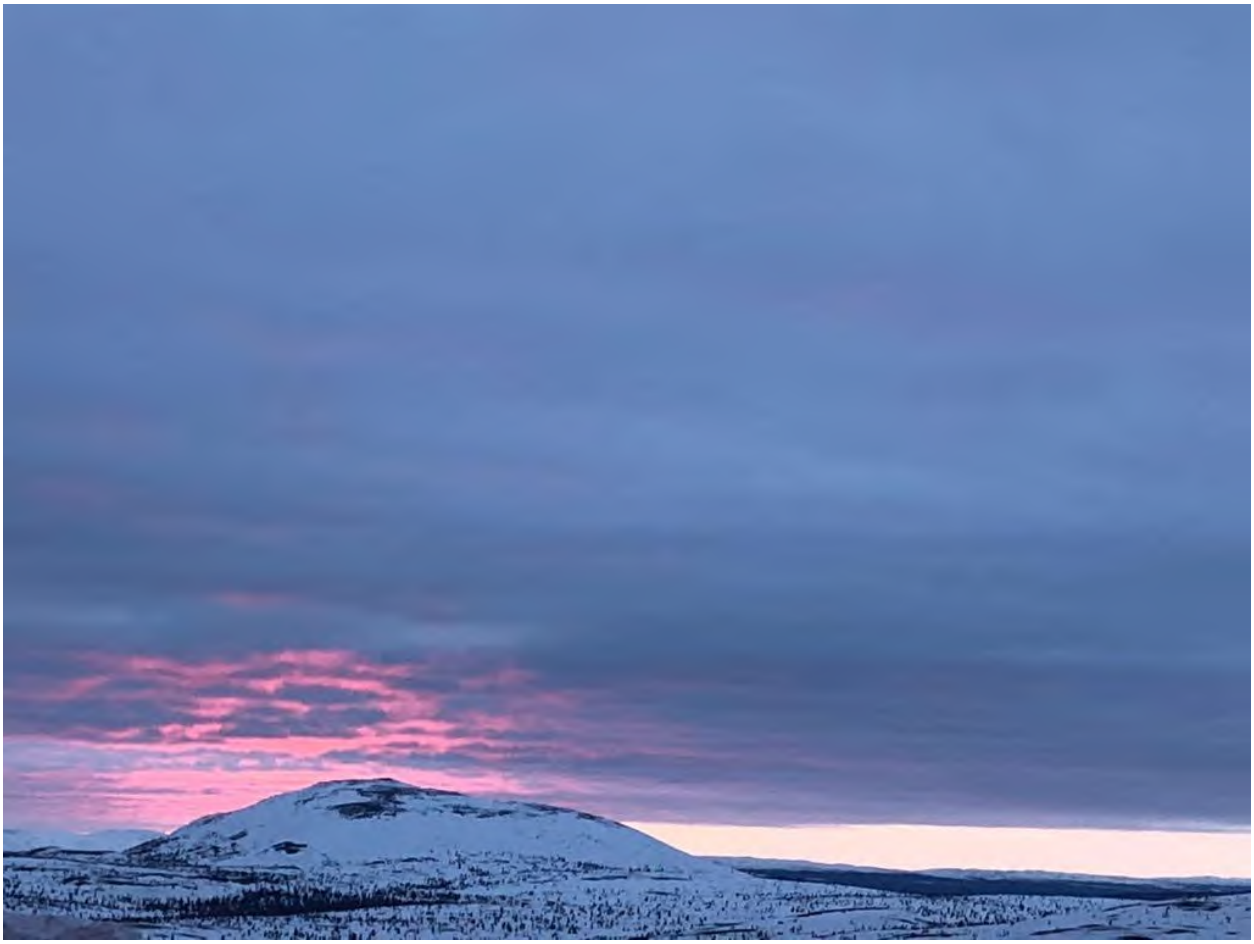
TATA STEEL MINERALS CANADA

Howse Property 2018 Annual Report



Sunset on Irony Mountain

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1. Howse Property project Update

As of June 28th, 2019, Tata Steel Minerals Canada has not started any work, including any construction activities, on the Howse Property Project. This report therefore covers the pre-construction phase of the Howse Property Project only.

2. Indigenous Groups

2.1 Follow up Programs

On May 10th, 2018, an email from Coco Calderhead (Community Affairs Manager for TSMC) was sent to community representatives:

- Lucien McKenzie (NIMLJ)
- George Guanish (Naskapi Nation of Kawawachikamach, NNK)
- Maude Regis (ITUM)
- Paula Reid (Innu Nation)
- George Russell (Nunatukavut)
- Lindsay Richardson (on behalf of the NIMLJ)

With the following message:

Chers Collègues / Dear Colleagues,

As part of the conditions set by the Canadian Environmental Assessment Agency (the Agency) for the Howse Project, you will find attached in this email the following follow-up plans:

1. *Cultural Heritage*
2. *Current Use of Lands*
3. *Communications*
4. *Fish*
5. *Migratory birds*
6. *Caribou*
7. *Environmental response plan*
8. *Air*
9. *Country food*
10. *Noise*
11. *Dust*

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The Wetlands follow-up plan will be sent in a separate email.

Please note that all these plans can also be found on our Google Shared Drive (Account: <email address removed>*, Password:* <personal information removed>*).*

We kindly request your comments on said plans by Friday, June 29th, 2018, so that they can be addressed in the final versions of the follow-up plans to be submitted to the Agency.

Thank you in advance, and please do not hesitate to contact myself or Loic Didillon at loic.didillon@tatasteelcanada.com

Regards,

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Dans le cadre des conditions établies par l'Agence canadienne d'évaluation environnementale (l'Agence) pour le Projet Howse, vous trouverez ci-joint les plans de suivi suivants :

1. *Patrimoine culturel*
2. *Utilisation courante du territoire*
3. *Communications*
4. *Poissons*
5. *Oiseaux migrateurs*
6. *Caribou*
7. *Urgences environnementales*
8. *Air*
9. *Nourriture traditionnelle*
10. *Bruit*
11. *Poussières.*

Le plan de suivi pour les milieux humides vous sera envoyé dans un courriel subséquent.

Veuillez noter que tous ces plans ont aussi été téléchargés sur notre serveur partagé Google (Compte : <email address removed>*, Mot de passe:* <personal information removed>*).*

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Nous vous demandons de nous faire parvenir vos commentaires sur ces plans d'ici vendredi, le 29 juin, 2018, afin que nous puissions les traiter en bonne et due forme dans la version finale de ces plans qui seront ensuite soumis à l'Agence.

Nous vous remercions à l'avance, et nous vous invitons à communiquer avec moi-même et Loic Didillon à loic.didillon@tatasteelcanada.com pour toute question.

Meilleures salutations,

Coco Calderhead

Gestionnaire en Affaires communautaires/Community Affairs Manager

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(a follow up email with the wetlands follow up plan was submitted on the same day)

On July 3rd, 2018, a letter was received from the NNK (Appendix 1), to which the Proponent provided a response (Appendix 2)

No other communication has been sent, or received, by TSMC regarding the Howse Follow up plans.

3. Biophysical monitoring

3.2 Howse Wetland Monitoring

During Summer 2018, wetland vegetation and water levels were monitoring in the Howse Project area. A total of 21 wells were installed in wetlands around the Howse area, with the purpose of initiating a

monitoring program. For this initial year, water levels were recorded at intermittent times between August 17th, 2018 and October 3rd, 2018. During the month of august and the beginning of September, water level seemed lower throughout the area. It was higher during the measurements in late September and beginning of October. Those observations are consistent with the conditions noted during fieldwork. As these are baseline data, no further interpretation is offered at this stage.

Appendix 3 presents the results of a wetland vegetation survey which will serve as reference values from which future data will be compared. The next vegetation survey is planned for the year 2023.

See Appendix 3 for more details

3.3 Lake Water Levels

Lake water levels were surveyed using Rugged TROLL 200 between January 1st, 2018 and October 6th, 2018. This baseline data will serve to detect any changes to lakes with respect to pit dewatering.

For each lake, over 26,000 data points were collected. Mean values for depth, temperature and pressure, as well as standard deviation values are provided in the table below. For O'Nelly lake, the control lake (not in the same watershed as the Howse Property Project), the equipment failed (negative values were obtained) and will be repaired during Summer 2019.

Table 1. Lake Water Levels.

	Mean depth, cm (STDEV)	***Mean temperature, deg.C (STDEV)***	***Mean pressure, PSI (STDEV)***
Burnetta	57.33 (9.26)	3.36 (2.51)	0.81 (0.13)
Morley	55.47 (14.31)	4.09 (5.09)	0.79 (0.20)
O'Nelly	Equip. Fail.	Equip. Fail.	Equip. Fail.
Pinette	51.78 (12.47)	4.33 (6.10)	0.74 (0.18)
Triangle	73.97 (13.58)	3.12 (4.42)	1.05 (0.19)

3.3 Surface Water Quality

The water management from the Howse project will release into surface water after collection and conveyance from ditches for retention in the Sedimentation Ponds for the project. The effluent discharged will be monitored against the following criteria as per the Effluent Monitoring Program for quality of effluent released as per the TSMC Certificate of Approval# AA18-055650.

This criterion is applicable to the following effluent discharge points as per the COA:

Table 2 - Effluent Monitoring Program				
Ref.	**Location**	**EDMS Code**	**Parameters**	**Frequency**
COA-SW11	Culvert B discharge to Timmins 1	00457	ALT and TPH	Monthly (at least 15 days apart)
COA-SW12	North of Timmins 4 Sedimentation Pond	00458	EDC (except ALT)	Weekly (at least 24 hours apart)
HOW-SP1	Sedimentation Pond HOWSEA Sedimentation Pond Discharge 1	TBD		
HOW-SP2	HOWSEA Sedimentation Pond Discharge 2	TBD		

The Effluent Discharge Criteria (EDC) for the Effluent Monitoring Program are listed below:

Table 3 – Effluent Discharge Criteria (EDC)			
Parameter	**Maximum Authorized Monthly Mean Concentration**	**Maximum Authorized Concentration in a Composite Sample**	**Maximum Authorized Concentration in a Grab Sample**
Arsenic	0.50 mg/L	0.75 mg/L	1.00 mg/L
Copper	0.30 mg/L	0.45 mg/L	0.60 mg/L
Lead	0.20 mg/L	0.30 mg/L	0.40 mg/L
Nickel	0.50 mg/L	0.75 mg/L	1.00 mg/L
Zinc	0.50 mg/L	0.75 mg/L	1.00 mg/L
TSS	15.00 mg/L	22.50 mg/L	30.00 mg/L
Radium 226	0.37 Bq/L	0.74 Bq/L	1.11 Bq/L
Acute Lethality	Toxic Pass		
pH	5.5 to 9		

In addition to the criteria added from this COA, the Canadian Environmental Assessment Agency (CEAA) has also mandated the monitoring of ammonia, water temperature and total kjeldahl nitrogen (TKN).

Surface water quality samples were taken between June 22nd and October 31st, 2018 for three quarters (taken at least 1 month apart). Due to the short flow season in 2018, only 3 quarters of sampling were possible for Howse instead of the usual 4 quarters of sampling. These samples were collected as a part of the baseline monitoring of surface water quality for the Water Chemistry Analysis Program in the creeks and lakes in

conjunction with the effluent discharge when the Howse pit will go into the construction and subsequently into the mining phase. The locations sampled are Triangle Lake (TL), Burnetta Creek (BC), Burnetta Lake (BL), Pinette Lake (SW5) and 4 points along Goodream Creek (SW1,2,3 and 4) that fall into the watershed and might be affected by Howse operations. Sampling results for the baseline surface water monitoring are displayed below:

Table 2. Surface Water Sample results at Burnetta Creek

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	***Units***	***Result***	***DL***	***Result***	***DL***	***Result***	***DL***
Dissolved oxygen	mg/L	10	1	6.5	1	8.1	1
Total suspended solids (TSS)	mg/L	<2.0	2	<2.0	2	<2.0	2
Total Dissolved Solids	mg/L	30	10	31	10	20	10
Reactive silica (SiO2)	mg/L	2.7	0.5	3.8	0.5	4.3	0.5
Dissolved organic carbon	mg/L	4.4	0.2	6.3	0.2	7.5	0.2
Phenols-4AAP	mg/L	0.0034	0.002	<0.0020	0.002	<0.0020	0.002
Conductivity	mS/cm	0.0051	0.001	0.0059	0.001	0.0059	0.001
Orthophosphate (P)	mg/L	0.014	0.01	<0.010	0.01	0.013	0.01
pH	pH	5.96	N/A	5.31	N/A	5.28	N/A
Real Color	UCV	28	2	43	2	38	2
Turbidity	NTU	0.3	0.1	0.34	0.1	0.24	0.1
Alkalinity Total (as CaCO3) pH 4.5	mg/L	1.3	1	<1.0	1	<1.0	1
Bicarbonates (HCO3 as CaCO3)	mg/L	1.3	1	<1.0	1	<1.0	1
Carbonate (CO3 as CaCO3)	mg/L	<1.0	1	<1.0	1	<1.0	1
Chloride (Cl)	mg/L	0.064	0.05	<0.050	0.05	0.12	0.05
Nitrate (N) and Nitrite(N)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Sulfates (SO4)	mg/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Nitrogen ammonia (N-NH3)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Total Extractable Aluminum (Al)	ug/L	120	10	170	10	160	10
Total Extractable Antimony (Sb)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Silver (Ag)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Arsenic (As)	ug/L	<1.0	1	<1.0	1	1.7	1
Total Extractable Barium (Ba)	ug/L	<2.0	2	2.8	2	2.6	2
Total Extractable Beryllium (Be)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Bismuth (Bi)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Boron (B)	ug/L	<50	50	<50	50	<50	50
Total Extractable Cadmium (Cd)	ug/L	<0.20	0.2	<0.20	0.2	<0.20	0.2
Total Extractable Calcium (Ca)	ug/L	<500	500	<500	500	<500	500

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	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Total Extractable Chromium (Cr)	ug/L	<5.0	5	<5.0	5	<5.0	5
Total Extractable Cobalt (Co)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Copper (Cu)	ug/L	<1.0	1	1.2	1	<1.0	1
Total Extractable Tin (Sn)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Iron (Fe)	ug/L	110	60	250	60	240	60
Total Extractable Magnesium (Mg)	ug/L	420	100	340	100	330	100
Total Extractable Manganese (Mn)	ug/L	6.9	1	20	1	17	1
Total Extractable Molybdenum (Mo)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Mercury (Hg)	ug/L	<0.10	0.1	<0.10	0.1	<0.10	0.1
Total Extractable Nickel (Ni)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Total phosphorous	ug/L	<10	10	<10	10	<10	10
Total Extractable Lead (Pb)	ug/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Total Extractable Potassium (K)	ug/L	<500	500	<500	500	<500	500
Total Extractable Selenium (Se)	ug/L	<3.0	3	<3.0	3	<3.0	3
Total Extractable Sodium (Na)	ug/L	<500	500	<500	500	<500	500
Total Extractable Strontium (Sr)	ug/L	<2.0	2	2	2	2.1	2
Total Extractable Thallium (Tl)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Titanium (Ti)	ug/L	<10	10	<10	10	<10	10
Total Extractable Uranium (U)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Vanadium (V)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Zinc (Zn)	ug/L	<7.0	7	<7.0	7	<7.0	7
Sulfides (S2-)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Nitrates (N-NO3-)	mg/L			<0.020	0.02	<0.020	0.02
Nitrites (N-NO2-)	mg/L			<0.020	0.02	<0.020	0.02
Total Extractable Total Hardness (CaCO3)	ug/L			2100	1000	2100	1000

Table 3. Surface Water Sample results at Triangle Lake

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Dissolved oxygen	mg/L	12	1	9.1	1	10	1
Total suspended solids (TSS)	mg/L	<2.0	2	<2.0	2	<2.0	2
Total Dissolved Solids	mg/L	36	10	43	10	23	10
Reactive silica (SiO2)	mg/L	4.2	0.5	3.8	0.5	4.1	0.5

