Rasp Mine, Broken Hill – Modification 6

Air Quality Assessment

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Air Quality Assessment

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EXECUTIVE SUMMARY

ERM Australia Pacific Pty Ltd (ERM) has been commissioned by Broken Hill Operations Pty Ltd (BHOP), a wholly owned subsidiary of CBH Resources Ltd (CBH), to complete an air quality impact assessment for a proposed modification to Rasp Mine, Broken Hill (Modification 6). BHOP owns and operates the Rasp Mine under Consolidated Mine Lease 7 (CML7).

The Rasp Mine (hereafter referred to as "the Mine") is an underground silver/zinc/lead operation located within the city limits of Broken Hill, NSW. Mining has been undertaken within CML7 since 1885. The existing operations at the Mine include underground mining operations, a processing plant producing zinc and lead concentrates, a rail siding for concentrate dispatch and other associated infrastructure. These operations are undertaken in accordance with Project Approval PA07_0018, granted from the then Minister for Planning on 31 January 2011, under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This report has assessed particulate matter and lead impacts associated with the proposed modification 6 (MOD6) activities at Rasp Mine. Local land use, terrain, air quality and meteorology have been considered in the assessment and dispersion modelling was completed using the AERMOD modelling system.

A comprehensive analysis of the baseline air quality was updated as part of this assessment and now includes data up to June 2019. The year 2016 was chosen for the background data and this aligns with the meteorological data used. This also aligns with previous modelling assessments for this Mine.

This assessment considered three scenarios:

- Business as Usual (BAU) – this scenario presents a representative operational year of operations under the existing situation and consists of 100% of operations from the Kintore Pit portal.
- MOD6 Construction scenario – this represents the construction of the box cut and the new portal.
- MOD6 Operational scenario – this represents a reasonable worst-case future year of operations, with progressive rehabilitation and 100% of operations from the new mine portal.

The construction of the new box cut included in the MOD6 construction scenario is expected to take six months. The MOD6 operational scenario was chosen as a representative reasonable worst-case future operational scenario as it comprised the period with the longest travel distances related to the transport and emplacement of waste rock material.

Emissions to air have been estimated both in terms of annual average as well as a 24-hour (reasonable worst-case) peak scenarios.

These emissions have then been evaluated in terms of their predicted off-site impacts using the AERMOD atmospheric dispersion model.

For the MOD6 construction scenario, there is anticipated to be a net increase in lead concentrations / deposition rates when considering all sensitive receptors when compared with MOD4 mine increment (current Project Approval for construction activities). However, all air quality metrics are predicted to be below their respective NSW EPA criteria for the MOD6 construction scenario. The MOD6 construction scenario is expected to be approximately six months in duration and modelling indicates that the associated impacts will reduce upon completion of this phase.

For the MOD6 operational scenario, which incorporates the new portal location and the proposed tailings harvesting activities, there is a predicted net reduction in lead concentrations / deposition rates when compared with the Preferred Project Report (PPR) (current Project Approval for operation activities) as well as the Business as Usual scenario (BAU). In addition, all air quality metrics are predicted to be below their respective NSW EPA criteria for the MOD6 operational scenario.

Table E.1 presents a comparison of the maximum predicted concentrations at sensitive receptor locations under comparable construction scenarios completed for the Mine. This includes both the

MOD4 and MOD6 construction scenarios, along with comparison against NSW EPA impact assessment criteria.

Table E.1: Maximum predicted concentrations at sensitive receptors under comparable construction scenarios

Metric	Maximum predicted concentrations at sensitive receptors			NSW EPA impact assessment criteria	Units
	MOD4 increment	MOD6 construction increment	MOD6 construction cumulative		
Annual average lead concentration	0.019	0.023	0.240	0.500	µg/m^3
Annual average lead deposition	0.050	0.060	0.060	N/A	g/m^2/annum
Annual average TSP concentration	1.1	1.3	36.6	90	µg/m^3
Annual average PM_{10} concentration	0.7	0.9	13.5	25	µg/m^3
Maximum 24-hour average PM_{10} concentration	7.7	14.2	46.6	50	µg/m^3
Annual average $PM_{2.5}$ concentration	0.2	0.3	5.5	8	µg/m^3
Maximum 24-hour average $PM_{2.5}$ concentration	1.7	4.0	19.0	25	µg/m^3
Annual average dust deposition	0.3	0.5	3.4	2 (increment) 4 (cumulative)	g/m^2/month

Table E.2 presents a comparison of the maximum predicted concentrations at sensitive receptor locations under comparable operational scenarios completed for the Mine. This includes the PPR, BAU and MOD6 operational scenarios along with comparison against NSW EPA impact assessment criteria.

Table E.2: Maximum predicted concentrations at sensitive receptors under comparable operational scenarios

Metric	Maximum predicted concentration at sensitive receptors					NSW EPA impact assessment criteria	Units
	PPR increment	BAU increment	BAU cumulative	MOD6 operation increment	MOD6 operation cumulative		
Annual average lead concentration	0.036	0.026	0.243	0.024	0.241	0.500	µg/m^3
Annual average lead deposition	0.200	0.069	0.069	0.067	0.067	N/A	g/m^2/annum
Annual average TSP concentration	2.9	1.5	36.9	1.8	37.0	90	µg/m^3
Annual average PM_{10} concentration	1.0	1.0	13.6	1.0	13.6	25	µg/m^3
Maximum 24-hour average PM_{10} concentration	10.5	6.6	46.7	6.4	46.9	50	µg/m^3
Annual average $PM_{2.5}$ concentration	0.3	0.3	5.6	0.3	5.5	8	µg/m^3
Maximum 24-hour average $PM_{2.5}$ concentration	2.3	2.2	18.9	1.9	18.9	25	µg/m^3
Annual average dust deposition	0.5	0.3	3.4	0.3	3.6	2 (increment) 4 (cumulative)	g/m^2/month

As the MOD6 operational scenario is considered to be a reasonable worst-case future year scenario, it can be concluded that all future operational years are anticipated to result in a net reduction in off-site air quality impacts (including lead) when compared with current operations. This is primarily due to the shorter travelling distance for ore transport from the new portal to the Run of Mine (ROM) pad.

The results for all three scenarios demonstrated compliance with all the NSW EPA impact assessment criteria for all air quality metrics assessed.

Cumulative impacts from the proposed Broken Hill North Mine Recommencement Project have been assessed against both short and long-term air quality criteria. The results demonstrate no exceedance of the NSW impact assessment criteria at any of the receptors assessed.

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Acronyms and Abbreviations

Name	Description
AWS	Automatic Weather Station
BAU	Business as Usual
BoM	Bureau of Meteorology
BHOP	Broken Hill Operations Pty Ltd
CABC	Confined Air Burst Chamber
CBP	Concrete Batching Plant
CML7	Consolidated Mine Lease 7
DDG	Dust Deposition Gauge
DPIE	Department of Planning, Industry and Environment
EA	Environmental Assessment
EP&A Act	Environmental Planning and Assessment Act
EPA	Environment Protection Authority
g/m^2	Grams per square meter
Ktpa	Kilotonnes per annum
HVAS	High Volume Air Sampler
NSW	New South Wales
Pb	Lead
PM	(airborne) particulate matter
PM_{10}	Airborne particulate matter with an aerodynamic diameter of less than 10 µm
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of less than 2.5 µm
PPR	Preferred Project Report
ROM	Run of Mine
TEOM	Tapered Element Oscillating Microbalances
TSF	Tailings Storage Facility TSF2 tailing stored in Blackwood Pit TSF3 tailing stored in Kintore Pit
TSP	Total Suspended Particulate (matter)
UG	Underground
WE	Wind Erosion
WR	Waste Rock
$µg/m^3$	Micrograms per cubic metre

1. INTRODUCTION

ERM has been commissioned by Broken Hill Operations Pty Ltd (BHOP), a wholly owned subsidiary of CBH Resources Ltd (CBH), to complete an air quality impact assessment for a proposed modification to Rasp Mine, Broken Hill (MOD6). BHOP owns and operates the Mine under Consolidated Mine Lease 7 (CML7).

1.1 Background

The Rasp Mine (hereafter referred to as “the Mine”) is an underground silver/zinc/lead operation located within the city limits of Broken Hill, NSW. Mining has been undertaken within CML7 since 1885. The existing operations at the Mine include underground mining operations, a processing plant producing zinc and lead concentrates, a rail siding for concentrate dispatch and other associated infrastructure. These operations are undertaken in accordance with Project Approval PA07_0018, granted from the then Minister for Planning on 31 January 2011, under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

BHOP seeks to modify the Rasp Mine approval to:

- Establish Kintore Pit as tailing storage facility 3 (TSF3) with co-disposal of tailing with excess waste rock;
- Relocate the mine access portal and access decline with associated infrastructure, to a new boxcut;
- Utilise Blackwood Pit (TSF2) for drying and harvesting tailing;
- Conduct periodical crushing of non-ore material in Kintore Pit and/or BHP Pit;
- Utilise excess underground waste rock (<0.5% lead (Pb)) for rehabilitation capping.

The planned work will include:

- Tailings Harvesting and transfer to Kintore Pit (TSF3)
  - Preparation involves the harvesting of thin layers of dry tailing (30 – 50 cm) from the surface of TSF2 prior to stockpiling and transferring to TSF3. This would allow fresh tailing to be deposited into TSF2 which would be dried and removed, resulting in cyclical rotation of depositing, drying, harvesting and transfer tailing to Kintore Pit TSF3. An indicative layout for the tailing harvesting is shown in Figure 1.1.

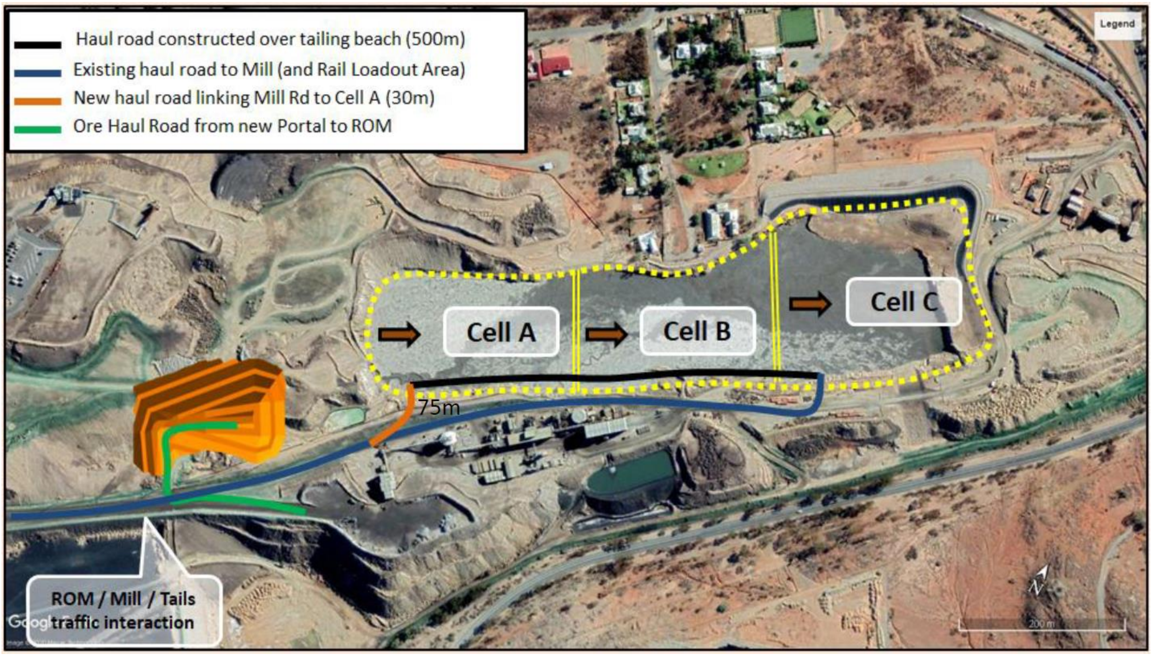

Figure 1.1: Indicative Layout Option for Tailing Harvesting (Source: BHOP))

- Relocation of Mine Access
  - Current underground mine access is via a portal located in Kintore Pit. It is proposed to establish a new portal to be located within a new boxcut.
- Rehabilitation Capping
  - Excess waste rock from underground mining, in particular any material that is greater than 0.5% lead, will be placed in Kintore Pit, and be co-disposed with tailing. Waste rock suitable for rehabilitation capping would be separated and placed on the current Kintore Pit Tipple or BHP Pit prior to confirmation testing of lead concentration. Waste rock that has a lead content greater than 0.5% would be permanently stored in Kintore Pit or taken underground for backfill or in the fill-in area of BHP Pit.
  - BHOP seek to commence rehabilitation activities over 'free areas' (non-active mining sites), across CML7 by using excess waste rock from underground that has been tested and contains less than 0.5% lead.

The proposed modification would:

- Permit mining at the Rasp Mine to continue post 2022 with additional storage of tailing;
- Significantly reduce the surface distance of hauling ore from underground to the ROM Pad thereby reducing impacts from noise and dust;
- Ensure continued employment of 186 full-time employees, 32 full-time contractors and indirectly over 200 casual contractors that provide specialist services when required;
- Engagement of approximately 20 contractors during construction and an additional 6 full time employees for operations;
- Allow the resource to be fully utilised; and
- Allow BHOP to continue to support the economic sustainability of Broken Hill.

The proximity of the Mine to the population of Broken Hill, and the cumulative emissions to air with existing operation of a similar nature in the vicinity, requires the completion of a detailed air quality assessment to assess the potential for increased risk of exposure to lead (and other pollutants) by the community.

1.2 Scope of Work

The following scope of work has been completed as part of the air quality assessment:

- Literature review
  - Brief literature review of relevant background documentation.
- Review and characterisation of the existing environment
  - Processing of site representative terrain and meteorology consistent with the methodology undertaken for previous air quality assessments to obtain a minimum one year of meteorological inputs suitable for use within an atmospheric dispersion model (AERMOD), and determining baseline local air quality based on 2014-2019 operations.
- Emissions estimation
  - Identification of all sources of particulate matter (PM) and lead bearing dust from mine activities and preparation of emissions inventories for total suspended particulates (TSP), particulate matter (both PM_{10} and $PM_{2.5}$) and lead (Pb).
  - The assessment has focused on three scenarios;
    - Business as Usual (BAU) – this scenario presents a representative operational year of operations under the existing situation and consists of 100% of operations from the Kintore Pit portal.
    - MOD6 construction phase consisting of the construction period for the boxcut.
    - MOD6 operational phase consisting of the worst-case future operational year with 100% of operations from the new mine portal.
- Modelling and results presentation
  - Atmospheric dispersion modelling for three scenarios (BAU, MOD6 construction and MOD6 operational) and presentation of the predicted air quality impacts (TSP, PM_{10}, $PM_{2.5}$, dust deposition and Pb).
  - Results were compared against relevant air quality criteria at sensitive receptor locations.

2. AMBIENT AIR QUALITY CRITERIA

The Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (Approved Methods) (NSW EPA, 2017) specifies air quality assessment criteria relevant for assessing impacts from air pollution. The air quality goals relate to the total particulate matter (PM) burden in the air and not just the PM from the Mine. In other words, consideration of background PM needs to be made when using these goals to assess potential impacts. These criteria are health-based (i.e. they are set at levels to protect against health effects). These criteria are consistent with the National Environment Protection Measure for Ambient Air Quality (referred to as the Ambient Air-NEPM) (NEPC, 1998a), and the air quality criteria as listed in conditions for Project Approval 07_0018.

Table 2.1 provides a summary of the air quality goals for pollutants that are relevant to this study. It is important to note that, with the exception of deposited dust, the criteria are applied to the cumulative impacts due to the proposed modification and other existing sources.

Table 2.1: NSW EPA air quality impact assessment criteria

Pollutant	Standard	Averaging Period
TSP	90 µg/m^3	Annual
PM_{10}	25 µg/m^3	Annual
	50 µg/m^3	24-Hour
$PM_{2.5}$	8 µg/m^3	Annual
	25 µg/m^3	24-Hour
Pb (TSP fraction)	0.5 µg/m^3	Annual
Deposited Dust	2 g/m^2/month (incremental) 4 g/m^2/month (cumulative)	Annual

3. EMISSIONS INVENTORY

3.1 Introduction

This assessment has focused on the following three scenarios:

1. Business as Usual (BAU) – this scenario presents a representative operational year under the existing situation and consists of 100% of operations from the Kintore Pit portal. Emissions from this scenario will be compared against the latest approved emissions for operations (PPR) and the MOD6 Operational Scenario.

   The annual material throughputs associated with the BAU scenario have been assumed to be:

   - 720 kilotonnes per annum (ktpa) of ore
   - 650 ktpa of tailing (all transported via piping to Blackwood Pit TSF2)
   - 190 ktpa of total waste rock

2. Modification 6 Construction Scenario – this scenario consists of the excavation of the box cut and installation of a new mine portal over a six month period, preparation works in Kintore Pit (for co-disposal of tailings and waste rock) and Blackwood Pit (for tailings harvesting). There will also be progressive rehabilitation from BHP Pit to Little Kintore Pit. Predicted impacts from this scenario will be compared against the latest approved predicted impacts for construction (MOD4 mine increments). Both the MOD6 construction scenario and the MOD4 scenario are presented as 'mine increments' inclusive of both construction activities as well as activities associated with ore handling and concentrate production.

3. Modification 6 Operational Scenario – this scenario is considered a reasonable worst-case future operational year based on the greatest travel distances for waste rock capping projected for this year. This scenario includes progressive rehabilitation and 100% of operations from the new mine portal, and incorporates the proposed tailings harvesting and transfer from TSF2 to TSF3. Emissions from this scenario will be compared against the latest approved emissions for operations (PPR) and BAU Scenario.

   The annual material throughputs associated with the MOD6 operational scenario have been assumed to be:

   - 500 ktpa of ore
   - 480 ktpa of tailing
   - 146 ktpa of total waste rock
   - 18 ktpa of waste rock to be rehabilitated as capping to Mount Hebbard

The assumptions in the emissions estimates are based on those documented within the Environ (2010) air quality assessment report for the Mine, which were repeated in subsequent air quality assessments (see Pacific Environment (2017a)) and are detailed in Appendix A (Table A.2 – BAU, Table A.4 – MOD6 construction and Table A.6 – MOD6 operational). Detailed information on mining operations were provided by BHOP.

To reflect the day to day variability in the construction activities for MOD6 construction scenario and the batch nature of the tailings harvesting activities during the MOD6 operational scenario, a daily worst case emissions scenario has been developed for PM_{10} and $PM_{2.5}$ and assessed accordingly. This approach was not applied to the BAU scenario as operations are assumed to be broadly consistent throughout the year.

3.2 Percentage lead (Pb) composition

The calculation of potential Pb emissions for all non-road sources has been based on the percentage lead composition of different material substrates.

Compositional data on waste rock (used for stockpiling), free areas and disturbed areas (roads and areas of active mining) based on site-specific material sampling, has been made available for this assessment. These data are anticipated to provide a conservative estimate of Pb percentage composition of waste rock. The adopted percentage Pb compositions used in this assessment are as follows:

- Tailings = 0.3% Pb
- Waste rock = 0.5% Pb
- Free areas = 1.4% Pb
- Active mined areas = 1.9% Pb

For road sources, BHOP conducted Pb analyses of seven unpaved road sections at the site during August 2019. The results of these analyses are provided in Table 3.1.

Table 3.1: Unpaved roads percentage (%) lead breakdown

Unpaved road segment	Material	% lead
Central laydown area road	Unpaved Road A	0.5%
Road north of Kintore Pit	Unpaved Road B	0.8%
Kintore Pit haul road	Unpaved Road C	0.5%
Road to top of Mt Hebbard	Unpaved Road D	1.3%
Road into BHP Pit	Unpaved Road F	1.9%
Road within processing plant	Unpaved Road G	1.1%
Road to lookout over Blackwood pit	Unpaved Road H	1.4%

3.3 Emission estimates

Emissions inventories contained in Appendix A. Table A.1 (BAU), Table A.3 (MOD6 construction) and Table A.5 (MOD6 operational) provide a summary of the annual TSP, PM and lead emissions estimates used in the dispersion modelling for the MOD6 construction and MOD6 operational scenarios, respectively.

Tables A.7 and A.8 provide a summary of the maximum 24-hour average PM_{10} and $PM_{2.5}$ emissions estimates used in the dispersion modelling for the MOD6 construction and MOD6 operational scenarios, respectively.

3.4 Particle size categories

Emission rates of TSP, PM_{10} and $PM_{2.5}$ have been calculated using emission factors developed by the US EPA (US EPA, 1995) and routinely applied in NSW. Modelling was completed using the particle size specific inventories and was assumed to emit and deposit from the plume in accordance with the deposition rate appropriate for particles with an aerodynamic diameter equal to the geometric mass of the particle size range.

Modelling was completed for three particle size categories; TSP, PM_{10} and $PM_{2.5}$. The particle mass mean diameters were determined from particle size distribution data for various (coal) mining activities (presented in SPCC, 1986).

3.5 Control measures

All of the control measures included within Pacific Environment (2017a) for the modification 4 (MOD4) assessment (Pacific Environment, 2017a) apply for the current MOD6 assessment. These are summarised below:

- Wind erosion post-TSF2 closure – for the MOD4 phase of the Mine, once the TSF was scheduled to close, it would be capped with waste rock. From field testing of this method, a control efficiency of 99% was deemed appropriate; and
- Dust suppression on haul roads – a control efficiency of 80% was adopted for PM emissions on unpaved haul roads due to the application of a chemical suppressant.

The additional control measure specifically included as part of this MOD6 assessment is the inclusion of sealing the road from the new portal to the ROM pad entry for the MOD6 operational scenarios.

Additional operational measures have been introduced to decrease the overall PM emissions from the Project. PM emissions from haul trucks have been specifically addressed through the implementation of larger haul trucks for the future of the tailings harvesting operations from TSF2 to TSF3. Through doing this, PM emissions will be reduced as there will be fewer haul trucks required to transport material. This control method is suggested as part of the NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining (Katestone, 2011) with reported improvements of between 20% and 45%.

4. DISPERSION MODELLING

4.1 Model selection

For consistency with the original environmental assessment (EA), and historical modelling and previous assessments (Pacific Environment 2011; 2013; 2015a; 2015b, 2016, 2017a), the current assessment has used the US-EPA regulatory model, AERMOD.

The air dispersion modelling conducted for this assessment represents an advanced modelling system using the AERMET/AERMOD model. AERMOD was selected as a suitable dispersion model due to the source types, location of nearest receptors and nature of local topography. AERMOD is the United States Environmental Protection Agency's (US EPA) recommended steady-state plume dispersion model for regulatory purposes. The AERMOD model was developed, and is supported by the US EPA and is now the model of choice for nearfield (less than 50 km from an emission source) applications in the US (US EPA, 2017).

A significant feature of AERMOD is that the Pasquill-Gifford stability based dispersion has been replaced with a turbulence-based approach that uses the Monin-Obukhov length scale to account for the effects of atmospheric turbulence based dispersion.

Site specific terrain information has been made available for this assessment. Pit retention has been applied to relevant sources only.

4.2 Model Uncertainty

Atmospheric dispersion models represent a simplification of the many complex processes involved in determining ground level concentrations of substances.

Model uncertainty comprises of model chemistry/physics uncertainties, input data uncertainties, and stochastic uncertainties. In addition, there is inherent uncertainty in the behaviour of the random turbulence. The generic sources of uncertainty in dispersion models and their potential effects on this assessment are summarised in Table 4.1.

Table 4.1: Summary of main sources of modelling uncertainty

Source	Effects
Oversimplification of physics in model code (varies with type of model)	A variety of effects that can lead to both under-prediction and over- prediction. Errors are greater in Gaussian plume models, which do not include the effects of non-steady-state meteorology (i.e., spatially- and temporally-varying meteorology).
Errors in emissions data	Ground-level concentrations are proportional to emission rate. Plume rise is affected by source dimensions, temperature and exit velocity. In this instance, latest mine plan information has been used for emission estimation, with industry standard emission estimation techniques adopted. Where possible, site specific data (e.g. variable %Pb) have been included to reduce uncertainty.
Errors in wind data	Wind direction affects direction of plume travel. Wind speed affects plume rise and dilution of plume, resulting in potential errors in distance of plume

Source	Effects
	impact from source, and magnitude of impact. Local variation in wind patterns if evident, even across the Rasp site. However, wind data from Broken Hill airport is anticipated to be site representative and is maintained to Bureau of Meteorology standards.
Errors in stability estimates	Gaussian plume models use estimates of stability class, and 3-D models use explicit vertical profiles of temperature and wind (which are used directly or indirectly to estimate stability class for Gaussian models). In either case, errors in these parameters can cause either under prediction or over prediction of ground-level concentrations.
Errors in temperature	Usually the effects are small, but temperature affects plume buoyancy, with potential errors in distance of plume impact from source, and magnitude of impact. This is not anticipated to be a significant source of uncertainty given the non-buoyant, near-ground level nature of the emission sources.
Inherent uncertainty	Models predict 'ensemble mean' concentrations for any specific set of input data (say on a 1-hour basis), i.e., they predict the mean concentrations that would result from a large set of observations under the specific conditions being modelled. However, for any specific hour with those exact mean hourly conditions, the predicted ground-level concentrations will never exactly match the actual pattern of ground-level concentrations, due to the effects of random turbulent motions and random fluctuations in other factors such as temperature.

A model uncertainty specific to the current assessment is the model predictions for lead deposition, discussed further in Section 5.2.2. In this case, the modelling predictions indicate that mine-only activities account for more than the observed lead deposition rates for the whole of Broken Hill, across a year. In other words, in this instance, the model is over-predicting relative to observations. From a regulatory perspective, it is acceptable (and even desirable) that dispersion models over-predict, since this allows for an additional level of conservatism within the assessment when predictions are compared to performance criteria.

4.3 Sensitive Receptors

The NSW EPA definition of sensitive receptors (NSW EPA, 2017) is:

"A location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area."

In total, 70 sensitive receptors have been included in this study. There are 42 from the original study (Environ, 2010a), seven receptors including the old bowling green and six playgrounds which were added as part of the MOD4 air quality assessment (Pacific Environment, 2017a). An additional 21 receptors have now been included in this assessment following a request from the Health Risk Assessment team for MOD6 (SLR/ToxConsult). Their locations are shown in Figure 4.1 and summary tables that describe each receptor are provided in Appendix F.

As mentioned, the original study (referred to as the Preferred Project Report (PPR) only assessed 42 receptors therefore a direct comparison between Receptors 43-70 cannot be made across PPR, BAU and MOD6 operational scenario. The modelling for MOD4 only assessed receptors 1 to 49; however, as the results are available for this modelling, results for receptors 50 to 70 could be interpolated.

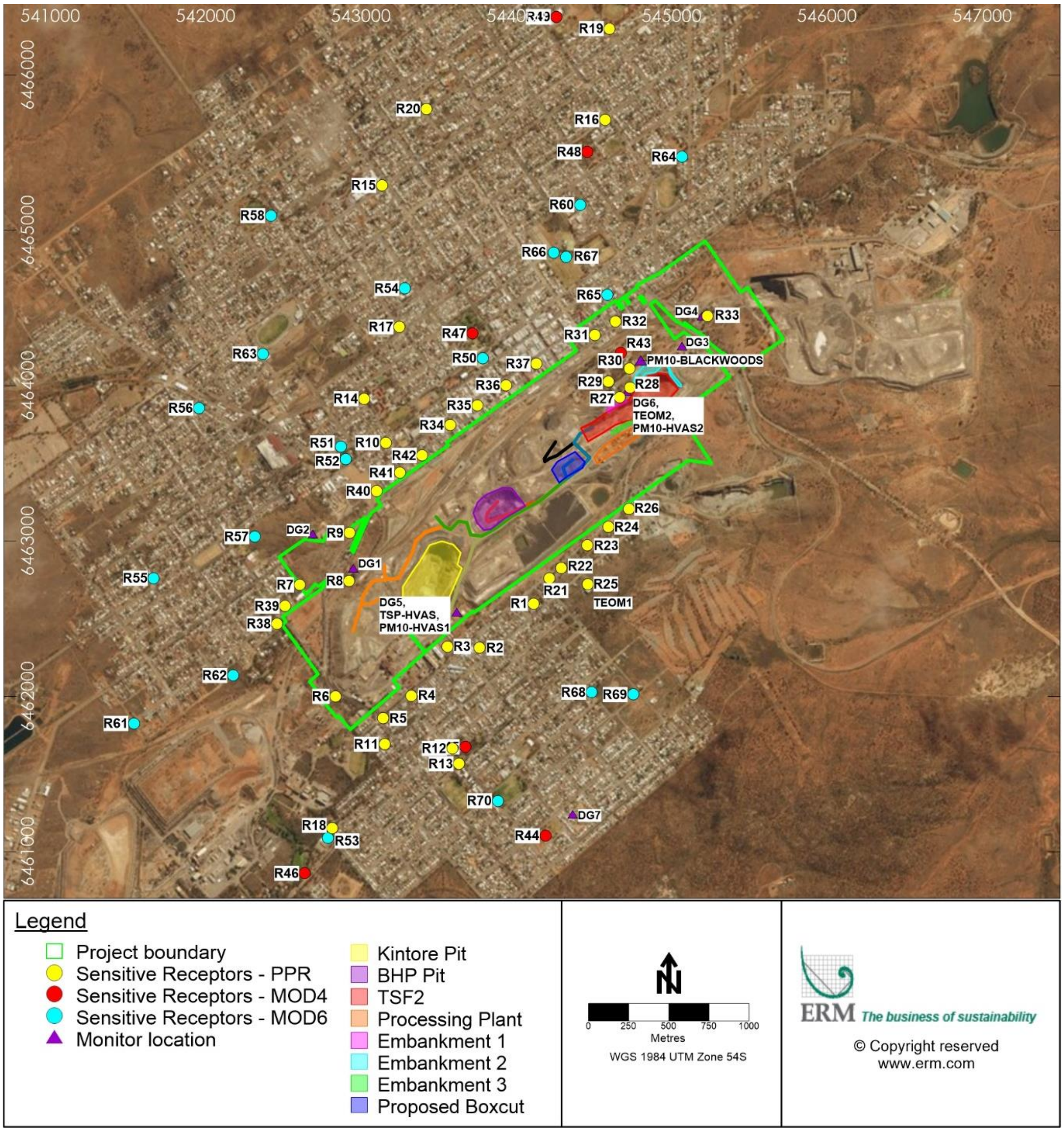

Figure 4.1: Site location and sensitive receptors

5. EXISTING ENVIRONMENT

5.1 Dispersion Meteorology

Air pollutant concentrations are strongly influenced by meteorological conditions, primarily in the form of prevailing wind directions and interactions with diurnal flow regimes. Wind speed, wind direction, temperature and relative humidity all affect the dispersion and transport of pollution, and are basic input requirements for dispersion modelling. The local meteorology for Broken Hill has been described in detail in Environ (2010) and Pacific Environment (2017a).

The assessment for MOD4 (Pacific Environment, 2017a), compiled a meteorological dataset for the year 2016 which was used in the dispersion modelling, representative of Broken Hill Airport. The annual and seasonal wind roses for 2016, 2017, 2018 and 2019 have been prepared and reviewed and are included in Appendix G. Across all four years mentioned the annual wind roses display a very similar wind distribution pattern, with the highest frequency of winds originating from the south. In the 2016 dataset the frequency of winds is more evenly spread across the south, south-southeast and south-southwest.

On the basis that the wind distribution pattern is similar across years and for comparison of results with MOD4, the 2016 meteorological dataset has been used in this assessment.

5.2 Local air quality

The following provides a description of the ambient air quality monitoring conducted at the mine:

- Three High Volume Air Samplers (HVAS) measuring Total Suspended Particulate (TSP) / particulate matter less than 10µm in aerodynamic diameter (PM_{10}) and lead (Pb) concentrations at one location on site (PM_{10} HVAS at TSF2), and one location offsite (TSP and PM_{10} HVAS at Silver Tank);
- Two Tapered Element Oscillating Microbalances (TEOMs) measuring PM_{10} at one location on site, and one offsite; and
- Seven Dust Deposition Gauges (DDGs) measuring dust deposition and % deposited Pb at seven locations; three on site, two on surface exclusion areas within the mining lease, and two offsite.

Locations of each of the monitors are shown in Figure 4.1.

Results from monitored data have been assessed to examine temporal trends between 2008 and 2019 (subject to data availability). The mean, maximum, minimum, median, standard deviation, 25th and 75th percentile statistics were then determined for each financial year (FY) period.

The current assessment has drawn on the extensive database of air quality monitoring reviewed up to end June 2019 to establish background air quality associated with the currently operating Rasp Mine and the contributions from other sources in the Broken Hill area (for example, wood fire smoke, other mines and quarries and agriculture).

The data show a trend of improvement in the local air quality up to 2017 across all parameters measured (TSP, PM_{10}, Pb and deposited dust). From 2018 onwards, there was a trend of worsening local air quality which likely originated due to the drought conditions that covered regional NSW at the time.

Background data have been used that corresponds with the year of modelling, 2016. Given that there are several locations where PM_{10}, Pb and deposited dust have been measured, a representative background data set for each receptor has been based on the proximity of the sensitive receptor to a given monitoring location. Information on the allocated monitoring locations is provided in Appendix F. Monitoring data summary is provided in Appendix H.

5.2.1 Characterising background

As the Rasp Mine is operating, incremental PM contributions from the current operations are captured as a contribution to the Rasp Mine air quality monitoring network.

Therefore to provide a more accurate understanding of the 'background' conditions (i.e. in the absence of mine activities), the current operations of Rasp Mine have been modelled using known quantities of materials handled and haul truck movements. This approach is consistent with that used in Environ (2010) and repeated in Pacific Environment (2017a).

Background air quality has then been estimated referencing the ambient air quality monitoring data for 2016, minus Rasp Mine's contribution for the same (modelled) year. These adopted concentrations are considered broadly representative of the background contributions from other sources.

As mentioned above, Rasp Mine currently operates two TEOMs that are located in the vicinity of the sensitive receptors assessed in this study. Both of the TEOM data sets have been used in the assessment to provide a background PM_{10} concentration. For the receptors to the north of the Mine, the more representative data set is from TEOM 2 and for the receptors to the south of the Mine, the more representative dataset is from TEOM 1.

Similarly, to provide a receptor-specific background of Pb in TSP concentration, the annual average Pb concentration recorded at the TSP-HVAS monitor at Silver Tank for 2016 (0.23 µg/m^3) has been referenced, minus Rasp Mine's predicted contribution during the same (modelled) year.

No site-specific $PM_{2.5}$ monitoring data is available for the study area. A $PM_{2.5}/PM_{10}$ ratio has been calculated of 0.41, based on particle size ratios experienced in rural areas, and applied to the available on-site TEOM data.

5.2.2 Background lead deposition

The background annual lead deposition rates adopted for this assessment are 0 g/m^2/year. This is since the model predictions indicate that mine-only activities account for more than the observed lead deposition rates across a year. That is to say, the Pb dispersion modelling currently over-predicts Pb deposition with model results higher than monitored results at the majority of monitoring locations). Therefore adopting a background 0 g/m^2/year is considered a conservative approach.

A summary of the Pb (in TSP) emission estimates and adopted %Pb composition is provided in Section 3.2.

The model predictions for the other air quality metrics assessed in this study were below their equivalent monitored concentrations. This is not to say that the model has under-predicted the remaining air quality metrics, but rather the model over-prediction for Pb deposition demonstrates that the emission inventory inputs regarding percentage lead within the site materials are considered to be conservatively high.

Such a model over-prediction is not unexpected given the desire to adopt conservatively high assumptions within dispersion modelling exercises.

To be explicit, this does not suggest that there are no other potential sources of fugitive lead in Broken Hill outside of the boundary of CML7, but rather that this assessment demonstrates a conservative approach in the evaluation of potential lead impacts. Other sources of lead deposition in the Broken Hill area include industrial activities within Broken Hill (including other Pb mining activities) as well as natural / legacy emission sources from soils with elevated Pb levels that occur around the vicinity of the ore body.

On the basis of the above, to account for this model artefact no accounting of background Pb deposition is required when reconciling model predictions with observed levels of Pb deposition.

5.2.3 Background values for the assessment

The following provides a summary of the adopted background values (averaged monitored data less Rasp Mine modelled contribution for 2016) used for this assessment:

- PM_{10} annual average concentration = (TEOM 1 = 13.0 µg/m^3 ; TEOM 2 = 13.1 µg/m^3)
- PM_{10} 24-hour concentration = daily varying from either TEOM 1 or TEOM 2
- $PM_{2.5}$ annual average concentration = (TEOM 1 = 5.3 µg/m^3 ; TEOM 2 = 5.7 µg/m^3)[1]
- $PM_{2.5}$ 24-hour concentration = daily varying as ratio from either TEOM 1 or TEOM 2
- TSP annual average concentration = 35.9 µg/m^3
- Annual monthly average deposited dust = 0.4 g/m^2/month to 2.6 g/m^2/month
- Annual average lead (TSP) concentration = 0.23 µg/m^3 (2016 annual average Pb at Silver Tank of 0.23 µg/m^3 minus modelled mine increment at each receptor for 2016)
- Annual lead deposition (TSP fraction)= 0 g/m^2/annum

[1] There were no $PM_{2.5}$ monitoring data available to establish background concentrations. Therefore a $PM_{2.5}$:PM_{10} ratio of 0.41 has been adopted. This value was derived based on the $PM_{2.5}$:PM_{10} ratio for the OEH monitoring station at Wagga Wagga for 2016, as adopted in previous Rasp mine assessments.

6. AIR QUALITY IMPACT ASSESSMENT

Modelling was undertaken to determine incremental mine-related concentrations and deposition rates occurring due to operation of the Mine, combined with the construction of the new portal (termed 'Incremental MOD6').

For annual average lead concentration and lead deposition, results have been presented for all 70 receptors in the main body of the report.

For TSP, PM_{10}, $PM_{2.5}$ and dust deposition, only the top five most impacted receptors (defined as the highest predicted incremental impact) have been presented in the main body of the report, for brevity. The full results tables for all receptors are provided in Appendix B.

A graphical representation of the results for the MOD6 construction scenario and MOD4 scenario are presented in Appendix C. A graphical representation of the results for the MOD6 operational scenario, PPR scenario and BAU scenario are presented in Appendix E.

Change plots of lead concentration / deposition predictions at sensitive receptor locations have been generated. These change plots indicate whether lead concentrations / deposition rates are anticipated to either increase or decrease relative to other modelling scenarios. Change plots are presented for the following comparable scenarios, based on incremental predictions:

- MOD6 construction scenario minus MOD4 construction scenario;
- MOD6 operational scenario minus PPR scenario; and
- MOD6 operational scenario minus BAU scenario.

Model results are expressed as the maximum predicted concentration for each averaging period at the sensitive receptors over a twelve month period.

The results for MOD4 have been taken from the response to submissions report. The results for MOD4 – increment and 'whole of mine' increment – are presented in Appendix C. To derive the MOD4 'whole of mine' results presented in the report, the construction increment (taken from the tables in the MOD4 report) have been added to the results of a model representing the baseline year 2016 increment.

The corresponding contour plots are included in Appendix I.

Throughout the section below, MOD6 construction scenario is compared against the approved MOD4 results for receptor 1 (R1) to receptor 70 (R70). MOD6 operations scenario is compared against the BAU (R1 to R70) and PPR scenarios (R1 to R42).

The results for PPR have been taken from the Air Quality Assessment Addendum – Proposed Relocation of the Processing Area (Environ, 2010b). From this report, the Scenario 2 results have been referenced as these are the most conservative.

6.1 Annual average lead concentration

Table B.9 (MOD6 construction and MOD4) and B.1 (PPR, BAU and MOD6 operational) in Appendix B present incremental and cumulative annual average lead concentrations predicted to occur at nearby receptor locations for the scenarios mentioned. MOD6 construction scenario is compared against the approved MOD4 predictions. The MOD6 operational scenario is compared against the BAU and PPR scenarios. Figure I-1 (BAU scenario), Figure I-2 (MOD6 construction scenario) and Figure I-3 (MOD6 operations scenario) in Appendix I present contour plots for incremental annual average lead concentrations.

At all receptors, and for all scenarios, the cumulative annual average lead concentrations are predicted to be well below the NSW EPA impact assessment criterion of 0.5 µg/m^3, with ranges of 0.2248 µg/m^3 to 0.2396 µg/m^3 for the MOD6 construction scenario, and 0.2247 µg/m^3 to 0.2412 µg/m^3 for the MOD6 operational scenario. When looking at the incremental concentrations, these range from

0.0005 µg/m³ – 0.0227 µg/m³ for the MOD6 construction scenario, and 0.0005 – 0.0242 µg/m³ for the MOD6 operational scenario. The annual average monitored data for the modelled year of 2016 is 0.23 µg/m³.

Table 6.1 presents the predicted incremental annual average lead concentrations for the MOD6 construction scenario compared with the MOD4 construction scenario. The five most impacted receptors under the MOD6 construction scenario have been highlighted in green. At four of the five most impacted receptors (R26 to R29), there is a predicted increase between MOD4 and the MOD6 construction scenario.

Table 6.1: Predicted incremental annual average lead concentration (as TSP) (µg/m³) for the MOD6 construction scenario, with comparison to MOD4

Receptor ID	MOD4	MOD6	Receptor ID	MOD4	MOD6
Criterion	n/a	n/a	Criterion	n/a	n/a
R1	0.0080	0.0085	R36	0.0072	0.0086
R2	0.0106	0.0084	R37	0.0062	0.0078
R3	0.0187	0.0152	R38	0.0034	0.0030
R4	0.0103	0.0073	R39	0.0036	0.0032
R5	0.0082	0.0062	R40	0.0069	0.0056
R6	0.0089	0.0065	R41	0.0085	0.0069
R7	0.0038	0.0036	R42	0.0094	0.0084
R8	0.0083	0.0072	R43	0.0063	0.0098
R9	0.0066	0.0056	R44	0.0019	0.0017
R10	0.0061	0.0055	R45	0.0043	0.0036
R11	0.0055	0.0044	R46	0.0026	0.0021
R12	0.0041	0.0036	R47	0.0045	0.0047
R13	0.0035	0.0032	R48	0.0019	0.0021
R14	0.0040	0.0039	R49	0.0009	0.0009
R15	0.0014	0.0014	R50	0.0005	0.0062
R16	0.0016	0.0017	R51	0.0004	0.0036
R17	0.0031	0.0032	R52	0.0004	0.0038
R18	0.0031	0.0026	R53	0.0002	0.0025
R19	0.0011	0.0011	R54	0.0002	0.0026
R20	0.0011	0.0011	R55	0.0001	0.0012
R21	0.0080	0.0099	R56	0.0001	0.0012
R22	0.0079	0.0106	R57	0.0002	0.0024
R23	0.0083	0.0127	R58	0.0001	0.0010
R24	0.0090	0.0140	R59	0.0000	0.0005
R25	0.0055	0.0072	R60	0.0002	0.0027
R26	0.0112	0.0193	R61	0.0001	0.0012
R27	0.0160	0.0227	R62	0.0002	0.0024
R28	0.0153	0.0192	R63	0.0001	0.0016

Receptor ID	MOD4	MOD6	Receptor ID	MOD4	MOD6
Criterion	n/a	n/a	Criterion	n/a	n/a
R29	0.0106	0.0150	R64	0.0002	0.0020
R30	0.0103	0.0131	R65	0.0005	0.0053
R31	0.0058	0.0075	R66	0.0003	0.0037
R32	0.0053	0.0068	R67	0.0003	0.0038
R33	0.0048	0.0073	R68	0.0004	0.0029
R34	0.0085	0.0086	R69	0.0003	0.0024
R35	0.0079	0.0087	R70	0.0002	0.0023

Notes:
- The number of decimal places is shown so the readers can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

Table 6.2 shows presents the predicted incremental annual average lead concentrations for the MOD6 operational scenario compared with the PPR and BAU scenarios. The five most impacted receptors from the MOD6 operational scenario have been highlighted in green. At all of the most impacted receptors, there is a predicted decrease in annual average lead concentrations when comparing either the PPR or the BAU scenario to the MOD6 operational scenario.

Table 6.2: Predicted incremental annual average lead concentration (as TSP) (µg/m^3) for the MOD6 operational scenarios, with comparison to the PPR and BAU

Receptor ID	PPR	BAU	MOD6	Receptor ID	PPR	BAU	MOD6
Criterion	n/a	n/a	n/a	Criterion	n/a	n/a	n/a
R1	0.0100	0.0093	0.0085	R36	0.0100	0.0089	0.0080
R2	0.0120	0.0096	0.0087	R37	0.0100	0.0081	0.0073
R3	0.0260	0.0165	0.0150	R38	0.0040	0.0034	0.0030
R4	0.0200	0.0082	0.0074	R39	0.0040	0.0035	0.0031
R5	0.0180	0.0069	0.0062	R40	0.0080	0.0064	0.0057
R6	0.0140	0.0073	0.0065	R41	0.0080	0.0078	0.0070
R7	0.0040	0.0039	0.0036	R42	0.0090	0.0092	0.0083
R8	0.0090	0.0080	0.0071	R43	-	0.0110	0.0100
R9	0.0080	0.0063	0.0056	R44	-	0.0018	0.0016
R10	0.0060	0.0060	0.0054	R45	-	0.0040	0.0036
R11	0.0070	0.0049	0.0044	R46	-	0.0023	0.0020
R12	0.0050	0.0039	0.0036	R47	-	0.0050	0.0045
R13	0.0050	0.0035	0.0032	R48	-	0.0022	0.0020
R14	0.0040	0.0043	0.0039	R49	-	0.0010	0.0009
R15	0.0020	0.0015	0.0013	R50	-	0.0065	0.0059
R16	0.0020	0.0019	0.0017	R51	-	0.0040	0.0036

Receptor ID	PPR	BAU	MOD6	Receptor ID	PPR	BAU	MOD6
Criterion	n/a	n/a	n/a	Criterion	n/a	n/a	n/a
R17	0.0040	0.0034	0.0031	R52	-	0.0043	0.0039
R18	0.0030	0.0029	0.0026	R53	-	0.0027	0.0025
R19	0.0020	0.0012	0.0011	R54	-	0.0028	0.0026
R20	0.0020	0.0011	0.0010	R55	-	0.0013	0.0012
R21	0.0130	0.0107	0.0096	R56	-	0.0013	0.0012
R22	0.0140	0.0114	0.0101	R57	-	0.0026	0.0024
R23	0.0170	0.0135	0.0120	R58	-	0.0010	0.0009
R24	0.0240	0.0148	0.0131	R59	-	0.0005	0.0005
R25	0.0090	0.0077	0.0070	R60	-	0.0029	0.0027
R26	0.0330	0.0207	0.0186	R61	-	0.0013	0.0012
R27	0.0360	0.0261	0.0242	R62	-	0.0026	0.0023
R28	0.0260	0.0224	0.0207	R63	-	0.0017	0.0016
R29	0.0220	0.0165	0.0151	R64	-	0.0022	0.0020
R30	0.0170	0.0150	0.0137	R65	-	0.0058	0.0052
R31	0.0100	0.0081	0.0073	R66	-	0.0040	0.0036
R32	0.0090	0.0075	0.0068	R67	-	0.0040	0.0037
R33	0.0100	0.0087	0.0078	R68	-	0.0032	0.0029
R34	0.0090	0.0092	0.0083	R69	-	0.0026	0.0024
R35	0.0090	0.0091	0.0082	R70	-	0.0025	0.0023

Notes:

- The number of decimal places is shown so the readers can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

- The PPR assessment only contains modelled results for Receptors 1 to 42. Receptors 43 to 70 were added for subsequent assessments.

The change plot for the MOD6 construction scenario versus MOD4 construction scenario (Figure 6.1) shows a net increase in annual average lead (as TSP) concentrations when compared with the MOD4 construction scenario. The maximum increase at any one receptor is anticipated to be 0.08 µg/m^{-3} and it is acknowledged that the MOD6 construction scenario will only occur within a single 12 month period.

The change plot for the MOD6 operational scenario versus PPR scenario for receptors R1 to R42 (Figure 6.2) shows a net decrease in annual average lead across all comparable receptors.

The change plot for the MOD6 operational scenario versus BAU scenario for receptors R1 to R70 (Figure 6.3) shows a predicted decrease in annual average lead (as TSP) concentrations at all sensitive receptor locations.

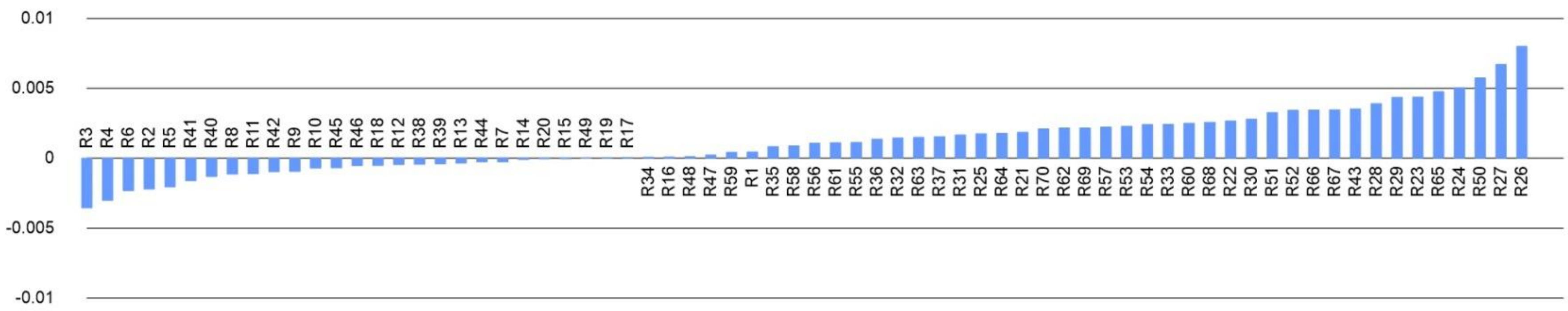

Figure 6.1: Change in annual average lead concentration (in TSP) - MOD6 construction scenario minus MOD4 construction scenario

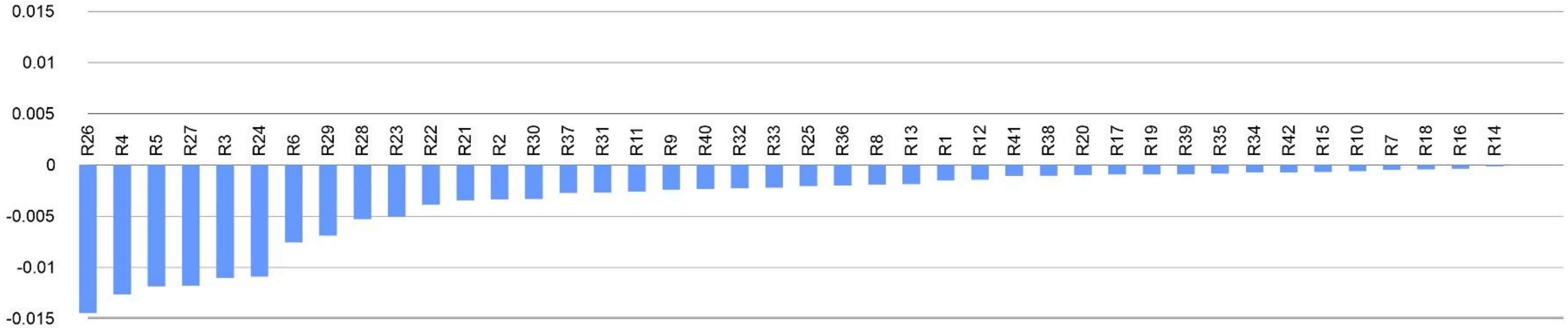

Figure 6.2: Change in annual lead concentration (in TSP) - MOD6 operational scenario minus PPR scenario

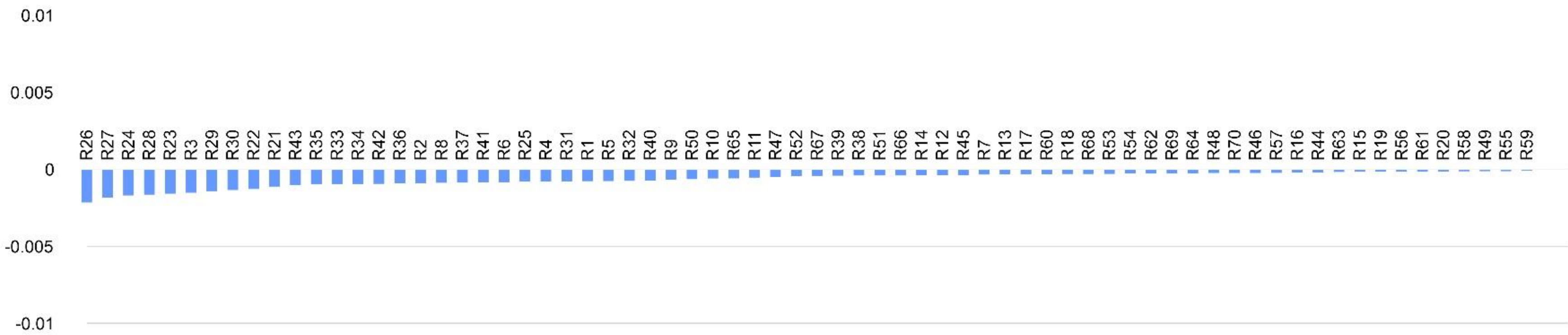

Figure 6.3: Change in annual lead concentration (in TSP) - MOD6 operational scenario minus BAU scenario

6.2 Annual average lead deposition

Table B.10 (MOD6 construction and MOD4) and B.2 (PPR, BAU and MOD6 operational) in Appendix B present the incremental and cumulative annual average lead deposition rates predicted to occur at nearby receptor locations for the scenarios mentioned. MOD6 construction scenario is compared against the approved MOD4 results. MOD6 operations scenario is compared against the BAU and PPR scenarios. Figure I-4 (BAU scenario), Figure I-5 (MOD6 construction scenario) and Figure I-6 (MOD6 operational scenario) in Appendix I present contour plots for the annual average lead deposition.

