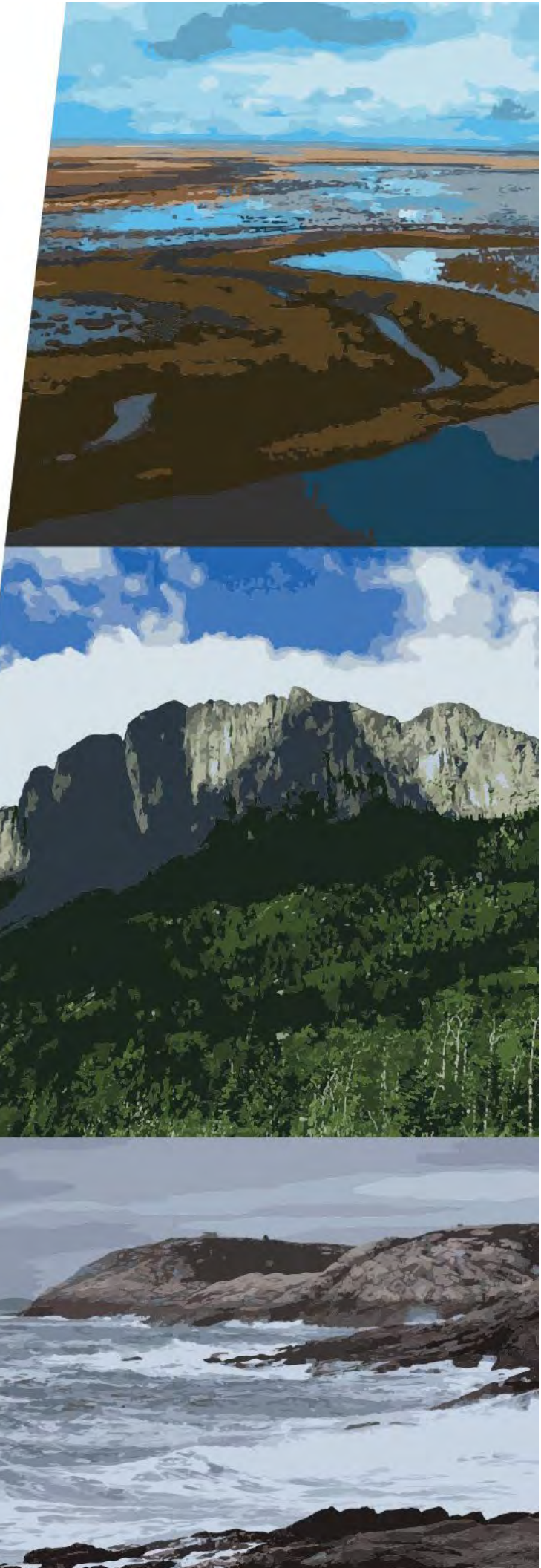
Appendix I.4

Lichen Monitoring Plan



Goldboro Gold Mine Lichen Management Plan

PREPARED FOR

Anaconda Mining Inc

Suite 790, Cabot Place, 100 New Gower Street St. John's, NL

A1C 6K3

PREPARED BY

McCallum Environmental Ltd.
2 Bluewater Road, Suite 115
Bedford, Nova Scotia, B4B 1G7

May 2022

McCallum Environmental Ltd.

Table of Contents

1.0 Introduction

Anaconda Mining Inc. (Anaconda) is proposing the construction, operation, decommissioning, and reclamation of an open pit gold mine (the Project) located 1.6 km northeast of the community of Goldboro, in Guysborough County, Nova Scotia. The Project would have an ore production rate of 4,000-tonne per day (tpd) and includes a tailings management facility (TMF), three waste rock storage areas (WRSAs), overburden and organic stockpiles, processing facility, support buildings including employee accommodations and associated infrastructure. The area that encompasses the project infrastructure with an additional 100 – 200 m buffer is referred as the Project Area (PA).

The Project is expected to impact several locations of Species at Risk (SAR) and Species of Conservation Interest (SOCI) lichen species. McCallum Environmental Ltd. (MEL) has been retained by Anaconda to develop a Lichen Management Plan (LMP) to mitigate effects to SAR and SOCI lichens and to monitor the health of potentially indirectly impacted lichen observations. The intent of this LMP is to provide a general overview of proposed lichen monitoring and translocation methods as well as proposed mitigation and adaptive management strategies. This LMP is a living document and Nova Scotia Department of Natural Resources and Renewables (NSDNRR) will be consulted for feedback and recommendations on the proposed methods. At this time, the number of monitoring stations and the level of effort at each station has not been determined.

1.1 Objectives and Scope

The objectives of the LMP are to monitor for potential Project-related indirect effects to observed SAR and SOCI, and to describe propose mitigations, adaptive management, and translocation efforts to reduce harm to SAR/SOCI lichen species. The general objectives of the LMP are to:

1. Outline potential pathways for Project-related direct and indirect effects to observed SAR/SOCI lichen occurrences.
2. Provide an overview of the lichen monitoring program, including data collection, proposed methodologies, timelines and reporting for all monitored SAR/SOCI lichens.
3. Discuss options when SAR/SOCI lichens cannot be avoided by the Project including translocation and/or collection of specimens and submission to an herbarium for scientific research; and,
4. Present mitigations and adaptive management strategies should Project-related impacts be observed during the monitoring program.

Monitored lichens will be chosen based on the maximum extent of expected indirect impacts to SAR/SOCI lichens from the Project, based on available literature review described in the Goldboro Gold Project Environmental Assessment Registration Document (EARD) and section 3.0 of this LMP. Reference sites (i.e. lichens observed outside the maximum predicted indirect effects to lichens) will be selected as control sites to support the determination of Project-related impacts to lichens within the area of predicted impacts.

2.0 Project Background

Anaconda has commissioned MEL to complete biophysical surveys and technical support to prepare an EARD for the proposed Goldboro Gold Project, in Guysborough county, NS. During the assessments completed from 2017-2021, two SAR lichens: blue felt lichen (*Pectenia plumbea*) and frosted glass whiskers (*Sclerophora peronella*) and five SOCI species: peppered moon lichen (*Sticta fuliginosa,* S3), corrugated shingles lichen (*Fuscopannaria cf. ahlerni,* S3), a

shingle lichen (*Fuscopannaria cf. sorediata,* S3), appressed jellyskin lichen (*Leptogium subtile,* S3), and slender monk's hood lichen (*Hypogymnia vittata,* S3S4) were observed. Fifty occurrences of blue felt lichen consisting of 268 thalli, and one observation of frosted glass whiskers (+100 podetia) were observed within the PA. Thirty-six occurrences of SOCI lichen species were also observed within the PA.

Where possible, micro-siting occurred to avoid SAR and SOCI lichen species, with an increased effort to avoid lichens listed in the *At-Risk Lichens – Special Management Practices* (NSDNRR 2018). However, not all locations could be avoided and some lichen observations are expected to be directly and indirectly impacted by Project-related effects. More details relating to avoidance efforts are addressed in the EARD. The following sections describes SAR/SOCI lichens observed, a summary of potential Project related effects, mitigation, adaptive management, translocation and proposed monitoring design.

3.0 Potential Project Related Effects

The construction and operation of the Project has potential to directly (e.g. direct loss by infrastructure) and indirectly impact lichen species via edge effects and air quality (i.e. dust). Poikliohydric organisms, such as lichens, have the inability to regulate and maintain their water content (Boudreault et al. 2008; COSEWIC 2002;Nash III, 2008), which makes them susceptible to edge effects and could result in desiccation, decreased health or death. The extent in which lichens are impacted by edge effects (referred as depth of influence) have been well documented, however, depending on the study, there are conflicting results. The depth of influence depends on many variables and is context dependent; the size of the clearing, substrate, species and climate are some of the variables that may contribute to the depth of influence. Some studies have shown the depth of influence to cyanolichens vary between 60 – 80 m (Haughian & Harper, 2020), while other studies suggest 240 m to 500 m (Gauslaa, Bartemucci & Solhhaug, 2018; Cameron et al. 2013). The SAR, Boreal felt lichen (*Erioderma pedicellatum)*, which has not been observed within the PA but identified in an ACCDC report, is known in the area and habitat is provided within the LAA. Stemming from the literature reviewed on edge effects, the depth of influence of boreal felt lichen, which has been documented as 500 m (Cameron et al., 2013), was selected as the maximum extent for potential negative impacts to lichens via edge effects.

Decreased air quality via sulfur dioxide and nitrous oxide emissions, metal mobilization and dust generation are other potential drivers that could negatively impact lichens. The Project is predicted to result in localized particulate and metal mobilization through dust generation during construction and operations (i.e., mining and haul traffic). Dust deposition may result in increased alkalinity in substrate pH composition (e.g. bark of host tree) and bioaccumulation in lichen tissue which can impact lichen health and species richness (Degtjarenko, 2016; Naeth and Wilkinson 2008; Farmer, 1993). Farmer (1993) presents that bryophytes and lichens along a gravel road (traffic and distance unknown) were unaffected within two years of operation, however, significant changes to the communities were noted at 10 years. Species decline was noted at dust deposition levels of 1.0-2.5 g/m^2/day, however, effects to lichens were still observed at levels 0.07 g/m^2/day. Modelled particulate deposition rate (described in the EARD) is expected to have a maximum dust deposition of 3.41 g/m^2/day concentrated immediately adjacent to the east and west pit and associated haul roads. Dust levels generally fall below 0.07 g/m^2/day ranging from 300 m to 1,800 m from the haul roads and the east and west pits. In general, edge effects are expected to be the primary driver to negative impacts to lichens and encompass modelled dust deposition extents.

The Project is expected to directly impact 21 occurrences (178 thalli) of blue felt lichen, one thallus of appressed jellyskin lichen, five thalli of shingle lichens and five thalli of corrugated shingles lichen. The remainder of the SAR and SOCI lichens observed within the PA are not expected to be directly impacted by the Project, however, they do have potential to be indirectly impacted by the potential project related effects described herein and in more detail in the EARD.

4.0 Observed Lichen SAR/SOCI Lichens

Seven SAR/SOCI lichen species have been observed in the PA during the surveys to support the Goldboro Gold Project EARD and took place in 2017-2021. Lichen occurrences that are not expected to be directly impacted by the Project are proposed to be monitored. SAR lichens that are expected to be directly impacted by the Project may be translocated as a form of mitigation should Anaconda receive approval from NSDNRR.The lichens observed and proposed to be monitored include:

- Blue felt lichen *(Pectenia plumbea*, ACCDC: S3, NSESA – Vulnerable, SARA Special Concern),
- Frosted glass whiskers (*Sclerophora peronella,* ACCDC: S1?, SARA Special Concern)
- Shingles lichen (*Fuscopannaria cf. sorediata,* S3);
- Appressed jellyskin lichen (*Leptogium subtile,* S3);
- Peppered moon lichen (*Sticta fuliginosa,* S3);
- Corrugated shingles lichen (*Fuscopannaria cf. ahlerni,* S3); and,
- Slender monk's hood lichen (*Hypogymnia vittata,* S3S4).

5.0 Lichen Translocation and Monitoring Plan

The following sections present the detailed objectives and methodologies of the proposed translocation/salvage and monitoring plan. When infrastructure could not be micro-sited to avoid SAR lichen species, translocation methods have been proposed should NSDNRR wish to pursue with this method. If translocation is not a favourable method, then Anaconda proposes to salvage lichen thalli where practicable, preserve and submit to the E.C. Smith Herbarium or the Nova Scotia Museum of Natural History as a voucher specimen and research.

Translocation and monitoring methods have been developed with considerations from studies completed by Jones and Goudie (2018), Gustafsson et al. (2012) and have been implemented by MEL for the *Translocation of a Blue Felt Lichen (Pectenia plumbea) Occurrence along the Proposed Right of Way of the Wellington Connector Road* (MEL, 2021). An overview of the proposed translocation, salvaging and monitoring methods are described below.

5.1 Lichen Translocation and Specimen Collection

When SAR and SOCI lichens can not be avoided by infrastructure, Anaconda proposes two options: 1) Blue felt lichen thalli are translocated to suitable habitat outside where indirect impacts from the Project are expected; 2) All SOCI lichens proposed to be directly impacted by the project will be collected and submitted to an herbarium for scientific research. If NSDNRR does not want blue felt lichen to be translocated, then species are proposed to be submitted to the herbarium. The following sections briefly describes the translocation and specimen collection methods for lichens which could not be directly avoided by Project infrastructure.

5.1.1 Lichen Translocation

Should NSDNRR be in favour of the translocation method, all blue felt lichen thalli expected to be directly impacted by the Project would be proposed to be translocated to suitable habitat. Due to blue felt lichen being listed under the *Species at Risk Act* (SARA) and *Nova Scotia Endangered Species Act* (NSESA) and listed in the *At-Risk Lichens – Special Management Practices* (NSDNRR 2018), translocation efforts are focused on this species only. SOCI lichens which could not be avoided by the Project are proposed to be collected and submitted to an herbarium (section 5.1.2).

Translocation is a technique that has been used to support the conservation of species whether it is a mammal, plant or lichen since the 20th century (Smith, 2014). In the past few years, translocation of lichens have been considered and implemented in some situations as a potential mitigation measure, if avoidance by the Project is not possible. MEL were the first consulting group in NS to design and implement a blue felt lichen translocation and monitoring program as described in the *Translocation of a Blue Felt Lichen (Pectenia plumbea) Occurrence along the Proposed Right of Way of the Wellington Connector Road* (MEL, 2021). Although the monitoring of the blue felt lichen transplant is still in the early stages, one year has passed and the transplant appears to be healthy and viable. The methods proposed in this LMP were adapted from the translocation program implemented for the Wellington Connector Road Project and the ongoing monitoring of the boreal felt lichen translocation program in Newfoundland (Jones & Goudie, 2018).

The translocation of blue felt lichen involves three components:

1) Identification of donor sites;

2) Identification of recipient sites; and,

3) Monitoring of the transplant.

An overview of each component required for the blue felt lichen translocation is described below.

5.1.1.1 Donor Sites

Donor sites would be blue felt lichen occurrences that could not be avoided by proposed infrastructure (Figure 1, Appendix A). These thalli would then be translocated to suitable habitat (recipient sites).

5.1.1.2 Recipient Site Identification

The identification of translocation recipient sites will consist of two components: 1) a desktop review which involves screening suitable recipient sites; and 2) field verification and assessment of suitable phorophytes. The sections below describe an overview of the screening framework, tools and datasets that may be used in the decision-making process.

5.1.1.2.1 *Desktop Candidate Recipient Site Location*

Potential recipient sites will be screened using various datasets available which could include but not limited to:

1. NSDNRR Forestry Database
2. NSECC or MEL Wet Area Mapping (WAM)
3. NSECC Wetland Inventory
4. Nova Scotia Topographic Database (NSDTB)
5. NS Protected Areas
6. NS Crownland Polygons

The datasets would then be categorized, and suitable habitat would be selected. Methods to select suitable recipient locations would involve querying through these datasets. If numerous blue felt lichen thalli are to be translocated, then a habitat suitability

model may be created to aid in the candidate recipient site location process. Candidate sites at a minimum would be required to meet criteria 1 and 2, however, priority is given to recipient sites that meet all the criteria listed below:

1) Mature Treed Swamps – Mature treed swamps are defined by swamps with tree height >= 8 m in conditions when Depth to Water (DTW) <= 0.5 m. Softwood, mixedwood and hardwood swamps are all potential recipient candidates, however, stands with higher hardwood species cover (i.e. mixedwood and hardwoods), would have a higher habitat suitability score.

2) Recipient site must be 100 m from clearings and anthropogenic disturbances - All sites would be a minimum of 100 m to mitigate from edge effects to blue felt lichen and be consistent with the the *At-Risk Lichens – Special Management Practices* (NSDNRR 2018).

3) Documented blue felt lichen occurrence within or adjacent to candidate recipient habitat – ACCDC, MTRI and INaturalist databases, as well as lichen data collected by MEL adjacent to Ocean Lake will be reviewed, and sites will be targeted that are known to support blue felt lichen.

4) Recipient sites will be within the LAA – Priority recipient sites would be within the LAA with the intent to keep blue felt lichen populations within the general area.

5) Recipient sites will be within Crown Land or Protected Areas – To ensure long term monitoring could occur for the transplants, candidate recipient sites on crown land or within protected areas would be prioritized.

5.1.1.2.2 *Field of Candidate Recipient Sites*

Candidate recipient sites chosen in the desktop screening process (section 5.1.1.2.1) will be visited in the field to collect site-specific information. In consultation with NSDNRR and the Lichen Recovery Team (LRT), a scoring system using the criteria below may be developed and deployed to aid in the decision-making process. The criteria below would be weighted based on expert knowledge and importance in blue felt lichen survival. The following criteria will be collected at each potential recipient site and scores will be tallied.

1. Treed Swamp (within the Wet Coniferous or Wet Deciduous group as per Forest Ecosystem Classification (FEC) for Nova Scotia).

2. The presence of mature/over mature red maple and ideally several other suitable host trees that could potentially support new thalli should the transplant be successful and proliferates. Trees with visibly coarse bark will be targeted as this seems to be a habitat requirement for blue felt lichen (ECCC 2020).

3. The presence of mature trees with epiphytic bryophyte cover. There appears be a relationship between the components of a lichen (i.e., mycobioint and photobiont), and the presence of moss and plays an important role in lichen development and growth.

4. Presence of lichens indicative of a rich arboreal lichen community, including species belonging to the Pannariacea, full suite of *Lobaria spp*., and *Sphaerophorus globusus*.

5. The habitat is minimum of 100 m away from any development or clearings to reduce potential edge effects.

6. The habitat is approximately 500 m or further away from any dust/particulate emitting Project infrastructure to reduce potential of air-born dust/particulates.

7. Presence of blue felt lichen.

8. No evidence of historical clearing within the wetland.

Once all candidate recipient sites have been field verified and multiple candidate phorophytes have been selected, data collected at each site and scores will be assessed. Sites which have the highest score and suitable site conditions, as verified by the expertise of MEL biologists, will be proposed as candidate recipient sites. Depending on the number of thalli available, the goal will be to disperse thalli on multiple phorophytes within multiple wetlands in suitable habitat. All candidate recipient sites evaluated will be presented to NSDNRR and Lichen Recovery Team (LRT) prior to translocation events.

5.1.1.3 Lichen Translocation Field Methods

Translocation methods would be deployed using methods implemented in previous translocation efforts. The methods would involve removing the thallus from the phorophyte with gloves, transporting the transplant to the recipient site and then fastening the thallus/thalli on a suitable phorophyte using a transparent plastic (ideally polypropylene) mesh. Translocation of the transplant will occur when trunks of the phorophyte are snow and frost free.

5.1.1.3.1 *Monitoring of the Transplant*

The transplant will be monitored using the methods described in section 5.2 and will be part of the general monitoring plan.

5.1.2 Specimen Collection

SOCI and blue felt lichen (if NSDNRR does not wish to proceed with translocation) that cannot be avoided by infrastructure will be collected, preserved, and submitted to either the E.C. Smith Herbarium or the Nova Scotia Museum of Natural History as a voucher specimen and for research.

5.2 Lichen Monitoring Plan

The following lichen monitoring plan has been developed to track changes to lichen status and health, with respect to Project development and the proposed translocation of blue felt lichen. Specifically, this plan aims to achieve the following:

1. Monitor lichen health to detect change to the observed lichen due to edge effects and changes in air quality (i.e., dust from mining activities);

2. Monitor the effectiveness of the *At-Risk Lichens – Special Management Practices* (NSL&F 2018) 100 m setback;

3. Monitor the effectiveness of lichen SAR translocation, as described in Section 5.1; and,

4. Provide data to inform provincial and federal SAR recovery strategies and action plans for these species and direct future mitigation and adaptive management approaches.

5.2.1 Proposed Monitoring Approach

The lichen monitoring program will involve monitoring all SAR and SOCI lichens observed within the PA during the biophysical surveys in 2017-2021 that are avoided by Project infrastructure. An additional area ranging from 200 m to 500 m from all Project infrastructure will be surveyed for additional SAR lichens which may be indirectly impacted (i.e. edge effects) by the Project and will take place prior to the implementation of the monitoring program (Figure 1). Within this additional survey area, only SAR lichens will be monitored however, any additional SOCI lichens will be recorded and the information will be submitted to NSDNRR. If many SAR are observed within the additional survey area and monitoring all SAR is not feasible, a subset of occurrences may be monitored. An overview of the lichen monitoring methods is described below.

5.2.2 Monitoring Methodology

Lichen monitoring may involve monitoring all SAR and SOCI lichens observed within the Project Area that are avoided by Project infrastructure and all SAR observed up to 500 m of the Project. Lichen monitoring is proposed to occur for a minimum of a five-year period. Baseline surveys will occur prior to construction and post-construction monitoring will occur after the commencement of construction into the operational phase. The frequency in which monitoring occurs (e.g. every year or every five years) will be discussed with NSDNRR and LRT to determine an appropriate monitoring frequency. A general overview of the monitoring stations, and data collection are described below.

5.2.2.1 Monitoring Stations

At this time, the lichen monitoring stations have not been selected and consultation with NSDNRR will occur to determine if all SAR/SOCI or a subset of lichens will be monitored.

Each confirmed lichen monitoring station will be clearly flagged on neighboring trees or the host tree branch and labelled with a metal forestry tag using a unique monitoring ID. If multiple thalli exist on a host tree, they will be labeled by placing a coloured pushpin/screw with an assigned unique ID next to the thallus. All pushpins/screws used will either be made out of stainless steel or will be coated with a rust-resistant enamel finish to prevent rusting and harm to the monitored lichens.

For monitored calicioid lichens (i.e. frosted glass whiskers), the methods described above will also apply. Since the thallus of this species is endosubstratic, a faint white thallus occasionally can be seen if carefully observed. If a thallus is detectable, extent markers (non-reactive plastic markers) will be placed on either extent of the thallus as a reference point. If the thallus cannot be detected and only fruiting bodies can be seen, then the markers will be placed above and below the upper and lower extent of that population. These markers will be used as reference points to determine if growth is occurring during the monitoring years.

While the plan will meet all described monitoring objectives, the specific number and locations of stations are subject to change, depending on final Project design, baseline surveys, translocation recipient sites and consultations with NSDNRR. Final locations and monitoring details will be determined at the permitting stage. Specifics on the data to be collected at the monitoring stations and the location of these stations is described below.

5.2.2.2 Monitoring Data Collected

The monitoring program would involve collecting data at the vegetation community, the phorophyte and details on thallus health. Monitoring of dust and temperature/relative humidity (RH) may also occur at a subset of monitoring stations to determine if there is a correlation between these two pathways and the health of the monitored lichens.

Chlorosis and necrosis ranks for each thallus will be determined in the field but also Image J software may be used to determine a more accurate approximately of % chlorosis and necrosis.

An attempt will be made to use imaging software to monitor frosted glass whiskers, however, due to the small size and the nearly invisible thallus, this technique may not be applicable. Determining % necrosis/chlorosis in the field may not be possible either for this species. See below for the data collected at the vegetation community, host tree and thallus level.

5.2.2.2.1 *Vegetation Community Level*

- Vegetation Type as per the Forest Ecosystem Classification (FEC) for Nova Scotia - NSDNR, 2010;
- Wetland Classification and type (softwood swamp, hardwood swamp, mixedwood swamp);
- Stand age (regenerative, immature, mature, over mature);
- Tree species present;
- Distance from edge of wetland from proposed/existing Project related infrastructure and non-Project related clearings;
- Canopy cover rank (1: <25%; 2: 25-50%; 3: 50-75%; 4:>75%);
- Invasive species present (yes or no, and list species); and
- Photograph of habitat.

5.2.2.2.2 *Phorophyte Descriptions and Data Collection*

- Coordinates of the host tree in NAD83 UTM 20;
- Tree species;
- Age class (mature, over-mature, dead and note if tree is standing or leaning);
- Canopy cover relative to host tree (use ranks 1 to 4);
- Lichen species present;
- Bryophytes present (Yes or No? Identify species if possible);
- Photograph of host tree;
- Distance from proposed/existing Project related infrastructure and non-Project related clearings;
- Bark pH; and

- Comments.

5.2.2.2.3 *Thallus Descriptions*

- Unique thallus ID;
- Life stage (Juvenile [lacking apothecia], Adult, Necrotic, Dead);
- Necrosis rank (1: 0%; 2: 1-25% ;3: 26-50%; 4: 51% - 75%; 5: >76%);
- Chlorosis rank (1: 0%; 2: 1-25% ;3: 26-50%; 4: 51% - 75%; 5: >76%);
- Area of the lichen will be determined by analysis of photographic images using imaging processing data such as Image J. Additionally, measurements of horizontal and vertical axis of thallus (measurements will be taken from furthest point on each axis) will be taken in the field;
- Rank of apothecia[1] (1: 0%; 2: 1-25%; 3: 26-50%; 4: 51% - 75%; 5: >76%);
- Rank of herbivory (1: 0%; 2: 1-25%; 3: 26-50%; 4: 51% - 75%; 5: >76%), and identification of grazing species (e.g., slugs), if observed.
- Cardinal direction the thallus is facing.
- Height up the tree thallus is positioned (cm);
- Photograph of thallus with scale (ruler or quadrate will be used as a scale); and
- Additional comments.

5.2.2.2.4 *Frosted Glass Whiskers*

As described above, frosted glass whiskers is a minute calicioid lichen with an endosubstratic thallus. The size of this species (often with stalks of 0.5 to 0.8 mm) and thallus which is a challenge to detect in the field, will limit the ability to monitor in detail without collecting specimens (Haughland pers. comm. 2020). To reduce any additional effects to this species, collecting of specimens will not occur, instead, presence-absence, thalli extent (if possible), approximate stalk number, presence of stalks and mazaedium state will be documented. The following data will be collected:

- Unique thallus ID;
- Life stage (Adult, Necrotic, Dead);
- Mazaedium state (% of stalks with 'empty' capitula);
- Measurements of horizontal and vertical axis of thallus (measurements will be taken from furthest point on each axis);

[1] Apothecia rank is based on the absolute cover of the total thallus size

- Rank of stalks[2] (1: 0%; 2: 1-25%; 3: 26-50%; 4: 51% - 75%; 5: >76%);
- Rank of herbivory (1: 0%; 2: 1-25%; 3: 26-50%; 4: 51% - 75%; 5: >76%);
- Cardinal direction the thallus is facing;
- Height up the tree thallus is positioned (cm);
- Photograph of thallus with scale (ruler will be used as a scale); and
- Additional comments.

5.2.2.2.5 *Monitoring Microclimates*

Temperature/RH (dataloggers) may be deployed at a subset of monitoring stations to monitor changes in relative humidity compared to reference sites. The intent of collecting this data would be to quantitatively determine if edge effects are occurring at certain monitoring stations. This data can then be analyzed and compared to lichen health data collected to determine if any correlations exist.

5.2.2.2.6 *Monitoring Dust Deposition*

Dust deposition may be monitored using dust collectors placed at a subset of representative monitoring stations. Dust collectors (if used), may be placed considering a graduated approach to capture changes in deposition with distance from Project development and include control sites. Collector placement will target high dust producing areas (i.e., haul roads) to monitor areas where the greatest potential effects are expected to occur.

Type and specifications of dust collectors will be determined at the implementation stage.

5.2.3 Lichen Monitoring and Translocation Summary

The purpose of this plan is to monitor the direct and indirect effects of the Project on lichen SAR/SOCI and to present translocation as a form of mitigation against potential Project impacts. Select monitoring stations may include data collection on microclimate and dust deposition. The data collected from this plan can be used to inform provincial and federal SAR recovery strategies and action plans for these species and direct future mitigation and adaptive management approaches. The translocation plan is proposed as a form of mitigation to preserve the lichen observations which could not be avoided by Project infrastructure or are expected to experience unmitigable impacts from Project development. These translocation methods will provide valuable information on the effectiveness of lichen translocation as a form of mitigation.

5.3 Reporting

An annual report will be submitted to NSDNRR which summarizes the methods and results of the monitoring and translocation plan. The report will include a summary on lichen health, verification of Project effects predictions, and health of transplants. Should additional parameters be monitored (e.g. pH, dust, temperature/RH), then these results will

[2] Stalk rank is based on the absolute cover of the total thallus size

be compared to baseline and/or reference sites to determine Project-related impacts and adaptive management strategies.

Due to the novelty of this initiative, the findings of this plan aim to further the current state of knowledge of the effects to lichens from industrial activities, specifically mining.

5.4 Mitigation and Adaptive Management

Efforts have been made to avoid lichen SAR occurrences, and maintain a 100 m setback where practicable, through detailed Project design and micro-siting infrastructure. The translocation plan is proposed as a form of mitigation where avoidance of blue felt lichen occurrences are not possible. However, it is recognized that translocation should not be considered as a standard mitigation and only applied when other mitigation measures are not possible or sufficient. Discussions with NSDNRR will occur to determine if translocation is a method they wish to pursue, and if so, to what extent translocation will occur (e.g. translocation one thallus vs. 40 thalli).

The results of the monitoring plan will aid in supplementing, where necessary, the mitigation commitments outlined in the EARD which include air quality monitoring, hydrological monitoring, wetland monitoring and Fugitive Dust Best Management Practices Plan. Findings from the lichen monitoring program, peer-reviewed studies and species-specific SARA Recovery Strategies, Action Plans, and Management Plans will be evaluated to support adaptive management approaches. Adaptive management strategies may include additional monitoring, increased dust suppression and consideration of alternative dust suppression methods.

6.0 Limitations

This plan is proposed to monitor and mitigate Project related effects to lichen SAR/SOCI. However, it is important to acknowledge other non-Project related activities may impact lichen health (i.e., Timber harvesting and forestry related traffic along dirt roads and traffic along highway 316). Anaconda cannot control impacts from activities unrelated to the Project, partially those beyond the PA. Timber harvesting or other non-Project related industrial activities may be unavoidably captured in the monitoring plan and influence the overall health and microclimate of the monitored lichens and habitat. As a result, if effects are observed in the monitored lichen (e.g., evidence of necrosis), this will not necessarily be attributed to the Project and may be a result of exterior factors (e.g., adjacent timber harvesting, climate change, acid rain etc.). Efforts have been made to tailor this monitoring plan to limited external interference and focus on the validation of Project effects predictions. These non-Project sources of impacts will be considered when selecting final monitoring stations and during reporting

Limited, if any, published data exists relating to blue felt lichen translocation. The translocation methods have been adapted from the ongoing translocation project: *The Translocation of a Blue Felt Lichen (Pectenia plumbea) Occurrence along the Proposed Right of Way of the Wellington Connector Road* (MEL, 2021). Although the efficacy of these methods is still being assessed and require a long-term study, the translocation methods deployed in the Wellington Connector Road Project were developed based on a thorough review of several other translocation projects throughout Canada and Europe. The results from this ongoing monitoring program shows that the blue felt lichen is still alive and appears healthy, albeit with only limited monitoring data collected to date. However, more data is required to be conclusive of the efficacy of these methods.

Monitoring the calicioid frosted glass whiskers presents a series of challenges (i.e., endosubstratic thallus, small size) which limits in-situ data collection. As a result, the same level of detail that is proposed to be collected on foliose lichens cannot be collected for frosted glass whiskers without sampling and microscopy work.

Blue felt lichen is often tightly appressed to the substrate which presents a challenge when attempting to remove the thallus in one piece. Methods will be applied such as wetting the lichen and removing pieces of bark attached to prevent breaking the thallus. However, creating unintentional lichen fragments while removal is a likely outcome of translocating efforts.

7.0 Closure

The methods for this translocation and monitoring plan have been selected from several studies referenced throughout and include ongoing lichen and translocation monitoring outlined in *Wellington Connector Road Lichen Monitoring Year 1* (MEL, 2021) and *Translocation of a Blue Felt Lichen (Pectenia plumbea) Occurrence along the Proposed Right of Way of the Wellington Connector Road* (MEL, 2021). The outcomes and lessons learned from this proposed plan could be used to help guide future translocation and monitoring efforts and further our understanding of industrial effects to SAR/SOCI and lichens in general. This draft plan has been prepared with the intent to share with NSDNRR for input and feedback on proposed objectives and methodologies.

John R. Gallop, B.Sc., P.Biol.
Intermediate Environmental Scientist
McCallum Environmental Ltd.

Meghan Milloy, MES
Vice President
McCallum Environmental Ltd.

8.0 References

Boudreault, C., Bergeron, Y., Drapeau, P., & Lopez, L. M. (2008). Edge effects on epiphytic lichens in remnant stands of managed landscapes in the eastern boreal forests of Canada. *Elsevier*, 1461-1471.

Brodo, I. M., Sharnoff, S. D., & Sharnoff, S. (2001a). Lichens of North America. In I. M. Brodo, S. D. Sharnoff, & S. Sharnoff, *Lichens of North America* (pp. 29-30). Yale: Yale University Press.

Brodo, I., Sharnoff, S. D., & Sharnoff, S. (2001b). Lichens of North America. In I. Brodo, S. D. Sharnoff, & S. Sharnoff, *Lichens of North America* (p. 309). Yale: Yale University Press.

Cameron, R.P., T. Neily, D.H.S. Richardson. 2007. Macro-lichen indicators of air quality in Nova Scotia. Northeastern Naturalist 14: 1-14.

Cameron, R., & McMullin, R. T. (2010). Provisional Status Report on Blue Felt Lichen (Degelia plumbea) in Canada. *COSEWIC - Committe on the Status of Endangered Wildlife in Canada*.

Cameron, R.P., Neily, T. and H. Clapp. 2013b. Forest harvesting impacts on mortality of an endangered lichen at the landscape and stand scales. Canadian Journal of Forest Research 43: 507-511

Cornejo, C., & Scheidegger, C. (2016). Cyaonbacterial Gardens: The liverwort Frullania asagrayana acds as a reservoir of lichen photobionts. *Environmental Microbiology Reports*, 352-357.

COSEWIC. (2002). *COSEWIC Assessment and Status Report on the Boreal Felt Lichen Erioderma pedicellatum.* Ottawa: COSEWIC.

COSEWIC. (2016). *Frosted Glass-whiskers (Schlerophora peronella) COSEWIC Assessment and Status report: Chapter 3.* Ottawa: COSEWIC.

Csanyi, C. (2020). *How Long do Lichens Live?* Retrieved from SFGate: https://homeguides.sfgate.com/steps-in-primary-succession-12255997.html

Cornelisson, J., T.V. Callaghan, J.M. Alatalo, A. Michelsen, E. Graglia,, A.E. Hartley, D.S. Hik, S.E. Hobbie, M.C. Press, C.H. Robinson, G.H.R. Henry, G.R. Shaver, G.K. Phoenix, D. Gwynn Jones, S. Jonasso, F.S. Chapin, III, U. Molau, C. Neil, J.A. Lee, J.M. Melillo, B. Sveinbjornsson and R. Aerts. (2001). *Global Change and Arctic Ecosystems: Is Lichen Decline a Function of Increase in Vascular Plant Biomass? J. Ecol. 89:984-994.*

Degtjarenko, P. (2016). Impacts of alkaline dust pollution on biodiversity of plants and lichens: from communities to genetic diversity. PhD Thesis. University of Tartu.

Esseen and Renhorn (1998). Growth and Vitality of Epiphytic Lichens – Responses to Microcilmate along a forest edge-interior gradient. Oceolgia:1-9

Farmer, A.M. (1993). The effects if dust on vegetation – A review. Environmental Pollution. 79: 63-75.

Farmer, Bates and Bell (1990). Short Communications – A Comparision of Methods for the Measurement of Bark pH. *Lichenologist,* 22(2):191-197

Gauslaa, Y., & Solhaug, K. A. (1998). The Significance of Thallus Size for the Water Economy of the Cyanbacterial Old-forest Lichen Degelia plumbea. *Oecologia*, 76-84.

Gauslaa, Y., & Goward, T. (2012). Relative Growth Rates of Two Epiphytic Lichens, Lobaria Pulmonaria and Hypogymnia occidentalis, transplants within and outside of Populus dripzones. Botany 90: 954 - 965.

Geiser L.H. et al. 2019. Assessing Ecological Risks from Atmospheric Deposition of Nitrogen and Sulfur to US Forests Using Epiphytic Macrolichens. Diversity. 11: 87.

Gustaffson, L., Fedrowitz, K., & Hazell, P. (2012). Survival and Vitality of a Macrolichen 14 years after Transplantation on Apsen Trees Retained at Clearcutting. *Elsevier*, 436 - 441.

Hilmo (2002). Growth and morphological response of old-forest lichens transplanted into a young and old Picea abies forest. Ecography 25:329-335

Hazell and Gustafsson (1999). Retention of trees at final harvest: evaluation of a conservation technique using epiphytic bryophyte and lichen transplants. Biol Conserv 90:133-142

INaturalist. (2020, December 12). *Frosted Glass-whiskers Lichen*. Retrieved from Inaturalist: https://www.inaturalist.org/observations?place_id=any&taxon_id=230637

Kricke, R. (2002). Measuring Bark pH. In P. L. Nimis, C. Scheidegger, & P. A. Wolseley, *Monitoring with Lichens - Monitoring Lichens* (pp. 333-336). Springer Science.

Jones and Goudie 2018. Boreal Felt Lichen Surveys, Transplantation and EEM Program: TL267 Transmission Line Project, Bay d'Espoir, Newfouldnad, 2016-2017, Final Report. LGL Report No. FA0098. Report by LGL Limited, St. John's NL, prepared for Newfoundland and Labrador Hydro, St. John's, NL. 50 p + appendices

Larsson, Solhaug, and Gauslaa (2012). Season partitioning of Growth Into Biomass and Area expansion in a cephalolichen and a cyanolichen of the Old Forest Genus Lobaria. New Phytologist: 991-1000

Lindo, Z., Nilsson, M. C., & Gundale, M. (2013). Bryophyte-cyanobacteria Associations as Regulators of the Northern Latitude Carbon Balance in Response to Global Change. *Global Change Biology*.

Maass, W. and D. Yetman. 2002. COSEWIC assessment and status report on the Boreal Felt Lichen Erioderma pedicellatum in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ontario. 50 pp.

McCune & Caldwell (2009). A single phosphorus Treatment Doubles Growth of Cyanobacterial Lichen Transplants. Ecology: 567-570

McCune, B. (2017). *Microlichens of Pacific Northwest. Volume 2: Keys to the Species.* Oregon: Wild Blueberry Media.

Nash III, T. (2008). Lichen Biology. Cambridge: Cambridge University Press.

Naeth, M. A. and Wilkinson, S. R. (2008). Lichens as Biomonitoris of Air Quality around a Diamond Mine, NWT. J. Env. Quality. 37:1675-1684

Neitlich, P.A., Var Hoef, Jay, M., Berryman, Shanti, D., Mines, Anaka, Geiser, L.H., Hassebach, L.M., & Shiel, A. E. (2017). *Trends in Spatial Patterns of Heavy Metal Deposition on National Park Service Lands along the Red Dog Mine Haul Road, Alaska*, 2001-20006. PLoS One, V.12 (5).

