# CSBP KWINANA: AMMONIUM NITRATE PRODUCTION EXPANSION PROJECT: PHASE 2

## Public Environmental Review - Summary of Submissions and Response to Submissions

Prepared for
Parsons Brinkerhoff
by Strategen

March 2011

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Strategen is a trading name of
Strategen Environmental Consultants Pty Ltd
Level 2, 322 Hay Street Subiaco WA
ACN: 056 190 419

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# CSBP KWINANA: AMMONIUM NITRATE PRODUCTION EXPANSION PROJECT: PHASE 2

# PUBLIC ENVIRONMENTAL REVIEW - SUMMARY OF SUBMISSIONS AND RESPONSE TO SUBMISSIONS

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# PUBLIC ENVIRONMENTAL REVIEW - SUMMARY OF SUBMISSIONS AND RESPONSE TO SUBMISSIONS

## 1. INTRODUCTION

CSBP Limited (CSBP), part of the Wesfarmers Limited group, proposes to expand its Kwinana Ammonium Nitrate Production Facility (ANPF), located within the CSBP Kwinana Industrial Complex. The Ammonium Nitrate Production Expansion Project: Phase 2 (the proposal) comprises the addition of components to the existing ANPF, with some existing components being re-engineered to enable increased throughput to increase ammonium nitrate production capacity from 520 000 tonnes per annum to 936 000 tonnes per annum.

The proposal was referred to the Environmental Protection Authority (EPA) under section 38 of the *Environmental Protection Act 1986* (EP Act) on 28 April 2010. On 10 May 2010, the EPA advised it would formally assess the proposal at the level of Public Environmental Review (PER).

The PER was subject to a 10-week period of public review following its release on 22 November 2010. The public review period ended on 31 January 2011. The PER of the Proposal (Strategen and Parsons Brinckerhoff 2010) was prepared for assessment by the EPA under Part IV of the EP Act, in accordance with EPA *Environmental Impact Assessment Administrative Procedures 2002*.

The PER described the proposal, examined the likely environmental effects and the proposed environmental management procedures. It included information from environmental investigations, reviews environmental impacts, and described management measures to mitigate effects the proposal may have on the environment.

Seven submissions on the PER were received by the EPA.

## 2. DOCUMENT STRUCTURE

This document contains all submissions received during the public review period of the PER and the CSBP responses to the issues raised.

The submissions received are outlined in **Section 3** and a response is presented to every individual comment raised in the submissions (set out in **Sections 4 and 5**). The individual submission issues and responses are presented under the following sorting arrangements:

**Section 4** – Contains a collation of the individual comments raised by an individual member of the public.

**Section 5** – Contains a collation of the individual comments raised in submissions from organisations. Each comment or issue responded to is attributed to the body that submitted it, where the identity is known.

Within each of these sections, the comments/issues have been arranged according to the subject of factor they address (e.g. air quality, greenhouse gas emissions, etc). The comments made on the proposal are essentially provided verbatim (with original typography, grammar and spelling). Optical character recognition software was used to convert the text from the scanned documents to word processor format for reproduction in this report, and this may have resulted in some inadvertent minor errors. Every effort has been made to ensure the reproduced comments are as close to verbatim as possible, including typographical or grammatical errors.

**Section 6** outlines minor changes to the proposal as described in the PER that have emerged during the public review period.

**Section 7** sets out the amended version of the proposed environmental conditions to be applied to the proposal, if approved.

**Appendix 1** includes the updated Air Dispersion Modelling Report by ENVIRON Australia Pty Ltd, which was updated after the PER document was released for public review to include information requested by the Air Quality Management Branch of the DEC. The report includes the analysis of particulates (Section 4.3) and further clarification of cumulative impacts (Sections 6.1.1 and 7, and Table 8).

# 3. SUMMARY OF SUBMISSIONS

## 3.1 SUBMISSIONS RECEIVED

Seven submissions were received during the public comment period from the following individuals/organisations:

- Private submitter (PS)
- Cockburn Sound Management Council (CSMC)
- Department of Environment and Conservation (Office of Climate Change, Noise Regulation Branch and Air Quality Management Branch) (DEC OCC, NRB & AQMB)
- Department of Water (DoW)
- Department of Health (DoH)
- Water Corporation (WC)
- Kwinana Industries Council (KIC).

The issues raised in the submissions are summarised in Table 1.

**Table 1 Issues raised in submissions**

| Submitters | Issue |
|---|---|
| Private submitter (PS) | Concerns over risk to the public and the transparency of the PER process. |
| Cockburn Sound Management Council (CSMC) | CSMC concerns referred to:<br>• air quality<br>• site contamination<br>• traffic and shipping<br>• clarification of calculations within the PER<br>• CSBP contribution to existing State ambient monitoring program of Cockburn Sound waters. |
| Department of Environment and Conservation (Office of Climate Change, Noise Regulation Branch and Air Quality Management Branch) (DEC OCC, NRB & AQMB) | OCC concerns referred to:<br>• that there is no effective carbon constraint on this project in the absence of a carbon pricing mechanism<br>• the 'Greenhouse gas offset strategies' noted in [the PER] are not consistent with the principles of offsetting.<br>NRB raised no issues; commenting that PER satisfactorily addressed noise issues.<br>AQMB concerns referred to:<br>• numbering of figures and tables<br>• adequacy of the assessment of cumulative $NO_2$ concentrations<br>• adequacy of the assessment of the effect of $NO_X$ emissions on photochemical smog<br>• analysis of particles does not include the contributions from any background concentrations<br>• analysis of ammonia concentrations are acceptable. |

| Submitters | Issue |
|---|---|
| Department of Water (DoW) | DoW concerns referred to:<br>• inconsistencies with some data provided in the PER<br>• groundwater abstraction impacts<br>• water saving initiatives and efficiencies within CSBP. |
| Department of Health (DoH) | No issues raised; PER satisfactorily addressed public health issues |
| Water Corporation (WC) | No issues raised; PER satisfactorily addressed water quality issues |
| Kwinana Industries Council (KIC) | No issues raised; PER satisfactorily addressed aspects of interest to the KIC (such as air quality, light spillage, noise and cumulative risk). |

# 4. INDIVIDUAL PUBLIC SUBMISSIONS

## 4.1 ENVIRONMENTAL FACTORS ADDRESSED IN PER

A submission was made on the public risk factor addressed in the PER. The submission and proponent responses are set out below.

### 4.1.1 Risk

| Item | Submission | Response |
|---|---|---|
| 1. | I write this submission on CSBP's PER for the proposed expansion of their ammonium nitrate facility in Kwinana (Phase 2). I write as an individual citizen of Western Australian. I am concerned about the risk to the public from this proposal as set out in the PER Appendix 6.<br>I am also concerned about the public risk related to the proposed Perdaman fertiliser plant near Collie and the two proposals are in some ways comparable. For Perdaman's proposal, the major contribution to off-site individual fatality risk was deemed to be a catastrophic release of anhydrous ammonia from a 10,000 tonne cryogenic double walled tank (Perdaman PER). The Perdaman PER Appendix K section 4.6.3 states the consequences of a release of 10,000 tonnes of ammonia would be up to 70% fatality 5km from the source and 1-7% fatality 8km from the source. This conclusion is vastly underestimated because nonstandard data and methods were used to calculate the risk.<br>For example, Perdaman's use of a figure for the toxic concentration of ammonia of 15,500ppm being 70% fatal after 10 minutes exposure whilst Australian Standard 2022:2003 and FESA guidance both state 5000ppm ammonia is 100% fatal within a few minutes. A Collie community group commissioned an independent evaluation of Perdaman's Risk Assessment (PRACE, 2010; available on request), which was written and reviewed pro-bono by the foremost experts in the field, and found that Perdaman vastly underestimated the off-site individual risk. The scientific reality is that Perdaman's proposal has, by the EPA's own criteria, an unacceptable fatality risk to the population more than 10km away, related to the possibility of 10,000 tonnes of cryogenic anhydrous ammonia being released from the double walled tank.<br>The CSBP PER states there are two single walled cryogenic anhydrous ammonia tanks of 10,000 tonnes and 30,000 tonnes respectively. Unlike Perdaman, there is also a significant amount of explosive ammonium nitrate involved in this plant. It is astounding then that CSBP's PER appears to conclude a lower off site individual fatality risk than Perdaman's PER with significant risk zones in CSBP PER Figures 6 to 8 shown as extending only about 700m from both the ammonia tanks to the north west. | The following response only addresses the concerns raised regarding the proposed expansion of the Ammonium Nitrate Production Facility, located in Kwinana, and the respondent's concern with the 'risk to the public from this proposal'. CSBP makes no comment here on the mentioned Perdaman fertiliser plant near Collie as assessment of the impact of that project is beyond the scope of this Project.<br>The two single walled cryogenic storage tanks for anhydrous ammonia are steel wall with full height concrete bunds designed for full containment. The ammonia storage tanks are associated with the existing CSBP Ammonia Manufacturing Facility, and are not considered part of the proposed ammonium nitrate expansion project.<br>The risks associated with the Ammonia Manufacturing Facility and the existing Ammonium Nitrate Production Facility have previously been assessed, and included as part of the Total Site Quantitative Risk Assessment (TSQRA). The risk assessment methodology, data inputs, software used for consequence modelling and risk calculations, has been extensively used by CSBP for many years for its site QRAs. The CSBP justification for the assumptions made has been accepted by the Department of Mines and Petroleum (DMP). CSBP has DMP approved Safety Reports for the Ammonia Manufacturing Facility and Ammonium Nitrate Production Facility The data inputs and assumptions made in the CSBP TSQRA are specific to the CSBP site (e.g. meteorological data, operational parameters, etc).<br>In order to assess the risk implications associated with the proposed expansion of the Ammonium Nitrate Production Facility, CSBP included the proposed expansion in the TSQRA model. An increase in ammonia imports via the pipeline from the Fremantle Ports Kwinana Bulk Cargo Jetty was also considered.<br>The CSBP TSQRA includes an assessment of risks associated with both ammonia and ammonium nitrate and demonstrates that the proposed expansion does not contribute to any increase in risk to residential or sensitive areas (as defined by the WA EPA criteria). The nearest residential area is over 3 km from the CSBP facility.<br>Ammonium nitrate is classified as a Class 5.1 oxidising agent under the UN classification system, adopted by Australia in the 7$^{th}$ Australian Dangerous Goods (ADG7) Code. |

| Item | Submission | Response |
|---|---|---|
| 2. | The EPA website states "informed comments are most useful, so find out as much as you can by…reading documents relating to the proposal or policy…"; "the EIA process is designed to be transparent and accountable".<br><br>The CSBP PER does not contain any information in the risk assessment about the methods or data used to calculate the risk, instead stating that Appendix 6 is a review of referenced previous risk assessments with a small amount of additional data. These previous documents therefore must be considered to form part of this PER.<br><br>Despite repeated requests for the referenced documents which are stated to contain all the details relevant to the Appendix 6, I was unable to obtain them in time before the submission period closed. After not replying to my initial request, CSBP replied to my second email that "these documents contain confidential information which is not for public release". They offered to supply me with information if I could be specific about what I needed but this was not practical as I wanted to read all the details of the risk assessment methodology so as to make a fully informed opinion. Neither the EPA nor the DMP were able to provide me with the documents. I therefore consider CSBP's refusal to provide these documents in their entirely as a breach of the PER process. | As mentioned in Appendix 6 of the PER, the objective of the review of the risk was to discuss the offsite impacts of the proposed expansion. The review utilised the existing quantitative risks assessments and the associated additional consequence modelling.<br><br>The CSBP TSQRA contains information relating to ammonium nitrate, which is considered under the *Dangerous Goods Safety Act 2004* as a Security Risk Substance, and the TSQRA is consequently considered to be confidential, and should not be included in a PER.<br><br>In response to requests from a Collie community group representative for copies of references from the PER risk assessment Appendix 6, CSBP provided a copy of the externally commissioned referenced document that is publicly available - Reference 3 Kwinana Cumulative Risk Study (2008) – Non Technical Summary, released on behalf of the Department of Industry and Resources, May 2008. CSBP advised that referenced documents that contained sensitive information that is not publicly available for reasons including product and facility security would not be provided. CSBP invited the representative on a number of occasions to discuss their request with CSBP so that relevant information to assist with their enquiries (without compromising the confidential nature of the information contained in them) could be provided. The CSBP offer to meet or speak with the representative to further clarify these remaining requests still stands. CSBP acknowledges that there was a delay in responding to the representative's initial request.<br><br>The methodology used in the TSQRA is outlined in the document itself, and CSBP can provide this methodology. CSBP would be happy to discuss any specific public risk concerns relating to the proposed expansion of the Ammonium Nitrate Production Facility located in Kwinana with any concerned citizen. |
| 3. | A basic internet search shows the consequences of an ammonia release are far greater than CSBP is admitting in their PER. For example, the actual accidental release of 7000 tonnes of ammonia in Jonova, Lithuania resulted in the evacuation of a city of 40,000 people located 12km from the plant.<br><br>Modelling software available free from the US EPA shows a release of 10,000 tonnes of cryogenic ammonia as having definite human fatalities more than 10km away. For CSBP to show the risk zone as less than 1km from the plant when they will store 40,000 tonnes of ammonia, plus vast amounts of highly explosive ammonium nitrate both in solution and as a solid, does not add up.<br><br>Hence, I object to this proposal as I feel that the risk to the public has not been made clear and transparent that the risk contours shown in Appendix 6 are not justified or explained and that CSBP appear to be grossly underestimating the true risk levels. | The consequence of all chemical releases depends on the conditions of the release and the conditions at the site at the time of the release. Predicted risk also depends on the modelling software utilised and assumption inputs. The risk assessment methodology, data inputs, software used for consequence modelling and risk calculations, has been extensively used by CSBP for many years for its site QRAs and complies with the EPA *Guidance for the Assessment of Environmental Factors No.2: Risk Assessment and Management: Offsite Individual Risk from Hazardous Plant (EPA 2000).*<br><br>The CSBP justification for the assumptions made has been accepted with the Ammonia Manufacturing Facility Safety Report being approved by the DMP.<br><br>The CSBP ammonia storage is an existing facility and is not considered part of the proposed ammonium nitrate expansion project.<br><br>The CSBP TSQRA considers the risks associated with the release of ammonia from the storage tanks, which includes identifying the scenarios that can lead to the release (failure of the tanks were considered), determining the consequences (in terms of severity and magnitude) and then combining this with the likelihood, to determine the risks. It is this risk that is compared against the EPA risk criteria.<br><br>The risks associated with the storage and handling of ammonia on site, as well as ammonium nitrate, have been demonstrated not to impact residential areas or sensitive areas. The PER risk information was relatively extensive and not limited to the consequence distance alone.<br><br>CSBP has shown how the existing site risk profile is affected by the proposed expansion of the Ammonium Nitrate Production Facility. |

| Item | Submission | Response |
|---|---|---|
| 4. | I request the EPA to require CSBP to make the PER fully transparent and accountable, particularly relating to Appendix 6, and for it to be readvertised for public comment, or alternatively, I request the EPA to commission a fully independent risk assessment which uses the National guidelines, including EPA, enHealth and Australian Standard requirements, for methods and data inputs to risk assessments. | The risk assessment methodology, data inputs, software used for consequence modelling and risk calculations, has been extensively used by CSBP for many years for its site QRAs and complies with the EPA *Guidance for the Assessment of Environmental Factors No.2: Risk Assessment and Management: Offsite Individual Risk from Hazardous Plant (EPA 2000)*.<br><br>The CSBP justification for the assumptions made has been accepted with the Safety Reports from the Ammonia Manufacturing Facility and Ammonium Nitrate Production Facility being approved by the DMP. |

# 5. SUBMISSIONS FROM ORGANISATIONS

## 5.1 GENERAL

### 5.1.1 Clarification of information

| Item | Submission | Response |
|---|---|---|
| 5. | It is felt that in several areas of the document reference to clearly outlined calculations would help clarify calculations and text that conclude in general marginal impacts or changes. This information could be provided in an Appendix on calculations.<br>(CSMC) | Given the extensive range of calculations associated with various components of the report, particularly modelling, and the lack of specificity of the parts of the document that require clarification, detailed information on any aspects of concern can be provided in response to any specific enquiries. |
| 6. | Text is provided in a number of pages referring to CSBP's contribution to the State's ambient monitoring program of the Sound's waters, e.g. page 3-67 discharge of wastewater. The CSMC presumes this contribution is through the Kwinana Industries Council (KIC) annual contribution to CSMC of approximately $30,000 per annum. It is also presumed this funding is a portion of all the industrial members who contribute to the KIC. This could be stated to clarify what program the PER is referring to.<br>(CSMC) | The CSBP contribution to the CSMC is via the KIC annual contribution.<br>Further, in October 2005, CSBP diverted discharge of wastewater from Cockburn Sound to the Sepia Depression Ocean Outlet Landline (SDOOL) at an increased cost to the business. |
| 7. | DEC notes that the section numbering has been changed, while the numbering of figures and tables has not; figure and table numbers "3.x" are used in sections 2 to 4. This does not affect the substance of the analysis, but would have been better avoided.<br>(DEC AQMB) | The table and figure numbering originates from the chapter numbering and not the section numbering. As Sections 2 to 4 are a part of Chapter 3 of the document, the tables and figures within these sections will have the "3.x" numbering. |

### 5.1.2 Support for proposal

| Item | Submission | Response |
|---|---|---|
| 8. | In this submission KIC will confine its views to the broader environmental aspects of the Impact of the proposal upon the Kwinana Industrial Area (KIA) and any associated potential impacts on the nearby residential communities. In essence, this primarily means there will be reference made to the ability of the Industrial Buffer to perform its job, however other additional aspects will receive comment.<br>Preserving and enshrining the Buffer Zone as an EPP or as a MRS Industrial Buffer Zone is one of KIC's key strategic issues. It is the ability of the industrial capacity of the KIA to expand that generates substantial wealth for the State. That ability is contingent on the capacity of the Buffer to operate effectively. The CSBP proposal adds further weight to the argument that the Buffer is critically necessary for industry and community, and thus its protection is very important.<br>There are several aspects of this proposal that are of relevance to the Buffer, including air quality (gasses and particulates), light spillage, noise and cumulative risk.<br>KIC submits that the proposal by CSBP to expand its operations as detailed In their PER is sound and it's [sic] environmental outcomes do not compromise the work being carried out across the KIA in respect to continually improving environmental performance.<br>(KIC) | Noted. |

## 5.2 ENVIRONMENTAL FACTORS ADDRESSED IN PER

Submissions were made on several environmental factors address in the PER. Those submissions and the proponent responses are set out below.

### 5.2.1 Air quality

| Item | Submission | Response |
|---|---|---|
| 9. | CSMC felt that some information or note should have been made of impacts on increased ammonia vapours, or exceedance incidents to avifauna, reptiles and other fauna groups, i.e. vapour toxicity on fauna. If information was unavailable or limited, statements should have been made in the PER to dismiss this possible environmental impact. The data provided seems to indicate this may not be an issue particularly for humans, but other animal groups live within the foreshore and the industrial estate that could potentially be impacted with possible management implications.<br>(CSMC) | To date, CSBP is unaware of any reports of impacts to fauna living within the foreshore and the industrial estate due to ammonia vapours. Given that maximum offsite average ammonia ground level concentrations are not expected to increase as a result of the proposed expansion, it is the opinion of CSBP that ammonia vapours from the expansion will not have an impact on fauna. |

| Item | Submission | Response |
|---|---|---|
| 10. | There remain weaknesses in the assessment of cumulative $NO_2$ concentrations. While the method used to assess the maximum possible hourly and annual averages at Hope Valley and North Rockingham is sound, there is no assessment of cumulative effects at any other location in the region. The "maximum incremental changes" estimated at these locations lie in the range 4 to 16 µg/$m^3$ (Table 3.6), while those for the whole region are in the range 31 to 82 µg/$m^3$ (Table 3.5). Addition of the highest value from Table 3.5 (82 µg/$m^3$) to that from Table 3.6 (173 µg/$m^3$) gives a value of 255 µg/$m^3$. This slightly exceeds the National Environment Protection Measure (NEPM) criterion of 246 µg/$m^3$. DEC recognises, however, that the Hope Valley measurement of 173 µg/$m^3$ reflects downwind transport of Kwinana plumes, which would not have reached ground level at the (near-source) location of the ISC3-modelled peak responsible for the highest model value of 82 µg/$m^3$. Any other assessment methodology leads to a maximum likely $NO_2$ concentration within the NEPM limit. As a result, it is concluded that $NO_2$ concentrations will remain within the NEPM limit.<br>(DEC AQMB) | It is agreed that $NO_2$ concentrations will remain within the NEPM limits. |
| 11. | The changes made to section 2.5.3 in response to DEC's previous technical advice of 10 September 2010 are minimal:<br>• There remains no evidence of any quantitative assessment of the effect of NOx emissions on photochemical smog. While it is stated that the total emissions will be only 0.59 % of the total airshed emissions, it can not [sic] be presumed that these will not have an effect on ozone concentrations (which may be both positive and negative, changing with distance) immediately downwind of the source.<br>• For example, the modelled contribution to the peak NOx concentration at Hope Valley equates to about 3 to 12 ppb, which has a potential, if undispersed, to generate an additional 10 to 40 ppb of ozone. What the actual effects would be, when the effects of a progressive chemical transformation, dispersion and day-to-day variations are included, are the responsibility of the proponent to assess.<br>• In addition, some of the added comments, such as "ozone production was greatest in areas where vehicle emissions were concentrated", are misleading, in that there is a clear attempt to imply that concentrations are highest in those locations, which they are not. Often, due to the titration effect of nitric oxide, they are actually the lowest.<br>(DEC AQMB) | Further to the AQMB comments in relation to the potential impacts of the NOx emissions on photochemical smog, ENVIRON has further analysed the incremental changes in the $NO_2$ concentrations predicted at the Hope Valley and North Rockingham receptors. This analysis indicates that the highest incremental changes in the $NO_2$ concentrations are predicted to occur between 19:00 hours and 08:00 hours which are times not associated with ozone production. The incremental $NO_2$ concentration predicted at Hope Valley and North Rockingham between 10:00 hrs and 18:00 hrs are less than 4 ug/$m^3$.<br>Emissions from the proposal will disperse as they travel downwind resulting in lower ground level concentrations with increasing distance. The photochemical reactions for $NO_2$ and ozone take time and peak ozone concentrations typically occur well downwind of the emission sources. At the point that the peak ozone concentrations would occur, the concentrations of $NO_2$ from the proposal would be well below the maximum concentrations predicted at Hope Valley and North Rockingham.<br>Therefore, it is concluded that the incremental change in the NOx emissions from the proposal is expected to have a very small impact on photochemical smog production. |
| 12. | The analysis of particles does not include the contributions from any background concentrations. This is a significant issue and contrary to DEC's modelling guidelines.<br>(DEC AQMB) | The Air Dispersion Modelling Report by ENVIRON Australia Pty Ltd has been updated to include the analysis of particulates (Section 4.3) and further clarification of cumulative impacts (Sections 6.1.1 and 7, and Table 8), and is included as Appendix 1. |
| 13. | The changes to the analysis of ammonia concentrations (section 4) now make this section acceptable.<br>(DEC AQMB) | Noted. |

| Item | Submission | Response |
|---|---|---|
| 14. | Ammonia:<br>No adverse environmental impact is expected as the emission levels are likely to be within the NEPM advisory standards, however, again the case for the existence and preservation of the buffer is strengthened.<br>Particulates:<br>Particulates of nitrogen to be emitted into the marine environment from this project are unlikely to compromise the objective of ongoing improvement of the health of Cockburn Sound.<br>(KIC) | Noted. |

## 5.2.2 Groundwater

| Item | Submission | Response |
|---|---|---|
| 15. | As previously recommended, relevant hydrogeological information should be included as well as a brief discussion of potential water quality issues. An increase in groundwater abstraction will increase the potential for salinity impacts (ie saltwater intrusion). Water quality issues currently experienced should be included.<br>(DoW) | It is understood that a primary management constraint on groundwater abstraction from the superficial aquifer in the Kwinana area is the potential salinity impact of saltwater intrusion, and DoW licence allocation limits are set accordingly. CSBP considers there is sufficient access to sustainable groundwater from the superficial and sub artesian aquifers to supply water for this proposed project within our current groundwater abstraction licences. There is no plan to seek an increase in groundwater licence allocation. The proposal is not entirely reliant on local groundwater (see Item 10 for more detailed discussion of alternate water sources).<br>Groundwater quality issues that may impact beneficial use (e.g. off-site contaminant plumes) are understood and therefore the water quality monitoring program ensures potential impacts are under constant review. Implementation of the Operating Strategy for Groundwater Abstraction ensures that groundwater quality trends are understood and abstraction bores are operated in a manner that minimises the risk that quality will deteriorate.<br>CSBP has an independent hydrogeological consultant prepare an annual Borefield Monitoring Review and this along with the DoW approved Operating Strategy for Groundwater Abstraction are provided to the DoW and DEC each year. |
| 16. | There appears to be some incorrect figures stated within the report. Within section 8.3 of chapter 3, the text states that process water usage sourced directly from groundwater is 1355 ML/yr, whilst table 3.24 states 1374 ML/yr.<br>Also within section 8.3, the last paragraph states that CSBP holds a water abstraction license to abstract up to 4400 ML/yr from the superficial and Yarragadee aquifers. However, abstraction figures within table 3.24 equal 4800 KL/yr. The correct figure as per abstraction licenses is 4800 KL/yr.<br>(DoW) | The amount of process water used was 1374 ML/yr; hence, process water usage by the CSBP Kwinana Industrial Complex was approximately 3249 ML/yr in 2009 to 2010. The reference to 1355 ML/yr was an error. Section 6.3 describes the changes in full.<br>Noted. The correct figure as per abstraction licenses is 4800 ML/yr. Section 6.3 describes the changes in full. |

| Item | Submission | Response |
|---|---|---|
| 17. | KIC members are investigating alternative supplies of industrial process water in line with an intention to reduce (and possibly eliminate) reliance on scheme water to fulfill this need. The advent of KWRP water is a significant factor in the achievement of this, as is ongoing development of additional sources of fit for purpose (recycled) water. The CSBP proposal aligns with this philosophy.<br>(KIC) | Noted. |

### 5.2.3 Water quality

| Item | Submission | Response |
|---|---|---|
| 18. | The Water Corporation commented on the Environmental Scoping Document on 25th June 2010, and believes our concerns are covered in the PER. Our concerns were:<br>a) Total nitrogen load to the sepia depression would not exceed the annual limit of 1778 tonnes as per Condition 10 of Ministerial Statement #665.<br>b) Relevant ANZECC and ARMCANZ guideline values for bio-accumulating toxicants continue to be met.<br>Based on information in the PER, CSBP's daily discharge to the SDOOL will increase from 2 to 2.4 ML/d, and discharge of N and bio-accumulating substances will remain within CSBP's Licence (6107/1967/16) load limits. These inputs will ensure the cumulative discharge to the sepia depression for all SDOOL participants is not exceeded.<br>(WC) | Noted. |
| 19. | CSBP has made significant advances in the discharge of wastewater into Cockburn Sound with the advent of the Kwinana Wastewater Treatment Plant, their nutrient stripping wetland and resultant access to the SDOOL, and with advances in wastewater recycling.<br>The document does not identify any problems arising in effluent issues in the Sound.<br>(KIC) | Noted. |

### 5.2.4 Water resources

| Item | Submission | Response |
|---|---|---|
| 20. | Has the reuse of wastewater, (stormwater and cooling tower blowdown water) that currently discharges into the nutrient stripping wetland prior to discharging into the SDOOL, been considered as a source of water for the proposed expansion? Reusing this wastewater is a feasible option (that is currently undertaken by other major industries for process purposes) to reduce the reliance and its impacts on groundwater abstraction. Has a water use efficiency plan, including a water balance, been developed for CSBP and its proposed expansion?<br>(DoW) | Re-use of wastewater in the proposed expansion has been considered and is not practicable at this time. To do so would necessitate additional water treatment to produce water of appropriate quality. CSBP has determined that it is more efficient to utilise high quality treated wastewater from the Kwinana Water Reclamation Plant (KWRP). Opportunities to reduce, reuse and recycle water are considered in all parts of the business to minimise the impact of wastewater generation and disposal. The extent of discharge into the SDOOL is water that cannot currently be practically reused.<br>A number of studies have been undertaken to consider the source, quantity and quality of wastewater generated in the various business units in the CSBP Kwinana industrial complex. The water supply needs are also considered to ensure the most practicable source of appropriate quality water is accessed. This has resulted in multiple parallel water supply systems being implemented to enable the use of alternative water sources in various parts of the process. Water sources used (in decreasing order of quantity) are KWRP, groundwater, reverse osmosis permeate from Western Power, scheme water (mainly for amenity/potable uses) and inter-process recycling.<br>Stormwater, cooling tower blowdown and other wastewater streams have been considered for various recycling opportunities resulting in implementation of a number of successful projects. This has included segregating nutrient rich wastewater from the ammonia, nitric acid and ammonium nitrate business units for recycling in the fertiliser business. Recycling opportunities have also been successfully implemented with external businesses resulting in beneficial re-use of wastewater and a reduction in discharges to the environment.<br>A Water Efficiency Management Plan (WEMP) has been developed in accordance with the WA Governmental process administered by the Water Corporation (WC). CSBP has expanded the WEMP beyond scheme water to include the alternative water supplies, as these have a significant effect in minimising the use of scheme water in process applications.<br>CSBP has a Department of Water (DoW) approved Operating Strategy for Groundwater Abstraction and Use which is reviewed annually. An independent Borefield Monitoring Review is produced each year by hydrogeological consultants to review groundwater volume and quality data, assess compliance with groundwater abstraction licence obligations and make recommendations regarding future groundwater use and monitoring. The Borefield Monitoring Review and Operating Strategy for Groundwater Abstraction are provided to the DoW and DEC each year.<br>Water quality and quantity data is included in monthly internal reports and the annual Wesfarmers Sustainability Report. |

### 5.2.5 Site contamination

| Item | Submission | Response |
|---|---|---|
| 21. | The CSMC believe a map showing areal [sic] extent of existing groundwater plumes on the CSBP estate should have been provided to help clarify the relevance of the arsenic plume to the PER.<br>It is presumed CSBP would also have a company policy in place in terms of its current and future plans to manage the historical arsenic contaminated plume.<br>(CSMC) | As detailed in Section 9.3 of the PER there is historic arsenic contamination in soil and groundwater within the proposal footprint. Preliminary results from a draft Tier 3 Human Health and Environmental Risk Assessment (HERA) of historic arsenic contamination at the site indicate that arsenic in soil does not exceed human health criteria for an industrial site. Risks to human health from groundwater are only considered relevant if workers inhale/ingest or dermally contact the groundwater. As the depth to groundwater in this location is 4 m and no groundwater is abstracted from the impacted Safety Bay Sand aquifer, with the exception for monitoring purposes, it was identified that a low risk exists only for workers performing environmental groundwater monitoring which is a separate activity to the project. Appropriate occupational health and safety measures to mitigate worker exposure risk from groundwater monitoring activities are in place. The proposed expansion will have no impact on the nature or extent of the arsenic plume.<br>The CSBP Kwinana site is classified as "possibly contaminated – investigation required" under the *Contaminated Sites Act 2003*. CSBP is continuing to undertake investigations of the contamination status of the site and will amend existing management plans with reference to investigation findings. |

### 5.2.6 Noise

| Item | Submission | Response |
|---|---|---|
| 22. | DEC has reviewed and commented on the Scoping PER document and draft PER document for this proposed expansion on 20 June and 8 October 2010, respectively. I have been advised that all the concerns raised by DEC previously on the noise issues have now been satisfactorily addressed in the final PER document. I have also been advised that the noise generated by the CSBP Kwinana Industrial Complex with the proposed expansion can be managed so that it complies with the Environmental Protection (Noise) Regulations 1997 at both nearby noise sensitive premises and neighbouring industrial premises. DEC has not identified any other noise-related issues.<br>In summary, DEC would consider that the potential noise impact from this proposed expansion is manageable.<br>(DEC NRB) | Noted. |
| 23. | Emanation of noise from the industrial area has been an ongoing source of concern for pockets of neighbouring communities over many years. Abatement activities by Kwinana industries in recent years has mitigated this problem and KIC has facilitated a Noise Reference Group comprised of community, local and state government representatives, and of course Industry representatives, including CSBP. As a consequence, noise modeling [sic] in the region is now well understood, and complaints from the community have been substantially reduced. The proponent has addressed noise in its PER and KIC supports their contention that noise can be managed within the appropriate standards.<br>(KIC) | Noted. |

