Appendix A: EPA comments

The following presents the comments by EPA on the original AQGHGA and indicates where they are addressed in this AAQA.

1. **It is unclear why some emissions during daily maximum operations are based on 75% intensity**

The particulate emissions for hauling ore from the portal to the ROM pad and materials processing at the ROM pad have been calculated assuming 75% intensity (492,750 tpa). All other waste rock and ore activities have been calculated assuming 100% intensity. It is noted that the emissions for annual average operations assumes 100% intensity.

The AQIA must clearly justify why 75% intensity can be used to calculate emissions for* some *waste and ore activities when assuming maximum daily operations.

RESPONSE:

For PM_{10} and $PM_{2.5}$ emissions, two scenarios were modelled to ensure the worst-case 24-hour average concentrations were predicted:

- Average day
    - This is based on the assumption that the annual maximum material movement and processing activities occur equally each day.
- Maximum day
    - This is based on the maximum possible amount of material that could be removed and processed in a single day.

Table 15 presents a comparison of the assumptions used for the annual average and maximum day calculations. It is noted that more material can be removed from the site in a single day than can be extracted and crushed.

2. **Emissions from combustion sources have not been included in the assessment**

Emissions from combustion sources (diesel engines) have not been considered in the assessment. These sources are generally considered a significant source of $PM_{2.5}$ emissions and should be assessed.

The AQIA should be revised to include emissions from combustion sources.

RESPONSE:

This AAQA includes diesel emissions in the $PM_{2.5}$ emissions. See **Table 14** and **Appendix E**

3. **It is unclear why results in Tables 9.5, 9.6 and Figures 9.8, 9.9, 9.11, and 9.12 show almost identical impacts for maximum daily operations and annual average operations**

The emissions assuming maximum daily operations are approximately 1.6 to 1.7 times the emissions assuming annual average operations. However, Tables 9.5 and 9.6 show identical impacts at almost all receptors, and isopleths in Figures 9.8/9.9 and 9.11/9.12 appear identical.

The AQIA should either correct Tables 9.5 and 9.6, and Figures 9.8, 9.9, 9.11 and 9.12, or provide a plausible explanation why they are not significantly different.

RESPONSE:

Whilst this AAQA replaces the results in the original AQGHGA, there were differences in the results in each table down at 2 to 3 decimal places but that that level of precision is not justified as impacts cannot be measured to that level detection.

As shown in the revised results presented in Section 7, the stack emissions remain constant for a typical and busy day, and as the vast majority of the predicted contribution for the Proposed mine site is due to the stack emissions, there is minimal change in the cumulative concentrations.

4. **Toxic Air Pollutants are only reported at sensitive receptors, and not at and beyond the mining lease boundary**

In accordance with the Approved Methods, ground level concentrations of toxic air pollutants should be reported at and beyond the mining lease boundary.

The AQIA should be revised to report impacts of toxic air pollutants at and beyond the mining lease boundary.

RESPONSE:

Please see **Section 7.3** for results at each receptors and the maximum at the boundary.

5. **Annual average cumulative lead impacts are not assessed at the nearest sensitive receptor**

In accordance with the Approved Methods, 100%ile cumulative annual average lead impacts should be reported at the nearest sensitive receptor.

The AQIA should report the 100%i/e annual average lead impacts at the nearest sensitive receptor

RESPONSE:

These results are presented in **Table 26**

6. **Isopleths of metals concentrations are not reported**

Metals concentrations are only reported in tabular form.

In accordance with the Approved Methods, isopleths should be presented to assess impacts.

RESPONSE:

Please see **Figure 27** and **Figure 28** for lead isopleths and **Appendix F** for the other metals assessed

7. **Proposed dust management practices are not consistent with best practice measures identified in the EIS**

Section 128 of the Protection of the Environment Operations Act 1997 requires that the occupier of any premises must ensure that all necessary practicable means are used

to prevent or minimise air pollution. The proposed control measures listed in Section 7.1 of the AQIA do not include all control practices listed in Section 4.2.6 of the EIS or those considered best practice for mining operations.

Specifically, requirements to limit operations where practicable during high winds should be included in the AQIA. It is noted that the AQIA did not assume ceasing operations during unfavourable winds and in this regard is considered conservative.

The AQIA should include management measures that are consistent with those that are identified in the EIS or those considered best practice for mining operations.

RESPONSE:

See Section 4 for full details of the best practice review completed. These are consistent with all commitments made by Perilya.

The AQIA has applied a full year of meteorological data (which includes high winds) and as demonstrated in Section 7, meets all relevant impact assessment criteria., Therefore it was not deemed necessary to complete a dispersion modelling exercise where activities were limited under unfavourable winds as this already forms part of the AQIA.

Appendix B: AERMOD Setup

Meteorology				
Meteorological data for Surface Files –(Samson file)	Broken Hill Airport - Meteorological Station • Air temperature • Relative Humidity • Wind speed • Wind direction • Station Pressure • Cloud cover • Cloud height			
Land Use	Urban: 240-360^{o} (Albedo – 0.2075, Bowen ratio – 1.625 and Surface roughness – 1) Desert Shrubland: 0 – 240^{o} (Albedo – 0.3275, Bowen ratio – 4.75 and Surface roughness – 0.2625)			
AERMET PFL	Upper Air estimator			
Year of analysis	January 2016 - December 2016			
Model Set up				
Centre of domain (lat, long)	-31°57'15.56" S, 141°29'13.3" E			
Centre of domain (easting, northing)	546025, 6464524			
MGA coordinate zone	54 J			
Grid domain size	12km x 8.4km			
Grid spacing	200m			
South west corner of gridded receptor domain (m)	538300, 645900			
Number of grid points	61 x 43			
Terrain data	SRTM3 at 30m resolution			
Rural Mode	Selected			
Particle parameters				
Particle type	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**Dust deposition**
Particle Method	Method 1	Method 1	Method 1	Selected
Particle diameter (microns)	17	5	1	17
Mass Fraction	1	1	1	1
Particle Density	2.5	2.5	2.5	2.5
Dry depletion	Selected	Selected	Selected	Selected
Output Options				
Highest values/9th highest				

Appendix C: Predicted concentrations at monitors & assumed background data

Table 30 presents a summary of the measured concentrations of PM_{10}, TSP and Pb in TSP, and levels of dust deposition and Pb in dust deposition, at the Perilya and Rasp monitors.

Table 31 presents the predicted contribution at each monitor for the relevant parameter due to the existing mine.

Table 32 presents the calculated background concentration/level in the absence of the existing mine. The values in bold for annual average Pb concentrations (in TSP) and annual average Pb in dust deposition were applied in the cumulative assessment as detailed in **Table 33**.

For annual average TSP and PM_{10}, and 24-hour average PM_{10}, the measured concentrations were conservatively used as the contribution from the existing Mine Site was so minor.

- Annual average TSP = 35.9 μg/m^3 (TSP-HVAS)
- Annual average PM_{10} = 13.0 μg/m^3 (TEOM1) and 13.2 (TEOM2)

For annual average and 24-hour average $PM_{2.5}$, as there are no $PM_{2.5}$ data collected in the area, the $PM_{2.5}$ to PM_{10} ratio of 0.409 calculated from OEH data collected at Wagga Wagga was applied to measured PM_{10} data.

- Annual average $PM_{2.5}$ = 5.3 μg/m^3 (TEOM1) and 5.4 (TEOM2)

Table 33 present a summary of which data were applied to which receptor.

Table 30: *2016 measured concentrations and dust deposition levels at Perilya and Rasp monitors*

ID	Measuring	2016 - measured background - annual average				
		TSP (μg/m^3)	Pb in TSP (μg/m^3)	Dust Deposition (g/m^2/mth)	Pb in Deposition (g/m$_2$/mth)	PM_{10} (μg/m^3)
LP15	Dust Dep/Pb in dust dep	N/A	N/A	1.573	2.64E-03	N/A
LP16	Dust Dep/Pb in dust dep	N/A	N/A	0.882	3.00E-03	N/A
LP17	Dust Dep/Pb in dust dep	N/A	N/A	1.533	8.95E-03	N/A
LP19	Dust Dep/Pb in dust dep	N/A	N/A	1.275	2.67E-03	N/A
LP20	Dust Dep/Pb in dust dep	N/A	N/A	1.500	3.45E-03	N/A
LP22	Dust Dep/Pb in dust dep	N/A	N/A	2.420	3.47E-03	N/A
LP23	Dust Dep/Pb in dust dep	N/A	N/A	1.917	4.36E-03	N/A
LP24	Dust Dep/Pb in dust dep	N/A	N/A	1.408	1.08E-02	N/A
LP25	Dust Dep/Pb in dust dep	N/A	N/A	2.209	4.15E-03	N/A
DG1	Dust Dep/Pb in dust dep	N/A	N/A	0.810	3.54E-03	N/A
DG2	Dust Dep/Pb in dust dep	N/A	N/A	0.415	2.26E-03	N/A
DG3	Dust Dep/Pb in dust dep	N/A	N/A	0.985	1.06E-02	N/A
DG4	Dust Dep/Pb in dust dep	N/A	N/A	1.141	7.40E-03	N/A
DG5	Dust Dep/Pb in dust dep	N/A	N/A	1.547	9.15E-03	N/A
DG6	Dust Dep/Pb in dust dep	N/A	N/A	2.678	2.45E-03	N/A
DG7	Dust Dep/Pb in dust dep	N/A	N/A	0.967	1.11E-02	N/A
TSP-HVAS;	TSP/Lead	35.9	2.30E-01	N/A	N/A	N/A
PM10-HVAS1	PM_{10}/Lead		N/A	N/A	N/A	N/A
PM10-HVAS2	PM_{10}/Lead		N/A	N/A	N/A	N/A
MP12	Concentration (TSP/Lead)	20.2	5.31E-02	N/A	N/A	N/A
MP26	Concentration (TSP/Lead)	26.1	2.20E-01	N/A	N/A	N/A
MP27	Concentration (TSP/Lead)	30.1	2.00E-01	N/A	N/A	N/A
TEOM1	PM_{10}	N/A	N/A	N/A	N/A	13.0
TEOM2	PM_{10}	N/A	N/A	N/A	N/A	13.8

Table 31: *2016 predicted concentrations and dust deposition levels at Perilya and Rasp monitors due to existing Mine Site emissions*

ID	Measuring	Existing Mine Site contribution - annual average				
		TSP (µg/m³)	Pb in TSP (µg/m³)	Dust Deposition (g/m²/mth)	Pb in Deposition (g/m₂/mth)	PM_{10} (µg/m³)
LP15	Dust Dep/Pb in dust dep	N/A	N/A	6.27E-04	5.22E-05	N/A
LP16	Dust Dep/Pb in dust dep	N/A	N/A	1.90E-03	1.58E-04	N/A
LP17	Dust Dep/Pb in dust dep	N/A	N/A	1.24E-02	1.03E-03	N/A
LP19	Dust Dep/Pb in dust dep	N/A	N/A	5.55E-03	4.62E-04	N/A
LP20	Dust Dep/Pb in dust dep	N/A	N/A	1.53E-03	1.27E-04	N/A
LP22	Dust Dep/Pb in dust dep	N/A	N/A	9.87E-03	8.23E-04	N/A
LP23	Dust Dep/Pb in dust dep	N/A	N/A	8.34E-03	6.95E-04	N/A
LP24	Dust Dep/Pb in dust dep	N/A	N/A	1.01E-03	8.46E-05	N/A
LP25	Dust Dep/Pb in dust dep	N/A	N/A	1.52E-02	1.27E-03	N/A
DG1	Dust Dep/Pb in dust dep	N/A	N/A	1.69E-04	1.41E-05	N/A
DG2	Dust Dep/Pb in dust dep	N/A	N/A	1.38E-04	1.15E-05	N/A
DG3	Dust Dep/Pb in dust dep	N/A	N/A	1.79E-03	1.49E-04	N/A
DG4	Dust Dep/Pb in dust dep	N/A	N/A	2.55E-03	2.13E-04	N/A
DG5	Dust Dep/Pb in dust dep	N/A	N/A	2.61E-04	2.17E-05	N/A
DG6	Dust Dep/Pb in dust dep	N/A	N/A	8.42E-04	7.01E-05	N/A
DG7	Dust Dep/Pb in dust dep	N/A	N/A	3.44E-04	2.87E-05	N/A
TSP-HVAS;	TSP/Lead	2.31E-02	7.05E-05	N/A	N/A	N/A
PM10-HVAS1	PM_{10}/Lead		N/A	N/A	N/A	N/A
PM10-HVAS2	PM_{10}/Lead		N/A	N/A	N/A	N/A
MP12	Concentration (TSP/Lead)	6.34E-03	2.02E-05	N/A	N/A	N/A
MP26	Concentration (TSP/Lead)	1.80E+00	4.10E-03	N/A	N/A	N/A
MP27	Concentration (TSP/Lead)	7.54E-02	2.46E-04	N/A	N/A	N/A
TEOM1	PM_{10}	N/A	N/A	N/A	N/A	4.91E-02
TEOM2	PM_{10}	N/A	N/A	N/A	N/A	6.59E-02

Table 32: *Assumed background concentrations and dust deposition levels for cumulative dust and Pb assessment*

ID	Measuring	Calculated background = measured - predicted			
		TSP (µg/m³)	Pb in TSP (µg/m³)	Pb in Deposition (g/m₂/mth)	PM_{10} (µg/m³)
LP15	Dust Dep/Pb in dust dep	N/A	N/A	**2.58E-03**	N/A
LP16	Dust Dep/Pb in dust dep	N/A	N/A	**2.84E-03**	N/A
LP17	Dust Dep/Pb in dust dep	N/A	N/A	**7.91E-03**	N/A
LP19	Dust Dep/Pb in dust dep	N/A	N/A	**2.21E-03**	N/A
LP20	Dust Dep/Pb in dust dep	N/A	N/A	**3.33E-03**	N/A
LP22	Dust Dep/Pb in dust dep	N/A	N/A	**2.65E-03**	N/A
LP23	Dust Dep/Pb in dust dep	N/A	N/A	**3.67E-03**	N/A
LP24	Dust Dep/Pb in dust dep	N/A	N/A	**1.07E-02**	N/A
LP25	Dust Dep/Pb in dust dep	N/A	N/A	**2.88E-03**	N/A
DG1	Dust Dep/Pb in dust dep	N/A	N/A	**3.52E-03**	N/A
DG2	Dust Dep/Pb in dust dep	N/A	N/A	**2.25E-03**	N/A
DG3	Dust Dep/Pb in dust dep	N/A	N/A	**1.04E-02**	N/A
DG4	Dust Dep/Pb in dust dep	N/A	N/A	**7.19E-03**	N/A
DG5	Dust Dep/Pb in dust dep	N/A	N/A	**9.13E-03**	N/A
DG6	Dust Dep/Pb in dust dep	N/A	N/A	**2.38E-03**	N/A
DG7	Dust Dep/Pb in dust dep	N/A	N/A	**1.11E-02**	N/A
TSP-HVAS;	TSP/Lead	35.9	**0.230**	N/A	N/A
PM10-HVAS1	PM_{10}/Lead		N/A	N/A	N/A
PM10-HVAS2	PM_{10}/Lead		N/A	N/A	N/A
MP12	Concentration (TSP/Lead)	20.1	**0.053**	N/A	N/A
MP26	Concentration (TSP/Lead)	24.3	**0.216**	N/A	N/A
MP27	Concentration (TSP/Lead)	30.1	**0.200**	N/A	N/A
TEOM1	PM_{10}	N/A	N/A	N/A	12.9
TEOM2	PM_{10}	N/A	N/A	N/A	13.7

