



*Treasury Metals  
Revised EIS Report  
Goliath Gold Project  
April 2018*



# **APPENDIX I**

## **LIGHT ENVIRONMENT STUDY**

## NOTE TO READER APPENDIX I

In April 2015, Treasury Metals submitted an Environmental Impact Statement (EIS) for the proposed Goliath Gold Project (the Project) to the Canadian Environmental Assessment Agency (the Agency) for consideration under the Canadian Environmental Assessment Act (CEAA), 2012. The Agency reviewed the submission and informed Treasury Metals that the requirements of the EIS Guidelines for the Project were met and that the Agency would begin its technical review of the submission. In June 2015, the Agency issued a series of information requests to Treasury Metals regarding the EIS and supporting appendices (referred to herein as the Round 1 information requests). The Round 1 information requests included questions from the Agency, other federal and provincial reviewers, and members of Indigenous communities, as well as interested stakeholders. As part of the Round 1 information request process, the Agency requested that Treasury Metals consolidate the responses to the information requests into a revised EIS for the Project.

Appendix I to the revised EIS (Light Environment Study) presents the results of the field program to determine and document the baseline light conditions in the vicinity of the Project. The information presented in this appendix was used in describing the existing conditions for light (Section 5.3.2 of the revised EIS). In addition, the baseline light levels were considered in the assessment of effects of the Project for the light component (presented in Section 6.5). No changes have been made to this appendix from the original EIS issued in April 2015.

As part of the process to revise the EIS, Treasury Metals has undertaken a review of the status for the various appendices. The status of each appendix to the revised EIS has been classified as one of the following:

- **Unchanged:** The appendix remains unchanged from the original EIS, and has been re-issued as part revised EIS.
- **Minor Changes:** The appendix remains relatively unchanged from the original EIS, and has been re-issued with relevant clarification.
- **Major Revisions:** The appendix has been substantially changed from the original EIS. A re-written appendix has been issued as part of the revised EIS.
- **Superseded:** The appendix is no longer required to support the EIS. The information in the original appendix has been replaced by information provided in a new appendix prepared to support the revised EIS.
- **New:** This is a new appendix prepared to support the revised EIS.

The following table provides a listing of the appendices to the revised EIS, along with a listing of the status of each appendix and their description.

List of Appendices to the Revised EIS		
Appendix	Status	Description
Appendix A	Major Revisions	Table of Concordance
Appendix B	Unchanged	Optimization Study
Appendix C	Unchanged	Mining Study
Appendix D	Major Revisions	Tailings Storage Facility
Appendix E	Minor Changes	Traffic Study
Appendix F	Major Revisions	Water Management Plan
Appendix G	Superseded	Environmental Baseline
Appendix H	Minor Changes	Acoustic Environment Study
<b>Appendix I</b>	<b>Unchanged</b>	<b>Light Environment Study</b>
Appendix J	Minor Changes	Air Quality Study
Appendix K	Minor Changes	Geochemistry
Appendix L	Superseded	Geochemical Modelling
Appendix M	Minor Changes	Hydrogeology
Appendix N	Unchanged	Surface Hydrology
Appendix O	Superseded	Hydrologic Modeling
Appendix P	Unchanged	Aquatics DST
Appendix Q	Major Revisions	Fisheries and Habitat
Appendix R	Major Revisions	Terrestrial
Appendix S	Major Revisions	Wetlands
Appendix T	Unchanged	Socio-Economic
Appendix U	Minor Changes	Heritage Resources
Appendix V	Major Revisions	Public Engagement
Appendix W	Unchanged	Screening Level Risk Assessment
Appendix X	Major Revisions	Alternatives Assessment Matrix
Appendix Y	Unchanged	EIS Guidelines
Appendix Z	Unchanged	TML Corporate Policies
Appendix AA	Major Revisions	List of Mineral Claims
Appendix BB	Unchanged	Preliminary Economic Assessment
Appendix CC	Unchanged	Mining, Dynamic And Dependable For Ontario's Future
Appendix DD	Major Revisions	Indigenous Engagement Report
Appendix EE	Unchanged	Country Foods Assessment
Appendix FF	Unchanged	Photo Record Of The Goliath Gold Project
Appendix GG	Minor Changes	TSF Failure Modelling
Appendix HH	Unchanged	Failure Modes And Effects Analysis
Appendix II	Major Revisions	Draft Fisheries Compensation Strategy and Plans
Appendix JJ	New	Water Report
Appendix KK	New	Conceptual Closure Plan
Appendix LL	New	Impact Footprints and Effects



