Six Mile Brook Pit Expansion Project – 2023 Wetlands Baseline Report

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EXECUTIVE SUMMARY

McCallum Environmental Ltd. (MEL) was retained by S.W. Weeks Construction Limited (S.W. Weeks; the Proponent) to prepare baseline biophysical reports, including wetland assessments, for the proposed Six Mile Brook Pit Expansion Project (the Project), which is a sand and gravel pit located in Six Mile Brook, Nova Scotia. These assessments are to support the preparation and submission of the provincial EARD.

Wetland field surveys were completed within the Study Area in June 2023

Wetland surveys were completed for the Project with the key objectives of facilitating avoidance of wetlands where practicable, assessing wetland function, including habitat provisions for species at risk, understanding the potential project interactions with wetlands, and to support wetland regulatory applications and permitting. This was achieved by completing a review of background desktop resources in combination with field studies to identify potential environmental constraints and sensitivities. This report outlines the methods and results of field evaluations completed within the Study Area.

A total of five wetlands were found within the Study Area, as shown in Table 3-1, and Figure 2 (Appendix A). These wetlands consisted of swamps, as well as complexes with combinations of swamps and marshes. The total wetland area in the Study Area is 7.07 ha. The majority of the wetlands are treed swamps (n=3), making up 9.6% of the total wetland area in the Study Area (Table 3-4). Two freshwater marshes were delineated within the Study Area and had a presence throughout complexes. Most individual wetlands are hydrological isolated swamps, in the sense that they do not have defined surface water connections (inlets/outlets/throughflow).

SAR species were observed within WL 5 in the Study Area and contained suitable habitat supporting breeding or dwellings, therefore, it is considered potential WSS (Table 3-4). All wetlands with confirmed SAR (mobile or sessile) within the wetland area will be reviewed with NSECC. Final WSS designation will be made by NSECC.

WESP-AC results display that the averaged grouped function and benefit scores for wetlands in the Study Area range from Moderate to Higher, with the exceptions of the Hydrologic group and Aquatic Support Group which rank both lower and higher, on average, for function. The highest functioning group the Transitional Habitat group which had a high function and benefit score. This is likely dude to suitable habitat found and multiple species at risk found within the Study Area and most specifically Wetland 5. Generally, higher average benefit scores were observed in comparison to functional scores as they varied from low to moderate to high. Wetlands in the Study Area likely have these varied function scores due to a multitude of factors including changes on the landscape from the pit construction, topography and presence or lack of open water/watercourses. In general benefits rank was high across the board, though the functional rank varied. High benefits rank shows that these wetlands are highly beneficial within the Study Area and surrounding area. The only functional group which scored low in benefits was the aquatic support group. This could be due to the disconnectedness of the watercourses within wetlands 1 and 5 and the slow flow from the open water areas and beaver activity. WESP-AC functional assessments have not identified any functional WSS.

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1 INTRODUCTION

McCallum Environmental Ltd. (MEL) was retained by S.W. Weeks Construction Limited (S.W. Weeks; the Proponent) to prepare baseline biophysical reports, including wetland assessments, for the proposed Six Mile Brook Pit Expansion Project (the Project), which is a sand and gravel pit located in Six Mile Brook, Nova Scotia. These assessments are to support the preparation and submission of the provincial EARD.

The objective of the wetland assessments was to:

- Identify wetlands occurring within the Study Area and assess these wetlands for function. A focus was also made on the presence of Species at Risk (SAR) and Species of Conservation Interest (SOCI) and their supporting wetland habitats within the Study Area (the Study Area was designed to include the maximum extent of expected impacts (and in consideration of property ownership)).

The biophysical surveys completed by MEL took place within the EA Study Area, which borders Stillman Road to the south, and is within 300 m of Four Mile Brook Rd to the east. The Study Area includes the entirety of PIDs 65173437, 00834622, and 00834721 as well as the northern portion of PID 00834739 and a 100 m buffer on a mapped watercourse, south of the proposed expansion. The EA Study Area is 96.9 ha in size, which includes 36.3 ha of disturbed area (historic and current pit), as indicated in Figure 1.

The results of these surveys will be carried forward in the EARD to evaluate the Project's effect to wetlands and wetland habitats.

1.1 Regulatory Context

In Nova Scotia, wetlands are protected under the Activities Designation Regulation of the *Environment Act* and the Wetland Conservation Policy (NSE, 2019). The *Environment Act* defines a wetland as "Land referred to as a marsh, swamp, fen, or bog that either periodically or permanently has water table at, near, or above the land surface or that is saturated with water, and sustains aquatic processes as indicated by the presence of poorly drained soils, hydrophytic vegetation, and biological activities adapted to wet conditions".

Nova Scotia's Wetland Conservation Policy (NSE, 2019) applies to all freshwater and certain tidal wetlands with the objectives to prevent net loss of wetland area or function, promote wetland protection and net gain and enhance impact mitigation efforts. Under this policy and the *Environment Act*, approvals are required to alter wetlands, with certain exceptions (e.g., unregulated wetlands <100 m^2, specific linear developments).

2 METHODOLOGY

2.1 Desktop Review Methodology

A desktop review of available topographic maps, provincial databases/datasets, and aerial photography was completed prior to field survey to aid in the determination and assessment of wetland habitat in the Study Area. Predicted wetland areas were identified from the Nova Scotia Environment and Climate Change (NSECC) Wetland Inventory Database. The Nova Scotia Wet Areas Mapping (WAM) database, the provincial flow accumulation data set and LiDAR data were reviewed to identify potential un-mapped wetlands. The predictive WSS layer, provided by NSECC, was consulted for the presence of expected and potential WSS within the Study Area.

2.2 Field Program Methodology

Following the initial desktop review, wetland field surveys were completed by MEL within the Study Area in June of 2023. Trained wetland evaluators completed all field surveys. Delineated wetlands that were observed to extend outside of the Study Area were only delineated to the Study Area boundary. During wetland delineation, delineators took notes on habitat suitability for priority species within the wetland by recording habitat dfescriptions, coordinates, and photos.

Wetland delineation was conducted in accordance with the US Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987) and the Regional Supplement to the United States Army Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (United States Army Corps of Engineers, 2012). In each wetland, vegetation, hydrology, and soils data were recorded at both wetland and upland data points on either side of the wetland boundary in accordance with the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987). Wetland types (i.e., fen, bog, swamp, marsh, and shallow open water) were determined using the Canadian Wetland Classification System (Warner and Rubec, 1997). Wetland complexes are systems comprised of two or more wetland types.