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	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	***Units***	***Result***	***DL***	***Result***	***DL***	***Result***	***DL***
Dissolved organic carbon	mg/L	1.7	0.2	3.3	0.2	2	0.2
Phenols-4AAP	mg/L	<0.0020	0.002	<0.0020	0.002	<0.0020	0.002
Conductivity	mS/cm	0.029	0.001	0.032	0.001	0.037	0.001
Orthophosphate (P)	mg/L	<0.010	0.01	<0.010	0.01	<0.010	0.01
pH	pH	7.29	N/A	7.4	N/A	7.39	N/A
Real Color	UCV	9.1	2	10	2	4.9	2
Turbidity	NTU	0.82	0.1	0.39	0.1	0.2	0.1
Alkalinity Total (as CaCO3) pH 4.5	mg/L	12	1	13	1	15	1
Bicarbonates (HCO3 as CaCO3)	mg/L	12	1	13	1	15	1
Carbonate (CO3 as CaCO3)	mg/L	<1.0	1	<1.0	1	<1.0	1
Chloride (Cl)	mg/L	0.2	0.05	0.2	0.05	0.19	0.05
Nitrate (N) and Nitrite(N)	mg/L	0.079	0.02	0.05	0.02	0.056	0.02
Sulfates (SO4)	mg/L	1.8	0.5	2	0.5	2.1	0.5
Nitrogen ammonia (N-NH3)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Total Extractable Aluminum (Al)	ug/L	34	10	12	10	<10	10
Total Extractable Antimony (Sb)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Silver (Ag)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Arsenic (As)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Barium (Ba)	ug/L	3	2	3	2	2.9	2
Total Extractable Beryllium (Be)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Bismuth (Bi)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Boron (B)	ug/L	<50	50	<50	50	<50	50
Total Extractable Cadmium (Cd)	ug/L	<0.20	0.2	<0.20	0.2	<0.20	0.2
Total Extractable Calcium (Ca)	ug/L	2400	500	2800	500	3400	500
Total Extractable Chromium (Cr)	ug/L	<5.0	5	<5.0	5	<5.0	5
Total Extractable Cobalt (Co)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Copper (Cu)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Tin (Sn)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Iron (Fe)	ug/L	130	60	82	60	60	60
Total Extractable Magnesium (Mg)	ug/L	2100	100	2300	100	2700	100
Total Extractable Manganese (Mn)	ug/L	20	1	7.5	1	5	1
Total Extractable Molybdenum (Mo)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Mercury (Hg)	ug/L	<0.10	0.1	<0.10	0.1	<0.10	0.1

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Total Extractable Nickel (Ni)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Total phosphorous	ug/L	<10	10	<10	10	<10	10
Total Extractable Lead (Pb)	ug/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Total Extractable Potassium (K)	ug/L	<500	500	<500	500	<500	500
Total Extractable Selenium (Se)	ug/L	<3.0	3	<3.0	3	<3.0	3
Total Extractable Sodium (Na)	ug/L	<500	500	550	500	530	500
Total Extractable Strontium (Sr)	ug/L	4.5	2	5.4	2	5.9	2
Total Extractable Thallium (Tl)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Titanium (Ti)	ug/L	<10	10	<10	10	<10	10
Total Extractable Uranium (U)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Vanadium (V)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Zinc (Zn)	ug/L	<7.0	7	<7.0	7	<7.0	7
Sulfides (S2-)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Nitrates (N-NO3-)	mg/L			0.05	0.02	0.056	0.02
Nitrites (N-NO2-)	mg/L			<0.020	0.02	<0.020	0.02
Total Extractable Total Hardness (CaCO3)	ug/L			16000	1000	19000	1000

Table 4. Surface Water Sample results at Burnetta Lake

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Dissolved oxygen	mg/L	13	1	9.3	1	9.9	1
Total suspended solids (TSS)	mg/L	<2.0	2	<2.0	2	<2.0	2
Total Dissolved Solids	mg/L	38	10	54	10	37	10
Reactive silica (SiO2)	mg/L	4.8	0.5	4.8	0.5	4.8	0.5
Dissolved organic carbon	mg/L	0.97	0.2	2.1	0.2	6.1	0.2
Phenols-4AAP	mg/L	<0.0020	0.002	<0.0020	0.002	<0.0020	0.002
Conductivity	mS/cm	0.05	0.001	0.055	0.001	0.052	0.001
Orthophosphate (P)	mg/L	0.01	0.01	<0.010	0.01	0.015	0.01
pH	pH	7.54	N/A	7.48	N/A	7.36	N/A
Real Color	UCV	<2.0	2	<2.0	2	3.1	2

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	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	***Units***	***Result***	***DL***	***Result***	***DL***	***Result***	***DL***
Turbidity	NTU	<0.10	0.1	0.15	0.1	<0.10	0.1
Alkalinity Total (as CaCO3) pH 4.5	mg/L	24	1	26	1	24	1
Bicarbonates (HCO3 as CaCO3)	mg/L	24	1	26	1	24	1
Carbonate (CO3 as CaCO3)	mg/L	<1.0	1	<1.0	1	<1.0	1
Chloride (Cl)	mg/L	0.16	0.05	0.16	0.05	0.14	0.05
Nitrate (N) and Nitrite(N)	mg/L	0.021	0.02	<0.020	0.02	<0.020	0.02
Sulfates (SO4)	mg/L	1.9	0.5	1.9	0.5	2.4	0.5
Nitrogen ammonia (N-NH3)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Total Extractable Aluminum (Al)	ug/L	<10	10	<10	10	<10	10
Total Extractable Antimony (Sb)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Silver (Ag)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Arsenic (As)	ug/L	<1.0	1	<1.0	1	1.9	1
Total Extractable Barium (Ba)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Beryllium (Be)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Bismuth (Bi)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Boron (B)	ug/L	<50	50	<50	50	<50	50
Total Extractable Cadmium (Cd)	ug/L	<0.20	0.2	<0.20	0.2	<0.20	0.2
Total Extractable Calcium (Ca)	ug/L	4300	500	5300	500	5000	500
Total Extractable Chromium (Cr)	ug/L	<5.0	5	<5.0	5	<5.0	5
Total Extractable Cobalt (Co)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Copper (Cu)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Tin (Sn)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Iron (Fe)	ug/L	<60	60	<60	60	<60	60
Total Extractable Magnesium (Mg)	ug/L	3500	100	3800	100	3700	100
Total Extractable Manganese (Mn)	ug/L	1.8	1	1.2	1	3.6	1
Total Extractable Molybdenum (Mo)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Mercury (Hg)	ug/L	<0.10	0.1	<0.10	0.1	<0.10	0.1
Total Extractable Nickel (Ni)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Total phosphorous	ug/L	14	10	<10	10	<10	10
Total Extractable Lead (Pb)	ug/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Total Extractable Potassium (K)	ug/L	<500	500	<500	500	<500	500

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	***Units***	***Result***	***DL***	***Result***	***DL***	***Result***	***DL***
Total Extractable Selenium (Se)	ug/L	<3.0	3	<3.0	3	<3.0	3
Total Extractable Sodium (Na)	ug/L	710	500	760	500	730	500
Total Extractable Strontium (Sr)	ug/L	5.6	2	6.2	2	6.6	2
Total Extractable Thallium (Tl)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Titanium (Ti)	ug/L	<10	10	<10	10	<10	10
Total Extractable Uranium (U)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Vanadium (V)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Zinc (Zn)	ug/L	<7.0	7	<7.0	7	<7.0	7
Sulfides (S2-)	mg/L	0.021	0.02	<0.020	0.02	<0.020	0.02
Nitrates (N-NO3-)	mg/L			<0.020	0.02	<0.020	0.02
Nitrites (N-NO2-)	mg/L			<0.020	0.02	<0.020	0.02
Total Extractable Total Hardness (CaCO3)	ug/L			29000	1000	28000	1000

Table 5. Surface water parameters for SW1 (Goodream Creek)

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	***Units***	***Result***	***DL***	***Result***	***DL***	***Result***	***DL***
Dissolved oxygen	mg/L	13	1	9.3	1	11	1
Total suspended solids (TSS)	mg/L	<2.0	2	<2.0	2	<2.0	2
Total Dissolved Solids	mg/L	36	10	45	10	23	10
Reactive silica (SiO2)	mg/L	4.2	0.5	4.1	0.5	4.5	0.5
Dissolved organic carbon	mg/L	1.1	0.2	2.7	0.2	1.9	0.2
Phenols-4AAP	mg/L	<0.0020	0.002	<0.0020	0.002	<0.0020	0.002
Conductivity	mS/cm	0.031	0.001	0.031	0.001	0.03	0.001
Orthophosphate (P)	mg/L	<0.010	0.01	<0.010	0.01	<0.010	0.01
pH	pH	7.26	N/A	7.34	N/A	7.19	N/A
Real Color	UCV	4.9	2	5.4	2	5.2	2
Turbidity	NTU	0.13	0.1	0.29	0.1	0.36	0.1
Alkalinity Total (as CaCO3) pH 4.5	mg/L	11	1	12	1	12	1
Bicarbonates (HCO3 as CaCO3)	mg/L	11	1	12	1	12	1
Carbonate (CO3 as CaCO3)	mg/L	<1.0	1	<1.0	1	<1.0	1
Chloride (Cl)	mg/L	0.43	0.05	0.32	0.05	0.27	0.05

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	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	***Units***	***Result***	***DL***	***Result***	***DL***	***Result***	***DL***
Nitrate (N) and Nitrite(N)	mg/L	0.22	0.02	0.16	0.02	0.16	0.02
Sulfates (SO4)	mg/L	2.1	0.5	2.2	0.5	2	0.5
Nitrogen ammonia (N-NH3)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Total Extractable Aluminum (Al)	ug/L	<10	10	<10	10	<10	10
Total Extractable Antimony (Sb)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Silver (Ag)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Arsenic (As)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Barium (Ba)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Beryllium (Be)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Bismuth (Bi)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Boron (B)	ug/L	<50	50	<50	50	<50	50
Total Extractable Cadmium (Cd)	ug/L	<0.20	0.2	<0.20	0.2	<0.20	0.2
Total Extractable Calcium (Ca)	ug/L	2600	500	2700	500	2500	500
Total Extractable Chromium (Cr)	ug/L	<5.0	5	<5.0	5	<5.0	5
Total Extractable Cobalt (Co)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Copper (Cu)	ug/L	1.2	1	<1.0	1	<1.0	1
Total Extractable Tin (Sn)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Iron (Fe)	ug/L	70	60	92	60	100	60
Total Extractable Magnesium (Mg)	ug/L	2100	100	2100	100	2100	100
Total Extractable Manganese (Mn)	ug/L	5.4	1	7	1	7.4	1
Total Extractable Molybdenum (Mo)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Mercury (Hg)	ug/L	<0.10	0.1	<0.10	0.1	<0.10	0.1
Total Extractable Nickel (Ni)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Total phosphorous	ug/L	<10	10	<10	10	<10	10
Total Extractable Lead (Pb)	ug/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Total Extractable Potassium (K)	ug/L	<500	500	<500	500	<500	500

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Total Extractable Selenium (Se)	ug/L	<3.0	3	<3.0	3	<3.0	3
Total Extractable Sodium (Na)	ug/L	650	500	600	500	520	500
Total Extractable Strontium (Sr)	ug/L	5	2	5.5	2	5.3	2
Total Extractable Thallium (Tl)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Titanium (Ti)	ug/L	<10	10	<10	10	<10	10
Total Extractable Uranium (U)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Vanadium (V)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Zinc (Zn)	ug/L	<7.0	7	<7.0	7	<7.0	7
Sulfides (S2-)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Nitrates (N-NO3-)	mg/L			0.16	0.02	0.16	0.02
Nitrites (N-NO2-)	mg/L			<0.020	0.02	<0.020	0.02
Total Extractable Total Hardness (CaCO3)	ug/L			15000	1000	15000	1000

Table 6. Surface Water Sampling results for SW4 (Goodream Creek)

	Sampling Date	July 4th		Aug 6		Sep 6	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Dissolved oxygen	mg/L	12	1	9.1	1	9.6	1
Total suspended solids (TSS)	mg/L	<2.0	2	<2.0	2	<2.0	2
Total Dissolved Solids	mg/L	32	10	34	10	20	10
Reactive silica (SiO2)	mg/L	4.1	0.5	3.8	0.5	4.7	0.5
Dissolved organic carbon	mg/L	1.5	0.2	2.7	0.2	3.5	0.2
Phenols-4AAP	mg/L	<0.0020	0.002	<0.0020	0.002	<0.0020	0.002
Conductivity	mS/cm	0.022	0.001	0.024	0.001	0.02	0.001
Orthophosphate (P)	mg/L	0.044	0.01	<0.010	0.01	0.013	0.01
pH	pH	6.91	N/A	7.05	N/A	6.77	N/A
Real Color	UCV	2.9	2	6.9	2	16	2
Turbidity	NTU	0.22	0.1	0.45	0.1	1.1	0.1
Alkalinity Total (as CaCO3) pH 4.5	mg/L	6.4	1	7.5	1	6.8	1
Bicarbonates (HCO3 as CaCO3)	mg/L	6.4	1	7.5	1	6.8	1

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	Sampling Date	July 4th		Aug 6		Sep 6	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Carbonate (CO3 as CaCO3)	mg/L	<1.0	1	<1.0	1	<1.0	1
Chloride (Cl)	mg/L	0.51	0.05	0.37	0.05	0.4	0.05
Nitrate (N) and Nitrite(N)	mg/L	0.32	0.02	0.18	0.02	0.21	0.02
Sulfates (SO4)	mg/L	1.7	0.5	2.3	0.5	0.77	0.5
Nitrogen ammonia (N-NH3)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Total Extractable Aluminum (Al)	ug/L	<10	10	12	10	24	10
Total Extractable Antimony (Sb)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Silver (Ag)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Arsenic (As)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Barium (Ba)	ug/L	<2.0	2	<2.0	2	3	2
Total Extractable Beryllium (Be)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Bismuth (Bi)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Boron (B)	ug/L	<50	50	<50	50	<50	50
Total Extractable Cadmium (Cd)	ug/L	<0.20	0.2	<0.20	0.2	<0.20	0.2
Total Extractable Calcium (Ca)	ug/L	1800	500	2100	500	1800	500
Total Extractable Chromium (Cr)	ug/L	<5.0	5	<5.0	5	<5.0	5
Total Extractable Cobalt (Co)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Copper (Cu)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Tin (Sn)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Iron (Fe)	ug/L	<60	60	<60	60	460	60
Total Extractable Magnesium (Mg)	ug/L	1500	100	1700	100	1400	100
Total Extractable Manganese (Mn)	ug/L	<1.0	1	1.2	1	25	1
Total Extractable Molybdenum (Mo)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Mercury (Hg)	ug/L	<0.10	0.1	<0.10	0.1	<0.10	0.1
Total Extractable Nickel (Ni)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Total phosphorous	ug/L	11	10	<10	10	<10	10

	Sampling Date	July 4th		Aug 6		Sep 6	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Total Extractable Lead (Pb)	ug/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Total Extractable Potassium (K)	ug/L	<500	500	<500	500	<500	500
Total Extractable Selenium (Se)	ug/L	<3.0	3	<3.0	3	<3.0	3
Total Extractable Sodium (Na)	ug/L	<500	500	<500	500	520	500
Total Extractable Strontium (Sr)	ug/L	4.2	2	5	2	4.2	2
Total Extractable Thallium (Tl)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Titanium (Ti)	ug/L	<10	10	<10	10	<10	10
Total Extractable Uranium (U)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Vanadium (V)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Zinc (Zn)	ug/L	<7.0	7	<7.0	7	<7.0	7
Sulfides (S2-)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Nitrates (N-NO3-)	mg/L			0.18	0.02	0.21	0.02
Nitrites (N-NO2-)	mg/L			<0.020	0.02	<0.020	0.02
Total Extractable Total Hardness (CaCO3)	ug/L			12000	1000	10000	1000

Table 7. Surface Water sampling results for SW3 (Goodream Creek)

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Dissolved oxygen	mg/L	10	1	6	1	8.3	1
Total suspended solids (TSS)	mg/L	<2.0	2	<2.0	2	<2.0	2
Total Dissolved Solids	mg/L	24	10	22	10	20	10
Reactive silica (SiO2)	mg/L	2	0.5	2.6	0.5	2.6	0.5
Dissolved organic carbon	mg/L	24	1	4.3	0.2	5.6	0.2
Phenols-4AAP	mg/L	<0.0020	0.002	<0.0020	0.002	<0.0020	0.002
Conductivity	mS/cm	0.0031	0.001	0.0043	0.001	0.0041	0.001
Orthophosphate (P)	mg/L	<0.010	0.01	<0.010	0.01	0.017	0.01