CONSULTING ENGINEERS  
& SCIENTISTS

Tel: 519.823.1311  
Fax: 519.823.1316

RWDI AIR Inc.  
650 Woodlawn Road West  
Guelph, Ontario, Canada  
N1K 1B8



## Treasury Metals Inc. - Goliath Gold Project Dryden, Ontario

# Final Report

## Baseline Light Assessment

RWDI #1300747  
August 14, 2013

### SUBMITTED TO:

**Mark Wheeler, P.Eng.**  
Senior Mining Engineer  
[mark@treasurymetals.com](mailto:mark@treasurymetals.com)

**Treasury Metals Inc.**  
130 King Street West, Suite 3680  
PO Box 99, The Exchange Tower  
Toronto, ON M5X 1B1

T: (416) 214-4654

### SUBMITTED BY:

**Nicole Korba, d.E.T.**  
Project Manager  
[Nicole.Korba@rwdi.com](mailto:Nicole.Korba@rwdi.com)

**John DeYoe, B.A., d.E.T.**  
Senior Consultant  
[John.DeYoe@rwdi.com](mailto:John.DeYoe@rwdi.com)

**Carol McClellan, GISP**  
Intermediate Scientist  
[Carol.McClellan@rwdi.com](mailto:Carol.McClellan@rwdi.com)

This document is intended for the sole use of the party to whom it is addressed and may contain information that is privileged and/or confidential. If you have received this in error, please notify us immediately.

© RWDI name and logo are registered trademarks in Canada and the United States of America



CONSULTING ENGINEERS  
& SCIENTISTS

## TABLE OF CONTENTS

---

<b>1. INTRODUCTION.....</b>	<b>1</b>
<b>2. STUDY AREA.....</b>	<b>1</b>
<b>3. ASSESSMENT CRITERIA .....</b>	<b>2</b>
3.1 Illuminance Criteria .....	2
3.2 Relative Brightness Criteria.....	3
<b>4. METHODS .....</b>	<b>3</b>
<b>5. EXISTING CONDITIONS.....</b>	<b>3</b>
5.1 Illuminance .....	3
5.2 Conclusion.....	4
<b>6. SUMMARY .....</b>	<b>4</b>
<b>7. REFERENCES / LITERATURE CITED.....</b>	<b>4</b>

### Tables

---

- Table 1: Illuminance Criteria (LEED)
- Table 2: Sample Relative Brightness Measurements
- Table 3: Baseline Maximum Illuminance Measurements at Receptors

### Figures

---

- Figure 1: Typical Landscape in the Study Area
- Figure 2: Monitoring Locations
- Figure 3: Receptor/Sampling Site #1
- Figure 4: Receptor/Sampling Site #2
- Figure 5: Receptor/Sampling Site #3
- Figure 6: Receptor/Sampling Site #4
- Figure 7: Receptor/Sampling Site #5
- Figure 8: Receptor/Sampling Site #6
- Figure 9: Receptor/Sampling Site #7
- Figure 10a: Receptor/Sampling Site #8
- Figure 10b: Receptor/Sampling Site # 8 (Nighttime)
- Figure 11a: Receptor/Sampling Site # 9
- Figure 11b: Receptor/Sampling Site # 9 (Nighttime)
- Figure 12a: Receptor/Sampling Site # 10
- Figure 12b: Receptor/Sampling Site # 10 (Nighttime)
- Figure 13a: Receptor/Sampling Site # 11
- Figure 13b: Receptor/Sampling Site # 11 (Nighttime)
- Figure 14a: Receptor/Sampling Site # 12
- Figure 14b: Receptor/Sampling Site # 12 (Nighttime)

### Appendices

---

- Appendix A: Light Meter Calibration Certificates
- Appendix B: Field Notes from Light Meter Measurements



CONSULTING ENGINEERS  
& SCIENTISTS

## 1. INTRODUCTION

---

The Treasury Metals Inc. (Treasury) Goliath Gold project (the Project) is located in northwestern Ontario, approximately 125 kilometres (km) east of the City of Kenora, 20 km east of the City of Dryden and 325 km northwest of the City of Thunder Bay. The total area of the Project is 4,991 hectares (50 km<sup>2</sup>) covering portions of Hartman and Zealand townships east of the City of Dryden, Ontario. The purpose of this report is to determine and document the baseline conditions to be used for a light assessment that will be undertaken to evaluate the potential effects of the Project lighting on nearby residences and/or receptors of interest.