Table 33: *Summary of monitors used for cumulative assessment*

Receptor ID	Receptor Description	Adopted monitoring location used for background			
		PM_{10}, $PM_{2.5}$	TSP	Pb concentration	Dust deposition & Pb deposition
1	Brady Street	TEOM2	Rasp TSP-HVAS	MP26	LP17
2	Mann Street	TEOM2	Rasp TSP-HVAS	MP26	LP17
3	Argent Street (Barrier Hwy)	TEOM2	Rasp TSP-HVAS	MP26	LP17
4	Argent Street (Barrier Hwy)	TEOM2	Rasp TSP-HVAS	MP26	LP17
5	Argent Street (Barrier Hwy)	TEOM2	Rasp TSP-HVAS	MP26	LP22
6	Argent Street (Barrier Hwy)	TEOM2	Rasp TSP-HVAS	MP26	LP22
7	Argent Street (Barrier Hwy)	TEOM2	Rasp TSP-HVAS	MP26	LP22
8	Chattel Street	TEOM2	Rasp TSP-HVAS	MP26	LP22
9	Sturt Street	TEOM2	Rasp TSP-HVAS	MP26	LP22
10	Crystal Street	TEOM2	Rasp TSP-HVAS	MP26	LP24
11	Crystal Street	TEOM2	Rasp TSP-HVAS	MP26	LP24
12	Iodide Street	TEOM2	Rasp TSP-HVAS	MP26	LP24
13	Lawton Street	TEOM1	Rasp TSP-HVAS	MP26	DG5
14	Duff Street	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG7
15	Airport Road	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG7
16	Airport Road	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG7
17	Menindee Road	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	LP23
18	Menindee Road	TEOM1	Rasp TSP-HVAS	MP26	LP23
19	Barrier Highway	TEOM1	Rasp TSP-HVAS	MP26	LP15
20	Barrier Highway	TEOM1	Rasp TSP-HVAS	MP26	LP15
21	Piper Street North	TEOM1	Rasp TSP-HVAS	MP26	DG5
22	Piper Street Central	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG5
23	Eyre Street North	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG5
24	Eyre Street Central	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG5
25	Eyre Street South	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG5
26	South Road	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG5
27	Carbon Lane	TEOM2	Rasp TSP-HVAS	Rasp TSP-HVAS	DG2
28	Old South Road	TEOM2	Rasp TSP-HVAS	MP12	DG1
29	South Rd	TEOM2	Rasp TSP-HVAS	MP12	DG2
30	Cnr Garnet & Blende Streets	TEOM2	Rasp TSP-HVAS	MP12	DG2
31	Eyre Street North	TEOM1	Rasp TSP-HVAS	MP12	DG5
32	Eyre Street North	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG5
33	Eyre Street North	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG5
34	Eyre Street North	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG5
35	Proprietary Square	TEOM2	Rasp TSP-HVAS	Rasp TSP-HVAS	DG6
36	Proprietary Square	TEOM2	Rasp TSP-HVAS	MP26	DG6
37	Iodide Street	TEOM2	Rasp TSP-HVAS	MP26	DG6
38	Iodide Street	TEOM2	Rasp TSP-HVAS	MP26	LP24
39	Crystal Street	TEOM2	Rasp TSP-HVAS	MP26	LP24
40	Crystal Street	TEOM2	Rasp TSP-HVAS	MP26	LP24
41	Brownes Shaft Dwelling	TEOM2	Rasp TSP-HVAS	MP26	DG4
42	Crystal Street	TEOM2	Rasp TSP-HVAS	MP26	DG1
43	Crystal Street	TEOM2	Rasp TSP-HVAS	MP12	DG6
44	Crystal Street	TEOM2	Rasp TSP-HVAS	MP26	DG6
45	Crystal Street	TEOM2	Rasp TSP-HVAS	MP26	DG6
46	Gypsum Street	TEOM2	Rasp TSP-HVAS	MP26	DG1
47	Gypsum Street	TEOM2	Rasp TSP-HVAS	MP12	DG1
48	Silver City Hwy	TEOM2	Rasp TSP-HVAS	MP12	DG1
49	Silver City Hwy	TEOM2	Rasp TSP-HVAS	MP12	DG1
50	Silver City Hwy	TEOM2	Rasp TSP-HVAS	MP12	DG1
51	Creedon Street	TEOM2	Rasp TSP-HVAS	MP12	DG1
52	Nicholls Street	TEOM2	Rasp TSP-HVAS	MP12	DG1
53	Willyama High School	TEOM2	Rasp TSP-HVAS	MP12	LP20
54	Morgan Street Public School	TEOM2	Rasp TSP-HVAS	MP26	LP20
55	Sacred Heart Parish Primary School	TEOM2	Rasp TSP-HVAS	MP26	LP24
56	Broken Hill Public School	TEOM2	Rasp TSP-HVAS	MP26	DG2
57	Broken Hill High School	TEOM2	Rasp TSP-HVAS	MP12	DG2
58	Railway Public School	TEOM2	Rasp TSP-HVAS	MP12	DG2
59	Burke Ward Primary School	TEOM2	Rasp TSP-HVAS	MP12	DG2
60	Alma Public School	TEOM1	Rasp TSP-HVAS	MP12	DG7
61	Alma Bugldi Preschool	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG5
62	Playtime Pre-school	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG7
63	Alma Primary School	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG7
64	N. Broken Hill Primary School	TEOM2	Rasp TSP-HVAS	Rasp TSP-HVAS	LP20
65	Rainbow Pre-school	TEOM1	Rasp TSP-HVAS	MP26	DG7
66	Broken Hill Family Day Care Scheme	TEOM2	Rasp TSP-HVAS	Rasp TSP-HVAS	DG2
67	Broken Hill Hospital	TEOM2	Rasp TSP-HVAS	MP12	LP24
68	Far West Mental Health Recovery Centre	TEOM2	Rasp TSP-HVAS	MP26	DG6

Receptor ID	Receptor Description	Adopted monitoring location used for background			
		PM_{10}, $PM_{2.5}$	TSP	Pb concentration	Dust deposition & Pb deposition
69	Aruma Lodge Aged Care Service	TEOM2	Rasp TSP-HVAS	MP26	DG6
70	Harold Williams Home Aged Care Service	TEOM1	Rasp TSP-HVAS	MP26	DG5
71	Broken Hill Airport	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG7
72	Water tank, Lawton Street #	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG5
73	Quarry offices	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG6
74	Bowling Green	TEOM2	Rasp TSP-HVAS	MP26	LP24
75	Playground Duff St Park	TEOM1	Rasp TSP-HVAS	MP26	DG7
76	Playground Patton Park	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG5
77	Playground Zinc Lakes	TEOM1	Rasp TSP-HVAS	Rasp TSP-HVAS	DG7
78	Playground Sturt Park	TEOM2	Rasp TSP-HVAS	Rasp TSP-HVAS	DG6
79	Playground Queen Elizabeth Park	TEOM2	Rasp TSP-HVAS	MP26	LP20
80	North Family Play Centre	TEOM2	Rasp TSP-HVAS	MP26	LP20
81	Excelsior Sportsground	TEOM2	Rasp TSP-HVAS	MP26	DG2
82	Picton Oval	TEOM2	Rasp TSP-HVAS	MP12	DG2
83	Playing field, cnr Barr Hwy & Garnet St	TEOM2	Rasp TSP-HVAS	MP12	DG2
84	Tennis courts Iodide Ln	TEOM2	Rasp TSP-HVAS	MP12	LP24
85	Sporting ground, cnr Bagot & Beryl St	TEOM2	Rasp TSP-HVAS	MP26	LP24
86	North Broken Hill football club	TEOM2	Rasp TSP-HVAS	MP26	LP22
A	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
B	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
C	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
D	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
E	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
F	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
G	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
H	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
I	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
J	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
K	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
L	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP22
M	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP17
N	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP18
O	Project-related residence	TEOM2	Rasp TSP-HVAS	MP26	LP19
P	Junction Circle	TEOM2	Rasp TSP-HVAS	MP26	LP22

Appendix D: Construction Assessment Methodology

Overview

The risk of dust impacts from a demolition/construction site causing loss of amenity and/or health or ecological impacts is related to the following (IAQM, 2014):

- The nature of the activities being undertaken.
- The duration of the activities.
- The size of the site.
- The meteorological conditions (wind speed, direction and rainfall). Adverse impacts are more likely to occur downwind of the site and during drier periods.
- The proximity of receptors to the activities.
- The sensitivity of the receptors to dust.
- The adequacy of the mitigation measures applied to reduce or eliminate dust.

It is very difficult to quantify dust emissions from construction activities. Due to the variability of the weather it is impossible to predict what the weather conditions would be when specific construction activities are undertaken. Any effects of construction on airborne particle concentrations would also generally be temporary and relatively short-lived. Moreover, mitigation should be straightforward, as most of the necessary measures are routinely employed as 'good practice' on construction sites. It is therefore usual to provide a qualitative assessment of potential construction dust impacts. A largely qualitative approach has also been used here, and the impacts of construction have not been specifically modelled. The approach used for Proposal was based on that described by IAQM (2014). The aim is to identify risks and to recommend appropriate mitigation measures.

The IAQM guidance is designed primarily for use in the UK, although it may be applied elsewhere. Here, the guidance has been adapted for use in NSW, taking into account factors such as the assessment criteria for ambient PM_{10} concentrations.

Construction activities at the Proposal

The construction areas for the Proposal are the:

- Haul road
- Amenity bund
- Evaporation ponds

The total construction work will take between one and two weeks with water carts available for dust suppression.

Assessment procedure

The IAQM assessment procedure for assessing risk is shown in Figure D1. Professional judgement is required in some steps, and where justification cannot be given a precautionary approach should be adopted.

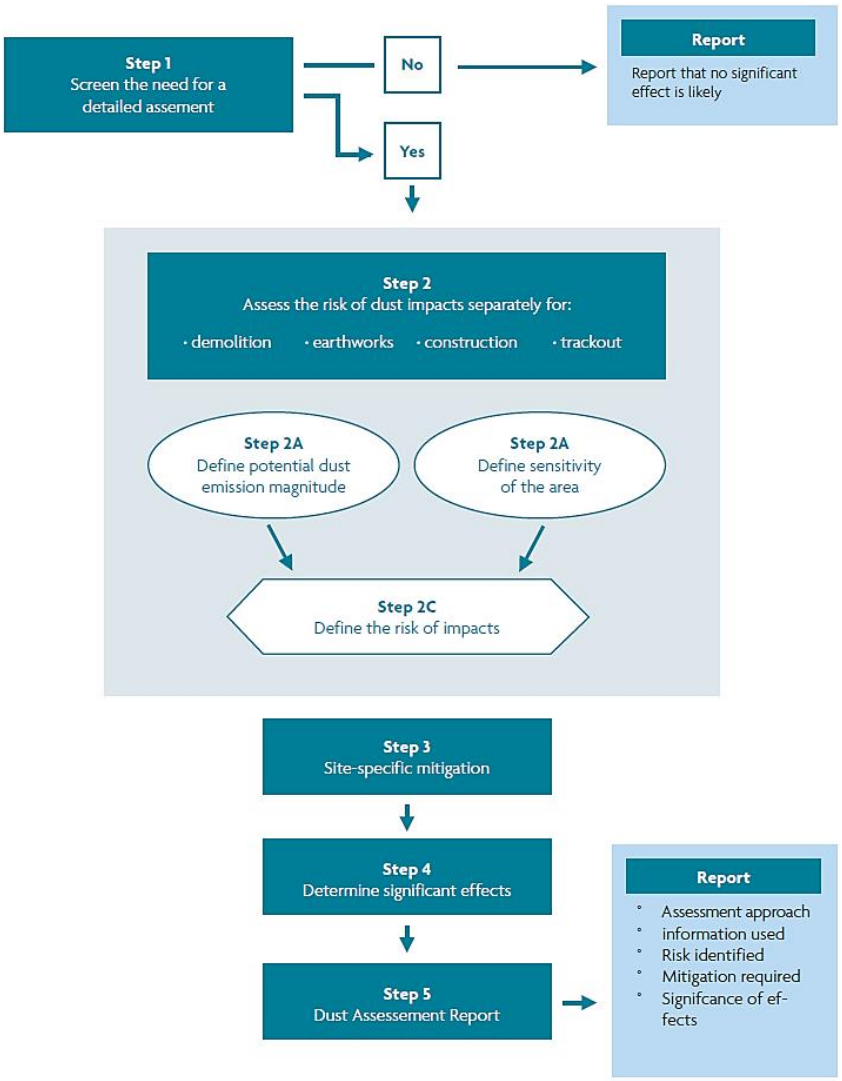

Figure 29: *Steps in an assessment of construction dust (IAQM, 2014)*

Activities on construction sites can be divided into four types to reflect their different potential impacts, and the potential for dust emissions is assessed for each activity that is likely to take place. These activities are:

- *Demolition*. Demolition is any activity that involves the removal of existing structures. This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time.
- *Earthworks*. This covers the processes of soil stripping, ground levelling, excavation and landscaping. Earthworks will primarily involve excavating material, haulage, tipping and stockpiling.
- *Construction*. Construction is any activity that involves the provision of new structures, modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, *etc*.

- *Track-out.* This involves the transport of dust and dirt by HDVs from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.

The assessment methodology considers three separate dust impacts:

- Annoyance due to dust soiling.
- The risk of health effects due to an increase in exposure to PM_{10}.
- Harm to ecological receptors

The assessment is used to define appropriate mitigation measures to ensure that there will be no significant effect.

The assessment steps, as they were applied to the mine, are summarised in the following Sections.

Step1: Screening

Step 1 is a screening assessment. A construction dust assessment will normally be required where:

- There are human receptors within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).
- There are ecological receptors within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

A 'human receptor', refers to any location where a person or property may experience the adverse effects of airborne dust or dust soiling, or exposure to PM_{10} over a time period relevant to air quality standards and goals. In terms of annoyance effects, this will most commonly relate to dwellings, but may also refer to other premises such as buildings housing cultural heritage collections (e.g. museums and galleries), vehicle showrooms, food manufacturers, electronics manufacturers, amenity areas and horticultural operations (e.g. salad or soft-fruit production). An 'ecological receptor' refers to any sensitive habitat affected by dust soiling. This includes the direct impacts on vegetation or aquatic ecosystems of dust deposition, and the indirect impacts on fauna (e.g. on foraging habitats) (IAQM, 2014).

In this screening stage the individual areas of proposed construction works were examined: the haul road, amenity bund and evaporation ponds. It can be seen from **Figure 30** that there are sensitive receptors (project-related residences) within 350 metres of the boundaries of the amenity bund and haul road. An assessment for the evaporation ponds has been screened out as there are no sensitive receptors within 350 m.

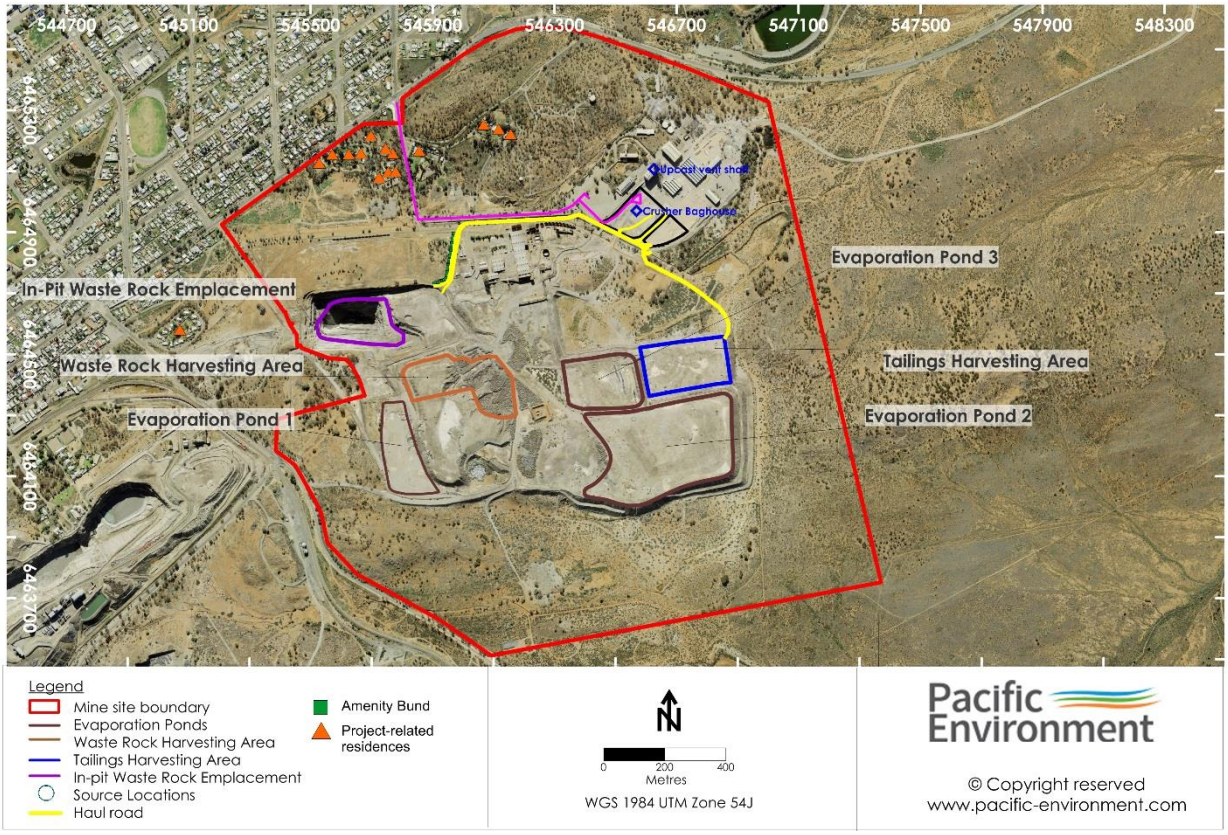

Figure 30: *Screening assessment – human receptors near the construction*

An assessment for ecological receptors has been screened out as no ecological receptors were identified within 50 m of the construction activities.

The construction assessment therefore proceeded to Step 2 for soiling and human health impacts only, and ecological impacts were not assessed.

Step 2: Risk assessment

In Step 2 the risk of dust arising in sufficient quantities to cause annoyance and/or health effects was determined separately for each scenario and each of the four activities (demolition, earthworks, construction, and track-out). Risk categories were assigned to the site based on two factors:

- The scale and nature of the works, which determines the magnitude of potential dust emissions. This is assessed in Step 2A.
- The sensitivity of the area, including the proximity of sensitive receptors (i.e. the potential for effects). This is assessed in Step 2B.

These factors are combined in Step 2C to give the risk of dust impacts. Risks are categorised as low, medium or high for each of the four separate potential activities. Where there is risk of an impact, then site-specific mitigation will be required in proportion to the level of risk.

Step 2A: Potential for dust emissions

The criteria for assessing the potential scale of emissions based on the scale and nature of the works are shown in **Table 34.** Based on these criteria and construction assumptions provided, the appropriate categories for the Proposal are shown in **Table 35**.

Table 34: Site categories (scale of works) (from IAQM, 2014)

Type of activity	Site category		
Demolition	Building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level.	Building volume 20,000–50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level.	Building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding, timber), demolition activities <10 m above ground and during wetter months.
Earthworks	Site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth-moving vehicles active at any one time, formation of bunds>8 m in height, total material moved >100,000 tonnes.	Site area 2,500-10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4-8 m in height, total material moved 20,000-100,000 tonnes.	Site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes, earthworks during wetter months.
Construction	Total building volume >100,000 m^3, piling, on site concrete batching; sandblasting	Building volume 25,000-100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching.	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).
Track-out	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.	10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50–100 m.	<10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.

Table 35: *Site categories for the Proposal*

Type of activity	Activity assumptions	Category
Demolition	- No demolition is expected	-
Earthworks	- Site area greater than 10,000 m^2	Large
Construction	- Building volumes will be between 25,000 – 100,000 m^3 - There will be potentially dusty construction material - There will not be any piling or concrete batching	Medium
Track-out	- Assumed large number of HDV outward movements at the peak - The surface material of the road will potentially be dusty e.g. during excavation activities.	Medium

Step 2B: Sensitivity of area

The sensitivity of the area takes into account the specific sensitivities of local receptors, the proximity and number of the receptors, and the local background PM_{10} concentration. Dust soiling and health impacts are treated separately.