NSL&F (2018). At-risk Lichens – Special Management Practices.

NSDNR 2010.Forest Ecosystem Classification for Nova Scotia – Part I: Vegetation Types.

Rheault, H., Drapeau, P., Bergeron, Y., & Esseen, P.-A. (2002). *Edge Effects on Epiphytic lichens in Managed Black Spruce Forests of Eastern North America.* NRC Canada.

Richardson, D.H.S. 1992. Pollution Monitoring with Lichens. Richmond Publishing, Slough, UK.

Richardson, D.H.S. and Cameron, R.P. (2004). Cyanolichens: Their response to pollution and possible management strategies for their conservation in northeastern North America. Northeastern Naturalist. 11(1): 1-22.

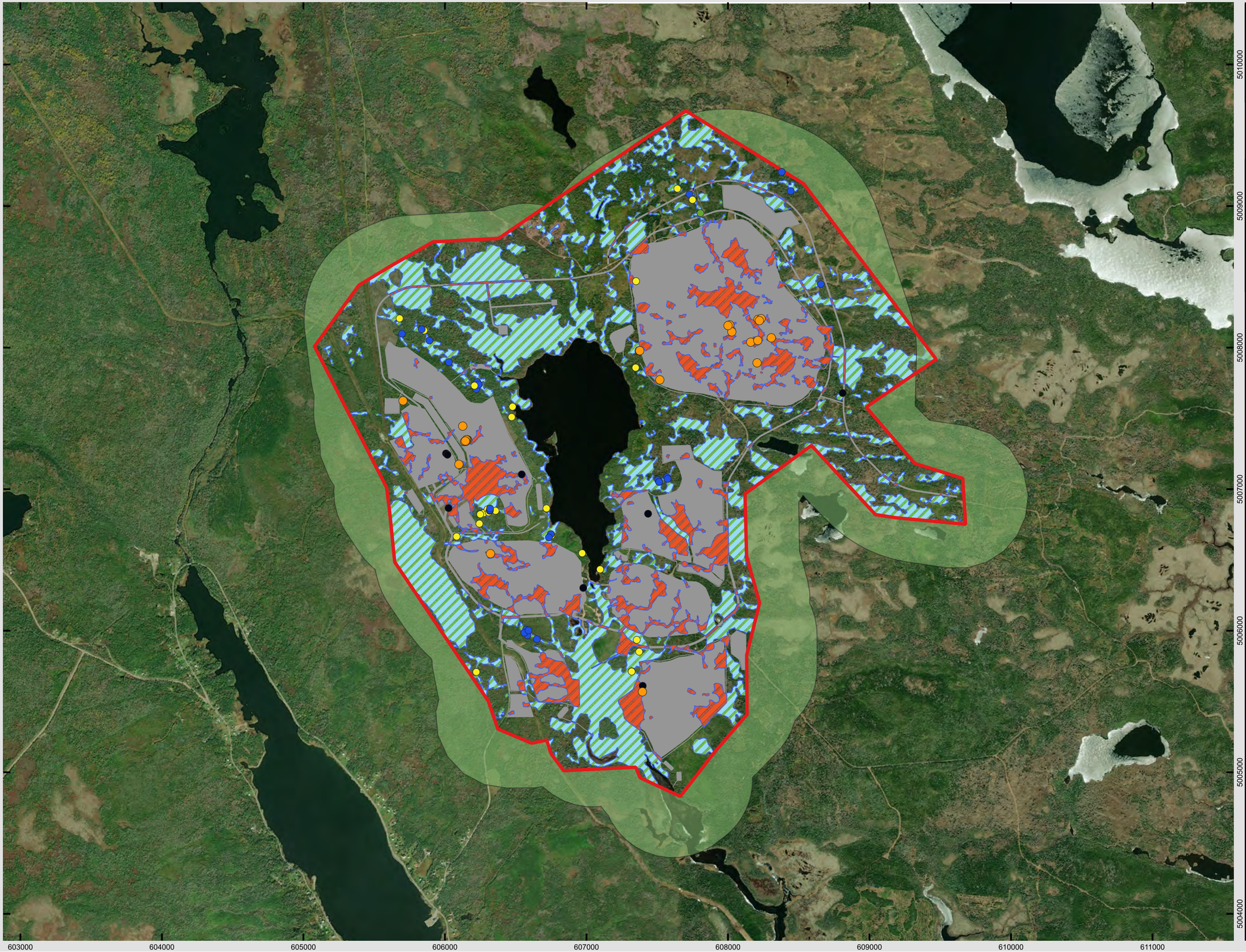
Schaefer, M., Levey, D., Schaefer, V., & Avery, M. (2006). The Role of Chromatic and Achromatic Signals for Fruit Detection by Birds. *Behavioural Ecology*, 784-789.

Smith, P. L. (2014). Lichen Translocation with Reference to Species Conservation and Habitat Restoration. *Symbiosis*, 62:17-28.

Sillett and McCune (1998). Survival and Growth of Cyanolichen transplants in Douglas-fir Forest canopies. Bryologist 101:20-31

Sonesson M., Sveinbjornsson B., Tehler A, Carlsson BA (2007). A comparison of the physiology, anatomy and ribosomal DNA in alpine and subalpine populations of the lichen Nephroma arcticum – the effects of an eight-year transplants experiment. Bryologist 110:224-253

Appendix A: Figures



Prepared for:

SIGNAL GOLD

FIGURE 1

Proposed Lichen Monitoring Plan

Goldboro, NS

Potential SAR/SOCI Lichen Monitoring Locations
- Blue Felt Lichen (SAR)
- Frosted Glass Whiskers (SAR)
- SOCI Lichens

Directly Impacted Lichen Locations (potential translocation and/or specimen collection locations)
- Blue Felt Lichen
- SOCI Lichens
- Field Delineated Wetlands (proposed to be directly impacted)
- Field Delineated Wetlands (not directly impacted)
- Proposed Project Infrastructure
- Additional Lichen Survey Area
- Project Area (PA)

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

0 400 800 1,200 m

Scale: 1:25,000

Scale when printed @ 11" x 17"

Drawn by: JG
Reviewed by: MM

2022-5-13

McCallum Environmental Ltd.

Appendix I.5

Wildlife Management Plan

Goldboro Gold Project - Wildlife Management Plan

PREPARED FOR

Anaconda Mining Inc.
Suite 790, Cabot Place, 100 New Gower Street
St. John's, NL
A1C 6K3

PREPARED BY

McCallum Environmental Ltd.
2 Bluewater Road, Suite 115
Bedford, NS
B4B 1G7

May 9th, 2022

McCallum Environmental Ltd.

EXECUTIVE SUMMARY

Anaconda Mining Inc. (Anaconda) has retained McCallum Environmental Ltd. (MEL) to prepare a Wildlife Management Plan (WMP) for the Goldboro Gold Project, located in Goldboro, Nova Scotia.

The primary goals of the WMP are to provide strategies to reducing human-wildlife interactions, promote safety of both wildlife and site personnel, and to provide best management practices for the management of vegetation. This document is intended to provide guidance on best practices during construction and operations and will be revised as necessary to reflect construction and operation activities. The WMP covers the following topics:

- Education and Awareness Training Plan;
- Communication protocol for wildlife observations;
- Sensitive wildlife time periods throughout the year;
- General wildlife mitigation strategies;
- Avifauna mitigation strategies;
- Herpetofauna mitigation strategies;
- Species at Risk mitigation strategies; and,
- Vegetation and weed management protocol.

It is the intention that this plan be used in conjunction with the Goldboro Gold Project Environmental Protection Plan (2022) completed under a separate cover.

TABLE OF CONTENTS

TABLES

APPENDICES

1 INTRODUCTION

This Wildlife Management Plan (WMP) describes mitigation and proposed monitoring to reduce impacts to wildlife and their habitat. Details on the proposed mitigations and monitoring are described below.

1.1 Project Overview

The Goldboro Gold Project (the Project) is located approximately 175 kilometres (km) northeast of Halifax, 60 km southeast of Antigonish, and 1.6 km northeast of the community of Goldboro on the eastern shore of Isaac's Harbour, in Guysborough County, Nova Scotia, Canada (Figure 1, Appendix A). Anaconda Mining Inc. (Anaconda) proposes to develop the Project as a 4,000-tonne per day (tpd) mine and processing facility. For the purposes of the environmental assessment, a Project Area (PA) was defined as the footprint of Project related infrastructure plus a buffer of 100 – 200 m. The mine plan includes two surface extraction areas (open pits), an ore processing facility, a tailings management facility (TMF), three waste rock storage areas (WRSAs), overburden and organic stockpiles, support buildings including an employee accommodation building, and associated infrastructure. The anticipated mine life for extraction of ore is approximately 11 years.

Refer to the Environmental Assessment Registration Document (EARD) for additional details.

1.2 Wildlife Management Plan Overview

This Wildlife Management Plan (WMP) has been prepared to guide the Project, while minimizing interaction and effects to wildlife.

The purpose of the WMP is to outline strategies for responsible management and protocols that minimize interactions between wildlife and Project activities.

Project activities can impact wild species in several ways as listed below:

- Development of infrastructure can cause direct impacts to habitat used by fauna, including upland forested habitat and wetlands.
- Sensory disturbance to fauna can result from blasting, clearing, grubbing, infrastructure construction, and overall increased traffic during the construction, operation, and closure phases. This may result in localized avoidance of the Project by some wildlife species.
- Increased human activity could result in increased usage of the Project by opportunistic species such as eastern coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*) or American black bear (*Ursus americanus*). These opportunistic species generally have a higher risk of becoming habituated to human activity, which can lead to nuisance or aggressive behaviors, increasing risk to both wildlife and site personnel. As such, several of the protocols outlined herein are related to reducing the risk of wildlife habituation.
- Changes to ambient noise levels, possibly light levels, and the presence of periodic vibrations from blasting have the potential to adversely affect fauna and birds by influencing migration and behavioral patterns.
- Decrease in air quality and increase in dust which may impact plants and lichens.
- Direct mortality of fauna species could result from project activities, particularly due to the increase in traffic during construction and operation of the facility.

- Habitat connectivity at the landscape level may be impacted by Project activity including clearing which may result in edge effects and negatively effect flora and fauna.

1.3 Regulatory Context

The construction, operation and closure of the Project will be governed by several federal and provincial acts and regulations. These include:

- *The Migratory Birds Convention Act*, S.C. 1994, c.22.
- *Migratory Birds Regulations (C.R.C., C. 1035)*
- *Wildlife Act*; RSNS 1989, c. 504.;
- *Species at Risk Act*, S.C. 2002, c. 29;
- *Nova Scotia Endangered Species Act*, 2010, c.2, s. 99; and,
- *Fisheries Act,* RSC 1985, c.F-14.

1.4 Scope and Objectives

The primary goals of this WMP are to provide strategies to reducing human-wildlife interactions, reduce disturbance to local vegetation, and to promote safety of both wildlife (including wildlife Species at Risk [SAR] and Species of Conservation Interest [SOCI]) and site personnel. This document is intended to be a living document, revised as necessary to reflect construction and operation activities. It is the intention that this plan be used in conjunction with the Goldboro Gold Project Environmental Protection Plan (2022) completed under a separate document.

1.5 Communication Plan

Clear communication between team members is the key to successful environmental management. Anaconda is committed to effective communication within the project team and all appropriate regulatory agencies. All communication and reporting for specific activities related to wildlife management will be outlined throughout this document. Key personnel involved in the implementation of this WMP are identified below. Any sightings of SAR are to be reported immediately to the Project Environment Manager on site.

Table 1 Key Personnel Contact List

Position	Name	Phone Number
ProjectEnvironment Department Contacts		
Environment, Compliance, and Social Responsibility Manager, Anaconda	Deidre Puddister	Tel: (709) 689-8086
Site Environment Manager	TBD	-
Environmental Advisor and Monitor	TBD	-
Regulatory Contacts		
Nova Scotia Environment and Climate Change (NSECC) Inspector	Sean Gillis	Tel: (902) 863-7389
Department of Fisheries and Oceans	-	Tel: 1-800-565-1633
Environment and Climate Change Canada (ECCC), including Canadian Wildlife Service (CWS)	-	Tel:1-800-668-6767 Email: ec.enviroinfo.ec@canada.ca

Position	Name	Phone Number
NS Department of Natural Resources and Renewables (NSDNRR), Halifax (Main Office)	-	Tel: 902-424-5935 For Wildlife Concerns: 1-800-565-2224
SAR Biologist	Mark McGarrigle	Tel: 902-324-1504 Email: Mark.mcgarrigle@novascotia.ca
NSECC After Hours Emergency	-	1-800-565-1633
RCMP (Sherbrooke)	-	902-522-2200

Table 1 will be reviewed and updated with key personnel change as soon as Anaconda is made aware. The Project Environment Manager is responsible for all communication relating to wildlife and SAR between Anaconda and regulatory agencies. Table 3 below outlines the communication plans and timing.

Table 2 Communication Plan

Species	Type of Observation	Regulatory Agencies (Personnel) to be Notified	Communication Type and Timing
SAR	All turtles, bats, and SAR bird non-breeding activities (e.g., flyover or other sighting)	ECCC-CWS	Report (phone and email) within 24 hours
		NSDNRR (Regional Biologist & Biodiversity Section, Wildlife Division)	Report (phone and email) within 24 hours
		NSECC	Written notification of reporting to ECCC-CWS and NSDNRR
	Turtle nests, bat roots/nests, and potential or confirmed SAR bird breeding activities	ECCC-CWS	Immediate phone call and email follow up
		NSDNRR (Regional Biologist & Biodiversity Section, Wildlife Division).	Immediate phone call and email follow up
		NSECC	Written notification of reporting to ECCC-CWS and NSDNRR
		NSECC	Written notification of reporting to ECCC-CWS and NSDNRR within 24 hours

Species	Type of Observation	Regulatory Agencies (Personnel) to be Notified	Communication Type and Timing
	Dead SAR wildlife	Report dead SAR wildlife to the same agency as live observations; dependant on species as listed above	Report dead SAR wildlife within the same timeframe and communication methods as live observations; dependant on species as listed above
Birds (non-SAR)	Potential/confirmed breeding activity inside or outside of the Project footprint within subject property – migratory birds	ECCC	Consult prior to any further construction activities
		NSDNRR (Regional Biologist & Biodiversity	Written notification of consultation with NSDNRR
		NSECC	Written notification of consultation with NSECC.
	Potential/confirmed breeding activity inside or outside of the Project footprint – migratory birds – non-migratory birds	NSDNRR (Regional Biologist & Biodiversity	Consult prior to any further construction activities
All	Harassment (any form) from site personnel	NSECC (Conservation Officer)	Immediate phone call
All	Dead wildlife (other than SAR)[1]	NSDNRR (Local Office)	Phone call within 24 hours
All	Injured or sick wildlife	NSDNRR (Local Office)	Immediate phone call
All	Potential or confirmed poaching incident	NSECC (Conservation Officer)	Immediate phone call
		Local RCMP detachment	Immediate phone call
All	Nuisance/aggressive wildlife	NSDNRR (Local Office)	Consult as needed

[1] *Includes large ungulates (i.e.,white-tailed deer, moose).*

1.6 Wildlife Education and Awareness Training Plan

Prior to the construction and operation of the Project, Anaconda will provide Wildlife Education and Awareness Training. All new staff hired will be provided this training by the Site Environmental Manager prior to working on site. The training will include a review of the WMP, Species at Risk ID cards (Appendix B), sensitive periods for wildlife, and commitments made to minimize impacts to wildlife. The

goal of the training is to increase awareness of potential wildlife interactions and employee responsibilities.

2 PROJECT ENVIRONMENT DEPARTMENT

The Project Environment Department will consist of the Environment, Compliance and Social Responsibility Manager, Site Environmental Manager and Environment Advisor and Monitor. These personnel will be responsible for overseeing all environmental permits, mitigation and monitoring required to protect wildlife and their habitat. More details on each environmental role are described in the Environmental Management Plan.

3 ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURES

Anaconda is committed to reducing human-wildlife interactions at the Project. The following strategies will help to identify and track where wildlife is using the PA, and the management strategies to help reduce interactions. Sensitive time periods for wildlife are noted in Table 4.

Table 3 Sensitive Time Periods for Wildlife

Wildlife	Sensitive Period
Avifauna	April 15- August 31st
Turtles	Active from May through October, nesting in June
Bats	Hibernation in caves from November – April; Maternity roosting from April 16 - September 15

January to March, November, and December are considered non-sensitive time periods as these months fall outside of the regional nesting period for migratory birds (April 15 to August 31st), and when turtles are most active. However, it is important to note that some species may breed outside of these regional nesting periods and more sensitive times of the year. Bat hibernation occurs during this period but blasting best management practices will mitigate negative impacts (ECCC, 2018; NSL&F, 2020b; 2020c; 2020d). Furthermore, an extensive search for bat hibernacula occurred to support the EARD and no suitable habitat was observed within a 5 km radius. During this sensitive time period, mine personnel must be the most vigilant in their wildlife sightings and deploy mitigation measures described in Sections 2.1 – 2.4.

3.1 General Wildlife

Anaconda acknowledges their responsibility to conduct appropriate operations with consideration of wildlife and wildlife habitat, and to adhere to all applicable regulations and conditions of the EA approval. As such, Anaconda will work with site personnel through the following actions and practices for each species group.

3.1.1 Wildlife Observations and Reporting

A wildlife sighting program has been developed and will be communicated to all site personnel during site orientation and/or toolbox talks. A wildlife sighting card has been developed to help facilitate communication of wildlife observations, particularly SAR listed under provincial and federal legislation. Any sightings of SAR will be reported immediately to the Project Environmental Manager using a

Wildlife Sighting Card similar to the one found in Appendix C. The Wildlife Sighting Cards will be made available to all site personnel.

3.1.2 Sick, Injured, and Dead Wildlife

In the event of encounters with injured large wildlife (i.e., bear, deer etc.) within the PA, the local NSDNRR office will be contacted as per the communication plan outlined in Section 1.5. No attempt will be made to move or be in contact with the animal.

Large, dead wildlife (i.e., bear, deer etc.) or SAR animals will be reported immediately to the Environment Team. The location, date, time, state of decomposition, injury sustained (if identifiable), and species of the animal will be recorded. The Environment Team will report all dead wildlife sightings as per the communication protocol outlined in Section 1.5.

3.1.3 Nuisance or Aggressive Wildlife

As a preventative measure site personnel will be directed to maintain good housekeeping within the PA to reduce wildlife attractants (e.g., no littering, no feeding wildlife, storing food and general waste in covered bins.)

Should it be evident that wildlife is accessing the PA on a regular basis (i.e. daily observations), access for wildlife to the PA will be limited by installation of a pit perimeter berm wherever practicable and necessary. Specific details relating to berm dimensions and construction will be provided to NSDNRR should a berm be deemed necessary to construct.

If aggressive wildlife are encountered, site personnel will leave the area immediately in a calm manner by backing away slowly and remain facing the animal. Do not run, as this may trigger the animal to chase. Site personnel will be aware of their surroundings and leave escape routes open for the animal.

Site personnel will be permitted to carry air horns and whistles to be used as wildlife deterrents. Where necessary, based on remote work or based on the level of wildlife activity, wildlife deterrents, bear bangers or bear spray may be permitted for use on site at the discretion of the Environment Team. Site personnel will be trained to use issued wildlife deterrents, and the risks and benefits of carrying wildlife deterrents, and their proper use, must be reviewed with Site Safety Personnel. All wildlife deterrent equipment shall be visually checked for defects. Equipment must be kept in an immediately available location, ready for use. Wildlife awareness and the use of wildlife deterrents must be considered during pre-job safety assessments or tail-gate meetings for their applicability for the safe completion of the task.

Anaconda will consult with NSDNRR to determine appropriate actions for managing nuisance or aggressive wildlife on a case-by-case basis. The conditions outlined herein are focused on preventative measures, to reduce the likelihood of wildlife becoming nuisance or aggressive.

3.1.4 Site Security and Prohibited Activity

- The mine site access will be gated with either security or swipe card access.
- Vehicles will adhere to safe speed limits, particularly around blind corners.

- Vehicles will yield to wildlife on roads.
- Vehicle collisions with wildlife will be immediately reported to the Site Environmental Manager.
- Wildlife harassment within the PA will not be tolerated. Wildlife will not be chased, caught, diverted, followed, or otherwise harassed by any site personnel. Any wildlife harassment shall be reported to the Site Environmental Manager, who will immediately report any incidents of harassment as per the communication protocol outlined in Section 1.5.
    - Depending on the species; harassment, harm, or disturbance of wildlife is a violation of the *Wildlife Act, Endangered Species Act,* and federal statues.
- Garbage disposal will occur at designated disposal locations throughout the PA for removal. Garbage bin lids shall be closed at all times other than during loading or unloading. No garbage is to be kept in trucks or opened garbage bins to reduce accessibility to wildlife (including birds). Bear-proof bins may be used where deemed appropriate or necessary based on bear activity.
- Feeding of any wildlife by site personnel will not be permitted. Any wildlife feeding will be reported to the Site Environmental Manager so disciplinary actions can be taken.
- Trapping or baiting for wildlife is prohibited within the PA.
- Release of any wildlife (e.g. nuisance skunks, racoons, etc.) within the PA is prohibited.
- All site personnel will be prohibited from engaging in fishing or hunting within the Project Area. Firearm possession by site personnel is prohibited within the Project Area.

3.1.5 Education and Training Program

- An awareness campaign about wildlife poaching will be implemented. Report a Poacher signs will be posted and reviewed during site orientation. Any evidence of poaching on site will be reported immediately to the Site Environmental Manager, who will ensure immediate reporting to NSDNRR, the local NSECC conservation officer and the local RCMP. A sample 'Report a Poacher' sign is provided in Appendix E.

3.1.6 Minimizing Disturbance

- An increase of habitat fragmentation will occur as a result of the Project; however, this disturbance is expected to be of low magnitude as a result of the fragmentated conditions currently present (due to recenttree harvesting). Additional clearing and disturbance will be limited to the approved Project footprint. A progressive decommissioning and reclamation program will be implemented to re-establish native vegetation and habitat connectivity across the PA.
- Appropriate Erosion and Sediment control measures will be implemented to protect aquatic habitat and aquatic species in the surrounding water features. Surface water monitoring will be conducted to ensure the efficacy of Erosion and Sediment controls. A Water Monitoring Plan has been initiated and will be continued through the life of the mine.

3.2 Avifauna

All site workers shall comply with regulations outlined in the *Migratory Birds Regulation* and *Migratory Birds Convention Act*, which prohibits the disturbance and destruction of migratory birds, their nests and eggs. If any nest is identified or behaviour observed which suggests a nest is present, work is to be immediately halted and the Site Environmental Manager will be notified, so steps can be taken to identify the species and determine appropriate mitigation or avoidance if required.

Clearing and grubbing activities will be completed outside the accepted breeding bird window (April 15th to August 31st), where practicable. If clearing is required within the breeding bird window, Anaconda will consult with NSECC, NSDNRR and ECCC for authorization and a qualified professional will be retained to conduct pre-clearing nest sweeps.

Should any nests used by non migratory birds that are protected under the *Nova Scotia Wildlife Act* be discovered in the PA, nests and birds will be avoided and undisturbed until breeding activities are determined to be over. This determination will be made by members of the Site Environmental Manager. If a nest is discovered within the PA, Anaconda will consult with NSDNRR (and ECCC in the case of migratory birds) to establish appropriate vegetated buffer zones prior to any required clearing. These buffers will be maintained and activity in the immediate area around the nest will be minimized until birds have naturally migrated from the area. No nests will be disturbed by site personnel, regardless of occupancy.

Identified nests will not be marked with flagging tape, as this can increase the risk of predation. Instead, the vegetated buffer may be flagged. The size of vegetative buffers may vary depending on the species encountered and will be confirmed through consultation with NSDNRR and ECCC.

The Project will limit the use of lights to the amount necessary to ensure safe operation within the PA, with recognition that excessive lighting can be disruptive to wildlife. Lights will be installed facing downward and wherever practicable using motion-sensing lights.

3.3 Herpetofauna

Wetland habitat present within the PA and immediate adjacent aquatic features provide suitable herpetofauna habitat. Nesting and overwintering habitats for turtles were identified within the PA in Wetland 18 and along Gold Brook Lake, but no turtles, signs or nests were observed. Due to the presence of aquatic features within and adjacent to the mine site, access for reptiles (including turtles) to the mine work areas is possible. This includes the presence of snapping turtle *(Cheydra serpintina)* and wood turtles *(Glyptemys insculpta)* which are both SAR. Should evidence of reptiles be discovered within the PA during construction, operation, and closure, the following mitigation and best management practices will be implemented:

- Both wood turtles and snapping turtles are drawn to gravelly roadsides during nesting season to lay their eggs. During this time, if turtles are observed, Anaconda will consult with NSDNRR and ECCC (written correspondence will be copied to NSECC) to determine the best course of action related to removal of the turtle from PA. If nesting has commenced, personnel must leave the turtle in place, and mark the location of the nest with flagging tape on a stationary object, within 1 m of the nest or with pylons within 1 m of each side of the nest and at a suitable height to be visible to passing vehicles. Anaconda will consult with NSDNRR and ECCC once a nest is identified to determine if and how the nest should be protected (e.g. implementation of a nest buffer).
- No species of turtle is to be handled unless authorised by the Manager of Biodiversity, NSDNRR.
- Any turtle sighting must be immediately reported to the Site Environmental Manager, for reporting to NSDNRR and ECCC.
- If possible, personnel are encouraged to take a photo of the turtle observed. Wood turtles should be photographed to show the top (carapace) if it is safe and possible to do so.

- In the event that reptiles are observed within mine areas, Anaconda will identify areas within the site where exclusion fencing could be used to prevent herpetofauna accessing the site. This will be determined in consultation with NSDNRR and ECCC. Such exclusion fences will be constructed wherever practicable and necessary, particularly at the lowest sloped areas.
- On-site personnel will practice diligence while driving and working especially during months marked highly sensitive for turtle nesting). If nesting is observed within a high-traffic area, Anaconda will consult with NSDNRR and ECCC to determine appropriate mitigation measures (i.e. re-routing of traffic patterns).

3.4 Species At Risk

As it relates to SAR, Anaconda will work with site personnel to ensure they are educated sufficiently to understand which species could be present within the PA and comprehend what constitutes a contravention of the *Species at Risk Act* (SARA), *Nova Scotia Endangered Species Act* (NSESA*), Nova Scotia Wildlife Act*, *Migratory Birds Convention Act* and *Migratory Bird Regulation.* Refer Section 1.6 for an education and awareness training plan and Section 1.5 for a detailed communication protocol between Anaconda and regulatory agencies as it related to SAR.

A list of SAR observed within the PA is provided in Table 6 below.

Table 4. Observed SAR Within the Project Area

Scientific Name	Common Name	SARA	COSEWIC	NSESA
Wilsonia canadensis	Canada Warbler	Threatened	Threatened	Endangered
Contopus cooperi	Olive-sided Flycatcher	Threatened	Special Concern	Threatened
Coccothraustes vespertinus	Evening Grosbeak	Special Concern	Special Concern	Vulnerable
Alces americanus	Mainland Moose	-	-	Endangered
Hylocichla mustelina	Wood Thrush	Threatened	Threatened	-

The following actions will be implemented to reduce the potential that SAR are adversely impacted by the Project:

- All SAR observations will be reported to ECCC, NSDNRR and NSECC.
- Limit disturbance to the approved areas and maintain vegetative buffers wherever possible.
- Control public access in the PA.

The following subsections outline the SAR with a heightened potential of being found within the PA due to the presence of appropriate habitat.

3.4.1 Common Nighthawk

No common nighthawks (*Chordeiles minor*) were identified during field programs completed to support the EA, however, one record was identified by the ACCDC report (Appendix F). Suitable habitat for common nighthawk includes disturbed open habitat, which is present within the PA currently and could be present throughout the construction and operation of the mine (Environment Canada, 2016, NSL&F, 2021). It is therefore important to be aware of the potential for common nighthawks on site.

Preventative or mitigative measures to avoid prohibited/unwanted impacts to the species include:

- Site personnel will be made aware of the identifying features of common nighthawks with focus on understanding nesting behavior. Personnel will be made aware of the protections to common nighthawk and their nests under the *Migratory Birds Convention Act*, SARA and NSESA through distribution of educational material during site orientation. Refer to Appendix B for identification, behavior, and habitat information of this species. Observations of common nighthawk by site personnel will be reported as per the communication protocol outlined in Section 1.5.
- Should any nests used by common nighthawks be discovered in mine development areas, nests and birds will be avoided and undisturbed until breeding activities are determined to be over. This determination will be made by site environment personnel.
- Consultation with NSDNRR and ECCC will occur to determine appropriate mitigation measures including no disturbance buffers around the common nighthawk nest.
- The breeding period for common nighthawk is mid-May to Mid-August (COSEWIC, 2007).
- Refer to Section 2.2 for additional mitigation measures.

3.4.2 Bank Swallow

No bank swallows (*Riparia riparia*) were identified on site during EA related bird surveys, however, one record was identified by the ACCDC report (Appendix F). Suitable habitat (i.e., pit face, ungraded stockpiles) could be available on site.

Preventative or mitigative measures to avoid prohibited/unwanted impacts to the species include:

- Site personnel will be made aware of the identifying features of bank swallows that may use portions of the mine, with focus on understanding nesting behavior. Personnel will be made aware of the protections to this species and their nests under the *Migratory Birds Convention Act*, SARA and NSESA through distribution of educational material during site orientation. Refer to Appendix B for identification, behavior, and habitat information of this species. Observations of bank swallow by site personnel will be reported as per the communication protocol outlined in Section 1.5.
- Bank swallows prefer cliff faces for nesting (e.g. pit face or sheer stockpiles slopes); therefore, mine staff will ensure that all bank swallows presenting nesting behaviour within the mine area will be reported to, and discussed with NSDNRR, ECC and NSECC to determine appropriate mitigative measures on a case-by-case basis.
- Prior to and during the breeding period stockpiles will be covered, graded to a slope less than 70% to remove vertical slopes, or regularly disturbed, reducing the potential for nesting bank swallows (ECCC, 2016). Additionally, during the breeding period, stockpiles will be visually assessed by site personnel for evidence of nesting bank swallows prior to excavating.
- Should any nests used by bank swallows be discovered in mine development areas, nests and birds will be avoided and undisturbed until breeding activities are determined to be over.
- The bank swallow breeding period is mid-April to late August (ECCC, 2016).
- Refer to Section 2.2 for additional mitigation measures

3.4.3 Other SAR Birds

In addition to bank swallow and common nighthawk, other SAR birds have the potential to use habitat within and immediately adjacent to the PA including barn swallow (*Hirundo rustica*). Four SAR birds were identified during the EA related avifauna surveys which include Canada warbler (*Cardellina*

canadensis), olive-sided flycatcher (*Contopus cooperi*), evening grosbeak (*Coccothraustes vespertinus*) and wood thrush (*Hylocichla mustelina*) (Table 6).

- All sightings of avian SAR as listed on Schedule 1 of SARA will be reported to ECCC and confirmation will be sent to NSDNRR. Refer to Appendix B for identification, behavior, and habitat information of these species. All sightings of avian species listed under NSESA will be reported to NSDNRR. Anaconda will provide written confirmation to NSECC of any SAR sightings reported to ECCC or NSDNRR. Refer to the communication protocol outlined in Section 1.5.
- Clearing and grubbing activities will be completed outside the accepted breeding bird window (April 15 to August 31), where practicable.
    - If clearing is required within the breeding bird window, Anaconda will consult with NSECC, NSDNRR and ECCC for authorization and a qualified professional will be retained to conduct pre-clearing nest sweeps (Refer to Section 2.2).
- If avifauna SAR are observed nesting in anthropogenic structures (e.g. barn swallows nesting in core shack), mitigations such as removal of nests after hatchlings have fledged the nest may be implemented to prevent the return of breeding pairs the following year. NSECC, ECCC and NSDNRR will be consulted on appropriate mitigation measures and methods of nest removal.

3.4.4 Bats

No bats or bat hibernacula were identified within the PA and the Local Assessment Area (LAA) during the EARD related surveys. Furthermore, no bat roosts were observed. However, habitat is present within the PA.

Preventative or mitigative measures to avoid prohibited/unwanted impacts to the species include:

- Any sightings of bats will be reported to ECCC, NSDNRR and NSECC.
- In the unlikely event that an active bat maternity roost is encountered, the roosting structure will be identified, and ECCC, NSDNRR and NSECC will be contacted to determine appropriate mitigation measures.
- Construction activities that could block access of nursing bat females to their pups, or that could trap bats inside structures will also be avoided when practicable until the identified bat has completed roosting.
- All buffers on active bat hibernacula or maternity roosts will be determined through consultation with NSDNRR and ECCC.
- Site personnel will be made aware of the identifying features of the little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*), and tri-colored bat (*Perimyotis subflavus*). Refer to Appendix B for identification, behavior, and habitat information.
- Limit the use of lights to the amount necessary to ensure safe operation within the Project Area, with recognition that excessive lighting can be disruptive to wildlife
- Install lights facing downward and wherever practicable using motion-sensing lights.

3.4.5 Mainland Moose

Evidence of mainland moose was observed within the Project Area during EA related surveys. Mainland moose are found in habitat mosaics of uneven age stands with abundant twigs and foliage for foraging.

During the summer months, they are reliant upon aquatic systems for submergent and emergent vegetation, and cover from thermal stress (McNeil, 2013).

Preventative or mitigative measures to avoid prohibited/unwanted impacts to the species include:

- Implementing a Mainland Moose Monitoring Program to describe frequency of occurrence of moose around the PA.
- Providing site personnel with information pertaining to the identification of moose and their activities (e.g., age and sex identification, evidence of breeding behaviors) for the purpose of monitoring population demographics and informing wildlife sighting reports. Refer to Appendix B for identification, behavior, and habitat information of these species.
- Recording sightings and maintaining a database on-site for NSDNRR to review. All wildlife sightings by site personnel are to be reported to the Site Environmental Manager and will be used to track observations of mainland moose (and signs thereof). Observations of mainland moose by site personnel will be followed up with a microhabitat assessment, wherever possible (Appendix C).
- Implement wildlife observation reporting to the Site Environmental Manager during construction, operation, and decommissioning of Project
- Install signage where specific wildlife concerns have been identified. Vehicles will yield to wildlife on roads.
- A speed limit of 15 - 40 km/hr within the PA (depending on the specific location within the PA) will be implemented to reduce likelihood of collisions.
- An unvegetated buffer of 10 m along roadsides will be maintained, where practicable, to improve visibility along roadsides and reduce the potential for collisions with wildlife. If vehicle interactions with wildlife become increasingly an issue in certain locations within the PA, additional vegetation clearing with wider buffer widths may occur.
- Work to reduce poaching within the PA through an awareness campaign. “Report a Poacher” signs will be posted in site offices and lunchrooms and reviewed during site orientation. Any evidence of Moose poaching will be reported immediately to the site supervisor, who will ensure immediate reporting to NSDNRR and the local RCMP. A sample ‘Report a Poacher’ sign is provided in Appendix E.

3.5 Invasive Plants

Measures to manage invasive and alien plant species during the Project are provided below.

3.5.1 Prevention

Prevention is paramount to an effective weed management program. In order to manage invasive and alien species, the following measures will be taken:

- All equipment and vehicles are to be visually inspected prior to being transported and used on-site to avoid the spread or introduction of invasive plant species (e.g., seed). Vehicles are to be cleaned offsite prior to their use on-site if mud/soil is observed. Any new equipment used during construction will be cleaned prior to entering the PA. Washing of construction equipment will be conducted at least 30 m from any watercourses.
- Anaconda will attempt to minimize the potential for weed introduction by seeding all disturbed areas with native seed mixes and straw.

- No invasive plants were observed within the PA, however, if invasive species are observed during construction, these areas will be flagged and avoided by construction equipment where practicable.
- Ensure any imported materials are free of vegetative matter and soil.
- Where possible, obtain straw sourced from a local supplier which comprises native, non-weed species.
- Topsoil will be salvaged and stored for use in site restoration where practicable. Upland and wetland soils will be stockpiled separately.
- Existing vegetation cover will be maintained whenever possible.

3.5.2 Vegetation Control

As the mine is built, Anaconda proposes to complete an invasive plant survey to identify whether noxious and invasive species are colonizing the PA and opportunistically threatening adjacent natural habitats. The invasive plant survey will enable Anaconda to identify such species and remove them by hand pulling if and when they are observed to be occurring. Mine staff will also routinely monitor the site for colonization of invasive and alien species. Occurrences will be reported to the Site Environmental Manager.

A daily log shall be used to record vegetation clearing and shall be available for review by NSDNRR. The log will include the date and time of the clearing, GPS coordinates, and the contractor. During reclamation (progressive and permanent), recontouring and revegetation will occur using native species.

3.5.3 Vegetation Monitoring and Identification

If identified, areas with invasive species will be communicated to mine staff by the Site Environmental Manager. Signage will also be used to minimize activities in these areas and reduce the potential to facilitate their spread.

4 SCHEDULE OF ACTIVITIES

Table 7 outlines a schedule of activities that summarizes the timing, frequency, and reporting requirements (where applicable) for mitigative commitments outlined within this document.

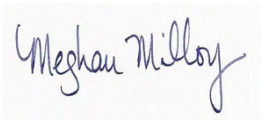
Table 5 Schedule of Activities

Activity	Section in WMP	Timing	Frequency	Reporting	Lead Agency
Education and Awareness Training	1.6	Orientation for new staff prior to working on site	Once	NA	NA
Breeding bird window (restricted period for clearing activities)	2.2	April 15 to August 15	Every year	If clearing is required within this window, Anaconda will consult with the lead agency regarding nest sweeps. Refer to Table 3.	NSDNRR, NSECC, and ECCC

5 CLOSING

We look forward to your attention to this plan. Please do not hesitate to contact the undersigned with any questions you might have.

Sincerely,



Meghan Milloy, MES
Vice-President and Project Manager
McCallum Environmental Ltd.
meghan@mccallumenvironmental.com

6 REFERENCES

COSEWIC. 2007 COSEWIC assessment and status report on the Common Nighthawk Chordeiles minor in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Vi + 25 pp. (www.sararegistry.gc.ca/status_e.cfm).

Department of Natural Resources (DNR). July 2012. Special Management Practices for Bald Eagle Nests. Retrieved from: https://novascotia.ca/natr/wildlife/habitats/terrestrial/pdf/SMP_Bald_Eagle_Nests.pdf.

