AIR QUALITY:

ASSESSMENT OF EFFECTS OF RAISING HEIGHT OF EASTERN EMPLACEMENT TO 135 M AND ELIMINATION OF WESTERN EMPLACEMENT

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Prepared
for
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by

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1. INTRODUCTION

This report provides information on the effects on air quality expected to arise as a result of changes to the proposed mine plan for the open cut mining operations associated with the Ashton project.

The changes to the mine plan involve the elimination of the western emplacement area and the disposal of the material previously destined for emplacement there, to the eastern emplacement area. This will result in the final height of the eastern emplacement area increasing from RL 125 m to RL 135 m. Changes to the slopes of the emplacement areas will also be required.

The location of the mine and its main components are shown in **Figure 1**.

An air quality assessment for the proposed mine was completed as part of the EIS and additional information, dealing with the management of short-term impacts among other matters, was provided to the EPA (now DEC) in April 2002. The April 2002 report provides the most up to date assessment of the air quality effects of the approved proposal. It is relevant to note that the EIS did not provide an assessment of any year in which the now eliminated western emplacement area was to be in operation. This is because "worst-case" impacts did not occur during years when the western emplacement area was being used, but rather arose when the eastern in-pit emplacement area was active in Year 4 and coal and overburden production levels would be high.

The assumed scenario was taken to be representative of "worst-case" operations because this period had the greatest potential to cause air quality impacts in Camberwell Village. This occurs because of the prevailing northwest winds in the winter and the location of the eastern in-pit emplacement area which lies upwind of Camberwell Village in winter. The eastern emplacement area lies immediately to the east of the eastern in-pit emplacement area and has the potential to contribute to dust concentrations in Camberwell Village, although the Village lies a little too far to the west to be in the main downwind direction of the emplacement area.

Much of the background information required for the assessment remains unchanged from that provided in the EIS and subsequent studies. For completeness this current report repeats some of this information, but does not provide a review of the climate and meteorology, nor does it provide a comprehensive review of existing air quality. The latest air quality data includes the effect of dust emissions from construction and mining and so cannot be used to estimate existing background levels. It can of course be used to determine the performance of dust controls on the existing mining activities.

2. DESCRIPTION OF THE PROPOSED CHANGES

As discussed above, the changes involve the elimination of the western emplacement area that would have been completed by Year 2 and the disposal of this additional material in the eastern emplacement area. This will necessitate increasing the height of the eastern emplacement area from RL 125 to RL 135 m.

Increasing the emplacement area height by an additional 10 m will increase the capacity of eastern emplacement area to 15.5 Mbcm from 12 Mbcm. The additional

3.5 Mbcm would be emplaced over a two year period. In addition a further 1.5 Mbcm will be emplaced in the in-pit emplacement. The worst case assessment undertaken in the EIS (Year 4) is likely to still represent the maximum impact likely to be experienced in the Camberwell Village area. However, the proposed change to the way in which the eastern emplacement will be operated requires that an additional assessment should be made focussing on the effects of operating the eastern emplacement. This report does this.

The air quality assessment criteria refer to TSP and PM_{10} concentrations averaged over one year and to deposition levels, also averaged over one year. In addition the assessment criteria also refer to short-term (24-hour) PM_{10} concentration. The short-term concentrations at Ashton are managed in the approval conditions by a reactive control strategy which included monitoring dust levels, and modifying mining operations to maintain short-term concentrations of PM_{10}, in Camberwell, at levels nominated in the approval. Thus short-term impacts cannot be addressed by dispersion modelling.

Modelling of annual average concentrations and deposition levels requires that mining operation is more or less in a steady state over a period of one year or so. In the year during which the eastern emplacement is to be completed, the operation will not be steady state. The ratio of material emplaced in the pit and on the eastern emplacement will change significantly over the year.

In practice the operation is planned to operate approximately as follows:

- Months 0 to 13: build the eastern emplacement up to and elevation of 125 m
- Months 14 to 20: build the eastern emplacement from 125 to 135 m
- Months 21 to 24: rehabilitate the eastern emplacement.

During the final stages of building the eastern emplacement the ratio of material disposed of in the in-pit emplacement will increase progressively.

To deal with this non-steady state operation, a hypothetical operating scenario has been developed. The hypothetical scenario assumes that all material is being emplaced in the eastern emplacement (as it will be in the earlier years) but that the height of the emplacement area is 135 m as it will be in the final stages of its construction. It assumes that this takes place over a 12 month period. Thus it is assumed that 8.5 Mbcm (half of 15.5 Mbcm plus half of the 1.5 Mbcm that will be emplaced in the in-pit emplacement over two years) will be emplaced on the eastern emplacement over a year and that the emplacement will be taking place at 135 m. For assessment purposes this represents a conservative model of the operations. It will exaggerate the impacts likely to arise as a result of operating the emplacement area.

The impacts of emplacing material in the pit were assessed in the EIS and subsequent reports to the EPA, which examined operations in Year 4. These operations and this period are still expected to be give rise to the highest dust impacts in Camberwell Village. As noted before, this is to a large extent due to the fact that the emission sources in Year 4 will be directly upwind of Camberwell Village in the prevailing north-westerly winter winds.

An emissions inventory for Year 2 is provided in **Appendix** A.

3. AIR QUALITY ASSESSMENT CRITERIA

The EPA document titled "Approved Methods and Guidance for Modelling in Assessment of Air Pollutants in NSW" (NSW EPA, 2001) provides guidelines as to how air quality assessments should be undertaken and define air quality goals for assessment.