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	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	***Units***	***Result***	***DL***	***Result***	***DL***	***Result***	***DL***
pH	pH	5.57	N/A	5.53	N/A	5.32	N/A
Real Color	UCV	17	2	21	2	23	2
Turbidity	NTU	0.17	0.1	0.22	0.1	0.34	0.1
Alkalinity Total (as CaCO3) pH 4.5	mg/L	<1.0	1	<1.0	1	<1.0	1
Bicarbonates (HCO3 as CaCO3)	mg/L	<1.0	1	<1.0	1	<1.0	1
Carbonate (CO3 as CaCO3)	mg/L	<1.0	1	<1.0	1	<1.0	1
Chloride (Cl)	mg/L	<0.050	0.05	<0.050	0.05	0.1	0.05
Nitrate (N) and Nitrite(N)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Sulfates (SO4)	mg/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Nitrogen ammonia (N-NH3)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Total Extractable Aluminum (Al)	ug/L	53	10	58	10	60	10
Total Extractable Antimony (Sb)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Silver (Ag)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Arsenic (As)	ug/L	<1.0	1	<1.0	1	2.3	1
Total Extractable Barium (Ba)	ug/L	<2.0	2	2.6	2	2.1	2
Total Extractable Beryllium (Be)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Bismuth (Bi)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Boron (B)	ug/L	<50	50	<50	50	<50	50
Total Extractable Cadmium (Cd)	ug/L	<0.20	0.2	<0.20	0.2	<0.20	0.2
Total Extractable Calcium (Ca)	ug/L	<500	500	<500	500	<500	500
Total Extractable Chromium (Cr)	ug/L	<5.0	5	<5.0	5	<5.0	5
Total Extractable Cobalt (Co)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Copper (Cu)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Tin (Sn)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Iron (Fe)	ug/L	120	60	83	60	160	60
Total Extractable Magnesium (Mg)	ug/L	130	100	180	100	150	100
Total Extractable Manganese (Mn)	ug/L	7.8	1	24	1	16	1

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Total Extractable Molybdenum (Mo)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Mercury (Hg)	ug/L	<0.10	0.1	<0.10	0.1	<0.10	0.1
Total Extractable Nickel (Ni)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Total phosphorous	ug/L	<10	10	<10	10	<10	10
Total Extractable Lead (Pb)	ug/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Total Extractable Potassium (K)	ug/L	<500	500	<500	500	<500	500
Total Extractable Selenium (Se)	ug/L	<3.0	3	<3.0	3	<3.0	3
Total Extractable Sodium (Na)	ug/L	<500	500	<500	500	<500	500
Total Extractable Strontium (Sr)	ug/L	<2.0	2	2.3	2	<2.0	2
Total Extractable Thallium (Tl)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Titanium (Ti)	ug/L	<10	10	<10	10	<10	10
Total Extractable Uranium (U)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Vanadium (V)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Zinc (Zn)	ug/L	<7.0	7	<7.0	7	<7.0	7
Sulfides (S2-)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Nitrates (N-NO3-)	mg/L			<0.020	0.02	<0.020	0.02
Nitrites (N-NO2-)	mg/L			<0.020	0.02	<0.020	0.02
Total Extractable Total Hardness (CaCO3)	ug/L			1400	1000	1200	1000

Table 8. Surface water results for SW2 (Goodream Creek)

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Dissolved oxygen	mg/L	12	1	8.1	1	9.2	1

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	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	***Units***	***Result***	***DL***	***Result***	***DL***	***Result***	***DL***
Total suspended solids (TSS)	mg/L	<2.0	2	2	2	<2.0	2
Total Dissolved Solids	mg/L	25	10	28	10	22	10
Reactive silica (SiO2)	mg/L	3.9	0.5	4.6	0.5	3.8	0.5
Dissolved organic carbon	mg/L	2.7	0.2	4.9	0.2	6.1	0.2
Phenols-4AAP	mg/L	<0.0020	0.002	<0.0020	0.002	<0.0020	0.002
Conductivity	mS/cm	0.0066	0.001	0.0067	0.001	0.0051	0.001
Orthophosphate (P)	mg/L	<0.010	0.01	<0.010	0.01	<0.010	0.01
pH	pH	6.42	N/A	6.35	N/A	5.86	N/A
Real Color	UCV	21	2	40	2	36	2
Turbidity	NTU	0.74	0.1	1.2	0.1	4.5	0.1
Alkalinity Total (as CaCO3) pH 4.5	mg/L	2.5	1	2	1	1.1	1
Bicarbonates (HCO3 as CaCO3)	mg/L	2.5	1	2	1	1.1	1
Carbonate (CO3 as CaCO3)	mg/L	<1.0	1	<1.0	1	<1.0	1
Chloride (Cl)	mg/L	0.058	0.05	0.059	0.05	0.13	0.05
Nitrate (N) and Nitrite(N)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Sulfates (SO4)	mg/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Nitrogen ammonia (N-NH3)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Total Extractable Aluminum (Al)	ug/L	51	10	72	10	110	10
Total Extractable Antimony (Sb)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Silver (Ag)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Arsenic (As)	ug/L	<1.0	1	<1.0	1	2.6	1
Total Extractable Barium (Ba)	ug/L	2.9	2	3.8	2	3.5	2
Total Extractable Beryllium (Be)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Bismuth (Bi)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Boron (B)	ug/L	<50	50	<50	50	<50	50
Total Extractable Cadmium (Cd)	ug/L	<0.20	0.2	<0.20	0.2	<0.20	0.2
Total Extractable Calcium (Ca)	ug/L	<500	500	530	500	<500	500
Total Extractable Chromium (Cr)	ug/L	<5.0	5	<5.0	5	<5.0	5

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	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	***Units***	***Result***	***DL***	***Result***	***DL***	***Result***	***DL***
Total Extractable Cobalt (Co)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Copper (Cu)	ug/L	<1.0	1	<1.0	1	32	1
Total Extractable Tin (Sn)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Iron (Fe)	ug/L	770	60	1100	60	540	60
Total Extractable Magnesium (Mg)	ug/L	320	100	310	100	240	100
Total Extractable Manganese (Mn)	ug/L	120	1	180	1	50	1
Total Extractable Molybdenum (Mo)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Mercury (Hg)	ug/L	<0.10	0.1	<0.10	0.1	<0.10	0.1
Total Extractable Nickel (Ni)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Total phosphorous	ug/L	17	10	<10	10	<10	10
Total Extractable Lead (Pb)	ug/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Total Extractable Potassium (K)	ug/L	<500	500	<500	500	<500	500
Total Extractable Selenium (Se)	ug/L	<3.0	3	<3.0	3	<3.0	3
Total Extractable Sodium (Na)	ug/L	<500	500	<500	500	<500	500
Total Extractable Strontium (Sr)	ug/L	3.5	2	4.2	2	3.3	2
Total Extractable Thallium (Tl)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Titanium (Ti)	ug/L	<10	10	<10	10	<10	10
Total Extractable Uranium (U)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Vanadium (V)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Zinc (Zn)	ug/L	<7.0	7	<7.0	7	<7.0	7
Sulfides (S2-)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Nitrates (N-NO3-)	mg/L			<0.020	0.02	<0.020	0.02
Nitrites (N-NO2-)	mg/L			<0.020	0.02	<0.020	0.02
Total Extractable Total Hardness (CaCO3)	ug/L			2600	1000	2100	1000

TATA STEEL MINERALS CANADA

Table 9. Surface Water Sample Results for SW5 (Pinette Lake)

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	***Units***	***Result***	***DL***	***Result***	***DL***	***Result***	***DL***
Dissolved oxygen	mg/L	12	1	8.2	1	9.3	1
Total suspended solids (TSS)	mg/L	<2.0	2	<2.0	2	<2.0	2
Total Dissolved Solids	mg/L	24	10	18	10	<10	10
Reactive silica (SiO2)	mg/L	1.1	0.5	0.84	0.1	0.78	0.1
Dissolved organic carbon	mg/L	1.9	0.2	2.9	0.2	2.7	0.2
Phenols-4AAP	mg/L	<0.0020	0.002	<0.0020	0.002	<0.0020	0.002
Conductivity	mS/cm	0.0032	0.001	0.0028	0.001	0.003	0.001
Orthophosphate (P)	mg/L	<0.010	0.01	<0.010	0.01	0.013	0.01
pH	pH	6.33	N/A	6.43	N/A	6.36	N/A
Real Color	UCV	5.5	2	6.9	2	2.5	2
Turbidity	NTU	0.31	0.1	0.38	0.1	0.39	0.1
Alkalinity Total (as CaCO3) pH 4.5	mg/L	1.6	1	1.5	1	1.7	1
Bicarbonates (HCO3 as CaCO3)	mg/L	1.6	1	1.5	1	1.7	1
Carbonate (CO3 as CaCO3)	mg/L	<1.0	1	<1.0	1	<1.0	1
Chloride (Cl)	mg/L	0.066	0.05	<0.050	0.05	<0.050	0.05
Nitrate (N) and Nitrite(N)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Sulfates (SO4)	mg/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Nitrogen ammonia (N-NH3)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Total Extractable Aluminum (Al)	ug/L	25	10	32	10	<10	10
Total Extractable Antimony (Sb)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Silver (Ag)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Arsenic (As)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Barium (Ba)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Beryllium (Be)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Bismuth (Bi)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Boron (B)	ug/L	<50	50	<50	50	<50	50
Total Extractable Cadmium (Cd)	ug/L	<0.20	0.2	<0.20	0.2	<0.20	0.2

TATA STEEL MINERALS CANADA

	Sampling Date	Jul 04, 2018		Aug 06, 2018		Sep 06, 2018	
Parameter Name	**Units**	**Result**	**DL**	**Result**	**DL**	**Result**	**DL**
Total Extractable Calcium (Ca)	ug/L	<500	500	<500	500	<500	500
Total Extractable Chromium (Cr)	ug/L	<5.0	5	<5.0	5	<5.0	5
Total Extractable Cobalt (Co)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Copper (Cu)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Tin (Sn)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Iron (Fe)	ug/L	<60	60	67	60	64	60
Total Extractable Magnesium (Mg)	ug/L	200	100	200	100	210	100
Total Extractable Manganese (Mn)	ug/L	4.4	1	6.3	1	2.8	1
Total Extractable Molybdenum (Mo)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Mercury (Hg)	ug/L	<0.10	0.1	<0.10	0.1	<0.10	0.1
Total Extractable Nickel (Ni)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Total phosphorous	ug/L	16	10	<10	10	11	10
Total Extractable Lead (Pb)	ug/L	<0.50	0.5	<0.50	0.5	<0.50	0.5
Total Extractable Potassium (K)	ug/L	<500	500	<500	500	<500	500
Total Extractable Selenium (Se)	ug/L	<3.0	3	<3.0	3	<3.0	3
Total Extractable Sodium (Na)	ug/L	<500	500	<500	500	<500	500
Total Extractable Strontium (Sr)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Thallium (Tl)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Titanium (Ti)	ug/L	<10	10	<10	10	<10	10
Total Extractable Uranium (U)	ug/L	<1.0	1	<1.0	1	<1.0	1
Total Extractable Vanadium (V)	ug/L	<2.0	2	<2.0	2	<2.0	2
Total Extractable Zinc (Zn)	ug/L	<7.0	7	<7.0	7	<7.0	7
Sulfides (S2-)	mg/L	<0.020	0.02	<0.020	0.02	<0.020	0.02
Nitrates (N-NO3-)	mg/L			<0.020	0.02	<0.020	0.02
Nitrites (N-NO2-)	mg/L			<0.020	0.02	<0.020	0.02
Total Extractable Total Hardness (CaCO3)	ug/L			1400	1000	1500	1000

3.4 Snow Sampling

Snow sample was collected at Air Quality Station (AQS)#8 near Pinette Lake along with the other air quality stations on site. Results from the campaign are displayed below:

Table 10. Snow sampling results for Pinette Lake

Sampling Date		2018-05-06
	Units	**DSO3-AQS8-SN-2018**
METALS		
Antimony (Sb) †	ug	0.1
Silver (Ag) †	ug	<0.5
Arsenic (As) †	ug	0.2
Barium (Ba) †	ug	2.22
Beryllium (Be) †	ug	<0.05
Cadmium (Cd) †	ug	<0.05
Chromium (Cr) †	ug	0.8
Copper (Cu) †	ug	1.6
Mercury (Hg) †	ug	<0.05
Nickel (Ni) †	ug	0.7
Lead (Pb) †	ug	0.7
Thallium (Tl) †	ug	<0.1
Vanadium (V) †	ug	<0.2
Zinc (Zn) †	ug	11.7

Air Quality

NO2

NO2 pucks are used to monitor the concentrations of nitrogen dioxide at the AQS#8 (Pinette Lake) location all year around. The results for sampling in 2018 are displayed below:

Table 11. Passive NO2 Monitoring for 2018 at Pinette Lake

Sampling Date		Jan 18	Feb 18	March 22	April 21	May 24	July 1	Aug 12	Sep 8	Oct 12	Nov 28
Passive Monitoring	Units										
Calculated NO2	ppb	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.2	<0.1	0.4	<0.1

Dustfall

Dustfall monitoring was carried out starting in July until the end of September in 2018 at AQS#8 (Pinette Lake). Results from the sampling in 2018 are displayed below:

Table 12. Dustfall Monitoring for 2018 at Pinette Lake

Sampling Date		Aug 12	Sept 12	Sept 29
METALS				
Antimony (Sb) †	ug	<0.1	<0.1	0.2
Silver (Ag) †	ug	<0.5	<0.5	<0.5
Arsenic (As) †	ug	0.2	0.7	0.2
Barium (Ba) †	ug	17.7	25.8	11.1
Beryllium (Be) †	ug	<0.05	<0.05	<0.05
Cadmium (Cd) †	ug	0.12	<0.05	<0.05
Chromium (Cr) †	ug	1.2	0.4	0.5
Copper (Cu) †	ug	29.5	51.5	5.2
Manganese (Mn) †	ug	43.5	1.6	50.4
Mercury (Hg) †	ug	<0.05	<0.05	<0.05
Nickel (Ni) †	ug	20.8	0.9	2.4
Lead (Pb) †	ug	4.2	9.7	0.6
Thallium (Tl) †	ug	<0.1	<0.1	<0.1
Vanadium (V) †	ug	<0.2	<0.2	<0.2
Zinc (Zn) †	ug	25.5	2.2	9.9

PM2.5

PM2.5 monitoring was carried out using the PQ200 portable air monitors starting on June until August 2018 at AQS#8 (Pinette Lake). Results from the sampling in 2018 are displayed below:

Table 13. PM2.5 Monitoring for 2018 at Pinette Lake

CONVENTIONAL PARAMETERS (FILTER)

	Units	DS03-AQS8-PM2.5-18-1	DS03-AQS8-PM2.5-2	DSO3-AQ58-PM2.5-3
CONVENTIONALS				
Weight of filter	g	0.1514	0.1516	0.1470
Weight of filter and sample	g	0.1521	0.1516	0.1472
Total particles	g	0.0007	<0.0002	0.0002

Appendices

Appendix 1: Letter from NNK

Appendix 2: TSMC Response to NNK

Appendix 3: Howse Wetland Monitoring

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BY EMAIL

Ms Coco Calderhead
Community Affairs Manager
Tata Steel Minerals Canada
1000, rue Sherbrooke ouest, bureau 1120
Montréal (Qc) H3A 3G4
Tel: (514) 764 6716
Email: coco.calderhead@tatasteelcanada.com

3 July, 2018

RE: Howse Property Iron Mine Project - Conditions of the Decision Statement

Dear Ms Calderhead,

The Naskapi Nation of Kawawachikamach (the "Nation") received a consultation request on 10 May, 2018, pertaining to the Follow up Programs set out in the conditions of the Canadian Environmental Assessment Agency's decision statement. The following information and documentation (the "Documentation") was produced and supplied by Tata Steel Minerals Canada ("TSMC"):

- Dust Management Strategy;
- Follow up program for air quality;
- Follow up Program for Caribou;
- Follow up Program for Current Use of Lands;
- Follow up program for country foods;
- Cultural Heritage Control Plan;
- Follow up program use of cultural and other sites as a result of noise;
- Follow up Program for Wetlands;
- Follow up Program for Avifauna;
- Follow-Up Program – Fish and Fish Habitat;
- Communication Strategy in line with the Decision Statement of the Canadian Environmental Assessment Agency.

Consequently, we understand that:

1. All the Documentation enabling the Nation to make an informed decision has effectively been communicated within a reasonable time frame;
2. An analysis of potential impacts was carried out by TSMC and no potential adverse impacts on the Aboriginal and treaty rights of the Nation have been identified.

