TMI_877-AE(2)-01

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TMI_877-AE(2)-01	AE(2)-01	1	CEA Agency	**Reference to EIS Guidelines:**	Part 2, Sections 10.1.3, 11.1
				Reference to EIS / Appendix	Section 6.6.4; Appendix J
				Cross-reference to Round 1 IRs	TMI_167-AE(1)-05
				Context and Rationale: • Appendix J-2, Section 4.4, Table 2 identifies the federal and provincial air quality criteria considered for the environmental assessment. The Canadian Council of Ministers of the Environment (CCME) established new Canadian Ambient Air Quality Standards (CAAQS) for SO_2 in 2016 (https://www.ccme.ca/en/resources/air/air/sulphur-dioxide.html) and for NO_2 in 2017 (http://www.ccme.ca/en/current_priorities/air/caaqs.ht ml). • The new CAAQS for NO_2 and SO_2, are more stringent than the criteria used in the revised EIS, and need to be incorporated into the environmental assessment. In particular, the maximum predicted concentrations of NO_2, provided in Section 6.6.4, Tables 6.6.4.1-2 and 6.6.4.2-2 of the revised EIS, would be above the new CAAQS - the maximum NO_2 1-hour average concentration of 148 µg/m3 in the construction phase and 171 µg/m3 in the operations phase, would both exceed the CAAQ 2020 standard of 115 µg/m3 (60 ppb) and 2025 standard of 80 µg/m3 (42 ppb). • The air quality assessment does not consider NO2 annual concentrations. These should be included in order to understand potential effects due to long-term exposure, with comparisons to the new CAAQS thresholds, and incorporated into the human health risk assessment (HHRA).	
				Specific Question / Request for Information: A. Include annual concentrations for NO2 in the air quality assessment, by providing the baseline concentrations in Appendix J-2, Table 1, and the maximum predicted concentrations in Section 6.6.4, Tables 6.6.4.1-2, 6.6.4.2-2 and 6.6.4.3-2 of the revised EIS. B. Describe additional mitigation measures that can be applied to reduce NO2 and SO2 concentrations to the new CAAQS levels, in keeping with CAAQS principles of Keeping Clean Areas Clean and Continuous Improvement.	

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C. Update the HHRA to account for the annual concentrations of NO2 predicted through Question A, the new CAAQS thresholds for NO2 and SO2, and the additional mitigation measures identified in Question B.

D. Characterize effects to human health from the updated HHRA in Question C.

E. If necessary, update the follow-up program for effects to human health, including objectives and any additional monitoring measures that will be implemented to verify the predictions of concentrations of NO2 and SO2. Add these new measures to the overall Follow-Up Program to be prepared in response to IR# EA(2)-01.

Draft Response:

PART A: The following tables present the maximum predicted NO_2 (including annual NO_2) and SO_2 concentrations at the gridded receptors as well as at the sensitive receptors. As shown in the tables, the background annual NO_2 concentrations, based on five years of data for Thunder Bay, is 14 µg/m³. Table 1 presents the maximum predicted concentrations during the Site Preparation and Construction Phase. These numbers represent updated predictions to the values presented in Table 6.6.4.1-2 of the revised EIS [April 2018]. Specifically, the results reflect the predicted maximum point of impingement (MPOI) and sensitive receptor concentration, taking into account changes in the property line since generating the modelling receptors used in the revised EIS (April 2018). The full set of results for the site preparation and construction phase are provided in TMI_877-AE(2)-01_Table_4a.

Table 1: Predicted NO_2 and SO_2 during Site Preparation and Construction

Compound	Averaging Period	Maximum at Gridded Receptors (MPOI)			Maximum at Sensitive Receptors		
		Modelled Prediction	Background (1)	Cumulative Prediction	Modelled Prediction	Background (1)	Cumulative Prediction
NO_2	1-hour	50	29	79	36	29	65
	24-hour	7.2	25	32	5.9	25	30
	Annual	1.0	14	15	0.84	14	15
SO_2	1-hour	0.77	4.0	4.8	0.65	4.0	4.7
	24-hour	0.11	4.0	4.1	0.082	4.0	4.1
	Annual	0.013	1.0	1.0	0.010	1.0	1.0

Table 2 presents the maximum predicted concentrations during the Operations Phase of the Project. These numbers represent updated predictions to the values presented in Table 6.6.4.2-2 of the revised EIS [April 2018]. Specifically, the results reflect the predicted maximum point of impingement (MPOI) and sensitive receptor concentration, taking into account changes in the property line since generating the modelling receptors used in the revised EIS (April 2018). The full set of results for the site preparation and construction phase are provided in TMI_877-AE(2)-01_Table_4b.

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Table 2: Predicted NO_2 and SO_2 during Operations

Compound	Averaging Period	Maximum at Gridded Receptors (MPOI)			Maximum at Sensitive Receptors		
		Modelled Prediction	Background (1)	Cumulative Prediction	Modelled Prediction	Background (1)	Cumulative Prediction
NO_2	1-hour	80	29	110	28	29	57
	24-hour	35	25	60	6.6	25	31
	Annual	9.2	14	23	0.99	14	15
SO_2	1-hour	4.6	4.0	8.6	0.18	4.0	4.2
	24-hour	2.2	4.0	6.2	0.022	4.0	4.0
	Annual	0.58	1.0	1.6	0.0024	1.0	1.0

Table 3 presents the maximum predicted concentrations during the Closure Phase of the Project. These numbers represent updated predictions to the values presented in Table 6.6.4.3-2 of the revised EIS [April 2018]. Specifically, the results reflect the predicted maximum point of impingement (MPOI) and sensitive receptor concentration, taking into account changes in the property line since generating the modelling receptors used in the revised EIS (April 2018). The full set of results for the site preparation and construction phase are provided in TMI_877-AE(2)-01_Table_4c.

Table 3: Predicted NO_2 and SO_2 during Closure

Compound	Averaging Period	Maximum at Gridded Receptors (MPOI)			Maximum at Sensitive Receptors		
		Modelled Prediction	Background (1)	Cumulative Prediction	Modelled Prediction	Background (1)	Cumulative Prediction
NO_2	1-hour	30	29	59	12	29	41
	24-hour	4.0	25	29	3.3	25	28
	Annual	0.70	14	14	0.48	14	14
SO_2	1-hour	0.78	4.0	4.8	0.60	4.0	4.6
	24-hour	0.14	4.0	4.1	0.11	4.0	4.1
	Annual	0.015	1.0	1.0	0.0092	1.0	1.0

Notes: (1) The 1-hour and 24-hour background values were based on 90th percentile of the monitoring data. The annual background values were based on the highest of the annual mean value over the latest 5 years of available monitoring data (see Section 5.2.4)

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PART B: The new Canadian Ambient Air Quality for SO_2 and NO_2 that will come into force 2025 are listed in Table 5. These ambient air quality criteria are applicable at community-oriented receptors (CCME 2000), which correspond to the sensitive receptor modelling results presented in Section 6.6 of the revised EIS (April 2018).

Table 5: 2025 Canadian Ambient Air Quality Standards for SO_2 and NO_2

Averaging Period	SO_2	NO2
Annual CAAQS (2025)	8 µg/m³	23 µg/m³
1-hour CAAQS (2025)	169 µg/m³	79 µg/m³

As shown in Tables 1 through 3, the maximum predicted concentrations at the sensitive receptors (including the background) are below the relevant 2025 CAAQS values. Therefore, additional improvements/mitigation measures for air quality are not required as the modelling shows the maximum concentrations meet the new CAAQS at all sensitive receptor locations. In addition, it is anticipated that on-going manufacturers' improvements to mobile equipment emissions will assist in reducing the anticipated effects of the Project as well as the background levels in the future. Furthermore, the sulphur content in fuel is expected lower in years to come and will aid in further reducing SO_2 concentrations.

PART C. The HHERA (August 2018) included the annual concentrations of NO_2 predicted through Question A, and the new CAAQS thresholds for NO_2 and SO_2. To satisfy a number of Round 2 Information Requests, asking that the Human Health Risk Assessment be revised to include an assessment of potential health impacts in areas where traditional land use is practiced, air quality modelling was re-performed using a receptor grid specifically designed to support the HHERA (August 2018). Activities associated with each Project phase are expected to emit Criteria Air Contaminants (CACs) including CO, NO_x, SO_2, TSP, PM_{10}, and $PM_{2.5}$. Treasury Metals recognizes that Project Workers may be exposed to CACs within the Operations Area (Study Area No. 1), and members of Indigenous communities may visit areas that fall outside of the Operations Area, but within the Property Boundary of the Goliath Gold Project, to practice traditional uses of the lands and resources. Project work and traditional land use do not meet the CCME definition of a community-based receptor and thus determination of compliance with the application of Ambient Air Criteria is not appropriate for these receptors. To capture the possible risk to peoples using these areas, the air modelling was redone using the same emissions and methods as presented in Section 6.6 of the revised EIS (April 2018), but focusing on possible modelling receptors covering the HHERA Study Areas. The refined modelling includes 308 modelling receptor located within the Operations Area (Study Area No. 1), 3,474 modelling receptor locations within the LSA (Study Area No. 2) 1,445 of which fall inside the Property Boundary, and at 46 modelling receptor locations within the Village of Wabigoon (Study Area No. 3). The revised air quality modelling grid in support of the HHERA is shown relative to the Property Boundary and the three Study Areas, on Figure 3.1.1-1 of the 2018 HHERA Report (August 2018). The locations of the sensitive receptors which meet the CCME definition of community-based receptors, and are appropriate for determining compliance with ambient air quality criteria, are also shown on Figure 3.1.1-1 of the 2018 HHERA Report.

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				The assessment of the effects of CACs on human health was performed using a two-step qualitative and quantitative approach. At the request of Health Canada, predicted exposure point concentrations (defined as the the highest UCLM of the maximum modelled over the five-year period modelled, at each receptor) of CACs were compared to the Canadian Ambient Air Quality Standards (CAAQS) or the Ontario Ambient Air Quality Criteria (AAQC) for all available averaging periods. As stated in the EIS (April 2018), there were no CAC exceedances identified at the sensitive receptor locations which are appropriate for determining regulatory compliance. The results indicated that the predicted EPC of CACs in the LSA and Village of Wabigoon were below the qualitative screening criteria. As such there are no potential health risks anticipated to human receptors who may access the areas within the Property Boundary but outside of the Operations Area via inhalation of CACs. There are no residual adverse effects identified to human receptors in the LSA or the Village of Wabigoon who may live, visit, or practice traditional use of land and resources via the inhalation of CACs in air as a result of the Project. Within the Operations Area, the predicted EPCs of NO_2, $PM_{2.5}$, and PM_{10} were larger than the CAAQS/AAQC (appropriate for use at sensitive receptors) for select averaging periods. Although a quantitative approach was considered for $PM_{2.5}$, PM_{10}, Treasury Metals was informed by Health Canada that they do not currently support a quantitative assessment of these forms of particulate matter, and the qualitative assessment would suffice at this time. The potential Health implications of NO_2 to a Project Worker within the Operation Area was quantitatively assessed. There is no access to the Operations Area by members of the public or Indigenous communities during the active life of the project and highlight that there are no sensitive or community-based receptors within the Operations Area. Under good health and safety practices, an occupational health and safety plan would be in place for Project Workers and serve as an appropriate risk management/ mitigation measure. As such no residual adverse effects are identified as a result of NO_2 and all other CACs concentrations within Operations Area. Predicted EPCs of metals sorbed to particulate matter satisfied their respective qualitative screening criteria at Study Areas No. 1, 2 and 3. As such there are no potential risks anticipated to Project Workers, Residents, and/or Visitors/Harvesters via the inhalation of fugitive dust pathway. Therefore, the HHERA (August 2018) indicated that a Health and Safety Plan would serve as an appropriate as a risk management measure for Project Workers within the Operations Area (Study Area 1) for the protection of select CACs in air. The Health and Safety Plan effectively mitigates any potential effect on human health and therefore no residual adverse effects are identified. This mitigation measure has been previously described in the EIS (April 2018) in Section 6.19 and is summarized in Section 10 of the EIS (April 2018), (Mit_130). No other residual effects were identified in the HHERA (August, 2018), as such no other mitigation measures are required. <u>PART D.</u> A Human Health Risk Assessment (HHRA) is the process to estimate the nature and probability of adverse health effects in humans who may be exposed to chemicals in contaminated environmental media, now or in the future. The risk assessment process involves the following four (4) fundamental steps: 1. Problem Formulation; 2. Exposure Assessment; 3. Toxicity Assessment; and

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				4. Risk Characterization. The 2018 HHERA Report included all four of these components including a problem formulation where receptors, chemicals of concern, and exposure pathways were identified, an exposure assessment where exposure predictions were quantified, a toxicity assessment where the details of the potential health outcome i.e. childhood asthma, cancer, changes to blood pressure were presented, and risk characterization where the effects to human health were qualitatively or quantitatively assessed. These 4 steps were completed for all chemicals identified as being a contaminant of concern based on qualitative screening against regulatory criteria for air, water, soil, waste rock, tailings supernatant water, and pit lake water. PART E: Section 7 of the 2018 HHERA Report provides new details regarding the Follow-Up Program for human health, however mostly with respect to the country foods assessment. With respect to air and human health, the expectation for the Follow-Up Program is that it will rely on the Follow-Up Program described for verifying the Air Quality Modeling predictions, including the predictions of concentrations of NO_2 and SO_2. A number of Round 2 Information Requests asked that the Follow-Up Program submitted as Section 13 of the EIS (April 2018) be revised. The Goliath Gold Follow-Up Addendum has been provided in support of the Round 2 Information Request Process and delivers a comprehensive and consolidated answer to all Round 2 Information Requests related to the Follow-Up Programs including those related to human health.
				Agency Comment 1 of 2 on Draft Response: ***The following Agency feedback on the draft responses identified the following comment as applying to each of TMI_877-AE(2)-01, TMI_879-AE(2)-03, and TMI_880-AE(2)-04.*** The responses to these IRs indicate that Treasury Metals has acquired additional properties since the air modelling receptors used in the April 2018 Revised EIS were identified. The response to TMI_877-AE(2)-01C indicates that "the revised air quality modelling grid in support of the HHERA is shown relative to the Property Boundary and the three Study Areas, on Figure 3.1.1-1 of the 2018 HHERA Report (August 2018)". The property boundary shown in Figure 3.1.1-1 of the 2018 HHERA Report appears similar to the property boundary used in the April 2018 Revised EIS in the inset of Figure 6.6.2.2-1 as well as figure 1.2.3-1. It is unclear where the newly acquired properties are located, and how the property boundary has changed. It is also unclear if the Property Boundary demarcated in the various documents of the EIS is an indication of all property owned by Treasury Metals Inc. or if this is a delineation of the lands for which the proponent holds surface/mineral rights and mining claims but which they may not own. **[i] In the response to AE(2)-01, provide a map with the updated property boundary, and describe how the property boundary has changed since the April 2018 Revised EIS. Clarify whether the updated property boundary meets the understanding of the property boundary as it is applied in Ontario Regulation 419/05. Clarify the property ownership and claim status of the lands within the updated property boundary.**

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				[ii] Identify where along the updated property boundary would be the maximum point of impingement, and where the sensitive receptor with maximum concentrations would be located. **[iii] Clarify whether the differences between the predictions in TMI_877-AE(2)-01_Table_4a, 4b and 4c and the predictions in the April 2018 Revised EIS, Tables 6.6.4.1-2, 6.6.4.2-2 and 6.6.4.3-2 are only due to the change in location of the property boundary, or whether there have been changes in the model itself. If necessary, describe any changes to the model since the April 2018 Revised EIS.** The response to TMI_879-AE(2)-03C indicates that some sensitive receptors were "eliminated" through purchase by Treasury Metals. **[iv] Identify the sensitive receptors that were no longer considered in the updated air quality assessment, and whether they will be physically removed or will no longer meet the definition of a sensitive receptor due to its location within the updated property boundary.** The response to TMI_877-AE(2)-01B states that, for NO_2 and SO_2, "additional improvements/mitigation measures for air quality are not required as the modelling shows the maximum concentrations meet the new CAAQS [Canadian Ambient Air Quality Standards] at all sensitive receptor locations." While the Agency understands that this conclusion is based on sensitive receptors outside of the updated property boundary, it notes that exceedances of the new CAAQS for 1-hour NO_2 are predicted at maximum point of impingement along the updated property boundary, and therefore there would be exceedances within the property boundary. The response to TMI_879-AE(2)-03E indicates that "there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands and resources". It remains that Indigenous users may be exposed to air with NO2 concentrations above the new CAAQS. **[v] The Agency reiterates question TMI_877-AE(2)-01B, in consideration of locations where Indigenous use may occur and where exceedances of CAAQS for NO_2 may occur.**
				Specific Response to Agency Comment 1 of 2: **[i]** The following three figures describe the evolutions of the property boundary with time. • **TMI_877-AE(2)-01_Figure_1:** This figure shows the property boundary used in the air modelling results presented in the original EIS, as well as air modelling results presented in the revised EIS (April 2018). This property boundary represented the conditions when the air modelling was originally commissioned, which was also shown on Figure 6.1.4.5-1 of the revised EIS (April 2018). • **TMI_877-AE(2)-01_Figure_2:** This figure shows the property boundary used for all disciplines except air quality in the revised EIS (April 2018). This property boundary, which was shown on Figure 1.2.3-1 of the revised EIS (April 2018), includes property obtained by Treasury Metals since the air modelling was originally commissioned, and includes the following differences from TMI_877-AE(2)-01_Figure_1: ○ Treasury Metals acquired the parcel of land to the west of Tree Nursery Road, and to the south of Norman's Road, and

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				○ Treasury Metals acquired the parcels of land between East Thunder Lake Road and the property boundary shown on TMI_877-AE(2)-01_Figure_1. • **TMI_877-AE(2)-01_Figure_3:** This figure shows the current property boundary, and corresponds to the property boundary used for preparing the Round 2 responses, including the results presented in Tables 1, 2 and 3 of this response, as well as TMI_877-AE(2)-01_Table_4a, TMI_877-AE(2)-01_Table_4b and TMI_877-AE(2)-01_Table_4c. This property boundary, includes the property obtained by Treasury Metals since of completion of the revised EIS (April 2018), specifically the following: ○ Treasury Metals acquired the parcel of land to the east of Tree Nursery Road, and to the south of Norman's Road. Since the filing of the revised EIS (April 2018), the property ownership and claim status of the lands within the property boundary have been updated from those presented in Figure 1.2.3-1 of the revised EIS (April 2018). The updated property status is provided on TMI_877-AE(2)-01_Figure_4. As shown on the figure, the lands in the western portion of the property boundary represent private or patent lands, lands for which Treasury Metals hold surface and mineral rights, lands to which Treasury Metals hold mineral rights and surface rights are pending, and lands where conversion from claim to lease is pending. Such lands would be consistent with the definition of a property line used in Ontario Regulation 419/05 (O.Reg. 419/05). As shown on TMI_877-AE(2)-01_Figure_4, Treasury Metals are not currently in the process of bringing the lands within the eastern portion of the property boundary to lease. As such, the limit of private, patent and leased lands (shown with a thick red line on TMI_877-AE(2)-01_Figure_4) would represent the property boundary for modelling in accordance with O.Reg. 419/05. To reflect this, the air modelling has been updated using the O.Reg. 419/05 definition of the property boundary. It should be noted that updating the modelling to reflect the current plans for disposition of the lands (see TMI_877-AE(2)-01_Figure_4) had no effect on the predicted concentrations at sensitive receptors as there are no sensitive receptors in the larger property boundary (including claims lands). There were also no changes to the maximum off-site gridded concentration predictions (i.e., MPOI predictions). The maximum sensitive receptor prediction and the MPOI are illustrated in a series of updated isopleth figures included as TMI_877-AE(2)-01_Figure_5 (1-hour NO_2 for site preparation and construction), TMI_877-AE(2)-01_Figure_6 (1-hour NO_2 for operations), and TMI_877-AE(2)-01_Figure_7 (1-hour NO_2 for closure). For reference a full set of isopleth figures have been included as TMI_877-AE(2)-01_Attachment_1 (site preparation and construction), TMI_877-AE(2)-01_Attachment_2 (operations), and TMI_877-AE(2)-01_Attachment_3 (closure). The isopleth figures provided in TMI_877-AE(2)-01_Attachment_2 (operations) supersede Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018). Each of the attachments includes 15 isopleth figures, 14 which correspond to the compounds and averaging periods presented in Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018), plus a fifteenth figure that provides the annual NO_2 predictions. **[ii]** Updated isopleth figures have been included as TMI_877-AE(2)-01_Attachment_1 (site preparation and construction), TMI_877-AE(2)-01_Attachment_2 (operations), and TMI_877-AE(2)-01_Attachment_3 (closure). Each of the attachments includes 15 isopleth figures, 14 which correspond to the compounds and averaging periods presented in Figures to replace the Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018), plus a

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				fifteenth figure that provides the annual NO_2 predictions. Each of the isopleth figures shows where along the limit of private, patent and leased lands (in accordance with the O.Reg. 419/05 definition of boundaries for modelling) the maximum point of impingement (MPOI) was predicted to occur, as well as showing at which sensitive receptors the maximum was predicted. **[iii]** The only differences between the predictions presented in Tables 6.6.4.1-2, 6.6.4.2-2 and 6.6.4.3-2 of the revised EIS (April 2018) and TMI_877-AE(2)-01_Table_4a, TMI_877-AE(2)-01_Table_4b and TMI_877-AE(2)-01_Table_4c were the changes to the gridded modelling locations as a result of the changes to the property line described in the response to [i], as well as the changes to the sensitive receptors described in the response to part [iv]. As part of the revisions to the response to TMI_877-AE(2)-01, the following changes were made: • TMI_877-AE(2)-01_Table_1 supersedes TMI_877-AE(2)-01_Table_4a; • TMI_877-AE(2)-02_Table_4a supersedes TMI_877-AE(2)-01_Table_4b; and • TMI_877-AE(2)-03_Table_4a supersedes TMI_877-AE(2)-01_Table_4c. **[iv]** TMI_877 AE(2) 01_Figure_3 shows the current property boundary, and corresponds to the property boundary used for preparing the Round 2 responses, including the results presented in TMI_877-AE(2)-01_Table_1, TMI_877-AE(2)-01_Table_2 and TMI_877-AE(2)-01_Table_3. This property boundary, includes the property obtained by Treasury Metals since of completion of the revised EIS (April 2018). On the figure, the sensitive receptors that have been excludes as a result of the changes to the property lines are marked as red on the figure. It is Treasury Metals intention to remove the residences at each of these locations. However, Treasury Metals may retain the secondary structures and outbuildings at these locations for use as possible wildlife habitat. A decision regarding the fate of the secondary structures and outbuildings would be made through consultation with Ontario Ministry of Natural Resources and Forestry (MNRF), as well as Environment and Climate Change Canada. **[v]** The CCME (2006) identified that compliance with ambient air quality criteria should be done at "community-oriented receptors". The only "community-oriented" receptors in the vicinity of the Goliath Gold Project are the sensitive receptor locations, shown as "yellow circles" on TMI_877 AE(2) 01_Figure_3. There are no community-oriented receptors within the property boundary. In recognition that "there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands and resources", the updated Human Health and Ecological Risk Assessment (2018 HHERA), has specifically included evaluation of the potential effects of exposure to air quality within the property boundary on human health. The 2018 HHERA includes consideration of air quality effects on both Project Workers and those who may transiently pass through areas within the Property Boundary to practice traditional land and resource use. In the case of Project Workers, their exposures were calculated using the area maximum concentrations within the operations area. In the case of areas where Indigenous communities may wish to

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				practice traditional uses of the lands and resources, their exposures were calculated as the area maximum concentration outside of the operations area. The area maximum concentrations for each parameter and averaging period were calculated as the 95th percentile UCLM of maximum predictions at the gridded modelling points within the property boundary. This approach is most appropriate for a detailed quantitative human health risk assessment as concentrations of chemicals vary spatially and temporally in the air to which humans are exposed. During long-term exposures, humans may move over areas, or in and out of impacted areas. As a result, individuals tend to integrate spatial and temporal variation in the chemical concentrations to which they are exposed. Therefore, estimates of the central tendency (e.g., arithmetic means, upper confidence limits) are generally used in human health exposure models as an expression of the spatial and temporal averaging of chemical concentrations in different media (U.S. EPA, 1992, 2001). The 2018 HHERA shows that there would be no potential risk to human receptors outside of the operations area via the inhalation of air exposure pathway. As such, no additional mitigation measures are required to protect the health of members of Indigenous communities who may wish to practice traditional uses of the lands and resource in areas outside of the operations area, but within the property boundary of the Goliath Gold Project. With respect to NO_2, none of the predicted air concentrations at the identified community-oriented receptors exceeded the relevant ambient air quality criteria, including the new 1-hour CAAQS for NO_2 that will come into force in 2025. As noted by the reviewers, there were areas along the property boundary and beyond where the maximum predicted 1-hour NO_2 concentrations were numerically higher than 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025). However, because these locations do not meet the requirements for "community-oriented receptors" defined by the CCME (2006), it is not obvious that predicted concentrations in excess of 79 µg/m³ represents an exceedance of the CAAQS. As such, no additional mitigation measures are required to ensure compliance with the new CAAQS for NO_2. In addition, it is anticipated that on-going manufacturers' improvements to mobile equipment emissions will assist in further reducing the anticipated effects of the Project. Future improvements in the emissions of NO_X from motor vehicles will also have a noticeable effect on reducing the background NO_2 levels in the future. The dispersion modelling results confirm that none of the maximum predicted SO_2 concentrations at community-oriented receptors exceed the new Canadian Ambient Air Quality (CAAQS) of 169 µg/m³ (1-hour SO_2) and 8 µg/m³ (annual SO_2) that will come into force 2025. In addition, it is expected that the sulphur content in fuel is expected lower in years to come, which will aid in further reducing both the SO_2 concentrations from Project activities, as well as the background SO_2 concentrations that account for most of the cumulative SO_2 predictions (87% of the 1-hour SO_2 and 99% of the annual SO_2). No additional specific mitigation measures are identified for managing the SO_2 emissions and effects associated with the Project.
				Agency Comment 2 of 2 on Draft Response: The proposed air monitoring programs include monitoring for NO_2 and either PM_{10} or $PM_{2.5}$. Health Canada identifies that the fine particles pose a greater risk to human health than coarse ones, as the fine particles can be inhaled deeply into the lungs, are chemically reactive and have complex characteristics (Health Canada. 2016). In the absence of monitoring for both particulate matter sizes, PM2.5 should be monitored to adequately assess the health

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				risks of air-borne articulate matters. (Health Canada. 2016. Guidance for Evaluating Human Health Impacts in Environmental Assessment: AIR QUALITY) **Update the monitoring plan and follow-up program to include PM2.5 and NO2 at the MPOI. Consider implementation of a notification system for Indigenous land users about PM2.5 and NO2 levels.**
				Specific Response to Agency Comment 2 of 2: The air monitoring program described in the Goliath Gold Project Follow-up Program Addendum has been revised to include specifically identify $PM_{2.5}$ as the fine particulate to be monitored at the continuous monitoring station, which also includes monitoring of NO_2. Treasury Metals plan to commission a single continuous monitoring station at a suitable location. For obvious reasons, the air continuous monitoring station should be located in a secure but accessible location, with ready access to power, and in a location relatively close to the areas where the maximum concentrations were predicted. The maximum point of impingement (MPOI) is an air modeling term that represents location along, or beyond, the property boundary where the maximum predicted concentrations occur. For security reasons, it would be preferred to place the monitoring station within the property boundary. It should also be noted that the MPOI will likely be different for each of the compounds and averaging periods modelled. Therefore, it is unlikely that the MPOI for the 1-hour NO_2 would be the same as the MPOI for the 24-hour $PM_{2.5}$. The final location for the monitoring station would be selected in consultation with Ontario Ministry of Environment, Conservation and Parks (MECP), Environment and Climate Change Canada, and the Agency.
				Revised Response: PART A: As requested, the dispersion modelling results presented in Tables 6.6.4.1-2, 6.6.4.2-2 and 6.6.4.3-2 of the revised EIS (April 2018) have been updated to include predictions of the annual NO_2. The background annual NO_2 concentrations of14 µg/m³ represents the highest measured annual NO_2 value from the five years of Thunder Bay data used. The updated results are provided in the following tables: • **TMI_877-AE(2)-01_Table_1**: This table presents the maximum predicted concentrations during the Site Preparation and Construction Phase. These numbers represent updated predictions that supersede the values presented in Table 6.6.4.1-2 of the revised EIS (April 2018). Specifically, the results reflect the predicted maximum point of impingement (MPOI) and sensitive receptor concentration, taking into account changes in the property line and land tenure since generating the modelling receptors used in the revised EIS (April 2018). • **TMI_877-AE(2)-01_Table_2**: This table presents the maximum predicted concentrations during the Operations Phase. These numbers represent updated predictions that supersede the values presented in Table 6.6.4.2-2 of the revised EIS (April 2018). Specifically, the results reflect the predicted maximum point of impingement (MPOI) and sensitive receptor concentration, taking into account changes in the property line and land tenure since generating the modelling receptors used in the revised EIS (April 2018).

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				• **TMI_877-AE(2)-01_Table_3**: This table presents the maximum predicted concentrations during the Closure Phase. These numbers represent updated predictions that supersede the values presented in Table 6.6.4.3-2 of the revised EIS (April 2018). Specifically, the results reflect the predicted maximum point of impingement (MPOI) and sensitive receptor concentration, taking into account changes in the property line and land tenure since generating the modelling receptors used in the revised EIS (April 2018). To clarify, the only differences between the predictions presented in Tables 6.6.4.1-2, 6.6.4.2-2 and 6.6.4.3-2 of the revised EIS (April 2018) and TMI_877-AE(2)-01_Table_1, TMI_877-AE(2)-01_Table_2 and TMI_877-AE(2)-01_Table_3 were the changes to the gridded modelling and sensitive receptors locations as a result of the changes to the property line since generating the modelling receptors used in the revised EIS (April 2018). As noted above, the property boundary used in the dispersion modelling has changed since the modelling receptors used in the revised EIS (April 2018) were generated. The changes to the property boundary with time can be described with the following three figures: • **TMI_877-AE(2)-01_Figure_1:** This figure shows the property boundary used in the air modelling results presented in the original EIS, as well as air modelling results presented in the revised EIS (April 2018). This property boundary represented the conditions when the air modelling was originally commissioned, which was also shown on Figure 6.1.4.5-1 of the revised EIS (April 2018). • **TMI_877-AE(2)-01_Figure_2:** This figure shows the property boundary used for all disciplines except air quality in the revised EIS (April 2018). This property boundary, which was shown on Figure 1.2.3-1 of the revised EIS (April 2018), includes property obtained by Treasury Metals since the air modelling was originally commissioned, and includes the following differences from TMI_877-AE(2)-01_Figure_1: o Treasury Metals acquired the parcel of land to the west of Tree Nursery Road, and to the south of Norman's Road, and o Treasury Metals acquired the parcels of land between East Thunder Lake Road and the property boundary shown on TMI_877-AE(2)-01_Figure_1. • **TMI_877-AE(2)-01_Figure_3:** This figure shows the current property boundary, and corresponds to the property boundary used for preparing the Round 2 responses, including the results presented in Tables 1, 2 and 3 of this response, as well as TMI_877-AE(2)-01_Table_4a, TMI_877-AE(2)-01_Table_4b and TMI_877-AE(2)-01_Table_4c of the draft response. This property boundary, includes the property obtained by Treasury Metals since of completion of the revised EIS (April 2018), specifically the following: o Treasury Metals acquired the parcel of land to the east of Tree Nursery Road, and to the south of Norman's Road. Since the filing of the revised EIS (April 2018), the property ownership and claim status of the lands within the property boundary have also been updated from those presented in Figure 1.2.3-1 of the revised EIS (April 2018). The updated property status is provided on TMI_877-AE(2)-01_Figure_4. As shown on the figure, the lands in the western portion of the property boundary represent private or patent lands, lands for which Treasury Metals hold

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surface and mineral rights, lands to which Treasury Metals hold mineral rights and surface rights are pending, and lands where conversion from claim to lease is pending. Such lands would be consistent with the definition of a property line used in Ontario Regulation 419/05 (O.Reg. 419/05). As shown on TMI_877-AE(2)-01_Figure_4, Treasury Metals are not planning on bringing the claimed lands within the eastern portion of the property boundary to lease at this time. As such, the limit of private, patent and leased lands (shown with a thick red line on TMI_877-AE(2)-01_Figure_4) would represent the property boundary for modelling in accordance with O.Reg. 419/05. This represents the property boundary used in the in the revised modelling presented in TMI_877-AE(2)-01_Table_1, TMI_877-AE(2)-01_Table_2 and TMI_877-AE(2)-01_Table_3.

The above changes to the property boundary also affected the sensitive receptor locations. TMI_877 AE(2) 01_Figure_3 shows the current property boundary used for preparing the Round 2 responses, including the results presented in TMI_877-AE(2)-01_Table_1, TMI_877-AE(2)-01_Table_2 and TMI_877-AE(2)-01_Table_3. On the figure, the sensitive receptors that have been excludes as a result of the changes to the property lines are marked as red on the figure. It is Treasury Metals intention to remove the residences at each of these locations. However, Treasury Metals may retain the secondary structures and outbuildings at these locations for use as possible wildlife habitat. A decision regarding the fate of the secondary structures and outbuildings would be made through consultation with Ontario Ministry of Natural Resources and Forestry (MNRF), as well as Environment and Climate Change Canada.

To help illustrate where the predicted maximum concentrations are likely to occur, a series of updated isopleth figures have been prepared. These are provided as TMI_877-AE(2)-01_Attachment_1 (site preparation and construction), TMI_877-AE(2)-01_Attachment_2 (operations), and TMI_877-AE(2)-01_Attachment_3 (closure). The isopleth figures provided in TMI_877-AE(2)-01_Attachment_2 (operations) supersede Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018). Each of the attachments includes 15 isopleth figures, 14 which correspond to the compounds and averaging periods presented in Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018), plus a fifteenth figure that provides the annual NO_2 predictions. The updated isopleth figures show where along the limit of private, patent and leased lands (i.e., modeling property boundary in accordance with the O.Reg. 419/05) the maximum point of impingement (MPOI) was predicted to occur, as well as showing at which sensitive receptors the maximum was predicted.

PART B:

The new Canadian Ambient Air Quality for SO_2 and NO_2 that will come into force 2025 are listed in Table 4. These ambient air quality criteria are applicable at community-oriented receptors (CCME 2000), which correspond to the sensitive receptor modelling results presented in Section 6.6 of the revised EIS (April 2018).

Table 4: 2025 Canadian Ambient Air Quality Standards for SO_2 and NO_2

Averaging Period	SO_2	NO_2
Annual CAAQS (2025)	8 µg/m³	23 µg/m³
1-hour CAAQS (2025)	169 µg/m³	79 µg/m³

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As shown in Tables 5 none of the maximum predicted SO_2 concentrations at the sensitive receptor locations exceed the new Canadian Ambient Air Quality (CAAQS) of 169 µg/m³ (1-hour SO_2) and 8 µg/m³ (annual SO_2) that will come into force 2025. It is important to note that the CCME (2006) identified that compliance with ambient air quality criteria should be done at "community-oriented receptors". The only "community-oriented" receptors in the vicinity of the Goliath Gold Project are the sensitive receptor locations. The current sensitive receptor locations used in the revised modelling are shown as "yellow circles" on TMI_877-AE(2)-01_Figure_3. In addition, none of the predicted MPOI SO_2 concentrations were numerically higher than 169 µg/m³ (1-hour SO_2) and 8 µg/m³ (annual SO_2). Based on the results of the SO_2 modelling, additional improvements or mitigation measures for air quality are not required in order to achieve compliance with the new CAAQS set to come in force in 2025. However, it is expected that the sulphur content in fuel will decrease in years to come, which will aid in further reducing both the SO_2 concentrations from Project activities, as well as the background SO_2 concentrations that account for most of the cumulative SO_2 predictions (87% of the 1-hour SO_2 and 99% of the annual SO_2).

Table 5: Maximum 1-hour and Annual SO_2 Predictions

Compound	Averaging Period	Maximum at Gridded Receptors (MPOI)			Maximum at Sensitive Receptors		
		Modelled Prediction	Background (1)	Cumulative Prediction	Modelled Prediction	Background (1)	Cumula Predict
Site Preparation and Construction							
SO_2	1-hour	0.77	4.0	4.8	0.65	4.0	4.7
	Annual	0.013	1.0	1.0	0.010	1.0	1.0
Operations							
SO_2	1-hour	4.6	4.0	8.6	0.18	4.0	4.2
	Annual	0.58	1.0	1.6	0.0024	1.0	1.0
Closure							
SO_2	1-hour	0.78	4.0	4.8	0.60	4.0	4.6
	Annual	0.015	1.0	1.0	0.0092	1.0	1.0

Tables 6 provides the maximum predicted NO_2 concentrations at the sensitive receptor locations, as well as the maximum MPOI concentrations for NO_2. None of the maximum predicted concentrations at the sensitive receptor locations exceed the new Canadian Ambient Air Quality (CAAQS) of 79 µg/m³ (1-hour NO_2) and 23 µg/m³ (annual NO_2) that will come into force 2025. It is important to note that the CCME (2006) identified that compliance with ambient air quality criteria should be done at "community-oriented receptors". The only "community-oriented" receptors in the vicinity of the Goliath Gold Project are the sensitive receptor locations. The current sensitive receptor locations used in the revised modelling are shown as "yellow circles" on TMI_877-AE(2)-01_Figure_3. The modeling

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indicates that there are areas along the property boundary where the maximum predicted 1-hour NO_2 concentrations were numerically higher than 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025). However, because these locations do not meet the requirements for "community-oriented receptors" defined by the CCME (2006), it is not obvious that predicted concentrations in excess of 79 µg/m³ represents an exceedance of the CAAQS. As such, no additional mitigation measures are required to ensure compliance with the new CAAQS for NO_2. It should also be noted that predicted 1-hour NO_2 concentrations in excess of 79 µg/m³ are extremely unlikely to occur, predicted on less than 0.3% of the hours modelled (see response to TMI_880-AE(2)-04). It anticipated that on-going manufacturers' improvements to mobile equipment emissions will assist in further reducing the anticipated effects of the Project. Also, future improvements in the emissions of NO_X from motor vehicles will also have a noticeable effect on reducing the background NO_2 levels in the future.

Table 6: Maximum 1-hour and Annual NO_2 Predictions

Compound	Averaging Period	Maximum at Gridded Receptors (MPOI)			Maximum at Sensitive Receptors		
		Modelled Prediction	Background (1)	Cumulative Prediction	Modelled Prediction	Background (1)	Cumula Predict
Site Preparation and Construction							
NO_2	1-hour	50	29	79	36	29	65
	Annual	1.0	14	15	0.84	14	15
Operations							
NO_2	1-hour	80	29	110	28	29	57
	Annual	9.2	14	23	0.99	14	15
Closure							
NO_2	1-hour	30	29	59	12	29	41
	Annual	0.70	14	14	0.48	14	14

As the results of the revised modeling indicate that there are areas along the property boundary where the maximum predicted 1-hour NO_2 concentrations were numerically higher than 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025), it is reasonable to expect there would be areas within the property boundary where concentrations could exceed 79 µg/m³ on an infrequent basis. However, given that the CCME (2006) identified that compliance with ambient air quality criteria should be done at "community-oriented receptors", the only "community-oriented receptors" in the vicinity of the Goliath Gold Project are the sensitive receptor locations, shown as "yellow circles" on TMI_877 AE(2) 01_Figure_3, and there are no sensitive receptors or "community-oriented receptors" within the property boundary, it is not obvious that predicted concentrations in excess of 79 µg/m³ represents an exceedance of the new CAAQS. As such, no exceedances of the new CAAQS would occur within the property boundary.

In recognition that "there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands

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				and resources", the updated Human Health and Ecological Risk Assessment (2018 HHERA), has specifically included evaluation of the potential effects of exposure to air quality within the property boundary on human health. The 2018 HHERA includes consideration of air quality effects on both Project Workers and those who may transiently pass through areas within the Property Boundary to practice traditional land and resource use. In the case of Project Workers, their exposures were calculated using the area maximum concentrations within the operations area. In the case of areas where Indigenous communities may wish to practice traditional uses of the lands and resources, their exposures were calculated as the area maximum concentration outside of the operations area. The area maximum concentrations for each parameter and averaging period were calculated as the 95th percentile UCLM of maximum predictions at the gridded modelling points within the property boundary. This approach is most appropriate for a detailed quantitative human health risk assessment as concentrations of chemicals vary spatially and temporally in the air to which humans are exposed. During long-term exposures, humans may move over areas, or in and out of impacted areas. As a result, individuals tend to integrate spatial and temporal variation in the chemical concentrations to which they are exposed. Therefore, estimates of the central tendency (e.g., arithmetic means, upper confidence limits) are generally used in human health exposure models as an expression of the spatial and temporal averaging of chemical concentrations in different media (U.S. EPA, 1992, 2001). The 2018 HHERA shows that there would be no potential risk to human receptors outside of the operations area via the inhalation of air exposure pathway. As such, no additional mitigation measures are required to protect the health of members of Indigenous communities who may wish to practice traditional uses of the lands and resource in areas outside of the operations area, but within the property boundary of the Goliath Gold Project. <u>PART C.</u> The 2018 HHERA (November revision) included the annual concentrations of NO_2 identified in Question A, and the new CAAQS thresholds for NO_2 and SO_2. To satisfy a number of Round 2 Information Requests, asking that the Human Health Risk Assessment be revised to include an assessment of potential health impacts in areas where traditional land use is practiced, air quality modelling was re-performed using a receptor grid specifically designed to support the HHERA (August 2018). Activities associated with each Project phase are expected to emit Criteria Air Contaminants (CACs) including CO, NO_x, SO_2, TSP, PM_{10}, and $PM_{2.5}$. Treasury Metals recognizes that Project Workers may be exposed to CACs within the Operations Area (Study Area No. 1), and members of Indigenous communities may visit areas that fall outside of the Operations Area, but within the Property Boundary of the Goliath Gold Project, to practice traditional uses of the lands and resources. Project work and traditional land use do not meet the CCME definition of a community-based receptor and thus determination of compliance with the application of Ambient Air Criteria is not appropriate for these receptors. To capture the possible risk to peoples using these areas, the air modelling was redone using the same emissions and methods as presented in Section 6.6 of the revised EIS (April 2018), but focusing on possible modelling receptors covering the HHERA Study Areas. The refined modelling includes 308 modelling receptors located within the Operations Area (Study Area No. 1), 3,474 modelling receptor locations within the LSA (Study Area No. 2) 1,445 of which fall inside the Property Boundary, and at 46 modelling receptor locations within the Village of Wabigoon (Study Area No. 3). The revised air quality modelling grid in support

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				of the HHERA is shown relative to the Property Boundary and the three Study Areas, on Figure 3.1.1-1 of the 2018 HHERA Report (included as TMI_877-AE(2)-01_Attachment 4). The locations of the sensitive receptors which meet the CCME definition of community-based receptors and are appropriate for determining compliance with ambient air quality criteria, are also shown on Figure 3.1.1-1 of the 2018 HHERA Report. TMI_877-AE(2)-01_Attachment 4 also contains Figure 3.6.2-1 from the 2018 HHERA Report that shows the confirmed Spatial Extent of Effects on Traditional Land and Resource Use Including Country Foods. The 2018 HHERA was completed under the assumption that all areas outside of the operations area will be accessible for traditional land and resource use. The assessment of the effects of CACs on human health was performed using a two-step qualitative and quantitative approach. At the request of Health Canada, predicted exposure point concentrations (defined as the the highest UCLM of the maximum modelled over the five-year period modelled, at each receptor) of CACs were compared to the Canadian Ambient Air Quality Standards (CAAQS) or the Ontario Ambient Air Quality Criteria (AAQC) for all available averaging periods. As stated in the EIS (April 2018), there were no CAC exceedances identified at the sensitive receptor locations which are appropriate for determining regulatory compliance. The results indicated that the predicted EPC of CACs in the LSA and Village of Wabigoon were below the qualitative screening criteria. As such there are no potential health risks anticipated to human receptors who may access the areas within the Property Boundary but outside of the Operations Area via inhalation of CACs. There are no residual adverse effects identified to human receptors in the LSA or the Village of Wabigoon who may live, visit, or practice traditional use of land and resources via the inhalation of CACs in air as a result of the Project. Within the Operations Area, the predicted EPCs of NO_2, $PM_{2.5}$, and PM_{10} were larger than the CAAQS/AAQC (appropriate for use at sensitive receptors) for select averaging periods. Although a quantitative approach was considered for $PM_{2.5}$, PM_{10}, Treasury Metals was informed by Health Canada that they do not currently support a quantitative assessment of these forms of particulate matter, and the qualitative assessment would suffice at this time. The potential Health implications of NO_2 to a Project Worker within the Operation Area was quantitatively assessed. There is no access to the Operations Area by members of the public or Indigenous communities during the active life of the project and highlight that there are no sensitive or community-based receptors within the Operations Area. Under good health and safety practices, an occupational health and safety plan would be in place for Project Workers and serve as an appropriate risk management/ mitigation measure. As such no residual adverse effects are identified as a result of NO_2 and all other CACs concentrations within Operations Area. Predicted EPCs of metals sorbed to particulate matter satisfied their respective qualitative screening criteria at Study Areas No. 1, 2 and 3. As such there are no potential risks anticipated to Project Workers, Residents, and/or Visitors/Harvesters via the inhalation of fugitive dust pathway. Therefore, the 2018 HHERA indicated that a Health and Safety Plan would serve as an appropriate as a risk management measure for Project Workers within the Operations Area (Study Area 1) for the protection of select CACs in air. The Health and Safety Plan effectively mitigates any potential effect on human health and therefore no residual adverse effects are identified. This mitigation measure has been previously described in the EIS (April 2018) in Section 6.19 and is summarized in Section 10 of the EIS (April 2018), (Mit_130). <u>PART D.</u>

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				A Human Health Risk Assessment (HHRA) is the process to estimate the nature and probability of adverse health effects in humans who may be exposed to chemicals in contaminated environmental media, now or in the future. The risk assessment process involves the following four (4) fundamental steps: 1. Problem Formulation; 2. Exposure Assessment; 3. Toxicity Assessment; and 4. Risk Characterization. The 2018 HHERA Report included all four of these components including a problem formulation where receptors, chemicals of concern, and exposure pathways were identified, an exposure assessment where exposure predictions were quantified, a toxicity assessment where the details of the potential health outcome i.e. childhood asthma, cancer, changes to blood pressure were presented, and risk characterization where the effects to human health were qualitatively or quantitatively assessed. These 4 steps were completed for all chemicals identified as being a contaminant of concern based on qualitative screening against regulatory criteria for air, water, soil, waste rock, tailings supernatant water, and pit lake water. <u>PART E</u>: An updated Follow-Up Program, which supersedes Section 13 of the revised EIS (April 2018) has been provided in support of the Round 2 process as the Goliath Gold Follow Up Program Addendum. The updated Follow-Up Program includes details of monitoring with respect to confirming the predicted effects outlined in the HHERA with respect to air, changes in country foods for consumption and human health. The air monitoring program described in the Goliath Gold Project Follow-up Program Addendum has been revised to include specifically identify $PM_{2.5}$ as the fine particulate to be monitored at the continuous monitoring station, which also includes monitoring of NO_2.
				Agency Comment on Revised Response i) Provide the most recent Follow-up Program Addendum in the final IR#2 response submission, with the aforementioned updates. As the frequency and duration of access by Indigenous traditional land users is not known, Health Canada recommends that the siting of air monitoring locations be determined in collaboration with Indigenous communities for PM2.5and NO2 as part of the EA conditions. In addition, consideration should be given to include a notification system/protocol for Indigenous traditional land users in the event of an exceedance. ii) Additional mitigation measures should be proposed to reduce 1-hr NO_2 concentrations and contour maps for all air contaminates of concern, including the maximum predicted air concentrations outside the fenced operations area should be presented (see comment HHRA(2)-01 from Health Canada's December 6, 2018 submission). iii:

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				a) Provide a summary of the maximum EPCs used in the HHRA for each contaminant for receptors outside the operations area but within the property boundary. This information will assist in the discussion of potential human health effects as well as providing additional support for monitoring recommendations. b) Revise the language used in the HHRA and supporting IR responses (e.g., where ILCR is below 1 in 100,000, the risk may be described as essentially negligible[1]). c) Note that the CAAQS are part of the Air Zone Management Framework to protect air quality in accordance with the principles of continuous improvement and keeping clean areas clean[2]. Include a discussion of the implications of the CAAQS-associated management levels, a qualitative analysis of the potential health effects of $PM_{2.5}$ in relation to exposure throughout the project area and the potential to reduce emissions of pollutants that form $PM_{2.5}$. Error: in the text on page 14 the incorrect annual SO_2 value has been referenced (i.e., 23 µg/m^3 listed). This should be corrected in the final response submission. [1]Health Canada. 2010. Part V: Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals (DQRACHEM). Contaminated Sites Division, Safe Environments Directorate, Health Canada. [2]Canadian Council of Ministers of the Environment. 2007. Guidance document on Continuous Improvement (CI) and Keeping-Clean-Areas-Clean (KCAC).
				Specific Comment to the Agency Part i) The Final Goliath Gold Follow Up Addendum supersedes all previous versions of the follow up program and captures all requested updated since September 2018 including the aforementioned updates. Treasury Metals will determine the locations of air monitoring in consultation with Indigenous communities and provincial and federal regulatory agencies. Treasury Metals has committed to all Indigenous communities to work with them in developing community specific risk communication plans including with respect to potential risk to human health via the inhalation of air pathway. Part ii) The results of the Final HHERA indicate that potential risk to human health via inhalation of criteria air contaminants (including NO_2) is essentially negligible to those who may practice traditional land use outside of the Operations Area but within the Property Boundary. No residual adverse effects were identified. Although the results of the HHERA do not indicate that risk management or mitigation measures are required during traditional land and resource use, as part of the sign in and access policy, Treasury Metals will offer personal protective equipment to those who prefer to wear it while within the Property Boundary. Treasury Metals has committed to working with Indigenous communities to develop community specific risk communication plans to mitigate any perception of risk. Treasury Metals has also committed to consult with Indigenous communities regarding the placement of dustfall monitoring jars to target areas of potential impact that overlap with areas where traditional land and resource occurs (this information will be shared confidentially by the community in the formal Traditional Knowledge studies completed, underway or expected in the future).

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				For Health and Safety purposes, there will also be an access plan, where visitors to the property will be required to sign in. The personal protective equipment will be offered to those individuals during sign in. With these mitigation measures in place, no potential risk via exposure to NO_2 or other CACs is anticipated to those who practice traditional land and resource use. Part iii) a) Section 3.5 of the HHERA provides exposure point concentrations for all contaminants of concern including criteria air contaminants. As per the correspondence with Health Canada in August 2018, the 95th upper confidence limit of the mean was appropriately selected as the exposure point concentration as per Health Canada's DQRA guidance document. An updated series of isopleths has been provided in support of the Air Quality assessment for the purposes of demonstrating regulatory compliance with the ambient air quality objectives. b) The language in the HHERA has been revised to describe risk as "essentially negligible" when predictions are less than the target risk benchmark accepted by the MECP and Health Canada. c) Health Canada indicates that the health effects of air contaminants may include disease, increased hospitalizations, and even premature death. At this time, there is not enough toxicological scientific data on PM2.5 to support the quantitative risk assessment of PM2.5 and thus Health Canada advised Treasury Metals and their consultants to proceed with a qualitative screening only (see correspondence dated August 1 through August 8 in TMI_954-HHRA(2)-01_Attachment 1). The results of the HHERA indicated that with the implementation of a health and safety plan (including the prescribed use of personal protective equipment) then exposure and subsequent risk would be essentially negligible to Project Workers within the Operations Area. The HHERA also indicates that potential risk outside of the Operations Areas would be essentially negligible to all receptors including those who practice traditional land and resource use given that there are no exceedances of the CAAQS-associated management levels. As such there are no potential health implications identified as a result of the Goliath Gold Project with respect to PM2.5. Health Canada states that exposure to PM2.5 is most dangerous for the following at-risk groups: • children with asthma because it affects breathing functions • older adults because it affects breathing, heart and blood functions • people with an underlying breathing and/or heart condition because it worsens their condition(s). Treasury Metals has committed to developing a risk communication plan which can be used as a platform to communicate to individuals the groups who are more susceptible to PM2.5 exposure (i.e. children with asthma, older adults, and people with underlying breathing issues). For Health and Safety purposes, there will be a sign in for those who wish to use areas within the Property Boundary, and those individuals who are more susceptible to health

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				effects may wish to take advantage of the personal protective equipment Treasury Metals will offer during the sign in process. It is unclear which page 14 the reviewer was referring to in their comment, however the Final Response to TMI_877-AE(2)-01 references the annual SO2 value as 8 µg/m^3 not 23 µg/m^3
				FINAL RESPONSE PART A: As requested, the dispersion modelling results presented in Tables 6.6.4.1-2, 6.6.4.2-2 and 6.6.4.3-2 of the revised EIS (April 2018) have been updated to include predictions of the annual NO_2. The background annual NO_2 concentrations of14 µg/m^3 represents the highest measured annual NO_2 value from the five years of Thunder Bay data used. The updated results are provided in the following tables: • **TMI_877-AE(2)-01_Table_1**: This table presents the maximum predicted concentrations during the Site Preparation and Construction Phase. These numbers represent updated predictions that supersede the values presented in Table 6.6.4.1-2 of the revised EIS (April 2018). Specifically, the results reflect the predicted maximum point of impingement (MPOI) and sensitive receptor concentration, taking into account changes in the property line and land tenure since generating the modelling receptors used in the revised EIS (April 2018). • **TMI_877-AE(2)-01_Table_2**: This table presents the maximum predicted concentrations during the Operations Phase. These numbers represent updated predictions that supersede the values presented in Table 6.6.4.2-2 of the revised EIS (April 2018). Specifically, the results reflect the predicted maximum point of impingement (MPOI) and sensitive receptor concentration, taking into account changes in the property line and land tenure since generating the modelling receptors used in the revised EIS (April 2018). • **TMI_877-AE(2)-01_Table_3**: This table presents the maximum predicted concentrations during the Closure Phase. These numbers represent updated predictions that supersede the values presented in Table 6.6.4.3-2 of the revised EIS (April 2018). Specifically, the results reflect the predicted maximum point of impingement (MPOI) and sensitive receptor concentration, taking into account changes in the property line and land tenure since generating the modelling receptors used in the revised EIS (April 2018). To clarify, the only differences between the predictions presented in Tables 6.6.4.1-2, 6.6.4.2-2 and 6.6.4.3-2 of the revised EIS (April 2018) and TMI_877-AE(2)-01_Table_1, TMI_877-AE(2)-01_Table_2 and TMI_877-AE(2)-01_Table_3 were the changes to the gridded modelling and sensitive receptors locations as a result of the changes to the property line since generating the modelling receptors used in the revised EIS (April 2018).

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				As noted above, the property boundary used in the dispersion modelling has changed since the modelling receptors used in the revised EIS (April 2018) were generated. The changes to the property boundary with time can be described with the following three figures: • **TMI_877-AE(2)-01_Figure_1:** This figure shows the property boundary used in the air modelling results presented in the original EIS, as well as air modelling results presented in the revised EIS (April 2018). This property boundary represented the conditions when the air modelling was originally commissioned, which was also shown on Figure 6.1.4.5-1 of the revised EIS (April 2018). • **TMI_877-AE(2)-01_Figure_2:** This figure shows the property boundary used for all disciplines except air quality in the revised EIS (April 2018). This property boundary, which was shown on Figure 1.2.3-1 of the revised EIS (April 2018), includes property obtained by Treasury Metals since the air modelling was originally commissioned, and includes the following differences from TMI_877-AE(2)-01_Figure_1: o Treasury Metals acquired the parcel of land to the west of Tree Nursery Road, and to the south of Norman's Road, and o Treasury Metals acquired the parcels of land between East Thunder Lake Road and the property boundary shown on TMI_877-AE(2)-01_Figure_1. • **TMI_877-AE(2)-01_Figure_3:** This figure shows the current property boundary, and corresponds to the property boundary used for preparing the Round 2 responses, including the results presented in Tables 1, 2 and 3 of this response, as well as TMI_877-AE(2)-01_Table_4a, TMI_877-AE(2)-01_Table_4b and TMI_877-AE(2)-01_Table_4c of the draft response. This property boundary, includes the property obtained by Treasury Metals since of completion of the revised EIS (April 2018), specifically the following: o Treasury Metals acquired the parcel of land to the east of Tree Nursery Road, and to the south of Norman's Road. Since the filing of the revised EIS (April 2018), the property ownership and claim status of the lands within the property boundary have also been updated from those presented in Figure 1.2.3-1 of the revised EIS (April 2018). The updated property status is provided on TMI_877-AE(2)-01_Figure_4. As shown on the figure, the lands in the western portion of the property boundary represent private or patent lands, lands for which Treasury Metals hold surface and mineral rights, lands to which Treasury Metals hold mineral rights and surface rights are pending, and lands where conversion from claim to lease is pending. Such lands would be consistent with the definition of a property line used in Ontario Regulation 419/05 (O.Reg. 419/05). As shown on TMI_877-AE(2)-01_Figure_4, Treasury Metals are not planning on bringing the claimed lands within the eastern portion of the property boundary to lease at this time. As such, the limit of private, patent and leased lands (shown with a thick red line on TMI_877-AE(2)-01_Figure_4) would represent the property boundary for modelling in accordance with O.Reg. 419/05. This represents the property boundary used in the in the revised modelling presented in TMI_877-AE(2)-01_Table_1, TMI_877-AE(2)-01_Table_2 and TMI_877-AE(2)-01_Table_3. The above changes to the property boundary also affected the sensitive receptor locations. TMI_877 AE(2) 01_Figure_3 shows the current property boundary used for preparing the Round 2 responses, including the results

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<tr><th>Unique Identifier</th><th>Agency IR #</th><th>Annex</th><th>Agency / Group / Stakeholder</th><th>Cross Reference / Comment / Information Request / Response</th></tr>
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presented in TMI_877-AE(2)-01_Table_1, TMI_877-AE(2)-01_Table_2 and TMI_877-AE(2)-01_Table_3. On the figure, the sensitive receptors that have been excluded as a result of the changes to the property lines are marked as red on the figure. It is Treasury Metals intention to remove the residences at each of these locations. However, Treasury Metals may retain the secondary structures and outbuildings at these locations for use as possible wildlife habitat. A decision regarding the fate of the secondary structures and outbuildings would be made through consultation with Ontario Ministry of Natural Resources and Forestry (MNRF), as well as Environment and Climate Change Canada.

To help illustrate where the predicted maximum concentrations are likely to occur, a series of updated isopleth figures have been prepared. These are provided as TMI_877-AE(2)-01_Attachment_1 (site preparation and construction), TMI_877-AE(2)-01_Attachment_2 (operations), and TMI_877-AE(2)-01_Attachment_3 (closure). The isopleth figures provided in TMI_877-AE(2)-01_Attachment_2 (operations) supersede Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018). Each of the attachments includes 15 isopleth figures, 14 which correspond to the compounds and averaging periods presented in Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018), plus a fifteenth figure that provides the annual NO_2 predictions. The updated isopleth figures show where along the limit of private, patent and leased lands (i.e., modeling property boundary in accordance with the O.Reg. 419/05) the maximum point of impingement (MPOI) was predicted to occur, as well as showing at which sensitive receptors the maximum was predicted.

PART B:

The new Canadian Ambient Air Quality for SO_2 and NO_2 that will come into force 2025 are listed in Table 4. These ambient air quality criteria are applicable at community-oriented receptors (CCME 2000), which correspond to the sensitive receptor modelling results presented in Section 6.6 of the revised EIS (April 2018).

<table>
<tr><th colspan="3">Table 4: 2025 Canadian Ambient Air Quality Standards for SO_2 and NO_2</th></tr>
<tr><th>Averaging Period</th><th>SO_2</th><th>NO_2</th></tr>
<tr><td>Annual CAAQS (2025)</td><td>8 µg/m³</td><td>23 µg/m³</td></tr>
<tr><td>1-hour CAAQS (2025)</td><td>169 µg/m³</td><td>79 µg/m³</td></tr>
</table>

As shown in Tables 5 none of the maximum predicted SO_2 concentrations at the sensitive receptor locations exceed the new Canadian Ambient Air Quality (CAAQS) of 169 µg/m³ (1-hour SO_2) and 8 µg/m³ (annual SO_2) that will come into force 2025. It is important to note that the CCME (2006) identified that compliance with ambient air quality criteria should be done at “community-oriented receptors”. The only “community-oriented” receptors in the vicinity of the Goliath Gold Project are the sensitive receptor locations. The current sensitive receptor locations used in the revised modelling are shown as “yellow circles” on TMI_877-AE(2)-01_Figure_3. In addition, none of the predicted MPOI SO_2 concentrations were numerically higher than 169 µg/m³ (1-hour SO_2) and 8 µg/m³ (annual SO_2). Based on the results of the SO_2 modelling, additional improvements or mitigation measures for air quality are not required in order to achieve compliance with the new CAAQS set to come in force in 2025. However, it is expected that the sulphur
</td></tr>
</table>

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response

content in fuel will decrease in years to come, which will aid in further reducing both the SO_2 concentrations from Project activities, as well as the background SO_2 concentrations that account for most of the cumulative SO_2 predictions (87% of the 1-hour SO_2 and 99% of the annual SO_2).

Table 5: Maximum 1-hour and Annual SO_2 Predictions

Compound	Averaging Period	Maximum at Gridded Receptors (MPOI)			Maximum at Sensitive Receptors		
		Modelled Prediction	Background (1)	Cumulative Prediction	Modelled Prediction	Background (1)	Cumula Predict
Site Preparation and Construction							
SO_2	1-hour	0.77	4.0	4.8	0.65	4.0	4.7
	Annual	0.013	1.0	1.0	0.010	1.0	1.0
Operations							
SO_2	1-hour	4.6	4.0	8.6	0.18	4.0	4.2
	Annual	0.58	1.0	1.6	0.0024	1.0	1.0
Closure							
SO_2	1-hour	0.78	4.0	4.8	0.60	4.0	4.6
	Annual	0.015	1.0	1.0	0.0092	1.0	1.0

Tables 6 provides the maximum predicted NO_2 concentrations at the sensitive receptor locations, as well as the maximum MPOI concentrations for NO_2. None of the maximum predicted concentrations at the sensitive receptor locations exceed the new Canadian Ambient Air Quality (CAAQS) of 79 µg/m³ (1-hour NO_2) and 23 µg/m³ (annual NO_2) that will come into force 2025. It is important to note that the CCME (2006) identified that compliance with ambient air quality criteria should be done at "community-oriented receptors". The only "community-oriented" receptors in the vicinity of the Goliath Gold Project are the sensitive receptor locations. The current sensitive receptor locations used in the revised modelling are shown as "yellow circles" on TMI_877-AE(2)-01_Figure_3. The modeling indicates that there are areas along the property boundary where the maximum predicted 1-hour NO_2 concentrations were numerically higher than 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025). However, because these locations do not meet the requirements for "community-oriented receptors" defined by the CCME (2006), it is not obvious that predicted concentrations in excess of 79 µg/m³ represents an exceedance of the CAAQS. As such, no additional mitigation measures are required to ensure compliance with the new CAAQS for NO_2. It should also be noted that predicted 1-hour NO_2 concentrations in excess of 79 µg/m³ are extremely unlikely to occur, predicted on less than 0.3% of the hours modelled (see response to TMI_880-AE(2)-04). It anticipated that on-going manufacturers' improvements to mobile equipment emissions will assist in further reducing the anticipated effects of the Project. Also, future improvements in the emissions of NO_X from motor vehicles will also have a noticeable effect on reducing the background NO_2 levels in the future.

Table 6: Maximum 1-hour and Annual NO_2 Predictions

Compound	Averaging Period	Maximum at Gridded Receptors (MPOI)			Maximum at Sensitive Receptors		
		Modelled Prediction	Background (1)	Cumulative Prediction	Modelled Prediction	Background (1)	Cumula Predict
Site Preparation and Construction							
NO_2	1-hour	50	29	79	36	29	65
	Annual	1.0	14	15	0.84	14	15
Operations							
NO_2	1-hour	80	29	110	28	29	57
	Annual	9.2	14	23	0.99	14	15
Closure							
NO_2	1-hour	30	29	59	12	29	41
	Annual	0.70	14	14	0.48	14	14

As the results of the revised modeling indicate that there are areas along the property boundary where the maximum predicted 1-hour NO_2 concentrations were numerically higher than 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025), it is reasonable to expect there would be areas within the property boundary where concentrations could exceed 79 µg/m³ on an infrequent basis. However, given that the CCME (2006) identified that compliance with ambient air quality criteria should be done at "community-oriented receptors", the only "community-oriented receptors" in the vicinity of the Goliath Gold Project are the sensitive receptor locations, shown as "yellow circles" on TMI_877 AE(2) 01_Figure_3, and there are no sensitive receptors or "community-oriented receptors" within the property boundary, it is not obvious that predicted concentrations in excess of 79 µg/m³ represents an exceedance of the new CAAQS. As such, no exceedances of the new CAAQS would occur within the property boundary.

