Weld Range Iron Ore Project

Response to EPA request for further information

(EPA Meeting - 12 April 2012)

May 2012
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APPENDICES

Appendix A - SRK Report
## ACRONYMS

<table>
<thead>
<tr>
<th>Alt</th>
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</tr>
</thead>
<tbody>
<tr>
<td>AMD</td>
<td>Acid and Metalliferous Drainage</td>
</tr>
<tr>
<td>BIF</td>
<td>Banded Iron Formation</td>
</tr>
<tr>
<td>DEC</td>
<td>Department of Environment and Conservation</td>
</tr>
<tr>
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<td>Environmental Protection Authority</td>
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<td>GDE</td>
<td>Groundwater Dependent Ecosystems</td>
</tr>
<tr>
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<td>Million tonnes per annum</td>
</tr>
<tr>
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<td>Potentially Acid Forming</td>
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<td>Public Environmental Review</td>
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<td>PEC</td>
<td>Priority Ecological Community</td>
</tr>
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<td>Response to Submissions</td>
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<td>SMC</td>
<td>Sinosteel Midwest Corporation</td>
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EXECUTIVE SUMMARY

The Weld Range Iron Ore Project was referred to the EPA and assessed under Part IV of the Environmental Protection Act 1986. The Project was assessed at a Public Environmental Review (PER) level of assessment, with the six week public review period commencing on the 6th September 2010 and closing on the 18th October 2010. A Response to Submissions document was submitted to the EPA in April 2012 and a formal meeting was held to assess potential changes to the Project, where further clarification on environmental matters was requested.

This document has been compiled to address six further comments from the EPA regarding the Weld Range Iron Ore Project. SMC has provided further clarification around the following six issues:

- Groundwater Dependent Ecosystems (GDE) and the impact from dewatering;
- Salt disposal options from the evaporation pond at Weld Range, including discussion around beneficial reuse.
- Long term environmental impact of Potentially Acid Forming (PAF) and non-PAF materials in the major waste dump areas.
- Long term water quality in the pit lakes and impacts to groundwater and fauna from hyper saline water.
- Distribution and cumulative impact of the Priority Ecological Community (PEC) including potential future mining deposits at Weld Range.
- The offset programme including long term environmental benefits, monitoring and measurability and success criteria.
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1. INTRODUCTION

1.1 Project Background

Sinosteel Midwest Corporation (SMC) proposes to develop a new iron ore mine at Weld Range, located approximately 85 km southwest of Meekatharra and 60 km northwest of Cue in the Midwest region of Western Australia. The Weld Range Iron Ore Project (the Project) has high grade outcrops over a 60 km strike length. SMC is targeting to export 15 million tonnes per annum (Mtpa) of iron ore over a 15 year period, however the initial assessment addresses the first 11 years of planned operations. Any extension beyond the 11 years will be the subject of a separate submission and assessment.

1.2 Document Purpose

This document has been compiled in response to a request from the EPA for further clarification on six particular issues regarding the Weld Range Iron Ore Project Public Environmental Review (Assessment No. 1714). These six items were formally addressed in a letter from Dr Paul Vogel (Chairman, EPA) to Sinosteel Midwest Corporation, dated 19th April 2012 (REF: OEPA2011/000147-2).

1.3 Project Proponent

The Proponent for the Weld Range Iron Ore Project is:

Sinosteel Midwest Corporation Ltd
7 Rheola Street
WEST PERTH WA 6005

PO Box 529
WEST PERTH WA 6872


ABN: 91 009 224 800
2. RESPONSE TO EPA COMMENTS

2.1 Groundwater Dependent Ecosystems and Dewatering

A full assessment should be provided for the impacts at various contours on Groundwater Dependent Ecosystems, as a result of pit dewatering both during dewatering and after dewatering has ceased.

As discussed in the 2010 Flora and Vegetation Assessment and in the 2011 PER Response Document, both vegetation communities 7a and 7b have been identified as potentially groundwater dependent. The total areas of the two vegetation types, 7a and 7b, including the areas outside the SMC lease have been recalculated and are consistent with the total areas calculated previously. The calculations on impact from drawdown to vegetation communities 7a and 7b are shown in Table 2.1.