Subject to the foregoing, please be informed that the Nation does not object to the Follow up Programs. Such position is however subject to the following terms and conditions:

1. No substantial modifications shall be brought to the Follow up Programs, as described in the Documentation, without undertaking additional consultation with the Nation;
2. Any modification that affects our Aboriginal and treaty rights in Québec and Labrador, shall be submitted to a new and distinct consultation process;
3. The position adopted by the Nation is entirely based upon the Documentation and may be modified where any other relevant issues are brought to the attention of our representatives;
4. The position adopted by the Nation is based upon current needs of our members, which are subject to change in the future;
5. The Nation would like to express its questions and concerns with respect to the Follow up Programs, as explained in greater detail in Appendix A, attached hereto.

Please note, such position does not amount to consent to any future activities, and shall not affect the Aboriginal and treaty rights of the Nation.

The Nation looks forward to continue to develop, with TSMC, a mutually beneficial relationship based on trust, transparency and open communication.

Should you have any questions or wish to discuss further, please do not hesitate to communicate with myself, or Ms Lindsay Richardson at Telephone: (514) 482-6887 or Email: richardson@atmacinta.com.

Best regards,

<Original signed by>

Curtis Tootoosis
Director General, Naskapi Nation of Kawawachikamach

c.c. (by email)
Chief and Council, Naskapi Nation of Kawawachikamach
Mr George Guanish, Environment Liaison Officer
Ms Lindsay Richardson, Project Coordinator

APPENDIX A

Howse Property Mine Project

Follow Up Programs

REVIEW AND COMMENTS

Submitted on behalf of the Naskapi Nation of Kawawachikamach to:

Tata Steel Minerals Canada/Howse Minerals Limited
1000, rue Sherbrooke ouest, bureau 1120
Montréal QC H3A 3G4

July, 2018

Context

Tata Steel Minerals Canada/Howse Minerals Limited ("TSMC/HML") plans to develop the iron ore deposit at the Howse Property, with the support of adjacent infrastructure (the "Project"). The deposit is located in Labrador between Irony Mountain (Kauteitnat), Pinette Lake and Phase 1 of TSMC Direct Shipping Ore project. The total Project footprint is planned to be approximately 200 hectares. The construction phase is scheduled to begin in 2018 and last approximately seven to 10 months, followed by 15 years of operations, and five years of decommissioning and reclamation.

The main objective of this document review by the Naskapi Nation of Kawawachikamach (the "Nation") is to assess the content and the quality of the Follow up Programs and to suggest any corrective methods that may be necessary.

Review of Follow up Programs

Dust Management Strategy

Section 2.3 states that "The contract for the maintenance of the road is the responsibility of the community itself and as such, the water truck can be engaged at any and all times, and by a community-based decision." Given that there is more than one community in the region, this statement is not clear and does not specify which community it refers to.

Furthermore section 2.3 notes that "During shift rotation and during shift change, a shuttle is in place to minimize vehicles in town." The Nation suggests that TSMC offer the shuttle service twice in the morning and twice in the evening (instead of only once) to enable a little bit more flexibility, especially for those wanting to get home to their families after a long day at site.

For the respiratory protection discussed in section 2.5.1, will TSMC provide this equipment to all the workers, including contractors?

Section 3.1 maintains, "Since 2016, the Proponent implemented a policy which restricts 90% of its vehicles from travelling to Schefferville. Of those 10% with special authorization to travel to Schefferville, they do so to go to the airport (which does not pass through the aboriginal community)..." First, this does not specify which Aboriginal community, and second this is very misleading since Matimekush is directly adjacent to Schefferville.

Follow Up Program for Air Quality

The location of the equipment for the air monitoring station in Kawawachikamach has yet to be discussed with the Nation.

Section 2.4 states that "In 2018 a wash bay will be installed at the entrance of Schefferville for trucks." Is this still planned for 2018? If yes, when and where will this be installed?

Follow Up Program for Caribou

Section 2 notes "However, caribou are known to be resilient to disturbances caused by mining infrastructures and have shown plasticity in their adaptability to anthropogenically altered landscapes." Please elaborate on this statement and provide references, as this does not corroborate the Nations understanding and views.

Section 2 further states that "Within the framework of the program, researchers will involve the concerned Aboriginal communities in its research initiatives by considering their views, their traditional indigenous knowledge in the studies and by involving them in the research activities held on their traditional territories." To the best of our knowledge, Caribou Ungava has never contacted the Nation to collaborate in their research. Can TSMC confirm when this was accomplished?

Section 2.4 outlines that "If monitoring data from the radio collars indicate that some of the caribou have moved to within 20 km of the Howse Project, TSMC will institute surveys within that radius to monitor their movements in greater detail." Is this to evaluate the number of caribou in order to apply the ceasing of activities or only to monitor caribou movements?

The mitigation measure proposed Section 2.4 are mainly regarding migratory caribou, but TSMC states, "In addition, the Proponent is committed to ceasing activities under the following circumstances:

- if 10 or more sedentary caribou are within 20 km of an active pit or the processing complex;
- if five or more sedentary caribou are within 5 km of an active pit or the processing complex; and
- if one or more sedentary caribou are within 1 km of an active pit or the processing complex."

These measures refer to sedentary caribou, therefore please clarify.
Additionally, is this commitment only for caribou equipped with collars? If so, the Newfoundland and Labrador Government - Wildlife Division do not have collars on sedentary caribou in this region. Last winter the Quebec Ministry of Forestry, Fauna and Parks, undertook a survey for Woodland caribou in the northern part of their range and installed 10 collars. It is suggested that these collars be added to the present monitoring procedures.

Follow Up Program for Current Use of Lands

As TSMC is aware, in 2017 there were several complaints relating to the poor condition of the bypass road and the Nation therefore requests that the condition of the bypass road be verified in the coming weeks alongside a Naskapi.

TSMC notes in section 2.1.2 that the Regional Steering Committee on Mining Issues was established in 2015. The Nation would like to know how many times it has met. Also, what is the difference between this Committee and the Health Safety and Environment Committee?

Follow Up Program for Country Foods

How and why did TSMC choose those particular country foods for sampling (Partridge berries and Labrador Tea, Willow Ptarmigan and Snowshoe Hare, Brook and Lake Trout)?

Cultural Heritage Control Plan

Section 1.4 states that "A specific presentation will be made by the TSMC Environment Department to these Managers, Foremen, and any worker potentially working in the field." The Nation wonders the following: if this includes contractors working in the field? How often will this presentation be given? Will there be annual refreshers?

TSMC maintains, "Before they begin, TSMC Environment and Site Supervisors will conduct a preliminary ground survey of the area where earthworks are planned" (section 1.5). When is this preliminary groundwork expected to occur? TSMC should consider hiring a Naskapi and an Innu to accompany them for this survey.

Follow up Program Use of Cultural and other sites as a result of noise

No specific comments.

Follow up Program for Wetlands

TSMC notes in section 2.1.3 that "The baseline [survey] for the wetland characterization will be done in 2018." Is TSMC still on target to complete this survey in 2018?

Follow up Program for Avifauna

Section 2.4.1 states, "Should the Bank Swallow be detected in active pits, deterrence measures should be taken to render the site inhospitable outside of the breeding season…" What will TSMC do if it's found during the breeding season?

Follow up Program – Fish and Fish Habitat

TSMC explains that "The groundwater quality monitoring…will continue until the end of the decommissioning phase" (section 3.1.4). The Nation would like to know if this is after all the remediation and rehabilitation work has been complete?

Communication Strategy in line with the Decision Statement of the Canadian Environmental Assessment Agency

The majority of community members are frequent users of social media, particularly Facebook. TSMC should strongly consider using Facebook as an additional and effective way of communicating with everyone in the community.

TSMC mentions the Annual Report several times throughout this Communication Strategy yet there are no details regarding when the Nation can expect to receive a copy of this report.

The Nation would appreciate information regarding where the blasting schedule will be posted?

It is noted in section 2.4 that TSMC will "Give awareness sessions to local teams to be able to recognize what could be a structure, site, or thing of historical, archaeological, paleontological or architectural significance." The Nation agrees with this but would like to understand the frequency of these trainings and if it applies to contractors as well?

Conclusion

The Nation has reviewed the information presented in the Follow up Programs and is satisfied with the majority of its content, conditional to responses to all the above-mentioned comments.

Montréal, October 19, 2018

Mariana Trindade
Corporate environmental manager
Tata Steel Minerals Canada Limited
1000 Sherbrooke West, Suite 1120
Montreal, Qc, H3A 3G4

Subject: Proponent response to NNK comments on Howse Follow Up and Management Plans

N/D: PR185-38-18

Dear Ms Trindade,

Please find below the Proponent's answers to the Naskapi Nation of Kawawachikamach comments on the following documents:

- Dust Management Strategy;
- Follow up program for air quality;
- Follow up Program for Caribou;
- Follow up Program for Current Use of Lands;
- Follow up program for country foods;
- Cultural Heritage Control Plan;
- Follow up program use of cultural and other sites as a result of noise;
- Follow up Program for Wetlands;
- Follow up Program for Avifauna;
- Follow-Up Program - Fish and Fish Habitat;
- Communication Strategy in line with the Decision Statement of the Canadian Environmental Assessment Agency.

1 Dust Management Strategy

Naskapi Nation of Kawawachikamach Comments

Section 2.3 states that "The contract for the maintenance of the road is the responsibility of the community itself and as such, the water truck can be engaged at any and all times, and by a community-based decision." Given that there is more than one community in the region, this statement is not clear and does not specify which community it refers to.

Proponent Response

It will be specified in the final strategy that the community that at the time has the contract for the maintenance of the mining road, including dust suppression, can extend its operations to the Schefferville community locations.

Furthermore section 2.3 notes that "During shift rotation and during shift change, a shuttle is in place to minimize vehicles in town." The Nation suggests that TSMC offer the shuttle service twice in the morning and twice in the evening (instead of only once) to enable a little bit more flexibility, especially for those wanting to get home to their families after a long day at site.

Proponent Response

TSMC sets the bussing schedule based on shift times, number of workers and destination. It is aware of the NNK's desire for an additional daily bus run between site and Kawawachikamach and will continue to monitor demands and adjust bussing schedule accordingly.

For the respiratory protection discussed in section 2.5.1, will TSMC provide this equipment to all the workers, including contractors?

Proponent Response

Respiratory protection is, and will continue to be, provided to all workers, including contractors.

Section 3.1 maintains, "Since 2016, the Proponent implemented a policy which restricts 90% of its vehicles from travelling to Schefferville. Of those 10% with special authorization to travel to Schefferville, they do so to go to the airport (which does not pass through the aboriginal community)..." First, this does not specify which Aboriginal community, and second this is very misleading since Matimekush is directly adjacent to Schefferville.

Proponent Response

The final strategy will specify that road traffic between site and the airport is, via site wide alerts and signage that will be imposed under the authority of the municipality, directed through intercommunity Schefferville road, which is bypassing the residential area of the Matimekush reserve.

2 Follow Up Program for Air Quality

Naskapi Nation of Kawawachikamach Comments

The location of the equipment for the air monitoring station in Kawawachikamach has yet to be discussed with the Nation.

Proponent Response

An air monitoring station in Matimekush was installed in August 2018 and a station will be set up in Kawawachikamach in Spring/Summer 2019. Note that, to TSMC knowledge, the location of the jar was discussed several times during our weekly meeting between the community and TSMC environment team. The decision on the final location was pending community member approval. TSMC is still waiting for this information to implement the plan.

Section 2.4 states that "In 2018 a wash bay will be installed at the entrance of Schefferville for trucks." Is this still planned for 2018? If yes, when and where will this be installed?

Proponent Response

The installation of a wash bay was being planned at the entrance of Schefferville, by the Nation Innu Matimekush-Lac John, in 2018. For a variety of reasons, the project did not take off to date. In the meantime, TSMC has installed a wash bay near its camp at the DSO Site. Wash Bay attendants were being sought from Kawawachikamach, however, due to the timing of this project and the difficulty in finding attendants for just a few weeks, it will be operational starting in Spring 2019. TSMC will also continue to work with the NIMLJ towards the installation of a wash bay at the entrance of Schefferville.

3 Follow Up Program for Caribou

Naskapi Nation of Kawawachikamach Comments

Section 2 notes "However, caribou are known to be resilient to disturbances caused by mining infrastructures and have shown plasticity in their adaptability to anthropogenically altered landscapes." Please elaborate on this statement and provide references, as this does not corroborate the Nations understanding and views.

Proponent Response

The statement means that some studies have shown that caribou exhibit avoidance behavior during the time that the disturbance lasts (noise, for example), but have been known to return to the original site once the disturbance ceases. For example, Chubbs et al. (1993) suggest that caribou avoid areas where forestry activities are ongoing, but that they do not necessarily avoid those areas that have been clear cut in the past (indicating that it is the activity-period of the disturbance that is concerning). Furthermore, the same study as well as Johnson and Todd (1977) suggest that caribou can become habituated to vehicular traffic. In addition, more recent studies that have shown that caribou may become accustomed to disturbances over time (Haskell and Ballard, 2008; Johnson and Russell, 2014).

These studies indicate what MAY happen in the future. TSMC believes that the mitigation measures that it is committed to for the duration of the project will 1. Verify these predictions and 2. Mitigate any adverse effects on the herd.

Chubbs, T.E, Keith, L.B., Mahoney, S.P., McGrath, M.J. (1993) Responses of woodland caribou (Rangifer tarandus caribou) to clear-cutting in east-central Newfoundland

Haskell SP and W.B. Ballard (2008) Annual re-habituation of calving caribou to oilfields in northern Alaska: implications for expanding development. Canadian Journal of Zoology 86: 627–637

Johnson, D.R., and Todd, M.C. (1977) Summer use of a highway crossing by mountain caribou. Can. Field-Nat. 91: 312 – 314

Johnson, C.J. and D.E Russell (2014) Long-term distribution responses of a migratory caribou herd to human disturbance, Biological Conservation 177: 52-63

Section 2 further states that "Within the framework of the program, researchers will involve the concerned Aboriginal communities in its research initiatives by considering their views, their traditional indigenous knowledge in the studies and by involving them in the research activities held on their traditional territories." To the best of our knowledge, Caribou Ungava has never contacted the Nation to collaborate in their research. Can TSMC confirm when this was accomplished?

Proponent Response

HML/TSMC will pursue its financial participation in Caribou Ungava to advance research on caribou and on the effects of mining activities on the George River herd decline. The 'researchers' are part of the Caribou Ungava team – not TSMC. As a condition of this funding, the Caribou Ungava team was urged by TSMC to further involve the NNK and the NIMLJ representatives.

It is suggested that the community or their representatives can contact the Ungava Program director directly at: Steeve Cote **steeve**.**cote**@bio.ulaval.ca, to become more implicated in the program.

Section 2.4 outlines that "If monitoring data from the radio collars indicate that some of the caribou have moved to within 20 km of the Howse Project, TSMC will institute surveys within that radius to monitor their movements in greater detail." Is this to evaluate the number of caribou in order to apply the ceasing of activities or only to monitor caribou movements?

Proponent Response

This additional monitoring will have both effects: it will increase the precision of the knowledge on animal locations and, if applicable, will dictate the ceasing of activities.

The mitigation measure proposed Section 2.4 are mainly regarding migratory caribou, but TSMC states, "In addition, the Proponent is committed to ceasing activities under the following circumstances:

- if 10 or more sedentary caribou are within 20 km of an active pit or the processing complex;
- if five or more sedentary caribou are within 5 km of an active pit or the processing complex; and
- if one or more sedentary caribou are within 1 km of an active pit or the processing complex."

These measures refer to sedentary caribou, therefore please clarify. Additionally, is this commitment only for caribou equipped with collars? If so, the Newfoundland and Labrador Government - Wildlife Division do not have collars on sedentary caribou in this region. Last winter the Quebec Ministry of Forestry, Fauna and Parks, undertook a survey for Woodland caribou in the northern part of their range and installed 10 collars. It is suggested that these collars be added to the present monitoring procedures.

Proponent Response

The mitigation measures for all caribou are the same, but indeed, the monitoring measures for both ecotypes differ. Migratory caribou are collared and followed by the Ungava Program and TSMC utilize this information to localize the animals. With respect to sedentary animals, there is no such program in place. However, TSMC believes that the mitigation measures that it is committed to for the duration of the project will 1. Verify these predictions and 2. Mitigate any adverse effects on the herd.

4 Follow Up Program for Current Use of Lands

Naskapi Nation of Kawawachikamach Comments

As TSMC is aware, in 2017 there were several complaints relating to the poor condition of the bypass road and the Nation therefore requests that the condition of the bypass road be verified in the coming weeks alongside a Naskapi.