In Appendix I there are two spatial change plots. Figure I-25 presents the predicted change in annual average lead deposition spatially for MOD6 construction scenario compared to the MOD4 scenarios (MOD6 construction minus the MOD4 scenario). Figure I-26 presents the change in annual average lead deposition spatially for MOD6 operational scenario compared to the BAU scenario (MOD6 operational scenario minus the BAU scenario). In these figures the green represents a reduction in anticipated lead deposition rates as a result of MOD6 activities (an improvement in predicted lead deposition). The purple represents a predicted increase in lead deposition rates. In both figures, it can be seen that any increase in lead deposition is predominantly contained within the site boundary, and is reflective of the location of site activites changing between scenarios. The extent of the green contours supports the desire that there will be no net increase in lead deposition relative to the status quo.

There is no lead deposition impact assessment criterion referenced by the NSW EPA, however this information is referenced within the Health Risk Assessment for MOD6.

In addition, as identified in Section 5.2.2, no background lead deposition has been included in the cumulative results so the incremental and cumulative concentrations are thus the same. This is a very conservative approach as there would be some contribution from other sources to background levels.

Table 6.3 presents the predicted incremental annual average lead deposition for the MOD6 construction scenario compared with the MOD4 construction scenario. The five most impacted receptors from the MOD6 construction scenario have been highlighted in green. At all five of the most impacted receptors, there is a predicted increase between MOD4 and the MOD6 construction scenario. Fundamentally, this is as a result of more site activities occurring during MOD6 construction compared with MOD4, albeit for a short duration.

Table 6.3: Predicted incremental annual average lead deposition (as total particulate) (g/m^2/annum) for the MOD6 construction scenario, with comparison to MOD4

Receptor ID	MOD4	MOD6	Receptor ID	MOD4	MOD6
Criterion	n/a	n/a	Criterion	n/a	n/a
R1	0.0187	0.0215	R36	0.0118	0.0197
R2	0.0226	0.0236	R37	0.0119	0.0187
R3	0.0347	0.0449	R38	0.0041	0.0057
R4	0.0206	0.0182	R39	0.0043	0.0060
R5	0.0139	0.0141	R40	0.0127	0.0134
R6	0.0134	0.0131	R41	0.0151	0.0176
R7	0.0047	0.0068	R42	0.0168	0.0238
R8	0.0126	0.0157	R43	0.0056	0.0259
R9	0.0095	0.0122	R44	0.0027	0.0034

Receptor ID	MOD4	MOD6	Receptor ID	MOD4	MOD6
Criterion	n/a	n/a	Criterion	n/a	n/a
R10	0.0095	0.0125	R45	0.0065	0.0081
R11	0.0084	0.0098	R46	0.0027	0.0039
R12	0.0065	0.0081	R47	0.0074	0.0113
R13	0.0054	0.0070	R48	0.0035	0.0049
R14	0.0055	0.0079	R49	0.0019	0.0024
R15	0.0023	0.0032	R50	0.0091	0.0145
R16	0.0030	0.0041	R51	0.0058	0.0073
R17	0.0047	0.0070	R52	0.0065	0.0079
R18	0.0036	0.0051	R53	0.0034	0.0048
R19	0.0020	0.0027	R54	0.0040	0.0058
R20	0.0020	0.0026	R55	0.0011	0.0020
R21	0.0188	0.0251	R56	0.0014	0.0021
R22	0.0188	0.0267	R57	0.0024	0.0040
R23	0.0213	0.0314	R58	0.0014	0.0020
R24	0.0253	0.0357	R59	0.0007	0.0010
R25	0.0125	0.0178	R60	0.0047	0.0066
R26	0.0342	0.0474	R61	0.0013	0.0021
R27	0.0501	0.0596	R62	0.0028	0.0042
R28	0.0466	0.0483	R63	0.0020	0.0030
R29	0.0317	0.0402	R64	0.0036	0.0048
R30	0.0315	0.0335	R65	0.0099	0.0132
R31	0.0141	0.0191	R66	0.0059	0.0086
R32	0.0136	0.0174	R67	0.0063	0.0090
R33	0.0144	0.0196	R68	0.0059	0.0073
R34	0.0146	0.0238	R69	0.0047	0.0059
R35	0.0128	0.0216	R70	0.0037	0.0049

Notes:
- The number of decimal places is shown so the readers can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

Table 6.4 presents the predicted incremental annual average lead deposition for the MOD6 operational scenario compared with the PPR and BAU scenarios. The five most impacted receptors from the MOD6 operational scenario have been highlighted in green. At all of the five most impacted receptors, there is a predicted decrease in annual average lead deposition from the PPR and BAU scenarios when compared to the MOD6 operational scenario.

Table 6.4: Predicted incremental annual average lead deposition (as total particulate) (g/m²/annum) for the MOD6 operational scenarios, with comparison to the PPR and BAU

Receptor ID	PPR	BAU	MOD6	Receptor ID	PPR	BAU	MOD6
Criterion	n/a	n/a	n/a	Criterion	n/a	n/a	n/a
R1	0.0400	0.0228	0.0223	R36	0.0400	0.0195	0.0181
R2	0.0500	0.0255	0.0249	R37	0.0500	0.0184	0.0170
R3	0.0900	0.0459	0.0451	R38	0.0100	0.0062	0.0057
R4	0.0600	0.0194	0.0185	R39	0.0100	0.0066	0.0060
R5	0.0400	0.0153	0.0143	R40	0.0300	0.0152	0.0142
R6	0.0400	0.0145	0.0132	R41	0.0300	0.0196	0.0185
R7	0.0100	0.0073	0.0068	R42	0.0400	0.0258	0.0245
R8	0.0300	0.0173	0.0160	R43	-	0.0290	0.0272
R9	0.0200	0.0136	0.0126	R44	-	0.0037	0.0035
R10	0.0200	0.0137	0.0129	R45	-	0.0087	0.0082
R11	0.0200	0.0106	0.0099	R46	-	0.0042	0.0039
R12	0.0200	0.0087	0.0082	R47	-	0.0117	0.0109
R13	0.0100	0.0074	0.0070	R48	-	0.0052	0.0048
R14	0.0100	0.0086	0.0081	R49	-	0.0026	0.0024
R15	0.0100	0.0034	0.0031	R50	-	0.0148	0.0138
R16	0.0100	0.0044	0.0041	R51	-	0.0081	0.0075
R17	0.0100	0.0074	0.0069	R52	-	0.0088	0.0082
R18	0.0100	0.0055	0.0051	R53	-	0.0052	0.0048
R19	0.0100	0.0029	0.0027	R54	-	0.0061	0.0057
R20	0.0100	0.0028	0.0026	R55	-	0.0021	0.0020
R21	0.0500	0.0259	0.0250	R56	-	0.0023	0.0021
R22	0.0600	0.0274	0.0260	R57	-	0.0043	0.0040
R23	0.0800	0.0324	0.0298	R58	-	0.0022	0.0020
R24	0.1100	0.0368	0.0336	R59	-	0.0011	0.0010
R25	0.0400	0.0185	0.0175	R60	-	0.0070	0.0064
R26	0.1500	0.0506	0.0460	R61	-	0.0023	0.0021
R27	0.2000	0.0687	0.0672	R62	-	0.0045	0.0042
R28	0.1500	0.0566	0.0550	R63	-	0.0032	0.0030
R29	0.1400	0.0442	0.0422	R64	-	0.0053	0.0048
R30	0.1000	0.0386	0.0365	R65	-	0.0143	0.0132
R31	0.0600	0.0202	0.0188	R66	-	0.0090	0.0083
R32	0.0500	0.0191	0.0178	R67	-	0.0095	0.0087
R33	0.0500	0.0233	0.0207	R68	-	0.0078	0.0074
R34	0.0400	0.0250	0.0236	R69	-	0.0063	0.0059

Receptor ID	PPR	BAU	MOD6	Receptor ID	PPR	BAU	MOD6
Criterion	**n/a**	**n/a**	**n/a**	**Criterion**	**n/a**	**n/a**	**n/a**
R35	0.0400	0.0220	0.0206	R70	-	0.0052	0.0049

Notes:
- The number of decimal places is shown so the readers can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.
- The PPR assessment only contains modelled results for Receptors 1 to 42. Receptors 43 to 70 were added for subsequent assessments.

The change plot for the MOD6 construction scenario versus MOD4 construction scenario (Figure 6.4) shows a net increase in annual average lead deposition when compared with the MOD4 construction scenario. The net increase is 0.2348 g/m^2/month and the MOD6 construction scenario will only last for 12 months.

The change plot for the MOD6 operational scenario versus PPR scenario for receptors R1 to R42 (Figure 6.5) shows a net decrease in annual average lead deposition across all receptors.

The change plot for the MOD6 operational scenario versus BAU scenario for receptors R1 to R70 (Figure 6.6) shows a predicted decrease in annual average lead deposition at all sensitive receptor locations.

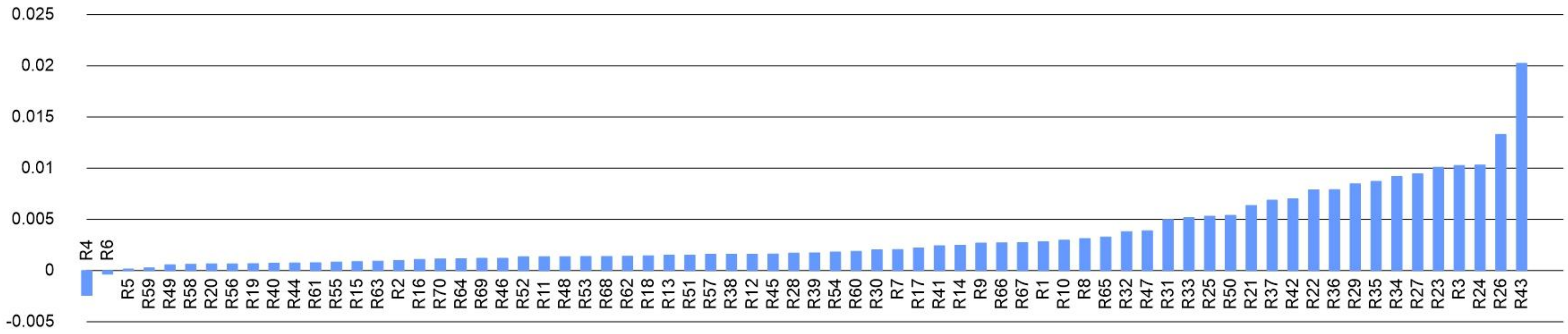

Figure 6.4: Change in annual average lead deposition - MOD6 construction scenario minus MOD4 scenario (g/m^2/annum)

Figure 6.5: Change in annual average lead deposition - MOD6 operational scenario minus PPR scenario (g/m^2/annum)

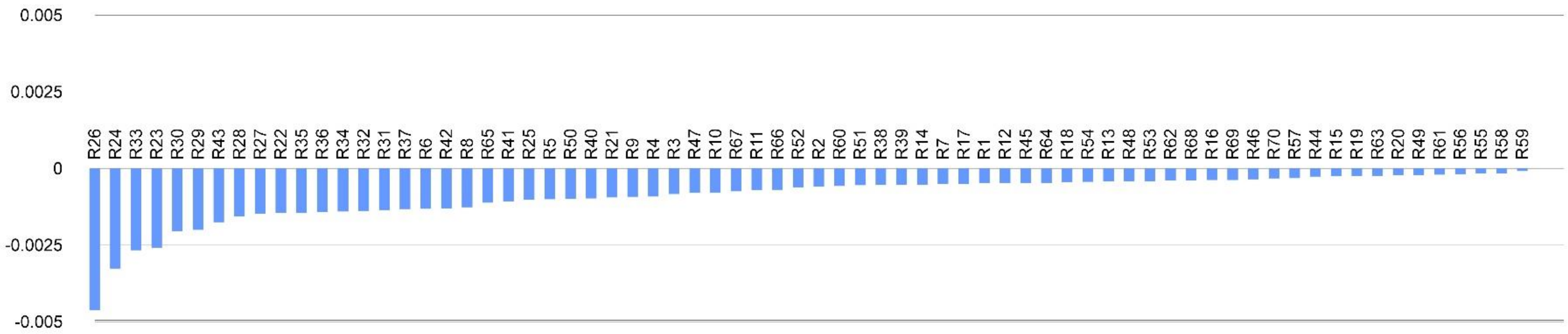

Figure 6.6: Change in annual average lead deposition - MOD6 operational scenario minus BAU scenario (g/m^2/annum)

6.3 Annual average TSP

Table B.11 (MOD6 construction and MOD4) and B.3 (PPR, BAU and MOD6 operational) in Appendix B present incremental and cumulative annual average TSP concentrations predicted to occur at nearby receptor locations for the scenarios mentioned. MOD6 construction scenario is compared against the approved MOD4 results. MOD6 operational scenario are compared against both the BAU and PPR scenarios. Figure I-7 (BAU scenario), Figure I-8 (MOD6 construction scenario) and Figure I-9 (MOD6 operations scenario) in Appendix I present contour plots for the incremental annual average TSP concentrations.

At all receptors, and for both scenarios, the cumulative annual average TSP concentrations are predicted to be well below the NSW EPA impact assessment criterion of 90 µg/m^3, with predicted cumulative concentrations ranging between 35.7 µg/m^{-3} and 36.6 µg/m^{-3} for the MOD6 construction scenario, and 35.7 µg/m^{-3} and 36.9 for the MOD6 operational scenario. When considering the incremental contribution, this ranges from 0.0 – 1.3 µg/m^3 for the MOD6 construction scenario, and 0.0 – 1.8 µg/m^3 for the MOD6 operational scenario.

As previously mentioned, for brevity only the top five most impacted receptors have been presented in the main body of the report. The full results tables for all receptors are provided in Appendix B.

Table 6.5 shows the five most impacted receptors for the MOD6 construction scenario and the MOD6 operational scenario. The annual TSP concentrations at the respective receptors for the MOD4, PPR and BAU scenarios have been included for comparison.

Table 6.5: Top five impacted receptors for annual average TSP concentrations for all modelled scenarios with comparison to previous assessments

Construction (µg/m^3)			Operation (µg/m^3)			
Receptor	MOD4	MOD6	Receptor	PPR	BAU	MOD6
R27	0.9458	1.3177	R27	2.9000	1.5176	1.7633
R3	0.7510	1.1459	R28	2.3000	1.4941	1.4945
R28	1.0626	1.1365	R3	2.1000	1.3667	1.1396
R26	0.4746	0.9961	R29	2.2000	0.9305	0.9934
R29	0.5238	0.8926	R30	1.7000	0.9991	0.9164

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

6.4 Annual and maximum 24-hour average PM_{10}

Table B.12 (MOD6 construction and MOD4) in Appendix B present predicted incremental and cumulative annual and maximum 24-hour PM_{10}, Table B.4 (PPR, BAU and MOD6 operational) present the incremental and cumulative annual average PM_{10} and Table B.5 (PPR, BAU and MOD6 operational) present incremental and cumulative maximum 24-hour average PM_{10} concentrations predicted to occur at nearby receptor locations for the scenarios mentioned. The MOD6 construction scenario is compared against the approved MOD4 predictions. The MOD6 operational scenario is compared against the BAU and PPR scenarios. Figure I-10 (BAU scenario), Figure I-11 (MOD6 construction scenario) and Figure I-12 (MOD6 operations scenario) in Appendix I present contour plots for the incremental annual average PM_{10} concentrations.

Figure I-19 (BAU scenario), Figure I-20 (MOD6 construction scenario) and Figure I-21 (MOD6 operations scenario) in Appendix I present contour plots for the incremental maximum 24-hour average PM_{10} concentrations. It should be noted that the maximum 24-hour average contour plots do not represent the dispersion pattern on any individual day. Rather, they illustrate an ensemble of the maximum concentrations simulated to be possible at each gridded receptor point across the modelling domain given the range of meteorological conditions occurring over the period modelled.

At all receptors, for both the MOD6 construction and MOD6 operational scenarios, the predicted cumulative annual average PM_{10} concentrations are well below the NSW EPA impact assessment criterion of 25 µg/m^3 with cumulative concentrations ranging from 12.8 to 13.5 µg/m^{-3} for the MOD6 construction scenario and 12.8 to 13.6 µg/m^{-3} for the MOD6 operational scenario. When considering the incremental concentrations, these range from 0.0 to 0.9 µg/m^3 for MOD6 construction scenario and 0.0 to 1.0 µg/m^3 for the MOD6 operational scenario.

As previously mentioned, for brevity, only the top five most impacted receptors have been presented in the main body of the report. The full results tables for all receptors are provided in Appendix B.

Table 6.6 shows the five most impacted receptors for the MOD6 construction scenario and the MOD6 operational scenario. The annual average PM_{10} concentrations at the respective receptors for the MOD4, PPR and BAU scenarios have been included for comparison.

Table 6.6: Top five impacted receptors for annual average PM_{10} concentrations for all modelled scenarios with comparison to previous assessments

Construction (µg/m^3)			Operation (µg/m^3)			
Receptor	MOD4	MOD6	Receptor	PPR	BAU	MOD6
R27	0.6583	0.8857	R27	1.0000	1.0421	1.0271
R3	0.5425	0.7870	R28	0.8000	0.9952	0.9032
R28	0.650	0.786	R3	0.8000	0.8014	0.6381
R26	0.3826	0.6322	R29	0.7000	0.6664	0.6019
R29	0.415	0.609	R30	0.6000	0.6833	0.5639

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

Figure C-4 in Appendix C presents bar charts for annual average PM_{10} concentrations for MOD4 and MOD6 construction scenario. Figure E-4 in Appendix E presents bar charts for annual average PM_{10} concentraitons for BAU, PPR and MOD6 operational scenario.

At all receptors, for both the MOD6 construction and MOD6 operational scenarios, the predicted cumulative 24-hour average PM_{10} concentrations are predicted to be below the NSW EPA impact assessment criterion of 50 µg/m^3 with cumulative concentrations ranging from 36.1 to 46.6 µg/m^3 for the MOD6 construction scenario and 36.1 to 46.9 µg/m^3 for the MOD6 operational scenario. When considering the incremental concentrations, these range from 0.5 to 14.2 µg/m^3 for MOD6 construction scenario and 0.3 to 6.4 µg/m^3 for the MOD6 operational scenario.

Table 6.7 shows the five most impacted receptors for the MOD6 construction scenario and the MOD6 operational scenario. The 24-hour maximum PM_{10} concentrations at the respective receptors for the MOD4, PPR and BAU scenarios have been included for comparison.

Table 6.7: Top five impacted receptors for 24-hour maximum PM_{10} concentrations for all modelled scenarios with comparison to previous assessments

Construction (µg/m^3)			Operation (µg/m^3)			
Receptor	**MOD4**	**MOD6**	**Receptor**	**PPR**	**BAU**	**MOD6**
R27	7.7474	14.2086	R27	7.4000	6.0472	6.4369
R26	2.4264	13.0068	R28	4.7000	6.6168	6.3830
R28	6.0291	11.4778	R3	5.1000	5.2081	4.6228
R35	1.7486	10.3788	R2	3.1000	5.0692	4.5000
R29	2.3024	9.1361	R29	3.8000	3.7467	4.0163

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

The results presented in Table 6.7 show that while maximum 24-hour average PM_{10} concentrations are predicted to increase above the values presented in the MOD4 construction scenario, these values are anticipated to reduce to at or below concentrations predicted under previous operational scenarios (i.e. PPR and BAU) once MOD6 is operational. All MOD6 increments are well within the (cumulative) NSW EPA impact assessment criterion of 50 µg/m^3.

Figure C-7 in Appendix C presents bar charts for maximum 24-hour average PM_{10} concentrations for MOD4 and MOD6 construction scenario. Figure E-7 in Appendix E presents bar charts for maximum 24-hour average PM_{10} concentraitons for BAU, PPR and MOD6 operational scenario. To determine the 24-hour cumulative concentrations, a contemporaneous assessment was adopted. This assessment combines the monitored background daily 24-hour average PM_{10} concentrations with the predicted project incremental concentration. For each of the scenarios modelled, the maximum 24-hour average prediction at each receptor ranged between 36 µg/m^3 and 47 µg/m^3. Review of the time series data for the receptors indicates that these reported maxima are heavily influenced by the contribution of the background rather than Rasp Mine related increments.

The MOD6 construction scenario had the highest maximum incremental 24-hour average contribution of all the scenarios. This result was recorded at Receptor 27, Proprietary Square, due to its proximity to the boxcut construction works. The maximum 24-hour average increment at R27 is predicted to be 14.2 µg/m^3, approximately 28% of the NSW EPA impact assessment criterion of 50 µg/m^3. The cumulative concentration at this receptor is 46.6 µg/m³ which is below the NSW EPA impact assessment criterion.

For the MOD6 operational scenario, the maximum incremental 24-hour average contribution was also at receptor R27. The maximum 24-hour average increment at R27 is predicted to be 6.4 µg/m³, approximately 13% of the NSW EPA impact assessment criterion of 50 µg/m³. The cumulative concentration at this receptor is 46.9 µg/m³ which is below the NSW EPA impact assessment criterion.

6.5 Annual and maximum 24-Hour average $PM_{2.5}$

Table B.13 (MOD6 construction and MOD4) and B.6 (PPR, BAU and MOD6 operational) in Appendix B present incremental and cumulative annual average $PM_{2.5}$ concentrations predicted to occur at nearby receptor locations for the scenarios mentioned. Table B.13 (MOD6 construction and MOD4) and B.7 (PPR, BAU and MOD6 operationa) in Appendix B present incremental and cumulative maximum 24-hour average PM_{10} concentrations predicted to occur at nearby receptor locations for the scenarios mentioned. Figure I-13 (BAU scenario), Figure I-14 (MOD6 construction scenario) and Figure I-15 (MOD6 operations scenario) in Appendix I present contour plots for incremental annual average $PM_{2.5}$ concentrations. Figure I-22 (BAU scenario), Figure I-23 (MOD6 construction scenario) and Figure I-24 (MOD6 operations scenario) in Appendix I present contour plots for incremental maximum 24-hour average $PM_{2.5}$ concentrations.

At all receptors, and for both the MOD6 construction and MOD6 operational scenarios, the predicted cumulative annual average $PM_{2.5}$ concentrations are below the NSW EPA impact assessment criterion of 8 µg/m³, with cumulative predictions ranging from 5.3 to 5.5 µg/m³ for MOD6 construction scenario and 5.3 to 5.5 µg/m³ for MOD6 operational scenario. When considering the incremental contributions, these range from 0.0111 – 0.3 µg/m³ for the MOD6 construction scenario and 0.0 to 0.3 µg/m³ for the MOD6 operational scenario.

Table 6.8 shows the five most impacted receptors for the MOD6 construction scenario and the MOD6 operational scenario. The annual average $PM_{2.5}$ concentrations at the respective receptors for the MOD4, PPR and BAU scenarios have been included for comparison.

Table 6.8: Top five impacted receptors for annual average $PM_{2.5}$ concentrations for all modelled scenarios with comparison to previous assessments

Construction (µg/m³)			Operation (µg/m³)			
Receptor	MOD4	MOD6	Receptor	PPR	BAU	MOD6
R27	0.1735	0.2583	R27	0.2500	0.3104	0.2799
R3	0.1256	0.2413	R28	0.2100	0.3061	0.2488
R26	0.0997	0.2322	R26	0.2000	0.2463	0.2169
R28	0.1806	0.2308	R3	0.2400	0.2079	0.2011
R29	0.1059	0.1853	R29	0.1900	0.2129	0.1833

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

At all receptors, and for both the MOD6 construction and MOD6 operational scenarios, the predicted cumulative 24-hour average $PM_{2.5}$ concentrations are predicted to be below the NSW impact assessment criterion of 25 µg/m^3, with ranges of 14.8 to 19.0 µg/m^3 for the MOD6 construction scenario and 14.8 to 18.9 µg/m^3 for the MOD6 operations scenario. When considering the incremental contributions, these range from 0.2 – 4.0 for the MOD6 construction scenario, and 0.1 – 1.9 µg/m^3 for the MOD6 operational scenario.

Table 6.9 shows the five most impacted receptors for the MOD6 construction scenario and the MOD6 operational scenario. The incremental maximum 24-hour average $PM_{2.5}$ concentrations at the respective receptors for the MOD4, PPR and BAU scenarios have been included for comparison.

Table 6.9: Top five impacted receptors for maximum 24-hour average $PM_{2.5}$ concentrations for all modelled scenarios with comparison to previous assessments

Construction (µg/m^3)			Operation (µg/m^3)			
Receptor	MOD4	MOD6	Receptor	PPR	BAU	MOD6
R27	1.6473	4.0044	R28	1.6000	2.2321	1.944
R26	0.5946	3.7679	R27	2.3000	2.0047	1.7737
R28	1.5429	3.2632	R26	1.8000	1.8022	1.6030
R35	0.4657	3.0729	R3	1.5000	1.4889	1.4767
R29	0.7889	2.8169	R29	1.3000	1.4099	1.3841

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

As for PM_{10}, a contemporaneous assessment has been adopted here. For each of the scenarios modelled the maximum 24-hour average $PM_{2.5}$ cumulative prediction varies between 15 µg/m^3 and 19 µg/m^3 (Appendix B Table B.7) and as with PM_{10}, these reported maxima are heavily influenced by the contribution of the background rather than Rasp Mine related increments.

The receptor that is predicted to experience the maximum incremental 24-hour average $PM_{2.5}$ contribution for the MOD6 construction scenario is R27, due to its proximity to the boxcut construction works. The maximum 24-hour average $PM_{2.5}$ increment at R27 is predicted to be 4.0 µg/m^3 with a cumulative prediction of 18.9 µg/m^3 or 76% of the NSW impact assessment criterion of 25 µg/m^3.

For the MOD6 operational scenario, the maximum incremental 24-hour average contribution was at R28. The maximum 24-hour average $PM_{2.5}$ increment at R28 is predicted to be 1.9 µg/m^3 with a cumulative prediction of 18.9 µg/m^3, approximately 76% of the NSW EPA impact assessment criterion of 25 µg/m^3.

6.6 Monthly average deposited dust

Table B.14 (MOD6 construction and MOD4) and B.8 (PPR, BAU and MOD6 operational) in Appendix B present incremental and cumulative monthly average dust deposition rates predicted to occur at nearby receptor locations for the scenarios mentioned. MOD6 construction scenario is compared against the approved MOD4 results and MOD6 future operations is compared against the BAU and PPR scenarios. Figure I-16 (BAU scenario), Figure I-17 (MOD6 construction scenario) and Figure I-18

(MOD6 operations scenario) in Appendix I presents contour plots for incremental monthly average deposited dust.

At all receptors, for both the MOD6 construction and MOD6 operational scenarios, the predicted incremental monthly dust deposition rates are below the NSW EPA impact assessment criterion of 2 g/m^2/month. The dust deposition rates range between 0.0 and 0.3 g/m^2/month for the MOD6 construction scenario and between 0.0 and 0.4 g/m^2/month for the MOD6 operational scenario.

Similarly, at all receptors, for both the MOD6 construction and MOD6 operational scenarios, the predicted cumulative monthly dust deposition levels are below the NSW EPA impact assessment criterion of 4 g/m^2/month. The dust deposition levels range between 0.3977 and 3.3771 g/m^2/month for the MOD6 construction scenario and 0.3978 and 3.5576 g/m^2/month for the MOD6 operational scenario.

Table 6.10 shows the five most impacted receptors for the MOD6 construction scenario and the MOD6 operational scenario. The monthly deposited dust at the respective receptors for the MOD4, PPR and BAU scenarios have been included for comparison.

Table 6.10: Top five impacted receptors for incremental monthly deposited dust levels for all modelled scenarios with comparison to previous assessments

Construction (g/m^2/month)			Operation (g/m^2/month)			
Receptor	MOD4	MOD6	Receptor	PPR	BAU	MOD6
R27	0.3199	0.2939	R27	0.4700	0.3167	0.4744
R3	0.1970	0.2761	R28	0.3700	0.2939	0.3895
R28	0.3308	0.2455	R3	0.3200	0.2858	0.2804
R26	0.1330	0.2227	R29	0.3400	0.1982	0.2654
R29	0.1597	0.2093	R30	0.2600	0.2028	0.2354

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

6.7 Cumulative impacts associated with the Broken Hill North Mine

In February 2017 the air quality assessment (Pacific Environment, 2017b) for the Broken Hill North Mine Recommencement Project (Broken Hill North Mine) was released for public exhibition by the NSW Department of Planning (Pacific Environment, 2017b).

The Broken Hill North Mine is located to the north east of Rasp Mine and therefore PM emissions from this source would have the potential to result in cumulative impacts when combined with predictions associated with the Rasp Mine.

It is important to acknowledge any potential changes in local air quality as a result of Broken Hill North Mine's potential future operations. Pacific Environment (2017b) has provided tabulated results for the short term and long term air quality metrics, including PM_{10}, $PM_{2.5}$, TSP, dust deposition and lead concentration. No data were presented for lead deposition and therefore this cumulative assessment are limited to these metrics.

The receptor locations adopted within Pacific Environment (2017b) have been compared with those that have been adopted for this assessment.

There are eight receptors that align with those used in Broken Hill North Mine air quality assessment such that impacts can be evaluated cumulatively. These receptors comprise R2, R11, R17, R18 R23, R24, R32 and R43 from the Rasp Mine receptor list.

At each of these receptors, the available maximum predictions for Broken Hill North Mine have been combined with the model results that have been compiled for this assessment. The annual average predictions for PM_{10} and $PM_{2.5}$ are presented in Table B-15 in Appendix B. The maximum 24-hour average predictions for PM_{10} and $PM_{2.5}$ are presented in Table B-16. The results for annual average TSP, monthly dust deposition and annual average lead concentration are presented in Table B-17.

The tabulated results presented in Pacific Environment (2017b) are limited to one decimal place consequently results for some residences have been reported as 0.0 µg/m^3. It has therefore been assumed that in these instances where the model prediction is 0.0 µg/m^3 that the contribution of Broken Hill North Mine is negligible.

In the case of lead concentration predictions the results have only been provided for the most impacted of the discrete receptors assessed (39 in total). In the absence of a full data set, a conservative approach has therefore been adopted by assuming a uniform annual average Pb concentration of 0.006 µg/m^3 from the Broken Hill North Mine across all receptors. This value represents the largest predicted increment across the most impacted receptors.

For all of the air quality metrics assessed the cumulative results that combine emissions from the proposed MOD6, the proposed Broken Hill North Mine Recommencement Project and contributions from other background sources are all below the NSW impact assessment criteria at the nominated receptors.

Without additional knowledge as to the Broken Hill North Mine's proposed scheduling, it should further be acknowledged that the two activities may or may not be undertaken at the same time, and as such the above discussion of cumulative impacts should be regarded as worst-case.

7. DUST MANAGEMENT

An additional aspect of the assessment process is to evaluate current and future operational dust management practices for the Mine. The following aspects are discussed for consideration in future dust management for the site.

7.1 Real-time PM and Meteorological Monitoring

As described in Section 5.2, the current BHOP air quality monitoring network comprises three HVAS, two TEOMs, two ES642 PM_{10} monitors and seven DDGs.

Monitoring is anticipated to continue at these locations, and could be supplemented with additional monitoring locations representative of conditions at the TSF tailings harvesting.

By combining these real-time observations with telemetry and readily available software, it is possible to introduce SMS or email alerts to relevant site personnel when critical PM concentrations or wind speeds occur. Site representative have confirmed that this is already being done with the two ES642 PM_{10} monitors. These instruments could be relocated to monitor the proposed TSF tailings harvesting.

A short-term average (e.g. 1-hour average) PM_{10} performance indicator can be set at a concentration that allows proactive dust management to be implemented in the event that PM concentrations are increasing, and may potentially approach the 24-hour PM_{10} impact assessment criterion in the near future.

The field investigations presented as part of the MOD4 AQIA (Pacific Environment, 2017a) indicate that a critical wind speed of 11 m/s (40 km/hr; measured at 10m) should be used as an initial alert value to trigger further investigation and remedial action as this is the threshold friction velocity where dust entrainment may occur. At wind speeds of 40 km/hr, Trigger 1 of the site's Air Quality Management Plan (AQMP) Trigger Action Response Plan (TARP) requires a review of construction activities and application of water to the TSF surface.

Winds that reach 14 m/s (50 km/hr) should be used as the critical wind speed alarm value when immediate action is required (i.e. implementation of TSF water sprays or chemical dust suppressant). A review of the onsite meteorological data indicates that winds exceeding 11m/s may occur 1.3% of the time (or 112 hours per year) and exceeding 14 m/s 0.02% of the time (or 2 hours per year). Site At 50 km/hr, the AQMP TARP Trigger 2 requires cessation of construction activities and engage TSF water sprays.

In addition, a particulate matter concentration an alarm and alert system may also be implemented. Default values adopted at other extractive industry sites for the 1-hour average concentration are 80µg/m^3 as an alert / investigation level and 100 µg/m^3 as an alarm requiring immediate rectification. Currently, the AQMP TARP uses one-hour average PM_{10} above 50 µg/m^3 as Trigger 1 and one-hour average PM_{10} above 100 µg/m^3 as Trigger 2.

Alert/alarm values may be reviewed iteratively to ensure that they are sufficiently protective without generating excessive false alarms.

The monitoring network would be reviewed and augmented (if warranted) to provide additional data relevant to the proposed activities at TSF2.

It is suggested that an augmentation to the existing PM monitoring might include a mobile PM / wind speed monitoring unit that can be placed close to the TSF surface and progressively moved as the TSF is filled. This will be explored further in the operational air quality management plan for the MOD6 works.

7.2 Predictive / Forecast Meteorology and Real Time Management

An additional component of proactive dust management would be a meteorological forecasting system. This system is used to predict meteorological conditions for the coming day(s) to determine, at a minimum one day in advance, when an elevated risk of PM emissions may occur (e.g. based on wind speed, direction, rainfall and atmospheric stability). The site is already receiving daily and weekly forecasts from Weather Intelligence.

The predictive meteorological forecasting system would provide simple indicators of the following day's dust risk, based on meteorological conditions that are known to have adverse impacts, and would allow mine personnel to put measures into place in advance. An example of such preparatory measures would include:

- scheduling additional water cart operations / chemical dust suppressant application;
- planning for modifying or relocating certain activities; and
- scheduling maintenance on equipment.

7.3 Greenhouse Gas Emissions

The World Resources Institute / World Business Council for Sustainable Development Greenhouse Gas Protocol (the GHG Protocol) originally documented the different scopes for greenhouse gas (GHG) emission inventories. The GHG Protocol is the most widely used international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions. This corporate accounting and reporting standard is endorsed by the Australian Government of Clean Energy Regulator.

The GHG Protocol defines three scopes for developing inventories leading to reporting of emissions. These scopes help to delineate direct and indirect emission sources, improve transparency, and provide a degree of flexibility for individual organisations to report based on their organisational structure, business activities and business goals.

Three scopes of emissions are defined in the GHG Protocol:

- 'Scope 1' emissions: direct GHG emissions occurring from sources owned or controlled by the company – for example vehicle fleet and direct fuel combustion. Any negative emissions (sequestration), for example from a plantation owned by the entity, would also be included in Scope 1.
- 'Scope 2' emissions: indirect GHG emissions from purchasing electricity or heat from other parties; and
- 'Scope 3' emissions: indirect emissions which occur due to the company's business activities, but from sources not owned or controlled by the company - for example emissions from employee business-related air travel.

Based on annual returns provided to the Federal Clean Energy Regulator under the National Greenhouse and Energy Reporting (NGER) scheme, annual emissions of GHG (Scope 1 and 2) are estimated to be less than 50 ktCO_2-e. The MOD6 operational scenario isnot anticipated to have a material impact upon current GHG emissions compared to the status quo.

8. CONCLUSIONS

This report has assessed particulate matter and lead impacts associated with the proposed modification 6 (MOD6) activities at Rasp Mine. Local land use, terrain, air quality and meteorology have been considered in the assessment and dispersion modelling was completed using the AERMOD modelling system.

A comprehensive analysis of the baseline air quality was updated as part of this assessment and now includes data up to June 2019.

This assessment considered three scenarios:

- Business as Usual (BAU) – this scenario presents a representative operational year of operations under the existing situation and consists of 100% of operations from the Kintore Pit portal.
- MOD6 Construction scenario – this year represents the construction of the box cut and the new portal
- MOD6 Operational scenario – this year represents a reasonable worst-case future year of operations, with progressive rehabilitation and 100% of operations from the new mine portal.

The construction of the new box cut covered in the MOD6 construction scenario is only expected to take six months. The MOD6 operational scenario was chosen as representative worst-case future operational scenario as it comprised the period with the longest travel distances related to the transport and emplacement of waste rock material.

Emissions to air were estimated both in terms of annual as well as a 24-hour average reasonable worst-case scenario.

These emissions were then evaluated in terms of their predicted off-site impacts using the AERMOD atmospheric dispersion model.

For the MOD6 construction scenario, there is anticipated to be a net increase in lead concentrations / deposition rates across the sensitive receptors when compared with MOD4 (current Project Approval for construction activities).

All air quality metrics are predicted to be below their respective NSW EPA criteria for the MOD6 construction scenario. The MOD6 construction scenario is expected to be approximately six months in duration and modelling predictions indicate that the associated impacts will reduce upon completion of this phase.

For the MOD6 operational scenario, which incorporates the new portal location and the proposed tailings harvesting activities, there is predicted to be a net reduction in lead concentrations / deposition rates when compared with the PPR scenario and the BAU scenario.

All air quality metrics are predicted to be below their respective NSW EPA criteria for the MOD6 operational scenario.

As the MOD6 operational scenario is considered to be a reasonable worst-case future year scenario, it can be concluded that all future operational years are anticipated to result in a net reduction in off-site air quality impacts (including lead) when compared with current operations. This is primarily due to the shorter travelling distance for ore transport from the new portal to the ROM pad with an anticipated reduction in travelling for all vehicles of approximately 10,800 kms

The results for all three scenarios demonstrated compliance with all the NSW EPA impact assessment criteria for all air quality parameters assessed.

Cumulative impacts from the proposed Broken Hill North Mine Recommencement Project have been assessed for the short term and long term air quality metrics. The results demonstrate no exceedance of the NSW impact assessment criteria at any of the co-located receptors assessed.

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APPENDIX A EMISSIONS INVENTORIES AND ASSUMPTIONS FOR THE BAU SCENARIO, MOD6 CONSTRUCTON SCENARIO AND MOD6 OPERATIONAL SCENARIO

Table A.1: Annual emissions estimates for the BAU scenario (kg/y)

Activity	Annual Emissions			
	TSP	PM_{10}	$PM_{2.5}$	Pb (TSP)
Ore - hauling ore from Kintore Pit to ROM pad by truck (unsealed roads)	12,580	3,151	315	68
Ore - hauling ore from Kintore Pit to ROM pad by truck (sealed roads)	4,079	783	189	22
Ore - unloading ore at ROM pad	1,401	663	100	42
Ore - dozers/front end loaders at ROM pad	4,869	883	511	146
Ore - crushed ore storage bin transfer	1,401	663	100	42
Ore - crushing	97	43	43	3
Ore - Hauling concentrate by trucks within processing plant (unsealed)	3,050	764	76	34
Ore - Hauling concentrate by trucks to rail siding (sealed)	3,187	612	148	35
CBP - truck movement - cement (unsealed roads)	125	31	3	1
CBP - truck movement - cement (sealed roads)	17	3	1	0
CBP - truck movement – aggregate (unsealed roads)	111	28	3	1
CBP - truck movement – aggregate (sealed roads)	61	12	3	0
CBP - truck movement - sand (unsealed roads)	426	107	11	2
CBP - truck movement - sand (sealed roads)	236	45	11	1
CBP - truck movement - shotcrete (unsealed roads)	632	158	16	3
CBP - truck movement - shotcrete (sealed roads)	65	12	3	0
CBP - Unloading cement at rail siding	13	6	1	-
CBP -Aggregate transfer	33	16	1	-
CBP - Sand transfer	16	8	0	-
CBP - Cement transfer	3	1	0	-
CBP - Weigh hopper loading	20	10	1	-
CBP - Truck loading	379	101	6	-
CBP - Residual from de-dusted air loading cement and fly-ash	-	53	3	-
CBP - Wind erosion (aggregate stock piles)	131	13	10	2
CBP - Wind erosion (whole CBP)	77	8	6	1
WR - hauling from Kintore Pit to Kintore Pit Waste Tipple (unsealed roads)	1,530	383	38	8
WR - unloading at Kintore Pit Waste Tipple	96	45	7	0
WR - dozers/front end loaders at Kintore Pit Waste Tipple	1,217	221	128	6
WR - hauling from Kintore Pit UG to BHP Pit (unsealed roads)	787	197	20	4

Activity	Annual Emissions			
	TSP	PM_{10}	$PM_{2.5}$	Pb (TSP)
WR - hauling from Kintore Pit UG to BHP Pit (sealed roads)	50	10	2	0
WR - unloading at BHP Pit	21	10	2	0
WR – dozers on overburden at BHP Pit	1,217	221	128	6
WR - loading at BHP Pit	17	8	1	0
WR – hauling from BHP Pit to TSF2 (unsealed roads)	480	172	17	9
WR – hauling from BHP Pit to TSF2 (sealed roads)	112	31	7	1
WR – Deliveries and General Heavy Vehicle Movements	17	8	1	0
WR – Material Handling (General)	406	74	43	2
WE - ROM Pad stockpile	74	37	6	2
WE - Free areas	705	353	53	10
WE - Disturbed areas	5,763	2,882	432	108
TOTAL	**45,503**	**12,825**	**2,446**	**562**

Table A.2: Assumptions used in the emissions estimation for the BAU scenario

Activity	Assumptions
Ore - hauling ore from Kintore Pit to ROM pad by truck (sealed roads)	No controls on sealed roads
Ore - unloading ore at ROM pad	No controls applied
Ore - dozers/front end loaders at ROM pad	Inputs based on Environ 2010 report. Assume water sprays on feeder hopper.
Ore - crushed ore storage bin transfer	Average wind speed from Broken Hill (2016), Moisture content based on Environ (2010)
Ore - Hauling concentrate by trucks within processing plant (unsealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
Ore - Hauling concentrate by trucks to rail siding (sealed)	No control on sealed roads
CBP - Unloading cement at rail siding	Assumes 3% moisture content
CBP -Aggregate transfer	Uncontrolled
CBP - Sand transfer	Uncontrolled
CBP - Cement transfer	Controlled through use of water spray
CBP - Weigh hopper loading	70& control applied as it will be in a building (per Environ 2010)
CBP - Truck loading	Controlled through use of water spray
CBP - Wind erosion (aggregate stockpiles)	Assumes area of stockpiles to be 0.1 ha. Control applied for

Activity	Assumptions
	enclosure
CBP - Wind erosion (whole CBP)	Chemical suppressant will be applied and achieve 95% dust control. Per Environ (2010)
WR - hauling from Kintore Pit to Kintore Pit Waste Tipple (unsealed roads)	Haul road length provided by Gwen Wilson. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - unloading at Kintore Pit Waste Tipple	Average wind speed and moisture content based on Environ (2010)
WR - hauling from Kintore Pit UG to BHP Pit (unsealed roads)	Haul road length provided by Gwen Wilson. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - hauling from Kintore Pit UG to BHP Pit (sealed roads)	No control on sealed roads
WR - unloading at BHP Pit	Average wind speed and moisture content based on Environ (2010)
WR - loading at BHP Pit	Average wind speed and moisture content based on Environ (2010)
WR – hauling from BHP Pit to TSF2 (unsealed roads)	Haul road length provided by Gwen Wilson. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR – hauling from BHP Pit to TSF2 (sealed roads)	No control on sealed roads
WR – Deliveries and General Heavy Vehicle Movements	Average wind speed and moisture content based on Environ (2010)
WR – Material Handling (General)	Average wind speed and moisture content based on Environ (2010)
WE - ROM Pad stockpile	CF based on CABC Results
WE - Free areas	CF based on CABC Results
WE - Disturbed areas	CF based on Environ (2010)

Table A.3: Annual emissions estimates for the MOD6 construction scenario (kg/y)

Activity	Annual Emissions			
	TSP	PM_{10}	$PM_{2.5}$	Pb (TSP)
Ore - hauling ore from Kintore Pit to ROM pad by truck (unsealed roads)	4,220	2,114	211	23
Ore - hauling ore from Kintore Pit to ROM pad by truck (sealed roads)	2,620	503	122	14
Ore - unloading ore at ROM pad	973	460	70	29
Ore - dozers/front end loaders at ROM pad	4,869	883	511	146
Ore - crushed ore storage bin transfer	973	460	70	29
Ore – crushing	68	30	30	2
Ore - Hauling concentrate by trucks within processing plant (unsealed)	2,046	513	51	23
Ore - Hauling concentrate by trucks to rail siding (sealed)	2,047	393	95	23
CBP - truck movement - cement (unsealed roads)	125	31	3	1
CBP - truck movement - cement (sealed roads)	17	3	1	0
CBP - truck movement – aggregate (unsealed roads)	111	28	3	1
CBP - truck movement – aggregate (sealed roads)	61	12	3	0
CBP - truck movement - sand (unsealed roads)	426	107	11	2
CBP - truck movement - sand (sealed roads)	236	45	11	1
CBP - truck movement - shotcrete (unsealed roads)	632	158	16	3
CBP - truck movement - shotcrete (sealed roads)	65	12	3	0
CBP - Loading cement at rail siding	13	6	1	-
CBP -Aggregate transfer	33	16	1	-
CBP - Sand transfer	16	8	0	-
CBP - Cement transfer	3	1	0	-
CBP - Weigh hopper loading	20	10	1	-
CBP - Truck loading	379	101	6	-
CBP - Residual from de-dusted air loading cement and fly-ash	-	53	3	-
CBP - Wind erosion (aggregate stock piles)	131	13	10	2
CBP - Wind erosion (whole CBP)	77	8	6	1
WR - hauling from Kintore Pit to Kintore Pit Waste Tipple (unsealed roads)	602	301	30	3
WR - unloading at Kintore Pit Waste Tipple from Kintore Portal	52	49	7	0
WR - unloading at Kintore Pit Waste Tipple from New Portal	0	0	0	-

Activity	Annual Emissions			
	TSP	PM_{10}	$PM_{2.5}$	Pb (TSP)
WR - dozers/front end loaders at Kintore Pit Waste Tipple	609	221	128	3
WR - hauling from Kintore Pit UG to BHP Pit (unsealed roads)	1,001	251	25	5
WR - hauling from Kintore Pit UG to BHP Pit (sealed roads)	58	11	3	0
WR - unloading at BHP Pit from Kintore Portal	37	18	3	0
WR - unloading at BHP Pit from New Portal	0	0	0	-
WR - front end loaders at BHP Pit	609	221	128	3
WE - ROM Pad stockpile	74	37	6	2
WE - Free areas	705	353	53	10
WE - Disturbed areas	5,763	2,882	432	108
WR - blasting in boxcut area 1	104	54	3	1
WR - blasting in boxcut area 2	43	22	1	0
WR - blasting in boxcut area 3	26	13	1	0
WR - blasting in boxcut area 4	0	0	0	0
WR - loading waste rock from boxcut into trucks	339	160	24	2
WR - hauling waste rock from boxcut to BHP Pit (unsealed)	101	25	3	2
WR - hauling waste rock from boxcut to BHP Pit (sealed)	49	9	2	1
WR - unloading at BHP Pit	8	8	1	0
WR - dozers/front end loaders on overburden at BHP	811	147	85	4
WR - hauling waste rock from boxcut to Little Kintore Pit (unsealed)	8,173	2,047	205	44
WR - hauling waste rock from boxcut to Little Kintore Pit (sealed)	1,709	328	79	9
WR - unloading at Little Kintore Pit	323	153	23	2
WR - front end loaders at Little Kintore Pit	1,217	221	128	6
Laydown area material - loading waste rock from boxcut into trucks	1	1	0	0
Laydown area material - hauling waste rock from laydown area to BHP Pit (unsealed)	9	2	0	0
Laydown area material - hauling waste rock from laydown area to BHP Pit (sealed)	4	1	0	0
Laydown area material - unloading waste rock at BHP Pit	1	1	0	0
Laydown area material - front end loaders at BHP Pit	203	37	21	1

Activity	Annual Emissions			
	TSP	PM_{10}	$PM_{2.5}$	Pb (TSP)
Prog Rehab - loading waste rock from BHP pit into trucks	19	9	1	0
Prog Rehab - hauling waste rock from BHP Pit to Little Kintore Pit (sealed)	118	23	5	2
Prog Rehab - hauling waste rock from BHP Pit to Little Kintore Pit (unsealed)	197	49	5	4
Prog Rehab - unloading waste rock at Little Kintore Pit	19	9	1	0
Prog Rehab - front end loaders at Little Kintore Pit	203	37	21	1
WE - Boxcut Activities	675	338	51	3
TOTAL	**44,027**	**14,006**	**2,714**	**519**

Table A.4: Assumptions used in the emissions estimation for the MOD6 construction scenario

Activity	Assumption
Ore - hauling ore from Kintore Pit to ROM pad by truck (unsealed roads)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
Ore - hauling ore from Kintore Pit to ROM pad by truck (sealed roads)	No control on sealed roads
Ore - unloading ore at ROM pad	Assumed that waste rock will be loaded in Kintore Pit. Average wind speed and moisture content based on Environ (2010).
Ore - dozers/front end loaders at ROM pad	Inputs based on Environ 2010 report
Ore - crushed ore storage bin transfer	Average wind speed from Broken Hill (2016), Moisture content based on Environ (2010)
Ore - Hauling concentrate by trucks within processing plant (unsealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
Ore - Hauling concentrate by trucks to rail siding (sealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
CBP - truck movement - cement (unsealed roads)	90% control per Environ (2010)
CBP - truck movement - cement (sealed roads)	No control on sealed roads
CBP - truck movement – aggregate (unsealed roads)	90% control per Environ (2010)
CBP - truck movement – aggregate (sealed roads)	No control on sealed roads
CBP - truck movement - sand (unsealed roads)	90% control per Environ (2010)
CBP - truck movement - sand (sealed roads)	No control on sealed roads
CBP - truck movement - shotcrete (unsealed roads)	90% control per Environ (2010)
CBP - truck movement - shotcrete (sealed roads)	No control on sealed roads

Activity	Assumption
CBP - Loading cement at rail siding	Assumes 3% moisture content
CBP -Aggregate transfer	Uncontrolled
CBP - Sand transfer	Uncontrolled
CBP - Cement transfer	Controlled through use of water spray
CBP - Weigh hopper loading	70% control applied as it will be in a building (per Environ 2010)
CBP - Truck loading	Controlled through use of water spray
CBP - Wind erosion (aggregate stockpiles)	Assumes area of stockpiles to be 0.1 ha. Control applied for enclosure
CBP - Wind erosion (whole CBP)	Chemical suppressant will be applied and achieve 95% dust control. Per Environ (2010)
WR - hauling from Kintore Pit to Kintore Pit Waste Tipple (unsealed roads)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - unloading at Kintore Pit Waste Tipple from Kintore Portal	Average wind speed and moisture content based on Environ (2010)
WR - unloading at Kintore Pit Waste Tipple from New Portal	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - dozers/front end loaders at Kintore Pit Waste Tipple	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - hauling from Kintore Pit UG to BHP Pit (unsealed roads)	Average wind speed and moisture content based on Environ (2010)
WR - hauling from Kintore Pit UG to BHP Pit (sealed roads)	Inputs based on Environ 2010 report
WR - unloading at BHP Pit from Kintore Portal	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - unloading at BHP Pit from New Portal	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - front end loaders at BHP Pit	Inputs based on Environ 2010 report
WE - ROM Pad stockpile	CF based on Environ (2010)
WE - Free areas	CF based on CABC Results (natural crusting or dust suppressants)
WE - Disturbed areas	CF based on CABC Results
WR - loading waste rock from boxcut into trucks	Assumed that waste rock will be loaded in Kintore Pit. Average wind speed and moisture content based on Environ (2010).
WR - hauling waste rock from boxcut to BHP Pit (unsealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - hauling waste rock from boxcut to BHP Pit (sealed)	Haul roads to lengths to be estimated from maps. Silt content