Based on these, the EPA have derived performance criteria for the Ashton Project which are part of the consent conditions as follows:

- Annual average TSP - 90 µg/m^3
- Annual average PM_{10} – 30 µg/m^3
- 24-hour average PM_{10} – 50 µg/m^3
- Annual average deposition (insoluble solids) – 2 µg/m^3 (maximum increase) and 4 µg/m^3 maximum total.

In addition the consent conditions provided short-term particulate matter acquisition criteria as follows:

- 24-hour average PM_{10} (incremental contribution of Ashton to ambient levels) 50 µg/m^3
- 24-hour average PM_{10} (cumulative ambient levels) 150 µg/m^3.

4. EXISTING AIR QUALITY - TSP AND PM_{10} CONCENTRATIONS

To test compliance with the assessment criteria discussed above it is necessary to establish existing concentrations of TSP and PM_{10}. A considerable body of information on air quality conditions in the Camberwell Village area and other areas likely to be affected by emissions from the mine was collected during the EIS and subsequent approval work. Currently an intensive monitoring program is being carried out as part of the air quality management plan required in the consent. As noted previously, the most recent data has been affected by the construction activities associated with the development of the mine. Thus the recent data, while useful for testing compliance with the assessment criteria, are not useful in providing information on baseline conditions. For this reason the database developed for the EIS has been used for this purpose. **Table 1** shows the results of PM_{10} and TSP monitoring that has been used to determine baseline background levels. **Figure 1** shows the locations of the monitors.

Table 1. TSP, PM_{10} concentrations and PM_{10}:TSP ratios for Camberwell area

Date	TSP Camberwell Church - mg/m^3	PM10 Camberwell - mg/m^3	Ratio PM10:TSP	Most common wind direction (degrees from North)
5/06/2001	84	17	0.20	180-190
11/06/2001	53	15	0.28	330-340
17/06/01	44	13	0.30	340-350
23/06/01	44	13	0.30	340-350
29/06/2001	60	13	0.22	350-360
5/07/2001	82	27	0.33	350-360
11/07/2001	38	20	0.53	180-190
17/07/2001	80	23	0.29	350-360
23/07/2001	50	13	0.26	150-160
29/07/2001	42	8	0.19	230-240
4/08/2001	32	13	0.41	350-360
10/08/2001	37	28	0.76	340-350
16/08/2001	70	33	0.47	10-20
22/08/2001	56	20	0.36	320-330
28/08/2001	29	12	0.41	340-350
3/09/2001	46	17	0.37	330-340
9/09/2001	**10**[1]	**21**[1]	2.10[1]	330-340
15/09/2001	42	16	0.38	340-350
21/09/2001	Missing	17		150-160
27/09/2001	Missing	17		150-160
3/10/2001	90	10	0.11	320-330
9/10/2001	66	15	0.23	140-150
15/10/2001	39	11	0.28	340-350
21/10/2001	84	10	0.12	130-140
27/10/2001	45	12	0.27	320-330
2/11/2001	48	45	0.94	150-160
8/11/2001	50	19	0.38	140-150
14/11/2001	75	26	0.35	160-170
20/11/2001	38	8	0.21	230-240
26/11/2001	45	14	0.31	350-360
2/12/2001	31	21	0.68	170-180
8/12/2001	20	10	0.50	160-170
14/12/2001	163	33	0.20	200-210
20/12/2001	**70**[2]	**30**[2]	**0.43**[2]	10-20
26/12/2001	**322**[2]	**32**[2]	**0.10**[2]	320-330
1/01/2002	**Missing**	**21**[2]		320-330
7/01/2002	**Missing**	**36**[2]		350-360
13/01/2002	**113**[2]	**40**[2]	**0.35**[2]	160-170
19/01/2002	57	18	0.32	180-200
Average[3]	**56.14**	**17.8**	**0.35**	

[1] This measurement is anomalous because TSP concentration is less than PM_{10} concentration. This reading has been excluded from the estimate of the average PM_{10}:TSP ratio. This type of reading indicates either an invalid reading(s) or a local source of emissions that affect the Camberwell Village monitor but not the Church monitor

[2] All measurements potentially affected by bushfire smoke have been excluded from the analysis.

[3] Averages exclude the bolded data.

It can be seen that on some days a very high TSP concentration is observed at the Church (TSP-1) while the PM_{10} data at Camberwell Village (PM10-1) is not correspondingly high; see for example the 14 and 26 December 2001. These data support the conclusion that the TSP measurements made at the Church are not representative of air quality in Camberwell Village. The data available suggest that the annual average PM_{10} concentration will be approximately 18 $\mu g/m^3$ allowing an increase of 32 $\mu g/m^3$ before the US EPA standard is reached, or an increase of 12 $\mu g/m^3$ before the NSW EPA goal is reached. Further the data suggest that the maximum 24-hour PM_{10} concentration will be below 50 $\mu g/m^3$ – the maximum to date has been 45 $\mu g/m^3$, however of greater importance for the project is the maximum 24-hour PM_{10} concentration of 32 $\mu g/m^3$ observed under northwesterly winds which are the winds that would carry dust from Ashton to Camberwell Village.

Using the PM_{10} data for Camberwell Village to infer a long-term average TSP concentration gives a value of 45 $\mu g/m^3$ [18 $\mu g/m^3$ x 1/0.4]. This is below the EPA's goal of 90 $\mu g/m^3$ and would allow an increase of 45 $\mu g/m^3$ before the goal was exceeded.

In summary the:

- Maximum 24 h PM_{10} concentration is 45 $\mu g/m^3$ (or 32 $\mu g/m^3$ under northwest winds)
- Annual average PM_{10} is 18 $\mu g/m^3$
- Annual average TSP is 45 $\mu g/m^3$.

