

LUNARLIGHT LP Post Construction Monitoring Report

LunarLight Solar Project

A Monitoring Report in accordance with the commitments outlined in the project Natural Heritage Assessment.



September 09, 2015 – 15-1664

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1.0 Project Information

In accordance with the commitments outlined in the LunarLight Natural Heritage Assessment (NHA) Environmental Impact Study (EIS) (Dillon Consulting Limited, 2012), one-year of postconstruction amphibian monitoring was required to reassess significant amphibian breeding habitats located within 120 m of the project location.

The purpose of the post-construction monitoring was to reassess these amphibian breeding habitats previously evaluated as significant (ABH1, ABH2, ABH3, ABH4, ABH5, and ABH6) and confirm if those habitats are still being utilized at levels equal to pre-construction densities as recorded during initial 2011 studies.

1.1 Monitoring Strategy and Methods for Significant Amphibian Breeding Habitat

Table 12 (Environmental Effects Monitoring Plan) (see *Appendix A*) in the LunarLight NHA EIS overviews the requirements for one year of post-construction amphibian surveys to determine if species presence, abundance and richness is not significantly different from pre-construction levels. The monitoring was conducted according to the Marsh Monitoring Program methodology described in Section 6.5.3.1 of the NHA Evaluation of Significance Report (Dillon Consulting Limited, 2012) and is outlined in Section 2.0 of this report.



2.0 **2015 Post-Construction Monitoring**

2.1 Monitoring of Significant Amphibian Breeding Habitat (ABH1-ABH6)

Six areas of wetland amphibian breeding habitat (ABH1-ABH6), identified based on ELC surveys and identification of appropriate habitat characteristics in delineated wetland areas during the NHA studies, were confirmed to be significant in the NHA submitted to the Ministry of Natural Resources and Forestry (MNRF).

2.1.1 Amphibian Monitoring Methods

For each of the six (6) habitat areas to be assessed post-construction, it was determined that one (1) point count location would be sufficient to cover the full extent of the habitat due to their relatively small size (see figure in *Appendix B* and photos in *Appendix C*). Where necessary, the point count locations used in 2011 were relocated to avoid overlapping results and to place the observer outside of the solar facility perimeter fencing. Survey locations were kept as identified in 2011 where possible.

Amphibian monitoring followed the Marsh Monitoring Program protocol (Bird Studies Canada, 2009). Three different surveys were conducted between April 15th and June 30th, with at least two weeks between each survey. Surveys began at least one half hour after sunset during evenings with a minimum night temperature of 5°C, 10°C and 17°C for each of the three respective surveys.

Each amphibian survey involved standing at a predetermined station (i.e., a candidate amphibian breeding habitat) and listening for amphibian calls. The calling activity of individuals estimated to be within 100 metres of the observation point was documented. All individuals beyond 100 metres were recorded as outside of the count circle and calling activity was not recorded. Calling activity was ranked using one of the following three abundance code categories:

- Code 1: Calls not simultaneous, number of individuals can be accurately counted
- Code 2: Some calls simultaneous, number of individuals can reliably be estimated
- Code 3: Calls continuous and overlapping, number of individuals cannot be estimated (i.e., chorus)

In areas where appropriate habitat existed, the areas were examined using non-intrusive methods (visual) for egg masses and amphibian larvae. The diversity and abundance of amphibian species observed was noted and considered during the evaluation of whether the habitat is not significantly different from pre-construction levels.

2.1.2 Amphibian Monitoring Results

Monitoring the use of previously evaluated significant amphibian breeding habitat by breeding amphibians at the LunarLight Project consisted of a series of three (3) surveys that were completed on April 21, May 28 and June 22, 2015. Conditions for the three surveys were determined to be appropriate according to the monitoring methods outlined above, and are summarized in **Table 1**.

				End Time	Weather Conditions						
Date (2015)	Surveyors	Sunset	Start Time		Ambient Air Temperature (°C)	Wind (Beaufort Scale)	Cloud Cover (%)	Precipitation			
April 21	Mike Wolosinecky	20:01	20:30	21:44	8	1	30	None			
May 28	Jonathan Harris	20:41	21:11	21:58	24	0	20	None			
June 22	Jonathan Harris	20:56	21:26	22:09	22	1	100	Drizzle			

TABLE 1: SURVEY DATES AND WEATHER CONDITIONS FOR AMPHIBIAN MONITORING AT LUNARLIGHT

Results of the 2015 monitoring are presented in **Table 2** which also contains a comparison with the 2011 NHA results.

The criteria used to assess the significance of the habitat in the 2012 NHA Evaluation of Significance Report, was based on the Significant Wildlife Habitat Ecoregion Criteria Schedules (MNRF, 2012). Under the Ecoregion 6E Criteria Schedule, the presence of three or more species with at least 20 breeding individuals (adults, juveniles, eggs/larval masses) must be observed to consider the habitat 'significant'.