Activity	Assumption
	based on Environ (2010). 80% control with water and chemical suppressant
WR - unloading at BHP Pit	Assumed that waste rock will be loaded in Kintore Pit. Average wind speed and moisture content based on Environ (2010).
WR - dozers/front end loaders on overburden at BHP	
WR - hauling waste rock from boxcut to Little Kintore Pit (unsealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - hauling waste rock from boxcut to Little Kintore Pit (sealed)	No control on sealed roads
WR - unloading at Little Kintore Pit	Assumed that waste rock will be loaded in Kintore Pit. Average wind speed and moisture content based on Environ (2010).
WR - front end loaders at Little Kintore Pit	Inputs based on Environ 2010 report
Laydown area material - loading waste rock from boxcut into trucks	Assumed that waste rock will be loaded in Kintore Pit. Average wind speed and moisture content based on Environ (2010).
Laydown area material - hauling waste rock from laydown area to BHP Pit (unsealed)	Assumed that waste rock will be loaded in Kintore Pit. Average wind speed and moisture content based on Environ (2010).
Laydown area material - hauling waste rock from laydown area to BHP Pit (sealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
Laydown area material - unloading waste rock at BHP Pit	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
Laydown area material - front end loaders at BHP Pit	Assumed that waste rock will be loaded in Kintore Pit. Average wind speed and moisture content based on Environ (2010).
Prog Rehab - loading waste rock from BHP pit into trucks	Assumed that waste rock will be loaded in Kintore Pit. Average wind speed and moisture content based on Environ (2010).
Prog Rehab - hauling waste rock from BHP Pit to Little Kintore Pit (sealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
Prog Rehab - hauling waste rock from BHP Pit to Little Kintore Pit (unsealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
Prog Rehab - unloading waste rock at Little Kintore Pit	Assumed that waste rock will be loaded in Kintore Pit. Average wind speed and moisture content based on Environ (2010).
Prog Rehab - front end loaders at Little Kintore Pit	Inputs based on Environ 2010 report
WE - Boxcut Activities	Control based on Environ 2010 report which states '65% control efficiency due to combined use of waster sprays and wind breaks'

Table A.5: Annual emissions estimates for MOD6 operational scenario (kg/y)

Activity	Annual Emissions			
	TSP	PM_{10}	$PM_{2.5}$	Pb (TSP)
Ore - hauling ore from boxcut to ROM pad by truck (sealed roads)	754	145	35	4
Ore - unloading ore at ROM pad	973	460	70	29
Ore - front end loaders at ROM pad	4,869	883	511	146
Ore - crushed ore storage bin transfer	973	460	70	29
Ore - crushing	68	30	30	2
Ore - Hauling concentrate by trucks within processing plant (unsealed)	2,118	530	53	24
Ore - Hauling concentrate by trucks to rail siding (sealed)	2,213	425	103	25
CBP - truck movement - cement (unsealed roads)	125	31	3	1
CBP - truck movement - cement (sealed roads)	17	3	1	0
CBP - truck movement - aggregate (unsealed roads)	111	28	3	1
CBP - truck movement - aggregate (sealed roads)	61	12	3	0
CBP - truck movement - sand (unsealed roads)	426	107	11	2
CBP - truck movement - sand (sealed roads)	236	45	11	1
CBP - truck movement - shotcrete (unsealed roads)	632	158	16	3
CBP - truck movement - shotcrete (sealed roads)	65	12	3	0
CBP - Loading cement at rail siding	13	6	1	-
CBP -Aggregate transfer	33	16	1	-
CBP - Sand transfer	16	8	0	-
CBP - Cement transfer	3	1	0	-
CBP - Weigh hopper loading	20	10	1	-
CBP - Truck loading	379	101	6	-
CBP - Residual from de-dusted air loading cement and fly-ash	-	53	3	-
CBP - Wind erosion (aggregate stock piles)	131	13	10	2
CBP - Wind erosion (whole CBP)	77	8	6	1
WR - hauling from New Portal to Kintore Pit (unsealed)	1,769	443	44	9.6
WR - hauling from New Portal to Kintore Pit (sealed)	235	45	11	1.3
WR - unloading at Kintore Pit	49	46	7	0.2
WR - dozers/front end loaders on overburden at Kintore Pit	1,217	221	128	6.1
WR - hauling from New Portal to BHP Pit (unsealed)	290	73	7	5.5
WR - hauling from New Portal to BHP Pit (sealed)	231	44	11	4.3
WR - unloading at BHP Pit	88	41	6	0.4

Activity	Annual Emissions			
	TSP	PM_{10}	$PM_{2.5}$	Pb (TSP)
WR - dozers/front end loaders at BHP Pit	1,217	221	128	6.1
WR - unloading at Mt Hebbard	1,963	492	49	10.6
WR - dozers on overburden at Mt Hebbard	186	36	9	1.0
WE - ROM Pad stockpile	74	37	6	2.2
WE - Free areas	705	353	53	9.9
WE - Disturbed areas	5,763	2,882	432	108.3
Opt A - Grader/Excavator shaving top layer of TSF2	112	53	8	0.3
Opt A - 2 dozers pushing shaved tailings into stockpile	216	35	23	0.7
Opt A - WE from TSF area	214	107	16	0.7
Opt A - WE from tailings stockpile	68	34	5	0.2
Opt A - Excavator loading tailings stockpile to truck	112	53	8	0.3
Opt A - hauling within TSF2 to sealed road (unsealed)	2,710	679	68	8.4
Opt A - hauling outside TSF2 to sealed road (unsealed)	4,321	1,082	108	23.3
Opt A - hauling on sealed portion of road toward Kintore	2,747	527	128	14.8
Opt A - hauling at Kintore pit (unsealed)	10,738	2,689	269	58.0
Opt A - Unloading at Kintore Pit	112	53	8	0.3
TOTAL	**48,269**	**13,487**	**2,476**	**529.7**

Table A.6: Assumptions used in the emissions estimation for the MOD6 operational scenario

Activity	Assumptions
Ore - hauling ore from boxcut to ROM pad by truck (sealed roads)	No control on sealed roads
Ore - unloading ore at ROM pad	Assumed that waste rock will be loaded in Kintore Pit. Average wind speed and moisture content based on Environ (2010).
Ore - front end loaders at ROM pad	Inputs based on Environ 2010 report. Assume water sprays on feeder hopper.
Ore - crushed ore storage bin transfer	Average wind speed from Broken Hill (2016), Moisture content based on Environ (2010)
Ore - Hauling concentrate by trucks within processing plant (unsealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
Ore - Hauling concentrate by trucks to rail siding (sealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical

Activity	Assumptions
	suppressant
CBP - truck movement - cement (unsealed roads)	90% control per Environ (2010)
CBP - truck movement - cement (sealed roads)	No control on sealed roads
CBP - truck movement - aggregate (unsealed roads)	90% control per Environ (2010)
CBP - truck movement - aggregate (sealed roads)	No control on sealed roads
CBP - truck movement - sand (unsealed roads)	90% control per Environ (2010)
CBP - truck movement - sand (sealed roads)	No control on sealed roads
CBP - truck movement - shotcrete (unsealed roads)	90% control per Environ (2010)
CBP - truck movement - shotcrete (sealed roads)	No control on sealed roads
CBP - Loading cement at rail siding	Assumes 3% moisture content
CBP -Aggregate transfer	Uncontrolled
CBP - Sand transfer	Uncontrolled
CBP - Cement transfer	Controlled through use of water spray
CBP - Weigh hopper loading	70% control applied as it will be in a building (per Environ 2010)
CBP - Truck loading	Controlled through use of water spray
CBP - Wind erosion (aggregate stockpiles)	Assumes area of stockpiles to be 0.1 ha. Control applied for enclosure
CBP - Wind erosion (whole CBP)	Chemical suppressant will be applied and achieve 95% dust control. Per Environ (2010)
WR - hauling from New Portal to Kintore Pit (unsealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - hauling from New Portal to Kintore Pit (sealed)	No control on sealed roads
WR - unloading at Kintore Pit	Average wind speed and moisture content based on Environ (2010)
WR - hauling from New Portal to BHP Pit (unsealed)	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - hauling from New Portal to BHP Pit (sealed)	No control on sealed roads
WR - unloading at BHP Pit	Average wind speed and moisture content based on Environ (2010)
WR - dozers/front end loaders at BHP Pit	Inputs based on Environ 2010 report
WR - unloading at Mt Hebbard	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WR - dozers on overburden at Mt Hebbard	Haul roads to lengths to be estimated from maps. Silt content based on Environ (2010). 80% control with water and chemical suppressant
WE - ROM Pad stockpile	CF based on Environ (2010)

Activity	Assumptions
WE - Free areas	CF based on CABC Results
WE - Disturbed areas	CF based on CABC Results

Table A.7: Maximum 24-hour emissions estimates for the MOD6 construction scenario (kg/y)

Activity	Maximum 24-hour Emissions	
	PM_{10}	$PM_{2.5}$
Ore - hauling ore from Kintore Pit to ROM pad by truck (unsealed roads)	2,114.1	211.4
Ore - hauling ore from Kintore Pit to ROM pad by truck (sealed roads)	503.0	121.7
Ore - unloading ore at ROM pad	460.3	69.7
Ore - dozers/front end loaders at ROM pad	883.2	511.2
Ore - crushed ore storage bin transfer	460.3	69.7
Ore - crushing	30.0	30.0
Ore - Hauling concentrate by trucks within processing plant (unsealed)	512.5	51.3
Ore - Hauling concentrate by trucks to rail siding (sealed)	392.9	95.1
CBP - truck movement - cement (unsealed roads)	31.3	3.1
CBP - truck movement - cement (sealed roads)	3.2	0.8
CBP - truck movement - aggregate (unsealed roads)	27.8	2.8
CBP - truck movement - aggregate (sealed roads)	11.8	2.9
CBP - truck movement - sand (unsealed roads)	106.8	10.7
CBP - truck movement - sand (sealed roads)	45.3	11.0
CBP - truck movement - shotcrete (unsealed roads)	158.3	15.8
CBP - truck movement - shotcrete (sealed roads)	12.4	3.0
CBP - Loading cement at rail siding	6.1	0.9
CBP - Aggregate transfer	15.9	0.9
CBP - Sand transfer	7.6	0.4
CBP - Cement transfer	1.1	0.2
CBP - Weigh hopper loading	10.0	0.6
CBP - Truck loading	101.2	5.7
CBP - Residual from de-dusted air loading cement and fly-ash	52.5	2.9
CBP - Wind erosion (aggregate stock piles)	13.1	9.9
CBP - Wind erosion (whole CBP)	7.7	5.7
WR - hauling from Kintore Pit to Kintore Pit Waste Tipple (unsealed roads)	301.4	30.1
WR - unloading at Kintore Pit Waste Tipple from Kintore Portal	49.5	7.5
WR - dozers/front end loaders at Kintore Pit Waste Tipple	220.8	127.8
WR - hauling from Kintore Pit UG to BHP Pit (unsealed roads)	250.8	25.1

Activity	Maximum 24-hour Emissions	
	PM_{10}	$PM_{2.5}$
WR - hauling from Kintore Pit UG to BHP Pit (sealed roads)	11.1	2.7
WR - unloading at BHP Pit from Kintore Portal	17.7	2.7
WR - front end loaders at BHP Pit	220.8	127.8
WE - ROM Pad stockpile	37.2	5.6
WE - Free areas	352.6	52.9
WE - Disturbed areas	2,881.5	432.2
WR - blasting in boxcut area 1	54.3	3.1
WR - blasting in boxcut area 2	22.2	1.3
WR - blasting in boxcut area 3	13.4	0.8
WR - blasting in boxcut area 4	0.0	0.0
WR - loading waste rock from boxcut into trucks	633.1	216.2
WR - dozers/front end loaders on overburden at BHP	220.8	127.8
WR - hauling waste rock from boxcut to Little Kintore Pit (unsealed)	8,481.8	1,912.3
WR - hauling waste rock from boxcut to Little Kintore Pit (sealed)	1,359.0	741.3
WR - unloading at Little Kintore Pit	633.1	216.2
WR - front end loaders at Little Kintore Pit	220.8	127.8
Laydown area material - loading waste rock from boxcut into trucks	0.7	0.1
Laydown area material - hauling waste rock from laydown area to BHP Pit (unsealed)	2.3	0.2
Laydown area material - hauling waste rock from laydown area to BHP Pit (sealed)	0.8	0.2
Laydown area material - unloading waste rock at BHP Pit	0.7	0.1
Laydown area material - front end loaders at BHP Pit	36.8	21.3
Prog Rehab - loading waste rock from BHP pit into trucks	9.2	1.4
Prog Rehab - hauling waste rock from BHP Pit to Little Kintore Pit (sealed)	22.6	5.5
Prog Rehab - hauling waste rock from BHP Pit to Little Kintore Pit (unsealed)	49.3	4.9
Prog Rehab - unloading waste rock at Little Kintore Pit	9.2	1.4
Prog Rehab - front end loaders at Little Kintore Pit	36.8	21.3
WE - Boxcut Activities	337.7	50.6

Activity	Maximum 24-hour Emissions	
	PM_{10}	$PM_{2.5}$
TOTAL	**22,457**	**5,505.5**

Table A.8: Maximum 24-hour emissions estimates for MOD6 operational scenario (kg/y)

Activity	Maximum 24-hour emissions	
	PM_{10}	$PM_{2.5}$
Ore - hauling ore from boxcut to ROM pad by truck (sealed roads)	144.7	35.0
Ore - unloading ore at ROM pad	460.3	69.7
Ore - front end loaders at ROM pad	883.2	511.2
Ore - crushed ore storage bin transfer	460.3	69.7
Ore - crushing	30.0	30.0
Ore - Hauling concentrate by trucks within processing plant (unsealed)	530.4	53.0
Ore - Hauling concentrate by trucks to rail siding (sealed)	424.8	102.8
CBP - truck movement - cement (unsealed roads)	31.3	3.1
CBP - truck movement - cement (sealed roads)	3.2	0.8
CBP - truck movement - aggregate (unsealed roads)	27.8	2.8
CBP - truck movement - aggregate (sealed roads)	11.8	2.9
CBP - truck movement - sand (unsealed roads)	106.8	10.7
CBP - truck movement - sand (sealed roads)	45.3	11.0
CBP - truck movement - shotcrete (unsealed roads)	158.3	15.8
CBP - truck movement - shotcrete (sealed roads)	12.4	3.0
CBP - Loading cement at rail siding	6.1	0.9
CBP - Aggregate transfer	15.9	0.9
CBP - Sand transfer	7.6	0.4
CBP - Cement transfer	1.1	0.2
CBP - Weigh hopper loading	10.0	0.6
CBP - Truck loading	101.2	5.7
CBP - Residual from de-dusted air loading cement and fly-ash	52.5	2.9
CBP - Wind erosion (aggregate stock piles)	13.1	9.9
CBP - Wind erosion (whole CBP)	7.7	5.7
WR - hauling from New Portal to Kintore Pit (unsealed)	575.8	57.6
WR - hauling from New Portal to Kintore Pit (sealed)	69.0	16.7

Activity	Maximum 24-hour emissions	
	PM_{10}	$PM_{2.5}$
WR - unloading at Kintore Pit	67.2	10.2
WR - dozers/front end loaders on overburden at Kintore Pit	294.4	170.4
WR - unloading at BHP Pit	8.3	1.3
WR - hauling from Kintore Pit to South Road (unsealed)	112.2	11.2
WR - unloading at South Road	8.3	1.3
WR - dozers on overburden at South Road	220.8	127.8
WE - ROM Pad stockpile	37.2	5.6
WE - Free areas	352.6	52.9
WE - Disturbed areas	2,881.5	432.2
Opt A - Grader/Excavator shaving top layer of TSF2	69.3	10.5
Opt A - 2 dozers pushing shaved tailings into stockpile	135.2	86.7
Opt A - WE from TSF area	107.0	16.0
Opt A - WE from tailings stockpile	34.2	5.1
Opt A - Excavator loading tailings stockpile to truck	69.3	10.5
Opt A - hauling within TSF2 to sealed road (unsealed)	884.8	88.5
Opt A - hauling outside TSF2 to sealed road (unsealed)	1,410.9	141.1
Opt A - hauling on sealed portion of road toward Kintore	687.5	166.3
Opt A - hauling at Kintore pit (unsealed)	3,505.8	350.6
Opt A - Unloading at Kintore Pit	69.3	10.5
TOTAL	**15,146.5**	**2,721.5**

APPENDIX B TABULATED RESULTS FOR BAU, PPR, MOD6 OPERATIONAL SCENARIO, MOD6 CONSTRUCTION SCENARIO AND MOD4

PPR, BAU and MOD6 operational scenarios – Predicted annual average lead (as TSP) concentrations

Table B.1: Predicted incremental and cumulative annual average lead (as TSP) concentrations (µg/m^3) for PPR, BAU and MOD6 operational scenario

Receptor ID	PPR	BAU		MOD6 operational		Receptor ID	PPR	BAU		MOD6 operational	
		Incremental	Cumulative (Incremental + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Incremental + background)	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	0.5	n/a	0.5	Criterion	n/a	n/a	0.5	n/a	0.5
R1	0.0100	0.0093	0.2324	0.0085	0.2317	R36	0.0100	0.0089	0.2323	0.0080	0.2315
R2	0.0120	0.0096	0.2308	0.0087	0.2299	R37	0.0100	0.0081	0.2324	0.0073	0.2316
R3	0.0260	0.0165	0.2305	0.0150	0.2291	R38	0.0040	0.0034	0.2302	0.0030	0.2299
R4	0.0200	0.0082	0.2293	0.0074	0.2285	R39	0.0040	0.0035	0.2302	0.0031	0.2299
R5	0.0180	0.0069	0.2295	0.0062	0.2287	R40	0.0080	0.0064	0.2303	0.0057	0.2296
R6	0.0140	0.0073	0.2291	0.0065	0.2283	R41	0.0080	0.0078	0.2302	0.0070	0.2294
R7	0.0040	0.0039	0.2303	0.0036	0.2300	R42	0.0090	0.0092	0.2309	0.0083	0.2300
R8	0.0090	0.0080	0.2304	0.0071	0.2295	R43	-	0.0110	0.2349	0.0100	0.2339
R9	0.0080	0.0063	0.2304	0.0056	0.2297	R44	-	0.0018	0.2301	0.0016	0.2299
R10	0.0060	0.0060	0.2304	0.0054	0.2299	R45	-	0.0040	0.2300	0.0036	0.2297
R11	0.0070	0.0049	0.2299	0.0044	0.2294	R46	-	0.0023	0.2298	0.0020	0.2296
R12	0.0050	0.0039	0.2302	0.0036	0.2299	R47	-	0.0050	0.2309	0.0045	0.2304
R13	0.0050	0.0035	0.2302	0.0032	0.2299	R48	-	0.0022	0.2305	0.0020	0.2302
R14	0.0040	0.0043	0.2305	0.0039	0.2302	R49	-	0.0010	0.2301	0.0009	0.2301
R15	0.0020	0.0015	0.2302	0.0013	0.2301	R50	-	0.0065	0.2308	0.0059	0.2302
R16	0.0020	0.0019	0.2304	0.0017	0.2302	R51	-	0.0040	0.2283	0.0036	0.2279
R17	0.0040	0.0034	0.2305	0.0031	0.2302	R52	-	0.0043	0.2286	0.0039	0.2281
R18	0.0030	0.0029	0.2300	0.0026	0.2297	R53	-	0.0027	0.2270	0.0025	0.2267

Receptor ID	PPR	BAU		MOD6 operational		Receptor ID	PPR	BAU		MOD6 operational	
		Incremental	Cumulative (Incremental + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Incremental + background)	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	0.5	n/a	0.5	Criterion	n/a	n/a	0.5	n/a	0.5
R19	0.0020	0.0012	0.2302	0.0011	0.2301	R54	-	0.0028	0.2271	0.0026	0.2268
R20	0.0020	0.0011	0.2301	0.0010	0.2300	R55	-	0.0013	0.2256	0.0012	0.2255
R21	0.0130	0.0107	0.2337	0.0096	0.2326	R56	-	0.0013	0.2256	0.0012	0.2255
R22	0.0140	0.0114	0.2344	0.0101	0.2332	R57	-	0.0026	0.2268	0.0024	0.2266
R23	0.0170	0.0135	0.2360	0.0120	0.2345	R58	-	0.0010	0.2253	0.0009	0.2252
R24	0.0240	0.0148	0.2366	0.0131	0.2350	R59	-	0.0005	0.2248	0.0005	0.2247
R25	0.0090	0.0077	0.2329	0.0070	0.2321	R60	-	0.0029	0.2272	0.0027	0.2269
R26	0.0330	0.0207	0.2403	0.0186	0.2381	R61	-	0.0013	0.2256	0.0012	0.2255
R27	0.0360	0.0261	0.2430	0.0242	0.2412	R62	-	0.0026	0.2269	0.0023	0.2266
R28	0.0260	0.0224	0.2418	0.0207	0.2402	R63	-	0.0017	0.2260	0.0016	0.2259
R29	0.0220	0.0165	0.2373	0.0151	0.2360	R64	-	0.0022	0.2265	0.0020	0.2262
R30	0.0170	0.0150	0.2375	0.0137	0.2362	R65	-	0.0058	0.2301	0.0052	0.2295
R31	0.0100	0.0081	0.2330	0.0073	0.2322	R66	-	0.0040	0.2283	0.0036	0.2279
R32	0.0090	0.0075	0.2329	0.0068	0.2322	R67	-	0.0040	0.2283	0.0037	0.2279
R33	0.0100	0.0087	0.2347	0.0078	0.2338	R68	-	0.0032	0.2275	0.0029	0.2272
R34	0.0090	0.0092	0.2316	0.0083	0.2307	R69	-	0.0026	0.2269	0.0024	0.2267
R35	0.0090	0.0091	0.2320	0.0082	0.2311	R70	-	0.0025	0.2268	0.0023	0.2266

Notes:

- The number of decimal places is shown so the readers can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

- The PPR assessment only contains modelled results for Receptors 1 to 42. Receptors 43 to 70 were added for subsequent assessments.

PPR, BAU and MOD6 operational scenarios – Predicted annual average lead deposition

Table B.2: Predicted incremental and cumulative annual average lead deposition (as total particulate) (g/m^2/annum) for the PPR, BAU and MOD6 operational scenarios

Receptor ID	PPR	BAU	MOD6 Operational		Receptor ID	PPR	BAU	MOD6 Operational	
		Incremental	Incremental	Cumulative (Incremental + background)			Incremental	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	n/a	n/a	Criterion	n/a	n/a	n/a	n/a
R1	0.0400	0.0228	0.0223	0.0223	R36	0.0400	0.0195	0.0181	0.0181
R2	0.0500	0.0255	0.0249	0.0249	R37	0.0500	0.0184	0.0170	0.0170
R3	0.0900	0.0459	0.0451	0.0451	R38	0.0100	0.0062	0.0057	0.0057
R4	0.0600	0.0194	0.0185	0.0185	R39	0.0100	0.0066	0.0060	0.0060
R5	0.0400	0.0153	0.0143	0.0143	R40	0.0300	0.0152	0.0142	0.0142
R6	0.0400	0.0145	0.0132	0.0132	R41	0.0300	0.0196	0.0185	0.0185
R7	0.0100	0.0073	0.0068	0.0068	R42	0.0400	0.0258	0.0245	0.0245
R8	0.0300	0.0173	0.0160	0.0160	R43	-	0.0290	0.0272	0.0272
R9	0.0200	0.0136	0.0126	0.0126	R44	-	0.0037	0.0035	0.0035
R10	0.0200	0.0137	0.0129	0.0129	R45	-	0.0087	0.0082	0.0082
R11	0.0200	0.0106	0.0099	0.0099	R46	-	0.0042	0.0039	0.0039
R12	0.0200	0.0087	0.0082	0.0082	R47	-	0.0117	0.0109	0.0109
R13	0.0100	0.0074	0.0070	0.0070	R48	-	0.0052	0.0048	0.0048
R14	0.0100	0.0086	0.0081	0.0081	R49	-	0.0026	0.0024	0.0024
R15	0.0100	0.0034	0.0031	0.0031	R50	-	0.0148	0.0138	0.0138
R16	0.0100	0.0044	0.0041	0.0041	R51	-	0.0081	0.0075	0.0075
R17	0.0100	0.0074	0.0069	0.0069	R52	-	0.0088	0.0082	0.0082
R18	0.0100	0.0055	0.0051	0.0051	R53	-	0.0052	0.0048	0.0048

Receptor ID	PPR	BAU	MOD6 Operational		Receptor ID	PPR	BAU	MOD6 Operational	
		Incremental	Incremental	Cumulative (Incremental + background)			Incremental	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	n/a	n/a	Criterion	n/a	n/a	n/a	n/a
R19	0.0100	0.0029	0.0027	0.0027	R54	-	0.0061	0.0057	0.0057
R20	0.0100	0.0028	0.0026	0.0026	R55	-	0.0021	0.0020	0.0020
R21	0.0500	0.0259	0.0250	0.0250	R56	-	0.0023	0.0021	0.0021
R22	0.0600	0.0274	0.0260	0.0260	R57	-	0.0043	0.0040	0.0040
R23	0.0800	0.0324	0.0298	0.0298	R58	-	0.0022	0.0020	0.0020
R24	0.1100	0.0368	0.0336	0.0336	R59	-	0.0011	0.0010	0.0010
R25	0.0400	0.0185	0.0175	0.0175	R60	-	0.0070	0.0064	0.0064
R26	0.1500	0.0506	0.0460	0.0460	R61	-	0.0023	0.0021	0.0021
R27	0.2000	0.0687	0.0672	0.0672	R62	-	0.0045	0.0042	0.0042
R28	0.1500	0.0566	0.0550	0.0550	R63	-	0.0032	0.0030	0.0030
R29	0.1400	0.0442	0.0422	0.0422	R64	-	0.0053	0.0048	0.0048
R30	0.1000	0.0386	0.0365	0.0365	R65	-	0.0143	0.0132	0.0132
R31	0.0600	0.0202	0.0188	0.0188	R66	-	0.0090	0.0083	0.0083
R32	0.0500	0.0191	0.0178	0.0178	R67	-	0.0095	0.0087	0.0087
R33	0.0500	0.0233	0.0207	0.0207	R68	-	0.0078	0.0074	0.0074
R34	0.0400	0.0250	0.0236	0.0236	R69	-	0.0063	0.0059	0.0059
R35	0.0400	0.0220	0.0206	0.0206	R70	-	0.0052	0.0049	0.0049

Notes:

- The number of decimal places is shown so the readers can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

- The background annual lead deposition rates adopted for this assessment are 0 g/m^2/year. As such, there is no difference between the incremetal and cumulative results.

- The PPR assessment only contains modelled results for Receptors 1 to 42. Receptors 43 to 70 were added for subsequent assessments.

PPR, BAU and MOD6 operational scenarios – Predicted annual average TSP

Table B.3: Predicted incremental and cumulative annual average TSP concentrations (µg/m^3) for the PPR, BAU and MOD6 operational scenarios

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Incremental + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Incremental + background)	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	90	n/a	90	Criterion	n/a	n/a	90	n/a	90
R1	1.5000	0.6252	36.2298	0.5769	36.1814	R36	1.2000	0.5118	36.1487	0.4207	36.0576
R2	1.4000	0.7817	36.3212	0.6711	36.2106	R37	1.2000	0.4602	36.1307	0.4011	36.0716
R3	2.1000	1.3667	36.6386	1.1396	36.4115	R38	0.4000	0.2164	35.9967	0.1607	35.9409
R4	1.4000	0.6044	36.1561	0.4789	36.0306	R39	0.4000	0.2193	35.9945	0.1616	35.9369
R5	1.0000	0.4860	36.0959	0.3738	35.9838	R40	0.9000	0.4606	36.1184	0.3570	36.0148
R6	1.2000	0.4765	36.0615	0.3494	35.9343	R41	1.1000	0.5388	36.1404	0.4228	36.0243
R7	0.5000	0.2237	35.9888	0.1796	35.9447	R42	1.2000	0.6063	36.1788	0.4793	36.0518
R8	0.9000	0.5277	36.1322	0.3951	35.9996	R43	-	0.6741	36.3170	0.6386	36.2816
R9	0.8000	0.4192	36.0911	0.3241	35.9960	R44	-	0.1069	35.9399	0.0864	35.9194
R10	0.8000	0.3760	36.0602	0.2960	35.9801	R45	-	0.2431	35.9895	0.2012	35.9476
R11	0.7000	0.3325	36.0367	0.2603	35.9646	R46	-	0.1306	35.9381	0.1020	35.9095
R12	0.5000	0.2430	35.9988	0.2013	35.9571	R47	-	0.2857	36.0244	0.2366	35.9753
R13	0.5000	0.2086	35.9835	0.1733	35.9481	R48	-	0.1224	35.9549	0.1047	35.9372
R14	0.5000	0.2438	36.0016	0.1941	35.9519	R49	-	0.0578	35.9247	0.0490	35.9158
R15	0.2000	0.0844	35.9348	0.0696	35.9200	R50	-	0.3697	36.0353	0.3044	35.9700
R16	0.2000	0.1035	35.9462	0.0883	35.9310	R51	-	0.2478	35.9135	0.1952	35.8608
R17	0.4000	0.1916	35.9807	0.1569	35.9460	R52	-	0.2719	35.9375	0.2126	35.8782
R18	0.3000	0.1709	35.9601	0.1335	35.9227	R53	-	0.1605	35.8261	0.1256	35.7912
R19	0.2000	0.0677	35.9286	0.0573	35.9182	R54	-	0.1594	35.8250	0.1314	35.7970

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Incremental + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Incremental + background)	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	90	n/a	90	Criterion	n/a	n/a	90	n/a	90
R20	0.2000	0.0674	35.9286	0.0562	35.9175	R55	-	0.0669	35.7325	0.0554	35.7210
R21	1.8000	0.6952	36.2871	0.6109	36.2028	R56	-	0.0758	35.7414	0.0597	35.7253
R22	1.9000	0.7018	36.2926	0.6045	36.1953	R57	-	0.1424	35.8080	0.1140	35.7796
R23	2.0000	0.7591	36.3347	0.6507	36.2263	R58	-	0.0621	35.7277	0.0496	35.7152
R24	2.2000	0.7963	36.3539	0.7014	36.2590	R59	-	0.0298	35.6955	0.0246	35.6902
R25	1.2000	0.4604	36.1542	0.3994	36.0933	R60	-	0.1648	35.8305	0.1410	35.8066
R26	2.3000	1.0101	36.4909	0.9077	36.3885	R61	-	0.0743	35.7399	0.0574	35.7230
R27	2.9000	1.5176	36.7890	1.7633	37.0347	R62	-	0.1503	35.8159	0.1144	35.7800
R28	2.3000	1.4941	36.8969	1.4945	36.8973	R63	-	0.0977	35.7633	0.0789	35.7445
R29	2.2000	0.9305	36.4396	0.9934	36.5025	R64	-	0.1257	35.7913	0.1072	35.7728
R30	1.7000	0.9991	36.5616	0.9164	36.4788	R65	-	0.3331	35.9987	0.2999	35.9655
R31	1.1000	0.4591	36.1524	0.4328	36.1262	R66	-	0.2189	35.8846	0.1884	35.8540
R32	1.0000	0.4433	36.1563	0.4066	36.1195	R67	-	0.2269	35.8925	0.1953	35.8610
R33	0.9000	0.6333	36.3581	0.5079	36.2326	R68	-	0.1957	35.8613	0.1701	35.8357
R34	1.2000	0.5715	36.1677	0.4507	36.0469	R69	-	0.1574	35.8230	0.1352	35.8008
R35	1.2000	0.5504	36.1656	0.4338	36.0490	R70	-	0.1463	35.8120	0.1218	35.7874

Notes:

- The number of decimal places is shown so the readers can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

- The PPR assessment only contains modelled results for Receptors 1 to 42. Receptors 43 to 70 were added for subsequent assessments.

PPR, BAU and MOD6 operational scenarios – Predicted annual average PM_{10}

Table B.4: Predicted annual average PM_{10} concentration (µg/m³) for the PPR, BAU and MOD6 operational scenarios

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	25	n/a	25	Criterion	n/a	n/a	25	n/a	25
R1	0.4000	0.4481	13.1405	0.3731	13.0655	R36	0.4000	0.3748	13.2370	0.2819	13.1441
R2	0.5000	0.5378	13.2331	0.4254	13.1206	R37	0.4000	0.3481	13.2344	0.2700	13.1564
R3	0.8000	0.8014	13.3074	0.6381	13.1442	R38	0.1000	0.1720	13.1732	0.1226	13.1237
R4	0.5000	0.4392	13.1469	0.3362	13.0439	R39	0.2000	0.1735	13.1665	0.1234	13.1165
R5	0.4000	0.3729	13.1311	0.2807	13.0389	R40	0.3000	0.3366	13.2118	0.2644	13.1396
R6	0.6000	0.3189	13.0747	0.2410	12.9968	R41	0.3000	0.4081	13.2348	0.3235	13.1503
R7	0.2000	0.1733	13.1444	0.1387	13.1098	R42	0.4000	0.4614	13.2449	0.3604	13.1440
R8	0.4000	0.3643	13.2073	0.2777	13.1207	R43	-	0.4704	13.3247	0.3910	13.2453
R9	0.3000	0.3010	13.2005	0.2337	13.1333	R44	-	0.0960	13.0378	0.0705	13.0124
R10	0.2000	0.2864	13.1968	0.2204	13.1308	R45	-	0.2154	13.0771	0.1614	13.0231
R11	0.3000	0.2705	13.1047	0.2025	13.0368	R46	-	0.1220	13.0422	0.0886	13.0088
R12	0.2000	0.2179	13.0879	0.1630	13.0329	R47	-	0.2228	13.1777	0.1677	13.1226
R13	0.2000	0.1871	13.0757	0.1398	13.0284	R48	-	0.1069	13.1439	0.0815	13.1185
R14	0.2000	0.1831	13.1585	0.1397	13.1150	R49	-	0.0596	13.1219	0.0454	13.1078
R15	0.1000	0.0809	13.1289	0.0613	13.1094	R50	-	0.2738	13.1572	0.2041	13.0875
R16	0.1000	0.0942	13.1375	0.0720	13.1153	R51	-	0.1865	13.0699	0.1412	13.0247
R17	0.1000	0.1538	13.1498	0.1189	13.1149	R52	-	0.2067	13.0901	0.1565	13.0400
R18	0.1000	0.1561	13.0609	0.1133	13.0181	R53	-	0.1475	12.9310	0.1071	12.8905
R19	0.1000	0.0675	13.1265	0.0513	13.1103	R54	-	0.1295	13.0130	0.1021	12.9856

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	25	n/a	25	Criterion	n/a	n/a	25	n/a	25
R20	0.1000	0.0701	13.1258	0.0540	13.1097	R55	-	0.0658	12.8492	0.0482	12.8317
R21	0.6000	0.5051	13.1578	0.4021	13.0549	R56	-	0.0730	12.9564	0.0534	12.9368
R22	0.6000	0.5116	13.1598	0.3982	13.0463	R57	-	0.1175	12.9009	0.0901	12.8736
R23	0.6000	0.5294	13.1765	0.4096	13.0567	R58	-	0.0625	12.9460	0.0482	12.9317
R24	0.7000	0.5432	13.2039	0.4332	13.0939	R59	-	0.0362	12.8196	0.0268	12.8103
R25	0.4000	0.3350	13.0939	0.2678	13.0267	R60	-	0.1356	13.0190	0.1034	12.9868
R26	0.8000	0.6662	13.3098	0.5478	13.1914	R61	-	0.0684	12.8519	0.0482	12.8317
R27	1.0000	1.0421	13.6214	1.0271	13.6064	R62	-	0.1269	12.9104	0.0890	12.8725
R28	0.8000	0.9952	13.6383	0.9032	13.5463	R63	-	0.0861	12.9696	0.0678	12.9513
R29	0.7000	0.6664	13.4139	0.6019	13.3494	R64	-	0.1070	12.9905	0.0820	12.9654
R30	0.6000	0.6833	13.4589	0.5639	13.3395	R65	-	0.2495	13.1329	0.1976	13.0811
R31	0.4000	0.3342	13.2455	0.2733	13.1846	R66	-	0.1703	13.0538	0.1304	13.0138
R32	0.3000	0.3176	13.2402	0.2564	13.1790	R67	-	0.1786	13.0621	0.1370	13.0205
R33	0.3000	0.4349	13.3137	0.3386	13.2174	R68	-	0.1624	12.9459	0.1250	12.9085
R34	0.4000	0.4292	13.2356	0.3248	13.1311	R69	-	0.1273	12.9107	0.0960	12.8795
R35	0.4000	0.3977	13.2361	0.2924	13.1308	R70	-	0.1318	12.9153	0.0987	12.8822

Notes:

- The number of decimal places is shown so the readers can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

- The PPR assessment only contains modelled results for Receptors 1 to 42. Receptors 43 to 70 were added for subsequent assessments.

PPR, BAU and MOD6 operational scenarios – Predicted maximum 24-hour average PM_{10}

Table B.5: Predicted maximum 24-hour average PM_{10} concentration (µg/m³) for the PPR, BAU and MOD6 operational scenarios

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	50	n/a	50	Criterion	n/a	n/a	50	n/a	50
R1	2.5000	2.7106	36.2146	2.3858	36.1458	R36	1.6000	2.8806	45.7813	2.4337	45.7434
R2	3.1000	5.0692	45.6505	4.5000	45.6469	R37	1.9000	2.5176	45.5316	1.9967	45.5141
R3	5.1000	5.2081	37.6258	4.6228	37.6999	R38	1.4000	1.3605	45.8523	1.5421	45.8505
R4	3.1000	3.5197	36.3044	2.6820	36.2127	R39	1.3000	1.5304	36.1487	1.2523	36.1482
R5	3.1000	3.6748	36.1480	3.0438	36.1475	R40	2.0000	3.4393	36.2346	3.2959	36.2425
R6	4.7000	2.6637	45.7240	2.0070	45.7226	R41	2.1000	3.0409	36.3621	2.7391	36.3563
R7	1.2000	1.9978	45.9010	1.7502	45.8941	R42	2.1000	3.8493	46.6449	3.4527	46.6059
R8	2.3000	2.5154	46.1348	1.9911	46.1274	R43	-	2.7302	46.2490	2.4865	46.2735
R9	1.6000	2.1332	46.1439	1.9076	46.0849	R44	-	0.6792	45.9382	0.5258	45.9370
R10	1.4000	2.0076	36.2523	1.7981	36.2555	R45	-	1.2936	36.1285	1.0300	36.1278
R11	2.2000	2.6181	45.9561	1.8822	45.9545	R46	-	1.2789	36.1159	0.9713	36.1155
R12	1.9000	1.5658	36.1196	1.1306	36.1189	R47	-	1.3093	46.0913	1.0627	46.0399
R13	1.8000	1.2738	45.9118	0.9423	45.9099	R48	-	0.8871	45.7048	0.8840	45.6923
R14	1.0000	1.5108	36.1577	1.2702	36.1623	R49	-	0.5119	45.7314	0.3927	45.7184
R15	0.6000	0.7405	36.1598	0.5959	36.1552	R50	-	1.6312	45.8963	1.4928	45.8446
R16	0.8000	0.8574	36.1873	0.9298	36.1840	R51	-	1.4825	45.9830	1.2440	45.9234
R17	0.9000	1.3584	36.2169	1.1059	36.2059	R52	-	1.6223	46.0005	1.3630	45.9368
R18	1.0000	1.6971	36.1254	1.3058	36.1249	R53	-	1.6022	36.1206	1.2265	36.1202
R19	0.6000	0.8543	36.1615	0.8603	36.1573	R54	-	1.1475	45.8539	1.0310	45.8177

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	50	n/a	50	Criterion	n/a	n/a	50	n/a	50
R20	0.6000	0.7188	45.7114	0.5641	45.7044	R55	-	0.9168	36.1204	0.7584	36.1199
R21	3.5000	2.8286	45.8183	3.0228	45.8152	R56	-	0.8870	45.7094	0.6579	45.7033
R22	4.1000	2.9948	45.7326	2.6007	45.7285	R57	-	1.2655	36.1245	0.9288	36.1241
R23	4.0000	2.7555	36.1070	2.3419	36.1084	R58	-	0.5725	45.7799	0.5083	45.7719
R24	5.0000	2.8825	45.8712	2.5759	45.8639	R59	-	0.4148	36.1174	0.2730	36.1172
R25	2.3000	1.9529	45.8541	1.6580	45.8515	R60	-	1.0895	45.7971	0.8160	45.7859
R26	6.3000	3.8962	45.9221	3.6704	45.9132	R61	-	0.6026	36.1193	0.3868	36.1188
R27	7.4000	6.0472	46.7060	6.4369	46.9197	R62	-	1.0896	36.1227	0.6813	36.1222
R28	4.7000	6.6168	46.1547	6.3830	46.3039	R63	-	0.7406	45.8140	0.6651	45.7800
R29	3.8000	3.7467	46.2646	4.0163	46.3435	R64	-	0.8018	45.7086	0.6311	45.7000
R30	3.0000	4.4027	46.1655	3.9679	46.2185	R65	-	1.2733	45.8794	1.5787	45.8684
R31	2.3000	1.9338	46.0167	1.9922	46.0418	R66	-	1.3553	45.8237	1.0363	45.8262
R32	1.8000	1.7877	46.2021	1.7952	46.1955	R67	-	1.4600	45.8277	1.1279	45.8284
R33	3.0000	3.3741	46.0015	2.4848	45.9897	R68	-	1.0043	36.1269	0.8035	36.1261
R34	1.8000	3.5195	36.6988	3.0751	36.6305	R69	-	0.9792	36.1247	0.7089	36.1240
R35	2.2000	2.3080	45.9672	1.8500	45.9013	R70	-	0.8687	36.1232	0.6782	36.1225

Notes:

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- The PPR assessment only contains modelled results for Receptors 1 to 42. Receptors 43 to 70 were added for subsequent assessments.

PPR, BAU and MOD6 operational scenarios – Predicted annual average $PM_{2.5}$

Table B.6: Predicted incremental annual average $PM_{2.5}$ concentrations (µg/m³) for the PPR, BAU and MOD6 operational scenarios

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Increment + background	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	8	n/a	8	Criterion	n/a	n/a	8	n/a	8
R1	0.1200	0.1354	5.3688	0.1306	5.3641	R36	0.1000	0.1217	5.4156	0.0980	5.3920
R2	0.1300	0.1424	5.3707	0.1351	5.3634	R37	0.1000	0.1131	5.4133	0.0927	5.3929
R3	0.2400	0.2079	5.3887	0.2011	5.3819	R38	0.0400	0.0477	5.3730	0.0410	5.3663
R4	0.1700	0.1199	5.3483	0.1111	5.3394	R39	0.0400	0.0491	5.3725	0.0419	5.3652
R5	0.1300	0.1025	5.3426	0.0931	5.3333	R40	0.0900	0.0995	5.3914	0.0882	5.3802
R6	0.1400	0.0877	5.3276	0.0777	5.3176	R41	0.1000	0.1229	5.4026	0.1071	5.3867
R7	0.0500	0.0540	5.3712	0.0480	5.3652	R42	0.1000	0.1390	5.4068	0.1176	5.3853
R8	0.1100	0.1009	5.3856	0.0894	5.3740	R43	-	0.1532	5.4481	0.1223	5.4173
R9	0.0800	0.0877	5.3859	0.0769	5.3751	R44	-	0.0299	5.3147	0.0261	5.3109
R10	0.0700	0.0878	5.3890	0.0748	5.3760	R45	-	0.0641	5.3289	0.0573	5.3221
R11	0.0700	0.0760	5.3351	0.0686	5.3277	R46	-	0.0362	5.3157	0.0315	5.3110
R12	0.0500	0.0648	5.3317	0.0579	5.3249	R47	-	0.0732	5.3862	0.0603	5.3733
R13	0.0400	0.0564	5.3279	0.0501	5.3216	R48	-	0.0350	5.3692	0.0288	5.3631
R14	0.0500	0.0598	5.3770	0.0508	5.3679	R49	-	0.0199	5.3602	0.0165	5.3568
R15	0.0200	0.0278	5.3639	0.0233	5.3594	R50	-	0.0887	5.3874	0.0726	5.3712
R16	0.0300	0.0308	5.3667	0.0255	5.3613	R51	-	0.0579	5.3565	0.0492	5.3478
R17	0.0400	0.0519	5.3742	0.0440	5.3664	R52	-	0.0633	5.3620	0.0539	5.3525
R18	0.0300	0.0456	5.3214	0.0399	5.3156	R53	-	0.0433	5.2919	0.0378	5.2864
R19	0.0200	0.0219	5.3616	0.0182	5.3578	R54	-	0.0448	5.3435	0.0384	5.3370

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Increment + background	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	8	n/a	8	Criterion	n/a	n/a	8	n/a	8
R20	0.0200	0.0244	5.3624	0.0206	5.3585	R55	-	0.0217	5.2704	0.0184	5.2670
R21	0.1600	0.1589	5.3854	0.1442	5.3706	R56	-	0.0240	5.3227	0.0202	5.3189
R22	0.1800	0.1652	5.3902	0.1441	5.3691	R57	-	0.0376	5.2862	0.0322	5.2808
R23	0.1700	0.1779	5.4020	0.1522	5.3763	R58	-	0.0218	5.3205	0.0186	5.3173
R24	0.1900	0.1897	5.4131	0.1639	5.3874	R59	-	0.0117	5.2603	0.0100	5.2587
R25	0.1100	0.1132	5.3595	0.0982	5.3445	R60	-	0.0441	5.3428	0.0363	5.3349
R26	0.2000	0.2463	5.4553	0.2169	5.4260	R61	-	0.0208	5.2695	0.0177	5.2663
R27	0.2500	0.3104	5.5436	0.2799	5.5131	R62	-	0.0365	5.2851	0.0311	5.2798
R28	0.2100	0.3061	5.5576	0.2488	5.5003	R63	-	0.0290	5.3277	0.0253	5.3240
R29	0.1900	0.2129	5.4812	0.1833	5.4516	R64	-	0.0345	5.3332	0.0283	5.3269
R30	0.1500	0.2228	5.5018	0.1680	5.4470	R65	-	0.0817	5.3803	0.0663	5.3649
R31	0.1000	0.1094	5.4157	0.0901	5.3964	R66	-	0.0554	5.3541	0.0457	5.3443
R32	0.0900	0.1039	5.4140	0.0837	5.3937	R67	-	0.0582	5.3568	0.0478	5.3464
R33	0.0900	0.1302	5.4422	0.1015	5.4135	R68	-	0.0516	5.3002	0.0458	5.2945
R34	0.1000	0.1358	5.4100	0.1118	5.3860	R69	-	0.0418	5.2904	0.0364	5.2850
R35	0.1000	0.1268	5.4127	0.1011	5.3870	R70	-	0.0407	5.2893	0.0359	5.2845

Notes:

- The number of decimal places is shown so the readers can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

- The PPR assessment only contains modelled results for Receptors 1 to 42. Receptors 43 to 70 were added for subsequent assessments.

PPR, BAU and MOD6 operational scenarios – Predicted maximum 24-hour average $PM_{2.5}$

Table B.7: Predicted maximum 24-hour average $PM_{2.5}$ concentrations (µg/m^3) for the PPR, BAU and MOD6 operational scenarios

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Increment + background	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	25	n/a	25	Criterion	n/a	n/a	25	n/a	25
R1	1.0000	0.9747	14.7834	0.9061	14.7842	R36	0.6000	0.9286	18.8150	0.8653	18.8055
R2	1.1000	1.1469	14.7837	1.0622	14.7844	R37	0.5000	0.7635	18.8095	0.6915	18.8068
R3	1.5000	1.4889	14.8416	1.4767	14.8762	R38	0.4000	0.3570	18.8006	0.3406	18.8004
R4	0.9000	0.9802	14.7811	0.8611	14.7812	R39	0.4000	0.4420	18.7968	0.4237	18.7964
R5	0.9000	1.0855	14.7803	1.0225	14.7803	R40	0.4000	1.2118	18.8453	1.1759	18.8427
R6	1.6000	0.7364	14.7788	0.6683	14.7787	R41	0.5000	1.1044	18.8471	1.0605	18.8515
R7	0.5000	0.6351	18.7872	0.6073	18.7857	R42	0.5000	1.2956	18.8448	1.2652	18.8445
R8	0.8000	0.7317	18.7741	0.6983	18.7730	R43	-	0.9495	18.8554	0.8318	18.8537
R9	0.5000	0.7152	18.8119	0.6736	18.8073	R44	-	0.2128	14.7816	0.2160	14.7815
R10	0.3000	0.6788	18.8350	0.6686	18.8377	R45	-	0.4365	14.7815	0.3934	14.7815
R11	0.6000	0.6735	14.7812	0.6090	14.7812	R46	-	0.4204	14.7814	0.3775	14.7814
R12	0.6000	0.4485	14.7819	0.3990	14.7818	R47	-	0.4182	18.8195	0.3829	18.8101
R13	0.5000	0.4105	14.7818	0.3697	14.7818	R48	-	0.2527	18.8138	0.2477	18.8106
R14	0.2000	0.5408	18.8231	0.5089	18.8248	R49	-	0.1484	18.8084	0.1325	18.8060
R15	0.1000	0.2475	18.8122	0.2286	18.8080	R50	-	0.4599	18.8596	0.4418	18.8491
R16	0.2000	0.2446	18.8111	0.2478	18.8082	R51	-	0.5349	18.8687	0.4947	18.8658
R17	0.2000	0.4520	18.8214	0.4166	18.8146	R52	-	0.5600	18.8728	0.5247	18.8697
R18	0.3000	0.5401	14.7815	0.4873	14.7814	R53	-	0.5117	14.7818	0.4607	14.7818

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Increment + background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Increment + background	Incremental	Cumulative (Incremental + background)
Criterion	n/a	n/a	25	n/a	25	Criterion	n/a	n/a	25	n/a	25
R19	0.2000	0.2090	18.8074	0.2099	18.8053	R54	-	0.3973	18.8464	0.3903	18.8402
R20	0.1000	0.2724	18.8086	0.2478	18.8072	R55	-	0.3109	14.7817	0.2795	14.7816
R21	1.4000	0.9784	14.7837	0.8719	14.7845	R56	-	0.2581	18.8047	0.2340	18.8040
R22	1.4000	1.0239	14.7838	0.8879	14.7842	R57	-	0.3403	14.7833	0.3179	14.7832
R23	1.1000	0.9734	14.7838	0.8885	14.7840	R58	-	0.1860	18.8259	0.1691	18.8245
R24	1.5000	1.1925	14.7843	1.0350	14.7843	R59	-	0.1321	14.7806	0.1126	14.7806
R25	0.7000	0.7573	14.7826	0.6953	14.7826	R60	-	0.3347	18.8272	0.2892	18.8237
R26	1.8000	1.8022	14.7918	1.6030	14.7862	R61	-	0.1556	14.7813	0.1409	14.7812
R27	2.3000	2.0047	18.8934	1.7737	18.9368	R62	-	0.2627	14.7826	0.2558	14.7825
R28	1.6000	2.2321	18.8859	1.9437	18.9105	R63	-	0.2743	18.8302	0.2672	18.8276
R29	1.3000	1.4099	18.8605	1.3841	18.8757	R64	-	0.2710	18.8014	0.2216	18.7992
R30	1.0000	1.5146	18.8653	1.1927	18.8710	R65	-	0.4981	18.8496	0.4652	18.8434
R31	0.7000	0.7202	18.8348	0.6670	18.8374	R66	-	0.4210	18.8369	0.3793	18.8359
R32	0.6000	0.6540	18.8441	0.5888	18.8366	R67	-	0.4408	18.8375	0.3957	18.8357
R33	1.0000	0.9595	18.8121	0.7245	18.8095	R68	-	0.3050	14.7958	0.3063	14.7952
R34	0.5000	1.1759	18.8434	1.1032	18.8235	R69	-	0.3240	14.7833	0.3071	14.7829
R35	0.6000	0.7058	18.8308	0.6860	18.8129	R70	-	0.2956	14.7826	0.2670	14.7826

Notes:

- The number of decimal places is shown so the readers can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

- The PPR assessment only contains modelled results for Receptors 1 to 42. Receptors 43 to 70 were added for subsequent assessments.

