

Duntroon Quarry Expansion Outline of Adaptive Management Plan Monitoring Program

Draft For Discussion

Submitted By Walker Aggregates Inc.

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1. AMP PURPOSE

- ◆ To provide an adaptive management plan and monitoring program for water resources and associated natural heritage features and functions that will:
 1. document the range of seasonal pre-expansion quarry baseline conditions;
 2. document changes to seasonal groundwater and surface water conditions and confirm the predicted groundwater/surface water response to quarrying;
 3. protect significant water resources and associated natural heritage features and functions through quarry operations and final rehabilitation;
 4. track the effectiveness of the operational water management and/or mitigation measures designed to minimize the predicted impacts;
 5. provide factual data to refine, if required, the operational management and mitigation measures.
- ◆ To provide a tracking mechanism to confirm the effectiveness of ecological enhancement and restoration initiatives and to implement improvements if required

2. KEY CONCEPTS

- ◆ Identification of key features to be protected;
- ◆ Identification of parameters to be quantitatively and qualitatively measured as an integral component of long term monitoring
- ◆ Identify importance of features and assign appropriate management/mitigation techniques
- ◆ Real time considerations: provide protocols for setting and adjusting threshold values for identified parameters
- ◆ Understandable and easily implemented by quarry operator and staff
- ◆ Reporting structure to facilitate agency review and input

3. TWO COMPONENTS OF ADAPTIVE MANAGEMENT PLAN

Category 1

Continuation of Quarry Operations will not negatively impact local natural heritage features or restoration initiatives outside the extraction area, namely

- ◆ Woodlands outside extraction area and reforestation initiative
- ◆ Hart's Tongue Fern transplantation initiative
- ◆ Butternut recovery initiative

Category 2

Continuation of Quarry Operations could negatively impact water resources which directly support significant natural heritage features such as provincially significant wetlands and fisheries outside the extraction area, namely:

- ◆ Springs that discharge at the Niagara Escarpment east of the site and which subsequently help to sustain surface water flow and fish habitat downstream in tributary streams of the Pretty River and Batteaux Creek, and Springs and surface flows that support fish habitat in the Beaver River west of the site.
- ◆ Surface water levels and flows and groundwater levels that support wetland features and functions.

It is noted that the resolution of any interference problems related to water supply wells is mandated by the Ministry of the Environment under Ontario Water Resources Act Permit To Take Water program. A specific response protocol to address any water well interference complaints will be a condition of the Permit To Take Water that will be required by the expanded quarry in order to operate the dewatering activities. As such, water wells are not included as part of this AMP document.

4. CATEGORY 1 COMPONENT

Consideration	Feature		
	Woodlands	Hart's Tongue Fern	Butternut
Planting/transplanting success	Measure survival rate of trees and assessment of success in creation of wildlife habitat	Measure success rate of different approaches to transplantation	Measure success of transplants and grafting initiatives; measure success of nursery stock plantings
Frequency	Annually after every planting cycle and for 5 years following final planting; then every other year for next 6 years, then every 5 years to surrender of licence.	Annually after every transplant and for 5 years after the final transplantation, then every 5 years to surrender of licence.	Phased transplanting for 5 years; monitor annually for 5 years after final transplantation, then every 5 years to surrender of licence.
Possible Response	If survival rate is less than 80%, replace those that died, modify planting treatments, substitute species, modify management practices (pest control, fertilization), etc. Monitoring reports will result in knowledge to improve long term resource management in Ontario	If survival rate is less than 80%, replace those that died, modify planting treatments, management practices (pest control, fertilization) etc. Transplant additional specimens to slightly different habitat/ microclimate, or alter approach to transplantation. Monitoring reports will result in knowledge to improve the potential success for transplanting Hart's Tongue Fern.	Considered successful if 100 vigorous young trees survive for 5 years. If not, plant additional specimens to slightly different habitat /microclimate, or alter approach to plantings or modify management practices. Monitoring reports will result in knowledge to improve management of butternut in Ontario

4.1 Category 1 Decision Steps

Category 1

Impacts of quarrying have been assessed and mitigation has been proposed as part of the licence application. Monitoring is required to determine the effectiveness of the proposed mitigation and to make adjustments, if required.

Continuing quarry operations will not effect the mitigation measures proposed.

Woodland

Predicted time of Impact	Woodland must be removed in order to Quarry in late Phase I and Phases II and III
Concern	<ul style="list-style-type: none"> ○ Loss of mature woodlot (albeit low diversity) ○ Loss of wildlife habitat ○ Loss of natural heritage linkages
Goals and Benefits	<p>Establish a healthier woodlot with enhanced species diversity, understory and wildlife habitat.</p> <p>Create and strengthen forest linkages to enhance existing landscape functions including Niagara Escarpment linkages.</p> <p>Long term net natural heritage gain.</p>

Woodland Decision Steps

Step 1

Create habitat features (such as topographic contours, rock and stone exposure etc),
Replant trees

Step 2

Maintain, nurture and monitor

Goal: <20% tree mortality; established forest diversity and habitat characteristics

Step 3

If successful, monitor every other year for the next 6 years:

- Species diversity;
- Understory;
- Wildlife use.

Step 3b

If unsuccessful, intervene with additional plantings and/or habitat enhancements; recommence with Step 1, above.

Step 4a

If successful, reduce monitoring to every 5 years.

Step 4b

If unsuccessful, intervene with additional plantings and/or habitat enhancements; recommence with Step 3a, above.