The extent of vegetation community 7a occurring beyond the boundaries of the SMC lease was ground truthed in April 2011, confirming a further 1,322 hectares and thus increasing the total extent of 7a to at least 1,958 hectares. The most recent calculations have been based on this updated extent of 7a. Vegetation communities 7a and 7b are not known to be represented anywhere else beyond Weld Range.

Table 2.1 demonstrates that at the most, approximately 52% of vegetation community 7a will be impacted from drawdown. This calculation was based on drawdown at the 0.25 m, 1 m, 2 m and 3 m drawdown contours after nine years of drawdown, as modelled by SRK in 2010. Impact to the known extent of vegetation community 7b is approximately 100% after nine years, at the 0.25 m drawdown contour.

For vegetation community 7a, the Melaleuca stereophloia is expected to be the most susceptible species to the impacts from drawdown. Based on the fact that Melaleuca species are typically obligate phreatophytes and that the existing water table is high, it is highly likely this species is an obligate phreatophyte. The ability of this species to respond to changes in the water table (particularly the ability in lowering its roots to reach the water at a newer, lower level) is not currently documented. Given it’s localization to the current water lens it can be suggested that if the current lens is slightly lowered at the perimeter and the species does not grow there now, it is unlikely that it will survive much further lowering.

The dominant Eucalypt species present in vegetation community 7b are not known phreatophytes as they also occur in non-riparian habitats and therefore may be less susceptible and more adaptable to changes in the water table. Neither Eucalyptus carnie nor Eucalyptus trivalvis are obligate phreatophytes and are recorded regionally in habitats where a lower water table would be present. However, these species may be reliant on the higher water table at the location near the Madoonga Pit and therefore may be vulnerable to changes in the availability of water unless their roots are capable of adapting to a lowering water table. The ability of these species to adapt at the proposed rate of change to the watertable is unknown.

Vegetation communities 7a and 7b do not occur within the projected drawdown cones at Beebyn Pit and no known phreatophytic species are known to occur within this area.
The predicted impact percentages in Table 2.1 represent the worst case scenario i.e. an assumption has been made that 100% of the vegetation communities will be impacted.

Table 2.1 – Impact on Groundwater Dependent Ecosystems from pit dewatering at various contours

<table>
<thead>
<tr>
<th>Drawdown Cone</th>
<th>Vegetation Community</th>
<th>Impact within Drawdown (ha)</th>
<th>Total Area (ha)</th>
<th>Percentage Impact</th>
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<tr>
<td>0.25 m</td>
<td>7a</td>
<td>1016.339155</td>
<td>1957.793271</td>
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<tr>
<td></td>
<td>7b</td>
<td>14.14631526</td>
<td>14.14631526</td>
<td>100.00%</td>
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<tr>
<td>1 m</td>
<td>7a</td>
<td>684.1231378</td>
<td>1957.793271</td>
<td>34.94%</td>
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<td>7b</td>
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<tr>
<td>2 m</td>
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<td>297.9660483</td>
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<td>7b</td>
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<tr>
<td>3 m</td>
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<tr>
<td></td>
<td>7b</td>
<td>9.962644377</td>
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<td>70.43%</td>
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</tbody>
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Slender-billed Thornbill Habitat

Slender-billed Thornbills are found predominantly in chenopod shrublands, in treeless or sparsely wooded flatlands, and also samphire and low melaleuca scrubs (Johnstone and Storr 2004; Pavey 2006). At Weld Range this habitat correlates to Community Type 7a as mapped in Technical Appendix 12 (ecologia 2011). At Lake Throssell, approximately 100 km north east of Weld Range, tall samphire and the adjacent Acacia/ Eremophila/Santalum shrubland at the foot of sand ridges was also utilised. Therefore it is possible that the vegetation adjacent to Community Type 7a at Weld Range could also be utilised to some degree. Slender-billed Thornbills are usually observed in pairs or small groups of up to 10 birds, feeding on small invertebrates caught on the ground or in low shrubs. They are sedentary and will remain in a single location, however they do have the ability to disperse to other areas of suitable habitat. Impacts to this species are expected to be related to the loss of suitable habitat, primarily Community Type 7a, however the extent to which adjacent vegetation units can also be utilised is unclear.