Environment and Climate Change Canada (ECCC). 2016. Bank Swallow (*Riparia riparia*) in sandpits and quarries. Retrieved from: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/related-information/bank-swallow-sandpits-quarries.html

Environment and Climate Change Canada. 2018. Recovery Strategy for the Little Brown Myotis (Myotis lucifugus), the Northern Myotis (Myotis septentrionalis), and the Tricolored Bat (Perimyotis subflavus) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 172 pp.

Environment Canada. 2016. Recovery Strategy for the Common Nighthawk (Chordeiles minor) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vii + 49 pp.

McNeil, Jeffie. 2013. Action Plan for the Recovery of Eastern Moose (Alces alces Americana) in Mainland Nova Scotia. Mainland Moose Recovery Team and Mersey Tobeatic Research Institute, Kempt, Nova Scotia.

Nova Scotia Department of Lands and Forestry (NSL&F). 2020b. Recovery Plan for Little brown myotis (Myotis lucifugus) in Nova Scotia [Final]. Nova Scotia Endangered Species Act Recovery Plan Series.

Nova Scotia Department of Lands and Forestry (NSL&F). 2020c. Recovery Plan for Northern Myotis (Myotis septentrionalis) in Nova Scotia [Final]. Nova Scotia Endangered Species Act Recovery Plan Series.

Nova Scotia Department of Lands and Forestry (NSL&F). 2020d. Recovery Plan for Tri-colored bat (Perimyotis subflavus) in Nova Scotia [Final]. Nova Scotia Endangered Species Act Recovery Plan Series.

Nova Scotia Department of Lands and Forestry (NSL&F). 2021. Recovery Plan for the Common Nighthawk (Cordeiles minor) in Nova Scotia [Final]. Nova Scotia Endangered Species Act Recovery Plan Series.

Nova Scotia Department of Lands and Forestry (NSL&F). N.D. Species at Risk – Recovery Update. Retrieved from https://novascotia.ca/natr/wildlife/species-at-risk/

Appendix A: Figures

Prepared For:

Anaconda Mining

FIGURE 1

Goldboro Gold Project

Goldboro, NS

- NSECC Watercourse Inventory
- Field Delineated Watercourses
- NSTDB Roads Inventory
- NSECC Wetland Inventory
- Field Delineated Wetlands
- Infrastructure
- Project Area

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

0 300 600 1,200 m

1:26,000 Scale when printed @ 11" x 17"

Drawn By: MQ
Reviewed By:
Date: 2022-04-13

McCallum Environmental Ltd.

Document Name: 220413_WMP

603000 603500 604000 604500 605000 605500 606000 606500 607000 607500 608000 608500 609000 609500 610000 610500 611000 611500

5010500 5010000 5009500 5009000 5008500 5008000 5007500 5007000 5006500 5006000 5005500 5005000 5004500 5004000

Appendix B: Species at Risk ID Cards

Bank Swallow *(Riparia riparia)*

Bank swallows are sleek brown songbirds with a small head, tiny bill, a pale belly with a brown breast band, and a long-notched tail. They fly with quick, fluttery wingbeats (Kaufman 1996).

Hearn 2017

McGowan 2017

Bank Swallow Measurements

Common Name	Length (cm)	Wingspan (cm)	Weight (g)
Bank swallow	12-14	25-29	10-19

Bank swallows live in low areas along watercourses and their territory usually includes vertical cliffs or banks. They nest in burrows along the banks and bluffs of watercourses where there is loose soil. They can also be found in anthropogenic made sites such as gravel quarries and roadcuts (Kaufman 1996).

Canada Warbler (*Cardellina canadensis*)

Canada warbler have a yellow underbelly and throat with a gray back; they have a distinguishing black “necklace” of lacey feathers around their throat. Females and immature males look similar, but with a more muted, gray necklace.

Male Canada Warbler *(Turgeon 2016)*

Female or Immature Adult Canada Warbler *(Edelen 2016)*

Canada Warbler Measurements

Common Name	Length (cm)	Wingspan (cm)	Weight (g)
Canada warbler	12 - 14	17-22	10-12

A small forest songbird, the Canada warbler generally breeds in mixedwood (containing both deciduous and coniferous trees) or deciduous forests that have a dense underbrush (including shrubs and tall vegetation underneath the tree canopy). This warbler is generally found in this habitat especially when it is near or within a swamp (Environment Canada 2015a).

Common Nighthawk *(Chordeiles minor)*

Common nighthawks are medium-sized mottled birds with very long pointed wings. Their flight pattern resembles that of a bat, though it is noticeably larger than any native bats (Kaufman 1996). This species is listed as threatened under provincial and federal legislation.

Mann 2017

Irons 2016

Common Nighthawk Measurements

Common Name	Length (cm)	Wingspan (cm)	Weight (g)
Common Nighthawk	22-24	53-57	65-98

Common nighthawk require open ground or clearings for nesting. The species breeds in a wide range of open habitats including sandy areas (e.g. dunes, eskers, and beaches), open forests (e.g., mixedwood and coniferous stands, burns, and clear-cuts), grasslands (e.g., short-grass prairies, pastures, and grassy plains), wetlands (e.g., bogs, marshes, lakeshores, and riverbanks), gravelly or rocky areas (e.g., outcrops, barrens, gravel roads, gravel rooftops, railway beds, mines, quarries, and bare mountain tops and ridges), and some cultivated or landscaped areas (e.g., parks, military bases, airports, blueberry fields, orchards, cultivated fields) (Hunt 2005; Campbell *et al*. 2006; and COSEWIC 2007a).

Evening Grosbeak (*Coccothraustes vespertinus)*

Evening grosbeaks are large songbirds that have a thick neck, full chest and thick, conical bill. Adult male grosbeaks are yellow and black birds with white patches on their wings and a yellow stripe over their eyes. Female and juveniles are grayish-brown with yellow on the nape and flanks and white-and-black wings (COSEWIC, 2016).

Megyesi 2016

Klick 2017

Evening Grosbeak Measurements

Common Name	Length (cm)	Wingspan (cm)	Weight (g)
Evening Grosbeak	16-18	30-36	53-74

Evening grosbeaks are social birds that are typically found in flocks. They prefer to forage in deciduous and coniferous forests (All About Birds, 2019).

Little Brown Myotis (*Myotis lucifugus*)

This small brown bat has blackish ears, wings and tail and a furry, dark brown body. The little brown myotis is listed as endangered under federal and provincial legislation.

DuBois 2003

Stuart n.d.

Little Brown Myotis Measurements

Common Name	Length (cm)	Wingspan (cm)	Weight (g)
Little brown myotis	9	22-27	7-9

Little brown myotis roost in trees, buildings or caves year-round. In winter, they hibernate in caves, cellars or empty buildings (Environment Canada 2015b). It eats insects and hunts at night.

Tri-colored Bat (*Perimyotis subflavus*)

The hairs on a tri-colored bat are black at the base, yellow in the middle and brown at the tip. Overall the bat appears reddish-brown to yellowish-brown. They are similar in size to little brown myotis and northern myotis (NYNHP 2020).

NYNHP 2020

Kiser 2014

Tri-colored Bat Measurements

Common Name	Length (cm)	Wingspan (cm)	Weight (g)
Tri-colored bat	8 - 9	21-26	5-8

Tri-colored bats forage in wooded riparian areas and forest edges. They may roost in open woods near water, buildings, cliff or rock crevices, and in the canopy of alive or dead trees (NYNHP 2020). They form maternity colonies in human-made structures such as barns and in natural forest stands (NYNHP 2020).

Northern Myotis (*Myotis septentrionalis*)

This bat looks similar to the little brown myotis: it is small, with a dark brown body, black ears, arms and tail. It can be distinguished by its longer ears that extend beyond the nose when pressed forward. It also has a longer tail and larger wingspan. The northern long-eared myotis is listed as endangered under federal and provincial legislation.

Taylor n.d.

Segers n.d.

Northern long-eared Myotis Measurements

Common Name	Length (cm)	Wingspan (cm)	Weight (g)
Northern long-eared myotis	8 - 9	22 - 25	5-8

Northern long-eared myotis roost in trees, buildings or caves year-round. In winter, they hibernate in caves, cellars or empty buildings (Environment Canada 2015b). It eats insects and hunts at night.

Mainland Moose

The mainland moose is a large mammal with long legs, high shoulders and a brown coat. Males produce large antlers every year. Mainland moose use to be abundant and wide spread, but have been reduced due to hunting, disease, fragmentation and habitat loss (NSDNRR, 2021).

Delicato, nd

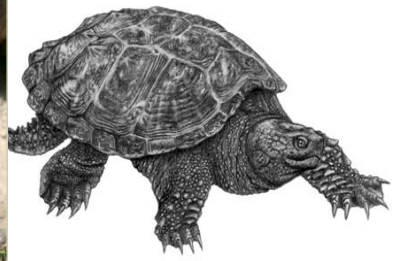
McNeil, 2013

Mainland moose use various habitats depending on the season, sex and their biological needs. In the summer, moose can be found in cool, moist habitats, as well as areas with closed canopy cover (NSDNRR, 2021). Cows will seek out secluded areas near water for calving sites. In the winter, moose prefer areas with closed conifer and mixedwood cover that provide shelter from deep snow and cold (NSDNRR, 2021).

Snapping Turtle (*Chelydra serpentina*)

These turtles are the largest freshwater turtles in Canada. They have a brown, black or olive colored shell that is deeply edged, it has noticeably exposed limbs (ECCC 2016).

ECCC 2016



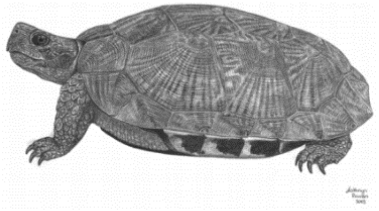
COSEWIC 2008

Preferred habitat for the Common Snapping Turtle includes ponds, lakes, slow-moving streams with soft mud bottoms and abundant aquatic vegetation (ECCC 2016). Hibernation occurs in freshwater systems deep enough to prevent freezing through during the winter, with a mucky or muddy substrate. Snapping Turtles travel through upland habitat and use gravelly areas to nest but they require wetland habitat as part of their life cycle activities (ECCC 2016, COSEWIC 2008).

Wood Turtle

The wood turtle is a medium sized turtle with a broad, low shell ranging from grayish-brown to yellow in color. The shell is covered in pyramidal points. The legs and neck of wood turtle are often orange, yellow, or reddish in color.

Environment Canada 2016b



COSEWIC 2007b

This species prefers clear rivers, streams or creeks with moderate current and their associated flood plains. Wood Turtles nest in open, sunny areas with sandy or gravelly material (Environment Canada, 2016; COSEWIC 2007b).

Wood Thrush (*Hylocichla mustelina*)

Rusty blackbirds are medium-sized songbirds. Adults are rusty-brown above and white with black spots on their breast and flanks (COSEWIC, 2012). They have a short tail, straight bill and big head (All About Birds, 2019).

Petruzzi 2017

Lipton 2016

Wood Thrush Measurements

Common Name	Length (cm)	Wingspan (cm)	Weight (g)
Wood thrush	19-21	30-34	40-50

Wood thrush breeds in deciduous and mixedwood mature forests with moderate understory and abundant leaf litter. They are often found foraging on the forest floor for insects (All About Birds, 2019).

Olive-sided Flycatcher (*Contopus cooperi*)

The olive-sided flycatcher has a brown – olive/gray back and wings with a white throat and underside. It has a short tail and a crested head. This bird makes a distinct song, which is often used for identification, it sounds like "*quick, THREE BEERS*". Olive-sided flycatchers find their food by keeping a look out from perches for flying insects; once spotted, the bird will sally out, catch the food, and return to the same perch.

Burrell 2013

Seitz 2017

Olive-sided Flycatcher Measurements

Common Name	Length (cm)	Wingspan (cm)	Weight (g)
Olive-sided flycatcher	18-20	31-35	31-34

Olive-sided flycatchers use open coniferous or mixedwood (containing both deciduous and coniferous trees) forests, often near water, wetlands, or wet areas. They need tall snags or perches from which to watch for food (Environment Canada 2016a).

References:

All About Birds. 2019. The Cornell Lab. https://www.allaboutbirds.org/news/

Burrell, M. 2013. Photo of an olive-sided flycatcher. Retrieved from: https://www.allaboutbirds.org/guide/Olive-sided_Flycatcher/media-browser/38663861

Callaghan, C. 2015 Photo of an Eastern Wood-Pewee. Retrieved from: https://www.allaboutbirds.org/guide/Eastern_Wood-Pewee/media-browser/65617351

Campbell, R.W., M.K. McNicholl, R.M. Brigham, and J. Ng. 2006. Wildlife data centre featured species: Common Nighthawk. Wildlife Afield 3:32-71.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2007a. COSEWIC assessment and status report on the Common Nighthawk Chordeiles minor in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. Available: http://www.sararegistry.gc.ca/status/status_e.cfm

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2007b. COSEWIC assessment and update status report on the Wood Turtle Glyptemys insculpta in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 42 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2008. COSEWIC assessment and status report on the Snapping Turtle *Chelydra serpentina* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 47 pp.

Cohen, T. 2017. Photo of a barn swallow. Retrieved from: https://www.allaboutbirds.org/guide/Barn_Swallow/media-browser-overview/68123101

COSEWIC. 2012. COSEWIC assessment and status report on the Wood Thrush Hylocichla mustelina in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 46 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).Delicato, B. 2013. Photo of a mainland moose. Retrieved from: https://novascotia.ca/natr/wildlife/sustainable/mmoosefaq.asp

COSEWIC. 2016. COSEWIC assessment and status report on the Evening Grosbeak Coccothraustes vespertinus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 64 pp. (http://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1).

Delicato, B. n.d. Photo of a mainland moose. Retrieved from https://novascotia.ca/natr/wildlife/sustainable/mmoosefaq.asp

Dreelin, A. 2017. Photo of a barn swallow. Retrieved from: https://www.allaboutbirds.org/guide/Barn_Swallow/media-browser-overview/68123101

Dubois, K. 2003. Photo of a little brown myotis. Retrieved from: http://fieldguide.mt.gov/speciesDetail.aspx?elcode=AMACC01010

Edelen, B. 2016. Photo of a Canada warbler. Retrieved from: https://www.allaboutbirds.org/guide/Canada_Warbler/media-browser-overview/64913361

Environment Canada. 2015a. Recovery Strategy for Canada Warbler (*Cardellina canadensis*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vi + 55pp.

Environment Canada. 2015b. Recovery Strategy for Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), and Tri-colored Bat (*Perimyotis subflavus*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. ix +11 pp.

Environment Canada. 2016a. Recovery Strategy for Olive-sided Flycatcher (*Contopus cooperi*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vii + 52pp.

Environment Canada. 2016b. Recovery Strategy for the Wood Turtle (*Glyptemys insculpta*) in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. v + 48 pp.

Environment Canada. 2016c. Recovery Strategy for Short-eared Owl (*Asio flammeus*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. v + 35pp.

Environment and Climate Change Canada (ECCC). 2016. Management Plan for the Snapping Turtle (*Chelydra serpentina*) in Canada [Proposed]. *Species at Risk Act* Management Plan Series. Ottawa, Environment and Climate Change Canada, Ottawa, iv + 39 p.

Goudie, R.I. 2015. Photo of boreal felt lichen. Retrieved from: https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=808614CB-1&pedisable=true#_01_2

Hearn, I. 2017. Photo of a bank swallow. Retrieved from: https://www.allaboutbirds.org/guide/Bank_Swallow/media-browser/68123451

Hunt, P.D. 2005. Species profile: Common Nighthawk Chordeiles minor. Pages A403- A409 in New Hampshire Wildlife Action Plan. New Hampshire Fish and Game Department, Concord, NH. Available: http://www.wildlife.state.nh.us/Wildlife/wildlife_plan.htm

Irons, D. 2016. Photo of a common nighthawk. Retrieved from: https://www.allaboutbirds.org/guide/Common_Nighthawk/media-browser-overview/66113501

Kaufman, K. 1996. National Audobon Society. Retrieved from: https://www.audubon.org/field-guide/bird/bank-swallow

Kiser, J. 2014. Photo of a tri-colored bat. Retrieved from: https://fw.ky.gov/Wildlife/Pages/Tricolored-Bat.aspx

Klick, B. 2017. Photo of a female/immature male Evening Grosbeak. Retrieved from https://www.allaboutbirds.org/guide/Evening_Grosbeak/photo-gallery

Lenz, T. 2013. Photo of a short-eared owl. Retrieved from: https://www.allaboutbirds.org/guide/Short-eared_Owl/media-browser/37180721

Lipton, E. 2016. Photo of Wood Thrush. Retrieved from: https://www.allaboutbirds.org/guide/Wood_Thrush/photo-gallery

Mann, J. 2017. Photo of a common nighthawk. Retrieved from: https://www.allaboutbirds.org/guide/Common_Nighthawk/media-browser-overview/66113501

McGowan, J. 2017. Photo of a bank swallow. Retrieved from: https://www.allaboutbirds.org/guide/Bank_Swallow/media-browser/68123451

Megyesi, J. 2016. Photo of an Evening Grosbeak. Retrieved from https://www.allaboutbirds.org/guide/Evening_Grosbeak/photo-gallery

Mersey Tobeatic Research Institute (MTRI). N.d. Landbird Species at Risk in Forested Wetlands. Retrieved from: http://landbirdsar.merseytobeatic.ca/rusty-blackbird-habitat/

New York Natural Heritage Program. 2020. Online Conservation Guide for *Perimyotis subflavus.* Retrieved from: https://guides.nynhp.org/tri-colored-bat/

Nova Scotia Department of Lands and Forests (NSL&F). 2013. Photo of a mainland moose. Retrieved from: https://novascotia.ca/natr/wildlife/sustainable/mmoosefaq.asp

Nova Scotia Department of Natural Resources (NSDNR). 2012. Endangered Boreal Felt Lichen Special Management Practices. Retrieved from: https://novascotia.ca/natr/wildlife/habitats/terrestrial/pdf/SMP_Boreal_Felt_Lichen.pdf

Nova Scotia Department of Natural Resources and Renewables (NSDNRR). 2021. Recovery Plan for the Moose (*Alces alces Americana*) in Mainland Nova Scotia. *Nova Scotia Endangered Species Act Recovery Plan Series*. 96pp.

Petruzzi, J. 2017. Photo of Wood Thrush. Retrieved from https://www.allaboutbirds.org/guide/Wood_Thrush/photo-gallery

Seitz, L. 2017. Photo of an olive-sided flycatcher. Retrieved from: https://www.allaboutbirds.org/guide/Olive-sided_Flycatcher/media-browser/38663861

Segers, J. n.d. Photo of a northern long-eared bat. Canadian Wildlife Health Cooperative. Retrieved from: https://www.cbc.ca/news/canada/newfoundland-labrador/bat-sighting-hotline-1.4522335

Stuart, J.N. nd. Photo of a little brown myotis. Retrieved from: https://sierraclub.bc.ca/little-brown-myotis/

Taylor, S. n.d. Photo of a northern long-eared bat. Retrieved from: https://www.fws.gov/midwest/endangered/mammals/nleb/FAQsFinalListNLEB.html

Turgeon, D. 2016. Photo of a Canada warbler. Retrieved from: https://www.allaboutbirds.org/guide/Canada_Warbler/media-browser-overview/64913361

Appendix C: Wildlife Sighting Cards

Wildlife Observation Report

*To be completed and submitted to Environmental Technician within 2 days of sighting
Observation Date: DD/MONTH/YEAR **Report Date**: DD/MONTH/YEAR
Name:_____

Species: ☐ Mainland Moose ☐ White-tailed Deer ☐ Black Bear ☐Coyote
☐ Snapping Turtle ☐ Wood Turtle ☐ Other: _____
☐ Raptor - Species :_____ ☐ Owl - Species :_____
☐ Swallow - Species :_____ ☐ Other Bird - Species :_____
Observation type: ☐ Individual ☐ Tracks ☐ Scat ☐ Nest or Den
Location (be as specific as possible, waypoint if possible) _____

_____

Individual observation details:
Sex: ☐Male ☐ Female ☐ Unknown **Maturity**: ☐ Adult ☐ Juvenile ☐ Unknown
Behaviour: _____
☐ Individual injured? Describe _____ ☐ Individual deceased?

Report the following to Site Supervisor ASAP: Moose (or signs thereof), Snapping or Wood Turtles (or signs thereof), any bird nesting activity (i.e. agitated behavior, bird carrying nesting material, nest with young, bird carrying food), any deceased or injured wildlife, or any nuisance or aggressive behavior from any species (particularly Black Bear or Coyote).

Wildlife Observation Report

*To be completed and submitted to Environmental Technician within 2 days of sighting
Observation Date: DD/MONTH/YEAR **Report Date**: DD/MONTH/YEAR
Name:_____

Species: ☐ Mainland Moose ☐ White-tailed Deer ☐ Black Bear ☐Coyote
☐ Snapping Turtle ☐ Wood Turtle ☐ Other: _____
☐ Raptor - Species :_____ ☐ Owl - Species :_____
☐ Swallow - Species :_____ ☐ Other Bird - Species :_____
Observation type: ☐ Individual ☐ Tracks ☐ Scat ☐ Nest or Den
Location (be as specific as possible, waypoint if possible) _____

_____

Individual observation details:
Sex: ☐Male ☐ Female ☐ Unknown **Maturity**: ☐ Adult ☐ Juvenile ☐ Unknown
Behaviour: _____
☐ Individual injured? Describe _____ ☐ Individual deceased?

Report the following to Site Supervisor ASAP: Moose (or signs thereof), Snapping or Wood Turtles (or signs thereof), any bird nesting activity (i.e. agitated behavior, bird carrying nesting material, nest with young, bird carrying food), any deceased or injured wildlife, or any nuisance or aggressive behavior from any species (particularly Black Bear or Coyote).

MOOSE SIGN MICROHABITAT ASSESSMENT

Fill out all information available

Site :_____ Date:_____

Observer Name & Employer:_____

Observation Type:

☐ Winter Track Survey ☐ Pellet Group Inventory ☐ Incidental Observation

Weather (current)_____

Tracking Conditions: _____

Moose Sign Type: ☐ Tracks ☐ Pellets/Scat ☐ Browse ☐ Individual

Description of Habitat:

☐ Upland ☐ Wetland (Wetland type? _____)

Forest Type: ☐ Deciduous/Hardwood ☐ Coniferous/Softwood

☐ Mixed Stand ☐Other: _____

Stand Age:

☐Regenerating ☐ Immature ☐ Mature ☐ Over-mature

Dominant species (If known): _____

Forest Ecosystem Classification Vegetation Type & Ecosite (If known): _____

Distance to Nearest Watercourse:_____ Distance to nearest Road:_____

Other habitat notes:_____

_____

☐ Wildlife Sighting Card Attached ☐ Photos taken and attached

Appendix D: Breeding Bird Codes

Bird Nesting Evidence:

PROBABLE

P	Pair observed in suitable nesting habitat in nesting season
T	Permanent territory presumed through registration of territorial song, or the occurrence of an adult bird, at the same place, in breeding habitat, on at least two days a week or more apart, during its breeding season. Use discretion when using this code. "T" is not to be used for colonial birds, or species that might forage or loaf a long distance from their nesting site e.g. Kingfisher, Turkey Vulture, and male waterfowl
D	Courtship or display, including interaction between a male and a female or two males, including courtship feeding or copulation
V	Visiting probable nest site
A	Agitated behaviour or anxiety calls of an adult
B	Brood Patch on adult female or cloacal protuberance on adult male
N	Nest-building or excavation of nest hole by wrens and woodpeckers

CONFIRMED

NB	Nest building or carrying nest materials, for all species except wrens and woodpeckers
DD	Distraction display or injury feigning
NU	Used nest or eggshells found (occupied or laid within the period of the survey)
FY	Recently fledged young (nidicolous species) or downy young (nidifugous species), including incapable of sustained flight
AE	Adult leaving or entering nest sites in circumstances indicating occupied nest
FS	Adult carrying fecal sac
CF	Adult carrying food for young
NE	Nest containing eggs
NY	Nest with young seen or heard

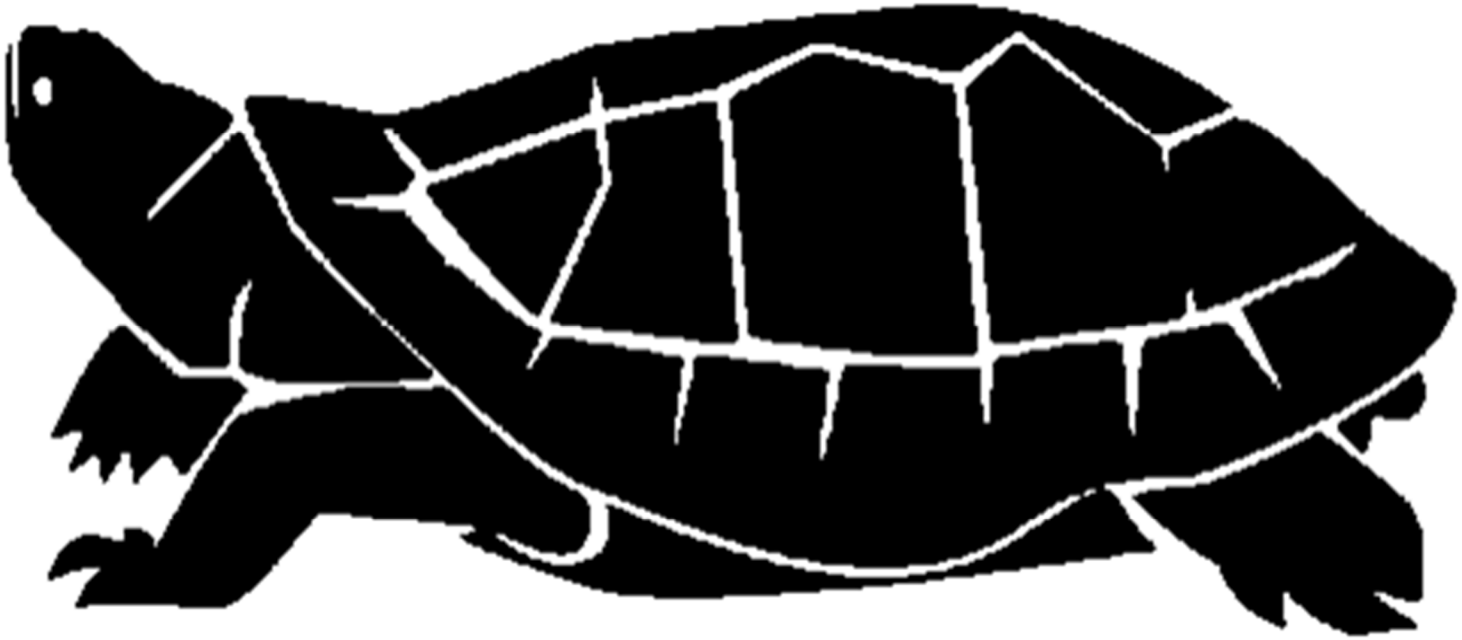
https://www.mba-aom.ca/jsp/codes.jsp?lang=en&pg=breeding

Appendix E: Public Education Signage

Report Suspected Poaching Activity to Environmental Technician Immediately,

Or call 1-800-565-2224. For more information, visit:

www.novascotia.ca/natr/enforcement/reportapoacher.asp



TURTLE CROSSING – MAY through OCTOBER

REDUCE SPEED

Report Turtle Sightings to Environmental Technician

Appendix F: ACCDC Report

DATA REPORT 6802: Goldboro, NS

Prepared 23 February 2021
by C. Robicheau, Data Manager

CONTENTS OF REPORT

Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; www.accdc.com) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The AC CDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the AC CDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename	Contents
GoldboroNS_6802ob.xls	Rare or legally-protected Flora and Fauna in your study area
GoldboroNS_6802ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
GoldboroNS_6802ff_py.xls	Rare Freshwater Fish in your study area (DFO database)

1.2 RESTRICTIONS

The AC CDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting AC CDC data, recipients assent to the following limits of use:

a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c) The AC CDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
d) AC CDC data responses are restricted to the data in our Data System at the time of the data request.
e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
f) AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area.
g) The absence of a taxon cannot be inferred by its absence in an AC CDC data response.

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

Please direct any additional questions about AC CDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries
Sean Blaney, Senior Scientist, Executive Director
Tel: (506) 364-2658
sean.blaney@accdc.ca

Animals (Fauna)
John Klymko, Zoologist
Tel: (506) 364-2660
john.klymko@accdc.ca

Plant Communities
Sarah Robinson, Community Ecologist
Tel: (506) 364-2664
sarah.robinson@accdc.ca

Data Management, GIS
James Churchill, Data Manager
Tel: (902) 679-6146
james.churchill@accdc.ca

Billing
Jean Breau
Tel: (506) 364-2657
jean.breau@accdc.ca

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

Western: Emma Vost
(902) 670-8187
Emma.Vost@novascotia.ca

Western: Sarah Spencer
(902) 541-0081
Sarah.Spencer@novascotia.ca

Central: Shavonne Meyer
(902) 893-0816
Shavonne.Meyer@novascotia.ca

Central: Kimberly George
(902) 890-1046
Kimberly.George@novascotia.ca

Eastern: Harrison Moore
(902) 497-4119
Harrison.Moore@novascotia.ca

Eastern: Maureen Cameron-MacMillan
(902) 295-2554
Maureen.Cameron-MacMillan@novascotia.ca

Eastern: Elizabeth Walsh
(902) 563-3370
Elizabeth.Walsh@novascotia.ca

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

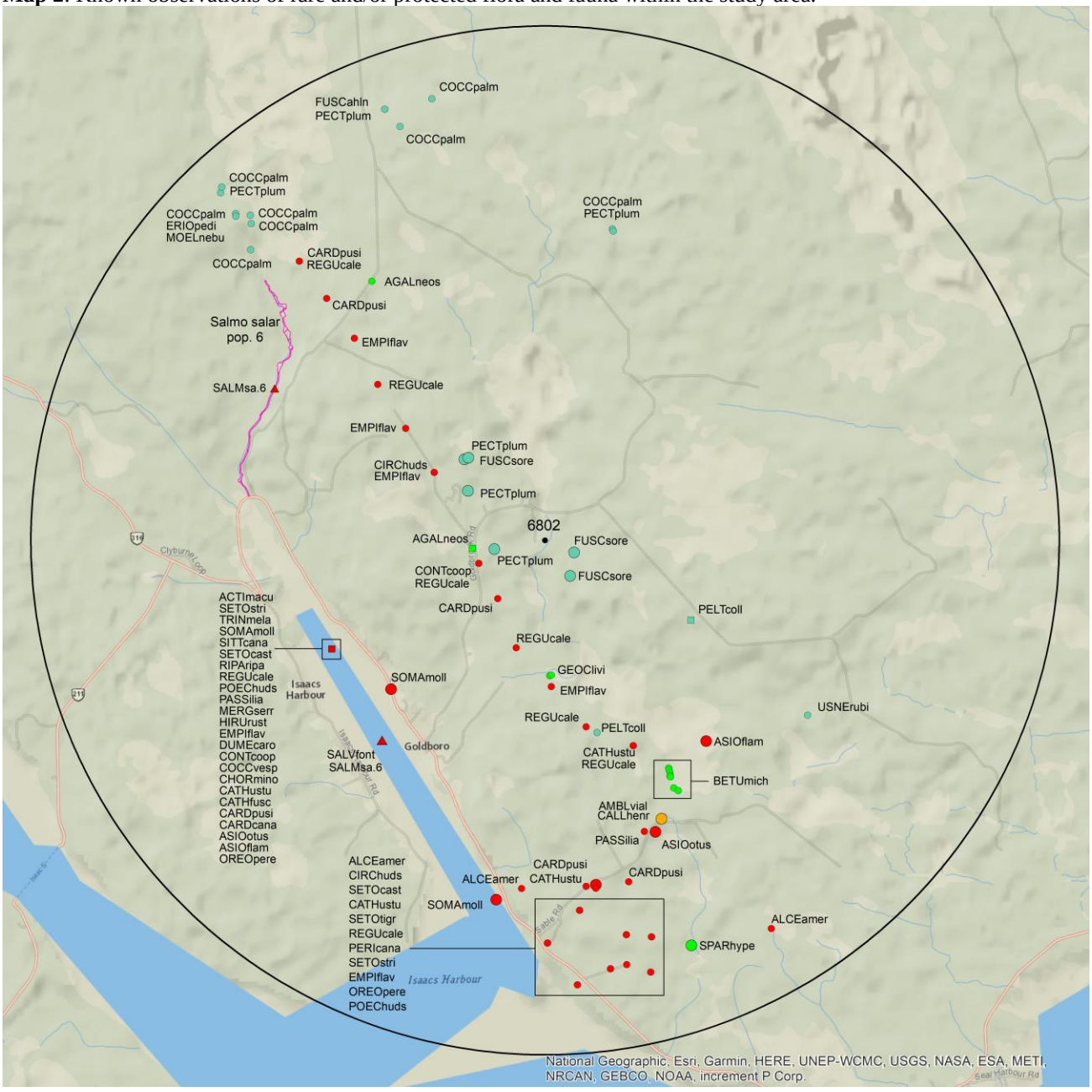
2.1 FLORA

The study area contains 13 records of 4 vascular and 25 records of 8 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 81 records of 30 vertebrate and 2 records of 2 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if "location-sensitive" species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within the study area.



RESOLUTION

- 4.7 within 50s of kilometers
- 4.0 within 10s of kilometers
- 3.7 within 5s of kilometers
- 3.0 within kilometers
- 2.7 within 500s of meters
- 2.0 within 100s of meters
- 1.7 within 10s of meters

HIGHER TAXON

- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora

3.0 SPECIAL AREAS

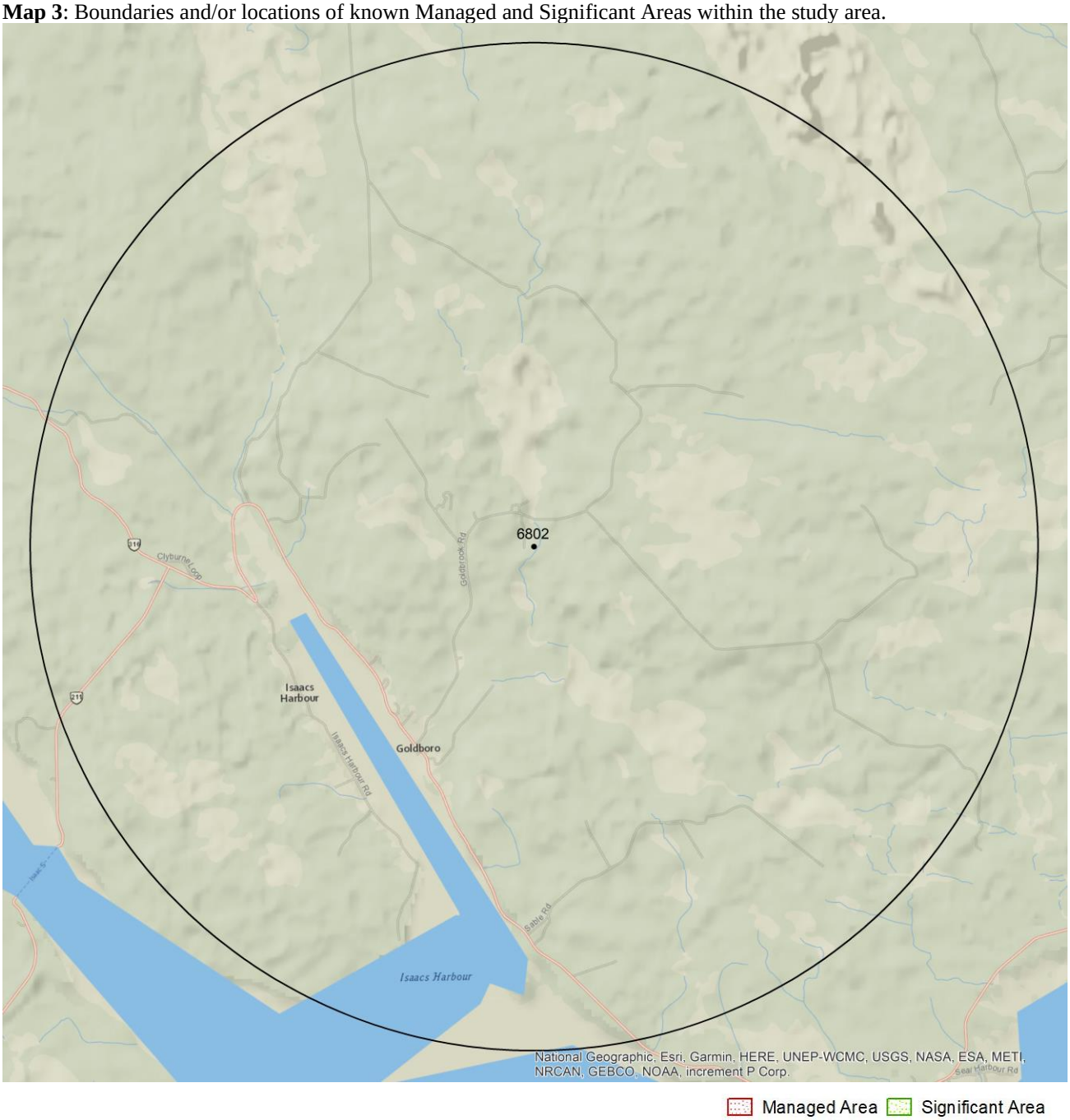
3.1 MANAGED AREAS

The GIS scan identified no managed areas in the vicinity of the study area (Map 3 and attached file: *msa.xls).

3.2 SIGNIFICANT AREAS

The GIS scan identified no biologically significant sites in the vicinity of the study area (Map 3 and attached file: *msa.xls).