PPR, BAU and MOD6 operational scenarios – Predicted monthly average deposited dust

Table B.8: Predicted incremental and cumulative monthly average deposited dust (g/m^2/month) for the PPR, BAU and MOD6 operational scenarios

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Incremental +background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Incremental + background)	Incremental	Cumulative (Incremental + background)
Criterion	2	2	4	2	4	Criterion	2	2	4	2	4
R1	0.1900	0.1332	1.1867	0.1401	1.1935	R36	0.1600	0.1011	0.4850	0.0934	0.4774
R2	0.1800	0.1638	1.2121	0.1640	1.2123	R37	0.1600	0.0908	0.4811	0.0916	0.4819
R3	0.3200	0.2858	1.2866	0.2804	1.2812	R38	0.0300	0.0345	0.8298	0.0284	0.8237
R4	0.2500	0.1165	1.1649	0.1038	1.1521	R39	0.0400	0.0358	0.8291	0.0298	0.8231
R5	0.1600	0.0869	1.1470	0.0751	1.1352	R40	0.1100	0.0967	0.4787	0.0862	0.4681
R6	0.1700	0.0808	1.1407	0.0639	1.1238	R41	0.1300	0.1188	0.4885	0.1075	0.4772
R7	0.0400	0.0389	0.8261	0.0336	0.8208	R42	0.1500	0.1436	0.5013	0.1298	0.4875
R8	0.1200	0.0958	0.8504	0.0809	0.8356	R43	-	0.1429	3.2879	0.1673	3.3123
R9	0.0900	0.0795	0.4676	0.0692	0.4573	R44	-	0.0200	0.9048	0.0182	0.9030
R10	0.0900	0.0776	0.4688	0.0697	0.4609	R45	-	0.0466	0.9114	0.0435	0.9083
R11	0.0800	0.0599	1.1390	0.0526	1.1317	R46	-	0.0222	0.9016	0.0185	0.8980
R12	0.0600	0.0463	0.9133	0.0432	0.9102	R47	-	0.0612	0.4642	0.0563	0.4593
R13	0.0500	0.0394	0.9109	0.0367	0.9082	R48	-	0.0258	0.4500	0.0249	0.4491
R14	0.0500	0.0467	0.4538	0.0415	0.4486	R49	-	0.0135	0.4438	0.0127	0.4430
R15	0.0200	0.0179	0.4440	0.0162	0.4422	R50	-	0.0770	3.2257	0.0707	3.2193
R16	0.0300	0.0221	0.4480	0.0213	0.4471	R51	-	0.0467	0.4353	0.0410	0.4297
R17	0.0500	0.0396	0.4520	0.0352	0.4476	R52	-	0.0520	0.4406	0.0457	0.4343
R18	0.0200	0.0295	0.9053	0.0250	0.9007	R53	-	0.0276	0.8763	0.0233	0.8720

Receptor ID	PPR	BAU		MOD6 Operational		Receptor ID	PPR	BAU		MOD6 Operational	
		Incremental	Cumulative (Incremental +background)	Incremental	Cumulative (Incremental + background)			Incremental	Cumulative (Incremental + background)	Incremental	Cumulative (Incremental + background)
Criterion	2	2	4	2	4	Criterion	2	2	4	2	4
R19	0.0200	0.0147	0.4444	0.0140	0.4436	R54	-	0.0327	3.1814	0.0293	3.1780
R20	0.0200	0.0151	0.4430	0.0138	0.4418	R55	-	0.0106	0.3992	0.0091	0.3978
R21	0.2800	0.1413	1.1877	0.1454	1.1919	R56	-	0.0123	0.4009	0.0105	0.3991
R22	0.3200	0.1413	1.1862	0.1420	1.1870	R57	-	0.0221	0.4107	0.0189	0.4075
R23	0.3100	0.1521	1.1962	0.1489	1.1929	R58	-	0.0119	0.4005	0.0106	0.3992
R24	0.3700	0.1644	1.2079	0.1635	1.2070	R59	-	0.0058	0.8544	0.0053	0.8539
R25	0.1700	0.0940	1.1603	0.0943	1.1606	R60	-	0.0345	3.1832	0.0338	3.1824
R26	0.4300	0.2054	1.2345	0.2064	1.2355	R61	-	0.0120	0.7806	0.0098	0.7785
R27	0.4700	0.3167	3.3998	0.4744	3.5576	R62	-	0.0240	0.7927	0.0196	0.7883
R28	0.3700	0.2939	3.3954	0.3895	3.4909	R63	-	0.0174	0.7861	0.0151	0.7837
R29	0.3400	0.1982	3.3165	0.2654	3.3837	R64	-	0.0265	1.6352	0.0256	1.6343
R30	0.2600	0.2028	3.3318	0.2354	3.3644	R65	-	0.0697	3.2183	0.0739	3.2225
R31	0.1600	0.0954	3.2516	0.1086	3.2649	R66	-	0.0444	3.1931	0.0438	3.1924
R32	0.1500	0.0939	3.2539	0.1033	3.2633	R67	-	0.0467	3.1953	0.0465	3.1951
R33	0.1500	0.1319	1.7539	0.1165	1.7385	R68	-	0.0422	0.8908	0.0412	0.8898
R34	0.1500	0.1344	0.4986	0.1205	0.4847	R69	-	0.0337	0.8823	0.0325	0.8811
R35	0.1600	0.1185	0.4944	0.1058	0.4818	R70	-	0.0275	0.8762	0.0255	0.8742

Notes:

- The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

- The PPR assessment only contains modelled results for Receptors 1 to 42. Receptors 43 to 70 were added for subsequent assessments.

MOD6 Construction and MOD4 scenarios – Predicted annual average lead (as TSP) concentrations

Table B.9: Predicted incremental and cumulative annual average lead (as TSP) concentrations (µg/m^3) for MOD6 construction scenario and MOD4 updated assessment

Receptor ID	MOD4 mine increment	MOD6 Construction		Receptor ID	MOD4 mine increment	MOD6 Construction	
		MOD6 mine increment	Cumulative (Incremental + background)			MOD6 mine increment	Cumulative (Incremental + background)
Criterion	n/a	n/a	0.5	Criterion	n/a	n/a	0.5
R1	0.0080	0.0085	0.2317	R36	0.0072	0.0086	0.2320
R2	0.0106	0.0084	0.2296	R37	0.0062	0.0078	0.2321
R3	0.0187	0.0152	0.2293	R38	0.0034	0.0030	0.2299
R4	0.0103	0.0073	0.2285	R39	0.0036	0.0032	0.2299
R5	0.0082	0.0062	0.2287	R40	0.0069	0.0056	0.2295
R6	0.0089	0.0065	0.2284	R41	0.0085	0.0069	0.2294
R7	0.0038	0.0036	0.2300	R42	0.0094	0.0084	0.2301
R8	0.0083	0.0072	0.2296	R43	0.0063	0.0098	0.2338
R9	0.0066	0.0056	0.2297	R44	0.0019	0.0017	0.2299
R10	0.0061	0.0055	0.2299	R45	0.0043	0.0036	0.2297
R11	0.0055	0.0044	0.2294	R46	0.0026	0.0021	0.2296
R12	0.0041	0.0036	0.2299	R47	0.0045	0.0047	0.2306
R13	0.0035	0.0032	0.2300	R48	0.0019	0.0021	0.2303
R14	0.0040	0.0039	0.2302	R49	0.0009	0.0009	0.2301
R15	0.0014	0.0014	0.2301	R50	0.0005	0.0062	0.2305
R16	0.0016	0.0017	0.2302	R51	0.0004	0.0036	0.2279
R17	0.0031	0.0032	0.2303	R52	0.0004	0.0038	0.2281
R18	0.0031	0.0026	0.2297	R53	0.0002	0.0025	0.2268
R19	0.0011	0.0011	0.2301	R54	0.0002	0.0026	0.2269
R20	0.0011	0.0011	0.2301	R55	0.0001	0.0012	0.2255
R21	0.0080	0.0099	0.2329	R56	0.0001	0.0012	0.2255
R22	0.0079	0.0106	0.2336	R57	0.0002	0.0024	0.2267
R23	0.0083	0.0127	0.2352	R58	0.0001	0.0010	0.2252
R24	0.0090	0.0140	0.2359	R59	0.0000	0.0005	0.2248
R25	0.0055	0.0072	0.2324	R60	0.0002	0.0027	0.2270
R26	0.0112	0.0193	0.2388	R61	0.0001	0.0012	0.2255
R27	0.0160	0.0227	0.2396	R62	0.0002	0.0024	0.2267
R28	0.0153	0.0192	0.2387	R63	0.0001	0.0016	0.2259
R29	0.0106	0.0150	0.2358	R64	0.0002	0.0020	0.2263
R30	0.0103	0.0131	0.2355	R65	0.0005	0.0053	0.2296

Receptor ID	MOD4 mine increment	MOD6 Construction		Receptor ID	MOD4 mine increment	MOD6 Construction	
		MOD6 mine increment	Cumulative (Incremental + background)			MOD6 mine increment	Cumulative (Incremental + background)
Criterion	n/a	n/a	0.5	Criterion	n/a	n/a	0.5
R31	0.0058	0.0075	0.2324	R66	0.0003	0.0037	0.2280
R32	0.0053	0.0068	0.2322	R67	0.0003	0.0038	0.2281
R33	0.0048	0.0073	0.2332	R68	0.0004	0.0029	0.2272
R34	0.0085	0.0086	0.2310	R69	0.0003	0.0024	0.2267
R35	0.0079	0.0087	0.2316	R70	0.0002	0.0023	0.2266

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

MOD6 Construction and MOD4 scenarios – Predicted annual average lead deposition

Table B.10: Predicted incremental and cumulative annual average lead deposition (as total particulate) (g/m^2/month) for MOD6 construction scenario and MOD4 updated assessment

Receptor ID	MOD4 mine increment	MOD6 Construction mine increment	Receptor ID	MOD4 mine increment	MOD6 Construction mine increment
Criterion	n/a	n/a	Criterion	n/a	n/a
R1	0.0187	0.0215	R36	0.0118	0.0197
R2	0.0226	0.0236	R37	0.0119	0.0187
R3	0.0347	0.0449	R38	0.0041	0.0057
R4	0.0206	0.0182	R39	0.0043	0.0060
R5	0.0139	0.0141	R40	0.0127	0.0134
R6	0.0134	0.0131	R41	0.0151	0.0176
R7	0.0047	0.0068	R42	0.0168	0.0238
R8	0.0126	0.0157	R43	0.0056	0.0259
R9	0.0095	0.0122	R44	0.0027	0.0034
R10	0.0095	0.0125	R45	0.0065	0.0081
R11	0.0084	0.0098	R46	0.0027	0.0039
R12	0.0065	0.0081	R47	0.0074	0.0113
R13	0.0054	0.0070	R48	0.0035	0.0049
R14	0.0055	0.0079	R49	0.0019	0.0024
R15	0.0023	0.0032	R50	0.0091	0.0145
R16	0.0030	0.0041	R51	0.0058	0.0073
R17	0.0047	0.0070	R52	0.0065	0.0079
R18	0.0036	0.0051	R53	0.0034	0.0048
R19	0.0020	0.0027	R54	0.0040	0.0058
R20	0.0020	0.0026	R55	0.0011	0.0020
R21	0.0188	0.0251	R56	0.0014	0.0021
R22	0.0188	0.0267	R57	0.0024	0.0040
R23	0.0213	0.0314	R58	0.0014	0.0020
R24	0.0253	0.0357	R59	0.0007	0.0010
R25	0.0125	0.0178	R60	0.0047	0.0066
R26	0.0342	0.0474	R61	0.0013	0.0021
R27	0.0501	0.0596	R62	0.0028	0.0042
R28	0.0466	0.0483	R63	0.0020	0.0030
R29	0.0317	0.0402	R64	0.0036	0.0048
R30	0.0315	0.0335	R65	0.0099	0.0132
R31	0.0141	0.0191	R66	0.0059	0.0086
R32	0.0136	0.0174	R67	0.0063	0.0090

Receptor ID	MOD4 mine increment	MOD6 Construction mine increment	Receptor ID	MOD4 mine increment	MOD6 Construction mine increment
Criterion	**n/a**	**n/a**	**Criterion**	**n/a**	**n/a**
R33	0.0144	0.0196	R68	0.0059	0.0073
R34	0.0146	0.0238	R69	0.0047	0.0059
R35	0.0128	0.0216	R70	0.0037	0.0049

Notes:

- The number of decimal places is shown so the readers can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

- The background annual lead deposition rates adopted for this assessment are 0 g/m^2/year. As such, there is no difference between the incremetal and cumulative results.

MOD6 Construction and MOD4 scenarios – Predicted annual average TSP

Table B.11: Predicted incremental and cumulative annual average TSP concentrations (µg/m^3) for MOD6 construction scenario and MOD4 updated assessment

Receptor ID	MOD4 mine increment	MOD6 Construction		Receptor ID	MOD4 mine increment	MOD6 Construction	
		Mine increment	Cumulative (Incremental + background)			Mineincrement	Cumulative (Incremental + background)
Criterion	n/a	n/a	90	Criterion	n/a	n/a	90
R1	0.3553	0.5251	36.1296	R36	0.3012	0.4985	36.1354
R2	0.4422	0.5882	36.1277	R37	0.2644	0.4687	36.1392
R3	0.7510	1.1459	36.4178	R38	0.1345	0.1598	35.9400
R4	0.4177	0.4639	36.0156	R39	0.1396	0.1657	35.9410
R5	0.3253	0.3594	35.9694	R40	0.2816	0.3300	35.9879
R6	0.3468	0.3516	35.9366	R41	0.3484	0.4006	36.0022
R7	0.1499	0.1794	35.9444	R42	0.3883	0.4786	36.0511
R8	0.3302	0.3953	35.9998	R43	0.1174	0.5870	36.2299
R9	0.2598	0.3111	35.9831	R44	0.0730	0.0868	35.9199
R10	0.2466	0.2908	35.9749	R45	0.1611	0.1990	35.9454
R11	0.2190	0.2513	35.9555	R46	0.0935	0.1037	35.9111
R12	0.1625	0.1986	35.9544	R47	0.1778	0.2583	35.9971
R13	0.1405	0.1717	35.9466	R48	0.0795	0.1112	35.9436
R14	0.1586	0.1963	35.9541	R49	0.0379	0.0522	35.9191
R15	0.0562	0.0718	35.9222	R50	0.2260	0.3405	36.0061
R16	0.0675	0.0926	35.9353	R51	0.1595	0.1884	35.8541
R17	0.1247	0.1647	35.9538	R52	0.1747	0.2037	35.8693
R18	0.1216	0.1343	35.9235	R53	0.1146	0.1266	35.7922
R19	0.0454	0.0601	35.9210	R54	0.1029	0.1358	35.8014
R20	0.0449	0.0578	35.9191	R55	0.0475	0.0571	35.7227
R21	0.3642	0.6124	36.2043	R56	0.0518	0.0590	35.7246
R22	0.3610	0.6383	36.2291	R57	0.0943	0.1175	35.7831
R23	0.3734	0.7351	36.3107	R58	0.0407	0.0509	35.7166
R24	0.3936	0.8148	36.3724	R59	0.0202	0.0245	35.6901
R25	0.2419	0.4228	36.1166	R60	0.1037	0.1514	35.8170
R26	0.4746	0.9961	36.4769	R61	0.0528	0.0598	35.7254
R27	0.9458	1.3177	36.5891	R62	0.1039	0.1180	35.7836
R28	1.0626	1.1365	36.5393	R63	0.0672	0.0790	35.7446
R29	0.5238	0.8926	36.4017	R64	0.0778	0.1098	35.7754
R30	0.6340	0.7850	36.3475	R65	0.1948	0.3045	35.9701
R31	0.2637	0.4419	36.1352	R66	0.1381	0.2050	35.8706

Receptor ID	MOD4 mine increment	MOD6 Construction		Receptor ID	MOD4 mine increment	MOD6 Construction	
		Mine increment	Cumulative (Incremental + background)			Mineincrement	Cumulative (Incremental + background)
Criterion	n/a	n/a	90	Criterion	n/a	n/a	90
R32	0.2546	0.3996	36.1125	R67	0.1390	0.2134	35.8790
R33	0.2493	0.4782	36.2029	R68	0.1249	0.1672	35.8328
R34	0.3565	0.4835	36.0797	R69	0.1006	0.1375	35.8032
R35	0.3292	0.5043	36.1196	R70	0.0994	0.1214	35.7870

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

MOD6 Construction and MOD4 scenarios – Predicted annual and maximum 24-hour average PM_{10}

Table B.12: Predicted annualand maximum 24-hour average PM_{10} concentration ($\mu g/m^3$) for MOD6 construction scenario and MOD4 updated assessment

Receptor ID	Annual Average			Maximum 24-hour			Receptor ID	Annual Average			Maximum 24-hour		
		MOD6 Construction			MOD6 Construction				MOD6 Construction			MOD6 Construction	
	MOD4 mine increme nt	Mine increment	Cumulative (Increment + background)	MOD4 mine increme nt	Mine increment	Cumulative (Increment + backgroun d)		MOD4 mine increme nt	Mine increment	Cumulative (Increment + background	MOD4 mine increme nt	Mine increment	Cumulative (Increment + background)
Criterion	n/a	n/a	25	n/a	n/a	50	Criterion	n/a	n/a	25	n/a	n/a	50
R1	0.3349	0.4096	13.1019	2.5036	3.9714	36.2266	R36	0.2590	0.3647	13.2269	1.6793	3.3181	46.1091
R2	0.3412	0.4889	13.1841	2.3785	5.0113	45.6532	R37	0.2347	0.3381	13.2244	1.6171	3.2595	45.9132
R3	0.5426	0.7870	13.2931	3.9565	5.4761	37.7194	R38	0.1070	0.1520	13.1532	1.2093	1.4181	45.8523
R4	0.3221	0.4032	13.1109	3.4064	3.5394	36.2878	R39	0.1148	0.1552	13.1483	1.2894	1.6130	36.1501
R5	0.2589	0.3374	13.0956	3.1522	3.6790	36.1502	R40	0.2421	0.3051	13.1802	2.3038	3.8177	36.2426
R6	0.2604	0.2939	13.0497	2.1103	3.6446	45.7244	R41	0.2962	0.3742	13.2009	2.7695	3.2661	36.3640
R7	0.1364	0.1612	13.1323	1.4378	1.8872	45.9018	R42	0.3450	0.4283	13.2119	3.1138	3.6845	46.6449
R8	0.2730	0.3362	13.1792	1.9028	2.9071	46.1378	R43	0.1005	0.4075	13.2618	1.1625	5.9558	46.1719
R9	0.2158	0.2760	13.1755	1.9721	2.7487	46.1564	R44	0.0618	0.0866	13.0285	0.7288	1.1873	45.9381
R10	0.2049	0.2622	13.1725	1.8020	2.5303	36.2577	R45	0.1377	0.1940	13.0556	0.9909	2.1515	36.1304
R11	0.1779	0.2434	13.0777	2.0117	2.4258	45.9563	R46	0.0806	0.1089	13.0291	1.1189	1.1943	36.1164
R12	0.1406	0.1960	13.0660	1.0952	1.9987	36.1214	R47	0.1521	0.2070	13.1619	0.9938	1.7729	46.2302
R13	0.1204	0.1682	13.0568	0.8927	1.9909	45.9118	R48	0.0708	0.0971	13.1340	0.6911	1.9592	45.6906
R14	0.1327	0.1686	13.1440	1.1371	2.2090	36.1626	R49	0.0402	0.0549	13.1173	0.4416	1.2717	45.7229
R15	0.0560	0.0729	13.1210	0.6067	0.8416	36.1606	R50	0.1862	0.2575	13.1409	1.3267	2.1375	46.0605
R16	0.0629	0.0846	13.1279	0.6375	1.2981	36.2271	R51	0.1350	0.1681	13.0515	1.3717	1.4123	45.9724
R17	0.1113	0.1446	13.1406	1.0064	2.8473	36.2171	R52	0.1479	0.1858	13.0692	1.4466	1.5442	45.9908

Receptor ID	Annual Average			Maximum 24-hour			Receptor ID	Annual Average			Maximum 24-hour		
	MOD4 mine increment	MOD6 Construction		MOD4 mine increment	MOD6 Construction			MOD4 mine increment	MOD6 Construction		MOD4 mine increment	MOD6 Construction	
		Mine increment	Cumulative (Increment + background)		Mine increment	Cumulative (Increment + background)			Mine increment	Cumulative (Increment + background)		Mine increment	Cumulative (Increment + background)
Criterion	n/a	n/a	25	n/a	n/a	50	Criterion	n/a	n/a	25	n/a	n/a	50
R18	0.1016	0.1393	13.0441	1.6091	1.6109	36.1260	R53	0.0961	0.1316	12.9150	1.5200	1.5187	36.1213
R19	0.0449	0.0608	13.1197	0.6414	1.1648	36.1880	R54	0.0946	0.1197	13.0032	1.0365	1.3659	45.8791
R20	0.0481	0.0632	13.1189	0.5208	0.6551	45.7429	R55	0.0440	0.0596	12.8431	0.7158	1.1782	36.1210
R21	0.3741	0.4669	13.1196	2.6784	4.9930	45.8224	R56	0.0498	0.0654	12.9488	0.7926	0.7907	45.7086
R22	0.3772	0.4765	13.1247	2.4515	4.6823	45.7377	R57	0.0830	0.1088	12.8922	0.8436	1.7776	36.1257
R23	0.3770	0.5003	13.1474	2.5068	6.0248	36.1815	R58	0.0440	0.0579	12.9413	0.4247	1.1149	45.7823
R24	0.3637	0.5322	13.1929	2.5112	6.9595	45.8799	R59	0.0237	0.0327	12.8162	0.2339	0.5262	36.1177
R25	0.2584	0.3158	13.0747	1.8364	4.3057	45.8573	R60	0.0897	0.1241	13.0075	0.7321	2.5143	45.7781
R26	0.3826	0.6322	13.2759	2.4264	13.0068	45.9275	R61	0.0443	0.0614	12.8449	0.6946	0.7752	36.1197
R27	0.6583	0.8857	13.4650	7.7474	14.2086	46.5502	R62	0.0790	0.1135	12.8970	0.8913	1.3336	36.1235
R28	0.6496	0.7863	13.4293	6.0291	11.4778	46.0329	R63	0.0650	0.0797	12.9631	0.6227	1.5517	45.8072
R29	0.4154	0.6087	13.3563	2.3024	9.1361	46.1555	R64	0.0720	0.0959	12.9794	0.7813	1.4804	45.7003
R30	0.4333	0.5475	13.3232	3.1442	8.6385	46.0763	R65	0.1645	0.2220	13.1054	1.0405	3.4302	45.8356
R31	0.2194	0.3061	13.2174	2.3688	4.6659	45.9667	R66	0.1118	0.1574	13.0409	0.8916	2.6013	45.8200
R32	0.2101	0.2818	13.2043	1.3199	4.0929	46.1438	R67	0.1178	0.1657	13.0491	0.9968	3.3467	45.8121
R33	0.2596	0.3378	13.2166	2.8243	3.8528	45.9891	R68	0.1108	0.1481	12.9316	0.9798	1.7092	36.1294
R34	0.3189	0.4042	13.2106	2.5495	4.8148	36.6896	R69	0.0869	0.1163	12.8998	0.9875	1.2352	36.1268
R35	0.2837	0.3882	13.2266	1.7486	10.3788	45.9982	R70	0.0844	0.1189	12.9024	0.7394	1.4303	36.1242

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

MOD6 Construction and MOD4 scenarios – Predicted annual and maximum 24-hour average $PM_{2.5}$

Table B.13: Predicted annual and maximum 24-hour average $PM_{2.5}$ concentrations (µg/m^3) for MOD6 construction scenario and MOD4 updated assessment

Receptor ID	Annual Average			Maximum 24-hour			Receptor ID	Annual Average			Maximum 24-hour		
	MOD4 mine increment	MOD6 Construction		MOD4 mine increment	MOD6 Construction			MOD4 mine increment	MOD6 Construction		MOD4 mine increment	MOD6 Construction	
		Mine increment	Cumulative (Increment + background)		Mine increment	Cumulative (Increment + background)			Mine increment	Cumulative (Increment + background)		Mine increment	Cumulative (Increment + background)
Criterion	n/a	n/a	8	n/a	n/a	25	Criterion	n/a	n/a	8	n/a	n/a	25
R1	0.0720	0.1296	5.3630	0.6746	1.3135	14.8029	R36	0.4451	0.1196	5.4136	0.4321	1.3594	18.9387
R2	0.0774	0.1448	5.3731	0.5123	1.6863	15.0324	R37	0.4343	0.1093	5.4096	0.4198	1.1631	18.9506
R3	0.1256	0.2413	5.4221	1.1291	2.4932	14.9888	R38	0.2312	0.0457	5.3710	0.2311	0.4458	18.8010
R4	0.0760	0.1232	5.3516	0.7932	1.1525	14.7841	R39	0.3195	0.0474	5.3707	0.3193	0.4974	18.7972
R5	0.0626	0.1022	5.3423	0.7944	1.2268	14.7818	R40	0.6496	0.0956	5.3876	0.6322	1.1972	18.8735
R6	0.0628	0.0872	5.3271	0.5728	1.3916	14.7798	R41	0.7942	0.1193	5.3990	0.7798	1.3210	18.8599
R7	0.0342	0.0525	5.3697	0.4039	0.6183	18.7877	R42	0.9840	0.1372	5.4049	0.9705	1.3323	18.8553
R8	0.0679	0.1015	5.3861	0.5219	1.1864	18.7770	R43	1.6632	0.1260	5.4209	0.2723	1.7223	18.8363
R9	0.0544	0.0860	5.3841	0.5650	0.8257	18.8345	R44	0.1420	0.0289	5.3137	0.2660	0.3821	14.7820
R10	0.0515	0.0852	5.3864	0.5674	1.0400	18.8471	R45	0.2856	0.0627	5.3275	0.3790	0.6854	14.7827
R11	0.0430	0.0749	5.3340	0.4763	0.8486	14.7823	R46	0.3360	0.0346	5.3141	0.3867	0.4556	14.7817
R12	0.0351	0.0634	5.3303	0.3255	0.6407	14.7831	R47	0.3350	0.0698	5.3828	0.3692	0.7454	18.8777
R13	0.0303	0.0548	5.3263	0.2669	0.6389	14.7828	R48	0.1266	0.0320	5.3662	1.5781	0.5966	18.8107
R14	0.0344	0.0578	5.3749	0.3756	0.8343	18.8337	R49	0.0781	0.0184	5.3587	1.5178	0.3730	18.8070
R15	0.0152	0.0260	5.3621	0.2006	0.3652	18.8296	R50	0.6314	0.0856	5.3842	0.6314	0.9153	18.9271
R16	0.0161	0.0282	5.3640	0.1413	0.4158	18.8086	R51	1.2090	0.0554	5.3540	1.2090	0.6611	18.8852
R17	0.0294	0.0498	5.3722	0.3185	0.8792	18.8315	R52	0.9466	0.0607	5.3593	0.9466	0.7144	18.8917

Receptor ID	Annual Average			Maximum 24-hour			Receptor ID	Annual Average			Maximum 24-hour		
	MOD4 mine increment	MOD6 Construction		MOD4 mine increment	MOD6 Construction			MOD4 mine increment	MOD6 Construction		MOD4 mine increment	MOD6 Construction	
		Mine increment	Cumulative (Increment + background)		Mine increment	Cumulative (Increment + background)			Mine increment	Cumulative (Increment + background)		Mine increment	Cumulative (Increment + background)
Criterion	n/a	n/a	8	n/a	n/a	25	Criterion	n/a	n/a	8	n/a	n/a	25
R18	0.0255	0.0438	5.3196	0.4210	0.5640	14.7819	R53	0.3863	0.0415	5.2901	0.3863	0.5335	14.7822
R19	0.0116	0.0201	5.3597	0.1167	0.3430	18.8058	R54	0.8305	0.0426	5.3412	0.8305	0.5802	18.8634
R20	0.0131	0.0228	5.3608	0.1804	0.2847	18.8230	R55	0.2114	0.0208	5.2694	0.2114	0.3618	14.7821
R21	0.0795	0.1524	5.3788	0.5408	1.4299	14.8480	R56	0.2126	0.0229	5.3215	0.2126	0.2922	18.8054
R22	0.0811	0.1585	5.3835	0.5336	1.6070	14.8668	R57	0.3013	0.0367	5.2854	0.3013	0.5149	14.7840
R23	0.0827	0.1695	5.3936	0.4621	1.9412	15.0304	R58	0.2888	0.0208	5.3194	0.2888	0.3301	18.8313
R24	0.0840	0.1811	5.4046	0.4685	2.5429	15.2048	R59	0.1011	0.0111	5.2597	0.1011	0.1916	14.7808
R25	0.0579	0.1083	5.3546	0.5335	1.3013	14.8826	R60	0.1942	0.0405	5.3392	0.1942	0.7637	18.8230
R26	0.0997	0.2322	5.4412	0.5946	3.7679	14.9068	R61	0.1985	0.0200	5.2686	0.1985	0.2585	14.7816
R27	0.1735	0.2583	5.4914	1.6473	4.0044	18.8724	R62	0.1854	0.0353	5.2839	0.1854	0.3897	14.7831
R28	0.1806	0.2308	5.4823	1.5429	3.2632	18.8641	R63	0.2244	0.0280	5.3266	0.2244	0.5568	18.8355
R29	0.1059	0.1853	5.4536	0.7889	2.8169	18.8435	R64	0.1452	0.0311	5.3297	0.1452	0.4319	18.7994
R30	0.1186	0.1653	5.4443	1.2399	2.5114	18.8454	R65	0.2242	0.0719	5.3705	0.2242	1.0312	18.8378
R31	0.0555	0.0980	5.4042	0.9819	1.3411	18.8255	R66	0.2146	0.0513	5.3499	0.2146	0.8005	18.8388
R32	0.0533	0.0896	5.3996	0.5021	1.1986	18.8276	R67	0.2381	0.0537	5.3524	0.2381	1.0128	18.8353
R33	0.0556	0.1004	5.4124	0.9369	1.1846	18.8094	R68	0.2067	0.0496	5.2983	0.2067	0.4998	14.8689
R34	0.0802	0.1331	5.4073	0.8168	1.9079	18.8609	R69	0.1642	0.0400	5.2886	0.1642	0.4654	14.8819
R35	0.0684	0.1253	5.4113	0.4657	3.0729	18.8580	R70	0.1764	0.0394	5.2881	0.1764	0.4095	14.7833

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

MOD6 Construction and MOD4 scenarios - Monthly average deposited dust

Table B.14: Predicted incremental and cumulative monthly average deposited dust (g/m^2/month) for MOD6 construction scenario and MOD4 updated assessment

Receptor ID	MOD4 mine increment	MOD6 Construction		Receptor ID	MOD4 mine increment	MOD6 Construction	
		Mine increment	Cumulative (Incremental +background)			Mine increment	Cumulative (Incremental +background)
Criterion	2	2	4	Criterion	2	2	4
R1	0.0903	0.1205	1.1740	R36	0.0670	0.1134	0.4973
R2	0.1141	0.1397	1.1880	R37	0.0603	0.1120	0.5023
R3	0.1970	0.2761	1.2769	R38	0.0249	0.0269	0.8222
R4	0.1079	0.0989	1.1472	R39	0.0262	0.0284	0.8217
R5	0.0757	0.0700	1.1302	R40	0.0681	0.0713	0.4533
R6	0.0734	0.0614	1.1213	R41	0.0856	0.0905	0.4602
R7	0.0295	0.0315	0.8187	R42	0.1048	0.1170	0.4748
R8	0.0767	0.0749	0.8295	R43	0.0285	0.1360	3.2810
R9	0.0566	0.0610	0.4492	R44	0.0148	0.0172	0.9020
R10	0.0563	0.0616	0.4527	R45	0.0359	0.0408	0.9056
R11	0.0475	0.0489	1.1281	R46	0.0166	0.0181	0.8976
R12	0.0362	0.0407	0.9076	R47	0.0420	0.0601	0.4631
R13	0.0303	0.0346	0.9061	R48	0.0184	0.0256	0.4498
R14	0.0334	0.0382	0.4453	R49	0.0096	0.0129	0.4432
R15	0.0127	0.0162	0.4422	R50	0.0525	0.0780	3.2266
R16	0.0160	0.0217	0.4475	R51	0.0333	0.0361	0.4248
R17	0.0279	0.0350	0.4474	R52	0.0372	0.0398	0.4284
R18	0.0224	0.0241	0.8999	R53	0.0209	0.0226	0.8712
R19	0.0107	0.0142	0.4438	R54	0.0228	0.0292	3.1779
R20	0.0107	0.0139	0.4418	R55	0.0076	0.0090	0.3977
R21	0.0916	0.1393	1.1857	R56	0.0089	0.0099	0.3985
R22	0.0904	0.1446	1.1895	R57	0.0161	0.0184	0.4071
R23	0.0951	0.1662	1.2103	R58	0.0084	0.0103	0.3989
R24	0.1050	0.1877	1.2312	R59	0.0042	0.0050	0.8536
R25	0.0606	0.0952	1.1615	R60	0.0243	0.0351	3.1837
R26	0.1330	0.2227	1.2518	R61	0.0087	0.0098	0.7784
R27	0.3199	0.2939	3.3771	R62	0.0175	0.0192	0.7878
R28	0.3308	0.2455	3.3470	R63	0.0126	0.0141	0.7827
R29	0.1597	0.2093	3.3276	R64	0.0200	0.0248	1.6334
R30	0.2035	0.1734	3.3024	R65	0.0506	0.0713	3.2200
R31	0.0683	0.1055	3.2617	R66	0.0309	0.0465	3.1951

Receptor ID	MOD4 mine increment	MOD6 Construction		Receptor ID	MOD4 mine increment	MOD6 Construction	
		Mine increment	Cumulative (Incremental +background)			Mine increment	Cumulative (Incremental +background)
Criterion	**2**	**2**	**4**	**Criterion**	**2**	**2**	**4**
R32	0.0707	0.0933	3.2533	R67	0.0324	0.0492	3.1978
R33	0.0756	0.1069	1.7289	R68	0.0303	0.0383	0.8870
R34	0.0952	0.1195	0.4837	R69	0.0241	0.0315	0.8802
R35	0.0805	0.1163	0.4922	R70	0.0207	0.0241	0.8727

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

Cumulative impacts associated with the Broken Hill North Mine

Table B.15: Predicted cumulative (in combination with Broken Hill North Mine) annual average PM_{10} and $PM_{2.5}$ concentrations (µg/m^3)

Receptor ID (Broken Hill North Mine Receptor ID)	MOD6 Construction			MOD6 Operational		
	MOD6 Increment	Broken Hill North Mine Increment	Cumulative (MOD6 + Broken Hill North Mine + background)	MOD6 Increment	Broken Hill North Mine Increment	Cumulative (MOD6 + Broken Hill North Mine + background)
Annual average PM_{10}						
Criterion	**n/a**	**n/a**	**25**	**n/a**	**n/a**	**25**
R2 (R38)	0.4889	0.1	13.2841	0.4254	0.1	13.2206
R11 (R34)	0.1089	0.1	13.1777	0.2025	0.1	13.1368
R17 (R28)	0.1446	0	13.1406	0.1189	0	13.1149
R18 (R30)	0.1393	0.1	13.1441	0.1133	0.1	13.1181
R23 (R15)	0.5003	0.1	13.2474	0.4096	0.1	13.1567
R24 (R14)	0.5322	0.1	13.2929	0.4332	0.1	13.1939
R32 (R12)	0.2818	0.1	13.3043	0.2564	0.1	13.279
R43 (R13)	0.4075	0.1	13.3618	0.391	0.1	13.3453
Annual average $PM_{2.5}$						
Criterion	**n/a**	**n/a**	**8**	**n/a**	**n/a**	**8**
R2 (R38)	0.1448	0.1	5.4731	0.1351	0.1	5.4634
R11 (R34)	0.0749	0.1	5.434	0.0686	0.1	5.4277
R17 (R28)	0.0498	0	5.3722	0.044	0	5.3664
R18 (R30)	0.0438	0.1	5.4196	0.0399	0.1	5.4156
R23 (R15)	0.1695	0.1	5.4936	0.1522	0.1	5.4763
R24 (R14)	0.1811	0.2	5.6046	0.1639	0.2	5.5874
R32 (R12)	0.0896	0.1	5.4996	0.0837	0.1	5.4937
R43 (R13)	0.126	0.1	5.5209	0.1223	0.1	5.5173

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

Table B.16: Predicted cumulative (in combination with Broken Hill North Mine) maximum 24-hour PM_{10} and $PM_{2.5}$ concentrations (µg/m³)

Receptor ID (Broken Hill North Mine Receptor ID)	MOD6 Construction			MOD6 Operational		
	MOD6 Increment	Broken Hill North Mine Increment	Cumulative (MOD6 + Broken Hill North Mine + background)	MOD6 Increment	Broken Hill North Mine Increment	Cumulative (MOD6 + Broken Hill North Mine + background)
Maximum 24-hour average PM_{10}						
Criterion	**n/a**	**n/a**	**50**	**n/a**	**n/a**	**50**
R2 (R38)	5.0113	1.8000	47.4532	4.5000	1.8000	47.4469
R11 (R34)	2.4258	0.6000	46.5563	1.8822	0.6000	46.5545
R17 (R28)	2.8473	0.4000	36.6171	1.1059	0.4000	36.6059
R18 (R30)	1.6109	0.4000	36.5260	1.3058	0.4000	36.5249
R23 (R15)	6.0248	1.0000	37.1815	2.3419	1.0000	37.1084
R24 (R14)	6.9595	0.7000	46.5799	2.5759	0.7000	46.5639
R32 (R12)	4.0929	0.8000	46.9438	1.7952	0.8000	46.9955
R43 (R13)	5.9558	3.2000	49.3719	2.4865	3.2000	49.4735
Maximum 24-hour average $PM_{2.5}$						
Criterion	**n/a**	**n/a**	**25**	**n/a**	**n/a**	**25**
R2 (R38)	1.6863	4.7000	19.7324	1.0622	4.7000	19.4844
R11 (R34)	0.8486	2.9000	17.6823	0.6090	2.9000	17.6812
R17 (R28)	0.8792	0.9000	19.7315	0.4166	0.9000	19.7146
R18 (R30)	0.5640	2.1000	16.8819	0.4873	2.1000	16.8814
R23 (R15)	1.9412	6.1000	21.1304	0.8885	6.1000	20.8840
R24 (R14)	2.5429	6.9000	22.1048	1.0350	6.9000	21.6843
R32 (R12)	1.1986	2.1000	20.9276	0.5888	2.1000	20.9366
R43 (R13)	1.7223	3.4000	22.2363	0.8318	3.4000	22.2537

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

Table B.17: Predicted cumulative (in combination with Broken Hill North Mine) annual average TSP, dust deposition and lead concentrations

Receptor ID	Construction year (2021)			Future operational year (2026)		
	MOD6 Increment	Broken Hill North Mine Increment	Cumulative (MOD6 + Broken Hill North Mine + background)	MOD6 Increment	Broken Hill North Mine Increment	Cumulative (MOD6 + Broken Hill North Mine + background)
Annual average TSP (μg/m^3)						
Criterion	**n/a**	**n/a**	**90**	**n/a**	**n/a**	**90**
R2 (R38)	0.5882	0.0000	35.5395	0.6711	0.0000	35.5395
R11 (R34)	0.2513	0.0000	35.7043	0.2603	0.0000	35.7043
R17 (R28)	0.1647	0.0000	35.7891	0.1569	0.0000	35.7891
R18 (R30)	0.1343	0.0000	35.7892	0.1335	0.0000	35.7892
R23 (R15)	0.7351	0.1000	35.6756	0.6507	0.1000	35.6756
R24 (R14)	0.8148	0.1000	35.6576	0.7014	0.1000	35.6576
R32 (R12)	0.3996	0.1000	35.8129	0.4066	0.1000	35.8129
R43 (R13)	0.5870	0.1000	35.7429	0.6386	0.1000	35.7429
Monthly dust deposition (g/m^2/month)						
Criterion	**2**	**2**	**4**	**2**	**2**	**4**
R2 (R38)	0.1397	0.0000	1.0483	0.1640	0.0000	1.0483
R11 (R34)	0.0489	0.0000	1.0792	0.0526	0.0000	1.0792
R17 (R28)	0.0350	0.0000	0.4124	0.0352	0.0000	0.4124
R18 (R30)	0.0241	0.0000	0.8758	0.0250	0.0000	0.8758
R23 (R15)	0.1662	0.0000	1.0441	0.1489	0.0000	1.0441
R24 (R14)	0.1877	0.0000	1.0435	0.1635	0.0000	1.0435
R32 (R12)	0.0933	0.0000	3.1600	0.1033	0.0000	3.1600
R43 (R13)	0.1360	0.0000	3.1450	0.1673	0.0000	3.1450
Annual average lead concentration (μg/m^3)						
Criterion	**n/a**	**n/a**	**0.5**	**n/a**	**n/a**	**0.5**
R2 (R38)	0.008	0.006	0.227	0.009	0.006	0.227
R11 (R34)	0.004	0.006	0.231	0.004	0.006	0.231
R17 (R28)	0.003	0.006	0.233	0.003	0.006	0.233
R18 (R30)	0.003	0.006	0.233	0.003	0.006	0.233
R23 (R15)	0.013	0.006	0.229	0.012	0.006	0.229
R24 (R14)	0.014	0.006	0.228	0.013	0.006	0.228
R32 (R12)	0.007	0.006	0.231	0.007	0.006	0.231
R43 (R13)	0.010	0.006	0.230	0.010	0.006	0.230

Note: The number of decimal places is shown so the reader can see the changes across receptors, not because this reflects the level of accuracy that may be expected from the modelling.

APPENDIX C MOD4 RESULTS

Table C.1: Modification 4 increment and whole of mine increment including baseline year 2016 for annual average lead (as TSP) concentrations (µg/m³)

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R1	0.0012	0.0080	R36	0.0006	0.0072
R2	0.0018	0.0106	R37	0.0006	0.0062
R3	0.0028	0.0187	R38	0.0003	0.0034
R4	0.0015	0.0103	R39	0.0003	0.0036
R5	0.0008	0.0082	R40	0.0008	0.0069
R6	0.0007	0.0089	R41	0.0009	0.0085
R7	0.0003	0.0038	R42	0.0011	0.0094
R8	0.0007	0.0083	R43	-	0.0063
R9	0.0006	0.0066	R44	-	0.0019
R10	0.0006	0.0061	R45	-	0.0043
R11	0.0005	0.0055	R46	-	0.0026
R12	0.0004	0.0041	R47	-	0.0045
R13	0.0003	0.0035	R48	-	0.0019
R14	0.0003	0.0040	R49	-	0.0009
R15	0.0001	0.0014	R50	-	0.0005
R16	0.0001	0.0016	R51	-	0.0004
R17	0.0003	0.0031	R52	-	0.0004
R18	0.0002	0.0031	R53	-	0.0002
R19	0.0001	0.0011	R54	-	0.0002
R20	0.0001	0.0011	R55	-	0.0001
R21	0.0011	0.0080	R56	-	0.0001
R22	0.0010	0.0079	R57	-	0.0002
R23	0.0009	0.0083	R58	-	0.0001
R24	0.0008	0.0090	R59	-	0.0000
R25	0.0006	0.0055	R60	-	0.0002
R26	0.0008	0.0112	R61	-	0.0001
R27	0.0029	0.0160	R62	-	0.0002
R28	0.0047	0.0153	R63	-	0.0001
R29	0.0014	0.0106	R64	-	0.0002
R30	0.0027	0.0103	R65	-	0.0005
R31	0.0007	0.0058	R66	-	0.0003
R32	0.0008	0.0053	R67	-	0.0003
R33	0.0008	0.0048	R68	-	0.0004
R34	0.0009	0.0085	R69	-	0.0003

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 ‘whole of mine’ increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 ‘whole of mine’ increment including baseline year 2016 and MOD4 increment
R35	0.0007	0.0079	R70	-	0.0002

Note: In the MOD4 report, values for the MOD4 increment are not present for receptors 49-70. These modelling results have been interpolated to provide the ‘whole of mine’ increment results.

Table C.2: Modification 4 increment and whole of mine increment including baseline year 2016 for annual average lead deposition (g/m^2/month)

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R1	0.005	0.0187	R36	0.002	0.0118
R2	0.006	0.0226	R37	0.002	0.0119
R3	0.010	0.0347	R38	0.001	0.0041
R4	0.005	0.0206	R39	0.001	0.0043
R5	0.002	0.0139	R40	0.003	0.0127
R6	0.002	0.0134	R41	0.004	0.0151
R7	0.001	0.0047	R42	0.004	0.0168
R8	0.002	0.0126	R43	-	0.0056
R9	0.002	0.0095	R44	-	0.0027
R10	0.002	0.0095	R45	-	0.0065
R11	0.002	0.0084	R46	-	0.0027
R12	0.001	0.0065	R47	-	0.0074
R13	0.001	0.0054	R48	-	0.0035
R14	0.001	0.0055	R49	-	0.0019
R15	0.000	0.0023	R50	-	0.0091
R16	0.001	0.0030	R51	-	0.0058
R17	0.001	0.0047	R52	-	0.0065
R18	0.001	0.0036	R53	-	0.0034
R19	0.000	0.0020	R54	-	0.0040
R20	0.000	0.0020	R55	-	0.0011
R21	0.004	0.0188	R56	-	0.0014
R22	0.004	0.0188	R57	-	0.0024
R23	0.003	0.0213	R58	-	0.0014
R24	0.003	0.0253	R59	-	0.0007
R25	0.002	0.0125	R60	-	0.0047
R26	0.003	0.0342	R61	-	0.0013
R27	0.010	0.0501	R62	-	0.0028
R28	0.016	0.0466	R63	-	0.0020
R29	0.005	0.0317	R64	-	0.0036
R30	0.010	0.0315	R65	-	0.0099
R31	0.002	0.0141	R66	-	0.0059
R32	0.003	0.0136	R67	-	0.0063
R33	0.003	0.0144	R68	-	0.0059
R34	0.004	0.0146	R69	-	0.0047

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R35	0.003	0.0128	R70	-	0.0037

Note: In the MOD4 report, values for the MOD4 increment are not present for receptors 49-70. These modelling results have been interpolated to provide the 'whole of mine' increment results.

Table C.3: Modification 4 increment and whole of mine increment including baseline year 2016 for annual average TSP concentrations (µg/m^3)

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R1	0.06	0.3553	R36	0.04	0.3012
R2	0.08	0.4422	R37	0.03	0.2644
R3	0.12	0.7510	R38	0.01	0.1345
R4	0.07	0.4177	R39	0.01	0.1396
R5	0.04	0.3253	R40	0.04	0.2816
R6	0.03	0.3468	R41	0.05	0.3484
R7	0.01	0.1499	R42	0.06	0.3883
R8	0.03	0.3302	R43	-	0.1174
R9	0.03	0.2598	R44	-	0.0730
R10	0.03	0.2466	R45	-	0.1611
R11	0.02	0.2190	R46	-	0.0935
R12	0.02	0.1625	R47	-	0.1778
R13	0.02	0.1405	R48	-	0.0795
R14	0.02	0.1586	R49	-	0.0379
R15	0.01	0.0562	R50	-	0.2260
R16	0.01	0.0675	R51	-	0.1595
R17	0.01	0.1247	R52	-	0.1747
R18	0.01	0.1216	R53	-	0.1146
R19	0.01	0.0454	R54	-	0.1029
R20	0.01	0.0449	R55	-	0.0475
R21	0.06	0.3642	R56	-	0.0518
R22	0.05	0.3610	R57	-	0.0943
R23	0.05	0.3734	R58	-	0.0407
R24	0.05	0.3936	R59	-	0.0202
R25	0.04	0.2419	R60	-	0.1037
R26	0.06	0.4746	R61	-	0.0528
R27	0.32	0.9447	R62	-	0.1039
R28	0.56	1.0618	R63	-	0.0672
R29	0.13	0.5237	R64	-	0.0778
R30	0.30	0.6338	R65	-	0.1948
R31	0.06	0.2637	R66	-	0.1381
R32	0.07	0.2546	R67	-	0.1390
R33	0.07	0.2493	R68	-	0.1249
R34	0.05	0.3565	R69	-	0.1006

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 ‘whole of mine’ increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 ‘whole of mine’ increment including baseline year 2016 and MOD4 increment
R35	0.04	0.3292	R70	-	0.0994

Note: In the MOD4 report, values for the MOD4 increment are not present for receptors 49-70. These modelling results have been interpolated to provide the ‘whole of mine’ increment results.

Table C.4: Modification 4 increment and whole of mine increment including baseline year 2016 for annual average PM_{10} concentrations (µg/m^3)

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R1	0.03	0.3349	R36	0.02	0.2590
R2	0.04	0.3412	R37	0.02	0.2347
R3	0.05	0.5426	R38	0.01	0.1070
R4	0.03	0.3221	R39	0.01	0.1148
R5	0.02	0.2589	R40	0.02	0.2421
R6	0.02	0.2604	R41	0.02	0.2962
R7	0.01	0.1364	R42	0.03	0.3450
R8	0.02	0.2730	R43	-	0.1005
R9	0.02	0.2158	R44	-	0.0618
R10	0.02	0.2049	R45	-	0.1377
R11	0.01	0.1779	R46	-	0.0806
R12	0.01	0.1406	R47	-	0.1521
R13	0.01	0.1204	R48	-	0.0708
R14	0.01	0.1327	R49	-	0.0402
R15	0.00	0.0560	R50	-	0.1862
R16	0.01	0.0629	R51	-	0.1350
R17	0.01	0.1113	R52	-	0.1479
R18	0.01	0.1016	R53	-	0.0961
R19	0.00	0.0449	R54	-	0.0946
R20	0.00	0.0481	R55	-	0.0440
R21	0.03	0.3741	R56	-	0.0498
R22	0.03	0.3772	R57	-	0.0830
R23	0.02	0.3770	R58	-	0.0440
R24	0.02	0.3637	R59	-	0.0237
R25	0.02	0.2584	R60	-	0.0897
R26	0.03	0.3826	R61	-	0.0443
R27	0.14	0.6578	R62	-	0.0790
R28	0.19	0.6491	R63	-	0.0650
R29	0.06	0.4153	R64	-	0.0720
R30	0.11	0.4332	R65	-	0.1645
R31	0.03	0.2194	R66	-	0.1118
R32	0.03	0.2101	R67	-	0.1178
R33	0.04	0.2596	R68	-	0.1108
R34	0.03	0.3189	R69	-	0.0869

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R35	0.02	0.2837	R70	-	0.0844

Note: In the MOD4 report, values for the MOD4 increment are not present for receptors 49-70. These modelling results have been interpolated to provide the 'whole of mine' increment results.

Table C.5: Modification 4 increment and whole of mine increment including baseline year 2016 for maximum 24-hour average PM_{10} concentrations (µg/m^3)

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R1	1.40	2.5036	R36	0.69	1.6793
R2	1.77	2.3785	R37	0.58	1.6171
R3	1.92	3.9565	R38	0.74	1.2093
R4	1.02	3.4064	R39	0.72	1.2894
R5	0.81	3.1522	R40	0.68	2.3038
R6	1.20	2.1103	R41	0.66	2.7695
R7	0.50	1.4378	R42	0.64	3.1138
R8	0.72	1.9028	R43	-	1.1625
R9	1.19	1.9721	R44	-	0.7288
R10	0.50	1.8020	R45	-	0.9909
R11	0.64	2.0117	R46	-	1.1189
R12	0.59	1.0952	R47	-	0.9938
R13	0.56	0.8927	R48	-	0.6911
R14	0.32	1.1371	R49	-	0.4416
R15	0.28	0.6067	R50	-	1.3267
R16	0.35	0.6375	R51	-	1.3717
R17	0.36	1.0064	R52	-	1.4466
R18	0.43	1.6091	R53	-	1.5200
R19	0.21	0.6414	R54	-	1.0365
R20	0.37	0.5208	R55	-	0.7158
R21	1.78	2.6784	R56	-	0.7926
R22	1.27	2.4515	R57	-	0.8436
R23	1.03	2.5068	R58	-	0.4247
R24	0.73	2.5112	R59	-	0.2339
R25	0.79	1.8364	R60	-	0.7321
R26	0.65	2.4264	R61	-	0.6946
R27	3.12	7.7474	R62	-	0.8913
R28	3.18	6.0291	R63	-	0.6227
R29	1.40	2.3024	R64	-	0.7813
R30	2.26	3.1442	R65	-	1.0405
R31	1.74	2.3688	R66	-	0.8916
R32	0.79	1.3199	R67	-	0.9968
R33	1.90	2.8243	R68	-	0.9798
R34	0.80	2.5495	R69	-	0.9875

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R35	0.97	1.7486	R70	-	0.7394

Note: In the MOD4 report, values for the MOD4 increment are not present for receptors 49-70. These modelling results have been interpolated to provide the 'whole of mine' increment results.