Using the data collected in 2015, the habitat was again evaluated using the 2012 criteria schedules. This information is summarized in **Table 2**.



IAD	LE 2: COMPARISON	OF 2011 AND 2015 AMPHIBIAN MO	NITOR				
Habitat	Composition	Results of the 2011 NHA Survey	Significant	Not Significant	Results of the 2015 NHA Survey	Significant	Not Significant
ABH1	2.03 ha of Wetland Community	 During amphibian breeding surveys in 2011, the call of five amphibian species were heard, including: American Toad (9 males) Spring Peeper (22 males) Gray Treefrog (41 males) Northern Leopard Frog (7 males) Green Frog (1 male) No egg masses were observed within this habitat. Tadpoles were observed within this habitat. 	~	_	 During amphibian breeding surveys in 2015, the call of four amphibian species were heard, including: Wood Frog (6 males) Spring Peeper (5 males, 2 full choruses) Gray Treefrog (6 males) Pickerel Frog (2 males) Green Frog (11 males) No egg masses were observed within this habitat. 	✓	_
ABH2	0.57 ha of Narrow-leaved Sedge Mineral Meadow Marsh	 During amphibian breeding surveys in 2011, the call of four amphibian species were heard, including: Spring Peeper (15 males) Green Frog (1 male) Gray Treefrog (2 males) Northern Leopard Frog (4 males) No egg masses were observed within this habitat. 	✓	_	During amphibian breeding surveys in 2015, the call of four amphibian species were heard, including: • Spring Peeper (7 males) • Green Frog (2 males) • Wood Frog (3 males) • Pickerel Frog (1 male) No egg masses were observed within this habitat.	_	✓
ABH3	0.33ha of Narrow-leaved Sedge Mineral Meadow Marsh and 0.36ha of Cattail Mineral Shallow Marsh *note, wetland was dry in April of 2015	 During amphibian breeding surveys in 2011, the call of five amphibian species were heard, including: American Toad (12 males) Spring Peeper (10 males) Green Frog (4 males) Gray Treefrog (9 males) Northern Leopard Frog (5 males) No egg masses were observed within this habitat. 	~	_	During amphibian breeding surveys in 2015, no amphibian calls were heard in this habitat. No egg masses were observed within this habitat.	-	¥



Habitat	Composition	Results of the 2011 NHA Survey	Significant	Not Significant	Results of the 2015 NHA Survey	Significant	Not Significant
ABH4	0.37ha Narrow- leaved Sedge Mineral Meadow Marsh	During amphibian breeding surveys in 2011, the call of three amphibian species were heard, including: American Toad (1 male) Green Frog (4 males) Gray Treefrog (2 males) Egg masses were observed within this habitat.	~	_	During amphibian breeding surveys in 2015, the call of four amphibian species were heard, including: American Toad (2 males) Green Frog (6 males) Wood Frog (3 males) Spring Peeper (4 males) No egg masses were observed within this habitat.	_	~
ABH5	0.31ha of Ash Mineral Deciduous Swamp	 During amphibian breeding surveys in 2011, the call of four amphibian species were heard, including: Spring Peeper (3 males) American Toad (3 males) Gray Treefrog (23 males) Northern Leopard Frog (2 males) No egg masses were observed within this habitat. 	~	_	During amphibian breeding surveys in 2015, the call of one amphibian species was heard: • Spring Peeper (3 males) No egg masses were observed within this habitat.	_	~
ABH6	0.15ha of Sedge Mineral Meadow Marsh	 During amphibian breeding surveys in 2011, the call of five amphibian species were heard, including: American Toad (5 males) Spring Peeper (4 males, 2 full choruses) Green Frog (4 males) Gray Treefrog (7 males) Northern Leopard Frog (1 male) Egg masses were observed within this habitat 	¥	-	During amphibian breeding surveys in 2015, the call of three amphibian species were heard, including: • Wood Frog (7 males) • Spring Peeper (6 males) • Green Frog (3 males) No egg masses were observed within this habitat.	_	¥

During the 2015 surveys more than 20 breeding individuals comprised of four amphibian species were observed in ABH1. Based on this, the species presence, abundance and richness for amphibians in ABH1 is similar to the pre-construction levels and ABH1 remained significant through construction and into the first year of operation of the solar project.



The remaining amphibian breeding habitats were found to be under the requirement for number of species and general abundance and would be evaluated as not significant based on the 2015 results.

Based on this, it appears that, and for all other habitats (ABH2, ABH3, ABH4, ABH5 and ABH6), the species presence, abundance and richness for amphibians is different from preconstruction levels. In most cases, the recorded abundance was lower in 2015 than in 2011. In ABH3 and ABH5, there was also a decrease in the number of species detected.