Sensitivity of area to dust soiling effects on people and property

The criteria for determining the sensitivity of an area to dust soiling effects are shown in **Table 36** Based on the IAQM guidance[2] the receptor sensitivity was assumed to be 'High':

Table 36: *Criteria for sensitivity of area to dust soiling effects (from IAQM, 2014*)

Receptor sensitivity	Number of receptors	Distance from source (m)			
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

The number of nearby receptors was estimated from site plans (see **Figure 1**). The exact counting of the number of 'human receptors' is not required by the IAQM guidance. Instead it is recommended that judgement is used to determine the approximate number of receptors within each distance band. For receptors which are not dwellings professional judgement should be used to determine the number of human receptors.

The numbers of receptors for each scenario and activity, and the resulting outcomes are shown in **Table 37**.

[2] Professional judgement is used to identify where on the spectrum between high and low sensitivity a receptor lies. High sensitivity receptors can reasonably expect enjoyment of a high level of amenity. The appearance, aesthetics or value of their properties would be diminished by soiling, and the people or properties would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.

Table 37: *Results - sensitivity to dust soiling effects*

Activity	Receptor sensitivity	Number of receptors by distance from source				Sensitivity of area
		<20 m	20-50 m	50-100 m	100-350 m	
Demolition	-	-	-	-	-	-
Earthworks	High	0	0	0	9	Low
Construction	High	0	0	0	9	Low
Track-out	High	0	5	N/A	N/A	Low

Sensitivity of area to human health impacts

The criteria for determining the sensitivity of an area to human health impacts caused by construction dust are shown in **Table 38**. Based on the IAQM guidance[3] the receptor sensitivity was assumed to be 'High'. The numbers of receptors for each scenario and activity, and the resulting outcomes are shown in **Table 39**.

[3] The sensitivity of people to the health effects of PM10 is based on exposure to elevated concentrations over a 24-hour period. High sensitivity receptors relate to locations where members of the public are exposed over a time period relevant to the air quality objective for PM10 (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.

Table 38: *Criteria for sensitivity of area to health impacts*

Receptor sensitivity	Annual mean PM_{10} conc. ($\mu g/m^3$) [(a)]	Number of receptors	Distance from source (m)				
			<20	<50	<100	<200	<350
High	>24	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	21-24	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	18-21	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<18	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

(a) Scaled for Sydney, according to the ratio of NSW and UK annual mean standards (30 $\mu g/m^3$ and 40 $\mu g/m^3$ respectively).

Table 39: *Results - sensitivity to health impacts*

Activity	Receptor sensitivity	Annual mean PM_{10} conc. ($\mu g/m^3$)	Number of receptors by distance from source					Sensitivity of area
			<20 m	20-50 m	50-100 m	100-200 m	100-350 m	
Demolition	High	18-21	0	0	0	0	9	Low
Earthworks	High	18-21	0	0	0	0	9	Low
Construction	High	18-21	0	0	0	0	9	Low
Track-out	High	18-21	0	5	N/A	N/A	N/A	Low

Risk of dust impacts

The dust emission potential determined in Step 2A is combined with the sensitivity of the area determined in Step 2B to give the risk of impacts with no mitigation applied. The criteria are shown in **Table 40**.

Table 40: *Criteria for sensitivity of area to health impacts (from IAQM, 2014)*

Type of activity	Sensitivity of area	Dust emission potential		
		Large	Medium	Small
Demolition	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Track-out	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

Final results

The final results for the construction risk assessment are provided in **Table 41**. Earthworks, construction activity and track-out were 'low risk'.

Table 41: *Summary of risk assessment for the Proposal*

Type of activity	Step 2A: Potential for dust emissions	Step 2B: Sensitivity of area			Step 2C: Risk of dust impacts		
		Dust soiling	Human health	Ecological	Dust soiling	Human health	Ecological
Demolition	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Earthworks	Large	Low	Low	N/A	Low Risk	Low Risk	N/A
Construction	Medium	Low	Low	N/A	Low Risk	Low Risk	N/A
Track-out	Large	Low	Low	N/A	Low Risk	Low Risk	N/A

Appendix E: Emission Inventories

Existing Mine Site - Annual (typical day day) inventories

Table 42: *Existing Mine Site TSP emission Inventory (Annual Activity)*

ACTIVITY	TSP (kg/y)	Intensity	Units	Emission factor	Units	Variable 1	Units	Control	Units	Control Assumption
WE - Existing - Area A	1,542	11	ha	0.1	kg/ha/h	8760	h	84	% control	Application of gravel to stabilise disturbed open areas - to reflect partly paved and covered by buildings
WE - Existing - Area B	32,850	75	ha	0.1	kg/ha/h	8760	h	50	% control	RASP - fre area dry-crusteed= 96.6%; Used 50% to take account of the fact there are some unstable areas
WE - Existing - Area C	11,826	45	ha	0.1	kg/ha/h	8760	h	70	% control	Per EPA Best Practice Report - Vegetative Ground Cover
WE - Existing - Area D	7,884	30	ha	0.1	kg/ha/h	8760	h	70	% control	Per EPA Best Practice Report - Vegetative Ground Cover
WE - Existing - Area E	2,803	20	ha	0.1	kg/ha/h	8760	h	84	% control	Application of gravel to stabilise disturbed open areas - to reflect partly paved and covered by buildings
WE - Existing - Area F	32,850	125	ha	0.1	kg/ha/h	8760	h	70	% control	Per EPA Best Practice Report - Vegetative Ground Cover
TOTAL EMISSIONS	89,755									

Table 43: *Existing Mine Site PM_{10} emission Inventory (Annual Activity)*

ACTIVITY	PM10(kg/y)	Intensity	Units	Emission factor	Units	Variable 1	Units	Control	Units	Control Assumption
WE - Existing - Area A	771	11	ha	0.05	kg/ha/h	8760	h	84	% control	Application of gravel to stabilise disturbed open areas - to reflect partly paved and covered by buildings
WE - Existing - Area B	16,425	75	ha	0.05	kg/ha/h	8760	h	50	% control	RASP - fre area dry-crusteed= 96.6%; Used 50% to take account of the fact there are some unstable areas
WE - Existing - Area C	5,913	45	ha	0.05	kg/ha/h	8760	h	70	% control	Per EPA Best Practice Report - Vegetative Ground Cover
WE - Existing - Area D	3,942	30	ha	0.05	kg/ha/h	8760	h	70	% control	Per EPA Best Practice Report - Vegetative Ground Cover
WE - Existing - Area E	1,402	20	ha	0.05	kg/ha/h	8760	h	84	% control	Application of gravel to stabilise disturbed open areas - to reflect partly paved and covered by buildings
WE - Existing - Area F	16,425	125	ha	0.05	kg/ha/h	8760	h	70	% control	Per EPA Best Practice Report - Vegetative Ground Cover
TOTAL EMISSIONS	44,877									

Table 44: *Existing Mine Site $PM_{2.5}$ emission Inventory (Annual Activity)*

ACTIVITY	PM2.5 (kg/y)	Intensity	Units	Emission factor	Units	Variable 1	Units	Control	Units	Control Assumption
WE - Existing - Area A	116	11	ha	0.0075	kg/ha/h	8760	h	84	% control	Application of gravel to stabilise disturbed open areas - to reflect partly paved and covered by buildings
WE - Existing - Area B	2,464	75	ha	0.0075	kg/ha/h	8760	h	50	% control	RASP - fre area dry-crusteed= 96.6%; Used 50% to take account of the fact there are some unstable areas
WE - Existing - Area C	887	45	ha	0.0075	kg/ha/h	8760	h	70	% control	Per EPA Best Practice Report - Vegetative Ground Cover
WE - Existing - Area D	591	30	ha	0.0075	kg/ha/h	8760	h	70	% control	Per EPA Best Practice Report - Vegetative Ground Cover
WE - Existing - Area E	210	20	ha	0.0075	kg/ha/h	8760	h	84	% control	Application of gravel to stabilise disturbed open areas - to reflect partly paved and covered by buildings
WE - Existing - Area F	2,464	125	ha	0.0075	kg/ha/h	8760	h	70	% control	Per EPA Best Practice Report - Vegetative Ground Cover
TOTAL EMISSIONS	6,732									

Proposed Mine Site - Annual (typical day day) inventories

Table 45: *Proposed Mine Site TSP emission Inventory (Annual Activity)*

ACTIVITY	TSP (kg/y)	Intensity	Units	Emission factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 3	Units	Variable 4	Units	Control	Units	Control Assumption
Ore																		
ORE - Hauling ore from Portal to ROM Pad - ramp (unsealed)	1,047	300000	t/y	0.021814927	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.4	km/return trip	2.454179327	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Hauling ore from Portal to ROM Pad (sealed)	5,498	300000	t/y	0.018327078	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	2	km/return trip	0.412359254	kg/VKT	2.5	g/m2 silt loading	0	% control	
ORE - Hauling ore from Portal to ROM Pad (unsealed)	1,571	300000	t/y	0.032722391	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.6	km/return trip	2.454179327	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Unloading ore at ROM Pad	293	300000	t/y	0.00195508	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - FEL Loading ore to crusher	293	300000	t/y	0.00195508	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - Unloading crushed ore to stockpile	293	300000	t/y	0.00195508	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - FEL Loading crushed ore to road trucks	293	300000	t/y	0.00195508	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - Hauling crushed ore out of site (unsealed)	1,033	300000	t/y	0.02152531	kg/t	58.5	t/load	49.25	Mean Vehicle Mass (t)	0.5	km/return trip	2.518461234	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Hauling crushed ore out of site (sealed)	4,485	300000	t/y	0.014948659	kg/t	58.5	t/load	49.25	Mean Vehicle Mass (t)	2	km/return trip	0.437248263	kg/VKT	2.5	g/m2 silt loading	0	% control	
Storage & Tailings																		
TAILINGS - FEL Loading tailings to haul trucks	147	150000	t/y	0.00195508	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
TAILINGS - Hauling tailings from Tailings Storage Facility to Pastefill Storage Facility (unsealed)	2,094	150000	t/y	0.087259709	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	1.6	km/return trip	2.454179327	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
TAILINGS - Emplacing tailings at Pastefill Plant Stockpile	147	150000	t/y	0.00195508	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
TAILINGS - FEL Loading tailings to hopper at Pastefill Plant Stockpile	147	150000	t/y	0.00195508	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
Waste																		
WASTE ROCK - Hauling from underground to Cosmopolitan Open-Cut (unsealed)	611	100000	t/y	0.038176123	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.7	km/return trip	2.454179327	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
WASTE ROCK - Emplacing underground waste rock at Cosmopolitan Open-Cut	196	100000	t/y	0.00195508	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							0	% control	
WASTE ROCK - FEL Loading waste rock to haul trucks from Waste Rock Harvesting Area	47	24000	t/y	0.00195508	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							0	% control	
WASTE ROCK - Hauling from Waste Rock Harvesting Area to underground (unsealed)	293	24000	t/y	0.076352246	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	1.4	km/return trip	2.454179327	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
Wind Erosion																		
WE - ROM Pad uncrushed ore stockpile	137	1.25	ha	0.1	kg/ha/h	8760	h									87.5	% control	Wind barriers (75%) and fixed water sprays (30%)
WE - ROM Pad crushed ore stockpile	27	0.25	ha	0.1	kg/ha/h	8760	h									87.5	% control	Wind barriers (75%) and fixed water sprays (30%)
WE - Pastefill Plant tailings stockpile	2	0.25	ha	0.1	kg/ha/h	8760	h									99	% control	Cover with tarps
WE - Tailings Harvesting Area	188	4.3	ha	0.1	kg/ha/h	8760	h									95	% control	Covering with waste rock per RASP measurements
WE - Waste Rock Harvesting Area	208	4.7	ha	0.1	kg/ha/h	8760	h									95	% control	Chemical dust suppressant per RASP measurements
WE - In-pit Waste Rock Emplacement	9	3.3	ha	0.1	kg/ha/h	8760	h									99.7	% control	Covering with waste rock per RASP measurements (Table 3)
WE - Rest of site	1,682	274.2	ha	0.1	kg/ha/h	8760	h									99.3	% control	Per RASP measurements (Average of Covering with Waste Rock - Table 3 (99.7%) ; Uncontrolled Free Areas with Dust Suppressant - Table 4 (98.9%) and Unsealed Area - Dust Suppressant - Table 5 (99.2%)
TOTAL EMISSIONS	**20,740**																	

Table 46: *Proposed Mine Site PM_{10} emission Inventory (Annual Activity)*

ACTIVITY	PM10 (kg/y)	Intensity	Units	Emission factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 3	Units	Variable 4	Units	Control	Units	Control Assumption
Ore																		
ORE - Hauling ore from Portal to ROM Pad - ramp (unsealed)	262	300000	t/y	0.005463906	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.4	km/return trip	0.614689449	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Hauling ore from Portal to ROM Pad (sealed)	1,055	300000	t/y	0.003517891	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	2	km/return trip	0.07915255	kg/VKT	2.5	g/m2 silt loading	0	% control	
ORE - Hauling ore from Portal to ROM Pad (unsealed)	393	300000	t/y	0.008195859	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.6	km/return trip	0.614689449	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Unloading ore at ROM Pad	139	300000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - FEL Loading ore to crusher	139	300000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - Unloading crushed ore to stockpile	139	300000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - FEL Loading crushed ore to road trucks	139	300000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - Hauling crushed ore out of site (unsealed)	259	300000	t/y	0.005391367	kg/t	58.5	t/load	49.25	Mean Vehicle Mass (t)	0.5	km/return trip	0.630789907	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Hauling crushed ore out of site (sealed)	861	300000	t/y	0.002869402	kg/t	58.5	t/load	49.25	Mean Vehicle Mass (t)	2	km/return trip	0.083930007	kg/VKT	2.5	g/m2 silt loading	0	% control	
Storage & Tailings																		
TAILINGS - FEL Loading tailings to haul trucks	69	150000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
TAILINGS - Hauling tailings from Tailings Storage Facility to Pastefill Storage Facility (unsealed)	525	150000	t/y	0.021855625	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	1.6	km/return trip	0.614689449	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
TAILINGS - Emplacing tailings at Pastefill Plant Stockpile	69	150000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
TAILINGS - FEL Loading tailings to hopper at Pastefill Plant Stockpile	69	150000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
Waste																		
WASTE ROCK - Hauling from underground to Cosmopolitan Open-Cut (unsealed)	153	100000	t/y	0.009561836	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.7	km/return trip	0.614689449	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
WASTE ROCK - Emplacing underground waste rock at Cosmopolitan Open-Cut	92	100000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							0	% control	
WASTE ROCK - FEL Loading waste rock to haul trucks from Waste Rock Harvesting Area	22	24000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							0	% control	
WASTE ROCK - Hauling from Waste Rock Harvesting Area to underground (unsealed)	73	24000	t/y	0.019123672	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	1.4	km/return trip	0.614689449	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
Wind Erosion																		
WE - ROM Pad uncrushed ore stockpile	68	1.25	ha	0.05	kg/ha/h	8760	h									87.5	% control	Wind barriers (75%) and fixed water sprays (30%)
WE - ROM Pad crushed ore stockpile	14	0.25	ha	0.05	kg/ha/h	8760	h									87.5	% control	Wind barriers (75%) and fixed water sprays (30%)
WE - Pastefill Plant tailings stockpile	1	0.25	ha	0.05	kg/ha/h	8760	h									99	% control	Cover with tarps
WE - Tailings Harvesting Area	94	4.3	ha	0.05	kg/ha/h	8760	h									95	% control	Covering with waste rock per RASP measurements
WE - Waste Rock Harvesting Area	104	4.7	ha	0.05	kg/ha/h	8760	h									95	% control	Chemical dust suppressant per RASP measurements
WE - In-pit Waste Rock Emplacement	4	3.3	ha	0.05	kg/ha/h	8760	h									99.7	% control	Covering with waste rock per RASP measurements (Table 3)
WE - Rest of site	841	274.2	ha	0.05	kg/ha/h	8760	h									99.3	% control	Per RASP measurements (Average of Covering with Waste Rock - Table 3 (99.7%) ; Uncontrolled Free Areas with Dust Suppressant - Table 4 (98.9%) and Unsealed Area - Dust Suppressant - Table 5 (99.2%)
TOTAL EMISSIONS	**5,585**																	

