



**Adaptive Management Plan Outline  
Ecological Component  
Nelson Aggregate Co., Burlington  
Proposed Extension**

**DRAFT**

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# Adaptive Management Plan Outline Ecological Component Nelson Aggregate Co., Burlington Proposed Extension

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**ADAPTIVE MANAGEMENT PLAN OUTLINE  
ECOLOGICAL COMPONENT  
NELSON AGGREGATE CO., BURLINGTON PROPOSED EXTENSION**

## **1.0 Introduction**

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This outline of an Adaptive Management Plan (AMP) has been prepared to stimulate dialogue amongst Nelson Aggregate team members and JART representatives. This outline addresses ecological considerations and needs to be reviewed in association with similar reporting issued by Golder Associates. Their work addresses the water aspects of the proposed AMP.

Together this aspect and the water component will be integrated and drawn together into a draft AMP. The AMP will evolve, in part associated with input and discussions held with JART, over time as new data are gathered and analyzed and in part, as effects begin to occur and are monitored through the life of the proposed extraction project.

This outline provides a framework for the assessment of individual parameters and measures to be defined by the plan and is presented according to the following key components:

- 1) Important Ecological Parameters;
- 2) Thresholds, Triggers and Management Options;
- 3) Monitoring Program Development; and,
- 4) Management System and Documentation.

The AMP will reflect the need to understand changing conditions on the Subject lands, both from the perspective of natural fluctuations (e.g. seasonally) and effects predicted to occur from extraction. As conditions change, an opportunity exists to refine mitigation and enhancement measures to ensure that:

- Predicted impacts accurately reflect field impacts;
- Unpredicted, field effects are swiftly identified and mitigated for; and
- That enhancement measures are optimizing positive outcomes.

There are various means of responding to these scenarios. For example, should wetland communities appear to be distressed more than would have been predicted by themselves, or in relation to other control areas, additional water can be added to the system to mitigate the effects. If populations of transplanted rare plant species are displaying signs of decline, additional propagation methods can be explored.

## **2.0 Important Ecological Parameters**

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The AMP requires the selection of parameters of most concern (or Valued Ecosystem Components – VECs) that will be the subject of monitoring as indicators of ecological change. For example, the Butternut species on the Subject Lands, designated endangered, would be selected for inclusion in the AMP.

A review of the Natural Environment Reporting, suggests that other important parameters are:

- Fish habitat associated with the Branches of West Nemo tributary;
- Jefferson Salamander habitat;
- Regionally significant wetlands; and,
- Other important species.

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In identifying the parameters for the adaptive management plan, the potential impacts to important natural heritage features must be carefully considered for the individual receptors. The following provides a summary of the more significant natural features or related aspects that will be considered as parameters for the AMP and the preliminary interpretation of the key areas of importance that can be used to establish tangible ecological monitoring opportunities.

### **2.1 FISH HABITAT**

Fish habitat along the western branch of the West Nemo tributary is proposed to be removed with or without the approval of the proposed extension, as pumping to this tributary will cease when the existing quarry is closed and dewatering activities are terminated. The ability to monitor/measure conditions will be affected by the fish habitat removal.

The east branch of this system which is not considered direct fish habitat, but a contributor to fish habitat, will see a transfer in the base flow from it over to the western branch where the discharge of the lake will occur approximately mid way along the eastern side of the property limit. Understanding these complex relations, initial thinking suggests that the focus of the main monitoring for AMP be considered from the confluence of these two tributaries and those areas downstream.

### **2.2 WETLANDS**

There are two wetlands that are of interest for the purpose of the AMP (both designated as regionally significant). These include the wetland adjacent to the eastern boundary of the property and the south central wetland straddling the southern Nelson property boundary.

The assessment of impacts to the wetland off-site to the east suggests that this feature will be exposed to more limited effects, given a limited potential catchment area reduction. Nonetheless, it is the intent of the ecological component of the AMP to validate this conclusion through monitoring and the preparation of a plan to respond to potential changes should they be observed.

The wetland to the south has predicted effects associated with a reduction in catchment area. The ecological component of the AMP will require more attention and will be linked with the selected means for maintaining a desired moisture regime.

There are two potential aspects to the monitoring component of the effectiveness of proposed mitigation system. They include the direct effects to the greater wetland area, and the effects to smaller wetland zone that support Salamander breeding pools. The latter component is described in the following section.

### **2.3 JEFFERSON SALAMANDER**

The presence of the threatened Jefferson Salamander in wetlands adjacent to the extension area, one of which straddles the property, establishes a need to implement a monitoring and response program to ensure that this significant species habitat is afforded protection through the duration of operation and post closure of the quarry. There are number of considerations concerning the Salamander habitat requirements that will be instrumental in design of an appropriate monitoring and response plan.