Historical climate data was examined for overall precipitation received by the project area for 2011 and 2015 (Canadian Climate Data, Environment Canada). The data suggests that the LunarLight project location received a much higher amount of rainfall preceding and during the amphibian monitoring surveys in 2011 than in 2015, which may have had an effect on amphibian presence and abundance in the area. Further evidence of this is included in *Appendix C* in the representative photographs taken of the habitat areas in April 2015. This data is summarized in **Table 3** below.

Time Period	2011 Precipitation (mm)	2015 Precipitation (mm)
Month of March	127.2	24.9
Month of April	126.9	66.9
Month of May	93.9	46.8
Month of June	81.8	150.2
TOTAL	429.8	288.8

TABLE 3: COMPARISON OF 2011 AND 2015 PRECIPITATION RECORDED AT BELLEVILLE WEATHER STATION



3.0 Summary

To meet the commitments outlined in the LunarLight NHA EIS (Dillon Consulting Limited, 2012), one-year of post-construction monitoring was carried out at the facility to assess the longevity of the significant wildlife habitat evaluated prior to the project's construction. The purpose of the post-construction monitoring was to determine if species presence, abundance and richness was significantly different from pre-construction levels for the habitat evaluated as significant Amphibian Breeding Habitat (ABH1-ABH6).

The amphibian breeding habitat, ABH1, in the LunarLight Project site was evaluated as significant based on the data collected prior to construction in 2011 and post-construction in 2015. The remaining amphibian habitats (ABH2, ABH3, ABH4, ABH5 and ABH6) were identified as significant in the NHA Evaluation of Significance Report (Dillon Consulting Limited, 2012), however did not meet the criteria for significance based on data collected during the 2015 post-construction surveys. Despite no longer meeting the criteria for significance, the previously evaluated significant habitats appeared to remain intact and did not exhibit signs of disturbance related to construction activity.

It should also be noted that historical weather records indicate the project area received a higher amount of precipitation in the periods preceding and during the initial amphibian monitoring surveys performed in 2011 than the surveys performed in 2015.

As committed to in the NHA EIS (Dillon Consulting Limited, 2012) and required under condition J of the Renewable Energy Approval (REA#3968-9AHRNA), LunarLight LP is required to submit this report to the Director, MOECC and the MNRF for information purposes only within 10 days of its completion. Should the MNRF wish to discuss the results of this report further, the NHA EIS commits the proponent only to consultation regarding the results.

If you have any questions about the content of this report, please contact Jennifer Petruniak at 416-671-6825 or at jpetruniak@dillon.ca.

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4.0 **References**

- Bird Studies Canada. 2009. Marsh Monitoring Program Participant's Handbook for Surveying Amphibians, 2009 Edition. 13 pages. Published by Bird Studies Canada in cooperation with Environment Canada and the U.S. Environmental Protection Agency. February 2009.
- Dillon Consulting Limited. 2012. LunarLight Natural Heritage Assessment Environmental Impact Study.
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- Ontario Ministry of Natural Resources. February 2012. Significant Wildlife Habitat Ecoregion Criteria Schedules. Addendum to Significant Wildlife Habitat Technical Guide. Working Draft. 73pp.