Proponent Response

A joint assessment of the bypass road was conducted on September 7th, 2018, by the NNK, NIMLJ and TSMC, and a report produced and distributed. A plan for repairs will be prepared by TSMC, in collaboration with the local communities.

TSMC notes in section 2.1.2 that the Regional Steering Committee on Mining Issues was established in 2015. The Nation would like to know how many times it has met. Also, what is the difference between this Committee and the Health Safety and Environment Committee?

Proponent Response

The Regional Steering Committee (RSC), comprised of representatives from the Ville de Schefferville, the local communities, Sûreté du Québec, the Schefferville Airport, differs from the Health, Safety and Environment Committee, which is comprised of the NNK, NIMLJ, ITUM, Innu Nation, NunatuKavut Community Council, and TSMC. The purpose of the RSC is to discuss the general areas of concern in the Schefferville region. For instance, dust control, cleanliness issues, air quality monitoring, emergency preparedness protocol.

The former met a number of times in 2015 and 2016, however a more recent meeting has yet to take place.

5 Follow Up Program for Country Foods

Naskapi Nation of Kawawachikamach Comments

How and why did TSMC choose those particular country foods for sampling (Partridge berries and Labrador Tea, Willow Ptarmigan and Snowshoe Hare, Brook and Lake Trout)?

Proponent Response

A country food survey was distributed in summer 2015. The main objective of the Country Food survey was to collect data on the country food collected and eaten by the population in the vicinity of the project for the purpose of the Health Risk Assessment. One of the secondary objectives was to use the results of the Country Food Survey to develop a sampling program for small game, fish and berries for the purpose of the Health Risk Assessment. Participants in the survey were those that collected country food in the area of interest (AOI). This covers the area where potential receptors are most likely to interact with the environment and traditional foods that may potentially be affected by the project plus an additional buffer of a minimum of 2 km. It also includes the existing DSO project. A list of 27 households that potentially collect country food in the AOI was established and they provided information on their habits. Partridge berries and Labrador Tea, Willow Ptarmigan, Snowshoe Hare, Brook and Lake Trout were identified as the main food harvested in the AOI.

Note that this information is fully provided in the Supporting Study in the Howse EIS and is available online at the CEAA website.

6 Cultural Heritage Control Plan

Naskapi Nation of Kawawachikamach Comments

Section 1.4 states that "A specific presentation will be made by the TSMC Environment Department to these Managers, Foremen, and any worker potentially working in the field." The Nation wonders the following: if this includes contractors working in the field? How often will this presentation be given? Will there be annual refreshers?

Proponent Response

The presentation will be given to every worker who will work in the field and it will be given as part of the orientation that every worker needs to follow before working on TSMC premises. There will be annual refresher.

TSMC maintains, "Before they begin, TSMC Environment and Site Supervisors will conduct a preliminary ground survey of the area where earthworks are planned" (section 1.5). When is this preliminary groundwork expected to occur? TSMC should consider hiring a Naskapi and an Innu to accompany them for this survey.

Proponent Response

As you are aware, it has been a significant challenge from TSMC to secure occasional support from Kawawachikamach for its environmental tasks.

TSMC's **Cultural Protection Pamphlet** is distributed to Mining Superintendents, which is in turn distributed to all department heads, including mining supervisors, to distribute to employees in the field. TSMC also has a Naskapi Environmental Assistant who will be assigned oversight tasks in new areas to be mined.

7 Follow up Program for Wetlands

Naskapi Nation of Kawawachikamach Comments

TSMC notes in section 2.1.3 that "The baseline [survey] for the wetland characterization will be done in 2018." Is TSMC still on target to complete this survey in 2018?

Proponent Response

The wetland survey was completed between August 21 and 28th by Groupe Hémisphères. The results have not been compiled to date.

8 Follow up Program for Avifauna

Naskapi Nation of Kawawachikamach Comments

Section 2.4.1 states, "Should the Bank Swallow be detected in active pits, deterrence measures should be taken to render the site inhospitable outside of the breeding season..." What will TSMC do if it's found during the breeding season?

Proponent Response

As committed to in the Howse EIS:

The Proponent is committed to surveying the Howse Pit area in early and mid-summer every year that the mine is in the operations phase (where vertical walls exist). Should the swallow be detected, then deterrence methods or measures should be taken to render the site inhospitable (noise, plastic covering of pit walls, etc.) for nesting. Any nest found will be protected with a buffer zone determined by a setback distance appropriate to the species, the level of the disturbance and the landscape context, until the young have permanently left the vicinity of the nest. Setback distance suggested by Environment Canada (Environment Canada, 2015) is up to 50m or more for swallow colonies.

Regular blasting should naturally deter the swallow to use the pit as a breeding site. If not, additional measures will be taken to cover the banks during the breeding season to deter the birds from using the large piles of unattended/unvegetated soil or the vertical banks in the mining pits if none of the previous mitigation measures can be provided. Swallows can be excluded from potential nest sites with barriers made from plastic sheeting (as suggested by Environment Canada), or fine-mesh wire. Nets or other barriers must be installed before swallows arrive on their breeding ground. Bank Swallow are late migrants and are expected to arrive in the Howse area at the beginning of June and will not start digging their nest as long as the soil is frozen.

9 Follow up Program - Fish and Fish Habitat

Naskapi Nation of Kawawachikamach Comments

TSMC explains that "The groundwater quality monitoring ...will continue until the end of the decommissioning phase" (section 3.1.4). The Nation would like to know if this is after all the remediation and rehabilitation work has been complete?

Proponent Response

Yes.

As indicated in the Howse EIS:

The decommissioning and reclamation phase involves the following activities:

- transportation and traffic;

- demobilization of Howse facilities and heavy machinery;

- final site restoration.

10 Communication Strategy in line with the Decision Statement of the Canadian Environmental Assessment Agency

Naskapi Nation of Kawawachikamach Comments

The majority of community members are frequent users of social media, particularly Facebook. TSMC should strongly consider using Facebook as an additional and effective way of communicating with everyone in the community.

Proponent Response

In addition to current methods of communicating via community radio is the local languages, TSMC will assess whether or not to include this popular means of communication to share information with both the NNK and the NIMLJ.

TSMC mentions the Annual Report several times throughout this Communication Strategy yet there are no details regarding when the Nation can expect to receive a copy of this report.

Proponent Response

Annual reporting on the Howse project is required under CEAA. These reports will be made public and will commence with the Howse project.

The Nation would appreciate information regarding where the blasting schedule will be posted?

Proponent Response

Blasting announcements will be made on the radio 48 hours in advance of blast periods, and band councils will also be notified. Prior to any blasting, security vehicles will be present on the bypass road to protect the local population. These methods mirror those currently in place for DSO project.

It is noted in section 2.4 that TSMC will "Give awareness sessions to local teams to be able to recognize what could be a structure, site, or thing of historical, archaeological, paleontological or architectural significance." The Nation agrees with this but would like to understand the frequency of these trainings and if it applies to contractors as well?

Proponent Response

TSMC is considering implementing and Archaeological awareness training into its Environmental Site Induction.

GroupeHemispheres

Howse Wetlands Monitoring - 2018

Tata Steel Minerals Canada Ltd.

Preliminary Technical Draft

N/D : PR185-38-18
V/D : 2200002065

December 20, 2018

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Revisions and publication		
Number	**Date**	**Modification or publication data**
00	2018-12-20	Preliminary report

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1 CONTEXT

Tata Steel Minerals Canada (TSMC) is developing an open-pit iron ore mine in Newfoundland and Labrador. About 46 Mt of iron ore will be extracted over the course of the Howse Property Iron Mine Project's lifespan (Howse Project), or about 15 years.

In 2014, an environmental assessment of the Howse Project was conducted in accordance with the requirements of the Canadian Environmental Assessment Act, 2012. As a result the Howse Project was accepted with several requirements. TSMC, in compliance with the migratory Birds Convention Act, 1994 and with the Species at Risk Act, must ensure that migratory bird populations and their habitat are in no way negatively impacted by the Howse Project implantation, operation and decommission.

In this regard and among other requirements, TSMC and Groupe Hémisphères developed a follow-up program to monitor and detect any adverse environmental effects of the Howse Project on wetland functions that support migratory birds, and to determine the effectiveness of the proposed mitigation measures.

This document presents the work mandated to Groupe Hémisphères by TSMC on wetlands characterization and water level. As a first survey that takes place prior to the Howse Project development, the specific objectives was to characterize wetlands vegetation and measures the natural water level and water level variation of wetlands in a way that enables a follow-up during the Howse Project..

2 METHODOLOGY

2.1 Wetlands Selection

Wetlands were selected based on a previous mapping done in the area. Wetlands were separated in two categories. The first category is those that may be affected by the Howse Project. Those wetlands are located close to the future installations. The second category is control wetlands, those that are located far enough from the installations that they should not be affected. This distinction was done in order to detect seasonal local changes like drought or flooding that may not be attributed to the Howse Project.

Table 1 presents a description of the ecotype in which monitoring was carried out.

Table 1. Wetland Ecotype Description

Ecotype	Wetland Type	Short Name	Description
MSF08	Swamp	Black Spruce / Tamarack Forested Swamp	Found on slopes or on flat expanses. These wetlands are not connected hydrologically. Soils are characterized by humic gleysol, with an organic horizon of less than 30 cm thickness and a water-retentive horizon (composed of silt and clay). Black Spruce dominates the arboreal stratum, along with Tamarack. The shrub layer is diverse, with Cloudberry being the most common. The herb layer is diverse.
MSF10	Bog	Black Spruce Bog	This type of wetland is hydrologically fed by precipitation and runoff only. These bogs occur in isolation or as part of larger wetland complexes. The soils are relatively thick organic soils with little decomposition. Some bogs are found on an underlaying of boulders and rocks. Trees are present but sparse, with Black Spruce being the dominant species. The shrub layer is diverse and composed of several willows and ericaceous species. Sedges are the main herbaceous species.
MSF12	Fen	Uniform Herb Fen	These fens are found on wide plains and are not generally connected to a watercourse but are usually inundated. Soils are always organic and usually fibric. Trees are absent from this fen. Black Spruce and Tamarack may be present in shrub form. Shrubs are mostly composed of ericaceous species. Sedge species dominate the herb layer.
MSF15	Fen	Uniform Fluvial Shrub Fen	This ecotype is found exclusively adjacent to water courses. It is a rich ecosystem which is enriched by inundation of the watercourse. Soils are regosol or humic gleysol. The arboreal layer is absent or negligible. The shrub layer is dense and composed of willows, Glandular Birch and the Sweet. The herb layer is diverse.

2.2 Wetland delineation

A wetland delineation was done in 2016 (Groupe Hémisphères, 2018). The limits of the wetland complex was verified during summer 2018 and wetland complex that were not previously delineated were done in 2018. The wetland delineation is shown on Figure 2.

2.3 Water Level Monitoring

2.3.1 Wells Installation

A total of 21 wells were installed in the wetlands located near the Howse project. The Table 2 details each well, Figure 1 present its components and the Figure 2 presents their locations.

A motorized soil auger (0.10 m drill; 1.25 m shaft) was used to dig into the organic matter up to the mineral and solid layers. The piezometers (0.04 m * 1.71 m) were then inserted in the holes and fixed with silica sand. A cap of bentonite was then added to limit surface water infiltration.

Finally, to limit vertical movement of the well in organic matter (ice, waterlogging, etc.), the piezometers were fixed to a 2 m rugged steel bar inserted in the mineral soil.

Table 2. Wetland Monitoring Wells Location

Well	Ecotype	Ecotype – Short Name	Depth (m)	Coordinates (NAD83/UTM 19N)	
				Latitude	Longitude
WMW01	MSF10	Black Spruce Bog	0.81	-67.10885338	54.90773052
WMW02	MSF15	Uniform Fluvial Shrub Fen	0.84	-67.11485149	54.90998019
WMW03	MSF12	Uniform Herb Fen	1.20	-67.12086831	54.91097017
WMW04	MSF12	Uniform Herb Fen	0.82	-67.12374799	54.91043943
WMW05	MSF12	Uniform Herb Fen	1.11	-67.12509565	54.90796152
WMW06	MSF12	Uniform Herb Fen	0.91	-67.12535378	54.90535409
WMW08	MSF15	Uniform Fluvial Shrub Fen	1.02	-67.1232684	54.8986742
WMW11	MSF08	Black Spruce / Tamarack Forested Swamp	0.81	-67.13570858	54.91896816
WMW12	MSF12	Uniform Herb Fen	1.22	-67.13841801	54.92031465
WMW13	MSF08	Black Spruce / Tamarack Forested Swamp	1.22	-67.1374291	54.9165781
WMW16	MSF08	Black Spruce / Tamarack Forested Swamp	0.79	-67.14139278	54.91830951
WMW18	MSF08	Black Spruce / Tamarack Forested Swamp	1.22	-67.14525253	54.91819127
WMW19	MSF08	Black Spruce / Tamarack Forested Swamp	0.71	-67.14418076	54.91726997
WMW21	MSF08	Black Spruce / Tamarack Forested Swamp	0.91	-67.14070469	54.9161988
WMW22	MSF08	Black Spruce / Tamarack Forested Swamp	0.84	-67.1457973	54.91606758
WMW24	MSF08	Black Spruce / Tamarack Forested Swamp	0.76	-67.14966342	54.91591623
WMW25	MSF12	Uniform Herb Fen	0.71	-67.15224653	54.91588043
WMW26	MSF10	Black Spruce Bog	0.81	-67.15663506	54.91741914
WMW27	MSF12	Uniform Herb Fen	1.22	-67.14865967	54.92205759
WMW29	MSF15	Uniform Fluvial Shrub Fen	0.69	-67.15529406	54.92833714
WMW30	MSF10	Black Spruce Bog	0.81	-67.15680867	54.92880363

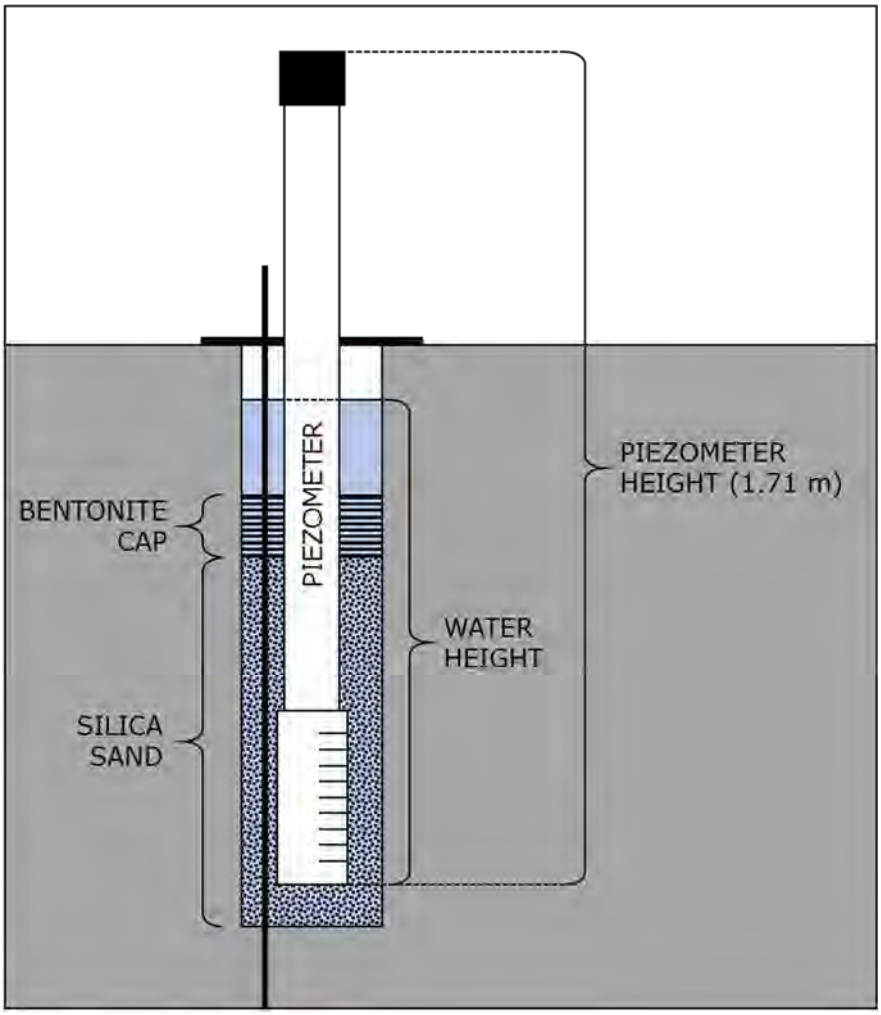


Figure 1. Sketch of a well

2.3.2 Water Level Measurements

The bottom of the well, which is fixed in the deep mineral soil was used to monitor changes in wetlands water levels. Indeed, the surface of the soil in wetlands is not at a constant altitude: it expands and swells as it is waterlogged. Hence, using the soil level next to the well as a reference altitude would give inaccurate data. While the measures using the bottom of the wells can't be used to compare levels between wells, it is the only way to assure a precise interannual comparison.