Table C.6: Modification 4 increment and whole of mine increment including baseline year 2016 for annual average $PM_{2.5}$ concentrations (µg/m^3)

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R1	0.01	0.0720	R36	0.00	0.4451
R2	0.01	0.0774	R37	0.01	0.4343
R3	0.01	0.1256	R38	0.00	0.2312
R4	0.00	0.0760	R39	0.00	0.3195
R5	0.00	0.0626	R40	0.00	0.6496
R6	0.00	0.0628	R41	0.00	0.7942
R7	0.00	0.0342	R42	0.00	0.9840
R8	0.00	0.0679	R43	-	1.6632
R9	0.00	0.0544	R44	-	0.1420
R10	0.00	0.0515	R45	-	0.2856
R11	0.00	0.0430	R46	-	0.3360
R12	0.00	0.0351	R47	-	0.3350
R13	0.00	0.0303	R48	-	0.1266
R14	0.00	0.0344	R49	-	0.0781
R15	0.00	0.0152	R50	-	0.6314
R16	0.00	0.0161	R51	-	1.2090
R17	0.00	0.0294	R52	-	0.9466
R18	0.00	0.0255	R53	-	0.3863
R19	0.00	0.0116	R54	-	0.8305
R20	0.00	0.0131	R55	-	0.2114
R21	0.01	0.0795	R56	-	0.2126
R22	0.01	0.0811	R57	-	0.3013
R23	0.01	0.0827	R58	-	0.2888
R24	0.01	0.0840	R59	-	0.1011
R25	0.00	0.0579	R60	-	0.1942
R26	0.01	0.0997	R61	-	0.1985
R27	0.06	0.1735	R62	-	0.1854
R28	0.08	0.1806	R63	-	0.2244
R29	0.02	0.1059	R64	-	0.1452
R30	0.05	0.1186	R65	-	0.2242
R31	0.01	0.0555	R66	-	0.2146
R32	0.01	0.0533	R67	-	0.2381
R33	0.02	0.0556	R68	-	0.2067
R34	0.00	0.0802	R69	-	0.1642

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R35	0.00	0.0684	R70	-	0.1764

Note: In the MOD4 report, values for the MOD4 increment are not present for receptors 49-70. These modelling results have been interpolated to provide the 'whole of mine' increment results.

Table C.7: Modification 4 increment and whole of mine increment including baseline year 2016 for maximum 24-hour average $PM_{2.5}$ concentrations (µg/m^3)

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R1	0.22	0.6746	R36	0.18	0.4321
R2	0.23	0.5123	R37	0.22	0.4198
R3	0.23	1.1291	R38	0.10	0.2311
R4	0.13	0.7932	R39	0.09	0.3193
R5	0.12	0.7944	R40	0.18	0.6322
R6	0.27	0.5728	R41	0.16	0.7798
R7	0.10	0.4039	R42	0.15	0.9705
R8	0.12	0.5219	R43	-	0.2723
R9	0.17	0.5650	R44	-	0.2660
R10	0.15	0.5674	R45	-	0.3790
R11	0.09	0.4763	R46	-	0.3867
R12	0.07	0.3255	R47	-	0.3692
R13	0.07	0.2669	R48	-	1.5781
R14	0.07	0.3756	R49	-	1.5178
R15	0.16	0.2006	R50	-	0.6314
R16	0.08	0.1413	R51	-	1.2090
R17	0.17	0.3185	R52	-	0.9466
R18	0.07	0.4210	R53	-	0.3863
R19	0.07	0.1167	R54	-	0.8305
R20	0.05	0.1804	R55	-	0.2114
R21	0.21	0.5408	R56	-	0.2126
R22	0.20	0.5336	R57	-	0.3013
R23	0.22	0.4621	R58	-	0.2888
R24	0.23	0.4685	R59	-	0.1011
R25	0.13	0.5335	R60	-	0.1942
R26	0.24	0.5946	R61	-	0.1985
R27	1.58	1.6473	R62	-	0.1854
R28	1.52	1.5429	R63	-	0.2244
R29	0.62	0.7889	R64	-	0.1452
R30	1.06	1.2399	R65	-	0.2242
R31	0.87	0.9819	R66	-	0.2146
R32	0.38	0.5021	R67	-	0.2381
R33	0.82	0.9369	R68	-	0.2067
R34	0.16	0.8168	R69	-	0.1642

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R35	0.18	0.4657	R70	-	0.1764

Note: In the MOD4 report, values for the MOD4 increment are not present for receptors 49-70. These modelling results have been interpolated to provide the 'whole of mine' increment results.

Table C.8: Modification 4 increment and whole of mine increment including baseline year 2016 for monthly average deposited dust (g/m^2/month)

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R1	0.02	0.0903	R36	0.01	0.0670
R2	0.02	0.1141	R37	0.01	0.0603
R3	0.04	0.1970	R38	0.00	0.0249
R4	0.02	0.1079	R39	0.00	0.0262
R5	0.01	0.0757	R40	0.01	0.0681
R6	0.01	0.0734	R41	0.02	0.0856
R7	0.00	0.0295	R42	0.02	0.1048
R8	0.01	0.0767	R43	-	0.0285
R9	0.01	0.0566	R44	-	0.0148
R10	0.01	0.0563	R45	-	0.0359
R11	0.01	0.0475	R46	-	0.0166
R12	0.01	0.0362	R47	-	0.0420
R13	0.00	0.0303	R48	-	0.0184
R14	0.01	0.0334	R49	-	0.0096
R15	0.00	0.0127	R50	-	0.0525
R16	0.00	0.0160	R51	-	0.0333
R17	0.00	0.0279	R52	-	0.0372
R18	0.00	0.0224	R53	-	0.0209
R19	0.00	0.0107	R54	-	0.0228
R20	0.00	0.0107	R55	-	0.0076
R21	0.02	0.0916	R56	-	0.0089
R22	0.02	0.0904	R57	-	0.0161
R23	0.01	0.0951	R58	-	0.0084
R24	0.02	0.1050	R59	-	0.0042
R25	0.01	0.0606	R60	-	0.0243
R26	0.02	0.1330	R61	-	0.0087
R27	0.09	0.3199	R62	-	0.0175
R28	0.16	0.3308	R63	-	0.0126
R29	0.04	0.1597	R64	-	0.0200
R30	0.10	0.2035	R65	-	0.0506
R31	0.02	0.0683	R66	-	0.0309
R32	0.02	0.0707	R67	-	0.0324
R33	0.02	0.0756	R68	-	0.0303
R34	0.02	0.0952	R69	-	0.0241

Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment	Receptor ID	Modification 4 Increment (as presented in MOD4 report)	MOD4 'whole of mine' increment including baseline year 2016 and MOD4 increment
R35	0.01	0.0805	R70	-	0.0207

Note: In the MOD4 report, values for the MOD4 increment are not present for receptors 49-70. These modelling results have been interpolated to provide the 'whole of mine' increment results.

APPENDIX D PREDICTED IMPACTS FOR RASP MINE FOR MOD6 CONSTRUCTION SCENARIO COMPARED WITH MOD4 SCENARIO

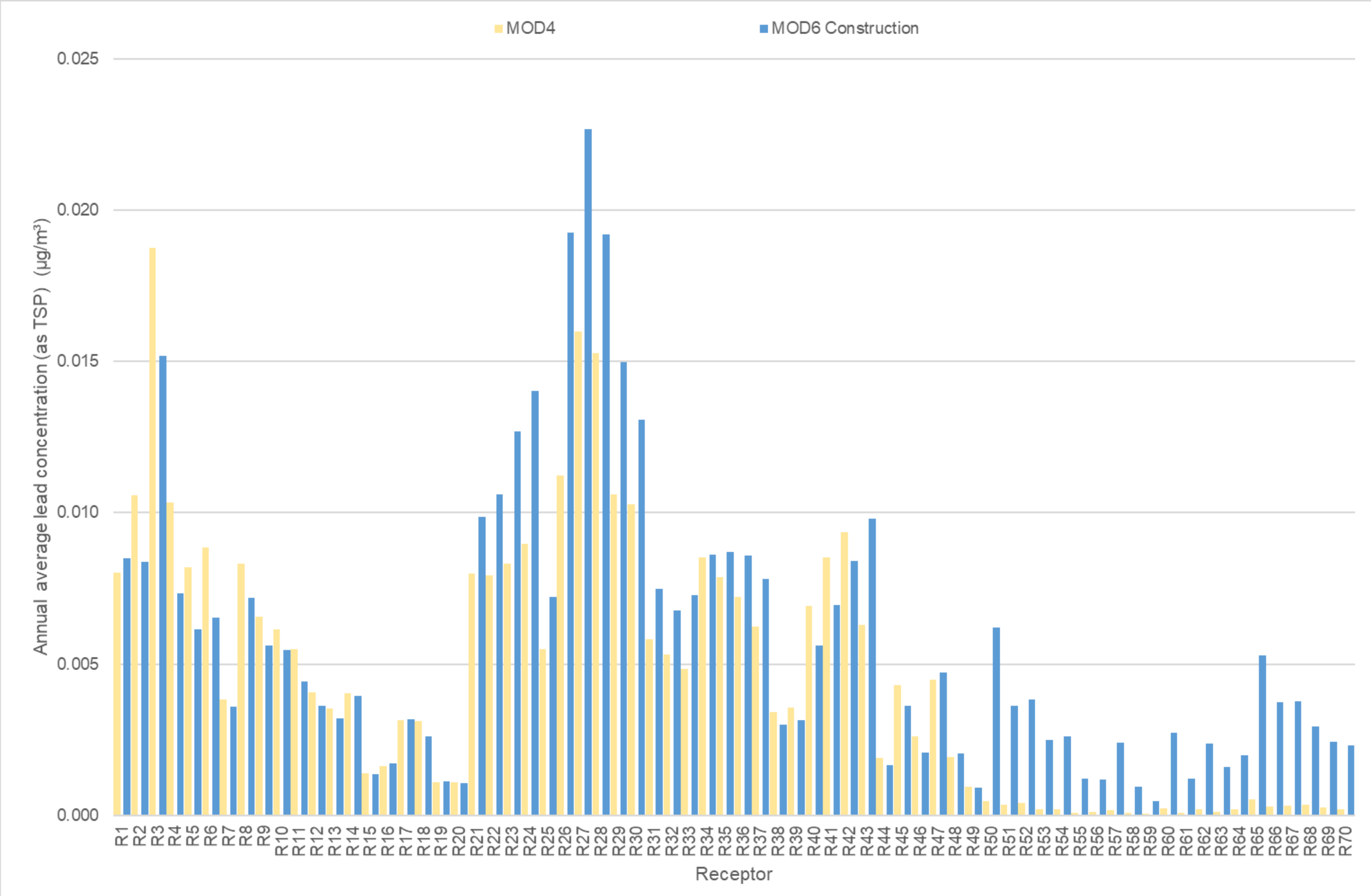

Figure D-1: Annual average lead concentration (as TSP) for the MOD6 construction scenario and MOD4 updated assessment

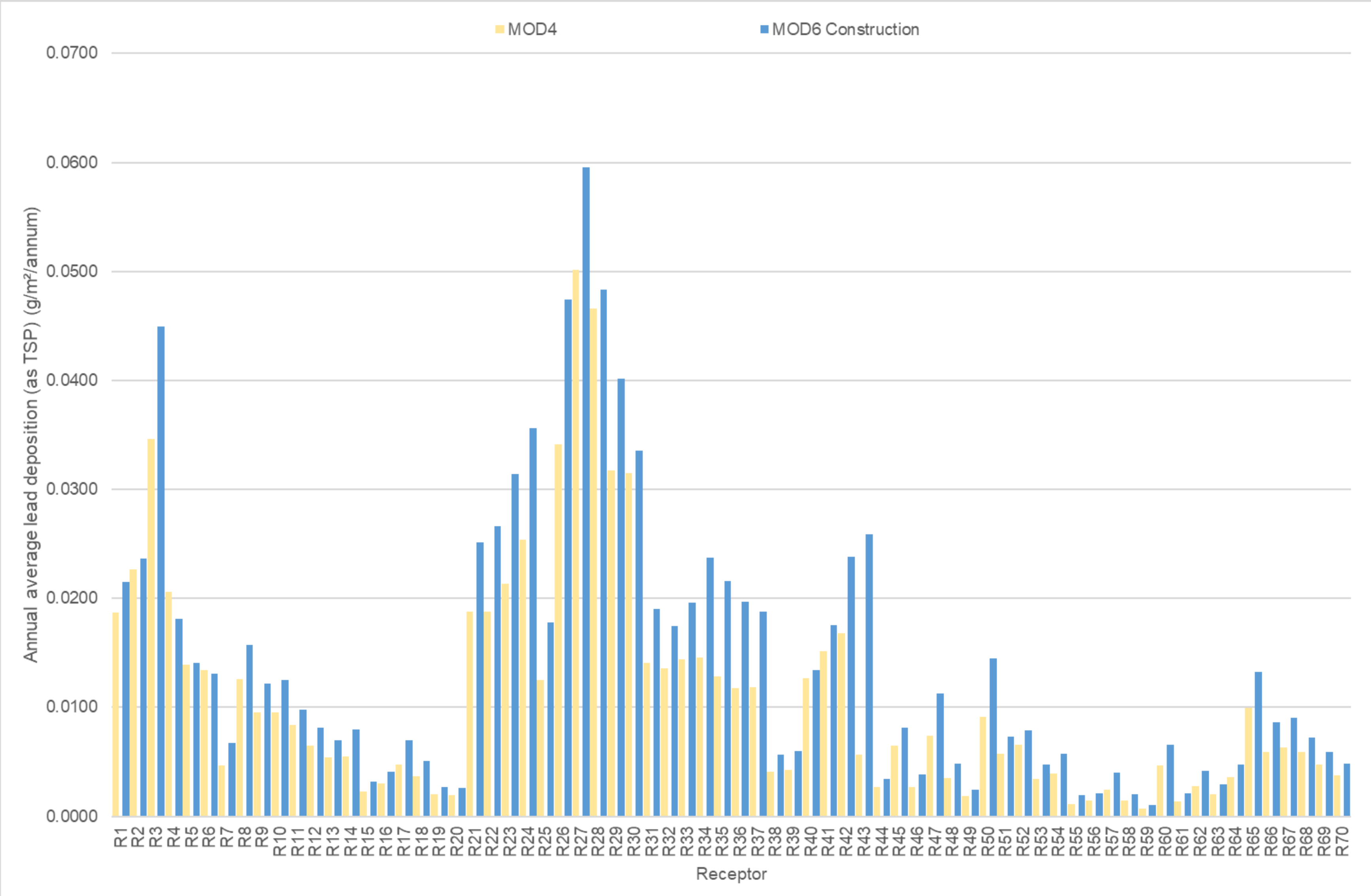

Figure D-2: Annual average lead deposition (as total particulate) for the MOD6 construction scenario and MOD4 updated assessment

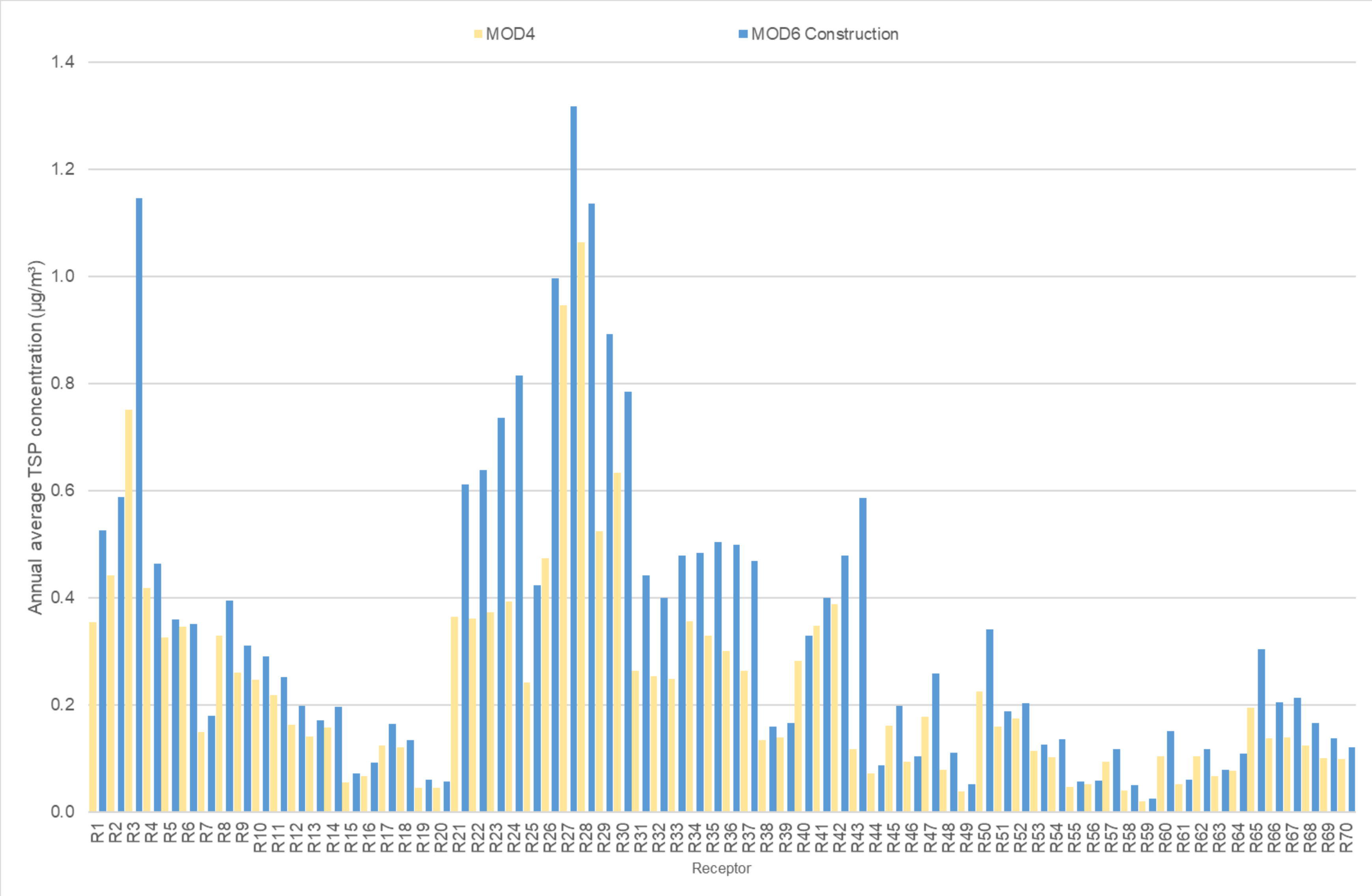

Figure D-3: Annual average TSP concentration for the MOD6 construction scenario and MOD4 updated assessment

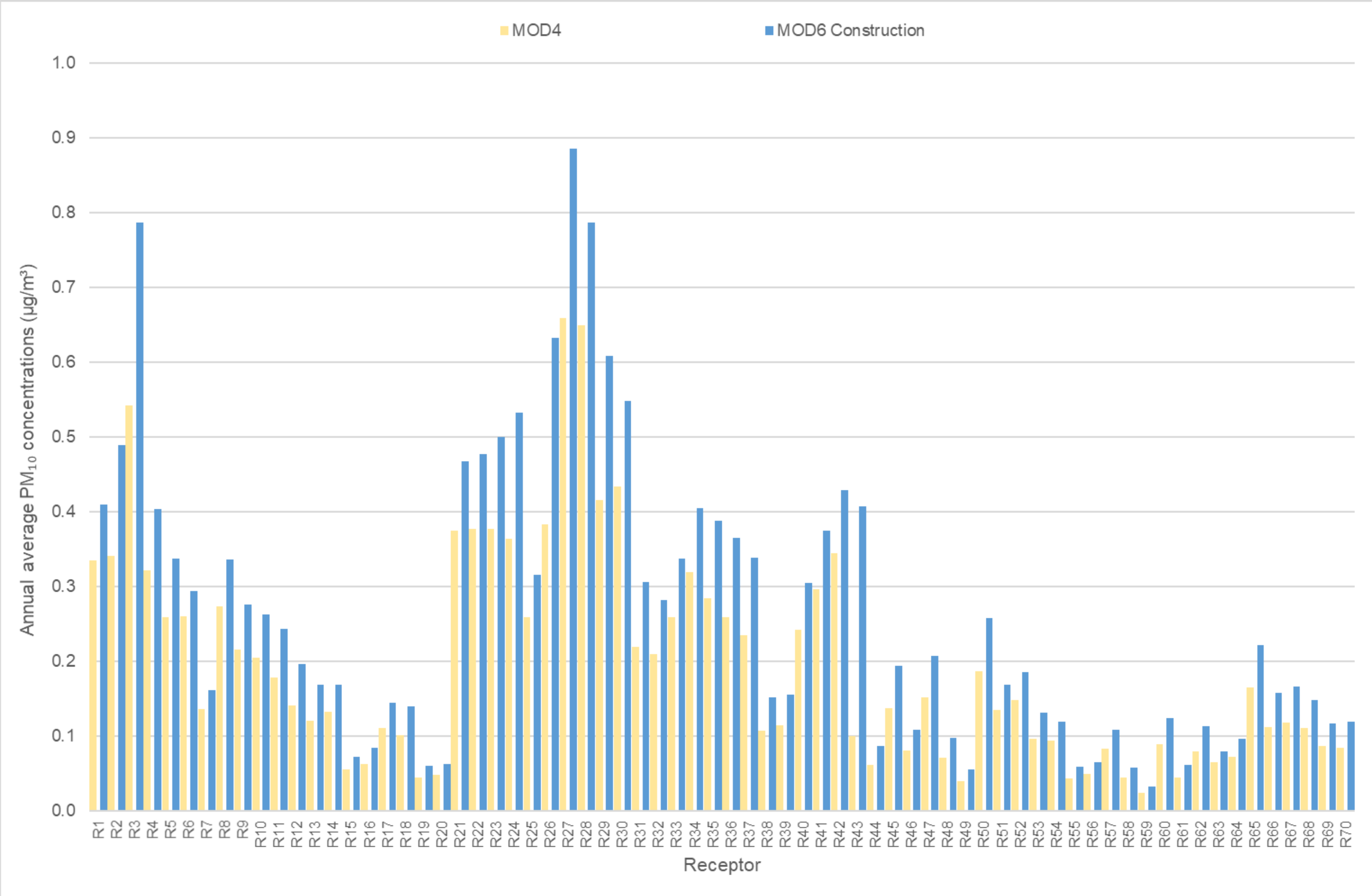

Figure D-4: Annual average PM_{10} concentration for the MOD6 construction scenario and MOD4 updated assessment

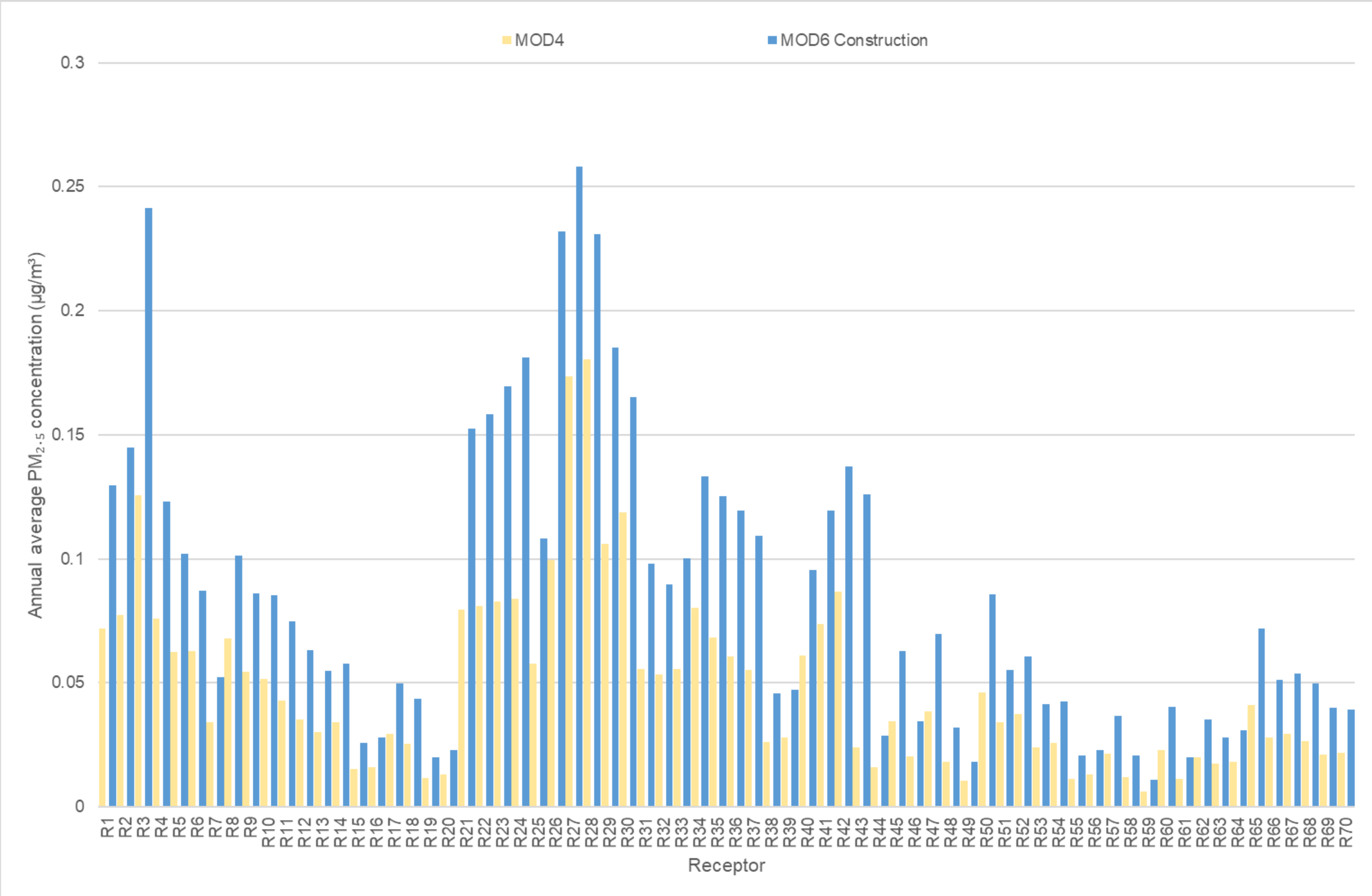

Figure D-5: Annual average $PM_{2.5}$ concentration for the MOD6 construction scenario and MOD4 updated assessment

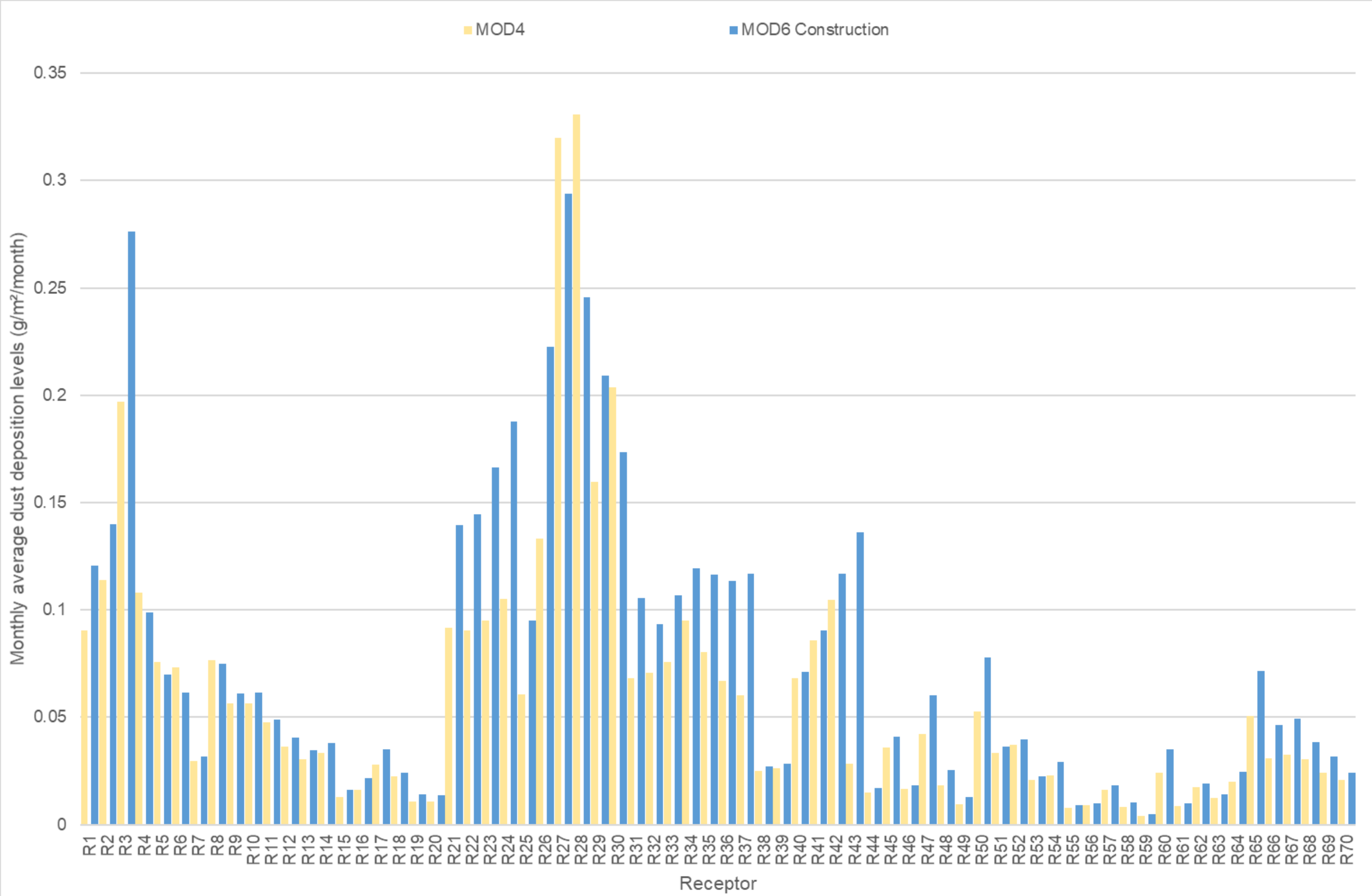

Figure D-6: Monthly average dust deposition levels for the MOD6 construction scenario and MOD4 updated assessment

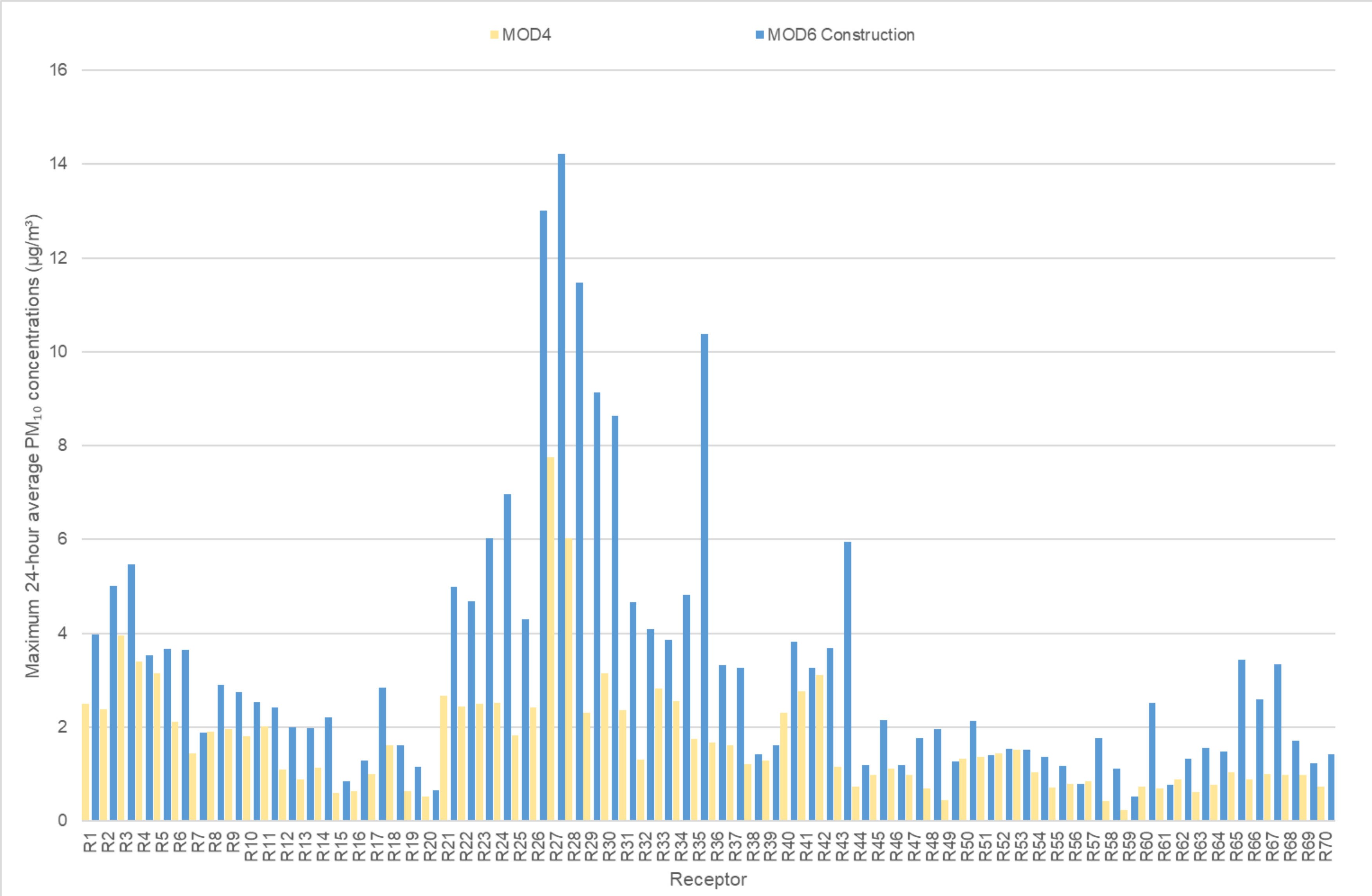

Figure D-7: Maximum 24-hour PM_{10} concentrations for the MOD6 construction scenario and MOD4 updated assessment

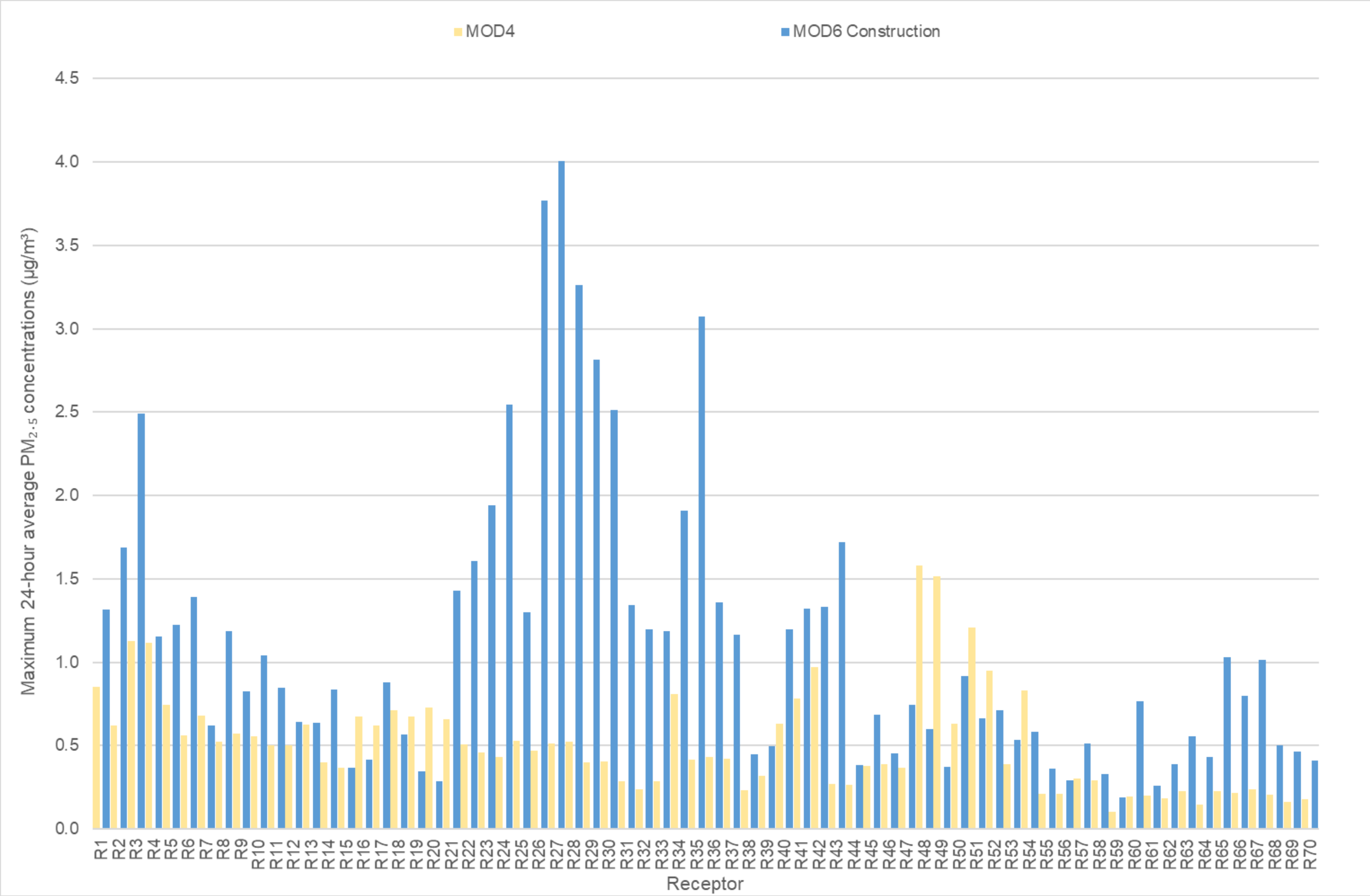

Figure D-8: Maximum 24-hour $PM_{2.5}$ concentrations for the MOD6 construction scenario and MOD4 updated assessment

APPENDIX E PREDICTED IMPACTS FOR RASP MINE FOR MOD6 OPERATIONAL SCENARIO COMPARED WITH BAU AND PPR SCENARIOS

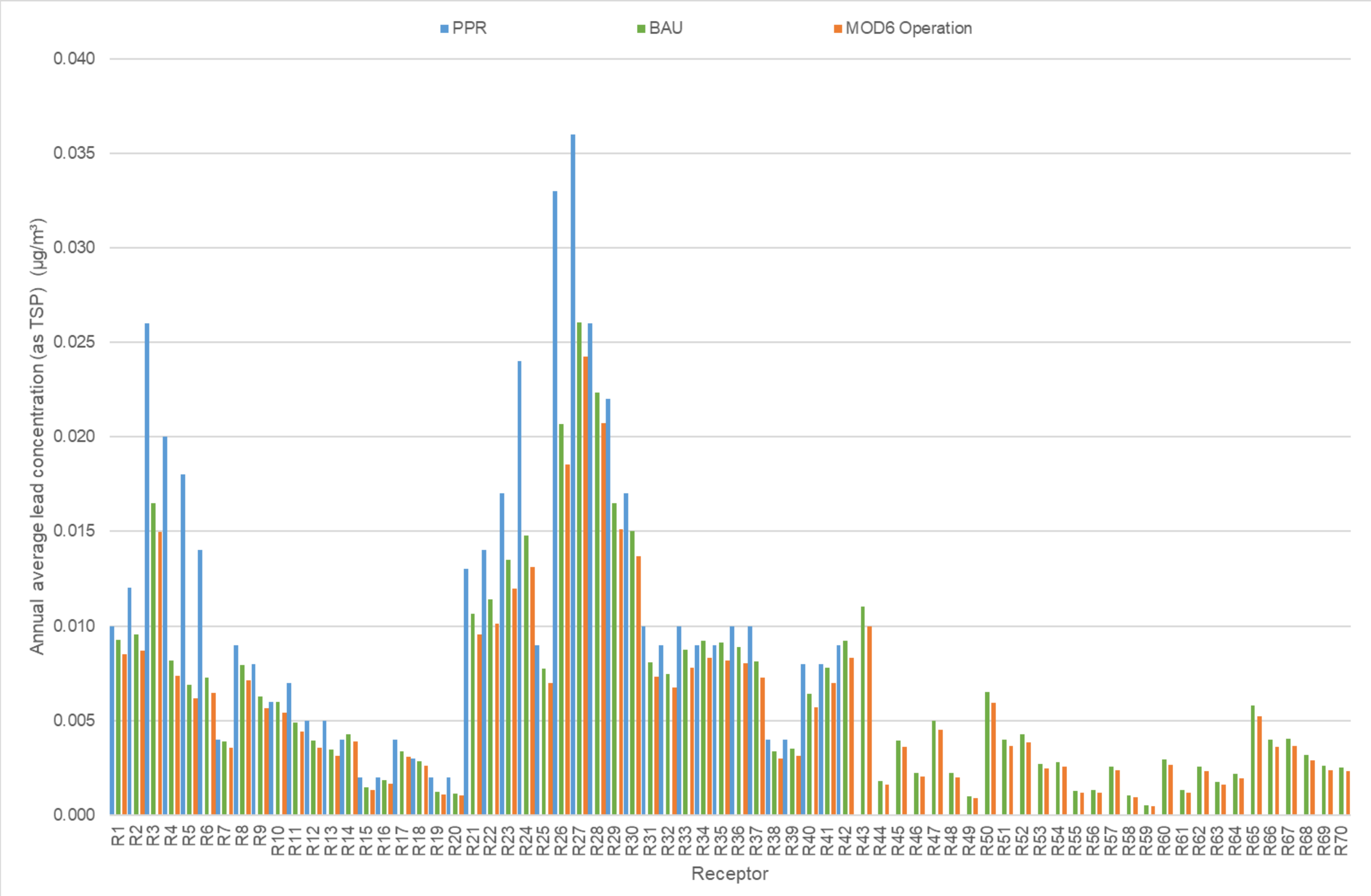

Figure E-1: Annual average lead concentration (as TSP) for the MOD6 operational scenario, PPR assessment and BAU scenario

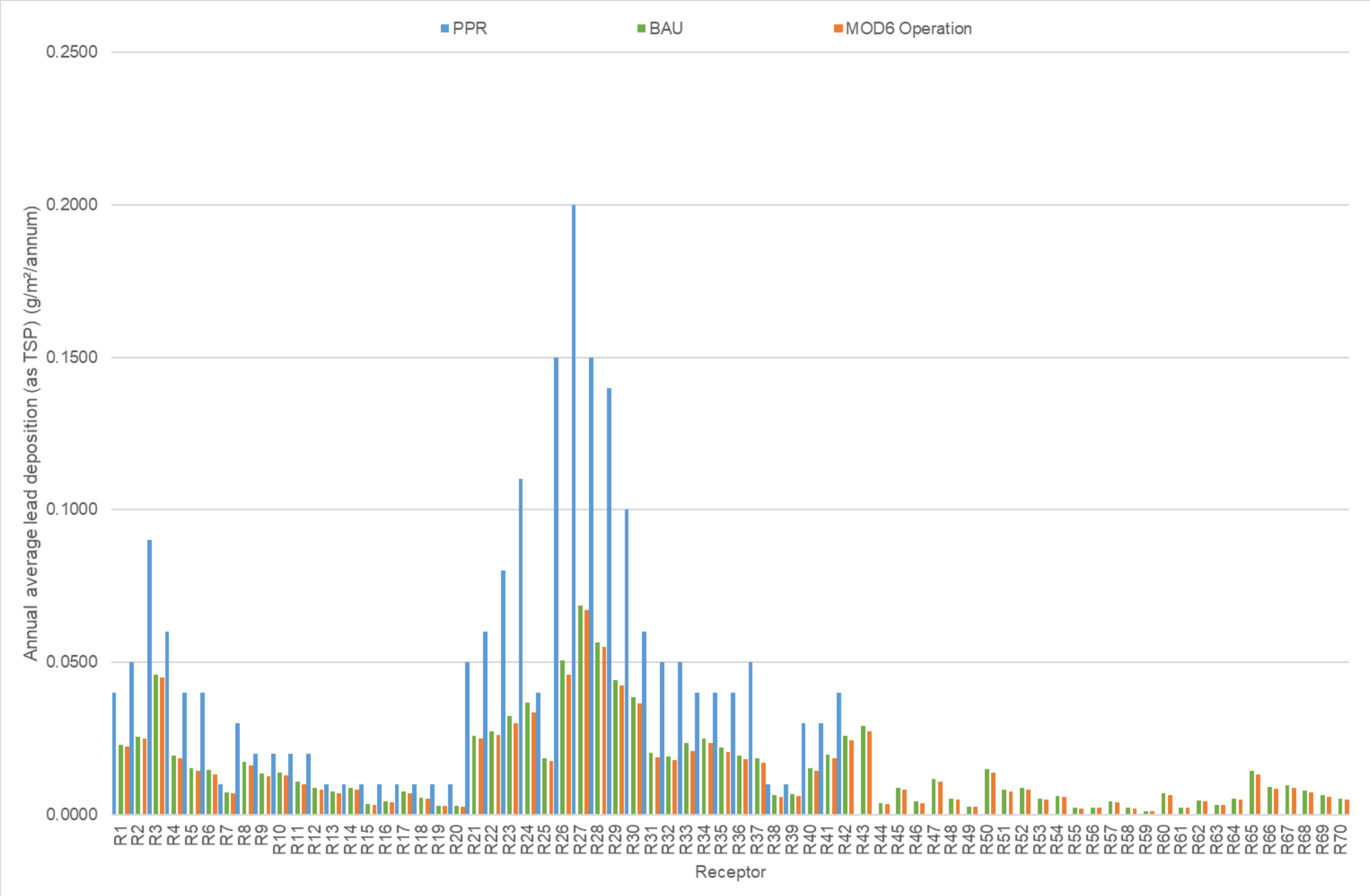

Figure E-2: Annual average lead deposition (as total particulate) for the MOD6 operational scenario, PPR assessment and BAU scenario

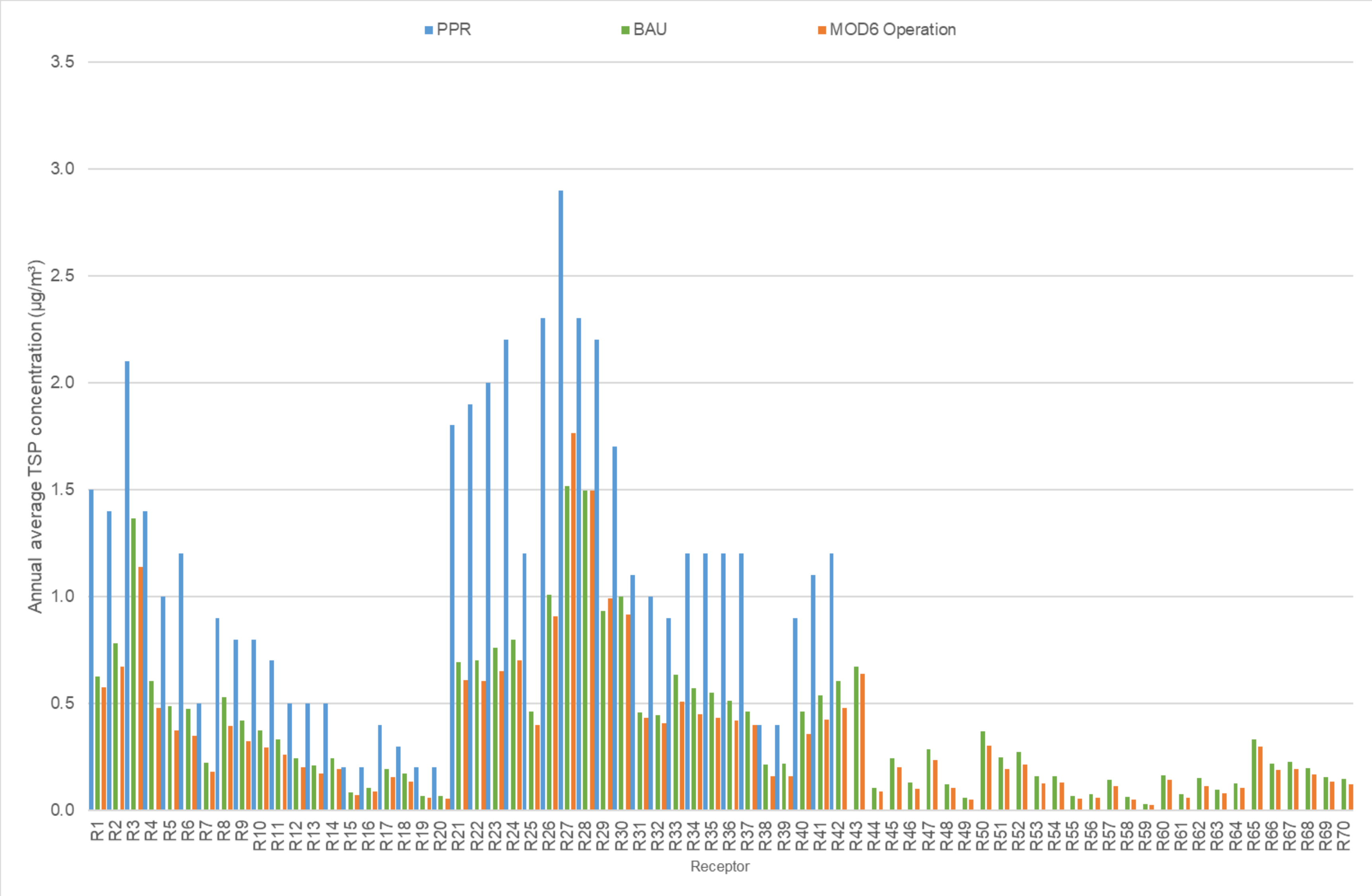

Figure E-3: Annual average TSP concentration for the MOD6 operational scenario, PPR assessment and BAU scenario