### 5.2.7 Greenhouse gas emissions

| Item | Submission | Response |
|---|---|---|
| 24. | *Issue: That there is no effective carbon constraint on this project in the absence of a carbon pricing mechanism.*<br>The Environmental Scoping Document noted the environmental objectives related to greenhouse gas emissions will include consideration of 'offsets to further reduce cumulative emissions'.<br>The PER notes the environmental objective for greenhouse gas emissions includes to "mitigate GHG emissions, mindful of Commonwealth and State GHG strategies and programs (EPA 2010).<br>The PER makes no mention of offsets, despite the fact that the expanded facility will potentially emit a significant amount of greenhouse gas emissions (total of 1.1 Mt $CO_2e$ under Scenario 2).<br>The proponent notes that EPA assessments undertaken in 2010 of projects with significant greenhouse gas emissions have indicated a policy approach based on providing an interim management strategy to cover the period until a Federal scheme becomes operational. These objectives were in the context of an anticipated Carbon Pollution Reduction Scheme (CPRS).<br>There is currently significant uncertainty over how and when a carbon price is to be introduced. In September 2010, the Prime Minister announced the establishment of the Multi-Party Climate Change Committee to explore options for the introduction of a carbon price, however, timing for the committee's outcomes is unclear. It seems likely that a clear carbon price policy will not emerge before late 2011 at the earliest, with implementation delayed for at least a year beyond that.<br>While the CPRS has been deferred indefinitely, it represented a well understood and developed model. In contrast, there is virtually no detail of how a carbon tax would operate.<br>The uncertainty around a carbon price policy means a period of several years where there will be no effective carbon constraint on new projects, including potentially significant emitters. This will potentially burden Western Australia's economy with an emissions legacy compounding the problem of transitioning to a low carbon economy.<br>*Recommendation 1*: The following recommendations should be considered for incorporation into the greenhouse gas abatement conditions:<br>• The proponent should be subject to an equivalent constraint as would have been imposed if the CPRS was currently operational. This constraint should be a "net" constraint which incorporates the impact of any shielding proposed under the CPRS.<br>• The proponent should be required to manage the liability they would have incurred under the CPRS by undertaking any combination of the following:<br>o geosequestration;<br>o biosequestration; or<br>o purchase of Kyoto compliant permits in the voluntary market.<br>• This requirement should apply while the current carbon price uncertainty persists. Once a carbon price is operational, proponents who are liable under that regime and thus managing their carbon liabilities should no longer be subject to these provisions.<br>(DEC OCC) | In the absence of a formal carbon emissions reduction scheme, CSBP has made commitments in the PER (Section 6.7) to implement measures to mitigate emissions of greenhouse gases from the ANPF (refer Section 6.7 of the PER). Implementation of the commitments will result in either a small increase in annual greenhouse gas emissions of 184 000 tonnes $CO_2e$ or 20 per cent of 2009/10 ANPF emissions (under Scenario 2 Section 6.5.6); or a substantial decrease in the annual greenhouse gas emissions from 925 688 tonnes $CO_2e$ in 09/10 to approximately 264 000 tonnes $CO_2e$ or 71 per cent of 2009/10 ANPF emissions (under Scenario 3 Section 6.5.6).Both Scenario 2 and Scenario 3 involve the application of tertiary nitrous oxide abatement technology in the proposed Nitric Acid Plant 3 to reduce nitrous oxide emissions by over 90 per cent from this plant. While tertiary abatement represents the most costly form of abatement, it is potentially the most effective method for reducing nitrous oxide emissions.<br>Implementation of Scenario 3 is predicated on the successful trialling of secondary abatement technology in Nitric Acid Plant 2 during 2011, and if successful, CSBP commits to installing the technology into Nitric Acid Plant 1 later in the year. It should be stressed that CSBP is strongly committed to achieving a successful trial with implementation of Scenario 3 being the target option. In February 2011, CSBP commenced the trial of secondary abatement in Nitric Acid Plant 2.<br>Further to this, CSBP commits to submitting an updated Greenhouse Gas Abatement Program to the EPA three months prior to commissioning of the third nitric acid plant providing detail on the progression of trialling of secondary abatement technology in Nitric Acid Plant 2, and if successful, the inclusion of secondary abatement in Nitric Acid Plant 1.The Program will be based on a template understood to be under development by the EPA.<br>CSBP considers that commitments made in the PER are consistent with the environmental objective to minimise greenhouse gas emissions in absolute terms and reduce emissions per unit of product to as low as reasonably practical.<br>Notwithstanding the above, the EPA policy approach provides for a situation in which no Commonwealth scheme to abate greenhouse gas emissions is implemented, or is delayed. It is also not dependent on any particular form of Commonwealth scheme having force until the conditions of approval become non-complementary to a Commonwealth scheme.<br>The EPA policy approach was effectively adopted by the Minister for the Environment in approving the recent proposals discussed in the PER, in accordance with the EPA recommendation with respect to management of greenhouse gas emissions. CSBP considers that the Minister should impose similar conditions as for any other current and relevant proposal on the CSBP proposal.<br>In accordance with the recent Commonwealth Government shift away from a trading scheme, the draft conditions proposed in the PER have been modified to remove reference to a trading scheme, enabling a more generic approach (see Section 7, Table 2). |

| Item | Submission | Response |
|---|---|---|
| 25. | *Issue: The 'Greenhouse gas offset strategies' noted in 6.5.4 and detailed in section 6.7 are not consistent with the principles of offsetting.*<br>The measures outlined in section 6.7 are actions to be implemented by the proponent to increase efficiency or otherwise reduce emissions associated with the ammonium nitrate processing facility.<br>The underlying principle of an offset is the payment of another entity to reduce greenhouse gas emissions and thereby offset the proponent's carbon footprint. On this basis, the measures proposed in section 6.7 are not considered to be 'greenhouse gas offset strategies'.<br>*Recommendation 2*: That the proponent identify the proposed measures as abatement measures rather than greenhouse gas offset strategies.<br>(DEC OCC) | The comment is accepted by CSBP. CSBP recognises that the proposed measures are abatement measures, rather than greenhouse gas offset strategies. |
| 26. | Whilst Kwinana industry is mindful of the need to reduce greenhouse gas emissions, it is inevitable that reductions on the one hand will be offset by increased activity within the industrial area on the other.<br>CSBP has previously demonstrated its performance in reducing greenhouse gas release into the environment, and is indicating that the trialling of secondary abatement technology in the future is strongly supported by KIC.<br>(KIC) | Noted. |

## 5.2.8 Traffic and shipping

| Item | Submission | Response |
|---|---|---|
| 27. | The CSMC is very concerned about the current level of marine pest monitoring that occurs in Cockburn Sound. Increased shipping will raise the risk of a potentially destructive and harmful marine pest incursion into the Sound. Discussion of how CSBP will address these issues or help Port authorities manage marine pests would help clarify this issue with increased ammonium nitrate production at this industrial facility.<br>Similarly, no information is provided to clarify if increased risk will result from increased truck movements and possible accidents associated with increased production of ammonium nitrate.<br>(CSMC) | CSBP understands there is a monitoring program in place that is due to commence over the period to the end of May 2011, together with a background monitoring project currently in place funded by the Ports. Fremantle Ports has not requested CSBP assistance in this project; however, should they seek funding for monitoring in Cockburn Sound this would be considered via the KIC.<br>CSBP has approved transport management plans for bulk chemicals transported on behalf of CSBP to its customers, and detailed training and procedures for all product transport, which adhere to regulatory requirements. Product is only transported by contracted transport providers that are licensed by the West Australian State Government to transport security–sensitive ammonium nitrate. Ammonium nitrate is transported on designated dangerous goods routes and this will continue to be the case with any additional transport. |
| 28. | These aspects of the proposal are unlikely to generate adverse environmental impacts.<br>(KIC) | Noted. |

### 5.2.9 Risk

| Item | Submission | Response |
|---|---|---|
| 29. | Published risk contours indicate that there will be no (or at most, negligible) change to the risk profile of neighbouring communities.<br>Risk profile changes to neighbouring industries have been identified and management strategies identified. Risk 'over the fencellne' is a fact of life in an industrial area such as the KIA. Companies in this environment manage this as part of their normal risk management planning. The proponent has indicated their awareness of this in their proposal.<br>(KIC) | Noted. |

### 5.2.10 Light overspill

| Item | Submission | Response |
|---|---|---|
| 30. | These aspects of the proposal are unlikely to generate adverse environmental impacts.<br>(KIC) | Noted. |

### 5.2.11 Solid waste

| Item | Submission | Response |
|---|---|---|
| 31. | These aspects of the proposal are unlikely to generate adverse environmental impacts.<br>(KIC) | Noted. |

## 5.3 OTHER FACTORS ADDRESSED

### 5.3.1 Health

| Item | Submission | Response |
|---|---|---|
| 32. | The Department of Health (WA Health) provided comments on the draft PER released for this project in September 2010 and is satisfied that the proponent has appropriately addressed these public health concerns within the current PER.<br>(DoH) | Noted. |

# 6. MINOR CHANGES TO THE PER

During the PER public comment period, CSBP was made aware of minor errors in the document in addition to the comments raised during submissions. This section outlines the minor errors found and presents the corrected text.

## 6.1 AIR QUALITY – OXIDES OF NITROGEN

In Section 2.5.2 on page 2-23, the cumulative impact 1-hour average $NO_2$ GLC is slightly larger than that quoted in Table 3.6 on page 2-22. The data in the Table 3.6 is the most up-to-date data; hence, the paragraph following Table 3.6 should read (changes in **bold**):

*From Table 3.6, the maximum 1-hour average $NO_2$ GLC monitored at the Hope Valley site is 173 $\mu g/m^3$. Under the expansion project, the cumulative 1-hour average $NO_2$ GLC is predicted to increase by **less than** 8 per cent to **185** $\mu g/m^3$ (ISC3 urban setting). This concentration is equal to **75** per cent of the 1-hour average NEPM for $NO_2$ of 246 $\mu g/m^3$ and is primarily driven by the maximum 1-hour $NO_2$ GLC measured at Hope Valley.*

In addition, the Air Dispersion Modelling Report by ENVIRON Australia Pty Ltd has been updated to include information requested by the Air Quality Management Branch of the DEC and is included as Appendix 1.

## 6.2 TRAFFIC AND SHIPPING

In Section 13.4.2 of the PER, the increase in shipping movements from CSBP was quoted to be an increase of 13 per cent from current shipping movements. This increase has been overestimated and is actually an increase of approximately five percent, as described in the following:

1. Average shipping movements are around 1500 in Cockburn Sound (calculated from average number of ships in Table 3.32 of the PER document).
2. The increase in shipping movements is 120 to 192 movements/yr, which gives an increase of 72 movements/yr.
3. This percentage increase gives (72/1500)*100 = 4.8%, or approximately 5%.

The paragraph should read (changes in **bold**):

*The increase in shipping movements from CSBP to a total of about 192 movements/yr is not regarded as significant in the context of the overall annual average number of shipping movements in Cockburn Sound of 1500 movements/yr (increase of **five** per cent). Ammonium nitrate export shipping is expected to be phased out within the next four years due to high domestic demand, which will decrease shipping movements by about 70 movements/yr.*

## 6.3 WATER RESOURCES

Further to the DoW comment of the figures stated within the report, the text from Section 8.3 on page 3-68 has been amended. The section should read (changes in **bold**):

*Process water usage by the CSBP Kwinana Industrial Complex was approximately **3249** ML/yr in 2009 to 2010. Water is sourced as follows:*

- *KWRP (1400 ML/yr)*
- *directly from groundwater (**1374** ML/yr)*
- *remediated groundwater from Western Power (455 ML/yr)*
- *recycled process waters (20 ML/yr).*

*The use of potable scheme water for processing is minimised wherever possible. Scheme water usage at CSBP has progressively decreased through ensuring process needs are met from alternative sources such as KWRP and bore water. Scheme water use by the CSBP Kwinana Industrial Complex was approximately 76 ML in 2009 to 2010.*

*CSBP is a foundation client of KWRP, which supplies (secondary treated) high quality industrial-grade water following treatment of wastewater from the Woodman Point wastewater treatment plant. Water from KWRP is supplied to purchasers in the KIA to replace potable scheme water use in industrial processes.*

*CSBP holds water abstraction licences under the RWI Act, which permits abstraction of up to **4800** ML/yr from bores in the Tamala (superficial) and Yarragadee (sub-artesian) aquifers. Annual groundwater abstraction has gradually increased over the years but has remained within licence limits. The increase is mainly due to scheme water saving initiatives between CSBP and its neighbours, where a significant volume of sub-artesian water is transferred to Tiwest.*

Further to the DoW comment on the figures stated within the report, the text from Section 8.4 on page 3-69 has been amended. The first paragraph in this section should read (changes in bold):

*The proposed expansion will increase annual water consumption to meet process demands. The expansion will require approximately 520 ML/yr (minimum usage when using preferred water source options) additional to the current usage of **3249** ML/yr. Table 3.24 outlines the current and future water resource use by the various CSBP facilities at Kwinana.*

# 7. CHANGE TO PROPOSAL

## 7.1 ENVIRONMENTAL CONDITIONS PROPOSED UNDER PART IV OF THE EP ACT

Chapter 4 of the PER presented proposed management framework for the proposal based on a range of Key Management Actions and proposed conditions of environmental approval to address the key environmental aspects of the proposed development. These were proposed so as not to duplicate management requirements of other regulatory controls (e.g. EP Act Environmental Licence for prescribed premises). It is proposed that these Key Management Actions be incorporated as environmental conditions into the approval instruments to apply to the Project. The resulting proposed conditions associated with the EP Act Part IV Ministerial Statement are re-presented in Table 2. They are similar to those presented in the PER, but with one minor amendment in the greenhouse gas condition to reflect the responses to public submissions discussed in the previous sections of this report.

CSBP proposes the Environmental Conditions presented in Table 2 for the management of the proposal for inclusion in the Ministerial Statement issued under the EP Act.

## Table 2 Proposed environmental conditions – EP Act Ministerial Statement

| Factor | Objective | Action | Timing |
|---|---|---|---|
| Compliance reporting | To report environmental compliance and performance. | A compliance report shall be submitted to the Chief Executive Officer of the Office of the Environmental Protection Authority prior to 1 December each year, that identifies compliance with each Ministerial Condition (including monitoring data collected under any condition) of the Statement for the preceding period of 1 July to 30 June. The compliance report shall address:<br>• the status of implementation of the proposal as defined in Schedule 1 of the statement<br>• evidence of compliance with the conditions and commitments<br>• performance of environmental management plans and programs. | Annually following issue of the Ministerial Statement |
| | | A performance review report shall be submitted every five years which addresses:<br>1. The major environmental issues associated with implementing the project; the environmental objectives for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those objectives.<br>2. The level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best practicable measures available.<br>3. Significant improvements gained in environmental management, including the use of external peer reviews.<br>4. Stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed.<br>5. The proposed environmental objectives over the next five years, including improvements in technology and management processes. | Five yearly following issue of the Ministerial Statement |
| Preliminary Decommissioning Plan | To minimise environmental impacts from decommissioning | Within six months following the date of publication of the Statement, the proponent shall prepare a Preliminary Decommissioning Plan for the Ammonium Nitrate Production Facility, which provides the framework to ensure that the site is left in an environmentally acceptable condition to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.<br>The Preliminary Decommissioning Plan shall address:<br>1. Conceptual plans for the removal or, if appropriate, retention of plant and infrastructure.<br>2. A conceptual rehabilitation plan for all disturbed areas and a description of a process to agree on the end land use(s) with all stakeholders.<br>3. A conceptual plan for a care and maintenance phase.<br>4. Management of noxious materials to avoid the creation of contaminated areas. | Within six months following commencement of construction |

| Factor | Objective | Action | Timing |
|---|---|---|---|
| Final Decommissioning Plan | To minimise environmental impacts from decommissioning | At least 12 months prior to the anticipated date of decommissioning, or at a time agreed with the Environmental Protection Authority, the proponent shall prepare a Final Decommissioning Plan designed to ensure that the site is left in an environmentally acceptable condition to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.<br>The Final Decommissioning Plan shall address:<br>1. Removal or, if appropriate, retention of plant and infrastructure in consultation with relevant stakeholders.<br>2. Rehabilitation of all disturbed areas to a standard suitable for the agreed new land use(s).<br>3. Identification of contaminated areas, including provision of evidence of notification and proposed management measures to relevant statutory authorities. | At least 12 months prior to the anticipated date of decommissioning |
| | | The proponent shall implement the Final Decommissioning Plan until such time as the Minister for the Environment determines, on advice of the Environmental Protection Authority, that the proponent's decommissioning responsibilities have been fulfilled. | During decommissioning |
| | | The proponent shall make the Final Decommissioning Plan publicly available. | During decommissioning |
| Construction | To inform the public of the management of construction activities | The proponent shall make the Construction Environmental Management Plan publicly available on the CSBP website. | Prior to and during construction |
| Nitric Acid Plant | To ensure that air emissions from the ongoing operation of the ANPF are minimised to as low a level as is practicable. | The proponent shall design and construct the new nitric acid plant with selective catalytic reactor technology for abatement of oxides of nitrogen emissions, such that oxides of nitrogen emissions from the exit stack are maintained nominally at 100 mg/Nm$^3$ during steady state operation. | During design and construction |
| | To ensure that high quality data are available to model and verify ambient air quality. | The proponent shall design and construct the new nitric acid plant to incorporate continuous monitoring of oxides of nitrogen emissions from the exit stack. | During design and construction |
| Greenhouse gases | To ensure that best practicable measures and technologies are used to minimise Western Australia's GHG emissions. | At least three months prior to commissioning of the new third nitric acid plant, the proponent shall update and submit to the Chief Executive Officer of the Office of the Environmental Protection Authority the Greenhouse Gas Abatement Program to:<br>1. Ensure that the plant is designed and operated in a manner which achieves reductions in "greenhouse gas" emissions as far as practicable.<br>2. Provide for ongoing "greenhouse gas" emissions reductions over time.<br>3. Ensure that through the use of available proven technology, the total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product from the proposal are minimised.<br>4. Achieve continuous improvement in "greenhouse gas" intensity through the periodic review, and where feasible, the adoption of advances in technology and process management. | Three months prior to commissioning |

| Factor | Objective | Action | Timing |
|---|---|---|---|
| | | The proponent shall make the Greenhouse Gas Abatement Program publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority. | Prior to commissioning |
| | | Annually until new technology is adopted for the plant, or until the Minister for the Environment advises that updating the Greenhouse Gas Abatement Program is no longer required, the proponent shall update this Program to the requirement of the Minister for the Environment on advice of the Environmental Protection Authority. | Annually |
| | | The above conditions will continue to have effect and condition the implementation of the proposal until such time as it is determined by the Chief Executive Officer of the Office of the Environmental Protection Authority that they are non-complementary to any Commonwealth GHG emissions[1] scheme in force in Western Australia and the Minister provides notice in writing of concurrence with this determination. | During design and construction |
| | | The proponent shall design and construct the new nitric acid plant to incorporate nitrous oxide abatement technology. | During design and construction |

[1] The word 'trading' has been deleted from this section.

# 8. REFERENCES

Strategen and Parsons Brinckerhoff 2010, *CSBP Kwinana: Ammonium Nitrate Production Expansion Project: Phase 2 – Public Environmental Review*, report prepared for CSBP Limited, Subiaco, Western Australia.

# Appendix 1

## Kwinana Ammonium Nitrate Expansion – Air Dispersion Modelling Report by ENVIRON Australia Pty Ltd

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# Kwinana Ammonium Nitrate Expansion – Air Dispersion Modelling Report

Prepared for:
**CSBP Limited**
**Kwinana, WA**

Prepared by:
**ENVIRON Australia Pty Ltd**

Date:
**28 March 2011**

Project Number:
**AS110489**

ENVIRON

**FINAL**

| **Prepared by:** | | | | **Authorised by:** | | | |
|---|---|---|---|---|---|---|---|
| Name: | Ruth Rogan | | | Name: | Brian Bell | | |
| Title: | Environmental Scientist | | | Title: | Principal | | |
| Phone: | +61 8 9225 5199 | | | Phone: | +61 8 9225 5199 | | |
| Email: | rrogan@environcorp.com.au | | | Email: | bbell@environcorp.com.au | | |
| Signature: | | Date: | 28/03/11 | Signature: | | Date: | 28/03/11 |



## VERSION CONTROL RECORD

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| AS110489 - CSBP Kwinana Ammonium Nitrate Expansion - Air Dispersion Modelling Report_100825_R1.doc | 25 August 2010 | Final Report Revision 1 | Ruth Rogan | Brian Bell/CSBP |
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# 1 Introduction

## 1.1 Background

CSBP Limited (CSBP), one of Australia's largest manufacturers and suppliers of high quality fertilisers and industrial and mining chemical products, is proposing to increase the ammonium nitrate production capacity at its Kwinana Industrial Complex, located approximately 40 km south of Perth, Western Australia.

CSBP's Kwinana Industrial Complex is licensed under the *Environmental Protection Act 1986* (Licence Number: L6107/1967), and includes the following production facilities:

Ammonium Nitrate Business:

- Integrated Nitric Acid Ammonium Nitrate Plants 1 and 2; and
- 2008 Ammonium Nitrate Prilling Plant.

Other:

- Superphosphate Plant;
- Compound Fertiliser Granulating Plant; and
- Ammonia Plant.

The 2008 Ammonium Nitrate Prilling Plant (also referred to as Prilling Plant 2) was commissioned by CSBP in 2008 and makes use of improved pollution control technology. This plant replaced CSBP's original Prilling Plant, which was decommissioned in 2009.

The expansion would involve the construction of a third integrated Nitric Acid Ammonium Nitrate plant (Plant 3), debottlenecking of the two existing Nitric Acid Ammonium Nitrate plants and proposed third plant, construction of a second auxiliary boiler and an upgrade of the existing prilling plant. The expansion project would result in an increase in the total ammonium nitrate production capacity at CSBP's Kwinana Industrial Complex from 520,000 tonnes per annum (tpa) to 936,000 tpa.

CSBP engaged ENVIRON Australia Pty Ltd (ENVIRON) to undertake air dispersion modelling in order to assess the potential air quality impacts arising from the atmospheric emissions and to support the environmental regulatory approval for the expansion project. The air dispersion modelling study has been carried out in two phases: the impact of emissions from existing sources at the CSBP Kwinana Industrial Complex was first assessed in order to establish a baseline of air quality impacts (baseline emissions scenario), followed by an assessment of emissions from the new and upgraded emissions sources in order to determine the air quality impacts associated with the increased ammonium nitrate production (expansion emissions scenario).

## 1.2 Purpose of this Report

This report outlines the approach, methodology and results for both the baseline and expansion emission scenarios. Ground level concentrations (GLCs) of nitrogen dioxide ($NO_2$), particulate matter (as $PM_{2.5}$) and ammonia ($NH_3$) have been predicted for all non-trivial sources of these pollutants at CSBP's Kwinana Industrial Complex.

Air quality impacts have been assessed for both the baseline and expansion emission scenarios, with each source operating under normal conditions, as well as with the Nitric Acid Plants operating under start-up and shutdown conditions. Ambient monitoring data have also been utilised in order to assess the cumulative impact of emissions associated with CSBP's operations along with other sources of emissions within the Kwinana area.

## 1.3 Site Description and Plant Layout

The CSBP Kwinana Industrial Complex is located in the Kwinana Industrial Area (KIA) approximately 40 km south of Perth. The CSBP Kwinana Industrial Complex encompasses an area of 138 ha and is adjacent to the intersection of Kwinana Beach Road and Rockingham Beach Road (Figure 1). A layout of the site is provided as Figure 2 and the locations of the emission sources considered in this assessment are highlighted in Figure 3.

# 2 Process Description and Emissions Control

Brief descriptions of the processes and emission control technologies utilised by the production facilities associated with CSBP's expansion project (i.e. Nitric Acid Ammonium Nitrate Plants 1, 2 and 3, the Auxiliary Boiler and the 2008 Ammonium Nitrate Prilling Plant) are provided in the following sections.

## 2.1 Integrated Nitric Acid Ammonium Nitrate Plants

The nitric acid process involves the production of oxides of nitrogen ($NO_x$) through the oxidisation of ammonia ($NH_3$) with air over platinum/rhodium gauzes to form nitric oxide (NO) (an exothermic reaction which generates heat and which is used to generate electricity). The NO is oxidised to $NO_2$ with additional air and is then passed through the absorber tower (the tallest part of the plant) where it is absorbed in water to create nitric acid ($HNO_3$). Unabsorbed $NO_x$ gas leaves the absorber tower as tail gas which is treated prior to discharge to atmosphere via the Nitric Acid Plant Stack. The $HNO_3$ is then reacted in a pipe reactor with $NH_3$ to form ammonium nitrate; this part of the process does not produce any gaseous emissions.

Each of the Nitric Acid Ammonium Nitrate plants has been designed and operates in the same manner.

It should be noted that as there are no gaseous emissions from the ammonium nitrate manufacturing component of the integrated plant, this report will refer to emissions from the Nitric Acid plants only, to ensure consistency with Environmental Protection Act Licence (L6107/1967).

### 2.1.1 Emission Control

The untreated tail gas leaving the absorber tower has a $NO_x$ concentration of approximately 800 ppm. Before being exhausted to atmosphere, the tail gas $NO_x$ content is reduced in a selective catalytic reactor (SCR). In the SCR, the $NO_x$ is reduced to $N_2$ via reaction with small quantities of ammonia. The treated tail gas, with a $NO_x$ concentration of approximately 50 ppm is then released to atmosphere through the stack, which is mounted alongside the absorber tower. The treated tail gas also contains small concentrations of $NH_3$ (typically less than 1 ppm) as a result of slippage of $NH_3$ past the SCR.

$NO_x$ concentrations from the SCR are measured continuously by an analyser located immediately upstream of the Tail-Gas Expander following the SCR and these are configured to alarm on high $NO_x$ concentrations, and trip the plant if elevated $NO_x$ concentrations are detected for a duration of greater than five minutes. Alarms are also configured to detect possible faults with the $NO_x$ analyser and detect low $NH_3$ flow to the SCR. The SCR catalyst performance is monitored continuously with alarms and trips when not operating at acceptable activity. Shut down of the SCR leads to a plant shut down on high $NO_x$ concentration alarm.

Elevated emissions of $NO_x$ occur during the start-up process as the tail gas is heated to the operating temperature required for effective performance of the SCR catalyst (around 200ºC). This process takes around 30-minutes, after which time $NO_x$ emissions decrease. Shutdown of the Nitric Acid Plants can also lead to elevated $NO_x$ emissions as it takes time for $NO_x$ to be cleared from the plant. Analysis of stack monitoring data for Nitric Acid Plants 1 and 2 provided by CSBP, indicates that start-up and shutdown conditions occur no more than four times a month. As $NH_3$ slippage is only associated with the operation of the SCR, $NH_3$ emissions from the Nitric Acid Plants are not expected during start-up or shut down conditions, when the SCR is offline.

The existing and proposed additional Nitric Acid Ammonium Nitrate plants will be debottlenecked as part of the expansion project in order to increase capacity and improve efficiency. This process is expected to result in an increase in the volumetric flow rate of emissions from the Nitric Acid Plants stacks to 39.5 $m^3$/s, which represents an increase of approximately 33% for Nitric Acid Plant 1, and 10% for Nitric Acid Plant 2.

## 2.2 Auxiliary Boiler

The existing auxiliary boiler is a natural gas-fired package boiler used to supply supplementary steam to the ammonia plant for use in the production process. The existing boiler has a steam generating capacity of 27 tonnes/hour. The new boiler proposed as part of the expansion project will have a steam generating capacity of 40 tonnes/hour. CSBP anticipates that once the new boiler has been commissioned, the existing boiler will no longer be required, except in the event of multiple plant trips that may require start up of the Ammonia Plant at the same time as one of the Nitric Acid Plants and for boiler maintenance (no more than 5% of the time).

### 2.2.1 Emission Control

The auxiliary boiler flue gas is vented to atmosphere via the Auxiliary Boiler Stack. Controlled gas to air ratio and flue gas oxygen analysis assists in optimising combustion.

It is anticipated that the volumetric flow rate of emissions from the new boiler will be 50% greater, based on the 50% increase in steam generating capacity, as compared to the existing boiler. However, the concentration of $NO_x$ emissions in the waste gas stream is expected to remain the same as that for the existing boiler.

## 2.3 2008 Ammonium Nitrate Prilling Plant

In the Prilling Plant (which contains a large tower approximately 60 m tall) hot ammonium nitrate solution is pumped to the top of the prilling tower and sprayed at a temperature of between 140ºC and 150ºC into the void inside the tower, where it falls under gravity against a fan forced air stream. The liquid cools as it falls, and creates the small round prill. The prill are then dried in the pre-dryer(s) and dryer, cooled, screened and coated to provide raw material for use in the mining industry.

### 2.3.1 Emission Control

The prilling air is scrubbed by the prilling air scrubber to remove any vaporised $NH_3$ and entrained fine particulates. $NH_3$ and ammonium nitrate ($NH_4NH_3$) particulates are caught by the slightly acidified and pH-controlled dilute $NH_4NH_3$ solution. After scrubbing the prilling air is recycled to the bottom of the prilling tower by the prilling air scrubber fans.

Waste air from the pre-dryer, dryer, and screen and transfer points dust recovery is sent to the final scrubber (a two stage packed tower scrubber) to be washed to remove $NH_4NH_3$ particulates and $NH_3$. Bleed air from the prilling tower air circulation system is also passed to the final scrubber. The pH of the scrubbing liquor is controlled automatically to ensure efficient removal of $NH_3$. Failure of scrubbing liquor circulation will result in a plant shut down.

After treatment, the waste air is discharged to atmosphere via the final scrubber fan to the Prilling Plant Stack, which runs to a height above the top of the prilling tower. The water effluent from the scrubber is recycled through the plant to recover the ammonium nitrate.

The Prilling Plant will be debottlenecked as part of the expansion project in order to increase capacity and improve efficiency. This process is expected to result in an increase in the volumetric flow rate of emissions from the Prilling Plant stack by up to 25%. However, the scrubbing system has sufficient capacity to accommodate the increased volume and the concentration of $NH_3$ and PM emissions in the exhaust gas stream is not expected to increase as part of the expansion project.

# 3 Air Quality Criteria

## 3.1 Ambient Air Quality Guidelines

In June 1998 the National Environment Protection Council (NEPC) set uniform standards for ambient air quality to allow for the adequate protection of human health and well being. This was achieved via the creation of the National Environmental Protection (Ambient Air Quality) Measure (NEPM) (NEPC, 2003) which defined ambient air quality standards for criteria pollutants, including $NO_2$ and $PM_{10}$. The NEPM also sets Advisory Reporting Standards for $PM_{2.5}$, with a goal to gather sufficient data to facilitate a review of Standards as part of the review of the ambient air quality NEPM that is currently underway. The Western Australian State Government has adopted the NEPM standards for ambient air quality as part of the *State Environmental (Ambient Air*) *Policy 2009* (EPA, 2009) and the NEPM standards for $NO_2$, $PM_{10}$ and $PM_{2.5}$ have subsequently been applied in this assessment.

The Victorian State Environmental Protection Policy (Vic SEPP) (Vic EPA, 2001) has established 3-minute average Design Criteria for a number of pollutants, including $NH_3$. The Design Criteria have been derived from the National Occupational Health and Safety Commission's (NOHSC) exposure standards for atmospheric contaminants in the occupational environment (Vic EPA, 2001) and are designed to protect against adverse health effects. The UK Environmental Agency (UKEA) has also defined Environmental Assessment Levels (EALs) for $NH_3$ which are derived from the UK Health and Safety Executive (HSE)'s Occupational Exposure Limits 2001 (UKEA, 2009). The UKEA criteria were referenced by the DEC in its assessment of monitored $NH_3$ concentrations collected as part of the Background Air Quality (Air Toxics) Study.

In the absence of a NEPM standard for $NH_3$, both the Vic SEPP and UKEA EALs have been applied in this assessment. The Vic SEPP 3-minute average Design Criteria has been converted to a 1-hour average concentration using the power law for timescale conversion, based on the approach recommended by Hanna *et al.* (1977). A summary of the air quality criteria applied in this assessment is provided in Table 1.