The lowering of the water table as a result of dewatering is expected to result in significant changes to the composition of vegetation mapped as 7a, due to the impact on *Melaleuca stereophloia*, one of the dominant species within the shrub stratum. Although no specific data is available regarding the water table dependence of *M. stereophloia*, *Melaleuca* species present in areas with shallow water tables are typically phreatophytic with shallow root systems that are vulnerable to lowering of the water table. It should also be noted that,
based on Google imagery, further areas of similar vegetation appear to be present beyond
the limits of current mapping.

The population is currently assumed to occupy only the area in which it has been identified,
and to be an important population, on the basis that the population is apparently healthy,
self-sustaining and self-contained. The extent to which the population will move to adjacent
areas of 7a and utilise other vegetation communities, and the affect on the viability of the
population is unknown.

Mitigation measures, such as livestock exclusion, are expected to improve the quality of
surrounding vegetation, through a reduction in grazing and trampling effects. The remaining
vegetation is expected to increase in value as habitat for Slender-billed Thornbill, as reduced
grazing pressure will increase the amount of vegetation available as habitat and increase the
amount of invertebrate prey available to the Slender-billed thornbill.

**Local and Regional Context**

The population of Slender-billed Thornbill located at the Claypan is expected to be relatively
small 10-20 individuals and due to their sedentary nature they are expected to largely restrict
their movement to the vegetation associated with the claypan.

The population in question is expected to form part of the western edge of the central
southern Western Australia sub population, one of seven subpopulations across Australia.
The central southern subpopulation includes populations associated with Lake Annean
(65 km east of Weld Range) and Lake Austin (75 km south east of Weld Range), and may
include populations located to the south east which are associated with Lake Barlee
(300 km) and Lake Ballard (400 km). The Carnarvon-Shark Bay region of Western Australia
sub population is located 340 km west of Weld Range, with no large salt lakes located in that
distance.

The importance of small areas of habitat for dispersal across the landscape is not well
understood and the claypan habitat may provide an important stageing post for individuals
dispersing through the region. However, due to the small size of the claypan, when
compared to larger salt lakes in the surrounding region, the importance of the population at a
regional scale is somewhat reduced.

The western subspecies of the Slender-billed Thornbills occurs in the arid and semi-arid
zones of southern Western Australia and South Australia. Slender-billed Thornbills are
uncommon, rare or extinct across most of their range with the exception of populations on
the Midwest coast (near Shark Bay), where they are considered moderately common
(Johnstone and Storr 2004).

The location of all the known SBTB records in WA are presented in Figure 2.1.
Figure 2.1 – NatureMap data all the known records that are publicly available


Impact mitigation

In order to mitigate the potential impact, SMC intends to include the removal of goats and livestock from the chenopod wetland area, in addition to the range.

SMC also proposes to irrigate the parts of vegetation communities 7a and 7b that are affected by the drawdown. It should be noted that the communities in question are mainly restricted to the outer boundary of the chenopod wetland area. Therefore, management by irrigation is a practical solution to mitigate potential impacts. In addition, there is an abundant supply of water suitable for irrigation purposes.

In addition, rehabilitation of affected vegetation is also proposed. SMC will conduct further surveys of the 7a and 7b vegetation communities to establish baseline data. Rehabilitation of the vegetation communities will occur in conjunction with the groundwater rebound in the affected area.
2.2 Salt disposal

A full discussion of options for disposing of salt from the evaporation ponds, including identification of beneficial reuse, approved disposal sites and proposed land fill sites.

Solid salts produced from the treatment dewatered brine can potentially be used to produce salt minerals for commercial or other beneficial use, disposed of in-situ (in the evaporation pond) or in an appropriately sited and licensed landfill. Alternatively, the brine can be disposed of by reinjection.

The hierarchy of salt disposal options proposed by SMC are:

Treatment for beneficial re-use

SMC proposes to treat the saline brine from the evaporation process to produce commercially viable product/s. Mineral salts for commercial use such as calcium carbonate, sodium bicarbonate and soda ash, can be produced from solid salts. The use of evaporation and crystallisation technologies such as solar evaporation ponds, evaporators (multi-effect evaporators with chemical pre-treatment) and grainers are required to produce a commercially viable product.

