to truck explosives and raw materials for manufacturing explosives to designated storage locations at the mine site.

The handling of explosives on-site will be carried out by the supplier and by qualified Agnico Eagle staff (blasters and helper-blasters) under a permit to conduct such work.

A 3T capacity explosive delivery truck will be used on-site to transport emulsion (in 1.2 t of capacity totes) from the Emulsion Plant to the underground mining operations. A 10 t capacity explosive truck called MMU will be used to deliver emulsion in the open pit production blastholes.

3.2 Storage

After the barges are unloaded, sea cans holding the raw products will be temporarily stored in a fenced laydown area at Itivia before being trucked to the mine site, with the exception of explosives, boosters, and caps, which will be transported directly to the mine site after being unloaded from the barges. In the event that these products require temporary storage in Rankin Inlet, they will be stored in appropriate storage magazines meeting federal *Explosives Act* and *Regulations*. The temporary storage magazines with remain under constant surveillance by Agnico Eagle personnel while in use.

On the mine site, raw materials such as sodium nitrate and ammonium nitrate used in the preparation of emulsion will be contained in 1.2 t tote bags, and stored in sea cans (capacity of approximately 20,000 kilograms each). Raw materials of different and incompatible types will be stored in separate sea cans to prevent their mixing. Raw materials will also be stored away from any other products as required by explosive regulations. The explosive caps will be stored in enclosed Cap Magazines (surface and underground). The boosters, detonating cord, and explosives used for pre-shearing and ANFO will be stored in an enclosed Powder Magazine. Surface and underground mining activities will require approximately 10 to 20 magazines in total, which will be managed according to the explosive regulations.

3.3 Blasting Activities

Blast frequency will be between two and four blasts per day, including underground and surface activities. Table 2.1 summarizes the blasting information for both the open pit and underground operations. The quarries, and possibly the borrow pits and stockpiles in some instances, will also require the use of explosives.

Table 2.1 Blasting Details – Meliadine Gold Project

Parameters	Values
Open Pit	
Quantity extracted per blast	120,000 t
Blasting area	120 m^2
Number of blasts per day	2 to 4
Underground	
Quantity extracted per blast (stope)	10,000 t
Quantity extracted per blast (development)	250-350 t
Number of blasts per day	2 to 4

The primary blasthole drills for surface mining will be diesel-powered rigs, whereas electric rigs will be used underground. A number of operating procedures will be implemented to adapt blasting to factors that can affect the operations, notably weather in relation to open pit operations. These may include minimizing the delays between the loading and blasting of holes, ensuring that cuttings are mounded around the holes collar after loading to prevent snow drifting into the holes, and utilizing blasthole covers. Emulsion is efficient (i.e., minimized loss rate) regardless of the presence of water. Unused explosives that remain viable will be returned to storage.

Blasting will likely be by electric initiation and will feature current technology with surface and in-the-hole delays to minimize the energy per delay to single hole loads. This will minimize backbreak, fly rock, vibration levels, and will optimize fragmentation and minimize excavation problems. The blasting patterns will favor communition, which will reduce energy consumption related to the crushing at the mill. Usage of explosives will therefore be optimized.

Blasting will be carried out by certified blasters who will follow blasting regulations and safe practices. The responsibility for blasting will be split between appropriately trained mine personnel and the explosives supplier.

Finally, there is often a relationship between ammonia and nitrate levels in surface water runoff and the quantity of ANFO type explosives that haven't detonated during the blast. Well planned blasts and strict control of spillage are keys to reducing ammonia losses. For safety, environmental, and economic reasons, blast designs will be optimized and will include measures that favor complete detonation of all explosives. Drill patterns, explosive loads, and initiation methods will be designed and performed by experienced professionals, and will be adaptively managed to make necessary adjustments should any problems be observed. Also, having a single explosives supplier and trained certified blasters loading the holes and performing blasting activities will ensure the consistency and

efficiency of the activity. Blasters who are conscientious and aware can prevent most spills by adjusting their loading practices.

3.4 Type of Explosives

The explosive composition can also influence ammonia and nitrate leaching rates, which ultimately can have an influence on loss rates. ANFO is less costly than other explosives, but it readily dissolves in water. Therefore, for economical, operational, and environmental reasons, ANFO will not be used when there is an anticipated presence of water. Emulsion releases ammonia and nitrates much more slowly than ANFO. This is in part why, when planning the operation, emulsion explosives will be favored over ANFO whenever possible. Emulsion is a versatile product that can be used in dry and wet conditions. Moreover, pumped emulsion reduces spillage, and with excellent water resistance, minimizes potential nitrate leaching and the resultant environmental impact (ammonia in water). Blasting with a high energy bulk emulsion explosive is planned with a targeted powder factor of 0.0.37 kg/t in ore, and 0.27 kg/t in waste. Emulsion will be produced on-site within an explosive plant operated and maintained by an explosive supplier. The current plan is to use the same emulsion product for both open pit and underground operations to minimize the complexity of the plant (i.e., only one product)

3.5 Blast Monitoring for the Protection of Fish

3.5.1 Objectives

Monitoring to evaluate blast related peak particle velocity and overpressure to protect nearby fish bearing waters will be conducted to ensure blast operations meet the requirements of specific charge weight/delay/set.

The detonation of explosives in or near water produces compressive shock waves that can cause significant impacts to the swim bladders of fish, rupture other internal organs, and/or damage or kill fish eggs and larvae. In addition, the effects of the shock waves can be intensified in the presence of ice. Fisheries and Oceans Canada guidelines developed in 1998 to protect fish and fish habitat from works or undertakings that involve explosives in or near fisheries waters (Wright and Hopky 1998; see Appendix A) have, in part, been superseded by research carried out by Godard et al. (2008). In particular, the recommended maximum instantaneous pressure change has been reduced from 100 to 50 kPa. As a result, Agnico Eagle will adhere to the following guidelines:

- No explosive is to be detonated in or near fish habitat that can produce an instantaneous pressure change greater than 50 kPa in the swim bladder of a fish.
- No explosive is to be detonated that produces a peak particle velocity greater than 13 millimetres per second in a spawning bed during the period of egg incubation (for lakes near the Project, the fisheries window is from August 15 to June 30 for fall spawning fish [e.g., lake trout]).

Peak particle velocity and overpressure monitoring data will be recorded at a minimum of two locations at the Project. The locations will be selected to confirm that the above guidelines are achieved. The data will be routinely reviewed, evaluated as compared to the guidelines, and compiled at the end of the year during annual reporting.

3.5.2 Methods

Blasts will be monitored using a vibration and overpressure monitoring system that is compliant with the international Society of Explosives and Engineers performance specification for blasting seismographs. The monitoring system has three main parts: a monitor, a standard transducer (geophone), and a microphone. The monitor contains the battery and electronic components of the instrument. It also checks the two sensors to be sure that they work properly.

The transducer measures transverse, vertical, and longitudinal ground vibrations with a mechanism called a geophone. Transverse ground vibrations agitate particles in a side-to-side motion. Vertical ground vibrations agitate particles in an up-and-down motion. Longitudinal ground vibrations agitate particles in a back-and-forth motion progressing outward from the event site. The monitoring system calculates the peak particle velocity for each geophone and calculates the vector sum of the three axes. The final result is the Peak Vector Sum (PVS) and is the resultant particle velocity magnitude of the event:

$$PVS = \sqrt{(T^2 + V^2 + L^2)}$$

Where:
T = particle velocity along the transverse plane
V = particle velocity along the vertical plane
L = particle velocity along the longitudinal plane

The transducer will be installed as per the model specifications.

3.6 Disposal of Wastes

Disposal of regular waste will follow the Landfill and Waste Management Plan for the Project.

Any hazardous material that requires disposal will be handled according to the Project's Hazardous Materials Management Plan, submitted as part of the Type A Water Licence application.

Used water generated at the Emulsion Plant will be re-used within the plant when feasible. Any excess used water will be collected and disposed in an appropriate method. Remaining solids will be disposed in the same manner as unusable emulsion as described below.

Any unusable/unused emulsion waste, as well as other explosive products whose expiry date has passed, will be taken to the open pit blast pattern for disposal down the blastholes.

The empty explosive boxes or bags that cannot be reused will be burned on-site according to the conditions stipulated in the permit.

SECTION 4 • SPILLS

4.1 Spill Prevention

The Emulsion Plant has a concrete floor with channels and sumps so spills are 100 % contained within the building. All facilities related to explosives handling on-site will be secured (locked) and regularly inspected by site security.

More details regarding spill preventive methods are provided in Spill Contingency Plan, submitted as part of the Type A Water Licence Application for the Project. The following is a summary of the main aspects:

- All storage tanks containing products that enter the composition of explosives will be in accordance with the provisions of regulations (e.g., National Fire Code, *Environmental Protection Act*).
- In case of a spill, the Spill Contingency Plan will be put into action and appropriate equipment will be used to contain the liquids or solids spilled.
- All preventive and breakdown maintenance will be carried out and recorded in accordance with standard operating procedures.

4.2 Intervention in Case of a Spill

Table 4-1 summarizes procedures to be applied in case of a leak or a spill of a product used in the manufacture of emulsion. Means of disposal of waste are also included. More details regarding hazardous materials and spill management are provided in the Spill Contingency Plan.

Table 4-1 Procedures in Case of Leaks and Spills of Explosive Products[1]

Product	Description	Spill and Leak Procedures	Waste Disposal
Ammonium Nitrate	Odorless, white to light, tan crystalline solid.	Remove source of heat and ignition. Sweep or shovel spill into a clean, non-combustible container. Wash remaining trace residues with water. Wear rubber gloves and safety glasses to prevent contact with skin and eyes.	Dispose of as-is in approved containers. As much as possible, remove, the spilled material as a solid.
Surfactant	Dyed or pale yellow liquid with petroleum odor.	Eliminate any source of ignition. Prevent spills from entering watercourses or drainage systems. Contain with sand or earth. Recover with pump or inert absorbent material, and place in clean container(s). Wear safety glasses and rubber gloves to prevent contact with eyes and skin.	Dispose as specified in the Hazardous Material Management Plan.
Emulsion	Blasting agent.	Remove all sources of heat and ignition. Prevent spills from entering watercourses or drainage systems. If a large amount of emulsion is involved, contain spill with earth or sand. Recover spilled material with a diaphragm pump. Use of a diaphragm pump also requires an air compressor. Limitation of the pump suction is approximately 2.5 metres, pump discharge is approximately 8 metres. Use a screening device on pump suction hose. Out of area spills will require taking two pumps and extra hose. Transfer the product into a tanker trailer or clean 200 litre drums. If a small amount of emulsion is involved, transfer material into a clean plastic container with a plastic shovel. Label tanker trailer or drums. Wear rubber gloves and rubber boots.	Recycle product, if possible. If not practical, detonate in a blasthole, or if a large amount is involved, demulsify with liquid detergent.
Sodium Nitrate prill	Oxydizing agent, white to light yellow crystals, faint odour.	In the event of a spill or leak, contact the vendor for advice. Wear respirator, protective clothing, and gloves. Vacuuming is the recommended method to clean-up spills. Do not sweep or use compressed air for clean-up. Recover spilled material using non-combustible materials, such as vermiculite. Use non-sparking tools and place in covered containers for disposal. Any recovered material may be used for its intended purpose, depending on contamination.	Waste material will need to be shipped south and disposed at an approved hazardous waste treatment/disposal facility in accordance with the Hazardous Material Management Plan.

[1] *Table will be updated on a regular basis considering the WHMIS sheets.*

SECTION 5 • PERSONNEL TRAINING PROGRAM

Only trained and certified persons will work with explosives. The explosives personnel will undertake formal training and on-the-job training to ensure compliance with legislation. Training requirements will include (but will not be limited to) the following:

- specific fire procedures as per the *Federal Explosives Act*;
- first aid;
- Transportation of Dangerous Goods;
- blasting certificate; and
- Workplace Hazardous Materials Information System (WHMIS).

SECTION 6 • BLASTING SAFETY MEASURES

6.1 Surface

Blasting safety procedures for breaking rock and frozen material are as follows for blasting on the surface (open pit and quarry operations):

- No unauthorized person is allowed inside a posted blast area whether the holes have been loaded or not.
- The blasting supervisor and the blaster are responsible for the safe handling, loading, and connection of a blast.
- The shift supervisor is responsible for the evacuation of all personnel and equipment from the blast area and the guarding of the blast.
- The general supervisor is responsible for notifying the appropriate blast personnel, and other departments and personnel who may be affected by a particular blast.
- Guards will be posted prior to blast time, and must remain guarding until they are told verbally by the shift supervisor that they can leave their position.
- Once guards are posted, the blast area must be inspected by the shift supervisor to ensure that no personnel or equipment remain inside the blast area.
- A blast-warning siren will be sounded for one minute; three minutes after this, the blast will be fired.
- The blaster will only fire the blast when given a direct verbal order to do so by the shift supervisor.
- Before firing a shot, the blaster must ensure the immediate area is clear (i.e., aircraft, etc.).
- The shift supervisor and blaster will inspect the fired shot for indications of any problems, such as misfires or cut-offs.
- Areas in which charged holes are awaiting firing shall be guarded or posted against unauthorized entry.
- Vehicles containing explosives shall not be taken to the repair shop or any other building for any purpose, with the exception of the MMU truck containing unused bulk emulsion. At the end of the shift, the MMU will be parked inside the explosive plant for usage the next day. No open flames or welding are to be used for field repairs unless explosives are first removed.
- All loaded patterns, in addition to being marked with blasting signs, will be clearly delineated to outline the pattern when necessary.
- Redrills shall be marked in an appropriate way and be designated by a member of the blasting crew; the marker shall be firmly implanted in the cuttings of the hole to be redrilled. The marker shall be removed by the driller before drilling and inverted in the hole after drilling for pickup by the blasting crew.

- Where redrills are required on loaded patterns, the drill must be guided by the blasting supervisor or blaster or a responsible person designated by them.
- Service vehicles and fuel trucks are not allowed on a loaded pattern; the drill must pull well clear of the loaded holes before any service or maintenance can be done on it. Where the drill cannot be moved and service is required, it may be done only under the direct supervision of the blast supervisor or designate, and all loaded holes must be covered.

6.2 Underground

Blasting safety procedures for breaking rock are as follows for underground operations:

- Underground blasts will occur at approximately the same time during the day.
- All employees working underground must be back on surface and have removed their badges from the presence board.
- Before blasting, the responsible supervisor makes sure that there are no badges remaining on the presence board.

SECTION 7 • INTERNAL AUDIT AND INSPECTION

Internal audits and inspections of all components related to the Explosives Management Plan will be conducted as required by the regulations. Inspections for physical condition and serviceability will be done on a regular basis by qualified personnel, and the results recorded according to quality and safety standard operating procedures. Qualified personnel will perform regular inspections of the Emulsion Plant and of the Powder and Cap magazines storing the boosters, caps, and explosives to ensure that inventory is documented and confirmed.

All recommendations and orders made by Natural Resources Canada Explosives Branch Inspectors, Fire Marshals, and Insurance Inspectors will be responded to and acted upon accordingly.

SECTION 8 • EMERGENCY RESPONSE PLAN

A detailed Emergency Response Plan is currently being prepared by the explosives supplier, which addresses potential incidents involving the manufacturing, transport, handling, and storage of explosives and related products. The supplier's Emergency Response Plan will be provided as an appendix in the next version of this Plan. It will prescribe the actions that supplier and Agnico Eagle employees must take to ensure employee and public safety in the event of an emergency.

The following situations (worse case scenarios) will be addressed relative to explosives in the Emergency Response Plan:

- fire/explosion;
- storage tank failure;
- spills from product delivery trucks;
- spills from raw material delivery trucks;
- process spills;
- shut-down due to weather, floods, lightning, fires, explosions, and other threats to the security and operation of supplier's facilities, equipment and material;
- bomb threats; and
- quantities of spills that are reportable to the supplier and authorities.

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APPENDIX A • GUIDELINES FOR THE USE OF EXPLOSIVES IN OR NEAR CANADIAN FISHERIES WATER



AGNICO EAGLE

MELIADINE GOLD MINE

Groundwater Management Plan

FEBRUARY 2018
VERSION 1

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Mine (the Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut.

The Mine Plan proposes mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one Underground Mine. Based on the current Mine Plan, the Mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings (Agnico Eagle 2017). There are four phases to the development of the Mine; just over 4 years of construction (Q4 2015 to 2019), 8 years of Mine operation (2020 to 2027), 3 years of closure (2028 to 2030), and post-closure (2031 forwards).

Tiriganiaq Underground Mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the Underground Mine will operate below the base of the continuous permafrost. The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the Underground Mine workings once the Mine has advanced below the base of the permafrost.

This document presents the Groundwater Management Plan (GWMP) for the discharge of saline groundwater in compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1525, Part E, Item 14.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	February 2018	All		In compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1525, Part E, Item 14	Golder Associates Ltd. on behalf of Agnico Eagle Mines Limited

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ANFO	Ammonium Nitrate/Fuel Oil
CP	Collection Pond
DDH	Diamond Drillhole(s)
EMPP	Environment Management and Protection Plan
EWTP	Effluent Water Treatment Plant
FEIS	Final Environmental Impact Statement
GWMP	Groundwater Management Plan
MMER	Metal Mining Effluent Regulations
NWB	Nunavut Water Board
Mine	Meliadine Gold Mine
QA	Quality Assurance
QC	Quality Control
RO	Reverse Osmosis
SD	Support Document
SSWQO	Site Specific Water Quality Objectives
SWTP	Saltwater Treatment Plant
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
WMP	Water Management Plan

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per metre
ha	hectare(s)
mg/L	milligram(s) per litre
km	kilometer(s)
km^2	kilo square meter(s)
m	metre(s)
m/day	metre(s) per day
mm	millimetre(s)
m^3	cubic metre(s)
m^3/day	cubic metre(s) per day
m^3/s	cubic metre(s) per second
m^3/hour	cubic metre(s) per hour
m^3/year	cubic metre(s) per year
Mm^3/year	million cubic metre(s) per year
Mm^3	million cubic metre(s)
t	tonne(s)
tpd	tonne(s) per day
Mt	million tonne(s)

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Mine (Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine is subject to the terms and conditions of both the Mine Certificate (No. 006) issued in accordance with the Nunavut Agreement Article 12.5.12 on February 26, 2015 and Nunavut Water Board Type A Water Licence (No. 2AM-MEL1631, 2016) issued by the Nunavut Water Board (NWB) on April 1, 2016.

This document presents the Groundwater Management Plan (GWMP) for the discharge of saline groundwater in compliance with the Type A Water Licence 2AM-MEL1631 (Licence). Overall water management for the life of the Mine and post-closure is described in the Agnico Eagle Meliadine Gold Mine Water Management Plan, dated March 2017 (6513-MPS-11) (WMP). The WMP provides descriptions of the Mine water control structures and associated design criteria. The WMP will be updated in March 2018 to reflect the groundwater management strategy presented in this document.

1.1 Concordance

The Mine is subject to the land and resource management processes established by the Nunavut Agreement and other Federal laws and regulations. Agnico Eagle submitted a Licence Application for a Mining and Milling Undertaking (Application) required to use water and to deposit waste in development of the Mine, in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and Nunavut Water Regulations.

The Licence was issued on April 1, 2016 and signed by the Minister on May 19, 2016. The GWMP reflects the commitments made with respect to submissions provided during the technical review of the Application, as well as final submissions and issues raised during the Public Hearing Process, where applicable, to comply with Part B Section 13, and Part E Section 14 of the Licence.

1.2 Objectives

The objective of the GWMP is to provide consolidated information on groundwater management for the Meliadine Gold Mine. The GWMP is divided into the following components:

- Introductory section (Section 1);
- A brief summary of the physical setting at the mine site and the mine development plan (Section 2);
- A description of groundwater management strategies (Section 3); and
- A description of the groundwater monitoring program (Section 4).

The GWMP will be updated as required to reflect any changes in operations or economic feasibility that occurs, and to incorporate new information and latest technology, where appropriate, to comply with Part B Section 15 of the Licence.

SECTION 2 • BACKGROUND

2.1 Site Conditions

The Mine is located in an area of poorly drained lowlands near the northwest coast of Hudson Bay. The dominant terrain in the Mine area consists of glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and many small lakes. The topography is gently rolling with a mean elevation of 65 metres above sea level (masl) and a maximum relief of 20 metres (m).

The local overburden consists of a thin layer of topsoil overlying silty gravelly sand glacial till. Cobbles and boulders are present throughout the region at various depths. Bedrock at the mine site area consists of a stratigraphic sequence of clastic sediments, oxide iron formation, siltstones, graphitic argillite and mafic volcanic flows (Snowden 2008; Golder 2009).

The climate is extreme in the area, with long cold winters and short cool summers, and mean air temperatures of 12 °C in July and -31 °C in January. The mean annual air temperature at the Mine site is approximately -10.4 °C (Golder 2012a). Strong winds blow from the north and north-northwest direction more than 30 percent of the time.

The mean annual precipitation in the area is approximately 412 mm and is typically equally split between rainfall and snowfall.

Late-winter ice thicknesses on freshwater lakes in the mine site area were recorded from 1998 to 2000. The measured data indicated that ice thickness ranges from 1.0 to 2.3 m with an average thickness of 1.7 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July (Golder 2012b).

2.2 Local Hydrology

The Mine is located within the Meliadine Lake watershed. Meliadine Lake has a surface water area of approximately 107 square kilometres (km^2), a maximum length of 31 km, features a highly convoluted shoreline of 465 km and has over 200 islands. Unlike most lakes, it has 2 outflows that drain into Hudson Bay through two separate river systems. It has a drainage area of 560 km^2 from its' two outflows. Most drainage occurs via the Meliadine River, which originates at the south west end of the lake. The Meliadine River flows for a total stream distance of 39 km. The Meliadine River flows through a series of waterbodies, until it reaches Little Meliadine Lake and then continues into Hudson Bay. A second, smaller outflow from the west basin of Meliadine Lake drains into Peter Lake, which discharges into Hudson Bay through the Diana River system (a stream distance of 70 km). At its mouth, the Diana River has a drainage area of 1,460 km^2.

Watersheds in the Mine area are comprised of an extensive network of waterbodies, and interconnecting streams. The hydrology of these watersheds is dominated by lake storage and evaporation.

2.3 Hydrogeology

The Mine is located in an area of continuous permafrost. Based on thermal studies and measurements of ground temperatures, the depth of permafrost at the mine site is estimated to be in the order of 360 to 495 m. The depth of the active layer ranges from about 1 m in areas with shallow overburden, up to about 3 m adjacent to the lakes. The depth of the permafrost and active layer varies depending on proximity to the lakes, overburden thickness, vegetation, climate conditions, and slope direction (Golder 2012b). The typical permafrost ground temperatures at the depths of zero annual amplitude are in the range of -5.0 to -7.5 °C in the areas away from lakes and streams. The geothermal gradient ranges from 0.012 to 0.02 °C/m (Golder 2012c).

Groundwater characteristics at the Mine are detailed in Final Environmental Impact Statement (FEIS) Volume 7, Section 7.2 Hydrogeology and Groundwater, and in an updated hydrogeological assessment completed for the Mine (Golder 2016). The groundwater characteristics for the Mine are briefly summarized herein.

Two groundwater flow regimes in areas of continuous permafrost are generally present:

- a deep groundwater flow regime beneath the base of the permafrost; and
- a shallow flow regime located in an active (seasonally thawed) layer near the ground surface.

From late spring to early autumn, when temperatures are above 0 ˚C, the active layer thaws. Within the active layer, the water table is expected to be a subdued replica of topography, and is expected to parallel the topographic surface. Mine area groundwater in the active layer flows to local depressions and ponds that drain to larger lakes.

Taliks exist beneath waterbodies that have sufficient depth such that they do not freeze to the bottom over the winter. Beneath small waterbodies that do not freeze to the bottom over the winter, a talik bulb that is not connected to the deep groundwater flow regime will form (a closed talik). Elongated waterbodies with terraces (where the depth is within the range of winter ice thickness), a central pool(s) (where the depth is greater than the range of winter ice thickness), and a width of 340 to 460 m or greater are expected to have open taliks extending to the deep groundwater flow regime at the Mine site. A review of bathymetric data, ice thickness data, and results of thermal modelling suggests that Meliadine Lake and Lake B7 are likely to have open taliks connected to the deep groundwater flow regime (Golder 2012a).

Tiriganiaq Underground Mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the underground mine will be operated below the base of the frozen

permafrost (top of the cryopeg). The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the underground mine workings once the mine has advanced below the base of the frozen permafrost.

Both Tiriganiaq Pit 1 and Tiriganiaq Pit 2 will be mined within the frozen permafrost, therefore, groundwater inflows to the open pits is expected to be negligible and were not considered in the WMP.

2.4 Mine Development Plan

The Mine Plan proposes mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one Underground Mine. Based on the current Mine Plan, the Mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings (Agnico Eagle 2017). The following phased approach is proposed for the development of the Tiriganiaq gold deposit:

- Phase 1: 4 years for Mine Construction. Construction began in 2015 and is estimated to be complete in 2019;
- Phase 2: 8 years for Mine Operations, beginning in 2017 and ending in 2027;
- Phase 3: 3 years Mine Closure, from 2028 to 2030; and
- Phase 4: Post-closure (2031 forwards).

Mine facilities on surface include a plant site and accommodation buildings, three ore stockpiles, a temporary overburden stockpile, a tailings storage facility, three waste rock storage facilities, a water management system that includes containment ponds, water diversion channels, retention dikes/berms, and a final Effluent Water Treatment Plant (EWTP). The general location and site layout of the Mine are shown in Figure 1 of Appendix A.

SECTION 3 • GROUNDWATER MANAGEMENT STRATEGY

3.1 Groundwater Volumes

In the WMP of the water licence application (Agnico Eagle 2015a) it was stated that supplemental hydrogeological investigations were to be undertaken to provide additional information on potential volumes and quality of the saline groundwater to be managed. These investigations were undertaken in 2015 and 2016 and are summarized in Golder (2016). They included the completion of 24 packer tests, two pumping tests, two injection tests, 11 groundwater samples, and seven surface water samples. The work plan for the field work was developed in consultation with two independent technical advisors, Dr. Shaun K. Frape and Dr. Walter A. Illman (both of the University of Waterloo).

The additional hydraulic conductivity measurements, in combination with the updated Mine geologic model, resulted in a refined interpretation on the variability of hydraulic conductivity between geological formations and data on the storage properties of the bedrock. A summary of predicted groundwater inflows between 2017 and 2032, based on this refined interpretation and updated predictions of groundwater inflow using the developed numerical (Golder 2017), are provided in Table 1.

Table 1: Predicted Groundwater Inflow to Underground Mine (2017 to 2032)

Period	Predicted Groundwater Inflow (m^3/day)
2017	230
2018	300
2019	280
2020	300
2021	340
2022	340
2023-2024	420
2025-2026	380
2027-2028	390
2029-2030	380
2031-2032	360

Source: Updated Predictions of Groundwater Inflow to Tiriganiaq Underground Mine (Golder 2017).

The groundwater inflow predictions presented in Table 1 do not account for grouting currently being conducted as a mitigation to reduce groundwater inflows to the underground development, or potential losses through the ventilation system. Both mechanisms reduce the actual groundwater

inflows to the Underground Mine relative to that which was predicted. As such, these predicted inflows to the underground development represent unmitigated estimates.

3.2 Existing Groundwater Management Control Structures

Contact water in the Underground Mine is contained within underground sumps. A proportion of the underground water will be recirculated as make-up water for underground drilling. The drilling water will report to the underground sumps for recirculation; however, the need for up to 3% treated water make-up has been assumed to compensate for losses of drilling water due to evaporation or capture within the mined waste rock that is transferred to surface. Calcium chloride is currently not added to the underground water but has been used in the past and potentially again in the future to increase salinity and reduce water freezing during drilling.

Groundwater inflows to the Underground Mine since 2015 have not been discharged to the environment and are being stored underground, in the Saline Pond, in the P-Area, Collection Pond 5 (CP5) or actively evaporated during the open water season (Agnico Eagle 2017). Details of the underground dewatering system are provided in the Mine Plan (Agnico Eagle 2015a) and details of the pond are provided in the WMP (Agnico Eagle 2017).

The pond capacities and maximum water elevation for storage of the saline water are presented in Table 2. The locations of the ponds are shown on Figure 1 of Appendix A. The estimated volume of groundwater inputs to surface storage for management are expected to range from approximately a minimum of 0.11 million cubic metre(s) per year (Mm^3/year) to a maximum of 0.18 Mm^3/year, dependent on year of Mine life (Agnico Eagle 2017).

Table 2: Salt Water Storage Capacity at the Mine for Groundwater and Water Primarily Influenced by Underground Workings

Surface Pond	Capacity (m^3)	Maximum Water Elevation (m)
CP5	46,674	66.0
Saline Pond	32,686	62.9
P1	20,781	68.5
P2	6,828	66.5
P3	18,432	67.0

Source: Agnico Eagle (2017).

3.3 Groundwater Quality

Groundwater investigations undertaken indicate that total dissolved solids (TDS) concentrations are relatively consistent below the permafrost at approximately 64,000 mg/L (Golder 2016). Recent groundwater quality data from the Underground Mine collected by Agnico Eagle in 2016 and 2017 from diamond drillholes (DDHs), indicates mostly stable concentrations for several parameters

(Table 3) and suggest that TDS concentrations may be less at approximately 50,000 to 55,000 mg/L, on average, and the assumption of TDS at 64,000 mg/L may represent a more conservative estimate. It should also be noted that mining operations include drill-and-blast excavation for the development of the Underground Mine, which results in certain parameters in groundwater to be influenced by explosives (particularly ammonia and nitrate due to ammonium nitrate, fuel oil [ANFO] and emulsion explosives).

Table 3: Average Underground Saline Water Quality

Representative Months (average per month)		Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017	Feb 2017	Mar 2017	Apr 2017	May 2017	Jun 2017	Jul 2017	Aug 2017	Sep 2017
Parameters (total metal)	**Units**														
pH	pH	7.09	7.09	7.34	7.99	7.17	7.08	6.87	7.11	7.32	7.38	7.27	8.27	7.45	7.33
Alkalinity	mg/L	65	69	56	72.6	64	57	61.7	51	64.5	68	68	75	68.2	64
Conductivity	µmhos/cm	53320	70323	77750	79800	56000	77000	76500	77000	79000	79000	76308	74385	72200	72667
Total Hardness (as $CaCO_3$)	mg/L	14923	14644	13125	13260	13700	13200	18267	12700	18400	12433	12623	12500	12583	11700
Turbidity	NTU	82.85	93.00	56.25	27.56	74.00	123.75	69.00	88.00	90.00	51.00	75.00	61.00	47.02	104.33
Total Dissolved Solids (TDS)	mg/L	39663	50765	58600	60600	55000	54350	66433	54900	57500	57300	55123	57815	57520	54567
Total Suspended Solids (TSS)	mg/L	41	68.5	61	108.6	29	45	75.7	63	248.5	102.7	102.2	156	86	102
Aluminum (Al)	mg/L	0.56	8.72	0.075	0.32	0.06	0.21	0.10	6.02	1.29	0.51	1.45	0.73	0.97	1.75
Ammonia Nitrogen (NH_3-NH_4)	mg/L	4.66	4.20	5.93	5.98	3.50	4.13	105.3	4.50	4.95	5.20	5.51	11.1	4.87	4.43
Arsenic (As)	mg/L	0.0012	0.32	0.005	0.005	0.002	0.003	0.005	0.01	0.008	0.004	0.016	0.016	0.102	0.013
Barium (Ba)	mg/L	0.05	0.19	0.09	0.10	0.05	0.06	0.61	0.10	0.27	0.07	0.09	0.25	0.10	0.07
Beryllium (Be)	mg/L	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.01	0.002	0.002	0.005	0.008	0.01	0.01
Boron (B)	mg/L	1.4	1.7	1.5	1.5	1.8	1.6	4.98	5.0	4.9	1.5	2.7	3.97	5.0	2.5
Total Organic Carbon (TOC)	mg/L	4.95	2.65	3.68	4.28	2.00	2.23	11.67	2.10	2.95	2.63	3.20	5.30	2.57	2.50
Dissolved Organic Carbon	mg/L	2.60	2.35	3.45	3.74	1.90	1.90	10.17	1.70	2.30	2.37	2.70	4.90	2.32	2.10
Calcium (Ca)	mg/L	1899	1955	1965	1816	1800	1710	3777	1650	3737	1593	1608	1771	1610	1565
Cadmium (Cd)	mg/L	0.00002	0.0002	0.0002	0.0013	0.0002	0.0003	0.0002	0.001	0.0003	0.0002	0.0005	0.001	0.001	0.002
Chloride (Cl - dissolved)	mg/L	—	33500	31000	32800	34000	31250	38000	31000	31500	32000	31385	31538	32800	29333
Chromium (Cr)	mg/L	0.01	0.015	0.018	0.014	0.02	0.025	0.017	0.01	0.02	0.017	0.05	0.075	0.1	0.88
Copper (Cu)	mg/L	0.26	0.44	0.009	0.009	0.01	0.01	0.008	0.05	0.01	0.01	0.02	0.04	0.05	0.03
Cyanide (CN)	mg/L	0.005	0.006	0.008	0.017	0.005	0.005	0.19	0.005	0.028	0.005	0.006	0.01	0.005	0.008
Iron (Fe)	mg/L	9.68	40.28	6.48	5.23	4.31	4.76	8.96	3.60	8.78	6.19	9.81	6.33	8.24	4.10
Lead (Pb)	mg/L	0.002	0.002	0.004	0.005	0.004	0.005	0.005	0.02	0.004	0.003	0.009	0.015	0.02	0.018
Magnesium (Mg)	mg/L	2475	2170	2053	2118	2230	2168	2150	2080	2200	2050	2092	1962	2105	1975
Mercury (Hg)	mg/L	0.0002	0.01	0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.000001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum (Mo)	mg/L	0.01	0.015	0.04	0.013	0.02	0.025	0.055	0.01	0.25	0.026	0.047	0.075	0.1	0.17
Nickel (Ni)	mg/L	0.05	0.04	0.02	0.01	0.02	0.025	0.04	0.1	0.07	0.017	0.05	0.08	0.1	0.35
Nitrate (NO_3) as N	mg/L	0.15	0.168	0.88	0.57	0.1	0.5	116.39	0.1	2.58	0.23	0.89	4.35	0.17	0.34
Nitrite (NO_2) as N	mg/L	0.02	0.04	0.089	0.072	0.05	0.05	8.01	0.1	0.125	0.086	0.14	0.391	0.042	0.027
Total Kjeldahl Nitrogen (TKN)	mg/L	4.49	3.65	6.95	7.58	5.90	3.78	112.47	4.60	5.20	7.83	7.40	12.0	72.02	4.50
Phosphorous (P)	mg/L	0.05	0.14	0.05	0.05	0.04	0.07	0.14	0.04	0.13	0.12	0.08	0.09	0.1	—
Potassium (K)	mg/L	512	504.5	460.5	493.6	454	496	595	407	609	433	463	518	488	763
Radium-226 (Ra 226)	mg/L	—	—	—	1.9	1.7	0.49	0.33	0.3	1.2	1.95	1.8	1.9	2.2	0.29
Selenium (Se)	mg/L	0.23	0.006	0.0018	0.0033	0.002	0.003	0.002	0.01	0.002	0.002	0.005	0.0075	0.01	0.007
Silver (Ag)	mg/L	0.002	0.003	0.0004	0.0005	0.0004	0.001	0.0003	0.002	0.0009	0.0004	0.0012	0.0018	0.0002	0.018
Sodium (Na)	mg/L	16379	16000	14100	14600	15100	14625	14700	13400	15400	13900	14369	14654	14417	9433
Strontium (Sr)	mg/L	39.8	39.4	44.7	40.9	40.1	43.1	171	38.4	136	40	39	43.5	36.5	23.6
Sulphate (SO_4 – dissolved)	mg/L	—	3350	3125	3260	3200	3125	2700	3100	3100	3233	3169	2969	3120	3067
Thallium (Tl)	mg/L	0.0009	0.0008	0.0009	0.0006	0.001	0.001	0.001	0.001	0.0002	0.0002	0.0005	0.001	0.001	0.002
Uranium (U)	mg/L	0.002	0.003	0.002	0.002	0.002	0.003	0.002	0.01	0.006	0.002	0.005	0.008	0.01	0.09
Vanadium (V)	mg/L	0.05	0.08	0.09	0.06	0.1	0.13	0.08	0.5	0.1	0.08	0.23	0.38	0.5	0.33
Zinc (Zn)	mg/L	0.06	0.08	0.36	0.1	0.1	0.125	0.1	0.5	0.12	0.08	0.23	0.38	0.5	0.34

Source: Groundwater quality data from DDH sample location (Agnico Eagle, October 2017)

3.4 Groundwater Management Strategy and Associated Control Structures

Based on the Type A Water Licence 2AM-MEL1631 Terms and Conditions, Part E: Conditions Applying to Water Use and Management, No. 14, Agnico Eagle has reviewed the Mine alternatives to apply to the GWMP. Condition No. 14 specifically states:

> *"The Licensee shall submit a Groundwater Management Plan to the Board for approval in writing, at least six (6) months prior to the discharge of any Groundwater. The Plan shall take into consideration all comments raised and commitments made with respect to submissions received during the technical review of the Application as well as final submissions and issues raised during the Public Hearing Process, where applicable."*

Groundwater management alternatives were considered for the Mine based on the potential range of groundwater flows and quality that could be generated (refer to Appendix F of the WMP; Agnico Eagle 2015a). The option selection has been driven by the expected quality and quantity of the water.

Based on the groundwater inflow volume, the following options were considered and form part of the short and long term management of groundwater inflows to the Underground Mine:

- Short-term Strategy: treat saline groundwater and store/use the brine from the treatment process on-site (Section 3.4.1)
- Current Long-term Strategy: treated discharge to receiving environment in Meliadine Lake in combination with treated surface contact water (Section 3.4.2)
- Potential Future Long-term Strategy: ocean disposal (see Section 3.4.3)

The short and long-term groundwater management strategies are described below. At this time, Agnico Eagle is requesting approval from the NWB for the short-term strategy and the current long-term strategy to discharge to Meliadine Lake. The potential future long-term strategy of ocean disposal is still under assessment and provided for information purposes.

3.4.1 Short-Term Management Strategy - Treat and Store/Use Groundwater On-site

This alternative was considered as part of the Type A Water Licence Application and is currently being implemented on-Site as part of the short-term management of groundwater inflow. It involves storing all excess groundwater in underground sumps and in surface water ponds at the Mine. As outlined in the WMP (Agnico Eagle 2017), a total of nine water containment ponds are planned on-site at the Mine surface (CP1, CP3, CP4, CP5 and CP6, the P-Area [P1, P2, and P3], and the Saline Pond), and associated water retention dykes, water diversion berms, channels, and culverts, to manage surface water and underground water (Figure 1).

Evaporators have been in-use on site since mid-2017 at P1 to reduce groundwater volumes stored in surface water ponds. A single evaporator is estimated to remove approximately 500 m^3/day when operated for 24 hours with ideal wind and relative humidity conditions. While evaporators have

been used with some success, the combined volumes of groundwater with anticipated surface water volumes influenced by underground waste rock to be managed is greater than the available long-term storage at the Mine, and therefore, discharge to environment is required.

These short-term storage and treatment options are being implemented at the Mine pending regulatory approvals for the long-term groundwater management option.

3.4.2 Current Long-Term Management Strategy - Treated Groundwater Discharge to Meliadine Lake

Effluent discharge to Meliadine Lake was assessed as part of the FEIS and modelled as part of the Water Licence Application (Agnico Eagle 2014, 2015a) and discharge criteria have been defined in the Licence. Provided the discharge criteria can be met following commissioning of the treatment system, this option represents the immediate long-term management strategy to be implemented at the Site in 2018. Approval of this plan will be required, prior to discharge, as per the Term and Condition Part E, No. 14 of the Licence. Total discharge to Meliadine Lake, including the treated groundwater, will remain within the permitted daily volume and meet the discharge criteria defined in the Licence.

Hatch (2013) investigated groundwater treatment options for the site and concluded that a combination chemical reverse osmosis (RO) and mechanical vapour compression evaporator plant would be the most efficient method of treating excess groundwater for discharge. Agnico Eagle has also undertaken a pilot test of a SaltMaker combined with a Chemical-RO post-treatment system and based on the results of this testing decided to proceed with this technology.

The groundwater will flow through a Saltwater Treatment Plant (SWTP), comprised of a set of SaltMakers, and will be treated to remove excessive total suspended solids (TSS), calcium chloride ($CaCl_2$), sodium chloride (NaCl), metals, phosphorous (P), and nitrogen compounds. The salt generated by the water treatment unit will be stored at the Mine, where it will be re-used for underground operations and/or disposed of at an appropriate disposal location. Given the predicted groundwater volumes, a maximum of three SaltMakers are proposed to be built at the Mine, forming the SWTP, to treat the groundwater for discharge to the environment. Two SaltMaker's have been procured and are anticipated to be in operation between Q3 2018 and Q1 2019. Additional SaltMakers could be built at the Mine to meet the discharge volumes required. This need will be evaluated based on the effectiveness of the short-term management strategies and observed operational capacities of the SaltMakers, which are anticipated to be 120 m^3/day. The saline effluent temperature from the SWTP is expected to be approximately 35 °C, with an approximate pH of 7.5 (Saltworks 2017). The SWTP effluent largely meets the required Water Quality Output requirements defined in Agnico Eagle's Desalination Water Treatment Plan Design Criteria and passes completed toxicity tests (Saltworks 2017). Treated effluent quality (of the groundwater) through the SWTP indicates that TDS concentrations would be approximately 158 mg/L (condensed water after treatment; Saltworks 2017).

Post-treatment options, such as the RO post-treatment system, are being considered if required, to meet applicable effluent quality criteria for Meliadine Lake. The permeate resultant from the Chemical-RO post-treatment system meets all the required Site Specific Water Quality Objectives (SSWQO) and passes completed toxicity tests. Saline effluent quality after secondary treatment through the SWTP indicates that TDS concentration would be considerably reduced, at approximately 55 mg/L after RO post-treatment (Saltworks 2017). Pilot testing of the SaltMaker condensed water and RO permeate quality results are presented in the SaltMaker Pilot Final Report document (Saltworks 2017). The results indicate that values will meet SSWQO for water management, which also comply with MMER.

3.4.3 Potential Future Long-Term Management Strategy - Treated Groundwater Discharge to Melvin Bay at Itivia Harbour

Based on the potential volumes of groundwater, it is anticipated that a second discharge location will be required for long-term groundwater management. Agnico Eagle is proposing to treat groundwater and discharge it as saline effluent to the ocean, either as a direct discharge and/or after temporary on-site storage in one or more of the water containment ponds at the Mine. Ocean discharge is currently not permitted and requires appropriate regulatory licenses and approvals, which are currently being assessed and applications prepared. An updated GWMP will be submitted if appropriate licenses and approvals are obtained prior to discharge.

For the ocean discharge option, the saline effluent would be trucked from the Mine and discharged in Melvin Bay at Itivia Harbour. The discharge facility will include an unheated saline water storage tank at the Itivia Fuel Storage Facility and a pipeline extending to an engineered diffuser located in Melvin Bay during the open water season from 2019 to 2035. The saline effluent will be discharged in a controlled manner through the diffuser in compliance with the required discharge criteria to allow for maximum dilution and minimum environmental impact to the marine environment. Saline effluent quality will be required to meet the Canadian federal end-of-pipe discharge criteria (Metal Mining Effluent Regulations – or MMER), including the amended MMER (GC 2017; anticipated to come into effect in 2018), and Canadian Surface Water Quality Guidelines (Canadian Council of Ministers of the Environment Guidelines for the Protection of Aquatic Life [CCME 2003]) or Site-Specific Water Quality Objectives at the edge of the mixing zone for the diffuser discharge into Melvin Bay. It is recognized that further discussions are required with relevant stakeholders to confirm that this approach meets the amended MMER (GC 2017).

3.5 Discharge Schedule

Table 4 outlines the timeline for key activities on the Mine related to the management of saline groundwater, including tasks and facilities for the current short-term and long-term management strategies for discharge to Meliadine Lake (Section 3.4.1 and 3.4.2). A detailed Mine schedule for the overall Mine Water Management (e.g., building of culverts, berms and containment ponds) are presented in the 2017 WMP, which will be updated in March 2018.

Table 4: High Level Mine Schedule

Activity	Timeline	Notes
On-site water storage	Ongoing	—
Groundwater Management Plan (Current Document)	Six months prior to discharge	Type A Water Licence 2AM-MEL1631 requirement
Commissioning of Salt Water Treatment Plants (SaltMaker #1 and #2)	Q3-2018 to Q1-2019	—
Earliest first Discharge of treated saline groundwater to Meliadine Lake	Q3-2018	
Commissioning of additional SaltMaker unit(s) if required	2019	—
Active Discharge to Meliadine lake	Annually May thru October to 2032	—
Operation of Salt Water Treatment Plant	24 h a day / 7 days a week, May thru Oct	In-service as required
Inactive Discharge	Annually November thru April to 2032	Water will be stored underground and in surface containment ponds during the winter
Final Saline Effluent Discharge to Meliadine Lake	End of Mine life 2032	—

Source: Agnico Eagle (2017).

SECTION 4 • GROUNDWATER MONITORING PROGRAM

4.1 Water Quality and Quantity Monitoring

Water quality monitoring is an important part of the Mine water management to verify the predicted water quality and quantity trends and conduct adaptive management should differing trends be observed. Water quality and quantity monitoring has been initiated and will continue during construction, operations, closure and post-closure. Monitoring will occur at three levels:

- Regulated discharge monitoring that occurs at monitoring points specified in the Licence or regulations.
- Verification monitoring that is carried out for operational and water management purposes by Agnico Eagle. This monitoring data will not be reported to the Regulators in the Annual Water License Report, but can be provided upon request by the Regulators.
- General monitoring that is included in the Licence requirements and is subject to compliance assessment to confirm sampling was carried out using established protocols, including quality assurance/quality control provisions, and addressing identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

All three types of monitoring will be used at the Mine. The WMP presents the conceptual water quality monitoring plan during construction, operations and closures and more detailed information on monitoring programs and is described in the Environment Management and Protection Plan (EMPP) (Agnico Eagle 2015b).

The groundwater quality monitoring plan, which will be further defined as the Mine advances and will be conducted in agreement with the WMP for the Mine (Agnico Eagle 2017). Required monitoring and frequency for pre- and post- treatment (i.e., monitoring above ground) is presented in the WMP (Agnico Eagle 2017).

4.2 Water Quantity

The volume of groundwater inflow being collected and transferred to surface water management systems with be measured using a flow meter installed at the Portal Water Sump Stope L75 surface water pond. This data will be supplemented by periodic seepage surveys which will record visually observed groundwater inflows in the Underground Mine.

Measured groundwater inflow rates will be compared to model predictions on an annual basis. If significant variations from model predictions are observed, the assumptions behind the analysis will be reviewed and the analysis updated if required. In addition, updates to the groundwater model may be required based on operational changes as the Underground Mine advances.

If the measured groundwater quantity represents a significant difference from the model predictions, a re-calibration of the model will be considered. If model re-calibration is deemed necessary, future groundwater inflow quantity would be predicted using this re-calibrated model and results considered as part of the adaptive management of the groundwater quantity contribution to the WMP.

4.3 Water Quality

Groundwater quality will be monitored opportunistically from DDHs to assess and verify the quality of groundwater flowing into the Underground Mine. Water samples will be analyzed for the following parameters: conductivity, TDS, pH, temperature, major anions, radium 226, dissolved and total metals and toxicity testing.

To understand and plan for treatment requirements at surface, water accumulating in sumps underground will also be sampled on a monthly basis at the Sump 125, which is the main collection sump prior to recirculation for underground use. Sump water samples will be analyzed for the following parameters: conductivity, TDS, pH, temperature, oil and grease, major anions, radium 226, dissolved and total metals, nitrate and nitrite, volatile organic compounds (i.e., benzene, xylene, ethylene, and toluene).

Water quality results are compared to MMER and SSWQO guidelines and will be compliant prior to discharging to Meliadine Lake.

SECTION 5 • QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality Assurance (QA) refers to plans or programs that encompass a wide range of internal and external management and technical practices designed to ensure the collection of data of known quality that matches the intended use of the data. Quality Control (QC) is a specific aspect of QA that refers to the internal techniques used to measure and assess data quality. Specific QA and QC procedures that will be followed during sampling performed for the Groundwater Monitoring Program are described in Section 5.1 and 5.2.

5.1 Quality Assurance

Quality assurance protocols will be diligently followed so data are of known, acceptable, and defensible quality. There are three areas of internal and external management, which are described in the following three sections.

5.1.1 Field Staff Training and Operations

To make certain that field data collected are of known, acceptable, and defensible quality, field staff will be trained to be proficient in standardized field groundwater sampling procedures, data recording, and equipment operations applicable to the Groundwater Monitoring Program. All field work will be completed according to specified instructions and established technical procedures for standard sample collection, preservation, handling, storage, and shipping protocols.

5.1.2 Laboratory

To make sure that high quality data are generated, accredited laboratories that will be selected for sample analysis. Accreditation programs are utilised by the laboratories so that performance evaluation assessments are conducted routinely for laboratory procedures, methods, and internal quality control.

5.1.3 Office Operations

A data management system will be utilized so that an organized consistent system of data control, data analysis, and filing will be applied to the Groundwater Monitoring Program. Relevant elements will include, but are not limited to the following:

- all required samples are collected;
- chain-of-custody and analytical request forms are completed and correct;
- proper labelling and documentation procedures are followed, and samples will be delivered to the appropriate locations in a timely manner;
- laboratory data will be promptly reviewed once they are received to validate data quality;
- sample data entered into a Mine-specific groundwater quality database will be compared to final laboratory reports to confirm data accuracy; and

- appropriate logic checks will be completed to ensure the accuracy of the calculations.

5.2 Quality Control

The QC component will consist of applicable field and sample handling procedures, and the preparation and submission of two types of QC samples to the various laboratories involved in the program. The QC samples include blanks (e.g., travel, field, equipment) and duplicate/split samples.

Sample bottle preparation, field measurement and sampling handling QC procedures include the following:

- Sample bottles will be kept in a clean environment, capped at all times, and stored in clean shipping containers. Samplers will keep their hands clean, wear gloves, and refrain from eating or smoking while sampling.
- Where sampling equipment must be reused at multiple sampling locations, sampling equipment will be cleaned appropriately between locations.
- Temperature, pH, and specific conductivity will be measured in the field using hand held meters.
- Samples will be cooled to between 4 °C and 10˚C as soon as possible after collection. Care will be taken in when packaging samples for transport to the laboratory to maintain the appropriate temperature (between 4°C and 10˚C) and minimize the possibility of rupture. Where appropriate, samples will be treated with preservatives to minimize physical, chemical, biological processes that may alter the chemistry of the sample between sample collection and analysis.
- Samples will be shipped to the laboratory as soon as reasonably possible to minimize sample hold times. If for any reason, samples do not reach the laboratory within the maximum sample hold time for individual parameters, the results of the specific parameters will be qualified, or the samples will not be analysed for the specific parameters.
- Chain of custody sample submission forms will be completed by field sampling staff and will be submitted with the samples to the laboratory.
- Only staff with the appropriate training in the applicable sampling techniques will conduct water sampling.

Quality control procedures implemented will consist of the preparation and submission of QA/QC samples, such as field blanks, trip blanks, and duplicate water samples. These are defined as follows:

- Field Blank: A sample will be prepared in the field using laboratory-provided deionized water to fill a set of sample containers, which will then be submitted to the laboratory for the same analysis as the field water samples. Field blanks will be used to detect potential sample contamination during collection, shipping and analysis.

- Travel Blank: A sample will be prepared and preserved at the analytical laboratory prior to the sampling trip using laboratory-provided deionized water. The sample will remain unopened throughout the duration of the sampling trip. Travel blanks will be used to detect potential sample contamination during transport and storage.
- Duplicate Sample: Two samples will be collected from a sampling location using identical sampling procedures. They will be labelled, preserved individually and submitted for identical analyses. Duplicate samples will be used to assess variability in water quality at the sampling site. Duplicate will be collected and submitted for analyses at approximately, 10% of sampling locations. For smaller batches of samples (less than 10), at least one duplicate will be collected and submitted for analysis.

Additional QA/QC procedures that will be applied to the seepage survey component of the Groundwater Monitoring Program will include:

- Location – Universal Transverse Mercator (UTM) coordinates of seepage will be defined through the use of a hand-held Global Positioning System (GPS) unit.
- Sample Labels – appropriate sample nomenclature will be assigned to the sample labels that will define sample locations, sample type, year, and designation (numerical from 01 sequentially upwards) (e.g., SEEP-13-01 for seepage; 5034PIT-13-02 for pit sump).

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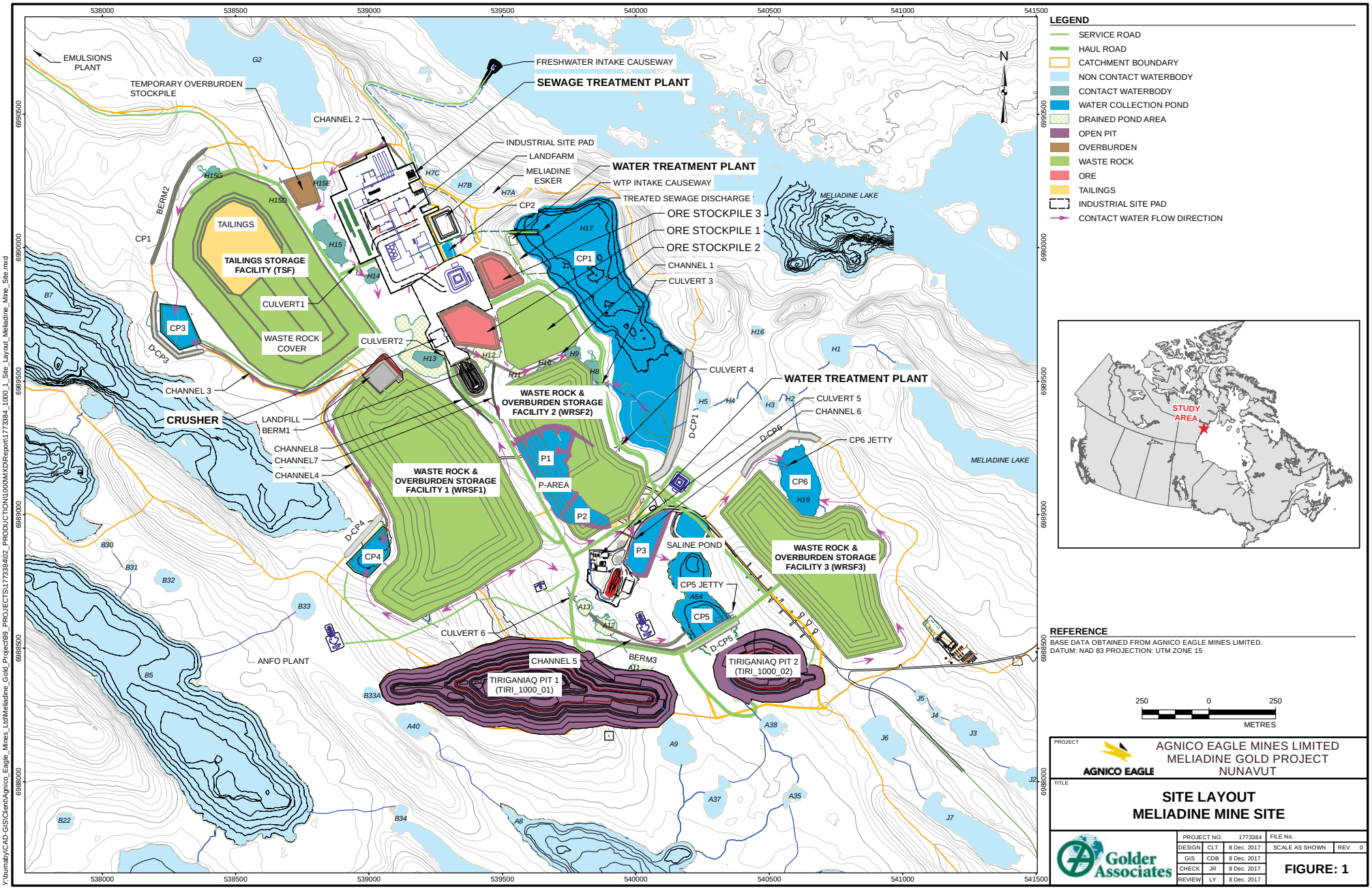
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APPENDIX A • FIGURES

Figure 1 General Mine Site Location Plan



LEGEND

- SERVICE ROAD
- HAUL ROAD
- CATCHMENT BOUNDARY
- NON CONTACT WATERBODY
- CONTACT WATERBODY
- WATER COLLECTION POND
- DRAINED POND AREA
- OPEN PIT
- OVERBURDEN
- WASTE ROCK
- ORE
- TAILINGS
- INDUSTRIAL SITE PAD
- CONTACT WATER FLOW DIRECTION

REFERENCE

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

250 0 250
METRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
SITE LAYOUT
MELIADINE MINE SITE

Golder Associates

PROJECT NO.	1773384		FILE No.	
DESIGN	CLT	8 Dec. 2017	SCALE AS SHOWN	REV. 0
GIS	CDB	8 Dec. 2017		
CHECK	JR	8 Dec. 2017		
REVIEW	LY	8 Dec. 2017		

FIGURE: 1

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AGNICO EAGLE

MELIADINE GOLD PROJECT

Hazardous Materials Management Plan

MARCH 2018
VERSION
56513-MPS-12

ᐊᕕᑎᒧᑦ ᐊᖏᓪᓗ ᐱᖁᑎᓄᑦ ᐊᖓᔪᓂᖅᑲᖅ ᓯᓚᑦᓂᖅᐸᐅᑦᓗᓂᒃ ᐱᓕᕆᐅᑎᖅᑎᓂᐊᖅᑐᖅ ᑲᒪᒋᐅᑦᑕᖏᑦᓗᓂᑦ ᐱᓕᐅᓂᖓᓄᑦ, ᖃᐅᔨᓴᐃᓂᖅᓄᑦ, ᐊᖏᓪᓗ ᑎᑎᕋᐅᓯᐅᓂᖓᓄᑦ ᐱᖁᑎᑎᕆᐅᔨᓗᒃᑕᑦ ᐃᓂᐅᔪᓂᑦ. ᐊᐃᓴᑐᖅᓯᒪᔪᓂ ᐊᐅᓚᑦᑎᐅᐅᔪᓂ ᐁᖅᑭᓯᖅᑕᑦᓂᖅᑎᓂᑦ ᑲᑎᕐᓂᖅᑐᑦ ᑎᑭᓴᖅᑕᐅᔪᑦ. ᖃᐸᓯᐅᓂᖓᓂᑦ ᐅᓗᓚᐃᓇᖅᑐᑦ ᐊᑐᖅᑕᐅᖃᖅᑕᖅᑐᑦ ᐱᖁᐅᔪᑦ, ᐊᑐᖅᑕᐅᔪᑦ, ᐊᖏᓪᓗ ᐱᖁᐅᓯᒪᔪᑦ ᐱᓚᒋᔭᓯᓂᐊᖅᑐᑦ ᐊᐃᓴᑐᖅᑕᐅᖃᖅᑕᑦᓂᖅᑐᑦ ᐱᖁᐅᔪᑦ, ᐊᑐᖅᑕᐅᖃᖅᑕᑦᓂᖅᑐᑦ ᐊᐃᓴᑐᖅᑕᐅᖃᖅᑕᑦᓂᖅᑐᑦ ᐱᖁᐅᔪᑦ, ᐊᑐᖅᑕᐅᔪᑦ, ᐊᖏᓪᓗ ᐱᖁᐅᓯᒪᔪᑦ ᐱᓚᒋᔭᓯᓂᐊ

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- ᓄᑦᑎᓂᔪᑦ ᐅᖅᓱᐊᓗᓐᒥᑦ ᐱᓕᕆᔨᐅᔨᔪᑦ ᖃᐅᔨᒪᔨᑦ ᒪᓕᒃᑕᐅᔨᖏᐅᔨᐅᓂᒃ;
- ᐅᖅᓱᐊᓗᓕᕆᔨᐅᔨᑦ ᑕᐃᒪᐅᖅᑎᑕᖅᑐᑦ ᑕᒪᐃᓐᓂᑦ ᐅᖅᓱᖅᑕᐅᑎᓂᒃ/ᐅᒥᐊᖏᐊᖏᑦᑕ ᐊᑎᒪᓗ ᐅᖅᓱᐊᓗᓱᐸᖃᓐᓂᑦ ᓄᑦᑎᓂᔪᑦ ᐊᐅᑎᓂᑦᑎᐊᖅᑐᑦ ᐊᑎᒪᓗ ᐊᖏᓪᓗᓂᑦ ᐊᑐᖅᑕᐅᓂᒪᓕᑦ; ᐊᑎᒪᓗ
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EXECUTIVE SUMMARY

A hazardous material is one that, as a result of its physical, chemical, or other properties, poses a hazard to human health or the environment when it is improperly handled, used, stored, disposed of, or otherwise managed. In combination with the Risk Management and Emergency Response Plan, and the Spill Contingency Plan, this Hazardous Materials Management Plan (Plan) provides instruction on the prevention, detection, containment, response, and mitigation of accidents that could result from handling hazardous materials.

The Meliadine Gold Project (Project) will require the use of the following types of classified hazardous materials:

- Petroleum Products and Lubricants – diesel fuel, oil, grease, anti-freeze, and solvents used for equipment operation and maintenance;
- Process Plant Consumables – chemicals for mineral extraction;
- Water Treatment Consumable – chemicals;
- Explosives – emulsion, caps, explosives, surfactants, and sodium nitrate used for blasting in the mine;
- Laboratory Wastes – various by-products classified as hazardous waste and chemicals used in the assay laboratory; and
- Other – batteries, paints, compressed gases, materials used and generated at the Health Care Centre, etc.

Agnico Eagle Mines Limited (Agnico Eagle) is committed to the safe and appropriate storage of fuels, hazardous materials, and hazardous wastes. This Plan outlines the guidelines on product supply, transportation, storage, handling, recycling, and waste disposal. Agnico Eagle is committed to ensuring proper life cycle management of all products used at the Project, including hazardous materials.

All hazardous materials will be delivered to site by commercial carriers in accordance with the requirements of the Canadian *Transportation of Dangerous Goods Act* (TDGA). A contract expediting company will arrange all deliveries from the Itivia docking site to the proposed mine site. All required permits, licences, and certificates of compliance will be the responsibility of the carriers. All shipments will be properly identified and labelled. Shipping papers will be accessible and include information describing the substance, immediate health hazards, fire and explosion risks, immediate precautions, fire-fighting information, procedures for handling leaks or spills, first aid measures, and emergency response telephone numbers. Each transportation company will be required to develop a spill prevention, control, and countermeasures plan to address the materials they are transporting.

The Environment & Infrastructure Superintendent will have ultimate responsibility for supervising the receipt, inspection, and recording of all material inventories at site. The Department Managers will reconcile total amounts received against amounts ordered. The quantity of hazardous materials received, used, and in possession of personnel will be recorded by appropriate Departments.

Once hazardous materials are received at the workplace, additional regulations will be applied. The federal *Workplace Hazardous Materials Information System* calls for the proper labelling of products, the availability of product information in the form of Material Safety Data Sheets (MSDS), and employee training on how to identify and handle hazardous products. Agnico Eagle will establish procedures for obtaining MSDS with new product deliveries, maintaining current MSDS (i.e., no older than three years), and ensuring that they are readily accessible to all employees. A chemical tracking system will also be established.

All hazardous materials will be stored in secured areas to prevent tampering, as well as access by unauthorized personnel. In support of pollution prevention, Agnico Eagle will establish procedures for the regular inspection of storage containers and facilities. If deficient conditions are identified, appropriate corrective actions will be taken and documented.

Materials that become waste will be stored and/or disposed of in accordance with specific government regulations and guidelines. The Environment Department monitors the movement of hazardous waste, from the generator to final disposal, through use of a tracking document known as a Waste Manifest. Accordingly, a Waste Manifest will accompany movements of hazardous wastes for the Project.

Hazardous wastes at the Itivia docking site in Rankin Inlet will be managed according to the appropriate regulation(s). More information can be found in the Shipping Management Plan (Agnico Eagle 2018) regarding waste generated on-board ships. The Preliminary Closure and Reclamation Plan provides additional information regarding unused hazardous materials upon completion of Project activities.

Due to transportation restrictions, a full year's supply of diesel fuel will be transported and stored to support the Project's operation. During the summer months, diesel will be shipped from eastern ports to Rankin Inlet, where it will be transferred into storage tanks at the Itivia Oil Handling Facility. Diesel tanks are single-walled, constructed of welded steel, and meet the Canadian Council of Ministers of the Environment guidelines for *Aboveground Storage Tank Systems Containing Petroleum and Allied Petroleum Products*. A continuous liner is installed under the tanks and within the perimeter berm. The containment area is be sized to hold 110% of the volume of the largest tank. From the Agnico Eagle's Itivia Oil Handling Facility, fuel will be transported daily to the proposed mine site via the bypass road and All-weather Access Road.

General procedures will ensure that the handling of fuel during bulk transfer meets the applicable legislation that includes the TDGA. The procedures will include verifying that:

- all fuel transfer hoses are connected properly and couplings are tight;
- transfer hoses are not obviously damaged;
- fuel transfer personnel are familiar with procedures;
- personnel are located at both the fuel delivery truck/ship and fuel transfer tank(s) and can manually shutoff the flow of fuel;
- if a high liquid level shutoff device is installed at the delivery tank, verify that the shutoff is operating correctly each time it is used; and
- fuel transfer proceeds per the established procedures of the contract supplier.

An environmental monitoring plan for fuel storage at the Itivia Oil Handling Facility and at the proposed mine site will include visual and operational inspections, routine surface water sampling to control and monitor the quality of the contact water, and event monitoring (in the case of a spill emergency or occurrence).

Any accident or spill will be reported immediately to the Supervisor or Environment Department. Emergency response procedures for spilled materials are provided in the Spill Contingency Plan, the Risk Management and Emergency Response Plan, and the Oil Pollution Emergency Plan (Agnico Eagle 2018) for the Project. These procedures outline the response to accidental spills or releases of hazardous materials to minimize health risks and environmental effects. Included are procedures for evacuating personnel, maintaining safety, clean-up and neutralization activities, emergency contacts, internal and external notifications to regulatory authorities, and incident documentation.

All staff and contractors at the Project will receive appropriate training to deal with hazardous materials.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	November 2012			First draft of the Hazardous Materials Management Plan	Mélanie Roy, Env. Coord., AEM
2	March 2013	3.1	7	Env. and health hazards control	John Witteman, Env. Consultant, AEM
		3.2	7	Shipping containers	
		3.2	7	Air transportation (none to rare)	
		3.4	8	Details; hazardous waste mgmt. at Rankin Inlet and upon closure	
		9	31	Purchasing controls	
3	April 2014	1.2	2	Reference to TDGR	John Witteman, Env. Consultant, AEM
		3.2	7		
		3.3	8		
		3.4	8		
		3.5	9		
		5.3	13		
		6.6	20	Reference to Nunavut's Environmental Guideline for Contaminated Site Remediation	Stéphane Robert, Env. Manager, AEM
4	April 2015			Update entire plan for Class A Water Licence Application	John Witteman, Env. Consultant, Agnico Eagle
5	March 2018			Annual review	Alexandre Gauthier, Env. Tech. Meliadine

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
AWAR	All-weather Access Road
CCME	Canadian Council of Ministers of the Environment
IBC	Intermediate Bulk Container
ICMC	International Cyanide Management Code
MSDS	Material Safety Data Sheet
Plan	Hazardous Materials Management Plan
PPE	Personal Protective Equipment
SCP	Spill Contingency Plan
TDG	Transportation of Dangerous Goods
TDGA	Canadian *Transportation of Dangerous Goods Act*
TDGR	*Transportation of Dangerous Goods Regulations*
WHMIS	Workplace Hazardous Materials Information System

SECTION 1 • INTRODUCTION

1.1 Purpose and Scope of the Plan

The purpose of the Hazardous Materials Management Plan (Plan) is to provide a consolidated source of information on the safe and environmentally sound transportation, storage, and handling of the major hazardous products that may be used at the Meliadine Gold Project (Project). A hazardous material is one that, as a result of its physical, chemical, or other properties, poses a hazard to human health or the environment when it is improperly handled, used, stored, disposed of, or otherwise managed. It can take many forms, for example, hydrocarbon contaminated soil, snow or water; fuel; lubricants; process reagents; chemical reagents; solvents and paint; medical wastes batteries; etc. In combination with the Risk Management and Emergency Response Plan, Spill Contingency Plan (SCP), and Oil Pollution Emergency Plan (Agnico Eagle 2018), this Plan provides instruction on the prevention, detection, containment, response, and mitigation of accidents that could result from handling hazardous materials.

This Plan is based on the following principles of best practice management for hazardous materials:

- identify and prepare materials and waste inventories;
- characterize potential environmental hazards posed by hazardous materials;
- allocate clear responsibility for managing hazardous materials;
- describe methods for transport, storage, handling, and use;
- identify means of long-term storage and disposal;
- prepare contingency and emergency response plans;
- ensure training for management, workers, and contractors whose responsibilities include handling hazardous materials; and,

All hazardous materials to be used at the Project will be manufactured, delivered, stored, and handled in compliance with all applicable federal and territorial laws and regulations. Agnico Eagle is committed to preventing, to the greatest extent possible, both the inadvertent release of these substances to the environment, and accidents resulting from mishandling or mishap.

As with all other aspects of Agnico Eagle's approach to sustainability at the Project, all employees will be expected to comply with all applicable precautions and handling procedures with regard to hazardous materials. Employees will also be expected to report any concerns to their supervisors, the Occupational Health and Safety Committee, the Environment Department, or senior site management. All staff will be encouraged to bring forward suggestions for improvements to hazardous materials management that can be incorporated into procedure revisions, as appropriate.

1.2 Applicable Legislation

Both federal and territorial legislation regulate the management of hazardous materials in Nunavut. Copies of relevant legal documents will be kept on file at the Project site. Agnico Eagle will regularly update this Plan with respect to applicable legislation, and ensure that current legislation documents will be available at the Project site.

Management and the safety department will provide an overview of the applicable regulations to all employees as part of their initiation and ongoing training.

The *Transportation of Dangerous Goods Act* (TDGA) established classes of dangerous goods as per the schedule in the Act. Hazardous materials are classified into the following nine main classes according to an internationally recognized system:

Class 1 – Explosives

Class 2 – Gases

Class 3 – Flammable liquids

Class 4 – Flammable solids

Class 5 – Oxidizing substances and organic products

Class 6 – Poisonous (toxic) and infectious substances

Class 7 – Nuclear substances, within the meaning of the *Nuclear Safety and Control Act*, which are radioactive

Class 8 – Corrosives

Class 9 – Miscellaneous products or substances

The *Transportation of Dangerous Goods Regulations* (TDGR) also applies to the Project and Agnico Eagle will comply with all applicable requirements.

2.1 Hazardous Materials and Fuel Storage Locations

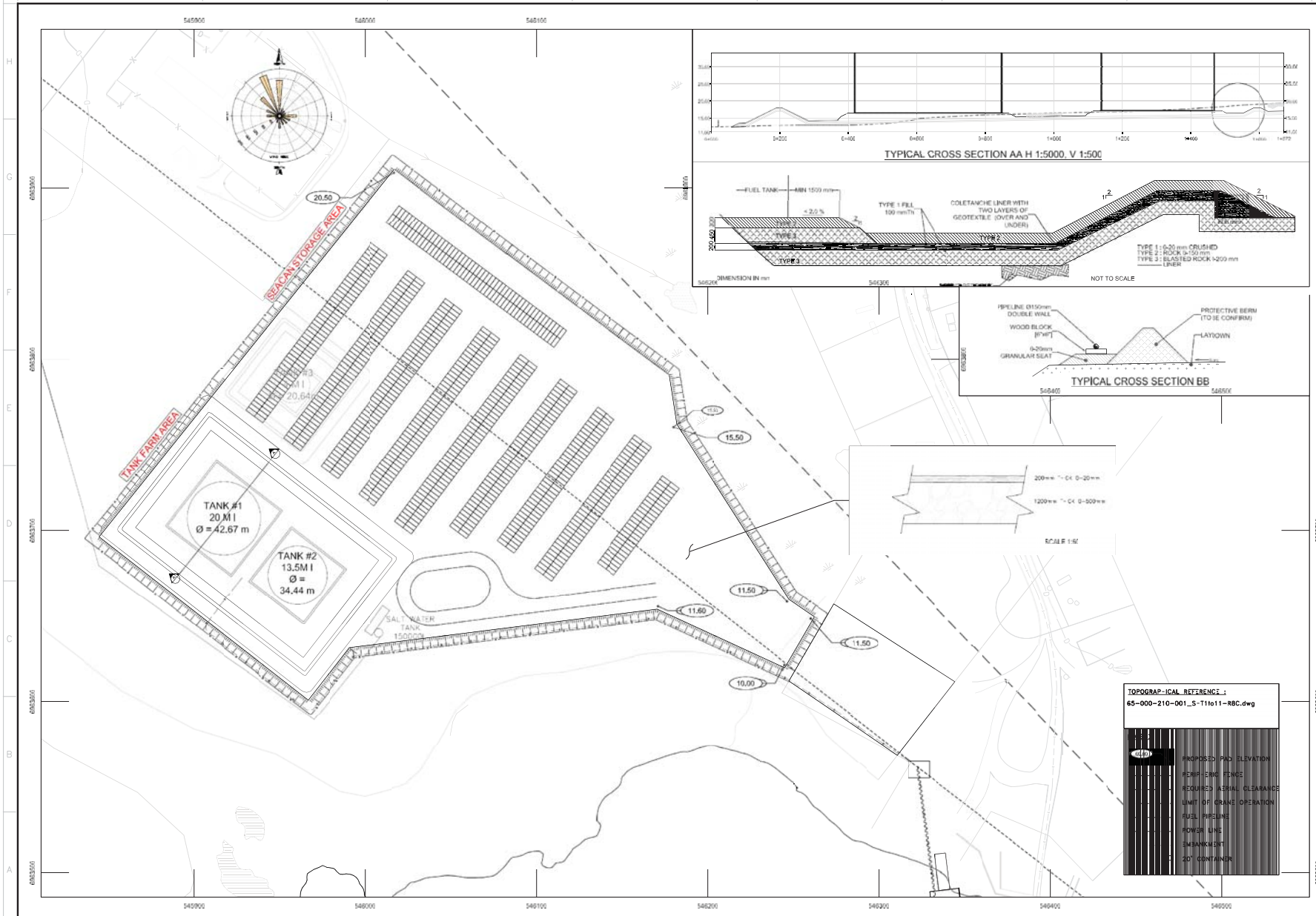
Comprehensive lists of all hazardous materials and the estimated quantities that could be stored for the Project are presented in the following sections. Figures 2-1 and 2-2 identify the fuel storage location at Itivia in Rankin Inlet. Figures 2-3 to 2-4 identify the fuel storage location at the Project.

Petroleum products, explosives, sodium cyanide, and miscellaneous hazardous materials will be stored in facilities that contain no open drains, and in concrete bermed areas or within sea cans. Storage tanks on-site will be regularly inspected and maintained.

The permanent storage areas will be clearly marked and only authorized personnel will be allowed access. These areas will be ventilated to prevent the build-up of toxic fumes or dust, which could harm both the personnel present and the environment.

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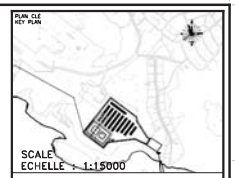
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PROPOSED PAD ELEVATION
PERIP ERIC FENCE
REQUIRED AERIAL CLEARANCE
LIMIT OF CRANE OPERATION
FUEL PIPELINE
POWER LINE
EMBANKMENT
20' CONTAINER

PLAN CLE
KEY PLAN



NOTES GÉNÉRAL / GENERAL NOTES

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG

AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT

REVISIONS

ISSUED FOR PERMITTING
DATE : 2015-03-05

TITRE / TITLE
AGNICO EAGLE–MELIADINE DIVISION
130 – FUEL TANK FARM (RANKIN)
GENERAL EARTHWORK
SITE PLAN
ITIVIA OIL HANDLING FACILITY LOCATION
Figure2-1

DESSINÉ PAR DRAWN BY	JOCELYN CRETE	DATE 2014-10-06
VÉRIFIÉ PAR CHECKED BY	DANY LAFLAMME	2014-10-06
APPROUVÉ PAR APPROVED BY	DANY LAFLAMME	2014-10-08
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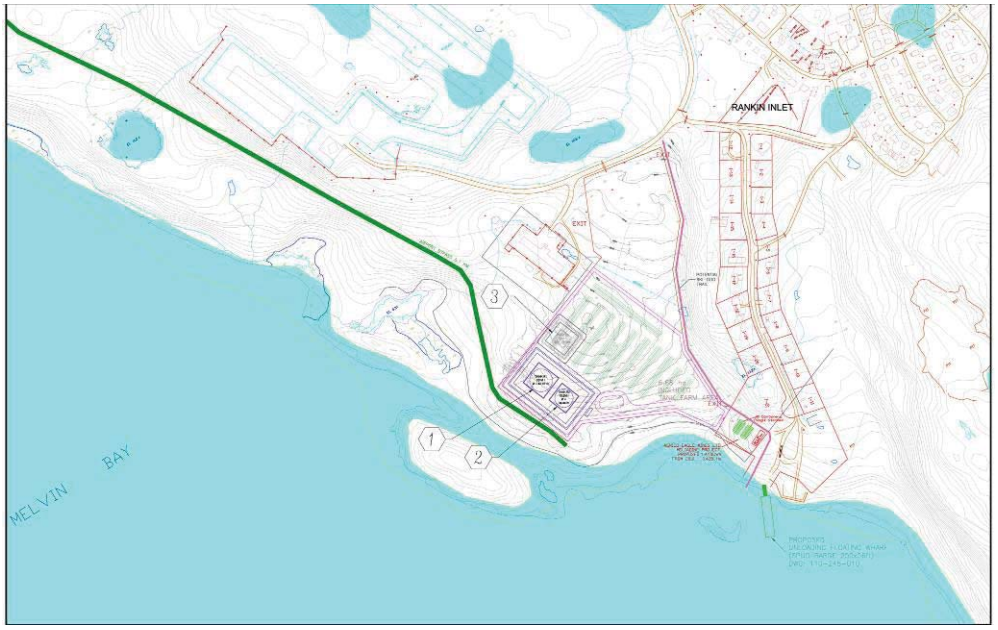


Figure 2-2 Fuel Storage at Itivia Oil Handling Facility

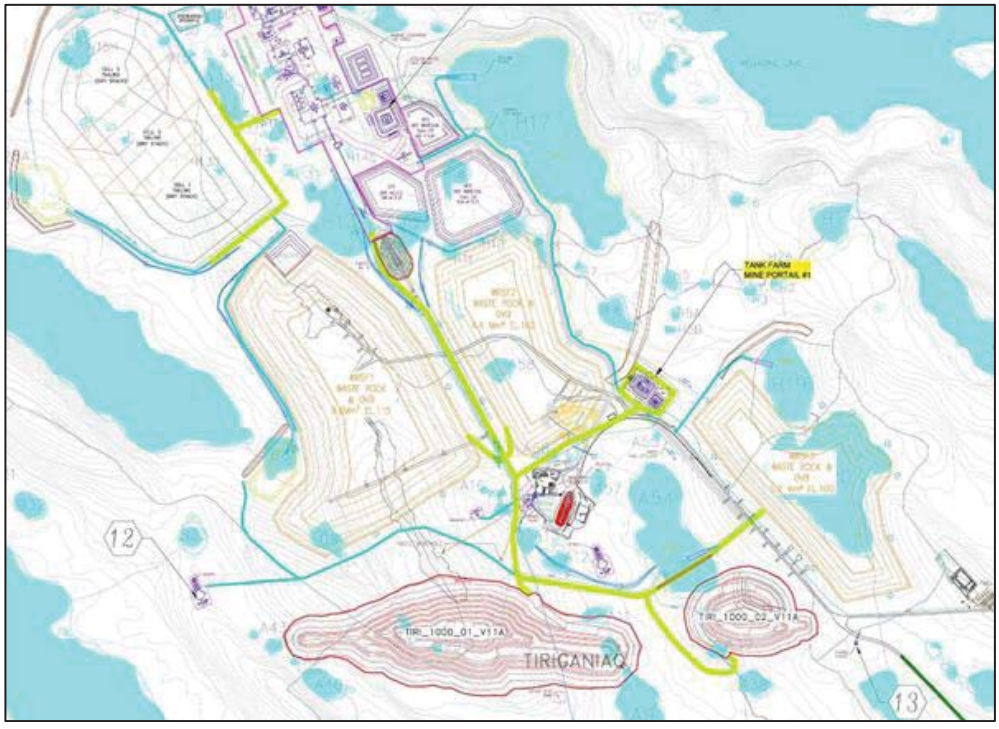


Figure 2-3 Project Fuel Storage Location



Figure 2-4 Fuel Storage at Project

2.2 Types of Hazardous Materials

The Project will require the use of the following types of hazardous materials:

- Petroleum products and lubricants – diesel fuel, oil, grease, anti-freeze, and solvents used for equipment operation and maintenance;
- Process Plant consumables – chemicals for mineral extraction;
- Water treatment consumables – chemicals;
- Explosives – emulsion, caps, explosives, surfactants, and sodium nitrate used for blasting; and
- Laboratory consumable and wastes – various by-products classified as hazardous waste and chemicals used in the assay laboratory.

Sections 5 and 6 contain general information and safe handling procedures regarding petroleum products and chemicals used in the process plant and water treatment. Details concerning explosives are available in the Explosives Management Plan. Laboratory wastes will be very limited in quantity and will only be handled by specialized lab technicians. These wastes will be pumped to the grinding circuit in the process plant for recycle and will eventually become part of the dry stack tailings disposal system. As such, they are not addressed separately in this Plan.

2.3 General Hazardous Materials Storage Guidelines

Agnico Eagle is committed to the safe and appropriate storage of fuels, hazardous materials, and hazardous wastes. The following sections outline Agnico Eagle's general guidelines for storing fuels, hazardous materials, and hazardous wastes. Agnico Eagle will also follow the Government of Nunavut (2010) Environmental Guidelines for the General Management of Hazardous Wastes (Appendix A).

2.3.1 General Guidelines for Storage Drums/Containers

Hazardous materials and wastes shall be stored in quatrex bags, drums, or sea cans according to the following guidelines:

- In the original containers, where possible, or in containers compatible with the material being stored to prevent corrosion or chemical interaction that could lead to leaks or fires.
- Storage containers shall be in good condition, sealable, and not damaged or leaking.
- Drums containing hazardous materials or wastes expected to be in storage for more than six months shall be placed on pallets or other appropriate foundation to prevent corrosion.
- Each container shall be clearly labelled to identify the substance being stored according to the requirements of the Workplace Hazardous Materials Information System (WHMIS) and MSDS (Material Safety Data Sheet).
- Containers shall be kept closed except when adding or removing product.
- Containers with product shall be kept in the upright position. Empty drums can be placed horizontally.

- Containers shall be arranged to prevent damage from falling or dislodging.

2.3.2 General Guidelines for Storage Areas

To assist in the safe and secure storage of fuels, hazardous materials, and hazardous wastes, the following general guidelines for storage areas/facilities will be followed:

- Design of storage areas will be in compliance with the *National Fire Code*, where appropriate.
- Compliance with the Canadian Council of Ministers of the Environment (CCME) publication, *"Environmental Code of Good Practice for Above Ground Storage Tank Systems Containing Petroleum Products"*. This CCME code deals with inventory control, inspections, corrosion protection, records, and monitoring. Environment Canada's *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* outline registration and documentation requirements for storage tanks.
- Storage areas will have controlled access. Only authorized and trained personnel will have access to storage areas.
- Storage areas will be adequately signed indicating that hazardous materials/wastes are stored therein.
- Storage locations will be clearly defined and marked to prevent damage of storage drums and containers in the event they are covered by snow.
- Incompatible materials will be segregated by chemical compatibility within the storage area to prevent contact of incompatible materials in the event of a release.
- Storage areas will be located at least 31 meters from surface waters.
- Storage areas will be readily accessible for firefighting and other emergency procedures.
- Storage areas will be adequately ventilated to prevent the build-up of noxious or toxic vapours.
- Secondary containment will be installed to allow for the containment of at least 110 % of the largest container or tank volume within the contained area.
- Storage areas will be constructed, or provided with barriers, to protect containers from physical damage.
- Adequate spill and emergency response equipment will be installed at each storage area (i.e., spill control, fire protection, etc.). A list of spill control equipment is provided in the SCP.

3.1 Life Cycle Management

"Life cycle management" implies the assessment of a particular product over its entire life, from the time a material need is identified, to the time the product is fully consumed or disposed of as waste. Life cycle management is important to managing and minimizing the potential environmental and health hazards posed by hazardous materials. It covers product supply, transportation, storage, handling, recycling, and waste disposal. Agnico Eagle is committed to ensuring proper life cycle management of all products used at the Project, including hazardous materials. Agnico Eagle and its contractors will deal only with reputable, certified suppliers, transporters, expediters, and hazardous waste recycling and treatment facilities.

3.2 Delivery

All hazardous materials will be delivered to the proposed site by commercial carriers in accordance with the requirements of the Canadian *TDGR, Part 3* and will be properly documented. Air transportation will not be used for the transfer of hazardous materials, with the exception of a rare emergency situation. Carriers will be licensed and inspected as required by Transport Canada. All required permits, licenses, and certificates of compliance will be the responsibility of the carrier.

Purchasing controls will ensure that no excess hazardous materials are purchased beyond that requested by the Project for the upcoming year. The hazardous materials will be shipped in approved containers housed in a sea can. All shipments will be properly identified and labelled. Shipping papers will be accessible and include information describing the substance, immediate health hazards, fire and explosion risks, immediate precautions, fire-fighting information, procedures for handling leaks or spills, first aid measures, and emergency response telephone numbers.

Each transportation company will be required to develop a spill prevention, control, and countermeasures plan to address the materials they are importing. In the event of a release during transport, the commercial transportation company is responsible for first response and clean-up. Agnico Eagle intends to annually verify the qualifications of transport companies, their personnel, and the existence of their spill prevention, control, and countermeasures plan.

Appropriate measures will be in place to minimize impacts to surface water, groundwater, and soil from potential vehicle accidents when transporting hazardous materials to the site. Details on spill response are presented in the SCP. The following general precautions will be taken:

- a maximum speed on the All-weather Access Road (AWAR) for loaded and empty vehicles will be 50 kilometers per hour;
- a maximum speed on the Hamlet Bypass Road will be 30 kilometers per hour;
- all Agnico Eagle and contractor's using the roads are expected to carry spill response equipment;

- trucks will be equipped with a reliable radio; and,
- Agnico Eagle commits to being prepared to respond to spills resulting from vehicle accidents in a timely and efficient manner.

3.3 On-Site Handling

Once hazardous materials are received by Agnico Eagle, additional regulations will be applied: the federal WHMIS calls for the proper labelling of products, the availability of product information in the form of MSDS, and employee education on how to identify and handle hazardous products. Agnico Eagle will establish procedures for obtaining MSDS for new product deliveries, maintaining current MSDS (i.e., no older than three years), and maintaining a system of hardcopy and/or electronic MSDS that is readily accessible by all employees. A chemical tracking system will also be established.

All hazardous materials will be stored in secured areas to prevent access by unauthorized personnel or tampering. All tanks used for the storage of diesel fuel are double walled. There are some exceptions where single walled tanks exist, but all are equipped with secondary containment areas sized to hold at least 110 % of the volume of the largest tank. Tanks and vessels in the process plant will be installed on concrete surfaces sloping to interior sumps that will route spilled solutions to lined collection areas. Additional guidelines for the storage of hazardous materials are provided in Section 2.3.

In support of pollution prevention, Agnico Eagle will establish procedures for the regular inspection of storage containers and facilities. If deficient conditions are identified, appropriate corrective actions will be taken and documented. Additional details for the inspection of storage areas are provided in Section 8.

Emergency response procedures for spilled chemical substances are provided in the SCP, and the Risk Management and Emergency Response Plan. These procedures outline the response to accidental spills or releases of hazardous materials to minimize health risks and environmental effects. Included are procedures for evacuating personnel, maintaining safety, clean-up and neutralization activities, emergency contacts, internal and external notifications to regulatory authorities, and incident documentation.

In the case of accidental release or imminent accidental release, Agnico Eagle will also comply with the reporting requirements listed in Part 8 of the *TDGR*.

3.4 Waste Management

On becoming wastes, materials will be stored and/or disposed of in accordance with specific government regulations and guidelines. This includes hazardous wastes that may be generated at the Rankin Inlet fuel storage, port facility, and laydown area.

Agnico Eagle will store in sea cans most hazardous waste materials at the proposed mine site until they can be transported for recycling or disposal. Likewise, any unused hazardous materials upon completion of Project activities will be inventoried and transported to a licensed waste disposal

facility for recycling or disposal

The Government of Nunavut Department of Environment, Environment Protection Service monitors the movement of hazardous waste, from the generator to final disposal, through use of a tracking document known as a Waste Manifest. Accordingly, a Waste Manifest will accompany movements of hazardous wastes for the Project. Agnico Eagle is registered with the Government of Nunavut Department of Environment, Environment Protection Service as a waste generator, and employs only registered waste carriers to transport waste to registered/approved waste receivers. A copy of the completed manifest will be maintained for a period of two years after the hazardous waste is received by the authorized waste disposal facility.

Process plant tailings will pass through a treatment plant for cyanide destruction using the standard SO_2/air process before being dryed and stacked. The cyanide weak acid dissociable content of the tailings material will be reduced as specified in the International Cyanide Management Code (ICMC). Agnico Eagle will integrate practices to respect the ICMC. The current regulatory requirement for cyanide content in liquids released to the environment is 1 milligrams per litre (mg/L) for a single grab sample as specified in the Metal Mining Effluent Regulations (2012), or no greater than a 0.5 mg/L average for the grab samples in any month.

3.5 Empty Product Containers

Many empty chemical containers are not safe for direct disposal and require handling precautions identical to those for full containers and may be subject to TDGR. Chemical users must be familiar with the safe waste handling and storage procedures described in the MSDS. When prescribed, the containers will be backhauled to the Rankin Inlet laydown area for transport to an approved facility for disposal. These containers will be stored and hauled south via sealift.

SECTION 4 • SODIUM CYANIDE

The Project operation will use sodium cyanide. Due to transportation restrictions, about a full year's supply of sodium cyanide will be transported and stored on-site during the shipping season. This product will be transported, stored, handled, transferred, and used in compliance with appropriate legislation and applying principles and standards of practice as specified in the ICMC.

4.1 Physical Properties

Cyanide is one of only a few chemical reagents that dissolve in water. Gold mining operations use very dilute solutions of sodium cyanide, typically in the range between 0.01 and 0.05 % cyanide (100 ppm and 500 ppm). Unlike many synthetic chemicals, cyanide oxidizes and decomposes when exposed to air or other oxidants, and does not persist in the environment. As such, it does not give rise to chronic health or environmental problems when present in low concentrations.

4.2 Cyanide Production

Cyanide production and handling is highly regulated, and its risk management is well documented. Both the manufacturer and Agnico Eagle will employ stringent risk management systems to prevent injury or environmental damage from the use of cyanide.

4.3 Cyanide Transport

Sodium cyanide for the Project will be shipped in briquette form, and packaged in water-resistant super sac 4 millimeter bags inside an Intermediate Bulk Container (IBC). The IBC will hold 1,000 kilograms of cyanide, and will have the following approximate dimensions: 1.1 m x 1.1 m x 1.1 m. For shipment, there are normally 20 IBCs in a sea can. This method of cyanide transport provides three levels of containment. The cyanide is contained within plastic bags. In the event one of the bags ruptures, the cyanide is contained within the IBC. In the event the IBC container breaks, the cyanide is contained within the sea can, which provides a tertiary precautionary containment measure for minimizing the impact of a potential spill.

Cyanide producers audit purchasers and transportation systems. They design special packaging for the transport of cyanide and inventory all shipments against delivery records to ensure proper surveillance at all times. All shipments will be accompanied by MSDS that provide the chemistry and toxicity of sodium cyanide, instructions in case of accidents, and emergency telephone numbers for assistance.

Truck, rail, and ship transporters screen their employees, carefully inventory packages, and establish and maintain systems for loading and unloading cyanide products. Product handling and transportation will be in accordance with protocols set by the industries and in compliance with national and international regulations.

For the Project, IBCs will be properly stacked in sea cans and transported by ship from eastern ports to Rankin Inlet. At Rankin Inlet, the containers will be transferred from ship to truck for transport to the proposed mine site. At no point during transport will the sea can or IBCs be opened. From the point of cyanide packaging onwards, the bags will only be opened on-site, when use of cyanide is required.

4.4 On-Site Storage and Handling

The cyanide will be stored on-site in a dark, cool, dry, location. It will be stored within sealed sea cans until cyanide is needed for ore processing. The cyanide storage area will be located close to the process plant. Only authorized personnel will have access to the cyanide storage area.

Only the quantity of cyanide required for immediate use will be removed from storage. The cyanide bag will be lifted by its straps (the straps will be provided by the manufacturer as part of packaging) using a forklift. An overhead crane will be used to lower the bag onto a specially designed knife slitter that will cut the bag. The contents of the bag will drop into a mixing tank. At no time will the cyanide have to be physically handled by Project personnel.

The IBCs will be properly decontaminated and disposed of according to all applicable regulations to prevent environmental impact. Before disposal, the bags will be visually inspected to ensure they are empty, and then flushed, triple rinsed, and drained to dissolve any residual cyanide left in the bag. Rinse water from the flushing process will be pumped into the cyanide mixing tank and used in the gold recovery plant.

All personnel potentially exposed to cyanide, including contractors and visitors, will receive appropriate training (refer to Section 9).

4.5 Spills

In the event a spill occurs, the cyanide will be promptly cleaned-up to minimize exposure to humans and the environment. A dry spill will be swept-up and disposed of in a drum or other suitable container. In the event of a wet spill, spill procedures will be carried out to prevent environmental contamination and the appropriate authorities will be contacted. For more information on spills handling and containment, see the SCP and Risk Management and Emergency Response Plan.

After cleaning-up as much cyanide as possible, the area will be decontaminated using a small amount of caustic solution (i.e., 1 ounce per 5 gallon hypochlorite solution). This will help keep the pH in the 10 to 11 range and suppress the formation of potentially lethal hydrogen cyanide gas.

4.6 International Cyanide Management Code

Agnico Eagle is a signatory to the ICMC for the manufacture, transport, and use of cyanide in the production of gold. The ICMC is administered by a non-profit institute consisting of participants from

the gold mining industry, governments, non-governmental organizations, labour, cyanide producers, and other interested parties.

The ICMC represents a voluntary commitment on the part of all signatories to identify and follow basic principles and guidelines for safe cyanide use at gold mining operations. This is the first such generic international code in the history of the mining industry. Under the ICMC, gold mines are required to manage their cyanide from source to site, thus assuming “full life cycle” responsibility for all cyanide used at their operation.

5.1 Product Description

During operations, the Project will use the fuel and lubricants (petroleum products) listed in Table 5-1. These products will be transported, stored, handled, transferred, and used in compliance with appropriate legislation.

Table 5-1 Project Fuel Products, Hazard Classes, and Potential Impacts

Material	TDGA Class	Potential Environmental Impact
Diesel	3	Water and soil contamination
Motor oil	Not regulated	Water and soil contamination
Aviation fuel	3	Water and soil contamination
Hydraulic fluid	Not regulated	Low risk to water and soil with proper handling
Solvent	3	Water and soil contamination
Automotive grease	Not regulated	Low risk to water and soil with proper handling
Ethylene glycol	Not regulated	Toxic by ingestion; could potentially be consumed by wildlife

5.2 Diesel Fuel Storage in Rankin Inlet and at the Project Site

Agnico Eagle's Itivia Oil Handling Facility consist of one 20 million L tank, one 13.5 million L tank, and one 4 million L tank, for a total capacity of up to 37.5 million L's of diesel fuel. Tanker trucks transfer the fuel from Agnico Eagle's Itivia Oil Handling Facility in Rankin Inlet to the tanks located at the proposed mine site. The main storage tanks at the proposed mine site include one 6 and one 3 million L tank. There also will be a number of storage tanks with capacities varying between 1,000 and 250,000 L (Table 5-2). The total diesel fuel storage capacity at the mine site will be in the range of 9.7 million L's.

The large diesel tanks at the mine and at Itivia are single-walled, constructed of welded steel, and designed, constructed, and located to meet the CCME guidelines for *Aboveground Storage Tank Systems Containing Petroleum and Allied Petroleum Products*. A continuous 60 millimeter high-density, polyethylene liner sheet is installed under the diesel tanks and within the sides of the perimeter berm. The containment area is sized to hold 110 % of the volume of the largest tank.

Table 5-2 Fuel Products – Storage Location

Product	Use/Location	Maximum Amount Anticipated	Maximum Amount by Unit
Diesel	**Itivia**		
	1- Itivia Oil Handling Facility	20 ML	20 ML tank
	2- Itivia Oil Handling Facility	13.5 ML	13.5 ML tank
	3- Itivia Oil Handling Facility (Sustaining)	4 ML	4 ML tank
	Industrial site Tank Farm		
	4- Site Main Fuel Tank	6 ML	6 ML tank
	5- Site Fuel Tank summer	250,000 L	250 000 L
	6- Powerhouse	50,000 L	25,000 L/tank
	7- Process Plant	10,000 L	10 000 L/tank
	8- Mechanical shop (Oil)	10,000 L	1,000 L/tank
	Portal #1 Mine Site Tank Farm		
	9- Site Main Fuel Tank	3 ML	3 ML
	10- Site Fuel Tank summer	250,000 L	250,000 L/tank
	11- Site Fuel Tank Measure for UG	2,000 L	2,000 L/tank
	12- Site Fuel Tank UG heating Intake West	25,000 L	25,000 L/tank
	13- Site Fuel Tank UG heating Intake East	25,000 L	25,000 L/tank
	Underground		
	14- UG Fuel Tank UG level 325	50,000 L	10,000 L/tank
	15- UG Fuel Tank (Sustaining)	10,000 L	10,000 L/tank
Motor Oil	Mechanical shop	800,000 L	20,800 L/sea can
	Powerhouse		
Hydraulic Fluid	Mechanical shop		Cubes or Barrels
	Powerhouse		Cubes or Barrels
	Process Plant		Cubes or Barrels
Ethylene glycol	Mechanical shop	60,000 L	10,000 L/sea can

5.3 Fuel Management Plan

The transportation of fuel from Itivia to the mine site and around the mine site will be subject to TDGR, Part 5.

5.3.1 Storage, Delivery to Site, and Safe Handling

With the exception of diesel fuel, most petroleum fuel and lubricant products will be delivered to site and stored in the original packing container from the manufacturer. These types of containers include a variety of sealed drums, pails, 1-ton super sac, bulk cubs, cans, and tubes.

Due to transportation restrictions, a full year's supply of petroleum fuel and lubricants products will be transported and stored at the mine during the shipping season. During the summer months, diesel will be shipped from eastern ports to Rankin Inlet, where it will be transferred into storage tanks at the Itivia Oil Handling Facility. From the Itivia storage tanks, fuel will be transported daily to the proposed mine site via the bypass road and All-weather Access Road. Table 5-2 provides the varieties and volumes of petroleum products that will be stored on-site, and the corresponding storage locations.

Safe handling procedures and personal protective equipment (PPE) regarding fuel products are presented in Table 5-3 and Table 5-4, respectively.

Table 5-3 Fuel Products – Safe Handling Procedures

Product	Handling Procedures
Diesel	Avoid contact with eyes, skin, or clothing. Avoid breathing vapours, mist, fume, or dust. Do not swallow. May be aspirated into lungs. Wear PPE and/or garments if exposure conditions warrant. Wash thoroughly after handling. Launder contaminated clothing before reuse. Use with adequate ventilation. Keep away from heat, sparks, and flames. Store in a well-ventilated area. Store in a closed container. Bond and ground during transfer.
Motor oil	Wear protective clothing and impervious gloves when working with used motor oils. To be handled generally consistent with other petroleum hydrocarbons.
Hydraulic fluid	Keep container closed until ready for use.
Ethylene glycol	Ensure adequate ventilation. Wear protective gloves and chemical safety goggles. Keep in tightly closed container, stored in a cool, dry, ventilated area. Separate from acids and oxidizing materials. Empty containers of this product, retain product residues; may be hazardous.

Table 5-4 Fuel Products – Personal Protective Equipment

Product	Personal Protective Equipment		
	Eyes	Skin	Respiration
Diesel	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required
Motor oil	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required
Hydraulic fluid	Chemical goggles	None usually required	None usually required

Ethylene glycol	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required; ensure adequate ventilation

5.3.2 Fuel Truck Transfer Procedures

A contract supplier will fill the storage tanks in the Itivia Oil Handling Facility as outlined in the Oil Pollution Emergency Plan (Agnico Eagle 2018). General procedures will ensure that the handling of fuel will meet the applicable legislation that includes the *TDGA*. The general procedures to be followed are listed below. Similar procedures would be followed for fueling remote station tanks.

Before fuel transfer, verify that:

- all fuel transfer hoses are connected properly and couplings are tight;
- transfer hoses are not obviously damaged;
- fuel transfer personnel are familiar with procedures;
- personnel are located at both the fuel delivery truck/ship and fuel transfer tank(s), and can communicate with each other and manually shutoff the flow of fuel;
- if a high liquid level shutoff device is installed at the transfer tank, verify that the shutoff is operating correctly each time it is used; and
- fuel transfer proceeds per the established procedures of the contract supplier.

Any accident or spill must be reported immediately to the Supervisor or Environment Department. Notification and response procedures are detailed in the SCP and the Oil Pollution Emergency Plan (Agnico Eagle 2014b).

5.3.3 Fuel Tank Performance Monitoring

The following section outlines the monitoring plan to be prepared and implemented, prior to construction, to evaluate the environmental performance of the bulk fuel storage facilities. The environmental performance monitoring plan is a tiered approach with an emphasis on visual and operational inspections, routine surface water sampling to control and monitor the quality of the contact water, and event monitoring (in the case of a spill emergency or occurrence).

Visual and Operational Inspections

Visual and operational inspections are a central component of performance monitoring.

Visual inspections will be conducted once per week by operations staff. Staff will inspect the facilities for:

- tank and piping condition;
- secondary containment berm structure and integrity;
- indicators of liner damage;
- precipitation and snow accumulation;
- evidence of tampering or misuse;
- any structural abnormalities; and
- visible sheens on contact water pools and crush material inside the secondary containment.

Visual inspections of the secondary containment structure are important because if the integrity of the berm walls or liner is compromised, this presents the greatest risk of leaks or seepage to the environment.

Environmental staff will follow-up with operations staff and conduct periodic visual inspections during routine-mine environmental conformity inspections. As licensed, a weekly written log will be completed and held on file at the Project site to be provided to appropriate authorities upon request.

Routine Contact Water Monitoring

Due to melting snow that accumulates over the winter and precipitation, contact water will unavoidably collect inside the secondary containment berm. During visual inspections, the quantity of contact water collected inside the secondary containment berm will be evaluated. If there is a visible sheen on the contact water or if water withdrawal is deemed necessary, water samples will be collected and analyzed. Accumulated water will only be released to the receiving environment if it meets discharge criteria.

Event Monitoring

The SCP will be followed in the event of a spill occurrence at a bulk fuel storage tank. If deemed necessary, the environmental staff will conduct an environmental assessment as a follow-up to a spill response to evaluate the extent of impacts to the nearby environment. This may include the identification of potential environmental pathways of concern that may result in impacts to surface water, soil, or groundwater.

5.4 Contaminated Material

Contaminated material, for example spill pads, resulting from the storage and handling of fuels and lubricants will be salvaged, put into appropriate containers, and labelled for temporary storage. Depending on the nature of the contamination, material will be either: treated on-site in the landfarm, incinerated, disposed of on-site if appropriate, or shipped off-site to an approved disposal facility.

5.5 Used Petroleum Products

Used oil that is no longer suitable for its intended use is classified as a hazardous waste. The discharge of used oil into the environment, including but not limited to landfills, sewers, and waterbodies, is prohibited.

Agnico Eagle intends to apply for a permit to incinerate used oil in the camp incinerator as per Schedule B of the *Used Oil and Waste Fuel Management Regulations.* Otherwise, all used oil products will be collected in tanks or drums marked “Waste Oil” and sent south annually for recycling and/or disposal at an approved disposal facility. Empty petroleum containers will be stored on-site in a designated area and returned to the supplier on backhauls. Oil filters will be punctured and/or crushed, and drained of their contents for 24 hours prior to disposal.

SECTION 6 • PROCESS PLANT AND WATER TREATMENT REAGENTS AND CONSUMABLES

6.1 Product Description

The process plant will use a number of chemicals and reagents to treat the ore and recover entrained gold. The Water Treatment Plant will also use a number of chemicals and reagents to treat water. Water treatment chemicals would be used over a three to four month period during frost-free months only.

The following tables present specific descriptions for each reagent at the time that the document was drafted, however current MSDS should be referred to prior to use of any reagent:

- Table 6-1 and Table 6-2 present the average annual consumption of reagents during the operation and in which format they will be delivered;
- Table 6-3 presents hazard classes and potential environmental impacts for each reagent;
- Table 6-4 presents handling procedures for each reagent; and
- Table 6-5 presents the Personal Protective Equipment for each reagent.

Table 6-1 Process Plant Reagents – Use and Consumption for Processing

Product	Use/Location	Maximum Amount Anticipated On-Site	Maximum Amount by Unit
Activated carbon	Carbon-In-Leach	76 t	500 kg/bag (10 t/sea can)
Anti-scaling agent	Mill	5.5 t	
Borax	Refinery	17 t	3,375 kg/sea can
Hydrochloric acid	Elution-Regeneration	652 t	
Copper sulfate	Cyanide Destruction	345 t	2,500 kg/bag (20 t/sea can)
Sodium cyanide	Carbon-In-Leach	1,414 t	1,000 kg/bag (19 t/sea can)
Flocculent	Grinding	46 t	750 kg/bag (15 t/sea can)
Lead nitrate	Carbon-In-Leach	-	
Lime	Carbon-In-Leach	1734 t	1,743 kg/bag
Silica	Refinery	17 t	
Sodium hydroxide	Elution-Regeneration	133 t	1,000 kg/bag
Sodium metabisulfite	Cyanide Destruction	1,758 t	1,000 kg/bag
Sodium nitrate	Refinery	17 t	5.1 t/sea can
Sulfur prills	Cyanide Destruction	0 t	1,000 kg/bag (20 t/sea can)

Table 6-2 Water Treatment Reagents and Others – Use and Consumption

Product	Use/Location	Maximum Amount Anticipated on-site	Maximum Amount by Unit
Ferric sulfate	Water Treatment Plant	260 t	1t/bag
Lime	Water Treatment Plant	320 t	1,743 kg/bag
Flocculent	Water Treatment Plant	5 bags	750 kg/bag (15 t/sea can)
Acetylene	Welding	830 bottles	11 m^3 / bottle
Paints	Maintenance	180 gal.	1 gal./pail
Solvents	Maintenance	56 gal.	1 gal./pail
Lead acid batteries (12V)	Maintenance	386	

Table 6-3 Process Plant, Water Treatment Reagents, and Others – Hazard Classes and Potential Environmental Impacts

Material	Class	Potential Impact
Acetylene	2.1	Generally not hazardous for water
Activated carbon	4.2	No information available
Anti-scaling agent	Not classified	Negligible with proper handling
Borax	Not classified	Presents no health hazards
Copper sulfate	9	Harmful to aquatic life
Sodium cyanide	6.1	Expected to be very toxic to aquatic life and to terrestrial life
Flocculent	Not classified	Acute fish, invertebrate, algae and bacteria toxicity
Ferric sulfate	8	Ecological impact has not been determined
Hydrochloric acid	8	Extremely toxic to aquatic life by lowering the pH below 5.5. When released into the soil, this material may leach into permafrost
Lead nitrate	5.1	Very toxic to aquatic organisms, may cause long-term effects in the aquatic environment
Lead acid batteries	8	Limited information available. Negligible with proper handling
Lime	8	This material is alkaline and if released into water or moist soil will cause an increase in pH
Paints	Not classified	Limited information available. Negligible with proper handling
Solvents	Not classified	Harmful to aquatic life with long lasting effect
Silica	Not classified	Generally not hazardous for water
Sodium hydroxide	8	Ecological impact has not been determined
Sodium metabisulfite	Not classified	Ecological impact has been determined
Sodium nitrate	5.1	Possibly hazardous; short-term degradation products are not likely. However, long-term degradation products may arise. The products of degradation are less toxic than the product itself
Sulfur prills	9	No information available (insoluble in water)

Table 6-4 Process Plant and Water Treatment Reagents – Safe Handling Procedures

Product	Handling Procedures
Acetylene	Do not mix with air or oxygen above atmospheric pressure. Store away from oxidizing agents. Open and handle cylinder with care. Keep ignition sources away - Do not smoke. Protect from heat. Protect against electrostatic charges. Pressurized container: protect from sunlight, store in a cool location and do not expose to temperatures exceeding 50°C. Do not pierce or burn, even after use. Prevent impact and friction. Store in accordance with local fire code and/or building code or any pertaining regulations.
Activated carbon	Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation. Activated carbon, especially when wet, can deplete oxygen from air in enclosed spaces, and dangerously low levels of oxygen may result. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.
Anti-scaling agent	Used in extremely small quantities. Can cause mild to moderate irritation of eyes, skin, and upper respiratory tract. Wash thoroughly after handling. Use sensible industrial hygiene and housekeeping products. Not flammable. Keep containers tightly closed
Borax	No special steps required.
Copper sulfate	Avoid contact with skin and eyes. DO NOT breathe dust. Always wash hands thoroughly after contact. Store and use only in dry, well-ventilated areas. Keep container tightly closed.
Flocculent	Dust generated in handling of this product can be explosive if sufficient quantities are mixed in air, in which case ignition sources should be avoided. Employ grounding, venting and explosion relief provisions in accordance with accepted engineering practices in process operations capable of generating dust/or static electricity. Handle in accordance with good industrial practice, handle with care and avoid unnecessary personal contact. Avoid contact with eyes and prolonged or repeated skin contact. Avoid continuous or repetitive breathing of dust. Use only with adequate ventilation. Remove contaminated clothing; launder or dry-clean before reuse. Wash thoroughly with soap and water after using. For industrial use only. Material is slippery when wet. Store in the original container, securely closed, in a cool and dry location. Avoid extremes of temperature and ignition sources.
Ferric sulfate	Store and handle in corrosion-proof materials (and area). Use FRP or PVC pipes. Be cautious of substance residue in empty containers. Act according to precautions and warnings set forth.
Lead nitrate	Keep away from heat. Keep away from sources of ignition. Keep away from combustible material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as combustible materials and organic materials.

Table 6-4 Process Plant and Water Treatment Reagents – Safe Handling Procedures (continued)

Product	Handling Procedures
Lead acid (batteries)	Keep containers tightly closed when not in use. If battery case is broken, avoid contact with internal components. Do not handle near heat, sparks, or open flames. Protect containers from physical damage to avoid leaks and spills. Place cardboard between layers of stacked batteries to avoid damage and short circuits. Do not allow conductive material to touch the battery terminals. A dangerous short-circuit may occur and cause battery failure and fire. Keep away from combustible materials, organic chemicals, reducing substances, metals, strong oxidizers and water.
Lime	Avoid contact with skin and eyes. Do not breathe dust. Wear suitable protective clothing, gloves and eye/face protection. In case of insufficient ventilation, wear suitable respiratory equipment. Hydrated lime should be stored in a cool protected place away from moisture, strong oxidants or acids and to minimize dust emissions. Storage in steel or concrete bins and silos, or plastic lined bags, is appropriate. An alkaline material that reacts vigorously with acids, generating some heat. May absorb carbon dioxide from the atmosphere, forming calcium carbonate. Soluble in glycerol, aqueous solution of sucrose, and ammonium chloride. Incompatible with maleic anhydride, nitroparaffins, and phosphorus.
Hydrochloric acid	Do not get in eyes, on skin, or on clothing. Wear protective clothing. Avoid breathing vapours or fumes. Store in cool, dry, ventilated area with acid-resistant floors. Keep container closed, out of direct sunlight, and away from heat, water, and incompatible materials. When diluting, add acid slowly to water and in small amounts. Never use hot water and never add water to acid. When opening metal drum, use non-sparking tools because hydrogen gas may be present. Do not wash out container and use for other purposes. Empty containers retain product residues and may be hazardous.
Paints	No special steps required.
Solvents	Use only with adequate ventilation. Wash thoroughly after handling. Observe good industrial hygiene practices. Keep container tightly closed and in a well-ventilated place. Store in closed original container at room temperature. Store away from incompatible materials.
Silica	Prevent formation of dust. This product is not flammable. When pouring into a container of flammable liquid, ground both containers electrically to prevent static electric spark. Keep containers tightly sealed.
Sodium cyanide	Highly toxic, corrosive to eyes, skin, and respiratory tract. Can be fatal if swallowed, inhaled, or absorbed through skin. Keep cyanide antidote kit available in any cyanide work area. Wear personal protective clothing at all times. Keep in tightly closed container in cool, dry, ventilated area. Protect against physical damage to containers. Do not store under sprinkler systems. Do not wash out container and use for other purposes. Empty containers retain product residues and may be hazardous.
Sodium hydroxide (caustic soda)	Can cause severe injury to eyes, skin, and respiratory tract. Use PPE at all times and DO NOT contact product directly. Wash thoroughly after handling. Store in dry, well-ventilated area. Keep in original container, tightly closed. Empty containers retain product residues and may be hazardous.

Table 6-4 Process Plant and Water Treatment Reagents – Safe Handling Procedures (continued)

Product	Handling Procedures
Sodium metabisulfite	May cause irritation to eyes, skin, and respiratory tract with prolonged exposure. Sulfite-sensitive individuals may experience severe allergic reaction to dust. Releases sulfur dioxide gas when mixed with water. Wear PPE and wash thoroughly after handling. Store in dry, well-ventilated area away from heat, acids, and oxidizers. Keep container tightly closed. Use vacuum to clean up dust.
Sodium nitrate	Keep away from heat. Keep away from sources of ignition. Keep away from combustible materials. Empty containers pose a fire risk; evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, and acids. Keep container dry. Keep in a cool place. Keep container tightly closed. Keep in a cool and well-ventilated area. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.
Sulfur prills	Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. May form flammable dust-air mixtures. Avoid contact with skin, eyes and clothing. Empty containers contain product residue (liquid and/or vapour), and can be dangerous. Keep containers tightly closed. Avoid contact with heat, sparks, and flame. Use with adequate ventilation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat spark, or open flames. Store away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances (oxidizing agents).

Table 6-5 Process Plant, Water Treatment Reagents, and Others – Personal Protective Equipment

Product	Personal Protective Equipment		
	Eyes	Skin	Respiration
Acetylene	Tightly sealed goggles	Protective gloves	Use atmosphere-supplying respirators (e.g. supplied-air: demand, pressure-demand, or continuous-flow or self-contained breathing apparatus: demand or pressure-demand or combination supplied-air with auxiliary self-contained air supply atmosphere-supplying respirator in case of insufficient ventilation)
Activated carbon	None required	None required	None required
Anti-scaling agent	For splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	Not normally needed
Borax	Avoid eye contact	None required	None required
Copper sulfate	Chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	Dust mask; NIOSH/MSHA approved respirator, if required
Flocculent	For splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	Dust mask
Ferric sulfate	Splash goggles	Lab coat; gloves	Dust respirator. Be sure to use an approved/certified respirator or equivalent
Lead nitrate	Splash goggles	Lab coat; gloves	Dust respirator. Be sure to use an approved/certified respirator or equivalent
Lead acid (batteries)	Wear protective glasses with side shields or goggles.	Wear chemical resistant gloves as a standard procedure to prevent skin contact	Not required for normal conditions of use.
Lime	Safety goggles	Wear impervious gloves, shoes and protective clothing to prevent skin contact	NIOSH/MSHA approved respirator, if required

Table 6-5 Process Plant, Water Treatment Reagents, and Others – Personal Protective Equipment

Product	Personal Protective Equipment		
	Eyes	**Skin**	**Respiration**
Hydrochloric acid	For splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	NIOSH/MSHA approved respirator
Paints	None required	None required	None required
Solvents	Use approved safety goggles or face shield	Wear appropriate chemical resistant clothing to prevent any possibility of skin contact	In case of inadequate ventilation, use respiratory protection
Silica	Safety goggles	Wear impervious gloves, shoes and protective clothing to prevent skin contact	NIOSH/MSHA approved respirator, if required
Sodium cyanide	For dust and splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious lab coat, apron, or coveralls and boots	NIOSH/MSHA approved respirator, if required
Sodium hydroxide (caustic soda)	Tight-fitting goggles if dust is generated. For splash protection use chemical goggles or full face shield	Gauntlet type rubber or neoprene gloves; impervious apron or coveralls and boots	NIOSH/MSHA approved respirator
Sodium metabisulfite	Chemical safety goggles	Cotton gloves adequate for handling dry product. For solutions, use rubber or neoprene gloves; impervious apron or overalls and boots	NIOSH/MSHA approved respirator
Sodium nitrate	Contact lenses should not be worn; they may contribute to severe eye injury	Impervious gloves of chemically resistant material (rubber or PVC), body suits, aprons, and/or coveralls of chemical resistant material and impervious boots of chemically resistant material should be worn at all times	For dusty or misty conditions, wear NIOSH-approved dust or mist respirator. In case of spill or leak resulting in unknown concentration, use NIOSH approved supplied air respirator
Sulfur prills	Chemical safety goggles	Wear impervious gloves, shoes and protective clothing to prevent skin contact	NIOSH/MSHA approved respirator, if required

SECTION 7 • MISCELLANEOUS HAZARDOUS/TOXIC MATERIALS

7.1 Product Description

Acids such as nitric acid, as well as emulsifiers and ammonium nitrate, will be used at the proposed mine site. Gases such as propane, oxygen, and acetylene, solvents, water/effluent treatment chemicals, and various additives will also be utilized.

The release or spillage of any of these substances would possibly result in environmental impacts and pose a potentially hazardous situation for those personnel exposed to these materials. It is essential that materials deemed to be potentially hazardous be dealt with in a cautious manner and in strict adherence to recommended regulations outlined in the legislation, whether the substance is provided in large or small quantities. This will prevent serious repercussions should an accidental release of material happen.

7.2 Storage Facilities of Hazardous/Toxic Chemicals

All explosive related chemicals will be stored as discussed in the Explosives Management Plan. All other chemicals and gases will be stored in appropriate locations.

These storage facilities ensure that chemicals that could interact and cause a serious incident will be kept segregated.

SECTION 8 • INVENTORY, INSPECTION, AND RECORDS

A contract expediting company will arrange all deliveries from the Itivia docking site to the proposed mine site. This will include the hazardous materials discussed in this Plan. The Environment & Infrastructure Superintendent will have ultimate responsibility for supervising the receipt, inspection, and recording of all material inventories at site. The Division Managers will reconcile total amounts received against amounts ordered. Purchasing controls will ensure that no excess hazardous materials are purchased beyond that requested by the Project for the coming year.

8.1 Petroleum Products

8.1.1 Inventory Management

Diesel fuel use will be automatically metered when it is pumped from the bulk tanks. The metered volumes will be summarized weekly and reconciled against tank levels determined manually with a dipstick from the top of the tanks. Diesel fuel consumption for the power generators will be recorded weekly.

8.1.2 Inspection

The Environment Department will perform regularly scheduled inspections of all fuel and lubricant storage areas. The inspection schedule and procedure to be followed are summarized in Table 8-1. All inspections will be logged with the date and time of inspection, facility inspected, and name of the person completing the inspection.

Table 8-1 Inspection of Petroleum Storage Sites

Site	Inspection
Fuel Tanks	*Schedule* – Weekly by Site Services Fuel Operator; weekly by Environment Technician; quarterly by Environment Coordinator. *Procedure* – Locate leak(s) and report promptly. Inspections will be reported annually and filed with the General Mine Manager or Site Services Superintendent and Environment Superintendent.
Diesel Power Generating Plant	*Schedule* – Daily by powerhouse operator; weekly by Environment Technician as part of regular internal environmental inspections. *Procedure* – Inspections will be reported annually and filed as above.
Other Fueling Stations	*Schedule* – Daily by Site Services Supervisor; weekly by Environment Technician as part of regular internal environmental inspections. *Procedure* – Inspections will be reported annually and filed as above.
Spill Kits	*Schedule* – Monthly by Environment Technician; quarterly by Environment Coordinator. *Procedure* – Inspections will be reported annually and filed as above.
Other Hazardous Material Storage Areas	*Schedule* – Weekly by Environment Technician when materials are on-site. *Procedure* – Inspections will be reported annually and filed as above.

The condition of hazardous materials storage areas, containers, tanks, connectors, and associated plumbing will be checked on a regular basis. Observations on their condition will be logged, dated, and kept near the corresponding storage area. Drums/containers will be inspected for the following:

- the presence and legibility of symbols, words, or other marks identifying the contents;
- signs of deterioration or damage such as corrosion, rust, leaks at seams; or,
- signs that the drum/container is under pressure such as bulging and swelling, spillage, or discoloration on the top or sides.

If a leak or deterioration is encountered, it will be noted and addressed in a timely manner.

The hazardous materials area's secondary containment will be inspected and the condition of the secondary containment will be noted. Arrangements will be made for repairs if necessary.

Any accidental damage to containment structures will be inspected immediately and appropriate repairs undertaken. The extent of damage will be reported in writing to the General Mine Manager and Environment Superintendent. The report will note any remedial repairs that have/may be made, the date of any repairs, and the need for any follow-up inspection.

8.1.3 Records

Records pertaining to storage, use, and loss of fuels and lubricants are required by CCME and the Fire Marshal (under the *National Fire Code).* The following records will be prepared by the Procurement and Logistics and Environment & Infrastructure Departments:

- reconciliation of bulk inventory from resupply logs;
- weekly use summaries;
- weekly reconciliation for each storage tank;
- overfill alarm tests;
- pressure tests (if applicable);
- inspections and maintenance checks of the storage tank, piping, and delivery systems;
- any alteration to the systems;
- reports of leaks or losses;
- reports of spill responses; and
- records of training.

8.2 Miscellaneous Hazardous/Toxic Materials

8.2.1 Inventory Management

Quantities of all hazardous chemicals will be reconciled against orders on receipt. The appropriate department responsible for the miscellaneous chemicals will be responsible for reconciling the resupply inventory.

8.2.2 Inspection

During operations, the appropriate department responsible for storage and handling of the miscellaneous chemicals will regularly inspect all areas where such hazardous materials are used and stored. Any problems will be noted and reported to the Department Manager. The Department Manager will be responsible for weekly or monthly inspections of miscellaneous hazardous materials and storage areas.

8.2.3 Records

The quantity of hazardous materials received, used, and in possession of personnel will be recorded by appropriate departments. The departments will comply with the environmental regulations.

SECTION 9 • TRAINING

9.1 General

All staff and contractors at the Project will receive the following training:

- WHMIS;
- emergency and spill response (see also the SCP and Risk Management and Emergency Response Plan);
- operations overview; and
- Mine Standard Operating Procedures.

Mine employees will receive additional training in mine safety as specified by the *Mine Health and Safety Act* and regulations. Agnico Eagle will ensure compliance with the training requirements specified in the Act and regulations.

Plant employees will receive additional training specific to their area of work and duties, including safe operating practices, safe handling and storage of chemicals, and use of PPE. Other training will include cyanide and chemical awareness, specific chemical training for specific tasks, and mill induction training. This training will be the responsibility of Agnico Eagle.

A record of training received will be maintained for each employee and contractors.

9.2 Petroleum Products Handlers

Personnel who handle petroleum products will be expected to be conversant with relevant MSDS information. As well, these personnel will be given training in the following:

- Transportation of Dangerous Goods (TDG);
- Agnico Eagle's fuel handling procedures (outlined in Section 5);
- spill response and clean-up procedures for petroleum (see the SCP); and
- emergency response, especially firefighting procedures (see the Risk Management and Emergency Response Plan).

9.3 Plant Employees

Plant operators may receive TDG training, if appropriate. All plant employees will be trained in spill and emergency response procedures. Emergency response procedures for spilled chemical substances are provided in the SCP.

9.4 Third Party Contractors

It is expected that third party contractors receive adequate and comprehensive training to conduct their work tasks from their employer. Agnico Eagle intends to review the general qualifications of third party contractors prior to having them work at the site. In addition, the contractor companies

may also be requested to confirm the qualifications of specific individuals they have working at the site.

Third party contractors working on-site will be required to participate in, and complete, a site specific health and safety training session. The training session will be valid for a period of three years, after which time the contractor will be required to complete the training again, or attend a refresher session. The training session will outline site specific hazardous and response procedures of which they need to be aware in the course of conducting work on-site. The training session will cover hazardous materials management.

SECTION 10 • PLAN EVALUATION, AUDIT AND IMPROVEMENT

As part of Agnico Eagle's commitment to attain certification under the ICMC, every three years Agnico Eagle will sponsor audits by Institute-approved, third-party professionals to verify its compliance with the Code's principles and standards of practice with regard to cyanide handling.

The Plan will be reviewed annually and updated if there are changes in operations and/or technology.

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APPENDIX A • ENVIRONMENTAL GUIDELINE FOR THE GENERAL MANAGEMENT OF HAZARDOUS WASTE

Environmental Guideline for the

General Management of Hazardous Waste







Department of Environment
Government of Nunavut

GUIDELINE: GENERAL MANAGEMENT OF HAZARDOUS WASTE

Original: April 1999
Revised: January 2002
April 2010
October 2010

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks and hazards associated with hazardous waste and to assist in its proper management. This Guideline does not replace the need for the owner or person in charge, management or control of a hazardous waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of hazardous waste.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

Cover Photos: E. Paquin

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Introduction

'Waste' is a term used to describe materials that are no longer wanted or are unusable for their original intended purpose. Many different types of waste are generated each day in Nunavut by industry and small business, hospitals and health centers, schools and individuals during the normal course of carrying out daily activities. Some types of waste pose greater risks than others because of their chemical, physical and biological properties. These wastes are generally referred to as being a 'hazardous waste'. Examples of hazardous waste include discarded paint, used solvents, motor and lubricating oil, cleaning compounds, certain building construction and demolition waste and products with an expired shelf life. They will generally exhibit one or more of the following characteristics - ignitable (i.e. flammable), reactive, corrosive or toxic. Hazardous waste often requires that specific management measures be taken to ensure the health and safety of the environment, workers and the general public.

The purpose of the Environmental Guideline for the General Management of Hazardous Waste (the Guideline) is to ensure the safe, effective and efficient management of hazardous waste in Nunavut. It provides information to generators, carriers and receivers of hazardous waste on its hazards, how best to reduce or eliminate the effects it can have on the environment, worker and public safety and guidance on its storage, registration and transportation.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures that preserve, protect and enhance the quality of the environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

The Guideline is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of a hazardous waste is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in hazardous waste management.

1.1 Definitions

Carrier	A person who accepts hazardous waste for transportation or transports hazardous waste, whether or not for hire or reward. A carrier is also referred to as a transporter of hazardous waste.
Commercial	Actions undertaken for hire or reward.
Commissioner's Land	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
Consignee	A person to whom hazardous waste is being or is intended to be transported. A consignee is also referred to as a receiver of hazardous waste.

Consignor	A person who has possession of hazardous waste immediately before it is transported. A consignor may also be a generator of hazardous waste.
Contaminant	Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or (d) causes or is likely to cause damage to plant life or to property.
Dangerous Good	Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* in any of the classes listed in the Schedule provided in the *Transportation of Dangerous Goods Act* (Canada).
Empty Container	A container that previously held a hazardous waste and has been emptied to the greatest extent practical or triple rinsed with an appropriate cleaning agent. This does not include containers that previously contained mercury or Class 2.3, 5.1 or 6.1 materials.
Environment	Means the components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Generator	The owner or person in charge, management or control of a hazardous waste at the time it is generated or a facility that generates a hazardous waste. A generator may also be a consignor of hazardous waste.
Hazardous Waste	A contaminant that is a dangerous good and is no longer wanted or is unusable for its original intended purpose and is intended for storage, recycling, treatment or disposal. A hazardous waste does not include a contaminant that is (a) household in origin; (b) exempted as a small quantity; (c) returned directly to a manufacturer or supplier of the product, substance or organism for reprocessing, repackaging or resale for any reason; (d) an empty container; or (e) intended for disposal in a landfill or a sewage treatment facility and meets the applicable standards set out in the Environmental Guideline for Industrial Waste Discharges.

Hazardous Waste Management Facility	A commercial facility used for the collection, storage, transfer, treatment, recycling or disposal of a hazardous waste. For clarity, a hazardous waste management facility does not include a municipal landfill or sewage lagoon.
Incompatible Hazardous Waste	A hazardous waste that, when in contact with another substance or hazardous waste under normal circumstances, reacts to produce heat, gas, fire, explosion or a corrosive or toxic substance.
Landfilling	The intentional depositing or placement of waste in or on land for the purposes of disposal.
Long-term Storage	The storage of hazardous waste for a period of 180 days or more.
Manifest	The manifest as set out in Schedule IX to the *Export and Import of Hazardous Waste and Hazardous Recyclables Regulations* under the *Canadian Environmental Protection Act* (Canada).
Minister	The Minister of Environment of the Government of Nunavut.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of hazardous waste management.
Receiver	A person to whom hazardous waste is being or is intended to be transported. A receiver is also referred to as a consignee of hazardous waste.
Responsible Party	The owner or person in charge, management or control of the hazardous waste.
Small Quantity	Hazardous waste that is generated in an amount that is less than five kilograms per month if a solid or less than five litres per month if a liquid, and where the total quantity accumulated at any one time does not exceed five kilograms or five litres. This does not include hazardous waste that is mercury or Class 2.3, 5.1 or 6.1 materials. These wastes must be generated in an amount that is less than one kilogram per month if a solid or less than one litre per month if a liquid, and where the total quantity accumulated at any one time does not exceed one kilogram or one litre.
Transport Authority	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations; Interprovincial Movement of Hazardous Waste Regulations* (CEPA) and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (CEPA). (b) Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and

	(c) Marine – *International Maritime Dangerous Goods Code* (IMDG).
Transfer	The temporary storage of hazardous waste for a period of 179 days or less for the purpose of changing from one vehicle or means of transportation to another.
Transporter	A person who accepts hazardous waste for transportation or transports hazardous waste, whether or not for hire or reward. A transporter is also referred to as a carrier of hazardous waste.
Waste Audit	An inventory or study of the amount and type of waste that is produced at a location.

1.2 Roles and Responsibilities

1.2.1 Environmental Protection Division

The Environmental Protection Division of the Department of Environment is the key environmental agency responsible for ensuring the proper management of hazardous waste and other contaminants on Commissioner's Land. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at http://env.gov.nu.ca/programareas/environmentprotection.

The Department of Environment will provide advice and guidance on the proper management of hazardous waste. However, it remains the responsibility of the owner or person in charge, management or control of the hazardous waste to ensure compliance with all applicable statutes, regulations, standards, guidelines and local by-laws.

1.2.2 Generators of Hazardous Waste

The generator is the owner or person in charge, management or control of the hazardous waste at the time it is produced or of the facility that produces the hazardous waste. The generator is responsible for any and all hazardous waste produced and must ensure the hazardous waste is properly and safely managed from the time it is generated to its final disposal. This is referred to as managing the waste from cradle-to-grave.

Contractors may manage hazardous waste on behalf of the generator. However, the generator remains responsible for determining whether the waste is hazardous and ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the generator may also be held liable.

The basic responsibilities of a hazardous waste generator in Nunavut are:

- Registering with the Department of Environment as a generator of hazardous waste. Registering
- the facility with the Department of Environment as a hazardous waste management facility where the facility is used for commercial purposes and is intended for the storage of hazardous waste for a period of 180 days or more, where stored quantities exceed the criteria set out in Appendix 8 or where hazardous waste is recycled, treated or disposed of in quantities in any single month that exceed a 'small quantity'.
- Classifying and labeling hazardous waste in accordance with the Transport Authority.
- Managing the hazardous waste in accordance with the Guideline, *Environmental Protection Act, Fire Prevention Act*, *Safety Act, Public Health Act* and all other applicable statutes, regulations, standards, guidelines and local by-laws.
- Reusing, recycling, treating or disposing of the hazardous waste in a proper and safe manner.
- Where the hazardous waste is transported off-site, completing Part A of the waste manifest form and retaining a copy for two years, using a registered hazardous waste carrier to transport the waste and sending the waste to a registered receiver or hazardous waste management facility.
- Ensuring staff are trained and qualified to safely handle the hazardous waste.
- Filing a spill contingency plan with the Minister where stored quantities of hazardous waste exceed the criteria set out in Schedule A of the *Spill Contingency Planning and Reporting Regulations*.
- Reporting any spill immediately to the NWT/Nunavut Spill Report Line at (867) 920-8130.

Further information and application forms for registering as a generator or a hazardous waste management facility are available from the Department of Environment. Refer to sections 3.2.1 and 3.2.2 and Appendices 4 and 7 for further information.

1.2.3 Carriers of Hazardous Waste

Hazardous waste must be transported in accordance with the appropriate Transport Authority: Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations, Interprovincial Movement of Hazardous Waste Regulations* (CEPA) and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (CEPA); Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and Marine – *International Maritime Dangerous Goods Code* (IMDG).

Carriers operating in Nunavut must be registered with the Department of Environment before transporting hazardous waste. Other basic responsibilities of hazardous waste carriers are:

- Placarding and labeling all transport vehicles and containers in accordance with the appropriate Transport Authority.
- Completing Part B of the waste manifest form and retaining a copy for two years.
- Accepting hazardous waste only from registered generators and safely transporting hazardous waste only to a registered receiver or hazardous waste management facility.
- Ensuring staff are trained and qualified to safely transport hazardous waste.
- Reporting any spill immediately to the NWT/Nunavut Spill Report Line at (867) 920-8130.

Further information and application forms for registering as a hazardous waste carrier are available from the Department of Environment. Refer to section 3.2.1 and Appendix 5 for further information.

1.2.4 Receivers of Hazardous Waste

Any person receiving or accepting hazardous waste in Nunavut for the purpose of storage, transfer, reuse, recycling, treatment or disposal must be registered with the Department of Environment as a hazardous waste receiver. The facility must also be registered as a hazardous waste management facility where it is used for commercial purposes and is used to store hazardous waste for a period of 180 days or more, store quantities that exceed the criteria set out in Appendix 8 or hazardous waste is recycled, treated or disposed of in quantities in any single month that exceed a 'small quantity'. Other basic responsibilities of hazardous waste receivers in Nunavut are:

- Handling and storing the hazardous waste in accordance with the Guideline, *Environmental Protection Act, Fire Prevention Act*, *Safety Act, Public Health Act* and all other applicable statutes, regulations, standards, guidelines and local by-laws.
- Reusing, recycling, treating or disposing of the hazardous waste in a proper and safe manner.
- Completing Part C of the waste manifest form and retaining a copy for two years.
- Accepting hazardous waste only from registered generators and carriers.
- Ensuring staff are trained and qualified to safely handle hazardous waste.
- Filing a spill contingency plan with the Minister where stored quantities of hazardous waste exceed the criteria set out in Schedule A of the *Spill Contingency Planning and Reporting Regulations*.
- Reporting any spill immediately to the NWT/Nunavut Spill Report Line at (867) 920-8130.