Wetland boundaries were waypointed using a handheld Garmin GPS units, with sub-five metre accuracy. Any inlet and outlet watercourses or other notable features were mapped during the delineation processes. All watercourses observed within the boundaries of the wetland were mapped and assessed (see Fish and Fish Habitat Baseline Report). Pink flagging tape was used to mark wetland boundaries in the field, while blue flagging tape was used to mark presence of watercourses. Please refer to the Fish and Fish Habitat Baseline Report for more information on watercourse delineation and assessment.

In keeping with the Army Corps of Engineers (Environmental Laboratory, 1987) methodologies for wetland delineation, three criteria are required for a wetland determination to be made:

- Presence of hydrophytic (water loving) vegetation;
- Presence of hydrologic conditions that result in periods of flooding, ponding, or saturation during the growing season; and,
- Presence of hydric soils.

Hydrophytic vegetation is defined as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanent or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present (Environmental Laboratory, 1987). Hydrophytic vegetation should be the dominant plant type in wetland habitat (Environmental Laboratory, 1987).

Dominant plant species observed at each data point were classified according to their wetland indicator status (based on probability of occurrence in wetlands) in accordance with the Nova Scotia Wetland Indicator Plant List. Further relevant information was reviewed in Flora of Nova Scotia (Roland, 1998) and Nova Scotia Plants (Munro, Newell & Hill, 2014).

If the majority (greater than 50%) of the dominant vegetation at a data point is classified as obligate (OBL), facultative wetland (FACW), or facultative (FAC) (excluding FAC-) vegetation, then the location of the data point is considered to be dominated by hydrophytic vegetation. Wetland vegetation compositions for wetland classes identified within the Study Area during field surveys have been described in Section 3.1.

A hydric soil is defined as a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (United States Department of Agriculture, 2003). Indicators that a hydric soil is present include soil colour (gleyed soils and soils with bright mottles and/or low matrix chroma), aquic or preaquic moisture regime, reducing soil conditions, sulfidic material (odour), soils listed on the hydric soils list, iron and manganese concretions, organic soils (histosols), histic epipedon, high organic content in surface layer in sandy soils, and organic streaking in sandy soils.

A soil pit was completed at each data point. These pits were excavated to a depth of 40 cm or to a restrictive layer (i.e., rock, tree root, etc.). The soil in each pit was then examined for hydric soil indicators. The matrix colour and mottle colour (if present) of the soil were determined using the Munsell Soil Colour Charts. Wetland habitat, by definition, either periodically or permanently, has a water table at, near, or above the land surface or is saturated with water.

To be classified as a wetland, a site should have at least one primary indicator or two secondary indicators of wetland hydrology. Examples of primary indicators of wetland hydrology include saturation, surface water, water-stained leaves, hydrogen sulfide odour, and presence of aquatic fauna. Examples of secondary indicators of wetland hydrology include surface soil cracks, drainage patterns, moss-trim lines, and stunted or stressed vegetation. Each area of expected wetland habitat was assessed for signs of wetland hydrology through observations across the area and assessment of soil pits at each data point.

2.3 Functional Assessment

Wetland functional assessments were completed for all wetlands within the Study Area using the Wetland Ecosystem Services Protocol – Atlantic Canada (WESP-AC) wetland evaluation technique. WESP-AC process involves the completion of three forms; a desktop review portion (Office Form) that examines the landscape level aerial conditions to which the wetland is situated, and two field forms identifying biophysical characteristics of the wetland (Field Form) and stressors within the wetland (Stressors Form), if any. The process serves as a rapid method for assessing individual wetland functions and values. WESP-AC addresses 17 specific functions wetlands may provide (Table 2-1).

The specific wetland functions are scored by “function” and/or “benefit”. Specific functions are then grouped and scored as functional groups (as shown in Table 2-1). Wetland function relates to what a wetland does naturally (i.e., water storage), whereas wetland benefits are benefits of the function, whether it is ecological, social, or economic. The highest functioning wetlands are those that have both high ‘function’ and ‘benefit’ scores for a given function. WESP-AC enables a comparison to be made between individual wetlands within a province to gain a sense of the importance each has in providing ecosystem services.

Table 2-1: WESP-AC Function Parameters

Grouped Wetland Function	Specific Wetland Functions
Hydrologic Function	Surface Water Storage
Aquatic Support	Aquatic Invertebrate Habitat
	Stream Flow Support
	Organic Nutrient Export
	Water Cooling
Water Quality	Sediment Retention & Stabilization
	Phosphorus Retention
	Nitrate Removal & Retention
	Carbon Sequestration
Aquatic Habitat	Anadromous Fish Habitat
	Resident Fish Habitat
	Waterbird Feeding Habitat
	Waterbird Nesting Habitat
	Amphibian and Turtle Habitat
Terrestrial Habitat	Songbird, Raptor, & Mammal Habitat
	Pollinator Habitat
	Native Plant Habitat

In addition to the grouped wetland functions above, WESP-AC also measures the following groups, however, these are only evaluated by their benefit scores:

- Wetland Condition; and
- Wetland Risk (i.e., sensitivity to potential impacts).

The following individual functions are assessed to determine the benefit scores associated with each wetland:

- Public Use & Recognition;
- Wetland Sensitivity;
- Wetland Ecological Condition; and
- Wetland Stressors.

For each wetland evaluated, the WESP-AC process calculates the overall score for the seven grouped wetland functions and the 17 specific wetland functions listed in Table 2-1 above. One score each is provided for function and benefit. Scores are ranked as ‘Lower’, ‘Moderate’, or ‘Higher’, allowing for analysis of the wetland as compared to calibrated baseline wetland scores in Nova Scotia to date. A ‘Higher’ WESP-AC score means that wetland has a greater capacity to support those processes as compared to other wetlands in the province. A ‘Higher’ WESP-AC score in both the function and benefits category means the wetland supports the natural ecosystem functions and provides services potentially important to society.

The WESP-AC Functional WSS Interpretation Tool is discussed in Section 2.4. A summary of the WESP-AC results is provided in Appendix B. The raw WESP-AC Excel files can be provided to the NSECC Wetland Specialist(s) upon request.