The most common marketable products produced from the crystallisation process include sodium chloride (table salt), sodium carbonate (soda ash) and sodium bicarbonate (bicarb soda). Unprocessed brine can also be utilised in other chemical processes such as caustic soda and chlorine production.

Leave salt in-situ and cap

This option integrates the capping of the existing evaporation pond that will allow for in-situ salt encapsulation. The current evaporation pond design provides for a liner to prevent the leaching of salt into groundwater. In addition to this, a cap could be used to encapsulate the in-situ salt effectively providing an impermeable multi-cell landfill. SMC understands this method is commonly used by mining companies in the Goldfields region of Western Australia.

Construction of an onsite landfill

The siting of an on-site landfill would be proposed for a location that either eliminates or reduces the potential impact to the environment. The disposal of solid salt to landfill would not add further salt to the existing environment as any saline discharge would returned to the system from which it was abstracted i.e. the leaching of salt would not result in an net increase to the groundwater system. In addition, SMC would construct any landfill to comply with appropriate DEC legislation and policy.

Reconsider the option to reinject

Two workshops were held in March and April 2010 with SMC personnel, consultants, and specialist advisers to address issues regarding dewatering prior to and during mining operations, and disposal of the water abstracted. Three options were selected including the
construction of an evaporation/infiltration pond, an evaporation pond and reinjection of saline water. The option to evaporate and infiltrate saline water was discounted as the infiltration of saline water at a high rate was considered to represent an unacceptable risk due to the potential mounding of groundwater in the vicinity of the pond. This could potentially cause impact to surrounding vegetation and would make management of the groundwater problematic. The option to dispose of the saline water by reinjection was discounted due lack of a suitable site to support reinjection. In addition, operational issues, such as the corrosion, blockage etc of the pumping system was considered to be potentially problematic. The option of evaporation was chosen due to the reduced environmental impact to the environment and low operation costs and management issues.

SMC will revisit the option of disposal via reinjection if there is no commercially viable market for salt or the option of in-situ disposal.

**Disposal at an approved landfill**

This option would only be considered if all other options are not feasible. Trucks would be used to cart the salt to an existing regulated Class 2 waste management facility. The closest landfill licensed to accept solid waste salt is located in the Shire of Cue. This option is technically feasible, and would not require any further investigation of environmental impacts or further permitting as the landfill is already licensed to accept the proposed category of waste. SMC would come to a commercial agreement with the Shire of Cue to manage the disposal of salt. If it was not feasible to dispose of the waste salt at the Cue landfill, other sites at Mt Magnet or Meekatharra could be considered.

All of the options outlined above would require further investigation by SMC to ensure viability for both the environment and economic factors.

### 2.3 Long Term Leaching of Potentially Acid Forming Material

*An assessment of predicted environmental impacts of long term leaching of Potentially Acid Forming (PAF) and non-PAF materials from the 50 million tonnes disposed of in the two major waste dump areas. The analysis should provide information on the potential impacts on the environment of the total load of chemicals that is expected to leach into the environment before equilibrium is reached.*

SRK Consulting (SRK) carried out a geochemical characterisation programme in July 2011 to assess the potential for acid and metalliferous drainage (AMD) from waste rock that will be mined from the open pits at Weld Range (Appendix A). The results of this programme indicated that there is potential for a proportion of the waste rock to be potentially acid forming. Results from the static and kinetic testing were used to estimate the potential seepage water quality that may be formed by the waste rock piles. The assessment was based on the assumption of 739 Mt of waste rock from both Beebyn and Madoonga deposits, produced over a twelve year period.

**Waste Characterisation**

The results from the Acid Base Accounting testing showed that for Madoonga, approximately 83 to 90% of the waste rock is likely to be NAF, with approximately 10% PAF. The PAF will comprise of portions of BIF, hydrated, mafic and shale, with up to 6% of the waste rock likely
to be classified as uncertain. For Beebyn, 99% of the waste rock is likely to be NAF, with about 1% PAF from the mafic domain (SRK, 2011).

The Kinetic Test results were used to estimate oxidation rates and solute release rates from the various material types, demonstrating that some of the materials were net acid generating. The shale was shown to be most reactive, followed by the hydrated BIF sample, which both had elevated content of sulphide sulphur. The Mafic and BIF samples were also net acid generating and had sulphide sulphur contents of 0.3% and 0.51%, respectively (SRK, 2011). Two potential contaminants, nickel and selenium are present in elevated levels.

