Pacific Environment Limited

Consulting • Technologies • Monitoring • Toxicology

13 December 2013

Rex Minerals
John Burgess
Hillside Project Study Manager

Email: jburgess@rexminerals.com.au

Dear John

**Re: Response to DMITRE Information Request - Dispersion Modelling Update**

This letter report has been prepared by Pacific Environment to address the DMITRE information request issued as the *Appendix 1 – Outcomes of the Statutory Consultation on Rex Minerals Hillside Mining Lease Proposal and Management Plan*.

This response addresses the items in regard to the update of the dust dispersion modelling that could not be provided with the previous response letter due to the dispersion model computational time requirements for the modelling. The results provided are for discrete receptor locations only since the full domain modelling for production of contour plots is not expected to finish processing until Monday 16th December.

The updates of the dispersion modelling address revisions to the proposed mining operations since the previous study and includes an increased waste rock handling rate, updates of the waste rock dump (WRD) areas (and also the soil stock piles designated for the WRD remediation) and further extensions for the haul road routes.

As discussed in our first part of the Appendix 1 response (dated 11 December 2013) the waste rock materials handling applied in the previous reports was based on the level of information that was available when the dust study was commissioned. Further mine planning has however seen changes to how the mining is proposed to take place within the mine lifetime which has increased the waste rock material handling rate[1]. The proposed highest waste rock handling rate is now increased to 125 Mtpa from the 60 Mtpa previously assessed[2]. This increase affects all emissions related to the waste rock materials handling which includes in pit loading, haul road transport, and unloading. The 125 Mtpa waste rock handling rate is the highest proposed processing rate for the mine and is equivalent of worst case conditions.

Yours Sincerely

Johan Meline
Manager SA

[1] The total amount of waste rock for the mine lifetime is understood to be unchanged.

[2] The ore handling rate is unchanged at 15 Mtpa which brings the updated total materials handling rate to 140 Mtpa from 75 Mtpa.



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## DISPERSION MODELLING UPDATE

The following sections provide details on the updated dispersion modelling:

- The Emissions Estimation Section gives a summary on the revised emission rates.
- The revised modelling results are presented and discussed in the Results Section.
- The outcome of the modelling update is summarised in the Conclusions Section.

### EMISSIONS ESTIMATION

The updated emissions rates are presented in Table 1 and for comparison the previously applied emission rates are also included.

The emissions were estimated as previously (with the same equations) with the only updates being around the increased waste rock handling rates and increased vehicle weights (also allowing for the update of proposed dump truck capacity). The haul road dust control based on water sprays was applied as discussed in our dust study report update from 31 July 2013.

As is evident from the revised emissions estimation the near doubling of the waste rock material handling produces a near doubling of estimated total dust emissions.

**Table 1: Updated Emission Rates (including previous emission rates for comparison)**

| Activity | TSP (kg/yr) Updated Emissions (125 Mtpa WR) | TSP (kg/yr) Previous Emissions (60 Mtpa WR) | $PM_{10}$ (kg/yr) Updated Emissions (125 Mtpa WR) | $PM_{10}$ (kg/yr) Previous Emissions (60 Mtpa WR) |
|---|---|---|---|---|
| Pit Activities ( including haul roads within the pit) | 1,232,133 | 589,378 | 640,034 | 356,984 |
| Loading and Unloading Activities | 79,451 | 68,957 | 37,238 | 29,026 |
| Wind Erosion from Exposed areas | 21,861 | 19,249 | 10,931 | 9,625 |
| Haul Roads outside of pit | 1,643,255 | 675,032 | 409,692 | 192,415 |
| Crushing Activities | 22,500 | 22,500 | 9,000 | 9,000 |
| Port Operations | 6,111 | 6,111 | 2,444 | 2,444 |
| TOTAL | 3,005,311 | 1,381,227 | 1,109,339 | 599,494 |

## RESULTS

The updated predicted $PM_{10}$ impacts are presented in Table 2. The near doubling in the estimated total annual dust emission rates translates to a near doubling of the predicted peak $PM_{10}$ impacts. Previously it was predicted that the NEPM air quality standard (50 µg/m³) would be exceeded in the order of four days per year at one of the nearest receptors (see Attachment A for receptor locations) if full mine production without any limitations of the operations to dust conditions were applied. The updated dispersion modelling predicts that the NEPM air quality standard would be exceeded in the order of 10 days per year at one of the nearest receptors if full production, without any limitation to the operations due to dust conditions, was in place.

While this is a significant increase in the predicted maximum impact conditions the number of predicted exceedances are not reflective of the impacts that are predicted as a result of the mine operations since active dust monitoring and management will be in place to proactively manage compliance conditions. The revised waste rock materials handling rate indicates that the number of days with operational limitations will be increased compared to previous predictions, however the increase in predicted number of days with required operational limitations are still considered to be manageable with the proposed dust compliance and management monitoring that is proposed to be put in place.

**Table 2: Updated Predicted $PM_{10}$ Maximum Impacts**

| | Daily Concentrations for Receptors (µg/m³)[a] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| Maximum daily | 28.5 | 32.3 | 47.3 | 50.5 | 43.0 | 42.2 | 58.3 | 97.5 | 98.5 | 60.0 | 77.3 |
| 2nd highest daily | 26.7 | 28.5 | 42.9 | 44.6 | 40.7 | 36.8 | 55.0 | 79.5 | 94.5 | 55.3 | 52.0 |
| 3rd highest daily | 25.3 | 26.9 | 38.9 | 43.5 | 37.2 | 36.7 | 50.1 | 65.5 | 82.0 | 48.0 | 48.1 |
| 4th highest daily | 24.6 | 26.2 | 38.3 | 41.7 | 33.3 | 35.2 | 46.5 | 59.4 | 74.3 | 43.0 | 46.2 |
| 5th highest daily | 24.5 | 25.3 | 36.2 | 40.7 | 32.8 | 30.8 | 43.8 | 59.0 | 70.9 | 36.2 | 45.8 |
| 6th highest daily | 24.2 | 25.1 | 35.3 | 39.6 | 32.6 | 30.4 | 41.1 | 58.4 | 67.8 | 33.2 | 45.7 |
| 7th highest daily | 24.0 | 25.0 | 33.2 | 38.9 | 32.3 | 29.3 | 40.9 | 56.6 | 62.2 | 32.8 | 40.2 |
| 8th highest daily | 23.6 | 24.7 | 32.9 | 38.1 | 29.1 | 28.4 | 40.8 | 53.8 | 60.9 | 31.7 | 39.0 |
| 9th highest daily | 23.1 | 24.4 | 31.2 | 37.4 | 28.4 | 27.6 | 40.3 | 53.4 | 60.5 | 31.4 | 36.1 |
| 10th highest daily | 23.0 | 24.2 | 30.7 | 34.3 | 28.4 | 27.1 | 38.4 | 49.9 | 59.1 | 30.6 | 35.6 |
| 11th highest daily | 22.8 | 23.5 | 30.6 | 33.7 | 28.4 | 26.9 | 37.0 | 47.2 | 49.5 | 30.1 | 34.3 |
| Annual avg[b] | 17.1 | 17.3 | 18.4 | 18.8 | 18.6 | 18.0 | 18.9 | 21.0 | 22.2 | 18.4 | 19.0 |