During the preparation of the EIS there was no data on dust deposition in Camberwell Village and data from the Church (to the west of Camberwell Village) was used to represent dust deposition levels likely to occur in the Village. The data indicated that annual average deposition levels would be 1.5 g/m^2/month. This was based on data collected in June to September 2001 inclusive. Subsequently data collected in the northern part of Camberwell Village between October 2003 and March 2004 indicates that the current level is 2.2 g/m^2/month. This later estimate includes the effects of construction and mining undertaken over that period and so it is not surprising that it is higher than the earlier estimate.

5. Emissions from nearby mines

The EIS modelling took into account emissions from neighbouring mines including Camberwell, Narama, Rix's Creek, Ravensworth East and Glendell. Other mines such as Nardell, Ravensworth South, Glennies Creek, Ravensworth No 2, Ravensworth East, Liddell, and Lemington also operate in the area.

The contributions that more distant mines and biogenic sources make to particulate matter levels in the Camberwell Village area were dealt with in the EIS by adding 0.5 g/m^2/month to annual average particulate matter deposition rates and 10 $\mu g/m^3$ and 5 $\mu g/m^3$ to TSP and PM_{10} concentrations respectively.

The current assessment focuses only on emissions from Ashton and how these are changed by the extended use of the eastern emplacement area.

6. OPTIONS FOR CONTROL MEASURES

Ashton has committed to a range of measures to manage dust as follows:

- Planning controls
- Engineering controls, and
- Operational controls.

Planning controls instituted by the project include:

- Locating all infrastructure as far from the village as practicable,
- Placing the raw coal storage area in an excavated slot to provide maximum wind protection,
- Constructing large earth berms and tree plantations between the operations and the village,
- Minimising the exposed operational area to less than 5% of mines recently approved in the Hunter,
- Rehabilitating all external emplacement areas within four years of commencement.

Engineering controls include:

- The use of water carts to keep trafficked areas in a damp condition
- The use of fixed water sprays on all stockpiles
- The partial enclosure of conveyors, the coal emplacement area hopper and the use of water sprays at the emplacement area hopper
- Regular grading of roads to ensure that loose dust-generating surface material is kept to the lowest level practicable
- The implementation of speed limits on mine roads
- The use of chemical dust suppressant on haul roads
- The clear marking of roads to minimise trafficked areas and to ensure that traffic is kept to watered areas
- The fitting of drills with dust control equipment
- The use of coarse material to stem blasts
- The use of haul trucks and other earthmoving equipment with upwardly directed exhausts to minimise the generation of dust by exhaust emissions
- Commitments to ensure that diesel equipment is maintained properly so that it does not generate excessive black smoke
- The operation of the mine to ensure that exposed areas susceptible to wind erosion are minimised

These measures when applied diligently represent "best practice" with respect to the implementation of engineering controls.

Active controls involve the hour by hour management of dust generating activities to ensure that dust emissions do not affect nearby sensitive receptors. Operations will be managed in response to real time air quality data measured within the village in accordance with the following protocols. When the wind direction indicates that Ashton is contributing to dust emissions within the village:

1. If the running average of the preceding 24-hour PM_{10} exceeds 50 $\mu g/m^3$, cancel all out-of-pit overburden operations. Utilise in-pit overburden emplacement areas (if available in lower levels of open cut).

2. If the running average of the preceding 24-hour PM_{10} exceeds 150 µg/m³, suspend all dust generating activities. Stop all overburden removal. Stop ROM coal extraction if generating dust.

Other controls include day-to-day planning of mining activities taking account of forecast weather and actual weather conditions. These include the following:

1. They will be no out of pit emplacement activity when ten minute average wind speeds exceed 10 m/s
2. Emplacement activity, dozing, loading and haulage operations will be managed to ensure that no visible dust leaves the "lease" area
3. Blasting will be undertaken using procedures that will involve an assessment of meteorological conditions and will be designed to prevent dust and other emissions causing exceedances, or air quality goals or nuisance effects

The effects of these controls requires were assessed in the April 2002 assessment provided to the EPA. The current modelling is based on the emissions files developed for that report adjusted to take account of the effect of the extended use of the eastern emplacement area.

The model results includes the assumption that operating hours are limited to 7 am to 10 pm. The original EIS work allowed operations 24 hours per day. The advantage of restricting operating hours is to ensure that emissions during poor dispersion conditions that apply at night are reduced to the minimum level practicable.

Finally, as was discussed in the April 2002 assessment, the effects of the real-time control measures cannot be assessed directly by modelling. They must be managed by a real-time monitoring program, the results of which are used to inform mine management when mining equipment needs to be relocated, and when particular activities should be modified. For this reason no modelling of 24-hour concentrations is presented here.

7. MODEL PREDICTIONS AND ASSESSMENT OF IMPACTS

The results of the model runs for Year 2 with emissions (reflecting best-practice controls) but excluding the effects of real-time management are shown in **Figures 2** to **4**. These show the predicted annual average PM_{10}, TSP and deposition levels for the worst-case Year 2 with the eastern emplacement area operation at an RL of 135 m.

It can be seen that the addition of the eastern emplacement area operations to the project extends the dust concentrations and deposition contours out to the west but the DEC assessment criteria are still met.

Although the area around the eastern emplacement is predicted to experience an increase in annual average PM_{10} and TSP concentrations and dust deposition levels, the remaining areas experience levels close to, and in some cases slightly lower than in the studies presented for the project approval.