Further information and application forms for registering as a receiver or hazardous waste management facility are available from the Department of Environment. Refer to sections 3.2.1 and 3.2.2 and Appendices 6 and 7 for further information.

1.2.5 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of hazardous waste as there may be other environmental or public and worker health and safety issues to consider. Some of the other agencies include:

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and load safety matters.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers. The Workplace Hazardous Materials Information System, or WHMIS, requires information be provided to workers on the safe use of any hazardous material used in the workplace. All hazardous waste generators, carriers and receivers should consult the Prevention Services Division for further information and guidance.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities. Emergency planning responsibilities under the *Emergency Measures Act* include developing territorial emergency response plans, coordinating emergency operations at the territorial and regional levels and supporting community emergency response operations.

The Office of the Fire Marshal is responsible for ensuring the safe storage, handling and use of flammable and combustible liquids and materials. The Office of the Fire Marshal derives its authority from the *Fire Prevention Act*, National Fire Code and National Building Code.

Department of Health and Social Services

Activities related to the generation, storage, transportation, treatment and disposal of hazardous waste may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Environment Canada

Environment Canada is responsible under the *Canadian Environmental Protection Act* for ensuring the safe management of designated hazardous waste at federal facilities and on federal lands. The management, disposal and export of polychlorinated biphenyl (PCB) waste is controlled under the *PCB Regulations*, the *Federal Mobile PCB Treatment and Destruction Regulations* and the *PCB Waste Export Regulations*. The interprovincial and international transport of waste is controlled under the *Interprovincial Movement of Hazardous Waste Regulations* and the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters in Nunavut, including the impact hazardous waste may have on the quality of these lands and waters.

Natural Resources Canada

The *Explosives Act* provides Natural Resources Canada with authority to manage explosives in Canada, including waste explosives. The Canadian Nuclear Safety Commission, which reports to Parliament through the Minister of Natural Resources, administers the safe handling and disposal of radioactive materials and licenses institutions and companies to possess and use radioactive materials under the *Nuclear Safety and Control Act* and *Nuclear Liability Act.*

Local Municipal Governments

The role of municipal governments is important in the proper local management of hazardous waste. Under the Nunavut Land Claim Agreement, municipalities are entitled to control their own municipal disposal sites. Hazardous waste may be deposited into municipal landfill sites and sewage treatment facilities only with the consent of the local government. Local environmental and safety standards are determined, in part, by how the property is designated under municipal government development plans (i.e. land use zoning). The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claim Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving hazardous waste may be controlled through the setting of terms and conditions in plans, licenses and permits issued by the Nunavut Water Board and other co-management boards and agencies.

Appendix 3 provides further assistance in determining the primary regulatory agency contact for managing hazardous waste in Nunavut.

Appendix 11 provides mailing addresses, phone and fax numbers for each of the regulatory agencies.

Management of Hazardous Waste

2.1 What is Hazardous Waste?

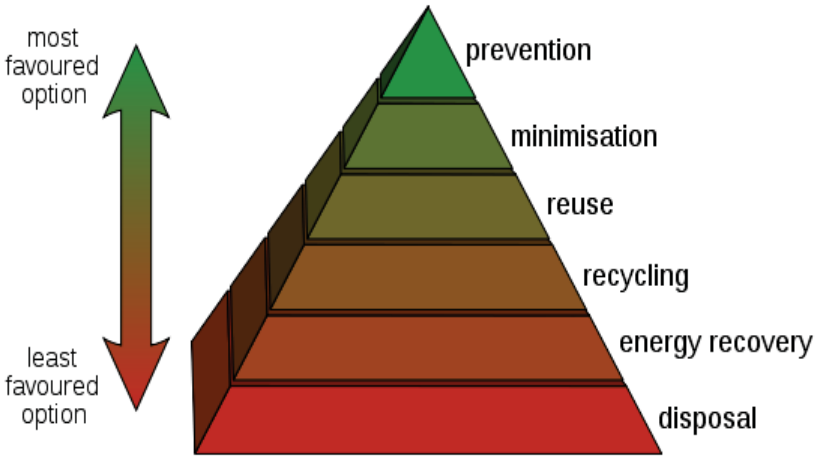
Hazardous waste is unwanted material or products that can cause illness or death to people, plants and animals. It may be a liquid, solid, sludge or gas and contain chemicals, heavy metals, radioactives, infectious organisms or other toxic substances. It may be a single product or a combination of many hazardous and non-hazardous materials (i.e. mixed waste). Its harmful effects may exist for a relatively short period of time (i.e. oil-based paint before hardening) or continue for hundreds of years. It can persist in soil, water and sediment (i.e. radioactive materials) or bioaccumulate in plants and animals (i.e. mercury, PCBs).

Hazardous waste is generated by everybody. Households commonly generate unwanted gasoline, brake and windshield wiper fluid, cleaning supplies, paints and paint thinners, lead acid batteries, used computer equipment and construction materials (i.e. asbestos), pesticides and others. Hospitals and nursing stations generate unwanted needles and waste human tissue, body fluids and biotic cultures. Business and industry generate many different types of hazardous waste including used motor and lubricating oil, cleaning solvent, drilling fluid and cuttings and mine tailings.

2.2 Waste Management

Proper waste management simply makes good sense. Minimizing or eliminating the generation of hazardous and other waste helps to reduce the hazards and costs associated with its handling, storage, transport, recycling, treatment and disposal. It also reduces the impacts waste could have on the environment, human and worker health and safety and reduces the global emission of greenhouse gases by minimizing the use of raw materials. Another term commonly used to describe activities that reduce the amount of material entering a waste stream or being released to the environment is 'pollution prevention'.

Once a waste is created, the generator is responsible for its safe management from cradle-to-grave. Waste generators can prevent pollution and reduce costs by implementing various waste reduction, reuse and recycling programs through changes to operational procedures, maintenance practices and raw material use. Treating and disposing of waste either locally or outside of Nunavut should be considered only if reuse and recycling options are not available or practical.



2.2.1 Reduce and Minimize – the first option

Using raw materials efficiently and reducing the amount of waste generated is the first and most important step in effective waste management. Both environmentally and economically, consuming less is the most fundamental and effective step to reducing waste.

A waste audit should be undertaken to inventory and study the waste produced at a location or business. The audit should identify the type and amount of waste being generated, the costs of current management methods including handling, storage, treatment, transport and disposal, and examine opportunities and set targets for reducing or reusing waste. These opportunities include awareness and education, the substitution or reduction of purchased raw materials, production redesign, process changes and improved maintenance activities. Other opportunities include purchasing products that are durable or are manufactured from environmentally-friendly materials (i.e. biodegradable or post-consumer materials), avoiding products that are designed for single or short life usage and buying only the quantity that is needed. Effective communications is critical to the success of any waste reduction program.

2.2.2 Reuse and Recycle

Even with effective waste reduction measures in place there will be waste generated. Reusing the waste product for a different but related purpose (reuse) or producing a new product from the original material (recycle) is an effective way to reduce the volume of waste. The waste audit should identify whether opportunities are available for reusing or recycling waste within the generating facility. Alternatively, other local or distant users may be found to reuse or recycle the waste that would otherwise require treatment or disposal.

The Department of Environment encourages the reuse and recycling of hazardous and other waste in the following ways:

- Local reuse and recycle programs are available in various communities for some types of hazardous waste including used oil and waste fuel. Generators should contact the Department of Environment or local municipal government for the names of registered waste receivers or other opportunities to reuse or recycle wastes locally.
- Waste exchanges and associations offer opportunities for waste generators to transfer unwanted, overstocked, obsolete, damaged, contaminated and post-dated material to another person or company that can use it. In some cases, the receiving company will purchase the waste from the generator. Appendix 10 provides a listing of several waste exchanges and associations in Canada.

2.2.3 Treatment and Disposal in Nunavut

Treatment and disposal of a hazardous waste is the last step in effective waste management and should be undertaken only after all other practical reuse and recycle options have been examined.

Treatment covers a broad spectrum of activities. It includes any method, technique or process that will change the physical, chemical or biological character or composition of a hazardous waste so as to reduce its volume, neutralize or make the waste less hazardous and make it safer to transport or store

prior to its disposal. In some cases, more than one process may be required to treat the waste. Facilities in Nunavut at which hazardous waste is stored, treated, recycled or disposed of for commercial purposes must be registered as a hazardous waste management facility. The owner or operator of a facility should refer to section 3.2.2 and Appendix 7 for further information.

It is a contravention of the *Environmental Protection Act* for hazardous waste to be abandoned or disposed of on land or into water in Nunavut. Although a detailed discussion on specific hazardous waste disposal methods is beyond the scope of the Guideline, the following are general points for consideration:

- Hazardous waste must not be mixed or diluted with another substance, or divided into smaller quantities, simply to avoid meeting the definition of a hazardous waste.
- The generator is responsible for determining how hazardous waste can be safely disposed of and to comply with all applicable statutes, regulations, standards, guidelines and local by-laws. The Department of Environment will provide advice and guidance on the management of hazardous waste. Other sources of information and assistance include:
    - Manufacturer or distributor of the new product;
    - Manufacturer's Material Safety Data Sheets (MSDS); and
    - Waste exchanges and associations, other regulatory authorities, waste management consultants and other qualified persons with expertise in the management of hazardous waste.
- Hazardous waste that meets standards set out in the Environmental Guideline for Industrial Waste Discharges may be directed to municipal landfills and sewage treatment systems for disposal. The local municipal government must be consulted and consent to the use of their facility prior to the waste being disposed. Waste that does not meet the standards set out in the Environmental Guideline for Industrial Waste Discharges must be treated prior to disposal or transported to a facility that is registered to accept the waste.
- The open burning of hazardous waste is not an acceptable practice as toxic substances may be released into the atmosphere.
- Incompatible hazardous waste should not be mixed, combined or stored together in the same container as new hazards may be created. Combining or mixing one waste with another waste may also prevent its reuse or recycling and increase disposal costs.
- Containers that previously held a hazardous waste must be emptied to the greatest extent practical or triple rinsed with an appropriate cleaning agent prior to disposal. The rinsings must then also be managed according to their waste characteristics. Cleaned containers should be rendered unusable by puncturing or crushing prior to disposal to prevent their reuse. This is especially important for containers that could be reused for water or food storage.

The Department of Environment will consider alternate hazardous waste management and disposal measures that provide an equivalent level of environmental protection to those identified in this Guideline.

2.2.4 Treatment and Disposal Outside Nunavut

Hazardous waste can be sent to a receiver or hazardous waste management facility located outside of Nunavut only where the receiver or facility has been registered in the receiving province or territory to

accept that waste. The generator must comply with all applicable statutes, regulations, standards, guidelines and local by-laws of the receiving jurisdiction.

Within Canada, Environment Canada monitors and controls the interprovincial movement of hazardous waste under the *Interprovincial Movement of Hazardous Waste Regulations*. Waste manifests must accompany each shipment of waste in accordance with the Transport Authorities' requirements. Generators and carriers should refer to section 3.3 of the Guideline for additional information on transport and waste manifest requirements.

The international movement of hazardous waste is controlled under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Known simply as the Basel Convention, it is an international treaty to control and reduce the transfer of hazardous waste from developed to less developed countries. Environment Canada monitors and controls the international movement of hazardous waste under the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*.

A listing of Canadian waste management facilities may be obtained by contacting the waste exchanges and other organizations listed in Appendix 10.

General Requirements

Hazardous waste is classified using the system developed under the *Transportation of Dangerous Goods Act (Canada)*. Wastes are categorized into one of nine classes according to their chemical, physical or biological properties. Each waste, or group of similar wastes, is then identified using a specific 'UN' number assigned under the *Transportation of Dangerous Goods Regulations*. Refer to Appendix 2 for additional information on dangerous goods classifications.

3.1 Storage

Storage refers to containment of a hazardous waste for transport, or while awaiting treatment and disposal. Except under extraordinary circumstances (i.e. radioactive materials), storage should always be considered as a temporary measure and is not acceptable for the long-term management of hazardous waste.

Recognition of the incompatibility of different wastes during storage is important in order to avoid the possibility of violent, explosive reactions and toxic fumes. Various systems have been developed to ensure compatible storage including the 'Hazardous Waste Compatibility Chart' adopted by the United States' Environmental Protection Agency[1].

3.1.1 Containers

Hazardous waste storage containers are designed to hold, store and transport small quantities of waste. Many different types of containers are available (i.e. barrels, bottles, bags and boxes) and are made from a variety of materials (i.e. aluminum, plastic, steel, and stainless steel). Selecting the proper container requires an understanding of the properties of the waste to be stored. If transport is to be undertaken, the generator should consult the Transport Authority to confirm the container meets all legislated requirements.

The following are additional general points for consideration:

- Hazardous waste should be stored in their original containers where possible or in containers specially manufactured for the purpose of storing hazardous waste. The containers must be sound, sealable and not damaged or leaking.
- Containers should be clearly labeled to identify their contents according to requirements of the Workplace Hazardous Materials Information System (WHMIS) and the relevant Transport Authority, if transport is planned.
- Small quantities of compatible hazardous waste should be bulked into 16 gauge or equivalent metal or plastic 205 litre (45 gallon) drums for the purpose of secondary containment.
- Containers should be closed and sealed at all times, except while waste is being added or removed.

[1] EPA-600/2-80-076 April 1980. A Method for Determining the Compatibility of Chemical Mixtures.

3.1.2 Facilities

A hazardous waste storage facility is a specially designed building or area that helps to ensure the safe and secure storage of hazardous waste. Detailed storage facility building designs are beyond the scope of the Guideline. The Department of Environment or other qualified person should be consulted prior to designing and constructing a storage facility.

The following are general points to consider when establishing a storage facility:

- The facility should meet all local and territorial siting and construction requirements and be readily accessible for fire fighting and other emergency responses. The local Fire Chief should be advised of the storage facility and its contents for emergency planning and response purposes.
- The facility should be secure. Access should be limited where practical to employees who have been trained in safety and emergency procedures. These procedures should be documented and a copy made available to those employees who have access to the facility.
- Inspections of the facility and stored wastes should be performed and recorded at least once every week.
- Containers should be placed so that each can readily and easily be inspected for signs of leakage, corrosion or deterioration. Leaking, corroded or deteriorated containers should immediately be removed and their contents transferred to a sound container.
- Records should be maintained indicating the type and quantity of waste being stored along with the date, type and quantity of hazardous waste brought into or removed from the facility.
- Drainage into and from the storage facility site should be controlled to prevent spills or leaks from leaving the site and to prevent run-off from entering the site.
- All waste should be stored on a firm working surface that is impervious to leaks.
- Incompatible waste must be stored in a manner that contact in the event of a spill or accidental release is not possible.
- Emergency response plans should be developed in cooperation with local emergency response personnel and emergency response equipment should be locally available in the event of a spill, fire or other emergency situation.

Where the facility is used for commercial purposes and is used to store hazardous waste for periods of 180 days or more or the quantity of waste stored on-site exceeds the criteria set out in Appendix 8, the facility must be registered with the Department of Environment as a hazardous waste management facility.

3.2 Registration

3.2.1 Hazardous Waste Generators, Carriers and Receivers

Generators, carriers and receivers of hazardous waste must be registered before undertaking activities involving these wastes. Completion of the approved form and submission of accurate information enables the Department of Environment to quickly complete the registration process. Registration enables the government to track the generation, transport and disposal of hazardous waste in Nunavut. It also provides assurance that the company has the necessary emergency response and spill

contingency plans in place should an accident or other incident occur involving a hazardous waste. Upon registration, the applicant will be assigned a unique identification number. This number is required in order to complete the waste manifest form.

Appendices 4, 5 and 6 provide samples of registration forms required for generators, carriers and receivers to apply for registration in Nunavut. Original forms and users' guides are available from Nunavut's Department of Environment or by downloading through the department's web site. Incomplete applications will result in delays in completing the registration process.

Generators and receivers of hazardous waste located in Nunavut must be registered with the Department of Environment. Carriers may be registered either in Nunavut or in the province or territory in which the company is based.

3.2.2 Hazardous Waste Management Facilities

A hazardous waste management facility is a facility or specially-designated area that is used for the collection, storage, transfer, treatment, recycling or disposal of hazardous waste for commercial purposes. Where the facility is used solely for the collection, storage or transfer of hazardous waste, the facility must be registered where waste is stored for a period of 180 days or more or the quantities exceed those set out in Appendix 8 of the Guideline. Where the facility is to be used for the treatment, recycling or disposal of hazardous waste, the facility must be registered where the quantity treated, recycled or disposed of in any single month exceeds a 'small quantity'.

The collection, storage, transfer, treatment, recycling or disposal of hazardous waste on behalf of a third-party does not remove the obligation of the owner or operator of a hazardous waste management facility to register the facility.

Appendix 7 includes a sample of the registration form required for the owner or operator of a hazardous waste management facility to apply for registration of the facility. The owner or operator may obtain an original form and users' guide by contacting Nunavut's Department of Environment or by downloading through the department's web site. Incomplete applications will result in delays in completing the registration process.

Registration of a hazardous waste management facility does not remove the obligation to comply with all other applicable municipal, territorial and federal statutes, regulations, standards, guidelines and by-laws. Guidance on planning for and achieving territorial environmental requirements for new industrial projects may be found in the *Environmental Guideline for Industrial Projects on Commissioner's Lands.*

3.3 Transportation

Carriers must ensure hazardous waste is packaged, documented, labeled and placarded in compliance with the method of transport used - road, rail, air or marine. A completed waste manifest must accompany each shipment of hazardous waste. Completion of the manifest together with proper marking and placarding of containers and vehicles enables police, ambulance, fire and other first responders to react effectively and safely in the event of a spill or other accident involving hazardous waste while in transit.

The transport of hazardous waste by road in Canada is controlled under the territorial and federal *Transportation of Dangerous Goods Acts* and the federal *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations.* These Acts and Regulations require that personnel are trained, containers and transport vehicles are labeled and placarded and a completed waste manifest accompanies each shipment. The generator, carrier and receiver must each complete their portion of the manifest form and provide copies to the Department of Environment at various stages in the transport process. Refer to Appendix 9 for a copy of the manifest. Original manifest forms are available from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further assistance in completing a waste manifest may be obtained by referring to the *User's Guide for the Hazardous Waste Manifest* produced by Environment Canada or by contacting the Motor Vehicles Division of the Department of Economic Development and Transportation.

The International Air Transport Association (IATA) requires that all shipments of hazardous wastes tendered to air carriers be accompanied by the IATA Shipper's Declaration of Dangerous Goods. The consignor is responsible for completion of the form in accordance with IATA requirements and to ensure all packaging, placarding and labeling is consistent with the product being transported.

The International Marine Dangerous Goods Code requires use of the International Marine Organization's Multimodal Dangerous Goods Form when transporting dangerous goods or hazardous waste by ship or barge.

Further information on transporting hazardous waste by air or marine can be obtained by contacting Transport Canada. Information and instructions on manifesting, placarding and labeling hazardous waste commonly generated in Nunavut can be obtained by referring to waste-specific guidelines produced by the Department of Environment. A complete listing of guidelines is available at http://env.gov.nu.ca/programareas/environmentprotection.

Conclusion

This is a general introduction to the risks associated with hazardous waste and is intended to inform the reader about the proper handling, storage and transportation of hazardous waste in Nunavut. Detailed guidance on the management of specific waste types can be obtained by referring to other guidelines developed by the Department of Environment.

For additional information on the management of hazardous waste, or to obtain a complete listing of available guidelines, contact the Department of Environment at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, Box 1000, Station 1360
Iqaluit, Nunavut, X0A 0H0

Phone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

References

Government of Alberta, Department of Environment. Alberta Users Guide for Waste Managers, (Catalogue # ENV-266-O/P).

Government of Alberta, Department of Environment. Hazardous Waste Storage Guidelines, (1988).

Government of the Northwest Territories, Department of Environment and Natural Resources. User's Guide for Hazardous Waste Movement Documents in the NWT, (2009).

Government of the Northwest Territories, Department of Municipal and Community Affairs. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories, (2003).

Government of Nunavut, Department of Environment. Environmental Guideline for General Management of Hazardous Waste, (2002).

Government of Nunavut, Department of Environment. Environmental Guideline for Industrial Projects on Commissioner's Lands, (2002).

Government of Nunavut, Department of Environment. Environmental Guideline for Industrial Waste Discharges, (2002).

APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;
   (d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;

(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

6. (1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 - DANGEROUS GOODS CLASSIFICATIONS

Class 1 – Explosives[1]



Class 2 – Compressed Gases
Division 2.1 – Flammable Gases
Division 2.2 – Non-flammable and Non-toxic Gases
Division 2.3 – Poison Gases



Class 3 - Flammable Liquids



Class 4 – Flammable Solids
Division 4.1 – Flammable Solids
Division 4.2 – Spontaneously Combustible
Division 4.3 – Water Reactive



Class 5 - Oxidizing Substances and Organic Peroxides
Division 5.1 – Oxidizing Substances
Division 5.2 – Organic Peroxides



Class 6 - Toxic and Infectious Substances
Division 6.1 – Toxic Substances
Division 6.2 – Infectious Substances



Class 7 - Radioactive Materials[2]



Class 8 - Corrosives

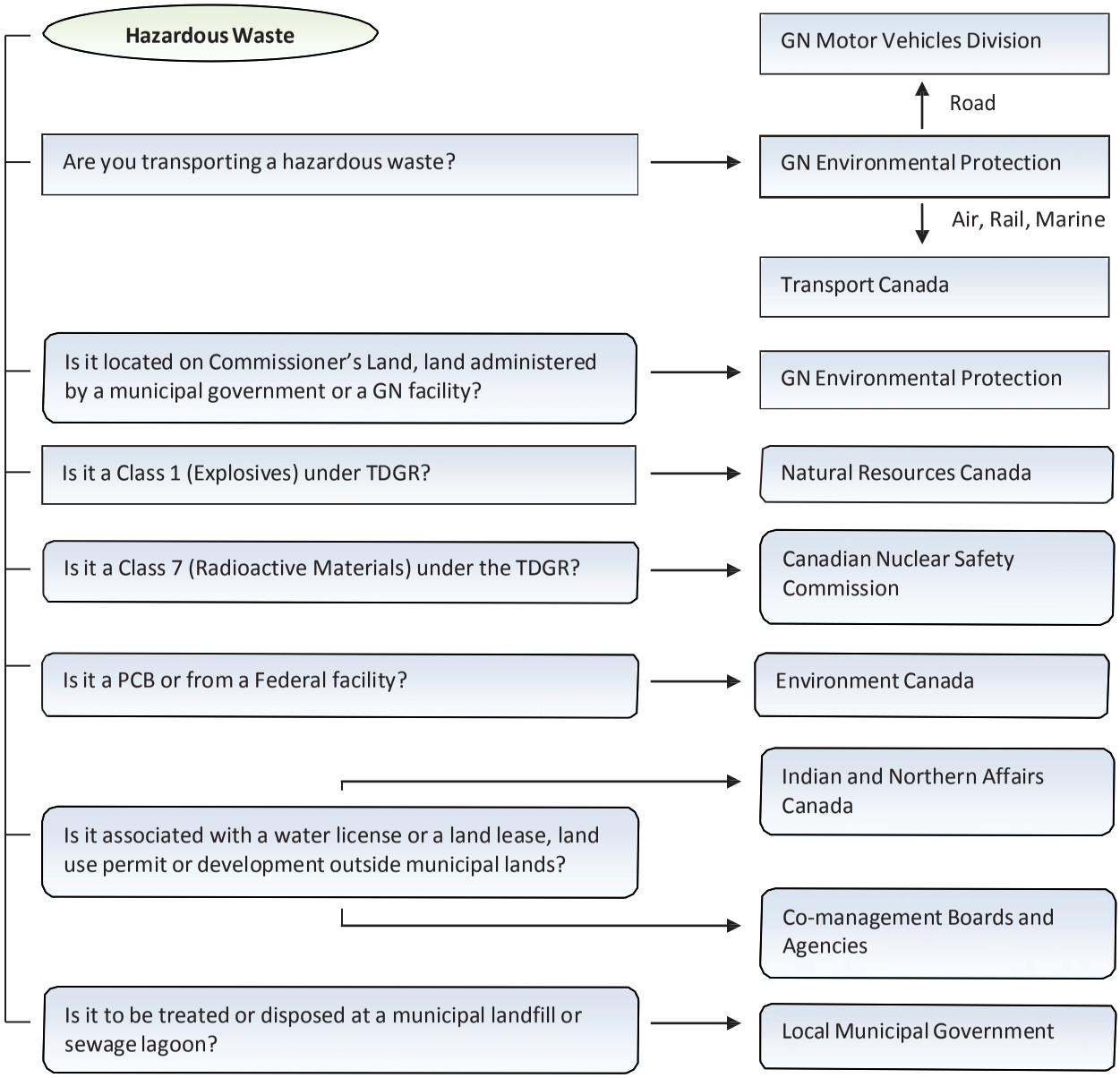


Class 9 - Miscellaneous



1. Class 1 substances (Explosives) are regulated by Natural Resources Canada under the *Explosives Act*.
2. Class 7 substances (Radioactive Materials) are regulated by the Canadian Nuclear Safety Commission under the *Nuclear Safety and Control Act* and *Nuclear Liability Act*.

APPENDIX 3 - DETERMINING REGULATORY AGENCY CONTACTS



APPENDIX 4 – REGISTRATION FORM – HAZARDOUS WASTE GENERATOR

A copy of the generator registration form and users' guide is available by contacting the Department of Environment or by downloading at http://env.gov.nu.ca/programareas/environmentprotection.

Instructions

1. The following information must be provided in order to register as a hazardous waste generator in Nunavut and to obtain a generator number. Incomplete applications will be returned to the applicant.
2. Completed registration forms are to be forwarded to the Manager of Pollution Control, Department of Environment, Government of Nunavut, Box 1000, Station 1360, Iqaluit, Nunavut, X0A 0H0. Electronic registration forms are preferred and may be forwarded to EnvironmentalProtection@gov.nu.ca.
3. Use additional pages to provide information as required.
4. Applicants should refer to the accompanying users' guide for further assistance on completing the generator registration form.

Section 1 - Identification

Generator (Legal Name) _____

Mailing Address _____ Postal Code _____

Principle Contact Person _____ Title _____

Phone _____ Email _____

Alternate Contact Person _____ Title _____

Phone _____ Email _____

Section 2 - Description of Waste Generated (provide a separate table if required)

Site Location(s) where Waste is Generated _____

Shipping Name (Description)	TDG Number	TDG Class	Quantity Generated each Month (L or Kg)	Frequency of Generation

Section 3 - Waste Management Information

General Type of Business _____

Source of Waste _____

Hazardous Waste Carrier(s) Used _____

Hazardous Waste Receiver(s) Used _____

Do you have an approved Emergency Response and Spill Contingency Plan? Yes_____(attach copy) No _____

Section 4 - Certification

I certify that the information provided on this form is correct, accurate and complete.

Signature of Contact Person _____ Date (dd/mm/yy) _____

Print Name of Contact Person _____ Title _____

Phone _____ Email _____

For Department Use Only
Generator Number NUG#_____ Approved by_____ Date _____

SAMPLE

APPENDIX 5 – REGISTRATION FORM – HAZARDOUS WASTE CARRIER

A copy of the carrier registration form and users' guide is available by contacting the Department of Environment or by downloading at http://env.gov.nu.ca/programareas/environmentprotection.

Instructions

1. The following information must be provided in order to register as a hazardous waste carrier in Nunavut and to obtain a carrier number. Incomplete applications will be returned to the applicant.
2. Completed registration forms are to be forwarded to the Manager of Pollution Control, Department of Environment, Government of Nunavut, Box 1000, Station 1360, Iqaluit, Nunavut, X0A 0H0. Electronic registration forms are preferred and may be forwarded to EnvironmentalProtection@gov.nu.ca.
3. Use additional pages to provide information as required.
4. Applicants should refer to the accompanying users' guide for further assistance on completing the carrier registration form.

Section 1 - Identification

Carrier (Legal Name) _____

Corporate Address _____

Site (Dispatch) Address _____

Principle Contact Person _____ Title _____

Phone _____ Email _____

Alternate Contact Person _____ Title _____

Phone _____ Email _____

Section 2 - Description of Waste Transported (provide a separate table if required)

Shipping Name (Description)	TDG Number	TDG Class	Quantity Transported each Month (L or Kg)	Frequency of Transport

Section 3 - Waste Management Information

Mode of Transport (check all that apply) Road _____ Rail _____ Marine_____Air _____

Hazardous Waste Generator(s) Used _____

Hazardous Waste Receiver(s) Used _____

Do you have an approved Emergency Response and Spill Contingency Plan? Yes_____(attach copy) No _____

Section 4 - Certification

I certify that the information provided on this form is correct, accurate and complete.

Signature of Contact Person _____ Date (dd/mm/yy) _____

Print Name of Contact Person_____Title _____

Phone_____Email _____

For Department Use Only
Carrier Number NUC#_____Approved by_____ Date _____

SAMPLE

APPENDIX 6 – REGISTRATION FORM – HAZARDOUS WASTE RECEIVER

A copy of the receiver registration form and users' guide is available by contacting the Department of Environment or by downloading at http://env.gov.nu.ca/programareas/environmentprotection.

Instructions

1. The following information must be provided in order to register as a hazardous waste receiver in Nunavut and to obtain a receiver number. Incomplete applications will be returned to the applicant.
2. A receiver who operates a commercial business for the purpose of collecting, storing, transferring, treating, recycling or disposing of hazardous waste may be required to register the facility as a hazardous waste management facility. Refer to section 3.2.2 of the *Environmental Guideline for the General Management of Hazardous Waste* for further information.
3. Completed registration forms are to be forwarded to the Manager of Pollution Control, Department of Environment, Government of Nunavut, Box 1000, Station 1360, Iqaluit, Nunavut, X0A 0H0. Electronic registration forms are preferred and may be forwarded to EnvironmentalProtection@gov.nu.ca.
4. Use additional pages to provide information as required.
5. Applicants should refer to the accompanying users' guide for further assistance on completing the receiver registration form.

Section 1 - Identification

Receiver (Legal Name) _____

Mailing Address _____ Postal Code _____

Principle Contact Person _____ Title _____

Phone _____ Email _____

Alternate Contact Person _____ Title _____

Phone _____ Email _____

[illegible]

[illegible] _____

Site Location(s) where Waste is Received

Shipping Name (Description)	TDG Number	TDG Class	Quantity Received each Month (L or Kg)	Frequency of Acceptance

[illegible]

[illegible] _____

General Type of Business _____

General Type of Activity _____

Hazardous Waste Generator(s) Used _____

Hazardous Waste Carriers(s) Used _____

Hazardous Waste Management Facilities Used

[illegible]

I certify that the information provided on this form is correct, accurate and complete.

Signature of Contact Person _____ Date (dd/mm/yy) _____

Print Name of Contact Person _____ Title _____

Phone _____ Email _____

SAMPLE

For Department Use Only
Receiver Number NUR#_____Approved by_____Date _____

APPENDIX 7
REGISTRATION FORM – HAZARDOUS WASTE MANAGEMENT FACILITY

A copy of the management facility registration form and users' guide is available by contacting the Department of Environment or by downloading at http://env.gov.nu.ca/programareas/environmentprotection.

1. The following information must be provided in order to register as a hazardous waste management facility in Nunavut and obtain a management facility number. Incomplete applications will be returned to the applicant.
2. Completed registration forms are to be forwarded to the Manager of Pollution Control, Department of Environment, Government of Nunavut, Box 1000, Station 1360, Iqaluit, Nunavut, X0A 0H0. Electronic registration forms are preferred and may be forwarded to EnvironmentalProtection@gov.nu.ca.
3. Use additional pages to provide information as required.
4. Applicants should refer to the accompanying users' guide for further assistance on completing the management facility registration form.

Applicant (Legal Name) _____

Corporate Address _____

Facility Address _____

Principle Contact Person _____ Title _____

Phone _____ Email _____

Alternate Contact Person _____ Title _____

Phone _____ Email _____

Site Location(s) where Waste is Managed _____

Shipping Name (Description)	TDG Number	TDG Class	Quantity Managed each Month (L or Kg)	Frequency of Acceptance

Attach a complete description of the proposed facility, safety measures, equipment and management processes to be used. Include engineered drawing where applicable.

General Type of Business (check all that apply) Receiver of Waste _____ Manage Self-generated Waste _____

Type of Activity (check all that apply) Collect and Store _____ Transfer _____

Treat _____ Recycle _____ Dispose _____

Hazardous Waste Generator(s) Used _____

Hazardous Waste Carriers(s) Used _____

Do you have an approved Emergency Response and Spill Contingency Plan? Yes _____ (attach copy) No _____

I certify that the information provided on this form is correct, accurate and complete.

Signature of Contact Person _____ Date (dd/mm/yy) _____

Print Name of Contact Person _____ Title _____

Phone _____ Email _____

For Department Use Only
Management Facility Number NUF# _____ Approved by _____ Date _____

SAMPLE

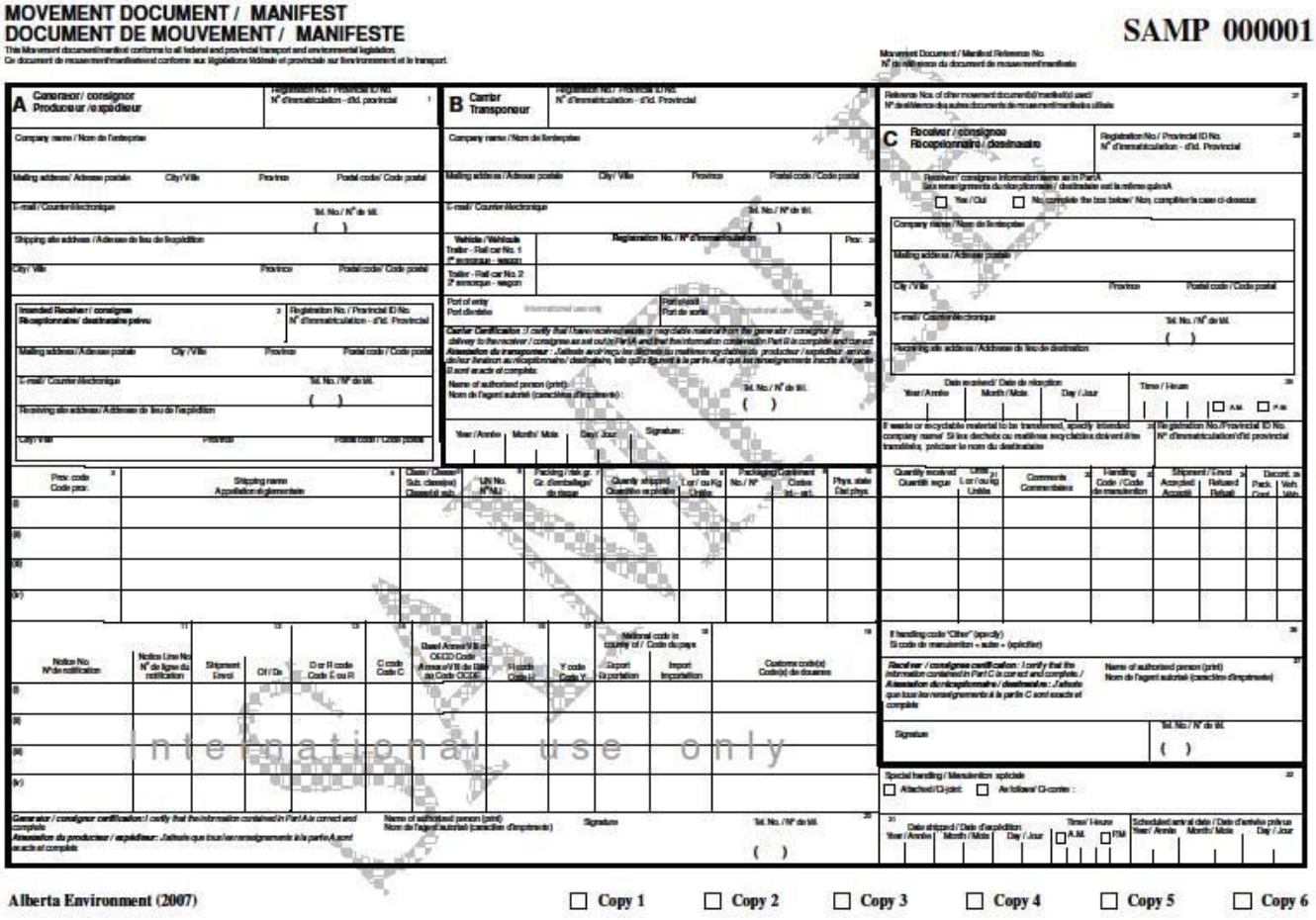
APPENDIX 8 - CRITERIA FOR REGISTERING A HAZARDOUS WASTE MANAGEMENT FACILITY

A facility must be registered with the Department of Environment as a hazardous waste management facility where it is used for commercial purposes to store hazardous waste for a period of 180 days or more or the quantity of hazardous waste[1] stored on-site at any one time exceeds the criteria established in the following table. Where the facility is to be used for the treatment, recycling or disposal of hazardous waste, the facility must be registered as a hazardous waste management facility where the quantity treated, recycled or disposed of each month exceeds a 'small quantity'[2].

	Description	Quantity[3] (Kg or L)
Class 1	Explosives	50
Class 2	Division 2.1 – Flammable Gases	500[4]
	Division 2.2 – Non-flammable and Non-toxic Gases	5000[4]
	Division 2.3 – Poison Gases	200[4]
Class 3	Flammable Liquids	4000
Class 4	Division 4.1 – Flammable Solids	5000
	Division 4.2 – Spontaneously Combustible	1000
	Division 4.3 – Water Reactive	500
Class 5	Division 5.1 – Oxidizing Substances	1000
	Division 5.2 – Organic Peroxides	50
Class 6	Division 6.1 – Toxic Substances	1000
	Division 6.2 – Infectious Substances	500[4]
Class 7	Radioactive Materials	Any amount
Class 8	Corrosives	1000
Class 9	Miscellaneous	1000
	PCB Materials	50
	Environmentally Hazardous Substance Solid – UN3077	5000
All Classes	Total Aggregate Quantity	5000

1. Applies to hazardous waste only and not to dangerous goods.
2. Small quantity means hazardous waste that is generated in an amount that is less than five kilograms per month if a solid or less than five litres per month if a liquid, and where the total quantity accumulated at any one time does not exceed five kilograms or five litres. This does not include hazardous waste that is mercury or Class 2.3, 5.1 or 6.1 materials. These wastes must be generated in an amount that is less than one kilogram per month if a solid or less than one litre per month if a liquid, and where the total quantity accumulated at any one time does not exceed one kilogram or one litre.
3. Quantity applies to solids when expressed in kilograms (kg) and liquids when expressed in litres (L).
4. Total liquid capacity of the container.

APPENDIX 9 – HAZARDOUS WASTE MANIFEST



MOVEMENT DOCUMENT / MANIFEST
DOCUMENT DE MOUVEMENT / MANIFESTE

SAMP 000001

This Movement document/manifest conforms to all federal and provincial transport and environmental legislation.
Ce document de mouvement/manifeste est conforme aux législations fédérale et provinciale sur l'environnement et le transport.

Movement Document / Manifest Reference No.
N° de référence du document de mouvement/manifeste

A Consignor / consignor
Producteur / expéditeur

Registration No.* / Provincial ID No.
N° d'immatriculation - d'id. provincial

Company name / Nom de l'entreprise

Mailing address / Adresse postale | City / Ville | Province | Postal code / Code postal

E-mail / Courriel électronique | Tel. No. / N° de tél.

Shipping site address / Adresse de lieu de l'expédition

City / Ville | Province | Postal code / Code postal

Intended Receiver / consignee
Réceptionnaire / destinataire prévu

Registration No. / Provincial ID No.
N° d'immatriculation - d'id. Provincial

Mailing address / Adresse postale | City / Ville | Province | Postal code / Code postal

E-mail / Courriel électronique | Tel. No. / N° de tél.

Receiving site address / Adresse de lieu de l'expédition

City / Ville | Province | Postal code / Code postal

B Carrier
Transporteur

Registration No.* / Provincial ID No.
N° d'immatriculation - d'id. Provincial

Company name / Nom de l'entreprise

Mailing address / Adresse postale | City / Ville | Province | Postal code / Code postal

E-mail / Courriel électronique | Tel. No. / N° de tél.

Vehicle / Véhicule
Trailer - Rail car No. 1
1er remorque - wagon
Trailer - Rail car No. 2
2e remorque - wagon

Registration No. / N° d'immatriculation | Prov.

Port of entry
Port d'entrée

Port of exit
Port de sortie

Carrier Certification: I certify that I have received waste or recyclable material from the generator / consignor for delivery to the receiver / consignee as set out in Part I/A and that the information contained in Part B is complete and correct.
Attestation du transporteur : J'atteste avoir reçu les déchets ou matières recyclables du producteur / expéditeur, arrivés de leur livraison au réceptionnaire / destinataire, tels qu'ils figurent à la partie A et que les renseignements inscrits à la partie B sont exacts et complets.

Name of authorized person (print)
Nom de l'agent autorisé (caractères d'imprimerie)

Tel. No. / N° de tél.

Year / Année | Month / Mois | Day / Jour | Signature

C Receiver / consignee
Réceptionnaire / destinataire

Registration No.* / Provincial ID No.
N° d'immatriculation - d'id. Provincial

Reference Nos. of other movement documents/ manifest(s) used
N° de référence des autres documents de mouvement/manifestes utilisés

Receiver / consignee information same as in Part A
Les renseignements du réceptionnaire / destinataire sont la même que ceux A
☐ Yes / Oui ☐ No, complete the box below / Non, compléter la case ci-dessous

Company name / Nom de l'entreprise

Mailing address / Adresse postale

City / Ville | Province | Postal code / Code postal

E-mail / Courriel électronique | Tel. No. / N° de tél.

Receiving site address / Adresse de lieu de destination

Date received / Date de réception
Year / Année | Month / Mois | Day / Jour

Time / Heure ☐ A.M. ☐ P.M.

If waste or recyclable material to be transferred, specify intended company name/ Si les déchets ou matières recyclables doivent être transférés, préciser le nom du destinataire

Registration No.* / Provincial ID No.
N° d'immatriculation* d'id provincial

Prov. code Code prov.	Shipping name Appellation d'expédition	Class / Classe / Sub. class(es) Classe(s) sub.	UN No. N° ONU	Packing / Nat. gr. Gr. d'emballage / de risque	Quantity shipped Quantité expédiée	Units Unités	Packaging / Containment No. / N°	Codes Int. – ext.	Phys. state Etat phys.
(i)									
(ii)									
(iii)									
(iv)									

Quantity received Quantité reçue	Units Unités	Comments Commentaires	Handling Code / Code de manutention	Shipment / Envoi Accepted Accepté	Shipment / Envoi Refused Refusé	Discrepancy Pack. Conf.	Discrepancy Veh. Véh.

Notice No. N° de notification	Notice Line No. N° de ligne de notification	Shipment Envoi	OI / Di	D or R code Code E ou R	C code Code C	Basel Annex VIII or OECD Code Annexe VIII de Bâle ou Code OCDE	H code Code H	Y code Code Y	National code in country of / Code du pays Export Exportation	National code in country of / Code du pays Import Importation	Customs code(s) Code(s) de douane
(i)											
(ii)											
(iii)											
(iv)											

If handling code "Other" (specify)
Si code de manutention « autre » (spécifier)

Receiver / consignee certification: I certify that the information contained in Part C is correct and complete. / Attestation du réceptionnaire / destinataire : J'atteste que tous les renseignements à la partie C sont exacts et complets

Name of authorized person (print)
Nom de l'agent autorisé (caractères d'imprimerie)

Signature | Tel. No. / N° de tél.

Special handling / Manutention spéciale
☐ Attached / Ci-joint ☐ As follows / Ci-contre :

Generator / consignor certification: I certify that the information contained in Part A is correct and complete.
Attestation du producteur / expéditeur : J'atteste que tous les renseignements à la partie A sont exacts et complets

Name of authorized person (print)
Nom de l'agent autorisé (caractères d'imprimerie)

Signature | Tel. No. / N° de tél.

Date shipped / Date d'expédition
Year / Année | Month / Mois | Day / Jour | Time / Heure ☐ A.M. ☐ P.M.

Scheduled arrival date / Date d'arrivée prévue
Year / Année | Month / Mois | Day / Jour

International use only

Alberta Environment (2007)

☐ Copy 1 ☐ Copy 2 ☐ Copy 3 ☐ Copy 4 ☐ Copy 5 ☐ Copy 6

APPENDIX 10 - WASTE EXCHANGES AND ASSOCIATIONS

The concept of exchanging waste began in Canada in the 1980s. It involves the transfer of unwanted, overstocked, obsolete, damaged, contaminated or post-dated material and waste to another company or person who would reuse it. Various waste exchanges and associations have been established in Canada to facilitate these transfers. Several, but not all, waste exchanges and associations are listed below.

Northern Territories Water and Waste Association
201, 4817- 49 Street
Yellowknife, Northwest Territories X1A 3S7
(867) 873-4325
http://www.ntwwa.com

Recycling Council of British Columbia
Unit #10, 119 West Pender Street
Vancouver, British Columbia V6B 1S5
(604) 683-6009
http://www.rcbc.bc.ca

Alberta Waste Materials Exchange
Building #350, 6815 Eighth Street NE
Calgary, Alberta T2E 7H7
(403) 297-7505

Calgary Materials Exchange
809 Fourth Avenue NE
Calgary, Alberta T2P 0K5
(403) 230-1443
http://www.cmex.ca

Saskatchewan Waste Materials Exchange
515 Henderson Drive.
Regina, Saskatchewan S4N 5X1
(306) 787-9800

Manitoba Waste Exchange
1329 Niakwa Road
Winnipeg, Manitoba R2J 3T4
(204) 257-3891

Ontario Waste Exchange
OCETA 63 Polson Street, 2nd floor
Toronto, Ontario M5A 1A4
(416) 778-4199
http://www.owe.org

Canadian Waste Materials Exchange
2395 Spearman Drive
Mississauga, Ontario L5K 1B3
(416) 822-4111

Canadian Chemical Exchange
900 Blondin
Ste-Adele, Quebec J0R 1L0
(450) 229-6511
http://www.stobec.com

Quebec Waste Materials Exchange
14 Place du Commerce, Bureau 350
Le-des-Squeurs, Quebec H3E 1T5
(514) 762-9012

APPENDIX 11 – GOVERNMENT CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free) Fax: 1-866-979-8501

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Motor Vehicles Division
Department of Economic Development and Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Department of Community and Government Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine only
Fax: (204) 983-1734 Air only

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

AGNICO EAGLE

MELIADINE GOLD PROJECT

Incineration Management Plan

MARCH 2018
VERSION 5
6513-MPS-01

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ᐊᑲᓂᔨᓯᑦ ᑕᓯᖏᐊᕐᒥᑦ ᔪᓗᒧᑦ ᐅᓴᖅᑕᕆᐊᕐᒥᑦ ᐱᓂᓪᓕᐊᓂᖅᑐᑦ, 25 ᑭᓪᒥᑕᓪᓗᐊᓂᒃ ᐅᐊᖏᓇᖏᓂᑦ ᑲᖏᖅᓂᓂᕐᒥᑦ ᐅᖏᓯᔨᑎᑎᔪᖅ, ᐊᑐᓗ 80 ᑭᓪᒥᑕᓪᓗᐊᓂᒃ ᓂᓕᖅᑮᔨᐊᓂᑦ ᐱᖏᓇᖅᑮᔨᐅᓂᑦ ᐃᑲᓗᓕᖏᕐᒥᑦ ᐅᖏᓯᔨᑎᑎᔪᖅ ᑭᓂᓪᓕᖏᕐᒥᑦ ᓄᓇᓕᐅᑎ. ᐅᓴᖅᑕᕆᐊᕐᒧᑦ ᕿᖏᐅᑎ ᓄᓇᒥᑦ ᐅᑦᑯᐃᖏᓗᒍ ᐊᑐᓗ ᓄᓇᐅᓴ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᐊᖏᓂᐅᓂᖅᑐᖅ ᐱᓂᓪᓕᐊᓗᒍ ᑎᓕᑦᓂᓂᐅᓗᒍ, ᓯᖏᑉᓂᒃ ᓄᓇᒥᑦ ᐅᑦᑯᐃᖏᓚᐃᓕᑎᒃ (ᑎᓕᑦᓂᓂᐊᖅ ᓄᓇᒥᑦ ᐅᑦᑯᐃᖏᓚᖅ 1 ᐊᑐᓗ ᑎᓕᑦᓂᓂᐊᖅ ᓄᓇᒥᑦ ᐅᑦᑯᐃᖏᓚᖅ 2) ᐊᑐᓗ ᐊᑕᐅᔪᖅ ᓄᓇᐅᓴ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᐊᖏᓂᖅ.

ᑕᑦᓓ ᑎᑎᖅᑲᖅ ᑕᑯᓴᐅᑎᑦᑎᔪᖅ ᐃᑯᐊᓪᓚᑦᑎᑭᒃᑐᒥᑦ ᐊᐅᓪᓚᑎᓂᖏᓪᓕᑦ ᐸᖏᓇᐅᑎᒥᑦ ᐊᑐᓗ ᓴᖅᑭᑎᓕᐅᕕᒃᑐᑦ ᐱᓕᕆᐊᖏᓪᓕᑦ ᐊᑎᖅᑭᔨᓕᐅᕕᖅᑐᑦ Type “A” ᐃᒪᖏᓪᓕᑦ ᓪᐃᓴᓀᓕᒥᒃ ᑐᑦᔪᕐᕆᐅᑎᓕᑦ. ᑕᑦᓓ ᐸᖏᓇᐅᑎ ᐱᓕᕆᐊᖑᓪᓚᐅᖅᑐᖅ ᒪᓕᒃᓗᑦᑕ ᐱᐅᓯᒃᑯᑦ ᐊᐅᓪᓚᑎᓂᖏᓪᓕᑦ ᐊᑐᖅᑕᐅᖅᑲᑦᑕᖅᑐᓂᒃ, *ᑲᓇᑕᒥᑦ ᐊᐸᑎᓕᓕᓴᒃᑯᑦ ᐱᓕᕆᓂᐊᕐᓗᑦ ᑎᑎᖅᑲᐅᑎᖑᓂᑦ ᑲᑎᑕᐅᔨᓂᒃ ᐊᑦᑕᑯᔨᓂᒃ ᐃᑯᐊᓪᓚᓪᓕᐅᔨᓗᑦ*, ᐊᑎᓕᑦ ᒪᓕᒃᑐᐅᓂᖅᑐᑦ ᐱᓕᕆᐊᖏᓪᓕᑦ ᐊᑐᖅᑕᐅᖅᑲᑦᑕᖅᑐᓂᒃ.

ᔪᑎᔨᓂᒃ ᐊᑦᑕᑯᓂᒃ ᐃᑯᐊᓪᓚᑦᑎᑭᒃᑐᒥᑦ ᐊᑎᓕᑦ ᐊᑦᑕᑯᒋᖅᑕᐅᔨᓂᒃ ᐅᖑᔨᐊᓗᓐᓂᒃ ᐃᑯᐊᓪᓚᑦᑎᑎᕐᔪᑦᑕ ᐊᐅᓚᑕᐅᔨᑦ ᓄᓇᖅᑮᓕᒥᑦ ᒪᓕᒃᑐᓗᒥᑦ *ᓄᓇᖅᑮᓕᒥ ᐃᓄᓗᒃᑕᓂᒃ ᑕᒪᓐᓇᖑᓪᓚᓕᓪᓕᖏᓪᓕᑦ ᐱᖁᔭᖅ*, *ᓄᓇᖅᑮᓕᒥ ᐊᐸᑎᓕᒥᒃ ᒥᐊᓂᖑᔪᓪᓕᑦ ᐱᖁᔭᖅ*, ᐊᑎᓕᑦ *ᑲᓇᑕᒥᑦ ᐊᐸᑎᓕᒥᒃ ᒥᐊᓂᖑᔪᓪᓕᑦ ᐱᖁᔭᖅ*. ᖃᓄᐃᓕᓂᐅᓪᓚᑦᑎᑭᒃ ᑭᒃᓂᐅᔨᑦ ᐃᑯᐊᓪᓚᑦᑎᑭᒃᑐᒥᑦ ᐱᓂᓪᓕᐊᓗᒥᑦ ᒪᓂᓪᓕᖅᑐᑦ ᐊᓂᓂᐊᔨᓄᑦ ᒪᓂᑕᐅᔨᖅᑲᓂᒃ ᑎᑎᕋᕐᓂᑦ ᑲᑎᑕᐅᔨᑦ ᓄᓇᖅᑮᓕᒥᑦ ᒪᓂᑕᐅᔨᖅᑲᓂᒃ ᐊᓂᓂᐊᔨᓄᑦ ᑎᑎᕋᕐᓂᑦ ᐊᑐᖅᑕᐅᖅᑲᑦᑕᖅᑐᓂᒃ ᐊᓂᓂᐊᔨᓄᑦ ᐊᑦᑕᑯᔨᓂᒃ ᐃᑯᐊᓪᓚᑦᑎᑭᒃᑐᒥ

ᓇᓕᐅᑦᑕᖅᑕᐅᔾᑦ ᐊᖏᑎᑎᓂᖏᑦ ᐅᓴᖅᑕᕆᐊᖃᑦ ᐊᐸᑕᑯᖅᑕᐅᔾᑦ. ᐊᐸᑕᑯᓂᐸ ᐊᐅᓕᑦᑎᓂᖃᒧᑦ ᐃᒡᓗᖓᐊᖅ [1] -ᑭᓴᓂᐊᖅᑐᖅ ᐊᐅᓕᑕᐅᓗᓂᓗ ᐊᔪᕐᓂᓴᖅᓴᖅᑕᐅᓯᒪᔪᓂᐸ ᐱᓕᕆᔨᓄᑦ.

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EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

This document presents the Incineration Management Plan for the Project and forms a component of the documentation series produced for the Type "A" Water Licence Application. This Plan was prepared in accordance with best management practices, Environment Canada's *Technical Document for Batch Waste Incineration,* and guidelines issued by the Nunavut Impact Review Board for the Project.

Solid waste incinerators and waste oil burners are regulated in Nunavut under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act,* and the federal *Environmental Protection Act*. Performance limits for the incinerator at the Project will be in accordance with the emission guidelines set out by the Canadian Council of Ministers of the Environment. Ash produced from the incineration process will be disposed of in accordance with the *Nunavut Environmental Guideline for Industrial Waste Discharges*.

The Project will select and operate its incinerator based on Environment Canada's *Technical Document for Batch Waste Incineration*. In addition to incinerator technology, the implementation of a waste segregation program will limit emissions (e.g., dioxins and furans, mercury) from the incinerator.

A typical modern controlled-air, batch, dual chamber incinerator will be installed. Critical process parameters, such as temperature, combustion air flow, and burner output will be computer-controlled to maintain optimal combustion conditions. The incinerator will have an incineration capacity of approximately 1,500 kilograms per day to accommodate predicted volumes of waste to be generated at the site. It will be located in the waste management building[2] and operated by appropriately trained personnel.

Monitoring and testing is planned for incinerator stack emissions, waste oil/fuel to be burned in the incinerator, as well as incinerator ash.

To demonstrate conformity with performance limits, an annual incineration management report will be prepared and submitted as part of annual reporting to authorizing agencies. The quantity and type of materials incinerated on-site during operation, together with results from periodic stack

[2] Also known as the incinerator building.

emission and ash monitoring, will be included in the annual report. A report will also be provided, if necessary, to the National Pollutant Release Inventory. Finally, Agnico Eagle is committed to reporting greenhouse gas emissions in support of Canada's Voluntary Challenge Registry.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	October 2012			First draft of the Incineration Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013			DEIS re-submission; rebranding	
3	April 2014	7.4.2	15	Revision made to address review comments and commitments	John Witteman, Env. Consultant, Agnico Eagle
4	April 2015			First version of Supporting Documents for Type A Water Licence Application, submitted to Nunavut Water Board for review	John Witteman, Env. Consultant, Agnico Eagle
5	February 2018			Reviewed internally	Agnico Eagle Environment Dept.

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
CCME	Canadian Council of Ministers of the Environment
CEPA	*Canadian Environmental Protection Act*
CWS	Canada-Wide Standards
EC	Environment Canada
GN	Government of Nunavut
IMP	Incinerator Management Plan

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The proposed mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Mining facilities include a plant site and accommodation buildings; three ore stockpiles; a temporary overburden stockpile; a tailings storage facility (TSF); three waste rock storage facilities (WRSFs); a water management system that includes collection ponds, water diversion channels, and retention dikes/berms; and a Water Treatment Plant (WTP).

This document presents the Incineration Management Plan (Plan) to support the Type A Water Licence application for the Project.

The purpose of the Plan is to provide consolidated information on the specifications, operations, management, monitoring, and reporting of the incinerator process proposed for the Project. This Plan will be reviewed and updated on a regular basis to reflect changes to the Project.

1.1 Concordance with Project Guidelines

This document was developed under the Guidelines for the Preparation of an Environmental Impact Statement for Agnico Eagle Mines Limited's Meliadine Project (the Guidelines) issued by the Nunavut Impact Review Board for the Project (NIRB 2012), and specifically those relating to the presentation of the Plan in Section 9.4.9 of the Guidelines. In addition this Plan has been developed to be consistent with the guidance provided in the Environment Canada's (EC) Technical Document for Batch Waste Incineration (EC 2010). It is one in a series of environmental management plans that have been prepared for the Project. All are included under the umbrella Environmental Management and Protection Plan.

1.2 Linkages to Other Management Plans

Documents included in the application package of this Type A Water Licence, which support this Plan include the:

- Environmental Management and Protection Plan;
- Landfill and Waste Management Plan;
- Hazardous Materials Management Plan; and
- Preliminary Closure and Reclamation Plan.

The Occupational Health and Safety Plan, submitted with the FEIS also supports this Plan (Agnico Eagle 2014).

SECTION 2.0 • BACKGROUND INFORMATION

At the Project site, all wastes will be safely managed from the time they are produced to their final disposal. All waste will be segregated at the proposed mine site and will predominately be landfilled, incinerated, or recycled. Used oil burning will be maximised as much as possible using the second chamber of the incinerator. Remaining wastes, including hazardous waste[3], will be packaged for shipment to a certified waste management facility for treatment, recycling, and/or disposal.

Incineration is an essential part of waste management at the proposed mine site. The incineration of acceptable solid waste from the accommodation complex, kitchen, lunch rooms, shops, warehouses, and offices will divert waste from directly reporting to the on-site landfill. It will have the advantage of eliminating putrescible waste that could potentially attract wildlife to the landfill, thereby reducing possible dangerous interactions between humans and wildlife.

The objectives of this Plan are summarized as follows:

1) To understand the quantity and composition of the waste to be generated at the proposed mine site, and separate waste acceptable for incineration from waste that is not;
2) To select the proper batch waste incinerator based on the characteristics and quantity of waste, and to locate it in an appropriate building away from other site infrastructure;
3) To properly equip and install the incinerator;
4) To operate the incinerator for optimal combustion, and avoid the formation of dioxins and furans in the combustion process;
5) To safely handle and dispose of incinerator residues; and
6) To establish a record keeping system for managing the facility and for future reporting.

As a component of the Project Environmental Management System, the Plan will be updated prior to mine operation and periodically thereafter to ensure that site experience is reflected in the Plan and subsequently communicated to all parties. The Project Environment Superintendent will be responsible for managing and implementing the IMP.

2.1 Incinerator Location

The incinerator will be located in its own building on the south end of the industrial pad, down-wind of other mine infrastructure. The incinerator building will have sufficient floor space to manage all Project wastes in one convenient location.

[3] Please refer to the Hazardous Materials Management Plan for further information on the handling and management of hazardous waste.

SECTION 3 • REGULATORY SETTING

Solid waste incinerators and waste oil burners are regulated in Nunavut under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act,* and the federal *Environmental Protection Act*. Various regulations and guidelines under these Acts, as well as guidelines developed by the Canada Council of Ministers of the Environment (CCME), were reviewed in preparing the Plan. They are as follows:

- *Canadian Environmental Protection Act* (CEPA)
    - Schedule 1: List of Toxic Substances
    - *Interprovincial Movement of Hazardous Waste Regulations*
    - *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*
- EC Technical Document for Batch Waste Incineration (EC 2010)
- Canada-Wide Standard for Dioxins and Furans (CCME 2001a)
- Canada-Wide Standard for Mercury (CCME 2000)
- Northwest Territories *Environmental Protection Act*
    - *Used Oil and Waste Fuel Management Regulations*
- Nunavut *Environmental Protection Act*
    - Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities (GN 2011b)
    - Environmental Guideline for the Burning and Incineration of Solid Waste (GN 2012)
    - Environmental Guideline for Ambient Air Quality (GN 2011)
    - Environmental Guideline for Mercury-Containing Products and Waste Mercury (GN 2010)
- Nunavut *Public Health Act*

Provincial and/or territorial regulations that pertain to emissions from incinerators were not found for Nunavut or the Northwest Territories. Therefore, performance limits for the incinerator at the Project will be in accordance with the emission guidelines set out by the CCME: Canada-Wide Standard for Dioxins and Furans (CCME 2001a), and Canada-Wide Standards for Mercury Emissions (CCME 2000).

The management of used oil is regulated in the Northwest Territories through the *Used Oil and Waste Fuel Management Regulations* (NWT 2012; Reg. 064-2003). In the absence of Nunavut guidelines/regulations pertaining to used oil and waste fuel, the Northwest Territories regulations will be followed for the Project.

Ash produced from the incineration process will be disposed of in accordance with the Nunavut Environmental Guideline for Industrial Waste Discharges (GN 2014).

SECTION 4 • BACKGROUND INFORMATION

4.1 Dioxins and Furans

Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans, commonly known as dioxins and furans, are toxic, persistent, and bioaccumulative chemicals. Their presence in the environment results predominantly from human activity. The biggest source of dioxins and furans in Canada is the large-scale burning of municipal and medical waste. Other major sources include:

- the production of iron and steel;
- backyard burning of household waste, especially plastics;
- fuel burning, including diesel fuel and fuel for agricultural purposes and home heating;
- wood burning, especially if the wood has been chemically treated;
- electrical power generation; and
- tobacco smoke.

Due to their environmental persistence and ability to accumulate in biological tissues, dioxins and furans are slated for virtual elimination under the CEPA, the Environment Canada Toxic Substances Management Policy (EC 2004) and the CCME *Policy Statement for the Management of Toxic Substances* (CCME 1998).

4.2 Mercury

Mercury is a naturally occurring substance, which can be transformed through biological processes to methyl mercury, a persistent substance which bioaccumulates in the food chain and is particularly toxic to humans and wildlife. Mercury contamination originates from natural and antropogenic sources, the latter including combustion of waste. Under a variety of regional, national, bi-national, and internal programs, treaties and agreements, mercury is being targeted for emissions reductions consistent with the CCME *Policy Statement for the Management of Toxic Substances* (CCME 1998), which identifies that mercury shall be managed through its lifecycle to minimize release.

4.3 Used Oil and Waste Fuel

The following definitions are provided in the *Used Oil and Waste Fuel Management Regulations*.

Used oil: Any oil, including lubrication oil, hydraulic fluids, metal working fluid, and insulating fluid, that is unsuitable for its intended purpose due to the presence of impurities or the loss of original properties, but does not include waste oil derived from animal or vegetable fat, a petroleum product spilled on land or water, or waste from a petroleum refining operation.

Waste fuel: A flammable or combustible petroleum hydrocarbon, with or without additives, that is unsuitable for its intended purpose due to the presence of contaminants or the loss of original properties, and includes gasoline, diesel fuel, aviation fuel, kerosene, naphtha, and fuel oil, but does not include paint, solvent, or propane.

SECTION 5 • PERFORMANCE LIMITS

5.1 Incinerator Selection

The Project selected its incinerator based on Environment Canada's *Technical Document for Batch Waste Incineration*. The incinerator for the Project is a camp waste incinerator (model no. ECO 1.75TN 1PVC100L 16-1MS) from Eco-Waste Solutions. The incinerator complies with the guidelines listed in Table 5-1, where the maximum emissions are expressed as a concentration in the exhaust gas exiting the facility's stack. The specifications of the incinerator are available in Appendix A. In addition to incinerator technology, the implementation of a waste segregation program will limit emissions of dioxins and furans, and mercury from the incinerator.

Table 5-1 Emission Regulations for Solid Waste Incinerators

Emissions	Sector	Guideline (max)[a]	Units	Reference
Dioxins and Furans	Municipal Solid Waste[b]	80	pg I-TEQ/Rm^3	CCME 2001a
Dioxins and Furans	Sewage Sludge Incineration	80	pg I-TEQ/Rm^3	CCME 2001a
Mercury	Municipal Waste	20	µg/Rm^3	CCME 2000
Mercury	Sewage Sludge Incineration	70	µg/Rm^3	CCME 2000

[a] Stack concentrations are corrected for 11% oxygen.

[b] According to the Canada-Wide Standards (CWS), "municipal solid waste" includes any waste that might be disposed of in a non-secure landfill site if not incinerated (i.e., non-hazardous wastes regardless of origin), but does not include "clean" wood waste.

Compliance to these performance limits will be confirmed by periodic stack testing, normally on an annual basis.

5.2 Used Oil and Waste Fuel

Agnico Eagle will manage used oil and waste fuel according to the *Used Oil and Waste Fuel Management Regulations* (NWT 2012) as presented in Table 5-2.

Table 5-2 Summary of Used Oil and Waste Fuel Regulations

Activity	Summary of Regulations
Registration	• Waste oil burner shall be registered with the Chief Environmental Protection Officer.
Disposal	• Used oil/waste fuel will not be disposed of directly into the environment.
Storage	• Used oil/waste fuel will be stored in specifically designed container for hydrocarbons to minimize the risk of spills; • Used oil/waste fuel containers will be periodically inspected for leaks or potential leaks; and • Used oil/waste fuel will be stored as per the Hazardous Materials Management Plan.

Sampling and Analysis	• A sample of one month's feedstock of used oil/waste fuel is required to be tested at least once a year;
	• Used oil/waste fuel will be tested for:
	  • Flash point; and
	  • Existence and amount of each impurity Listed in Table 5-3.

Burning	• Used oil/waste fuel will not be openly burned; • Used oil will not be burned in accommodation areas; • Used oil with a flash point of less than 37.7°C will not be burned or blended with another used oil/waste fuel; • Used oil that exceeds guidelines will not be burned; and • A 14-day notice will be given for the burning of waste fuel.

Records	• The following will be recorded in association with the incineration of used oil/waste fuel:
	  • Volume of used oil/waste fuel generated;
	  • Volume of used oil/waste fuel incinerated/consumed;
	  • Name and address of person in charge, management or control of the used oil;
	  • Location of production of used oil/waste fuel;
	  • A summary of maintenance performed on used oil/waste fuel burners or processing equipment; and
	  • Volume and nature of the products produced from the used oil.

Table 5-3 summarizes the maximum level of contaminants in used oil that can be incinerated as stipulated in the *Used Oil and Waste Fuel Management Regulations* (NWT 2012). Under the regulations blending of used oil that exceeds one of more of the criteria listed in Table 5-3 is not allowed.

Table 5-3 Used Oil Impurity Limit

Impurity	Maximum Level Allowed in Used Oil (ppm)
Cadmium	2
Chromium	10
Lead	100
Total Organic Halogens (as Chlorine)	1,000
Polychlorinated Biphenyls	2

5.3 Incinerator Ash

Provided the materials that go into the incinerator are controlled to exclude all hazardous materials, the incinerator ash should be non-hazardous. Even small quantities of hazardous waste, such as batteries, should not be mixed with waste to be incinerated. An ash testing protocol is implemented to ensure that the incinerator ash is suitable for disposal in the landfill. Ash not meeting the guidelines will be packaged in drums to be sent to a certified waste management facility for appropriate treatment, recycling, and/or disposal, or will be buried within the dry stacked tailings.

SECTION 6 • INCINERATOR SPECIFICATIONS AND OPERATION

The Project has selected a dual chamber, high-temperature incinerator as the primary incinerator. The technical specifications are included in Appendix A. The incinerator will be housed inside a separate building that will have sufficient floor space to manage all Project wastes in one convenient location.

6.1 Incinerator Specifications

Typical modern, controlled-air, batch, dual chamber incinerators are design using the principles of pyrolysis (starved-air burning condition) in the primary chamber and complete oxidation (high temperature, excess oxygen, and sufficient combustion time) in the secondary chamber. The incineration system will be a two-stage process. In the first stage, waste will be converted to gas in the primary chamber at approximately 650 to 850 degrees Celsius (°C). This process will be self fueling until the volume is reduced by 90 %. Gasses from the primary chamber will enter the secondary chamber of oxygen-rich and turbulent conditions, which is typically at a higher temperature – around 1,000°C. Combustion will be complete after a retention time of about two seconds. The temperature of combustion gases exiting the stack is anticipated to exceed 700°C and to flash cool in the ambient air, thereby leaving little opportunity for the *de novo* synthesis of dioxins/furans. Heat capture will not be used on the exhaust gases.

Critical process parameters, such as temperature, air flow, and burner output will be computer-controlled to maintain optimal combustion conditions.

For an incinerator capacity suitable for the predicted volumes of waste to be generated at the Project, the total particulate matter generated is expected to be extremely low. Therefore, dust collection technologies, such as baghouse filters, will not be necessary, as very minor amount of fly ash will be generated. Ash residues generated in the primary chamber are manually removed on a daily basis using a shovel emptied into a metal bin.

6.1.1 Operation Procedures

General operating procedures for the incinerator include:

1. Sort the waste on the basis of origin and heating value. Food waste and waste that has been in contact with food will have priority for incineration.
2. Mix the waste to ensure a calorific value within the incinerator's specification and to achieve good combustion inside the primary chamber.
3. Observe the start of the burn cycle to ensure the incinerator is operating correctly.
4. The door to the incinerator is only opened after the burn cycle is complete and the unit cooled.
5. The ash is removed from the incinerator before it is charged with the next load of waste to be incinerated.

6. The ash is placed in drums or bags before disposal.
7. The ash is disposed of in the on-site landfill. If the concentration of trace metals exceeds the Government of Nunavut's *Environmental Guideline for Industrial Waste Discharges* (GN 2014), ash will be either packaged and sent to an approved disposal facility or buried in the dry stack tailings.

The system has a sizable front door for easy access to manually load/feed waste into the unit with a front-end loader. The proposed waste streams are layered wherever possible during loading to ensure proper combustion.

6.1.2 Emissions

The incinerator is designed to meet performance limits described in Section 5.1. Good engineering practices will be used to ensure required incineration temperatures and dispersion of gases meet applicable air quality standards/guidelines.

The incinerator stack design incorporates appropriate sampling ports, with caps where necessary, at appropriate locations to allow for stack testing to be undertaken during incinerator operation.

6.1.3 Dust/Odour Control Measures

Modern incinerators are commonly designed such that the non-turbulent atmosphere in the primary burn chamber reduces the formation of particulate matter. Therefore, the need for additional dust and/or odour control measures is not anticipated. Organic/putrescible wastes will be given incineration priority to limit odours.

6.1.4 Staffing and Equipment

The computerized incinerator typically requires one operator to interact with the equipment for approximately 1 to 1.5 hour per day, largely for ash removal, loading, and start-up. Operators are not typically required to be in attendance during the rest of the operation, as it is normally a fully automated process. The incinerator is designed, installed and operated so that the operators are not exposed to high temperatures during loading or ash removal due to complete cool down after the burn cycle. Also, the waste will not be allowed to combust until the chamber is sealed thus isolating the worker from smoke and high temperatures.

6.1.5 Inspections

Weekly inspections will be undertaken of the incinerator building for cleanliness and the proper management of wastes delivered to the facility. The Environment Department will carry out the inspections.

6.2 Used Oil and Waste Fuel

The incinerator is able to efficiently burn used oil and waste fuel. A quantity of about 365,000 litres of used oil and waste fuel should be incinerated per year. The quantity of waste fuel is expected to

be small and will be dependent on the adherence to standard operating procedures. The goal is to avoid practices that could result in waste fuel. The principal sources of the used oil will be from oil changes on the mining equipment and light vehicles, as well as oil changes to mechanical gearboxes within the mill. Typical used oil and waste fuel furnaces include a storage tank and a filter to recover sludge prior to burning. Sludge collected in the filters will be drummed and shipped, as needed, to a certified waste management facility for treatment, recycling, and/or disposal.

6.3 Shipboard Incinerator

See Section 8 of the Shipping Management Plan (Agnico Eagle 2018).

6.4 Closure Plan

In accordance with the Preliminary Closure and Reclamation Plan, salvageable buildings and surface structures, including the incinerator and waste management building, will be dismantled and demobilized from the site.

SECTION 7 • WASTE MANAGEMENT

Waste reduction is being worked towards by implementing purchasing policies that focus on reduced packaging. Reduce, reuse, and recycle initiatives as well as the waste segregation program at the Project as per the Landfill and Waste Management Plan minimizes the quantity of waste incinerated or directed to the landfill.

7.1 Approach

A waste segregation program is implemented at the site. This allows materials that are unsuitable for incineration to be either landfilled on-site or shipped off-site to a certified waste management facility for treatment, recycling, and/or disposal.

7.2 Acceptable Waste for Incineration

Acceptable wastes for incineration will include the following:

- organic matter including food;
- food containers and wrappings, including plastics that are contaminated by food;
- medical waste from the Health Care Station;
- paper, cardboard, and the like;
- hydrocarbon spill absorbents;
- plastic and Styrofoam except plastic containing chlorine;
- dead animals; and
- used oils and waste fuel.

7.3 Unacceptable Waste for Incineration

Materials that are not listed above would be unacceptable for incineration. These materials include, but are not limited to:

- chlorinated plastics;
- inert materials, such as concrete, bricks, ceramics, ash, asbestos, drywall;
- bulky materials such as machinery parts or large metal goods such as appliances;
- radioactive materials, such as smoke detectors and laboratory wastes;
- potentially explosive materials, such as propane tanks, other pressurized vessels, unused or ineffective explosives;
- hazardous materials such as organic chemicals (pesticides), other toxic substances (arsenic, cyanide);
- electronics;
- batteries;
- vehicles and machinery;
- fluorescent light bulbs;

- whole tires;
- paint and solvents;
- any materials containing mercury, lead, and cadmium;
- used oil or waste fuel that exceeds the maximum impurity limits for parameters listed in Table 5-3;
- waste oil and waste fuel with a flash point of less than 37.7°C; and
- propane.

7.4 Waste Volumes

7.4.1 Solid Waste and Incinerator Ash

The number of people working on-site and the activities occurring at the time have a direct bearing on the volume of waste destined for the landfill, the incinerator, and the amount removed from waste streams for reuse and recycling.

It has been assumed that each person will produce 1 tonne of refuse per year[4]. Mean camp populations of approximately 200 during construction, 680 during operation, and 50 during closure have been estimated. Fifty percent of the refuse by weight can be incinerated, approximately 30% of incinerated material by mass is converted into ash, thereby reducing the mass of waste by approximately 70 %. Thus for 680 workers, the annual quantity of ash during 8 years of operations would be about 105 tonnes. Table 7-1 estimates the annual tonnes of ash resulting from incineration for each project phase, based on the number of people on site, and cumulatively over the life of mine.

Table 7-1 Estimation of Ash over the Life of the Project

Project Phase	Workers On-Site	Annual Tonnes of Waste Incinerated	Annual Tonnes of Ash	Numbers of Years	Cumulative Tonnes of Ash
Construction	200	100	30	4	120
Operation	680	340	102	8	816
Closure	50	25	7.5	3	22.5
Total					**958.5**

Incinerator ash will be packaged in drums or sacks before being preferentially disposed of in the on-site landfill, thus eliminating any wind-blown effects.

[4] Environment Canada's "State of the Environment InfoBase", Environmental Indicator Series 2003 (http://www.ec.gc.ca), indicates that the per capita non-hazardous solid waste generation in 2000 for Canada was almost 1 tonne per person per year.

7.4.2 Used Oil and Waste Fuel

The quantity of used oil anticipated to be generated from the servicing of machinery at the Project was estimated to be approximately 365,000 litres per year (based incineration's maximum capacity of 1,000 litres per day).

The quantity of waste fuel is expected to be small but may vary between years.

7.5 Waste Incineration Rate

Due to the predicted volumes of waste to be generated at the site, the incinerator will have an approximate incineration capacity of 1,750 kilogram per day. If this cannot be achieved due to a lower volume of waste, the primary chamber could be used as storage of wastes until the desired volume is reached. This will primarily be wastes associated with food and small amount of medical waste. The batch cycle will be 6 to 10 hours for the burn cycle, followed by a cool-down of 6 to 8 hours.

SECTION 8 • MONITORING AND TESTING

The following presents the monitoring and testing plan for the incinerator.

8.1 Incinerator Emissions Testing

The incinerator stack design incorporates appropriate sampling ports at appropriate locations, in right angle configuration, to allow for stack testing to be undertaken during incinerator operation. Table 8-1 summarizes the frequency of testing that will be completed as per relevant guidelines (see also CCME 2001b).

Table 8-1 Summary of Incinerator Emissions Testing

	Frequency	Number of Test Required	Reference
Dioxins and Furans	Annual	3	CCME 2001a
Mercury	Annual	3	CCME 2000

8.2 Used Oil/Waste Fuel Testing

A sample of feedstock of used oil/waste fuel will be collected each month with one of the monthly samples being tested each year. Used oil/waste fuel not meeting impurity limits or having a flash point less than 37.7°C will be drummed and shipped to a certified management facility for re-refining, treatment, recycling, and/or disposal.

8.3 Ash Testing

An ash testing protocol is implemented on site to ensure that the incinerator ash is suitable for disposal in the landfill. Ash is disposed of and then covered immediately to prevent mobilization.

Three ash samples will be collected during the first year of operation and the leachate tested for metals content. The samples will be compared to the *Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities* (GN 2011b) presented in Table 8-2. Following the initial testing, ash samples will be collected and tested quarterly.

If monitoring indicates the ash is above the guidelines and not suitable for landfilling, an investigation will be undertaken to identify the cause and eliminate the source for the exceedance. If deemed necessary, the ash will be packaged in drums and sent to a certified waste management facility for treatment, recycling, and/or disposal.

Table 8-2 Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities

Parameter	Maximum Concentration (mg/L)
Arsenic	2.5
Barium	100
Cadmium	0.5
Chromium	5
Lead	5
Mercury	0.1
Selenium	1
Silver	5
Zinc	5

SECTION 9 • REPORTING

As part of the annual reporting, results from periodic stack emissions and ash monitoring, will be provided.

9.1 National Pollutant Release Inventory

The National Pollutant Release Inventory is a Canadian database containing information on the annual on-site release of specific substances to the air, water, and land from industrial and institutional sources (EC 2012). The National Pollutant Release Inventory provides a list of tracked substances and requirements for reporting incinerator emissions. Table 9-1 lists the substances under the National Pollutant Release Inventory that the Project expects to report annually. In addition, there are certain substances, as indicated in Table 9-1 that may require reporting depending on the quantity of incinerator emissions. Whether or not reporting is necessary will depend on results of periodic stack emission testing data and the quantity of annual emission calculated with emissions factors.

Table 9-1 National Pollutant Release Inventory Incineration Reportable Substance List

Substance	Note
Hexachlorobenzene	Required to report
Dioxins and Furans	
Carbon Monoxide	Required to report if released to air from facility in a quantity of 20 tonnes or more per annum
Oxides of Nitrogen	
Sulphur Dioxide	
Total Particulate Matter with diameter <100 microns	
Particulate matter with diameter less than or equal to 10 microns (PM_{10})	Required to report if released to air from facility in a quantity of 0.5 tonne or more per annum
Particulate matter with diameter less than or equal to 2.5 microns ($PM_{2.5}$)	Required to report if released to air from facility in a quantity of 0.3 tonne or more per annum

9.2 Greenhouse Gas Emissions and Global Warming

Agnico Eagle is committed to reporting greenhouse gas emissions in support of Canada's Greenhouse Gas Reporting Program.

SECTION 10 • PLAN REVIEW AND ADAPTIVE MANAGEMENT

The Plan will be updated regularly to reflect the operating conditions at the Project during construction, operation, and closure. The Plan will be reviewed annually and an updated version will be produced every two years of operation at a minimum.

The up-to-date Plan will be made available by Agnico Eagle at all times for review by the Government of Nunavut, Kivalliq Inuit Association, Nunavut Water Board, and Aboriginal Affairs and Northern Development Canada (formerly Indigenous and Norther Affairs Canada).

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APPENDIX A • TECHNICAL SPECIFICATIONS OF THE INCINERATOR

AGNICO EAGLE

Vendor Document Status

1 ☐ Proceed to next submission and status.

2 ☐ Proceed with exceptions as noted to next submission and status.

3 ☐ Do not proceed.
Revise as noted and resubmit next submission and status.

4 ☑ Complete, no further submission required.

By: Dominique Richard — Signature numérique de Dominique Richard Date : 2017.09.25 11:37:18 -04'00' Date:

Review and authorization to fabricate are only for general conformance with the design concept of the Project as expressed in the Contract Documents. Sole responsibility for the accuracy and completeness of this document, including but not limited to dimensions and quantities, remains with the Supplier/Contractor. Agnico Eagle does not warrant the accuracy or completeness of any of the information contained herein, nor does Agnico Eagle authorize or approve any construction means, methods, techniques, sequences or any safety precautions or procedures.

Agnico Eagle No. 6515-S-265-008-154-MNL-0002 R: Sub002

DOCUMENT FOR INFORMATION

Bolts and torques for breech and stack installation pg.33 & pg.35
Capacity typo corrected pg.47
Table of content added
Parts list added pg.123-128
Stack erection revised pg.35&36

ECO WASTE SOLUTIONS

Meliadine Incinerator
ECO 1.75TN 1PVC100L
16-1MS

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ECO WASTE SOLUTIONS

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SECTION 1

HEALTH & SAFETY PRECAUTIONS

Health and Safety Precautions

This machine has a number of energy sources:

e.g. Electricity
Heavy mechanical parts which may move due to gravity
High Temperature
Explosive Gases
Flammable Liquids



- **THE INCINERATOR HAS THE POWER TO CAUSE SERIOUS INJURY OR DEATH**
- **KEEP CLEAR OF ANY MOVING PARTS AT ALL TIMES**
- **BEFORE STARTING THE CYCLE ENSURE THAT ALL PERSONNEL ARE CLEAR OF THE INCINERATOR**
- **DO NOT ATTEMPT TO START OR OPERATE THIS EQUIPMENT UNTIL THIS MANUAL IS READ THOROUGHLY AND IS UNDERSTOOD**.
- **RESPONSIBILITY FOR THE SAFE OPERATION AND MAINTENANCE OF THE EQUIPMENT SUPPLIED RESTS SOLELY ON THOSE OPERATING IT.**

OBEY THE FOLLOWING SAFETY INSTRUCTIONS:



A qualified person is a person whom the owner of the equipment deems as having the required experience, training and skills to perform the required work.

1. Keep the electrical panel doors closed at all times except when doing electrical trouble-shooting.
2. Allow only qualified people to perform maintenance and troubleshooting on the machine.
3. Open and lockout the Main Disconnect Switch on the electrical control panel while working on the machine.
4. Do not bypass or tie down any of the door safety switches.
5. Do not open any of the doors while the Primary or Secondary Chambers are above 90^0C
6. Do not enter the chamber unless the Emergency Stop Button is pushed in
7. When opening or closing the chamber door keep clear of the door and ensure that the path for the door is clear.
8. Secure the chamber door when it is open so it cannot move accidentally.
9. Immediately correct any fuel leaks.
10. Do not fill the Primary Chamber more than ¾ full. Overfilling can result in poor burning and damage to the oxidizer.
11. Use proper tools, wear goggles, dust mask and gloves while loading and cleaning the oxidizer.
12. This unit is a confined space. Follow the safety rules for working in a confined space.
13. Ensure that all personnel who are going to operate or work on the machine read and understand the above points and are trained in the operation and maintenance of the machine.

SECTION 2

GENERAL DESCRIPTION

General Description - Thermal Oxidation Concept

The **ECO 1.75 TN 1PVC100L Incinerator system** consists of a **Primary Chamber** and a **Secondary Chamber** (also known as the Afterburner). Both chambers are vessels constructed of steel with a special insulating liner known as refractory.

The **Primary Chamber** has **Hydraulic Roof Lifters** installed for loading of the waste material from the top of the **Primary Chamber** and the front door is used for the removal of residual ash.

The waste material is loaded into the **Primary Chamber** until it is ¾ full. Once ¾ full the **Primary Chamber** is sealed and the combustion cycle begins. This type of system is known as *batch-fed* processing.

Primary Chamber

In the first stage, a burner is used to elevate the temperature of the **Primary Chamber** to ignite the waste. Once the **Primary Chamber** reaches a temperature of approximately 650-850°C, the burn process becomes self-fuelling and the burner will shut off. To save fuel and control temperatures, only when the energy contained within the waste is depleted, will the burner periodically turn on. At these operating temperatures, waste is allowed to fully combust and is rendered sterile.

The **Primary Chamber** operates under *controlled temperature* conditions. The amount of heat released, from the burning of the waste, is controlled by limiting the air into the **Primary Chamber** to less than what is required to complete combustion. This is described as *starved air* conditions. With controlled air and temperature the waste is dried, heated and burned thereby releasing moisture and volatile components. The non-volatile, combustible portion of the waste is burned in the **Primary Chamber** to provide heat while the non-combustible portion accumulates as ash.

In the end, the waste volume is reduced by over 90%. Independent tests have shown that the residual ash is non-hazardous, non-leaching and essentially inert. After enduring the combustion process, metals and glass remain intact. Preservation of metals and glass not only protects the refractory lining from damage caused by melted and fused metals and glass, but also allows for post-combustion recycling where possible.

Remaining in the **Primary Chamber** are non-combustibles, such as metal and glass, and carbonaceous residue. The incoming air, subjecting the non-combustibles to high temperatures, further burns the carbonaceous residue. The result is an oxidized ash product.

Controlling the gas velocity through the system is an important factor in limiting pollution. The gases flowing from the **Primary Chamber** are a result of the interaction of the air with the waste during the controlled burning process. Both the quantity and velocity of the gas product vary according to chamber temperature conditions and the type of waste being burned. The integrated controls for the **Primary** and **Secondary Chamber** act to minimize peaking activity thus controlling pollution automatically.

The combustion gases released in the **Primary Chamber** then pass into the **Secondary Chamber** through a turbulent mixing zone where ignition takes place and additional combustion air is provided to complete the burning process.

Secondary Chamber

As waste burns in the **Primary Chamber**, gases containing the products of combustion enter the high temperature zone of the **Secondary Chamber** for cleansing. The **Secondary Chamber** is sized to retain the incoming gases for a minimum of 2 seconds at 1000°C. This chamber utilizes a high output, fully modulating dual fuel (diesel & waste oil) burner to maintain the required temperature (even in the absence of energy input from the first stage which is important when processing wet or low energy waste). This stage employs a large blower, tightly controlled by the control system using a variable frequency drive on the motor. The blower creates the turbulence required to mix the gases and oxygenate them. This fosters the high efficiency combustion required to break hydrocarbon chains into carbon dioxide and water vapour.

The **Secondary Chamber Blower** air is introduced into the **Secondary Chamber** by an air ring manifold that surrounds the **Secondary Chamber**. The manifold has small air jets called tweers that open into the **Secondary Chamber** at the side walls and create a powerful vortex of excess air to mix the incoming gases and ensure complete combustion. The flow of air is tightly managed by the control system using a Variable Frequency Drive (VFD) by controlling the speed of the fan and modulating motors on the blower inlet dampers.

The **Secondary Chamber Blower** is extremely important as it creates the turbulence required to mix the gases and oxygenate them. This fosters the high efficiency combustion required to break hydrocarbon chains into carbon dioxide and water vapour. It also acts to cool the **Primary Chamber** and prevent temperature overruns.

The **Secondary Chamber** burner is a high output burner and its output is self modulated over a broad range for very precise temperature control.

The **Secondary Chamber** is sized to allow two seconds of retention time. This is the time that the gases from the **Primary Chamber** are retained in the **Secondary Chamber** before they exit to the next stage. Two seconds of retention is considered to be ideal to destroy any harmful organic hydrocarbons produced from the **Primary Chamber**.

Main Control Panel

There is one **Main Control Panel** that controls all of the interconnecting modules. The Operator has one simple **Human Machine Interface (HMI)** to start the equipment, view system status and change control settings if required. The system utilizes a PLC (programmable logic controller) to automate its functions. All critical process parameters such as temperature, combustion airflow and burner output are operated using EWS' patented system control program to maintain optimal combustion and air pollution abatement.

Protecting the Environment

Why Incinerate?

As society becomes more environmentally conscious, environmental regulations on the proper disposal of solid waste have become more stringent. As a result, incineration has become an environmentally responsible and socially acceptable alternative for handling waste at the point of need. However, incineration does not eliminate the need to landfill waste but it does reduce the amount of waste that must be placed in landfills.

Primary advantages of incineration are:

- It greatly reduces the weight and volume of waste material that must be disposed of in landfills
- It destroys organic materials that may be harmful or that may be degradable to harmful materials in landfills
- The incinerator sterilizes the waste; that is, the high temperatures in incinerators can destroy any pathogens that may be in infectious waste materials
- The incinerator destroys animal or human pathological wastes that the general public finds objectionable to handle or see.

Environmental Concerns

The general public will not accept incineration as an option for treating waste of any kind, if they do not believe that it is safe environmentally. The primary concerns are about air pollutants produced by the incinerator and the toxicity of the residual ash. This section will present some of the terminology that is important to understanding these concerns. The remainder of the manual will describe how an incineration system can be operated and maintained in a way that keeps environmental releases at an acceptable level.

Air Pollutants of Concern

Particulate matter may be defined as fine liquid or solid matter such as dust, smoke, mist, or fumes found in the gaseous emissions from the incinerator. Particulate matter emissions may have a dark or light color. Particulate matter emissions can be described in terms of opacity. Opacity is the degree to which light is obscured by a polluted gas (a clear window has 0 percent opacity while black paper has 100 percent opacity). Opacity may be measured with the naked eye or using an opacity monitor. Particulate matter is a problem because it can cause or aggravate respiratory problems in humans. It also creates aesthetic problems since it is readily noticed and is a nuisance because of soiling of exposed surfaces on houses and cars.

Hydrochloric (HCl) acid is generated when polyvinyl chloride (PVC) plastic (usually clear plastic) material is burned in the incinerator. The appearance of a white plume or cloud a short distance above the stack indicates that HCl is condensing. The major concerns about HCl are that it causes respiratory problems in humans, contributes to acid rain problems, and causes material damage to metals and concrete.

Toxic metals include cadmium, arsenic, beryllium, chromium, nickel, lead, and mercury. These metals may be found in municipal wastes. These metals are known to be hazardous to human health.

Organic compounds are compounds that contain primarily carbon and hydrogen and may also contain other elements such as oxygen, nitrogen, and chlorine in smaller amounts. Some organic compounds are known to cause or are suspected of causing cancer and are considered hazardous air pollutants. The public's primary concern is related to dioxin and furan emissions, but other organic compounds such as benzene and vinyl chloride may be emitted.

Carbon Monoxide (CO) also is generated during combustion if the combustor is not operated properly. (Your automobile generates some amount of CO.) CO is toxic to humans if concentrations are high enough, and it also is an indicator of combustion quality.

Solid Waste Ash Quality

One of the major objectives of incineration is to generate a high quality ash for land disposal. All pathogens should be destroyed, and almost all organic material should be completely burned. Ideally, no large chunks of unburned waste material (other than metals or glass) should remain in the waste. A measure of ash quality is "burnout," which is the percentage of organic material remaining in the waste. For example, a burnout of 95 percent means that the ash can contain only 5 percent organics. Adequately burned and quenched ash may be disposed of in a sanitary (municipal) landfill. The ash should be stored in covered containers or kept wet prior to transport to the landfill to prevent 'fugitive \ emissions.' Individual landfills may have requirements that must be followed in order for your waste to be accepted. You should familiarize yourself with these requirements to prevent refusal of the waste.

The Operator – Your Role

It is the operator's role and responsibility to protect the environment by:

1. Complying with all emission limits and operating practices specified in the permit to operate.
2. Minimizing emissions of particulate matter, HCl, toxic metals, carbon monoxide, and organic compounds through proper incineration;
3. Operating the incinerator to generate high quality ash that is sterile and can be disposed of in landfills;
4. Minimizing particulate matter emissions from ash handling;
5. Disposing of ash properly by sending it to appropriate disposal sites; and
6. Performing the regular maintenance inspections to catch any operational problems early.

Basic Combustion Principles

The Combustion Process

Combustion of Municipal Solid Waste (MSW) is a chemical reaction. In the incinerator, organic materials and oxygen react rapidly and violently to produce combustion gases and energy in the form of heat and light.

Organic Solid Material + Oxygen $\xrightarrow[\text{Heat}]{}$ Combustion Gas + Solid Residue + Energy(Heat)

For the reaction to begin and to keep going, all three elements - organic material, oxygen, and heat-must be present. The organic material used in the reaction comes from two sources, waste and auxiliary fuel. Some organic material is contained in most solid waste types. Depending on the fraction of organics and the specific organic composition, the waste may be adequate to sustain combustion. Auxiliary fuel may be used to maintain combustion if the waste material does not contain enough organic material to maintain high temperatures. The combustion reaction between the organic material and oxygen that causes the organics to burn will occur only after the temperature of the organic material is raised to the point that combustion can begin.

Energy in the form of heat is required to raise the temperatures of the incinerator chamber and organic material and O_2. This energy usually is supplied by the auxiliary fuel burners.

Rate of Combustion Air

The oxygen needed for the combustion reaction is supplied by the ambient combustion air. Combustion air is supplied to the combustion chambers through air ports by natural draft. In general, this air contains about 21 percent oxygen (O_2) and 79 percent nitrogen (N_2), so about 21 percent of the total combustion air fed to the incinerator is oxygen that is available to react with the organic material in the waste and fuel. The nitrogen passes through the chamber mostly unreacted; some nitrogen oxides are formed.

Oxygen Reaction

Solid waste contains two types of organic materials

1. Volatile Matter
2. Fixed Carbon

These two types of materials are involved in distinct types of combustion reactions, and the operating variables that control the two types of reaction are different.

Volatile matter is that portion of the waste that is vaporized (or evaporated) when the waste is heated. Combustion occurs after the material becomes a gas. The combustion variables that influence this reaction are gas temperature, residence time, and mixing.

- A minimum temperature is needed to start and sustain the chemical reaction.
- Residence time is the length of time, generally measured in seconds that the combustion gas spends in the high temperature combustion chamber. The residence time must be long enough for the reaction to be completed before it leaves the high temperature zone.
- Turbulent mixing of the volatile matter and combustion air is required to ensure that the organic material and oxygen are well mixed.

Fixed carbon is the nonvolatile organic portion of the waste. The combustion reaction is a solid-phase reaction that occurs primarily in the waste bed (although some materials may burn in suspension). Key operating parameters are bed temperature, solids retention time, and mechanical turbulence in the bed.

- The solids retention time is the length of time that the waste bed remains in the Primary Chamber.
- Mechanical turbulence of the bed is needed to expose all the solid waste to oxygen for complete burnout. Without mechanical turbulence, the ash formed during combustion can cover the unburned waste and prevent the oxygen necessary for combustion from contacting the waste.

Products of complete combustion are:

- Carbon dioxide
- Water

One example of volatile waste is backyard charcoal grill with starting fluid. The starting fluid is highly volatile. When put on the charcoal and ignited with a match, it rapidly volatilizes and burns. The charcoal contains less volatile matter and primarily burns slowly as a fixed carbon bed.

Operating Factors Related to Combustion

The three operating factors that have the greatest effects on the combustion reaction are:

- Combustion airflow rate and distribution,
- Operating temperatures, and
- Waste feed rate and characteristics.

These three factors are all related. Controlling them controls the combustion reaction.

Stoichiometric Air

In the chemical reaction between organic materials and oxygen, the amount of oxygen required under ideal or "perfect" conditions to burn all of the organic materials with no oxygen left over is called the stoichiometric (or theoretical) oxygen level. The amount of combustion air associated with that oxygen level is called the stoichiometric air level. At stoichiometric air level the combustion gas would contain no oxygen because it would all be used in the combustion reaction.

Substoichiometric Air

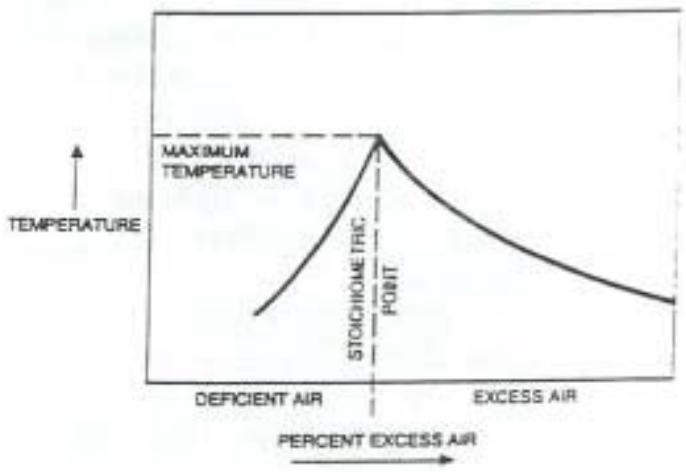
Airflows less than those required at stoichiometric levels are called deficient air or substoichiometric starved-air levels. Under starved-air conditions, the combustion gas would again contain no oxygen, but organics also would remain because combustion is not complete.

Excess Air

Air flows greater than those required at stoichiometric levels are called excess-air levels. Typically an incinerator operates with an overall 140 to 200 percent excess air level. That is, the incinerator operates with one and one-half to two times more air than required at stoichiometric levels. Excess air is used to assure that enough oxygen is available for complete combustion.

Control of Temperature as a Function of Air Level

Maximum combustion temperatures are always attained at stoichiometric conditions. As the amount of excess air is increased above the stoichiometric point, the temperature in the incinerator drops because energy is used to heat the combustion air. If the amount of combustion air is too great, the temperature drops below “good combustion temperature," and undesirable combustion products are generated as a result of incomplete combustion. As the amount of excess air is decreased, the combustion temperature increases until it becomes maximum at the stoichiometric point. Below the stoichiometric point, the temperature decreases because complete combustion has not occurred.



CONTROL OF TEMPERATURE AS A FUNCTION OF EXCESS AIR

The relationship of how combustion air level can affect temperature has just been shown. Temperature also plays an important role in the combustion of waste. Temperatures need to be maintained at levels high enough to ensure pathogen destruction and to sustain the combustion reaction. However, temperatures that are too high also cause problems. Continuous exposure of the combustor refractory to high temperatures is generally not desirable because it can cause the ash to fuse and can cause damage to the refractory.

Waste Characteristics

The primary characteristics of the waste that affect the combustion reaction are:

- The heating value
- The moisture content
- The chlorine content

Different wastes have different heating values and moisture contents. They will affect the combustion process.

The HEATING VALUE of a waste is a measure of the energy released when the waste is burned. It is measured in units of Btu/lb (J/kg). A heating value of about 5,000 Btu/lb ($11.6x10^{-6}$ J/kg) or greater is needed to sustain combustion. Wastes with lower heating values can be burned but they will not maintain adequate temperature without the addition of auxiliary fuel. The heating value of the waste can be used to calculate total heat input to the incinerator where:

Heat Input (Btu/h) = Feed Rate (lb/h) x Heating Value (Btu/lb)

Heat input to the incinerator will affect temperature. More heat input yields higher temperature. Heat input also will affect air requirements; more air is required (1 SCF/100 Btu).

MOISTURE is evaporated from the waste as the temperature of the waste is raised in the combustion chamber. It passes through the incinerator, unchanged, as water vapor. Evaporation of moisture uses energy and reduces the temperature in the combustion chamber.

CHLORINE in plastics or solvents in the waste feed will react to form hydrochloric acid (HCl). This HCl can be an emission problem. It can create corrosion problems of the equipment downstream from the incinerator.

The heating value (Btu value) and moisture varies widely. Compare plastics (high Btu, no moisture) to beddings, shavings, etc. to anatomical.

Summary of Key Operation Factors Affecting Combustion

1 Key factors are interrelated.
2 Air quality/distribution
3 Sufficient air for complete reaction
4 Distributed to promote mixing
5 Mixing
6 Assure contact of oxygen and organics
7 Temperature
8 High enough to sustain combustion
9 High enough to have complete reaction
10 Residence/retention time
11 Sufficient time to allow reaction to complete

Waste Characteristics are also important

12 Heating value
13 Measure of energy released

14 Heat input determines air required
15 Moisture content
16 Requires energy to vaporize water
17 Chlorine content
18 Affects HCl emissions

This summarizes the key parameters affecting combustion.

Products of Combustion Reaction

Complete Combustion

The primary products of waste incineration are:

- Combustion gases
- Solid residue (ash)
- Energy

The primary objectives of the combustion process are to generate an ash residue that is sterile (free of pathogens) and does not contain unburned, recognizable wastes; and to minimize air pollutants in the combustion gas stream.

The organic materials that enter the incinerator with the waste and fuel are primarily made up of carbon, hydrogen, and oxygen. Ideally, these organic materials react with oxygen in the combustion gas to form carbon dioxide and water vapor. The chemical reaction for this ideal situation is

$$\text{Organics} + O_2 + \text{Heat} \longrightarrow CO_2 + H_2O + \text{Heat}$$
(C, H, 0)

This ideal reaction represents complete combustion.

Incomplete Combustion

However, this ideal reaction does not occur in operating waste combustion systems. Factors that lead to a less than ideal reaction are poor mixing, too little combustion air, and low temperatures. Under those conditions products of incomplete combustion are emitted with the stack gases. The most common product of incomplete combustion is CO. Another product of incomplete combustion that often is emitted under poor mixing conditions or high temperature, low excess air conditions, is elemental carbon (or soot). The soot particles are very fine and generally result in high opacity at the combustion stack. Other products of incomplete combustion that cause concern because of their health impacts are hazardous organic compounds such as benzene, dioxins, and furans. Although these compounds are not found in the waste, under incomplete combustion conditions they can be formed as intermediate combustion products.

The waste feed also includes inorganic materials; generally, they are not involved in the combustion reaction. The inorganic materials in the waste feed (ash) are either retained in the ash or are emitted as particulate matter in the combustion gas. Air velocities in the combustion bed are controlled to reduce the amount of inorganic material entrained (picked up by) the combustion gas and emitted with the combustion gas. If combustion is not complete, organics

will remain in ash; this is typical…it is atypical to have 100 percent combustion of ash bed. Under poor conditions (low temperature, low turbulence in ash bed) may have pathogens remaining in ash; i.e., may not sterilize ash.

Combustion Indicators

The information presented in the above section suggests that the following indicators can be used to monitor combustion quality.

Opacity

The opacity of the combustion gas stream is a measure of the degree to which the stack gas plume blocks light.

- High opacities indicate high emissions.
- Opacity is primarily caused by noncombustible ash or uncombusted carbon (soot) in the flue gas.
- High opacities can indicate poor mixing or low levels of combustion air.
- High opacities also may be generated by high levels of HCl emissions or poor burner operation in the secondary chamber.

If a large amount of water vapor is present in the combustion gas, the water can condense when it cools as it leaves the stack forming a dense white "steam plume." This is not an indicator of poor combustion and should not be confused with a black or white smoke plume caused by soot or acid gases. Opacity can be visually determined by a person or measured by an instrument.

Other indicators which provide information about combustion conditions are measurements of the combustion gas oxygen and CO levels. However, these measurements require instruments and most facilities do not have those instruments.

Ash Quality

Visual appearance of ash can be an indicator of combustion problems. If an incinerator is operating properly, little organic material will remain in the ash. Whitish gray ash indicates better burnout and less carbon than black. The extent of organics combustion can be measured by the quantity of combustible materials remaining in the ash. Noted increases in combustibles in the ash indicate a combustion problem which may include bed temperatures that are too low, improper distribution of combustion air in the bed, or insufficient waste retention times.

SECTION 3

PHOTOS OF THE INCINERATOR

NOTE some of these are sample photos and may not depict the actual Incinerator components

Primary (right) & Secondary (left) Chambers

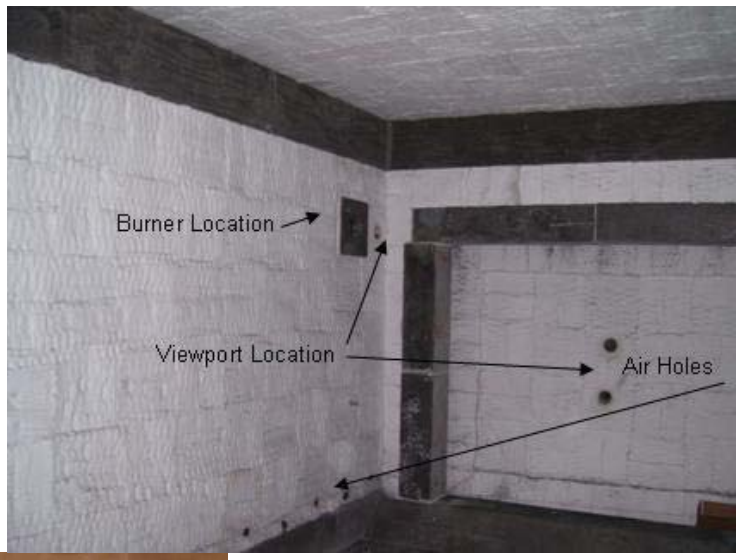


NOTE **Stack sections and breech have not been installed.**

Primary Chamber Access Door View

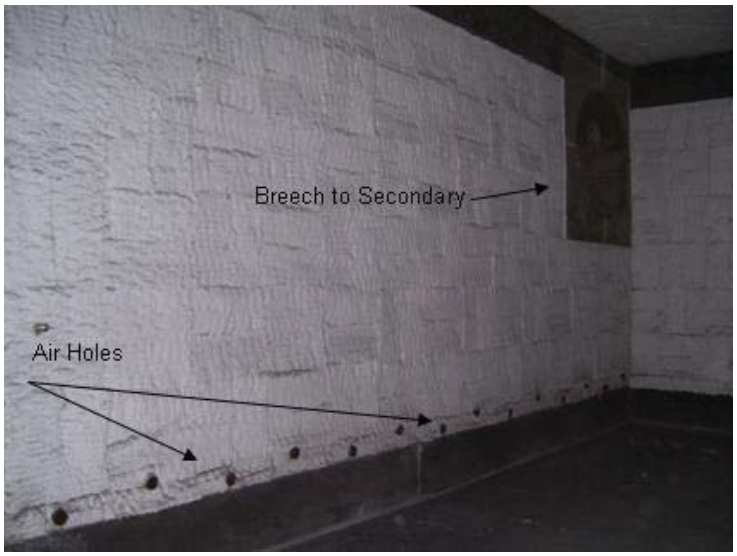


Primary Chamber Interior View (sample picture)





Floor and grate detail



Secondary Chamber Door View



Secondary Chamber / T-section View



Primary Chamber Blower



Secondary Chamber Blower

Adjustable Damper and Modutrol Motor



Primary Chamber Burner



NOTE **Burner is shown without cover installed.**

Diesel Tank (4,500lt)



Secondary Chamber Burner



Waste Oil Tank (5,000lt)



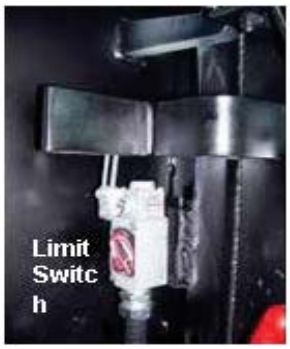
Main Control Panel



Thermocouple, Viewport and Limit Switch







T-Stack and Stack Sections



Spark Arrestor



SECTION 4

ASSEMBLY & INSTALLATION INSTRUCTIONS

General Assembly and Installation Overview

The incinerator is factory pre-assembled to ensure proper fit then shipped disassembled. On-site assembly by certified trade's people is required. Trades people (Riggers, Mechanical Contractors, Millwrights, Electricians, Gas Fitters, etc) are to be arranged by Purchaser and/or Contractor.

This is a **general overview**, therefore, project specific details must still be considered. Please refer to relevant data and drawings supplied by EWS.

Purchaser/Contractor Responsibilities

These responsibilities include, but are not limited to, the following:

1. Ensure all concrete and structural steelwork, as may be required, is adequate to support the incinerator and associated equipment. The Purchaser/Contractor is responsible for all concrete design such as slab thickness, footing depths and dimensions and any placement reinforcement so as to be consistent with all applicable building codes.

2. Supply of any anchor bolts when applicable.

3. Provide all utility services to the equipment including fuel, electrical, water, air, etc, as may be required.

4. Provide adequate air makeup to the incinerator room through forced air circulation blowers, air intakes and/or opened louvers to avoid the creation of negative pressures within the building.

5. Observe caution in the selection of materials and coating of building walls or other structural components to the incinerator area giving due consideration to high-localized temperatures of the incinerator.

6. Provide all external thermal insulation when required on steam piping, water piping, etc.

   NOTE External thermal insulation should never be applied to any surface of the incinerator or refractory lined stacks and breeching. If applied to these surfaces, structural damage may result.

7. Provide proper roof thimbles, clearances, flashing and counter flashing around all roof penetrations, including the incinerator stack.

8. Guying of all stacks (if required) is to be done by the Purchaser/Contractor. Guying should be at three points at 120° apart or four points at 90° apart. The Purchaser/Contractor provides design of guying and guying connection points to the stacks. Torque draw band bolts to 35 lbs. during stack assembly.

9. Provide proper protection of all equipment from damage, vandalism and weather, while on-site and/or when installation is in progress.

10. Provide all touch up painting and cleanup of equipment after erection.

11. Inspect and field weld miscellaneous flanges, when applicable.

12. Supply all main fuel line regulators at connection points to the Incinerator. Fuel lines should be sized for maximum pressures and instantaneous fuel flow at cold starting. Pressures should be based under flow conditions, not static. Static pressure should never exceed the design pressure of the pressure regulator. Gas volume includes burner pilot requirements.

13. General Arrangement drawings are normally provided by EWS. As soon as possible after acknowledgement of a Purchaser/Contractor's order, it is the responsibility of the Purchaser/Contractor to provide EWS with all applicable sketches, layouts, building drawings, roof and floor elevations and other pertinent information to allow preparation of the General Arrangement drawings. With this information, the Purchaser/Contractor's will provide desired orientation of the chambers.

14. The Purchaser/Contractor must recognize the importance of proper waste material descriptions concerning physical and chemical properties. Changes in waste composition to be incinerated should be made known to EWS, as soon as possible.

15. It is the Purchaser/Contractor's responsibility to obtain all construction, operating and environmental/air emissions permits as may be required in the area of jurisdiction for the incinerator equipment. EWS will assist in supplying all technical information required for these permits to the Purchaser/Contractor.

16. The Purchaser/Contractor must be aware that certain components will be broken down for shipment purposes and reassembly will be required in the field by the Purchaser/Contractor.

17. Locating and mounting the incinerator in a confined area should be avoided. The Purchaser/Contractor should maintain ample space around all equipment for maintenance, cleaning and safety considerations. A rule of thumb would be to provide a minimum of six feet from all major equipment surfaces and edges. Always allow proper space for the swing radius of loading doors, cleanout doors and electrical panel doors. If space limitations exist, it is the Purchaser/Contractor's responsibility to make EWS aware of these dimensional restraints so that modifications may be considered.

18. Do not scale drawings: If certain dimensions are required which are not shown on drawings, the Purchaser/Contractor should contact EWS Project Manager. EWS will not be responsible for any dimensional conflicts resulting from dimensions not shown on a certified drawing. Do not use general sales literature or other general equipment submittals for construction unless so indicated. EWS reserves the right to change equipment dimensions as required for design purposes.

19. All drawing dimensions are typically subject to ¼"tolerances.

20. If the refractory is shipped in the green condition, the refractory has not been heat cured. This curing process must be accomplished in the field after final erection and assembly. It is understood that the Purchaser/Contractor will provide all required utilities for this curing process and initial equipment operation for adjustments at no expense to EWS including but not limited to fuel, electrical, water, etc.

21. Due to the physical size of the incinerator, the unit is shipped partially dismantled and will, therefore, require reassembly in the field. Consult EWS for maximum component weights so that properly sized cranes are available at the site for unloading and erecting. Purchaser/Contractor may, also therefore, have to reinstall electrical components and control connections, burners, blowers, lifters, etc. These connections are normally of the flexible type with leads marked.

22. Lifting lugs are provided on chambers, stacks, and major accessories. These lugs should be used in setting the pieces into position. Do not attach lifting chains or cables to piping, control panel or mounting flanges as they may be damaged. Avoid dragging lifting gear across painted surfaces as this will cause damage to the high temperature paint. When placing the incinerator into position be extremely careful not to subject the refractory to mechanical shock as this may result in refractory damage.

Step by Step Assembly and Installation Instructions

The following **sequence** applies specifically to the Meliadine Waste Incinerator.

Trades-people required for the following steps:

Forklift Operator, Crane Operator, Riggers, Electrician and Mechanical Contractors (pipe and gas fitter)

Please refer to the supplied drawings and data.

Foundation Drawing: Anchor Bolt and Loading Diagram ECO1.75TN1PVC100L-00D rev.0

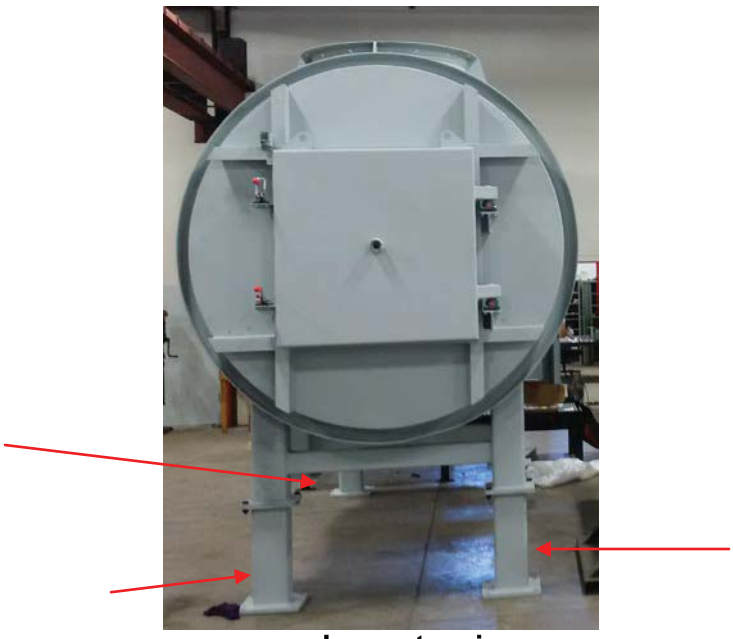
1. The incinerator and related components must be installed on a level concrete pad. It is recommended that appropriate consultation with civil engineers and/or architects is taken before designing an appropriate foundation for the equipment.

2. Please refer to General Arrangement Drawing ECO1.75TN1PVC100L-00A rev.1 and its Bill of Materials.

Place the Primary Chamber and Secondary Chamber on the Foundation

3. Locate leg extension for the Secondary Chamber and put into position.

4. Once the leg extensions have been put into place, using a crane, lift the **Secondary Chamber** into position and connect the leg extensions.



Leg extensions

5. Position the Secondary Chamber (item 2) beside the Primary Chamber (Item 1) on the level concrete pad. Ensure that the breech openings on each Chamber are facing each other.

6. Shim with steel shim plates to ensure the Secondary Chamber is level. This is required to prevent rocking, or any movement of the **Secondary Chamber.**



Connecting the Breech to the Secondary Chamber

1. Install the **Secondary Breech Gasket,** by spraying the gasket adhesive on the Breech connecting flange and on the gasket material. Line up holes of the **Secondary Breech Gasket** to line up with the flange bolt holes. Press **Secondary Breech Gasket** onto flange securely.



Gasket adhesive spray being applied



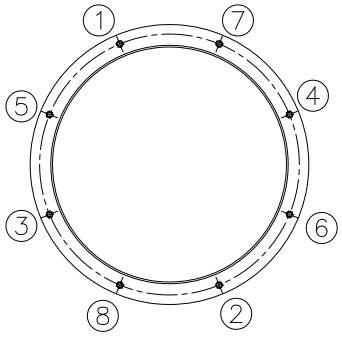
Correctly Installed Gasket

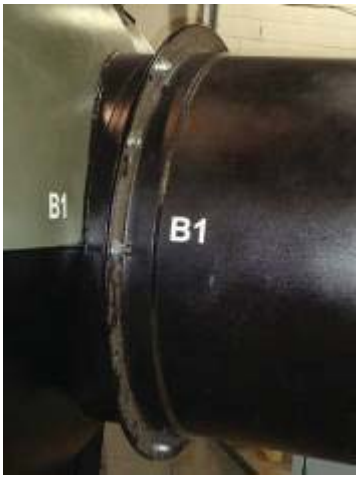
2. Raise the **Breech** (Item 7) with forklift and slings, once the **Breech** is 8 to 13 cm from the flange, use alignment bars to help with the final alignment of the two (2) breech flanges, as shown below.





3. Once breech flanges are aligned and together bolt flanges together using the numerical order described in the pattern below using hardware provided.





Correctly installed Breech on Secondary Chamber

Position the Primary Chamber

1. Install the **Primary Breech Gasket,** by spraying the gasket adhesive on the Breech connecting flange and on the gasket material. Line up holes of the **Primary Breech Gasket** to line up with the flange bolt holes. Press **Primary Breech Gasket** onto flange securely.



Gasket NOT installed



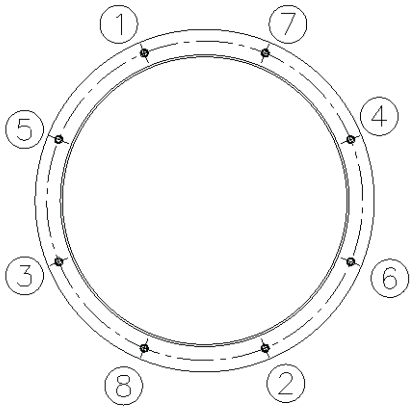
Correctly Installed Gasket

2. While constantly checking alignment of the **Breech** move **Primary Chamber** along the floor using the forklift and skates until the flanges are aligned.

NOTE Do NOT pull the Primary Chamber closer to the Secondary Chamber with the flange bolts. Doing so will bow the steep plate, in turn damaging the breech refractory.

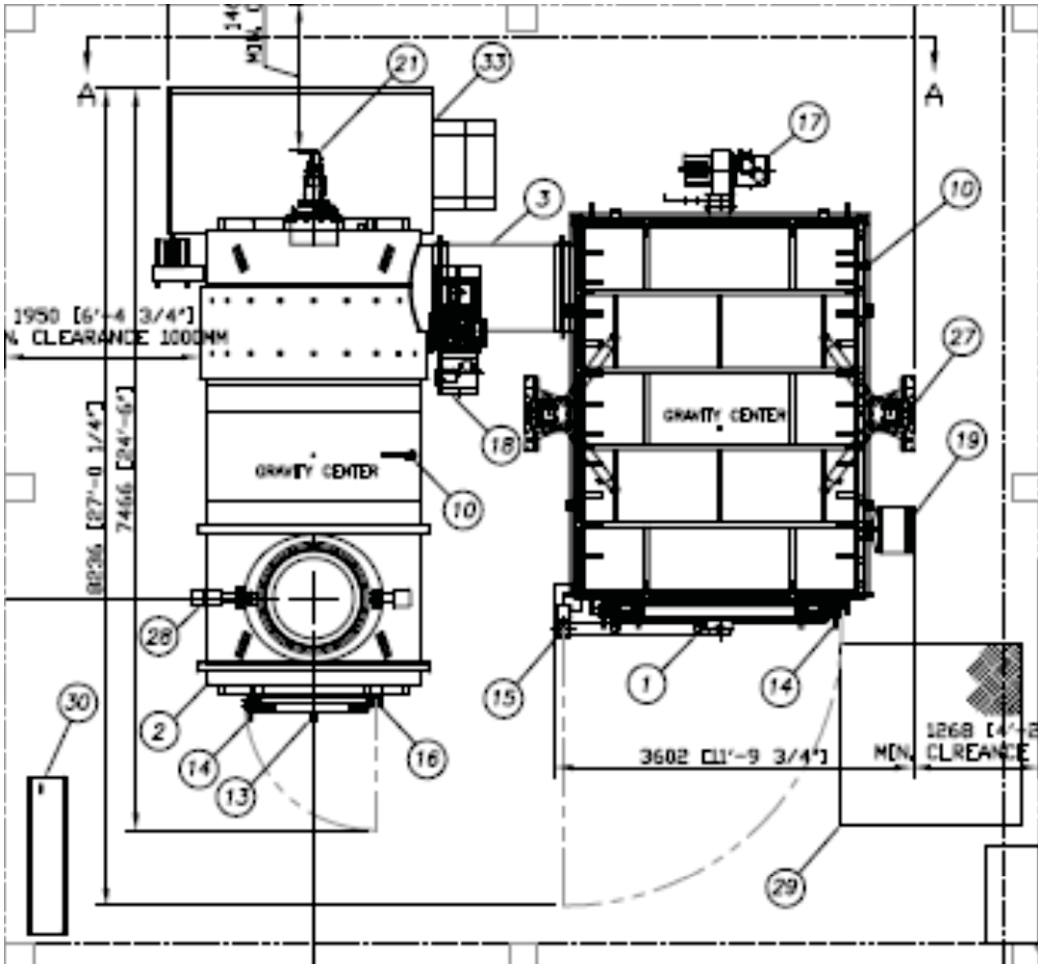
3. Once breech flanges are aligned bolt flanges together, shim and level the Primary Chamber with steel shim plates. Support pads should be shimmed as required to prevent rocking, or any movement of the Primary Chamber.

4. Using the numerical order described in the pattern below using hardware provided.





Correctly Installed Breech on Primary Chamber



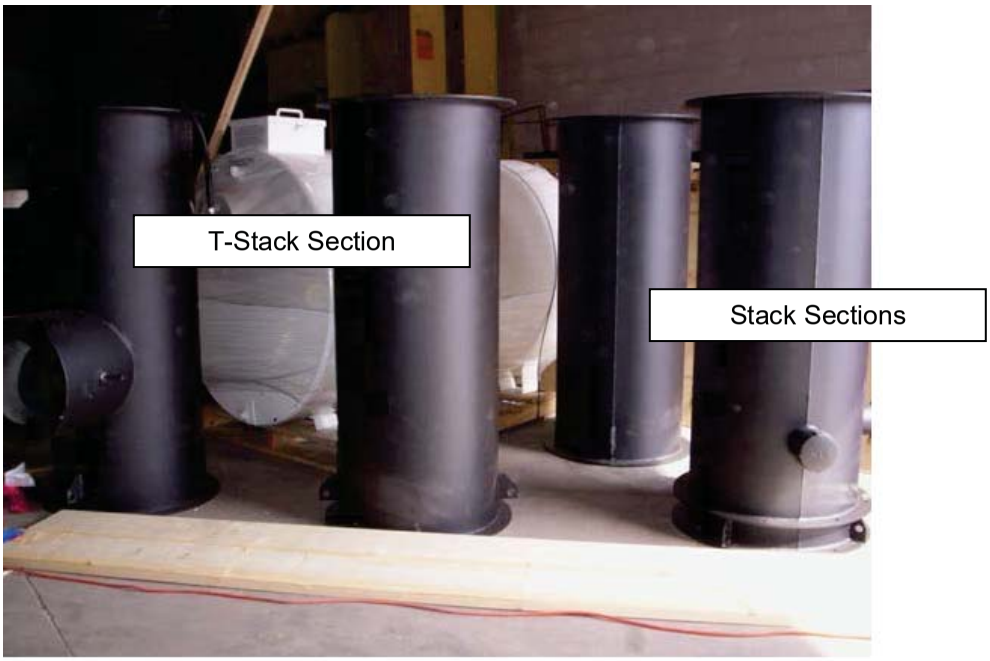
NOTE The diagram above shows the burners and blowers already attached to the Primary and Secondary Chambers. When positioning the Primary Chamber, Breech and Secondary Chamber, these items will not be attached.

Installing the Stack

Install stack gaskets between stack sections.



Install refractory-lined *T-Stack Section* on top of the *Secondary Chamber* using the hardware provided. Then install the next four *Stack Sections and the spark arrestor* as per the drawing using hardware provided.



T-Stack and Stack Sections

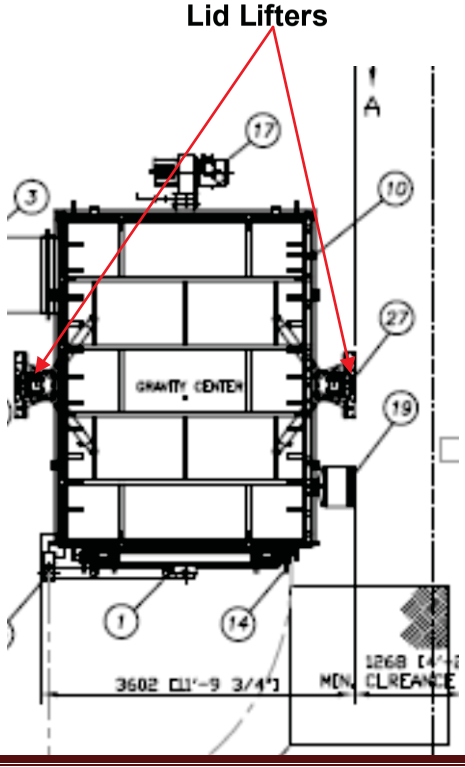


This is a Sample Photo only of Erection of the Stack Sections

Installing the Lid Lifters

1. Place the lid lifters (item 27) on either end of the Primary Chamber. The slave column, the one without the hydraulic power pack, is to be located in between the chambers.

Lid Lifters



2. Once lifters are in place, shim and level, do not exceed 2.54 cm under the column. Anchor the columns to the floor.

3. Install the pre-assembled hydraulic pump on the master column reinforcement and connect the hydraulic hose and piping.

4. Install the limit switches, proximity switches and solenoid valves with the hardware provided.

5. Install the control stations for the lid lifters (attached to junction box at the master column). Location determined by customer.

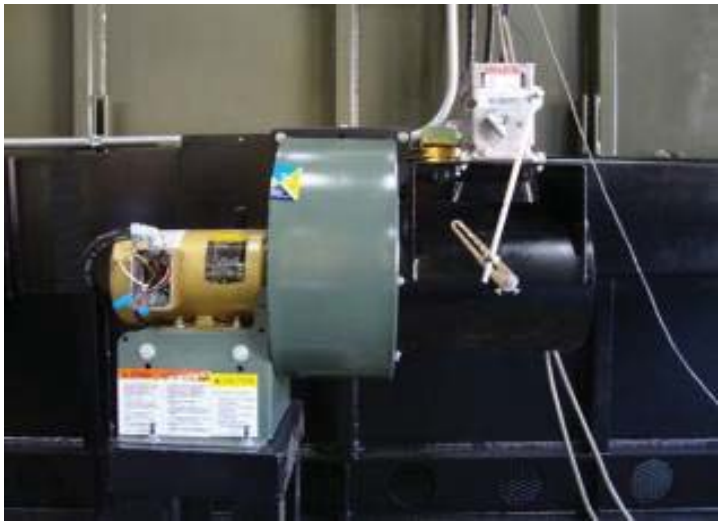
For further detail consult the OEM manual of this lifter in 6515-S-265-008-280-EDS-0015_Sub002.pages175to190

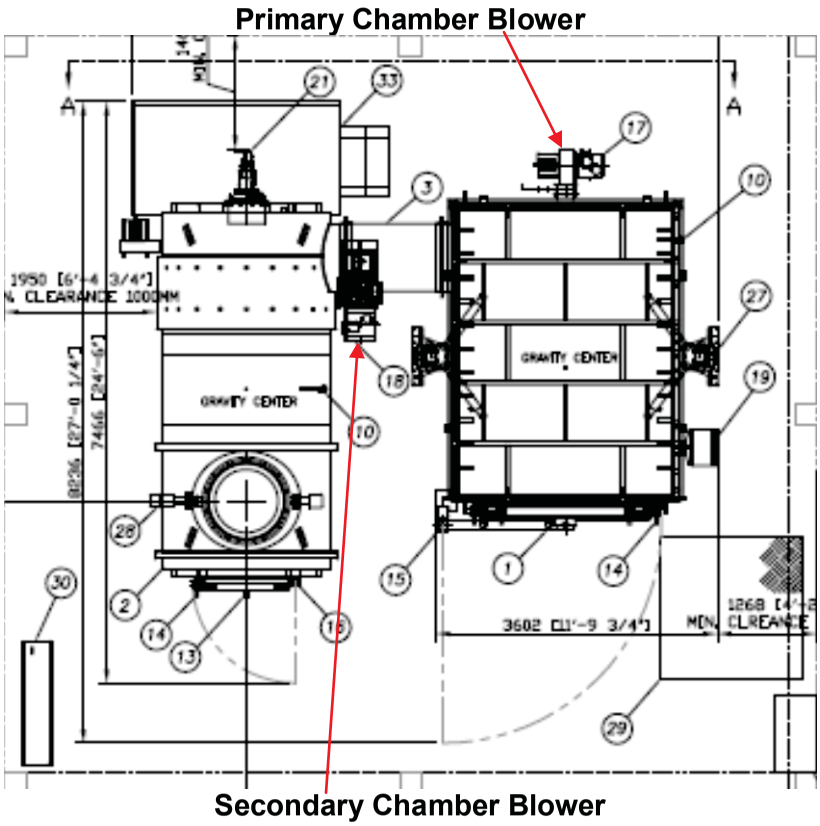
Assembling and Installing the Primary Chamber Blower

1. Place the **Primary Blower** mounting frame where the **Primary Blower** is to be installed.

2. Install **Primary Blower**, shim and level as required with steel shim plates until the flanges are align. Support pads should be shimmed as required to prevent rocking.

3. Bolt together using bolts provided after alignment of all bolt holes





Assembling and Installing the Secondary Chamber Blower

1. Place the **Secondary Blower** mounting frame where the **Secondary Blower** is to be installed.

2. Install **Secondary Blower**, shim and level as required with steel shim plates until the connecting flanges are level.

3. Bolt together using bolts provided after alignment of all bolt holes.

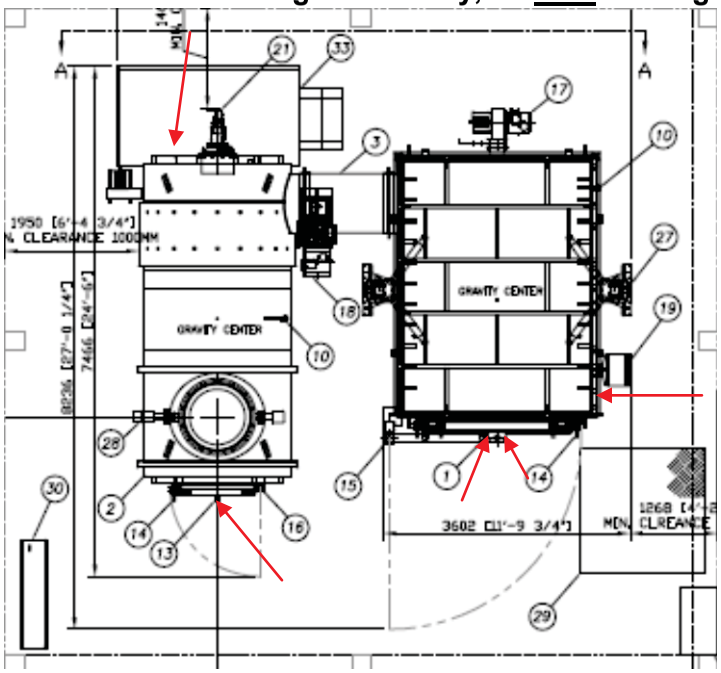


Secondary Chamber Blower

Installing the View Ports

1. Install four (5) 2" threaded **Viewports** at positions indicated in red below on **Primary Chamber** door, the left hand side of the **Primary Chamber Burner,** the **Secondary Chamber** door and the right hand side of the **Secondary Chamber Burner.**

NOTE **The viewports should be hand tightened only, do NOT over tighten.**



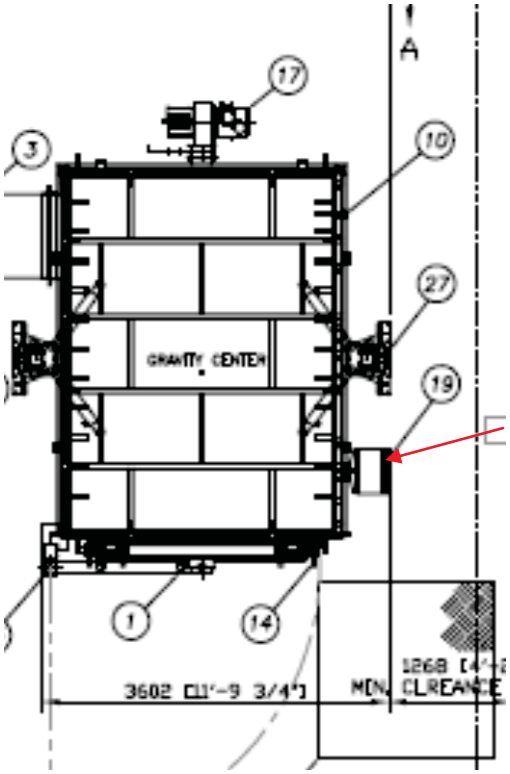
Installing the Primary Chamber Burner

1. Install the **Primary Burner** and burner gasket in the burner port located on the right side of the **Primary Chamber**.

2. Bolt together using provided hardware after alignment of all bolt holes.



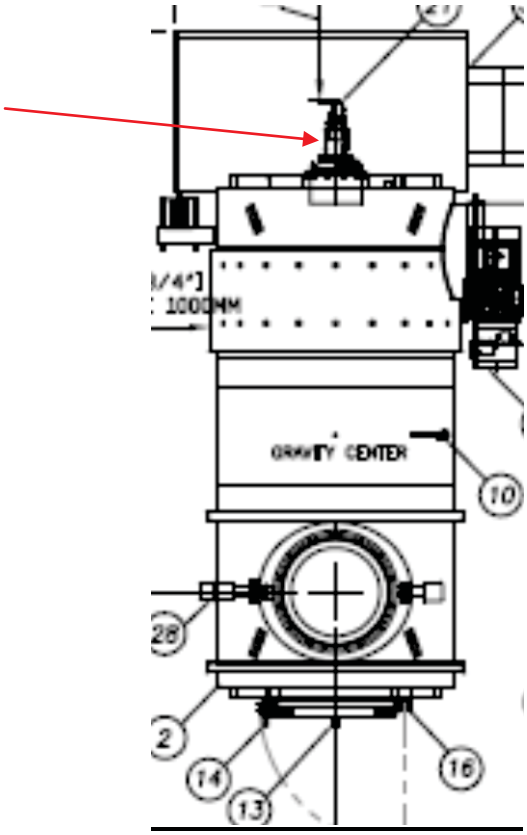
Primary Burner shown without red cover installed.



Installing the Secondary Chamber Dual Burner

1. Install the **Secondary Chamber Burner** and gasket in secondary burner ports using the hardware provided. The fuel train is pre-assembled and the final installation to follow the P&ID drawing





It is the customer's responsibility to conform to any local codes when installing the Waste Oil System.



