Miller's Creek Extension Project Area

Miller's Creek Mine (Existing Operation)

Non-Mineral Registration: No. 002

Non-Mineral Registration: No. 001

Avon River
Kennetcook River
St. Croix River
Belmont Road
Ferry Road
Avondale Road

411000 412000 413000 414000 415000 416000 417000 418000 419000
4983000 4984000 4985000 4986000 4987000 4988000 4989000

figure 2.1
SITE LOCATION
Miller's Creek Extension Project
CGC INC. - WINDSOR PLANT
Hants County, Nova Scotia

LEGEND:
- Proposed Extraction Area
- Proposed Stockpiles
- Proposed Conservation Area
- Non Mineral Registration

SOURCE:
Basemap - Nova Scotia Topographic Database, SNS&MR
Mineral Registration - NS Natural Resources.
DPME 51 Feb 2009
Project Data - CGC Inc. & CRA

SCALE: 1:30,000
DATE: August 20, 2009
PROJECTION: UTM z20 NAD83

CONESTOGA-ROVERS & ASSOCIATES
Figure 2.2

SITE LAYOUT - PHOTO MAP
Miller's Creek Extension Project
CGC INC - WINDSOR PLANT
Hants County, Nova Scotia
FIGURE 2.2b

SITE LAYOUT - PHOTO MAP
EXISTING MINE
Miller’s Creek Extension Project
CGC INC - WINDSOR PLANT
Hants County, Nova Scotia

LEGEND:
- Proposed Extraction Area
- Proposed Stockpiles
- Proposed Conservation Area

SOURCE:
Airphoto Hauts-Monts Inc 14 May 2006 (AS06106-6, & -8)
Baseemap - Nova Scotia Topographic Database, DEM/ARN
Mineral Registration - NS Natural Resources
Project Data - CGC Inc. & CRA

PROJECTION:
UTM z20 NAD83

SCALE:
1:15,000

DATE:
August 20, 2009

CONESTOGA-ROVERS & ASSOCIATES
For the Current Proposal
(Layout 5)
See Figures 2.1 & 2.2

NOTE:
Extraction Area
Stockpile Areas
Conservation Area

CHRONOLOGY OF ALTERNATE MINE LAYOUTS
Miller's Creek Extension Project
CGC Inc. - Windsor Plant
Hants County, Nova Scotia
Domestic Water Well Locations

Distance from Edge of Pit (m)

- 500 m - 4
- 1000 m - 32
- 1500 m - 85
- 2000 m - 75
- 2500 m - 16
- 3000 m - 20 (6 on Peninsula)

No. of Potential Wells

- 500 m - 4
- 1000 m - 32
- 1500 m - 85
- 2000 m - 75
- 2500 m - 16
- 3000 m - 20 (6 on Peninsula)

LEGEND:
- Domestic Water Well Locations
- Distance from Edge of Pit (m)
- Proposed Stockpile
- Proposed Extraction Area
- Wetlands
- Conservation Area
- Extent of Domestic Well Surveys

SOURCE:
Nova Scotia Topographic Database
NSGAMR - NS Geomatics Centre
Water Wells approximated based on Civic Location (NSCAFM) and the limits of Municipal Water Systems

HANTS COUNTY, NOVA SCOTIA
Miller's Creek Extension Project
CGC Inc., Windsor Plant
Hants County, Nova Scotia

Figure 4.1-1
DOMESTIC WELL LOCATIONS - DISTANCES FROM EXTRACTION AREA
DATE: August 28, 2009
SCALE: 1:30,000
0° North

PROJECTION: UTM z20 NAD83
MAP ANGLE: 0° North
PROJECT NO: 820677K
DRAWN / CHECKED BY: JJP / JJP
NO. OF POTENTIAL WELLS
Distance from Pit

No. of Potential Wells
500 m - 4
1000 m - 32
1500 m - 85
2000 m - 75
2500 m - 16
3000 m - 20 (6 on Peninsula)
Figure 4.1-2
GROUNDWATER ELEVATIONS
Miller's Creek Extension Project
CGC INC. - WINDSOR PLANT
Hants County, Nova Scotia

LEGEND:
- Cross Section
- Contours
- Proposed Extraction Area
- Proposed Stockpiles
- Proposed Conservation Area