Water Quality Estimation

The assessment undertaken by SRK to estimate water quality from the waste rock dumps was done on a “base-case evaluation”, under the assumption that the waste rock is intermixed. Each material type was assumed to react according to the reaction kinetics in the kinetic tests and the percolate water would represent a weighted average of these leach rates. In addition, to fully understand the ingress of oxygen to support oxidation reactions, detailed physical and geochemical properties of the waste material must be known. At this stage in the development of the Weld Range Iron Ore Project, SMC do not yet have this detailed information. Therefore, the assessment undertaken by SRK was based on simplified and conservative assumptions.

The water quality results indicated that the Madoonga dump is likely to be net acid generating, with percolate likely to contain concentrations of sulphate and metals. It is likely that seepage water at Madoonga will be unacceptable for direct discharge and therefore, mitigation will be required. A detailed waste production schedule is required to evaluate options for the management of waste rock during operations, which must include detail on waste properties such as sulphide. As stated above, this detail must be known to allow accurate assessment of the potential for acid generating waste, and in particular, the potential for the waste to be segregated and placed strategically within the waste rock dump, or for further consideration into backfilling (SRK, 2011).

For the Beebyn waste dumps, results indicated that seepage from the dumps should remain neutral in pH, with sulphate concentrations likely to be elevated and metal concentrations likely to be comparatively low (SRK, 2011). It is considered possible that without mitigation at Beebyn, the discharge would be acceptable; however a more in-depth impact assessment is required to evaluate the minimum requirements for oxidation control acid generation mitigation. The SRK report is attached in Appendix A.

Calculations show that, with appropriate mitigation methods such as those committed to by SMC, potential acid flow would be neutralised by the available ANC that remains in the waste rock at depth. Because of the high ratio of the oxidation zone to the balance of the dump a large excess of ANC is available. Therefore, water that seeps would be near neutral pH and the concentrations of metals in general would decrease.

Notwithstanding the low potential for AMD generation, SMC’s Acid and Mine Drainage Plan has been developed such that best practice management of AMD is implemented both throughout mining operations and at mine closure. The Plan has been developed in accordance with, and reference to, State and Federal guidance.
Receiving Environment

The surrounding environment is not considered to be sensitive to potential AMD impacts from the site due to a number of factors:

- As annual evaporation potential is significantly higher than precipitation, the potential for leaching in the long term though the waste rock dumps is predicted to be very low in the semi-arid climate. The mine can however, from time to time, experience extreme rainfall events as a result of subtropical cyclonic systems moving across WA from the northwest coastal regions.

- The nearest river, the Sanford River (a tributary of the Murchison River), is located approximately 25 kilometres to the west of the mine site. The results of modelling at Madoonga Creek (Worley Parsons 2008) suggest that all runoff during 20-, 50- and 100- year ARI design flood events will be contained within a significant salt pan depression immediately north of the Madoonga tenement. Thus there will be little or no outflow through Madoonga Gap.

- The groundwater down gradient from the proposed waste dumps is unlikely to be used for extraction for consumption by humans. Most of the groundwater beneath the waste dumps will flow towards the pit as a result of the cone of depression caused during mine dewatering.

- Surrounding flora and fauna are not likely to come into direct contact with mine site discharges as a result of the proposed surface water management control measures. Therefore, no pathway is thought to exist at this time linking these receptors with potential sources of AMD at the mine site.

- Two potential contaminants from metal leaching, nickel and selenium are found to naturally occur at elevated levels in the surrounding environment. In addition, selenium uptake will occur in the surrounding vegetation.

SMC does not have specific information regarding waste scheduling at this time. In addition, the water quality information is an estimation using the current data and therefore cannot provide the total load of chemicals that will leach. However, SMC will continue to do the appropriate testing throughout operations and will reassess the data when it is available. This will allow SMC to further develop the management required to mitigate potential leaching of contaminants before equilibrium is reached.