Positioning and Installing the Diesel Tank

The Fuel Tanks are to be installed at ground level as per the site layout. Locations are to be determined by the customer to satisfy all local codes. Interconnecting piping and filters for each burner have been shipped with the equipment

Fuel Connections

Reference: General Arrangement ECO1.75TN1PVC100L-00A rev.1 and P&ID ECO1.75TN1PVC100L-00B rev.1 drawings

NOTE All fuel connections to be done by a certified technician and should satisfy all local codes (all lines to be pressure tested), including the distance between the incinerator system and the fuel tanks. If not properly installed and maintained, the waste oil tank (see image) can become a serious threat to the environment. Ensure the installation follows all local regulations and environmental protection measures.

Even though the tank is double walled, it is highly recommended that the installation site of the storage tank be equipped with a secondary containment system consisting of the following: dikes, berms, or retaining walls and a floor. The floor should cover the entire area within the dike, berm or retaining wall.

WASTE OIL PIPING TRAIN
The Waste Oil piping train consists of:
1. Pump skid.
2. Interconnecting piping.
3. Fuel train to dual burner.

When installing the waste oil piping train check to ensure that:
- Piping is clean.
- That the pipe has been reamed and free of burrs
- The work is done to trade standards

To perform the installation a (½" and 1") pipe threader is needed.

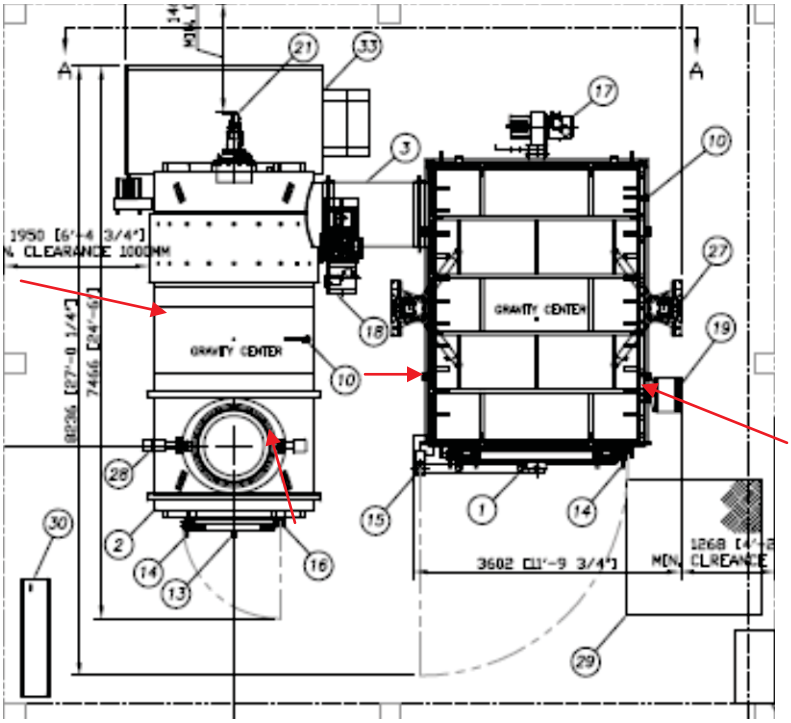
Note: When the pipe installation is complete flush out the line to remove any sediment and dirt that may have contaminated the pipes.

This incinerator system includes two (2) waste oil totes and their correspondent containment, as well as spill kits according to the volume, these items are to be deployed by the customer according with their waste management plan.

Also, two (2) ash bins are included for the storage of the ash removed from the incinerator.

Installing the Thermocouples

1. Install the four (4) ¾" threaded **Thermocouples** at the positions indicated in red below: two (2) in the **Primary Chamber,** one (1) on **Secondary Chamber** and one (1) on **T-Stack**



Installing the Weigh Scale

The weigh scale is to be installed closer to the loading point (to be determined by customer) and anchor it (note: the loading of this incinerator is intended to be through the roof when the lid is in the open position.

Electrical Connections

Reference: Electrical Drawings ECO1.75TN1PVC100L-10A / B/ C/ D rev.0 (17drawings)

NOTE All electrical connections, terminations and conduit installation to be done by a certified electrician and should satisfy all local codes.

1. The **Main Control Panel** should be installed at a minimum of 8' from the Incinerator system.

2. Wiring is necessary (customer's scope) from the power source to the **Main Control Panel** and between the **Main Control Panel** and the **Junction Boxes** on the incinerator and all Teck Cable from the junction boxes to the components.

3. The **Thermocouples** must be wired directly to the thermocouple input card on the **PLC** with the thermocouple wire provided, without splicing the wire. Interconnecting cable has been shipped with the equipment

4. Connect terminal wires. Connect main electrical feed through conduit connection in the bottom of the panel enclosure to the line terminals on the disconnect switch.

5. Run cables to scale and tank

Start Up and Commissioning EWS Field Services



Do not attempt to place the equipment into operation until an EWS Service Technician has inspected all equipment and interlocks.

1. Upon completion of mechanical erection, interconnection of equipment and provisions of utilities as described above, arrangements should be made with the EWS field service department for scheduling of a service technician for initial start-up.

2. An EWS representative must perform start-up of all incinerator systems unless specifically arranged otherwise in writing by EWS.

3. Attempts to start-up incinerator systems by the buyer without prior written approval may result in revocation of all expressed or implied warranties.

SECTION 5

OPERATING INSTRUCTIONS

Important Information

Proper operating and maintenance procedures must be followed in order for the ECO Model Incinerator system to perform at maximum efficiency.



Do not attempt to start or operate this equipment until this Operator Manual is read thoroughly and is understood.

The equipment has been designed with many safety features, however, like all thermal processes; this equipment is not free from the inherent hazards of high temperature processes.



Safety procedures and precautions must be followed at ALL times during operation.

There are safety procedures outlined in this Manual, however, no amount of written instruction can replace good judgment and safe operating practices.



Responsibility for the safe operation and maintenance of the equipment supplied rests solely on those operating it.

There are many engineered features incorporated into the ECO Model Incinerator system to free the operator of repetitive chores. They do not, however, relieve the operator of maintenance responsibilities. In order to maximize the operating life of the equipment, it is strongly recommended that the maintenance procedures, outlined in Section 6, be followed diligently. It is advisable to keep an equipment log for recording maintenance activities along with unusual operation.

NOTE

In the event that the equipment is not operating in the normal manner, contact Eco Waste Solutions immediately at (905) 634-7022 and ask for Customer Service Manager. It is important to report problems as soon as they are noticed to minimize damage that faulty operation could cause.

Design Specification Criteria

The **ECO 1.75 TN 1PVC100L incinerator systems** was designed specifically for the **Meliadine Mine.** Based on information provided, the EWS team designed an incinerator with the following criteria in mind.

Waste Description and Assumptions

Solid waste:

- Food waste (food, food packaging and containers, plastic and paper waste from food preparation) - 50%
- Domestic waste (paper, plastics, bottles, newsprint, cans, cardboard) - 40% Packaging (cardboard boxes, paper, plastic containers, plastic film, Styrofoam, poly-weave bags) - 10%
- Absorbents (Rags, wipes, spill cleanup materials) - negligible
- Medical waste (bandages, dressings, gloves, swabs, syringes, sharps) - Negligible

Waste Oil:

- Used Oils (hydraulic, transmission, motor, crankcase, gear box, synthetic and brake fluids)

The waste is expected to be bagged or stored in skips/bins around the mine operation and then brought to the incinerator building by truck. The waste oils will be brought to the incinerator by totes (handling by forklift or pallet jack).

Waste Quantity

The incinerator is designed to process and treat the waste generated on site, up to 1,750 kg per day. Therefore the ECO 1.75TN 1PVC100L incinerator system was selected, as it will process up to 1,750 kg of camp waste per day in a single batch.

Incinerator Design Parameters

Incinerator Design Parameters	Unit	Details
Secondary Chamber Operating Temperature	°C	1000
Secondary Chamber Retention Time	s	2 (minimum)
Incineration capacity	Kg/day	~~1700~~ 1750
Charge per cycle	Kg	1700
Burn Cycle Duration for entire load	h	less than 10
Cool Down Cycle Duration	h	8 to 12

NOTE

This incinerator was only designed for the type of waste and amount of waste mentioned above. It is important that the waste quantities and characteristics described above are processed in the incinerator. Otherwise, the incinerator system will not operate properly.

It is also important to note that some waste-streams are unacceptable and SHOULD NOT be processed in the incinerator.

Unacceptable Waste-streams

The following is a list of some of the waste streams that should not be processed in this system.

Waste Materials Not Suitable for Processing in Eco Waste Solutions Technology

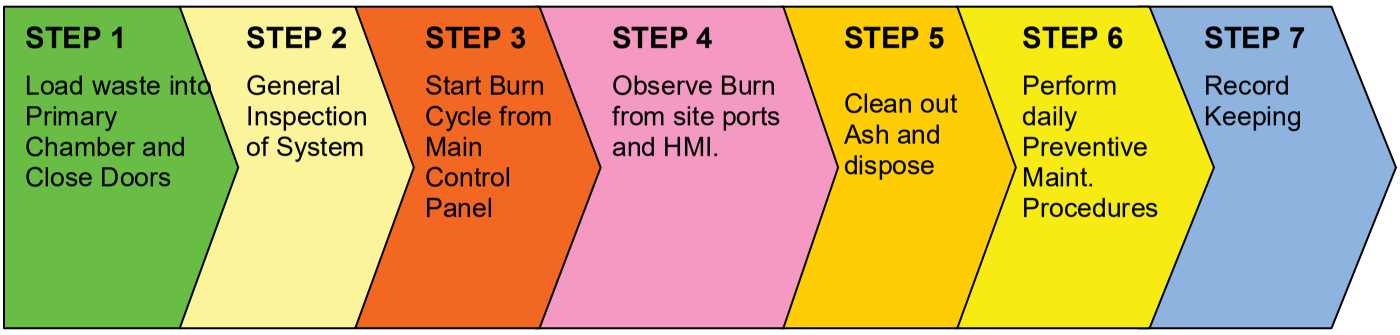
Solid Waste	Description	Origin
Bulky Materials	Automotive or heavy equipment parts such as engine blocks and transmissions	From vehicles and equipment maintenance shop
Non-Combustible Materials	Drywall, asbestos, bricks, concrete, soils	Construction activity
Radioactive Materials	Smoke detectors, laboratory wastes	From Buildings, laboratories
Potentially Explosive Materials	Large propane tanks, other pressurized vessels. Actual explosives	From warehouse, plant and production facilities
Heavy Metals	Items containing lead, mercury, cadmium, for example: batteries, electronic devices, fittings, old pipe work, fluorescent light bulbs, electrical switches, thermometers, PVC plastics, aluminum solder, photovoltaic cells	From maintenance activities, operations and construction activities
Liquid Waste	**Description**	**Origin**
High Alkaline or High Acid Materials	By-products of industrial processes, unrefined fuels	From warehouse, plant and production facilities
Solvents	Solvents such as acetone, xylene, methanol	From vehicles and equipment maintenance shop

Important Notes:

1. These lists are guides and should not be assumed to be an exhaustive list of materials
2. A waste and procurement audit is highly recommended and encouraged to ensure that all sources of heavy metals (especially mercury) are identified and diverted from the incinerator

General Operating Overview

The operation of the **ECO 1.75TN 1PVC100L Incinerator** package follows 7 general steps that take place over a 24-hour period.



Although all 7 steps are critical in the general operation of the incinerator system, this section of the manual focuses on **Step 1, Step 3** and **Step 4** and how to start the system and monitor it during operation.

It is assumed, at this point, that the waste material is properly loaded with the weight, density and type the incinerator is designed for, as outlined on page 5 of this section.

It is also assumed that the waste is loaded after the ash has been removed from the previous burn cycle and any daily maintenance routines have been completed.

This section will also cover **Step 7** on how to use the historical charts, store incinerator data, and access incinerator historical information for record keeping purposes.

Monitoring and Data Acquisition System

Overview

The **Human Machine Interface (HMI)** system automatically monitors the entire process and all system inputs are recorded and logged for record-keeping purposes and also allows for historical trending of key operating conditions.

The integrated **Human Machine Interface (HMI)** in the Main Control Panel monitors and records the following:

1. Temperature sensors
2. Differential pressure sensor with transmitter (draft)
3. Monitoring of burner functions
4. Auxiliary burner operation and fan amperage monitoring via current transducer
5. Door position interlock monitoring
6. High temperature limit and interlock
7. Low Fuel level limit and interlock
8. Air proving switch interlocks
9. Waste loading records

All data can be transferred to storage by using USB port (to transfer to PC to print)

HMI Operator Interface

Main Control Panel Components



Number	Name	Purpose
1	**Main Disconnect Switch**	Isolates the incinerator from its source of electric power.
2	**Human Machine (Operator) Interface**	Displays various screens reflecting system performance.
3	**Control Power ON**	1. Green light indicates the control power in the panel is on. 2. Pushing it if the **Emergency-Stop** is out will turn on the control power.
4	**Emergency Stop Pushbutton**	When pushed, shuts down the system and disables any possibility of starting it.
5	**Communications Port**	Allows for communication to/from the PLC
6	**Start Switch**	Activates the system

The Human Machine Interface (HMI)

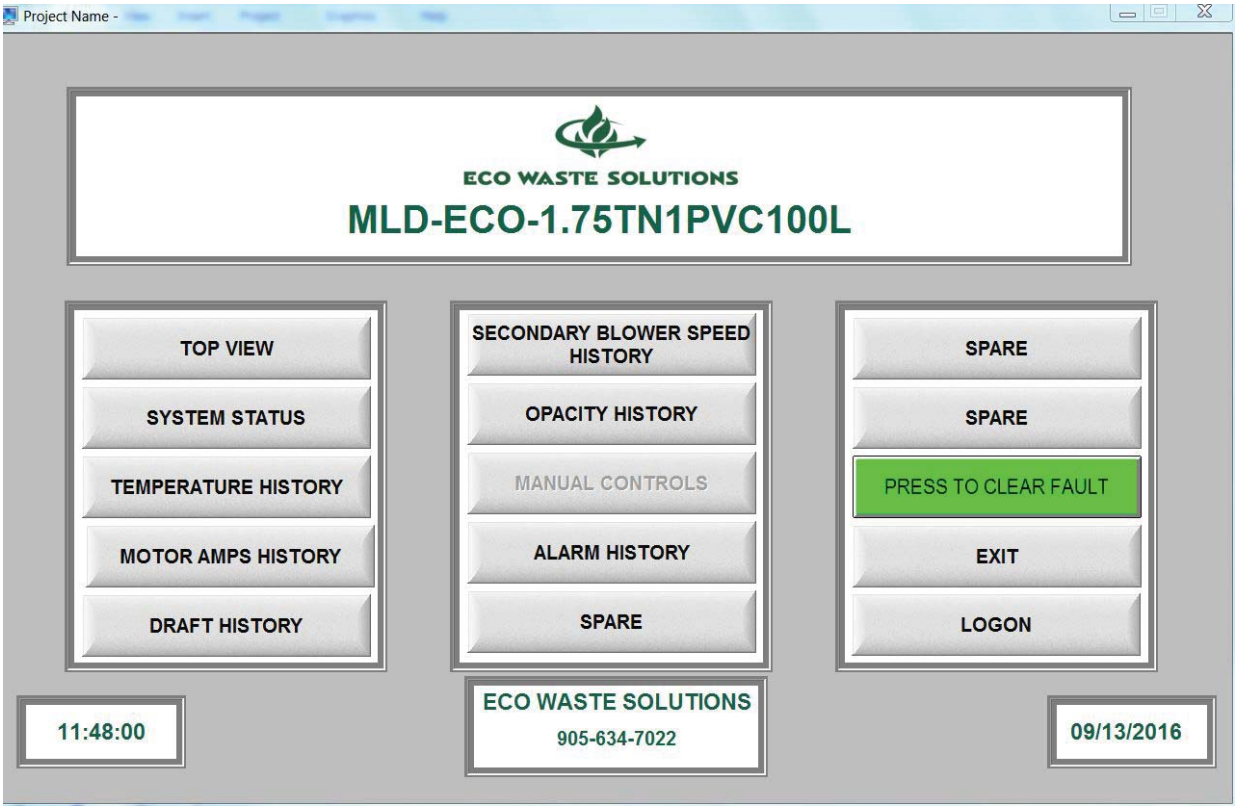
The **Human Machine Interface (HMI)** controls the operation of the incinerator directly from the **Main Control Panel.**

The **Main Menu** screen displays all the available options for viewing the system in operation.

The **Human Machine Interface (HMI)** has a touch-screen and items can be selected by touching them on the screen.

Main Menu

The first screen the operator will view is the **Main Menu** (see below).



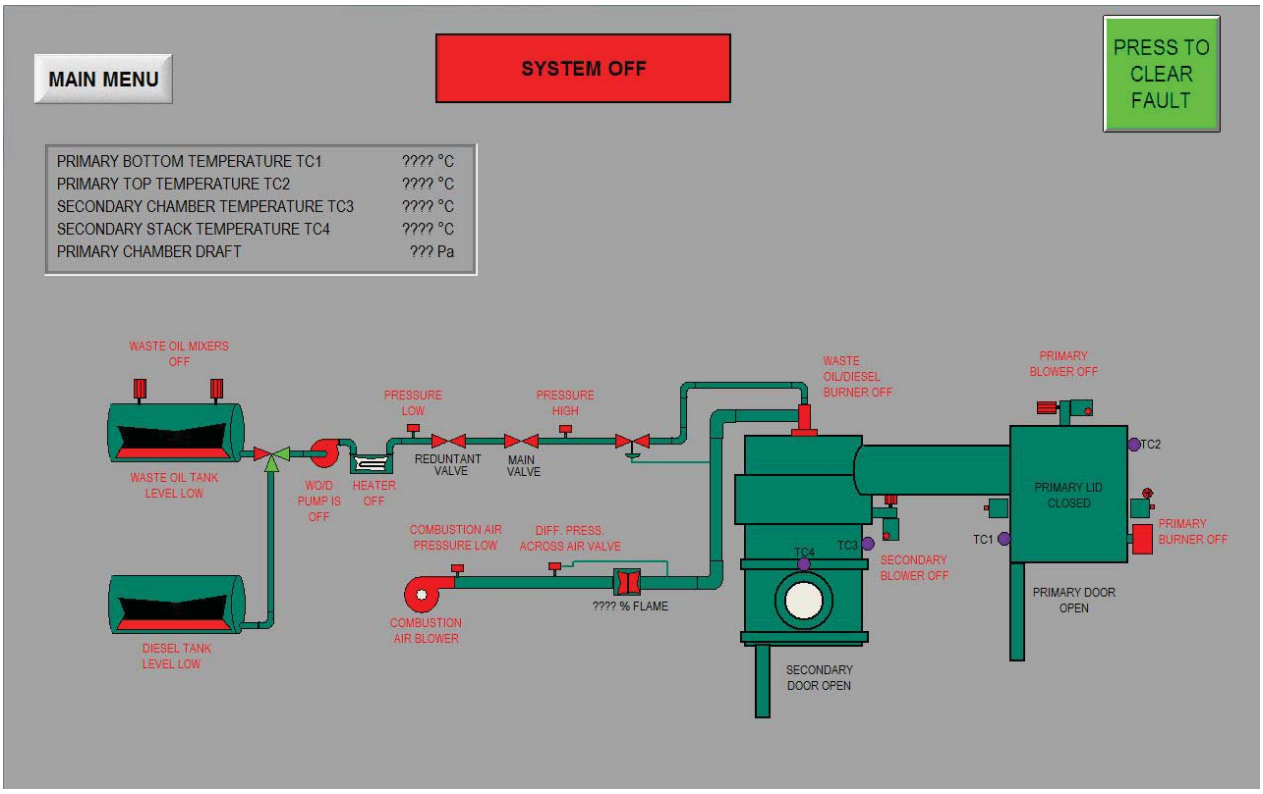
Top View

When the ***Top View*** button is selected, an overview of the incinerator and related components is displayed. This shows key temperatures, flows, and other indicators of what is happening in the process in a real-time basis.

NOTE

The system will not start if there are alarms or faults present. Clear and/or acknowledge faults.

At any time, touch **Main Menu** to go back to the main screen.

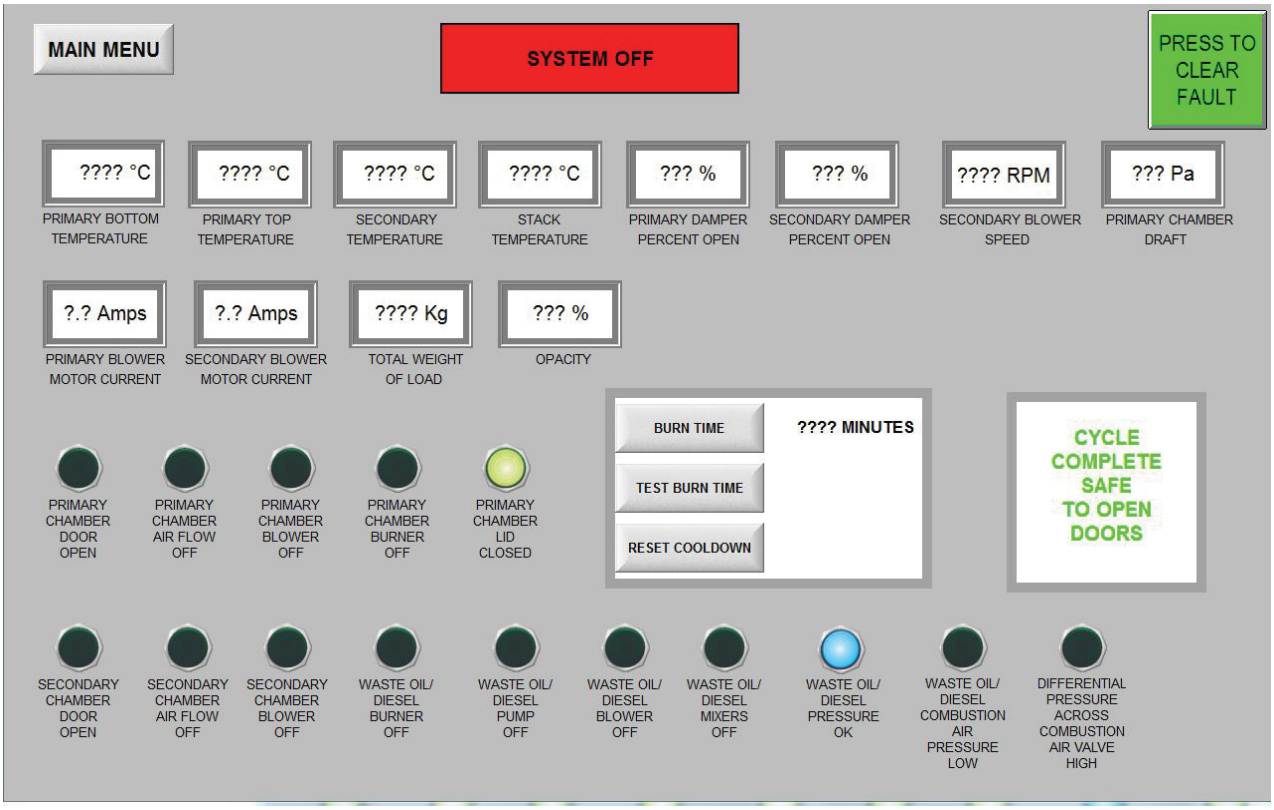


System Status

When the ***System Status*** button is selected from the **Main Menu,** a screen will display the status of all the operating parameters of the incinerator, such as the temperatures and the time remaining in the cycle, as well as displaying other informational items such as status of the door, lid lifter, blowers, etc.

The operator can change the burn time of the cycle by selecting “BURN TIME” and entering a time (in minutes). The operator may do this over time to either prolong the burn time, or decrease the burn time depending on the waste mixture; for example a very wet batch of garbage will take more time to burn than a dryer batch of waste.

At any time, touch **Main Menu** to go back to the main screen.



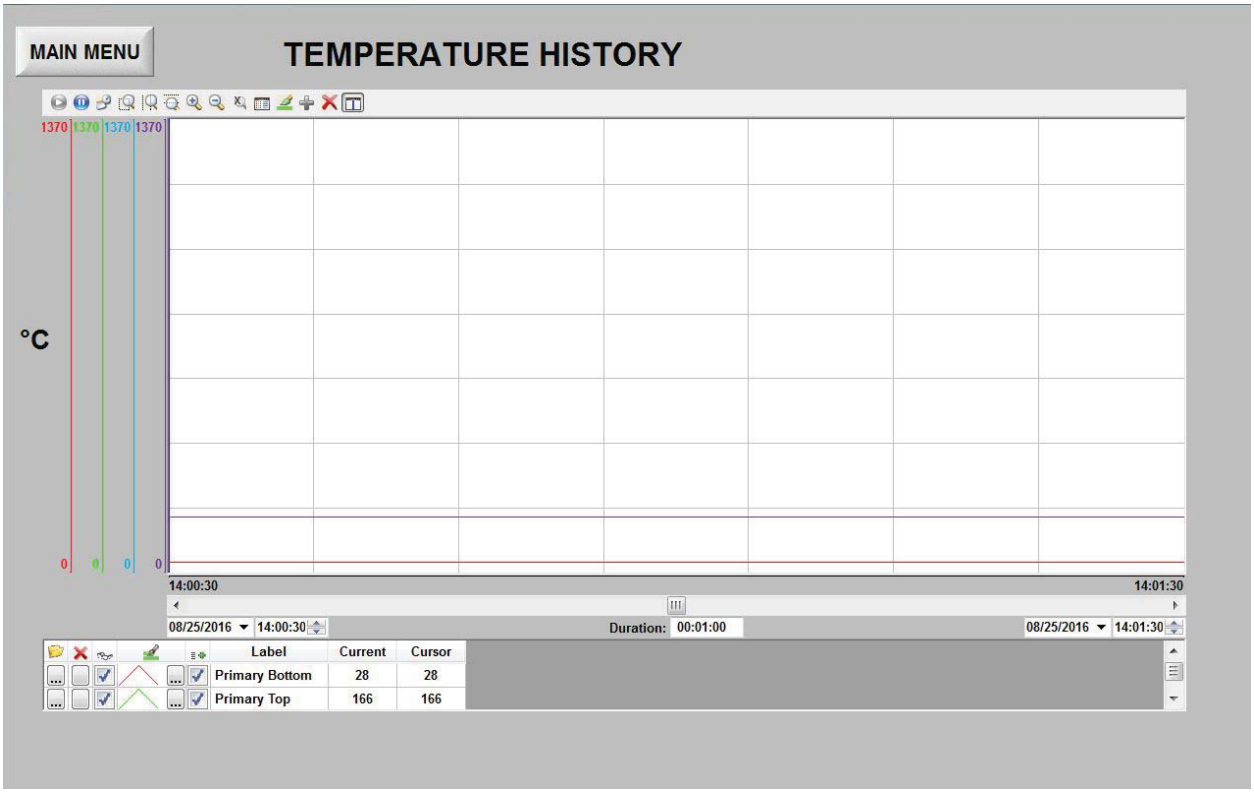
Overview of Historical Charts

The **Human Machine Interface (HMI)** monitors and records (every minute) critical operating parameters of the incinerator system like the temperature, motors, draft, load weights and alarms. Each operating parameter has its own graphic display for the operator to view, at any given time. Each display can easily be selected from the **Main Menu** of the **Human Machine Interface (HMI)**. The display will show the specific data collected from previous burn cycles.

This **Incinerator Data** is important for regulatory purposes and for general operating purposes. Also, the incinerator data is to be downloaded on a weekly basis to USB key for record-keeping purposes.

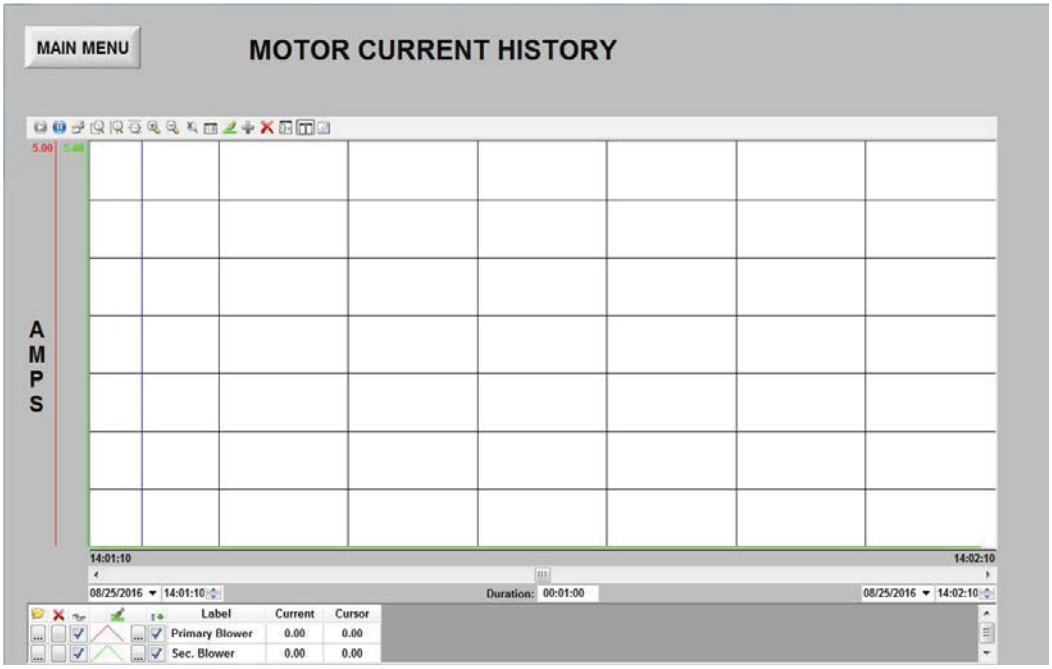
Temperature History

For example, when the ***Temperature History*** button is selected, the screen will display the trend in temperature during the operation of the system, include date & time of occurrence of that specific temperature.



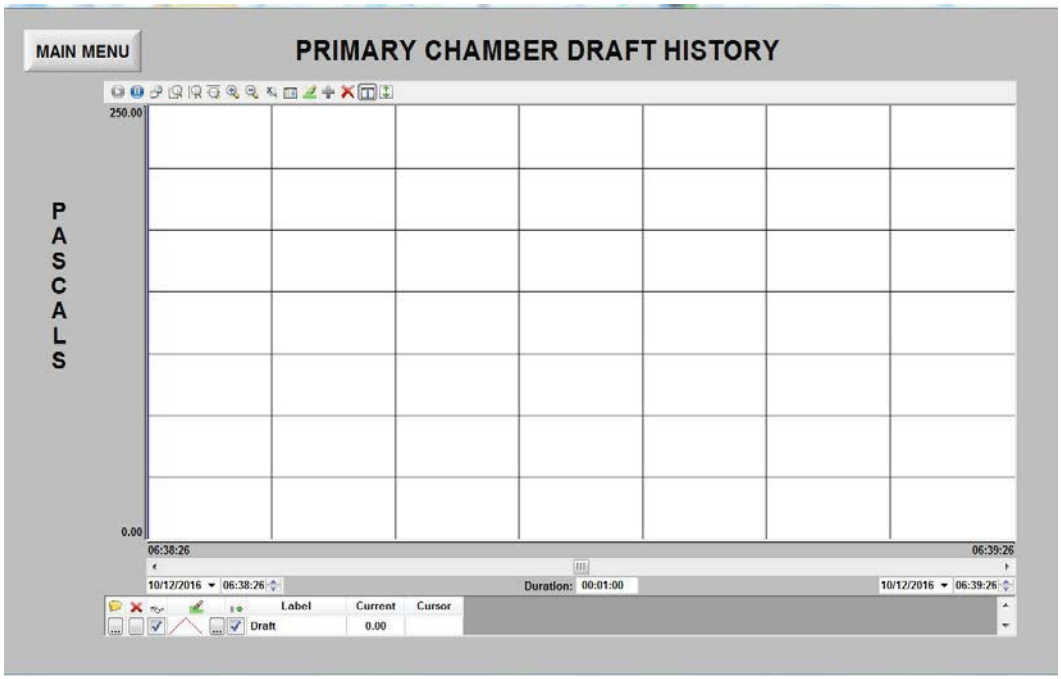
Motor Currents History

When the ***Motor Currents History*** is selected a screen will display the motor currents from the Primary Burner and the Secondary Burner, in AMPS, during the operation of the system, including date & time of occurrence of that specific motor current.



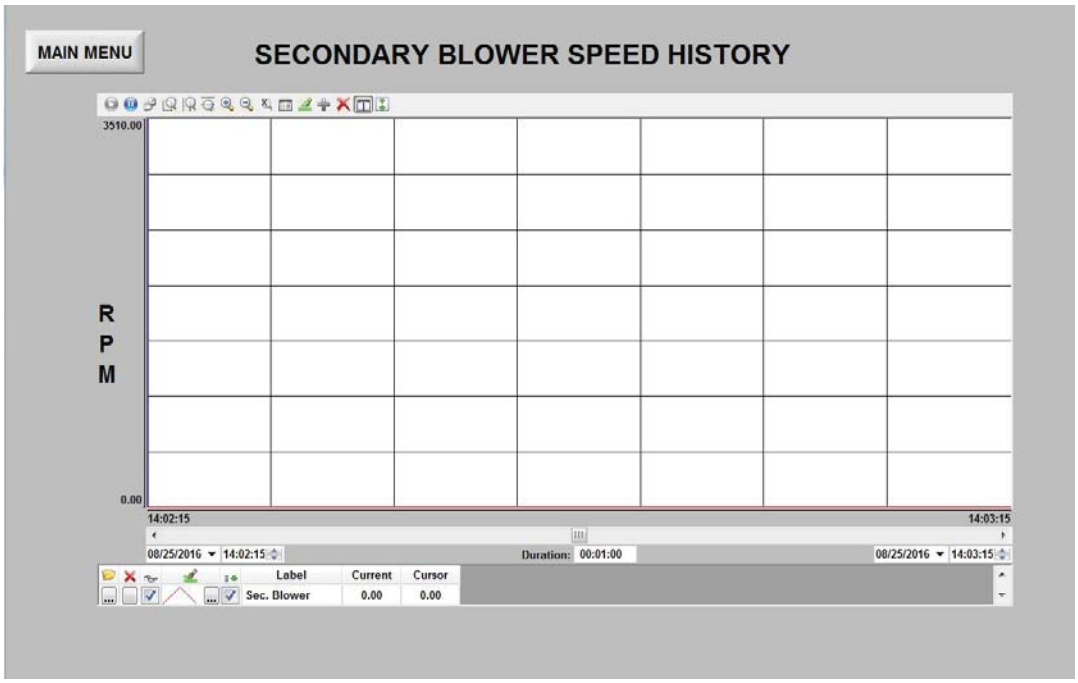
Draft History

When the ***Draft History*** button is selected a screen will display the draft during the operation of the system, include date & time of occurrence of that specific draft trend.



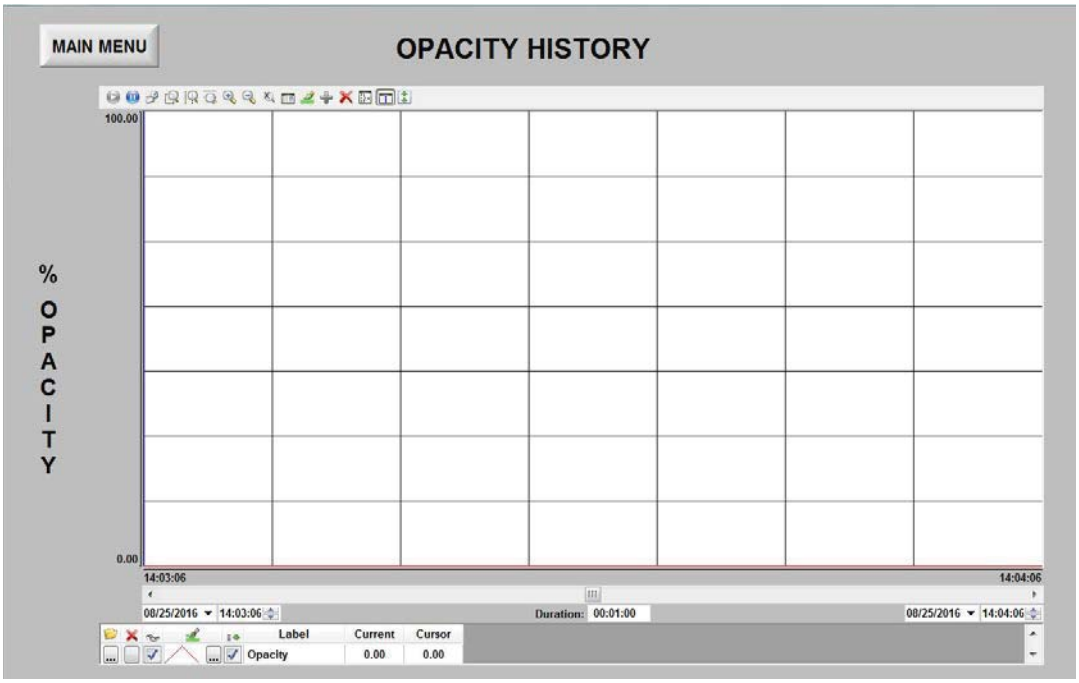
Secondary Blower Speed History

When the ***Secondary Blower Speed History*** button is selected a screen will display the RPM during the operation of the system, include date & time of occurrence of that specific speed.



Opacity History

When the ***Opacity History*** button is selected a screen will display the Opacity during the operation of the system, include date & time of occurrence of that specific reading.

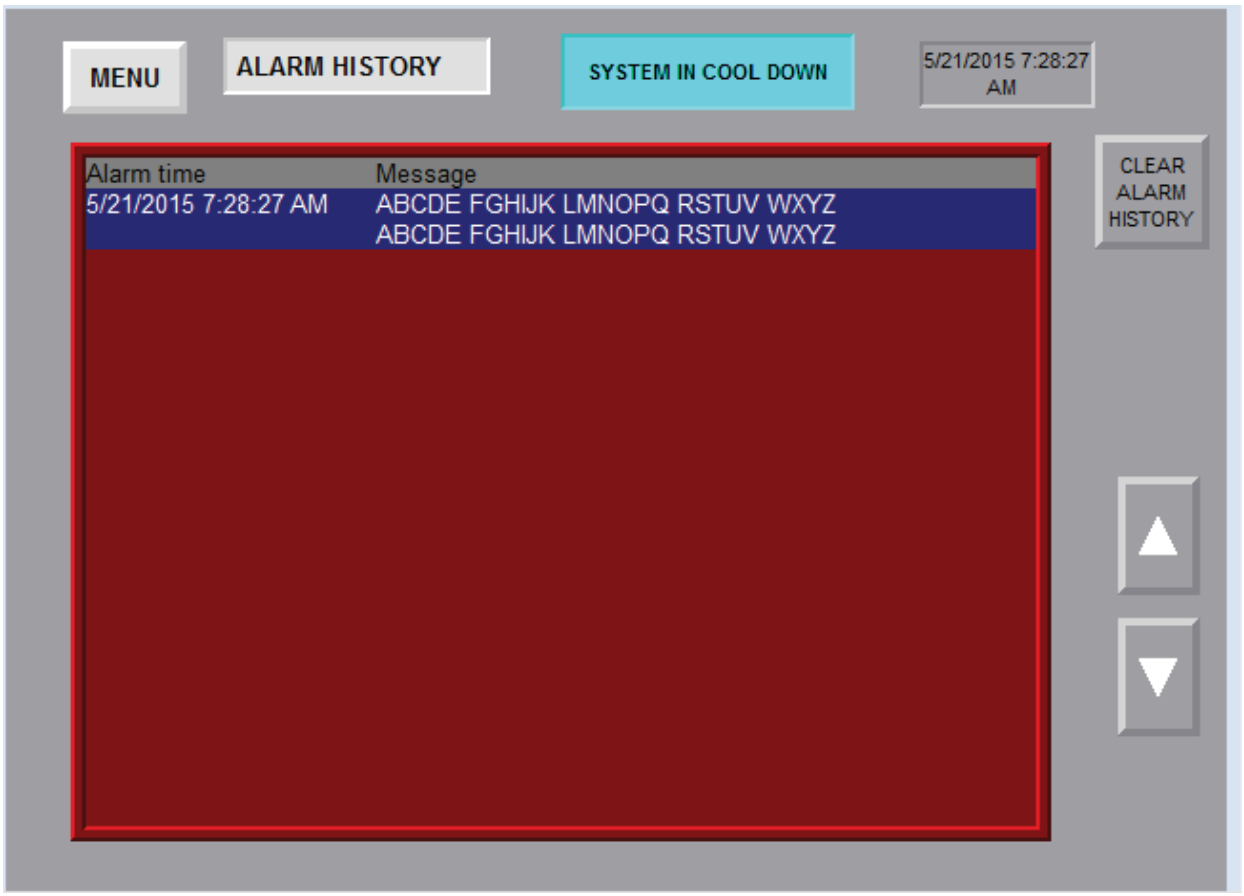


Alarm History

When the ***Alarm History*** button is selected a screen will display the last 128 faults with the date & time of occurrence.

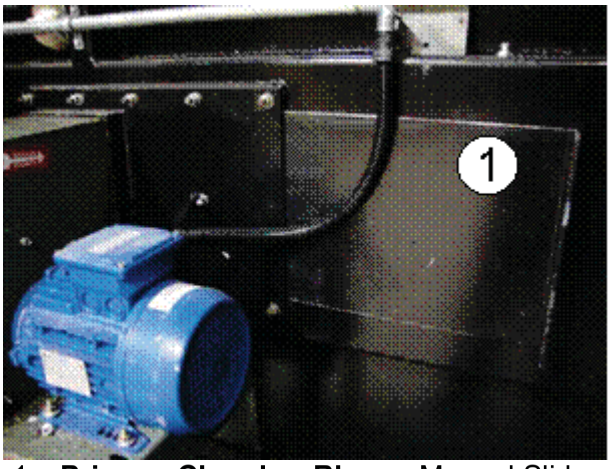
The operator can press the *CLEAR ALARM HISTORY* to clear all of the faults, if they wish to. This does not affect the record-keeping feature of the system.

At any time, touch **Main Menu** to go back to the main screen.

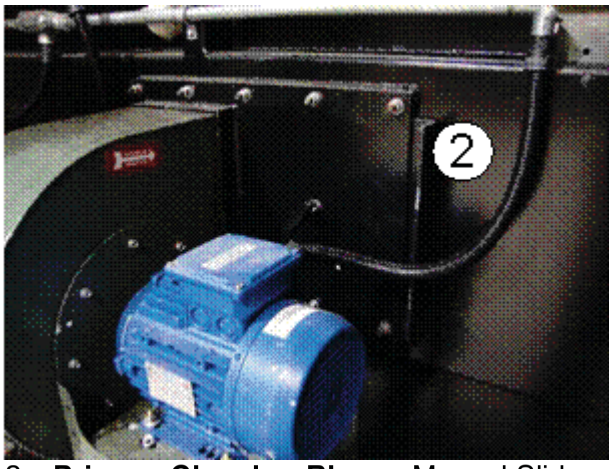


Incinerator Daily Start up

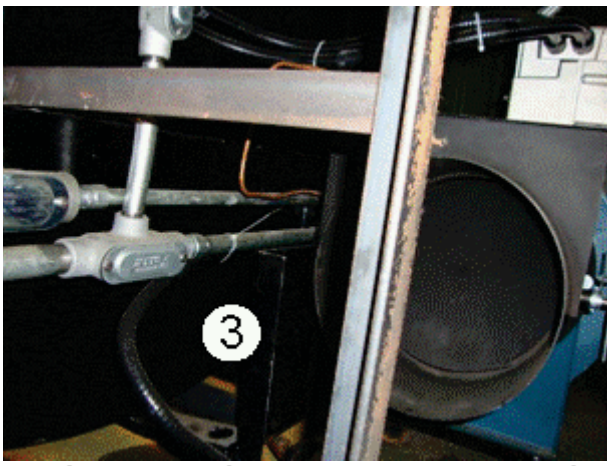
1. Ensure that manual slide gates for each blower are in the open position for free airflow into the **Primary and Secondary Chambers**.



1. **Primary Chamber Blower** Manual Slide Gate Open



2. **Primary Chamber Blower** Manual Slide Gate Closed



3. **Secondary Chamber Blower** Manual Slide Gate Open

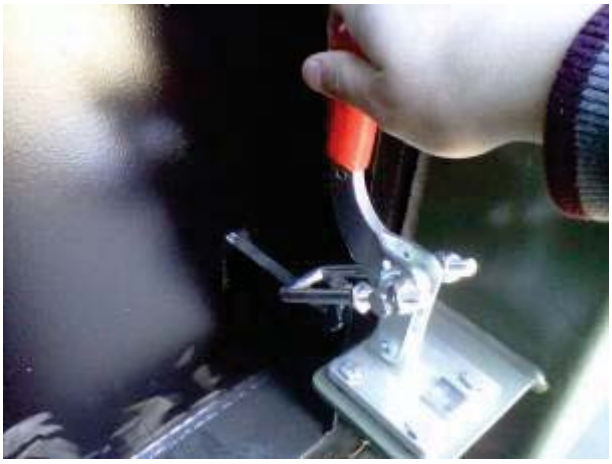
2. Visually inspect the burner hoses to ensure that there are no fuel leaks. Check to see if lines are brittle or cracked, check for any oil spills near the burner, which would indicate a leak.

3. Ensure the draft gauge hose connection is tight and sealed. This is a clear flexible tubing located in the **Primary Chamber** (see photo below).



Sample picture

4. Unlatch all clamps on the **Primary Chamber** door, open and secure in the open position





5. Ensure the Primary Chamber floor is cool (less than 90°C). Remove all the ash from the previous burn and store ash is ash bins.
6. Lock the **Primary Chamber** Front Loading Door and ensure all latches are properly engaged.

If the floor is too hot the waste may spontaneously catch on fire during loading.

High Output dual Burner Secondary Chamber Start-up

SYSTEM CHECK



Filter & Pump.(sample image)

Do a walk around the Waste Oil System, ensuring that there are no leaks, all ball valves are in the proper and fully open position for either Diesel or Waste Oil according to the fuel to be used for this specific cycle

Ensure that the correspondent storage tank has enough fuel for the entire cycle.

Using Waste Oil: 800 L minimum of Waste Oil and 300 L minimum of Diesel (the Primary Chamber operated with Diesel only)

Using Diesel Only: 1100 L of Diesel minimum

Both the Waste Oil and Diesel Tanks require at least 150L stored at all time to keep the level sensor closed.

Clean the filter if necessary.

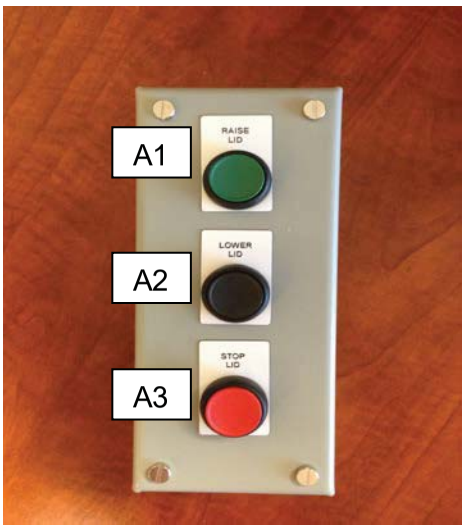
Check that all of the ball valves on the burner fuel oil train are fully open

Check that the Incinerator is not in cool down and the Primary temperature is 90°C or less.

Loading Procedure

Operator Stations for Lid Lifter

The Primary Chamber of the ECO 1.75TN 1PVC100L Waste Incinerator has a lid lifter to allow the roof of the chamber to be opened for quick loading of the waste.



Number	Name	Purpose
A1	**Raise Lid**	Raises the Lid on the Primary Chamber
A2	**Lower Lid**	Lowers the Lid on the Primary Chamber
A3	**Stop Lid**	Stops the lid during raising or lowering.

Once the roof is opened, the chamber can be loaded by the operator with the waste going to the incinerator.

Operating the Integrated Weigh Scale

1. The Operator has two options for managing the waste quantity prior to loading the selected Primary Chamber:

    i. Option 1: The operator will use the hoppers (previously tarred) to load waste onto the weigh scale.

    ii. Option 2: The operator may load waste/garbage (in bags/boxes) on the weigh scale directly.

2. Regardless of the option selected above, once the waste is on the weigh scale the Operator has to push the RECORD WEIGHT (black button) on the Weigh Scale Push-Button Station. By pressing this button, the weight value of that particular load of waste is sent to the PLC and the weight is recorded. At this time, the MAXIMUM WEIGHT (green button) will flash green once to show that the weight has been logged.

3. Then, the operator must take the waste and load it into the Primary Chamber. The hopper is to be raised just past the top edge of the Primary Chamber (using proper lifting equipment by others).

4. Once the hopper clears the edge of the Primary Chamber, the hopper's content can be dumped inside the chamber.

5. The empty hopper can now be pulled from the edge of the chamber and then lowered.

6. The operator returns to the weigh scale with some more waste and repeats Steps 2 to 6. This entire procedure is repeated until the maximum load weight for the Primary Chamber is reached. The PLC will indicate this to the operator when the MAXIMUM WEIGHT (green light) comes on and remains on. This indicates that the maximum weight permitted, in this case, the incinerator is designed for a maximum of 1,750Kg of waste material.

NOTE

No more waste should be loaded into the Primary Chamber after the load has reached the maximum weight.

7. The Primary Chamber is loaded, and the incinerator is ready to start.

Tips for loading: To decrease burn time and allow for more uniform burn.

a. Load the less dense waste first

b. Load dry waste first. Placing wet waste near the top of the Primary Chamber allows moisture to evaporate early in the cycle.

NOTE

Do not load waste greater than 90 Kg using the top loading system. This waste is to be loaded from the front of the unit. Loading waste over 90 Kg from the top will cause refractory floor to fracture.

NOTE

Do not throw the waste towards the sides of the Primary Chamber. Doing so will damage the ceramic blanket refractory.

NOTE

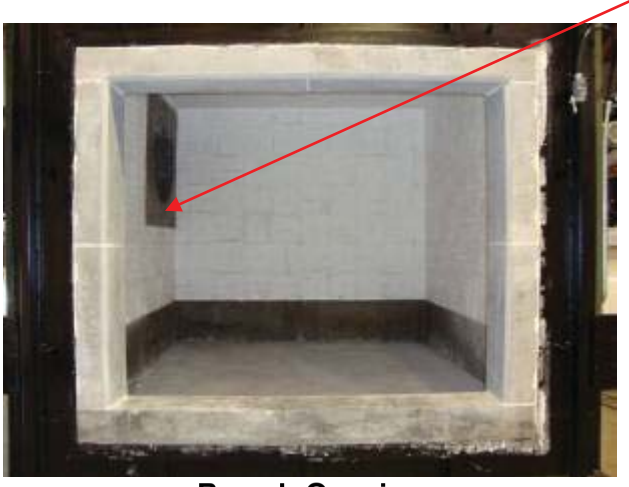
Load only the waste stream that the system has been designed for. DO NOT load a lot of high BTU rated waste for one burn (e.g. do not load more than three (3) gallons of bacon grease, kitchen grease or cooking oil). Doing so will result in excessive temperatures in the system reducing the life of the refractory.

NOTE

Do not load the Primary Chamber above its rated capacity by weight.

NOTE

Do not load the Primary Chamber such that the Breech and Burner section is blocked in any way.



Breech Opening



Burner port

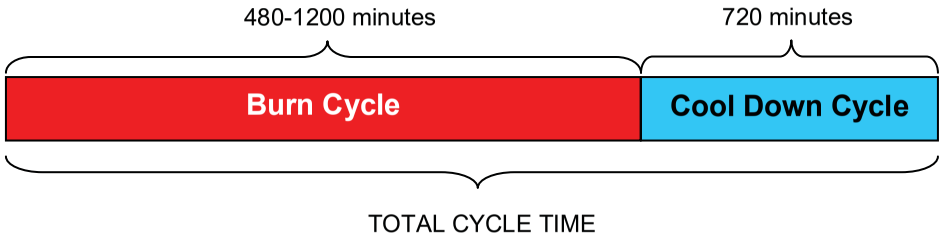
8. Inspect the lid ledge of the Primary Chamber and remove any debris that will prevent a tight seal with the lid.
9. Close the **Primary Chamber** lid by pressing the close button on the Lid Lifter Station. The lid will initially raise, after 0.5 seconds the safety pawls will pull out. Two seconds after sensing that the safety pawls are out the lid will lower.
10. The lid will keep lowering until either the down limit switch is activated or the stop button is pressed.
11. If the stop button was pushed just press the close button to resume lowering. The lid will raise then lower again. When the lid is stopped by either the lower limit switch or the stop button the safety pawls will be released back in.
12. Proceed to the **Main Control Panel.**

NOTE

The burn time will be set to the previous burn, if you wish to change the set time, proceed to the Primary Status screen and click on the BURN TIME button. The minimum number of minutes you can enter is 480 (8 hours). When you have finished, the time will be displayed in minutes beside the BURN TIME button

NOTE

The burn time value (in minutes) determines the length of the burn cycle before cool down cycle starts.



13. Check that the PRIMARY DOOR AND LID are closed on the **Human Machine Interface (HMI)** screens.
14. Check that no alarms are displayed on the **Human Machine Interface (HMI)**
15. Check that the EMERGENCY STOP BUTTON is out.
16. Check the GREEN CONTROL POWER BUTTON is lit up. Press this button to power on the control panel
17. On the **Main Control Panel turn the SELECTOR SWITCH** to the right to start the cycle. The following steps will automatically take place, controlled by the **Main Control Panel**:
    I. The **Primary Blower and Secondary Blower** will purge the system for 2 minutes.
    II. The **Secondary Burner** will purge for safety, and upon completion will ignite.
    III. Once the **Secondary Chamber** temperature reaches 1000°C, the **Primary Burner** on both Primary Chambers will purge for safety and upon completion will ignite.

IV. The burn time will start counting down when the temperature in the **Primary Chamber** reaches 427°C.

NOTE

The Main Control Panel System will maintain proper operating conditions and will provide continuous monitoring capability

After the burn cycle is completed the system will enter the cool-down cycle when the following things will occur:

- Primary Chamber & Secondary Chamber burners OFF
- Secondary Chamber Blower OFF
- Primary Modutrol 100% open
- Primary Blower ON

Once fully cooled and the temperature is below 90°C, proceed to the **Primary Chamber Clean Out Procedures**.

Primary Chamber Clean Out Procedures

Operators responsible for loading and cleaning out incinerators should wear appropriate protective equipment, including eye protection, dust masks, heavy gloves and safety shoes with puncture-proof toes and soles to avoid injury.

Although the ash from the system is considered sterile and will not contain microorganisms, it may contain a quantity of sharp objects, such as broken glass and other sharps which may not be fully destroyed in the burning process, and may thus still pose a hazard to persons who clean out the ash and residues. Also removing the ash does create dust particles in the air. Dust should not be inhaled. The operator must wear dust protection safety gear.

Please follow these steps when the cycle is complete:

1. When the internal temperature of the **Primary Chamber** has cooled to less than 40°C, lock out the power to the system on the **Main Control Panel** by moving the main disconnect to the “OFF” position.
2. Unlock all door latches on the access door to the **Primary Chamber.**
3. While standing in front of the **Primary Chamber** door, slowly open the door to allow clear entry. Secure **Primary Chamber** Door in the OPEN position.
4. With the **Primary Chamber** Door secured in the open position, raise the lid to fully opened
5. Clean the **Primary Chamber** by using ash handling tool(s) and proper safety equipment (not provided).
6. Inspect the interior of the **Primary Chamber** for wear and inspect around the door seals to ensure the door will maintain a tight seal upon closure.
7. Check the air inlet holes and remove any obstructions if necessary.

8. Inspect the door seals to ensure there are no gaps between the door gasket and the door jamb.
9. Close the **Primary Chamber** access door by clamping each latch until it is tight.
10. Clean the inspection **View Port** (glass) with a mild soap and water. To clean the view port, unscrew it by hand and re-tighten by hand.

In Case of Emergency



1. Go to manual Slide Gates on the **Primary Chamber**, located just after the blower and close them all the way. This will help to put the fire in the **Primary Chamber** out.
2. Check alarms to see what the problem is.
3. Do not open the door of the **Primary Chamber** unless the temperature inside the chamber is below 90°C.
4. Call a certified technician to fix the problem and/or consult with **Eco Waste Solutions Customer Service Department at 905.634.7022, toll free 1-866-326-2876.**

Start Up After Power Failure

1. Once the power is restored turn breaker (main disconnect) back on.
2. The **Human Machine Interface (HMI)** and PLC will begin a boot up procedure.
3. Wait until the **Human Machine Interface (HMI)** on the **Main Control Panel** has booted up before turning the control power to the panel back on by pressing the Control Power ON button.
4. When the power is restored to the **Main Control Panel**, the button should illuminate.
5. If the system was interrupted during a burn cycle, restart the system by turning the selector switch on the main panel to the right to start the cycle . If the system was interrupted during cool-down cycle, it will resume the cycle where it left off.

Dealing with Warning and Faults

Troubleshooting

The burn cycle will not start if one of the following conditions exists:

1. The system is in the “cool-down” part of the cycle. Wait until the “cool down” cycle is complete.

2. There is a fault in the system as indicated on the **HMI**

3. Loss of power due to any one or more of the following:

    - The main disconnect (see image) is off or there is no electrical power. Turn on the disconnect switch or check why there is no power.



Power is OFF in this position



Power is ON in this position

    - An open breaker. Check the breakers and replace any that are defective.

    - The EMERGENCY STOP is pushed in. Twist the EMERGENCY STOP button to unlock, and then push the CONTROL POWER ON button. The CONTROL POWER BUTTON should now be illuminated.





4. If on the Main Control Panel HMI the **Primary Chamber** door is not closed, the door has not been shut properly. Adjust the limit switch lever arm if necessary. Check the limit switch and that the wiring is in working order.

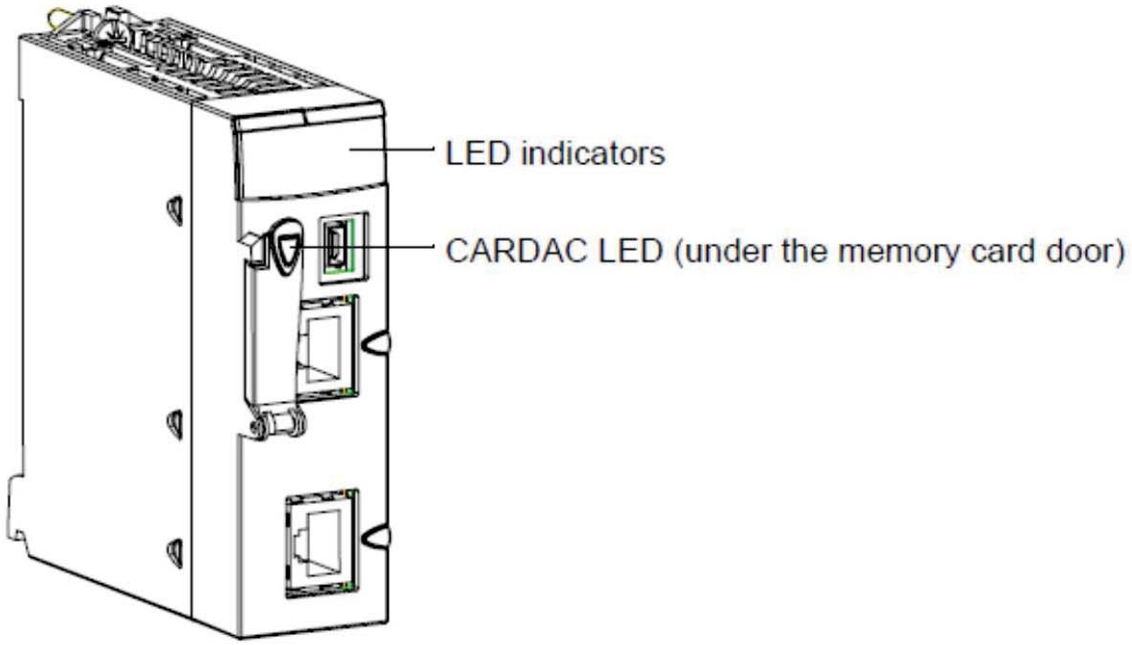
5. If on the Main Control Panel HMI the **Primary Chamber** roof lid is not closed, the lid has not been shut properly. Adjust the limit switch lever arm if necessary. Check the limit switch and that the wiring is in working order.

6. If on the Main Control Panel HMI the **Secondary Chamber** door is not closed, the door has not been shut properly. Adjust the limit switch lever arm, if necessary. Check the limit switch and that the wiring is in working order.

7. If fuel tank is low, system will not start. Tank on the **HMI** will be red, indicating the level is low and needs to be filled.

PLC Processor Problem

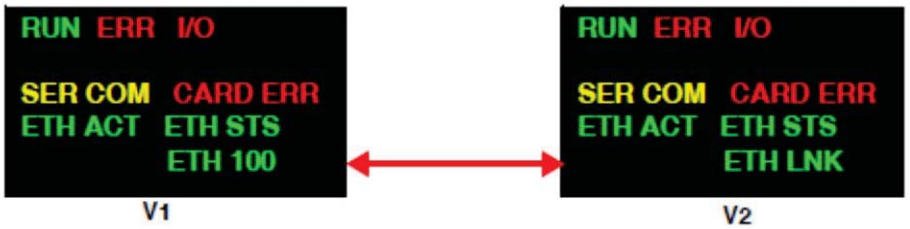
There are several LEDs available on the front panel of each Modicon M340 module or processor, enabling rapid diagnosis of the PLC status:



These LEDs provide information on:
- PLC functioning
- the memory card
- communication with the modules
- serial communication
- communication on the CANopen network
- communication on the Ethernet network

The following diagram shows the diagnostic LEDs on the BMX P34 2020 processor. Note that two displays exist, depending on whether you are using firmware V1 or V2

(or greater) of the processor.



The colors and blink patterns of the LEDs indicate the status and operating conditions of Ethernet communications on the module:

Label	Pattern	Indication
RUN (green): operational state	on	• PLC hardware and PLC program operations are normal. • Module is in RUN state.
	flashing	• PLC is in STOP mode or a blocking error in the application has been detected. • Processor is configured but not in RUN state.
	off	PLC is not configured (application is absent, invalid, or incompatible).
ERR (red): detected error	on	Processor, system, or configuration detected error
	flashing	• PLC is not configured (application is absent, invalid, or incompatible). • PLC is in STOP mode or a blocking error in the application has been detected.
	off	Normal (no detected errors)
ETH STS (green): Ethernet communication status	on	Communication OK
	2 flashes	Invalid MAC address
	3 flashes	Link not connected
	4 flashes	Duplicate IP address
	5 flashes	Waiting for a server IP address
	6 flashes	Secure and safe mode (with default IP address)
	7 flashes	Configuration conflict between rotary switches and internal configuration
CARDERR (red): memory card detected error	on	• Memory card is missing. • Memory card not usable (bad format, unrecognized type). • Memory card content is inconsistent with internal RAM application.
	off	• Memory card is valid and recognized. • Application on card is consistent with the internal RAM application.
I/O (red): input/output status	on	• Error detected on a configured module or CPU channel • Configuration mismatch with the application (module missing...)
	off	Normal (no detected errors)

SER COM (yellow): serial data status	flashing	Data exchange (send/receive) on the serial connection in progress
	off	No data exchange on the serial connection
CAN RUN (green): CANopen operations	on	CANopen network operational
	rapid flashing (note 1)	Automatic detection of data flow or LSS services in progress (alternates with CAN ERR).
	slow flashing (note 2)	CANopen network is pre-operational.
	1 flash	CANopen network is stopped.
	3 flashes	Downloading CANopen firmware.
CAN ERR (red): CANopen detected error	on	CANopen bus is stopped.
	rapid flashing (note 1)	Automatic detection of data flow or LSS services in progress (alternates with CAN RUN).
	slow flashing (note 2)	CANopen configuration is not valid.
	1 flash	At least one error counter has reached or exceeded alert level.
	2 flashes	A guard event (NMT slave or NMT master) or a heartbeat event has occurred.
	3 flashes	The SYNC message was not received before the end of the communication cycle period.
	off	No error detected on CANopen.
CARDAC (green): memory card access **Note:** This LED is located under the memory card door (see *The Module, p. 20*).	on	Access to the card is enabled.
	flashing	Activity on the card: during each access, the card LED is set to OFF, then back to ON.
	off	Access to the card is disabled. You can remove the card after you disable card access by setting system bit %S65 to 0.
Note 1: Rapid flashing is defined as ON for 50 ms and OFF for 50 ms.		

Note 2: Slow flashing is defined as ON for 200 ms and OFF for 200 ms.

The following table describes the meaning of the ETH ACT and ETH 100 LEDs on the front panel for firmware V1 NOE and CPU modules.

Label	**Pattern**	**Indication**
ETH ACT (green): Ethernet communication (transmission/ reception activity)	on	Ethernet link detected: no communications activity.
	off	No Ethernet link detected.
	flashing	Ethernet link detected: receiving or sending packets.
ETH 100 (green): Ethernet transmission speed	on	Ethernet transmission at 100 Mbit/s (Fast Ethernet).
	off	Ethernet transmission at 10 Mbit/s (Ethernet) or no link detected.

The following table describes the meaning of the ETH ACT and ETH LNK LEDs on the front panel for firmware V2 NOE and CPU modules.

Label	Pattern	Indication
ETH ACT (green): Ethernet communication (transmission/ reception) activity	on	Communications activity detected.
	off	No communications activity detected.
ETH LNK (green): Ethernet link status	on	Ethernet link detected.
	off	No Ethernet link detected.

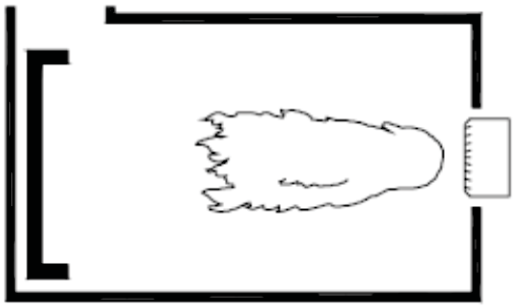
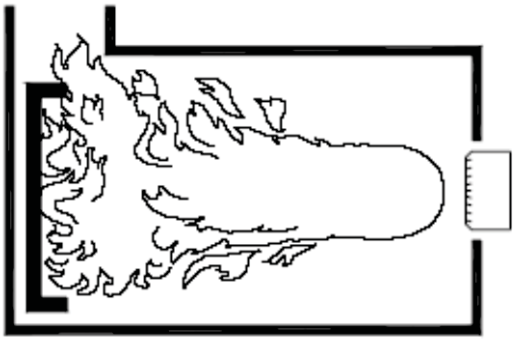
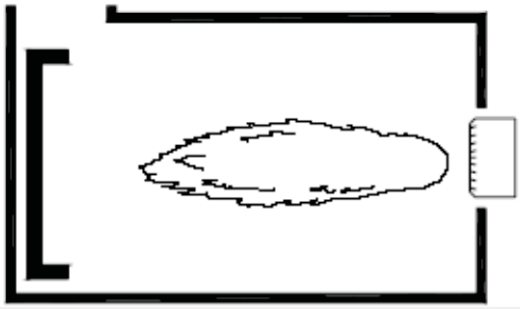
Note:

- Rapid flashing is defined as ON for 50 ms and OFF for 50 ms.
- Slow flashing is defined as ON for 200 ms and OFF for 200 ms.

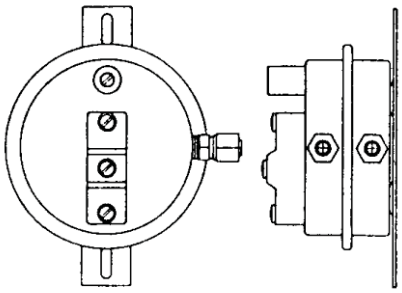
Possible Problems, Causes and Solutions

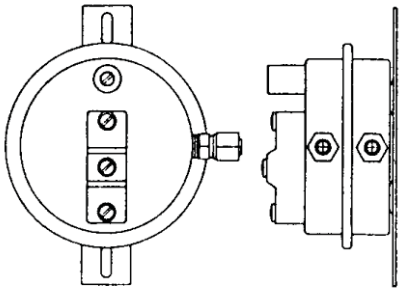
Problem	Causes	Solutions
Blower Fails to start	Over load tripped, blown fuse	Turn power off. Open Panel and reset overload. Check fuse and replace.
	Motor starters or contactor coil is burnt out	Locate contactor for Blower and visually observe if the contactor is pulled in. Use a volt meter to check for voltage across the coil If there is voltage across the coil and the contactor is not pulled in, replace the contactor.
Secondary Burner won't ignite	Bad Electrodes	Refer to Section 6 of this manual.
	Low Oil Pressure	Adjust pressure setting on burner pump. Refer to Riello Manual in Section 10.
	Fuel Line Leak	Visually inspect the lines for the leak. Tighten any fittings that are near the leak.
	Door Switch not making contact Burner alarm has been tripped	Make sure main door is closed and latched shut. Make sure limit switch is hitting striker plate.
	Bad Thermocouple	Replace thermocouple .
Primary Burner won't ignite	Bad Electrode	Refer to Section 6 of this manual.
	Low Oil Pressure	Adjust pressure setting on burner pump. Refer to Riello Manual in Section 8.
	Fuel Line Leak	Visually inspect the lines for the leak. Tighten any fittings that are near the leak.
	Door Switch not making contact or broken	Make sure main door is closed and latched shut. Make sure limit switch is hitting striker plate.
	Secondary temperature not at 1000°C	Wait until Secondary temperature is at 1000°C and try again.
	Burner main switch is turned off	Turn switch on.
	Burner alarm has been tripped	Acknowledge burn alarm and then hit the reset button on control panel.

Problem	Causes	Solutions
Persistent Black Smoke	Insufficient air supply to Secondary Chamber to completely consume emissions	Check to ensure combustion air blower/damper assembly is operating properly.
	Secondary Chamber is not hot enough.	Check that the Secondary temperature is operating at required temperature set point.
	Secondary Chamber is not hot enough.	Too much draft, open barometric damper.
	Overloading or loading highly volatile material	Decrease load size on next batch (confirm by weighing), ensure the waste mix is correct.
	Burner failure	Check burner operation – if no flame or a poor flame is visible through the flame view port adjust air/fuel ratio.
	Operating at a too high Primary Chamber temperature	Check/decrease primary chamber combustion air.
Smoke coming out of Primary	Too much air	Check dampers on primary blower.
	Too much volatile material loaded	Decrease load size on next batch to ensure the waste mix is correct.
	Primary Chamber temperature too high	Waste loaded may not be a good mix of heat value.
	Low draft	Close barometric damper on stack's T-section
Too much fuel usage	Too much secondary combustion air	Check/reduce secondary combustion air.
	Too much air infiltration	Reduce air flow by adjusting the damper.
	Fuel leakage	Check fuel trains and burners for fuel leakage.
	Wet waste	Spread wet waste with other waste through several loads – do not charge all of the wet waste at one time.
	Excessive draft	Check/reduce draft – check door seals and other seals for leakage adjust damper.
	Burner setting too high	Check air/fuel mix.

Problem	Causes	Solutions
		Correct Maximum Flame Adjustment (Proper Oil and Air Pressure with correct supply of combustion air)
		Incorrect Flame Adjustment (Not enough Combustion Air)
		Incorrect Flame Adjustment (Air Pressure too high; too much air)
Incomplete burnout/poor ash quality	Build-up around air holes – clogged with ash from previous burn	Check around air holes and clean.
	Poor draft	Draft should be -0.2-0.06 KPa (or 0.8-0.25“ W.C).
	Too much wet waste – overloading system	Spread wet waste with other waste through several loads – do not charge all of the wet waste at one time.
	Insufficient burn time	Allow longer burn time period.

Possible Alarms (Faults)

#	ALARM (System Fault)	SOLUTION
1	The Primary Chamber top/bottom thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
2	The Secondary Chamber thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
3	The Secondary Stack Thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
4	The primary burner is faulted	The primary burner has failed to light when it received a signal to start. To reset the burner, press the reset button located on the Burner. If this does not start the burner, refer to Supplier Catalogue (Riello Burner) in Section 8
5	The secondary burner is faulted	The secondary burner has failed to light when it received a signal to start. To reset the burner,
6	The system has shut down due to primary blower low air flow. 	Visually examine the primary blower for any obstructions that may be causing low air flow. Check slide gate located between Primary chamber and blower, ensure it is open. Check damper assembly, ensuring modutrol crank arm is still connected and that butterfly damper is open, allowing air flow. Air proving switch may be defective. Refer to Section 6 of this manual. There are two ports on the air flow switch marked V and P. Ensure the inlet tube is attached to the port marked “P” for pressure. V stands for vacuum. Ensure the “V” port is open to atmosphere and is not blocked. If no air restriction is observed (i.e. blockage in the tube) change the air proving switch. Refer to Section 6 of this manual.
7	The primary blower motor overload is tripped.	Turn power off on Control panel by turning the Main Disconnect to the OFF position. Reset overload.

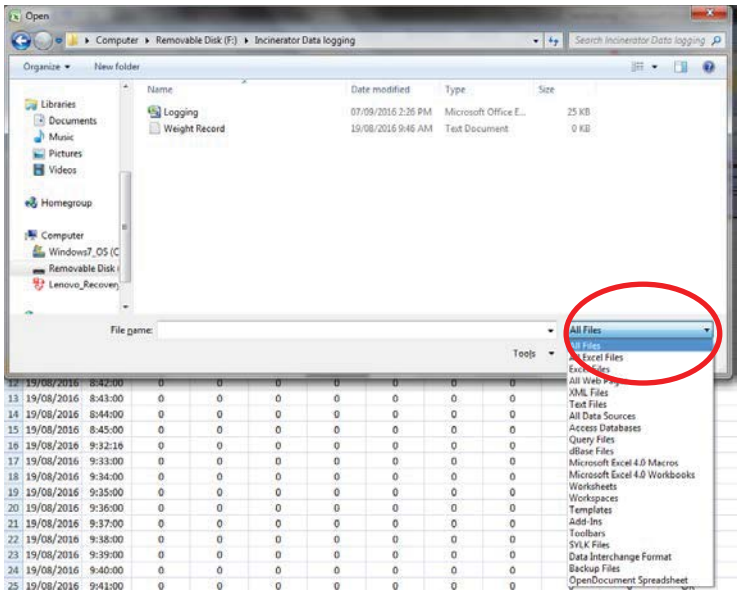
#	ALARM (System Fault)	SOLUTION
8	The system has shut down due to secondary blower low air flow 	Visually examine the Secondary Blower for any obstructions that may be causing low air flow. . Check slide gate located between Secondary chamber and blower, ensure it is open. Check damper assembly, ensuring Modutrol crank arm is still connected and that butterfly damper is open, allowing air flow. Air flow switch may be defective. Refer to Section 6 of this manual. There are two ports on the air flow switch marked V and P. Ensure the inlet tube is attached to the port marked “P” for pressure. V stands for vacuum. Ensure the “V” port is open to atmosphere and is not blocked. If no air restriction is observed (i.e. blockage in the tube) change the air proving switch. Refer to Section 6 of this manual.
9	The Secondary blower variable frequency drive is faulted	Push fault reset button on the HMI If fault persist check the error code on the variable frequency drive and check manual for troubleshooting alarm.
10	The burner fuel level is low.	Add fuel to the fuel tank and the alarm should reset itself. If alarm persists, replace the low level switch.
11	Primary Chamber – lid lifter hydraulic pump overload.	Turn power off on Control panel by turning the Main Disconnect to the OFF position. Reset overload.
12	Primary Chamber – lid lifter stuck while rising.	Check to see if anything is blocking the lifts or roof from raising Check the power pack fluid level to ensure enough hydraulic oil is available Check the limit switch is working

#	ALARM (System Fault)	SOLUTION
13	Primary Chamber - lid lifter stuck while lowering.	Check to see if anything is blocking the lifts or roof from lowering Check the power pack fluid level to ensure enough hydraulic oil is available Check the limit switch is working This can be caused by a burnt out solenoid valve. Check that the control valve is open.
14	Primary Chamber - lid lifter left or right safety pawl failed to retract.	Check the proximity switch that senses that the safety catch is out Check the solenoid valves (located on each column)

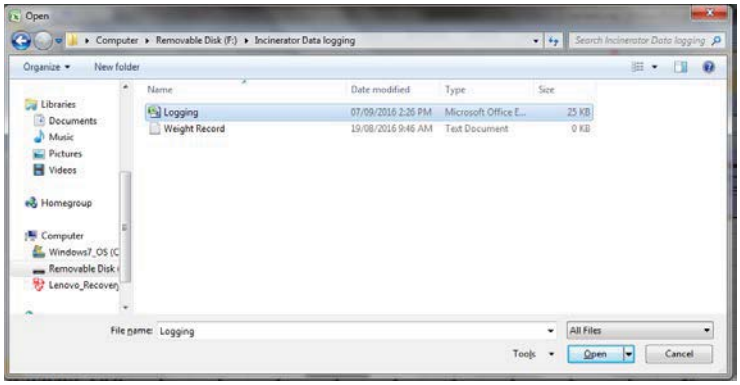
Record Keeping

Accessing Historical Information

1. It is recommended that a dedicated folder be set on the destination computer that is used for storing data from the Incinerator Package (e.g. “Incinerator Data”)
2. Turn power off to the Main Control panel by turning the Main Disconnect to the OFF position.
3. Open the Main Control Panel door and remove the USB from the back of the HMI panel and insert the USB into the destination computer.
4. Open an Excel File, once opened go to File/Open locate the USB on your computer, in the bottom right corner choose “All Files”.

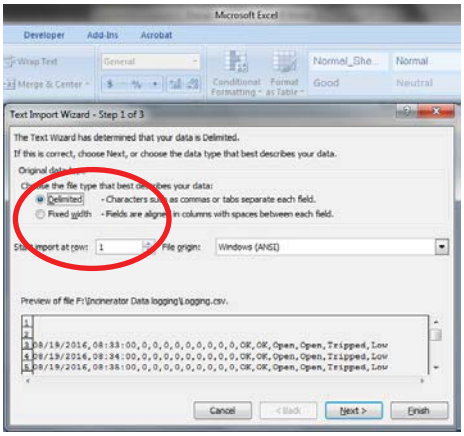


5. Click on the “logging” file and press open.

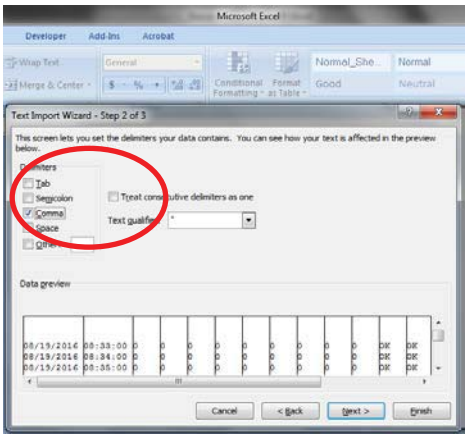


6. Excel will prompt you with a text import wizard, follow the next 3 steps to ensure the log files is displayed properly:

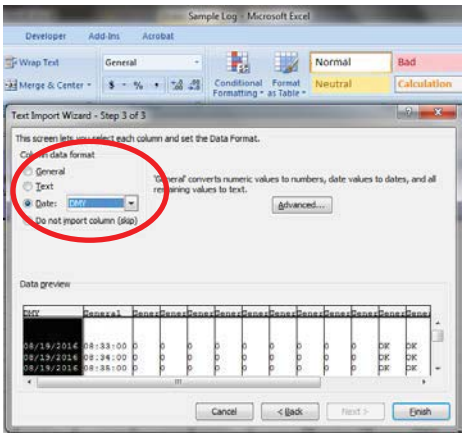
7. Steps 1 of 3 choose delimited – character such as commas or tabs separate each field, and choose Next:



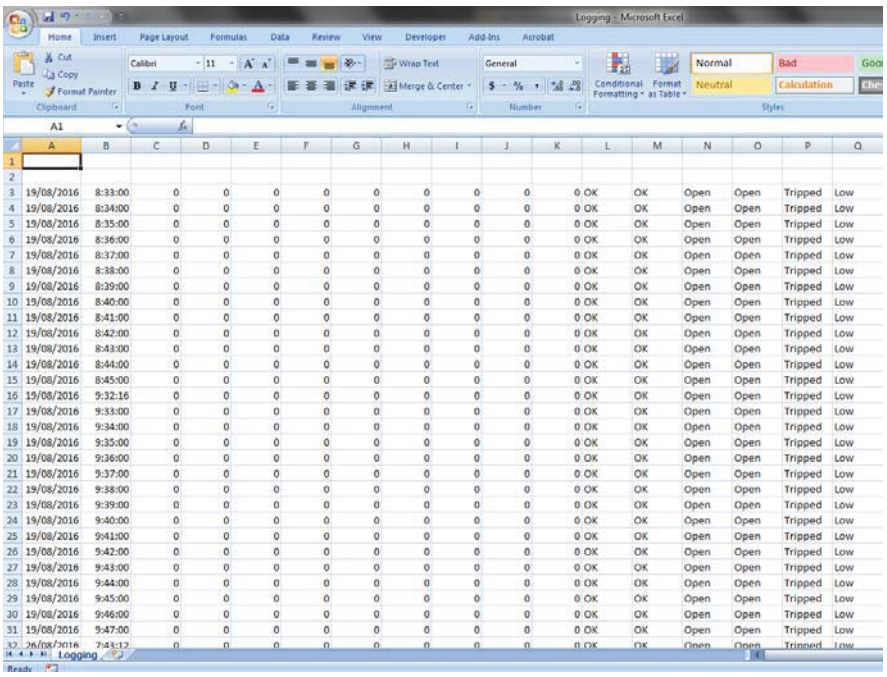
8. Steps 2 of 3 choose Comma as the delimiting item, and choose Next:



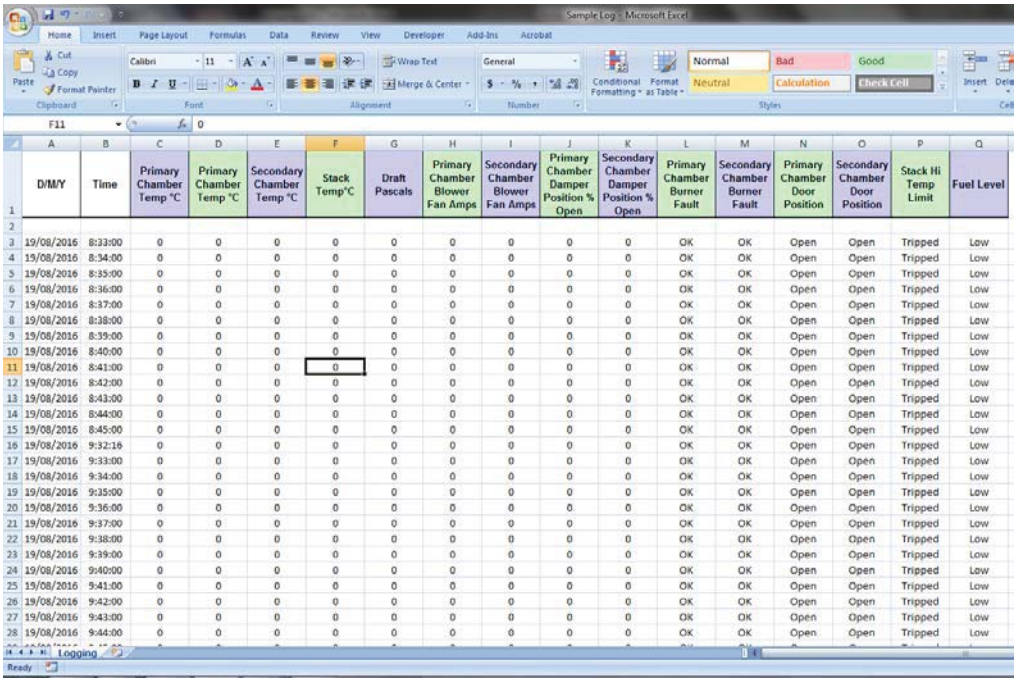
9. Steps 3 of 3 Column data format should be Date with DMY – character such as commas or tabs separate each field, choose Finish.



10. Once the data is open, it will look similar to the following:



11. From the electronic template file located on the USB for the manual copy the first row and paste into your log file:



	D/M/Y	Time	Primary Chamber Temp °C	Primary Chamber Temp °C	Secondary Chamber Temp °C	Stack Temp°C	Draft Pascals	Primary Chamber Blower Fan Amps	Secondary Chamber Blower Fan Amps	Primary Chamber Damper Position % Open	Secondary Chamber Damper Position % Open	Primary Chamber Burner Fault	Secondary Chamber Burner Fault	Primary Chamber Door Position	Secondary Chamber Door Position	Stack Hi Temp Limit	Fuel Level
1																	
2																	
3	19/08/2016	8:33:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
4	19/08/2016	8:34:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
5	19/08/2016	8:35:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
6	19/08/2016	8:36:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
7	19/08/2016	8:37:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
8	19/08/2016	8:38:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
9	19/08/2016	8:39:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
10	19/08/2016	8:40:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
11	19/08/2016	8:41:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
12	19/08/2016	8:42:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
13	19/08/2016	8:43:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
14	19/08/2016	8:44:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
15	19/08/2016	8:45:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
16	19/08/2016	9:32:16	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
17	19/08/2016	9:33:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
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20	19/08/2016	9:36:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
21	19/08/2016	9:37:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
22	19/08/2016	9:38:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
23	19/08/2016	9:39:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
24	19/08/2016	9:40:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
25	19/08/2016	9:41:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
26	19/08/2016	9:42:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
27	19/08/2016	9:43:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
28	19/08/2016	9:44:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low

12. Save your excel file with the date in the designated folder.

13. Reinstall the USB to the back of the HMI, close the Main Control Panel door and turn power back on to the system.

SECTION 6

MAINTENANCE INSTRUCTIONS

Zero Mechanical State & Lock Out Procedures

Proper maintenance of the equipment is essential to ensure long term, reliable operation of the EWS Incinerator.

NOTE The warranty will become void if proper maintenance is not performed as instructed.

Safety

During maintenance of the EWS mobile incinerator, it is very important to be aware of special hazards. Two safety programs are described in the following sections:

1. Zero Mechanical State
2. Power Lock Out Procedures



Failure to comply with these instructions during maintenance could result in injury or death. The responsibility for implementation of a comprehensive safety program rests with the operating staff and supervision. The safety procedures in this *Manual* should be considered only as a starting point for the safety program at site.



ACCIDENTS CAN BE PREVENTED A CAREFUL WORKER IS THE BEST SAFETY DEVICE

Zero Mechanical State

Zero Mechanical State (ZMS) exists when the possibility of an unexpected mechanical movement has been eliminated. During maintenance, it is absolutely mandatory to totally deactivate the incinerator so that there is no possibility of an unexpected machine movement. Power lock-out, described in the next section, is commonly used for this purpose. Most machines are powered by electrical, hydraulic or pneumatic drives. Energy may be stored in a shutdown machine in various ways: Air pressure in a cylinder, hydraulic pressure fluid stored in pressurized hoses, or machine members whose weight can generate fluid pressure. Therefore, just cutting off the electrical power may not be enough to neutralize all power sources. Certain maintenance procedures at site should require ZMS condition as a matter of course.

Zero Mechanical State (ZMS) Checklist:

1. Every electrical power source to the incinerator must be cut off and locked out (to prevent others who may not be aware of maintenance work from turning the power back on inadvertently).

2. Ensure that the mechanical potential energy of the incinerator is at its lowest practical value so that opening of pipe, tubing, hose or actuation of any valve will not produce an unexpected movement that could cause injury.

3. Check that there is no pressurized fluid (air, oil, gas or other) trapped in the incinerator lines, cylinders or other components. This will ensure that there will be no incinerator motion when a valve is actuated.

4. Secure loose or freely moving parts so that there is no possibility of accidental movement.

Power Lock Out Procedures



Unexpected operation of electrical equipment started by automatic or manual remote control may cause injuries to persons who happen to be nearby. For this reason, when repair work is to be done on motors or other electrical equipment the circuit should be opened at the switch box and the switch pad locked in the OFF position. Tag the switch with a lock out tag indicating who must be contacted before the power is turned back on again.

BECAUSE OF THE SEVERE CONSEQUENCES, INCLUDING DEATH, OF NOT PROPERLY LOCKING OUT ELECTRICITY SUPPLIES DURING MAINTENANCE, THE SUPERVISOR SHOULD ENSURE THAT THERE IS ONLY 1 KEY FOR THE LOCK USED TO LOCK OUT THE POWER SUPPLY.

For identification, locks may be color coded to indicate different crews or shifts.

The Supervisor should maintain the master key and list of key numbers, and should keep an extra key to each lock for his department. The master key should not be loaned out under any circumstances.

No matter what method is used to lock out power to electricity, strict discipline and constant supervision should be employed during any equipment maintenance work.

Power Lock Out Checklist

1. Alert the operator of the equipment.

2. Before starting the work on an engine or motor, line shaft or other power transmission equipment or power-driven machine, make sure it can not be set in motion without your knowledge.

3. Place your own padlock on the control switch, lever, or valve, even if someone has locked the control panel before you. You will not be protected unless you put your own padlock on it. (Another maintenance person could remove their lock and then someone else could start the equipment if they were not aware of maintenance work being done.)

When finished working at the end of your shift remove your own padlock. Never permit someone else to remove it for you. Be sure you are not exposing someone else to danger by removing your padlock

Instruction Classification

Each component is associated with an identification number, see table below:

System Component	Identification number
Primary Blower	01-001
Secondary Blower	02-001
Primary Burner	01-002
Secondary Burner	02-002
Refractory	05-001
Air Compressor	03-001
Thermocouple	05-002
Main Control Panel	03-010
Paint	05-003
Electrical	05-004
Limit Switch	05-005
Lid Lifters	06-001

To differentiate if the instruction is weekly, monthly, quarterly or yearly, the above identification number will be followed by a letter:

Daily: D
Weekly: W
Monthly: M
Quarterly: Q
Yearly: Y

For example**, 01-001.Q.01** Primary blower assembly quarterly instruction number 1.

i. Daily Instructions

Primary Chamber Burner: (01-002.D)

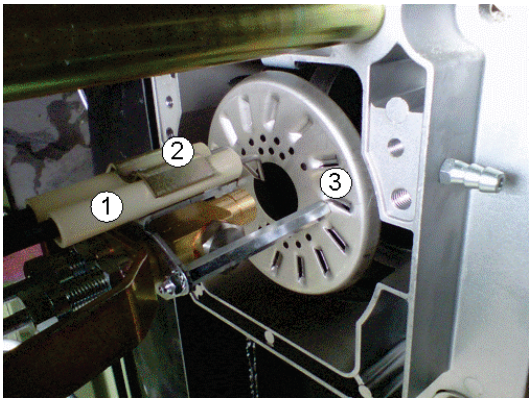
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

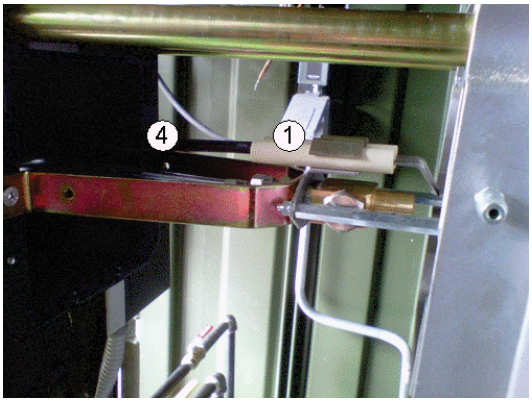
Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

INSTRUCTION 01-002.D.01: INSPECTING AND CLEANING ELECTRODES

1. Remove the cover from the Burners as described in 01-002.W.01
2. Inspect the electrodes (PN: 3003796) for any soot build-up.



1. Electrode
2. U-bolt
3. Diffuser Disc

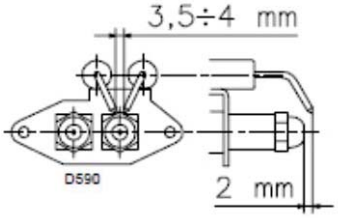


4. HT Leads

3. Clean/wipe down the ignition electrode with a cloth should there be a build-up of soot.

NOTE Do not use sand paper as this will increase the deposit of future soot.

4. If electrodes are damaged remove the screws and u-bolt (see above photo) and install new electrodes. When reinstalling the electrodes make sure that they are positioned as shown below.



Primary Burner

Check the High Temperature (HT) Leads (PN: 3012995) for any heat damage. If HT Leads are severely damaged (ie, you can see the wire beneath the sheathing) then replace. (See *CMI 6.3.3/01-002A)*

INSTRUCTION 01/02-002.D.02: INSPECTING THE FUEL LINES

1. Visually inspect all fuel lines to the Primary and Secondary Burner for any leaks.
2. The Primary Burner have two oil lines, one feed and one return. the Secondary Burner has only a feed line
3. If any leaks are observed tighten or replace the fitting where the leak is occurring

INSTRUCTION 01-002.D.03: INSPECT AND CLEAN BURNER NOZZLES

Primary Burner:

1. Remove the burner cover as outlined in 01/02-002.W.01 REMOVAL OF BURNER COVERS
2. Remove the centre retaining bolt.
3. Slide burner out.
4. Check nozzle. If there is carbon, remove the nozzle and clean.
5. Reinstall or replace if necessary (PN: C5222433)

Refractory: (05-001.D)

When working with the refractory make sure you use the proper tools; wear goggles, approved dust mask and gloves

INSTRUCTION 05-001.D.01: INSPECTING THE REFRACTORY

Ensure power is locked out.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

1. Open Primary Chamber door by unlatching all four clamps.
2. Tie-off door to open position to ensure that it will not close unintentionally.
3. Enter Primary Chamber and check the refractory for shrinkage, any gap between the modules greater than 2.5 cm should be patched with the blanket refractory
4. Check for any exposed metal between the modules, if metal is exposed make sure to patch area with blanket material (PN: 1" x 24" 8# 2600) or new module (PN: 6" Mod ZR) (*CMI 6.3.2/05-001A & 6.3.2/05-001B)*

ii. Weekly Instructions

Primary & Secondary Chamber Blowers: (01-001.W & 02-001.W)



Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

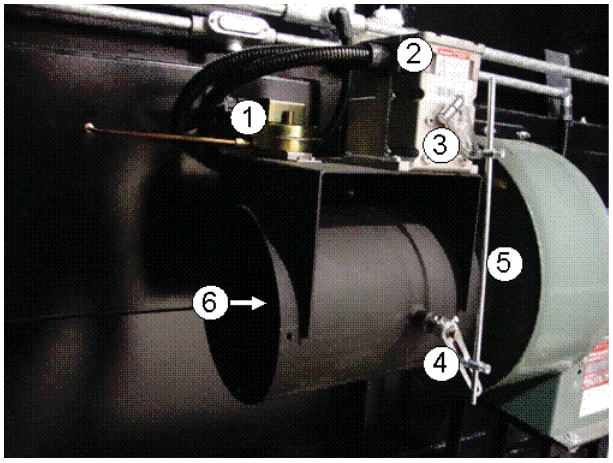
A fan can windmill despite removal of all electrical power therefore, take extra care when working with fans in the system.

The rotating assembly should be blocked securely before attempting maintenance of any kind.

INSTRUCTION 01/02-001.W.01: DAMPER CRANK ARM

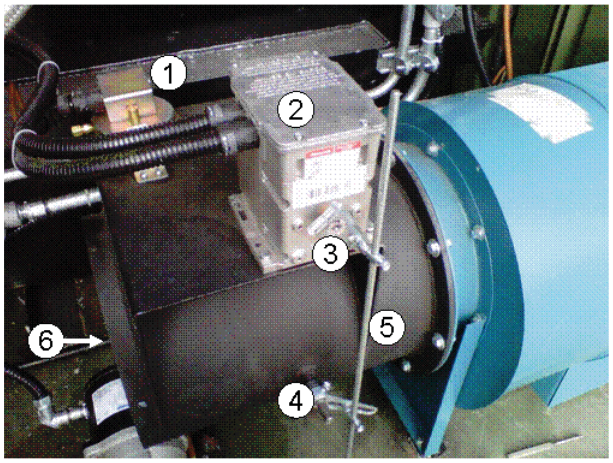
Check to see that the damper crank arm is connected to the damper and the rod.

Ensure mechanical linkage on damper is tight, if loose tighten with wrench.



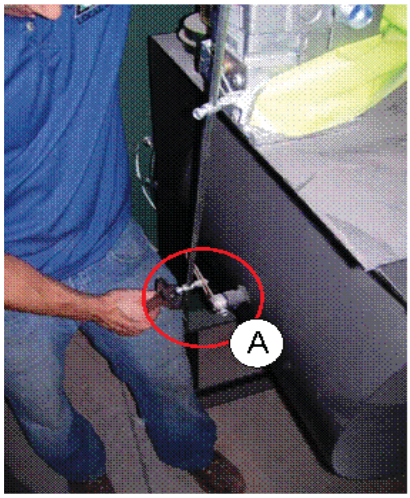
PRIMARY BLOWER

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper



SECONDARY BLOWER

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper



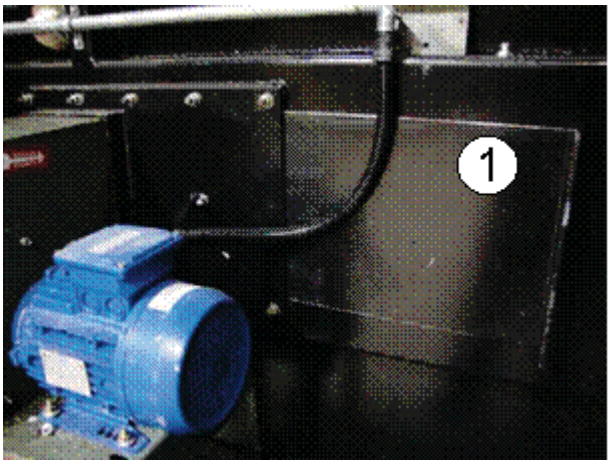
A. Damper Crank arm and connection to Damper and Rod

INSTRUCTION 01/02-001.W.02: SLIDE GATES

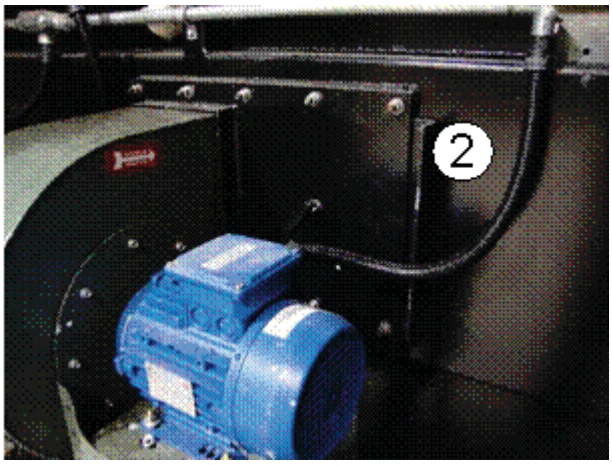
Check to see if slide gates move freely.

1. Move slide gate in and out to ensure free movement. If sticking, use lubricant to loosen. Lubricant should be rated for a high temperature (>150°F) application.

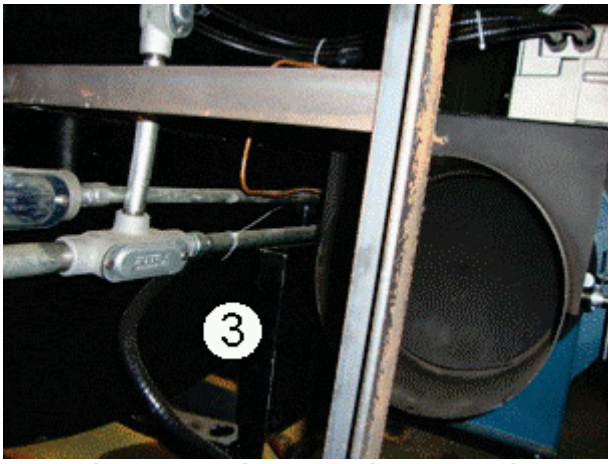
2. Gates must be opened to allow under fire air to enter the chamber. They should only be closed to reduce air in abnormal operating conditions.



1. Primary Chamber Slide Gate Open



2. Primary Chamber Slide Gate Closed



3. Secondary Chamber Slide gate Open

Primary Chamber Burner: (01-002.W)

⚠ Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

INSTRUCTION 01/-002.W.01: REMOVAL OF BURNER COVER

Switch off the electrical power. Please follow all instructions in *Section 6.1 Zero Mechanical State & Lock Out Instructions.* Cover must be removed to perform maintenance on the burner.

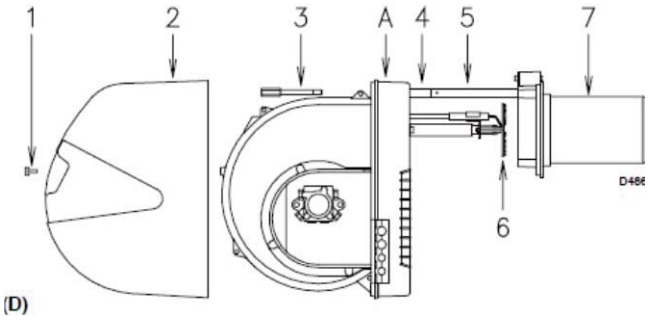
To remove the cover and to pull out the Primary or Secondary Burner, follow instructions below:

1. Loosen screw (Item #1, in the following diagrams) and withdraw the cover (Item #2, in the following diagrams)

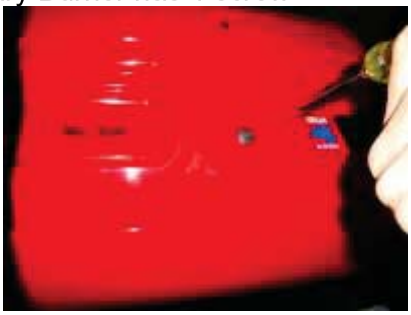
2. Primary Burner has one screw to remove the cover. The Secondary Burner has four screws to remove the cover.

3. Remove bolt (Item #3) for the Primary Burner, or screws (Item #3) for the Secondary Burner.

4. Pull (Part A) backwards keeping it slightly raised to avoid damaging the diffuser disk (Item #6).



Primary Burner has 1 screw



INSTRUCTION 01/02-002.W.02: CLEANING THE PHOTO ELECTRIC CELL

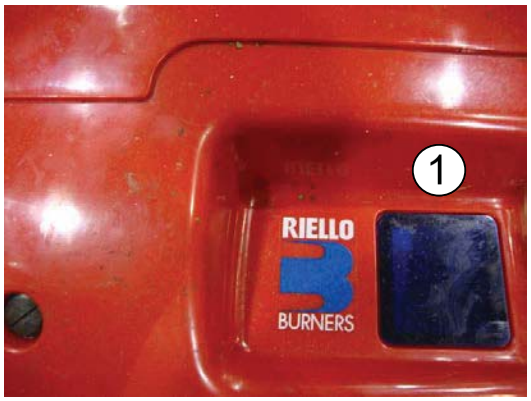
1. Remove the cover from the Burners as described in Instruction 01-002.W.01.
2. Clean Photo Electric (P.E) cell with a wet cloth (Primary Burner PN: 3006216)
3. P.E. cell (Item #1) can be removed by pulling it outward forcefully. Ensure you take note of the position of the eye while removing, this will help when reinstalling.
4. Once cleaned insert P.E. cell back into position ensuring the eye is not facing directly into the chamber (where the flame will be) but on the same angle as before it was removed.
5. Replace burner cover.

Primary Burner PE Cell



INSTRUCTION 01-002.W.03: CLEANING THE INSPECTION WINDOWS

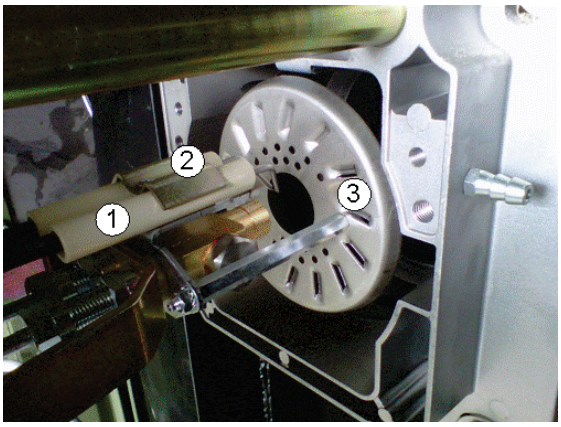
Clean the inspection windows with a wet cloth.



1. Primary Burner Inspection Window

INSTRUCTION 01-002.W.04: INSPECTING THE DIFFUSER DISC ASSEMBLY

1. Remove the cover from the Burners as described in 01-002.W.01.
2. Check the diffuser disc assembly (Primary Burner PN: 3003791) for any heat damage
3. If any heat damage, deformation or excess rust is noted, replace. (*CMI 6.3.8/03-009K)*



1. Electrode
2. U-bolt
3. Diffuser Disc

Secondary Chamber High Output Dual Burner: (02-002.W)

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

INSTRUCTION 02-002.W.01: SECONDARY BURNER WEEEKLY ROUTINE

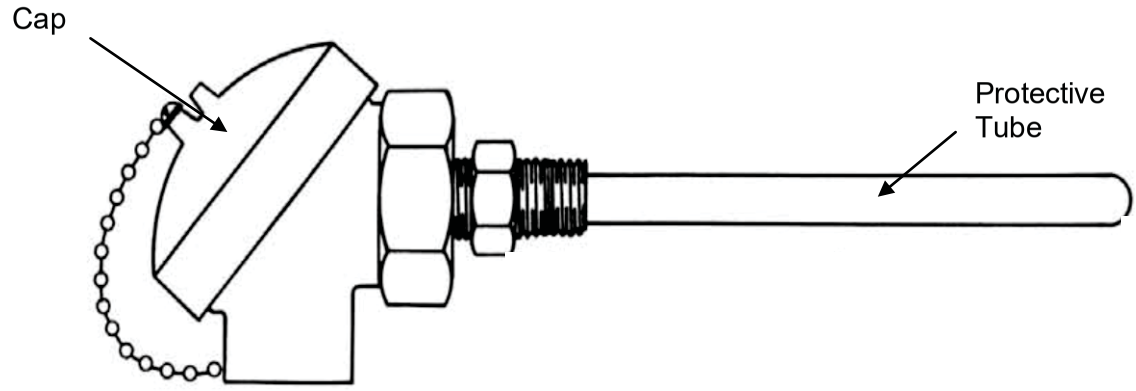
1. Clean flame sensors.
2. Clean the glass on the flame inspection window.
3. Clean spark ignitors.
4. Clean pilot assemblies.
5. Check spark ignitor lead connections.
6. Check turbulator ring.
7. Clean all filters and filter screens.
8. Lubricate all moving parts (i.e. bearings on doors, door latches & hinges, air and fuel valves, proportioning fuel valves, particularly the shafts on both air modulation valves

9. Check all motors for bearing noise, loose fans, etc.

10. Inspect fuel lines for leaks

Thermocouple: (05-002.W)

When working with electrical components ensure lock out instructions are being followed.





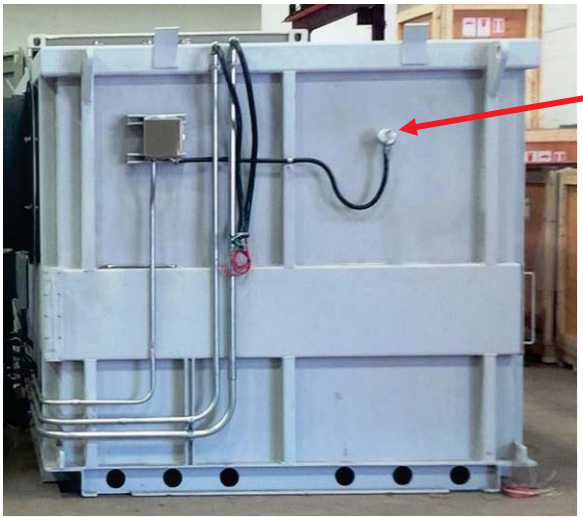
Thermocouple Assembly



Thermocouple Element

INSTRUCTION 05-002.W.01: INSPECT THERMOCOUPLE FOR DAMAGE

Turn main power to the system off - Remove thermocouple and visually inspect for damage. If damaged, see *CMI 6.3.1/05-002A*



1. Primary Chamber #1 Thermocouple



2. Two Secondary Thermocouples on Secondary Chamber body and beside the burner



3. Stack Thermocouple on Stack

i. Monthly Instructions

Primary & Secondary Chamber Blowers: (01-001.M & 02-001.M)

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 01/02-001.M.01: CHECK FAN WHEEL



1. Check the fan wheel for any wear or corrosion, as either can cause catastrophic failures, if left in operation.
2. The wheel can be accessed one of two ways.
   a. Remove the blower assembly from the unit and look down the outlet of the blower.
   b. Remove the damper assembly from the inlet of the blower and inspect by looking through the inlet of the blower.
3. Check also for the build-up of material which can cause unbalance resulting in vibration, bearing wear and serious safety hazards.
4. Clean the wheel as required.
5. If replacement is necessary follow these steps:

   a. Remove damper assembly from the unit
   b. Remove the blower assembly
   c. Remove the blower housing around the wheel
   d. Loosen all set screws that are located on the wheel.
   e. A puller may be required if the wheel hasn't been removed for some time.
   f. Ensure the shaft "key" is installed on the shaft before installing the new wheel.
   g. When installing a new wheel, the wheel should be positioned in the housing with the correct spacing between the edge of the inlet cone and the wheel. The wheel to cone clearance on the Primary Blower is 0.3175 cm.
   h. Ensure that the wheel is installed securely before reassembling the blower assembly.
   i. Install the blower assembly
   j. Install the damper assembly

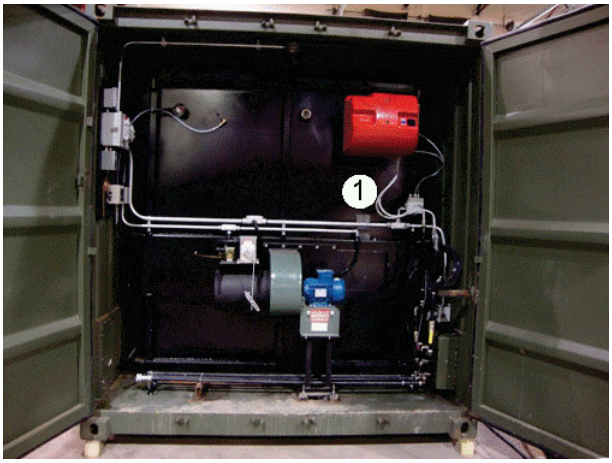
Primary Chamber Burner: (01-002.M)

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

INSTRUCTION 01-002.M.01: CHECK FLEXIBLE OIL LINE

1. Check flexible oil lines to make sure that they are still in good condition. This includes frayed, leaking, or worn swivel joints.

2. If any type of damage is observed replace the flexible oil lines see *CMI 6.3.3/01-002F & 6.3.3/02-0002F*



Primary Chamber Burner Flexible lines

INSTRUCTION 01-002.M.02: INSPECT BURNER PUMP DELIVERY PRESSURE

1. Remove the cover from the Burner as described in Instruction 01/02-002.W.01.

2. The pump delivery pressure must be between 180-210 psi, and can be viewed on the gauge shown below.



3. If the pressure is found to be unstable or if the pump is running noisily try the following:
    a. Detach the flexible hose from the line filter (Shown below as #1).
    b. At the tank pour fuel into the supply line.
    c. If there is fuel coming in through the filter it means the filter is not clogged. If no fuel is coming through the filter remove and replace.



Primary Chamber Burner Flexible lines

4. If the pump is found to be responsible:
    a. Loosen the bleed screw.
    b. Turn on the burner
    c. Once all the air has been bled out. Close the bleed screw.

    If the pump is still not working after these steps replace the pump.

5. If the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping from a loose fitting or damaged line.

INSTRUCTION 01-002.M.03: CLEAN BURNER OF DUST

1. Remove the cover from the Burners as described in Instruction 01-002.W.01.

2. Check that no dust has accumulated inside the burner fan or on fan blades.

3. If any dust is visible take a clean soft cloth to the fan or the blades and wipe clean.

INSTRUCTION 01-002.M.04: CHECK BURNER COMBUSTION HEAD

1. Remove the cover from the Burners as described in Instruction 01-002.W.01.

2. Check that all parts of the combustion head are in good condition, free of all impurities, and that no deformation has been caused by operation at high temperatures.

(Below is an example of burner in good condition)



If damage is found, please refer to *CMI 6.3.3/01-002D* & *6.3.3/02-002D*

Secondary Chamber High Output Dual Burner: (02-002.M)

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

INSTRUCTION 02-002.M.01: SECONDARY BURNER IN-LINE HEATER

1. Check all electrical connections.
2. Remove heater element from casing and inspect for build-up. Clean any deposits. When reinstalling always ensure the bundle will be restarted immersed. **NEVER** use the inline oil heater dry.

INSTRUCTION 02-002.M.02: SECONDARY BURNER SOLENOID VALVES

1. Examine solenoid valves for any deposits. Remove if necessary
2. Check electrical connections.

Refractory: (05-001.M)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 05-001.M.01: INSPECT REFRACTORY

1. Ensure power is locked out.
2. Open Secondary Chamber door.
3. Fasten door open, ensuring it will not close by its own weight.
4. Enter Secondary Chamber and check the refractory for shrinkage, any gaps between the modules greater than 2.5 cm should be patched.
5. Fix gaps with supplied blanket by stuffing material into opening. (See *CMI 6.3.2/05-001A)*
6. Check for any exposed metal, if metal is exposed make sure to patch area with blanket material or new module. (See *CMI 6.3.2/05-001A* & *6.3.2/05-001B)*
7. Pay special attention to areas where the junction boxes are located, as any excessive heat may melt the wires within the box.
8. From Secondary Chamber interior look up the stack while the cap is in closed position.
9. View the surface of the bottom of the stack cap flap with a flash light
10. Some cracking is normal, however if pieces are missing or have fallen out, (See *CMI 6.3.2/05-001E)*

Lid Lifters: (06-001.M)

Controls are normally closed. Do not modify to by-pass or leave the controls open.

Always remain vigilant and avoid injury.

INSTRUCTION 06-001.M.01: CHECK HYDRAULIC FLUID

Check the level of the hydraulic fluid. Fill if necessary.

1. Always use High temperature hydraulic oil Grade 32 to fill the tank.

ii. Quarterly Instructions

Primary & Secondary Chamber Blowers: (01-001.Q & 02-001.Q)

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 01/02-001.Q.01: LUBRICATE BEARINGS

1. Lubricate the bearings, but do not over lubricate.

2. Bearings are completely filled with grease at the factory; they may run at an elevated temperature during initial operation. Surface temperatures may reach 180°F and grease may bleed from the bearing seals. This is normal and no attempt should be made to replace lost grease. Bearing surface temperatures will decrease when the internal grease quantity reaches a normal operating level.

3. Bearings should be lubricated with premium quality lithium-based grease conforming to NLGI Grade 2. Examples are:

   Mobil - Mobilgrease XHP
   Texaco - Premium RB
   Chevron - Amolith #2
   Shell - Alvania #2

4. Add grease to the bearing via the grease nipple while running the fan or rotating the shaft by hand. Be sure all guards are in place if lubrication is performed while the fan is operating. Add just enough grease to cause a slight purging at the seals. Do not over lubricate.

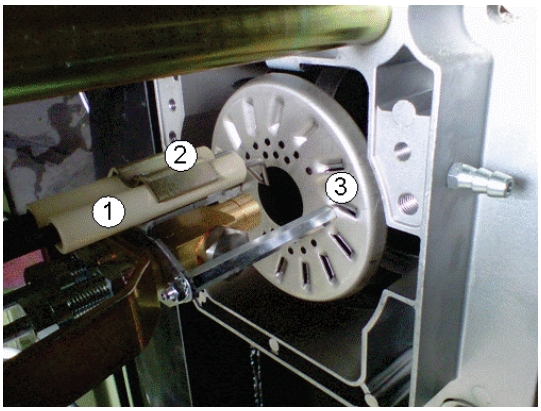


Primary Chamber Burner: (01-002.Q)

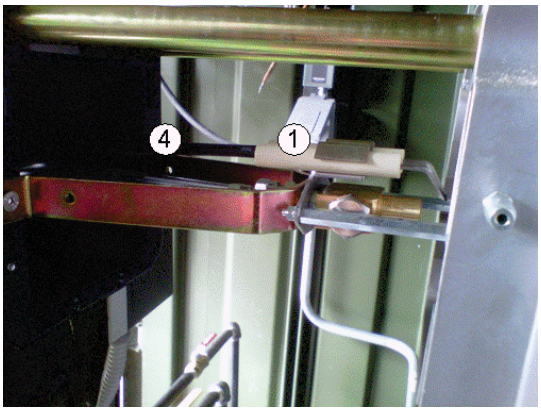
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

INSTRUCTION 01-002.Q.01: INSPECT COMPONENTS FOR HEAT DAMAGE

1. Check all components for heat damage.
2. Look for excessive rust, deformation of all the parts including but not limited to the end cone and the diffuser disc.
3. Check to see that the High Temperature Leads (HT leads) are still intact and have not melted from any excessive heat coming back into the burner. If they are damaged replace with new HT Leads (PN: 3012995 Primary). *See CMI 6.3.3/01.002A.*
    a. The HT leads are attached to the control box and the electrode via a squeeze fitting. Remove the leads from the electrode and control box by simply pulling them out.



1. Electrode
2. U-Bolt
3. Diffuser Disc



4. HT Leads



End cone

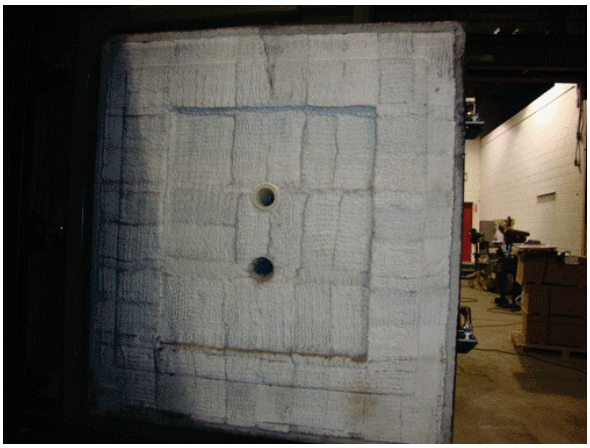
Refractory: (05-001.Q)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 05-001.Q.01: INSPECT DOOR GASKETS

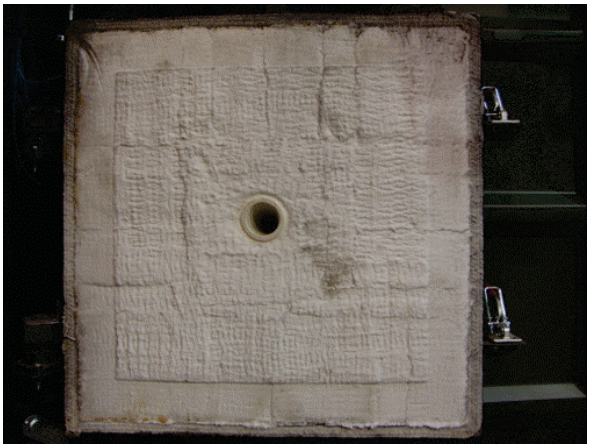
1. Open Primary and Secondary Chamber doors.
2. Fasten doors open, ensuring the door will not close on its own.
3. Inspect door gasket for damage.
4. Replace any damaged segments of door gasket (PN: GSB 1.5") if necessary. Cut out the damaged section and replace with new door gasket. See *CMI 6.3.2/05-001C*.
5. Doors must close tightly and securely, ensuring a good seal.



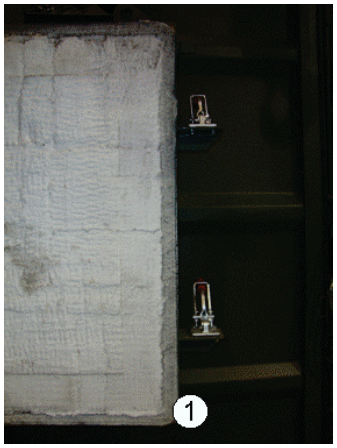
Primary Door (refractory lined)



1. Primary Door Gasket



Secondary Door (refractory lined)



1. Secondary Door Gasket

INSTRUCTION 05-001.Q.02: INSPECT REFRACTORY FOR SHRINKAGE

1. Ensure power is locked out.
2. Open Primary and Secondary Chamber doors.
3. Fasten doors open, ensuring they will not close on their own.
4. Enter Primary and Secondary Chamber and check the refractory for shrinkage, anything greater than 2.54 cm should be patched.
5. Check to make sure the anchoring of the modules is still strong and intact, if any modules seem loose replace complete module with new module.

A. **REMOVAL:** Remove existing Module (physically pull away existing refractory from underlying Module Anchor).

B. Remove welded stud from steel casing (cut with hack saw or other device between Module Anchor and Furnace Casing/Shell).

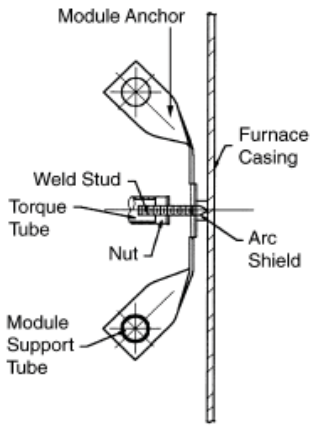


Figure 1: Side view of the Weld Loc Module

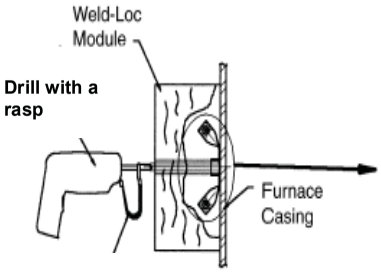


Figure 2: Stud Gun with rasp and Torque Tube.

A. **INSTALLATION**: Once the new module (PN: 433026) is in place take the stud gun (PN: ECO-STUD) with rasp to the Torque Tube and drill into place.

B. Once it has tightened the Torque Tube should come off with the drill.

Paint: (05-003.Q)



Ensure proper ventilation and proper equipment is being used when using any paint product.

INSTRUCTION 05-003.Q.01: INSPECT AND MAINTAIN EXTERIOR PAINT

1. Maintain paint exterior to protect metal from heat and corrosion damage. This includes all components in the system including containers and incinerator components.

2. If discoloration is noted and painting needs to be performed, on areas where paint will be applied, you must do a light sanding before application.

3. Follow paint manufacturer's application instructions which will include surface preparation, priming and painting.

4. If components within the container need to be painted, for example the Primary Chamber or the Secondary Chamber, proceed as above. Use a type of paint that meets the following specifications:

Paint Specifications:

Incinerator Paint: This is the paint coated directly on the incinerator shell. This includes the following components:

1. Primary Chamber
2. Secondary Chamber
3. Breech Section
4. Hot Stack Section (Black)

Finish needs to be able to withstand temperatures in the 650-750°F (340-400°C) range.

Parts: There are no paint specifications for each individual component. This is left up to the discretion of the customer.

iii. Yearly Instructions

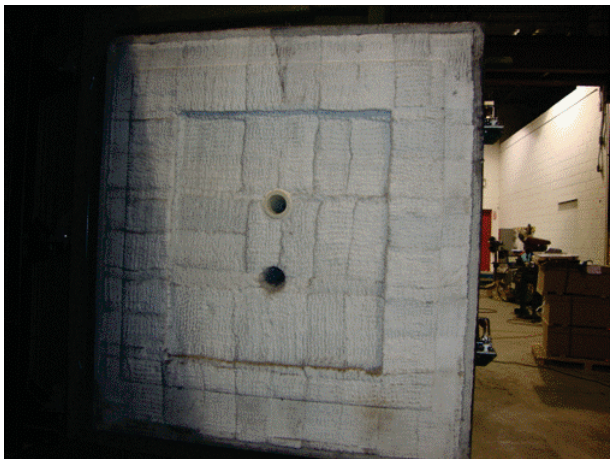
Refractory: (05-001.Y)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

INSTRUCTION 05-001.Y.01:
CHECK DOOR GASKET ALONG PRIMARY & SECONDARY CHAMBER DOORS

1. If required replace the door gasket. The gasket can last over 2 years but will depend on the careful use by the operator when loading and unloading.

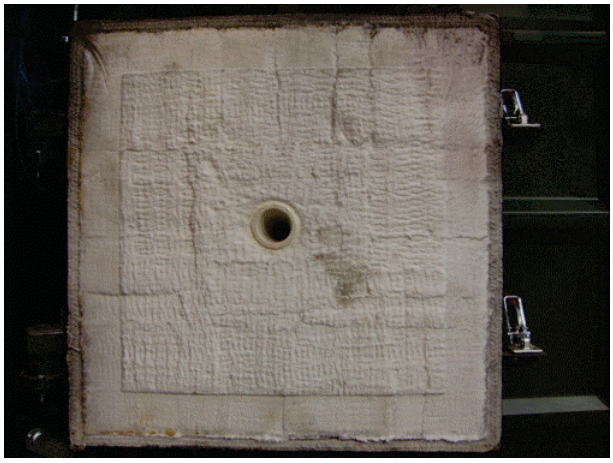
2. Remove the damaged section of door gasket from door and reinstall new gasket (PN: GSB 1.5")



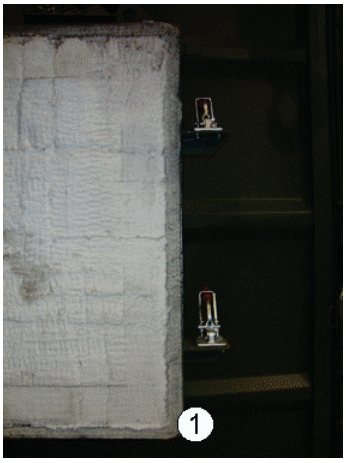
Primary Door (refractory lined)



Primary Door Gasket



Secondary Door (refractory lined)



Secondary Door Gasket

Electrical: (05-004.Y)

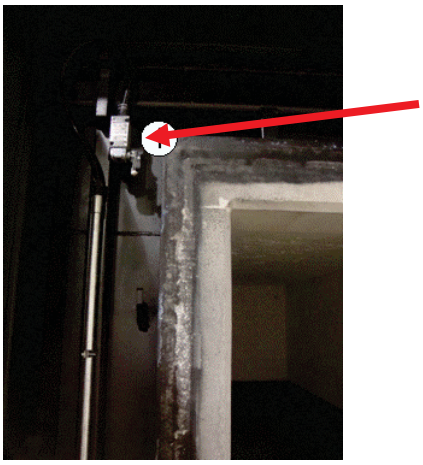
When working with electrical components ensure lock out instructions are being followed

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

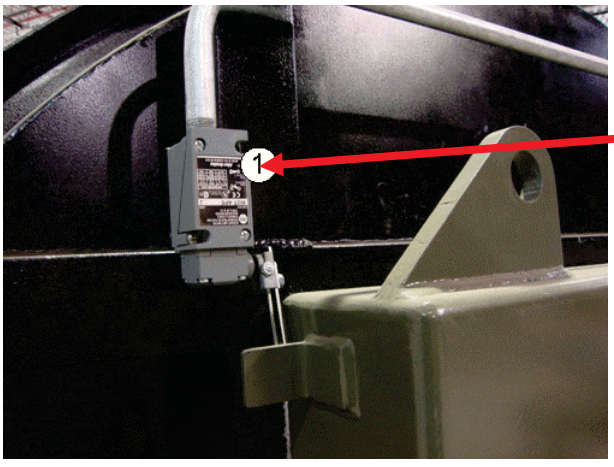
INSTRUCTION 05-004.Y.01: CHECK LIMIT SWITCHES

NOTA **System must not be running or in cool down to perform this inspection**.

1. Open Primary and Secondary Chamber doors and check top view screen on the HMI to ensure that it indicates door is open.
2. Close Primary and Secondary Chamber doors and check top view screen on the HMI to ensure that it indicates door is open.
3. All limit switches located on the unit are checked this way.
4. Replace limit switches (PN: 802T-APE) if necessary.



Primary Chamber Limit Switch



Secondary Chamber Limit Switch

1. See *CMI 6.3.1/05-005A)*.

2. Check all other limit switches in the system.

    a. Limit Switch located at upper limit of lid lifter Primary Chamber
    b. Limit Switch located at lower limit of lid lifter Primary Chamber

CORRECTIVE MAINTENANCE INSTRUCTIONS (CMI)

The following instructions relate to the replacement or correction (fixing) of components of the EWS Incinerator Package.

These Corrective Instructions are grouped in this section by the following:

6.3.1 General Corrective Maintenance Instructions
6.3.2 Refractory Corrective Maintenance Instructions
6.3.3 Primary & Secondary Burner Corrective Maintenance Instructions
6.3.4 Primary & Secondary Blower Corrective Maintenance Instructions
6.3.5 Waste Oil Burner Corrective Maintenance Instructions
6.3.6 Main Control Panel Corrective Maintenance Instructions

the following table is utilized to identify the components of the system that require corrective maintenance.

System Component		**Identification number**	
Primary Blower		**01-001**	
	Air Proving Switch Replacement		6.3.4/01-001A
	Damper Calibration		6.3.4/01-001B
	Modutrol Resistor Replacement		6.3.4/01-001C
	Damper Crank Arm Replacement		6.3.4/01-001D
	Motor Replacement		6.3.4/01-001E
	Modutrol Motor & Transformer Replacement		6.3.4/01-001F
Secondary Blower		**02-001**	
	Air Proving Switch Replacement		6.3.4/02-001A
	Damper Calibration		6.3.4/02-001B
	Modutrol Resistor Replacement		6.3.4/02-001C
	Damper Crank Arm Replacement		6.3.4/02-001D
	Motor Replacement		6.3.4/02-001E
	Modutrol Motor & Transformer Replacement		6.3.4/02-001F
Primary Burner		**01-002**	
	Replacing Fuel Filter		6.3.1/01-002A
	HT Lead & Electrode Replacement		6.3.3/01-002A
	Diffuser Disc Replacement		6.3.3/01-002B
	Nozzle Replacement		6.3.3/01-002C
	End Cone Replacement		6.3.3/01-002D
	Nozzle Assembly Repair or Replacement		6.3.3/01-002E
	Burner Flexible Oil Line Replacement		6.3.3/01-002F
	Low Level Switch Replacement		6.3.3/01-002G
	Inspection Window Replacement		6.3.3/01-002H
	Fuel Pump Replacement		6.3.3/01-002I
	Control Box Replacement		6.3.3/01-002J
	Oil Tube Replacement		6.3.3/01-002K
	Burner PE Cell & UV Detector Replacement		6.3.3/01-002L
	Burner Fan Motor Replacement		6.3.3/01-002M

Refractory		**05-001**	
	Wall Refractory: Gaps between the Modules		6.3.2/05-001A
	Wall Refractory: Replacement of the Modules		6.3.2/05-001B
	Door Gasket		6.3.2/05-001C
	Castable Refractory		6.3.2/05-001D
	Temporary Repair of Castable		6.3.2/05-001E
Main Control Panel		**03-010**	
	Main Control Panel		6.3.6/03-010A
	Reboot PLC		6.3.6/03-010B
Limit Switch		**05-005**	
	Limit Switch Replacement		6.3.1/05-005A

iv. General Corrective Maintenance Instructions

LIMIT SWITCH REPLACEMENT (6.3.1/05-005A)

1. Loosen the 2 screws holding the limit switch in place.
2. Remove limit switch, replace with a new one (PN: 802T-APE).
3. Take arm off of old body and mount to new.
4. Tighten the 2 screws holding the limit switch body.

REPLACING THERMOCOUPLE (6.3.1/05-002A)

The thermocouple will require routine replacement. The environment inside the incinerator will erode the protection tube to the point of failure. If the element is exposed to this environment it will be destroyed and will need to be replaced.

1. Unscrew thermocouple lid and remove wires.
2. Remove protection tube. To aid with this a vise and a pipe wrench will be needed.
3. Remove element and replace with new element (PN: TK-K08B-0100-S) and protection tube (PN: TA-A427A-K08B-010).









4. Reinstall on incinerator.

5. After installation turn power back on. Observe the temperature reading of the thermocouple you were just working on. If the wires were installed incorrectly the temperature will read the opposite temperature. (ie 20°C would read as -20°C). If this is the case open the thermocouple housing and switch the wires.

REPLACING FUEL FILTER (6.3.1/01-002A AND 02-002A)

The fuel filter will require routine replacement to ensure clean fuel delivery to the Primary and Secondary Chamber burners.

1. Close the ball valve on the supply line.



2. Unscrew the used filter. Use a bucket to catch the surplus fuel when you unscrew the filter.



3. Before installing the filter lubricate the seal on the new filter.

4. Install the new filter, and open the supply line ball valve.

v. Refractory Corrective Maintenance Instructions

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

WALL REFRACTORY: GAPS BETWEEN THE MODULES (6.3.2/05-001A)

The ceramic block refractory will shrink over time exposing the exterior metal shell. These gaps need to be filled in with ceramic refractory blanket.

1. Identify gaps in the chamber that are larger than 1” in width between the modules or if you can see exterior shell.

2. With a Utility knife cut a length of ceramic blanket (PN: 1" x 24" 8# 2600) that will fit in the gap between the modules.

3. Stuff the blanket into the space with a straight edge or ruler.

WALL REFRACTORY: REPLACEMENT OF MODULES (6.3.2/05-001B)

Excessive damage to a section of refractory may necessitate the replacement of modules in the incinerator. Such damage is largely due to mechanical wear. The following diagram walks through the removal and installation of new modules.

A. REMOVAL: Remove existing Module (physically pull away existing refractory from underlying Module Anchor)

B. Remove welded stud from steel casing (cut with hack saw or other device between Module Anchor and Furnace Casing/Shell)

Figure 1: Side view of the Weld Loc Module

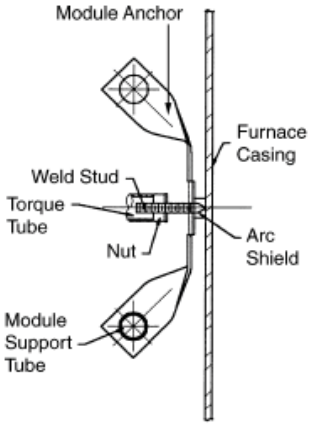
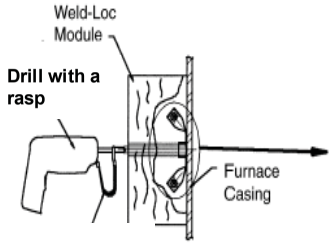


Figure 2: Stud Gun with rasp and Torque Tube (part of module assembly).



C. INSTALLATION: Once the new module is in place take the stud gun (PN: Eco-Stud) with rasp to the Torque Tube and drill into place.

D. Once it has tightened the Torque Tube should come off with the drill.

DOOR GASKET REFRACTORY (6.3.2/05-001C)

The door gasket will degrade over time and will need to be replaced over time. The bottom of the door will see more degradation due to the waste burning in that vicinity.

1. Identify the damaged section of gasket that will need to be removed
2. With a utility knife cut out the section that needs to be replaced.
3. A new piece of gasket (PN: GSB 1.5”) will need to be cut the same length as the removed piece.
4. With contact cement coat the gasket on one side and the door section and install.