As a part of the Project, exterior lighting will be installed for operations, safety and security. The light that escapes the Project site (known as light trespass) can be regarded as a nuisance by property owners immediately adjacent or in relatively close proximity to the Project. The following concepts and definitions are important for this assessment:

- **Illuminance** – the total luminous flux (the perceived power of light) incident on a surface per unit area. Illuminance is measured in lux (luminous power per square metre) and can be thought of as the amount of incident light available to read the text on a piece of paper at a specific location. A casual reading area in the home should reach between 300 and 500 lux, whereas workshop areas or places of intensive reading should reach between 500 and 1,200 lux. Detailed work areas should reach levels of 1,100 to 2,100 lux.
- **Relative brightness** – While illuminance levels can be low at a particular location, bright lights in the distance can still be objectionable to people looking at the light (this issue is also typically discussed as “glare”). Brightness however, is subjective and does not have an accepted industry standard procedure for its measurement in this context. As such, “relative brightness” is used to bring an approximate measure of quantification to this subject. Relative brightness is based on luminance which is a measurable quantity that closely corresponds to brightness as both parameters are significantly dependent on the area and angle from which the light is emitted. Luminance is the luminous intensity (i.e., the power of light energy emitted) per unit area projected in a given direction and a direct line of sight is required for this issue to be of importance. Luminance is measured in candela per square metre (cd/m<sup>2</sup>).

For the baseline light assessment, only measurements of illuminance were taken, which is the appropriate measurement to assess baseline conditions. Note that for this baseline light assessment, relative brightness was not measured as currently exterior lighting for the Project site is not installed.

## 2. STUDY AREA

---

The Project is located in northwestern Ontario, approximately 125 km east of the City of Kenora, 20 km east of the City of Dryden and 325 km northwest of the City of Thunder Bay. The total area of the Project is 4,991 hectares (50 km<sup>2</sup>) covering portions of Hartman and Zealand townships east of the city of Dryden, Ontario.



CONSULTING ENGINEERS  
& SCIENTISTS

The area surrounding the Project site is a mix of mostly forested and some open rural land cover. The topography in the area is generally low, rolling hills, with elevation decreasing along the shoreline of Thunder Lake to the west of the project site, and again along Wabigoon Lake to the west/southwest of the Project site. The closest residences are located along East Thunder Lake Road, which runs along the western edge of the Project property boundary. Additionally, there are other pockets of houses/cottages along the shore of Thunder Lake and Wabigoon Lake further away from the Project site. There does not appear to be any residences located close to the Project site on the east side of the property boundary. Generally, the surrounding area is sparsely populated with land that is heavily treed.

Occupied areas such as residences and cottages in close proximity to the Project are considered to be receptors of interest that could potentially be affected by the light emitted from the Project. Because light intensity decreases significantly with increasing distance (the intensity of light diminishes inversely with the square of distance), receptors farther than 1 km from the Project are generally not considered to be affected. Light impacts (in regard to illuminance and relative brightness) beyond 1 km are typically comparable to general lighting in the vicinity of the receptor (e.g., streetlights, garage lights, etc). Consequently, a light study area (LSA) extending 1 km from the Project boundary area was selected to determine receptors/sampling sites that could be directly impacted by the Project. Additionally, representative receptors on the far side of Thunder Lake were also sampled since the lake body provides an unobstructed line of sight to the Project. Note that this study area refers to the more geographically immediate issues of illuminance, which is the relevant measure for a baseline assessment. Figure 1 is a photograph depicting the typical landscape in the study area.

A total of 12 receptor locations were determined for the purpose of the baseline light assessment. Receptors R1 through R3 are located on / within the Project site boundary, while receptors R4 through R8 and R12 are neighbouring residences or cottages within 1 km of the property boundary on the shoreline of Thunder Lake. Receptors R9 through R11 are the representative receptors for clusters of cottages located on the far (west) shoreline of Thunder Lake from the Project Site, and were grouped for reasons of sharing similar view-scapes and topographic features. The selected receptor/sampling locations are depicted in Figure 2.

### **3. ASSESSMENT CRITERIA**

---

Criteria are typically established by regulatory agencies to specify acceptable levels of a specific parameter (e.g., contaminant levels or lighting levels). In Ontario, there are no provincial guidelines or regulations governing light trespass. Therefore, this assessment relies on information researched from other sources (as described in the following paragraphs).

#### **3.1 Illuminance Criteria**

Lighting criteria for illuminance are available from the U.S. Green Building Council Leadership in Energy and Environmental Design (LEED), Reference Guide for New Construction, Version 2.2 (see Table 1). To put these numbers in context, the Illuminating Engineering Society (IES) of North America recommends a minimum lighting level of 5.4 lux for safety. They also recommend 5 to 22 lux for outdoor pedestrian walkways, and about 100 lux for interior stairways (malls). Interiors of buildings typically measure in the hundreds of lux.