Table 47: *Proposed Mine Site $PM_{2.5}$ emission Inventory (Annual Activity)*

ACTIVITY	PM2.5 (kg/y)	Intensity	Units	Emission factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 3	Units	Variable 4	Units	Control	Units	Control Assumption
Ore																		
ORE - Hauling ore from Portal to ROM Pad - ramp (unsealed)	26	300000	t/y	0.000546391	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.4	km/return trip	0.061468945	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Hauling ore from Portal to ROM Pad (sealed)	255	300000	t/y	0.000851103	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	2	km/return trip	0.019149811	kg/VKT	2.5	g/m2 silt loading	0	% control	
ORE - Hauling ore from Portal to ROM Pad (unsealed)	39	300000	t/y	0.000819586	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.6	km/return trip	0.061468945	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Unloading ore at ROM Pad	21	300000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - FEL Loading ore to crusher	21	300000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - Unloading crushed ore to stockpile	21	300000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - FEL Loading crushed ore to road trucks	21	300000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - Hauling crushed ore out of site (unsealed)	26	300000	t/y	0.000539137	kg/t	58.5	t/load	49.25	Mean Vehicle Mass (t)	0.5	km/return trip	0.063078991	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Hauling crushed ore out of site (sealed)	208	300000	t/y	0.00069421	kg/t	58.5	t/load	49.25	Mean Vehicle Mass (t)	2	km/return trip	0.020305647	kg/VKT	2.5	g/m2 silt loading	0	% control	
Storage & Tailings																		
TAILINGS - FEL Loading tailings to haul trucks	11	150000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
TAILINGS - Hauling tailings from Tailings Storage Facility to Pastefill Storage Facility (unsealed)	52	150000	t/y	0.002185562	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	1.6	km/return trip	0.061468945	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
TAILINGS - Emplacing tailings at Pastefill Plant Stockpile	11	150000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
TAILINGS - FEL Loading tailings to hopper at Pastefill Plant Stockpile	11	150000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
Waste																		
WASTE ROCK - Hauling from underground to Cosmopolitan Open-Cut (unsealed)	15	100000	t/y	0.000956184	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.7	km/return trip	0.061468945	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
WASTE ROCK - Emplacing underground waste rock at Cosmopolitan Open-Cut	14	100000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							0	% control	
WASTE ROCK - FEL Loading waste rock to haul trucks from Waste Rock Harvesting Area	3	24000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							0	% control	
WASTE ROCK - Hauling from Waste Rock Harvesting Area to underground (unsealed)	7	24000	t/y	0.001912367	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	1.4	km/return trip	0.061468945	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
Wind Erosion																		
WE - ROM Pad uncrushed ore stockpile	10	1.25	ha	0.0075	kg/ha/h	8760	h									87.5	% control	Wind barriers (75%) and fixed water sprays (30%)
WE - ROM Pad crushed ore stockpile	2	0.25	ha	0.0075	kg/ha/h	8760	h									87.5	% control	Wind barriers (75%) and fixed water sprays (30%)
WE - Pastefill Plant tailings stockpile	0	0.25	ha	0.0075	kg/ha/h	8760	h									99	% control	Cover with tarps
WE - Tailings Harvesting Area	14	4.3	ha	0.0075	kg/ha/h	8760	h									95	% control	Covering with waste rock per RASP measurements
WE - Waste Rock Harvesting Area	16	4.7	ha	0.0075	kg/ha/h	8760	h									95	% control	Chemical dust suppressant per RASP measurements
WE - In-pit Waste Rock Emplacement	1	3.3	ha	0.0075	kg/ha/h	8760	h									99.7	% control	Covering with waste rock per RASP measurements (Table 3)
WE - Rest of site	126	274.2	ha	0.0075	kg/ha/h	8760	h									99.3	% control	Per RASP measurements (Average of Covering with Waste Rock - Table 3 (99.7%) ; Uncontrolled Free Areas with Dust Suppressant - Table 4 (98.9%) and Unsealed Area - Dust Suppressant - Table 5 (99.2%)
Diesel Emissions																		
Diesel usage on-site	913	1383	kL/y	0.66	kg/kl													
TOTAL EMISSIONS	**1845**																	

Proposed Mine Site Maximum Day Inventories

Table 48: *Proposed Mine Site PM_{10} emission Inventory (Maximum Day)*

ACTIVITY	PM10 (kg/y)	Intensity	Units	Emission factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 3	Units	Variable 4	Units	Control	Units	Control Assumption
Ore																		
ORE - Hauling ore from Portal to ROM Pad - ramp (unsealed)	354	405000	t/y	0.005463906	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.4	km/return trip	0.614689449	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Hauling ore from Portal to ROM Pad (sealed)	1,425	405000	t/y	0.003517891	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	2	km/return trip	0.07915255	kg/VKT	2.5	g/m2 silt loading	0	% control	
ORE - Hauling ore from Portal to ROM Pad (unsealed)	531	405000	t/y	0.008195859	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.6	km/return trip	0.614689449	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Unloading ore at ROM Pad	187	405000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - FEL Loading ore to crusher	187	405000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - Unloading crushed ore to stockpile	187	405000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - FEL Loading crushed ore to road trucks	250	540000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - Hauling crushed ore out of site (unsealed)	466	540000	t/y	0.005391367	kg/t	58.5	t/load	49.25	Mean Vehicle Mass (t)	0.5	km/return trip	0.630789907	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Hauling crushed ore out of site (sealed)	1,549	540000	t/y	0.002869402	kg/t	58.5	t/load	49.25	Mean Vehicle Mass (t)	2	km/return trip	0.083930007	kg/VKT	2.5	g/m2 silt loading	0	% control	
Storage & Tailings																		
TAILINGS - FEL Loading tailings to haul trucks	97	210000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
TAILINGS - Hauling tailings from Tailings Storage Facility to Pastefill Storage Facility (unsealed)	734	210000	t/y	0.021855625	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	1.6	km/return trip	0.614689449	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
TAILINGS - Emplacing tailings at Pastefill Plant Stockpile	97	210000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
TAILINGS - FEL Loading tailings to hopper at Pastefill Plant Stockpile	97	210000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
Waste																		
WASTE ROCK - Hauling from underground to Cosmopolitan Open-Cut (unsealed)	918	600000	t/y	0.009561836	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.7	km/return trip	0.614689449	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
WASTE ROCK - Emplacing underground waste rock at Cosmopolitan Open-Cut	555	600000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							0	% control	
WASTE ROCK - FEL Loading waste rock to haul trucks from Waste Rock Harvesting Area	277	300000	t/y	0.0009247	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							0	% control	
WASTE ROCK - Hauling from Waste Rock Harvesting Area to underground (unsealed)	918	300000	t/y	0.019123672	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	1.4	km/return trip	0.614689449	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
Wind Erosion																		
WE - ROM Pad uncrushed ore stockpile	68	1.25	ha	0.05	kg/ha/h	8760	h									87.5	% control	Wind barriers (75%) and fixed water sprays (30%)
WE - ROM Pad crushed ore stockpile	14	0.25	ha	0.05	kg/ha/h	8760	h									87.5	% control	Wind barriers (75%) and fixed water sprays (30%)
WE - Pastefill Plant tailings stockpile	1	0.25	ha	0.05	kg/ha/h	8760	h									99	% control	Cover with tarps
WE - Tailings Harvesting Area	94	4.3	ha	0.05	kg/ha/h	8760	h									95	% control	Covering with waste rock per RASP measurements
WE - Waste Rock Harvesting Area	104	4.7	ha	0.05	kg/ha/h	8760	h									95	% control	Chemical dust suppressant per RASP measurements
WE - In-pit Waste Rock Emplacement	4	3.3	ha	0.05	kg/ha/h	8760	h									99.7	% control	Covering with waste rock per RASP measurements (Table 3)
WE - Rest of site	841	274.2	ha	0.05	kg/ha/h	8760	h									99.3	% control	Per RASP measurements (Average of Covering with Waste Rock - Table 3 (99.7%) ; Uncontrolled Free Areas with Dust Suppressant - Table 4 (98.9%) and Unsealed Area - Dust Suppressant - Table 5 (99.2%)
TOTAL EMISSIONS	**9,957**																	

Table 49: *Proposed Mine Site $PM_{2.5}$ emission Inventory (Maximum Day)*

ACTIVITY	PM2.5 (kg/y)	Intensity	Units	Emission factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 3	Units	Variable 4	Units	Control	Units	Control Assumption
Ore																		
ORE - Hauling ore from Portal to ROM Pad - ramp (unsealed)	35.4	405000	t/y	0.000546391	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.4	km/return trip	0.061468945	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Hauling ore from Portal to ROM Pad (sealed)	344.7	405000	t/y	0.000851103	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	2	km/return trip	0.019149811	kg/VKT	2.5	g/m2 silt loading	0	% control	
ORE - Hauling ore from Portal to ROM Pad (unsealed)	53.1	405000	t/y	0.000819586	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.6	km/return trip	0.061468945	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Unloading ore at ROM Pad	28.4	405000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - FEL Loading ore to crusher	28.4	405000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - Unloading crushed ore to stockpile	28.4	405000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - FEL Loading crushed ore to road trucks	37.8	540000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
ORE - Hauling crushed ore out of site (unsealed)	46.6	540000	t/y	0.000539137	kg/t	58.5	t/load	49.25	Mean Vehicle Mass (t)	0.5	km/return trip	0.063078991	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
ORE - Hauling crushed ore out of site (sealed)	374.9	540000	t/y	0.00069421	kg/t	58.5	t/load	49.25	Mean Vehicle Mass (t)	2	km/return trip	0.020305647	kg/VKT	2.5	g/m2 silt loading	0	% control	
Storage & Tailings																		
TAILINGS - FEL Loading tailings to haul trucks	14.7	210000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
TAILINGS - Hauling tailings from Tailings Storage Facility to Pastefill Storage Facility (unsealed)	73.4	210000	t/y	0.002185562	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	1.6	km/return trip	0.061468945	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
TAILINGS - Emplacing tailings at Pastefill Plant Stockpile	14.7	210000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
TAILINGS - FEL Loading tailings to hopper at Pastefill Plant Stockpile	14.7	210000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							50	% control	Water application
Waste																		
WASTE ROCK - Hauling from underground to Cosmopolitan Open-Cut (unsealed)	91.8	600000	t/y	0.000956184	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	0.7	km/return trip	0.061468945	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
WASTE ROCK - Emplacing underground waste rock at Cosmopolitan Open-Cut	84.0	600000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							0	% control	
WASTE ROCK - FEL Loading waste rock to haul trucks from Waste Rock Harvesting Area	42.0	300000	t/y	0.000140026	kg/t	2.913	average of (wind speed/2.2)^1.3 in m/s	3	moisture content (%)							0	% control	
WASTE ROCK - Hauling from Waste Rock Harvesting Area to underground (unsealed)	91.8	300000	t/y	0.001912367	kg/t	45	t/load	46.5	Mean Vehicle Mass (t)	1.4	km/return trip	0.061468945	kg/VKT	4.4	% silt content	84	% control	Dust Suppressant
Wind Erosion																		
WE - ROM Pad uncrushed ore stockpile	10.3	1.25	ha	0.0075	kg/ha/h	8760	h									87.5	% control	Wind barriers (75%) and fixed water sprays (30%)
WE - ROM Pad crushed ore stockpile	2.1	0.25	ha	0.0075	kg/ha/h	8760	h									87.5	% control	Wind barriers (75%) and fixed water sprays (30%)
WE - Pastefill Plant tailings stockpile	0.2	0.25	ha	0.0075	kg/ha/h	8760	h									99	% control	Cover with tarps
WE - Tailings Harvesting Area	14.1	4.3	ha	0.0075	kg/ha/h	8760	h									95	% control	Covering with waste rock per RASP measurements
WE - Waste Rock Harvesting Area	15.6	4.7	ha	0.0075	kg/ha/h	8760	h									95	% control	Chemical dust suppressant per RASP measurements
WE - In-pit Waste Rock Emplacement	0.6	3.3	ha	0.0075	kg/ha/h	8760	h									99.7	% control	Covering with waste rock per RASP measurements (Table 3)
WE - Rest of site	126.1	274.2	ha	0.0075	kg/ha/h	8760	h									99.3	% control	Per RASP measurements (Average of Covering with Waste Rock - Table 3 (99.7%) ; Uncontrolled Free Areas with Dust Suppressant - Table 4 (98.9%) and Unsealed Area - Dust Suppressant - Table 5 (99.2%)
Diesel Emissions																		
Diesel usage on-site	913	1383	kL/y	0.66	kg/kl													
TOTAL EMISSIONS	**2486**																	

Appendix F: Metal contours plots

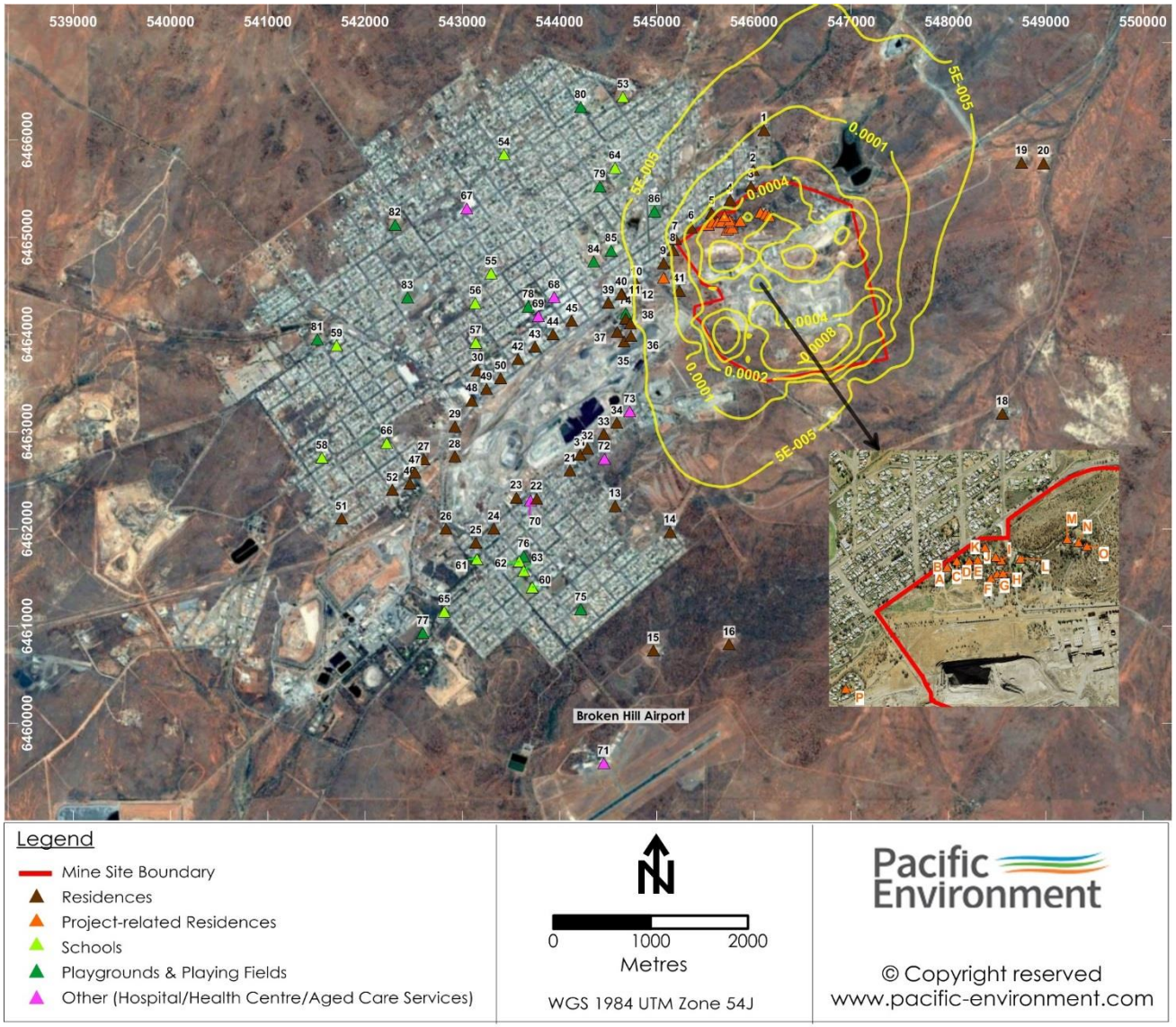

Figure 31: *Predicted 1-hour average 99.9th percentile Silver (soluble) concentration – existing mine site only (µg/m3)*

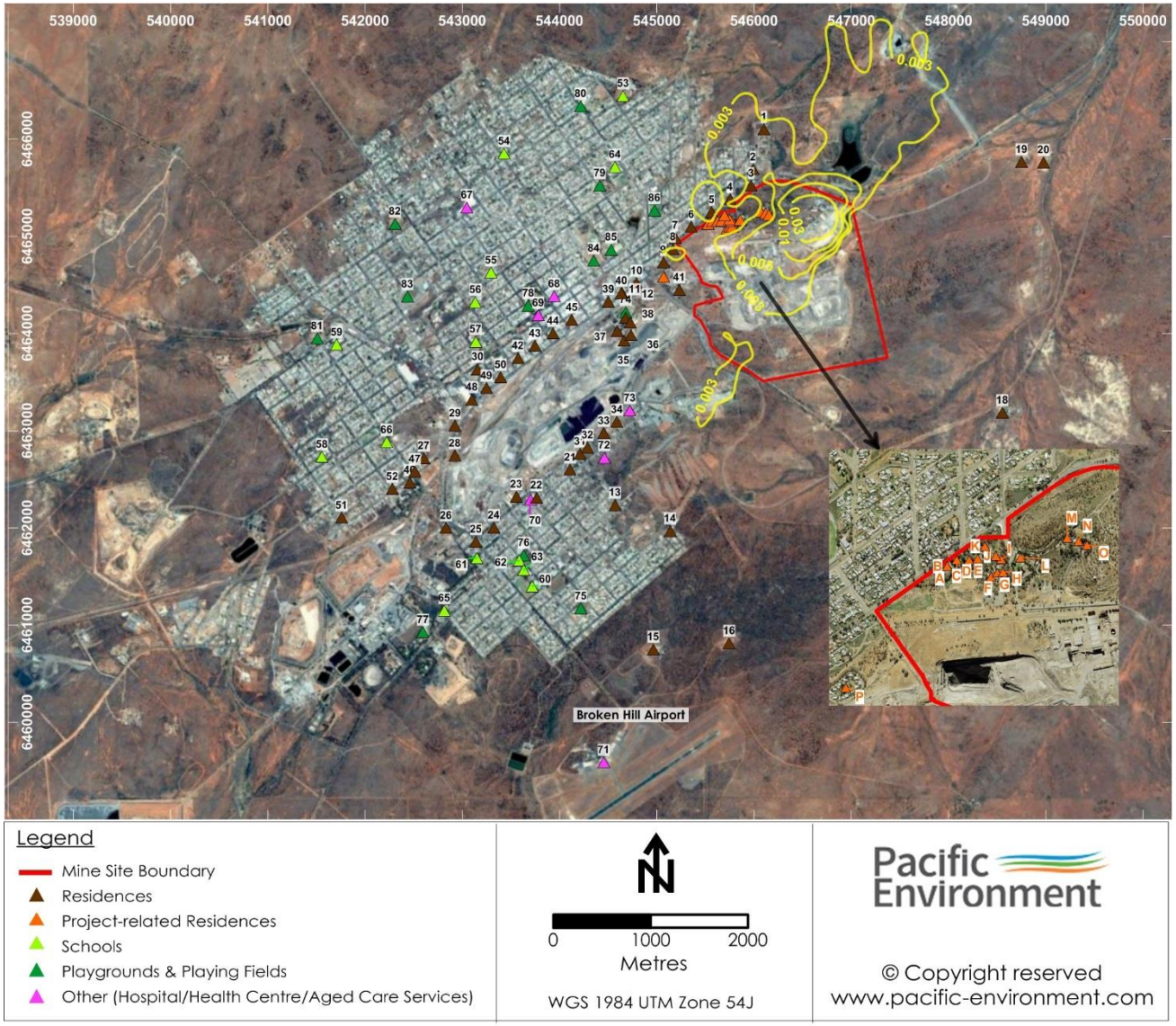

Figure 32: *Predicted 1-hour average 99.9th percentile Silver (soluble) concentration – proposed mine site only (µg/m³)*