Map 3: Boundaries and/or locations of known Managed and Significant Areas within the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding "location-sensitive" species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	3	4.4 ± 0.0
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	6	0.5 ± 0.0
N	*Peltigera collina*	Tree Pelt Lichen				S2?	2	1.6 ± 4.0
N	*Usnea rubicunda*	Red Beard Lichen				S2S3	1	3.1 ± 0.0
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S3	1	4.5 ± 0.0
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S3	1	4.4 ± 0.0
N	*Fuscopannaria sorediata*	a Lichen				S3	3	0.3 ± 0.0
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	8	3.1 ± 0.0
P	*Sparganium hyperboreum*	Northern Burreed				S1S2	1	4.2 ± 0.0
P	*Betula michauxii*	Michaux's Dwarf Birch				S2S3	8	2.5 ± 0.0
P	*Geocaulon lividum*	Northern Comandra				S3	2	1.3 ± 0.0
P	*Agalinis neoscotica*	Nova Scotia Agalinis				S3S4	2	0.7 ± 4.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Salmo salar pop. 6*	Altantic Salmon - Nova Scotia Southern Upland pop.	Endangered			S1	2	2.5 ± 1.0
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	1	2.3 ± 7.0
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	1	2.3 ± 7.0
A	*Cardellina canadensis*	Canada Warbler	Threatened	Threatened	Endangered	S3B	1	2.3 ± 7.0
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern		S1S2B	2	2.3 ± 7.0
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S2B	1	2.3 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	2	0.7 ± 0.0
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3S4B,S3N	1	2.3 ± 7.0
A	*Circus hudsonius*	Northern Harrier	Not At Risk			S3S4B	2	1.3 ± 0.0
A	*Alces americanus*	Moose			Endangered	S1	3	3.4 ± 0.0
A	*Setophaga tigrina*	Cape May Warbler				S2B	1	3.9 ± 0.0
A	*Asio otus*	Long-eared Owl				S2S3	2	2.3 ± 7.0
A	*Perisoreus canadensis*	Canada Jay				S3	2	3.9 ± 0.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3	3	2.3 ± 7.0
A	*Sitta canadensis*	Red-breasted Nuthatch				S3	1	2.3 ± 7.0
A	*Salvelinus fontinalis*	Brook Trout				S3	1	2.5 ± 1.0
A	*Dumetella carolinensis*	Gray Catbird				S3B	1	2.3 ± 7.0
A	*Cardellina pusilla*	Wilson's Warbler				S3B	6	0.7 ± 0.0
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S3S4M	1	2.3 ± 7.0
A	*Somateria mollissima*	Common Eider				S3S4	4	2.1 ± 0.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	2	2.3 ± 7.0
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	7	1.3 ± 0.0
A	*Regulus calendula*	Ruby-crowned Kinglet				S3S4B	13	0.7 ± 0.0
A	*Catharus fuscescens*	Veery				S3S4B	1	2.3 ± 7.0
A	*Catharus ustulatus*	Swainson's Thrush				S3S4B	10	2.2 ± 0.0
A	*Oreothlypis peregrina*	Tennessee Warbler				S3S4B	2	2.3 ± 7.0
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B	3	2.3 ± 7.0
A	*Setophaga striata*	Blackpoll Warbler				S3S4B	2	2.3 ± 7.0
A	*Passerella iliaca*	Fox Sparrow				S3S4B	2	2.3 ± 7.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5N	1	2.3 ± 7.0
I	*Callophrys henrici*	Henry's Elfin				S3	1	2.9 ± 0.0
I	*Amblyscirtes vialis*	Common Roadside-Skipper				S3S4	1	2.9 ± 0.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species "location sensitive". Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are indicated below with "YES".

Nova Scotia

Scientific *Name*	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
Fraxinus nigra	Black Ash		Threatened	No
Emydoidea blandingii	*Blanding's Turtle - Nova Scotia pop.*	Endangered	Vulnerable	No
Glyptemys insculpta	Wood Turtle	Threatened	Threatened	No
Falco peregrinus pop. 1	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Vulnerable	No
Bat hibernaculum or bat species occurrence		**[Endangered][1]**	**[Endangered][1]**	**YES**

1 *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NS Endangered Species Act.

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
43	Bell, G. 2018. Moose, bat and bird records from Goldboro LNG Project, NS, Environmental Assessment. Amec Foster Wheeler.
34	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
13	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.
11	LaPaix, R.W.; Crowell, M.J.; MacDonald, M.; Neily, T.D.; Quinn, G. 2017. Stantec Nova Scotia rare plant records, 2012-2016. Stantec Consulting.
8	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
4	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
2	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.
1	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
1	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
1	Munro, Marian K. Tracked lichen specimens, Nova Scotia Provincial Museum of Natural History Herbarium. Atlantic Canada Conservation Data Centre. 2019.
1	Neily, T.H. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
1	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-03-18]. Mersey Tobeatic Research Institute.
1	Neily, T.H. 2010. Erioderma Pedicellatum records 2005-09. Mersey Tobiatic Research Institute, 67 recs.
1	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 20,364 records of 143 vertebrate and 435 records of 47 invertebrate fauna; 3536 records of 227 vascular and 1819 records of 91 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including "location-sensitive" species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	42	27.7 ± 0.0	NS
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered		S1	1	95.9 ± 0.0	NS
A	*Salmo salar pop. 4*	Atlantic Salmon - Eastern Cape Breton pop.	Endangered			S1	10	55.7 ± 0.0	NS
A	*Salmo salar pop. 6*	Altantic Salmon - Nova Scotia Southern Upland pop.	Endangered			S1	35	2.5 ± 1.0	NS
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	728	18.0 ± 7.0	NS
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	76	10.5 ± 0.0	NS
A	*Dermochelys coriacea (Atlantic pop.)*	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered		S1S2N	2	51.9 ± 0.0	NS
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered	Endangered	Endangered	S2M	17	13.1 ± 0.0	NS
A	*Pagophila eburnea*	Ivory Gull	Endangered	Endangered		SNA	1	82.4 ± 0.0	NS
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S1?B	2	58.5 ± 7.0	NS
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Threatened	Endangered	S1S2B	1	75.8 ± 7.0	NS
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S1S2M	5	54.6 ± 0.0	NS
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2	3865	22.1 ± 10.0	NS
A	*Anguilla rostrata*	American Eel	Threatened			S2	3	81.9 ± 0.0	NS
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	155	20.5 ± 7.0	NS
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	566	2.3 ± 7.0	NS
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	448	2.3 ± 7.0	NS
A	*Cardellina canadensis*	Canada Warbler	Threatened	Threatened	Endangered	S3B	400	2.3 ± 7.0	NS
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	197	16.4 ± 7.0	NS
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened		SHB	2	24.3 ± 0.0	NS
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened		SUB	8	12.0 ± 7.0	NS
A	*Salmo salar pop. 12*	Atlantic Salmon - Gaspe - Southern Gulf of St Lawrence pop.	Special Concern			S1	23	43.5 ± 50.0	NS
A	*Passerculus sandwichensis princeps*	Savannah Sparrow princeps ssp	Special Concern	Special Concern		S1B	3	16.4 ± 7.0	NS
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern		S1N	2	90.7 ± 0.0	NS
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern		S1S2B	4	2.3 ± 7.0	NS
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	174	17.2 ± 0.0	NS
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S2B	199	2.3 ± 7.0	NS
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	619	0.7 ± 0.0	NS
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S2N	37	13.1 ± 0.0	NS
A	*Balaenoptera physalus*	Fin Whale	Special Concern	Special Concern		S2S3	2	100.0 ± 0.0	NS
A	*Morone saxatilis pop. 1*	Striped Bass- Southern Gulf of St Lawrence pop.	Special Concern			S2S3N	1	53.1 ± 1.0	NS
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	31	28.8 ± 0.0	NS
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	229	12.0 ± 7.0	NS
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3S4B,S3N	246	2.3 ± 7.0	NS
A	*Phocoena phocoena pop. 1*	Harbour Porpoise - Northwest Atlantic pop.	Special Concern			S4	1	52.2 ± 0.0	NS
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern		S4N	6	51.4 ± 0.0	NS
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern			S4S5	2	45.3 ± 1.0	NS
A	*Calidris subruficollis*	Buff-breasted Sandpiper	Special Concern	Special Concern		SNA	1	85.2 ± 0.0	NS
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S1	6	68.2 ± 1.0	NS
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B	2	98.2 ± 0.0	NS
A	*Chlidonias niger*	Black Tern	Not At Risk			S1B	3	13.1 ± 0.0	NS
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk	Special Concern	Vulnerable	S1B,SNAM	3	52.1 ± 7.0	NS
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S2?B	5	31.4 ± 7.0	NS
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	11	14.5 ± 0.0	NS
A	*Megaptera novaeangliae*	Humpback Whale (NW	Not At Risk			S3	2	52.2 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
		Atlantic pop.)							
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	387	8.0 ± 7.0	NS
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	14	12.1 ± 7.0	NS
A	*Buteo lagopus*	Rough-legged Hawk	Not At Risk			S3N	5	25.9 ± 6.0	NS
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	55	18.0 ± 7.0	NS
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	4	52.3 ± 0.0	NS
A	*Circus hudsonius*	Northern Harrier	Not At Risk			S3S4B	195	1.3 ± 0.0	NS
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	79	8.0 ± 7.0	NS
A	*Morone saxatilis*	Striped Bass	E,SC			S2S3	1	57.7 ± 0.0	NS
A	*Alces americanus*	Moose			Endangered	S1	61	3.4 ± 0.0	NS
A	*Picoides dorsalis*	American Three-toed Woodpecker				S1?	4	22.5 ± 7.0	NS
A	*Passerina cyanea*	Indigo Bunting				S1?B	4	38.4 ± 7.0	NS
A	*Uria aalge*	Common Murre				S1?B,S5N	1	78.3 ± 0.0	NS
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1B	1	62.9 ± 7.0	NS
A	*Anas acuta*	Northern Pintail				S1B	3	38.4 ± 7.0	NS
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	2	50.5 ± 7.0	NS
A	*Haematopus palliatus*	American Oystercatcher				S1B	7	51.5 ± 7.0	NS
A	*Myiarchus crinitus*	Great Crested Flycatcher				S1B	1	100.0 ± 7.0	NS
A	*Mimus polyglottos*	Northern Mockingbird				S1B	16	13.2 ± 0.0	NS
A	*Toxostoma rufum*	Brown Thrasher				S1B	4	48.2 ± 0.0	NS
A	*Vireo gilvus*	Warbling Vireo				S1B	5	53.7 ± 7.0	NS
A	*Setophaga pinus*	Pine Warbler				S1B	4	51.4 ± 0.0	NS
A	*Calidris minutilla*	Least Sandpiper				S1B,S3M	147	13.2 ± 0.0	NS
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S3S4M	246	12.5 ± 0.0	NS
A	*Vespertilionidae sp.*	bat species				S1S2	64	3.2 ± 0.0	NS
A	*Pluvialis dominica*	American Golden-Plover				S1S2M	22	54.6 ± 0.0	NS
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B	16	13.1 ± 0.0	NS
A	*Spatula clypeata*	Northern Shoveler				S2B	1	93.9 ± 0.0	NS
A	*Mareca strepera*	Gadwall				S2B	2	49.4 ± 0.0	NS
A	*Empidonax traillii*	Willow Flycatcher				S2B	4	38.4 ± 7.0	NS
A	*Setophaga tigrina*	Cape May Warbler				S2B	73	3.9 ± 0.0	NS
A	*Piranga olivacea*	Scarlet Tanager				S2B	5	51.1 ± 7.0	NS
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	6	22.5 ± 7.0	NS
A	*Molothrus ater*	Brown-headed Cowbird				S2B	31	20.5 ± 7.0	NS
A	*Bucephala clangula*	Common Goldeneye				S2B,S5N	111	7.1 ± 12.0	NS
A	*Branta bernicla*	Brant				S2M	1	36.1 ± 16.0	NS
A	*Phalacrocorax carbo*	Great Cormorant				S2S3	94	13.1 ± 0.0	NS
A	*Asio otus*	Long-eared Owl				S2S3	23	2.3 ± 7.0	NS
A	*Spinus pinus*	Pine Siskin				S2S3	220	8.0 ± 7.0	NS
A	*Cathartes aura*	Turkey Vulture				S2S3B	2	85.8 ± 0.0	NS
A	*Rallus limicola*	Virginia Rail				S2S3B	7	39.0 ± 7.0	NS
A	*Tringa semipalmata*	Willet				S2S3B	537	8.0 ± 7.0	NS
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	101	16.4 ± 7.0	NS
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S2S3B	161	8.0 ± 7.0	NS
A	*Icterus galbula*	Baltimore Oriole				S2S3B	22	37.3 ± 7.0	NS
A	*Pinicola enucleator*	Pine Grosbeak				S2S3B,S5N	78	12.0 ± 7.0	NS
A	*Numenius phaeopus hudsonicus*	Hudsonian Whimbrel				S2S3M	57	13.1 ± 0.0	NS
A	*Calidris melanotos*	Pectoral Sandpiper				S2S3M	27	13.2 ± 0.0	NS
A	*Perisoreus canadensis*	Canada Jay				S3	365	3.9 ± 0.0	NS
A	*Poecile hudsonicus*	Boreal Chickadee				S3	667	2.3 ± 7.0	NS
A	*Sitta canadensis*	Red-breasted Nuthatch				S3	486	2.3 ± 7.0	NS
A	*Alosa pseudoharengus*	Alewife				S3	19	19.1 ± 1.0	NS
A	*Salvelinus fontinalis*	Brook Trout				S3	43	2.5 ± 1.0	NS
A	*Salvelinus namaycush*	Lake Trout				S3	1	81.0 ± 0.0	NS
A	*Menidia menidia*	Atlantic Silverside				S3	2	78.6 ± 0.0	NS
A	*Pekania pennanti*	Fisher				S3	5	40.1 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Calidris maritima*	Purple Sandpiper				S3?N	31	13.1 ± 0.0	NS
A	*Calcarius lapponicus*	Lapland Longspur				S3?N	2	59.7 ± 0.0	NS
A	*Falco sparverius*	American Kestrel				S3B	227	12.1 ± 7.0	NS
A	*Charadrius vociferus*	Killdeer				S3B	159	16.4 ± 7.0	NS
A	*Gallinago delicata*	Wilson's Snipe				S3B	239	8.0 ± 7.0	NS
A	*Sterna paradisaea*	Arctic Tern				S3B	109	8.0 ± 7.0	NS
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	44	22.5 ± 7.0	NS
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	73	13.1 ± 0.0	NS
A	*Dumetella carolinensis*	Gray Catbird				S3B	165	2.3 ± 7.0	NS
A	*Cardellina pusilla*	Wilson's Warbler				S3B	68	0.7 ± 0.0	NS
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S3S4M	304	2.3 ± 7.0	NS
A	*Oceanodroma leucorhoa*	Leach's Storm-Petrel				S3B,S5M	67	13.1 ± 0.0	NS
A	*Rissa tridactyla*	Black-legged Kittiwake				S3B,S5N	2	13.4 ± 0.0	NS
A	*Fratercula arctica*	Atlantic Puffin				S3B,S5N	4	13.1 ± 0.0	NS
A	*Pluvialis squatarola*	Black-bellied Plover				S3M	190	13.0 ± 0.0	NS
A	*Tringa flavipes*	Lesser Yellowlegs				S3M	229	13.1 ± 0.0	NS
A	*Arenaria interpres*	Ruddy Turnstone				S3M	85	13.1 ± 0.0	NS
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	194	13.1 ± 0.0	NS
A	*Calidris fuscicollis*	White-rumped Sandpiper				S3M	58	59.2 ± 0.0	NS
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	122	13.1 ± 0.0	NS
A	*Calidris alba*	Sanderling				S3M,S2N	108	13.1 ± 0.0	NS
A	*Chroicocephalus ridibundus*	Black-headed Gull				S3N	18	54.2 ± 0.0	NS
A	*Somateria mollissima*	Common Eider				S3S4	553	2.1 ± 0.0	NS
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	91	8.0 ± 7.0	NS
A	*Loxia curvirostra*	Red Crossbill				S3S4	56	18.0 ± 7.0	NS
A	*Botaurus lentiginosus*	American Bittern				S3S4B	141	20.6 ± 0.0	NS
A	*Spatula discors*	Blue-winged Teal				S3S4B	71	19.1 ± 7.0	NS
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	511	2.3 ± 7.0	NS
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	539	1.3 ± 0.0	NS
A	*Regulus calendula*	Ruby-crowned Kinglet				S3S4B	1221	0.7 ± 0.0	NS
A	*Catharus fuscescens*	Veery				S3S4B	211	2.3 ± 7.0	NS
A	*Catharus ustulatus*	Swainson's Thrush				S3S4B	954	2.2 ± 0.0	NS
A	*Oreothlypis peregrina*	Tennessee Warbler				S3S4B	159	2.3 ± 7.0	NS
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B	311	2.3 ± 7.0	NS
A	*Setophaga striata*	Blackpoll Warbler				S3S4B	89	2.3 ± 7.0	NS
A	*Passerella iliaca*	Fox Sparrow				S3S4B	87	2.3 ± 7.0	NS
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5N	116	2.3 ± 7.0	NS
A	*Bucephala albeola*	Bufflehead				S3S4N	38	7.1 ± 12.0	NS
A	*Lanius borealis*	Northern Shrike				S3S4N	1	78.7 ± 1.0	NS
A	*Leucophaeus atricilla*	Laughing Gull				SHB	3	13.1 ± 0.0	NS
A	*Progne subis*	Purple Martin				SHB	4	13.1 ± 0.0	NS
A	*Eremophila alpestris*	Horned Lark				SHB,S4S5N	1	82.9 ± 7.0	NS
A	*Morus bassanus*	Northern Gannet				SHB,S5M	34	13.2 ± 0.0	NS
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2B	35	13.0 ± 0.0	NS
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Threatened	S1S2	8	21.0 ± 0.0	NS
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern	Special Concern	Vulnerable	S3	2	20.4 ± 0.0	NS
I	*Neurocordulia michaeli*	Broadtailed Shadowdragon				S1	26	27.1 ± 0.0	NS
I	*Lycaena dorcas*	Dorcas Copper				S1?	19	82.5 ± 0.0	NS
I	*Strymon melinus*	Grey Hairstreak				S1S2	2	71.3 ± 1.0	NS
I	*Nymphalis l-album*	Compton Tortoiseshell				S1S2	1	90.3 ± 2.0	NS
I	*Haematopota rara*	Shy Cleg				S1S3	1	85.3 ± 0.0	NS
I	*Lycaena hyllus*	Bronze Copper				S2	2	36.1 ± 0.0	NS
I	*Lycaena dospassosi*	Salt Marsh Copper				S2	1	97.2 ± 0.0	NS
I	*Satyrium calanus*	Banded Hairstreak				S2	1	89.9 ± 2.0	NS
I	*Aglais milberti*	Milbert's Tortoiseshell				S2	1	90.3 ± 2.0	NS
I	*Margaritifera margaritifera*	Eastern Pearlshell				S2	67	20.2 ± 0.0	NS
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	1	36.1 ± 1.0	NS
I	*Thorybes pylades*	Northern Cloudywing				S2S3	19	36.2 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
I	*Amblyscirtes hegon*	Pepper and Salt Skipper				S2S3	5	32.1 ± 0.0	NS
I	*Satyrium liparops*	Striped Hairstreak				S2S3	4	89.2 ± 1.0	NS
I	*Euphydryas phaeton*	Baltimore Checkerspot				S2S3	24	24.0 ± 0.0	NS
I	*Gomphus descriptus*	Harpoon Clubtail				S2S3	16	69.0 ± 0.0	NS
I	*Ophiogomphus aspersus*	Brook Snaketail				S2S3	5	69.0 ± 0.0	NS
I	*Ophiogomphus mainensis*	Maine Snaketail				S2S3	14	54.0 ± 0.0	NS
I	*Ophiogomphus rupinsulensis*	Rusty Snaketail				S2S3	36	27.1 ± 0.0	NS
I	*Alasmidonta undulata*	Triangle Floater				S2S3	7	33.9 ± 0.0	NS
I	*Naemia seriata*	a Ladybird beetle				S3	1	54.8 ± 0.0	NS
I	*Iphthiminus opacus*	a Darkling Beetle				S3	1	85.8 ± 0.0	NS
I	*Monochamus marmorator*	a Longhorned Beetle				S3	2	20.3 ± 0.0	NS
I	*Callophrys henrici*	Henry's Elfin				S3	2	2.9 ± 0.0	NS
I	*Callophrys lanoraieensis*	Bog Elfin				S3	1	72.3 ± 1.0	NS
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4	44.7 ± 100.0	NS
I	*Polygonia faunus*	Green Comma				S3	7	36.1 ± 0.0	NS
I	*Megisto cymela*	Little Wood-satyr				S3	1	79.5 ± 1.0	NS
I	*Oeneis jutta*	Jutta Arctic				S3	4	39.7 ± 0.0	NS
I	*Aeshna clepsydra*	Mottled Darner				S3	3	46.1 ± 1.0	NS
I	*Aeshna constricta*	Lance-Tipped Darner				S3	1	99.5 ± 1.0	NS
I	*Boyeria grafiana*	Ocellated Darner				S3	7	27.2 ± 0.0	NS
I	*Gomphaeschna furcillata*	Harlequin Darner				S3	3	56.6 ± 0.0	NS
I	*Nannothemis bella*	Elfin Skimmer				S3	3	56.6 ± 0.0	NS
I	*Sympetrum danae*	Black Meadowhawk				S3	8	7.6 ± 0.0	NS
I	*Enallagma vernale*	Vernal Bluet				S3	4	64.1 ± 0.0	NS
I	*Amphiagrion saucium*	Eastern Red Damsel				S3	4	85.3 ± 0.0	NS
I	*Cupido comyntas*	Eastern Tailed Blue				S3?	1	71.5 ± 0.0	NS
I	*Polygonia interrogationis*	Question Mark				S3B	18	17.6 ± 0.0	NS
I	*Erynnis juvenalis*	Juvenal's Duskywing				S3S4	1	51.0 ± 1.0	NS
I	*Amblyscirtes vialis*	Common Roadside-Skipper				S3S4	16	2.9 ± 0.0	NS
I	*Polygonia progne*	Grey Comma				S3S4	20	34.0 ± 0.0	NS
I	*Lanthus parvulus*	Northern Pygmy Clubtail				S3S4	10	28.6 ± 0.0	NS
I	*Lampsilis radiata*	Eastern Lampmussel				S3S4	16	28.4 ± 0.0	NS
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	488	4.4 ± 0.0	NS
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered	Endangered	Endangered	S1S2	14	45.1 ± 0.0	NS
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened	Threatened	Threatened	S1	6	49.6 ± 0.0	NS
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened	Threatened	S1S2	1	97.7 ± 0.0	NS
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S2S3	5	67.6 ± 0.0	NS
N	*Anzia colpodes*	Black-foam Lichen	Threatened	Threatened	Threatened	S3	8	50.7 ± 0.0	NS
N	*Sclerophora peronella (Atlantic pop.)*	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S1?	21	11.2 ± 0.0	NS
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	146	0.5 ± 0.0	NS
N	*Fissidens exilis*	Pygmy Pocket Moss	Not At Risk			S1S2	5	42.2 ± 0.0	NS
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	4	10.5 ± 0.0	NS
N	*Cinclidium stygium*	Sooty Cupola Moss				S1	2	88.0 ± 0.0	NS
N	*Cladonia brevis*	Short Peg Lichen				S1	1	85.6 ± 0.0	NS
N	*Conardia compacta*	Coast Creeping Moss				S1?	1	99.8 ± 2.0	NS
N	*Oligotrichum hercynicum*	Hercynian Hair Moss				S1?	1	98.0 ± 0.0	NS
N	*Lichina confinis*	Marine Seaweed Lichen				S1?	2	89.1 ± 2.0	NS
N	*Polychidium muscicola*	Eyed Mossthorns Woollybear Lichen				S1?	2	43.9 ± 0.0	NS
N	*Parmeliella parvula*	Poor-man's Shingles Lichen				S1?	6	9.8 ± 0.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S1S2	4	82.0 ± 0.0	NS
N	*Cyrto-hypnum minutulum*	Tiny Cedar Moss				S1S2	1	77.0 ± 0.0	NS
N	*Hamatocaulis vernicosus*	a Moss				S1S2	1	91.2 ± 0.0	NS
N	*Barbilophozia lycopodioides*	Greater Pawwort				S1S3	1	98.9 ± 0.0	NS
N	*Peltigera neckeri*	Black-saddle Pelt Lichen				S1S3	1	52.9 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Riccardia multifida*	Delicate Germanderwort				S2?	1	20.3 ± 0.0	NS
N	*Anacamptodon splachnoides*	a Moss				S2?	1	44.6 ± 0.0	NS
N	*Anomodon viticulosus*	a Moss				S2?	1	99.4 ± 0.0	NS
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S2?	1	54.9 ± 3.0	NS
N	*Campylium polygamum*	a Moss				S2?	2	52.9 ± 0.0	NS
N	*Campylium radicale*	Long-stalked Fine Wet Moss				S2?	1	83.5 ± 0.0	NS
N	*Fissidens taxifolius*	Yew-leaved Pocket Moss				S2?	2	99.4 ± 0.0	NS
N	*Platydictya jungermannioides*	False Willow Moss				S2?	3	59.1 ± 0.0	NS
N	*Pohlia sphagnicola*	a moss				S2?	1	36.4 ± 0.0	NS
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2?	2	83.4 ± 0.0	NS
N	*Sphagnum subnitens*	Lustrous Peat Moss				S2?	2	94.3 ± 0.0	NS
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S2?	3	41.9 ± 0.0	NS
N	*Tortella fragilis*	Fragile Twisted Moss				S2?	1	98.8 ± 0.0	NS
N	*Leptogium teretiusculum*	Beaded Jellyskin Lichen				S2?	4	59.1 ± 0.0	NS
N	*Cladonia labradorica*	Labrador Lichen				S2?	1	11.0 ± 0.0	NS
N	*Peltigera collina*	Tree Pelt Lichen				S2?	29	1.6 ± 4.0	NS
N	*Tetraplodon mnioides*	Entire-leaved Nitrogen Moss				S2S3	1	51.6 ± 0.0	NS
N	*Limprichtia revolvens*	a Moss				S2S3	5	81.6 ± 0.0	NS
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2S3	1	55.4 ± 0.0	NS
N	*Solorina saccata*	Woodland Owl Lichen				S2S3	5	53.5 ± 0.0	NS
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S2S3	4	68.2 ± 0.0	NS
N	*Cetraria muricata*	Spiny Heath Lichen				S2S3	2	5.4 ± 1.0	NS
N	*Cladonia incrassata*	Powder-foot British Soldiers Lichen				S2S3	1	50.5 ± 0.0	NS
N	*Leptogium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	12	5.2 ± 0.0	NS
N	*Parmelia fertilis*	Fertile Shield Lichen				S2S3	1	91.3 ± 0.0	NS
N	*Usnea mutabilis*	Bloody Beard Lichen				S2S3	1	82.8 ± 0.0	NS
N	*Usnea rubicunda*	Red Beard Lichen				S2S3	2	3.1 ± 0.0	NS
N	*Stereocaulon condensatum*	Granular Soil Foam Lichen				S2S3	4	61.8 ± 0.0	NS
N	*Cladonia coccifera*	Eastern Boreal Pixie-cup Lichen				S2S3	3	22.2 ± 0.0	NS
N	*Collema tenax*	Soil Tarpaper Lichen				S3	1	56.4 ± 0.0	NS
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	4	59.6 ± 0.0	NS
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3	14	11.1 ± 0.0	NS
N	*Leptogium subtile*	Appressed Jellyskin Lichen				S3	5	56.4 ± 0.0	NS
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S3	38	4.5 ± 0.0	NS
N	*Heterodermia speciosa*	Powdered Fringe Lichen				S3	7	29.0 ± 0.0	NS
N	*Heterodermia squamulosa*	Scaly Fringe Lichen				S3	1	46.5 ± 0.0	NS
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S3	22	45.8 ± 0.0	NS
N	*Leptogium lichenoides*	Tattered Jellyskin Lichen				S3	10	50.4 ± 0.0	NS
N	*Nephroma bellum*	Naked Kidney Lichen				S3	4	60.4 ± 0.0	NS
N	*Placynthium nigrum*	Common Ink Lichen				S3	1	60.7 ± 10.0	NS
N	*Platismatia norvegica*	Oldgrowth Rag Lichen				S3	2	14.3 ± 0.0	NS
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S3	31	4.4 ± 0.0	NS
N	*Fuscopannaria sorediata*	a Lichen				S3	7	0.3 ± 0.0	NS
N	*Ephebe lanata*	Waterside Rockshag Lichen				S3	2	37.4 ± 0.0	NS
N	*Anomodon tristis*	a Moss				S3?	1	55.6 ± 0.0	NS
N	*Sphagnum riparium*	Streamside Peat Moss				S3?	2	90.8 ± 0.0	NS
N	*Phaeophyscia pusilloides*	Pompom-tipped Shadow Lichen				S3?	4	60.1 ± 0.0	NS
N	*Cladonia stygia*	Black-footed Reindeer Lichen				S3?	2	45.1 ± 0.0	NS
N	*Dicranella varia*	a Moss				S3S4	3	82.9 ± 0.0	NS
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	1	57.2 ± 0.0	NS
N	*Encalypta procera*	Slender Extinguisher Moss				S3S4	5	56.3 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S3S4	5	36.4 ± 0.0	NS
N	*Splachnum ampullaceum*	Cruet Dung Moss				S3S4	2	66.5 ± 0.0	NS
N	*Schistidium agassizii*	Elf Bloom Moss				S3S4	1	27.3 ± 3.0	NS
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	4	52.1 ± 0.0	NS
N	*Hypogymnia vittata*	Slender Monk's Hood Lichen				S3S4	123	11.0 ± 0.0	NS
N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4	11	12.0 ± 0.0	NS
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	1	86.0 ± 0.0	NS
N	*Vahliella leucophaea*	Shelter Shingle Lichen				S3S4	1	60.5 ± 0.0	NS
N	*Melanohalea olivacea*	Spotted Camouflage Lichen				S3S4	1	74.8 ± 0.0	NS
N	*Parmotrema chinense*	Powdered Ruffle Lichen				S3S4	1	46.3 ± 0.0	NS
N	*Physconia detersa*	Bottlebrush Frost Lichen				S3S4	1	50.7 ± 0.0	NS
N	*Sphaerophorus fragilis*	Fragile Coral Lichen				S3S4	1	52.6 ± 0.0	NS
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	627	3.1 ± 0.0	NS
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	1	45.9 ± 3.0	NS
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	23	10.5 ± 0.0	NS
N	*Evernia prunastri*	Valley Oakmoss Lichen				S3S4	2	58.8 ± 0.0	NS
N	*Dermatocarpon luridum*	Brookside Stippleback Lichen				S3S4	7	14.6 ± 8.0	NS
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	22	14.6 ± 0.0	NS
P	*Fraxinus nigra*	Black Ash	Threatened		Threatened	S1S2	90	35.0 ± 0.0	NS
P	*Bartonia paniculata ssp. paniculata*	Branched Bartonia	Threatened	Threatened		SNA	1	92.1 ± 10.0	NS
P	*Juncus caesariensis*	New Jersey Rush	Special Concern	Special Concern	Vulnerable	S2	71	83.4 ± 0.0	NS
P	*Floerkea proserpinacoides*	False Mermaidweed	Not At Risk			S2	9	44.1 ± 1.0	NS
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S1	1	50.2 ± 0.0	NS
P	*Sanicula odorata*	Clustered Sanicle				S1	3	74.6 ± 0.0	NS
P	*Zizia aurea*	Golden Alexanders				S1	19	32.3 ± 0.0	NS
P	*Arnica lonchophylla*	Northern Arnica				S1	1	68.5 ± 7.0	NS
P	*Bidens hyperborea*	Estuary Beggarticks				S1	1	54.6 ± 1.0	NS
P	*Ageratina altissima*	White Snakeroot				S1	2	53.7 ± 7.0	NS
P	*Cardamine dentata*	Toothed Bittercress				S1	1	80.8 ± 0.0	NS
P	*Cochlearia tridactylites*	Limestone Scurvy-grass				S1	12	28.4 ± 0.0	NS
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	1	88.7 ± 2.0	NS
P	*Hudsonia tomentosa*	Woolly Beach-heath				S1	6	51.5 ± 1.0	NS
P	*Desmodium canadense*	Canada Tick-trefoil				S1	10	88.2 ± 0.0	NS
P	*Fraxinus pennsylvanica*	Red Ash				S1	1	51.6 ± 0.0	NS
P	*Bistorta vivipara*	Alpine Bistort				S1	1	77.2 ± 1.0	NS
P	*Montia fontana*	Water Blinks				S1	2	51.0 ± 3.0	NS
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S1	2	83.3 ± 0.0	NS
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S1	1	27.8 ± 1.0	NS
P	*Pilea pumila*	Dwarf Clearweed				S1	1	74.7 ± 6.0	NS
P	*Carex alopecoidea*	Foxtail Sedge				S1	2	49.9 ± 0.0	NS
P	*Carex granularis*	Limestone Meadow Sedge				S1	11	83.7 ± 0.0	NS
P	*Carex gynocrates*	Northern Bog Sedge				S1	11	84.2 ± 0.0	NS
P	*Carex haydenii*	Hayden's Sedge				S1	2	62.1 ± 5.0	NS
P	*Carex pellita*	Woolly Sedge				S1	7	88.3 ± 0.0	NS
P	*Carex plantaginea*	Plantain-Leaved Sedge				S1	2	96.8 ± 0.0	NS
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S1	3	20.8 ± 1.0	NS
P	*Carex tincta*	Tinged Sedge				S1	1	49.9 ± 1.0	NS
P	*Carex viridula var. saxilittoralis*	Greenish Sedge				S1	4	90.9 ± 0.0	NS
P	*Carex viridula var. elatior*	Greenish Sedge				S1	20	85.3 ± 0.0	NS
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	6	49.4 ± 0.0	NS
P	*Cyperus lupulinus*	Hop Flatsedge				S1	5	51.0 ± 0.0	NS
P	*Cyperus lupulinus ssp. macilentus*	Hop Flatsedge				S1	10	51.5 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Eleocharis erythropoda*	Red-stemmed Spikerush				S1	1	92.4 ± 0.0	NS
P	*Iris prismatica*	Slender Blue Flag				S1	2	33.3 ± 7.0	NS
P	*Luzula spicata*	Spiked Woodrush				S1	1	49.8 ± 0.0	NS
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	1	39.7 ± 7.0	NS
P	*Bromus latiglumis*	Broad-Glumed Brome				S1	15	61.2 ± 0.0	NS
P	*Elymus wiegandii*	Wiegand's Wild Rye				S1	6	64.2 ± 0.0	NS
P	*Elymus hystrix*	Spreading Wild Rye				S1	1	78.7 ± 1.0	NS
P	*Potamogeton nodosus*	Long-leaved Pondweed				S1	1	36.1 ± 5.0	NS
P	*Sparganium androcladum*	Branching Bur-Reed				S1	1	51.9 ± 1.0	NS
P	*Equisetum palustre*	Marsh Horsetail				S1	8	94.7 ± 0.0	NS
P	*Solidago hispida*	Hairy Goldenrod				S1?	1	72.1 ± 7.0	NS
P	*Dichanthelium lindheimeri*	Lindheimer's Panicgrass				S1?	1	86.6 ± 0.0	NS
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S1S2	2	37.0 ± 0.0	NS
P	*Cornus suecica*	Swedish Bunchberry				S1S2	2	53.2 ± 0.0	NS
P	*Anemone virginiana var. alba*	Virginia Anemone				S1S2	6	95.7 ± 0.0	NS
P	*Parnassia parviflora*	Small-flowered Grass-of-Parnassus				S1S2	10	74.8 ± 1.0	NS
P	*Carex livida*	Livid Sedge				S1S2	23	47.8 ± 0.0	NS
P	*Juncus greenei*	Greene's Rush				S1S2	1	51.6 ± 1.0	NS
P	*Juncus alpinoarticulatus ssp. americanus*	Northern Green Rush				S1S2	8	51.6 ± 5.0	NS
P	*Platanthera huronensis*	Fragrant Green Orchid				S1S2	2	57.3 ± 10.0	NS
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1S2	24	61.2 ± 0.0	NS
P	*Sparganium hyperboreum*	Northern Burreed				S1S2	3	4.2 ± 0.0	NS
P	*Cryptogramma stelleri*	Steller's Rockbrake				S1S2	17	97.1 ± 0.0	NS
P	*Selaginella selaginoides*	Low Spikemoss				S1S2	2	81.5 ± 0.0	NS
P	*Carex vacillans*	Estuarine Sedge				S1S3	3	49.9 ± 0.0	NS
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2	16	41.0 ± 0.0	NS
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2	4	58.5 ± 7.0	NS
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S2	3	22.4 ± 0.0	NS
P	*Impatiens pallida*	Pale Jewelweed				S2	7	29.1 ± 7.0	NS
P	*Caulophyllum thalictroides*	Blue Cohosh				S2	35	40.9 ± 0.0	NS
P	*Cardamine parviflora*	Small-flowered Bittercress				S2	2	94.9 ± 0.0	NS
P	*Draba arabisans*	Rock Whitlow-Grass				S2	3	97.8 ± 1.0	NS
P	*Lobelia kalmii*	Brook Lobelia				S2	72	77.1 ± 0.0	NS
P	*Stellaria humifusa*	Saltmarsh Starwort				S2	4	36.0 ± 0.0	NS
P	*Stellaria longifolia*	Long-leaved Starwort				S2	1	64.6 ± 0.0	NS
P	*Oxybasis rubra*	Red Goosefoot				S2	5	62.9 ± 7.0	NS
P	*Crassula aquatica*	Water Pygmyweed				S2	2	75.8 ± 7.0	NS
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S2	4	23.6 ± 0.0	NS
P	*Utricularia resupinata*	Inverted Bladderwort				S2	1	99.4 ± 0.0	NS
P	*Persicaria arifolia*	Halberd-leaved Tearthumb				S2	7	20.9 ± 0.0	NS
P	*Rumex triangulivalvis*	Triangular-valve Dock				S2	4	60.9 ± 6.0	NS
P	*Anemonastrum canadense*	Canada Anemone				S2	2	53.8 ± 3.0	NS
P	*Anemone quinquefolia*	Wood Anemone				S2	5	27.4 ± 0.0	NS
P	*Anemone virginiana*	Virginia Anemone				S2	31	50.4 ± 0.0	NS
P	*Caltha palustris*	Yellow Marsh Marigold				S2	3	54.0 ± 0.0	NS
P	*Galium labradoricum*	Labrador Bedstraw				S2	32	81.0 ± 0.0	NS
P	*Salix pedicellaris*	Bog Willow				S2	6	82.3 ± 0.0	NS
P	*Comandra umbellata*	Bastard's Toadflax				S2	30	50.7 ± 0.0	NS
P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S2	1	93.2 ± 7.0	NS
P	*Tiarella cordifolia*	Heart-leaved Foamflower				S2	2	54.2 ± 3.0	NS
P	*Viola nephrophylla*	Northern Bog Violet				S2	6	65.9 ± 0.0	NS
P	*Carex bebbii*	Bebb's Sedge				S2	10	44.8 ± 7.0	NS
P	*Carex castanea*	Chestnut Sedge				S2	15	80.9 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Carex hystericina*	Porcupine Sedge				S2	29	50.3 ± 0.0	NS
P	*Carex tenera*	Tender Sedge				S2	3	50.4 ± 1.0	NS
P	*Carex atratiformis*	Scabrous Black Sedge				S2	2	96.7 ± 7.0	NS
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S2	10	84.8 ± 0.0	NS
P	*Juncus stygius ssp. americanus*	Moor Rush				S2	27	81.4 ± 1.0	NS
P	*Allium schoenoprasum var. sibiricum*	Wild Chives				S2	1	61.8 ± 7.0	NS
P	*Lilium canadense*	Canada Lily				S2	48	27.2 ± 1.0	NS
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	28	50.5 ± 0.0	NS
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	1	99.4 ± 0.0	NS
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	127	53.3 ± 0.0	NS
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S2	1	29.7 ± 1.0	NS
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	31	78.4 ± 1.0	NS
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S2	1	90.8 ± 7.0	NS
P	*Potamogeton friesii*	Fries' Pondweed				S2	5	65.2 ± 0.0	NS
P	*Potamogeton richardsonii*	Richardson's Pondweed				S2	6	33.7 ± 0.0	NS
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S2	5	96.7 ± 10.0	NS
P	*Dryopteris fragrans*	Fragrant Wood Fern				S2	3	27.7 ± 0.0	NS
P	*Polystichum lonchitis*	Northern Holly Fern				S2	5	78.8 ± 5.0	NS
P	*Woodsia glabella*	Smooth Cliff Fern				S2	2	96.7 ± 7.0	NS
P	*Symphyotrichum boreale*	Boreal Aster				S2?	52	82.8 ± 0.0	NS
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2?	6	49.7 ± 0.0	NS
P	*Epilobium coloratum*	Purple-veined Willowherb				S2?	3	56.4 ± 0.0	NS
P	*Crataegus submollis*	Quebec Hawthorn				S2?	2	64.5 ± 7.0	NS
P	*Eleocharis ovata*	Ovate Spikerush				S2?	1	17.2 ± 0.0	NS
P	*Scirpus pedicellatus*	Stalked Bulrush				S2?	3	61.7 ± 0.0	NS
P	*Senecio pseudoarnica*	Seabeach Ragwort				S2S3	18	13.4 ± 0.0	NS
P	*Betula michauxii*	Michaux's Dwarf Birch				S2S3	19	2.5 ± 0.0	NS
P	*Sagina nodosa*	Knotted Pearlwort				S2S3	6	36.3 ± 1.0	NS
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2S3	2	89.5 ± 0.0	NS
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2S3	1	20.3 ± 1.0	NS
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S2S3	151	40.9 ± 0.0	NS
P	*Shepherdia canadensis*	Soapberry				S2S3	8	94.3 ± 0.0	NS
P	*Empetrum atropurpureum*	Purple Crowberry				S2S3	1	52.5 ± 3.0	NS
P	*Euphorbia polygonifolia*	Seaside Spurge				S2S3	11	51.1 ± 0.0	NS
P	*Halenia deflexa*	Spurred Gentian				S2S3	23	29.1 ± 1.0	NS
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	2	73.6 ± 5.0	NS
P	*Polygonum aviculare ssp. buxiforme*	Box Knotweed				S2S3	1	90.6 ± 0.0	NS
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	4	22.2 ± 1.0	NS
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S2S3	1	21.4 ± 1.0	NS
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	1	52.2 ± 2.0	NS
P	*Galium aparine*	Common Bedstraw				S2S3	15	50.1 ± 0.0	NS
P	*Salix pellita*	Satiny Willow				S2S3	1	47.2 ± 1.0	NS
P	*Carex adusta*	Lesser Brown Sedge				S2S3	1	41.5 ± 5.0	NS
P	*Carex hirtifolia*	Pubescent Sedge				S2S3	22	41.0 ± 0.0	NS
P	*Eleocharis flavescens var. olivacea*	Bright-green Spikerush				S2S3	3	45.0 ± 0.0	NS
P	*Eriophorum gracile*	Slender Cottongrass				S2S3	8	6.7 ± 1.0	NS
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S2S3	54	50.4 ± 0.0	NS
P	*Poa glauca*	Glaucous Blue Grass				S2S3	8	97.1 ± 0.0	NS
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	10	60.9 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S2S3	5	79.8 ± 0.0	NS
P	*Botrychium simplex*	Least Moonwort				S2S3	3	75.7 ± 1.0	NS
P	*Angelica atropurpurea*	Purple-stemmed Angelica				S3	11	60.3 ± 0.0	NS
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	18	50.3 ± 0.0	NS
P	*Bidens beckii*	Water Beggarticks				S3	6	44.2 ± 0.0	NS
P	*Packera paupercula*	Balsam Groundsel				S3	59	50.4 ± 0.0	NS
P	*Betula pumila*	Bog Birch				S3	1	83.0 ± 0.0	NS
P	*Campanula aparinoides*	Marsh Bellflower				S3	9	35.1 ± 0.0	NS
P	*Vaccinium boreale*	Northern Blueberry				S3	5	21.4 ± 1.0	NS
P	*Vaccinium cespitosum*	dwarf bilberry				S3	46	27.0 ± 0.0	NS
P	*Bartonia virginica*	Yellow Bartonia				S3	1	78.7 ± 0.0	NS
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	27	52.8 ± 0.0	NS
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S3	2	87.8 ± 1.0	NS
P	*Teucrium canadense*	Canada Germander				S3	41	47.2 ± 0.0	NS
P	*Decodon verticillatus*	Swamp Loosestrife				S3	1	82.8 ± 7.0	NS
P	*Epilobium strictum*	Downy Willowherb				S3	6	36.8 ± 0.0	NS
P	*Polygala sanguinea*	Blood Milkwort				S3	3	7.2 ± 0.0	NS
P	*Persicaria pensylvanica*	Pennsylvania Smartweed				S3	15	49.6 ± 0.0	NS
P	*Fallopia scandens*	Climbing False Buckwheat				S3	26	29.2 ± 0.0	NS
P	*Plantago rugelii*	Rugel's Plantain				S3	2	93.8 ± 0.0	NS
P	*Samolus parviflorus*	Seaside Brookweed				S3	12	49.7 ± 0.0	NS
P	*Pyrola asarifolia*	Pink Pyrola				S3	3	84.1 ± 0.0	NS
P	*Pyrola minor*	Lesser Pyrola				S3	1	97.3 ± 2.0	NS
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	46	33.1 ± 2.0	NS
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3	335	52.2 ± 0.0	NS
P	*Agrimonia gryposepala*	Hooked Agrimony				S3	197	35.1 ± 0.0	NS
P	*Amelanchier spicata*	Running Serviceberry				S3	5	14.6 ± 0.0	NS
P	*Galium kamtschaticum*	Northern Wild Licorice				S3	5	92.1 ± 0.0	NS
P	*Geocaulon lividum*	Northern Comandra				S3	65	1.3 ± 0.0	NS
P	*Limosella australis*	Southern Mudwort				S3	3	82.0 ± 5.0	NS
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	11	50.1 ± 0.0	NS
P	*Laportea canadensis*	Canada Wood Nettle				S3	16	40.8 ± 3.0	NS
P	*Verbena hastata*	Blue Vervain				S3	48	40.9 ± 0.0	NS
P	*Carex cryptolepis*	Hidden-scaled Sedge				S3	7	45.9 ± 1.0	NS
P	*Carex eburnea*	Bristle-leaved Sedge				S3	23	54.7 ± 5.0	NS
P	*Carex lupulina*	Hop Sedge				S3	11	49.8 ± 6.0	NS
P	*Carex rosea*	Rosy Sedge				S3	5	35.1 ± 4.0	NS
P	*Carex tribuloides*	Blunt Broom Sedge				S3	11	17.5 ± 0.0	NS
P	*Carex wiegandii*	Wiegand's Sedge				S3	2	47.6 ± 0.0	NS
P	*Carex foenea*	Fernald's Hay Sedge				S3	1	69.5 ± 0.0	NS
P	*Schoenoplectus americanus*	Olney's Bulrush				S3	1	49.8 ± 0.0	NS
P	*Juncus subcaudatus*	Woods-Rush				S3	6	13.1 ± 0.0	NS
P	*Juncus dudleyi*	Dudley's Rush				S3	84	31.3 ± 0.0	NS
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3	8	65.8 ± 0.0	NS
P	*Neottia bifolia*	Southern Twayblade				S3	47	11.2 ± 0.0	NS
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	50	19.1 ± 10.0	NS
P	*Platanthera hookeri*	Hooker's Orchid				S3	3	46.7 ± 0.0	NS
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	2	37.5 ± 0.0	NS
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S3	3	82.8 ± 0.0	NS
P	*Alopecurus aequalis*	Short-awned Foxtail				S3	5	56.2 ± 1.0	NS
P	*Dichanthelium clandestinum*	Deer-tongue Panic Grass				S3	81	27.3 ± 0.0	NS
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	11	45.1 ± 1.0	NS
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3	10	29.1 ± 10.0	NS
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S3	1	97.2 ± 7.0	NS
P	*Sparganium natans*	Small Burreed				S3	8	26.0 ± 0.0	NS
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3	4	46.7 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Asplenium viride*	Green Spleenwort				S3	20	62.3 ± 0.0	NS
P	*Equisetum pratense*	Meadow Horsetail				S3	14	79.3 ± 0.0	NS
P	*Equisetum variegatum*	Variegated Horsetail				S3	39	43.2 ± 0.0	NS
P	*Isoetes tuckermanii ssp. acadiensis*	Acadian Quillwort				S3	3	17.3 ± 0.0	NS
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S3	19	35.2 ± 1.0	NS
P	*Huperzia appressa*	Mountain Firmoss				S3	1	92.9 ± 1.0	NS
P	*Sceptridium dissectum*	Dissected Moonwort				S3	3	49.2 ± 1.0	NS
P	*Polypodium appalachianum*	Appalachian Polypody				S3	1	91.2 ± 0.0	NS
P	*Bidens vulgata*	Tall Beggarticks				S3?	1	80.1 ± 0.0	NS
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S3?	1	50.0 ± 0.0	NS
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3?	3	58.0 ± 5.0	NS
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S3S4	1	46.1 ± 0.0	NS
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	5	28.8 ± 0.0	NS
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	2	54.0 ± 0.0	NS
P	*Nuphar microphylla*	Small Yellow Pond-lily				S3S4	1	95.9 ± 2.0	NS
P	*Sanguinaria canadensis*	Bloodroot				S3S4	141	40.0 ± 5.0	NS
P	*Polygonum fowleri*	Fowler's Knotweed				S3S4	4	54.2 ± 0.0	NS
P	*Rumex fueginus*	Tierra del Fuego Dock				S3S4	9	88.3 ± 0.0	NS
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	18	56.2 ± 0.0	NS
P	*Salix petiolaris*	Meadow Willow				S3S4	4	82.3 ± 0.0	NS
P	*Agalinis neoscotica*	Nova Scotia Agalinis				S3S4	3	0.7 ± 4.0	NS
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	7	46.7 ± 5.0	NS
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3S4	23	53.8 ± 0.0	NS
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	3	52.0 ± 0.0	NS
P	*Luzula parviflora*	Small-flowered Woodrush				S3S4	3	46.1 ± 0.0	NS
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	9	40.3 ± 0.0	NS
P	*Panicum philadelphicum*	Philadelphia Panicgrass				S3S4	1	77.2 ± 0.0	NS
P	*Trisetum spicatum*	Narrow False Oats				S3S4	1	88.3 ± 0.0	NS
P	*Cystopteris bulbifera*	Bulblet Bladder Fern				S3S4	117	46.8 ± 1.0	NS
P	*Equisetum hyemale*	Common Scouring-rush				S3S4	1	82.6 ± 0.0	NS
P	*Equisetum hyemale ssp. affine*	Common Scouring-rush				S3S4	36	44.3 ± 0.0	NS
P	*Equisetum scirpoides*	Dwarf Scouring-Rush				S3S4	64	79.8 ± 0.0	NS
P	*Diphasiastrum complanatum*	Northern Ground-cedar				S3S4	2	82.8 ± 5.0	NS
P	*Schizaea pusilla*	Little Curlygrass Fern				S3S4	9	8.3 ± 0.0	NS
P	*Viola canadensis*	Canada Violet				SH	1	97.7 ± 0.0	NS