Appendix A

Environmental Effect Monitoring Plan







Table 12: Environmental Effects Monitoring Plan

Potential Positive/Negative Environmental Effects		Significant/							
Physical	Functional	Provincially Significant Natural Feature(s) Affected by Activity	Performance Objective	Mitigation Measure	Monitoring Strategy & Methods	Monitoring Locations	Frequency & Duration	Reporting Requirements	Contingency Measures
Site Preparation and Cons	struction								
Removal of 1.86 ha of Old Field meadow and 3.26 ha of Cultural Woodland during clearing, grubbing and grading of project location	 Loss of breeding and foraging habitat Reduction of habitat Change in land topography associated with vegetation clearing, grubbing and subsequent surficial grading Change in surface water run-off volumes/patterns Potential to changes in water quality Increased vulnerability of cleared areas to invasion by non-native species 	Candidate Significant Amphibian Movement Corridor* Amphibian Breeding Habitats (ABH1, ABH2, ABH3, ABH4, ABH5, ABH6) Candidate Significant Turtle Over-wintering Area* (TOW1 and TOW2) Wetland Units (1, 3, 4, 6, 7, 8) Woodland Unit B Candidate Significant Reptile Hibernacula* (RH1 and RH2) Generalized	 Maintain overall site drainage patterns No excessive mortality of tree species exposed to edge effects after vegetation clearing Ensure surface water flow is maintained to the wetland areas to prevent abnormal water level fluctuations for amphibian breeding habitat and turtle over- wintering area Minimize soil exposure and erosion to adjacent lands 	 Erosion and Sediment Control Minimize soil exposure Install erosion and sediment control measures prior to vegetation clearing, grubbing and grading to prevent mobilization of sediment from the project location into the surrounding landscape Restrict vegetation clearing to only within project location Stormwater Management Develop and implement a water flow management plan to ensure drainage patterns are not significantly altered from existing conditions due to road drainage, reduction in surface permeability, etc. Vegetation Considerations Limit the use of heavy machinery within 5 m of the dripline of the woodland/ swamp wetland to prevent soil compaction Limit vegetation clearing outside of the core bird breeding period (May 1 to July 15) to avoid 	Monitor erosion and sediment control measures regularly during site preparation and construction Monitor effectiveness of water flow management measures; ensure flow is free of sedimentation Visual assessment of edge vegetation One year post- construction amphibian and reptile surveys to determine species presence, abundance and richness is not significantly different from pre- construction levels (should amphibian and reptile habitat be evaluated as significant after pre-construction studies are undertaken as per methodology in	Around the perimeter of project location where ESC measures are implemented Monitor for evidence of erosion/ sedimentation to the wetland areas supporting ABH1, ABH2, ABH3, ABH4, ABH4, ABH5, and ABH6 ABH4, ABH1, ABH2, ABH3	Monitor ESC measures regularly during construction Post- construction ESC monitoring to occur monthly or after rain events 10 mm or greater until vegetation is re-established Amphibian and reptile surveys to be conducted during first appropriate season post- construction	ESC inspection checklist log compiled for each monitoring event Submitted to the MOE at the end of the construction phase Amphibian and reptile survey results to be submitted to the MNR for information purposes only	Repair deficiencies in ESC structures as soon as possible upon notification of breach in E&SC structure and buffer fencing Appropriate replacement of wetland vegetation in ABH1, ABH2, ABH3, ABH4, ABH5, and ABH6 if a high degree of sedimentation occurs or excessive (more than 50%) vegetation mortality is observed If use of habitat is not documented at levels equal to pre-construction densities, consultation with the MNR will be undertaken to discuss results.
		Candidate Significant Wildlife Habitat		disturbance to breeding birds; if any vegetation clearing must occur during this period a qualified biologist will conduct	Appendix A).	according to Marsh Monitoring Protocol (see			



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UMAR (*) UEB

	S O L A R								
Potential Positive/Negat	tive Environmental Effects	Significant/							
		Provincially							
Physical	Functional	Significant Natural Feature(s) Affected by Activity	Performance Objective	Mitigation Measure	Monitoring Strategy & Methods	Monitoring Locations	Frequency & Duration	Reporting Requirements	Contingency Measures
				 nest searches prior to clearing <u>Wildlife</u> Check engines for snakes and other wildlife regularly before machinery use Visual monitoring for wildlife species and avoidance where encountered Minimize vehicular speeds in the project location 		Appendix A)			
Removal of rock pile snake hibernaculum	 Reduction in habitat Disturbance/ displacement of species Incidental mortality of species 	Candidate Significant Reptile Hibernacula* (RH3)	Minimize disturbance to reptiles	 If removal of feature is permitted, conduct removal of rock pile during the summer months when it is least likely to be used as winter cover. If removal of feature is not feasible, project components will be setback from the feature at a distance agreed upon with the MNR. If the feature persists in the project location, the following mitigation measures will occur throughout the life cycle of the project: Conduct removal of rock pile during the summer months when it is least likely to be used as winter cover Conduct searches in the area before grading in order to remove snakes according to safe handling procedures for snakes developed in consultation with the MNR and conducted by a qualified biologist Minimize vehicular speeds in the project location Regular engine checks for snake presence before use of machinery during construction 	Visual surveys will be undertaken by a qualified biologist during the removal of rock structure. All material to be removed from the project location will be inspected for reptiles and will be immediately removed from the construction area (i.e., not stockpiled elsewhere)	At RH3	Inspection of feature during removal during construction stage	Survey results for reptiles during rock removal to be submitted to the MNR for information purposes only	If sensitive species are encountered, activities will cease and consultation will be undertaken with the MNR.



Natural Heritage Assessment Environmental Impact Study Report May 2012

Appendix B

Figures

LunarLight LP Post Construction Monitoring Report September 09, 2015 – 15-1664





Created By: GM/SFG Checked By: JH/SR Date Created: 2/16/2012 Date Modified: 7/24/2015 File Path: I\GIS\151664 LunarLight LP\ Mapping\Survey Locations\

Appendix C

Habitat Photographs

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c Habitat Photographs **C** - 2





c Habitat Photographs C - 3