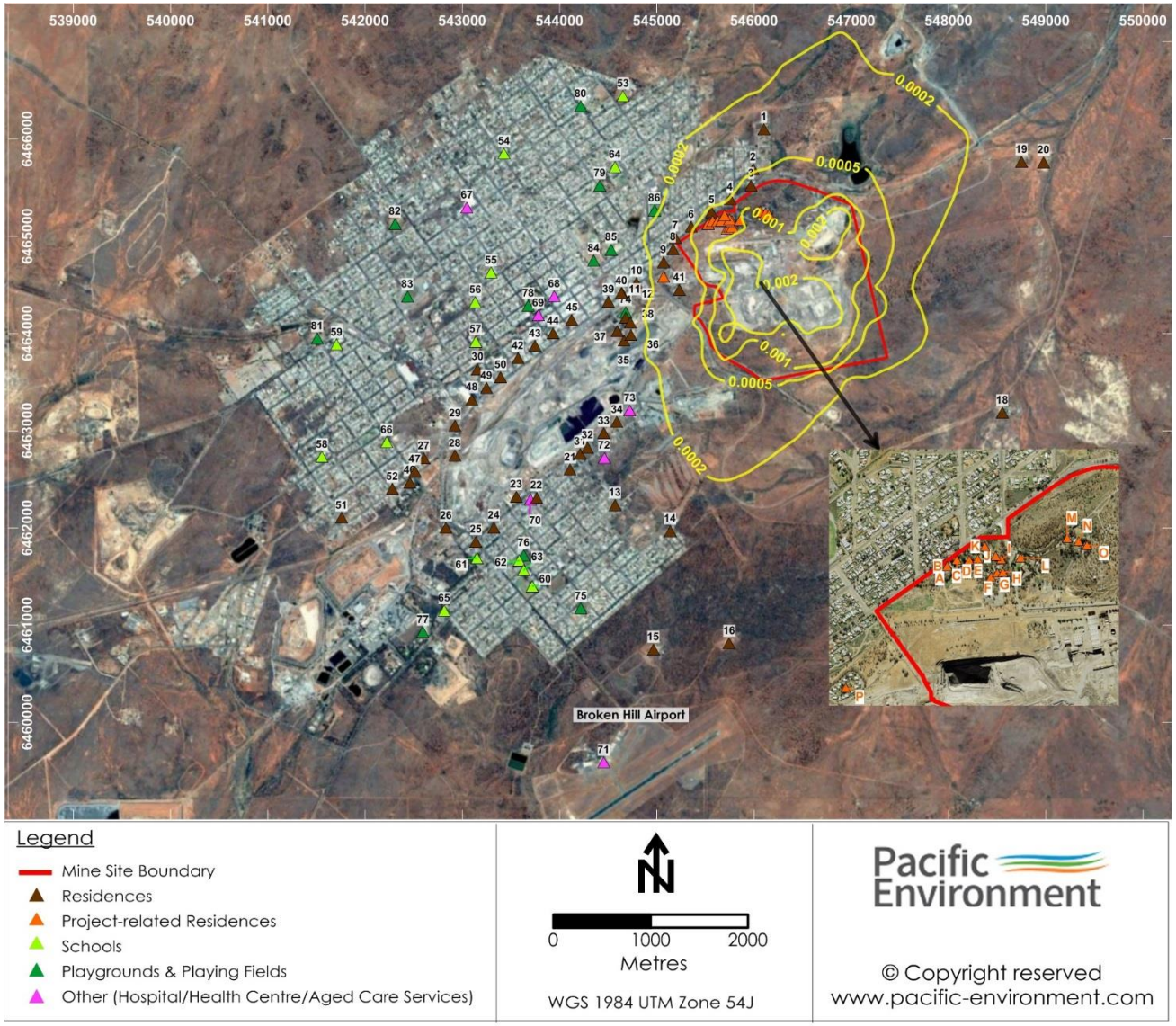

Figure 33: *Predicted 1-hour average 99.9th percentile Arsenic concentration – existing mine site only (µg/m³)*

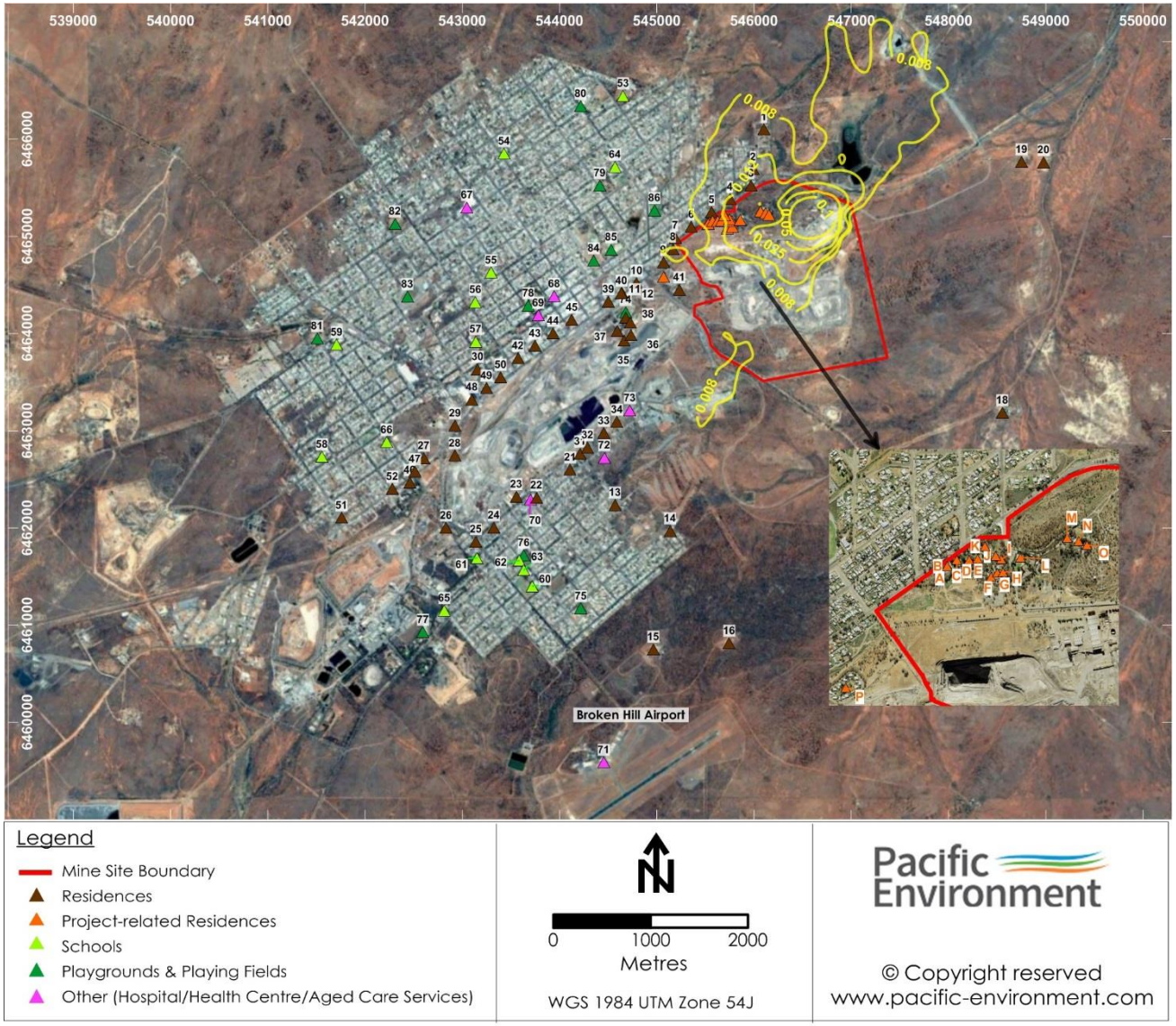

Figure 34: *Predicted 1-hour average 99.9th percentile Arsenic concentration – proposed mine site only (µg/m3)*

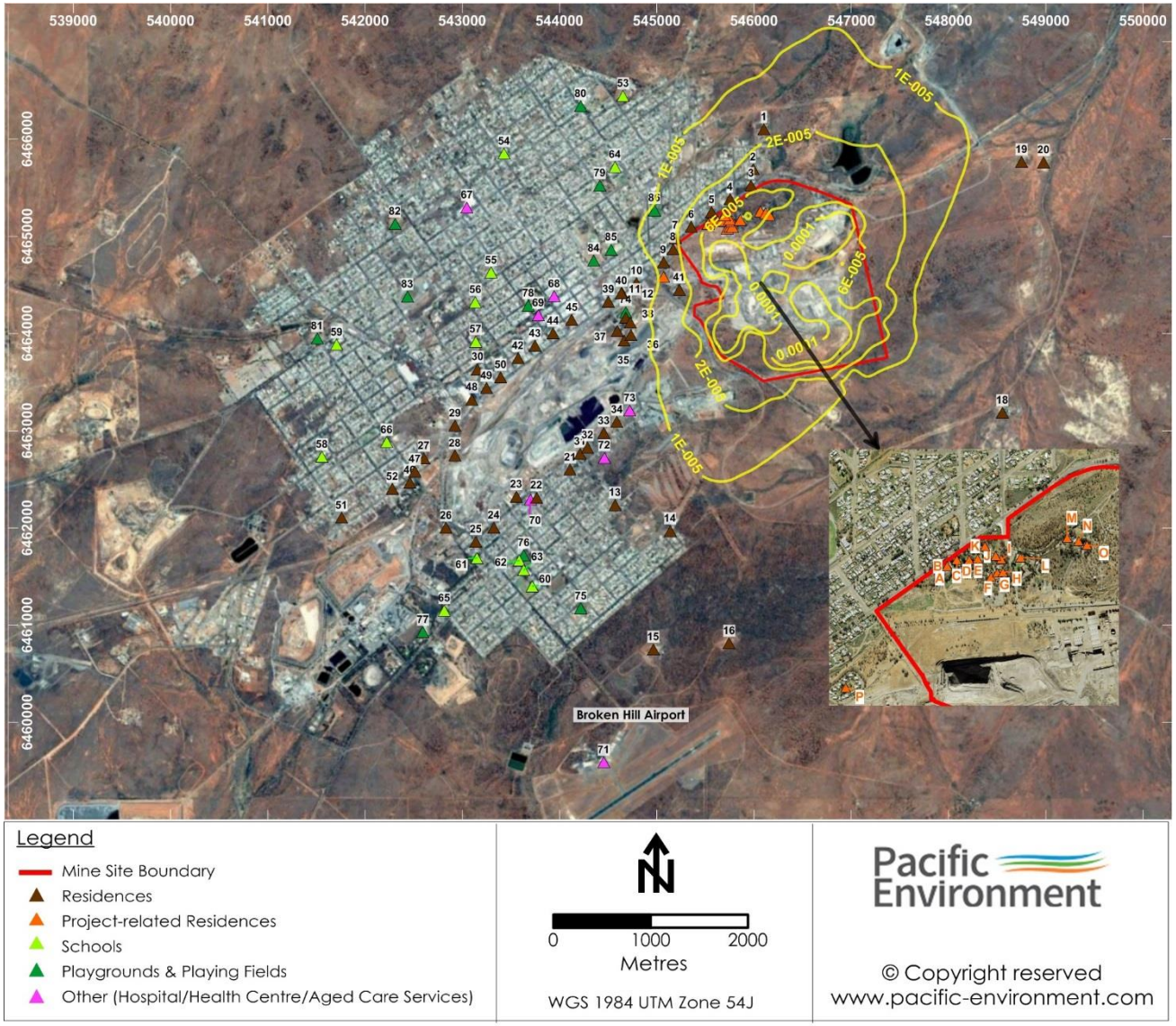

Figure 35: *Predicted 1-hour average 99.9th percentile Cadmium concentration – existing mine site only (µg/m3)*

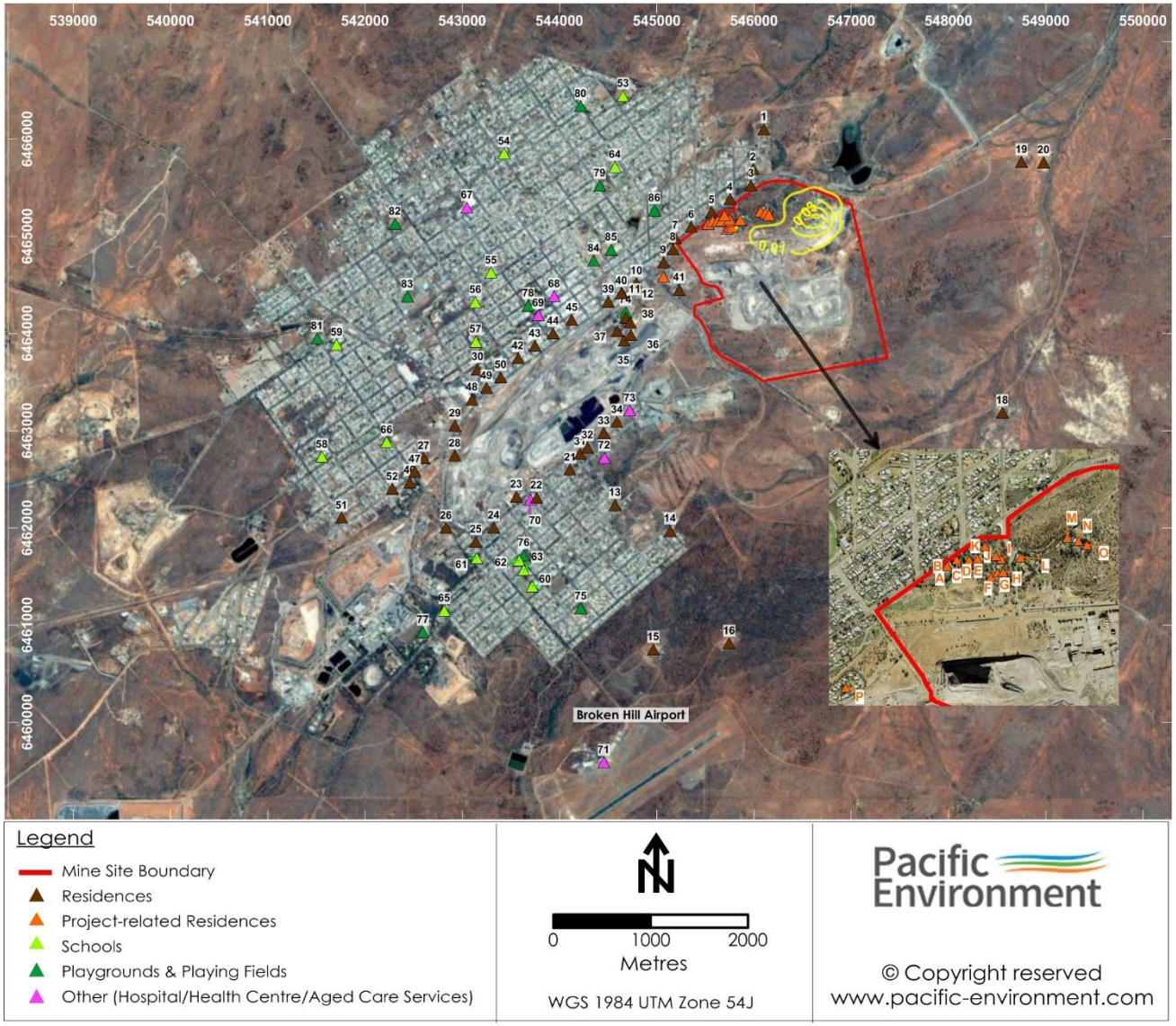

Figure 36: *Predicted 1-hour average 99.9th percentile Cadmium concentration – proposed mine site only (µg/m³)*