a. Maximum predictions including a background concentration of 18.1 µg/m³.
b. Annual average background concentration of 16.5 µg/m³ applied (calculated for the same period for Whyalla data as the 70th percentile background concentration)

In relation to the overall $PM_{10}$ impacts considering more frequent conditions (and not just the peak impact conditions) the annual averages (as also presented in Table 2) are all predicted to be lower than the NSW annual average air quality criteria of 30 µg/m³. The percentile plots showing predicted concentrations for all days in the modelling period (365 days) are presented for the receptors with exceedances predicted (Receptor 4, 7, 8, 9, 10, 11) in Attachment A. The results for Receptor 9 (also including the results based on the 60 Mtpa waste rock handling rate for comparison) are presented in Figure 1. Across the receptors elevated $PM_{10}$ concentrations (compared to background conditions) are predicted to occur for around 50% of the time.

The source apportionment results are presented in Figure 2 and show similar results to what was seen previously with the most significant contribution being from wheel generated dust.

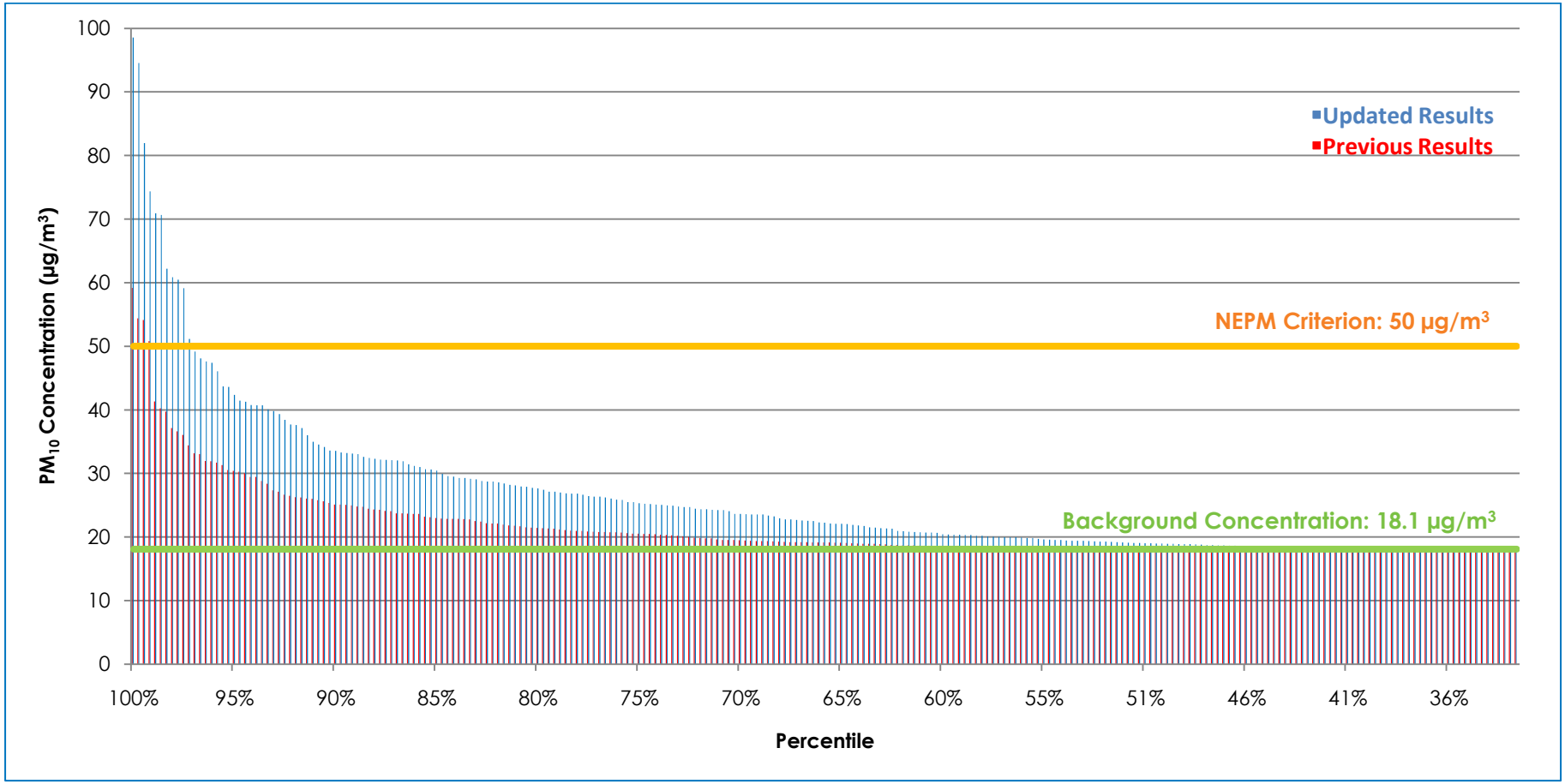


**Figure 1: Daily Average $PM_{10}$ Concentrations at Receptor 9 Including Results of Previous Modelling**

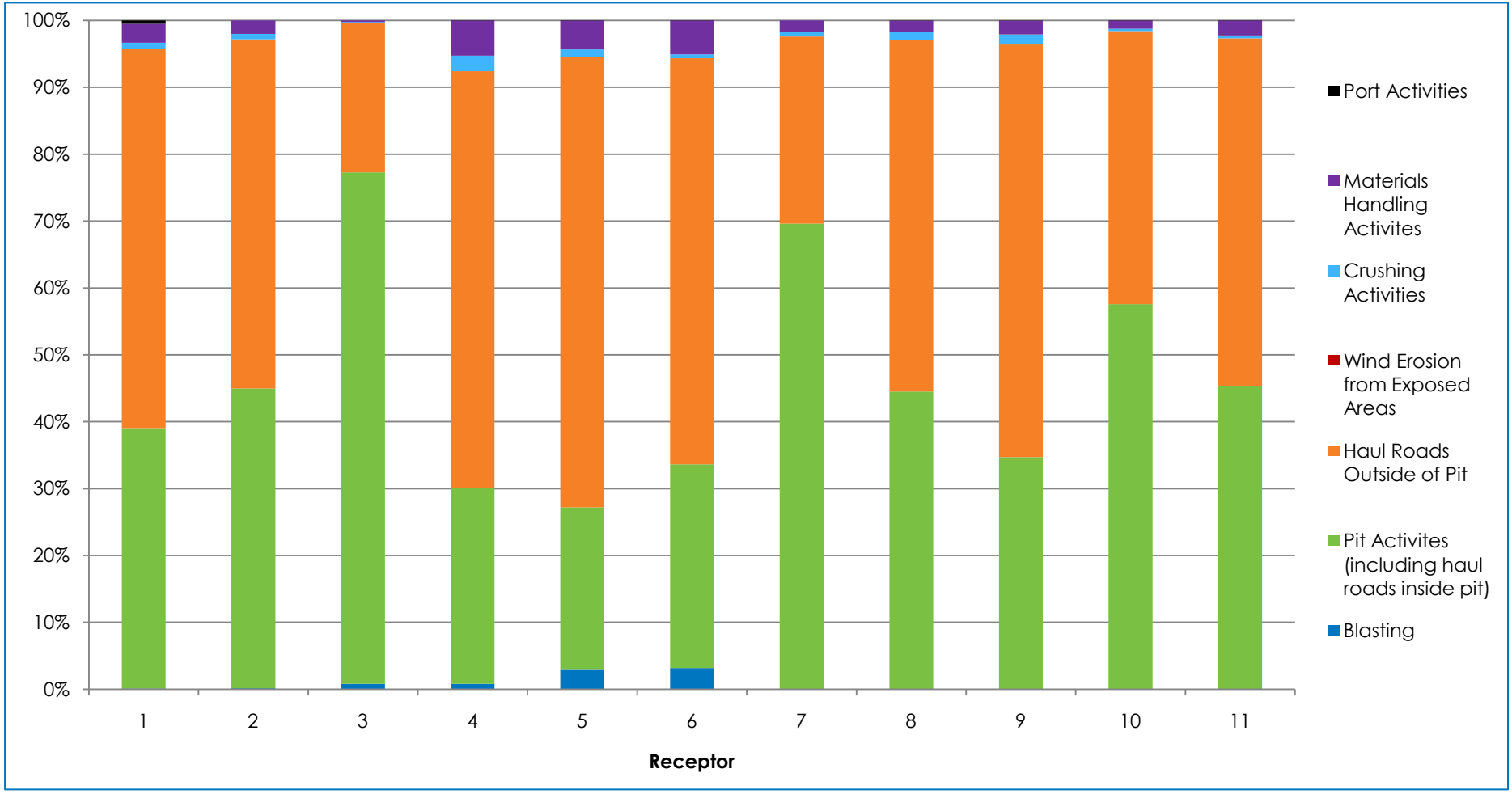


**Figure 2: Source Apportionment Results for Peak Impacts**

The increase in the annual average TSP results is limited considering the TSP assessment annual average assessment criteria of 90 µg/m$^3$.

**Table 3: Updated Predicted TSP Annual Average Concentrations**

| Receptor | Annual Average TSP Concentration (µg/m$^3$)[a] |
|---|---|
| 1 | 27 |
| 2 | 27 |
| 3 | 30 |
| 4 | 31 |
| 5 | 31 |
| 6 | 29 |
| 7 | 31 |
| 8 | 36 |
| 9 | 39 |
| 10 | 30 |
| 11 | 31 |

a. Incl background annual average TSP concentration 26 µg/m$^3$