CONSULTING ENGINEERS  
& SCIENTISTS

## 3.2 Relative Brightness Criteria

Although criteria similar to LEED do not exist for relative brightness, estimated Project lighting levels can be compared with levels familiar from daily experience, (e.g., comparing an estimated relative brightness value to that from a full moon or a street light). See Table 2 for sample relative brightness values for familiar light sources.

## 4. METHODS

---

Existing (baseline) conditions represent the current light levels within the LSA. To assess these conditions at the receptors, illuminance data were measured at 12 selected receptor locations as described in Table 3. One sample was taken at each of the 12 sites on July 2, 2013 and again on July 3, 2013 (total of 2 samples per site) between the hours of 10:40pm and 1:00am. Sample site photographs are shown in Figures 3 through 13b. Illuminance measurements were taken in two ways at each location – in a regular/general standing position, and secondly with the light meter directly pointed at any local source of light (i.e.: streetlights or exterior house lighting). Relative brightness measurements in  $\text{cd/m}^2$  (based on luminance) were not specifically collected or assessed for the baseline assessment.

Considering the Project does not currently operate, measured light levels for a baseline assessment are associated with other existing sources.

The area surrounding the Project mainly comprises heavy forest. However, terrain features (e.g., changes in topography) are also common, and can reduce the amount of light reaching the receptor locations.

## 5. EXISTING CONDITIONS

---

To provide an indication of existing conditions, illuminance levels were measured at the selected receptors (see Table 3). Fieldwork in the Project area was conducted overnight on July 2 and July 3, 2013 under a clear sky with light cloud coverage (< 10% cloud cover). The ambient temperature was 22°C on July 2 and 19°C on July 3. The moon visibility was 21% and 14% for each sample date respectively [2]. An International Light Technologies IL1400A light meter was used to record the lighting levels. The light meter unit was rented directly from the manufacturer, and calibrations were performed by the manufacturer prior to the field work. The Calibration Certificate is provided in Appendix A.

### 5.1 Illuminance

Baseline illuminance measurements at the selected receptors (see Table 3) were all below the LEED criteria for rural residential areas (1.1 lux) with the exception of sample sites that were directly influenced by a local light source such as a street light or exterior house light near the measurement location. Any areas, including the three sample sites that were on the Project property, that were away from these types of direct sources were generally measured to be 0.0 lux.





CONSULTING ENGINEERS  
& SCIENTISTS

## 5.2 Conclusion

In conclusion, baseline illuminance measurements at the selected receptors were all below the LEED criteria for rural residential areas (1.1 lux) with the exception of those measurements taken near or directly pointing the light meter at nearby sources of light. Any areas away from local light sources were at or close to a lux value of 0.0.

## 6. SUMMARY

---

Illuminance was assessed for residential receptors located within about 1 km of the expected Project primary light area as well as some representative receptors located across Thunder Lake from the Project site. Current illuminance levels at the receptors are below LEED criteria for rural residential areas with the exception of any sample sites that were located in direct proximity to light sources such as exterior home light or street light.

Illuminance levels decrease rapidly with distance from the light source and, as all the selected receptors are expected to be beyond 500 m of the expected primary Project light sources, it is expected that they will not experience a measurable increase in illuminance levels. Additionally, the surrounding terrain and vegetation (forest) will likely block most, if not all of the direct views of the Project from the various receptors.

## 7. REFERENCES / LITERATURE CITED

---

1. Leadership in Energy and Environmental Design (LEED). Green Building Rating System for New Construction and Major Renovations. Version 2.2: Sustainable Sites, Credit 8. October, 2005.
2. Moon calendar July 2013. <http://www.calendar-365.com/moon/moon-calendar.html>. Accessed on July 2 and 3, 2013.

# TABLES

**Table 1: Illuminance Criteria (LEED)**

<b>Item</b>	<b>Description</b>	<b>Maximum Illuminance (Lux)</b>
Intrinsically dark landscape	Parks	0.0
Low ambient brightness	Outer urban and rural residential areas	1.1
Medium ambient brightness	Urban residential areas	2.2
High ambient brightness	Urban areas with residential and commercial areas	6.5

**Table 2: Sample Relative Brightness Measurements**

<b>Item</b>	<b>Relative Brightness (cd/m<sup>2</sup>)</b>
Street lamp	23,000
Full moon	400
Typical Industrial Facility at 2 km	<10
Car with high beams at 1 km	60