8. ASSESSMENT OF THE EFFECTS OF THE PROPOSAL (BY ITSELF) ON 24-HOUR PM_{10} CONCENTRATIONS

The potential for exceedances in the 24-hour average criterion for PM_{10} was identified in the earlier studies submitted to the DEC. This matter was to be controlled using an extensive network of real-time monitors and a plan to modify mining operations when the contribution that the mine made to 24-hour average PM_{10} level exceeded 50 $\mu g/m^3$ due to emissions from Ashton alone or 150 $\mu g/m^3$ cumulatively when Ashton's emissions were contributing to the PM_{10} level. This same plan will be used to manage emissions and achieve compliance with the short-term goals.

9. CONCLUSIONS

The modelling studies undertaken for this report indicate that the Ashton mine considered with the expanded eastern emplacement area will comply with the NSW EPAs air quality criteria for annual average TSP, PM_{10} and deposition and where it may exceed the 24-hour average PM_{10} criterion of 50 $\mu g/m^3$ it will employ best practice controls to minimise impacts.

10. REFERENCES

Holmes Air Sciences (2002)

"Additional information requested by NSW EPA for Ashton Project Assessment" Prepared by Holmes Air Sciences, Suite 2B, 14 Glen Street, Eastwood, NSW 2122.

NERDDC (1988)

"Air Pollution from surface coal mining: Vol 2 emission factors and model refinement" National Energy Research and Demonstration Council" Project 921.

US EPA (1985 and updates)

"Compilation of Air Pollutant Emission Factors", AP-42, Fourth Edition United States Environmental Protection Agency, Office of Air and Radiation Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711. Note this reference is now a web-based document.

APPENDIX A
ESTIMATED TSP EMISSIONS FOR FINAL YEAR OF EMPLACEMENT AT EASTERN EMPLACEMENT AREA – COAL PRODUCTION AND OTHER ACTIVITIES ARE AS PLANNED FOR YEAR 2

ESTIMATED DUST EMISSIONS - ASHTON OPEN CUT MINE

INTRODUCTION

The dust emission inventory has been estimated using the emission factors and the mine plan information provided by the Ashton Joint Venture. Emission factors have been developed using emission factor equations provided by the **US EPA (1985)** (and subsequent updates) publication referred to as AP-42 and from factors determined by **NERDDC (1988)**.

Estimated emissions are presented for all significant dust generating activities associated with the mine.

It has been assumed that mining activities occur from 7 am to 10 pm, 7 days per week. Dust from wind erosion is assumed to occur over 24 hours per day and the emission rate associated with wind erosion is assumed to be proportional to the third power of wind speed. Generally, this will mean that most wind erosion occurs in the day when wind speeds are highest.

Mining activity will be taking place in the Barrett Pit with overburden being emplaced in the eastern emplacement area. Coal will be removed from the western edge of the pit and be taken to the ROM stockpile.

OPERATIONS ON OVERBURDEN

Drilling O/B

In the assumed scenario approximately 8.5 Mbcm of overburden will be blasted. Assuming that 90% of material needs to be drilled using a hole spacing of approximately 7.5 m, and 10 m benches the number of holes required is determined to be approximately 13,600 [0.9 x 8,500,000 m^3 /(10 m x 7.5 m x 7.5 m]. It is assumed that 0.59 kg of dust will be generated in drilling each hole **(US EPA, 1985)**, and so the total annual dust emission is estimated to be 8,024 kg/y [13,900 holes x 0.59 kg/hole].

Blasting O/B

TSP emissions from blasting can be estimated using the **US EPA (1985)** emission factor equation given in **Equation 1**.

Equation 1

$$E_{TSP} = 0.00022 \times A^{1.5} \qquad \text{kg/blast}$$

where :

A = area to be blasted in m^2

The area of each blast has been estimated assuming that 90% of material is blasted and the average shot depth is 10 m and that there are on average 40 shots per year. The average area of each blast is 13,661 m^2 [0.9 X 8,500,000 m^2 /(10 m x 56 blasts/y)]. The average emissions from each blast is 351 kg, which gives a total emission due to blasting in The assumed scenario of approximately 19,671 kg/y [351 kg/blast x 56 blasts/year].

Loading O/B to trucks

In The assumed scenario, approximately 8,500,000 bcm of overburden will be loaded into trucks and transported to the emplacement area area. Assuming a density of 2.4 t/bcm this is equivalent to approximately 20,400,000 t. Each tonne of material loaded will generate a certain amount of dust, depending on the wind speed and the moisture content. **Equation 2** shows the relationship between these variables.

Equation 2

$$E_{TSP} = k \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \right) \quad \text{kg/t}$$

where,
$k = 0.74$
$U = \text{wind speed(m/s)}$
$M = \text{moisture content (\%)}$
$[\text{where } 0.25 \leq M \leq 4.8]$

Assuming a moisture content of 2%, the total emission for The assumed scenario is therefore given by;

$$E_{TSP} = 20{,}400{,}000 \text{ x } 0.0012 \times \left(\frac{U}{2.2}\right)^{1.3}$$

The "wind speed factor", [that is the $(U/2.2)^{1.3}$ part of Equation 2], will vary from hour to hour. This factor has been calculated for each hour in the meteorological data file (and an annual average determined to be approximately 1.7493. The total emissions from loading overburden to trucks will therefore be approximately 42,823 kg/y [20,400,000 x 0.0012 x 1.7493].

Hauling O/B to waste emplacement areas
Approximately 8,500,000 bcm of material (24,960,000 t at 2.4 t/m^3) will be hauled to the in pit waste emplacement area area in The assumed scenario, using 150 t trucks. Assuming an average return travel distance of 3 km and a generation rate of 4 kg/VKT and 80% control of dust by watering of the haul road, the total dust generated is expected to be 399,360 kg/y [(24,960,000 t / 150 t) x 3 km x 4 kg/km x 0.2].