Firstly, the upland portion (woodlands) of the habitat that support the Salamander is proposed to remain intact on the Subject Lands. Given this and the lack of dependence upon elevated soil moisture conditions, it is unlikely that these areas would be potentially impacted by the proposed quarry extension. The Wetland Vernal Pool (south of and extending onto the Subject Lands) provides some limited breeding areas for Jefferson Salamander and may be impacted by the proposed quarry extension. This pool yielded one triploid Salamander egg mass (No Jefferson adults and no pure Jefferson egg masses). The AMP monitoring program will address the potential for impact and the need for mitigation designs to attain the proposed goals of protection.

The second vernal pool (referred to in Natural Environment Reporting as Woodland Vernal Pool) is the more productive of the two pools in terms of Jefferson Salamander breeding. Based on the information available and presented in the assessment reports, the woodland pond will not be affected by the proposal considering that it is not support by groundwater and rather support by local surface water that will not be compromised. Nonetheless, given that this pond is the more significant of the two breeding sites identified, it is important that the AMP include a monitoring component to validate this prediction.

It must be noted that the foregoing proposal is subject to permission to access and monitor those private property areas being granted by the property owner.

## **2.4 BUTTERNUT TREES**

The Butternut trees on Site are excluded from the footprint of the extraction limit. They are also not dependent on hydric environments that could be compromised as a result of changes in water regime. Indirect impacts associated with water interference are not anticipated. Nonetheless the AMP should include consideration of these species given their provincial status and in particular those individuals that occur close to the extraction footprint. In addition the final AMP may include the monitoring of Butternut individuals that were transplanted in 2006.

## **2.5 OTHER SPECIES AND AREAS.**

A number of regionally and locally significant species or representative populations of these species that occur within the extraction zone are suggested for transplant to appropriate locations as part of the detailed mitigation design. These efforts should be incorporated into the AMP monitoring plan to record the level of success of these transplanting initiatives. This monitoring would be used to further understand transplanting techniques and provide knowledge instrumental in the design and determination of appropriate future transplanting opportunities.

The above noted parameters are provided for consideration only and do not necessarily include the entire suite of potential parameters to be included in the Ecological AMP. They do however identify the most critical and obvious parameters noted on or adjacent to the Nelson extension lands. Further review of these parameters may result in the exclusion of some of them or the inclusion of new components.

### **3.0 Thresholds, Triggers and Management Options**

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Thresholds and/or triggers will be defined that will reflect the limits of tolerance to change (e.g. changes in microclimate, habitat composition, structure, species competition) that species, populations and habitats will safely endure without significant detrimental effect. These will also contribute to the determination of optimal performance standards (i.e. measures at which, species, populations and habitats appear to be functioning optimally).

A Preliminary Threshold Discussion is provided on the following table. The table, while not comprehensive, is meant to stimulate discussion around thresholds, triggers and management option.

The translation of the thresholds into triggers that will prompt action is the next stage in the AMP. For example, in the case of Jefferson Salamander, at what population size or at what minimum number of genetically pure Jefferson, does action begin to implement some management measures?

Once triggers are established the range of management options identified need to be reviewed to determine the best course of action. Carrying the salamander example forward, management options might include:

- The control of any stressors that can be controlled (e.g. soil moisture and water depth levels)
- The creation of additional vernal pools to buffer from stressors
- The transplantation of affected populations into existing, viable habitat or into new habitat.

The development of ecological thresholds will be considered in conjunction with hydrogeological and hydrological threshold indicators. Often hydrogeological and hydrological indicators are more easily measured and the associated effects are most likely to occur or be observed well in advance of the predicted ecological changes. The ecological components discussed in this outline will be incorporated into a single AMP document that will include both ecologic and hydrological components.

It is important to recognize that the dynamics of ecological systems will change over the time period for which the proposed extension is to occur. Some ecological features are expected to change over this time period in response to natural changes (i.e. not related to quarry impacts) and are not expected to remain in a steady state. These considerations must be incorporated into the evaluation of threshold level of indicators. In addition ecological features are subject to climatic trends and seasonal extremes that may solicit unexpected change. The intent of the ecological AMP design will be establish a monitoring and baseline condition assessment that can be used to assist in

differentiate between these naturally occurring variations and those that are attributable to operations activities or response to inappropriate or insufficient mitigation efforts.