The WESP-AC functional evaluation technique recognizes that, in many cases, delineation of entire wetlands where they extend beyond a Study Area is not always feasible (e.g., property ownership) or necessary (Adamus, 2018). Instead, WESP-AC permits the delimitation of an Assessment Area (AA), defined as the wetland or portion of wetland physically assessed in the field, while the Office Form considers the broader landscape characteristics and functions that extend beyond the AA and/or Study Area.

2.4 Wetlands of Special Significance

The Wetland Conservation Policy was developed by NSECC in 2011 and amended in 2019 (NSE, 2019) provides a framework for the identification of WSS. According to NSECC (2019, p.11-12), the following criteria define WSS:

- All salt marshes;
- Wetlands that are within or partially within a designated Ramsar site, Provincial Wildlife Management Area (Crown and Provincial lands only), Provincial Park, Nature Reserve, Wilderness Areas or lands owned or legally protected by nongovernment charitable conservation land trusts;
- Intact or restored wetlands that are project sites under the North American Waterfowl Management Plan and secured for conservation through the NS-EHJV;
- Wetlands known to support at-risk species as designated under the federal Species at Risk Act or the Nova Scotia *Endangered Species Act*; and,
- Wetlands in designated protected water areas as described within Section 106 of the *Environment Act*.

To date, NSECC Wetland Specialists have provided guidance that the presence of a sessile or mobile SAR within a delineated wetland may trigger the determination of that wetland as a WSS. These may be field observed or from the ACCDC database. During WSS determination assessments MEL considers species-specific and site-specific conditions, including the following factors:

- whether the species was observed during field surveys within the wetland;
- whether the species was observed historically (e.g., ACCDC) within the wetland and the temporal and spatial accuracy of the observation point;
- timing of observations (i.e., frequency of observations, the time of year observed), and,
- whether suitable habitat is present within the wetland, in consideration of:
    - what the wetland habitat is used for (i.e., does the habitat provided within the wetland provide necessary life functions (i.e., nesting, or overwintering habitat)); and,
    - the discreteness or specificity of habitat use by the mobile species (i.e., wood turtles have specific and discrete nest beach requirements, compared with the in-discrete and non-specific foraging habitat usage by mainland moose, for example).

A framework for determination of WSS designation based on functional benefit using WESP-AC has recently been developed and implemented by NSECC in August 2021. A Functional WSS Interpretation Tool automatically assesses the subject wetland based on the WESP-AC functional results. The grouped functions in Table 2-1are used to calculate a “Functional Benefit Product” (FBP). The FBP is categorized into scores of “low”, “moderate” and

"high". The thresholds for these categories are calibrated by WESP-AC assessments across Nova Scotia. These categories are used to create WSS determination rules. The grouped functions are further combined into "supergroups" for habitat (Aquatic Habitat and Transition Habitat) and support (Hydrologic Support, Water Quality Support and Aquatic Support) functions. The wetland could be designated as a WSS if certain 'high' or combination of 'moderate and 'high' scores are satisfied within these supergroups. See Appendix B for functional WSS results.

NSECC has also developed a WSS predictive GIS layer (September 2020, pers. Comm., Ian Bryson, NSECC Wetland Specialist), which overlies mapped wetlands with the protected areas layers, and rare species observations from ACCDC, among other attributes. According to NSECC, this WSS GIS layer is intended to be used as a planning tool and should be interpreted as potential WSS. The actual determination of WSS status is based on field verification of the parameters or considerations listed above. At the time of submission, NSECC was in the process of updating their WSS definition.

The predictive layer was consulted during the desktop evaluation for wetlands prior to field delineations by MEL. Final WSS designation will be determined by NSECC with guidance from data collected through Project field surveys. The Project Team will continue to engage with NSECC and NSDNRR to discuss WSS designation on a site-specific basis.

3 RESULTS

3.1 Field Program Results

A total of five wetlands were found within the Study Area, as shown in Table 3-1 below, and Figure 2 (Appendix A). A summary of wetlands, including type, area and dominant flow paths are provided in Table 3.

A photo log is presented in Appendix C, providing representative photographs of observed wetland habitats. In addition, representative photographs of potential wetlands of special significance are provided based on SAR observations and suitable habitat review presented in Table 3-4.

Table 3-1: Wetland Delineation Summary

Wetland ID	Wetland Type	Wetland Area (ha)	Water Flow Path	Landform	Hydric Soil Indicator(s)	Hydrologic Indicator(s)	Dominant Vegetation
Project Area							
1	Complex	1.97	Throughflow	Basin	A1 Histosol & S1 Sandy Mucky mineral	A1 Surface Water, A2 High Water Table, A3 Saturation, B13 Aquatic fauna	**Herbs**: *Phalaris arundinacea, Typha latifolia, Carex lurida, Myostis scorpiodes, Glyceria canadensis, Carex gynandra, Onoclea sensibilis, Rubus pubescens, Equisetum palustre, Festuca rubra* **Shrubs**: *Alnus alnobetula, Alnus incana, Salix eriocephala* **Trees**: *Abies balsamea*
2	Treed swamp	0.37	Isolated	Basin	A1 Histosol	A1 Surface Water, A2 High Water Table, A3 Saturation, S1 Sandy Mucky Mineral	**Herbs:** *Onoclea sensibilis, Osmundastrum cinnamomeum, Carex intumescens, Rubus pubescens, Trientalis borealis, Maianthemum canadense, Typha latifolia, Phleum pratense, Ranunculus repens* **Shrubs:** *Acer rubrum, Abies balsamea* **Trees**: *Acer rubrum, Betula populifolia, Abies balsamea*
3	Treed Swamp	0.18	Isolated	Basin	A1 Histosol	A1 Surface Water, A2 High Water Table, A3 Saturation, B9 Water-stained leaves, B10 Drainage Patterns, B16 Moss Trimmed Lines	**Herbs**: *Osmundastrum cinnamomeum, Onoclea sensibilis, Ranunculus repens, Equisetum palustre, Carex disperma* **Shrubs**: *Abies balsamea, Acer rubrum* **Trees**: *Betula alleghaniensis, Abies balsamea, Acer rubrum*
4	Treed Swamp	0.13	Isolated	Basin	A1 Histosol	A1 Surface Water, A2 High Water Table, B9 Water-stained leaves, B16 Moss Trimmed Lines	**Herbs**: *Osmundastrum cinnamomeum, Onoclea sensibilis, Ranunculus repens, Carex disperma, Asteraceae sp, Dryopteris carthusiana* **Shrubs**: *Abies balsamea, Acer rubrum* **Trees**: *Abies balsamea, Acer rubrum, Salix eriocephala*
5*	Complex	4.42	Throughflow	Convex	A1 Histosol	A1 Surface Water, B13 Aquatic fauna, C9 Saturation Visible on Aerial Imagery, D1 Stunted or Stressed Plants, D3 Shallow Aquitard	**Herbs**: *Carex gynandra, Phalaris arundinacea, Onoclea sensibilis, Typha latifolia* **Shrubs**: *Alnus incana* **Trees**: *Alnus incana*
Total Six Mile Brook Wetland Area: 7.07 ha							

*Wetland continues beyond the Study Area boundary used at the time of survey.