CASTABLE REFRACTORY (6.3.2/05-001D)

Operators will notice that the castable refractory will show signs of minor cracking. The minor cracking is normal. Large sections of castable should not separate from the rest of the monolithic cast. Such occurrences are largely due to a sudden impact from machinery or dropping of the units themselves. Mortar (PN: SM3000) is supplied to help with a temporary repair while a permanent repair is resolved. Such permanent repairs are a third level repair and have to be considered on a case by case basis.

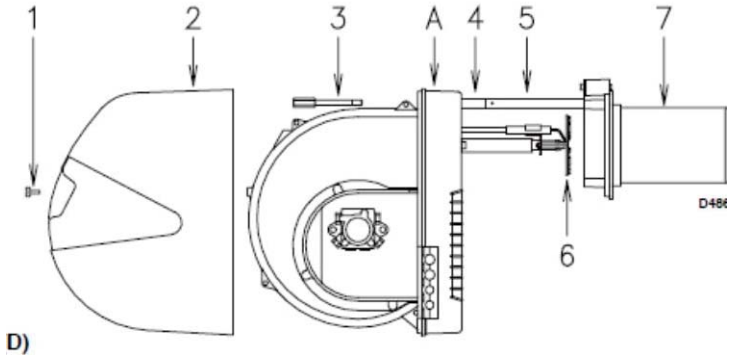
TEMPORARY REPAIR OF CASTABLE (6.3.2/05-001E)

1. Find the pieces of castable refractory that have separated.
2. Clean both the pieces of refractory and the area where the separation occurred.
3. Spread an even amount of high temperature mortar on the pieces and the area of separation.
4. Put the pieces back where they originated and support as necessary for a minimum of an hour while the mortar cures.

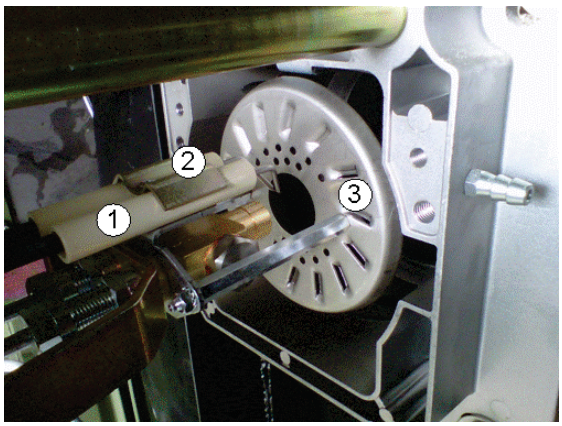
vi. Burner Corrective Maintenance Instructions

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

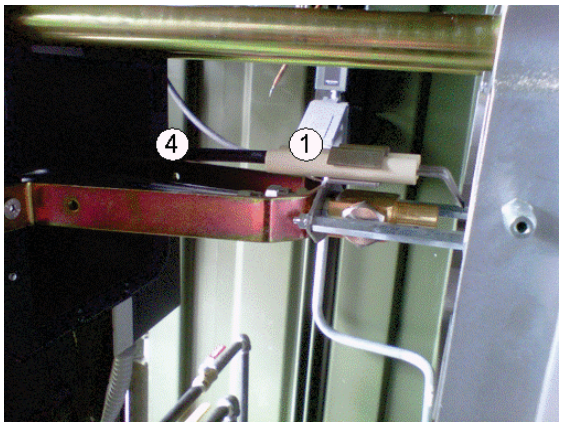
The Burners are pieces of equipment that will require routine corrective and preventive maintenance. Parts within this assembly will need to be repaired or replaced. The most common parts to be repaired or replaced are located at the front end of the burner where the parts are exposed to high temperatures.



Front End Primary Burner



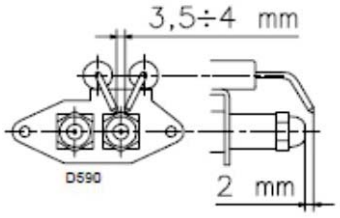
1. Electrode
2. U-bolt
3. Diffuser Disc



4. HT Leads

HT LEAD & ELECTRODE REPLACEMENT (6.3.3/01-002A)

1. In order to change out the HT leads (PN: 3012995) Primary Burner or Electrode (PN: 3003796) the U-Bolt will have to be removed
2. Remove the electrode by pulling the lead out of the white ceramic tube, replace and re-install.
3. To change the Leads the wire will need to be removed from the burner.
4. Pull the wire out of the burner housing through the rubber grommet.
5. The other end is connected to the back of the control box. Pull the wire straight out and the spring fitting will disengage.
6. Replace the lead with a new one reversing the above directions.
7. When reinstalling the electrodes make sure that they are positioned as shown below:



Primary Burner

DIFFUSER DISC REPLACEMENT (6.3.3/01-002B)

1. Identify the diffuser disc in the above pictures.
2. The disc assembly is secured to the nozzle housing by 2 hex nuts.
3. Remove these nuts and remove the assembly from the burner.
4. The disc is attached to the assembly with 2 screws.
5. Remove the screws and replace the disc.
    - Primary Chamber Burner diffuser disc PN: 3003791
6. Reassemble.

NOZZLE REPLACEMENT (6.3.3/01-002C)

1. Identify the nozzle at the very front end of the burner just behind the diffuser disc.

2. Remove the nozzle with a wrench.

3. Install the new nozzle.
    - Primary Chamber Burner nozzle PN: C5222433

END CONE REPLACEMENT (6.3.3/01-002D)

The end cone will need replacement when the flame becomes unstable from too much heat damage.

1. Loosen and remove the 4 hex bolts that hold the burner on the flange.

2. Remove the burner completely from the incinerator. This will require more than one operator because the burner is heavy.

3. There are two screws that hold the end cone on. Remove and save the screws for the new end cone.

4. Install the new End Cone with the old screws.
    - Primary Chamber burner end cone PN: 3003807

5. Reinstall the burner.

NOZZLE ASSEMBLY REPAIR OR REPLACEMENT (6.3.3/01-002E)

The nozzle assembly is subjected to high heat cycling. The heat cycling will eventually cause the seals and assembly to leak. The assembly will have to be replaced when this occurs. First identify the location of the nozzle assembly.

The parts (seals, nozzle assembly) needed for these replacements are all included under one part number.

- Primary Chamber Burner nozzle assembly: PN: 3003814

Remove all connections to the nozzle assembly and replace with the above parts.

BURNER FLEXIBLE OIL LINE REPLACEMENT (6.3.3/01-002F)

1. Turn the inline ball valve to the closed position to isolate the fuel supply from the burner. This valve is located down line from the burner.

2. Remove flexible lines.

3. Replace with new lines.

    - Primary Chamber Burner flexible oil line: PN: C5281160

4. Open ball valve.



Primary Chamber Burner Flexible lines
(Item # 1 Above)

LEVEL SWITCH REPLACEMENT (6.3.3/01-002G & 02-002G)

The level switch is located in the Fuel Tank.

NOTA
Tanks do not have to be emptied to replace.

1. Unplug the level switch.
2. Disconnect the cord and remove the level switch.
3. Replace level switch (PN: FS301-01) and reconnect the cord.
4. Plug in the level switch.

INSPECTION WINDOW REPLACEMENT (6.3.3/01-002H & 02-002H)

To replace the inspection window simply remove the old inspection window and replace with a new one:

- Primary Burner inspection window PN: 3003763

FUEL PUMP REPLACEMENT (6.3.3/01-002I)

Identify the pump on the burner you wish to replace.

Remove all fuel connections to the pump with the appropriate wrench. Unbolt the pump from the main body of the burner and pull the pump away from the burner to remove.

Reinstall the new pump, and reattach all fuel connections.

- Primary Burner: PN: 3013027

CONTROL BOX REPLACEMENT (6.3.3/01-002J & 02-002J)

Identify the control box on the burner you wish to replace:

Ensuring the power is off unscrew the old control box and install the new one.

- Primary Burner: PN: 3012933

OIL TUBE REPLACEMENT (6.3.3/01-002K)

Oil tubes leak due to heat cycling which causes the fittings to fail or a loose fitting.

1. Identify the oil tubes on the Primary Burner and on the Secondary burner.
2. First try tightening the fittings to see if the leak stops. If the leak does not stop:
3. Remove the old oil tubes with a wrench and install the new ones:

- Primary Burner Tubes: PN: 3003821
  PN: 3003822

BURNER PE CELL REPLACEMENT (6.3.3/01-002L)

Primary Burner: If the PE cell has been damaged, then it will need to be replaced. The PE cell while removed needs to be unplugged from the control box. This is accomplished by pulling the connection towards you. With the new PE cell install the control box end first by pushing the connection hard. Reinstall the PE cell in the burner.

BURNER FAN MOTOR REPLACEMET (6.3.3/01-002M)

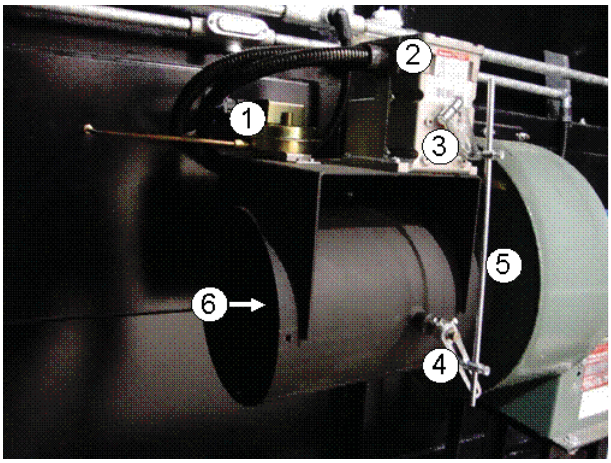
Identify the malfunctioning motor in the affected burner:

Unbolt and remove the malfunctioning motor from the housing. Disconnect all electrical connections. Reinstall the new motor exactly how the old motor was installed.

vii. Primary & Secondary Blower Corrective Maintenance Instructions

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

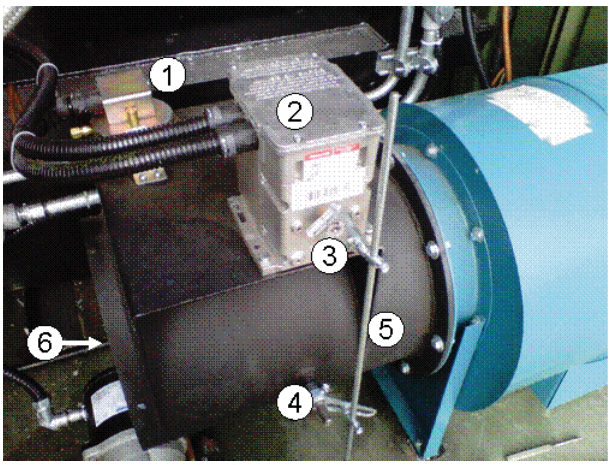
Primary Blower assemblies are not a commonly repaired part on the incinerator. Parts within this assembly will need to be repaired or replaced. They are outlined below.



Primary Blower

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper

Secondary Blower assemblies are not a commonly repaired part on the incinerator. Parts within this assembly will need to be repaired or replaced. They are outlined below.



*Sample picture of a Secondary Blower and its assembly

Secondary Blower

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper

AIR PROVING SWITCH REPLACEMENT (6.3.4/01-001A & 02-001A)

1. Ensure all power is locked out.
2. Remove wiring from switch.
3. Remove tubing from switch.
4. Unscrew screws at the two locations and remove switch.
5. Reinstall new switch (PN: SML8221210034) complete with tubing and wiring and then retighten.
6. Turn power back on.

DAMPER CALIBRATION (6.3.4/01-001B & 02-001B)

Sometimes the damper linkage will slip when the connections become loose (Items 3,4,5 in the Secondary Blower photo) In order to ensure that the linkage is correctly calibrated the operator will need to look at the display screen on the control panel while the unit is in operation

1. Read the % Open value on the control panel operator interface (PanelView) for the Primary Blower.
2. During operation the damper is factory preset to be 0% open, or fully closed.
3. Look inside the damper (Item 6) and ensure that the linkage is completely closed.
4. If it is then this maintenance is complete.
5. Should the damper be open even a small percentage the linkages are to be loosened and the damper adjusted to be completely closed, and then retighten.

MODUTROL RESISTOR REPLACEMENT (6.3.4/01-001C & 02-001C)

The Modutrol resistors are located inside the top lid of the Modutrol motor. Remove the lid to the Modutrol motor by unscrewing the top four (4) screws. The connection between the control panel and the Modutrol is made with a small white connector with 3 terminals. Jumpered between these terminals is the resistors.

Remove and replace the resistors one at a time to ensure the correct resistors are replaced. You identify the correct resistor by examining the color band on the center node of the resistor. Replace like resistors.

DAMPER CRANK ARM REPLACEMENT (6.3.4/01-001D & 02-001D)

The crank arm will only need to be replaced if the arm is damaged due to misuse. Identify the damper crank arm (Item #4 in the picture on the previous page).

Identify the location of the linkage on the rod and the damper arm with a marker, so the new crank arm will be in the same spot when reinstalled. Remove the connections to the crank arm and replace with the new one (PN: 26026G) and ensure it is in the same spot as the old one.

MODUTROL MOTOR & TRANSFORMER REPLACEMENT (6.3.4/01-001F & 02-001F)

To replace the Modutrol motor all power needs to be off to the system as you will need to expose electrical connections. Firstly get the new motor and orientate the motor in the same direction as the old motor. Identify where the conduit is connected on the old motor and punch the connector holes for the new motor.

Removal

1. Remove all electrical terminations and remove the transformer.
2. Install the transformer in the new Modutrol motor.
3. Remove all conduit connections on the motor.
4. Remove the damper arm and linkage from the motor.
5. Unbolt the motor from the damper, and ensure all nuts and bolts are kept for the new motor install

Install

1. Bolt the new motor in the same orientation as the old motor.
2. Install the damper arm and linkage to the motor
3. Install all conduit connections

Terminate all electrical connections the same as the old motor.

REPLACE THE BLOWER CONTACTOR 6.3.4/01-001G

1. Turn the Main Disconnect Switch off.
2. Open Panel.
3. Remove the wires from M1.
4. Pull the retaining clip up.
5. Tilt contactor forward and remove.
6. To reinstall tilt new contactor (PN: 100-C09D10) until it clicks back in.
7. Pull the retaining clip back down to lock.
8. Reinstall wires to M1.
9. Close panel.
10. Turn power back on.

viii. Main Control Panel Corrective Maintenance Instructions

MAIN CONTROL PANEL (6.3.6/03-010A)

All control panel diagnostics are to be completed by certified or trained technicians. Electrical drawings / diagrams are provided to aid electricians with any diagnostics.

REBOOT PLC (6.3.6/03-010B)

Turn Main Disconnect to the off position on the front of the Control Panel. Turn the main disconnect back on.

SECTION 7

PARTS LIST

ECO WASTE SOLUTIONS

ECO 1.75TN 1PV100L Parts List

General Incinerator Components	Quantity		Part #	Supplier
Primary Door Bearings			F4B-E-200R DGE	Canadian Bearings Ltd.
Secondary Door Bearings	5		F4B-E-104R DGE	Canadian Bearings Ltd.
Stack Bearings	2		P2B-SC-100	Canadian Bearings Ltd.
Toggle Clamps US$	6		51335A66	McMaster-Carr
View Ports	5		P1030/8	Pegasus
Thermocouple	4		TA-A427A-K08B-010.0	Thermo-Kinetics Company Ltd.
Metal ash bins 2.5 yds with lid	2		JT-2.5-60-188	JT Fabrication Ltd..
Blower Assemblies	Quantity		Part #	Supplier
Primary Chamber Blower	1		BI10	Canarm
Secondary Chamber Blower w/flanges	1		BI13	Canarm
Modutrol	2		M9184D4009	Yorkland Controls Limited
Air Proving Switch	3		SML 8221210034	Yorkland Controls Limited
Primary Chamber Burner	Quantity		Part #	Supplier
Primary Burner RL 28/2	1		C9511200	Riello
Fuel Tank 4500l	1		6011000	Hassco Industries Inc.
Ktech 37.5" low level switch stainless steel	1		FS301SF-1 28"NC	Ktech Industrial Products Inc.
Diesel filter	1		VF1210	National Energy Equipment Inc.
5 micron pleated paper filter	2	KPP21005B		National Energy Equipment Inc.
High Output Used Oil Burner	Quantity		Part #	Supplier
Special 6514-8-A fireall dual fuel burner complete with refractory tile, standard capacity iron nose	1		6514-8-A/LX/1.0A-X13546	Fives North American Combustion
3/4" Pilot Set	1		4015-0-T	Fives North American Combustion
1/2" std regulator	1		7218-01	Fives North American Combustion
3/8" sensitrol oil valve	1		1813-02-D	Fives North American Combustion
1/2"dia. x 18" AOL; 1/2" mnpt connectors e/e; braided CGA approved and tagged	1		C8777-01/18-CGA	Fives North American Combustion
2" butterfly valve	1		1122-4	Fives North American Combustion
Gauge, 0 - 60" wc and 0 - 35 osi	2		8735-HI	Fives North American Combustion
8" wafer valve	1		1156-9	Fives North American Combustion
Control motor, 310 IN/LBS, 37 second timing,4-20 ma, no feedback signal, 1000 ohm potentiometer, 135 degree travel, 110-120VAC	1		1615-F	Fives North American Combustion
Bracket and Linkage for 1615-A through N, for 1136, 1146, and 1156-9 through -22	1		2-9004-205	Fives North American Combustion
Pressure switch, 12 - 60" wc	1		8757-GAO-A4/4/6	Fives North American Combustion
DIF. PRES. SW 1-20"W.C.AUTO.RST	1		C8757-DG50T-DIF	Fives North American Combustion
1/2" ball valve	4		C1821-01	Fives North American Combustion
1/4" ball valve	5		C1821-03	Fives North American Combustion
Pressure gauge, 2-1/2"; 0-60 psi/400 kPa, dual scale; liquid filled 1/4" bottom; SS case;	2		C8735-M-LF	Fives North American Combustion
1/2" pressure regulator	1		7142-01-25	Fives North American Combustion
1/2" relief valve	1		7177-01-75	Fives North American Combustion

Pressure switch #B424B range=0-100 psi	2	C8757-B424B-100	Fives North American Combustion
1/2" oil solenoid valve, NEMA 3R	1	1483-01	Fives North American Combustion
1/2" automatic reset oil shutoff valve 120/1/60	1	1517-01	Fives North American Combustion
1/4" Oil flow meter nickel-plated brass housing Buna o-ring 0.2-0.9 GPM SS orifice and spring vertical flow up	1	8598B-03-0.9-VU	Fives North American Combustion
1/2" ratiotrol with gauges	1	7052-01-WG	Fives North American Combustion
1/2" expansion chamber	1	C7000-0-HSR	Fives North American Combustion
3/4" regulator	2	C1485-01	Fives North American Combustion
Combution Blower -Chicago Blower	1	D53 E4	Canada Blower
Burner control	1	RM7895C1012	Yorkland Controls Limited
1" three way valve	1	4093T25	McMaster-Carr
1/2" three way valve	1	4093T23	McMaster-Carr
Used Oil Pump	1	03HB1131 code10/13	Albany Pump Company Ltd.
Basket suction strainer with 60 mesh	1	SBS-100	Albany Pump Company Ltd.
Ball Valve, 1” NPT, cUL Listed	1	BAVA-100	Albany Pump Company Ltd.
Relief Valve c/w WS spring (30-100 PSI)	1	FVJ-3R-SS	Albany Pump Company Ltd.
Pressure gauge, 4” Dial; liquid filled, 100 PSI	1	PG100LF-100	Albany Pump Company Ltd.
Compound Gauge;4" Dial; liquid filled; 30-0-30 PSI	1	CG100LF-30/30	Albany Pump Company Ltd.
Watson McDaniel size 3/4” Series ‘B’ pressure reducing valve	1	with Viton disc and diaphragm. 1-50 psig	Albany Pump Company Ltd.
Waste Oil ciculation heater with controller 600v. 3ph, 4687watts	1	CBLS747E13S	Hassco Industries Inc.
Transfer Pump	1	FR450B	National Energy Equipment Inc.
Oil Filter	1	VF1210	National Energy Equipment Inc.
5 micron pleated paper filter	2	KPP21005B	National Energy Equipment Inc.
Waste oil Tank 5000L	1	CUSTOMTANK	Hassco Industries Inc.
Level Switch	1	FS301SF-1 45”NC for 60 dia. tank	Ktech Industrial Products Inc.
Mixer	2	NP HGL-3.3	Metex Corporations
Waste oil totes IBC containment	2	H4435	ULINE CANADA CORPORATION
Waste oil totes IBC	2	H-3886	ULINE CANADA CORPORATION
Salt and/or sand box spillage kit	2	S18304	ULINE CANADA CORPORATION
Top Loading Package	Quantity	Part #	Supplier
Lid lifter HT 3500 Stoke 72"	1	9-LL-3500-72-BE-575	Canada Hydraulique Equipment Inc.
Lid Lifting Link Assembly	4	ECO5TN2PV-06-XX	P.D.S. WELDING LTD
Jaw Only 3/4" - 10 Right Hand Thread 12" max adj	4	3001T23	McMaster-Carr
18-8 Stainless Steel Clevis Pin, 3/4" Dia 2" L	4	92390A521	McMaster-Carr
Opacity Monitor	Quantity	Part #	Supplier
Compliance Opacity Monitoring System (EPA PS-1)	1	PN 80-0290	Akrulogic
Includes:			
Transceiver / Reflector			
Stack Mounting Flanges			
Local Control Panel			
1hp Air Purge Assembly			

-60C Air Purge Hose (2 pcs @ 20')	1	PN 80-3411 (Upgrade)	Akrulogic
Opacity Optic Head Extension Control Cable	1	PN 80-0297	Akrulogic
Scale	Quantity	Part #	Supplier
4 x 4 Scale w/ digital indicator, analog output and weather gland	1		Matrix Scale Service Inc.
Electrical	Quantity	Part #	Supplier
IEC 60 amp 600 volt rotary disconnect	1	GS2GU3N	Graybar
Disconnect operating handle	1	GS2AH420	Graybar
Operating shaft	1	GS2AE81	Graybar
175 amp power distribution block	1	PDB220-3	Graybar
175 amp power distribution block cover	1	CPB162-1	Graybar
Ground lug	1	LAMA2/0-14-QY	Graybar
600 volt 30 amp 3 pole class J fuse block	11	JT60030	Graybar
250 volt 30 amp 1 pole class RK1 fuse block	11	H25030-1CR	Graybar
600 volt 60 amp class J fuse	3	LPJ-60SP	Graybar
600 volt 17 amp class J fuse	3	LPJ-17SP	Graybar
600 volt 10 amp class J fuse	3	LPJ-10SP	Graybar
600 volt 7 amp class J fuse	8	LPJ-7SP	Graybar
600 volt 4 amp class J fuse	9	LPJ-4SP	Graybar
250 volt 30 amp class RK1 fuse	1	LPNRK-30SP	Graybar
250 volt 10 amp class RK1 fuse	1	LPNRK-10SP	Graybar
250 volt 6 amp class RK1 fuse	1	LPNRK-6SP	Graybar
250 volt 5 amp class RK1 fuse	2	LPNRK-5SP	Graybar
250 volt 2 amp class RK1 fuse	2	LPNRK-2SP	Graybar
250 volt 1 amp class RK1 fuse	4	LPNRK-1SP	Graybar
12 amp IEC contactor 120 VAC coil	1	LC1D12G7	Graybar
9 amp IEC contactor 120 VAC coil	6	LC1D9F7	Graybar
4 N.O. top mount auxilary contact	1	LADN40	Graybar
IEC solid state overload relay range 6.4- 32 a	1	LR9D32	Graybar
IEC solid state overload relay range 1.6-8 a	2	LR9D08	Graybar
IEC solid state overload relay range 0.2- 2 a	2	LR9D02	Graybar
16 amp SPDT slim line relay 120 VAC coil	10	RXG15F7	Graybar
Base slim line relay	10	RGZE1S35M	Graybar
8 PIN tube based relay 120VAC coil	10	RUMC23F7	Graybar
DPDT 8 PIN tube based relay base	10	RUZC2M	Graybar
600 to 120 VAC 3000 VA transformer	1	CE3000JA	Graybar
24 VDC 1.3 amp switching power supply	1	PS5R-SC24	SnS
5 port unmanaged ethernet switch US$99	1	SE-SW5U	Automation Direct
Current transducer US$75.5	1	ACT050-42L-F	Automation Direct
10.4" TFT touch panel with Intouch run time	1	TCND1U-10AC-CM2	Wonderware Canada East
600 volt 3 H.P. V.F.D.	1	ACS25-03U-04A1-6	Gerrie
480 volt 8 amp line reactor	1	3PR-004C5H	Graybar
0-1" H2O draft transmitter	1	616KD-00	Furneco
Ethernet PLC programing port	1	P-R2-F3R0	Gerrie

ECO WASTE SOLUTIONS

ECO 1.75TN 1PV100L Parts List

22mm Green illuminated push button operator	2	ZB5AW333	Graybar
22mm Emergency stop push button operator	1	ZB5AS844	Graybar
22mm 3 position return to center selector switch	1	ZB5AD5	Graybar
22mm Green flush push button operator	2	ZB5AA34	Graybar
22mm Black flush push button operator	2	ZB5AA24	Graybar
22mm Red extended push button operator	2	ZB5AL4	Graybar
Green integrated led module	2	ZBVG3	Graybar
N.O. contact block	5	ZBE101	Graybar
N.C. contact block	3	ZBE102	Graybar
Limit switch	4	802T-AP	Gerrie
Limit switch lever	4	802T-W2B	Gerrie
18 mm AC inductive proximity switch US$31	2	VK1-AO-1B	Automation Direct
Pt100 RTD for cold junction compensation	1	TFD	Omega
Unity CPU cw 1 Enet port and 1 serial port	1	BMXP342020	Graybar Canada Inc.
8 Slot Backplane	1	BMXXBP0800	Graybar Canada Inc.
110Vac Power supply	1	BMXCPS2000	Graybar Canada Inc.
16 point 120 vac input module	2	BMXDAI1604	Graybar Canada Inc.
8 channel analog input module	1	BMXAMI0810	Graybar Canada Inc.
4 channel thermocouple input module	1	BMXART0414	Graybar Canada Inc.
16 point relay output module	1	BMXDRA1605	Graybar Canada Inc.
4 Channel analog output module	1	BMXAMO0410	Graybar Canada Inc.
Connectors for all modules except AMI0810 and ART0814	4	BMXFTB2000	Graybar Canada Inc.
Connector for AMI080	1	BMXFTB2800	Graybar Canada Inc.
Connector	1	BMXFCW301S	Graybar Canada Inc.
IEC solid state overload relay range 0.2- 2 a	1	LR9D02	Graybar
1hp VFD ABB	1	ACS250-03U-02A1-6	Gerrie
1hp line reactor	1	REX3PR0002C5H	Graybar Canada Inc.
Type K Thermocouple 20AWG	300	K-20S-TT	Thermo-Kinetics Company Ltd.

AGNICO EAGLE

MELIADINE GOLD PROJECT

Landfarm Management Plan

March 2018
Version 3
6513-MPS-15

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ᑕᑦᓇ ᑎᑎᖅᑲᖅ ᑕᔪᓴᐅᑎᑕᑎᔪᖅ ᐊᓯᑕᔪᓂᒃ ᐊᐅᓪᓕᑎᓂᖏᓪᓗᑦ ᕿᖏᐅᑎᑎᒃ ᐱᓕᓚᐊᖏᓪᓗᑦ ᐊᖏᒪᓗ ᐋᖅᑭᒃᓯᔪᓕᐊᓂᒃ ᐅᓂᒋᓂᐊᖅᑐᑦ ᐱᓕᓚᐊᖏᓪᓗᑦ ᐊᐅᓚᑦ Type “A” ᐃᒪᖏᓗᑦ ᓪᐃᓴᓵᓂᒃ ᑐᓴᔪᕐᓗᐅᒪᓗᑦ. ᑕᑦᓇ ᕿᖏᐅᑎ ᐅᑯᐅᔪᑯᖅᑐᑦ ᐋᖅᑭᒃᓯᔪᓕᐊᓂᒃᓴᓕᓂᒃ ᐊᐅᓪᓕᑎᓂᖏᓪᓗᑦ ᐊᑐᓪᓚᓂᐊᖅᑐᑦ ᐃᓂᒋᔭᐅᑕᑯᓂᖅᑐᑦ ᐊᐅᓪᓕᑎᓂᖏᓪᓗᑦ ᐊᑐᓪᓚᓂᐊᖅᑐᑦ ᐱᓕᓚᐊᖏᓪᓗᑦ ᑕᐃᔨᔪᓂᑯᓂᖅᑐᑦ ᐱᓕᓚᐊᖏᓪᓗᑦ ᐃᓂᒋᔭᐅᑕᑯᓂᖅᑐᑦ ᐱᓕᓚᐊᖏᓪᓗᑦ ᐅᓯᐯᐃᖓᓚᔪᖅ ᐱᓕᓚᐊᖏᓪᓗᑦ ᐊᐅᓚ

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

This document presents the Landfarm Management Plan for the Project and forms a component of the documentation series produced for the Type A Water Licence Application. The Plan describes the design features and operational procedures for the landfarm to be constructed at the Project for the storage and treatment of petroleum hydrocarbon contaminated soils.

On-site storage and remediation has been established as the preferred method for treatment of light petroleum hydrocarbon contaminated soil that may be generated on the proposed mine site. The landfarm is designed to receive soils, rock, snow, and ice contaminated with petroleum hydrocarbons. This will include light hydrocarbons such as diesel and gasoline being treated in the landfarm.

The landfarm is located just off the infrastructure pad, approximately 200 metres from Collection Pond 1 (CP1). The central location of the landfarm was chosen to minimize the footprint of the site and the transport distance of contaminated material from potential spill locations. The landfarm is expected to effectively treat up to 5,000 cubic metres of contaminated soil over the construction, operations, and closure of the Project, and 500 cubic metres of snow and ice annually. Water accumulating in the landfarm will not be discharged directly to the receiving environment. It will be collected and directed to CP1 for treatment. The landfarm will have an impervious liner and no impacts on shallow groundwater are anticipated.

A report of landfarm activities will be prepared annually by Environment Department, indicating the volume of material added to the facility, amount of material removed and disposal or re-use location, all analysis results, volume and type of nutrient addition, visual inspection results, and volume of contact water pumped.

Soils contaminated with light end petroleum hydrocarbons will require an estimated three full summer seasons for complete remediation. When remediated, the soils will be removed from the facility and can be used for construction purpose such as part of the cover of the Tailings Storage Facility or stacked in the Waste Rock Storage Facility.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	April 2015			First version of the Landfarm Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	February 2018	Figure 2-1	5	- "Main Infrastructure for the Meliadine Project, including the Landfarm" - figure added to figure reference	Meliadine Environment Department
		3.1	9	- Antifreeze removed from list of acceptable contaminates for landfarm disposal	
		2.1	3	-Approximate volume of material adjusted to 700 m3	
		1.3	2	- Updated Oil Pollution Emergency Plan revision date and version	
		All	All	-General review and revision	

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
BTEX	benzene, toluene, ethylbenzene, and xylene
CP1	Collection Pond 1
GN	Government of Nunavut
NWB	Nunavut Water Board
PHC	Petroleum hydrocarbons
Project	Meliadine Gold Project
RMMS	Responsible Mining Management System
TSF	Tailings Storage Facility
WRSF	Waste Rock Storage Facility

SECTION 1 • INTRODUCTION

1.1 Project History

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the proposed Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The proposed mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

The Landfarm Management Plan (Plan) focuses on minimizing the waste footprint on-site, and maximizing remediation potential through implementation of bioremediation experience and research carried out at the Agnico Eagle's Meadowbank Gold Mine.

During the advanced exploration phase of the Project, the Nunavut Water Board (NWB) approved amendment #6 to Water Licence 2BB-MEL1424, which allowed the operation of light PHC soil stockpile. This approval supported using a landfarm developed inside a bermed and lined area previously used to store fuel bladders. Soil contaminated with light PHC is being deposited in this bermed and lined area for treatment. To date, there is approximately 420 cubic metres (m^3) of contaminated soil being treated. This quantity resulted from inadvertent spills that occurred during the advanced exploration phase of the Project. Some or all of this material will be transferred to the landfarm for the proposed mine upon its completion and commissioning.

When possible, materials contaminated with heavy hydrocarbons (e.g., hydraulic fluid or grease), are to be segregated, packaged, and shipped south for treatment and/or disposal.

1.2 Objectives

On-site storage and remediation has been established as the preferred method for treatment of light PHC contaminated soil that may be generated at the proposed mine. Specifically, remediation through landfarming has been identified as the primary treatment option and, as such, is the focus of this contaminated soil management plan. A pilot project to enhance rates of bioremediation through addition of a nutrient source is being carried out at Meadowbank and will be employed at the Project

should it prove successful. Alternate contingency options in the event that landfarming is not successful or as efficient as planned are also discussed.

This Plan is a component of the Responsible Mining Management System (RMMS)[1]. The objectives of this Plan are to:

- provide an overview of contaminated soil management at the Project;
- describe the physical setting, location, and design criteria of the landfarm;
- define acceptable types of contaminated soils to be placed in the landfarm and conditions for removal of treated soil;
- define operating procedures and monitoring requirements for the landfarm; and
- describe contingency options for alternate treatment/storage of PHC contaminated soil.

1.3 Related Documents

Spill prevention is the first stage in contaminated soil management at the Project. Documents containing information related to this Plan and submitted as part of the Type A Water Licence Application include:

- Spill Contingency Plan;
- Environmental Management and Protection Plan; and
- Risk Management and Emergency Response Plan.

There is also a related Oil Pollution Emergency Plan (Agnico Eagle 2018), which is specific to spills at Agnico Eagle's Itivia Oil Handling Facility located in Rankin Inlet. The Oil Handling Facility is located on the shore of Melvin Bay, which is part of Hudson Bay. The Oil Pollution Emergency Plan was prepared as a requirement of *Canadian Shipping Act* and associated regulations. It will be submitted to Transport Canada for approval prior to any shipping related to the development of the proposed mine.

1.4 Spill Prevention

Similar to the waste management philosophy, plans are to actively work towards minimizing spills through suitable work procedures. Plans developed from the environmental impact study address the management of spills on land, ice, water, and into the marine environment. When spills do occur, the goal is to limit the spread of the spill, and then manage contaminated material resulting from the spill. The Spill Contingency Plan describes spill prevention measures.

[1] The RMMS is described in the Environmental Management and Protection Plan.

SECTION 2 • LANDFARM DESIGN

2.1 Background

In the event of a spill, on-site storage and remediation is the most practical and efficient method in handling contaminated soil, particularly in an isolated location such as the Project. Any PHC contaminated soils generated during the construction, operation, and closure phases will be adequately managed. Soils contaminated with light PHCs, such as diesel, will be treated on-site in a landfarm. This method involves spreading, mechanical mixing, and placing the contaminated soil in windrows within a containment area and promoting conditions favorable for the volatilization and aerobic microbial degradation of hydrocarbons.

When possible, materials contaminated with heavy hydrocarbons (e.g., hydraulic fluid or grease), are to be segregated, packaged, and shipped south for treatment and/or disposal.

There are currently PHC contaminated soils, totalling approximately 2900 m³, stored on-site in two landfarms resulting from spills that occurred during the exploration and construction phases. This volume has been accounted for in the design of the facilities.

A landfarm options analysis prepared for Agnico Eagle by Golder (2007) identified factors relevant to landfarming in the north. This include environmental factors and physical properties of the soil that affect microbial growth and rates of biodegradation, including temperature, pH, soil moisture, nutrient content, salinity, and soil particle size.

Although rates of biodegradation decline with temperature, landfarming is still a feasible technique in Arctic climates as demonstrated by the Meadowbank landfarm. Degradation in the north is typically restricted because microbial activity stops between 0 to -5 degrees Celsius (°C) restricting biodegradation to the months of June to September[2]. Nevertheless, degradation was reported at 90% over two summers on Resolution Island (Paudyn et al. 2008).

The landfarm design was based on the design and operation of the Meadowbank landfarm (Tetra Tech EBA 2014). At the Meadowbank mining operation, it was estimated during the design phase of the landfarm that the volume of PHC soils would be between 300 and 350 m³ per year (Agnico Eagle 2008). Therefore, the landfarm at the proposed mine has been designed assuming that 350 m³ per year of PHC soils will need to be managed for the construction, operations, and closure of the Project. Similar to the Meadowbank landfarm, it was assumed that a yearly volume of 500 m³ of contaminated ice and snow would require management and the landfarm has been designed to account for this volume.

It is estimated that soils contaminated with light end PHCs would require three full summer seasons for complete remediation. When remediated, the soils will be removed from the facility and can be

[2] Even though bioremediation ceases below -5°C, volatilization of the PHCs does continue but at a much slower rate.

used for construction purpose such as part of the cover of the Tailings Storage Facility (TSF) or stacked in the Waste Rock Storage Facility (WRSF). Based on a remediation period of three seasons, it would be possible to close the landfarm facility on three years after the end of the process plant operation.

2.2 Location

The overall site plan showing the main infrastructure for the Project, including the landfarm, is shown in Figure 2-1. The area has no exposed bedrock and up to 20 metres (m) of glacial-fluvial till that has little ground ice and shows no permafrost degradation. The central location of the landfarm was chosen to minimize the footprint of the site and the transport distance of contaminated material from potential spill locations. The management of all waste generated at the Project in the form of dry stack tailings, waste rock, incinerator, and landfill waste are located in close proximity to the main infrastructure.

2.2.1 Proximity of Surface Water

The landfarm is located just off the infrastructure pad, approximately 200 m from Collection Pond 1 (CP1). The landfarm is to be located on land that slopes towards the southwest corner, which results in any rainwater or snowmelt draining to temporary water storage having the capacity to store a 1:100 wet year spring freshet plus 500 m^3 of water from melting of the contaminated snow/ice. Drainage from the landfarm may be used as water in the turning of the windrows during the remediation process. Excess water is collected within a sump inside the landfarm and will be pumped to an oil pre-treatment plant to remove any oil. The pre-treated water will then be discharged into the CP1. Discharge from CP1, is controlled by a dike, which stops direct flow to Meliadine Lake. Meliadine Lake is the source of freshwater for the site and is used by Inuit for traditional pursuits. If water is to be discharged from CP1 to Meliadine Lake, it is treated to meet discharge criteria. Except for a short duration during the spring freshet or a heavy rainfall, water ponding will be eliminated in the landfarm by the end of the summer such that a sufficient storage capacity is available for the upcoming spring freshet.

Figure 2-1 Landfarm Site Location Plan



2.2.2 Proximity of Groundwater

In the Project area, the groundwater within the active layer is estimated to reach 1.5 m in October. The active layer begins to form in July when temperatures largely remain above 0°C, and deepens to a maximum in October. Shallow groundwater flow in the area of the landfarm is towards the industrial site.

To prevent movement of contaminants from the landfarm facility into groundwater and the surrounding environment, Environment Canada (SAIC 2006) recommends implementation of a barrier with 10^{-7} centimetres per second hydraulic conductivity at a thickness of 0.6 m. The Meliadine landfarm will have an impervious liner and no impacts on shallow groundwater are anticipated.

2.3 Design

The landfarm is designed to receive soils, rock, snow, and ice contaminated with petroleum hydrocarbons. This will include light hydrocarbons such as diesel and gasoline. The design volume of the landfarm is based on allowances for the materials being treated at Meadowbank.

The average floor slope is 3.1% going in the designed direction of northwest to southeast, matching the natural ground slope. This slope is still adequate allowing leachate/drainage from the PHC soils and internal runoff to gradually seep through the filter berm into the sump area. The water collected in the sump will be pumped to the oil separator for oil removal before being discharge into CP1. The sump area was built as per design capacity.

The geomembrane liner crest elevation was installed at an elevation of 74.80 m, it does allow for 0.45 m of freeboard before reaching the geomembrane liner crest elevation.

2.3.1 Soil Volume Requirements

The landfarm is expected to effectively treat up to 5,000 m^3 of contaminated soil over the construction, operations, and closure of the Project, and 500 m^3 of snow and ice annually. Based on the experience at Meadowbank, the volume of PHC would be approximately 350 m^3 per year during construction, operation, and closure phases. Table 2-1 outlines the estimated volumes of contaminated soils and rock, and contaminated snow and ice expected during each phase of the mine.

Table 2-1 Estimated Volume of Petroleum Hydrocarbon Contaminated Soil and Ice/Snow to be Managed

Project Phase	Volume of PHC Soil/Rock (m^3)	Annual PHC Snow/Ice (m^3)
Advanced exploration	2,209 (volume in exploration landfarm to date)[(a)]	500 per year
Predevelopment (2 years)	350 (175 per year)	
Construction (3 years)	1,050 (350 per year)	
Operations (7 years)	2,450 (350 per year)	
Closure & Reclamation (2 years)	700 (350 per year)	
Total	**4,970**	

[(a)] The contaminated soil in the advanced exploration landfarm will be transferred to the mine landfarm upon its completion and commissioning.

As described in (Agnico Eagle 2008), it is estimated that soils contaminated with light end PHCs would require three full summer seasons for complete remediation. When remediated, the soils will be removed from the landfarm and used on-site, placed in a WRSF or used as cover at the TSF.

2.3.2 Design Specifications

The design criteria for the landfarm are outlined in Table 2-2. Its footprint will be approximately 11,000 square metres (m^2), with a perimeter berm that is approximately 2.0 m high over the landfarm surface. The geometry of the characteristics of the landfarm are shown in Table 2.2.

Table 2.2 Geometry and Characteristics of the Landfarm

Item	Actual
Dimensions of Perimeter Berm Crest Exterior (avg.)	86.8 m x 68.4 m
Dimensions of Perimeter Berm Crest Interior (avg.)	74.4 m x 53.3 m
Side Slopes of Perimeter Berm (avg.)	1V:2.5H (40%)
Perimeter Berm Crest Width (avg.)	3.5 m
Perimeter Berm Height (Min. to Max.)	1.4 m to 5.2 m
Perimeter Berm Crest Elevation (avg.)	75.25 m
Dimensions of Filter Berm Crest Interior (avg.)	19.0 m x 12.0 m
Side Slopes of Filter Berm (avg.)	1V:1.5H (67%)
Filter Berm Crest Width (avg.)	1.0 m
Geomembrane Liner Crest Elevaton	74.80 m
Interior Floor Slope (avg.)	-3.1% (NW to SE)
Fill Thickness Above Original Ground for Inside Base/ Sump Area (Min.)	1.52 / 1.48 m
Fill Thickness Above Liner	0.5 m
Inside Base Surface area Including Sump Area	3,794 m²
Sump Surface Area	10,040 m²

Table 2-3 shows the growth and stabilization of the volume of PHC considering remediation over three years and the maximum volume of contaminated material that is anticipated to be stored over a period of 13 years.

The size of the landfarm was based on the design criteria (Table 2-2), the estimated volume of material (Table 2-3), and the requirement to turn over the surface of the piles during the summer months. The designed footprint of the landfarm is 11,000 m² with a useful landfarm surface of 3,650 m². Contaminated material will be piled 1.5 m so that the material is below the crest height of the perimeter berm. At the maximum estimated capacity of the facility, three windrows having each 890 m³ of PHC will cover 1,800 m² allowing 1,850 m² for turnover and water management.

Table 2-3 Volume of Petroleum Hydrocarbon Contaminated Material in the Landfarm

Mine Year	Estimated PHC Produced (m^3)	Accumulated PHC in Landfarm for Remediation (m^3)	Treated PHC Removed from Landfarm (m^3)	Hydrocarbon Contaminated Snow or Ice to Landfarm (m^3)	Maximum Accumulated PHC in Landfarm (m^3)
Before -6	420			0	0
-6 and -5	350			0	0
-4	350			0	0
-3	350	1,470		500	1,970
-2	350	1,820		500	2,320
-1	350	2,170		500	2,670
1	350	1,400	1,120	500	1,900
2	350	1,400	350	500	1,900
3	350	1,400	350	500	1,900
4	350	1,400	350	500	1,900
5	350	1,400	350	500	1,900
6	350	1,400	350	500	1,900
7	350	1,400	350	500	1,900
8	350	1,400	350	500	1,900
9	0	1,050	350	0	1,050
10	0	525	525	0	525
11	0	0	525	0	0

SECTION 3 • LANDFARM OPERATION AND MANAGEMENT

Agnico Eagle will be responsible for managing and implementing the landfarm operation plan. Operation and monitoring of the landfarm as well as designation of training requirements will be the responsibility of the Environment General Supervisor and Coordinators.

3.1 Acceptable Landfarm Material

3.1.1 Contaminants

The landfarm facility will only treat and/or store light PHC contaminated soils that have been generated through mine related activities at the Project and that transferred from the Project's advanced exploration camp landfarm upon closure. Material from the Hamlet of Rankin Inlet or other sites will not be accepted without approval from the NWB, Aboriginal Affairs and Northern Development Canada, Water Resources Inspectors, and the Kivalliq Inuit Association.

The following products are acceptable for treatment in the landfarm if used on-site and spilled on soil:

- diesel fuel;
- gasoline;
- aviation fuel (Jet A);
- hydraulic oil;
- other light oil (e.g., engine oil, lubricating oil);

In the event that the contaminant source is unknown, soil samples will be analyzed for PHCs and possibly additional contaminants prior to placement in the landfarm. These additional parameters could include total metals, oil and grease, and volatile organic compounds. Analysis for additional compounds will be determined by the Environment Department on a case-by-case basis. Concentrations of contaminants will be compared to the site background values (for metals) and/or criteria in the Government of Nunavut (GN) *Guidelines for Contaminated Site Remediation* (GN 2009). If this analysis indicates soil contamination above background or GN guidelines for any substance not approved for landfarming (i.e., non-PHC contaminants), the spill material will not be placed in the landfarm. This is to ensure that PHC contaminated soils are not contaminated with other products.

Spills of non-PHC material (e.g., solvents) will be placed in drums and stored on-site for shipment south to approved facilities during shipping season.

3.1.2 Grain Size

Bioremediation of very coarse-grained larger soil material is inhibited as it does not readily retain moisture. However, volatilization will occur more rapidly (SAIC 2006). It has been noted that this material likely contains lower concentrations of contaminants due to a lower volume: surface area ratio, and can typically be screened out prior to landfarming (SAIC 2006). As a result, soils and rock

material with grain size less than 2.5 centimetres (cm) will be separated from larger-grained material, where possible. This will occur at the spill location or in the landfarm using a screen sieve, should it prove necessary. The two soil fractions will be treated separately in the landfarm.

3.2 Contaminated Soil Additions

3.2.1 Spill Excavation

Soil contaminated with the above-described petroleum hydrocarbon materials will be excavated and transported to the landfarm facility in dump trucks Care will be exercised to ensure that the entire spill is excavated (verified by olfactory and visual assessment, or sampling if necessary) and that none of the contaminated material is lost during transport.

3.2.2 Placement in the Landfarm

As above, larger coarse material (rocks) will be separated from the finer material (sand and gravel) in the landfarm and assessed visually for PHC staining and product. If the material is saturated it will be spread to allow volatilization in the designated area of the landfarm.

Materials identified as acceptable in the landfarm will be placed in windrows with dimensions about 18 m wide at base x 1.5 m high x 34 m long. Windrows may be piled wider, higher, or longer as space permits. A record will be kept by the on-site Environmental Coordinator of the amount of contaminated soil placed in the landfarm and the location of each load within it.

3.2.3 Decontamination of Soil Movement Equipment

The decontamination of soil movement equipment is outlined in the separate procedure, included as the Appendix A to this Management Plan.

3.3 Contaminated Snow

Petroleum hydrocarbon contaminated snow and ice will be placed in a designated area of the landfarm and treated as contact water after snowmelt. After snowmelt, the contaminated water will accumulate in the landfarm sump and be pumped through the site's oil-water separator to remove PHC residue. The treated water will be discharged to the CP1.

3.4 Remediation

Remediation of fine grained PHC contaminated soil in landfarms occurs naturally through volatilization and aerobic microbial degradation. Soil aeration and nutrient amendment are recognized as methods of improving rates of remediation. Agnico Eagle commissioned the National Research Council Canada to undertake the bioremediation research study to optimize the biodegradation process. Agnico Eagle will look at increasing biodegradation rates through potential opportunities such as nutrient amendment.

3.4.1 Absorbent Materials

Coarse-grained soils are not readily bio-remediated, but concentrations of PHC contaminants may still be reduced through volatilization. Oil absorbent pads will be used to help remove visible product from coarse-grained material.

3.4.2 Aeration

To promote aerobic conditions throughout the windrows, soil will be mixed mechanically with earth-moving equipment. This turnover of soil piles will occur two to four times per year, during the summer months.

3.4.3 Soil Moisture

Prior to turning, site personnel will ensure that soil is not so dry as to generate significant dust, nor overly saturated. If soil is too dry, non-contaminated water from within the landfarm containment area will be used as a moisture source and sprayed on the piles. If no accumulated water is available, water from CP1 or freshwater will be used. If the windrows are saturated, aeration will be delayed until the moisture content is reduced.

3.4.4 Nutrient Amendment

The use of sewage sludge as a nutrient amendment has precedent in the north. Sewage sludge as a nutrient source has also been proposed for the Milne Inlet Mary River Project (EBA 2010). This material not only provides the benefit of nutrients, but also adds organic matter to help retain moisture and microorganisms. Furthermore, the use of sewage sludge produced on-site helps to reduce the waste footprint of the mine by re-directing this material from disposal facilities and avoids needing to import a chemical fertilizer. The use of sewage sludge or another recommended nutrient amendment will be considered for optimization of biodegradation.

3.5 Removal of Soil From the Landfarm

3.5.1 Government of Nunavut Remediation Guidelines

The following parameters will be measured and compared with the GN industrial remediation criteria to determine whether PHC contaminated soil has been adequately remediated:

- benzene, toluene, ethylbenzene and xylene (BTEX); and
- petroleum hydrocarbon fractions 1 - 4.

The GN remediation criteria are characterized for agricultural/wildlife, residential/parkland, commercial, and industrial land uses. At the Project, remediation to agricultural/wildlife criteria is targeted; however, if these criteria cannot be met, industrial criteria will be followed.

The GN remediation criteria for coarse-grained soils will be applied. Table 3-1 presents the applicable Tier 1 criteria for coarse-grained soil, assuming agricultural/wildlife or industrial land uses.

Table 3-1 Summary of Relevant GN Tier 1 Soil Remediation Criteria for Surface Soil (mg/kg)

	Land Use Criteria (mg/kg)	
	Agricultural/Wildlife	**Industrial**
Benzene	0.03	0.03
Toluene	0.37	0.37
Ethylbenzene	0.082	0.082
Xylene	11	11
PHC Fraction 1	30	320
PHC Fraction 2	150	260
PHC Fraction 3	300	1,700
PHC Fraction 4	2,800	3,300

mg/kg = milligram per kilogram

3.5.2 Sampling and Analysis

Landfarm windrows will be sampled annually at the end of the summer season to determine if remediation objectives have been met. Representative composite samples will be taken of each windrow to estimate remaining PHC concentrations. For each 10 m of windrow length, one composite sample will be collected, each consisting of three surface sub-samples and three sub-samples at 1 m depth. Sub-samples will be taken approximately 3.3 m apart, and will be taken from both sides of the windrow. Sampling QA/QC measures will include collection of 1 duplicate per 10 samples.

After two seasons of treatment in the landfarm, degradation rates will be assessed to estimate the total remediation time required for PHC contaminated soil under these conditions. If remediation to GN guidelines is feasible within the life-of-mine timeframe, landfarm operations will continue, with aeration and possible nutrient amendments as described above. If rates of degradation are not sufficient through this method, alternate options will be further investigated as described in Section 4.2.

3.5.3 Soil Removal

Coarse-grained soils will be assessed near the end of the summer season by Environment Department technicians for PHC product and odour. Based on the experience learned at Meadowbank, Agnico Eagle is confident that confirmatory sampling and laboratory analysis is not required prior to removing coarse-grained soil from the Landfarm. Observations show that volatilization of PHCs from coarse-grained soil occurs more rapidly than biodegradation. It has been noted that this material likely contains lower concentrations of contaminations due to a lower volume: surface area ratio, and can typically be screened out prior to landfarming. Thus, the use of a photoionization detector (PID) is sufficient to confirm material is in a suitable state to be removed from the landfarm When PHC odours are no longer detected, the material will be removed to waste rock storage facility or at the TSF to be used as cover material.

When sample analysis of fine-grained material at the end of a season indicates that concentrations of contaminants are below GN guidelines, a soil pile or the appropriate section of a pile will be deemed acceptable for removal from the facility. Interim monitoring may be conducted through measurements of headspace with a portable instrument (e.g., flame ionization detector), but samples will be confirmed by an accredited laboratory prior to soil removal.

When remediated, the soils will be removed from the facility and can be used for construction purpose such as normal overburden (i.e., part of the cover of the TSF) or stacked in the WRSF. Based on a remediation period of three seasons, it would be possible to close the landfarm facility three years after the end of the process plant operation.

3.6 Water Management

Since the landfarm facility is uncovered to facilitate natural weathering, water accumulating inside the bermed area may come into contact with contaminated material.

While the landfarm will have an impermeable liner, visual inspections by the Environment Department will be conducted for seepage of contact water coming through the perimeter berm, or the accumulation of water within the containment berm. This will be conducted on a weekly basis starting after freshet and continuing until October when water is likely to be present. In the event of water accumulation or seepage, the ponded water will be pumped through the site's oil-water separator to remove PHC residue and will be analyzed for BTEX, lead, and oil and grease prior to discharge to CP1 or used on the windrows to increase moisture content, as required. Water accumulating in the landfarm will not be discharged directly to the receiving environment.

3.7 Winter landfarm management

Uncontaminated snow will be removed as much as possible during winter to minimize the quantity of spring melt water inside the berm. Care will be taken to ensure contaminated snow/soil is not disturbed by leaving a base layer of snow of no less than 10 cm in place. Following snowmelt, any contaminated product left from winter spill clean-up operations will be padded up. The base soil in these areas will be excavated and added to existing remediation windrows as soon as possible after snowmelt to minimize migration into the facility substrate.

3.8 Landfarm Closure and Reclamation

After removal of all remediated soil and prior to closure and reclamation of the landfarm, the berm and base will be sampled on a 10 m grid, to determine if these soils are free from PHC contamination. Results of this analysis will be compared to GN criteria set out in Table 3-1. No excavation will be necessary if agricultural/wildlife are met. If industrial criteria are used, the landfarm will be covered with 2 m of waste rock or other material used for reclamation. The surrounding berm will be breached to avoid water accumulation on the landfarm.

3.9 Summary of Activities

A summary of landfarm activities including monitoring of the physical condition and potential environmental impacts of the landfarm is provided in Table 3-2. An annual report will be prepared indicating the volume of material added to the facility, amount of material removed, disposal or reuse location, all analysis results, volume and type of nutrient addition, visual inspection results, and volume of contact water pumped. This information will be appended to Agnico Eagle's NWB Annual Report.

Table 3-2 Summary of Landfarm Activities, Analyses, and Records

Activity	Analysis	Frequency of Analysis	Record
Excavation of spill and transport of contaminated material to landfarm.	If unsure of full excavation - F1-F4, BTEX If contaminant source unknown, F1-F4, BTEX, metals, oil and grease, VOCs	As needed	Date, time and location of spill and excavation; estimated volume of spill; estimated quantity of excavated soil; storage/disposal location of excavated soil, if applicable. Any evidence of remaining product
Soil aeration	NA	Two to four times over the summer	Date and time of the aeration; location; soil condition (moisture, odour, granulometrie, etc.)
Soil treatment with sewage sludge as nutrient supplement.	Visual inspection to ensure proper incorporation	At least once during summer on selected windrows	Date and time; type of treatment (aeration or nutrient amendment); location in landfarm; any odour noticed during aeration
Sampling for progress of remediation	Hydrocarbon vapour in headspace (by PID); F1-F4, BTEX (laboratory)	Vapour – as needed; Laboratory - annually	Date and time; location; odour; laboratory report
Soil removal from landfarm	Removal subject to meeting GN criteria	Once GN criteria are met	Date and time; location; quantity of soil removed; final location
Ponded contact water	BTEX, oil and grease, lead – as specified in Water Licence	Prior to any dewatering; if re-used in landfarm, no sampling necessary	Date and time, location, laboratory report, in Annual Report
Seepage	Visual inspection; BTEX, oil and grease, lead – as specified in Water License	Weekly during summer	Location, extent, approximate depth, evidence of sheen
Identification of maintenance requirements	Visual inspection of landfarm	Twice over the summer	Inspected areas; condition of berm and base; previously unidentified safety concerns

SECTION 4 • CONTINGENCY OPTIONS

This section describes the contaminated soil management plan, should a large spill event occur, and if landfarm treatment proves not successful.

4.1 Large Spill Event

A large spill event producing a quantity of soil that cannot be contained in the landfarm is unlikely because the landfarm is designed to hold nearly two times as much contaminated soil as is expected to be produced. Nevertheless, in this event, soils will be placed in a temporary storage area. A temporary stockpile area would be set up on an emergency basis, such as in the Waste Rock Storage Facility (WRSF) or the Tailings Storage Facility (TSF). As space becomes available, the soil would be added to the landfarm. Through spill prevention measures discussed earlier in this Plan, Agnico Eagle is minimizing the probability of this scenario occurring.

4.2 Alternate Treatment Options

Should landfarm treatment not perform as anticipated and it is evident that rates of degradation are not sufficient to meet GN Tier 1 criteria within the life-of-mine and the anticipated closure, the following alternative treatment options will be considered. Implementation will be after development of a more detailed protocol and approval of a revised plan by the NWB.

4.2.1 Soil Amendment

Since pH, salinity, moisture content, and microbial population density all affect rates of biodegradation by microbes, these factors may be monitored and adjusted through soil amendments if they are not found to be optimal (SAIC 2006). In addition, the height of soil windrows could be reduced to maximize air exposure if space in the landfarm allows.

4.2.2 Tier 2 – Modified-Criteria Approach

According to the GN *Environmental Guideline for Contaminated Site Remediation* (GN 2009), in cases where site conditions, land uses, receptors, or exposure pathways are different from those assumed in the development of the Tier 1 criteria, modified criteria may be permitted. This process requires the collection of site-specific information on exposure and risk estimates, and is subject to GN approval. For this Project, landfarmed soils are to be encapsulated in a WRSF rather than used in surface applications, as assumed in Tier 1, reducing the likelihood of exposure to any remaining contamination. Therefore, the Tier 2 approach could be warranted if Tier 1 criteria cannot be met. Any consideration for this approach would be based on soil sampling results and science based information.

4.2.3 Direct Placement in Waste Rock Storage Facility or on Tailings Storage Facility

Another option for management of contaminated soil if bioremediation proves not effective would be the direct placement of this material in a WRSF or on the TSF. Although the use of PHC contaminated soils in these storage areas is not optimal, the quantity generated on-site is small in comparison to the quantity of waste rock and cover on the TSF. While this method would not result in the treatment of soil, it is a viable contingency option because it would allow for the safe disposal of the contaminated material. Encapsulation and freeze-back would occur, eliminating any movement of contaminants. Over time, this material would undergo natural degradation. Consideration of this option would also include a suitable monitoring program for PHCs, which would be incorporated into the Closure and Reclamation Plan.

SECTION 5 • ASSESSMENT AND REPORTING

5.1 Feasibility

After two seasons of treatment in the landfarm, degradation rates of PHC contaminants will be assessed to estimate the total remediation time required under these conditions. If remediation to GN guidelines is feasible within the life-of-mine timeframe, landfarm operations will continue, with aeration and possible nutrient amendments as described above. If rates of degradation are not sufficient through this method, alternate options will be further investigated (Section 4).

5.2 Reporting

Reporting of landfarm activities will be submitted annually by Environment Department, indicating the volume of material added to the facility, amount of material removed and disposal or re-use location, and confirmatory analysis results. This information will be appended to Agnico Eagle's NWB Annual Report.

5.3 Plan Review and Continual Improvement

The Landfarm Management Plan will be reviewed annually by the Meliadine Environmental Department, and, if necessary, updated at least every two years of operation.

REFERENCES

Agnico Eagle (Agnico Eagle Mines Limited). 2008. Landfarm Design and Management Plan In Accordance with Water License 2AM-MEA0815, Meadowbank Gold Project, 20 p. + Figures and Appendix. October 2008.

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APPENDIX A

	DOCUMENT ID: NU-E&I-PRO – Land farm soil movement
People concerned: Site services HEO, environmental department	**Effective Date: 2018-03-13**
This procedure corresponds to the required minimum standard. Each and everyone also have to comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.	

Rev #	Date	Description	Initiator
0	2018-03-13	Draft	Guillaume Gemme

Objective:

- Safe operation of equipment during land farm soil movement

Definitions (If applicable):

This procedure is in place to ensure proper usage of heavy equipment on the land farm during the soil movement process.

Tool/Equipment Required	PPE Required
• Heavy equipment (Backhoe/excavator/ Dozer/ Etc.) equipped with flat lip bucket to avoid membrane damage • Measuring device (Ex: Measuring tape) • Shovel and broom	• Standard PPE

Specific Training Requirements
• Appropriate Heavy equipment operator training. (Class 2 Operator or equivalent)

1. Access to the Land farm a. Before entering the land farm, the operator need to have the approval of the Site Services field Supervisor and be accompanied by an environmental representative. 2. Soil movement a. Following the environmental department direction, proceed with the requested soil movement work. (Drawing of the work to be done including exact location, dimension of the area and maximum deepness to reach need to be done by Environment department before proceeding with the work) b. Sampling will be completed by environment department following procedure : MEL-ENV-Permanent Land farm & Soil Sampling

3. Equipment decontamination

   a. Before exiting the area, make sure to remove all contaminated soil from the heavy equipment.

   b. Using a hand shovel remove all contaminated soil on the equipment. If required use a broom to reach all potential contaminated parts of equipment

   c. Call the field supervisor to assess the equipment cleanness before exiting the land farm.

Related Documentation (If applicable):
• N/A

References (If applicable):
• Meliadine Water license type A (Land farm Management plan)

Appendix (If applicable):
• Pictures • Plans

Authorization (Print Name)	
Approved: _____ Name JOHSC Worker Rep.	Date: _____
Approved: _____ Name Department Superintendent / Delegate	Date: _____
Approved: _____ Name Health & Safety Superintendent / Delegate	Date: _____

AGNICO EAGLE

MELIADINE GOLD PROJECT

Landfill and Waste Management Plan

MARCH 2018
VERSION 6
6513-MPS-06

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ᐊᑐᐊᒃᑯᑦ ᑕᓯᔨᐊᕐᒥᑦ ᔪᓕᓗᑦ ᐅᓴᖏᖅᓂᐊᕐᓚᐅᓪᓕᓐᓂᐊᔨᑦ (ᐱᓕᓚᐊᖅ), 25 ᑭᓪᒥᑕᒥᒃ ᐅᐊᖏᓇᖅᓯᓂᑦ ᐅᖏᓯᓄᑎᑦᔪᖅ ᑲᖏᖅᑕᓂᕐᒥᑦ, ᐊᒪᓗ 80 ᑭᓪᒥᑕᒥᒃ ᓂᑎᖅᐸᓄᐊᓂᑦ ᐱᖏᖅᓯᓄᐊᓂᑦ ᐅᖏᓯᓄᑎᑦᔪᖅ ᐃᓗᓕᓴᕐᖏᒥᑦ ᑭᓪᓕᓂᕐᒥᑦ ᓄᓇᕗᓴᒥᑦ. ᐅᓴᖏᖅᓂᐊᕐᓂᕆᔪᑦ ᐸᖏᓇᐅᑕᐅᔪᖅ ᐅᑦᑯᐃᖏᓴᒥᒃ ᐊᒪᓗ ᓄᓇᕗᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖏᖅᓂᐊᕐᓂᕆᓴᖅᑐᖅᖃᖅᑐᖅ ᐱᓪᓚᑦᔨᐊᓂᑦ ᑎᓪᓗᓯᓂᐊᕐᖅᑎᑦ-ᒥᑦ ᔪᓗᓂᑦ ᐱᓂᑦ, ᒪᖅᑭᖏᓂᒃ ᐅᑦᑯᐃᖏᓴᖏᓂᒃ ᓄᓇᒥᑦ (ᑎᓪᓚᓯᓂᐊᕐᖅ Pit 1 ᐊᒪᓗ ᑎᓪᓚᓯᓂᐊᕐᖅ Pit 2) ᐊᒪᓗ ᐊᑕᐅᓂᖅ ᓄᓇᕗᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖏᖅᓂᐊᕐᓂᕐᖅ.

ᑕᑦᓇ ᑎᑎᖅᑲᖅ ᐅᖅᑲᐅᓂᖅᑲᖅᑐᖅ ᐊᑲᑕᑯᓂᕐᒪᑦ ᐊᒪᓗ ᐊᑲᑕᑯᓕᓪᓕᓐᓂᑦ ᐊᐅᓪᓚᑎᓂᕐᓕᑦ ᐊᖅᓪᓚᑎᑦᑎᓂᒃ ᐱᓪᓚᓕᓐᓂᑦ ᐊᑲᑕᑯᓂᕐᒪᑦ ᐊᐅᓪᓚᑎᓂᕐᓕᑦ ᑕᓯᔨᐊᕐᓂᕆᔪᑦ ᐊᑲᑕᑯᓂᕐᒪᑦ Type A ᐃᒪᖅᓕᑦ ᓪᐃᓴᓂᓯᒥᒃ ᑐᓂᓯᐅᑎᑦᑎᒥᒃ. ᑕᑦᓇ ᐸᖏᓇᐅᑎ ᐅᖅᑲᐅᓂᖅᑲᖅᑐᖅ ᐊᑲᑦᑯᓂᑯᓂᖅᑐᑦ ᐊᑲᑕᑯᓂᖅ ᐊᐅᓪᓚᑎᓂᕐᓕᑦ ᑕᓯᔨᐊᕐᓂᕆᔪᑦ ᔪᓂᑦᑐᐊᓕᖅᑐᑦ ᐊᑲᖅᑕᐅᑎᓂᕐᓕᑦ ᐊᑲᖅᑕᐅᑲᓂᕐᓂᓕᑦ, ᑕᐃᒪᓐᓇᐃᓪᓕᖅᑎᓯᑲᓂᒃ ᐅᓗᓇᐊᓇᖅᑐᑦ ᐊᑲᑕᑯᓃᑦ ᐊᐅᓪᓚᑎᑎᐊᑯᓯᑲᓂᒃ.

ᐊᑲᑕᑯᓂᕐᒪᖅ ᐊᑲᖅᑕᐅᑲᓚᐊᖅᑎᓂᐊᕐᖅᑐᖅ ᐃᖅᑲᖅᑕᐃᓂᕐᓕᑦ ᐅᑎᖅᑎᑲᑎᓂᐊᕐᖅᑐᖅ 1 (WRSF 1) ᓂᒋᖅᓯᓄᐊᓂᑦ ᐱᖏᓇᓇᖅᓯᓄᐊᓵᓂᑐᖅ ᐅᖅᑲᖏᓂᐊᕐᖅᐊᒃᓯᑦ. ᐊᑲᑕᑯᓂᕐᒪᖅ ᐃᓗᓪᓚᖅᑐᖅᑕᐅᖏᖅᑎᓯᑲᓂᕐᓂᐊᕐᖅᑐᖅ ᑯᖅᑭᐅᒪᔪᓕᑦ. “ᐃᓂᐅᔪᒥᒃ ᐊᑐᔪᓗᑎᒃ” ᐃᖅᑲᖅᑕᐃᓂᕐᓕᑦ ᐊᑲᖅᑕᐅᓂᐊᕐᖅᑐᖅ ᐊᑲᑕᑯᖅᑕᐅᔪᓕᑦ ᑐᑭᓯᓚᓪᔪᓗᑎᒃ ᐊᒪᓗ ᖃᑦᓪᓚᖅᑕᐅᔪᓗᑎᒃ ᐱᒃᓚᐊᖃᖅᓂᖅ ᒪᓪᓚᔪᓄ. ᐊᑲᑕᑯᓂ ᐃᑎᑕᐅᖃᖅᑕᕐᓂᐊᕐᖅᑐᖅ ᐊᑲᑕᑯᓂᕐᒪᖅ ᐊᐅᓪᓚᑎᓂᕐᓕᑦ ᐊᑲᑕᑯᓂᕐᒪᖅ ᐊᐅᓪᓚᑎᓂᕐᓕᑦ ᐊᑲᑕᑯᓂᕐᒪᖅ ᐊᐅᓪᓚᑎᓂᕐᓕᑦ ᑕᓯᔨᐊᕐᓂᕆᔪᑦ ᐅᓴᖏᖅᓂᐊᕐᓂᕆᔪᑦ ᐊᑲᑕᑯᓂᕐᒪᖅ ᐊᐅᓪᓚᑎᓂᕐᓕ

ᐊᖏᕆᓯᒪᔨᒧᑦ WRSF-ᒧᑦ. ᐊᖕᖏᒍᑕᒻᒥᑦ ᐊᐅᑕᑯᓯᖏᕐᕋᑦ ᐊᐅᓪᓚᑎᐅᓂᒋᑦ ᐊᐳᑕᐃᔨᐃᓂᕐᓂᖏᑦᑐᒥᒃ ᐅᐱᕐᓴᖅᑲᖅᑎᓐᓄᑕᒍ ᐊᐅᐹᑦᑕᓪᓕᐊᓂᕐᒥᑦ. ᑭᓯᐊᓂ, ᑯᕆᔨᖅᑲᖅᑦᑦ ᐊᐹᑕᑯᓯᖏᕐᕋᑦ ᒪᖖᑯᒪᔨᓐᓂᒋᑦ ᐱᔨᔪᑎᐱᓐᓇᒍ ᐅᓂᓗᓂᑦ ᐅᐱᕐᓴᐅᑯᑦ, ᑯᕆᔨᖅᑲᖅᑦᑦ ᐊᐅᓪᓚᑎᐅᔪᓂᕐᒥᑦ, ᑯᕆᔨᖅ ᑲᑎᑕᐅᓂᐊᖅᑐᖅ, ᐊᐅᓪᓕᑕᐅᓗᓂᓂ ᐊᒪᓗ ᐱᓕᕆᐊᖓᓗᓂᓂ, ᐱᔨᕆᐊᖅᑲᖏᓐᓄᑦ.

ᐊᐹᑕᑯᓯᖏᕐᕋᓱᒃ ᖃᐹᓕᕐᓕᑕᐅᓂᐊᖅᑐᖅ ᒥᑭᓪᓚᒃᑯᑦ 3.7 m-ᒥᒃ ᐊᐹᑕᑯᖅᑕᐅᔪᓂᒃ ᐅᔨᖅᑲᓂᒃ ᐃᖏᒻᒥᑯᓐᓄᑕᒍ ᐊᖓᑎᒥᑦ ᐊᒪᓗ ᓄᖅᑲᖏᓐᓄᑕᒍ.

AGNICO EAGLE

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

This document presents the Landfill and Waste Management Plan (Plan) for the Project and forms a component of the documentation series produced for the Type A Water Licence Application. The Plan describes Agnico Eagle Mines Limited's (Agnico Eagle) strategies regarding waste management for the proposed Meliadine Gold Project (Project).

Reduce, reuse, and recycle initiatives will be developed at the Project to minimize the quantity of waste generated. Waste segregation will be used to capture wastes suitable for reuse or recycling, while at the same time ensuring that hazardous waste is managed appropriately.

A landfill will be required for the disposal of non-salvageable, non-hazardous, non-putrescible solid wastes from the construction, operation, and closure of the Project. The Project will be totally independent of, and will not use, municipal facilities or services for waste management.

The proposed landfill will be located within the Waste Rock Storage Facility 1 (WRSF 1) located to the southwest of the main mine infrastructure. The landfill will be filled progressively and in an orderly manner. An "area method" of dumping will be used such that materials will be dumped in rows and covered as required. Wastes will be disposed directly on the landfill floor and compacted with heavy equipment against the berm or an existing row of debris that was compacted earlier. Controlling the materials that can be placed in the landfill is a strategy aimed to reduce the concentration of constituents in potential leachate and to minimize the attraction of wildlife to the landfill. Landfill operation will also conform to best management practices to reduce the potential for windblown debris.

Leachate from the landfill is anticipated to be weak due to the controls placed on materials acceptable for landfilling. Moreover, drainage from the landfill is largely expected to freeze within the WRSF with little to none migrating to the water collection infrastructure placed around the WRSF. Annual landfill operation will also involve clearing of snow prior to spring melt. However, in the event there is leachate from the landfill due to periods of heavy rainfall or spring freshet, the runoff will be collected, controlled and treated, if necessary.

The landfill will be covered with a minimum 3.7 m of waste rock to isolate it from the environment and physically stabilize it.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	November 2012			First draft of the Landfill and Waste Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013			Draft Environment Impact Statement re-submission; rebranding	
3	April 2014	1.3 1.4 4.3.1 4.5 5 6 7	2-3 3 11 13-14 16-17 18 19	Addressed commitments made during review of Draft Environmental Impact Statement: - Leachate management - Landfill schedule - Asbestos management - Records and reports - More details on Standard Operation Procedures - More details on best practices and training	John Witteman, Env. Consultant, Agnico Eagle
4	April 2015			Complete update to correspond with the Mine Plan	John Witteman, Env. Consultant, Agnico Eagle
5	February 2017	- 1.1 4.1 4.4.1 - - -	All Pages 1 9 12 Title Page 3 4	- Changed effective date from April 2015 to March 2017 - Added statement “Plan will have to be updated and submitted 90 days prior to landfill construction” - Removed statement “paper lunch bags will be replaced by sturdy metal or plastic lunch boxes” - Added ultraviolet lamp tubes to the section on fluorescent lamp tube disposal, as both contain mercury and will be disposed of in the same way - Changed April 2015 to March 2017 - Landfill Site Location diagram added - Typical Sections for Landfill Closure diagrams added	Justin MacMillan, Environmental Technician, Agnico Eagle

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ARD/ML	Acid-Rock Drainage/Metal Leaching
CP1	Collection Pond 1
GN	Government of Nunavut
INAC	Indian and Northern Affairs Canada
NIRB	Nunavut Impact Review Board
Project	Meliadine Gold Project
WHMIS	Workplace Hazardous Materials Information System
WRSF	Waste Rock Storage Facility

UNITS

km	kilometre
m	metre
t	metric tonnes

SECTION 1 • INTRODUCTION

1.1 Purpose and Scope of the Plan

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the proposed Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The proposed mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

The Landfill and Waste Management Plan (Plan) outlines the design, operation, and closure of a solid waste landfill as part of Agnico Eagle's proposed Project. It also highlights the waste segregation strategies that will be implemented to minimize the quantity of waste to be placed in the proposed landfill or incinerated. The Plan will have to be updated and submitted 90 days prior to permanent landfill construction.

The objectives of this Plan are summarized as follows:

1. To define the location, design, and operating procedures to be used in the landfill disposal of non-salvageable, non-hazardous, non-putrescible solid waste generated at the proposed mine.
2. To define acceptable/non-acceptable types of solid waste to be placed in the proposed landfill.
3. To describe plans to reduce/reuse/recycle Project wastes.
4. To define monitoring requirements for the proposed landfill.

A landfill is required for the disposal of non-salvageable, non-hazardous, non-putrescible solid industrial wastes that cannot be incinerated and that result from construction, operations, and closure of the Project. The proposed Project will be operated totally independent of, and will not use, any municipal facilities or services for waste management.

Hazardous wastes will not be placed in the proposed landfill. All hazardous materials will be packaged for shipment to a certified waste management company for treatment, recycling, and/or

disposal. The proposed Project also includes a landfarm to treat soils and rocks contaminated with hydrocarbons. The landfarm is described in the Landfarm Management Plan.

1.2 Location of the Landfill

The proposed landfill will be situated within the Waste Rock Storage Facility 1 (WRSF 1), which is located close to, and northeast of, the main mine infrastructure. The following criteria were considered in determining its location:

- Drainage – sites that will drain into areas where water will be collected and monitored as part of the overall site plan were preferred;
- Disturbed areas – sites within or near areas that will be disturbed as part of the future overall mine plan were preferred to minimise the environmental footprint of the Project;
- Access – sites located close to existing service or haul roads were preferred; and
- The landfill site had to be large enough to accommodate non-salvageable, non-hazardous, non-putrescible solid industrial wastes for the life of the Project, including the development of the other pits.

The first three criteria are recommendations from the *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

1.3 Landfill Design

The proposed landfill will not be a conventional landfill; it will be a controlled landfill where:

- Wastes will be segregated with liquids, hazardous and putrescible waste all being diverted away from the landfill (Section 4.3 and 4.4). The segregation of waste involves a major commitment by Agnico Eagle to educating all its employees and contractors in directing wastes to the proper waste collection bins.
- Waste management will include an incinerator where all organic, office waste, and any waste coming in contact with food is incinerated. Ash from the incineration process will be disposed of in the landfill (Section 4.6).
- Waste in the proposed landfill will not be scattered all over the floor of the landfill, but will be placed daily at the active working face where the waste can be leveled, compacted, and covered (Section 5).

The proposed landfill is planned to be located within the WRSF 1 as shown on Figure 1-1. The active WRSF 1 will set the bounds of the proposed landfill on its south and west sides, while berms will be constructed on the north and east sides of the landfill (see Figure 1-2). The purpose of the berms will be to confine the area for waste disposal and to act as a wind shield to reduce windblown debris. The landfill will be a rectangular shape with the length perpendicular to the prevailing wind direction so that much of the waste will be protected from wind by the berm.

Figure 1-1 Landfill Location for Meliadine Gold Project

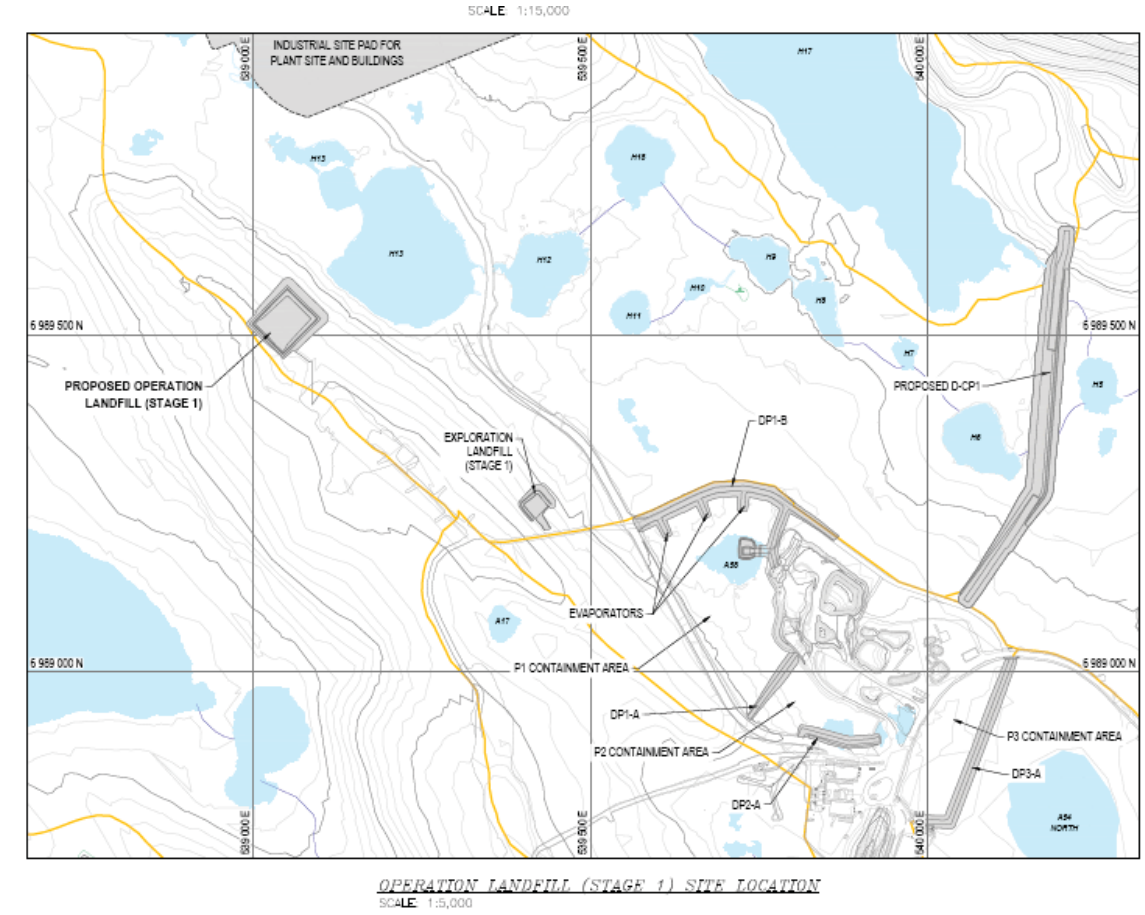
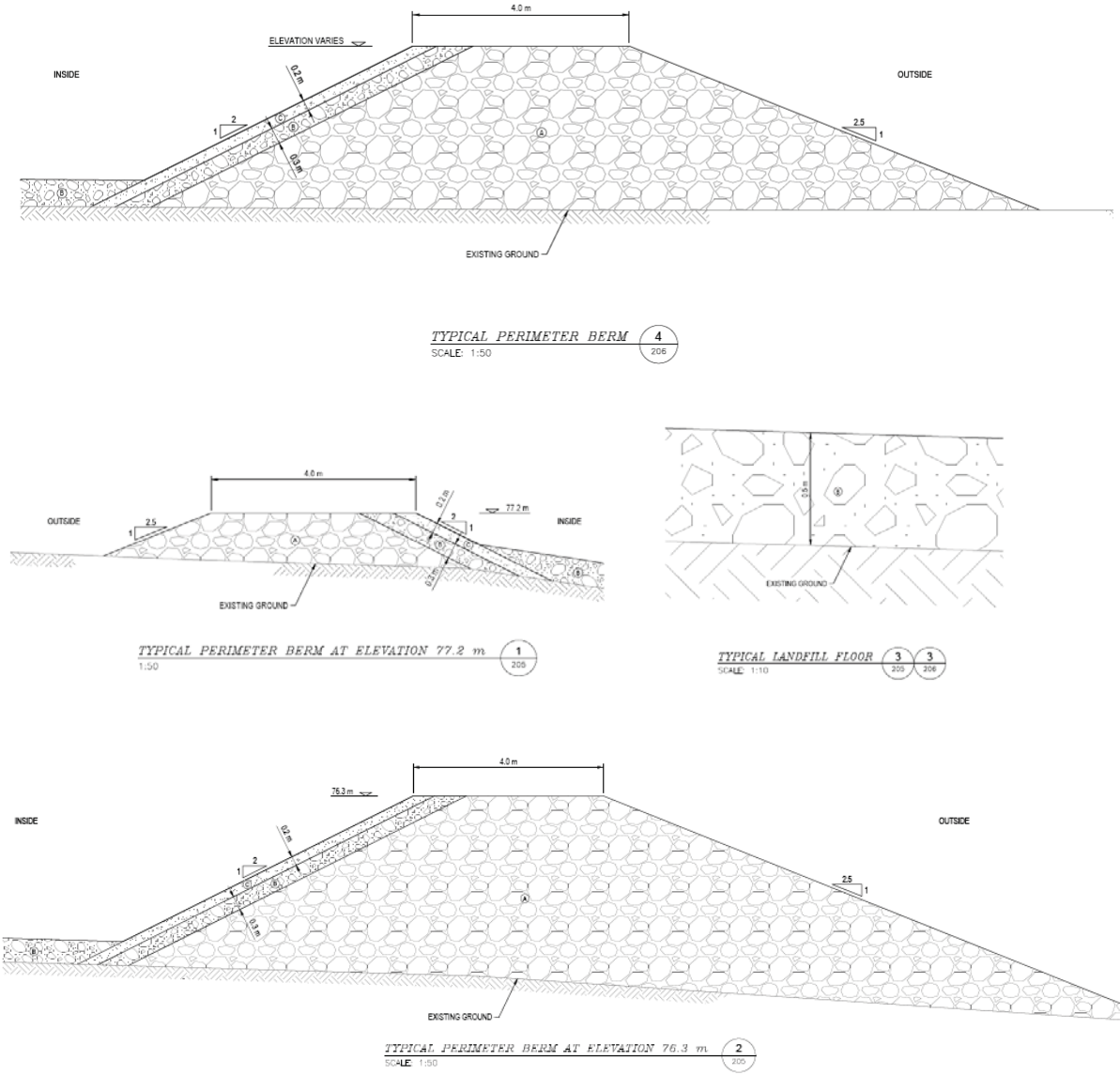


Figure 1-2 Typical Sections for Landfill Closure



Both the floor and the berm of the proposed landfill will be constructed with material (rockfill and/or waste rock) sourced from open pit stripping of Tiriganiaq Pit 1 or 2. The landfill floor will be approximately 1.2 m thick. The design of the berms will not assume that they will be in a frozen state or permanently impermeable to leakage. The final design will take into account berm and subgrade stability.

Due to the restriction on wastes that can be landfilled (see Section 4.3), and since the proposed landfill will be located within the WRSF 1, the quantity of leachate is expected to be minimal (if any), and of low ionic strength. The proposed landfill will nonetheless receive precipitation during the summer period, which could infiltrate the landfill before it can evaporate. In the event that leachate migrates from the landfill, it will be collected, monitored, and, if necessary, treated before being released to the receiving environment.

Closure design for the proposed landfill is described in Section 7 and illustrated in Figure 1-2. Based on the design strategy for the proposed landfill, and the management and operating procedures listed above, a liner is not considered necessary for the landfill.

1.4 Landfill Schedule

The proposed landfill will be used for the construction, operations, and closure phases. It will not be required for post-closure. The exploration landfill approved under water licence 2BB-MEL0914[1] will be used during the pre-development phase; this is until the proposed landfill for the mine has been constructed and becomes operational.

The schedule for the proposed landfill is as follows:

- Years -3 to -1: Construction of the landfill will occur directly after the placement of minimum 1.2 m of waste rock or rockfill to serve as a base or foundation. This will occur during the first year of construction, with commissioning of the landfill directly thereafter. This will allow non-salvageable, non-hazardous, non-putrescible solid construction waste to be placed in the landfill;
- Years 1 to 8: The landfill will be used continuously during operations;
- Years 9 to 11: The landfill will be one of the last parts of mine infrastructure to close. It is expected to be extensively used during closure for demolition waste and will remain operational until it is no longer needed.[2]

[1] Although approved by the Nunavut Water Board, this landfill has not been built as of March 2015.
[2] The incinerator will close before the landfill.

SECTION 2 • RELATED DOCUMENTS

Related documents include the following:

- Risk Management and Emergency Response Plan;
- Hazardous Materials Management Plan;
- Incineration Management Plan;
- Environmental Management and Protection Plan;
- Preliminary Closure and Reclamation Plan; and
- Occupational Health and Safety Plan (Agnico Eagle 2014).

The Landfill and Waste Management Plan is part of the Environmental Management and Protection Plan, which provides overarching environmental direction for the Project.

SECTION 3 • REGULATORY SETTING

Waste management in Nunavut is regulated under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act*, the federal *Environmental Protection Act,* and the federal *Transport of Dangerous Goods Act*. Agnico Eagle will also be bound by the forthcoming terms and conditions of its commercial lease with the Kivalliq Inuit Association and its water licence from the Nunavut Water Board.

In addition to mandatory requirements, a number of waste management guidelines are commonly used in the Northwest Territories and Nunavut. The most recent of these was developed for municipal solid waste and is titled: "*Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT*" (Ferguson Simek Clark 2003). *Environmental Guideline for Industrial Waste Discharge into Municipal Solid Waste and Sewage Treatment Facilities* (GN 2011c) were also used (Appendix D). While not all of the recommendations provided in these guidelines are appropriate for the management of industrial waste expected at the proposed Project, principles considered applicable have been adopted in this Plan.

In addition, the *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007) were followed regarding specific landfill design and mitigation for potential impacts pertaining to waste.

SECTION 4 • WASTE MANAGEMENT APPROACH

Waste[3] at the proposed Project is divided into the following categories:

1. Domestic waste: general waste materials coming from the kitchen, cafeteria, lunch rooms, dormitories, and offices. Bins will be located in high traffic areas for segregating wastes destined for incineration, landfilling, or recycling.

2. Medical waste: medical waste generated in the first aid/health room will require special handling and will be placed in easily identifiable single use medical waste containers. Both the containers and its contents will be incinerated.

3. Industrial waste: waste arising from operations in the truck shops, process plant, emulsion plant, paste plant, and warehouses. Each work area will have specially marked bins for segregating waste for incineration, recycling, or disposal. Special bins or areas will be set aside for hazardous waste. Large bulky items that cannot be incinerated will be prepared for shipment south for recycling, or be cleaned of any hydrocarbon contamination and have the electronics removed before disposal in the landfill.

4. Sewage: wastewater from the accommodation complex will be treated in the Sewage Treatment Plant before being directed to Collection Pond 1 (CP1). Sewage sludge removed from the Sewage Treatment Plant will be added to the landfarm as nutrient amendment on an as needed basis. Excess sludge will be disposed of in the tailings storage facility.

5. Used oil and waste fuels: used engine oil, hydraulic fluids, and fuels that do not meet specifications for designated use. This does not include solvents or paints. The used oil and waste fuels will be used in waste oil burners if it is found acceptable. For more details on the used oil and waste fuels, refer to the Incineration Management Plan.

6. Incinerator ash: ash testing protocol developed by the Government of Nunavut in accordance with the *Nunavut Environmental Guideline for Industrial Waste Discharges* will be implemented to ensure that the incinerator ash is suitable for disposal in the landfill (GN 2012). Ash not meeting the guidelines will be packaged in drums to be sent to a certified waste management facility for appropriate treatment, recycling, and/or disposal, or will be buried within the dry stacked tailings.

7. Hazardous waste: refer to the Hazardous Materials Management Plan for details on how hazardous waste will be managed.

[3] Tailings, waste rock, and overburden are also considered waste materials. The Mine Waste Management Plan provides details on these wastes.

4.1 Reduce/Recycle/Reuse Initiatives

Waste management begins by keeping all materials that can be economically recycled out of the waste stream destined for the landfill or incineration. The three R's of waste management - reduce, reuse, and recycle - will be encouraged within the waste management program.

Reduce, reuse, and recycle initiatives will be developed at the Project to minimize the quantity of waste incinerated or directed to the landfill. To support this initiative, operating procedures will be developed to maximize the volume of materials that are recycled and/or reused. This will include eliminating the use of disposable materials where possible, and segregating waste destined for reuse, and recycle alternatives.

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created (Environment Canada 2003). Waste management for the proposed Project will include efforts directed at eliminating, where practicable, the use of disposable materials in everyday use, such as disposable cups, plates, and table ware. Workers will be encouraged to use ceramic mugs and stainless steel cutlery in the cafeteria or lunch rooms, and to carry personal drink containers or thermoses. Water will be recycled from CP1 for use in the mill with fresh water from Meliadine Lake only being used as makeup water. A tailings pond will not be constructed; instead, Dry Stack Tailings technology will be employed whereby tailings water will be reclaimed within the mill before the tailings are trucked for disposal. This will increase the volume of water available for recycling to the process. Low flush toilets and water saving showers heads will also be used throughout the facility to conserve water.

Recycle bins will be located in high traffic areas for small waste items such as alkaline and rechargeable batteries, obsolete computer equipment and supplies, and fluorescent light bulbs. Scrap metal will be collected on-site. These wastes will be packed for shipment off-site to licensed recycling depots.

All hazardous materials collected on-site will also be sent off-site to a licensed hazardous waste management company. Many of these materials end up being compatible with recycling after treatment. Examples include lead recovered from lead-acid batteries and oil filters becoming scrap metal after cleaning.

4.2 Collection and Handling of Waste

The strategy for the management of solid waste at the proposed Project will be to first identify and segregate acceptable disposal items from non-acceptable items. Within the acceptable disposal items, the second step will be to segregate those items that can be economically recycled from those that cannot. This segregation will be done at source by locating bins throughout the facilities for the collection of items suitable for recycling.

Waste will be generated and segregated in all buildings and will need to be collected and transported to the incinerator (waste management) building for final disposal or incineration. The Site Services Department will be responsible for the collection and transport of waste to the incinerator building.

All solid wastes that may contain medical waste from the Health Centre, food waste, food packaging waste, or other organic waste that could attract wildlife will be incinerated in the on-site incinerator. This will include all garbage from the accommodation complex, kitchen, lunchrooms, and offices. These will receive priority in being incinerated. Food wastes and wastes associated with food will be collected daily, at a minimum, and immediately transported to the incinerator building. This waste will not be allowed to remain unattended in vehicles at any time. The ash from the incinerator will be disposed of in the landfill.

The development of the proposed landfill will minimize the area required for waste storage and re-handling of waste. Acceptable items that will be disposed of in the landfill will be those that are solid, non-salvageable, non-hazardous, non-putrescible, with a low leachate and low heat generation potential. Controlling the materials that can be placed in the landfill is a strategy aiming at reducing the concentration of constituents in potential leachate. The proposed landfill will conform to best management practices allowing for orderly landfill development, which will reduce the potential for windblown debris.

Hazardous waste and materials that can be recycled will be appropriately packaged (as per regulations under the *Transport of Dangerous Goods Act)* to be sent off-site to a licensed hazardous waste management facility or recycling facility, respectively. Management of hazardous materials is covered in detail in the Hazardous Materials Management Plan.

4.3 Waste Acceptable for Placement in Landfill

The following materials will be acceptable for disposal in the proposed landfill:

- Plastic (except expanded polystyrene);
- Steel, copper, aluminum, iron;
- White goods;
- Wire;
- Wood;
- Fiberglass insulation;
- Fiberglass;
- Roofing;
- Asphalt;
- Concrete;
- Carpet;
- Bricks;

- Ceramics;
- Rubber;
- Empty caulking tubes;
- Hardened caulk;
- Clothing;
- Glass, including light bulbs (fluorescent bulbs will require special handling, see below for more details);
- Waste Asbestos (see below for more details);
- Small appliances (with batteries removed);
- Gyproc;
- Ash, provided it has cooled to 60 degrees Celsius or less;
- Vehicles and machinery provided all liquids, grease, batteries, and electronics have been removed; and
- Treated soils from landfarm.

4.3.1 Waste Asbestos[4]

Waste asbestos includes any type of material with greater than 1 % asbestos by weight (GN 2011a). Asbestos that has been immersed or fixed in a natural or artificial binder or included in a manufactured product is not considered waste asbestos; it is considered a hazardous waste and will be disposed of accordingly. Waste asbestos can either be backhauled off-site for disposal in an approved facility or it can be landfilled. The following are guidelines for landfilling waste asbestos:

- Immediate burial and cover with 0.5 m of cover material;
- Burial where it will not be disturbed; and
- Maintenance of the location on a map or diagram for future reference.

In addition to following the *Environmental Guideline for the General Management of Hazardous Waste* (GN 2010a), Agnico Eagle will adhere to the Government of Nunavut's (GN) *Environmental Guideline for Waste Asbestos* (GN 2011a). Before landfilling waste asbestos, Agnico Eagle will review the steps in this guideline with the GN.

The complete *Environmental Guideline for Waste Asbestos* (GN 2011a) and *Environmental Guideline for the General Management of Hazardous Waste* (GN 2010a) can be found in Appendix A and the Hazardous Materials Management Plan, respectively. All Government of Nunavut environmental guidelines can be accessed online at http://env.gov.nu.ca/programareas/environmentprotection/legislation.

[4] It is unlikely that asbestos waste will result from mine operations. Agnico Eagle will avoid using asbestos wherever possible.

4.4 Waste Unacceptable for Placement in Landfill

Materials not listed in the previous section will be unacceptable for placement in the landfill, unless approved in writing by the Meliadine Environment Department. These materials include the following:

- Organic matter, including food, sludge from the Sewage Treatment Plant, dead animals, paper, cardboard;
- Food containers and wrappings, unless cleaned;
- Hazardous wastes including mercury, batteries, solvents, glues, ethylene glycol antifreeze, adhesives (except empty caulking tubes);
- Electronics;
- Materials that can be recycled economically;
- Petroleum products, including materials contaminated with petroleum products; and
- Expanded polystyrene.

In particular, organic matter will not be accepted in the landfill, thus eliminating the attraction of small mammals, carnivores, and/or raptors. This will be accomplished by requiring all personnel to dispose of domestic waste in designated receptacles and by sending all collected domestic waste (e.g., from kitchen, offices, and living quarters) to the on-site incinerator.

4.4.1 Fluorescent Lamp Tubes

Fluorescent tubes contain mercury phosphorus powder and traces of lead and cadmium, which are considered environmental contaminants under the Nunavut *Environmental Protection Act* (GN 2010b). The only disposal method for fluorescent tubes is through an approved hazardous waste recycling or disposal facility (GN 2003). Government of Nunavut guidelines on *Mercury-Containing Products and Waste Mercury* (GN 2010b) and E*nvironmental Guideline for the General Management of Hazardous Waste* (GN 2010a) are included in Appendix B and the Hazardous Materials Management Plan, respectively. These guidelines will be followed and wastes having mercury will be sent to a certified waste management company for treatment, recycling, and/or disposal.

Ultraviolet (UV) lamp tubes used in the wastewater and potable water treatment systems shall be disposed of in the same way as fluorescent lamp tubes, as they also contain mercury (vapour).

4.4.2 Ozone Depleting Substances

Ozone depleting substances include chlorofluorocarbons or halons. Common sources include refrigeration equipment, air conditioning equipment, motor vehicle air conditioners, and fire extinguishing equipment (GN 2011b). These materials are hazardous in nature; consequently, all disposal of ozone depleting substances will take place at an approved facility.

Any non-salvageable equipment containing ozone depleting substances will have the ozone depleting substances removed by a certified technician prior to disposal in the proposed landfill. The *Environmental Guideline for Ozone Depleting Substances* is included in Appendix C.

4.5 Total Volume of Waste

The number of people working on-site, and the activities occurring at the time, will have a direct bearing on the volume of waste destined for the proposed landfill, the incinerator, and the amount of materials removed from the waste stream for reuse and recycling. Also, purchasing policies that focus on reduced packaging will have a bearing on the volume of waste.

An estimate of waste volume is required to determine the appropriate size of the landfill. However, an exact waste volume is not a critical parameter in the design because of the flexibility of design to accommodate extensions (larger to accept more waste) or contractions (smaller to accept less waste) within WRSF 1.

Table 4-1 tabulates the estimated mass of waste destined for the landfill each year and cumulatively for the life of the Project. As mentioned earlier, the flexibility in the landfill design allows for greater flexibility in the landfill design and allows for increased volume in case more waste than estimated is generated. This ensures there will be enough room for all landfill waste for the life of the Project.

Table 4-1 Estimated Waste in Landfill

Project Phase	Waste Not Incinerated (t/year)	Ash From Incinerator (t/year)	Estimated Volume of Non-Hazardous Waste and Ash Produced (m^3/year)	Approximate Treated Soil From Landfarm (m^3/year)	Maximum Accumulated Waste Material in Landfill (m^3)
Construction	100	30	260	0	1,040
Operations	340	102	884	446	37,043
Closure	25	7.5	65	525	25,226
Total					**63,309**

As part of the larger waste management system, records will be kept of quantity of waste landfilled, the quantity of waste incinerated, type and quantity of materials recycled, and any analytical results. All this information will be submitted to regulators in an annual report.

4.6 Incinerator Ash Testing Protocol

Provided the materials that go into the incinerator are controlled to exclude all hazardous materials, then ash from the incineration process should be non-hazardous. An ash testing protocol, as described in Section 8.3 of the Incineration Management Plan, will be implemented to ensure that the incinerator ash is suitable for disposal in the proposed landfill.

SECTION 5 • LANDFILL MANAGEMENT

5.1 Site Development and Landfilling Method

The site for the proposed landfill will be prepared by first placing a foundation (or base) of 1.2 m of waste rock or and/or rockfill material directly on top of the natural ground to form a floor. A service road, accessible only to mine staff and Agnico Eagle's contractors, will connect the landfill to other mine infrastructure. Berms surrounding the facility on three sides will be built of waste rock and/or rockfill material. The design of the berms does not assume that they will be in a frozen state, or permanently impermeable to leakage. The berms will serve to confine the area for waste disposal and act as a wind shield to reduce windblown debris (Figure 5.1).

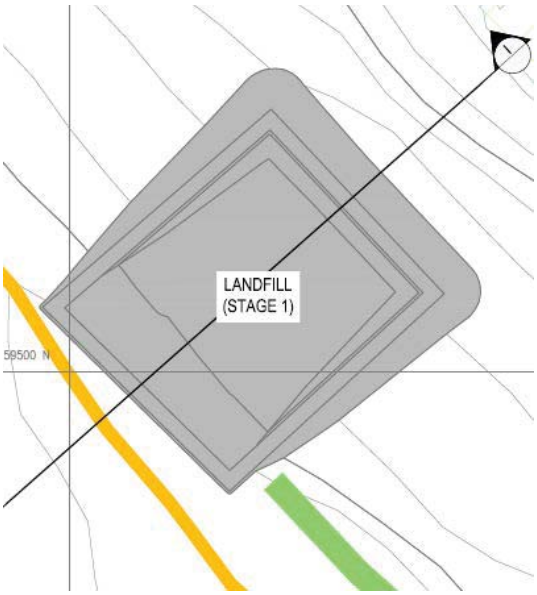


Figure 5-1 Landfill Stage 1

The Project's Site Services Department will be responsible for the operation and maintenance of the proposed landfill and will develop standard operating procedures for the same. The landfill will progressively be filled in an orderly manner. Specifically, waste will be placed to full height at one end of the proposed landfill and then the active waste area will progressively advance. An "area method" of dumping will be used such that materials will be dumped in rows and covered as required. Wastes will be deposited directly onto the landfill floor and compacted with heavy equipment against the berm or an existing row of debris that was compacted earlier.

Areas where the waste has been placed to full height, compacted and levelled will be progressively covered by placement of a minimum of 0.3 m thick of rock fill on top of the waste to reduce windblown debris.

Owing to its placement within the WRSF 1, the proposed landfill will become encapsulated within waste rock. Agnico Eagle plans to use waste rock to surround and cover the landfill. Upon closure, the entire landfill will be covered with 3.7 m of waste rock.

5.2 Staffing and Equipment

The Project's Site Services Department will collect all waste throughout the proposed mine site using trucks. Waste will be segregated at source with different waste streams following different paths. Trucks will haul waste destined for the proposed landfill and dump it at the working face where a dozer will be used to spread, level, and compact the waste.

Landfill operation will not require a full-time attendant as waste will only be delivered to the landfill for short periods each day.

5.3 Leachate Management

The leachate from the proposed landfill is anticipated to be of very low ionic strength (dilute) due to controls on materials to be placed in the landfill, and, as a result, site-specific landfill leachate management is not considered necessary.

In the event there is leachate from the landfill during periods of heavy rainfall or spring freshet, the runoff will be collected and directed to CP1[5], where it will be controlled and, if necessary, treated before release to the receiving environment. During operations, wastewater in CP1 could also be recycled and sent to the mill for use in the process.

In the event that greater volumes of leachate, or leachate with high ionic strength, is found coming from the proposed landfill, an investigation would immediately be undertaken to determine the cause. This could lead to changes in the configuration and/or management of the landfill to further limit water coming in contact with landfill materials and/or modify the water management strategy in this area.

The toe of WRSF 1 will be visually inspected monthly during the open water season and, if required, samples of water found ponding on the natural ground below the proposed landfill will be collected and analysed. The collection of samples, their analysis and reporting of results are anticipated to be part of the Water Licence for the mine.

Because the proposed landfill will be located in an area with underlying permafrost (see Permafrost Thermal Regime Baseline Studies in Agnico Eagle 2014), deep groundwater contamination from potential landfill leachate is not anticipated.

[5] Collection Pond 1 collects contact water runoff from a number of mine areas. For more details on CP1, refer to Water Management Plan.

5.4 Surface Water and Erosion Control

The slopes of the proposed landfill will be constructed of waste rock and should not be subject to erosion.

5.5 Operational Inspections

The Project's Environment Department will undertake periodic inspections of the landfill operations to verify compliance with applicable plans, including the condition of landfill works, evidence of erosion, excessive ponding or unusual landfill settlement, and adequacy of safety measures. The Environment Department will also visually inspect the toe of the WRSF 1 monthly during the open water season for leachate from the proposed landfill and, if present, collect samples for analysis.

SECTION 6 • TRAINING

All Agnico Eagle personnel and contractors working at the proposed Project site will be trained in waste management. This will be included in the site orientation upon arrival, which will include the identification of waste bins and dumpsters for the different categories of waste, where these are located, and the signage associated with each. Stewardship of the environment will be emphasized in that it is everybody's responsibility to properly dispose of waste, including wastes that can be recycled. This extends to ensuring wildlife does not have access to food or food wastes.

The success of the waste management system at the proposed mine site will be dependent on the proper disposal of all waste by all employees and contractors. Waste management training beyond the initial orientation will occur in each department. Environment department staff will reinforce proper waste segregation and disposal at various departmental meetings.

The Project's Site Services Department will have enhanced on-the-job waste management training as they will be collecting and processing all mine site waste. They will be trained in identifying misdirected waste, identifying where to dispose of it and in recommending where further waste management training is required on-site.

All maintenance staff must successfully complete equipment training before they can operate machinery and vehicles related to waste management on-site. Additionally, crews handling waste will be fully trained in safe work procedures. Training programs will include Workplace Hazardous Materials Information System (WHMIS) and Transportation of Dangerous Goods (TDG). Training completion and retraining will be documented and tracked by the Project's Human Resources Department.

SECTION 7 • CLOSURE PLAN

The proposed landfill is designed to be located within the WRSF 1. This location serves to minimize the area of surface disturbance, stabilize disturbed land surfaces against erosion, and return the land to a post-mining use that is chemically and physically stable, and consistent with past traditional pursuits and wildlife habitat. While waste rock will be disposed on land and in a manner that encourages total freezing. The design, operation, and/or closure of the WRSFs and landfill do not rely on total freezing. Any unacceptable leachate that is generated following closure of these facilities will be contained, collected, and/or treated, if necessary.

The following is a plan for closing the proposed landfill; more information is available in the Mine Preliminary Closure and Reclamation Plan:

a) Estimate of Total Waste Volume at Closure

Upon closure, it is estimated that the landfill will have a volume of approximately 63,000 m^3 of waste.

b) Final Cover Design

The proposed landfill will be covered with a minimum of 3.7 m of waste rock, and should thereafter be stable. When finalizing the design for the cover, the need for thermistors to be installed will be evaluated. The cover surface will be left irregular so as to capture snow, windblown sediment, and plant seeds.

c) Water Management

Contact water from the proposed landfill at its closure will continue to be managed using best management practices in accordance with the Project's closure and reclamation plan.

SECTION 8 • PLAN REVIEW AND UPDATE

The Landfill and Waste Management Plan will be reviewed annually by the Meliadine Environment Department. This plan will be reviewed and updated on an annual basis, as required, to reflect changes in operations and/or technology. Improvements suggested through these reviews would be implemented in consultation with the Nunavut Water Board and Kivalliq Inuit Association.

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APPENDIX A • ENVIRONMENTAL GUIDELINE FOR WASTE ASBESTOS

APPENDIX B • ENVIRONMENTAL GUIDELINE FOR MERCURY-CONTAINING PRODUCTS AND WASTE MERCURY

APPENDIX C • ENVIRONMENTAL GUIDELINE FOR OZONE DEPLETING SUBSTANCES

APPENDIX D • ENVIRONMENTAL GUIDELINE FOR INDUSTRIAL WASTE DISCHARGES INTO MUNICIPAL SOLID WASTE AND SEWAGE TREATMENT FACILITIES

AGNICO EAGLE

MELIADINE GOLD PROJECT

Mine Waste Management Plan

MARCH 2018
VERSION 3
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ᐊᑯᓂᖅᓂᑦ ᑕᓯᔨᐊᖏᑦ ᔪᓕᓗᒍ ᐅᓴᖃᖅᓂᕐᐊᖏᖅᑐᓕᕐᓂᕐᓗᔨᑦ (ᐱᓕᕆᐊᖅ), 25 ᑭᓪᒥᑕᒥᒃ ᐅᐊᖅᓇᖅᓯᓂᓕᒃ ᐅᖅᓯᓄᑎᔨᖅ ᑲᖏᕐᒃᓴᓂᖏᑦ, ᐊᒪᓗ 80 ᑭᓪᓕᒥᑕᒥᒃ ᓂᑎᖅᓴᓯᐊᓂᑦ ᐱᖅᓯᓇᖅᓴᓯᐊᓂᑦ ᐅᖅᓯᓄᑎᔨᖅ ᐃᒃᓗᓕᑎᔨᖅᓯᑦ ᑭᓕᕐᓂᖏᑦ ᓄᓇᕗᒻᒥᑦ. ᐅᓴᖃᖅᓂᐊᖏᖅᓱᒧᓪᓗᑦ ᓴᖅᓇᐅᑕᐅᔨᖅ ᐅᑯᐊᐃᖅᓯᒪᔪᒃ ᐊᒪᓗ ᓄᓇᐅᓴ ᐃᓗᐊᓂᑦ ᐅᓴᖃᖅᓂᐊᖏᖅᓱᖅᑎᓂᐊᖏᖅᑐᒍᖅ ᐱᓕᕐᓂᐊᓂᖏᓪᓗᑦ ᑎᓪᓚᑐᐊᖏᖅᓯᒥᑦ ᔪᓐᓇᒥᑦ, ᓴᖅᑭᑎᒃ ᑭᓪᓕᒥᑕᒥᒃ Pit 1 ᐊᒪᓗ ᑎᓪᓚᑐᐊᖏᖅᓯᒥᑦ Pit 2) ᐊᒪᓗ ᐊᑕᐅᓯᖅᓄᑦ ᓄᓇᐅᓴ ᐃᓗᐊᓂᑦ ᐅᓴᖃᖅᓂᐊᖏᓂᖅ.

ᓯᑕᒪᐅᓕᖅᓯᒪᔪᖅ ᐱᓕᕐᓂᐊᓂᖅᓚ ᑎᓪᓚᑐᐊᕐᕆ: ᓯᑕᒪᐃᑦ ᐅᑭᐅᑦ ᐅᖅᓯᑎᐊᖏᔨᐊᓄᑦ ᓴᓇᓴᐅᓂᖅᓚ (Q4 ᐅᑭᐅᖅ -5-ᒥᑦ ᐅᑭᐅᖅ -1-ᒧᑦ), 8-ᓄᑦ ᐅᑭᐅᓄᑦ ᐅᓴᖃᖅᓂᐊᖏᓐᓇᖅ ᐊᐅᓪᓛᖃᓗᓂ (ᐅᑭᐅᖅ 1-ᒥᑦ ᐅᑭᐅᖅ 8-ᒧᑦ), ᐱᖅᓯᓯᑦ ᐅᑭᐅᓂᖅ ᐅᖅᑯᐊᖅᑐᑦᓕᐊᔪᔭ (ᐅᑭᐅᖅ 9-ᒥᑦ ᐅᑭᐅᖅ 11-ᒧᑦ), ᐊᒪᓗ ᐅᖅᑯᐊᖅᓯᒪᓕᖅᑎᑦᓗᔭ (ᐅᑭᐅᖅ 11-ᒥᑦ ᐅᖅᑭᒧᓄᑦ). 12.1 ᒥᓕᓴᓐ ᑕᓐᓂᖅ ᐅᓴᖅᑲᓂᖅ ᐱᓂᐊᖅᑐᑦ. ᐅᓴᖅᑲᐃᑦ ᐱᓴᐅᓪᓛᑦ ᓯᖁᑦᓕᓕᖅᑎᖅᑕᐅᓂᐊᖅᑐᑦ 8-ᓄᑦ ᐅᑭᐅᑦᓗᐊᓄᑦ ᐅᓴᖃᖅᓂᐊᖏᓂᐅᓴ ᐊᐅᓪᓛᖃᓗᓂᓕᖅᑐᖅᓯᓂᑦ 3,000 ᑕᓐᓂᖅ ᐅᑦᓗᑕᒧᑦ (tpd) ᐅᑭᐅᖅ 1-ᒥᑦ ᐅᑭᐅᖅ 3-ᒧᑦ ᐊᒪᓗ 5,000 tpd-ᓂᖅ ᐅᑭᐅᖅ 4-ᒥᑦ ᐅᑭᐅᖅ 8-ᒧᑦ.

ᐊᖏᑕᐃᖅᑕᐅᓪᓛᑦ ᐅᓴᖅᑲᐃᑦ ᐅᖅᓯᑕᐅᑎᓪᓕᓗ ᓄᓇᖅᐃᕐᓂᖅᓂᐃᓂᑦ ᐊᖅᓴᖅᑕᐅᓂᐊᖏᖅᑐᑦ ᐅᓴᖅᑲᓄᑦ ᐊᖏᑕᐃᓯᕐᓇᓐᖅ (WRSFs) ᑕᐃᑲᐅᓂᓗᑎᒃ ᑭᓯᐊᓂ ᐅᓴᖃᖅᓂᐊᓂᓴᖅ ᓄᓴᖅᑲᖅᓯᑦ, ᐊᖅᓴᖅᑐᓴᖅᑲᑕᓪᓗᑕᑦ ᒪᓕᖅᓗᑕᑦ ᐊᐅᓚᒪᓕᖅᓂᓪᓕᒧᑦ ᐊᑐᖅᑕᐅᓴᖅᑲᑕᖅᑐᓴᖅ. ᖃᐅᓄᐃᖅᓯᓂᐅᔪᑦ ᓄᓇᐅᓴ ᖃᐅᓄᐃᖅᓯᖅᓯᓄᓂ ᐅᑉᐊᑐᓴᓕᓂᓄᑦ ᐃᓕᓴᕐᓂᖅᓂᓕᓂ ᐊᓯᔾᔨᐅᑉᐳᖅᓯᓂᑦ (NPAG); ᑕᒪᓕᒃ ᐅᖅᓯᖅᑲᐃᑦ ᐊᖏᑕᐃᖅᑕᐅᔨᑦ ᐅᖅᓯᑕᐅᑎᓪᓕᓗ ᓴᐃᖅᓯᖅᑐᑦᓂᖅᓂᐃᓂᑦ ᐊᖏᑕᐃᖅᑕᐅᔨᑦ ᐅᖅᓯᑕᐅᑎᓪᓕᓗ ᓴᐃᖅᓯᖅᑐᑦᓂᖅᓂᐃᓂᑦ. ᐱᖅᓯᓯᐃᑦ ᐃᓂᐅᔨᑦ ᐃᓕᑕᓴᐅᓯᕐᓇᓐᖅ WRSFs-ᖏᓂᖅᑐᓄᑦ. ᐅᖅᓯᐊᖅᑕᐅᑎᐊᖅᓂᐊᖏᖅᑐᑦ WRSFs ᐱᔨᖅᓇᖅᓯᓗᑎᒃ ᐃᓕᑎᕐᒃᐅᔨᔪᑦ ᐅᑎᖅᑎᕆᑎᓕᕐᓂᕐᓗᔨᑦ. WRSFs ᖃᐅᑕᖅᑕᐅᕐᒪᖏᖅᑐᑦ ᐊᒪᓗ ᐱᑭᖅᑐᑕᖅᑐᖅᑕᐅᖅᑐᑕᑎᒃ ᐊᒪᓗ ᖃᐅᓄᐃᑐᓂᖅᑐᑦ ᐊᓂᖅᓴᖅᑐᑦᓂᖅᓂᐃᓂᑦ ᒪᓕᖅᓗᑕᑦ ᐅᖅᓯᖅᑲᐃᑦ ᐊᑐᖅᑕᐅᓴᖅᑲᑕᖅᑐᑦ ᐸᖅᓇᐅᑎ. ᐅᓐᓇᖅᓂᖅᑎᒃ ᐅᖅᑐᑦᑕᐅᑦ ᐃᓕᓴᕐᓂᐊᖏᖅᑐᑦ WRSFs-ᒥᑦ ᖃᐅᔨᓕᐊᖅᑲᑕᖅᓂᖅᓗᑦ ᖃᓄᐅᖓᐃᓐᓇᐅᔨᖅᑐᖅᑕᖅᑕᒃᓴᖅᑐᓕᕐᓂᖅ.

ᑲᑎᓗᒍᑦ 12.1 Mt ᖃᑭᒃᑎᑦᑐᙵᖅᓂᐊᖏᖅᑐᑦ, 9.7 Mt-ᓗᐊᑦ ᖃᑭᒃᑎᑐᑦ ᑐᖅᓄᖅᑕᐅᓕᐹᖓᓕᒫᐊᖅᑕᐅᓂᐊᖏᖅᑐᑦ (TSF)-ᒧᑦ ᐸᓂᖅᑐᓂᑦ ᖃᑭᒃᑎᑦᑐᓄᑦ, ᐊᒥᐊᓄᐃᓕᓚ 2.4 Mt ᐃᓕᓴᐅᓗᑎᒃ ᓄᓇᐅᓴ ᐊᑕᓄᑦ ᐅᖅᓯᖅᑲᐃᑦᓯᖅᓄᑦ ᖃᓄᐃᓗᒍ. ᖃᑭᒃᑎᑦᑐᙵᖅᑐᑦ ᐃᓕᓐᓂᑦᓯᐅᔨᑦ ᐊᓯᔾᔨᐅᑉᐳᖅᓯᓂᑦ (NPAG). TSF ᐱᖅᓯᓯᓕᖅᓂᕐᓗᔨᑦ, ᐊᑕᐅᓯᐅᑕᓪᓗᑎᑦ ᐱᓕᕆᐊᖓᔪᓂᐊᖏᖅᑐᑦ ᐅᖅᓯᖅᑐᑦᓂᖅᓂᐃᓂᑦ ᐅᖅᓯᖅᑲᐃᑦᓯᖅᓄᑦ ᐊᐅᓪᓛᖃᓕᒫᓗᒍ. ᖃᐅᔨᓴᓕᖅᑐᑦ ᐅᖅᓯᑕᐅᑎᓪᓕᓗ ᐊᖏᑕᐃᖅᑕᐅᔨᑦ ᐊᑐᖅᑕᐅᓴᖅᑲᑕᖅᑐᑦ TSF ᐅᖅᓯᖅᑲᐃᑦᑕᐅᓂᖅᓄᑦ. ᒪᓂᒪᓕᓂᑦ ᐅᖅᑐᑦᑕᐅᑦᓗᑦ

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ᖃᓄᐃᖅᑲᓇᑦ ᐊᒪᓗ ᒪᓕᒃᓂᒋᑦ ᓯᓂᖅᑐᑦ ᖃᓄᐃᖅᑲᓇᖅ, ᑎᓪᓗᓂᔪᖅᑎᑦ ᖃᒪᓕᒃᑎᑐᑦ ᐃᓱᒋᓕᐅᖅᑐᖅᓯᖅᑎᑦᑐᑦ, ᓴᖅᖃᓄᖅᓯᐅᑦ ᐊᓂᔪᓚᖅᓴᓇᑎᒃ ᐊᑯᓂᐅᕙᓕᑦ ᑕᑭᓂᒥᑦ.

WRSFs ᐊᒪᓗ TSF ᐃᖃᑭᑕᐅᓕᐅᖅᑐᑦ ᐊᒪᓗ ᐊᑐᖅᑕᐅᓗᑎᒃ ᒥᑭᓴᖅᑎᑲᓂᖅᑐᑦ ᐊᒃᑐᖅᓱᓂᐅᕙᖅ ᐊᐅᑎᒧᑦ ᐊᒪᓗ ᐃᓱᒪᒋᔭᓗᒍ ᓄᓇᒥᒃ ᖃᐅᐅᔨᐊᐃᓐᓂᑦ ᐊᒪᓗ ᓄᓇᐅᔨ ᖃᓄᐃᓕᓚᐅᖏᓂᕐᓗᓂᒃᑕ ᐊᔪᖁᑎᓂᓂᓄᓕᒋ. ᑯᓴᕽ ᖃᓄᖁᒃ ᐊᓂᔪᓚᖅ ᐃᒪᖅ ᑐᖅᑯᖅᓱᒪᒃᖁᓂ ᓱᔭᓄᑯᑦ ᐊᓱᐊᔫᖅᑎᑕᐅᓂᔪᖅᑐᑦ ᐊᒪᓗ ᑲᑎᑕᐅᓗᑎᒃ ᐃᒪᖏᓄ ᑲᑎᖅᓱᐃᖁᒃᓂ (Cps). ᐃᒪᐅᔨ ᖃᓄᐃᓕᓂᒃᑎᑕᐅᑎᓪᓕᖏᑦ ᑎᑭᐅᑎᖓᔪᖏᑦ ᐃᖃᑭᐅᒪᔨᒥᒃ ᒪᑕᒃᓴᐃᒍ ᐃᒪᖏᒧᑦ ᑕᐃᓴᖓᓱᑎᑦ ᐱᔪᓚᐊᖏᖏᓂᖅ, ᑲᑎᑕᐅᔨᖅ ᐃᒪᖅ ᐱᑕᓚᐊᖓᔪᓂᖅᑐᖅ ᐃᒪᑕᓚᖕᖁᓂᒥ (WTP)-ᒥᑦ ᑯᖁᑎᑕᐅᓂᐊᓖᑦᓴᓂᓂ ᓱᑕᒧᑦ.

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EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (the Project), located approximately 25 km north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards). Approximately 12.1 million tonnes (Mt) of ore will be produced. The produced ore will be milled over approximately 8 years of mine life at a rate of 3,000 tonnes per day (tpd) in Year 1 to Year 3 and 5,000 tpd in Year 4 to Year 8.

Waste rock and overburden will be trucked to the waste rock storage facilities (WRSFs) until the end of mine operation, with distribution according to an operation schedule. Results of geochemical testing indicate that the produced waste rock and overburden is non-potentially acid generating (NPAG); both the waste rock and overburden are considered non-metal leaching. Three areas have been identified as the WRSFs. Closure of the WRSFs will begin when practical as part of the progressive reclamation program. The WRSFs will not be covered and vegetated and no additional re-grading activity will be required under the closure plan. Thermistors will be installed within the WRSFs to monitor permafrost development.

Of the total 12.1 Mt of tailings produced, about 9.7 Mt of tailings will be placed in the tailings storage facility (TSF) as dry stack tailings, while the remaining 2.4 Mt will be backfilled to the underground mine as cemented paste backfill. The produced tailings are considered to be non-acid generating (NAG). The TSF consists of three cells, which will be operated one by one to facilitate progressive closure during mine operation. A layer of overburden and waste rock will be used for the TSF closure. From the available testing results and based on the dry stack tailings design, the Tiriganiaq tailings will not pose an acid generation problem, nor a metal leaching problem in the long-term.

The WRSFs and TSF were designed and to be operated to minimize the impact on the environment and to consider geotechnical and geochemical stability. The surface runoff and seepage water from the storage facilities will be diverted via channels and collected in the water collection ponds (CPs). If the water quality does not meet the discharge criteria as per the Water Licence requirement, the collected water will be treated by the Water Treatment Plant (WTP) prior to being discharged to the outside environment.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	April 2015			First draft version of Mine Waste Management Plan as Supporting Document for Type A Water Licence Application, submitted to Nunavut Water Board for review and approval	Tetra Tech EBA Inc.
2	June 2016	1.1, 1.2,	1-2	Update to reflect issuance of the Type A Water Licence.	Golder Associates Ltd.
		1.3	12-15	Removal of original Section 1.3 as was specifically linked to the application.	
		3.3	22-24	Update to reflect receipt of Type A Water Licence	
		5.5, 6.1, 9.1, 9.2	34-35; 37-38	The Plan updated to comply with Part B Section 13, and Part F Sections 12, and20 of the Type A Water Licence 2AM-MEL1631 and commitments made during the licensing process.	
3	March 2017			General update of the plan	Environment, Engineering and Mine Departments
4	March 2018			Minor revisions	Environment, Engineering Departments

ACRONYMS

ABA	Acid Base Accounting
Agnico Eagle	Agnico Eagle Mines Limited
ARD	Acid Rock Drainage
ML	Metal Leaching
CP	Collection Pond
CRA	Commercial, Recreational, and Aboriginal
DFO	Department of Fisheries and Oceans Canada
FEIS	Final Environmental Impact Statement
HCT	Humidity Cell Test
INAC	Indigenous and Northern Affairs Canada
MEND	Mining Environment Neutral Drainage
MMER	Metal Mining Effluent Regulations
NAG	Non-Acid Generating
NLCA	Nunavut Land Claims Agreement
NPAG	Non-Potential Acid Generating
NPR	Net Potential Ratio
NWB	Nunavut Water Board
NWR	Nunavut Water Regulations
NWNSRTA	Nunavut Waters and Nunavut Surface Rights Tribunal Act
PAG	Potential Acid Generating
PGA	Peak Ground Acceleration
Project	Meliadine Gold Project
SFE	Shake Flask Extraction
TSF	Tailings Storage Facility
WRSF	Waste Rock Storage Facility
WTP	Water Treatment Plant
WRTP	Waste Rock Transfer Pad

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per meter
cm/s	centimetre per second
ha	hectare
kPa	kilopascal
km	kilometre(s)
L	liter(s)
m	metre
mg	milligram
m/s	metre per second
mm	millimetre
mm/h	millimetre per hour
m^2/year	square metre(s) per year
m^3	cubic metre(s)
Mm^3	million cubic metre(s)
t	tonne
t/m^3	tonne per cubic metre
Mt	million tonne(s)
µm	micrometre

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.4 Mt of waste rock, 7.1 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Mining facilities include a plant site and accommodation buildings, three ore stockpiles, a temporary overburden stockpile, a tailings storage facility (TSF), three waste rock storage facilities (WRSFs), and a water management system that includes collection ponds (CPs), water diversion channels, and retention dikes/berms, and a Water Treatment Plant (WTP). The general mine site location for the Project and the site layout plan are shown in Figures 1.1 and 1.2, respectively, as attached in Appendix A.

1.1 Concordance

The Project is subject to land and resource management processes established by the Nunavut Land Claims Agreement (NLCA) and other Federal laws and regulations. Agnico Eagle submitted a Type A Water Licence Application for a Mining and Milling Undertaking (Application) required to use water and to deposit waste in development of the Project, in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA) and Nunavut Water Regulations (NWR) to submit to the Nunavut Water Board (NWB).

The Type A Water Licence 2AM-MEL1631 was issued on April 15, 2016 and signed by the minister on May 19, 2016. The Mine Waste Management Plan reflects the commitments made with respect to submissions provided during the technical review of the Application, as well as final submissions and issues raised during the Public Hearing Process, where applicable, to comply with Part B Section 13, and Part E Section 10 of the Type A Water Licence 2AM-MEL1631.

1.2 Mine Waste Management Plan Summary

This document presents the Mine Waste Management Plan (the Plan) in compliance with the Type A Water Licence 2AM-MEL1631. The purpose of the Plan is to provide consolidated information on

waste rock, overburden, and tailings management, including strategies for runoff and dust control and monitoring programs for the storage facilities. The Plan is divided into the following components:

- Introductory section (Section 1);
- A brief summary of the physical setting at the mine site (Section 2),
- A brief summary of the mine plan (Section 3);
- A description of the waste rock and overburden management plan (Section 4);
- A description of the tailings management plan (Section 5);
- A description of water management associated with mine waste management (Section 6);
- A description of dust management associated with mine waste management (Section 7);
- A description of reclamation and closure related to mine waste management (Section 8); and
- Monitoring program (Section 9).

The Plan will be updated, as required, to reflect changes in operation or economic feasibility occurs, and incorporate new information and latest technology, where appropriate, to comply with Part B Section 15 of the Type A Water Licence 2AM-MEL1631.

1.3 Overall Schedule and General Activities

The construction phase is anticipated to start in last quarter of Year -5 and take approximately just over 4 years (Q4 Year-5 to Year -1). The mine construction period will primarily focus on site preparation and the construction of infrastructure, with some mining activities (advancement of the mine ramp) occurring at the Tiriganiaq underground mine. The first year of operation (Year 1) will commence after commissioning is completed in the last quarter of construction (Year -1). The operation phase will span approximately 8 years (Year 1 to Year 8). Mining activities are expected to end in Year 7 and ore processing is expected to end in Year 8. Closure will occur within three years (Year 9 to Year 11) after the completion of mining and will include the removal of non-essential site infrastructure. Flooding of the mined-out open pits with water pumped from Meliadine Lake and flooding of the underground mine with natural groundwater seepage will start in Year 8 as progressive reclamation. Post-closure phase will commence as closure is completed in Year 11 and will continue until it is shown that the site and water quality meets all the regulatory closure objectives. Table 1.1 summarizes the overview of the timeline and general activities.

Table 1.1: Key Mine Development and Water Management Activities and Sequence

Mine Year	Mine Development Activities	Water Management Activities
Q4 of Yr-5 2015	• Start to construct the industrial pad • Develop the ramp to Tiriganiaq underground mine • Construct portion of rock pad for OP1 and OP2 stockpiles to store the ore from Tiriganiaq underground ramp development • Install Culvert2 • Construct Channel2	• Start to re-use the underground water • Dewatering top 0.5 to 1.0 m of fresh water in Pond H17
Yr -4 PC: 2016	• Continue construction of the industrial pad • Start Construction of D-CP1 to impound CP1 • Start Construction of D-CP5 to impound CP5 • Construct and operate the temporary landfill • Start to place waste rock in the WRSF2 • Construct and operate P-Area Containment Ponds • Construct Saline Pond for additional underground saline water storage	• Dewatering of H17 into Meliadine Lake. • Dewater Pond A54 in Q3 of Year -4 and pump the water to CP1. • Start to store the excess groundwater from the underground mine at surface. • Implement and test evaporators at P-Area to reduce water volumes stored at surface. • Construct trenches down gradient from DP1-B and DP3-A to be able to pump collected water seep and pump back to the associated containment pond.

Table 1.1: Key Mine Development and Water Management Activities and Sequence

Mine Year	Mine Development Activities	Water Management Activities
Yr -3 PC: 2017	• Complete the industrial pad • Construct and operate the land farm • Construct and operate the operation landfill • Complete Construction D-CP1, jetty and Pumping station CP1 • Complete Construction D-CP5 jetty and Pumping station CP5 • Erect and close all main buildings except, Crusher, Paste Plant and Crushed Ore Storage • Erect Incinerator • Erect and operate Effluent Water Treatment plant • Fuel tanks at portal 1 • Construct channel 1, 7 & 8 and berm 1 and 3 • Install all Culverts • Construct freshwater intake causeway in Meliadine Lake & Install Pumping station • Construct Lv75 Water stope for additional underground saline water storage	• Start to pump the water from CP1 to WTP for treatment prior to discharge to the outside environment via the diffuser in Meliadine Lake. • Pump the underflow sludge water from the WTP to CP1. To limit recirculation of the sludge within CP1, the discharge will be located away from the WTP intake. • Start to treat sewage water and pump the treated sewage water from sewage treatment plant to CP1. • Start to pump the contact water from CP5 to CP1 for treatment/dilution • Start to pump water seepage collected in trenches, down gradient from D-CP1, D-CP5, DP1 and DP3 to the associated containment pond. • Start to pump the water from the Landfarm to CP1 after pre-treatment for oil. • Start to pump water from washbay to underground for storage until treatment for oil plant arrives at the site • De-ice or divert water from Lakes H17A, H17B, and H17 C • Start to pump the water from CP1 to WTP for treatment prior to discharge to the outside environment via the diffuser in Meliadine Lake
Yr -2 PC: 2018	• Expand the pad footprint of OP1 and OP2 to increase the storage capacity • Start to place waste rock in the WRSF1 • Erect and close crusher, paste plant and Crushed ore storage • Channels 3, 4, berm 2, • Construct D-CP3 to form CP3, jetty and start to collect contact water • Construct D-CP4 to form CP4, jetty and start to collect contact water • Fuel tank 20ML in Rankin, • Fuel Tank 6ML and 250KL at site • Install all Culverts	• Start to divert the contact water from industrial pad to CP1 via Channel1 • Construct and operate saline water treatment to be discharged to CP1

Table 1.1: Key Mine Development and Water Management Activities and Sequence

Mine Year	Mine Development Activities	Water Management Activities
Yr -1 PC: 2019	• Start process commissioning in Q2 of Year -1 • Start to place dry stack tailings in Cell 1 of TSF in Q2 of Year -1 • Start full capacity of ore processing end Q3	• Start to pump the treated water from WTP to mill as make-up water • Start to pump the underflow sludge water from WTP to the mill during the open water season, the mill will be supplemented as much as possible with water from the WTP. For the balance of the year, fresh water will be used for ore processing • Start to pump excess truck wash water from the wash bay to the saline treatment plan to and then to CP1
Yr 1 PC: 2020		• Start to pump the contact water in CP3 to the partially drained Pond H13 where the water will flow through Channel1 into CP1 • Start to pump the contact water in CP4 to the partially drained Pond H13 where the water will flow though Channel1 into CP1
Yr 2	• Start to mine Tiriganiaq Pit 1 • Start to place overburden and waste rock from Tiriganiaq Pit 1 in WRSF1	• Start to pump contact water collected in Tiriganiaq Pit 1 to CP5
Yr 3	• Expand process plant to reach the process capacity of 6,000 tpd • Construct temporary overburden stockpile to store the selected ice-poor overburden that will be used for progressive reclamation of TSF	• Dewater Ponds H19 and H20 in Q3 of Year 3 and pump the water to CP1
Yr 4	• Increased mill production to 5,500 tpd for 2023 and 6,000 tpd beyond • Start to mine Tiriganiaq Pit 2 • Start to place waste rock and overburden from Tiriganiaq Pit 2 in WRSF3 • Construct D-CP6 to CP6 and start to collect contact water • Start to place dry stack tailings in Cell 2 of TSF • Start to place low grade ore from the open pits in the OP1 stockpile • Construct rock pad for OP3 to store marginal grade ore from the open pits	• Start to pump contact water collected in Tiriganiaq Pit 2 to CP5 • Start to pump contact water in CP6 to CP1

Table 1.1: Key Mine Development and Water Management Activities and Sequence

Mine Year	Mine Development Activities	Water Management Activities
	• Stop placing rock and overburden in WRSF1 when WRSF1 reaches design capacity	
Yr 5	• Start to place waste rock from Tiriganiaq Pit 1 in WRSF2 • Place final closure cover on top of tailings surface in Cell 1 of TSF (waste rock cover over final Cell 1 perimeter slope to be placed as progressive reclamation -as soon as slope reaches final grade)	• Water management plan similar to Year 4
Yr 6	• Start to place dry stack tailings in Cell 3 of TSF • Stop placing overburden waste in WRSF3	• Water management plan similar to Year 4
Yr 7	• Place final closure cover on top of tailings surface in Cell 2 of TSF (waste rock cover over final Cell 2 perimeter slope to be placed as for progressive reclamation as soon as slope reaches final grade) • Stop mining of Tiriganiaq Pit 1 and Tiriganiaq Pit 2 when the open pits reach design elevation • Stop Tiriganiaq underground operation when underground mine reaches design elevation • Stop placing waste rock and overburden in WRSF2 when WRSF2 reaches design capacity • Stop placing waste rock in WRSF3 when WRSF3 reaches design capacity	• Water management plan similar to Year 4 • Stop pumping water from the open pits when the pits are mined-out at end of year • Stop pumping excess water from underground when underground mine is completed
Yr 8	• Process the ore from the OP1, OP2, and OP3 until all stored ore are processed • Decommission of underground mine surface openings as needed	• Start to fill the mined-out Tiriganiaq Pits 1 and 2 with active pumping water from Meliadine Lake • Start natural flooding of Tiriganiaq Underground mine with groundwater seepage • Stop pumping water to process plant when the processing is completed

Table 1.1: Key Mine Development and Water Management Activities and Sequence

Mine Year	Mine Development Activities	Water Management Activities
Closure (Yr 9 to 11)	• Place final closure cover on top of tailing surface in Cell 3 of TSF in Year 9 (waste rock cover over final Cell 3 perimeter slope to be placed as progressive reclamation - as soon as slope reaches final grade) • Decommission non-essential mine infrastructure and support buildings in Years 9 and 10 • Continue to fill the mined-out open pits with active pumping water from Meliadine Lake until Year 10 • Start monitoring and maintenance in Year 9 (start in Year 8 if possible)	• Finish flooding Tiriganiaq Pit 1 and Tiriganiaq Pit 2 by Q4 of Year 10 • Continue to collect and manage the contact water in CP1 to CP6 • Continue to pump the contact water in CP1 to WTP, if required, for treatment before being discharged to the outside environment • Remove non-essential site infrastructure • Pump the underflow sludge water from WTP to CP1 • Continue natural flooding of Tiriganiaq Underground mine with groundwater seepage • Remove Meliadine Lake pumping system
Post-Closure	• Continue monitoring and maintenance until Year 18	• Treat the contact water until water quality meet direct discharge criteria and then decommission the water management system • Continue natural flooding of Tiriganiaq Underground (progressive reclamation since Year 8) • Breach water retention dikes D-CP1, D-CP3, D-CP4, D-CP5 and D- CP6 once water quality monitoring results meet discharge criteria to allow water to naturally flow to outside environment • Remove culverts and breach remaining water retention dikes/berms in Year 18

SECTION 2 • PHYSICAL SETTING

2.1 Site Conditions

The mine site is located in lowlands near the northwest coast of Hudson Bay. The dominant terrain at the mine site area comprises glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and small lakes. The topography is gently rolling with a mean elevation of 65 m above sea level and a maximum relief of 20 m.