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**Table 1: Threshold Analysis – Preliminary Ideas**

<b>Parameter</b>	<b>Characteristics</b>	<b>Stressors</b>	<b>Monitoring Components</b>	<b>Initial Ideas Regarding Triggers and Thresholds</b>
Butternut	13 stems scattered in forest communities  3 transplanted stems	Viral fungus Soil Moisture Light Exposure	Canker presence and degree Crown health/dieback	50% crown dieback with no stem canker 30% crown dieback with 20% of stem cankered
Jefferson Salamander	Breeding in two vernal pools Summer and overwintering habitat in adjacent upland forests Local movement patterns (unconfirmed); expected to be associated with woodland surrounding southern regionally significant wetland	Seasonal fluctuations in water levels and inundation duration associated with weather Artificial moisture regime decline/drying and reduced inundation periods from extraction impacts Predation from fish Water temperature and quality changes	Population size and genetic composition Surface water levels and inundation duration Absence of fish	Pool depths between 0.5 and 1.0 m at highest spring water level Presence of standing water by July 1 <sup>st</sup> each year Minimum pool depth of 25 cm Presence of Fish
Fish Habitat	Fish habitat in west branch of Mount Nemo Tributary Fish habitat contribution to east branch of Mount Nemo east tributary Overall contribution to Grindstone creek	Changes in base flow Changes in temperature Changes in water quality Loss of energy	Monitoring of flow, temperature, water quality, fish and benthic communities at establish monitoring stations	Base flow contribution levels below existing levels at confluence of two branches. Identification of inorganic and organic concentrations above surface water quality objectives Reduction of percentage of fish species below specified threshold Shift in benthic composition towards more pollution tolerant organisms

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 Thresholds, Triggers and Management Options  
 May 17, 2006

**Table 1: Threshold Analysis – Preliminary Ideas**

<b>Parameter</b>	<b>Characteristics</b>	<b>Stressors</b>	<b>Monitoring Components</b>	<b>Initial Ideas Regarding Triggers and Thresholds</b>
Wetlands	Two swamp deciduous wetlands supported primarily by surface water. One wetland contributing to critical Salamander habitat. Wetlands providing regional ecological function, important for flora and fauna. Southern wetland providing storage capacity for Mount Nemo tributary	Loss of surface source (catchments changes). Change in water regime affecting hydro-period Associated impact on flora and fauna composition Reduction in extent of wetland	Surface flow contribution to wetlands. Wetland hydro-period Wetland inundation duration and depths Species (fauna Flora) composition Wetland size	Specified percentage change in overland runoff contributions Continuous shift in length of established hydroperiod beyond predicted shifts Loss of specified % of obligate wetland species Reduction in specified size of overall wetland.
Other species	Regional and locally significant individuals or populations of flora to be transplanted Individual species and population characteristics	Effect of transplanting (i.e. root or stem impacts) Differing soil, water, and nutrient conditions at transplant location Light and shade effects differing at transplant location Competition with other species at transplant location	Baseline condition water, nutrients, etc. Health of individuals transplanted Reproductive success Composition of encroaching species	Changes in baseline specified conditions % Success of transplanting % of reproductive capacity relative to potential or predicted Visible excessive competition effecting transplant viability

## 4.0 Monitoring Program Development

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Once identified, the thresholds and triggers will be included in a monitoring program that will ensure data collected are relevant and are integrated across physical and biological disciplines. In this case, for example, monitoring will ensure sampling points for ground and surface water monitoring are associated with vernal pools and associated wetlands/woodlands surrounding the pools. The foregoing is, of course, subject to permission from adjacent property owners to access and monitor features not located on the Subject Lands. Sampling and data collection integration will result in more meaningful observations.

The ecological monitoring program for the proposed Nelson quarry extension will involve the following potential aspects:

- Species composition – of wetland areas, proposed rehabilitation zones, benthic stations;
- Species Occurrence – of amphibians in various pools, fish at stations, etc.;
- Species Health – of transplanted herbaceous species, butternuts;
- Spatial extent observations – of susceptible feature boundaries (wetlands, breeding pools);
- Reproductive success – of amphibians, transplanted flora; and,
- Water Quality indices – inorganic and organic water quality analysis in tributaries and or at water discharge locations (wetlands), other upland locations.

Data regarding these aspects will be collected at appropriate sites and established as stations, transects or plots (or a combination of the latter two). Some monitoring sites will be established as controls or baseline condition sites to assist in the analysis and interpretation of monitoring data. The aspects to be monitored for each parameter will be developed in consultation with the regulatory stakeholders having responsibility for the protection of various natural heritage features.

## **5.0 Management System and Documentation**

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The AMP will result in the production of various data that will be required to be stored and maintained. A system will be established to permit:

- Secure data storage;
- Simple update methods;
- Analyses of data results and trends; and,
- Data reporting and presentation.

The results of the analysis of the monitoring data will be provided as an annual report and design into the on-going compliance monitoring for the extension. The intent of the reporting requirement is to ensure that a corrective action initiative is addressed and implemented as required. A discussion around data reporting frequency and reporting channels will be required.

A completed draft ecological AMP will be submitted for review to agencies prior to finalization. The ecological monitoring for the AMP is anticipated to commence in phases 1 and 2 of the operations.

This outline of the preliminary ecological components of the AMP has been provided to engage discussion in the development of the final AMP and in particular to assist in focusing of the monitoring and response program to a concise and plausible program that will be easily interpreted and effectively implemented.

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