5.1 SOURCE BIBLIOGRAPHY (100 km)

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
8648	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
3734	Eaton, S. 2014. Nova Scotia Wood Turtle Database. Environment and Climate Change Canada, 4843 recs.
1653	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
1274	Paquet, Julie. 2018. Atlantic Canada Shorebird Survey (ACSS) database 2012-2018. Environment Canada, Canadian Wildlife Service.
822	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
668	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
604	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
531	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database [as of 2018-03]. Mersey Tobeatic Research Institute.
507	eBird. 2020. eBird Basic Dataset. Version: EBD_relFeb-2020. Ithaca, New York. Feb 2020, Cape Breton Bras d'Or Lakes Watershed subset. Cornell Lab of Ornithology, 5063 recs.

# recs	CITATION
437	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
392	eBird. 2020. eBird Basic Dataset. Version: EBD_relNov-2019. Ithaca, New York. Nov 2019, Cape Breton Bras d'Or Lakes Watershed subset. Cornell Lab of Ornithology.
383	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
342	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
338	Neily, T.H. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
310	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
309	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
267	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
266	Churchill, J.L. 2020. Atlantic Canada Conservation Data Centre Fieldwork 2020. Atlantic Canada Conservation Data Centre, 1083 recs.
263	Neily, T.H. 2017. Nova Scotia lichen records. Mersey Tobeatic Research Institute.
215	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
193	Blaney, C.S.; Mazerolle, D.M.; Hill, N.M. 2011. Nova Scotia Crown Share Land Legacy Trust Fieldwork. Atlantic Canada Conservation Data Centre, 5022 recs.
181	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
181	Belliveau, A.G. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
159	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
147	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
144	Blaney, C.S & Spicer, C.D.; Popma, T.M.; Basquill, S.P. 2003. Vascular Plant Surveys of Northumberland Strait Rivers & Amherst Area Peatlands. Nova Scotia Museum Research Grant, 501 recs.
124	LaPaix, R.W.; Crowell, M.J.; MacDonald, M.; Neily, T.D.; Quinn, G. 2017. Stantec Nova Scotia rare plant records, 2012-2016. Stantec Consulting.
116	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.
116	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
106	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
101	Blaney, C.S. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 6719 recs.
96	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
96	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-03-18]. Mersey Tobeatic Research Institute.
93	Mazerolle, D.M. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
92	Bryson, I.C. 2020. Nova Scotia flora and lichen observations 2020. Nova Scotia Environment, 139 recs.
89	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
82	Toms, B. 2018. Bat Species data from www.batconservation.ca for Nova Scotia. Mersey Tobeatic Research Institute, 547 Records.
81	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.
77	Staicer, C. & Bliss, S.; Achenbach, L. 2017. Occurrences of tracked breeding birds in forested wetlands. , 303 records.
67	MacDonald, E.C. 2018. Piping Plover nest records from 2010-2017. Canadian Wildlife Service.
67	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
65	Belliveau, A.G. 2018. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2018. E.C. Smith Herbarium, 6226 recs.
63	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
56	Pulsifer, M.D. 2002. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 369 recs.
55	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
53	MacDonald, E.C. 2018. CWS Piping Plover Census, 2010-2017. Canadian Wildlife Service, 672 recs.
48	Neily, T.H. & Pepper, C.; Toms, B. 2015. Nova Scotia lichen location database [as of 2015-02-15]. Mersey Tobeatic Research Institute, 1691 records.
45	Bell, G. 2018. Moose, bat and bird records from Goldboro LNG Project, NS, Environmental Assessment. Amec Foster Wheeler.
44	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
44	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
43	Mazerolle, D.M. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 13515 recs.
42	Pepper, C. 2013. 2013 rare bird and plant observations in Nova Scotia. , 181 records.
41	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
39	Wilhelm, S.I. et al. 2019. Colonial Waterbird Database. Canadian Wildlife Service.
35	Benjamin, L.K. 2009. D. Anderson Odonata Records for Cape Breton, 1997-2004. Nova Scotia Dept Natural Resources, 1316 recs.
35	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
35	Munro, Marian K. Tracked lichen specimens, Nova Scotia Provincial Museum of Natural History Herbarium. Atlantic Canada Conservation Data Centre. 2019.
34	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
33	iNaturalist. 2018. iNaturalist Data Export 2018. iNaturalist.org and iNaturalist.ca, Web site: 11700 recs.
33	Nova Scotia Nature Trust. 2013. Nova Scotia Nature Trust 2013 Species records. Nova Scotia Nature Trust, 95 recs.
32	Quigley, E.J. & Neily, P.D,. 2012. Botanical Discoveries in Inverness County, NS. Nova Scotia Dept Natural Resources. Pers. comm. to C.S. Blaney, Nov. 29, 141 rec.
29	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
25	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
25	Neily, T.H. 2017. Maritmes Lichen and Bryophyte records. Atlantic Canada Conservation Data Centre, 1015 recs.
24	Neily, T.H. 2013. Email communication to Sean Blaney regarding Listera australis observations made from 2007 to 2011 in Nova Scotia. , 50.
24	Porter, C.J.M. 2014. Field work data 2007-2014. Nova Scotia Nature Trust, 96 recs.
23	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
23	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.

# recs	CITATION
22	Chapman, C.J. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 11171 recs.
22	Churchill, J.L. 2019. Atlantic Canada Conservation Data Centre Fieldwork 2019. Atlantic Canada Conservation Data Centre.
21	Neily, T.H. 2010. Erioderma Pedicellatum records 2005-09. Mersey Tobiatic Research Institute, 67 recs.
20	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
20	Neily, T.H. 2012. 2012 Erioderma pedicellatum records in Nova Scotia.
19	Neily, T.H. 2019. Tom Neily NS Bryophyte records (2009-2013). T.H. Neily, Atlantic Canada Conservation Data Centre, 1029 specimen records.
17	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
17	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
16	Chapman, C.N. (Cody). 2020. Nova Scotia Black Ash (Fraxinus nigra) field observations by Confederacy of Mainland Mi'kmaq. Forestry Program, Confederacy of Mainland Mi'kmaq.
16	Mazerolle, D.M. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
15	Clayden, S. Digitization of Wolfgang Maass Nova Scotia forest lichen collections, 1964-2004. New Brunswick Museum. 2018.
14	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
14	e-Butterfly. 2016. Export of Maritimes records and photos. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
14	Patrick, A.; Horne, D.; Noseworthy, J. et. al. 2017. Field data for Nova Scotia and New Brunswick, 2015 and 2017. Nature Conservancy of Canada.
14	Robinson, S.L. 2011. 2011 ND dune survey field data. Atlantic Canada Conservation Data Centre, 2715 recs.
13	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
13	Hill, N.M. 1994. Status report on the Long's bulrush Scirpus longii in Canada. Committee on the Status of Endangered Wildlife in Canada, 7 recs.
13	White, S. 2018. Notable species sightings, 2016-2017. East Coast Aquatics.
13	WIlliams, M. Cape Breton University Digital Herbarium. Cape Breton University Digital Herbarium. 2013.
12	anon. 2001. S.. H.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 76 recs.
12	Archibald, D.R. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 213 recs.
11	Cameron, R.P. 2017. 2017 rare species field data. Nova Scotia Environment, 64 recs.
11	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
11	Neily, T.H. Tom Neily NS Sphagnum records (2009-2014). T.H. Neily, Atlantic Canada Conservation Data Centre. 2019.
11	Robinson, S.L. 2015. 2014 field data.
10	Basquill, S.P., Porter, C. 2019. Bryophyte and lichen specimens submitted to the E.C. Smith Herbarium. NS Department of Lands and Forestry.
10	Holder, M.L.; Kingsley, A.L. 2000. Kinglsey and Holder observations from 2000 field work.
10	Knapton, R. & Power, T.; Williams, M. 2001. SAR Inventory: Fortress Louisbourg NP. Parks Canada, Atlantic, SARINV01-13. 157 recs.
10	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
9	Bryson, I. 2020. Nova Scotia and Newfoundland rare species observations, 2018-2020. Nova Scotia Environment.
9	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
9	Newell, R.E. 2004. Assessment and update status report on the New Jersey Rush (Juncus caesariensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 15 recs.
9	Power, T.; Gilhen, J. 2018. Status, distribution, and nesting ecology of Snapping Turtle (Chelydra serpentina) on Cape Breton Island, Nova Scotia, Canada. The Canadian Field Naturalist, 132(1): 8-17.
9	Whittam, R.M. 1999. Status Report on the Roseate Tern (update) in Canada. Committee on the Status of Endangered Wildlife in Canada, 36 recs.
8	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
8	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
7	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2013. Atlantic Canada Conservation Data Centre Fieldwork 2013. Atlantic Canada Conservation Data Centre, 9000+ recs.
7	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
7	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
7	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
7	NatureServe Canada. 2019. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
7	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-05-25]. Mersey Tobeatic Research Institute, 668 recs.
7	Nussey, Pat & NCC staff. 2019. AEI tracked species records, 2016-2019. Chapman, C.J. (ed.) Atlantic Canada Conservation Data Centre, 333.
7	Robinson, S.L. 2014. 2013 Field Data. Atlantic Canada Conservation Data Centre.
7	Taylor, B.R., and Tam, J.C. 2012. Local distribution of the rare plant Triosteum aurantiacum in northeastern Nova Scotia, Canada. Rhodora, 114(960): 366-382.
6	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
6	Cameron, R.P. 2005. Erioderma pedicellatum unpublished data. NS Dept of Environment, 9 recs.
6	NS DNR. 2017. Black Ash records from NS DNR Permanent Sample Plots (PSPs), 1965-2016. NS Dept of Natural Resources.
6	Phinney, Lori; Toms, Brad; et. al. 2016. Bank Swallows (Riparia riparia) in Nova Scotia: inventory and assessment of colonies. Merset Tobeiatc Research Institute, 25 recs.
6	Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
6	Powell, B.C. 1967. Female sexual cycles of Chrysemy spicta & Clemmys insculpta in Nova Scotia. Can. Field-Nat., 81:134-139. 26 recs.
5	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
5	Cameron, R.P. 2014. 2013-14 rare species field data. Nova Scotia Department of Environment, 35 recs.
5	Cameron, R.P. 2018. Degelia plumbea records. Nova Scotia Environment.
5	Power, T. 2019. Cape Breton Wood Turtle records. NS Lands and Forestry.
5	Richardson, D., Anderson, F., Cameron, R, McMullin, T., Clayden, S. 2014. Field Work Report on Black Foam Lichen (Anzia colpodes). COSEWIC.
5	Whittam, R.M. 1997. Status Report on the Roseate Tern (Sterna dougallii) in Canada. Committee on the Status of Endangered Wildlife in Canada, 5 recs.
4	Basquill, S.P. 2012. 2012 rare vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.

# recs	CITATION
4	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
4	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
4	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
4	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
4	Ferguson, D.C. 1954. The Lepidoptera of Nova Scotia. Part I, macrolepidoptera. Proceedings of the Nova Scotian Institute of Science, 23(3), 161-375.
4	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database Update. Mersey Tobeatic Research Institute, 14 recs.
4	O'Neil, S. 1998. Atlantic Salmon: Northumberland Strait Nova Scotia part of SFA 18. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-08. 9 recs.
4	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
4	Rousseau, J. 1938. Notes Floristiques sur l'est de la Nouvelle-Ecosse in Contributions de l'Institut Botanique de l'Universite de Montreal. Universite de Montreal, 32, 13-62. 11 recs.
3	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
3	e-Butterfly. 2018. Selected Maritimes butterfly records from 2016 and 2017. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
3	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
3	Manthorne, A. 2019. Incidental aerial insectivore observations. Birds Canada.
3	Neily, T.H. 2016. Email communication (May 6, 2016) to Sean Blaney regarding Fissidens exilis observations made in 2016 in Nova Scotia. Pers. Comm., 3 recs.
3	O'Neil, S. 1998. Atlantic Salmon: Eastern Shore Nova Scotia SFA 20. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-10. 4 recs.
3	Ogden, J. NS DNR Butterfly Collection Dataset. Nova Scotia Department of Natural Resources. 2014.
2	Basquill, S.P. 2012. 2012 Bryophyte specimen data. Nova Scotia Department of Natural Resources, 37 recs.
2	Blaney, C.S. Miscellaneous specimens received by ACCDC (botany). Various persons. 2001-08.
2	Cameron, B. 2005. C. palmicola, E. pedicellatum records from Sixth Lake. Pers. comm. to C.S. Blaney. 3 recs, 3 recs.
2	Cameron, R.P. 2006. Erioderma pedicellatum 2006 field data. NS Dept of Environment, 9 recs.
2	COSEWIC (Committee on the Status of Wildlife in Canada). 2013. COSEWIC Assessment and Status Report on the Eastern Waterfan Peltigera hydrothyria in Canada. COSEWIC, 46 pp.
2	Frittaion, C. 2012. NSNT 2012 Field Observations. Nova Scotia Nature Trust, Pers comm. to S. Blaney Feb. 7, 34 recs.
2	Gillis, J. 2007. Botanical observations from bog on Skye Mountain, NS. Pers. comm., 8 recs.
2	Gillis, J. 2015. Rare plant records from Cape Breton gypsum sites. Pers. comm., 25 rare plant records.
2	Hill, N. 2003. Floerkea proserpinacoides at Heatherdale, Antigonish Co. 2002. , Pers. comm. to C.S. Blaney. 2 recs.
2	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
2	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
2	Ogden, K. Nova Scotia Museum butterfly specimen database. Nova Scotia Museum. 2017.
2	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
2	Whittam, R.M. et al. 1998. Country Island Tern Restoration Project. Canadian Wildlife Service, Sackville, 2 recs.
1	Baechler, Lynn. 2016. Plant observations & photos, 2016. Pers. comm. to S. Blaney, May 2016, 2 recs.
1	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
1	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
1	Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
1	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
1	Boyne, A.W. & Grecian, V.D. 1999. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 23 recs.
1	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
1	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
1	Crowell, M. 2013. email to Sean Blaney regarding Listera australis at Bear Head and Mill Cove Canadian Forces Station. Jacques Whitford Environmental Ltd., 2.
1	Daury, R.W. & Bateman, M.C. 1996. The Barrow's Goldeneye (Bucephala islandica) in the Atlantic Provinces and Maine. Canadian Wildlife Service, Sackville, 47pp.
1	Doucet, D.A. 2009. Census of Globally Rare, Endemic Butterflies of Nova Scotia Gulf of St Lawrence Salt Marshes. Nova Scotia Dept of Natural Resources, Species at Risk, 155 recs.
1	Gregory, G. 2018. Bat species observation. Pers. comm. to J.L. Churchill.
1	Haughian, S.R. 2018. Description of Fuscopannaria leucosticta field work in 2017. New Brunswick Museum, 314 recs.
1	Klymko, J. 2019. Atlantic Canada Conservation Data Centre zoological fieldwork 2018. Atlantic Canada Conservation Data Centre.
1	Klymko, J. Henry Hensel's Butterfly Collection Database. Atlantic Canada Conservation Data Centre. 2016.
1	Klymko, J.J.D. 2016. 2015 field data. Atlantic Canada Conservation Data Centre.
1	Marshall, L. 1998. Atlantic Salmon: Cape Breton SFA 18 (part) & SFA 19. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-09. 5 recs.
1	McNeil, J.A. 2016. Blandings Turtle (Emydoidea blandingii), Eastern Ribbonsnake (Thamnophis sauritus), Wood Turtle (Glyptemys insculpta), and Snapping Turtle (Chelydra serpentina) sightings, 2016. Mersey Tobeatic Research Institute, 774 records.
1	McNeil, J.A. 2019. Snapping Turtle records, 2019. Mersey Tobeatic Research Institute.
1	Neily, P.D. Plant Specimens. Nova Scotia Dept Natural Resources, Truro. 2006.
1	Neily, T.H. & Pepper, C.; Toms, B. 2019. Boreal Felt Lichen Observation, April 2019. Mersey Tobeatic Research Institute.
1	Neily, T.H. & Pepper, C.; Toms, B. 2019. Boreal Felt Lichen Observation, January 2019. Mersey Tobeatic Research Institute, 1 rec.
1	Neily, T.H. 2013. Email communication to Sean Blaney regarding Agalinis paupercula observations made in 2013 in Nova Scotia. , 1 rec.
1	Newell, R.B.; Sam, D. 2014. 2014 Bloodroot personal communication report, Antigonish, NS. NS Department of Natural Resources.
1	Newell, R.E. 2001. Fortress Louisbourg Species at Risk Survey 2001. Parks Canada, 4 recs.
1	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
1	Parker, G.R., Maxwell, J.W., Morton, L.D. & Smith,G.E.J. 1983. The ecology of Lynx , Lynx canadensis, on Cape Breton Island. Canadian Journal of Zoology, 61:770-786. 51 recs.
1	Pepper, Chris. 2012. Observations of breeding Canada Warbler's along the Eastern Shore, NS. Pers. comm. to S. Blaney, Jan. 20, 28 recs.

# recs	CITATION
1	Porter, K. 2013. 2013 rare and non-rare vascular plant field data. St. Mary's University, 57 recs.
1	Quigley, E.J. 2006. Plant records, Mabou & Port Hood. Pers. comm. to S.P. Basquill, Jun. 12. 4 recs, 4 recs.
1	Robinson, C.B. 1907. Early intervale flora of eastern Nova Scotia. Transactions of the Nova Scotia Institute of Science, 10:502-506. 1 rec.
1	Standley, L.A. 2002. Carex haydenii in Nova Scotia. , Pers. comm. to C.S. Blaney. 4 recs.
1	Webster, R.P. Atlantic Forestry Centre Insect Collection, Maritimes butterfly records. Natural Resources Canada. 2014.
1	White, S. 2019. Notable species sightings, 2018. East Coast Aquatics.
1	Whittam, R.M. 2000. Senecio pseudoarnica on Country Island. , Pers. comm. to S. Gerriets. 1 rec.

Appendix J.1

Socioeconomic Impact of the Goldboro Gold Project

Anaconda Mining

SOCIO-ECONOMIC IMPACT OF THE GOLDBORO GOLD PROJECT

For: Anaconda Mining TSX:ANX

Group ATN Consulting Inc.

www.groupatn.ca

GROUP ATN CONSULTING INC

FEBRUARY 18, 2022

18 February 2022

Robert Dufour
Anaconda Mining
20 Adelaide Street East
Suite 915
Toronto, Ontario, Canada
M5C 2T6
Phone: (416) 304-6622
Sent via e-mail to: rdufour@AnacondaMining.com
647-921-7751

RE: The Goldboro Gold Project Feasibility Study (FS)

Dear Mr. Dufour,

Group ATN Consulting Inc. (GATN) is pleased to provide Anaconda Mining ("Anaconda" or the "Company") with the following socio-economic assessment of Anaconda Mining's proposed Goldboro Gold Project ("Goldboro" or the "Project"), detailing its potential impact on the economy of Nova Scotia as well as an assessment of the potential economic benefits arising from the participation of the Mi'kmaq of Nova Scotia on various aspects of the Project.

This report provides a conceptual assessment of what the Project could potentially look like over time, based on projections currently available from the Feasibility Study prepared for the Project.

Sincerely,

Thomas McGuire, Principal
Group ATN Consulting Inc.
Suite 400, 1883 Upper Water St
Halifax, NS
B3J 1S9
(902) 830-7191
Halifax, Nova Scotia
Email: mcguire@groupatn.ca

Anaconda Mining

GOLDBORO GOLD PROJECT IMPACTS in Nova Scotia

Total project spending of $1.7b will generate...

Jobs in Nova Scotia

Total Construction will generate

325
jobs directly on site with an additional

213
spinoff jobs for each year of construction

Operations will generate

215
jobs directly on-site for the 13 years of operation and an additional

517
spinoff jobs in each year of operation

Combined, an average of

735
jobs per year for each of the 15 years of the project, including

230
direct and on-site jobs and

505
in yearly spinoff jobs

YEARS OF BENEFITS

15
years of direct and spin-off benefits for NS

GDP IMPACT

$2.1b
direct and spin-off GDP impact for NS

HOUSEHOLD INCOME

$1.1b
direct and spin-off household income for NS

GOVERNMENT REVENUES

$528m in total government tax revenue = **$209m** in federal tax revenue + **$274m** in provincial tax revenue + **$44m** in municipal tax revenue

EXECUTIVE SUMMARY

Mining is an important economic generator in Canada and Anaconda is an important part of this sector.

Anaconda Mining (TSX:ANX) is a gold mining, development, and exploration company, focused on Atlantic Canada. In existence for more than a decade, Anaconda has operated mining and milling operations in the Newfoundland Baie Verte Mining District, including the Pine Cove Mill, tailings facility and deep-water port.

Anaconda's[1] Goldboro Gold Project is an advanced development project in Guysborough County, Nova Scotia, planned as a long-life open pit mining operation.

An economic engine: The mining industry has contributed greatly to Canada's economic strength. The industry directly employs 392,000 workers across the country in mineral extraction, smelting, fabrication, and manufacturing, and indirectly employs an additional 327,000 people.

Proportionally, the mining industry is also the largest private sector employer of Indigenous peoples, providing over 16,500 jobs. In 2019, the minerals sector directly and indirectly contributed $109 billion, or roughly 5%, to Canada's total nominal GDP.

Mining Facts | The Mining Association of Canada

https://mining.ca/wp-content/uploads/dlm_uploads/2021/04/FF-2020-EN-Web.pdf

Anaconda has been actively working in Nova Scotia since 2017 to advance this significant project. This has included completing extensive exploration programs, geotechnical, hydrogeological, and baseline environmental studies, and undertaking community and Indigenous engagement.

In 2018, Anaconda received the permits required to proceed with the extraction of a 10,000-tonne underground bulk sample which showed encouraging results.

Initially envisioned to be a small-scale underground mining project, the project scope has undergone several iterations over the past four years and has become a significant long-life gold project in Canada.

In February 2021, Anaconda announced a significant increase to its mineral resource estimates which the Company noted at the time "demonstrate[d] the potential to meaningfully expand the scale of the Project." With the increased scale and mine longevity comes greater economic potential for Nova Scotia.

[1] The Goldboro Gold Project is a high-grade, advanced exploration and development project that forms a strategic part of Anaconda's strategy for near-term growth. Goldboro is located in Guysborough County approximately 185 km northeast of Halifax. https://www.anacondamining.com/

Based on the current Feasibility Study for the Project, the surface gold mine will operate a 4,000-tonne per day ("tpd") processing facility and associated mining infrastructure. The mine is projected to produce on average 100,000 ounces of gold per year over approximately 11-years generating approximately $2.2 billion in gross revenues.

The Company has noted there continue to be significant upside both to the west of the deposit and at-depth, however for the purposes of this study, we have factored information for a 15-year project life cycle including construction (2 years), operations (11 years), and initial remediation[2] (2 years). For the purposes of our impact analysis, operations and remediation have been combined and will be reflected as such.

The Project consists of two surface extraction areas (open pits). An ore processing facility, constructed north of the current road, will accept feed material that would be subject to crushing, grinding, and concentration methods to produce a gold doré bar on site, which would then be further refined into gold bullion.

Over the course of the Project life cycle, which is projected to be over 15 years including construction and long-term environmental reclamation and monitoring, Anaconda will spend $1.7 billion on a variety of capital and operating costs, including wages and salaries, equipment, supplies, and sub-contractors, reaching nearly $235 million in pre-preproduction work, and averaging nearly $90 million per year during the operational phase of the mine.

To independently demonstrate the social and economic impacts of the Goldboro Gold Project throughout its approximately 15 years of construction and operations activity, Anaconda engaged Group ATN to complete a socio-economic impact analysis of the potential benefits accruing to the Province of Nova Scotia, and the potential benefits to Nova Scotia Mi'kmaq. The resulting analysis estimates the impacts based on construction and operational forecasts provided by Anaconda over the life of the mine, from construction and pre-production activity to commercial production, and finally the decommissioning phase, which includes environmental rehabilitation and long-term environmental monitoring.

The Goldboro Gold Project is a significant development project for the province of Nova Scotia. It is taking place in a part of the province that has historically faced significant economic challenges, punctuated by historical industry closures, outmigration, and an aging demographic. More recent impacts of the global Covid-19 pandemic are yet to be fully understood, but anecdotally there is some evidence that the region has experienced in-migration as those from larger centres seek what they perceive to be safer arrangements, augmented by increasingly enhanced connectivity which permits efficient remote working. In an area of the province where the labour force may be limited, the

[2] Remediation: The environmental monitoring component of remediation can continue for an undetermined amount of time. For the purpose of this study only the first two years are considered in the financial analysis because that is when the vast amount of spending will occur.

confluence of the Goldboro Gold Project and the influx of new residents may mean that the municipality, and the province may be able to capture more of the economic benefit than might

THE GOLDBORO PROJECT, NOVA SCOTIA: The Goldboro Property (the Property) is situated on the eastern shore of Nova Scotia, Canada. The Property's central point is approximately located at 45° 12′ 2.6″ N latitude and 61° 39′ 2.0″ W longitude. The Property consists of 37 contiguous claims, registered through the Company's wholly owned subsidiary Orex Exploration Inc., covering a total area of approximately 592 hectares held under Exploration Licence No. 05888. This title is in its 42nd year of issue and is renewed every two years, with the next renewal date on November 29, 2021.

The Property is located approximately 175 km northeast of the city of Halifax, 60 km southeast of the town of Antigonish, and 1.6 km north of the village of Goldboro, on the eastern shore of Isaac's Harbour, in Guysborough County, Nova Scotia, Canada. The elevation is nominally 70 m above sea level.

Anaconda Mining

https://www.anacondamining.com/anx/goldboro_project/3312

Summary of Provincial Economic Impacts:

- Over 15 years Anaconda will spend $1.7 billion on goods and services. The majority of this spending will be in Nova Scotia, resulting in a provincial GDP impact of $2.1 billion.
- Household income in Nova Scotia will increase by nearly $1.1 billion because of this project.
- 538 full time direct jobs will be created during the two-year construction phase. It is expected that
    - 325 of those jobs will be directly on site at the Goldboro Gold Project over this period.
    - There will be a further 213 full time spinoff jobs over this period.
- Once operational, the Project will provide direct annual employment for approximately 215 full time positions at the Project site, in the Eastern Region of Nova Scotia where the unemployment level of 14.2% exceeds the provincial average.
- Over the 15 year life of the project:
    - An average of 230 direct full-time jobs will be created including both the construction and operations phase, representing a total of 3,445 full time direct year-long jobs over that period.

- Additionally, an equivalent average of 505 spin-off full time jobs will be generated through the provision of related spin off good and services, representing a further 7,576 spinoff year-long jobs over the 15-year period.