**Table 3:** Baseline Maximum Illuminance Measurements at Receptors

Receptor ID	Observation #	X	Y	Illum (lux) July 2, 2013	Illum (lux) Direct July 2, 2014	Illum (lux) July 3, 2013	Illum (lux) Direct July 3, 2014	Type	Description
R1	1	527822	5511764	0.00	0.00	0.00	0.00	Goliath Gold Site	Center of Proposed Pit
R2	2	528782	5512129	0.00	0.00	0.00	0.00	Goliath Gold Site	East of Proposed Pit
R3	3	528751	5510726	0.00	0.00	0.01	0.00	Goliath Gold Site	Nystrom House on Tree Nursery Road
R4	4	525549	5511888	0.00	0.00	0.01	0.00	Receptor	Field to east of E Thunder Lake Road (Noise Site #1)
R5	5	525760	5512145	2.40	4.00	2.70	4.30	Receptor	249 E. Thunder Lake Road, next to street light on road, edge of pavement and gravel
R6	6	525969	5512235	0.21	3.00	0.21	3.20	Receptor	Measured ~14m from road near the hydro station (SW2), next to street light near location 1A
R7	7	526092	5512473	0.00	0.00	0.00	0.03	Receptor	352 E. Thunder Lake Road
R8	8	526338	5512493	0.00	0.50	0.00	0.00	Receptor	At Noise Site # 2, light from resident, front door light on house
R9	9	521559	5514880	0.00	15.20	0.00	15.10	Receptor	65 Thunder Lake Road. Edge of road pavement to gravel. Pointed at streetlight.
R10	10	522658	5515699	4.40	0.00	4.10	0.00	Receptor	Taken under street light corner of North Shore and Thunder Lake Road (Stop sign)
R11	11	523810	5516134	0.03	0.22	0.02	0.19	Receptor	North side of Thunder Lake, pointed at residence, measured from edge of road, approximately 12m from light source
R12	12	525296	5514963	0.05	0.19	0.02	0.17	Receptor	Johnsons Beach (by Noise Site 3)

# FIGURES

**Figure 1:** Typical Landscape in the Study Area





**Monitoring Locations**

Map Projection: NAD 1983 UTM Zone 15N.



Drawn by: CAM

Figure: 2

Approx. Scale: 1:40,000

Date Revised: July 25, 2013



**Figure 3:** Receptor/Sampling Site #1



**Figure 4:** Receptor/Sampling Site #2





**Figure 5:** Receptor/Sampling Site #3



**Figure 6:** Receptor/Sampling Site #4



**Figure 7:** Receptor/Sampling Site #5



**Figure 8:** Receptor/Sampling Site #6



**Figure 9:** Receptor/Sampling Site #7



**Figure 10a:** Receptor/Sampling Site #8



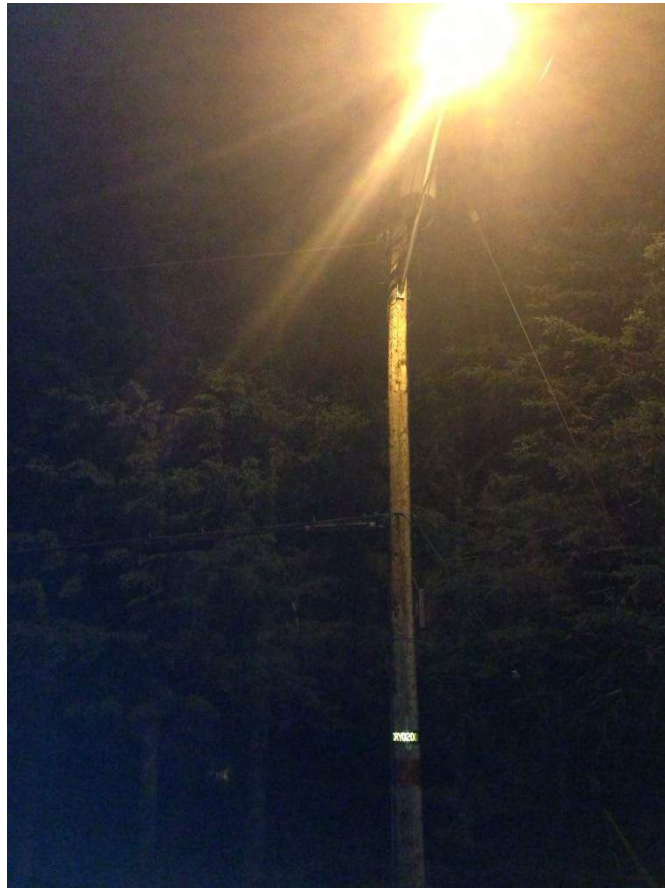
**Figure 10b:** Receptor/Sampling Site #8 (Nighttime)