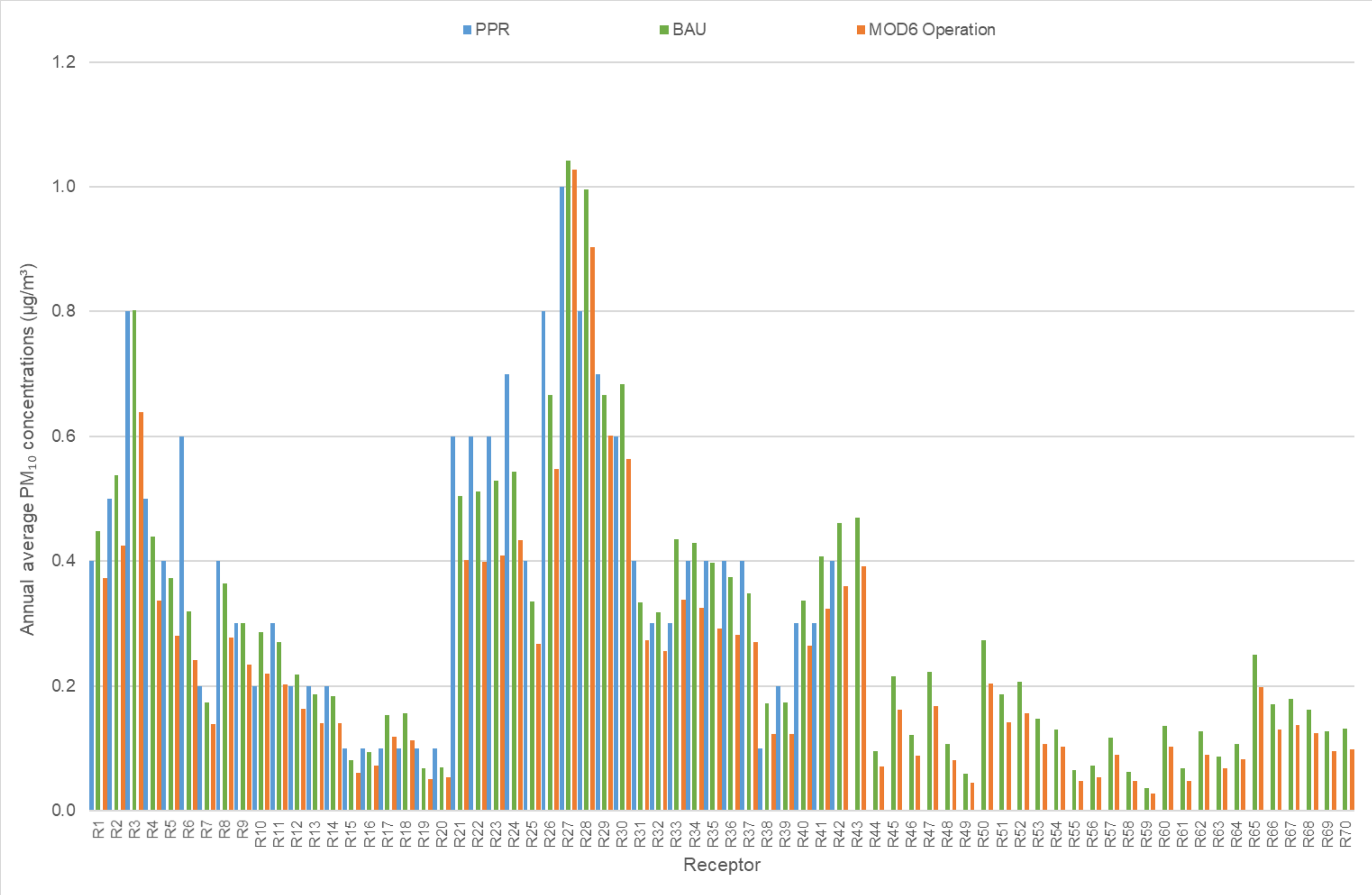

Figure E-4: Annual average PM_{10} concentration for the MOD6 operational scenario, PPR assessment and BAU scenario

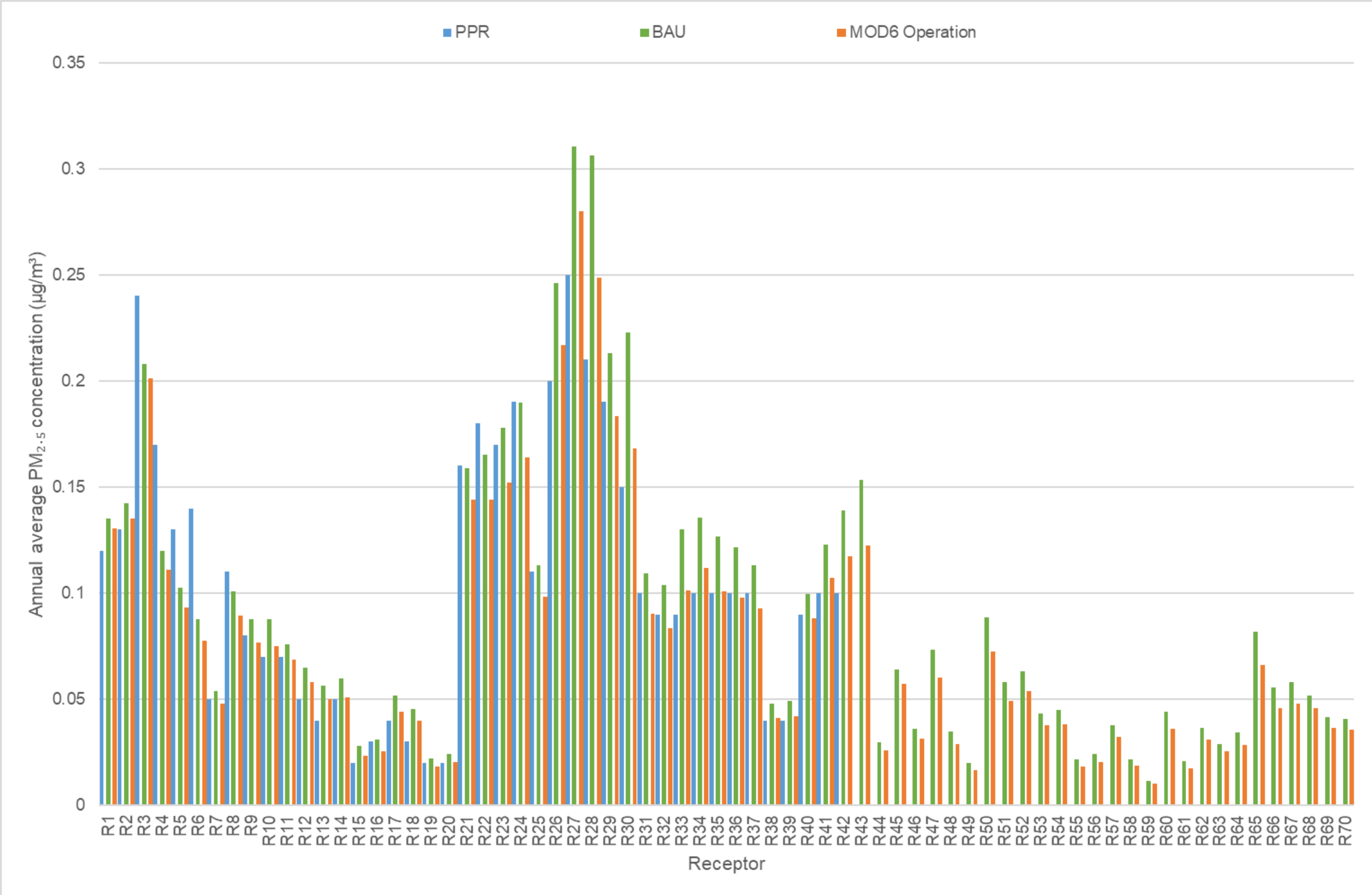

Figure E-5: Annual average $PM_{2.5}$ concentration for the MOD6 operational scenario, PPR assessment and BAU scenario

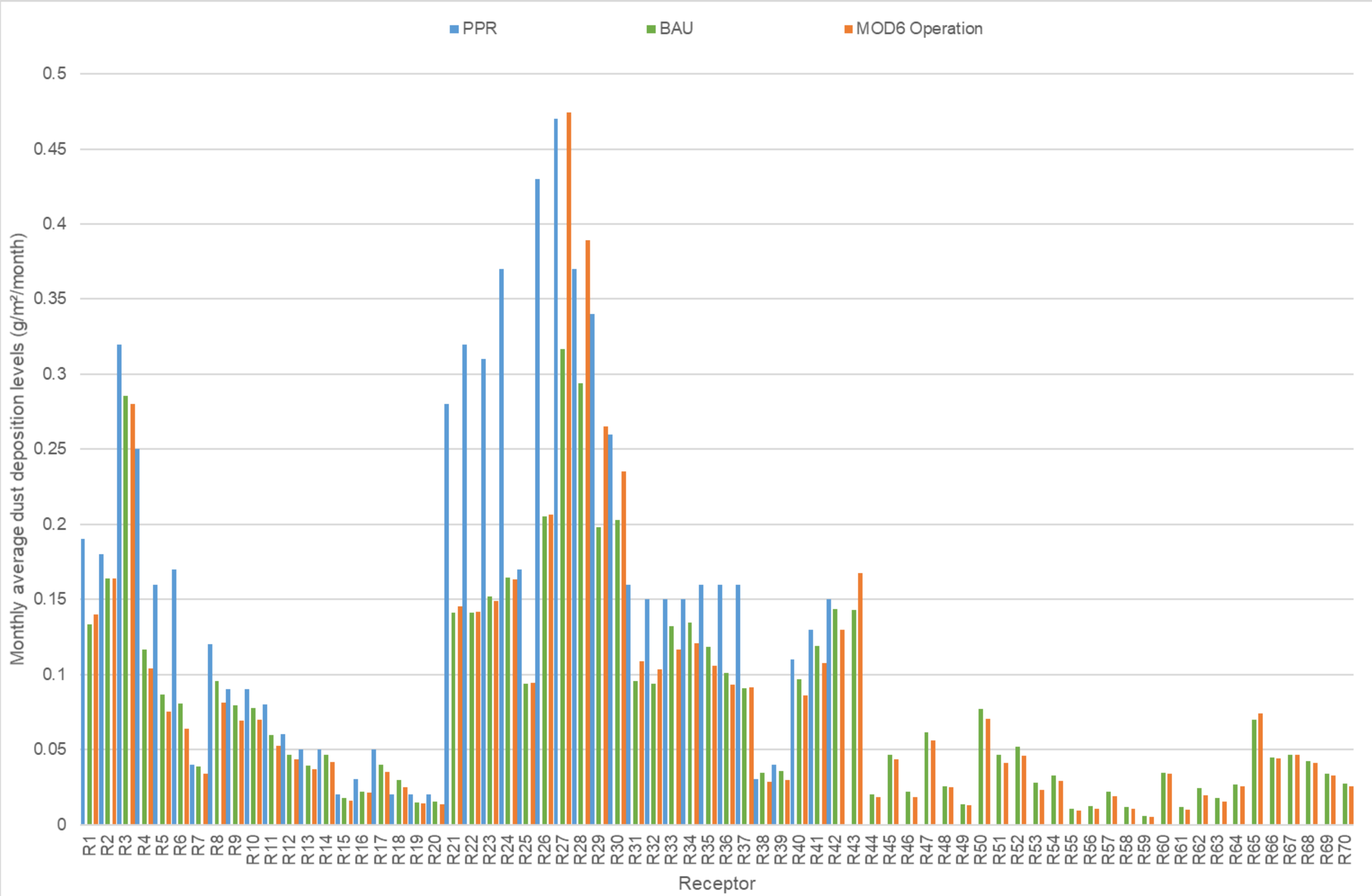

Figure E-6: Monthly average dust deposition levels for the MOD6 operational scenario, PPR assessment and BAU scenario

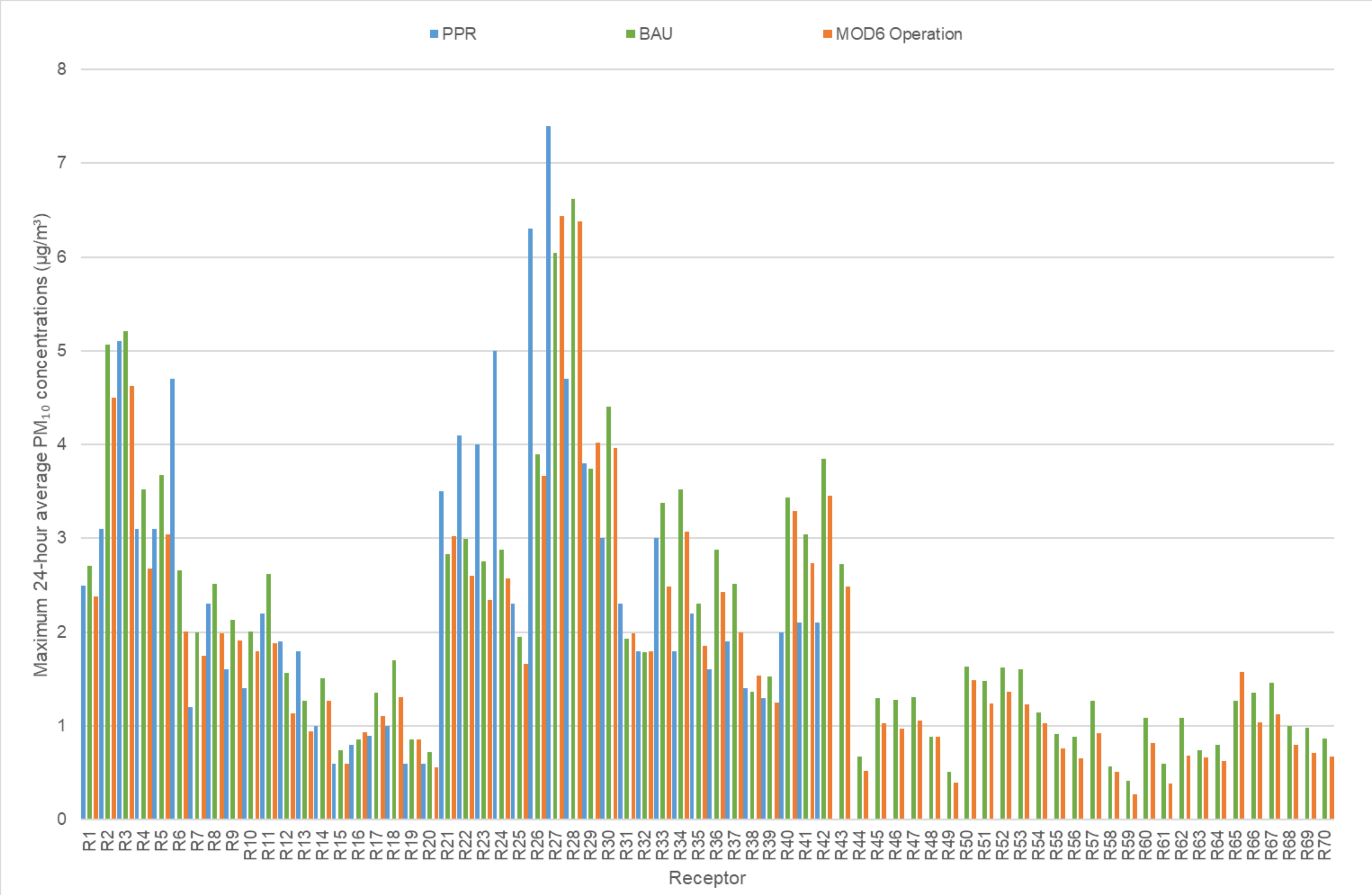

Figure E-7: Maximum 24-hour average PM_{10} concentrations for the MOD6 operational scenario, PPR assessment and BAU scenario

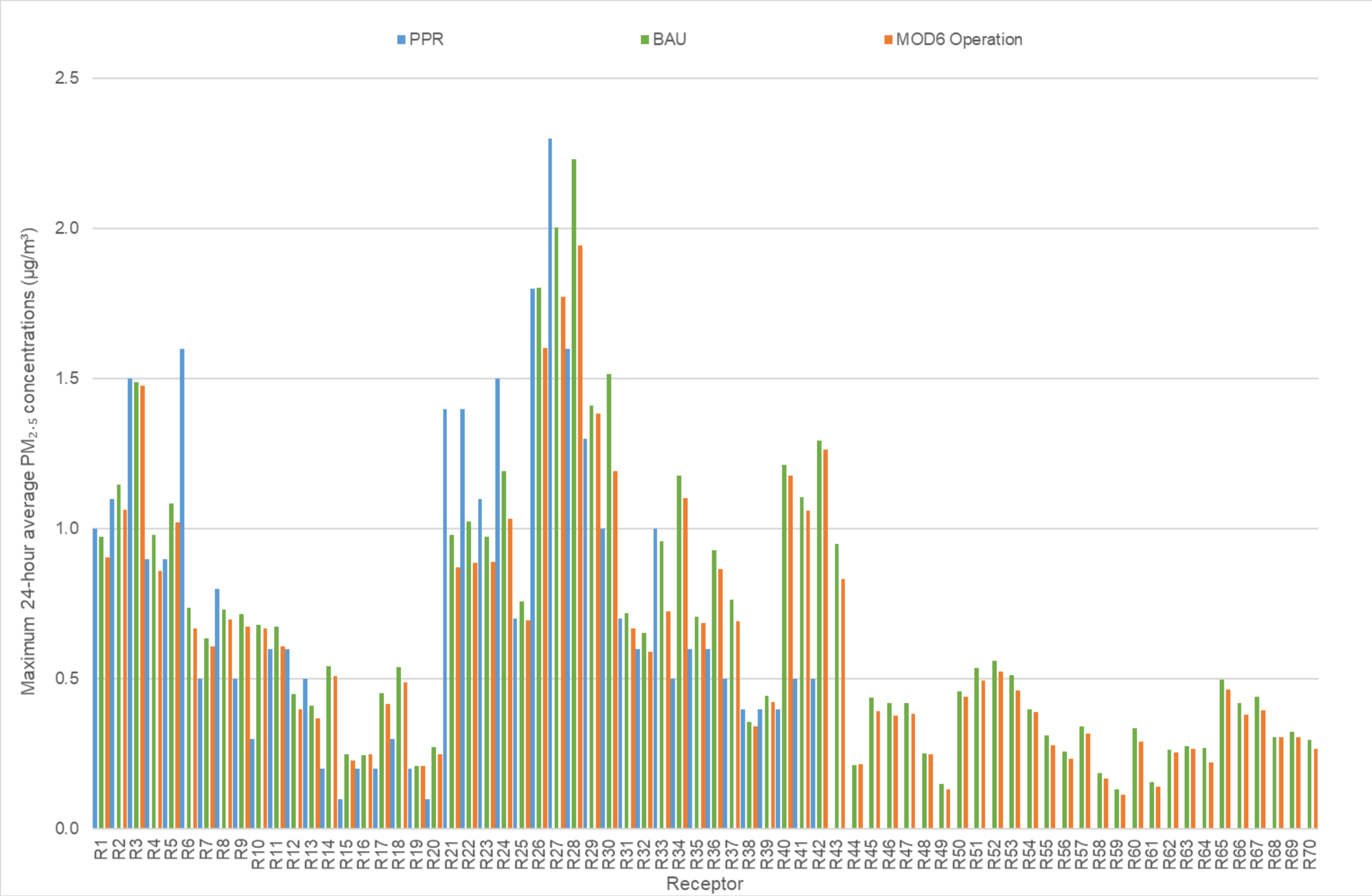

Figure E-8: Maximum 24-hour average $PM_{2.5}$ concentrations for the MOD6 operational scenario, PPR assessment and BAU scenario

APPENDIX F DESCRIPTION OF SENSITIVE RECEPTORS AND ALLOCATED BACKGROUND MONITORING LOCATION

Table F.1: Sensitive receptor locations and adopted monitoring location used for background

Receptor ID	Receptor Name	Description	x	y	Adopted monitoring location used for background		
					PM_{10}, $PM_{2.5}$	TSP	Dust and % lead deposition
R1	Piper Street North	Residence	544110	6462598	TEOM1	TSP-HVAS	DG5
R2	Piper Street Central	Southern Cross Care (St Anne's)	543763	6462312	TEOM1	TSP-HVAS	DG5
R3	Eyre Street North	Residence	543555	6462322	TEOM1	TSP-HVAS	DG5
R4	Eyre Street Central	Residence	543324	6462003	TEOM1	TSP-HVAS	DG5
R5	Eyre Street South	Residence	543140	6461859	TEOM1	TSP-HVAS	DG5
R6	South Road	Residence	542833	6462000	TEOM1	TSP-HVAS	DG5
R7	Carbon Lane	Residence	542604	6462718	TEOM2	TSP-HVAS	DG1
R8	Old South Road	Residence	542923	6462744	TEOM2	TSP-HVAS	DG1
R9	South Rd	RSPCA	542926	6463052	TEOM2	TSP-HVAS	DG2
R10	Cnr Garnet & Blende Streets	Duke of Cornwall Park	543158	6463633	TEOM2	TSP-HVAS	DG2
R11	29 Comstock Street	Alma Bugdli Pre-school	543150	6461692	TEOM1	TSP-HVAS	DG5
R12	Cnr Patton & Comstock Streets	Playtime Pre-school	543587	6461665	TEOM1	TSP-HVAS	DG7
R13	Comstock Street	Alma Primary School	543631	6461566	TEOM1	TSP-HVAS	DG7
R14	76 Garnet Street	Broken Hill High School	543019	6463916	TEOM2	TSP-HVAS	DG2
R15	176 Thomas St	Broken Hill Base Hospital	543133	6465290	TEOM2	TSP-HVAS	DG2
R16	Chapple Street	N. Broken Hill Primary School	544570	6465713	TEOM2	TSP-HVAS	DG2
R17	Mica Street	Broken Hill Public School	543245	6464378	TEOM2	TSP-HVAS	DG2

Receptor ID	Receptor Name	Description	x	y	Adopted monitoring location used for background		
					PM_{10}, $PM_{2.5}$	TSP	Dust and % lead deposition
R18	2 Patton Street	Rainbow Pre-school	542815	6461151	TEOM1	TSP-HVAS	DG7
R19	Murton Street	Willyama High School	544599	6466299	TEOM2	TSP-HVAS	DG2
R20	470 Morgan Street	Morgan Street Primary School	543420	6465782	TEOM2	TSP-HVAS	DG2
R21	Eyre Street North	Residence	544212	6462762	TEOM1	TSP-HVAS	DG5
R22	Eyre Street North	Residence	544288	6462828	TEOM1	TSP-HVAS	DG5
R23	Eyre Street North	Residence	544456	6462974	TEOM1	TSP-HVAS	DG5
R24	Eyre Street North	Residence	544591	6463090	TEOM1	TSP-HVAS	DG5
R25	Lawton Street	Essential Water Tank	544460	6462723	TEOM1	TSP-HVAS	DG5
R26	Holten Drive	Mawsons Quarry offices	544723	6463208	TEOM1	TSP-HVAS	DG5
R27	Proprietary Square	Residence	544666	6463926	TEOM2	TSP-HVAS	DG6
R28	Proprietary Square	British Flats Playground	544731	6463988	TEOM2	TSP-HVAS	DG6
R29	Iodide Street	Residence	544592	6464026	TEOM2	TSP-HVAS	DG6
R30	Iodide Street	Perilya Social Club	544728	6464112	TEOM2	TSP-HVAS	DG6
R31	Crystal Street	Residence	544503	6464328	TEOM2	TSP-HVAS	DG6
R32	Crystal Street	Residence	544637	6464415	TEOM2	TSP-HVAS	DG6
R33	Brownes Shaft	Brownes Shaft Residence	545231	6464450	TEOM2	TSP-HVAS	DG4
R34	Crystal Street	Residence	543572	6463746	TEOM2	TSP-HVAS	DG2
R35	Crystal Street	Residence	543748	6463873	TEOM2	TSP-HVAS	DG2
R36	Crystal Street	Nachiapan Surgery	543934	6464002	TEOM2	TSP-HVAS	DG2

Receptor ID	Receptor Name	Description	x	y	Adopted monitoring location used for background		
					PM_{10}, $PM_{2.5}$	TSP	Dust and % lead deposition
R37	Crystal Street	Residence	544127	6464141	TEOM2	TSP-HVAS	DG2
R38	Gypsum Street	Residence	542459	6462467	TEOM2	TSP-HVAS	DG1
R39	Gypsum Street	Residence	542512	6462581	TEOM2	TSP-HVAS	DG1
R40	Silver City Hwy	Coles Supermarket	543099	6463321	TEOM2	TSP-HVAS	DG2
R41	Silver City Hwy	Residence	543249	6463439	TEOM2	TSP-HVAS	DG2
R42	Silver City Hwy	Residence	543394	6463551	TEOM2	TSP-HVAS	DG2
R43	Proprietary Square	Bowling Green	544670	6464213	TEOM2	TSP-HVAS	DG6
R44	Cnr Duff and South Streets	Duff Street Park Playground	544186	6461103	TEOM1	TSP-HVAS	DG7
R45	141 Patton Street	Patton Park	543670	6461675	TEOM1	TSP-HVAS	DG7
R46	Wentworth Street	Zinc Lakes	542637	6460861	TEOM1	TSP-HVAS	DG7
R47	Cnr Beryl and Sulphide Streets	Sturt Park Playground	543716	6464336	TEOM2	TSP-HVAS	DG2
R48	Queen Elizabeth Park	Playground	544457	6465505	TEOM2	TSP-HVAS	DG2
R49	Aquatic Centre	Playground	544257	6466375	TEOM2	TSP-HVAS	DG2
R50	229 Beryl Street	Aruma Lodge	543782	6464178	TEOM2	TSP-HVAS	DG6
R51	1 Braceman St	Eureka Shorty O'Neill	542870	6463609	TEOM2	TSP-HVAS	DG2
R52	1 - 40 Blende St	Con Crowley Village	542900	6463529	TEOM2	TSP-HVAS	DG2
R53	168 Thomas St	War Vets Retirement Living	542787	6461088	TEOM1	TSP-HVAS	DG7
R54	192 Lane	Sacred	543282	6464626	TEOM2	TSP-HVAS	DG6

Receptor ID	Receptor Name	Description	x	y	Adopted monitoring location used for background		
					PM_{10}, $PM_{2.5}$	TSP	Dust and % lead deposition
	Street	Heart Parish Primary School					
R55	106 Wills Street	Railwaytown Public School	541663	6462761	TEOM1	TSP-HVAS	DG2
R56	185 Rakow Street	Burke Ward Public School	541956	6463856	TEOM2	TSP-HVAS	DG2
R57	Gypsum Street	AJ Keast Park	542316	6463028	TEOM1	TSP-HVAS	DG2
R58	367 Kaolin Street	Picton Oval	542418	6465095	TEOM2	TSP-HVAS	DG2
R59	Broken Hill Airport	Flying Doctors Medical Centre	544243	6459543	TEOM1	TSP-HVAS	DG7
R60	121 Bagot Street	Busy kids child care centre	544409	6465165	TEOM2	TSP-HVAS	DG6
R61	Cnr Slag and Gaffney Streets	Residence	541538	6461826	TEOM1	TSP-HVAS	DG1
R62	Slag Street	Residence	542174	6462135	TEOM1	TSP-HVAS	DG1
R63	Williams Street	Memorial Oval	542368	6464205	TEOM2	TSP-HVAS	DG1
R64	Silver Street	Jubilee Oval	545067	6465474	TEOM2	TSP-HVAS	DG4
R65	Argent Lane	Residence	544584	6464584	TEOM2	TSP-HVAS	DG6
R66	Blende Street	O'Neill Park Soccer Grounds	544241	6464857	TEOM2	TSP-HVAS	DG6
R67	Blende Street	Cricket Grounds	544319	6464830	TEOM2	TSP-HVAS	DG6
R68	Whitaker Street	Residence	544485	6462026	TEOM1	TSP-HVAS	DG7
R69	King Street	Residence	544751	6462012	TEOM1	TSP-HVAS	DG7
R70	Talbot Street	Lamb Oval	543879	6461328	TEOM1	TSP-HVAS	DG7

APPENDIX G ANNUAL AND SEASONAL WINDROSES FOR BROKEN HILL AIRPORT

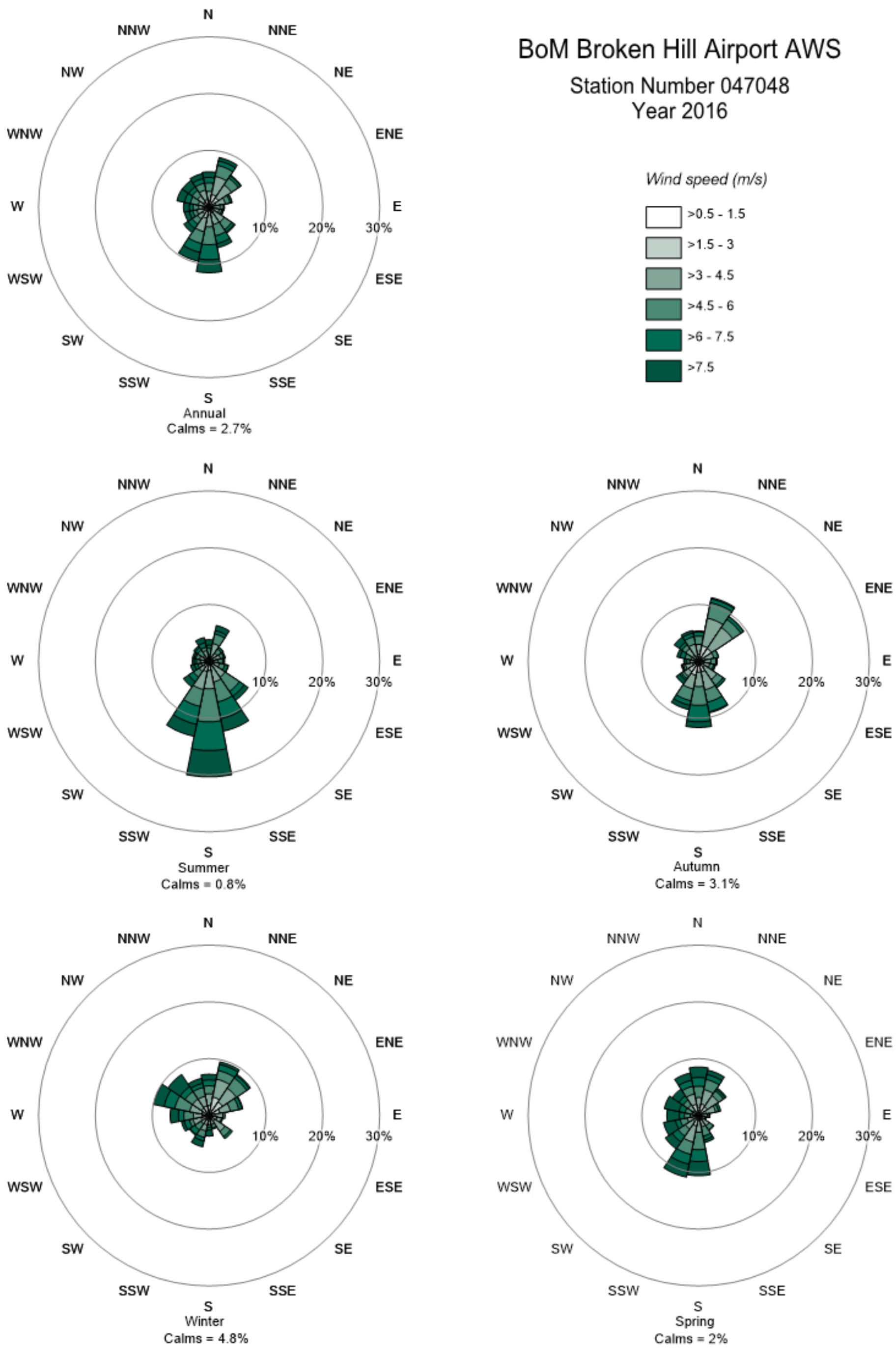

Figure G.1: Annual and seasonal wind roses for Broken Hill Airport (2016)

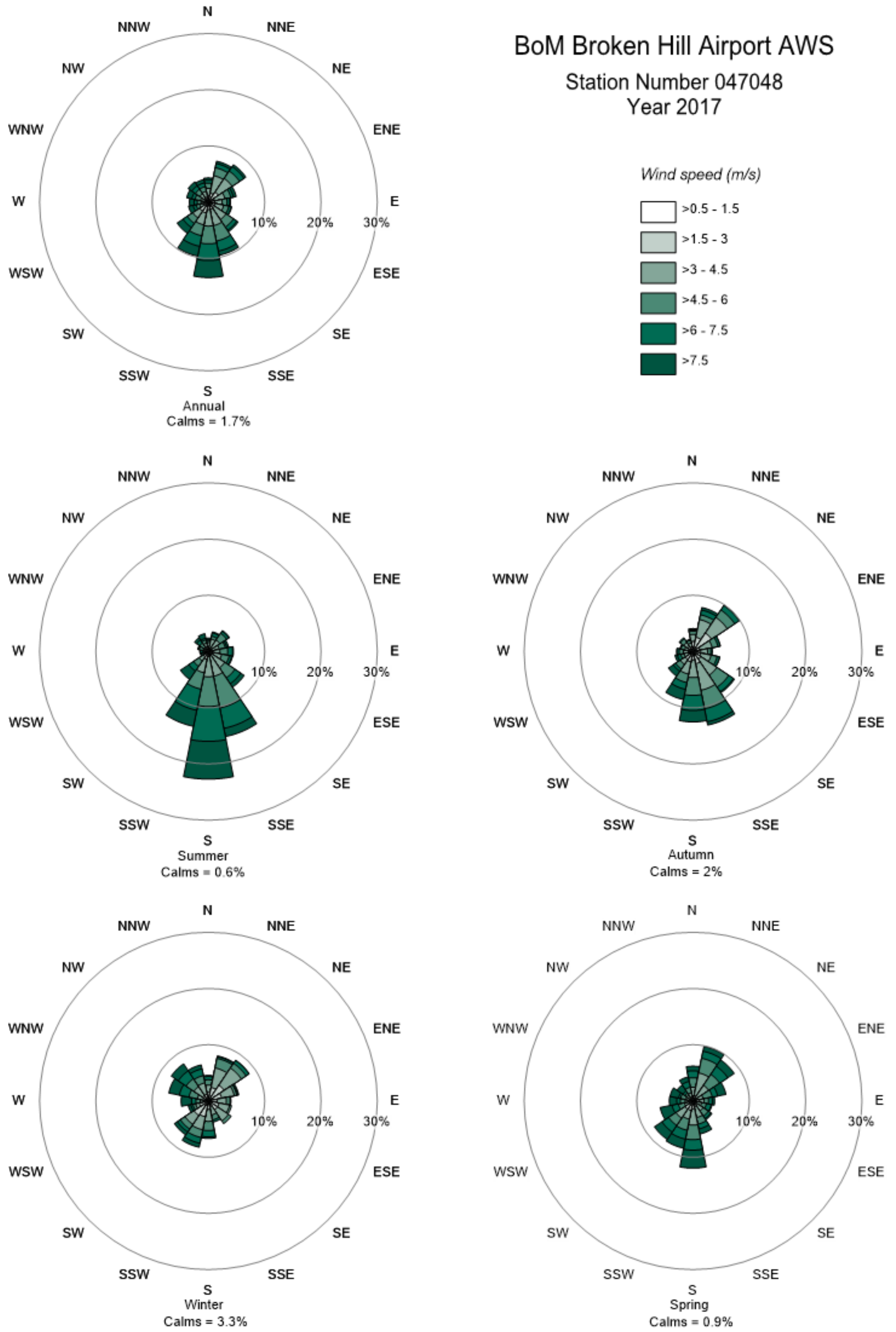

Figure G.2: Annual and seasonal wind roses for Broken Hill Airport (2017)

Figure G.3: Annual and seasonal wind roses for Broken Hill Airport (2018)

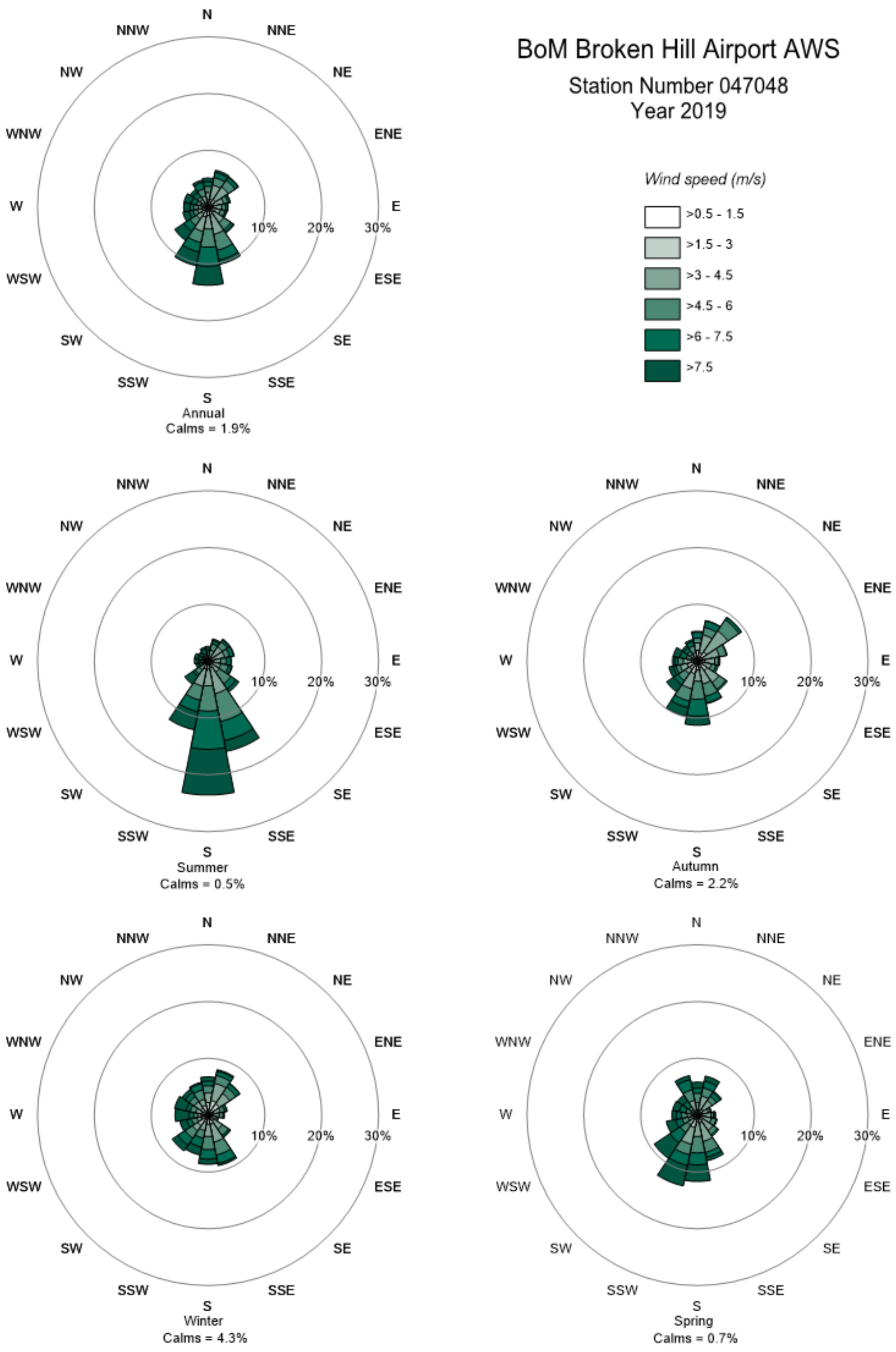

Figure G.4: Annual and seasonal wind roses for Broken Hill Airport (2019)

APPENDIX H MONITORING DATA REVIEW

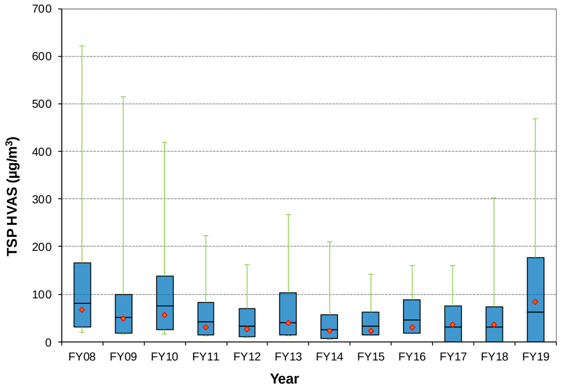

Figure H-1: TSP concentration measured by HVAS

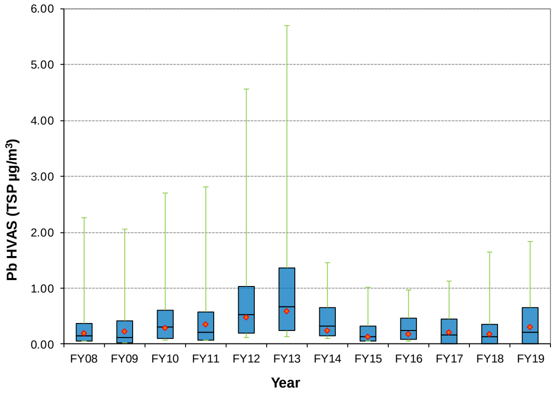

Figure H-2: Pb concentration measured by HVAS

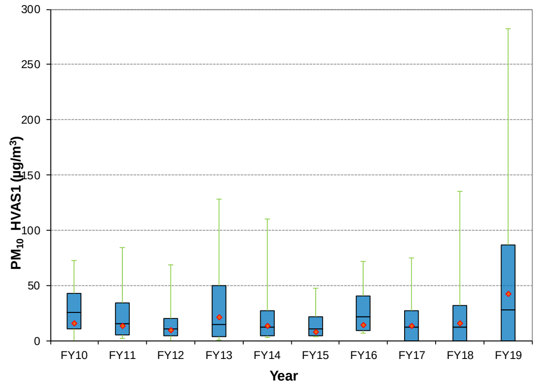

Figure H-3: PM_{10} concentrations measured by HVAS1

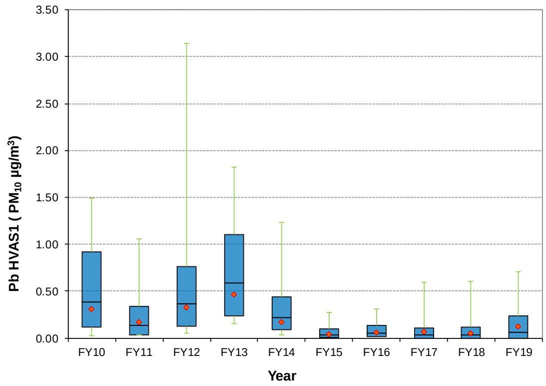

Figure H-4: Pb concentrations measured by HVAS1

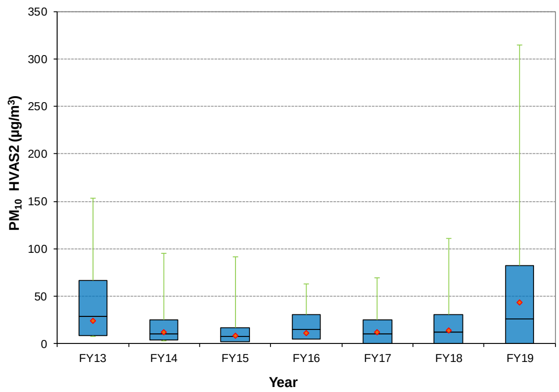

Figure H-5: PM_{10} concentrations measured by HVAS2

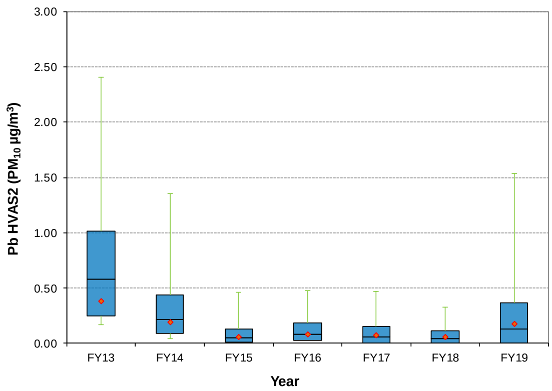

Figure H-6: Pb concentrations measured by HVAS2

Note: The extents of the box denote the 25th and 75th percentile of the data and the median is the line across the box. The mean is the red dot and the green error bars are the maximum and minimum values.

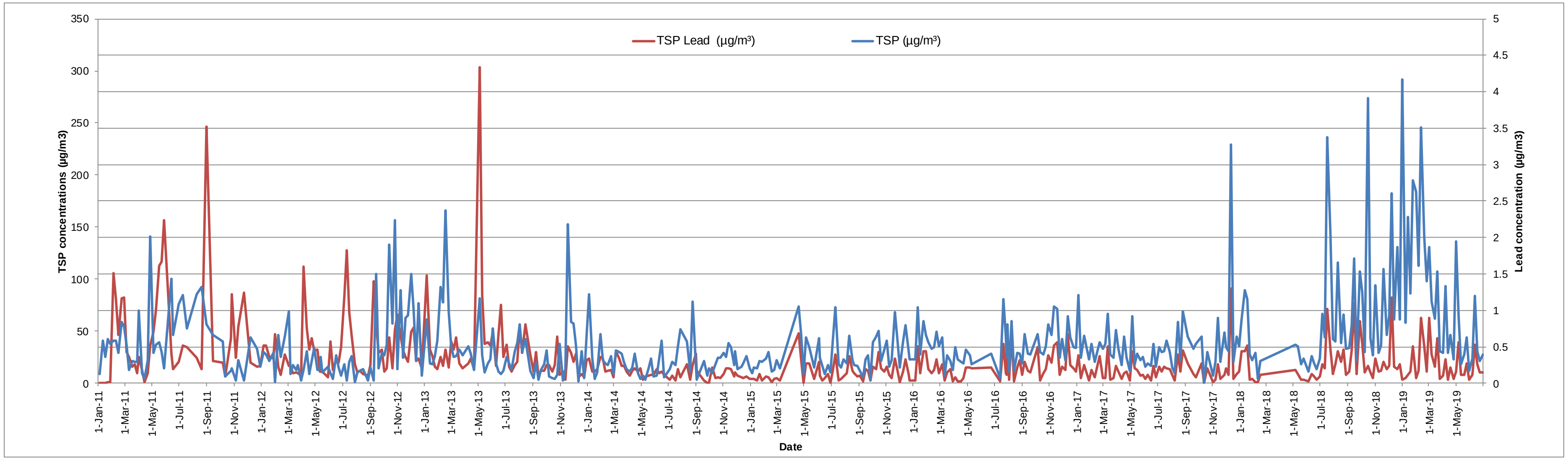

Figure H-7: Time series of HVAS data for TSP and Pb concentrations

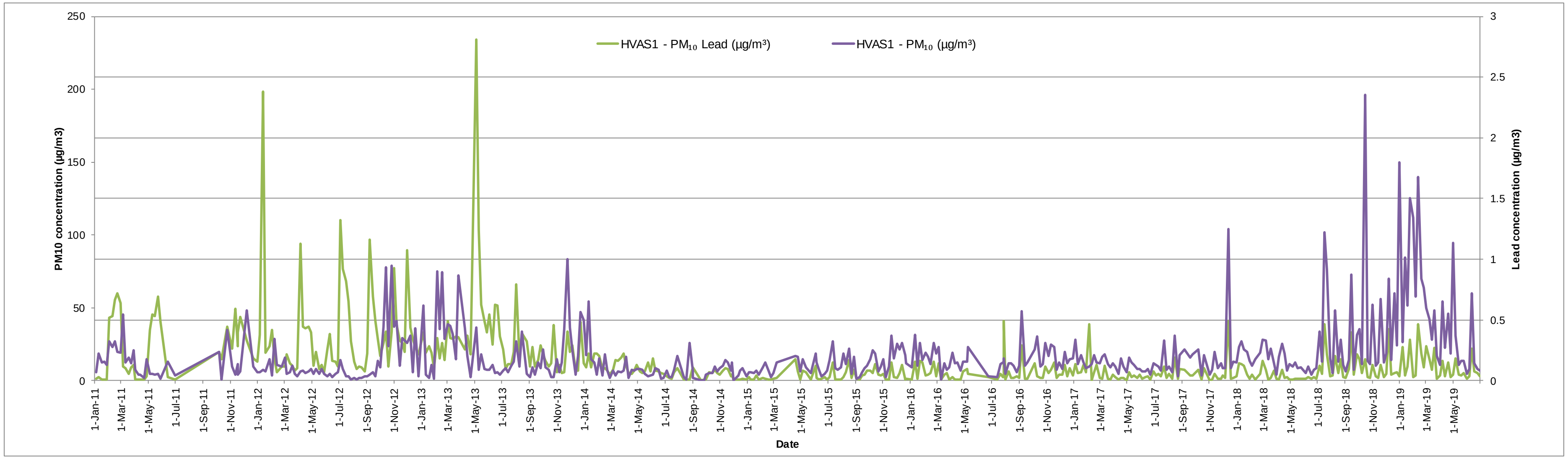

Figure H-8: Time series of HVAS1 data for PM_{10} and Pb concentrations

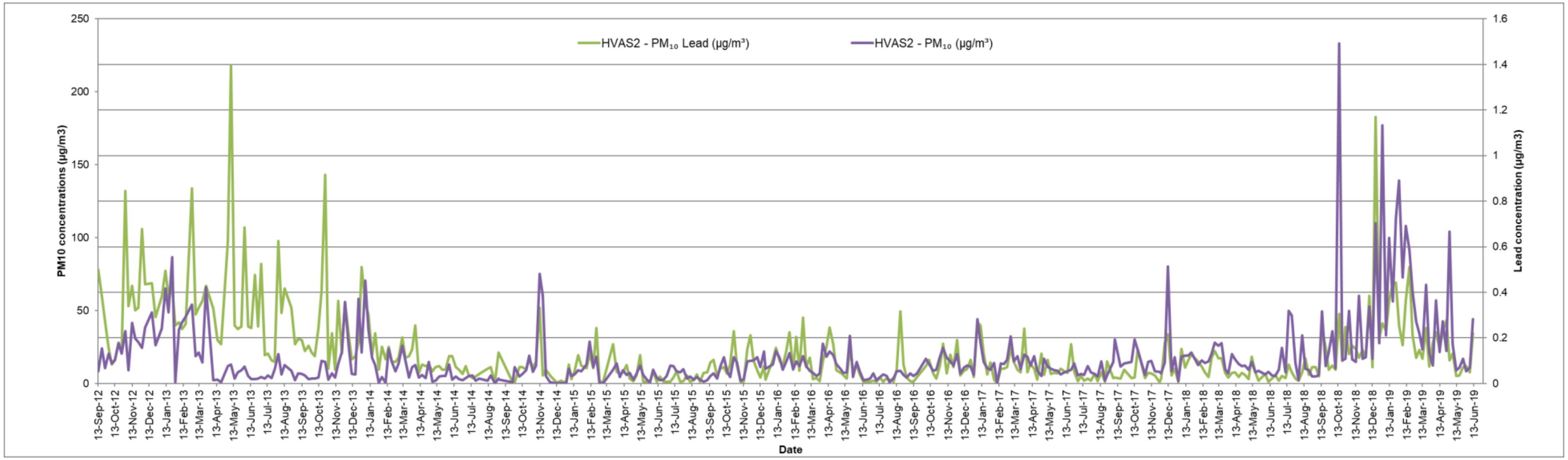

Figure H-9: Time series of HVAS2 data for PM_{10} and Pb concentrations

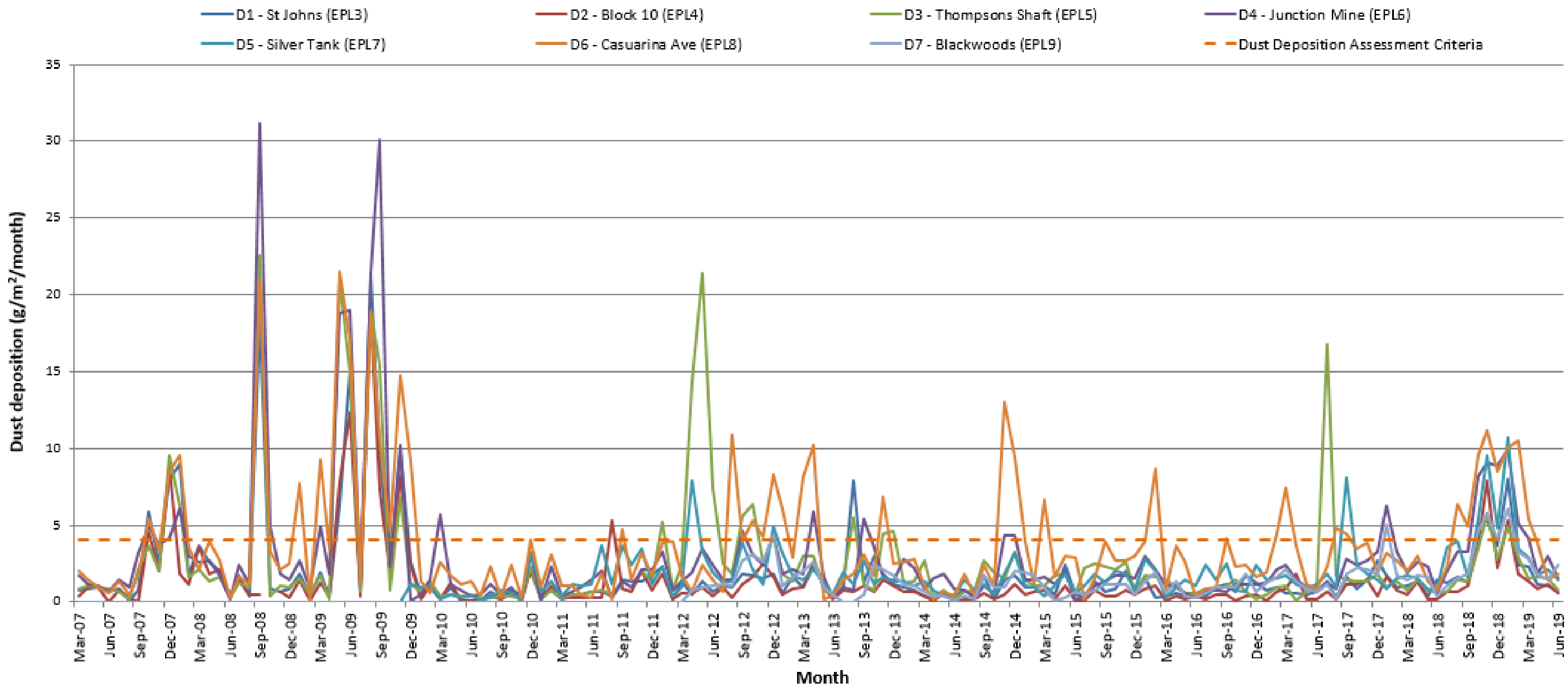

Figure H-10: Time series of dust deposition gauges for deposited dust

Note: October 2008 a value of 60.1 g/m^2/month was recorded at dust gauge D2 (Block 10). However, for clarity, this outlier value is not shown in the above figure

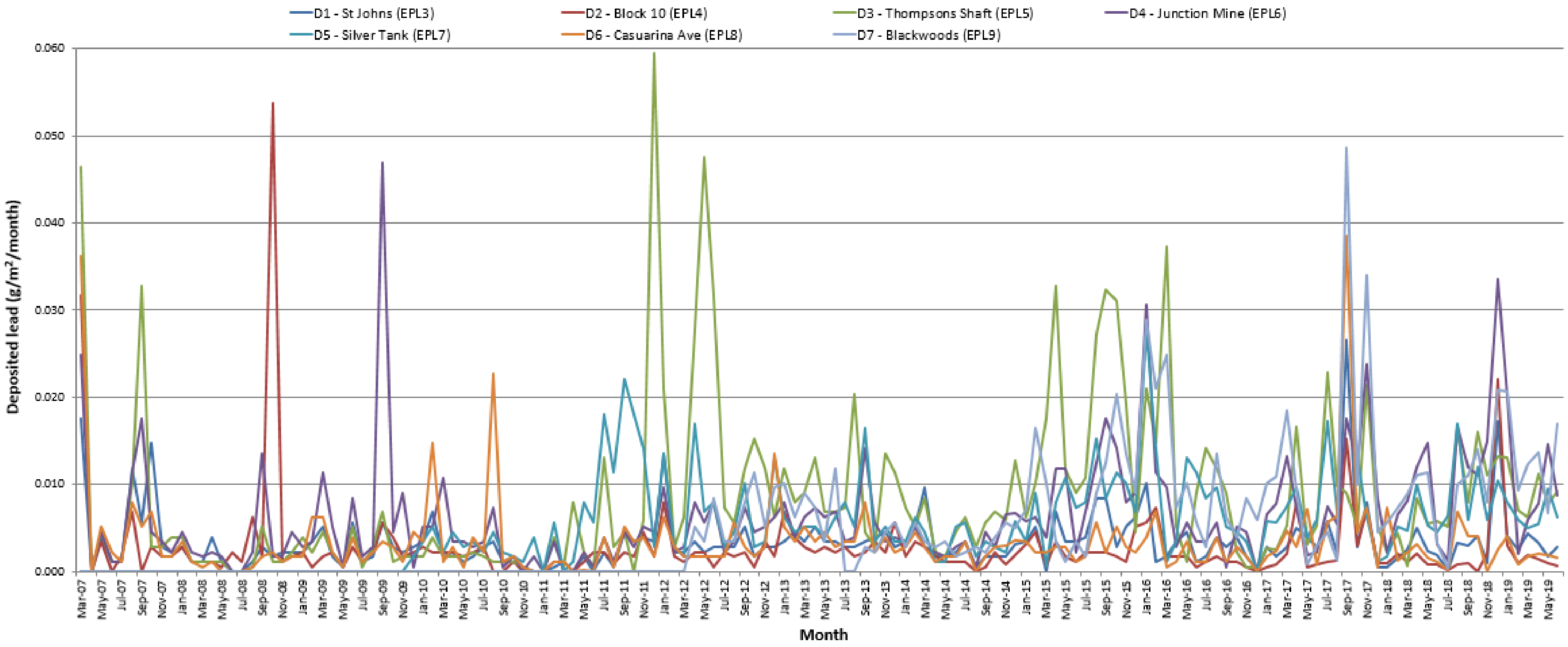

Figure H-11: Time series of lead deposition from the dust deposition gauges

Note: In September 2017, a value of 0.401 g/m^2/month (lead) was recorded at dust gauge D5 (Silver Tank). However, for clarity, this outlier value is not shown in the above figure.