The dust deposition results show an increase in impacts for one of the nearest receptors to 1.3 g/(m$^2$ month) compared to the impact evaluation criteria of 2 g/(m$^2$ month) as an annual average.

**Table 4: Updated Predicted Dust Deposition Annual Average Concentrations**

| Receptor | Annual Average Dust Deposition (g/(m$^2$ month))[a] |
|---|---|
| 1 | 0.1 |
| 2 | 0.1 |
| 3 | 0.3 |
| 4 | 0.4 |
| 5 | 0.6 |
| 6 | 0.2 |
| 7 | 0.5 |
| 8 | 1.0 |
| 9 | 1.3 |
| 10 | 0.3 |
| 11 | 0.4 |

a. Not including background dust deposition and based on a 30 day month

## CONCLUSIONS

The revised dispersion modelling including the increase in the waste rock handling rate from 60 Mtpa to 125 Mtpa shows increases in the predicted dust concentrations as assessed against the assessment criteria. The number of exceedances, for the mining operations (with no assumed limitations on the mining operations due to dust conditions), are predicted to increase to around 10 days per year from previously 4 days per year.

There is a significant elevation in the predicted peak impacts with up to 10 exceedance days predicted for one of the nearest receptors. However, this number of exceedances is not reflective of the impacts that are predicted as a result of the mine operations since active dust monitoring and management will be in place to proactively manage compliance conditions. The number of predicted exceedance days should be considered as a prediction of the number of days a higher degree of operational limitations could be expected to be required to maintain operation within compliance conditions.

While dust impacts are predicted at a higher level for the 125 Mtpa waste rock handling rate compared to the previously assessed 60 Mtpa, the level of impacts predicted can be managed with the level of monitoring that is proposed for the proactive compliance management based on separate (yet linked) compliance and dust management monitoring systems.