In total, the five wetlands within the Study Area account for approximately 7.07 hectares (Figure 2 Appendix A). According to guidance from the US Corps of Engineers wetland delineation manual (Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987), at least 50% vegetation cover must be present to be classified as wetland, as such, habitats lacking vegetation cover in observed low flow periods were described as open water features. It is important to note that areas that meet this open water definition within delineated wetland boundaries have been removed from the calculation of wetland areas. Open water features are discussed specifically relating to watercourses and fish habitat (Fish and Fish Habitat Baseline Report). Data determination forms describing vegetation cover, soil characteristics and hydrology indicators were collected for each wetland, along with WESP-AC, and adjacent upland habitat. This data is available to support alteration applications in the permitting phase of the Project.

Swamps represent the most abundant wetland class in the Study Area (n=3), accounting for 60% of all wetlands (Table 3-2). Swamps identified in the Study Area are predominantly mixedwood or coniferous. Common tree species identified within swamp habitat includes red maple (*Acer rubrum*), balsam fir (*Abies balsamea*), heart-leaved willow (*Salix eriocephala*) yellow birch (*Betual alleghaniensis*), and white and (Paper) birch (*Betula populifolia*). Swamps with prominent shrub layers were generally dominated by red maple, speckled alder (*Alnus incana*), heart-leaved willow (*Salix eriocephala*) and balsam fir (*Abies balsamea*). Herbaceous layers within swamps were observed to be diverse throughout the Study Area, with high presence of cinnamon fern (*Osmundastrum cinnamomeum*), Broad-leaved cattail (*Typha latifolia*), Creeping buttercup (*Ranunculus repens*), two-seeded sedge (*Carex disperma*), and sensitive fern (*Onoclea sensibilis*). Swamps delineated within the Study Area (100%) are under one hectare in size, and these features collectively account for 9.62% of the Study Area's total wetland area (Table 3-2). However, this is likely slightly underrepresented, as the two wetland complexes contain a swamp component (Table 3-3). The two wetland complexes with swamp component delineated within the Study Area are in a throughflow position.

Two wetland complexes, WL1 & WL5, within the Study Area included freshwater marsh habitat. Both delineated marshes contained standing pooled water and are fed by throughflow watercourses. WL1 is an isolated marsh located adjacent to the pit and partially fed from one of the four anthropogenic reservoirs on site. WL1 and WL5 are hydrologically linked through watercourse (WC) 1. The marsh habitats were generally dominated by herbaceous species including common cattail (*Typha latifolia*), reed canary grass (*Phalaris arundinacea*), nodding sedge (*Carex gynandra*) and sallow sedge (*Carex lurida*). These marshes had tree and shrub layers along their edges where the moisture gradient decreased, comprising of balsam fir, speckled alder and green alder (*Alnus alnobetula*).

Table 3-2: Summary of Wetland Classes within Six Mile Brook Study Area

Project Area							
Wetland Type	**Area**				**Relative Abundance**		
	Average (ha)	**Minimum (ha)**	**Maximum (ha)**	**Total (ha)**	**# of Wetlands**	**% of all Wetlands**	**% of all Wetland area**
Swamp	0.23	0.13	0.37	0.68	3	60	9.6
Complex	3.2	1.97	4.42	6.39	2	40	90.4

Of the five wetlands delineated within the Study Area, two have been identified as wetland complexes consisting of two or more wetland types. These complexes were comprised of swamp, and marsh components (Table 3-3). While representing 40% of all wetlands delineated, wetland complexes comprise 40% of delineated wetland total

area (Table 3-2). The largest wetland complex is Wetland 5, which is approximately 4.42 hectares and consists of marsh and swamp habitats.

Table 3-3: Wetland Complex Class Composition within Six Mile Brook Study Area

Wetland ID	Swamp	Bog	Fen	Marsh	Wetland ID	Swamp	Bog	Fen	Marsh
Project Area									
1	✓			✓	**82**	✓		✓	✓
5	✓			✓	**89**	✓		✓	

3.2 Wetlands of Special Significance

As part of the qualitative wetland field assessments, along with a review of the latest (June 2020) NSECC predictive WSS layer, each wetland was reviewed to assess potential for WSS designation. MEL completed this WSS assessment in consideration of the desktop and field assessments, the Wetland Conservation Policy (NSE, 2019) and NSECC guidance received to date. However, final WSS determination lies with NSECC.

The Study Area does not interact with any Ramsar sites, Provincial Wildlife Management Areas, Provincial Parks, Nature Reserves, Wilderness Areas, intact or restored wetlands under the North American Waterfowl Management Plan, or protected water areas. Game Sanctuaries are excluded from WSS designation under the Wetland Conservation Policy (NSE, 2019). No wetlands within the Study Area are present within any of these above defined areas. Nearby protected areas include Gully Lake Provincial Park 8.76 km to the East, Salt Springs Provincial Park 5.67 km to the southeast, Dalhousie Mountain Nature Reserve 4.93km to the southwest, and the MacKay Brook Nature Reserve 4.65km to the west of the Study Area.

3.2.1 NSECC Predicted Wetlands of Special Significance

A review of the NSECC predictive WSS layer did not identify any wetlands as WSS within the Study Area. Field observations of SAR species within WL5 suggest potential as WSS based on the occurrences of these species and habitat suitability. One Canada warbler (*Cardellina canadensis*) and one rusty blackbird (*Euphagus carolinus*) were field observed within WL5 and the wetland has been deemed to support preferred Canada Warbler and rusty blackbird habitat.