Profile GW1
Vertical 4X Horizontal

Profile GW2
Vertical 4X Horizontal

Groundwater Elevations
- Existing
- Full Mine Life
- Post Reclamation
Surface Water Sampling

Existing Locations
- Flow / Water Level Monitoring
- Water Quality Monitoring

Proposed Locations
- Flow / Water Level Monitoring
- Rain Gauge
- CGC catchments
- Wetlands
- Wetland / Stream
- Wetland / Stream indefinite
- Ditch
- CGC Property
- Property
- Proposed Extraction Area
- Proposed Stockpiles
- Proposed Conservation Area
- Waterbodies

SOURCE:
Nova Scotia Topographic Database | NSD&MRI - NS Geomatics Centre
Field Surveys: CRA Ltd.

figure 4.2-2
EXISTING & PROPOSED MONITORING STATIONS
Miller's Creek Extension Project
CGC Inc. - Windsor Plant
Hants County, Nova Scotia
figure 4.2.3
CONCEPTUAL SETTLING POND LOCATIONS
Miller's Creek Extension Project
CGC INC. - WINDSOR PLANT
Hants County, Nova Scotia

LEGEND:
- Site Wetlands
- CGC Property
- Property
- Proposed Extraction Area
- Proposed Stockpiles
- Proposed Conservation Area
- Conceptual Settling Pond Location

SOURCE:
Basemap - Nova Scotia Topographic Database, NS&MR
Project Data - CGC Inc. & CRA
CONSERVATION AREA CROSS-SECTION
Miller's Creek Extension Project
CGC Inc. - WINDSOR PLANT
Hants County, Nova Scotia

Cross Section
Proposed Extraction Area
Proposed Stockpiles
Proposed Conservation Area

Clay
* Miller Creek Formation gypsum, minor siltstone, limestone, dolostone

Overburden
Bedrock

* Conceptualized based on overburden thickness and bedrock surface elvations

figure 4.3-2

820677K (10) GIS-DA432_ConservationXS.mxd August 31, 2009
WETLAND 12 CROSS-SECTION
Miller's Creek Extension Project
CGC Inc. - WINDSOR PLANT
Hants County, Nova Scotia

Cross Section
Proposed Extraction Area
Proposed Stockpiles
Proposed Conservation Area

Solar Elevation Jun. 21 12:00
Solar Elevation Dec. 21 12:00
Stockpile
Interpolated GW Elev
Predicted Post Reclamation GW Elev
Predicted End of Mine Life GW Elev

North
South

Distance (m)
Elevation (m a.s.l.)
Vertical 2X Horizonal

©2007K (09) GIS-DA413_Wetland 12XS.mxd October 7, 2009
CONCEPTUAL PLANNED EXTENT OF PROJECT
20, 40 YEARS & FULL MINE LIFE
Miller's Creek Extension Project
CGC Inc. - Windsor Plant
Hants County, Nova Scotia

SOURCE:
Nova Scotia Topographic Database (SNS&MRI - NS Geomatics Centre)
Field Surveys: CRA Ltd.
Mine Layout: CGC Inc.

PROJECTION: UTM 220 NAD83
SCALE: 1:20,000, 1:25,000
DATE: October 6, 2009
PROJECT NO: 820677K

figure 4.3-4
Site Wetlands
River / Stream
River / Stream indefinite
Ditch
Waterbodies
Proposed Extraction Area
Proposed Stockpiles
Proposed Conservation Area

SOURCE:
Nova Scotia Topographic Database (NSG&M - NS Geomatics Centre)
Field Surveys: CRA Ltd.
Mine Layout: CGC Inc.

figure 4.4-1
WETLANDS
Miller's Creek Extension Project
CGC Inc. - Windsor Plant
Hants County, Nova Scotia
Miller’s Creek Extension Project
CGC Inc. - WINDSOR PLANT
Hants County, Nova Scotia

WETLAND 15 CROSS-SECTION

Cross Section
Contours
Proposed Extraction Area
Proposed Stockpiles

figure 4.4-2

Predicted Post Reclamation GW Elev
Predicted 20 yr, 40 yr & End of Mine Life GW Elev
Interpolated GW Elev

Edge of Stockpile
Edge of Extraction Area

North
South

Edge of Stockpile
Edge of Extraction Area

Wetland 16
Wetland 15

Distance (m)

Elevation (m a.s.l.)