In recognition that "there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands and resources", the updated Human Health and Ecological Risk Assessment (2018 HHERA), has specifically included evaluation of the potential effects of exposure to air quality within the property boundary on human health. The 2018 HHERA includes consideration of air quality effects on both Project Workers and those who may transiently pass through areas within the Property Boundary to practice traditional land and resource use. In the case of Project Workers, their exposures were calculated using the area maximum concentrations within the operations area. In the case of areas where Indigenous communities may wish to practice traditional uses of the lands and resources, their exposures were calculated as the area maximum concentration outside of the operations area. The area maximum concentrations for each parameter and averaging period were calculated as the 95th percentile UCLM of maximum predictions at the gridded modelling points within the property boundary. This approach is most appropriate for a detailed quantitative human health risk assessment as concentrations of chemicals vary spatially and temporally in the air to which humans are exposed. During long-term exposures, humans may move over areas, or in and out of impacted areas. As a result, individuals tend to integrate spatial and temporal variation in the chemical concentrations to which they are exposed. Therefore, estimates of the central tendency (e.g., arithmetic means, upper confidence

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				limits) are generally used in human health exposure models as an expression of the spatial and temporal averaging of chemical concentrations in different media (U.S. EPA, 1992, 2001). The results of the HHRA screening, identified that three (3) valued components/criteria air contaminants; nitrogen dioxide, and both fractions of particulate matter (NO_2, PM_{10} and $PM_{2.5}$) exceeded their respective ambient air quality criteria inside the Operations Area and only during the active phases of mining, thereby indicating that potential risk to Project Workers via the inhalation pathway may not be considered negligible. At the request of Health Canada and the Agency, diesel particulate matter (DPM) was also included in the health assessment even though there are no federal or provincial criteria available within Canada. It should be noted that air quality is not typically modelled within the Property Boundary as part of the EA process unless sensitive receptors are present, as the federal and provincial criteria are only applicable at the Property Boundary or sensitive receptor locations. There are no sensitive receptors located within the Property Boundary of the Goliath Gold Project, however at the continued request of the Agency and Health Canada, modelling inside the Property Boundary was performed and used to determine the 95th UCLM concentrations. A Health and Safety Plan including the prescribed use of personal protective equipment (including but not limited to dust masks and other similar equipment) will be implemented for all Project Workers of the Goliath Gold Project. The Health and Safety Plan will serve as an appropriate risk management/ mitigation measure to mitigate any adverse health effect. With a Health and Safety Plan implemented as a risk management measure, exposure via the inhalation pathway is considered negligible and no residual adverse effects are identified to Project Workers. Concentrations of all CACs modelled within the LSA (including areas within the Property Boundary) and the Village of Wabigoon were below their criteria protective of human health, and the potential risk associated with exposure to DPM was determined to be essentially negligible. Therefore, health risks to residents or visitors/ harvesters who may practice traditional land and resource use are considered essentially negligible. No residual adverse effects were identified. Although the results of the HHERA do not indicate that risk management or mitigation measures are required during traditional land and resource use, as part of the sign in and access policy, Treasury Metals will offer appropriate personal protective equipment to those who prefer to wear it while within the Property Boundary. <u>PART C.</u> As described in Part B, a Health and Safety Plan including the prescribed use of personal protective equipment (including but not limited to dust masks and other similar equipment) will be implemented for all Project Workers of the Goliath Gold Project. The Health and Safety Plan will serve as an appropriate risk management/ mitigation measure to mitigate any adverse health effect. With a Health and Safety Plan implemented as a risk management measure, exposure via the inhalation pathway is considered negligible and no residual adverse effects are identified to Project Workers. Health risks to residents or visitors/ harvesters who may practice traditional land and resource use are considered essentially negligible. No residual adverse effects were identified. Although the results of the HHERA do not indicate that risk management or mitigation measures are required during traditional land and resource use, as part of the sign in and access policy, Treasury Metals will offer personal protective equipment (e.g. dust masks) to those who prefer to wear it while within the Property Boundary.

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response
				PART D. Health Canada indicates that the health effects of air contaminants may include disease, increased hospitalizations, and even premature death. Health Canada states that exposure to PM2.5 is most dangerous for the following at-risk groups: • children with asthma because it affects breathing functions • older adults because it affects breathing, heart and blood functions • people with an underlying breathing and/or heart condition because it worsens their condition(s). Treasury Metals has committed to developing a risk communication plan which can be used as a platform to communicate to individuals the groups who are more susceptible to PM2.5 exposure (i.e. children with asthma, older adults, and people with underlying breathing issues). Although the results of the HHERA do not indicate that risk management or mitigation measures are required during traditional land and resource use, as part of the sign in and access policy, Treasury Metals will offer personal appropriate protective equipment to those who prefer to wear it while within the Property Boundary. A Health and Safety Plan including the prescribed use of personal protective equipment (including but not limited to dust masks and other similar equipment) will be implemented for all Project Workers of the Goliath Gold Project. The Health and Safety Plan will serve as an appropriate risk management/ mitigation measure to mitigate any adverse health effect. PART E: The Final Follow-Up Program includes details of monitoring with respect to confirming the predicted effects outlined in the HHERA with respect to air, changes in country foods for consumption and human health. The air monitoring program described in the Goliath Gold Project Follow-up Program Addendum has been revised to include specifically identify $PM_{2.5}$ as the fine particulate to be monitored at the continuous monitoring station, which also includes monitoring of NO_2. Treasury Metals has also committed to consult with Indigenous communities regarding the placement of dustfall monitoring jars to target areas of potential impact that overlap with areas where traditional land and resource occurs (this information will be shared confidentially by the community in the formal Traditional Knowledge studies completed, underway or expected in the future). Treasury Metals recognizes that the perception of risk, safety and well-being is a concern to members of Indigenous communities and has proposed to work with each community to develop a risk communication plan to help mitigate the perceptions of risk, safety and well-being associated with the Goliath Gold Project.

TMI_878-AE(2)-02

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response	
TMI_878-AE(2)-02	AE(2)-02	1	CEA Agency	**Reference to EIS Guidelines:**	Part 2, Section 10.1.3.
				Reference to EIS / Appendix	Appendix J-5
				Cross-reference to Round 1 IRs	TMI_168-AE(1)-06
				Context and Rationale: • Appendix J-5, Tables 8, 9 and 10 do not consider diesel particulate matter (DPM) as independent from particulate matter. DPM is typically fine to ultra-fine in particle size, and is therefore considered a highly respirable toxic air contaminant associated with cancer and adverse health problems such as respiratory illnesses and increased risk of heart disease. In 2013, the International Agency for Research on Cancer (IARC) concluded that exposure to outdoor air pollution and to PM in outdoor air, which includes DPM, is carcinogenic to humans (IARC, Group 1). • International Agency on Cancer Research. 2013. IARC: Outdoor air pollution a leading environmental cause of cancer deaths. Press Release No. 221, dated October 17. http://www.iarc.fr/en/media-centre/pr/2013/pdfs/pr221_E.pdf	
				Specific Question / Request for Information: A. Indicate the sources and predicted concentrations of diesel particulate matter (DPM) in air as a result of project activities. B. Update the human health risk assessment by providing a quantitative assessment of incremental cancer risk from DPM using the unit risk and inhalation slope factor available from the California Office of Health Hazard Assessment, CalEPA (2015). https://www.arb.ca.gov/toxics/dieseltac/de-fnds.htm C. Propose and describe additional mitigation measures to reduce incremental cancer risk from emissions of DPM. D. Characterize effects to human health from quantitative assessment developed in Question A. E. If necessary, update the follow-up program for effects to human health, including objectives and any additional monitoring measures that will be implemented to verify the predictions of concentrations of DPM. Add these new measures to the overall Follow-Up Program to be prepared in response to IR# EA(2)-01.	

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Response:

PART A

As discussed with the Agency and the Agency reviewers on August 26, 2018, the air quality assessment completed to support the revised EIS (April 2018) explicitly identifies the sources of exhaust particulate associated with the Project, and includes those emissions in the modelling of airborne concentrations of total suspended particulates (TSP), inhalable particulate matter (PM_{10}) and respirable particulate matter ($PM_{2.5}$). At the request of the Agency reviewers, the diesel particulate (DPM) emissions associated with the Project have been tabulated for the site preparation and construction phase, operations phase, and closure phase, and the numbers tabulated in Table 1. In tabulating the DPM emissions, the following is noted:

- All of the tailpipe particulate emissions associated with the Project are considered to be emissions of diesel particulate matter (DPM).
- All of the particulate (TSP, PM_{10} and $PM_{2.5}$) emissions from the backup generators are considered to be emissions of diesel particulate matter (DPM).
- A portion of the particulate matter in the exhaust from underground mine workings (i.e., vent raises) will be emitted from the tailpipes of vehicles operating underground. For the purposes of calculating exposures, it was conservatively assumed that diesel particulate matter (DPM) represents 50% of the particulate matter released from the vent raises.
- As diesel particulate matter (DPM) in comprised of particles that are nearly all less than 1 µm in diameter, the particulate emissions of TSP, PM_{10} and $PM_{2.5}$ from diesel combustion are numerically the same (see Table 1, Table 3.5.3.1-8 of the 2018 HHERA)) as each other.

Table 1: Diesel Particulate Matter (DPM) Emissions (Mg/yr) by Project Phase

Emission Source	Site Preparation and Construction			Operations			Closure		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Haul Roads (1)	3.469	3.469	3.469	2.807	2.807	2.807	3.469	3.469	3.469
Bulldozer 1 (1)	0.312	0.312	0.312	0.312	0.312	0.312	0.312	0.312	0.312
Bulldozer 2 (1)	0.312	0.312	0.312	0.312	0.312	0.312	0.312	0.312	0.312
Bulldozer_3 (1)	—	—	—	0.312	0.312	0.312	—	—	—

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Loader (1)	0.473	0.473	0.473	0.473	0.473	0.473	0.473	0.473	0.473
Excavator (1)	0.120	0.120	0.120	0.120	0.120	0.120	0.240	0.240	0.240
Back-up generators (2)	4	4	4	4	4	4	2	2	2
Vent raises (3)	0	0	0	9.5	9.5	9.5	0	0	0
TOTAL DPM Emissions	**8.686**	**8.686**	**8.686**	**17.836**	**17.836**	**17.836**	**6.806**	**6.806**	**6.806**

NOTES:

(1) Tailpipe emissions of diesel particulate matter (DPM) are taken directly from Appendix B to Appendix J-2 (Environmental Air Quality Assessment) prepared by RWDI Air Inc. Specifically, the Site Preparation and Construction phase DPM emissions were taken from Appendix B2 to Appendix J-2, the Operations phase DPM emissions were taken from Appendix B7 to Appendix J-2, and the Closure phase DPM emissions were taken from Appendix B18 to Appendix J-2.

(2) All of the particulate emissions from e back-up generators were assumed to be diesel particulate matter (DPM). The particulate emissions for back-up generators were taken from Appendix B to Appendix J-2 (Environmental Air Quality Assessment) prepared by RWDI Air Inc., specifically, Appendices B12 and B13 to Appendix J-2.

(3) The particulate matter emissions from the underground workings (i.e., vent raises) were taken directly from Appendix B16 to Appendix J-2 (Environmental Air Quality Assessment) prepared by RWDI Air Inc. Although there was no specific breakdown provided with regards to the composition of the particulate emissions from the underground workings, a portion is likely to result from the tailpipe emissions from diesel fired equipment working underground. For the purposes of the health assessment, it was conservatively assumed that 50% of the particulate matter from the vent raises was diesel particulate matter (DPM).

As the diesel particulate matter (DPM) emissions from the Project are associated with the same source groups as the overall particulate matter emissions, it is reasonable to conclude that the resulting concentrations of diesel particulate matter (DPM) would relate to the overall particulate predictions in a manner consistent with the proportional emissions. Table 2 (Table 3.5.3.1-9 of the 2018 HHERA) provides a comparison of the overall particulate emissions from the Project to the emissions of diesel particulate matter (DPM).

Table 2 Comparison of Project Particulate and Diesel Particulate Matter (DPM) Emissions, by Project Phase

Emission Category	Site Preparation and Construction			Operations			Closure		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Overall Project Emissions (1)	631.420	173.920	27.275	569.030	184.360	56.628	622.040	168.540	23.290

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Diesel Particulate Matter (DPM) (2)	8.686	8.686	8.686	17.836	17.836	17.836	6.806	6.806	6.806
DPM, as a Fraction of particulate emissions.	**1.4%**	**5.0%**	**31.8%**	**3.1%**	**9.7%**	**31.5%**	**1.1%**	**4.0%**	**29.2%**

NOTES:

(1) Based on the summary of emissions provided in Table 6.6.1.2-1 of the revised EIS (April 2018). It should be noted that an error was found in the version of emissions tables included as part of the revised EIS (April 2018). Revised copies of the emission summary tables from Section 6.6 of the revised EIS (April 2018) have been included as TMI_878-AE(2)-02_Attachment_1.

(2) As presented in Table 2 to this response.

Although there are currently no Canadian regulatory limits for diesel particulate matter (DPM) in Canada, the State of California has established levels for use in describing the chronic cancer and non-cancer risks associated with exposure to diesel particulate matter (DPM). At the request of the Agency and their reviewers, consideration has been given to the potential chronic effects of DPM on human health as part of the human health risk assessment, completed in support of the Round 2 information requests and included as part of the overall response package. The Human Health Risk Assessment for the Goliath Gold Project identifies exposure point concentrations of criteria air contaminants for the three study areas used, namely: the Operations Area (which is consistent with the operations area used throughout the revised EIS [April 2018]), the Local Study Area (which includes the portions of the human health LSA outside of the operations area) and the Village of Wabigoon. There will be no access to the operations are throughout the operating life of the Project, from the start of the Site Preparation and Construction Phase, through to the end of the closure phase. However, the local study area for the Human Health Risk Assessment includes those areas beyond the Operations Area and within the property line of the Goliath Gold Project where the use of lands and resources could by members of Indigenous communities could continue. Table 3 (Table 3.5.3.1-10 of the 2018 HHERA) provides a summary of the modelled annual exposure point concentrations of TSP, PM_{10} and $PM_{2.5}$ for each of the study areas used in the Human Health Risk Assessment.

Table 3: Annual Exposure Point Concentrations (µg/m³) of Particulate Matter (1) from the Project, by Phase

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Study Area	Site Preparation and Construction			Operations			Closure		
	TSP (2)	PM_{10} (3)	$PM_{2.5}$ (4)	TSP (2)	PM_{10} (3)	$PM_{2.5}$ (4)	TSP (2)	PM_{10} (3)	$PM_{2.5}$ (4)
Operations Area (5)	34.7	9.6	1.5	30.9	10.2	2.8	34.0	9.3	1.4
Local Study Area	1.6	0.5	0.1	1.8	0.6	0.2	1.6	0.5	0.1
Village of Wabigoon	0.3	0.1	0.0	0.3	0.1	0.0	0.3	0.1	0.0

NOTES:

(1) Data are compiled from Table 3.5.2.1-1 of the Goliath Gold Project Human Health and Ecological Risk Assessment (September 2018).

(2) Includes background annual TSP of 14 µg/m³.

(3) Includes background annual PM_{10} of 6.4 µg/m³.

(4) Includes background annual $PM_{2.5}$ of 4.3 µg/m³.

(5) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

The corresponding exposure point concentrations for diesel particulate matter from the Project can be determined by applying the corresponding relationships between the emissions of particulate matter and DPM emissions to the relevant predicted particulate exposure point concentrations. To ensure the assessment is conservative, Table 4

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(Table 3.5.3.1-11 of the 2018 HHERA) presents the calculation of DPM exposure point concentrations for each of the Project phases for: (1) using the relationship between TSP and DPM; (2) using the relationship between PM_{10} and DPM; and (3) using the relationship between $PM_{2.5}$ and DPM. The relationship that gives the highest DPM concentrations for each phase and study area are summarized in Table 5 (Table 3.5.3.1-12 of the 2018 HHERA). These values are used in the Human Health Risk Assessment.

Table 4: Calculated Annual Exposure Point Concentrations (µg/m³) of Diesel Particulate Matter (DPM) from the Project, by Phase

Study Area	Site Preparation and Construction			Operations			Closure		
	DPM using TSP Emissions	DPM using PM_{10} Emissions	DPM using $PM_{2.5}$ Emissions	DPM using TSP Emissions	DPM using PM_{10} Emissions	DPM using $PM_{2.5}$ Emissions	DPM using TSP Emissions	DPM using PM_{10} Emissions	DPM using $PM_{2.5}$ Emissions
Operations Area (1)	0.48	0.48	0.47	0.97	0.98	0.89	0.37	0.37	0.40
Local Study Area	0.02	0.02	0.02	0.06	0.05	0.06	0.02	0.02	0.02
Village of Wabigoon	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00

NOTES:

(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

Table 5: Annual Exposure Point Concentrations (µg/m³) of Diesel Particulate Matter (DPM) from the Project

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response

Study Area	Site Preparation and Construction	Operations	Closure
Operations Area (1)	0.479	0.984	0.396
Local Study Area	0.023	0.063	0.019
Village of Wabigoon	0.005	0.010	0.004

NOTES:

(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

PART B

The 2018 HHERA included a quantitative assessment of incremental cancer risk from DPM using the unit risk and inhalation slope factor available from the California Office of Health Hazard Assessment, CalEPA (2015). In the 2018 HHERA the potential health outcomes associated with the non-cancer endpoint of DPM were also appropriately considered. The following paragraphs and series of Tables explain the risk characterization of DPM in response to the Round 2 Information Requests (TMI_878-AE(2)-02 [IR# AE(2)-02] and TMI_931-HE(2)-11 [IR# HE(2)-11]) that explicitly requested that the human health risk include a quantitative assessment of incremental cancer risk resulting from exposure to DPM using the unit risk and inhalation slope factor available from the California Office of Health Hazard Assessment, California EPA (2015).

Quantitative Risk Characterization of DPM:

Provincial regulatory agencies across Canada offer differing guidance on the risk characterization process. The risk characterization methods adopted by the Province of Ontario are accepted for the assessment of potential human health risks associated with the Goliath Gold Project. When characterizing the potential risks posed by exposure to non-carcinogenic substances, Ontario accepts a hazard quotient (HQ) of 0.2 (exposure ≤ 1/5 TRV). For non-carcinogens (i.e., threshold chemicals), potential risk is estimated by calculating the ratio of the estimated exposure to the TRV, which is referred to the hazard quotient (HQ) as follows:

$$Hazard\ Quotient\ (HQ) = \frac{Estimated\ Exposure}{TRV}$$

Therefore, the target HQ for the Base Case, Project Alone and Project Assessment Scenarios will be an HQ of 0.2. It is important to note that the magnitude of the HQ does not necessarily correspond to the magnitude of expected health effects, therefore the results of the risk characterization will be stated as potential risk, and negligible potential risk.

The estimated HQs resulting from exposure to DPM from the Project in each of the Study Areas are provided in Table 6 (3.5.3.1-13 in 2018 HHERA Report). None of the estimated HQs exceeded Health Canada's target of 0.2. As such, no potential non-cancer risks are anticipated for all human receptors who may be exposed to DPM in air from the Project.

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Table 6: Calculated HQs based on California EPA TRV of 5 µg/m³

Study Area	Site Preparation and Construction	Operations	Closure
Operations Area (1)	9.6×10^{-2}	2.0×10^{-1}	7.9×10^{-2}
Local Study Area	4.5×10^{-3}	1.3×10^{-2}	3.7×10^{-3}
Village of Wabigoon	9.5×10-4	1.9×10-3	7.5×10-4

NOTES:

(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

For chemicals with carcinogenic endpoints (i.e., non-threshold chemicals), deemed to be carcinogenic, the estimated exposure (amortized as appropriate) is multiplied by the appropriate slope factor to derive a conservative estimate of the potential incremental lifetime cancer risk (ILCR) associated with that exposure. The ILCR is derived as:

$$Incremental\ Lifetime\ Cancer\ Risk\ (ILCR) = Exposure\ \times TRV$$

Health Canada indicates that cancer risks will be deemed to be "essentially negligible" where the estimated ILCR is ≤ 1 in 100,000 (≤1×10^{-5}). For conservatism, the more conservative Ontario benchmark ILCR of 1 in 1 million (1×10^{-6}) has been applied in the assessment of carcinogenic effects in the HHRA for the Goliath Gold Project. The US EPA accepts ILCR targets between 1×10^{-4} and 1×10^{-6}.

The results indicate that potential cancer risks may not be ruled out as a result of DPM emissions as a result of the Project based on the California EPA slope factor of 3×10^{-4} $(\mu g/m^3)^{-1}$ as shown in Table 7 (Table 3.5.3.1-14 in the 2018 HHERA). The estimated ILCR values marginally exceed what would be considered "essentially negligible" in Ontario for the LSA and the Village of Wabigoon. Estimated ILCR values for the Operations Area marginally exceed what would be considered "essentially negligible" by the US EPA, however no potential risks are anticipated within the Operations Area as an occupational health and safety plan is within good construction practices and would effectively mitigate any potential risk to a Project Worker. No potential cancer risks are anticipated to any human receptor from exposure to DPM as a result of the Project. Further discussion to support this conclusion is provided in the paragraph below.

Table 7: Calculated Cancer Risk Using California EPA Slope of 3×10^{-4} $(\mu g/m^3)^{-1}$

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response

Study Area	Site Preparation and Construction	Operations	Closure
Operations Area (1)	1.4×10-4	3.0×10-4	1.2×10-4
Local Study Area	6.8×10-6	1.9×10-5	5.6×10-6
Village of Wabigoon	1.4×10-6	2.9×10-6	1.1×10-6

NOTES:

(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

If the same relationship between DPM and Project $PM_{2.5}$ that was applied to the Project emissions (Table 3.5.3.1-9) was applied to the background levels of $PM_{2.5}$ (which results in the most conservative DPM EPC estimate), then the background DPM concentrations presented in Table 3.5.3.1-15 would result. While the numbers in Table 8 (Table 3.5.3.1-15 of the 2018 HHERA) are consistent with what the California EPA indicates are typical background DPM concentrations (California reports a background DPM concentration of 1.5 µg/m³), they are likely overly conservative estimates for the rural area in and around the Project that should have a much lower percentage of diesel particulate sources than in a highly urbanized are such as southern California.

Table 8: Background Annual Exposure Point Concentrations (µg/m³) of Diesel Particulate Matter (DPM)

Study Area	Site Preparation and Construction	Operations	Closure
Operations Area (1)	1.37	1.35	1.26
Local Study Area	1.37	1.35	1.26
Village of Wabigoon	1.37	1.35	1.26

NOTES:

(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

If the potential carcinogenic risks are then calculated using only background DPM concentrations (see Table 9, Table 3.5.3.1-15 of the 2018 HHERA), the resulting ILCR estimates exceed the Health Canada ILCR target, by 2 orders of magnitude, and are higher than the risks associated with the Project. As stated above, the in the U.S. EPA accepts a target ILCR that is less conservative than Health Canada (US EPA accepts 1×10^{-4} compared to Health Canada which accepts 1×10^{-5} – 1×10^{-6}). Therefore, in the United States the application of a slope factor for DPM as conservative as 3×10^{-4} $(\mu g/m^3)^{-1}$ may not result in ILCR estimates at background that are greater than what may be considered “essentially negligible”. Given that Health Canada requires that ILCR values be 1–2 times lower than the requirements of the US EPA in order to rule out potential carcinogenic risks, obtaining “essentially negligible” as per the Health Canada definition may not be feasible with the application of the California EPA slope factor, even for background DPM levels in the environment. Certainly, the results presented herein illustrate the need for additional consideration prior to adopting values provided by other regulatory agencies within Canada.

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Table 9: Calculated Background Cancer Risk Using California EPA Slope of 3×10^{-4}

Study Area	Site Preparation and Construction	Operations	Closure
Operations Area (1)	4.1×10-4	4.1×10-4	3.8×10-4
Local Study Area	4.1×10-4	4.1×10-4	3.8×10-4
Village of Wabigoon	4.1×10-4	4.1×10-4	3.8×10-4

NOTES:

(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

Given that there is a relatively large level of uncertainty associated with the application of the California EPA cancer slope factor in Canada, that Health Canada has not adopted a quantitative approach for other forms of particulate matter (i.e., PM_{10} and $PM_{2.5}$ as discussed above), and that the non-cancer risk estimates for DPM were below levels anticipated to pose risk to human receptors, no potential risks form DPM are determined at this time.

PART C:

The results of the 2018 HHERA indicated that there were no potential human health risks as a result of exposure to DPM as a result of the Project. Therefore, no residual adverse effects were identified and no mitigation measures were required. Mitigation measures for other CACs and air quality were provided in Section 6.6.5 of the EIS (April 2018). It is important to highlight that as described in the EIS (April 2018), the Project will not have to generate its own electricity as there is an existing 115 kV transmission line that runs adjacent to the proposed processing plant. Power generation is typically the largest DPM emission source associated with relatively large industrial Projects at remote locations. The Project will be equipped with backup diesel-fired generators that will be used in the event of a power outage to maintain key equipment and allow for the safe and orderly shutdown of operations. The backup generators are expected to be tested for about 1 hour every month. The effects of the backup generators on air quality were assessed in Section 6.6 of the EIS (April 2018), based on the results provided in Appendix J-2 of the EIS (April 2018). As stated in 6.6 of the EIS,

> *"Section 3.3.6 of the Environmental Air Quality Assessment (Appendix J-2 to the revised EIS) describes the approach used for calculating the emissions from the emergency generators at the Project. These generators are present to provide back-up power in case of a power failure of the power supplied by the 115 kV transmission line that runs adjacent to the proposed plant site. Emissions were estimated using emission factors obtained from Chapter 11.9 of AP-42 (U.S. EPA 2014). The AP-42 factors pre-date the implementation of the U.S EPA Tier 1-4 emission standards. It is expected that the actual generators used at the site will be at least meet the Tier 1 emission standards, therefore the AP-42 factors are considered conservative."*

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				A summary of all required mitigation measures for the Project are provided in Section 10 of the EIS (April 2018). **PART D:** To date Health Canada and other regulatory agencies with risk assessment guidance in Canada, have not identified DPM to be of sufficient health concern to warrant the establishment of specific criteria or to conduct health studies related to population health effects of DPM. That stated, Health Canada following their review of the EIS (April 2018), noted that the California published a report entitled *"The Report on Diesel Exhaust"* dated 1988 and requested that the Health Risk Assessment be revised to include a quantitative assessment of potential carcinogenic health outcomes associated with DPM. In the absence of any regulatory guidance including toxicological reference values (TRVs) for DPM in Canada, a quantitative risk assessment of DPM was completed to support the Round 2 Information Request process using the data provided by the CalEPA in their 1988 report of DPM as requested by Health Canada. Potential carcinogenic health risks were not identified in 2018 HHERA via the quantitative risk assessment of exposure to DPM. The Round 2 Information Requests specifically asked that the carcinogenic effects of exposure to DPM be characterized using the Cal EPA slope factor. However, upon reviewing the CalEPA document, a number of potential non-cancer health outcomes were identified, therefore in the 2018 HHERA the non-cancer endpoint of DPM was also appropriately considered. No potential non-carcinogenic health effects were identified in the 2018 HHERA. No effects were predicted from exposure to DPM as a result of the Project, therefore there was no requirement to characterize effects to human health from quantitative assessment developed in Question A. For completeness, a toxicological review was performed on the literature used to derive the non-cancer and cancer TRV published by the CalEPA and is summarized within this Information Request. For the non-cancer endpoint, the CalEPA reports that DPM occupational exposures to DPM may result in decreases in lung function, greater incidence of cough, phlegm and chronic bronchitis, and reductions in pulmonary function have also been reported following occupational exposures in chronic studies. For characterizing carcinogenic effects, the inhalation slope factor (also known as a Reference Concentration for Chronic Inhalation Exposure (RfC)) cited by the CalEPA was obtained from the US EPA's Integrated Risk Information System (IRIS), published in 1993 and as reviewed in 2003. Respiratory effects are considered the "critical effect" for the derivation of a chronic RfC for Diesel Engine Exhaust (DE) defined to be a complex mixture of airborne particles and gases. The RfC was derived from the no-observed-adverse-effect level (NOAEL) reported in the results of a 1988 study by Ishinishi et al. and "respiratory effects" as the critical endpoint in a study relying on dosing Fischer rats. While no histopathological changes were observed in the lungs of rats exposed to 0.46 mg/m^3 DPM or less, at higher concentrations, severe morphological changes were observed, including shortened and absent cilia in the tracheal and bronchial epithelium, marked hyperplasia of the bronchiolar epithelium, and swelling of the Type II cellular epithelium. Human equivalent concentrations corresponding to the animal NOAEL, values were computed using a dosimetry model developed by Yu et al. (1991). The highest human equivalent dose

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				associated with no apparent effect ($NOAEL_{HEC}$) is 144 µg DPM/m³ from the Ishinishi et al. (1988) study; this becomes the point of departure for deriving an RfC. It is worthwhile to mention that the maximum predicted concentration of DPM was a result of the Project was 0.9 µg DPM/m³ (Table 5, PART A response). To obtain the RfC, this point of departure was divided by two types of uncertainty factors (UFs): a factor of 3 recognizes residual interspecies (i.e., rat to human) extrapolation uncertainties, and a factor of 10 reflects uncertainties about interindividual human variation in sensitivity. Evaluation of chronic effects other than respiratory effects, as well as some aspects of reproductive and developmental toxicity, showed that none of these effects were expected to occur at DPM levels lower than the identified point of departure. The US EPA concluded that they had only moderate confidence in the adoption of the TRV for DE, and while some work indicates that humans may be as sensitive as rats and mice to the immunologic effects, the database used to derive the TRV is currently lacking key exposure-response data. There is also a degree of uncertainty associated with the TRV being published for DE versus DPM. **PART E.** Based on the results of the 2018 HHERA, it was not necessary to update the Follow-Up Program for human health. A revised quantitative health assessment of DPM may be considered once the level of uncertainty associated with the TRV is assessed by government agencies within Canada and formal regulatory guidance is provided to support the feasibility of a quantitative assessment of DPM that would be feasible under Health Canada's definition of "essentially negligible risk". Although exposures to the levels of DPM predicted as a result of the Project would meet what is considered "essentially negligible" by Health Canada, background levels including those reported as common in ambient and indoor air environments by the CalEPA, would not. The U.S. EPA accepts a target ILCR that is less conservative than Health Canada (US EPA accepts 1×10^{-4} compared to Health Canada which accepts 1×10^{-5} – 1×10^{-6}). Therefore, in the United States the application of a slope factor for DPM as conservative as the one provided by the CalEPA (as published by the U.S. EPA IRIS, 1993), may not result in ILCR estimates at background that are greater than what may be considered "essentially negligible". Given that Health Canada requires that ILCR values be 1–2 times lower than the requirements of the US EPA in order to rule out potential carcinogenic risks, obtaining "essentially negligible" as per the Health Canada definition may not be feasible with the application of the California EPA slope factor, even for background DPM levels in the environment. The results presented herein as well as in the 2018 HHERA, illustrate the need for additional consideration prior to adopting values provided by other regulatory agencies within Canada. In the absence of any Human Health Risk Assessment guidance, or regulatory guidance for federal Environmental Assessments in Canada with respect to DPM, a Follow-Up Program specific to DPM is not provided at this time. **References** California Air Resources Board. 1998. The Report on Diesel Exhaust. last reviewed July 21, 2015. https://www.arb.ca.gov/toxics/dieseltac/de-fnds.htm

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				Ishinishi, N; Inamasu, T; Hisanaga, A; et al. (1988) Intratracheal instillation study of diesel particulate extracts in hamsters. In: diesel exhaust and health risk. Ibaraki, Japan: Research committee for HERP Studies; pp. 209-216. U.S. EPA (United States Environmental Protection Agency). Integrated Risk Information System. Chemical Assessment Summary. Diesel engine exhaust; CASRN N.A. 2003.
				Agency Comment on Draft Response: A. The proponent indicates "[b]ased on the summary of emissions provided in Table 6.6.1.2-1 of the revised EIS (April 2018) [….] an error was found in the version of emissions tables included as part of the revised EIS (April 2018). Revised copies of the emission summary tables from Section 6.6 of the revised EIS (April 2018) have been included as TMI_878-AE(2)-02_Attachment_1." Details on the error have not been provided. Furthermore it appears that there is an error in the naming structure of TMI_878-AE(2)-02_Attachment_1 which should possibly be labeled as TMI_877-AE(2)-01_Attahcment_1 in the attachments. **A. Provide details on the error in the emissions table from the EIS. Update the attachment reference as appropriate.** C. Exposure related to project DPM emissions is expected to exceed Health Canada guidance of 1 in 100,000 ILCR in the LSA during operations (Table 3.5.3.1-14). Additionally as background concentrations of DPM are expected to exceed the HC guidance of 1 in 100,000 ILCR for all scenarios (Table 3.5.3.1-16) any project contributions would exacerbate existing background levels. As such, additional mitigation should be proposed to reduce DPM emissions to the extent practical. **C. Propose additional mitigation measures to reduce DPM project emissions (e.g. reducing idling).** E. As monitoring of particulate matter has been recommended, DPM ILCR calculations should be completed as part of the follow up plan to validate EA prediction. **E. Update the monitoring plan and follow-up program to include monitoring for PM2.5 at the MPOI to verify the revised predictions above. The follow- up program should include ILCR calculations for DPM to validate the predictions of the HHRA. See also comment for AE(2)-01.**
				Specific response to Agency Comment: [A] Table 2 of the draft response to TMI_878-AE(2)-02 included the following footnote:

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(1) Based on the summary of emissions provided in Table 6.6.1.2-1 of the revised EIS (April 2018). It should be noted that an error was found in the version of emissions tables included as part of the revised EIS (April 2018). Revised copies of the emission summary tables from Section 6.6 of the revised EIS (April 2018) have been included as TMI_878-AE(2)-02_Attachment_1.

As noted by the reviewers, the footnote erroneously referenced TMI_878-AE(2)-02_Attachment_1 as providing the updated emission tables. In fact, the updated emission tables were provided within the draft response to TMI_880-AE(2)-04—Part A. As described in the response to TMI_880-AE(2)-04—Part A, there were several typographical errors in the emission tables presented in Section 6.6 and Appendix J-5 of the revised EIS (April 2018). A detailed review of the emissions used in the modelling confirmed that the modelling files used to predict the maximum concentrations for the Site Preparation and Construction, Operations, and Closure Phases were correct, and that any errors were restricted to the summary emission tables presented in the revised EIS (April 2018). The typographical errors occurred when transferring the emission numbers from the model input filed to the spreadsheets used to summarize the emissions Section 6.6 of the revised EIS (April 2018), specifically: Table 6.6.4.1-1 (site preparation and construction); Table 6.6.4.2-1 (operations); and Table 6.6.3-1 (closure). For convenience, the updated emission tables have been reproduced below as Tables 1, 2 and 3. It should be noted that the emissions used as inputs to the dispersion modelling files used to predict the maximum concentrations for the Site Preparation and Construction, Operations, and Closure Phases were correct, and match the numbers presented below in Table 1, 2, and 3.

Table 1: Air Emissions – Site Preparation and Construction

Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul Roads (Including tailpipe)	547	147	18	30
Dozers (including tailpipe)	19	4	2.6	3.5
Loader (including tailpipe)	49	13	1.8	2.8
Material Handling (load/unload)	5.1	2.4	0.36	—
Excavator (tailpipe)	0.12	0.12	0.12	0.67
Crusher	4.7	2.1	0.32	--
Blasting	2.5	1.3	0.075	0.073
Back-up generators	4.0	4.0	4.0	99
Total:	**631**	**174**	**27**	**136**

Note: The above table supersedes Table 6.6.4.1-1 of the revised EIS (April 2018)

Table 2: Air Emissions: Operations

Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul roads (Including tailpipe)	477	128	18	75
Dozers (including tailpipe)	29	5.9	3.9	16
Loader (including tailpipe)	0.81	0.64	0.51	15
Material handling (load/unload)	6.5	3.1	0.5	-
Excavator (tailpipe)	0.12	0.12	0.12	2.0
Wind erosion of tailings	22	18	10	-
Crusher	0.18	0.18	0.18	-
Blasting	10.0	5.2	0.30	0.073
Vent raises	19	19	19	87
Drilling	0.32	0.12	0.018	-
Heaters	0.10	0.10	0.10	1.35
Back-up generators	4.0	4.0	4.0	100
Total:	**569**	**184**	**57**	**296**

Note: The above table supersedes Table 6.6.4.2-1 of the revised EIS (April 2018).

Table 3: Air Emissions: Closure

Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul Roads (Including tailpipe)	547	147	18	30
Dozers (including tailpipe)	19	4	2.6	3.5
Loader (including tailpipe)	49	13	0.1	2.8
Material Handling (load/unload)	4.8	2.3	0.35	—
Excavator (tailpipe)	0.12	0.12	0.24	0.67
Back-up generator	2.0	2.0	2.0	28
Total:	622	168	23	65

Note: The above table supersedes Table 6.6.4.2-1 of the revised EIS (April 2018).

[C] As noted by the reviewers, the background concentrations of DPM in the region are expected to result in incremental lifetime cancer risks (ILCR) that are in excess of the Health Canada guidance of 1 in 100,000. As such, the reviewers have suggested that Treasury Metals should propose mitigation measures to help to reduce DPM

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				emissions, to the extent practical. As detailed in Section 6.6.6 of the revised EIS (April 2018), the following mitigation measure will be implemented by Treasury Metals: • All internal combustion engines will be properly maintained and all emission control systems (e.g., diesel particulate filters) will be kept in good working order [Mit_044]. Properly maintained emission control systems, especially diesel particulate filters, will help to ensure diesel particulate emissions are minimized. Additionally, Treasury Metals intend on purchasing diesel-fired equipment that comply with the relevant emission standards, including the phase in periods, for non-road emission standards. As the emissions used in the revised EIS (April 2018) were based on the assumptions that the equipment was manufactured in 2010, it is anticipated that on-going manufacturers' improvements to mobile equipment emissions will assist in reducing the DPM emissions from those used in the assessment. In addition, Treasury Metals plan to implement a number of measures to help reduce costs by reducing haul distances, and thus fuel consumption. Although not targeted as a mitigation measure for air quality, or specifically DPM, the placement of PAG rock in the mined out areas of the open pit (Mit_020) will greatly reduce haul distances and thereby exhaust emissions, including DPM. In addition to the above measures, Treasury Metals are willing to consider other fuel saving, and emission cutting measures, where such measures are practical, and do not adversely affect safety of operational performance. One such measure would be a plan that helps reduce the amount of vehicle idling at the mine site. The implementation of measures to reduce vehicle idling would have to recognize the challenges faced during the winter months when such measures may not be practical and could affect safety and mine operations. [E] The follow-up program for air quality has been revised as part of the Round 2 process, and is now provided in the Goliath Gold Project Follow-up Program Addendum. This addendum superseded the follow-up program presented in Section 13 of the revised EIS (April 2018). The air monitoring program described in the Goliath Gold Project Follow-up Program Addendum has been revised to include specifically identify $PM_{2.5}$ as the fine particulate to be monitored at the continuous monitoring station. Treasury Metals plan to commission a single continuous monitoring station at a suitable location. For obvious reasons, the air continuous monitoring station should be located in a secure but accessible location, with ready access to power, and in a location relatively close to the areas where the maximum concentrations were predicted. The maximum point of impingement (MPOI) is an air modeling term that represents location along, or beyond, the property boundary where the maximum predicted concentrations occur. For security reasons, it would be preferred to place the monitoring station within the property boundary. It should also be noted that the MPOI will likely be different for each of the compounds and averaging periods modelled. Therefore, it is unlikely that the MPOI for the 24-hour $PM_{2.5}$ would be exactly the same as for the other compounds. The final location for the monitoring station would be selected in consultation with Ontario Ministry of Environment, Conservation and Parks (MECP), Environment and Climate Change Canada, and the Agency. Goliath Gold Project Follow-up Program Addendum has incorporated information related to periodic updates to the ILCR calculations related to DPM emissions. However, it is not currently feasible to directly monitor the emissions of

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DPM from operating mine equipment. Therefore, the DPM emissions used in the periodic updates to the ILCR calculations will be based on the hourly operations for the on-site equipment.

Revised Response:

PART A

As discussed with the Agency and the Agency reviewers on August 26, 2018, the air quality assessment completed to support the revised EIS (April 2018) explicitly identifies the sources of exhaust particulate associated with the Project, and includes those emissions in the modelling of airborne concentrations of total suspended particulates (TSP), inhalable particulate matter (PM_{10}) and respirable particulate matter ($PM_{2.5}$). It was identified by the reviewers (see TMI_880-AE(2)-04. Part A) that there were several typographical errors in the emission tables presented in Section 6.6 and Appendix J-5 of the revised EIS (April 2018). A detailed review of the emissions used in the modelling confirmed that the modelling files used to predict the maximum concentrations for the Site Preparation and Construction, Operations, and Closure Phases were correct, and that any errors were restricted to the summary emission tables presented in the revised EIS (April 2018). The typographical errors occurred when transferring the emission numbers from the model input filed to the spreadsheets used to summarize the emissions Section 6.6 of the revised EIS (April 2018), specifically: Table 6.6.4.1-1 (site preparation and construction); Table 6.6.4.2-1 (operations); and Table 6.6.3-1 (closure). The updated emission tables for the site preparation and construction, operations, and closure phases have been provided as Tables 1, 2 and 3, respectively. It should be noted that the emissions used as inputs to the dispersion modelling files used to predict the maximum concentrations for the site preparation and construction, operations, and closure phases were correct, and match the numbers presented below in Table 1, 2, and 3.

Table 1: Air Emissions – Site Preparation and Construction

Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul Roads (Including tailpipe)	547	147	18	30
Dozers (including tailpipe)	19	4	2.6	3.5
Loader (including tailpipe)	49	13	1.8	2.8
Material Handling (load/unload)	5.1	2.4	0.36	—
Excavator (tailpipe)	0.12	0.12	0.12	0.67
Crusher	4.7	2.1	0.32	--
Blasting	2.5	1.3	0.075	0.073
Back-up generators	4.0	4.0	4.0	99
Total:	**631**	**174**	**27**	**136**

Note: The above table supersedes Table 6.6.4.1-1 of the revised EIS (April 2018)

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Table 2: Air Emissions: Operations

Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul roads (Including tailpipe)	477	128	18	75
Dozers (including tailpipe)	29	5.9	3.9	16
Loader (including tailpipe)	0.81	0.64	0.51	15
Material handling (load/unload)	6.5	3.1	0.5	-
Excavator (tailpipe)	0.12	0.12	0.12	2.0
Wind erosion of tailings	22	18	10	-
Crusher	0.18	0.18	0.18	-
Blasting	10.0	5.2	0.30	0.073
Vent raises	19	19	19	87
Drilling	0.32	0.12	0.018	-
Heaters	0.10	0.10	0.10	1.35
Back-up generators	4.0	4.0	4.0	100
Total:	**569**	**184**	**57**	**296**

Note: The above table supersedes Table 6.6.4.2-1 of the revised EIS (April 2018).

Table 3: Air Emissions: Closure

Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul Roads (Including tailpipe)	547	147	18	30
Dozers (including tailpipe)	19	4	2.6	3.5
Loader (including tailpipe)	49	13	0.1	2.8
Material Handling (load/unload)	4.8	2.3	0.35	—
Excavator (tailpipe)	0.12	0.12	0.24	0.67
Back-up generator	2.0	2.0	2.0	28
Total:	622	168	23	65

Note: The above table supersedes Table 6.6.4.2-1 of the revised EIS (April 2018).

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At the request of the Agency reviewers, the diesel particulate (DPM) emissions associated with the Project have been tabulated for the site preparation and construction phase, operations phase, and closure phase, and the numbers tabulated in Table 4 (this table reproduces the information provided in Table 3.5.3.1-8 of the 2018 HHERA). In tabulating the DPM emissions, the following is noted:

- All of the tailpipe particulate emissions associated with the Project are considered to be emissions of diesel particulate matter (DPM).
- All of the particulate (TSP, PM_{10} and $PM_{2.5}$) emissions from the backup generators are considered to be emissions of diesel particulate matter (DPM).
- A portion of the particulate matter in the exhaust from underground mine workings (i.e., vent raises) will be emitted from the tailpipes of vehicles operating underground. For the purposes of calculating exposures, it was conservatively assumed that diesel particulate matter (DPM) represents 50% of the particulate matter released from the vent raises.
- As diesel particulate matter (DPM) in comprised of particles that are nearly all less than 1 µm in diameter, the particulate emissions of TSP, PM_{10} and $PM_{2.5}$ from diesel combustion are numerically the same as each other.

Table 4: Diesel Particulate Matter (DPM) Emissions (Mg/yr) by Project Phase

Emission Source	Site Preparation and Construction			Operations			Closure		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Haul Roads (1)	3.469	3.469	3.469	2.807	2.807	2.807	3.469	3.469	3.469
Bulldozer 1 (1)	0.312	0.312	0.312	0.312	0.312	0.312	0.312	0.312	0.312
Bulldozer 2 (1)	0.312	0.312	0.312	0.312	0.312	0.312	0.312	0.312	0.312
Bulldozer_3 (1)	—	—	—	0.312	0.312	0.312	—	—	—
Loader (1)	0.473	0.473	0.473	0.473	0.473	0.473	0.473	0.473	0.473
Excavator (1)	0.120	0.120	0.120	0.120	0.120	0.120	0.240	0.240	0.240
Back-up generators (2)	4	4	4	4	4	4	2	2	2
Vent raises (3)	0	0	0	9.5	9.5	9.5	0	0	0
TOTAL DPM Emissions	**8.686**	**8.686**	**8.686**	**17.836**	**17.836**	**17.836**	**6.806**	**6.806**	**6.806**

Notes:

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(1) Tailpipe emissions of diesel particulate matter (DPM) are taken directly from Appendix B to Appendix J-2 (Environmental Air Quality Assessment) prepared by RWDI Air Inc. Specifically, the Site Preparation and Construction phase DPM emissions were taken from Appendix B2 to Appendix J-2, the Operations phase DPM emissions were taken from Appendix B7 to Appendix J-2, and the Closure phase DPM emissions were taken from Appendix B18 to Appendix J-2.

(2) All of the particulate emissions from e back-up generators were assumed to be diesel particulate matter (DPM). The particulate emissions for back-up generators were taken from Appendix B to Appendix J-2 (Environmental Air Quality Assessment) prepared by RWDI Air Inc., specifically, Appendices B12 and B13 to Appendix J-2.

(3) The particulate matter emissions from the underground workings (i.e., vent raises) were taken directly from Appendix B16 to Appendix J-2 (Environmental Air Quality Assessment) prepared by RWDI Air Inc. Although there was no specific breakdown provided with regards to the composition of the particulate emissions from the underground workings, a portion is likely to result from the tailpipe emissions from diesel fired equipment working underground. For the purposes of the health assessment, it was conservatively assumed that 50% of the particulate matter from the vent raises was diesel particulate matter (DPM).

As the diesel particulate matter (DPM) emissions from the Project are associated with the same source groups as the overall particulate matter emissions, it is reasonable to conclude that the resulting concentrations of diesel particulate matter (DPM) would relate to the overall particulate predictions in a manner consistent with the proportional emissions. Table 5 (Table 3.5.3.1-9 of the 2018 HHERA) provides a comparison of the overall particulate emissions from the Project to the emissions of diesel particulate matter (DPM).

Table 5: Comparison of Project Particulate and Diesel Particulate Matter (DPM) Emissions, by Project Phase

Emission Category	Site Preparation and Construction			Operations			Closure		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Overall Project Emissions (1)	631.420	173.920	27.275	569.030	184.360	56.628	622.040	168.540	23.290
Diesel Particulate Matter (DPM) (2)	8.686	8.686	8.686	17.836	17.836	17.836	6.806	6.806	6.806
DPM, as a Fraction of particulate emissions.	**1.4%**	**5.0%**	**31.8%**	**3.1%**	**9.7%**	**31.5%**	**1.1%**	**4.0%**	**29.2%**

Notes:

(1) Based on the updates summaries of emissions provided in Table 1, 2 and 3 of this response.

(2) As presented in Table 2 to this response.

Although there are currently no Canadian regulatory limits for diesel particulate matter (DPM) in Canada, the State of California has established levels for use in describing the chronic cancer and non-cancer risks associated with exposure to diesel particulate matter (DPM). At the request of the Agency and their reviewers, consideration has been given to the potential chronic effects of DPM on human health as part of the human health risk assessment,

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completed in support of the Round 2 information requests and included as part of the overall response package. The Human Health Risk Assessment for the Goliath Gold Project identifies exposure point concentrations of criteria air contaminants for the three study areas used, namely: the Operations Area (which is consistent with the operations area used throughout the revised EIS [April 2018]), the Local Study Area (which includes the portions of the human health LSA outside of the operations area) and the Village of Wabigoon. There will be no access to the operations are throughout the operating life of the Project, from the start of the Site Preparation and Construction Phase, through to the end of the closure phase. However, the local study area for the Human Health Risk Assessment includes those areas beyond the Operations Area and within the property line of the Goliath Gold Project where the use of lands and resources could by members of Indigenous communities could continue. Table 6 (which reproduces the content of Table 3.5.3.1-10 of the 2018 HHERA) provides a summary of the modelled annual exposure point concentrations of TSP, PM_{10} and $PM_{2.5}$ for each of the study areas used in the Human Health Risk Assessment.

Table 6: Annual Exposure Point Concentrations (µg/m³) of Particulate Matter (1) from the Project, by Phase

Study Area	Site Preparation and Construction			Operations			Closure		
	TSP (2)	PM_{10} (3)	$PM_{2.5}$ (4)	TSP (2)	PM_{10} (3)	$PM_{2.5}$ (4)	TSP (2)	PM_{10} (3)	$PM_{2.5}$ (4)
Operations Area (5)	34.7	9.6	1.5	30.9	10.2	2.8	34.0	9.3	1.4
Local Study Area	1.6	0.5	0.1	1.8	0.6	0.2	1.6	0.5	0.1
Village of Wabigoon	0.3	0.1	0.0	0.3	0.1	0.0	0.3	0.1	0.0

Notes:

(1) Data are compiled from Table 3.5.2.1-1 of the Goliath Gold Project Human Health and Ecological Risk Assessment (September 2018).
(2) Includes background annual TSP of 14 µg/m³.
(3) Includes background annual PM10 of 6.4 µg/m³.
(4) Includes background annual PM2.5 of 4.3 µg/m³.
(5) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

The corresponding exposure point concentrations for diesel particulate matter from the Project can be determined by applying the corresponding relationships between the emissions of particulate matter and DPM emissions to the relevant predicted particulate exposure point concentrations. To ensure the assessment is conservative, Table 7 (which reproduces the content of Table 3.5.3.1-11 of the 2018 HHERA) presents the calculation of DPM exposure point concentrations for each of the Project phases for: (1) using the relationship between TSP and DPM; (2) using the relationship between PM_{10} and DPM; and (3) using the relationship between $PM_{2.5}$ and DPM. The relationship that gives the highest DPM concentrations for each phase and study area are summarized in Table 8 (which reproduces the content of Table 3.5.3.1-12 of the 2018 HHERA). These values are used in the Human Health Risk Assessment.

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Table 7: Calculated Annual Exposure Point Concentrations (µg/m³) of Diesel Particulate Matter (DPM) from the Project, by Phase

Study Area	Site Preparation and Construction			Operations			Closure		
	DPM using TSP Emissions	DPM using PM_{10} Emissions	DPM using $PM_{2.5}$ Emissions	DPM using TSP Emissions	DPM using PM_{10} Emissions	DPM using $PM_{2.5}$ Emissions	DPM using TSP Emissions	DPM using PM_{10} Emissions	DPM using $PM_{2.5}$ Emissions
Operations Area (1)	0.48	0.48	0.47	0.97	0.98	0.89	0.37	0.37	0.40
Local Study Area	0.02	0.02	0.02	0.06	0.05	0.06	0.02	0.02	0.02
Village of Wabigoon	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00

Note:

(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

Table 8: Annual Exposure Point Concentrations (µg/m³) of Diesel Particulate Matter (DPM) from the Project

Study Area	Site Preparation and Construction	Operations	Closure
Operations Area (1)	0.479	0.984	0.396
Local Study Area	0.023	0.063	0.019
Village of Wabigoon	0.005	0.010	0.004

Note:

(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

PART B

The 2018 HHERA included a quantitative assessment of incremental cancer risk from DPM using the unit risk and inhalation slope factor available from the California Office of Health Hazard Assessment, CalEPA (2015). In the 2018 HHERA the potential health outcomes associated with the non-cancer endpoint of DPM were also appropriately considered. The following paragraphs and series of Tables explain the risk characterization of DPM in response to the Round 2 Information Requests (TMI_878-AE(2)-02 [IR# AE(2)-02] and TMI_931-HE(2)-11 [IR# HE(2)-11]) that explicitly requested that the human health risk include a quantitative assessment of incremental cancer risk resulting

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from exposure to DPM using the unit risk and inhalation slope factor available from the California Office of Health Hazard Assessment, California EPA (2015).

Quantitative Risk Characterization of DPM:

Provincial regulatory agencies across Canada offer differing guidance on the risk characterization process. The risk characterization methods adopted by the Province of Ontario are accepted for the assessment of potential human health risks associated with the Goliath Gold Project. When characterizing the potential risks posed by exposure to non-carcinogenic substances, Ontario accepts a hazard quotient (HQ) of 0.2 (exposure ≤ 1/5 TRV). For non-carcinogens (i.e., threshold chemicals), potential risk is estimated by calculating the ratio of the estimated exposure to the TRV, which is referred to the hazard quotient (HQ) as follows:

$$Hazard\ Quotient\ (HQ) = \frac{Estimated\ Exposure}{TRV}$$

Therefore, the target HQ for the Base Case, Project Alone and Project Assessment Scenarios will be an HQ of 0.2. It is important to note that the magnitude of the HQ does not necessarily correspond to the magnitude of expected health effects, therefore the results of the risk characterization will be stated as potential risk, and negligible potential risk.

The estimated HQs resulting from exposure to DPM from the Project in each of the Study Areas are provided in Table 9 (which reproduces the content from Table 3.5.3.1-13 in 2018 HHERA Report). None of the estimated HQs exceeded Health Canada's target of 0.2. As such, no potential non-cancer risks are anticipated for all human receptors who may be exposed to DPM in air from the Project.

Table 9: Calculated HQs based on California EPA TRV of 5 µg/m³

Study Area	Site Preparation and Construction	Operations	Closure
Operations Area (1)	9.6×10^{-2}	2.0×10^{-1}	7.9×10^{-2}
Local Study Area	4.5×10^{-3}	1.3×10^{-2}	3.7×10^{-3}
Village of Wabigoon	9.5×10^{-4}	1.9×10^{-3}	7.5×10^{-4}

Note:

(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

For chemicals with carcinogenic endpoints (i.e., non-threshold chemicals), deemed to be carcinogenic, the estimated exposure (amortized as appropriate) is multiplied by the appropriate slope factor to derive a conservative estimate of the potential incremental lifetime cancer risk (ILCR) associated with that exposure. The ILCR is derived as:

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$$Incremental\ Lifetime\ Cancer\ Risk\ (ILCR) = Exposure \times TRV$$

Health Canada indicates that cancer risks will be deemed to be "essentially negligible" where the estimated ILCR is ≤ 1 in 100,000 (≤1 × 10^{-5}). For conservatism, the more conservative Ontario benchmark ILCR of 1 in 1 million (1 ×10^{-6}) has been applied in the assessment of carcinogenic effects in the HHRA for the Goliath Gold Project. The US EPA accepts ILCR targets between 1× 10^{-4} and 1 ×10^{-6}.

The results indicate that potential cancer risks may not be ruled out as a result of DPM emissions as a result of the Project based on the California EPA slope factor of 3×10^{-4} (µg/m^3)$^{-1}$ as shown in Table 10 (which reproduces the content from Table 3.5.3.1-14 in the 2018 HHERA). The estimated ILCR values marginally exceed what would be considered "essentially negligible" in Ontario for the LSA and the Village of Wabigoon. Estimated ILCR values for the Operations Area marginally exceed what would be considered "essentially negligible" by the US EPA, however no potential risks are anticipated within the Operations Area as an occupational health and safety plan is within good construction practices and would effectively mitigate any potential risk to a Project Worker. No potential cancer risks are anticipated to any human receptor from exposure to DPM as a result of the Project. Further discussion to support this conclusion is provided in the paragraph below.

Table 10: Calculated Cancer Risk Using California EPA Slope of 3×10^{-4} (µg/m^3)$^{-1}$

Study Area	Site Preparation and Construction	Operations	Closure
Operations Area (1)	1.4 × 10^{-4}	3.0 × 10^{-4}	1.2 × 10^{-4}
Local Study Area	6.8 × 10^{-6}	1.9 × 10^{-6}	5.6 × 10^{-6}
Village of Wabigoon	1.4 × 10^{-6}	2.9 × 10^{-6}	1.1 × 10^{-6}

Note:
(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

If the same relationship between DPM and Project $PM_{2.5}$ that was applied to the Project emissions (Table 5) was applied to the background levels of $PM_{2.5}$ (which results in the most conservative DPM EPC estimate), then the background DPM concentrations presented in Table 11 (which reproduces the content of Table 3.5.3.1-15 of the 2018 HHERA) would result. While the numbers in Table 11 are consistent with what the California EPA indicates are typical background DPM concentrations (California reports a background DPM concentration of 1.5 µg/m^3), they are likely overly conservative estimates for the rural area in and around the Project that should have a much lower percentage of diesel particulate sources than in a highly urbanized are such as southern California.

Table 11: Background Annual Exposure Point Concentrations (µg/m^3) of Diesel Particulate Matter (DPM)

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Study Area	Site Preparation and Construction	Operations	Closure
Operations Area (1)	1.37	1.35	1.26
Local Study Area	1.37	1.35	1.26
Village of Wabigoon	1.37	1.35	1.26

Note:
(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

If the potential carcinogenic risks are then calculated using only background DPM concentrations (see Table 12, which reproduces the content of Table 3.5.3.1-15 of the 2018 HHERA), the resulting ILCR estimates exceed the Health Canada ILCR target, by 2 orders of magnitude, and are higher than the risks associated with the Project. As stated above, the in the U.S. EPA accepts a target ILCR that is less conservative than Health Canada (US EPA accepts 1×10^{-4} compared to Health Canada which accepts 1×10^{-5} – 1×10^{-6}). Therefore, in the United States the application of a slope factor for DPM as conservative as 3×10^{-4} $(\mu g/m^3)^{-1}$ may not result in ILCR estimates at background that are greater than what may be considered "essentially negligible". Given that Health Canada requires that ILCR values be 1–2 times lower than the requirements of the US EPA in order to rule out potential carcinogenic risks, obtaining "essentially negligible" as per the Health Canada definition may not be feasible with the application of the California EPA slope factor, even for background DPM levels in the environment. Certainly, the results presented herein illustrate the need for additional consideration prior to adopting values provided by other regulatory agencies within Canada.

Table 12: Calculated Background Cancer Risk Using California EPA Slope of 3×10^{-4}

Study Area	Site Preparation and Construction	Operations	Closure
Operations Area (1)	4.1×10^{-4}	4.1×10^{-4}	3.8×10^{-4}
Local Study Area	4.1×10^{-4}	4.1×10^{-4}	3.8×10^{-4}
Village of Wabigoon	4.1×10^{-4}	4.1×10^{-4}	3.8×10^{-4}

Note:
(1) There will be no public access to the Operations area throughout the active life of the Project (i.e., from the start of the Site Preparation and Construction phase through the end of Closure).

Given that there is a relatively large level of uncertainty associated with the application of the California EPA cancer slope factor in Canada, that Health Canada has not adopted a quantitative approach for other forms of particulate matter (i.e., PM_{10} and $PM_{2.5}$ as discussed above), and that the non-cancer risk estimates for DPM were below levels anticipated to pose risk to human receptors, no potential risks form DPM are determined at this time.

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				PART C: The results of the 2018 HHERA indicated that there were no potential human health risks as a result of exposure to DPM as a result of the Project. Therefore, no residual adverse effects were identified and no mitigation measures were required beyond those provided in Section 6.6.5 of the EIS (April 2018). As noted by the reviewers, the background concentrations of DPM in the region are expected to result in incremental lifetime cancer risks (ILCR) that are in excess of the Health Canada guidance of 1 in 100,000. As such, the reviewers have suggested that Treasury Metals should propose mitigation measures to help to reduce DPM emissions, to the extent practical. As detailed in Section 6.6.6 of the revised EIS (April 2018), the following mitigation measure will be implemented by Treasury Metals: • All internal combustion engines will be properly maintained and all emission control systems (e.g., diesel particulate filters) will be kept in good working order [Mit_044]. Properly maintained emission control systems, especially diesel particulate filters, will help to ensure diesel particulate emissions are minimized. Additionally, Treasury Metals intend on purchasing diesel-fired equipment that comply with the relevant emission standards, including the phase in periods, for non-road emission standards. As the emissions used in the revised EIS (April 2018) were based on the assumptions that the equipment was manufactured in 2010, it is anticipated that on-going manufacturers' improvements to mobile equipment emissions will assist in reducing the DPM emissions from those used in the assessment. In addition, Treasury Metals plan to implement a number of measures to help reduce costs by reducing haul distances, and thus fuel consumption. Although not targeted as a mitigation measure for air quality, or specifically DPM, the placement of PAG rock in the mined out areas of the open pit (Mit_020) will greatly reduce haul distances and thereby exhaust emissions, including DPM. In addition to the above measures, Treasury Metals are willing to consider other fuel saving, and emission cutting measures, where such measures are practical, and do not adversely affect safety of operational performance. One such measure would be a plan that helps reduce the amount of vehicle idling at the mine site. The implementation of measures to reduce vehicle idling would have to recognize the challenges faced during the winter months when such measures may not be practical and could affect safety and mine operations. PART D: To date Health Canada and other regulatory agencies with risk assessment guidance in Canada, have not identified DPM to be of sufficient health concern to warrant the establishment of specific criteria or to conduct health studies related to population health effects of DPM. That stated, Health Canada following their review of the EIS (April 2018), noted that the California published a report entitled *"The Report on Diesel Exhaust"* dated 1988 and requested that the Health Risk Assessment be revised to include a quantitative assessment of potential carcinogenic health outcomes associated with DPM. In the absence of any regulatory guidance including toxicological reference values (TRVs) for DPM in Canada, a quantitative risk assessment of DPM was completed to support the Round 2 Information Request process using the data provided by the CalEPA in their 1988 report of DPM as requested by

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				Health Canada. Potential carcinogenic health risks were not identified in 2018 HHERA via the quantitative risk assessment of exposure to DPM. The Round 2 Information Requests specifically asked that the carcinogenic effects of exposure to DPM be characterized using the Cal EPA slope factor. However, upon reviewing the CalEPA document, a number of potential non-cancer health outcomes were identified, therefore in the 2018 HHERA the non-cancer endpoint of DPM was also appropriately considered. No potential non-carcinogenic health effects were identified in the 2018 HHERA. No effects were predicted from exposure to DPM as a result of the Project, therefore there was no requirement to characterize effects to human health from quantitative assessment developed in Question A. For completeness, a toxicological review was performed on the literature used to derive the non-cancer and cancer TRV published by the CalEPA and is summarized within this Information Request. For the non-cancer endpoint, the CalEPA reports that DPM occupational exposures to DPM may result in decreases in lung function, greater incidence of cough, phlegm and chronic bronchitis, and reductions in pulmonary function have also been reported following occupational exposures in chronic studies. For characterizing carcinogenic effects, the inhalation slope factor (also known as a Reference Concentration for Chronic Inhalation Exposure (RfC)) cited by the CalEPA was obtained from the US EPA's Integrated Risk Information System (IRIS), published in 1993 and as reviewed in 2003. Respiratory effects are considered the "critical effect" for the derivation of a chronic RfC for Diesel Engine Exhaust (DE) defined to be a complex mixture of airborne particles and gases. The RfC was derived from the no-observed-adverse-effect level (NOAEL) reported in the results of a 1988 study by Ishinishi et al. and "respiratory effects" as the critical endpoint in a study relying on dosing Fischer rats. While no histopathological changes were observed in the lungs of rats exposed to 0.46 mg/m³ DPM or less, at higher concentrations, severe morphological changes were observed, including shortened and absent cilia in the tracheal and bronchial epithelium, marked hyperplasia of the bronchiolar epithelium, and swelling of the Type II cellular epithelium. Human equivalent concentrations corresponding to the animal NOAEL, values were computed using a dosimetry model developed by Yu et al. (1991). The highest human equivalent dose associated with no apparent effect ($NOAEL_{HEC}$) is 144 µg DPM/m³ from the Ishinishi et al. (1988) study; this becomes the point of departure for deriving an RfC. It is worthwhile to mention that the maximum predicted concentration of DPM was a result of the Project was 0.9 µg DPM/m³ (Table 5, PART A response). To obtain the RfC, this point of departure was divided by two types of uncertainty factors (UFs): a factor of 3 recognizes residual interspecies (i.e., rat to human) extrapolation uncertainties, and a factor of 10 reflects uncertainties about interindividual human variation in sensitivity. Evaluation of chronic effects other than respiratory effects, as well as some aspects of reproductive and developmental toxicity, showed that none of these effects were expected to occur at DPM levels lower than the identified point of departure. The US EPA concluded that they had only moderate confidence in the adoption of the TRV for DE, and while some work indicates that humans may be as sensitive as rats and mice to the immunologic effects, the database used to derive the TRV is currently lacking key exposure-response data. There is also a degree of uncertainty associated with the TRV being published for DE versus DPM. <u>PART E.</u>

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				Although the results of the 2018 HHERA did not identify the need to update the Follow-Up Program for human health to address issues related to diesel particulate matter (DPM), the follow-up program for both air quality and human health have been revised as part of the Round 2 process. The updated follow-up program is provided in the Goliath Gold Project Follow-up Program Addendum. This addendum superseded the follow-up program presented in Section 13 of the revised EIS (April 2018). The air monitoring program described in the Goliath Gold Project Follow-up Program Addendum has been revised to include specifically identify $PM_{2.5}$ as the fine particulate to be monitored at the continuous monitoring station. Treasury Metals plan to commission a single continuous monitoring station at a suitable location. For obvious reasons, the air continuous monitoring station should be located in a secure but accessible location, with ready access to power, and in a location relatively close to the areas where the maximum concentrations were predicted. The maximum point of impingement (MPOI) is an air modeling term that represents location along, or beyond, the property boundary where the maximum predicted concentrations occur. For security reasons, it would be preferred to place the monitoring station within the property boundary. It should also be noted that the MPOI will likely be different for each of the compounds and averaging periods modelled. Therefore, it is unlikely that the MPOI for the 24-hour $PM_{2.5}$ would be exactly the same as for the other compounds. The final location for the monitoring station would be selected in consultation with Ontario Ministry of Environment, Conservation and Parks (MECP), Environment and Climate Change Canada, and the Agency. Goliath Gold Project Follow-up Program Addendum has also incorporated information related to periodic updates to the ILCR calculations related to DPM emissions. However, it is not currently feasible to directly monitor the emissions of DPM from operating mine equipment. Therefore, the DPM emissions used in the periodic updates to the ILCR calculations will be based on the hourly operations for the on-site equipment. **References** California Air Resources Board. 1998. The Report on Diesel Exhaust. last reviewed July 21, 2015. https://www.arb.ca.gov/toxics/dieseltac/de-fnds.htm Ishinishi, N; Inamasu, T; Hisanaga, A; et al. (1988) Intratracheal instillation study of diesel particulate extracts in hamsters. In: diesel exhaust and health risk. Ibaraki, Japan: Research committee for HERP Studies; pp. 209-216. U.S. EPA (United States Environmental Protection Agency). Integrated Risk Information System. Chemical Assessment Summary. Diesel engine exhaust; CASRN N.A. 2003.
				Agency Comment on Draft Response None Received

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				FINAL RESPONSE Agency accepted Revised Response as Final.