Butternut Trees

Predicted time of Impact	A small number of trees must be removed in order to Quarry in Phase II
Concern	Loss of individual trees that are threatened due to natural canker disease. Possible loss of genetic diversity.
Goals and Benefits	Increase the likelihood of long term survival of butternut in the immediate landscape by establishing a higher number of young vigorous trees with variable genetic characteristics. Enhanced probability of long term survival of butternut species in Ontario.

Butternut Trees Decision Steps

Step 1

Propagate and plant Butternut trees from onsite stock; and
Plant trees from alternate sources

Step 2

Maintain, nurture and monitor

Goal: 100 vigorous, young trees survive transplant shock for 5 years

Step 3a

If successful, recommence with Step 2, above

Step 3b

If unsuccessful, recommence with Step 1, above.

Hart's Tongue Fern Transplantation

Predicted time of Impact	A portion of the regional population must be removed in order to Quarry in Phase II and III
Concern	Loss of a portion of the regional Hart's Tongue Fern population
Goals and Benefits	Preservation of the genetics of the existing Hart's Tongue ferns by creating a healthy population in a new habitat area Transfer ownership of the new habitat area to a long term stewardship group. Gain knowledge to assist with future management of Hart's Tongue fern. A secure, controlled access site that will highlight the species ecology and natural heritage value for the general public.

Hart's Tongue Fern Decision Steps

Step 1

Characterize micro ecological conditions

Step 2

Establish transfer site suitability

Step 3a

Phased transplanting over a 5 year period

Step 3b

Monitor survival of transplants and return to Step 1 to modify transplant techniques as appropriate – repeat annually over the five year period

Step 4

Publish information to share outcome and improve success of future transplanting

5. CATEGORY 2 AMP

Key Concepts

1. Performance Indicator (Green): A physical parameter including surface water flow and temperature, wetland surface water level and flow, and groundwater level that can be readily measured and monitored and that will demonstrate the effectiveness of routine operational water management activities and / or specific mitigation measures.
2. Seasonal Early Warning Value (Yellow): A defined quantitative value of a performance indicator that is set higher than the Seasonal Action Threshold Trigger value for that indicator to provide seasonal early warning of a potential downward or upward trend.
3. Seasonal Action Threshold Trigger Value (Red): A defined quantitative minimum or maximum acceptable seasonal value of a performance indicator, beyond which additional change may result in unacceptable adverse impact to water resources which directly support significant natural heritage features, namely: wetlands and fish habitat.

CATEGORY 2 COMPONENT

	Stage	Possible Response
GREEN	Normal operating condition	Continue routine monitoring as per ARA site plans
YELLOW	One or more of the monitored parameter values falls below (or above, as applicable) its Seasonal Early Warning value	<ul style="list-style-type: none"> ○ Verify parameter value ○ investigate possible causes ○ if quarry related then: <ul style="list-style-type: none"> ○ Increase monitoring ○ Review/modify operational components ○ Data evaluation ○ Implement appropriate operational modifications / mitigation measures ○ Document and report
RED	One or more of the monitored parameter values falls below (or above, as applicable) its Seasonal Action Threshold Trigger Value	<ul style="list-style-type: none"> ○ If measured parameter does not recover to at or above (or below if applicable) the Seasonal Action Threshold Trigger value within one week of hitting red, the quarry shall adapt operations in the quarry (move extraction area, move to a different lift or suspend quarrying in the area causing the impact) ○ Notify appropriate agency ○ Assess reason for red condition and options to remedy problem and implement remedy ○ Resume extraction once specified set of conditions has been achieved

5.1 Seasonal Early Warning and Action Threshold Trigger Monitoring Locations and Values

Seasonal early warning and action threshold trigger values are provided in the appended table for the performance indicators that are to be monitored at key locations as part of the AMP. It is noted that the monitoring locations are positioned on publicly-owned lands, such as municipal road rights-of-way, or on lands owned by Walker Aggregates Inc. It is recognized that, in some instances, there may be other factors that could affect flow and/or temperature conditions at some monitoring locations and which have no connection to quarry operations and the monitoring as proposed will assist in identifying cause and effect.

Walker Aggregates Inc. will accept the responsibility to identify the cause(s) for any and all exceedances of action threshold trigger levels should they occur for any reason. Walker Aggregates Inc. will resolve these issues in an appropriate manner, if it is determined that quarry operations are the cause of the problem.

Figure 1 provides a schematic of the surface water and wetland areas to illustrate the proposed AMP monitoring locations, as described below.

Surface Water: Temperature and Flow

Pretty River Tributary Below Escarpment Springs

1. SW16 at 26/27 Sideroad (north side): channel flow from Escarpment springs on H/E. Franks property.
2. SW17 at 26/27 Sideroad (south side): Outflow channel from former Sestito Property (now H/E Franks), below collection pond.
3. SW17A at 26/27 Sideroad (north side): Channel flow representing cumulative flow from springs at Escarpment, upstream from junction with SW17 flow.
4. SW18 at Concession 10 (east side): Main channel flow representing combined flow from SW17 and SW17A and other springs in this area.

Batteaux Creek Tributary Below Escarpment Springs

1. SW15 at Concession 10 (east side): Main channel flow representing outflow from pond on H/E. Franks property that collects spring discharge and overflow from water supply spring on that property.
2. SW14 at Concession Road 10 (east side): Main channel flow representing outflow from pond on W. Franks property that collects spring discharge from all springs on that property.