3.2.2 Wetlands with Observed SAR

Two wetlands within the Study Area contained field observations of SAR within their boundaries, of these, two are proposed WSS due to an assessment of habitat suitability (Figure 2, Appendix A). Table 3-4 below presents the wetland-associated SAR observations and the presence of species-specific suitable breeding or discrete dwelling habitat (such as nests, dens, overwintering areas, hibernacula). Suitable habitat does not include broader supporting habitat used by the species for general life functions (such as foraging or movement). Observations are further detailed in their respective Project baseline reports (i.e., Habitat and Flora, Fauna, and Avifauna Baseline Reports).

SAR and SOCI observation, in relation to wetlands, are provided in respective flora and fauna baseline reports and associated figures.

Table 3-4: Wetlands with Observed SAR and WSS Assessment

Wetland ID	Observed SAR and Designations	Wetland Habitat Provisions and WSS Determination Rationale	Suitable Habitat Present	Potential WSS Determination (and triggering species where multiple)
5	Canada Warbler (SARA T, COSEWIC SC, NSESA E, S3B)	Complex: Mixed wood swamp with prominent shrub layer, northern forested section. Shrub and herb Marsh habitat dominated by speckled alder, common bulrush and snags present. Forested edge mixed wood swamp habitat present, along with forested upland. Canada warbler is known to prefer moist forest with a prominent shrub understory. WL5 contains preferred Canada warbler breeding/nesting habitat.	Y	Y
	Rusty blackbird (SARA SC, COSEWIC SC, NSESA E, S2B)	Rusty blackbird breeding habitat is characterized by coniferous-dominated forests adjacent to wetlands, such as slow-moving streams, peat bogs, sedge meadows, marshes, swamps and beaver ponds. (COSEWIC, 2018). Observation in WL5 Complex of mixed wood swamp with prominent shrub layer. Shrub and herb Marsh habitat in southern section is where species was observed. Habitat dominated by speckled alder, common bulrush and snags present. High amounts of flooding due to beaver activity.	Y	

The Canada warbler's (*Cardellina canadensis*, SARA Threatened, COSEWIC Special Concern, NSESA Endangered, S3B) preferred breeding habitat is found in moist streamside forests and forested wetlands. Important habitat features for this species include complex understories with dense shrubs and ferns (e.g., cinnamon fern), and forest floors with extensive hummocks and downed wood (Environment Canada, 2016). Canada warbler were observed within the Study Area in WL 5 in swamp or complexes containing shrub understories with Canada warbler breeding habitat., wetlands dominated by speckled alder, sensitive fern and common bulrush. WL 5 is proposed for WSS designation.

Eastern wood-pewee (*Contopus virens,* SARA/COSEWIC Special Concern, NSESA Vulnerable, S3S4B) preferred breeding habitat includes deciduous or mixed wood forests, typically avoiding the use of coniferous dominant forest (COSEWIC, 2012). The species is also known to nest and forage at high canopy level in areas associated with clearings and forest edges (COSEWIC, 2012). Within the Study Area, there were various observations of eastern wood-pewees and all were associated with open habitat such as the pit pit edge and potentially wetlands. Due to the nature of the observations, no observations of Eastern wood-pewees could be definitively placed in a WL. Due to its observed presence within the Study Area, but with no confirmed wetland observations, these observations will not constitute a WSS designation.

Rusty blackbird (*Euphagus carolinus*, SARA/COSEWIC Special Concern, NSESA Endangered, S2B) is common to a variety of wetland habitats, most commonly observed within riparian habitat, peatlands, marshes, and shrub swamps (ECC, 2014). Rusty blackbird was observed within WL 5. The observation was in the southern section of the wetland 5 complex in the marsh habitat. The area is dominated speckled alders, common bulrush with a throughflow watercourse present and open water feature due to beaver activity. Supporting riparian habitat preferred by this species. Due to presence of rusty blackbird within WL5 during surveys, it is proposed for WSS designation.

3.3 Wetland Hydrology

The Study Area, is located in West River Pictou Secondary Watershed (1DP-1), which empties into the Northumberland Strait. The Study Area is located fully in one tertiary watershed (1DP-E) but is very close to a second tertiary watershed (1DP-E) by a little under 70 m (Figure 3).

In general, water flows southeast within the Study Area. Hydrological flow north of the pit pit is characterized by smaller systems originating from the topographic high point where the pit now stands. For example, WC4 is an outlier, flowing north as opposed to the rest of the watercourses within the Study Area which directionally flow south-east. There was a historical topographic high point in the center of the Study Area (north of WL 1), prior to pit activities; the majority of watercourses within the study area flow east and south. Hydrological flow in the southern section of the Study Area is towards Six Mile Brook, which partially makes its way through the study area and was delineated out as WC7. Wetlands 1 and 5 are hydrologically connected in by throughflow, and flow out of the Study Area, again connecting with Six Mile Brook.

Wetland hydrology is highly dependent on wetland type and its position on the landscape. Within the Study Area, two classes of wetland were observed (excluding the complex): swamp and marsh. Swamps may be classified as peatlands (organic) or mineral wetlands depending on their substrate. Water table fluctuations in swamps are often greater than those of bogs and fens (commonly resulting in lower/slower organic accumulation) and are on average drier than most other wetland types, with a water table below the surface for the majority of the year (Warner & Rubec 1997). Most swamps in the Study Area, not including complexes, are small (<1 ha) and isolated. Swamps

located at the base of hillslopes may function as groundwater seepage or discharge areas. Complexes that included swamps were larger (>1ha) and contained throughflow.

Marshes are dominated by shallow water that fluctuates in level, they have periodic or persistent standing water or slow-moving surface water (Warner & Rubec 1997). Marshes receive their water from the surrounding area as runoff, stream flow, precipitation, storm surges, groundwater discharge, currents and tidal action (Warner & Rubec 1997).

3.4 Functional Assessment

The following sections summarize the results of the WESP-AC functional assessments for all wetlands assessed within the Study Area, broken into Grouped Functions. The results are presented in their individual summary tables below. No functional WSS were identified through the WESP-AC WSS Interpretation Tool. The raw scores for the Grouped and Specific Functions are further detailed in the summary tables provided in Appendix B.

3.4.1 Hydrologic Group

The Hydrologic Group evaluates the effectiveness of a wetland to store or delay the downslope movement of surface water. However, the model does not account for wetland size, and in turn, the ability of larger wetlands to store more water than smaller wetlands. Wetlands that have the highest functions within this group include those that do not have surface water outlets, and instead, are isolated from flowing surface water.