TMI_879-AE(2)-03

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response	
TMI_879-AE(2)-03	AE(2)-03	1	CEA Agency	**Reference to EIS Guidelines:**	Part 2, Section 10.1.3
				Reference to EIS / Appendix	Section 6.19.1; Section 6.21.4; Appendix J-5
				Cross-reference to Round 1 IRs	TMI_169-AE(1)-07
				Context and Rationale: • The response to IR# TMI_169C indicates that "for safety and security reasons, access to the operations area would be restricted throughout the active life of the Project." The same response indicates that "no traditional uses of the lands within the project site would be allowed until after the closure and reclamation activities are complete." While the operations area is presented in Figure 6.21.4-1 of the revised EIS, it is unclear what is meant by the "active life of the Project". Section 6.19.1 of the revised EIS indicates that "access to the site during operations would be restricted for safety and security reasons", but it doesn't mention if restrictions to access would occur during construction activities. • The potential health effects due to traditional use of the operations area during the construction phase are unclear. According to Appendix J-5. Table 11, 24-hour total suspended particulate (TSP) concentrations and annual dustfall are expected to exceed the criteria, and 24-hour PM10 concentration is close to the criteria at the fenceline. Health impacts should be assessed at locations where site access is not restricted, to fully understand the potential effects to human health from using the land within the operations area while project activities are occurring.	

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				Specific Question / Request for Information: A. Based on the project schedule provided in Section 3.2 of the revised EIS, identify the time periods when access to the operations area would be restricted during each phase. Describe the physical means that TMI would use to restrict access to the operations area during each phase. If access to the operations area is allowed during any phase of the Project for traditional use by Indigenous people, respond to questions B-F below. B. Identify and list any new receptor locations in the operations area, where traditional use will be allowed during any phase of the Project. C. Update the air quality assessment to include any locations identified in question B. Where any contaminants are found to exceed federal or provincial criteria, including the new CAAQS for NO2 and SO2, incorporate this into the frequency analysis (in days or in percentage) found in IR# AE(2)-04 Question B. D. Provide and describe additional mitigation measures to reduce concentrations of contaminants at receptor locations identified in question B. E. Update the human health risk assessment to include any new receptors identified in Question B. F. If necessary, update the follow-up program for effects to human health, including objectives and any additional monitoring measures that will be implemented to verify the predictions of concentrations in locations identified in question B. Add these new measures to the overall Follow-Up Program to be prepared in response to IR# EA(2)-01.
				Draft Response: PART A: During the active life of the Project (i.e., Site Preparation and Construction, Operations, and Closure) access to the Operations area will be restricted for safety and security reasons. Only employees of Treasury Metals will be allowed within the Operations Area. There will be no access to the Operations Area by members of Indigenous communities or members of the public during the active life of the Project. There will be no harvesting of country foods allowed within the Operations Area for the active phases of the Project, and there are no community-based receptors within the Operations Area. As part of the site preparation and construction activities, a perimeter ditch and seepage collection system will be constructed around the perimeter of the Operations Area. The spoils from this activity will be used to construct a berm along the outboard edge of the ditch that will act as a physical barrier to accessing the site. In addition, Treasury Metals will implement administrative controls on access including posting signs around the site and regular patrols by security personal. In some areas, Treasury Metals may also implement additional physical barriers in the form of exclusionary fencing. Following Closure, during the passive Post-Closure Phase of the Project, full access to the Operations Area will be allowed to resume once the regulators are confident the closure landscape is functioning properly and institutional controls on access to the areas are no longer required. Once access is restored to the Operations Area, members of Indigenous communities will be free to practice traditional uses of the land and resources. PART B. As described in the response to Part A, there will be no access allowed to members of Indigenous communities or members of the public to the Operations Area throughout the active life of the Project (i.e., Site

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				Preparation and Construction, Operations, and Closure). There are no identified community-oriented (i.e., sensitive receptors) within the operations area, or within the property boundary of the Treasury Metals property. As discussed in the response to TMI_877-AE(2)-01, Treasury Metals has acquired additional properties since the air modelling receptors used in the revised EIS (April 2018) were identified. As a result, several sensitive (i.e., community oriented) receptors used in the revised EIS (April 2018) no longer exist. PART C. As discussed in the response to TMI_877-AE(2)-01, Treasury Metals has acquired additional properties since the air modelling receptors used in the revised EIS (April 2018) were identified. As a result, several sensitive (i.e., community oriented) receptors used in the revised EIS (April 2018) no longer exist. The modelling results that reflect the new property line for the Goliath Gold Project, as well as removal of those sensitive receptors that have eliminated through purchase by Treasury Metals, have been presented in TMI_877-AE(2)-01_Table_4. None of the maximum predicted concentrations exceed the relevant criteria at the sensitive receptors (including the new CAAQS for NO_2 and SO_2 that will be implemented in 2025). As described in the response to TMI_880-AE(2)-04, Part B, there are predicted concentrations at a limited number of the gridded receptors on and outside the property boundary that exceed the 1-hour CAAQS for NO_2 (to be implemented in 2025). Part B of the response to TMI_880-AE(2)-04 provides a frequency analysis for the predicted concentration in excess of the 1-hour CAAQS for NO_2 (to be implemented in 2025) at the gridded receptors on and outside the property boundary. PART D. As described in Part B of TMI_877-AE(2)-01, none of the predicted maximum concentrations (including background) at any of the sensitive receptor locations exceed the relevant criteria (including the new CAAQS values for NO_2 and SO_2 to be implemented in 2025). As stated by the CCME (2000), achievement of ambient air quality criteria, (which included the new CAAQS) is based on community-oriented receptors, which correspond with the sensitive receptor location used in the air quality assessment. Therefore, additional improvements/mitigation measures for air quality are not required as the modelling shows the maximum concentrations meet the new CAAQS at all sensitive receptor locations. In addition, it is anticipated that on-going manufacturers' improvements to mobile equipment emissions will assist in reducing the anticipated effects of the Project, especially for NO_2. In addition, the on-going manufacturers' improvements to mobile equipment emissions will also result in decreases to the background levels in the future. Furthermore, the sulphur content in fuel is expected lower in years to come, which will aid in further reducing the Project and background SO_2 concentrations. In addition to the air quality mitigation measures described in the revised EIS (April 2018), details were provided for a Health and Safety Plan (Mit_30) to effectively mitigate any potential risk to Project Workers. Based on the results of the 2018 HHERA (discussed in the response to Part E, and included as part of the overall Round 2 information request response package), there are is no need for additional mitigation measures for the protection of human health. A summary of mitigation measures (including Mit_130) are provided ion Section 10 of the revised EIS (April 2018).

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				PART E. As described in the responses to Parts A through D, there will be no access to the Operations Area during the active life of the Project, and there are no additional receptors identified within the operations area through preparing the responses to Parts A through D. Access to the Operations Area by members of Indigenous communities for traditional uses of lands and resources will only be permitted in the post-closure phase of the Project, once the regulators are confident the closure landscape is functioning properly and institutional controls on access to the areas are no longer required. However, in preparing the responses to the Round 2 information requests, Treasury Metals have prepared a detailed Human Health and Ecological Risk Assessment (referred to as the 2018 HHERA) that has been provided as part of the overall responses to the Round 2 information requests. While there will be no access permitted in the Operations Area during the active life of the Project, and there are no community-based identified by CCME (2000) as the appropriate locations for evaluating achievement of ambient air quality criteria (including the new CAAQS) within either the Operations Area of the property boundary for the Goliath Gold Project, the 2018 HHERA recognizes that there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands and resources. Additionally, throughout the active life of the Project, workers will be accessing the operations area and be exposed to the air quality that may be higher than those at sensitive receptors beyond the property boundary. To capture these exposures and effects in 2018 HHERA, revised air modelling was completed using a refined receptor grid that provided additional focus on areas within the operations area and within the property boundary. However, the predictions within the Operations Area (where access will not be allowed to members of Indigenous communities and members of the public during the active life of the Project) and at locations outside the operations and within the property line do not represent community-based receptors as described by the CCME (2000) to used when determining whether ambient air quality criteria are achieved. Additionally, the reviewers have stated, as part of the Round 2 information request process, that Treasury Metals should not assume that members of Indigenous communities will avail themselves of opportunities to access lands and resources within the property boundary for the Project, and that those areas where Treasury Metals have committed to providing ,escorted access (for safety reasons) to members of Indigenous communities should be evaluated as if there will be no access (see response TMI_940-AC(2)-07). The 2018 HHERA assessed potential risk at three Study Areas chosen to represent the areas where human and ecological receptors would experience the highest magnitude, frequency, and duration of chemical exposure representative of the various phases of the Project. The 2018 HHERA considered all active phases of the Project (Site Preparation and Construction, Operations and Closure), as well as the Post-Closure Phase when there would be no sources of air emissions at the Project. The three Study Areas assessed are as follows: • **Study Area No 1. Operations area**: The Operations Area includes all of the active mining areas associated with the Project. During the active life of the Project access to the Operations Area will be restricted for safety and security reasons. Only employees of Treasury Metals will be allowed within the Operations Area. There will be no access to the Operations Area by members of the public or Indigenous communities during the active life of the Project. There will be no harvesting of country foods within the Operations Area for the active phases of the Project, and there are no community-based receptors within the Operations Area. Following Closure, during the

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				passive Post-Closure phase of the Project, full access to the Operations Area will resume as will the practice of traditional land and resource use. A total of 308 gridded air modelling receptors were placed at 100 m intervals across the Operation Area (Study Area No. 1). • **Study Area No. 2 Local Study Area**: The LSA corresponds with the LSA used in the revised EIS (April 2018) for evaluating the effects of the Project on wildlife and wildlife habitat, as well as evaluating the effects of the Project on terrestrial vegetation. The LSA excludes the Operations Area but includes areas within the Property Boundary where traditional land and resource use may be practiced. The LSA includes areas within the Property Boundary of the Project (i.e., the lands leased by Treasury Metals, or for which Treasury Metals holds surface and mineral rights), which would continue to be available for traditional uses by members of Indigenous communities. There are no community-based receptors within the Property Boundary. A total of 3,474 gridded air modelling receptors were placed at 100 m intervals across within the LSA (Study Area No. 2), including 1,445 receptors that fall inside the property boundary. • **Study Area No. 3 Village of Wabigoon**: The Village of Wabigoon is located approximately 4 km to the south of the Project and represents the closest populated community to the Project. A total of 46 gridded air modelling receptor were located within the Village of Wabigoon (Study Area No. 3). As part of the 2018 HHERA, the air modelling was redone using the same emissions and methods as presented in Section 6.6 of the revised EIS (April 2018), but focusing on above three study PART F. As described in Part D, none of the predicted concentrations (including background) at any of the sensitive receptor locations exceed the relevant criteria (including the new CAAQS values for NO_2 and SO_2 to be implemented in 2025). As stated by the CCME (2000), achievement with ambient air quality criteria, (which included the new CAAQS) is based on community-oriented receptors, which correspond with the sensitive receptor location used in the air quality assessment. Therefore, no refinements are warranted to the follow-up program with respect to air quality at the community-oriented receptors. However, Section 7 of the 2018 HHERA report provides new details regarding the Follow-Up Program for human health, mostly with respect to follow-up related to the country foods assessment of the 2018 HHERA. With respect to air and human health, the expectation for the Follow-Up Program is that it will rely heavily on the Follow-Up Program described for verifying the Air Quality Modeling predictions, including the predictions of concentrations of NO_2 and SO_2. As part of the Round 2 information request process there are several questions relating to updates to the Follow-Up Program submitted as Section 13 of the revised EIS (April 2018). In order to effectively responds to these various requests, and specifically to respond to TMI_869-EA(2)-01, Treasury Metals has prepared the Goliath Gold Follow-Up Addendum, which has been provided as part of the overall response package to the Round 2 information. This document delivers a comprehensive and consolidated answer to all Round 2 Information Requests related to the Follow-Up Programs including those related to human health.
				Agency Comment on Draft Response: ***The following Agency feedback on the draft responses identified the following comment as applying to each of TMI_877-AE(2)-01, TMI_879-AE(2)-03, and TMI_880-AE(2)-04. A full response to each of these comments***

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				has been provided in the response to TMI_877 AE(2) 01. The portions of the Agency feedback relevant to the draft response for TMI_879 AE(2) 03 have been highlighted below, and are addressed specifically in this response. The responses to these IRs indicate that Treasury Metals has acquired additional properties since the air modelling receptors used in the April 2018 Revised EIS were identified. The response to TMI_877-AE(2)-01C indicates that "the revised air quality modelling grid in support of the HHERA is shown relative to the Property Boundary and the three Study Areas, on Figure 3.1.1-1 of the 2018 HHERA Report (August 2018)". The property boundary shown in Figure 3.1.1-1 of the 2018 HHERA Report appears similar to the property boundary used in the April 2018 Revised EIS in the inset of Figure 6.6.2.2-1 as well as figure 1.2.3-1. It is unclear where the newly acquired properties are located, and how the property boundary has changed. It is also unclear if the Property Boundary demarcated in the various documents of the EIS is an indication of all property owned by Treasury Metals Inc. or if this is a delineation of the lands for which the proponent holds surface/mineral rights and mining claims but which they may not own. [i] In the response to AE(2)-01, provide a map with the updated property boundary, and describe how the property boundary has changed since the April 2018 Revised EIS. Clarify whether the updated property boundary meets the understanding of the property boundary as it is applied in Ontario Regulation 419/05. Clarify the property ownership and claim status of the lands within the updated property boundary. [ii] Identify where along the updated property boundary would be the maximum point of impingement, and where the sensitive receptor with maximum concentrations would be located. [ii] Clarify whether the differences between the predictions in TMI_877-AE(2)-01_Table_4a, 4b and 4c and the predictions in the April 2018 Revised EIS, Tables 6.6.4.1-2, 6.6.4.2-2 and 6.6.4.3-2 are only due to the change in location of the property boundary, or whether there have been changes in the model itself. If necessary, describe any changes to the model since the April 2018 Revised EIS. **The response to TMI_879-AE(2)-03C indicates that some sensitive receptors were "eliminated" through purchase by Treasury Metals.** **[iv] Identify the sensitive receptors that were no longer considered in the updated air quality assessment, and whether they will be physically removed or will no longer meet the definition of a sensitive receptor due to its location within the updated property boundary.** The response to TMI_877-AE(2)-01B states that, for NO_2 and SO_2, "additional improvements/mitigation measures for air quality are not required as the modelling shows the maximum concentrations meet the new CAAQS [Canadian Ambient Air Quality Standards] at all sensitive receptor locations." While the Agency understands that this conclusion is based on sensitive receptors outside of the updated property boundary, it notes that exceedances of the new CAAQS for 1-hour NO_2 are predicted at maximum point of impingement along the updated property boundary, and therefore there would be exceedances within the property boundary. **The response to TMI_879-AE(2)-03E indicates that "there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands and resources". It remains that Indigenous users may be exposed to air with**

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				NO_2 concentrations above the new CAAQS. **[v] The Agency reiterates question TMI_877-AE(2)-01B, in consideration of locations where Indigenous use may occur and where exceedances of CAAQS for NO_2 may**
				Specific Response to Agency Comment: A full response to each of the above comments from the Agency has been provided in the response to TMI_877-AE(2)-01. The following provides a responses to those comments relevant to the draft response for TMI_879-AE(2)-03. **[iv]** TMI_877 AE(2) 01_Figure_3 shows the current property boundary, and corresponds to the property boundary used for preparing the Round 2 responses,. This property boundary, includes the property obtained by Treasury Metals since of completion of the revised EIS (April 2018). The changes to the property boundary resulted in the elimination of five (5) sensitive receptors. The sensitive receptors that have been excludes as a result of the changes to the property lines are marked as red on TMI_877 AE(2) 01_Figure_3. It is Treasury Metals intention to remove the residences at each of these locations. However, Treasury Metals may retain the secondary structures and outbuildings at these locations for use as possible wildlife habitat. A decision regarding the fate of the secondary structures and outbuildings would be made through consultation with Ontario Ministry of Natural Resources and Forestry (MNRF), as well as Environment and Climate Change Canada. **[v]** The CCME (2006) identified that compliance with ambient air quality criteria should be done at "community-oriented receptors" only. The only "community-oriented" receptors in the vicinity of the Goliath Gold Project are the sensitive receptor locations, shown as "yellow circles" on TMI_877 AE(2) 01_Figure_3. There are no community-oriented receptors within the property boundary. In recognition that "there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands and resources", the updated Human Health and Ecological Risk Assessment (2018 HHERA), has specifically included evaluation of the potential effects of exposure to air quality within the property boundary on human health. The 2018 HHERA includes consideration of air quality effects on both Project Workers and those who may transiently pass through areas within the Property Boundary to practice traditional land and resource use. In the case of Project Workers, their exposures were calculated using the area maximum concentrations within the operations area. In the case of areas where Indigenous communities may wish to practice traditional uses of the lands and resources, their exposures were calculated as the area maximum concentration outside of the operations area. The area maximum concentrations for each parameter and averaging period were calculated as the 95th percentile UCLM of maximum predictions at the gridded modelling points within the property boundary. This approach is most appropriate according to Health Canada guidance for a detailed quantitative human health risk assessment as concentrations of chemicals vary spatially and temporally in the air to which humans are exposed. During long-term exposures, humans may move over areas, or in and out of impacted

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				areas. As a result, individuals tend to integrate spatial and temporal variation in the chemical concentrations to which they are exposed. Therefore, estimates of the central tendency (e.g., arithmetic means, upper confidence limits) are generally used in human health exposure models as an expression of the spatial and temporal averaging of chemical concentrations in different media (U.S. EPA, 1992, 2001). The 2018 HHERA shows that there would be no potential risk to human receptors outside of the operations area via the inhalation of air exposure pathway. As such, no additional mitigation measures are required to protect the health of members of Indigenous communities who may wish to practice traditional uses of the lands and resource in areas outside of the operations area, but within the property boundary of the Goliath Gold Project. With respect to NO_2, none of the predicted air concentrations at the identified community-oriented receptors exceeded the relevant ambient air quality criteria, including the new 1-hour CAAQS for NO_2 that will come into force in 2025. As noted by the reviewers, there were areas along the property boundary and beyond where the maximum predicted 1-hour NO_2 concentrations were numerically higher than 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025). However, because these locations do not meet the requirements for "community-oriented receptors" defined by the CCME (2006), it is not obvious that predicted concentrations in excess of 79 µg/m³ represents an exceedance of the CAAQS. As such, no additional mitigation measures are required to ensure compliance with the new CAAQS for NO_2. In addition, it is anticipated that on-going manufacturers' improvements to mobile equipment emissions will assist in further reducing the anticipated effects of the Project. Future improvements in the emissions of NO_X from motor vehicles will also have a noticeable effect on reducing the background NO_2 levels in the future.
				Revised Response: PART A: During the active life of the Project (i.e., Site Preparation and Construction, Operations, and Closure) access to the Operations area will be restricted for safety and security reasons. Only employees of Treasury Metals will be allowed within the Operations Area. There will be no access to the Operations Area by members of Indigenous communities or members of the public during the active life of the Project. There will be no harvesting of country foods allowed within the Operations Area for the active phases of the Project, and there are no community-based receptors within the Operations Area. As part of the site preparation and construction activities, a perimeter ditch and seepage collection system will be constructed around the perimeter of the Operations Area. The spoils from this activity will be used to construct a berm along the outboard edge of the ditch that will act as a physical barrier to accessing the site. In addition, Treasury Metals will implement administrative controls on access including posting signs around the site and regular patrols by security personal. In some areas, Treasury Metals may also implement additional physical barriers in the form of exclusionary fencing. Following Closure, during the passive Post-Closure Phase of the Project, full access to the Operations Area will be allowed to resume once the regulators are confident the closure landscape is functioning properly and institutional controls on access to the areas are no longer required. Once access is restored to the Operations Area, members of Indigenous communities will be free to practice traditional uses of the land and resources.

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				PART B. As described in the response to Part A, there will be no access allowed to members of Indigenous communities or members of the public to the Operations Area throughout the active life of the Project (i.e., Site Preparation and Construction, Operations, and Closure). There are no community-oriented receptors (i.e., sensitive receptors) within the operations area. In addition, no traditional land and resource use will be allowed within the operations area through the active life of the Project. There are also no community-oriented receptors (i.e., sensitive receptors) within the property boundary of the Treasury Metals property. Additionally, Treasury Metals has acquired further properties since the air modelling receptors used in the revised EIS (April 2018) were identified. TMI_877 AE(2) 01_Figure_3 shows the current property boundary, and corresponds to the property boundary used for preparing the Round 2 responses. This property boundary, includes the property obtained by Treasury Metals since of completion of the revised EIS (April 2018). The changes to the property boundary resulted in the elimination of five (5) sensitive receptors. The sensitive receptors that have been excludes as a result of the changes to the property lines are marked as red on TMI_877 AE(2) 01_Figure_3. It is Treasury Metals intention to remove the residences at each of these locations. However, Treasury Metals may retain the secondary structures and outbuildings at these locations for use as possible wildlife habitat. A decision regarding the fate of the secondary structures and outbuildings would be made through consultation with Ontario Ministry of Natural Resources and Forestry (MNRF), as well as Environment and Climate Change Canada. As defined by CCME (2006), areas within the property boundary (but outside the operations area) where members of Indigenous communities may wish to practice traditional uses of lands and resources would not meet the definition of “community-oriented receptors”. In recognition that “there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands and resources”, the updated Human Health and Ecological Risk Assessment (2018 HHERA), has specifically included evaluation of the potential effects of exposure to air quality within the property boundary on human health. The 2018 HHERA includes consideration of air quality effects on individuals who may transiently pass through areas within the Property Boundary to practice traditional land and resource use. The exposures for members of Indigenous communities who may wish to practice traditional uses of the lands and resources in those portions of the property boundary outside the operations area, were calculated as the area maximum concentration outside of the operations area. The area maximum concentrations for each parameter and averaging period were calculated as the 95th percentile UCLM of maximum predictions at the gridded modelling points within the property boundary. This approach is most appropriate according to Health Canada guidance for a detailed quantitative human health risk assessment as concentrations of chemicals vary spatially and temporally in the air to which humans are exposed. During long-term exposures, humans may move over areas, or in and out of impacted areas. As a result, individuals tend to integrate spatial and temporal variation in the chemical concentrations to which they are exposed. Therefore, estimates of the central tendency (e.g., arithmetic means, upper confidence limits) are generally used in human health exposure models as an expression of the spatial and temporal averaging of chemical concentrations in different media (U.S. EPA, 1992, 2001).

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				PART C. As discussed in the response to Part B, there are no additional sensitive receptors identified within the property boundary, and especially within operations area. As described in the response to Parts A and B, Treasury Metals has acquired further properties since the air modelling receptors used in the revised EIS (April 2018) were identified. As a result, several sensitive receptors (i.e., community-oriented receptors) used in the revised EIS (April 2018) no longer exist. The air quality modelling has been updated to reflect the new property boundary and list of sensitive receptors. None of the maximum predicted concentrations exceed the relevant criteria at the sensitive receptors (including the new CAAQS for NO_2 and SO_2 that will be implemented in 2025). As described in the response to TMI_880-AE(2)-04, Part B, there are a limited number of the gridded receptors where the maximum predicted 1-hour NO_2 concentrations were numerically higher than 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025). However, because these locations do not meet the requirements for "community-oriented receptors" as defined by the CCME (2006), it is not obvious that predicted concentrations in excess of 79 µg/m³ represents an exceedance of the CAAQS. Regardless, Part B of the response to TMI_880-AE(2)-04 provides a frequency analysis for the predicted concentration in excess of 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025). PART D. As described in the responses to Parts A, B and C, there were no sensitive receptors identified either within the operations area, or outside the operations area but within the property boundary. Additionally, changes to the property boundary since the identification of the air modelling receptors used in the revised EIS (April 2018) have resulted in the elimination of five (5) of the sensitive receptors used in the revised EIS (April 2018). As described in Part C, none of the predicted maximum concentrations (including background) at any of the sensitive receptor locations exceed the relevant criteria (including the new CAAQS values for NO_2 and SO_2 to be implemented in 2025). As stated by the CCME (2000), achievement of ambient air quality criteria, (which included the new CAAQS) is based on community-oriented receptors, which correspond with the sensitive receptor location used in the air quality assessment. Therefore, additional improvements/mitigation measures for air quality are not required as the modelling shows the maximum concentrations meet the new CAAQS at all sensitive receptor locations. In addition, it is anticipated that on-going manufacturers' improvements to mobile equipment emissions will assist in reducing the anticipated effects of the Project, especially for NO_2. In addition, the on-going manufacturers' improvements to mobile equipment emissions will also result in decreases to the background levels in the future. Furthermore, the sulphur content in fuel is expected lower in years to come, which will aid in further reducing the Project and background SO_2 concentrations. PART E. As described in the responses to Parts A through D, there will be no access to the Operations Area during the active life of the Project, and there are no additional receptors identified within the operations area through preparing the responses to Parts A through D. Access to the Operations Area by members of Indigenous communities for traditional uses of lands and resources will only be permitted in the post-closure phase of the Project, once the regulators are

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response
				confident the closure landscape is functioning properly and institutional controls on access to the areas are no longer required. However, in preparing the responses to the Round 2 information requests, Treasury Metals have prepared a detailed Human Health and Ecological Risk Assessment (referred to as the 2018 HHERA) that has been provided as part of the overall responses to the Round 2 information requests. While there will be no access permitted in the Operations Area during the active life of the Project, and there are no community-oriented receptors as identified by CCME (2000) as the appropriate locations for evaluating achievement of ambient air quality criteria (including the new CAAQS) within either the Operations Area of the property boundary for the Goliath Gold Project, the 2018 HHERA recognizes that there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands and resources. Additionally, throughout the active life of the Project, workers will be accessing the operations area and be exposed to the air quality that may be higher than those at sensitive receptors beyond the property boundary. To capture these exposures and effects in 2018 HHERA, revised air modelling was completed using a refined receptor grid that provided additional focus on areas within the operations area and within the property boundary. However, the predictions within the Operations Area (where access will not be allowed to members of Indigenous communities and members of the public during the active life of the Project) and at locations outside the operations and within the property line do not represent community-based receptors as described by the CCME (2000) to used when determining whether ambient air quality criteria are achieved. Additionally, the reviewers have stated, as part of the Round 2 information request process, that Treasury Metals should not assume that members of Indigenous communities will avail themselves of opportunities to access lands and resources within the property boundary for the Project, and that those areas where Treasury Metals have committed to providing ,escorted access (for safety reasons) to members of Indigenous communities should be evaluated as if there will be no access (see response TMI_940-AC(2)-07). The 2018 HHERA assessed potential risk at three Study Areas chosen to represent the areas where human and ecological receptors would experience the highest magnitude, frequency, and duration of chemical exposure representative of the various phases of the Project. The 2018 HHERA considered all active phases of the Project (Site Preparation and Construction, Operations and Closure), as well as the Post-Closure Phase when there would be no sources of air emissions at the Project. The three Study Areas assessed are as follows: • **Study Area No 1. Operations area**: The Operations Area includes all of the active mining areas associated with the Project. During the active life of the Project access to the Operations Area will be restricted for safety and security reasons. Only employees of Treasury Metals will be allowed within the Operations Area. There will be no access to the Operations Area by members of the public or Indigenous communities during the active life of the Project. There will be no harvesting of country foods within the Operations Area for the active phases of the Project, and there are no community-based receptors within the Operations Area. Following Closure, during the passive Post-Closure phase of the Project, full access to the Operations Area will resume as will the practice of traditional land and resource use. A total of 308 gridded air modelling receptors were placed at 100 m intervals across the Operation Area (Study Area No. 1).

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				• **Study Area No. 2 Local Study Area**: The LSA corresponds with the LSA used in the revised EIS (April 2018) for evaluating the effects of the Project on wildlife and wildlife habitat, as well as evaluating the effects of the Project on terrestrial vegetation. The LSA excludes the Operations Area but includes areas within the Property Boundary where traditional land and resource use may be practiced. The LSA includes areas within the Property Boundary of the Project (i.e., the lands leased by Treasury Metals, or for which Treasury Metals holds surface and mineral rights), which would continue to be available for traditional uses by members of Indigenous communities. There are no community-based receptors within the Property Boundary. A total of 3,474 gridded air modelling receptors were placed at 100 m intervals across within the LSA (Study Area No. 2), including 1,445 receptors that fall inside the property boundary. • **Study Area No. 3 Village of Wabigoon**: The Village of Wabigoon is located approximately 4 km to the south of the Project and represents the closest populated community to the Project. A total of 46 gridded air modelling receptor were located within the Village of Wabigoon (Study Area No. 3). As part of the 2018 HHERA, the air modelling was redone using the same emissions and methods as presented in Section 6.6 of the revised EIS (April 2018), but focusing on above three study PART F. As described in Part D, none of the predicted concentrations (including background) at any of the sensitive receptor locations exceed the relevant criteria (including the new CAAQS values for NO_2 and SO_2 to be implemented in 2025). As stated by the CCME (2000), achievement with ambient air quality criteria, (which included the new CAAQS) is based on community-oriented receptors, which correspond with the sensitive receptor location used in the air quality assessment. Although no changes were warranted to the follow-up program for to address human health issues related to additional sensitive receptors, the follow-up program for human health and air quality has been revised as part of the Round 2 process and are provided in the Goliath Gold Project Follow-up Program Addendum, which superseded Section 13 of the revised EIS (April 2018).
				Agency Comment on Draft Response None Received
				FINAL RESPONSE Agency accepted Revised Response as Final.

TMI_880-AE(2)-04

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response	
TMI_880-AE(2)-04	AE(2)-04	1	CEA Agency	**Reference to EIS Guidelines:**	Part 2, Section 10.1.3
				Reference to EIS / Appendix	Section 6.6.4; Appendix J-5
				Cross-reference to Round 1 IRs	TMI_168-AE(1)-06, TMI_169-AE(1)-07
				Context and Rationale: • The response to IR# TMI_169B provides maximum predicted concentrations for various contaminants and averaging periods in the construction, operations and "decommissioning/restoration" phases, which are also found in Section 6.6.4 of the revised EIS, Tables 6.6.4.1-2, 6.6.4.2-2, and 6.6.4.3-2. Several contaminants have maximum predicted concentrations that exceed applicable federal and provincial criteria, including 24-hour total suspended particulate (TSP) and 1-hour NO2 (based on new CAAQS) for construction, operation and decommissioning phases, and 24-hour PM10 and PM2.5 during the operations phase. However, there is no analysis of the frequency of exceedances, in terms of days or percentage of days when exceedances may occur, along with meteorological conditions and seasons when exceedances would be more likely, in Appendix J or in Section 6 of the revised EIS. • In Appendix J-5, Table 9, the total of operation phase maximum hourly emissions for all of the contaminants is smaller than some individual sources. It is unclear whether the individual source emission rates or the	

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total maximum hourly emission rates are incorrect. It is also unclear whether the dispersion modelling used the correct source emission rates.

Specific Question / Request for Information:

A. Review total maximum hourly emission rates for the operations phase (Appendix J-5, Table 9) to provide the correct individual sources and the correct total maximum hourly emission rates. If necessary, redo the dispersion modelling based on the correct emission rates.

B. Provide a frequency analysis (in days or in percentage) for any pollutants that are predicted to exceed the standards based on cumulative concentrations shown in Appendix J-5, Tables 11, 12 and 13. Describe how meteorological conditions and the season of the year would affect the likelihood of an exceedance. Ensure that this frequency analysis uses new CAAQS standards for NO2 and SO2, as discussed in IR# AE(2)-01.

C. Update the human health risk assessment to reflect any changes to the air quality assessment from the responses to Questions A to D.

D. If necessary, update the follow-up program for effects to human health, including objectives and any additional monitoring measures that will be implemented to verify the predictions of concentrations in locations within the operations area where access will be allowed during any phase of the Project. Add these new measures to the overall Follow-Up Program to be prepared in response to IR# EA(2)-01.

Draft Response:

Part A. As noted by the reviewers, there were several typographical errors in the emission tables presented in Section 6.6 and Appendix J-5 of the revised EIS (April 2018). A detailed review of the emissions used in the modelling confirmed that the modelling files used to predict the maximum concentrations for the Site Preparation and Construction, Operations, and Closure Phases were correct, and that any errors were restricted to the summary emission tables presented in the revised EIS (April 2018). Therefore, there is no requirement to redo the dispersion modelling to address apparent issues related to the emissions. As noted in the response to TMI_879-AE(2)-01, Treasury Metals has acquired additional properties since the air modelling receptors used in the revised EIS (April 2018) were identified. The dispersion modelling has been redone to reflect the new property line for the Goliath Gold Project, as well as removal of those sensitive receptors that have eliminated through purchase by Treasury Metals.

An updated summary of the emissions for the site preparation and construction, operations, and closure phases are presented, respectively, in Tables 1, 2 and 3.

Table 1: Air Emissions – Site Preparation and Construction

Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul Roads (Including tailpipe)	547	147	18	30

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Dozers (including tailpipe)	19	4	2.6	3.5
Loader (including tailpipe)	49	13	1.8	2.8
Material Handling (load/unload)	5.1	2.4	0.36	—
Excavator (tailpipe)	0.12	0.12	0.12	0.67
Crusher	4.7	2.1	0.32	--
Blasting	2.5	1.3	0.075	0.073
Back-up generators	4.0	4.0	4.0	99
Total:	**631**	**174**	**27**	**136**

Note: The above table supersedes Table 6.6.4.1-1 of the revised EIS (April 2018)

Table 2: Air Emissions: Operations

Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul roads (Including tailpipe)	477	128	18	75
Dozers (including tailpipe)	29	5.9	3.9	16
Loader (including tailpipe)	0.81	0.64	0.51	15
Material handling (load/unload)	6.5	3.1	0.5	-
Excavator (tailpipe)	0.12	0.12	0.12	2.0
Wind erosion of tailings	22	18	10	-
Crusher	0.18	0.18	0.18	-
Blasting	10.0	5.2	0.30	0.073
Vent raises	19	19	19	87
Drilling	0.32	0.12	0.018	-
Heaters	0.10	0.10	0.10	1.35
Back-up generators	4.0	4.0	4.0	100
Total:	**569**	**184**	**57**	**296**

Note: The above table supersedes Table 6.6.4.2-1 of the revised EIS (April 2018).

Table 3: Air Emissions: Closure				
Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul Roads (Including tailpipe)	547	147	18	30
Dozers (including tailpipe)	19	4	2.6	3.5
Loader (including tailpipe)	49	13	0.1	2.8
Material Handling (load/unload)	4.8	2.3	0.35	—
Excavator (tailpipe)	0.12	0.12	0.24	0.67
Back-up generator	2.0	2.0	2.0	28
Total:	622	168	23	65

Note: The above table supersedes Table 6.6.4.2-1 of the revised EIS (April 2018).

Part B. As noted in the response to TMI_879-AE(2)-01, Treasury Metals has acquired additional properties since the air modelling receptors used in the revised EIS (April 2018) were identified. Table 4 summarizes the results of the dispersion modelling that has been redone to reflect the new property line for the Goliath Gold Project, as well as removal of those sensitive receptors that have eliminated through purchase by Treasury Metals. The results in Table 4 present the maximum concentrations predicted at the sensitive receptor locations, which correspond to the community-oriented receptors identified by CCME (2000) as the appropriate location for determining the achievement with ambient air quality criteria (e.g., the new CAAQS for NO_2 and SO_2). None of the predicted maximum concentrations at the sensitive receptor locations exceed the relevant criteria, including the new CAAQS for NO_2 and SO_2 scheduled to come into force in 2025.

Table 4: Residual Adverse Air Quality Effects					
Compound	Averaging Period	Maximum Cumulative Prediction at Sensitive Receptors (1,2)			
		Site Preparation and Construction	Operations	Closure	Post-closure (4)
TSP	24-hour	50	47	50	—
	Annual	17	16.3	16.7	—
PM_{10}	24-hour	20	19	20	—
$PM_{2.5}$	24-hour	11	11	11	—
	Annual	4.4	4.5	4.4	—
Dustfall (3)	30 day	0.65	0.57	0.63	—
	Annual	0.51	0.45	0.49	—
CO	1-hour	1,257	1258	1251	—
	8-hour	1,251	1253	1249	—
NO_2	1-hour	65	57	41	—
	24-hour	30	31	28	—

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	Annual	15	15	14	—
SO_2	1-hour	4.7	4.2	4.6	—
	24-hour	4.1	4.0	4.1	—
	Annual	1.0	1.0	1.0	—
Arsenic	24-hour	0.0015	0.0014	0.0015	—
Barium	24-hour	0.008	0.0065	0.0078	—
Beryllium	24-hour	0.000040	0.000033	0.000039	—
Cadmium	24-hour	0.000057	0.000047	0.000056	—
Chromium	24-hour	0.0074	0.0070	0.0074	—
Cobalt	24-hour	0.00020	0.00016	0.00020	—
Lead	24-hour	0.0069	0.0065	0.0068	—
Manganese	24-hour	0.028	0.027	0.028	—
Nickel	24-hour	0.00065	0.00053	0.00063	—
	Annual	0.00065	0.00053	0.00063	—
Phosphorous	24-hour	0.0085	0.0070	0.0084	—
Platinum	24-hour	0.00034	0.00028	0.00033	—
Rhodium	24-hour	0.00010	0.00008	0.00010	—
Thallium	24-hour	0.00028	0.00023	0.00028	—
Titanium	24-hour	0.031	0.025	0.030	—
Uranium	24-hour	0.00017	0.00014	0.00017	—
	Annual	0.00017	0.00014	0.00017	—
Vanadium	24-hour	0.00081	0.00066	0.00079	—

Notes:

The values in the above table supersede Table 6.6.6-1 of the revised EIS (April 2018).

(1) The air quality effects are presented at the sensitive receptor locations, which correspond to the definition of "community-oriented locations" used by CCME (2000). The cumulative predictions include background air concentrations.

(2) The values in the above table include background concentrations.

(3) Predicted dustfall values are in units of g/m²/30 days. Annual values are averaged over 12 months.

(4) There are no sources of air emissions during the post-closure phase.

Although not consistent with the CCME definition of community-oriented receptors to be used for determining achievement with ambient air quality criteria, the revised dispersion modelling identified that at the gridded receptors on, and beyond, the property line, only the maximum 1-hour NO_2 concentrations (including background) were predicted to exceed any of the relevant criteria. It should be noted that the maximum 1-hour NO_2 concentrations (including background), do not exceed either the current ambient air quality criteria federally or provincially. Nor do the

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				maximum 1-hour NO_2 concentrations (including background), exceed the CAAQS for NO_2 of 60 ppb (112.8 µg/m³) scheduled to come into force in 2020. Only the maximum 1-hour NO_2 concentrations (including background) during operations are predicted to exceed the CAAQS for NO_2 of 42 ppb (79 µg/m³) scheduled to come into force in 2025. During site preparation and construction, the maximum 1-hour NO_2 concentrations (including background) were predicted to equal, but not exceed, the new CAAQS for NO_2 of 42 ppb (79 µg/m³) scheduled to come into force in 2025. The maximum 1-hour NO_2 concentrations (including background) during closure were below the new CAAQS for NO_2 of 42 ppb (79 µg/m³) scheduled to come into force in 2025. CAAQS for NO_2 and SO_2 scheduled to come into force in 2025. TMI_880-AE(2)-04_Table_5 presents the requested frequency analysis for receptors along the property line where the maximum 1-hour NO_2 concentrations during operations (including background) were predicted to exceed the new CAAQS for NO_2 of 42 ppb (79 µg/m³) scheduled to come into force in 2025. It is important to note that these gridded receptors along the property line do not represent community-oriented receptors identified by CCME (2000) as appropriate locations for determining whether the ambient air quality criteria are achieved. Part C. As described in the responses to TMI_879-AE(2)-03, there will be no access to the Operations Area during the active life of the Project, and there are no additional receptors identified within the operations area through preparing the responses to Parts A through D. Access to the Operations Area by members of Indigenous communities for traditional uses of lands and resources will only be permitted in the Post-Closure Phase of the Project, once the regulators are confident the closure landscape is functioning properly and institutional controls on access to the areas are no longer required. However, in preparing the responses to the Round 2 information requests, Treasury Metals have prepared a detailed Human Health and Ecological Risk Assessment (referred to as the 2018 HHERA) that has been provided as part of the overall responses to the Round 2 information requests. While there will be no access permitted in the Operations Area during the active life of the Project, and there are no community-based identified by CCME (2000) as the appropriate locations for evaluating achievement of ambient air quality criteria (including the new CAAQS) within either the operations area of the property boundary for the Goliath Gold Project, the 2018 HHERA recognizes that there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands and resources. Additionally, throughout the active life of the Project, workers will be accessing the Operations Area and be exposed to the air quality that may be higher than those at sensitive receptors beyond the property boundary. The three Study Areas assessed in the 2018 HHERA are as follows: • **Study Area No 1. Operations Area**: The Operations Area includes all of the active mining areas associated with the Project. During the active life of the Project access to the Operations Area will be restricted for safety and security reasons. Only employees of Treasury Metals will be allowed within the Operations Area. There will be no access to the Operations Area by members of the public or Indigenous communities during the active life of the Project. There will be no harvesting of country foods within the Operations Area for the active phases of the Project, and there are no community-based receptors within the Operations Area. Following Closure, during the passive Post-Closure Phase of the Project, full access to the Operations Area will resume as will the practice of

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				traditional land and resource use. A total of 308 gridded air modelling receptors were placed at 100 m intervals across the operation area (Study Area No. 1). • **Study Area No. 2 Local Study Area**: The LSA corresponds with the LSA used in the revised EIS (April 2018) for evaluating the effects of the Project on wildlife and wildlife habitat, as well as evaluating the effects of the Project on terrestrial vegetation. The LSA excludes the Operations Area but includes areas within the Property Boundary where traditional land and resource use may be practiced. The LSA includes areas within the Property Boundary of the Project (i.e., the lands leased by Treasury Metals, or for which Treasury Metals holds surface and mineral rights), which would continue to be available for traditional uses by members of Indigenous communities. There are no community-based receptors within the Property Boundary. A total of 3,474 gridded air modelling receptors were placed at 100 m intervals across within the LSA (Study Area No. 2), including 1,445 receptors that fall inside the property boundary. • **Study Area No. 3 Village of Wabigoon**: The Village of Wabigoon is located approximately 4 km to the south of the Project and represents the closest populated community to the Project. A total of 46 gridded air modelling receptor were located within the Village of Wabigoon (Study Area No. 3). As part of the 2018 HHERA, the air modelling was redone using the same emissions and methods as presented in Section 6.6 of the revised EIS (April 2018), but focusing on above three study Part D. As described in Part B, none of the predicted concentrations (including background) at any of the sensitive receptor locations exceed the relevant criteria (including the new CAAQS values for NO_2 and SO_2 to be implemented in 2025). As stated by the CCME (2000), achievement with ambient air quality criteria, (which included the new CAAQS) is based on community-oriented receptors, which correspond with the sensitive receptor location used in the air quality assessment. Therefore, no refinements are warranted to the follow-up program with respect to air quality at the community-oriented receptors. However, Section 7 of the 2018 HHERA report provides new details regarding the Follow-Up Program for human health, mostly with respect to follow-up related to the country foods assessment of the 2018 HHERA. With respect to air and human health, the expectation for the Follow-Up Program is that it will rely heavily on the Follow-Up Program described for verifying the Air Quality Modeling predictions, including the predictions of concentrations of NO_2 and SO_2. As part of the Round 2 information request process there are several questions relating to updates to the Follow-Up Program submitted as Section 13 of the revised EIS (April 2018). In order to effectively responds to these various requests, and specifically to respond to TMI_869-EA(2)-01, Treasury Metals has prepared the Goliath Gold Follow-Up Addendum, which has been provided as part of the overall response package to the Round 2 information. This document delivers a comprehensive and consolidated answer to all Round 2 Information Requests related to the Follow-Up Programs including those related to human health. **References:**

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response
				Canadian Council of Ministers of the Environment. 1999. Canadian National Ambient Air Quality Objectives: Process and Status. Excerpt from Publication No. 1299; ISBN 1-896997-34-1. Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment. Winnipeg, MB. Canadian Council of Ministers of the Environment (CCME). 2000. Canada-Wide Standards for Particulate Matter (PM) and Ozone. Ottawa, Canada. CEAA (Canadian Environmental Assessment Agency). 2013. Guidelines for the preparation of an Environmental Impact Statement for an environmental assessment conducted pursuant to the Canadian Environmental Assessment Act, 2012. Goliath Gold Project, Treasury Metals Inc. February 2013.
				Agency Comment 1 of 2 on Draft Response: In response to TMI_880-AE(2)-04B, a table was provided for frequency analysis of exceedances of NO_2. This information would be better conveyed in a map. While it is understood that this list includes "these gridded receptors along the property line", it should also include locations within the updated property boundary where Indigenous use could occur. Provide a map with isopleths that conveys the information given in TMI_880-AE(2)-04_Table_1. The map should also include locations within the property boundary where Indigenous use may occur, particularly within Study Area Number 2 (the Local Study Area).
				Specific Response to Agency Comment 1 of 2: Given the extremely low number of 1-hour NO_2 concentrations predicted to be numerically higher than 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025), it is unclear how the information provided in TMI_880-AE(2)-04_Table_5 could be more clearly presented in a map. The table shows that none of the gridded modelling receptors experienced maximum 1-hour NO_2 concentrations above 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025), more than 0.3% of the hours modelled. In fact, of all receptors where at least 1-hour was predicted to experience NO_2 concentrations in excess of 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025), 97% were predicted with concentration in excess of 79 µg/m³ less than 0.1% of the five (5) years of hourly data modelled. It should also be noted that none of the gridded modelling receptors where maximum 1-hour NO_2 concentrations were to be numerically higher than 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025) meet the requirements for "community-oriented receptors" as defined by the CCME (2006). Given CCME (2006) indicated that compliance with ambient air criteria should only be done at "community-oriented receptors", it is not obvious that predicted concentrations in excess of 79 µg/m³ represents an exceedance of the CAAQS. To help illustrate where the predicted maximum concentrations are likely to occur, as well as those areas where modelled concentrations were predicted to be numerically higher than the relevant criteria, a series of updated isopleth figures have been prepared. These have been provided as TMI_877-AE(2)-01_Attachment_1 (site preparation and construction), TMI_877-AE(2)-01_Attachment_2 (operations), and TMI_877-AE(2)-01_Attachment_3 (closure). The isopleth figures provided in TMI_877-AE(2)-01_Attachment_2 (operations) supersede Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018). Each of the attachments includes 15 isopleth figures, 14

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				which correspond to the compounds and averaging periods presented in Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018), plus a fifteenth figure that provides the annual NO_2 predictions. The updated isopleth figures show concentrations contours outside of the limit of private, patent and leased lands, which is consistent with the definition for property boundaries used for modelling in accordance with O.Reg. 419/05.
				Agency Comment 2 of 2 on Draft Response: ***The following Agency feedback on the draft responses identified the following comment as applying to each of TMI_877-AE(2)-01, TMI_879-AE(2)-03, and TMI_880-AE(2)-04. A full response to each of these comments has been provided in the response to TMI_877 AE(2) 01. Although there are no specific components of this request related to the draft response for TMI_880 AE(2) 04, the full text has been provided for completeness.*** The responses to these IRs indicate that Treasury Metals has acquired additional properties since the air modelling receptors used in the April 2018 Revised EIS were identified. The response to TMI_877-AE(2)-01C indicates that "the revised air quality modelling grid in support of the HHERA is shown relative to the Property Boundary and the three Study Areas, on Figure 3.1.1-1 of the 2018 HHERA Report (August 2018)". The property boundary shown in Figure 3.1.1-1 of the 2018 HHERA Report appears similar to the property boundary used in the April 2018 Revised EIS in the inset of Figure 6.6.2.2-1 as well as figure 1.2.3-1. It is unclear where the newly acquired properties are located, and how the property boundary has changed. It is also unclear if the Property Boundary demarcated in the various documents of the EIS is an indication of all property owned by Treasury Metals Inc. or if this is a delineation of the lands for which the proponent holds surface/mineral rights and mining claims but which they may not own. [i] In the response to AE(2)-01, provide a map with the updated property boundary, and describe how the property boundary has changed since the April 2018 Revised EIS. Clarify whether the updated property boundary meets the understanding of the property boundary as it is applied in Ontario Regulation 419/05. Clarify the property ownership and claim status of the lands within the updated property boundary. [ii] Identify where along the updated property boundary would be the maximum point of impingement, and where the sensitive receptor with maximum concentrations would be located. [ii] Clarify whether the differences between the predictions in TMI_877-AE(2)-01_Table_4a, 4b and 4c and the predictions in the April 2018 Revised EIS, Tables 6.6.4.1-2, 6.6.4.2-2 and 6.6.4.3-2 are only due to the change in location of the property boundary, or whether there have been changes in the model itself. If necessary, describe any changes to the model since the April 2018 Revised EIS. The response to TMI_879-AE(2)-03C indicates that some sensitive receptors were "eliminated" through purchase by Treasury Metals. [iv] Identify the sensitive receptors that were no longer considered in the updated air quality assessment, and whether they will be physically removed or will no longer meet the definition of a sensitive receptor due to its

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				location within the updated property boundary. The response to TMI_877-AE(2)-01B states that, for NO_2 and SO_2, "additional improvements/mitigation measures for air quality are not required as the modelling shows the maximum concentrations meet the new CAAQS [Canadian Ambient Air Quality Standards] at all sensitive receptor locations." While the Agency understands that this conclusion is based on sensitive receptors outside of the updated property boundary, it notes that exceedances of the new CAAQS for 1-hour NO_2 are predicted at maximum point of impingement along the updated property boundary, and therefore there would be exceedances within the property boundary. The response to TMI_879-AE(2)-03E indicates that "there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands and resources". It remains that Indigenous users may be exposed to air with NO_2 concentrations above the new CAAQS. [v] The Agency reiterates question TMI_877-AE(2)-01B, in consideration of locations where Indigenous use may occur and where exceedances of CAAQS for NO_2 may
				Specific Response to Agency Comment 2 of 2: ***The following Agency feedback on the draft responses identified the following comment as applying to each of TMI_877-AE(2)-01, TMI_879-AE(2)-03, and TMI_880-AE(2)-04. A full response to each of these comments has been provided in the response to TMI_877 AE(2) 01. As there are no specific components of this request related to the draft response for TMI_880 AE(2) 04, a summary of the detailed information provided in has been included as a response.*** The property boundary used in the dispersion modelling has changed since the modelling receptors used in the revised EIS (April 2018) were generated. TMI_877-AE(2)-01_Figure_3 shows the current property boundary, and corresponds to the property boundary used for preparing the Round 2 responses. Since the filing of the revised EIS (April 2018), the property ownership and claim status of the lands within the property boundary have also been updated from those presented in Figure 1.2.3-1 of the revised EIS (April 2018). The updated property status is provided on TMI_877-AE(2)-01_Figure_4. As shown on the figure, the lands in the western portion of the property boundary represent private or patent lands, lands for which Treasury Metals hold surface and mineral rights, lands to which Treasury Metals hold mineral rights and surface rights are pending, and lands where conversion from claim to lease is pending. Such lands would be consistent with the definition of a property line used in Ontario Regulation 419/05 (O.Reg. 419/05). As shown on TMI_877-AE(2)-01_Figure_4, Treasury Metals are not planning on bringing the claimed lands within the eastern portion of the property boundary to lease at this time. As such, the limit of private, patent and leased lands (shown with a thick red line on TMI_877-AE(2)-01_Figure_4) would represent the property boundary for modelling in accordance with O.Reg. 419/05. This represents the property boundary used in the in the revised modelling to support the Round 2 responses.

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The above changes to the property boundary also affected the sensitive receptor locations. TMI_877 AE(2) 01_Figure_3 shows the current property boundary used for preparing the Round 2 responses, including the results presented in TMI_877-AE(2)-01_Table_1, TMI_877-AE(2)-01_Table_2 and TMI_877-AE(2)-01_Table_3. On the figure, the sensitive receptors that have been excludes as a result of the changes to the property lines are marked as red on the figure. It is Treasury Metals intention to remove the residences at each of these locations. However, Treasury Metals may retain the secondary structures and outbuildings at these locations for use as possible wildlife habitat. A decision regarding the fate of the secondary structures and outbuildings would be made through consultation with Ontario Ministry of Natural Resources and Forestry (MNRF), as well as Environment and Climate Change Canada.

Revised Response:

Part A.

As noted by the reviewers, there were several typographical errors in the emission tables presented in Section 6.6 and Appendix J-5 of the revised EIS (April 2018). A detailed review of the emissions used in the modelling confirmed that the modelling files used to predict the maximum concentrations for the Site Preparation and Construction, Operations, and Closure Phases were correct, and that any errors were restricted to the summary emission tables presented in the revised EIS (April 2018). Therefore, there is no requirement to redo the dispersion modelling to address apparent issues related to the emissions. As noted in the response to TMI_879-AE(2)-01, Treasury Metals has acquired additional properties since the air modelling receptors used in the revised EIS (April 2018) were identified. The dispersion modelling has been redone to reflect the new property line for the Goliath Gold Project, as well as removal of those sensitive receptors that have eliminated through purchase by Treasury Metals.

An updated summary of the emissions for the site preparation and construction, operations, and closure phases are presented, respectively, in Tables 1, 2 and 3.

Table 1: Air Emissions – Site Preparation and Construction

Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul Roads (Including tailpipe)	547	147	18	30
Dozers (including tailpipe)	19	4	2.6	3.5
Loader (including tailpipe)	49	13	1.8	2.8
Material Handling (load/unload)	5.1	2.4	0.36	—
Excavator (tailpipe)	0.12	0.12	0.12	0.67
Crusher	4.7	2.1	0.32	--
Blasting	2.5	1.3	0.075	0.073
Back-up generators	4.0	4.0	4.0	99

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Total:	**631**	**174**	**27**	**136**

Note: The above table supersedes Table 6.6.4.1-1 of the revised EIS (April 2018)

Table 2: Air Emissions: Operations

Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul roads (Including tailpipe)	477	128	18	75
Dozers (including tailpipe)	29	5.9	3.9	16
Loader (including tailpipe)	0.81	0.64	0.51	15
Material handling (load/unload)	6.5	3.1	0.5	-
Excavator (tailpipe)	0.12	0.12	0.12	2.0
Wind erosion of tailings	22	18	10	-
Crusher	0.18	0.18	0.18	-
Blasting	10.0	5.2	0.30	0.073
Vent raises	19	19	19	87
Drilling	0.32	0.12	0.018	-
Heaters	0.10	0.10	0.10	1.35
Back-up generators	4.0	4.0	4.0	100
Total:	**569**	**184**	**57**	**296**

Note: The above table supersedes Table 6.6.4.2-1 of the revised EIS (April 2018).

Table 3: Air Emissions: Closure

Emission Source	Annual Emission Rate (Mg/y)			
	TSP	PM_{10}	$PM_{2.5}$	NO_X
Haul Roads (Including tailpipe)	547	147	18	30
Dozers (including tailpipe)	19	4	2.6	3.5
Loader (including tailpipe)	49	13	0.1	2.8
Material Handling (load/unload)	4.8	2.3	0.35	—
Excavator (tailpipe)	0.12	0.12	0.24	0.67
Back-up generator	2.0	2.0	2.0	28

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Total:	622	168	23	65

Note: The above table supersedes Table 6.6.4.2-1 of the revised EIS (April 2018).

Part B.

The property boundary used in the dispersion modelling has changed since the modelling receptors used in the revised EIS (April 2018) were generated. TMI_877-AE(2)-01_Figure_3 shows the current property boundary, and corresponds to the property boundary used for preparing the Round 2 responses. Since the filing of the revised EIS (April 2018), the property ownership and claim status of the lands within the property boundary have also been updated from those presented in Figure 1.2.3-1 of the revised EIS (April 2018). The updated property status is provided on TMI_877-AE(2)-01_Figure_4. As shown on the figure, the lands in the western portion of the property boundary represent private or patent lands, lands for which Treasury Metals hold surface and mineral rights, lands to which Treasury Metals hold mineral rights and surface rights are pending, and lands where conversion from claim to lease is pending. Such lands would be consistent with the definition of a property line used in Ontario Regulation 419/05 (O.Reg. 419/05). As shown on TMI_877-AE(2)-01_Figure_4, Treasury Metals are not planning on bringing the claimed lands within the eastern portion of the property boundary to lease at this time. As such, the limit of private, patent and leased lands (shown with a thick red line on TMI_877-AE(2)-01_Figure_4) would represent the property boundary for modelling in accordance with O.Reg. 419/05. This represents the property boundary used in the in the revised modelling to support the Round 2 responses.

The above changes to the property boundary also affected the sensitive receptor locations. TMI_877 AE(2) 01_Figure_3 shows the current property boundary used for preparing the Round 2 responses, including the results presented in TMI_877-AE(2)-01_Table_1, TMI_877-AE(2)-01_Table_2 and TMI_877-AE(2)-01_Table_3. On the figure, the sensitive receptors that have been excludes as a result of the changes to the property lines are marked as red on the figure. It is Treasury Metals intention to remove the residences at each of these locations. However, Treasury Metals may retain the secondary structures and outbuildings at these locations for use as possible wildlife habitat. A decision regarding the fate of the secondary structures and outbuildings would be made through consultation with Ontario Ministry of Natural Resources and Forestry (MNRF), as well as Environment and Climate Change Canada.

Table 4 summarizes the results of the dispersion modelling at the sensitive receptors, that reflect the adjustments to the property boundary and sensitive receptor locations discussed above. The sensitive receptor locations correspond to the definition of “community-oriented receptors” identified by CCME (2000) as the appropriate location for determining the achievement with ambient air quality criteria (e.g., the new CAAQS for NO_2 and SO_2). None of the predicted maximum concentrations at the sensitive receptor locations exceed the relevant criteria, including the new CAAQS for NO_2 and SO_2 scheduled to come into force in 2025.

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Table 4: Maximum Cumulative Prediction at Sensitive Receptors [1][2]

Compound	Averaging Period	Maximum Concentration (µg/m³) [3]			
		Site Preparation and Construction	Operations	Closure	Post-closure [4]
TSP	24-hour	50	47	50	—
	Annual	17	16.3	16.7	—
PM_{10}	24-hour	20	19	20	—
$PM_{2.5}$	24-hour	11	11	11	—
	Annual	4.4	4.5	4.4	—
Dustfall [3]	30 day	0.65	0.57	0.63	—
	Annual	0.51	0.45	0.49	—
CO	1-hour	1,257	1258	1251	—
	8-hour	1,251	1253	1249	—
NO_2	1-hour	65	57	41	—
	24-hour	30	31	28	—
	Annual	15	15	14	—
SO_2	1-hour	4.7	4.2	4.6	—
	24-hour	4.1	4.0	4.1	—
	Annual	1.0	1.0	1.0	—
Arsenic	24-hour	0.0015	0.0014	0.0015	—
Barium	24-hour	0.008	0.0065	0.0078	—
Beryllium	24-hour	0.000040	0.000033	0.000039	—
Cadmium	24-hour	0.000057	0.000047	0.000056	—
Chromium	24-hour	0.0074	0.0070	0.0074	—
Cobalt	24-hour	0.00020	0.00016	0.00020	—
Lead	24-hour	0.0069	0.0065	0.0068	—
Manganese	24-hour	0.028	0.027	0.028	—
Nickel	24-hour	0.00065	0.00053	0.00063	—
	Annual	0.00065	0.00053	0.00063	—
Phosphorous	24-hour	0.0085	0.0070	0.0084	—
Platinum	24-hour	0.00034	0.00028	0.00033	—
Rhodium	24-hour	0.00010	0.00008	0.00010	—
Thallium	24-hour	0.00028	0.00023	0.00028	—
Titanium	24-hour	0.031	0.025	0.030	—

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Uranium	24-hour	0.00017	0.00014	0.00017	—
	Annual	0.00017	0.00014	0.00017	—
Vanadium	24-hour	0.00081	0.00066	0.00079	—

Notes:

The values in the above table supersede Table 6.6.6-1 of the revised EIS (April 2018).

(1) The air quality effects are presented at the sensitive receptor locations, which correspond to the definition of "community-oriented receptors" used by CCME (2000). The cumulative predictions include background air concentrations.

(2) The values in the above table include background concentrations.

(3) Predicted dustfall values are in units of g/m²/30 days. Annual values are averaged over 12 months.

(4) There are no sources of air emissions during the post-closure phase.

Table 5 summarizes the results of the dispersion modelling at the gridded modelling receptors. The gridded modelling receptors are not consistent with the CCME definition of "community-oriented receptors" used for determining compliance with ambient criteria. A review of the results presented in Table 5 shows that only the maximum 1-hour NO_2 concentrations (including background) were predicted to numerically higher than the ambient criteria, specifically the new CAAQS for NO_2 of 42 ppb (79 µg/m³) scheduled to come into force in 2025. The maximum 1-hour NO_2 concentrations (including background), are not numerically larger than the current ambient air quality criteria of 400 µg/m³, nor are they numerically larger than do 1-hour CAAQS for NO_2 of 60 ppb (112.8 µg/m³) scheduled to come into force in 2020.

Table 5: Maximum Cumulative Prediction at Gridded Modelling Receptors (1)(2)(3)

Compound	Averaging Period	Maximum Concentration (µg/m³) (4)			
		Site Preparation and Construction	Operations	Closure	Post-closure (5)
TSP	24-hour	55	61	56	—
	Annual	18	18	18	—
PM_{10}	24-hour	21	37	21	—
$PM_{2.5}$	24-hour	11	23	11	—
	Annual	4.5	5.0	4.5	—
Dustfall (4)	30 day	0.96	1.52	0.95	—
	Annual	0.76	0.95	0.76	—
CO	1-hour	1263	1273	1259	—
	8-hour	1253	1261	1,251	—
NO_2	1-hour	79	**110 (6)**	59	—
	24-hour	32	60	29	—
	Annual	15	23	14	—

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SO_2	1-hour	4.8	8.6	4.8	—
	24-hour	4.1	6.2	4.1	—
	Annual	1.0	1.6	1.0	—
Arsenic	24-hour	0.0017	0.0019	0.0017	—
Barium	24-hour	0.011	0.013	0.011	—
Beryllium	24-hour	0.000053	0.000066	0.000053	—
Cadmium	24-hour	0.000076	0.000095	0.000077	—
Chromium	24-hour	0.0082	0.0090	0.0083	—
Cobalt	24-hour	0.00027	0.00033	0.00027	—
Lead	24-hour	0.0075	0.0081	0.0075	—
Manganese	24-hour	0.032	0.035	0.032	—
Nickel	24-hour	0.00086	0.0011	0.00087	—
	Annual	0.00086	0.0011	0.00087	—
Phosphorous	24-hour	0.011	0.014	0.011	—
Platinum	24-hour	0.00045	0.00057	0.00046	—
Rhodium	24-hour	0.00013	0.00017	0.00014	—
Thallium	24-hour	0.00038	0.00048	0.00038	—
Titanium	24-hour	0.041	0.051	0.041	—
Uranium	24-hour	0.00022	0.00028	0.00023	—
	Annual	0.00022	0.00028	0.00023	—
Vanadium	24-hour	0.0011	0.0014	0.0011	—

Notes:

The values in the above table supersede Table 6.6.6-1 of the revised EIS (April 2018).

(1) The gridded modelling receptors do not meet the definition of "community-oriented receptors" used by CCME (2000) for determining compliance with ambient criteria.

(2) The cumulative predictions include background air concentrations.

(3) The values in the above table include background concentrations.

(4) Predicted dustfall values are in units of g/m²/30 days. Annual values are averaged over 12 months.

(5) There are no sources of air emissions during the post-closure phase.

(6) The numbers highlighted bold and shading indicates where the predicted maximum concentrations are numerically higher that the ambient criteria. Given CCME (2006) indicated that compliance with ambient air criteria should only be done at "community-oriented receptors", it is not obvious that predicted concentrations numerically higher than the ambient criteria at gridded modeling receptors represents an exceedance of the ambient criteria.

TMI_880-AE(2)-04_Table_6 presents the requested frequency analysis for receptors along the property line where the maximum 1-hour NO_2 concentrations during operations (including background) were predicted to numerically larger than 79 µg/m³, the new CAAQS for NO_2 of 42 ppb (79 µg/m³) scheduled to come into force in 2025. It is

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				important to note that these gridded receptors along the property line do not represent community-oriented receptors identified by CCME (2000) as appropriate locations for determining whether the ambient air quality criteria are achieved. Given the extremely low number of 1-hour NO_2 concentrations predicted to be numerically higher than 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025), the information provided in TMI_880-AE(2)-04_Table_6 cannot be readily presented on a map. However, to illustrate where the predicted maximum concentrations are likely to occur, as well as those areas where modelled concentrations were predicted to be numerically higher than the relevant criteria, a series of updated isopleth figures have been prepared. These have been provided as TMI_877-AE(2)-01_Attachment_1 (site preparation and construction), TMI_877-AE(2)-01_Attachment_2 (operations), and TMI_877-AE(2)-01_Attachment_3 (closure). The isopleth figures provided in TMI_877-AE(2)-01_Attachment_2 (operations) supersede Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018). Each of the attachments includes 15 isopleth figures, 14 which correspond to the compounds and averaging periods presented in Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018), plus a fifteenth figure that provides the annual NO_2 predictions. The updated isopleth figures show concentrations contours outside of the limit of private, patent and leased lands, which is consistent with the definition for property boundaries used for modelling in accordance with O.Reg. 419/05. <u>Part C.</u> As described in the responses to TMI_879-AE(2)-03, there will be no access to the Operations Area during the active life of the Project, and there are no additional receptors identified within the operations area through preparing the responses to Parts A through D. Access to the Operations Area by members of Indigenous communities for traditional uses of lands and resources will only be permitted in the Post-Closure Phase of the Project, once the regulators are confident the closure landscape is functioning properly and institutional controls on access to the areas are no longer required. However, in preparing the responses to the Round 2 information requests, Treasury Metals have prepared a detailed Human Health and Ecological Risk Assessment (referred to as the 2018 HHERA) that has been provided as part of the overall responses to the Round 2 information requests. While there will be no access permitted in the Operations Area during the active life of the Project, and there are no community-based identified by CCME (2000) as the appropriate locations for evaluating achievement of ambient air quality criteria (including the new CAAQS) within either the operations area of the property boundary for the Goliath Gold Project, the 2018 HHERA recognizes that there may be locations outside of the Operations Area, but within the property boundary of the Goliath Gold Project, where members of Indigenous communities may wish to practice traditional uses of the lands and resources. Additionally, throughout the active life of the Project, workers will be accessing the Operations Area and be exposed to the air quality that may be higher than those at sensitive receptors beyond the property boundary. The three Study Areas assessed in the 2018 HHERA are as follows:

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				• **Study Area No 1. Operations Area**: The Operations Area includes all of the active mining areas associated with the Project. During the active life of the Project access to the Operations Area will be restricted for safety and security reasons. Only employees of Treasury Metals will be allowed within the Operations Area. There will be no access to the Operations Area by members of the public or Indigenous communities during the active life of the Project. There will be no harvesting of country foods within the Operations Area for the active phases of the Project, and there are no community-based receptors within the Operations Area. Following Closure, during the passive Post-Closure Phase of the Project, full access to the Operations Area will resume as will the practice of traditional land and resource use. A total of 308 gridded air modelling receptors were placed at 100 m intervals across the operation area (Study Area No. 1). • **Study Area No. 2 Local Study Area**: The LSA corresponds with the LSA used in the revised EIS (April 2018) for evaluating the effects of the Project on wildlife and wildlife habitat, as well as evaluating the effects of the Project on terrestrial vegetation. The LSA excludes the Operations Area but includes areas within the Property Boundary where traditional land and resource use may be practiced. The LSA includes areas within the Property Boundary of the Project (i.e., the lands leased by Treasury Metals, or for which Treasury Metals holds surface and mineral rights), which would continue to be available for traditional uses by members of Indigenous communities. There are no community-based receptors within the Property Boundary. A total of 3,474 gridded air modelling receptors were placed at 100 m intervals across within the LSA (Study Area No. 2), including 1,445 receptors that fall inside the property boundary. • **Study Area No. 3 Village of Wabigoon**: The Village of Wabigoon is located approximately 4 km to the south of the Project and represents the closest populated community to the Project. A total of 46 gridded air modelling receptor were located within the Village of Wabigoon (Study Area No. 3). As part of the 2018 HHERA, the air modelling was redone using the same emissions and methods as presented in Section 6.6 of the revised EIS (April 2018), but focusing on above three study <u>Part D.</u> The follow-up program for to address human health issues related to additional sensitive receptors, the follow-up program for human health and air quality has been revised as part of the Round 2 process and are provided in the Goliath Gold Project Follow-up Program Addendum, which superseded Section 13 of the revised EIS (April 2018). **References:** Canadian Council of Ministers of the Environment. 1999. Canadian National Ambient Air Quality Objectives: Process and Status. Excerpt from Publication No. 1299; ISBN 1-896997-34-1. Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment. Winnipeg, MB. Canadian Council of Ministers of the Environment (CCME). 2000. Canada-Wide Standards for Particulate Matter (PM) and Ozone. Ottawa, Canada. CEAA (Canadian Environmental Assessment Agency). 2013. Guidelines for the

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				preparation of an Environmental Impact Statement for an environmental assessment conducted pursuant to the Canadian Environmental Assessment Act, 2012. Goliath Gold Project, Treasury Metals Inc. February 2013.
				Agency Comment on Draft Response None Received
				FINAL RESPONSE Agency accepted Revised Response as Final. The although the Agency did not issue an formal comment on TMI_880-AE(2)-04. Email correspondence dated December 17, 2018 provided a series of clarifications to the Agency. This correspondence has been included as TMI_880-AE(2)-04_Attachment 1.