Beaver River Tributary West of Duntroon Quarry and Expansion Property:

1. SWO-2 Osprey Quarry property downstream of RR#6 wetland at cattle crossing.
2. SW6A Twin Culverts at Osprey (Grey Highlands) Sideroad 30 (west side): Main channel flow representing the entire surface water flow out of Rob Roy Provincially Significant Wetland Complex.

Wetland Areas: Surface Water Level/Depth and Groundwater Table Elevation

- | | |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rob Roy Unit #2: | Drivepoint monitor DP5, and
Drivepoint monitor DP7 (location to be established) |
| Rob Roy Unit #6: | Drivepoint monitor DP2 west of existing quarry),
Drivepoint monitor DP8 (to be established west of quarry)
Drivepoint monitor DP4 (west of Grey Road 31) |

ANSI A Wetland: Drivepoint monitor DP6

ANSI B Wetland: Bridson Drivepoint monitor, and Drivepoint Monitor DP9 (to be established at east end of wetland)

Wetland Areas: Surface Water Flow

Rob Roy Unit #2: Outflow at culvert SW3 on Grey Road 31

Rob Roy Unit #6: Inflow at culvert SW2 on Simcoe Road 91, and Outflow at culvert SW1

ANSI B Wetland: Outflow to sinkhole area at SW9 on former Bridson property (now Walker Aggregates Inc)

5.2 Category 2 Decision Steps

Category 2

Possible impacts of quarrying are predicted for these components at different stages of quarrying. Adapting various aspects of quarry operations will reduce the impacts that may be temporarily experienced.

Surface Water Temperature

Predicted time of Impact	Phase I and II not predicted to be an issue Phase III – the possibility exists for minor impacts to occur
Concern	Increase in temperature affecting downstream coldwater fish habitat Coldwater fish habitat generally requires water with a maximum summer temperature of <22°C
Monitoring Location On publicly-owned lands (road right-of-way) and/or on lands owned by Walker Aggregates Inc.	<p>1. Pretty River Below Escarpment Springs</p> <ul style="list-style-type: none"> • SW16 at 26/27 Sideroad • SW17 at 26/27 Sideroad • SW17A at 26/27 Sideroad • SW18 at Concession 10 Road <p>2. Batteaux Creek Below Escarpment Springs</p> <ul style="list-style-type: none"> • SW15 at Concession 10 Road • SW14 at Concession 10 Road <p>3. Beaver River West of Site</p> <ul style="list-style-type: none"> • SW0-2 On Osprey license west of existing quarry • SW6A at Osprey (Grey Highlands) Sideroad 30
Triggers	<p>Red = highest temperature ever measured during each season, as appropriate, plus 0.5°C Yellow = Red minus 2°C</p> <p>Need to factor in consideration of ambient air temperature. If the differential between air and water temperature (i.e. the cooling effect of the groundwater) remains constant, despite long term climate trends to increasing summer temperatures, temperature changes at the springs are not related to impacts from the quarry.</p> <p>If red zone temperature shows no effect on downstream fisheries, then the trigger value will be reassessed.</p>
Trigger Period	Seasonally, as appropriate (May 1 to October 1 is critical time)

Surface Water Temperature Decision Steps

GREEN	<p>Regular monitoring Regular operations</p>
YELLOW	<p>Implement increased monitoring program:</p> <ul style="list-style-type: none"> - Check exit temperature from quarry; - Check upstream and downstream temperatures in receiver; - Monitor temperature and dissolved oxygen in downstream fishery for changes; - Compare ambient air temperature to historic values; - Assess regional conditions. <p>Is quarry pumping to springs and/or to other discharge locations? If not, start pumping if possible. If pumping, increase pumping rate if possible. Check pumps to ensure functioning properly; if not, repair. If there is a continuing temperature increase within the yellow zone, discharge cooler water from quarry (such as from a bottom-draw system at sump).</p>
RED	<p>Adapt operations</p> <ul style="list-style-type: none"> - move extraction area; - move to a different lift; - suspend quarrying in the area causing the impact; - assess other options available at the time of exceeding the threshold

Surface Water Flow

Predicted time of Impact	Phase I and II – not predicted to be an issue Phase III – minor impacts may occur
Concern	Low flow could affect downstream coldwater fish habitat
Monitoring Location On publicly-owned lands (road right-of-way) and/or lands owned by Walker Aggregates	<ol style="list-style-type: none"> 1. Pretty River Below Escarpment Springs <ul style="list-style-type: none"> • SW16 at 26/27 Sideroad • SW17 at 26/27 Sideroad • SW17A at 26/27 Sideroad • SW18 at Concession 10 Road 2. Batteaux Creek Below Escarpment Springs <ul style="list-style-type: none"> • SW15 at Concession 10 Road • SW14 at Concession 10 Road 3. Beaver River West of Site <ul style="list-style-type: none"> • SW02 On Osprey license • SW6A at Osprey (Grey Highlands) Sideroad 30 4. Wetland Area Flows <ul style="list-style-type: none"> • RR#2: Outlet at culvert SW3 on Grey Road 31 • RR#6: Inflow at culvert SW2 on Simcoe Road 91 Outflow at culvert SW1 on Grey Road 31 • ANSI B: Outflow to sinkhole area at SW9
Triggers	<p>Red = lowest flow ever measured in each season minus 10%</p> <p>Yellow = Red plus 20%</p> <p>If climate conditions change, reassess trigger. If reduction of flow has no impact, reassess trigger.</p>
Trigger Period	Year round except when springs / seeps / channel flows are frozen as naturally occurs pre-quarry