Table 3-5: Hydrologic Group

Function	Benefit		
	Lower	Moderate	Higher
Lower	None	None	WL 1, 2, 3, 4 & 5
Moderate	None	None	None
Higher	None	None	None
Note: The numbers presented in this table indicate the wetland IDs			

All wetlands in the Hydrologic Group scored Lower function with Higher benefits. Wetlands 2, 3 and 4 all lack a surface water connection, and are central in the Study Area. All three wetlands are located on a slight southern sloping area. It is likely that these wetlands are holding and storing water before allowing it to slowly percolate into groundwater, as well as allowing some of that water to run off the sloped surface. This is likely resulting in a functional score decrease as they are not holding and collecting all the water that comes into the system. Both wetlands 1 and 5 have watercourse flowing through with open water systems in each. Due to WL1 and 5 both having flowing surface water, their functional scores are decreased.

3.4.2 Water Quality Group

The Water Quality Group is compiled from four different functions: sediment retention and stabilization; phosphorus retention; nitrate removal; carbon sequestration. The main function of this group is to evaluate the wetland's potential to intercept, retain, and filter sediments, particulates, and organic matter. Similar to the hydrologic group, the wetlands that have the highest functions in this regard include those that do not have a surface water outlet, and instead are isolated from flowing surface water. This model also does not account for wetland size and as such, larger wetlands do not necessarily score higher than small wetlands, although in reality size may factor into this function.

Table 3-6: Water Quality Group

Function	Benefit		
	Lower	Moderate	Higher
Lower	None	None	WL 2
Moderate	None	WL 3, 4	WL 1, 5
Higher	None	None	None
Note: The numbers presented in this table indicate the wetland IDs			

Wetlands within the Study Area have both a Lower to Moderate function rank and Moderate to Higher benefit rank. Scores were varied for both function and benefit. Wetlands 1 and 5 both score Moderate function with Higher benefit scores. These wetlands had surface water connections and standing water present within their boundaries allowing these wetlands to retain, and filter sediments. These wetlands are in flatter topography with longer flow paths, where water moves slowly across the surface.WL2 scored lowest in function, though had a high benefit rank. This could be due to the steeper slope that the wetland is on, resulting in more runoff. Both wetland 3 and 4 had Moderate function and benefit; both wetlands are in similar locations and sizes and lack any inflow or outflow.

3.4.3 Aquatic Support Group

The Aquatic Support Group comprises four individual functions: stream flow support; aquatic invertebrate habitat; organic nutrient export; and water cooling. The main function of this group is to determine the wetland's ability to support ecological stream functions that promote habitat health. Wetlands lying adjacent to or containing flowing water score higher than those that do not (i.e. isolated wetlands). In addition, however, headwater wetlands are crucial for supporting stream flow during the dry season by contributing to water flow via groundwater input and storage capacity.

Table 3-7: Aquatic Support Group

Function	Benefit		
	Lower	Moderate	Higher
Lower	None	None	None
Moderate	WL 2, 3, 4	None	None
Higher	WL 5	WL1	None
Note: The numbers presented in this table indicate the wetland IDs			

On average, wetlands scored Moderate to Higher for function and Lower to Moderate for benefit in this group. Most wetlands (n=3) scored Moderate in function within this group. Wetlands within this category (WL 2, 3 & 4) do not have any surface flow from watercourses within them. Both WL 1 & 5 have watercourses running through them, for which they likely provide stream flow and cooling functions.

3.4.4 Aquatic Habitat Group

The Aquatic Habitat Group is compiled from five different functions: anadromous fish habitat, resident fish habitat, amphibian and turtle habitat, waterbird feeding habitat, and waterbird nesting habitat. Wetlands that have the highest functions within this group include those that are adjacent to or contain water features.

Table 3-8: Aquatic Habitat Group

Function	Benefit		
	Lower	**Moderate**	**Higher**
Lower	None	None	None
Moderate	None	WL 5	WL 2, 3, 4
Higher	None	None	WL 1
Note: The numbers presented in this table indicate the wetland IDs			

All wetlands scored Moderate or Higher in benefits and function. WL1 scored Higher for both, indicating it contributes to various aquatic habitats.

3.4.5 Transitional Habitat Group

The Transition Habitat Group comprises three different functions: songbird, raptor, and mammal habitat, native plant habitat and pollinator habitat. The main function of the collective group is to evaluate the wetland's ability to support healthy habitat for birds, mammals, and native plants.

Table 3-9: Transitional Habitat Group

Function	Benefit		
	Lower	**Moderate**	**Higher**
Lower	None	None	None
Moderate	None	None	None
Higher	None	None	WL 1, 2, 3, 4 & 5
Note: The numbers presented in this table indicate the wetland IDs			

All wetlands in the Study Area were found to score Higher in function within the transitional habitat group. While the site does have some disturbed areas, largely historically forested upland, these wetlands provide a variety of habitats to support flora and fauna. These wetland provide relatively remote, undisturbed and unfragmented habitat, resulting in a Higher average function and benefit rating for Transitional Habitat.

3.4.6 Wetland Condition

Wetland Condition refers to the integrity or health of a wetland as defined by its vegetative composition and richness of native species. Scores are derived from the similarity between the wetland being evaluated and reference wetlands of the same type and landscape setting (Adamus, 1996).

Table 3-10: Wetland Condition

Benefit		
Lower	**Moderate**	**Higher**
WL 2, 3, 4 & 5	None	WL 1
Note: The numbers presented in this table indicate the wetland IDs		

Most of the assessed wetlands within the Study Area scored in the low category for wetland condition, generally indicating poor vegetative community health and species diversity. Those that scored low were generally found to be within or adjacent to historically forested areas and existing roads, which make them more vulnerable to anthropogenic disturbances which can impact wetland health.

3.4.7 Wetland Risk

Wetland Risk takes sensitivity and stressors into account by averaging the two. Sensitivity is the lack of intrinsic resistance and resilience of the wetland to human or naturally caused stress (Niemi et al., 1990). The functional assessment tool uses five metrics to measure sensitivity: abiotic resistance, biotic resistance, site fertility, availability of colonizers, and growth rate. Stress relates to the degree to which the wetland is or has recently been altered by humans in a way that degrades its ecological condition. The model applies four stress groups: hydrologic stress, water quality stress, fragmentation stress, and general disturbance stress. Wetlands that are highly resilient may have Lower risk scores despite their exposure to multiple stressors. Additionally, wetlands exposed to fewer threats, but with low resilience may have Higher risk scores. Wetland resilience is tied to multiple factors, such as size, proximity to natural land cover, and presence of invasive species.