Up to four measures were taken in each well between August 17th and October 3rd to assess the natural water level variation within wetlands. The measurements were taken at least one week after the installation to make sure the water level was stabilized following the boring.

2.4 Wetland Vegetation Survey

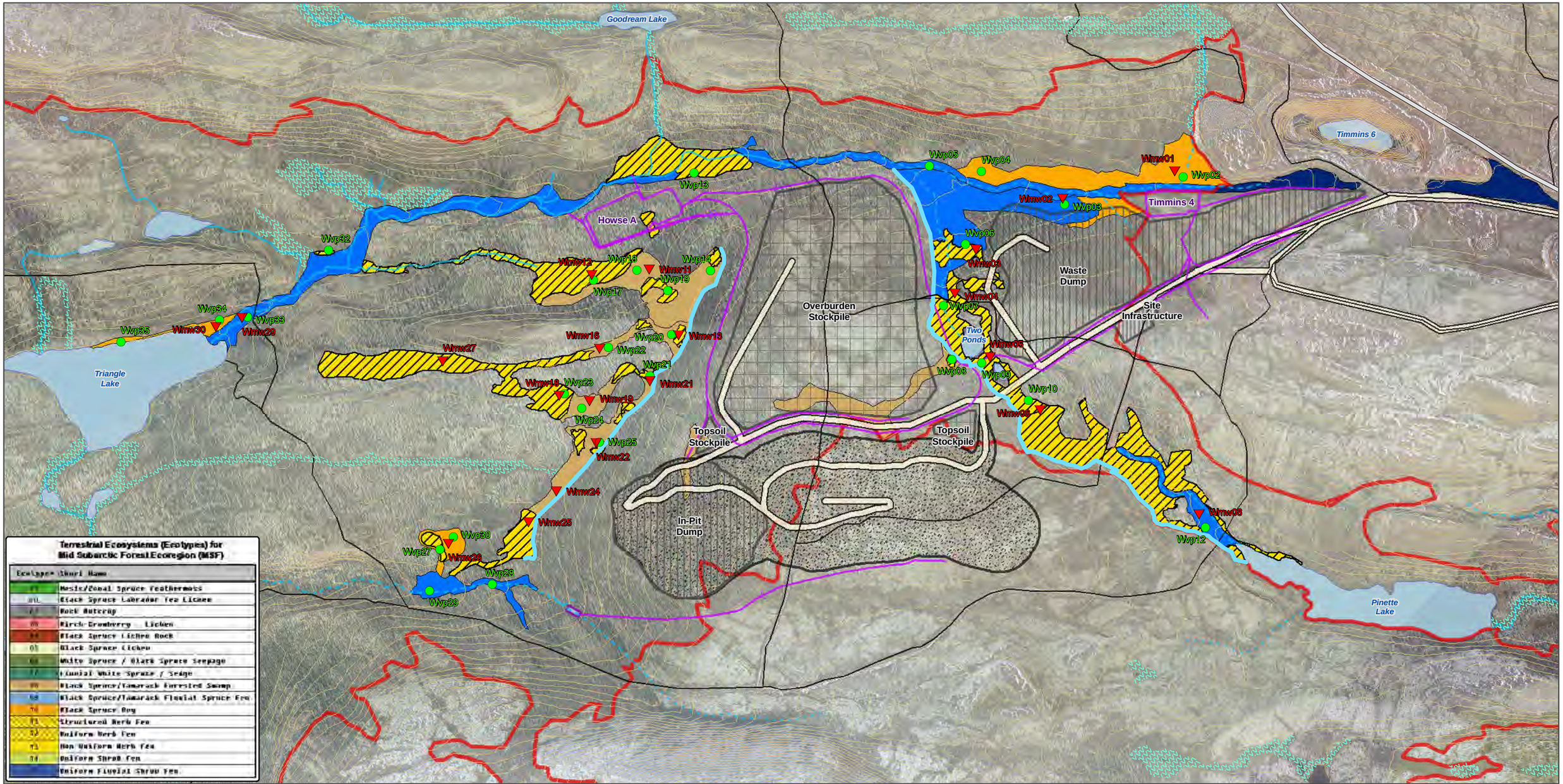
In the event that the local hydrology is affected by the Howse Project, it may have an effect on wetland vegetation. Herbs cover and species composition would be where the shift would first be detected. In order to detect a long-term change, 29 permanent vegetation survey point were implemented in wetlands close to the future installations as well as in wetlands that will not be affected.

For each permanent vegetation survey point, a marker was installed in a nearby tree. Distance and angle to the survey point were noted, so it could be revisited during periodically during the project. Table 3 presents the location of survey point.

Site and ecosystem were first described. Low vegetation (small shrubs, herbs, moss and lichen) were sampled in a 1 m^2 plot. Species were identified, and their cover percentage was noted.

Table 3. Wetland Vegetation Survey Point Location

Station	Ecotype	Ecotype – Short Name	Coordinates (NAD83/UTM 19N)	
			Latitude	Longitude
WVP02	MSF10	Black Spruce Bog	-67.1087525	54.9073847
WVP03	MSF15	Uniform Fluvial Shrub Fen	-67.1150303	54.9097968
WVP04	MSF10	Black Spruce Bog	-67.1170855	54.9127609
WVP05	MSF15	Uniform Fluvial Shrub Fen	-67.1190738	54.9142474
WVP06	MSF12	Uniform Herb Fen	-67.1210609	54.9113755
WVP07	MSF12	Uniform Herb Fen	-67.1247678	54.9104409
WVP08	MSF12	Uniform Herb Fen	-67.1268306	54.9089107
WVP09	MSF12	Uniform Herb Fen	-67.1256956	54.9080426
WVP10	MSF12	Uniform Herb Fen	-67.1253977	54.9059099
WVP12	MSF15	Uniform Fluvial Shrub Fen	-67.123564	54.8981871
WVP13	MSF12	Uniform Herb Fen	-67.1294545	54.9201857
WVP14	MSF08	Black Spruce / Tamarack Forested Swamp	-67.1331222	54.91735
WVP17	MSF12	Uniform Herb Fen	-67.1385522	54.9201654
WVP18	MSF08	Black Spruce / Tamarack Forested Swamp	-67.136273	54.9192713
WVP19	MSF12	Uniform Herb Fen	-67.1358511	54.9179795
WVP20	MSF08	Black Spruce / Tamarack Forested Swamp	-67.137662	54.9167924
WVP21	MSF12	Uniform Herb Fen	-67.1404672	54.9163355
WVP22	MSF08	Black Spruce / Tamarack Forested Swamp	-67.1409567	54.9181145
WVP23	MSF12	Uniform Herb Fen	-67.1449198	54.918118
WVP24	MSF08	Black Spruce / Tamarack Forested Swamp	-67.1448411	54.9173103
WVP25	MSF08	Black Spruce / Tamarack Forested Swamp	-67.1455879	54.9160162
WVP27	MSF12	Uniform Herb Fen	-67.157233	54.9175224
WVP28	MSF15	Uniform Fluvial Shrub Fen	-67.1565827	54.915297
WVP29	MSF15	Uniform Fluvial Shrub Fen	-67.1595474	54.9167695
WVP30	MSF10	Black Spruce Bog	-67.1561195	54.9174682
WVP32	MSF12	Uniform Herb Fen	-67.1485404	54.9277659
WVP33	MSF15	Uniform Fluvial Shrub Fen	-67.1550156	54.9282191
WVP34	MSF10	Black Spruce Bog	-67.156345	54.9288842
WVP35	MSF10	Black Spruce Bog	-67.1615262	54.9309



LEGEND

Wetland survey
- Wetland vegetation point
- Active piezometer
- Wetland Delineation

Basemap
- Contour Line (5m)
- Ecoregion Boundary
- Existing Road

Howse Proposed Infrastructures
- Proposed Howse Pit
- Proposed Topsoil/Overburden Stockpile
- Proposed Waste Dump/In-Pit Dump
- Proposed Site Infrastructure
- Proposed Sedimentation Pond
- Proposed Dissipation Pool
- Haul Road
- Proposed Ditch and Outlet

Hydrography
- Permanent Watercourse
- Intermittent Watercourse
- Storm Runoff
- Water Body
- Other Wetland

FILE, PROJECT, DATE, AUTHOR:
GH-0917 , PR185-38-18, 2018-12-20, jfbrisard

N

0 150 300 450 600
Meters

UTM 19N NAD 83 SCALE: 1:15 000

SOURCES:
Basemap
Government of Canada, NTDB, 1:50,000, 1979 Government of NL and government of Quebec, Boundary used for claims
SNC Lavalin, Groupe Hémisphères, Hydrology update, 2013

Infrastructure and Mining Components
New Millennium Capital Corp., Mining sites and roads
Howse Minerals Limited/ MET-CHEM Howse Deposit Design for General Layout, 2015

HOWSE PROPERTY PROJECT

Wetlands monitoring stations

Follow Up Program

Hemispheres
1001, rue De l'Eglise, Suite 208, Québec (QC) Canada, G1V 3V7
1453, rue Beaubien est, Bureau 301, Montréal (QC) Canada, H2G 3C6

Figure 2

3 RESULTS

3.1 Water Levels

The Table 4 shows the water height in each wells and Figure 3 presents mean height with minimum and maximum value for each wells.

Table 4. Wells readings – 2018

Wells	Water Height (m)									
	08/17	09/09	09/10	09/15	09/16	09/28	09/30	10/01	10/02	10/03
WMW01	-	0.60	-	-	0.76	-	0.82	-	-	-
WMW02	-	0.62	-	-	0.59	-	0.67	-	-	-
WMW03	1.21	1.20	-	1.18	-	-	1.19	-	-	-
WMW04	0.66	0.63	-	0.58	-	-	0.65	-	-	-
WMW05	1.03	0.92	-	1.12	-	-	1.12	-	-	-
WMW06	-	0.59	-	0.79	-	-	0.83	-	-	-
WMW08	-	-	-	-	0.94	-	-	1.02	-	-
WMW11	-	-	0.55	-	0.59	-	-	-	-	0.59
WMW12	-	-	1.12	-	1.08	-	-	-	-	1.11
WMW13	-	-	0.55	-	0.61	-	-	-	-	0.71
WMW16	-	-	0.70	-	0.67	-	-	-	-	0.71
WMW18	-	-	0.98	-	0.95	-	-	-	-	-
WMW19	-	-	0.67	-	0.56	-	-	-	-	-
WMW21	-	-	0.78	-	0.75	-	-	-	-	-
WMW22	-	0.67	-	-	0.71	-	-	-	0.74	-
WMW24	-	0.67	-	-	0.64	-	-	-	-	-
WMW25	-	0.49	-	-	0.53	-	-	-	0.53	-
WMW26	-	0.74	-	-	0.70	-	-	0.74	-	-
WMW27	-	-	1.17	-	1.15	-	-	-	1.17	-
WMW29	-	-	0.94	-	0.87	0.88	-	-	-	-
WMW30	-	-	0.72	-	0.68	0.85	-	-	-	-

During the month of august and the beginning of September, water level seemed lower throughout the area. It was higher during the measurements in late September and beginning of October. Those observations are consistent with the conditions noted during fieldwork.

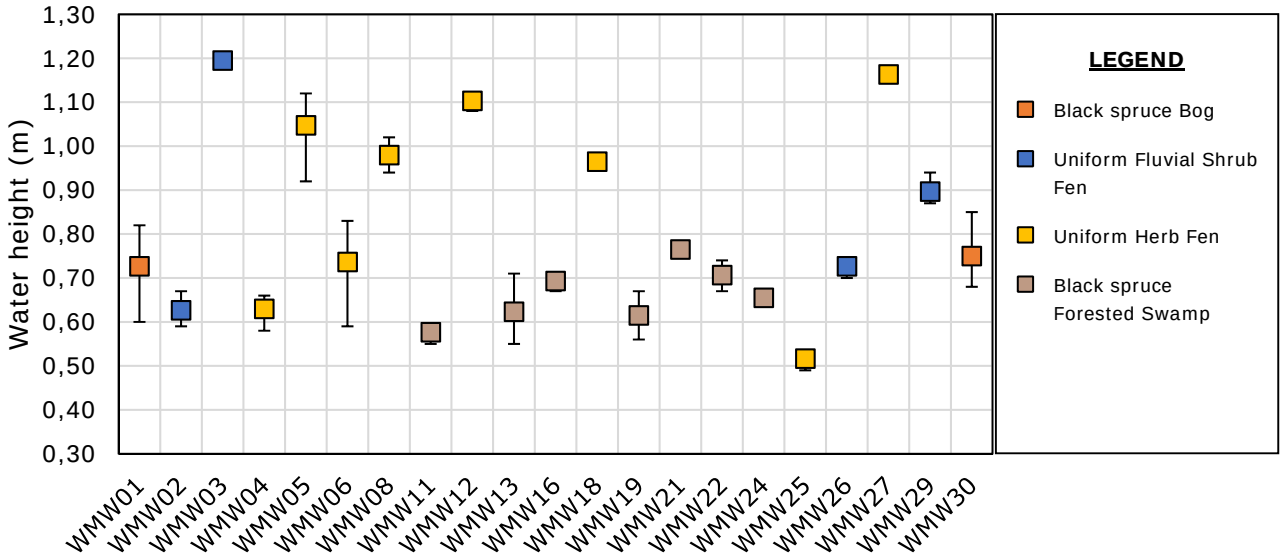


Figure 3. Wetland water height natural variation – Summer 2018

3.2 Wetland Vegetation Characterization

Appendix I presents the results of the wetland vegetation survey. These are considered to be the reference for the future monitoring. It will be possible to compare species richness and cover between each station. Table 5 presents species distribution for each station per ecotype. Wetland status have been extracted from the proposed lists for arctic and subarctic species (FloraQuebeca, 2018).

Number and proportion on species for each class of wetland status will be one of the results that will be used to compare vegetation evolution following the subsequent monitoring. Comparison of species cover will also be used.

Table 5. Species distribution per wetland status

Ecotype	Station	Species wetland status						Total
		NI		FAC		OBL		
		number	%	number	%	number	%	
MSF08	WVP14	9	56.3	5	31.3	2	12.5	16
	WVP18	7	46.7	5	33.3	3	20.0	15
	WVP20	1	6.7	9	60.0	5	33.3	15
	WVP22	3	30.0	4	40.0	3	30.0	10
	WVP24	2	20.0	3	30.0	5	50.0	10
	WVP25	3	23.1	4	30.8	6	46.2	13
	Mean	**4.2**	**31.6**	**5**	**38.0**	**4**	**30.4**	**13.2**
MSF10	WVP02	3	33.3	3	33.3	3	33.3	9
	WVP04	2	14.3	7	50.0	5	35.7	14
	WVP30	5	41.7	5	41.7	2	16.7	12
	WVP34	2	15.4	5	38.5	6	46.2	13
	WVP35	13	68.4	4	21.1	2	10.5	19
	Mean	**5**	**37.3**	**4.8**	**35.8**	**3.6**	**26.9**	**13.4**

Ecotype	Station	Species wetland status						Total
		NI		FAC		OBL		
		number	%	number	%	number	%	
MSF12	WVP06			2	33.3	4	66.7	6
	WVP07	2	14.3	7	50.0	5	35.7	14
	WVP08	3	30.0	3	30.0	4	40.0	10
	WVP09	6	40.0	4	26.7	5	33.3	15
	WVP10			3	42.9	4	57.1	7
	WVP13	2	25.0	3	37.5	3	37.5	8
	WVP17			3	37.5	5	62.5	8
	WVP19	4	26.7	6	40.0	5	33.3	15
	WVP21	2	14.3	6	42.9	6	42.9	14
	WVP23			2	33.3	4	66.7	6
	WVP32	2	28.6	3	42.9	2	28.6	7
	Mean	**3.0**	**30.0**	**3.8**	**38.2**	**4.3**	**42.7**	**10.0**
MSF15	WVP03	4	25.0	7	43.8	5	31.3	16
	WVP05	4	30.8	7	53.8	2	15.4	13
	WVP12	6	85.7	1	14.3			7
	WVP27	2	22.2	3	33.3	4	44.4	9
	WVP28	7	46.7	5	33.3	3	20.0	15
	WVP29	4	33.3	6	50.0	2	16.7	12
	WVP33	7	46.7	6	40.0	2	13.3	15
	Mean	**4.9**	**39.1**	**5**	**40.2**	**3**	**24.1**	**12.4**

NI: Species not indicator of wetland
FAC: Species facultative of wetland
OBL Species obligated of wetland

4 DISCUSSION & CONCLUSION

The decision statement established several conditions that must be respected prior and throughout the Howse Project. As part of those conditions, and as a first survey, wetlands vegetation was characterized, and wetlands natural water level was measured.