**Table 1: Ambient Air Quality Criteria**

| Compound | Averaging Period | Concentration ($\mu g/m^3$) | Goal[1] | Source |
|---|---|---|---|---|
| $NO_2$ | 1-hour | 246 | Not to be exceeded more than 1 day per year | NEPC NEPM |
| | Annual | 62 | NA | |
| $PM_{10}$ | 24-hour | 50 | Not to be exceeded more than 5 days per year | NEPC NEPM |
| $PM_{2.5}$ | 24-hour | 25 | Goal is to gather sufficient data nationally to facilitate a review of the Advisory Reporting Standards | NEPC NEPM |
| | Annual | 8 | | |
| $NH_3$ | 1-hour | 330[2] | NA | Vic SEPP |
| | | 2,500[3] | NA | UKEA |
| | Annual | 180[4] | NA | |

Notes

1. From July 2008.
2. Derived from 3-minute average Vic SEPP (2001) design criteria and converted to 1-hour average using the 0.2 power law for timescale conversion, based on the approach recommended by Hanna *et al.* (1977).
3. Derived from 15-minute average Occupational Exposure Level and converted to 1-hour average by UKEA.
4. Derived from 8-hour average Occupational Exposure Level and converted to annual mean by UKEA.

## 3.2 Emission Limits

CSBP's Kwinana Industrial Complex currently operates under an Environmental Licence (L6107/1967/16) which contains emission limits and targets for $NO_x$, Total Particulates and $NH_3$ for a number of sources including the Nitric Acid Plants (operating under normal and start-up conditions), Granulating Plant, Ammonia Plant and 2008 Ammonium Nitrate Prilling Plant. A summary of the atmospheric emission licence conditions relevant to this assessment is provided in Table 2.

**Table 2: CSBP Environmental Licence Atmospheric Emission Conditions**

| Source | Compound | Averaging Period | Emission Limit[1] |
|---|---|---|---|
| Nitric Acid Plants – Normal Operations | $NO_x$ | 1-hour | 0.41 g/m$^3$ |
| Nitric Acid Plants – Start-up Operations | $NO_x$ | 30-minutes | 2.0 g/m$^3$ |
| Granulating Plant Scrubber | $NH_3$ | Not specified | 1.0 g/m$^3$ |
| Ammonia Plant Primary Reformer | $NO_x$ | 1-hour | 144 mg/m$^3$ |
| Ammonia Plant Auxiliary Boiler | $NO_x$ | 1-hour | 144 mg/m$^3$ |
| 2008 Ammonium Nitrate Prilling Plant | Total Particulates | 1-hour | 0.05 g/m$^3$ |

Notes
1. At dry standard temperature and pressure (i.e. 0ºC and 101.3 kPa, dry).

The licence conditions also specify that the two existing Nitric Acid Plants cannot be started up at the same time. CSBP is required to maintain a minimum of one hour between the start-up of each Plant.

While the Superphosphate Plant Scrubber and Granulation Plant Deduster stacks are not subject to TSP or $NH_3$ licence emission conditions, they have also been included in the modelling assessment as non-trivial sources of emissions including PM and $NH_3$.

# 4 Ambient Air Quality

## 4.1 Nitrogen Dioxide

The DEC has conducted ambient air quality monitoring of nitrogen oxide (NO) and $NO_2$ concentrations within the Kwinana region. Monitoring has been conducted at the Hope Valley (until April 2008 when this station was decommissioned) and North Rockingham stations, both located within approximately 5 km of the CSBP facility (Figure 1). The $NO_2$ concentrations are collected by the DEC in compliance with the NEPM (NEPC, 2003) and are made available in the annual DEC air monitoring reports.

As noted in the 2008 Western Australian Annual Air Monitoring Report (DEC, 2009a) the NEPM $NO_2$ 1-hour standard of 0.12 ppm has not been exceeded at either the Hope Valley or North Rockingham monitoring stations over the last ten years (1999 to 2008). The highest maximum 1-hour $NO_2$ concentration monitored at Hope Valley between these years was 0.084 ppm (recorded in 2007). The highest maximum 1-hour $NO_2$ concentration monitored at North Rockingham during the same period was 0.055 ppm (recorded in 2004).

To assess the cumulative impacts of the current proposal on ambient $NO_2$ concentrations at each site, the maximum 1-hour and annual averaged $NO_2$ concentrations monitored between 1999 and 2008 have been used, as detailed in Table 3.

**Table 3: Summary of Ambient $NO_2$ Concentrations Measured in Kwinana**

| Monitoring Station | Hope Valley | | | North Rockingham | | |
|---|---|---|---|---|---|---|
| | ppm | µg/m³ | % NEPM[1] | ppm | µg/m³ | % NEPM[1] |
| **1-hour Average** | | | | | | |
| Max. between 1999 and 2008 | 0.084[2] | 173 | 70% | 0.055[3] | 113 | 46% |
| **Annual Average** | | | | | | |
| 2008 | 0.009 | 18 | 30% | 0.013 | 27 | 43% |

Notes
1. 1 hour $NO_2$ NEPM = 0.12 ppm; Annual $NO_2$ NEPM = 0.03 ppm.
2. As recorded in 2007.
3. As recorded in 2004.

## 4.2 Ammonia

The DEC conducted the Background Air Quality (Air Toxics) Study that involved monitoring of ambient concentrations of various air toxics in the Perth metropolitan area (including Kwinana). The results of the study are posted on the DEC website:

(http://portal.environment.wa.gov.au/portal/page?_pageid=54,3168889&_dad=portal&_schema=PORTAL).

Passive samplers were used to collect six day samples of $NH_3$ at Wells Park between May 2005 and July 2006. The average concentration of $NH_3$ collected over the duration of the study was found to be 17 µg/m$^3$, and is considered to be the best information available to determine the annual average background $NH_3$ concentration.

Due to the limitations of the passive samplers used in the Background Air Quality (Air Toxics) Study to measure $NH_3$ concentrations, shorter term average $NH_3$ background concentrations were not available for analysis within this study.

## 4.3 Particulate Matter

The 2008 Western Australia Air Monitoring Report (DEC 2009a) contains ambient air concentrations of $PM_{10}$ and $PM_{2.5}$ throughout the Perth metropolitan region. The South Lake station is the closest operational monitoring site to Kwinana. However, South Lake is located some 15 km north-northeast of the CSBP facility and falls outside the modelled domain. As such, historical $PM_{10}$ monitoring data were sourced from a site located in closer proximity to CSBP.

The Kwinana Industries Council (KIC) operated an air quality monitoring station during the 1990's at Abercrombie Road, located approximately 4 km northeast of the CSBP facility. Ambient $PM_{10}$ concentrations were measured at this site between January 1997 and March 1998. The DEC has indicated that monitoring data collected over the last 10 years shows a general decrease in $PM_{10}$ concentrations in the region, and that the monitoring data available from Abercrombie Road is appropriate to determine background $PM_{10}$ concentrations for use in this study (*pers.comm. P. Rye, 3 December 2010)*.

Two exceedances of the $PM_{10}$ NEPM standard were recorded at Abercrombie Rd during 1997. A maximum 24-hour average $PM_{10}$ concentration of 50.3 µg/m$^3$ was measured on the 9 December and a 24-hour average $PM_{10}$ concentration of 63 µg/m$^3$ measured on the 30 December. The NEPM goal of no more than 5 exceedances per year was met at this site. Four exceedances of the $PM_{10}$ NEPM standard were recorded between January and April 1998. The 24-hour average $PM_{10}$ concentration measured at Abercrombie Rd on the 27 January was 51µg/m$^3$ and on the 28 January was 54 µg/m$^3$. Consecutive exceedances of 52 µg/m$^3$ and 67 µg/m$^3$ were also measured at Abercrombie Rd on the 6 and 7 of March 1998.

$PM_{10}$ monitoring data collected by the DEC the South Lake site between 2000 and 2009 shows similar trends. Single exceedances of the $PM_{10}$ NEPM standard were recorded in 2001, 2002, 2004, 2007 and 2008, two exceedances were recorded in 2002 and three were recorded in 2005 (DEC, 2009a). The NEPM goal of no more than 5 exceedances was met each year. Smoke haze has been identified as a contributing factor to the majority of the exceedance events at South Lake (DEC, 2009a).

# 5 Modelling Methodology

## 5.1 Air Dispersion Models

The Gaussian dispersion models Dispmod (Version 2005) and the Industrial Source Complex 3 (ISC3) (Version 5.1.0) were both used in this study to predict the air quality impacts for the baseline emissions scenario. Dispmod was developed by the DEC and includes the effects of coastal fumigation on plume dispersion, and is therefore considered to be an appropriate model to predict dispersion characteristics of emissions on the Western Australian coastline. ISC3 was developed by the United States Environmental Protection Agency (USEPA) and includes enhanced treatment of the effects of buildings on plume dispersion. ISC3 has since been replaced by AERMOD as the USEPA's preferred model for most small scale regulatory applications, however it is still used extensively for regulatory assessments of industrial sources within Australia, particularly when buildings or structures are expected to impact the plume dispersion.

These two models have been chosen in order to ensure the modelling results account for coastal dispersion influences and building wake effects. The Dispmod air dispersion model has very limited capacity for considering the influence of building wake effects on plume dispersion, while the ISC3 model can account for building wakes but does not include an algorithm for coastal fumigation. As a general rule, building wake effects are likely to influence plume dispersion if the height of the exhaust stack is less than 2.5 times the height of the nearest building. As there are a number of buildings and structures within the vicinity of the modelled sources (refer to Figure 3), building wakes effects were considered a potential influence on plume dispersion.

Previous modelling carried out by ENVIRON (2009) for CSBP indicated that the worst case predicted impacts varied depending on source characteristics (i.e. stack height) and that no one model generated the most conservative results. As such, this assessment has also utilised both the Dispmod and ISC3 air dispersion models in order to predict $NH_3$, PM (as $PM_{2.5}$) and $NO_2$ GLCs.

## 5.2 Meteorological Data

Meteorological data collected by the DEC, at Hope Valley during the 1996 and 1997 calendar years were used for Dispmod and ISC3 modelling respectively. The Dispmod and ISC3 models have different meteorological data requirements and as data for a single year are not available in both of the required formats, meteorological data files for successive years were selected for this assessment. The 1996 and 1997 data files were also used by ENVIRON in past assessments for CSBP (e.g. ENVIRON, 2008).

Hope Valley is located approximately 4 km north northeast of the CSBP site (Figure 1) and is considered to be generally representative of the meteorology of the area. In addition, the meteorological data sets were chosen for consistency as these data sets have been used for several previous air quality assessments for CSBP and other Kwinana industries.

Annual wind roses derived from the 1996 and 1997 datasets are presented in Figures 4. Each windrose illustrates the strong influence of south-southwesterly and easterly winds on the meteorological conditions throughout the year. Moderate to strong south-southwesterly winds of between 4.5 and 9 m/s are common, as are easterly winds of between 1.5 and 4.5 m/s.

## 5.3 Model Parameterisation

The Dispmod and ISC3 models were used to predict the dispersion of $NO_2$, PM (as $PM_{2.5}$) and $NH_3$ emissions for each source operating under normal conditions, as well as for the Nitric Acid Plants operating under start-up and shutdown conditions. Each scenario was conservatively modelled assuming constant and continuous emissions from each source throughout the modelled year. The maximum predicted GLCs outside of the CSBP site boundary were assessed against the relevant ambient air quality criteria.

GLCs were predicted over a model domain of 4.8 km by 6.8 km. Gridded receptors were spaced at 200 m intervals. Boundary receptors were also incorporated into the ISC3 model at 25 m spacings in order to differentiate between on-site and off-site impacts. As the Dispmod model does not enable this same function, the Dispmod results were post-processed in order to define the predicted on-site and off-site GLCs.

The terrain of the modelled domain is considered to be relatively flat for modelling purposes and is not expected to influence the predicted GLCs. As such, terrain data were not incorporated into the ISC3 model (the Dispmod model does not have the option to incorporate terrain effects).

Dispmod was run in both statistical and non-statistical modes with the standard input configurations as defined in the *Instructions for use of Dispmod and Post Processing Software*, previously supplied to ENVIRON by the DEC. The development of a probabilistic emissions profile for use in the statistical analysis is described further in Section 5.4.1. A sample of the Dispmod model inputs for both statistical and non-statistical modes is provided in Appendix A.

ISC3 was run using regulatory default parameters and with both the urban and rural wind profile exponents. While the area within 3 km of CSBP is primarily rural, there are also industrial regions immediately surrounding the site which could influence the dispersive characteristics of the atmosphere. Both the urban and rural wind profile exponents were run in order to determine the most conservative setting. A sample of the ISC3 input file is provided in Appendix B.

Building wake effects were incorporated into the ISC3 model using the Building Profile Input Program (BPIP) – Plume Rise Model Enhancements (PRIME) building algorithm. Building locations and dimensions were based on facility drawings as provided by CSBP as part of previous air quality assessments (ENVIRON, 2008). The coordinates and building heights and the resulting PRIME algorithm parameters are provided as part of the sample ISC3 input file in Appendix B.

The ISC3 outputs were also post-processed using the Dispmod tools developed by the DEC to calculate GLCs from emissions that are described probabilistically. This approach is described further in Section 5.4.1.

## 5.4 Emission Estimates and Stack Parameters

The sources and associated compounds considered in the modelling assessment are as follows:

Ammonium Nitrate Business:

- Nitric Acid Plants Stacks: $NO_x$, $NH_3$;
- 2008 Ammonium Nitrate Prilling Plant: $NH_3$, PM (as $PM_{2.5}$); and
- Proposed Auxiliary Boiler Stack: $NO_x$.

Other:

- Superphosphate Plant Scrubber Stack: PM (as $PM_{2.5}$);
- Granulation Plant Scrubber Stack: $NH_3$, PM (as $PM_{2.5}$);
- Granulation Plant De-duster Stack: $NH_3$, PM (as $PM_{2.5}$);
- Ammonia Plant Primary Reformer Stack: $NO_x$; and
- Existing Auxiliary Boiler Stack: $NO_x$.

The stack parameters, exhaust characteristics and emissions estimates associated with each of the above sources were based on data provided by CSBP (unless otherwise indicated). It has been assumed that the exhaust characteristics for Nitric Acid Plant 3 are the same as Nitric Acid Plant 2, based on the same design and operation.

Stack monitoring data were analysed by ENVIRON in order to determine the average volumetric flow rate for each source for use in the modelling. The maximum mass emission rates measured under normal operations for each of the modelled compounds were also selected from the monitoring data for each source. However, analysis of continuous emissions monitoring data for the Nitric Acid Plants indicates that the concentration of $NO_x$ emissions varies under 'normal' operating conditions and is generally much lower than the maximum concentrations. A probabilistic approach was adopted to model $NO_x$ emissions during 'normal' operation of the Nitric Acid Plants in order to account for this variation in the emissions. The probabilistic emissions profile used in this assessment is described further in Section 5.4.1.

Emissions of $NH_3$ from the Nitric Acid Plants however, were modelled using a non-probabilistic approach. The modelled $NH_3$ emission rate was conservatively based on the maximum $NH_3$ concentration of 4.8 ppm, as recorded for Nitric Acid Plant 2 during normal operations (excluding data associated with calibration events). As this concentration is only expected to occur for a small proportion (0.02%) of the time and $NH_3$ concentrations are typically much lower (i.e. less than 1 ppm), the modelled $NH_3$ emission rate is considered conservative.

For the Nitric Acid Plants operating under start-up conditions, the modelled $NO_x$ emission rate was conservatively based on the emission concentration limit of 2,000 mg/m$^3$ (at STP, dry) as specified in CSBP's Environmental Licence (see Section 3.2). In the absence of site specific data, a moisture content of 0.3% was adopted in order to calculate the mass emission rate at stack conditions. This percentage is based on the typical moisture content of tail gas from Nitric Acid Plants operating in line with best available pollution control techniques (EFMA, 2000).

The exhaust characteristics for the new Auxiliary Boiler were based on a 50% increase in emissions as compared to the existing boiler stack (refer to Section 2.2.1) based on a 50% larger boiler.  It is assumed the new Auxiliary Boiler stack will be constructed to the same specifications as the existing boiler stack.

The volumetric flow rate and mass emission rate for the debottlenecked Prilling Plant were assumed to increase by 25%, as compared to the emission estimates defined for the baseline emissions scenario (refer to Section 2.3.1).

Exhaust gas density, which is required in order to run the Dispmod model, was based on the reported exhaust gas temperature. As Dispmod is not able to process negative buoyancy, sources which have a calculated density greater than that of air at 40ºC (i.e. 1.13 kg/m$^3$), were assumed to have an exhaust gas density of 1.13 kg/m$^3$ in order to enable the model to run.  Negative buoyancy sources included the Granulation Plant De-duster Stack, Nitric Acid Plant 2 (during start-up), Nitric Acid Plant 1, 2 and 3 (during shut-down), and the 2008 Ammonium Nitrate Prilling Plant.

In the absence of particle sizing information, all reported PM emissions have conservatively been assumed to be $PM_{2.5}$. Compliance of the maximum predicted 24-hour average PM (as $PM_{2.5}$) GLCs with the respective NEPM advisory reporting standard would also indicate compliance with the higher 24-hour average $PM_{10}$ standard.

The stack monitoring data from which the modelled PM (as $PM_{2.5}$) emission rate for the De-duster Stack was based consists of four separate samples collected over a 3-year period. The maximum of the reported particulate emission rates of 1.16 g/s (ECS, 2008) is not considered to be representative of normal operations (*Pers comm*. Nick Burkett, CSBP. 17 June 2010), and as such for the purposes of this assessment, has been excluded from the dataset.  The maximum reported particulate emission rate of the remaining three samples (which range from 0.2 g/s to 0.3 g/s) has been adopted for modelling purposes.

Summaries of the source parameters and non-statistical emission estimates used in the model for the baseline and expansion emissions scenarios are provided in Tables 4 and 5 respectively.

**Table 4: Summary of Stack Parameters and Emission Estimates – Baseline Emissions Scenario**

| Source | Coordinates | | Distance from Coast | Stack Height | Stack Diameter | Velocity[1] | Volumetric Flow rate[2] | Exhaust Density | Exhaust Temperature | Compound | Emission Rate[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | mE | mN | m | m | m | m/s | $m^3/s$ | $kg/m^3$ | K | | g/s |
| Superphosphate Plant Scrubber | 383,476 | 6,432,254 | 312 | 37.4 | 2.5 | 5.7 | 27.9 | 1.126 | 315 | $PM_{2.5}$[4] | 0.64 |
| Granulation Plant Scrubber | 383,615 | 6,432,437 | 430 | 43.1 | 1.8 | 7.1 | 18.7 | 1.074 | 330 | $NH_3$ | 0.29 |
| | | | | | | | | | | $PM_{2.5}$[4] | 0.18 |
| Granulation Plant De-duster | 383,620 | 6,432,451 | 430 | 36.8 | 1.6 | 12.2 | 24.0 | 1.157[5] | 307 | $NH_3$ | 0.24 |
| | | | | | | | | | | $PM_{2.5}$[4] | 0.29 |
| Nitric Acid Plant 1 (Normal) | 383,624 | 6,432,497 | 460 | 63.8 | 1.1 | 31.4 | 29.8 | 0.932 | 378 | $NH_3$ | 0.079[6] |
| | | | | | | | | | | $NO_x$[7] | See Table 6 |
| Nitric Acid Plant 1 (Shutdown) | | | | | | 32.1 | 30.5 | 1.191[5] | 298 | $NO_x$ | 70.37[8] |
| Nitric Acid Plant 2 (Normal) | 383,626 | 6,432,564 | 456 | 70.7 | 1.1 | 37.8 | 35.9 | 0.932 | 378 | $NH_3$ | 0.096[6] |
| | | | | | | | | | | $NO_x$[7] | See Table 6 |
| Nitric Acid Plant 2 (Start-up)[9] | | | | | | 22.3 | 21.2 | 1.159 | 306 | $NO_x$ | 37.81[10] |
| Nitric Acid Plant 2 (Shutdown) | | | | | | 35.9 | 34.1 | 1.191[5] | 298 | $NO_x$ | 50.8[8] |
| Ammonia Plant Primary Reformer | 383,811 | 6,432,690 | 640 | 30 | 2.1 | 13.7 | 48.9 | 0.774 | 458 | $NO_x$ | 5.17 |
| Ammonia Plant Auxiliary Boiler | 383,812 | 6,432,704 | 640 | 30 | 1.2 | 5.7 | 6.5 | 0.802 | 443 | $NO_x$ | 1.59 |
| 2008 Ammonium Nitrate Prilling Plant | 383,913 | 6,432,587 | 728 | 65 | 1.7 | 16.6 | 38.5 | 1.171[5] | 303 | $NH_3$ | 0.04 |
| | | | | | | | | | | $PM_{2.5}$[4] | 0.26 |

Notes

1. Based on average reported volumetric flow rate.
2. Average reported volumetric flow rate.
3. Maximum reported mass emission rate, except as noted.
4. In the absence of particulate sizing information, all reported PM was conservatively assumed to be $PM_{2.5}$.
5. An exhaust gas density of 1.13 $kg/m^3$ was selected for use in the Dispmod in order to avoid negative buoyancy and enable the model to run.
6. The mass emission rate has been conservatively based on the maximum reported half hour average emission concentration of 4.8 ppm. This concentration is only expected to occur for 0.02% of the time and $NH_3$ concentrations are typically less than 1 ppm.
7. A probabilistic emissions profile was applied to $NO_x$ emissions from the Nitric Acid Plants operating under normal conditions. The probabilistic emissions profile is presented in Table 6.
8. The mass emission rate has been based on the maximum concentration, as contained in the emission monitoring data for Nitric Acid Plant shut-downs provide by CSBP.
9. As start-up of the Nitric Acid Plants is restricted to one plant at a time, the baseline start-up scenario was modelled assuming Nitric Acid Plant 1 was operating under normal conditions while Nitric Acid Plant 2 was starting up (refer to Section 5.4.2).
10. The mass emission rate has been conservatively based on the half hour average emission limit of 2,000 $mg/m^3$ (at $0^oC$ and 101.3 kPa, dry) and a moisture content of 0.3%.

**Table 5: Summary of Stack Parameters and Emission Estimates – Expansion Emissions Scenario**

| Source | Coordinates | | Distance from Coast | Stack Height | Stack Diameter | Velocity[1] | Volumetric Flow rate[2] | Exhaust Density | Exhaust Temperature | Compound | Emission Rate[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | mE | mN | m | m | m | m/s | $m^3/s$ | $kg/m^3$ | K | | g/s |
| Superphosphate Plant Scrubber | 383,476 | 6,432,254 | 312 | 37.4 | 2.5 | 5.7 | 27.9 | 1.126 | 315 | $PM_{2.5}$[4] | 0.64 |
| Granulation Plant Scrubber | 383,615 | 6,432,437 | 430 | 43.1 | 1.8 | 7.1 | 18.7 | 1.074 | 330 | $NH_3$ | 0.29 |
| | | | | | | | | | | $PM_{2.5}$[4] | 0.18 |
| Granulation Plant De-duster | 383,620 | 6,432,451 | 430 | 36.8 | 1.6 | 12.2 | 24.0 | 1.157[5] | 307 | $NH_3$ | 0.24 |
| | | | | | | | | | | $PM_{2.5}$[4] | 0.29 |
| Nitric Acid Plant 1 (Normal) | 383,624 | 6,432,497 | 460 | 63.8 | 1.1 | 41.6 | 39.5 | 0.932 | 378 | $NH_3$ | 0.11[6] |
| | | | | | | | | | | $NO_x$[7] | See Table 6 |
| Nitric Acid Plant 1 (Shutdown) | | | | | | 41.6 | 39.5 | 1.191[5] | 298 | $NO_x$ | 91.2[8] |
| Nitric Acid Plant 2 (Normal) | 383,626 | 6,432,564 | 456 | 70.7 | 1.1 | 41.6 | 39.5 | 0.932 | 378 | $NH_3$ | 0.11[6] |
| | | | | | | | | | | $NO_x$[7] | See Table 6 |
| Nitric Acid Plant 2 (Start-up)[9] | | | | | | 22.3 | 21.2 | 1.159[5] | 306 | $NO_x$ | 37.81[10] |
| Nitric Acid Plant 2 (Shutdown) | | | | | | 41.6 | 39.5 | 1.191[5] | 298 | $NO_x$ | 58.0[8] |
| Nitric Acid Plant 3 (Normal) | 383,633 | 6,432,672 | 465 | 70.7 | 1.1 | 41.6 | 39.5 | 0.932 | 378 | $NH_3$ | 0.11[6] |
| | | | | | | | | | | $NO_x$[7] | See Table 6 |
| Nitric Acid Plant 3 (Shutdown) | | | | | | 41.6 | 39.5 | 1.191[5] | 298 | $NO_x$ | 58.0[8] |
| Ammonia Plant Primary Reformer | 383,811 | 6,432,690 | 640 | 30 | 2.1 | 13.7 | 48.9 | 0.774 | 458 | $NO_x$ | 5.17 |
| Ammonia Plant Auxiliary Boiler | 383,812 | 6,432,704 | 640 | 30 | 1.2 | 5.7 | 6.5 | 0.802 | 443 | $NO_x$ | 1.59 |
| New Ammonia Plant Auxiliary Boiler | 383,824 | 6,432,697 | 655 | 30 | 1.2 | 8.5 | 9.7 | 0.802 | 443 | $NO_x$ | 2.39 |
| 2008 Ammonium Nitrate Prilling Plant (Debottlenecked) | 383,913 | 6,432,587 | 728 | 65 | 1.7 | 20.7 | 48.1 | 1.171[5] | 303 | $NH_3$ | 0.04 |
| | | | | | | | | | | $PM_{2.5}$[4] | 0.33 |

Notes

1. Based on average reported volumetric flow rate.
2. Average reported volumetric flow rate.
3. Maximum reported mass emission rate, except as noted.
4. In the absence of particulate sizing information, all reported PM was conservatively assumed to be $PM_{2.5}$.
5. An exhaust gas density of 1.13 $kg/m^3$ was selected for use in the Dispmod in order to avoid negative buoyancy and enable the model to run.
6. The mass emission rate has been conservatively based on the maximum reported half hour average emission concentration of 4.8 ppm. This concentration is only expected to occur for 0.02% of the time and $NH_3$ concentrations are typically less than 1 ppm.
7. A probabilistic emissions profile was applied to $NO_x$ emissions from the Nitric Acid Plants operating under normal conditions. The probabilistic emissions profile is presented in Table 6.
8. The mass emission rate has been based on the maximum concentration, as contained in the emission monitoring data for Nitric Acid plant shut-downs provide by CSBP.
9. As start-up of the Nitric Acid Plants is restricted to one plant at a time, the baseline start-up scenario was modelled assuming Nitric Acid Plants 1 and 3 were operating under normal conditions while Nitric Acid Plant 2 was starting up (refer to Section 5.4.2).
10. The mass emission rate has conservatively been based on the half hour average emission limit of 2,000 $mg/m^3$ (at $0^oC$ and 101.3 kPa, dry) and a moisture content of 0.3%.

### 5.4.1 Identification and Treatment of Probabilistic Emissions

Analysis of the continuous emissions monitoring data provided by CSBP for the Nitric Acid Plants indicates that during 'normal' operations, the one hour average $NO_x$ concentrations remain between 100 mg/m$^3$ (STP, dry) and 150 mg/m$^3$ (STP, dry) for the vast majority (>98%) of the time. However, peaks in the one hour average $NO_x$ concentrations of up to 370 mg/m$^3$ (STP, dry) have occurred which is comparable to the licence limit of 410 mg/m$^3$ and are generally associated with a time period of a few hours following a start-up event. CSBP understands that these excursions are primarily related to the transition from manual to automatic operation of the Nitric Acid Plant $NO_x$ emission control system following start-up of the plant(s).

In order to account for the short-term peak $NO_x$ concentrations that occur during 'normal' operation of the Nitric Acid Plants, while also taking into consideration that $NO_x$ concentrations remain much lower for the large majority of the time, a probabilistic approach was adopted to model the $NO_x$ emissions from these sources.

A series of post-processing tools were developed by the DEC to determine the predicted GLCs associated with different frequencies of emissions from modelled sources as used for the Kwinana EPP sulphur dioxide redetermination (DEC, 2009b). In essence, these tools compute exceedance frequencies of a range of concentrations for a combination of emissions and multiply these exceedance frequencies by the probability that the emissions combination will occur, before summing the probability-weighted exceedance frequencies to give a final result.

Following the definition of emission profiles and the probability of occurrence associated with each case, the following modelling procedures are followed to determine the probability-weighted GLCs:

- The air dispersion model is run once with all emission sources using a representative emission rate (based on the emissions identified for each case). Fixed emissions sources (i.e. those sources for which emissions are not expected to vary significantly) are also included in the model run using their actual emission rates. The predicted concentrations for each variable emission source and for the fixed emission sources are saved to a file for each hour of the year and for each grid point such that they can be used by the post-processor.
- The potential combinations of the emissions cases across each source are reviewed to select the non-negligible "emissions scenarios" that need to be considered. This selection is done by computing the joint probability of every possible combination of emissions cases across all sources, screening out those combinations which fail an emissions-weighted probability threshold test and then re-assigning the screened fragments of probability such that the set of retained scenarios have probabilities which total 1.0. The emissions-weighted threshold is determined for each scenario by multiplying a user-specified constant threshold probability (e.g. 0.0001) by a factor which is the sum of all emissions represented by the scenario divided by the sum of all emissions when all industries are operating in "normal" (highest probability) mode. This weighting attaches importance to large emissions which might occur infrequently.

- For each non-negligible emissions scenario that is selected, the post-processor reads the ambient concentrations predicted by the air dispersion model, scales these concentrations by the ratio of the actual emission rates to those used in the model. The predicted concentrations resulting from each emission source are then accumulated and combined with the concentrations resulting from the constant emission sources, to determine the total ground-level concentration for each model grid point for each time-step. The post-processor checks for exceedances of each of 20 “reference levels” which span the expected range of ground-level concentrations (e.g. 20 points over the range 0 to 200 µg/m$^3$) and updates the running totals for each grid-point with the probability that the combination of emissions can occur and then proceeds to the next time-step.
- Once the post-processing of a scenario is complete the accumulated number of hours above each of the 20 reference levels are multiplied by the scenario’s probability of occurrence to calculate the total expected number of hours of exceedance for each reference level, at each grid point, for that scenario.
- All scenarios are processed sequentially and the probability-weighted exceedance counts for each reference level, across all scenarios, are summed at each grid-point. These resultant total exceedance counts include non-integer values which are interpreted as the average number of exceedances of a reference level per year (e.g. an exceedance count of 0.25 is interpreted to mean "once in four years").
- The output from the post-processor is a file that contains the count of exceedances for each grid point and for each reference level. This output file is used to extract exceedance counts of particular reference levels for contouring or calculation of cumulative frequencies. A single grid of 99.9 percentile concentrations is also computed by log linear interpolation between the exceedance grids to find, for each grid-point, the concentration at which the annual exceedance count is 8.77 (the 99.9 percentile level). The contour map produced from this grid is used to assess compliance with standards.

This approach has also been adopted in the recent redetermination of the maximum permissible quantities for sulphur dioxide at Kwinana (DEC, 2009b).

A summary of the probabilistic emissions profiles defined for the Nitric Acid Plants under the baseline and expansion emissions scenarios is presented in Table 6. Note start-up and shutdown operations have been excluded from the probabilistic approach and the predicted GLCs associated with these events have been determined separately as they are not totally independent events for each plant.