## ATTACHMENT A

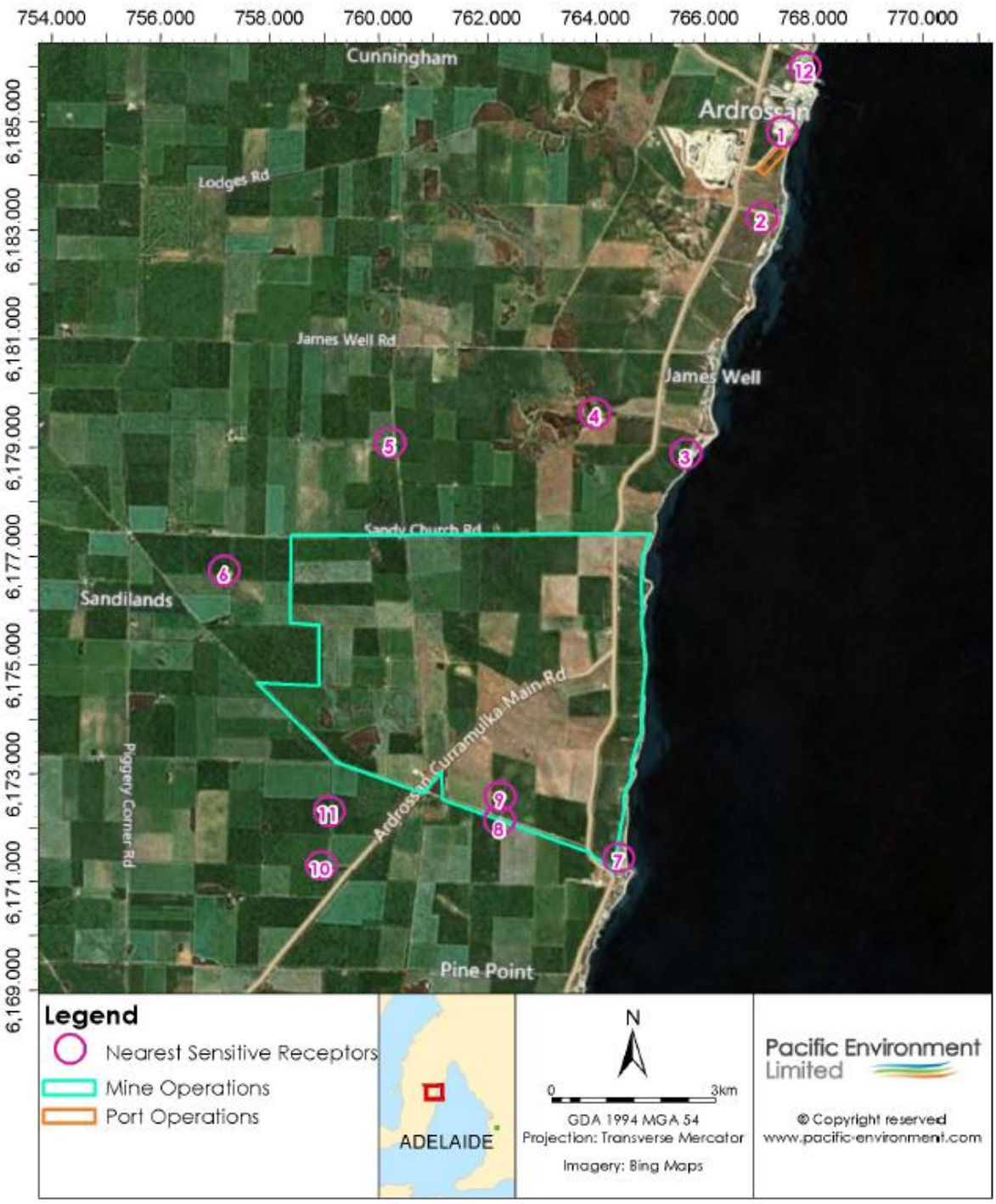


**Figure** Error! No text of specified style in document.**3: Receptor Locations**

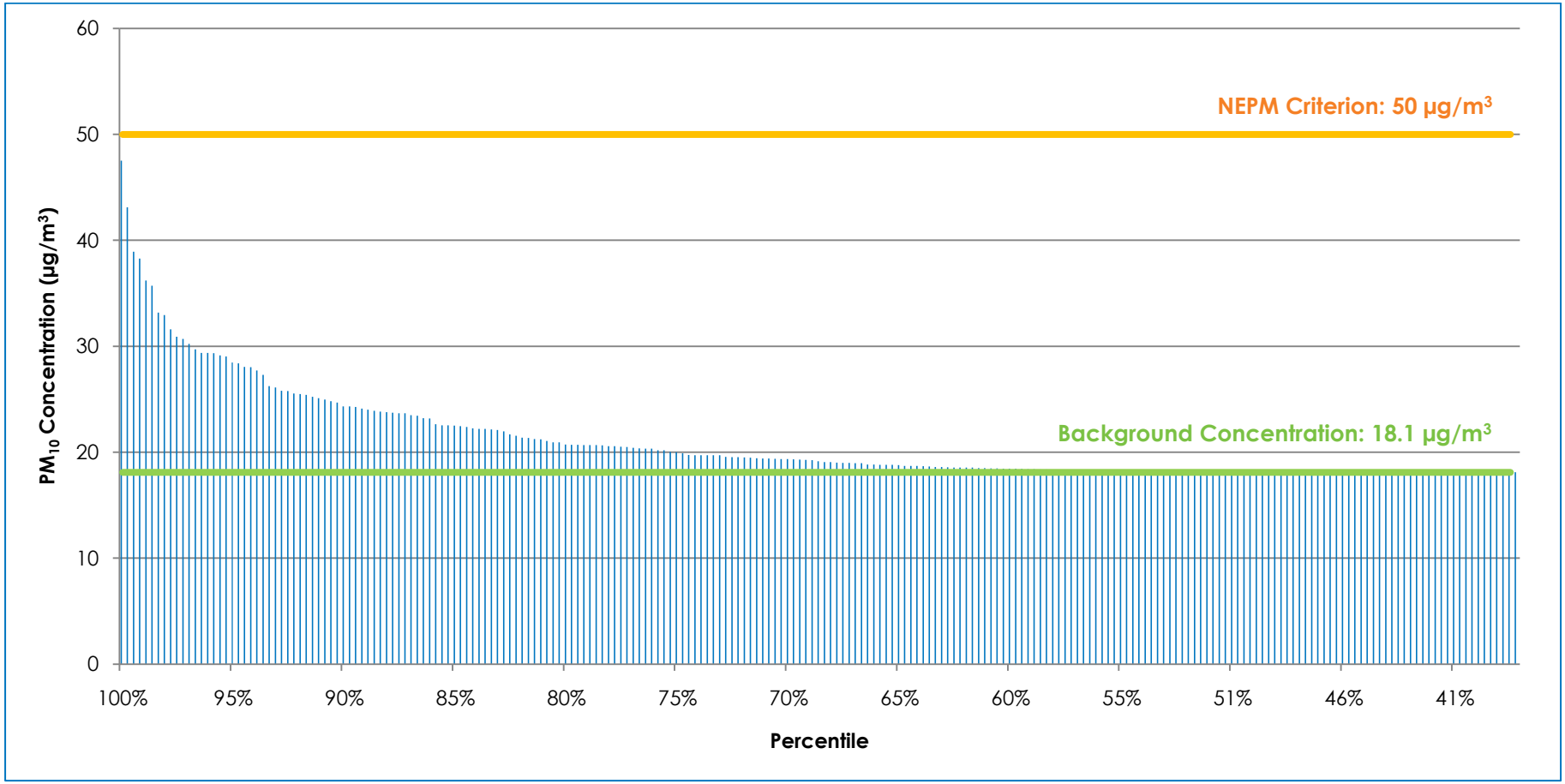