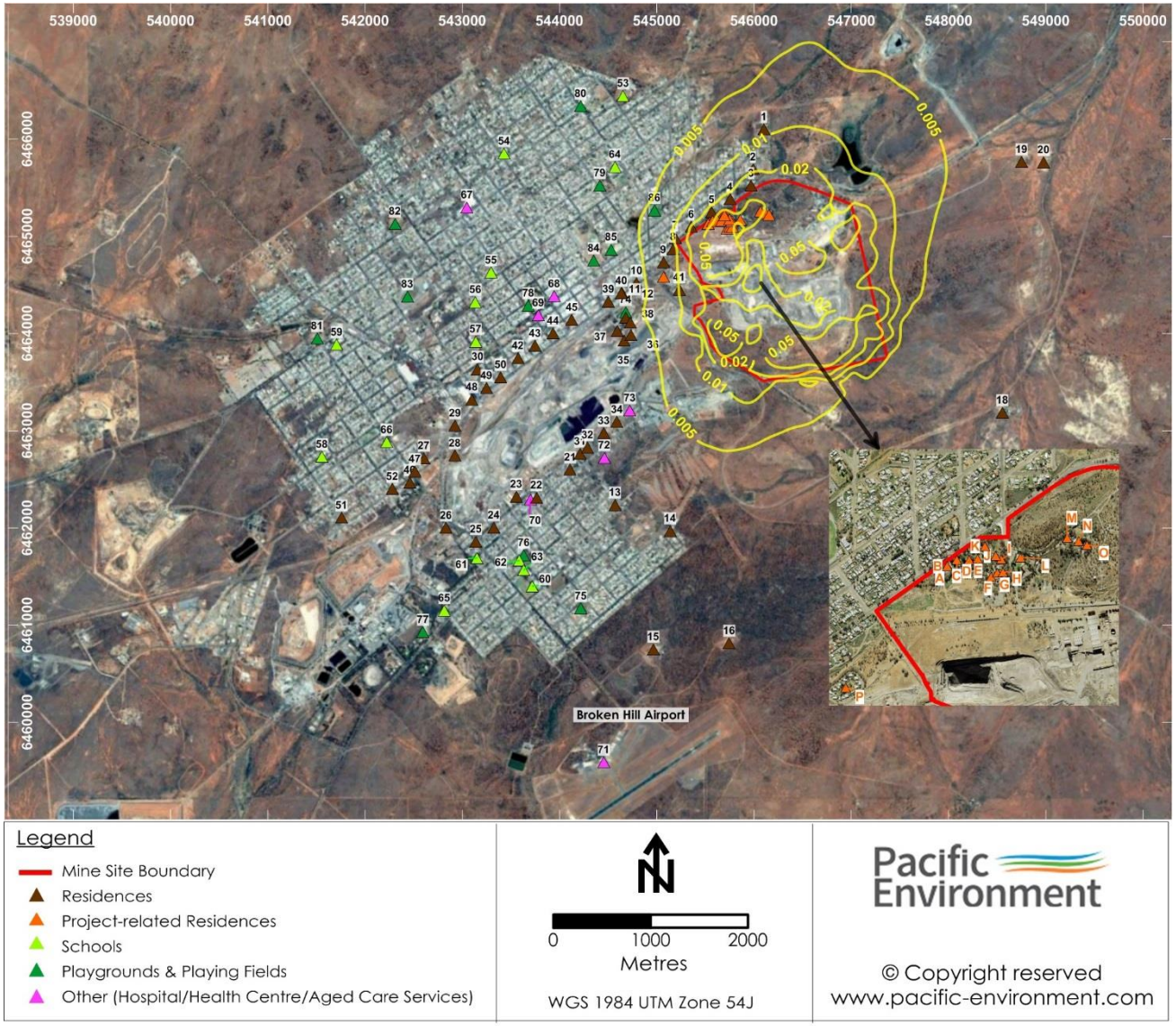

Figure 37: *Predicted 1-hour average 99.9th percentile Chromium concentration – existing mine site only (µg/m³)*

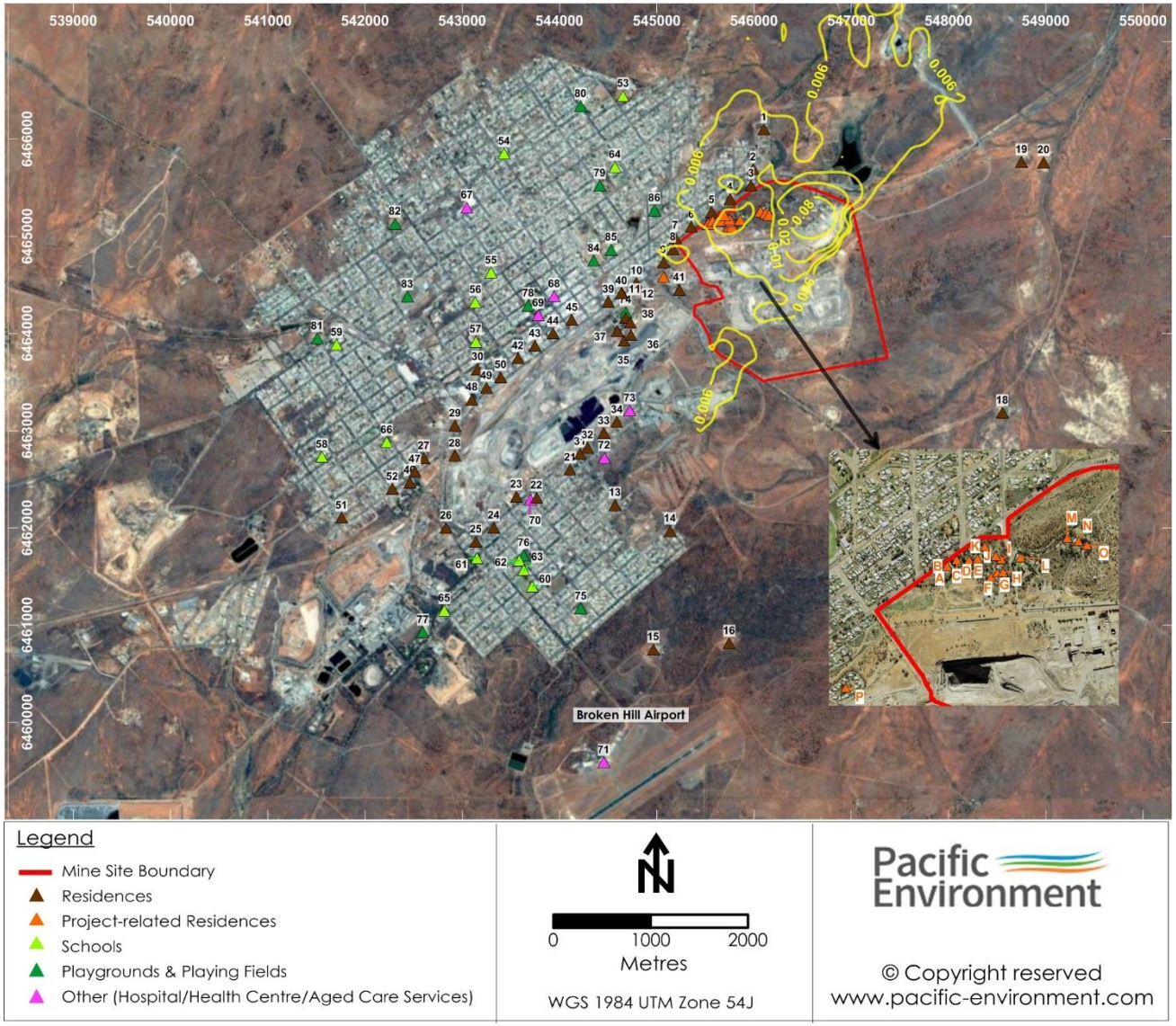

Figure 38: *Predicted 1-hour average 99.9th percentile Chromium concentration – proposed mine site only (µg/m3)*

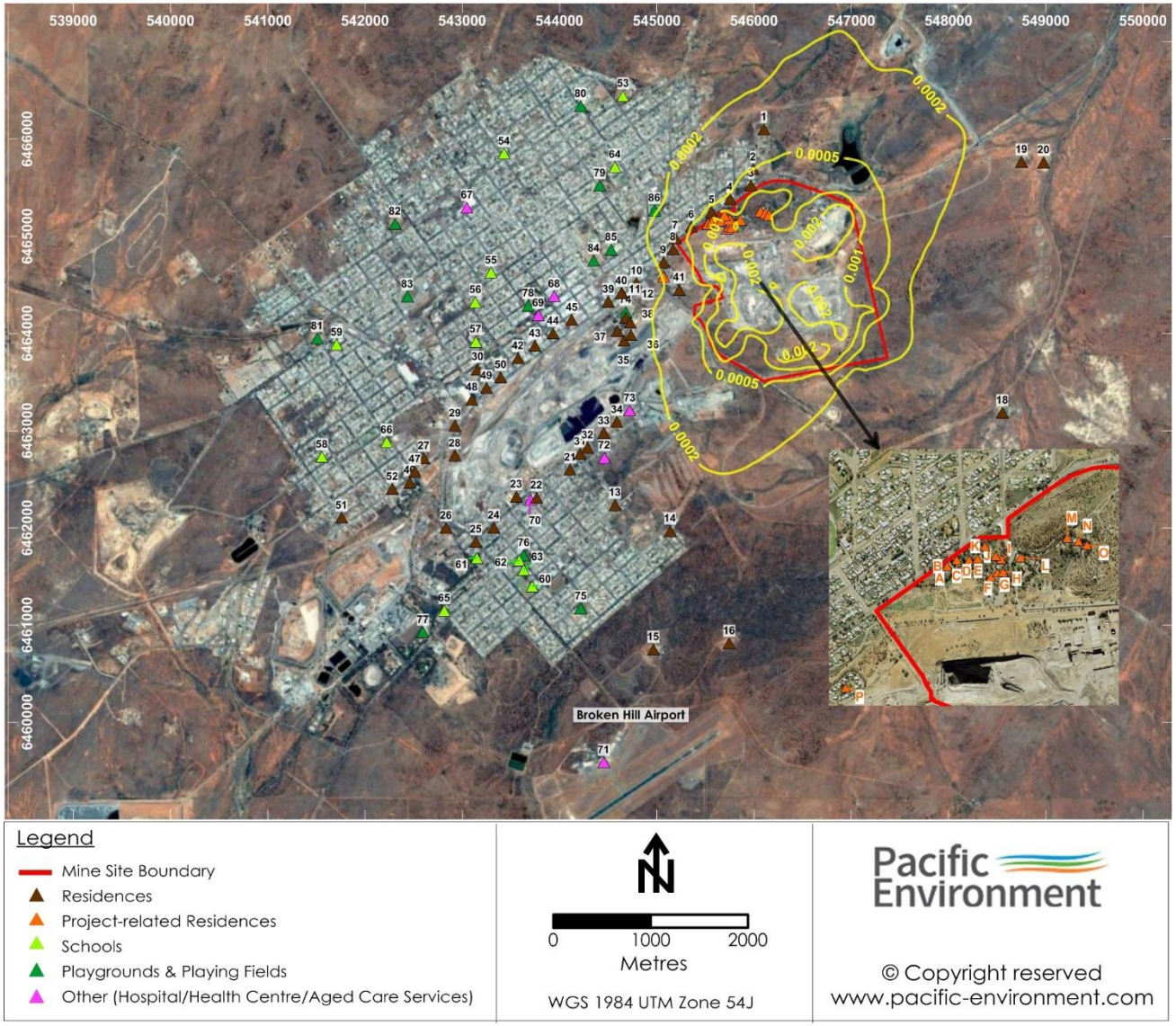

Figure 39: *Predicted 1-hour average 99.9th percentile Copper concentration – existing mine site only (µg/m³)*

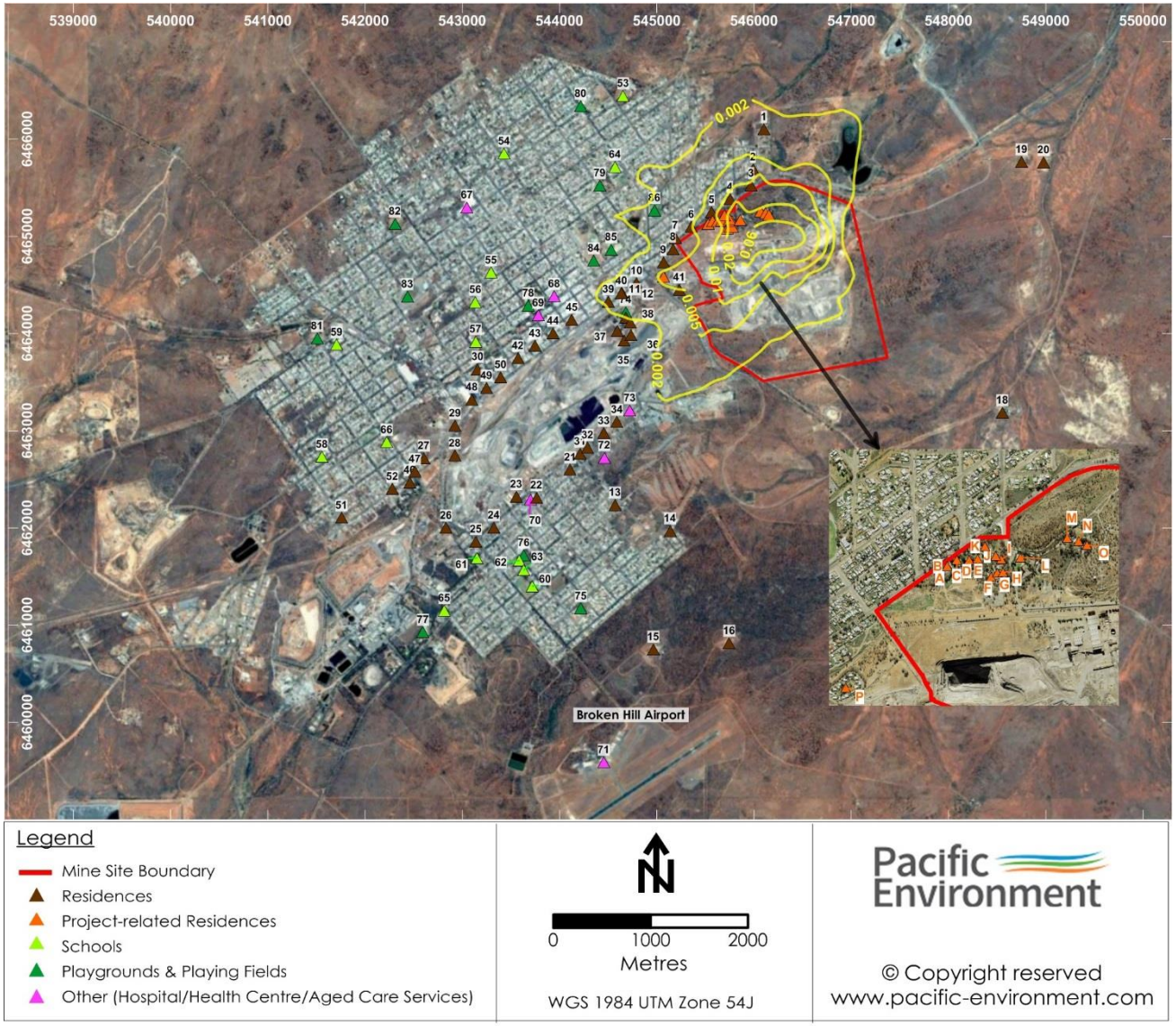

Figure 40: *Predicted 1-hour average 99.9th percentile Copper concentration – proposed mine site only (µg/m3)*

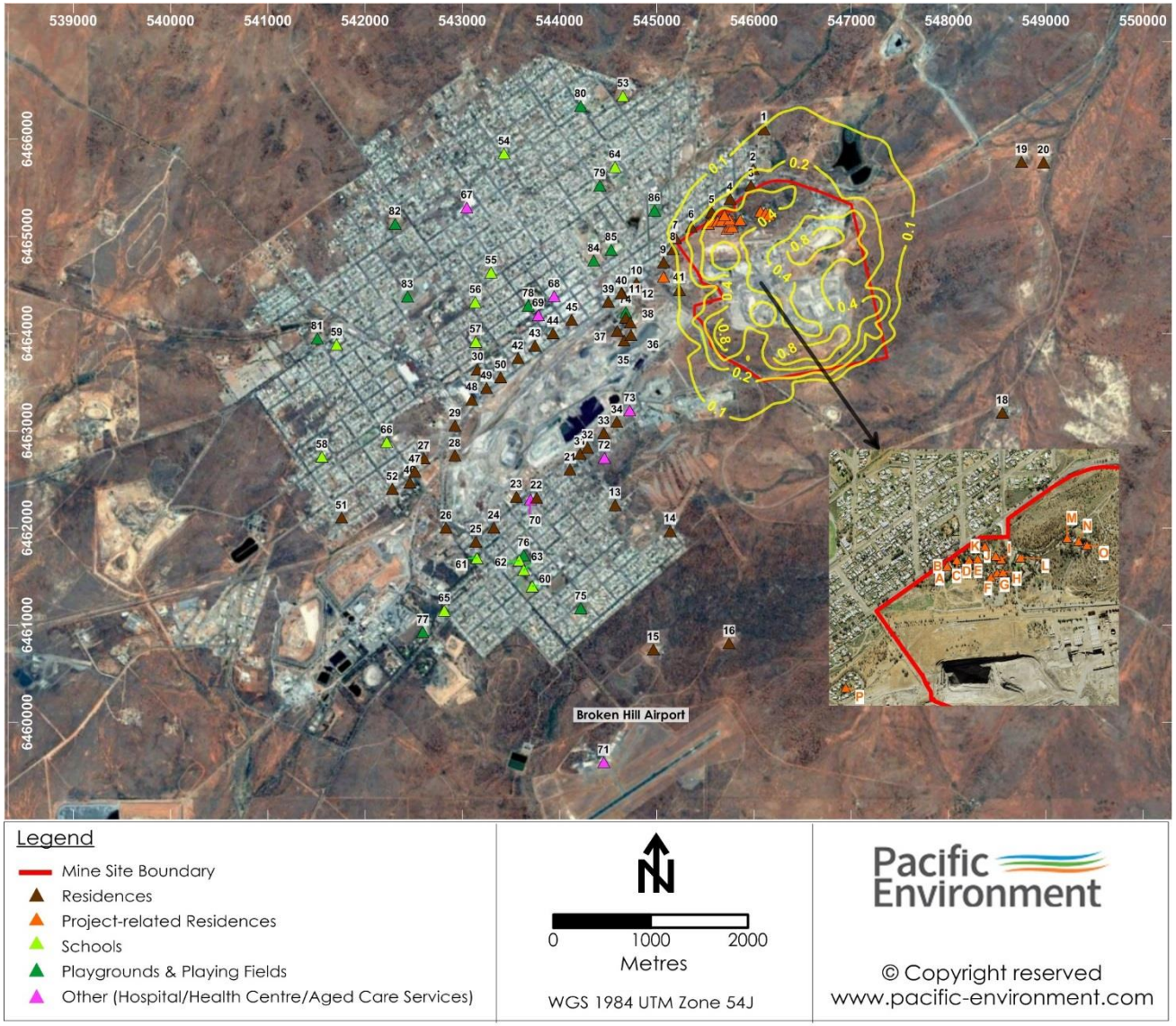

Figure 41: *Predicted 1-hour average 99.9th percentile Iron concentration – existing mine site only (µg/m³)*