**Table 6: Summary of Probabilistic Emissions Profile - Nitric Acid Plants, Normal Operations**

| Source | Volumetric Flowrate[1] | Exhaust Temp. | $NO_x$ Concentration | | $NO_x$ Emission Rate | Probability |
|---|---|---|---|---|---|---|
| | $m^3/s$ | K | $mg/m^3$, STP | $mg/m^3$[2] | g/s | % |
| **Baseline Emissions Scenario** | | | | | | |
| Nitric Acid Plant 1 | 29.8 | 378 | 120 | 86 | 2.6 | 96% |
| | | | 150 | 108 | 3.2 | 2% |
| | | | 410[3] | 295 | 8.8 | 2% |
| Nitric Acid Plant 2 | 35.9 | 378 | 120 | 86 | 3.1 | 96% |
| | | | 150 | 108 | 3.9 | 2% |
| | | | 410[3] | 295 | 10.6 | 2% |
| **Expansion Emissions Scenario** | | | | | | |
| Nitric Acid Plant 1 | 39.5 | 378 | 120 | 86 | 3.4 | 96% |
| | | | 150 | 108 | 4.3 | 2% |
| | | | 410[3] | 295 | 11.7 | 2% |
| Nitric Acid Plant 2 | 39.5 | 378 | 120 | 86 | 3.4 | 96% |
| | | | 150 | 108 | 4.3 | 2% |
| | | | 410[3] | 295 | 11.7 | 2% |
| Nitric Acid Plant 3 | 39.5 | 378 | 120 | 86 | 3.4 | 96% |
| | | | 150 | 108 | 4.3 | 2% |
| | | | 410[3] | 295 | 11.7 | 2% |

Notes
1. At stack conditions
2. Assumes a moisture content of 0.3%.
3. Hourly average $NO_x$ emission concentration limit (excluding start-ups), as specified in CSBP's Environmental Licence.

### 5.4.2 Modelled Scenarios

Air quality impacts have been assessed for the baseline and expansion emissions scenarios operating under the following conditions:

- Normal Operations;
- Nitric Acid Plant Start-up; and
- Nitric Acid Plant Shutdown.

Under normal operations, each source was modelled assuming constant and continuous emissions throughout the modelled year, with the exception of $NO_x$ emissions from the Nitric Acid Plants. A probabilistic emissions profile was developed for the Nitric Acid Plants to account for variations in the concentration of $NO_x$ emissions during 'normal' operations (refer to Section 5.4.1).

As start-up of the Nitric Acid Plants is restricted to one plant at a time, the baseline start-up scenario was modelled assuming Nitric Acid Plant 1 was operating under normal conditions while Nitric Acid Plant 2 was starting up, and all other sources of $NO_x$ emissions (i.e. the Ammonia Plant Primary Reformer and Auxiliary Boiler stacks) were operating under normal conditions. Under the expansion start-up scenario, Nitric Acid Plants 1 and 3 were assumed to be operating under normal conditions while Nitric Acid Plant 2 was starting up and all other sources of $NO_x$ emissions were operating under normal conditions.

The assessment has also taken into account that the duration of a Nitric Acid Plant start-up is typically less than 30-minutes by modelling the cumulative impacts of the Nitric Acid Plant 2 operating under start-up conditions for 30-minutes and under normal conditions for the remaining 30-minutes, for each modelled hour. The Nitric Acid Plant 2 under start-up and under normal conditions was treated as two separate sources in the model and the average of the maximum 1-hour $NO_x$ concentrations predicted for both 'sources' was determined by adjusting the respective $NO_x$ emission rates by half.

Under certain upset conditions, such as loss of power to the site, it is possible that each Nitric Acid Plant would need to be shut down at the same time. As such, the 'shutdown' scenario was conservatively modelled assuming all Nitric Acid Plants would be shutdown simultaneously while all other sources of $NO_x$ emissions (i.e. the Ammonia Plant Primary Reformer and Auxiliary Boiler stacks) were modelled under normal conditions. Similar to the treatment of Nitric Acid Plant start-ups, the assessment has taken into account that the duration of a Nitric Acid Plant shutdown is typically less than 10-minutes by modelling the cumulative impacts of each of the Nitric Acid Plants operating under shutdown conditions for 10-minutes and assuming no further $NO_x$ emissions for the remaining 50-minutes (as the plants are in shut down mode), for each modelled hour.

While it is anticipated that the existing Auxiliary Boiler will operate for no more than 5% of the time (i.e. in the event of multiple plant start-ups), the maximum 1-hour $NO_x$ GLCs have been predicted for normal, start-up and shutdown operations under the expansion scenario conservatively assuming that both the existing and proposed Auxiliary Boilers are operating simultaneously. The annual average $NO_x$ GLCs have been predicted for normal operations under the expansion scenario assuming the existing Auxiliary Boiler was not in operation.

## 5.5 Treatment of Oxides of Nitrogen Concentrations

A key element in assessing the potential environmental impacts from ground level $NO_2$ concentrations is estimating the $NO_2$ concentrations from modelled $NO_x$ emissions. The final $NO_2$ concentration is a combination of the $NO_x$ emitted as $NO_2$ from the source stacks and the amount of $NO_x$ that is converted to $NO_2$ by oxidation in the plume after release.

Generally, after $NO_x$ is emitted from the stack, additional $NO_2$ is formed as the plume mixes and reacts with the surrounding air. There are several reactions that both form and destroy $NO_2$, but the primary reaction is oxidation with ozone according to the following reaction:

$$NO + O_3 \rightarrow NO_2 + O_2 \qquad \text{Equation 1}$$

This reaction is essentially instantaneous as the plume entrains the surrounding air. It is limited by the amount of ozone available and by how quickly the plume mixes with the surrounding air. Thus, the ratio of $NO_2$ to $NO_x$ increases as the plume disperses downwind.

In the absence of modelling including photochemistry directly, there are four common methods used to estimate the final ratio of $NO_2$ to $NO_x$. These are:

- Total Conversion: This method conservatively assumes all $NO_x$ is converted to $NO_2$.
- United States Environmental Protection Agency (USEPA) Tier 2 Assumption: This method assumes a national default ratio of $NO_2$ to $NO_x$ of 0.75.
- Ozone Limiting Method (OLM): This method commonly assumes 10% of the stack $NO_x$ emissions are $NO_2$ and that ozone is the limiting reagent for Equation 1 (i.e. the ozone concentration is less than the remaining $NO_x$ concentration). The estimated $NO_2$ concentration can be calculated using Equation 2 (the equation can vary depending on the $NO_2$ content of the stack emissions and whether ozone or $NO_x$ is the limiting reagent):

  $$NO_2 = (0.1 \text{ x } NO_x) + O_3 \qquad \text{Equation 2}$$

  Where:
  $NO_2$ = estimated ground level concentration of nitrogen dioxide (ppm)
  $NO_x$ = predicted ground level concentration of oxides of nitrogen (ppm)
  $O_3$ = measured background concentration of ozone (ppm)

  The actual $NO_2$ in the stack emissions can be used should these data be available.

- Ambient Ratio Method (ARM): This method typically relies on at least a years worth of ambient monitoring data and assumes the final plume $NO_2$ to $NO_x$ ratio will be equal to the existing ambient $NO_2$ to $NO_x$ ratio. An equation developed by Dames and Moore (1993) based on monitoring data from Kwinana determined a $NO_2$ to $NO_x$ ratio of 0.59 to 0.43 as follows:

  $$[NO_2] = 0.59 \text{ x } [NO_x] - 0.00038 \text{ x } [NO_x]^2 \qquad \text{Equation 3}$$

The suitability of each of these methods with regards to predicting $NO_2$ GLCs associated with emissions from CSBP was investigated by ENVIRON as part of a previous air quality assessment (ENVIRON, 2008). The Total Conversion and USEPA Tier 2 Assumption were considered overly conservative and did not allow for locally available data to be taken into account. The OLM was also considered likely to overestimate $NO_2$ concentrations as it would rely on very conservative estimates of background ozone concentrations (one hour maximum for the region).

The ARM method and the equation developed by Dames and Moore (1993) was considered the most appropriate method while still remaining conservative enough that actual $NO_2$ concentrations are likely less than those predicted by the modelling. This method was also selected for the purpose of this report as it is consistent with previous air quality studies carried out by ENVIRON for CSBP (i.e. ENVIRON, 2008) and other analyses conducted in the Kwinana region.

## 5.6 Ammonium Nitrate Deposition Over Cockburn Sound

Particulate emissions from the 2008 Ammonium Nitrate Prilling Plant are largely composed of ammonium nitrate particles. The Public Environmental Review (PER) completed for the previous Ammonium Nitrate Production Expansion Project (CSBP, 2005) looked at ammonium nitrate particle deposition over Cockburn Sound as a contributing factor to the total load of nitrogen entering the Sound. The assessment included emissions from Prilling Plant 1 (now decommissioned), and concluded that the nutrient addition from particulate ammonium nitrate were not significant when compared to the total load of nitrogen entering Cockburn Sound.

Since the 2005 PER was conducted, the estimated particulate emission load from the 2008 Ammonium Nitrate Prilling Plant has been revised from 2.8 g/s (derived originally from equipment design specifications), down to 0.26 g/s (derived from the results of stack testing during actual plant operations). The concentration of particulate emissions from the 2008 Ammonium Nitrate Prilling Plant will not be impacted as a result of the expansion project (refer to Section 2.3.1), however the particulate emission load is expected to increase by up to 25% (to 0.33 g/s), as a result of the increased volumetric flow rate of emissions arising from the debottlenecking (refer to Tables 4 and 5).

The particulate load from the 2008 Ammonium Nitrate Prilling Plant for the expansion project is estimated to be an order of magnitude lower than was used for the previous assessment of ammonium nitrate deposition over Cockburn Sound. As such, based on the findings from the previous assessment of ammonium nitrate deposition over Cockburn Sound conducted for the 2005 PER, emissions from the debottlenecked 2008 Ammonium Nitrate Prilling Plant are expected to remain a relatively minor contributor to the total load of nitrogen entering Cockburn Sound.

# 6 Modelling Results

## 6.1 Normal Operations

A summary of the maximum off-site $NH_3$, PM (as $PM_{2.5}$) and $NO_x$ concentrations predicted by both the Dispmod and ISC3 dispersion models for the baseline and expansion emissions scenarios, under normal operating conditions is presented in Table 7. $NO_2$ concentrations have been calculated from the predicted $NO_x$ concentrations using the Dames and Moore (1993) equation (refer to Section 5.5).

The concentrations predicted for CSBP operating under normal conditions in isolation have been compared to the relevant ambient air quality criteria and are expressed as percentages of the guideline values. The concentrations highlighted in bold represent the highest off-site GLC predicted by the alternative models and model options applied. Contours of the maximum short-term (1-hour or 24-hour average) and long-term (annual average) $NH_3$, PM (as $PM_{2.5}$) and $NO_2$ GLCs predicted by the most conservative model and configuration are presented as Figures 5 through 10.

**Table 7: Summary of Maximum Predicted Off-site GLCs (µg/m$^3$) – Normal Operations**

| Compound | Averaging Period | Baseline Emissions Scenario | | | Expansion Emissions Scenario | | |
|---|---|---|---|---|---|---|---|
| | | Dispmod | ISC3 | | Dispmod | ISC3 | |
| | | | Rural | Urban | | Rural | Urban |
| $NH_3$ | 1-hour | 11 | **25** | 24 | 11 | **25** | 24 |
| | Guideline[1] | 330 | 330 | 330 | 330 | 330 | 330 |
| | % Guideline | 3.3% | **7.6%** | 7.3% | 3.3% | **7.6%** | 7.3% |
| | Annual | 0.3 | 1.0 | **1.1** | 0.3 | 1.0 | **1.1** |
| | Guideline[2] | 180 | 180 | 180 | 180 | 180 | 180 |
| | % Guideline | 0.1% | 0.5% | **0.6%** | 0.1% | 0.5% | **0.6%** |
| PM (as $PM_{2.5}$) | 24-hour | 3.8 | **13.5** | 13 | 3.8 | **13.5** | 13 |
| | Guideline[3] | 25 | 25 | 25 | 25 | **25** | 25 |
| | % Guideline | 15% | **54%** | 52% | 15% | **54%** | 52% |
| | Annual | 0.5 | **2.1** | 2.1 | 0.5 | **2.1** | 2.1 |
| | Guideline[3] | 8 | 8 | 8 | 8 | **8** | 8 |
| | % Guideline | 6.5% | **27%** | 26% | 6.5% | **27%** | 26% |
| $NO_x$ | 1-hour | 50 | 55 | **100** | 55 | 95 | **155** |
| | Annual | 0.7 | 2.0 | **3.4** | 1.4 | 3.7 | **5.1** |
| $NO_2$ | 1-hour | 29 | 31 | **55** | 31 | 53 | **82** |
| | Guideline[3] | 246 | 246 | 246 | 246 | 246 | 246 |
| | % Guideline | 12% | 13% | **22%** | 13% | 21% | **34%** |
| | Annual | 0.4 | 1.2 | **2.0** | 0.8 | 2.2 | **3.0** |
| | Guideline[3] | 62 | 62 | 62 | 62 | 62 | 62 |
| | % Guideline | 0.7% | 1.9% | **3.2%** | 1.4% | 3.6% | **4.9%** |

Notes
1. Source: Vic EPA (2001).
2. Source: UKEA (2009).
3. Source: NEPC (2003).

The data presented in Table 7 indicates that the expansion project is likely to result in an increase in the maximum off-site 1-hour and annual average $NO_2$ GLCs predicted for normal operations. However, the maximum off-site 1-hour and annual average $NH_3$ GLCs predicted for normal operations are expected to remain unchanged, as are the maximum off-site 24-hour and annual average PM (as $PM_{2.5}$) GLCs. All of the predicted GLCs comply with the relevant ambient air quality criteria, for both the baseline and expansion scenarios when CSBP's operations are considered in isolation.

The ISC3 model consistently predicts higher GLCs than the Dispmod model. The higher GLCs associated with ISC3 are likely to be a result of the building wake effects on the predicted plume dispersion. Within ISC3, the rural setting tends to predict higher short-term maximum concentrations, while the urban setting predicts higher long-term concentrations.

The maximum off-site 1-hour average $NH_3$ GLC predicted for both the baseline and expansion emissions scenarios for CSBP in isolation is 25 µg/m$^3$ (ISC3 rural setting). This concentration comfortably complies with the UKEA's 1-hour average $NH_3$ EAL of 2,500 µg/m$^3$ and the Vic SEPP equivalent design criteria of 330 µg/m$^3$. The maximum off-site annual average $NH_3$ GLC predicted for both the baseline and expansion scenarios is 1.1 µg/m$^3$ (ISC3 urban setting). This concentration also complies comfortably with the annual average $NH_3$ UKEA EAL of 180 µg/m$^3$.

Contours of the maximum 1-hour average $NH_3$ GLCs predicted for the baseline and expansion emission scenarios for CSBP's operations in isolation, as presented in Figure 5, illustrate that peak off-site impacts are predicted to occur immediately to the west of the CSBP site boundary. Contours of the annual average $NH_3$ GLCs also indicate peak off-site impacts are predicted to occur immediately to the west of the CSBP site boundary (Figure 6).

Analysis of the model results indicates that emissions from the Granulation Plant Scrubber Stack and De-duster Stack primarily drive the maximum predicted off-site $NH_3$ concentrations from CSBP's emission sources. As the Granulation Plant does not form part of the expansion project, the emissions and consequent GLCs arising from these sources remains the same as for existing operations. The combined emissions from the Nitric Acid Plants and Prilling Plant contribute less than 8% to the maximum predicted 1-hour or annual average $NH_3$ GLC under both the baseline and expansion scenarios. As such, the upgrade of the Nitric Acid Plants and Prilling Plant and the associated increase in $NH_3$ emissions from these sources under the expansion project do not significantly impact on the maximum off-site $NH_3$ GLCs predicted for CSBP's operations in isolation.

Emissions from the Prilling Plant contribute less than 6% to the maximum predicted 24-hour and annual average PM (as $PM_{2.5}$) GLCs under both the baseline and expansion scenarios. As such, the increase in PM emissions from this source under the expansion project has a minimum effect on the maximum predicted off-site PM GLCs. Analysis of the predicted PM (as $PM_{2.5}$) GLCs indicates that emissions from the Granulation Plant De-duster Stack contribute less than 36% to the maximum predicted 24-hour and annual average PM (as $PM_{2.5}$) GLCs for CSBP in isolation.

The maximum off-site 24-hour average PM (as $PM_{2.5}$) GLC predicted for both the baseline and expansion emissions scenarios for CSBP's operations in isolation is 13.5 µg/m$^3$ (ISC3 rural setting). This concentration complies with the 24-hour average advisory reporting standard for $PM_{2.5}$ of 25 µg/$m^3$. As all of the particulate emissions were assumed to be $PM_{2.5}$, compliance with the $PM_{2.5}$ standard also demonstrates compliance with the 24-hour average $PM_{10}$ NEPM of 50 µg/$m^3$. The maximum off-site annual average PM (as $PM_{2.5}$) GLC predicted for both the baseline and expansion scenarios for CSBP's operations in isolation is 2.1 µg/$m^3$ (ISC3 rural setting). This concentration also complies with the annual average $PM_{2.5}$ advisory reporting standard of 8 µg/$m^3$.

Contours of the maximum predicted 24-hour average PM (as $PM_{2.5}$) GLCs predicted for both the baseline and expansion emission scenarios for CSBP's operations in isolation are presented in Figure 7 and indicate that peak off-site impacts are likely to occur to the west of the site boundary. Contours of the annual average PM (as $PM_{2.5}$) GLCs also indicate peak off-site impacts are predicted to occur immediately to the west of the CSBP site boundary (Figure 8).

The maximum off-site 1-hour average $NO_2$ GLC predicted under the expansion scenario for CSBP in isolation is 82 µg/$m^3$ (ISC3 urban setting). This concentration is 50% higher than the maximum 1-hour average $NO_2$ GLC predicted for the baseline scenario, but is well below the 1-hour average NEPM for $NO_2$ of 246 µg/$m^3$. The maximum off-site annual average $NO_2$ GLC predicted under the expansion scenario for CSBP in isolation is 3.0 µg/$m^3$ (ISC3 urban setting). This concentration is also 50% higher than the maximum off-site annual average $NO_2$ GLC predicted for the baseline scenario, but is well below the annual average $NO_2$ NEPM of 62 µg/$m^3$.

Contours of the maximum 1-hour average $NO_2$ GLCs predicted for the baseline and expansion emission scenarios for CSBP's operations in isolation are presented in Figure 9. Peak concentrations are predicted to occur across the model domain in each scenario (Figure 9). The annual average $NO_2$ GLCs predicted for the baseline and expansion emission scenarios indicate that the highest long-term $NO_2$ GLCs are predicted to occur immediately to the north of the CSBP site boundary (Figure 10).

### 6.1.1 Cumulative Impacts

A summary of the cumulative impacts of normal operations under the baseline and expansion emissions scenarios on ambient air quality at the available monitoring locations is presented in Table 8. Ambient $NO_2$ GLCs monitored at the Hope Valley and North Rockingham sites, ambient $NH_3$ concentrations monitored at the Wells Park site and ambient $PM_{10}$ concentrations monitored at Abercrombie Rd have been used in this assessment (refer to Section 4).

As the monitored GLCs effectively take into account the regional impact of emissions from CSBP's existing operations (i.e. the baseline emissions scenario), the cumulative impact of CSBP's proposed expansion project on ambient concentrations at each site has been determined by adding the maximum incremental change in predicted GLCs associated with the expansion project at each of the monitoring sites to the monitored GLCs at each site. It should be noted that this assessment is extremely conservative for the short term (i.e. 1-hour and 24-hour) averaging times as the maximum predicted incremental change in GLCs associated with the proposed expansion project at each of the monitoring sites has been added to the maximum ambient concentrations recorded at the monitoring sites, which is not expected to occur in reality.

The cumulative GLCs have been expressed as a percentage of the corresponding ambient air quality criteria. The concentrations highlighted in bold represent the greatest incremental change in GLCs predicted by the alternative models and model options applied. The measured ambient GLCs have also been expressed as a percentage of the corresponding ambient air quality criteria, to enable comparison of the relative increase in cumulative air quality impacts predicted to occur as a result of the expansion project, within the context of compliance with the relevant ambient air quality criteria.

**Table 8: Summary of the Cumulative Maximum Predicted GLCs for the Expansion Emissions Scenario**

| Compound | Averaging Period | Reference Parameter | Maximum GLC (µg/m3) | | |
|---|---|---|---|---|---|
| | | | Dispmod | ISC3 | |
| | | | | Rural | Urban |
| **Hope Valley** | | | | | |
| $NO_2$ | 1-hour | Maximum Incremental Change[1] | 4.1 | 8.8 | **11.6** |
| | | Ambient GLC[2] | 173 | 173 | 173 |
| | | Cumulative GLC[3] | 177 | 182 | **185** |
| | | Guideline[4] | 246 | 246 | 246 |
| | | % Guideline Ambient GLC | 70% | 70% | 70% |
| | | % Guideline Cumulative GLC | 72% | 74% | **75%** |

**Table 8: Summary of the Cumulative Maximum Predicted GLCs for the Expansion Emissions Scenario**

| Compound | Averaging Period | Reference Parameter | Maximum GLC (µg/m3) | | |
|---|---|---|---|---|---|
| | | | Dispmod | ISC3 | |
| | | | | Rural | Urban |
| $NO_2$ | Annual | Maximum Incremental Change[1] | 0.06 | **0.11** | 0.05 |
| | | Ambient GLC[2] | 18 | 18 | 18 |
| | | Cumulative GLC[3] | 18.1 | **18.1** | 18.1 |
| | | Guideline[4] | 62 | 62 | 62 |
| | | % Guideline Ambient GLC | 29.0% | 29.0% | 29.0% |
| | | % Guideline Cumulative GLC | 29.1% | **29.2%** | 29.1% |
| **North Rockingham** | | | | | |
| $NO_2$ | 1-hour | Maximum Incremental Change[1] | 4.3 | 9.3 | **16** |
| | | Ambient GLC[2] | 113 | 113 | 113 |
| | | Cumulative GLC[3] | 117 | 122 | **129** |
| | | Guideline[4] | 246 | 246 | 246 |
| | | % Guideline Ambient GLC | 46% | 46% | 46% |
| | | % Guideline Cumulative GLC | 48% | 50% | **52%** |
| | Annual | Maximum Incremental Change[1] | 0.02 | 0.12 | **0.13** |
| | | Ambient GLC[2] | 27 | 27 | 27 |
| | | Cumulative GLC[3] | 27.0 | 27.1 | **27.1** |
| | | Guideline[4] | 62 | 62 | 62 |
| | | % Guideline Ambient GLC | 43.5% | 43.5% | 43.5% |
| | | % Guideline Cumulative GLC | 43.6% | 43.7% | **43.8%** |

**Table 8: Summary of the Cumulative Maximum Predicted GLCs for the Expansion Emissions Scenario**

| Compound | Averaging Period | Reference Parameter | Maximum GLC (µg/m3) | | |
|---|---|---|---|---|---|
| | | | Dispmod | ISC3 | |
| | | | | Rural | Urban |
| **Wells Park** | | | | | |
| $NH_3$ | Annual | Maximum Incremental Change[1] | 0.004 | 0.004 | **0.01** |
| | | Ambient GLC[2] | 17 | 17 | 17 |
| | | Cumulative GLC[3] | 17 | 17 | **17** |
| | | Guideline[5] | 180 | 180 | 180 |
| | | % Guideline | 9.4% | 9.4% | **9.4%** |
| **Abercrombie Rd[6]** | | | | | |
| $PM_{10}$ | 24-hour | Maximum Incremental Change[1] | 0.01 | **0.13** | 0.03 |
| | | Ambient GLC[7] | 67 | 67 | 67 |
| | | Cumulative GLC[3] | 67 | **67** | 67 |
| | | Guideline[4] | 50 | 50 | 50 |
| | | % Guideline | 134% | **134%** | 134% |

Notes
1. Maximum incremental change in predicted GLCs associated with the expansion project.
2. Ambient GLC as monitored by the DEC.
3. The cumulative GLCs have been calculated by adding the maximum predicted incremental change in GLCs associated with the expansion project to the monitored GLCs at each site.
4. Source: NEPC (2003).
5. Source: UKEA (2009).
6. As the Abercrombie Rd monitoring site is approximately 600 m outside the model domain, the maximum predicted incremental change at nearest model grid point has been selected for use in this assessment. This is considered conservative as the model grid point is closer to the CSBP facility by approximately 600 m.
7. Maximum 24-hour ambient GLC as monitored by the KIC between January 1997 and March 1998.

The data presented in Table 8 indicates that CSBP’s expansion project may result in an increase in the short-term ambient $NO_2$ GLCs at the Hope Valley and North Rockingham monitoring stations, while annual average ambient $NO_2$ GLCs at these sites are expected to increase only marginally.

The maximum 1-hour average $NO_2$ GLC monitored at the Hope Valley site is 173 µg/m$^3$. Under the expansion project the cumulative 1-hour average $NO_2$ GLC is predicted to increase by approximately 7% to 185 µg/m$^3$ (ISC3 urban setting). This concentration remains below the 1-hour average $NO_2$ NEPM of 246 µg/m$^3$ and is primarily driven by the maximum

1-hour $NO_2$ GLC measured at Hope Valley. Furthermore, it is considered highly conservative as it assumes that the monitored and predicted maximum concentrations occur at the same time.

The highest annual average $NO_2$ GLC monitored at the Hope Valley site is 18 µg/m$^3$. Under the expansion project the cumulative annual average $NO_2$ GLC is predicted to increase by 0.6% to 18.1 µg/m$^3$ (ISC3 rural setting). This concentration remains well below the annual average $NO_2$ NEPM of 62 µg/m$^3$.

The maximum 1-hour average $NO_2$ GLC monitored at the North Rockingham site is 113 µg/m$^3$. Under the expansion project the cumulative 1-hour average $NO_2$ GLC is predicted to increase by approximately 14% to 129 µg/m$^3$ (ISC3 urban setting). This concentration is equal to 52% of the 1-hour average $NO_2$ NEPM and is primarily driven by the maximum 1-hour $NO_2$ GLC measured at North Rockingham. It is also considered highly conservative as it assumes that the monitored and predicted maximum concentrations occur at the same time.

The highest annual average $NO_2$ GLC monitored at the North Rockingham site is 27 µg/m$^3$. Under the expansion project the cumulative annual average $NO_2$ GLC is predicted to increase by 0.4% to 27.1 µg/m$^3$ (ISC3 urban setting) and remains below the annual average $NO_2$ NEPM of 62 µg/m$^3$.

The CSBP expansion project is not expected to impact on the cumulative annual average ambient $NH_3$ GLCs predicted at the Wells Park monitoring station. The annual average $NH_3$ GLC monitored at the Wells Park site is 17 µg/m$^3$. This concentration is predicted to remain unchanged under the expansion project and complies comfortably with the annual average ammonia UKEA EAL of 180 µg/m$^3$.

The CSBP expansion project is similarly not expected to impact on the 24-hour average $PM_{10}$ concentrations predicted at the Abercrombie Rd monitoring site. The maximum 24-hour average $PM_{10}$ concentration recorded at the site between January 1997 and March 1998 was 67 µg/m$^3$. This concentration is predicted to remain unchanged under the expansion project. The number of predicted exceedances of the $PM_{10}$ NEPM standard at Abercrombie Rd during the monitoring period is also expected to remain unchanged and in compliance with the NEPM goal of no more than 5 exceedances per year for the 1997 calendar year (monitoring data were not collected for all of the 1998 calendar year).

Comparison of the predicted cumulative GLCs to monitored ambient concentrations, when expressed as a percentage of the relevant ambient air quality criteria, indicates that the expansion project is not expected to have a significant bearing upon achieving compliance with the relevant ambient air quality criteria in Hope Valley, North Rockingham, Wells Park or Abercrombie Rd, relative to existing cumulative air quality impacts.

## 6.2 Start-up Operations

A summary of the maximum off-site 1-hour $NO_x$ concentrations predicted by both the Dispmod and ISC3 dispersion models for start-up conditions under both the baseline and expansion emissions scenarios is presented in Table 9. Each scenario has been modelled assuming Nitric Acid Plant 2 is operating under start-up conditions for 30-minutes and then normally for the other 30 minutes of every hour, while all other sources of $NO_x$ emissions are operating under normal conditions.

$NO_2$ concentrations have been calculated from the predicted $NO_x$ concentrations using the Dames and Moore (1993) equation (refer to Section 5.5). The predicted concentrations have been compared to the relevant ambient air quality criteria and are expressed as percentages of the guideline values. The concentrations highlighted in bold represent the highest off-site GLC predicted by the alternate models and model options applied. Contours of the most conservative maximum 1-hour average $NO_2$ GLCs as predicted by Dispmod are presented as Figure 11.

**Table 9: Summary of Maximum Predicted Off-site GLCs (µg/m$^3$) – Start-up Operations**

| Compound | Averaging Period | Baseline Emissions Scenario | | | Expansion Emissions Scenario | | |
|---|---|---|---|---|---|---|---|
| | | Dispmod | ISC3 | | Dispmod | ISC3 | |
| | | | Rural | Urban | | Rural | Urban |
| $NO_x$ | 1-hour | **403** | 257 | 300 | **524** | 345 | 429 |
| $NO_2$ | 1-hour | **176** | 127 | 143 | **205** | 158 | 183 |
| | Guideline[1] | 246 | 246 | 246 | 246 | 246 | 246 |
| | % Guideline | **72%** | 51% | 58% | **83%** | 64% | 75% |

Notes
1. Source: NEPC (2003).

The data presented in Table 9 indicates that the maximum off-site 1-hour $NO_2$ GLCs predicted for start-up operations are expected to increase following the expansion project, although remain below the applicable ambient air quality criteria. The Dispmod model predicts higher GLCs than the ISC3 model. This is likely to be a result of start-up emissions from the Nitric Acid Plant 2 stack (which primarily drive the maximum predicted GLCs), being free from building wakes and the dominant influence of coastal fumigation (as considered in the Dispmod model) on the dispersion of emissions from this source.

The maximum off-site 1-hour average $NO_2$ GLC predicted under the expansion scenario is 205 µg/m$^3$. This concentration is 16% higher than the maximum 1-hour average $NO_2$ GLC predicted for the baseline scenario, although remains below the 1-hour average NEPM for $NO_2$ of 246 µg/m$^3$. The peak off-site 1-hour average $NO_2$ concentrations are predicted to occur along the western boundary of the site, as illustrated in Figure 11.

## 6.3 Shutdown Operations

A summary of the maximum off-site 1-hour $NO_x$ concentrations predicted by both the Dispmod and ISC3 dispersion models for shutdown conditions under both the baseline and expansion emissions scenarios is presented in Table 10. The baseline scenario has been modelled assuming Nitric Acid Plants 1 and 2 are shutting down, while all other sources of $NO_x$ emissions are operating under normal conditions. The expansion scenario has been modelled assuming Nitric Acid Plants 1, 2 and 3 are shutting down and all other sources of $NO_x$ emissions are operating as normal.

$NO_2$ concentrations have been calculated from the predicted $NO_x$ concentrations using the Dames and Moore (1993) equation (refer to Section 5.5). The predicted concentrations have been compared to the relevant ambient air quality criteria and are expressed as percentages of the guideline values. The concentrations highlighted in bold represent the highest off-site GLC predicted by the alternate models and model options applied. Contours of the most conservative maximum 1-hour average $NO_2$ GLCs as predicted by Dispmod are presented as Figure 12.

**Table 10: Summary of Maximum Predicted Off-site GLCs (µg/m$^3$) – Shutdown Operations**

| Compound | Averaging Period | Baseline Emissions Scenario | | | Expansion Emissions Scenario | | |
|---|---|---|---|---|---|---|---|
| | | Dispmod | ISC3 | | Dispmod | ISC3 | |
| | | | Rural | Urban | | Rural | Urban |
| $NO_x$ | 1-hour | **302** | 279 | 260 | **442** | 373 | 400 |
| $NO_2$ | 1-hour | **143** | 135 | 128 | **187** | 167 | 175 |
| | Guideline[2] | 246 | 246 | 246 | 246 | 246 | 246 |
| | % Guideline | **58%** | 55% | 52% | **76%** | 68% | 71% |

Notes
1. Source: NEPC (2003).

The data presented in Table 10 indicates that the maximum off-site 1-hour $NO_2$ GLCs predicted for shutdown operations are expected to increase following the expansion project, while remaining below the NEPM ambient air quality criteria. The Dispmod model predicts higher GLCs than the ISC3 model. This is likely to be a result of shutdown emissions from the Nitric Acid Plant 1 stack (which primarily drive the maximum predicted GLCs), being free from building wakes and the dominant influence of coastal fumigation (as considered in the Dispmod model) on the dispersion of emissions from this source.

The maximum off-site 1-hour average $NO_2$ GLC predicted under the expansion scenario is 187 µg/m$^3$. This concentration is 31% higher than the maximum 1-hour average $NO_2$ GLC predicted for shutdown operations under the baseline scenario, although remains below the 1-hour average NEPM for $NO_2$ of 246 µg/m$^3$. The peak off-site 1-hour average $NO_2$ concentrations are predicted to occur along the western boundary of the site, as illustrated in Figure 12.