TMI_881-AE(2)-05

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response	
TMI_881-AE(2)-05	AE(2)-05	1	CEA Agency	**Reference to EIS Guidelines:**	Part 2, Section 16
				Reference to EIS / Appendix	Section 13.6.3
				Cross-reference to Round 1 IRs	TMI_163-AE(1)-01, TMI_164-AE(1)-02
				Context and Rationale: • In Section 13.6.3 of the revised EIS, the proponent has committed to monitoring ambient air quality during construction, operation and until "heavy equipment operations cease in the closure phase". Further clarification is needed to understand the program that is being committed by the proponent. It is unclear whether the monitoring plan will be developed to meet provincial regulatory requirements, or whether it will form part of a follow-up program to validate predictions made in the EA in the air quality assessment. • It is noted that the proponent has not developed an ambient air quality follow-up monitoring program in consultation with relevant regulatory agencies that clearly outlines thresholds that trigger the need to consider additional mitigation. The plan should include the details about the monitoring parameters, methods, sampling locations, applicable standards, duration, and frequencies for information to be submitted for review prior to commencing work for the construction phase. Also, the program should encompass measures to address public concerns, where appropriate. • Section 13.6.3 of the revised EIS also indicates that "particulate matter will be collected passively over a 30-day period using dust fall jars. These collected samples will be submitted for analysis of total dustfall, as well as for the metals content within the collected particulates." It is not clear where the dust samples will be collected or what parameters will be included. • The response to IR# TMI_168 states that "greater [air quality] controls are possible but we would suggest that applying additional controls is not necessary for compliance since the CCME guidelines apply at the residences and the MOECC guidelines do not include roadway emissions. Additional controls will be contingent on monitoring results." As part of the follow- up plan that is proposed for air quality in Section 13.6, it is important for the Agency to understand the additional measures that would be taken if it is found, that predictions in the EA are not met even if they are under the thresholds for compliance.	
				Specific Question / Request for Information: A. Clarify whether the "continuous air monitoring station" will include real-time monitoring for PM10, PM2.5 and NO2, and describe how it will be used to ensure timely mitigation measures are implemented in case of exceedances.	

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response
				B. Discuss whether airborne metals, specifically the ones shown in Table 1 of the response to IR# TMI_163B (arsenic, chromium, manganese, lead), would be collected and analyzed as a portion of total suspended particulates (TSP) collected at the continuous air monitoring station, or provide a clear rationale for not doing so. C. Provide the locations of the dust fall jars mentioned in Section 13.6.3, and specify whether the metals shown in Table 1 of the response to IR# TMI_163B (arsenic, chromium, manganese, lead) would be analyzed within these samples. D. Provide details of additional mitigation measures that could be applied in case that the predictions in the EA are found to not be met. E. Include the information requested in Questions A to D in the overall Follow-Up Program and Environmental Monitoring Program to be prepared in response to IR# EA(2)-01.
				Draft Response: Part A. The proposed air monitoring programs for the Goliath Gold Project would include a combination of periodic samplers (e.g., high volume samplers for TSP, and one of PM10 or PM2.5), passive samplers (e.g., dustfall), and a continuous monitoring station (e.g., samplers for NO2 and one of the fine particles [PM10 or PM2.5]). It is not usual for the continuous samplers to be configured to provide real time results, especially for fine particles (e.g. PM10 or PM2.5) that are regulated on a 24-hour integrated basis. The continuous monitoring station would only be configured to provide real-time air sampling results if such results are essential for the implementation of the mitigation strategies. If real time air sampling results are to be provided, the continuous monitors would be configured to provide Treasury Metals a warning of any exceedance. In the case of the NO2 analyzer, warnings would be logged on the basis of the 1-hour readings, consistent with the new CAAQS to come into force in 2020 and 2025. In the case of fine particles (e.g. PM10 or PM2.5), warnings would be logged on a 24-hour basis. Treasury Metals would then review any of the logged warnings, the measurement information, and the meteorological records to determine whether the exceedance was due to activities on site (and the likely source of the emissions), or whether due to external influences (e.g., forest fires). As soon as practical, Treasury Metals would implement actions to reduce concentrations resulting from sources on-site, which may include increased road watering, reductions in vehicle speed, change in equipment, or reduction in plant operations as a form of operational control. Part B. The airborne metals will be collected and analyzed on TSP filter samples. There is no approved technology for completing these measurements in real-time so the samples will be collected on 24-hour sample filters that will be sampled on the 6-day NAPS schedule. Part C. The dustfall jars will be deployed along the property boundary, and may be placed at selected locations within the property boundary, but outside of the Operations Area. The siting of air quality monitoring station(s) is dependent on the physical site characteristics including: unobstructed airflow at least a horizontal distance 10 times the vertical height of any obstruction from the nearest obstruction, safe access for sample retrieval, relatively flat terrain, etc. The siting requirements for dust fall are specified in documents from the MOECP, USEPA and ASTM. The locations

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response
				cannot be chosen without a physical inspection of the site. Metals will not be analyzed in the dustfall samples since there are no criteria for metals in dustfall. Part D. Additional mitigation measures can be implemented if required to minimize concentrations. The recommended controls would be completely dependent on the nature of the impacts. Examples could include increased road watering or surfactant applications, limitations on maximum vehicle speed, administrative controls that restrict activities based on forecast meteorology. Part E. In response to TMI_869 EA(1) 01, Treasury Metals has prepared two addendums (Goliath Gold Project Follow-up Program Addendum and Goliath Gold Project Monitoring Addendum) that provide details on the monitoring programs planned to support the follow-up program, as well as the ongoing monitoring (separate from the follow-up program) planned for the Project. As with any regulatory monitoring program, the details of the air monitoring for the Goliath Gold Project (separate from monitoring to support the follow-up program) will be finalized through engagement with the appropriate regulatory agency as part of the permitting process.
				Agency Comment on Draft Response: C. The proponent stated in the response to HE(2)-12 that "there are no anticipated changes to environmental media (soil, water, sediment, country foods) as a result of the predicted dustfall rates associated with the Project. As such, no adverse effects as a result of the Project are anticipated". A follow-up program is required to validate this finding. Furthermore dustfall jars should be located in areas within the property boundary (but outside the operations area) where country foods harvesting activities are likely to occur (e.g., blueberry and mushroom collection south of the tree nursery, HHRA Section 3.6.2). **C. Update the follow-up program such that dustfall sample jars be located within the property boundary where country foods harvesting activities may occur.** **E. See comment for AE(2)-01.**
				Specific Response to Agency Comment: [C] The Follow-Up Program for both air quality and human health have been revised as part of the Round 2 process. The updated follow-up program is provided in the Goliath Gold Project Follow-up Program Addendum. This addendum superseded the follow-up program presented in Section 13 of the revised EIS (April 2018). Text has been added to the Goliath Gold Project Follow-up Program Addendum related to the siting of dustfall monitors "within the property boundary (but outside the operations area) where country foods harvesting activities are likely to occur".

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response
				[E] The air monitoring program described in the Goliath Gold Project Follow-up Program Addendum has been revised to include specifically identify $PM_{2.5}$ as the fine particulate to be monitored at the continuous monitoring station, which also includes monitoring of NO_2. Treasury Metals plan to commission a single continuous monitoring station at a suitable location. For obvious reasons, the air continuous monitoring station should be located in a secure but accessible location, with ready access to power, and in a location relatively close to the areas where the maximum concentrations were predicted. The maximum point of impingement (MPOI) is an air modeling term that represents location along, or beyond, the property boundary where the maximum predicted concentrations occur. For security reasons, it would be preferred to place the monitoring station within the property boundary. It should also be noted that the MPOI will likely be different for each of the compounds and averaging periods modelled. Therefore, it is unlikely that the MPOI for the 24-hour $PM_{2.5}$ would be exactly the same as for the other compounds. The final location for the monitoring station would be selected in consultation with Ontario Ministry of Environment, Conservation and Parks (MECP), Environment and Climate Change Canada, and the Agency.
				Revised Response: Part A. The proposed air monitoring programs for the Goliath Gold Project would include a combination of periodic samplers (e.g., high volume samplers for TSP, and one of PM_{10} or $PM_{2.5}$), passive samplers (e.g., dustfall), and a continuous monitoring station (e.g., samplers for NO_2 and fine particulate matter [$PM_{2.5}$]). It is not usual for the continuous samplers to be configured to provide real time results, especially for fine particles (e.g., PM_{10} or $PM_{2.5}$) that are regulated on a 24-hour integrated basis. The continuous monitoring station would only be configured to provide real-time air sampling results if such results are essential for the implementation of the mitigation strategies. If real time air sampling results are to be provided, the continuous monitors would be configured to provide Treasury Metals a warning of any exceedance. In the case of the NO_2 analyzer, warnings would be logged on the basis of the 1-hour readings, consistent with the new CAAQS to come into force in 2020 and 2025. In the case of fine particles ($PM_{2.5}$), warnings would be logged on a 24-hour basis. Treasury Metals would then review any of the logged warnings, the measurement information, and the meteorological records to determine whether the exceedance was due to activities on site (and the likely source of the emissions), or whether due to external influences (e.g., forest fires). As soon as practical, Treasury Metals would implement actions to reduce concentrations resulting from sources on-site, which may include increased road watering, reductions in vehicle speed, change in equipment, or reduction in plant operations as a form of operational control. Part B. The airborne metals will be collected and analyzed on TSP filter samples. There is no approved technology for completing these measurements in real-time so the samples will be collected on 24-hour sample filters that will be sampled on the 6-day NAPS schedule.

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response
				Part C. The dustfall jars will be deployed along the property boundary, and may be placed at selected locations within the property boundary, but outside of the Operations Area. At the request of the reviewers, language has been included in the Goliath Gold Project Follow-up Program Addendum related to the siting of dustfall monitors "within the property boundary (but outside the operations area) where country foods harvesting activities are likely to occur". The siting of air quality monitoring station(s) is dependent on the physical site characteristics including: unobstructed airflow at least a horizontal distance 10 times the vertical height of any obstruction from the nearest obstruction, safe access for sample retrieval, relatively flat terrain, etc. The siting requirements for dust fall are specified in documents from the MOECP, USEPA and ASTM. The locations cannot be chosen without a physical inspection of the site. Metals will not be analyzed in the dustfall samples since there are no criteria for metals in dustfall. Part D. Additional mitigation measures can be implemented if required to minimize concentrations. The recommended controls would be completely dependent on the nature of the impacts. Examples could include increased road watering or surfactant applications, limitations on maximum vehicle speed, administrative controls that restrict activities based on forecast meteorology. Part E. In response to TMI_869 EA(1) 01, Treasury Metals has prepared two addendums (Goliath Gold Project Follow-up Program Addendum and Goliath Gold Project Monitoring Addendum) that provide details on the monitoring programs planned to support the follow-up program, as well as the ongoing monitoring (separate from the follow-up program) planned for the Project. As with any regulatory monitoring program, the details of the air monitoring for the Goliath Gold Project (separate from monitoring to support the follow-up program) will be finalized through engagement with the appropriate regulatory agency as part of the permitting process. The air monitoring program described in the Goliath Gold Project Follow-up Program Addendum has been revised to include specifically identify $PM_{2.5}$ as the fine particulate to be monitored at the continuous monitoring station, which also includes monitoring of NO_2.
				Agency Comment on Draft Response None Received
				FINAL RESPONSE Agency accepted Revised Response as Final.

TMI_882-AE(2)-06

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response	
TMI_882-AE(2)-06	AE(2)-06	1	CEA Agency	**Reference to EIS Guidelines:**	Part 2, Section 10.1.2
				Reference to EIS / Appendix	Section 6.4
				Cross-reference to Round 1 IRs	TMI_184-AE(1)-22
				Context and Rationale: • The response to IR# TMI_184C indicates that "the effects of potential noise and vibration impacts on fisheries, specifically spawning shoals has been evaluated as part of Section 6.4 of the revised EIS." However, Section 6.4 of the revised EIS does not describe effects of blasting- related vibration on fish and fish habitat. The vibration sensitive points of reception, listed in Section 6.4.4.1, Table 6.4.4.1-4, do not include locations within fish- bearing waterbodies such as Blackwater Creek. There is no discussion in the IR response, in Section 6 of the revised EIS, or in Appendices H or Q, about Fisheries and Oceans Canada guidelines for blasting. http://www.dfo- mpo.gc.ca/Library/232046.pdf • Section 6.4.5 of the revised EIS indicates, as a mitigation measure, that "where potential effects of vibration to spawning shoals is identified, blasting practices will be adjusted to mitigate the effects." The Agency needs to understand where these potential effects could occur, how blasting practices could be adjusted, any other mitigation measures that could be applied to avoid or reduce effects to fish habitat (including timing considerations), and any follow-up that would be undertaken to ensure that fish and fish habitat are not affected by blasting.	

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response
				Specific Question / Request for Information: A. Identify fish-bearing waterbodies adjacent to the open pit or any other locations expected to have blasting activities. B. Include, in the noise and vibration assessment, sensitive points of reception in any waterbody within 500 metres of blasting activities where fish may be located and fish spawning would be expected to occur. C. Update the noise and vibration assessment to include the locations identified in Question A and B, and compare against Fisheries and Oceans Canada Guidelines for blasting (including peak particle velocity and overpressure). D. Clarify how blasting practices could be adjusted if peak particle velocity and overpressure levels identified in Question C are found to exceed Fisheries and Oceans Canada guidelines. E. Provide an assessment of effects on fish and fish habitat as a result of blasting during the Project. F. Describe mitigation measures that would be used to avoid effects on fish and fish habitat from blasting. G. Characterize residual effects on fish and fish habitat that would occur due to vibration from blasting activities. H. Update the follow-up program designed in response to IR# EA(2)-01 to include blasting noise and vibration for receptors related to fish habitat, including objectives and any monitoring measures that will be implemented to verify the predictions of effects and evaluate the effectiveness of the proposed mitigation measures. Identify any monitoring that would be required by Fisheries and Oceans Canada. If follow-up is not required, provide a rationale.
				Response: There was a typographical error in the response to IR# TMI_184C. It should have said "the effects of potential noise and vibration impacts on fisheries, specifically spawning shoals has been evaluated as part of Section 6.14 of the revised EIS." In Section 6.14 it is stated, for both the Site Preparation and Construction Phase and the Operations Phase, under the heading "Blasting", "Fish habitat within the Operations Area will be isolated and fish will be relocated at the outset of the Project. Therefore, it is not expected that there will be fish in proximity to blasting. Should this not be the case, DFO guidelines for the use of explosives in or near Canadian fisheries waters (Wright and Hopky 1998) will be adhered to in order to ensure that no harm to fish occurs." As also indicated in Section 6.14.1, no blasting is anticipated during the Closure Phase and no blasting will occur during the Post-Closure Phase. PART A: No blasting activities are expected except at the open pit and associated underground mine. Under baseline conditions, the only fish-bearing waterbody in proximity to the open pit is Blackwater Creek Tributary 1 (please refer to TMI_882-AE(2)-06_Figure_1). As part of the site preparation and construction activities, a perimeter berm and ditch will be constructed to isolate the areas where activities are occurring from the surrounding environment. The fish

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				found in the isolated portion of Blackwater Creek Tributary 1 will be relocated, to the extent practicable (some fish mortality is expected as described in Section 6.14 of the revised EIS [April 2018]). Following the fish relocation, and prior to blasting occurring, the isolated portion of Blackwater Creek Tributary 1 will be drained and it will no longer be fish habitat. The elimination of the upper reaches of Blackwater Creek Tributary 1 will reduce flow in Blackwater Creek Tributary 1 downstream from the Operations Area. The portions of Blackwater Creek Tributary 1 that are immediately downstream from the Operations Area are unlikely to contain water, and thus unlikely to contain fish, during the remainder of the Site Preparation and Construction, Operations, and Closure Phases. Blasting is only expected to occur during the Site Preparation and Construction Phase, and during the Operations Phase. PART B: The only known fish habitat within 500 m of the perimeter of the open pit, where blasting will occur, is Blackwater Creek Tributary 1 (please refer to TMI_882-AE(2)-06_Figure_1). Resident small-bodied fish that are present under baseline conditions are not aggregate spawners; they will spawn throughout the creek, including in beaver ponds. Therefore, no specific locations are considered to be more sensitive. As indicated in Part A, the portion of Blackwater Creek Tributary 1 that is within the Operations Area will be isolated and, following fish relocation, drained so that it will not contain fish during either the Site Preparation and Construction Phase, or the Operations Phase of the Project, which are the phases during which blasting will occur. Further, with the removal of the upstream drainage area, the portion of Blackwater Creek Tributary 1 that is immediately downstream from the Operations Area is expected to be dry and, therefore, it is not expected to contain fish. PART C. Based on a review of the proposed blasting practices, the baseline fisheries information, and the areas where fish habitat will remain after the construction of the perimeter berm and ditch, noise and vibration predictions were made at three (3) potential areas where blasting could affect fish and fish habitat. These locations, which are illustrated on TMI_882-AE(2)-06_Figure 2, include the following: • On the shoreline for Thunder Lake, at the location closest to the open pit; • On Blackwater Creek, main stem, at the location closest to the open pit; and • On Blackwater Creek Tributary 1, immediately downstream from the perimeter berm surrounding the Operations Area. It should be noted that the responses to Part A and Part B confirm that while the third location is outside of the Operations Area, there is expected to be virtually no flow in the portion of Blackwater Creek Tributary 1 as over 90% of the catchment for the watercourse will be contained within the perimeter berm and ditch that is to be constructed around the perimeter of the Operations Area. Therefore, this location will have no water, and thus will not support fish during Site Preparation and Construction, and Operations Phases of the Project (the phases when blasting will occur). The results of the blasting analysis at the above locations (including the location on Blackwater Creek Tributary 1 that will not have any water) has been presented in nTMI_882-AE(2)-06_Table 1. The results show that the estimated

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				blasting pressure in water, assuming a 100 kg charge weight, are below the 100 kPa limit for water overpressure set out in (Wright and Hopky 1998). In addition, the peak particle velocities, assuming a 100 kg charge weight, are below the 13 mm/s limit suggested in Wright and Hopky (1998) at the closest points in Thunder Lake and Blackwater Creek to the open pit in. The only location predicted to exceed the 13 mm/s limit is within Blackwater Creek Tributary 1, immediately downstream of the berm surrounding the Operations Area. Once the perimeter berm is constructed around the Operations Area, this watercourse is not expected to have sufficient flow to support fish as more than 90% of the catchment areas for this portion of Blackwater Creek Tributary 1 will be contained within the perimeter berm and ditch. Therefore, there would be no fish, and no spawning areas to be affected during the Site Preparation and Construction, and Operations Phases (the phases of the Project when blasting will occur). PART D: Mitigation measures presented in the EIS to reduce the potential impacts of blasting on fish, including: • Mit_029 - "Implement a modern blasting program that minimizes the blast area, the overall amount of explosives required, and through detonating procedures, minimize the amount of explosives per delay." • Mit_030 – "Adjust blasting practices if effects of vibration to spawning shoals is identified." In the event that vibration is identified to cause effects to fish and fish habitat, the quantity of explosives used during one detonation will be altered along with the timing of blasting. These changes to blasting practices will be completed by a qualified person and will continue to be altered until blasting effects no longer effect fish or fish habitat. PART E: As described in the response to Part C, the predicted overpressure in water as a result blasting from the Project is less than the 100 kPa limit set out in (Wright and Hopky 1998). Additionally, the peak particle velocities at the nearest point in Blackwater Creek and Thunder Lake to the open pit are less than the 13 mm/s limit set out in (Wright and Hopky 1998). The only location predicted to exceed the 13 mm/s limit is within Blackwater Creek Tributary 1, immediately downstream of the berm surrounding the Operations Area. Once the perimeter berm and ditch is constructed around the Operations Area, this watercourse is not expected to have sufficient flow to support fish as more than 90% of the catchment areas for this portion of Blackwater Creek Tributary 1 will be contained within the perimeter berm and ditch. Therefore, there would be no fish, and no fish spawning areas to be affected during the Site Preparation and Construction, and Operations phases (the phases of the Project when blasting will occur). This conclusion is consistent with the analysis of blasting effects on fish and fish habitat presented in Section 6.14 of the revised EIS (April 2018). PART F: Based on the responses provided in Parts C and E of this response the Mitigation Measures described in the revised EIS (April 2018) and provided in Part D of this response, remain the mitigation measures that would be used to avoid effects on fish and fish habitat from blasting.

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				PART H: A number of Round 2 information requests have requested for revisions and updates be made to the Follow-Up Program submitted as Section 13 of the revised EIS (April 2018). The Goliath Gold Follow-Up Addendum has been provided in support of the overall response package to the Round 2 information requests, and provides a comprehensive and consolidated answer to all Round 2 information requests related to the Follow-Up Programs including those related to verifying the predictions with respect to blasting and vibration on fish and fish habitat. References: Wright, D.G., and G.E. Hopky. 1998. Guidelines for the use of explosives in or near Canadian fisheries waters. Can. Tech. Rep. Fish. Aquat. Sci. 2107: iv + 34p.
				Agency Comment on Draft Response None Received
				Revised Response Not required. Agency accepted Draft Response.

TMI_883-AE(2)-07

<table>
<tr><th>Unique Identifier</th><th>Agency IR #</th><th>Annex</th><th>Agency / Group / Stakeholder</th><th colspan="2">Cross Reference / Comment / Information Request / Response</th></tr>
<tr><td rowspan="5">TMI_883-AE(2)-07</td><td rowspan="5">AE(2)-07</td><td rowspan="5">1</td><td rowspan="5">CEA Agency</td><td>Reference to EIS Guidelines:</td><td>Part 2, Sections 11.1.2, 11.4</td></tr>
<tr><td>Reference to EIS / Appendix</td><td>Section 13.4; Appendix H-2, Section 3.2</td></tr>
<tr><td>Cross-reference to Round 1 IRs</td><td>TMI_185-AE(1)-23, TMI_193-AE(1)-31</td></tr>
<tr><td colspan="2"><u>Context and Rationale:</u>

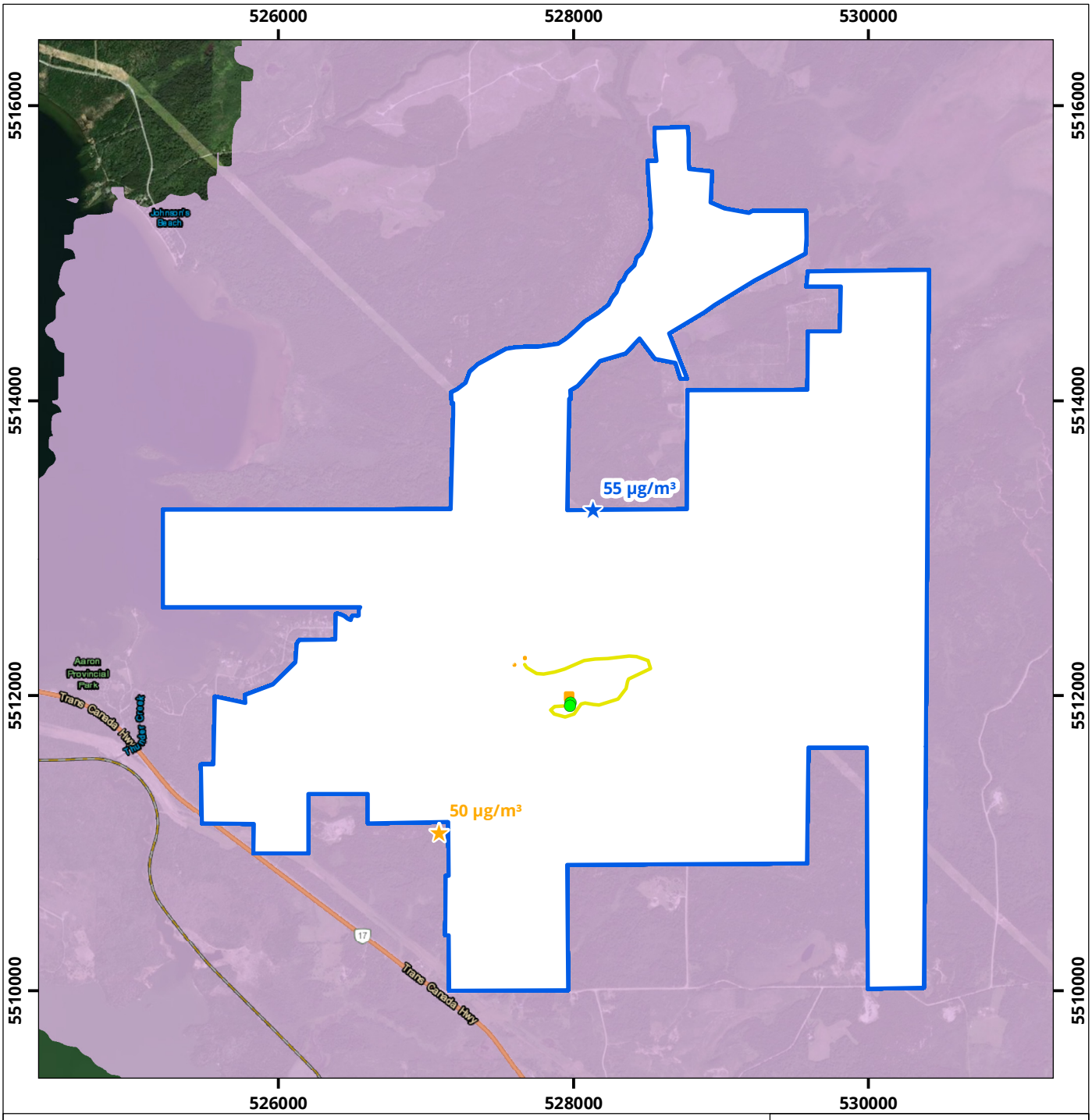
• The response to IR# TMI_185B indicates that, in order to reduce noise levels on the event that they are unacceptable to nearby sensitive receptors, "mitigation measures will be developed as necessary based on field data collected as part of the complaint response process". The response to TMI_185C further states that a process for complaint resolution will be developed as part of a noise management plan “as part of the environmental compliance approval process". The Agency requires an understanding of likely mitigation measures that would be applied.
• It is noted in Section 13.4.3.1 of the revised EIS that ambient noise monitoring is expected to be conducted in accordance with Provincial approvals, but otherwise every three years during operations. As it appears, from Figure 6.4.6-1 that noise effects will occur in areas where access will not be restricted during the operations phase, a more stringent follow-up program is recommended to ensure that predictions of noise levels are met, along with proposed mitigation measures in case the noise levels are higher than predicted. This information is needed to ensure that effects on human health and effects to current use due to wildlife being affected by noise will remain as predicted in the EA.</td></tr>
<tr><td colspan="2"><u>Specific Question / Request for Information:</u>

I. At the nearest receptor around the project footprint, discuss potential mitigation measures to reduce annoyance or increase the quality of experience, and what metrics would be used to determine the application of these measures.
J. Describe how Indigenous groups would be involved in the development of the noise management plan, and discuss how complaints from Indigenous people related to noise would be managed.</td></tr>
<tr><td colspan="2"><u>Response:</u>

<u>Part A.</u> The noise and vibration assessment is based on conservative assumptions that allow for sound levels that will meet the applicable guideline levels in spite of natural operational variations; hence a specific need for monitoring or mitigation measures is not anticipated. The reference in the EIS to monitoring is a voluntary commitment by the</td></tr>
</table>

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response
				proponent to improve trust in the results of the assessment and to address issues that may arise in the future that were not known at this time. Hence, sound or vibration monitoring could be conducted if: • Required by the Provincial permitting process. • Required by the site operator; currently this is anticipated as outlined in Section 13.4.3.1 of the revised EIS. • In the event that a complaint is recorded and subsequently confirmed per the noise management plan. In this case, monitoring would be used to validate the extent of any excess of the applicable guidelines and would inform the required approach for mitigation. Compliance with the applicable guideline limits will be based on the same metrics evaluated in the EA as described in Section 13.4.3.1, unless specifically prescribed by a regulator (e.g., the Province). If any of the above scenarios result in levels above the applicable guideline levels at a sensitive receptor, action would be taken to mitigate the excess. The specifics of the mitigation plan would be subject to many factors such as the particular source, the position relative to the sensitive receptor, and the types of practical measures possible. As a result, at this stage in the assessment, hypothetical mitigation techniques are too numerous to specifically identify. However, they could include (in order of preference): • At source mitigation such as mufflers, silencers, baffles, barriers, or alterations in operations processes (eg, reduced blast size, changes in operating time). • Intermediate mitigation such as property line barriers (eg, berms or walls). • At receptor mitigation such as barriers, upgraded façade or window construction. Part B. A noise management plan would include items such as the complaint process, communications process, and types of potential actions. In preparing the noise management plan, Treasury Metals will engage with affected stakeholders, including members of Indigenous communities. A key aspect of the plan would be tracking and responding to noise complaints. All complaints received under a noise management plan would need to be confirmed prior to specific action being taken. Based on the assessment results, predicted levels are below the applicable thresholds and and any anticipated complaints will be dealt with through the appropriate channels using scientifically based support. Indigenous people are expected to have the same access to the noise management plan as any other person. In any instance of expressed noise concern by a member of the indigenous community or public, fully understanding the concern and communicating the actions, investigations, and results of those will be key. Hence, communication is a critical part of all complaint investigation and noise management. All complaints would be assessed relative to the applicable guideline levels identified in the assessment or as required by Provincial regulation.
				Agency Comment on Draft Response None Received

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response
				Revised Response Not required. Agency accepted Draft Response.



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

36 - 64

64 - 92

92 - 120

> 120

= 120 µg/m³ (AAQC)

0 500 1,000 1,500 m

TSP 24hr Contour Plot (Site Preparation and Construction)

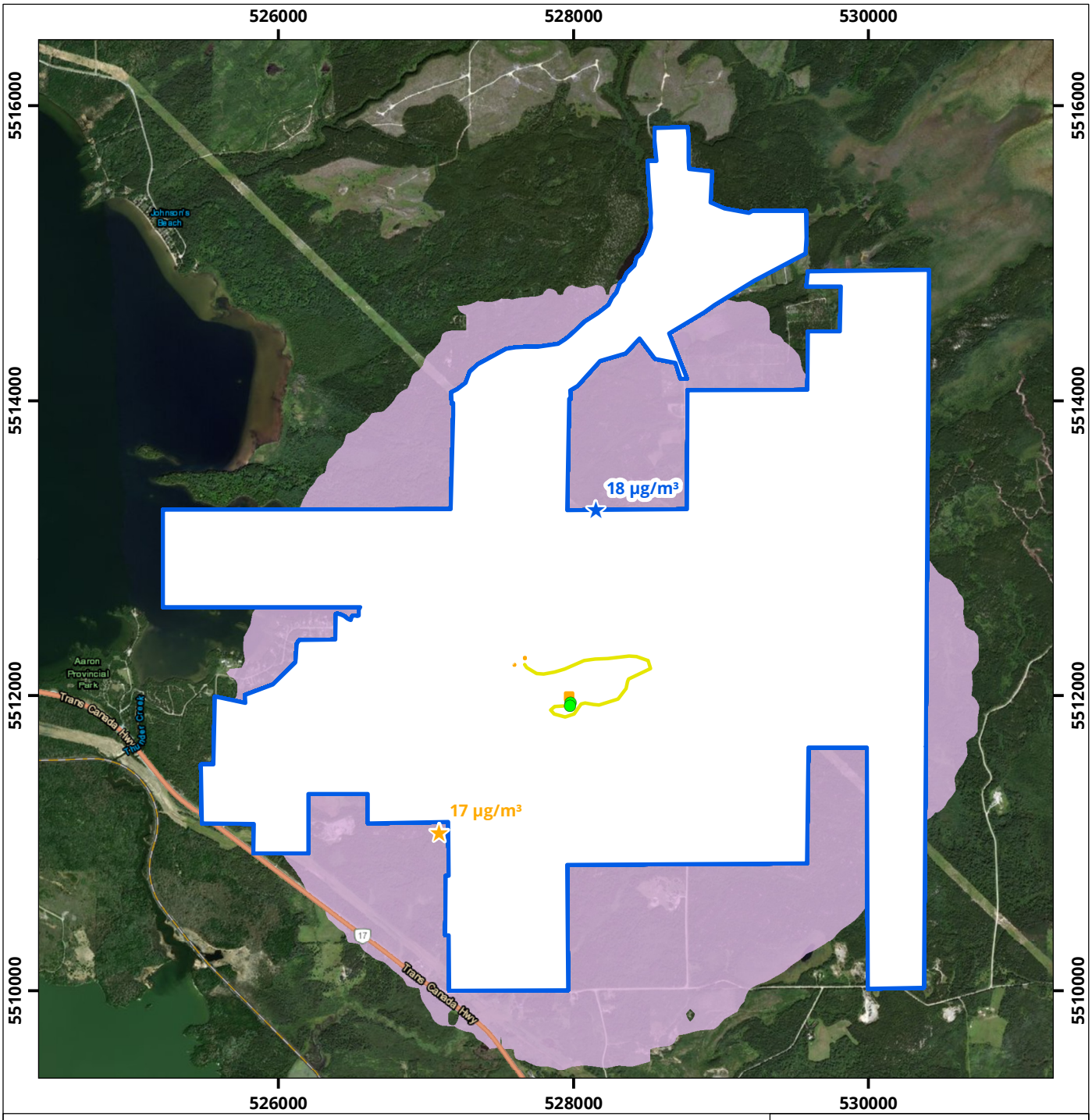
Map Projection: NAD 1983 UTM Zone 15N

Goliath Gold Mine - Wabigoon, Ontario

True North

Project #: 1602163

Drawn by: DJH	Figure: 6a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

15 - 30

30 - 45

45 - 60

> 60

= 60 µg/m³ (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

TSP Annual Contour Plot (Site Preparation and Construction)

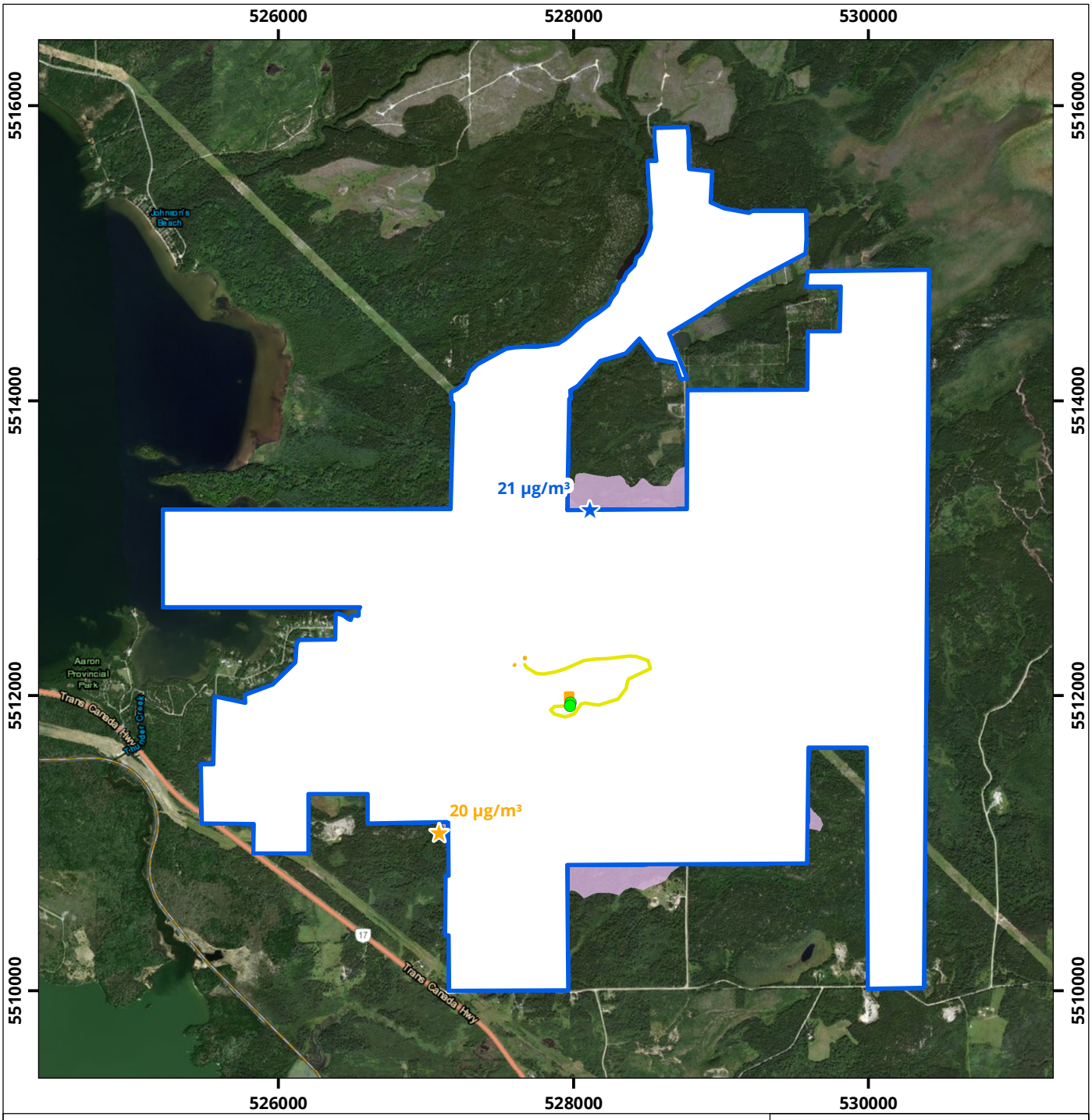
Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

True North

Project #: 1602163

Drawn by: DJH	Figure: 7a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

20 - 30

30 - 40

40 - 50

> 50

= 50 µg/m³ (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

PM_{10} 24hr Contour Plot (Site Preparation and Construction)

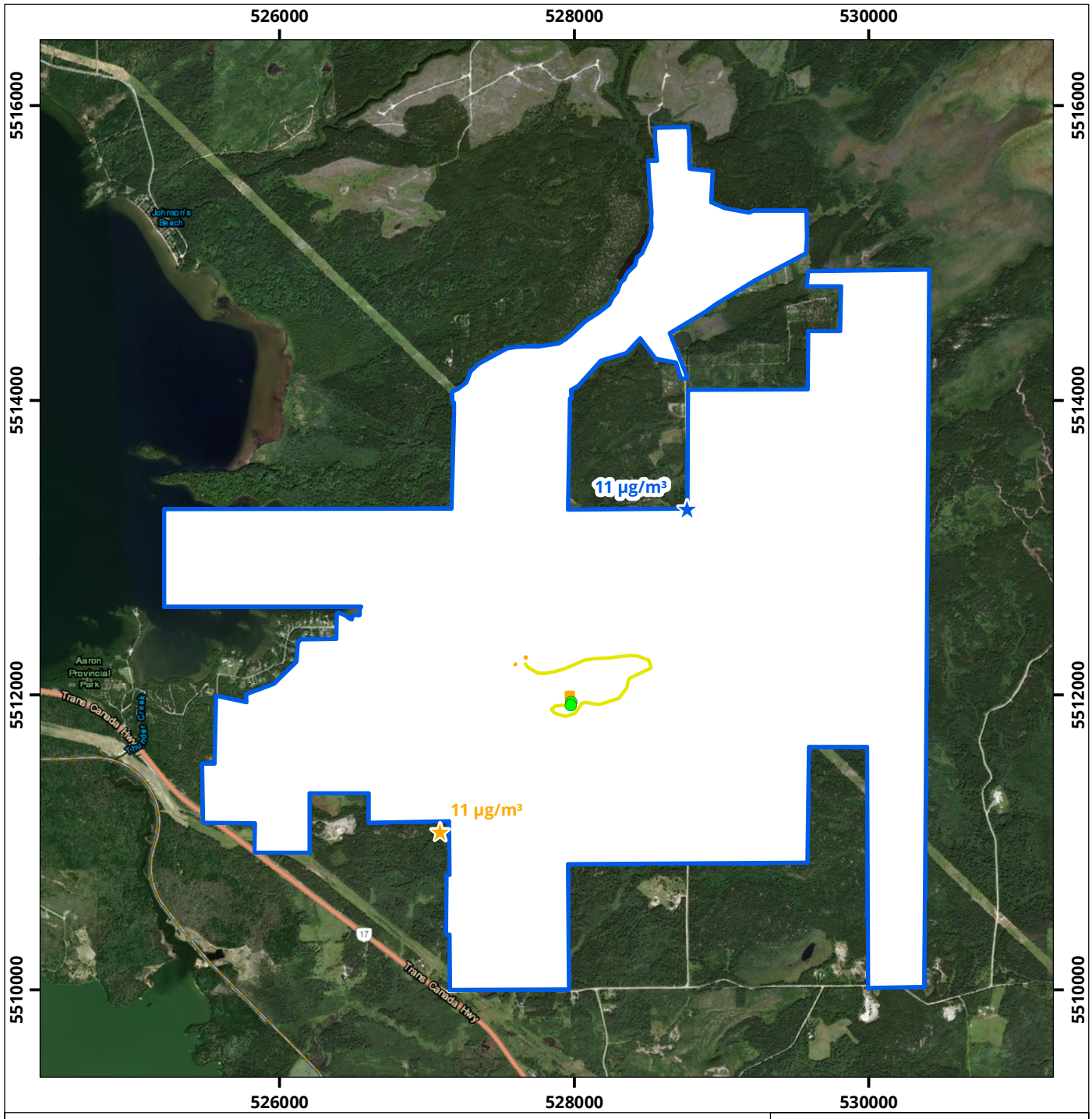
Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

True North

Project #: 1602163

Drawn by: DJH	Figure: 8a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602 163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

12 - 17

17 - 22

22 - 27

> 27

= 27 µg/m³ (CAAQS)

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0 500 1,000 1,500 m

$PM_{2.5}$ 24hr Contour Plot (Site Preparation and Construction)

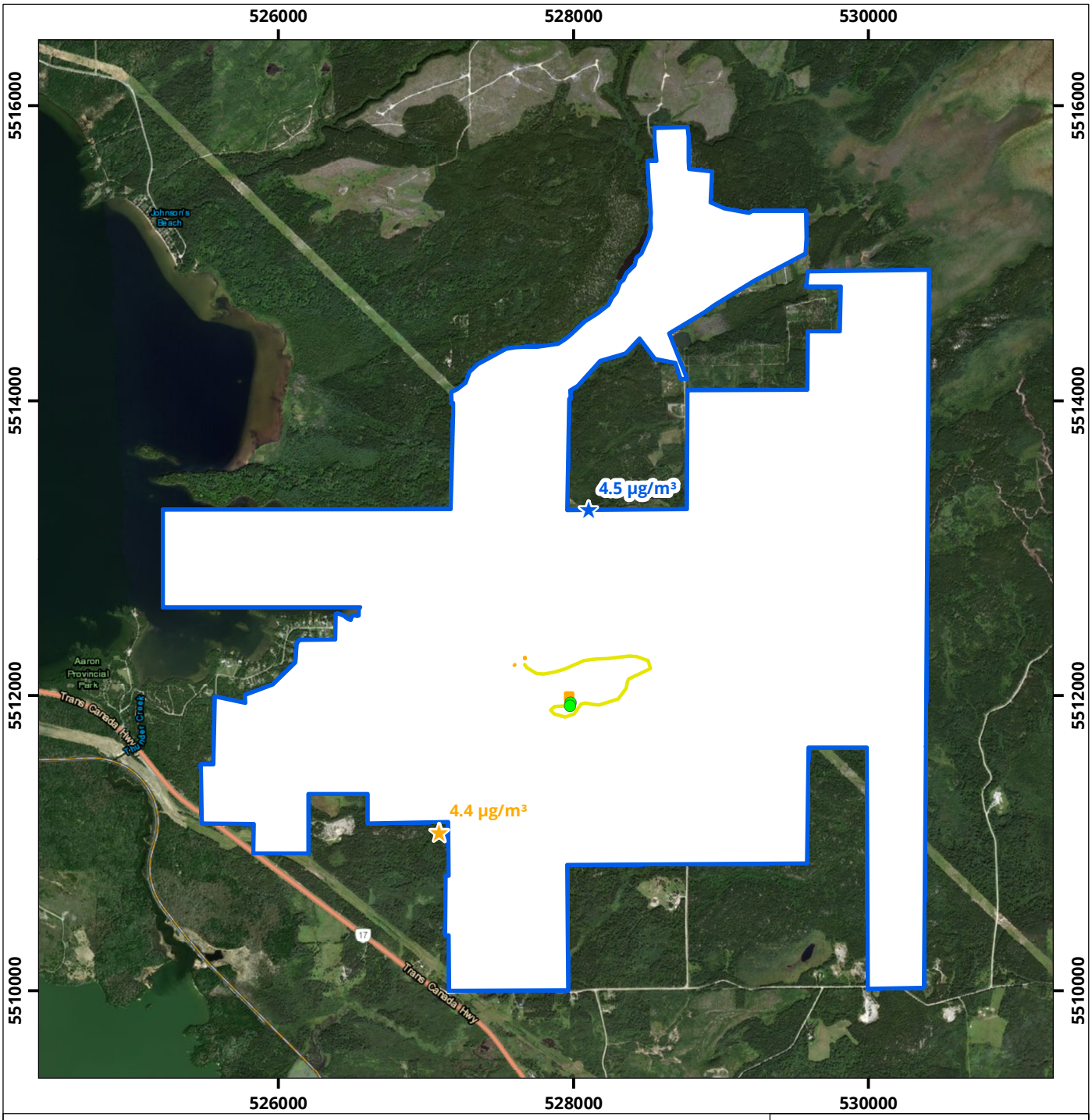
Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

True North

Project #: 1602163

Drawn by: DJH	Figure: 9a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

- 4.5 - 6
- 6 - 7.4
- 7.4 - 8.8
- > 8.8

= 8.8 µg/m³ (CAAQS)

0 500 1,000 1,500 m

$PM_{2.5}$ Annual Contour Plot (Site Preparation and Construction)

True North

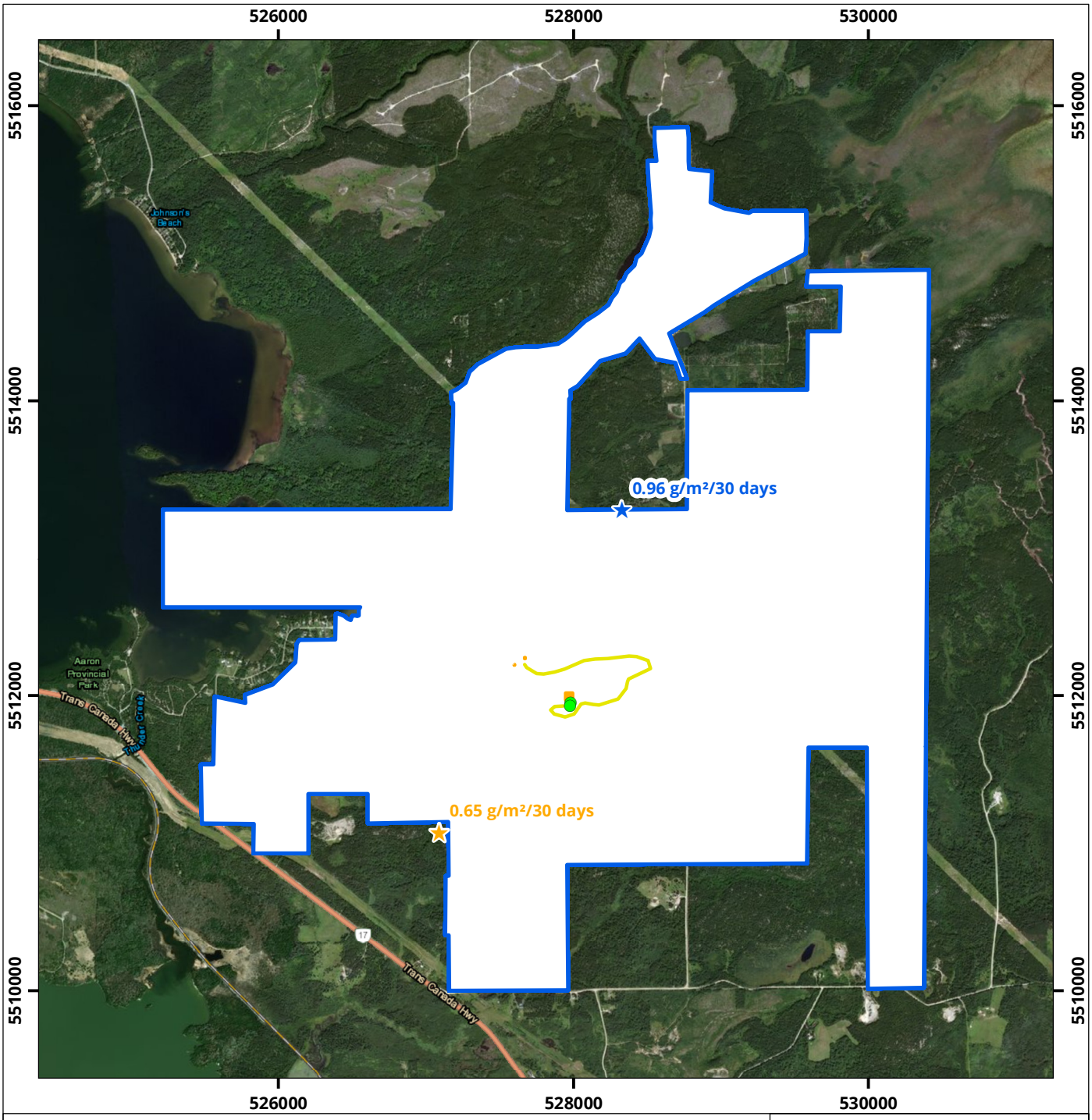
Map Projection: NAD 1983 UTM Zone 15N

Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 10a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Dustfall (g/m²/30 days)

1.8 - 3.5

3.5 - 5.3

5.3 - 7

> 7

= 7 g/m²/30 days (AAQC)

Service Layer Credits:
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Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

Dustfall 30 day Contour Plot (Site Preparation and Construction)

True North

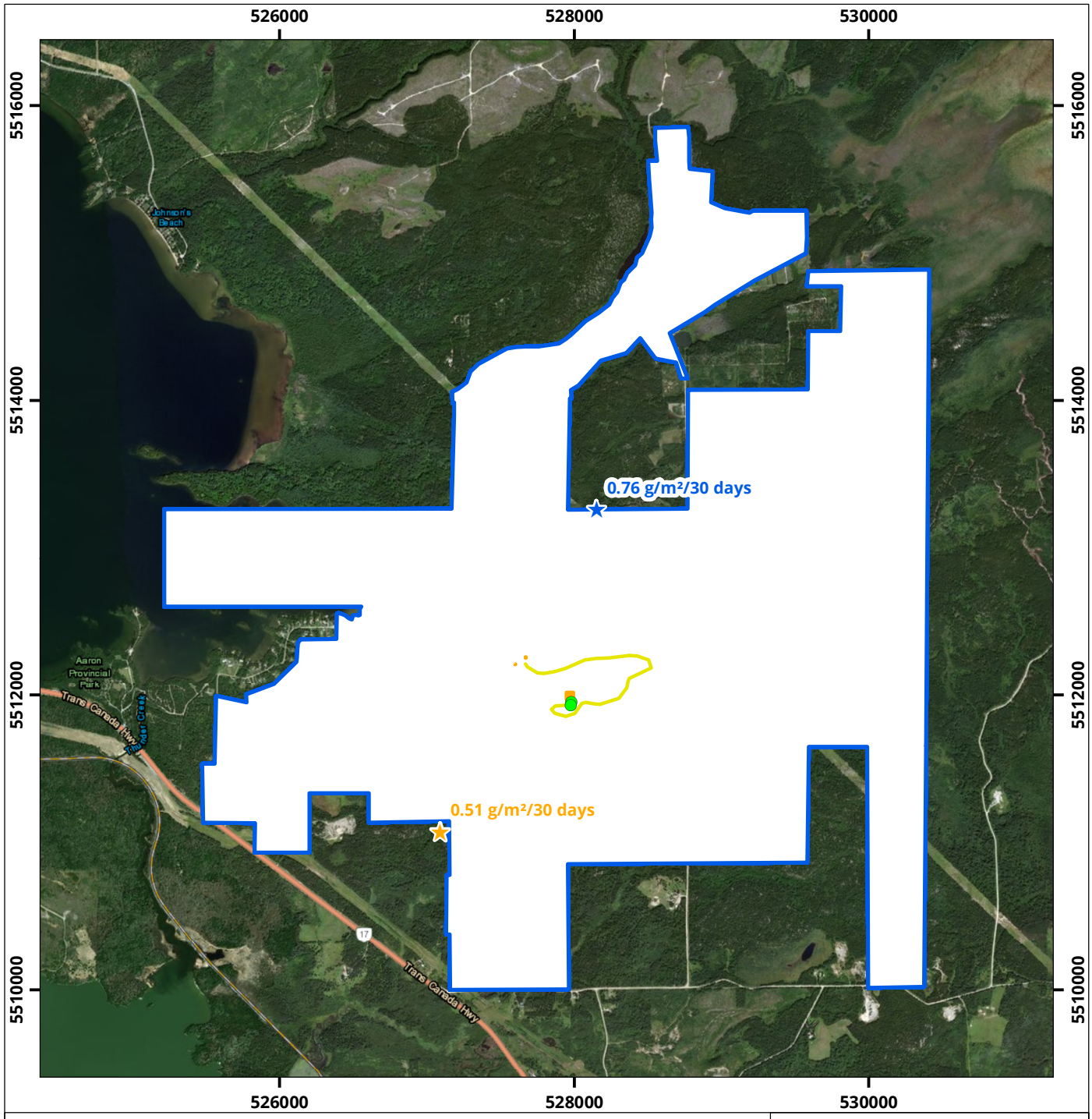
Map Projection: NAD 1983 UTM Zone 15N

Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 11a
Approx. Scale:	1:40,000
Date Revised:	Nov 30, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Dustfall (g/m²/30 days)

1.2 - 2.3

2.3 - 3.5

3.5 - 4.6

> 4.6

= 4.6 g/m²/30 days (AAQC)

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0 500 1,000 1,500 m

Dustfall Annual Contour Plot (Site Preparation and Construction)

True North

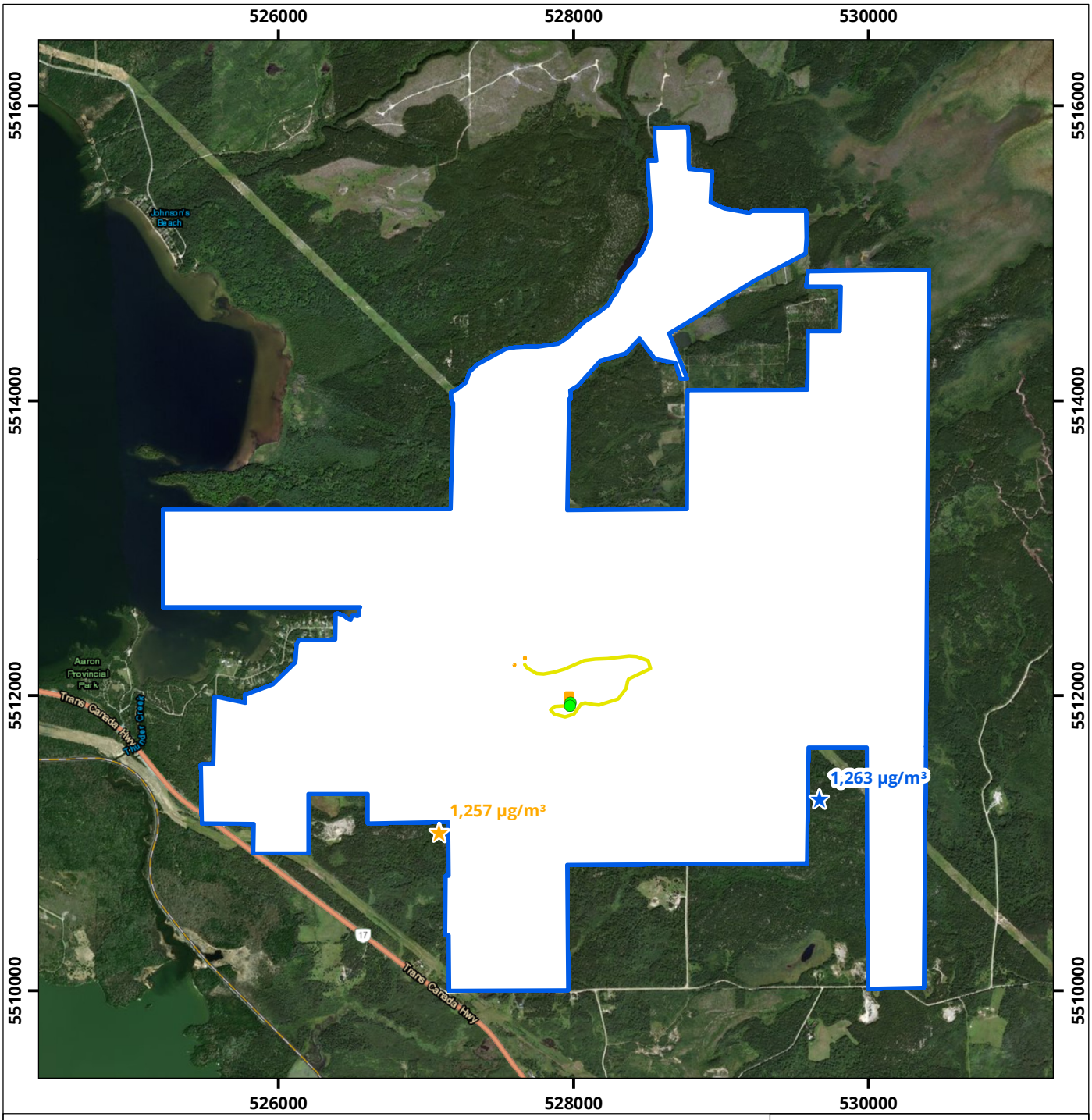
Map Projection: NAD 1983 UTM Zone 15N

Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 12a
Approx. Scale:	1:40,000
Date Revised:	Nov 30, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

- 9,050 - 18,100
- 18,100 - 27,150
- 27,150 - 36,200
- > 36,200

= 36,200 µg/m³ (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

CO 1hr Contour Plot (Site Preparation and Construction)

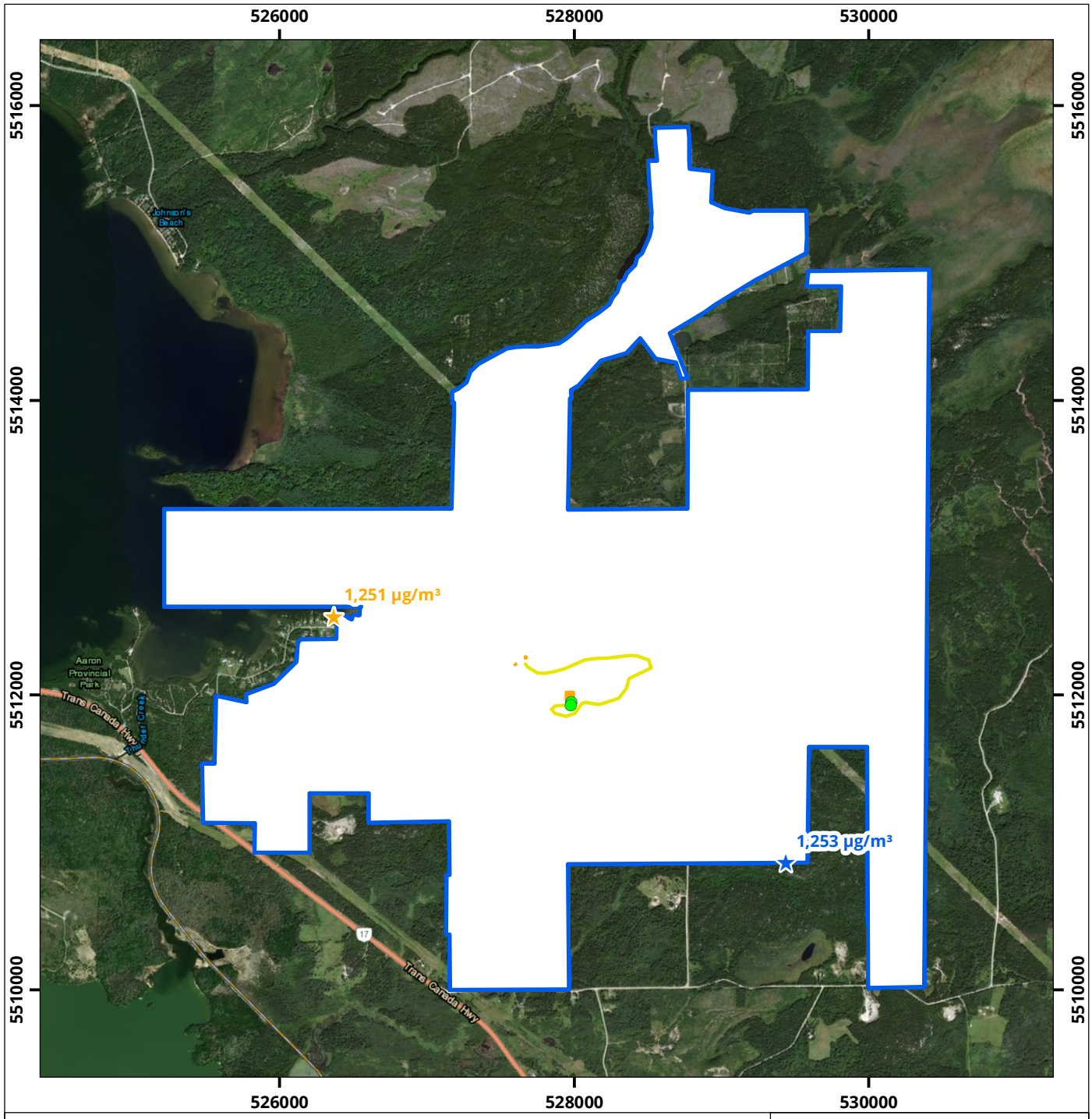
Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

True North

Project #: 1602163

Drawn by: DJH	Figure: 13a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

- 3,925 - 7,850
- 7,850 - 11,775
- 11,775 - 15,700
- > 15,700

= 15,700 µg/m³ (AAQC)

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

CO 8hr Contour Plot (Site Preparation and Construction)

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

True North

Project #: 1602163

Drawn by: DJH	Figure: 14a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

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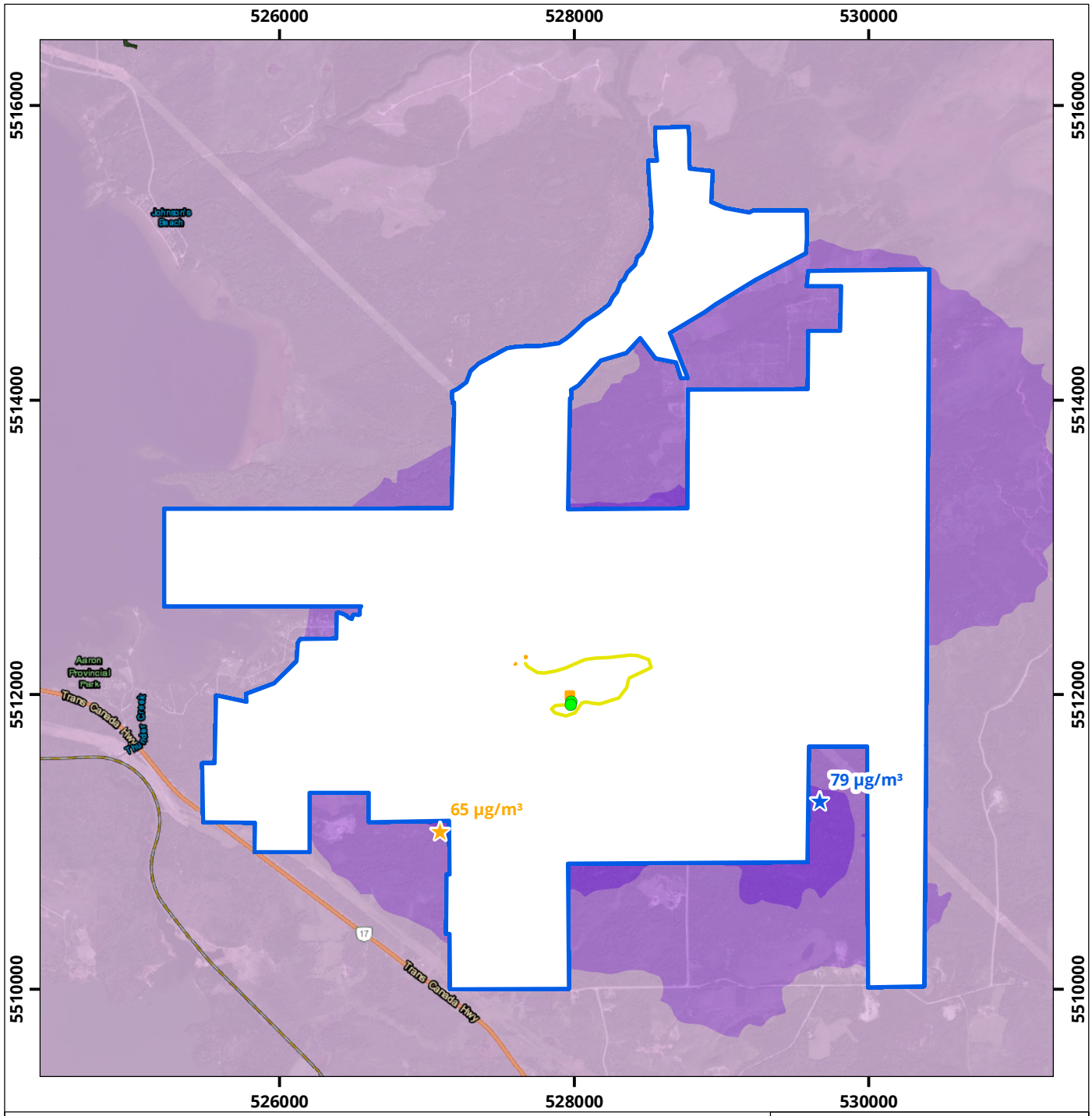

Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

35 - 50

50 - 65

65 - 80

> 80

= 80 µg/m³ (CAAQS)

Service Layer Credits:
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0 500 1,000 1,500 m

NO_2 1hr Contour Plot (Site Preparation and Construction)

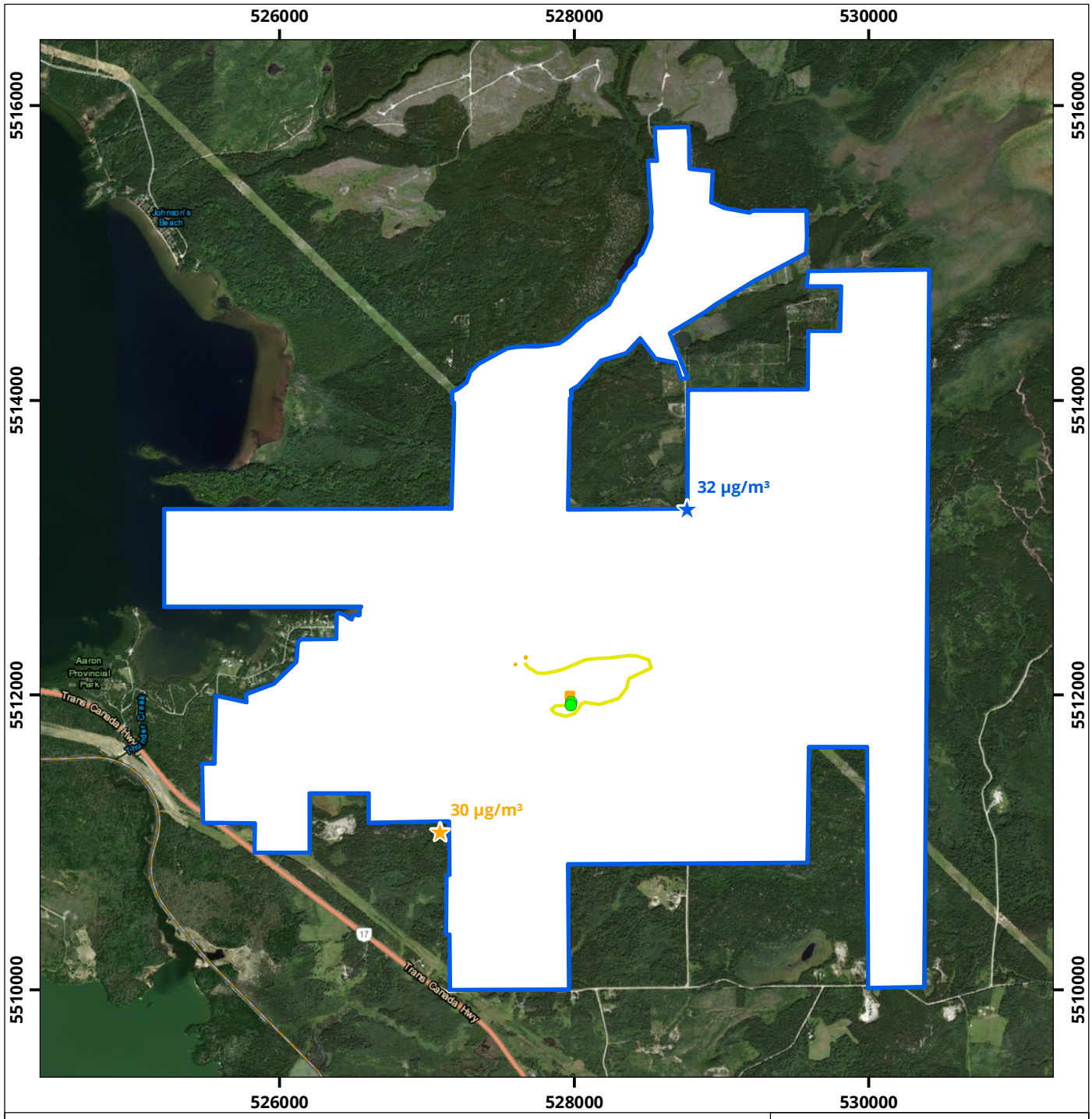
Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

True North

Project #: 1602163

Drawn by: DJH	Figure: 15a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

50 - 100

100 - 150

150 - 200

> 200

= 200 µg/m³ (AAQC)

0 500 1,000 1,500 m

NO_2 24hr Contour Plot (Site Preparation and Construction)

True North

Map Projection: NAD 1983 UTM Zone 15N

Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 16a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

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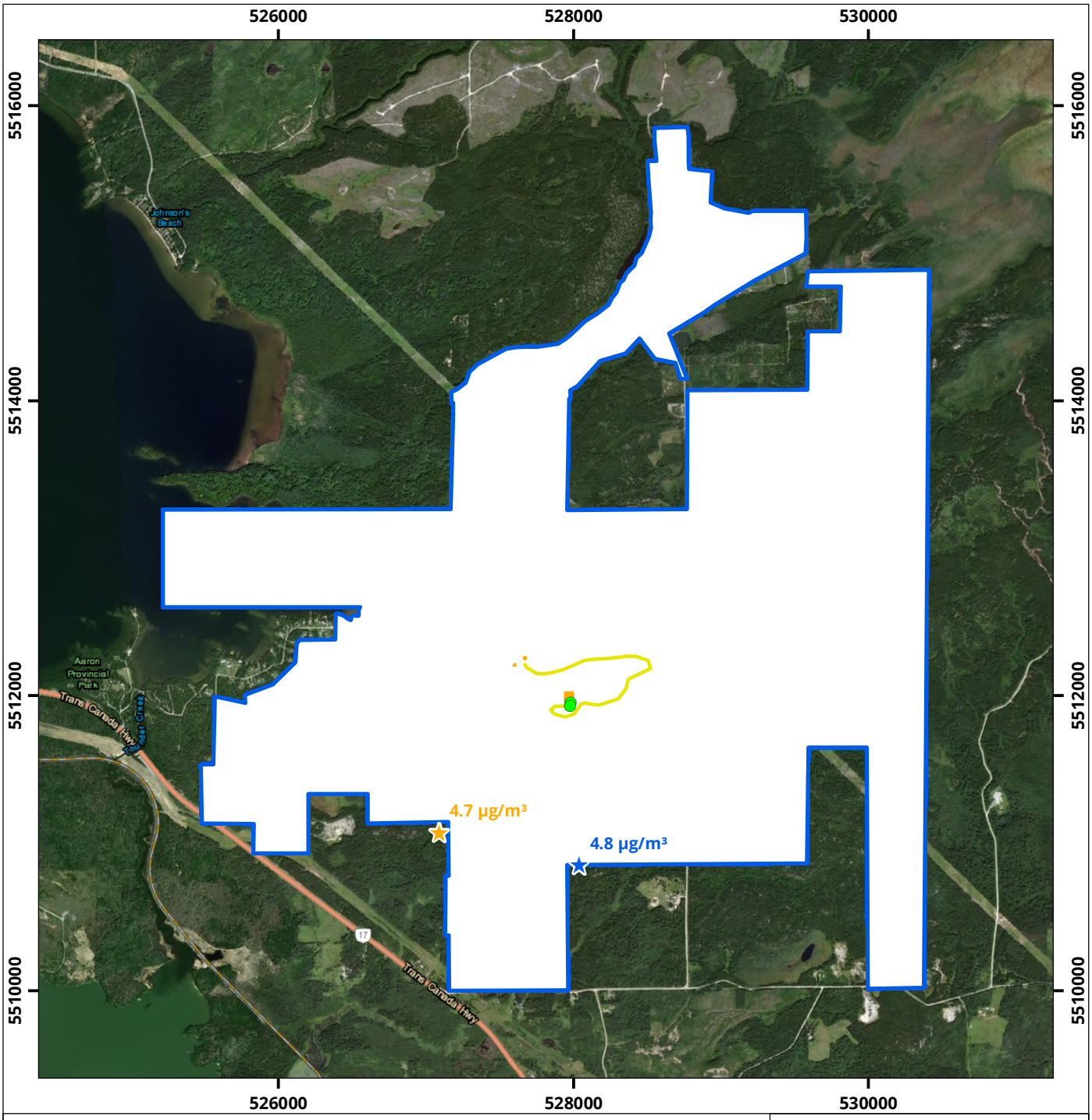

Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

43 - 85

85 - 128

128 - 170

> 170

= 170 µg/m³ (CAAQS)

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0 500 1,000 1,500 m

SO_2 1hr Contour Plot (Site Preparation and Construction)

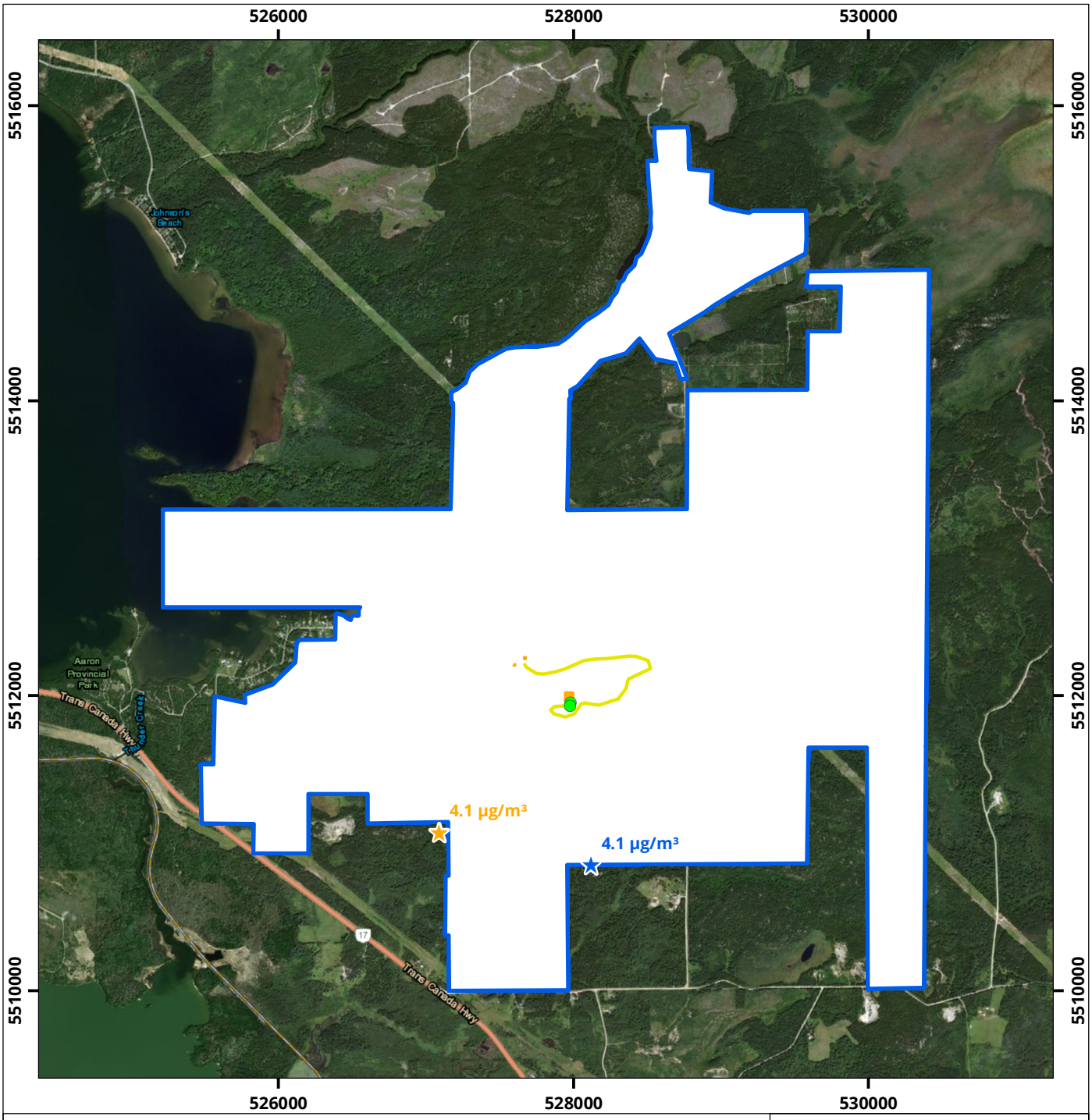
Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

True North

Project #: 1602163

Drawn by: DJH	Figure: 17a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

69 - 138

138 - 206

206 - 275

> 275

= 275 µg/m³ (AAQC)

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0 500 1,000 1,500 m

SO_2 24hr Contour Plot (Site Preparation and Construction)

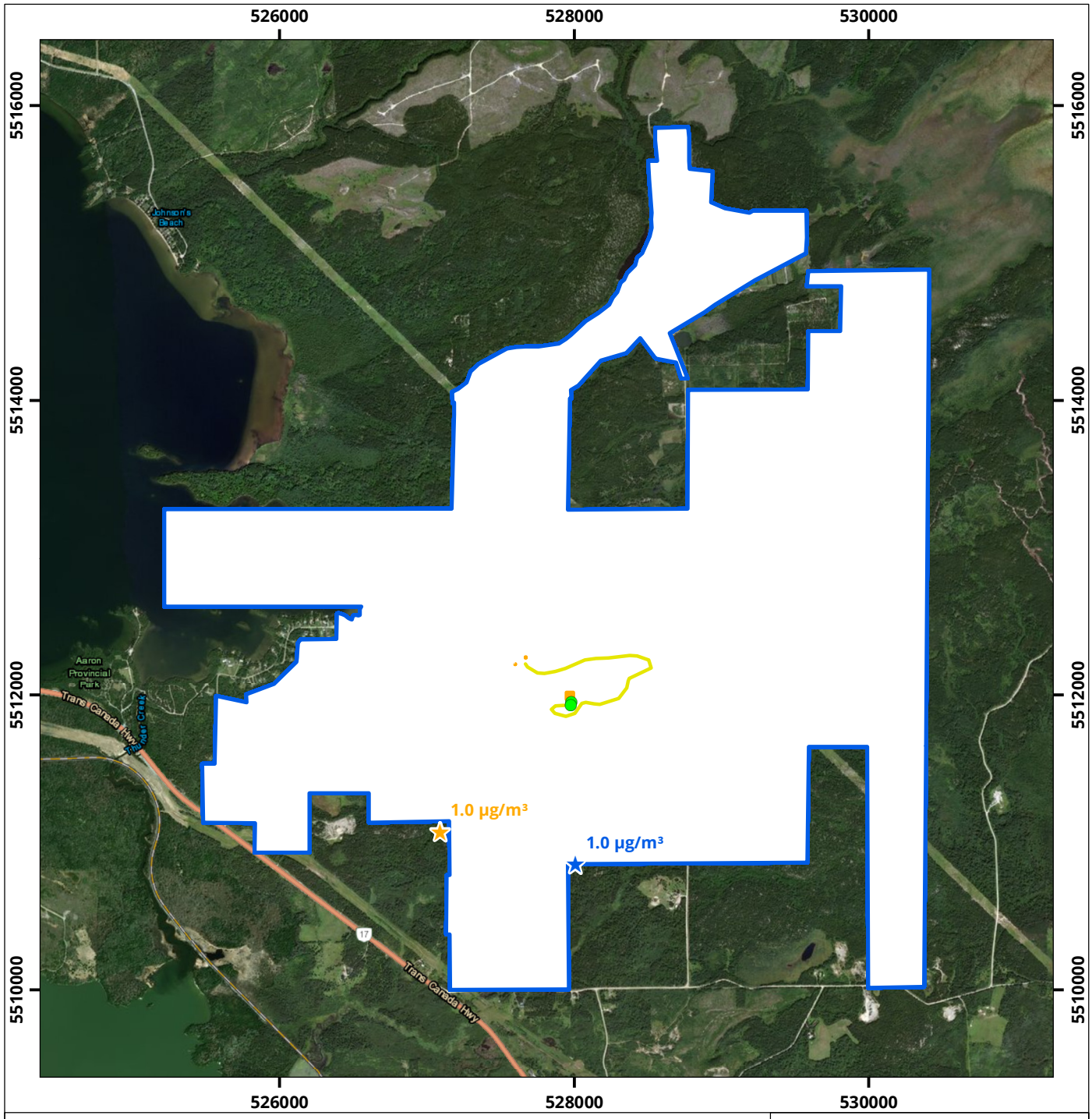
Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

True North

Project #: 1602163

Drawn by: DJH	Figure: 18a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

2 - 4

4 - 6

6 - 8

> 8

= 8 µg/m³ (CAAQS)

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

SO_2 Annual Contour Plot (Site Preparation and Construction)

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

True North

Project #: 1602163

Drawn by: DJH	Figure: 19a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

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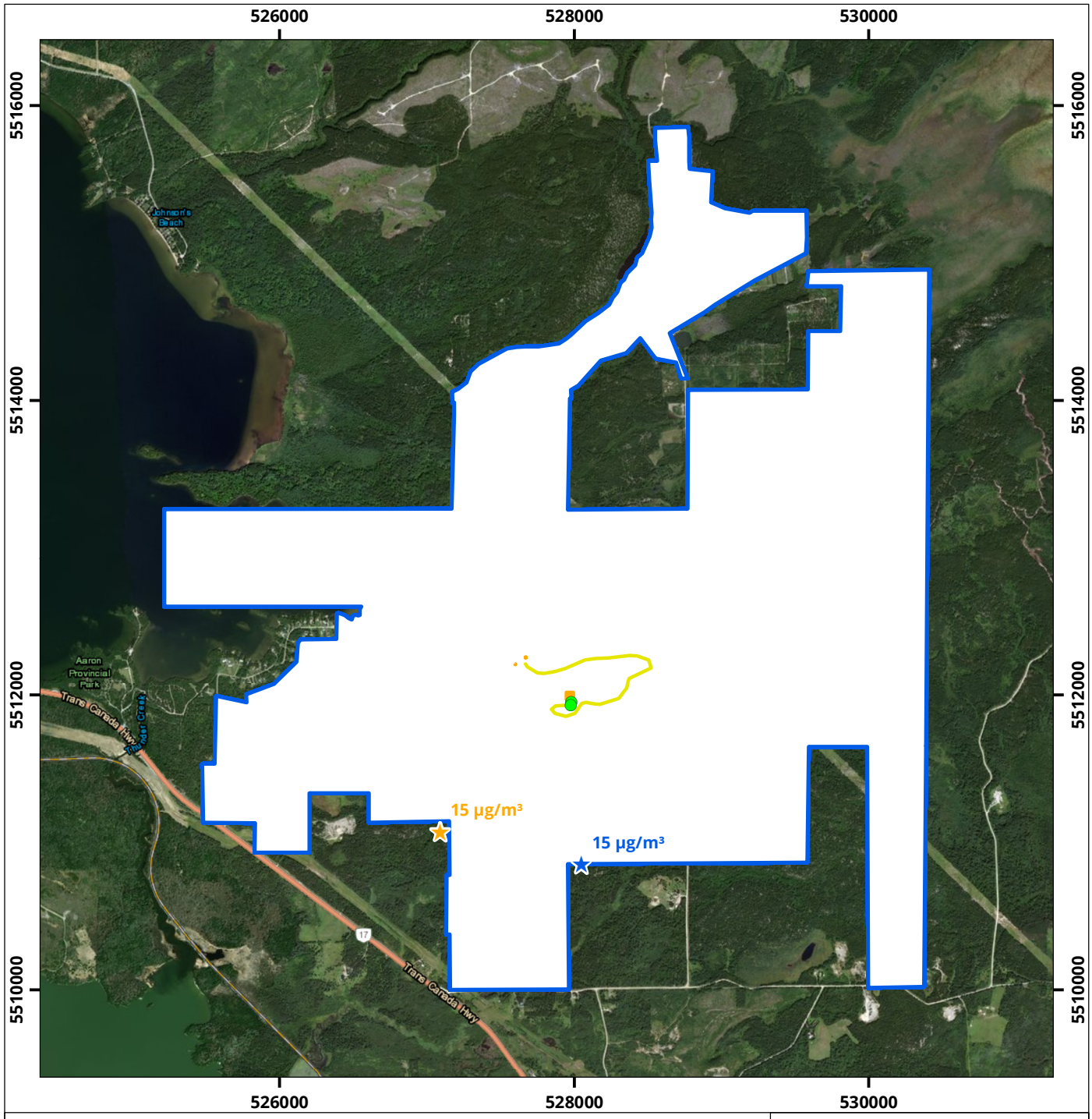


Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

17 - 19

19 - 21

21 - 23

> 23

= 23 µg/m³ (CAAQS)

0 500 1,000 1,500 m

NO_2 Annual Contour Plot (Site Preparation and Construction)

True North

Map Projection: NAD 1983 UTM Zone 15N

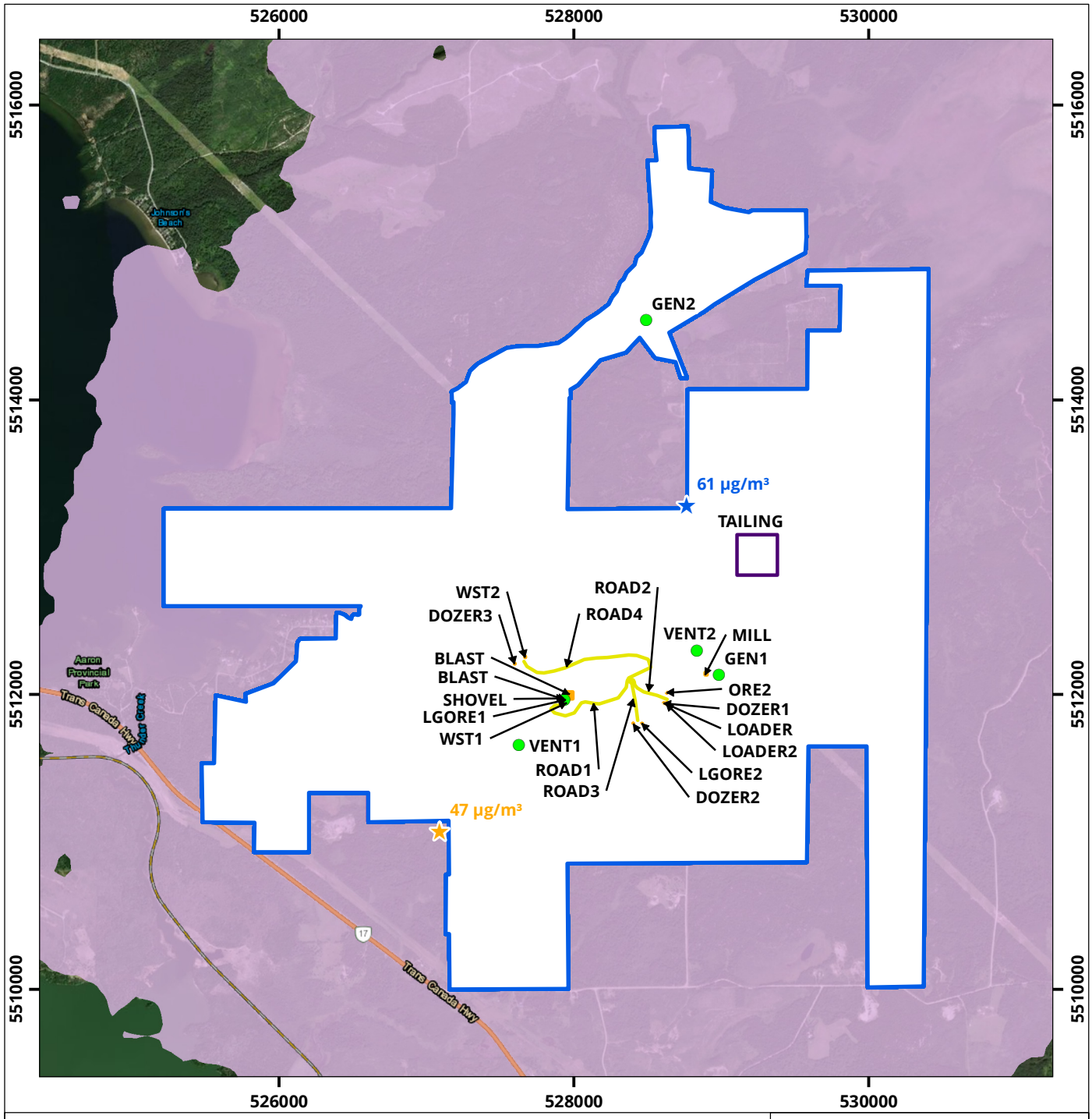
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 20a
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd

TMI_877_AE(2) 01_Attachment_2



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

36 - 64

64 - 92

92 - 120

> 120

= 120 µg/m³ (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

TSP 24hr Contour Plot (Operations)

True North

Map Projection: NAD 1983 UTM Zone 15N

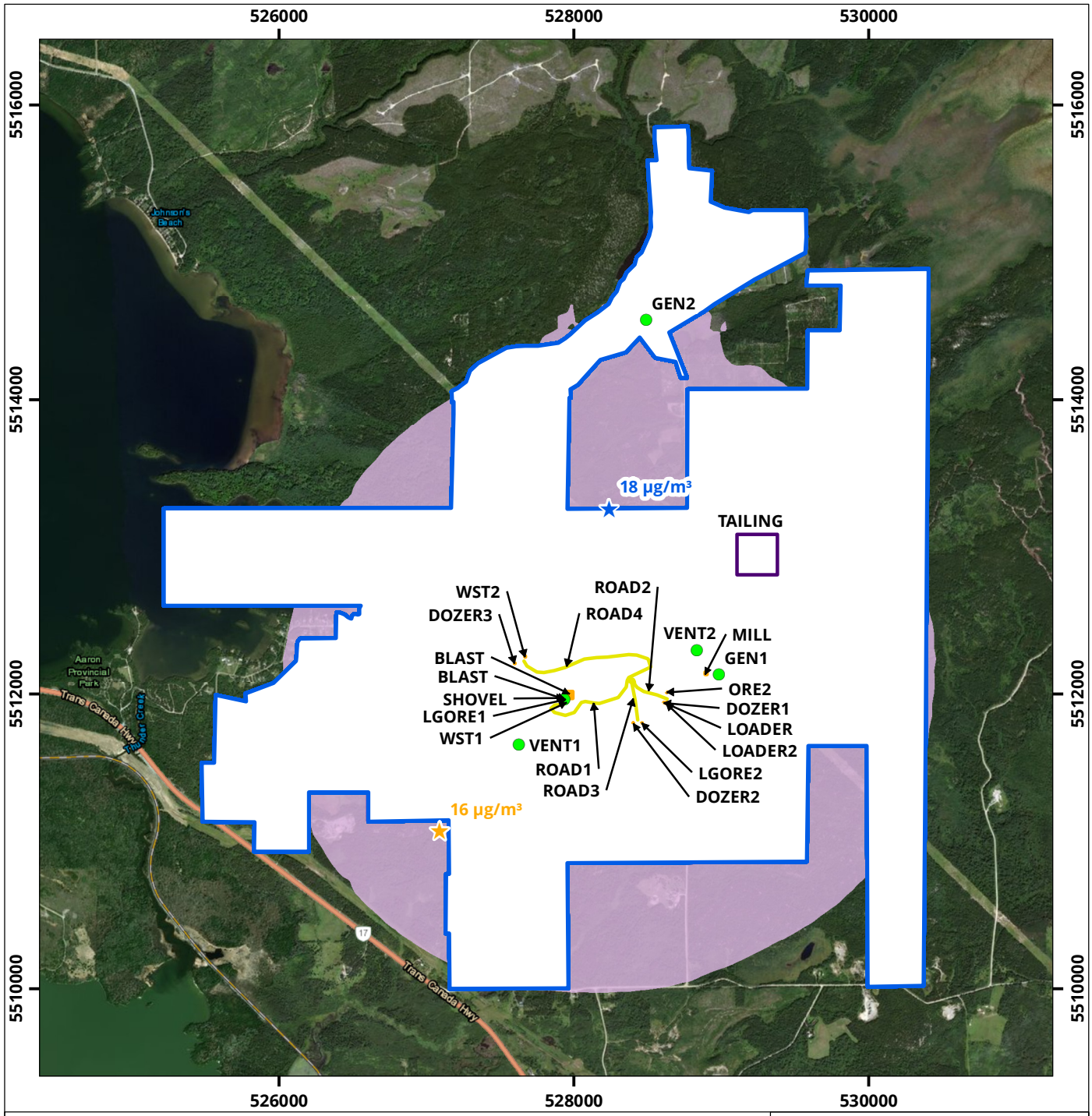
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 6b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

Map Document: C:\Users\dj\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602 163 - Goliath Gold - Contour Plot Template_181129 - Copy_new.mxd

TMI_877_AE(2) 01_Attachment_2



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

15 - 30

30 - 45

45 - 60

> 60

= 60 µg/m³ (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

TSP Annual Contour Plot (Operations)

True North

Map Projection: NAD 1983 UTM Zone 15N

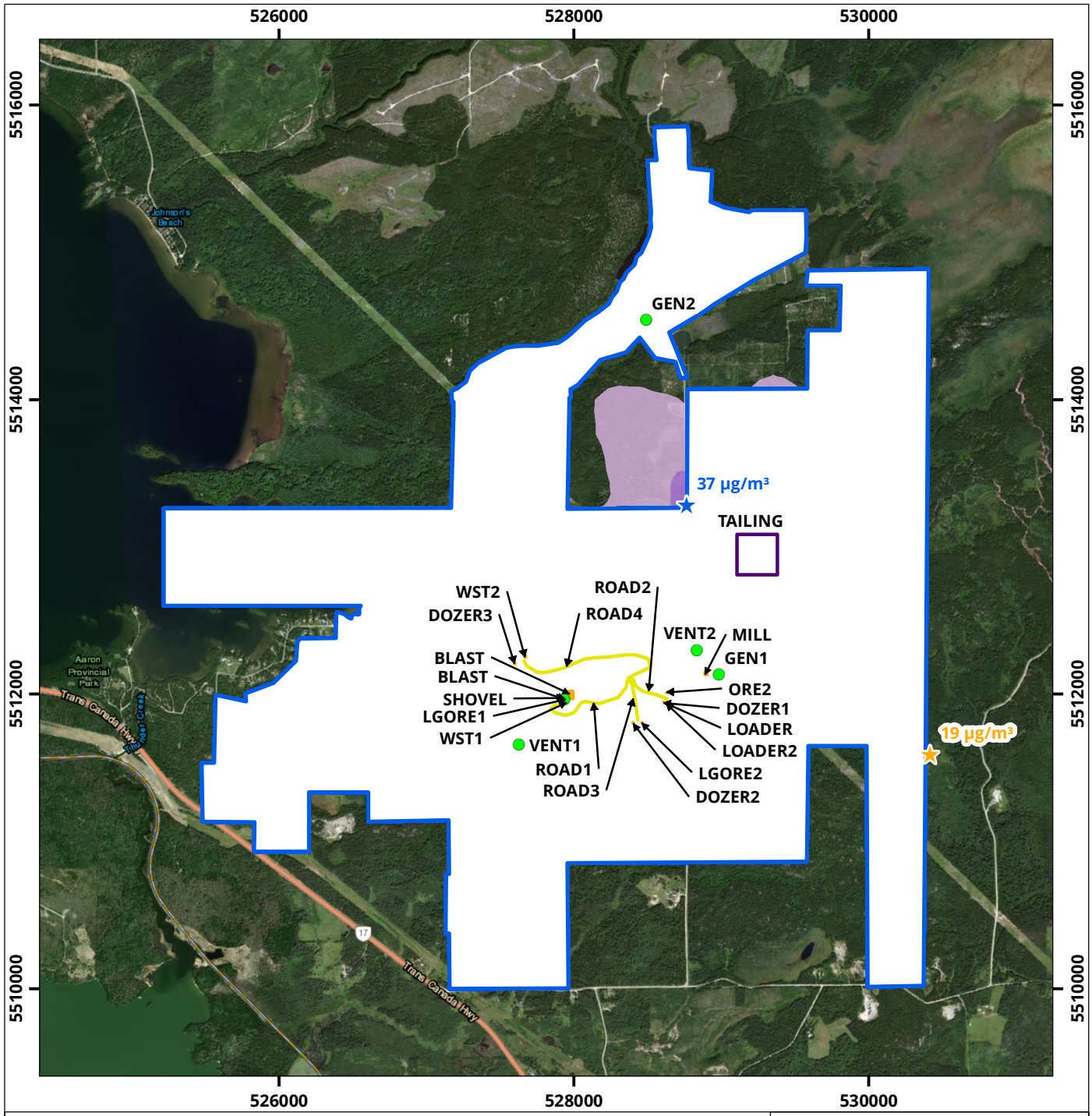
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 7b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

Map Document: C:\Users\dj\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129 - Copy_new.mxd

TMI_877_AE(2) 01_Attachment_2



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

20 - 30

30 - 40

40 - 50

> 50

= 50 µg/m³ (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

PM_{10} 24hr Contour Plot (Operations)

True North

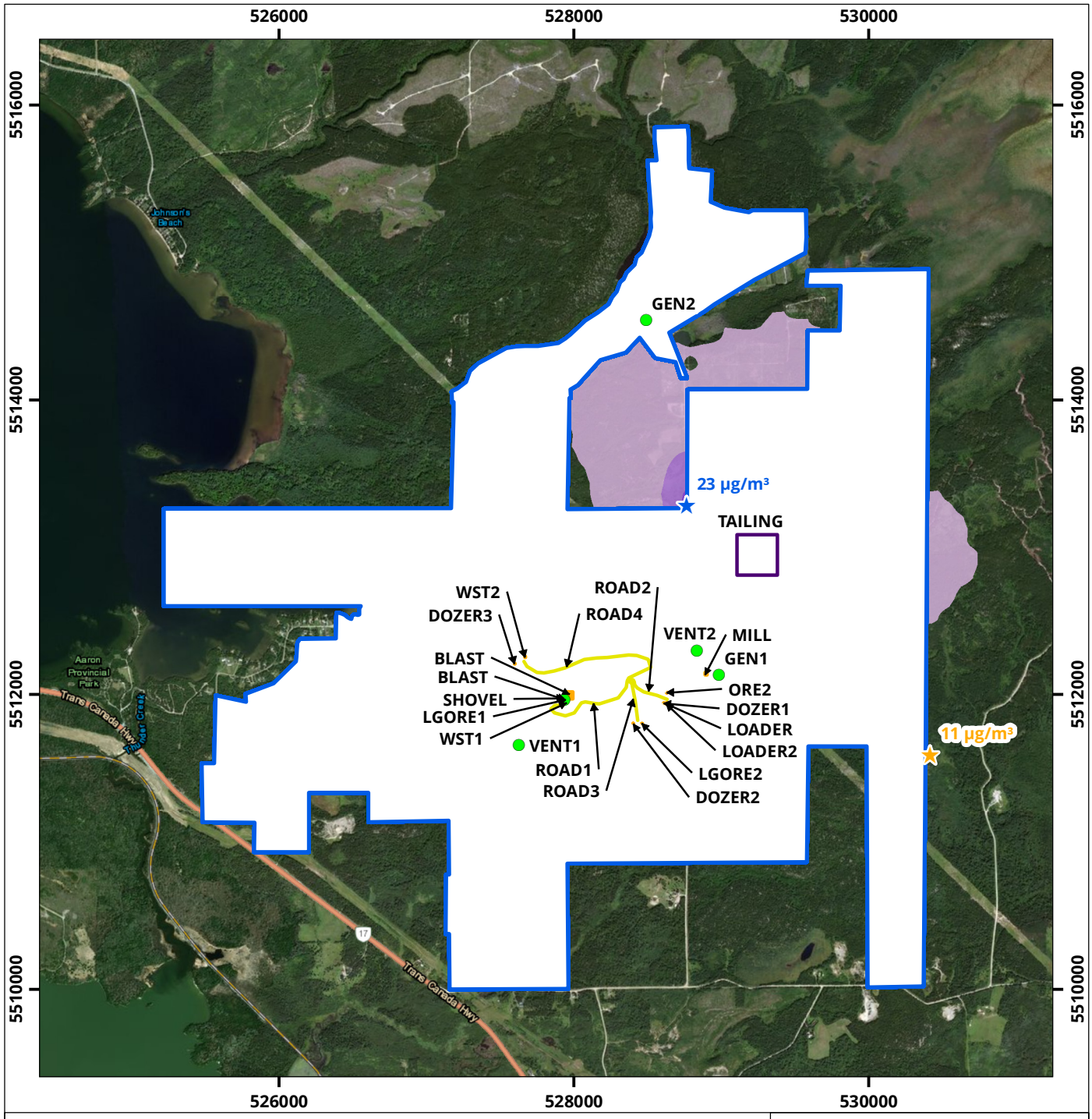
Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 8b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129 - Copy_new.mxd

TMI_877_AE(2) 01_Attachment_2



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

12 - 17

17 - 22

22 - 27

> 27

= 27 µg/m³ (CAAQS)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

$PM_{2.5}$ 24hr Contour Plot (Operations)

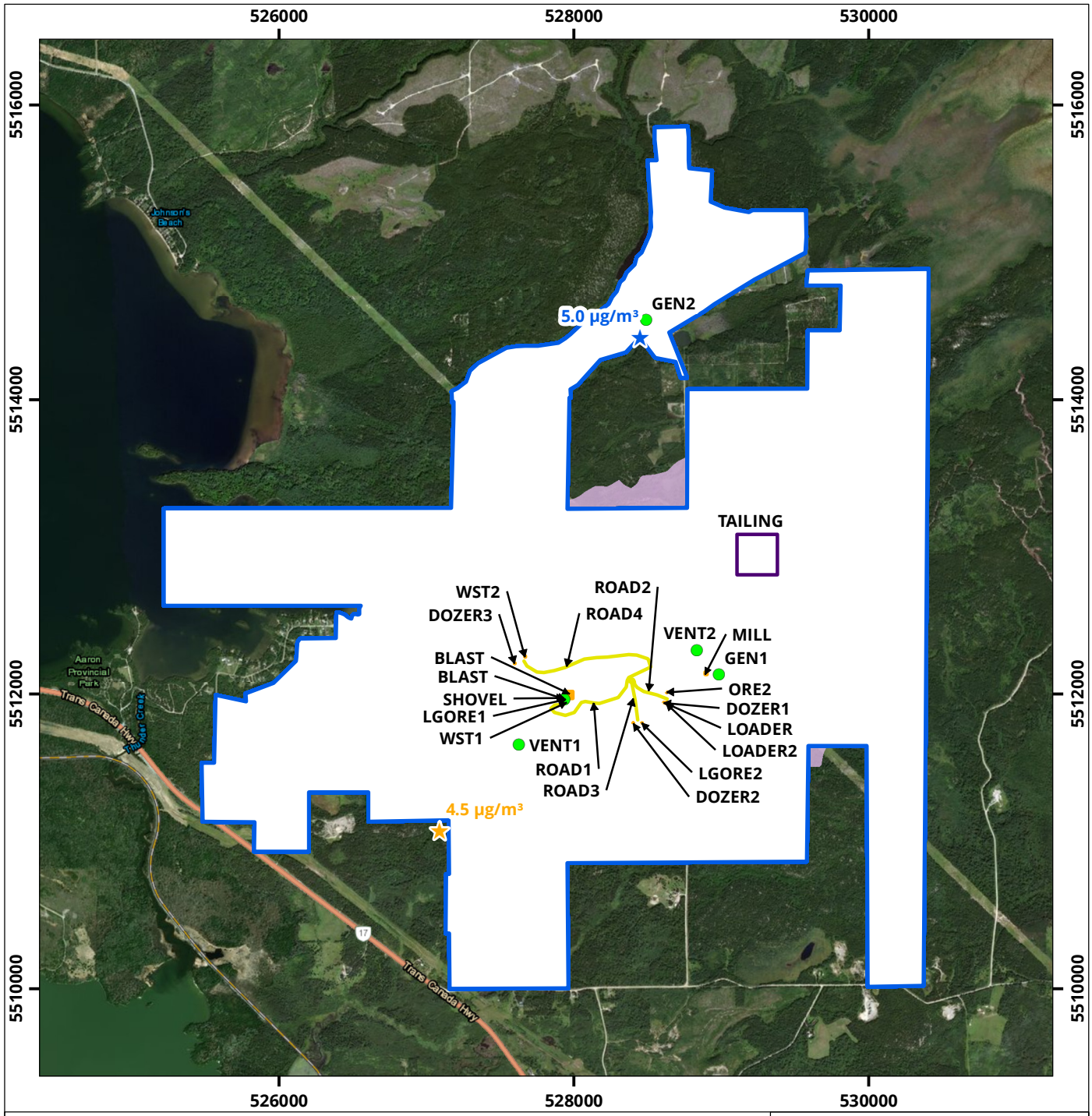
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 9b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129 - Copy_new.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

4.5 - 6

6 - 7.4

7.4 - 8.8

> 8.8

= 8.8 µg/m³ (CAAQS)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

$PM_{2.5}$ Annual Contour Plot (Operations)

True North

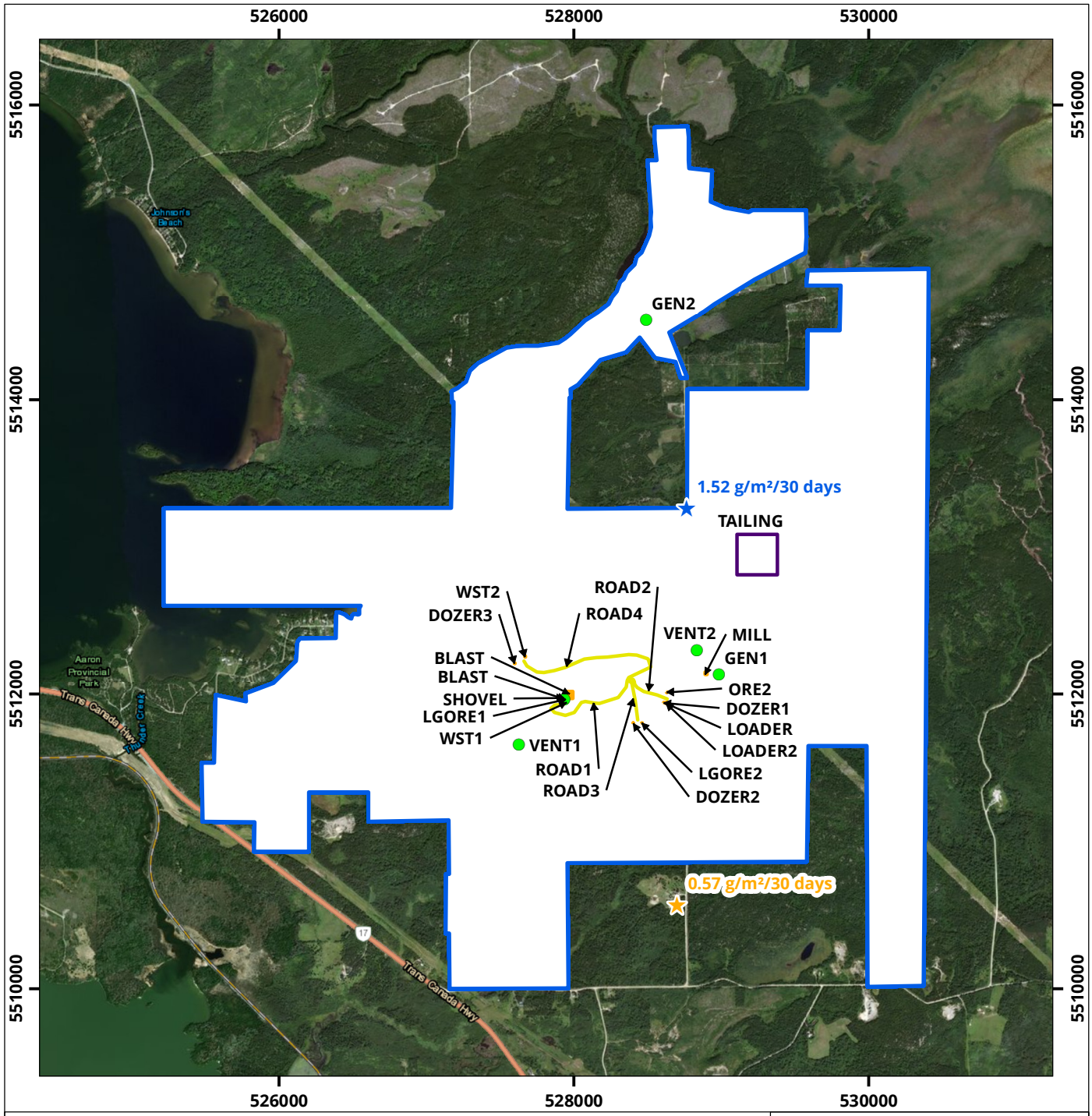
Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 10b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129 - Copy_new.mxd

TMI_877_AE(2) 01_Attachment_2



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Dustfall (g/m²/30 days)

1.8 - 3.5

3.5 - 5.3

5.3 - 7

> 7

= 7 g/m²/30 days (AAQC)

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0 500 1,000 1,500 m

Dustfall 30 day Contour Plot (Operations)

True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

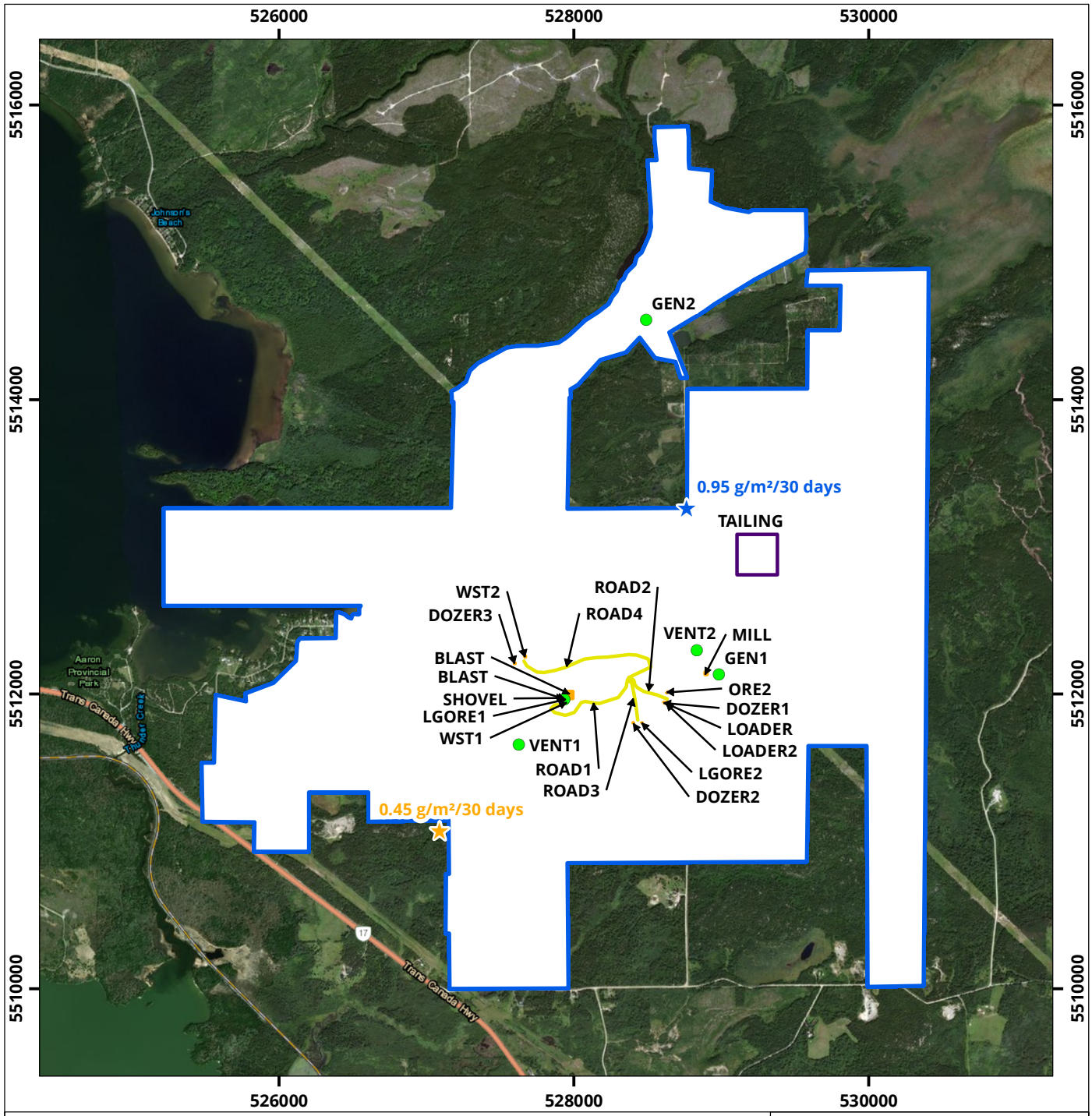
Project #: 1602163

Drawn by: DJH	Figure: 11b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

RWDI

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129 - Copy_new.mxd

TMI_877_AE(2) 01_Attachment_2



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Dustfall (g/m²/30 days)

1.2 - 2.3

2.3 - 3.5

3.5 - 4.6

> 4.6

= 4.6 g/m²/30 days (AAQC)

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0 500 1,000 1,500 m

Dustfall Annual Contour Plot (Operations)

True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 12b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

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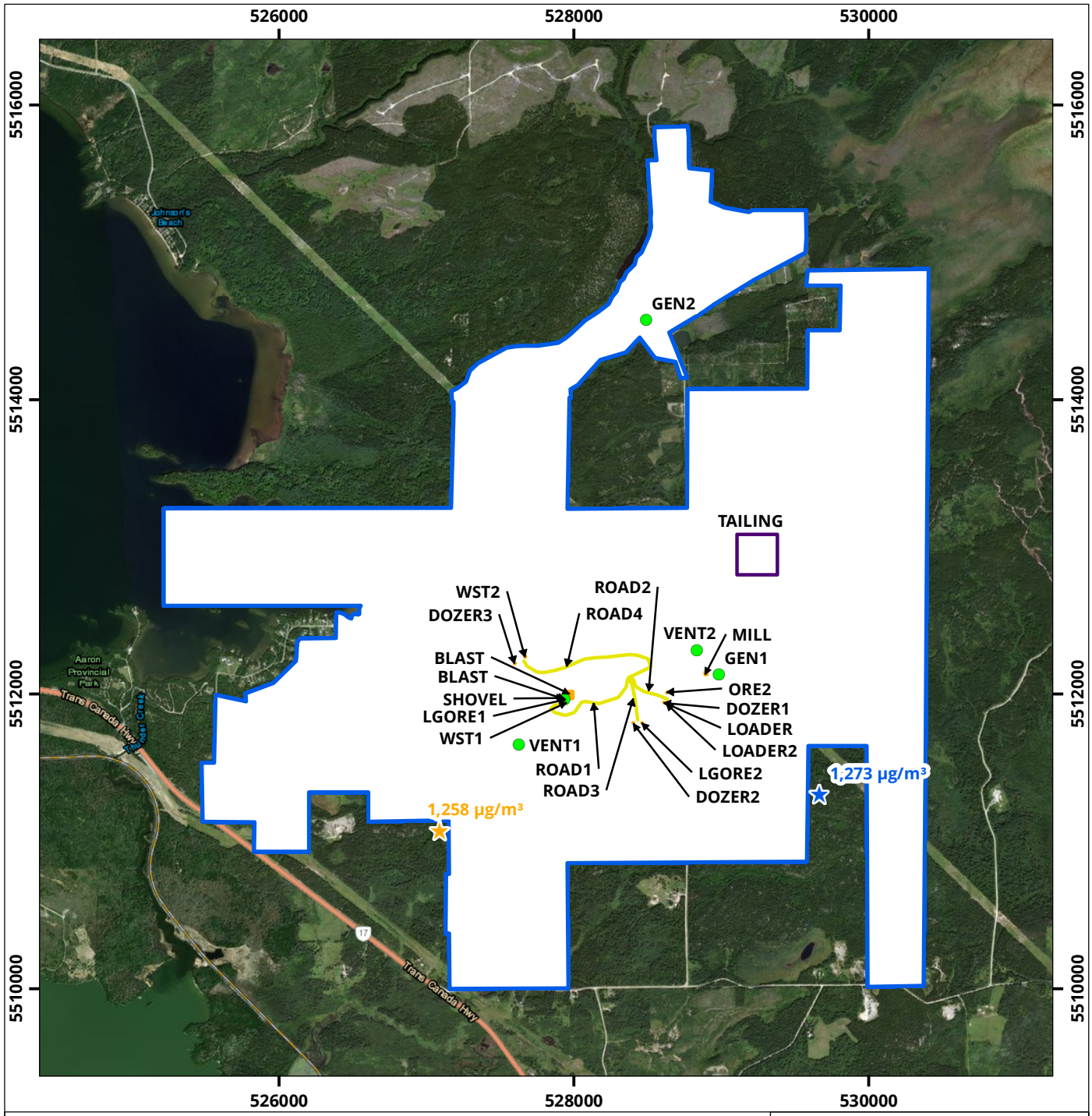
TMI_877_AE(2) 01_Attachment_2



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

9,050 - 18,100

18,100 - 27,150

27,150 - 36,200

> 36,200

= 36,200 µg/m³ (AAQC)

0 500 1,000 1,500 m

CO 1hr Contour Plot (Operations)

True North

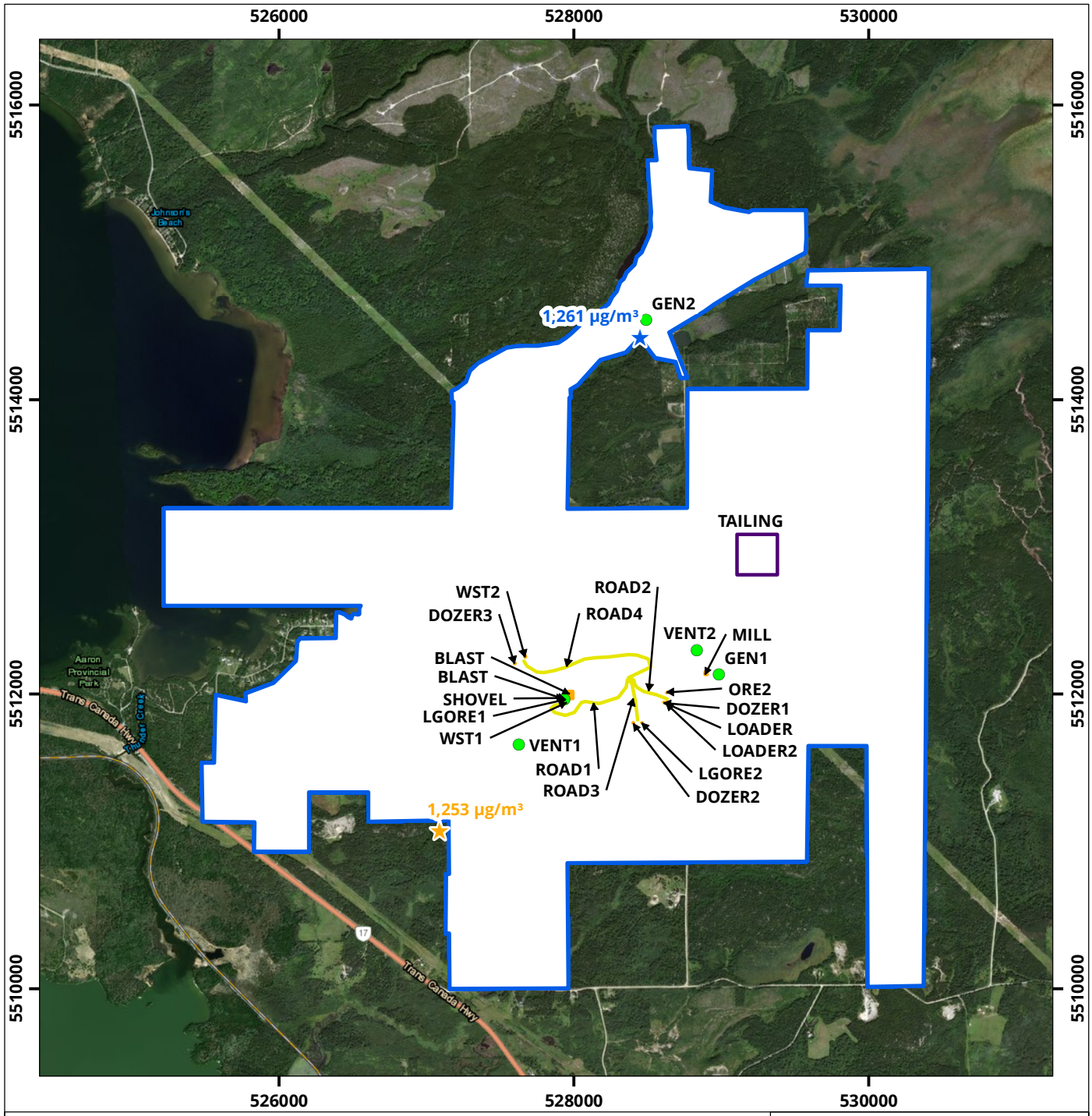
Map Projection: NAD 1983 UTM Zone 15N

Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 13b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

TMI_877_AE(2) 01_Attachment_2



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

- 3,925 - 7,850
- 7,850 - 11,775
- 11,775 - 15,700
- > 15,700
- = 15,700 µg/m³ (AAQC)

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0 500 1,000 1,500 m

CO 8hr Contour Plot (Operations)

True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 14b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

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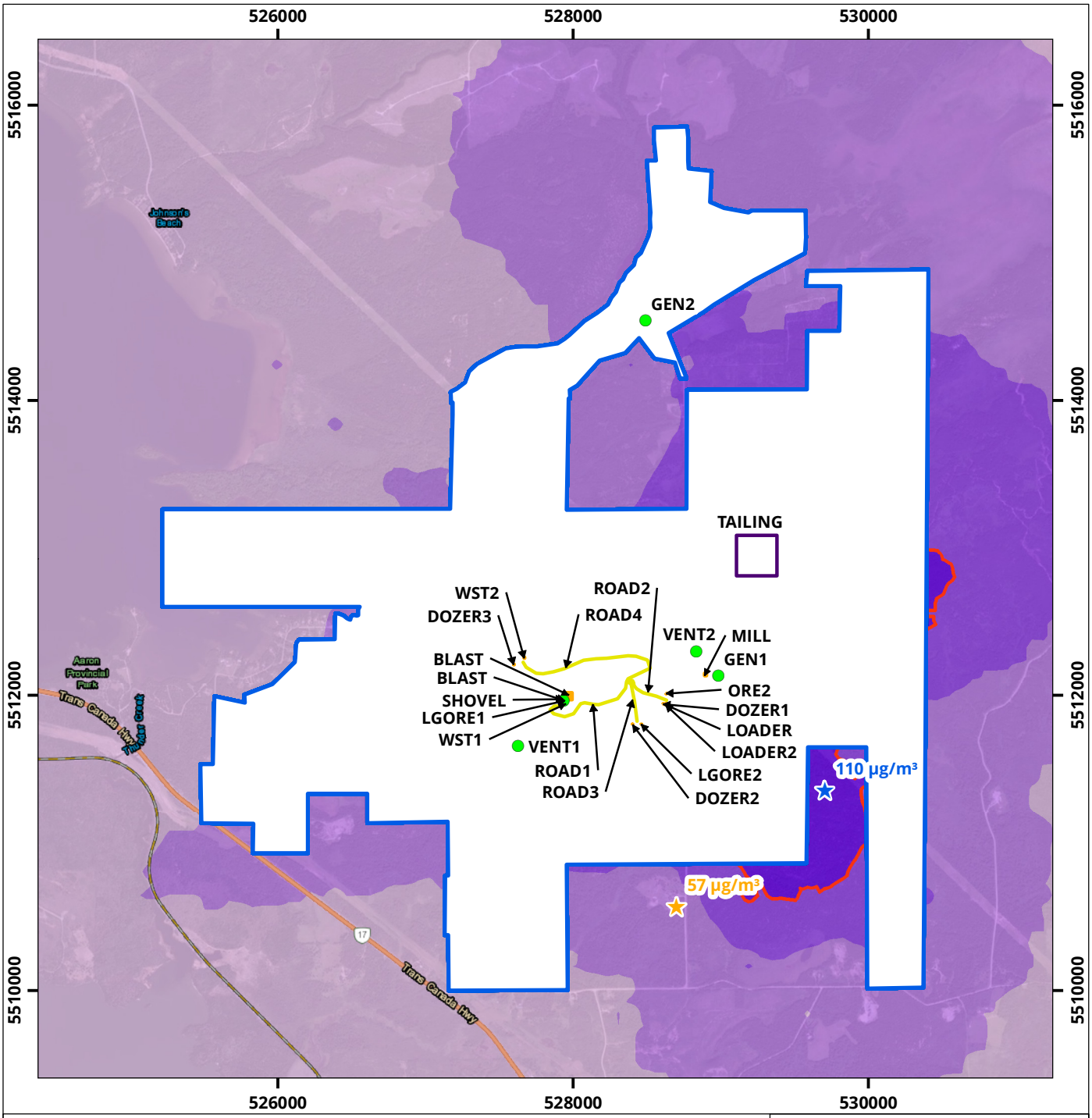

Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

35 - 50

50 - 65

65 - 80

> 80

= 80 µg/m³ (CAAQS)

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0 500 1,000 1,500 m

NO_2 1hr Contour Plot (Operations)

True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 15b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

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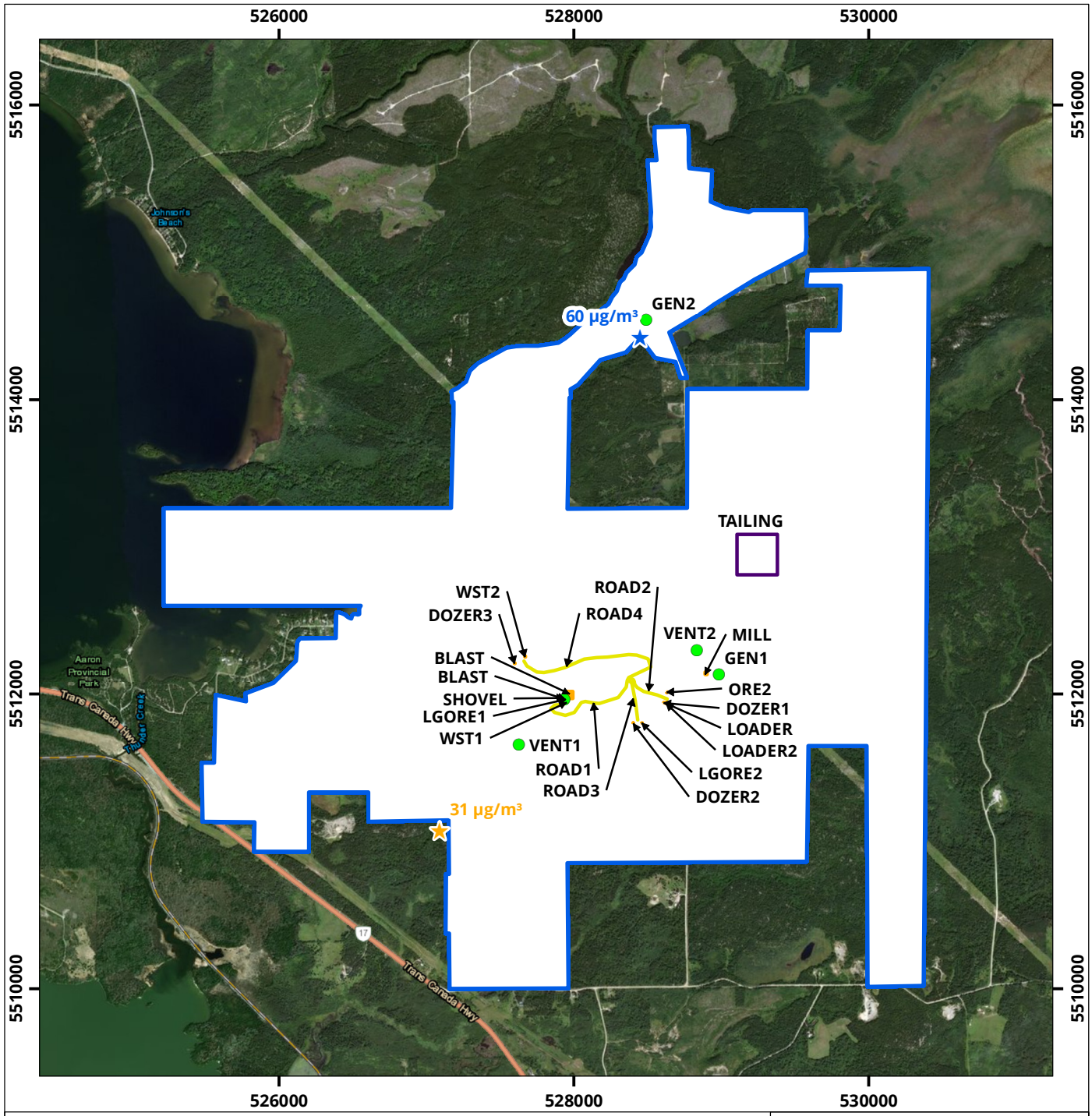

Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

50 - 100

100 - 150

150 - 200

> 200

= 200 µg/m³ (AAQC)

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

NO_2 24hr Contour Plot (Operations)

True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 16b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

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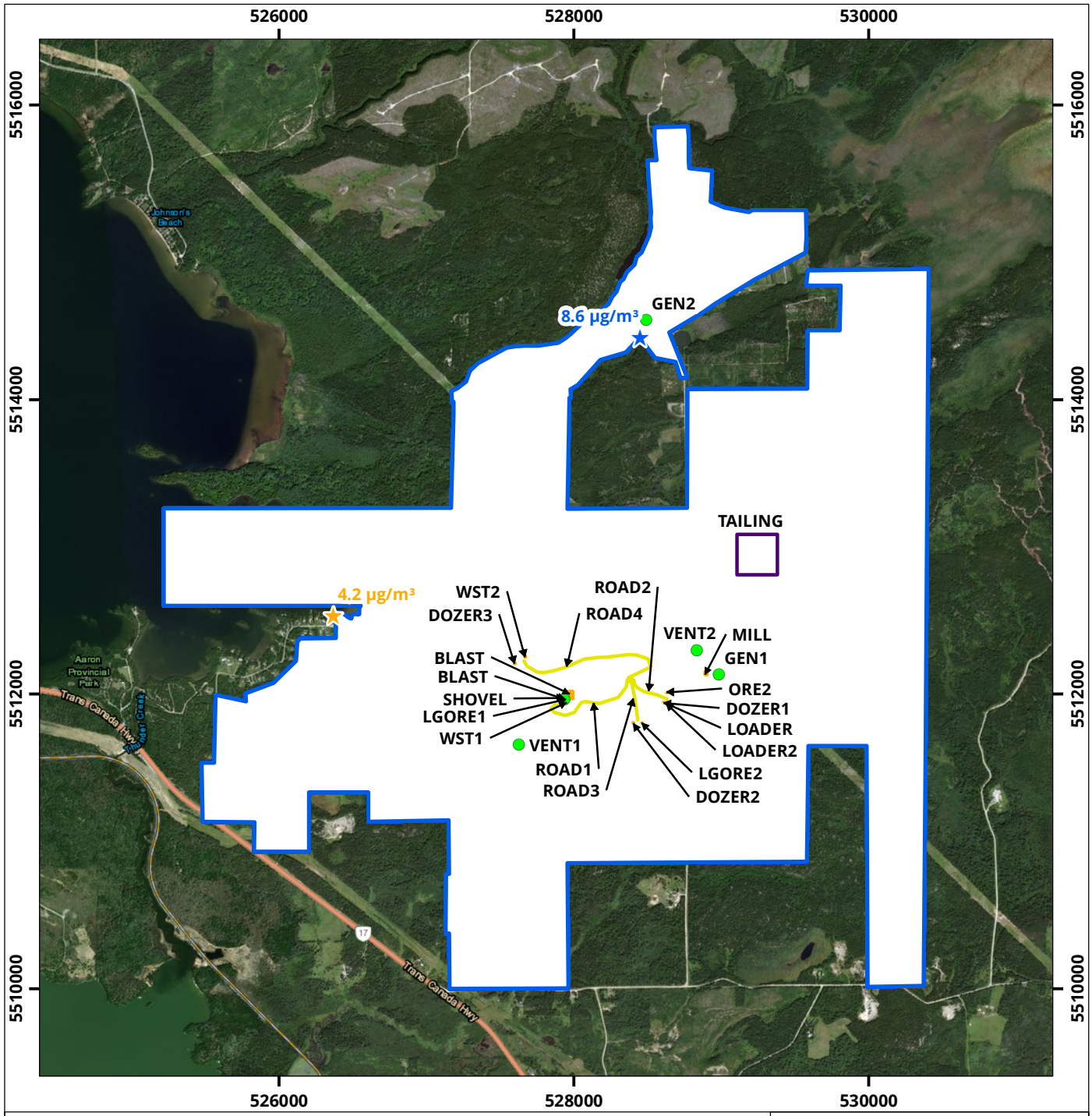

Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

43 - 85

85 - 128

128 - 170

> 170

= 170 µg/m³ (CAAQS)

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0 500 1,000 1,500 m

SO_2 1hr Contour Plot (Operations)

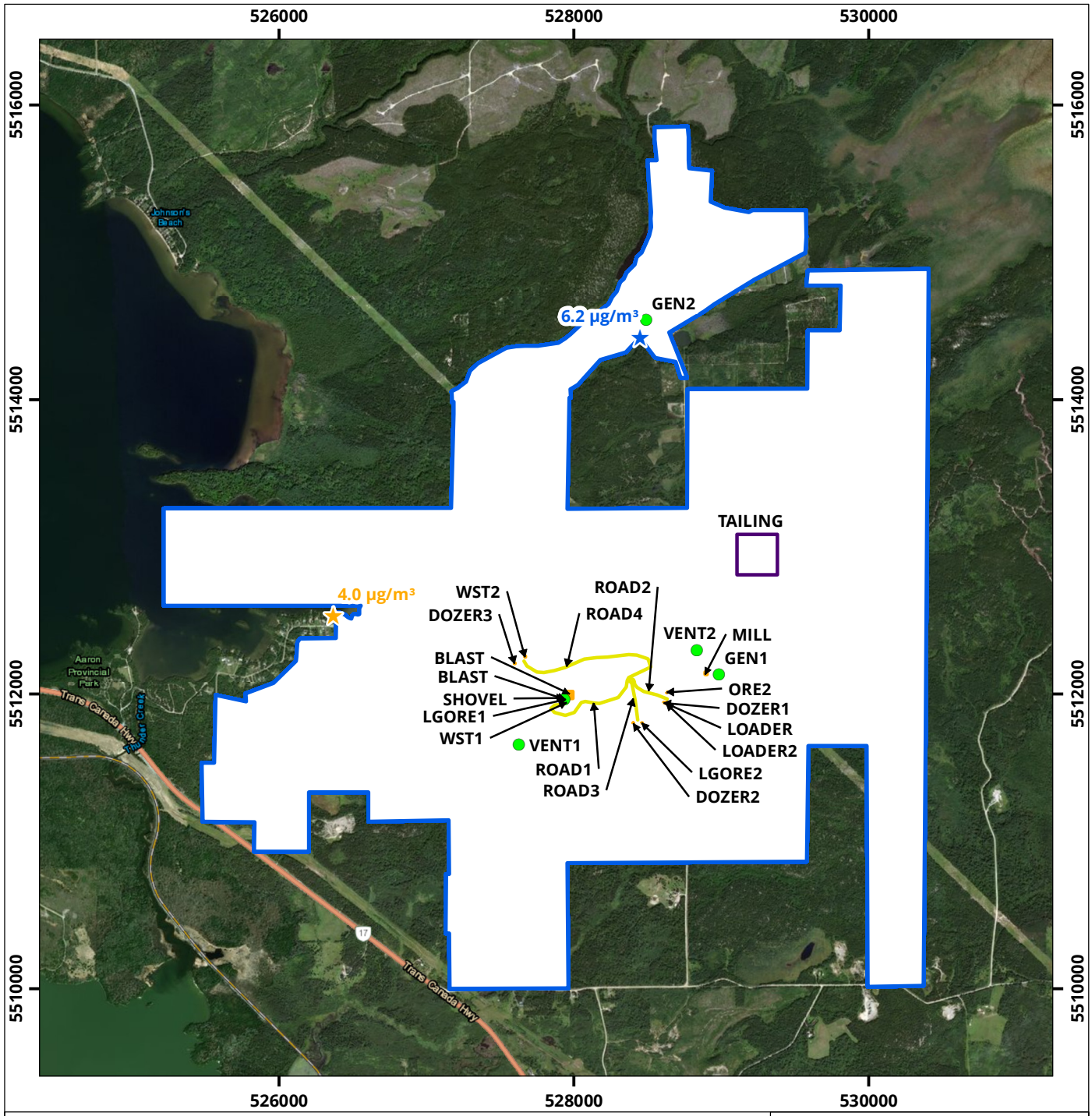
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 17b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129 - Copy_new.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

69 - 138

138 - 206

206 - 275

> 275

= 275 µg/m³ (AAQC)

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0 500 1,000 1,500 m

SO_2 24hr Contour Plot (Operations)

True North

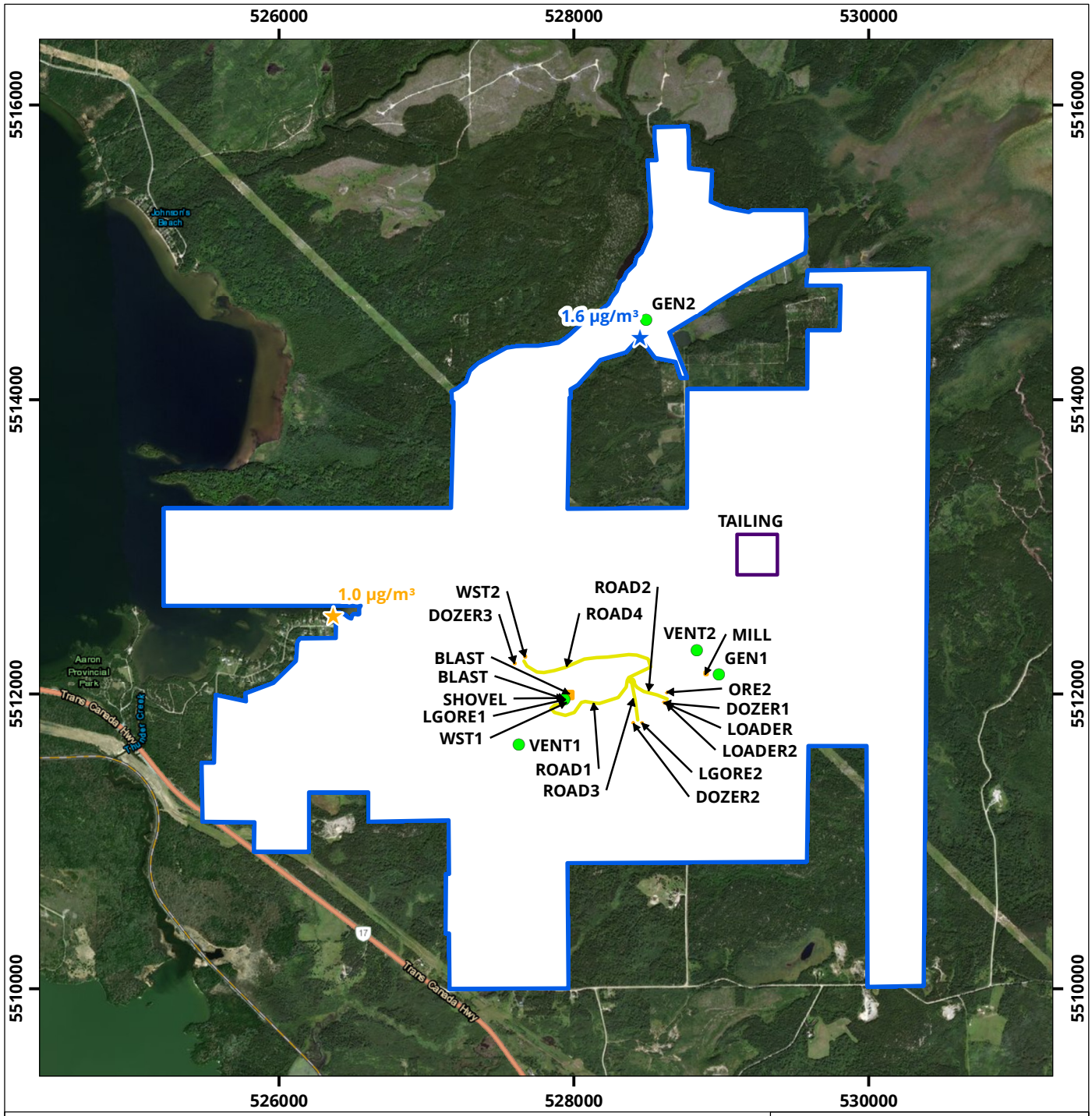
Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 18b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

Map Document: C:\Users\dj\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129 - Copy_new.mxd

TMI_877_AE(2) 01_Attachment_2



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

2 - 4

4 - 6

6 - 8

> 8

= 8 µg/m³ (CAAQS)

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0 500 1,000 1,500 m

SO_2 Annual Contour Plot (Operations)

True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 19b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

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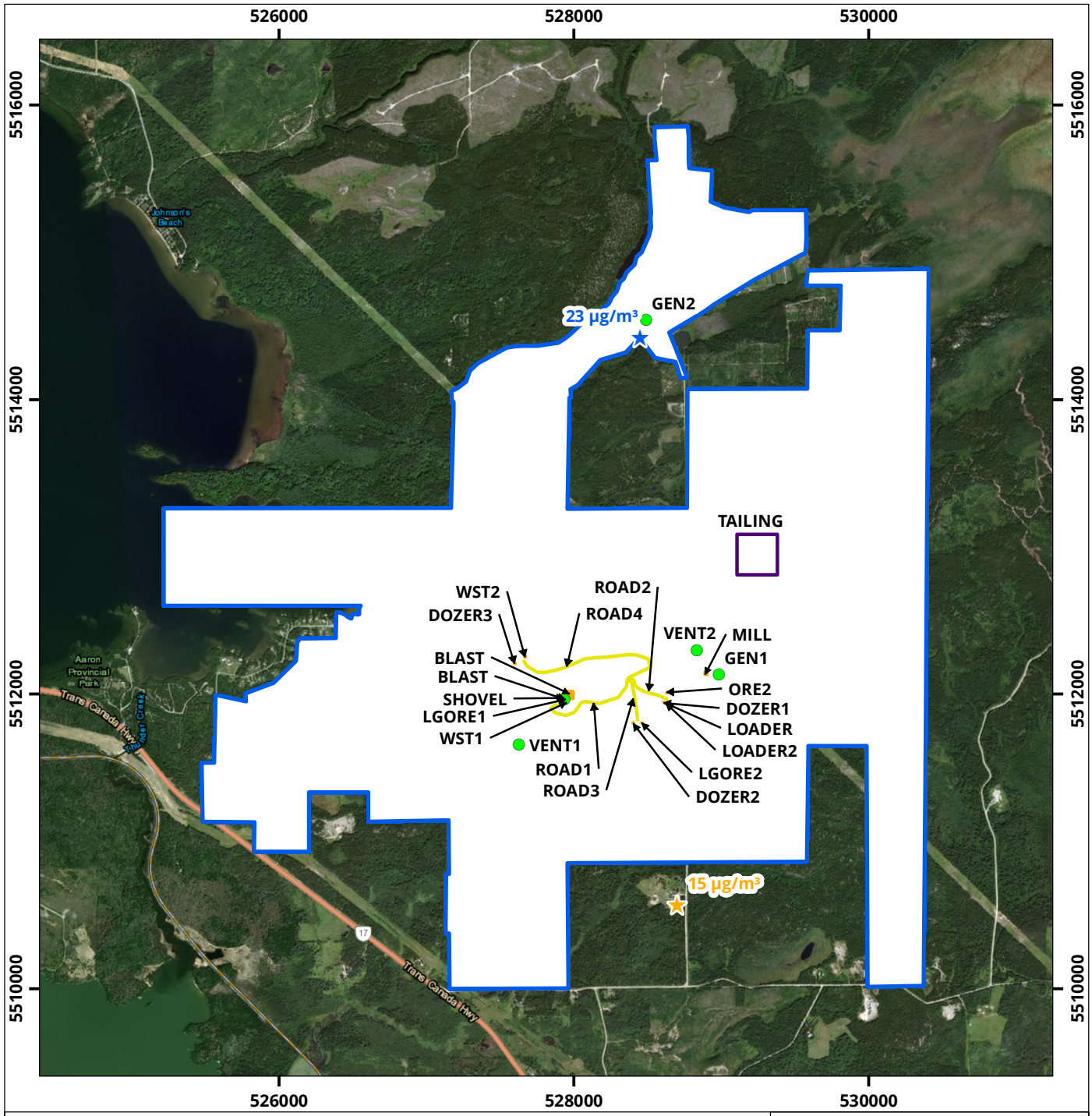

Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

17 - 19

19 - 21

21 - 23

> 23

= 23 µg/m³ (CAAQS)

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0 500 1,000 1,500 m

NO_2 Annual Contour Plot (Operations)

True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 20b
Approx. Scale:	1:40,000
Date Revised:	Dec 22, 2018

RWDI

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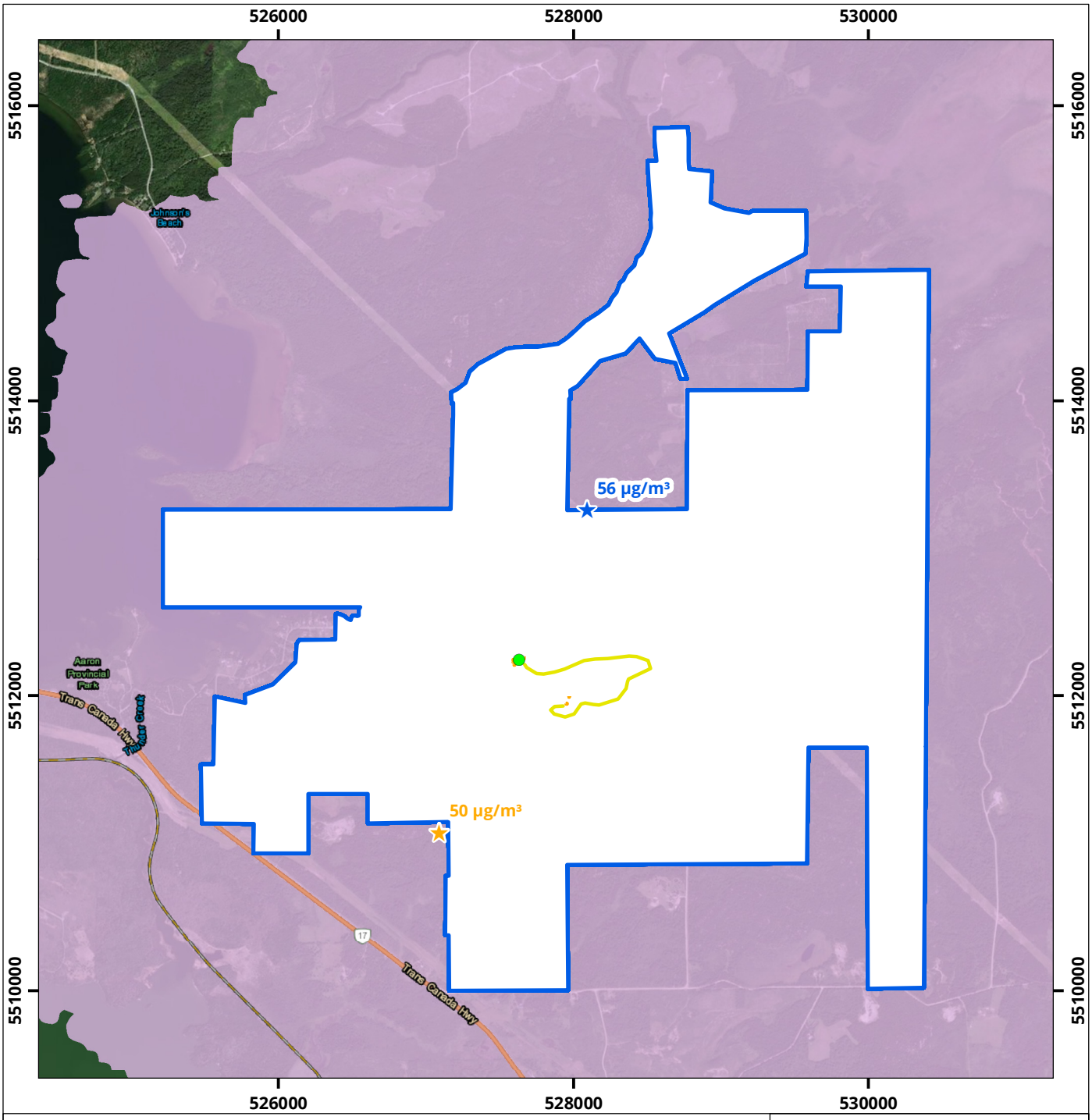

Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

36 - 64

64 - 92

92 - 120

> 120

= 120 µg/m³ (AAQC)

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0 500 1,000 1,500 m

TSP 24hr Contour Plot (Closure)

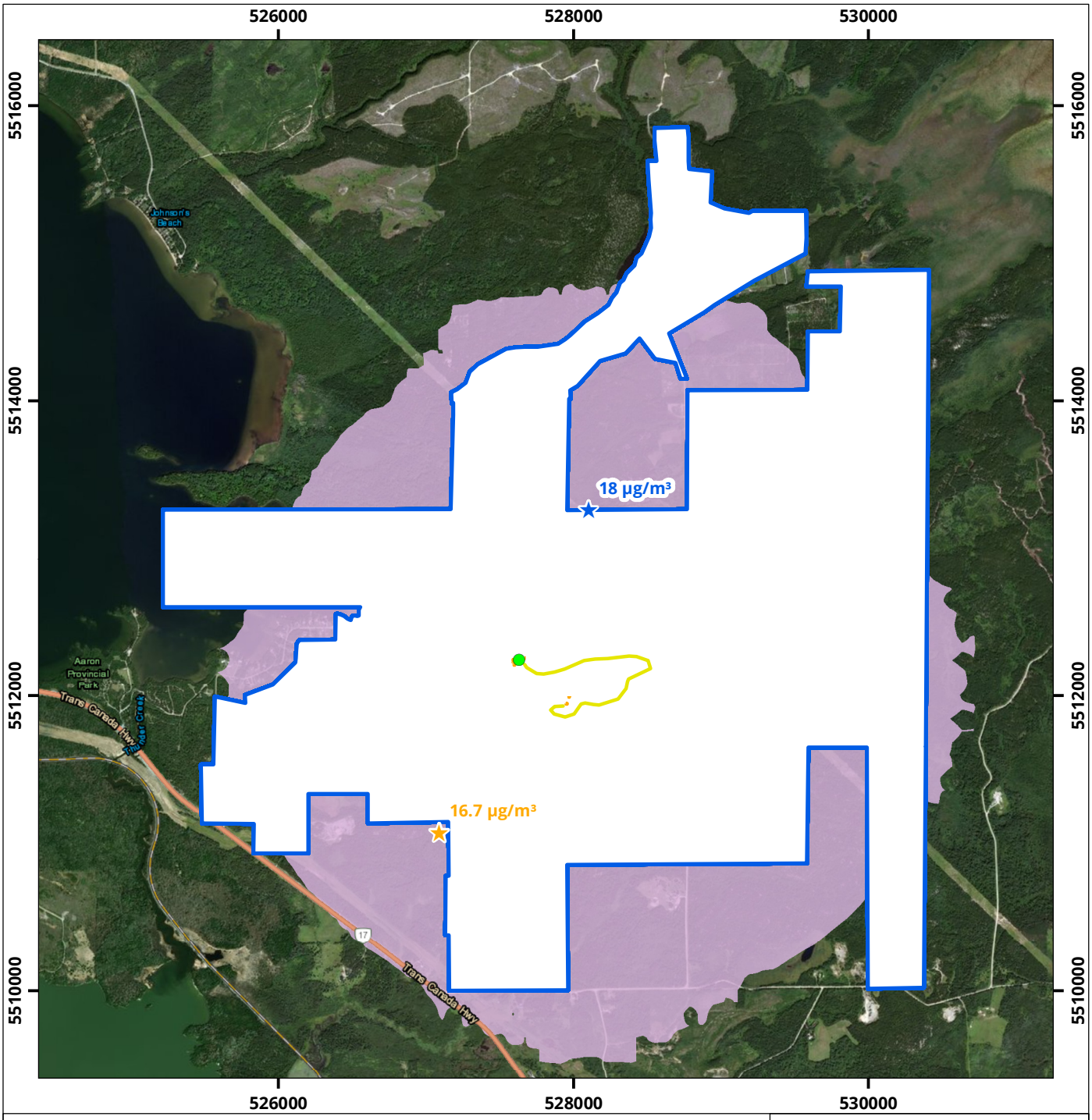
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 6c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

15 - 30

30 - 45

45 - 60

> 60

= 60 µg/m³ (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

TSP Annual Contour Plot (Closure)

True North

Map Projection: NAD 1983 UTM Zone 15N

Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 7c
Approx. Scale:	1:40,000
Date Revised:	Nov 30, 2018

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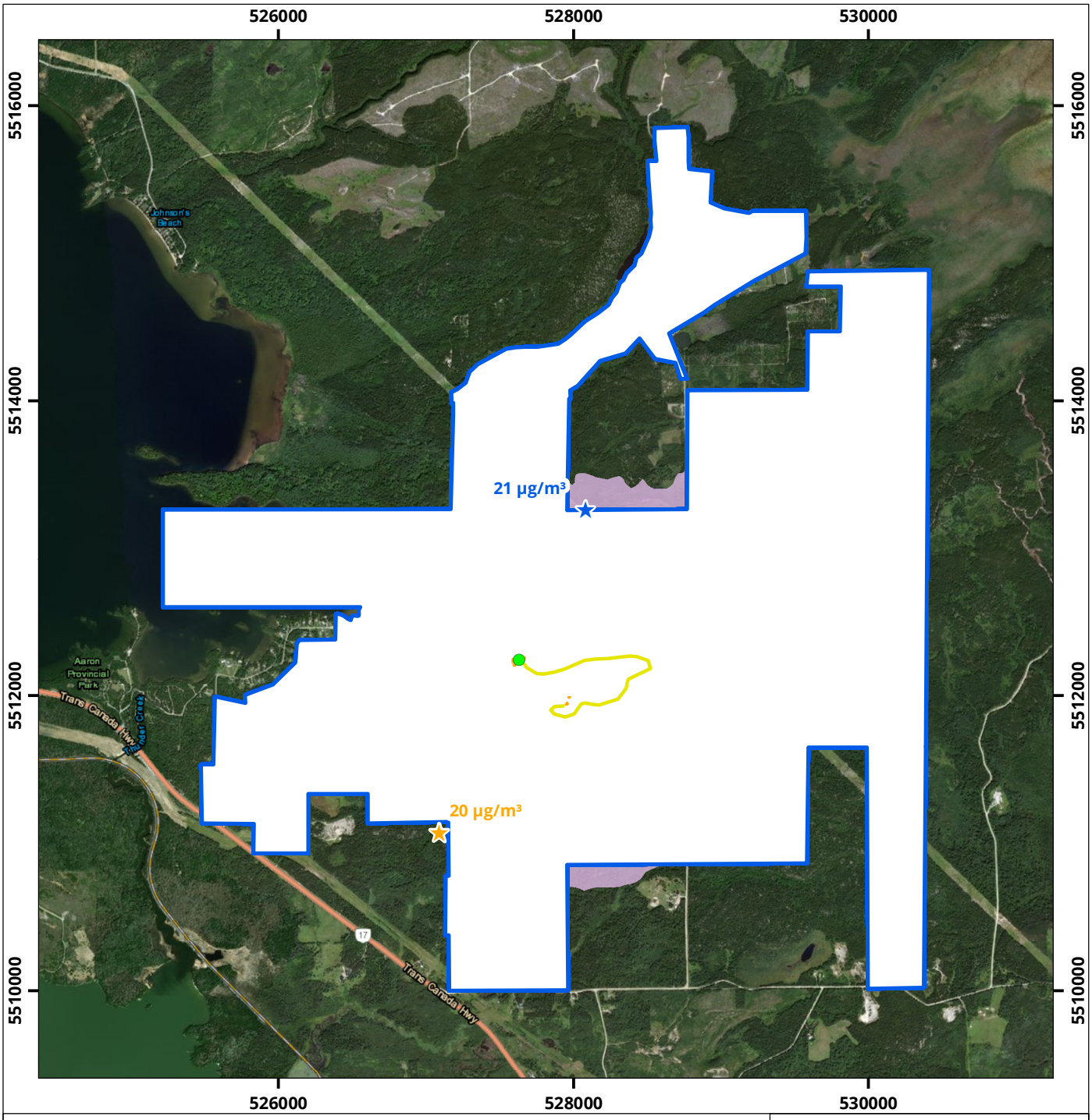

Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

20 - 30

30 - 40

40 - 50

> 50

= 50 µg/m³ (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

PM_{10} 24hr Contour Plot (Closure)

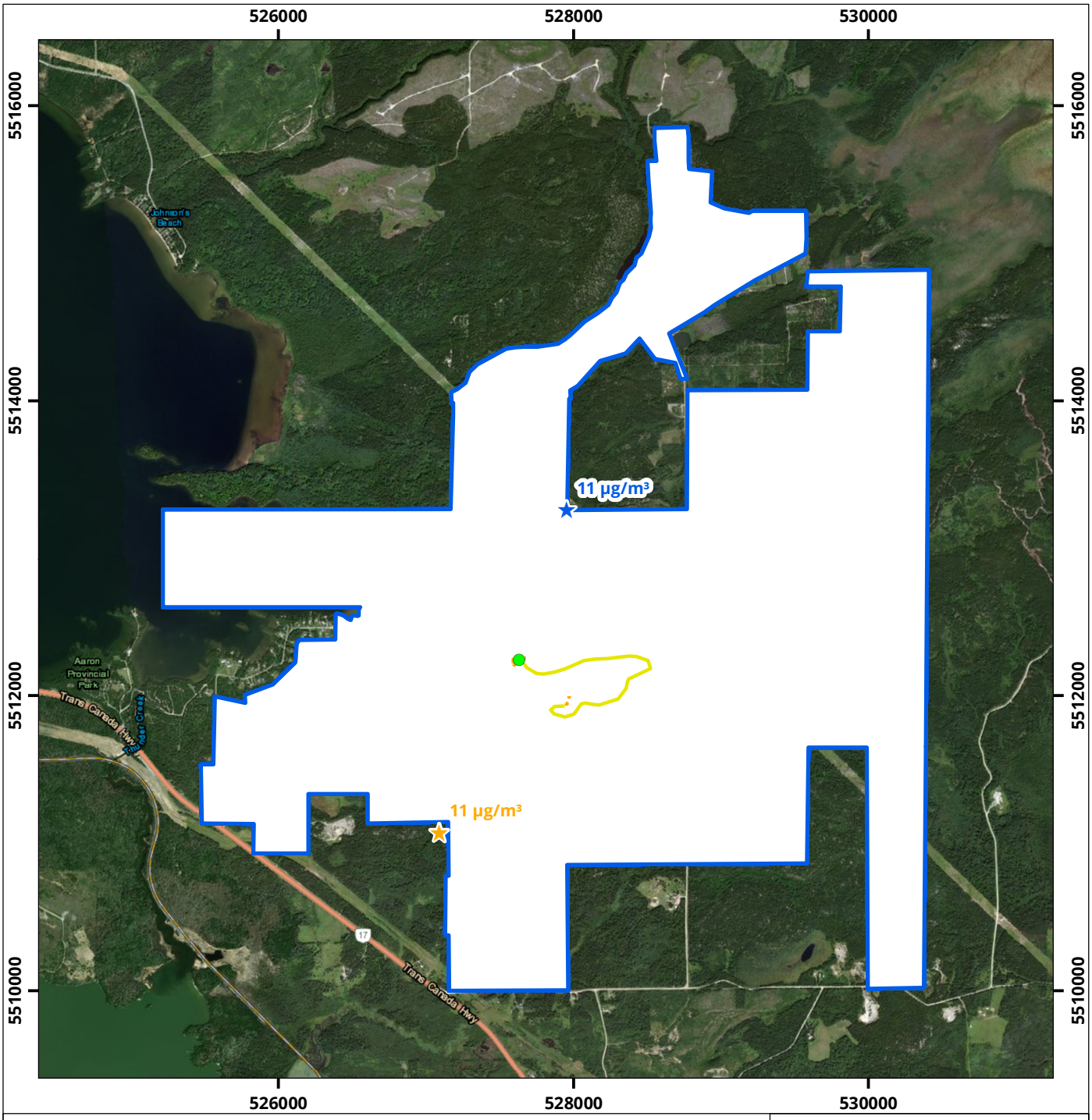
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 8c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



- Maximum Point of Impingement (MPOI)
- Sensitive Receptor Maximum
- Point Sources
- Volume Sources
- Roads
- Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

- 12 - 17
- 17 - 22
- 22 - 27
- > 27
- = 27 µg/m³ (CAAQS)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

$PM_{2.5}$ 24hr Contour Plot (Closure)

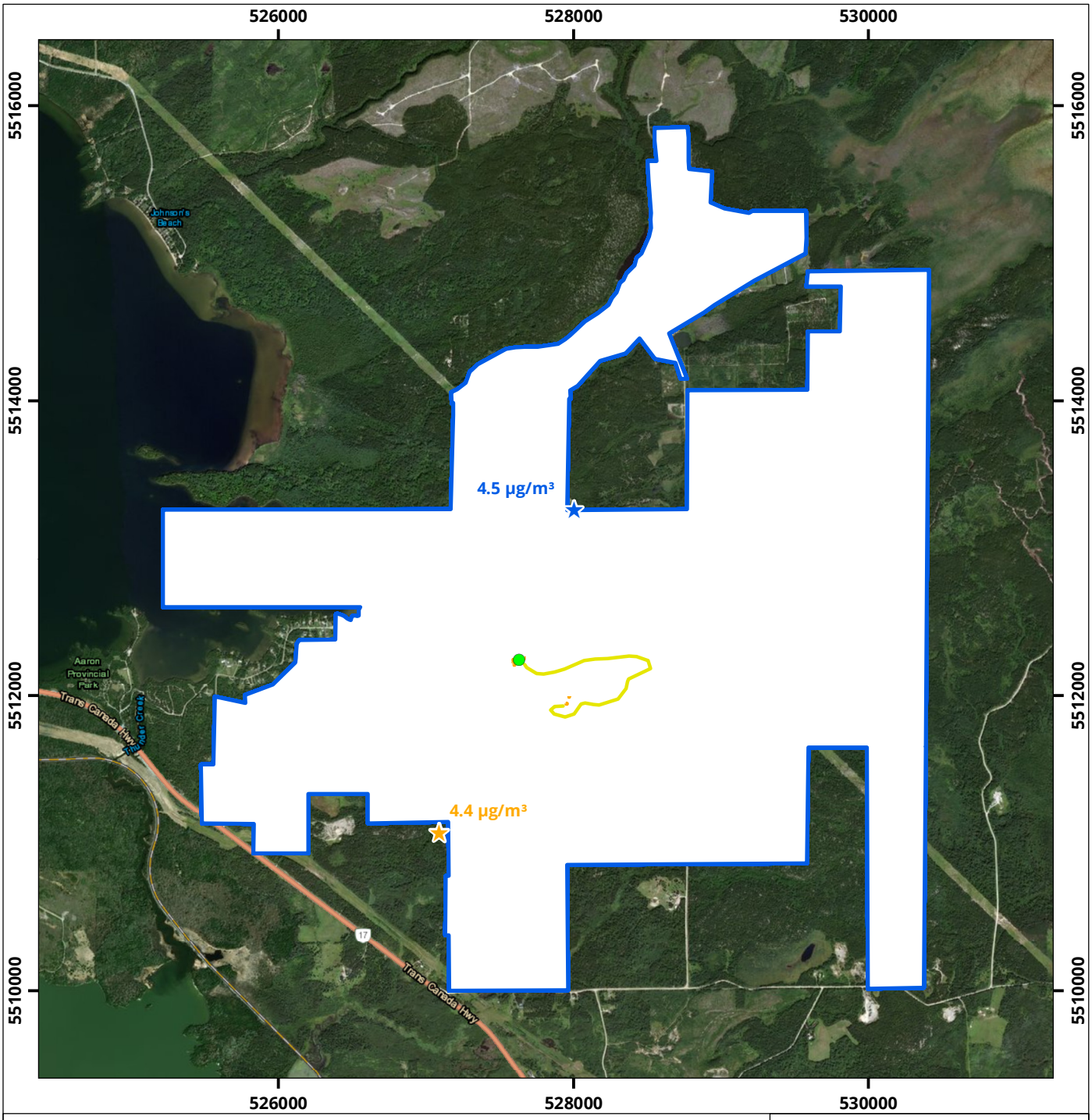
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 9c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

- 4.5 - 6
- 6 - 7.4
- 7.4 - 8.8
- > 8.8

= 8.8 µg/m³ (CAAQS)

0 500 1,000 1,500 m

$PM_{2.5}$ Annual Contour Plot (Closure)

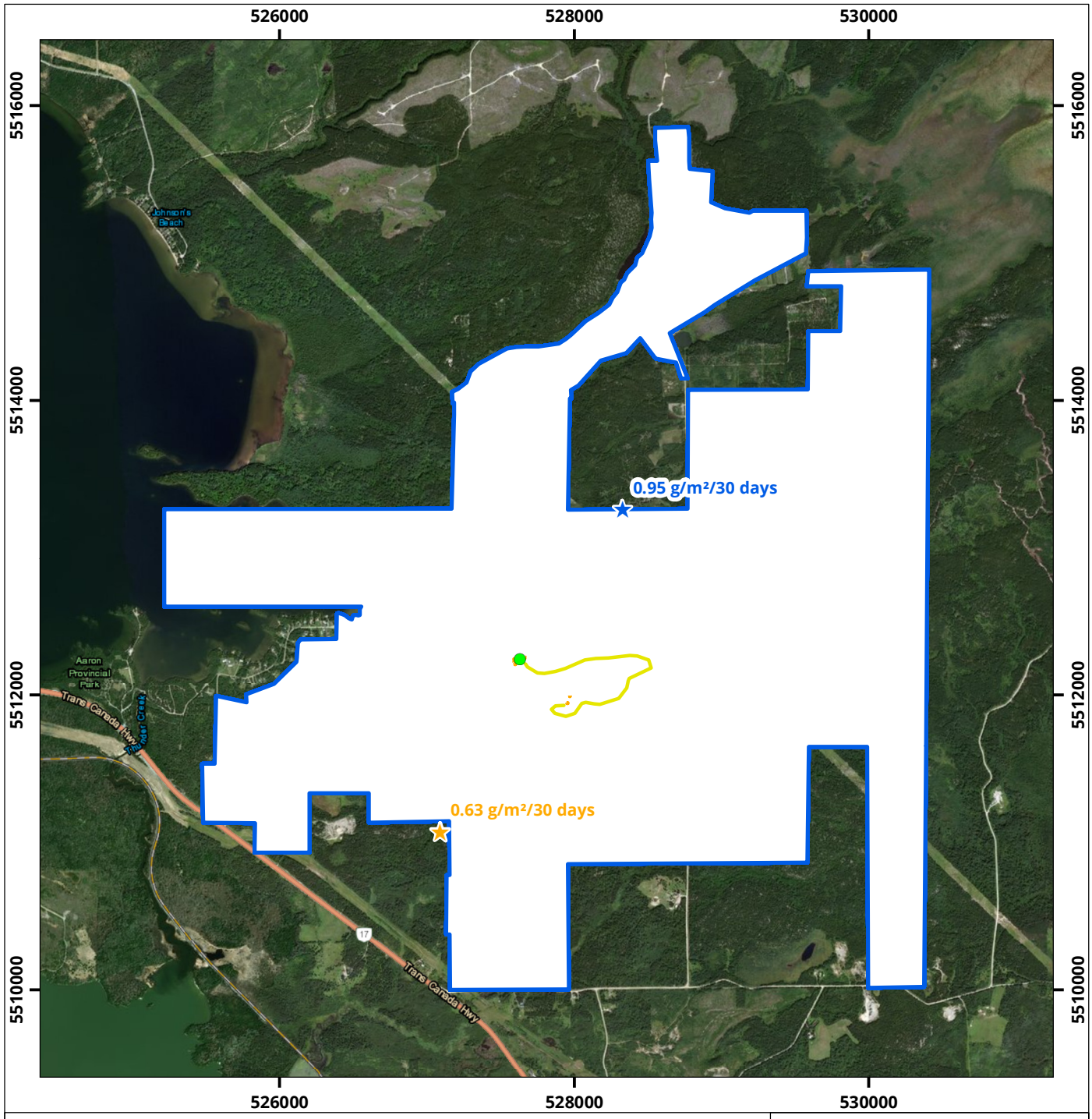
True North

Map Projection: NAD 1983 UTM Zone 15N

Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 10c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Dustfall (g/m²/30 days)

1.8 - 3.5

3.5 - 5.3

5.3 - 7

> 7

= 7 g/m²/30 days (AAQC)

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Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

Dustfall 30 day Contour Plot (Closure)

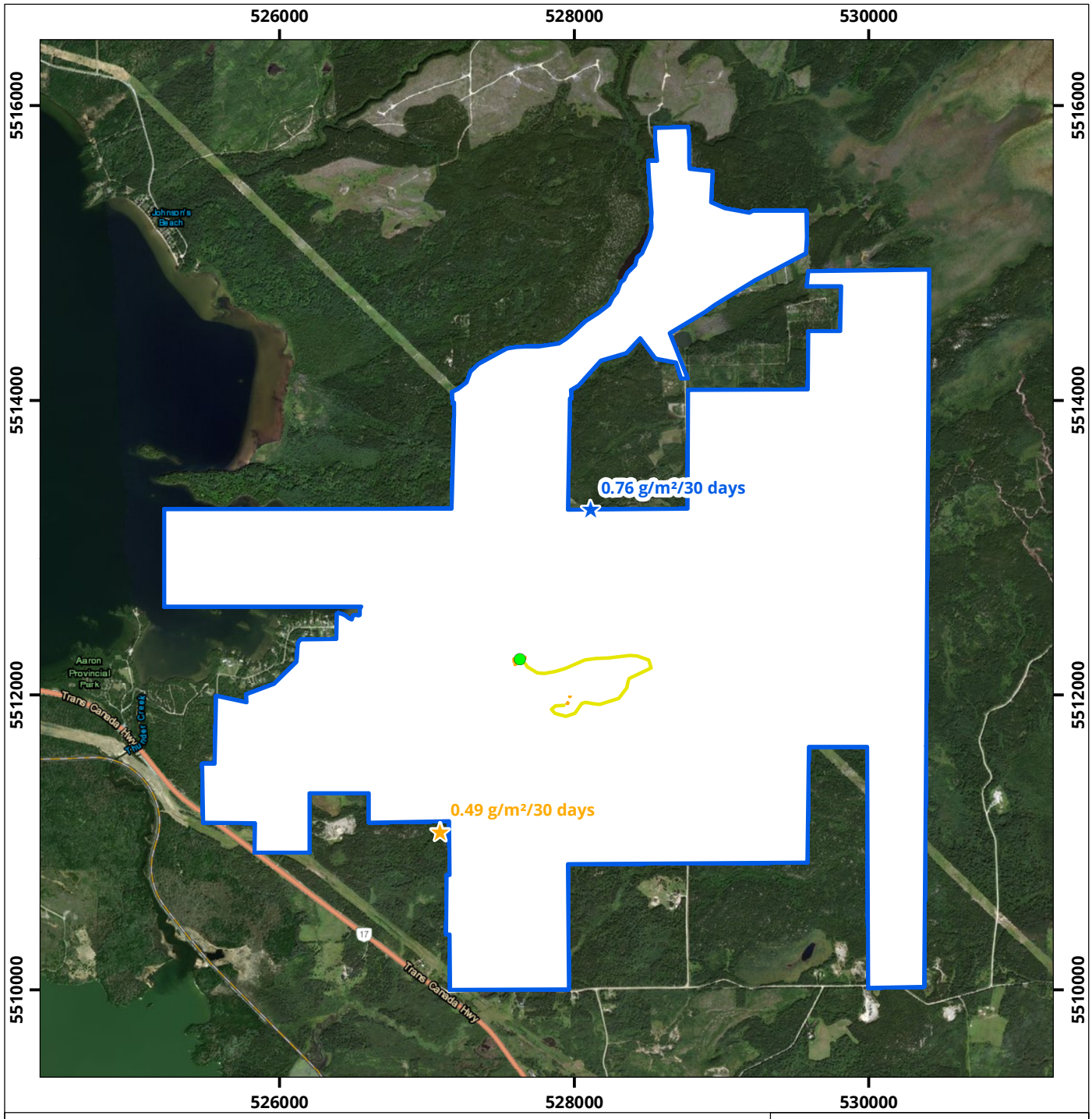
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 11c
Approx. Scale:	1:40,000
Date Revised:	Nov 30, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Dustfall (g/m²/30 days)

1.2 - 2.3

2.3 - 3.5

3.5 - 4.6

> 4.6

= 4.6 g/m²/30 days (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

Dustfall Annual Contour Plot (Closure)

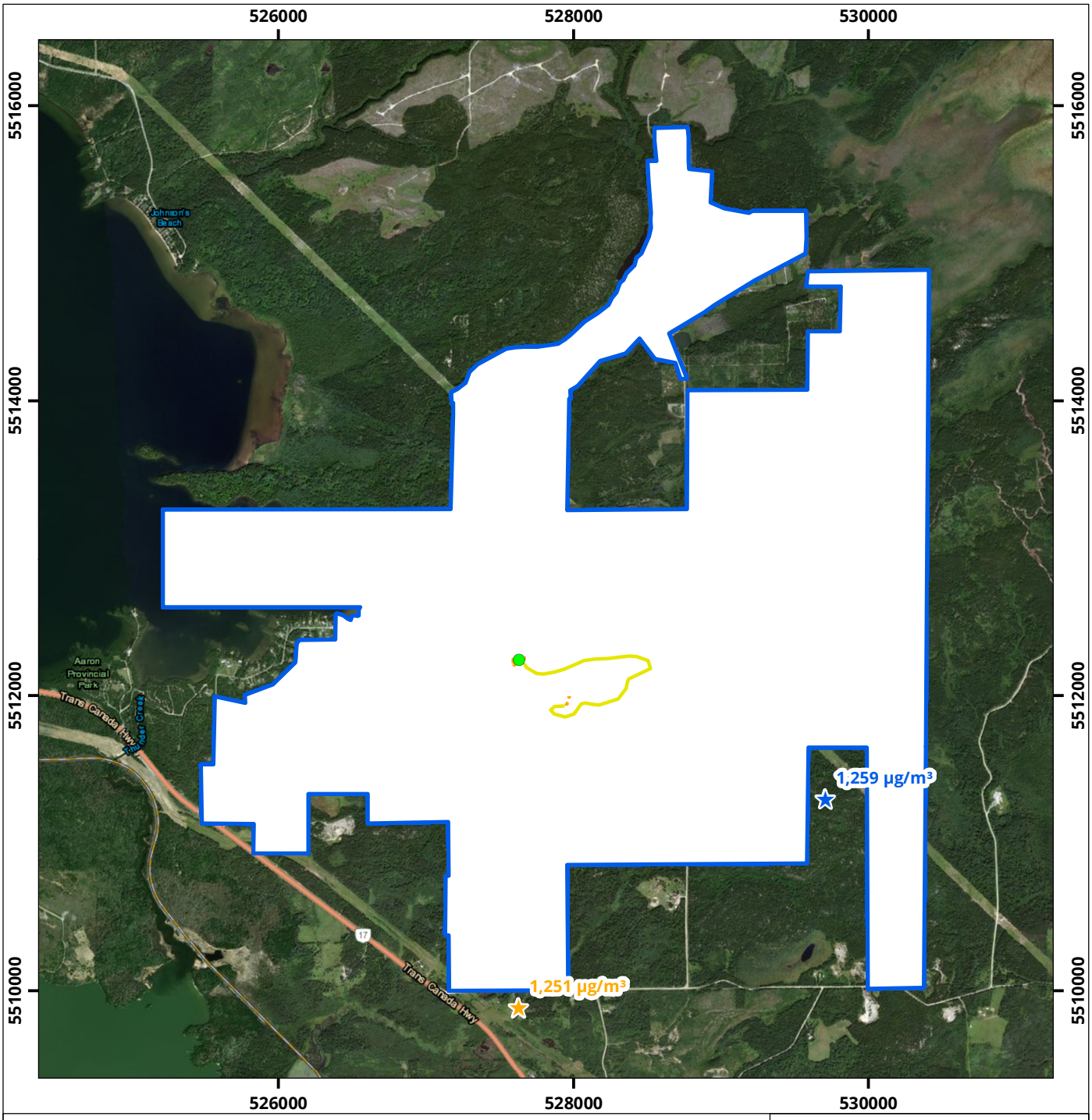
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 12c
Approx. Scale:	1:40,000
Date Revised:	Nov 30, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

- 9,050 - 18,100
- 18,100 - 27,150
- 27,150 - 36,200
- > 36,200

= 36,200 µg/m³ (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

CO 1hr Contour Plot (Closure)

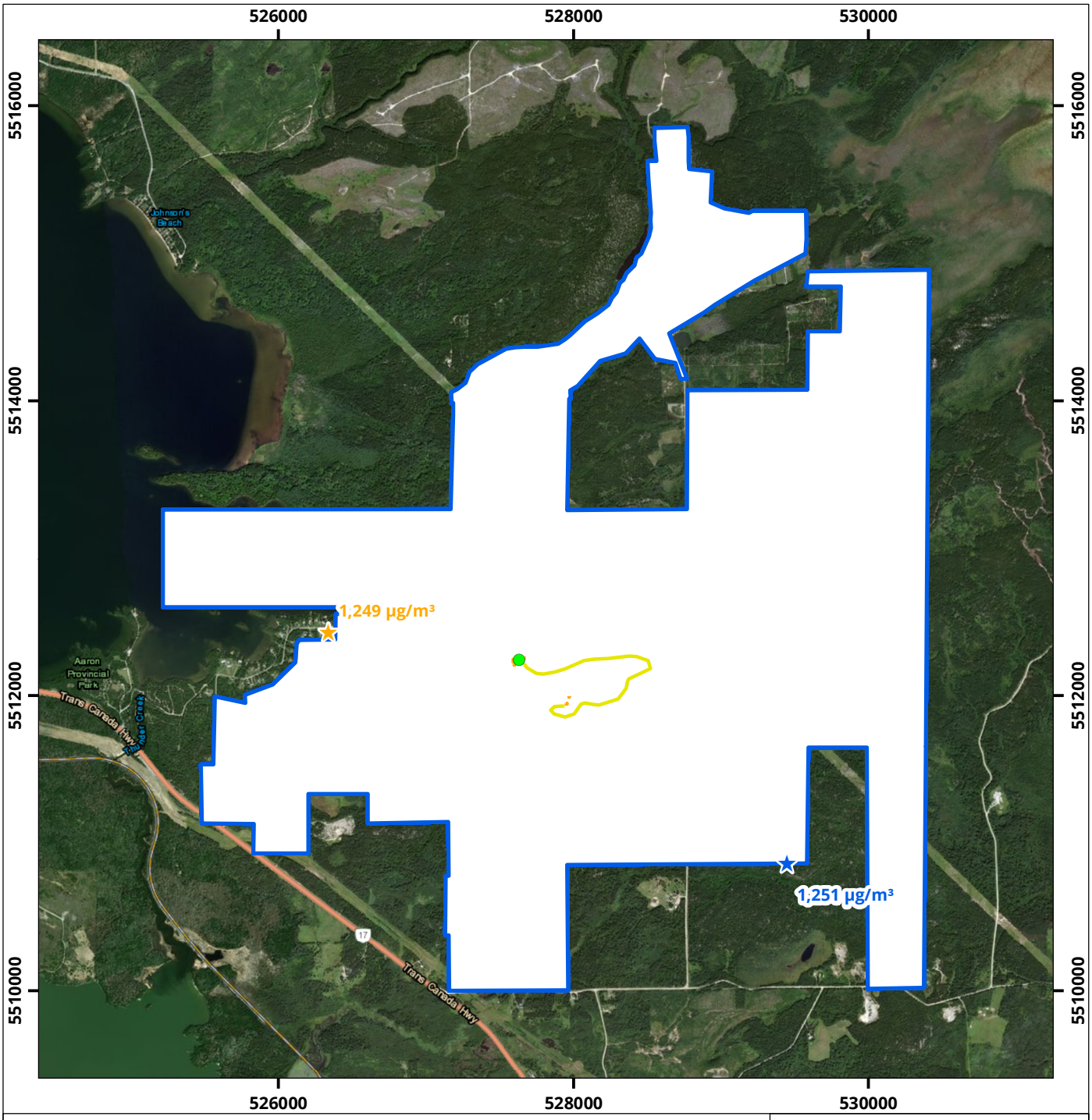
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 13c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

- 3,925 - 7,850
- 7,850 - 11,775
- 11,775 - 15,700
- > 15,700

= 15,700 µg/m³ (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

CO 8hr Contour Plot (Closure)

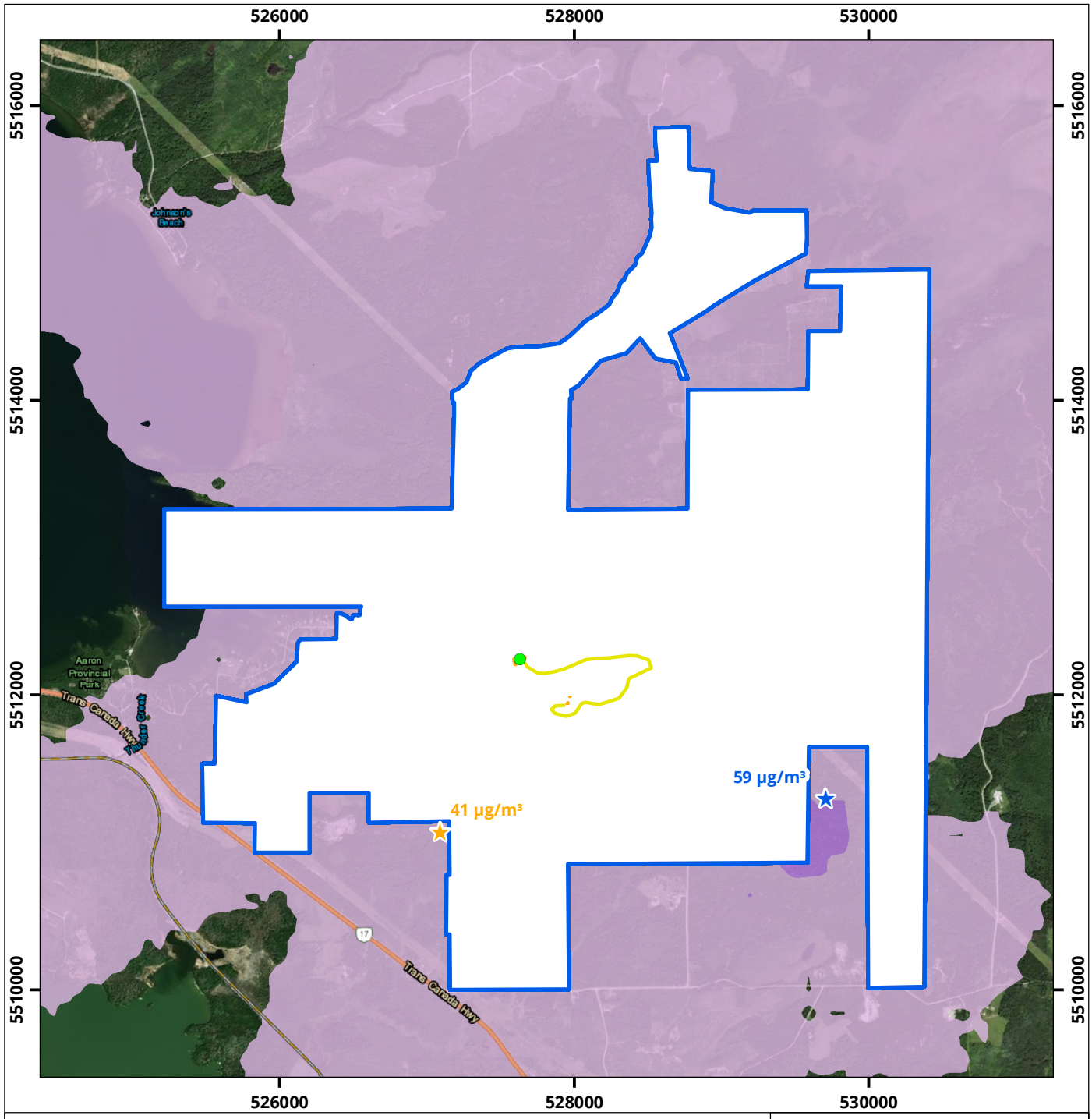
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 14c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

35 - 50

50 - 65

65 - 80

> 80

= 80 µg/m³ (CAAQS)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

NO_2 1hr Contour Plot (Closure)

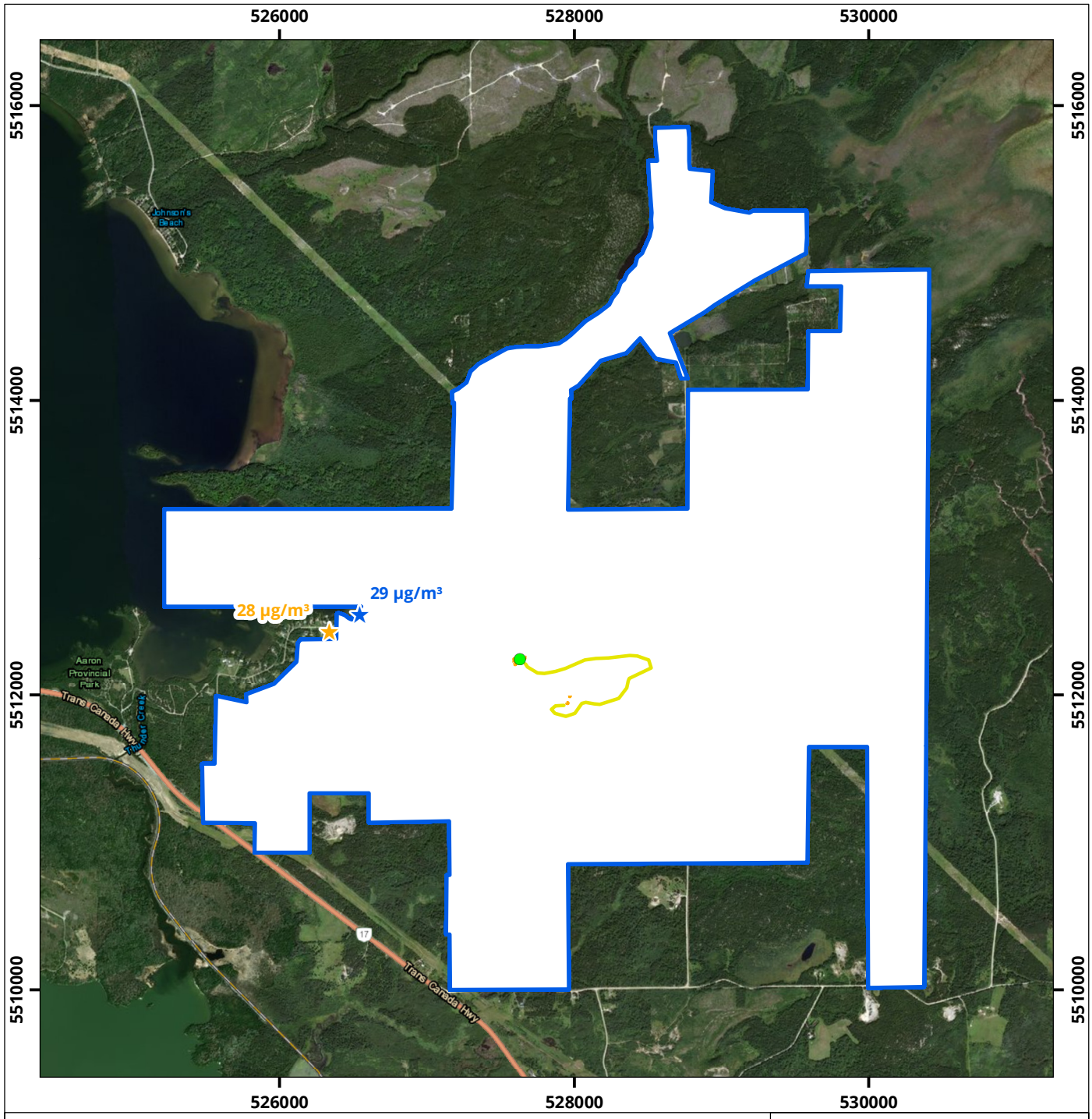
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 15c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

50 - 100

100 - 150

150 - 200

> 200

= 200 µg/m³ (AAQC)

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

NO_2 24hr Contour Plot (Closure)

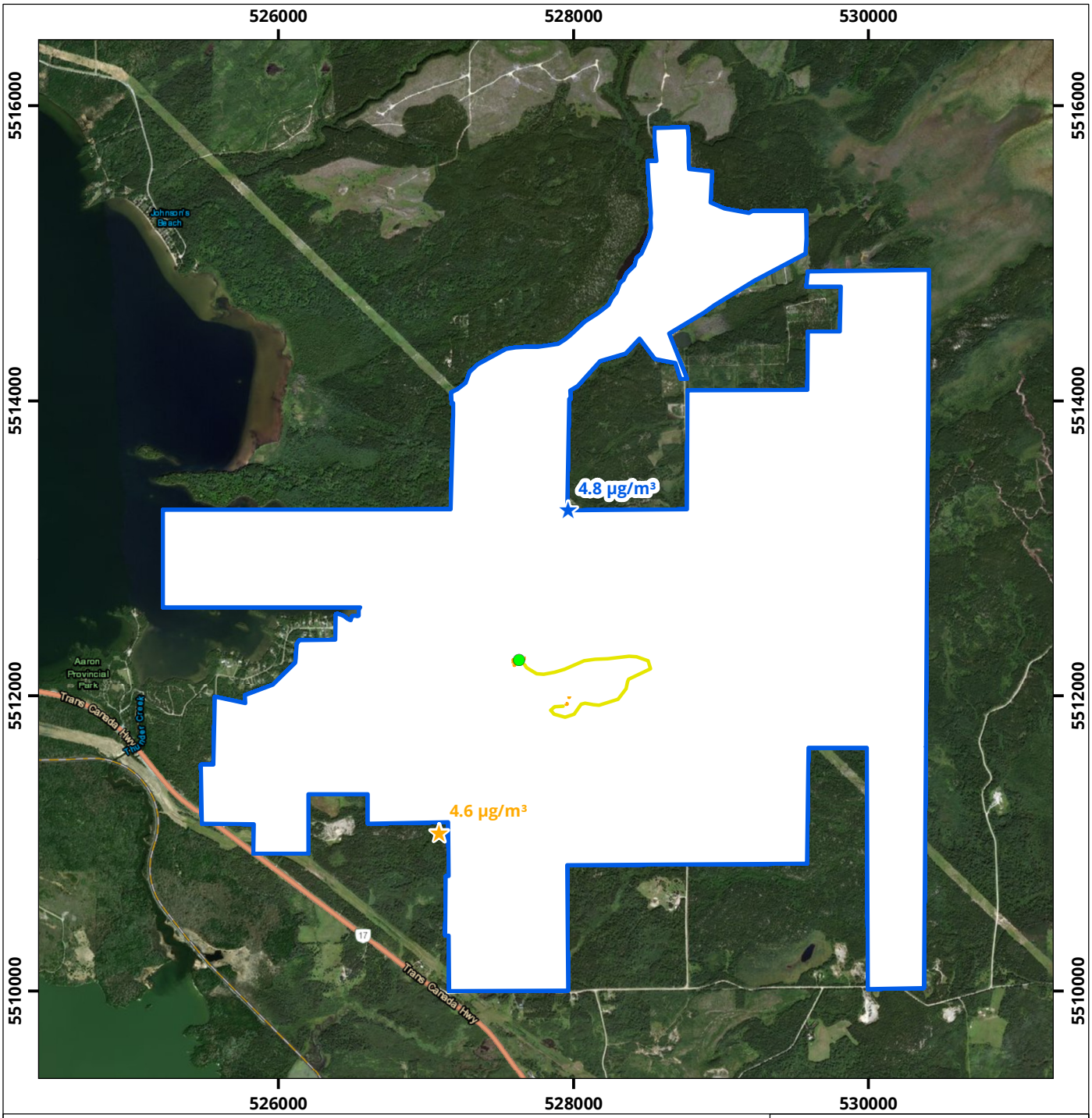
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 16c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

43 - 85

85 - 128

128 - 170

> 170

= 170 µg/m³ (CAAQS)

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

SO_2 1hr Contour Plot (Closure)

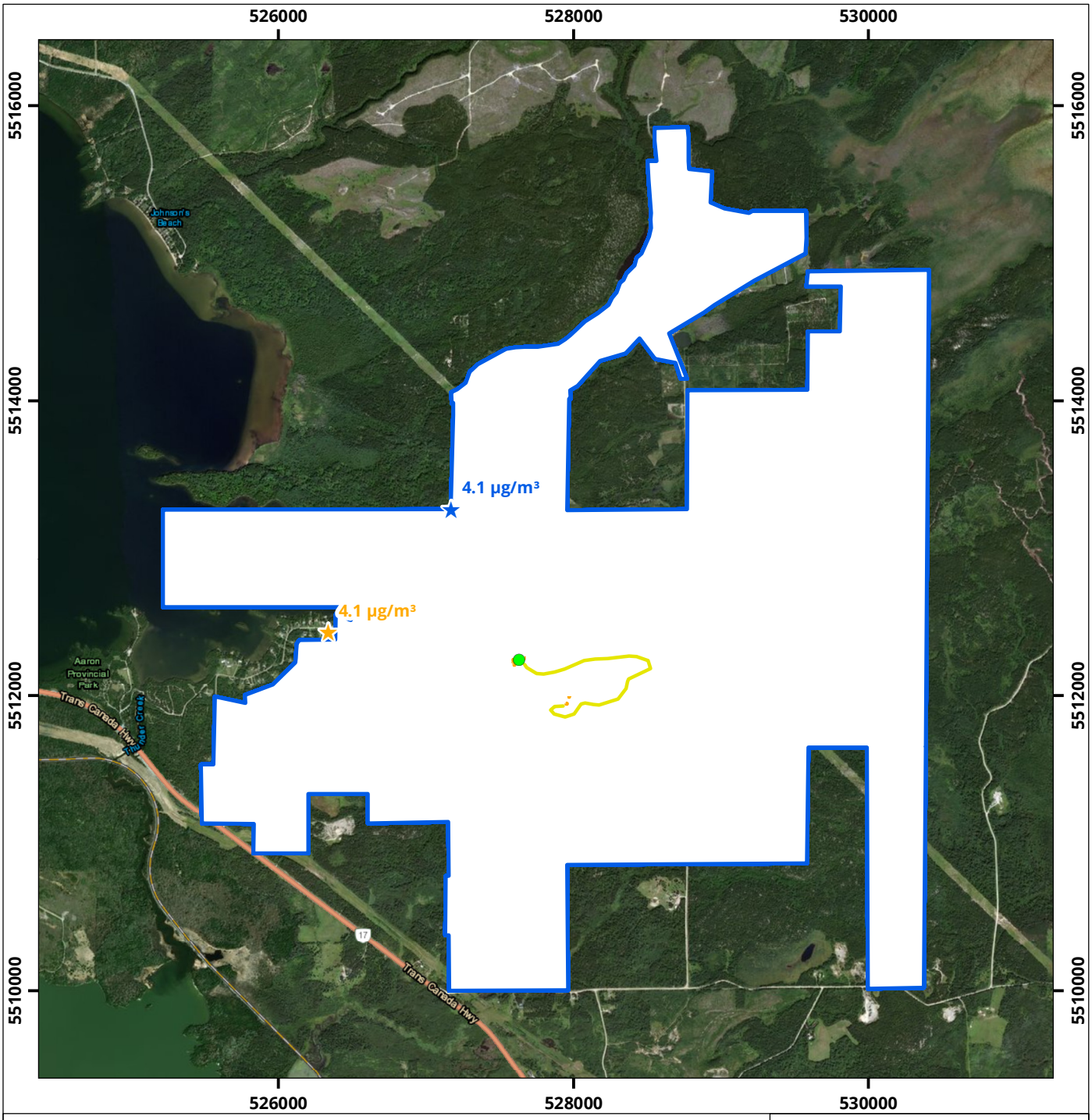
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 17c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