- **Ultimately, the Goldboro Gold project will create 735 NEW full time equivalent jobs a year in Nova Scotia for 15 years.**

At $1.7 billion in direct spending and $2.1 billion impact on provincial GDP, **the Goldboro Gold Project will be the largest private sector project in the Province of Nova Scotia** and compares with other planned projects including[3]:

- Halifax Infirmary Expansion, estimated at $1.5 billion+, and
- Sydney Container Terminal estimated at $1.5 billion.

To compare projects closer to the region and yearly financial benefits, the annual benefits of the Goldboro Gold Project is on par with the spending contemplated for the Port Hawkesbury Paper 112-megawatt wind farm which will only happen in one year – the Goldboro Gold Project is equivalent to building a new 112-megawatt wind farm project every year for 15 years.

The Company will pay $528 million in federal/provincial/municipal taxes over the life of the project. More than 80% of tax revenue will be collected by the province of Nova Scotia, supporting important public programs and services such as health care and education, as well as infrastructure such as roads, schools, and recreational facilities. Beyond the economic impact of this Project, two important values Anaconda brings to this development are:

- A commitment to meaningful and ongoing engagement with all stakeholders and rights holders; and
- Strong environmental practices, as demonstrated by over 10 years of successful operations in Newfoundland.

At a time when Corporate Social Responsibility has become so important, ensuring productive and open relationships with all stakeholders and rightsholders is a key component of Anaconda's corporate culture. This is a central element of Anaconda's socio-economic commitment to the region.

Anaconda has been diligent in engaging with the local community and other stakeholders, including Mi'kmaq interests. Anaconda has opened opportunities for dialogue and engagement with representatives of Nova Scotia Mi'kmaq First Nations, the Municipality of the District of Guysborough, and the public regarding the Goldboro Gold Project since 2017.

To optimize the local economic benefits and impacts of this Project, Anaconda's objective is to focus on opportunities for the residents and businesses within the region to participate in the Project. This has been an enduring commitment throughout the permitting process.

[3] These values are based on APEC' Major Projects Inventory for 2021.

Taking this approach enables Anaconda to establish its operations as an active member of the community and a participant in the sustainable development in North Eastern Nova Scotia. To further aggregate local economic benefit impacts, Anaconda will endeavour to award contracts to local businesses where feasible, as well as other businesses within the province.

In relation to environmental practices, Anaconda is committed to best practices in sustainable mine development and ensuring the protection of natural resources and the environment. These practices include reducing water and energy consumption, preventing soil, water, and air pollution at the mine site, minimizing land disturbance and waste production, and conducting successful mine closure and reclamation activities.

Company Engagement with Mi'kmaq of Nova Scotia

Anaconda initiated engagement with the Mi'kmaq of Nova Scotia upon acquiring the mineral rights for the project from Orex Exploration in 2017, including conversations with Kwilmu'kw Maw-klusuaqn (KMKNO), the Assembly of Nova Scotia Mi'kmaq Chiefs and Paqtnkek First Nation.

Anaconda recognizes the asserted Aboriginal and Treaty Rights and Title of Nova Scotia Mi'kmaq. The Company routinely shares project information Kwilmu'kw Maw-klusuaqn Negotiation Office ("KMKNO") and representatives of Paqtnkek Mi'kmaw Nation. On June 2, 2019, the Company and the Assembly of Nova Scotia Mi'kmaw Chiefs signed a Memorandum of Understanding ("MOU") that outlines the process the parties are using toward the development of a Mutual Benefits Agreement ("MBA") with respect to the Project. This process is ongoing.

Anaconda maintains its commitment to work collaboratively with Nova Scotia Mi'kmaq regarding environmental and cultural priorities, as well as social and economic opportunities throughout the life of the project. Information shared through ongoing Mi'kmaq engagement as well as completion of a Mi'kmaq Ecological Knowledge Study ("MEKS") in 2017, has been reflected in the development of the Project. A new MEKS is in progress that will reflect any new information or considerations related to the current footprint. The Company welcomes an opportunity to engage with any Mi'kmaw Community's Council or Mi'kmaq organization that has an interest in the Project.

With this in mind, Group ATN have presented a number of scenarios to quantify potential impacts for the Mi'kmaq of Nova Scotia.

Detailed Summary of Economic Impacts

In presenting these impacts, the economic impact analysis highlights the significant employment potential of this important development in a largely rural area of Nova Scotia. This detailed summary of impacts addresses the economic value of the two streams associated with the proposed mine development.

The analysis of these impacts is based on:

- Capital spending during construction; and
- Cumulative Operation of the mine over its life of mine, including the decommissioning phase comprising environmental rehabilitation and long-term environmental monitoring.

Results are as follows:

NOVA SCOTIA WIDE CONSTRUCTION IMPACTS

Estimated direct and spin-off impacts on Nova Scotia because of the construction activity are:

- $198 million in direct and spinoff Gross Domestic Product
- 538 full time jobs, inclusive of 325 full-time direct jobs, in each year of construction (1,504 person years in direct and spinoff employment over the two-year period)
- $151.5 million in direct and spinoff household income
- $45.9 million in direct and spinoff government tax revenues, including:
    - $19.8 million in direct and spinoff federal tax revenues
    - $19.8 million in direct and spinoff provincial tax revenues; and
    - $6.3 million in direct and spinoff municipal tax revenues.

NOVA SCOTIA WIDE OPERATIONAL IMPACTS

Operationally, the approximately 13 years of activity will generate the following direct and spin-off impacts:

- $1.9 billion in direct and spinoff Gross Domestic Product
- 732 NEW full-time jobs in each year of operations, including 215 direct full-time jobs at the Project (9,517 person years in direct and spinoff employment over the 13 years of operations)
- $955.6 million in direct and spinoff household income
- $481.6 million in direct and spinoff government tax revenues, including:
    - $189.2 million in direct and spinoff federal tax revenues
    - $254.4 million in direct and spinoff provincial tax revenues; and
    - $38.1 million in direct and spinoff municipal tax revenues.

The following table provides a summary of the construction impacts (over a two-year period), the 13 years of operational spending impacts, and the cumulative total in millions of dollars.

Total Impacts to Nova Scotia	Construction Impacts	Operational Impacts	Total Impacts for Nova Scotia
Gross Domestic Product	$198.7 M	$1,927.5 M	$2,126.2 M
Employment (person years, full year positions)	1,504	9,517	11,021
Household income	$151.5 M	$955.6 M	$1,107.2 M
Government tax revenues	$45.9 M	$481.6 M	$527.5 M
Federal tax revenues	$19.8 M	$189.2 M	$209.0 M
Provincial	$19.8 M	$254.4 M	$274.2 M
Municipal	$6.3 M	$38.1 M	$44.3 M

This level of employment demand in this part of the province is significant and has been encouraged by the Municipality of the District of Guysborough. In general, the demographic challenges in Nova Scotia are very significant. The population is older and outmigration from rural areas continues to erode the labour force in these communities.

The Municipality of the District of Guysborough has had similar challenges, so this development has the potential to help reverse that worrisome trend by creating meaningful, well-paying jobs in a rural community.

The Goldboro Gold Project is a modern mining project being undertaken with a focus on environmental probity and with a clear interest in earning a social license to operate by engaging key stakeholders and rightsholders. – local citizens, Mi'kmaq, The Municipality of the District of Guysborough, as well as government departments, agencies and regulators.

LIMITATIONS

This report was prepared by Group ATN Consulting Inc. ("GATN") for Anaconda Mining Inc. in accordance with the professional services agreement GATN entered with Anaconda. The disclosure of any information contained in this report is the sole responsibility of Anaconda. The material within the report reflects GATN's best judgement considering the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. GATN accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report. The original of the technology-based document sent herewith has been authenticated and will be retained by GATN for a minimum of ten years. Since the file transmitted is now out of GATN's control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications that may have been made to this document.

Table of Contents

1 INTRODUCTION

Nova Scotia has a rich mining history. Extraction of minerals in Nova Scotia predates colonial contact. Historically, the Mi'kmaq of Nova Scotia mined clay, native copper and used stone to make tools and various implements.

Many small communities in Nova Scotia, including Goldboro, proudly celebrate the mining tradition as an important part of their heritage.

The objective of this analysis is to provide an understanding of the social and economic impacts of the Goldboro Gold Project on the Province of Nova Scotia.

An important sub-objective of this analysis is to contribute to a broadening of understanding as to the potential benefits of the Goldboro Gold Project to the Mi'kmaq of Nova Scotia.

A few important facts are noteworthy. These include:

- Mining is **the highest-paying natural resource industry and one of the highest-paying of all industries in the Province** of Nova Scotia employing 5,500 people, mostly in rural areas, and contributing $420 million to the province's economy each year.

- Usually located in rural areas, **mining is often the backbone of the local rural economy**, helping to provide jobs in the community, sustaining population growth and retention, creating broader economic spin-offs through the mining supply chain, and helping shore up the local tax base which supplies a broad range of important services to citizens.

- Mining in Nova Scotia and elsewhere is **governed by a strong regulatory regime** including environmental considerations - dust, noise and blasting activities – which are closely regulated by the Province of Nova Scotia.

- All mining companies, Anaconda included, are required to submit an **environmental reclamation** plan at the beginning of the Project. With that comes a financial performance bond that is determined by the provincial government and held with them to ensure that adequate funds are in place to ensure that environmental remediation takes place. This commitment and important practice are key to ensuring future generations will continue to enjoy an area after mining operations have ceased.

Equally noteworthy, globally, responsible mining accompanies like Anaconda are taking active steps on an ESG agenda – **environmental, social and governance** considerations. Like many other industries, this involves identifying priorities, measuring their performance, and reporting on results.

The value of this focus on ESG for the mining industry is that it is an important methodology to consider whether there are environmental, social or governance risks that may affect the industry or operation's ability to: raise capital; obtain permits; work with communities, regulators and NGOs; and/or protect their assets from impairments.

This focus also supports the identification of opportunities to reduce energy; water usage; carbon emissions; improve operational performance; enhance community and regulatory relationships; and manage closure and reclamation.

ESG reporting adds an added dimension of industry transparency and accountability. It is also an important dimension of the mining industry's investment in securing a social license for its operations.

Why is ESG important?

ESG has come to the forefront primarily through investors demanding increased attention on environmental, social and governance-related matters and data. In short, investors are starting to look beyond financial statements and now want to consider the ethics, competitive advantage and culture of a mining organisation.

https://www.slrconsulting.com/news-and-insights/insights/esg-insights-what-does-esg-mean-mining-industry

How does ESG apply to the mining industry?

Due to the very nature of the metals and mining industry, ESG has long been a focus for governments, NGOs, industry bodies and wider society concerned by the environmental and social impacts of the extractives sector. Over recent years, these concerns have led to the introduction of wide-reaching and robust ESG-focused regulations, codes and principles for mining.

https://www.decipher.com.au/blog/mining-resources/the-growing-importance-of-esg-in-mining

1.1 STUDY BACKGROUND

Typically, studies on the economic impact of the mining projects have taken a narrow approach, accounting for the mining operations themselves. The focus of this study is on taking a more integrated approach to examining the industry's impact on the Province of Nova Scotia, but also the potential benefits that may accrue to the Mi'kmaq of Nova Scotia, including but not limited to their role in supply chain opportunities, in procurement, and direct employment opportunities.

Any scan of global trends in mining reveals several important areas of focus including:

- Recovery from the pandemic.
- From a climate change accountability perspective, greater attention to the growing need to seamlessly integrate emissions data with a company's operational and financial data; and

- Adoption of *environmental, social and governance* (ESG) frameworks and metrics.

As noted in the above text box, ESG metrics and reporting are becoming an important consideration across a variety of sectors, mining among them.

2 METHODOLOGY

At a high level, our approach to assess the economic impacts of the Goldboro Gold Project involved collecting expenditure data from Anaconda and reviewing the financial operations of the proposed mine site near the Village of Goldboro, NS. This includes an examination of the construction cost estimates and mine operations, taking place over a period of 15 years, from construction to pre-production, to mining and commercial production, to mine decommissioning and reclamation.

Existing secondary information was secured and referenced to complement this primary research. This included an examination of input-output ("I-O") tables, as well as documents provided by the Company. Supplemental primary sources included interviews with Anaconda staff. A significant component of these materials reflects an innovative goal of engaging the Mi'kmaq of Nova Scotia as partners and to actively leverage opportunities going forward so that maximum social and economic benefits are realized.

A proprietary inter-provincial I-O model was used to map the economic relationships of the Goldboro Gold Project, and ultimately quantify its contribution to the Nova Scotian economy across the life cycle of the mine operations, from development to decommissioning.

The I-O simulation model was tailored to the Nova Scotia economy to generate all mine-related economic impacts. The results of this I-O analysis provides a detailed measure of the impact of the Goldboro Gold Project and its relationship to the Nova Scotian economy including:

- Economic impact in terms of direct, indirect, and induced[4] activity reflecting the entire Goldboro Gold Project supply chain:
  - Employment (jobs)
  - Household income; and
  - Contribution to federal, provincial, and local taxes.

The key assumptions used in this analysis relate to the financial information and are based on information provided by Anaconda. **Table 1** provide details on mine expenditures relating to capital (CAPEX) and operations (OPEX) as outlined in the independent feasibility study prepared for the Project.

[4] Combined, the indirect and induced effects are referred to as spinoff effects.

When completed, the Company will have spent almost $1.7 billion over 15 years on a variety of good and services in support of the full range of activities surrounding the Project, from pre-production development efforts, through to commissioning and operations, to site reclamation. This includes over $271 million in construction work related to the pre-production mine development, with the balance of nearly $1.4 billion spent on mine operations and related costs. The Company expects incur a further $528 million in direct income and mining taxes.

Table 1: Summary of Mining Revenues, Expenses, Capital (CAPEX) and Operating (OPEX)

	Details	Amount
1	Gross Revenue	$2,203,565,000
2	Selling Costs	$(4,658,000)
3	**Net Revenue**	**$2,198,907,000**
4	Operating Costs	$(1,059,324,000)
5	**Operating Cash Flows**	**$1,139,583,000**
6	Sustaining Capital	$(63,105,000)
7	Upfront Capital Costs	$(271,050,000)
8	Other Costs	$(50,302,000)
9	**Total Pre-Tax Cash Flow**	**$755,126,000**
10	Income Tax (Federal and Provincial)	$(204,198,000)
11	Mining Tax	$(21,989,000)
12	Subtotal Tax Costs	$(226,187,000)
13	**After-Tax Cash Flow**	**$528,939,000**

As a site specific and labour- and capital-intensive project, most of this spending will be within Nova Scotia at an estimated $1.1 billion, or nearly 71% of wage spending. As a result, the project is expected to have significant direct and indirect employment opportunities for Nova Scotia. This will have a significant impact on the communities along Nova Scotia' Eastern Shore, an area that has been beset with economic challenges. Estimates show that the mine operations will require upwards of 215 direct full-time positions as soon as production begins. Most of these jobs will be in the mine operations, followed by mill work and office/administration.

This level of employment demand in this part of the province is significant and will be encouraging to residents and municipal leaders alike. In general, the demographic challenges in Nova Scotia are very significant. The population is older and outmigration from rural areas continues to erode the labour force in these communities. Guysborough County has had similar challenges.

These trends have had implications for the area's infrastructure. As such, housing and accommodations may need to be provided for a workforce that may commute from other areas and / or take short-term residence within the area.

This will create an opportunity to provide accommodation options for employees that could include onsite accommodations, short-term rentals, or purchase of single or multi-unit dwellings in the surrounding area, factors which will further enhance the economic impact.

In the Community Benefits Agreement signed with the Municipality of the District of Guysborough, Anaconda has committed to $5,000 for Anaconda employees who purchase or build a home within the municipality.

3 CONSTRUCTION / CAPITAL SPENDING

The economic impacts generated by this **$271 million in capital spending** are provided in the following table:

Table 2: Construction Impacts

Mine Goldboro – CAPEX (Millions)	Nova Scotia	Rest of Canada	Total
Gross Domestic Product	$198.7 M	$102.4 M	$301.2 M
Employment (person years, full year positions)	1,504	953	2,457
Household income	$151.5 M	$62.3 M	$213.8 M
Government tax revenues	$45.9 M	$20.0 M	$65.9 M
Federal tax revenues	$19.8 M	$8.6 M	$28.4 M
Provincial	$19.8 M	$8.5 M	$28.3 M
Municipal	$6.3 M	$2.9 M	$9.2 M

The **cumulative capital impacts for Nova Scotia resulting** from the Goldboro Gold Project are:

- $198 million in direct and spinoff Gross Domestic Product
- 538 full time jobs, inclusive of 325 full-time direct jobs, in each year of construction (1,504 person years in direct and spinoff employment over the 2-year period)
- $151.5 million in direct and spinoff household income
- $45.9 million in direct and spinoff government tax revenues, including:
  - $19.8 million in direct and spinoff federal tax revenues
  - $19.8 million in direct and spinoff provincial tax revenues; and
  - $6.3 million in direct and spinoff municipal tax revenues.

These impacts occur during the first two years of pre-production capital work.

4 OPERATIONAL / CAPITAL SPENDING

The economic impacts generated by the operational spending of **$1.4 billion** are provided in the following table:

Table 3: Operational Impacts

Mine Goldboro – OPEX	Nova Scotia	Rest of Canada	Total
Gross Domestic Product	$1.9 B	$646.7 M	$2.6 B
Employment (person years, full year positions)	9,517	4,273	13,790
Household income	$955.6 M	$386.0 M	1.3 B
Government tax revenues	$481.6 M	$101.6 M	$583.2 M
Federal tax revenues	$189.2 M	$39.0 M	$228.2 M
Provincial	$254.4 M	$44.7 M	$299.1 M
Municipal	$38.1 M	$17.9 M	$56.0 M

The **full impacts (direct and spin-off) for Nova Scotia** resulting from the Goldboro Mining Project's operational spending include:

- $1.9 billion in direct and spinoff Gross Domestic Product
- 732 NEW full-time jobs in each year of operations, including 215 direct full-time jobs at the Project (9,517 person years in direct and spinoff employment over the 13 years of operations)
- $955.6 million in direct and spinoff household income
- $481.6million in direct and spinoff government tax revenues, including:
  - $189.2 million in direct and spinoff federal tax revenues
  - $254.4 million in direct and spinoff provincial tax revenues; and
  - $38.1 million in direct and spinoff municipal tax revenues.

5 TOTAL ECONOMIC IMPACTS FOR NOVA SCOTIA

Cumulative impacts arising from construction and operational spending are summarized in the following table:

Table 4: Construction and Operational Impact

Total Impacts to Nova Scotia (Millions)	Construction Impacts	Operational Impacts	Total Impacts for NS
Gross Domestic Product	$198.7M	$1.9B	$2.1B
Employment (person years, full year positions)	1,504	9,517	11,021
Household income	$151.5M	$955.6M	$1,107.2
Government tax revenues	$45.9M	$481.6M	$527.5
Federal tax revenues	$19.8M	$189.2M	$209.0
Provincial	$19.8M	$254.4M	$274.2
Municipal	$6.3M	$38.1M	$44.3

The cumulative direct and spinoff impacts for Nova Scotia resulting from the construction and operational **Goldboro Gold Project** at its conclusion will have amounted to:

- $2.1 billion in direct and spinoff GDP
- 735 NEW direct and spin-off full-time equivalent jobs for 15 years.
- $1.1 billion in direct and spinoff household income; and
- $527.5 million in government tax revenues including
  - $209.0 million in federal tax revenues
  - $274.2 million in provincial taxes
  - $44.3 million in municipal taxes

Appendix A provides summary charts of all impact results.

6 Indigenous Engagement

Part of the mandate for this research was to ascertain an estimate of the potential economic benefits that may accrue to the Mi'kmaq of Nova Scotia. In this regard, outreach was conducted with a number of relevant organizations – KMKNO, Ulnooweg Development Group (UDG), Atlantic Policy Congress (APC), as well as Paqtnkek Mi'kmaw Nation. As well, Group ATN considered some of the benefits being contemplated by as part of a potential Mutual Benefits Agreement.

Engagement regarding a potential Mutual Benefits Agreement with Nova Scotia Mi'kmaq is ongoing. Out of respect for that process, details contemplated in a potential Mutual Benefits Agreement are not included in this document.

In addition to engagement with relevant Mi'kmaq Communities and Organizations, Group ATN also considered other major projects with which we are familiar and that involved impact benefits for Indigenous Communities. These analogues included the completed ~$400 million Sydney Tar ponds remediation, the planned Boat Harbour Remediation, as well as ongoing projects including Vale's mining in Nunatsiavut, other Western resource development projects and the Muskrat Falls project. Among the analogues examined, the 6-year Sydney Tar Ponds cleanup is regarded by many as a highly successful project. Of the $400 million in estimated total spending on the Sydney Tar Ponds remediation, an estimated $70 million accrued to Indigenous-owned businesses and employment activity. Estimates for other projects are contextualized to the particular project and the opportunities presented with the focus on optimizing benefits along a continuum of opportunities including but not limited to training, employment, and contracting.

The Mi'kmaq of Nova Scotia have a well-developed approach to advancing collective commercial projects that benefit all 13 Mi'kmaw Communities. Examples include projects in renewable energy, other energy developments, advanced manufacturing, the Indigenous fishery and cannabis production. These projects contribute to 'own source revenues' which are often reinvested in Mi'kmaq Community infrastructure, education, cultural activities and recreation.

Moreover, the training and employment opportunities associated with these developments open new career and skill development opportunities for Mi'kmaq youth.

7 POTENTIAL ECONOMIC IMPACTS FOR MI'KMAQ OF NOVA SCOTIA

Cumulative impacts arising from construction and operational spending that accrue to the Mi'kmaq of Nova Scotia will be dependent on a number of factors including the nature of any agreements between the Mi'kmaq of Nova Scotia and Anaconda, the interest/opportunity to form partnerships with other companies in the creation of purposeful Mi'kmaq corporations to conduct project related business, the capacity of Community owned enterprises and/or Mi'kmaq owned enterprises to provide services needed, and the availability of the Mi'kmaq labour force.

Striking a balance between ambition and what may be achievable in the context of many other demands on and opportunities for Mi'kmaq businesses and workers, some basic options for project participation include:

- Training and employment for Nova Scotia Mi'kmaq
- Cultivating entrepreneurship and growth potential for new or existing Mi'kmaq companies through teaming arrangements with non-Indigenous companies or aggregating capacity across several Indigenous companies (including Atlantic Indigenous companies)
- Identifying contracts that Mi'kmaq already have capacity to undertake
- Encouraging teaming arrangements and Joint Ventures between Indigenous and non-Indigenous companies
- Bursaries for Mi'kmaq youth in career opportunities related to - mining operations, including but not limited to engineering, environmental monitoring, safety, geology, etc.
- Review of current corporate policies and procedures to appropriately reflect Indigenous inclusion and Cultural Awareness
- All employees at the Goldboro Gold Project will receive Mi'kmaq developed and delivered cultural awareness training
- Funding for workforce development and community capacity building; and
- Regular reporting on results.

To illustrate the range of potential benefits, if the Mi'kmaq of Nova Scotia serviced 15% of all project opportunities, it would mean contributing to $319 million in GDP, 1,653 full time equivalent positions (110 full time jobs for 15 years) and a contribution to Mi'kmaq household income of over $166 million in direct and spinoff impacts combined.

Table 5 summaries this example and also includes one other scenario of 6% (which is scaled to the per-capita equivalent benefit – the 2016 Census indicated that Indigenous people represented 5.7% of the Nova Scotia total population).

Table 5: Potential Range of Impacts for the Mi'kmaq of Nova Scotia

Total Impacts to Nova Scotia	6% Share of Benefits	15% Share of Benefits
Gross Domestic Product (millions)	$127.6M	$318.9M
Employment (person years, full year positions)	661	1,653
Household income (millions)	$66.4M	$166.1M

Recognizing the uniqueness of this project, the breadth of potential opportunities, its geography and the intent to optimize Mi'kmaq collaboration and economic benefits, Anaconda believes that the best

path forward is to engage an Indigenous Coordinator as part of the Project Team. This position will include the assessment of project-related opportunities to optimize benefits through the various project phases. This position can provide other value-added inputs through the ongoing evaluation of what's working, whether impacts are being materially achieved by tracking and reporting on results and through continued liaison and engagement with Mi'kmaq communities.

This proposed approach has leveraged leading practices from a scan of major projects which provide useful insights into how best to positively impact local economic benefits for Indigenous Communities.

8 BENEFITS TO MUNICIPALITY OF THE DISTRICT OF GUYSBOROUGH

In addition to municipal tax revenue, Anaconda has signed a Community Benefits Agreement with the Municipality of the District of Guysborough to support sustainable social and economic benefits within the Municipality with respect to the Company's Goldboro Gold Project. The Municipality has a strong history of significant natural resource development, including mining, natural gas, and wind energy. It is well established as "open for business" for sustainable commercial and industrial development. Anaconda has maintained engagement with the Municipality as well as with residents and property owners in the region since it acquired the Project in 2017. A Community Liaison Committee was established to foster environmental stewardship and act as a conduit for transparent and ongoing communications between the Company, the community, and local stakeholders, on all matters pertaining to potential development.

The Community Benefits Agreement establishes a framework for a long-term relationship between Anaconda Mining and the Municipality of the District of Guysborough over the life of the Goldboro Gold Project, confirming the Municipality's support for the Project and Anaconda's commitment to bring sustainable social and economic benefits to the members of the Guysborough community.

Such benefits include:

1. Implement targeted measures for local recruitment and employment at both at the construction and operational stages of the Project.

2. Collaborate with the Guysborough Career Resource Centre to assess local labour market training and employment opportunities.

3. Encourage contractors, suppliers, and service providers to maximize opportunities to hire locally and support businesses activities in the Municipality of the District of Guysborough.

4. Engage local businesses and suppliers to identify procurement and service opportunities with the Project.

5. Contribute annual grants for community groups, organizations, and community projects within the Municipality. The value of grants will be $15,000 per year until commercial production of gold when it will increase to $100,000 per year for the life of the project.

6. Provide financial incentives for Goldboro employees to purchase or build homes within the Municipality ($5000 per employee).

7. Establish five bursaries for local high school students. This year there will be $5000 allocated for the bursaries. This will increase to $10,000 in 2025 or when commercial gold production begins.

8. Hire co-op work term students and apprenticeship placements.

9. Establish a local Project Information Office within the Municipality in 2022 with a further commitment to maintain a local Operational Office within the Municipality for the life of the Project.

10. Facilitate ongoing dialogue between the Municipality and the Company including quarterly updates to the Municipality as they relate to the Agreement, the implementation of the benefits outlined in the Agreement, and general updates concerning the Project.

9 OBSERVATIONS & CONSIDERATIONS

As one of the highest income sectors in Nova Scotia, mining projects such as the one being contemplated by Anaconda are very valuable in terms of the economic impacts that can be created both from direct mine operations and through supply chain dynamics. What is more difficult to quantify is the leverageable capacity that is gained by the talent developed at these mine site. It is notable that Canadian mining interests are both domestic and international.

As the Mining Industry of Canada points out, Canada's global minerals industry creates opportunities in more than 100 countries. Canada is home to the industry's best exploration firms and a capital market that is the base of operations for more than half of the world's publicly traded mining companies. Likewise, Nova Scotian based expertise, develop on local and national projects, are active in projects world-wide.

At $1.7 billion in direct spending and $2.1 billion impact on provincial GDP, **the Goldboro Gold Project will be the largest private sector project in the Province of Nova Scotia** and compares with other planned projects including[5]:

- Halifax Infirmary Expansion, estimated at $1.5 billion+, and
- Sydney Container Terminal estimated at $1.5 billion.

[5] These values are based on APEC' Major Projects Inventory for 2021.

To compare projects closer to the region and yearly financial benefits, the Goldboro Gold Project is on par with the spending contemplated for the Port Hawkesbury Paper 112-megawatt wind farm which will only happen in one year – the Goldboro Gold Project is equivalent to building a new 112-megawatt wind farm project every year for 15 years.

The Goldboro Gold Project is a modern mining project being undertaken with a focus on environmental probity and with a clear interest in earning a social license to operate by engaging key stakeholders and rightsholders. – local citizens, Mi'kmaq, The Municipality of the District of Guysborough, as well as government departments, agencies and regulators.

APPENDIX A:

	CAPEX			OPEX			Total		
	Nova Scotia	Rest of Canada	Total	Nova Scotia	Rest of Canada	Total	Nova Scotia	Rest of Canada	Total
EMPLOYMENT (full time, full year positions)	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**
DIRECT	1,076	158	1,234	3,798	-	3,798	4,874	158	5,032
INDIRECT	251	457	708	3,535	2,286	5,821	3,786	2,743	6,529
INDUCED	177	338	515	2,184	1,987	4,171	2,361	2,325	4,686
TOTAL	1,504	953	2,457	9,517	4,273	13,790	11,021	5,226	16,248
	61%	*39%*	*100%*	*69%*	*31%*	*100%*	*68%*	*32%*	*100%*
HOUSEHOLD INCOME	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**
DIRECT	$110.1	$10.5	$120.6	$484.5	$0.0	$484.5	$594.6	$10.5	$605.1
INDIRECT	$21.3	$31.6	$53.0	$289.6	$238.7	$528.4	$310.9	$270.4	$581.3
INDUCED	$20.1	$20.2	$40.3	$181.5	$147.3	$328.8	$201.7	$167.5	$369.1
TOTAL	$151.5	$62.3	$213.8	$955.6	$386.0	$1,341.7	$1,107.2	$448.3	$1,555.5
	71%	*29%*	*100%*	*71%*	*29%*	*100%*	*71%*	*29%*	*100%*
GROSS DOMESTIC PRODUCT	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**
DIRECT	$132.7	$16.4	$149.1	$1,221.8	$0.0	$1,221.8	$1,354.5	$16.4	$1,370.9
INDIRECT	$32.5	$50.7	$83.2	$403.0	$389.5	$792.5	$435.5	$440.2	$875.7
INDUCED	$33.6	$35.3	$68.9	$302.7	$257.2	$560.0	$336.3	$292.5	$628.8
TOTAL	$198.7	$102.4	$301.2	$1,927.5	$646.7	$2,574.2	$2,126.2	$749.1	$2,875.4
	66%	*34%*	*100%*	*75%*	*25%*	*100%*	*74%*	*26%*	*100%*
IMPORTS	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**
DIRECT	$60.8	$0.0	$60.8	$446.9	$0.0	$446.9	$507.7	$0.0	$507.7
INDIRECT	$45.6	$20.3	$66.0	$134.3	$101.4	$235.7	$179.9	$121.7	$301.7
INDUCED	$20.4	$14.8	$35.3	$184.3	$108.8	$293.2	$204.8	$123.7	$328.4
TOTAL	$126.9	$35.2	$162.1	$765.5	$210.2	$975.8	$892.5	$245.4	$1,137.9
	78%	*22%*	*100%*	*78%*	*22%*	*100%*	*78%*	*22%*	*100%*
GOVERNMENT TAX REVENUES	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**
DIRECT	$26.3	$2.5	$28.8	$328.1	$0.0	$328.1	$354.4	$2.5	$356.8
INDIRECT	$7.6	$8.4	$16.0	$64.2	$43.0	$107.1	$71.8	$51.4	$123.2
INDUCED	$12.0	$9.1	$21.1	$89.4	$58.6	$148.0	$101.4	$67.8	$169.1

TOTAL	$45.9	$20.0	$65.9	$481.6	$101.6	$583.2	$527.5	$121.6	$649.2
	70%	*30%*	*100%*	*83%*	*17%*	*100%*	*81%*	*19%*	*100%*
FEDERAL TAX REVENUES	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**
DIRECT	$12.0	$1.2	$13.1	$134.3	$0.0	$134.3	$146.3	$1.2	$147.5
INDIRECT	$3.5	$3.9	$7.4	$26.5	$17.7	$44.2	$29.9	$21.6	$51.6
INDUCED	$4.4	$3.5	$7.9	$28.4	$21.3	$49.7	$32.7	$24.8	$57.6
TOTAL	$19.8	$8.6	$28.4	$189.2	$39.0	$228.2	$209.0	$47.6	$256.6
	70%	*30%*	*100%*	*83%*	*17%*	*100%*	*81%*	*19%*	*100%*
PROVINCIAL	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**
DIRECT	$10.8	$1.0	$11.8	$184.1	$0.0	$184.1	$194.9	$1.0	$195.9
INDIRECT	$3.1	$3.3	$6.4	$25.2	$17.2	$42.3	$28.3	$20.5	$48.8
INDUCED	$5.9	$4.2	$10.1	$45.2	$27.5	$72.6	$51.0	$31.7	$82.7
TOTAL	$19.8	$8.5	$28.3	$254.4	$44.7	$299.1	$274.2	$53.1	$327.4
	70%	*30%*	*100%*	*85%*	*15%*	*100%*	*84%*	*16%*	*100%*
MUNICIPAL	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**
DIRECT	$3.5	$0.3	$3.8	$9.7	$0.0	$9.7	$13.2	$0.3	$13.5
INDIRECT	$1.0	$1.2	$2.2	$12.5	$8.1	$20.6	$13.5	$9.3	$22.8
INDUCED	$1.8	$1.4	$3.2	$15.8	$9.8	$25.7	$17.6	$11.3	$28.9
TOTAL	$6.3	$2.9	$9.2	$38.1	$17.9	$56.0	$44.3	$20.9	$65.2
	68%	*32%*	*100%*	*68%*	*32%*	*100%*	*68%*	*32%*	*100%*
PARAFISCALITY REVENUES	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**	**Nova Scotia**	**Rest of Canada**	**Total**
DIRECT	$2.0	$0.5	$2.5	$3.5	$0.0	$3.5	$5.5	$0.5	$6.0
INDIRECT	$0.5	$1.5	$2.0	$5.9	$8.5	$14.5	$6.4	$10.0	$16.4
INDUCED	$0.3	$0.8	$1.1	$2.7	$6.0	$8.7	$3.1	$6.7	$9.8
TOTAL	$2.8	$2.8	$5.6	$12.1	$14.5	$26.6	$14.9	$17.3	$32.3
	50%	*50%*	*100%*	*46%*	*54%*	*100%*	*46%*	*54%*	*100%*

Appendix J.2

Viewshed Analysis

Viewshed Analysis

Goldboro Gold Project
Goldboro, Guysborough Co., NS

Anaconda Mining Inc.

April 28, 2022

→ The Power of Commitment

GHD
120 Western Parkway, Suite 110
Bedford, Nova Scotia B4B 0V2, Canada
T +1 902 468 1248 | **F** +1 902 468 2207 | **E** info-northamerica@ghd.com | **ghd.com**

Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	00	Jeff Parks	Callie Andrews		Callie Andrews		Apr 28, 2022

Contents

Table index

Figure index (following text)

1. Introduction

The Goldboro Gold Project (the Project) is located approximately 175 kilometres (km) northeast of Halifax, 60 km southeast of Antigonish, and 1.6 km northeast of the community of Goldboro (Figure 1) on the eastern shore of Isaacs Harbour, in Guysborough County, Nova Scotia, Canada. Anaconda Mining Inc. (Anaconda) proposes to develop the Project as a 4,000-tonne per day (tpd) mine and processing facility. For the purposes of this environmental assessment, a Project Area (PA) was defined as the footprint of Project related infrastructure plus a buffer of 100 – 200 m. The mine plan includes two open pits (East Pit and West Pit), an ore processing facility, a tailings management facility (TMF), three waste rock storage areas (WRSAs), overburden and organic stockpiles, support buildings, and associated infrastructure. The anticipated mine life for extraction of ore is approximately 11 years.

The scope of the Project includes activities associated with construction, operation, and closure. Project construction activities will include clearing and grubbing the overburden and organic stockpiles, WRSAs, pit, plant, and TMF areas, and construction of the initial lift of the TMF, plant site, secondary access roads, construction laydowns, Run-of-Mine (ROM) pad, surface water management and other Project infrastructure. The operation phase will include conventional ore extraction methods (drilling, blasting, loading, and hauling), ore processing, and waste management. ROM ore will go directly to the crusher while stockpiled high-grade and low-grade ore will be progressively processed throughout the mine life. Non-ore bearing waste rock, not used for construction or backfill, will be stockpiled at its final disposal point, managed and reclaimed in place. The closure phase will include earthworks and demolition required to return the Project Area to a safe, stable, and vegetated state, and all monitoring and treatment, if required. Reclamation and Closure Plan requirements are governed by the *Nova Scotia Mineral Resources Act*.

2. Purpose of the Viewshed Assessment

The purpose of this viewshed assessment is to identify and evaluate the potential visual impacts of the proposed Project. This report should be read in conjunction with any plans, reports, or observations that accompany the Environmental Assessment Registration Document.

The visual environment was identified as part of the Socio-economic Valued Component (VC) during the Environmental Assessment scoping process. The Project will result in changes to the landscape that may affect scenery as viewed by others. The landscape is the visual presentation of an area of land. Scenery refers to the aesthetic or recreational qualities of the landscape.

Visual impacts refer to a change in the character and scenic value of the landscape and the effects of those changes on people. The direct visual impacts of any development will affect the landscape through intrusion or obstruction in some manner, the reactions of viewers, and the overall impact on visual amenity (Zhang *et al.* 2000). In the life of a project, many different sources of impact occur at different stages, such as construction, operation, decommissioning and reclamation.

Stakeholders may be concerned with the potential negative visual effects associated with the Project. This analysis addresses the viewshed using a modelled approach. An aesthetic assessment of the scenery from observer locations may be undertaken from time to time to assess the validity of the model and assist in the consideration of mitigation options, if required.

3. Methodology

GHD completed a viewshed analysis estimate of the potential impact on the visual environment with respect to the Project. This assessment is strictly an estimate, given that visual assessment is an individual and subjective experience because it depends on preferences related to social conditioning, personal experience, temperament, sensibilities, and even formal artistic training (NSM 1996).

A visual impact assessment of a proposed development addresses three factors: spatial, quantitative, and qualitative.

– ***Spatial*** includes where the development is visible from or, more specifically, to what or whom it is visible.
– ***Quantitative*** refers to how much of the development is visible, how much of the surrounding area is affected, and to what degree.
– ***Qualitative*** is the visual character of the development and its compatibility with its surroundings (Zhang *et al.* 2000).

The analysis of the Project uses the following scale to describe the potential visual impact to an Observer:

– **No impact** – Project components cannot be seen from the Observer location.
– **Low impact** – Project components may be seen but do not stand out or are not discernible in the view (i.e. low exposure on the horizon).
– **Moderate impact** – Project components can bee seen but are not a prominent feature in the view.
– **High impact** - Project components are a prominent feature in the view.

Impacts are associated with the visibility of the Project at a specific location during a snap shot in time. The viewshed analysis is based on the fully developed Project as a worst case and does not consider development of the Project through progressive reclamation and closure, although commentary on these activities is provided when a particular viewpoint in the analysis has a rating higher than a low visual impact.