## 6.4 Contribution to Photochemical Smog Pollution

Photochemical smog is an air pollution problem common in large cities. It is characterised by high ozone concentrations at ground level, and can be generated through the interaction of $NO_x$ and reactive organic compounds (ROC) in the environment. Potential sources of $NO_x$ and ROC include industrial processes, vehicle exhausts and bushfires.

Current ambient air quality monitoring of ozone concentrations reported by the DEC (2010) for the Perth airshed indicate that the NEPM 1-hour and 4-hour ozone standards (0.10 ppm and 0.08 ppm respectively) were exceeded at the inland Caversham and Rolling Green monitoring sites (located more than 40 km north east of Kwinana) during 2009. Only the 4-hour ozone concentrations recorded at Rolling Green did not meet the NEPM goal of no more than 1-day in excess of the standard. The DEC (2010) indicated that these events were smoke induced and were the first exceedances of the NEPM 1-hour and 4-hour ozone standards recorded since 2004.

The Perth Photochemical Smog Study (Western Power and Department of Environmental Protection, 1996) found that the control of photochemical smog is a complex issue in the Perth airshed. The study also reported that motor vehicles were the dominant cause of photochemical smog in the Perth airshed being the largest emission sources of $NO_x$ and ROC.

Overall CSBP is a relatively small emitter of $NO_x$ in the Perth airshed. Data from the National Pollutant Inventory (NPI) for 2008-2009 indicates that CSBP emitted 340 tonnes of $NO_x$ compared to the total airshed emissions of 58,090 tonnes (or 0.59% of the total airshed emissions). In considering these figures, the 2008-2009 NPI data indicate that within the Perth airshed approximately 41,717 tonnes (out of the total of 58,090 tonnes) of $NO_x$ emissions are from diffuse (i.e. non industrial) sources including motor vehicles (28,000 tonnes) and biogenic sources (8,400 tonnes) and that these diffuse emission estimates are for 1999.

The proposed NAP Expansion Project will apply Best Available Techniques (BAT) for controlling $NO_x$ emissions and is conservatively estimated to add approximately 150 tonnes per year of $NO_x$ to the Perth airshed (i.e. a further 0.26% to the total airshed NOx emissons). Due to the complexity of photochemistry in the Perth airshed, it is difficult to reliably quantify the impact of such a small increase in the overall $NO_x$ emissions as the change in the total airshed's emission is very small and would be no more than "noise" in any numerical modelling assessment.

The Perth Photochemical Smog Study found that the emissions from the KIA "resulted in a significant quenching of ozone across those portions of the metropolitan area impacted by the Kwinana $NO_x$ plume" (Western Power and Department of Environmental Protection, 1996). This quenching was due to the presence of NO and a low ROC:$NO_x$ ratio within the KIA emissions. Therefore, as the proposal will result in a small increase in the airshed's $NO_x$ emissions, it may result in further slight quenching of ozone in the airshed. The proposal will result in a small reduction in the ROC-$NO_x$ ratio which may also contribute to a small reduction in the ozone formation potential.

# 7 Conclusions

Air dispersion modelling has been undertaken to assess the potential air quality impacts arising from the atmospheric emissions from CSBP's ammonium nitrate expansion project at the Kwinana Industrial Complex. The modelling approach used for the assessment is conservative (i.e. tends to over-predict GLCs) throughout, and as such the results are considered to be representative of potential worst-case air quality impacts.

The results of the air dispersion modelling assessment indicate that atmospheric emissions associated with the expansion project at the CSBP Kwinana Industrial Complex are not likely to result in unacceptable air quality impacts.

Under normal operating conditions, the model results indicate that the expansion project is likely to result in a 50% increase in the predicted maximum off-site 1-hour and annual average $NO_2$ GLCs. The maximum short-term and long-term off-site $NH_3$ and PM (as $PM_{2.5}$) GLCs predicted for the expansion emissions scenario are expected to remain unchanged.

The predicted concentrations for CSBP's operations in isolation and under the expansion emissions scenario comply with the relevant ambient air quality criteria, as follows:

- the maximum predicted 1-hour average $NH_3$ concentration of 25 µg/m$^3$ is equal to 7.6% of the Vic SEPP equivalent 1-hour average design criteria for $NH_3$;
- the maximum predicted annual average $NH_3$ GLC of 1.1 µg/m$^3$ is equal to 0.6% of the corresponding UKEA EAL;
- the maximum predicted 24-hour average PM (as $PM_{2.5}$) concentration of 13.5 µg/m$^3$ is equal to 54% of the 24-hour average $PM_{2.5}$ advisory reporting standard. As all of the particulate emissions were assumed to be $PM_{2.5}$, compliance with the $PM_{2.5}$ standard also demonstrates compliance with the 24-hour average $PM_{10}$ NEPM of 50 µg/m$^3$. Emissions from the Prilling Plant contribute less than 6% to the maximum predicted 24-hour PM (as $PM_{2.5}$) GLCs;
- the maximum predicted annual average PM (as $PM_{2.5}$) concentration of 2.1 µg/m$^3$ is equal to 27% of the corresponding advisory reporting standard. Emissions from the Prilling Plant contribute less than 6% to the maximum predicted annual average PM (as $PM_{2.5}$);
- the maximum predicted 1-hour average $NO_2$ concentration of 82 µg/m$^3$ is equal to 34% of the 1-hour average NEPM for $NO_2$; and
- the maximum predicted annual average $NO_2$ concentration of 3.0 µg/m$^3$ is equal to 4.9% of the corresponding NEPM.

Under start-up and shutdown operations, the expansion project is expected to lead to increases of 16% and 31% respectively in the maximum 1-hour average $NO_2$ GLCs. However, the predicted concentrations for CSBP's operations in isolation comply with the NEPM criteria, as follows:

- With the Nitric Acid Plant 2 operating under start-up conditions for 30-minutes and then normally for the other 30 minutes of every hour and the remaining $NO_2$ emission sources operating under normal conditions, the maximum predicted 1-hour average

$NO_2$ concentration is 205 µg/m$^3$ and is equal to 83% of the 1-hour average NEPM for $NO_2$; and

- With Nitric Acid Plants 1, 2 and 3 operating under shutdown conditions and other $NO_2$ emission sources at normal conditions, the maximum predicted 1-hour average $NO_2$ concentration is 187 µg/m$^3$ and is equal to 76% of the 1-hour average NEPM for $NO_2$.

The maximum predicted concentrations for start-up and shutdown conditions are considered to be conservative as the emissions are expected to occur less than 1% of the time, and hence may not necessarily coincide with the occurrence of worst-case meteorological conditions.

Assessment of the cumulative impact of emissions associated with normal operations under the expansion scenario and background levels of air pollutants in the Kwinana area indicates that the expansion project may conservatively result in an increase in short-term ambient $NO_2$ GLCs at the Hope Valley and North Rockingham monitoring stations, as follows:

- the cumulative 1-hour $NO_2$ GLC is predicted to increase by approximately 7% to 185 µg/m$^3$ at Hope Valley; and
- the cumulative 1-hour $NO_2$ GLC is predicted to increase by 14% to 129 µg/m$^3$ at North Rockingham.

The cumulative concentrations however, are driven by the maximum measured $NO_2$ GLCs at each site and are considered highly conservative as it assumes that the monitored and predicted maximum concentrations occur at the same time.

CSBP's normal operations are predicted to contribute less than 1% to the cumulative annual average $NO_2$ GLC at the Hope Valley and North Rockingham sites and predicted increases associated with the expansion project are minimal. At Wells Park, the modelled sources are also predicted to contribute less than 1% to the cumulative annual average $NH_3$ average and the expansion project is not expected to impact on the ambient concentration. CSBP's normal operations are similarly predicted to contribute less than 1% to the cumulative 24-hour average $PM_{10}$ GLC at the Abercrombie Rd monitoring site and the expansion project is not expected to impact on the ambient concentration.

Assessment of the impact of increased $NO_x$ emissions on photochemical smog levels in the Perth airshed indicates that the proposed expansion project is conservatively expected to result in an increase of 0.26% to the total Perth airshed emissions of $NO_x$ based on the 2008-2009 NPI data. While this increase is considered to be too small to be meaningfully considered within a complex photochemistry model, it is qualitatively expected to result in small additional quenching of ozone in the Perth airshed. The proposal is also expected to result in a very small reduction in the ROC-$NO_x$ ratio which may also contribute to a very small reduction in the ozone formation potential of the Perth airshed.

A conservative approach has been adopted throughout the modelling assessment, including definition of the emissions for each of the modelled sources, set-up of the air dispersion models, calculation of $NO_2$ concentrations from predicted $NO_x$ concentrations, assessment of the cumulative impacts of the expansion project and assessment of the impacts under start-up and shutdown conditions.

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# 9 Limitations

ENVIRON Australia prepared this report in accordance with the scope of work as outlined in our proposal to CSBP Limited dated 26 February 2010 and in accordance with our understanding and interpretation of current regulatory standards.

Site conditions may change over time. This report is based on conditions encountered at the site at the time of the report and ENVIRON disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent ENVIRON's professional judgement based on information made available during the course of this assignment and are true and correct to the best of ENVIRON's knowledge as at the date of the assessment.

ENVIRON did not independently verify all of the written or oral information provided to ENVIRON during the course of this investigation. While ENVIRON has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to ENVIRON was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

## 9.1 User Reliance

This report has been prepared exclusively for CSBP Limited and may not be relied upon by any other person or entity without ENVIRON's express written permission.

# Figures

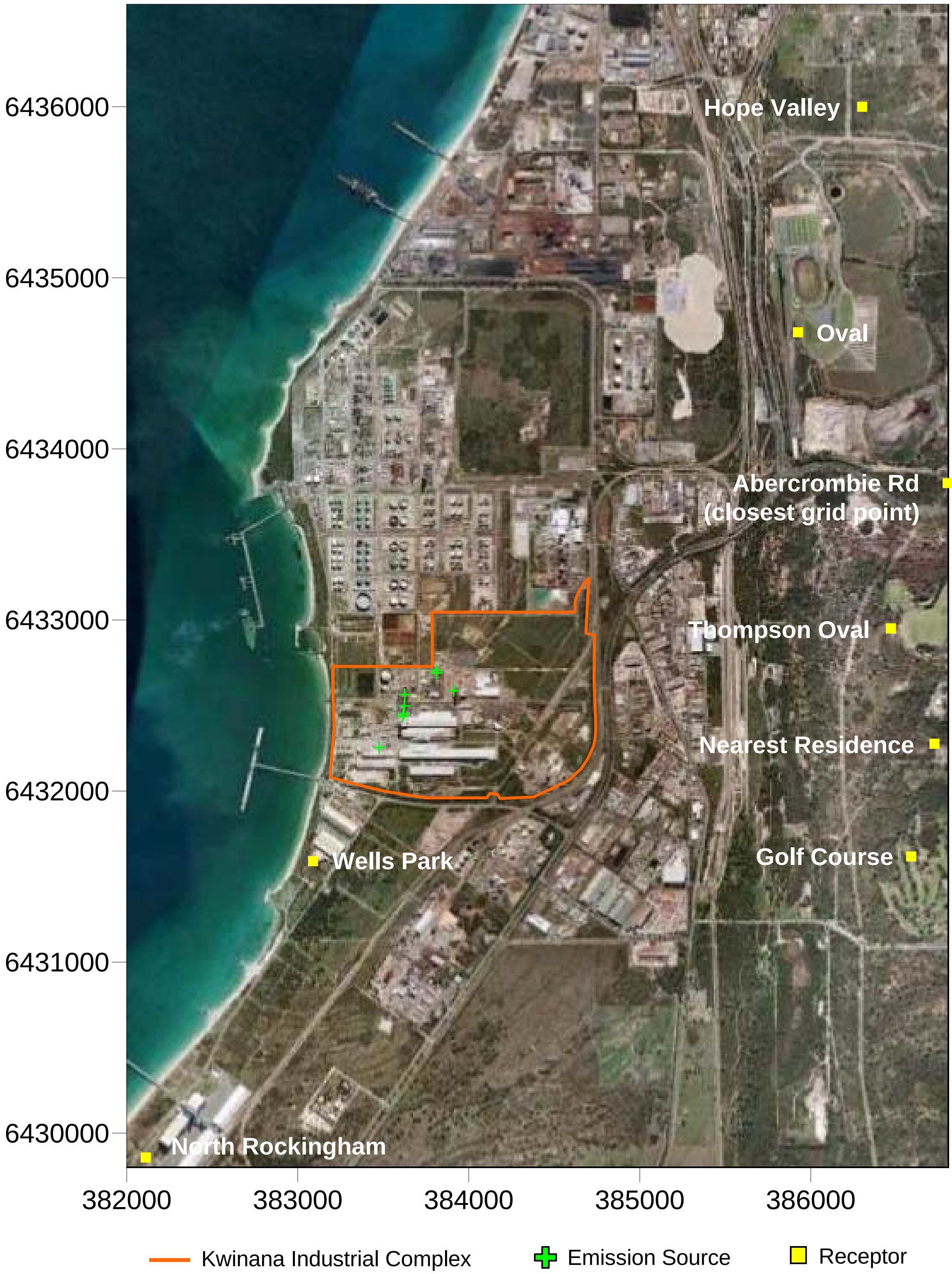



**Figure 1**

**Locations of the CSBP Kwinana Industrial Complex**

| | | |
|---|---|---|
| Client: CSBP Limited | ENVIRON | |
| Project: Kwinana Ammonium Nitrate Expansion | Drawn: RR | Date: Dec 2010 |

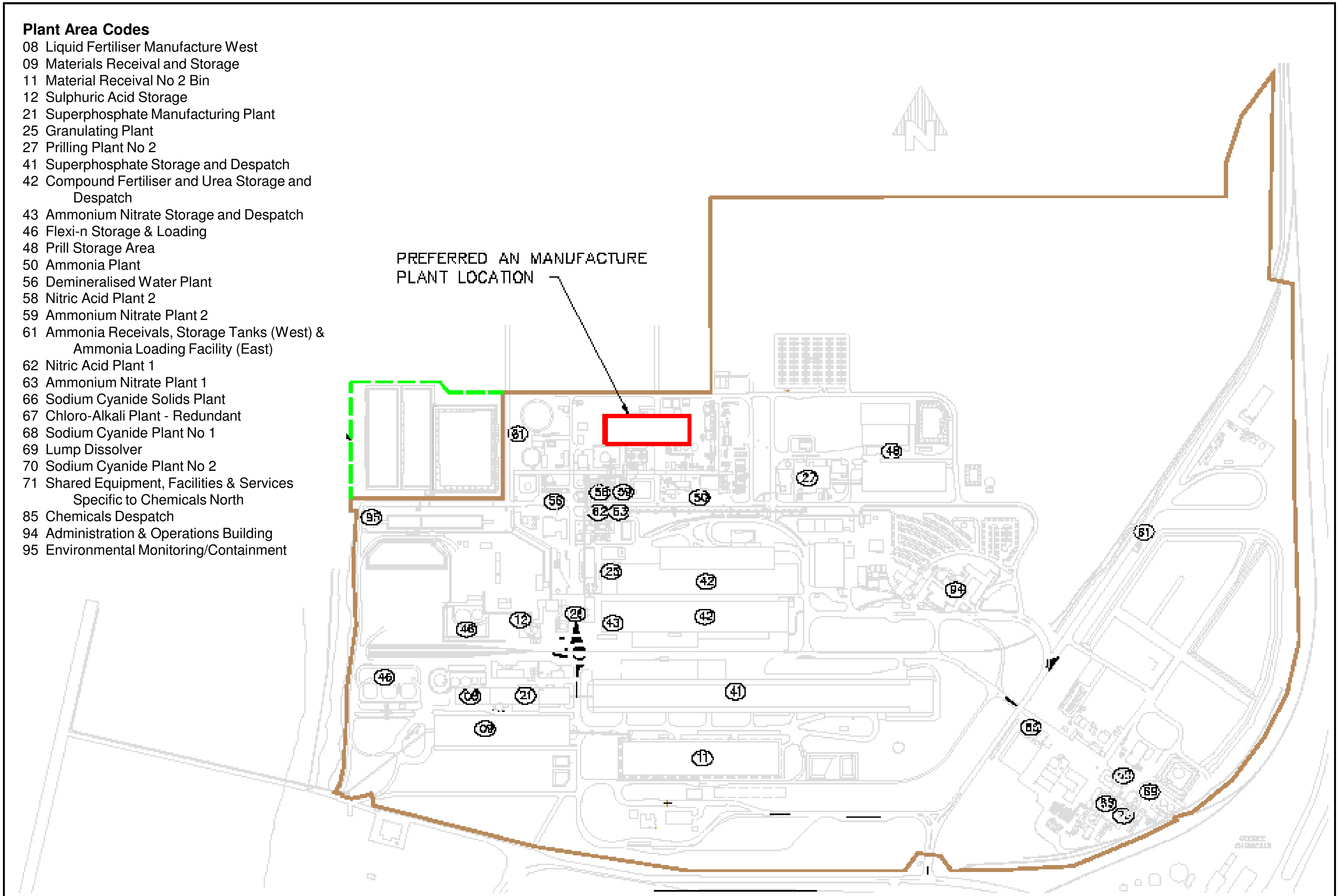



**Figure 2**

**CSBP Kwinana Industrial Complex Site Layout**

| | | |
|---|---|---|
| Client: CSBP Limited | ENVIRON | |
| Project: Kwinana Ammonium Nitrate Expansion | Supplied by CSBP | Date: Dec 2010 |

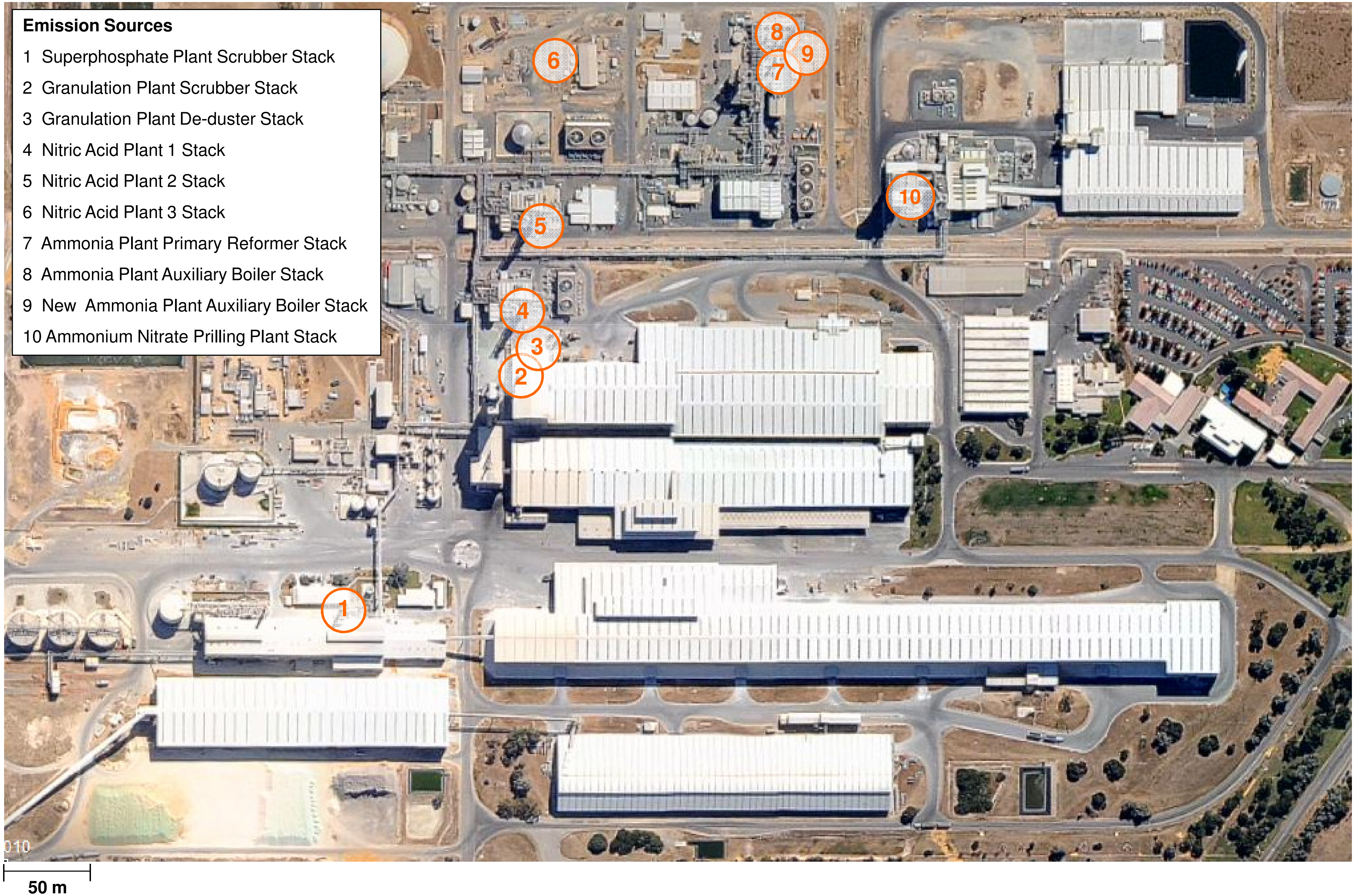



**Figure 3**

**Location of the Modelled Emission Sources**

| Client: CSBP Limited | ENVIRON | |
|---|---|---|
| Project: Kwinana Ammonium Nitrate Expansion | Drawn: RR | Date: Dec 2010 |

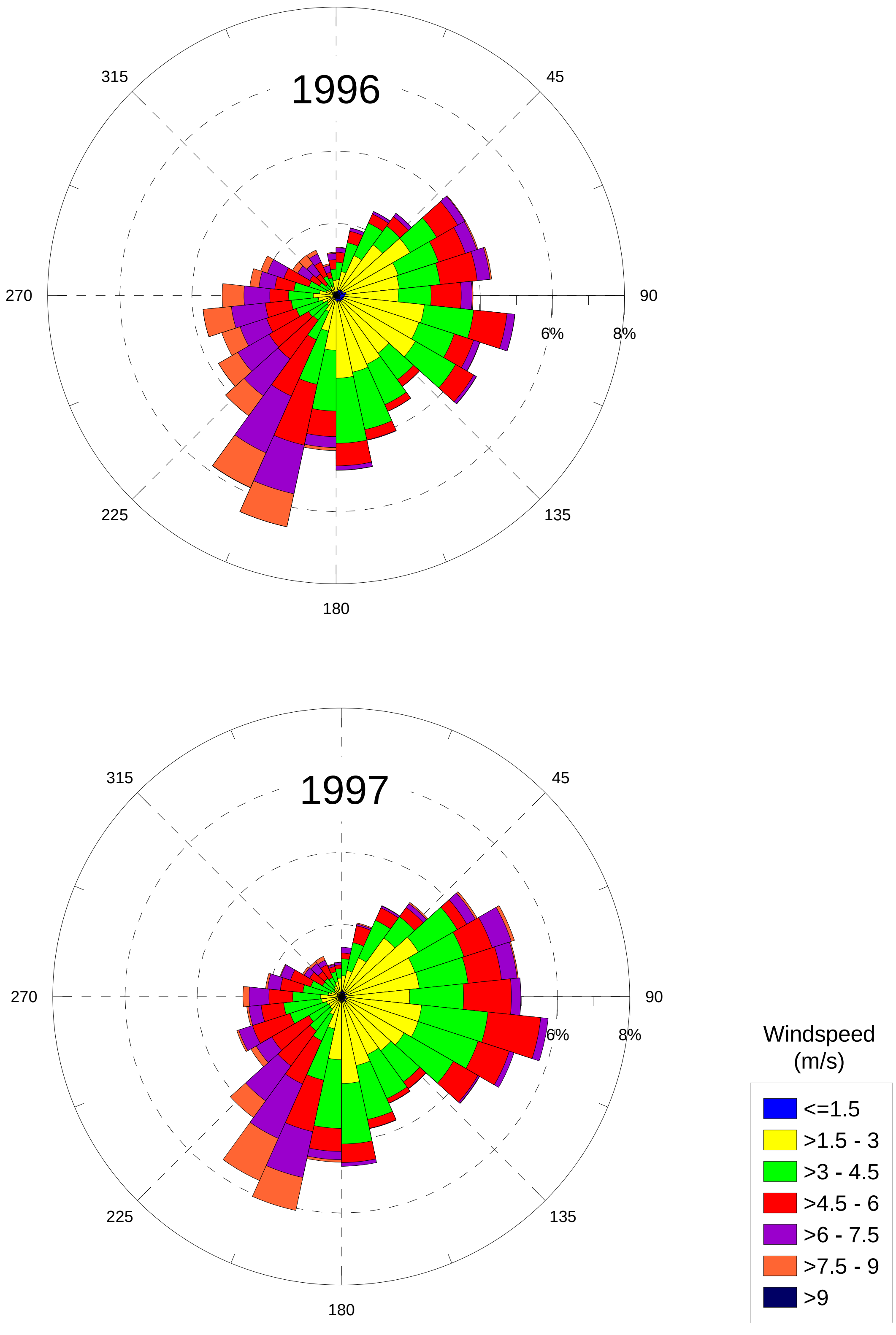



**Figure 4**

**1996 and 1997 Annual Windroses, Hope Valley**

| Client: CSBP Limited | ENVIRON | |
|---|---|---|
| Project: Kwinana Ammonium Nitrate Expansion | Drawn: RR | Date: Dec 2010 |

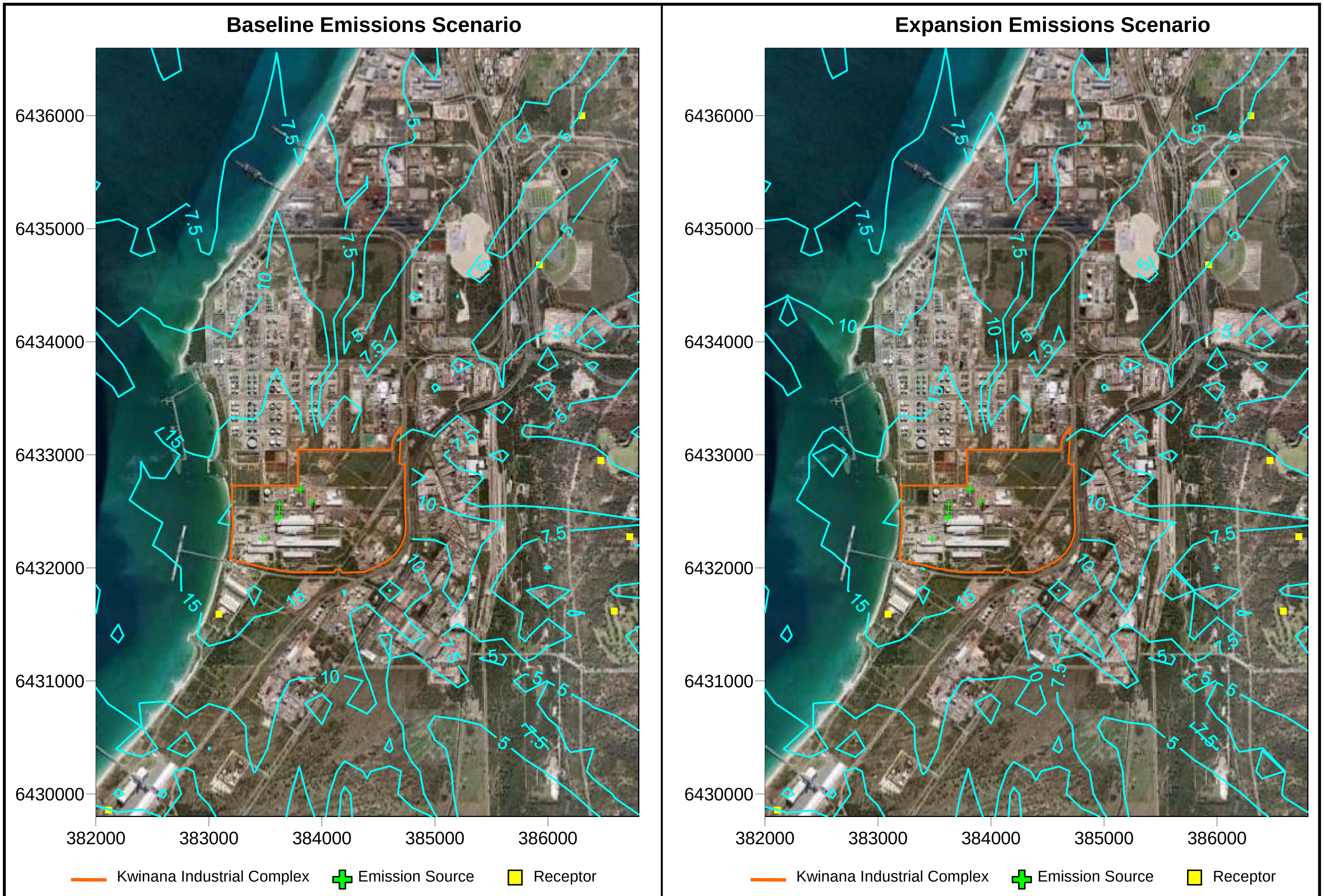



**Figure 5**

**Maximum Predicted 1-hour $NH_3$ GLCs – Normal Operations**
ISC3 – Rural

| Client: CSBP Limited | ENVIRON | |
|---|---|---|
| Project: Kwinana Ammonium Nitrate Expansion | Drawn: RR | Date: Dec 2010 |

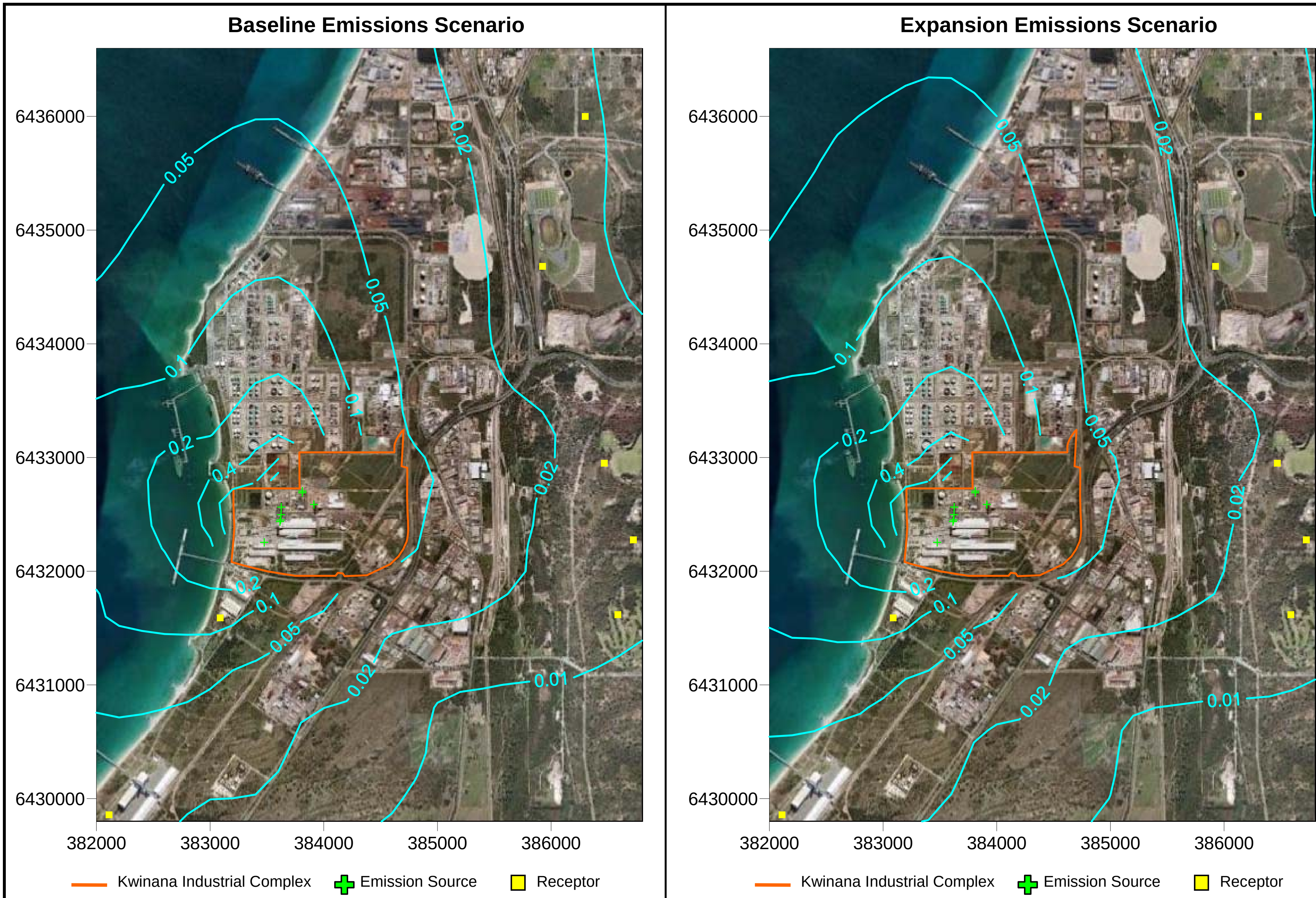



**Figure 6**

**Predicted Annual Average $NH_3$ GLCs – Normal Operations**
ISC3 – Urban

| | | |
|---|---|---|
| Client: CSBP Limited | ENVIRON | |
| Project: Kwinana Ammonium Nitrate Expansion | Drawn: RR | Date: Dec 2010 |