0 50 100 150 200 250 300 350 400 450 500 550 600

0 20 40 60

North
South

20 40 60

50 60 70 80 90 100

500 600 700 800 900 1000
figure 4.5-1
STREAM HABITAT OVERVIEW
Miller's Creek Extension Project
CGC Inc. - Windsor Plant
Hants County, Nova Scotia

SOURCE:
Nova Scotia Topographic Database | SNS&MR - NS Geomatics Centre
CGC Inc. - Windsor Plant
Field Surveys: CRA

LEGEND:
A Map Reference
B Mapped Streams
C River / Stream
D River / Stream indefinite
E Ditch
F Proposed Extraction Area
G Proposed Stockpiles
H Waterbodies

Map Reference
Ephemeral Drainage channel with intermittent flow

Beaver pond

Drainage channel

Drainage channel

Step Pools

Channeless drainage

1st beaver dam

2nd beaver dam

Legend

- Stream
- Stream indefinite
- Ditch
- Pond
- Wetland Area
- Proposed Extraction Area
- Proposed Stockpiles

HABITAT SURVEY - SHAW BROOK
Miller's Creek Extension Project
CGC Inc - Windsor Plant
Avondale, Nova Scotia

Figure 4.5-2

820677K (09) GIS-DA452_Habitat_Survey.mxd August 24, 2009
Figure 4.5-3
HABITAT SURVEY - UNNAMED TRIBUTARY TO AVON RIVER
Miller's Creek Extension Project
CGC Inc - Windsor Plant
Avondale, Nova Scotia

Legend
- Stream
- Stream indefinite
- Ditch
- Pond
- Wetland Area
- Proposed Extraction Area
- Proposed Stockpiles

Photos (P#)
Drainage channel with intermittent flow

HABITAT SURVEY - UNNAMED TRIBUTARY TO ST. CROIX RIVER
Miller's Creek Extension Project
CGC Inc. - Windsor Plant
Avondale, Nova Scotia

Legend
- Photos (P#)
- Pond
- Stream
- Wetland Area
- stream indefinite
- Proposed Extraction Area
- Ditch
- Proposed Stockpiles

figure 4.5-5

820677K (09) GIS-DAS6_HabitatSurvey.mxd August 24, 2009
Habitat Survey - Fish Brook

Miller's Creek Extension Project
CGC Inc. - Windsor Plant
Belmont, Nova Scotia

Legend:
- Photos (P#)
- Pond
- Stream
- Stream indefinite
- Wetland Area
- Proposed Extraction Area
- Ditch
- Proposed Stockpiles

Figure 4.5-6

Aquamarsh
Beaver pond
Braided surface flow
Drainage channel with intermittent flow