**Figure 11a:** Receptor/Sampling Site #9



**Figure 11b:** Receptor/Sampling Site #9 (Nighttime)



**Figure 12a:** Receptor/Sampling Site #10



**Figure 12b:** Receptor/Sampling Site #10 (Nighttime)



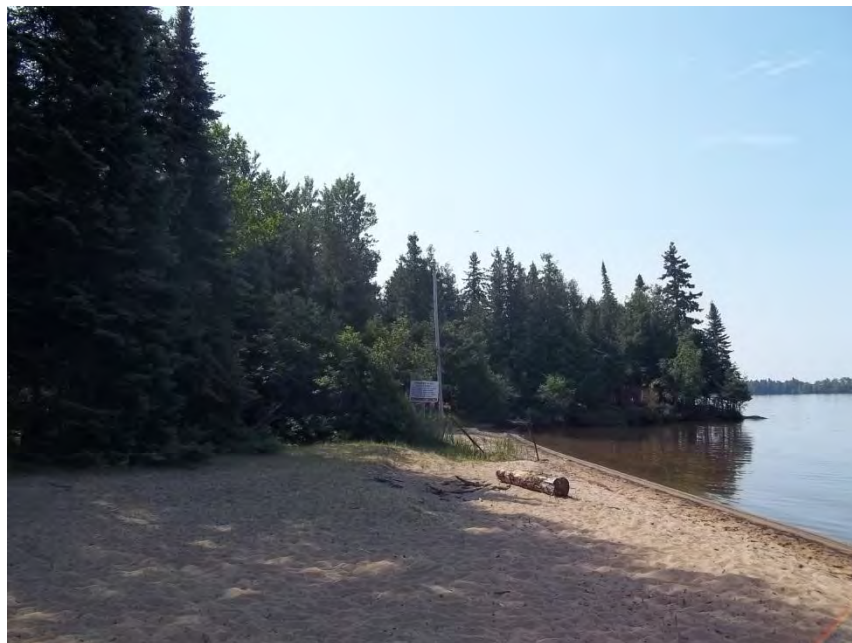
**Figure 13a:** Receptor/Sampling Site #11



**Figure 13b:** Receptor/Sampling Site #11 (Nighttime)



**Figure 14a:** Receptor/Sampling Site #12



**Figure 14b:** Receptor/Sampling Site #12 (Nighttime)





# APPENDIX A



**ELECTRICAL INSTRUMENTATION CALIBRATION REPORT**

R3693

This document states that the instrument described below meets or exceeds all manufacturer specifications. The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable to NIST and through NIST to the International System of Units (SI). ILT is Accredited to ISO 17025:2005. Calibration conforms to ANSI/NCSI Z540.1-1994 and ANSI/NCSI Z540.3-2006.

Date: 28-Mar-13 Certificate #: 1303281112E SO#: 142603  
Temp: 23 Degrees C Humidity: 23 % Procedure: TP-0112:09MAY2012

Rendered To: Ashtead Technology Rentals

Instrument Model-S/N: IL1400A #5335

Calibration/Repair Remarks: None

Parts (If Needed): None

As Found Tolerance In Out	As Found Readings	As Found Permissible Tolerance	Applied Current	Adjusted Readings	Permissible Adjustment Error	As Left Tolerance In Out
<input checked="" type="checkbox"/> <input type="checkbox"/>	302 uA	-0.7% to 1.3%	300 uA	302 uA	+/- 4 uA	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	100.2 uA	+/-0.3%	100.0 uA	100.0 uA	+/- .2 uA	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	10.02 uA	+/-0.3%	10.00 uA	10.00 uA	+/- .02 uA	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.001 uA	+/-0.4%	1.000 uA	1.000 uA	+/- .002 uA	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	97.9 nA	+/-3.0%	100.0 nA	100.0 nA	+/- .2 nA	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	9.86 nA	+/-3.0%	10.00 nA	10.07 nA	+/- .2 nA	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	0.98 nA	+/-4.0%	1.00 nA	1.00 nA	+/- .02 nA	<input checked="" type="checkbox"/> <input type="checkbox"/>

Tolerance after repair and/or calibration:  In  Out

Measurement Uncertainty: 300uA=±0.20%, 100uA=±0.068%, 10uA=±0.062%, 1uA=±0.064%, 100nA=±0.065%, 10nA=±0.12%, 1nA=±0.22%

The above Instrument was compared to the Keithley Current Calibrator/Source Model 263 S/N 0621350 calibrated on 12/19/2012 which is traceable to NIST Calibration Due: 12/19/2013  
<Original signed by>

Calibrated By:

Electrical Calibration Tech. Paul DeLauri

Authorized Original Unless Marked "Copy"

"For authorized copies of this certificate please contact International Light, Inc."