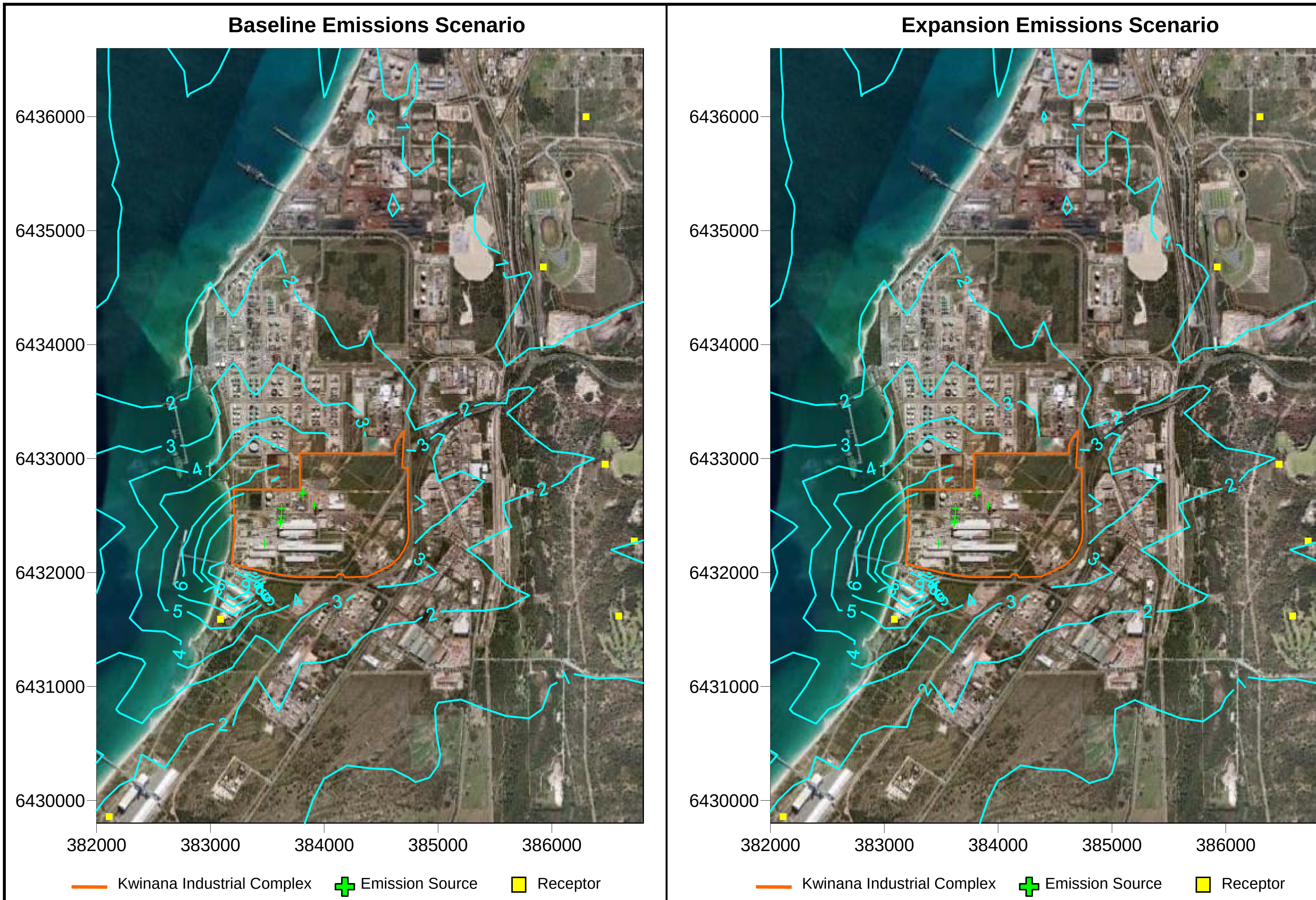



**Figure 7**

**Maximum Predicted 24-hour PM (as $PM_{2.5}$) GLCs – Normal Operations**

ISC3 – Rural

| | | |
|---|---|---|
| Client: CSBP Limited | ENVIRON | |
| Project: Kwinana Ammonium Nitrate Expansion | Drawn: RR | Date: Dec 2010 |

**Baseline Emissions Scenario** | **Expansion Emissions Scenario**

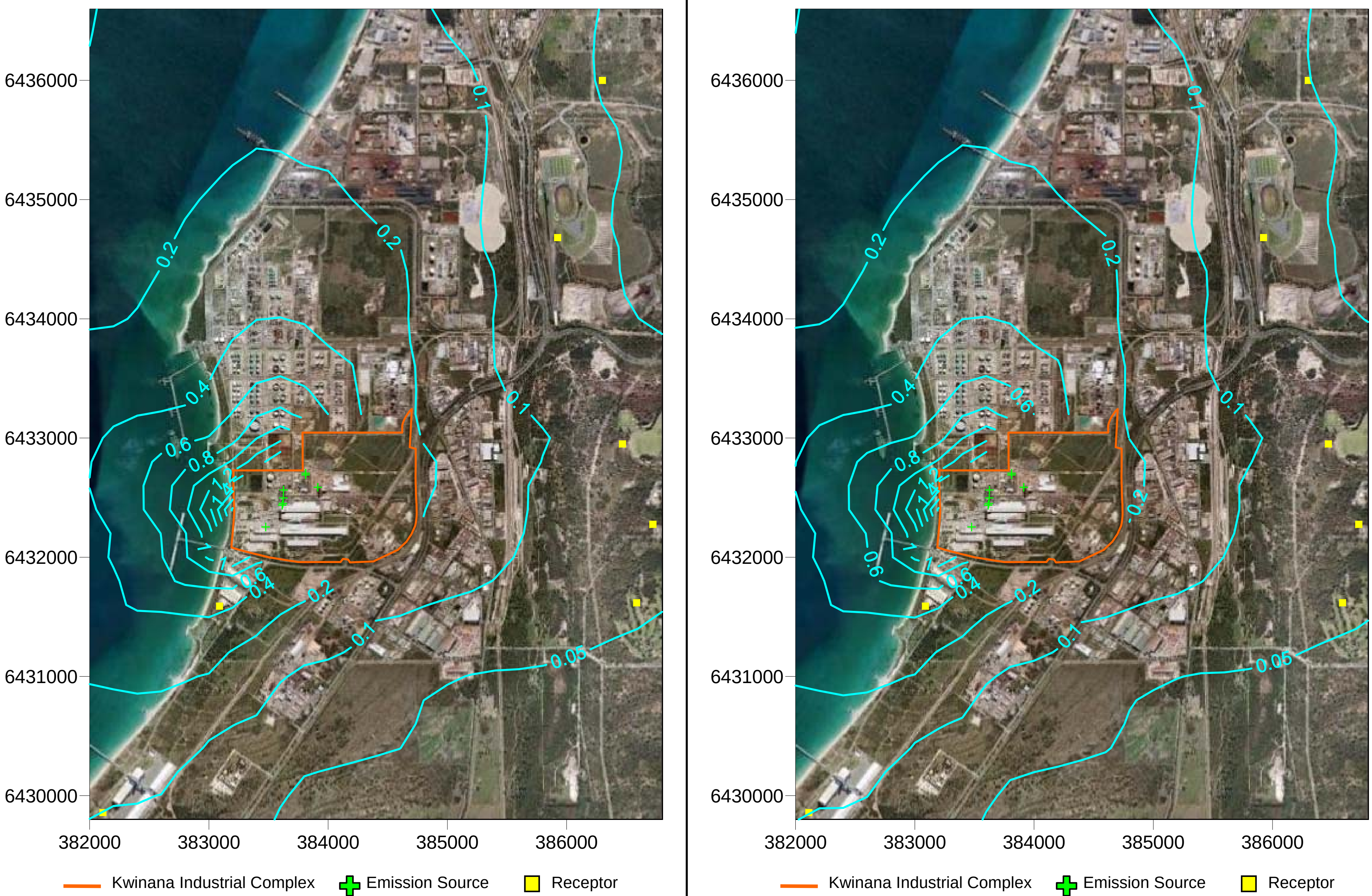



**Figure 8**

**Predicted Annual Average PM (as $PM_{2.5}$) GLCs – Normal Operations**

ISC3 – Rural

Client: CSBP Limited

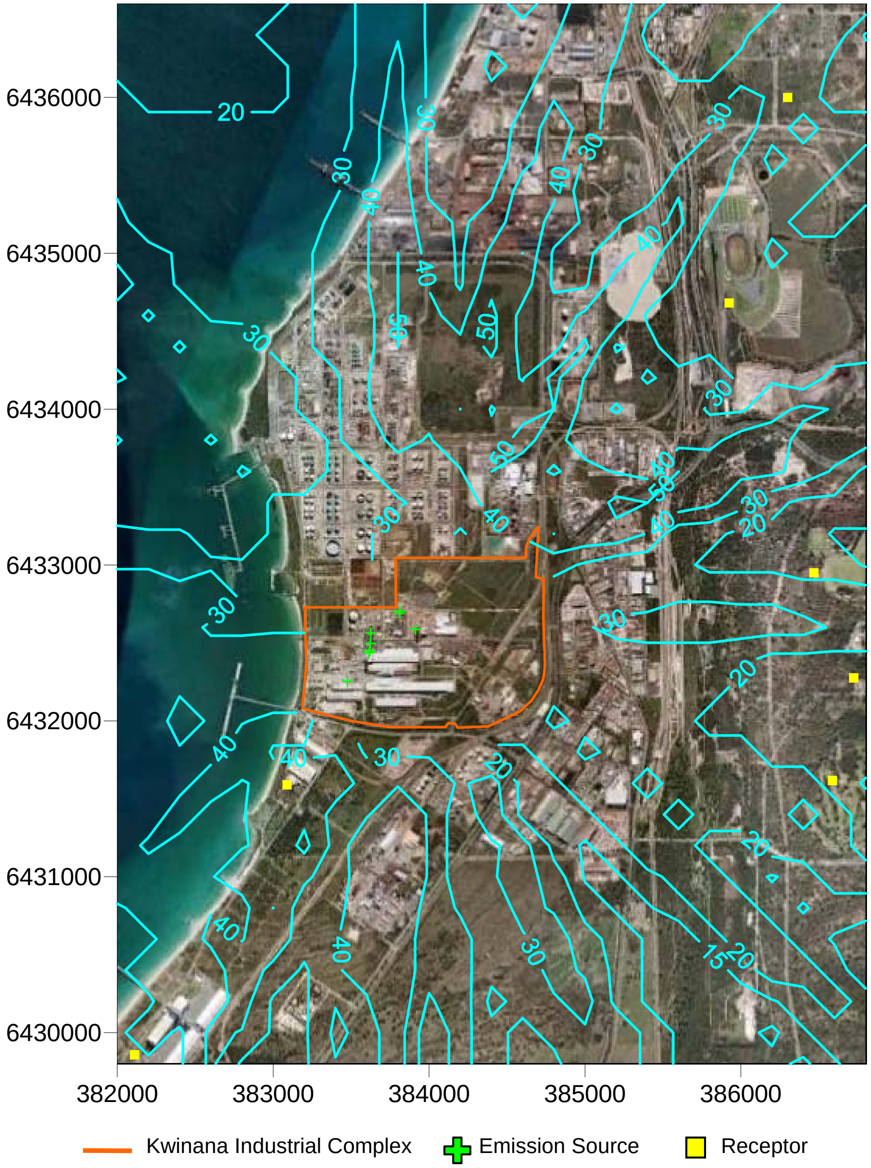
ENVIRON

Project: Kwinana Ammonium Nitrate Expansion

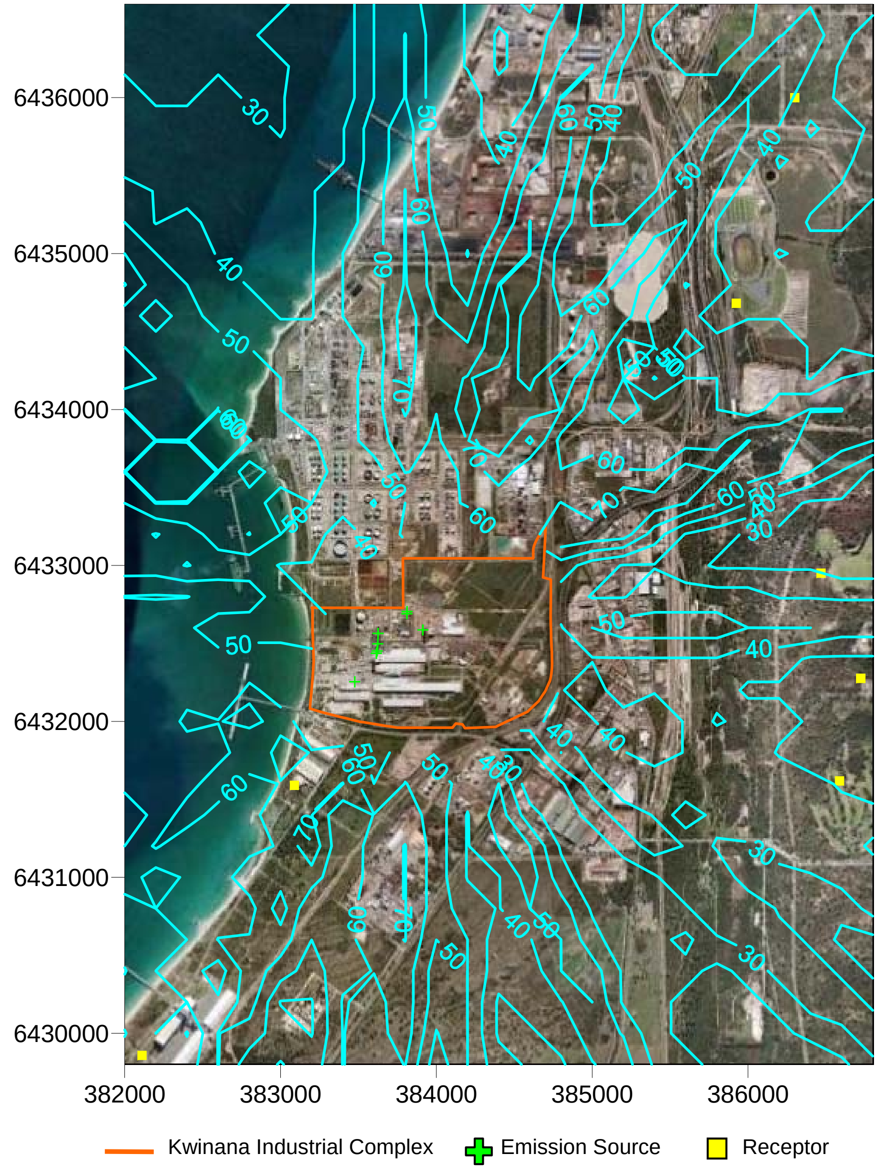
Drawn: RR

Date: Dec 2010

**Baseline Emissions Scenario**




**Expansion Emissions Scenario**




| | | | |
|---|---|---|---|
| **Figure 9** | Client: CSBP Limited | ENVIRON | |
| **Maximum Predicted 1-hour $NO_2$ GLCs – Normal Operations**<br>ISC3 – Urban | Project: Kwinana Ammonium Nitrate Expansion | Drawn: RR | Date: Dec 2010 |

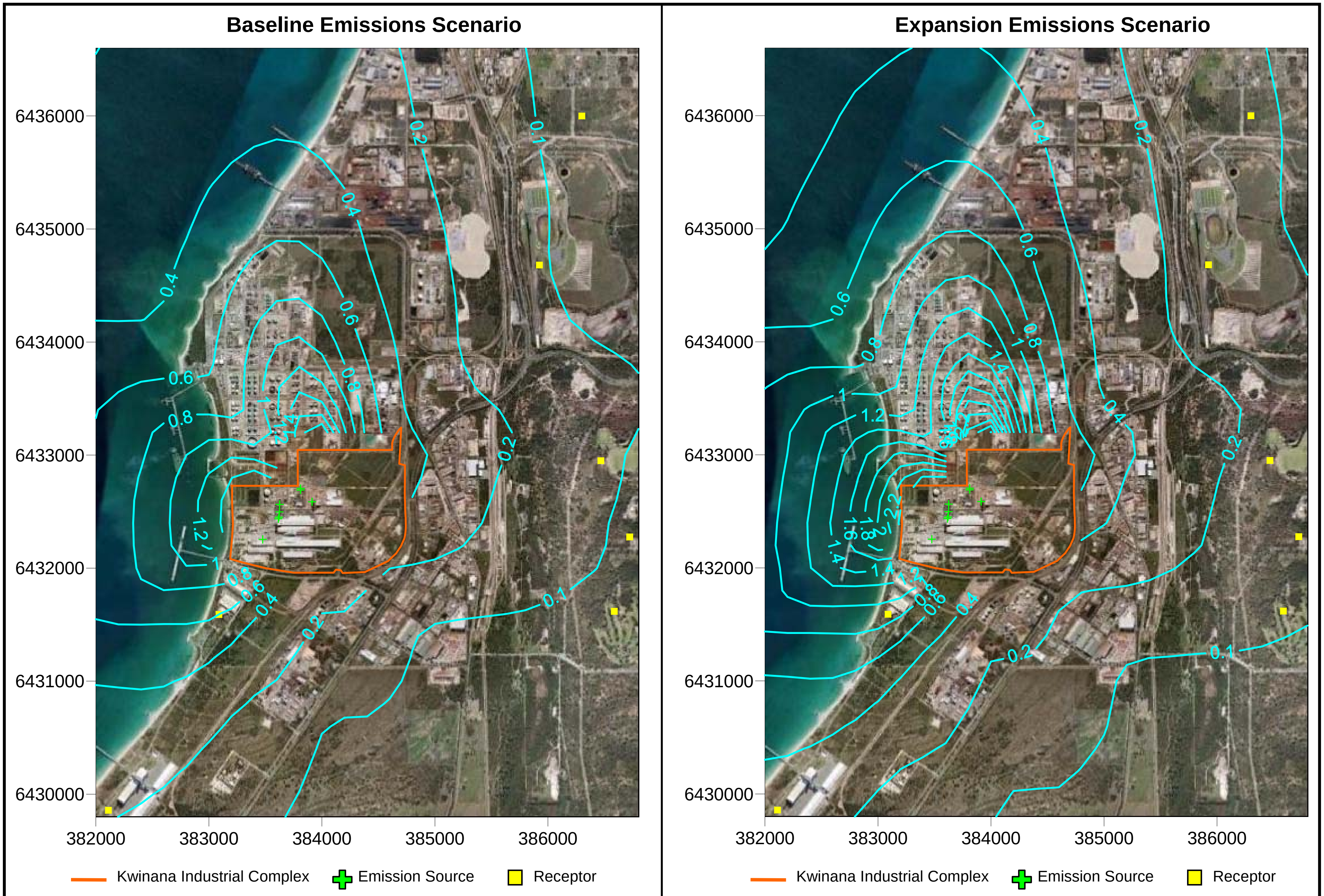



**Figure 10**

**Predicted Annual Average $NO_2$ GLCs – Normal Operations**
ISC3 – Urban

Client: CSBP Limited

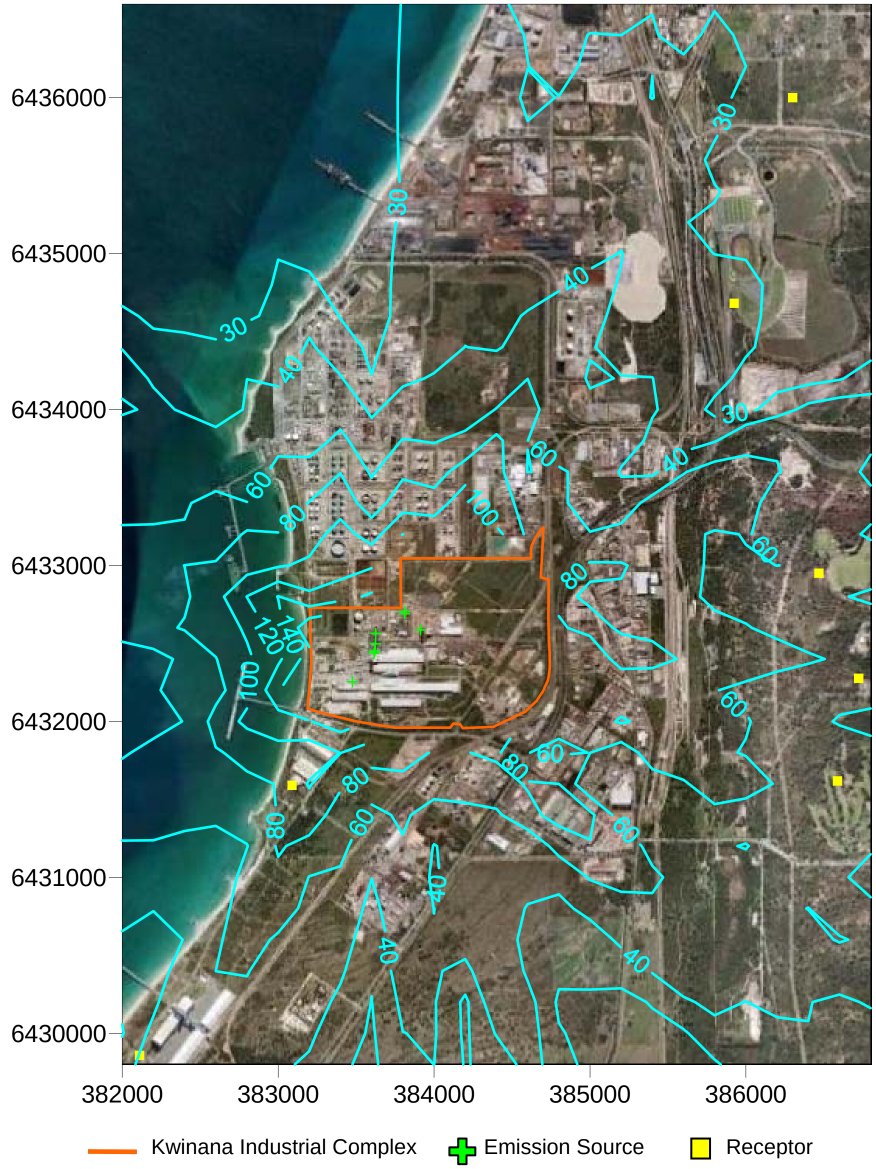
ENVIRON

Project: Kwinana Ammonium Nitrate Expansion

Drawn: RR

Date: Dec 2010

## Baseline Emissions Scenario




## Expansion Emissions Scenario

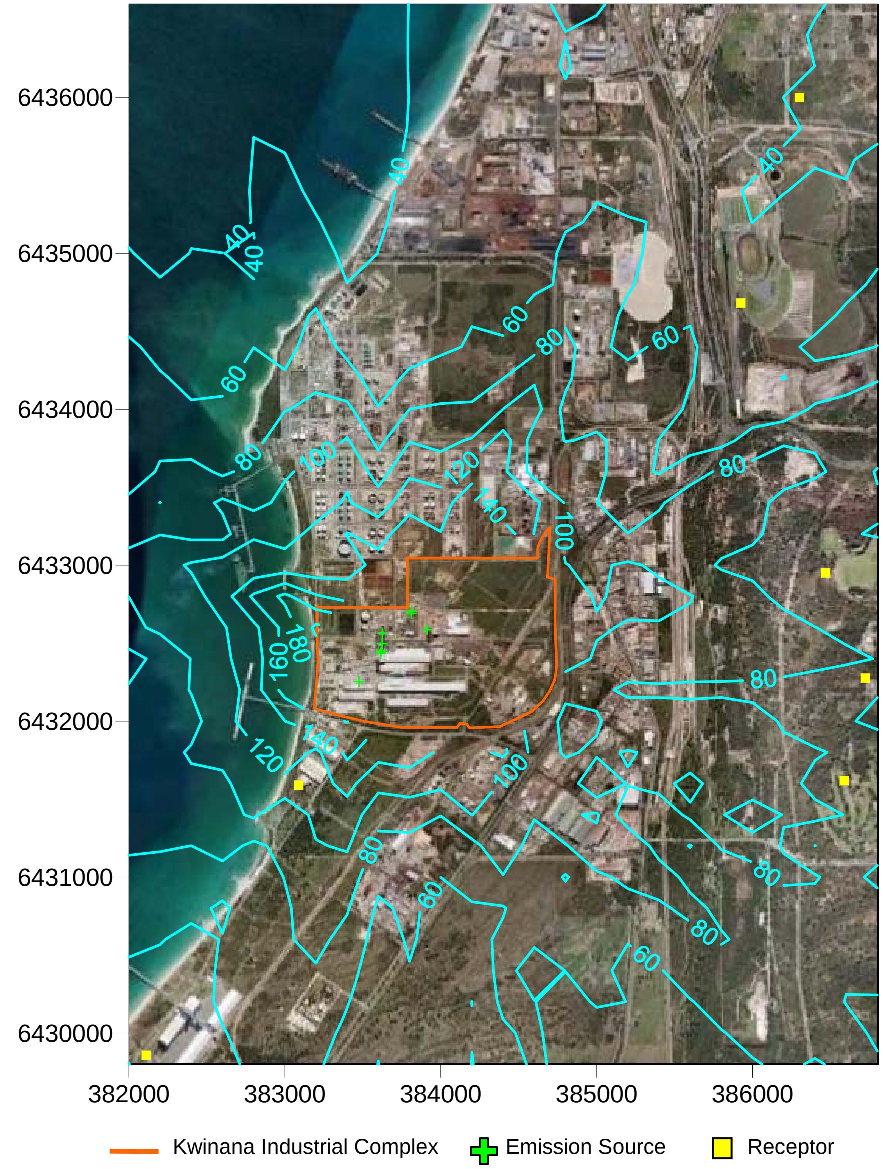
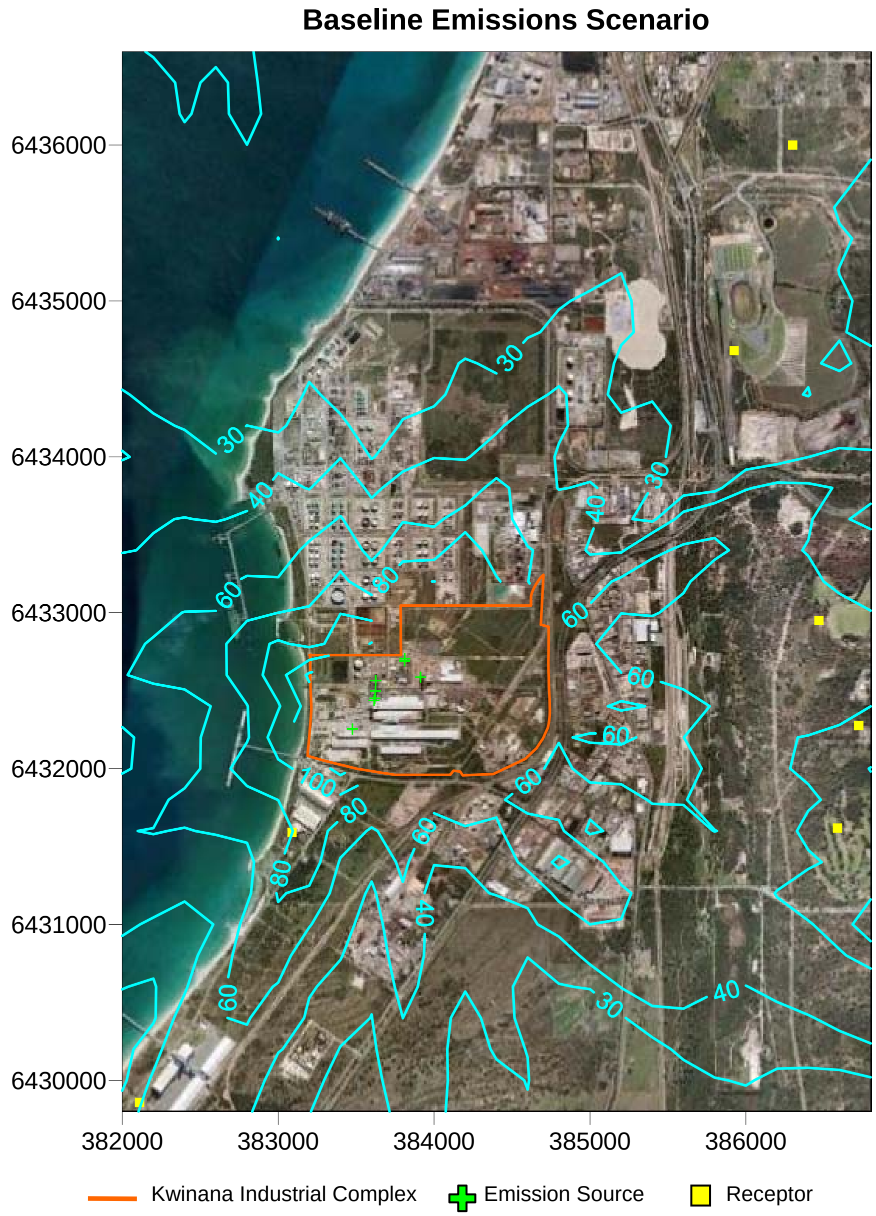



**Figure 11**

**Maximum Predicted 1-hour $NO_2$ GLCs – Start-up Operations**
Dispmod

| | |
|---|---|
| Client: CSBP Limited | ENVIRON |
| Project: Kwinana Ammonium Nitrate Expansion | Drawn: RR / Date: Dec 2010 |