69 - 138

138 - 206

206 - 275

> 275

= 275 µg/m³ (AAQC)

Service Layer Credits:
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

SO_2 24hr Contour Plot (Closure)

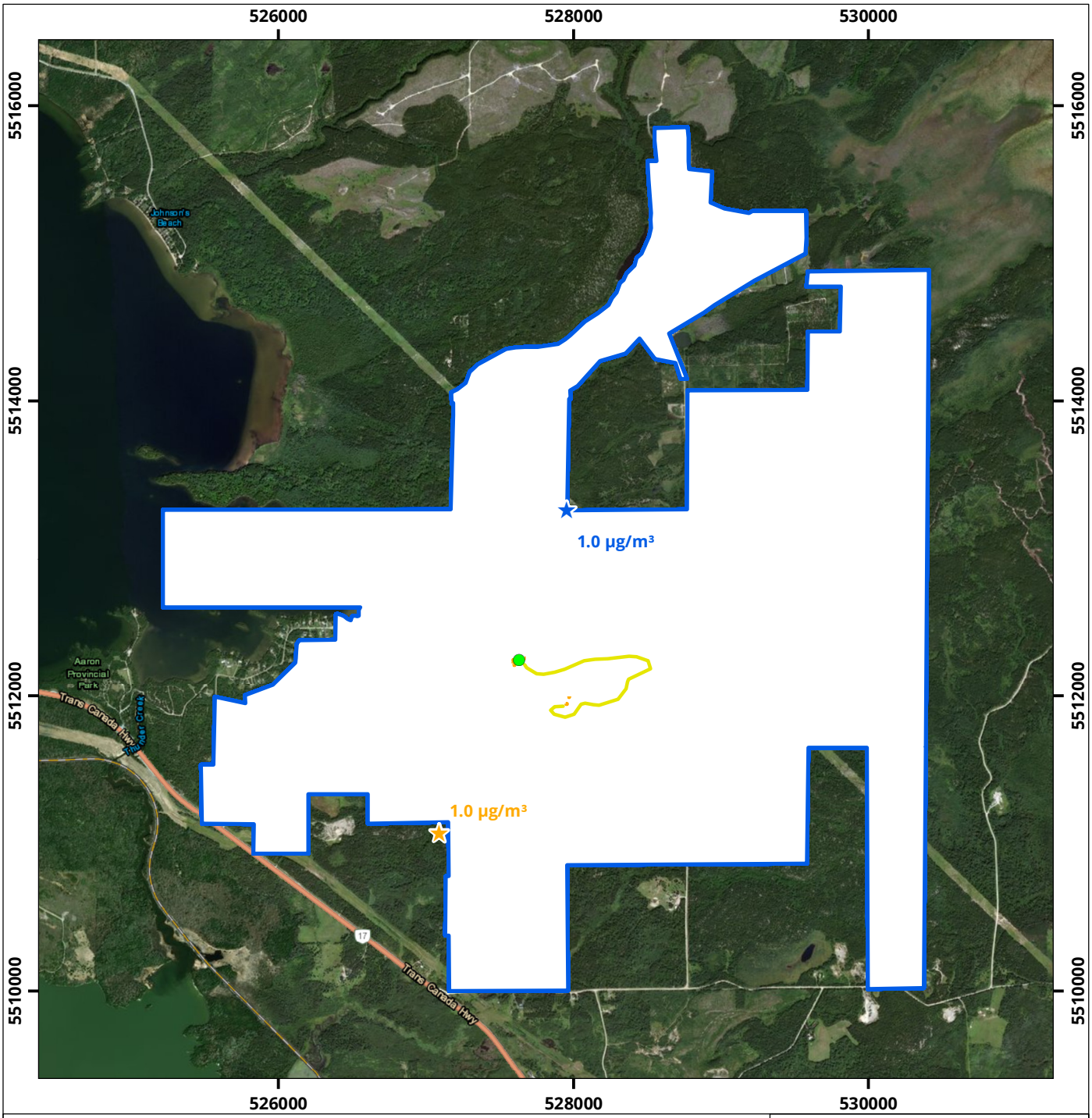
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 18c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

2 - 4

4 - 6

6 - 8

> 8

= 8 µg/m³ (CAAQS)

0 500 1,000 1,500 m

SO_2 Annual Contour Plot (Closure)

True North

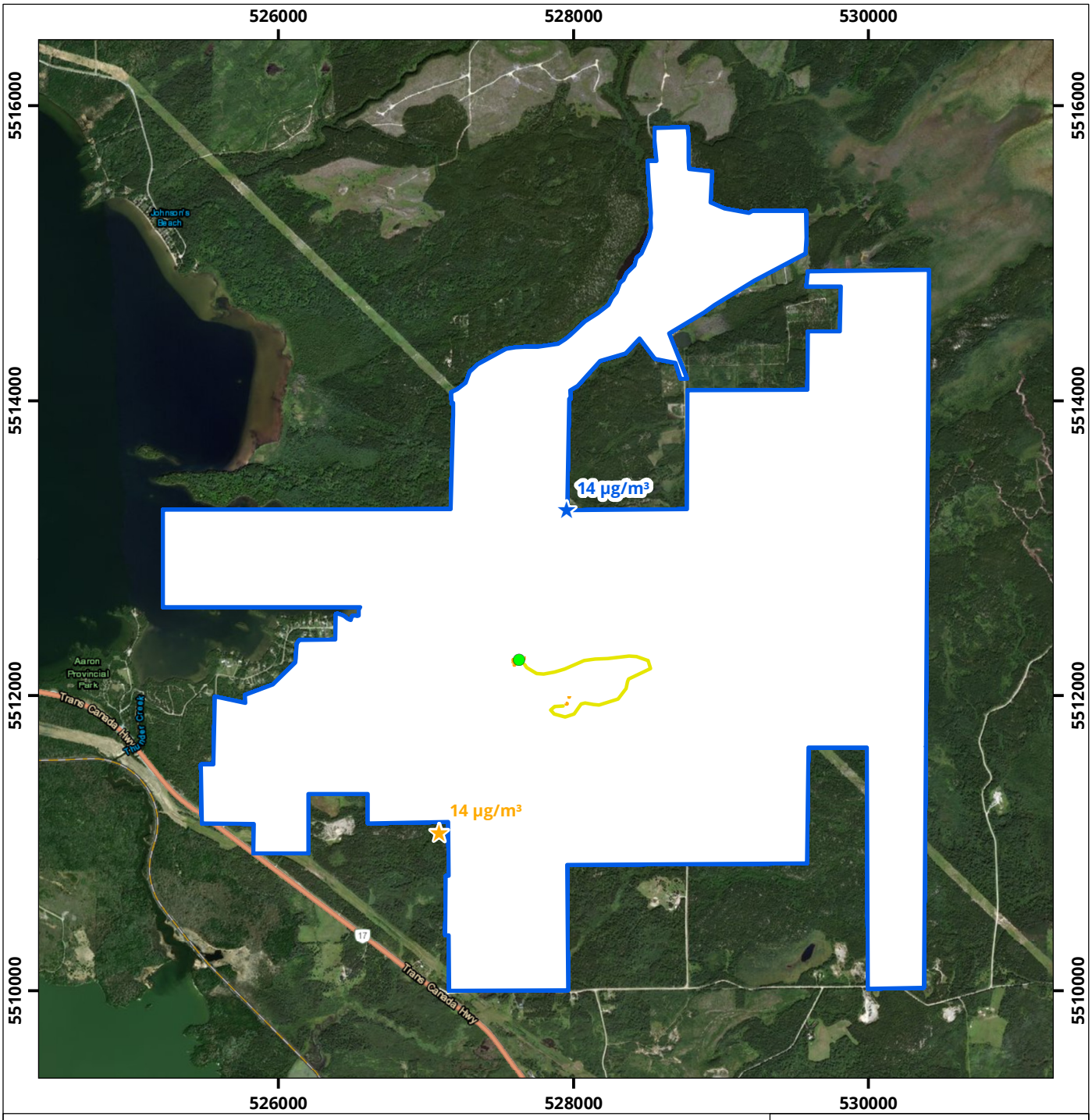
Map Projection: NAD 1983 UTM Zone 15N

Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 19c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\dj\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



Maximum Point of Impingement (MPOI)

Sensitive Receptor Maximum

Point Sources

Volume Sources

Roads

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Concentration (µg/m³)

17 - 19

19 - 21

21 - 23

> 23

= 23 µg/m³ (CAAQS)

Service Layer Credits:
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Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 500 1,000 1,500 m

NO_2 Annual Contour Plot (Closure)

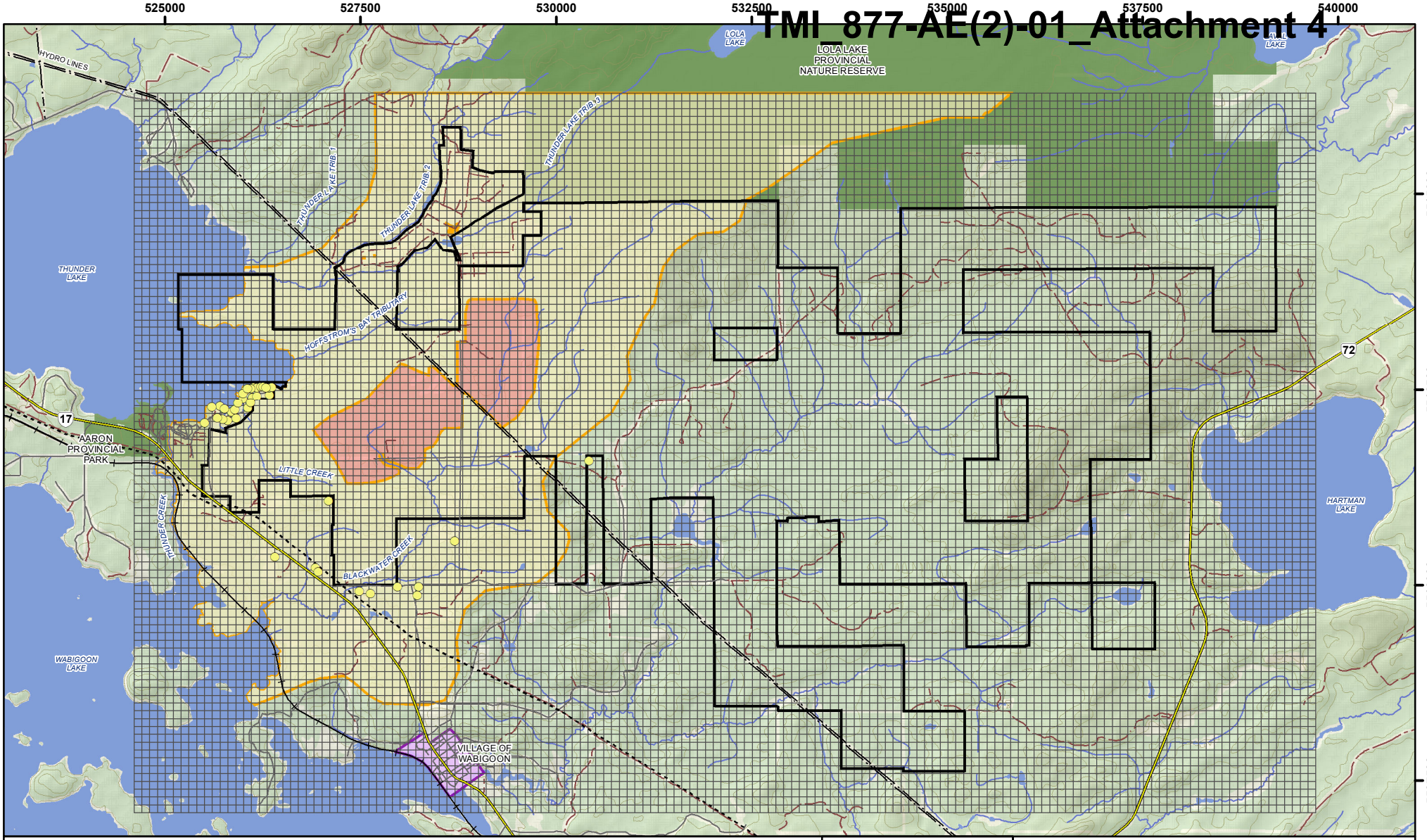
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by: DJH	Figure: 20c
Approx. Scale:	1:40,000
Date Revised:	Nov 29, 2018

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\GIS Temp\1602163\1602163 - Goliath Gold - Contour Plot Template_181129.mxd



P:\2016\Projects\TC160516_TML_GGP_Support_JRs\02_Work_Files\GIS\Human_Health_Risk_Assessment\MXD\Human_Helth_Risk_Assess_Study_Areas_7.mxd

LEGEND

- Air Modelling Grid
- Sensitive Receptors
- Railway
- Hydro Line
- Natural Gas Pipeline
- Highway
- Local Street
- Resource / Recreation Trail
- Provinical Park
- Watercourse
- Waterbody
- Contours (10 m interval)
- Property Boundary

Human Health and Ecological Risk Assessment Study Areas

- 1. Operations Area
- 2. Local Study Area
- 3. Village of Wabigoon

NOTES:
- Topographic data extracted from Land Information Ontario (LIO), MNRF.
- Watercourses represent pre-development conditions based on LIO database, as modified by KBM.

Datum: NAD83
Projection: UTM Zone 15N

N W E S

0 1 2 4 6 8 10 Kilometres

TREASURY METALS Inc. wood.

GOLIATH GOLD PROJECT

Human Health and Ecological Risk Assessment Study Areas

PROJECT N°: TC160516	**FIGURE: 3.1.1-1**
SCALE: 1:68,000	DATE: August 2018

TMI_877-AE(2)-01_Attachment 4

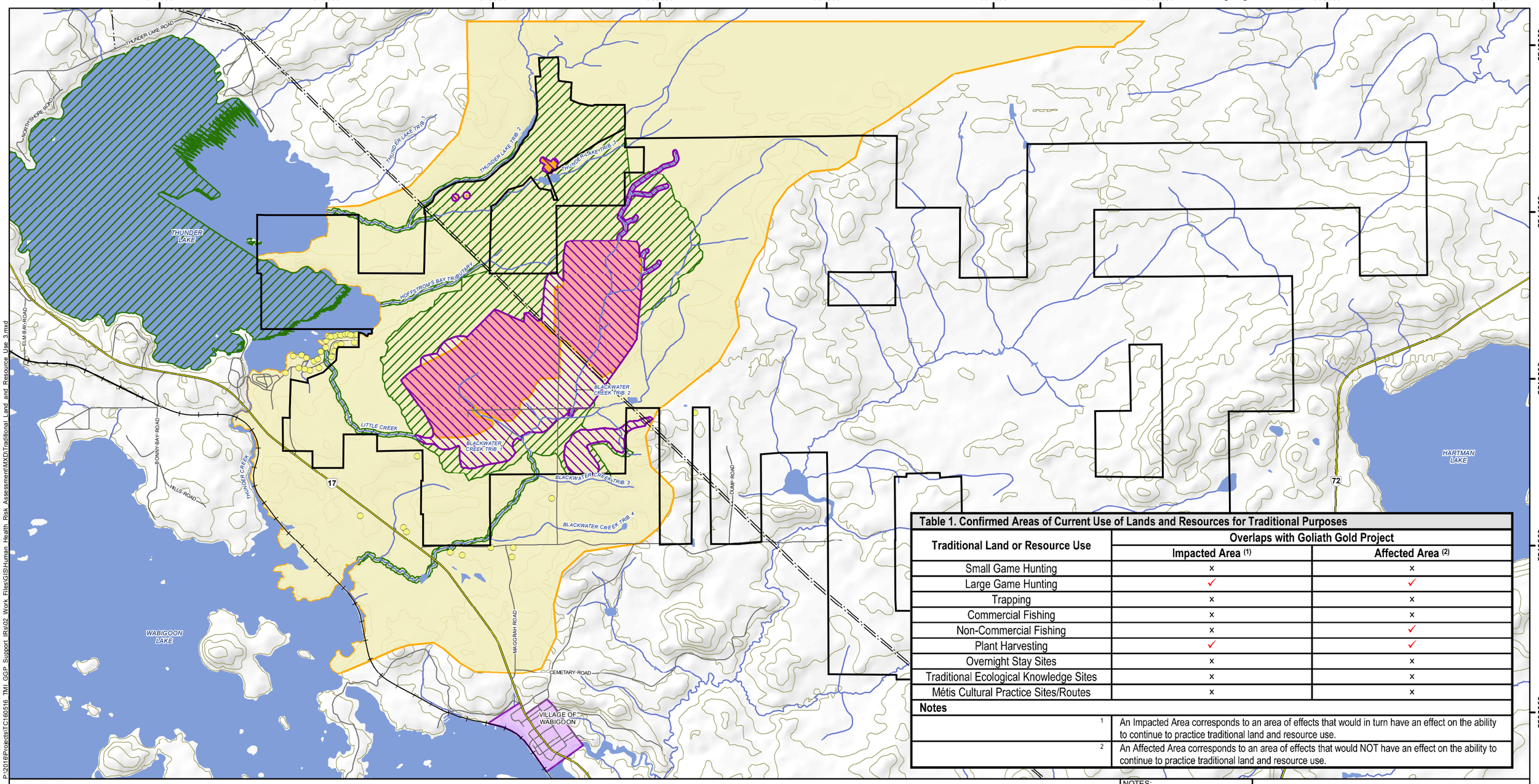


Table 1. Confirmed Areas of Current Use of Lands and Resources for Traditional Purposes

Traditional Land or Resource Use	Overlaps with Goliath Gold Project	
	Impacted Area (1)	Affected Area (2)
Small Game Hunting	×	×
Large Game Hunting	✓	✓
Trapping	×	×
Commercial Fishing	×	×
Non-Commercial Fishing	×	✓
Plant Harvesting	✓	✓
Overnight Stay Sites	×	×
Traditional Ecological Knowledge Sites	×	×
Métis Cultural Practice Sites/Routes	×	×

Notes

1. An Impacted Area corresponds to an area of effects that would in turn have an effect on the ability to continue to practice traditional land and resource use.
2. An Affected Area corresponds to an area of effects that would NOT have an effect on the ability to continue to practice traditional land and resource use.

LEGEND

- Sensitive Receptors
- Property Boundary
- Combined Impact Footprint
- Combined Affected Areas
- Highway
- Local Street
- Hydro Line

Human Health and Ecological Risk Assessment Study Areas

- 1. Operations Area
- 2. Local Study Area
- 3. Village of Wabigoon

0 0.5 1 2 3 4 5 Kilometres

NOTES:
- Topographic data extracted from Land Information Ontario (LIO), MNRF.
- Watercourses represent pre-development conditions based on LIO database, as modified by KBM.

Datum: NAD83
Projection: UTM Zone 15N

TREASURY wood. METALS Inc.

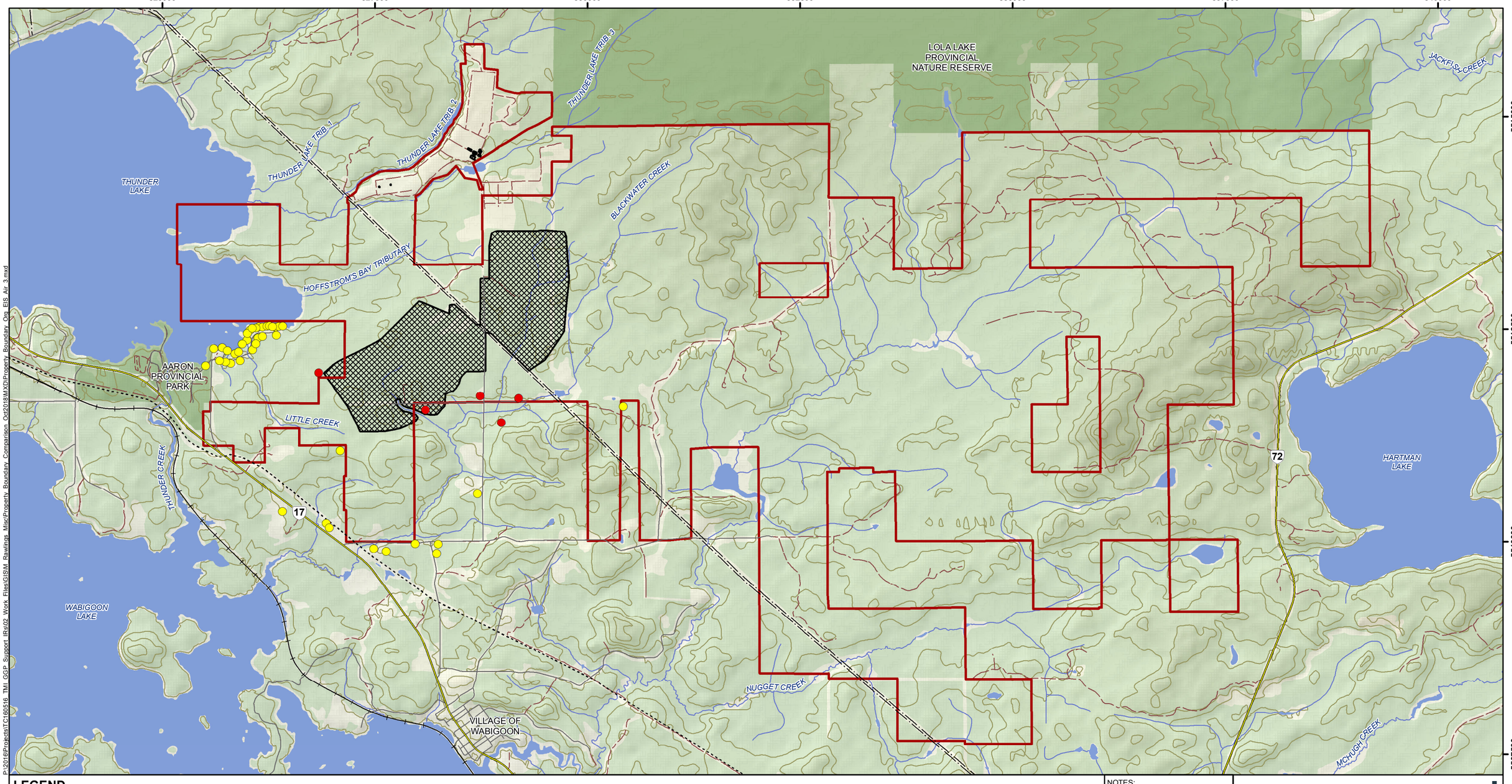
GOLIATH GOLD PROJECT

Spatial Extent of Effects on Traditional Land and Resource Use Including Country Foods

PROJECT N°: TC160516 | **FIGURE: 3.6.2-1**

SCALE: 1:44,000 | DATE: November 2018

P:\2016\Projects\TC160516_TMI_GGP_Support_IRs\02_Work_Files\GIS\Human_Health_Risk_Assessment\MXD\Traditional_Land_and_Resource_Use_3.mxd



P:\2016\Projects\TC160516 TMI GGP Support IRs\02 Work Files\GIS\M Rawlings Misc\Property Boundary Comparison Oct2018\MXD\Property Boundary Org EIS Air 3.mxd

LEGEND

- Sensitive Receptors
- Excluded Sensitive Receptors
- Operations Area
- Railway
- Hydro Line
- Natural Gas Pipeline
- Highway
- Local Street
- Resource / Recreation Trail
- Provinical Park
- Watercourse
- Waterbody
- Contours (10 m interval)
- Property Boundary (Orginal EIS, Revised EIS [April 2018], Round 1 IR Responses)

NOTES:
- Topographic data extracted from Land Information Ontario (LIO), MNRF.
- Watercourses represent pre-development conditions based on LIO database, as modified by KBM.

0 1 2 4 6 8 10 Kilometres

Datum: NAD83
Projection: UTM Zone 15N

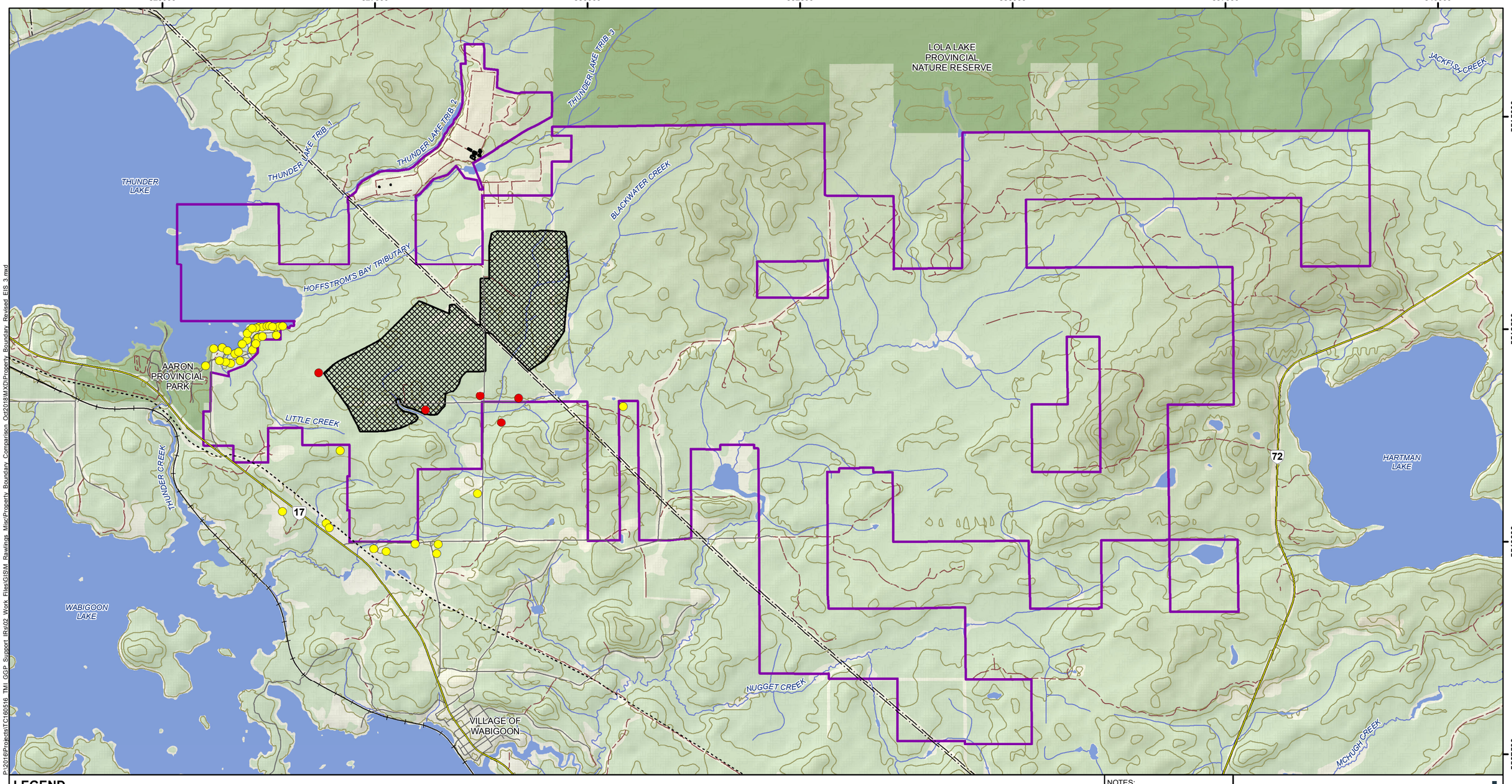
N W E S

TREASURY wood. METALS Inc.

GOLIATH GOLD PROJECT

Property Boundary for Air Modelling in Orginal EIS and Revised EIS (April 2018)

PROJECT N°: TC160516	**TMI_877-AE(2)-01_FIGURE_1**
SCALE: 1:42,000	DATE: November 2018



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LEGEND

- Sensitive Receptors
- Excluded Sensitive Receptors
- Operations Area
- Railway
- Hydro Line
- Natural Gas Pipeline
- Highway
- Local Street
- Resource / Recreation Trail
- Provinical Park
- Watercourse
- Waterbody
- Contours (10 m interval)
- Property Boundary (Revised EIS All Disciplines Except Air)

NOTES:
- Topographic data extracted from Land Information Ontario (LIO), MNRF.
- Watercourses represent pre-development conditions based on LIO database, as modified by KBM.

0 1 2 4 6 8 10 Kilometres

Datum: NAD83
Projection: UTM Zone 15N

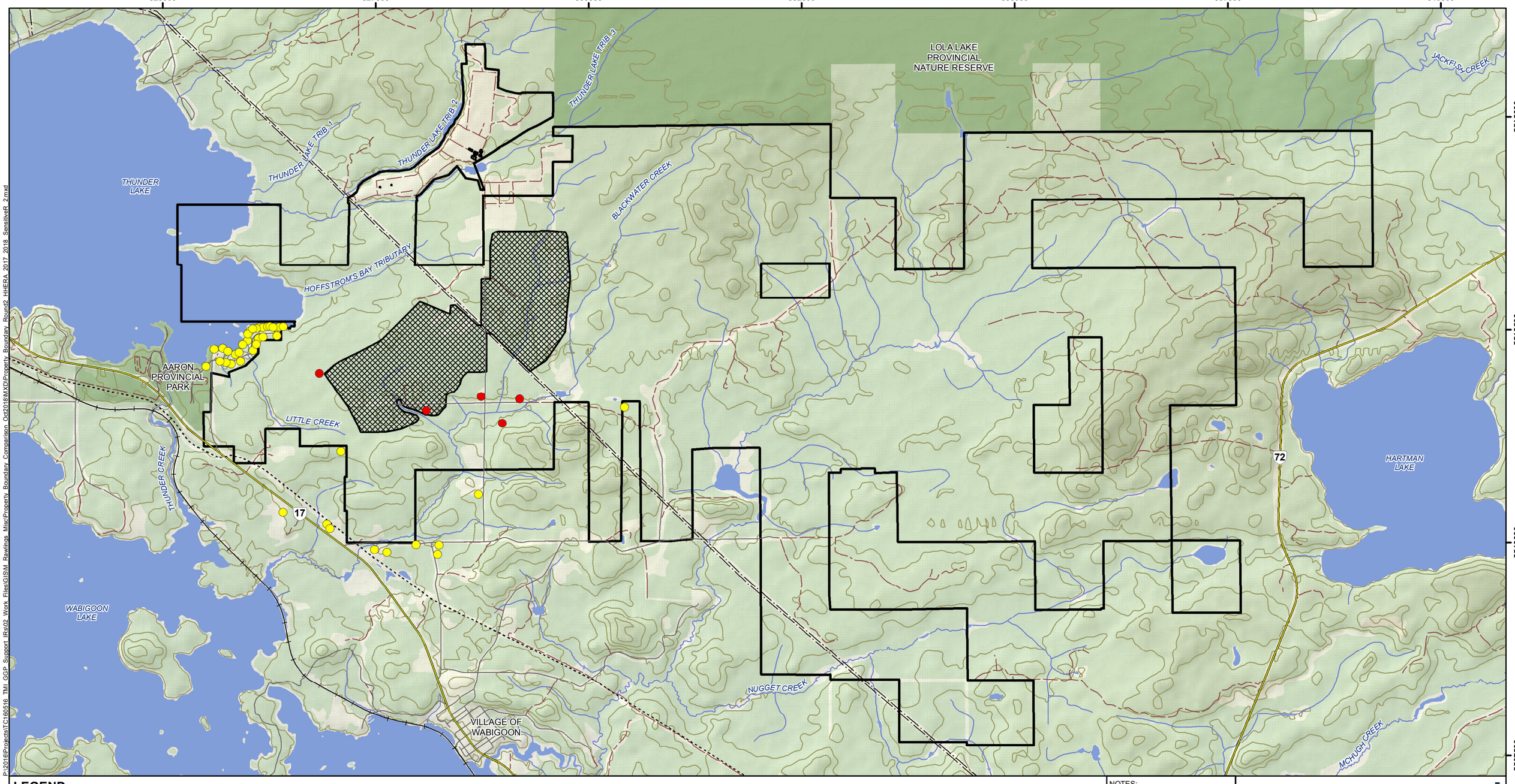
N W E S

TREASURY wood. METALS Inc.

GOLIATH GOLD PROJECT

Property Boundary Revised EIS (April 2018) (except air modelling)

PROJECT N°: TC160516	TMI_877-AE(2)-01_FIGURE_2
SCALE: 1:42,000	DATE: November 2018



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LEGEND

- Sensitive Receptors
- Excluded Sensitive Receptors
- Operations Area
- Railway
- Hydro Line
- Natural Gas Pipeline
- Highway
- Local Street
- Resource / Recreation Trail
- Provinical Park
- Watercourse
- Waterbody
- Contours (10 m interval)
- Property Boundary (Draft Round 2 IR Responses and HHERA)

NOTES:
- Topographic data extracted from Land Information Ontario (LIO), MNRF.
- Watercourses represent pre-development conditions based on LIO database, as modified by KBM.

Datum: NAD83
Projection: UTM Zone 15N

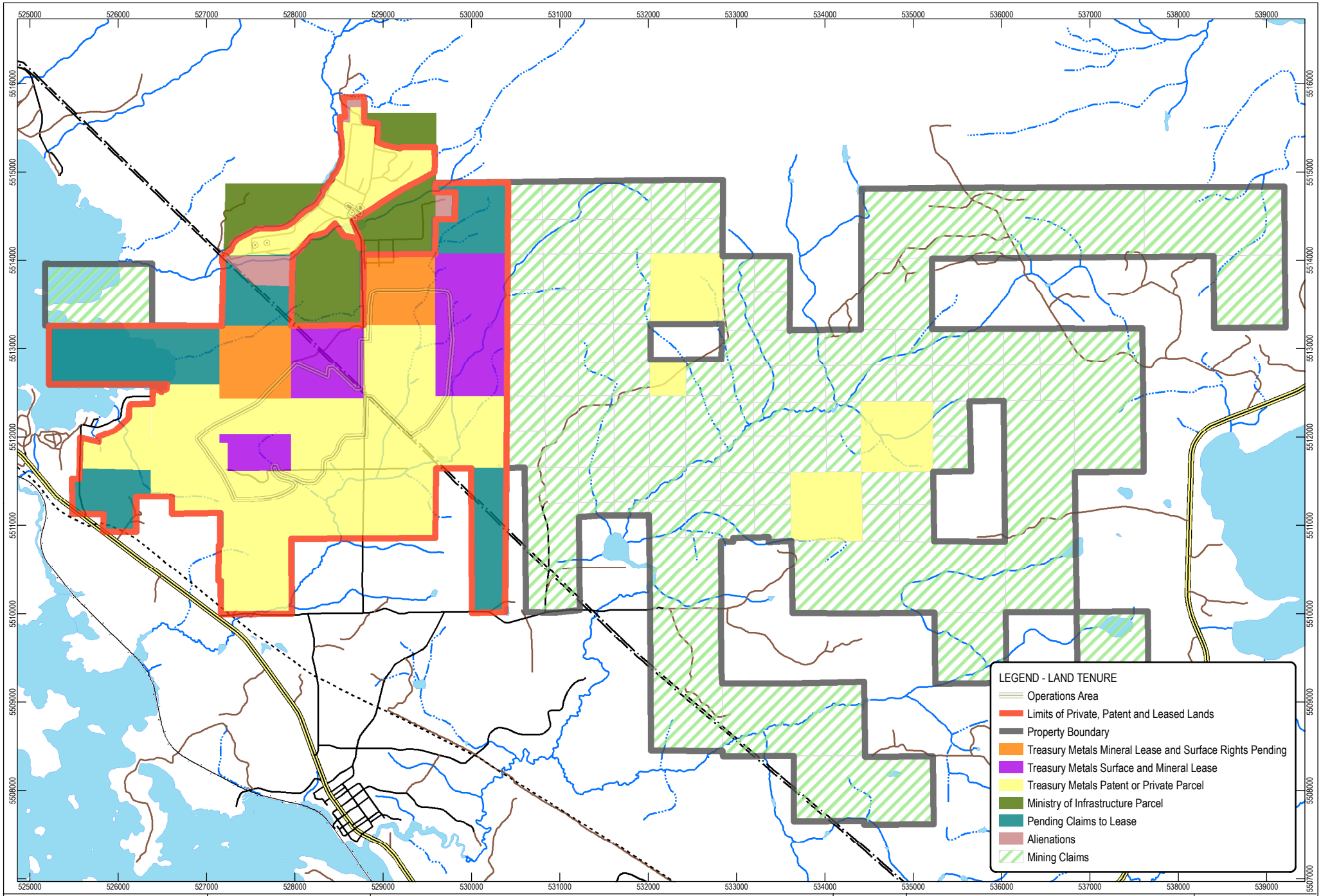
0 1 2 4 6 8 10 Kilometres

TREASURY wood. METALS Inc.

GOLIATH GOLD PROJECT

Property Boundary
Draft Round 2 IR Responses and 2018 HHERA

PROJECT N°: TC160516	**TMI_877-AE(2)-01_FIGURE_3**
SCALE: 1:42,000	DATE: November 2018



GOLIATH GOLD PROJECT
DRYDEN, ONTARIO, CANADA

Land Tenure
Goliath Gold Project

Figure: #4 | REV.05

TREASURY METALS Inc.

DESIGN:	MP	10/08/2018
GIS:	MP	10/08/2018
CHECK:	MW	10/08/2018
REVIEW:	MW	10/08/2018

- Hydro Line
- Natural Gas Pipeline
- Railway
- Expressway / Highway
- Local Road
- Resource / Recreation Road
- Waterbody
- Intermittent Watercourse
- Permanent Watercourse

SCALE 1:55,000

N

0 3,000
Meters

Base Data:
Treasury Metals Inc., LIO Database
Projection:
NAD83 UTM Zone 15N
Notes:
All details preliminary and subject to change as Project develops

TMI_877-AE(2)-01_Table_1: Predicted Air Quality Effects – Site Preparation and Construction

Compound	Averaging Period	Maximum at Gridded Receptors (MPOI)			Maximum at Sensitive Receptors		
		Modelled Prediction	Background (1)	Cumulative Prediction	Modelled Prediction	Background (1)	Cumulative Prediction
TSP	24-hour	22	33	55	17	33	50
	Annual	3.8	14	18	2.7	14	17
PM_{10}	24-hour	6.2	15	21	4.7	15	20
$PM_{2.5}$	24-hour	0.90	10	11	0.76	10	11
	Annual	0.15	4.3	4.5	0.12	4.3	4.4
Dustfall (2)	30 day	0.96	— (3)	0.96	0.65	—	0.65
	Annual	0.76	—	0.76	0.51	—	0.51
CO	1-hour	15	1,248	1263	8.6	1,248	1,257
	8-hour (4)	5.1	1,248	1253	2.5	1,248	1,251
NO_2	1-hour	50	29	79	36	29	65
	24-hour	7.2	25	32	5.9	25	30
	Annual	1.0	14	15	0.84	14	15
SO_2	1-hour	0.77	4.0	4.8	0.65	4.0	4.7
	24-hour	0.11	4.0	4.1	0.082	4.0	4.1
	Annual	0.013	1.0	1.0	0.010	1.0	1.0
Arsenic	24-hour	0.00072	0.001	0.0017	0.00054	0.001	0.0015
Barium	24-hour	0.011	—	0.011	0.0079	—	0.008
Beryllium	24-hour	0.000053	—	0.000053	0.000040	—	0.000040
Cadmium	24-hour	0.000076	—	0.000076	0.000057	—	0.000057
Chromium	24-hour	0.0032	0.005	0.0082	0.0024	0.005	0.0074
Cobalt	24-hour	0.00027	—	0.00027	0.00020	—	0.00020
Lead	24-hour	0.0025	0.005	0.0075	0.0019	0.005	0.0069
Manganese	24-hour	0.013	0.019	0.032	0.0095	0.019	0.028
Nickel	24-hour	0.00086	—	0.00086	0.00065	—	0.00065
	Annual	0.00086	—	0.00086	0.00065	—	0.00065
Phosphorous	24-hour	0.011	—	0.011	0.0085	—	0.0085
Platinum	24-hour	0.00045	—	0.00045	0.00034	—	0.00034
Rhodium	24-hour	0.00013	—	0.00013	0.00010	—	0.00010
Thallium	24-hour	0.00038	—	0.00038	0.00028	—	0.00028
Titanium	24-hour	0.041	—	0.041	0.031	—	0.031
Uranium	24-hour	0.00022	—	0.00022	0.00017	—	0.00017
	Annual	0.00022	—	0.00022	0.00017	—	0.00017
Vanadium	24-hour	0.0011	—	0.0011	0.00081	—	0.00081

Notes:

The above table supersedes Table 6.6.4.1-2 of the revised EIS (April 2018).

(1) The 1-hour and 24-hour background values were based on 90th percentile of the monitoring data. The annual background values were based on the highest of the annual mean value over the latest 5 years of available monitoring data (see Section 5.2.4)

(2) Predicted dustfall values are in units of g/m²/30 days. Annual values are averaged over 12 months.

(3) The "—" in the table indicates that background values were not available for the compound.

(4) The 8-hour predicted CO concentration is calculated from 1-hr predicted concentration using a published conversion factor [Ontario Regulation 419/05, 17(2)].

TMI_877-AE(2)-01_Table_2: Predicted Air Quality Effects – Operations

Compound	Averaging Period	Maximum at Gridded Receptors (MPOI)			Maximum at Sensitive Receptors		
		Modelled Prediction	Background (1)	Cumulative Prediction	Modelled Prediction	Background (1)	Cumulative Prediction
TSP	24-hour	28	33	61	14	33	47
	Annual	3.6	14	18	2.3	14	16.3
PM_{10}	24-hour	22	15	37	3.9	15	19
$PM_{2.5}$	24-hour	13	10	23	0.95	10	11
	Annual	0.73	4.3	5.0	0.16	4.3	4.5
Dustfall (2)	30 day	1.5	— (3)	1.52	0.57	—	0.57
	Annual	0.95	—	0.95	0.45	—	0.45
CO	1-hour	25	1,248	1273	10	1,248	1258
	8-hour	13	1,248	1261	4.5	1,248	1253
NO_2	1-hour	80	29	110	28	29	57
	24-hour	35	25	60	6.6	25	31
	Annual	9.2	14	23	0.99	14	15
SO_2	1-hour	4.6	4.0	8.6	0.18	4.0	4.2
	24-hour	2.2	4.0	6.2	0.022	4.0	4.0
	Annual	0.58	1.0	1.6	0.0024	1.0	1.0
Arsenic	24-hour	0.00090	0.001	0.0019	0.00044	0.001	0.0014
Barium	24-hour	0.013	—	0.013	0.0065	—	0.0065
Beryllium	24-hour	0.000066	—	0.000066	0.000033	—	0.000033
Cadmium	24-hour	0.000095	—	0.000095	0.000047	—	0.000047
Chromium	24-hour	0.0040	0.005	0.0090	0.0020	0.005	0.0070
Cobalt	24-hour	0.00033	—	0.00033	0.00016	—	0.00016
Lead	24-hour	0.0031	0.005	0.0081	0.0015	0.005	0.0065
Manganese	24-hour	0.016	0.019	0.035	0.0078	0.019	0.027
Nickel	24-hour	0.0011	—	0.0011	0.00053	—	0.00053
	Annual	0.0011	—	0.0011	0.00053	—	0.00053
Phosphorous	24-hour	0.014	—	0.014	0.0070	—	0.0070
Platinum	24-hour	0.00057	—	0.00057	0.00028	—	0.00028
Rhodium	24-hour	0.00017	—	0.00017	0.00008	—	0.00008
Thallium	24-hour	0.00048	—	0.00048	0.00023	—	0.00023
Titanium	24-hour	0.051	—	0.051	0.025	—	0.025
Uranium	24-hour	0.00028	—	0.00028	0.00014	—	0.00014
	Annual	0.00028	—	0.00028	0.00014	—	0.00014
Vanadium	24-hour	0.0014	—	0.0014	0.00066	—	0.00066

Notes:

The above table supersedes Table 6.6.4.2-2 of the revised EIS (April 2018).

(1) The 1-hour and 24-hour background values were based on 90th percentile of the monitoring data. The annual background values were based on the highest of the annual mean value over the latest 5 years of available monitoring data (see Section 5.2.4)

(2) Predicted dustfall values are in units of g/m²/30 days. Annual values are averaged over 12 months.

(3) The "—" in the table indicates that background values were not available for the compound.

TMI_877-AE(2)-01_Table_3: Predicted Air Quality Effects – Closure

Compound	Averaging Period	Maximum at Gridded Receptors (MPOI)			Maximum at Sensitive Receptors		
		Modelled Prediction	Background (1)	Cumulative Prediction	Modelled Prediction	Background (1)	Cumulative Prediction
TSP	24-hour	23	33	56	17	33	50
	Annual	3.8	14	18	2.7	14	16.7
PM_{10}	24-hour	6.2	15	21	4.5	15	20
$PM_{2.5}$	24-hour	0.83	10	11	0.65	10	11
	Annual	0.15	4.3	4.5	0.11	4.3	4.4
Dustfall (2)	30 day	0.95	— (3)	0.95	0.63	—	0.63
	Annual	0.76	—	0.76	0.49	—	0.49
CO	1-hour	11	1248	1259	3.5	1,248	1251
	8-hour	3.3	1,248	1,251	1.4	1,248	1249
NO_2	1-hour	30	29	59	12	29	41
	24-hour	4.0	25	29	3.3	25	28
	Annual	0.70	14	14	0.48	14	14
SO_2	1-hour	0.78	4.0	4.8	0.60	4.0	4.6
	24-hour	0.14	4.0	4.1	0.11	4.0	4.1
	Annual	0.015	1.0	1.0	0.0092	1.0	1.0
Arsenic	24-hour	0.00072	0.001	0.0017	0.00053	0.001	0.0015
Barium	24-hour	0.011	—	0.011	0.0078	—	0.0078
Beryllium	24-hour	0.000053	—	0.000053	0.000039	—	0.000039
Cadmium	24-hour	0.000077	—	0.000077	0.000056	—	0.000056
Chromium	24-hour	0.0033	0.005	0.0083	0.0024	0.005	0.0074
Cobalt	24-hour	0.00027	—	0.00027	0.00020	—	0.00020
Lead	24-hour	0.0025	0.005	0.0075	0.0018	0.005	0.0068
Manganese	24-hour	0.013	0.019	0.032	0.0093	0.019	0.028
Nickel	24-hour	0.00087	—	0.00087	0.00063	—	0.00063
	Annual	0.00087	—	0.00087	0.00063	—	0.00063
Phosphorous	24-hour	0.011	—	0.011	0.0084	—	0.0084
Platinum	24-hour	0.00046	—	0.00046	0.00033	—	0.00033
Rhodium	24-hour	0.00014	—	0.00014	0.00010	—	0.00010
Thallium	24-hour	0.00038	—	0.00038	0.00028	—	0.00028
Titanium	24-hour	0.041	—	0.041	0.030	—	0.030
Uranium	24-hour	0.00023	—	0.00023	0.00017	—	0.00017
	Annual	0.00023	—	0.00023	0.00017	—	0.00017
Vanadium	24-hour	0.0011	—	0.0011	0.00079	—	0.00079

Notes:

The above table supersedes Table 6.6.4.3-2 of the revised EIS (April 2018).

(1) The 1-hour and 24-hour background values were based on 90th percentile of the monitoring data. The annual background values were based on the highest of the annual mean value over the latest 5 years of available monitoring data (see Section 5.2.4)

(2) Predicted dustfall values are in units of $g/m^2/30$ days. Annual values are averaged over 12 months.

(3) The "—" in the table indicates that background values were not available for the compound.

NO2 Frequency Analysis

Treasury Metals

Receptor Information					Maximum Predicted 1-hour Concentration	Cummulative Concentration	Predicted Excursions of Cumulative Concentrations Above CAAQS (79µg/m³) Over 5 Year Period	
ID#	Description	X (m)	Y (m)	Z (m)	(ug/m³)	(ug/m³)	Count (hours)	Frequency (%)
R01	Gridded Receptor	528483	5514372	400.0	50.1	79.1	6	<0.1%
R02	Gridded Receptor	528463	5514392	399.6	56.2	85.2	100	0.2%
R03	Gridded Receptor	528463	5514372	399.4	49.1	78.1	0	n/a
R04	Gridded Receptor	528452	5514424	401.6	70.9	99.9	112	0.3%
R05	Gridded Receptor	528433	5514403	400.5	57.3	86.3	63	0.1%
R06	Gridded Receptor	528439	5514410	400.7	61.3	90.3	89	0.2%
R07	Gridded Receptor	528446	5514417	400.9	65.8	94.8	102	0.2%
R08	Gridded Receptor	528458	5514416	400.8	66.8	95.8	91	0.2%
R09	Gridded Receptor	528464	5514408	400.4	63.6	92.6	77	0.2%
R10	Gridded Receptor	528469	5514400	400.1	60.4	89.4	60	0.1%
R11	Gridded Receptor	528475	5514392	399.9	57.3	86.3	53	0.1%
R12	Gridded Receptor	528481	5514384	400.0	54.4	83.4	36	<0.1%
R13	Gridded Receptor	528486	5514377	400.0	51.6	80.6	24	<0.1%
R14	Gridded Receptor	528492	5514369	400.0	49.0	78.0	0	n/a
R15	Gridded Receptor	528650	5514456	408.7	53.1	82.1	44	0.1%
R16	Gridded Receptor	528654	5514446	407.6	50.0	79.0	0	n/a
R17	Gridded Receptor	528658	5514460	408.8	51.3	80.3	23	<0.1%
R18	Gridded Receptor	528667	5514465	408.7	49.2	78.2	0	n/a
R19	Gridded Receptor	528675	5514470	408.7	49.9	78.9	0	n/a
R20	Gridded Receptor	529438	5510818	416.4	57.4	86.4	4	<0.1%
R21	Gridded Receptor	529388	5510818	409.7	51.0	80.0	2	<0.1%
R22	Gridded Receptor	529488	5510618	411.9	46.4	75.4	0	n/a
R23	Gridded Receptor	529488	5510518	415.4	47.9	76.9	0	n/a
R24	Gridded Receptor	529388	5510618	416.9	52.7	81.7	6	<0.1%
R25	Gridded Receptor	529388	5510518	419.7	51.5	80.5	6	<0.1%
R26	Gridded Receptor	529288	5510618	421.3	56.2	85.2	12	<0.1%
R27	Gridded Receptor	529288	5510518	421.9	53.9	82.9	8	<0.1%
R28	Gridded Receptor	529188	5510618	420.9	57.9	86.9	10	<0.1%
R29	Gridded Receptor	529277	5510860	404.7	45.3	74.3	0	n/a
R30	Gridded Receptor	529287	5510860	405.2	46.2	75.2	0	n/a
R31	Gridded Receptor	529297	5510860	405.9	47.6	76.6	0	n/a
R32	Gridded Receptor	529306	5510860	406.8	49.2	78.2	0	n/a
R33	Gridded Receptor	529316	5510860	407.7	50.4	79.4	1	<0.1%
R34	Gridded Receptor	529326	5510860	408.5	51.3	80.3	3	<0.1%
R35	Gridded Receptor	529336	5510860	409.3	51.9	80.9	3	<0.1%
R36	Gridded Receptor	529346	5510860	410.1	53.1	82.1	3	<0.1%
R37	Gridded Receptor	529356	5510860	411.1	54.5	83.5	4	<0.1%
R38	Gridded Receptor	529366	5510860	412.2	55.8	84.8	4	<0.1%
R39	Gridded Receptor	529376	5510861	413.3	57.0	86.0	4	<0.1%
R40	Gridded Receptor	529386	5510861	414.3	58.0	87.0	4	<0.1%
R41	Gridded Receptor	529396	5510861	415.3	58.7	87.7	3	<0.1%
R42	Gridded Receptor	529406	5510861	416.3	59.4	88.4	3	<0.1%
R43	Gridded Receptor	529416	5510861	417.4	59.9	88.9	3	<0.1%
R44	Gridded Receptor	529426	5510861	418.5	60.3	89.3	2	<0.1%
R45	Gridded Receptor	529436	5510861	419.6	60.6	89.6	2	<0.1%
R46	Gridded Receptor	528663	5514432	404.9	47.3	76.3	0	n/a
R47	Gridded Receptor	529608	5511118	412.6	61.7	90.7	10	<0.1%
R48	Gridded Receptor	529608	5511138	413.9	64.2	93.2	12	<0.1%
R49	Gridded Receptor	529608	5511158	415.5	66.7	95.7	12	<0.1%
R50	Gridded Receptor	529608	5511178	417.2	68.7	97.7	12	<0.1%
R51	Gridded Receptor	529608	5511198	418.6	69.9	98.9	14	<0.1%
R52	Gridded Receptor	529608	5511218	419.6	70.6	99.6	14	<0.1%
R53	Gridded Receptor	529608	5511238	420.0	72.6	101.6	12	<0.1%
R54	Gridded Receptor	529608	5511258	419.2	74.2	103.2	14	<0.1%
R55	Gridded Receptor	529608	5511278	418.0	74.9	103.9	14	<0.1%
R56	Gridded Receptor	529608	5511298	416.4	74.7	103.7	14	<0.1%
R57	Gridded Receptor	529608	5511318	414.6	73.5	102.5	14	<0.1%

Receptor Information					Maximum Predicted 1-hour Concentration	Cummulative Concentration	Predicted Excursions of Cumulative Concentrations Above CAAQS (79µg/m³) Over 5 Year Period	
ID#	Description	X (m)	Y (m)	Z (m)	(ug/m³)	(ug/m³)	Count (hours)	Frequency (%)
R58	Gridded Receptor	529608	5511338	413.0	71.6	100.6	14	<0.1%
R59	Gridded Receptor	529608	5511358	411.6	70.5	99.5	14	<0.1%
R60	Gridded Receptor	529608	5511378	409.8	68.9	97.9	14	<0.1%
R61	Gridded Receptor	529608	5511398	408.1	66.0	95.0	10	<0.1%
R62	Gridded Receptor	529608	5511418	406.4	61.6	90.6	10	<0.1%
R63	Gridded Receptor	529608	5511438	404.6	56.1	85.1	10	<0.1%
R64	Gridded Receptor	529628	5511118	413.5	62.5	91.5	10	<0.1%
R65	Gridded Receptor	529628	5511138	415.3	65.2	94.2	12	<0.1%
R66	Gridded Receptor	529628	5511158	417.3	67.5	96.5	12	<0.1%
R67	Gridded Receptor	529628	5511178	419.3	69.1	98.1	12	<0.1%
R68	Gridded Receptor	529628	5511198	420.7	69.7	98.7	14	<0.1%
R69	Gridded Receptor	529628	5511218	421.9	71.5	100.5	12	<0.1%
R70	Gridded Receptor	529628	5511238	422.7	74.1	103.1	12	<0.1%
R71	Gridded Receptor	529628	5511258	422.4	75.9	104.9	14	<0.1%
R72	Gridded Receptor	529628	5511278	421.6	77.0	106.0	14	<0.1%
R73	Gridded Receptor	529628	5511298	420.5	77.3	106.3	14	<0.1%
R74	Gridded Receptor	529628	5511318	418.5	76.3	105.3	14	<0.1%
R75	Gridded Receptor	529628	5511338	416.5	75.0	104.0	14	<0.1%
R76	Gridded Receptor	529628	5511358	414.5	75.0	104.0	12	<0.1%
R77	Gridded Receptor	529628	5511378	412.1	73.0	102.0	12	<0.1%
R78	Gridded Receptor	529628	5511398	409.7	69.4	98.4	12	<0.1%
R79	Gridded Receptor	529628	5511418	407.5	64.7	93.7	10	<0.1%
R80	Gridded Receptor	529628	5511438	405.6	59.2	88.2	10	<0.1%
R81	Gridded Receptor	529648	5511118	414.8	63.4	92.4	12	<0.1%
R82	Gridded Receptor	529648	5511138	416.7	65.7	94.7	12	<0.1%
R83	Gridded Receptor	529648	5511158	418.7	67.5	96.5	12	<0.1%
R84	Gridded Receptor	529648	5511178	420.7	68.6	97.6	14	<0.1%
R85	Gridded Receptor	529648	5511198	422.1	70.0	99.0	12	<0.1%
R86	Gridded Receptor	529648	5511218	423.4	72.4	101.4	12	<0.1%
R87	Gridded Receptor	529648	5511238	424.7	74.8	103.8	12	<0.1%
R88	Gridded Receptor	529648	5511258	424.8	76.5	105.5	14	<0.1%
R89	Gridded Receptor	529648	5511278	424.5	77.5	106.5	14	<0.1%
R90	Gridded Receptor	529648	5511298	423.7	77.9	106.9	14	<0.1%
R91	Gridded Receptor	529648	5511318	421.9	77.1	106.1	12	<0.1%
R92	Gridded Receptor	529648	5511338	419.9	77.9	106.9	12	<0.1%
R93	Gridded Receptor	529648	5511358	417.9	78.6	107.6	12	<0.1%
R94	Gridded Receptor	529648	5511378	414.2	75.9	104.9	12	<0.1%
R95	Gridded Receptor	529648	5511398	410.8	71.2	100.2	12	<0.1%
R96	Gridded Receptor	529648	5511418	408.2	66.0	95.0	12	<0.1%
R97	Gridded Receptor	529648	5511438	406.7	62.2	91.2	10	<0.1%
R98	Gridded Receptor	529668	5511118	415.5	63.5	92.5	12	<0.1%
R99	Gridded Receptor	529668	5511138	417.0	65.2	94.2	12	<0.1%
R100	Gridded Receptor	529668	5511158	418.6	66.3	95.3	12	<0.1%
R101	Gridded Receptor	529668	5511178	420.2	67.6	96.6	12	<0.1%
R102	Gridded Receptor	529668	5511198	422.3	70.1	99.1	12	<0.1%
R103	Gridded Receptor	529668	5511218	424.3	72.8	101.8	12	<0.1%
R104	Gridded Receptor	529668	5511238	426.0	75.0	104.0	14	<0.1%
R105	Gridded Receptor	529668	5511258	426.6	76.4	105.4	14	<0.1%
R106	Gridded Receptor	529668	5511278	426.9	77.3	106.3	12	<0.1%
R107	Gridded Receptor	529668	5511298	427.0	77.4	106.4	12	<0.1%
R108	Gridded Receptor	529668	5511318	424.8	77.5	106.5	12	<0.1%
R109	Gridded Receptor	529668	5511338	422.3	79.3	108.3	12	<0.1%
R110	Gridded Receptor	529668	5511358	419.5	79.7	108.7	12	<0.1%
R111	Gridded Receptor	529668	5511378	415.2	76.7	105.7	14	<0.1%
R112	Gridded Receptor	529668	5511398	411.5	71.8	100.8	12	<0.1%
R113	Gridded Receptor	529668	5511418	408.9	66.9	95.9	10	<0.1%
R114	Gridded Receptor	529668	5511438	407.0	62.6	91.6	10	<0.1%
R115	Gridded Receptor	529688	5511118	415.9	63.1	92.1	12	<0.1%
R116	Gridded Receptor	529688	5511138	417.2	64.3	93.3	12	<0.1%
R117	Gridded Receptor	529688	5511158	418.5	65.0	94.0	12	<0.1%
R118	Gridded Receptor	529688	5511178	419.9	67.1	96.1	12	<0.1%

Receptor Information					Maximum Predicted 1-hour Concentration	Cummulative Concentration	Predicted Excursions of Cumulative Concentrations Above CAAQS (79µg/m³) Over 5 Year Period	
ID#	Description	X (m)	Y (m)	Z (m)	(ug/m³)	(ug/m³)	Count (hours)	Frequency (%)
R119	Gridded Receptor	529688	5511198	422.4	70.3	99.3	12	<0.1%
R120	Gridded Receptor	529688	5511218	424.9	72.9	101.9	12	<0.1%
R121	Gridded Receptor	529688	5511238	427.1	74.8	103.8	14	<0.1%
R122	Gridded Receptor	529688	5511258	428.0	75.9	104.9	12	<0.1%
R123	Gridded Receptor	529688	5511278	428.8	76.3	105.3	12	<0.1%
R124	Gridded Receptor	529688	5511298	429.5	76.0	105.0	12	<0.1%
R125	Gridded Receptor	529688	5511318	427.3	78.2	107.2	12	<0.1%
R126	Gridded Receptor	529688	5511338	424.4	80.1	109.1	10	<0.1%
R127	Gridded Receptor	529688	5511358	420.9	80.2	109.2	10	<0.1%
R128	Gridded Receptor	529688	5511378	416.2	77.1	106.1	10	<0.1%
R129	Gridded Receptor	529688	5511398	412.1	72.0	101.0	10	<0.1%
R130	Gridded Receptor	529688	5511418	409.3	67.0	96.0	10	<0.1%
R131	Gridded Receptor	529688	5511438	407.2	62.3	91.3	10	<0.1%
R132	Gridded Receptor	529708	5511118	415.9	62.4	91.4	12	<0.1%
R133	Gridded Receptor	529708	5511138	417.2	63.3	92.3	10	<0.1%
R134	Gridded Receptor	529708	5511158	418.5	64.8	93.8	12	<0.1%
R135	Gridded Receptor	529708	5511178	419.9	67.3	96.3	12	<0.1%
R136	Gridded Receptor	529708	5511198	422.4	70.3	99.3	12	<0.1%
R137	Gridded Receptor	529708	5511218	425.1	72.8	101.8	12	<0.1%
R138	Gridded Receptor	529708	5511238	427.7	74.4	103.4	12	<0.1%
R139	Gridded Receptor	529708	5511258	429.1	75.1	104.1	12	<0.1%
R140	Gridded Receptor	529708	5511278	430.1	75.0	104.0	12	<0.1%
R141	Gridded Receptor	529708	5511298	430.8	75.5	104.5	10	<0.1%
R142	Gridded Receptor	529708	5511318	429.0	78.4	107.4	10	<0.1%
R143	Gridded Receptor	529708	5511338	426.2	80.4	109.4	10	<0.1%
R144	Gridded Receptor	529708	5511358	422.3	80.4	109.4	8	<0.1%
R145	Gridded Receptor	529708	5511378	417.1	77.2	106.2	10	<0.1%
R146	Gridded Receptor	529708	5511398	412.6	71.9	100.9	10	<0.1%
R147	Gridded Receptor	529708	5511418	409.3	66.3	95.3	10	<0.1%
R148	Gridded Receptor	529728	5511118	416.0	61.5	90.5	10	<0.1%
R149	Gridded Receptor	529728	5511138	416.8	62.2	91.2	10	<0.1%
R150	Gridded Receptor	529728	5511158	418.1	64.5	93.5	12	<0.1%
R151	Gridded Receptor	529728	5511178	419.8	67.4	96.4	12	<0.1%
R152	Gridded Receptor	529728	5511198	422.0	70.0	99.0	12	<0.1%
R153	Gridded Receptor	529728	5511218	424.6	72.2	101.2	14	<0.1%
R154	Gridded Receptor	529728	5511238	427.7	73.7	102.7	12	<0.1%
R155	Gridded Receptor	529728	5511258	429.6	74.0	103.0	12	<0.1%
R156	Gridded Receptor	529728	5511278	430.9	73.4	102.4	10	<0.1%
R157	Gridded Receptor	529728	5511298	431.5	75.8	104.8	10	<0.1%
R158	Gridded Receptor	529728	5511318	430.2	78.5	107.5	10	<0.1%
R159	Gridded Receptor	529728	5511338	427.6	80.2	109.2	8	<0.1%
R160	Gridded Receptor	529728	5511358	423.6	80.3	109.3	10	<0.1%
R161	Gridded Receptor	529728	5511378	418.8	77.8	106.8	10	<0.1%
R162	Gridded Receptor	529728	5511398	414.2	73.1	102.1	10	<0.1%
R163	Gridded Receptor	529728	5511418	410.0	66.7	95.7	10	<0.1%
R164	Gridded Receptor	529748	5511118	416.3	60.7	89.7	10	<0.1%
R165	Gridded Receptor	529748	5511138	416.9	62.1	91.1	10	<0.1%
R166	Gridded Receptor	529748	5511158	418.0	64.6	93.6	12	<0.1%
R167	Gridded Receptor	529748	5511178	419.8	67.3	96.3	12	<0.1%
R168	Gridded Receptor	529748	5511198	421.8	69.6	98.6	12	<0.1%
R169	Gridded Receptor	529748	5511218	424.3	71.6	100.6	12	<0.1%
R170	Gridded Receptor	529748	5511238	427.7	72.7	101.7	12	<0.1%
R171	Gridded Receptor	529748	5511258	429.8	72.7	101.7	12	<0.1%
R172	Gridded Receptor	529748	5511278	431.3	73.6	102.6	10	<0.1%
R173	Gridded Receptor	529748	5511298	431.9	76.0	105.0	10	<0.1%
R174	Gridded Receptor	529748	5511318	430.8	78.3	107.3	8	<0.1%
R175	Gridded Receptor	529748	5511338	428.6	79.9	108.9	8	<0.1%
R176	Gridded Receptor	529748	5511358	425.2	80.0	109.0	10	<0.1%
R177	Gridded Receptor	529748	5511378	420.6	78.0	107.0	10	<0.1%
R178	Gridded Receptor	529768	5511118	417.0	60.9	89.9	10	<0.1%
R179	Gridded Receptor	529768	5511138	417.5	62.7	91.7	12	<0.1%