Surface Water Flow Decision Steps

GREEN	Regular monitoring Regular operations
YELLOW	Implement increased monitoring program: <ul style="list-style-type: none"> - Check exit flow from quarry; - Check upstream and downstream flows; - Check pumps - Review pumping records. <p>Is quarry currently pumping to off-site discharge locations? If not, start pumping if possible. If pumping, increase pumping volume if possible. Check pumps to ensure functioning properly; if not, repair.</p>
RED	Adapt operations <ul style="list-style-type: none"> - Move extraction area; - Move to a different lift; - Suspend quarrying in area causing the impact - assess other options available at the time of exceeding the threshold

Wetland Water Levels

Wetland water levels will be managed during the active phase of the quarry through pumping excess water from the extraction area to wetlands as required. The water will be pumped at rates and at times to replicate as closely as possible "Target Hydrographs". The target hydrographs will be established for each wetland in consultation with the agencies and using site specific data.

Preliminary target hydrographs for major wetland types are appended as Figures 2, 3 and 4, and include targets for average years, wet years and dry years. Target hydrographs for wetlands with amphibian breeding habitat will be set to ensure that adequate water is present in the habitat areas to enable successful amphibian breeding, even in dry years. Both the approach and the actual targets will be refined with input from agency staff.

The target refinement process will be augmented by biological monitoring of wetlands to obtain data on the trends in amphibian habitat conditions, wetland plant species diversity and percent cover, and other ecological indicators of healthy functional wetlands. Biological monitoring will be related to the water level monitoring and interpreted in conjunction with the agencies.

Wetland Water Levels

Predicted time of Impact	Potential impacts on wetland water levels are not predicted until Phase II
Concern	Loss of wetland species and/or amphibian habitat
Monitoring Locations	<p>Groundwater and surface water levels in the following wetland areas:</p> <p>RR#2: Drivepoint monitor DP5, and Drivepoint monitor DP7 (location to be established).</p> <p>RR#6: Drivepoint monitor DP2 Drivepoint monitor DP4, and Drivepoint monitor DP8 (location to be established)</p> <p>ANSI A: Drivepoint DP6</p> <p>ANSI B: Bridson Drivepoint, and Drivepoint DP9 (location to be established)</p>
Triggers	<p>Vegetation Too dry</p> <p>Red = more than one month operating outside the dry year hydrograph (i.e. water levels lower than target) or anytime the water level falls below the lowest water level recorded for that month minus 10%..</p> <p>Yellow = Red level plus 20%</p> <p>Vegetation Too wet</p> <p>Red = more than one month operating with water levels higher than the levels in the wet year hydrograph for that month or anytime water levels rise above the highest historic level for that month plus 10%</p> <p>Yellow = Red level minus 20%</p> <p>Amphibian habitat–</p> <p>Red – Critical ponds go dry during short breeding period (March to second week of July)</p> <p>Yellow - depth of critical ponds drops below 80 % of historic minimum depths during the extended breeding period (March to second week of August)</p> <p>If climate conditions change, reassess trigger.</p> <p>Need to consider length of time that the water levels are near trigger values and whether the change in water levels appears to be affecting wetland functions or vegetation dynamics.</p>
Trigger Period	<ul style="list-style-type: none"> ○ Spring and fall saturated period ○ Amphibian breeding season based on the species present.

Wetland Water Levels Decision Steps

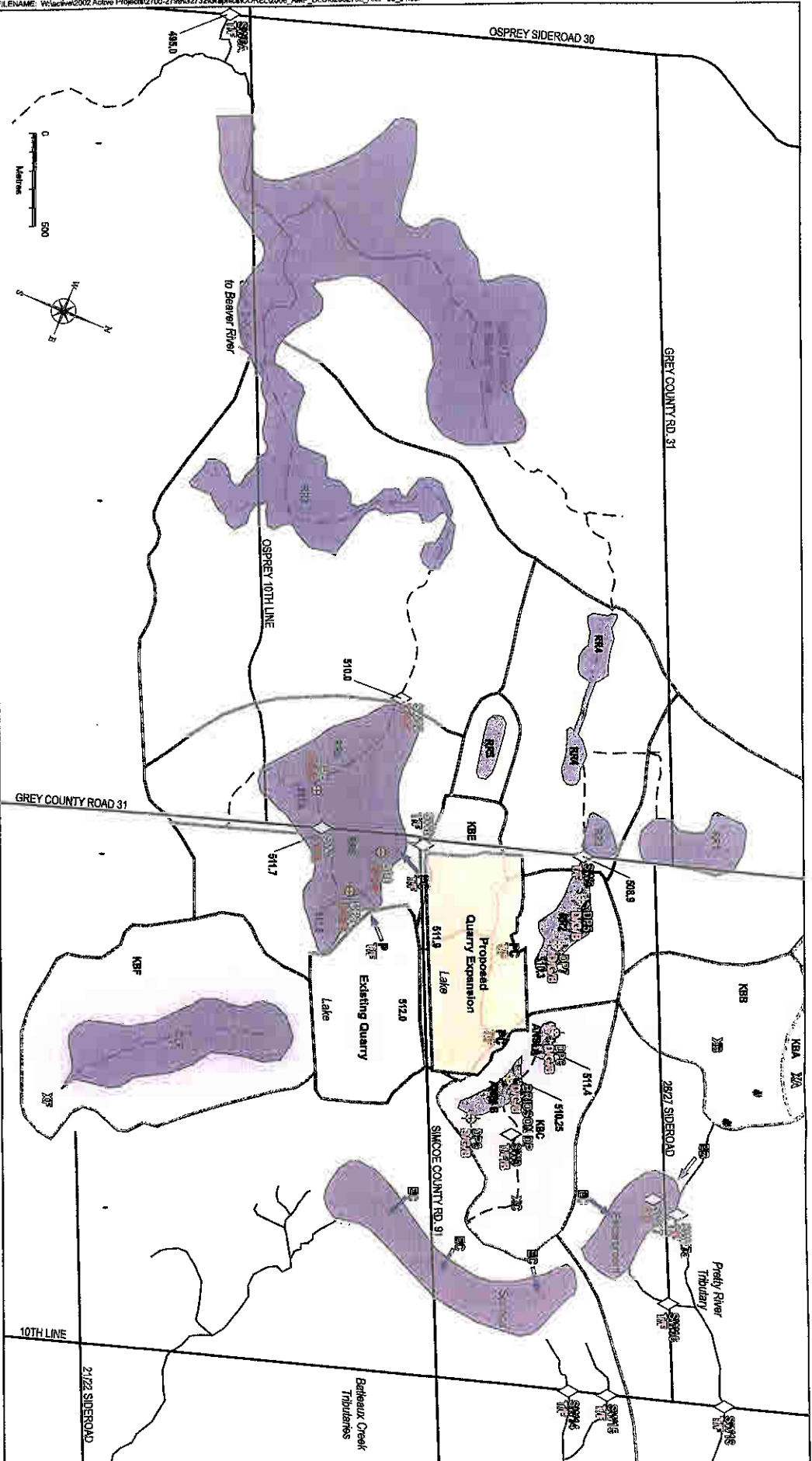
GREEN	<p>Regular monitoring Regular operations</p>
YELLOW	<p>Implement increased monitoring program:</p> <ul style="list-style-type: none"> - Check water levels; - Check pumps - Review pumping records. <p>Is quarry currently pumping? If not, start pumping if possible. If pumping, increase pumping volume if possible. Check pumps to ensure functioning properly; if not, repair.</p>
RED	<p>Adapt operations</p> <ul style="list-style-type: none"> - Injection wells - Move extraction area; - Move to a different lift; - Suspend quarrying in area causing the impact - Other.