**Figure 4: Daily $PM_{10}$ Concentrations at Receptor 3 (Rogues Point)**

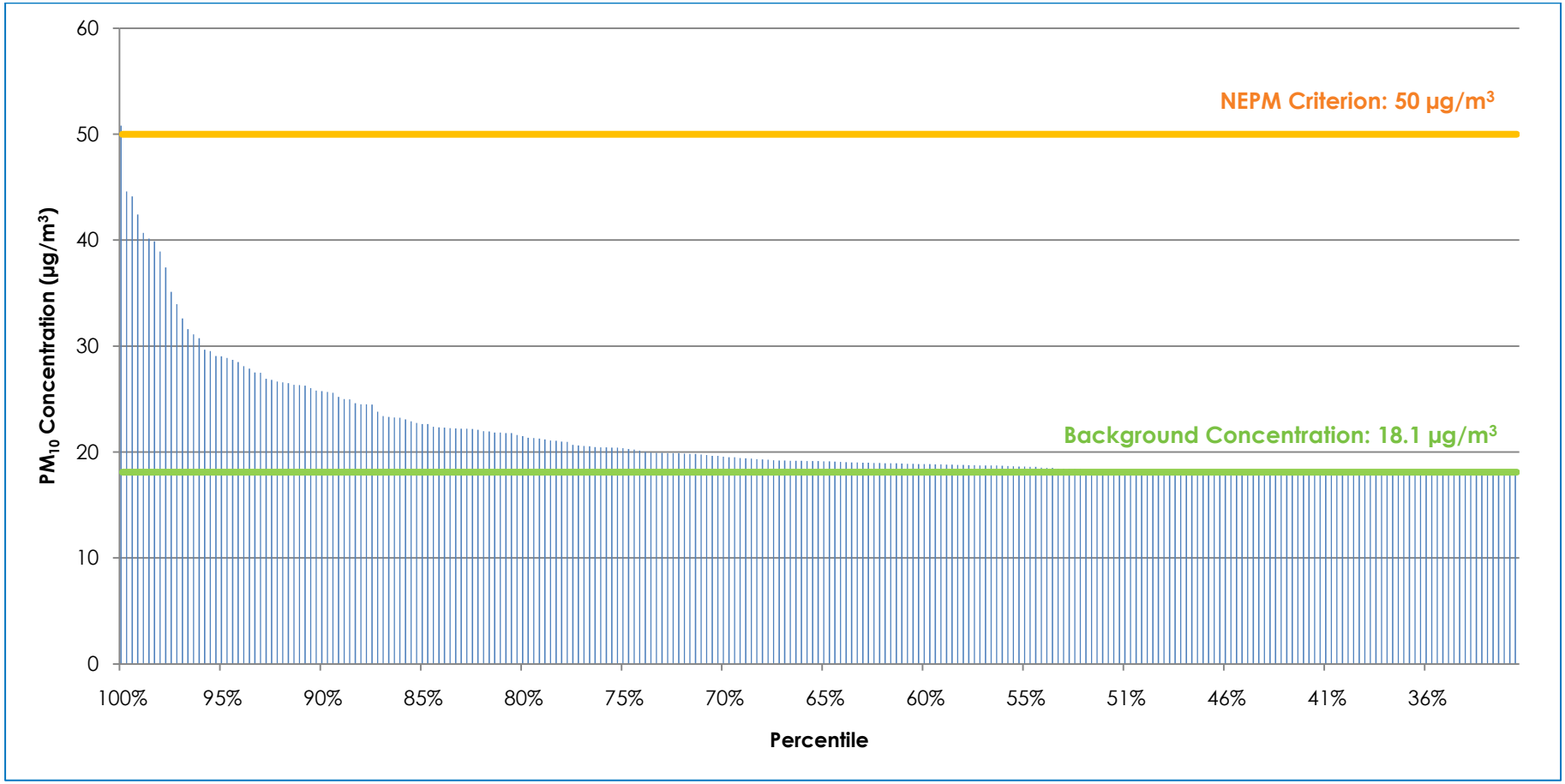


**Figure 5: Daily $PM_{10}$ Concentrations at Receptor 4**