APPENDIX I CONTOUR PLOTS

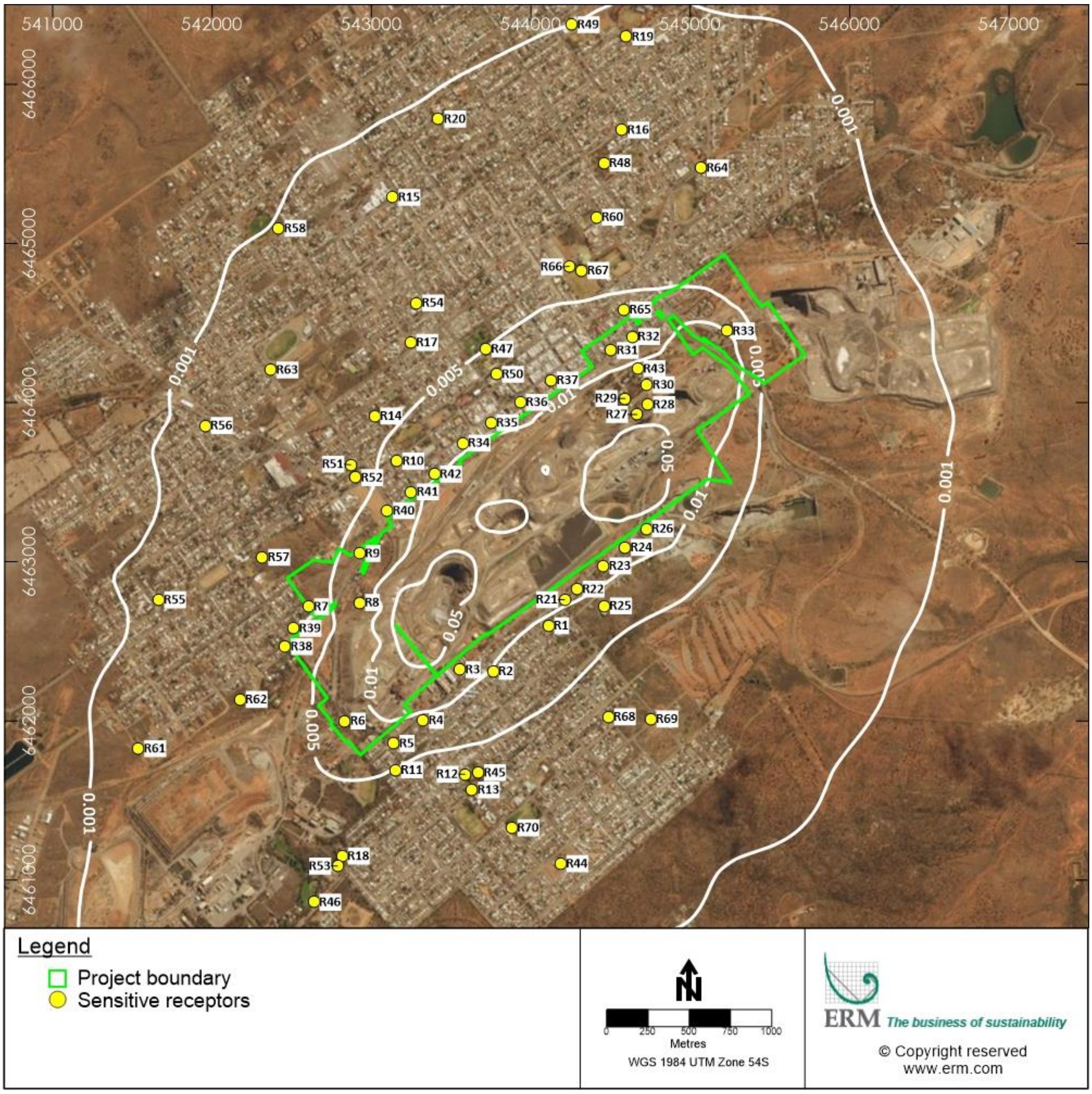

Figure I-1: Predicted incremental annual average lead concentrations (µg/m^3) for the BAU scenario

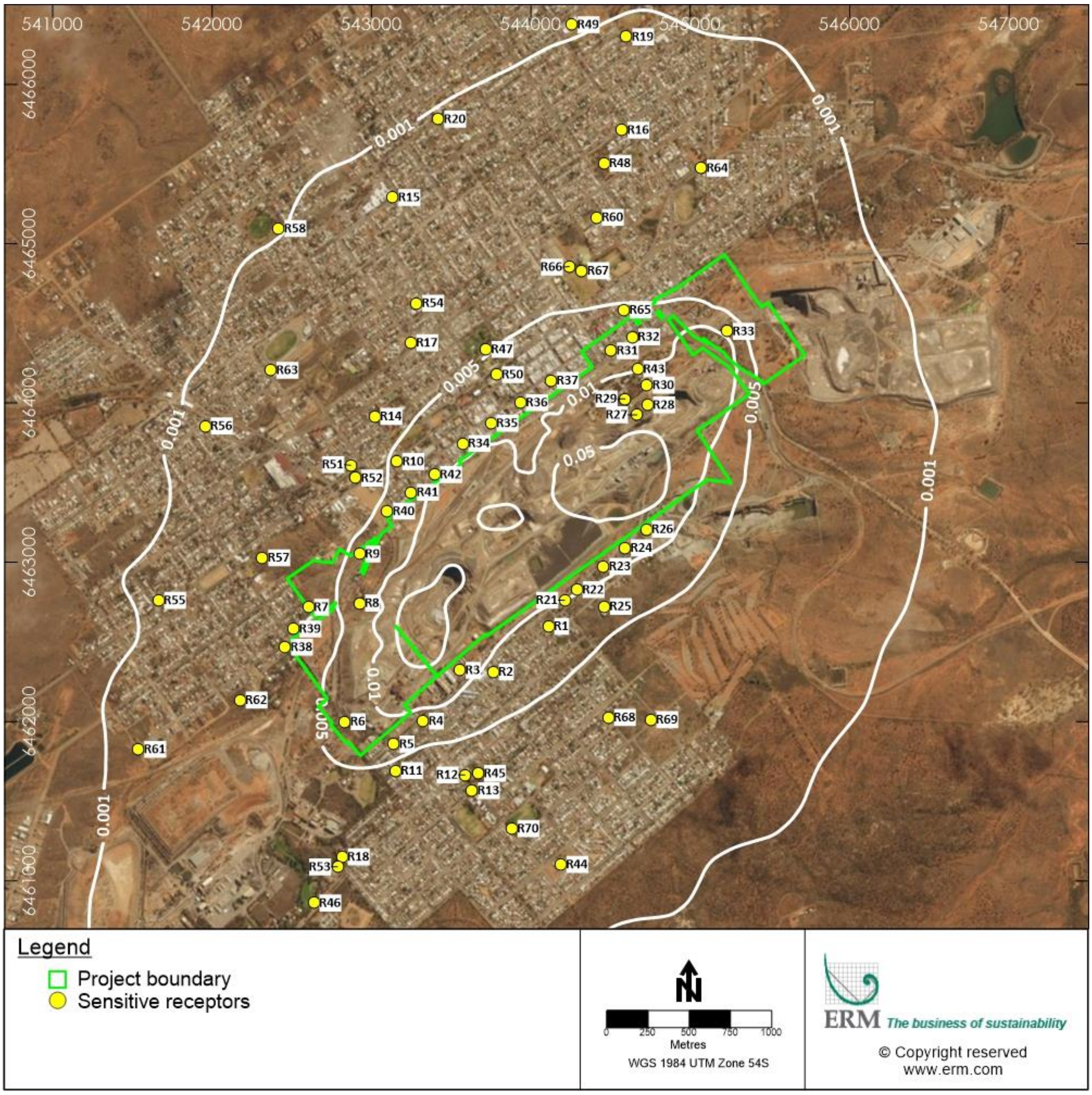

Figure I-2: Predicted incremental annual average lead concentrations (µg/m^3) for MOD6 construction scenario

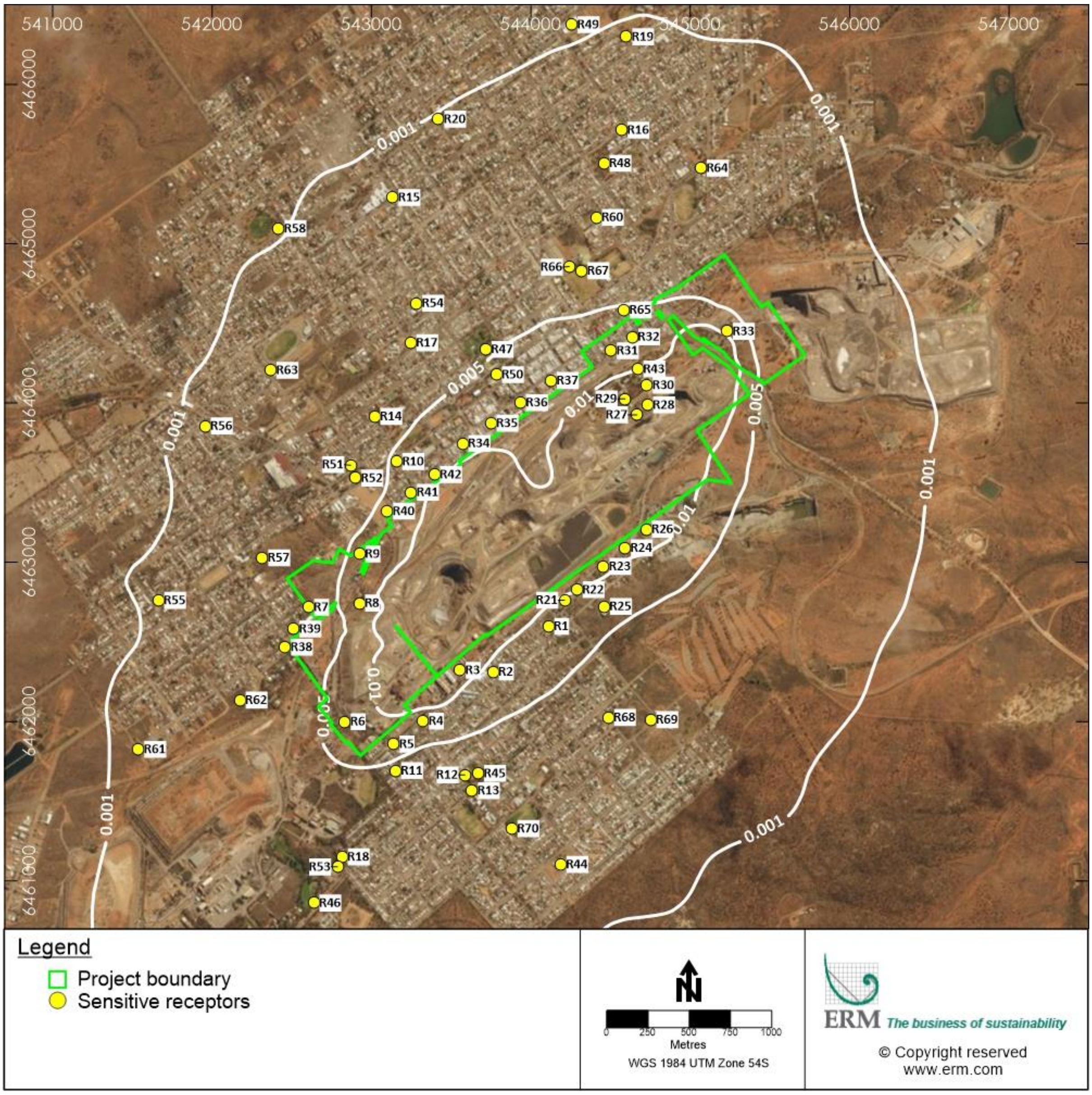

Figure I-3: Predicted incremental annual average lead concentrations (µg/m^3) for MOD6 operation scenario

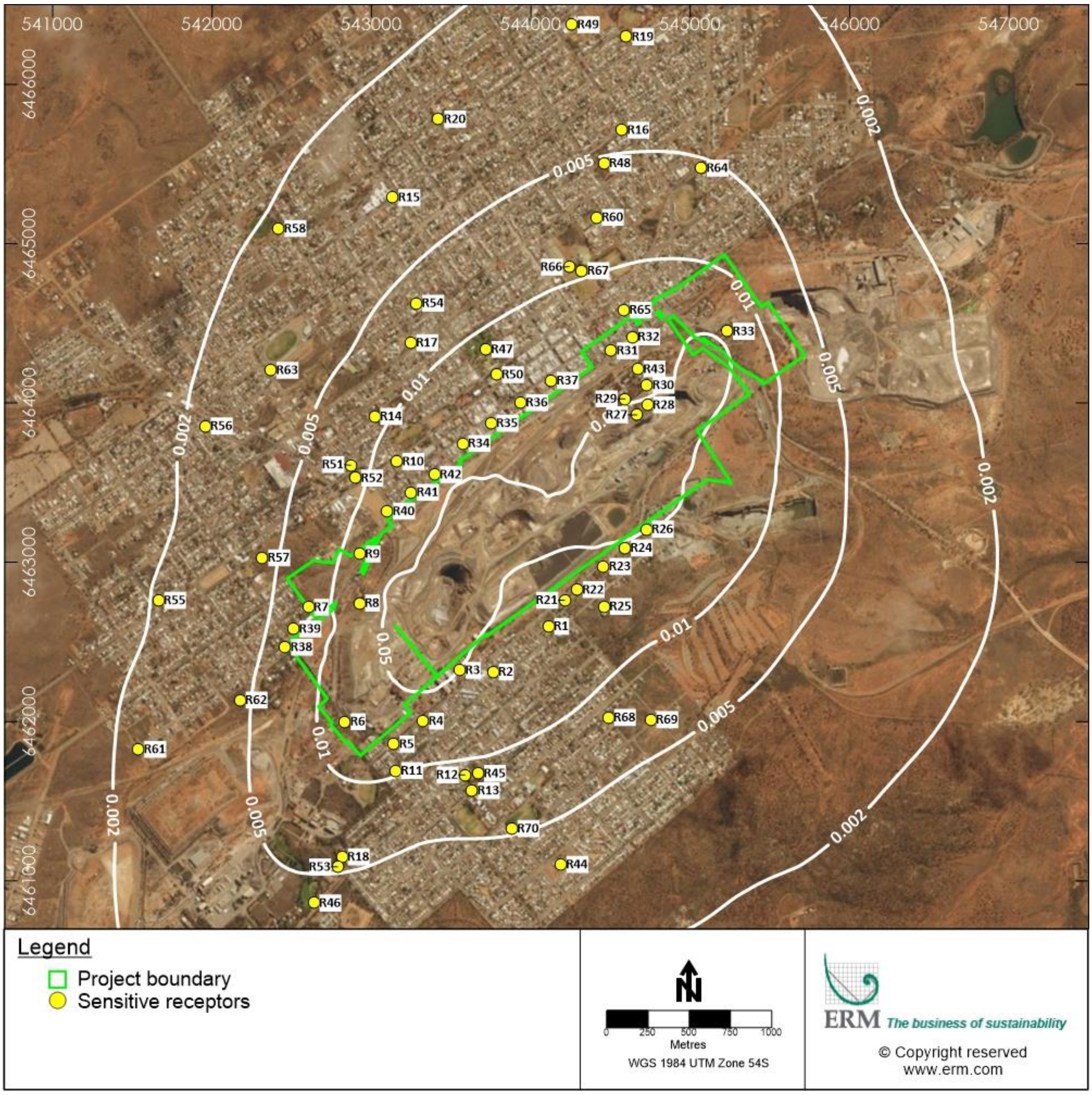

Figure I-4: Predicted annual average lead deposition (g/m^2/year) for the BAU scenario

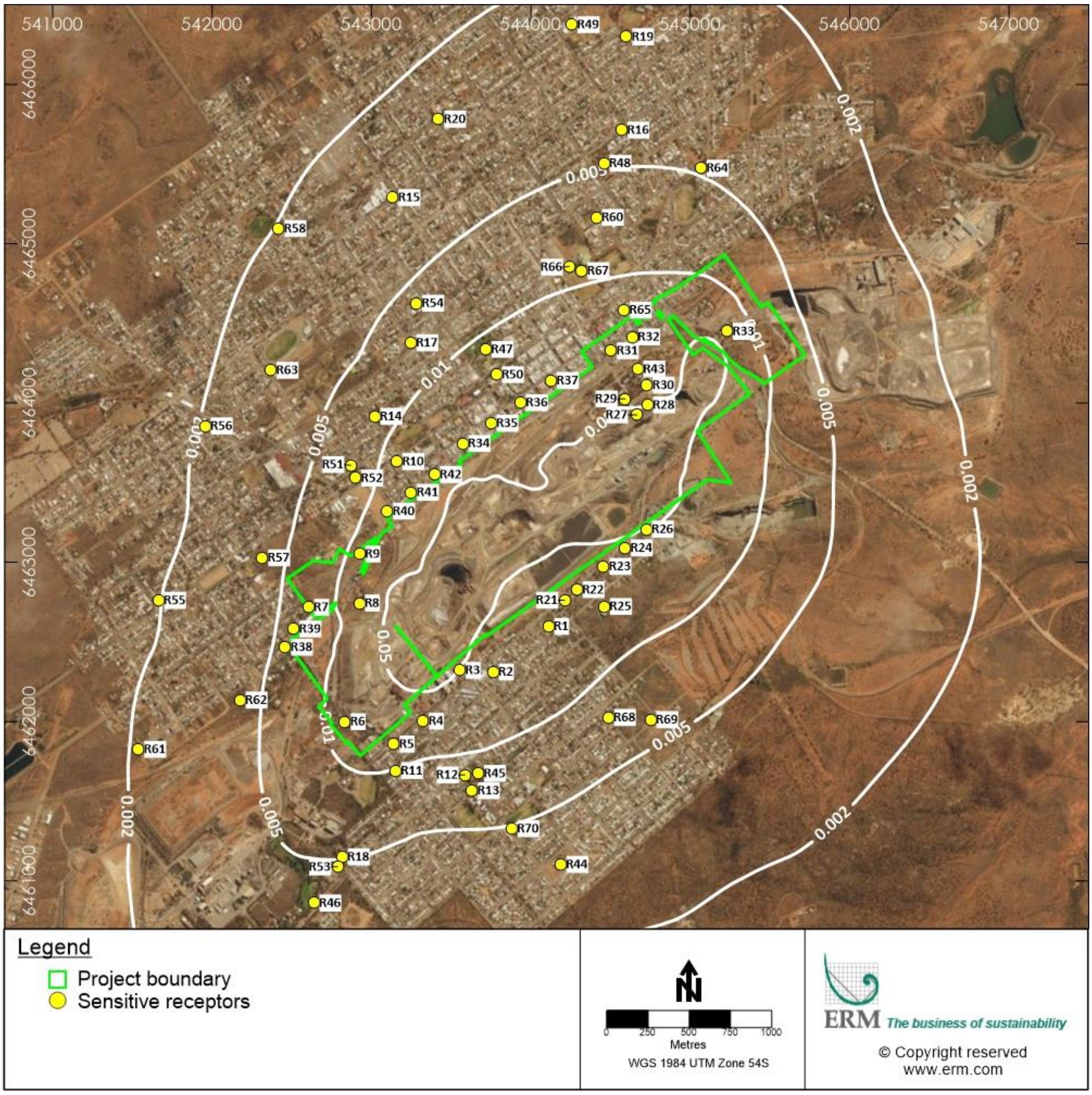

Figure I-5: Predicted annual average lead deposition (g/m^2/year) for MOD6 construction scenario

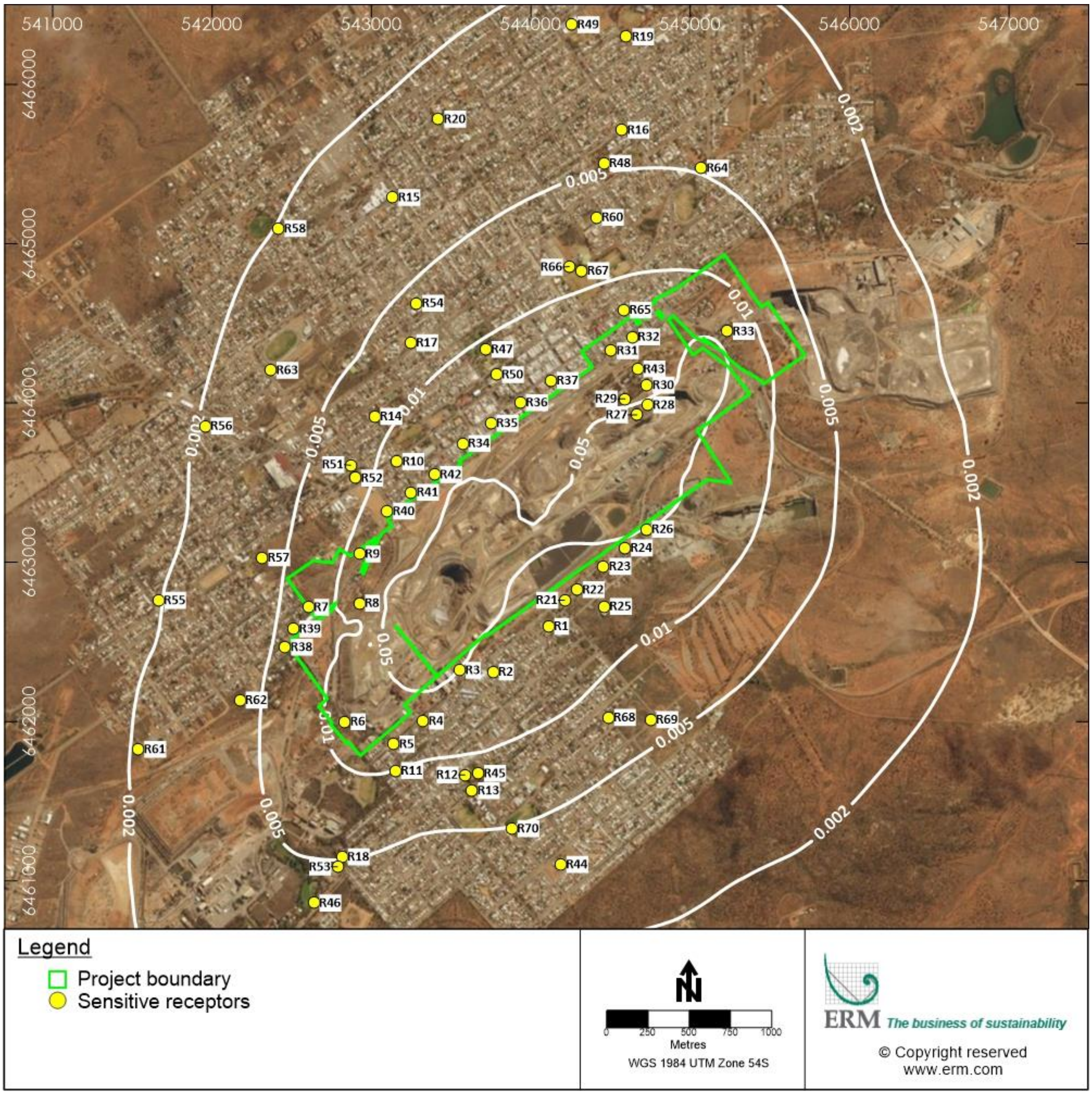

Figure I-6: Predicted annual average lead deposition (g/m^2/year) for MOD6 operational scenario

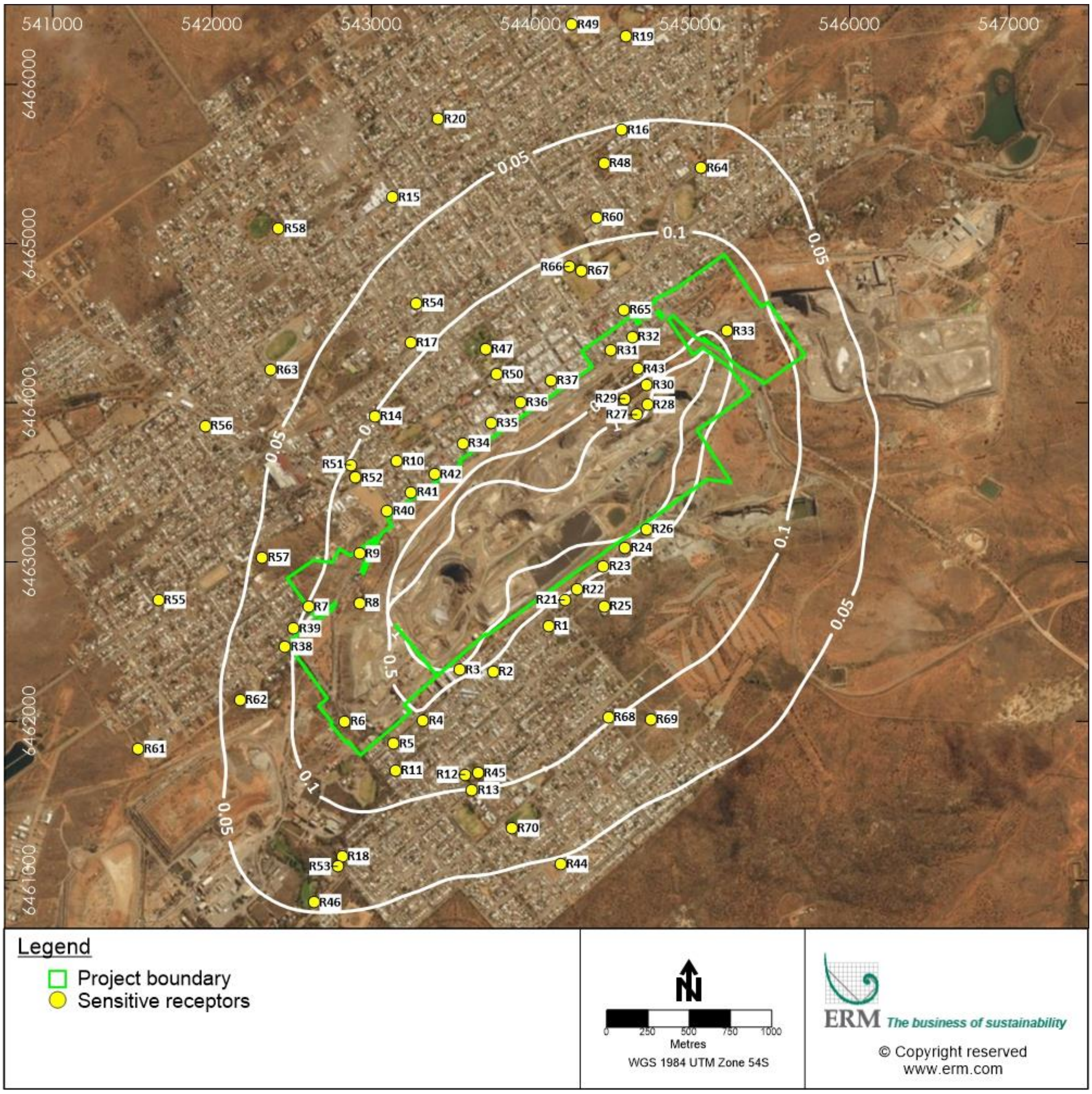

Figure I-7: Predicted incremental annual average TSP concentrations (µg/m^3) for the BAU scenario

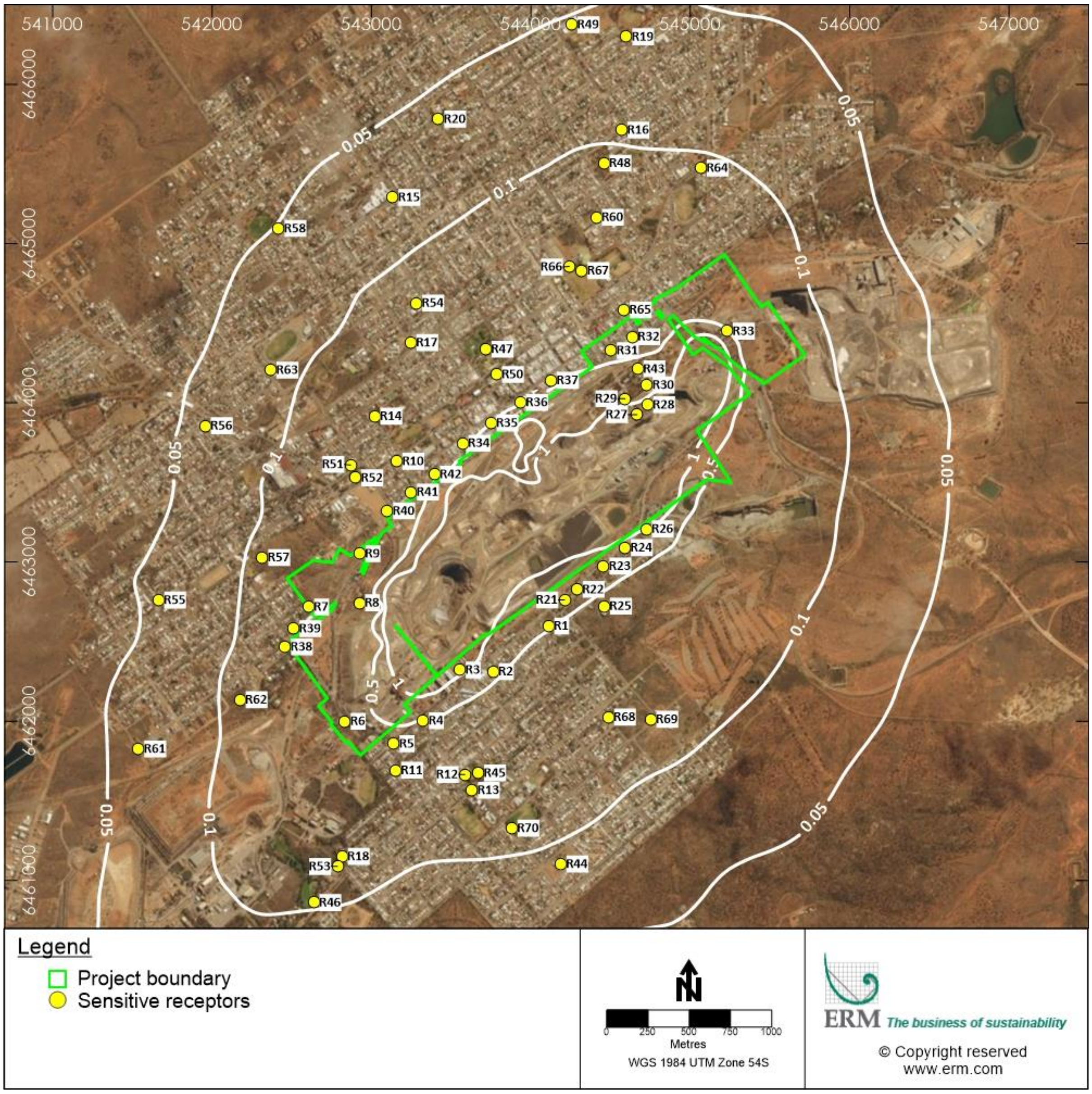

Figure I-8: Predicted incremental annual average TSP concentrations (µg/m³) for MOD6 construction scenario

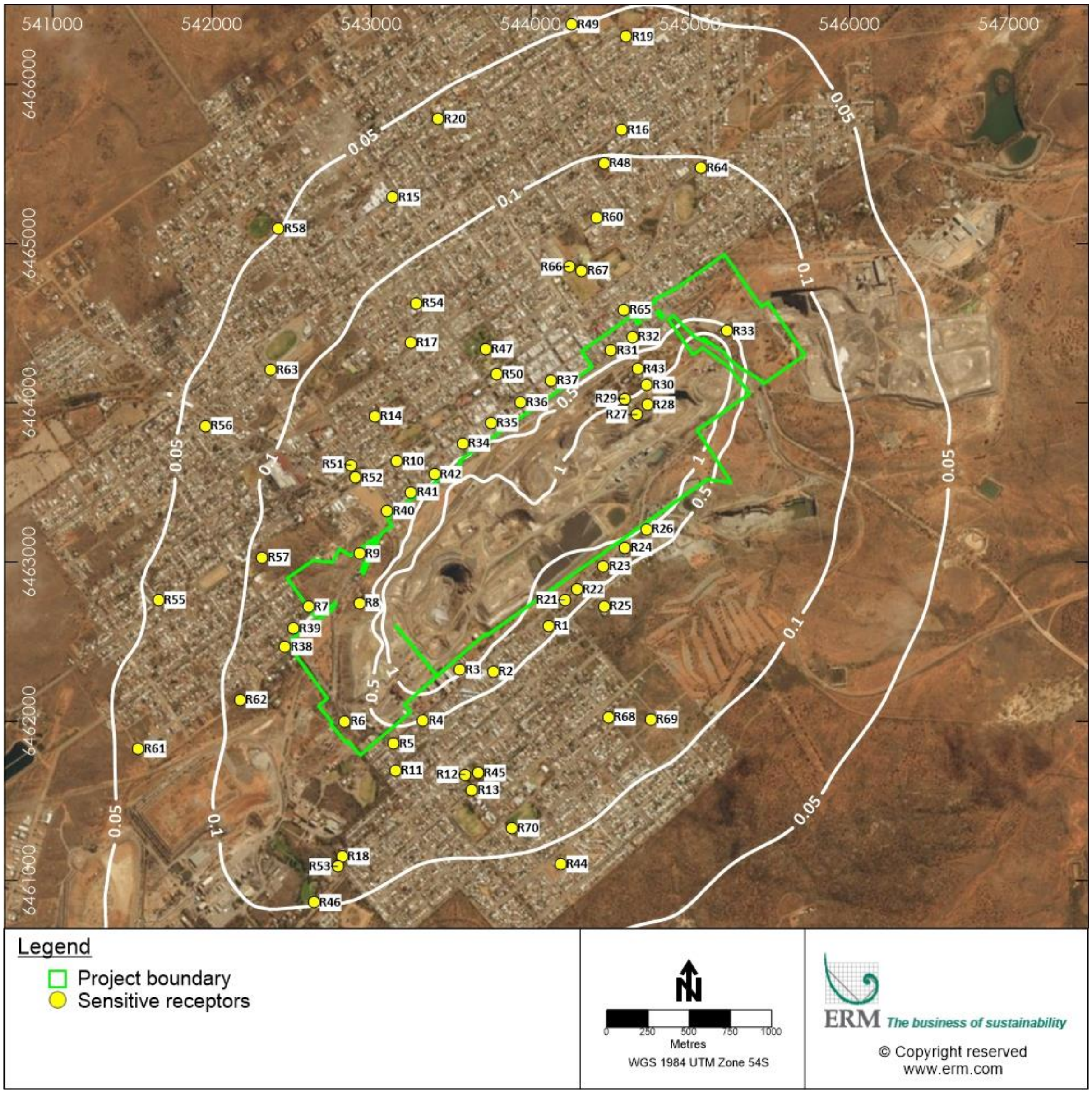

Figure I-9: Predicted incremental annual average TSP concentrations (µg/m³) for MOD6 operational scenario

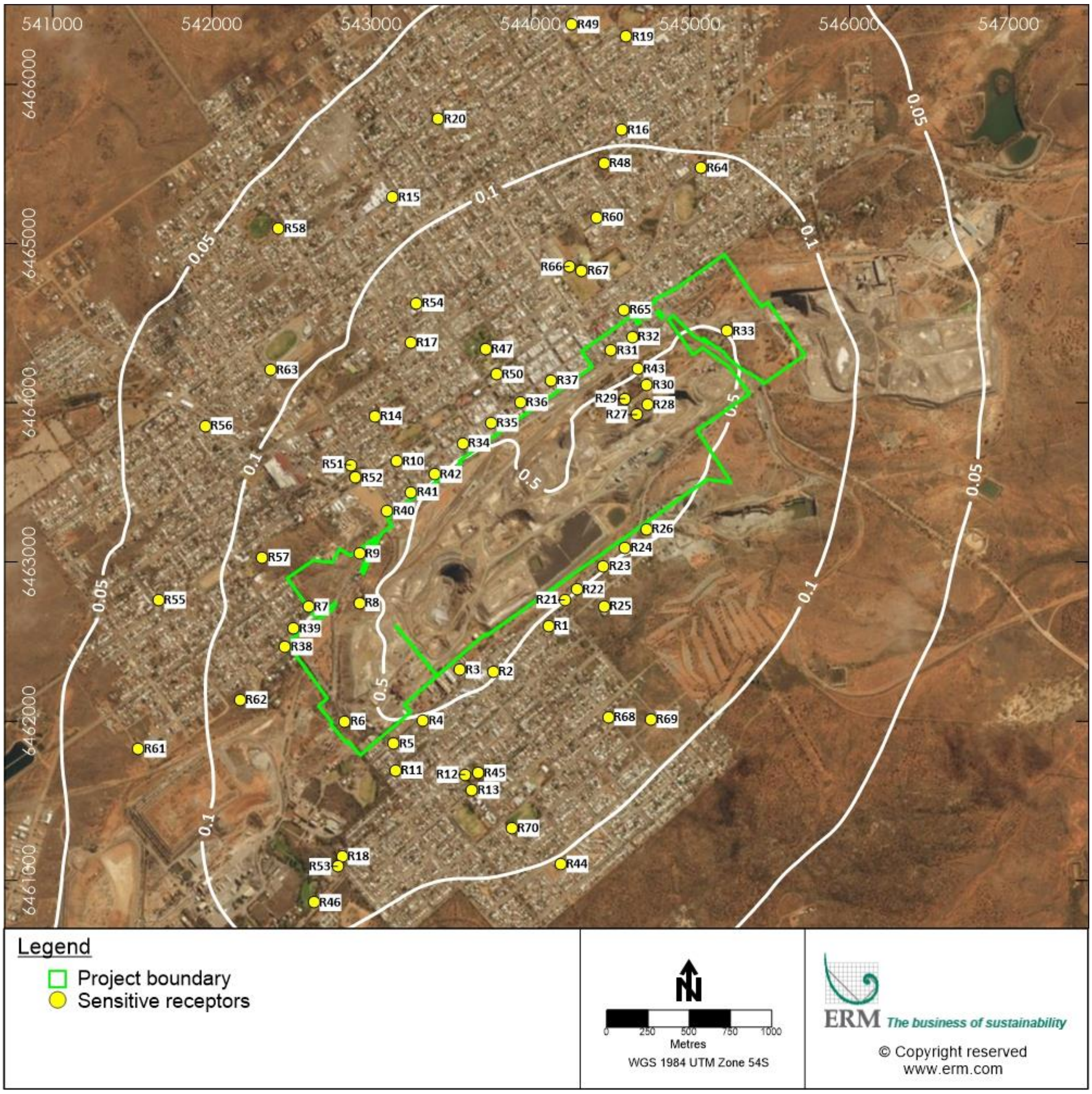

Figure I-10: Predicted incremental annual average PM_{10} concentrations (µg/m^3) for the BAU scenario

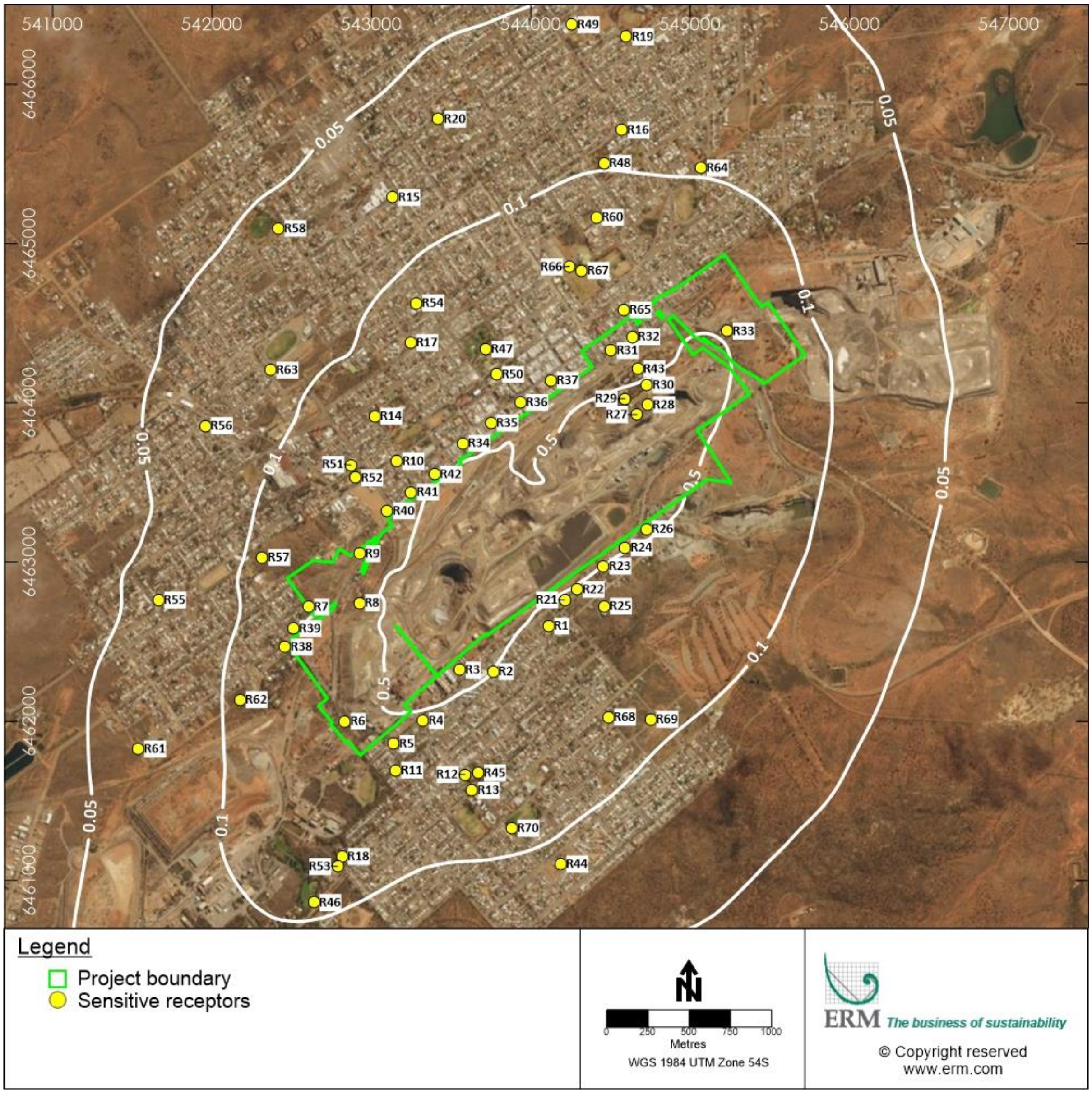

Figure I-11: Predicted incremental annual average PM_{10} concentrations (µg/m^3) for MOD6 construction scenario

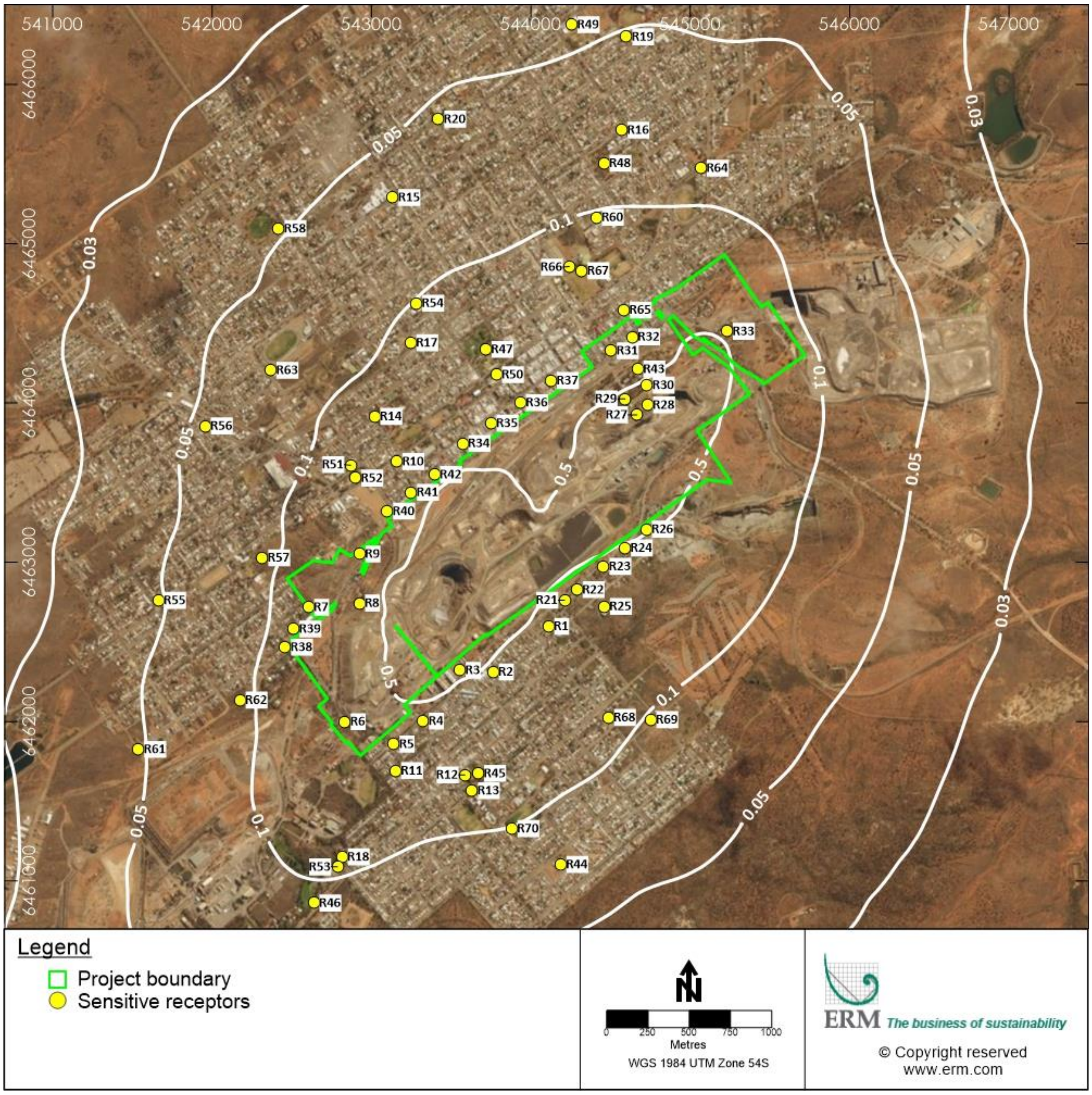

Figure I-12: Predicted incremental annual average PM_{10} concentrations (µg/m^3) for MOD6 operation scenario