gis-d4466_habitat_survey.mxd August 24, 2009

8236778 (08) GIS-DA46_Habitat_Survey.mxd August 24, 2009
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<td>Baseflow reduction at SW-18 from 0.63 L/s (existing) to 0.36 L/s, i.e. -43%</td>
<td>Surface water runoff volume reduction of 9%.</td>
<td>Continue to monitor flow. Controlled release of surface water from settling ponds to maintain pre-development flows.</td>
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<td>Baseflow reduction at SW-17 from 3.03 L/s (existing) to 2.36 L/s, i.e. -22%</td>
<td>Surface water runoff volume reduction of 14%.</td>
<td>Continue to monitor flow. Controlled release of surface water from settling ponds to maintain pre-development flows.</td>
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Notes:
N/A - CGC catchments not defined since no aerial disturbance will occur in these subcatchments
Refer to Figure C.4 in Appendix C.1 for CRA/CGC subcatchment delineation
Refer to Figure C.5 in Appendix C.1 for 20-year subcatchment delineation
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<tr>
<td></td>
<td>52</td>
<td>SW-07</td>
<td>-</td>
<td>5-2</td>
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<td>5-3</td>
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<td>6</td>
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<td>Surface water runoff volume reduction of 13%.</td>
<td>Continue to monitor flow. Controlled release of surface water from settling ponds to maintain pre-development flows.</td>
</tr>
<tr>
<td></td>
<td>62</td>
<td>SW-02, SW-03</td>
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<td>63</td>
<td>SW-01</td>
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Notes:
- N/A - CGC catchments not defined since no aerial disturbance will occur in these subcatchments
- Refer to Figure C.4 in Appendix C.1 for CRA/CGC subcatchment delineation
- Refer to Figure C.6 in Appendix C.1 for 40-year subcatchment delineation
<table>
<thead>
<tr>
<th>Watershed</th>
<th>CGC Catchment #</th>
<th>CRA Subcatchment #</th>
<th>Flow Monitoring Location</th>
<th>Outlet #</th>
<th>Groundwater Model Results</th>
<th>Hydrologic Model Results</th>
<th>Conclusions and Suggested Mitigation Options</th>
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<td>3</td>
<td>31</td>
<td>31</td>
<td>-</td>
<td>3-1</td>
<td>Baseload reduction at SW-18 from 0.63 L/s (existing) to 0.36 L/s, i.e. -43%</td>
<td>Surface water runoff volume reduction of 9%.</td>
<td>Continue to monitor flow. Controlled release of surface water from settling ponds to maintain pre-development flows.</td>
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<tr>
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<td>32</td>
<td>SW-18</td>
<td>3-3</td>
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<td>34</td>
<td>SW-17</td>
<td>3-2</td>
<td>Baseload reduction at SW-17 from 3.03 L/s (existing) to 1.70 L/s, i.e. -44%</td>
<td>Surface water runoff volume reduction of 15%.</td>
<td>Continue to monitor flow. Controlled release of surface water from settling ponds to maintain pre-development flows.</td>
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<tr>
<td>4</td>
<td>41</td>
<td>41</td>
<td>SW-15, SW-16</td>
<td>4-1</td>
<td>No effect</td>
<td>No effect</td>
<td>No predicted effects.</td>
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<td>42</td>
<td>SW-14</td>
<td>4-2</td>
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<td></td>
<td>43</td>
<td>SW-13</td>
<td>4-3</td>
<td>Negligible baseload reduction at SW-11 from 0.30 L/s (existing) to 0.25 L/s, i.e. -16%</td>
<td>No effect</td>
<td>Monitor water level in Highfield Pond, just d/s of SW-11, to ensure that it is not affected by mine development.</td>
</tr>
<tr>
<td></td>
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<td>44</td>
<td>SW-11</td>
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<td></td>
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<td>45</td>
<td>SW-10, SW-12</td>
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<tr>
<td>5</td>
<td>51</td>
<td>51</td>
<td>SW-08, SW-09</td>
<td>5-1</td>
<td>No effect</td>
<td>Surface water runoff volume reduction of 8%.</td>
<td>Continue to monitor flow. Controlled release of surface water from settling ponds to maintain pre-development flows.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>52</td>
<td>SW-07</td>
<td>5-2</td>
<td>No effect</td>
<td>Surface water runoff volume reduction of 6%.</td>
<td>Continue to monitor flow. Controlled release of surface water from settling ponds to maintain pre-development flows.</td>
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<tr>
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<td>53</td>
<td>SW-06</td>
<td>5-3</td>
<td>No effect</td>
<td>Surface water runoff volume reduction of 25%.</td>
<td>Continue to monitor flow. Controlled release of surface water from settling ponds to maintain pre-development flows.</td>
</tr>
<tr>
<td>6</td>
<td>61</td>
<td>61</td>
<td>SW-02, SW-03</td>
<td>6-1</td>
<td>No effect</td>
<td>Surface water runoff volume reduction of 13%.</td>
<td>Continue to monitor flow. Controlled release of surface water from settling ponds to maintain pre-development flows.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>62</td>
<td>SW-01</td>
<td>6-2</td>
<td>Baseload reduction at SW-01 from 2.21 L/s (existing) to 0 L/s, i.e. -100%</td>
<td>Surface water runoff volume reduction of 45%.</td>
<td>Continue to monitor flow. Controlled release of surface water from settling ponds to maintain pre-development flows.</td>
</tr>
</tbody>
</table>