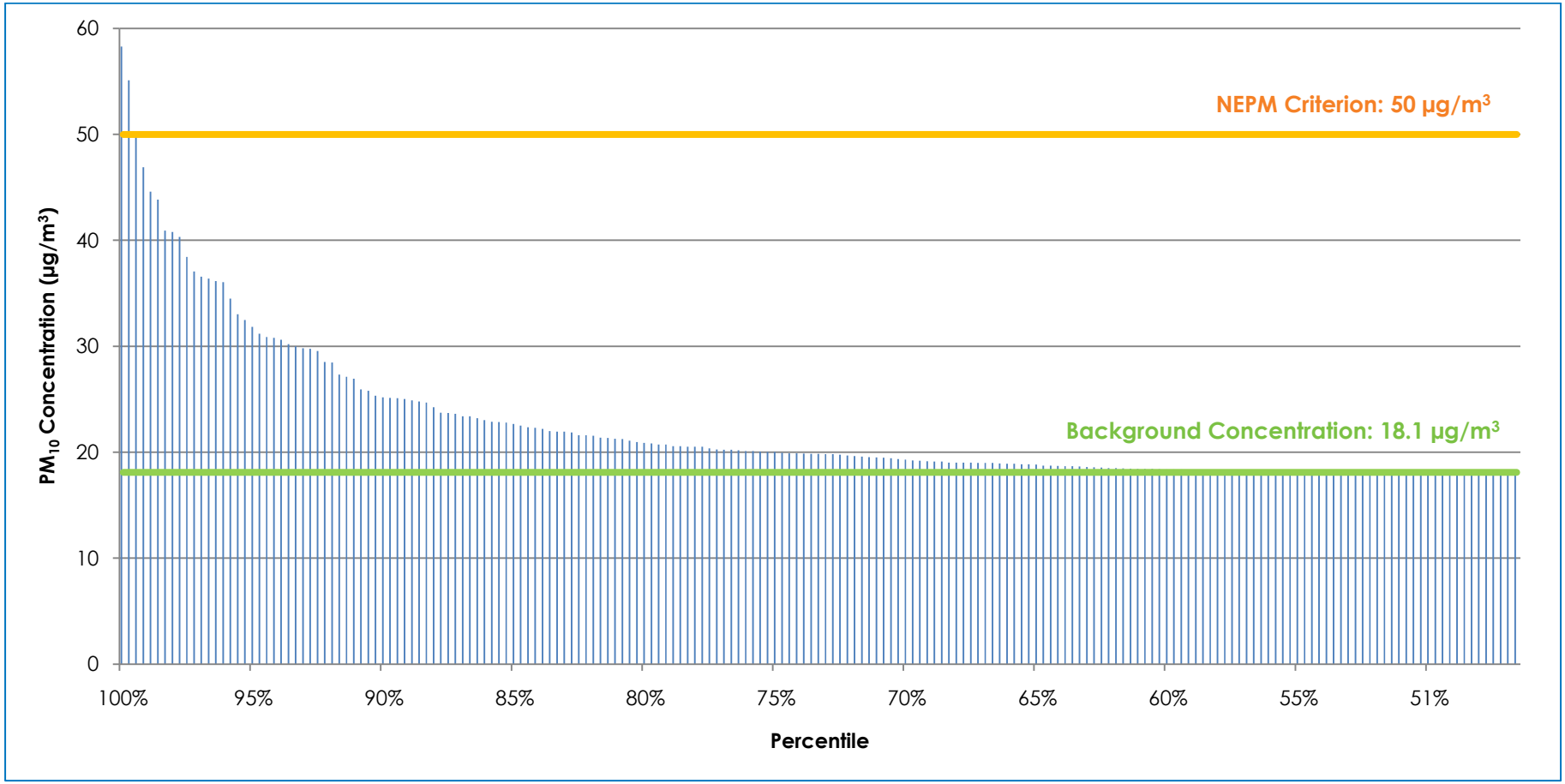


**Figure 6: Daily $PM_{10}$ Concentrations at Receptor 7 (Pine Point)**

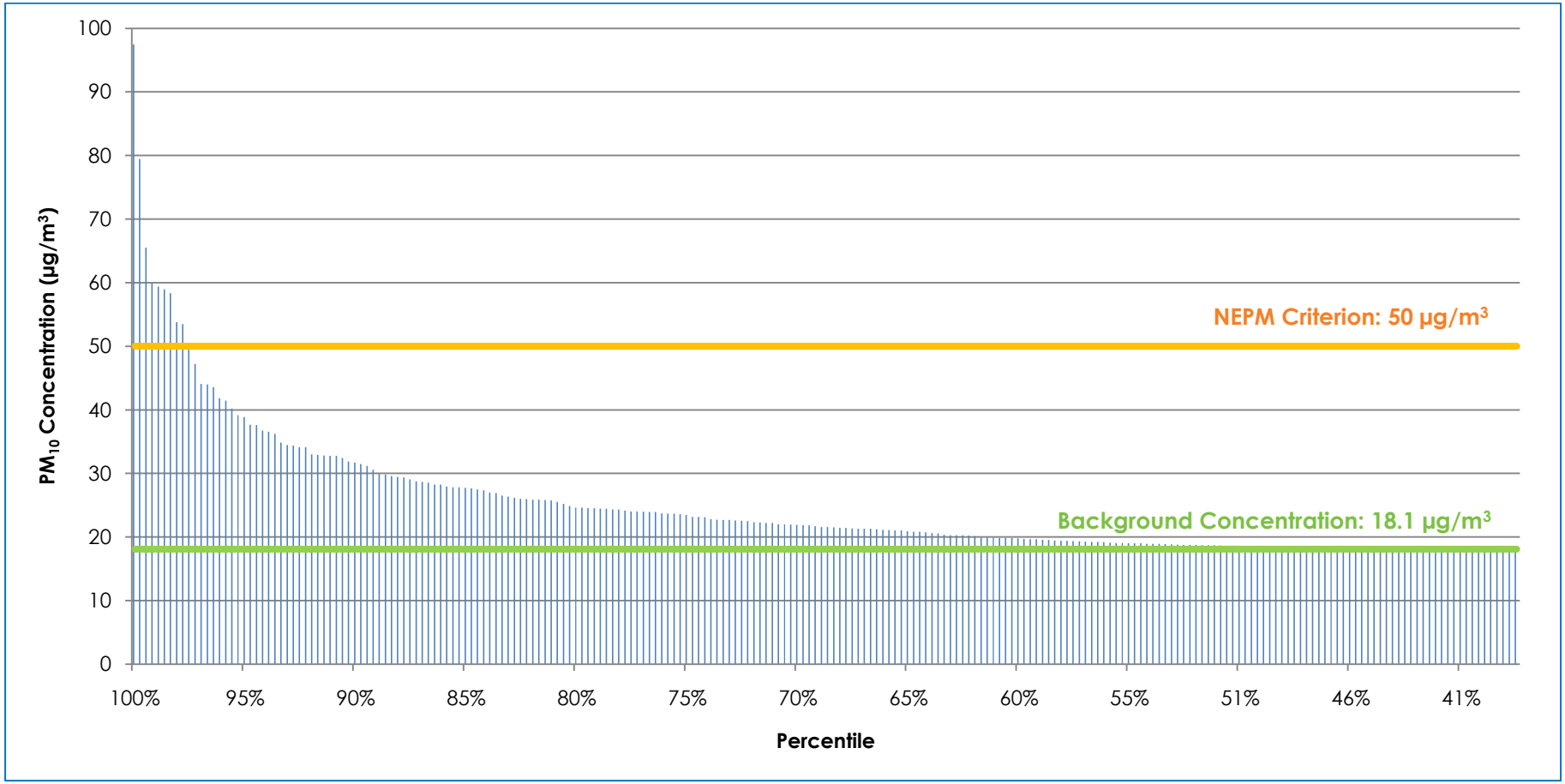


**Figure 7: Daily $PM_{10}$ Concentrations