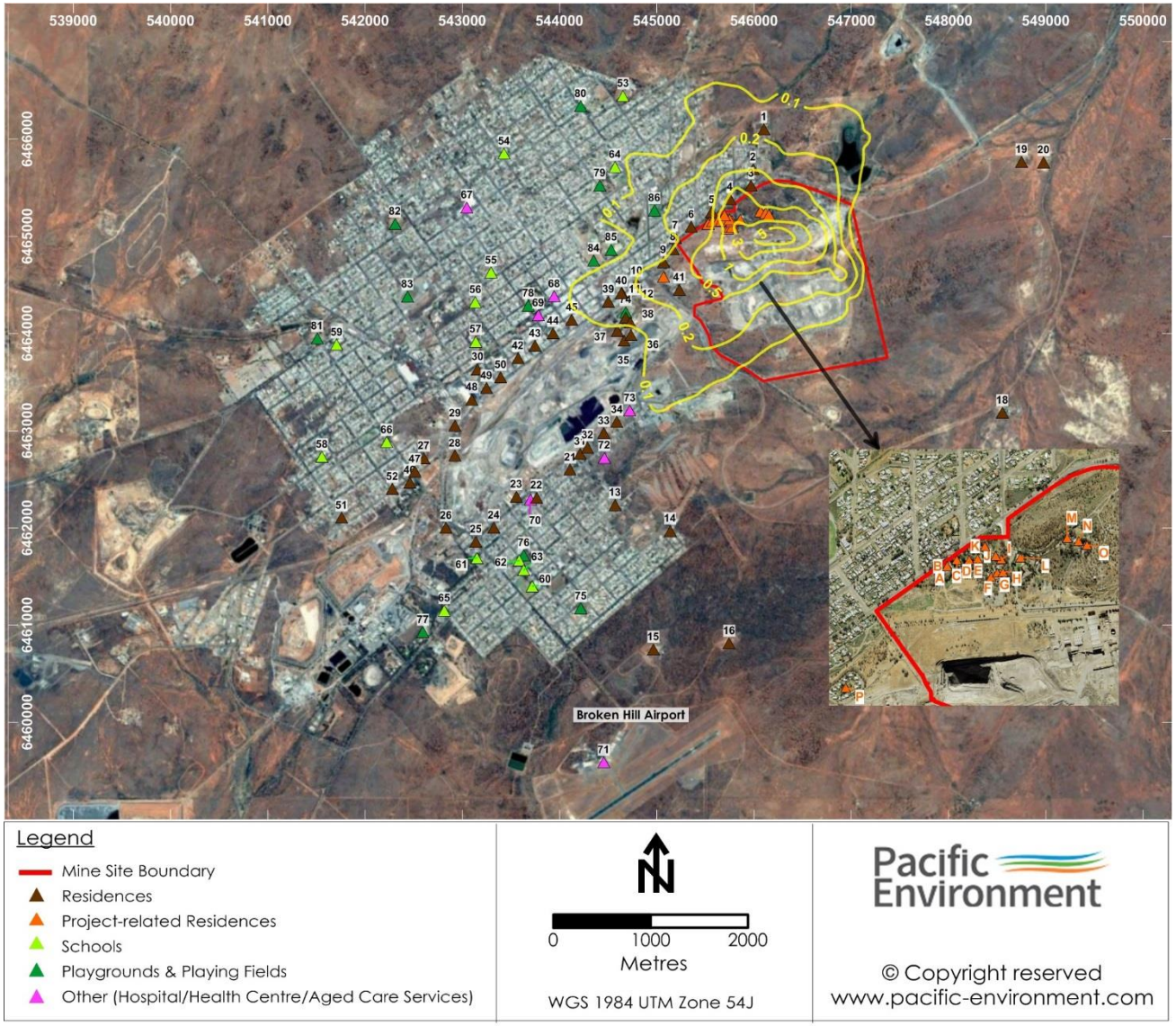

Figure 42: *Predicted 1-hour average 99.9th percentile Iron concentration – proposed mine site only (µg/m³)*

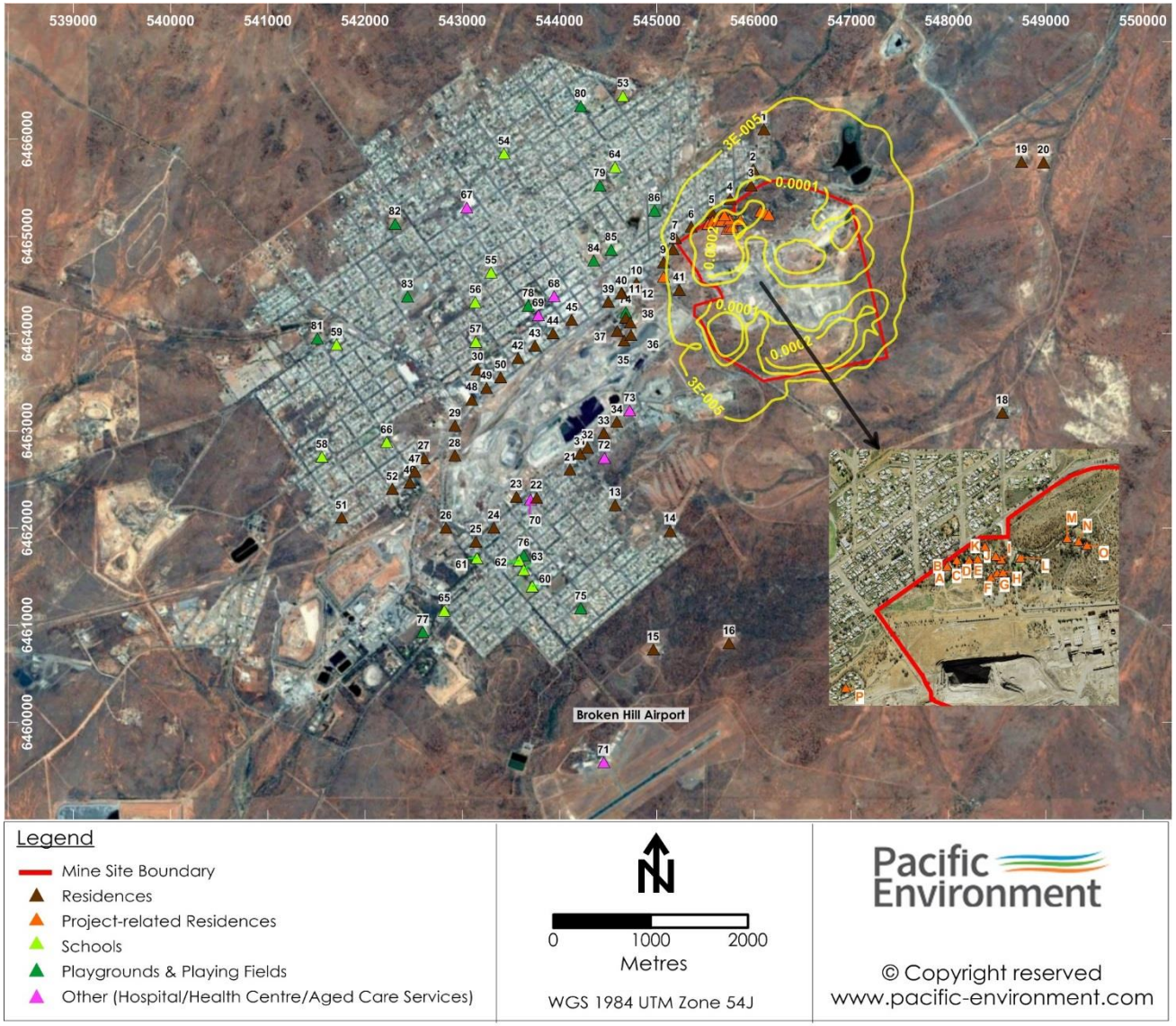

Figure 43: *Predicted 1-hour average 99.9th percentile Mercury (organic) concentration – existing mine site only (µg/m3)*

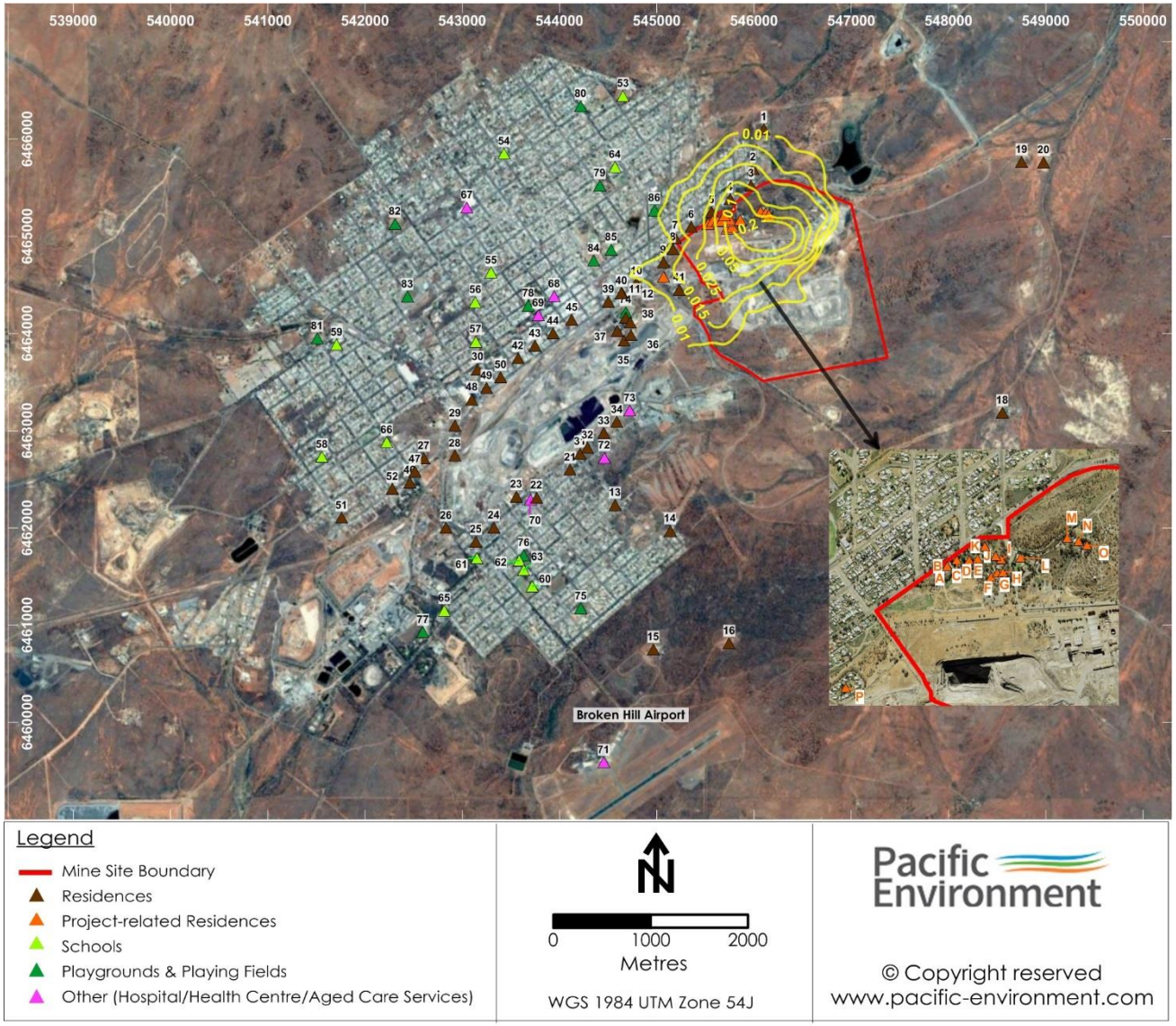

Figure 44: *Predicted 1-hour average 99.9th percentile Mercury (organic) concentration – proposed mine site only (µg/m³)*

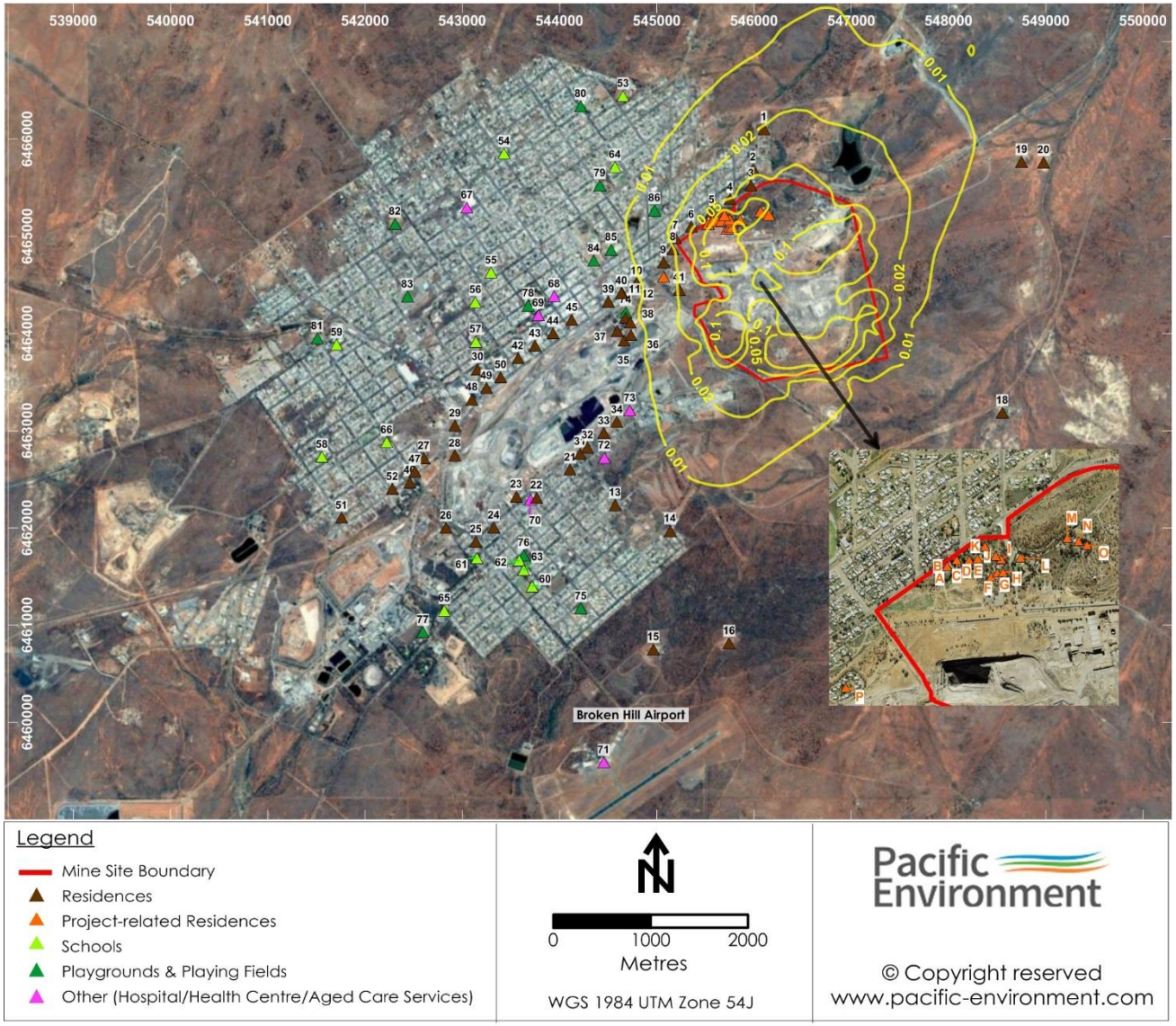

Figure 45: *Predicted 1-hour average 99.9th percentile Manganese concentration – existing mine site only (µg/m³)*