The local overburden typically consists of sand and gravel deposits of various thicknesses overlying till with cobbles and boulders. Some of the surfaces are covered by a thin layer of organics. Bedrock at the mine site area consists of a stratigraphic sequence of clastic sediments, oxide iron formation, siltstones, graphitic argillite, and mafic volcanic flows (Snowden 2008; Golder 2009a).

Low-lying areas are poorly drained as a result of a low slope in the landscape and intermittent streams connect numerous shallow ponds and lakes. The following subsections summarize the physical setting at the mine site.

2.2 Climate

The mine site is located in the Kivalliq Region of Nunavut, near the northern border of the southern Arctic terrestrial ecozone, and within the Arctic tundra climate region. Within this region daylight reaches a minimum of 4 hours per day during the winter to a maximum of 20 hours per day during the summer. The climate is extreme with long cold winters and short cool summers. Temperatures are cool, with a mean temperature of 12°C in July and -31 °C in January. The mean annual air temperature at the Project site is approximately -10.4 °C (Golder 2012a).

The recorded prevailing winds are from north and north-northwest. The wind blows from the north and north-northwest direction more than 30% of the time, and the least frequent wind direction is west-southwest, with a frequency of 2.1%. The calm frequency is 2.8% of the time. The mean values for wind speed show that the north-northwest together with north and northwest winds have the highest speeds and tend to be the strongest.

Mean annual precipitation at the mine site, based on the hydrological year from 1 October to 30 September, is estimated to be 411.7 mm after accounting for rainfall and snowfall undercatch. Approximately 51% of precipitation occurs as rain (207.1 mm) and 49% occurs as snow (199.1 mm).

2.3 Permafrost

The mine site is located in an area of continuous permafrost, as shown on Figure 2.1 as attached in Appendix A.

Late-winter ice thicknesses on freshwater lakes in the mine site area were recorded from 1998 to 2000. The measured data indicated that ice thickness ranges from 1.0 to 2.3 m with an average thickness of 1.7 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July (Golder 2012 b).

Published data regarding permafrost were used to recreate the permafrost map of Canada shown in Figure 2.1. Based on thermal studies and measurements of ground temperatures, the depth of permafrost at the mine site is estimated to be in the order of 360 to 495 m. The depth of the active layer ranges from about 1 m in areas with shallow overburden, up to about 3 m adjacent to the lakes. The depth of the permafrost and active layer will vary based on proximity to the lakes, overburden thickness, vegetation, climate conditions, and slope direction (Golder 2012b). The typical permafrost ground temperatures at the depths of zero annual amplitude (typically at the depth of below 15 m) are in the range of -5.0 to -7.5 °C in the areas away from lakes and streams. The geothermal gradient ranges from 0.012 to 0.02 °C/m (Golder, 2012c).

2.4 Taliks

Taliks (areas of unfrozen ground) are to be expected where lake depths are greater than about 1.0 to 2.3 m. Formation of an open-talik, which penetrates through the permafrost, would be expected for lakes that exceed a critical depth and size. It is anticipated that an open-talik exists below Lake B7 based on the depth and geometry of this lake (Golder, 2012b). The salinity of groundwater also influences the temperature at which the groundwater will freeze. The test results on two deep groundwater samples collected below the base of the permafrost for baseline study indicated salinity level leads to a freezing point depression of about 3.2 °C (FEIS Volume 7, Appendix 7.2-A).

2.5 Subsurface Condition

A series of geotechnical site investigation programs had been carried out at the mine site (Golder 1999, 2009b, 2010a, 2010b, 2012d, 2012e, SRK 2007, Tetra Tech EBA 2013a, 2014a, 2016a), and LVM (2015). A total of 175 geotechnical boreholes were drilled and 37 thermistor cables were installed during the site investigation programs.

Fourteen boreholes were drilled within the footprints of the WRSFs during the previous site investigations. In general, a veneer of organic material ranging from 0.02 to 0.70 m was encountered in most of boreholes. The underlying overburden material encountered in most of boreholes consisted of a sand and silt matrix, gravelly, and some gravel with cobbles and boulders. The overburden thickness ranges between 1.5 to 13.6 m and is underlain by greywacke bedrock. Overburden soils with excess ice were observed in most of the boreholes. Massive icy beds up to 1.5 m thick were also encountered.

In 2014, a total of seven boreholes were drilled within the footprint of the TSF. The subsurface soil profile is similar to the soil encountered within the footprint of the WRSFs. Generally, the soil profile consists of a veneer of organic material ranging from 0.1 to 0.75 m, layers of a sand and silt matrix, and overlaid by bedrock. The overburden thickness ranges from 1.3 to 7.3 m. An ice layer up to 1.75 m thick was encountered in one borehole. Soil porewater salinity tests (Tetra Tech EBA, 2013a) indicated that the overburden soils at the mine site may have a porewater salinity of 4 to 12 parts per thousand.

2.6 Seismic Zone

The mine site is situated in an area of low seismic risk. The peak ground acceleration (PGA) for the area was estimated using seismic hazard calculator from the 2010 National Building Code of Canada website (http://www.earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/index_2010-eng.php). The estimated PGA is 0.019 g for a 5% in 50-year probability of exceedance (0.001 per annum or 1 in 1,000 year return) and 0.036 g for a 2% in 50-year probability of exceedance (0.000404 per annum or 1 in 2,475 year return) for the area.

SECTION 3 • MINING PLAN

3.1 Mine Development Plan

Tiriganiaq gold deposit will be developed using traditional open-pit and underground mining methods. Two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and an underground mine (Tiriganiaq Underground) will be developed as shown in Figure 1.2. Approximately 31.4 Mt of waste rock, 7.1 Mt of overburden material, and 12.1 Mt of tailings will be produced.

The following mining development sequence is planned:

- Tiriganiaq underground mine will be developed and operated from Year -5 to Year 7;
- Tiriganiaq Pit 1 will be mined from Year 2 to Year 7; and
- Tiriganiaq Pit 2 will be mined from Year 4 to Year 7.

3.2 Mine Waste Development Plan

Three mine waste streams will be produced: waste rock, tailings, and overburden material.

The term “waste rock” designates all fragmented rock mass that has no economic value and needs to be stored separately. Waste rock is also commonly referred to as “mine rock” in the mining industry. Typically, waste rock is produced during the initial stripping and the subsequent development of open pits and underground workings.

The term “overburden” designates all soils above the bedrock that needs to be stripped at surface prior to developing the open pits. Generally, the overburden at the site consists of a thin layer of organic material overlying a layer of non-cohesive soil with variable amounts of silt, sand, and gravel.

Tailings are the processed material by-product of the gold recovery process and generally comprise water with gravel, sand, silt, and clay sized particles.

Table 3.1 summarizes the schedule and quantities to be mined from the open pit and underground mining operations. The usage or destination of the three mine waste materials is presented in Table 3.2. Figure 3.1 presents a graphical representation of the mine waste management flow sheet.

Further details on the management of the mine waste materials are presented in Sections 4 and 5 of this plan.

Table 3.1: Summary of Mine Waste Production Schedule

Year	Mine Waste and Ore from Underground (t)		Mine Waste and Ore from Tiriganiaq Pit 1 (t)			Mine Waste and Ore from Tiriganiaq Pit 2 (t)		
	Waste Rock	Ore	Overburden	Waste Rock	Ore	Overburden	Waste Rock	Ore
Yr-5	290,705*	36,911**	0	0	0	0	0	0
Yr-4	355,200	7,646	0	0	0	0	0	0
Yr-3	583,679	5,725	0	0	0	0	0	0
Yr-2	691,529	120,865	0	0	0	0	0	0
Yr-1	764,683	602,440	0	0	0	0	0	0
Yr1	959,950	1,185,403	0	0	0	0	0	0
Yr2	789,614	1,051,472	2,038,237	68,930	0	0	0	0
Yr3	608,626	1,254,293	4,328,239	4,205,799	0	0	0	0
Yr4	336,059	1,237,507	236,246	5,774,071	905,004	391,137	287,727	6,509
Yr5	31,567	1,154,294	0	5,004,160	742,892	97,830	1,667,353	70,586
Yr6	0	967,430	0	3,703,548	781,391	0	2,468,635	123,008
Yr7	0	888,008	0	1,830,060	710,953	0	973,358	254,040
Total (t)	**5,411,612**	**8,511,994**	**6,602,722**	**20,586,568**	**3,140,240**	**488,967**	**5,397,073**	**454,143**

*The amount include approximately 112,775 tonnes of waste rock produced during development of ramp to underground mine before construction phase starting in Year-5

**Volume from 2008-2015 of ore produced during development of ramp to underground mine before construction phase starting in Year-5

Table 3.2: Summary of Mine Waste Tonnage and Destination

Mine Waste Stream	Estimated Quantities		Waste Destination
Overburden	7.1 Mt		Temporary storage in the Overburden Stockpile ~ 0.1 Mt for reclamation of TSF
			Closure and site reclamation for the TSF
			Co-disposed with waste rock within WRSFs
Waste Rock	31.4 Mt		Dike and road construction
			WRSFs
			Closure and site reclamation for the TSF
Tailings	12.1 Mt	9.7 Mt	As dry stack tailings placed in the TSF
		2.4 Mt	Backfilled to underground mine as cemented paste backfill

3.2 Mine Waste Storage

The overall objective of the site selection for the WRSFs and TSF was to minimize the footprint of the areas occupied by the waste rock, overburden, and tailings, and where possible, avoid environmentally and socially sensitive areas.

3.2.1 Waste Rock and Overburden Storage Area

Three areas were identified for the combined storage of waste rock and overburden material as shown in Figure 1.2 of Appendix A. These areas can be described as follows:

- The WRSF1: located north of Tiriganiaq Pit 1 with an approximate footprint of 41.4 ha.
- The WRSF2: located south of Pond H17 (CP1) with an approximate footprint of 20.2 ha.
- The WRSF3: located north of Tiriganiaq Pit 2, covered H20 pond basin with an approximate footprint of 22.7 ha.

Originally, four main areas were proposed as the waste rock storage areas in the baseline study for the project during the FEIS to store the waste rock and overburden generated from mining the five deposits. Comparatively, the WRSFs for Tiriganiaq have less impact on existing waterbodies, smaller footprints, shorter haul distances, and it will be easier to manage the surface runoff and seepage from the facilities as shown in Figure 3.2.

3.2.2 Tailings Storage Area

Tailings will be placed and stored the as a dry stacked tailings within the TSF that is located on an area of high ground located between the mill and east of Lake B7 as shown on Figure 1.2. It will be constructed on land and will not cover any major waterbodies. A total 12.1 Mt of tailings will be produced over a mine life of approximately 8 years. About 9.7 Mt tailings (80% of total tailings) will be placed in the TSF as dry stack tailings. The remaining 2.4 Mt (20% of total tailings) will be used as underground cemented paste backfill for the primary stopes and longitudinal stopes.

3.3 Use of Traditional Knowledge in the Planning for Mine Waste Management

Inuit Qaujimajatuqangit (IQ) is the most successful and oldest monitoring practice in Nunavut, where the resource users do the observing or monitoring. Information collected can contribute to mine design and monitoring.

Agnico Eagle is committed to including IQ and public concerns stemming from IQ, where practical, in the design of management and monitoring plans for the Project. Agnico Eagle will continue active engagement with communities and Inuit organizations as the Project proceeds through permitting, and if approved, construction, operations and closure. This consultation and engagement should lead to further inclusion of IQ, as it becomes available, in updates to the design and implementation of environmental programs. Section 1.5 of the Main Application Document developed for the Type A

Water Licence Application (Agnico Eagle 2015a) summarizes IQ and public concerns. A list of public concerns can be found in the Public Engagement and Consultation Baseline Report, in compliance with the Type A Water Licence 2AM-MEL-1631.

This Mine Waste Management Plan considers IQ, including traditional ecological knowledge (TEK), traditional land use (TLU) and public concerns regarding Project effects on traditional resources and traditional land use sites, through the following Project design and mitigation measures:

- Based on IQ and community consultation, it is clear that clean water and the health of fish, wildlife, birds, and caribou is important to Elders and other people in the communities. Therefore, the WRSFs and TSF for the Project are designed and will be operated to minimize the impact on the environment. For example, the surface runoff and seepage water from the storage facilities will be diverted via channels, collected in water collection ponds, and treated as needed prior to discharge to the outside environment. In addition, contact water quality will be monitored and assessed throughout the construction, operations, closure, and post-closure phases such that any required changes to how the water is managed on site can be identified and implemented in a timely fashion.
- Inuit Qaujimajatuqangit indicates that caribou move through the Project area on a regular basis. Therefore, progressive reclamation of Project waste management infrastructure includes closure activities that take place prior to the end of mining (final closure). These closure activities consider minimizing the risk of erosion and sediment loss as a result of on-site runoff, minimizing dust generation and soil drifting, stabilizing slopes, and the creation of a final landscape that allows caribou to continue to move through the area in the future as they have done in the past. They also provide for clean water, as well as healthy fish, wildlife, birds, and caribou.
- Through IQ and community consultation, it is known that people have fished and continue to fish in the Meliadine area. The use of dry stack tailings avoids potentially impacting and/or using significant bodies of water, such as Lake B7, and further limits the amount of seepage potentially reporting from the TSF, both during operations and into closure and post-closure of the proposed mine. The dry stack tailings process also minimizes the traditional “tailings pond” surface area thereby reducing the potential for contact between migratory birds and the tailings “pond”.
- Inuit Qaujimajatuqangit states that berry picking and caribou hunting are important parts of the Inuit culture in the past and today. Community members have expressed concern over dust that could impact the health of the caribou and berries. Therefore, dust suppression measures will be considered though the design, operation, and closure phases of all waste management infrastructures at the Project. Monitoring programs have been included to monitor the impact of dust on vegetation near the mine site and to specifically measure uptake of metals by such vegetation.

SECTION 4 • WASTE ROCK AND OVERBURDEN MANAGEMENT

4.1 General Description of Waste Rock and Overburden Management

Approximately 31.4 Mt of waste rock will be mined from the open pits and underground mine operations. The majority of the waste rock produced (about 25.3 Mt) will be placed and stored within the designated WRSFs. The remaining 6.1 Mt of waste rock will be used for other purposes, including: about 2.0 Mt will be backfilled to the underground mine, 1.65 Mt of waste rock will be used for construction activities, and 2.45 Mt of waste rock will be used as TSF closure cover material.

Approximately 7.1 Mt of overburden will be produced. About 7.0 Mt of overburden will be co-disposed within the WRSFs. The remaining, approximately 0.1 Mt, will be stored in a temporary overburden stockpile that will be used as cover material for progressive closure and reclamation of the TSF area.

Seepage and runoff water from the WRSFs and the temporary overburden stockpile will be managed by a series of water diversion channels, water retention dikes/berms, and water collection ponds. If the water quality does not meet the discharge criteria the collected contact water will be treated by the WTP prior to discharge to the outside environment. The contact water quality and the water management structures for the WRSFs will be monitored and assessed according to an approved environmental protocol during each stage of the mine life, including construction, operations, closure, and post-closure. The geochemical characterization of the waste rock, ore, tailings and overburden was submitted as SD 6-3 Geochemical Characterization of Waste Rock, Ore, Tailings and Overburden Meliadine Gold Project, Nunavut (Agnico Eagle 2014).

The waste rock will be managed as one mixed pile; the management plan for waste rock considers the overall leachability of the mixed pile, and aims to limit arsenic leaching during operation and post-closure. Predictive water quality modelling also considered the overall leachability of waste rock and results show that the mine effluent will meet MMER during operation, and MMER, Canadian Council of Ministers of the Environment water quality guidelines, or site specific water quality objectives post-closure. No arsenic treatment is anticipated to be needed.

4.2 Waste Rock Storage Facilities

The design location of the WRSFs took into consideration the environmental, social, economic, and technical aspects of waste rock management which included the following:

- maintain a minimum distance of 100 m between the toe of the WRSFs and the open pits;
- maintain a minimum distance of 20 m from the toe of the WRSFs to haul and access roads; and
- maintain a distance between the toe of the WRSFs and adjacent lakes that will ensure stability of the facilities and ensure no effects to lakes not disturbed by mine activities.

Table 4.1 summarizes some of the key physical parameters used for the design of the WRSFs:

Table 4.1: Design Parameters for Waste Rock Storage Facilities

Design Parameters	WRSF1	WRSF2	WRSF3
Height of the first lift above original ground surface (m)	5		
Sideslope of each lift of waste rock	1.3(H):1(V)		
Width of the horizontal offset between the first and second lift (m)	15		
Width of the horizontal offset between two adjacent lifts above the second lift (m)	30	20	20
Maximum crest elevation above the sea level (m)	115	102	100
Average overall sideslopes of each WRSFs (from bottom toe of first lift to top crest of final lift)	2.5(H):1(V) to 3.4(H):1(V)	2.2(H):1(V) to 2.4(H):1(V)	2.3(H):1(V) to 2.5(H):1(V)
Sideslope for each lift of overburden	1.6(H):1(V)		
Internal Overburden setback distance from toe of WRSF for the first lift (m)	120	80	88
Assumed waste rock in place bulk density (t/m^3)	1.88		
Assumed overburden in place bulk density (t/m^3)	1.62		

Based on the above design criteria, the WRSFs will provide a 9.4 Mm^3, 3.6 Mm^3, and 5.0 Mm^3 of design capacity for WRSF1, WRSF2, and WRSF3, respectively.

4.2.1 Waste Rock Storage Facility 1

The proposed WRSF1 will occupy an area of approximately 41.4 ha and will be located to the north of Tiriganiaq Pit 1. Two small shallow ponds (Ponds A17 and B9) are located within the footprint of WRSF1 and will be covered by the facility as shown in Figure 4.1. The ponds are less than 2 m deep and freeze to the bottom annually during the winter season. These ponds do not provide habitat for fish designated as commercial, recreational, or aboriginal (CRA) fish species (Golder 2015).

The proposed WRSF1 was designed in consideration of both frozen and unfrozen foundation conditions. Thus, the stability of the facility does not rely on the presence of permafrost foundations even though permafrost foundation conditions are expected to be present over long term based on the geothermal analyses that consider long-term climate change, waste rock placement schedule, and annual thaw of the active layer. The WRSF1 will accommodate waste rock produced from Tiriganiaq underground mining and Tiriganiaq Pit 1 and the overburden produced from Tiriganiaq Pit 1. It is anticipated that approximately 10.2 Mt (5.42 Mm^3) of waste rock and 6.5 Mt (4.02 Mm^3) of overburden will be placed in WRSF1.

From Year -2 to Year 4, the majority of the waste rock produced will be placed at WRSF1, with a portion of waste rock being used for underground backfill and TSF progressive closure cover. All overburden material produced from pre-stripping of Tiriganiaq Pit 1 will be placed at WRSF1. To

manage the slope stability of the placed overburden, the overburden will be placed within areas that will be surrounded by waste rock. The WRSF1 is expected to reach its design capacity at the end of Year 4.

4.2.2 Waste Rock Storage Facility 2

The proposed WRSF2 is located to the south of Pond H17 (CP1) with an approximate footprint of 20.2 ha. Five small ponds (Ponds A58, H8, H9, H10, and H11) are located within the footprint of WRSF2 as shown in Figure 4.1. Pond A58 will be fully covered and the other four ponds will be partially covered by waste rock. All five ponds are less than 2.0 m deep and freeze to bottom during the winter (about 8 months of the year). Of the five ponds impacted by WRSF2, only nine spine stickleback were caught in Ponds A58 and H10. These ponds do not provide habitat for fish designated as CRA fish species and the ninespine stickleback is not considered to be a species supporting the CRA fisheries (Golder 2015).

The WRSF2 will accommodate the majority of waste rock produced from Tiriganiaq Pit 1 from Year 5 to Year 7. The WRSF2 is expected to reach its design capacity by the end of Year 7.

4.2.3 Waste Rock Storage Facility 3

The proposed WRSF3 is located to the north of Tiriganiaq Pit 2, covered basin of Pond H20 with an approximate footprint of 22.7 ha as shown in Figure 4.1. The runoff water from WRSF3 will be collected within Pond H19. Maximum water depths for Ponds H19 and H20 are 1.4 m and 1.6 m, respectively. No fish species were found in these two ponds.

The proposed WRSF3 was designed in consideration of both frozen and unfrozen foundation conditions. Thus, the stability of the facility does not reply on the presence of permafrost foundations even though permafrost foundation conditions are expected to be present over long term based on the geothermal analyses that consider long-term climate change, waste rock placement schedule, and annual thaw of the active layer. The WRSF3 will accommodate overburden from pre-stripping of Tiriganiaq Pit 2 and all waste rock produced from Tiriganiaq Pit 2 with some portions of waste rock from Tiriganiaq Pit 1 in Year 4 and Year 5. The WRSF3 is expected to reach its design capacity by end of Year 7.

4.3 Waste Rock Distribution

An estimate for the production schedule, quantities, and distribution of waste rock by year is presented in Table 4.2. The development plan for the waste rock placement is shown in Figures 1.2.

Table 4.2: Schedule, Quantities, and Distribution of Waste Rock by Year

Mine Year	Total Waste Rock from Mine Operation (t)	Utilization of Waste Rock (t)			Waste Rock to be Placed in WRSFs(t)		
		Construction	Rockfill for Underground Backfill	TSF Closure Cover	WRSF1	WRSF2	WRSF3
Yr -5	290,705*	290,705	0	0	0	0	0
Yr -4	355,200	355,200	0	0	0	0	0
Yr -3	583,679	583,679	0	0	0	0	0
Yr -2	691,529	0	0	0	691,529	0	0
Yr -1	764,683	0	31,910	0	732,773	0	0
Yr 1	959,950	0	190,180	160,929	608,842	0	0
Yr 2	858,544	0	235,839	164,214	458,491	0	0
Yr 3	4,814,425	19,268	188,991	128,402	4,477,764	0	0
Yr 4	6,397,857	0	349,005	236,634	3,221,661	0	2,590,557
Yr 5	6,703,080	0	364,965	411,296	0	3,059,326	2,867,493
Yr 6	6,172,183	0	370,885	239,114	0	3,093,548	2,468,635
Yr 7	2,803,418	0	319,338	533,194	0	977,528	973,358
Yr 8	0	0	0	313,774	0	-313,774	0
Yr 9	0	0	0	269,094	0	-269,094	0
Total (t)	**31,395,253**	**1,248,852**	**2,051,112**	**2,456,651**	**10,191,060**	**6,547,534**	**8,900,043**
Volume (m^3)	**16,999,603**	**664,283**	**1,091,017**	**1,306,729**	**5,420,777**	**3,482,731**	**4,734,065**

*The amount include approximately 112,775 tonnes of waste rock produced during development of ramp to underground mine before construction phase starting in Year-5

4.4 Overburden Storage and Management

Approximately 7.1 Mt of overburden material will be removed from the surface footprint of the two pits over the mine life. The approximate quantities and proposed placement location of the overburden is presented in Table 4.3.

The overburden material will be mainly stored within the WRSFs. A small volume of overburden (approximately 0.5% of total overburden produced) will be used for site infrastructure construction. The amount of overburden used for site infrastructure construction is included within the quantities of overburden placed into the WRSFs, as presented in Table 4.3. About 0.1 Mt of selected ice-poor overburden will be stored in a temporary overburden stockpile as TSF closure cover material. This temporary overburden stockpile is located at the east side of the TSF and has a footprint of approximately 1.12 ha and is shown in Figure 1.2. The temporary overburden stockpile is approximately 5.0 m high with sideslopes of 3(H):1(V).

The design of the main overburden WRSF was revisited to determine if a portion of the 7.1 M tonnes of overburden removed prior to mining of the Tiriganiaq open pits could be placed in a manner within the same overburden/WRSF footprint that would permit later recovery of this overburden for use in mine site reclamation purposes for use in mine site reclamation purposes. Two options were considered (Tetra Tech EBA 2016b), including the placement, storage, and recovery of the overburden material in a zone at the outer edge of the facility; and the recovery of the overburden material from the top of the facility. However, given the small footprint and compactness of the mine layout, there is no available real estate to reconfigure the WRSF's to accommodate the late recovery of overburden materials. There is the potential to recover some of the overburden materials from the top of WRSF1, which would require careful management and would yield approximately 0.15 M tonnes.

Table 4.3: Schedule, Quantities, and Distribution of Overburden by Year

Mine Year	Total Overburden from Mine Operation (t)	Utilization of Overburden (t)		Overburden to be Placed in WRSFs (t)		
		Overburden Stockpile for TSF Closure Cover	Withdraw from Stockpile for TSF Closure Cover	WRSF1	WRSF2	WRSF3
Yr -5	0	0	0	0	0	0
Yr -4	0	0	0	0	0	0
Yr -3	0	0	0	0	0	0
Yr -2	0	0	0	0	0	0
Yr -1	0	0	0	0	0	0
Yr 1	0	0	0	0	0	0
Yr 2	2,038,237	0	0	2,038,237	0	0
Yr 3	4,328,239	94,816	0	4,233,423	0	0
Yr 4	627,383	0	0	236,246	0	391,137
Yr 5	97,830	0	20,844	0	0	97,830
Yr 6	0	0	0	0	0	0
Yr 7	0	0	26,737	0	0	0
Yr 8	0	0	0	0	0	0
Yr 9	0	0	47,235	0	0	0
Total (t)	**7,091,689**	**94,816**	**94,816**	**6,507,906**	**0**	**488,967**
Volume (m^3)	**4,377,585**	**58,528**	**58,528**	**4,017,226**	**164,806**	**301,831**

4.5 Anticipated Design Performance of WRSFs

The WRSFs were designed to minimize the impact on the environment and consider both the physical and geochemical stability of the stored waste rock and overburden.

Slope stability analyses for the WRSFs were carried out during the feasibility study. Using the geometric parameters presented in Section 4.2, the results of the stability analysis indicates that the calculated minimum factors of safety for the WRSFs meet or exceed the acceptable factors of safety. Thermal analyses were conducted to estimate the thermal regime of the WRSFs and foundations during mine operations and after closure. The results indicate that material placed in the winter period will probably stay in a frozen condition while the material placed in the summer period will take 2 to 10 years to freeze back. Information on the stability and thermal studies for the WRSFs is described in the report of Tailings, Waste and Water Management for Feasibility Level Study, Meliadine Project, Nunavut (Tetra Tech EBA, 2014b).

It should be noted that the design and performance of the WRSFs are not dependent on freeze-back of waste rock and permafrost conditions continuing to exist at the site (i.e., the design has included for thaw of the WRSFs and its foundations). The permafrost development within the WRSFs will provide additional benefits (i.e., more physical stable and less seepage water) during operation and closure of WRSFs.

SECTION 5 • TAILINGS MANAGEMENT

5.1 General Description of Tailings Management

Dry stack tailings produced in the mill at Meliadine will be dewatered to a solids content of 85%. The dewatered tailings will be trucked to the TSF with haul trucks and spread and compacted into thin lifts using a dozer and compactor.

Site contact water from the TSF will be collected by the perimeter water management system located to the northwest and south of the TSF. The contact water quality and the water management structures for the TSF will be monitored and assessed according to an approved environmental protocol during each stage of the mine life. The geochemical characterization is provided in the document *Meliadine Project Trade-Off Dry-Stack vs. Slurry* (Agnico Eagle 2013).

5.2 Tailings Storage Facility

The TSF is located on high ground west of the proposed mill and east of Lake B7, as shown in Figure 1.2. The direct distance from the mill to the tailings stack ranges from 300 to 900 m. The minimum setback distance from the edge of Lake B7 is approximately 200 m.

The TSF is designed to accommodate approximately 9.7 Mt of tailings. As shown in Figure 5.1, the tailings will be managed using a three cell system (Cell 1, Cell 2, and Cell 3) to limit dust generation, control tailings surface erosion, and to facilitate the progressive reclamation and closure of the TSF. As the tailings reach final elevation, it is proposed that the tailings are progressively encapsulated with either waste rock or a layered combination of waste rock and overburden. The closure plan for TSF is described in Section 8 and the Preliminary Closure and Reclamation Plan.

The properties of the tailings and TSF operation parameters relevant to the design of the TSF are presented in Table 5.1.

Table 5.1: Design Parameters for the Tailings Storage Facility Operations

Parameters	Value
Mine design life	8 years
Mill production	3,000 tpd in Years -1 to 3 5,000 tpd per day in Years 4 to 8
Ore processed	12.1 Mt
Tailings to TSF as dry stack	9.7 Mt (or 80% or total tailings)
Tailings backfilled to underground mine	2.4 Mt (or 20% or total tailings)
Average specific gravity of tailings	2.83
Tailings solid content to TSF	85%

Table 5.1: Design Parameters for the Tailings Storage Facility Operations

Parameters	Value
Average tailings dry density	1.71 t/m^3
Maximum height of TSF over original ground surface	30 m
Side slope for the bottom 15 m thick (or below elevation of 84 m)	4H:1V
Side slope for the top 15 m thick (or above elevation of 84 m)	3H:1V
Slope of the final tailings surface at crest	4%
TSF storage capacity	9.7 Mt (5.65 Mm^3)

5.3 Tailings Physical and Geotechnical Properties

A laboratory test program on the tailings was conducted for the slurry tailings option with solids contents of 65% and 72%. The test program included physical index tests, a gradation analysis test, settling tests, thermal conductivity tests, a consolidated-undrained triaxial test, a consolidation test, a hydraulic conductivity test, and a direct shear test. The index and gradation analysis tests indicated that the tailings are inorganic silt with low plasticity and low compressibility and consist of 17% sand, 81% silt, and 2% clay size particles. Tailings have the gradation curve of 98% passing 150 µm, 83% passing 75 µm, 40% passing 20 µm, and 5% passing 3 µm (Tetra Tech EBA 2013b).

Additional tailings laboratory geotechnical tests were carried out in 2014 for the dry stack tailings option with a tailings solid content of 85% at disposal (Tetra Tech EBA 2014c). The test included moisture-density relationship (Standard Proctor), consolidation test, soil water characteristic curve, direct shear test, and hydraulic conductivity test. The key finding from the test results were briefly summarized below:

- The moisture-density relationship (Standard Proctor, ASTM D698) test indicated that the maximum dry density of the tailings was 1.8 t/m^3 at an optimum moisture content of 14.9%.
- The coefficient of consolidation (cv) of the tailings ranged from 24.6 to 29.8 (m^2/year) under various pressures ranging between 10 and 1,600 kPa.
- The tailings had a soil water characteristic curve with an air entry value of 20 kPa and a residual suction of 900 kPa.
- The shear strength parameters were determined to be an inferred internal angle of friction of 33.5° and an apparent cohesion of 9.9 kPa for the tailings samples with a dry density of 1.7 t/m^3.
- The saturated hydraulic conductivity of the tailings sample was 2.91E-07 m/sec for the tailings sample with a dry density of 1.7t/m^3.

5.4 Schedule, Quantities, and Distribution of Tailings

Commissioning of the process plant is planned to start in the second quarter of Year-1. Approximately 12.1 Mt of tailings will be produced over an eight year period. Approximately 9.7 Mt or 80% of the tailings will be deposited within the TSF and the remaining 2.4 Mt or 20% will be used as underground cemented paste backfill. Based on a tailings dry density of 1.71 t/m^3, the TSF will have a storage volume of 5.65 Mm^3.

The production schedule, quantities, and distribution of tailings by year are presented in Table 5.2.

Table 5.2: Schedule, Quantities, and Distribution of Tailings by Year

Mine Year	Tailings Solids from Mill (t)	Tailings Solids to be Used as Underground Backfill (t)	Tailings Solids to be Placed in Dry Stacked TSF (t)		
			Cell 1	Cell 2	Cell 3
Yr -1	202,350*	164,196	38,154	0	0
Yr 1	1,095,000	362,047	732,953	0	0
Yr 2	1,095,000	256,607	838,393	0	0
Yr 3	1,095,000	381,440	713,560	0	0
Yr 4	1,808,880	334,949	1,018,350	455,581	0
Yr 5	1,825,000	358,645	469,171	997,184	0
Yr 6	1,825,000	375,746	0	838,819	610,435
Yr 7	1,825,000	200,371	0	265,328	1,359,301
Yr 8	1,320,602	0	0	0	1,320,602
Total	**12,091,832**	**2,434,001**	**3,810,581**	**2,556,912**	**3,290,338**
*Tailings produced during commissioning in the last quarter of Year -1 (construction phase)					

5.5 Tailings Placement Plan

The dry stacked tailings will be dewatered to a solid content of 85% by mass in the mill. Thereafter the tailings will be hauled from the mill to the TSF by truck; end dumped, spread, and compacted. The following tailings placement and management strategy will be used:

- Prior to tailings placement, remove all surface water and snow within the footprint of placement.
- Tailings placement will start from Cell 1 in the last quarter of Year -1. The dewatered tailings will be hauled to the TSF Cell 1 with haul trucks, end dumped, and bladed into thin lifts using a dozer. Thereafter, the tailings' lifts will be compacted using a vibratory drum roller. This compaction is designed to promote runoff, reduce the potential for oxygen ingress and water infiltration, and maintain geotechnical stability. The thickness of each lift will be approximately 0.3m.
- Based on the tailings production schedule, Cell 1 will reach its design capacity by Year 5 at a height of 30 m above the original ground. Cell 2 will start operation from Year 4 and will reach design capacity in Year 7 and Cell 3 will start operation from Year 6 and will reach design capacity in Year 8.
- When possible and practical, as the tailings stack increases in height, a waste rock layer will be placed along the side slopes as erosion and thermal protection.
- At the final elevation, the top of the tailings stack will be progressively capped with a layered combination of overburden and waste rock. This will comprise 0.5 m of overburden followed by 2.5 m of waste rock.

Table 5.3 presents the tailings placement schedule for the TSF. The annually tailings placement plan is shown in Figure 5.2 to 5.14 and Figure 6.2 shows the typical cross-section of the TSF. The external perimeter slopes of the TSF will be covered with waste rock but no perimeter berm is planned.

Table 5.3: Tailings Placement Schedule and Estimated Tailings Heights

Mine Year	Estimated Average Height of Tailings Placed in Each Cell (m)			Planned Tailings Placement Period		
	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3
Yr -1	2.0*			Oct to Dec		
Yr 1	4.0			Jan to Dec		
Yr 2	8.5			Jan to Dec		
Yr 3	13.0			Jan to Dec		
Yr 4	23.0	4.5		May to Dec	Jan to Apr	
Yr 5	30.0	15.0		Jan to Apr	May to Dec	
Yr 6		26.0	4.5		Jun to Dec	Jan to May
Yr 7		30.0	15.0		Jan to Feb	Mar to Dec
Yr 8			28.0			Jan to Sep
*Tailings produced during commissioning in the last quarter of Year -1 (construction phase)						

5.6 Tailings Freeze-back

Based on ground temperatures and climate data for the Project site, it is anticipated that the TSF will freeze back in the long term. In order to promote freeze-back of the TSF, the following tailings placement strategies will be adopted during mine operation, when feasible and practical:

- During the initial year of placing tailings in a cell, limit the maximum yearly thickness of the tailings placed to 4.5 m;
- In the subsequent years, limit the total yearly thickness of the tailings placed in a cell to be no greater than 13 m.
- When feasible, place the initial tailings over the original ground during the winter period; and
- When feasible, use up to two operating cells in a given year to alternate tailings placement to promote the in situ freezing of the stacked tailings.

Preliminary thermal analyses were conducted to estimate the thermal conditions of the tailings and foundations during the TSF operation and after closure. The detailed information of the thermal analysis is described in the report of Tetra Tech EBA (2014b).

5.7 Anticipated Design Performance of TSF

The TSF is designed to minimize the impact to the environment and the design does not rely on freeze-back of the tailings to meet the design intent of the structure. However, the freeze-back of the TSF

and the foundations will provide additional benefits such as increasing stability and minimizing seepage from the TSF during operation and closure of TSF.

The stability analysis of the TSF indicates that the calculated minimum factors of safety meet or exceed the acceptable factors of safety. The information of the stability analysis is described in the Tetra Tech EBA (2014b) report.

SECTION 6 • WATER MANAGEMENT ASSOCIATED WITH MINE WASTE MANAGEMENT

6.1 Water Management

The water management objectives for the Project are to minimize potential impacts to the quantity and quality of surface water at the site. This is further detailed in the Water Management Plan provided with the Annual Report 2017. Seepage and runoff water from the WRSFs, TSF, and temporary overburden stockpile will be managed by water diversion channels, water retention dikes/berms, and water collection ponds. If the water quality does not meet the discharge criteria, the contact water in the water collection ponds will be treated by the WTP prior to being discharged to the outside environment. No water will be discharged without authorization.

6.1.1 Water Management Associated with WRSFs

As shown in Figure 5.1, WRSF1 will straddle three catchment areas (catchment of Pond H17, catchment of Pond A54, and catchment of Lake B7), WRSF2 will straddle two catchment areas (catchment of Pond H17 and catchment of Pond A54), and WRSF3 will be located within the basin of Pond H20.

Seepage and runoff from the WRSFs during construction and operation phases will be managed using the water management system described below:

- Seepage and runoff from WRSF1 within the catchment of Pond H17 will be diverted to CP1 via Channels 1, 7 and 8;
- Seepage and runoff from WRSF1 within the catchment of Pond A54 will be diverted to CP5 via Channels 5 and 6;
- Seepage and runoff from WRSF1 within the catchment of Lake B7 will be diverted and collected in CP4 via Channel 4;
- Seepage water and runoff from WRSF2 within the catchment of Pond H17 will be diverted to CP1 via Channel1 and Channel7 or directly flow into CP1;
- Seepage water and runoff from WRSF2 within the catchment of Pond A54 will be diverted to CP5 via Channel 6;
- Seepage and runoff from WRSF3 will directly report to CP6; and
- The water collected in CP4, CP5, and CP6 will be pumped to CP1, where the contact water will be treated by the WTP prior to discharging to outside environment.

The WRSFs water management infrastructure will remain in place until mine closure activities are completed and monitoring results demonstrate that the contact water quality from the WRSFs meets discharge criteria. Once the water quality from the WRSFs meets the discharge criteria, the water retention dikes/berms will be breached to allow the water from the WRSFs to directly flow to the

outside environment. Further details on water management for the WRSFs are described in the Water Management Plan.

6.1.2 P Area Containment Ponds

Late in the winter/early spring of 2016, Agnico Eagle initiated a series of corrective actions as a result of the water quality issues associated with the Portal No.1 area. The result was additional water management controls, such as monitoring, improved explosives management, the design/construction of a more robust series of containment ponds around the area of Portal No.1, and a review of chloride management practices.

The immediate focus was to increase the storage capacity at original Containment Pond P1 to accommodate the 2016 spring freshet and minimize seepage towards CP5 (former A54).

To obtain the required minimum temporary storage capacity for management of underground mine inflows and WRTP runoff, the original Containment Pond P1 basin was divided in two ponds [a "new" P1-Containment Pond (P1) and P2-Containment Pond (P2); a third [P3-Containment Pond (P3)] was also added to the area.

The three newly constructed containment ponds are collectively known as the P-Area Containment Ponds (P-Area). The total storage capacity of the P-Area ponds is 46,041 m^3. P1 is located at the northern area of the existing containment. P2 is located at the southern area of the original containment area footprint. P3 was constructed east of the existing south access road, with the primary purpose of collecting seepage originating from the P2 confining berm and its abutments. A pumping station was installed to collect and pump any collected water from P3 to P1.

To accommodate these modifications, four (4) emergency water containment berms DP1-A, DP1-B, DP2-A, and DP3-A, with three evaporators (on DP1-B) were constructed during the spring of 2016 to provide the required containment and mitigate the water quality issues in the nearby lakes.

Increased water monitoring protocols for the P-Area, over and above that required by the water license, were also implemented. More details on the P Area are available in the Water Management Plan.

6.1.3 Water Management Associated with TSF

The TSF is located within the catchment of Lake B7 with a small portion straddling the water catchment of Pond H17 as shown in Figure 4.1. Water sources from the TSF during construction and operation will be managed as follows:

- Seepage and runoff from the TSF within the catchment of Pond H17 will be diverted to the CP1 using Channel 1;
- The seepage and runoff from the TSF within the catchment of Lake B7 will be diverted and collected and monitored for water quality in CP3 via Channel 3; and
- The water collected in CP3 will be pumped to CP1, where the contact water will be treated by the WTP prior to discharging to outside environment.

The TSF water management infrastructure will remain in place until mine closure activities are completed and monitoring results demonstrate that the contact water quality from the TSF meets discharge criteria. Once the water quality from the TSF meets the discharge criteria, the water retention dikes/berms will be breached to allow the water from the TSF to directly flow to the outside environment. Further details on water management for the TSF are described in the Water Management Plan.

SECTION 7 • DUST MANAGEMENT ASSOCIATED WITH MINE WASTE MANAGEMENT

The possible sources of dust related to the waste rock, overburden, and dry stacked tailings management during construction, operation, and closure include:

- Site preparation prior to placement of waste rock, overburden or dry stacked tailings i.e., stripping, excavation and/or placement of foundation pad;
- Wind erosion of fine particles from the WRSFs and TSF surface;
- Vehicle traffic dislodging fine particles from the surface of WRSFs and TSF, and associated service and haul roads to WRSFs and TSF;
- Waste rock, overburden, and dry stack tailings handling and transfer - loading, hauling, unloading, placement and compaction; and
- Placement of closure and capping layers.

Dust suppression measures, which are considered to be typical of the current mine practices (i.e. Meadowbank Mine) and consistent with best management practices, will be considered through design, operation and closure phases to control the dust.

Minimal site preparation is required for the WRSFs and the TSF during the construction phase. Therefore, dust is not expected to be problematic.

Dust is expected to be a minor issue during the operation of the WRSFs as the waste rock produced at the Project site will generally comprise large pieces of rock that will not be susceptible to wind erosion. The overburden contains material that is fine-grained and thus more susceptible to wind erosion. The plan is to store the majority of the overburden materials within the core of the WRSFs. Therefore, dust from the overburden materials is not expected to be an issue. However, should dusting become an issue, dust control measures such as spraying water and/or other approved chemical dust suppressants will be used as necessary.

Dry stacked tailings will be placed in lifts and spread with a dozer and then compacted. The surface compaction of the lifts will significantly reduce the potential for wind erosion of the tailings surface. Dust related to TSF operation during the winter season will be further managed by limiting the exposed surface area of the tailings. In the summer period, dust from the TSF will be controlled by spraying water and/or other approved chemical dust suppressants if problematic. Other control measures considered in the design of TSF to minimize dust generation include:

- Place the waste rock cover over the final perimeter tailings slope surface as soon as possible;
- TSF will be operated by cells to limit the tailings surface area exposed to wind and facilitate progressive closure;
- Tailings surface will be covered progressively once it reaches the design elevation; and
- Flat sideslope of 4(H):1(V) for the TSF was adopted to minimize the erosion potential and maintain overall stability of the tailings stack.

Dust generated from vehicles travelling on the surface of the WRSFs, TSF, and associated access roads will be controlled principally by spraying water on the traffic area, which will be carried out regularly by mine services during dry periods in the summer. Watering the haul and access roads is only possible when temperatures are above freezing. When the temperature is below freezing, dust suppression using water or chemical will pose a safety hazard for travel; therefore, reducing the speed limit will be the principal way of controlling dust during these periods. More details on the dust management for traffic are described in the Roads Management Plan.

Other control measures considered in design and operation related to dust generation by vehicles travelling include:

- Road will be designed as narrow and short as possible while maintaining safe construction and operation practices;
- Coarse size rock will be used as much as possible for road construction;
- Roads will be regularly graded to mix the fines found on the road surface with coarser material located deeper in the roadbed; and
- As required, roads and travel areas will be topped with additional aggregate.

Dust from material handling is not expected to be problematic on site. Long end dumps which can generate significant amounts of dust will not occur at site, since waste rock, overburden and dry stack tailings will be dumped in lifts and spread with a dozer. Where possible, multiple handlings of materials that have the potential to generate dust will be avoided. However, should dust related to material handling occur on site, specific control measures will be evaluated and applied, as required.

At closure, the TSF will be fully covered to prevent further wind erosion of the tailings. The proposed closure cover includes a layer of 0.5 m thick of overburden followed by a layer of 2.5 m thick waste rock on the top of the facility. The TSF slopes closure cover includes a 3.7 m to 4.2 m thick waste rock layer only. The overburden will be surrounded by waste rock in the WRSFs; therefore, dusting is not expected to be an issue. The need for dust control at closure will be further evaluated during closure activities.

SECTION 8 • RECLAMATION AND CLOSURE OF THE WRSFs AND TSF

Progressive reclamation includes closure activities that take place prior to permanent closure in areas or at facilities that are no longer actively required for current or future mining operations. Reclamation activities can be done during operations with the available equipment and resources to reduce future reclamation costs, minimize the duration of environmental exposure, and enhance environmental protection. Progressive reclamation may shorten the time for achieving reclamation objectives and may provide valuable experience on the effectiveness of certain measures that might be implemented during permanent closure. The WRSFs and TSF will be operated to facilitate progressive reclamation as discussed in the above sections. Detailed mine closure and reclamation activities are provided in the Preliminary Closure and Reclamation Plan.

Monitoring will be carried out during all stages of the mine life to demonstrate geotechnical stability and the safe environmental performance of the facilities (Section 9). If any non-compliant conditions are identified, then maintenance and planning for corrective measures will be completed in a timely manner to ensure successful completion of the Mine Closure and Reclamation Plan.

8.1 Closure and Reclamation of WRSFs

Mine closure and the reclamation of the WRSFs will use currently accepted management practices and appropriate mine closure techniques that will comply with accepted protocols and standards.

Geochemical testing indicates that the waste rock and overburden from the Project is non-potentially acid generating (NPAG) and non- ML. Kinetic tests completed on all waste rock types and at various scales show that drainage water quality is expected to meet MMER monthly mean effluent limits, including results for arsenic. Therefore, a closure cover system is not proposed for the WRSFs. The Water Management Plan provides the water quality site predictions.

The WRSFs were designed for long-term stability and no additional re-grading will be required at closure. It is anticipated that the native lichen community will naturally re-vegetate the surface of the WRSFs over time.

The contact water management system for the WRSFs and TSF will remain in place until mine closure activities are completed and monitoring results demonstrate that water quality conditions from the WRSFs are acceptable for the discharge of all contact water to the environment with no further treatment required. Once water quality meets the discharge criteria established through the water licensing process, diversion channels/berms/dikes will be decommissioned to allow the surface runoff and seepage water from the WRSFs to naturally flow to the outside environment.

8.2 Closure and Reclamation of the TSF

Mine closure and reclamation of the TSF will utilize currently accepted management practices and appropriate mine closure techniques that will comply with accepted protocols and standards.

Results of geochemical characterization indicates that the tailings produced at the Project are NPAG and ML is not predicted to be an issue as there will be limited seepage from the tailings porewater at closure. The closure plan for the TSF is to progressively place an engineered cover over the tailings surface. The proposed closure cover includes a 0.5 m thick layer of overburden followed by a 2.5 m thick layer of waste rock on the top of the facility. The TSF slopes closure cover includes a 3.7 m to 4.2 m thick waste rock layer only. The overburden material is intended to limit runoff water infiltration into the tailings. This closure cover concept will be further evaluated during the final detailed design stage. It is anticipated that the native lichen community will naturally re-vegetate the TSF cover over time.

The contact water management system for the TSF will remain in place until mine closure activities are completed and monitoring results demonstrate that water quality conditions from the TSF are acceptable for the discharge of all contact water to the environment with no further treatment required. Once the water quality meets the discharge criteria established through the water licensing process, the TSF water management infrastructure will be decommissioned to allow the water to naturally flow to the outside environment.

SECTION 9 • MONITORING PROGRAM

This section presents a summary of the monitoring programs that will be carried out during construction and operation related to mine waste storage management. The monitoring program presented here includes; stability and deformation, ground temperature, and annual inspections. The detailed information on monitoring of runoff and seepage from the WRSFs and the TSF is described in the Water Management Plan. There are two types of monitoring related to mine waste management. Verification monitoring is carried out for operational and management purposes by Agnico Eagle. This type of monitoring provides data for decision making and builds confidence in the success of processes being used, with no obligation to report. General monitoring is commonly included in a water licence specifying what is to be monitored according to a schedule. It covers all types of monitoring (e.g., geotechnical). This monitoring is subject to compliance assessment to confirm sampling was carried out using established protocols, included quality assurance/quality control provisions, and addresses identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

9.1 Monitoring Activities for WRSFs

Table 9.1 summarizes the monitoring activities for each WRSF. Each monitoring activity will be further defined, including location and type of instrumentation, prior to construction of each WRSF, according to the approved environmental protocols.

Table 9.1: Waste Rock Storage Facilities Monitoring Activities

Monitoring Component		Monitoring Frequency	Reporting
Verification Monitoring	Quantities of waste rock produced	Monthly	Monitoring data will be used by Agnico Eagle internally.
	Routine visual inspections of WRSFs	Daily during active rock placement, Monthly to semi-annually after placement	
	Elevation and geometry survey	Annually	
	Waste rock and overburden sampling	To be determined	
	Seepage collection and monitoring	Monthly over the open water season	
General Monitoring	Quantities of waste rock placed into facilities	Monthly	Monitoring data will be reported to the Regulators in the annual water licence report or annual inspection report
	Geochemical monitoring	Eight samples per 100,000 tonnes of mined material	
	Thermal and freeze-back monitoring	Quarterly	
	Dust monitoring related to WRSFs	Governed by Air Quality Monitoring Plan	
	Geotechnical inspection by qualified Geotechnical Engineer	Annually or more frequent at the request of an Inspector	

9.1.1 Verification Monitoring Program for WRSF

Verification monitoring data will be used by Agnico Eagle for the management of waste rock and overburden. The following verification monitoring data will be collected, compiled, and managed internally:

- The WRSFs were designed to store approximately 25.3 Mt of waste rock and 7.1 Mt of overburden material during mine operation. Monthly quantities of the waste rock and overburden produced during mine operation will be recorded.
- During the active development of each WRSF, site staff will carry out daily visual inspections in relation to the performance and condition of each structure. When placement activity ceases on an interim or seasonal basis, the inspection frequency will shift to monthly. Following the completion of a WRSF, inspections will continue on a semi-annual basis until closure. The purpose of these inspections is to identify and document any potential hazards or risks to the facility, such as deformations, unusual seepage, slumping, local failure, etc.
- The heights of the WRSFs are estimated to be approximately 35 to 40 m. During operation an annual elevation survey of the WRSFs will be performed to estimate the overall volume placed, determine the reclamation progress, and provide input information to the operation plan.
- Surface runoff and seepage from the WRSFs will be monitored during the construction and operation phases by visual inspection during the ice free season. Additional inspections will be carried out after the extreme rainfall event (1 in 100 wet year 24 hours rainfall event). The detailed information on the monitoring of surface runoff and seepage from the WRSFs is described in the Water Management Plan.

9.1.2 General Monitoring Program for WRSF

The following general monitoring data will be reported to the NWB through either the Water Licence Annual Report or an Annual Inspection Report:

- Monthly quantities of the waste rock and overburden placed into the WRSFs during mine operation.
- Waste rock samples will be taken from the production blast holes and analyzed the percentage of sulphur and carbon. The results from these analyses will be used to differentiate NPAG and PAG based on the derived NPR. To validate the classification method of NPAG/PAG based on NPR, additional samples will be taken evenly at a rate of one sample per 100,000 tonnes of mined material. The collected samples will be sent to an accredited commercial laboratory for ARD and ML using the ABA (the modified Sobek method) and SFE analyses.
- The placed waste rock and overburden are expected to freeze back and permafrost is likely to develop within the WRSFs with time. Thermistors will be installed in each WRSF to monitor the rate of freeze-back and permafrost development progress in the facilities during closure.

Temperature readings will be taken quarterly to track permafrost development within the WRSFs.

- Dust related to waste rock and overburden management is not expected to be an issue by employing the dust suppression measures presented in Section 7.0 through design, operation, and closure phases. Air quality at the mine site will be monitored during construction, operation, and closure through air quality monitoring stations and reported annually.
- The performance of the WRSFs will be inspected and assessed during the annual geotechnical site inspection by a geotechnical or civil engineer registered in Nunavut. The visual assessment and recommended actions to be taken related to the WRSFs will be summarized in the Annual Inspection Report. Inspections may occur more frequently at the request of the Inspector. Records of all inspections will be maintained for the review of the Inspector upon request.

The results from the general monitoring program related to waste rock and overburden management will be reported to the Regulators in the annual water license report or in the annual geotechnical inspection report.

9.2 Monitoring Activities for the TSF

Table 9.2 summarizes the monitoring activities for the TSF. Each monitoring activity will be further defined, including location and type of instrumentation prior to construction, according to the approved environmental protocols.

Table 9.2: Tailings Storage Facility Monitoring Activities

Proposed Monitoring	Monitoring Component	Monitoring Frequency	Reporting
Verification Monitoring	Tailings production rate and solid content	Continuous	Monitoring data will be used by Agnico Eagle internally, and will be reported to the Regulators upon request
	In situ density testing and moisture content determination of recently placed tailings	Weekly	
	Routine visual inspections of TSF	Daily to weekly when water is being actively managed	
	Elevation and geometry survey	Annually	
	Runoff and seepage collection and monitoring	Monthly over the open water season or when water is present	
General Monitoring	Quantities of tailings placed into facilities	Monthly	Monitoring data will be reported to the Regulators in annual water licence report or annual inspection report
	Thermal and freeze-back monitoring	Quarterly	
	Dust monitoring related to TSF	Governed by Air Quality Monitoring Plan	
	Geotechnical inspection by qualified Geotechnical Engineer	Annually or more frequent at the request of an Inspector	

9.2.1 Verification Monitoring Program for TSF

A summary of the verification monitoring program for the TSF is presented below.

- The tailings production rate at the mill and solid content will be continuously monitored during mine operation.
- In situ density testing and moisture content of placed tailings will be carried out weekly to ensure that dry density of placed tailings meets the design criteria.
- During the active development of the TSF, the procedures and protocols for routine and annual inspections of the WRSFs will also apply, consistent with the inspection of the TSF.
- The heights of the TSF are estimated to be approximately 28 to 30 m. An annual elevation survey of the TSF will be performed to estimate the overall volume placed, determine the reclamation progress, and provide input information to the operation plan.
- The runoff and seepage monitoring procedures and protocols for the WRSFs during mine operation will also apply to the TSF.

9.2.2 General Monitoring Program for TSF

A summary of the general monitoring program for the TSF is presented below.

- The monthly quantities of tailings placed into the TSF will be recorded.
- Thermistor cables will be installed in the TSF to monitor the permafrost development within the facility during closure. The temperature readings will be taken quarterly (i.e. 4 times per year) to monitor permafrost development. The monitoring schedule will be reviewed and modified as necessary. The measured temperatures within the TSF will provide the background information for the study of permafrost development.
- Dust related to tailings management is not expected to be an issue by employing the dust suppression measures presented in Section 7 through design, operation, and closure phases. Air quality at the mine site will be monitored during construction, operation, and closure through air quality monitoring stations.
- The performance of the TSF will be inspected and assessed during the annual geotechnical site inspection by a geotechnical or civil engineer registered in Nunavut. The visual assessment and recommended actions to be taken related to the TSF will be summarized in the annual inspection report. Inspections may occur more frequently at the request of the Inspector. Records of all inspections will be maintained for the review of the Inspector upon request.

The results from general monitoring program related to tailings management will be reported to the Regulators in the Annual Water License Report or in the Annual Geotechnical Inspection Report.

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APPENDIX A • FIGURES

Figure 1.1 General Mine Site Location Plan

Figure 1.2 General Site Layout Plan (Year 7 Operation)

Figure 2.1 Permafrost Map of Canada

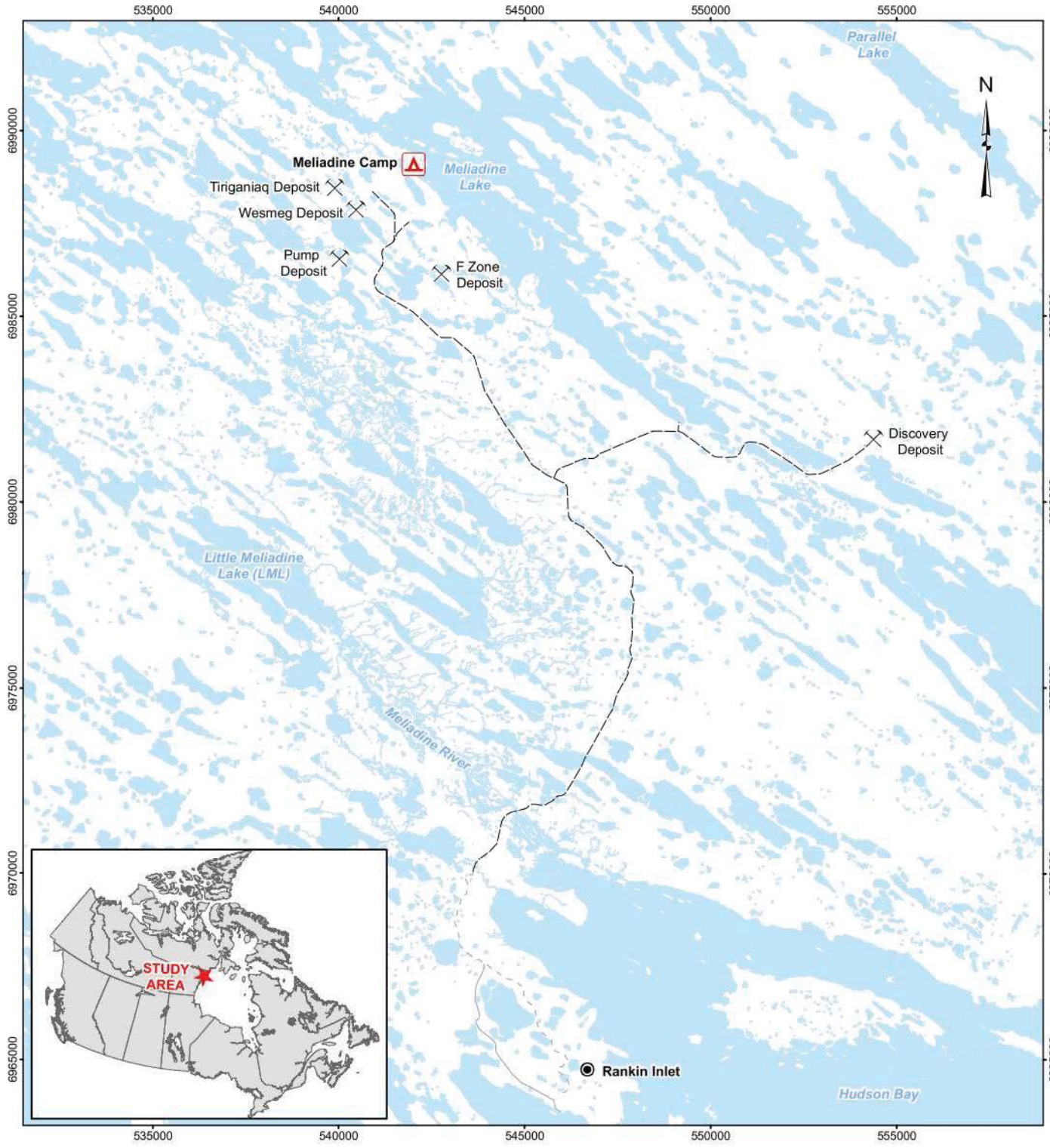
Figure 3.1 Mine Waste Management Flow Diagram

Figure 3.2 Locations and Footprints of Waste Rock Storage Facilities and TSF

Figure 4.1 Watershed and Waterbodies Affected By Site Infrastructure

Figure 5.1 Tailings Placement Plan in Cells

Figure 5.2 Typical Design Cross-Section for TSF



LEGEND

- Camp
- Proposed Mine Site
- All-weather Access Road (AWAR)
- Road - New
- Road - Existing
- Watercourse
- Waterbody

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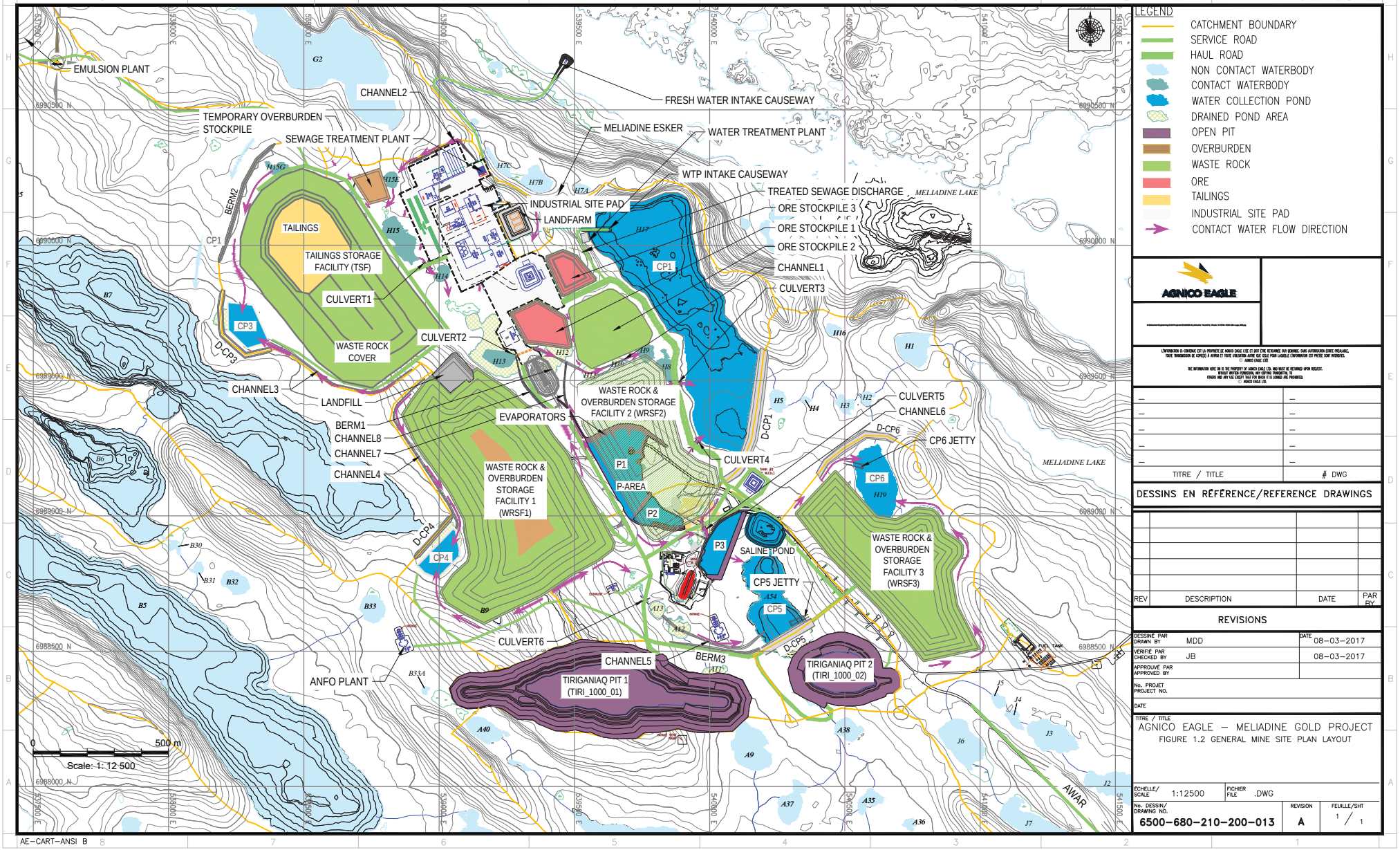
FIGURE 1.1 GENERAL PROJECT LOCATION PLAN

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LEGEND

- CATCHMENT BOUNDARY
- SERVICE ROAD
- HAUL ROAD
- NON CONTACT WATERBODY
- CONTACT WATERBODY
- WATER COLLECTION POND
- DRAINED POND AREA
- OPEN PIT
- OVERBURDEN
- WASTE ROCK
- ORE
- TAILINGS
- INDUSTRIAL SITE PAD
- CONTACT WATER FLOW DIRECTION

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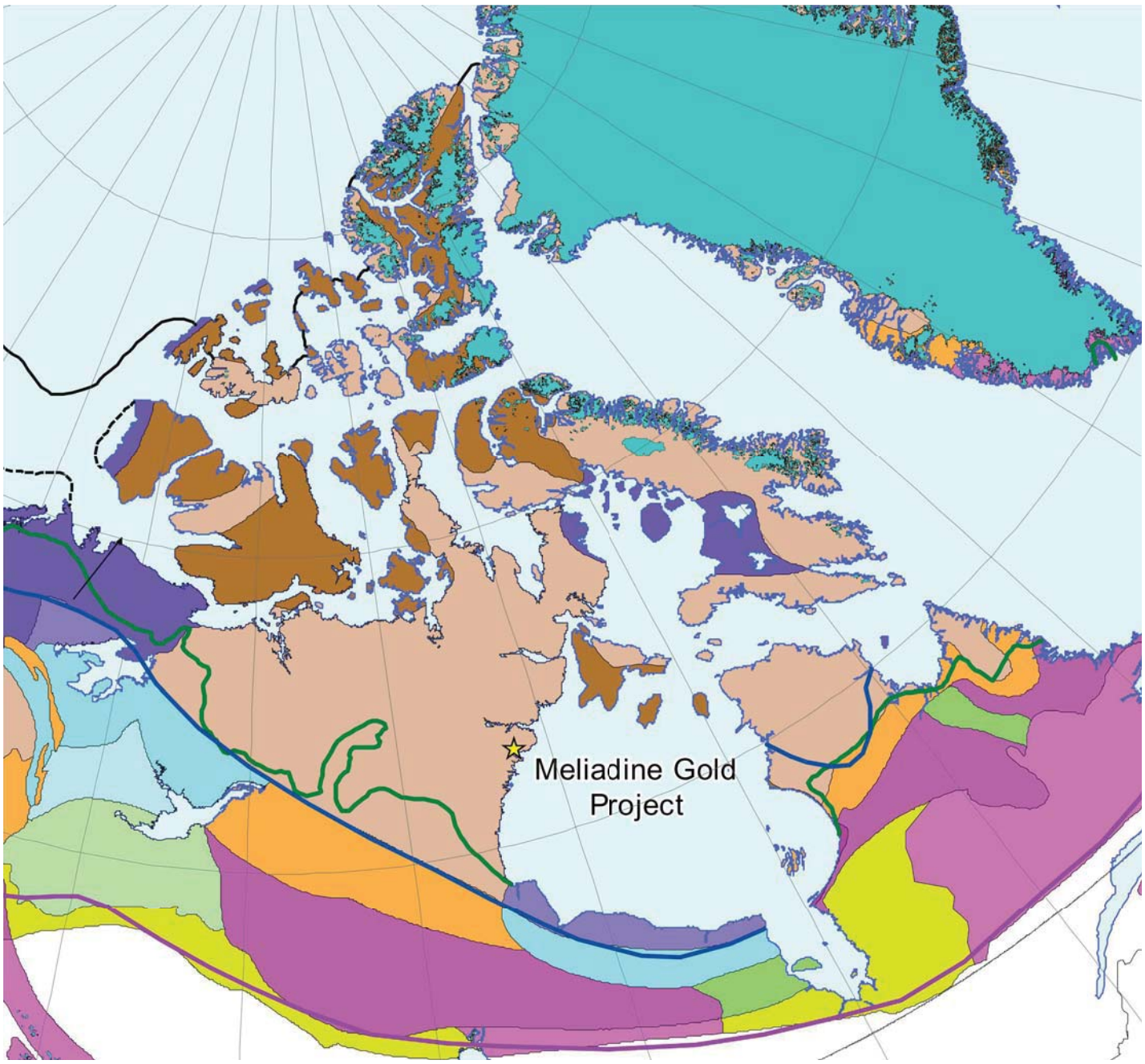
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FIGURE 1.2 GENERAL MINE SITE PLAN LAYOUT

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Legend for EASE-Grid Permafrost and Ground Ice Map

Permafrost Extent (percent of area)	Ground Ice Content (visible ice in the upper 10-20 m of the ground; percent by volume)				
	Lowlands, highlands, and intra- and intermontane depressions characterized by thick overburden cover (>5-10m)			Mountains, highlands, ridges, and plateaus characterized by thin overburden cover (<5-10 m) and exposed bedrock)	
	High (> 20%)	Medium (10-20%)	Low (0-10%)	High to medium (>10%)	Low (0-10%)
Continuous (90-100%)	Ch	Cm	Cl	Ch	Cl
Discontinuous (50-90%)	Dh	Dm	Dl	Dh	Dl
Sporadic (10-50%)	Sh	Sm	Sl	Sh	Sl
Isolated Patches (0-10%)	Ih	Im	Il	Ih	Il

Variations in the extent of permafrost are shown by the different colors; variations in the amount of ground ice are shown by the different intensities of color. Letter codes assist in determining to which basic permafrost and ground ice class any particular unit belongs. Letter codes are defined in the documentation that accompanies the data files.

Ice caps and glaciers

LEGEND

- MELIADINE GOLD PROJECT
- SOUTHERN BOUNDARY OF CONTINUOUS PERMAFROST - PRESENT
- SOUTHERN BOUNDARY OF DISCONTINUOUS PERMAFROST - PRESENT
- TREELINE
- SEA-ICE EDGE LIMIT
- SUBSEA PERMAFROST LIMIT

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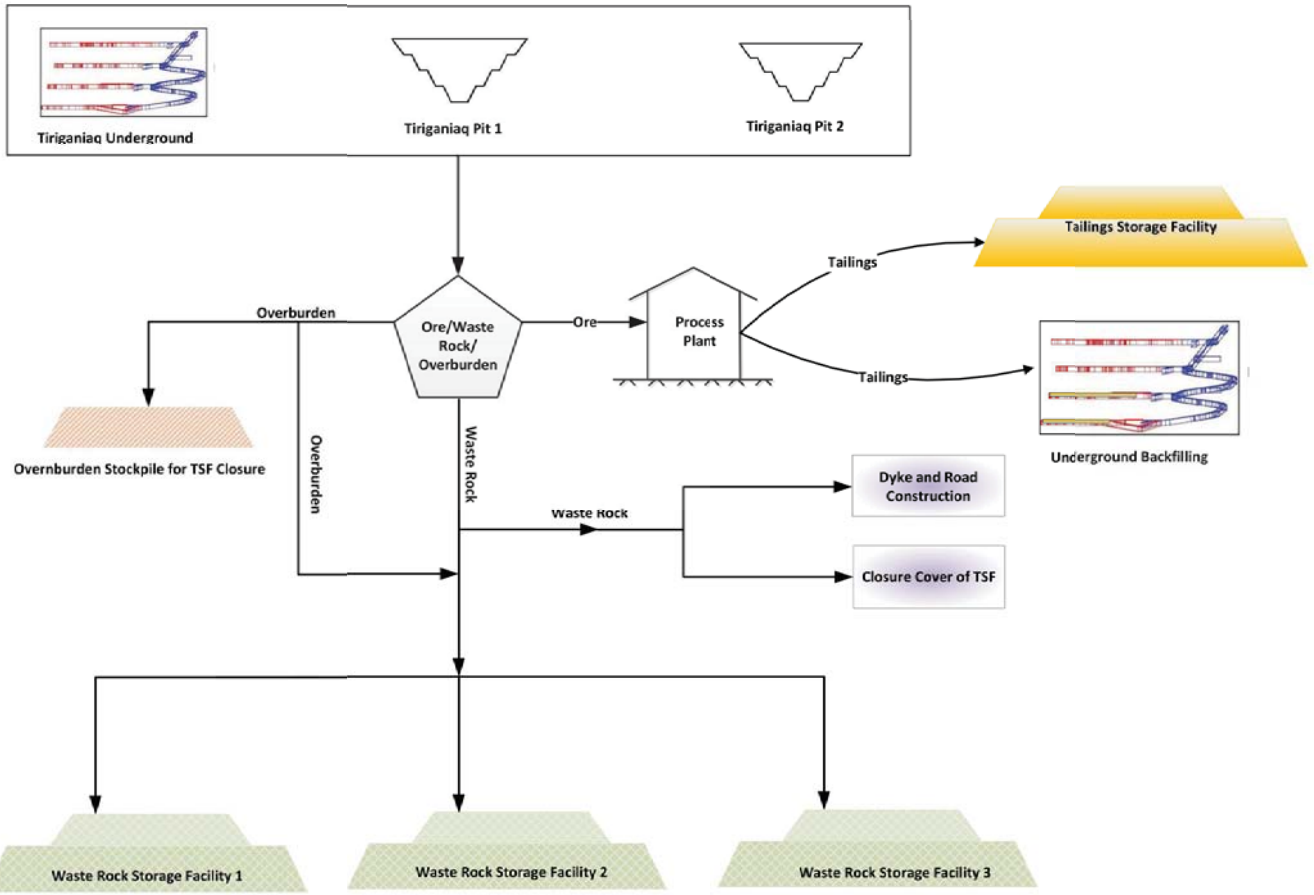
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FIGURE 2.1 PERMAFROST MAP OF CANADA

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AGNICO EAGLE – MELIADINE GOLD PROJECT
FIGURE 3.1 MINE WASTE MANAGEMENT FLOW DIAGRAM

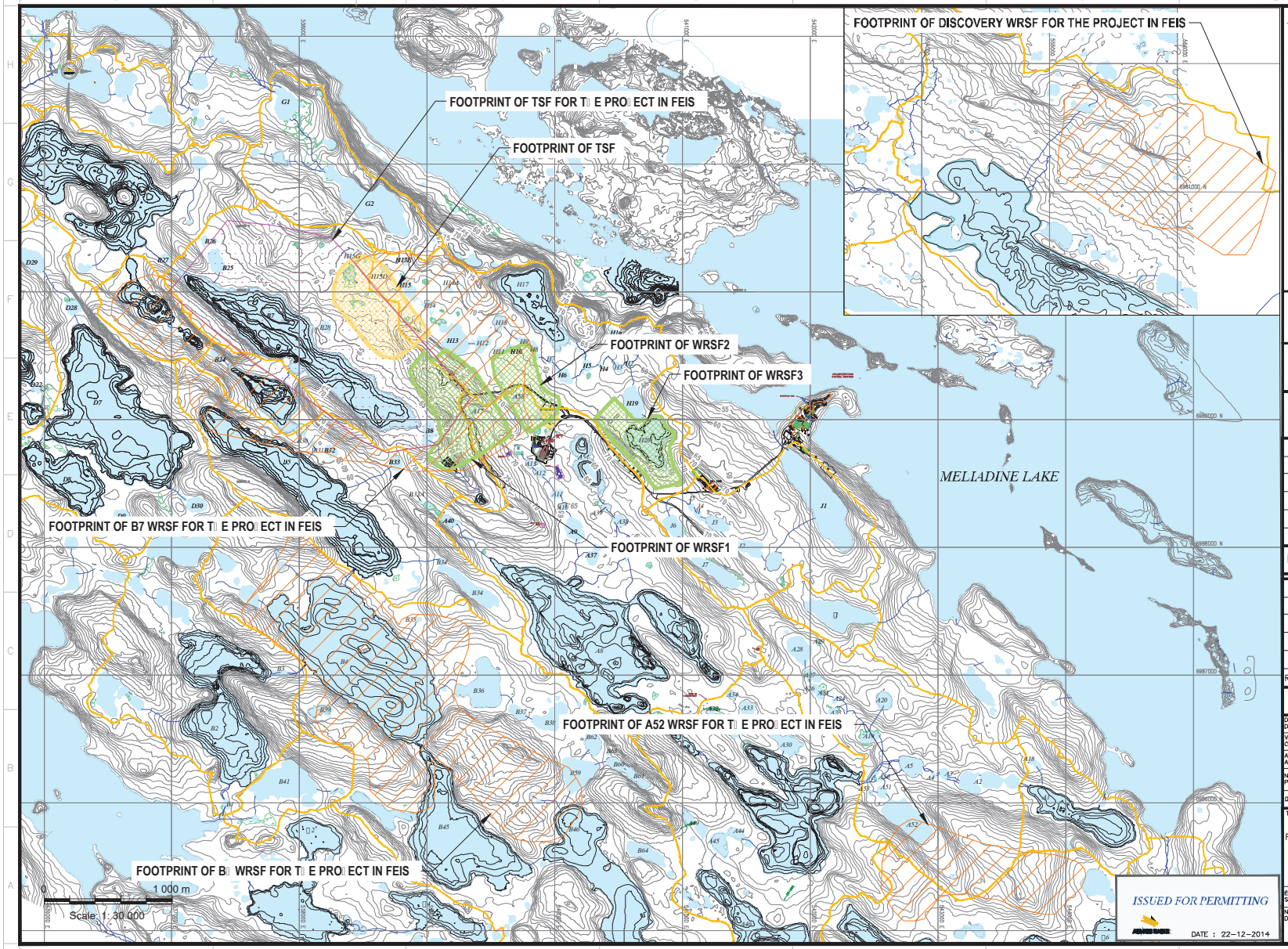
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LEGEND

CATCHMENT BOUNDARY
WATERBODY

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AGNICO EAGLE – MELIADINE GOLD PROJECT

FIGURE 3.2 LOCATIONS AND FOOTPRINTS OF WASTE ROCK STORAGE FACILITES AND TAILINGS STORAGE FACILITY

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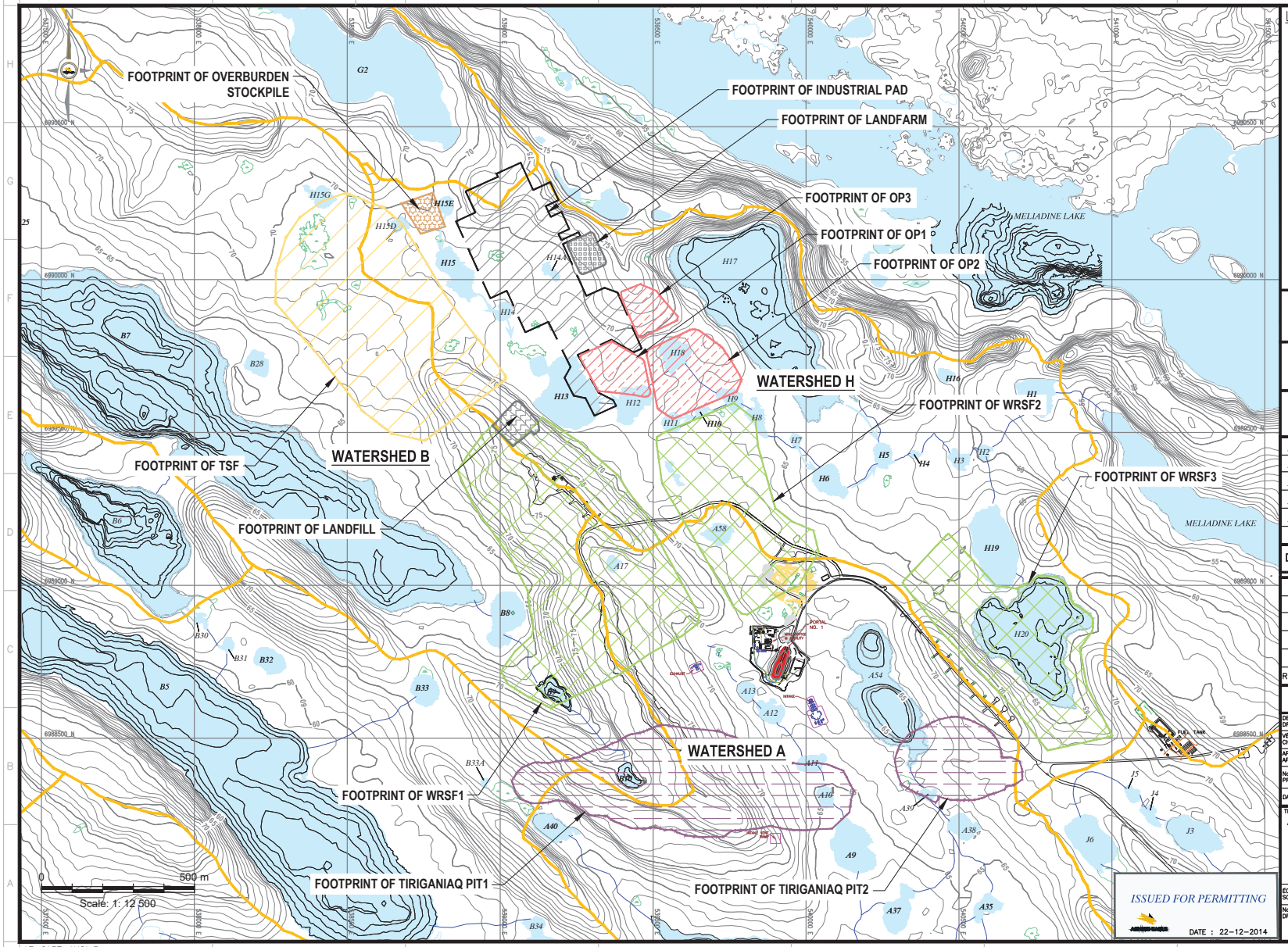
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Q:\Edmonton\Engineering\E141\Projects\E14103209_Meladine_Mgmt_Plans\EBA Drawings\Mine Waste MP\CAD_Feb_2015\FIGURE 3.2.dwg–September 5, 2014

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LEGEND

CATCHMENT BOUNDARY

NON CONTACT WATERBODY

AGNICO EAGLE

TETRA TECH EBA

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AGNICO EAGLE – MELIADINE GOLD PROJECT

FIGURE 4.1 WATERSHED AND WATERBODIES AFFECTED BY SITE INFRASTRUCTURE

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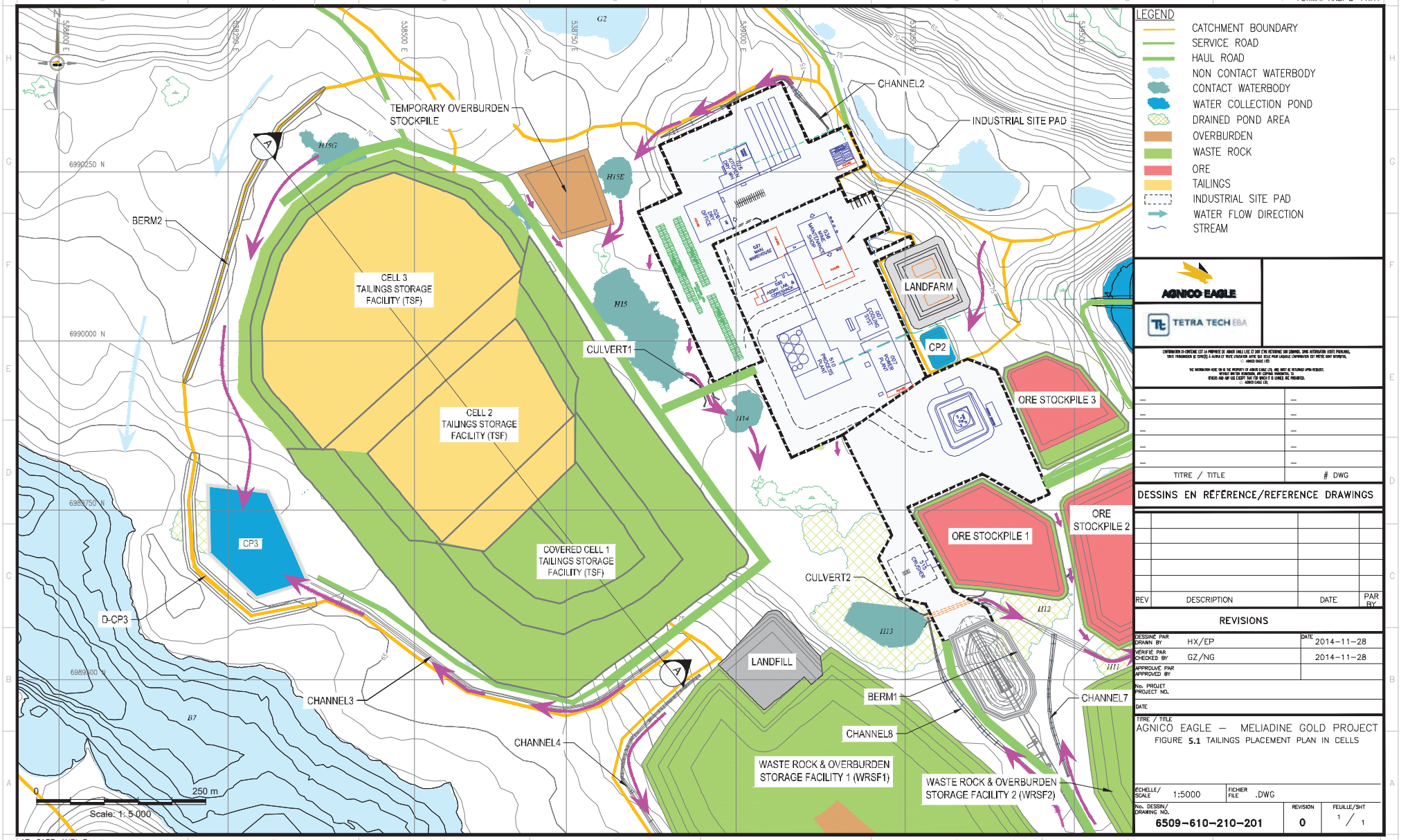
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Q:\Edmonton\Engineering\E141\Projects\E14103209_Meladine_Mgmt_Plans\EBA Drawings\Mine Waste MP\CAD_Feb_2015\FIGURE 5.1.dwg–September 5, 2014

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LEGEND

- CATCHMENT BOUNDARY
- SERVICE ROAD
- HAUL ROAD
- NON CONTACT WATERBODY
- CONTACT WATERBODY
- WATER COLLECTION POND
- DRAINED POND AREA
- OVERBURDEN
- WASTE ROCK
- ORE
- TAILINGS
- INDUSTRIAL SITE PAD
- WATER FLOW DIRECTION
- STREAM

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AGNICO EAGLE – MELIADINE GOLD PROJECT

FIGURE 5.1 TAILINGS PLACEMENT PLAN IN CELLS

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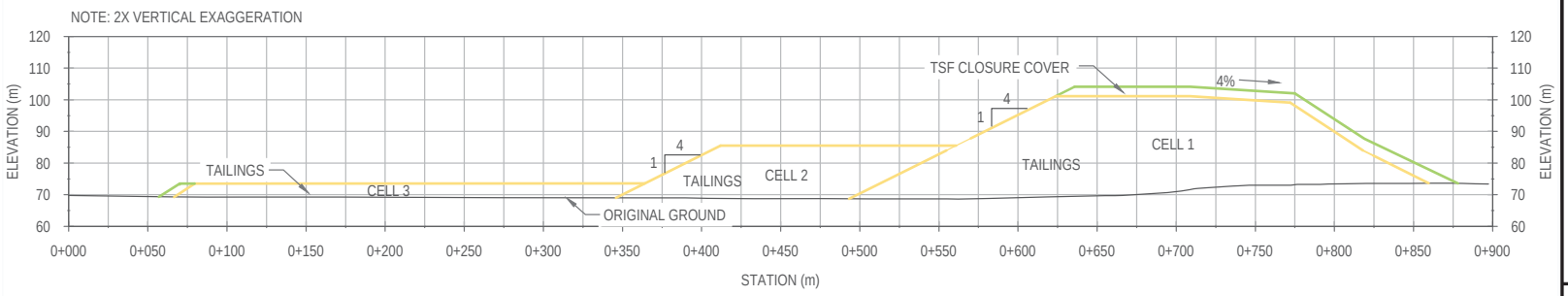
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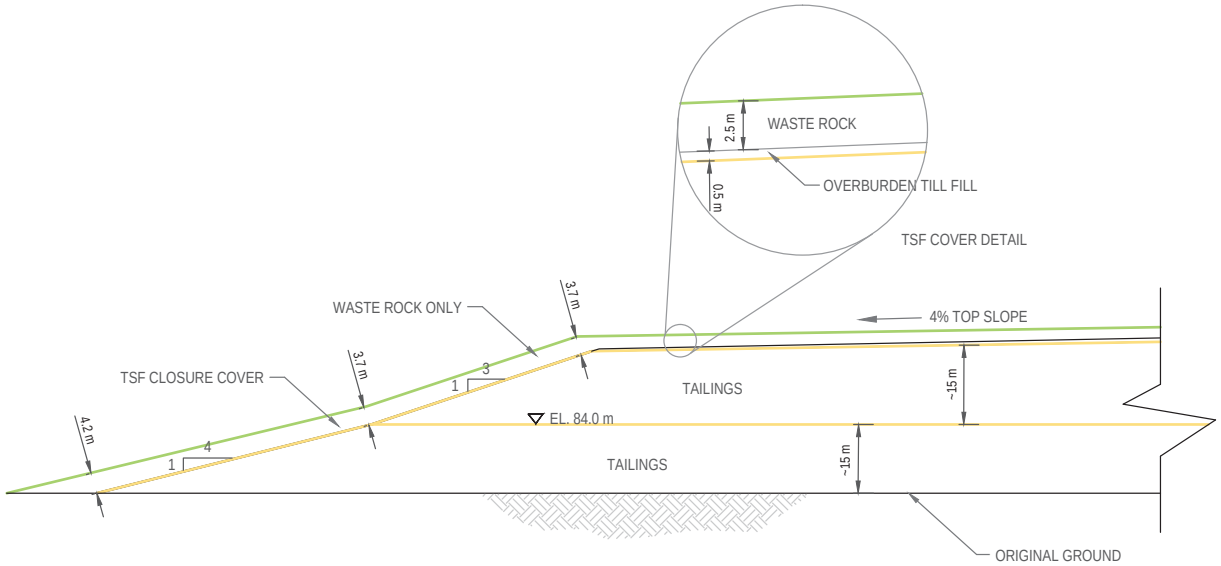
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NOTES:



SECTION A–A TSF DURING OPERATION (YEAR 6 SHOWN)



TYPICAL DESIGN SECTION FOR TSF

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FIGURE **5.2** TYPICAL DESIGN CROSS SECTION FOR TSF

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AGNICO EAGLE

MELIADINE GOLD PROJECT

Quality Assurance/Quality Control Plan

MARCH 2018
VERSION 2
6513-QQY-01

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AGNICO EAGLE

EXECUTIVE SUMMARY

This document presents the Meliadine Mine Quality Assurance / Quality Control (QA/QC) Plan. It summarizes the field sampling equipment, and methods, as well as laboratory and data requirements.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	April 2015			This is the first version of this Plan, developed for the Type A Water Licence Application	Golder Associates Ltd.
2	March 2018	All	All	-Updated revision date	Meliadine Environment Department
		2.1	3	-Changed Hanna multi-meter to Eureka Manta II	
		2.2.4	6	-Laboratory name change: MultiLab to H2Lab	
		Table A-2	Appendix 12	-Updated table of analytical parameters (removed Group listing)	
		Figure A-2		-Removed figure heading for site sampling location – no figure was included with the heading	
		Figure A-1	Appendix 16	-Added General Site Plan figure to existing heading	

ACRONYMS

AANDC	Aboriginal Affairs and Northern Development Canada
Agnico Eagle	Agnico Eagle Mines Limited
AEMP	Aquatic Effects Monitoring Program
Mine	Proposed Meliadine Gold Mine
MMER	Metal Mining Effluent Regulations
NWB	Nunavut Water Board
Project	Meliadine Gold Project
QA/QC	Quality Assurance and Quality Control
SNP	Surveillance Network Program

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres north from Rankin Inlet, and 80 kilometres southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson's Bay, the proposed Project site is located on a peninsula (the Peninsula) between the east, south, and west basins of Meliadine Lake (63°01'23.8"N, 92°13'6.42"W), on Inuit Owned Land.

This report presents the Quality Assurance/Quality Control (QA/QC) Plan for the Project. The Plan was prepared in accordance with the requirements of Type A Water Licence Application and the Supplementary Information Guidelines for Mining and Water Works, issued by Nunavut Water Board (NWB 2010a, b, c). It has been developed in accordance with the Aboriginal Affairs and Northern Development Canada (AANDC) 1996 '*Guidelines for Use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan*', which includes the following definitions:

- Quality Assurance: the system of activities designed to better ensure that quality control is done effectively; and
- Quality Control: the use of established procedures to achieve standards of measurement for the three principal components of quality – precision, accuracy and reliability.

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The proposed mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

A general location plan of the proposed Mine is shown in Figure A-1.

This Plan, which is part of the Environmental Management System for the proposed Mine, is divided into the following components:

- procedures for field sample collection (Section 2);
- external and internal laboratory requirements (Section 3); and
- data verification procedures and regulatory reporting requirements (Section 4).

The objective of the QA/QC program is to assure that the chemical data collected are representative of the material being sampled, are of known quality, are properly documented, and are scientifically defensible. Data quality is assured throughout the collection and analysis of samples using specified standardized procedures, by the employment of accredited laboratories, and by staffing the program with experienced technicians.

This QA/QC Plan sets out standard procedures for sample and data collection with respect to surface water and groundwater sampling in support of monitoring programs outlined in the Water Management Plan and the Aquatic Effects Monitoring Program (AEMP) Design Plan.

SECTION 2 • FIELD SAMPLING

Water quality monitoring will be initiated at the pre-development stage and will continue during construction, operations, and closure. Proposed sampling stations, frequency, and parameters are listed Appendix A, Table A-1. Table A-2 provides supporting definitions. The stations and their requirements may be adjusted based on the requirements of the Type A Water Licence and/or any updates to the Mine management plans over the life of the Mine. Proposed sampling stations are shown in Appendix A, Figure A-2.

There are three categories of aquatic monitoring at Meliadine:

- **Regulated discharge monitoring** occurs at monitoring points specified in licences or regulations. It includes discharge limits that must be achieved to maintain compliance with an authorization (i.e., water licence) or regulation (i.e., Metal Mining Effluent Regulations). Enforcement action may be taken if discharge limits are exceeded for a parameter.
- **Verification monitoring** is carried out for operational and management purposes by Agnico Eagle. This type of monitoring provides data for decision making and builds confidence in the success of processes being used. There is no obligation to report verification monitoring results, although some monitoring locations and these results can be mentioned in environmental management plans (i.e., sampling to verify soil remediation in the landfarm).
- **General monitoring** is commonly included in a water licence specifying what is to be monitored according to a schedule. It covers all types of monitoring (i.e., geotechnical, lake levels, etc.). This monitoring is subject to compliance assessment to confirm sampling was carried out using established protocols, included QA/QC provisions, and addresses identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the Water Board.

All sampling stations will be clearly identified; their GPS coordinates collected and stored. All sampling will be conducted by qualified personnel, at the same location, using the same techniques to reduce operational error. The following sections outline the standard procedures for collection and handling of all surface water and groundwater samples.

2.1 Sampling Equipment

New laboratory supplied containers will be used for sample collection. The bottles will be either polyethylene plastic or glass, dependent on the specific parameter being analyzed.

Equipment, such as the Analite NEP 160 Meter (turbidity), Oakton PCS35 Meter (pH and conductivity), and Eureka Manta II (pH, dissolved oxygen and conductivity) are handheld instruments that can be used to collect, as required, field parameters. The YSI 6-series MPS (multiprobe system) can also be used to measure parameters in field like pH, temperature, conductivity, dissolved oxygen, and

oxidation reduction potential data as required. The instruments are to be calibrated before each sample event to ensure optimal performance and record of the calibration will be kept in a log Calibration and maintenance procedures will be followed as set out by the supplier's operation manual. Equipment and bottles will be selected so that they do not contaminate or alter the concentrations of parameters of interest according to laboratory standards.

For groundwater sampling, and to collect water samples at depth from the surrounding lake receiving environments, a pump with tubing will be used. Low Density Polyethylene tubing, filter apparatus, manual or electric pump, and ashless filter paper will be used to filter water for specific analyses (e.g., dissolved metals, chlorophyll *a*) and/or for depth integrated sampling (e.g., chlorophyll *a*, phytoplankton, or biological oxygen demand).

2.2 Sampling Methods and Handling

2.2.1 Sampling Identification

All samples have a unique sample identification name based on a station identifier, date, and time of collection. For duplicates and field blanks, the sample identification will follow the naming convention *year* and *sampling number* by following the Environment QAQC table (e.g. 2018-0001)

All sample bottles will be identified with the sample identification and date of collection. This information will be marked on a label with a water resistant pen or using a label printer and affixed to the sample bottle. Additional information (time of sampling and parameters to analyze) will be included in the analysis request that will be sent to the accredited laboratory.

2.2.2 Surface Water Sampling

The bottles will be pre-labelled with the required sample identification before going to the field. Surface grab samples will be collected by submerging the sample bottle to half depth of the stream. For sumps, diversion ditches and piped discharge points, sample will be collected below the surface of the water.

Samples bottles will be provided by the accredited laboratory. They will be received pre-rinsed and pre-preserved or pre-rinsed with vials of preservative to be added in the field by qualified technicians in the case that bottles are not pre-preserved, bottles will be rinsed three times with sample water before filling. When the sampling bottle contains preservative, the bottle will be filled by using another clean bottle to avoid any release of preservative. Sometimes, a preservative is added after filling as directed by the laboratory; see Section 2.2.4 for more details on preservation. The bottles will be filled properly to allow mixing, preservative addition, and thermal expansion.

Samples analyzed for dissolved metals and chlorophyll *a* are filtered through ashless filter paper at the time of collection when the delay before analyses is long. However, when the delay before analyses is short, the accredited laboratory filters the sample before analyses. In some cases, when the analysis delay is long, the sample will be frozen to prevent parameter degradation.

2.2.3 Groundwater Sampling

Well Preparation for Sampling

At the time of purging and sampling, if necessary, any heat trace cables will be activated to warm the well pipe. The well is only purged once the well is thawed.

Well Purging

Purging is performed by inserting a ¾'' Low Density Polyethylene Waterra tube to approximately 20 metres below the water surface and using a compressor to completely dry the well. The wells are purged to remove standing water inside the well and to induce the flow of fresh groundwater from the rock formation. The quality of the purged water is monitored for pH, conductivity, temperature, water clarity, and colour (visual observation) during this activity. Sampling occurs after three well volumes of water (between the in-well packer and bottom of screened interval) have been removed or once the monitored parameters stabilize (values remaining within 10% for three consecutive readings).

Groundwater Sampling

Groundwater is sampled immediately after purging by lowering the intake of the Double Valve Pumping tubing to 3 to 5 metres above the screened interval.

A groundwater sample is collected in clean, laboratory-supplied containers as per the instructions in the previous section. Samples analyzed for dissolved metals are filtered through a 45 micrometer inline filter.

Samples are collected in duplicate (see Section 2.2.5) and submitted to an accredited analytical laboratory. Duplicate samples are collected.

Measurements of groundwater temperature, pH, electrical conductivity, and salinity are obtained in the field during the purging and sampling. Measurements are recorded for future reference and to check against laboratory data.

The following procedures are followed to provide data quality control on the samples:

- measuring field parameters at selected intervals until stable readings (within 10% of each other);
- minimizing the exposure of the sampled water to the atmosphere;
- using compressed, inert gas (nitrogen) to evacuate water for sample collection;
- measuring, in-situ, sensitive chemical parameters (pH, conductivity, where applicable); and
- abiding by sample preservation methods (refrigeration and use of preservatives where needed); and specified holding times.

Bottles are labelled with required information.

2.2.4 Preservation

Preservatives, if required, are added to sample bottles by the laboratory or added by the technician after filling, as directed by the analytical laboratory. Table A-3 summarizes the minimum sample volumes, preservation, and holding times for select parameters. This information was provided by the accredited laboratory H2Lab (formerly MultiLab) for the Meadowbank Mine; however, they are also applicable to the Project.

2.2.5 Field Duplicates and Blanks

One field duplicate, one filter blank, one field blank and one trip blank will be collected for a) every 10 samples (i.e., duplicate samples are taken for 10% of the samples); b) each sampling event; or c) once per year (Table A-4).

Field duplicates and filter blanks will be collected and handled in the same manner as the other samples in the field.

Field blanks are samples of distilled water handled concurrently and in the same manner as the other samples in the field.

Trip blanks are used to determine whether contamination (particularly VOC) has been introduced to aqueous samples through cross-contamination during shipment and storage of sample containers. Trip blanks are typically prepared by the lab and travel with the sample to the site and back to the lab without being opened.

The duplicate samples will be given sample identification numbers and included in the sample stream. The indication of the sample as a duplicate is maintained in the data records at site.

2.2.6 Sample Transport

All water samples will be stored upright in coolers with ice packs and preserved as specified by the laboratory. Samples are to be shipped to the external laboratory as soon as possible via Nolinor Charter flight and dedicated ground transportation to ensure arrival in a safe and timely manner. If the sample cannot be shipped the same day, they are to be stored in a refrigerator at 4°C until shipping.

A Chain of Custody form with the following information is completed for every shipment of samples:

- company name and sampler's name;
- sample identification name;
- time and date of sampling;
- presence and type of preservative and whether the sample was filtered or not;
- requested analytical parameters for each bottle;
- time and date of shipping; and

- analytical laboratory address and contact person.

One electronic or PDF copy will be sent by email to the laboratory; an electronic copy will be kept at the Mine site for reference.

Section 3 • LABORATORY ANALYSIS

3.1 External Laboratory

All analytical chemistry analyses are performed by an accredited laboratory.

In most cases, these analyses will be performed by Maxxam, an accredited facility (see Appendix B) located in Ottawa, Ontario. All data from Maxxam undergoes a rigorous internal QA/QC process, including the use of spiked samples and duplicate samples. Toxicity tests will be performed by Aquatox in Nova Scotia. Testing will be conducted as stipulated by Environment Canada's Biological Test Methods.

Agnico Eagle may also require the services of laboratory, such as Maxxam in Edmonton, AB, SGS in Lakefield, ON and H2Lab in Val d'Or, QC. Agnico Eagle may also use the services of ALS Global for some of the AEMP water quality analysis.

3.2 Internal Laboratory

The assay lab at the Mine site is not an accredited laboratory but will be used periodically for "real-time" results for some parameters like pH, total suspended solids, and Weak Acid Dissociable Cyanide. These results are for observational purposes and do not meet the standards of an accredited laboratory.

SECTION 4 • DATA REQUIREMENTS

4.1 Data Collection

A database of all water sampling data is to be maintained at the Mine site. The database should be designed based on the various discharge limits designated in the Water Licence. The database functionality will include event scheduling, trend analysis, and flagging out-of-compliance samples, all to enhance the effectiveness of the QA/QC program. The database information will be presented to regulators in the annual report.

The following data is collected for each sample in the field and will be entered into the database by the sampler for the corresponding sampling station:

- sample identification name;
- name of sampler;
- date and time of sampling or measurement; and
- physical characteristics (pH, temperature, etc.), if required.

Upon receipt of sample results from the laboratory, the data will be input to the database and matched to the sample identification name. The analysis certificate for each sample from the accredited laboratory will include but is not limited to:

- analytical methods or techniques used;
- date of analysis;
- name of the person(s) / laboratory that approved the certificate; and
- results of any analysis.

4.2 Data Verification

Upon receipt of analytical results, the field blank and duplicate analyses will be verified for potential contamination and accuracy, respectively. Results will be interpreted and recommended actions will be taken if necessary.

4.3 Exceedance Reporting

Any measured concentration at a sample station exceeding a regulated discharge criterion stipulated in the Water Licence or the Metal Mining Effluent Regulations will be reported to the Nunavut Water Board, Environment Canada, and AANDC water inspector within 30 days of the receipt of the analysis. In addition, results of the action plan, where required, will be reported and, where necessary, mitigation options identified within 90 days after receipt of the analyses.

SECTION 5 • REFERENCES

AANDC (Aboriginal Affairs and Northern Development Canada). 1996. Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan.

NWB (Nunavut Water Board). 2010a. Guide 4: Completing and Submitting a Water Licence Application for a New Licence. April 2010.

NWB. 2010b. Supplemental Information Guideline (SIG) for General Water Works (M1). Issued February 2010.

NWB. 2010c. Supplemental Information Guideline (SIG) for Mine Development (MM3). Issued February 2010.

APPENDIX A • TABLES AND FIGURES

Table A-1: Proposed Water Quality Regulated, General Aquatic, and Verification Monitoring for the Project during Construction, Operations, and Closure

Monitoring Type	Mine Development Phase	Monitoring Station Number	Station Description	Purpose of Station	UTM Zone 11		Sampling Depth	Sample Type	Number of Samples per Station
					Easting	Northing			
Regulated	Construction	MEL-D-1 to TBD	Dewatering: Water transferred from lakes to Meliadine Lake during dewatering of lakes	Quality of intake water	TBD	TBD	Shoreline	Grab	1
Regulated	Construction, and Operations	MEL-SR-1-TBD	Surface Runoff – runoff downstream of Construction areas at Meliadine Site and Itivia Site, Seeps in contact with the roads, earthworks and any Runoff and/or discharge from borrow pits and quarries	Confirm no adverse effects from leakage/runoff	546244	963636	Surface water runoff (if present)	Grab	1
Aquatic	Construction, and Operations	MEL-11	Water intake from Meliadine Lake	Test quality of final effluent before release	TBD	TBD	From pipe	Grab	1
Verification	Construction (prior to release), Operations, and Closure	MEL-12	Water treatment plant (pre-treatment) coming from CP1, off the pipe and not in the pond	Test quality of water before treatment (required to evaluate treatment efficiency)	TBD	TBD	From pipe	Grab	1
Aquatic	Construction (prior to release), Operations, and Closure	MEL-13	Mixing zone in Meliadine Lake, Station 1; and MMER exposure stations for final discharge point	Test mixing of effluent in the receiving environment; sample at varied distances and directions from pipe; MMER exposure for final discharge point	TBD	TBD	Depends on presence of a vertical conductivity gradient	Discrete	1 (depth of maximum conductivity, or mid-depth if no conductivity gradient is present)
Regulated	Construction (upon effluent release), Operations, and Closure	MEL-14	Water treatment plant from CP-1 (post-treatment), end of pipe (before offsite release) in the plant before release.	Quality of intake water	539724	6989988	Depth Integrated or from Intake Pipe	Grab	1
Verification	Construction, and Operations	MEL-15	Local Lake E-3	Confirm no leakage/runoff from Emulsion Plant	536753	6990492	Shoreline	Grab	1
Verification	Construction, Operations, and Closure	MEL-16	Local Lake G2	Possible seepage or dust loadings from site infrastructure	538840	6990498	Shoreline	Grab	1
Verification	Construction, Operations, and Closure	MEL-17	Local Pond H1		540685	6989588	Shoreline	Grab	1
Verification	Construction, Operations, and Closure	MEL-18	Local Lake B5		537306	6988841	Shoreline	Grab	1
Verification	Construction, Operations, and Closure	MEL-19	CP-2 Collection of natural catchment drainage from the outer berm slopes of the Landfarm and industrial pad	Collection of natural catchment drainage from the outer berm slopes of the Landfarm and industrial pad	TBD	TBD	TBD	Grab	1
Verification	Construction, and Operations	MEL-20	CP-3 Collection of drainage from dry stacked tailings	Collection of drainage from dry stacked tailings	TBD	TBD	TBD	Grab	1
Verification	Construction, and Operations	MEL-21	CP-4 Collection of drainage from WRSF1	Collection of drainage from WRSF1	TBD	TBD	TBD	Grab	1
Verification	Construction, Operations, and Closure	MEL-22	CP-5 Collection of drainage from WRSF1 and WRSF2	Collection of drainage from WRSF1 and WRSF2	540120	6988825	TBD	Grab	1

Monitoring Type	Mine Development Phase	Monitoring Station Number	Station Description	Purpose of Station	UTM Zone 11		Sampling Depth	Sample Type	Number of Samples per Station
					Easting	Northing			
Verification	Construction, Operations, and Closure	MEL-23	CP-6 Collection of drainage from WRSF3	Collection of drainage from WRSF3	TBD	TBD	TBD	Grab	1
Verification	Construction, Operations, and Closure	MEL-24	Seepage from the Landfill between the landfill and Pond H3	Located between the landfill and Pond H3 to monitor seepage from the landfill	NA	NA	Pooling Water (if present)	Grab	1
Regulated	Construction, Operations, and Closure	MEL-25	Secondary containment area at the Itivia Site Fuel Storage and Containment Facility	Located in the secondary containment area of the tankfarm at Itivia to monitor water quality prior to discharge to land	NA	NA	Pooling Water (if present)	Grab	1

Notes: as per Metal Mining Effluent Regulations (MMER), samples for effluent characterization and receiving environment must be collected quarterly, or at least one month apart while effluent is being deposited.

Grey shading indicates that verification monitoring parameters and locations are internal for Agnico Eagle. A systematic approach will be used in communicating inspections results, likely on an annual basis. This will allow Agnico Eagle to inform government, Inuit associations, and the public of inspection outcomes.

CP = collection pond; WRSF = waste rock storage facility; TBD = to be determined

Table A-2: List of Analytical Parameters

	Parameters
Total/Dissolved Metals	Aluminum, antimony, arsenic, barium, beryllium, boron cadmium, chromium, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, zinc and mercury
Nutrients	Ammonia-nitrogen, total Kjeldahl nitrogen, nitrate-nitrogen, nitrite-nitrogen, ortho-phosphate, total phosphorus, total organic carbon, dissolved organic carbon
MMER	Total cyanide, arsenic, copper, lead, nickel, zinc, radium-226, TSS, pH, sulphate, turbidity, and aluminum. Effluent volumes and flow rate of discharge, acute toxicity (Rainbow Trout and *Daphnia magna*) and environmental effects monitoring (EEM).
Conventional Parameters	Bicarbonate alkalinity, carbonate alkalinity, turbidity, conductivity, hardness, pH, total alkalinity, TDS, TSS, turbidity
Cyanide	Free and total cyanide
Major Ions	Calcium, magnesium, potassium, sodium, chloride and sulphate
Petroleum Hydrocarbons	F1, F2-F4 and BTEX
Other	Reactive silica, radium-226, oil & grease
Flow	Flow datalogger/meter
Field measurements	Field pH, specific conductivity, dissolved oxygen, and temperature.

MMER = Metal Mining Effluent Regulations.

Table A-3: Holding times for sampling parameters

Parameters	Matrix				Type of Bottle	Preservative	Volume
	Drinking Water	Waste Water	Surface Water	Ground Water (1)			
Microbiology							
Escherichia coli, total coliforms, A.A.H.B	48[h]	48[h]	48[h]	48[h]	PPS	TS, E	250[ml]
Enterococcus	48[h]	48[h]	48[h]	48[h]	PPS	TS, E	250[ml]
Thermo tolerant coliforms (fecal)	48[h]	48[h]	48[h]	48[h]	PPS	TS, E	250[ml]
Inorganic Chemistry							
Absorbance UV, Transmittance UV	24[h]			24[h]	P. T. V	N	125[ml]
Alkalinity, Acidity, Bicarbonates, Carbonates	14[d]	14[d]	14[d]	14[d]	P, T, V	N	250[ml]
Ammonia nitrogen (NH3-NH4)	28[d]	28[d]	28[d]	28[d]	P, T, V	AS	125[ml]
Kjeldahl ammonia (NTK)		28[d]	28[d]	28[d]	P, T, V	AS	125[ml]
Anions (Cl, F,SO4)	28[d]	28[d]	28[d]	28[d]	P, T, V	N	250[ml]
Color, Free & total Chlorine	48[h]	48[h]	48[h]	48[h]	P, T, V	N	125[ml]
Conductivity	28[d]	28[d]	28[d]	28[d]	P, T, V	N	250[ml]
Cyanides total/available, Cyanides	14[d]	14[d]	14[d]	14[d]	P, T, V	NaOH	250[ml]
BOD5/Carbonated BOD5 (2)		48[h]/4°	48[h]/4°		P, T, V	N	250[ml]
COD (chemical oxygen demand)		28[d]	28[d]		P, T, V	AS	125[ml]
Mercury (Hg)	28[d]	28[d]	28[d]	28[d]	P, T, V	AN	250[ml]
Total/dissolved metals (filtered on field)	180[d]	180[d]	180[d]	180[d]	P, T, V	AN	250[ml]
Dissolved metals (filtered in the laboratory)	24[h]	24[h]	24[h]	24[h]	P, T, V	N	250[ml]
Total suspended solids & volatile TSS		7[d]	7[d]	7[d]	P. T. V	N	500[ml]
NH3 or NH4		24[h]	24[h]	24[h]	P.T.V	N+AS	2/125[ml]
Nitrites (NO2), Nitrates (NO3), Turbidity	48[h]	48[h]	48[h]	48[h]	P, T, V	N	250[ml]
Nitrites-Nitrates (NO2-NO3)	28[d]	28[d]	28[d]	28[d]	P, T, V	AS	250[ml]
O-Phosphates (O-PO4)	48[h]	48[h]	48[h]	48[h]	P, T, V	N	500[ml]
pH	24[h]	24[h]	24[h]	24[h]	P, T, V	N	125[ml]
Total Phosphorus (P-tot)	28[d]	28[d]	28[d]	28[d]	P, T, V	AS	125[ml]
Dissolved solids (TDS)		7[d]	7[d]	7[d]	P. T. V	N	250[ml]

Parameters	Matrix				Type of Bottle	Preservative	Volume
	Drinking Water	Waste Water	Surface Water	Ground Water (1)			
Total solids		7[d]	7[d]	7[d]	P. T. V	N	250[ml]
Sulphides (H2S) (3)	28[d]	28[d]	28[d]	28[d]	P. T. V	E.D.T.A	125[ml]
Thiosulfates	48[h]	48[h]	48[h]	48[h]	P. T. V	N	125[ml]
Radioactive & Organic Chemistry							
Fatty resin acids (S-T)	-	28[d]	28[d]	-	VA, VT	AS	1[L]
Congeners PCB (S-T)	28[d]	28[d]	28[d]	28[d]	VA, VT	N	1[L]
Chlorobenzene	28[d]	28[d]	28[d]	28[d]	2 Vial+1 blank	TSS	2/40[ml]
Total organic carbon (TOC)	28[d]	28[d]	28[d]	28[d]	P, T, V (B)	AC	100[ml]
Dissolved organic carbon (DOC)	48[h]	48[h]	48[h]	48[h]	P, T, V (B)	N	100[ml]
Total inorganic carbon (TIC)	48[h]	48[h]	48[h]	48[h]	P, T, V (B)	N	100[ml]
Phenolic compound (GC-MS)	28[d]	28[d]	28[d]	28[d]	VA, VT	AS	1[L]
Glyphosate (S-T)	14[d]	14[d]	14[d]	14[d]	P.T	N	500[ml]
PAH	28[d]	28[d]	28[d]	28[d]	VB	AS	1[L]
Oil & greases (total and non-polar)	28[d]	28[d]	28[d]	28[d]	VA, VT	AS	1[L]
C10-C50 HP and/or Petroleum product identification	28[d]	28[d]	28[d]	28[d]	VA, VT	AS	1[L]
Phenol index	28[d]	28[d]	28[d]	28[d]	VA, VT	AS	500[ml]
Radium-226	180[d]	180[d]	180[d]	180[d]	P, T. V	AN	1[L]
VOC (MAH, CAH, THM, BTEX) (3)	28[d]	28[d]	28[d]	28[d]	2 Vial+1 blank	TSS	2/40[ml]

Notes:

Type of Bottle:

- = non-applicable; P.S.V.T. = plastic bottle, bag or glass bottle with Teflon cap; P, T = Plastic bottle or plastic bottle with Teflon cap; P.T.V. = Plastic bottle or glass bottle with plastic or Teflon cap; PPS = Sterile propyl ethylene bottle; VA = Clear or amber glass with aluminium or Teflon seal; VB = Amber glass (or clear glass covered with aluminium paper) aluminium seal of Teflon; *VT = Clear or amber glass bottle with Teflon seal*

Preservative:

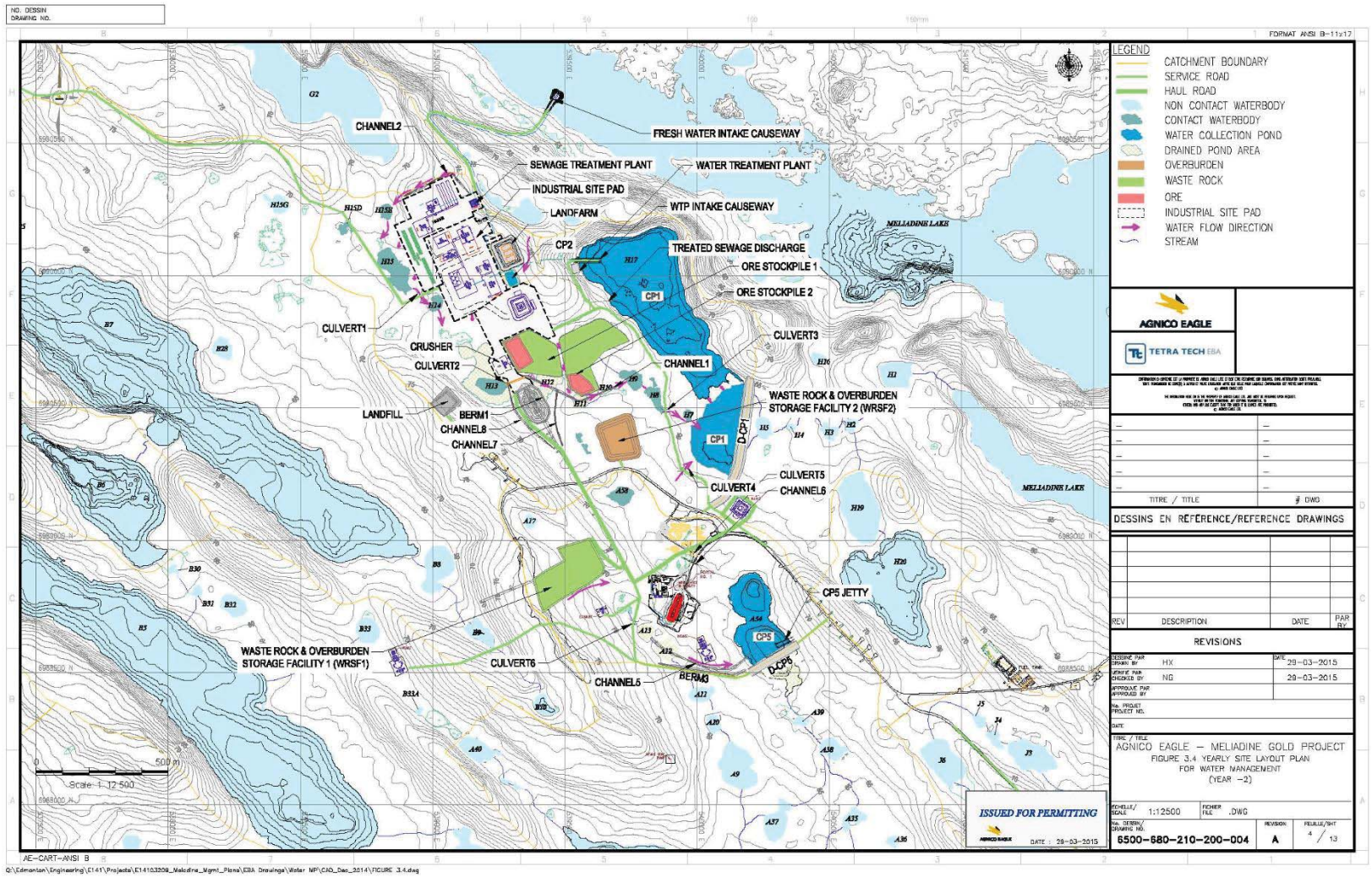
AC = 0.1ml (100 µl) of HCl per 100 ml of sample; AcZn = 0.2 ml zinc acetate 2 N per 100 ml of sample and NaOH 10 N to pH >9; AN = HNO3 to pH <2; AS = H2SO4 to pH <2; E = 2.5 ml EDTA 1.5% (p/v) per 100 ml of sample if heavy metals are suspected; ED = 0.1 ml diamine ethylene 45 mg/l per 100 ml of sample; EDTA = 1 ml EDTA 0.25 M per 100 ml of sample; N = No preservative; NaOH = NaOH 10 N to >12; TS = Sodium thiosulfate final concentration in the sample of 0.1% (p/v); TSS = about 40 mg of thiosulfate sodium

Table A-4: Quality Control Sample Frequency

Sampling Site	QA/QC Sampling Frequency
Regulated and General Aquatic Monitoring	
Collection Pond 1 [a]	1 field duplicate and 1 field blank per year
Mine facilities - operations	1 field duplicate per year
Mine facilities - closure	1 field duplicate per year
Mine facilities - post-closure	1 field duplicate per year
Receiving water chemistry	Blind field duplicates, laboratory and field blanks, sediment cleaning swipes, laboratory matrix spike duplicates per 10 samples
Event Monitoring Program	
Each event	One field duplicate per 10 samples

[a] Collection Pond 1 is the Water Management Pond for the Project

Figure A-1: General Site Plan





AGNICO EAGLE

MELIADINE GOLD PROJECT

ROAD MANAGEMENT PLAN

MARCH 2018
VERSION 5
6513-MPS-03

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ᐊᖏᓂᒃ ᐅᓴᖅᑕᕆᐊᑦ ᓕᒥᑎᑦ (ᐊᖏᓂᓄᒃᓂᑦ) ᐱᓕᕐᓗᐊᓂᕐᕿᖅᖢᑦ ᑕᓯᔪᐊᖏᑎᑦ ᒍᓗᒐᑦ ᐱᓕᕆᐊᖏᑎᑦ (ᐱᓕᕆᐊᖅ), ᐃᓂᐅᔪᒥᑦ 25 ᑭᓪᒥᑕᕐᓗᐊᓂᒃ ᐅᖓᓯᓄᑎᕐᔪᖅ ᐅᐊᖓᓇᖓᓂᑦ ᑲᖓᖅᓀᓂᐅᓚᑦ, ᐊᒻᒪᓗ 80 ᑭᓪᒥᑕᕐᓗᐊᓂᒃ ᐅᖓᓯᓄᑎᕐᔪᖅ ᓂᑎᖅᖢᓯᐊᓂᑦ ᐱᖓᖓᓇᖅᖢᓯᐊᓂᑦ ᐃᓅᓗᑎᓴᒃᖢᑦ ᑭᓐᓇᓕᖅ ᓄᓇᕗᒻᒥᑦ. ᐱᓕᕆᐊᖅ ᑕᓯᔪᐊᖅᖢᑦ ᐃᒪᓕᕆᓂᐊᓂᖅᓯᓚᓂᖅ ᐅᐃᓪᓕᖅᓯᓂᖅ ᐅᓴᖅᑕᕆᐊᖅ ᐅᐊᖓᓇᖓᓂᑦ (ᓄᓇᕗᒻᒥᑦ ᐃᒪᓕᑕᓂᔪᑦ ᒪᓕᑎᕋᓪᒍ ᐅᖃᓕᕐᓂᖅ 4).

ᐅᓴᖅᑕᕆᐊᓕᐊᖓᔪᒪᔪᖅ ᐃᓄᐃᑦ ᓄᓇᕋᐴᖓᖏᓐᓂᖅᓯᖅ, ᑕᐃᒪᐃᓇᒍᓪᓗ, ᓄᓇᒥᒃ ᐊᒻᒪᓗ ᐊᖏᑎᓕᑕᓂᔪᑦ ᐊᐅᓪᓚᕆᓂᐅᔪᖅ ᐊᐅᓪᓚᑕᐅᖅᑎᑕᖅᑐᑦ ᒪᓕᒪᖓᓂᒃ ᓄᓇᕗᒻᒥᑦ ᓄᓇᑦᓂᔪᑦ ᐊᖓᕿᖅᑲᐱᒍᑎᓕᑦ. ᑭᒪᓇ ᑎᑎᕋᖅᑲᖅ ᑕᐯᖏᑐᕆᔪᖅ ᐊᕐᕋᐴᒥᓂᒃ ᐊᐅᓪᓚᕆᓂᐅᔪᑦ <ᕋᓇᐅᑎᑦ (<ᕋᓇᐅᑎ) ᐅᓴᖅᑕᕆᐊᓕᐊᖓᔪᒪᔪᓕᔪᑦ ᐊᒻᒪᓗ ᐃᓕᓴᐅᕋᖅᑐᑦ ᑎᑎᕋᖅᑲᐅᑉᐳᖅ ᑲᑦᔪᓕᐊᖏᓂᕐᓂᑦ Type A ᐃᒪᓕᑦ ᓕᐃᓴᓐᓂᔪᑦ ᑐᓂᔪᖅᑐᑎᒃ. ᑎᑎᕋᖅᑲᖅᑐᑦᑦ ᓂᕆᐅᕐᓴᐅᔪᑦ >ᒥᑦᖏᓐᓂᑦ, ᐊᖓᕿᖅᑎᑦᓱᑦᓂᑦ, ᐱᔪᖏᓇᖅᑎᑕᐅᓂᑦ, ᐊᒻᒪᓗ ᓇᓪᒪᕐᓴᐅᔪᑦ ᐊᑐᖅᑐᑦ ᑕᐸᔪᖏᓐᓂᒃ <ᕋᓇᐅᑎᒍᑦ ᕿᐃᑦᓯᕗᖅᑐᑦ.

ᐊᖏᓂᒃᓂᑦ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖏᓚᒥᑦ ᐊᒻᒪᓗ ᓄᓇᐅᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕐᒪᓚᔪᑦ ᐱᓕᕐᓂᐊᖅᐅᔪᒥᑦ ᑎᓪᓗᓂᐊᖅᓄᑦᒥᑦ ᒍᓗᑕᓂᒃ, ᓚᖁᔭᖏᓂᒃ ᐅᒃᑯᐃᖏᓚᓱᖏᓂᒃ (ᑎᓪᓗᓂᐊᖅᓄᑦ ᐃᓗᓕᑐᖅᓯᓚᔪᖅ 1 ᐊᒻᒪᓗ ᑎᓪᓗᓂᐊᖅᓄᑦ ᐃᓗᓕᑐᖅᓯᓚᔪᖅ 2) ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᒥᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕐᓂᖅ. ᐅᓴᖅᑕᕆᐊᓕᐊᖓᔪᒪᔪᖅ 12.1 ᒥᓕᓴᓐ ᑕᓐᓗᐊᓂᒃ (Mt) ᐅᓴᖅᑕᕐᓂᐊᖅᑐᖅ, 31.8 Mt-ᓂᒃ ᐊᒃᑕᑯᖅᑕᐅᔪᓂᑦ ᐅᓴᖅᑲᓂᒃ, 7.5 Mt-ᓂᒃ ᐅᖓᑕᐅᕐᑎᔪᓂᒃ ᐊᒃᑕᑯᓂᒃ, ᐊᒻᒪᓗ 12.1 Mt-ᓂᒃ ᖃᑭᒃᑎᕐᑐᓂᑦ. ᔪᑕᒪᐅᓕᖅᖢᓂᔪᖅ ᐱᓕᕐᓂᐊᖅᐅᓂᖓᓕ ᑲᓇᕐᔪᐅᓗᓂᒃ ᐊᒻᒪᓗ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕐᓂᖅ: ᔪᑕᒪᑦ ᐅᑭᐅᑦ ᐅᖓᓚᐅᖅᓯᐊᓄᑦ ᓴᓇᔨᐅᓗᓂ (Q4 ᐅᑭᐅᖅ -5-ᒥᑦ ᐅᑭᐅᖅ -1-ᒧᑦ), 8-ᓄᑦ ᐅᑭᐅᓄᑦ ᐅᓴᖅᑕᕆᐊᖅ ᐊᐅᓪᓚᕆᓂ (ᐅᑭᐅᖅ 1-ᒥᑦ ᐅᑭᐅᖅ 8-ᒧᑦ), ᐱᖓᓱᑦ ᐅᑭᐅᓄᑦ ᐅᒃᑯᐃᖅᖢᑦᓯᒥᐊᑐᒍ (ᐅᑭᐅᖅ 9-ᒥᑦ ᐅᑭᐅᖅ 11-ᒧᑦ), ᐊᒻᒪᓗ ᐅᒃᑯᐃᖅᓯᒪᓕᖅᑎᑦᓗᒍ (ᐅᑭᐅᖅ 11-ᒥᑦ ᓯᐅᓪᒧᑦ).

ᐊᖏᓂᒃᓂᑦ ᐊᐅᓚᑕᓂᖅ

ᖃᓄᐅᑎᑦ ᐃᓚᐅᕐᓂᑦ ᐊᖏᓂᒃᓂ, ᐱᓕᕐᑎᕋᐃᓂᖅ, ᐊᒻᒪᓗ ᐅᓯᒃᑯᑦᓂᔪᑦ ᐊᖏᓂᒃᓂᕆᔨᒪᔪᓂᑦ ᐱᓕᕆᐊᖏᑦ ᐃᓂᖓᓂᑦ, ᐊᒻᒪᓗ ᐃᓚᐅᕐᓂᐊᓕᒍ ᓴᓇᐅᑎᓂᒃᑐᒍ, ᐊᐅᓪᓚᕆᓂᐅᒍ, ᐅᒃᑯᐃᖅᖢᓂᐊᓕᒍ ᐊᒻᒪᓗ ᐅᒃᑯᐃᖅᓯᒪᓕᖅᑎᑦᓗᒍ ᐊᖏᓂᒃᓂᑦ ᐅᒃᑯᐃᖅᖢᑦᓯᒥᐊᑐᒍ ᐱᖓᓱᑦ ᐃᓚᐅᕐᓂᖅ ᐊᒻᒪᓗ ᓄᓇᕗᒻᒥᑦ ᐊᐅᓪᓚᕆᓂᐅᔪᖅ ᐊᖏᓂᒃᓂᑦ ᐅᓴᖅᑕᕐᓂᖅ ᐊᒻᒪᓗ ᓴᐅᑕᐅᓯᐅᑎᓂᒃᑯᑦ ᐱᓕᕆᐊᖏᑦ ᐊᖏᓂᒃᓂᑦ ᐅᓴᖅᑕᕆᐊᓕᐊᖓᔪᒪᔪᓕᔪᑦ

ᐃᓄᖅᓯᒪᓂ ᖃᐅᔨᓴᐃᔨᖃᖅᖃᑎᒃ ᐃᓕᓴᐅᔪᕐᓗᒃ ᐅᑭᐅᓄᑦᑐᖅ ᐊᐸᖅᑯᑎᒋᑦ ᐅᓴᖃᑕᓚᐊᓕᐊᖏᓚᐅᐸᑦ ᖃᐅᔪᓕᖅᓯᓂ ᐃᓄᖅᓂ ᐃᑎᖅᑕᐅᑕᐃᓕᓕᖅᓯᓪᓚᔪ. ᐃᓄᖅᖏᕐᓴᑎᑕᐅᖅ ᐱᑕᖃᖅᐳᔪᕐᓗᒃᑐᖅ ᑭᓪᓗᒍᑦ 7-ᒥᑦ ᓂᕈᐅᐸᑦ ᐃᓕᓴᐅᓂ AWAR ᐊᐸᖅᑯᑎᐅᐸᑦ. ᐊᐸᖅᑯᑎᑎ ᐅᖅᑯᐊᖅᓕᒫᖃᖅᑕᐅᔪᕐᓗᒃᑐᖅ ᓴᓕᖅᓄᓪᓚᔪ, ᐊᐸᖅᑯᑎᒋᑦ ᐱᓂᖅᓚᐊᕈᓂᖅᑕᖃᖅᐸᑦ, ᐊᐸᖅᑯᓴᓕᐅᔪᓕᖅᑎᓪᓚᔪ, ᐊᓕᒪᓗ ᑐᐅᑐᐃᑦ ᓀᓕᑦᓯᖏᓐᓄᑦ.

ᓇᓗᓇᐃᖅᑯᑎᒃ ᐃᓕᓴᐅᔪᕐᓗᒃᑐᑦ ᑲᖏᑎᒃᓂᐅᐸᑦ ᖃᐅᔨᓴᐃᓂᐅᐸᑦ ᖃᐅᔨᑕᒧᑦ ᖃᐅᓇᐃᖏᓂᖏᓂᒃ ᐊᐸᖅᑯᑎᐅᐸᑦ ᒥᖁᓇᑦ, ᐅᖅᖃᖅᓴᒪᓗᓂ ᐅᖅᑯᐊᖅᓴᒪᖏᖅᑎᑦᓀᓐᓂᑦᓂᒃᑯᓂᑦ ᐃᓄᖅᓂᐅᔪᓕᖅᑎᑦᓀᓐᓂᑦᓂᒃᑯᓂᑦ ᐊᐸᖅᑯᑎᒋᑦ ᐃᓄᖅᓂᕐᓂᖅᓯᐅᑉᐳᖅᑐᑦ ᐊᐸᖅᑯᑎᑎᒃ ᐃᓕᓴᐅᔪᕐᓗᒃᑐᑦ ᖃᐅᔨᓴᐃᓂᐅᐸᑦ ᖃᐅᔨᑕᒧᑦ ᐊᐸᖅᑯᑎᐅᐸᑦ ᒥᖁᓇᑦ ᖃᐅᔨᓴᐃᓂᐅᐸᑦ ᐃᓄᖅᓂᕐᓂᖅᓯᐅᑉᐳᖅᑐᑦ ᐃᓄᖅᓂᕐᓂᖅᓯᐅᑉᐳᖅᑐᑦ ᐊᐸᖅᑯᑎᑎᒃ ᐃᓕᓴᐅᔪᕐᓗᒃᑐᑦ ᐊᐸᖅᑯᑎᐅᐸᑦ ᐃᓄᖅᓂᕐᓂᖅᓯᐅᑉᐳᖅ

ᑕძᖏᐅᔪᓂᑦ ᐅᔭᕃᑕᕆᐊᑦ ᖃᑲᓂᖅᓯᒪᑦ. ᐊᔪᖃᑦᑕᒃ ᑕᐃᒪᐅᖃᑦᑕᕐᓂᐊᖅᑐᖅ ᐊᐅᔭᖅᐸᓂᖅᑎᑦ ᐊᓪᒪᓗ ᐊᐅᔭᕐᒥᑦ, ᒥᒃᓯᒋᐊᖅᑦᓯᓪᓗᓂ ᐅᑭᐊᖅᓴᓂᑦ ᐊᓪᒪᓗ ᐅᑭᐅᖅᓂᑦ.