6. RESULTS

- ✦ Early warning of potential negative impact to feature or function provided.
- ✦ Water resources and associated significant natural heritage features and functions are protected.

APPENDIX

Figure 1	Schematic of Proposed Monitoring Locations
Figure 2	Swamp with Vernal Pools Target Hydrograph
Figure 3	Swamp/Marsh Shallow Over Bedrock Target Hydrograph
Figure 4	Wetlands Associated With Channel and Karst Target Hydrograph
Table 1	Seasonal Early Warning and Action Threshold Trigger Values



Source: Adapted From Kent Investigation of the Durston Quarry Expansion Limits - Fig. 1 for Jagger-Harris Ltd., April 2007

- KBC Kasal Basin C
- 285 Conceptual Location of Kasal Infiltration for Basin C
- 286 Conceptual Location of Kasal exfiltration for Basin C
- RRT Rob Roy Wetland Complex Unit 7
- ANS1A Unrestaked ANSI Wetland A
- CLF Unrestaked Wetland at Caranfort Lake Farm
- Embankment Springs Unrestaked Wetlands associated with springs at base of Manitoulin formation
- S120 med - Soil Elevations and Proposed Average Lake Levels (lake levels will fluctuate seasonally)

- Dike Point
- Discharge from Existing Quarry
- Conceptual Location of Discharge from Proposed Quarry
- Surface Water Monitoring Location
- Monitoring
- Temperature
- Depth of Surface Water
- Ground Water Elevations
- Flow
- Biological Monitoring

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PROJECT NAME:	DURSTON QUARRY EXPANSION	DATE:	FEBRUARY, 2006	SCALE:	AS SHOWN
CLIENT NAME:	WALKER INDUSTRIES	PROJECT NO.:	2700-2799	PROJECT NO.:	2700-2799
PROJECT TITLE:	PROPOSED QUARRY EXPANSION	DATE:	FEBRUARY, 2006	SCALE:	AS SHOWN
PROJECT NO.:	2700-2799	PROJECT NO.:	2700-2799	PROJECT NO.:	2700-2799
PROJECT TITLE:	PROPOSED QUARRY EXPANSION	DATE:	FEBRUARY, 2006	SCALE:	AS SHOWN
PROJECT NO.:	2700-2799	PROJECT NO.:	2700-2799	PROJECT NO.:	2700-2799