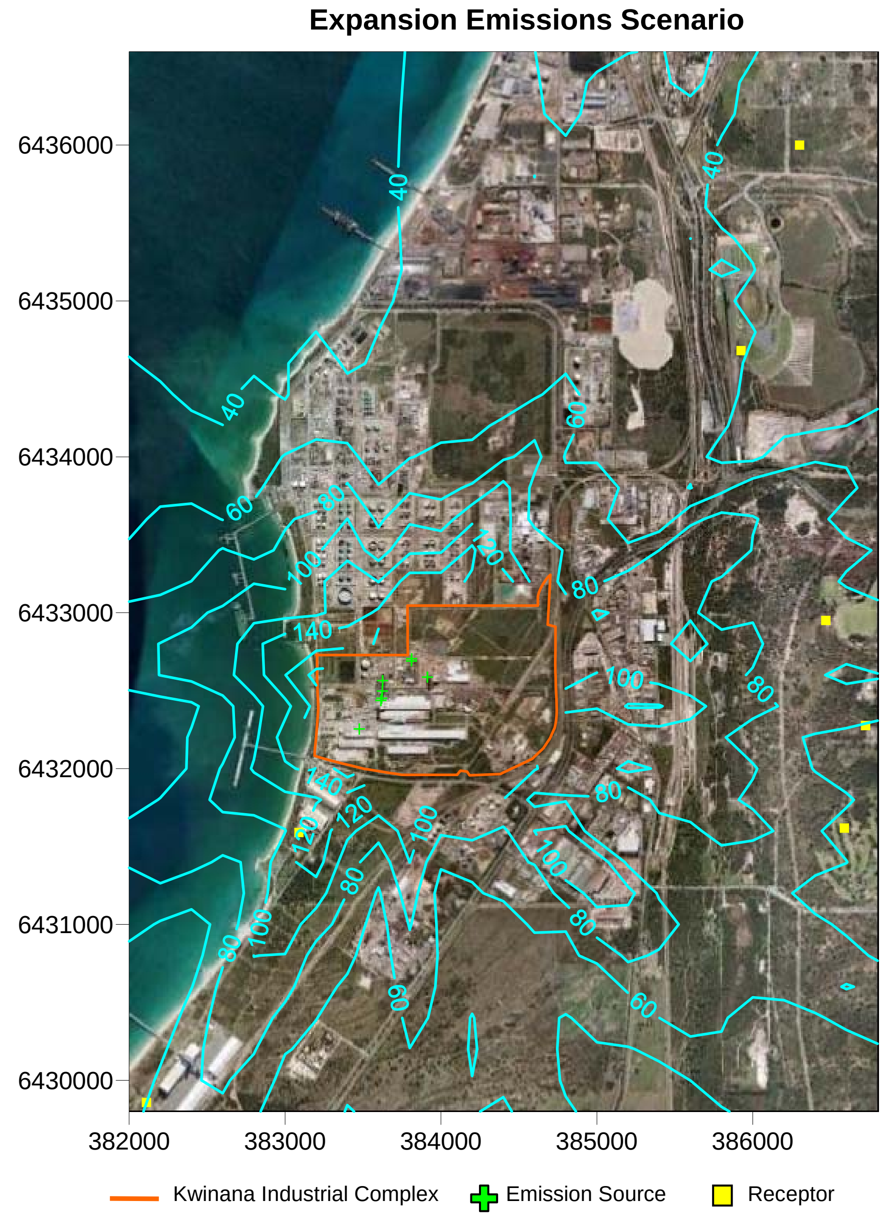




**Figure 12**

**Maximum Predicted 1-hour $NO_2$ GLCs – Shutdown Operations**
Dispmod

| | |
|---|---|
| Client: CSBP Limited | ENVIRON |
| Project: Kwinana Ammonium Nitrate Expansion | Drawn: RR / Date: Dec 2010 |

**FINAL**

# Appendix A
# Dispmod Input Files

### Control File

```
CSBP Kwinana Ammonium Nitrate Expansion Air Dispersion Modelling -
Expansion Case 11/7/10 Rerun
  382000. 6429800. 0200. 25 35 0.2833 -32.0 181.7 360.0   3.0  .083  .047
0.25
 01011996 31121996 0000 2400  3  1 77  1.9  2.3
 14 0.00 0350. 0500. 0700. 1000. 0   5000.
  1  1  1  1  1  1  1  1  1  1  1  1  1  1
  1  2  3  4  5  6  7  8  9 10 11 12 13 14
  0         ! NUMBER OF STACKS THAT ARE NOT BEING USED
SMP SCRUBBER   37.4 2.50 383476 6432254 1.00  0. 312
GRAN SCRUBBER  43.1 1.83 383615 6432437 1.00  0. 430
GRAN DEDUSTER  36.8 1.58 383620 6432451 1.00  0. 430
NAP1           63.8 1.10 383624 6432497 1.00  0. 460
NAP1 SHUTDOWN  63.8 1.10 383624 6432497 1.00  0. 460
AP REFORM      30.0 2.13 383811 6432690 1.00  0. 640
AP AUX BOILER  30.0 1.20 383812 6432704 1.00  0. 640
NEW AUX BOIL   30.0 1.20 383824 6432697 1.00  0. 655
NAP2           70.7 1.10 383626 6432564 1.00  0. 456
NAP2 START UP  70.7 1.10 383626 6432564 1.00  0. 456
NAP2 SHUTDOWN  70.7 1.10 383626 6432564 1.00  0. 456
NAP3           70.7 1.10 383633 6432672 1.00  0. 465
NAP3 SHUTDOWN  70.7 1.10 383633 6432672 1.00  0. 465
PRILL PLANT 2  65.0 1.72 383913 6432587 1.00  0. 728
0
```

### Emissions File – Non-statistical Mode

```
CSBP Kwinana Ammonium Nitrate Expansion Air Dispersion Modelling -
Expansion Case 11/7/10 Rerun
Name                 Q        V     Rho  Nd   Nh Int
SMP SCRUBBER       .001     27.9   1.126           1
GRAN SCRUBBER      .001     18.7   1.074           1
GRAN DEDUSTER      .001     24.0   1.129           1
NAP1               .001     39.5   0.939           1
NAP1 SHUTDOWN      .001     39.5   1.129           1
AP REFORM          .001     48.9   0.774           1
AP AUX BOILER      .001      6.5   0.802           1
NEW AUX BOIL       .001      9.7   0.802           1
NAP2               .001     39.5   0.939           1
NAP2 START UP      .001     21.2   1.129           1
NAP2 SHUTDOWN      .001     39.5   1.129           1
NAP3               .001     39.5   0.939           1
NAP3 SHUTDOWN      .001     39.5   1.129           1
PRILL PLANT 2      .001     48.1   1.129           1
```

### Emissions File – Statistical Mode

```
CSBP - Probabilistic NOx Assessment - Expansion DM

columns are Q (kg/s), V(m**3/s), rho(kg/m**3)

No. industries  4
```

```
Industry No.  1  No. cases   3  No. stacks 1

Case 1  Typical         probability 0.96000
NAP1            .00341    39.5    .932   1

Case 2  Peak            probability 0.02000
NAP1            .00427    39.5    .932   1

Case 3  Licence         probability 0.02000
NAP1            .01166    39.5    .932   1


Industry No.  2  No. cases   3  No. stacks  1

Case 1  Typical         probability 0.96000
NAP2            .00341    39.5    .932   1

Case 2  Peak            probability 0.02000
NAP2            .00427    39.5    .932   1

Case 3  Licence         probability 0.02000
NAP2            .01166    39.5    .932   1


Industry No.  3  No. cases   3  No. stacks  1

Case 1  Typical         probability 0.96000
NAP3            .00341    39.5    .932   1

Case 2  Peak            probability 0.02000
NAP3            .00427    39.5    .932   1

Case 3  Licence         probability 0.02000
NAP3            .01166    39.5    .932   1


Industry No.  4  No. cases   1  No. stacks  3

Case 1  Other           probability 1.00000
AP REFORM        .00517   48.9   0.774   0
AP AUX BOILER    .00159    6.5   0.802   0
NEW BOILER       .00239    9.7   0.802   0
```

### Dispmod Input File

```
CSBP_Exp.ctl
z.out
y           ! plume spread in s.b. due to self gen turb?
y           ! use new PDF model for TIBL fumigation?
N           ! account for wind shear in TIBL PDF fumigation?
y           ! use numerical method to calculate TIBL height
95.             ! Tibl integration distance
y               ! use coastal AMG file
kwinana_GDA94.coa
Y           ! use pdf for convective dispersion within TIBL & PBL?
N           ! account for wind shear within the TIBL?
```

```
N            ! use stability classes? - not with PDF
N            ! plume centreline mode?
4            ! option for lapse rate determination
Y            ! apply seasonal variation to lapse rates?
N            ! use measured sigma theta?
n                ! mixing into TIBL sharper than SGPHI?
y            ! if direction meander sigma greater, use it
n            ! info to screen on big timestep concs?
2            ! plume penetration: 1 ISC, 2 Manins, 3 Ausplume, 4 Aermod
(Berkowicz)
n            ! include invers temp jump in pot temp lapse rate for
pentration?
y                ! write all concs to disk for post-processing?
wml_0-0_96.dat
pmkwin.dat
CSBP_Exp.emi
w_veer.dat
```

**FINAL**

# Appendix B
# ISC Input File

** BREEZE ISC GIS Pro v5.1.0 - V:\Expansion Emissions Scenario\ISC_Rural_Exp\CSBP Expansion - Rural.dat
** Trinity Consultants

** PRIME

CO STARTING
CO TITLEONE CSBP Kwinana Ammonium Nitrate Expansion Air Dispersion Modelling
CO TITLETWO Rural Landuse Selected - Expansion Emissions Scenario
CO MODELOPT DFAULT CONC RURAL
CO AVERTIME 1 ANNUAL
CO POLLUTID NOX_SHUT
CO TERRHGTS FLAT
CO RUNORNOT RUN
CO FINISHED

SO STARTING
SO ELEVUNIT METERS
SO LOCATION SRC1 POINT 383476.2 6432253.8 0
** SRCDESCR Superphosphate Plant Scrubber Stack
SO LOCATION SRC2 POINT 383614.6 6432436.5 0
** SRCDESCR Granulation Plant Scrubber Stack
SO LOCATION SRC3 POINT 383620.0 6432451.5 0
** SRCDESCR Granulation Plant De-Duster Stack
SO LOCATION SRC4 POINT 383624.0 6432497.0 0
** SRCDESCR Nitric Acid Plant 1
SO LOCATION SRC5 POINT 383624.0 6432497.0 0
** SRCDESCR Nitric Acid Plant 1 Shutdown
SO LOCATION SRC6 POINT 383810.8 6432690.2 0
** SRCDESCR Ammonia Plant Primary Reformer Stack
SO LOCATION SRC7 POINT 383812.0 6432704.2 0
** SRCDESCR Ammonia Plant Auxiliary Boiler Stack
SO LOCATION SRC8 POINT 383824.2 6432697.4 0
** SRCDESCR New Auxiliary Boiler
SO LOCATION SRC9 POINT 383625.7 6432563.6 0
** SRCDESCR NAP2
SO LOCATION SRC10 POINT 383625.7 6432563.6 0
** SRCDESCR NAP2 Start-up
SO LOCATION SRC11 POINT 383625.7 6432563.6 0
** SRCDESCR NAP2 Shutdown
SO LOCATION SRC12 POINT 383632.5 6432672.4 0
** SRCDESCR NAP3
SO LOCATION SRC13 POINT 383632.5 6432672.4 0
** SRCDESCR NAP3 Shutdown
SO LOCATION SRC14 POINT 383913.3 6432586.5 0
** SRCDESCR Prilling Plant 2 Debottlenecked
SO SRCPARAM SRC1 0.000000E+00 37.4 315 5.683741 2.5
SO SRCPARAM SRC2 0.000000E+00 43.1 330 7.109671 1.83
SO SRCPARAM SRC3 0.000000E+00 36.8 307 12.24072 1.58
SO SRCPARAM SRC4 0.000000E+00 63.8 378 41.56443 1.1
SO SRCPARAM SRC5 1.519000E+01 63.8 298 41.56443 1.1
SO SRCPARAM SRC6 5.170000E+00 30 458 13.72334 2.13
SO SRCPARAM SRC7 1.590000E+00 30 443 5.747261 1.2
SO SRCPARAM SRC8 2.390000E+00 30 443 8.576681 1.2
SO SRCPARAM SRC9 0.000000E+00 70.7 378 41.56443 1.1
SO SRCPARAM SRC10 0.000000E+00 70.7 306 22.308 1.1
SO SRCPARAM SRC11 9.800000E+00 70.7 298 41.56443 1.1
SO SRCPARAM SRC12 0.000000E+00 70.7 378 41.56443 1.1
SO SRCPARAM SRC13 9.800000E+00 70.7 298 41.56443 1.1
SO SRCPARAM SRC14 0.000000E+00 65 303 20.70133 1.72
SO BUILDHGT SRC1 24.4 24.4 24.4 24.4 24.4 24.4
SO BUILDHGT SRC1 24.4 24.4 24.4 24.4 24.4 24.4
SO BUILDHGT SRC1 24.4 24.4 24.4 24.4 24.4 24.4
SO BUILDHGT SRC1 24.4 24.4 24.4 24.4 24.4 24.4
SO BUILDHGT SRC1 24.4 24.4 24.4 24.4 24.4 24.4
SO BUILDHGT SRC1 24.4 24.4 24.4 24.4 24.4 24.4
SO BUILDWID SRC1 136.65 134.74 128.74 118.83 105.31 88.59
SO BUILDWID SRC1 69.18 47.66 24.7 47.66 69.18 88.59
SO BUILDWID SRC1 105.31 118.83 128.74 134.74 136.65 134.4
SO BUILDWID SRC1 136.65 134.74 128.74 118.83 105.31 88.59
SO BUILDWID SRC1 69.18 47.66 24.7 47.66 69.18 88.59
SO BUILDWID SRC1 105.31 118.83 128.74 134.74 136.65 134.4
SO BUILDLEN SRC1 47.66 69.18 88.59 105.31 118.83 128.74
SO BUILDLEN SRC1 134.74 136.65 134.4 136.65 134.74 128.74
SO BUILDLEN SRC1 118.83 105.31 88.59 69.18 47.66 24.7
SO BUILDLEN SRC1 47.66 69.18 88.59 105.31 118.83 128.74
SO BUILDLEN SRC1 134.74 136.65 134.4 136.65 134.74 128.74
SO BUILDLEN SRC1 118.83 105.31 88.59 69.18 47.66 24.7
SO XBADJ SRC1 -43.65 -59.48 -73.5 -85.29 -94.48 -100.81
SO XBADJ SRC1 -104.07 -104.17 -101.1 -99.25 -94.39 -86.66
SO XBADJ SRC1 -76.29 -63.61 -48.99 -32.89 -15.78 1.8
SO XBADJ SRC1 -4.01 -9.7 -15.09 -20.03 -24.35 -27.94
SO XBADJ SRC1 -30.68 -32.48 -33.3 -37.4 -40.36 -42.09
SO XBADJ SRC1 -42.54 -41.7 -39.6 -36.29 -31.88 -26.5
SO YBADJ SRC1 30.93 27.02 22.28 16.87 10.95 4.7
SO YBADJ SRC1 -1.7 -8.05 -14.15 -19.82 -24.89 -29.2
SO YBADJ SRC1 -32.63 -35.06 -36.43 -36.7 -35.84 -33.9
SO YBADJ SRC1 -30.93 -27.02 -22.28 -16.87 -10.95 -4.7
SO YBADJ SRC1 1.7 8.05 14.15 19.82 24.89 29.2
SO YBADJ SRC1 32.63 35.06 36.43 36.7 35.84 33.9
SO BUILDHGT SRC2 33.5 65.3 65.3 65.3 65.3 65.3
SO BUILDHGT SRC2 65.3 33.5 33.5 33.5 33.5 33.5
SO BUILDHGT SRC2 33.5 33.5 33.5 33.5 33.5 33.5
SO BUILDHGT SRC2 33.5 65.3 65.3 65.3 65.3 65.3
SO BUILDHGT SRC2 65.3 33.5 33.5 33.5 33.5 33.5
SO BUILDHGT SRC2 33.5 33.5 33.5 33.5 33.5 33.5
SO BUILDWID SRC2 50.74 16.54 16.6 16.54 16.54 16.6
SO BUILDWID SRC2 16.54 51.87 48.5 51.98 53.89 54.15
SO BUILDWID SRC2 52.77 49.79 45.29 39.42 55.53 49.7
SO BUILDWID SRC2 50.74 16.54 16.6 16.54 16.54 16.6
SO BUILDWID SRC2 16.54 51.87 48.5 51.98 53.89 54.15

SO BUILDWID SRC2 52.77 49.79 45.29 39.42 55.53
49.7
SO BUILDLEN SRC2 53.34 16.54 16.6 16.54 16.54
16.6
SO BUILDLEN SRC2 16.54 32.35 24.8 32.81 39.82
45.63
SO BUILDLEN SRC2 50.04 52.94 54.23 53.87 51.87
48.5
SO BUILDLEN SRC2 53.34 16.54 16.6 16.54 16.54
16.6
SO BUILDLEN SRC2 16.54 32.35 24.8 32.81 39.82
45.63
SO BUILDLEN SRC2 50.04 52.94 54.23 53.87 51.87
48.5
SO XBADJ SRC2 -36.37 -39.02 -40.76 -41.45 -41.17
-39.91
SO XBADJ SRC2 -37.64 -11.33 -5.7 -8.03 -10.11 -
11.89
SO XBADJ SRC2 -13.3 -14.31 -14.89 -15.01 -14.68
-13.9
SO XBADJ SRC2 -16.97 22.47 24.15 24.91 24.63
23.31
SO XBADJ SRC2 21.1 -21.03 -19.1 -24.78 -29.71 -
33.74
SO XBADJ SRC2 -36.74 -38.63 -39.34 -38.86 -37.19
-34.6
SO YBADJ SRC2 0.59 12.54 7.01 1.27 -4.51 -10.15
SO YBADJ SRC2 -15.49 -11.26 -10.35 -9.02 -7.42 -
5.59
SO YBADJ SRC2 -3.59 -1.48 0.67 2.8 -6.74 -5.75
SO YBADJ SRC2 -0.59 -12.54 -7.01 -1.27 4.51
10.15
SO YBADJ SRC2 15.49 11.26 10.35 9.02 7.42 5.59
SO YBADJ SRC2 3.59 1.48 -0.67 -2.8 6.74 5.75
SO BUILDHGT SRC3 33.5 65.3 65.3 65.3 65.3 33.5
SO BUILDHGT SRC3 33.5 33.5 33.5 33.5 33.5 33.5
SO BUILDHGT SRC3 33.5 33.5 33.5 33.5 33.5 33.5
SO BUILDHGT SRC3 33.5 33.5 33.5 33.5 33.5 33.5
SO BUILDHGT SRC3 33.5 33.5 33.5 33.5 33.5 33.5
SO BUILDHGT SRC3 33.5 33.5 33.5 33.5 33.5 33.5
SO BUILDWID SRC3 50.74 16.54 16.6 16.54 16.54
54.23
SO BUILDWID SRC3 53.87 51.87 48.5 51.98 53.89
54.15
SO BUILDWID SRC3 52.77 49.79 45.29 39.42 55.53
49.7
SO BUILDWID SRC3 50.74 39.82 45.63 50.04 52.94
54.23
SO BUILDWID SRC3 53.87 51.87 48.5 51.98 53.89
54.15
SO BUILDWID SRC3 52.77 49.79 45.29 39.42 55.53
49.7
SO BUILDLEN SRC3 53.34 16.54 16.6 16.54 16.54
45.29
SO BUILDLEN SRC3 39.42 32.35 24.8 32.81 39.82
45.63
SO BUILDLEN SRC3 50.04 52.94 54.23 53.87 51.87
48.5
SO BUILDLEN SRC3 53.34 53.89 54.15 52.77 49.79
45.29
SO BUILDLEN SRC3 39.42 32.35 24.8 32.81 39.82
45.63
SO BUILDLEN SRC3 50.04 52.94 54.23 53.87 51.87
48.5
SO XBADJ SRC3 -52.08 -54.96 -56.45 -56.41 -54.94
-34.15
SO XBADJ SRC3 -27.11 -19.25 -11.1 -10.74 -10.05
-9.06
SO XBADJ SRC3 -7.8 -6.29 -4.6 -2.76 -0.84 1.1
SO XBADJ SRC3 -1.26 -3.58 -5.8 -7.83 -9.63 -11.14
SO XBADJ SRC3 -12.31 -13.1 -13.7 -22.07 -29.77 -
36.56
SO XBADJ SRC3 -42.25 -46.65 -49.63 -51.11 -51.03
-49.6
SO YBADJ SRC3 3.3 12.49 4.19 -4.23 -12.53 -
22.52
SO YBADJ SRC3 -24.17 -25.09 -25.35 -24.73 -23.36
-21.28
SO YBADJ SRC3 -18.55 -15.26 -11.51 -7.4 -14.66 -
11.15
SO YBADJ SRC3 -3.3 9.86 13.75 17.23 20.18 22.52
SO YBADJ SRC3 24.17 25.09 25.35 24.73 23.36
21.28
SO YBADJ SRC3 18.55 15.26 11.51 7.4 14.66
11.15
SO BUILDHGT SRC4 65.3 65.3 65.3 19.7 19.7 19.7
SO BUILDHGT SRC4 19.7 19.5 19.5 23.2 23.2 23.2
SO BUILDHGT SRC4 23.2 23.2 33.5 33.5 33.5 33.5
SO BUILDHGT SRC4 33.5 33.5 33.5 19.7 19.7 19.7
SO BUILDHGT SRC4 19.7 19.5 19.5 23.2 23.2 23.2
SO BUILDHGT SRC4 23.2 23.2 33.5 33.5 33.5 33.5
SO BUILDWID SRC4 16.54 16.54 16.56 40.71 44.52
46.98
SO BUILDWID SRC4 48.01 26.31 28.2 100.16 147.68
190.7
SO BUILDWID SRC4 227.94 258.25 45.29 39.42
55.53 49.7
SO BUILDWID SRC4 50.74 39.82 45.63 40.71 44.52
46.98
SO BUILDWID SRC4 48.01 26.31 28.2 100.16 147.68
190.7
SO BUILDWID SRC4 227.94 258.25 45.29 39.42
55.53 49.7
SO BUILDLEN SRC4 16.54 16.54 16.6 44.52 40.71
35.67
SO BUILDLEN SRC4 29.54 56.31 60.6 300.39 295.06
280.76
SO BUILDLEN SRC4 257.93 227.27 54.23 53.87
51.87 48.5
SO BUILDLEN SRC4 53.34 53.89 54.15 44.52 40.71
35.67
SO BUILDLEN SRC4 29.54 56.31 60.6 300.39 295.06
280.76
SO BUILDLEN SRC4 257.93 227.27 54.23 53.87
51.87 48.5
SO XBADJ SRC4 -97.58 -99.08 -97.85 -78.7 -75.42
-69.85
SO XBADJ SRC4 -62.16 -48.56 -54.0 16.66 24.11
30.83
SO XBADJ SRC4 36.62 41.29 32.81 38.63 43.27
46.6
SO XBADJ SRC4 44.24 40.54 35.61 34.18 34.71
34.19
SO XBADJ SRC4 32.62 -7.75 -6.6 -317.05 -319.17 -
311.6
SO XBADJ SRC4 -294.55 -268.56 -87.04 -92.49 -
95.14 -95.1
SO YBADJ SRC4 16.44 0.68 -15.1 -2.98 -12.73 -
22.1
SO YBADJ SRC4 -30.8 14.37 3.7 -41.93 -12.28
17.74
SO YBADJ SRC4 47.23 75.27 -37.72 -26.72 -26.5 -
15.15
SO YBADJ SRC4 0.66 21.66 33.04 2.98 12.73 22.1
SO YBADJ SRC4 30.8 -14.37 -3.7 41.93 12.28 -
17.74
SO YBADJ SRC4 -47.23 -75.27 37.72 26.72 26.5
15.15
SO BUILDHGT SRC5 65.3 65.3 65.3 19.7 19.7 19.7
SO BUILDHGT SRC5 19.7 19.5 19.5 23.2 23.2 23.2
SO BUILDHGT SRC5 23.2 23.2 33.5 33.5 33.5 33.5
SO BUILDHGT SRC5 33.5 33.5 33.5 19.7 19.7 19.7
SO BUILDHGT SRC5 19.7 19.5 19.5 23.2 23.2 23.2
SO BUILDHGT SRC5 23.2 23.2 33.5 33.5 33.5 33.5

SO BUILDWID  SRC5  16.54  16.54  16.56  40.71  44.52
46.98
SO BUILDWID  SRC5  48.01  26.31  28.2  100.16  147.68
190.7
SO BUILDWID  SRC5  227.94  258.25  45.29  39.42
55.53  49.7
SO BUILDWID  SRC5  50.74  39.82  45.63  40.71  44.52
46.98
SO BUILDWID  SRC5  48.01  26.31  28.2  100.16  147.68
190.7
SO BUILDWID  SRC5  227.94  258.25  45.29  39.42
55.53  49.7
SO BUILDLEN  SRC5  16.54  16.54  16.6  44.52  40.71
35.67
SO BUILDLEN  SRC5  29.54  56.31  60.6  300.39  295.06
280.76
SO BUILDLEN  SRC5  257.93  227.27  54.23  53.87
51.87  48.5
SO BUILDLEN  SRC5  53.34  53.89  54.15  44.52  40.71
35.67
SO BUILDLEN  SRC5  29.54  56.31  60.6  300.39  295.06
280.76
SO BUILDLEN  SRC5  257.93  227.27  54.23  53.87
51.87  48.5
SO XBADJ  SRC5  -97.58  -99.08  -97.85  -78.7  -75.42
-69.85
SO XBADJ  SRC5  -62.16  -48.56  -54.0  16.66  24.11
30.83
SO XBADJ  SRC5  36.62  41.29  32.81  38.63  43.27
46.6
SO XBADJ  SRC5  44.24  40.54  35.61  34.18  34.71
34.19
SO XBADJ  SRC5  32.62  -7.75  -6.6  -317.05  -319.17  -
311.6
SO XBADJ  SRC5  -294.55  -268.56  -87.04  -92.49  -
95.14  -95.1
SO YBADJ  SRC5  16.44  0.68  -15.1  -2.98  -12.73  -
22.1
SO YBADJ  SRC5  -30.8  14.37  3.7  -41.93  -12.28
17.74
SO YBADJ  SRC5  47.23  75.27  -37.72  -26.72  -26.5  -
15.15
SO YBADJ  SRC5  0.66  21.66  33.04  2.98  12.73  22.1
SO YBADJ  SRC5  30.8  -14.37  -3.7  41.93  12.28  -
17.74
SO YBADJ  SRC5  -47.23  -75.27  37.72  26.72  26.5
15.15
SO BUILDHGT  SRC6  23.5  23.5  18.0  18.0  18.0  18.0
SO BUILDHGT  SRC6  18.0  18.0  18.0  12.0  12.0  12.0
SO BUILDHGT  SRC6  12.0  12.0  23.5  23.5  23.5  18.0
SO BUILDHGT  SRC6  23.5  23.5  18.0  18.0  18.0  18.0
SO BUILDHGT  SRC6  18.0  18.0  18.0  12.0  12.0  12.0
SO BUILDHGT  SRC6  12.0  12.0  23.5  23.5  23.5  18.0
SO BUILDWID  SRC6  14.85  15.5  18.04  18.88  19.15
18.84
SO BUILDWID  SRC6  26.6  26.95  26.55  117.59  113.51
105.98
SO BUILDWID  SRC6  95.23  81.58  15.5  15.5  14.85
51.6
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-29.42
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113.51  105.98
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21.04
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6.4
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18.8
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14.34
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18.8
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14.34
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-17.97
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11.65  -9.1
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SO XBADJ     SRC14  -3.43  -3.19  -2.86  -2.44  -1.95  -1.4
SO YBADJ     SRC14  6.68  7.05  7.21  7.15  6.87  8.46
SO YBADJ     SRC14  7.12  5.57  3.85  2.01  0.11  -1.79
SO YBADJ     SRC14  -1.16  -2.36  -3.48  -4.5  -5.38  -6.1
SO YBADJ     SRC14  -6.68  -7.05  -7.21  -7.15  -6.87  -
8.46
SO YBADJ     SRC14  -7.12  -5.57  -3.85  -2.01  -0.11
1.79
SO YBADJ     SRC14  1.16  2.36  3.48  4.5  5.38  6.1
SO EMISUNIT  1.0E+06  GRAMS/SEC
MICROGRAMS/M**3
SO SRCGROUP  PM10  SRC1  SRC2  SRC3  SRC14
SO SRCGROUP  NH3  SRC2  SRC3  SRC14
SO SRCGROUP  NOXNORM1  SRC4  SRC6  SRC8
SRC9  SRC12
SO SRCGROUP  NOXNORM2  SRC4  SRC6  SRC7
SRC8  SRC9  SRC12
SO SRCGROUP  NOXSTART  SRC4  SRC6  SRC7
SRC8  SRC9  SRC10  SRC12
SO SRCGROUP  NOXSHUT  SRC5  SRC6  SRC7  SRC8
SRC11  SRC13
SO SRCGROUP  ALL
SO SRCGROUP  SCR1  SRC1
SO SRCGROUP  SCR2  SRC2
SO SRCGROUP  SCR3  SRC3
SO SRCGROUP  SCR14  SRC14
SO FINISHED

RE STARTING
** ONSITGRD STA
** RE GRIDCART GRD1 STA 1
** ** GRDDESCR  Large Grid
** RE GRIDCART GRD1 XYINC  382000.0  25  200.0
6429800.0  35  200.0
** RE GRIDCART GRD1 END
** ONSITGRD END
** OFFSTRCP  GRD1
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**FINAL**