To assess a possible dewatering of wetlands, groundwater level in each wetland piezometer should be measured every month prior to the operation phase and then every two weeks during operations. As explained in section 2.3.2, since the piezometer's length is known, a **simple measure of the distance from the top of the PVC tube to the surface of water** should be recorded and substracted from total length, as shown in Figure 1. There is an example of how to record water level in Appendix II.

Regarding wetland vegetation, the next survey must be conducted in five years, in 2023, to assess any change in wetland functions. The same protocol should be followed to limit bias.

5 QUALITY ASSURANCE

Groupe Hémisphères possesses an internal quality control program which is derived from ISO 9001 standards. This is based on a review and approval of all concepts and document production by a senior professional. The program considers the management, the control of documentation, the personnel's continuous training, as well as the quality assurance of the deliverables. The system also includes a tight control of the field work and the prevention and safety measures specific to the project.

6 BIBLIOGRAPHY

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Groupe Hémisphères (2016) *DSO3 and DSO4 Wetland management report.* Technical report for Tata Steel Minerals of Canada, 19 p. and 2 appendices.

APPENDIX

Appendix I

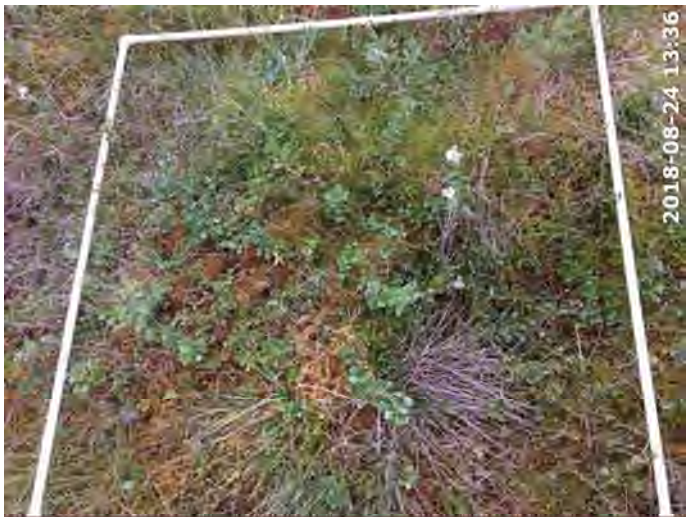
Wetland Vegetation Station

WVP02	
	
Marker position	**Quadrat**
Marker position :	Marker in a tamarack
Quadrat position :	12,40 m at 34 °

Site description	
Ecotype	FSM10 - Black Spruce Bog
Drainage	Poorly drained
Surficial material	Fibric over Boulders, Silt, Sand
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Salix pellita	Satiny willow	40		
Rubus arcticus subsp.arcticus	Arctic rasberry	4		
Viola macloskeyi	Small white violet		25	
Calamagrostis canadensis	Bluejoint reedgrass		20	
Carex magellanica	Boreal bog sedge		15	
Juncus effusus	Soft rush		5	
Agrostis mertensii	Northern bentgrass		4	
Sphagnum sp.	Sphagnum			98
Polytrichum sp.	Hollyfern			1

WVP03	
	
Marker position	**Quadrat**
Marker position :	Marker in a tamarack
Quadrat position :	8,50 m at 250 °

Site description	
Ecotype	FSM15 - Uniform Fluvial Shrub Fen
Drainage	Poorly drained
Surficial material	Mesic over Boulders, Silt
Soil class	Humic Gleysol
Texture	Mesic

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Salix pellita	Satiny willow	10		
Betula glandulosa	Glandular birch	7		
Salix pedicellaris	Bog willow	5		
Larix laricina	Tamarack	4		
Kalmia polifolia	Pale bog laurel	2		
Lonicera villosa	Mountain fly honeysuckle	1		
Rubus chamaemorus	Cloudberry	1		
Deschampsia cespitosa	Tufted hairgrass		7	
Trichophorum cespitosum	Tufted clubrush		7	
Carex pauciflora	Few-flower sedge		5	
Eurybia radula	Low rough aster		3	
Calamagrostis canadensis	Bluejoint reedgrass		2	
Coptis trifolia	Goldthread		1	
Sphagnum sp.	Sphagnum			95
Polytrichum sp.	Hollyfern			3
Tomentypnum nitens	Golden fuzzy fen moss			3

WVP04	
	
Marker position	**Quadrat**
Marker position :	Marker in a black spruce
Quadrat position :	4,90 m at 182 °

Site description	
Ecotype	FSM10 – Black Spruce Bog
Drainage	Poorly drained
Surficial material	Mesicover Boulders, Silt , Sand
Soil class	Humic Gleysol
Texture	Mesic

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Rubus chamaemorus	Cloudberry	20		
Betula glandulosa	Glandular birch	15		
Larix laricina	Tamarack	10		
Kalmia polifolia	Pale bog laurel	4		
Lonicera villosa	Mountain fly honeysuckle	1		
Salix pellita	Satiny willow	1		
Vaccinium oxycoccos	Small cranberry	0,1		
Carex limosa	Mud sedge		5	
Carex pauciflora	Few-flower sedge		5	
Equisetum sylvaticum	Woodland horsetail		5	
Eurybia radula	Low rough aster		4	
Juncus effusus	Soft rush		3	
Sphagnum sp.	Sphagnum			99
Polytrichum sp.	Hollyfern			1

WVP05	
	
Marker position	**Quadrat**
Marker position :	Marker in a black spruce
Quadrat position :	5,35 m at 225 °

Site description	
Ecotype	FSM15 - Uniform Fluvial Shrub Fen
Drainage	Poorly drained
Surficial material	Mesic over Boulders, Silt
Soil class	Humic Gleysol
Texture	Mesic

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Salix pellita	Satiny willow	40		
Betula glandulosa	Glandular birch	35		
Lonicera villosa	Mountain fly honeysuckle	4		
Rubus arcticus subsp.arcticus	Arctic rasberry	3		
Deschampsia cespitosa	Tufted hairgrass		5	
Equisetum sylvaticum	Woodland horsetail		5	
Petasites frigidus var. palmatus	Palmate coltsfoot		5	
Solidago macrophylla	Large-leaved goldenrod		5	
Eurybia radula	Low rough aster		4	
Coptis trifolia	Goldthread		1	
Sphagnum sp.	Sphagnum			80
Polytrichum sp.	Hollyfern			15
Tomentypnum nitens	Golden fuzzy fen moss			5

WVP06	
	
Marker position	**Quadrat**
Marker position :	Marker in a black spruce
Quadrat position :	16,50 m at 250 °

Site description	
Ecotype	FSM 12 - Uniform Herb Fen
Drainage	Very poorly drained
Surficial material	Fibric
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Kalmia polifolia	Pale bog laurel	7		
Vaccinium oxycoccos	Small cranberry	0,1		
Trichophorum cespitosum	Tufted clubrush		30	
Carex limosa	Mud sedge		20	
Carex rostrata	Swollen beaked sedge		4	
Sphagnum sp.	Sphagnum			90

WVP07

Marker position

Quadrat

Marker position :	Marker in a tamarack
Quadrat position :	14,40 m at 290 °

Site description	
Ecotype	FSM 12 - Uniform Herb Fen
Drainage	Very poorly drained
Surficial material	Fibric
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Betula glandulosa	Glandular birch	5		
Larix laricina	Tamarack	3		
Kalmia polifolia	Pale bog laurel	1		
Rubus arcticus subsp.arcticus	Arctic rasberry	1		
Rubus chamaemorus	Cloudberry	1		
Carex limosa	Mud sedge		10	
Juncus effusus	Soft rush		10	
Coptis trifolia	Goldthread		7	
Carex oligosperma	Few-feeded sedge		5	
Trichophorum cespitosum	Tufted clubrush		5	
Carex aquatilis	Water sedge		3	
Maianthemum trifolium	Three-leaved false Solomon's-seal		1	
Sphagnum sp.	Sphagnum			80
Tomentypnum nitens	Golden fuzzy fen moss			2

WVP08	
	
Marker position	**Quadrat**
Marker position :	Marker in a tamarack
Quadrat position :	X m at X °

Site description	
Ecotype	FSM12 - Uniform Herb Fen
Drainage	Poorly drained
Surficial material	Fibric
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Betula glandulosa	Glandular birch	2		
Rubus chamaemorus	Cloudberry	1		
Vaccinium oxycoccos	Small cranberry	0,1		
Trichophorum cespitosum	Tufted clubrush		20	
Juncus effusus	Soft rush		15	
Carex pauciflora	Few-flower sedge		10	
Coptis trifolia	Goldthread		10	
Carex aquatilis	Water sedge		2	
Sphagnum sp.	Sphagnum			95
Polytrichum sp.	Hollyfern			0,5

WVP09

Marker position

Quadrat

Marker position :	Marker in a tamarack
Quadrat position :	8,80 m at 180 °

Site description	
Ecotype	FSM12 - Uniform Herb Fen
Drainage	Very poorly drained
Surficial material	Fibric
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Betula glandulosa	Glandular birch	5		
Kalmia polifolia	Pale bog laurel	3		
Vaccinium uliginosum	Alpine bilberry	3		
Larix laricina	Tamarack	2		
Empetrum nigrum	Black crowberry	1		
Vaccinium oxycoccos	Small cranberry	0,5		
Carex limosa	Mud sedge		20	
Carex oligosperma	Few-feeded sedge		15	
Carex pauciflora	Few-flower sedge		10	
Coptis trifolia	Goldthread		10	
Trichophorum cespitosum	Tufted clubrush		10	
Lysimachia borealis	Northern starflower		3	
Sphagnum sp.	Sphagnum			80
Mousse sp.	Moss			3
Tomentypnum nitens	Golden fuzzy fen moss			1

WVP10

Marker position

Quadrat

Marker position :	Marker in a black spruce
Quadrat position :	13,80 m at 195 °

Site description	
Ecotype	FSM12 - Uniform Herb Fen
Drainage	Very poorly drained
Surficial material	Fibric
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Kalmia polifolia	Pale bog laurel	3		
Vaccinium oxycoccos	Small cranberry	0,1		
Carex limosa	Mud sedge		25	
Carex rostrata	Swollen beaked sedge		15	
Trichophorum cespitosum	Tufted clubrush		10	
Sphagnum sp.	Sphagnum			80
Tomentypnum nitens	Golden fuzzy fen moss			2

WVP12

Marker position

Quadrat

Marker position :	Marker in a black spruce
Quadrat position :	9 m at 330 °

Site description	
Ecotype	MSF15 - Uniform Fluvial Shrub Fen
Drainage	Imperfectly drained
Surficial material	Mesic over Boulders, Silt, Sand
Soil class	Humic Gleysol
Texture	Mesic

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Betula glandulosa	Glandular birch	40		
Deschampsia cespitosa	Tufted hairgrass		70	
Solidago macrophylla	Large-leaved goldenrod		20	
Coptis trifolia	Goldthread		5	
Chamaenerion angustifolium	Fireweed		2	
Pleurozium schreberi	Schreber's big red stem moss			30
Polytrichum sp.	Hollyfern			5

WVP13	
	
Marker position	**Quadrat**
Marker position :	Marker in a tamarack
Quadrat position :	12,50 m at 13 °

Site description	
Ecotype	MSF12 - Uniform Herb Fen
Drainage	Very poorly drained
Surficial material	Fibric
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Salix pellita	Satiny willow	30		
Betula glandulosa	Glandular birch	10		
Kalmia polifolia	Pale bog laurel	3		
Carex aquatilis	Water sedge		20	
Carex limosa	Mud sedge		10	
Sphagnum sp.	Sphagnum			90
Tomentypnum nitens	Golden fuzzy fen moss			7
Polytrichum sp.	Hollyfern			3
Salix pellita	Satiny willow	30		

WVP14

Marker position

Quadrat

Marker position :	Marker in a black spruce
Quadrat position :	3,58 m at 345 °

Site description	
Ecotype	MSF08 - Black Spruce / Tamarack Forested Swamp
Drainage	Poorly drained
Surficial material	Mesic over Silt, Sand
Soil class	Humic Gleysol
Texture	Mesic

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Vaccinium uliginosum	Alpine bilberry	25		
Rhododendron groenlandicum	Common Labrador tea	5		
Salix pedicellaris	Bog willow	5		
Betula glandulosa	Glandular birch	4		
Empetrum nigrum	Black crowberry	2		
Vaccinium vitis-idaea	Mountain cranberry	0,5		
Equisetum sylvaticum	Woodland horsetail		10	
Carex canescens	Hoary sedge		5	
Petasites frigidus var. palmatus	Palmate coltsfoot		5	
Calamagrostis canadensis	Bluejoint reedgrass		3	
Cornus canadensis	Bunchberry		3	
Solidago macrophylla	Large-leaved goldenrod		2	
Coptis trifolia	Goldthread		1	
Deschampsia cespitosa	Tufted hairgrass		1	
Lycopodium annotinum	Stiff clubmoss		1	
Sphagnum sp.	Sphagnum			100

WVP17	
	
Marker position	**Quadrat**
Marker position :	Marker in a tamarack
Quadrat position :	10,95 m at 9 °

Site description	
Ecotype	MSF12 - Uniform Herb Fen
Drainage	Very poorly drained
Surficial material	Fibric
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Andromeda polifolia var. latifolia	Glaucous-leaved bog rosemary	7		
Kalmia polifolia	Pale bog laurel	2		
Vaccinium oxycoccos	Small cranberry	0,5		
Carex limosa	Mud sedge		25	
Trichophorum cespitosum	Tufted clubrush		15	
Carex oligosperma	Few-feeded sedge		5	
Sphagnum sp.	Sphagnum			70
Tomentypnum nitens	Golden fuzzy fen moss			15

WVP18	
	
Marker position	**Quadrat**
Marker position :	Marker in a black spruce
Quadrat position :	5,60 m at 232 °

Site description	
Ecotype	MSF08 - Black Spruce / Tamarack Forested Swamp
Drainage	Poorly drained
Surficial material	Mesic over Silt, Sand
Soil class	Humic Gleysol
Texture	Mesic

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Betula glandulosa	Glandular birch	10		
Salix pedicellaris	Bog willow	10		
Salix pellita	Satiny willow	5		
Petasites frigidus var. palmatus	Palmate coltsfoot		10	
Viola macloskeyi	Small white violet		7	
Calamagrostis canadensis	Bluejoint reedgrass		5	
Linnaea borealis	Twinflower		5	
Coptis trifolia	Goldthread		4	
Equisetum sylvaticum	Woodland horsetail		4	
Chamaenerion angustifolium	Fireweed		3	
Deschampsia cespitosa	Tufted hairgrass		3	
Cornus canadensis	Bunchberry		2	
Solidago macrophylla	Large-leaved goldenrod		2	
Sphagnum sp.	Sphagnum			90
Tomentypnum nitens	Golden fuzzy fen moss			5

WVP19

Marker position

Quadrat

Marker position :	Marker in a black spruce
Quadrat position :	8,80 m at 203 °

Site description	
Ecotype	MSF12 - Uniform Herb Fen
Drainage	Very poorly drained
Surficial material	Fibric
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Vaccinium uliginosum	Alpine bilberry	8		
Lonicera villosa	Mountain fly honeysuckle	5		
Kalmia polifolia	Pale bog laurel	4		
Vaccinium oxycoccos	Small cranberry	0,5		
Trichophorum cespitosum	Tufted clubrush		20	
Carex limosa	Mud sedge		15	
Eurybia radula	Low rough aster		15	
Maianthemum trifolium	Three-leaved false Solomon's-seal		15	
Deschampsia cespitosa	Tufted hairgrass		10	
Lysimachia borealis	Northern starflower		1	
Agrostis mertensii	Northern bentgrass		0,5	
Coptis trifolia	Goldthread		0,5	
Sphagnum sp.	Sphagnum			80
Scorpidium scorpioides	Scorpion feather moss			5
Tomentypnum nitens	Golden fuzzy fen moss			5

WVP20	
	
Marker position	**Quadrat**
Marker position :	Marker in a black spruce
Quadrat position :	7,45 m at 126 °