Unloading O/B to waste emplacement areas
In the assumed scenario, approximately 8,500,000 bcm of material (20,400,000, t at 2.4 t/m^3) will be unloaded from trucks at the in pit emplacement area. Assuming the same meteorological factors and material properties as for loading the total emissions from unloading overburden from trucks will therefore be approximately 42,823 kg/y [20,400,000 x 0.0012 x 1.7493].

Dozers on overburden

In the assumed scenario it is assumed that 1,192 dozer hours will be devoted to working on overburden. The US EPA emission factor equation (**US EPA, 1985**) is given in **Equation 3**.

Equation 3

$$E_{TSP} = 2.6 \times \frac{s^{1.2}}{M^{1.3}} \quad \text{kg/hour}$$

where,
s = silt content (%), and
M = moisture content (%)

Taking M to be 2% and s to be 10%, the emission factor is estimated to be approximately 14.8 kg/hour. The total dust emissions from the dozers are estimated to be approximately 17,641 kg/y [1,192 h/y x 14.8 kg/h].

OPERATIONS ON COAL

Drilling and blasting coal

There will be no drilling or blasting of coal.

Dozers ripping coal and partings

In The assumed scenario it is assumed that 1,270 dozer-hours will be devoted to ripping coal or partings. The US EPA emission factor equation is given in **Equation 4**.

Equation 4

$$E_{TSP} = 35.6 \times \frac{s^{1.2}}{M^{1.4}} \quad \text{kg/hour}$$

where,
s = silt content (%), and
M = moisture content (%)

Taking M to be 6.5% and s to be 10%, the emission factor is estimated to be approximately 41.1 kg/hour. The total dust emission from the dozers is therefore approximately 52,197 kg/y [1,270 h/y x 41.1 kg/h].

Loading coal to trucks

In The assumed scenario, approximately 2,150,000 t of ROM coal will be loaded into trucks: 2.15 Mt from the open cut. The emission factor used for this process is given in **Equation 5**:

Equation 5

$$E_{TSP} = \frac{0.580}{M^{1.2}} \quad \text{kg/hour}$$

where,

M = moisture content (%)

Taking M to be 6.5%, the emission factor is estimated to be approximately 0.061 kg/hour. The total dust emissions from loading coal to trucks are therefore approximately 131,150 kg/y [2,150,000 t/y x 0.061 kg/t].

Hauling coal to CPP

Approximately 2,150,000 t of ROM coal will be hauled, using 150 t trucks, to the CPP in the assumed scenario. The haulage distance will be approximately 3 km return. Using an emission factor of 4 kg/VKT with 80% control the total dust emission is estimated to be 57,333 kg/y [(2,150,000 t/150 t/truck) x 5 km x 4 kg/VKT x 0.2].

Unloading coal to hopper

In The assumed scenario, approximately 2,150,000 t of ROM coal will be unloaded from trucks to the CPP. The emission factor used for this process is 0.010 kg/t (**NERDDC, 1988**). The total dust generated from unloading ROM coal in the assumed scenario is therefore expected to be approximately 21,500 kg/y [2,150,000 t x 0.010 kg/t].

Re-handle coal at the ROM hopper

Allow for 20% of coal at the ROM hopper to be dumped to the temporary stockpile and reloaded to the hopper i.e. 215,000 t is dumped and reloaded to the hopper. The emission factor for dumping is 0.01 kg/t and reloading is 0.061 kg/t thus the dust generated by this process is 30,530 t/y [2,150,000 t/y x 0.2 x (0.01 + 0.061)].

Loading coal to stockpiles

In The assumed scenario, approximately 2,000,000 t of product coal (including open cut, high-wall and underground coal) will be loaded to the stockpiles. The emission factor used for this process is 0.0045 kg/t. The total dust generated from this operation in The assumed scenario is therefore expected to be approximately 9,000 kg/y [2,000,000 t x 0.0045 kg/t].

Loading coal to trains

In The assumed scenario, approximately 2,000,000 t of product coal will be loaded to trains. The emission factor used for this process is 0.00045 kg/t. The total dust generated from this operation in Year 3 is therefore expected to be approximately 900 kg/y [2,00,000 t x 0.00045 kg/t].

Handling rejects

Rejects would be loaded to trucks (approximately 190 t capacity) and emplaced in areas that have been mined. In the assumed scenario approximately 467,000 t of rejects will be generated. This material will be wet when loaded and unloaded so the only significant source of dust will be from haulage of the rejects. Assuming a 5 km return trip and an emissions factor of 0.4 kg/VKT after controls of 80%, the total estimated emission is 9,832 kg [467,000 t / 190 t x 5 km x 4 kg/km x 0.2]

Graders on roads

Estimates of dust emissions from the grader on the roads have been made using the US EPA (1985) emission factor equation (**Equation 6**).