at Receptor 8**

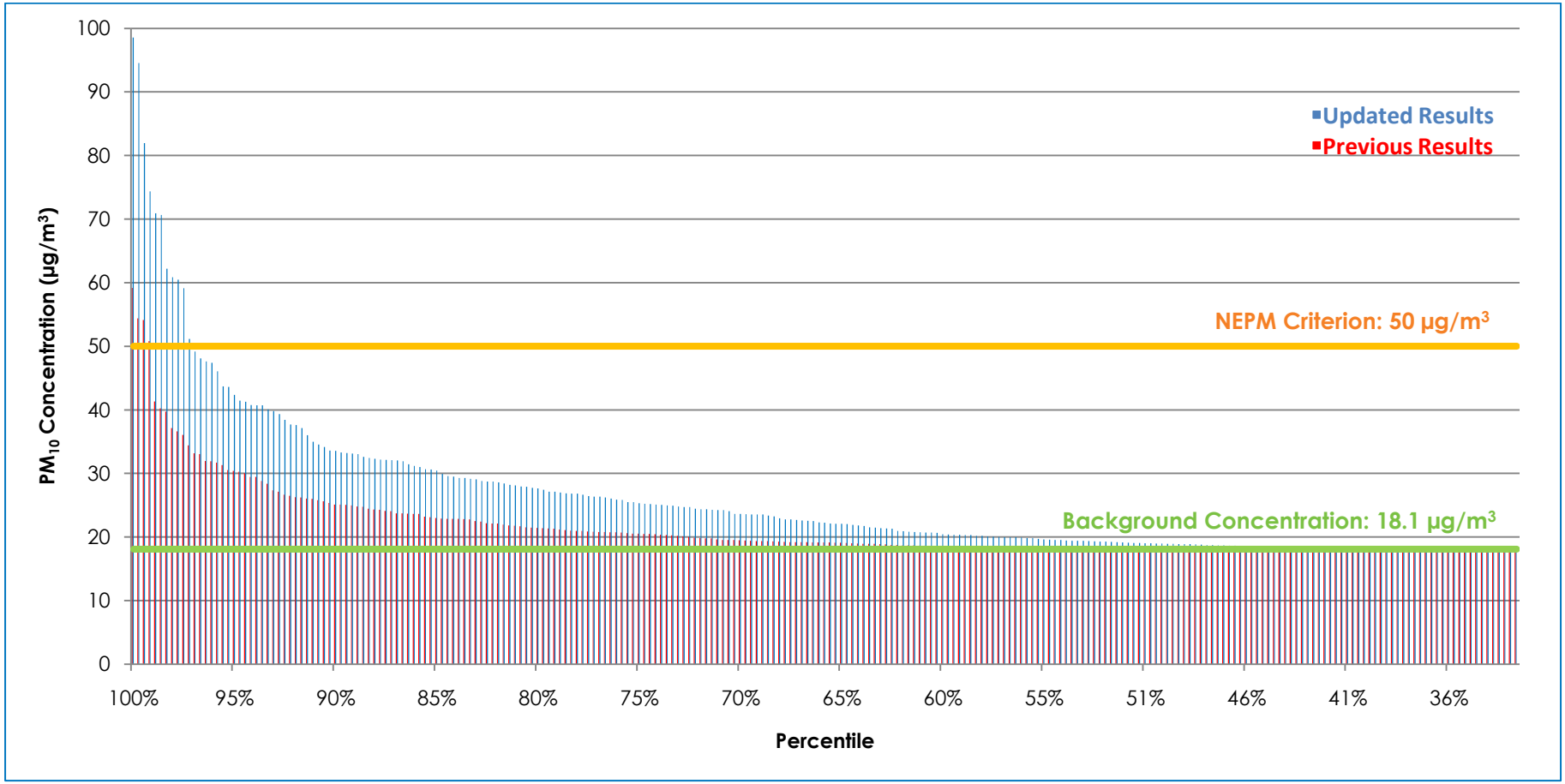


**Figure 8: Daily $PM_{10}$ Concentrations at Receptor 9 Including Results of Previous Modelling**

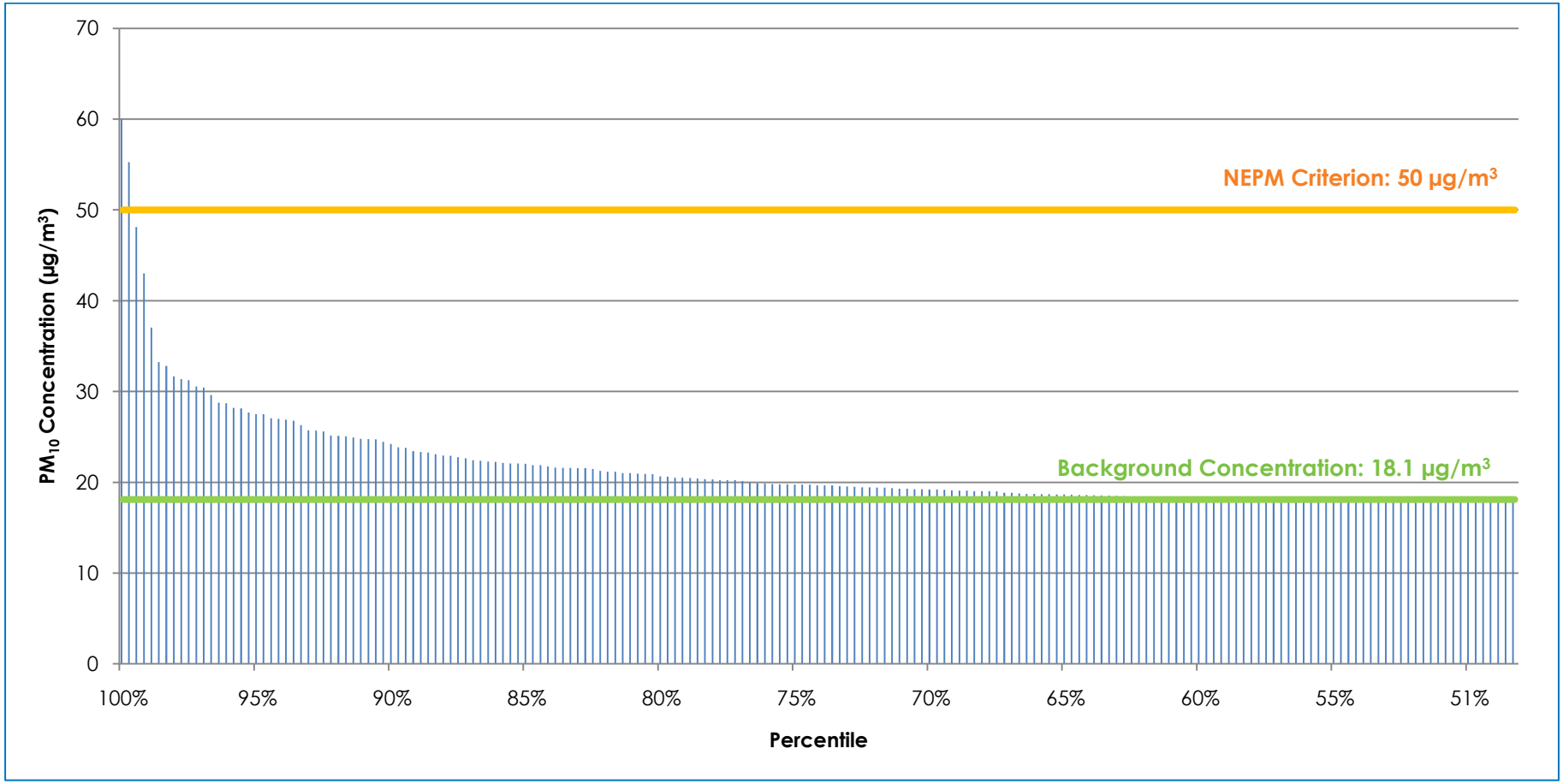