Presently, there is no legislation for visual impact assessment in Nova Scotia or in Canada. The Province of British Columbia has created a Visual Impact Assessment Guidebook (British Columbia Ministry of Forests, 2001) as a component of their Forest Practices Code. This guidebook primarily applies to forest harvesting activities, planning and development. The Impact Assessment Agency of Canada provides a Case Study for a transportation corridor in its Cumulative Effects Assessment Practitioners Guide. While not directly relevant to mining projects, these guides were used to the extent possible for conceptual design of this assessment.

The analysis considers two observer activities: standing and boating from a stationary location. Viewing heights of observers for the boating activity locations were set at 0.75 m (sitting in the boat) above the topographic height and walking/standing set at 1.65 m (average height of a Canadian). Other activities may occur in the Viewshed study area including hiking and ATVing. These activities would have similar viewshed effects to those presented in the analysis if in a stop and stare situation; however, as one moves about the landscape, their viewplane changes as screening changes due to forest cover, topography, and distance.

3.1 Data Development and Analysis

Geographic Information System (GIS) software (ESRI ArcGIS© and ESRI 3D Analyst©) was used to create projective (views-from) and reflective (views-to) mapping of the area. The Viewshed Analysis Area for the analysis was defined by the topography and the potential distance to the horizon from the Project (Figure 1). The viewshed analysis used a 360° view from an observer location due to the elevation of the Project (high point) but mainly focusses on the potential impact to the south and west of the Project, which has a higher aesthetic viewshed value due to the location of residential receptors.

Projective mapping (inside looking out) was initiated from four viewpoints on the proposed TMF (2 locations) and WRSAs (Southeast and Northwest) to reveal the potential extent of visibility of the Project to the surroundings, and therefore, inferring from where the Project, or components of it, will be potentially visible. The two tallest buildings in

the Mill Area are the Mill Building (26 m) and the Reagents Building (13 m) which are more than 40 m lower than the adjacent WRSA so they have not been considered in the analysis.

Reflective mapping (outside looking in) was initiated from the chosen viewpoints in the landscape with the objective of determining whether, and to what extent, Project development is visible from its surroundings.

These methods assume that the Project (Figure 2) is cleared of trees and has fully developed infrastructure.

To summarize, the following assumptions and factors were built into the model.

– No vegetative cover within disturbed areas of the proposed Project.
– Forest cover and vegetation height as per the current digital surface model (GeoNova 2021).
– Completely developed footprint of the Project.
– No progressive reclamation of the Project.
– Observer viewing radius is 360°.

Using these assumptions and factors, the model is intended to be a worst-case scenario, since the Project will be developed in a gradual manner and other factors such as viewing direction and weather can greatly affect what is seen. For example, a foggy or snowy day may result in less than 1 kilometre viewing distance over prolonged periods.

GHD used a Digital Surface Model (DSM) to support the viewshed assessment. The DSM provides a dataset of both natural and anthropogenic features (*e.g.,* buildings, tops of trees) within the landscape. In comparison, a Digital Elevation Model (DEM) provides a quantitative representation of the topography of the bare Earth, removing all natural and anthropogenic features in a digital format.

The Province of Nova Scotia has an extensive, publicly available LiDAR and associated products (*i.e., DEM, DSM*) data set. There is complete coverage of the Analysis Area from these products (GeoNova 2021). The DSM was used as the base of the viewshed model. The Project infrastructure developed during Anaconda's Project Feasibility Study (Nordmin 2021) was added (or subtracted for the open pits) to complete the terrain model used for the viewshed analysis

Completing the visual analysis on the DEM would provide a worst-case scenario; however, utilizing the DSM provides additional screening between the Observer and the Project and could aid in developing future screening mitigation.

The ArcGIS tool *Visibility* (ESRI 2020) was used to determine the surface locations visible to a set of observer features. Each Observer location was analyzed independent of other locations.

3.2 Limitations

A GIS-generated viewshed analysis has been conducted to assess potential visual impacts to resources that are located near the Project. The analysis was based on the parameters of the proposed Project, the regional topography, and the forest height within the viewshed.

Visibility analysis is equivalent to shining a powerful light beam from an observation point and scanning around in a full circle. A DSM requires a high-resolution data, takes considerable calculation time to develop, and provides precise results (Ruzickova et al 2021). Low-resolution data, such as might be derived from Nova Scotia Enhanced Topographic Database contours dataset (5m), will lead to imprecise results. Every effort is made to include the most up-to-date and accurate data that have the most relevant resolution for the task. The projected viewsheds as indicated on the enclosed maps are based on a static forest height from data collected in 2017 and 2018 and do not reflect new growth (increased height) over the life of the Project.

LiDAR does provide a highly accurate terrain (1 m resolution). The method used is an ArcGIS documented approach. Other methods or tools may provide similar or differing results depending on the application, model inputs, and data requirements.

The analysis does consider the curvature of the earth for visibility in this application. For an Observer with a height of 1.5 m (5 ft) standing on the seashore, the horizon would be at a distance of 4.37 km. For an Observer 1.85 m (6 ft) tall,

the horizon would be at a distance of 4.85 km (Line of Sight Calculator 2020). As elevation increases, the distance to the horizon may increase depending on the surrounding terrain. As one moves inland from the shoreline, the distance to the horizon may decrease based on the obstructions to the view, such as topography and tree cover, that may block one's viewplane to the natural horizon.

4. Results

4.1 Projective Mapping

From the vantage point at the top of the TMF (Observer 1 and 2) and WRSAs (Observer 20 and 21) looking out (projective) to the surrounding areas (Figure 3 and 4), the analysis has determined that there are several key locations that an Observer may be able to see within the Viewshed Analysis Area. These areas include the eastern side of Ocean Lake, the western shore of Issacs Harbour (Issacs Harbour Road), and several smaller lakes and open vistas. The western shore of Ocean Lake and the eastern shore of Isaacs Harbour (Highway 316 in Goldboro) are not visible from the TMF or WRSAs due to the topography and tree cover.

The projective mapping and the visuals of vistas assist in determining Observer locations that are representative of the region and have open views toward the Project and have the potential to see/be visible.

Table 1 summarizes the Observer locations that were selected during the projective mapping exercise and used in the reflective mapping exercise.

Table 1 Viewshed Scenarios and Observer Locations

Observer / Location		Activity	Viewer Height (m)	Figure No.	Elevation (masl)	Rationale for location
1	TMF 1 (Projective)	Standing	1.65	3	110	Aesthetic value
2	TMF 2 (Projective)	Standing	1.65	3	110	Aesthetic value
20	WRSA 1 (Projective)	Standing	1.65	4	170	Aesthetic value
21	WRSA 2 (Projective)	Standing	1.65	4	155	Aesthetic value
3	459 Isaacs Harbour Rd Isaacs Harbour	Standing	1.65	5	1	Aesthetic value
4	652 Isaacs Harbour Rd Isaacs Harbour	Standing	1.65	6	20	Aesthetic value
5	49 Dick Giffins Hill Goldboro	Standing	1.65	7	18	Aesthetic value
6	29 Irving Lane Goldboro	Standing	1.65	8	17	Aesthetic value
7	214 Isaacs Harbour Rd Isaacs Harbour	Standing	1.65	10	5	Aesthetic value
8	12636 Hwy 316 Goldboro	Standing	1.65	8	8	Aesthetic value
9	13379 Hwy 316 Goldboro	Standing	1.65	8	1	Aesthetic value
10	13208 Hwy 316 Goldboro	Standing	1.65	8	3	Aesthetic value
11	13132 Hwy 316 Goldboro	Standing	1.65	8	12	Aesthetic value
12	11976 Hwy 316 Drum Head	Standing	1.65	9	23	Aesthetic value
13	11478 Hwy 316 Seal Harbour	Standing	1.65	9	9	Aesthetic value
14	13508 Hwy 316 Isaacs Harbour North	Standing	1.65	10	11	Aesthetic value
15	37 Isaacs Harbour Road Isaacs Harbour North	Standing	1.65	11	5	Aesthetic value

Observer / Location		Activity	Viewer Height (m)	Figure No.	Elevation (masl)	Rationale for location
16	99 Goldbrook Road Goldboro	Standing	1.65	12	26	Aesthetic value
17	Gold Brook Lake	Boating	0.75	13	52	Recreational value
18	Ocean Lake	Boating	0.75	14	43	Recreational value
19	Southwest Cove, Ocean Lake	Boating	0.75	14	43	Recreational value

Viewing heights of Observers for the canoeing/boating activity locations were set at 0.75 m (sitting in the boat) above the topographic height of the DSM; and standing 1.65 m (average height of a Canadian) were used.

4.2 Reflective Mapping

Reflective mapping was based on Observer locations chosen from the projective mapping exercise and areas that were representative of a particular area or view.

Figures 5 to 14 generally represent the results of viewshed analysis for a homeowner standing in their yard or of a boater on a lake. Viewpoints were chosen to give the longest open view across water or a cleared area. In all cases the high vantage point of the Project and the height of trees surrounding it, effectively screen it from view.

The Observer locations/viewpoints are summarized below.

Observer 3 – 459 Issacs Harbour Rd

An observer standing near the water at this location has a comprehensive view of Isaacs Harbour, including the east side of the harbour along Highway 316 (Figure 5).

It is expected that Observer 3 may notice the tops of the Southwest Till Stockpile and Southeast WRSA on or near the horizon from this location; however, they may not be able to discern any difference from the other surroundings given the distance of 2.4 and 2.7 km respectively from these features.

A person driving northwesterly along Isaacs Harbour Road may get a brief glimpse of these features, however they are not in the direct line of sight along the road for the driver. Passengers may have the ability to hold the location in their gaze for a longer period but the tree cover along the road may block the view as the vehicle proceeds.

A pedestrian walking along the road may have the similar view as Observer 3; however, this would require finding the right location to view past the trees that line the road. As one progresses along the road the viewshed also changes, thereby changing the perspective.

Photo 1/2 was taken in the direction of the Project from Isaacs Harbour Road, 550 m south of Observer 3 (Figure 5) and 375 m north of Observer 4 (Figure 6). From this photo location, the top 5 m of the Southeast WRSA is visible above the horizon. Photo 1 shows the WRSA fully developed during operations (native rock) and Photo 2 shows the WRSA after rehabilitation (grass cover) from this vantage point. It is barely discernible in either case.

Photo 1 ***Simulation of the Southeast WRSA Fully Developed during Operations***

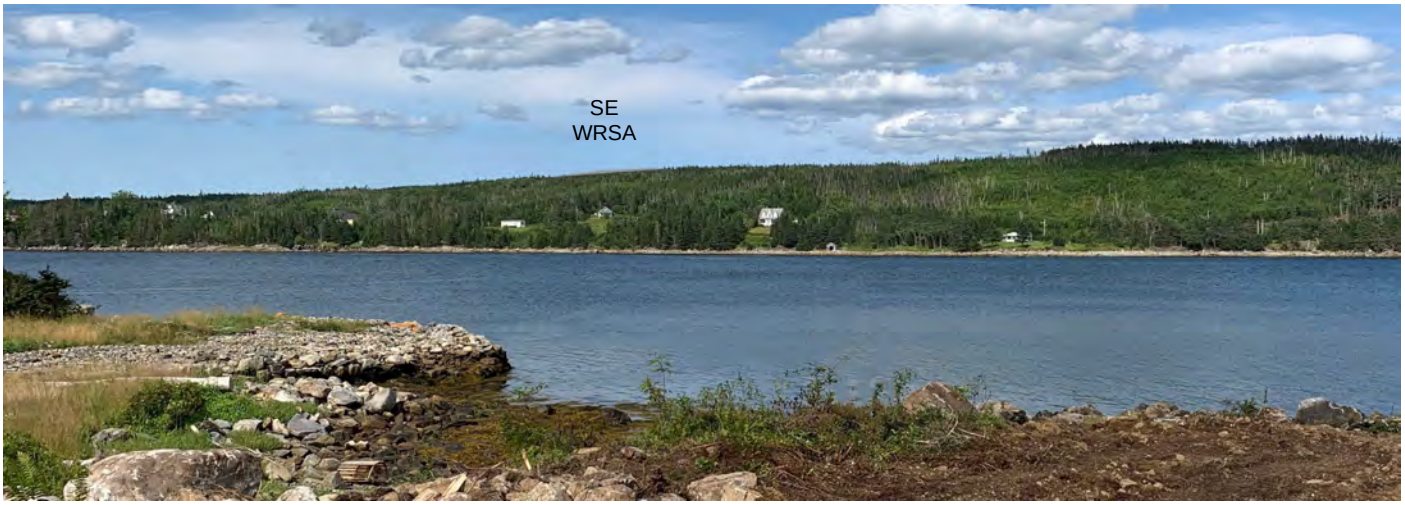


Photo 2 ***Simulation of the Southeast WRSA after Rehabilitation***

As depicted in Figure 5a (below), the elevation difference between the photo horizon (top of the hill) and the Southeast WRSA is approximately 100 m (+/-); however, the horizon is about 1.3 km from the photo location and the WRSA is about 3.0 km from the photo location, so the WRSA appears to be near equal height because of the line of sight. Figure 5a shows the elevation and line of sight from the modelled topographic profile (DSM) – the roughness of the data in the center of the profile is indicative of the various heights of tree cover.

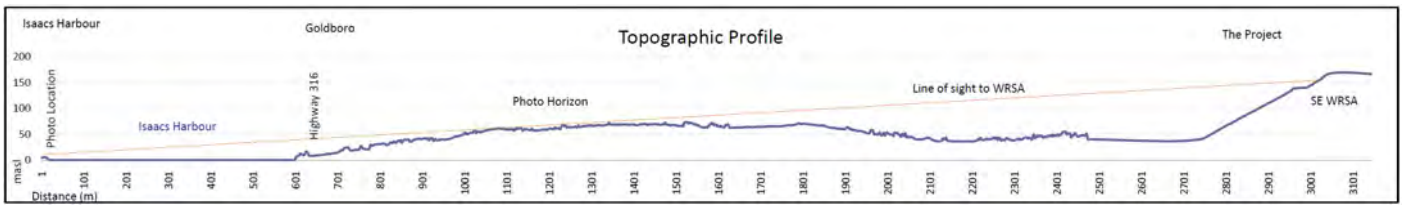


Figure 5a ***Topographic Profile and Line of Sight between a viewing location (Photo 1/2) and the Southeast WRSA.***

The Southeast WRSA will be fully developed in Year 5 of the Project. Progressive reclamation will occur throughout the development of the WRSA. Following completion of the Southeast WRSA, till and organics will be placed, and the area will be seeded. The viewshed impacts are anticipated to be minor based on the temporal scale of the disturbance. The visual impact of the Project from the viewpoint of Observer 3 is low.

Observer 4 – 652 Issacs Harbour Rd

Like Observer 3, Observer 4 (Figure 6) has a southeast view of Isaacs Harbour and the hills on the east side of the harbour. The Northwest WRSA, Southwest Till Stockpile and Southeast WRSA are visible to this Observer. The Observer location is 2.9 and 3.1 km from the Southwest Till Stockpile and Southeast WRSA. The view to the Northwest WRSA is 4.1 to 4.7 km for the Observer; however, this is near the limit of the horizon (Section 2.2), therefore the view may be similar to that shown in Photos 1 & 2.

The Observer 4 viewpoint will not be impacted by the Project until Year 5 and 6. Progressive reclamation will occur as noted above. The visual impact of the Project from the viewpoint of Observer 4 is low.

Observer 5 – 49 Dick Giffins Hill

Observer 5 is located at an elevation of 17.5 metres above sea level (masl) next to a house (Figure 7). This vantage point provides a view of Isaacs Harbour to the southwest. The Observer location was chosen because it is near the proposed Project. While the undeveloped Project is not visible to the Observer, the fully developed tops of the Southwest Till Stockpile (1.4 km) and Southeast WRSA (1.8 km) may be visible.

The Southwest Till Stockpile will be completed to 95 masl in Year 7 but may be visible to the Observer when the pile is constructed above 82 masl in Year 6 or 7.

The Southeast WRSA will be completed to an elevation of 165 masl in Year 5 of the Project. The WRSA may begin to be visible to the Observer when the WRSA elevation is constructed above 98 masl, given the current tree height and other viewshed screening.

Progressive reclamation, as described above, will minimize the visibility of these features as they are developed, and added vegetation will assist in blending these components of the view with their surroundings, thus making these features less prominent in the viewshed. The viewpoint may be low to moderately impacted by the fully developed Project.

Observer 6, 8, 9, 10 & 11 – Goldboro (Highway 316)

Observers 6, 8 to 11 (Figure 8) all have west-facing viewsheds. The locations are sheltered by trees to the east, therefore the fully developed Project is not visible. The analysis shows that an observer would see the harbour and treetops in the communities of Issacs Harbour and Isaacs Harbour North and only treetops in the direction of the Project.

These viewpoints are not impacted by the Project.

Observer 12 & 13 – Drum Head / Seal Harbour

The analysis shows that the top of the Southeast WRSA could be visible to Observer 12 (Drum Head). The communities of Drum Head and Seal Harbour are 4.0 and 5.5 km, respectively, south of the Project (Figure 9). These distances are near the normal horizon distance; however, the elevation difference between the Project and the Observer locations could put the WRSA above the horizon. It is unlikely, given the distance between the WRSAs and the Observers, that the Project would be seen or even discernible in the viewplane.

These viewpoints are not impacted by the Project.

Observer 7 & 14 - Isaacs Harbour / Isaacs Harbour North

Both Observer locations are on the west side of Isaacs Harbour (Figure 10). The projective mapping indicates that many locations along the Isaacs Harbour Road including the area north of Observer 7 and south to Observer 4, could potentially have the WRSAs in the viewplane. The location of Observer 7, over 3 km from the WRSAs, demonstrates that even a few trees near the observers location can effectively screen all or part of the view.

Observer 14 Is located on the turn at the head of Isaacs Harbour and has a view from the road to the south; however, this Observer is also screened by trees and has a limited view beyond that location.

These viewpoints are not impacted by the Project.

Observer 15 – 37 Isaacs Harbour Road

Observer 15 is located along a narrow portion (250 m) of Isaacs Harbour (Figure 11) and is about 2.2 km from the Northwest WRSA. The location has a full view of the water and the eastern shore / slopes of the harbour. The slope of the topography on the eastern shore elevates the horizon for the Observer and therefore the Project is below the horizon in this viewplane.

This viewpoint is not impacted by the Project.

Observer 16 – 99 Goldbrook Road

Observer 16 is the closest (< 1km) residential location to the Project (Figure 12). The Observer location was placed in the driveway of the property adjacent to Goldbrook Road to provide the longest view up the road. The analysis did not indicate any infrastructure would be in the viewplane. The projective mapping also shows that only treetops in the vicinity of the Observer will be seen from the WRSAs.

This viewpoint is not impacted by the Project unless the forested screening changes.

Observer 17 – Gold Brook Lake

This Observer (Figure 13) is seated in a canoe/boat on Gold Brook Lake. The Project is fully developed around the west, south and east sides of the lake. Observer 17 would have a clear and commanding view of the TMF, WSRAs and some Till Stockpiles. Since the lake is in the middle of the Project, access to the lake will be limited during construction, operations, and active closure. Post-mining, the TMF and WRSA will remain and be rehabilitated. The closure period is approximately 2 years, during which time the planned reclamation activities will include resloping, as necessary, of the TMF and WSRAs. Material from the till and organics piles will be used as a cover and growing medium, and these features will be seeded Any seeds remaining in the organics material will also provide potential native plants to the surroundings. Buildings will also be removed during this period and the mill area rehabilitated.

There will be no access to the lake during operations, so there will be no impact to the public from this Observer location. Post closure, as vegetation is established and plantings thrive, the mining infrastructure (TMF and WRSAs) will blend in with the surroundings and eventually trees will screen some of the view from the lake.

Observer 18 & 19 – Ocean Lake

Ocean Lake is located about 1.5 km (west shore) to 3.1 km (east shore) from the nearest Project infrastructure (TMF). There are several cottages located on Ocean Lake and boating in the lake is known to occur. Observer 18 and 19 locations were chosen as representative points with unobstructed views to the west. The Observer locations in the analysis considers a boater at 43 masl elevation and therefore 57 m (TMF) to 137 m (WRSA) lower than the highest Project elevations. Neither Observer 18 nor 19 have the Project in the viewshed (Figure 14).

The projective analysis (Figure 4) shows that Observer 21 (NE WSRA) has the eastern nearshore of the Lake in its view, but only treetops beyond that.

The Project will have a low impact on these Observer locations (Figure 14); however, an observer on the eastern shore of the Lake (Figures 3 and 4) may receive a low to moderate impact to their viewpoint. The view from western shores and most of the western side of the Lake will not be impacted by the Project.

5. Summary

A Viewshed Analysis was conducted to determine the visual impacts of the Project on the surrounding areas. The analysis assumes 1) trees removed from the Project Area; and 2) full Project development. This represents the worst-case scenario from a visual impact perspective.

The viewshed analysis is based on an available digital surface model (DSM) that includes forest and building heights. Over time conditions could change as some forested areas are harvested and other forests areas regenerate. Also, stand heights may increase over time, thereby limiting visual impact. Viewsheds may eventually only consist of tree canopy, and any changes (*e.g.,* growth, logging, and other development) may alter the predicted effect.

The projective mapping from Observers looking out from vantage points on the TMF and WRSAs, reveals that the Project will be seen from lakes and other open vistas in the area in the surrounding landscape. Observers on the western shore of Isaacs Harbour, especially along Isaacs Harbour Road have a low potential of having their view impacted by the Project infrastructure.

The Observer locations in the reflective mapping was based on a combination of the results projective view analysis and proximity of Observers to the Project, especially those residents around Issacs Harbour in the communities of Goldboro, Isaacs Harbour North and Issacs Harbour. The analysis also shows that the existing forest cover provides effective screening in many regards thus breaking up the viewplane. The tops of the WRSAs and potentially the west end of the TMF may be visible but given the distances, may not be discernible or a prominent feature in the viewplane.

Given the current conditions, it is expected that there is a low potential impact to the view from many areas surrounding the Project. The distance between prominent Project infrastructure (TMF and WRSAs) to each Observer location ranges from 1 km to over 5 km. Analysis shows that topography and increased distance to the horizon will screen most of the Project from residential receptors, and if the Project is visible to an Observer, it may not be discernable from other features. Recreational observers, such as boater on lakes, ATVers on trails, or hikers in almost any location, may see the Project if in the right place with a vista that has a low horizon; however, given forest heights (0-10 m) the view may be negligible due to screening, topography, or distance.

6. Closure

All of Which is Respectfully Submitted,

Jeff Parks, P.Geo.
Senior Environmental Geoscientist

+1 902 334-1819
jeff.parks@ghd.com

Callie Andrews, M.Sc.
Senior Environmental Assessment and Permitting Specialist

+1 902 334-1805
Callie.andrews@ghd.com

7. References

ESRI. 2019. Understanding Visibility Analysis. Environmental Systems Research Inc. https://desktop.arcgis.com/en/arcmap/10.6/extensions/3d-analyst/understanding-the-observer-and-target.htm. Accessed March 2022.

ESRI. 2020. *ArcGIS* [GIS software]. Version 10.8.1. Redlands, CA, Environmental Systems Research Institute, Inc., 2010. Accessed March 2022

GeoNova. 2021. Geographic Data Directory and Elevation Explorer, Province of Nova Scotia – Geographic Information Services, Halifax, NS. https://gis8.nsgc.gov.ns.ca/DataLocatorASP/main.html. Accessed December 2021.

Line of Sight Calculator. 2020. https://www.everthingrf.com/rf-calculators/line-of-sight-calculator. [online software application]. Accessed March 2022.

British Columbia Ministry of Forests. 2001. Visual Impact Assessment Guidebook. 2nd ed. Forest Practices Branch, Victoria, B.C. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/visual-resource-mgmt/visual_impact_assessment_guidebook.pdf. Aaccessed March 2022.

Nordmin 2021. NI 43-101 Technical Report and Feasibility Study for the Goldboro Gold Project, Eastern Goldfields District, Nova Scotia. Nordmin Engineering Ltd Project #20048-02. Report Effective Date 16 Dec 2021.Nova Scotia Museum of Natural History (NSM). 1996. The Natural History of Nova Scotia (rev. ed.). D. Davis and S. Browne (eds.) Nova Scotia Museum. Nova Scotia, Canada.

Ruzickova, K., Ruzicka, J, and Bitta, J. 2021. A new GIS-compatible methodology for visibility analysis in digital surface models of earth sites. Geoscience Frontiers. Vol 12 Issue 4 July 2021. https://www.sciencedirect.com/science/article/pii/S1674987120302498#bi0005. Aaccessed April 2022

Zhang Z., J Tsou J.Y., and Lin, H. 2000. GIS for Visual Impact Assessment. Department of Architecture, Geography, The Chinese University of Hong Kong, Shatin, Hong Kong, China. https://a-a-r-s.org/proceeding/ACRS2000/Papers/GIS00-3.htm. Accessed March 2022.

Paper Size ANSI A

0 800 1,600 2,400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT

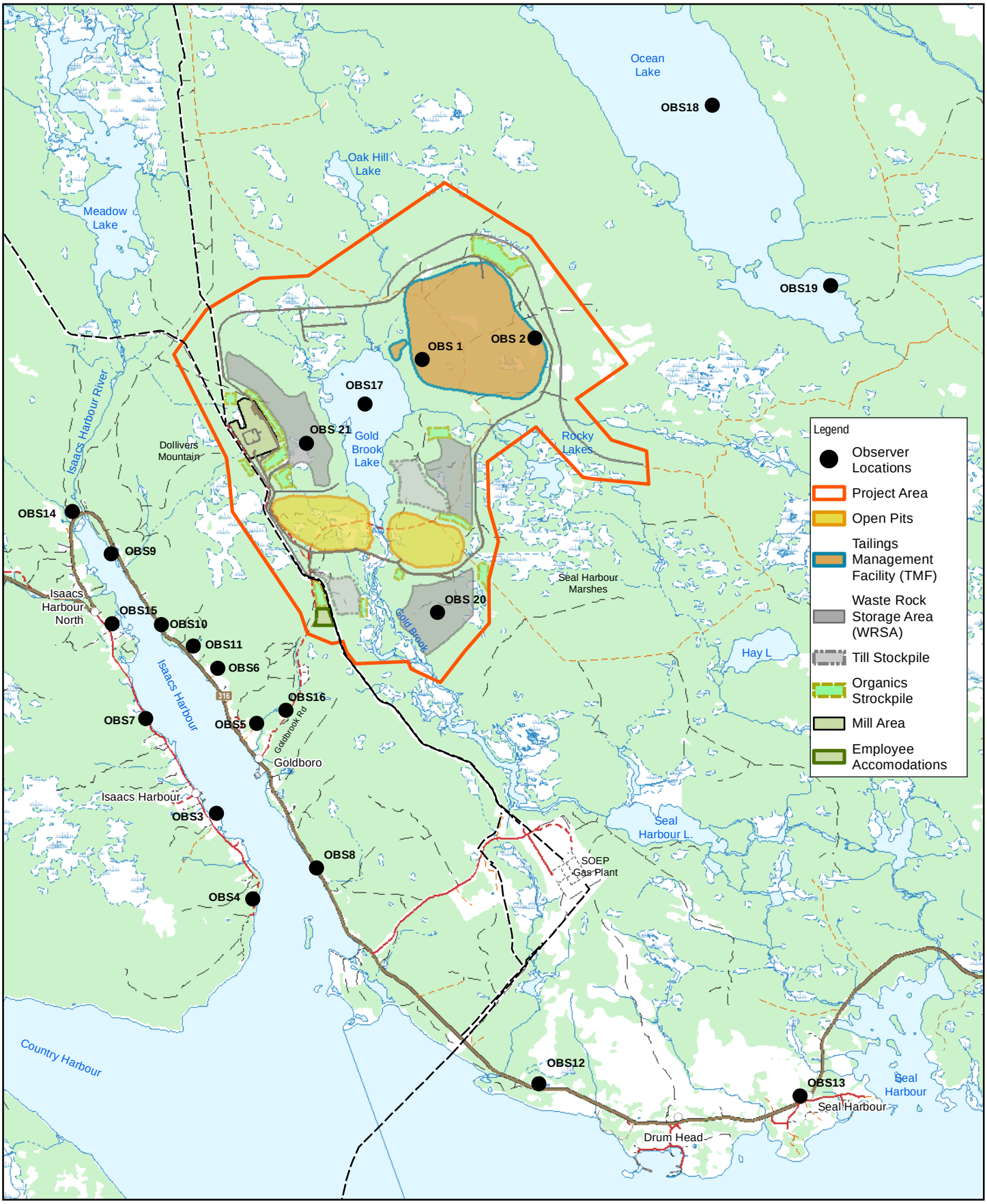
VIEWSHED ANALYSIS MODEL AREA

Project No. 11222385
Revision No. -
Date 022/03/2022

FIGURE 1

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX001.mxd
Print date: 07 Apr 2022 - 14:31

Data source: GEONOVA, GHD, Anaconda . Created by: jjparks



Paper Size ANSI A

0 500 1,000 1,500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

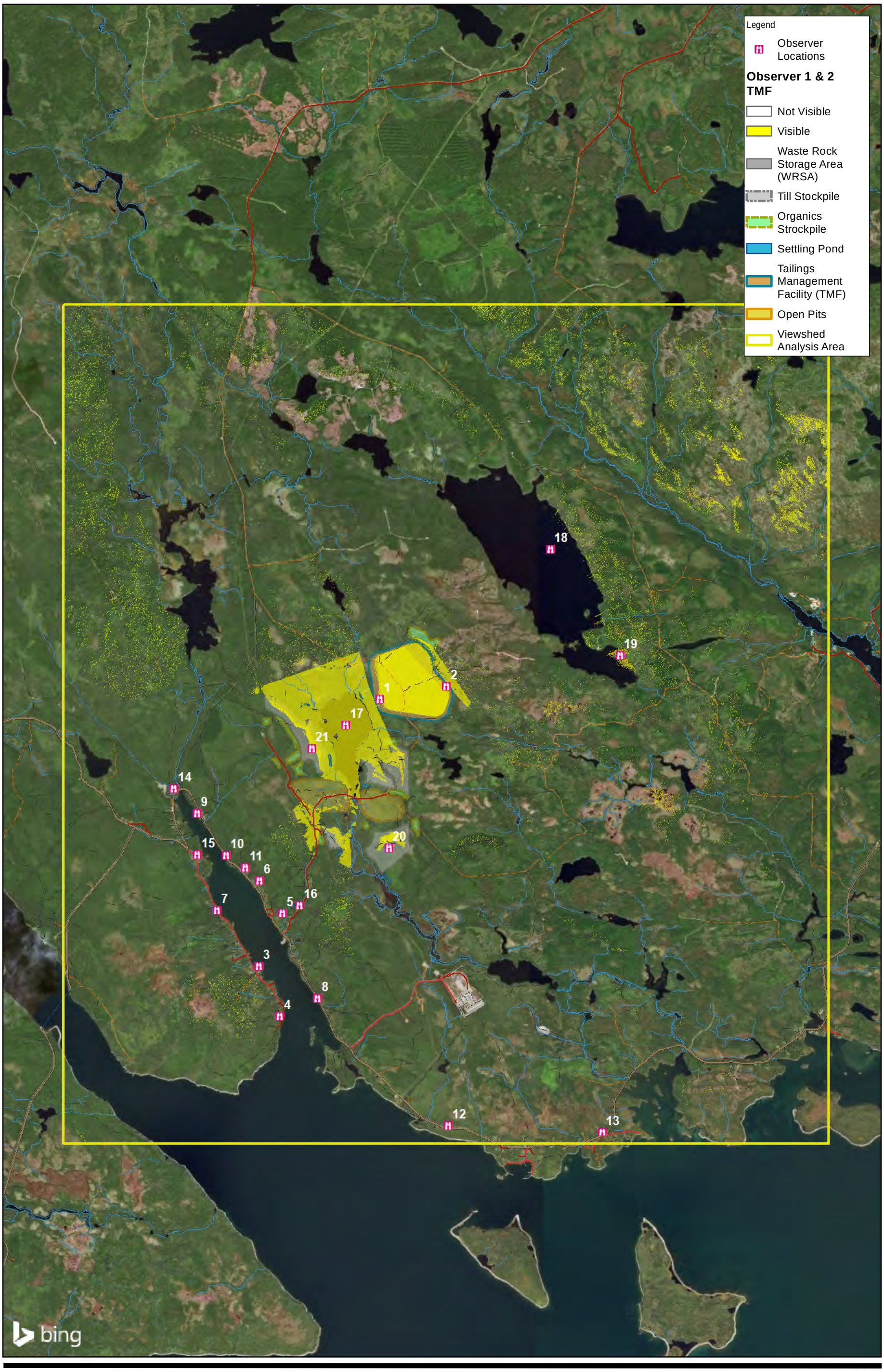
PROJECT AREA AND OBSERVERS

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 2

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX002.mxd
Print date: 07 Apr 2022 - 14:15

Data source: GEONOVA, GHD, Anaconda . Created by: jjparks



Paper Size ANSI B

0 600 1,200 1,800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

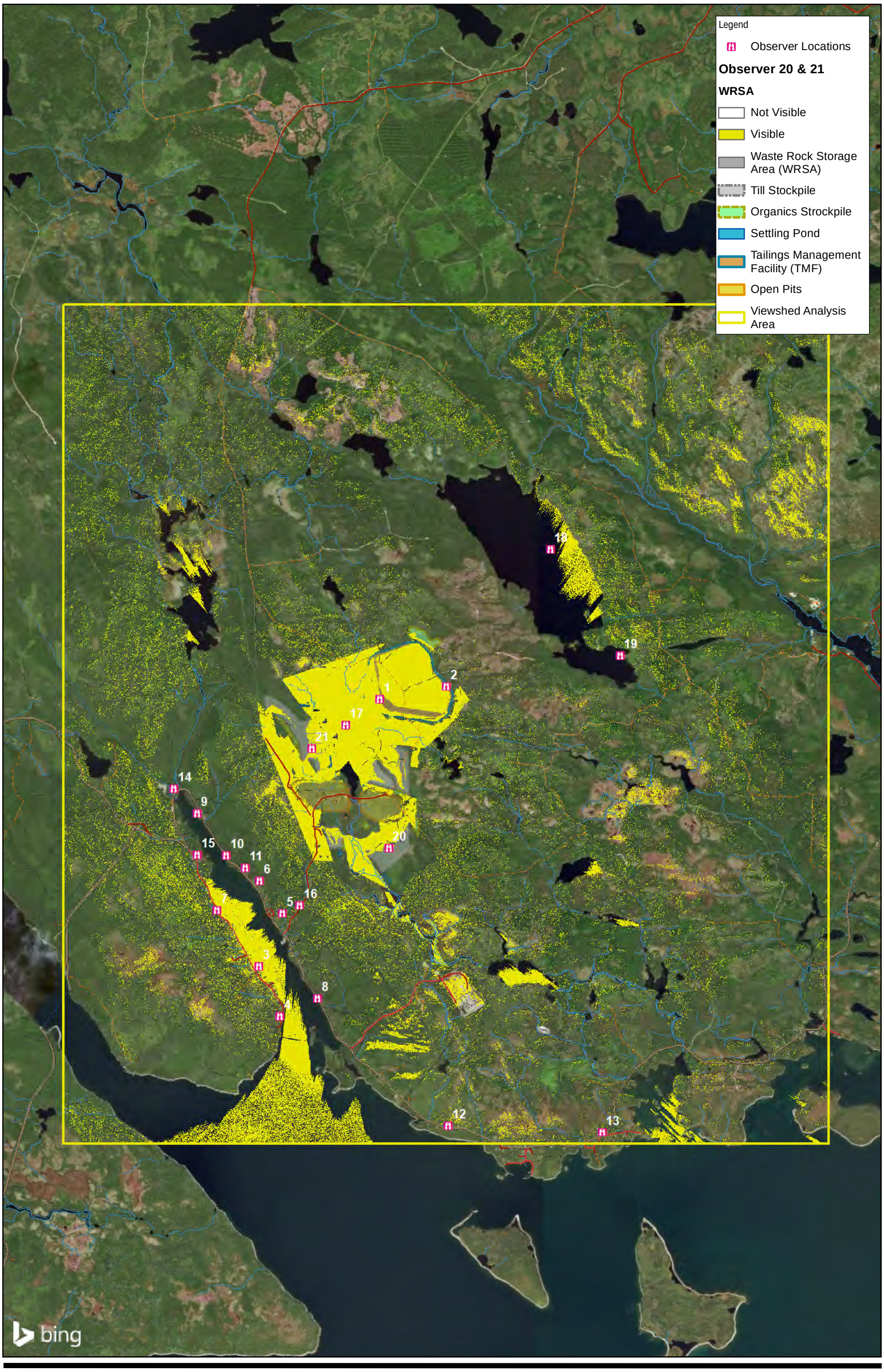
OBSERVER LOCATIONS 1 & 2 PROJECTIVE VIEW FROM TAILINGS MANAMENT FACILITY

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 3

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX003.mxd
Print date: 07 Apr 2022 - 14:32

Data source: GHD, GeoNova; © 2022 Microsoft Corporation © 2022 Maxar ©CNES (2022) Distribution Airbus DS. Created by: jjparks