Notes:
N/A - CGC catchments not defined since no aerial disturbance will occur in these subcatchments
Refer to Figure C.4 in Appendix C.1 for CRA/CGC subcatchment delineation
Refer to Figure C.7 in Appendix C.1 for end of mine life (70-year) subcatchment delineation
<table>
<thead>
<tr>
<th>Species</th>
<th>Current Total Number of specimens(^1) known on Project site</th>
<th># to be removed(^2)</th>
<th>Location of Specimens</th>
<th># to be removed(^2)</th>
<th>Location of Specimens</th>
<th># to be removed(^2)</th>
<th>Location of Specimens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow lady’s-slipper</td>
<td>7936</td>
<td>1877</td>
<td>Wetland 1m northeastern southeastern edges of proposed Pit</td>
<td>1571</td>
<td>Centre of Project site, near historically mined areas</td>
<td>300</td>
<td>Along Shaw Brook, above Dump Pond</td>
</tr>
<tr>
<td>Black ash</td>
<td>37</td>
<td>19</td>
<td>Wetlands 1 and 2</td>
<td>0</td>
<td>N/A</td>
<td>5</td>
<td>Wetlands 8 and 10</td>
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<tr>
<td>Canada buffalo-berry</td>
<td>447</td>
<td>0</td>
<td>N/A</td>
<td>195</td>
<td>Centre of Project site, near historically mined areas</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Solorina saccata</td>
<td>303</td>
<td>53</td>
<td>West of Wetland 1</td>
<td>0</td>
<td>N/A</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Collema cristatum var.</td>
<td>3 locations (each &lt;9m(^2))</td>
<td>1 location (&lt;9m(^2))</td>
<td>West of Wetland 1</td>
<td>0</td>
<td>N/A</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

\(^1\) Number of stems for yellow lady’s-slipper

\(^2\) Numbers of each species within extraction area may fluctuate naturally over time, numbers provided are based on most recent counts (2008)