**Figure 9: Daily $PM_{10}$ Concentrations at Receptor 10**

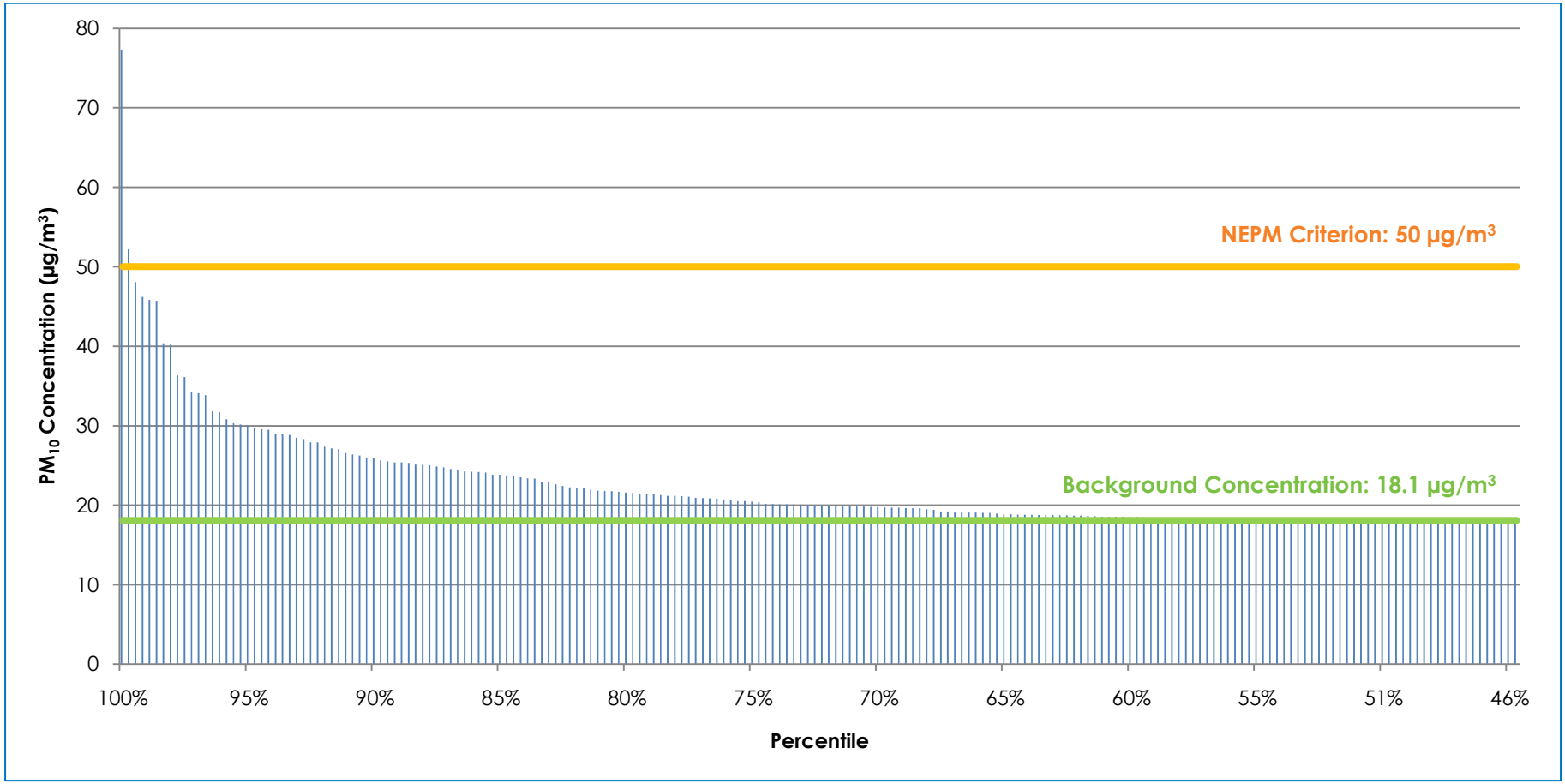


**Figure 10: Daily $PM_{10}$ Concentrations at Receptor 11**