ᐊᖏᑕᓗᐊᖏᑎᐊᖅᑎᕐᓂᑕᓕᒫᖅᓯᐅᓴᐅᔪᑦ ᐊᐅᓪᕐᓂᐅᔪᑦ ᐊᔪᖃᑦᑕᖏᑦ ᐃᓪᒃᐅᔪᑦ ᐅᔭᕃᑕᕆᐊᑦ ᖃᓄᐃᖓᓂᖏᖅᓱ ᐊᓪᒪᓗ ᐊᐅᓴᖅᑎᕐᓂᕐᒧᑦ ᒪᓪᒃᑕᐅᔪᖅᓴᐃᓕᑦ. ᐊᐅᓴᖅᑎᕐᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᔭᕃᑦᑕᖅᑐᑦ, ᓱᐢᓗ ᓇᑭᖅᓴᓂᕐᒧᑦ ᑭᖑᓪᓕᔪᐅᔪᑦ ᐊᓪᒪᓗ ᐊᐢᕐᔨᐅᑎᓪᓗᒋᑦ, ᐃᑲᓂᓕᓂᐊᕐᓂᖅᑐᖅ ᐊᔪᖃᑦᑕᕐᑐᑦ. ᐃᒪᖅ ᐊᓪᒪᓗ ᐊᔪᖃᑦᑕᖃᓕᒫᖅᑕᐃᓪᓕᓴᐅᑎᑦ Calcium Chloride ($CaCl_2$) ᐊᑐᖅᑕᐅᓂᐊᖅᑐᑦ ᐊᐅᓪᓂᓂᐊᕐᓕᒍ ᐊᓪᒪᓗ ᒥᒃᓯᒋᐊᖅᑎᑦᓗᒍ ᐊᔪᖃᑦᑕᒃ ᐊᐢᕐᔨᐅᑎᓂᑦ ᐊᓱᖏᑐᓂᑦ ᐅᔭᕃᑕᕆᐊᑦ ᖃᓂᑦᑕᖃᓕᕐᓂᖅᖢᖅ ᐃᓕᓴᐅᓂᖅᖃᕐᓂᑦ ᐃᓕᐊᑎᓂᖅᖃᖅᐸᑦ ᐃᓅᓚᐅᔪᑦ ᐃᓂᖏᑐᓂᑦ ᐊᔪᖃᑦᑕᖃᓕᕐᓂᖅᖢᖅ ᐅᓗᓚᐊᓇᓗᐊᓕᖅᐸᑦ ᐅᕝᕙᓗᓂᐅᓂᑦ ᐊᓇᑐᓂᖅᓱᓂᖅᖃᖅᐸᑦ ᐃᓇᐱᑎᓂᖅᖃᕐᓂᑦ ᓇᓇᑦ ᐃᓂᖏᑐᓂᑦ.

ᐊᔪᖃᑦᑕᖃᓕᕐᓂᐊᖅᑕᐃᓕᒫᑎᓂᑎᐅᓂᑦ ᑕᐃᒪᐅᓂᐊᖅᑐᑦ ᓴᓇᔨᐅᕙᓪᓕᐊᑎᓪᓗᒍ, ᐊᒪᓗᓗ ᐅᓴᐃᐊᖅᐸᓪᓕᐊᑎᓪᓗᒍ.

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (the Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The proposed mine is located on Inuit Owned Lands and, as such, land and environmental management are generally governed by the provisions of the Nunavut Land Claims Agreement. This document presents the Roads Management Plan (the Plan) for the proposed mine and forms a component of the documentation series produced for the Type A Water Licence Application. A list of anticipated permits, licenses, agreements, authorizations, and approvals applicable to this Plan are provided.

Agnico Eagle proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The proposed mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Roads Management

The Plan includes access, service, and haul roads proposed within the Project area, and covers construction, operations, closure and post-closure phases of the Project. This Plan is linked to the Spill Contingency Plan and the Terrestrial Environment Management and Monitoring Plan (Agnico Eagle 2014a). Access roads will be used by Agnico Eagle but will also provide unrestricted access to the public, if it is safe to do so. Roads outside the mine area include:

3. A 30 km All-weather Access Road (AWAR) from Rankin Inlet to the proposed mine site. The AWAR will be used to transport the building materials, construction/mining equipment, fuel, reagents, supplies, workers, and contractors to the proposed mine site. This road will have unrestricted public access providing rules of the road are observed.
4. A 5.9 km bypass road around the Hamlet of Rankin Inlet from the Rankin Inlet Itivia land-based facilities (Itivia) to the AWAR. This road will be closed to public use.

A manned gate is installed on the AWAR near the proposed mine site to prevent public entry. There will also be an unmanned gate at km 7 at the south end of the AWAR. The road will be closed during periods of bad weather, in the event of a road accident, during periods of major road maintenance, and, during caribou migration.

A sign will be installed near Rankin Inlet giving the daily status of the AWAR, stating whether it is open or closed to the public that day. Monitoring the average daily traffic on the AWAR including the type and numbers of vehicles depending on the season, is included in the Plan.

This Plan presents mitigation measures and protocols to be implemented during construction and operations to preserve wildlife, to prevent permafrost degradation, to control surface runoff and sedimentation, and to mitigate dust. Agnico Eagle has put in place operational procedures for daily operation and maintenance of the roads including dust suppression methods, snow removal, de-icing and snow drifts/banks management, and snow management at bridges and culverts.

Protocols for accidents and anticipated use of police services are presented in the sections below. Agnico Eagle will put the procedures in place and will keep resources close-at-hand to respond to emergencies on the roads in a timely manner. Agnico Eagle will also report all reportable incidents to the appropriate Government authority.

Reclamation of the access, service and haul roads will follow the completion of all mining. For a third party to take over the road(s), that third party would have to complete its own arrangements with the landowner (the Kivalliq Inuit Association and/or the Hamlet) and then complete its own environmental assessment and permitting process covering future use.

Dust Management

Agnico Eagle will use best management practices to minimize dust generation from becoming airborne at the proposed mine site, Itivia, and AWAR, service, and haul roads. This includes identification of major sources of dust, implementation of dust mitigation measures, inspections for unacceptable levels of dust, and recording dust monitoring data to document Agnico Eagle's success in controlling and reducing dust at the Project. The Dust Management Plan (Appendix C) focuses primarily on dust generated from roads, with some reference to other mining activities. Dust generated from other mining activities, such as the tailings storage facility, are addressed in other plans, including the Mine Waste Management Plan.

Dust could potentially be generated by such activities as road use, drilling, blasting, crushing, conveying, loading, hauling, unloading, stockpiling, and by wind erosion of dry, exposed mine areas. Dust emissions will be prevalent during late spring and summer, while being much reduced in fall and winter.

Mitigation measures to control dust include mine design and operational procedures. Operational practices, such as speed limits and road maintenance, will assist in reducing dust. Water and the addition of Calcium Chloride ($CaCl_2$) will be used to control and reduce dust on roads and other mine areas when airborne dust becomes a safety hazard or impacts sensitive natural areas.

Dust suppression measures will be in place during construction, operations, and closure.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	September 2012			First draft of the Roads Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013			Additions made throughout the Plan	John Witteman, Env. Consultant, Agnico Eagle
		6.4	17	Addition of Section 6.4	
3	April 2014	1.2.1	4	Added IQ box	Larry Connell, Corp. Dir. Reg. Affairs, Agnico Eagle
		1.2.5	6-7	Details on snowmobile trails	
			8	Added new Figure 1-2 (Itivia)	
		2.2	12-14	Update including *Navigation Protection Act*	
		4	17	Added details on consultation wrt road mgmt. and use	
		6.1	20	Details on emergency reporting	
		6.5	23	Territorial Park	
		6.6	24	Periodic survey of road use	
		7.1	25-26	Section on sedimentation control	
		7.2.1	28	Protection of archaeological sites	
		7.3	29	Meadowbank experience wrt winter maintenance	
		8.2	34	Role of the Royal Canadian Mounted Police (RCMP)	John Witteman, Env. Consultant, Agnico Eagle
		App. C		New Appendix: Dust Management Plan	
4	April 2015			Complete plan update based on Feasibility Study and NIRB Conditions for the Water Licence Application	John Witteman, Env. Consultant, Agnico Eagle
5	March 2017			General review of the plan	Environment Department, Agnico Eagle Mines
6	March 2018			Update plan based on NIRB requests	Environment and E&I Departments, Agnico Eagle Mines

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ARD/ML	Acid Rock Drainage/Metal Leaching
ATV	All-Terrain Vehicle
AWAR	All-weather Access Road
CGS	Department of Community and Government Services, Government of Nunavut
DFO	Department of Fisheries and Oceans Canada
ERT	Emergency Response Team
GN	Government of Nunavut
HTO	Hunters and Trappers' Organization
INAC	Indigenous and Northern Affairs Canada
IOL	Inuit Owned Lands
IQ	Inuit Qaujimajatuqangit
KIA	Kivalliq Inuit Association
MDAG	Multidisciplinary Advisory Group
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claims Agreement
NTI	Nunavut Tunngavik Incorporated
NU	Nunavut
NWB	Nunavut Water Board
RCMP	Royal Canadian Mounted Police

UNITS

km	kilometre
m	metre

SECTION 1 • INTRODUCTION

1.1 Project Description

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the proposed Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands (IOL). The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

Agnico Eagle proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The proposed mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Figure 1-1 provides an overview of the Project access road network. There is presently a controlled access, Phase 1 All-weather Access Road (AWAR) between the proposed mine site and Rankin Inlet[1] (constructed in 2013/2014). A bypass road remains partially built. The remote location of the Project necessitates that access, service, and haul roads be built to support the development.

The following structures and facilities located near the Tiriganiaq gold deposit include:

- Two open pits for the Tiriganiaq gold deposit and ancillary facilities;
- Underground and ancillary facilities;
- Tailings storage facility consisting of dry stack tailings;
- Overburden/waste rock/ore storage facilities;
- Plant site and ancillary facilities;
- Storage areas;
- Fuel tanks holding up to 9 million litres;
- Quarries and granular borrow pits;
- Water management facilities;
- All-weather access, bypass, service and haul roads;
- Incinerator building;

[1] The Meliadine Phase 1 AWAR was authorized under a separate process (Golder Associates 2010, 2011a, 2011b) and subject to separate monitoring and management plans (Agnico Eagle 2011, 2012). The concepts and monitoring and management plans are being merged with the current Project.

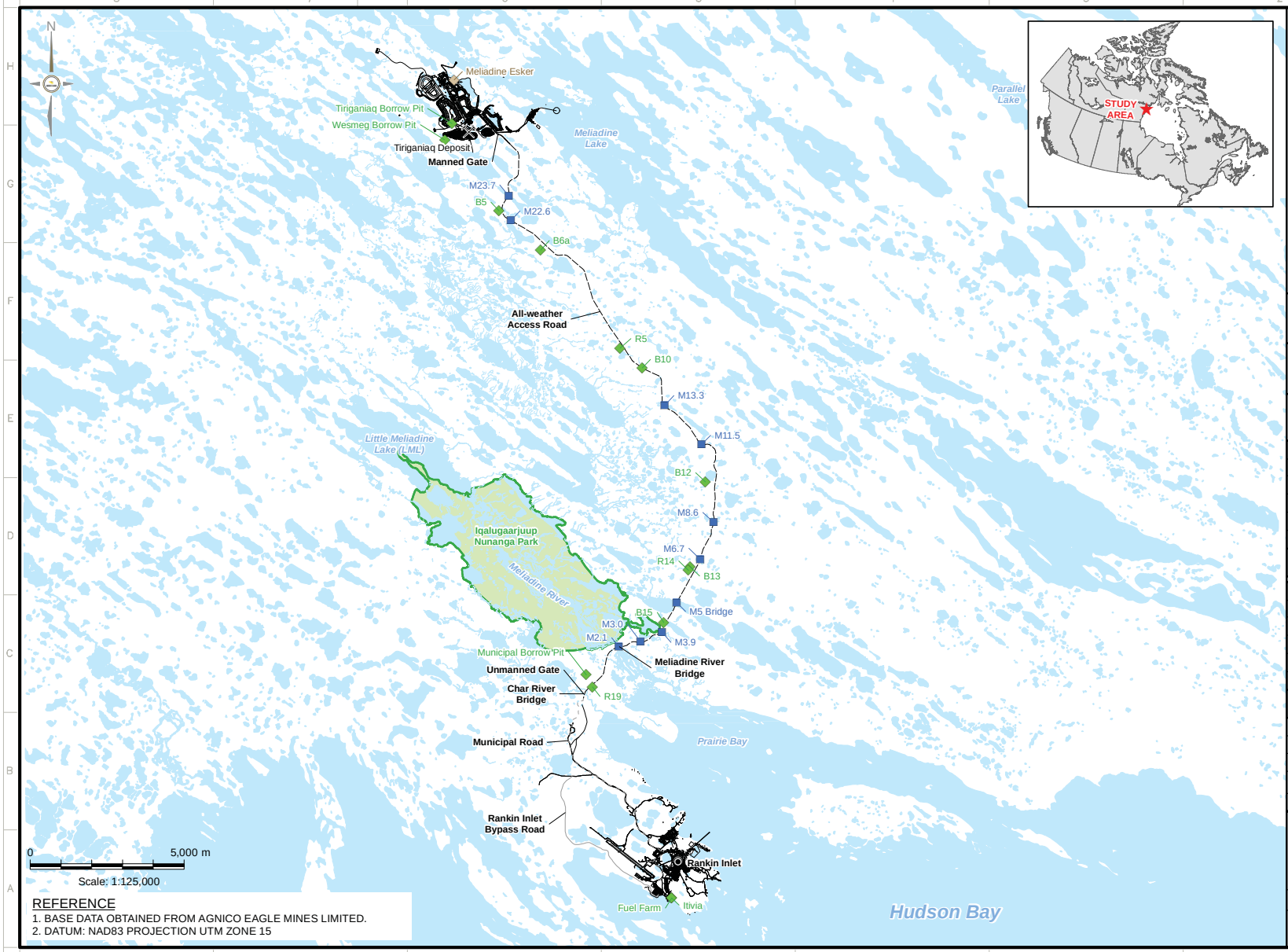
- Landfarm for petroleum hydrocarbon contaminated soils and snow/ice; and
- Industrial waste landfill.

The following structures and facilities located in Rankin Inlet include:

- Spud barge located at Itivia and serving as a dock;
- Oil Handling Facility at Itivia holding up to 38 million litres;
- Laydown yard at Itivia;
- 5.9 km bypass road around the community;
- Two kilometres of the AWAR located on municipal land;
- Bridges over the Char and Meliadine Rivers on municipal land; and
- Reclaimed rock quarry (R19) on municipal land.

NO. DESSIN
DRAWING NO.

FORMAT ANSI B–11x17



REFERENCE

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

LEGEND

- PROPOSED MINE SITE
- QUARRY/BORROW PIT LOCATION
- ESKER LOCATION
- WATERCOURSE CROSSING
- ALL-WEATHER ACCESS ROAD (AWAR)
- ROAD - NEW
- ROAD - EXISTING
- Road - New Bypass
- WATERCOURSE
- WATERBODY
- TERRITORIAL PARK

AGNICO EAGLE

Golder Associates

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TITRE / TITLE

AGNICO EAGLE – MELIADINE DIVISION

FIGURE 1–1 LOCATION OF BORROW PITS AND QUARRIES FOR THE MELIADINE GOLD MINE

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1.2 Access Roads, Service Roads, and Haul Roads

What is the difference between access roads, service roads and haul roads?

Access Roads will have public access. The public can use small vehicles such as All-Terrain Vehicle (ATVs), skidoos, and pick-up trucks on these roads, providing use is in a safe manner. Small mine and contractor vehicles will frequently use access roads. Large vehicles such as fuel tankers, buses, transport trucks, graders, and snow plows can also be expected. If oversized vehicles were to use an access road, they will be accompanied by escort vehicles. Access roads will have two-way traffic, be 6.5 metres (m) wide with pull offs approximately every 400 ± 50 m.

Service Roads will not have public access. These roads will be restricted to mine and Agnico Eagle contractor vehicles. All mine and contractor drivers using service roads will be trained to do so. Large equipment will on occasion use service roads but will normally use haul roads. Service roads will have two-way traffic and be 6.5 m wide.

Haul Roads will not have public access. All mine and contractor drivers using haul roads will be trained to do so. Haul roads will essentially be reserved for haul trucks transporting waste rock and ore from open pits. Haul roads will be approximatively 17 m, and will have safety berms where required.

Access, service, and haul roads are needed in the operation of the Project. Access roads will be used by Agnico Eagle but will also have unrestricted access by the public, if it is safe to do so. The only access road will be a 30 km AWAR between Rankin Inlet and the proposed mine site as shown on Figure 1-1. The bypass road around Rankin Inlet, which remains to be completed, will be closed to public use. It will be used by Agnico Eagle and its contractors to transport fuel, supplies, and reagents from Itivia to the AWAR.

A gate is installed on the AWAR near the proposed mine site to prevent public entry. There is an unmanned gate at km 7 at the south end of the AWAR. The road is closed during periods of bad weather, in the event of a serious road accident, during periods of major road maintenance, and during migration. A chronological record of consultation on the AWAR to date is provided in Appendix A.

Service roads will be exclusively for Agnico Eagle and its contractors use; the public will not have right of entry to these roads. These will service mine areas. They will be found in and around open pits, leading to waste rock storage facilities, around the mill site, to the landfill and Emulsion Plant to mention a few. Service vehicles, trucks carrying explosives, and small trucks with mine personnel will use the service roads. All Agnico Eagle workers and its contractors using service roads will receive training before doing so.

Haul roads will primarily be restricted to haul trucks, loaders, and other heavy machinery. Small vehicles operated by Agnico Eagle and its contractors can also use haul roads, but only after driver training and when it is safe to do so.

The Plan applies equally to access, service, and haul roads. Operations and maintenance of all types of roads will largely be the same. While public safety is emphasized in the use of the access roads, the safety of its workers and contractors will be of no less importance to Agnico Eagle in their use of all roads.

1.2.1 Road Routes

The routing of the AWAR and service roads were selected to minimize possible effects of construction and operation on the environment, and to facilitate maintenance of the road, particularly during winter. Prior to future road construction, Agnico Eagle will conduct a survey along proposed road routes to verify that dens of foxes, bears or wolverines are not destroyed or damaged. Other considerations include the overall length of the road, the route's proximity to satellite ore bodies, the number of stream crossings, the availability of quarries along the route, acid rock drainage/metal leaching (ARD/ML) potential of borrow materials, geomorphology, avoidance of archaeological resources, avoidance of the Iqalugaarjuup Nunanga Territorial Park, Inuit Qaujimajatuqangit (IQ), and avoidance of raptor nesting sites. An additional design consideration for roads was to remain on the height of land as much as possible to allow for drainage in the summer and for wind to assist in clearing snow in the winter.

> The location of the Meliadine Bridge was in part determined by IQ. Inuit Elders spoke of graves on an esker downstream of the present bridge location, which ruled out crossing at this location.
>
> The elevation of the bridge above the Meliadine River was based on IQ as Elders spoke of significant overflow at the selected location, which could impinge on the bridge. This caused Agnico Eagle to raise the elevation of the bridge more than first described in the engineering design.

Wildlife concerns also factor into road routes. Their design will take into account measures that roads do not prevent or unduly limit the movement of wildlife. This includes limiting the height of the road above the surrounding topography and limiting safety berms on haul roads where possible. Ore from the underground mine will be transported by conveyor underground to the primary crusher. This design feature eliminates the surface transport of underground ore and mitigates possible interactions with wildlife.

Haul roads will be proximal to open pits and used year round; they connect open pits to Waste Rock Storage Facilities, ore storage pads and the primary crusher. Haul roads will be kept as short as possible and, where feasible, follow routes that limit the need for safety berms, which can block the movement of wildlife.

The routing of the bypass road, as shown on Figure 1-1, avoids the built-up part of the Hamlet thereby ensuring homes, businesses, recreation centres, schools, and healing centre are not disturbed by mine traffic. It does not interfere with the operation of the airport, potential runway expansion, community's water intake source (i.e. Nipissar Lake) or the new Hamlet landfill, and joins the municipal road leading to the AWAR, Iqalugaarjuup Nunanga Territorial Park, and a community borrow pit.

1.2.2 All-weather Access Road

The AWAR, as shown on Figure 1-1, connects Rankin Inlet to the proposed mine site. The route was selected following consultation with Inuit. The AWAR is a 30 km private road built with a 6.5 m running surface between the Char River bridge turn-off and the proposed mine site, and has passing turnouts approximately every 400 ± 50 m (9.5 m total road width at passing turnouts[2]).

There will be controlled access to the proposed mine area by a manned gate located on the AWAR just south of the mine area. There will also be an unmanned gate at km 7 at the south end of the AWAR. The road will be closed during periods of bad weather, in the event of a road accident, during periods of major road maintenance and, during caribou migration. Finally, a sign will be installed near Rankin Inlet giving the daily status of the AWAR stating whether it is open or closed to the public today.

1.2.3 Hamlet Bypass Road

A bypass road is planned for completion prior to barge season 2018 and will be built around the south of the airstrip to Itivia as shown on Figure 1-1. Its design and width will be identical to the AWAR (6.5 m). The bypass road will be approximately 5.9 km long and will allow traffic from Itivia to bypass the Hamlet in delivering materials and fuel to the proposed mine site. By building the bypass road, use of municipal roads by Agnico Eagle will be kept to a minimum. The bypass road will be closed to the public.

Why a bypass road is preferable to using existing roads in the Hamlet?

Thirty million litres of fuel are required annually for mine operations and it will be stored in the Itivia tank farm. All this fuel needs to be transported to the proposed mine site where two tank farms, each having 2 tanks will be constructed. The total fuel that can be stored on site is approximately 9 million litres. If each fuel tanker carries 45,000 litres, it will result in a total of 667 trips annually or, on average, 1.8 trips per day. Added to this would be moving 20,000 to 40,000 tonnes of dry cargo from Itivia to the site annually, and up to 350 workers to and from the airport for each two-week work rotation.

[2] Passing turnouts allow vehicles to pass each other when travelling in opposite directions.

A small amount of material will also be transported from the proposed mine site to Itivia for transport south by sea, including hazardous materials and other wastes that require shipment to the south.

1.2.4 Traditional ATV and Snowmobile Trails

The building of roads and the infrastructure at Itivia will impact existing ATV and snowmobile trails. Where these trails cross a road, a ramp has been constructed to ease road crossing, and signage is in place to alert road users of the crossing. Similarly, there are signs alerting ATVs and snowmobiles when approaching a road. Maintenance of the roads would ensure the snowmobile crossings are kept clear of snow.

Rankin Inlet residents, the Rankin Inlet and Kangiqliniq Hunters' and Trappers' Organization (HTO) have identified that there is an existing snowmobile trail in the area of the proposed Itivia laydown yard that local residents use in winter months to access the sea ice at Melvin Bay. Agnico Eagle is aware of this trail and has accommodated the trail to allow continued unfettered snowmobile access along the east side of the proposed laydown yard to the sea ice at Melvin Bay. The location of this trail in relation to the proposed laydown yard is shown in Figure 1-2.

While the laydown area will be fenced, this snowmobile trail will not be hampered or blocked by any fencing.

1.2.5 Haul Roads

The building of haul roads will be governed by the sequence of the two open pits to be mined, Tiriganiaq 1 and 2, and their width determined by the size of the haul trucks and other equipment using the roads. Haul roads will be kept separate from access and service roads to ensure road safety. The proposed layout of haul roads in the vicinity of the proposed mine site is presented in Figure 1-3.

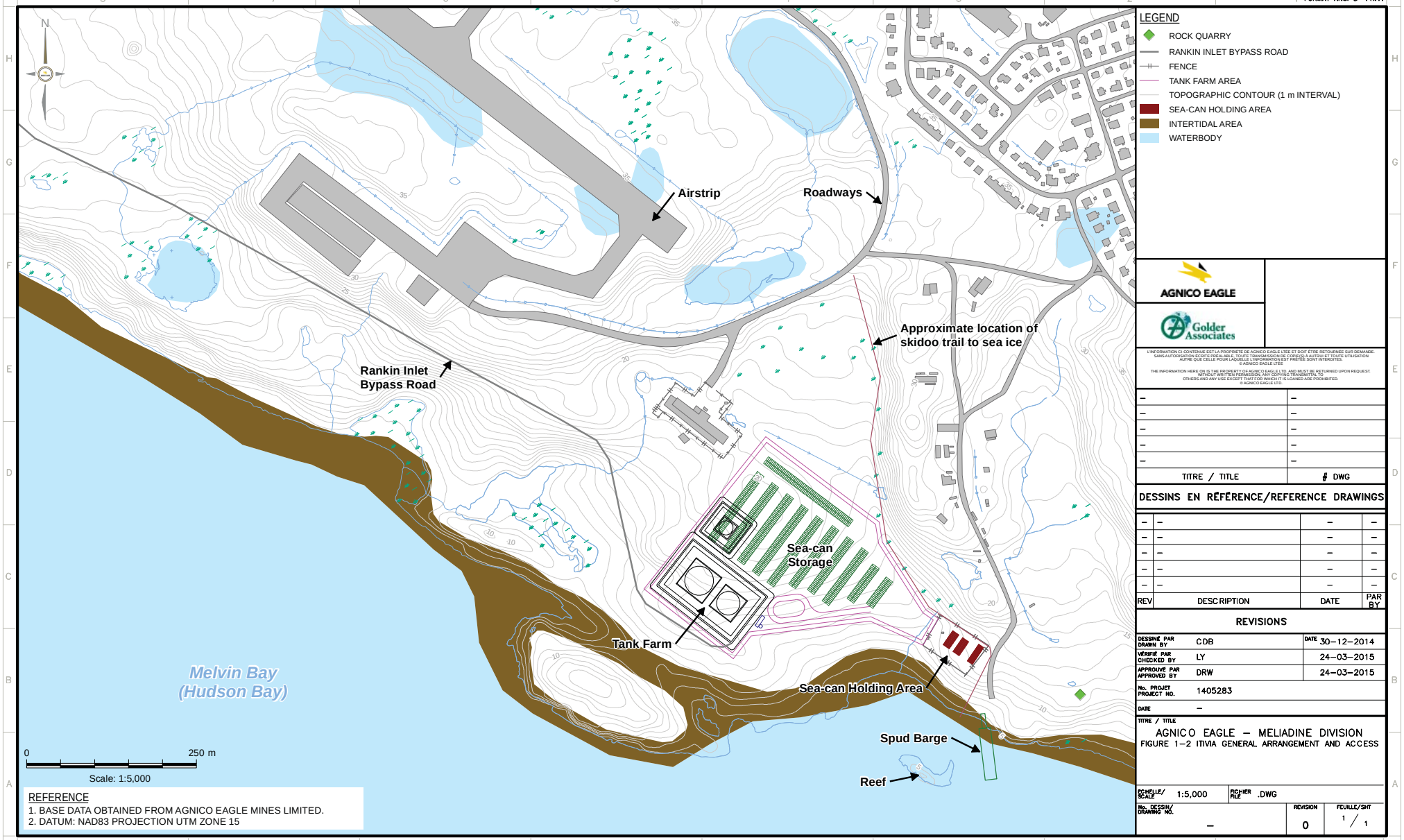
Haul roads outside the open pits will be 26 m wide to allow for two way traffic, or 17 m for single lane traffic with passing zones spaced accordingly. A two-lane 17 m wide haul road designed for 70-t trucks in dual lanes is required for access to the TSF and Paste Plant. Safety berms will be installed where necessary along the haul roads.

The ramps and haul roads were designed for the largest equipment (70 payload tonne class haul trucks), with an operational width not exceeding 5.7 m, in accordance with Nunavut mine regulations. For double lane traffic, the ramp width will be 21.5 m decreasing to 15.8 m for single lane traffic at the pit bottom (last three benches) to reduce waste stripping. The ramp's width includes a protection berm and a drainage ditch. The safety berm on the outside edge will be constructed of crushed rock to a height equal to 3/4 of the rolling radius of the largest tire using the

ramp. To facilitate drainage, ramp gradients have been established at 10% and will increase to 12% for the last three benches at the bottom of the open pit.

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LEGEND

- ROCK QUARRY
- RANKIN INLET BYPASS ROAD
- FENCE
- TANK FARM AREA
- TOPOGRAPHIC CONTOUR (1 m INTERVAL)
- SEA-CAN HOLDING AREA
- INTERTIDAL AREA
- WATERBODY

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TITRE / TITLE

AGNICO EAGLE – MELIADINE DIVISION
FIGURE 1–2 ITIVIA GENERAL ARRANGEMENT AND ACCESS

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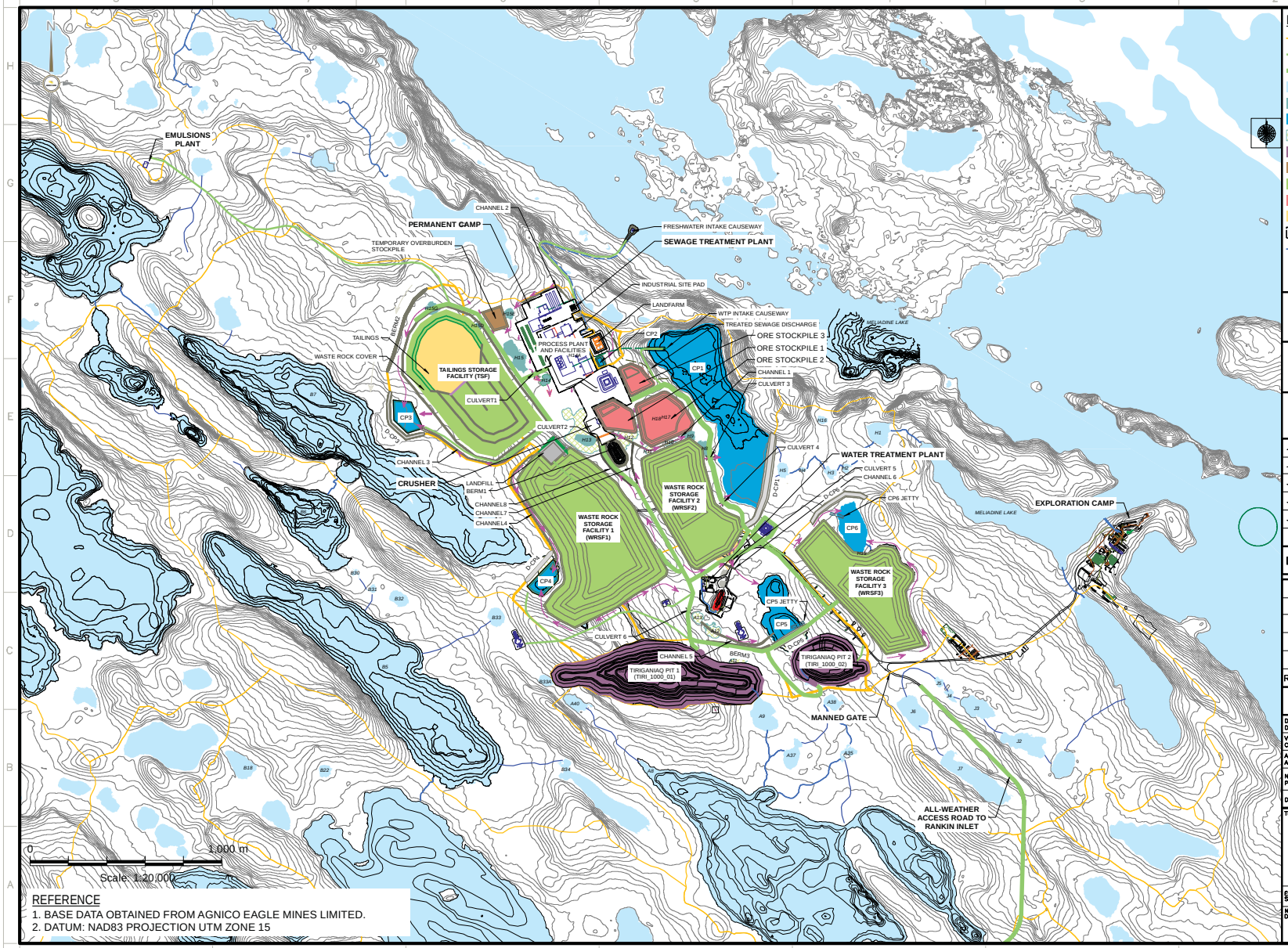
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LEGEND
- CATCHMENT BOUNDARY
- SERVICE ROAD
- HAUL ROAD
- NON CONTACT WATERBODY
- CONTACT WATERBODY
- WATER COLLECTION POND
- DRAINED POND AREA
- OPEN PIT
- OVERBURDEN
- WASTE ROCK
- ORE
- TAILINGS
- INDUSTRIAL SITE PAD
- STREAM

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No. PROJET PROJECT NO.	1405283	
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TITRE / TITLE

AGNICO EAGLE – MELIADINE DIVISION
FIGURE 1–3 MELIADINE HAUL ROADS NETWORK

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SECTION 2 • REGULATORY SETTING

2.1 Land Tenure

The large part of all proposed access, service and haul roads are to be located on IOL administered by the Kivalliq Inuit Association (KIA). The surface ownership of the land encompassing the roads right-of-ways was transferred to the KIA when the Nunavut Land Claims Agreement came into effect. Land and environmental management in this area are generally governed by the provisions of the Nunavut Land Claims Agreement.

Closer to Rankin Inlet, 2.3 km of the AWAR and the complete bypass road are on Commissioner's land held by the Department of Community and Government Services (CGS) for the benefit of the Hamlet of Rankin Inlet.

The Phase 1 AWAR was constructed under land use permits issued by CGS on municipal land, and the KIA on IOL. Leases followed the completion of construction and a legal survey of the road right-of-way. The width of the land leases is 20 m for the length of the roads, wide enough to accommodate their 6.5 m width.

Service and haul roads will exclusively be constructed on IOL under the mine lease(s) issued by the KIA.

2.2 Permitting Regime

Federal, territorial, and municipal laws and regulations that apply to the construction, operation and closure of all access, service, and haul roads are itemized in Appendix B. No land use permit, operating permit, authorization, or license can be issued by any regulatory agency that would allow Agnico Eagle to undertake construction of the bypass road or start construction on any other road until the Nunavut Impact Review Board (NIRB) has completed its environmental assessment and issued a Project Certificate No. 006.

Table 2-1 outlines the current licences and permits held by Agnico Eagle in relation to the Phase 1 AWAR and for advanced exploration. Most winter roads right-of-way permits are being allowed to expire because the AWAR is complete, but are included for sake of completeness. After receiving a Project Certificate and all necessary authorizations, land use permits will be issued by CGS on behalf of the Hamlet for the construction of the bypass road. This permit will subsequently be taken to lease following completion of the bypass road.

A list of anticipated permits, licenses, agreements, authorizations, and approvals for all roads is presented in Table 2-2.

Table 2-1 Licenses and Permits held by Agnico Eagle – Roads

License Number	Explanation	Issued By	NIRB File	Remarks
KVL100B195	Meliadine Prospecting – Land Use	KIA		general land use permit applying to exploration and drilling
KVL302C268	NTI RI-01 Parcel Drilling	KIA		drilling on RI-01 Inuit Owned Lands
KVL308C07	Mel E Exploration RI-01	KIA		drilling on RI-01 Inuit Owned Lands
N2010C0002	PB1, Drilling Permit	INAC	10EN006	
N2013-C002	Exploration, drilling claims CWM	AANDC		
KVCL102J168	Commercial Lease	KIA	07EN044	commercial lease for exploration and underground activities
KVRW98F149	Meliadine Right-of-Way	KIA		amended to allow access to old Discovery camp (renewed annually)
KVRW07F02	Overland Right-of-Way	KIA	07AN063	winter road along proposed all-weather road route(will be allowed to expire)
KVRW11F02	Permanent Road Right-of-Way	KIA	11RN017	
KVCA07Q08	Mainland Esker Quarry Permit	KIA		Tiriganiaq Esker quarry
KVCA11Q01	Permanent Road Quarries	KIA	11RN017	
	WCB Program Authorization	WCB		annual renewal
2BB-MEL1424	Bulk Sampling - Water License	NWB	07EN044, 11RN017	
2BE-MEP1318	Exploration – Water License	NWB	08EN043	
2AM-MEL1631	Meliadine Mine	NWB	11MN034	

Table 2-2 Approvals and Authorizations for All Roads

Authorization	Authority	Basis
Conformity determination with Keewatin Regional Land Use Plan	Nunavut Planning Commission	allows Project to proceed to screening
Article 12, Part 5 Environmental Assessment	Nunavut Impact Review Board	allows Project to proceed to authorizations to build and operate roads
Type A Water License	Nunavut Water Board	allows for construction of the proposed mine and related roads
Navigation Protection Act evaluation	Transport Canada	Agnico Eagle provided a list of water crossings for the Phase 1 AWAR and requested a navigability determination for each from Transport Canada. Subsequently, a navigation evaluation was prepared for small streams, lakes, and ponds impacted by the Project
Inuit Impact and Benefits Agreement	Kivalliq Inuit Association	impacts are compensated and benefits provided to Inuit
Water Compensation Agreement	Kivalliq Inuit Association	compensation for Inuit Water Rights under NLCA Section 20
Right-of-way Lease	Kivalliq Inuit Association	allows right-of-way for AWAR across Inuit lands
Land Use Permit	Rankin Inlet and Community and Government Services	allows construction of the bypass road on municipal land
Right-of-way Lease	Rankin Inlet and Community and Government Services	allows right-of-way for AWAR and bypass road located on municipal lands
Quarry License	Kivalliq Inuit Association	various quarry and borrow pit sites on Inuit Owned Land along the right-of-way for building the road to the proposed mine site and infrastructure pad.
Explosive Magazine Permit Renewal	Workers' Safety and Compensation Commission	permits an explosive magazine on-site and at other approved locations
Class 2 Permit for Heritage Sites (obtained by qualified professional archaeologist)	Department of Culture, Language, Elders and Youth	unavoidable impacts of roads on heritage sites have been mitigated

Amendments to the *Navigable Waters Protection Act* came into force in April 2014 as part of the Federal Government's 2012 Bill C-45. In part, these amendments:

- Changes the name of the *Navigable Waters Protection Act* to the *Navigation Protection Act*;
- Includes a schedule, which clearly lists the major waterways for which regulatory approval is required prior to the placement or construction of a work;
- Allows proponents of works in non-scheduled waters to opt-in and seek approval of their proposed work to give them additional legal certainty; and
- Expands the list of low risk works (e.g., minor repairs on bridges) that can be pre-approved because they pose very little impact on safe navigation.

Schedules listing major waterbodies requiring regulatory approval include Schedule 2 Part 1 – Oceans and Lakes, and Schedule 2 Part 2 – Rivers and Riverines. Schedule 2, Parts 1 and 2 do not include any waterbodies found within the Project's footprint. As such, all are non-scheduled waterbodies and Agnico Eagle undertook an assessment to determine navigability.

Using the *Navigation Protection Act*, Agnico Eagle assessed the navigability of the small lakes, ponds and streams within the Project's footprint through the following questions[3]:

- Are the waterbodies within the Project's footprint capable of being navigated by floating vessels for the purpose of transportation/recreational use?
    - If the answer is "no" to this question, the waterbodies are not navigable.
    - If the answer is "yes", then additional questions were asked.

- Is there a public right to travel?
- Is there any historical use of the waterbodies for navigation?
- Is there any proposed future use of the waterbodies for navigation?
- Is the waterbody part of a navigational network or transit route to other waterbodies?
- Is the waterbody a self-contained route for fishing or recreation?
- Will Agnico Eagle's roads offer access to waterbodies with the Project's footprint?

Based on these questions, Agnico Eagle determined that:

- Navigation of streams found within the Project's footprint is not feasible;
- Navigation to and between waterbodies is not feasible;
- The waterbodies within the Project's footprint do not form part of a navigational network or transit route;
- There is no evidence of historical use of the waterbodies for navigation or recreation; and

[3] The questions being asked are in part based on the *Draft Working Framework for determining a Navigable Water under the Navigation Protection Act* prepared by Transport Canada.

- There is no anticipated future use of the waterbodies for navigation.

At this time, Agnico Eagle does not believe that the small lakes, ponds, and streams within the Project's footprint are navigable waterbodies. Agnico Eagle does recognize that Meliadine Lake, Meliadine River, and Melvin Bay[4] as navigable waterbodies.

[4] The port of Itivia is located in Rankin Inlet at Melvin Bay, which is part of Hudson Bay.

SECTION 3 • RELATED DOCUMENTS

Final Environmental Impact Statement documents and documents submitted in support of the Water Licence Application that provided input to the Roads Management Plan include the following:

- Terrestrial Environment Management and Monitoring Plan (Agnico Eagle 2014a);
- Spill Contingency Plan;
- Occupational Health and Safety Plan (Agnico Eagle 2014b);
- Preliminary Closure and Reclamation Plan;
- Borrow Pits and Quarries Management Plan; and
- Dust Management Plan (Appendix C).

The Plan is part of the Environmental Management and Protection Plan for the Project and will be in effect during the construction, operation, and closure of the Project. The Dust Management Plan is presented in Appendix C of this Plan.

SECTION 4 • CONSULTATION

Consultations on the road route with the community of Rankin Inlet, Inuit Elders, Kangiqliniq HTO and KIA were ongoing from as early as 2004. A chronological record of consultation on the AWAR is provided in Appendix A. Extensive details on all consultation for the Project can be found in the Public Engagement and Consultation Baseline Report. In Agnico Eagle's June and August 2014 Kivalliq community consultations, concerns with the AWAR or the bypass road were not raised.

On several occasions in 2013, Agnico Eagle met with the KIA and with the Rankin Inlet HTO to discuss how the Phase 1 AWAR should be managed and to develop a plan on how limited public access would be provided. The HTO told Agnico Eagle that they believe the AWAR should be open to unlimited public access but acknowledged that for Phase 1, the AWAR must be operated with controlled, limited public access until NIRB has the time and opportunity to assess the impact of such open public access. In the interim closure, Agnico Eagle and the HTO discussed how to control and manage limited public access on the Phase 1 AWAR beginning in the summer of 2014. It was agreed that access be limited to ATVs only unless otherwise permitted and be via a pass system where the HTO has involvement over who is granted a pass. Agnico Eagle and the HTO have also been discussing a program that would see the HTO provide wildlife monitoring services for Agnico Eagle along the Phase 1 AWAR. In 2016, 3 meetings were attended by Agnico Eagle personnel at the KHTO meetings. Agnico provided the KHTO with offers and opportunities to assist in the AWAR road surveys. Agreement on this program still remains to be concluded with KTHO. In 2017, Agnico will continue communicating with KTHO to engage the organization in assisting in these programs.

Agnico Eagle presented its proposed management procedures for the AWAR, along with options for the proposed further development of the Rankin Inlet by-pass road at public meetings held in Rankin Inlet in 2012 (mid-October) and 2013 (mid-February).

There were some elders who would have preferred the AWAR be built using a different alignment that ran west of the Iqalugaarjuup Nunanga Territorial Park and then cut north towards the Project. This would have given them better access to the Diana River and traditional hunting and fishing area to the northwest. Agnico Eagle explained that this was a much longer route as it moved away from the site (i.e. was not a straight line to the Project site) and involved more water crossings and was thus not an acceptable route from Agnico Eagle's needs and perspectives. The community spoke to its preference to the Rankin Inlet by-pass route going along the southwest side of the Rankin Inlet airport and not along the northeast side as proposed in one option by Agnico Eagle. This option placed the by-pass road in conflict with the entry to the airport terminal and future housing development areas.

At the NIRB's technical meeting and pre-hearing conference in early December 2013, road issues were raised by various Kivalliq communities. Unrestricted road accessibility to Inuit, road interactions with

caribou, peregrine nests, dust control, what happens to the roads upon closure, and fuel transport were all raised as concerns.

4.1 Upcoming Consultations Prior to Opening the All-weather Access Road to Public Use

Agnico Eagle wants to meet the expectation of Rankin Inlet residents in opening the AWAR to public use. However, Agnico Eagle shares the concerns of others that all AWAR users need to abide by 'rules of the road' to protect their own safety and that of others. While Agnico Eagle will maintain the AWAR in good operating condition and close it when poor driving conditions prevail, it will be incumbent on all organizations and the public to share in the responsibility in educating AWAR users in safe and responsible road use. This could be as simple as leading by example to participating in developing and endorsing the rules of the road.

Prior to the opening of the All-weather Access Road to public use, Agnico Eagle will:

- Undertake extension consultation with the KIA, HTO, residents of Rankin Inlet, and the Hamlets of Rankin Inlet and Chesterfield Inlet with the purpose of developing rules of the road and safety requirements for public use of the AWAR;
- Update this Plan, with particular emphasis on public safety, and submit it to the Nunavut Impact Review Board, KIA, HTO, the Government of Nunavut (GN), Nunavut Water Board (NWB), Hamlet of Rankin Inlet and authorizing agencies;
- Prior to opening the AWAR to the public, hold community meetings to go over the rules of the road and impress on all potential AWAR users their responsibility for their own safety and that of others in using the AWAR safely; and
- Place signs emphasising safe use of the AWAR at strategic locations along the AWAR.

The rules of the road will be posted on community bulletin boards; and on a quarterly basis, read over the community radio and placed on the local television station. Agnico Eagle will also post them on its Nunavut web site.

4.2 Road Use by Nunavummiut and Other Developers

The AWAR partly covers existing ATV and snowmobile trails, which were used as access to traditional areas for hunting, fishing, and recreation in the Meliadine Lake, Machum Lake, and Twin Lakes areas. Agnico Eagle is unaware of any possible future developments near the Project that could make use of the access and/or service roads.

It is Agnico Eagle's responsibility to decommission and reclaim the roads once its activities in the area are complete. For a third party to take over the road(s), that third party would have to complete its own arrangements with the landowners (the KIA and the Hamlet) and then complete its own environmental assessment and permitting process covering future use. Agnico Eagle does not own the land on which the roads are constructed and, thus, cannot transfer future ownership or use privileges to any third party. Agnico Eagle must complete its obligation to decommission and reclaim

all roads unless directed otherwise by a combination of the landowners and other regulatory agencies who issued permits/authorizations for the roads.

4.3 Use of Inuit Qaujimajatuqangit in the Planning of the Roads Management Plan

Inuit Qaujimajatuqangit (IQ) is the most successful and oldest monitoring practice in Nunavut, where the resource users do the observing or monitoring. Information collected through IQ can contribute to mine design and planning, as well as monitoring activities. Agnico Eagle is committed to including IQ and public concerns raised through IQ, where practical, in the design of management and monitoring plans for the Project. Agnico Eagle will continue active engagement with communities and Inuit organizations as the Project proceeds through permitting, and if approved, construction, operations, and closure. Additional IQ collected through consultation and engagement will be included in updates to the design and implementation of environmental programs.

The Road Management Plan considered IQ (including TEK, TLU) and concerns regarding Project effects on traditional resources and traditional land use sites through the following Project design and mitigation measures:

- In allowing public access on the AWAR, Agnico Eagle took into consideration that the area in the vicinity of the Project will continue to be used for traditional purposes during the construction, operation, and closure phases of the Project.
- Access to traditional use sites are being mitigated by constructing ramps and installing signage along Project roads to facilitate road crossings for existing ATV and snowmobile trails. Snow clearing takes into consideration the location of snowmobile trails such that they are not blocked, and snowmobile crossings are identified with signs identifying the location of the trail prior to snow removal.
- The proposed Itivia laydown yard was designed to avoid impacting the existing snowmobile trail so that local residents can continue to access the sea ice at Melvin Bay.
- Elders expressed the greatest concern regarding potential effects of the Project on caribou including road construction and motorized vehicles potentially limiting or altering their movement patterns, and the potential for overhunting to occur as a result of increased access to caribou migration routes and calving grounds. Agnico Eagle will consult the Government of Nunavut, the KIA, the Kivalliq Wildlife Board, local HTOs, and the public in developing appropriate monitoring and mitigation measures related to the ease in harvesting of caribou afforded by the AWAR. The result of these consultations will be a Road Access Management Agreement (see Section 10.2).
- IQ indicated that land mammals including Arctic fox, wolverine, and wolf are important traditional resources for harvesting, and community concerns were raised regarding the potential effects of snowmobiles, and the potential of road construction creating barriers to

wildlife movement. The routing and design of the AWAR and service roads were selected to minimize potential Project effects on the environment, including to wildlife movement. Potential adverse effects to wildlife abundance or movement were considered in setting the rules of the road, including setting maximum speed limits and ensuring wildlife has right-of-way on the roads, wildlife will not be harassed and hunting is prohibited within 1 km of the AWAR. Furthermore, locations of large aggregations of animals will be reported and all incidents between vehicles and wildlife will be reported and investigated. Finally, a wildlife monitoring program will be implemented with input from the local stakeholders to record the species, numbers and location of wildlife observed along the roads, with particular focus on caribou, muskoxen, bears, wolves, migratory birds and raptors.

- Community concerns were also raised regarding the potential for the Project to change the land and water, subsequently impacting the diet of land animals. There was also concern that road construction could affect environmental stability and contaminate water. IQ also indicated that berry harvesting is an important activity in the area, and community members expressed concerns over dust that could impact the health of both water and vegetation. These concerns were considered in proposing the following mitigation measures and protocols to be implemented during construction and operations to preserve wildlife, prevent permafrost degradation, control surface runoff and sedimentation, and mitigate dust:
    - Sedimentation and erosion control measures will be implemented prior to the start of work and maintained until after all disturbed areas have been stabilized; and
    - Regular inspection of the roads will be conducted to identify areas of ponding, erosion or sedimentation.

- IQ indicated that the rivers and Meliadine Lake are considered important fish harvesting sites, and community concerns were raised regarding potential contamination of waterbodies in the entire Meliadine watershed, and for potential adverse effects to fish and other traditional resources. Accordingly, to protect fish spawning and nursery periods of local fish populations, no in-water work will take place from May 1st to July 15th. In addition, areas where dust deposition could impact fish habitat and/or water quality, mitigation measures will be implemented, including grading of the road surface, placement of new coarser topping, and/or watering/addition of $CaCl_2$ on the road surface.

- IQ has indicated that the entire Meliadine valley, including Iqalugaarjuup Nunanga Territorial Park, has a long history of traditional use and many important cultural sites. To mitigate the potential for disturbance to cultural sites, all employees or contractors are not allowed to construct any side roads/trails off the west side of the AWAR between Km 1 and Km 8, and regular road inspections will occur to ensure that no unauthorized trails or access routes leading from the AWAR into the Park are being created. In addition, Agnico Eagle and GN-DoE Park staff will work together to discuss what other measures can be taken to prevent

unauthorized access into the park, including potential signage, public education and the placement of barriers.

- To prevent potential ice buildup at the lower Meliadine River crossing bridge resulting in flooding of important cultural sites upstream from the bridge, regular inspections and monitoring will occur so that potential risks to cultural sites can be mitigated.

SECTION 5 • MEASURES TO PREVENT PERMAFROST DEGRADATION

Roads have been designed with a minimum fill thickness to maintain permafrost conditions within the subgrade soils. The thermal modelling indicated a minimum road fill thickness of 1 m is required above ice poor subgrade soils to maintain the soil in a frozen condition year round. Similarly, a minimum road fill thickness of at least 1.3 m is required above ice rich subgrade soils.

To the greatest extent possible, roads will be constructed in the winter when the subgrade soils are frozen to prevent insulation of thawed subgrade soils. A rough base would be advanced at the full road width so that the base of the roads is laid down in winter frozen ground conditions. The stream crossing culverts would also be installed in the winter. Once the rough base and stream culverts are installed, the remainder of the construction will be completed by building up the rough base primarily under winter conditions, and placing the final topping materials during the spring and early summer.

Mitigation and environmental design features to reduce the potential for permafrost degradation are as follows:

- Road alignments avoid, where possible, fine-grained, poorly drained, ice-rich, frost susceptible soil conditions as noted by geomorphologic mapping, due to their susceptibility to thaw related settlement;
- Regions of high ground relief (higher elevations) are sought to provide better drainage conditions, to minimize the potential for snow drifting on the road and to avoid organic depressions and/or other poor ground conditions, which are more abundant in the low lying areas;
- Road fill material will be placed directly over the existing soil layer without cutting, stripping, or grubbing to avoid disturbing the subgrade soils;
- Thick drifted snow will be removed before road fills are placed;
- The road fill thickness should be a minimum of 1 m in thaw-stable soils, and 1.3 m in thaw-sensitive soils; and
- Construct access, service, and haul roads in the winter when the subgrade soils are frozen to prevent insulation of thawed subgrade soils, to the greatest extent possible.

The road and its shoulders will be inspected weekly (at a minimum) during the summer period (June to August) for evidence of seasonal freeze and thaw adjacent to the toe of the road embankment. Such movements are expected and may lead to longitudinal cracking and thaw settlement especially for portions of the road founded on thaw susceptible (ice rich) soils. When such areas are discovered, the affected area will be repaired using granular material and/or crushed rock. Agnico Eagle will maintain stockpiles of such material in select borrow/quarry areas along the road.

SECTION 6 • TRAFFIC MANAGEMENT ON ACCESS ROADS

6.1 Management of Agnico Eagle Traffic on the Access Roads

All of the required fuel, supplies, equipment, and workers for the mine will be transported to the proposed mine via the bypass road and AWAR. All drivers transporting these materials and personnel will either be Agnico Eagle employees or employees of contractors directly hired by Agnico Eagle. They must possess a valid driver's license from a Canadian province or territory, for the appropriate class of vehicle, for them to be allowed to operate vehicles on access roads. Agnico Eagle educates all of its employees and all of its contractor's employees on road safety rules during the safety introduction training that occurs when first starting work at the mine site.

All Agnico Eagle vehicles that routinely travel on the access roads are equipped with a radio set to the requisite road frequency. Similarly, contractor's vehicles that routinely travel on the access roads are also equipped with a radio set to the requisite road frequency. Consequently, Agnico Eagle and contractor traffic on the road will always have radio contact with the northern gatehouse, security, and other Agnico Eagle and contractor traffic. This system is used to report any unusual conditions along the roads such as: location of other vehicles, presence of wildlife on or near the roadway, presence of non-Agnico Eagle traffic such as ATVs, snowmobiles or other vehicles on the access roads, special road conditions, and special weather conditions. All Agnico Eagle drivers using the road are required to monitor and report to the northern gatehouse by radio any observed unauthorized or unsafe use of the road.

Once the AWAR is open to unrestricted public access, Agnico Eagle will implement a process to inform the public using the AWAR on how they can communicate with Agnico Eagle in the event of an emergency on the road. Agnico Eagle is hoping that it will be able to establish full cell phone service along the full length of the AWAR at some point in time during the construction phase of the Project and continuing into the operational phase. Thus, the prime mechanism for contacting Agnico Eagle in the event of an emergency will be by cell phone. Once such service capability is in place, Agnico Eagle will take the following action to communicate how the public can contact Agnico Eagle to report an emergency on the AWAR:

- Signage at the Rankin Inlet end of the road and at the mid-point Emergency Spill Response station(at a minimum) will provide the public with the Agnico Eagle phone contact number (probably site security) to which the public can report an emergency along the AWAR.
- Signage near Rankin Inlet will provide the current status of the AWAR, stating whether it is open or closed to public use that day.
- Include this information on periodic public information sessions on the rules of the road and road safety procedures delivered in Rankin Inlet.
- Include this information in periodic community radio and TV announcements.

6.2 Management of Non-Agnico Eagle Traffic on the All-weather Access Road

Agnico Eagle will work with the KIA, HTO, the Government of Nunavut, and the Hamlet of Rankin Inlet to devise a system for unrestricted public access to the AWAR at a future date. Until this system is in place, traffic on the AWAR will be controlled by Agnico Eagle through an unmanned gate at its southern end and a manned gatehouse at its northern end.

The rules of the road[5] developed for the roads will apply to all users of the road, including Agnico Eagle employees, Agnico Eagle contractor employees, and the public. Agnico Eagle will hold public information sessions in Rankin Inlet for AWAR users prior to its opening to unrestricted access, and on a regular basis thereafter (minimum of twice per year). The Government of Nunavut will also be consulted prior to opening the AWAR to unrestricted traffic. A copy of the rules of the road, which will have a strong emphasis on road safety, will be presented at these sessions.

Agnico Eagle will also hold public information sessions in Chesterfield Inlet for AWAR users prior to its opening and on a regular basis thereafter (minimum of once per year). A copy of the rules of the road will be presented at these sessions. This is required because Chesterfield Inlet has now built approximately 17 km of trail/road south from their community towards Rankin Inlet and occasionally drive their ATVs/snowmobiles to Rankin Inlet.

Agnico Eagle will also use other communication tools to get the road access procedures and road safety rules out to the public in Rankin Inlet. These will include community radio, community TV[6], and postings around town, signage near Rankin Inlet, through the Project office in Rankin Inlet, and via an Agnico Eagle Project website. The communication will be in both English and Inuktitut. All non-Agnico Eagle road users will also be encouraged to monitor and report any observed unsafe use of the roads to Agnico Eagle.

6.3 Other Access Control Procedures

There will be occasions when access to the AWAR will be restricted for short time periods for special reasons. This includes bad weather, unsafe road conditions, maintenance activity on the roads, heavy project related truck traffic, movement of oversized loads, and/or presence of large numbers of caribou on or adjacent to the road. The AWAR could also be temporarily closed in the event of an incident, accident or other event requiring mitigation or response. These short-term closures will be required to ensure safety.

In communicating such short-term closures, Agnico Eagle will take the following actions:

[5] See Section 8 for complete details on rules of the road measures proposed for the AWAR.

[6] Notices on rules of the road will be placed on community radio and television a minimum of 4 times a year.

- Agnico Eagle will issue a daily road condition bulletin by means of email to a subscriber list, through an Agnico Eagle website, and through community radio. The bulletin will provide information on current road and weather conditions and on special activity planned for that day on the AWAR.
- Agnico Eagle (with the consent of the Hamlet of Rankin Inlet) will set up and maintain a sign in English and in Inuktitut to be located close to Rankin Inlet on the existing municipal road out to the Char River and the Territorial Park that indicates whether the AWAR is "open" or "closed" at that specific point in time. This will be in place by Q4 2018.
- Agnico Eagle will limit access and, in certain conditions, close the roads to all traffic during bad winter weather (blizzard or white out conditions). In the worst weather, the southern gate on the AWAR near the Char River will be closed and signed accordingly;
- Agnico Eagle will limit access to the AWAR when it is not safe as a result of an accident or a road maintenance problem.
- Agnico Eagle will limit access to the AWAR when large numbers of caribou are near to or crossing the road. This will occur in consultation with the Kangiqliniq HTO.
- Agnico Eagle will work with the GN, KIA, and HTO to establish a one kilometre no shooting zone on both sides of the AWAR to ensure that project workers and all other road users are not inadvertently exposed to the risk of accidental shooting.
- Agnico Eagle reserves the right to refuse access to individuals who do not respect the rules of the road on safety, speed and the no shooting zone when using the AWAR.

The GN Department of Environment (GN-DoE) has expressed a valid concern that there is potential for unauthorized trails/access routes to be created from the AWAR into a designated preservation zone within the Iqalugaarjuup Nunanga Territorial Park at an area to the northeast of the Meliadine River just north of the new Meliadine River Bridge. The AWAR is in close proximity to the park boundary in this location. The GN-DoE have pointed out that such an unauthorized use of this designated preservation zone could cause irreparable damage to the natural and cultural features meant to be protected within this territorial park. Agnico Eagle acknowledges this concern and commits to work with the GN-DoE to reduce/prevent this potential unauthorized access from the AWAR to this part of the Iqalugaarjuup Nunanga Territorial Park.

In this respect, Agnico Eagle will take the following actions:

- Agnico Eagle commits that it will not allow any of its employees or contractors to construct any side roads/trails off the west side of the AWAR between Km 1 and Km 7. Agnico Eagle has no intention of constructing any side roads and/or trails off the designated AWAR corridor at any point along its length, and if so, additional regulatory approval would be needed under the Terms of the Road Use Lease with the KIA and/or Community & Government Services before any side road/trail could be constructed;

- Agnico Eagle will task its Road Supervisor with keeping an eye on this critical section of the AWAR as part of its regular road inspections (as outlined in Section 7 of this Roads Management Plan) with the objective of identifying any signs of unauthorized trails/access routes leading from the AWAR into this area of the Park. If any evidence of unauthorized access trails is discovered, the Road Supervisor will contact GN-DoE Park Staff in Rankin Inlet to inform the GN-DoE Park staff of the discovery and to jointly work on a plan to prevent any further use of such access points. Agnico Eagle would then take the agreed upon measures to implement the plan provided that such measures are reasonable; and
- Agnico Eagle will meet with GN-DoE Park staff to jointly discuss what other measures can be taken to dissuade/prevent such potential unauthorized access into this area of the Park (e.g. possibly signage, public educational measures, placement of barriers, etc.). Agnico Eagle will then implement the agreed upon measures. Agnico Eagle will continue to periodically meet with GN-DoE park staff (at least annually, but more frequently if required) to discuss protection of this designated preservation zone within the Park.

6.4 Projected All-weather Access Road Traffic between Itivia and the Proposed Mine

Agnico Eagle and contractor traffic on the AWAR between Itivia and the mine site is not expected to vary as much as public traffic between summer and winter. Table 6-1 provides the projected traffic for the bypass road and AWAR.

Agnico Eagle and contractor vehicles expected to use the road will include, but not be limited to: pick-up trucks, cube vans, buses, fuel trucks, tractor-trailers, snowplows and graders. However, the amount of traffic will be highly dependent on the level of activity on site and the time of year, such as when supplies and materials arrive by sea, as well as on the weather. Also, should flights not be able to get into Rankin Inlet, passenger vans/buses would only transport local employees to the mine site, which would reduce the number of vans/buses by half.

Summer traffic is expected to be moderately higher than winter traffic as more contractual work can be expected over the summer. Fuel deliveries and passenger van/bus traffic are not expected to vary a great deal between winter and summer.

Table 6-1 Estimated Average Daily Traffic on the All-weather Access Road

Type of vehicle	Winter		Summer	
# of vehicles	Week Days	Weekends	Week Days	Weekends
Mine-Related Traffic				
Pick-up trucks	10-12	4-8	12-14	6-10
Cube vans	4	1	4	1
Passenger vans/buses	2	1	2	1
Fuel trucks[(a)]	2	2	2	2
Transport trucks[(b)]	1	1	6-14	6-14
Public Road Use				
Pick-up trucks	4-6	2-4	6-8	12-16
ATVs/snowmobiles	4-8	4-10	10-16	10-20

[(a)] Transport of fuel will be continuous, year round. A fuel truck will carry on average 45,000 litres.
[(b)] Transport of dry goods from Itivia will largely take place over a 4-month period, from August to November.

Projected public traffic on the access roads has greater uncertainty as it will be weather dependent. Agnico Eagle estimates that 25-50% of the anticipated trips will be incremental to current access, which is by ATVs and snowmobiles. During periods of mild weather, more traffic can be expected as those living in Rankin Inlet may travel up the AWAR for a day of fishing, hunting, berry picking, or other leisure activities. During poor weather conditions, public traffic on the road can be expected to drop significantly and it is likely that no public access will occur during such conditions.

During the Phase 1 operation of the AWAR, Agnico Eagle will collect information on traffic volume on the road on a daily basis. The survey information will record the number and types of mine vehicles, and the number and types of public vehicles using the AWAR over a 12-hour period, typically from 8:00 AM to 8:00 PM. The surveys will gauge the accuracy of the predictions contained within Table 6-1. The survey results will form part of Agnico Eagle's annual report.

SECTION 7 • INSPECTION AND MAINTENANCE OF ACCESS, SERVICE, AND HAUL ROADS

Agnico Eagle recognizes that inspection precedes maintenance, and believes that a thorough inspection program will lead to the early identification of areas of the roads where improvements are necessary. The early resolution of any deficiencies will result in less ongoing maintenance and repair of the driving surface and water crossings.

Agnico Eagle has the sole responsibility for the ongoing inspection and maintenance of all of the components of the access, service, and haul roads, including road beds, bridges, culverts, and borrow/quarry sites used in the construction and maintenance of the roads. Agnico Eagle will apply the experience that it has gained from the ongoing operation of the Meadowbank All-Weather Road, which has now been in operation for eight years. This experience will be applied in the planning of day-to-day operation, inspection, and maintenance of the Project roads. Agnico Eagle has a road supervisor who is responsible for the ongoing road inspection and maintenance of the access, service and haul roads. The operation and maintenance of all roads will apply the same principles.

The road supervisor conducts periodic inspections (minimally on a weekly basis) of the roads to ensure that the roads are maintained for safe travel of personnel, equipment, and supplies. These inspections are recorded, including deficiencies which are followed up by a corrective plan. These periodic inspections include an inspection of the bridge abutments and a visual observation of the road surfaces to assess the status of road foundation.

During the summer period (June to August), the road surface is maintained with fresh gravel being spread as required and regular grading of the road. By September, the road starts to freeze; therefore, gravel is added for safety reasons. Snow clearing and road sanding along the road are done to operate vehicles on roads safely. The manner in which the snow is cleared will also take into account the road configuration to avoid snow accumulation that could cause problems during the freshet or block snowmobile trails.

All roads are inspected for signs of accumulation of ponded water either on the road surface or along the sides of the road. Where noticed, the Agnico Eagle road supervisor will evaluate and monitor the accumulation to determine why water is accumulating in these areas. Based on these evaluations, the road supervisor will take remedial action where and when necessary to correct the cause of such ponding, such as grading of the road surface to remove areas of ponding or installation of additional culverts if the road is causing excessive water ponding.

7.1 Sedimentation Control

7.1.1 Construction

Various mitigations and best practices that will be followed during the bypass road construction to control sedimentation are as follows:

- No in-water work will take place from May 1st to July 15th, to protect fish spawning and nursery periods of local fish populations; this would apply to all stream crossings;
- Sediment and erosion control measures will be implemented prior to the start of work and maintained during the work phase to prevent entry of sediment into water or the movement of re-suspended sediment into the stream crossings;
- Sediment and erosion control measures will be left in place until all disturbed areas have been stabilized;
- All disturbed areas will be physically stabilized as soon as possible following construction using rock and/or vegetation;
- Machinery used near stream crossings or working within the drainage of Nipissar Lake will arrive on-site in a clean condition and be maintained free of fluid leaks to keep contaminants out of the drainage basin;
- The equipment will be re-fuelled, serviced, and washed away from the stream crossings to prevent deleterious substances from entering the water. Fuel, lubricants, hydraulic fluids, etc., will not be stored within 31 m of the high water mark of any waterbody, and will be kept in an area where spillage can be contained, and in a manner inaccessible to all wildlife; and
- An emergency spill kit will be kept at the work site in case of fluid leaks or spills from machinery.

In addition to those listed above, the following mitigation measures will be used to minimize potential effects on water resources should road construction activities occur in non-winter months:

- Regular inspection of the road to identify areas of ponding, erosion, or sedimentation, will be conducted;
- Construction runoff will be captured and managed to minimize suspended solids in the watercourses, where applicable; and
- In-stream construction work will be avoided, or limited, to the minimum extent possible.

7.1.2 Operation

During the operational phase, routine periodic inspections of the AWAR and bypass road will continue to be conducted as discussed previously in this Section. These inspections will include looking to identify areas of ponding, erosion, or sedimentation. If identified, any such areas will be addressed using the same mitigation measures described in this section for the construction phase.

7.2 Watercourse Crossings Inspections and Maintenance

The watercourse crossing inspection and maintenance program has three main components:

- A regular inspection program to identify issues relating to watercourse crossings, such as structural integrity and hydraulic function;

- An event inspection program to track the impacts of large storm events on watercourse crossings, such as structural integrity and hydraulic function; and
- A culvert location inspection program to ensure that culverts have been installed in the right locations with respect to the watercourse and that culvert capacity is adequate to ensure that the culvert(s) pass the water under all hydraulic conditions. In most cases there will be multiple culverts installed at different elevations at each stream crossing to ensure that these culverts can adequately pass normal summer flows as well as spring freshet and heavy rainfall flows.

7.2.1 Regular Crossing Inspection and Maintenance

Just prior to spring freshet, all culverts and stream crossings (including the bridge crossings at the Char River, lower Meliadine River and at the M5 Bridge (see Figure 1-1) will be inspected to confirm that they are in a state that will allow them to accommodate the rapid spring thaw that is seen in the north. During the freshet period, crossings inspections will be performed twice a week (mid-May through June) and weekly during the remainder of the ice-free period prior to fall freeze-up (July through October).

These inspection activities for each watercourse crossing will consist of:

- Visual inspection of its infrastructure to identify defects, cracks or any other risks to structural integrity. Particular attention will be paid to the inlet and outlet structures of culverts, and to bridge abutments and their foundations, as required.
- Visual inspection to identify sediment or other debris accumulation impeding the free flow of water through the crossings. Maintenance operations will consist of hand removal of accumulated debris and repairing damages as soon as possible.
- Visual inspection of upstream and downstream channel to identify bed erosion or scour around the watercourse crossing structure. Particular attention will be paid to bridge abutments and abutment foundations as they will be vulnerable to scouring and erosion during flood events. Particular attention will also be paid to potential sources of sediment transport at the crossing.

Inspection results will be recorded by Agnico Eagle to help track changes in conditions over time. Maintenance operations will consist of undertaking remediation of any detected problems and repairing damage as soon as possible.

7.2.2 Archaeological Sites and Ice Buildup

Agnico Eagle acknowledges that the GN Territorial Archaeologist has concerns that potential ice buildup at the site of the lower Meliadine River crossing bridge can cause water to back up and flood important archaeological sites upstream from the bridge in the Iqalugaarjuup Nunanga Territorial Park. Agnico Eagle has committed to work with the GN to inspect and mitigate where possible such

risks. To this effect, Agnico Eagle has committed to provide copies of its twice weekly inspections at the lower Meliadine River Bridge to the GN Territorial Archaeologist in the spring/early summer freshet period via email or fax. The intention is to allow both Agnico Eagle and the GN Territorial archaeologist to monitor for this potential risk, specifically for the purpose of taking appropriate action in a timely manner should ice buildup reach the point where these sites are at risk of flooding. The intent is for action to be taken prior to harm being done. The action plan would be developed and implemented by Agnico Eagle in consultation with the GN.

Agnico Eagle has agreed to work with the GN to develop other protective measures to protect important archaeological sites upstream of the Meliadine River Bridge within the Iqalugaarjuup Nunanga Territorial Park if it is shown that these sites continue to be damaged by flooding caused by ice and snow accumulation at the bridge.

7.2.3 Event Crossing Inspection and Maintenance

Inspection frequency will increase just after heavy or prolonged rainfall storm events. Visual inspection of each watercourse crossing will be completed to identify potential risks to the crossing's structural integrity, debris accumulation, and whether erosion and scouring have occurred. Water accumulation along the road will also be monitored. Results will be recorded by Agnico Eagle to help track changes in condition over time. The remediation of any detected problem and any necessary damage repairs will be undertaken as soon as possible, under the direction of Agnico Eagle's road supervisor.

7.2.4 Culvert Location Inspection

Following their installation, the culvert crossings will be visually inspected to confirm they have been properly executed and installed. These culverts will initially be installed during winter conditions and thus it is possible that a culvert will not be sited correctly to pass all ponding of water through the road. The intent is to check for such conditions during the first snow melt and after rain events so that adjustments can be made accordingly. Additional culverts will be installed, if necessary, should the inspection indicate that the culverts were installed in a location that does not optimally route water flows.

7.3 Snow Removal and Snow Management – Winter Maintenance

Sections of the Meliadine roads are expected to experience snow drifts because of strong winds over the winter period[7]. As much as possible, this snow will be cleared to the downwind side of the road to limit the wind re-depositing the same snow on the cleared road. Routine spring snow management

[7] This has been the experience along the AWAR where significant snow accumulation occurs at one location on municipal land known as Apache Pass.

will include the removal of any snow that accumulates at bridges and culverts so that water at freshet can move freely through the culverts and under bridges. In the case of culverts, snow will be removed from both ends but not from the inside.

Where snowmobile trails cross the road, snow clearing will be mindful of not placing snow on the trails thereby making crossing the roads easy.

The report, "Preliminary Snow Drift Assessment of the Meliadine All-Weather Road from Rankin Inlet to the proposed mine site, Nunavut" (Golder Associates 2011c) provides an assessment where snow drifts can be expected. It states:

> *"Observations seem to indicate that snow drifts can be expected on the lee of short, steep slopes and along lake shores."* and
>
> *"Maintenance will be required during operations to manage snow accumulation along the road alignment; however, most of the alignment appears to be located along the windward slopes and ridge crests where there should be a limited tendency for snow to build up."*

The design of the AWAR between the proposed mine site and Rankin Inlet factored in snow accumulation and this is one of the reasons the road is located along the height of land as much as possible and has a northerly alignment.

Dangerous ice formation on road surfaces, including the AWAR, is expected to occur periodically leading to their temporary closure until they can be graded and/or sanded. These procedures are employed at Meadowbank and were adopted for the Project. Road sanding and grading equipment is available at Meliadine to address icy road conditions.

7.4 Dust Suppression

The Dust Management Plan in Appendix C addresses in detail the actions that Agnico Eagle will take to suppress dust generated by road traffic during the non-winter months when dust becomes an issue. Particular attention will be paid to the dryness of the bypass road surface, the number of vehicles, weight and speed, and maintenance road near Nipissar Lake where dust suppression will be a priority.

In general, the amount of dust generated along a road is dependent on the driving surface. Regular grading of the roads combined with the addition of granular material to the driving surface will be needed. This will improve road safety and reduce the amount of dust. Dust will also be mitigated by maintaining posted speed limits.

In areas or times identified by the Agnico Eagle road supervisor as being prone to high dust levels, where safe road visibility is impaired, or in areas where dust deposition could impact fish habitat and/or water quality, the road supervisor will arrange mitigation measures as appropriate. This could involve actions such as grading of the road surface, placement of new coarser topping, and/or

watering of the road surface. Use of chemical dust suppressants will be only used as a last resort and only in accordance with the Guideline for Dust Suppression on Unpaved Roads published by the Government of Nunavut Department of Environment (GN 2014).

Dust control measures along the AWAR, service and haul roads, and travel surfaces such as yards at the mine site have been identified by the community of Rankin Inlet as an important health concern[8].

[8] Following the technical review and community roundtable sessions held by the NIRB on the Draft EIS, NIRB directed Agnico Eagle to prepare a Dust Management Plan for inclusion with the Final EIS. This plan was prepared and attached as an appendix to the Roads Management Plan and can be found in Appendix C. It was updated following receipt of Final Hearing Report.

SECTION 8 • ROAD SAFETY

Agnico Eagle security personnel along with Agnico Eagle's road supervisor monitor activity on all roads through radio contact with both staff at the gatehouse and drivers on the roads, and through periodic patrols of the roads. All Agnico Eagle and contractor vehicles that routinely travel on the roads are equipped with a radio set to the requisite road frequency (Section 6). This radio system will be used to report any unusual conditions along the roads such as:

- Location of other Agnico Eagle vehicles;
- Presence of wildlife on the roadway;
- Presence of non-Agnico Eagle traffic such as ATVs, snowmobiles, or other vehicles;
- Non-Agnico Eagle vehicles broken down on the roads;
- Any unsafe practices noticed;
- Any special road conditions; and
- Any special weather conditions; etc.

Agnico Eagle will work to develop partnerships with the residents of Rankin Inlet, community organizations, and government departments in developing rules of the road, and educating the non-Project related users on road safety, on good driving practices, and on influencing people's behaviour on the roads. Emphasis will be directed to the use of helmets, seat belts, observing the posted speed limits, improving one's visibility by wearing reflective clothing when on a snowmobile or ATV, not drinking and driving, dealing with driver inexperience, etc.

These are the same safety rules that will apply to all users of the roads, including Agnico Eagle employees, Agnico Eagle contractor employees, and public users of the roads. The rules of the road include but not limited to the following:

- Maximum speed limits:
    - on AWAR: 50 km/h;
    - on the bypass road: 30 km/h;
- Use of seat belts by all drivers and passengers is mandatory;
- Driving under the influence of alcohol or intoxicating drugs is prohibited;
- Wildlife has right-of-way on the roads, and no harassment of wildlife is allowed;
- All hunting activity must avoid shooting across the road and should respect a safe shooting distance from the road (suggested at 1 km);
- Hunting is prohibited within 1 km of the AWAR and the Project;
- Vehicles are not to park on the travelling surface of the roads but pull off the road at a safe location such as passing turnouts to prevent accidents (passing turnouts are spaced approximately every 400 ± 50 m along AWAR length); and

- No public traffic is allowed within mining areas; these are industrial work sites and, thus, non-Project related vehicles will be stopped at the gate. Signs will be posted warning of an upcoming gate[9].

Agnico Eagle will hold public information sessions in Rankin Inlet for users of the roads prior to the roads opening and on a regular basis thereafter (minimum of twice per year). The rules of the road and safety considerations will be presented at these sessions, and modified if necessary based on broad and frequent consultation.

Agnico Eagle will also use other communication tools to get the road access procedures and rules of the road and safety considerations out to the public in Rankin Inlet. These will include community radio, community TV, and postings around town, signage near Rankin Inlet indicating whether the AWAR is open, through the Project office in Rankin Inlet and via the Agnico Eagle Project website. The communication will be in English, Inuktitut, and French.

Agnico Eagle has placed an emergency spill response trailer at km 7 and km 18 along the AWAR. The station will have the necessary spill response supplies to address any spills that occur along the road in an emergency situation.

8.1 Road Signage

Agnico Eagle has posted appropriate road signs along the roads in both English and Inuktitut. Typically, signs will advise drivers of the posted speed limit, of approaching bridges, of approaching curves, and/or areas of lower visibility (blind hills or obstructed curves).

English and Inuktitut signs are posted at the southern and northern ends of the AWAR, and at an appropriate mid-point to advise any public travelling by snowmobile or ATV that they are entering an area that may be potentially hazardous due to the presence of heavy vehicle traffic. This recognizes that snowmobiles and ATVs can enter and leave the road from any point along the roads. Signs will also be posted to advise the public that they are approaching the gate at the northern end of the AWAR where public access is not allowed. This will be just before entering the proposed mine site, where heavy industrial activity and large vehicles can be expected. Both ends of the bypass road will have an automatic gate with signs indicating it is not open to public access.

Speed limit signs are posted at intervals of approximately every 5 km along the roads. Reflective flags are installed along one side of the roads to help drivers identify the road shoulder during blizzard, white-out conditions or dense fog. Typically, these flags will be black in colour to help them stand out

[9] A manned gate will be installed on the AWAR near the proposed mine site.

in white-out conditions, and are nominally set at intervals of 100 m to 200 m apart. Kilometre markers are posted at intervals of at least 1 km along the roads.

A list of road signage on roads is presented in Table 8-1.

Table 8-1 Road Signage

Element	Location
Safety precautions and users advice	at the southern and northern ends of the AWAR, and at an appropriate mid-point
Stop signs	where required at road junctions
Give way	at haul and service road junctions
Blind hill	200 m ahead of the beginning of a blind hill
Speed limit	nominally at 5 km intervals
Curve	200 m ahead of a curve
Bridge announcement	200 m ahead of a bridge
Bridge side sign	On each side of the bridge
Flexible delineators (flags)	nominally at 100 to 200 m intervals
Kilometres markers	nominally at 1 km intervals

8.2 Policing of Rules of the Road

As privately operated roads, responsibility for “policing” will not fall to the RCMP. Responsibility for all operating and maintenance activity on roads will rest solely with Agnico Eagle. For the access roads, Agnico Eagle will concentrate on raising public awareness and commitment to road safety, and improving communication, cooperation and collaboration among all stakeholders on the safe use of the roads. For all roads, all Agnico Eagle employees and its contractors who will use the roads will be required to take road safety training before being allowed to access the roads.

Agnico Eagle uses its road supervisor and site security to monitor what is occurring on the roads. They monitor activity on the roads through radio contact with the staff at the gatehouse, through periodic patrols of the roads, and in conversation with drivers on the roads at the time. Agnico Eagle monitors speed limit infractions by direct observation of drivers seen driving too fast and by recording the time taken to drive between the Project and the Hamlet. Agnico Eaglealso relies on radio contact with all Agnico Eagle and Agnico Eagle contractor vehicles on the roads to monitor unsafe conditions or activity. Agnico Eagle records unsafe practices, warns the person causing the infraction, and in severe or repeated cases of violation, removes all privileges for future access to the roads by an offending driver. In the case when Agnico Eagle is aware of unsafe or illegal activity on the road, the RCMP will be informed.

Regulatory inspectors can inspect the roads and any associated infrastructure at will. Agnico Eagle abides with the recommendations and directives provided by the inspectors.

However, the *Criminal Code* of Canada applies to private roads. For example, if an accident were to occur on a road and alcohol was involved, that person could be charged by the RCMP. Under their current mandate, while the RCMP is not responsible for policing of the AWAR as it is a privately operated road, the RCMP will have the right to access the AWAR at any time to investigate any accident or incident where they believe there is a need.

8.3 Public Use of Private Roads in Other Jurisdictions

The AWAR is a private road constructed, operated, and maintained by Agnico Eagle. The AWAR covers traditional trails that were openly and continuously used by Inuit for many years. As well, most of the AWAR is on Inuit Owned Land. Agnico Eagle had to obtain land use permits from the KIA. After completion of the AWAR, these land use permits were taken to lease. Agnico Eagle is subject to the terms and conditions of the leases.

Before the construction of the bypass road is complete, Agnico Eagle will meet with all regulatory agencies and the public as it finalizes the rules of the road and this Plan.

SECTION 9 • ACCIDENTS, SPILLS, MALFUNCTIONS, AND EMERGENCY RESPONSE

Emergency response is reactive whereas prevention lowers the frequency of incidents occurring requiring emergency response. Agnico Eagle's emphasis will be on the latter, while at the same time keeping resources nearby to respond to emergencies on the roads in a timely manner.

Three possible causes of road emergencies are the road, vehicle, and people. It is the interplay of these three elements that lead to either safe use of the roads or emergency response. Agnico Eagle is fully responsible for the design, construction, and maintenance of the roads for Project related use, and public use of the access roads. This includes regular inspection and maintenance of transportation infrastructure, including access roads, service roads, haul roads, road crossings, water crossings, signage and the two emergency spill response stations.

Agnico Eagle verify its vehicles are in good working order prior to use. Agnico Eagle, however, has little influence on the condition of the non-Agnico Eagle owned vehicles that will use the AWAR. Vehicles could be poorly maintained and individuals could also make poor decisions such as using an ATV in winter when a snowmobile would be more appropriate. Nonetheless, Agnico Eagle will provide emergency assistance where the health or safety of people is at risk when travelling on the AWAR or on the land near Project facilities. Additionally, Agnico Eagle trains its employees and contractors on road safety and emergency response (first aid, firefighting, spill response, etc.). By educating and protecting its workers, they lead by example in road safety.

While Agnico Eagle feels it can successfully manage the condition of the AWAR and influence what vehicles use it, shaping an individual's responsible driving habits and attitudes to safety could prove more difficult. As a result, Agnico Eagle, in cooperation with Inuit organizations, authorizing agencies and others, will, to the best of its ability, implement all such measures necessary to protect public and mine traffic on all roads open to unrestricted public use. Responsibility and risk comes with driving on the AWAR and Agnico Eagle will:

- Impress on AWAR users that they should always remain aware of what is happening around them as they drive and make responsible decisions about hazards and problems;
- Highlight the environmental and human costs of irresponsible driving habits, and a driver's accountability for his/her decisions; and
- Repeatedly inform AWAR users of the rules of the road.

In 2018, Agnico Eagle will educate the public on road safety, shaping good driving practices and influencing people's behaviour on the roads. Emphasis will be directed to the use of helmets, seat belts, observing the posted speed limits, improving one's visibility by wearing reflective clothing when on a snowmobile or ATV, not drinking and driving, dealing with driver inexperience, etc. This will also include encouraging all drivers to abide by the rules of the road to control speeds and advance

considerate driving. Vests and buggy whips will be available for borrow at the gatehouse (km 7) when accessing the AWAR.

An Agnico Eagle trained site-based emergency response and spill clean-up team[10] are available on site with appropriate equipment to respond to all spills and road accidents. The Emergency Response Team (ERT) are trained in emergency response (firefighting, first aid, mine rescue, spill response, vehicle accidents, etc.). In addition, emergency response equipment and spill kits are carried in all Agnico Eagle vehicles using the roads to improve response in the event of an incident or accident. This equipment includes emergency first aid equipment, and initial spill response equipment. Spill response will be implemented by environmental staff who will advise, document, and report on initial response and clean-up actions. The Spill Contingency Plan will be activated in responding to a spill. Minor spills will be handled safely without the assistance of the ERT using initial spill response equipment carried in the vehicle. Major spills[11] will require the ERT, who will use spill response equipment and supplies maintained by Agnico Eagle at the mine site, from the two emergency spill response stations on the AWAR and/or at Itivia.

In urgent circumstances, where appropriate, Agnico Eagle may request assistance from other parties in Rankin Inlet. However, based on Agnico Eagle's experience with the Meadowbank access, service, and haul roads, Agnico Eagle does not believe that its Project roads will result in any increased demand on local public service providers (i.e., fire, police, ambulance, medical, and maintenance) in Rankin Inlet.

9.1 Accidents and Malfunctions

Agnico Eagle understands that accidents can occur, but the prevention and proposed mitigation measures along the roads, emergency response planning, training, and preparation will substantially reduce the risk, frequency, and severity of such incidents. Agnico Eagle emergency response personnel are tasked with responding to any vehicle accident resulting in personal injury or spillage of harmful material. Agnico Eagle will initiate response and transport to medical assistance at the mine's health centre or Rankin Inlet's medical center. Agnico Eagle staff will follow the procedures in place in Risk Management and Emergency Response Plan. The types of accidents and malfunctions that may occur are as follows:

- Vehicle collisions that may result in personal injury and spillage of potential harmful materials such as fuel, lubricating fluids, and antifreeze;

[10] For more details on emergency and spill response, please refer to the Risk Management and Emergency Response Plan and the Spill Contingency Plan, respectively.

[11] A major spill is defined as an event that cannot be handled safely without the assistance of Emergency Response Team, including all events where a person is injured or contaminated.

- Contact between vehicles and wildlife that may result in harm to wildlife, personal injury and spillage of potentially harmful materials;
- Single vehicle accidents that may result in personal injury and spillage of potentially harmful materials;
- Risk of people getting stuck on the roads in bad weather such as in blizzard, white out or dense fog conditions, or due to mechanical breakdown;
- Risk of accident due to an intoxicated or impaired driver on the roads; and
- Spills of harmful materials onto the land or into water through a vehicle rollover or tipping over.

Agnico Eagle will report all reportable incidents to the appropriate Government authority (e.g., Mines Inspector, RCMP, NWB, NU Spill Line, Environment Canada, GN Department of Environment, Fisheries and Oceans Canada (DFO), KIA, and Hamlet of Rankin Inlet).

The following actions are to be taken in the event of an accident on the roads involving other vehicles (including ATVs), or in the event of an accident involving contact with wildlife such as caribou, muskox, bear, and wolf, the ERT will:

- Check the condition of people involved in the accident and provide immediate first aid if appropriate;
- Call the Meliadine road dispatch by radio and report the location and nature of the accident and indicate the type of assistance required (medical help, environmental cleanup, fire and/or mechanical help);
- Secure the accident site so that the vehicles do not continue to present a hazard to others. This may involve moving the vehicles to the nearest pull off in the event of a minor accident, or blocking off the road in both directions in the event of a more serious accident; and
- If safe to do so, secure the site to prevent continued spill or leakage of contaminants into the surrounding environment.

Upon receiving the accident call, the road dispatch will initiate the emergency response procedure passing along the information to the emergency response coordinator. The emergency response coordinator will then call out the required emergency response personnel to assist at the accident site.

Once the accident site is secured and all people requiring assistance have been removed to medical care, the emergency coordinator will turn the scene over to the mine's safety personnel so that an appropriate accident investigation can be initiated.

In the event of an incident involving contact with wildlife, the road dispatch will notify the site security personnel and the environmental representatives. Security and the site environmental team will then initiate an appropriate accident investigation. The Environmental Department will ensure that

appropriate reporting of such incidents is done in a timely manner to the KIA, the Rankin Inlet HTO, and the GN Conservation Officer in Rankin Inlet.

In the event of a serious accident, the RCMP will be contacted and advised of the incident. The RCMP will then decide on whether they will become involved or take the lead on any subsequent accident investigation.

SECTION 10 • WILDLIFE MANAGEMENT

Wildlife is occasionally expected to be observed on or near the AWAR, service, and haul roads. Caribou and other wildlife will have the right-of-way at all times. In case of problems (e.g., aggregations of caribou), the environmental personnel on-site will be in charge of managing the situation and, with the collaboration of the security department, will advise road users by patrolling the roads. The Project personnel will be notified by dispatch radio if any wildlife is observed on the roads.

The following protocol is implemented on the roads for the protection of wildlife:

- Vehicle traffic speeds on the access, service and haul roads will be limited to 50 km/h;
- Where small to moderate aggregations of caribou (i.e., 1 to 50 animals) are observed within 100 m of a road, travel speeds are reduced to 30 km/h;
- Where large aggregations of caribou (i.e., 50 or more) are observed within 100 m of a road, the protocol outlined in section 10.2 is followed;
- Caribou and all wildlife are given right-of-way on the road: vehicles must stop until the animal is off the road;
- Locations of large aggregations of animals are reported to the road supervisor who will inform all potentially affected employees and the environmental representative, and put the protocol in Section 10.2 into effect. Agnico Eagle's environmental coordinator will then inform the KIA, the Hamlet, HTO, and the GN Conservation Officer in Rankin Inlet;
- All incidents between vehicles and wildlife are reported to the Agnico Eagle road supervisor and the environmental representative whether they are:
    - Near-miss;
    - Collision with injury to the wildlife; or
    - Accidental death.
- Each incident is investigated by the road supervisor and the Environment Department, and measures taken to avoid re-occurrence are put in place. Disciplinary measures will be taken against any employee if the investigation concludes that the accident is the result of negligence; and
- In the case of accidental death of an animal, the Environmental Coordinator will contact the GN Conservation Officer in Rankin Inlet. The carcass will be removed from the road and incinerated to avoid attracting scavengers such as Arctic foxes, wolves, grizzly bears, and/or wolverines.

10.1 Wildlife Monitoring Program

Agnico Eagle has implemented a monitoring program to record on a systematic basis the prevalence of wildlife seen along the roads. This program will be developed further with the input of the local HTO and the KIA. The program will focus on caribou, muskoxen, bears, wolves, migratory birds, and

raptors. Agnico Eagle and the HTO have also been discussing a program that would see the HTO provide wildlife monitoring services.

The current program consists of weekly ground surveys of wildlife observed along the roads. The survey is logged and includes type of wildlife observed, estimate of numbers, and nearest kilometre marking along the roads. The data is aggregated and presented in the annual report for the mine. Complete details on wildlife monitoring can be found in the Terrestrial Environment Management and Monitoring Plan (Agnico Eagle 2014a).

10.2 Road Management Agreement

Agnico Eagle plans to consult the Government of Nunavut, the KIA, the Kivalliq Wildlife Board, local HTOs, and the public in developing appropriate monitoring and mitigation measures related to the ease in harvesting of caribou afforded by the AWAR. The result of these consultations will be known as the Road Access Management Agreement that endorses the following measures:

- During periods when large aggregations of caribou (greater than 50 individuals) are detected within 1 km of the AWAR, the southern gate is closed to public cars and trucks. Public access using ATVs will still be allowed.
- In consultation with the Kivalliq Wildlife Board (KWB), as required under the Nunavut Wildlife Act, Agnico Eagle will seek the establishment of a no-shooting zone (1 km wide) on either side of the road. If the KWB, other agencies and the public are in agreement, AWAR use by hunters will be conditional on observing the 1 km no-shooting zone[12].
- Dedicated 'road monitors' patrol the road to ensure compliance relating to public safety and wildlife. Monitoring is increased during periods of road closure when large aggregations of caribou are present;
- All incidents of hunting involving shooting along or across the AWAR are reported by the Agnico Eagle to the GN.
- During periods when large aggregations of caribou are detected near the Project, harvest monitoring intensity is increased to properly document harvesting levels of caribou.

The roads supervisor, in consultation with the environment coordinator is responsible for ordering the southern gate shut and preventing the use of bridges by ATVs while large numbers of caribou remain on or near the AWAR. Similarly, the roads supervisor, in consultation with the environment coordinator, would open the southern gate and bridges to all traffic once the caribou have moved on.

SECTION 11 • RECLAMATION

Reclamation of the access, service, and haul roads will follow the completion of all mining. Progressive reclamation will, in some instances, lead to roads being reclaimed after they are no longer needed. As described in the Preliminary Closure and Reclamation Plan, the access roads should be one of the last mining components to be reclaimed.

In most circumstances, the AWAR will continue to be open to public access during any temporary closure of the mine. The status of the road during such periods would be assessed by Agnico Eagle on a case-by-case basis. For short duration temporary shutdowns (short-term temporary closure), the AWAR would remain open and be maintained in the same manner as proposed during the operational phase. While each case would be assessed separately, temporary shutdowns of less than 6 months duration would not change the way the access road is operated or maintained. For temporary shutdowns of greater than six months and less than 12 months in duration, and/or for indefinite shutdowns (period of time greater than one year: long-term temporary closure), Agnico Eagle would have to change the way it operates and maintains the road. In such an instance, Agnico Eagle would evaluate what level of activity was expected to continue at the site during the shutdown period and adjust its care and maintenance of the access road accordingly. For example, here are two possible scenarios:

Case 1: Long-term Temporary Closure of the Proposed Mine due to a low Gold Price

Under an indefinite shutdown of the mine due to a low gold price, in this case the duration of the event would be unknown and beyond the control of Agnico Eagle. Agnico Eagle would likely shutdown all mining and milling operations in a progressive manner and put the facilities into a care and maintenance mode with a minimal site presence to protect the integrity of the facilities at the site. In this event, Agnico Eagle would likely suspend winter snow clearing along the AWAR and would significantly reduce summer maintenance. Winter use of the AWAR by public would stop; summer access would still be open but likely limited to ATVs as the road would no longer be maintained to its normal standard.

Case 2: Short-term Temporary Closure of the Proposed Mine

Short-term Temporary Closure is defined as the shutdown of the proposed mine with a defined timeline, less than 1 year mill shutdown. The duration of the event would be known and would be within the control of Agnico Eagle. Agnico Eagle would reduce activity at the site while the mill is rebuilt and/or repaired. In this case, there would be a continued presence on site and thus regular road access would still be required. In this event, Agnico Eagle would likely maintain the road in the same manner as during normal operations with potential extended shut downs during the worst winter conditions. In this event, continued public access to the road would continue as normal except for periods when the road is closed due to severe winter conditions or some other eventuality.

There are a number of scenarios that could fall between those presented above and each would be considered on a case-by-case basis. In general, if during the short-term or long-term shutdown period there is ongoing activity planned at the site, the AWAR would for the most part remain open to public access. However, if during the shutdown period there is no ongoing activity planned at the site, the road would not be maintained, thereby limiting public access to snowmobiles or tracked vehicles during winter and to ATVs during summer months.

The question as to how public use of the AWAR will be monitored and how road use rules and procedures will continue to be enforced during any short-term or long-term temporary closure of the mine has been raised as a valid concern.

- For short-term temporary closures (up to 12 months in duration), the AWAR would continue to be monitored, maintained and operated (enforcement of rules and procedures) in the same manner as those laid out in Sections 6 through 10 of this Plan for normal operations; and

- For long-term temporary closures or for indefinite shutdowns (greater than 12 months in duration) where further site activity is being curtailed and the intention is that the mine will resume operations as soon as possible after the cause for the indefinite shutdown has been addressed, then AWAR monitoring, maintenance and enforcement activities would be significantly reduced. A decision on the estimated length of the indefinite shutdown would be made after the initial one year period. Decisions on possible extensions to the indefinite shutdown would be made every 6 months thereafter and would be based on the conditions at that time. At present, the maximum length of time or number of extensions for interim shutdown before moving to final closure has not been defined.

When further site activity is curtailed, a physical barrier would be established on the AWAR before the Meliadine River Bridge that prevents open public access by cars, trucks or other motorized vehicles larger than an ATV. This would likely be a rockfill barrier with appropriate signage. During winter months, the road would not be kept open thus curtailing travel other than by snowmobile or tracked snow vehicle. In summer months, Agnico Eagle would continue to carry out environmental monitoring both along the AWAR and at the mine site but at a reduced frequency in accordance with its license/permit requirements. During these inspections, Agnico Eagle personnel would continue to monitor for inappropriate use of the AWAR and for conditions along the AWAR that could result in risk to public safety or to the environment (e.g., wash outs, erosion, plugged culverts, etc.). This would include monitoring and addressing any unauthorized trails/access into the designated preservation zone of the Iqalugaarjuup Nunanga Territorial Park as discussed in Section 6.3 of this Plan.

For the permanent closure scenario and as outlined in the Preliminary Closure and Reclamation Plan, the AWAR will remain available for use during closure as access to the mining areas is required until post-closure and reclamation activities have been completed. The road surface will at this point

be rehabilitated to promote natural re-vegetation, water crossings removed, and natural drainages re-established.

Agnico Eagle would like to emphasis that it has the responsibility of decommissioning and reclaiming all roads once construction, operations, closure, and post-closure activities are complete. For a third party to take over the road(s), that third party would have to complete its own arrangements with the landowners (the KIA and the Hamlet) and then complete its own environmental assessment and permitting process covering future use. Agnico Eagle does not own the land on which the roads are constructed and, thus, cannot transfer future ownership or use privileges to any third party. Agnico Eagle must complete its obligation to decommission and reclaim all roads unless directed otherwise by a combination of the landowners and other regulatory agencies who issued permits/authorizations for the roads.

Decommissioning of the roads will be accomplished by loosening compacted surfaces, flattening side slopes, and removing all culverts, bridges (not including the Char River bridge as this would become the property of the Hamlet of Rankin Inlet), and other potential obstructions to drainage paths. The objective will be to make the road surface impassable by vehicle traffic by ripping the entire road bed and removing all bridges and culverts along the route.

The loosening of compacted surfaces will be accomplished by ripping of the road bed using a dozer with a “ripper” attachment on the back. Successive passes with the dozer longitudinally along the road bed will eliminate the level road surface and make travel difficult (Figure 11-1). It is anticipated that, in this way, the abandoned roads will not be useable by wheeled vehicles (i.e., cars, trucks, and pick-up trucks). The road bed would still be useable by ATV or snowmobile and, thus, even after final reclamation, the reclaimed roadbed would offer similar passage to the existing set of trails that currently exist and are used by the residents of Rankin Inlet for traditional use purposes.

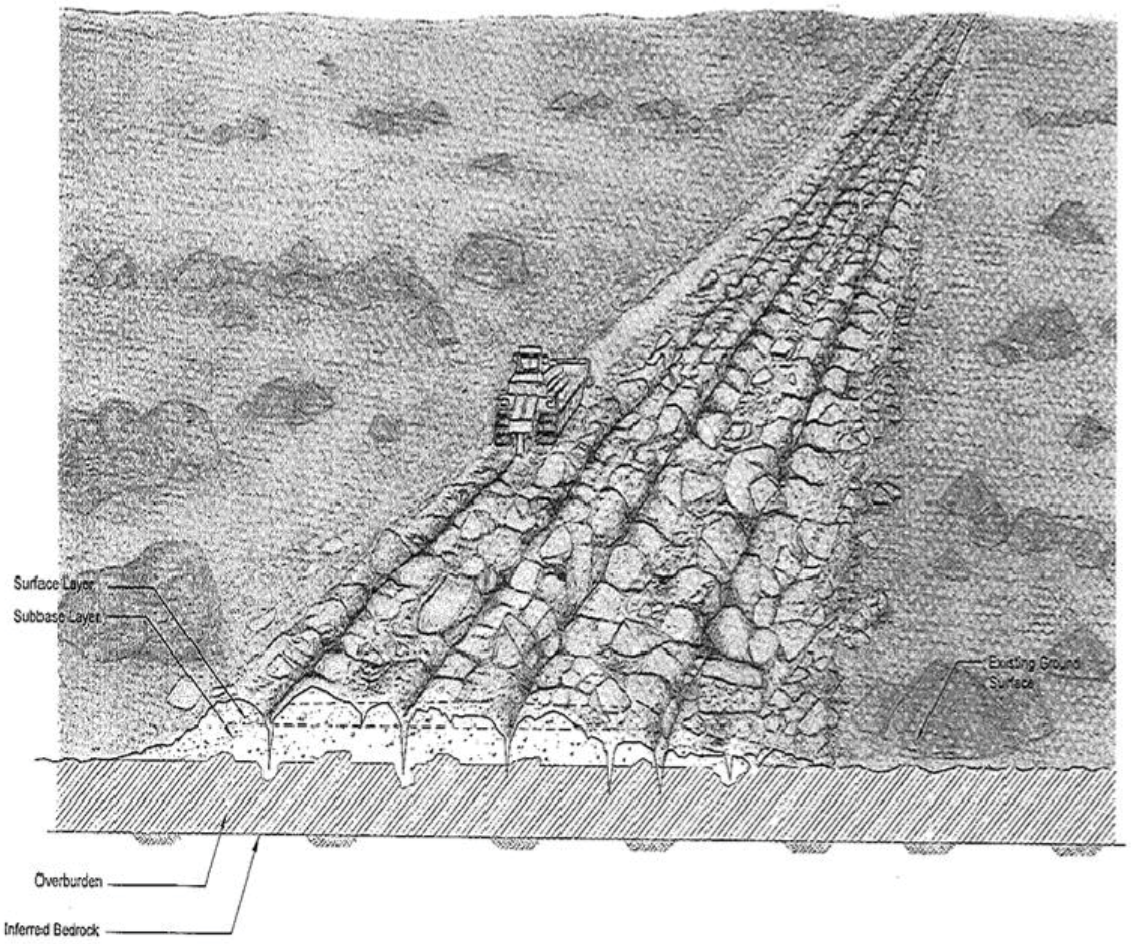


Figure 11-1 Schematic Showing the Ripping of the Road upon Closure

The road deactivation works will be carried out as necessary to stabilize any slopes where potential for slope erosion may exist. Stabilization measures may require pulling back of side-cast fills on locally steep slopes or buttressing and/or re-contouring of steepened out slopes using non-acid generating material.

These measures would also be applicable to borrow pits/quarries that remained open following construction and are located adjacent to the roadway. As much as practical, deactivated surfaces will be graded to blend with the existing topography.

To the extent practical, the reclamation would also restore the natural pre-road hydrology. Natural drainage courses would be restored primarily through the removal of all culverts and bridges (excluding the Char River bridge, which will belong to the Hamlet of Rankin Inlet), and through rehabilitation of channels and banks at the crossing sites. Cross-drain structures (cross-ditches) will also be installed where necessary between culvert sites. Where armouring rock (rip-rap) is required, this rock will be non ARD/ML for the protection of aquatic life. Where affected watercourses are fish

bearing, the timing of work will have to be restricted to within the designated DFO fisheries work window (July 16th to April 30th). For these sites, appropriate fish exclusion measures will be undertaken prior to the in-stream works. All in-stream works will be carried out using best management practices for erosion and sediment control.

Decommissioning of the roads will start from the Project site and progress south towards Rankin Inlet and will include reclamation of the bypass road. Stream crossings will be rehabilitated as they are encountered during the progression of the work. The culverts and bridges, as previously mentioned, will be removed from the crossings using a backhoe and crane, and then removed materials (i.e., culvert steel, bridge decks, abutment steel, etc.) will be transported to Rankin Inlet using a semi-tractor and a low-boy trailer, for disposal and salvage.

11.1 Reclamation of Quarries and Borrow Pits Sites

All quarry sites and borrow sources developed during the construction of the roads have been selected to generate only non-acid generating/low metal leaching materials (see Borrow Pits and Quarries Management Plan). Water quality monitoring and testing will be undertaken periodically during the construction and operational period of the roads to measure the quality of water draining from the open quarry/borrow sites and from the road base materials.

The quarries and borrow pits will have gently sloping walls and be designed for positive drainage wherever possible. Reclamation and closure of quarries and borrow pits will depend on the individual site conditions. With a conservative initial design, the quarries should require little reclamation following completion of the roads. Loose rock will be pulled to the floor of the quarry and the entrance blocked with large boulders. Reclamation should lead to natural re-vegetation establishing on disturbed areas.

During reclamation of the roads, should acid-generating bedrock be exposed along the roadway or in borrow pit/quarries, these areas will be covered with a minimum 2m thick layer of non-acid generating soil or rock to direct water away from the surface.

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GN (Government of Nunavut) 2014. Guideline: Dust Suppression on Unpaved Roads Published by the Government of Nunavut Department of Environment.

APPENDIX A • AGNICO EAGLE CONSULTATION ON THE ALL-WEATHER ACCESS ROAD

A chronological record is provided of the consultation undertaken on the routing of the AWAR between Rankin Inlet and the proposed mine site.

Date	Place	Parties Present and Subject(s) of Meeting
21/10/2004	Rankin Inlet	Presentation on Project status to KIA Board of Directors with a request for a proposal of motion to support a future road from Rankin Inlet to the site.
26/03/2007	Chesterfield Inlet	Presentation to the KIA Board of Directors on the proposed underground program and 2007 Meliadine West exploration plans. Verbal Motion of Support from the Board.
27/03/2007	Rankin Inlet	Presentation of the proposed 2007 Meliadine West exploration program to the Rankin Inlet Community Lands and Resources Committee.
28/03/2007	Rankin Inlet	Presentation of the proposed 2007 Meliadine West exploration program to the Kivalliq Chamber of Commerce.
28/03/2007	Rankin Inlet	Town hall meeting - presentation of the proposed 2007 Meliadine West exploration program.
04/07/2007	Rankin Inlet	Briefing on Project status to Hamlet Council with specific discussions on road alignment and overwinter fuel storage in barge.
4/07/2007	Rankin Inlet	Elders Luncheon at Nunavut Arctic College. Project overview and immediate project plans for underground exploration was presented by Mark Balog with a slide show. Issues that were raised: - employment opportunities for young people, - all-season road location and utility for other projects, - soapstone from Newfoundland. Attendees: Hamlet Elders including Mr/Mrs Tatty, Mr/Mrs. Itinuar, Mr/Mrs Kabvitok, Mrs. Pissuk, others: Comaplex Minerals: Mark Balog, Ben Hubert. Arranged by John Hickes.
6-8/05/2009	Rankin Inlet	Multidisciplinary Advisory Group (MDAG), chaired by Bernie MacIssac, INAC: all regulatory groups in attendance. Presented the Project and All-weather Road to regulators. Met regulators who will work on Project, including Jackson Lindell and Stephen Hartman, KIA, and Keith Morrison and Jorgan Aitaok, NTI.
17/06/2009	Rankin Inlet	Meeting with Manager CED (Robert Connelly) and Nunavut Transport (Alan Johnson) regarding proposal to access federal infrastructure money for the Meliadine River bridge and Comaplex fund the road. Visit to the bridge site.
18/06/2009	Rankin Inlet	Discussion with Rankin Inlet Mayor John Hickes, the SAO, and several council members. Project update and proposed application for road and bridge funding.

Date	Place	Parties Present and Subject(s) of Meeting
01/06/2010	Chesterfield Inlet	Mark Balog and John Witteman, Comaplex sponsored a town hall meeting providing an update on the Project and the building of an All-weather Road. The road would link to the planned road to Chesterfield Inlet.
02/06/2010	Rankin Inlet	Mark Balog and John Witteman, Comaplex sponsored a town hall meeting providing an update on the Project and the building of an All-weather Road. The meeting was particularly well attended and there were no objections to the routing to the All-weather Road. There were no objections to the proposed road alignment.
01/09/2010	Meliadine site	John Witteman and Jacek Patalas (Golder Associates) met with Gary Cooper and Nicola Johnson of DFO to discuss fisheries habitat and compensation issues relating to the development of the Meliadine Gold Project. Discussions regarding compensation for road crossings were also discussed.
06/01/2011	Cambridge Bay	Eric Lamontange, Denis Gourde and John Witteman met with Ryan Barry, Kelli Gillard and one more staff member, NIRB, to describe the status of the Project and in particular the AWAR. Agnico Eagle described what had been done in regards to gathering baseline information for the road, regulatory permits required and use of the road (having it open access).
07-09/02/2011	Rankin Inlet	Larry Connell and John Witteman met with the Lands Division of KIA to discuss the road and other matters. A meeting with the HTO was cancelled due to a blizzard.
01/03/2011	Rankin Inlet	John Witteman, Bertho Caron and Selma Eccles of Agnico Eagle attended a meeting with the HTO, Rankin Inlet. The HTO raised a number of concerns with the route of the road, bridge location over the Meliadine River, wildlife monitoring along the road, plans for the Itivia port area, fish concerns with the bridge. Agnico Eagle talked to each of the concerns raised and were subsequently informed that the HTO Board was satisfied with the responses received.
23/03/2011	Rankin Inlet	Denis Gourde, Eric Lamontagne, Larry Connell, Selma Eccles, John Witteman met with the Hamlet Council to describe the AWAR and ongoing activities at the Meliadine site. The Hamlet Council supports the All- weather Access Road and a letter of support can be expected. The underground program was explained and what is hoped to be gained from carrying out this work - getting needed information on the deep ore. The question of dust control was raised and lands available in town for development. The underground development was discussed.
23/03/2011	Rankin Inlet	Denis Gourde, Eric Lamontagne, Larry Connell, Selma Eccles, John Witteman hosted a town hall meeting with the community to discuss the All-weather Access Road and the proposed mine. A PowerPoint presentation in English and Inuktitut was presented. The meeting was well attended with over 100 persons present. The road is widely supported by the community as it offers access to Meliadine Lake

Date	Place	Parties Present and Subject(s) of Meeting
		and also is expected to lead to more economic activity. The question of jobs and careers was frequently raised and what must be done to get jobs such as supervisors and managers. Education was emphasized by Agnico Eagle as well as on-the-job training. Support was voiced for the road and the proposed mine.
7/04/2011	Iqaluit	Meeting with NIRB and NWB in Iqaluit during the Nunavut Mining Symposium. PowerPoint presentation was made on the proposed Meliadine AWAR and our application to amend our Type B water license to allow for construction of this road. Good exchange with NIRB an NWB pointing out omissions in what was presented.
6/05/2011	Geovector, consultant to KIA	AWAR – quarry locations and need to check for ground ice, geochemistry of the waste rock and potential quarries, snow drifting along road, design of culverts, lessons learned from Meadowbank.
6/06/2011	Cambridge Bay Gjoa Haven Iqaluit	Presentation to NIRB, NWB, Regulatory Agencies in Iqaluit. Discussions on next steps in EA process, possible predevelopment activities, class A water licence, Agnico Eagle's use of municipal infrastructure, need to submit a land use permit for crown land to be crossed by the AWAR, quarries along road.
14/06/2011	KIA, Mayor of Rankin Inlet	Possible predevelopment, Hamlet motion to approve AWAR, build only 1 lane at this time.
31/10/2011	Rankin Inlet	Larry Connell and John Witteman met with the HTO. A PowerPoint presentation was made on the All-weather Access Road and developments at the Meliadine site. The HTO wanted to discuss the alignment of the AWAR to the Meliadine site and the arrangement of Agnico Eagle facilities at Itivia. A more southerly route was proposed by the HTO but Agnico Eagle indicated it was too long and had too many water crossings. The HTO want a role and contract in monitoring wildlife along the AWAR. The arrangement at Itivia was raised but Agnico Eagle did not have maps of the area. Discussion was deferred to the next meeting when Agnico Eagle would bring maps of Itivia and surrounding area. Agreement was reached on a ski-doo trail along the east side of the laydown area.
29/02/2012	Rankin Inlet	A public meeting with the community. The meeting covered the status of the Meliadine Project with emphasis on the planned construction of the Phase 1 AWAR between Rankin Inlet and the Meliadine Project site. Options for a bypass road around the Hamlet were presented with support for keeping Agnico Eagle traffic outside the community. Other topics touched on the fate of the existing Char River bridge, the formation of a Liaison Committee for Rankin Inlet, plans for the Itivia area and employment opportunities in the building of the road.
18/04/2012	Iqaluit	Presentation made to the NIRB and the NWB on the proposed Meliadine All-weather Access Road and update on the exploration project.
16/08/2012	Rankin Inlet	Site visit of the Phase 1 AWAR by two representatives of the Hunters and Trappers' Organization. Progress on the bridges and road was viewed.

Date	Place	Parties Present and Subject(s) of Meeting
11/09/2012	Rankin Inlet	Site visit of the Phase 1 AWAR by KIA and CLARC representatives. Progress on the bridges and road was viewed.
21/06/2013	Rankin Inlet	Meeting was held with the hamlet and Government Services (GN) concerning the removal of the Char River Bridge, the Apache Pass, and the airport by-pass road.
27/06/2013	Rankin Inlet	Presentation on Agnico Eagle exploration activities, Phase 1 AWAR and road access made to town council, community, Land and Resources, Hunters and Trappers' Organization, Kivalliq Inuit Association, NTI.
10/07/2013	Rankin Inlet	Discussions were held with the Airport Manager and Government Services (GN) concerning the airport by-pass road.
8/08/2013	Rankin Inlet	Meeting with town council, community, Land and Resources, Hunters and Trappers' Organization, Kivalliq Inuit Association, NTI on the Phase 1 AWAR and Road Access Policy – minutes are available.
6/11/2013	Rankin Inlet	Meeting with HTO Board explaining the status of the Project, Phase 1 All-weather Access Road, caribou migration, sewage treatment – minutes available.
29/05/2014	Rankin Inlet	Rankin Inlet Public consultation on the road access by ATV.
5/05/2016	Rankin Inlet	Meeting with the KHTO to discuss the proposed joint Wildlife Monitoring Program to be conducted along the AWAR.
9/06/2016	Rankin Inlet	Meeting with Nunavut Airports, Government Services (GN) and the Hamlet to present the updated road route for the bypass road. The permitting process was also discussed.
7/07/2016	Rankin Inlet	Meeting with the KHTO to discuss the proposed joint Wildlife Monitoring Program to be conducted along the AWAR.
25/08/2016	Rankin Inlet	Meeting with Nunavut Airports, Government Services (GN) and the Hamlet to provide an update on the bypass road design process and hear concerns. The permitting process was also discussed.
20/09/2016	Rankin Inlet	Meeting with KHTO to discuss signage erected on AWAR.
28/11/2016	Rankin Inlet	Pre-Hamlet Council meeting with Nunavut Airports, Government Services (GN) and the Hamlet to discuss the bypass road project. Pre-Council concerns were also shared by all parties.
28/11/2016	Rankin Inlet	Hamlet Council Meeting. Bypass road project presented to request support for the project by the Hamlet.
13/12/2016	Rankin Inlet	Hamlet Council Meeting. Bypass road project receives support from the Hamlet.
27/02/2017	Rankin Inlet	Hamlet Council Meeting. Bypass road project application for lease presented for approval by Council. Outstanding concerns discussed. Vote postponed.
13/03/2017	Rankin Inlet	Hamlet Council Meeting. Bypass road project application for lease discussed. Agnico Eagle is requested to provide design for road extention.

APPENDIX B • APPLICABLE ACTS, REGULATIONS, AND GUIDELINES FOR THE ACCESS, SERVICE AND HAUL ROADS

Applicable Acts, Regulations, and Guidelines for the Access, Service and Haul Roads

Act	Regulation	Guideline
Federal		
Canadian Environmental Protection Act (1999 c.33)	Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197) Environmental Emergency Regulations (SOR/2003-307) Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2002-301) Release and Environmental Emergency Notification Regulations (SOR/2011-90)	CCME - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Notice with respect to substances in the National Pollutant Release Inventory (threshold for hydrochloric acid 6.8 tonnes) Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil
Canada Wildlife Act (1985 w9)		
Species at Risk Act (2002 c.29)		Species at Risk Policies
Migratory Birds Convention Act (1994 c.22)	Migratory Birds Regulations (C.R.C., c. 1035)	
Canada Water Act (1985 c.11)		
Oceans Act (S.C. 1996, c. 31)		
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c. A-12)	Arctic Waters Pollution Prevention Regulations (C.R.C., c. 354) Arctic Shipping Pollution Prevention Regulations (C.R.C., c. 353)	
Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)	Transportation Safety Board Regulations (SOR/92-446)	
Canada Shipping Act, 2001 (S.C. 2001, c. 26)	Response Organizations and Oil Handling Facilities Regulations (SOR/95-405) Pollutant Discharge Reporting Regulations, 1995 (SOR/95-351) Environmental Response Arrangements Regulations (SOR/2008-275) Ballast Water Control and Management Regulations (SOR/2006-129) Vessel Pollution and Dangerous Chemicals Regulations (SOR/2012-69)	Oil Handling Facilities Standards – TP12402 Environmental Prevention and Response National Preparedness Plan 2008 – TP13585 Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants – TP9834E 2009 Arctic Waters Oil Transfer Guidelines, 1997 - TP10783E Response Organizations Standards – TP 12401E 1995 Guidelines for the Control of Ballast Water Discharge from Ships in Waters under Canadian Jurisdiction (TP 13617)
Navigation Protection Act		

Act	Regulation	Guideline
Marine Liability Act (A.C. 2001, c.6)	Marine Liability Regulations (SOR/2002-307)	
Fisheries Act (1985, c. F-14)	Metal Mining Effluent Regulations (SOR/2002-2222) Marine Mammal Regulations (SOR/93-56)	The Policy for the Management of Fish Habitat Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters Freshwater Intake End-of-Pipe Fish Screen Guideline Standard Operating Procedure – Clear Span Bridges
Safe Containers Convention Act (R.C.C. 1985, c. S-1)		
Transport of Dangerous Goods Act (1992, c. 34)	Transportation of Dangerous Goods Regulations (SOR/2001-286)	
Explosives Act (1985 c.E-17)	Explosives Regulations (C.R.C., c. 599) Ammonium Nitrate and Fuel Oil Order (C.R.C., c. 598)	
National Fire Code of Canada (2010)		
Nuclear Safety and Control Act (s.c. 1997, c.9)	General Nuclear Safety and Control Regulations (SOR/2000-202)	
Canadian Human Rights Act (R.S.C., 1985, c. H-6)	Canadian Charter of Rights and Freedom	
Canada Labour Code (R.S.C., 1985, c. L-2)	Canada Labour Standards Regulations (C.R.C., c. 986) Canada Occupational Health and Safety Regulations (SOR/86 304)	
Territorial Lands Act (R.S. 1985, c. T-7)	Northwest Territories and Nunavut Mining Regulations (C.R.C., c. 1516) Territorial Land Use Regulations (C.R.C. 1524) Territorial Quarrying Regulations (C.R.C. c. 1527)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002, c.10)	Northwest Territories Waters Regulations (SOR/93/303)	
Nunavut Act (1993 c.28)	Nunavut Archaeological and Paleontological Sites Regulations (SOR/2001-220)	
Nunavut Land Claims Agreement Act (1993, c.29)		

Act	Regulation	Guideline
Territorial - Nunavut		
Environmental Protection Act (RSNWT (nu) 1988, c E-7)	Spill Contingency Planning and Reporting Regulations (NWT Reg (Nu) 068-93) Used Oil and Waste Fuel Management Regulations (NWT Reg 064-2003) [The removal of hazardous materials will require the registration with the Government of Nunavut, Department of Environment as a waste generator as well as carrier (if applicable) prior to transport.]	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Guidelines on Mercury-Containing Products and Waste Mercury Environmental Guideline for Waste Asbestos Guideline for Industrial Waste Discharges in Nunavut Guideline for Air Quality – Sulphur Dioxide and Suspended Particulates Guideline for the Management of Waste Antifreeze Guideline for the Management of Waste Batteries Guideline for the Management of Waste Paint Guideline for the Management of Waste Solvents Guideline for Industrial Projects on Commissioner's land Environmental Guideline for Ozone Depleting Substances
Scientists Act (RSNWT (Nu) 1988, c S-4)	Scientists Act Administration Regulations (NWT Reg (Nu) 174-96)	
Historical Resources Act (RSNWT (Nu) 1988, c. H-3)		
Territorial Parks Act (RSNWT (Nu) 1988, c T-4)	Territorial Parks Regulations (RRNWT (Nu) 1990 c T-13)	
Wildlife Act (RSNWT (Nu) 1988, c W-4)	Wildlife General Regulations (NWT Reg (Nu) 026-92) Wildlife Licences And Permits Regulations (NWT Reg (Nu) 027-92) Wildlife Management Barren-Ground Caribou Areas Regulations (NWT Reg (Nu) 099-98) Wildlife Management Grizzly Bear Areas Regulations (NWT Reg (Nu) 155-96) Wildlife Management Zones Regulations (RRNWT (Nu) 1990 c W-17) Wildlife Regions Regulations (NWT Reg (Nu) 108-98)	

Act	Regulation	Guideline
Commissioner's Land Act (RSNWT 1988, c C-11)	Commissioner's Airport Lands Regulations (NWT Reg (Nu) 067-97)	
	Commissioner's Land Regulations (RRNWT 1990, c C-13)	
Safety Act (RSNWT 1988, c.S-1)	General Safety Regulations (RRNWT (Nu) 1990 c S-1)	
	Work Site Hazardous Materials Information System Regulations (RSNWT 1988, C 81 (Supp))	
Mine Health And Safety Act (SNWT (Nu) 1994, c 25)	Mine Health And Safety Regulations (NWT Reg (Nu) 125-95)	
Workers' Compensation Act (RSNWT, 1988, c. W-6)	Workers' Compensation General Regulations (Nu Reg 017-2010)	
Apprenticeship, Trade And Occupations Certification Act (RSNWT (Nu) 1988, c A-4)	Apprenticeship, Trade And Occupations Certification Regulations (RRNWT (Nu) 1990 c A-8)	
Labour Standards Act (RSNWT (Nu) 1988, c L-1)	Annual Vacations Regulations (RRNWT 1990, c.L-1)	
	Educational Work Experience Regulations (RRNWT 1990, c.L-2)	
	Employment of Young Persons Regulations (RRNWT 1990, c.L-3)	
	Labour Standards Meal Regulations (RRNWT 1990, c.L-4)	
	Notice of Termination Exemption Regulations (RRNWT 1990 c.L-5)	
	Pregnancy and Parental Leave Regulations (RRNWT 1990, c.8(Supp.))	
	Reciprocating Jurisdiction Order (RRNWT 1990, c.L-6)	
	Wages Regulations (RRNWT 1990, c.L-7)	
Electrical Protection Act (RSNWT (Nu) 1988, c E-3)	Electrical Protection Regulations (RRNWT 1990 c. E-21)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	Explosives Regulations (RRNWT (Nu) 1990 c E-27)	
Petroleum Products Tax Act (RSNWT (Nu) 1988, c P-5)	Petroleum Products Tax Regulations (RRNWT (Nu) 1990 c P-3)	
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	Fire Prevention Regulations (RRNWT (Nu) 1990 c F-12)	

Act	Regulation	Guideline
Hospital Insurance And Health And Social Services Administration Act (RSNWT 1988, c T-3)	Territorial Hospital Insurance Services Regulations (RRNWT (Nu) 1990 c T-12)	
Public Health Act (RSNWT (Nu) 1988, c P-12)	Camp Sanitation Regulations (RRNWT (Nu) 1990 c P-12) General Sanitation Regulations (RRNWT (Nu) 1990 c P-16)	
All-Terrain Vehicles Act (RSNWT (Nu) 1988, c A-3)	All-Terrain Vehicles Regulations (RRNWT (Nu) 1990 c A-1)	
Motor Vehicles Act (RSNWT (Nu) 1988, c M-16)	Large Vehicle Control Regulations (RRNWT (Nu) 1990 c M-30) Motor Vehicle Registration And Licence Plate Regulations (RWT Reg (Nu) 054-94)	
Public Highways Act (RSNWT (Nu) 1988, c P-13)	Highway Designation And Classification Regulations (NWT Reg (Nu) 047-92)	
Transportation of Dangerous Goods Act (1990. RSNWT (Nu) 1988, c 81 (Supp))	Transportation Of Dangerous Goods Regulations (1991, NWT Reg (Nu) 095-91)	

Appendix C • Dust Management Plan



AGNICO EAGLE

MELIADINE GOLD PROJECT

Dust Management Plan

MARCH 2017

VERSION 3

Executive Summary

Agnico Eagle Mines Limited (Agnico Eagle) will use best management practices to minimise dust generation from becoming airborne at the mine site, Itivia, and all access, service, and haul roads. This includes identification of major sources of dust, implementation of dust mitigation measures, inspections for unacceptable levels of dust, and recording dust monitoring data to document Agnico Eagle's success in controlling and reducing dust at the Meliadine Project. The Dust Management Plan focuses primarily on dust generated from roads, with some reference to other mining activities. Dust generated from other mining activities, such as the tailings storage facility, are addressed in other plans, including the Mine Waste Management Plan.

Dust could potentially be generated by such activities as road use, drilling, blasting, crushing, conveying, loading, hauling, unloading, stockpiling, and by wind erosion of dry, exposed mine areas. Dust emissions will be prevalent during late spring and summer, while being much reduced in fall and winter.

Mitigation measures to control dust include mine design and operational procedures. Operational practices, such as speed limits and road maintenance, will assist in reducing dust. Water and, if necessary, chemical dust suppressants will be used to control and reduce dust on roads and other mine areas when airborne dust becomes a safety hazard or impacts on sensitive natural areas. The Itivia bypass road will not have any chemical dust suppressants applied. Only water will be applied on this portion of the road for dust suppression.

Dust suppression measures will be in place during construction, operations, and closure.

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Document Control

Version	Date	Section	Page	Revision	Author
1	April 2014			Version 1 of the Dust Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	April 2015	7.2	8	Update plan for Water Licence application - Added EK-35 and DUST-STOP to chemical dust suppressants approved for use in Nunavut	John Witteman, Env. Consultant, Agnico Eagle
3	April 2017			General review of the plan	Environment Department, Agnico Eagle Mines
4	March 2018			Minor modifications	Environment Department, Agnico Eagle Mines

1. Introduction

The Dust Management Plan (the Plan) is a framework for the management and control of dust[13] (airborne particulate matter) arising from traffic related to mine activities. Best management practices are identified to minimize and reduce the impact of dust on the natural and human environment.

The Plan identifies the sources of dust along with measures for their control during mine construction, operation, and closure.

2. Climate

The Meliadine Gold Project (Project) is located in the low Arctic eco-climate characterized by long cold winters and short cool summers. The frost-free period can be as short as 90 days and have prolonged periods with no precipitation. The 30-year climate normals for Rankin Inlet (1971 to 2000) indicate that wind speeds are relatively high, averaging more than 19 km/h every month.

Dust can be a problem at certain times of the year. During the winter and early spring, dust does not pose a significant problem as snow and ice cover most surfaces. However, surfaces that are exposed to the wind can result in dust, especially if ice resulting from fall rains is not present to bond fine particles together. However, in the late spring and summer, and under the right conditions, dust generation could present an issue at the mine site and along its roads. In late spring when temperatures remain below freezing, sublimation tends to cause mine surfaces, including roads, to be dry leading to a potential for dust generation. In summer, when evaporation is high and with little rain, mine surfaces and roads can again be dry. The combination of low precipitation and drying winds promote dust generation from developed areas where work is underway and where vehicle traffic is present, especially if mitigation measures are not employed. High winds by themselves can also erode dust from exposed mine surfaces.

3. Related Documents

3.1 Environment Management and Protection Plan

The Environmental Management and Protection Plan (EMPP) provides Agnico Eagle with overarching direction to environmental and socio-economic management for the Project throughout its life (i.e., across all Project phases). It is a site-specific plan that describes the systematic means by which Agnico Eagle will consistently manage and control potentially adverse impacts, and enhance potential project benefits identified through the Environmental Assessment process and the subsequent licensing and permitting of the Project.

The EMPP offers enough flexibility to respond to changes, for example, in the mining development plan, the regulatory regime, the biophysical and socio-economic environments, technology, research results, best management practices, and the understanding of traditional knowledge. Thresholds and indicators to trigger management actions are provided in the sub plans embedded in the EMPP, along with a system of accountability.

3.2 Air Quality Monitoring Plan

In the Air Quality Monitoring Plan (Agnico Eagle 2015), dust monitoring is expected throughout all phases of the mine, during all seasons, at various locations on the mine site, along the All-weather Access Road (AWAR), and at the Rankin Inlet Itivia land-based facilities area (Itivia). The principle monitoring means are anticipated to be particulate fallout measurements.

The Air Quality Monitoring Plan outlines how dust monitoring data will help in verifying if the actual effects from air emissions are less than those predicted in the FEIS. The data collected will provide feedback for continuous improvement in dust mitigation measures. If the dust monitored indicates more dust than expected, adaptive management will be used to understand the reason for the elevated levels and recommend mitigation measures to reduce it.

4. Environmental, Safety and Operational Effects of Dust

The Project is anticipated to generate dust representative of local overburden and rock type. There should not be enrichment of any metal in the dust. Agnico Eagle will use all reasonable and practicable measures to minimise dust generated from the Project.

4.1 Environmental Concern

Physical and chemical stresses on the tundra environment are commonly associated with unpaved roads. Dust generated by vehicle traffic along the roads is carried by the prevailing wind onto the surrounding tundra where it is deposited onto the vegetation and waterbodies.

Chemically inert dust can have negative effects on sensitive receptors such as vegetation. It can accumulate on leaf surfaces and negatively affect leaf physiology. Dust has a shading effect, which reduces the amount of photosynthesis and increases the leaf temperature through incident solar radiation being absorbed by the dust, thus increasing the transpiration rate (Agnico Eagle 2008). Adverse impacts might occur on the wildlife that depend upon the vegetation as a food source. Dust carried off the roads can eventually wash into the local waterbodies adding suspended solids to the water, which can adversely affect water quality and possibly the health of aquatic species.

4.2 Safety Concern

Dust generated by vehicle traffic along roads and other mine surfaces is typically fine, inorganic particulate matter. It reduces visibility along roads, thereby increasing the risk of vehicle accidents. Inhalation of fine particulate matter can potentially cause adverse health effects, especially in persons with pre-existing respiratory problems.

4.3 Operational Cost Concern

Excessive dust when drawn into a vehicle's engine can result in rapid clogging of vehicle air filters, diminishing engine performance and increasing maintenance costs. While the engines are equipped with air filters, the finer sized particulate matter can pass through these filters, getting into the engine where it can cause premature scouring and wear on the pistons and other moving components, thereby leading to a need for more frequent maintenance and shortening the life of the engine.

5. Sources of Dust

The greatest source of dust at mine sites is vehicle traffic on unpaved roads (Thompson and Visser 2001). Dust emissions will vary by the time of week, as well as the time of year. Dust will be more prevalent during the late spring and summer than during winter. Dust emissions are anticipated to be greatest during the operation of the AWAR, when traffic along the road will be at its peak (e.g., on days when additional road traffic is required due to barge unloading and transport to the mine site).

The most significant sources of dust during construction, operations, and closure include the following:

- Preparation of ground surface for construction through stripping, excavating, covering, and/or stockpiling;
- Wind erosion of exposed mine surfaces – e.g., roads, ore stockpiles, waste rock storage facilities, and dry stack tailings;
- Vehicle traffic on unpaved roads and other mine surfaces – haul, service and access roads, pit ramps, other vehicle travel areas (e.g. waste rock storage facilities, storage pads, laydown pads, parking lots);
- Material handling and transfer – loading, hauling, unloading, crushing, conveying;
- Open pit mining activities – drilling, blasting; and
- Closure activities such as covering the tailings, decommissioning of other mine areas, and scarification of roads.

Dust from buildings where people are working such as the mill, maintenance shop and warehouse is expected to be minimal due to the use of bag houses or equivalent means to control dust.

6. Dust Suppression

Dust suppression measures, which are considered to be typical of current mine practices and consistent with best management practices, are expected to achieve desired results through design, operations, and closure.

6.1 Design-Based Dust Suppression Measures

In assessing dust emissions associated with the Project, consideration was given to those mitigation measures that were considered integral in the mine design. Design-based means of dust suppression include:

- The mine site will be compact thereby reducing the area where dust generation can occur;
- Dry stack tailings were selected as the preferred form of tailings. These will be trucked from the mill to a tailings storage area northwest of the mill[14];
- Roads were designed as narrow and short as possible while maintaining safe construction and operation practices. This reduces the surface area of roads and the potential to generate dust;
- To minimize dust during construction and operations, coarse sized rock will be used as much as possible in building roads, pads, and laydown areas;
- If possible, road construction will largely occur during the winter when the generation of dust is at its lowest;

[14] Details on the use of dry stack tailings and how dust arising from them will be mitigated can be found in Mine Waste Management Plan

- Sheds, enclosures, covers, and/or bag houses will be used on most crushing and processing equipment to limit dust emissions; and
- Most outside conveyer belts will have covers.

6.2 Operation-Based Dust Suppression Measures

Best management practices will be used to control and suppress dust emissions from the Project. Dust suppression during operations include:

- Overburden stripped in opening the open pits is anticipated to be prone to wind erosion, and will be stored with the core of the waste rock storage facilities;
- Roads will be regularly graded to mix excessive silt found on the road surface with the coarser materials located deeper in the roadbed. This will reduce the percentage of silt in the road surface with the benefit of reducing related dust;
- As needed, roads and travel areas will be topped with aggregate and stabilized, which will minimize erosion and dust emissions;
- Where appropriate, larger sized aggregate will be used on the road surface to replace material lost due to wind and water erosion;
- Water and/or approved chemical dust suppressants recognized by the Government of Nunavut will be applied as needed to reduce airborne dust and improve visibility on access, service, haul roads, pit ramps and other travel areas. This will remove a safety hazard;
- The Itivia bypass road will not have any chemical dust suppressants applied. Only water will be applied on this portion of the road for dust suppression.
- Dust aprons will be used on open pit, production drills, where practical during all open pit drilling to control dust emissions;
- Should further rock crushing occur in the quarries along the access roads, the crushers location will be best shielded from the prevailing wind, preferably behind a high wall in the quarry so as to reduce the quantity of wind-blown dust, and to have as much dust as possible fall within the bounds of the quarry;
- The maximum speed limit on the AWAR will be 50 km/hr but will be lower where required for safety reasons (e.g., approaches to bridges, intersections, etc.);
- The number of mine vehicles on the AWAR will be kept to a minimum (e.g., vans and buses are to be used to transport employees to and from the Rankin Inlet airport);
- Maximize the transport of materials from Itivia to the mine site in late summer when rain events are more common, and in the fall when the road surface is frozen and less susceptible to dust generation;
- Regularly inspect the road and undertake timely repairs to minimize the silt loading on the road surface;
- Avoid multiple handling of materials that have the potential to generate dust, where possible;
- Conveyor loads will be kept within designated load limits, and conveyor covers used, where practical;
- Stockpiles will be of a suitable height, width and slope to minimise wind effects;

- Employees and contractors will be encouraged to report excessive dust to their supervisor; and
- Contractors for activities that have the highest potential for dust generation are required to submit detailed work plans that indicate dust mitigating practices and procedures. This may include the modification of activities to reduce the dust created by their activities.