Receptor Information					Maximum Predicted 1-hour Concentration	Cummulative Concentration	Predicted Excursions of Cumulative Concentrations Above CAAQS (79µg/m³) Over 5 Year Period	
ID#	Description	X (m)	Y (m)	Z (m)	(ug/m³)	(ug/m³)	Count (hours)	Frequency (%)
R180	Gridded Receptor	529768	5511158	418.5	64.9	93.9	12	<0.1%
R181	Gridded Receptor	529768	5511178	419.9	67.1	96.1	12	<0.1%
R182	Gridded Receptor	529768	5511198	421.8	69.2	98.2	10	<0.1%
R183	Gridded Receptor	529768	5511218	424.3	70.9	99.9	12	<0.1%
R184	Gridded Receptor	529768	5511238	427.7	71.7	100.7	12	<0.1%
R185	Gridded Receptor	529768	5511258	429.8	71.6	100.6	10	<0.1%
R186	Gridded Receptor	529768	5511278	431.3	74.0	103.0	10	<0.1%
R187	Gridded Receptor	529768	5511298	431.9	76.2	105.2	8	<0.1%
R188	Gridded Receptor	529768	5511318	430.8	78.1	107.1	8	<0.1%
R189	Gridded Receptor	529768	5511338	429.2	79.2	108.2	8	<0.1%
R190	Gridded Receptor	529788	5511118	417.7	61.4	90.4	10	<0.1%
R191	Gridded Receptor	529788	5511138	417.8	63.0	92.0	12	<0.1%
R192	Gridded Receptor	529788	5511158	418.5	64.8	93.8	12	<0.1%
R193	Gridded Receptor	529788	5511178	419.9	66.8	95.8	12	<0.1%
R194	Gridded Receptor	529788	5511198	421.4	68.4	97.4	12	<0.1%
R195	Gridded Receptor	529788	5511218	423.7	69.8	98.8	12	<0.1%
R196	Gridded Receptor	529788	5511238	427.1	70.5	99.5	10	<0.1%
R197	Gridded Receptor	529788	5511258	429.6	72.1	101.1	10	<0.1%
R198	Gridded Receptor	529788	5511278	431.3	74.3	103.3	8	<0.1%
R199	Gridded Receptor	529788	5511298	431.9	76.1	105.1	8	<0.1%
R200	Gridded Receptor	529788	5511318	430.8	77.7	106.7	8	<0.1%
R201	Gridded Receptor	529838	5511268	429.9	73.5	102.5	8	<0.1%
R202	Gridded Receptor	529838	5511218	423.8	67.2	96.2	10	<0.1%
R203	Gridded Receptor	529838	5511168	419.6	65.0	94.0	10	<0.1%
R204	Gridded Receptor	529838	5511118	419.0	62.4	91.4	12	<0.1%
R205	Gridded Receptor	529838	5511068	419.8	59.6	88.6	10	<0.1%
R206	Gridded Receptor	529838	5511018	421.0	59.6	88.6	8	<0.1%
R207	Gridded Receptor	529838	5510968	419.9	58.3	87.3	6	<0.1%
R208	Gridded Receptor	529888	5511218	425.0	68.2	97.2	8	<0.1%
R209	Gridded Receptor	529888	5511168	420.5	63.8	92.8	8	<0.1%
R210	Gridded Receptor	529888	5511118	420.0	62.5	91.5	8	<0.1%
R211	Gridded Receptor	529888	5511068	420.9	60.3	89.3	8	<0.1%
R212	Gridded Receptor	529888	5511018	420.6	57.4	86.4	8	<0.1%
R213	Gridded Receptor	529888	5510968	418.0	56.1	85.1	8	<0.1%
R214	Gridded Receptor	529938	5511168	420.0	61.6	90.6	8	<0.1%
R215	Gridded Receptor	529938	5511118	421.1	61.9	90.9	6	<0.1%
R216	Gridded Receptor	529938	5511068	421.6	60.6	89.6	8	<0.1%
R217	Gridded Receptor	529938	5511018	419.4	56.4	85.4	6	<0.1%
R218	Gridded Receptor	529988	5511118	421.7	60.5	89.5	6	<0.1%
R219	Gridded Receptor	529988	5511068	420.6	59.4	88.4	6	<0.1%
R220	Gridded Receptor	529788	5511068	419.6	61.1	90.1	10	<0.1%
R221	Gridded Receptor	529788	5511018	421.0	61.2	90.2	8	<0.1%
R222	Gridded Receptor	529788	5510968	420.0	58.7	87.7	8	<0.1%
R223	Gridded Receptor	529738	5511068	418.1	62.2	91.2	12	<0.1%
R224	Gridded Receptor	529738	5511018	421.0	61.9	90.9	10	<0.1%
R225	Gridded Receptor	529688	5511068	415.9	61.6	90.6	10	<0.1%
R226	Gridded Receptor	529688	5511018	419.7	61.6	90.6	8	<0.1%
R227	Gridded Receptor	529638	5511068	414.3	60.5	89.5	8	<0.1%
R228	Gridded Receptor	529588	5511071	414.3	61.3	90.3	4	<0.1%
R229	Gridded Receptor	529589	5511081	413.6	61.1	90.1	4	<0.1%
R230	Gridded Receptor	529589	5511091	413.0	60.9	89.9	4	<0.1%
R231	Gridded Receptor	529589	5511101	412.6	60.9	89.9	4	<0.1%
R232	Gridded Receptor	529589	5511111	412.3	61.0	90.0	5	<0.1%
R233	Gridded Receptor	529589	5511121	412.0	61.2	90.2	5	<0.1%
R234	Gridded Receptor	529589	5511131	412.3	62.2	91.2	5	<0.1%
R235	Gridded Receptor	529589	5511141	412.7	63.2	92.2	5	<0.1%
R236	Gridded Receptor	529589	5511151	413.0	64.1	93.1	6	<0.1%
R237	Gridded Receptor	529590	5511161	413.7	65.4	94.4	6	<0.1%
R238	Gridded Receptor	529590	5511171	414.4	66.6	95.6	6	<0.1%
R239	Gridded Receptor	529590	5511181	415.0	67.6	96.6	6	<0.1%
R240	Gridded Receptor	529590	5511191	415.7	68.5	97.5	6	<0.1%

Receptor Information					Maximum Predicted 1-hour Concentration	Cummulative Concentration	Predicted Excursions of Cumulative Concentrations Above CAAQS (79µg/m³) Over 5 Year Period	
ID#	Description	X (m)	Y (m)	Z (m)	(ug/m³)	(ug/m³)	Count (hours)	Frequency (%)
R241	Gridded Receptor	529590	5511201	416.4	69.3	98.3	7	<0.1%
R242	Gridded Receptor	529590	5511211	417.0	69.8	98.8	7	<0.1%
R243	Gridded Receptor	529590	5511221	417.0	69.8	98.8	7	<0.1%
R244	Gridded Receptor	529590	5511231	417.1	69.9	98.9	7	<0.1%
R245	Gridded Receptor	529590	5511241	417.0	70.7	99.7	7	<0.1%
R246	Gridded Receptor	529591	5511251	416.4	71.2	100.2	7	<0.1%
R247	Gridded Receptor	529591	5511261	415.8	71.6	100.6	6	<0.1%
R248	Gridded Receptor	529591	5511271	415.1	71.8	100.8	7	<0.1%
R249	Gridded Receptor	529591	5511281	414.1	71.4	100.4	7	<0.1%
R250	Gridded Receptor	529591	5511291	413.2	70.7	99.7	7	<0.1%
R251	Gridded Receptor	529591	5511301	412.2	69.9	98.9	7	<0.1%
R252	Gridded Receptor	529591	5511311	411.6	69.3	98.3	7	<0.1%
R253	Gridded Receptor	529591	5511321	410.9	68.5	97.5	7	<0.1%
R254	Gridded Receptor	529592	5511331	410.3	67.7	96.7	7	<0.1%
R255	Gridded Receptor	529592	5511341	409.9	67.2	96.2	7	<0.1%
R256	Gridded Receptor	529592	5511351	409.6	66.7	95.7	7	<0.1%
R257	Gridded Receptor	529592	5511361	409.2	66.0	95.0	7	<0.1%
R258	Gridded Receptor	529592	5511371	408.5	65.3	94.3	7	<0.1%
R259	Gridded Receptor	529592	5511381	407.9	64.4	93.4	7	<0.1%
R260	Gridded Receptor	529592	5511391	407.2	63.1	92.1	6	<0.1%
R261	Gridded Receptor	529592	5511400	406.5	61.5	90.5	5	<0.1%
R262	Gridded Receptor	529593	5511410	405.8	59.6	88.6	5	<0.1%
R263	Gridded Receptor	529593	5511420	405.2	57.5	86.5	5	<0.1%
R264	Gridded Receptor	529593	5511430	404.5	55.3	84.3	5	<0.1%
R265	Gridded Receptor	529995	5511119	421.5	60.1	89.1	3	<0.1%
R266	Gridded Receptor	529995	5511109	421.5	60.2	89.2	3	<0.1%
R267	Gridded Receptor	529995	5511099	421.5	60.2	89.2	3	<0.1%
R268	Gridded Receptor	529995	5511089	421.5	60.1	89.1	3	<0.1%
R269	Gridded Receptor	529995	5511079	420.8	59.6	88.6	3	<0.1%
R270	Gridded Receptor	529995	5511069	420.1	59.0	88.0	3	<0.1%
R271	Gridded Receptor	529995	5511059	419.4	58.4	87.4	3	<0.1%
R272	Gridded Receptor	529995	5511049	418.3	57.3	86.3	2	<0.1%
R273	Gridded Receptor	529995	5511039	417.1	56.1	85.1	2	<0.1%
R274	Gridded Receptor	528664	5514419	403.0	45.9	74.9	0	n/a
R275	Gridded Receptor	528661	5514428	404.4	47.2	76.2	0	n/a
R276	Gridded Receptor	528657	5514437	406.0	48.4	77.4	0	n/a
R277	Gridded Receptor	528684	5514475	408.8	51.1	80.1	1	<0.1%
R278	Gridded Receptor	529648	5511458	405.1	57.4	86.4	8	<0.1%
R279	Gridded Receptor	529668	5511458	405.2	57.2	86.2	8	<0.1%
R280	Gridded Receptor	529688	5511458	405.2	56.7	85.7	8	<0.1%
R281	Gridded Receptor	529708	5511438	407.2	61.6	90.6	10	<0.1%
R282	Gridded Receptor	529708	5511458	405.2	56.2	85.2	8	<0.1%
R283	Gridded Receptor	529728	5511438	407.8	62.3	91.3	10	<0.1%
R284	Gridded Receptor	529728	5511458	405.8	57.4	86.4	10	<0.1%
R285	Gridded Receptor	529728	5511478	403.8	52.1	81.1	4	<0.1%
R286	Gridded Receptor	529748	5511398	415.9	73.9	102.9	10	<0.1%
R287	Gridded Receptor	529748	5511418	411.0	67.5	96.5	10	<0.1%
R288	Gridded Receptor	529748	5511438	408.6	63.3	92.3	10	<0.1%
R289	Gridded Receptor	529748	5511458	406.5	58.6	87.6	10	<0.1%
R290	Gridded Receptor	529748	5511478	404.5	53.7	82.7	6	<0.1%
R291	Gridded Receptor	529768	5511358	427.0	79.4	108.4	10	<0.1%
R292	Gridded Receptor	529768	5511378	422.6	77.9	106.9	10	<0.1%
R293	Gridded Receptor	529768	5511398	417.7	75.2	104.2	14	<0.1%
R294	Gridded Receptor	529768	5511418	412.4	69.4	98.4	14	<0.1%
R295	Gridded Receptor	529768	5511438	409.5	64.8	93.8	14	<0.1%
R296	Gridded Receptor	529768	5511458	407.1	59.8	88.8	10	<0.1%
R297	Gridded Receptor	529768	5511478	405.1	54.9	83.9	8	<0.1%
R298	Gridded Receptor	529768	5511498	403.7	51.8	80.8	4	<0.1%
R299	Gridded Receptor	529788	5511338	429.5	78.4	107.4	8	<0.1%
R300	Gridded Receptor	529788	5511358	428.3	78.5	107.5	10	<0.1%
R301	Gridded Receptor	529788	5511378	424.0	77.8	106.8	10	<0.1%

Receptor Information					Maximum Predicted 1-hour Concentration	Cummulative Concentration	Predicted Excursions of Cumulative Concentrations Above CAAQS (79µg/m³) Over 5 Year Period	
ID#	Description	X (m)	Y (m)	Z (m)	(ug/m³)	(ug/m³)	Count (hours)	Frequency (%)
R302	Gridded Receptor	529788	5511398	419.2	76.0	105.0	14	<0.1%
R303	Gridded Receptor	529788	5511418	414.3	71.5	100.5	14	<0.1%
R304	Gridded Receptor	529788	5511438	411.0	67.1	96.1	16	<0.1%
R305	Gridded Receptor	529788	5511458	408.4	62.4	91.4	12	<0.1%
R306	Gridded Receptor	529788	5511478	406.4	57.9	86.9	10	<0.1%
R307	Gridded Receptor	529788	5511498	405.0	54.4	83.4	6	<0.1%
R308	Gridded Receptor	529788	5511518	403.5	51.3	80.3	4	<0.1%
R309	Gridded Receptor	529838	5511518	405.5	55.0	84.0	8	<0.1%
R310	Gridded Receptor	529838	5511468	410.9	65.0	94.0	14	<0.1%
R311	Gridded Receptor	529838	5511418	418.0	73.4	102.4	14	<0.1%
R312	Gridded Receptor	529838	5511368	427.7	77.2	106.2	8	<0.1%
R313	Gridded Receptor	529838	5511318	430.4	75.9	104.9	8	<0.1%
R314	Gridded Receptor	529888	5511518	406.2	56.1	85.1	14	<0.1%
R315	Gridded Receptor	529888	5511468	411.6	64.7	93.7	16	<0.1%
R316	Gridded Receptor	529888	5511418	418.5	71.3	100.3	12	<0.1%
R317	Gridded Receptor	529888	5511368	428.6	75.8	104.8	6	<0.1%
R318	Gridded Receptor	529888	5511318	431.3	73.2	102.2	6	<0.1%
R319	Gridded Receptor	529938	5511518	404.4	50.2	79.2	2	<0.1%
R320	Gridded Receptor	529938	5511468	410.5	62.2	91.2	14	<0.1%
R321	Gridded Receptor	529938	5511418	417.7	68.1	97.1	14	<0.1%
R322	Gridded Receptor	529938	5511368	426.4	73.2	102.2	10	<0.1%
R323	Gridded Receptor	529938	5511318	429.6	72.4	101.4	6	<0.1%
R324	Gridded Receptor	529988	5511518	403.5	47.0	76.0	0	n/a
R325	Gridded Receptor	529988	5511468	408.9	58.5	87.5	14	<0.1%
R326	Gridded Receptor	529988	5511418	415.5	64.3	93.3	14	<0.1%
R327	Gridded Receptor	529988	5511368	421.2	68.7	97.7	10	<0.1%
R328	Gridded Receptor	529988	5511318	422.6	68.9	97.9	6	<0.1%
R329	Gridded Receptor	529993	5511518	403.6	47.2	76.2	0	n/a
R330	Gridded Receptor	529993	5511508	404.6	49.4	78.4	0	n/a
R331	Gridded Receptor	529993	5511498	405.7	51.9	80.9	2	<0.1%
R332	Gridded Receptor	529993	5511488	406.7	54.4	83.4	5	<0.1%
R333	Gridded Receptor	529993	5511478	407.7	56.4	85.4	6	<0.1%
R334	Gridded Receptor	529993	5511468	408.7	58.0	87.0	7	<0.1%
R335	Gridded Receptor	529993	5511458	409.7	59.4	88.4	7	<0.1%
R336	Gridded Receptor	529993	5511448	410.8	60.5	89.5	7	<0.1%
R337	Gridded Receptor	529993	5511438	412.2	61.9	90.9	7	<0.1%
R338	Gridded Receptor	529993	5511428	413.5	63.0	92.0	7	<0.1%
R339	Gridded Receptor	529993	5511418	414.9	63.7	92.7	7	<0.1%
R340	Gridded Receptor	529993	5511408	416.2	64.4	93.4	6	<0.1%
R341	Gridded Receptor	529993	5511398	417.5	65.6	94.6	6	<0.1%
R342	Gridded Receptor	529993	5511388	418.8	66.7	95.7	6	<0.1%
R343	Gridded Receptor	529993	5511378	419.6	67.4	96.4	6	<0.1%
R344	Gridded Receptor	529993	5511368	420.5	68.1	97.1	5	<0.1%
R345	Gridded Receptor	529994	5511358	421.2	68.6	97.6	5	<0.1%
R346	Gridded Receptor	529994	5511349	421.4	68.7	97.7	4	<0.1%
R347	Gridded Receptor	529994	5511339	421.6	68.7	97.7	3	<0.1%
R348	Gridded Receptor	529994	5511329	421.7	68.6	97.6	3	<0.1%
R349	Gridded Receptor	529994	5511319	421.5	68.2	97.2	3	<0.1%
R350	Gridded Receptor	529994	5511309	421.4	67.7	96.7	3	<0.1%
R351	Gridded Receptor	529994	5511299	421.2	67.1	96.1	4	<0.1%
R352	Gridded Receptor	529994	5511289	420.5	66.1	95.1	3	<0.1%
R353	Gridded Receptor	529994	5511279	419.8	65.5	94.5	3	<0.1%
R354	Gridded Receptor	528692	5514480	408.9	51.7	80.7	1	<0.1%
R355	Gridded Receptor	528701	5514485	408.9	51.3	80.3	1	<0.1%
R356	Gridded Receptor	528709	5514490	408.9	50.5	79.5	1	<0.1%
R357	Gridded Receptor	528717	5514495	409.0	49.7	78.7	0	n/a
R358	Gridded Receptor	528726	5514500	408.9	49.0	78.0	0	n/a
R359	Gridded Receptor	528734	5514505	408.7	48.2	77.2	0	n/a
R360	Gridded Receptor	528426	5514396	400.2	53.7	82.7	45	0.1%
R361	Gridded Receptor	528498	5514361	400.0	46.6	75.6	0	n/a
R362	Gridded Receptor	528443	5514372	399.1	47.5	76.5	0	n/a

Receptor Information					Maximum Predicted 1-hour Concentration	Cummulative Concentration	Predicted Excursions of Cumulative Concentrations Above CAAQS (79µg/m³) Over 5 Year Period	
ID#	Description	X (m)	Y (m)	Z (m)	(ug/m³)	(ug/m³)	Count (hours)	Frequency (%)
R363	Gridded Receptor	528417	5514919	402.6	50.5	79.5	3	<0.1%
R364	Gridded Receptor	528424	5514944	401.3	47.5	76.5	0	n/a
R365	Gridded Receptor	528422	5514936	401.8	48.5	77.5	0	n/a
R366	Gridded Receptor	528420	5514927	402.2	49.5	78.5	0	n/a
R367	Gridded Receptor	528411	5514914	402.1	50.0	79.0	0	n/a
R368	Gridded Receptor	528405	5514908	401.4	49.1	78.1	0	n/a
R369	Gridded Receptor	528399	5514902	400.7	47.8	76.8	0	n/a
R370	Gridded Receptor	528420	5514389	400.0	50.3	79.3	5	<0.1%
R371	Gridded Receptor	529608	5511458	403.0	50.0	79.0	0	n/a
R372	Gridded Receptor	529608	5511478	401.4	46.7	75.7	0	n/a
R373	Gridded Receptor	529608	5511498	400.2	46.2	75.2	0	n/a
R374	Gridded Receptor	529608	5511558	398.0	45.9	74.9	0	n/a
R375	Gridded Receptor	529608	5511578	397.3	46.8	75.8	0	n/a
R376	Gridded Receptor	529608	5511598	396.7	47.8	76.8	0	n/a
R377	Gridded Receptor	529608	5511618	395.6	48.5	77.5	0	n/a
R378	Gridded Receptor	529608	5511638	394.7	49.0	78.0	0	n/a
R379	Gridded Receptor	529628	5511458	403.9	53.7	82.7	8	<0.1%
R380	Gridded Receptor	529628	5511478	402.4	48.4	77.4	0	n/a
R381	Gridded Receptor	529628	5511498	401.1	46.8	75.8	0	n/a
R382	Gridded Receptor	529628	5511518	399.9	45.5	74.5	0	n/a
R383	Gridded Receptor	529628	5511558	398.4	45.3	74.3	0	n/a
R384	Gridded Receptor	529628	5511578	397.7	46.2	75.2	0	n/a
R385	Gridded Receptor	529628	5511598	397.1	47.2	76.2	0	n/a
R386	Gridded Receptor	529628	5511618	396.0	47.8	76.8	0	n/a
R387	Gridded Receptor	529628	5511638	395.0	48.1	77.1	0	n/a
R388	Gridded Receptor	529648	5511478	403.1	50.9	79.9	2	<0.1%
R389	Gridded Receptor	529648	5511498	401.7	47.7	76.7	0	n/a
R390	Gridded Receptor	529648	5511518	400.4	46.3	75.3	0	n/a
R391	Gridded Receptor	529648	5511578	397.7	45.8	74.8	0	n/a
R392	Gridded Receptor	529648	5511598	397.1	46.5	75.5	0	n/a
R393	Gridded Receptor	529648	5511618	396.4	47.0	76.0	0	n/a
R394	Gridded Receptor	529648	5511638	395.7	47.1	76.1	0	n/a
R395	Gridded Receptor	529668	5511478	403.2	50.9	79.9	2	<0.1%
R396	Gridded Receptor	529668	5511498	401.8	47.5	76.5	0	n/a
R397	Gridded Receptor	529668	5511518	400.5	46.1	75.1	0	n/a
R398	Gridded Receptor	529688	5511478	403.2	50.6	79.6	2	<0.1%
R399	Gridded Receptor	529688	5511498	401.8	47.3	76.3	0	n/a
R400	Gridded Receptor	529708	5511478	403.2	50.4	79.4	2	<0.1%
R401	Gridded Receptor	529838	5510918	418.7	55.6	84.6	6	<0.1%
R402	Gridded Receptor	529838	5510868	415.3	51.7	80.7	6	<0.1%
R403	Gridded Receptor	529838	5510818	414.7	50.2	79.2	2	<0.1%
R404	Gridded Receptor	529888	5510918	416.1	53.8	82.8	4	<0.1%
R405	Gridded Receptor	529888	5510868	413.1	49.5	78.5	0	n/a
R406	Gridded Receptor	529888	5510818	413.1	48.0	77.0	0	n/a
R407	Gridded Receptor	529938	5510968	414.4	52.3	81.3	4	<0.1%
R408	Gridded Receptor	529938	5510918	409.8	47.1	76.1	0	n/a
R409	Gridded Receptor	529938	5510868	410.0	46.0	75.0	0	n/a
R410	Gridded Receptor	529938	5510818	410.5	45.1	74.1	0	n/a
R411	Gridded Receptor	529988	5511018	415.0	53.5	82.5	4	<0.1%
R412	Gridded Receptor	529788	5510918	419.4	56.4	85.4	6	<0.1%
R413	Gridded Receptor	529788	5510868	417.0	53.5	82.5	6	<0.1%
R414	Gridded Receptor	529788	5510818	415.4	51.9	80.9	2	<0.1%
R415	Gridded Receptor	529738	5510968	420.9	59.5	88.5	6	<0.1%
R416	Gridded Receptor	529738	5510918	420.0	57.0	86.0	6	<0.1%
R417	Gridded Receptor	529738	5510868	417.7	55.4	84.4	4	<0.1%
R418	Gridded Receptor	529738	5510818	416.0	52.9	81.9	2	<0.1%
R419	Gridded Receptor	529688	5510968	420.0	59.2	88.2	6	<0.1%
R420	Gridded Receptor	529688	5510918	420.0	58.9	87.9	6	<0.1%
R421	Gridded Receptor	529688	5510868	418.9	56.7	85.7	4	<0.1%
R422	Gridded Receptor	529688	5510818	417.7	53.6	82.6	4	<0.1%
R423	Gridded Receptor	529638	5511018	418.2	61.1	90.1	6	<0.1%

Receptor Information					Maximum Predicted 1-hour Concentration	Cummulative Concentration	Predicted Excursions of Cumulative Concentrations Above CAAQS (79µg/m³) Over 5 Year Period	
ID#	Description	X (m)	Y (m)	Z (m)	(ug/m³)	(ug/m³)	Count (hours)	Frequency (%)
R424	Gridded Receptor	529638	5510968	420.0	61.4	90.4	6	<0.1%
R425	Gridded Receptor	529638	5510918	420.0	59.7	88.7	8	<0.1%
R426	Gridded Receptor	529638	5510868	420.0	56.9	85.9	4	<0.1%
R427	Gridded Receptor	529588	5511018	417.5	62.7	91.7	8	<0.1%
R428	Gridded Receptor	529588	5510968	420.0	62.4	91.4	8	<0.1%
R429	Gridded Receptor	529588	5510918	420.1	59.3	88.3	6	<0.1%
R430	Gridded Receptor	529588	5510868	421.0	57.6	86.6	4	<0.1%
R431	Gridded Receptor	529988	5510718	420.4	49.0	78.0	0	n/a
R432	Gridded Receptor	529888	5510718	417.3	49.5	78.5	0	n/a
R433	Gridded Receptor	529586	5510862	421.0	57.7	86.7	2	<0.1%
R434	Gridded Receptor	529595	5511650	394.3	49.9	78.9	0	n/a
R435	Gridded Receptor	529566	5510862	421.0	58.7	87.7	3	<0.1%
R436	Gridded Receptor	529576	5510862	421.0	58.2	87.2	3	<0.1%
R437	Gridded Receptor	529586	5510872	421.0	57.7	86.7	2	<0.1%
R438	Gridded Receptor	529586	5510882	421.0	57.6	86.6	2	<0.1%
R439	Gridded Receptor	529586	5510892	421.0	57.7	86.7	2	<0.1%
R440	Gridded Receptor	529586	5510902	421.0	58.5	87.5	3	<0.1%
R441	Gridded Receptor	529587	5510912	421.0	59.2	88.2	3	<0.1%
R442	Gridded Receptor	529587	5510922	420.1	59.6	88.6	3	<0.1%
R443	Gridded Receptor	529587	5510932	420.1	60.3	89.3	3	<0.1%
R444	Gridded Receptor	529587	5510942	420.1	60.9	89.9	3	<0.1%
R445	Gridded Receptor	529587	5510952	420.1	61.5	90.5	4	<0.1%
R446	Gridded Receptor	529587	5510962	420.0	62.0	91.0	4	<0.1%
R447	Gridded Receptor	529587	5510972	419.9	62.5	91.5	4	<0.1%
R448	Gridded Receptor	529587	5510982	419.3	62.6	91.6	4	<0.1%
R449	Gridded Receptor	529587	5510992	418.6	62.6	91.6	4	<0.1%
R450	Gridded Receptor	529588	5511001	418.0	62.6	91.6	4	<0.1%
R451	Gridded Receptor	529588	5511011	417.7	62.7	91.7	4	<0.1%
R452	Gridded Receptor	529588	5511021	417.4	62.7	91.7	4	<0.1%
R453	Gridded Receptor	529588	5511031	417.0	62.6	91.6	4	<0.1%
R454	Gridded Receptor	529588	5511041	416.4	62.2	91.2	3	<0.1%
R455	Gridded Receptor	529588	5511051	415.7	61.7	90.7	4	<0.1%
R456	Gridded Receptor	529588	5511061	415.0	61.4	90.4	4	<0.1%
R457	Gridded Receptor	529593	5511440	403.8	53.0	82.0	4	<0.1%
R458	Gridded Receptor	529593	5511450	403.1	50.3	79.3	1	<0.1%
R459	Gridded Receptor	529593	5511460	402.1	47.4	76.4	0	n/a
R460	Gridded Receptor	529593	5511470	401.2	46.8	75.8	0	n/a
R461	Gridded Receptor	529594	5511550	397.8	46.6	75.6	0	n/a
R462	Gridded Receptor	529594	5511560	397.5	46.8	75.8	0	n/a
R463	Gridded Receptor	529594	5511570	397.2	46.9	75.9	0	n/a
R464	Gridded Receptor	529595	5511580	396.8	47.4	76.4	0	n/a
R465	Gridded Receptor	529595	5511590	396.5	47.8	76.8	0	n/a
R466	Gridded Receptor	529595	5511600	396.2	48.1	77.1	0	n/a
R467	Gridded Receptor	529595	5511610	395.8	48.6	77.6	0	n/a
R468	Gridded Receptor	529595	5511620	395.4	49.0	78.0	0	n/a
R469	Gridded Receptor	529595	5511630	395.0	49.3	78.3	0	n/a
R470	Gridded Receptor	529595	5511640	394.7	49.6	78.6	0	n/a
R471	Gridded Receptor	529605	5511650	394.3	49.4	78.4	0	n/a
R472	Gridded Receptor	529615	5511650	394.3	48.8	77.8	0	n/a
R473	Gridded Receptor	529625	5511650	394.5	48.3	77.3	0	n/a
R474	Gridded Receptor	529635	5511650	394.9	47.7	76.7	0	n/a
R475	Gridded Receptor	529645	5511650	395.2	47.4	76.4	0	n/a
R476	Gridded Receptor	529996	5510800	411.6	45.4	74.4	0	n/a
R477	Gridded Receptor	529996	5510790	412.1	45.6	74.6	0	n/a
R478	Gridded Receptor	529996	5510780	413.6	46.7	75.7	0	n/a
R479	Gridded Receptor	529996	5510770	415.1	47.6	76.6	0	n/a
R480	Gridded Receptor	529996	5510760	416.6	48.3	77.3	0	n/a
R481	Gridded Receptor	529996	5510750	417.7	48.7	77.7	0	n/a
R482	Gridded Receptor	529996	5510740	418.9	49.0	78.0	0	n/a
R483	Gridded Receptor	529996	5510730	420.0	49.2	78.2	0	n/a
R484	Gridded Receptor	529996	5510720	420.3	49.0	78.0	0	n/a

Receptor Information					Maximum Predicted 1-hour Concentration	Cummulative Concentration	Predicted Excursions of Cumulative Concentrations Above CAAQS (79µg/m³) Over 5 Year Period	
ID#	Description	X (m)	Y (m)	Z (m)	(ug/m³)	(ug/m³)	Count (hours)	Frequency (%)
R485	Gridded Receptor	529996	5510710	420.7	48.8	77.8	0	n/a
R486	Gridded Receptor	529996	5510700	421.0	48.5	77.5	0	n/a
R487	Gridded Receptor	529996	5510690	421.2	48.3	77.3	0	n/a
R488	Gridded Receptor	529996	5510680	421.4	48.4	77.4	0	n/a
R489	Gridded Receptor	529997	5510670	421.6	48.5	77.5	0	n/a
R490	Gridded Receptor	529997	5510660	421.4	48.4	77.4	0	n/a
R491	Gridded Receptor	529997	5510650	421.2	48.3	77.3	0	n/a
R492	Gridded Receptor	529997	5510640	421.0	48.2	77.2	0	n/a
R493	Gridded Receptor	529997	5510630	420.7	48.0	77.0	0	n/a
R494	Gridded Receptor	528413	5514382	400.0	48.7	77.7	0	n/a
R495	Gridded Receptor	529708	5511498	401.8	47.1	76.1	0	n/a
R496	Gridded Receptor	529728	5511498	402.4	48.4	77.4	0	n/a
R497	Gridded Receptor	529748	5511498	403.1	50.2	79.2	2	<0.1%
R498	Gridded Receptor	529748	5511518	401.7	46.9	75.9	0	n/a
R499	Gridded Receptor	529768	5511518	402.4	48.8	77.8	0	n/a
R500	Gridded Receptor	529768	5511538	401.1	45.8	74.8	0	n/a
R501	Gridded Receptor	529788	5511538	401.8	47.6	76.6	0	n/a
R502	Gridded Receptor	529838	5511568	401.2	46.2	75.2	0	n/a
R503	Gridded Receptor	529888	5511568	401.2	45.3	74.3	0	n/a
R504	Gridded Receptor	529888	5511268	430.7	72.8	101.8	8	<0.1%
R505	Gridded Receptor	529938	5511268	428.0	71.0	100.0	6	<0.1%
R506	Gridded Receptor	529938	5511218	423.2	67.4	96.4	8	<0.1%
R507	Gridded Receptor	529988	5511268	420.3	66.1	95.1	6	<0.1%
R508	Gridded Receptor	529988	5511218	416.9	62.6	91.6	8	<0.1%
R509	Gridded Receptor	529988	5511168	416.6	59.4	88.4	8	<0.1%
R510	Gridded Receptor	529994	5511269	419.1	65.2	94.2	3	<0.1%
R511	Gridded Receptor	529994	5511259	418.5	64.7	93.7	3	<0.1%
R512	Gridded Receptor	529994	5511249	417.8	64.0	93.0	3	<0.1%
R513	Gridded Receptor	529994	5511239	417.1	63.3	92.3	3	<0.1%
R514	Gridded Receptor	529994	5511229	416.4	62.4	91.4	3	<0.1%
R515	Gridded Receptor	529994	5511219	415.8	61.4	90.4	3	<0.1%
R516	Gridded Receptor	529994	5511209	415.1	60.4	89.4	3	<0.1%
R517	Gridded Receptor	529994	5511199	414.9	59.7	88.7	4	<0.1%
R518	Gridded Receptor	529994	5511189	414.7	59.0	88.0	4	<0.1%
R519	Gridded Receptor	529994	5511179	414.7	58.3	87.3	4	<0.1%
R520	Gridded Receptor	529994	5511169	416.0	59.0	88.0	4	<0.1%
R521	Gridded Receptor	529994	5511159	417.3	59.4	88.4	4	<0.1%
R522	Gridded Receptor	529994	5511149	418.6	59.6	88.6	4	<0.1%
R523	Gridded Receptor	529994	5511139	419.6	59.4	88.4	4	<0.1%
R524	Gridded Receptor	529995	5511129	420.6	59.7	88.7	3	<0.1%
R525	Gridded Receptor	529995	5511029	415.9	54.8	83.8	2	<0.1%
R526	Gridded Receptor	528743	5514510	408.5	47.2	76.2	0	n/a
R527	Gridded Receptor	528751	5514515	408.3	46.0	75.0	0	n/a
R528	Gridded Receptor	529993	5511528	402.6	45.2	74.2	0	n/a
R529	Gridded Receptor	529638	5510818	419.9	54.7	83.7	4	<0.1%
R530	Gridded Receptor	529588	5510818	419.9	56.8	85.8	6	<0.1%
R531	Gridded Receptor	529538	5510818	420.6	58.0	87.0	4	<0.1%
R532	Gridded Receptor	529488	5510818	420.3	58.0	87.0	4	<0.1%
R533	Gridded Receptor	529588	5510718	409.8	45.9	74.9	0	n/a
R534	Gridded Receptor	529588	5510618	410.8	45.3	74.3	0	n/a
R535	Gridded Receptor	529446	5510861	420.1	60.4	89.4	2	<0.1%
R536	Gridded Receptor	529456	5510861	420.3	60.0	89.0	2	<0.1%
R537	Gridded Receptor	529466	5510861	420.6	59.7	88.7	2	<0.1%
R538	Gridded Receptor	529476	5510861	420.8	60.0	89.0	2	<0.1%
R539	Gridded Receptor	529486	5510861	421.2	60.3	89.3	2	<0.1%
R540	Gridded Receptor	529496	5510861	421.5	60.4	89.4	3	<0.1%
R541	Gridded Receptor	529506	5510861	421.7	60.5	89.5	3	<0.1%
R542	Gridded Receptor	529516	5510861	421.8	60.5	89.5	3	<0.1%
R543	Gridded Receptor	529526	5510861	422.0	60.4	89.4	3	<0.1%
R544	Gridded Receptor	529536	5510862	421.8	60.1	89.1	3	<0.1%
R545	Gridded Receptor	529546	5510862	421.5	59.7	88.7	3	<0.1%

Receptor Information					Maximum Predicted 1-hour Concentration	Cummulative Concentration	Predicted Excursions of Cumulative Concentrations Above CAAQS (79µg/m³) Over 5 Year Period	
ID#	Description	X (m)	Y (m)	Z (m)	(ug/m³)	(ug/m³)	Count (hours)	Frequency (%)
R546	Gridded Receptor	529556	5510862	421.1	59.2	88.2	3	<0.1%
R547	Gridded Receptor	528427	5514952	400.9	46.3	75.3	0	n/a
R548	Gridded Receptor	528380	5514347	399.9	45.6	74.6	0	n/a
R549	Gridded Receptor	528387	5514354	399.9	46.5	75.5	0	n/a
R550	Gridded Receptor	528394	5514361	399.9	47.3	76.3	0	n/a
R551	Gridded Receptor	528400	5514368	399.9	48.0	77.0	0	n/a
R552	Gridded Receptor	528407	5514375	400.0	48.5	77.5	0	n/a
R553	Gridded Receptor	529668	5511618	396.4	46.0	75.0	0	n/a
R554	Gridded Receptor	529668	5511638	395.7	46.4	75.4	0	n/a
R555	Gridded Receptor	529688	5511638	395.7	46.0	75.0	0	n/a
R556	Gridded Receptor	529708	5511638	395.7	45.5	74.5	0	n/a
R557	Gridded Receptor	529728	5511518	401.2	46.0	75.0	0	n/a
R558	Gridded Receptor	529988	5510968	410.1	47.0	76.0	0	n/a
R559	Gridded Receptor	529655	5511650	395.4	47.2	76.2	0	n/a
R560	Gridded Receptor	529665	5511650	395.4	47.0	76.0	0	n/a
R561	Gridded Receptor	529675	5511649	395.4	46.8	75.8	0	n/a
R562	Gridded Receptor	529685	5511649	395.4	46.5	75.5	0	n/a
R563	Gridded Receptor	529695	5511649	395.4	46.2	75.2	0	n/a
R564	Gridded Receptor	529705	5511649	395.4	45.9	74.9	0	n/a
R565	Gridded Receptor	529714	5511649	395.4	45.6	74.6	0	n/a
R566	Gridded Receptor	529724	5511649	395.5	45.2	74.2	0	n/a
R567	Gridded Receptor	529995	5511019	414.4	53.0	82.0	2	<0.1%
R568	Gridded Receptor	529995	5511009	412.9	51.0	80.0	2	<0.1%
R569	Gridded Receptor	529995	5510999	411.4	48.8	77.8	0	n/a
R570	Gridded Receptor	529995	5510989	410.8	47.5	76.5	0	n/a
R571	Gridded Receptor	529995	5510979	410.1	46.8	75.8	0	n/a
R572	Gridded Receptor	530382	5510738	420.2	45.2	74.2	0	n/a
R573	Gridded Receptor	530382	5510748	419.8	45.4	74.4	0	n/a
R574	Gridded Receptor	530382	5510758	419.3	45.5	74.5	0	n/a
R575	Gridded Receptor	529608	5511518	399.3	45.5	74.5	0	n/a
R576	Gridded Receptor	529608	5511538	398.7	45.6	74.6	0	n/a
R577	Gridded Receptor	529988	5510618	420.3	47.8	76.8	0	n/a
R578	Gridded Receptor	529888	5510618	418.9	47.3	76.3	0	n/a
R579	Gridded Receptor	529788	5510718	412.6	46.5	75.5	0	n/a
R580	Gridded Receptor	529593	5511480	400.2	46.1	75.1	0	n/a
R581	Gridded Receptor	529593	5511490	399.9	45.9	74.9	0	n/a
R582	Gridded Receptor	529594	5511500	399.5	45.7	74.7	0	n/a
R583	Gridded Receptor	529594	5511510	399.1	45.4	74.4	0	n/a
R584	Gridded Receptor	529594	5511520	398.8	45.6	74.6	0	n/a
R585	Gridded Receptor	529594	5511530	398.5	46.0	75.0	0	n/a
R586	Gridded Receptor	529594	5511540	398.1	46.3	75.3	0	n/a
R587	Gridded Receptor	529997	5510620	420.3	47.7	76.7	0	n/a
R588	Gridded Receptor	529997	5510610	420.0	47.5	76.5	0	n/a
R589	Gridded Receptor	529997	5510600	419.7	47.2	76.2	0	n/a
R590	Gridded Receptor	529997	5510590	419.3	46.8	75.8	0	n/a
R591	Gridded Receptor	529997	5510580	419.0	46.5	75.5	0	n/a
R592	Gridded Receptor	529997	5510570	418.7	46.1	75.1	0	n/a
R593	Gridded Receptor	529997	5510560	418.3	45.7	74.7	0	n/a
R594	Gridded Receptor	529997	5510550	418.0	45.2	74.2	0	n/a
R595	Gridded Receptor	529388	5510418	413.9	46.2	75.2	0	n/a
R596	Gridded Receptor	529288	5510418	415.2	48.0	77.0	0	n/a
R597	Gridded Receptor	529188	5510518	418.5	53.6	82.6	6	<0.1%
R598	Gridded Receptor	529088	5510618	412.9	54.4	83.4	8	<0.1%
R599	Gridded Receptor	529088	5510518	416.1	53.8	82.8	8	<0.1%
R600	Gridded Receptor	528988	5510518	412.9	52.9	81.9	10	<0.1%
R601	Gridded Receptor	528988	5510418	409.6	47.4	76.4	0	n/a
R602	Gridded Receptor	528888	5510518	406.5	45.2	74.2	0	n/a
R603	Gridded Receptor	529188	5510418	412.6	47.6	76.6	0	n/a
R604	Gridded Receptor	529788	5510618	413.3	45.2	74.2	0	n/a
R605	Gridded Receptor	529688	5510718	411.2	46.7	75.7	0	n/a
R606	Gridded Receptor	528443	5514332	399.0	45.3	74.3	0	n/a

Receptor Information					Maximum Predicted 1-hour Concentration	Cummulative Concentration	Predicted Excursions of Cumulative Concentrations Above CAAQS (79µg/m³) Over 5 Year Period	
ID#	Description	X (m)	Y (m)	Z (m)	(ug/m³)	(ug/m³)	Count (hours)	Frequency (%)
R607	Gridded Receptor	528443	5514352	399.0	46.8	75.8	0	n/a
R608	Gridded Receptor	528463	5514352	399.4	45.6	74.6	0	n/a
R609	Gridded Receptor	528388	5515118	408.1	46.0	75.0	0	n/a
R610	Gridded Receptor	528429	5514961	400.4	45.2	74.2	0	n/a
R611	Gridded Receptor	528393	5514897	400.0	46.2	75.2	0	n/a
R612	Gridded Receptor	528503	5514352	400.0	46.0	75.0	0	n/a
R613	Gridded Receptor	528504	5514353	400.0	46.1	75.1	0	n/a
R614	Gridded Receptor	528509	5514345	400.0	46.4	75.4	0	n/a
R615	Gridded Receptor	528515	5514337	400.1	46.3	75.3	0	n/a
R616	Gridded Receptor	528521	5514329	400.4	46.0	75.0	0	n/a
R617	Gridded Receptor	528526	5514321	400.7	45.4	74.4	0	n/a
R618	Gridded Receptor	528464	5514999	401.3	45.5	74.5	0	n/a
R619	Gridded Receptor	528457	5514993	400.9	45.1	74.1	0	n/a
R620	Gridded Receptor	529668	5511578	397.7	45.2	74.2	0	n/a
R621	Gridded Receptor	529668	5511598	397.1	45.8	74.8	0	n/a
R622	Gridded Receptor	529688	5511518	400.5	45.8	74.8	0	n/a
R623	Gridded Receptor	529708	5511518	400.7	45.5	74.5	0	n/a
R624	Gridded Receptor	529995	5510969	409.4	46.2	75.2	0	n/a
R625	Gridded Receptor	529995	5510959	408.9	45.6	74.6	0	n/a
R626	Gridded Receptor	529996	5510810	411.1	45.2	74.2	0	n/a
R627	Gridded Receptor	529088	5510418	409.3	45.6	74.6	0	n/a

From: Bell, Dave (CEAA/ACEE)
To: Denyes, Mackenzie
Subject: RE: Goliath-Atmospheric clarifications IR#2
Date: December-17-18 4:41:14 PM
Attachments: image001.png

Recevied and forwarded.

From: Denyes, Mackenzie <mackenzie.denyes@woodplc.com>
Sent: December 17, 2018 4:39 PM
To: Bell, Dave (CEAA/ACEE) <dave.bell@canada.ca>
Cc: Mark Wheeler <mark@treasurymetals.com>; Rawlings, Martin <martin.rawlings@woodplc.com>
Subject: Goliath-Atmospheric clarifications IR#2

Dave,
Please find below our responses in red to the atmospheric environment related questions raised last week.

Mackenzie Denyes, PhD, P.Geo.
Environmental Scientist
Office: +1 905.568.2929 ext. 4146
Cell: +1 905.330.1601
www.woodplc.com

CLARIFICATIONS FOR GOLIATH GOLD ATMOSPHERIC ENVIRONMENT IR#2 UPDATED RESPONSES

1. On page 8, it is stated that "*the isopleth figures provided in TMI_877-AE(2)-01_Attachment_2 (operations) supersede Figures 6 through 19 of Appendix J-2 of the revised EIS (April 2018)*". The response [iii] on page 9 states that "*the only differences between the predictions presented in Tables 6.6.4.1-2, 6.6.4.2-2 and 6.6.4.3-2 of the revised EIS (April 2018) and TMI_877-AE(2)-01_Table_4a, TMI_877-AE(2)-01_Table_4b and TMI_877-AE(2)-01_Table_4c were the changes to the gridded modelling locations as a result of the changes to the property line described in the response to [i], as well as the changes to the sensitive receptors described in the response to part [iv]*". This response implies that the underlying air quality model (emissions and sources) has not changed since April 2018.
Yes, the underlying air quality used to create the isopleth figures are unchanged. Only the property line, receptor locations, and shading contour levels were changed.

Therefore, it would be expected that the isopleths in Attachment 2 should be consistent with their analogous isopleths in Figures 6 to 19 of Appendix J-2, with only the locations of some of the boundaries changing. The Agency has not compared all 14 pairs of figures, but it has found two examples that appear to show inconsistencies.

a) NO_2 1hr contour plot (Appendix J-2, Figure 15 vs TMI_877_AE(2) 01_Attachment_2, Figure 15b): the older figure shows areas to the north of the tailings source with predicted concentrations of 100 to 125 µg/m^3. Those same areas, in the revised figure, shows concentrations between 50 to 80 µg/m^3. In the new figure, the area across the Nursery Road from the location identified as being 57 µg/m^3 shows concentrations of 50 to 65 and 65 to 80 µg/m^3; in the older figure, this area shows 100 to 125 µµg/m^3.

b) $PM_{2.5}$ 24hr contour plot (Appendix J-2, Figure 9 vs TMI_877_AE(2) 01_Attachment_2, Figure 9b): the revised figure shows the concentration at the maximum point of impingement (MPOI) at 23 µg/m^3, and an area to the north of the MPOI with concentrations above 12 µg/m^3. That area in the older figure indicates concentrations of less than 5 µg/m^3.

The Agency comments are noted, but the air modelling team provides assurances that the results used as the basis for both sets figures are the same and the apparent differences may be the result of both the changes to the contour levels used for the shading and the location of the property lines. One additional item to note is that the AERMOD model version has changed twice between generating the figure in Appendix J-2 and the figures included in TMI_877-AE(2)-01_Attachment_2. The figures in Appendix J-2 were generated using the 12345 version of AERMOD, which was the regulatory model in Ontario at the time. The figures in TMI_877-AE(2)-01_Attachment_2 were generated using the 16216 version of AERMOD, which is the current regulatory model in Ontario. The current version of AERMOD (16216) typically results in lower concentrations for the volume sources used to model emissions from material handling and haul roads (note that Ontario MECP confirmed this trend in their own sensitivity tests when they moved to the new model version).

It is also noted that the figures in Attachment 2 do not show a number of the area sources that are in the older figures (e.g., DOZER1, DOZER2, DOER 3, LOADER, ORE). It is not clear whether this is an error in creating the revised figures, or an indication of changes to the air quality model by removing some sources.

As stated above, the air quality modelling files used to create both sets of isopleth figures are unchanged. Only the property line, receptor locations, shading contour levels, and the version of AERMOD used (TMI_877-AE(2)-01_Attachment_2 was created using the current regulatory model in Ontario, vesion 16216 of AERMOD). The area sources (i.e., DOZER1, DOZER2, DOER 3, LOADER, ORE) had been omitted from the operation phase modelling (i.e., Figures 6b through 20b) to avoid clutter. The figures are being regenerated to include the locations of the area sources that were used in the modelling.

Explain the differences between Figures 6 to 19 in Appendix J-2 and their analogous figures in Attachment 2, particularly the two examples given above. Confirm whether any sources or parameters in the air quality modelling changed between April 2018 and December 2018. If so, provide a list of sources or parameters that have changed, and the rationale for the changes.

The only differences between the original isopleth figures included in Appendix J-2 and Figures 6b through 19b of TMI_877-AE(2)-01_Attachment_2 are the property line, receptor locations, shading contour levels, and the regulatory version of AERMOD used

(TMI_877-AE(2)-01_Attachment_2 used the 16216 version of AERMOD). None of the sources were changed or omitted. With respect to the apparent differences for the 1-hour NO2 and 24-hour PM2.5 isopleths between those presented in Appendix J-2 and those presented in TMI_877-AE(2)-01_Attachment_2, the air modelling team provides assurances that the sources used as the basis for both sets figures are the same and the any apparent differences will be the result of changes to the contour levels used for the shading, the location of the property lines, and the version of the model used.

2. On page 65, the Agency requested a map with frequency of exceedances of NO_2. No map was provided, as "*given the extremely low number of 1-hour NO2 concentrations predicted to be numerically higher than 79 µg/m³ (the value of the 1-hour CAAQS for NO_2 in 2025), it is unclear how the information provided in TMI_880-AE(2)-04_Table_5 [sic] could be more clearly presented in a map.*" It is much easier for the reviewers to see the locations where the exceedances could occur in a figure instead of plotting numerous easting and northing values on a map. Further, while Table 6 shows receptor R02 as having a maximum cumulative concentration of 85.2 µg/m3, that location in Attachment 2, Figure 15b (NO2 1hr contour plot) appears in a zone with concentration between 50-65 µg/m^3. It is also unclear why the percentage exceedances listed in Table 6 are based on a benchmark of 45 µg/m^3, as the CAAQS threshold would be 79 µg/m^3.

Figure 15b of TMI_877-AE(2)-01_Attachment_2 provides the concentration isopleths for 1-hour NO2 during the operations phase, and clearly shows where the predicted 1-hour NO2 exceeds the CAAQS of 42 ppb set to come in force in 2025 (depending on the temperature used in the conversion, 42 ppb converts to either 79 or µg/m³). A figure clearly showing those areas where the concentrations are predicted to exceed the CAAQS, along with the frequency of exceeding the CAAQS of 42 ppb is being prepared. This figure will allow for direct analysis and avoid the need to try and plot the results from TMI_880-AE(2)-04_Table_6 receptors on the figure. There was a error in the table. Th frequencies were calculated for the model results directly, and the frequency should have been based on 50 µg/m³ (i.e., 79 µg/m³, less 29 µg/m³ of background). A revised table will be provided that determines the frequencies based on the cumulative predictions.

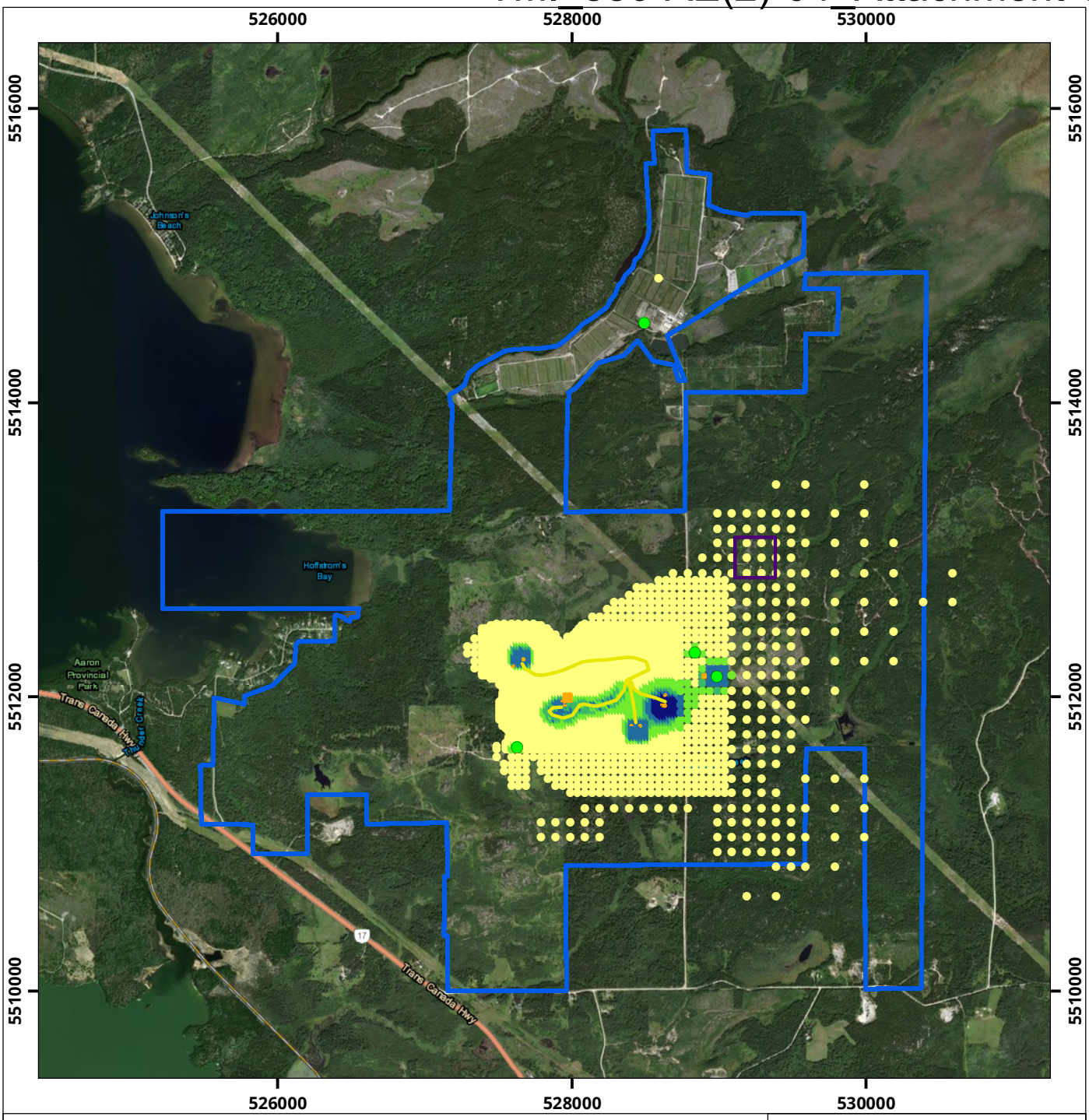
The Agency reiterates its comment: **In response to TMI_880-AE(2)-04B, a table was provided for frequency analysis of exceedances of NO_2. This information would be better conveyed in a map. While it is understood that this list includes "these gridded receptors along the property line", it should also include locations within the updated property boundary where Indigenous use could occur.**

Provide a map with isopleths of frequency levels that conveys the information given in TMI_880-AE(2)-04_Table_6. The map should also include locations within the property boundary where Indigenous use may occur, particularly within Study Area Number 2 (the Local Study Area).

The Agency notes that the original question AE(2)-04B asked for a frequency analysis (in days or in percentage) for any pollutants that are predicted to exceed the standards based on <u>cumulative concentrations</u>…"

It should be noted that as part of TMI_940-AC(2)-07, the Agency requested that the effects of the

Project to Aboriginal peoples, specifically their traditional use of lands and resources, be recalculated to include not only those areas where the resources would lost as a result of the Project, but also those areas where "Changes in access" and "Diminished on-the-land experience" were predicted to occur. These areas were calculated as lost for the purposes of traditional land use, and include all areas where predicted air quality is expected to have concentrations above a criteria level that is based on health. These have been recalculated to include the new CAAQS for 1-hour NO2. Therefore, the EIS has assumed that traditional land use will not occur in all areas where resources are not accessible (i.e., the operations area), all areas where access is controlled for safety reasons (i.e., the former MNRF tree nursery) and all areas within the property line where maximum air concentrations are predicted to be higher than relevant health based criteria.
Additionally, the 2018 HHERA has explicitly evaluated the potential effects to the health of individual members of Indigenous communities that practice traditional uses of the lands within Treasury Metals property boundary.



Point Sources

Volume Sources

Roads

Area Sources

Limit of Private, Patent, and Leased Lands (Includes pending claims to lease)

Number of Exceeding Hours

- 1 - 2,000
- 2,000 - 8,000
- 8,000 - 16,000
- 16,000 - 32,000
- > 32,000

Service Layer Credits:
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0 500 1,000 1,500 m

NO_2 1hr Number of Exceeding Hours Plot

Total Number of Hours Modelled = 42,930

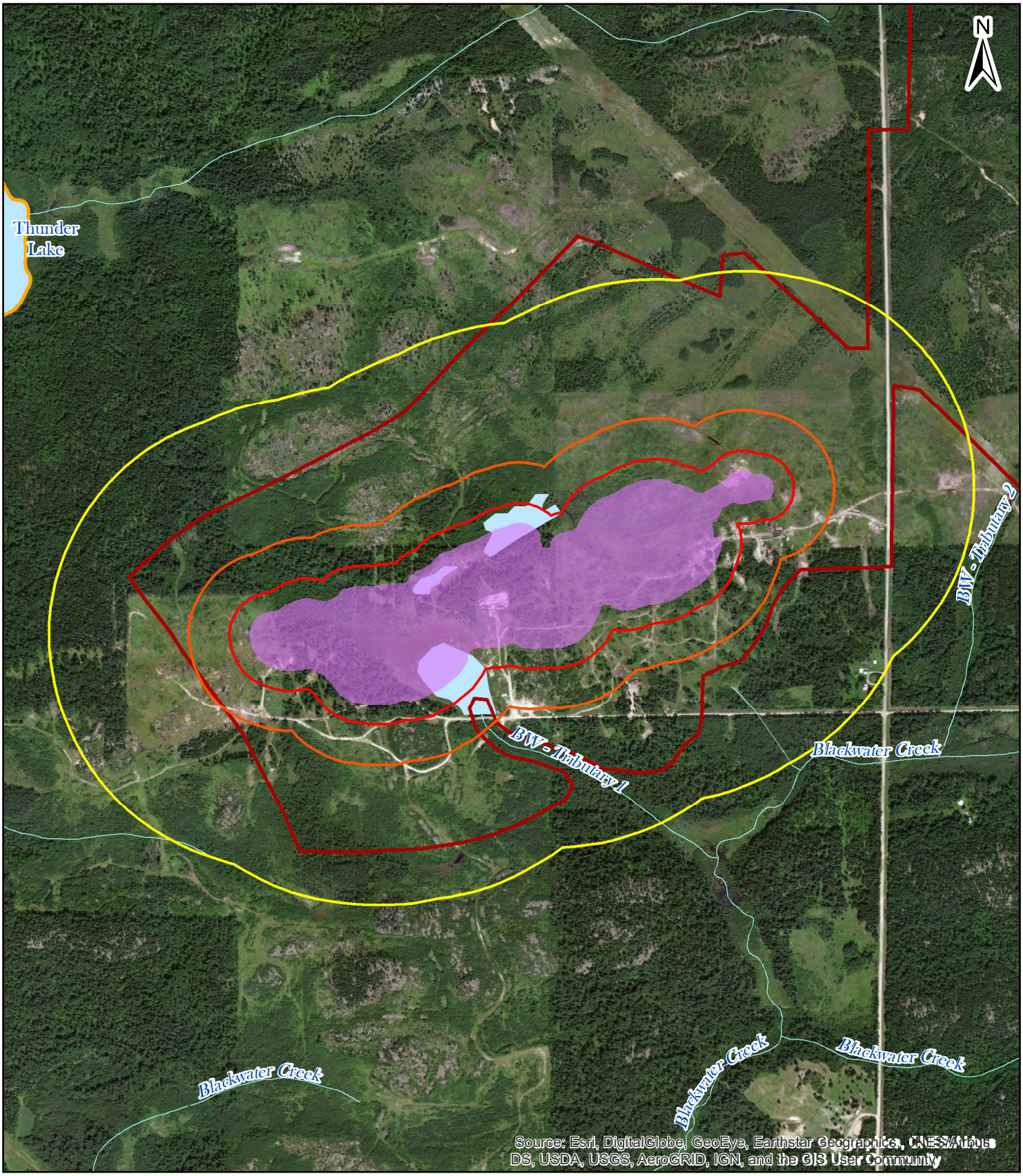
True North

Map Projection: NAD 1983 UTM Zone 15N
Goliath Gold Mine - Wabigoon, Ontario

Project #: 1602163

Drawn by:	DJH	Figure:	1
Approx. Scale:		1:40,000	
Date Revised:		Feb 5, 2019	

Map Document: C:\Users\djh\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC.\GIS Temp\1602163\1602163 - Goliath Gold - FOE Contour Plot_181220.mxd



TMI_882-AE(2)-06_Figure 1

Projection: NAD 1983 UTM Zone 15N

Date created: 2018-08-16

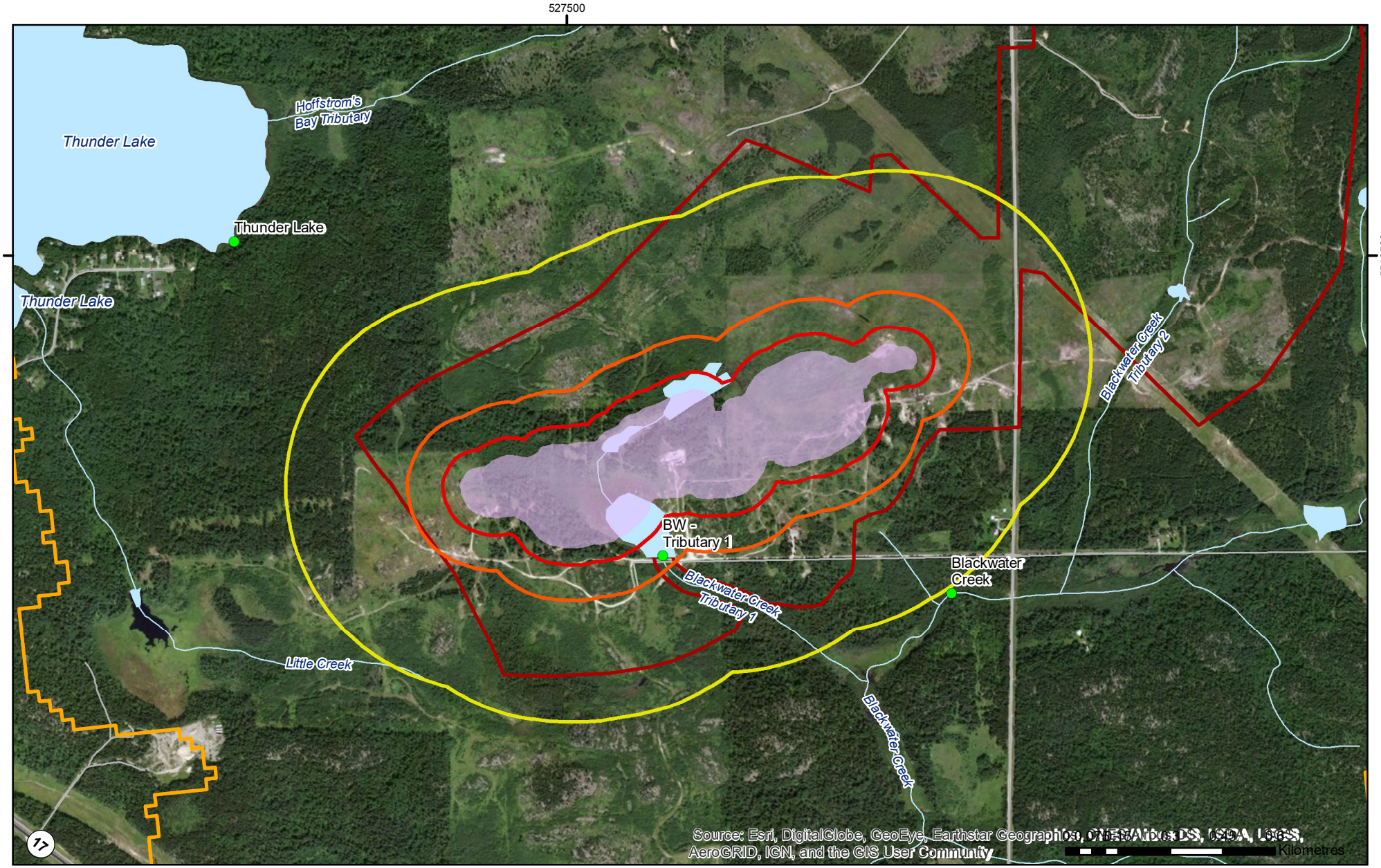
Legend

- Operations Area
- Local Study Area
- Waterbody
- Watercourses
- Open Pit
- 50 m
- 150 m
- 500 m

SCALE: 1:13,014

RESOURCES GROUP

0 0.0750.15 0.3 0.45 0.6 Km



TMI_882-AE(2)-06_Figure 2

Projection: NAD 1983 UTM Zone 15N
Date created: 2018-08-22
SCALE: 1:15,000

Legend

- Operation Area
- Local Study Area
- Road
- Highway
- Stream
- Waterbody
- 50 m
- 150 m
- 500 m
- Open Pit
- Nearest Points

RESOURCES GROUP

TMI_882-AE(2)-06_Table_1

Name	Description	Distance to Pit Perimeter	Estimated Upper Bound [1]		Estimated from DFO Method [3]		Estimated Blasting Overpressure in Water [4]	Estimated Blasting Overpressure in Air [5]
			PPV	Maximum Charge to Meet Limit [2]	PPV	Maximum Charge to Meet Limit [2]		
		(m)	(mm/s)	(kg)	(mm/s)	(kg)	(kPa)	(dBL Peak)
Thunder Lake	at the point closest to the pit	938	3.3	--	0.7	--	0.9	124
Blackwater Creek	at the point closest to the pit	519	8.2	--	1.8	--	2.4	128
BW - Tributary 1	outside of the operations area at the point closest to the pit	111	86	8.3	21	54	28	138

Notes:

Values based on assumed 100 kg charge weight per delay unless otherwise noted

[1] PPV estimated from ISEE Blasting Handbook Table 26.3 upper bound equation for coal mines

[2] Maximum charge weight per delay to meet 13 mm/s DFO limit for spawning fish habitat

[3] PPV estimated from DFO document (Appendix II); appears to be based on ISEE Blasting Handbook general curve fit

[4] Peak water overpressure estimated from DFO document (Appendix II) equations, using PPV from DFO methodology (see Note [3]). When upper bound PPV values are used to derive the water overpressure, some locations may see higher predicted values. For example, Blackwater Creek Tributary 1 (BW – Trib 1) would need to have the charge weight limited to 85 kg to achieve the 100 kPa limit when based on the upper bound values (see Note [1])

[5] Unweighted decibels referenced to 20 microPascals based on metal mines equation from Table 26.7 of ISEE Blasting Handbook