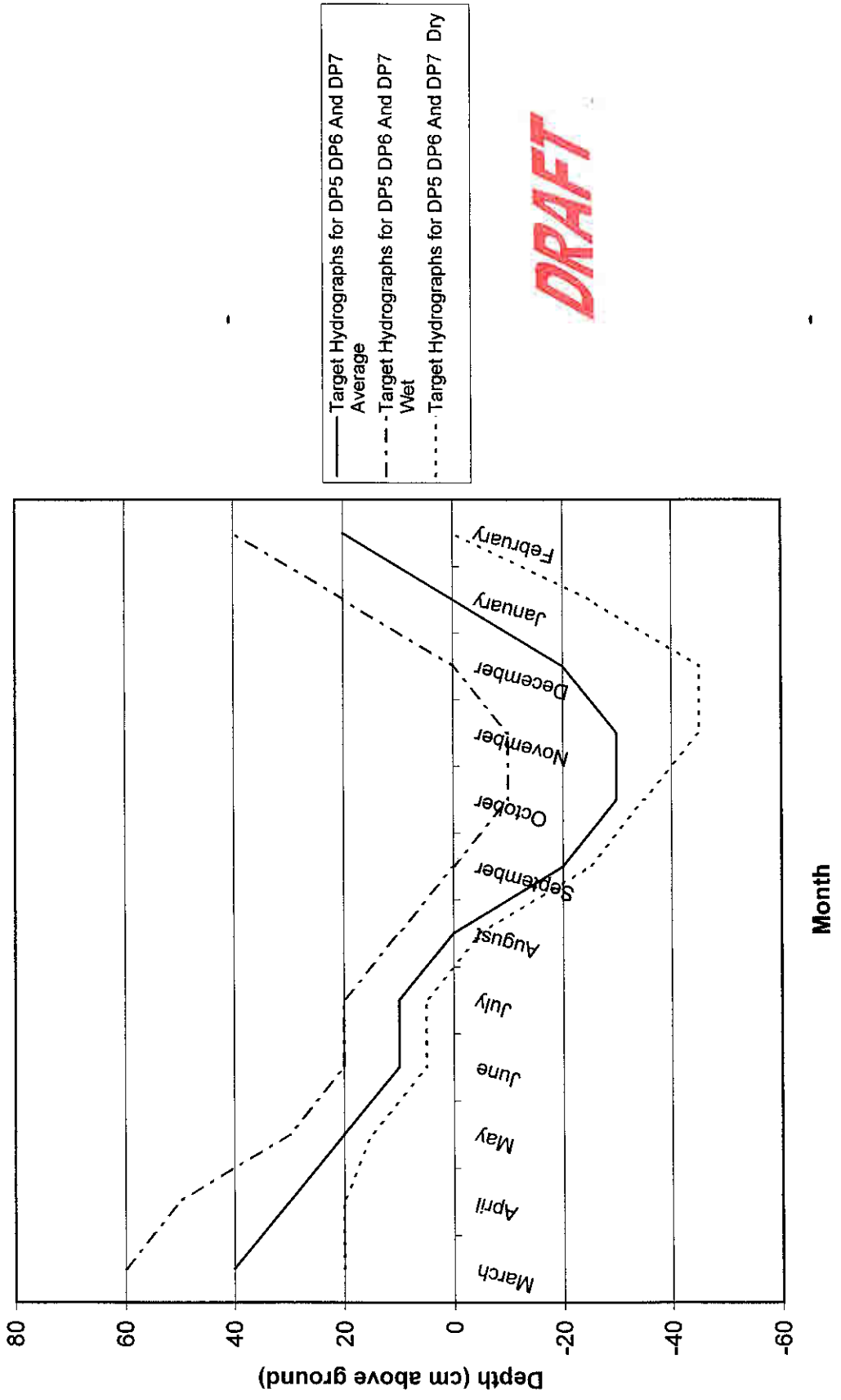
PROPOSED WATER MONITORING LOCATIONS

FIGURE NO. 1.0



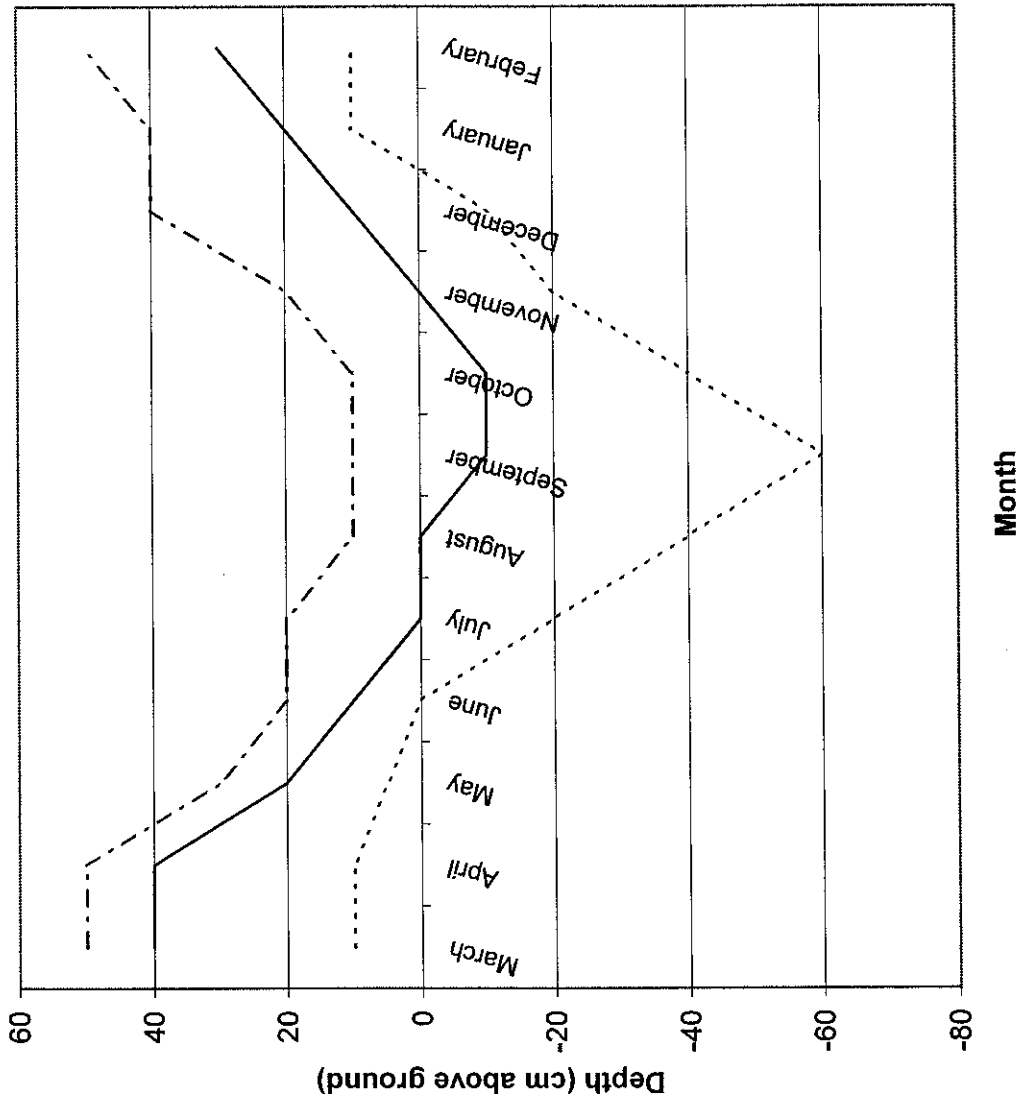
walker
Industries

Figure 2.0: Swamp with Vernal Pool Target Hydrograph



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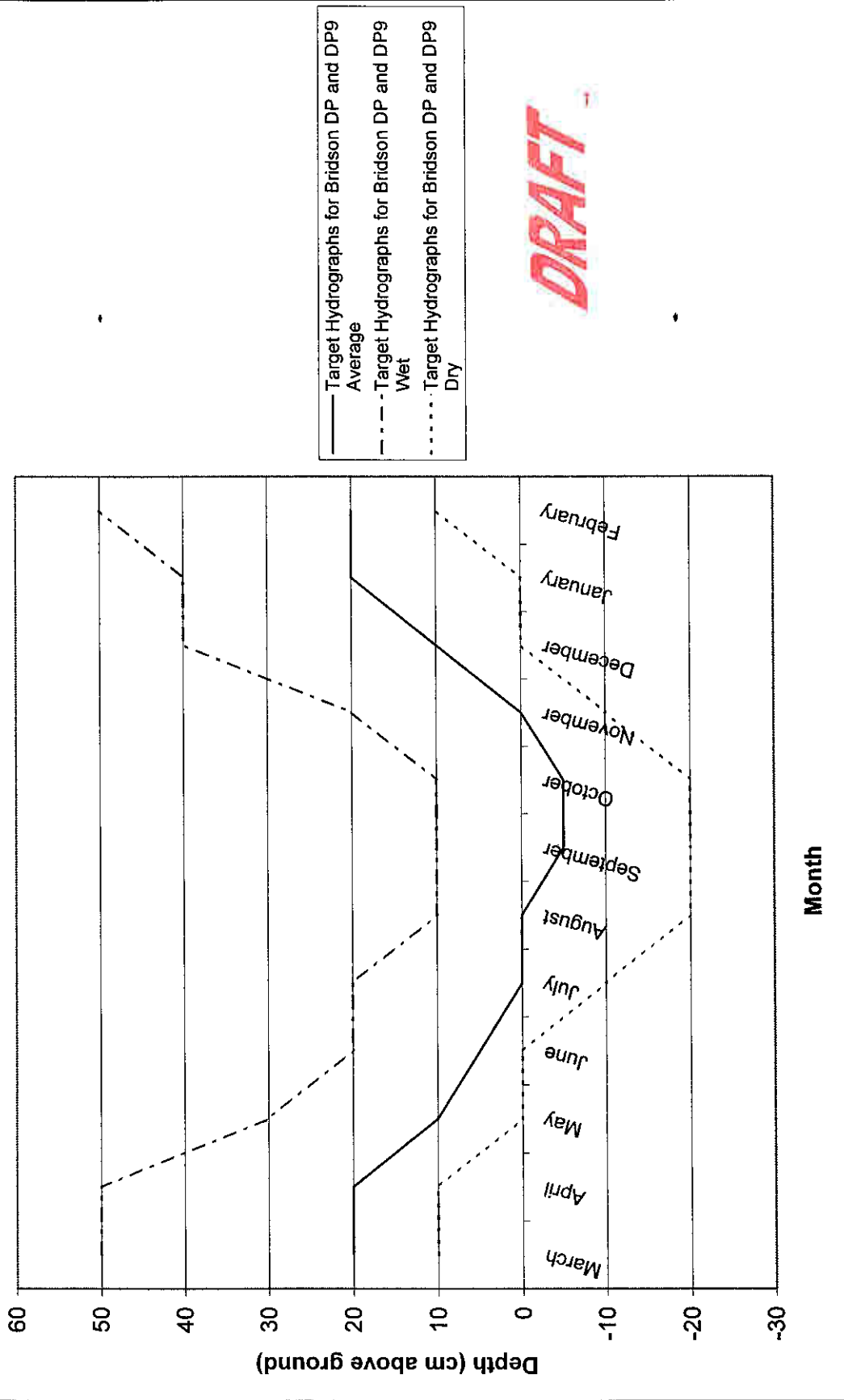
Figure 3.0: Swamp/Marsh Shallow Over Bedrock Target Hydrograph



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— Target Hydrographs for DP2 DP4 And DP8
 Average
 - - - Target Hydrographs for DP2 DP4 And DP8
 Wet
 ····· Target Hydrographs for DP2 DP4 And DP8 Dry

Figure 4.0: Wetlands Associated with Channel and Karst Target Hydrograph



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TABLE 1: PRELIMINARY SEASONAL EARLY WARNING AND ACTION THRESHOLD TRIGGER VALUES