Table 3-11: Wetland Risk

Benefit		
Lower	**Moderate**	**Higher**
None	WL 3	WL 1, 2, 4 & 5
Note: The numbers presented in this table indicate the wetland IDs		

The wetlands in the Study Area scored Moderate or Higher for Wetland Risk, meaning they are generally exposed to pre-existing stressors (e.g., roads, forestry) and/or may be less resilient and susceptible to change. As discussed above, these scores are likely related to the presence of existing roads, historically forested areas, and associated stressors.

4 SUMMARY

A total of five wetlands were found within the Study Area, as shown in Table 3-1, and Figures 2 and 3 (Appendix A). These wetlands consisted of swamps, as well as complexes with combinations of swamps and marshes. The total wetland area in the Study Area is 7.07 ha. The majority of the wetlands are treed swamps (n=3), making up 9.6% of the total wetland area in the Study Area (Table 3-4). Two freshwater marshes were delineated within the Study Area and had a presence throughout complexes. Most individual wetlands are hydrological isolated swamps, in the sense that they do not have defined surface water connections (inlets/outlets/throughflow).

SAR species were observed within WL 5 in the Study Area and contained suitable habitat supporting breeding or dwellings, therefore, it is considered potential WSS (Table 3-4). All wetlands with confirmed SAR (mobile or sessile) within the wetland area will be reviewed with NSECC. Final WSS designation will be made by NSECC.

WESP-AC results display that the averaged grouped function and benefit scores for wetlands in the Study Area range from Moderate to Higher, with the exceptions of the Hydrologic group and Aquatic Support Group which rank both lower and higher, on average, for function. The highest functioning group the Transitional Habitat group which had a high function and benefit score. This is likely dude to suitable habitat found and multiple species at risk found within the Study Area and most specifically Wetland 5. Generally, higher average benefit scores were observed in comparison to functional scores as they varied from low to moderate to high. Wetlands in the Study Area likely have these varied function scores due to a multitude of factors including changes on the landscape from the pit construction, topography and presence or lack of open water/watercourses. In general benefits rank was high across the board, though the functional rank varied. High benefits rank shows that these wetlands are highly beneficial within the Study Area and surrounding area. The only functional group which scored low in benefits was the aquatic support group. This could be due to the disconnectedness of the watercourses within wetlands 1 and 5

and the slow flow from the open water areas and beaver activity. WESP-AC functional assessments have not identified any functional WSS.

5 LIMITATIONS

The following limitations regarding wetlands data collection and interpretation are acknowledged:

- Wetland delineation, classification and identification of soils, vegetation, wetland types, and general environmental characteristics have been completed by qualified professionals to accepted industry standards. However, a single assessment may not define the absolute status of wetlands conditions. While wetlands will be further assessed at the permitting stage, conditions and characteristics may change over the lifetime of this Project, either naturally or through non- Project related anthropogenic influences (e.g., climate change).
- GPS coordinates taken in the field using handheld Garmin GPS units have inherent accuracy limitation between 3 to 5 m. Wetland boundaries and observation points identified in this document are based upon these GPS readings and limited by this positional accuracy.
- There is inherent subjectivity in wetland assessments (e.g., % vegetation cover), which may cause discrepancies between assessors. However, all Project assessors are qualified personnel trained in wetland delineation and assessment and thus minor differences should not influence conclusions and analysis based upon the collected information.
- All reasonable assessment programs will involve an inherent risk that some site conditions or characteristics may not be detected during surveys. While multi-faceted and targeted surveys are completed to mitigate this risk, reports and analysis on such investigations will be based on reasonable interpretation from representative field sample points, supporting desktop interpretation and professional judgment.

6 CLOSING

This report has considered relevant factors and influences pertinent within the scope of the assessment and has completed and provided relevant information in accordance with the methodologies described herein.

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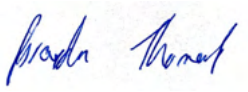

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Eastern Wood-pewee (Contopus virens) - Species search - Species at risk registry (canada.ca)

APPENDIX A. FIGURES

Prepared For:

WEEKS

FIGURE 1

Project Overview

Six Mile Brook Pit Expansion

Pictou County, NS

- Project Location
- Contour Line (5m)
- Roads
- Mapped Watercourse (NSTDB)
- Secondary Watersheds
- West River Pictou Secondary Watershed (1DP-1)
- Mapped Waterbody (NSTDB)
- On-site Settling Ponds
- Proposed Quarry Expansion Area
- Historic Workings To Be Remediated Prior IA Expiration June 2024
- Area To Be Remediated As Part of EA
- Pit Floor Currently In use
- Study Area

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter

0 75 150 300 m

1:6,000

Scale when printed @ 11" x 17"

Drawn By: MD
Reviewed By:

Project Number: 23-767
Date: 2023-12-21

McCallum Environmental Ltd.

Document Name: 231221_SixMile_EARD_ProjectOverview

Six Mile Brook

Six Mile Brook Rd

Four Mile Brook Road

Back Rd

Six Mile Brook

5049600 5049500 5049400 5049300 5049200 5049100 5049000 5048900 5048800 5048700 5048600 5048500 5048400 5048300 5048200 5048100

506400 506500 506600 506700 506800 506900 507000 507100 507200 507300 507400 507500 507600 507700 507800 507900 508000 508100 508200 508300 508400

Prepared For:

WEEKS

FIGURE 2

Wetland and Watercourse Field Results

Six Mile Brook Quarry Expansion

Pictou County, NS

WC4
WC5
WC7
WC2
WC1
WC3
WL1
WL2
WL3
WL4
WL5
A
B
C
D
E
F
G
Six Mile Brook
Six Mile Brook Rd
Back Rd
Four Mile Brook Road

5049500
5049000
5048500

506500
507000
507500
508000

- Field Delineated Watercourses
- NSTDB Mapped Watercourse
- Potential Wetland of Special Significance
- Open Water (Beaver Pond)
- Wetland Mosaic
- On-site Settling Pond
- Field Delineated Wetlands
- Proposed Quarry Expansion Area
- Historic Workings To Be Remediated Prior IA Expiration June 2024
- Pit Floor Currently In use
- Area To Be Remediated As Part of EA
- Study Area

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter

0 75 150 300 m

1:5,600

Scale when printed @ 11" x 17"

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Prepared For:

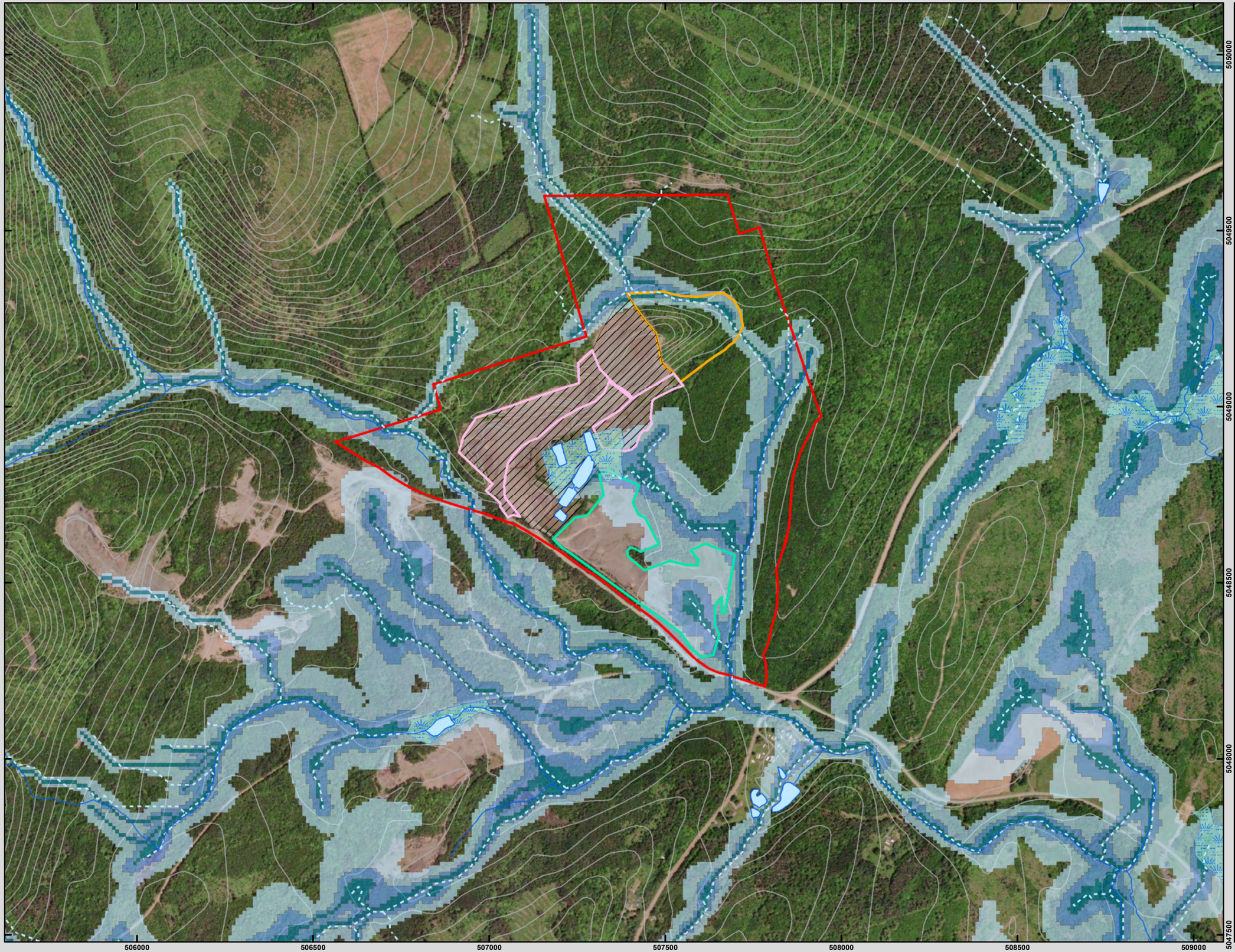
WEEKS

FIGURE 3

Desktop Hydrology Review

Six Mile Brook Quarry Expansion

Pictou County, NS



- Flow Accumulation
- NSTDB Mapped Watercourse
- NSTDB Contour Line (5 m)

Depth to Saturation

- 0 - 0.10m
- 0.11 - 0.50m
- 0.51 - 2.00m
- Mapped Waterbody (NSTDB)
- NSECC Wetland Inventory
- Proposed Quarry Expansion Area
- Historic Workings To Be Remediated Prior IA Expiration June 2024
- Pit Floor Currently In use
- Area To Be Remediated As Part of EA
- Study Area

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter

0 125 250 500 m

1:10,000 Scale when printed @ 11" x 17"

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APPENDIX B. WESP-AC SUMMARY

Wetland	Function-Benefit Product (FBP)										Conclusion
	Support Supergroup – Hydrologic		Support Supergroup – Water Quality Support		Support Supergroup – Aquatic Support		Habitat Supergroup – Aquatic Habitat		Habitat Supergroup – Transition Habitat		
	FBP Score	FBP Score Category	FBP Score	FBP Score Category	FBP Score	FBP Score Category	FBP Score	FBP Score Category	FBP Score	FBP Score Category	
1	26.13	Low	28.69	Low	39.63	Low	51.74	Low	74.67	Low	Not a WSS
2	21.4	Low	18.09	Low	16.74	Low	37.68	Low	77.34	Moderate	Not a WSS
3	32.58	Low	14.42	Low	16.38	Low	37.71	Low	77.48	Moderate	Not a WSS
4	32.58	Low	16.64	Low	19.41	Low	44.54	Low	75.6	Low	Not a WSS
5*	18.57	Low	35.54	Low	29.76	Low	15.81	Low	69.26	Low	Not a WSS

*Wetland extends beyond Project Area boundary.

Wetland	Habitat Rule Satisfied	Support Rule Satisfied	Habitat/Support Rule Hybrid Satisfied	Conclusion
1	No	No	No	Not a WSS
2	No	No	No	Not a WSS
3	No	No	No	Not a WSS
4	No	No	No	Not a WSS
5	No	No	No	Not a WSS

APPENDIX C. PHOTO LOG

Photo 1: Representative photo of WL 1

Photo 2: Representative vegetation community of WL 1

Photo 3: Representative photo of WL 2

Photo 4: Representative vegetation community of WL 2

Photo 5: Representative photo of WL 3

Photo 6: Representative vegetation community of WL 3

Photo 7: Representative photo of WL 4

Photo 8: Representative vegetation community of WL 4

Photo 9: Representative photo of WL 5

Photo 10: Representative photo of open water/flooding from beaver activity