Form F-094A Rev E

Page 1 of 1





**InternationalLight**  
TECHNOLOGIES

# CALIBRATION CERTIFICATE

## OPTICAL CALIBRATION CERTIFICATE

International Light Technologies certifies that the calibration results published in this certificate were obtained using equipment capable of producing results that are traceable to NIST and through NIST to the International System of Units (SI). ILT is Accredited to ISO/IEC 17025:2005. Calibration conforms to ANSI/NCSL Z540.1-1994 and ANSI/NCSL Z540.3-2006.

Rendered-to: ASHTEAD TECHNOLOGY RENTALS R7955  
 Detector: SCL110 #1975 Input Optic: N/A #  
 Filter: N/A # Misc.: N/A #  
 Calibrated With: ILI400A #7668

(N1S) ILLUMINANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 28-Mar-2013

6.09E-10 (A)(lux-1) assuming 3215 K Color Temperature

-0.49% \*Change In Sensitivity From Previous Calibration Dated: 13-Jan-2012

Tolerance As Found:  In  Out Tolerance As Left:  In  Out

Unit will read directly in lux when used with an IL1400A and the Sensitivity Factor Above.

REFERENCE PLANE: Front

\*difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response  
 I219 - November 2005 - NIST Test No. 844/272521-05 : U1023 - January 1997 - NIST Test No. 844/257423-96/2 : D204 -  
 January 1997 - NIST Test No. 844/257423-96/1

ILT Transfer Uncertainty to Customer = +/- 4.3% plus NIST Uncertainty of: +/- 0.5%

LIGHT SOURCE: IF 1000W OTH LAMP OUTPUT: 2.30E+3 lux

INSTRUMENTATION: #6400/Y PROCEDURE: LP-0036 Rev A

TEMPERATURE: 22.8 degrees C HUMIDITY: 21%

CALIBRATED BY: <Original signed by>

Calibration Technician: Cathy Olson

FOR AUTHORIZED COPIES OF THIS CERTIFICATE OR OTHER INFORMATION PLEASE REFER TO THESE NUMBERS. THIS CERTIFICATE SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF INTERNATIONAL LIGHT TECHNOLOGIES

Calibration Date: 3/28/2013 Certificate No: 303283329 Sales Order #: 142603



InternationalLight

**International Light Technologies, Inc.**  
 10 Technology Drive, Peabody, MA 01960 USA  
 978-818-6180 / 978-818-6181 fax  
 intl-lighttech.com

Form F-074 (Rev G)



# APPENDIX B

**Light Measurement Observations**

Project Name/Number: Treasury Metals / 1300<sup>747</sup>~~424~~ Name: R. Jean  
 Location: Wabigoon Area - Thunder Lake Date: July 2/13  
 Measurement Description: Receptors Time: 10:40-1:00am  
 (receptor, line, flare) Mac Potter (Treasury Env. Tech.)

Area Description (field, forest, urban, rural, buildings): Field, Forest, Ruam  
 Ground Conditions (wet, snow, grass, pavement): sand, pavement, gravel (location dependant)  
 Cloud Cover and Precipitation (% cover, rain): Clear sky w some clouds. (<10%)  
 Moon: 21% visible (according to calendar - 365.com) Temp: 22°C  
 Other: \_\_\_\_\_

Obs. #	Photo #	Description	UTM E	UTM N	Lum 1 (cd/m <sup>2</sup> )	Lum 2 (cd/m <sup>2</sup> )	Lum 3 (cd/m <sup>2</sup> )	Illum (lux)
1		Goliath Site.	527864	5511437				0.0
Comment: CENTER OF PROPOSED PIT								
2		Goliath Site	528809	5511869				0.0
Comment: EAST OF PROPOSED PIT (Nursery Rd)								
3		GOLIATH SITE	528778	5510392				0.0
Comment: MYSTERY HOUSE ON TREE NURSERY RD.								
4		RECEPTOR <del>GOLIATH SITE</del>	525596	5511688				0.0
Comment: FIELD TO EAST OF THUNDER LAKE RD (NOISE SITE #1)								
5		RECEPTOR	525787	5511885	4.0	POINTED AT LIGHT		2.4
Comment: <sup>249</sup> <del>525</del> E. THUNDER LAKE RD, NEXT TO STREET LIGHT ON RD.								
6		RECEPTOR	525996	5511975	3.0	WIDE LIGHT		0.21
Comment: MEASURED 14M FROM RD. NEAR THE HYDROSTATION (SW2), NEXT TO STREET LIGHT, NEAR LOCATION 1A								
7		RECEPTOR	526119	5512213				0.0
Comment: 352 E. THUNDER LAKE RD.								
8	1	RECEPTOR	526358	5512240	0.5	POINTED AT RESIDENCE		0.0
Comment: PIT LOCATION 2, LIGHT FROM RESIDENT, FRONT DOOR PHOTO LIGHT AND HOUSE [PHOTO 1]								
Comment: _____								
Comment: _____								