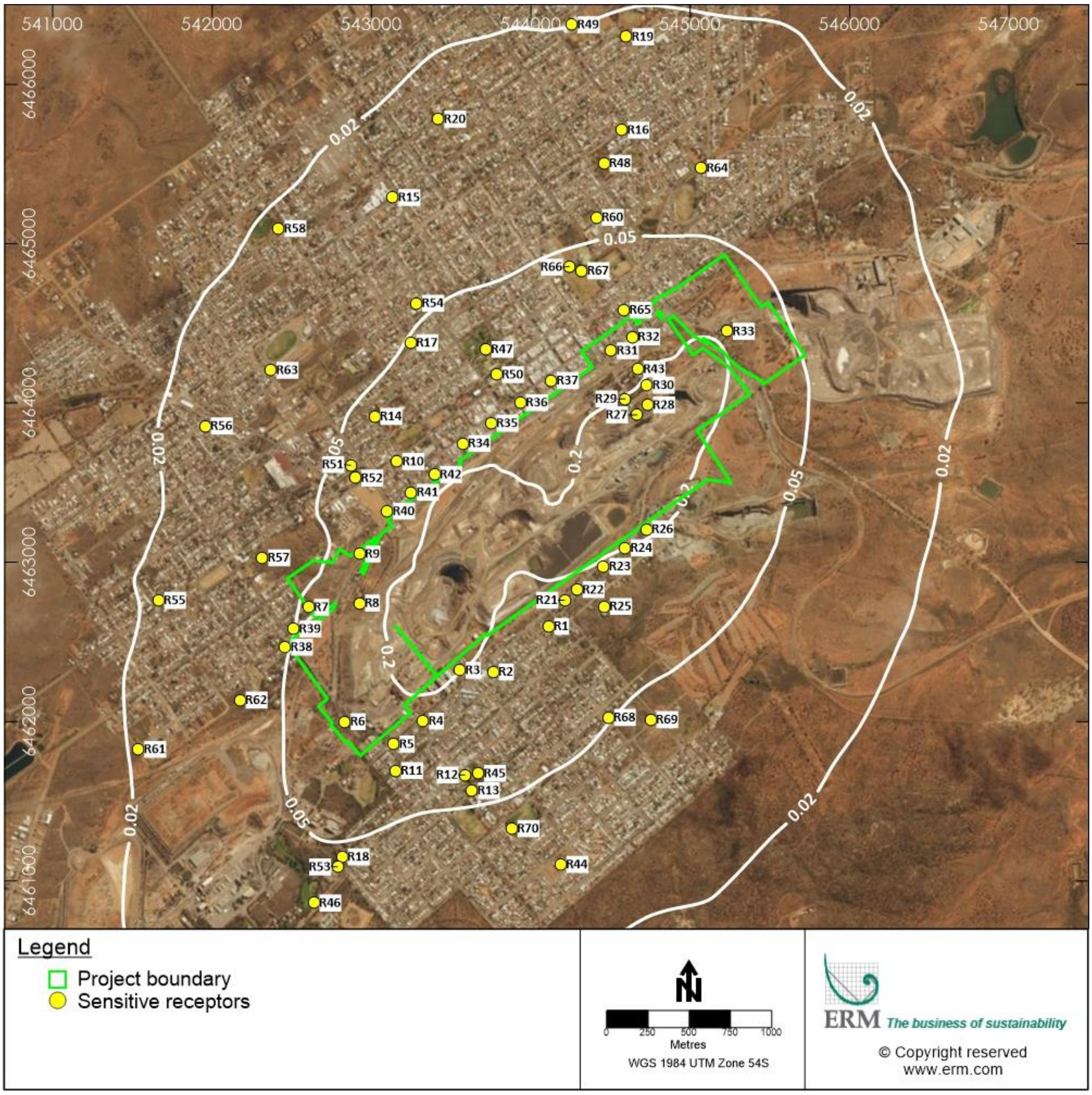

Figure I-13: Predicted incremental annual average $PM_{2.5}$ concentrations (µg/m^3) the BAU scenario

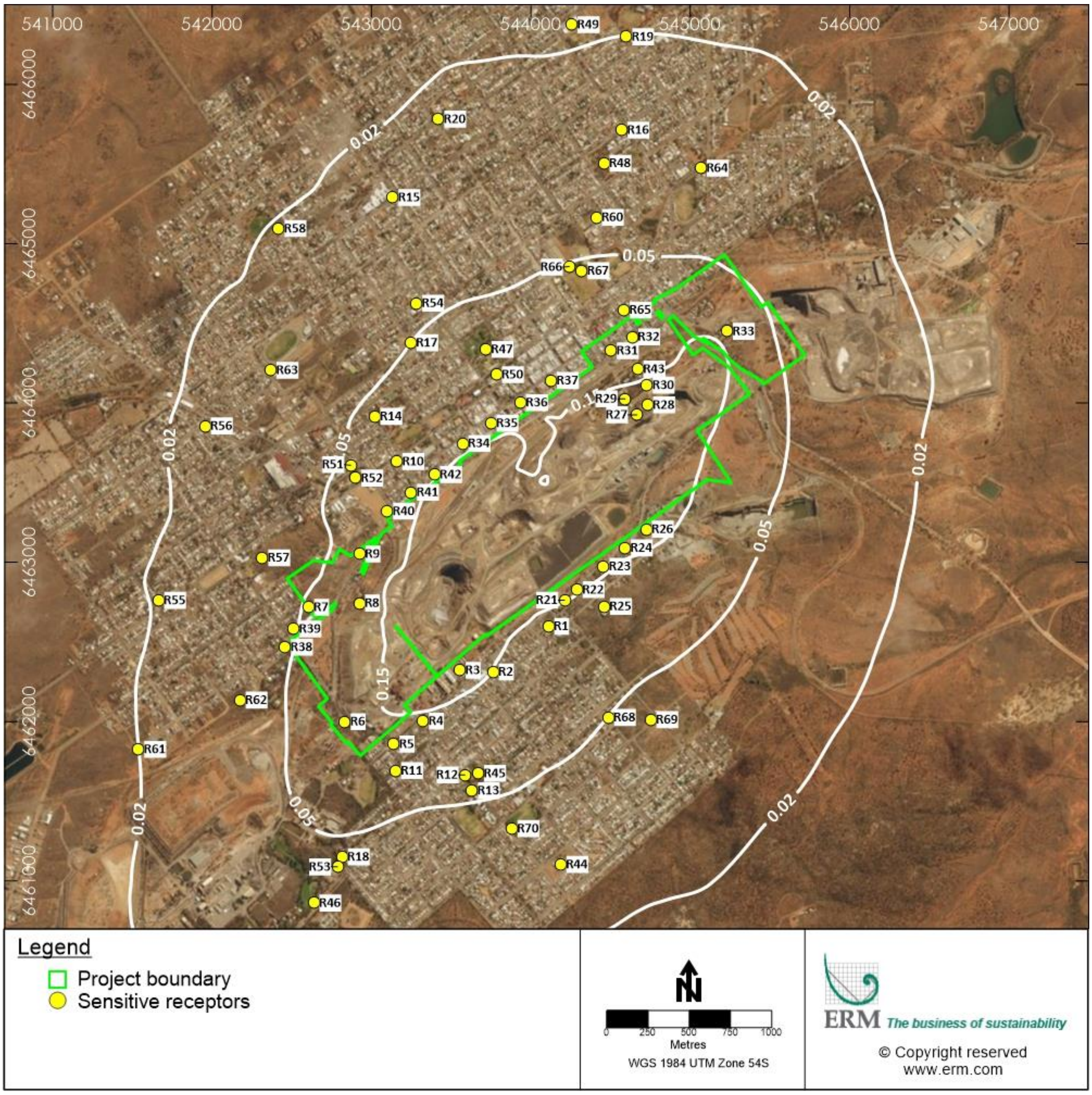

Figure I-14: Predicted incremental annual average $PM_{2.5}$ concentrations (µg/m^3) for MOD6 construction scenario

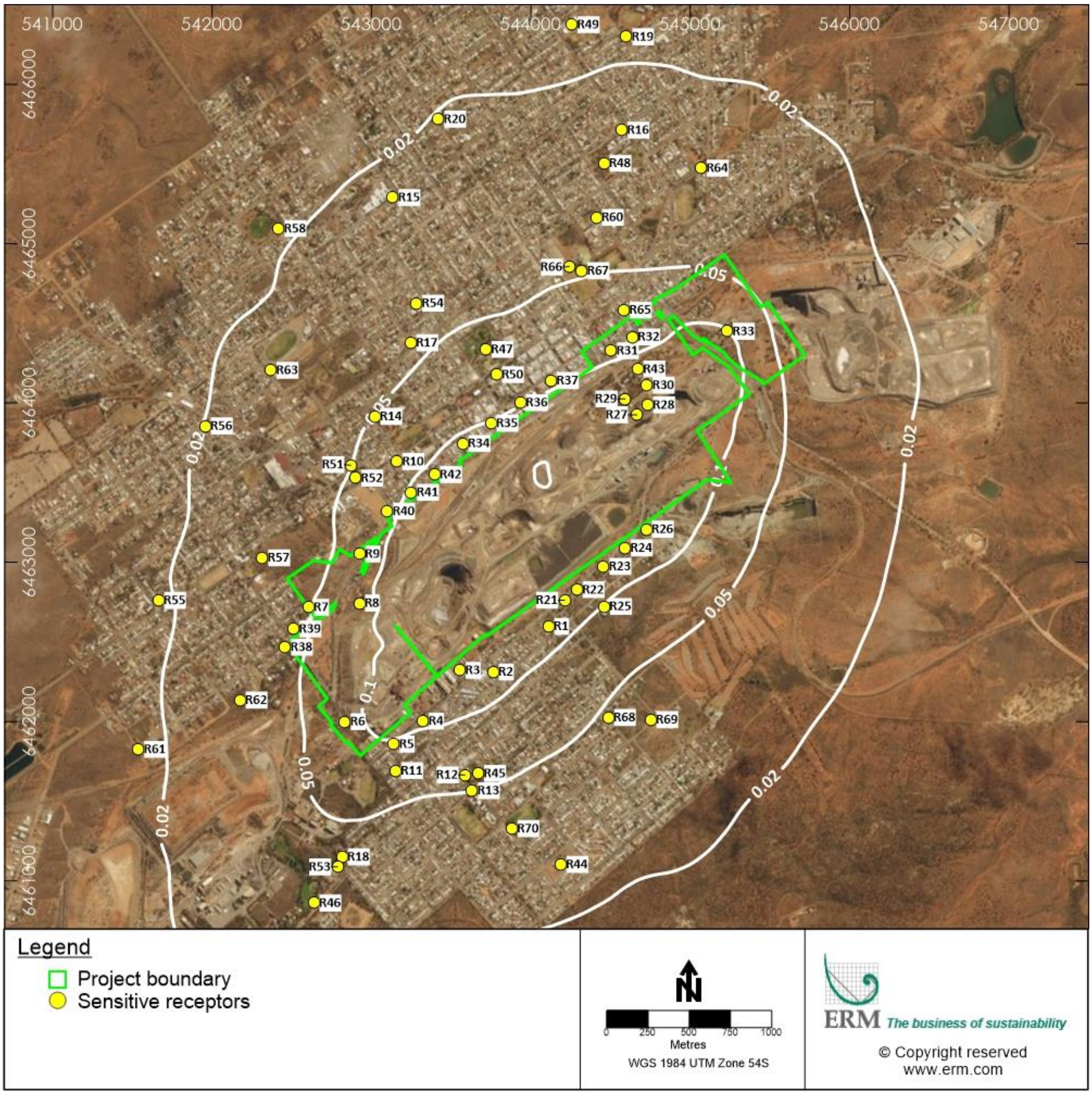

Figure I-15: Predicted incremental annual average $PM_{2.5}$ concentrations (µg/m^3) for MOD6 operational scenario

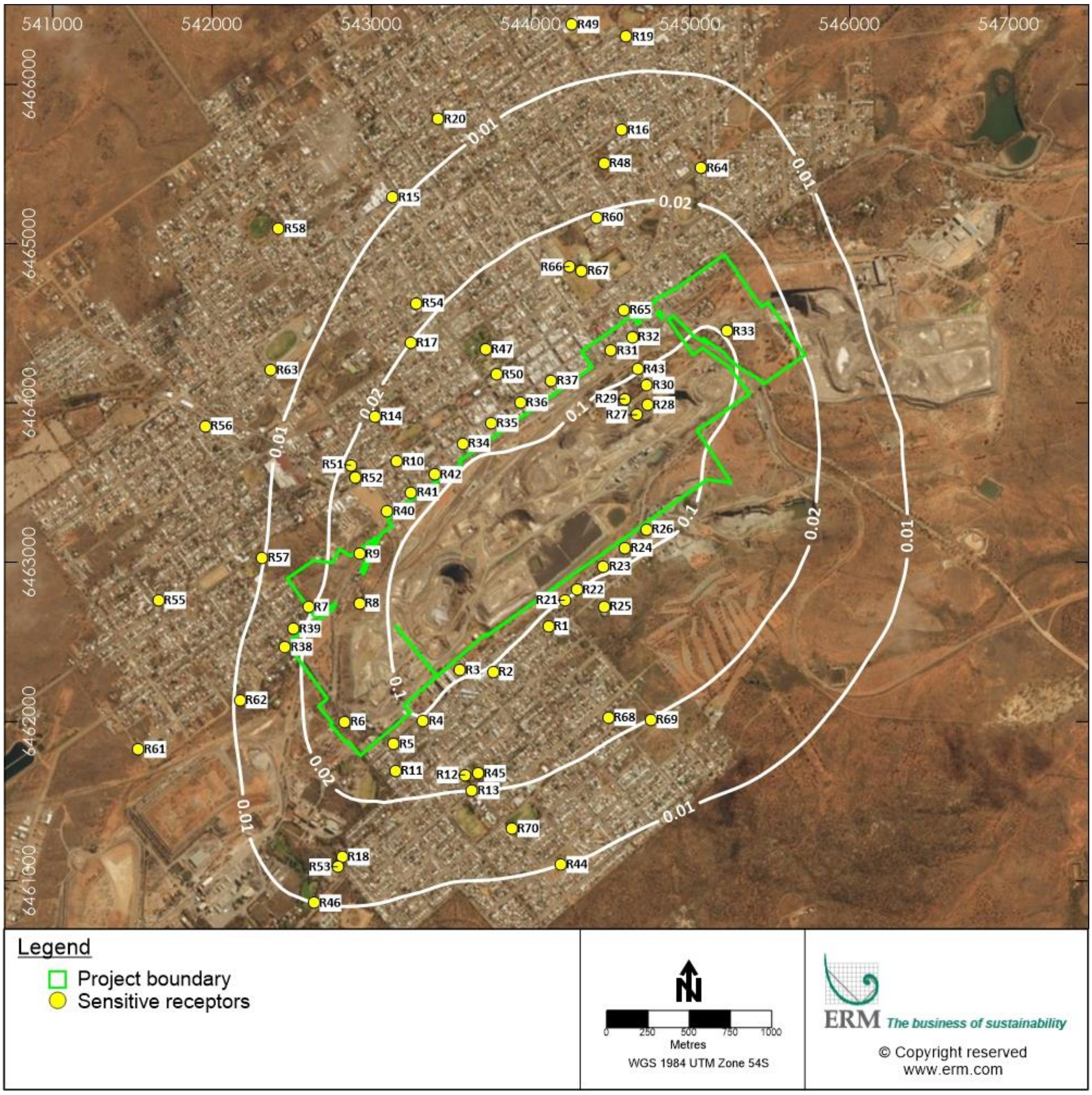

Figure I-16: Predicted incremental monthly average deposited dust (g/m^2/month) for the BAU scenario

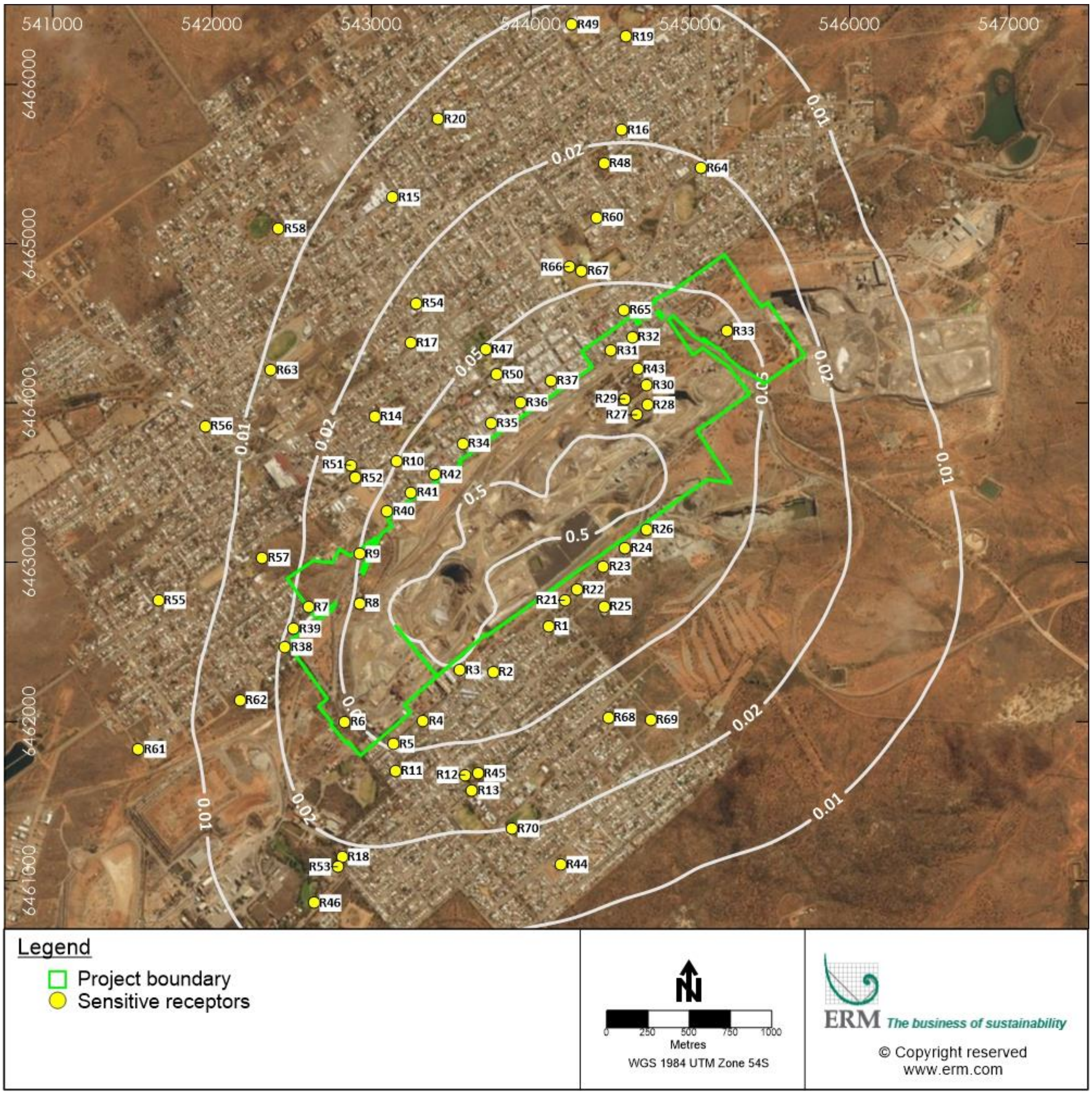

Figure I-17: Predicted incremental monthly average deposited dust (g/m^2/month) for MOD6 construction scenario

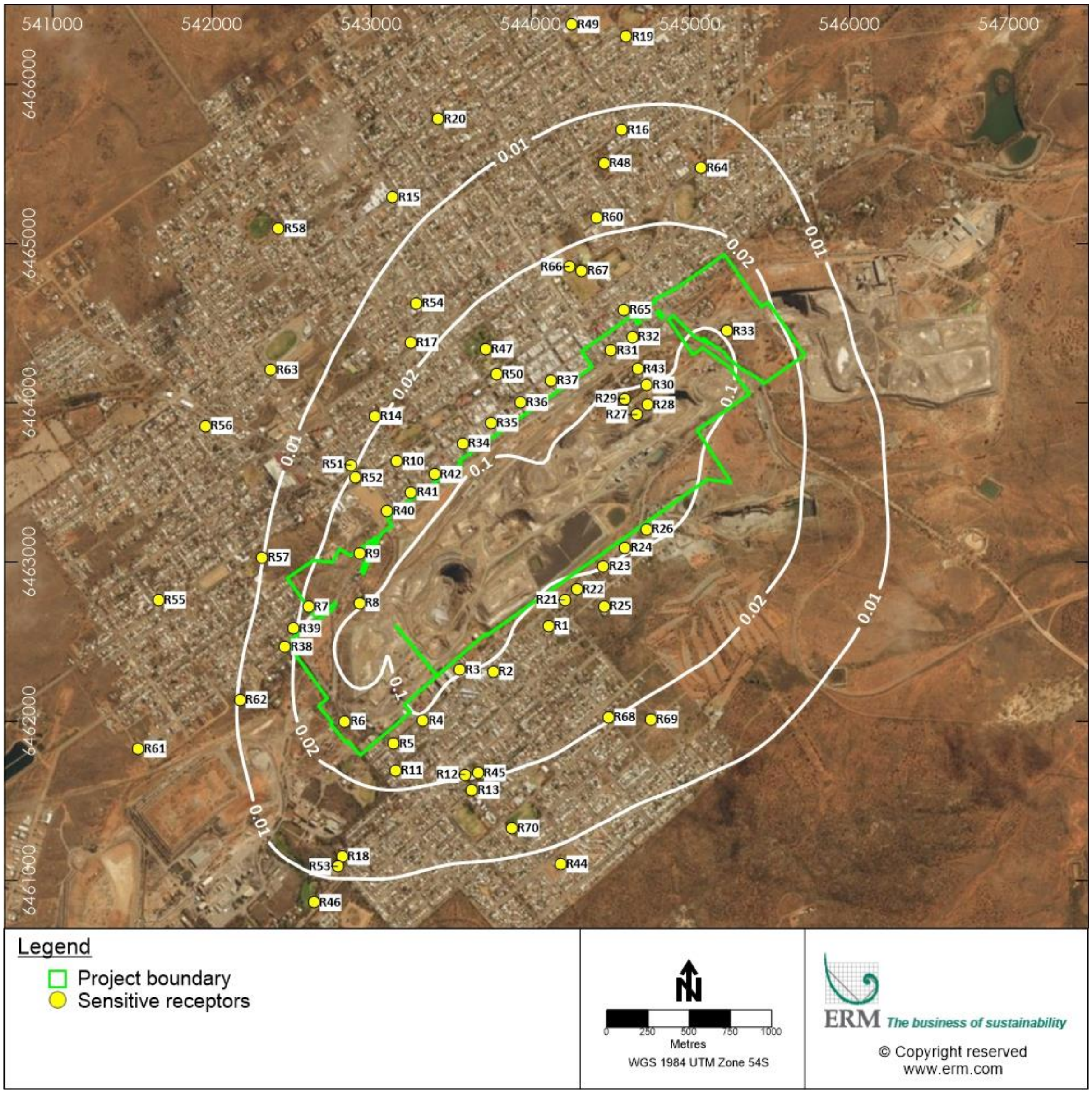

Figure I-18: Predicted incremental monthly average deposited dust (g/m²/month) for MOD6 operational scenario

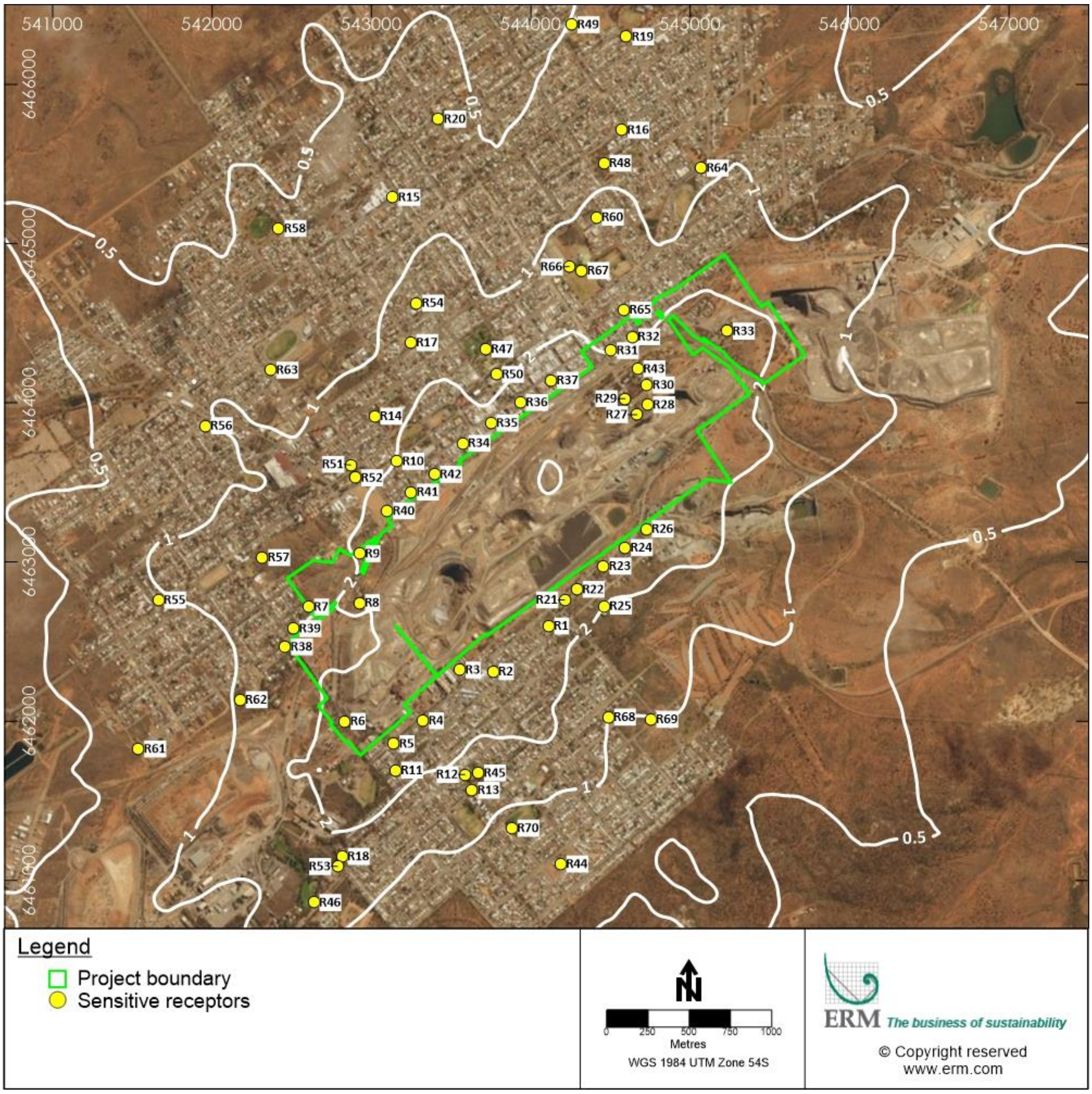

Figure I-19: Predicted incremental maximum 24-hour average PM_{10} concentrations ($\mu g/m^3$) for the BAU scenario

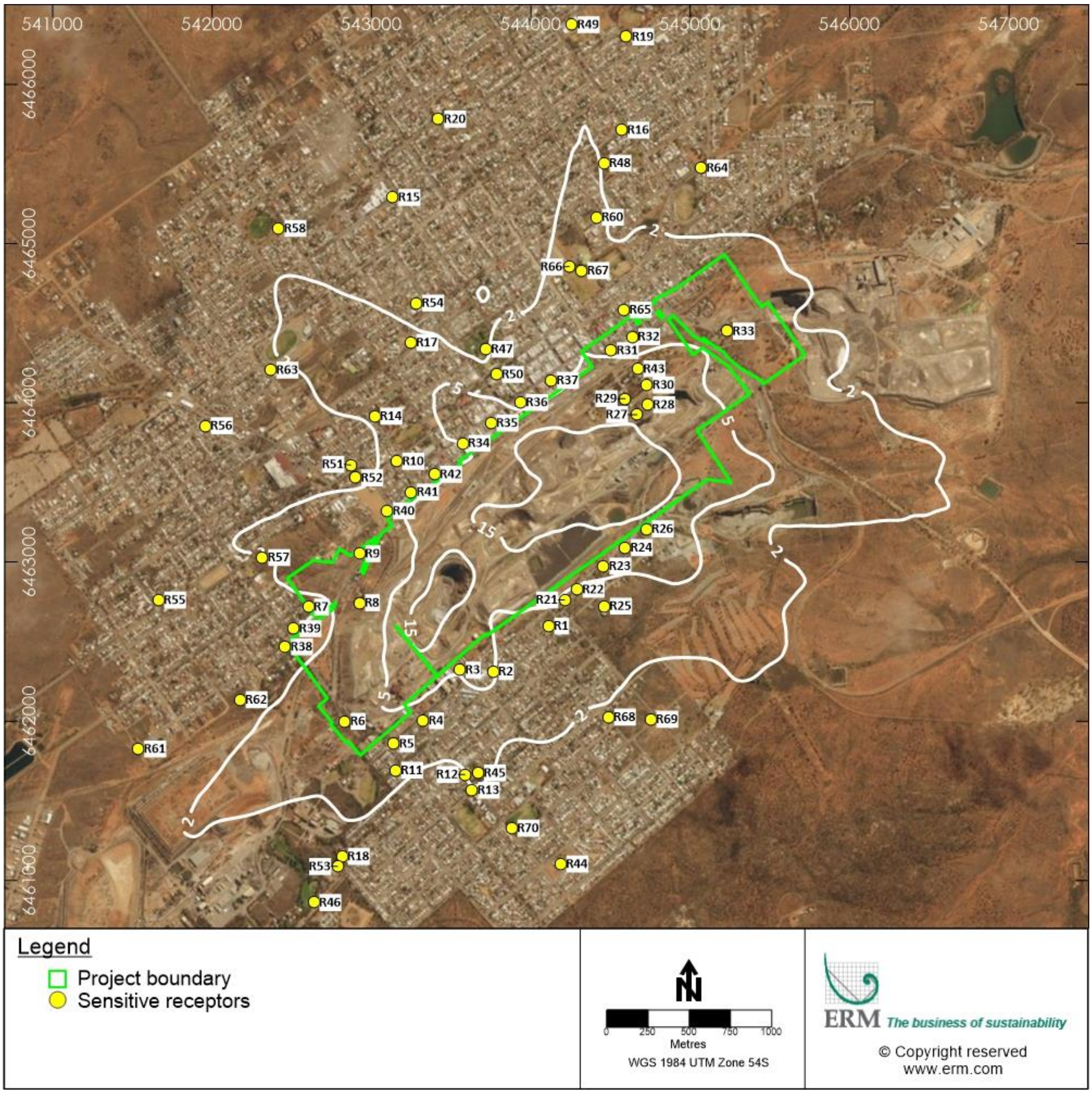

Figure I-20: Predicted incremental maximum 24-hour average PM_{10} concentrations (µg/m^3) for MOD6 construction scenario

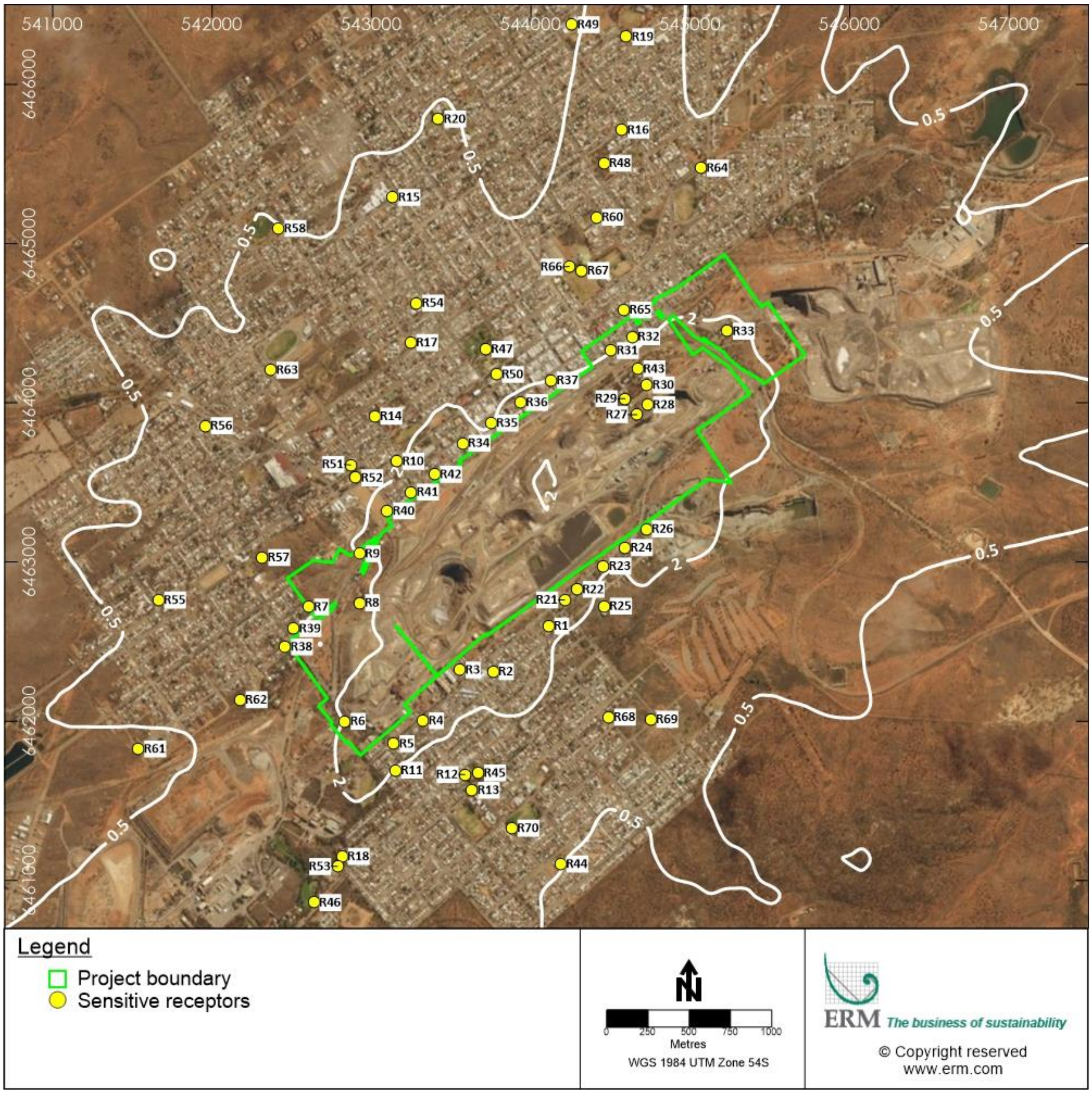

Figure I-21: Predicted incremental maximum 24-hour average PM_{10} concentrations ($\mu g/m^3$) for MOD6 operational scenario

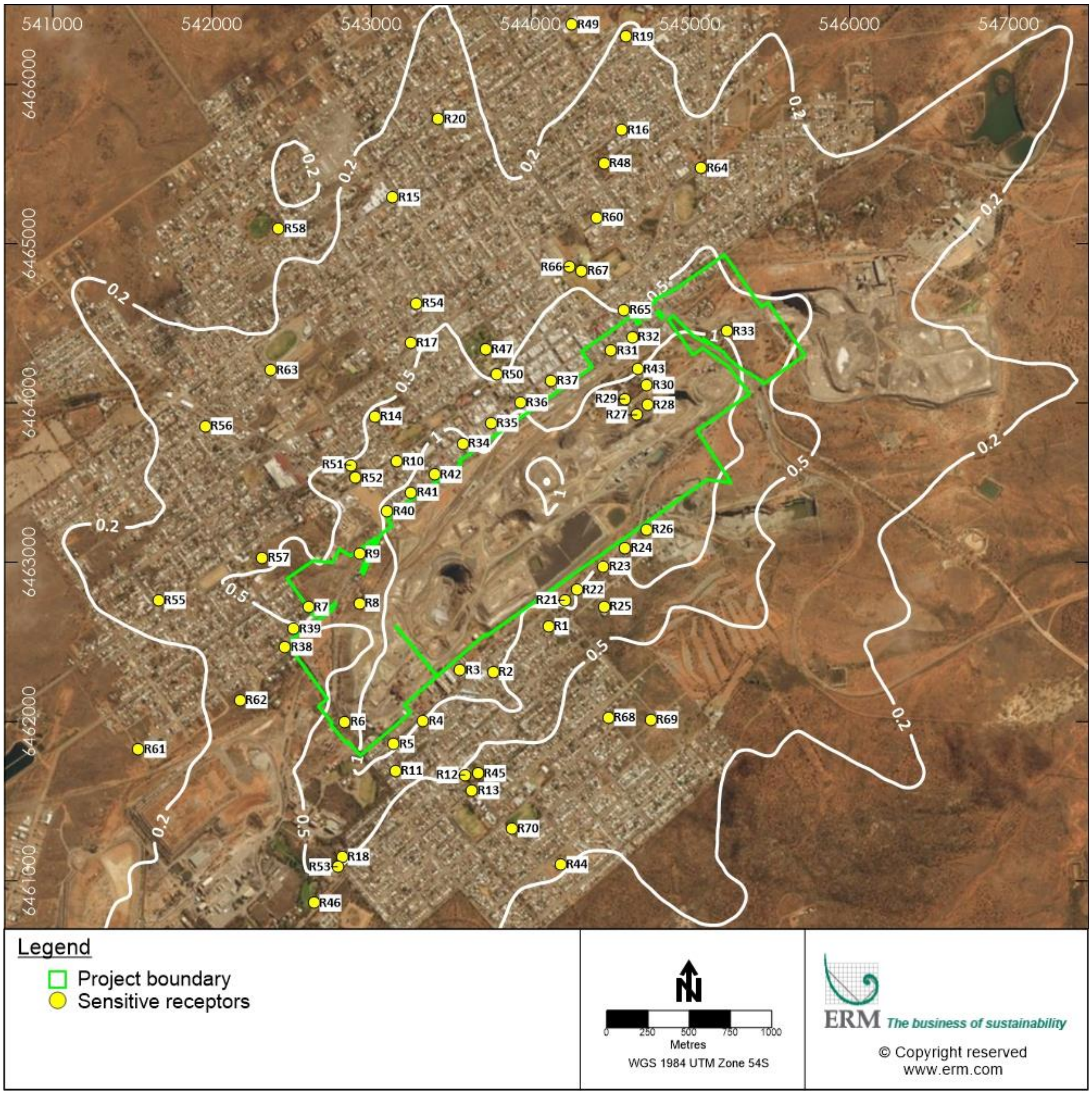

Figure I-22: Predicted incremental maximum 24-hour average $PM_{2.5}$ concentrations (µg/m^3) for the BAU scenario

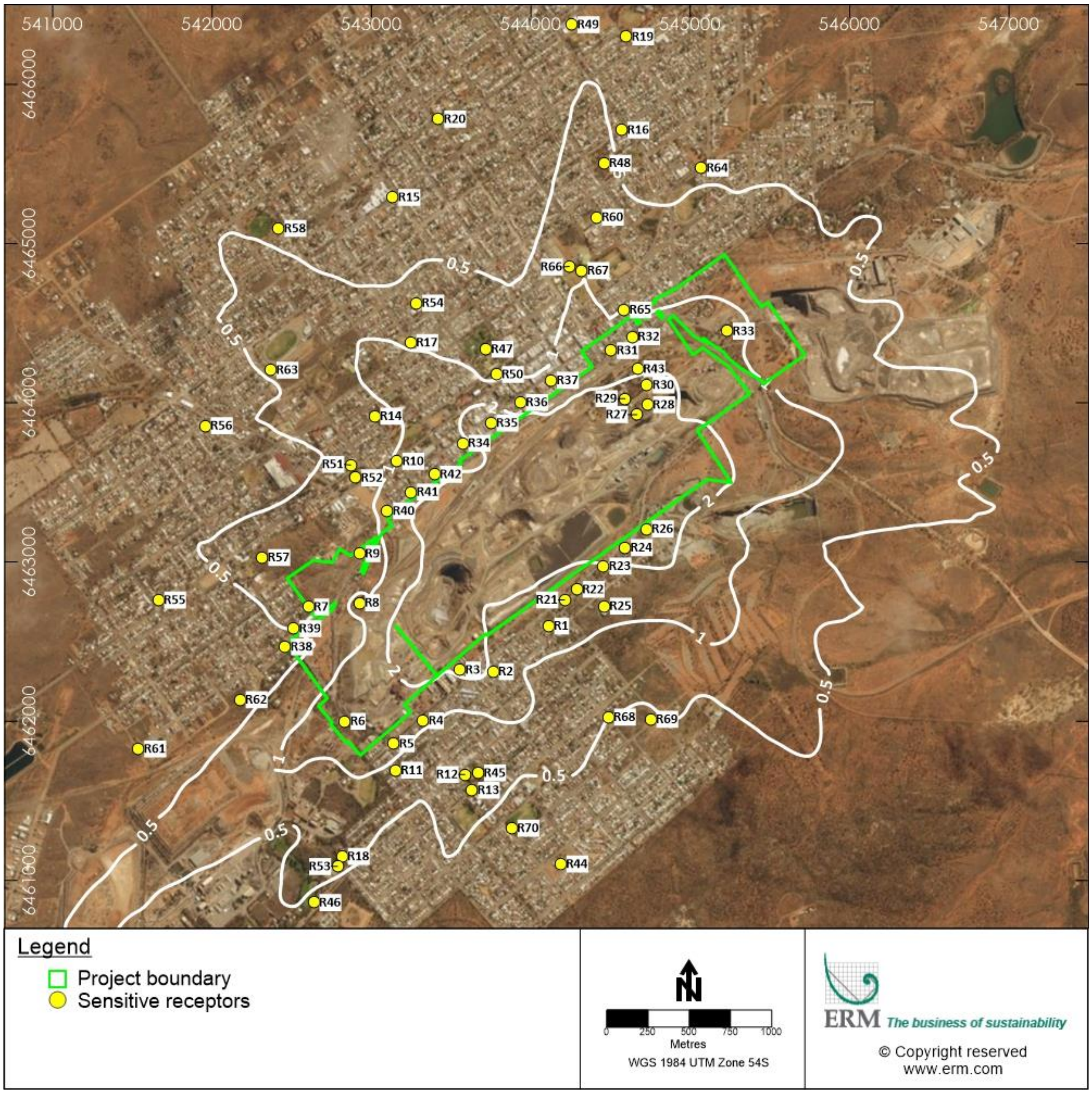

Figure I-23: Predicted incremental maximum 24-hour average $PM_{2.5}$ concentrations ($\mu g/m^3$) for MOD6 construction scenario

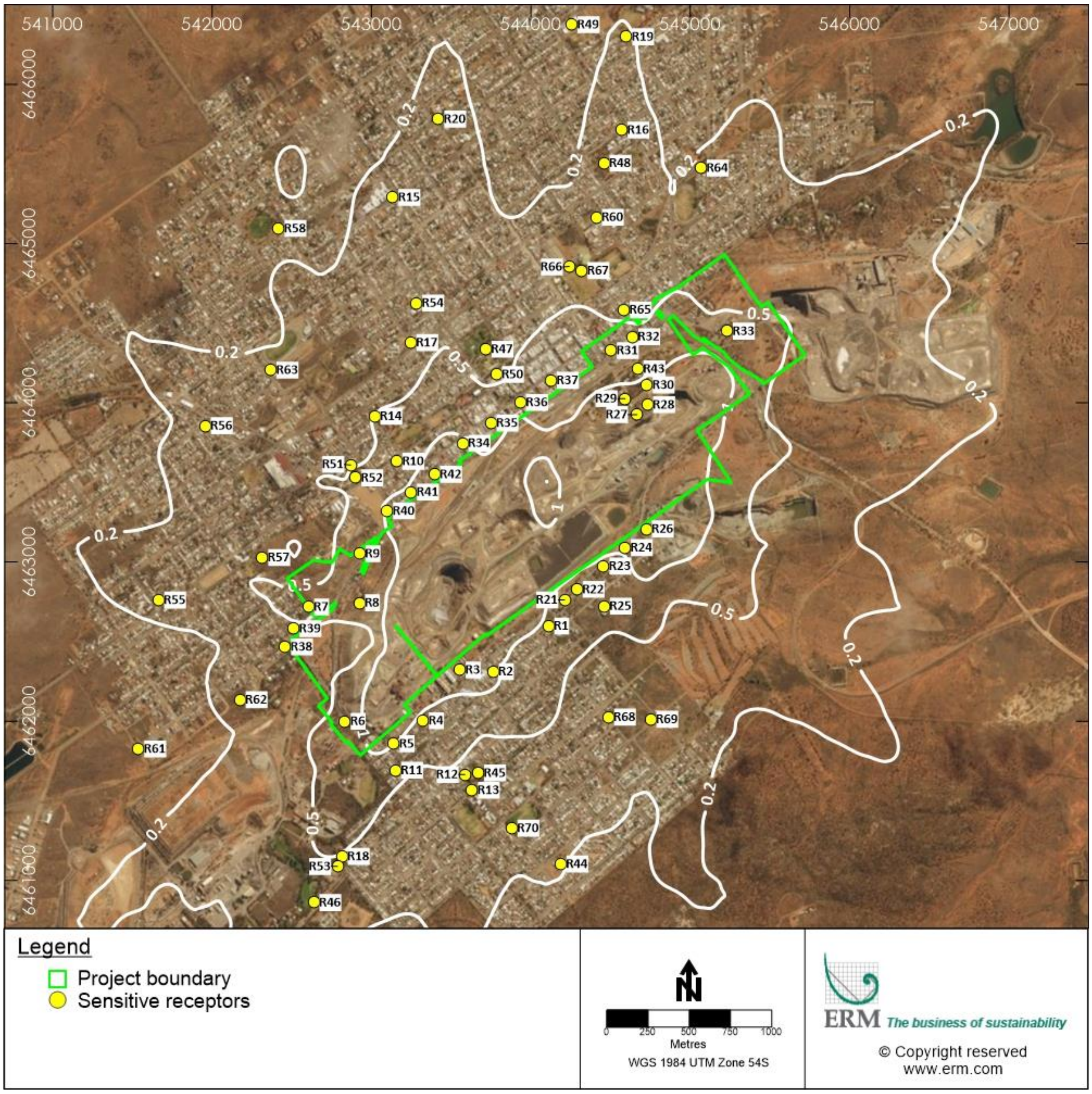

Figure I-24: Predicted incremental maximum 24-hour average $PM_{2.5}$ concentrations (µg/m^3) for MOD6 operational scenario

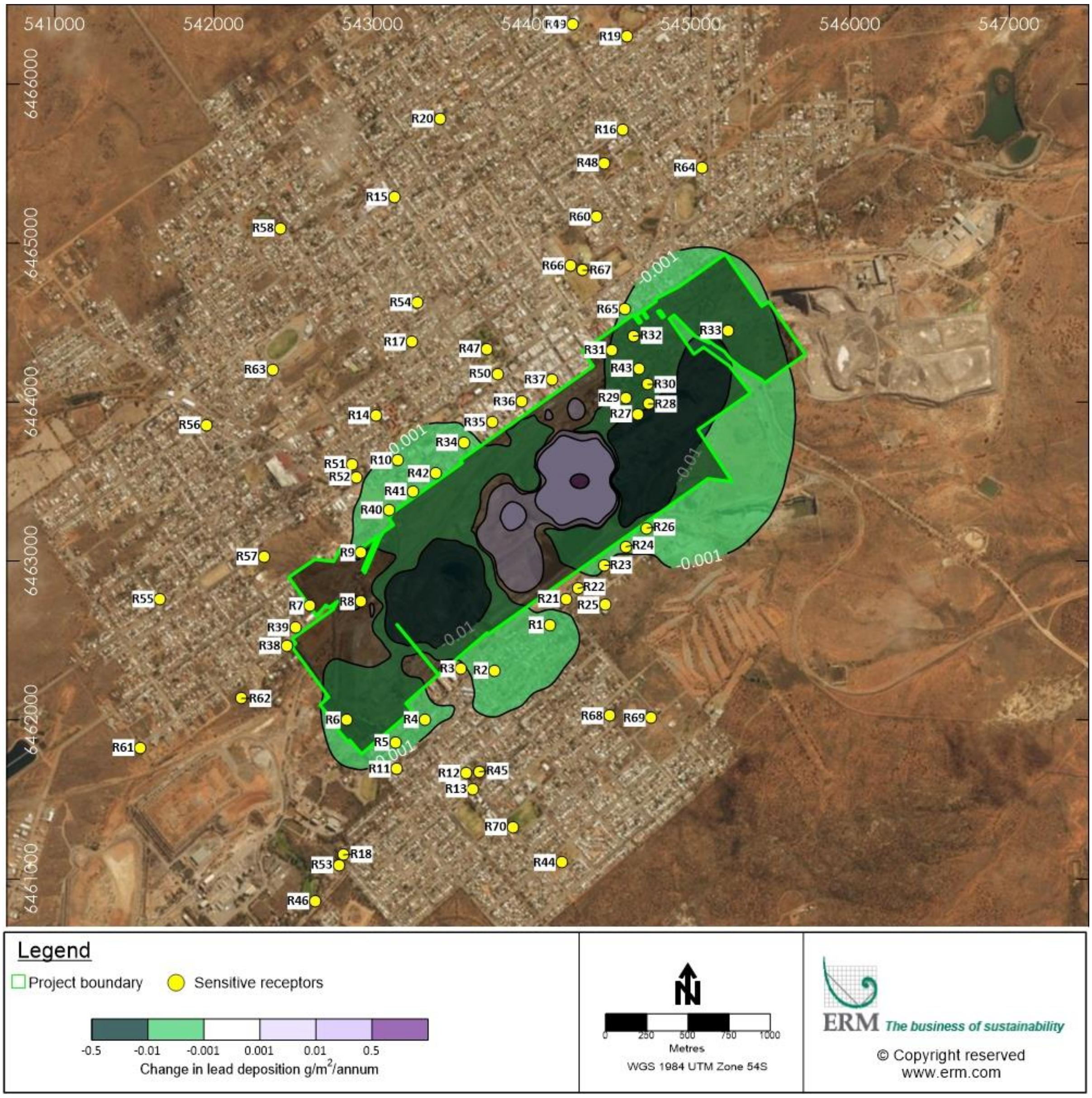

Figure I-25: Change in annual average lead deposition for MOD6 construction scenario minus the MOD4 scenario (g/m^2/annum)

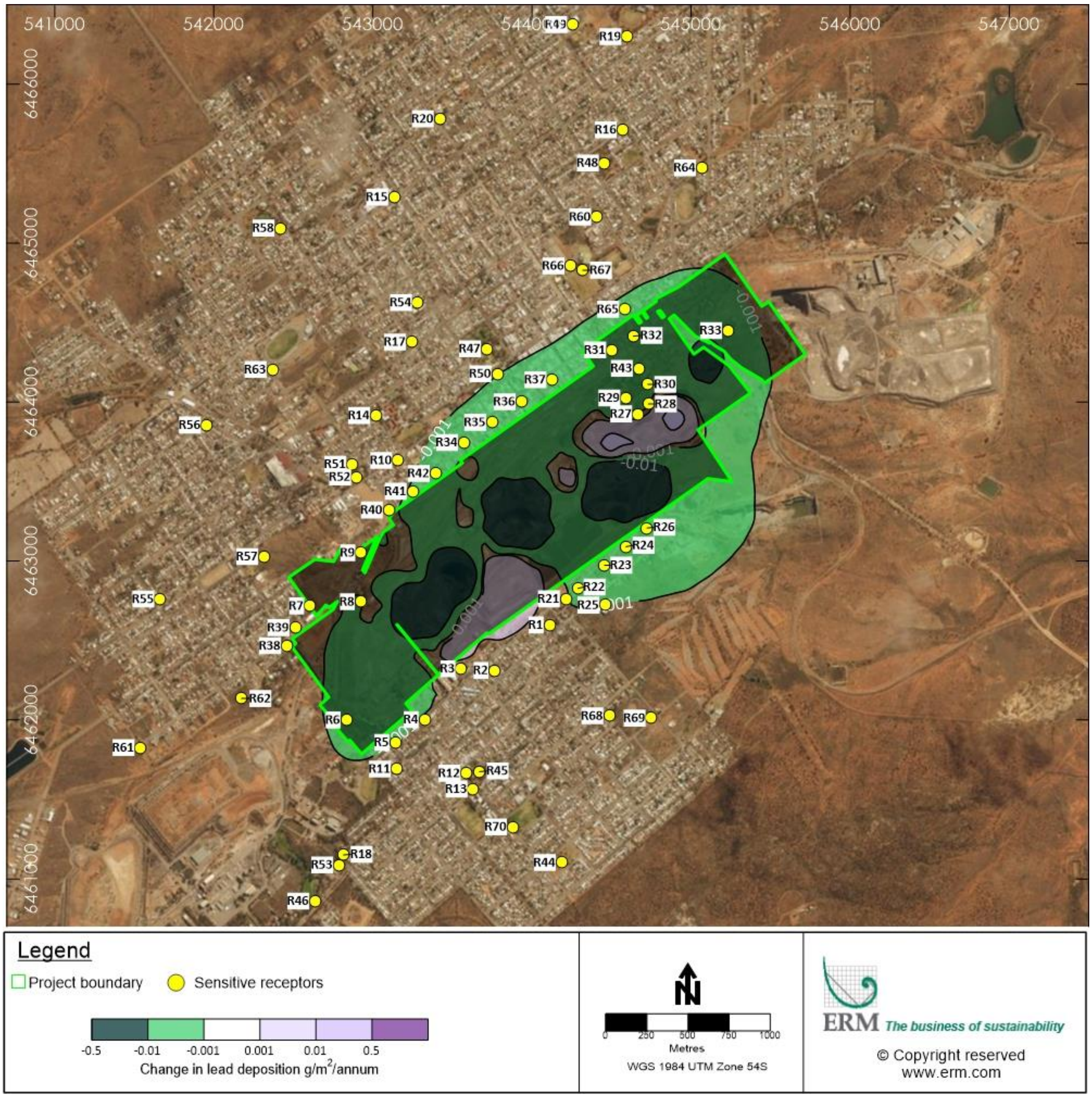

Figure I-26: Change in annual average lead deposition for MOD6 operational scenario minus the BAU scenario (g/m^2/annum)

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