Equation 6

$$E_{TSP} = 0.0034 \times S^{2.5} \quad \text{kg/vkt}$$

where S = speed of the grader in km/h

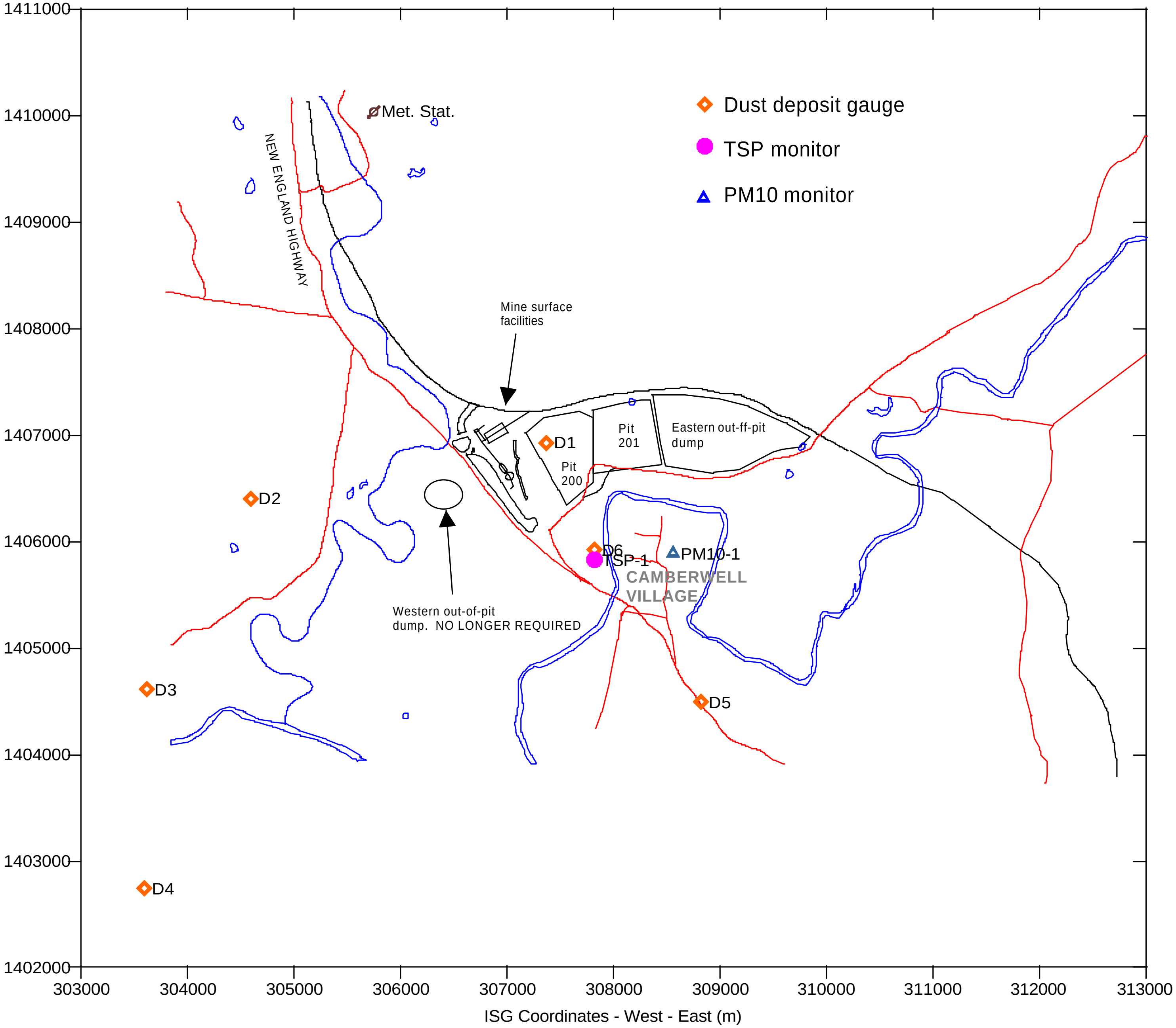
Assuming an average speed of 8 km/h, the emission factor is 0.62 kg/vkt. Assuming 8 hours of operation per day at 8 km/h, this makes a total of 23,360 km/y. The total dust emissions from this operation are therefore approximately 14,483 kg/y [23,360 km/y x 0.62 kg/km].

WIND EROSION

The **SPCC (1983)** indicates 0.4 kg/ha/h is a representative emission factor for exposed areas on open cut coalmines in the Hunter Valley. For in-pit areas there will be some sheltering provided by the pit and it has been assumed that this reduces the emission factor by 50% for in-pit areas. The area susceptible to wind erosion and the estimated annual erosion rates are:

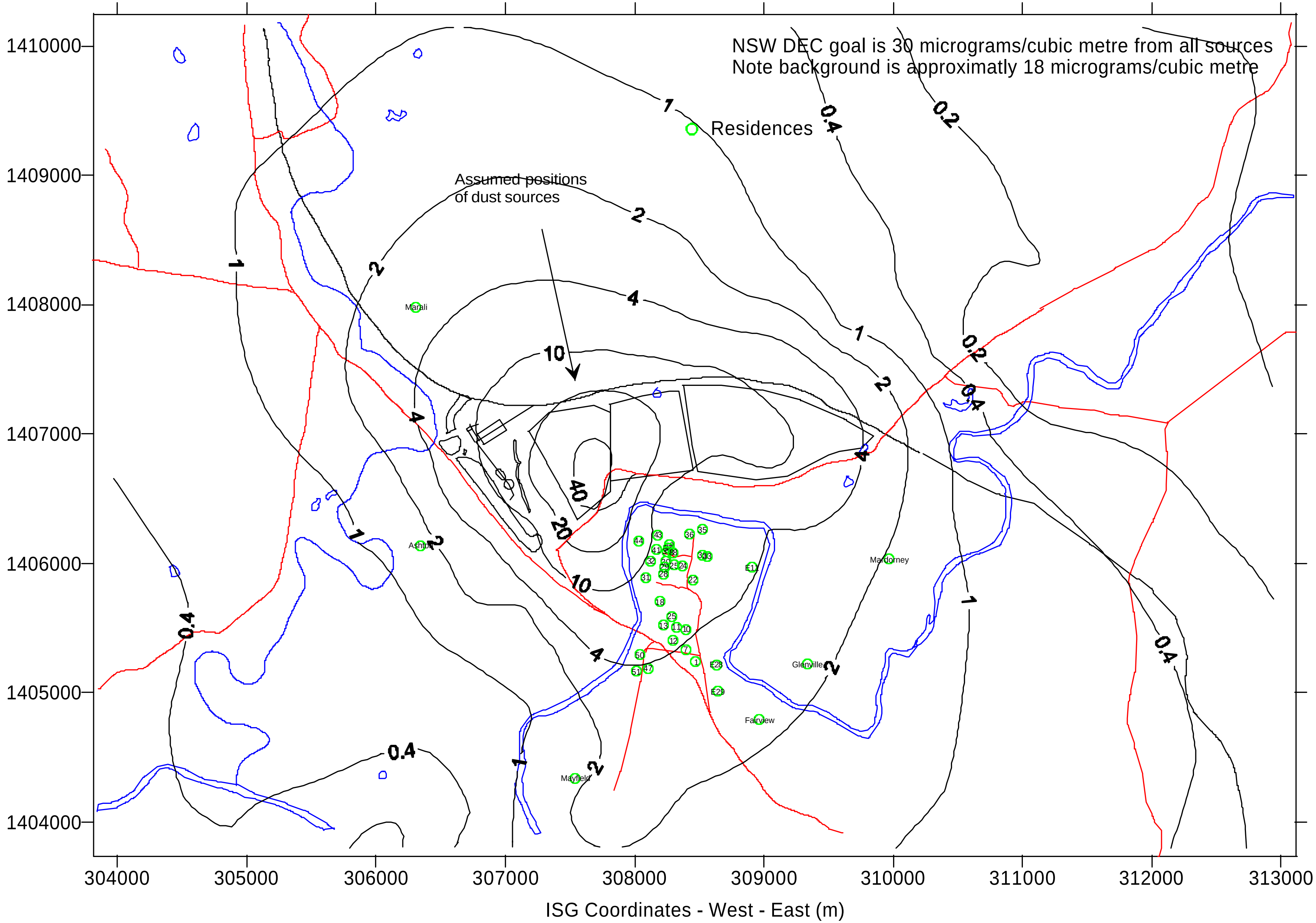
- In pit 26 ha – 45,552 kg/y
- Out of pit area 23 ha – 80,592 kg/y
- ROM stockpile 1 ha – 3,504 kg/y
- Product stockpile 1 ha – 3,504 kg/y
- Eastern Emplacement area 62 ha – 217,248

FIGURES



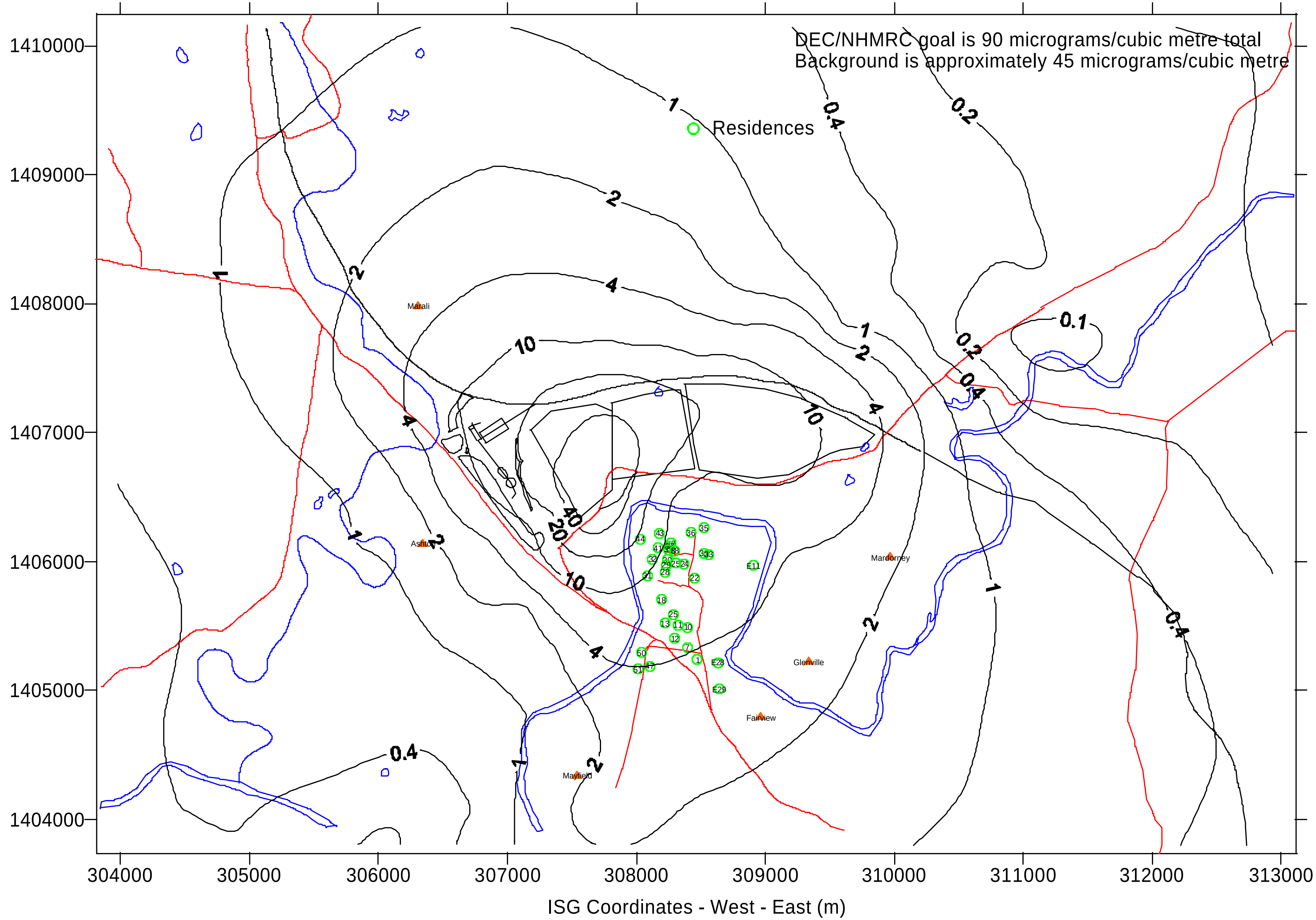
Location of project area and monitoring sites