6.3 Closure-Based Dust Suppression Measures

Closure will include the following dust suppression measures:

- The tailings storage facility will be covered progressively, with an engineered cover, thereby isolating it from the environment and preventing dust generation;
- Other exposed mine areas subject to wind erosion will also be covered with waste rock;
- Open pits will be flooded;
- All roads will be scarified and bridges and culverts removed thereby making the roads impassable to large vehicles and associated dust generation. Scarification will also allow plants to establish on the former roads and, in doing so, prevent wind and water erosion; and
- During operations, obsolete roads will be closed and scarified.

7. Access, Service and Haul Roads

For the Phase 1 AWAR, Agnico Eagle committed to apply active controls on the road surfaces to reduce dust. These controls could include actions such as using water or applying chemical dust suppressants. Although literature does not provide a control efficiency for regular maintenance of the road surfaces, the commitment by Agnico Eagle to maintain the road surface is expected to have benefits with respect to the amount of dust generated (Agnico Eagle 2011b).

The nature of the road surface and the size distribution of the material, in particular the percentage content of silt and fine sand (2 µm to 75 µm), directly influences the potential to generate dust (Thompson and Visser 2001). The greatest sources of dust on a mine site are the disturbance of granular surfaces, and this normally occurs when materials are handled or when vehicles pass over an unpaved surface[15]. Of the two, by far the largest source of dust is vehicle traffic on unpaved roads; this has been estimated to reach 70 percent in some instances (*Cecala 2012*). The mechanical grinding of surface materials on the road and their breakdown under the weight of vehicle wheels creates dust, while the air turbulence created by the vehicle causes dust to become airborne. The amount of dust generated along a road is dependent on the dryness of the road surface, the percentage of silt on the

[15] Volume 5 of the Final Environmental Impact Statement Atmospheric, Environment and Impact Assessment, section 1.4 Emissions Estimation provides details on how dust emissions can be calculated for various mine sources (*Golder Associate 2013*).

road surface, the number of vehicles, weight and vehicle speed, weather conditions[16], and maintenance of the driving surface.

The composition of the road surface will be analysed to determine what dust suppression measures will work best. Different types of road surfaces dictate different approaches to dust control. Kissel (*2003*) makes the following recommendations based on the particle size distribution of material on the road surface:

- *Gravel with few fines.* In gravel road surfaces with not enough fines, only watering will be effective. Chemical dust suppressants can neither compact the surface (because of the poor size gradation) nor form a new surface, and water soluble suppressants will thus leach.
- *Sand.* In compact sandy soils, bitumens, which are not water-soluble, are the most effective dust suppressant. Water-soluble suppressants such as salts, lignons, and acrylics will leach from the upper road surface. However, in loose, medium, and fine sands, bearing capacity will not be adequate for the bitumen to maintain a new surface.
- *Good size gradation.* In road surfaces with a good surface particle gradation, all chemical suppressant types offer potential for equally effective control.
- *Silt.* In road surfaces with too much silt (greater than about 20 to 25%), no dust suppression program is effective, and the road should be rebuilt. In high-silt locations, chemical suppressants can make the road slippery, and there is an inability to compact the surface or maintain a new road surface because of poor bearing capacity. Further, rutting under wet conditions requires that the road be graded, which destroys chemical dust suppressant effectiveness. If the road cannot be rebuilt, watering is the best option.

Optimally designed and maintained roads offer the best means of controlling dust but it does not remove the potential for dust generation completely. The potential for dust generation decreases significantly when road design and maintenance are combined with the application of water and/or chemical dust suppressants.

7.1 Dust Suppression Using Water

Water remains the most readily available means of controlling dust in Nunavut. It is common at mine sites worldwide to apply water through fantail sprayers or spray bars attached to a haul truck or equivalent fitted with a large tank. Agnico Eagle recognises that water is only a temporary measure, and reapplications could be necessary to achieve the desired dust control efficiency[17]. The control

[16]Humidity, frequency of days with rain, mean daily evaporation rates, and the prevailing wind speed and direction. Wind erosion contributes to road dust emissions, especially when strong winds combined with vehicle traffic moves the dust generated far afield.

[17] Regular light watering is more effective than infrequent heavy watering (Thompson and Visser 2007).

efficiency of water applications is dependent on the amount of water applied, the time between re-applications, penetration depth of the water into the road surface, the traffic volume, prevailing weather conditions, and the state of the road surface (e.g., excessive fines over coarse material). All these variables need to be considered before selecting water to control dust from roads and other mine areas. If water is selected to suppress dust, Agnico Eagle will use it with a greater frequency near critical areas along the roads.

Watering the roads is only possible during frost-free days. In late spring significant sublimation can be expected when the temperatures remain below freezing, which can lead to dry roads and significant dust potential. If water is applied while the temperature is below freezing, it will turn to ice on the road and pose a safety hazard for travel. Dust suppression using water or chemicals will not be possible at this time of the year.

7.2 Chemical Dust Suppression

Chemical dust suppressants offer advantages over water under the right conditions. They tend to have the benefit of a reduced treatment frequency over water. However, use of chemical suppressants under all conditions does not necessarily lead to improved dust suppression over that of water. Presently, only fresh water, seawater, DL10, calcium chloride, EK-35 and DUST-STOP are approved for use in Nunavut. Other chemical dust suppressants can be approved for use in Nunavut following their assessment by the Government of Nunavut's Environmental Protection Service.

Numerous types of chemical suppressants are available; broad categories that encompass those approved for use in Nunavut are as follows:

- Wetting agents are designed to increase the ability of water to adhere to and spread over the dust particle. This increases the bulk density of the particle and leads to agglomeration. Calcium chloride ($CaCl_2$) is one such wetting agent.
- Binders hold particulates together and can provide long-term dust suppression on roads. DL10, EK-35, and DUST-STOP are examples of binders approved for use in Nunavut (*GN 2014*).
- Crusting agents work best on inactive storage piles. They are reasonably long lasting, rain resistant, and wind proof. None are approved for use in Nunavut.

Table C.1 provides a comparison of the advantages and disadvantages of using water, wetting agents, and binders for dust suppression.

Analysis of the road surface will be considered when the decision on whether to use chemical dust suppressants or not is made. The chemical dust suppressant most likely to be used by Agnico Eagle is calcium chloride; however, its use will be kept to a minimum to prevent damage to vegetation adjacent to the road and to mitigate the risk of creating an attractant to wildlife (salt lick effect). It will be used selectively where it will be more effective than water alone, and where it will not adversely

affect the environment immediately next to the road. As calcium chloride is susceptible to leaching, Agnico Eagle will not use it within 30 metres of waterbodies or sensitive plant communities.

Table C.1. Comparison of Dust Suppressants

Dust Suppressant	Advantages	Disadvantages
Water	- no environmental impacts - readily available	- short term dust suppression, requires frequent re-application - works better than chemical dust suppressants on roads having greater than 20 – 25 % silt on the driving service or having a majority of sand - can cause water erosion if too much is applied
Calcium chloride	-effective in climatic areas when relative humidity greater than 30% -less frequent applications required than water	- possible impact on water and aquatic species when washed from the road and into the environment - soil salinization and impact on plant life; attractant for wildlife - not effective when road surface has greater than 20 – 25 % silt or has a majority of sand on the driving surface
Oil based binders (DL10)	- effective and long lasting	- may have adverse impacts on vegetation, soil, water and aquatic life
Organic binders (EK-35, DUST-STOP)	- effective and applied directly to road surfaces- Less frequent applications than water	- significantly more expensive to use than water - limited effectiveness if road has greater than 20 to 25 % site on the driving surface, it is better to use water under this condition

Adapted from Alberta Environment 2012

As part of its Meliadine Update Technical Study Phase 2, 2015 Agnico Eagle plans to use saline groundwater as the primary dust suppressant (Agnico Eagle 2015). If this proves not to be sufficiently efficient, Agnico Eagle will evaluate other dust suppression techniques and chemical dust suppressants with the results to be used in selecting the chemical dust suppressant(s) that will work best at the Project. If the selected dust suppressant is not calcium chloride, DL10, or some other approved product, Agnico Eagle will request that the Department of Environment carry out an assessment.

7.3 Planned Dust Suppression

During the peak season where dust suppression is required, Agnico Eagle will complete daily inspections of the road and, on an as-needed basis, will apply water and/or a mix of $CaCl_2$ and water along the length of the AWAR, as well as the Bypass Road (when completed).

Other chemical suppressants will be tested to evaluate the performance in terms of dust suppression. It is Agnico Eagle's intention to use best management practices with regards to dust suppression along all of its roads.

7.4 Maintenance of the Road Surface for Dust Suppression

Agnico Eagle recognizes that inspection precedes maintenance and a good inspection program will lead to the early identification of areas of the roads where improvements are necessary. The early resolution of any deficiencies will result in less ongoing maintenance and repair of the driving surface (Agnico Eagle 2011a). It will also lead to less dust generation.

The amount of dust generated is a function of the composition of the road surface. If there is a significant percentage of silt size particles on the road surface, one can expect greater dust generation. Likewise, any reduction in the percentage of silt on the road surface leads to an equivalent reduction in dust. Grading roads provides relief from excessive dust by mixing silt sized material on the road surface with coarser road materials found deeper in the roadbed.

On an ongoing basis, unpaved roads and travel areas are topped with new aggregate and graded, with goals of improving safety, minimizing erosion, and reducing dust emissions. This is required as unpaved road constantly lose surface material through wind and water erosion, and from vehicles throwing material off the road.

8. Thresholds for Initiating Dust Suppression

Table C.2 outlines the thresholds Agnico Eagle will use at the Project to initiate mitigation measures.

Dustfall measurements are regularly be collected along the roads and other parts of the mine site using passive sampling methods to record the quantity of dust collected over time, and to allow the success of mitigation measures to be quantified. The monitoring data will be used to adjust mitigation measures to improve dust management strategies.

Table C.2. Thresholds and Mitigation Measures

Location	Frequency	Indicator	Threshold	Mitigation Measure
Itivia laydown and Oil Handling Facility	routine inspection by Itivia supervisor during summer period.	- measured dustfall. - deterioration of visibility along road.	- deterioration of visibility. - safety concern. - dust reaching Hamlet.	- use water and/or dust suppressant to control the dust.
AWAR and bypass road	regular weekly or more frequent inspection by road supervisor during the late spring and summer periods.	- measured dustfall. - deterioration of visibility along road.	- deterioration of visibility. - safety concern. - high dust levels evident near significant waterbodies.	- use water and/or dust suppressant in areas requiring attention. - grade the road surface. - add new granular material to the road surface. - temporarily lower the speed limit on the road.
Mine site, including travel areas, haul and service roads	regular weekly or more frequent inspection by site services supervisor during the late spring and summer periods.	- measured dustfall.	- deterioration of visibility. - safety concern. - dust reaching Meliadine Lake.	- use water and/or dust suppressant on exposed surfaces such as parking areas, pads, haul, access and service roads, dry stack tailings. - review mitigation measures in place. - add new granular material to surface, - if applicable, grade the surface. - temporarily lower speed limit on site.
Ramps in the open pits	regular inspection by pit supervisor during summer period.	- deterioration of visibility.	- deterioration of visibility. - safety concern.	- use water as a dust suppressant.

Table adapted from Baffinlands 2010

8.1 The Role of the Road Supervisor

The road supervisor[18] will conduct periodic inspections (minimum weekly) of roads to ensure that they are maintained for safe travel of personnel, equipment, and supplies. These inspections will be recorded and any deficiency recorded and followed up by a corrective plan.

In areas or times identified by the Agnico Eagle road supervisor as being prone to high dust levels, where safe road visibility is impaired, or in areas where dust deposition could impact waterbodies or the Hamlet, the road supervisor will arrange mitigation measures as appropriate. This could involve actions such as grading of the road surface, addition of aggregate to the road surface, watering of the road surface and/or using an approved chemical dust suppressant.

The bypass road will receive special attention and extra dust suppression measures may be taken to avoid dust impinging on Nipissar Lake.

Adaptive management will be used when inspections or monitoring shows the generation of dust to be greater than anticipated and that additional mitigation measures are required. As well, if dust is unexpectedly generated where it was not anticipated, adaptive management will be used to understand the source and find ways to reduce or eliminate the same.

9. Dust Management Plan Update

The Plan will be reviewed annually and updated if there are changes in operations and/or technology.

[18] The open pit supervisor will do the same for the open pit ramps.

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AGNICO EAGLE

MELIADINE GOLD PROJECT

Spill Contingency Plan

MARCH 2018
VERSION 7
6513-MPS-05

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EXECUTIVE SUMMARY

The Spill Contingency Plan (Plan) for the Agnico Eagle Mines Limited (Agnico Eagle) Meliadine Gold Project (Project) covers: the proposed Meliadine site, Rankin Inlet Itivia land-based facilities and All-weather Access Road (AWAR) and associated roads on-site and in between, including the Rankin Inlet bypass road.

This PLAN ensures that Agnico Eagle respects all applicable federal and territorial laws, regulations, and guidelines for spills to land, water and/or ice. Spills that are deemed "reportable spills" pursuant to applicable laws and regulations will be reported by Agnico Eagle to the NT-NU 24-Hour Spill Report Line, Aboriginal Affairs and Northern Development Canada, Environment Canada, Department of Fisheries and Oceans, Kivalliq Inuit Association, and Nunavut Water Board.

The goal of the Plan is to minimize the impacts of spills by the establishment of predetermined lines of response and plans of action, and to protect the safety of workers and contractors in the event of a spill. This goal will be achieved by applying best management practices, by promoting environmental awareness and safety, by encouraging prevention and maintenance, and by facilitating efficient cleanup of spills, releases, or discharges to land, water, ice and snow.

Substances covered by the Plan include hydrocarbon products, liquid and solid hazardous substances, and compressed gas. Other types of spills such as seepage from water containment structures or waste sources that could affect off site receptors are also considered.

For all spill emergencies, priority actions are: (1) ensure safety, (2) respond quickly, and (3) report the spill. The Plan outlines response organization and communication lines, and lists emergency response contacts. The person, who is the primary person involved in a spill, or the first to observe a spill, is the first responder. The first responder shall contact a Supervisor or the Incident Commander, which will be responsible for initiating appropriate spill emergency response. Agnico Eagle will have an Emergency Response Team (ERT) that will be trained and will support in the response of major spills, as needed. All members of the ERT will be trained and familiar with emergency and spill response resources, the Plan, and appropriate emergency spill response methodologies. The ERT members receive basic training on hazardous materials handling (Material Safety Data Sheets) and are equipped to respond safely while wearing Personal Protective Equipment. The General Mine Manager, Environment Superintendent, Health and Safety Superintendent and Health care personnel are all identified as key elements to spill emergency response.

Spill response kits will be strategically located where required on-site. All mobile equipment on-site (surface heavy equipment) will also be equipped with an emergency spill kit. A mobile environmental emergency trailer will be located on-site. Sea cans with spill response equipment and supplies will also be located near the Meliadine River at Km 18 and at Itivia (during barge season).

Action plans will first involve standard and appropriate spill control and containment techniques (e.g., dikes and trenches, floating booms, etc.). Free-product will be recovered as much as possible using vacuums, pumps, etc. and placed in appropriate containers. Absorbent materials will be used to soak up residual products. Contaminated materials will be salvaged, put into appropriate containers, and labelled for temporary storage. Depending on the nature of the contamination, solid materials will be either treated on-site (landfarm), or eventually shipped off-site to an approved treatment and disposal facility.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	October 2012			First draft of the Spill Contingency Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013			DEIS re-submission Rebranding	
3	April 2014	7	23-24	Included Tables 7-2 and 7-3 as per Information Request answer (TC_149)	John Witteman, Env. Consultant, Agnico Eagle
		6.5	21	Included commitment from technical review wrt TDGR.	
		App. H	A-32 A-36	Completed regulations table (ref. information requests)	Josée Noël, Env. Coord., Agnico Eagle
4	April 2015			Update for Type A Water License Application	John Witteman, Env. Consultant, Agnico Eagle
5	December 2015			Comprehensive revision and updates. Adapted to licenses B (MEL1424, 2BW-MEL1525 and 8BC-MEL1516) and future Type A Water License	Environment dept., Agnico Eagle
6	March 2017			Spill kit list and spill kit location updated	Alexandre Gauthier, Environment dept., Agnico Eagle
7	March 2018			Annual review	Jessica Huza Alexandre Gauthier, Environment dept., Agnico Eagle

Approved By:

Jessica Huza
General Supervisor Environment

DISTRIBUTION LIST

Agnico Eagle - Environmental Superintendent AEM – General Mine Manager
Agnico Eagle – Engineering Superintendent
Agnico Eagle – Health and Safety Superintendent AEM – Geology Superintendent
Agnico Eagle – Mill Superintendent
Agnico Eagle – Maintenance Superintendent AEM – Mine Superintendent
Agnico Eagle – Energy & Infrastructure Superintendent
Agnico Eagle – General Services Superintendent

IMPLEMENTATION SCHEDULE

The implementation schedule for this Plan is effective immediately (December 2015) subject to any modification proposed by the NIRB and/or NWB as a result of the review and approval process.

ACRONYMS

INAC	Indigenous and Northern Affairs Canada
Agnico Eagle	Agnico Eagle Mines Limited
ANFO	Ammonium Nitrate – Fuel Oil, a type of explosive
AWAR	All-Weather Access Road
DFO	Department of Fisheries and Oceans Canada
ERT	Emergency Response Team
IQ	Inuit Qaujimajatuqangit
KIA	Kivalliq Inuit Association
MSDS	Material Safety Data Sheet
NIRB	Nunavut Impact Review Board
NT	Northwest Territories
NU	Nunavut
NWB	Nunavut Water Board
PLAN	Spill Contingency Plan
PPE	Personal Protective Equipment
Project	Meliadine Gold Project
RMMS	Responsible Mining Management System
TSF	Tailing Storage Facility
WHMIS	Workplace Hazardous Materials Information Sheet
Water Licence	Type A Water Licence No. 2AM-MEL1631
WRSF	Waste Rock Storage Facility

1.1 Purpose and Scope

The goal of the Spill Contingency Plan (Plan) is to minimize the impacts of spills by the establishment of predetermined lines of response and plans of action, and to protect the safety of workers and contractors in the event of a spill.

This goal will be achieved by applying best management practices, by promoting environmental awareness and safety, by encouraging prevention and maintenance, and by facilitating efficient cleanup of spills, releases, or discharges to land, water, ice, and snow related to Agnico Eagle Mines Limited Meliadine Project (Project).

This Plan has been designed to facilitate effective communication and efficient cleanup of spills of potentially hazardous materials. Hazardous materials include and are not limited to:

- hydrocarbon products such as diesel fuel, gasoline, hydraulic oil;
- soluble solids, such as ammonium nitrate pill;
- liquids, such as glycols and paints;
- corrosive liquids, such as sulphuric acid and sodium cyanide;
- compressed (inert and flammable) gas; and,
- Seepage from waste related structures that could affect off site receptors.

Furthermore, the objectives of this Plan are to:

- comply with federal and territorial laws, regulations, and guidelines;
- identify roles, responsibilities, and reporting procedures;
- detail plans of action to be followed in the event of a spill at the Project;
- provide readily accessible emergency information to the cleanup crews, management, and government agencies;
- promote the safe and effective recovery of spilled materials; and,
- minimize the environmental impacts of spills to land, water and/or ice and snow.

This Plan applies to all Agnico Eagle employees and any contractors associated with:

- the proposed Project site including Itivia fuel storage facility; and,
- the All-weather Access Road (AWAR) and associated roads on-site and in between including by-pass road in Rankin Inlet.

1.2 Related Documents

Documents containing information related to this Plan, submitted as part of the Type A Water Licence No. 2AM-MEL1631 (Water Licence) include the following management plans:

- Environmental Management and Protection Plan;
- Risk Management and Emergency Response Plan;
- Explosives Management Plan;
- Borrow Pits and Quarries Management Plan;
- Roads Management Plan;
- Landfill and Waste Management Plan;
- Hazardous Materials Management Plan;
- Water Management Plan; and,
- Waste Management Plan.

1.3 Use of Inuit Qaujimajatuqangit in Spill Management

Inuit Qaujimajatuqangit (IQ) is the most successful and oldest monitoring practice in Nunavut, where the resource users do the observing or monitoring. Information collected through IQ can contribute to mine design and planning, as well as monitoring activities. Agnico Eagle is committed to including IQ and public concerns stemming from IQ, where practical, in the design of management and monitoring plans for the Project.

This Plan considers IQ, including traditional ecological knowledge, traditional land use, and concerns regarding Project effects on traditional resources and traditional land use sites. The IQ indicates that the Project area is important for the traditional harvesting of caribou, other land mammals, waterfowl and geese, fish and vegetation, and maintaining the health of these resources so that traditional land use activities can continue. This Plan is designed to minimize the potential impacts of spills to land, water, and/or ice and snow and focuses on promoting environmental awareness, encouraging prevention and maintenance, and facilitating efficient cleanup of spills, releases, or discharges to land, water, ice, and snow as follows:

- Predetermined lines of response and plans of action will be established.
- Spill prevention will occur though regular inspections of storage areas for leaks and hazardous materials, and the training of workers in the use of safe work and spill clean-up procedures.
- Spill response kits are strategically located where required on-site and all mobile equipment on-site (surface heavy equipment) are required to be equipped with an emergency spill kit. A mobile environmental emergency trailer and a designated and trained emergency response team will also be located on-site, and sea cans with spill response equipment and supplies will also be located at km 7 and 18 along the AWAR.
- Spill and emergency response equipment will be installed at hazardous material storage areas.
- To minimize potential impacts to surface water, groundwater, and soil from potential vehicle accidents, a maximum speed of 50 km/hr on the AWAR is applied to all vehicles (empty and transporting hazardous materials). All employees and contractors using the roads will carry spill response equipment.

2.1 Classification of Spills

For the purposes of this Plan, a major spill is defined as an accidental release of a large or small quantity of material into the environment that has the potential for adverse impact, and cannot be handled safely without the assistance of the Emergency Response Team (ERT), including all events where a person is injured or contaminated. The ERT must be notified immediately of a major spill or emergency and will respond accordingly. As an example, for the purpose of this Plan, a tanker truck overturned on the AWAR is considered a major spill. Major spills will be reported to the NU/NT Spill Report Line @ 867 920 8130, fax 867 873 6924, spills@gov.nt.ca.

A minor spill is defined as any spill of material that does not involve highly toxic, highly reactive, or explosive chemicals, in a situation that is not life threatening to humans, fish or wildlife. Furthermore, this type of spill presents a manageable physical or health hazard to personnel who, when wearing proper personal protective equipment (PPE), will not be exposed to any chemical at a level that exceeds any recognized action levels or permissible exposure limits. Minor spills will be reported to the Environment Department but are not expected to involve emergency responders.

2.2 Materials and Reportable Spills on-site

To ensure compliance with Section 36 (3) of the *Fisheries Act*, all spills of fuel or hazardous materials, regardless of quantity, into a waterbody or onto ice will be reported immediately to the NT-NU 24-Hour Spill Report Line[1].

As a precaution, if there is any doubt as to whether the quantity spilled meets the minimum reportable thresholds listed in Table 2-1 (AANDC 2010), the spill incident will be reported to the Spill Report Line. Furthermore, Agnico Eagle will maintain a detailed log of all spills of hazardous materials, including non-reportable spills. As part of Agnico Eagle's overall Responsible Mining Management System (RMMS), and for continuous improvement of environmental performance, procedures will be implemented to ensure that employees communicate non-reportable spill incidents and clean them up as required.

[1] Nunavut Environmental Protection Act. *Consolidation of Spill Contingency Planning and Reporting Regulations* R-068-93.

Table 2-1 Spill Quantities to be Reported to the Spill Report Line[(a)]

Transportation Class	Type of Substance	Compulsory Reporting Amount
1	Explosives	Any amount
2.1	Compressed gas (flammable)	Any amount of gas from containers with a capacity exceeding 100 L
2.2	Compressed gas (non-corrosive, non-flammable)	Any amount from containers with a capacity exceeding 100 L
2.3	Compressed gas	Any amount
2.4	Compressed gas (corrosive)	Any amount
3.1, 3.2, 3.3	Flammable liquid	100 L
4.1	Flammable solid	25 kg
4.2	Spontaneously combustible solid	25 kg
4.3	Water reactant solids	25 kg
5.1	Oxidizing substances	50 L or 50 kg
5.2	Organic peroxides	1 L or 1 kg
6.1	Poisonous substances	5 L or 5 kg
7	Radioactive substances	Any amount
8	Corrosive substances	5 L or 5 kg
9.1 (in part)	Miscellaneous substances	50 L or 50 kg
9.2	Environmentally hazardous	1 L or 1 kg
9.3	Dangerous wastes	5 L or 5 kg
9.1 (in part)	PCB mixtures of 5 ppm or more	0.5 L or 0.5 kg
None	Other contaminants	100 L or 100 kg

[(a)] *Nunavut Environmental Protection Act. Consolidation of Spill Contingency Planning and Reporting Regulations* R-068-93.
Note: PCB = polychlorinated biphenyls; ppm = parts per million.

A variety of petroleum products and other hazardous materials are used as part of the mining operations. Explosives will also be stored on-site; details are available in the Explosives Management Plan. Other hazardous materials will be used but in smaller quantities and are presented in Table 3-1. Nonetheless, all these products are considered as potential environmental and safety hazards.

Material Safety Data Sheets (MSDS) of all materials transported, stored and used on-site will be made available at strategic locations near to where hazardous materials or toxic substances are stored or utilized. As a reference; the up-to-date MSDS's can be found on the Agnico Eagle SDS portal called ***3E-Online***. Appendices B to G also provide general response procedures for specific spilled chemical substances.

Table 3-1 Main Hazardous Materials Stored and Used On-Site

Product	Use/Location	Maximum Amount Anticipated On-Site	Maximum Amount by Unit
Process Plant Reagents			
Activated Carbon	Carbon-In-Leach	76 t	500 kg/bag (10 t/sea can)
Anti-scaling agent	Mill	5.5 t	
Borax	Refinery	17 t	3,375 kg/sea can
Hydrochloric acid	Elution-Regeneration	652 t	
Copper Sulfate	Cyanide Destruction	345 t	2,500 kg/bag (20 t/sea can)
Sodium cyanide	Carbon-In-Leach	1,414 t	1,000 kg/bag (19 t/sea can)
Flocculant	Grinding	46 t	750 kg/bag (15 t/sea can)
Lead Nitrate	Carbon-In-Leach	-	
Lime	Carbon-In-Leach	1734 t	1,743 kg/bag
Silica	Refinery	17 t	
Sodium Hydroxide	Elution-Regeneration	133 t	1,000 kg/bag
Sodium Metabisulfite	Cyanide Destruction	1,758 t	1,000 kg/bag
Sodium Nitrate	Refinery	17 t	5.1 t/sea can
Sulfur Prills	Cyanide Destruction	0 t	1,000 kg/bag (20 t/sea can)
Water Treatment Reagents			
Ferric Sulfate	Water Treatment Plant	260 t	1 t/bag
Lime	Water Treatment Plant	320 t	1,743 kg/bag
Flocculant	Water Treatment Plant	5 bags	750 kg/bag (15 t/sea can)
Caustic Soda	Sewage Treatment Plant	1 t	22.5 kg/pail
Soda Ash	Sewage Treatment Plant	365 kg	25 kg/bag

Citric Acid	Sewage Treatment Plant	50 kg	25 kg/bag
Chlorine (NaOCl)	Sewage Treatment Plant	962 L	20 L/bucket
Acetylene	Welding	830 bottles	11 m^3 / bottle
Paints	Maintenance	180 gal.	1 gal./pail
Solvents	Maintenance	56 gal.	1 gal./pail
Lead acid batteries (12V)	Maintenance	386	
Fuel Products			
Diesel	**Itivia**		
	1- Itivia Oil Handling Facility	20 ML	20 ML tank
	2- Itivia Oil Handling Facility	13.5 ML	13.5 ML tank
	3- Itivia Oil Handling Facility (Sustaining)	4 ML	4 ML tank
	Industrial site Tank Farm		
	4- Site Main Fuel Tank	6 ML	6 ML tank
	5- Site Fuel Tank summer	250,000 L	250,000 L
	6- Powerhouse	50,000 L	25,000 L/tank
	7- Process Plant	10,000 L	10,000 L/tank
	8- Mechanical shop (Oil)	10,000 L	1,000 L/tank
	Portal #1 Mine Site Tank Farm		
	9- Site Main Fuel Tank	3 ML	3 ML
	10- Site Fuel Tank summer	250,000 L	250,000 L/tank
	11- Site Fuel Tank Measure for UG	2,000 L	2,000 L/tank
	12- Site Fuel Tank UG heating Intake West	25,000 L	25,000 L/tank 25,000 L/tank
	13- Site Fuel Tank UG heating Intake East	25,000 L	10,000 L/tank
	Underground		
	14- UG Fuel Tank UG level 325	50,000 L	10,000 L/tank
	15- UG Fuel Tank (Sustaining)	10,000 L	10,000 L/tank
Motor Oil	Mechanical shop	800,000 L	20,800 L/sea can
	Powerhouse		
Hydraulic Fluid	Mechanical shop		Cubes or Barrels
	Powerhouse		Cubes or Barrels
	Process Plant		Cubes or Barrels
Ethylene glycol	Mechanical shop	60,000 L	10,000 L/sea can

SECTION 4 • PREVENTION AND INSPECTIONS

Spill response is reactive while spill prevention is proactive. Spill prevention, response, and reporting will be part of the online induction which is mandatory for anyone coming to work at the Meliadine site. As well, all staff will be trained to call the Environment Department in the event of a major spill and to notify their supervisor in the event of a minor spill. Spill kits will be made available to assist with retaining the spill or starting cleanup, if safe to do so. Upon arriving and inspection of the spill site, if potential hazards are present, call ERT or initiate a Code 1.

Regular worksite inspections are conducted to identify measures to minimize or prevent the risk of spills. As part of online orientation sessions, all staff is to understand the steps to be undertaken in the event of a spill. This includes that all spills are to be reported, and that containment and clean-up is necessary for all minor and/ or major spills. Following the clean-up of a spill, the Environmental Department will inspect the spill site and, if necessary, collect samples to verify that the clean-up is complete.

All personnel are trained to be aware of the potential hazards associated with the fuel/chemicals with which they will be assigned to work. In addition to work site inspections conducted by area specific employees, the Environmental Department conducts weekly inspections to audit facilities where hazardous materials are handled and stored.

Agnico Eagle will implement the following general principles for spill prevention:

- provide up-to-date and accessible MSDS for all hazardous materials to designated emergency response personnel and mine health staff, and to the Rankin Inlet health center staff;
- regular inspection of fuel/chemical storage areas for leaks (including flex connectors and plumbing) and platform shifting;
- regular inspection of hazardous materials storage areas;
- train workers in the use of safe work procedures for hazardous materials, and procedures to clean up spills;
- encourage workers to take reasonable measures to prevent spills;
- keep drums/containers sealed or closed;
- place drums/containers within a suitable form of secondary or spill containment.
- segregate incompatible materials;
- ensure chemical storage areas are adequately protected from weather and physical damage; and,
- provide adequate spill response materials at storage areas (details of spill prevention and response equipment are outlined in Section 7 • Response Equipment).

During site orientation, inductions are scheduled to ensure employees have an understanding of the steps to be undertaken in the event of a spill. All employees and contractors will be shown where spill kits are stored, will be aware of their contents, and will be familiar with using spill equipment and responding to spills.

Figure 5-1 illustrates Agnico Eagle's spill/incident reporting procedure and the following sub-sections list the major responsibilities of site staff that will be participating in the emergency response.

5.1 First Responder

The person who is the primary person involved in a spill, or the first to observe a spill, is the first responder. The responsibilities of the First Responder are as follows:

- If considered safe to do so after initial assessment, STOP the spill using equipment contained in spill response kits, if required.
- in case of a tanker truck overturn or other type of major spill where human life is threatened or the spill is uncontrollable, initiate Code 1. Remain on radio to provide guidance to the ERT;
- in case of spill to land, ice or water, contact the Supervisor and/or the Environment Department to report the incident;
- identify spilled product and contain the spill, IF SAFE TO DO SO; and,
- participate in spill response as a member of the cleanup crew.

5.2 Supervisor

The responsibilities of the Supervisor are as follows:

- initially assess the severity of the incident;
- contact the ERT Incident Commander and/or the Environment Department;
- gather facts about the spill; and,
- participate in spill response as a member of the cleanup crew.

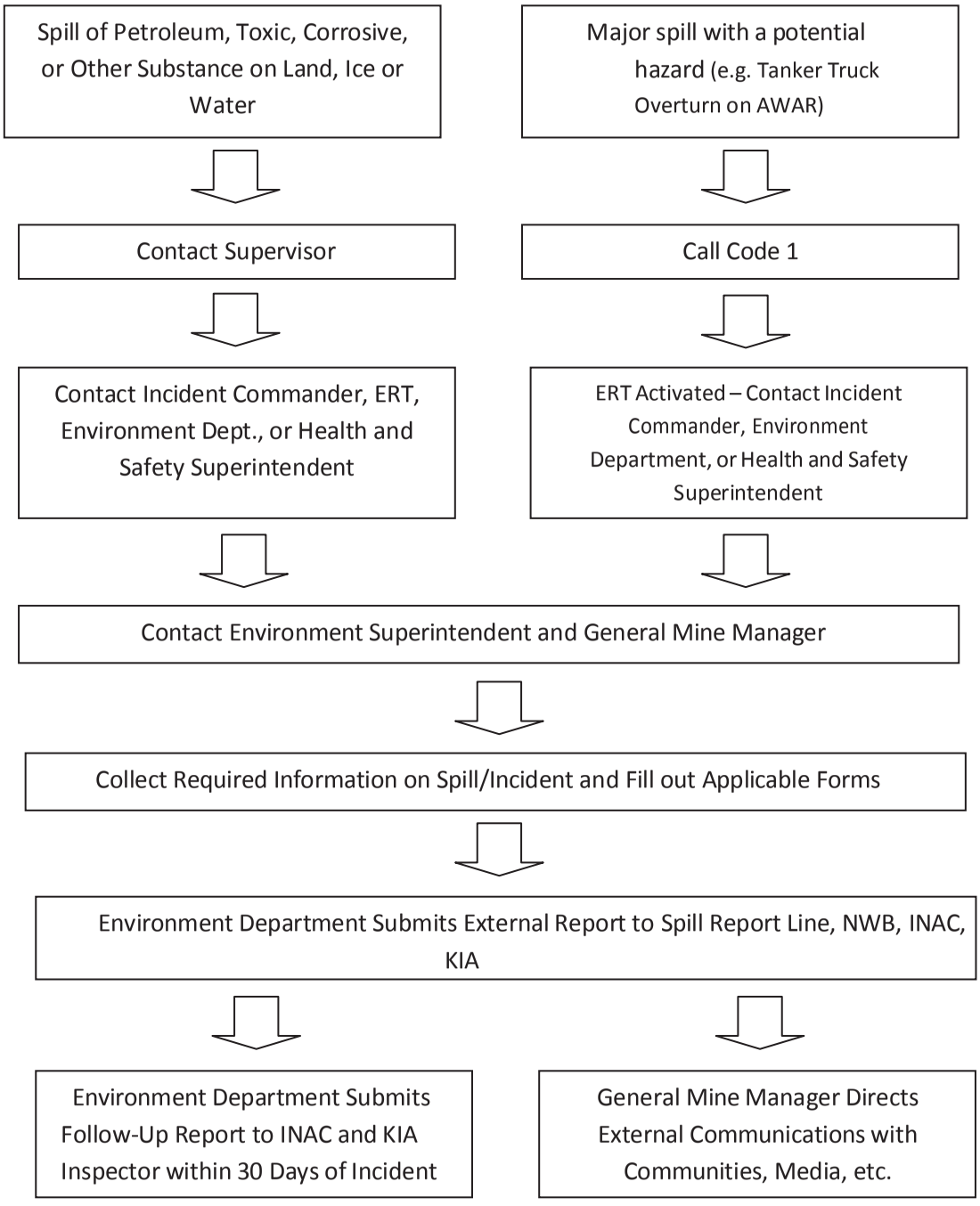


Figure 5-1 Spill/Incident Reporting Procedure

5.3 Environment Incident Coordinator

Responsibilities of the Environment Incident Commander are as follows:

- assume complete authority over cleanup personnel and the spill scene;
- assume responsibility for all mitigation efforts;
- evaluate the initial situation and assess the magnitude of the problem;
- activate the initial response plan;
- alert and assemble key personnel in the ERT, as deemed appropriate, to handle the situation;
- in consultation with the Environment Superintendent or designate, develop the overall plan of action for containment and cleanup, and direct and implement the plan;
- ensure assigned responsibilities are carried out and the activities of team members are coordinated;
- assess the requirements for people, equipment, materials, and tools to contain the spill in light of what resources are immediately available - urgency will depend on the nature of the spill; and
- in consultation with the Environment Superintendent or designate, mobilize any additional resources that may be required and arrange for the transportation of necessary personnel and/or materials to the spill site.

5.4 Emergency Response Team

Prior to the commencement of construction, Agnico Eagle will have an ERT that is trained and assist for controlling major spills. For example, they will be called upon to respond to spills from potential tanker truck rollovers along the AWAR. These team members will attend regular training sessions in spill response.

5.5 Emergency Response Team Incident Commander

The responsibilities of the Emergency Response Team Incident Commander are as follows:

- assume complete authority over securing the scene prior to cleanup;
- mobilize all ERT personnel, equipment, PPE, and supplies as required to the site of the spill;
- assist the Environment Incident Coordinator in obtaining any additional resources not available on-site;
- ensure that appropriate PPE is worn and used properly;
- assist in developing and implementing emergency response training programs and exercises; and
- ensure that all spill response personnel receive adequate training to fulfil their responsibilities as part of the ERT.

5.6 Environment Superintendent

The Environment Superintendent or designate will be responsible for implementing and maintaining

the Plan. In addition, the responsibilities of the Environment Superintendent or designate are as follows:

- liaise with the Environment Incident Coordinator;
- provide technical advice on the anticipated environmental impacts of the spill;
- advise on the effectiveness of various containment, recoveries, and disposal options, and suggest the most appropriate approach;
- prepare and submit any formal report (see Appendix A for the Spill Report Form) to regulators and Agnico Eagle management detailing the occurrence of a spill;
- contact the Senior Vice President - Environment and Sustainable Development immediately in case of a major spill;
- contact the Corporate Director of Communication & Public Affairs immediately in case of a major spill;
- act as the spokesperson with regulatory and government agencies;
- if authorized by the General Mine Manager or delegate, act as a spokesperson with the public and media, as required;
- implement a sampling protocol for the collection and analysis of samples to identify and monitor possible contaminant levels resulting from the spill;
- ensure on-site resources for spill response and cleanup are available;
- monitor the effectiveness of the cleanup operation and recommend further work, if necessary
- review incident occurrences and recommend preventative measures; and,
- assist in implementing training and simulation requirements for spill response personnel.

5.7 General Mine Manager

The General Mine Manager or designate will be required to inform ERT members of the detailed nature of the operations to be performed in the event of a facility malfunction causing a spill during the operations phase. The responsibilities of the General Mine Manager or designate are as follows:

- liaise with appropriate Agnico Eagle personnel and keep them informed of cleanup activities; and,
- assist the Incident Commander and ERT as needed, particularly in obtaining any additional personnel and resources not available on-site for spill response and cleanup.

5.8 Health and Safety Superintendent

The following will be the responsibilities of the Health and Safety Superintendent or designate in conjunction with the Training Department:

- maintain emergency and health and safety records;
- assist in conducting emergency spill response exercises;
- track all emergency and health and safety training that on-site staff, including contractors, have received, and when retraining is required;

- notify the Incident Commander (related to ERT) when retraining is required;
- ensure that employees are retrained in appropriate emergency response skills prior to expiry of existing training certification (e.g., Workplace Hazardous Materials Information System (WHMIS), Hazard Communication, Occupational Health and Safety Administration, first aid, respirator fit-testing; and
- consult with appropriate organizations regarding retraining requirements and schedule.

5.9 On-Site Health Care Providers

On-site nurses are responsible to:

- provide on-site first aid and other medical support; and,
- provide additional training for ERT members.

In addition to the health care providers on-site, the Rankin Inlet health professionals will be called for assistance, if required. For example, they may be the first to respond to incidences that could occur at Itivia.

5.10 Emergency Response Team Contact Information

Table 5-1 provides contact information for select Agnico Eagle contractors present at the Project. Internal contact information is presented in Table 5-2 for all Agnico Eagle personnel involved in spill recovery and subsequent reporting. Important external contacts relating to spill response, such as regulatory agencies and health organizations, are listed in Table 5-3. Table 5-4 provides contact information for external spill response contractors should incident warrant assistance from outside sources. These tables will be updated on a minimum annual basis and updated, as required.

Table 5-1 Contractor Contacts

Title	Telephone No.	Contact in Emergency for:
Nolinor Aviation Services	Protocol Agent 867.759.3700 ext. 8008	Flight services for additional crew, or additional supplies
First Air	(867) 669-6605	Flight services for additional crew, or additional supplies
Calm Air	(867) 793-2873	Flight services for additional crew, or additional supplies
Dyno Nobel Explosives Ltd.	(867) 793-4610 ext. 6804	Heavy Equipment, Man power, Emergency Blasting
Woodward Group of Companies (Shipping)	(709) 896-2421	Fuel Hauler
M&T Enterprises, Rankin Inlet	867 645-2778	

Table 5-1 Internal Contacts

Title	Name	Telephone No.
Sr. Vice President, Environment and Sustainable Development	Louise Grondin	416.847.8656 Cell: 819.724.2020
Vice President of Environment	Michel Julien	416-947-1212 ext. 3738 Cell: 514.244.5876
Corporate director, Communications & Public Affairs	Dale Coffin	416.847.8669 Cell: 647.274.4154
Manager of Nunavut Services Group	Jason Allaire	819.759.3555 ext. 8004 Cell: 819.355.2608
Meliadine General Mine Manager	Martin Plante	819-759-3555 Cell: 819.856.1873
H&S Superintendent	Normand Ladouceur	819.759.3555 ext.6720 MBK Cell: 819.860.6258
Sr H&S Coordinators	Nathalie Ledoux Jean Ladouceur	819.759.3555 Ext 3968
Emergency Measure Counsellor	Dave Loder Darren Wilcox	819.759.3555 ext.3906
Environmental Superintendent	Nancy Duquet Harvey	819.759.3555 ext.6980 Cell: 819.856.4385
Environmental General Supervisor	Jessica Huza	819.759.3555 ext.3928 Cell: 819.856.5097
SR. Environmental Coordinator	Jennifer Brown Daniel Gorton	819.759.3555 ext.3996
Environmental Department	Environmental Technicians	819.759.3555 ext.3903 & 3925
On-site Nurses		819.759.3555 ext.3011

Table 5-3 External Contacts

Organization/Authority	Telephone Number	Fax Number
NT-NU 24-Hour Spill spills@gov.nt.ca	(867) 920-8130	(867) 873-6924
Workers Safety and Commission	(867) 979-8500	(867) 979-8501
Kivalliq Inuit Association	(867) 645-5725	(867) 645-2348
Nunavut Water Board	(867) 360-6338	(867) 360-6369
INAC Inspector	(867) 645-2830	(867) 979-6445
Department of Fisheries and Ocean (DFO) – Nunavut Regional Office	(867) 979-8000	(867) 979-8039
Manager, Environmental Protection, Government of Nunavut	(867) 975-7748	(867) 975-5981
Kivalliq Health Services – Rankin Inlet After Hours	867 645-8300 867 645-6700	
Rankin Hamlet Office	867 645-2895	
Rankin Fire Emergency	867 645-2525	
RCMP 24 Hour Emergency Number	(867) 645-1111	
Canadian Coast Guard (in the event of a spill to the marine environment) Superintendent Environmental Response	(800) 265-0237 (519) 383-1954 (519) 381-6186 (cell)	(519) 337-2498
Transport Canada – Marine Safety Jaideep Johar Ian Salisbury	 (204) 880-0754 or (204) 984-8618 (780) 495-8360	 (780) 495-8607

The primary form of ensuring safety is by using preventative measures. All personnel who will have to deal with chemicals will have training in first aid and safe materials handling, including WHMIS. In addition, regular training updates and site-specific exercises/drills will be integral to preventing incidents.

Procedures will vary depending on the season and hazardous materials spilled, as well as on location of the spill (on land, water, ice, or snow). The MSDS will be consulted to ensure that safety procedures are followed. Response procedures specific to spills on land, water, snow, and ice are presented in the following sub-sections as general guidelines.

6.1 Initial Action

For all spill emergencies, it is required that the following priority actions be undertaken:

- Ensure personal safety;
- respond quickly; and,
- report the spill.

6.1.1 Respond Safely

Responding safely involves the following:

- consult the MSDS and Product Guides for further information on the substance;
- control the spill area to prevent unauthorized access by other workers;
- Ensure adequate ventilation;
- assess whether the spill, leak, or system failure can be readily stopped or brought under control;
- stop product flow or leak if possible and IF SAFE TO DO SO;
- approach spill from upwind IF SAFE TO DO SO;
- do not contain compounds (e.g., gasoline, aviation fuel) if vapours might ignite – allow them to evaporate;
- depending on the type of compound spilled and IF SAFE TO DO SO, contain product using booms, berms, absorbent pads, earthen dike, trenches or improvise with materials at hand; and,
- wear appropriate PPE, such as impervious clothing, goggles, and gloves when containing the spill.

6.1.2 Respond Quickly

Responding quickly involves the following:

- identify the spilled material;
- stop the spill if safe to do so;
- be alert – ensure safety of yourself and others by notifying them of the incident;
- contact the Incident Commander if it is a major spill (Code 1), identify the location, and request assistance as required. The Incident Commander will mobilize the ERT if necessary
- shut off ignition sources such as vehicles and unplug electrical equipment – NO SMOKING nearby;
- attend to the injured if applicable; and,
- assess the severity of the spill.

6.1.3 Report Spill

Reporting the spill includes the following:

- obtain all necessary information to complete the external spill report and forward to Environment Department (see Appendix A). External reportable spills must be reported by Agnico Eagle Environment Staff to the NT-NU 24-Hour Spill Report Line, Aboriginal Affairs and Northern Development Canada (INAC), Kivalliq Inuit Association (KIA), NWB and NIRB.
- Submit a detailed spill follow up report to the same external stakeholders no later than 30 days after the spill. This is to be done by Agnico Eagle Environment Staff. The report shall contain the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain, cleanup, and restore the spill site.

6.2 Spills on Land

Response to spills on land will include the general procedures detailed in the following section. The main spill control techniques involve the use of two types of barriers: dikes and trenches. Barriers should be placed down-gradient (down-slope) from the source of the spill, and as close as possible to the source of the spill. Barriers will slow the progression of the spilled material and will also serve as containment to allow recovery of the spilled material.

Depending on the spill volume, the site of the spill and available material, a dike may be constructed with soil, booms, lumber, snow, etc. A plastic liner should be placed at the foot of and over the dikes to protect the underlying soil or other material and to facilitate recovery of the spill material.

Dikes should be constructed to accumulate a thick layer of free product in a single area (V- shaped or U-shaped).

Trenches are useful in the presence of permeable soil and when the spilled material is migrating below the ground surface. If deemed necessary, a material specific liner should be placed on the down-gradient edge of the trench to protect the underlying soil. Liners should not be placed on the bottom of the trench to allow water to continue flowing underneath the layer floating material (such as fuel).

The use of large quantities of absorbent materials to recover significant volumes of spilled material should be avoided. Large volumes of free-product should be recovered, as much as possible, by using vacuums and pumps, and containerized. Mixtures of water and fuel may be processed through an oil-water separator. Absorbent sheets should be used to soak up residual fuel on water, on the ground (soil and rock), and on vegetation. Peat moss may also be sprinkled on vegetation to absorb films of petroleum products. Excavations will be planned for contaminated areas using heavy equipment and contaminated soil will be disposed at the Landfarm.

6.3 Spills on Water

Response to spills on water will include the general procedures provided in the following section. Various containment, diversion and recovery techniques are discussed. The following elements must be taken into consideration when conducting response operations:

- type of waterbody or watercourse (lake, stream, river);
- type of spilled material;
- water depth and surface area;
- wind speed and direction;
- water flow and direction;
- type of shoreline;
- seasonal considerations (open-water, freeze-up, break-up, frozen).
- Equipment and personnel available for first response

Containment of an oil slick in water will require the deployment of mobile floating booms, maritime barrier to intercept, control, contain and concentrate (i.e., increase thickness) the floating oil.

Measures will be taken to protect sensitive and accessible shoreline. The spill will be monitored to determine the direction of migration. In the absence of strong winds, the material will likely follow water flow direction. Measures will be taken to block and concentrate the spilled material at the discharge of a waterbody using booms where it will subsequently be recovered.

In the case of spills in larger rivers, with fast moving currents, diversion booming will be used to direct the spilled material ashore for recovery. Single or multiple booms (i.e., cascading) may be used for diversion. Typically, the booms are anchored across the river at an angle. The angle depends on the current velocity. Choosing a section of a river that is both wider (i.e., less current) and shallower makes boom deployment easier. Diversion booming may also be used to direct the spilled material away from a sensitive area to be protected.

6.4 Spills on Snow and Ice

In general, snow and ice will slow the movement of hydrocarbons or other spilled material. Snow is generally a good natural sorbent. Hydrocarbons have a tendency to be soaked up by snow through capillary action. However, the use of snow as a sorbent material will be limited as much as possible. Snow and frozen ground will also prevent spilled material from migrating down into soil or at least slow the migration process. Ice will prevent seepage of spilled material into the water. On the other hand, the presence of snow may hide the spilled material (especially oil slicks) and make it more difficult to follow its progression.

Most response procedures for spills on land can be used for spills on snow and ice. The use of dikes (i.e., compacted snow berms lined with plastic sheeting) or trenches (dug in ice) will slow the progression of the spilled material and will also serve as containment to allow recovery of the material. Free-product will be recovered by using a vacuum, a pump, or sorbent materials. Contaminated snow and ice will be scraped up manually or using heavy equipment depending on volumes. The contaminated snow and ice will be disposed at the Landfarm and treated in spring with the oil and water separator.

6.5 Disposal of Spilled Material

Contaminated materials will be salvaged, put into appropriate containers (e.g., Quatrex bags/drums), and labelled for temporary storage. Water contaminated with oil or fuel will be sent to the oil separator. Water contaminated with other products will be placed in drums for shipment. Depending on the nature of the contamination, solid materials will be either treated on-site (landfarm), or eventually shipped off-site to an approved disposal facility.

Soils contaminated with light hydrocarbons (such as gasoline or aviation fuel) will be treated on-site in a landfarm. Details on the design and operation of the landfarm are provided in the Landfarm Management Plan.

Soils contaminated with other spilled products will be segregated, packaged and shipped to an external approved facility for proper treatment and disposal. In this, Agnico Eagle will adhere to the requirements under the *Transportation of Dangerous Goods Regulations*, particularly Part 5. All contaminated materials (dangerous goods) will be shipped in a means of containment required or permitted by Part 5 of the Regulations.

6.6 Seepage management

Seepage from the tailings storage facility (TSF) and waste rock storage facilities (WRSF) will be treated as actionable and reportable spills. In the event that seepage would be observed, an action plan would be elaborated to address the problem. The action plan would include: cause identification, mitigation measures put in place to stop and/or control the seepage, clean-up actions and disposal of contaminated material if applicable and follow-up and monitoring actions.

6.7 Event Monitoring

The Event Monitoring (EM) program addresses the site specific monitoring that is required following any accidental release. A "release" may be caused by a spill or an emergency. The EM program is designed to verify whether contamination of the surface soil, nearby receiving environment and active zone has occurred as a result of an accidental release of a hazardous material or contaminated water, through monitoring of surface runoff and nearby receiving environment following remediation of any release. It is anticipated that owing to the presence of permafrost beneath most of the mine footprint, there will be minimum impact to groundwater.

The EM plan is developed on a site specific basis subsequent to a spill or accidental release, and considers the location and extent of the spill, the type of product spilled, the potential receptors and the potential for any remaining contamination after clean up. The plan is done in coordination with the Environmental Superintendent, or designate. In the event of an accidental release, the water quality of the downstream receptor and possibly upstream of the receiving point, if any, is to be sampled (during the ice-free season) and analyzed. Should the spill have happened over snow cover, water and possibly soil sampling is to take place at the earliest feasible time after thaw to verify if there has been any impact to the receiving water or soil quality. The specific parameters monitored as part of the EM program will depend on the nature of the spill, and will be determined for the specific hazardous material released.

This section addresses the emergency response machinery, equipment, tools and other resources that will be made available on-site for spill recovery measures (see Tables 7-1, 7-2, and 7-3).

Table 7-1 Equipment for Spill Emergency Response

Mobile Equipment	
Excavators	Pickup trucks
Snowmobiles	Generator
ATV	Fire truck *
Vacuum truck	Boats
Loaders	Fuel trucks
Backhoe	Haul truck
Bulldozer	Spill response trailer
Zoomboom	Bobcat
Water trucks	
Temporary Containment Systems	
Booms	Spill absorbent material
Drums Tanks	Packages/pads
Flexible bladder	Silt fencing
Temporary secondary Containment	Maritime barrier
Emergency Transportation	
Helicopter if available	Snow mobile
ATV	Boats
Sno Cat	
Communication Equipment	
Radio	Email
Phone	Wireless communication system

* Not yet available on site

If required, additional on-site equipment will be made available to assist with spill recovery. Temporary containment systems will be also available on-site and at Itivia. If required, external resources available in Rankin Inlet are listed in Table 5-2 and Table 5-4.

Communication equipment on-site will include radios, telephones, and other wireless communication systems that will be available in the event of an emergency situation.

Spill response kits will be strategically located where required on-site. Each department and work area will be responsible for providing sufficient spill response kits in their respective work areas. The kits will be kept in marked and accessible locations. The locations will notably include all fuel storage areas and chemical storage areas.

All mobile equipment on-site (surface heavy equipment) will also be equipped with an emergency spill kit and quarterly audit is performed by the Environment Department.

A mobile environmental emergency trailer, which will be easily accessible and transportable, will be located on-site and will contain the items listed in Table 7-2.

Table 7-2 Contents of Mobile Environmental Emergency Trailer

Emergency Response Equipment	
Pump centrifugal (summer only)	White oil spill pads and roll
Pump accessories, Vacuum ends	Universal booms
Tubing or pipes for vacuum or pumping	Quatrex bags
Tyvek suit and glove	Wedge wood, Plug pattie
Diesel fuel jerry can (placed on a miniberm)	Hand shovel
Leak control Kit	Sledge hammer, Re- bars
Drum opener	Pipe patch kit
Wescot (to open empty drum screw)	Absorbent pellet bag
Drums	Crow bar
Absorbent booms	Secondary containment
Tarps	
Ropes	
Evac treatment system	
Yellow liner roll (Bags)	

Environmental emergency sea cans are located near the Meliadine River at km 7 and 18 along the AWAR as well as at Itivia. Each environmental emergency sea can contains material listed in Table 7-3.

Table 7-3 Environmental emergency sea can content

Quantity	Equipment/tool name
3	Empty drum (sealed)
2	Mini berm 36”x 36”
2	4 drums berm 4’x 8’
4	Tarp 20’x 30’
4	Tarp 30’x 50’
10	Oil spill absorbent pad
5	Universal absorbent boom 5”x 10’ (for hydro-soluble chemical)
5	Universal absorbent boom 8”x 10’ (for hydro-soluble chemical)
5	Petroleum base absorbent boom 5”x 10’ (for petroleum product)
3	Maritime barrier (baffle)
2	Cell-U-Sorb (absorbent)
2	Amerisorb peat moss (absorbent)
2	Oil gator absorbent
1	Plug pattie
4	Quatrex bag and liners
2	Fork lift wood pallet
4	Hand shovel
1	Crowbar chisel
1	Ice breaker chisel
1	Sledge hammer
15	Re- bar 4’
1	½ drum containment
1	Yellow liner roll
1	Toolbox
2	Silt fence
2	Silt bag
2	EVAC System
1	45 gallon Spill Kit
1	Yellow Nylon rope roll

TABLE 7-4 Spill kit Location

Area	Location	
	Easting	Northing
Fountain tire ome, Fuel Tank	541904	6989004
Jet-A Tank	541941	6988939
Orbit Dome	541861	6988932
Gaz Station	541837	6988946
Fuel Farm	541222	6988453
DCP5	540468	6988747
DCP1	540144	6989255
Nuna Yard (beside Nuna Dome)	540048	6989058
Nuna Dome (2 SK available)	540019	6989058
Warehouse Dome	539900	6988854
Dome 1 (Brine shop)	539892	6988800
Fuel Tank Portal (Dome1)	539892	6988791
Mine Compressor Room	539838	6988848
Mine Gen Set	539834	6988853
Waste Rock Area	539806	6989147
Batch Plan Yard 1	539594	6989084
Batch Plan Yard 2	539577	6989067
Batch Plan Yard 3	539541	6989077
Batch Plan Yard 4	539539	6989060
A & K Dome	539198	6990190
A & K Industrial Pad	539138	6990034
BLAIS Industrial Pad	539027	6990361
TANGMAARVIK Industrial Pad	538917	6990253
Camp Gen Set Tank	542034	6989099
Camp Gen Set Building	542038	6989093
ANFO Plant Shop	539567	6988322
Crusher (Meliadine esker, 3 SK available)	539447	6990118
Emulsion Plant Shop	537626	6990745

8.1 Training

8.1.1 On-Site Personnel

A designated ERT consisting of on-site personnel is established. Agnico Eagle will ensure that the ERT is trained and present at all times. All members of the team will be trained and familiar with emergency and spill response resources, including their location and access, the Spill Contingency Plan, and appropriate emergency spill response methodologies. The ERT will receive 4 hours of training per quarter.

The training will include the following:

- a review of the spill response plan and responsibilities of the ERT members;
- the nature, status, and location of fuel and chemical storage facilities;
- the on-site and off-site spill response equipment and how to use it;
- distribution of MSDS sheets;
- emergency contact lists;
- worker health and safety during emergency interventions;
- communication methods and signals;
- desktop exercises of “worst case” scenarios;
- emergency evacuation;
- fires or explosions;
- emergency equipment and use;
- personal protective equipment and clothing;
- marine shoreline recovery operations; and,
- likely causes and possible effects of spills.

Every employee and contractor at the Meliadine site will receive basic spill and waste management training during their online induction, so that they are able to respond to small spills and raise the alarm if a larger response is required. The ERT members will receive more spill response training and learn how to respond while wearing PPE.

The Environment Department will regularly attend tool-box sessions to provide information on spill response and reporting procedures. The Health and Safety Department, including the Health Center staff, will be familiar with and have up-to-date MSDS available.

To prepare for emergency spill response, potential spill analysis will be conducted for a variety of potential worst case scenarios. The exercise will serve in identifying potential risk areas, as well as in determining the fate of spilled products and their environmental effects. The following example is used to demonstrate the application of the spill response as part of the spill analysis. The example is of tanker truck spill along the AWAR.

Description of incident: Roll-over of fuel tanker due to poor road conditions. The roll-over has resulted in approximately 1,000 L of fuel to the ground along the road side.

Potential causes: Vehicle accident, human error.

Hazardous product(s) spilled: Diesel fuel.

Maximum potential volume spilled: 45,000 litres.

Immediate receiving medium: Land.

Distance and direction to nearest receiving body of water: 500 metres.

Resources to protect: land and any nearby stream, river or waterbody.

Estimated emergency response time: Maximum time is 90 minutes depending on location of spill (assuming truck driver is injured and cannot commence spill response procedures). Minimum time to respond to a spill on the AWAR is 15 minutes, depending on the distance from the proposed Meliadine site.

Spill response procedures: Under this scenario, the truck driver is not injured, and therefore he acted as the first responder and immediately activated the Plan as defined in Section 6. The driver attempted to seal the leak. He tried to use the spill kit carried in the fuel truck and made all attempts to contain and recover the fuel on the ground using dikes, sumps or trenches as described in Section 6.2. A sorbent boom[2] will be used to block the flow of the fuel towards the Lake. The first responder notified the Incident Commander, ERT and Environment Department by calling a Code 1 on radio. The mobile emergency response trailer was brought to the spill site by the ERT, who assisted in digging trenches to contain and collect free-product for temporary storage. Spilled material was recovered using pumps. The Environment Superintendent immediately transmitted the information to the General Mine Manager. The fuel remaining in the tanker was pumped into a temporary storage tank using appropriate equipment. The leak stopped as the tank volume was

[2] Tanker trucks will be required to carry sorbent booms as part their spill kit.

reduced below the leaking safety valve. Pumping continued until all of the fuel was removed. The empty tanker was righted and brought back to the site. All soil was cleaned up thereafter and disposed of in the landfarm. The spill was reported to the NT/NU spill report line, KIA, and INAC. After the cleanup had been completed, the Environment Department collected soil samples to verify that no residual fuel remained at the spill site. A follow-up of the spill causes results in the development of mitigation measures including:

- Fuel deliveries from Itivia to the mine site will be suspended during poor weather or poor road conditions.
- Agnico Eagle will sand the roads when road ice poses a safety risk to travel.
- All Agnico Eagle vehicles will carry basic spill response equipment and the drivers will be trained in its use. This will allow the truck driver to act as the first responder if it is safe to do so, and attempt to contain the spill and recover any spilled product.

These mitigation measures, combined with the procedures outlined in this Plan above, will provide protection to Nipissar Lake.

INAC (Aboriginal Affairs and Northern Development Canada). 2010. Guidelines for Spill Contingency Planning. Last modified- 2010/09/15 http://www.aadnc-INAC.gc.ca/eng/1100100024236/1100100024253#sub1A_6

Agnico Eagle (Agnico Eagle Mines Limited). 2014. Oil Pollution Emergency Plan (OPEP), Final Environmental Impact Statement, Meliadine Gold Project, Nunavut, Volume 8, Support Document 8-2.

NWB (Nunavut Water Board). 2010. Guide 4 – Completing and Submitting a Water Licence Application for a New Licence and the Supplemental Information Guide for Mining and Milling (SIG-MM3 Guide).

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

Northwest Territories · Nunavut · Canada

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR	REPORT NUMBER
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME	☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	
C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS		
F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION		
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER	
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER	
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES	
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS			

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ NAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

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B.1 Ammonium Nitrate

The first step to prevent potential spills and associated hazards is the application of proper storage procedures for bulk ammonium nitrate, including the following:

- ensure good housekeeping of the storage facility to prevent spilling and/or cross-contamination of materials;
- store ammonium nitrate away from combustible materials, fuels, and other blasting accessories (i.e., boosters, delays, detonating cords, and detonators);
- post proper signage restricting the use/exposure of ammonium nitrate to ignition sources (e.g., no hot work, smoking or vehicle maintenance);
- ensure the storage facility is well ventilated; and
- ensure the storage facility is locked at all times with only authorized personnel allowed access.

The following is a general spill response procedure for ammonium nitrate. Consult the MSDS to determine whether deviations from the general guidance are required.

For an **ammonium nitrate spill** (solid):

1) Isolate and evacuate the spill area.

2) Contact your Supervisor who will then contact the Incident Commander and coordinate appropriate spill response (assemble ERT members and the appropriate spill response materials). **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

3) Put on appropriate personal protective equipment. For an ammonium nitrate spill, this includes:

    a. Gloves as recommended by the MSDS or glove manufacturer;

    b. Protective eyeglasses or chemical safety goggles or face shield as recommended by the MSDS;

    c. Lab coat, coveralls or TyvekTM coveralls as recommended by the MSDS; and

    d. Half mask air-purifying respirator with cartridges and/filters as recommended by the MSDS or respirator manufacturer.

4) Ventilate (open windows/doors to outdoor) closed spaces before entering.

5) Remove all sources of heat and ignition (no smoking, flares, sparks, or flames in immediate area) and remove uncontaminated combustible materials and organic compounds (wood, paper, oil, etc.) from spill area.

6) For spills on land, protect the spill area from water runoff by constructing a ditch or dike using suitable absorbent materials, soil or other appropriate barrier.

7) Vacuum or sweep the spill residue using non-metal, non-sparking tools and place the residue in a labelled plastic container (plastic pail with lid or double heavy duty plastic bags) for re-use or off-site disposal at a licensed disposal facility.

   Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid and clearly label the container per WHMIS Guidelines.

   Note: Minimize dust generation during the operation.

8) Remove and bag PPE for cleaning or disposal at a licensed facility. Thoroughly wash potential skin contact locations after handling.

B.2 Ammonium Nitrate Fuel Oil

Proper storage, handling and disposal of ammonium nitrate fuel oil (ANFO) are an important first step in preventing spills and associated hazards.

The proper storage procedures are as follows:

- use ANFO under the supervision of authorized trained personnel;
- keep ANFO away from heat, sparks, and flames, as well as initiating explosives, oxidizing agents, combustibles, and other sources of heat; and
- protect containers from physical damage and store them in dry, well ventilated conditions.

Explosives that have been identified as deteriorated or damaged will need to be disposed of or destroyed. The appropriate method of disposal or destruction and subsequent course of action will be determined by authorized personnel or the explosive supplier.

Transportation of explosives-related compounds and materials will be in accordance with Section 14 of the *Mine Health and Safety Act* and associated regulations, and the *Transportation of Dangerous Goods Act*. Transport vehicles will be in sound mechanical condition and equipped with proper safety equipment. Loaded vehicles will not be left unattended, and only authorized personnel will be responsible for the security of the explosives under their control.

The following is a general spill response procedure for ammonium nitrate fuel oil – ANFO. The following procedure does not apply to emulsions or other explosives. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For an **ANFO spill** (solid):

1) Isolate and evacuate the spill area.

2) **IF SAFE TO DO SO,** immediately extinguishe any open flames and remove ignition sources (no smoking, flares, sparks in immediate area). **Fires involving large quantities of ANFO should not be fought.**

3) Contact the Incident Commander who will assemble ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

4) Put on appropriate personal protective equipment. For an ANFO spill this includes:

    a. Gloves as recommended by the MSDS or glove manufacturer;

b. Protective eyeglasses or chemical safety goggles or face shield as recommended by the MSDS;

c. Lab coat, coveralls or TyvekTM coveralls as recommended by the MSDS;

d. Shoe covers or rubber boots; and

e. Half mask air-purifying respirator with cartridges and/filters as recommended by the MSDS or respirator manufacturer.

5) If the spill occurred outdoors, stay upwind and avoid low lying areas. Ventilate (open windows/doors to outdoors) closed spaces before entering. Ensure adequate explosion proof ventilation for cleanup.

6) Remove all sources of heat and ignition (no smoking, flares, sparks or flames in immediate area) and remove uncontaminated combustible materials and organic compounds (wood, paper, oil, etc.) from spill area.

7) Do not operate radio transmitters within 100 m of electric detonators.

8) For a spill on land, protect the spill area from water runoff by constructing a ditch or dike using suitable absorbent materials, soil or other appropriate barrier. For a spill to water, utilize damming, and/or water diversion to minimize the spread of contamination.

9) Collect, sweep or shovel spilled material and the other contaminated material/soil using non-metallic, spark-proof tools and place residue into a labelled plastic waste container (plastic pail with lid or double heavy duty plastic bags) for off-site disposal at a licensed disposal facility.

   Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid, and clearly label the container per WHMIS Guidelines.

   Note: The drums/containers/residues are to be stored in ventilated areas away from incompatible materials for eventual off-site disposal at a licensed disposal facility.

10) Remove and bag PPE for cleaning or disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated.

The following is a general spill response procedure for compressed gases. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **compressed (inert and flammable) gas** leak:

1) **IF SAFE TO DO SO** and if it will stop the gas leak, turn off cylinder valve.

2) If the leak cannot be stopped by closing the cylinder valve and it is **an inert atmospheric gas** (e.g., nitrogen, carbon dioxide, etc.), isolate and evacuate the affected area. If the leak is a **flammable gas** and the leak is outside of a ventilated building enclosure that will contain the gas, immediately activate the fire alarm system and evacuate the area/building.

3) Contact the Incident Commander who will assemble ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

4) If possible and if safety permits, adjust leaking cylinder so that gas escapes rather than liquid.

5) If possible and if safety permits, eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area) and turn off electrical equipment.

6) If a spill has occurred outdoors, stay upwind and avoid low lying areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, it may also be necessary to have it shut-down. Allow vapours to ventilate outdoors by opening windows and doors to the exterior.

7) Isolate area until gas has dispersed. Incident Commander to verify safe conditions.

APPENDIX D • GENERAL RESPONSE PROCEDURES FOR SPILLED FLAMMABLE OR COMBUSTABLE LIQUIDS

The following is a general spill response procedure for flammable or combustible liquids, particularly petroleum hydrocarbon products. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a spill of **flammable or combustible petroleum hydrocarbon product (liquid):**

1) Isolate and evacuate the spill area.

2) **IF SAFE TO DO SO**, immediately extinguishes any open flames and remove ignition sources (no smoking, flares, sparks in immediate area).

3) **IF SAFE TO DO SO**, stop leak and contain spill (**see Step 9**).

4) Contact the Incident Commander who will assemble ERT members if required and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

5) Put on appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the MSDS or glove manufacturer;

    b. Splash goggles or face shield;

    c. Shoe covers or rubber boots;

    d. Lab coat or TyvekTM coveralls; and

    e. Half mask air-purifying respirator with **organic vapour or combination cartridges**, or as otherwise recommended by the MSDS or respirator manufacturer.

6) If the spill has occurred outdoors, stay upwind and avoid low lying areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, it may also be necessary to have it shut-down.

7) Ventilate (open windows/doors to outdoors) closed spaces before entering. Ensure adequate explosion-proof ventilation for cleanup. A vapour suppressing foam or water spray may be used to reduce vapours.

8) Remove all sources of ignition (no smoking, flares, sparks or flames in immediate area) and combustible materials (wood, paper, oil, etc.) from within the spill area.

9) Contain spill by using spill absorbent, spill pads or pillows, soil or snow by constructing a dike that will limit flow and prevent entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate. If possible, compact soil or snow dikes, and place plastic tarps over the dike and at its foot to allow the product to pool on the plastic for easy recovery.

   Note: Do not use paper towels to absorb spill as this increases the rate of evaporation and vapour concentration in the air.

   Note: Do not flush with water into drainage areas or ditches as this will spread spill.

   Note: Snow works well as a natural absorbent to collect and contain spilled petroleum hydrocarbons. However, its use in containing a spill will result in a water-contaminant mixture that may be more difficult to manage. It is important to scrape up the contaminated snow and ice as soon as possible.

10) Carefully cover the spill area with spill absorbent, spill pads, soil or snow, starting at the outside and working inward. Do not touch or walk through spilled material.

11) Sweep up or shovel the residue using non-metallic, spark-proof tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy duty plastic bags). For larger spills to land, excavate impacted absorbent material and soil, place in lined and bermed temporary storage area or directly into sealed drums/containers.

   Note: The drums/containers/residues are to be stored in ventilated areas away from incompatible materials for eventual treatment at on-site landfarm facility or off-site disposal at a licensed disposal facility. Electrically ground all containers and transporting equipment.

   Note: Larger pools of product may be pumped into empty storage tanks or drums.

12) If a spill is indoors, mop the affected area using detergent and water. Dispose of this water to drums for eventual off-site disposal at a licensed disposal facility. Spills to land may require further excavation or remediation of contaminated soil until acceptable soil quality is achieved. The Incident Commander and/or Environment Superintendent will assess this requirement.

13) For spills to water, immediately limit the area of the spill on water using absorbent pads and booms and similar materials to capture small spills on water. Deploy and slowly draw in absorbent booms to encircle and absorb the spilled product. Recover larger spills on water with floating skimmers and pumps, as required, and discharge recovered product to drums or tanks.

   Note: Petroleum hydrocarbons are generally hydrophobic, and as such, do not readily dissolves in water. They typically tend to float on the water's surface. Absorbent booms are often relied on to recover hydrocarbons that escape land containment and enter water.

   Note: Antifreeze sinks and mixes with water. If released to water, attempt to isolate/confine the spill by damming or diverting the spill. Pump contaminated water to tanks or drums.

14) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated leather articles (including boots and shoes) that cannot be decontaminated.

E.1 Liquids

The following is a general spill response procedure for liquid oxidizer compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **liquid oxidizer** spill:

1) Isolate and evacuate the spill area.

2) **IF SAFE TO DO SO**, stop leak and contain spill (**see Step 8**).

3) Contact the Incident Commander who will assemble, if required, ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

4) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the MSDS or glove manufacturer;

    b. Splash goggles or face shield;

    c. Shoe covers or rubber boots;

    d. Lab coat, coveralls or TyvekTM coveralls as recommended by the MSDS; and

    e. Half mask air-purifying respirator with cartridges and/or filters as recommended by the MSDS or respirator manufacturer.

5) Ventilate closed spaces before entering. Ensure adequate explosion-proof ventilation for cleanup.

6) Remove and/or moisten with water any combustible material (wood, paper, oil, etc.) affected by the spill.

7) Use water spray to reduce vapours or divert vapour cloud drift, if required.

8) Contain spill by using non-combustible spill absorbent, soil or snow to construct a dike that limits flow and prevents entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate.

    Note: Flushing area with flooding quantities of water may also be appropriate assuming this does not make cleanup and waste management more difficult – refer to the MSDS.

9) Carefully cover the spill area with spill absorbent, soil or snow, starting at the outside and working inward. Use non-combustible absorbent. Do not touch or walk through spilled material.

10) Sweep up or shovel the spill residue using non-metal, non-sparking tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy duty plastic bags) for off-site disposal at a licensed disposal facility.

11) For indoor spills, mop the affected area using detergent and water. Flushing area with flooding quantities of water may also be appropriate – refer to the MSDS. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate. Spills to land may require further excavation or remediation of contaminated soil until acceptable soil quality is achieved. The Incident Commander and/or Environment Superintendent will assess this requirement.

12) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

E.2 Solids

The following is a general spill response procedure for solid oxidizer compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **solid oxidizer** spill:

1) Isolate and evacuate the spill area.

2) Contact the Incident Commander who will assemble, if required, ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

3) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the MSDS or glove manufacturer;

    b. Safety glasses or goggles;

    c. Lab coat; and

    d. Half mask air-purifying respirator with **N95 or greater protection** particulate filter or as recommended by the MSDS or respirator manufacturer.

4) Remove all sources of heat and ignition (no smoking, flares, sparks or flames in immediate area) and remove uncontaminated combustible materials and organic compounds (wood, paper, oil, etc.) from spill area.

5) For spills to land, protect the spill area from water runoff by constructing a ditch or dike using suitable non-combustible absorbent materials, soil or other appropriate barrier. For spills to water, utilize damming and/or water diversion to minimize the spread of contamination.

6) Vacuum, sweep, or shovel the spill residue using non-metal, non-sparking tools, and place the residue into a labelled plastic container (plastic pail with lid or double heavy duty plastic bags) for re-use or off-site disposal at a licensed disposal facility.

    Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid, and clearly label the container per WHMIS Guidelines.

    Note: Minimize dust generation.

7) If there is still oxidizer residue left in the spill area, neutralize with appropriate agent as recommended by the MSDS, or for spills to land, continue to excavate until no visible spilled solid remains. Use non-combustible spill absorbent or soil to absorb the neutralized residue. Place in suitable drums/containers for disposal at a licensed facility.

8) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate.

9) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

APPENDIX F • GENERAL RESPONSE PROCEDURES FOR SPILLED POISONOUS AND TOXIC SUBSTANCES

F.1 Sodium Cyanide

The following is a general spill response procedure for solid Sodium Cyanide.

For a **Sodium Cyanide (solid)** spill:

1) Isolate and evacuate the spill area.

2) Contact the Incident Commander who will assemble ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

3) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the MSDS or glove manufacturer;

    b. Safety glasses or goggles;

    c. Lab coat; and

    d. Half mask air-purifying respirator as recommended by the MSDS or respirator manufacturer.

    Note: For worker safety, maintain readily accessible supply of cyanide antidote kits on-site.

4) Ventilate area of spill or leak.

5) Avoid exposure to acids, water or weak alkalis, which can react to form toxic Hydrogen Cyanide gas.

6) Contain spill to prevent release to sewer, waterway or onto ice. For spills to land, protect the spill area from water runoff by constructing a ditch or dike using absorbent materials, soil or other appropriate barrier. If raining, cover spill area with tarp or plastic to minimize contact with water and prevent subsequent runoff. For spill to water, utilize damming, and/or water diversion to minimize the spread of contamination.

7) Shovel the spilled material into labelled drums, containers or plastic bags for re-use or off-site disposal at a licensed disposal facility.

    Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid and clearly label the container per WHMIS Guidelines.

    Note: Minimize dust generation.

8) If there residue from the Sodium Cyanide spill remaining in the spill area, neutralize with appropriate agent **as recommended by the MSDS** (Sodium or Calcium Hypochlorite solution), or for spills to land, continue to excavate until no visible spilled solid remains. Use suitable spill absorbent or soil to absorb the neutralized residue. Place in suitable drums/containers for disposal to a licensed facility. Collect material and place in a closed container for recovery or disposal.

9) For indoor spills, mop the affected area using detergent and water. Dispose of this water to waste drums/containers for disposal to a licensed facility.

10) Remove and bag PPE for disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

G.1 Acids, Liquids

The following is a general spill response procedure for liquid acid compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **liquid acid** spill:

1) Isolate and evacuate the spill area.

2) **IF SAFE TO DO SO**, stop leak and contain spill (**see Step 8**).

3) Contact the Incident Commander who will assemble, if required, ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

4) Put on appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the MSDS or glove manufacturer;

    b. Splash goggles or face shield;

    c. Shoe covers or rubber boots;

    d. Lab coat or TyvekTM coveralls; and

    e. Half mask air-purifying respirator with **acid gas or combination** cartridges, or as otherwise recommended by the MSDS or respirator manufacturer.

5) If the spill has occurred outdoors, stay upwind and stay out of low areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, it may also be necessary to have it shut-down.

6) Ventilate (open windows/doors to outdoors) closed spaces before entering.

7) Remove all sources of ignition (no smoking, flares, sparks or flames in immediate area).

8) Contain spill by using spill absorbent, spill pads or pillows, or dry soil to construct a dike that limits flow and prevents entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate. Ideally, use spill absorbent that contains a mild neutralizing agent as recommended by the MSDS.

Note: Many acids, particularly concentrated acids, react violently in the presence of water. Do not flush spill area with water unless the MSDS indicates acceptable.

Note: Nitric Acid reacts violently and explosively with organic chemicals and organic material such as wood, cotton and paper; therefore, do not use organic absorbent material on Nitric Acid.

Note: Hydrofluoric Acid will fume during neutralization. Provide adequate ventilation and approach from upwind. Neutralize carefully with Sodium Bicarbonate, soda ash or lime. Use water spray to disperse the gas/vapour if required. Remove all sources of ignition.

9) Carefully cover the spill area with spill absorbent, spill pads or dry soil, starting at the outside and working inward. If practical, neutralize spill using MSDS-recommended or commercially available neutralizers. Use pH indicator paper to determine if spill is neutralized (pH 7).

   Note: Use caution as neutralization reactions generate heat.

10) Sweep or shovel the neutralized spill residue using non-metal, non-sparking tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy duty plastic bags) for off-site disposal at a licensed disposal facility.

11) Check the pH of the spill area. If it is less than pH 6, then further neutralize with a dilute solution of a suitable reagent as identified on the MSDS, or for spills to land, continue to excavate contaminated soil.

12) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate.

13) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

14) After the spill has been cleaned up, the area should be free of vapours. However, if personnel note odours or irritation, isolate the spill area, re-clean the area as per Steps 11 and 12 or wait at least 1 hour before re-entering or until considered safe by the Incident Commander or Environment Superintendent.

G.2 Acids, Solids

The following is a general spill response procedure for solid acid compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **solid acid** spill:

1) Isolate and evacuate the spill area.

2) Contact the Incident Commander who will assemble, if required, ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

3) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the MSDS or glove manufacturer;

    b. Safety glasses or goggles;

    c. Lab coat; and

    d. Half mask air-purifying respirator with **N95 or greater protection** particulate filter, or as otherwise recommended by the MSDS or respirator manufacturer.

4) Contain spill to prevent release to sewer, waterway or onto ice. For spills to land, protect the spill area from water runoff by constructing a ditch or dike using absorbent materials, dry soil or other appropriate barrier. If raining, cover spill area with tarp or plastic to minimize contact with water and prevent reaction and/or subsequent runoff. For spills to water, utilize damming, and/or water diversion to minimize the spread of contamination.

5) If necessary to minimize dust production, slightly moisten the solid. Use water, or if the material is water reactive, another inert liquid as recommended by the MSDS.

6) Sweep up or shovel the residue using non-metallic, spark-proof tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy duty plastic bags) for reuse or off-site disposal at a licensed disposal facility.

    Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid and clearly label the container per WHMIS Guidelines.

7) Remaining solid acid residue may be neutralized using a dilute solution of appropriate agent as recommended by the MSDS (e.g., Sodium Bicarbonate - baking soda) or, for spills to land,

continue to excavate until no visible spilled solid remains. Check the pH of the spill area; the final pH should be between pH 6 and 10. Use spill absorbent, spill pads or dry soil to absorb the neutralized residue.

Note: Use caution as neutralization reactions generate heat.

8) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate.

9) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

G.3 Bases/Alkali, Liquids

The following is a general spill response procedure for liquid alkali or base compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **liquid alkali or base** spill:

1) Isolate and evacuate the spill area.

2) **IF SAFE TO DO SO**, stop leak and contain spill (**see Step 8**).

3) Contact the Incident Commander who will assemble ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

4) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the MSDS or glove manufacturer;

    b. Splash goggles or face shield;

    c. Shoe covers or rubber boots;

    d. Lab coat or TyvekTM coveralls; and

    e. Half mask air-purifying respirator with cartridges/filters as recommended by the MSDS or respirator manufacturer.

5) If the spill has occurred outdoors, stay upwind and stay out of low areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, it may also be necessary to have it shut-down.

6) Ventilate (open doors/windows to outdoors) closed spaces before entering.

7) Remove all sources of ignition (no smoking, flares, sparks or flames in immediate area) and combustible materials (wood, paper, oil, etc.).

8) Contain spill by using spill absorbent, spill pads or pillows, or dry soil to construct a dike that limits flow and prevents entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate. Ideally, use spill absorbent that contains a mild neutralizing agent as recommended by MSDS.

Note: Use caution as neutralization reactions generate heat.

9) Carefully cover the spill area with spill absorbent, spill pads or dry soil, starting at the outside and working inward. If practical, neutralize spill using MSDS-recommended or commercially available neutralizers. Use pH indicator paper to determine if spill is neutralized (pH 7).

   Note: Use caution as neutralization reactions generate heat.

10) Sweep or shovel the neutralized spill residue using non-metal, non-sparking tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy duty plastic bags) for off-site disposal at a licensed disposal facility.

11) Check the pH of the spill area. If it is greater than pH 10, then further neutralize with a dilute solution of a suitable reagent as identified on the MSDS, or for spills to land, continue to excavate contaminated soil.

12) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate.

13) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

14) After the spill has been cleaned up, the area should be free of vapours. However, if personnel note odours or irritation, isolate the spill area, re-clean as per Steps 11 and 12 or wait at least 1 hour before re-entering or until it is considered to be safe by the Incident Commander or Environment Superintendent.

G.4 Bases/Alkali,Solids

The following is a general spill response procedure for solid alkali or base compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **solid alkali or base** spill:

1) Isolate and evacuate the spill area.

2) Contact the Incident Commander who will assemble, if required, ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

3) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the MSDS or glove manufacturer;

    b. Safety glasses or goggles;

    c. Lab coat; and

    d. Half mask air-purifying respirator with **N95 or greater protection** particulate filter or as recommended by the MSDS or respirator manufacturer.

4) Contain spill to prevent release to sewer, waterway or onto ice. For spills to land, protect the spill area from water runoff by constructing a ditch or dike using absorbent materials, dry soil or other appropriate barrier. If raining, cover spill area with tarp or plastic to minimize contact with water and prevent reaction and/or subsequent runoff. For spills to water, utilize damming, and/or water diversion to minimize the spread of contamination.

5) If necessary to minimize dust production, slightly moisten the solid. Use water or, if the material is water reactive, another inert liquid as recommended by the MSDS.

    Note: Do not use water to flush bases in powdered form, such as Calcium Oxide (lime), as this material is not very soluble.

6) Sweep or shovel the residue using non-metallic, spark-proof tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy duty plastic bags) for off-site disposal at a licensed disposal facility.

    Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid and clearly label the container per WHMIS Guidelines.

7) Remaining solid alkali or base residue may be neutralized using a dilute solution of appropriate acid. Check the pH of the spill area; the final pH should be between pH 6 and 10. Use spill absorbent, spill pads or dry soil to absorb the neutralized residue.

8) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate.

9) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

Act	Regulation	Guideline
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (SOR/2008-197) *Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301)	CCME - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-wide Standards for Petroleum Hydrocarbons (PHC) in Soil
Canada Wildlife Act (1985 w9)		
Species at Risk Act (2002 c.29)		
Migratory Birds Convention Act (1994 c.22)	*Migratory Birds Regulations* (C.R.C., c. 1035)	
Canada Water Act (1985 c.11)		
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c. A-12)		
Canada Shipping Act, 2001 (S.C. 2001, c. 26)	*Response Organizations and Oil Handling Facilities Regulations* (SOR/95-405)	
Navigable Waters Protection Act (R.S. 1985 c. N-22)	*Navigable Waters Works Regulations* (C.R.C., c. 1232) *Navigable Waters Bridges Regulations* (C.R.C., c. 1231)	
Marine Liability Act (A.C. 2001, c.6)	*Marine Liability Regulations* (SOR/2002-307)	
Fisheries Act (1985, c. F-14)	*Metal Mining Effluent Regulations* SOR/2002-2222)	The Policy for the Management of Fish Habitat Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters Freshwater Intake End-of-Pipe Fish Screen Guideline Standard Operating Procedure – Clear Span Bridges
Transport of Dangerous Goods Act (1992, c. 34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	

Act	Regulation	Guideline
Explosives Act (1985 c.E-17)	*Ammonium Nitrate and Fuel Oil Order* (C.R.C., c. 598)	
	Explosives Regulations (C.R.C., c. 599)	
National Fire Code of Canada (2010)		
Nuclear Safety and Control Act (s.c. 1997, c.9)	*General Nuclear Safety and Control Regulations* (SOR/2000-202)	
Canadian Human Rights Act (R.S.C., 1985, c. H-6)		
Canada Labour Code (R.S.C., 1985, c. L-2)	*Canada Labour Standards Regulations* (C.R.C., c. 986) *Canada Occupational Health and Safety Regulations* (SOR/86 304)	
Territorial Lands Act (R.S. 1985, c. T-7)	*Northwest Territories and Nunavut Mining Regulations* (C.R.C., c. 1516) *Territorial Land Use Regulations* (C.R.C., c. 1524) *Territorial Quarrying Regulations* (C.R.C. c. 1527)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002, c. 10)	*Northwest Territories Waters Regulations* (SOR/93/303)	
Nunavut Act (1993 c.28)	*Nunavut Archaeological and Paleontological Sites Regulations* (SOR/2001-220)	
Nu*navut Land Claims Agreement Act* (1993, c. 29)		
Territorial		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations (NWT Reg (Nu) 068-93)* *Used Oil and Waste Fuel Management Regulations (NWT Reg 064-2003)* [The removal of hazardous materials will require the registration with the Government of Nunavut, Department of Environment as a waste generator as well as carrier (if applicable) prior to transport.]	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for Air Quality – Sulphur Dioxide and Suspended Particulates Guideline for the Management of Waste Antifreeze Guideline for the Management of Waste Batteries

Act	Regulation	Guideline
		Paint Guideline for the Management of Waste Solvents Guideline for Industrial Projects on Commissioner's Land
Scientists Act (RSNWT (Nu) 1988, c S-4)	*Scientists Act Administration Regulations* (NWT Reg (Nu) 174-96)	
Historical Resources Act (RSNWT (Nu) 1988, c H-3)		
Territorial Parks Act (RSNTW (Nu) 1988, c T-4)	*Territorial Parks Regulations* (RRNWT (Nu) 1990 c T-13)	
Wildlife Act (RSNWT (Nu) 1988, c W-4)	*Wildlife General Regulations* (NWT Reg (Nu) 026-92) *Wildlife Licences and Permits Regulations* (NWT Reg (Nu) 027-92) *Wildlife Management Barren-Ground Caribou Areas Regulations* (NWT Reg (Nu) 099-98) *Wildlife Management Grizzly Bear Areas Regulations* (NWT Reg (Nu) 155-96) *Wildlife Management Zones Regulations* (RRNWT (Nu) 1990 c W-17) *Wildlife Regions Regulations* (NWT Reg (Nu) 108-98)	
Commissioner's Land Act (RSNWT 1988, c C-11)	*Commissioner's Airport Lands Regulations* (NWT Reg (Nu) 067-97) *Commissioner's Land Regulations* (RRNWT 1990, c C-13)	
Safety Act (RSNWT 1988, c.S-1)	*General Safety Regulations* (RRNWT (Nu) 1990 c S-1) *Work Site Hazardous Materials Information System Regulations* (RSNWT 1988, C 81 (Supp))	
Mine Health And Safety Act (SNWT (Nu) 1994, c 25)	*Mine Health And Safety Regulations* (NWT Reg (Nu) 125-95)	
Workers' Compensation Act (RSNWT, 1988, c. W-6)	*Workers' Compensation General Regulations* (Nu Reg 017-2010)	

Act	Regulation	Guideline
Apprenticeship, Trade and Occupations Certification Act (RSNWT (Nu) 1988, c A-4)	*Apprenticeship, Trade and Occupations Certification Regulations* (RRNWT (Nu) 1990 c A-8)	
Labour Standards Act (RSNWT (Nu) 1988, c L-1)	*Annual Vacations Regulations* (RRNWT 1990, c.L-1) *Educational Work Experience Regulations* (RRNWT 1990, c.L-2) *Employment of Young Persons Regulations* (RRNWT 1990, c.L-3) *Labour Standards Meal Regulations* (RRNWT 1990, c.L-4) *Notice of Termination Exemption Regulations* (RRNWT 1990 c.L-5) *Pregnancy and Parental Leave Regulations* (RRNWT 1990, c.8(Supp.)) *Reciprocating Jurisdiction Order* (RRNWT 1990, c.L-6) *Wages Regulations* (RRNWT 1990, c.L-7)	
Electrical Protection Act (RSNWT (Nu) 1988, c E-3)	*Electrical Protection Regulations* (RRNWT 1990 c. E-21)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	*Explosives Regulations* (RRNWT (Nu) 1990 c E-27)	
Petroleum Products Tax Act (RSNWT (Nu) 1988, c P-5)	*Petroleum Products Tax Regulations* (RRNWT (Nu) 1990 c P-3)	
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	*Fire Prevention Regulations* (RRNWT (Nu) 1990 c F-12)	
Hospital Insurance and Health and Social Services Administration Act (RSNWT 1988, c T-3)	*Territorial Hospital Insurance Services Regulations* (RRNWT (Nu) 1990 c T-12)	
Public Health Act (RSNWT (Nu) 1988, c P-12)	*Camp Sanitation Regulations* (RRNWT (Nu) 1990 c P-12) *General Sanitation Regulations* (RRNWT (Nu) 1990 c P-16)	
All-terrain Vehicles Act (RSNWT (Nu) 1988, c A-3)	*All-terrain Vehicles Regulations* (RRNWT (Nu) 1990 c A-1)	
Motor Vehicles Act (RSNWT (Nu) 1988 c M-16)	*Large Vehicle Control Regulations* (RRNWT (Nu) 1990 c M-30)	

Act	Regulation	Guideline
Public Highways Act (RSNWT (Nu) 1988, c P-13)	*Highway Designation and Classification Regulations* (NWT Reg (Nu) 047-92)	
Transportation Of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c 81 (Supp))	*Transportation Of Dangerous Goods Regulations* (1991, NWT Reg (Nu) 095-91)	

AGNICO EAGLE

MELIADINE GOLD PROJECT

Water Management Plan

MARCH 2018
VERSION 2
6513-MPS-11

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ᐊᒃᓗᓂᒃᓂᑦ ᐱᓕᕕᐊᓂᖅᖃᑦ ᑕᓯᔨᐊᖏᑦ ᔪᓚᒃᑭᑦ ᐱᓕᕕᐊᖏᑦ (ᐅᓴᖅᑕᕆᐊᖅ), 25 ᑭᓪᓗᑕᓂᒃ ᐅᖓᓱᒃᑎᑎᔪᖅ ᐅᐊᖓᓇᖓᓂ ᒪᖏᖅᓯᓂᐅᐸ, ᐊᒻᒪᓗ 80 ᑭᓪᓗᑕᓂᒃ ᓂᑎᖅᕿᓯᐊᓂ ᐱᖓᓱᓇᖅᕿᓯᐊᓂ ᐃᒃᓚᓕᔪᖓᑕᑦ ᐅᖓᓱᒃᑎᑎᔪᖅ ᑭᓇᐯᓂᖅ ᓄᓇᕗᒻᒥᑦ. ᐅᓴᖅᑕᕆᐊᖏᓪᓗᑦ ᕿᖅᓇᐅᑎ ᓄᓇᑦ ᐅᒃᐞᐃᖓᔪᓂᖅ ᐊᒻᒪᓗ ᓄᓇᐅᐸ ᐃᓚᐊᓂ ᐅᓴᖅᑕᕆᐊᖏᓂᖏᓪᓗᑦ ᐃᓅᖅᑭᐅᒪᔪᓂᒃ ᐱᓕᕕᐊᓂᖏᓪᓗᑦ ᑎᓕᓴᓂᐊᖅ ᔪᓚᑕᓕᒻᒥᑦ, ᒪᖅᑲᓂᒃ ᓄᓇᑦ ᐅᒃᐞᐃᖓᔪᓐᓂᓂᑦ (ᑎᓕᓴᓂᐊᖅ ᐅᒃᐞᐃᖓᔪᓐᓂᓂᑦ 1 ᐊᒻᒪᓗ ᑎᓕᓴᓂᐊᖅ ᐅᒃᐞᐃᖓᔪᓐᓂᓂᑦ 2) ᐊᒻᒪᓗ ᐊᑕᐅᓯᖏᑦ ᓄᓇᐅᐸ ᐃᓚᐊᓂᓂ ᐊᓴᖅᑕᕆᐊᖅ.

ᐃᒪᖏᑲᒃ ᐊᐅᓪᓕᑎᓂᔪᓐᓇᖅ ᒪᓕᕕᐊᖓᔪᒪᔪᓂ ᒥᑭᓪᓚᐃᓐᓇᓕᒃᑐᓗᓕᓂ ᐊᒃᑐᖅᓯᓂᐅᔪᖓᓪᓕᖅᑐᑦ ᐃᒪᐅᐸ ᐊᖏᓂᑎᖓᓇᓂ ᖃᒃᓚᓇᓕᓂᑐᓄᓇᓂ ᐃᒪᖓᓂ ᐅᓴᖅᑕᕆᐊᖏᑦ. ᐃᒪᖏᑲᒃ ᐊᐅᓪᓕᑎᓂᔪᓐᓇᖅ ᐊᑦᑭᐅᒪᔪᓂ (ᖃᒃᓚᓇᓕᓂᑐᓄᓇᓂ ᐃᒪᖅᓯᐃᓂ, ᐃᒪᖏᑲᒃ ᐸᐸᓂᑎᓂᔪᓐᓇᖅ ᐊᓂᓗᐃᓂ, ᐃᒪᖏᑲᒃ ᓴᐖᑎᓂᑎᓂᔪᓐᓇᖅ ᓯᐠᓗᐃᓂ ᐊᒻᒪᓗ ᓯᐠᓗᓂᐸᓂ) ᓴᓇᐅᐅᓂᐊᖅᑐᑦ ᐃᒪᖅᑕᖅᖃᑎᓂᑎᓂᔪᓐᓇᖅ ᐊᒻᒪᓗ ᐊᐅᓪᓕᑎᓂᔪᓐᓇᖅ ᐊᑐᖅᑕᐅᓯᒪᑦ ᐃᒪᖏᑲᒃ ᐊᒃᑐᖅᑕᐅᓯᒪᓕᓂᓂ ᐅᓴᖅᑕᕆᐊᖏᓪᓗᑦ ᐅᓴᖅᑕᕆᐊᖏᓪᓗᑦ ᐊᐅᓪᓕᑎᓂᔪᓐᓇᖅ ᐃᓕᐅᐅᓂᖅ: ᐃᒪᖅᖃᑎᓂᑎᓂᔪᓐᓇᖅ ᑕᓯᕋᐃᓂ, ᐃᒪᖏᑲᒃ ᐸᐸᑎᓂᔪᓐᓇᖅ ᐊᓂᓗᐃᓂ, ᓯᐸᓗᐃᓂ, ᐃᒪᓕᓚᖓᓕᒃ, ᖃᓂᓕᖅᑭᓱᓇᖅᑐᓚᓚᐅᑎ, ᐃᒪᖏᑦ ᑕᓚᐅᖅᑐᑦᑕᓚᓚᐅᑎ ᐊᒻᒪᓗ ᓂᓕᕕᐅᓯᓂᓱᓇᖅᑐᓄᓇ ᐃᒪᓕᓚᖓᓚᐅᑎ.

ᐅᓴᖅᑕᕆᐊᖅ ᓴᓇᐅᑎᓂᔪᓐᓇᒍ ᐊᐅᓪᓚᖅᓂᔪᓐᓇᒍᓗ, ᐊᑐᖅᑕᐅᓯᖅ ᐃᒪᖅ ᐱᐅᓯᖅ ᐊᖅᑐᖅᑕᐅᓯᒪᓕᓂᑐᓄᓇᓂ ᓄᓇᐅᐸ ᖃᖓᓱᓂ ᖃᒪᓕᕆᐅᓂᐊᕐᓇᖅᑐᓂᒃ, ᓴᐖᑎᑕᐅᓪᓚᔪᓐᓇᒍ ᐊᐅᓪᓚᔪᓐᓇᒍᓗ, ᓴᐖᑎᑕᐅᓪᓚᔪᓐᓇᖅᑐᓂᒃ ᓄᓇᐅᐸ ᐃᒪᓕᓚᖓᓚᐅᑎ ᐊᒻᒪᓗ ᓄᓇᐅᐸ ᐃᒪᓕᓚᖓᓚᐅᑎ ᐊᐅᓪᓚᔪᓐᓇᖅ

(ᑎᓕᒍᓂᐊᖅ ᐅᖅᑯᐃᖏᓚᖅ 1 ᐊᓗᒐᓗ ᑎᓕᒍᓂᐊᖅ ᐅᖅᑯᐃᖏᓚᖅ 2) ᐊᓗᒐᓗ ᐊᑕᐅᓯᕆᑕ ᓄᓇᐅᐸ ᐃᓗᐊᓂᕐ ᐊᕐᕿᖅᑕᓕᐊᖅ.

ᐃᒪᖏᑦ ᐊᐅᓪᓚᕐᑎᓂᕐᒧᑦ ᐱᓕᕐᓂᕐᒪᓗᓚᓂᕐ ᒥᑭᑐᓂᓗᑎᑦ ᐊᖅᑐᓯᓂᐅᔨᖏᓪᓗᑦ ᐃᒪᐅᐸ ᐊᖏᑎᒋᓂᖅᓯᓄᑦ ᐊᓗᒐᓗ ᐱᐅᓂᖏᖅᓯᓄᑦ ᐃᒪᖏᓂ ᐅᕐᕿᑕᓕᐊᖏᑦ. ᐃᒪᖏᑦ ᐊᐅᓪᓚᕐᑎᓂᕐᒧᑦ ᐋᖅᑭᐅᒪᓚᓂ (ᖃᖅᓯᓂ ᐃᒪᖅᓯᐃᑦ, ᐃᒪᖏᑦ ᐸᐸᕐᑎᓂᕐᒧᑦ ᐊᓂᔪᐃᑦ, ᐃᒪᖏᑦ ᓴᖓᑎᕐᑎᓂᕐᒧᑦ ᓯᐸᓗᐃᑦ ᐊᓗᒐᓗ ᓯᐸᓗᓪᓕᐊᑦ) ᓴᓇᐅᐅᓂᐊᖅᑐᑦ ᐃᒪᖅᑕᖃᖅᑎᕐᑎᓂᕐᒧᑦ ᐊᓗᒐᓗ ᐊᐅᓪᓚᕐᑎᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᔨᒥᑦ ᐃᒪᖏᑦ ᐊᐅᖅᑕᐅᔨᒪᓂᐅᑦ ᐅᕐᕿᑕᓕᐊᖅᓯᒪᓕᕐᓂᖅ ᐅᕐᕿᑕᓕᐊᓕᓂᐅᔨᓇᓪᓕᓂᖅ. ᐊᖏᓯᔨᖅ ᐃᒪᖏᑦ ᐊᐅᓪᓚᕐᑎᓂᕐᒧᑦ ᐱᖅᔨᑎᐅᔨᓂᖅ ᐃᓕᐅᔨᓂ: ᐃᒪᖃᖅᑎᕐᑎᓂᕐᒧᑦ ᑕᓯᕐᓴᐃᓂ, ᐃᒪᖏᑦ ᐸᐸᑎᓂᕐᒧᑦ ᐊᖏᓚᐃᓂ, ᓯᐹᓚᐃᓂ, ᐃᒪᓕᓕᖏᓚ, ᖃᓄᖅᑭᒥᓴᖅᑐᓕᓕᐊᑎ, ᐃᒪᖏᓂ ᑕᓕᐅᖃᖅᑐᓕᓕᐊᑎ ᐊᓪᓚᓗ ᔨᓚᕐᐅᔨᓂᕐᓴᓴᖅᑐᑐᒃ ᐃᒪᓕᓕᐊᑎ.

ᐅᕐᕿᑕᓕᐊᖅ ᓴᓇᐅᐅᑎᓕᓚᔪ ᐊᐅᓯᖅᑎᓕᓚᔪᓗ, ᐊᑐᖅᑕᐅᔨᖅ ᐃᒪᖅ ᐱᕐᐅᔨᖅ ᐊᐅᖅᑕᐅᔨᒥᑦ ᓄᓇᐅᐸ ᖃᖅᓱᓂᐅᑦ ᑲᒪᒋᐅᐅᔨᐊᖅᑐᖅ, ᓴᖓᑎᑕᐅᓗᓚᓂ ᐊᓪᓚᓗ ᑲᑎᒪᓂᐅᑦ ᐊᓪᓚᓗ ᐃᒪᖏᓂ ᐅᕐᕿᑕᓕᐊᖅᑎᑦᑕᓂ ᐃᓕᓴᐅᔨᖅᑐᖅ ᐊᓪᓚᓗ ᐃᒪᖏᓂ ᐅᕐᕿᑕᓕᐊᖅᑎᑦᑕᓂ

EXECUTIVE SUMMARY (ENGLISH)

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (the Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine Plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one Underground Mine.

The water management objectives are to minimize potential impacts to the quantity and quality of surface water at the Mine. Water management structures (surface ponds, water retention dikes/berms, water diversion channels and culverts) will be constructed as needed to contain and manage the contact water from the areas affected by the Mine or mining activities. The major water management infrastructure include: water containment ponds, water retention dikes, berms, channels, a potable Water Treatment Plant (WTP), a Sewage Treatment Plant (STP), a Saline Water Treatment Plant (SWTP) and an Effluent Water Treatment Plant (EWTP).

During mine Construction and Operations, contact water originating from affected areas on surface will be intercepted, diverted and collected within the various containment ponds. The collected water at the Mine will be eventually pumped and stored in Containment Pond 1 (CP1), where the contact water will be treated by the EWTP for removal of Total Suspended Solids (TSS) prior to discharge to the outside environment or as make-up water by the Process Plant. Contact water from the Underground Mine will be collected in underground storage stopes and sumps. Some water from Underground will be reused for underground operations.

The long-term, post-closure water quality in the containment ponds and in the flooded open pit lakes will meet Metal Mining Effluent Regulations (MMER) , Canadian Council of Ministers of the Environment Water Quality Guidelines (CCME-WQG) for the protection of aquatic life and/or the Site Specific Water Quality Objectives (SSWQO) developed for the Mine.

During mine closure, the water management infrastructure on site will remain in place until mine closure activities are completed and monitoring demonstrates that the water quality is acceptable for environmental discharge without treatment.

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ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
AWAR	All Weather Access Road
CCME-WQG	Canadian Council of Ministers of the Environment Water Quality Guidelines
CP	Containment Pond
EMPP	Environmental Management and Protection Plan
EWTP	Effluent Water Treatment Plant
GWMP	Groundwater Management Plan
IDF	Inflow Design Flood
Licence	Type A Water Licence 2AM-MEL1631
MMER	Metal Mining Effluent Regulations
NWB	Nunavut Water Board
Mine	Meliadine Gold Project
SD	Support Document
SSWQO	Site Specific Water Quality Objectives
STP	Sewage Treatment Plant
SWTP	Saline Water Treatment Plant
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
WMP	Water Management Plan
WRSF	Waste Rock Storage Facility
WTP	Water Treatment plant

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per metre
mg/L	milligram per litre
km	kilometer(s)
km^2	kilo square meter(s)
m	metre
mm	millimetre
m^3	cubic metre(s)
m^3/day	cubic metre per day
m^3/s	cubic metre per second
m^3/hour	cubic metre per hour
m^3/year	cubic metre per year
Mm^3/year	million cubic metre (s) per year
Mm^3	million cubic metre(s)
masl	metres above sea level
Mt	million tonne(s)

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Ltd. (Agnico Eagle) is developing the Meliadine Gold Project (the Mine) located approximately 25 kilometres (km) north of Rankin Inlet (Figure 1.1), Nunavut, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine is subject to the terms and conditions of both the Project Certificate issued in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on February 26, 2015 and Type A Water Licence No. 2AM-MEL1631 (the Licence), issued by the Nunavut Water Board (NWB) on April 1, 2016 (NWB, 2016).

This report presents an updated version of the Water Management Plan (WMP).

1.1 Water Management Objectives

The water management objectives are to minimize potential impacts to the quantity and quality of surface water at the Mine and surrounding waterbodies. The groundwater management plan (GWMP) developed in 2018 is included as Appendix A. The purpose of the WMP is to provide information for water management practices, proposed infrastructure, the water balance model, water quality predictions, and water quality monitoring plan for the Mine.

Water management structures (culverts, sumps, pipelines, water diversion channels and water retention dikes/berms) will be utilized to contain and manage contact water from areas affected by mining activities. Measures will be implemented for both the Mine Construction and Mine Operation phases.

1.2 Management and Execution of the Water Management Plan

Revisions of the WMP can be initiated by changes in the Mine Development Plan (Mine Plan), operational performance, personnel or organizational structure, regulatory or social considerations, and/ or design philosophy. The WMP will be reviewed annually by Agnico Eagle and updated as necessary.

SECTION 2 • BACKGROUND

2.1 Site Conditions

The Mine is located in an area of poorly drained lowlands near the northwest coast of Hudson Bay. The dominant terrain in the area consist of glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and many small lakes. The topography is gently rolling with a mean elevation of 65 metres above sea level (masl) and a maximum relief of 20 meters.

The local overburden consists of a thin layer of topsoil overlying silty gravelly sandy glacial till. Cobbles and boulders are present throughout the region at various depths. Bedrock at the Mine site area consists of a stratigraphic sequence of clastic sediments, oxide iron formation, siltstones, graphitic argillite, and mafic volcanic flows (Snowden, 2008; Golder, 2009).

The climate is extreme in the area, with long cold winters and short cool summers, and mean air temperatures of 12°C in July and -31°C in January. The mean annual air temperature at the Mine site is approximately -10.4 °C (Golder, 2012a). Strong winds blow from the north and north-northwest direction more than 30 percent of the time.

The mean annual precipitation in the area is approximately 412 mm and is typically equally split between rainfall and snowfall.

2.1.1 Local Hydrology

The Mine is located within the Meliadine Lake watershed. Meliadine Lake has a water surface area of approximately 107 square kilometres (km^2), a maximum length of 31 km, features a highly convoluted shoreline of 465 km, and has over 200 islands. Unlike most lakes, it has 2 outflows that drain into Hudson Bay through two separate river systems. It has a drainage area of 560 km^2 upstream of its two outflows. Most drainage occurs via the Meliadine River, which originates at the south west end of the lake. The Meliadine River flows for a total stream distance of 39 km. The Meliadine River flows through a series of waterbodies, until it reaches Little Meliadine Lake and then continues into Hudson Bay. A second, smaller outflow from the west basin of Meliadine Lake drains into Peter Lake, which discharges into Hudson Bay through the Diana River system (a stream distance of 70 km). At its mouth, the Diana River has a drainage area of 1,460 km^2.

Watersheds in the Mine area are comprised of an extensive network of waterbodies, and interconnecting streams. The hydrology of these watersheds is dominated by lake storage and evaporation.

2.1.2 Ice and Winter Flows

Late-winter ice thicknesses on freshwater lakes in the Mine area range between 1.0 to 2.3 m with an average thickness of 1.7 m. Ice covers usually appear by the end of October and are completely

formed in early November. The spring ice melt (freshet) typically begins in mid-June and is complete by early July (Golder, 2012b).

2.1.3 Spring Melt (freshet) and Freeze-up Conditions

With the exception of the main outlet of Meliadine Lake, which has been observed to flow continuously throughout the year, outlets of waterbodies near the Mine typically start flowing late May or early June, followed by freshet flows in mid-to-late-June. Flows steadily decrease in July and low flows are ongoing from August to the end of October, prior to winter freeze.

2.1.4 Permafrost

The Mine is located in an area of continuous permafrost. The depth of permafrost is estimated to be in the order of 360 to 495 m. The depth of the active layer ranges from about 1 m in areas with shallow overburden, up to 3 m adjacent to the lakes. The typical permafrost ground temperatures at the depths of zero annual amplitude (typically at the depth of below 15 m) are in the range of -5.0 to -7.5 °C in the areas away from lakes and streams. The geothermal gradient ranges from 0.012 to 0.02 °C/m (Golder, 2012b).

2.1.5 Local Hydrogeology

Groundwater characteristics at areas of continuous permafrost that are generally present in the Mine area include the following flow regimes:

- A shallow flow regime located in an active layer (seasonally thawed) near the ground surface and above permafrost; and,
- A deep groundwater flow regime beneath the base of the permafrost.

From late spring to early autumn, when temperatures are above 0 ˚C, the shallow active layer thaws. Within the active layer, the water table is projected to be a subdued replica of topography. Groundwater in the active layer flows to local depressions and ponds that drain to larger waterbodies. The talik beneath large waterbodies will be open. The open talik will connect to the deep groundwater flow regime beneath the permafrost.

Elongated waterbodies with terraces and a width of 340 to 460 m or greater are expected to have open taliks extending to the deep groundwater flow regime at the Mine. Meliadine Lake and Lake B7 are likely to have open taliks connected to the deep groundwater flow regime (Golder, 2012a). No impact is expected to Lake B7 by mine activities.

2.2 Mine Development Plan

The Mine Plan and key mine development activities, including mine waste management are currently used concurrently with the WMP.

The Mine Plan proposes one underground mine (Tiriganiaq Underground Mine) and two open pits (Tiriganiaq Open Pit 1 and Tiriganiaq Open Pit 2) for the development of the Tiriganiaq gold deposit.

The Mine is estimated to produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. The following phased approach is proposed for the development of the Tiriganiaq gold deposit;

- Phase 1: 4 years for Mine Construction. Construction began in 2015 and is estimated to be completed in 2019 (Q4 Year -5 to Year 1);
- Phase 2: 8 years for Mine Operations, beginning in 2018 (Year 1 to Year 8);
- Phase 3: 3 years Mine Closure (Year 9 to Year 11); and;
- Phase 4: Post-Closure (Year 11 forward).

Mining facilities on surface will include a plant site and accommodation buildings, three ore stockpiles, a temporary overburden stockpile, a tailings storage facility (TSF), three waste rock storage facilities (WRSFs), a water management system that includes containment ponds, water diversion channels, retention dikes/berms, and a series of water treatment plants. The general mine site layout plan is shown on Figure 1.2.

SECTION 3 • WATER MANAGEMENT CONTROLS AND STRUCTURES

A network of berms, dikes, containment ponds, channels, culverts and sumps will be constructed and maintained to facilitate water management. The following sections describe the water management design criteria for the infrastructure required at the Mine.

3.1 Water Management Systems

The water management systems, as shown in Figure 1.2, include the following components:

- Five water containment ponds (CP1, CP3, CP4, CP5, and CP6) and their associated dikes or thermal berms (D-CP1, D-CP3, D-CP4, D-CP5, and D-CP6)
- Three P-Area containment ponds (P1, P2, and P3) and four dikes (DP1-A, DP1-B, DP2-A, and DP3-A)
- A surface Saline Pond
- Three diversion berms (Berm 1, Berm 2, and Berm 3)
- Eight water diversion channels (Channel 1 to Channel 8)
- Fourteen water passage culverts to convey water (Culverts 1 to 4, 78, 8, 10 to 14, 16, 18 & 19)
- Three evaporators
- A reverse osmosis (RO) treatment plant
- An effluent water treatment plant (EWTP)
- A saline water treatment plant (SWTP)
- A sewage treatment plant (STP)
- A freshwater treatment plant (FWTP)
- A network of surface pumps and pipelines
- A freshwater intake causeway
- Two jetties and pumping infrastructure (CP1 and CP5)
- An effluent diffuser located in Meliadine Lake

During the Mine Construction and Mine Operation phases, surface contact water will be intercepted, diverted and contained within various containment ponds prior to evaporation or treatment. Water contained in CP5 will be treated by the RO treatment plant prior to discharging to CP1. The saline water collected in the Saline Pond and P-area will be temporarily stored and then actively evaporated or pumped to the SWTP prior to being pumped to CP1. At CP1, the water will be treated for total suspended solids (TSS) at the EWTP and either transferred to the process plant for use as make-up water or discharged through the diffuser located in Meliadine Lake.

Contact water from the Underground Mine will be collected in underground sumps and recirculated for use in various underground operations. Underground contact water that is not used for operations will be stored underground and any excess water that cannot be stored underground will

be pumped to the Saline Pond temporarily and then eventually transferred to P1 for active evaporation or for treatment at the SWTP and then to CP1.

During the mine closure, the water management infrastructure will remain in place until closure activities are completed and monitoring demonstrates that water quality is acceptable for discharge to the environment without treatment.

A list of the water management control structures are presented in Table 1 with the approximate Mine phase. Figure 1.2 shows the location of the respective structures at the different development stages (Year – 5 to Year 8) of the mine life. Final design details of these structures have been or will be provided to the Regulators for approval at least 30 days prior to construction, as per the Licence.

Table 1: Water Management Control Structures

Mine Phase	Infrastructure Name
Pre-Production Construction (Y-5 to Y 1)	Culvert 2
	Channel 2
	D-CP1
	CP1 Jetty
	D-CP5
	CP5 Jetty
	Permanent Freshwater Intake Causeway and Pumping Station
	Channel 1
	Berm 3
	Channel 5
	Berm 1
	Channel 6
	Channel 7
	Channel 8
	Culvert 3
	Culvert 4
	Submerged Diffuser
	WTP Intake Causeway
	Culvert 1
	CP3
	CP4
	Berm 2
	D-CP3
	D-CP4

	Channel 3
	Channel 4
Sustaining Construction during Mine Operation (Y1 to Y8)	D-CP6

3.2 Water Management Structures Design Criteria

The following sections describe various water management systems that will be designed to meet the criteria:

- Water quality guidelines that meet regulatory criteria (described in Section 8).
- Design capacity of the EWTP, D-CP1 and CP1 will be able to manage the surface contact water from the entire site for a 1:100 wet year spring freshet or a 1:2 mean year spring freshet, plus a 1:1000 return 24-hour extreme rainfall.
- With the design capacity of pumping from CP5 to CP1, D-CP5 and CP5 will be able to manage the water from its catchment area for 3/7 of a 1:100 wet year spring freshet or a 1:1000 return 24-hour extreme rainfall.
- Each of the other water management dikes (D-CP3, D-CP4, and D-CP6) and associated ponds (CP3, CP4, and CP6, respectively), with the design pumping capacity, will be able to manage the water from their respective catchment area for 3/7 of a 1:100 wet year spring freshet or a 1:1000 return 24-hour extreme rainfall.
- The daily pumping rate for each of the ponds (CP3 to CP6), Tiriganiaq Pit 1 sump, and Tiriganiaq Pit 2 sump will be designed to have sufficient pumping capacity to handle the runoff water, which would result from one day (24.4 mm) of a 1:100 return wet spring freshet plus a 1:2 return one-hour rainfall (9.8 mm).

Channel 2 to Channel 4 are designed to pass an extreme intensity flow under a 5-minute 1:100 return rainfall of 9.2 mm. Channel 1 and Channel 5 to Channel 8 are internal channels where any water overflowing the channels will remain within the catchment areas of various containment ponds. Hydraulic analyses indicated that very wide channels are required to pass an extreme intensity flow under a 5-minute 1:100 return rainfall of 9.2 mm. As a result, these channels were designed to have a reasonable bottom width to pass a flow with lesser intensity, but the water overflowing the channels can be safely managed by berms or temporarily stored in a lower basin nearby. For example, water overflowing Channel 5 can be contained by Berm 3. Water overflowing Channel 7 and Channel 8 can be stored in the lower basin in the drained Pond H13, and Berm 1 will protect Portal No.2 from flooding. Water overflowing Channel 1 will flow through the flat ground between Ore Pad 1 (OP1)/Ore Pad 2 (OP2) and WRSF2 into CP1.

Hydraulic analyses indicated that many more culverts or larger culverts would be required to pass an extreme intensity flow under a 5-minute 1:100 return rainfall of 9.2 mm for Culvert 1. As a result, Culvert 1 was designed to pass a flow with lesser intensity, but the excess water can be safely managed by berms or temporarily stored in a lower basin nearby. The excess water that cannot pass through Culvert 1 can be temporarily stored in the lower basin in the drained Pond H13, and Berm1 will protect Portal No.2 from flooding. Other culverts are less critical and the excess water that cannot pass through the culverts can be temporarily stored in a lower basin nearby, within the water containment pond catchment area.

Table 2 presents the design parameters for CP1, CP5 and CP6.

Table 2: Design Parameters for CP1, CP5 and CP6

Pond	CP1	CP5	CP6
Pond Volume for Water Elevation at Projected Maximum Pond Operating Water Elevation under Normal Operating Conditions and Mean Precipitation Years (m^3)	742,075	46,674	19,154
Estimated Maximum Operating **Water Elevation (m)**	66.2	66.0	63.9
Dike for Pond	D-CP1	D-CP5	D-CP6
Design Crest Elevation of Dike Containment Element (liner system) (m)	66.50	66.30	64.30
Pond Volume for Water Elevation at Design Crest Elevation of Dike Containment Element (m^3)	778,502	66,231	49,627

CP3 and CP4 will be established through sub excavation of the original ground to increase the water storage capacity and eliminate or limit the requirement for berm construction. The key design parameters for CP3 and CP4 are provided in Table 3.

Table 3: Design Parameters for CP3 and CP4

Pond	CP3	CP4
Elevated Pond Bottom Elevation (m)	62.20	61.00
Excavated Pond Outlet Elevation (m)	64.15	63.46
Pond Volume for Water Elevation at Pond Outlet Elevation (m^3)	25,454	30,911
Projected Maximum Pond Operating Water Elevation under Normal Operating Conditions and Mean Precipitation Years (m)	63.49	62.55
Pond Volume for Water Elevation at Projected Maximum Pond Operating Water Elevation under Normal Operating Conditions and Mean Precipitation Years (m^3)	16,899	19,458
Estimated Maximum Water Elevation during IDF (m)	64.32	63.55

Pond	CP3	CP4
Pond Volume for Water Elevation at Estimated Maximum Water Elevation during IDF (m^3)	28,056	32,304
Dike for Pond	D-CP3	D-CP4
Design Crest Elevation of Dike containment Element (liner system) (m)	65.10	64.40
Pond Volume for Water Elevation at Design Crest Elevation of Dike Containment Element (m^3)	42,456	51,337

3.3 Water Containment ponds

Five water containment ponds (CP1, CP3, CP4, CP5, and CP6) will be constructed as part of the water management infrastructure. Table 4 presents the locations and the required operational period of the containment ponds. The locations of the five water containment ponds are shown on Figure 1.2. CP1, CP5, and CP6 have been or will be established within existing shallow ponds.

Table 4: Location of Containment Pond and Required Operation Periods

Containment Pond	Relative Location	Required Operation Period
CP1	Pond H17	Year 2017 to Mine closure
CP3	North of Lake B7 and southwest of TSF	Year 2019 to Mine closure
CP4	Southeast of Lake B7 and south of WRSF1	Year 2019 to Mine closure
CP5	North of Tiriganiaq Pit 2	Year 2017 to Mine closure
CP6	Pond H19 and north of WRSF3	Year 2023 to Mine closure

3.4 P-Area Containment Ponds

The P-area consists of three storage ponds, four water containment berms and three evaporators. This area contains surface runoff and is part of the surface water management system dedicated to saline water. The total storage capacity of the P-Area ponds is 46,041 m^3. P1 is divided by a berm and P1-A (6,131.8 m^3) is the southern section of P1 and P1-B (14,649 m^3) is the northern section. P2 is adjacent and located south of P1-A. P3 was constructed east of the existing south access road, with the primary purpose of collecting seepage originating from the P2 confining berm and its abutments. A pumping station was installed to collect and pump any collected water from P3 to P1.

P1, P2 and P3 are contained by water containment berms DP1-A, DP1-B, DP2-A, and DP3-A, with three evaporators (on DP1-B). Table 5 summarizes the as-built capacities for the P-Area ponds and Figure 3.1 illustrates the P-Area plan view.

Table 5: As-Built Capacity for P-Area Ponds

Pond	P1	P2	P3
As-built Capacity (m^3)	20,781	6,828	18,432
Maximum Design Water Elevation (m)	68.5	67.5	67.0
Total P-Area Capacity (m^3)	46,041		

Increased water monitoring protocols for the P-Area, over and above that required by the Licence, were also implemented. The additional monitoring includes water quality and transfer data, such as locations and flow volumes for water pumped to and from the containment ponds are discussed further in Section 8.

3.5 Saline Pond

The Saline Pond was constructed in Q3-2016 to accommodate excess saline water from the Underground. The Saline Pond is located east of P3 and north of CP5 (Figure 1.2). Table 6 summarizes the Saline Pond capacity for storage and maximum designed operating water levels. The maximum saline water capacity, is the volume that can be stored in the Saline Pond prior to winter freeze. Approximately 9,000 m^3 capacity should be available to accommodate precipitation that may accumulate throughout winter and at freshet.

Table 6: As-Built Storage Capacity for the Saline Pond

Item	Water Balance Under Mean Precipitation Conditions
Maximum Design Water Elevation (m)	62.9
Maximum Saline Water Capacity (m^3)	23,686
Estimated Maximum Storage Capacity at Maximum Water Elevation (m^3)	32,686 *

* Includes the capacity for saline water to be pumped into the Saline Pond from Underground, a combined capacity for net precipitation, and potential seepage water into the pond.

3.6 Water Diversion Channels, Dikes and Berms

3.6.1 Water Diversion Channels

Eight water diversion channels (Channel 1 to Channel 8) will be constructed as part of the water management infrastructure. The key information and design parameters for each channel are presented in Table 7.

Table 7: Design Parameters for Channels

Item	**Channel**

	1	2	3	4	5	6	7	8
Approximate Total Length (m)	493	270	619	710	429	69	214	315
Bottom Width (m)	3	1	1 or 2*	1 or 2*	3	1	1	1
Side Slopes	3(H):1(V)	1.82(H):1(V)	3(H):1(V)	3(H):1(V)	3(H):1(V)	3(H):1(V)	3(H):1(V)	3(H):1(V)
Rip-rap Thickness (m)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Minimum Bottom Slope Gradient (%)	0.28	0.30	0.17	0.13	0.17	0.44	0.42	0.38

* 1 m bottom width for first 100 m upstream section, and 2 m bottom wide for the remaining channel section

3.6.2 Water Retention Dikes and Berms

In general terms, “dikes” will retain continuous water during normal operations and “berms” may retain short-term water during high level water events. At the end of Mine closure, when the water quality in the corresponding pond meets direct discharge criteria, each of the other dikes and berms on site (except for Berm 2) will be breached to restore the original natural drainage paths. Berm 2 will remain in place to prevent non-contact water from flowing into the TSF.

Permafrost is expected to exist beneath the footprint of each dike and berm at the Mine. Each of the water retention dikes (D-CP1, D-CP3, D-CP4, D-CP5, and D-CP6) has been designed as a zoned earth fill dam with a geomembrane liner keyed into the expected permafrost foundation to limit the seepage through the dike and its foundation. The characteristics of the dikes and berms required for the WMP are summarized in Table 8.

3.7 Evaporators

Three evaporators were installed on jetties constructed at DP1-B. The evaporator system is designed for vaporizing water contained at the P-Area. The evaporators were installed to accommodate the quantity of excess saline water before saline water treatment options and disposal plans have been implemented at the Mine. Based on data collected during 2016, the efficiency of one evaporator was estimated to be 22 m^3/hr.

3.8 Freshwater Intake

Freshwater usage at the Mine includes potable uses, fire suppression, make-up water for the mill, and other operational requirements, such as drilling water, batch plant use and use at the washbay. The main freshwater intake is housed within a rockfill causeway located north east of the industrial pad in Meliadine Lake, as shown on Figure 1.2 and an additional freshwater intake pump is located at Lake A8. The intakes consist of vertical filtration wells fitted with vertical turbine pumps that supply water on demand. Both intake pipes will be fitted with a screen of an appropriate mesh size

to ensure that fish are not entrained and shall withdraw water at a rate such that fish do not become impinged on the screen (NWB, 2016).

The Meliadine Lake freshwater intake is connected to the pump house with piping buried under the rockfill causeway.

3.9 Water Treatment

Contact water will be treated (if necessary) to meet Licence requirements prior to be discharged to the environment. TSS mitigation techniques (i.e., attenuation ponds, silt screens, etc), oil separation treatment, STP, SWTP, and an EWTP will be used at various locations at the Mine prior to water being transferred to containment ponds and/or as effluent discharge to Meliadine Lake. Water quality criteria are discussed in Section 8.

Table 8: Design Parameters for Water Retention Dike/Berm

Item	D-CP1	D-CP3	D-CP4	D-CP5	D-CP6	DP1-A	DP1-B	DP2-A	DP3-A	Berm1	Berm2	Berm3
Approximate Maximum Height (m)	5.6	2.0	2.0	3.3	1.8	3.7	3.4	4.0	3.4	1.6	2.5	2.76
Maximum Elevation (m)	67.5	66.1	65.4	67.3	65.3	70.5	70.7	69.5	69.0	68.5	varies	67.37
Maximum Head of Water Retained (m)	3.5	0.2	0.1	1.4	0.5	68.5	68.7	67.5	67.0	0	0	0

3.9.1 Freshwater Treatment Plant (WTP)

Freshwater from Meliadine Lake will be treated in the WTP before being directed to the camp areas for potable (domestic) water uses. The design flow rate for freshwater for the main camp and accommodations is 216 m^3/day. In the WTP, freshwater will be pumped through cartridge filters, then pumped through ultraviolet units, and finally treated with sodium hypochloride (chlorine). The treated water will be stored within a potable water tank. Potable water will be monitored according to the Nunavut Health Regulations for total and residual chlorine and microbiological parameters. Operation and maintenance details for the WTP can be reviewed in the Process and Control Narrative (H2O Innovation, 2016).

3.9.2 Sewage Treatment Plant (STP)

Waste water from the accommodation complex and from satellite sewage tanks will be treated in the STP before being directed to CP1. Operation and maintenance details for the STP can be reviewed in the Operational & Maintenance Manual – Sewage Treatment Plant (Agnico Eagle, 2017c).

3.9.3 Saline Water Treatment Plant (SWTP)

Saline water generated from the Underground Mine is currently being stored underground and on surface at the P-Area and the Saline Pond. A SWTP will be installed at the Mine in 2018. The location for the SWTP will be near Portal 1.

3.9.4 Effluent Water Treatment Plant (EWTP)

The Effluent Water Treatment Plant (EWTP) will be required to treat and discharge 470,000 m^3 of contact water at Year -4. The volume of water requiring treatment for TSS and discharge will increase to a maximum of 798,000 m^3 at Year 3 and then decrease to 673,000 m^3 during the final year of the life of mine (Year 8).

Based on the anticipated water quality (Section 8) and water quantity, the EWTP will be used to treat TSS at CP1. Based on the maximum flow rate required each year, it was determined that the EWTP (Actiflo® system model ACP-600R) will have a maximum capacity of 520 m^3/h (nominal flow) at Year -4 and will be increased with a second ACP-600R to reach a maximum capacity of 1,040 m^3/h at Year 3.

TSS mitigation is ongoing with runoff water and is described further in the Freshet Action Plan (Agnico Eagle, 2018b). Additional TSS removal options are being considered for underground water, prior to pumping to surface.

3.9.6 Oil Separator

In 2018, an oil separator will be installed at the Maintenance Shop to collect and separate oil from water used for washing mining equipment.

3.10 Discharge Diffuser

The discharge diffuser will be the final effluent discharge location for the Mine. The overall purpose of the diffuser is to discharge water from CP1 (at sampling station Mel_14) to Meliadine Lake while providing minimal environmental impacts to the Lake. The effluent mixing will be dependent on ambient currents in Meliadine Lake, driven by wind during the open water period. The diffuser modelling was initially conducted by Golder (Golder, 2015) and updated design progress was reported by Tetra Tech EBA (Tetra Tech, EBA 2016).

SECTION 4 • WATER MANAGEMENT STRATEGY

There are four major sources of inflow water considered in the Mine water management system; freshwater pumped from Meliadine Lake and Lake A8, natural run off from precipitation, natural groundwater inflow to the Underground Mine and open pits, and water produced during freshet.

A brief summary of the water management strategy for the Mine is presented as follows:

- Contact water from key mine infrastructure will be diverted and/or collected in the containment ponds (CP1, CP3, CP4, CP5, CP6, the Saline Pond and the P-Area).
- The collected water in CP3 to CP6 will be pumped to CP1. Water collected in CP1 will be reused by the process plant and the excess water will be treated by the EWTP prior to discharge to the outside environment via the diffuser into Meliadine Lake.
- Contact water from the Underground Mine will be contained in underground sumps and the water storage stope and reused for mining operations. Excess water volumes will be pumped to the Saline Pond or P-Area Ponds to be stored on surface, actively evaporated to reduce water quantities or treated before transferring to CP1.
- Runoff water in the open pits will be collected in sumps and then pumped to the designated water containment ponds.
- Natural flooding to the open pits at end of mining will be supplemented by using freshwater from Meliadine Lake.
- Upon the completion of underground mining, the Underground Mine workings will be allowed to naturally flood by groundwater seepage.

Appendix B presents the Freshet Action Plan and the Snow Management Plan for the Mine. Table 9 summarizes the overall contact water management plan for the key infrastructure and presents the initial water collection locations and final water destinations. The plans for water management at key areas are described in following sections.

Table 9: Overall Site Surface Contact Water Management Plan

Contact Water Source	Initial Contact Water Collection Location	Final Contact Water Collection Location
Industrial Site Pad Area (camp/process plant area)	CP1	CP1
WRSF1 Area	CP1, CP4 and CP5	
WRSF2 Area	CP1 and CP5	
WRSF3 Area	CP6	
Dry Stack TSF Area	CP1 and CP3	
Ore Stockpiles OP1 to OP3	CP1	
Landfill	CP1	
Landfarm (biopile)	Sump within Landfarm	To CP1 after oil separation
Tiriganiaq Pit 1 Tiriganiaq Pit 2	Open pit sumps	First to CP5 and then to CP1
Tiriganiaq underground	Sump in underground mine	Mainly within the Underground Mine with excess surface water to be pumped to the ground surface and stored at the P-Area or Saline Pond.

Various containment ponds will be dewatered and treated (as necessary), prior to freshet (open water season) or prior to discharging through the diffuser to Meliadine Lake. The following sections describe the strategy for water management at different areas for the Mine.

4.1 Key Water Management Activities

The activities required for the WMP are summarized in Table 10. Water management activities during closure are described in Section 6.

Table 10: Key Water Management Activities

Mine Year	Major Water Management Activities and Sequence
Q4 of Yr -5 (2015)	• Start to re-use the underground water.
Yr -4 (2016)	• Dewatering of H17 into Meliadine Lake. • Dewater Pond A54 in Q3 of Year -4 and pump the water to CP1. • Start to store the excess groundwater from the underground mine at surface. • Implement and test evaporators at P-Area to reduce water volumes stored at

Mine Year	Major Water Management Activities and Sequence
	surface. • Construct trenches down gradient from DP1-B and DP3-A to be able to pump collected water seep and pump back to the associated containment pond.
Yr -3 (2017)	• Start to treat sewage water and pump the treated sewage water from the STP to CP1. • Start to pump the contact water from CP5 to CP1 for treatment/dilution • Start to pump water seepage collected in trenches, down gradient from D-CP1, D-CP5, DP1 and DP3 to the associated containment pond. • Start to pump water from washbay to underground for storage until treatment for oil plant arrives at the site • De-ice or divert water from Lakes H17A, H17B, and H17 C
Yr -2 (2018)	• Start to pump the water from CP1 to EWTP for treatment prior to discharge to the outside environment via the diffuser in Meliadine Lake. • Pump the underflow sludge water from the EWTP to CP1. To limit recirculation of the sludge within CP1, the discharge will be located away from the EWTP intake. • Start to divert the contact water from industrial pad to CP1 via Channel 1. • Start to pump the water from the Landfarm to CP1 after pre-treatment for oil. • Start to treat CP5 water by RO for removal of TDS. Permeate will blend with CP1 water prior to environmental discharge.
Yr -1 (2019)	• Start to pump the treated water from EWTP to the Process Plant as make-up water • Start to pump the underflow sludge water from WTP to the mill • During the open water season, the Process Plant will be supplemented as much as possible with water from the EWTP. For the balance of the year, freshwater will be used for ore processing
Yr 1 (2020)	• Start to pump the contact water in CP3 to the partially drained Pond H13 where the water will flow through Channel 1 into CP1 • Start to pump the contact water in CP4 to the partially drained Pond H13 where the water will flow though Channel 1 into CP1
Yr 2 (2021)	• Start to pump the contact water collected in Tiriganiaq Pit 1 to CP5
Yr 3 (2022)	• Dewater Ponds H19 and H20 in Q3 of Year 3 and pump the water to CP1
Yr 4 (2023)	• Start to pump the contact water collected in Tiriganiaq Pit 2 to CP5 • Start to pump the contact water in CP6 to CP1
Yr 5 (2024)	• WMP similar to Year 4
Yr 6 (2025)	• WMP similar to Year 4
Yr 7 (2026)	• WMP similar to Year 4 • Stop pumping water from open pits when the pits are mined-out at the end of year • Stop pumping excess water from underground when underground mining is completed

Mine Year	Major Water Management Activities and Sequence
Yr 8 (2027)	• Start to fill the mined-out Tiriganiaq Pit 1 and Tiriganiaq Pit 2 with active pumping water from Meliadine Lake • Start natural flooding of Tiriganiaq Underground Mine with groundwater seepage • Stop pumping water to process plant when the processing is completed

4.1.1 Pond Dewatering and Displacement

The initial dewatering at Lake H17 and Lake A54 was conducted in 2016 prior to constructing CP1 and CP5, respectively. The water from these ponds was pumped to Meliadine Lake through a temporarily installed diffuser. Dewatering of Ponds H19, and H20, is assumed that approximately half the volume of water in these ponds will be pumped to Meliadine Lake if it meets discharge criteria, and the remaining volume of water will be pumped to CP1 to be stored for treatment or dilution. Table 11 summarizes the dewatering plan and estimated volume of water to be dewatered for construction or prior to freshet.