Temperature recorded in °C; Flow recorded in L/s

FEATURE	LOCATION	SEASONAL EARLY WARNING AND ACTION THRESHOLD TRIGGER VALUES														
		SPRING			SUMMER			FALL			WINTER					
		TEMPERATURE EARLY WARNING	ACTION TRIGGER	FLOW WARNING	TEMPERATURE EARLY WARNING	ACTION TRIGGER	FLOW WARNING	TEMPERATURE EARLY WARNING	ACTION TRIGGER	FLOW WARNING	TEMPERATURE EARLY WARNING	ACTION TRIGGER	FLOW WARNING			
PRETTY RIVER TRIBUTARY SYSTEM	SW16	17.9	19.8	0.59	0.6	18.5	20.5	N/A	N/A	10.9	N/A	N/A	N/A	N/A	N/A	N/A
	SW17	19.9	21.8	0.6	0.5	20.8	22.8	0.11	0.09	11.3	13.3	0.26	0.22	N/A	N/A	2.1
	SW17A	12.0	14.0	7.8	8.5	13.4	15.4	1.0	0.84	9.7	11.7	2.4	2.0	N/A	N/A	9.94
	SW18	16.0	18.0	12.4	10.4	17.8	19.8	1.7	1.4	13.4	15.4	3.5	2.9	N/A	N/A	10.8
BATAUX CREEK TRIBUTARY SYSTEM	SW14	20.3	22.3	1.73	1.44	20.1	22.1	0.054	0.045	8.3	10.3	0.33	0.28	N/A	N/A	3.24
	SW15	21.5	23.5	0.26	0.21	22.3	24.3	0.054	0.045	8.6	10.6	0.49	0.41	N/A	N/A	TBD
	SW16	23.9	25.9	0.0011	0.001	27.7	29.7	0.0011	0.001	15.6	17.6	0.0011	0.001	N/A	N/A	52.1
BEAVER RIVER SYSTEM	SW6A	20.0	22.0	62.36	52.47	18.1	20.1	9.72	8.1	10.7	12.7	35.42	29.57	N/A	N/A	143.6

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TABLE 2: PRELIMINARY SEASONAL EARLY WARNING AND ACTION THRESHOLD TRIGGER VALUES

FEATURE	LOCATION	SEASONAL EARLY WARNING AND ACTION THRESHOLD TRIGGER VALUES											
		SPRING			SUMMER			FALL			WINTER		
		TEMPERATURE EARLY WARNING	ACTION TRIGGER	FLOW WARNING	TEMPERATURE EARLY WARNING	ACTION TRIGGER	FLOW WARNING	TEMPERATURE EARLY WARNING	ACTION TRIGGER	FLOW WARNING	TEMPERATURE EARLY WARNING	ACTION TRIGGER	FLOW WARNING
WETLAND AREA SURFACE WATER FLOW	ROB ROY #2: at SW3	4.7	3.9	N/A	N/A	N/A	N/A	0.12	0.10				
	ROB ROY #6: INFLOW at SW2	1.8	1.5	0.022	0.018	0.011	0.009	1.7	1.4				
	OUTFLOW at SW1	117	130	TBD	TBD	63	70	TBD	TBD	TBD	TBD	TBD	TBD
	Maximum Value	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Minimum Value	0.63	0.52	DRY: N/A	N/A	DRY: N/A	N/A	DRY: N/A	DRY: N/A	DRY: N/A	DRY: N/A	DRY: N/A	DRY: N/A	DRY: N/A

- NOTES**
- DRY: N/A refers to ponded, dry or mostly dry conditions observed at the location. Early Warning and Action Threshold values not appropriate
 - N/A for temperature means that water temperature is not a criterion during the winter period
 - Flows at SW1 are highly dependent on existing quarry discharge flow and prevailing climatic conditions.
 - SW1 Maximum Trigger values are based on the current Permit To Take Water; Early Warning Values are 90% of Trigger values.
 - TBD means minimum values are to be determined based on target hydrographs in consultation with review agencies.
 - Similarly, flow at SWO-2 is highly dependent on quarry discharge, particularly in summer / fall. Zero flow is tabulated as 0.001 L/s
 - SW3 Spring Early Warning and Action Trigger Values are reported for April only. The historic low spring flow at SW3 is less than 1 L/s (observed in May 2004 and 2006). SW3 was observed as ponded with no visible/measurable flow in May 2003, 2005 and 2007 and as dry during the month of June (2003 to 2007).
 - Spring values for SW9 were developed using surface water flow data collected during April and May - SW9 has been observed as dry or slightly ponded during June monitoring events. Ponded surface water with no visible/monitorable flow was observed during the May 2003 monitoring event. SW9 Early Warning and Action Threshold Trigger Values are reported for April and May only - slightly ponded or dry conditions are expected during June.

TABLE 3: PRELIMINARY SEASONAL EARLY WARNING AND ACTION THRESHOLD TRIGGER VALUES

Seasonal Early Warning and Action Threshold Trigger Values will be determined in consultation with the regulatory agencies and will be based on the target hydrograph for the wetland type. Figures 2, 3 and 4 in the Appendix provide preliminary target hydrographs.

Figure 2 Swamp With Vernal Pool:
Rob Roy Wetland #2
ANSI A

Figure 3 Swamp Marsh Over Shallow Bedrock:
Rob Roy Wetland #6

Figure 4 Wetland Associated With Channel and Karst Topography:
ANSI B