N/A = Not applicable
<table>
<thead>
<tr>
<th>Wetland ID</th>
<th>Wetland Area (ha)</th>
<th>Wetland Classification</th>
<th>Wetland Description</th>
<th>Wetland Functions (Hydrological, Biogeochemical, Habitat)</th>
<th>Relative Importance of Wetland Functions to Ecosystem</th>
<th>Wetland Hydrology (Water Budget)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.22</td>
<td>Treed basin swamp and marsh complex</td>
<td>Treed swamp; mineral soils, some peat accumulation; semi-disturbed through deforestation, logging and disturbance from skidder trails; beaver dam present</td>
<td>Storm water moderation; Water quality treatment; Nutrient and organic export; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Moderate Biogeochemical: Moderate Habitat: Moderate</td>
<td>Input: groundwater (springs); precipitation run-off: Wetland 4 Output: tributary of Shaw Brook; evaporation</td>
</tr>
<tr>
<td>2</td>
<td>0.12</td>
<td>Treed basin swamp</td>
<td>Mineral soils, some peat accumulation; sinkhole; long, narrow and shallow hummocky pool situated in a small valley between two small ridges</td>
<td>Storm water moderation; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Negligible Biogeochemical: Negligible Habitat: Negligible</td>
<td>Input: precipitation run-off Output: evaporation</td>
</tr>
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<td>3</td>
<td>0.03</td>
<td>Isolated basin marsh</td>
<td>Situated in closed shallow basin, sinkhole; some emergent vegetation around well-defined edge</td>
<td>Water quality treatment; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Negligible Biogeochemical: Negligible Habitat: Negligible</td>
<td>Input: precipitation run-off Output: evaporation</td>
</tr>
<tr>
<td>4</td>
<td>0.34</td>
<td>Treed basin swamp and marsh complex</td>
<td>Mostly basin marsh; mineral soils, some peat accumulation; semi-disturbed through deforestation; logging and disturbance from skidder trails; beaver evidence</td>
<td>Storm water moderation; Water quality treatment; Nutrient and organic export; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Low Biogeochemical: Low Habitat: Moderate</td>
<td>Input: intermittent streams; precipitation run-off Output: Wetland 3; evaporation</td>
</tr>
<tr>
<td>5</td>
<td>0.12</td>
<td>Isolated basin marsh</td>
<td>Situated in closed shallow basin; some emergent vegetation around well-defined edge</td>
<td>Water quality treatment; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Negligible Biogeochemical: Negligible Habitat: Negligible</td>
<td>Input: precipitation run-off Output: evaporation</td>
</tr>
<tr>
<td>6</td>
<td>0.19</td>
<td>Isolated basin marsh</td>
<td>Situated in closed shallow basin; some emergent vegetation around well-defined edge</td>
<td>Water quality treatment; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Negligible Biogeochemical: Negligible Habitat: Negligible</td>
<td>Input: precipitation run-off Output: evaporation</td>
</tr>
<tr>
<td>7</td>
<td>0.17</td>
<td>Isolated basin marsh</td>
<td>Situated in closed shallow basin, some emergent vegetation around well-defined edge</td>
<td>Water quality treatment; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Negligible Biogeochemical: Negligible Habitat: Moderate</td>
<td>Input: precipitation run-off Output: evaporation</td>
</tr>
<tr>
<td>8</td>
<td>0.02</td>
<td>Isolated basin marsh</td>
<td>Situated in closed shallow basin, sinkhole; some emergent vegetation around well-defined edge</td>
<td>Water quality treatment; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Negligible Biogeochemical: Negligible Habitat: Negligible</td>
<td>Input: precipitation run-off Output: evaporation</td>
</tr>
<tr>
<td>9</td>
<td>0.09</td>
<td>Isolated basin marsh</td>
<td>Situated in closed shallow basin; some emergent vegetation around well-defined edge</td>
<td>Water quality treatment; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Negligible Biogeochemical: Negligible Habitat: Low</td>
<td>Input: precipitation run-off Output: evaporation</td>
</tr>
<tr>
<td>10</td>
<td>0.72</td>
<td>Treed basin swamp</td>
<td>Mineral soils, some peat accumulation; semi-disturbed through deforestation, logging and disturbance from skidder trails</td>
<td>Storm water moderation; Water quality treatment; Nutrient and organic export; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Low Biogeochemical: Low Habitat: Moderate</td>
<td>Input: groundwater (seepage); two intermittent surface water inflows; precipitation run-off Output: intermittent stream; evaporation</td>
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<td>11</td>
<td>0.04</td>
<td>Isolated basin marsh</td>
<td>Situated in closed shallow basin, sinkhole; some emergent vegetation around well-defined edge</td>
<td>Water quality treatment; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Negligible Biogeochemical: Negligible Habitat: Negligible</td>
<td>Input: precipitation run-off Output: evaporation</td>
</tr>
<tr>
<td>12</td>
<td>1.53</td>
<td>Treed basin swamp</td>
<td>Mineral soils, some peat accumulation; semi-disturbed through deforestation, logging and disturbance from skidder trails; beaver evidence</td>
<td>Storm water moderation; Water quality treatment; Nutrient and organic export; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Moderate Biogeochemical: Moderate Habitat: High</td>
<td>Input: precipitation run-off Output: small intermittent tributary of Shaw Brook; evaporation</td>
</tr>
<tr>
<td>13</td>
<td>0.26</td>
<td>Isolated basin marsh</td>
<td>Situated in closed shallow basin; some emergent vegetation around well-defined edge</td>
<td>Storm water moderation; Water quality treatment; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Low Biogeochemical: Low Habitat: Low</td>
<td>Input: precipitation run-off, intermittent stream Output: intermittent stream; evaporation</td>
</tr>
<tr>
<td>14</td>
<td>0.05</td>
<td>Isolated basin marsh</td>
<td>Situated in closed shallow basin; some emergent vegetation around well-defined edge</td>
<td>Water quality treatment; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Negligible Biogeochemical: Negligible Habitat: Negligible</td>
<td>Input: precipitation run-off Output: evaporation</td>
</tr>
<tr>
<td>15</td>
<td>0.60</td>
<td>Shallow water wetland</td>
<td>Emergent vegetation around well-defined edge; semi-disturbed through deforestation, logging and disturbance from skidder trails; dammed by road and beaver</td>
<td>Storm water moderation; Possible ground water recharge; Water quality treatment; Nutrient and organic export; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Moderate Biogeochemical: Moderate Habitat: Moderate</td>
<td>Input: groundwater; seepage from Wetland 15; precipitation run-off Output: stream to wetland off-site; evaporation</td>
</tr>
<tr>
<td>16</td>
<td>0.86</td>
<td>Treed basin swamp</td>
<td>Mineral soils, some peat accumulation; semi-disturbed through deforestation, logging and disturbance from skidder trails; dammed by road and beaver</td>
<td>Storm water moderation; Possible ground water recharge; Water quality treatment; Nutrient and organic export; Carbon sequestration and storage; Biological productivity and biodiversity</td>
<td>Hydrological: Moderate Biogeochemical: Moderate Habitat: Moderate</td>
<td>Input: – possible groundwater recharge; precipitation run-off Output: – possible groundwater recharge; evaporation</td>
</tr>
<tr>
<td>17</td>
<td>0.06</td>
<td>Unclassified Old mine pit</td>
<td>Old mine pit; very little soil accumulation, mostly rocky sides and bottom; depth &gt;2m; low primary productivity (clear water)</td>
<td>Storm water moderation; Water quality treatment; Biological productivity and biodiversity</td>
<td>Hydrological: Low Biogeochemical: Low Habitat: Negligible</td>
<td>Input: – possible groundwater recharge; precipitation run-off Output: – possible groundwater recharge; evaporation</td>
</tr>
<tr>
<td>18</td>
<td>0.06</td>
<td>Unclassified Old mine pit</td>
<td>Old mine pit; very little soil accumulation, mostly rocky sides and bottom; depth &gt;2m, very little organics; low primary productivity</td>
<td>Storm water moderation; Water quality treatment; Biological productivity and biodiversity</td>
<td>Hydrological: Low Biogeochemical: Low Habitat: Negligible</td>
<td>Input: – possible groundwater recharge; precipitation run-off Output: – possible groundwater recharge; evaporation</td>
</tr>
</tbody>
</table>