Table 11: Pond Dewatering Plan

Pond	A54 (CP5)	H17 (CP1)	H20	H19
Maximum Pond Water Depth (m)	1.3	1.7	1.6	1.4
Existing Pond Surface Area (ha)	5.99	15.4	9.58	2.91
Dewatering Schedule	Sept. to Oct. of 2016	August to September of 2016	Sept. to Oct. of Year 3	Sept. to Oct. of Year 3
Estimated Total Volume of Water to be Dewatered (m^3)	34,545	82,400	90,307	16,431

The Meliadine Esker is located adjacent and north of CP1 and contains three shallow ponds (H17a, H17b, and H17c) (Figure 1.2). The three ponds will have ice removed or the water will be diverted directly to CP1 during the open water season. During the freshet, excess water at Ponds H15 and H15E will be diverted and pumped directly to CP1.

Ponds may also be displaced by the placement of fills. The water displaced by fill material will be diverted and collected in the adjacent water containment ponds. During winter season, the ice within the ponds will be removed and deposited at CP1 before site infrastructure construction.
Channel 1 will drain Ponds H8, H9, H10, H11, H12, and H13. The water in these ponds will be contained and treated prior to discharge to CP1. If water quality meets requirements, these ponds will flow naturally to CP1 via Channel 1 without prior treatment.

Channel 5 will drain Ponds A12 and A13. The water in these ponds will flow into CP5 via Channel 5.

4.1.2 Underground Water Management

The Underground Mine will extend approximately 650 m below the ground surface and part of the underground workings will be operated below the base of continuous permafrost. The underground excavations will act as a sink for groundwater flow during mining, with water induced to flow through the bedrock to the Underground Mine workings once the Mine has advanced below the base of the permafrost. Table 12 presents the predicted groundwater inflow rates for passive groundwater inflow to the Underground Mine.

Table 12: Predicted Groundwater Inflow to the Underground Mine (2017 to 2032)

Period	Predicted Groundwater Inflow (m^3/day)
2017	230
2018	300
2019	280
2020	300
2021	340
2022	340
2023-2024	420
2025-2026	380
2027-2028	390
2029-2030	380
2031-2032	360

Source: Updated Predictions of Groundwater Inflow to Tiriganiaq Underground Mine (Golder 2016).

Underground contact water will be contained within underground sumps and the Water Stope. A proportion of the underground water will be recirculated as make-up water for underground drilling. The drilling water will report to the underground sumps for recirculation; however, the need for up to 3% treated water make-up has been assumed to compensate for losses of drilling water due to evaporation or capture within the mined waste rock that is transferred to surface.

Excess underground water will be pumped to surface to be managed. The estimated volume of water to be managed is expected to range from a minimum of about 0.11 Mm^3/year to a maximum of 0.18 Mm^3/year depending on the production. Details of the underground dewatering system are provided in the Mine Plan (Agnico Eagle, 2017a).

Calcium chloride is added to the underground water to increase salinity and reduce water freezing during drilling. A heating system was installed in Q4-2017 and calcium chloride usage will be decreased underground. Excess water that is pumped to surface will be treated to meet regulatory criteria prior to any discharge to environment. Additional details are described in the GWMP in Appendix A.

4.1.3 Water Management for Haul Road

A network of haul roads will be used to provide access to infrastructure at the Mine. The majority of the roadways servicing the mining area will be located so that drainage will be directed towards the contact water management infrastructure. Detailed information about water management on roads is described in the Roads Management Plan (Agnico Eagle, 2014).

4.1.4 Water Management for Landfarm and Landfill

Water management for water collected at the Landfarm will be treated for oil and then pumped to CP1. Additional details for Landfarm water management is described in the Landfarm Management Plan (Agnico Eagle, 2015b).

Leachate from the Landfill is anticipated to be diluted due to the controls placed on materials acceptable for the landfill. Drainage from the Landfill is expected to freeze within the WRSF with minimal amounts of leachate reporting to the water collection infrastructure placed around the WRSF. Annual Landfill operations will involve clearing of snow prior to spring melt. However, in the event there is leachate from the Landfill due to periods of heavy rainfall or spring freshet, the runoff will be collected, controlled and treated, if necessary (Agnico Eagle, 2015a), and sent to CP1.

4.1.5 Water Management for Emulsion Plant Area

Freshwater will be trucked to the emulsion plant and used for manufacturing emulsion as well as for washing the explosive trucks. Water within the emulsion plant will be re-used when feasible, and excess water will be collected and disposed of with an appropriate method that is currently being evaluated by Agnico Eagle.

4.1.6 Water Management for the Batch Plant

Freshwater is pumped from Lake A8 to the Batch Plant and used for concrete production. Water used in the Batch Plant will be re-used when feasible and excess used water will be collected and disposed of in P1.

4.1.7 Water Management for the Wash Bay

Freshwater is pumped from Lake A8 to the Wash Bay and used to wash equipment at the Mine. Water used in the Wash Bay will be re-used when feasible and excess used water will be collected and disposed of appropriately. Water treatment will be commissioned in 2018 for excess Wash Bay water at the Maintenance Shop.

4.2 Freshwater and Sewage Water Management

Additional freshwater usage and sewage water management is described in the following sections.

4.2.1 Freshwater Management

Major freshwater usages on site include potable use, fire suppression, a portion of make-up water for the mill, and other operational needs, such as drilling. Freshwater will be sourced from Meliadine Lake through a freshwater intake and pump system. For dust suppression, water will be sourced from ponded water against the All Weather Access Road (AWAR), small ponds proximal to the road and/or from the Meliadine River.

Freshwater will be pumped through an overland pipeline to an insulated main storage tank located at the plant site. Approximately 62,000 m^3/year of freshwater will be required during construction phase, and approximately 318,000 m^3/year of freshwater will be required during operation phase. Additionally, approximately 4,000,000 m^3 of freshwater will be required per year to fill the mined-out open pits during the mine closure. These quantities are inclusive of water needs for dust suppression.

The design flow rate for the potable water for the main camp and accommodations (kitchen, laundry) is 136 m^3 per day (based on a 680-people camp capacity and a nominal consumption of 200 L/day/person). Treated potable water will be treated at the freshwater treatment plant (FWTP) and then piped to areas in the process plant, service complex, and other facilities requiring potable water.

4.2.2 Sewage Water Management

Sewage will be collected from the camp and change-room (dry) facilities and pumped to the STP. The objective of the STP is to treat sewage to an acceptable level for discharge to CP1 via a sewage water discharge pipeline. The STP is housed in a prefabricated (modular) structure, located at south-east of the service complex at the Industrial Pad, as shown in Figure 1.2. The sewage treatment system will be designed based on a flow rate of 200 L per day per worker for a peak load of 680 people, for an average daily flow rate of 136 m^3 (5.67 m^3/h).

The STP for the camp facilities will be designed to meet appropriate guidelines for wastewater discharge (Agnico Eagle, 2017).

4.2.3 Process Water Management

Process water will be required in the mill for ore processing. Both contact water from CP1 and sludge water from the EWTP will be used as process water. When possible, water from CP1 will be the main source of water for the ore process. Additional water needs will be supplied by freshwater from Meliadine Lake. Approximately 460 m^3/day of process water will be required in Year 1 to Year 3 operations and approximately 770 m^3/day of process water will be required in Year 4 to Year 8.

4.3 Discharge Diffuser Effluent Flow Rates

The effluent discharge pump responsible for sending effluent into Meliadine Lake via a diffuser has a design rate of 11,688 m^3/day (a water treatment rate of 12,000 m^3/day minus 312 m^3/day of sludge returned back to CP1). The pump does not operate continuously. It was assumed that once the pump is activated, it would stay active, i.e., pumping, for at least three consecutive days. The amount of effluent flow released over each month and over each year was based on the overall water balance for the feasibility study (Tetra Tech EBA, 2016).

Table 13 shows the estimated total volume of effluent released per month per year.

Table 13: Estimated Effluent Flow Rates over Mine Operating Life

Year	Effluent Released Over the Course of the Month (m^3)				
	June	July	August	September	October
Year -3: 2017	175,320	233,760	70,128	70,128	23,376
Year -2: 2018	175,320	163,632	81,816	70,128	23,376
Year -1: 2019	175,320	151,944	93,504	58,440	23,376
Year 1: 2020	175,320	268,824	116,880	93,504	35,064
Year 2: 2021	175,320	303,888	105,192	93,504	35,064
Year 3: 2022	175,320	292,200	105,192	163,632	70,128
Year 4: 2023	175,320	350,640	128,568	105,192	35,064
Year 5: 2024	175,320	350,640	128,568	93,504	35,064
Year 6: 2025	175,320	350,640	128,568	93,504	35,064
Year 7: 2026	175,320	350,640	128,568	93,504	35,064
Year 8: 2027	175,320	280,512	105,192	81,816	35,064
Year 9: 2028	175,320	292,200	116,880	93,504	35,064
Year 10: 2029	175,320	292,200	116,880	93,504	35,064
Year 11: 2030	175,320	280,512	116,880	93,504	35,064

SECTION 5 • WATER BALANCE

5.1 Global Water Balance

A water balance model was developed to assist in the evaluation of the water management infrastructure and estimation of the pumping requirements over the life of the Mine and under closure conditions. The model includes a water balance conducted on both a monthly and yearly basis. The model focuses specifically on contact water management infrastructure and areas that have been affected by mining activities.

A monthly site-wide water balance was conducted for CP1, CP3, CP4, CP5 to CP6, Tiriganiaq Pit 1, Tiriganiaq Pit 2, water in the underground mine operation, make-up water for the mill, water for the WTPs, and freshwater during mine construction period to mine closure under mean precipitation years. The water balance will be updated in further iterations of the WMP, as stated in the Licence, prior to operations. The following sections present the parameters and assumptions adopted in the water balance model along with a summary of the water balance results.

5.2 Water Balance Framework

The water balance framework developed for the site-wide water balance model was presented in Version 1 of the WMP (Agnico Eagle, 2015a). To simulate a range of conditions, the model was run for the proposed mine life and closure conditions.

5.3 Water Balance Assumptions

The water balance was based on the following:

- snow accumulates throughout the months of November to May, and thaws in June during the annual spring freshet period;
- average precipitation year climate conditions;
- the open pits and water containment ponds (CP3 to CP6) are not to be used for long-term storage of water during operations;
- the water collection sumps and ponds are empty in the autumn prior to the spring freshet each year; and,
- other water management assumptions described in Section 4 of this WMP.

A general water management flow sheet illustration is presented in Appendix C.

5.4 Water Balance Results

The estimated maximum annual water input/output from each of the various water management facilities under mean precipitation conditions are summarized in Table 14. Results were also

provided for 1:100 year wet and dry conditions, with corresponding basis and assumptions, in a separate technical memorandum (Tetra Tech EBA, 2015).

Table 14: Estimated Maximum Annual Volumes from Mine Site Water Balance

Item	Maximum Annual Water Volume (Mm^3)
Contact Water from CP1	0.800
Contact Water from CP3	0.088
Contact Water from CP4	0.087
Contact Water from CP5	0.240
Contact Water from CP6	0.076
Water Pumped from CP1 to WTP for Treatment	0.798
Fresh Water Pumped from Meliadine Lake during Construction	0.062
Fresh Water Pumped from Meliadine Lake during Operation	0.318
Treated Water from WTP to be Discharged to Outside Environment	0.730
Underground Water Pumped to Underground TSS Removal Plant	0.696
Excess Water from Underground Mine to be Stored on Surface	0.155
Fresh Water Pumped from Meliadine Lake to Fill Mined-out Tiriganiaq Pit 1	3.068
Fresh Water Pumped from Meliadine Lake to Fill Mined-out Tiriganiaq Pit 2	0.749

5.5 Waterbody Inventory

Three watersheds (Watershed A, Watershed B and Watershed H) will be impacted by the Mine activities. Table 15 presents the waterbodies that are impacted by mining activities. Watersheds and waterbodies in proximity to the Mine location and waterbodies affected by Mine infrastructure are shown on Figure 5.1.

Table 15: Inventory of Waterbodies Impacted by Mining Activities

Watershed	Waterbody	Maximum Lake Water Depth, m	Total Area (ha)	Water Volume (m^3)	Notes
A	A9	N/A	0.18	-	Flow regimes impacted by the development of Tiriganiaq Pit 1
	A10	0.67	0.26	-	Ponds removed by development of Tiriganiaq Pit 1
	A11	0.45	0.40	-	
	A12	0.87	0.47	-	Pond drained due to construction of Channel 5
	A13	0.30	0.26	-	
	A17	0.30	0.16	-	Covered by WRSF 1
	A38	N/A	0.05	-	Flow regimes impacted by the development of Tiriganiaq Pit 2
	A39	0.48	0.12	-	Ponds removed by development of Tiriganiaq Pit 2
	A54	1.3	5.99	34,545	Dewatered for CP5
	A58	0.50	0.43	-	Covered by WRSF 2
B	B8	0.8	1.43	-	As part of CP4/D-CP4
	B9	1.40	0.64	-	Covered by WRSF1
	B10	0.8	0.33	-	Ponds removed by development of Tiriganiaq Pit 1
	B28	N/A	0.45	-	As part of CP3/D-CP3
H	H6	0.58	0.75	-	As part of CP1
	H7	0.67	0.11	-	
	H8	0.59	0.38	-	Partially covered by WRSF2 and haul road
	H9	0.40	0.42	-	Partially covered by WRSF2 and OP2
	H10	0.11	0.10	-	Partially covered by WRSF2 and OP2, drained due to construction of Channel1
	H11	0.27	0.28	-	
	H12	0.81	0.97	-	Drained due to construction of Channel1 and partially covered by OP1
	H13	1.04	3.49	-	Drained due to construction of Channel1 and partially covered by industrial pad
	H14A	0.37	0.15	-	Covered by industrial pad
	H15D	0.30	0.15	-	Partially covered by TSF
	H15G	0.40	0.38	-	
	H17	1.70	15.8	195,700	Dewatered for CP1
	H17A	1.50	0.13	1,365	Dewatered for Meliadine esker
	H17B	1.50	0.69	10,350	Dewatered for Meliadine esker
	H17C	1.50	0.23	3,450	Dewatered for Meliadine esker
	H18	0.67	0.74	-	Covered by OP2
	H19	1.40	2.91	16,431	Dewatered for CP6
	H20	1.60	9.58	90,307	Covered by WRSF3

"-" indicates that data not available or not applicable Ponds to be drained Ponds to be dewatered

SECTION 6 • WATER MANAGEMENT DURING CLOSURE

The detailed Mine closure and reclamation activities are provided in the Preliminary Closure and Reclamation Plan (Agnico Eagle, 2015d).

Water management during closure and reclamation will involve flooding the open pits using precipitation and freshwater from Meliadine Lake, flooding the Underground Mine workings with groundwater inflows (groundwater seepage), and maintaining contact water management systems on site until monitoring results demonstrate that water quality are acceptable for discharge of all contact water to the environment without further treatment. Once water quality meets the discharge criteria, the water management systems will be decommissioned to allow the water to naturally flow to the environment.

The key water management activities during Mine closure are summarized in Table 16. Figures 6.1 and 6.2 illustrate the WMP during and after Mine closure, respectively. Additional details for the activities are described in the following sections.

Table 16: Key Water Management Activities during Mine Closure

Mine Year	Figure	Key Water Management Activities and Sequence
Yr 9 to 11	6.1	• Finish flooding the mined-out Tiriganiaq Pit 1 and Tiriganiaq Pit 2 by Q4 of Year 10 • Continue to collect and manage the contact water in CP1, CP3, CP4, CP5 and CP6 • Continue to pump the contact water in CP1 to EWTP, if required, for treatment before being discharged to the outside environment • Remove non-essential site infrastructure • Pump the underflow sludge water from EWTP to CP1 • Continue natural flooding of Tiriganiaq Underground Mine with groundwater seepage • Remove Meliadine Lake pumping system
Post-Closure	6.2	• Treat the contact water until water quality meet direct discharge criteria and then decommission the water management system • Continue natural flooding of Tiriganiaq Underground (progressive reclamation since Year 8) • Breach water retention dikes D-CP1, D-CP3, D-CP4, D-CP5, and D- CP6 once water quality monitoring results meet discharge criteria to allow water to naturally flow to outside environment • Remove culverts and breach remaining water retention dikes/berms in Year 18

6.1 Open Pits Flooding

When flooding the open pits for closure, the maximum pumping rate from Meliadine Lake shall not exceed 4,000,000 m^3/year during closure of the Mine, as stated in Part E of the Licence. The planned pumping period will occur during the open water season from mid-June to end of September for each year. Table 17 summarizes the pit volume and expected water elevations at the completion of flooding activities. It will take approximately three years to fill the pits with an assumed pumping rate of 0.44 m^3/s (38,300 m^3/day). The assumed pumping rate of 0.44 m^3/s from Meliadine Lake during closure will have negligible effect to Meliadine Lake when compared to the average outflow rate at the outlet of Meliadine Lake. The pumping rate will be evaluated further to validate that any possible negative effects to Meliadine Lake do not occur.

Table 17: Pit and Underground Flooding

Pit	Volume (Mm^3)	Final Water Elevation (masl)	Water Source
Tiriganiaq Pit 1	9.20	64.14	Freshwater from Meliadine Lake
Tiriganiaq Pit 2	2.25	64.38	Freshwater from Meliadine Lake
Tiriganiaq Underground	1.4	Groundwater level	Groundwater seepage

The water quality model results indicated that water quality in the flooded pits will meet the discharge criteria and post closure treatment will not be required. The water quality within the pits will be monitored during flooding to verify the prediction of the water quality model. The information will be used to develop a strategy to minimize contamination of the regional surface water system.

6.2 Underground Mine Flooding

Passive flooding of the Tiriganiaq Underground Mine will occur following the completion of mining. The estimated total flooding volume of the underground workings is 1,372,000 m^3. Seepage water into the Underground Mine will be the main water source for flooding. At the predicted seepage rate it is estimated to take 6 years to flood the Underground Mine.

6.3 Containment Ponds, Dikes and Berms

The containment ponds, dikes and berms will remain in place to collect the surface runoff water and seepage from the Mine until the water quality meets discharge criteria. Once the water quality meets discharge criteria, dikes/berms will be breached to allow the water to naturally flow to the environment. Dikes/berms breaching will involve the removal of a portion of the dikes to a minimum depth of 1 m below average water level or back to original ground levels. Consideration

will be given to breach staging, with the above water portions of the dike/berm in the breach area removed during winter periods, when there will be little surface water flow, thereby minimizing the potential release of sediments to the neighbouring waterbodies. The remainder of the breach would be conducted during the open water season following freshet so as to allow for the deployment of turbidity controls to minimize potential sediment release to the environment.

6.3 Channels and Sumps

Once monitoring results have indicated that contact water conveyed in channels and sumps meets acceptable water quality, the infrastructure will be graded and/or surface treated according to site-specific conditions to minimize wind-blown dust and erosion from surface runoff, if required. This closure activity is intended to enhance site area development for re-colonization by native plants and wildlife habitat.

SECTION 7 • WATER QUALITY

Water quality predictions for the Mine were generated using the GoldSim database management and simulations code (Version 11.1.2) where Mine contact water flows derived from the Meliadine water balance are combined with chemistry data from materials exposed in mine infrastructure (tailings storage facility, waste rock piles, etc.), and site baseline information. Where site specific information is not available, data collected at other mine sites in the north are used to supplement the input data.

Water quality estimates were generated for the operational and post-closure periods, for each contact water containment ponds, for sumps in the two open pits and for the two fully flooded open pit lakes post-closure.

The sensitivity of water quality to an added TSS load was evaluated outside of the GoldSim mass balance model. Total parameter concentrations were evaluated at ponds that discharge to the receiving environment (i.e., CP1 during operations, and CP1, CP3, CP4, and CP6 post-closure) based on an addition of 15 milligrams per litre TSS, the maximum monthly mean of the Metal Mining Effluent Regulations (MMER) criteria. Given the uncertainties associated with the modelling exercise (i.e., the development stage of the Mine, laboratory-based input values, assumptions where data do not exist and consideration of an average climate year), the predicted concentrations are considered to be order-of-magnitude estimates. The estimates are sensitive to the assumptions and design elements considered. The water quality modelling predictions will be updated as stated in the Licence in future iterations of the WMP, prior to operations. A water balance and water quality model will be updated at a minimum of every two (2) years following commencement of Operations, as required by the License.

Table 18 shows the various constituent concentrations corresponding to the Licence and the predicted values. These concentrations correspond to end-of-pipe concentrations discharge from the diffuser to Meliadine Lake (Tetra Tech EBA, 2016).

7.1 Summary of Regulatory Guidelines

Water quality results are compared to MMER and Site Specific Water Quality Objectives (SSWQO) guidelines and will be compliant prior to discharging to Meliadine Lake or the environment. Post-closure discharge water quality will be compared to Canadian Council of Ministers of the Environment Water Quality Guidelines (CCME-WQG) guidelines or the Meliadine SSWQO developed for aluminum, fluoride, and iron (Golder 2013a, 2013b, 2014).

Table 18: Effluent Characteristics

	Water Licence "A"		Meliadine Lake Median Background Concentration [mg/L]	End-of-Pipe Prediction based on Tiriganiaq Monthly Average Concentrations	
	Maximum end-of-pipe Average Concentration [mg/L]	Maximum end-of-pipe Concentration of Any Grab Sample [mg/L]		Dissolved Contaminant Concentration [mg/L]	Total Used in the Model (Dissolved + 15 mg/L TSS) [mg/L]
Conventional Constituents					
Total Dissolved Solids	1400	1400	35.0	204	204
Total Suspended Solids	15	30	1.5		15
pH	6 to 9.5	6 to 9.5	7.4		
Major Ions					
Chloride			6.4	20	20
Fluoride			0.03	0.0002	0.0002
Sodium			3.2	5.3	5.6
Sulphate			2.9	35.9	35.9
Nutrients					
Total Ammonia as Nitrogen	14	18	0.025	4.6	4.6
Nitrate Ion	-	-	0.11	5.8	5.8
Phosphorus (total)	2	4	0.0055	0.4	0.4
Cyanides					
Total cyanide	0.5	1.0	0.00100	0.005	0.005
Free cyanide	-	-			
Metals					
Aluminum	2	3	0.0025	0.09	1.20
Antimony			0.0001	0.0029	0.0029
Arsenic	0.3	0.6	0.0003	0.101	0.191
Barium			0.0071	0.012	0.021
Cadmium			0.00003	0.000005	0.000012
Chromium			0.0002	0.00001	0.0030
Copper	0.2	0.4	0.00111	0.0011	0.0037
Iron			0.0235	0.01	1.70
Lead	0.2	0.4	0.00003	0.0011	0.0049
Manganese			0.00283	0.12	0.13

7.2 Operations

During operations, the water quality at the Mine (including CP1 water) is anticipated to meet regulatory monthly mean discharge criteria, with the possible exception of TSS at all ponds and arsenic, on occasion, at CP3 which receives water from the TSF. Although TSS content was not specifically modelled, experience at other northern mine sites suggests that TSS in site contact water is likely to require attenuation during operations to meet the MMER effluent criteria of 15 mg/L monthly average (Government of Canada, 2012). An EWTP that removes TSS is planned to be operational in Year -4 of the Mine.

CP3 arsenic concentration may exceed MMER on occasion if precipitation events generate drainage from the TSF (Golder, 2012c). The main source of arsenic in CP3 is predicted to be from residual process water that is assumed to be present in the filtered tailings. Arsenic transfer from process water to CP3 water will be minimized by effective dewatering of the tailings prior to placement into the TSF, and from freezing of the tailings in the TSF which will act to limit infiltration and seepage. Water from CP3 will be pumped to CP1 where it will mix with other site waters before discharge. Dissolved arsenic concentration in CP1 is predicted to meet the MMER monthly average maximum concentration. All other chemical parameters in CP3 and all chemical parameters in CP4, CP5, and CP6 are predicted to meet MMER limits for chemical constituents.

7.3 Post-Closure

The long-term, post-closure water quality in the containment ponds and in the flooded open pit lakes are anticipated to meet MMER limits and CCME-WQG for the protection of aquatic life or the SSWQO developed for the Mine for aluminum, fluoride, and iron. Arsenic concentrations in CP3 could slightly exceed the SSWQO post-closure, a criteria that is conservatively protective of the receiving aquatic environment (Golder, 2013a). Concentrations that exceed predictions are minor, much less than the mixing capacity in the receiving environment. These arsenic concentrations (Golder, 2013a) are within the tolerance levels that have been deemed non- deleterious by Environment Canada for the Mine (Environment Canada, 2014).

SECTION 8 • WATER QUALITY MONITORING PROGRAM

Water quality monitoring is an important part of the Mine WMP to verify the predicted water quality trends and conduct adaptive management should differing trends be observed. This section outlines the water quality monitoring plan, which will be further defined as the Mine advances.

Water quality monitoring has been initiated at the pre-development stage and will continue during construction, operations, closure, and post-closure. Monitoring will occur at three levels:

1. Regulated discharge monitoring that occurs at monitoring points specified in the Licence or regulations.
2. Verification monitoring that is undertaken for operational and water management purposes by Agnico Eagle. This monitoring data will not be reported to the Regulators in the Annual Water Licence Report, but can be provided upon request by the Regulators
3. General monitoring that is commonly included in the Licence, specifying what is to be monitored according to a schedule. This monitoring is subject to compliance assessment to confirm sampling was carried out using established protocols, included quality assurance/quality control provisions, and addressing identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

All three types of monitoring will be used at the Mine. The following section presents the conceptual water quality monitoring plan during construction, operations and closure. More detailed information on monitoring programs is described in the Environmental Management and Protection Plan (EMPP) (Agnico Eagle, 2018a) and is based on the Licence.

8.1 Water Quality Monitoring

Table 19 presents the water quality monitoring stations during construction, operation, closure and post-closure phases. Figure 8.1 presents the water quality monitoring locations for all three Mine phases.

Table 19: Water Quality Regulated, General Aquatic and Verification Monitoring for the Meliadine Gold Mine during Construction, Operations, and Closure

Monitoring Type	Mine Development Phase	Monitoring Station Number	Station Description	Purpose of Station	Frequency
Regulated	Construction	MEL-D-1 to TBD	Dewatering: Water transferred from lakes to Meliadine Lake during dewatering of lakes		Prior to discharge and weekly during discharge Daily during periods of discharge
Regulated	Construction and Operations	MEL-SR-1-TBD	Surface Runoff – runoff downstream of Construction areas at Meliadine Site and Itivia Site, Seeps in contact with the roads, earthworks and any Runoff and/or discharge from borrow pits and quarries		Prior to construction, weekly during construction Monthly during open water or when water is present upon completion
General Aquatic	Construction, Operation, and Closure	MEL_11 (MEL-04 suggested by Agnico Eagle in the Application)	Water intake from Meliadine Lake	Quality of intake water	Monthly during period of intake (Full Suite); Daily during periods of intake (Volume m^3)
Verification	Construction (prior to release), Operation, and Closure	MEL_12	Water treatment plant (pre-treatment) coming from H17 station will be off the pipe and not in the pond	Test quality of water before treatment (required to evaluate treatment efficiency	Monthly during periods of discharge

Monitoring Type	Mine Development Phase	Monitoring Station Number	Station Description	Purpose of Station	Frequency
General Aquatic	Construction (prior to release), Operations, and Closure	MEL_13	Mixing zone in Meliadine Lake, station 1; and MMER exposure stations for final discharge point within mixing zone	Test mixing of effluent in the receiving environment; sample at varied distances and directions from pipe; MMER exposure for final discharge point	Monthly during periods of discharge
Regulated	Construction (upon effluent release), Operation, and Closure	MEL_14[a] (MEL-01 suggested by Agnico Eagle in the Application)	Water treatment plant (post-treatment), end of pipe (before offsite release) in the plant before release.	Test quality of final effluent before release	Prior to discharge and weekly during discharge (Full Suite, Group 3); Daily during periods of discharge (Volume m^3); Once prior to discharge and monthly thereafter (Acute Lethality)
Verification	Operations, Closure	MEL_15	Local Lake, E3	Confirm no leakage/runoff from Emulsion Plant	Bi-annually during open water
Verification	Construction, Operations, Closure	MEL_16	Local Lake, G2	Possible seepage or dust loadings from site infrastructure	Bi-annually during open water
Verification	Construction, Operations, Closure	MEL_17	Pond, H1	Possible seepage or dust loadings from site infrastructure	Bi-annually during open water
Verification	Construction, Operations, Closure	MEL_18	Local Lake, B5	Possible seepage or dust loadings from site infrastructure	Bi-annually during open water

Monitoring Type	Mine Development Phase	Monitoring Station Number	Station Description	Purpose of Station	Frequency
Verification	Operations, Closure	MEL_20	CP3	Collection of drainage from dry stacked tailings	Monthly during open water or when water is present
Verification	Operations, Closure	MEL_21	CP4	Collection of drainage from WRSF1	Monthly during open water or when water is present
Verification	Construction, Operations, Closure	MEL_22	CP5	Collection of drainage from WRSF1 and WRSF2	Monthly during open water or when water is present
Verification	Operations, Closure	MEL_23	CP6	Collection of drainage from WRSF3	Monthly during open water or when water is present
Verification	Construction, Operations, Closure	MEL_24	Seepage from Landfill between the Landfill and H13	Located between the landfill and Pond H3 to monitor seepage from the landfill	Monthly during open water or when water is present
Regulated	Construction, Operations, Closure	Mel-25	Secondary containment area of the tankfarm at Itivia	Test quality before discharge to land	Prior to discharge or transfer of effluent

[a] *Sampling may not occur during break-up (June)*

CP = contact pond; WRSF = waste rock storage facility;

During the closure period, parameters included in the CCME-WQG for freshwater aquatic life may also be included in the verification monitoring program.

8.2 Licence Water Monitoring

Regulatory guidelines are applied at the last point of control prior to discharge to the receiving environment as part of the Licence.

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Figure 1.2 General Mine Site Plan Layout

Figure 3.1 P-Area Plan View

Figure 5.1 Watersheds and Waterbodies in Proximity of Mine Site

Figure 6.1 Mine Site Layout for Water Management During Closure

Figure 6.2 Mine Site Layout After Closure

Figure 8.1 Water Quality Monitoring Locations

APPENDIX A • MELIADINE GROUNDWATER MANAGEMENT PLAN



AGNICO EAGLE

MELIADINE GOLD MINE

Groundwater Management Plan

FEBRUARY 2018
VERSION 1

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Mine (the Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut.

The Mine Plan proposes mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one Underground Mine. Based on the current Mine Plan, the Mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings (Agnico Eagle 2017). There are four phases to the development of the Mine; just over 4 years of construction (Q4 2015 to 2019), 8 years of Mine operation (2020 to 2027), 3 years of closure (2028 to 2030), and post-closure (2031 forwards).

Tiriganiaq Underground Mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the Underground Mine will operate below the base of the continuous permafrost. The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the Underground Mine workings once the Mine has advanced below the base of the permafrost.

This document presents the Groundwater Management Plan (GWMP) for the discharge of saline groundwater in compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1525, Part E, Item 14.

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ᐅᓴᖅᑕᑌᐊᖅᓗᑦ ᐸᖅᓇᐅᑎ ᐅᓴᖅᑕᑌᐊᖅᓂᖅᓗᑦ ᐋᖅᑭᐅᒪᔪᑦ ᐱᓂᕐᐊᕐᓂᐅᓂᖓᓄᑦ ᑎᑌᓂᐊᖏᑦᑕ ᔨᓗᑕᓕᒃ, ᒪᕐᕉᓂᒃ ᓄᓇᕗᑦ ᐅᒃᑯᐃᖖᓂᕐᒪᖅᑕ (ᑎᑌᓂᐊᖅ ᓄᓇᕗᑦ ᐅᒃᑯᐃᖖᓂᕐᒪᖅᖅ 1 ᐊᒻᒪᓗ ᑎᑌᓂᐊᖅ ᓄᓇᕗᑦ ᐅᒃᑯᐃᖖᓂᕐᒪᖅᖅ 2) ᐊᒻᒪᓗ ᐊᑕᐅᓯᖏᑦᑕ ᓄᓇᐅᐸ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᑌᐊᖅᓂᖅ. ᒪᓕᒃᓴᔪᒍ ᐃᓕᓴᐅᔪᖅ ᐅᓴᖅᑕᑌᐊᖅᓗᑦ ᐸᖅᓇᐅᑎ, ᐅᓴᖅᑕᑌᐊᖅ 12.1 ᒥᓕᒃᓕ ᑕᓕ-ᓗᐊᓂᒃ ᐅᓴᖅᑕᖅᓂᐊᖅᑐᖅ, 31.8 ᒥᓕᒃᓕ ᑕᓕ-ᓂᒃ ᐊᒃᑕᑯᖅᑕᐅᔪᓂᑦ ᐅᓴᖅᑲᓂᒃ, 7.4 ᒥᓕᒃᓕ ᑕᓕ-ᓂᒃ ᐅᖓᓪᑕᐅᖅᑎᔪᑦ ᐊᒃᑕᑯᖅᑕᐅᔪᓂᑦ, ᐊᒻᒪᓗ 12.1 ᒥᓕᒃᓕ ᑕᓕ-ᓂᒃ ᖃᒪᒃᑎᑦᑐᓂᑦ (ᐊᒻᒪᓂᑯᓂᑦ 2017). ᔪᑕᒪᐅᓕᖅᓯᐊᖅᑐᑦ ᐱᖓᓱᓕᑕᑌᐊᖅᓂᖓ ᐅᓴᖅᑕᑌᐊᖅᐸ; ᐅᑭᐅᑦ ᔪᑕᒪᐃᑦ ᐅᖓᓂᑎᐊᖅᓯᐊᓄᑦ ᓴᓇᓴᐅᓗᓂ (Q4 2015-ᒥᑦ 2019-ᒧᑦ), 8-ᓄᑦ ᐅᑭᐅᓄᑦ ᐅᓴᖅᑕᑌᐊᖅ ᐊᐅᓪᓚᓗᓂ (2020-ᒥᑦ 2027-ᒧᑦ), ᐱᖓᔪᓄᑦ ᐅᑭᐅᓄᑦ ᐅᑲᐊᖅᐸᓪᓕᐊᓗᓂ (2028-ᒥᑦ 2030-ᒧᑦ), ᐊᒻᒪᓗ ᐅᑲᐊᖅᔪᒪᓕᖅᑎᓪᓗᒍ (2013-ᒥᑦ ᔪᐳᒪᒧᑦ).

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DOCUMENT CONTROL

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1	February 2018	All		In compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1525, Part E, Item 14	Golder Associates Ltd. on behalf of Agnico Eagle Mines Limited

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ANFO	Ammonium Nitrate/Fuel Oil
CP	Collection Pond
DDH	Diamond Drillhole(s)
EMPP	Environment Management and Protection Plan
EWTP	Effluent Water Treatment Plant
FEIS	Final Environmental Impact Statement
GWMP	Groundwater Management Plan
MMER	Metal Mining Effluent Regulations
NWB	Nunavut Water Board
Mine	Meliadine Gold Mine
QA	Quality Assurance
QC	Quality Control
RO	Reverse Osmosis
SD	Support Document
SSWQO	Site Specific Water Quality Objectives
SWTP	Saltwater Treatment Plant
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
WMP	Water Management Plan

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per metre
ha	hectare(s)
mg/L	milligram(s) per litre
km	kilometer(s)
km^2	kilo square meter(s)
m	metre(s)
m/day	metre(s) per day
mm	millimetre(s)
m^3	cubic metre(s)
m^3/day	cubic metre(s) per day
m^3/s	cubic metre(s) per second
m^3/hour	cubic metre(s) per hour
m^3/year	cubic metre(s) per year
Mm^3/year	million cubic metre(s) per year
Mm^3	million cubic metre(s)
t	tonne(s)
tpd	tonne(s) per day
Mt	million tonne(s)

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Mine (Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine is subject to the terms and conditions of both the Mine Certificate (No. 006) issued in accordance with the Nunavut Agreement Article 12.5.12 on February 26, 2015 and Nunavut Water Board Type A Water Licence (No. 2AM-MEL1631, 2016) issued by the Nunavut Water Board (NWB) on April 1, 2016.

This document presents the Groundwater Management Plan (GWMP) for the discharge of saline groundwater in compliance with the Type A Water Licence 2AM-MEL1631 (Licence). Overall water management for the life of the Mine and post-closure is described in the Agnico Eagle Meliadine Gold Mine Water Management Plan, dated March 2017 (6513-MPS-11) (WMP). The WMP provides descriptions of the Mine water control structures and associated design criteria. The WMP will be updated in March 2018 to reflect the groundwater management strategy presented in this document.

1.1 Concordance

The Mine is subject to the land and resource management processes established by the Nunavut Agreement and other Federal laws and regulations. Agnico Eagle submitted a Licence Application for a Mining and Milling Undertaking (Application) required to use water and to deposit waste in development of the Mine, in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and Nunavut Water Regulations.

The Licence was issued on April 1, 2016 and signed by the Minister on May 19, 2016. The GWMP reflects the commitments made with respect to submissions provided during the technical review of the Application, as well as final submissions and issues raised during the Public Hearing Process, where applicable, to comply with Part B Section 13, and Part E Section 14 of the Licence.

1.2 Objectives

The objective of the GWMP is to provide consolidated information on groundwater management for the Meliadine Gold Mine. The GWMP is divided into the following components:

- Introductory section (Section 1);
- A brief summary of the physical setting at the mine site and the mine development plan (Section 2);
- A description of groundwater management strategies (Section 3); and
- A description of the groundwater monitoring program (Section 4).

The GWMP will be updated as required to reflect any changes in operations or economic feasibility that occurs, and to incorporate new information and latest technology, where appropriate, to comply with Part B Section 15 of the Licence.

SECTION 2 • BACKGROUND

2.1 Site Conditions

The Mine is located in an area of poorly drained lowlands near the northwest coast of Hudson Bay. The dominant terrain in the Mine area consists of glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and many small lakes. The topography is gently rolling with a mean elevation of 65 metres above sea level (masl) and a maximum relief of 20 metres (m).

The local overburden consists of a thin layer of topsoil overlying silty gravelly sand glacial till. Cobbles and boulders are present throughout the region at various depths. Bedrock at the mine site area consists of a stratigraphic sequence of clastic sediments, oxide iron formation, siltstones, graphitic argillite and mafic volcanic flows (Snowden 2008; Golder 2009).

The climate is extreme in the area, with long cold winters and short cool summers, and mean air temperatures of 12 °C in July and -31 °C in January. The mean annual air temperature at the Mine site is approximately -10.4 °C (Golder 2012a). Strong winds blow from the north and north-northwest direction more than 30 percent of the time.

The mean annual precipitation in the area is approximately 412 mm and is typically equally split between rainfall and snowfall.

Late-winter ice thicknesses on freshwater lakes in the mine site area were recorded from 1998 to 2000. The measured data indicated that ice thickness ranges from 1.0 to 2.3 m with an average thickness of 1.7 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July (Golder 2012b).

2.2 Local Hydrology

The Mine is located within the Meliadine Lake watershed. Meliadine Lake has a surface water area of approximately 107 square kilometres (km^2), a maximum length of 31 km, features a highly convoluted shoreline of 465 km and has over 200 islands. Unlike most lakes, it has 2 outflows that drain into Hudson Bay through two separate river systems. It has a drainage area of 560 km^2 from its' two outflows. Most drainage occurs via the Meliadine River, which originates at the south west end of the lake. The Meliadine River flows for a total stream distance of 39 km. The Meliadine River flows through a series of waterbodies, until it reaches Little Meliadine Lake and then continues into Hudson Bay. A second, smaller outflow from the west basin of Meliadine Lake drains into Peter Lake, which discharges into Hudson Bay through the Diana River system (a stream distance of 70 km). At its mouth, the Diana River has a drainage area of 1,460 km^2.

Watersheds in the Mine area are comprised of an extensive network of waterbodies, and interconnecting streams. The hydrology of these watersheds is dominated by lake storage and evaporation.

2.3 Hydrogeology

The Mine is located in an area of continuous permafrost. Based on thermal studies and measurements of ground temperatures, the depth of permafrost at the mine site is estimated to be in the order of 360 to 495 m. The depth of the active layer ranges from about 1 m in areas with shallow overburden, up to about 3 m adjacent to the lakes. The depth of the permafrost and active layer varies depending on proximity to the lakes, overburden thickness, vegetation, climate conditions, and slope direction (Golder 2012b). The typical permafrost ground temperatures at the depths of zero annual amplitude are in the range of -5.0 to -7.5 °C in the areas away from lakes and streams. The geothermal gradient ranges from 0.012 to 0.02 °C/m (Golder 2012c).

Groundwater characteristics at the Mine are detailed in Final Environmental Impact Statement (FEIS) Volume 7, Section 7.2 Hydrogeology and Groundwater, and in an updated hydrogeological assessment completed for the Mine (Golder 2016). The groundwater characteristics for the Mine are briefly summarized herein.

Two groundwater flow regimes in areas of continuous permafrost are generally present:

- a deep groundwater flow regime beneath the base of the permafrost; and
- a shallow flow regime located in an active (seasonally thawed) layer near the ground surface.

From late spring to early autumn, when temperatures are above 0 ˚C, the active layer thaws. Within the active layer, the water table is expected to be a subdued replica of topography, and is expected to parallel the topographic surface. Mine area groundwater in the active layer flows to local depressions and ponds that drain to larger lakes.

Taliks exist beneath waterbodies that have sufficient depth such that they do not freeze to the bottom over the winter. Beneath small waterbodies that do not freeze to the bottom over the winter, a talik bulb that is not connected to the deep groundwater flow regime will form (a closed talik). Elongated waterbodies with terraces (where the depth is within the range of winter ice thickness), a central pool(s) (where the depth is greater than the range of winter ice thickness), and a width of 340 to 460 m or greater are expected to have open taliks extending to the deep groundwater flow regime at the Mine site. A review of bathymetric data, ice thickness data, and results of thermal modelling suggests that Meliadine Lake and Lake B7 are likely to have open taliks connected to the deep groundwater flow regime (Golder 2012a).

Tiriganiaq Underground Mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the underground mine will be operated below the base of the frozen

permafrost (top of the cryopeg). The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the underground mine workings once the mine has advanced below the base of the frozen permafrost.

Both Tiriganiaq Pit 1 and Tiriganiaq Pit 2 will be mined within the frozen permafrost, therefore, groundwater inflows to the open pits is expected to be negligible and were not considered in the WMP.

2.4 Mine Development Plan

The Mine Plan proposes mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one Underground Mine. Based on the current Mine Plan, the Mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings (Agnico Eagle 2017). The following phased approach is proposed for the development of the Tiriganiaq gold deposit:

- Phase 1: 4 years for Mine Construction. Construction began in 2015 and is estimated to be complete in 2019;
- Phase 2: 8 years for Mine Operations, beginning in 2017 and ending in 2027;
- Phase 3: 3 years Mine Closure, from 2028 to 2030; and
- Phase 4: Post-closure (2031 forwards).

Mine facilities on surface include a plant site and accommodation buildings, three ore stockpiles, a temporary overburden stockpile, a tailings storage facility, three waste rock storage facilities, a water management system that includes containment ponds, water diversion channels, retention dikes/berms, and a final Effluent Water Treatment Plant (EWTP). The general location and site layout of the Mine are shown in Figure 1 of Appendix A.

SECTION 3 • GROUNDWATER MANAGEMENT STRATEGY

3.1 Groundwater Volumes

In the WMP of the water licence application (Agnico Eagle 2015a) it was stated that supplemental hydrogeological investigations were to be undertaken to provide additional information on potential volumes and quality of the saline groundwater to be managed. These investigations were undertaken in 2015 and 2016 and are summarized in Golder (2016). They included the completion of 24 packer tests, two pumping tests, two injection tests, 11 groundwater samples, and seven surface water samples. The work plan for the field work was developed in consultation with two independent technical advisors, Dr. Shaun K. Frape and Dr. Walter A. Illman (both of the University of Waterloo).

The additional hydraulic conductivity measurements, in combination with the updated Mine geologic model, resulted in a refined interpretation on the variability of hydraulic conductivity between geological formations and data on the storage properties of the bedrock. A summary of predicted groundwater inflows between 2017 and 2032, based on this refined interpretation and updated predictions of groundwater inflow using the developed numerical (Golder 2017), are provided in Table 1.

Table 1: Predicted Groundwater Inflow to Underground Mine (2017 to 2032)

Period	Predicted Groundwater Inflow (m^3/day)
2017	230
2018	300
2019	280
2020	300
2021	340
2022	340
2023-2024	420
2025-2026	380
2027-2028	390
2029-2030	380
2031-2032	360

Source: Updated Predictions of Groundwater Inflow to Tiriganiaq Underground Mine (Golder 2017).

The groundwater inflow predictions presented in Table 1 do not account for grouting currently being conducted as a mitigation to reduce groundwater inflows to the underground development, or potential losses through the ventilation system. Both mechanisms reduce the actual groundwater

inflows to the Underground Mine relative to that which was predicted. As such, these predicted inflows to the underground development represent unmitigated estimates.

3.2 Existing Groundwater Management Control Structures

Contact water in the Underground Mine is contained within underground sumps. A proportion of the underground water will be recirculated as make-up water for underground drilling. The drilling water will report to the underground sumps for recirculation; however, the need for up to 3% treated water make-up has been assumed to compensate for losses of drilling water due to evaporation or capture within the mined waste rock that is transferred to surface. Calcium chloride is currently not added to the underground water but has been used in the past and potentially again in the future to increase salinity and reduce water freezing during drilling.

Groundwater inflows to the Underground Mine since 2015 have not been discharged to the environment and are being stored underground, in the Saline Pond, in the P-Area, Collection Pond 5 (CP5) or actively evaporated during the open water season (Agnico Eagle 2017). Details of the underground dewatering system are provided in the Mine Plan (Agnico Eagle 2015a) and details of the pond are provided in the WMP (Agnico Eagle 2017).

The pond capacities and maximum water elevation for storage of the saline water are presented in Table 2. The locations of the ponds are shown on Figure 1 of Appendix A. The estimated volume of groundwater inputs to surface storage for management are expected to range from approximately a minimum of 0.11 million cubic metre(s) per year (Mm^3/year) to a maximum of 0.18 Mm^3/year, dependent on year of Mine life (Agnico Eagle 2017).

Table 2: Salt Water Storage Capacity at the Mine for Groundwater and Water Primarily Influenced by Underground Workings

Surface Pond	Capacity (m^3)	Maximum Water Elevation (m)
CP5	46,674	66.0
Saline Pond	32,686	62.9
P1	20,781	68.5
P2	6,828	66.5
P3	18,432	67.0

Source: Agnico Eagle (2017).

3.3 Groundwater Quality

Groundwater investigations undertaken indicate that total dissolved solids (TDS) concentrations are relatively consistent below the permafrost at approximately 64,000 mg/L (Golder 2016). Recent groundwater quality data from the Underground Mine collected by Agnico Eagle in 2016 and 2017 from diamond drillholes (DDHs), indicates mostly stable concentrations for several parameters

(Table 3) and suggest that TDS concentrations may be less at approximately 50,000 to 55,000 mg/L, on average, and the assumption of TDS at 64,000 mg/L may represent a more conservative estimate. It should also be noted that mining operations include drill-and-blast excavation for the development of the Underground Mine, which results in certain parameters in groundwater to be influenced by explosives (particularly ammonia and nitrate due to ammonium nitrate, fuel oil [ANFO] and emulsion explosives).

Table 3: Average Underground Saline Water Quality

Representative Months (average per month)		Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017	Feb 2017	Mar 2017	Apr 2017	May 2017	Jun 2017	Jul 2017	Aug 2017	Sep 2017
Parameters (total metal)	**Units**														
pH	pH	7.09	7.09	7.34	7.99	7.17	7.08	6.87	7.11	7.32	7.38	7.27	8.27	7.45	7.33
Alkalinity	mg/L	65	69	56	72.6	64	57	61.7	51	64.5	68	68	75	68.2	64
Conductivity	µmhos/cm	53320	70323	77750	79800	56000	77000	76500	77000	79000	79000	76308	74385	72200	72667
Total Hardness (as $CaCO_3$)	mg/L	14923	14644	13125	13260	13700	13200	18267	12700	18400	12433	12623	12500	12583	11700
Turbidity	NTU	82.85	93.00	56.25	27.56	74.00	123.75	69.00	88.00	90.00	51.00	75.00	61.00	47.02	104.33
Total Dissolved Solids (TDS)	mg/L	39663	50765	58600	60600	55000	54350	66433	54900	57500	57300	55123	57815	57520	54567
Total Suspended Solids (TSS)	mg/L	41	68.5	61	108.6	29	45	75.7	63	248.5	102.7	102.2	156	86	102
Aluminum (Al)	mg/L	0.56	8.72	0.075	0.32	0.06	0.21	0.10	6.02	1.29	0.51	1.45	0.73	0.97	1.75
Ammonia Nitrogen (NH_3-NH_4)	mg/L	4.66	4.20	5.93	5.98	3.50	4.13	105.3	4.50	4.95	5.20	5.51	11.1	4.87	4.43
Arsenic (As)	mg/L	0.0012	0.32	0.005	0.005	0.002	0.003	0.005	0.01	0.008	0.004	0.016	0.016	0.102	0.013
Barium (Ba)	mg/L	0.05	0.19	0.09	0.10	0.05	0.06	0.61	0.10	0.27	0.07	0.09	0.25	0.10	0.07
Beryllium (Be)	mg/L	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.01	0.002	0.002	0.005	0.008	0.01	0.01
Boron (B)	mg/L	1.4	1.7	1.5	1.5	1.8	1.6	4.98	5.0	4.9	1.5	2.7	3.97	5.0	2.5
Total Organic Carbon (TOC)	mg/L	4.95	2.65	3.68	4.28	2.00	2.23	11.67	2.10	2.95	2.63	3.20	5.30	2.57	2.50
Dissolved Organic Carbon	mg/L	2.60	2.35	3.45	3.74	1.90	1.90	10.17	1.70	2.30	2.37	2.70	4.90	2.32	2.10
Calcium (Ca)	mg/L	1899	1955	1965	1816	1800	1710	3777	1650	3737	1593	1608	1771	1610	1565
Cadmium (Cd)	mg/L	0.00002	0.0002	0.0002	0.0013	0.0002	0.0003	0.0002	0.001	0.0003	0.0002	0.0005	0.001	0.001	0.002
Chloride (Cl - dissolved)	mg/L	—	33500	31000	32800	34000	31250	38000	31000	31500	32000	31385	31538	32800	29333
Chromium (Cr)	mg/L	0.01	0.015	0.018	0.014	0.02	0.025	0.017	0.01	0.02	0.017	0.05	0.075	0.1	0.88
Copper (Cu)	mg/L	0.26	0.44	0.009	0.009	0.01	0.01	0.008	0.05	0.01	0.01	0.02	0.04	0.05	0.03
Cyanide (CN)	mg/L	0.005	0.006	0.008	0.017	0.005	0.005	0.19	0.005	0.028	0.005	0.006	0.01	0.005	0.008
Iron (Fe)	mg/L	9.68	40.28	6.48	5.23	4.31	4.76	8.96	3.60	8.78	6.19	9.81	6.33	8.24	4.10
Lead (Pb)	mg/L	0.002	0.002	0.004	0.005	0.004	0.005	0.005	0.02	0.004	0.003	0.009	0.015	0.02	0.018
Magnesium (Mg)	mg/L	2475	2170	2053	2118	2230	2168	2150	2080	2200	2050	2092	1962	2105	1975
Mercury (Hg)	mg/L	0.0002	0.01	0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.000001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum (Mo)	mg/L	0.01	0.015	0.04	0.013	0.02	0.025	0.055	0.01	0.25	0.026	0.047	0.075	0.1	0.17
Nickel (Ni)	mg/L	0.05	0.04	0.02	0.01	0.02	0.025	0.04	0.1	0.07	0.017	0.05	0.08	0.1	0.35
Nitrate (NO_3) as N	mg/L	0.15	0.168	0.88	0.57	0.1	0.5	116.39	0.1	2.58	0.23	0.89	4.35	0.17	0.34
Nitrite (NO_2) as N	mg/L	0.02	0.04	0.089	0.072	0.05	0.05	8.01	0.1	0.125	0.086	0.14	0.391	0.042	0.027
Total Kjeldahl Nitrogen (TKN)	mg/L	4.49	3.65	6.95	7.58	5.90	3.78	112.47	4.60	5.20	7.83	7.40	12.0	72.02	4.50
Phosphorous (P)	mg/L	0.05	0.14	0.05	0.05	0.04	0.07	0.14	0.04	0.13	0.12	0.08	0.09	0.1	—
Potassium (K)	mg/L	512	504.5	460.5	493.6	454	496	595	407	609	433	463	518	488	763
Radium-226 (Ra 226)	mg/L	—	—	—	1.9	1.7	0.49	0.33	0.3	1.2	1.95	1.8	1.9	2.2	0.29
Selenium (Se)	mg/L	0.23	0.006	0.0018	0.0033	0.002	0.003	0.002	0.01	0.002	0.002	0.005	0.0075	0.01	0.007
Silver (Ag)	mg/L	0.002	0.003	0.0004	0.0005	0.0004	0.001	0.0003	0.002	0.0009	0.0004	0.0012	0.0018	0.0002	0.018
Sodium (Na)	mg/L	16379	16000	14100	14600	15100	14625	14700	13400	15400	13900	14369	14654	14417	9433
Strontium (Sr)	mg/L	39.8	39.4	44.7	40.9	40.1	43.1	171	38.4	136	40	39	43.5	36.5	23.6
Sulphate (SO_4 – dissolved)	mg/L	—	3350	3125	3260	3200	3125	2700	3100	3100	3233	3169	2969	3120	3067
Thallium (Tl)	mg/L	0.0009	0.0008	0.0009	0.0006	0.001	0.001	0.001	0.001	0.0002	0.0002	0.0005	0.001	0.001	0.002
Uranium (U)	mg/L	0.002	0.003	0.002	0.002	0.002	0.003	0.002	0.01	0.006	0.002	0.005	0.008	0.01	0.09
Vanadium (V)	mg/L	0.05	0.08	0.09	0.06	0.1	0.13	0.08	0.5	0.1	0.08	0.23	0.38	0.5	0.33
Zinc (Zn)	mg/L	0.06	0.08	0.36	0.1	0.1	0.125	0.1	0.5	0.12	0.08	0.23	0.38	0.5	0.34

Source: Groundwater quality data from DDH sample location (Agnico Eagle, October 2017)

3.4 Groundwater Management Strategy and Associated Control Structures

Based on the Type A Water Licence 2AM-MEL1631 Terms and Conditions, Part E: Conditions Applying to Water Use and Management, No. 14, Agnico Eagle has reviewed the Mine alternatives to apply to the GWMP. Condition No. 14 specifically states:

> *"The Licensee shall submit a Groundwater Management Plan to the Board for approval in writing, at least six (6) months prior to the discharge of any Groundwater. The Plan shall take into consideration all comments raised and commitments made with respect to submissions received during the technical review of the Application as well as final submissions and issues raised during the Public Hearing Process, where applicable."*

Groundwater management alternatives were considered for the Mine based on the potential range of groundwater flows and quality that could be generated (refer to Appendix F of the WMP; Agnico Eagle 2015a). The option selection has been driven by the expected quality and quantity of the water.

Based on the groundwater inflow volume, the following options were considered and form part of the short and long term management of groundwater inflows to the Underground Mine:

- Short-term Strategy: treat saline groundwater and store/use the brine from the treatment process on-site (Section 3.4.1)
- Current Long-term Strategy: treated discharge to receiving environment in Meliadine Lake in combination with treated surface contact water (Section 3.4.2)
- Potential Future Long-term Strategy: ocean disposal (see Section 3.4.3)

The short and long-term groundwater management strategies are described below. At this time, Agnico Eagle is requesting approval from the NWB for the short-term strategy and the current long-term strategy to discharge to Meliadine Lake. The potential future long-term strategy of ocean disposal is still under assessment and provided for information purposes.

3.4.1 Short-Term Management Strategy - Treat and Store/Use Groundwater On-site

This alternative was considered as part of the Type A Water Licence Application and is currently being implemented on-Site as part of the short-term management of groundwater inflow. It involves storing all excess groundwater in underground sumps and in surface water ponds at the Mine. As outlined in the WMP (Agnico Eagle 2017), a total of nine water containment ponds are planned on-site at the Mine surface (CP1, CP3, CP4, CP5 and CP6, the P-Area [P1, P2, and P3], and the Saline Pond), and associated water retention dykes, water diversion berms, channels, and culverts, to manage surface water and underground water (Figure 1).

Evaporators have been in-use on site since mid-2017 at P1 to reduce groundwater volumes stored in surface water ponds. A single evaporator is estimated to remove approximately 500 m^3/day when operated for 24 hours with ideal wind and relative humidity conditions. While evaporators have

been used with some success, the combined volumes of groundwater with anticipated surface water volumes influenced by underground waste rock to be managed is greater than the available long-term storage at the Mine, and therefore, discharge to environment is required.

These short-term storage and treatment options are being implemented at the Mine pending regulatory approvals for the long-term groundwater management option.

3.4.2 Current Long-Term Management Strategy - Treated Groundwater Discharge to Meliadine Lake

Effluent discharge to Meliadine Lake was assessed as part of the FEIS and modelled as part of the Water Licence Application (Agnico Eagle 2014, 2015a) and discharge criteria have been defined in the Licence. Provided the discharge criteria can be met following commissioning of the treatment system, this option represents the immediate long-term management strategy to be implemented at the Site in 2018. Approval of this plan will be required, prior to discharge, as per the Term and Condition Part E, No. 14 of the Licence. Total discharge to Meliadine Lake, including the treated groundwater, will remain within the permitted daily volume and meet the discharge criteria defined in the Licence.

Hatch (2013) investigated groundwater treatment options for the site and concluded that a combination chemical reverse osmosis (RO) and mechanical vapour compression evaporator plant would be the most efficient method of treating excess groundwater for discharge. Agnico Eagle has also undertaken a pilot test of a SaltMaker combined with a Chemical-RO post-treatment system and based on the results of this testing decided to proceed with this technology.

The groundwater will flow through a Saltwater Treatment Plant (SWTP), comprised of a set of SaltMakers, and will be treated to remove excessive total suspended solids (TSS), calcium chloride ($CaCl_2$), sodium chloride (NaCl), metals, phosphorous (P), and nitrogen compounds. The salt generated by the water treatment unit will be stored at the Mine, where it will be re-used for underground operations and/or disposed of at an appropriate disposal location. Given the predicted groundwater volumes, a maximum of three SaltMakers are proposed to be built at the Mine, forming the SWTP, to treat the groundwater for discharge to the environment. Two SaltMaker's have been procured and are anticipated to be in operation between Q3 2018 and Q1 2019. Additional SaltMakers could be built at the Mine to meet the discharge volumes required. This need will be evaluated based on the effectiveness of the short-term management strategies and observed operational capacities of the SaltMakers, which are anticipated to be 120 m^3/day. The saline effluent temperature from the SWTP is expected to be approximately 35 °C, with an approximate pH of 7.5 (Saltworks 2017). The SWTP effluent largely meets the required Water Quality Output requirements defined in Agnico Eagle's Desalination Water Treatment Plan Design Criteria and passes completed toxicity tests (Saltworks 2017). Treated effluent quality (of the groundwater) through the SWTP indicates that TDS concentrations would be approximately 158 mg/L (condensed water after treatment; Saltworks 2017).

Post-treatment options, such as the RO post-treatment system, are being considered if required, to meet applicable effluent quality criteria for Meliadine Lake. The permeate resultant from the Chemical-RO post-treatment system meets all the required Site Specific Water Quality Objectives (SSWQO) and passes completed toxicity tests. Saline effluent quality after secondary treatment through the SWTP indicates that TDS concentration would be considerably reduced, at approximately 55 mg/L after RO post-treatment (Saltworks 2017). Pilot testing of the SaltMaker condensed water and RO permeate quality results are presented in the SaltMaker Pilot Final Report document (Saltworks 2017). The results indicate that values will meet SSWQO for water management, which also comply with MMER.

3.4.3 Potential Future Long-Term Management Strategy - Treated Groundwater Discharge to Melvin Bay at Itivia Harbour

Based on the potential volumes of groundwater, it is anticipated that a second discharge location will be required for long-term groundwater management. Agnico Eagle is proposing to treat groundwater and discharge it as saline effluent to the ocean, either as a direct discharge and/or after temporary on-site storage in one or more of the water containment ponds at the Mine. Ocean discharge is currently not permitted and requires appropriate regulatory licenses and approvals, which are currently being assessed and applications prepared. An updated GWMP will be submitted if appropriate licenses and approvals are obtained prior to discharge.

For the ocean discharge option, the saline effluent would be trucked from the Mine and discharged in Melvin Bay at Itivia Harbour. The discharge facility will include an unheated saline water storage tank at the Itivia Fuel Storage Facility and a pipeline extending to an engineered diffuser located in Melvin Bay during the open water season from 2019 to 2035. The saline effluent will be discharged in a controlled manner through the diffuser in compliance with the required discharge criteria to allow for maximum dilution and minimum environmental impact to the marine environment. Saline effluent quality will be required to meet the Canadian federal end-of-pipe discharge criteria (Metal Mining Effluent Regulations – or MMER), including the amended MMER (GC 2017; anticipated to come into effect in 2018), and Canadian Surface Water Quality Guidelines (Canadian Council of Ministers of the Environment Guidelines for the Protection of Aquatic Life [CCME 2003]) or Site-Specific Water Quality Objectives at the edge of the mixing zone for the diffuser discharge into Melvin Bay. It is recognized that further discussions are required with relevant stakeholders to confirm that this approach meets the amended MMER (GC 2017).

3.5 Discharge Schedule

Table 4 outlines the timeline for key activities on the Mine related to the management of saline groundwater, including tasks and facilities for the current short-term and long-term management strategies for discharge to Meliadine Lake (Section 3.4.1 and 3.4.2). A detailed Mine schedule for the overall Mine Water Management (e.g., building of culverts, berms and containment ponds) are presented in the 2017 WMP, which will be updated in March 2018.

Table 4: High Level Mine Schedule

Activity	Timeline	Notes
On-site water storage	Ongoing	—
Groundwater Management Plan (Current Document)	Six months prior to discharge	Type A Water Licence 2AM-MEL1631 requirement
Commissioning of Salt Water Treatment Plants (SaltMaker #1 and #2)	Q3-2018 to Q1-2019	—
Earliest first Discharge of treated saline groundwater to Meliadine Lake	Q3-2018	
Commissioning of additional SaltMaker unit(s) if required	2019	—
Active Discharge to Meliadine lake	Annually May thru October to 2032	—
Operation of Salt Water Treatment Plant	24 h a day / 7 days a week, May thru Oct	In-service as required
Inactive Discharge	Annually November thru April to 2032	Water will be stored underground and in surface containment ponds during the winter
Final Saline Effluent Discharge to Meliadine Lake	End of Mine life 2032	—

Source: Agnico Eagle (2017).

SECTION 4 • GROUNDWATER MONITORING PROGRAM

4.1 Water Quality and Quantity Monitoring

Water quality monitoring is an important part of the Mine water management to verify the predicted water quality and quantity trends and conduct adaptive management should differing trends be observed. Water quality and quantity monitoring has been initiated and will continue during construction, operations, closure and post-closure. Monitoring will occur at three levels:

- Regulated discharge monitoring that occurs at monitoring points specified in the Licence or regulations.
- Verification monitoring that is carried out for operational and water management purposes by Agnico Eagle. This monitoring data will not be reported to the Regulators in the Annual Water License Report, but can be provided upon request by the Regulators.
- General monitoring that is included in the Licence requirements and is subject to compliance assessment to confirm sampling was carried out using established protocols, including quality assurance/quality control provisions, and addressing identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

All three types of monitoring will be used at the Mine. The WMP presents the conceptual water quality monitoring plan during construction, operations and closures and more detailed information on monitoring programs and is described in the Environment Management and Protection Plan (EMPP) (Agnico Eagle 2015b).

The groundwater quality monitoring plan, which will be further defined as the Mine advances and will be conducted in agreement with the WMP for the Mine (Agnico Eagle 2017). Required monitoring and frequency for pre- and post- treatment (i.e., monitoring above ground) is presented in the WMP (Agnico Eagle 2017).

4.2 Water Quantity

The volume of groundwater inflow being collected and transferred to surface water management systems with be measured using a flow meter installed at the Portal Water Sump Stope L75 surface water pond. This data will be supplemented by periodic seepage surveys which will record visually observed groundwater inflows in the Underground Mine.

Measured groundwater inflow rates will be compared to model predictions on an annual basis. If significant variations from model predictions are observed, the assumptions behind the analysis will be reviewed and the analysis updated if required. In addition, updates to the groundwater model may be required based on operational changes as the Underground Mine advances.

If the measured groundwater quantity represents a significant difference from the model predictions, a re-calibration of the model will be considered. If model re-calibration is deemed necessary, future groundwater inflow quantity would be predicted using this re-calibrated model and results considered as part of the adaptive management of the groundwater quantity contribution to the WMP.

4.3 Water Quality

Groundwater quality will be monitored opportunistically from DDHs to assess and verify the quality of groundwater flowing into the Underground Mine. Water samples will be analyzed for the following parameters: conductivity, TDS, pH, temperature, major anions, radium 226, dissolved and total metals and toxicity testing.

To understand and plan for treatment requirements at surface, water accumulating in sumps underground will also be sampled on a monthly basis at the Sump 125, which is the main collection sump prior to recirculation for underground use. Sump water samples will be analyzed for the following parameters: conductivity, TDS, pH, temperature, oil and grease, major anions, radium 226, dissolved and total metals, nitrate and nitrite, volatile organic compounds (i.e., benzene, xylene, ethylene, and toluene).

Water quality results are compared to MMER and SSWQO guidelines and will be compliant prior to discharging to Meliadine Lake.

SECTION 5 • QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality Assurance (QA) refers to plans or programs that encompass a wide range of internal and external management and technical practices designed to ensure the collection of data of known quality that matches the intended use of the data. Quality Control (QC) is a specific aspect of QA that refers to the internal techniques used to measure and assess data quality. Specific QA and QC procedures that will be followed during sampling performed for the Groundwater Monitoring Program are described in Section 5.1 and 5.2.

5.1 Quality Assurance

Quality assurance protocols will be diligently followed so data are of known, acceptable, and defensible quality. There are three areas of internal and external management, which are described in the following three sections.

5.1.1 Field Staff Training and Operations

To make certain that field data collected are of known, acceptable, and defensible quality, field staff will be trained to be proficient in standardized field groundwater sampling procedures, data recording, and equipment operations applicable to the Groundwater Monitoring Program. All field work will be completed according to specified instructions and established technical procedures for standard sample collection, preservation, handling, storage, and shipping protocols.

5.1.2 Laboratory

To make sure that high quality data are generated, accredited laboratories that will be selected for sample analysis. Accreditation programs are utilised by the laboratories so that performance evaluation assessments are conducted routinely for laboratory procedures, methods, and internal quality control.

5.1.3 Office Operations

A data management system will be utilized so that an organized consistent system of data control, data analysis, and filing will be applied to the Groundwater Monitoring Program. Relevant elements will include, but are not limited to the following:

- all required samples are collected;
- chain-of-custody and analytical request forms are completed and correct;
- proper labelling and documentation procedures are followed, and samples will be delivered to the appropriate locations in a timely manner;
- laboratory data will be promptly reviewed once they are received to validate data quality;
- sample data entered into a Mine-specific groundwater quality database will be compared to final laboratory reports to confirm data accuracy; and

- appropriate logic checks will be completed to ensure the accuracy of the calculations.

5.2 Quality Control

The QC component will consist of applicable field and sample handling procedures, and the preparation and submission of two types of QC samples to the various laboratories involved in the program. The QC samples include blanks (e.g., travel, field, equipment) and duplicate/split samples.

Sample bottle preparation, field measurement and sampling handling QC procedures include the following:

- Sample bottles will be kept in a clean environment, capped at all times, and stored in clean shipping containers. Samplers will keep their hands clean, wear gloves, and refrain from eating or smoking while sampling.
- Where sampling equipment must be reused at multiple sampling locations, sampling equipment will be cleaned appropriately between locations.
- Temperature, pH, and specific conductivity will be measured in the field using hand held meters.
- Samples will be cooled to between 4 °C and 10˚C as soon as possible after collection. Care will be taken in when packaging samples for transport to the laboratory to maintain the appropriate temperature (between 4°C and 10˚C) and minimize the possibility of rupture. Where appropriate, samples will be treated with preservatives to minimize physical, chemical, biological processes that may alter the chemistry of the sample between sample collection and analysis.
- Samples will be shipped to the laboratory as soon as reasonably possible to minimize sample hold times. If for any reason, samples do not reach the laboratory within the maximum sample hold time for individual parameters, the results of the specific parameters will be qualified, or the samples will not be analysed for the specific parameters.
- Chain of custody sample submission forms will be completed by field sampling staff and will be submitted with the samples to the laboratory.
- Only staff with the appropriate training in the applicable sampling techniques will conduct water sampling.

Quality control procedures implemented will consist of the preparation and submission of QA/QC samples, such as field blanks, trip blanks, and duplicate water samples. These are defined as follows:

- Field Blank: A sample will be prepared in the field using laboratory-provided deionized water to fill a set of sample containers, which will then be submitted to the laboratory for the same analysis as the field water samples. Field blanks will be used to detect potential sample contamination during collection, shipping and analysis.

- Travel Blank: A sample will be prepared and preserved at the analytical laboratory prior to the sampling trip using laboratory-provided deionized water. The sample will remain unopened throughout the duration of the sampling trip. Travel blanks will be used to detect potential sample contamination during transport and storage.
- Duplicate Sample: Two samples will be collected from a sampling location using identical sampling procedures. They will be labelled, preserved individually and submitted for identical analyses. Duplicate samples will be used to assess variability in water quality at the sampling site. Duplicate will be collected and submitted for analyses at approximately, 10% of sampling locations. For smaller batches of samples (less than 10), at least one duplicate will be collected and submitted for analysis.

Additional QA/QC procedures that will be applied to the seepage survey component of the Groundwater Monitoring Program will include:

- Location – Universal Transverse Mercator (UTM) coordinates of seepage will be defined through the use of a hand-held Global Positioning System (GPS) unit.
- Sample Labels – appropriate sample nomenclature will be assigned to the sample labels that will define sample locations, sample type, year, and designation (numerical from 01 sequentially upwards) (e.g., SEEP-13-01 for seepage; 5034PIT-13-02 for pit sump).

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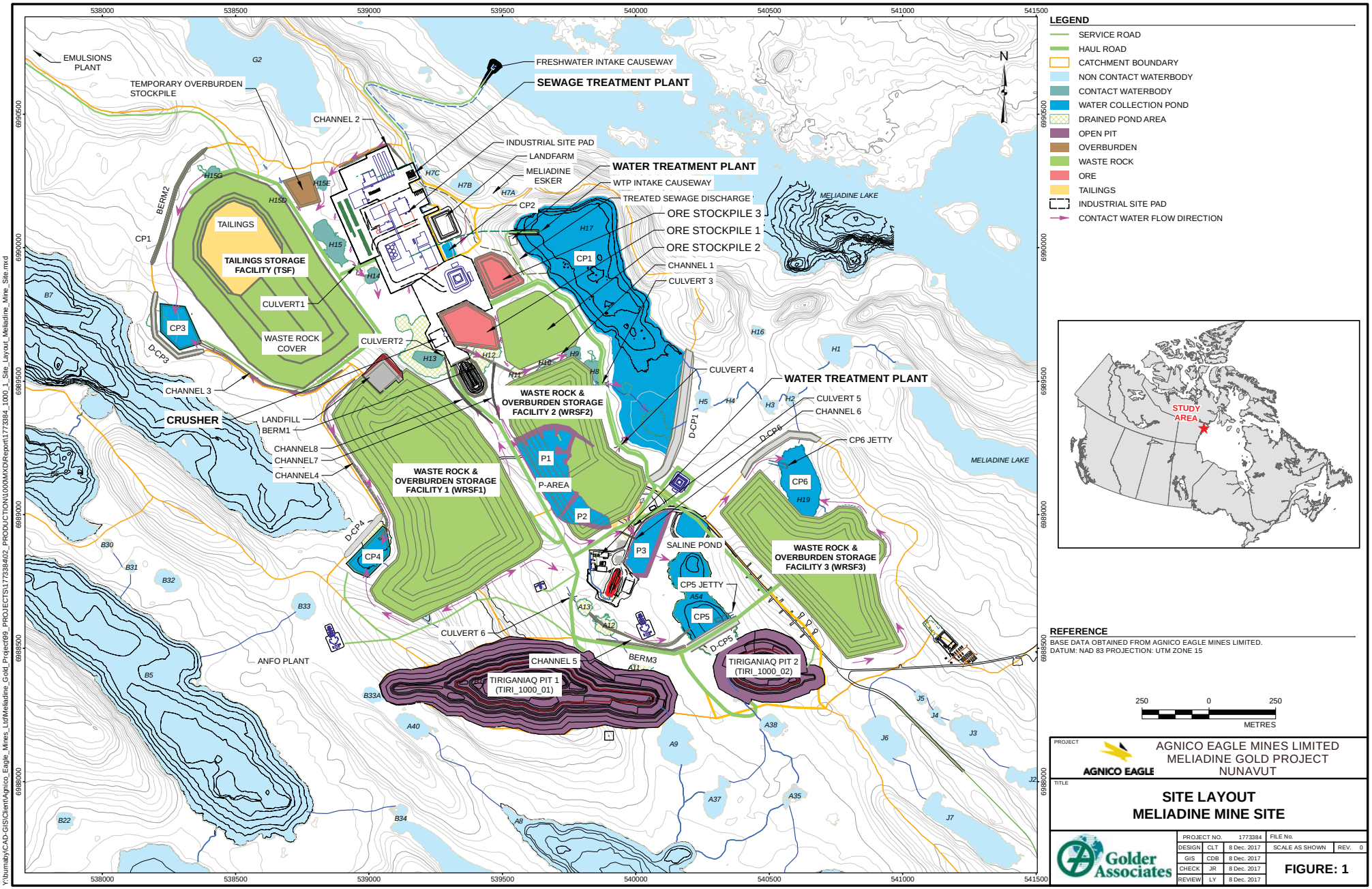
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APPENDIX A • FIGURES

Figure 1 General Mine Site Location Plan



LEGEND

- SERVICE ROAD
- HAUL ROAD
- CATCHMENT BOUNDARY
- NON CONTACT WATERBODY
- CONTACT WATERBODY
- WATER COLLECTION POND
- DRAINED POND AREA
- OPEN PIT
- OVERBURDEN
- WASTE ROCK
- ORE
- TAILINGS
- INDUSTRIAL SITE PAD
- CONTACT WATER FLOW DIRECTION

REFERENCE

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

250 0 250
METRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
SITE LAYOUT
MELIADINE MINE SITE

Golder Associates

PROJECT NO.	1773384		FILE No.	
DESIGN	CLT	8 Dec. 2017	SCALE AS SHOWN	REV. 0
GIS	CDB	8 Dec. 2017		
CHECK	JR	8 Dec. 2017		
REVIEW	LY	8 Dec. 2017		

FIGURE: 1

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\1773384\02_PRODUCTION\10000MXD\Report\1773384_1000_1_Site_Layout_Meliadine_Mine_Site.mxd

APPENDIX B • FRESHET ACTION PLAN AND SNOW MANAGEMENT PLAN

AGNICO EAGLE

MELIADINE GOLD PROJECT

FRESHET ACTION PLAN

MARCH 2018
VERSION 3

DOCUMENT CONTROL

Revision				Pages Revised	Remarks
#	Prepared by	Revised	Date		
01	AGNICO EAGLE	Internally	March 2016	All	
02	AGNICO EAGLE	Internally	March 2017	All	
03	AGNICO EAGLE	Internally	March 2018	All	

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1 INTRODUCTION

The purpose of this Freshet Action Plan (Plan) is to provide Agnico Eagle with specific management and mitigation measures to address and manage water associated with the freshet season (Freshet), a response plan and procedures to prevent and to minimize potential negative impacts to the surrounding environment at the Meliadine Site (Site).

The term freshet refers to spring thaw, which can result in inundation of floodplains. Freshet at Meliadine typically takes place between May 15 and July 30. In some years, Freshet can also happen in early fall, when freezing re-occurs (mid-October) and then thaws. There are areas at the Site that are vulnerable to excess water produced during Freshet; the objective of this document is to identify those areas, and to develop a plan with defined roles and responsibilities to manage excess water produced on site.

The following guiding principles are applicable to the Plan:

- To ensure that mine contact water from runoff or seepage is managed to prevent adverse environmental impacts;
- To ensure the health and safety of Agnico Eagle employees and contractors; and
- To ensure the Site is in compliance with the Nunavut Water Board (NWB) Type A Water Licence No.: 2AM-MEL1631 (Type A Licence).

The Plan identifies areas of risk during Freshet, risk management and the procedures necessary to address potential concerns.

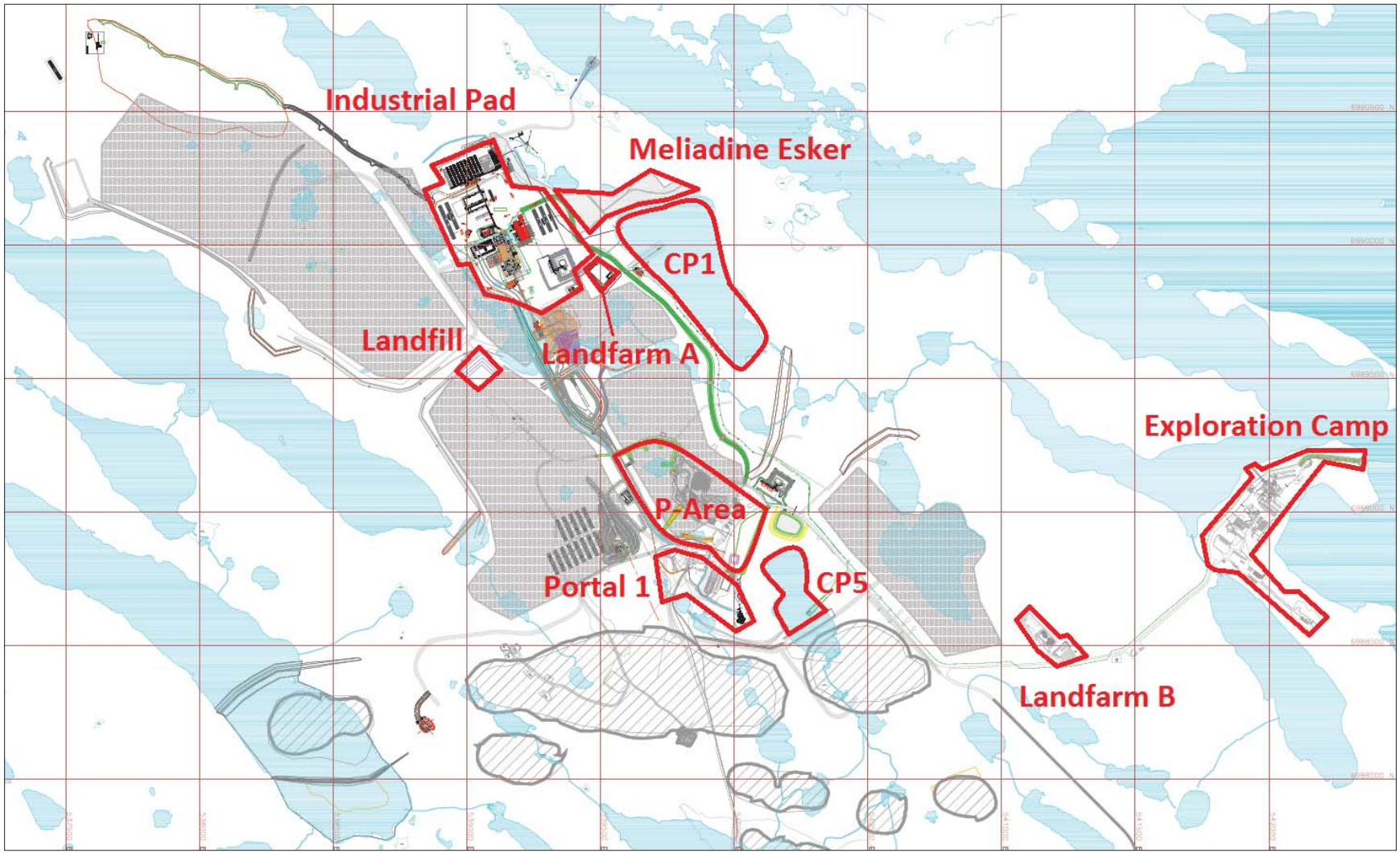
2 AREAS OF RISK DURING FRESHET

The key areas of risk during Freshet at the Site include the following:

- P-Area
- Sump 1 (Sump LV50)
- New (Type A) and old (Type B) Landfarms
- Landfill
- All Weather Access Road (AWAR) and Quarries along the road
- Infrastructure Areas; including the Exploration Camp area, Portal 1 and the Industrial Pad Areas
- Containment Pond 1 (CP1), Containment Pond 5 (CP5)
- Meliadine Esker Quarry
- Itivia laydown and fuel handling facility (Itivia)

Identified areas of risk at Site are shown in Figure 1, and are described in the following section.

Figure 1: Site Plan View with Areas of Risk at Site during Freshet



2.1 P-AREA

The P-Area is the initial containment area identified for precipitation events; snow melt or Freshet water that has come in contact with mine waste rock or surface works in the area of the Underground Portals (contact water).

The P-Area includes three containment areas (Figure 2); P1 Containment Area (P1), P2 Containment Area (P2), and P3 Containment Area (P3) and has a cumulative capacity of 46,041 m^3. Periodic pumping to P1, from P2 and P3, is planned to manage water levels and to assist with active evaporation at P1.

2.1.2 P1

P1 is the largest containment of the three ponds that make up the P-Area (20,781 m^3). Snow removed from the selected areas at the Site throughout winter months, will be directed to P1. Precipitation, water drainage from the adjacent waste rock pile, and any water pumped from P2 or P3 will also be contained within P1. Surface water that flows to Portal 2 is pumped to P1. Three evaporators are installed at P1 to assist with active evaporation of water contained at P1 during the open water season at Site.

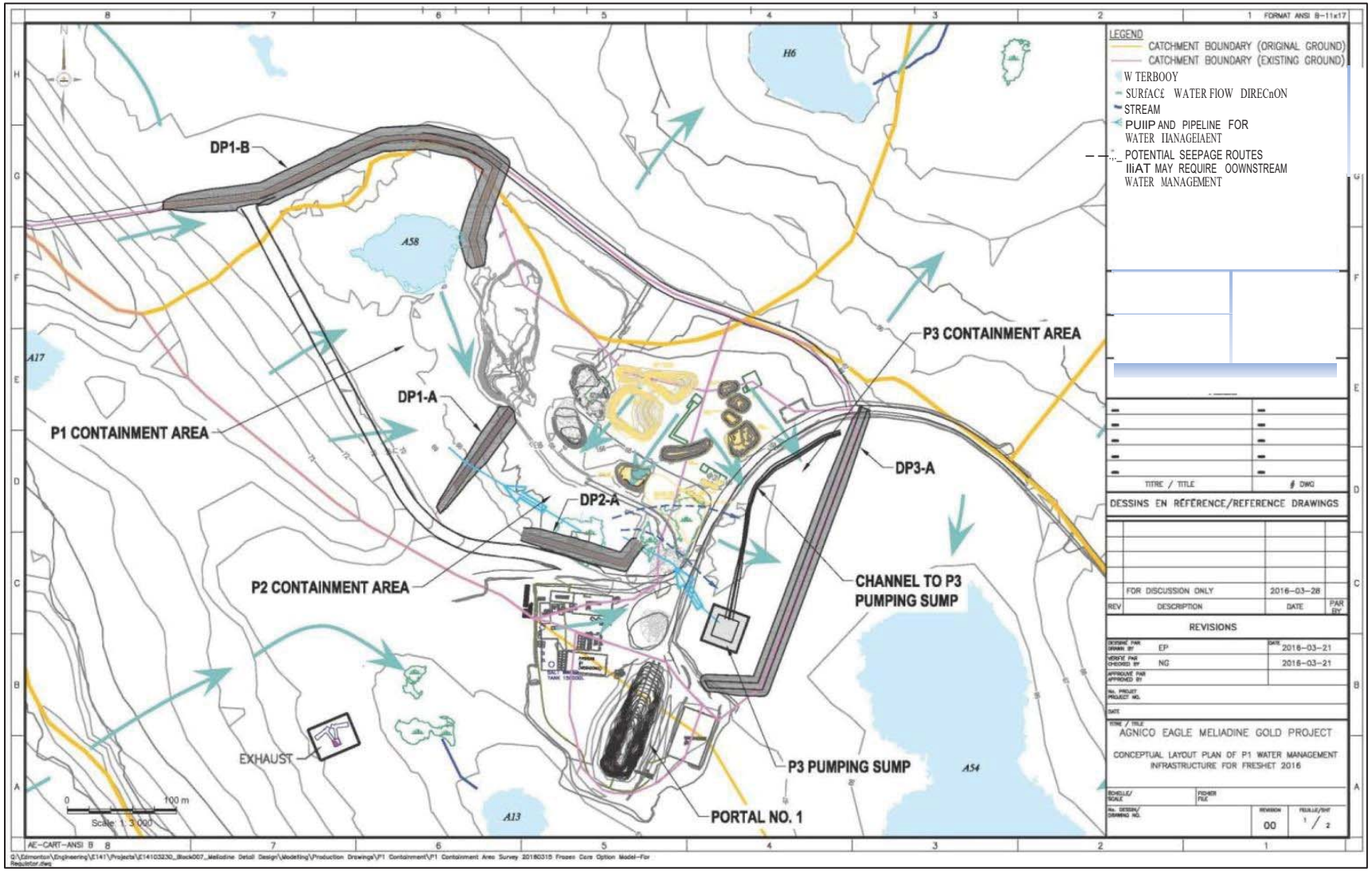
2.1.3 P2

P2 is directly adjacent and down-gradient to P1. P2 allows for additional contact water, precipitation and waste rock drainage water management with a capacity of 6,828 m^3. Additionally, P2 is the main containment area for water pumped to surface from underground Sump 1 (LV50). LV50 is the receptor of surface water that flows from the surface to Portal 1. Water from P2 is pumped to P1 to be actively evaporated.

2.1.3 P3

P3 is down-gradient to P1 and P2. P3 contains surface runoff from the surrounding portal entrance surface area, precipitation, and inflow water from waste rock and ore piles to the north-northwest of P3. Water from P3 is pumped to P1 to be actively evaporated.

Figure 2: P-Area Plan View



2.3 SUMP 1 (LV50 SUMP)

LV50 is located 50 meters below grade (mbg) and is the first sump, closest to the entrance of Portal 1. Snow melt and surface run-off that flows to the portal entrance (the lowest elevation at the Site), down the underground haulage ramp to sump LV50, is pumped from LV50 to the P-Area. The overall capacity for LV50 is 29 m^3. Water pumped from LV50 to P2 is measured with a volumetric flow meter and recorded daily.

2.4 LANDFARM

The Type A Licence Landfarm will be located adjacent and east of the Industrial Site Pad and is designed to receive soils, rock, snow, and ice contaminated with petroleum hydrocarbons. This will include light hydrocarbons such as diesel and gasoline (Agnico Eagle 2016). It was assumed that an annual volume of 500 m^3 of contaminated ice and snow would require management and the landfarm has been designed to account for this volume.

The Landfarm has geotextile liners and are filled with soil. Water that pools, collects or flows from the Landfarm needs to be collected for monitoring (as per the Licence requirements) and treated before it is discharged to CP1, nearby.

2.5 ALL WEATHER ACCESS ROAD (AWAR)

The All-Weather Access Road (AWAR) was built in 2013 to connect the Site to the hamlet of Rankin Inlet. The road is approximately 23.8 km long with twenty-two water crossings; three bridge crossings and nineteen culverts installed (Figure 3).

2.6 INFRASTRUCTURE AREAS

Infrastructure Areas represent buildings, pads and towers installed at the Site and include the Industrial Pad, Exploration Camp, ANFO Plant and Emmulsion Plant (Figure 1).

2.7 CP1 AND CP5

Engineered water containment dikes constructed in 2017 at lakes A54 and H17 were developed as CP5 and CP1, respectively. The dikes are designed to contain contact water within the footprint of the Site and prevent pollution provisions of the *Fisheries Act*. Both CP1 and CP5 will be used for Site contact water and snow and ice collection prior to Freshet. CP1 and CP5 are illustrated in Figure 1 and discussed in Section 4 of this report.

2.8 ITIVIA

Itivia is located in Rankin Inlet and is accessed by Site from the AWAR. Itivia is intended to support the Site with a bypass road to divert site-related traffic around the community of Rankin Inlet, for fuel storage and containment facility, and as a laydown area for barge shipments. The location of Itivia is shown on Figure 3 and the plan view of the Itivia Site is presented as Figure 4. A culvert is installed to allow runoff at the Itivia laydown area.

Figure 3: AWAR Map Showing Water Crossing Location

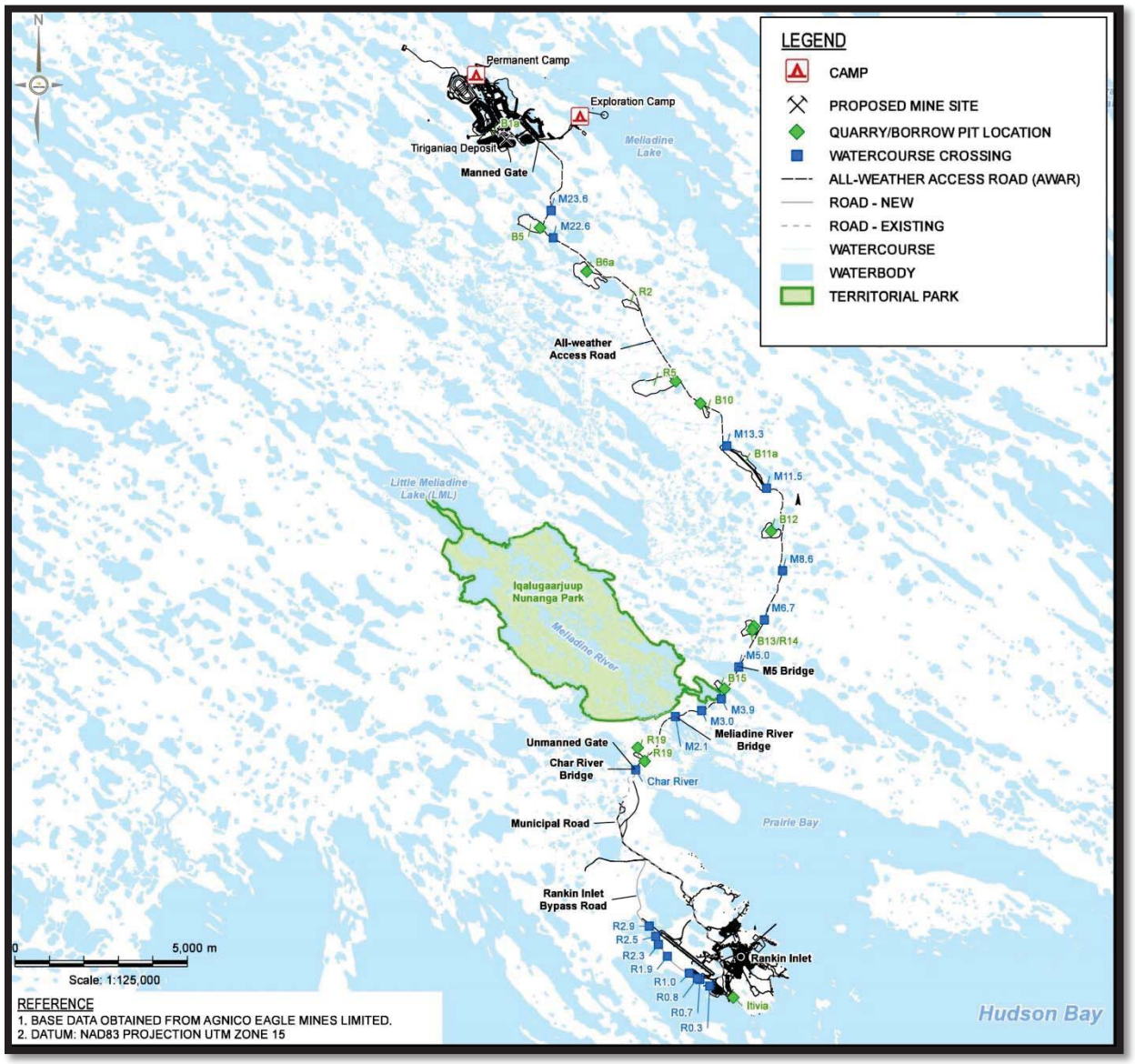
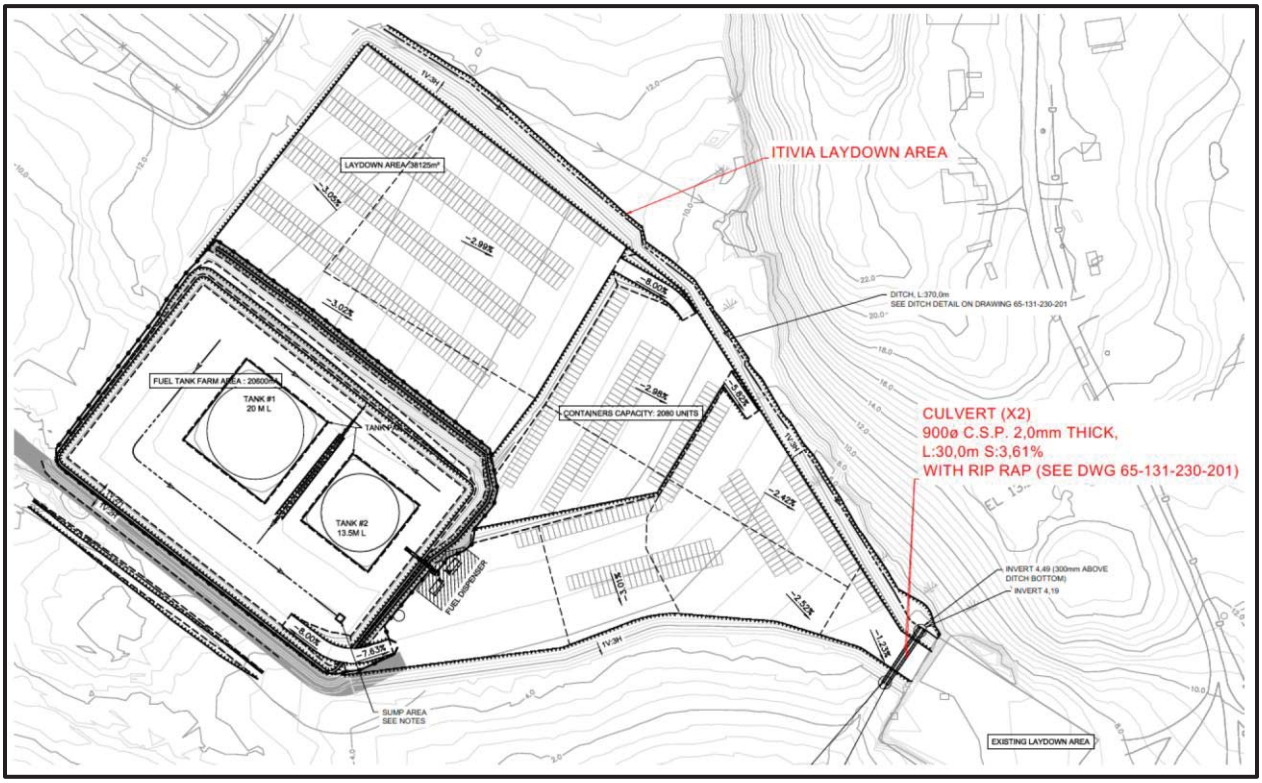


Figure 4: Itivia Laydown Area and Culvert Location



3 FRESHET RISK MANAGEMENT

Managing the risks prior to Freshet is a primary objective at Site. Planning and preparing before Freshet alleviates some of the risk from excess water that may suddenly occur, and ensures compliance with applicable regulations. This is managed by removing water (pumping) at containment pond areas prior to winter freeze (fall) to allow for increased capacity from precipitation, snow and ice removal on roads, road water crossings, culverts, ditches, and select containment ponds after winter freeze and before Freshet (winter and spring).

Water treatment options (equipment and technology) are currently being planned by Agnico Eagle. A saltwater treatment system is estimated to be operational on the Site before the end of 2018. Water contained at the P-Area, CP1, CP5, the Saline Pond, the underground sumps and water stope will be contained and then treated to meet the Mining Metal Effluent Regulations (MMER) and/or Type A Licence requirements prior to effluent discharge to the environment.

Risk management for the Site areas during Freshet are described below and Appendix A presents the Freshet Action Plan Procedure for preparation prior to, during and after Freshet. Section 4 describes snow management at Site and Appendix B presents the Snow Management procedure.

3.1 P-Area Risk Management

The following management practices are maintained at the P-Area during Freshet and are described in more detail in Appendix A:

- Water levels will be monitored. The water level will not exceed the maximum design elevation in any of the three containment ponds (P1, P2 or P3).
- Environment will conduct visual inspections of the P-Area. This will include visually monitoring the base of the downstream side of dikes DP1-B and DP3-A (see Figure 2) for seepage, sedimentation deposition, and erosion. If seepage or water with increased total suspended solids (TSS) is noted during inspections, water will be sampled, contained, and pumped back to the P-Area.
- Engineering will undertake structural inspections of the dikes and note observed seepage.
- Active evaporation from use of the evaporators will contribute to managing the quantity of water contained at P-Area.

If an emergency occurs, such as the dikes indicating compromised integrity, Agnico Eagle will discharge the water to CP5. The definition and associated design criteria for managing the integrity of the dikes is defined by Golder and Associates during an annual geotechnical inspection.

If CP5 does not have the capacity for water from the P-Area, water will be diverted to the Saline Pond or to the Underground Water Stope for storage until a system for suitable water treatment to meet the Type A Licence and/or MMER discharge criteria.

3.2 LV50 Risk Management

If the P-Area becomes filled to capacity and LV50 sump needs to be pumped, the water from LV50 will flow down gradient to the Underground Water Stope.

3.3 Landfarm Risk Management

During Freshet, if there is any excess water collected at the Landfarm, the Environmental Department will request that the Energy & Infrastructure (E&I) Department pump the excess water. Water samples will be collected in accordance with the Type A Water Licence to ensure compliance prior to its release to the environment. Based on the Landfarm Management Plan and the Type A Water Licence requirements; notice will be provided to the Inspector 10 days prior to this pumping activity. Once sample results have been obtained, the Environmental Department will advise the E&I Department if pumping can begin. If sample results permit, the pumping may begin; to direct water to CP1 or the tundra / ground (water will be discharged in a manner that will eliminate soil erosion or transport of TSS).

In the event that the water sample results do not meet discharge criteria, the water will be stored until suitable treatment system can be put in place to remove contaminants. Suitable treatment methods potentially used are as follows:

- Oil/water Separator
- CI Agent E-VAC Waste Water Filter System
- Carbon Filter System

If a suitable treatment system cannot be obtained the water will be pumped to bladders or totes and will be shipped south for disposal in a certified disposal facility.

3.4 AWAR Risk Management

The following management practices are maintained to ensure the integrity of the AWAR before and during the Freshet and are described in further detail in Appendix A:

- Snow and ice will be removed from ditches and culverts (water crossings). Proper technique will be used to ensure that no ground disturbance occurs during snow and ice removal.
- Large culverts will be heated / steamed to allow the free flow of Freshet.
- Prior to Freshet, water crossings will have snow removed from ice surface on the up and downstream side of the crossing to allow free flow of water.
- Daily visual inspections will be undertaken as to the structural integrity of the abutments and road integrity by the E&I Supervisor.
- Weekly throughout freshet and daily during peak flows a written inspection will be completed by the Environment Department in conjunction with the E&I Department.
- As per the Type A Water Licence, monthly water samples are collected at the following locations (Figure 3) and possibly during Freshet:
    - Mel-River (M2.1)
    - M3.0
    - M5.0
    - M11.5
    - M23.6
    - Any significant water seeps or ponding on the road will be sampled

If soil erosion or ground surface scouring are observed, the E&I Department will be notified for repairs. Turbidity barriers, silt fences, straw logs or other sediment control methods will be implemented as required.

3.5 Infrastructure Areas

Risk management practices for the main Infrastructure Areas at the Site during Freshet are described in the following sections.

3.5.2 Camp Pads and Surroundings

Risk management practices are maintained at the Exploration Camp, Main Camp and surrounding camp areas by monitoring observed water pooling. If water pooling is observed, a water sample will be collected and monitored for turbidity. Turbidity will also be monitored at the culvert beside the garage that flows straight to Meliadine Lake. This area will be monitored for TSS and preventative measures (install straw wattles and/or booms) will be installed to prevent deleterious substances from entering Meliadine Lake.

3.5.3 Industrial Pad and Access Road

The following management practices are maintained to ensure the integrity of the industrial pad and access road:

- The culvert between Lake H12 and H13 will be heated/steamed prior to freshet and will be monitored closely for turbidity.
- This area will be monitored for turbidly and preventative measures (install straw wattles and/or booms) will be implemented to prevent deleterious substances from entering Meliadine Lake.

3.6 CP1, CP5 AND QUARRIES

Risk management practices for CP1, CP5, the Meliadine Esker and Quarries include discharging/pumping the water prior to winter freeze to be treated and/or discharged as per the Type A Water Licence and Water Management Plan for the Site. If water is observed to be flowing or ponding, it will be sampled to ensure deleterious substances and TSS is not released to surrounding water bodies (Part I, Item 11 of the Type A Water Licence).

3.7 ITIVIA

The following management practices are maintained to ensure the integrity of Itivia and the Itivia access road:

- The culvert installed between the Itivia laydown and the existing laydown areas (Figure 4) will be cleared of snow and ice prior to freshet and will be monitored closely for turbidity.
- Rip rap installed around the culvert to control erosion.
- The upstream and downstream of the culvert area will be monitored for turbidly and preventative measures (install straw wattles and/or booms) will be implemented to prevent deleterious substances from entering Hudson's Bay.

4 SNOW MANAGEMENT

Proper snow management during the winter contributes to risk mitigation from excess water during Freshet and prevents possible environmental impacts. *The Snow Management Procedure* (Procedure Number MEL-ENV-0017) (Appendix B) presents the plan to efficiently manage snow at the Site.

Snow that is collected and moved from the fuel farm, landfarm, ANFO plant, the area surrounding the portal entrance, waste rock pile and surrounding P-Area will be moved and collected at P1. Snow and ice from the other areas at the Site are removed from roadways with a snow blower or plow and /or collected and transported to the CP1 or CP5. Figure 5 illustrates the locations for snow collection during the winter and prior to Freshet. Figure 6 illustrates the snow management and storage areas for Itivia.

Figure 5: Snow Management Plan

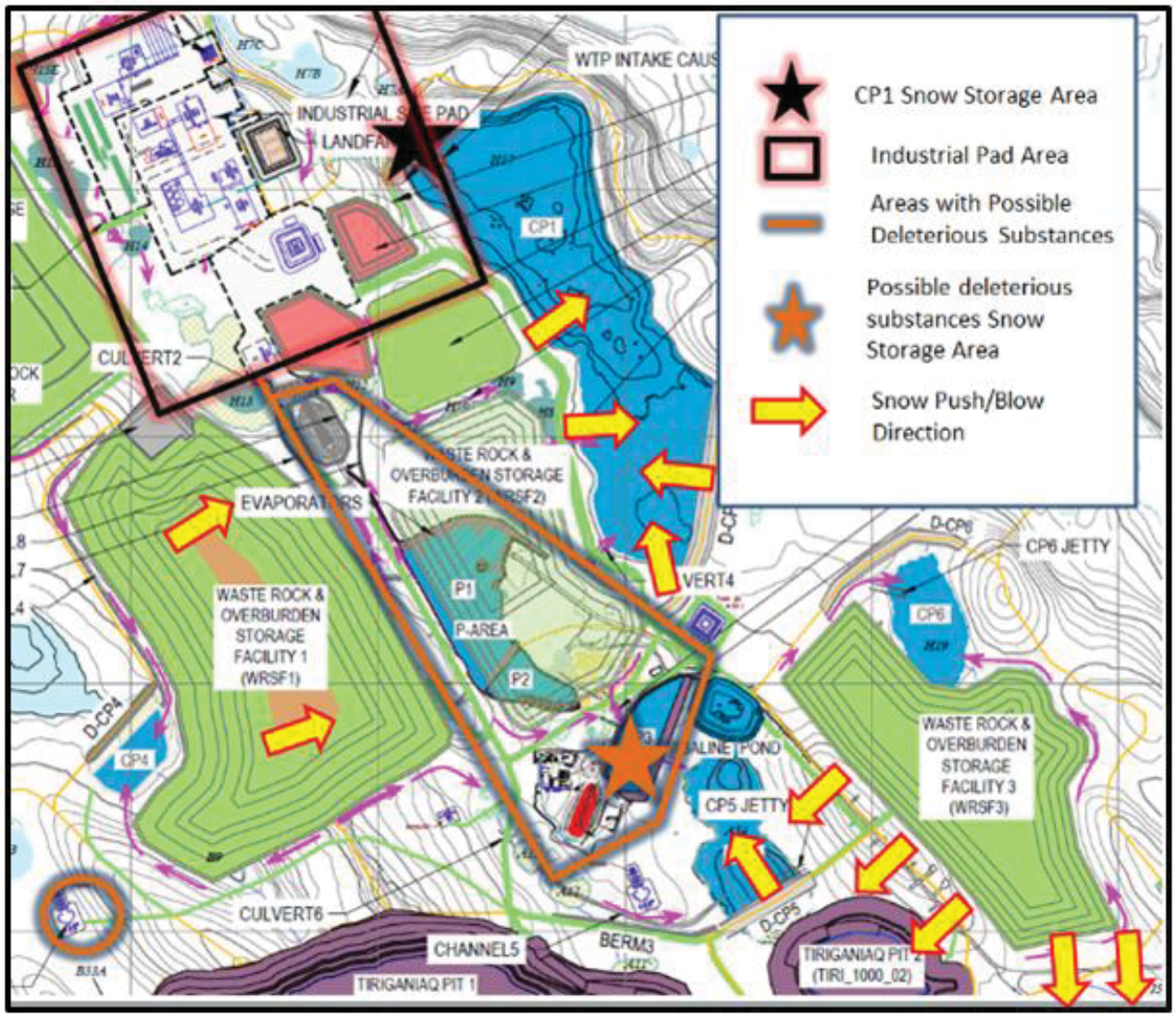
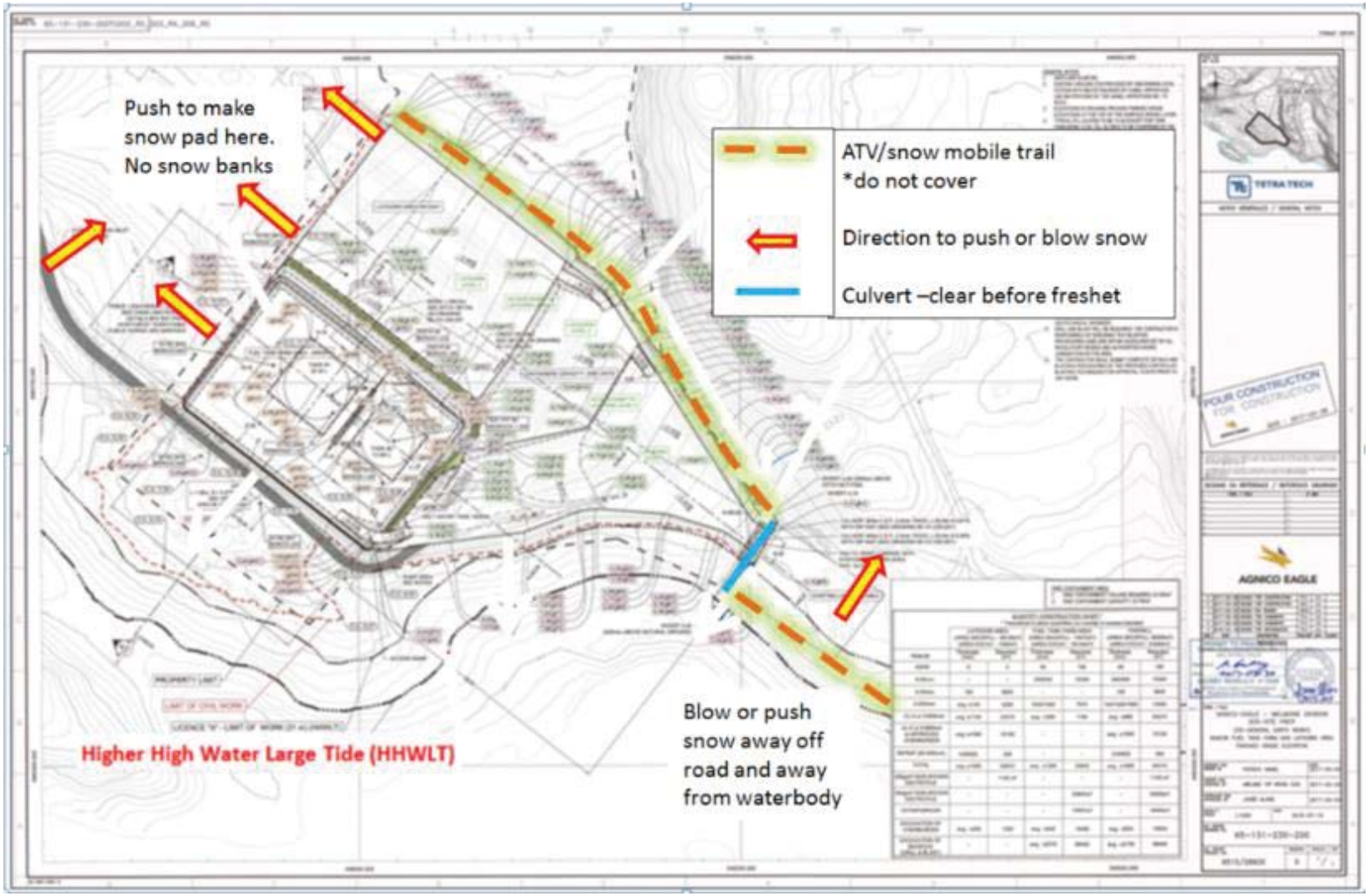


Figure 6: Itivia Snow Management Areas



5 REFERENCES

Agnico Eagle. 2015. Meliadine Gold Project: Landfarm Management Plan. Version 1. April 2015. 6513-MPS-15.

Agnico Eagle. 2016. Meliadine Gold Project: Water Management Plan. Version 2. March 2017.

Nunavut Water Board (NWB). 2015. Type A Water Licence No: 2AM-MEL1631.

APPENDIX A: FRESHET ACTION PLAN PROCEDURE

Freshet Management Procedure

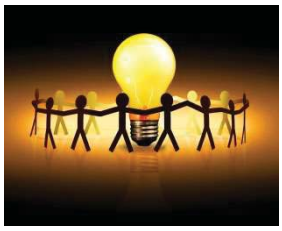
		PROCEDURE NUMBER:	**MEL-ENV-024**
People concerned	All Departments	**Prepared by**	Jennifer Brown, Water Engineer
		Reviewed by	Jeff Pratt, Sr. Environmental Coordinator Guillaume Gemme, Energy & Infrastructure General Foreman Jack Dutil, Construction Manager
Effective Date: **Revision Date:**	January 26, 2017	*"Safety First, Safety Last … Safety Always!"* *"No Repeats" – Our Stepping Stone to ZERO HARM*	
This procedure corresponds to the required minimum safety and environmental standards. All employees must comply with the rules and regulations of the Nunavut Government in terms of health, safety, and environment at work.			

Objective:

To provide a plan to prevent potential environmental incidents at the Meliadine Site (Site) caused by the freshet season (Freshet) by recognizing specific areas for risk at the Site, possible actions to be undertaken and the departmental responsibilities to address the required actions.

Concerned Departments:

Environment, Energy & Infrastructure, Construction, Engineering and Departmental Supervisors



Note: It is the responsibility of all Meliadine Site employees to report any observed environmental concerns or incidents to their supervisor and/or the Environmental Department to ensure that any required mitigation or corrective procedures will be implemented in a timely manner.

Risks/ Impacts Legend

Health & Safety | Process/quality | Costs | Environment

Freshet Management Procedure

Procedure					
Winter and Spring – Preparation Prior to Freshet[1]					***Risks/ Impacts***
Area for Risk		**Action**	**Responsible Department**	**Approximate Dates**	
P-Area	P1, P2 & P3	• Snow must not be stockpiled to be greater than the containment capacity	Environment to coordinate with Energy & Infrastructure, Engineering and Construction	March - May	
AWAR	Culverts	• Weekly Inspections	Environment	March - May	
	Major Crossings	• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Repairs (mark culvert locations, add armouring at downstream around culverts and bridges, replace pipe as needed, and document maintenance and repairs • Monitor signs of erosion (especially downstream at culverts 14.9 and 16 Km) • Notify the Environmental Department about any areas for concern[2, 3]	Energy & Infrastructure	Winter Freeze to May (start of thaw)	
	Overall Road				
Industrial Pad	Culverts	• Weekly Inspections	Environment		
	Channels and ditches	• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Repairs • Notify the Environmental Department about any areas for concern[2, 3]	Construction		
	Access Road				
Quarries		• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Re-grade disturbed areas to provide appropriate drainage	Construction Environment (for Sampling)	Winter Freeze to May (start of thaw)	

Note:

[1] See the *Snow Management Procedure* (Procedure No.: MEL-ENV-0017) for additional information for snow removal at the Site.

[2] The Environmental Department will assess the area of concern and action will be undertaken to comply with the Nunavut Water Board (NWB) Water Licence No.: 2AM-MEL1631 (Licence)(i.e. collect field parameters or water samples for analysis of total suspended solids, turbidity, or any deleterious substance).

[3] Areas of concern are defined as high water areas on roads, near the up gradient opening of a culvert, flowing water with sediment, spills, wildlife, etc.

Freshet Management Procedure

Spring and Summer – During Freshet or During Heavy Rainfall				*Risks/ Impacts*
Area for Risk	**Action**	**Responsible Department**	**Approximate Dates**	
P-Area				
P1, P2, and P3	• Daily visual inspection • Daily monitor and record water levels • Weekly written inspection • Water sampling	Environment	May - October	
	• If water levels or structural integrity of berms are observed to be compromised, immediate action is required. Notify Supervisor	Engineering		
	• P2 and P3 water volume should be kept as minimal as possible. Pumping of this water should occur regularly (daily) • Measure and record pumping volumes daily and report to Environment weekly	Energy & Infrastructure		
Evaporators	• Commission after sub-zero temperatures no longer occur • Operate as efficient as possible	Energy & Infrastructure		
DP1 and DP3 Trenches /Seep	• Install pump and flow meter at trench to collect seep • Pump water to respective containment area (P1 or P3) • Measure and record pumping volumes daily and report to Environment weekly	Energy & Infrastructure		
All Weather Access Road (AWAR)				
AWAR Culverts	• Inspections for free flow water through culverts and major crossings, pooling water on road, and integrity of road and abutments (2x per Week or after heavy rainfall between May and October and daily during peak flow)	Environment	May - October	
AWAR Major Crossings	• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Repairs and erosion/sediment control implementation • Notify the Environmental Department about any areas for concern [2, 3]	Energy & Infrastructure Environment (for Sampling)		
AWAR (Overall)				
Quarries	• Repairs and erosion/sediment control implementation • Re-grade disturbed areas to provide appropriate drainange • Notify the Environmental Department about any areas for concern [2, 3]	Construction Environment (for Sampling)		

Spring and Summer – During Freshet or During Heavy Rainfall			
New Camp Pad/Industrial Pad			
Culverts	• Daily inspections for free flow water through culverts and major crossings, pooling water on road, and integrity of road and abutments	Construction Environment (for Sampling)	May - October
Channels and Ditches Access Road	• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Repairs and erosion/sediment control implementation • Notify the Environmental Department about any areas for concern [2, 3]	Construction Environment (for Sampling)	May - October
Infrastructure Pads			
Exploration Camp	• Daily visual inspections • Water sampling as required	Environment	May - June
Landfarm Structure	• Daily inspection of the landfarm retaining wall • Daily visual inspection for seepage • Collect a seepage water sample for hydrocarbon analysis. If seepage is present it should be immediately sampled and the seep be controlled. Whether by creating a sump and pumping back the water or by other methods.	Environment	
Landfarm	• Visually monitor excess water in containment area • Monitor seep (weekly) and collect water sample • Sample water according to the Licence	Environment	Mid-June and September
	• Provide notice of pumping (include estimated volume) to be pumped to NWB		10 days prior to pumping
	• Once approval has been received, and if water meets the Licence criteria, water can be pumped to tundra at a low flow to avoid erosion • Measure and record pumped volume	Energy & Infrastructure	Mid-June and September
Garage (Agnico Eagle)	• Install sump to contain excess water • Install straw wattles for sediment control on the other side of the road	Energy & Infrastructure	May
	• Daily monitoring of TSS and turbidity and possible contaminant runoff	Environment	May - June
Core Box Cemetery and Culvert	• Install straw wattles for sediment control on the other side of the road	Energy & Infrastructure	May
	• Daily monitoring of TSS and turbidity and possible contaminant runoff	Environment	May - June
ANFO Pad	• Weekly Inspections • Water sampling as required for ammonia, nitrates, turbidity and TSS	Environment	May - June
	• Daily visual inspection for pooling water and water run off form ANFO pad, if noticed immediately contact environment department	Dyno Nobel	

Note:

[1] See the *Snow Management Procedure* (Procedure No.: MEL-ENV-0017) for additional information for snow removal at the Site.

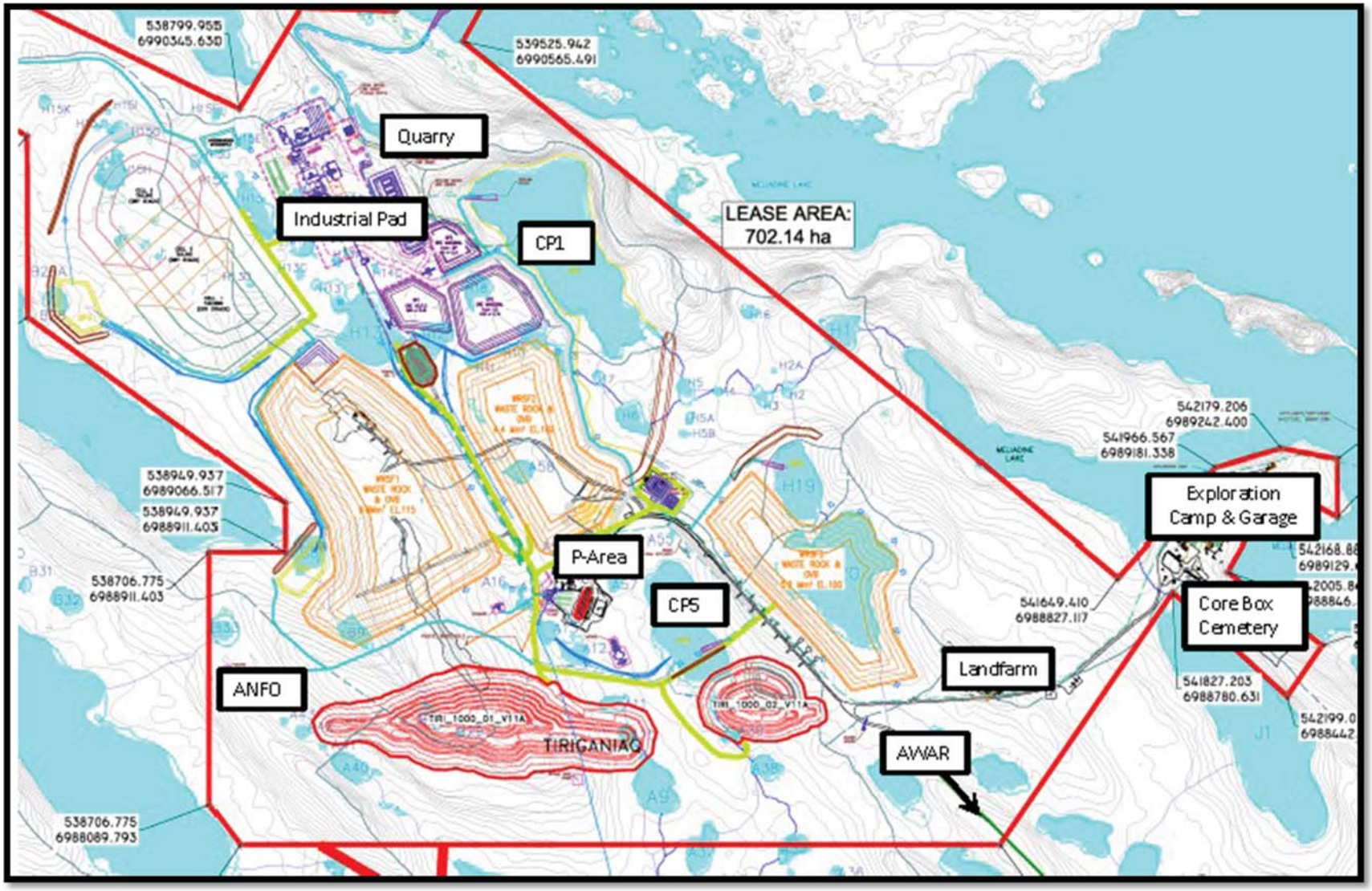
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[3] Areas of concern are defined as high water areas on roads, near the up gradient opening of a culvert, flowing water with sediment, spills, wildlife, etc.

Freshet Management Procedure

Fall – Preparation Prior to Winter Freeze					Risks/ Impacts
Area for Risk		**Action**	**Responsible Department**	**Approximate Dates**	
LV50		• Survey water level and calculate water volume and provide to Environment, and/or • Measure and record flow meter volume prior to pumping and after pumping and provide to Environment • Remove pumps and prepare equipment for maintenance and winter storage	Mining	Prior to pumping to P2 (Late September)	
		• Pump to P2		Late September/Early October	
Lv75/Water Stope		• Pump to Saline Pond		June - September	
P-Area	P2 and P3	• Pump water to P1 for active evaporation	Energy & Infrastructure	June - September	
	P1, P2 & P3	• Remove pumps and prepare equipment for maintenance and winter storage		At beginning of winter freeze	
	Evaporators	• Decommission for winter and prepare equipment for maintenance and winter storage		Prior to any sub-zero temperatures	
A8		• Move pump house/pump closer to Site		Late September	
CP1		• Written inspection • Water sampling • Discharge approval	Environment	June - September	
		• Pump water to discharge at Meliadine Lake	Process Plant		
		• Remove pumps and prepare equipment for maintenance and winter storage		Late September/Early October	
Downstream D-CP1		• Pump water to CP1	Energy & Infrastructure	June - September	
		• Remove pumps and prepare equipment for maintenance and winter storage		Late September/Early October	
CP5		• Pump water to CP1/Saline Water Treatment Plant		Late September	
Downstream D-CP		• Pump water to CP5		June - September	
		• Remove pumps and prepare equipment for maintenance and winter storage		Late September/Early October	
Saline Pond		• Remove pumps and prepare equipment for maintenance and winter storage		First week of October	

Figure 1: Areas for Risk



APPENDIX B: SNOW MANAGEMENT PROCEDURE

Freshet Management Procedure

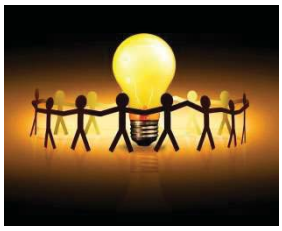
		PROCEDURE NUMBER:	**MEL-ENV-024**
People concerned	All Departments	**Prepared by**	Jennifer Brown, Water Engineer
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Effective Date: **Revision Date:**	January 26, 2017	*"Safety First, Safety Last … Safety Always!"* *"No Repeats" – Our Stepping Stone to ZERO HARM*	
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Risks/ Impacts Legend

Health & Safety | Process/quality | Costs | Environment

Freshet Management Procedure

Procedure					
Winter and Spring – Preparation Prior to Freshet[1]					***Risks/ Impacts***
Area for Risk		**Action**	**Responsible Department**	**Approximate Dates**	
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	Overall Road				
Industrial Pad	Culverts	• Weekly Inspections	Environment		
	Channels and ditches	• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Repairs • Notify the Environmental Department about any areas for concern[2, 3]	Construction		
	Access Road				
Quarries		• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Re-grade disturbed areas to provide appropriate drainage	Construction Environment (for Sampling)	Winter Freeze to May (start of thaw)	

Note:

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	• P2 and P3 water volume should be kept as minimal as possible. Pumping of this water should occur regularly (daily) • Measure and record pumping volumes daily and report to Environment weekly	Energy & Infrastructure		
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AWAR Major Crossings	• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Repairs and erosion/sediment control implementation • Notify the Environmental Department about any areas for concern [2, 3]	Energy & Infrastructure Environment (for Sampling)		
AWAR (Overall)				
Quarries	• Repairs and erosion/sediment control implementation • Re-grade disturbed areas to provide appropriate drainange • Notify the Environmental Department about any areas for concern [2, 3]	Construction Environment (for Sampling)		

Spring and Summer – During Freshet or During Heavy Rainfall			
New Camp Pad/Industrial Pad			
Culverts	• Daily inspections for free flow water through culverts and major crossings, pooling water on road, and integrity of road and abutments	Construction Environment (for Sampling)	May - October
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	• Daily visual inspection for pooling water and water run off form ANFO pad, if noticed immediately contact environment department	Dyno Nobel	

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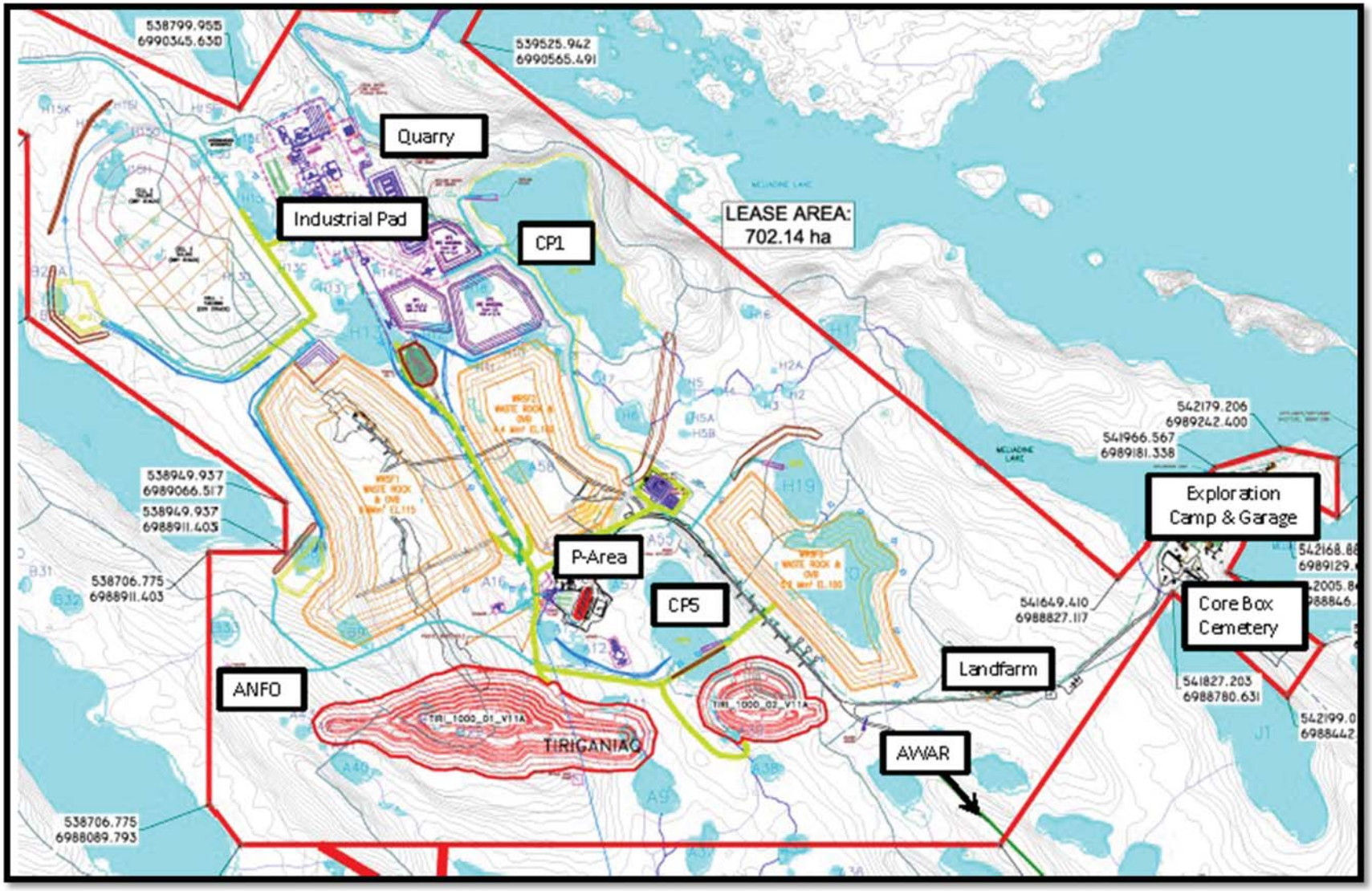
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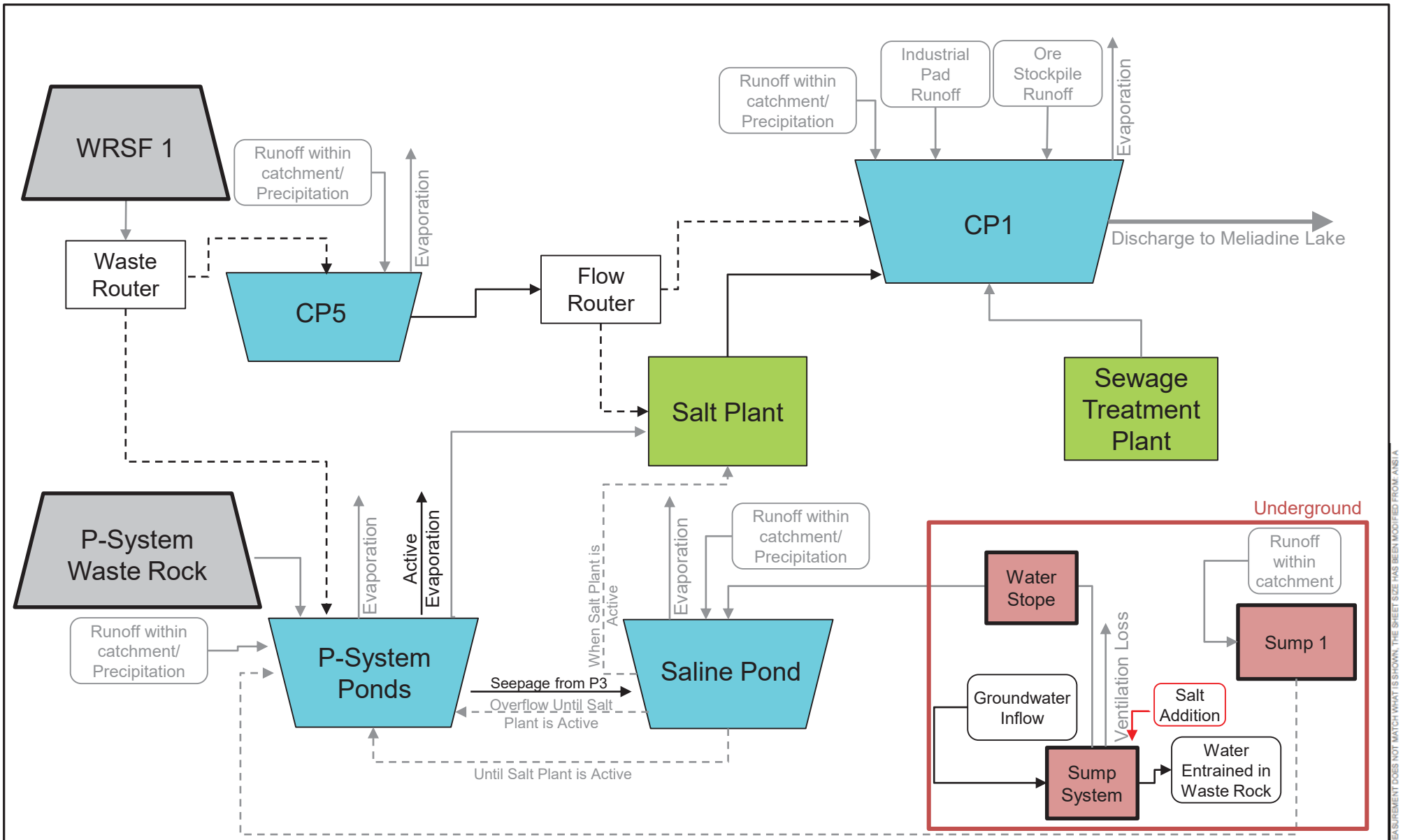
Freshet Management Procedure

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		• Pump to P2		Late September/Early October	
Lv75/Water Stope		• Pump to Saline Pond		June - September	
P-Area	P2 and P3	• Pump water to P1 for active evaporation	Energy & Infrastructure	June - September	
	P1, P2 & P3	• Remove pumps and prepare equipment for maintenance and winter storage		At beginning of winter freeze	
	Evaporators	• Decommission for winter and prepare equipment for maintenance and winter storage		Prior to any sub-zero temperatures	
A8		• Move pump house/pump closer to Site		Late September	
CP1		• Written inspection • Water sampling • Discharge approval	Environment	June - September	
		• Pump water to discharge at Meliadine Lake	Process Plant		
		• Remove pumps and prepare equipment for maintenance and winter storage		Late September/Early October	
Downstream D-CP1		• Pump water to CP1	Energy & Infrastructure	June - September	
		• Remove pumps and prepare equipment for maintenance and winter storage		Late September/Early October	
CP5		• Pump water to CP1/Saline Water Treatment Plant		Late September	
Downstream D-CP		• Pump water to CP5		June - September	
		• Remove pumps and prepare equipment for maintenance and winter storage		Late September/Early October	
Saline Pond		• Remove pumps and prepare equipment for maintenance and winter storage		First week of October	

Figure 1: Areas for Risk



APPENDIX C • WATER MANAGEMENT SCHEMATIC FLOW SHEET



Notes:
P-System Ponds have been grouped for illustrative purposes. Active evaporation from P1 Pond only.

Components shown in black can be controlled via the dashboard. Grey Components are fixed flows.

Dashed lines represent flow/mass routing that changes with time or by scenario.

CLIENT
AGNICO EAGLE MINES LIMITED

PROJECT
MELIADINE GOLD PROJECT
CONSTRUCTION PHASE WATER QUALITY MODEL

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-03-17
PREPARED	MIB
DESIGN	MIB
REVIEW	VJB
APPROVED	VJB

TITLE
WATER BALANCE SCHEMATIC

PROJECT No.	Doc.	Rev.	FIGURE
1668371	**611**	**0**	**1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0