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RE DISCCART 384422.0 6433045.2
RE DISCCART 384397.0 6433045.2
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RE DISCCART 384097.0 6433045.2
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RE DISCCART 384047.0 6433045.2
RE DISCCART 384022.0 6433045.2
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RE DISCCART 383872.0 6433045.2
RE DISCCART 383847.0 6433045.2
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RE DISCCART 383785.4 6433045.2
RE DISCCART 383785.53 6433020.2
RE DISCCART 383785.67 6432995.2
RE DISCCART 383785.8 6432970.2
RE DISCCART 383785.94 6432945.2
RE DISCCART 383786.07 6432920.2
RE DISCCART 383786.21 6432895.2
RE DISCCART 383786.34 6432870.2
RE DISCCART 383786.47 6432845.2
RE DISCCART 383786.61 6432820.2
RE DISCCART 383786.74 6432795.2
RE DISCCART 383786.88 6432770.2
RE DISCCART 383787.01 6432745.2
RE DISCCART 383787.1 6432728.7
RE DISCCART 383762.1 6432728.7
RE DISCCART 383737.1 6432728.7
RE DISCCART 383712.1 6432728.7
RE DISCCART 383687.1 6432728.7
RE DISCCART 383662.1 6432728.7
RE DISCCART 383637.1 6432728.7
RE DISCCART 383612.1 6432728.7
RE DISCCART 383587.1 6432728.7
RE DISCCART 383562.1 6432728.7
RE DISCCART 383537.1 6432728.7
RE DISCCART 383512.1 6432728.7
RE DISCCART 383487.1 6432728.7
RE DISCCART 383462.1 6432728.7
RE DISCCART 383437.1 6432728.7
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RE DISCCART 383387.1 6432728.7
RE DISCCART 383362.1 6432728.7
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RE DISCCART 383312.1 6432728.7
RE DISCCART 383287.1 6432728.7
RE DISCCART 383262.1 6432728.7
RE DISCCART 383237.1 6432728.7
RE DISCCART 383212.1 6432728.7
RE DISCCART 383200.9 6432728.7
RE DISCCART 383209.6 6432730.4
RE FINISHED

```
ME STARTING
ME INPUTFIL  V:\kw97aus.isc
ME ANEMHGHT  10  METERS
ME SURFDATA  1  1997
ME UAIRDATA  1  1997
ME STARTEND  1997  01  01  1  1997  12  31  24
ME WDROTATE  180
ME FINISHED

OU STARTING
OU RECTABLE  1  FIRST
OU PLOTFILE  1  NOXSHUT  FIRST  "V:\Expansion
Emissions Scenario\ISC_Rural_Exp\CSBP Expansion -
Rural_NOxShut_1hr.PLT"
OU FINISHED

** PROJECTN  0 104 7 -177 0 0.9996 500000 0
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LAYOUT22.JPG" "CSBP LAYOUT22" 3 UNKNOWN
UNKNOWN 1 0 0 0 0 0 0 1 0 0 0 0 0 0 1 1 383111.43
384872.91 6431893.26 6432839.55
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LAYOUT42.JPG" "CSBP LAYOUT42" 3 UNKNOWN
UNKNOWN 1 0 0 0 0 0 0 1 0 0 0 0 0 0 1 1 383425.22
384023.89 6432476.39 6432798
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LAYOUT52.JPG" "CSBP LAYOUT52" 3 UNKNOWN
UNKNOWN 1 0 0 0 0 0 0 0 0 0 0 16777215 0 0 1 1
384128.82 384723.2 6431933.6 6432251
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LAYOUT32.JPG" "CSBP LAYOUT32" 3 UNKNOWN
UNKNOWN 1 0 0 0 0 0 0 1 0 0 0 0 0 0 1 1 383292.7
383882.87 6432225.81 6432542.86
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AERIAL1.JPG" "CSBP W AERIAL1" 3 UNKNOWN
UNKNOWN 1 0 0 0 0 0 0 0 0 0 0 16777215 0 0 1 1
376819.74 388838.78 6429266.93 6436015.22
** MAPLAYER "C:\PROGRAM
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AERIAL2.JPG" "CSBP S AERIAL2" 3 UNKNOWN
UNKNOWN 1 0 0 0 0 0 0 0 0 0 0 16777215 0 0 1 1
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** MAPLAYER "C:\PROGRAM
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AERIAL1.JPG" "CSBP N AERIAL1" 3 UNKNOWN
UNKNOWN 1 0 0 0 0 0 0 0 0 0 0 16777215 0 0 1 1
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** MAPLAYER "C:\PROGRAM
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MAP1.JPG" "CSBP ROAD MAP1" 3 UNKNOWN
UNKNOWN 1 0 0 0 0 0 0 0 0 0 0 16777215 0 0 1 1
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** MAPLAYER "C:\PROGRAM
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AERIAL11.JPG" "CSBP AERIAL11" 3 UNKNOWN
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386801.59 6431276.68 6434137.41
** MAPLAYER "C:\PROGRAM
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AERIAL22.JPG" "CSBP AERIAL22" 3 UNKNOWN
UNKNOWN 1 0 0 0 0 0 0 1 0 0 0 0 0 0 1 1 382975.67
384848.18 6431895.74 6432762.3
** MAPLAYER "C:\PROGRAM
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383903.83 6432239.34 6432537.99
** MAPLAYER "C:\PROGRAM
FILES\BREEZE\ISC5\PROJECTS\CSBP\CSBP
AERIAL52.JPG" "CSBP AERIAL52" 3 UNKNOWN
UNKNOWN 1 0 0 0 0 0 0 1 0 0 0 0 0 0 1 1 384197.18
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** MAPLAYER "C:\PROGRAM
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383939.5 6432550.56 6432770.82
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FILES\BREEZE\ISC5\PROJECTS\CSBP\CSBP LAYOUT
PROP BOUND1.JPG" "CSBP LAYOUT PROP BOUND1"
3 UNKNOWN UNKNOWN 1 0 0 0 0 0 0 0 0 0 0 16777215
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** OUTFILE  "V:\Expansion Emissions
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** RAWFILE  "V:\Expansion Emissions
Scenario\ISC_Rural_Exp\CSBP Expansion - Rural.RAW"
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** HILLBOUN  0 0 0 0

** POLLUTNT IDN  01  PM10  X
** POLLUTNT NAM  01  PM10
** POLLUTNT IDN  02  NH3  X
** POLLUTNT NAM  02  NH3
** POLLUTNT IDN  03  NOX_NORM1  X
** POLLUTNT NAM  03  NOx - Normal with new boiler
** POLLUTNT IDN  04  NOX_START  X
** POLLUTNT NAM  04  NOx - Startup
** POLLUTNT IDN  05  NOX_SHUT  X
** POLLUTNT NAM  05  NOx - Shutdown
** POLLUTNT IDN  06  NOX_NORM2  X
** POLLUTNT NAM  06  NOx - Normal with both boilers
** POLLUTNT EMS  SRC1 6.400000E-01 0 0 0 0 0
** POLLUTNT EMS  SRC2 1.810000E-01 2.900000E-01 0
0 0 0
** POLLUTNT EMS  SRC3 2.900000E-01 2.350000E-01 0
0 0 0
** POLLUTNT EMS  SRC4 0 0 1.067000E+01
1.067000E+01 0 1.067000E+01
** POLLUTNT EMS  SRC5 0 0 0 0 1.519000E+01 0
** POLLUTNT EMS  SRC6 0 0 5.170000E+00
5.170000E+00 5.170000E+00 5.170000E+00
** POLLUTNT EMS  SRC7 0 0 0 1.590000E+00
1.590000E+00 1.590000E+00
** POLLUTNT EMS  SRC8 0 0 2.390000E+00
2.390000E+00 2.390000E+00 2.390000E+00
** POLLUTNT EMS  SRC9 0 0 1.462000E+01
7.310000E+00 0 1.462000E+01
** POLLUTNT EMS  SRC10 0 0 0 1.890000E+01 0 0
** POLLUTNT EMS  SRC11 0 0 0 0 9.800000E+00 0
** POLLUTNT EMS  SRC12 0 0 1.462000E+01
1.462000E+01 0 1.462000E+01
** POLLUTNT EMS  SRC13 0 0 0 0 9.800000E+00 0
** POLLUTNT EMS  SRC14 3.300000E-01 4.400000E-02
0 0 0 0

** BUILDING BLD  1  1  0  22.3  5
** BUILDING IDN  BLD1
** BUILDING NAM  Prilling Plant
** BUILDING CRN  383583.6  6432396.9
** BUILDING CRN  383583.6  6432356.3
** BUILDING CRN  383598.9  6432356.3
** BUILDING CRN  383598.9  6432396.9
** BUILDING CRN  383583.6  6432396.9
** BUILDING BLD  2  1  0  65.3  24
** BUILDING IDN  BLD2
** BUILDING NAM  Prill Plant Stack
** BUILDING TNK  383592.3  6432411.9  8.3
** BUILDING BLD  4  1  0  18.9  4
** BUILDING IDN  BLD4
** BUILDING NAM  No 1 Compuonds Bin
```

```
** BUILDING CRN  383608.7  6432389.6
** BUILDING CRN  383608.7  6432341.3
** BUILDING CRN  383914.2  6432341.3
** BUILDING CRN  383914.2  6432389.6
** BUILDING BLD  5  1  0  25.9  4
** BUILDING IDN  BLD5
** BUILDING NAM  S No 1 Compounds Bin
** BUILDING CRN  383686.6  6432341.3
** BUILDING CRN  383686.6  6432317.5
** BUILDING CRN  383763.1  6432317.5
** BUILDING CRN  383763.1  6432341.3
** BUILDING BLD  6  1  0  21.34  6
** BUILDING IDN  BLD6
** BUILDING NAM  S of No 1 Compounds Bin
** BUILDING CRN  383762.6  6432341.3
** BUILDING CRN  383762.6  6432330.8
** BUILDING CRN  383877.9  6432331.0
** BUILDING CRN  383877.9  6432330.3
** BUILDING CRN  383877.9  6432341.3
** BUILDING CRN  383761.6  6432341.3
** BUILDING BLD  7  1  0  10  4
** BUILDING IDN  BLD7
** BUILDING NAM  W side Prilling Plant
** BUILDING CRN  383583.6  6432376.3
** BUILDING CRN  383578.8  6432376.3
** BUILDING CRN  383578.8  6432355.6
** BUILDING CRN  383583.6  6432355.6
** BUILDING BLD  8  1  0  33.5  5
** BUILDING IDN  BLD8
** BUILDING NAM  W of Gran Plant
** BUILDING CRN  383604.8  6432438.2
** BUILDING CRN  383604.8  6432426.4
** BUILDING CRN  383608.9  6432426.4
** BUILDING CRN  383608.7  6432438.4
** BUILDING CRN  383603.6  6432438.2
** BUILDING BLD  9  1  0  33.5  5
** BUILDING IDN  BLD9
** BUILDING NAM  Gran Plant
** BUILDING CRN  383609.2  6432450.2
** BUILDING CRN  383609.2  6432401.9
** BUILDING CRN  383633.7  6432402.1
** BUILDING CRN  383633.5  6432450.4
** BUILDING CRN  383608.9  6432450.4
** BUILDING BLD  11  1  0  23.2  5
** BUILDING IDN  BLD11
** BUILDING NAM  No. 2 Compounds Bin
** BUILDING CRN  383633.7  6432450.4
** BUILDING CRN  383633.5  6432401.9
** BUILDING CRN  383929.3  6432402.6
** BUILDING CRN  383929.0  6432451.5
** BUILDING CRN  383632.7  6432450.4
** BUILDING BLD  12  1  0  18.3  5
** BUILDING IDN  BLD12
** BUILDING NAM  N of No. 2 Compounds Bin
** BUILDING CRN  383704.3  6432477.5
** BUILDING CRN  383704.5  6432442.5
** BUILDING CRN  383891.7  6432442.5
** BUILDING CRN  383891.2  6432477.8
** BUILDING CRN  383704.3  6432477.8
** BUILDING BLD  14  1  0  19.7  4
** BUILDING IDN  BLD14
** BUILDING NAM  Compounds Building
** BUILDING CRN  383582.6  6432474.7
** BUILDING CRN  383582.6  6432429.0
** BUILDING CRN  383597.4  6432429.0
** BUILDING CRN  383597.4  6432474.7
** BUILDING BLD  15  1  0  10  4
** BUILDING IDN  BLD15
** BUILDING NAM  Cooling Tower 1
** BUILDING CRN  383641.7  6432520.0
** BUILDING CRN  383641.6  6432488.5
** BUILDING CRN  383656.6  6432488.5
** BUILDING CRN  383656.6  6432520.1
** BUILDING BLD  16  1  0  7  12
** BUILDING IDN  BLD16
** BUILDING NAM  W of Nitric Acid Plant
** BUILDING CRN  383515.5  6432524.7
** BUILDING CRN  383515.5  6432494.3
** BUILDING CRN  383535.7  6432494.3
** BUILDING CRN  383535.4  6432502.1
** BUILDING CRN  383543.9  6432502.1
** BUILDING CRN  383543.9  6432491.5
** BUILDING CRN  383552.9  6432491.5
** BUILDING CRN  383552.9  6432523.3
** BUILDING CRN  383543.9  6432523.3
** BUILDING CRN  383543.9  6432519.3
** BUILDING CRN  383535.7  6432519.3
** BUILDING CRN  383535.7  6432524.7
** BUILDING BLD  17  1  0  19.5  4
** BUILDING IDN  BLD17
** BUILDING NAM  Nitric Acid Plant 1
** BUILDING CRN  383598.0  6432514.7
** BUILDING CRN  383598.0  6432504.1
** BUILDING CRN  383621.5  6432504.1
** BUILDING CRN  383621.4  6432514.8
** BUILDING BLD  18  1  0  19.5  4
** BUILDING IDN  BLD18
** BUILDING NAM  Nitric Acid Plant 2
** BUILDING CRN  383601.0  6432520.9
** BUILDING CRN  383601.0  6432515.0
** BUILDING CRN  383606.1  6432515.0
** BUILDING CRN  383606.1  6432520.9
** BUILDING BLD  19  1  0  19.5  4
** BUILDING IDN  BLD19
** BUILDING NAM  Nitric Acid Plant 3
** BUILDING CRN  383592.0  6432499.5
** BUILDING CRN  383592.0  6432487.3
** BUILDING CRN  383599.1  6432487.3
** BUILDING CRN  383599.1  6432499.4
** BUILDING BLD  20  1  0  19.5  5
** BUILDING IDN  BLD20
** BUILDING NAM  Nitric Acid Plant 4
** BUILDING CRN  383570.1  6432498.2
** BUILDING CRN  383570.1  6432486.6
** BUILDING CRN  383578.5  6432486.7
** BUILDING CRN  383578.5  6432498.4
** BUILDING CRN  383570.0  6432498.2
** BUILDING BLD  21  1  0  7  4
** BUILDING IDN  BLD21
** BUILDING NAM  W of Prill Plant
** BUILDING CRN  383509.9  6432430.1
** BUILDING CRN  383509.6  6432403.4
** BUILDING CRN  383520.1  6432403.7
** BUILDING CRN  383520.1  6432430.1
** BUILDING BLD  22  1  0  7  4
** BUILDING IDN  BLD22
** BUILDING NAM  W of Prill Plant
** BUILDING CRN  383520.2  6432373.8
** BUILDING CRN  383538.9  6432373.8
** BUILDING CRN  383538.9  6432391.8
** BUILDING CRN  383520.2  6432391.8
** BUILDING BLD  23  1  0  7  4
** BUILDING IDN  BLD23
** BUILDING NAM  W of Prill Plant
** BUILDING CRN  383506.2  6432379.4
** BUILDING CRN  383520.0  6432379.4
** BUILDING CRN  383520.0  6432391.8
** BUILDING CRN  383506.2  6432391.8
** BUILDING BLD  24  1  0  5  6
** BUILDING IDN  BLD24
** BUILDING NAM  W of Prill Plant
** BUILDING CRN  383509.0  6432375.0
** BUILDING CRN  383509.0  6432361.2
** BUILDING CRN  383499.8  6432361.2
** BUILDING CRN  383499.8  6432354.4
** BUILDING CRN  383516.2  6432354.4
```

** BUILDING CRN 383516.2 6432375.0
** BUILDING BLD 25 1 0 7 24
** BUILDING IDN BLD25
** BUILDING NAM N
** BUILDING TNK 383548.2 6432388.3 4.8
** BUILDING BLD 26 1 0 7 24
** BUILDING IDN BLD26
** BUILDING NAM 2nd N
** BUILDING TNK 383548.0 6432374.5 4.5
** BUILDING BLD 27 1 0 7 24
** BUILDING IDN BLD27
** BUILDING NAM 2nd S
** BUILDING TNK 383547.8 6432363.5 5.5
** BUILDING BLD 28 1 0 7 24
** BUILDING IDN BLD28
** BUILDING NAM S
** BUILDING TNK 383548.0 6432350.6 5.5
** BUILDING BLD 29 1 0 12.2 4
** BUILDING IDN BLD29
** BUILDING NAM SMP Bldg
** BUILDING CRN 383375.7 6432252.0
** BUILDING CRN 383375.7 6432227.5
** BUILDING CRN 383557.3 6432227.5
** BUILDING CRN 383557.3 6432252.0
** BUILDING BLD 30 1 0 15.24 4
** BUILDING IDN BLD30
** BUILDING NAM N of SMP Bldg
** BUILDING CRN 383474.1 6432257.2
** BUILDING CRN 383474.1 6432251.8
** BUILDING CRN 383506.9 6432251.8
** BUILDING CRN 383506.9 6432257.2
** BUILDING BLD 31 1 0 12.2 4
** BUILDING IDN BLD31
** BUILDING NAM S of SMP Bldg
** BUILDING CRN 383465.7 6432227.5
** BUILDING CRN 383465.7 6432216.3
** BUILDING CRN 383509.2 6432216.3
** BUILDING CRN 383509.2 6432227.5
** BUILDING BLD 32 1 0 17.61 4
** BUILDING IDN BLD32
** BUILDING NAM Rock Bin
** BUILDING CRN 383339.5 6432209.3
** BUILDING CRN 383339.3 6432159.5
** BUILDING CRN 383559.9 6432159.3
** BUILDING CRN 383560.1 6432209.5
** BUILDING BLD 33 1 0 4.5 4
** BUILDING IDN BLD33
** BUILDING NAM N of SMP bldg
** BUILDING CRN 383441.9 6432279.8
** BUILDING CRN 383441.9 6432268.2
** BUILDING CRN 383483.5 6432268.2
** BUILDING CRN 383483.5 6432279.8
** BUILDING BLD 34 1 0 4.5 6
** BUILDING IDN BLD34
** BUILDING NAM N of SMP bldg
** BUILDING CRN 383523.0 6432273.8
** BUILDING CRN 383523.0 6432267.7
** BUILDING CRN 383549.2 6432267.7
** BUILDING CRN 383549.2 6432278.7
** BUILDING CRN 383528.8 6432278.7
** BUILDING CRN 383528.8 6432273.8
** BUILDING BLD 36 1 0 10 24
** BUILDING IDN BLD36
** BUILDING NAM SMP Tank
** BUILDING TNK 383418.3 6432262.8 5.0
** BUILDING BLD 37 1 0 10 24
** BUILDING IDN BLD37
** BUILDING NAM SMP tank
** BUILDING TNK 383405.7 6432263.0 5.0
** BUILDING BLD 38 1 0 10 24
** BUILDING IDN BLD38
** BUILDING NAM SMP tank
** BUILDING TNK 383391.4 6432260.7 7.9
** BUILDING BLD 39 1 0 10 24
** BUILDING IDN BLD39
** BUILDING NAM SMP tank
** BUILDING TNK 383374.6 6432260.7 7.9
** BUILDING BLD 40 1 0 19.8 4
** BUILDING IDN BLD40
** BUILDING NAM No 2 Receivals bin
** BUILDING CRN 383644.5 6432166.5
** BUILDING CRN 383644.5 6432109.9
** BUILDING CRN 383898.3 6432109.9
** BUILDING CRN 383898.3 6432166.5
** BUILDING BLD 41 1 0 21.34 6
** BUILDING IDN BLD41
** BUILDING NAM Super Bin
** BUILDING CRN 383595.4 6432265.1
** BUILDING CRN 383586.1 6432256.2
** BUILDING CRN 383586.1 6432223.5
** BUILDING CRN 383596.8 6432213.2
** BUILDING CRN 384148.9 6432213.7
** BUILDING CRN 384148.9 6432265.1
** BUILDING BLD 42 1 0 25.9 4
** BUILDING IDN BLD42
** BUILDING NAM N of Super Bin
** BUILDING CRN 383640.8 6432296.4
** BUILDING CRN 383640.8 6432265.1
** BUILDING CRN 383808.4 6432265.3
** BUILDING CRN 383808.4 6432296.6
** BUILDING BLD 43 1 0 10 4
** BUILDING IDN BLD43
** BUILDING NAM Cooling Tower 2
** BUILDING CRN 383826.7 6432615.2
** BUILDING CRN 383826.9 6432572.3
** BUILDING CRN 383840.7 6432572.3
** BUILDING CRN 383840.7 6432615.2
** BUILDING BLD 45 1 0 18.6 4
** BUILDING IDN BLD45
** BUILDING NAM Ammonia Proj Comp Shelter A
** BUILDING CRN 383768.4 6432597.3
** BUILDING CRN 383768.4 6432576.1
** BUILDING CRN 383798.6 6432576.1
** BUILDING CRN 383798.6 6432597.3
** BUILDING BLD 46 1 0 16 4
** BUILDING IDN BLD46
** BUILDING NAM Ammonia Proj Comp Shelter B
** BUILDING CRN 383798.9 6432596.8
** BUILDING CRN 383798.9 6432569.5
** BUILDING CRN 383815.5 6432569.5
** BUILDING CRN 383815.5 6432596.8
** BUILDING BLD 47 1 0 12 4
** BUILDING IDN BLD47
** BUILDING NAM N-S Pipe Rack
** BUILDING CRN 383791.2 6432715.1
** BUILDING CRN 383791.2 6432597.0
** BUILDING CRN 383798.6 6432597.0
** BUILDING CRN 383798.6 6432715.1
** BUILDING BLD 48 1 0 23.5 4
** BUILDING IDN BLD48
** BUILDING NAM Primary Reformer Bldg
** BUILDING CRN 383805.2 6432661.1
** BUILDING CRN 383805.2 6432647.6
** BUILDING CRN 383817.9 6432647.6
** BUILDING CRN 383817.9 6432661.1
** BUILDING BLD 49 1 0 18 4
** BUILDING IDN BLD49
** BUILDING NAM Ammonia Proj Structure B
** BUILDING CRN 383777.2 6432670.9
** BUILDING CRN 383777.2 6432656.3
** BUILDING CRN 383789.6 6432656.3
** BUILDING CRN 383789.6 6432670.9
** BUILDING BLD 52 1 0 11 4
** BUILDING IDN BLD52
** BUILDING NAM E-W Pipe Rack
** BUILDING CRN 383713.0 6432606.0

**FINAL**

** BUILDING CRN  383713.0  6432600.0
** BUILDING CRN  383798.3  6432600.0
** BUILDING CRN  383798.3  6432606.0
** BUILDING BLD  53  1  0  5  24
** BUILDING IDN  BLD53
** BUILDING NAM  Ammonia Proj tank
** BUILDING TNK  383758.9  6432643.1  5.6
** BUILDING BLD  54  1  0  5  24
** BUILDING IDN  BLD54
** BUILDING NAM  Ammonia Proj tank
** BUILDING TNK  383743.8  6432641.2  4.0
** BUILDING BLD  56  1  0  14  4
** BUILDING IDN  BLD56
** BUILDING NAM  HAP Bldg
** BUILDING CRN  384289.4  6432179.2
** BUILDING CRN  384258.0  6432134.4
** BUILDING CRN  384291.5  6432111.5
** BUILDING CRN  384321.9  6432156.8
** BUILDING BLD  57  1  0  8.2  4
** BUILDING IDN  BLD57
** BUILDING NAM  CAP Control Room
** BUILDING CRN  384322.7  6432112.3
** BUILDING CRN  384315.2  6432100.1
** BUILDING CRN  384337.9  6432084.9
** BUILDING CRN  384345.6  6432096.6
** BUILDING BLD  58  1  0  7.9  4
** BUILDING IDN  BLD58
** BUILDING NAM  CAP Cell Bldg
** BUILDING CRN  384330.4  6432123.3
** BUILDING CRN  384323.5  6432112.1
** BUILDING CRN  384346.1  6432096.1
** BUILDING CRN  384354.1  6432107.5
** BUILDING BLD  59  1  0  9  6
** BUILDING IDN  BLD59
** BUILDING NAM  CAP Bldg
** BUILDING CRN  384344.0  6432141.9
** BUILDING CRN  384331.5  6432123.8
** BUILDING CRN  384354.4  6432108.1
** BUILDING CRN  384371.2  6432133.1
** BUILDING CRN  384360.3  6432139.8
** BUILDING CRN  384356.0  6432132.8
** BUILDING BLD  61  1  0  37.1  4
** BUILDING IDN  BLD61
** BUILDING NAM  S NaCN Solids Process Bldg
** BUILDING CRN  384442.9  6432097.4
** BUILDING CRN  384436.7  6432088.6
** BUILDING CRN  384447.1  6432081.7
** BUILDING CRN  384454.0  6432090.2
** BUILDING BLD  62  1  0  16.8  4
** BUILDING IDN  BLD62
** BUILDING NAM  NaCN Solids Process Bldg
** BUILDING CRN  384450.3  6432120.6
** BUILDING CRN  384438.1  6432101.4
** BUILDING CRN  384453.8  6432090.8
** BUILDING CRN  384467.1  6432110.2
** BUILDING BLD  63  1  0  13.8  4
** BUILDING IDN  BLD63
** BUILDING NAM  N NaCN Control
** BUILDING CRN  384415.9  6432092.1
** BUILDING CRN  384403.2  6432074.2
** BUILDING CRN  384410.1  6432069.7
** BUILDING CRN  384422.9  6432087.3
** BUILDING BLD  64  1  0  26  4
** BUILDING IDN  BLD64
** BUILDING CRN  384426.3  6432084.9
** BUILDING CRN  384416.7  6432070.5
** BUILDING CRN  384436.7  6432056.4
** BUILDING CRN  384446.6  6432071.3
** BUILDING BLD  65  1  0  6  4
** BUILDING IDN  BLD65
** BUILDING CRN  384425.8  6432063.3
** BUILDING CRN  384405.8  6432034.0
** BUILDING CRN  384411.9  6432030.0
** BUILDING CRN  384431.1  6432059.6
** BUILDING BLD  66  1  0  13.5  4
** BUILDING IDN  BLD66
** BUILDING NAM  Turbine Alt Bldg
** BUILDING CRN  384401.3  6432029.2
** BUILDING CRN  384390.6  6432014.0
** BUILDING CRN  384397.6  6432009.2
** BUILDING CRN  384408.5  6432024.7
** BUILDING BLD  67  1  0  5  6
** BUILDING IDN  BLD67
** BUILDING NAM  CAP area bldg
** BUILDING CRN  384379.4  6432185.0
** BUILDING CRN  384369.1  6432170.4
** BUILDING CRN  384373.5  6432167.3
** BUILDING CRN  384382.3  6432180.4
** BUILDING CRN  384390.1  6432174.7
** BUILDING CRN  384391.7  6432177.1
** BUILDING BLD  68  1  0  5  4
** BUILDING IDN  BLD68
** BUILDING NAM  CAP area bldg
** BUILDING CRN  384380.9  6432178.0
** BUILDING CRN  384377.7  6432173.2
** BUILDING CRN  384398.6  6432159.0
** BUILDING CRN  384402.1  6432164.0
** BUILDING BLD  69  1  0  5  4
** BUILDING IDN  BLD69
** BUILDING NAM  CAP area bldg
** BUILDING CRN  384408.3  6432166.0
** BUILDING CRN  384401.9  6432157.0
** BUILDING CRN  384417.2  6432145.9
** BUILDING CRN  384423.6  6432155.5
** BUILDING BLD  10  1  0  6.4  8
** BUILDING IDN  BLD10
** BUILDING NAM  Chlorine Despatch Bldg
** BUILDING CRN  384370.9  6432123.2
** BUILDING CRN  384362.4  6432111.4
** BUILDING CRN  384383.2  6432097.0
** BUILDING CRN  384374.8  6432084.1
** BUILDING CRN  384366.9  6432090.0
** BUILDING CRN  384358.2  6432076.6
** BUILDING CRN  384373.7  6432067.0
** BUILDING CRN  384399.2  6432103.8
** BUILDING BLD  44  1  0  24.4  4
** BUILDING IDN  BLD44
** BUILDING NAM  Top of SMP Bldg
** BUILDING CRN  383375.1  6432252.0
** BUILDING CRN  383375.1  6432227.3
** BUILDING CRN  383509.5  6432227.3
** BUILDING CRN  383509.5  6432252.0
** BUILDING BLD  60  1  0  15  24
** BUILDING IDN  BLD60
** BUILDING NAM  SMP tank
** BUILDING TNK  383350.2  6432262.1  10.0
** BUILDING BLD  70  1  0  19.5  4
** BUILDING IDN  BLD70
** BUILDING NAM  Nitric Acid Plant
** BUILDING CRN  383574.3  6432504.1
** BUILDING CRN  383574.3  6432499.2
** BUILDING CRN  383630.6  6432499.4
** BUILDING CRN  383630.6  6432504.2
** BUILDING BLD  71  1  0  18  6
** BUILDING IDN  BLD71
** BUILDING NAM  Ammonia Project Structure A
** BUILDING CRN  383742.8  6432630.6
** BUILDING CRN  383742.8  6432619.1
** BUILDING CRN  383736.8  6432619.1
** BUILDING CRN  383736.8  6432606.0
** BUILDING CRN  383755.3  6432606.0
** BUILDING CRN  383755.3  6432630.8
** BUILDING BLD  72  1  0  18  4
** BUILDING IDN  BLD72
** BUILDING NAM  Ammonia Proj Structure S of reformer
** BUILDING CRN  383804.0  6432641.9

** BUILDING CRN 383804.0 6432605.2
** BUILDING CRN 383820.0 6432605.2
** BUILDING CRN 383820.0 6432641.9
** BUILDING BLD 73 1 0 24 24
** BUILDING IDN BLD73
** BUILDING NAM V3001
** BUILDING TNK 383785.1 6432681.0 1.85
** BUILDING BLD 74 1 0 46 24
** BUILDING IDN BLD74
** BUILDING NAM V3008
** BUILDING TNK 383784.9 6432675.1 1.7
** BUILDING BLD 75 1 0 10.9 4
** BUILDING IDN BLD75
** BUILDING NAM Ammonia Proj Elec & Tech
** BUILDING CRN 383728.5 6432587.5
** BUILDING CRN 383728.3 6432572.8
** BUILDING CRN 383751.1 6432572.8
** BUILDING CRN 383751.1 6432587.3
** BUILDING BLD 0 0 0 19.4 4
** BUILDING IDN BLD76
** BUILDING NAM Nitric Acid Plant 1b
** BUILDING CRN 383608.0 6432582.0
** BUILDING CRN 383608.0 6432572.0
** BUILDING CRN 383631.5 6432572.1
** BUILDING CRN 383631.4 6432582.0
** BUILDING BLD 0 0 0 19.5 4
** BUILDING IDN BLD77
** BUILDING NAM Nitric Acid Plant 2b
** BUILDING CRN 383611.0 6432588.0
** BUILDING CRN 383611.0 6432583.0
** BUILDING CRN 383616.1 6432583.0
** BUILDING CRN 383616.1 6432588.0
** BUILDING BLD 0 0 0 19.5 4
** BUILDING IDN BLD78
** BUILDING NAM Nitric Acid Plant 3b
** BUILDING CRN 383602.0 6432567.0
** BUILDING CRN 383602.0 6432555.0
** BUILDING CRN 383609.1 6432555.0
** BUILDING CRN 383609.1 6432567.0
** BUILDING BLD 0 0 0 19.5 5
** BUILDING IDN BLD79
** BUILDING NAM Nitric Acid Plant 4b
** BUILDING CRN 383580.1 6432566.0
** BUILDING CRN 383580.1 6432554.0
** BUILDING CRN 383588.5 6432554.0
** BUILDING CRN 383588.5 6432566.0
** BUILDING CRN 383580.0 6432566.0
** BUILDING BLD 0 0 0 19.5 4
** BUILDING IDN BLD80
** BUILDING NAM Nitric Acid Plant b
** BUILDING CRN 383584.3 6432572.0
** BUILDING CRN 383584.3 6432567.0
** BUILDING CRN 383640.6 6432567.0
** BUILDING CRN 383640.6 6432572.0
** BUILDING BLD 0 0 0 55 4
** BUILDING IDN BLD81
** BUILDING NAM PP2 Structure
** BUILDING REC 383908.6 6432585.1 8.0 10.0 0.0
** BUILDING BLD 0 0 0 62 4
** BUILDING IDN BLD82
** BUILDING NAM PP2 Tower
** BUILDING REC 383897.8 6432585.1 10.5 10.5 0.0
** BUILDING BLD 0 0 0 15 4
** BUILDING IDN BLD83
** BUILDING NAM PP2 Storage
** BUILDING REC 383934.3 6432573.6 32.0 36.0 0.0
** BUILDING BLD 0 0 0 37 24
** BUILDING IDN BLD3
** BUILDING NAM 30K NH3 Tank
** BUILDING TNK 383509.6 6432683.1 25.0
** BUILDING BLD 0 0 0 30 24
** BUILDING IDN BLD13
** BUILDING NAM 10K NH3 Tank
** BUILDING TNK 383499.0 6432616.5 15.0
** BUILDING BLD 0 0 0 10 4
** BUILDING IDN BLD35
** BUILDING NAM NAP3 Cooling tower
** BUILDING REC 383709.5 6432647.6 30.0 12.0 0.0
** BUILDING BLD 0 0 0 19.4 4
** BUILDING IDN BLD50
** BUILDING NAM NAP3a
** BUILDING REC 383629.9 6432651.8 25.0 10.0 0.0
** BUILDING BLD 0 0 0 19.4 4
** BUILDING IDN BLD51
** BUILDING NAM NAP3b
** BUILDING REC 383648.2 6432646.0 5.0 5.0 0.0
** BUILDING BLD 0 0 0 19.5 4
** BUILDING IDN BLD55
** BUILDING NAM NAP3c
** BUILDING REC 383655.6 6432667.8 7.0 12.0 0.0
** BUILDING BLD 0 0 0 19.5 4
** BUILDING IDN BLD84
** BUILDING NAM NAP3d
** BUILDING REC 383676.6 6432668.9 10.0 10.0 0.0
** BUILDING BLD 0 0 0 19.5 4
** BUILDING IDN BLD85
** BUILDING NAM NAP3e
** BUILDING REC 383623.6 6432663.1 56.0 5.0 0.0
** BUILDING BLD 0 0 0 15.5 4
** BUILDING IDN BLD86
** BUILDING NAM PP2a
** BUILDING REC 384023.9 6432573.3 136.0 50.0 0.0
** BUILDING BLD 0 0 0 9 4
** BUILDING IDN BLD87
** BUILDING NAM PP2b
** BUILDING REC 384023.9 6432623.3 60.0 10.0 0.0
** BUILDING BLD 0 0 0 9 4
** BUILDING IDN BLD88
** BUILDING NAM PP2c
** BUILDING REC 384023.9 6432633.3 53.0 15.0 0.0
** BUILDING BLD 0 0 0 9.5 4
** BUILDING IDN BLD89
** BUILDING NAM PP2d
** BUILDING REC 384023.7 6432648.3 75.0 35.0 0.0
** BUILDING BLD 0 0 0 26.3 4
** BUILDING IDN BLD90
** BUILDING NAM PP2e
** BUILDING REC 384023.9 6432625.1 7.0 7.0 0.0
** BUILDING BLD 0 0 0 17.5 4
** BUILDING IDN BLD91
** BUILDING NAM PP2f
** BUILDING REC 384025.8 6432632.1 4.5 16.2 0.0
** BUILDING BLD 0 0 0 17.5 4
** BUILDING IDN BLD92
** BUILDING NAM PP2g
** BUILDING REC 384023.7 6432648.3 7.0 7.0 0.0
** BUILDING BLD 0 0 0 25.8 4
** BUILDING IDN BLD93
** BUILDING NAM PP2h
** BUILDING REC 384046.1 6432626.1 9.0 9.0 0.0