# Light Measurement Observations

Project Name/Number: TREASURY METERS / 1300474  
 Location: WABIBOON AREA - THUNDER LAKE  
 Measurement Description: (receptor, line, flare)

Name: R. JEAN  
 Date: 02/07/13  
 Time: 10:40

Area Description (field, forest, urban, rural, buildings): RURAL / FOREST

Ground Conditions (wet, snow, grass, pavement):

Cloud Cover and Precipitation (% cover, rain):

Moon: CLEAR W SOME CLOUDS

Other: THUNDER LAKE RD. Temp: \_\_\_\_\_

→ 0 AMBIENT LIGHT UNLESS SOURCE SEEN

Obs #	Photo #	Description	UTM E	UTM N	Lum 1 (cd/m <sup>2</sup> )	Lum 2 (cd/m <sup>2</sup> )	Lum 3 (cd/m <sup>2</sup> )	Illum (lux)
4	2	RECEPTOR	521586	5514620	15.20			
Comment: <u>POINTED AT STREET LIGHT, 65 THUNDER LAKE RD.</u>								
10	3	RECEPTOR	522692	5515466				4.4 <sup>STOP SIGN</sup>
Comment: <u>TAKEN UNDER STREET LIGHT CORNER OF NORTH SIDE + THUNDER LAKE RD. (STOP SIGN)</u>								
11	4	RECEPTOR	525837	5515874	0.22			0.03
Comment: <u>NORTH SIDE OF T-LAKE, POINTED AT RESIDENCE, MEASURED FROM APPROX 12m FROM LIGHT SOURCE EDGE OF RD.</u>								
12	5, 6	RECEPTOR	525303	5514730	.19			0.03
Comment: <u>JOHNSON'S BEACH, LIGHT RE LOCATION'S (COTTAGES)</u>								
Comment:								
Comment:								
Comment:								
Comment:								
Comment:								
Comment:								
Comment:								

- APPROX 4-5 STREET LIGHTS ON THUNDER LAKE RD.  
 - ROUGHLY 0.0 LUX EVERYWHERE W NO SOURCE.

# Light Measurement Observations

Project Name/Number: Treasury Metals / 1300747  
 Location: Wabigoon Area / Thunder Lake.  
 Measurement Description: Receptors  
 (receptor, line, flare)

Name: R. Jean / M. Potter (Treasury)  
 Date: July 3 / 13  
 Time: 10:40 - 12:00

Area Description (field, forest, urban, rural, buildings):  
Field, Forest, Rural

Ground Conditions (wet, snow, grass, pavement):  
sand, pavement, gravel

Cloud Cover and Precipitation (% cover, rain):  
Clear sky w some clouds.

Moon: 14% visible - (website) Temp: 19°C

Other: - NO STARS VISIBLE, INITIALLY TRANSITIONING TO HAZY TO NO MOON VISIBLE, T-STREAM ROLLING IN (stars visible by 11:00pm)

Obs. #	Photo #	Description	UTM E	UTM N	Lum 1 (cd/m <sup>2</sup> )	Lum 2 (cd/m <sup>2</sup> )	Lum 3 (cd/m <sup>2</sup> )	Illum (lux)
1		Goliath Site	527869	5511437				0.0
Comment: Center of Proposed Pit								
2		Goliath Site	528809	5511869				0.0
Comment: East of Proposed Pit (Nursery Rd)								
3		Goliath Site	528778	5510372				0.0 - 0.01
Comment: Nystrom House on Tree Nursery Rd.								
4		Receptor	525596	5511688				0.0 - 0.01
Comment: Field to East of E. Thunder Lake Rd. (Noise Site #1)								
5		Receptor	525787	5511885	4.3			2.7
Comment: 249 E. Thunder Lake Rd., next to Street Light on Rd. <small>EDGE OF PAVEMENT + GRAVEL</small>								
6		Receptor	525996	5511975	3.2			2.1
Comment: <small>Measured ~14m from Light on Road</small> Near the Hydrostation (SW2), near location 1A								
7		Receptor	526119	5512213	0.03			0.0
Comment: 352 E. Thunder Lake Rd. → <small>POINTED AT LIGHT HOUSE DOWN</small>								
8		Receptor	526358	5512240				0.0
Comment: Noise Site 2 → LIGHT OFF AT FRONT OF RESIDENCE								
Comment:								
Comment:								