Figure 1



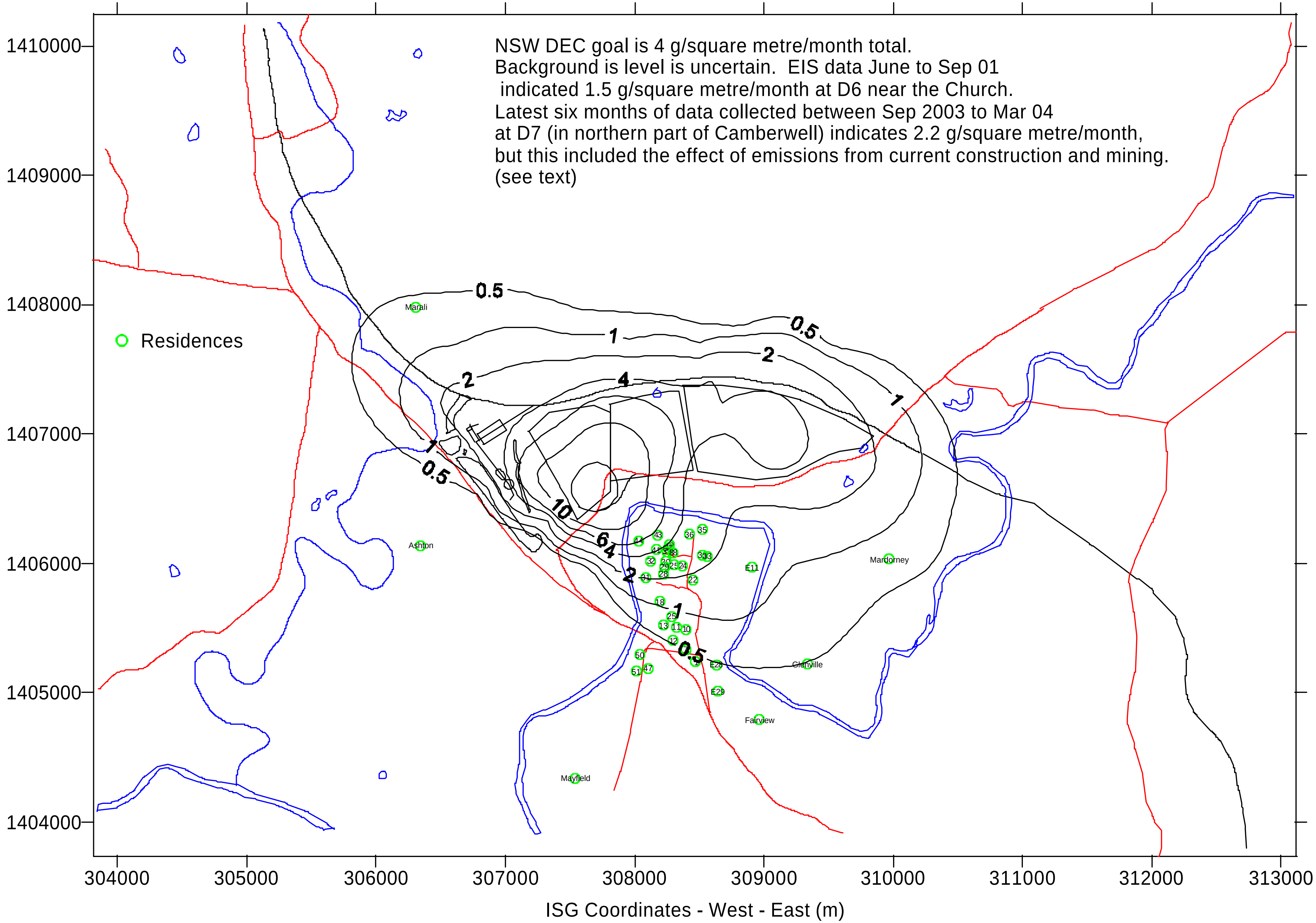
Predicted annual average PM_{10} concentrations due to Year 2 emissions from Ashton, with 80% control on haul road emissions but no real-time management controls, and with the eastern emplacement in operation - micrograms/cubic metre

Figure 2



Predicted annual average TSP concentrations due to Year 4 emissions from Ashton, with 80% control on haul road emissions but no real-time management controls, and with the eastern empacement in operation - micrograms/cubic metre

Figure 3



Predicted annual average dust deposition levels due to Year 2 emissions from Ashton, with 80% control on haul road emissions but no real-time management controls, and with the eastern emplacement in operation - grams/square metre/month

Figure 4