Site description	
Ecotype	MSF08 - Black Spruce / Tamarack Forested Swamp
Drainage	Very poorly drained
Surficial material	Fibric over Silt , Sand , Boulders
Soil class	Humic Gleysol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Betula glandulosa	Glandular birch	3		
Lonicera villosa	Mountain fly honeysuckle	3		
Kalmia polifolia	Pale bog laurel	2		
Rubus chamaemorus	Cloudberry	2		
Vaccinium oxycoccos	Small cranberry	0,5		
Trichophorum cespitosum	Tufted clubrush		30	
Maianthemum trifolium	Three-leaved false Solomon's-seal		7	
Carex pauciflora	Few-flower sedge		5	
Equisetum sylvaticum	Woodland horsetail		4	
Juncus effusus	Soft rush		4	
Petasites frigidus var. palmatus	Palmate coltsfoot		4	
Carex aquatilis	Water sedge		3	
Tomentypnum nitens	Golden fuzzy fen moss			25
Scorpidium scorpioides	Scorpion feather moss			15

WVP21

Marker position

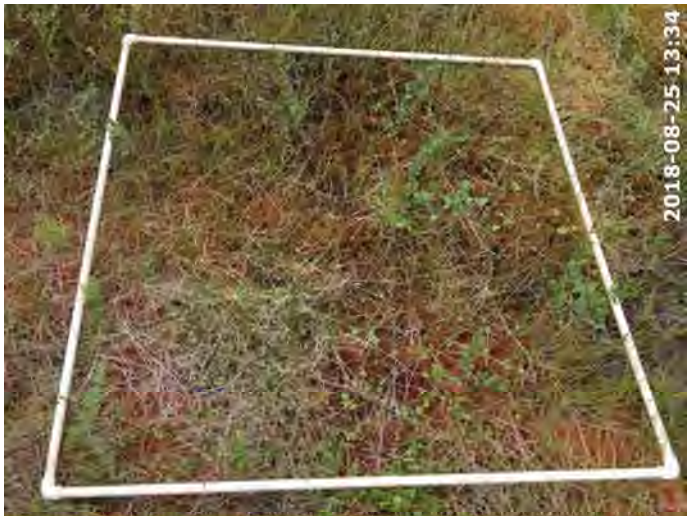
Quadrat

Marker position :	Marker in a tamarack
Quadrat position :	6,75 m at 9 °

Site description	
Ecotype	MSF12 - Uniform Herb Fen
Drainage	Poorly drained
Surficial material	Mesic over Silt, Sand
Soil class	Humic Gleysol
Texture	Mesic

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Lonicera villosa	Mountain fly honeysuckle	5		
Vaccinium uliginosum	Alpine bilberry	3		
Kalmia polifolia	Pale bog laurel	2		
Vaccinium oxycoccos	Small cranberry	1		
Trichophorum cespitosum	Tufted clubrush		20	
Carex limosa	Mud sedge		15	
Eriophorum virginicum	Tawny cottongrass		5	
Deschampsia cespitosa	Tufted hairgrass		3	
Carex pauciflora	Few-flower sedge		2	
Coptis trifolia	Goldthread		2	
Platanthera dilatata	Tall white bog orchid		1	
Viola macloskeyi	Small white violet		0,5	
Sphagnum sp.	Sphagnum			80
Tomentypnum nitens	Golden fuzzy fen moss			2

WVP22	
	
Marker position	**Quadrat**
Marker position :	Marker in a black spruce
Quadrat position :	6,30 m at 21 °

Site description	
Ecotype	MSF08 - Black Spruce / Tamarack Forested Swamp
Drainage	Poorly drained
Surficial material	Fibric over Silt, Sand
Soil class	Humic Gleysol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Betula glandulosa	Glandular birch	8		
Kalmia polifolia	Pale bog laurel	4		
Larix laricina	Tamarack	4		
Vaccinium oxycoccos	Small cranberry	0,5		
Juncus effusus	Soft rush		10	
Carex limosa	Mud sedge		5	
Coptis trifolia	Goldthread		5	
Carex pauciflora	Few-flower sedge		3	
Lysimachia borealis	Northern starflower		1	
Sphagnum sp.	Sphagnum			95

WVP23	
	
Marker position	**Quadrat**

Marker position :	Marker in a tamarack
Quadrat position :	11,40 m at 34 °

Site description	
Ecotype	MSF12 - Uniform Herb Fen
Drainage	Very poorly drained
Surficial material	Fibric over Boulders
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Kalmia polifolia	Pale bog laurel	2		
Vaccinium oxycoccos	Small cranberry	1		
Carex limosa	Mud sedge		20	
Maianthemum trifolium	Three-leaved false Solomon's-seal		10	
Eriophorum russeolum	Russet cottongrass		5	
Sphagnum sp.	Sphagnum			95

WVP24	
	
Marker position	**Quadrat**
Marker position :	Marker in a black spruce
Quadrat position :	8,40 m at 272 °

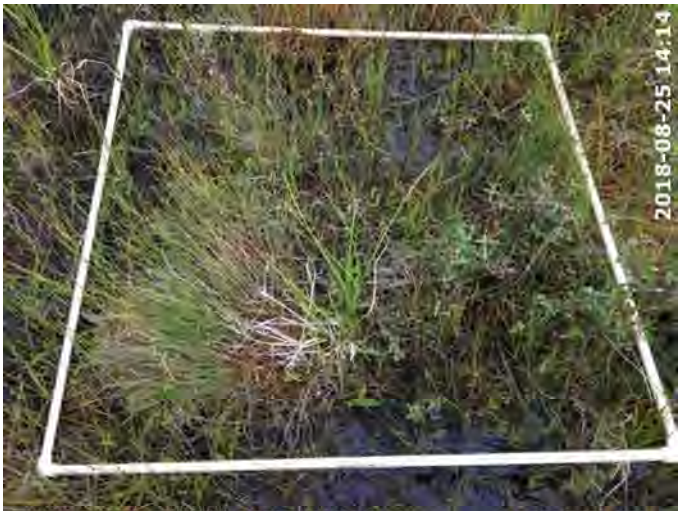
Site description	
Ecotype	MSF08 - Black Spruce / Tamarack Forested Swamp
Drainage	Very poorly drained
Surficial material	Fibric over Silt , Boulders, Sand
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Larix laricina	Tamarack	15		
Andromeda polifolia var. latifolia	Glaucous-leaved bog rosemary	4		
Kalmia polifolia	Pale bog laurel	4		
Vaccinium oxycoccos	Small cranberry	1		
Vaccinium uliginosum	Alpine bilberry	1		
Carex limosa	Mud sedge		25	
Trichophorum cespitosum	Tufted clubrush		25	
Carex pauciflora	Few-flower sedge		5	
Mousse sp.	Moss			25
Sphagnum sp.	Sphagnum			20

WVP25

Marker position



Quadrat

Marker position :	Marker in a black spruce
Quadrat position :	6,60 m at 225 °

Site description	
Ecotype	MSF08 - Black Spruce / Tamarack Forested Swamp
Drainage	Very poorly drained
Surficial material	Fibric over Silt, Boulders, Sand
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Kalmia polifolia	Pale bog laurel	7		
Betula glandulosa	Glandular birch	3		
Picea mariana	Black spruce	2		
Vaccinium oxycoccos	Small cranberry	1		
Carex limosa	Mud sedge		10	
Maianthemum trifolium	Three-leaved false Solomon's-seal		10	
Trichophorum cespitosum	Tufted clubrush		10	
Juncus effusus	Soft rush		5	
Carex rostrata	Swollen beaked sedge		3	
Eriophorum russeolum	Russet cottongrass		3	
Sphagnum sp.	Sphagnum			40
Tomentypnum nitens	Golden fuzzy fen moss			2
Polytrichum sp.	Hollyfern			0,5

WVP27

Marker position

Quadrat

Marker position :	Marker in a tamarack
Quadrat position :	13,3 m at 75 °

Site description	
Ecotype	MSF10 - Black Spruce Bog
Drainage	Very poorly drained
Surficial material	Fibric
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Vaccinium uliginosum	Alpine bilberry	2		
Betula glandulosa	Glandular birch	1		
Kalmia polifolia	Pale bog laurel	1		
Rubus chamaemorus	Cloudberry	1		
Vaccinium oxycoccos	Small cranberry	0,5		
Carex limosa	Mud sedge		40	
Carex oligosperma	Few-feeded sedge		20	
Maianthemum trifolium	Three-leaved false Solomon's-seal		2	
Sphagnum sp.	Sphagnum			100

WVP28	
	
Marker position	**Quadrat**
Marker position :	Marker in a tamarack
Quadrat position :	2,60 m at 60 °

Site description	
Ecotype	MSF15 - Uniform Fluvial Shrub Fen
Drainage	Very poorly drained
Surficial material	Mesic over Boulders, Silt
Soil class	Fibrisol
Texture	Mesic

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Betula glandulosa	Glandular birch	15		
Salix pellita	Satiny willow	5		
Rubus chamaemorus	Cloudberry	4		
Rubus arcticus subsp.arcticus	Arctic rasberry	2		
Petasites frigidus var. palmatus	Palmate coltsfoot		20	
Carex trisperma	Three-seeded sedge		10	
Cornus canadensis	Bunchberry		5	
Solidago macrophylla	Large-leaved goldenrod		5	
Viola macloskeyi	Small white violet		5	
Carex limosa	Mud sedge		3	
Calamagrostis canadensis	Bluejoint reedgrass		2	
Coptis trifolia	Goldthread		2	
Chamaenerion angustifolium	Fireweed		1	
Galium triflorum	Three-flowered bedstraw		1	
Sphagnum sp.	Sphagnum			95

WVP29	
	
Marker position	**Quadrat**
Marker position :	Marker in a tamarack
Quadrat position :	1,5 m at 330 °

Site description	
Ecotype	MSF15 - Uniform Fluvial Shrub Fen
Drainage	Poorly drained
Surficial material	Mesic over Boulders, Silt, Sand
Soil class	Humic Gleysol
Texture	Mesic

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Salix pellita	Satiny willow	80		
Betula glandulosa	Glandular birch	10		
Lonicera villosa	Mountain fly honeysuckle	5		
Rubus arcticus subsp.arcticus	Arctic rasberry	2		
Carex trisperma	Three-seeded sedge		40	
Deschampsia cespitosa	Tufted hairgrass		5	
Viola macloskeyi	Small white violet		5	
Calamagrostis canadensis	Bluejoint reedgrass		3	
Chamaenerion angustifolium	Fireweed		3	
Petasites frigidus var. palmatus	Palmate coltsfoot		2	
Galium triflorum	Three-flowered bedstraw		1	
Sphagnum sp.	Sphagnum			100

WVP30

Marker position

Quadrat

Marker position :	Marker in a black spruce
Quadrat position :	0,80 m at 50 °

Site description	
Ecotype	MSF10 - Black Spruce Bog
Drainage	Poorly drained
Surficial material	Mesic over Silt, Sand, Boulders
Soil class	Humic Gleysol
Texture	Mesic

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Rubus chamaemorus	Cloudberry	70		
Kalmia polifolia	Pale bog laurel	20		
Betula glandulosa	Glandular birch	15		
Larix laricina	Tamarack	8		
Vaccinium vitis-idaea	Mountain cranberry	1		
Vaccinium oxycoccos	Small cranberry	0,5		
Carex pauciflora	Few-flower sedge		1	
Sphagnum sp.	Sphagnum			95
Polytrichum sp.	Hollyfern			3
Cladonia sp.	Reindeer lichen			1
Pleurozium schreberi	Schreber's big red stem moss			1
Tomentypnum nitens	Golden fuzzy fen moss			1

WVP32	
	
Marker position	**Quadrat**
Marker position :	Marker in a black spruce
Quadrat position :	6,60 m at 260 °

Site description	
Ecotype	MSF12 - Uniform Herb Fen
Drainage	Very poorly drained
Surficial material	Fibric
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Salix pellita	Satiny willow	40		
Rubus arcticus subsp.arcticus	Arctic rasberry	3		
Carex aquatilis	Water sedge		35	
Calamagrostis canadensis	Bluejoint reedgrass		5	
Sphagnum sp.	Sphagnum			85
Tomentypnum nitens	Golden fuzzy fen moss			3
Mnium sp.	Leafy moss			2

WVP33	
	
Marker position	**Quadrat**
Marker position :	Marker in a black spruce
Quadrat position :	10,10 m at 5 °

Site description	
Ecotype	MSF15 - Uniform Fluvial Shrub Fen
Drainage	Poorly drained
Surficial material	Mesic over Boulders, Silt, Sand
Soil class	Humic Gleysol
Texture	Mesic

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Salix pellita	Satiny willow	95		
Lonicera villosa	Mountain fly honeysuckle	0,5		
Carex sp.	Sedge		15	
Solidago macrophylla	Large-leaved goldenrod		15	
Equisetum sylvaticum	Woodland horsetail		5	
Fragaria vesca subsp. americana	American woodland strawberry		5	
Petasites frigidus var. palmatus	Palmate coltsfoot		5	
Calamagrostis canadensis	Bluejoint reedgrass		3	
Mitella nuda	Naked mitrewort		3	
Achillea borealis	Wooly yarrow		2	
Chamaenerion angustifolium	Fireweed		1	
Luzula parviflora	Small-flowered woodrush		1	
Viola macloskeyi	Small white violet		1	
Coptis trifolia	Goldthread		0,5	
Pleurozium schreberi	Schreber's big red stem moss			40

WVP34

Marker position

Quadrat

Marker position :	Marker in a tamarack
Quadrat position :	12 m at 220 °

Site description	
Ecotype	MSF10 - Black Spruce Bog
Drainage	Poorly drained
Surficial material	Fibric over Boulders
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Salix pedicellaris	Bog willow	7		
Betula glandulosa	Glandular birch	4		
Larix laricina	Tamarack	3		
Kalmia polifolia	Pale bog laurel	2		
Vaccinium uliginosum	Alpine bilberry	1		
Vaccinium oxycoccos	Small cranberry	0,5		
Carex aquatilis	Water sedge		25	
Carex limosa	Mud sedge		5	
Carex pauciflora	Few-flower sedge		3	
Juncus effusus	Soft rush		1	
Maianthemum trifolium	Three-leaved false Solomon's-seal		1	
Sphagnum sp.	Sphagnum			70
Tomentypnum nitens	Golden fuzzy fen moss			10

WVP35	
	
Marker position	**Quadrat**
Marker position :	Marker in a black spruce
Quadrat position :	8,70 m at 35 °

Site description	
Ecotype	MSF10 - Black Spruce Bog
Drainage	Poorly drained
Surficial material	Fibric over Boulders
Soil class	Fibrisol
Texture	Fibric

Vegetation description

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Betula glandulosa	Glandular birch	25		
Salix pellita	Satiny willow	25		
Rubus arcticus subsp.arcticus	Arctic rasberry	1		
Solidago macrophylla	Large-leaved goldenrod		40	
Agrostis mertensii	Northern bentgrass		15	
Cerastium alpinum	Alpine chickweed		15	
Viola macloskeyi	Small white violet		7	
Deschampsia cespitosa	Tufted hairgrass		5	
Luzula parviflora	Small-flowered woodrush		5	
Coptis trifolia	Goldthread		3	
Petasites frigidus var. palmatus	Palmate coltsfoot		3	
Calamagrostis canadensis	Bluejoint reedgrass		2	
Cornus canadensis	Bunchberry		1	
Equisetum arvense	Field horsetail		1	
Phleum alpinum	Alpine thimothy		1	
Veronica wormskjoldii	Wormskjold's alpine speedwell		0,5	
Mousse sp.	Moss			40

Latin Name	English Name	% of Cover		
		Shrubs	Herbs	Moss
Mnium sp.	Leafy moss			5
Pleurozium schreberi	Schreber's big red stem moss			1

Appendix II

Example of wetland monitoring wells data table

Well	Date (AA/MM/DD)	Time (HH:MM)	Observer	A	B	Water level = (B – A)
				Measure (m)	PVC Length (m)	
WMW01					1.71	
WMW02					1.71	
WMW03					1.71	
WMW04					1.71	
WMW05					1.71	
WMW06					1.71	
WMW08					1.71	
WMW11					1.71	
WMW12					1.71	
WMW13					1.71	
WMW16					1.71	
WMW18					1.71	
WMW19					1.71	
WMW21					1.71	
WMW22					1.71	
WMW24					1.71	
WMW25					1.71	
WMW26					1.71	
WMW27					1.71	
WMW29					1.71	
WMW30					1.71	