Paper Size ANSI B

0 600 1,200 1,800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

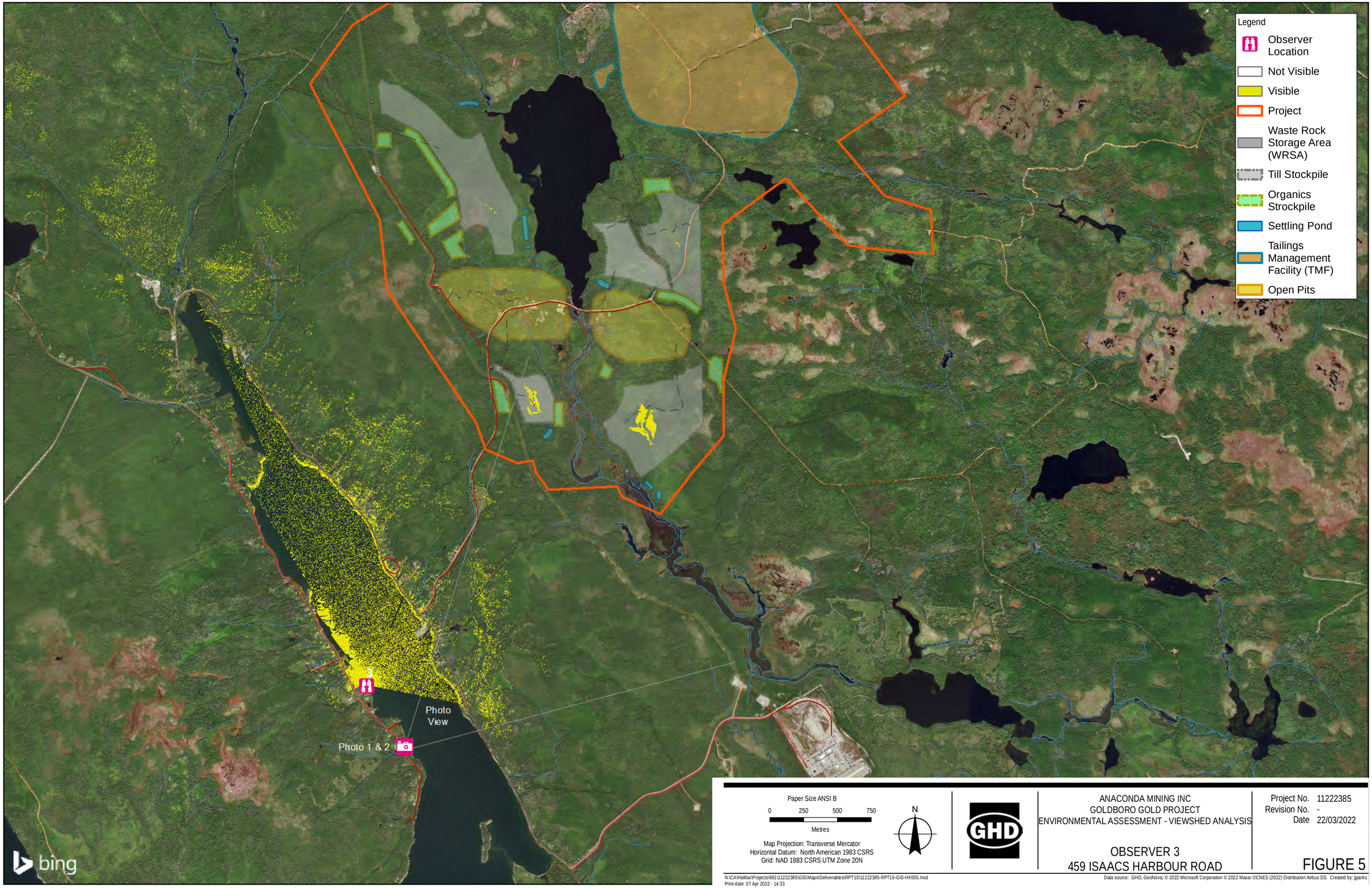
ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

OBSERVER LOCATIONS 20 & 21 PROJECTIVE VIEW FROM WASTE ROCK STORGAE AREAS

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 4

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX004.mxd
Print date: 07 Apr 2022 - 14:27



Paper Size ANSI B

0 250 500 750

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

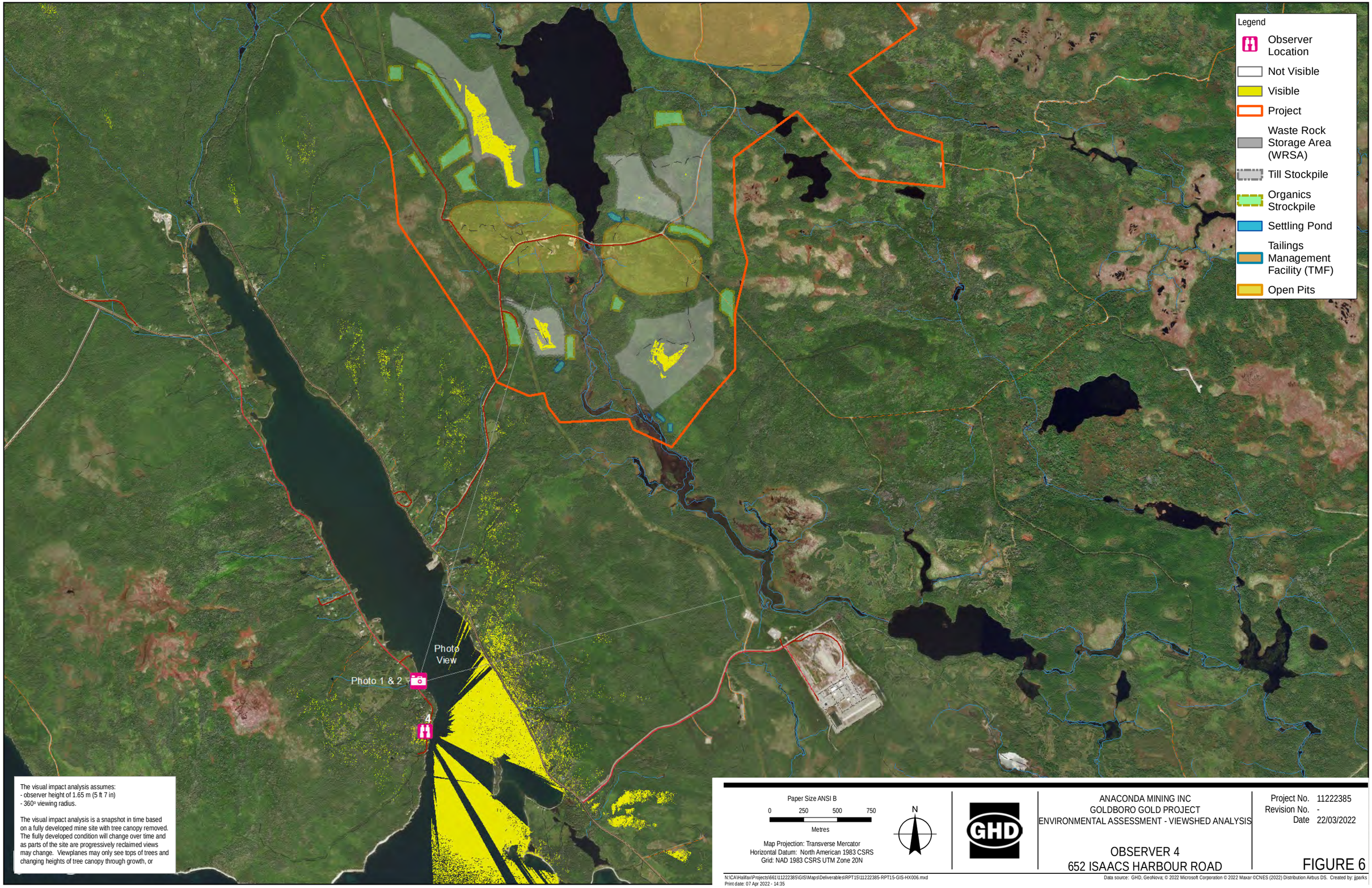
ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

OBSERVER 3
459 ISAACS HARBOUR ROAD

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 5

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX005.mxd
Print date: 07 Apr 2022 - 14:33



The visual impact analysis assumes:
- observer height of 1.65 m (5 ft 7 in)
- 360º viewing radius.

The visual impact analysis is a snapshot in time based on a fully developed mine site with tree canopy removed. The fiully developed condition will change over time and as parts of the site are progressively reclaimed views may change. Viewplanes may only see tops of trees and changing heights of tree canopy through growth, or

Paper Size ANSI B

0 250 500 750

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

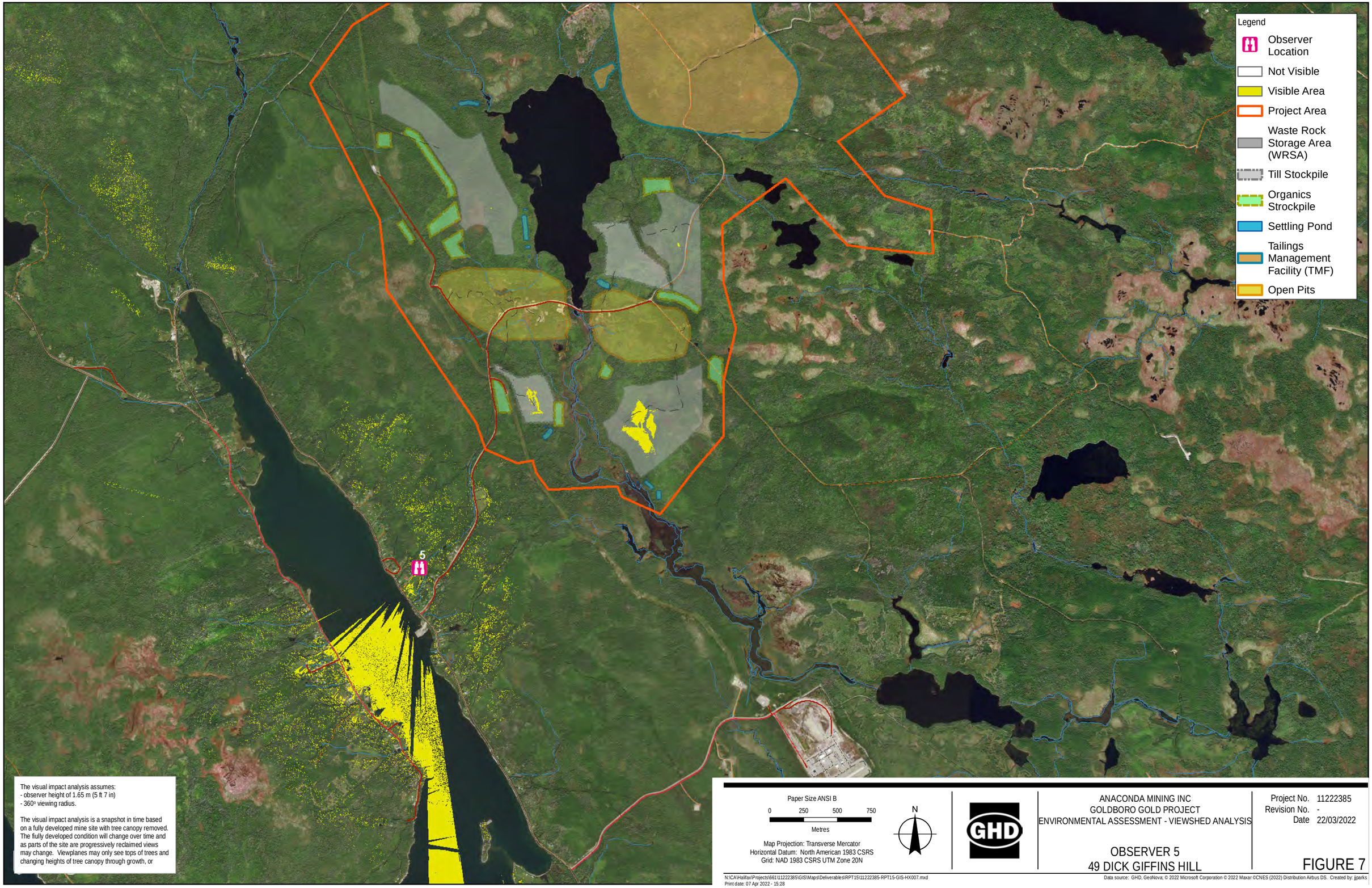
ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

OBSERVER 4
652 ISAACS HARBOUR ROAD

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 6

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX006.mxd
Print date: 07 Apr 2022 - 14:35



The visual impact analysis assumes:
- observer height of 1.65 m (5 ft 7 in)
- 360º viewing radius.

The visual impact analysis is a snapshot in time based on a fully developed mine site with tree canopy removed. The fiully developed condition will change over time and as parts of the site are progressively reclaimed views may change. Viewplanes may only see tops of trees and changing heights of tree canopy through growth, or

Paper Size ANSI B

0 250 500 750

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

OBSERVER 5
49 DICK GIFFINS HILL

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 7

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX007.mxd
Print date: 07 Apr 2022 - 15:28

Legend

- Project Area
- Waste Rock Storage Area (WRSA)
- Till Stockpile
- Organics Strockpile
- Settling Pond
- Tailings Management Facility (TMF)
- Open Pits
- Observer Location
- Not Visible
- Observer 6
- Observer 8
- Observer 9
- Observer 10
- Observer 11

9
10
11
6
8

The visual impact analysis assumes:
- observer height of 1.65 m (5 ft 7 in)
- 360º viewing radius.

The visual impact analysis is a snapshot in time based on a fully developed mine site with tree canopy removed. The fiully developed condition will change over time and as parts of the site are progressively reclaimed views may change. Viewplanes may only see tops of trees and changing heights of tree canopy through growth, or

Paper Size ANSI B

0 250 500 750

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

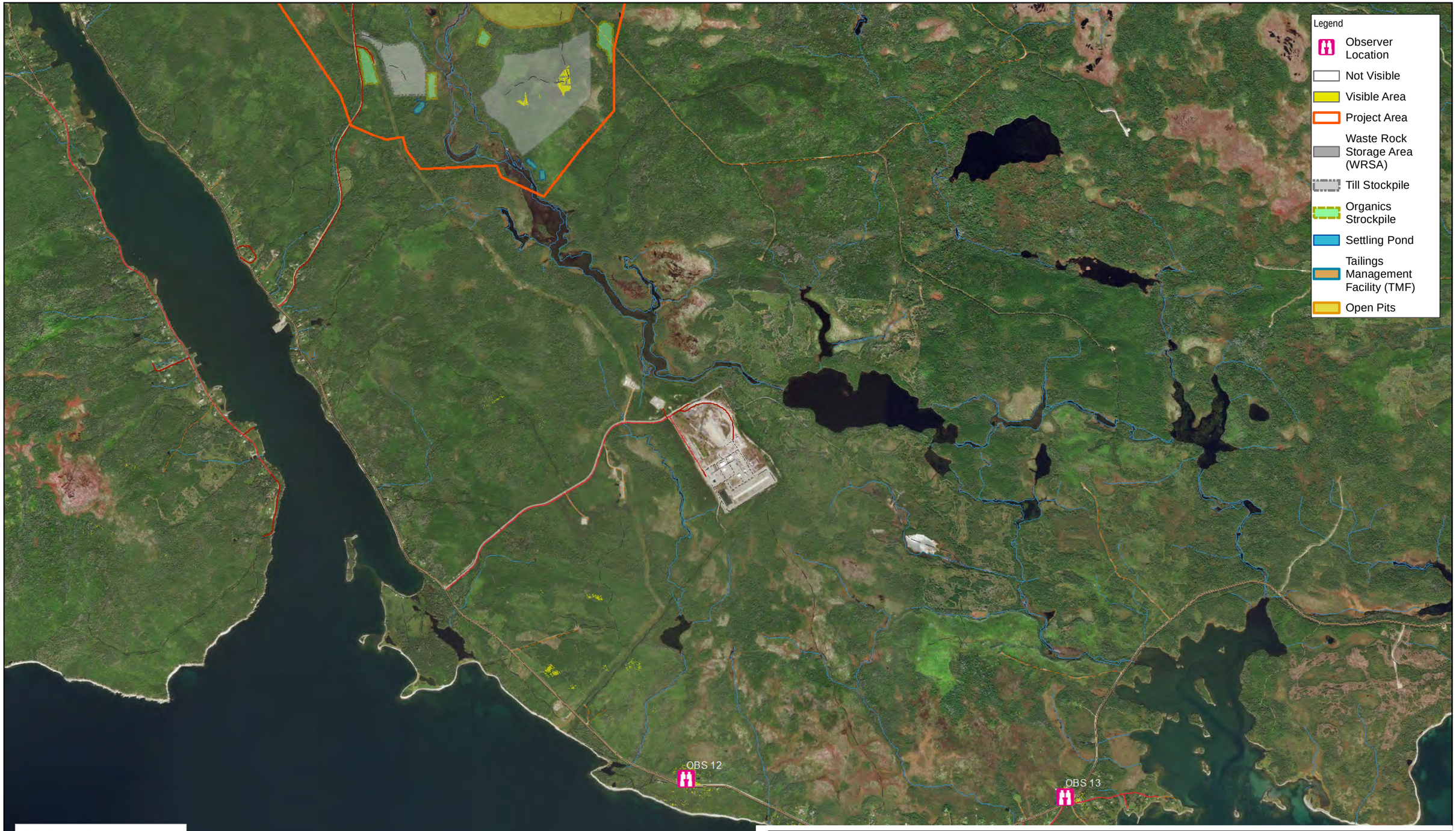
ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

OBSERVERS 6, 8, 9, 10 & 11
GOLDBORO (HIGHWAY 316)

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 8

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX008.mxd
Print date: 07 Apr 2022 - 16:08



The visual impact analysis assumes:
- observer height of 1.65 m (5 ft 7 in)
- 360º viewing radius.

The visual impact analysis is a snapshot in time based on a fully developed mine site with tree canopy removed. The fiully developed condition will change over time and as parts of the site are progressively reclaimed views may change. Viewplanes may only see tops of trees and changing heights of tree canopy through growth, or

Paper Size ANSI B

0 250 500 750

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

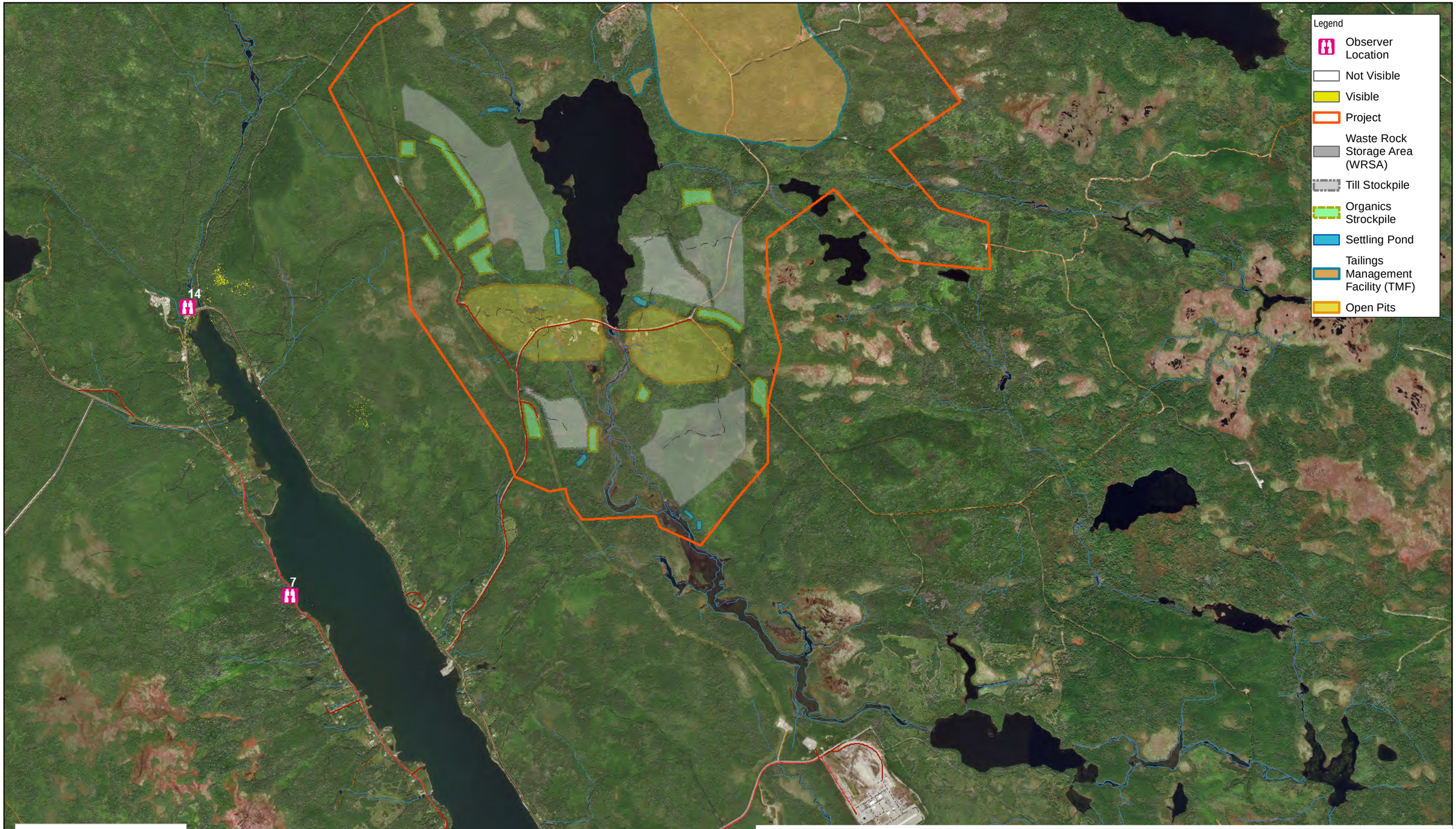
ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

OBSERVER 12 & 13
DRUM HEAD - SEAL HARBOUR

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 9

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX009.mxd
Print date: 07 Apr 2022 - 14:16



The visual impact analysis assumes:
- observer height of 1.65 m (5 ft 7 in)
- 360º viewing radius.

The visual impact analysis is a snapshot in time based on a fully developed mine site with tree canopy removed. The fiully developed condition will change over time and as parts of the site are progressively reclaimed views may change. Viewplanes may only see tops of trees and changing heights of tree canopy through growth, or

Paper Size ANSI B

0 250 500 750

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

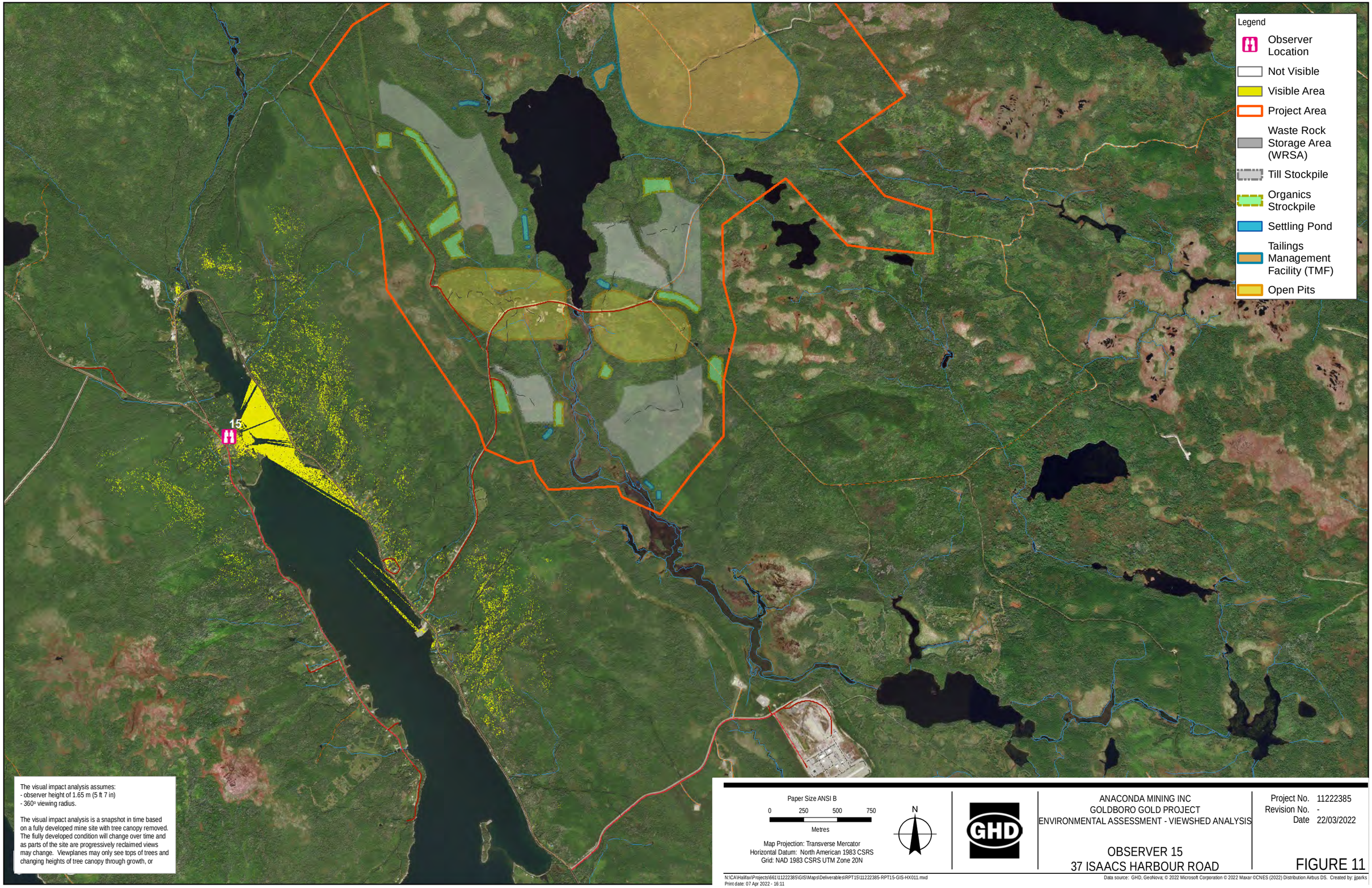
ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

OBSERVER 7 & 14
ISAACS HARBOUR/ NORTH

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 10

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX010.mxd
Print date: 07 Apr 2022 - 16:09



The visual impact analysis assumes:
- observer height of 1.65 m (5 ft 7 in)
- 360º viewing radius.

The visual impact analysis is a snapshot in time based on a fully developed mine site with tree canopy removed. The fiully developed condition will change over time and as parts of the site are progressively reclaimed views may change. Viewplanes may only see tops of trees and changing heights of tree canopy through growth, or

Paper Size ANSI B

0 250 500 750

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

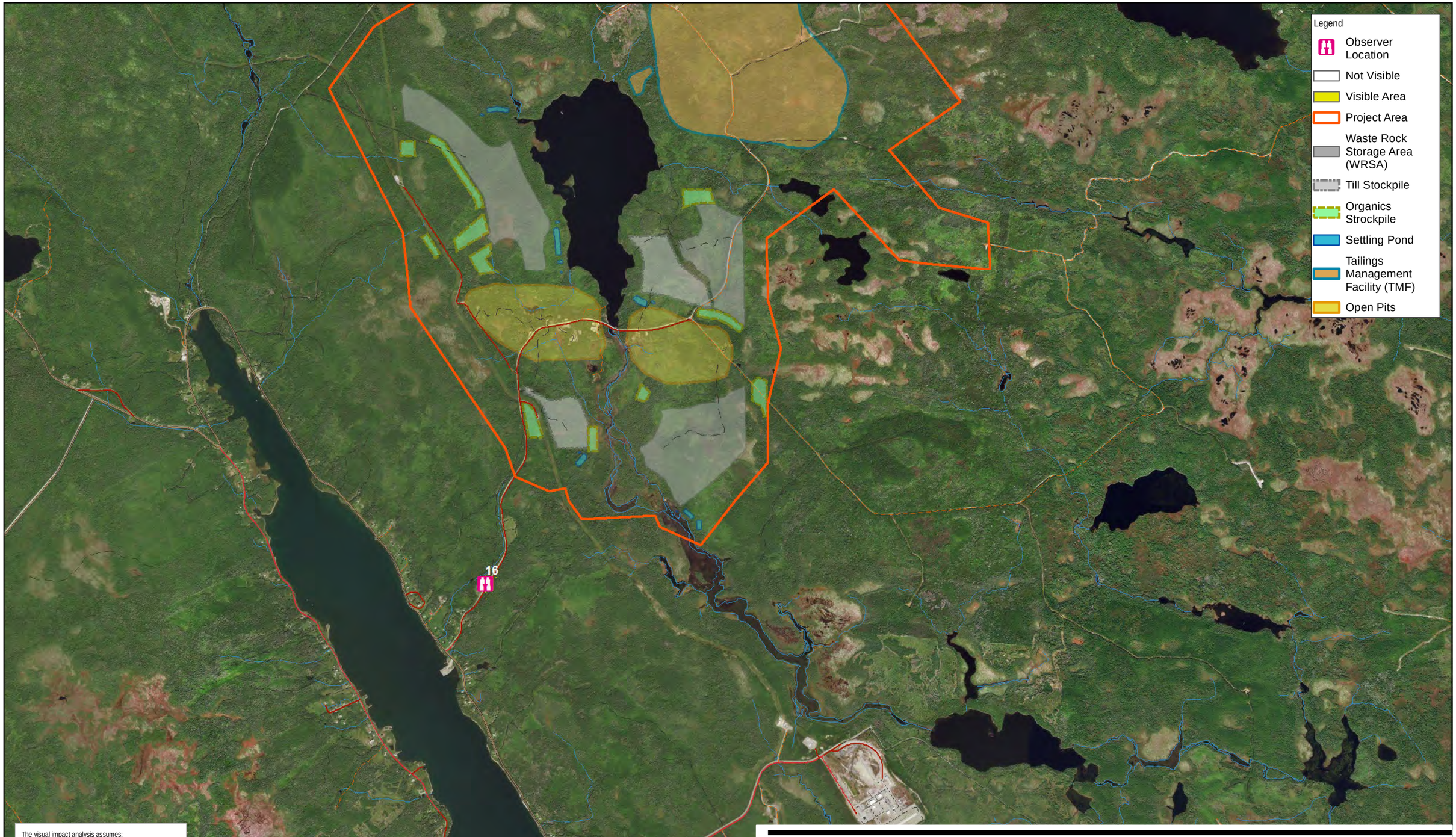
ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

OBSERVER 15
37 ISAACS HARBOUR ROAD

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 11

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX011.mxd
Print date: 07 Apr 2022 - 16:11



The visual impact analysis assumes:
- observer height of 1.65 m (5 ft 7 in)
- 360º viewing radius.

The visual impact analysis is a snapshot in time based on a fully developed mine site with tree canopy removed. The fiully developed condition will change over time and as parts of the site are progressively reclaimed views may change. Viewplanes may only see tops of trees and changing heights of tree canopy through growth, or

Paper Size ANSI B

0 250 500 750

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

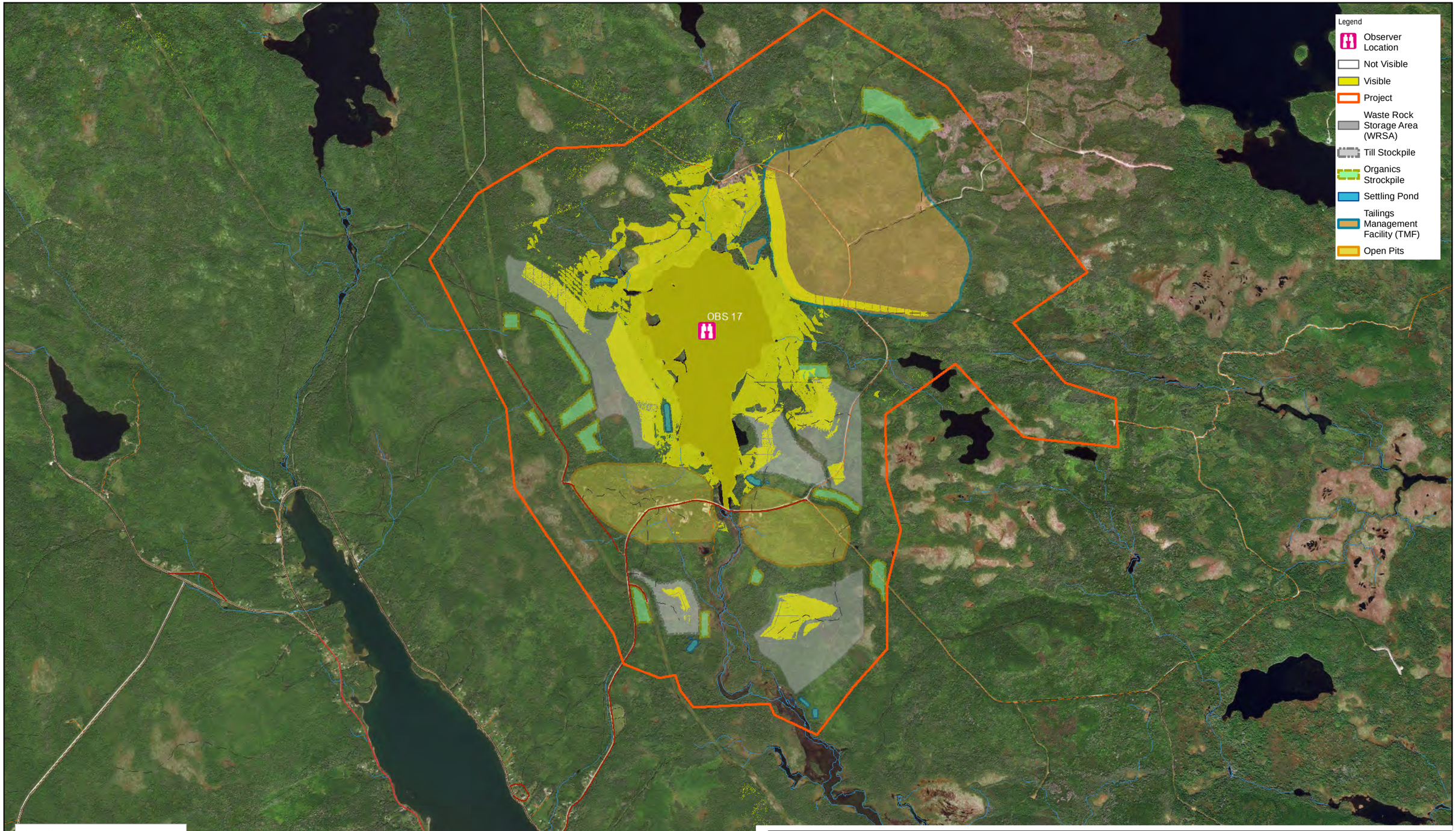
ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

OBSERVER 16
99 GOLD BROOK ROAD

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 12

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX012.mxd
Print date: 07 Apr 2022 - 16:12



The visual impact analysis assumes:
- observer height of 1.65 m (5 ft 7 in)
- 360º viewing radius.

The visual impact analysis is a snapshot in time based on a fully developed mine site with tree canopy removed. The fiully developed condition will change over time and as parts of the site are progressively reclaimed views may change. Viewplanes may only see tops of trees and changing heights of tree canopy through growth, or

Paper Size ANSI B

0 250 500 750

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

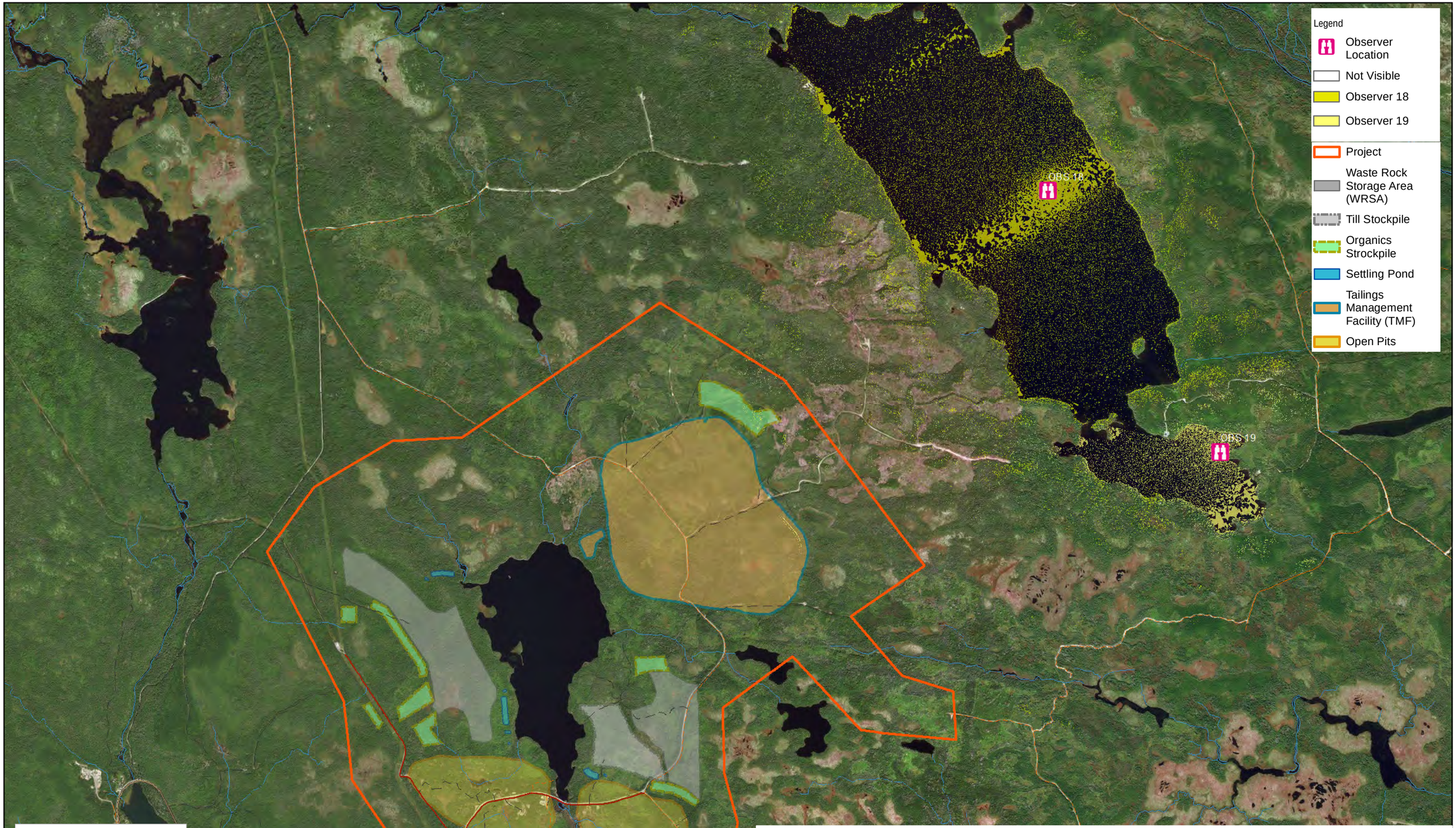
ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

OBSERVER 17
GOLD BROOK LAKE

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 13

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX013.mxd
Print date: 07 Apr 2022 - 16:17



The visual impact analysis assumes:
- observer height of 1.65 m (5 ft 7 in)
- 360º viewing radius.

The visual impact analysis is a snapshot in time based on a fully developed mine site with tree canopy removed. The fully developed condition will change over time and as parts of the site are progressively reclaimed views may change. Viewplanes may only see tops of trees and changing heights of tree canopy through growth, or

Paper Size ANSI B

0 250 500 750

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983 CSRS
Grid: NAD 1983 CSRS UTM Zone 20N

N

GHD

ANACONDA MINING INC
GOLDBORO GOLD PROJECT
ENVIRONMENTAL ASSESSMENT - VIEWSHED ANALYSIS

OBSERVER 18 & 19
OCEAN LAKE

Project No. 11222385
Revision No. -
Date 22/03/2022

FIGURE 14

N:\CA\Halifax\Projects\661\11222385\GIS\Maps\Deliverables\RPT15\11222385-RPT15-GIS-HX014.mxd
Print date: 07 Apr 2022 - 16:15


GHD