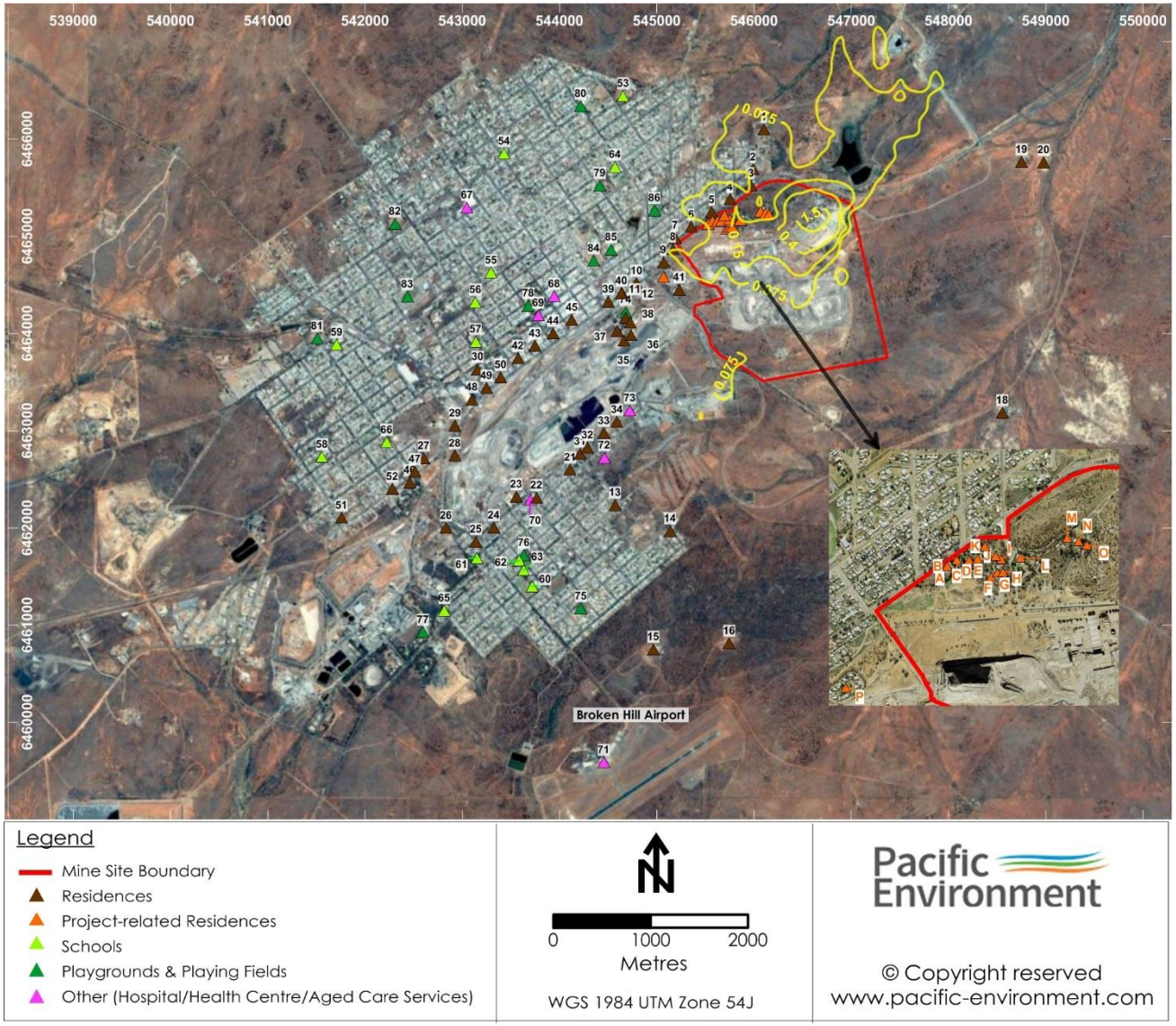

Figure 46: *Predicted 1-hour average 99.9th percentile Manganese concentration – proposed mine site only (µg/m³)*

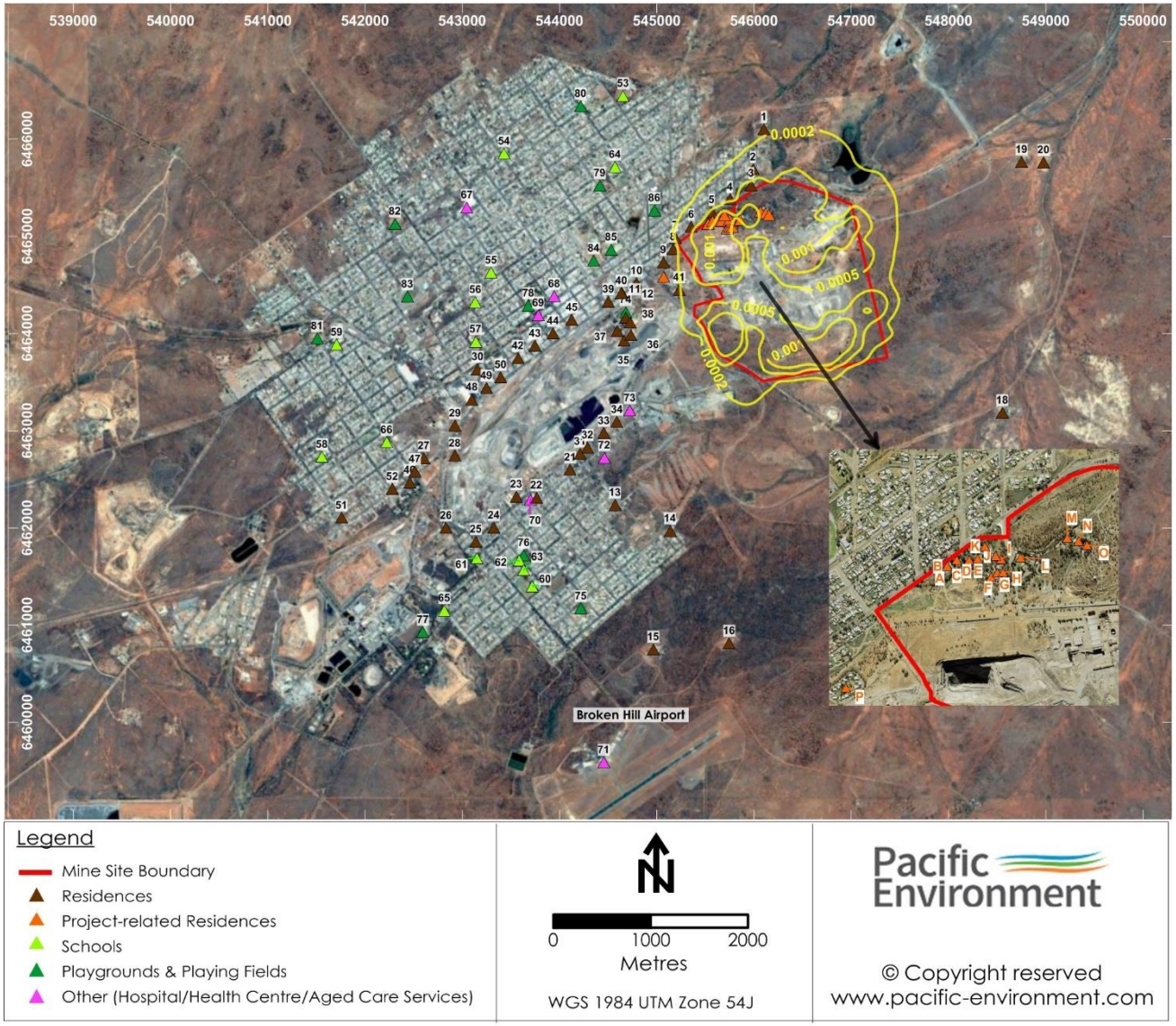

Figure 47: *Predicted 1-hour average 99.9th percentile Nickel concentration – existing mine site only (µg/m³)*

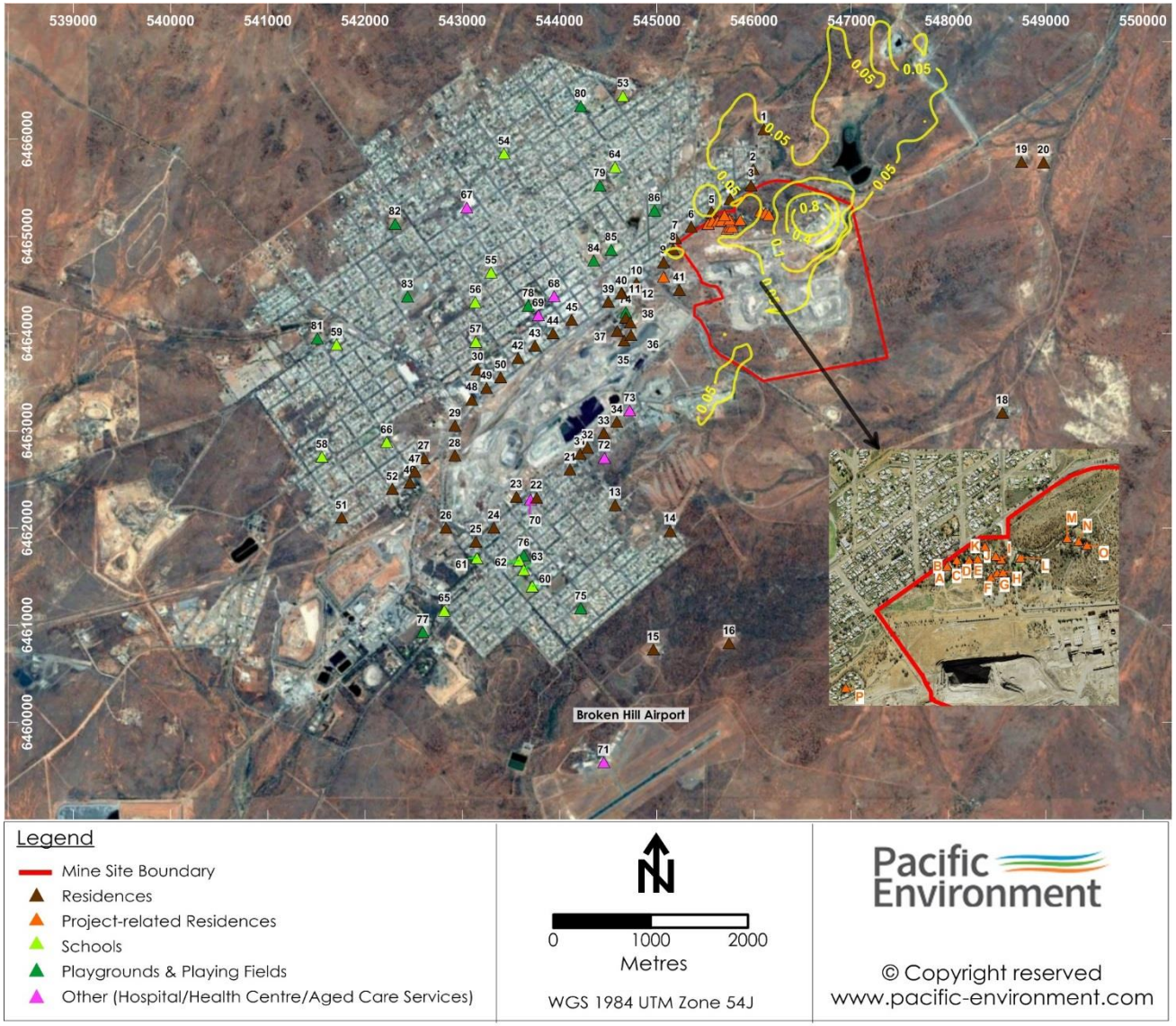

Figure 48: *Predicted 1-hour average 99.9th percentile Nickel concentration – proposed mine site only (µg/m3)*

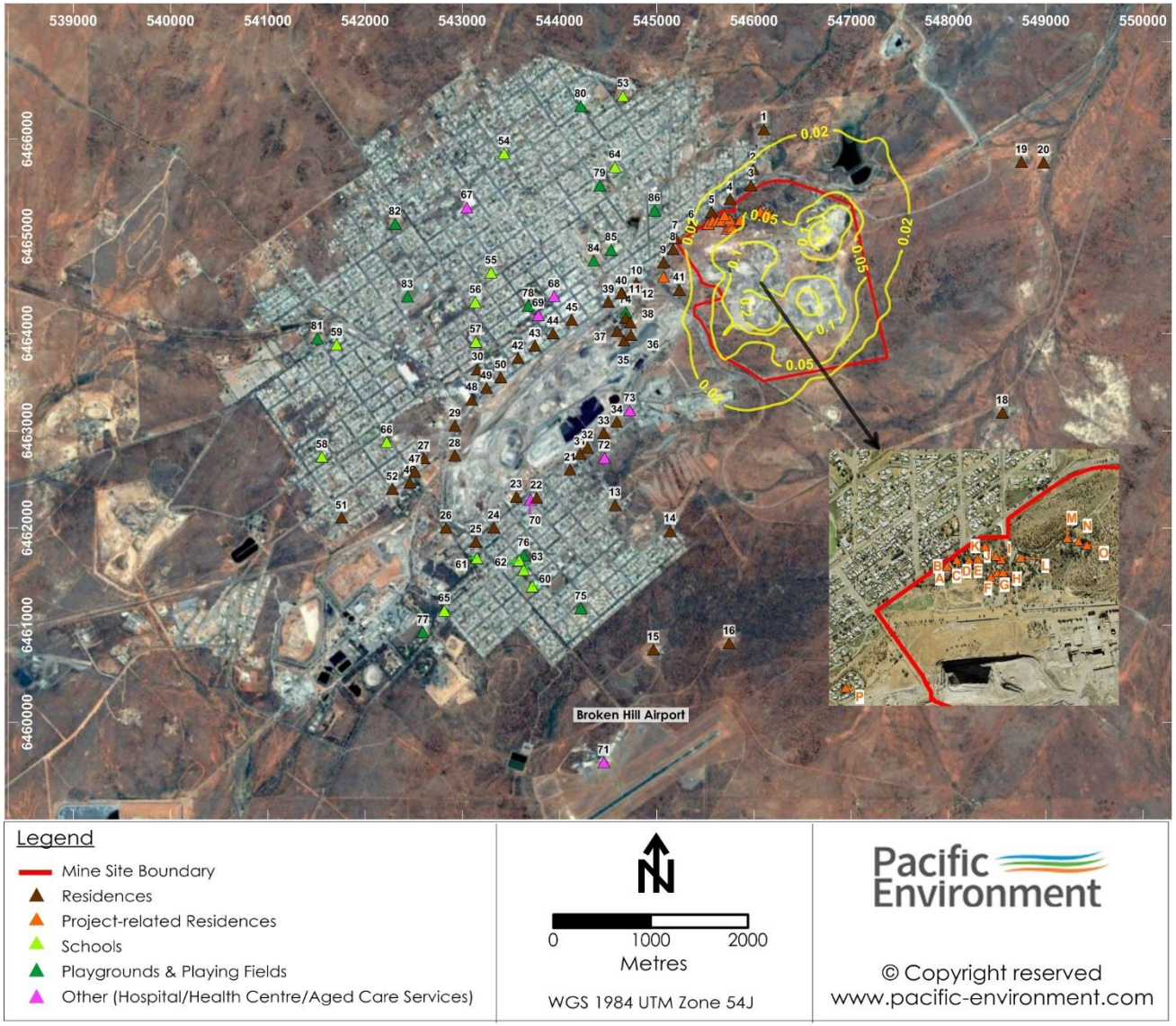

Figure 49: *Predicted 1-hour average 99.9th percentile Zinc concentration – existing mine site only (µg/m3)*

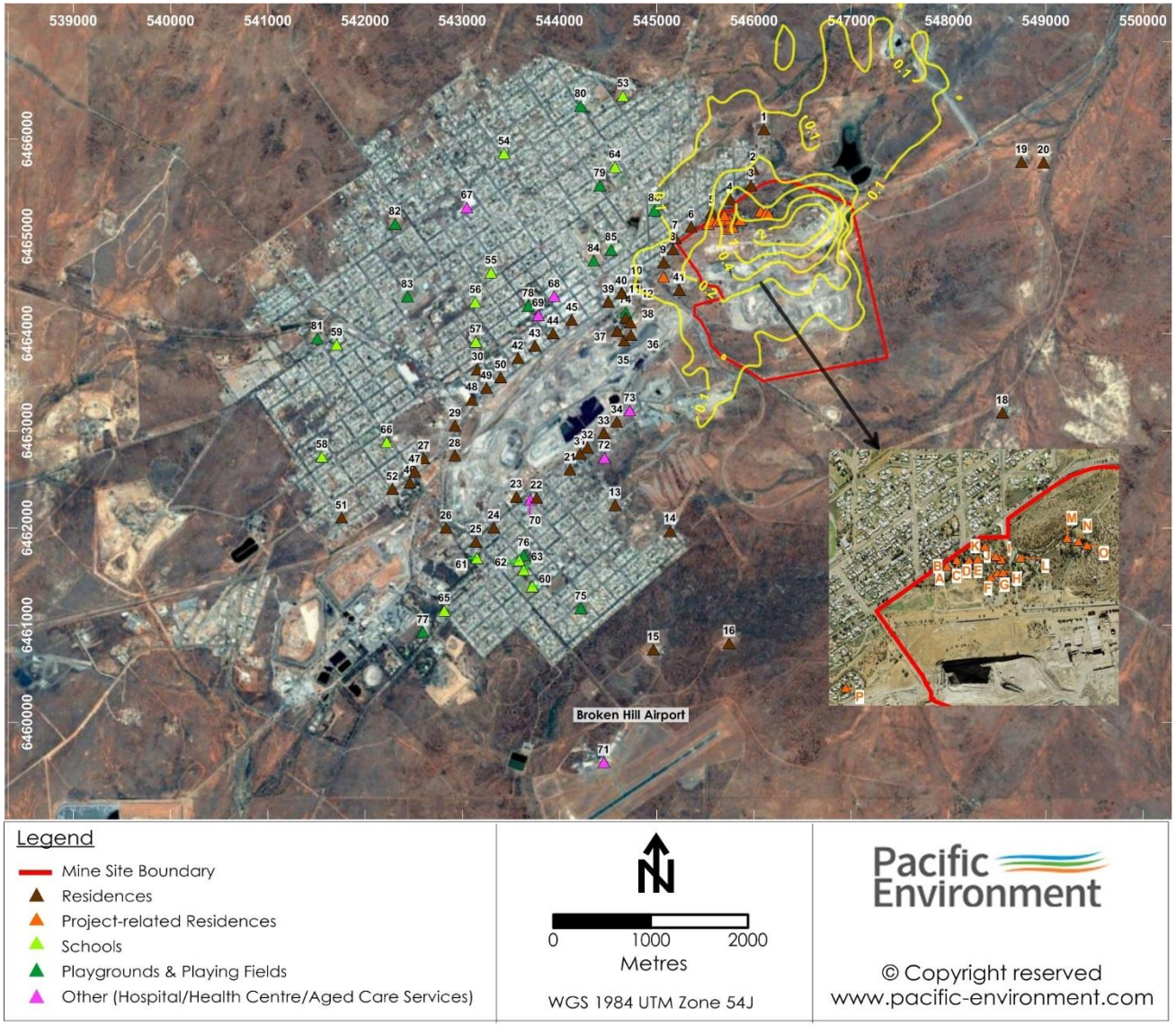

Figure 50: *Predicted 1-hour average 99.9th percentile Zinc concentration – proposed mine site only ($\mu g/m^3$)*