* Based on Canadian Wetland Classification System (National Wetlands Working Group, 1997)
* Based on Wetland Ecological Functions Assessment: An Overview of Approaches (Atlantic Region; Environment Canada, 2008)
* High: Important at landscape/watershed level; Moderate: Important at sub-watershed level; Low: Important to immediate surroundings of wetland (< 30 m); Negligible: Little importance beyond wetland boundary

820677K (9)
TABLE 4.4-2: SUMMARY OF MITIGATION OPTIONS TO MINIMIZE PROJECT-RELATED IMPACTS TO AVOIDED WETLANDS

<table>
<thead>
<tr>
<th>Wetland ID</th>
<th>Wetland Classification</th>
<th>Wetland Area (ha)</th>
<th>Mitigative Options to Maintain Annual and Interannual Hydroperiods for Streams and Wetlands</th>
<th>Mitigative Options to Reduce Sediment Discharge from Mining Activities</th>
</tr>
</thead>
</table>
| 12         | Mixed-Wood Treed Basin Swamp | 1.53             | • Install data loggers to monitor soil moisture levels  
• Control release of surface water from settling ponds to maintain pre-development soil moisture levels and hydrological input | • Maintain 30 m buffer area around Wetland  
• Partially buried, water-permeable silt fencing around buffer area  
• Annual spring maintenance of silt fencing |
| 13         | Isolated Basin Marsh | 0.26             | • Install water level meters to measure and maintain pre-development water levels  
• Control release of surface water from settling ponds to maintain pre-development water levels and hydrological input | • Maintain 30 m buffer area around Wetland  
• Partially buried, water-permeable silt fencing around buffer area  
• Annual spring maintenance of silt fencing |
| 14         | Isolated Basin Marsh | 0.05             | • Install water level meters to measure and maintain pre-development water levels  
• Control release of surface water from settling ponds to maintain pre-development water levels and hydrological input | • Maintain 30 m buffer area around Wetland  
• Partially buried, water-permeable silt fencing around buffer area  
• Annual spring maintenance of silt fencing |
| 15         | Shallow Water Wetland | 0.60             | • Install water level meters piezometres to measure and maintain pre-development water levels  
• Control release of surface water/groundwater from settling ponds as required to maintain pre-development water levels and hydrological input  
• Installation of temporary cofferdam to shore-up the old-logging/mining road  
• Placement of culvert to control water flow to Wetland 16 | • Maintain 30 m buffer area around wetland, where possible  
• Silt fencing in water along northeast edge of wetland  
• Partially buried, water-permeable silt fencing around buffer area  
• Annual spring maintenance of silt fencing |
| 16         | Mixed-Wood Treed Basin Swamp | 0.86             | • Install data loggers and piezometres to monitor soil moisture and groundwater inputs  
• Control release of surface water/groundwater from settling ponds to maintain pre-development soil moisture levels and hydrological input  
• Control water flow from Wetland 16 | • Maintain 30 m buffer area around Wetland  
• Partially buried, water-permeable silt fencing around buffer area  
• Annual spring maintenance of silt fencing |