Post Closure Management of ADML

SMC proposes to implement a number of measures to either eliminate or reduce the potential for impacts on the environment. Specifically, the following measures are designed as a precaution should leaching occur from the encapsulated PAF material:

- Long term passive treatment systems, such as specifically designed wetlands or seepage interception drains lined with crushed limestone, can be used to treat any ADML that may be generated well after mine closure.
• At the time of mine closure, a system could also be designed such that any contaminated seepage discharge can be diverted into the mine voids which are expected to contain pit lakes but remain groundwater sinks.

2.4 Water Quality in Pit Lakes and Potential Impacts

Predictions should be provided on the long term water quality in the pit lakes, the rate of efflux from the pits in terms of hypersaline water and potential impacts to groundwater and fauna.

There is potential for pit lakes to become point sources of hypersaline water and as such impact on the surrounding groundwater resources. Page 24 of the Response to Submission document states that the concentrations of solutes within the Weld Range pit lakes will increase over time, due to the high evaporation and low precipitation of the area.

SRK (2010) reported that the contouring of the groundwater salinity data indicated that the regional groundwater is fresh (TDS < 500 mg/l) to marginal (500 < TDS < 1,500 mg/l), except in the boreholes or wells located in the palaeochannels. The palaeochannels presented areas of higher groundwater salinity. The water within the palaeochannels has been listed ranging from brackish (1,500 < TDS < 500 mg/l). Varying from 2,643 mg/l at 7 mile well to 4,900 mg/l at Gap bore to saline with the highest salinity measured at MDWB01 (48,000 mg/l), M_WBG_01R (63,000 mg/l) and M_LTM_04 (35,000 mg/l). Figure 2.2 illustrated the regional groundwater salinity described above.

During the PFS several bores were drilled to investigate the hydraulic characteristics of the ore and the country rock. The locations of these are illustrated in Figure 2.3 for Madoonga and Figure 2.4 for Beebyn with the water level and salinity results presented in Table 2.2 for Madoonga and Table 2.3 for Beebyn.

At Madoonga SRK believes that there is lateral distribution of the saline waters within the Gap.

Based on the estimation of pit lake elevation with time after pumping has stopped, as presented in the Weld Range PER page 143, reproduced here in Table 2.4, the pit lake will peak in Madoonga at 25 years to be at 430 mRL and Beebyn at 480 mRL. Both of these levels are below the known water levels as presented in Table 2.2 and Table 2.3 above, as such both pit lakes will create a sink. As stated in the PER, page 143, the groundwater will rapidly rebound within the first 5 years post pumping, followed by a slow down over time. A conceptual model showing this relationship is illustrated in Figure 2.5 for Madoonga pit and Figure 2.6 for Beebyn pit.

It is expected that the pit lakes will over time increase in salinity to become hypersaline lakes. The information currently available does not allow SMC to adequately determine the timeframe of this occurring. However, based on experience, SRK would estimate that this would potentially take over 100 years for this to occur. Monitoring information, which is to be gained from the proposed monitoring program, will allow the hydrological system of the area to be better understood to a level that will allow SMC to make these determinations.
Figure 2.2 – Regional Groundwater Salinity

(source SRK 2010 page 24)
Figure 2.3 – SRK 2010 bore locations for Madoonga.

Source Figure 4-15 from SRK 2010
Figure 2.4 – SRK 2010 bore locations for Beebyn.

Source Figure 4-16 from SRK 2010
Figure 2.5 – Madoonga pit conceptual cross section showing pit lake level compared with the know water table as presented in Table 1.

Not to scale.

West

The Gap

494 m RL

485.72 mRL water level

TDS 32000

Water this side more saline

East

Surface - 502 MRL (average)

485 MRL – water level (average)

430 MRL – Pit Lake level at 25 years

300 mRL

Water this side Fresh to marginal

Legend

Probable water movement at hydraulic head
Figure 2.6 – Beebyn pit conceptual cross section showing pit lake level compared with the known water table as presented in Table 1.

Not to scale.

Legend

Probable water movement at hydraulic head
### Table 2.2 – Summary of bore hole details for Madoonga

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<th>Ground Level (mRL)</th>
<th>Water levels (Nov 2009) (mRL)</th>
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<td>M_WBG_01R</td>
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<td>481.42</td>
<td>6.2</td>
<td>63000</td>
<td>Saline</td>
</tr>
<tr>
<td>M_WBG_02</td>
<td>490.91</td>
<td>481.90</td>
<td>Not</td>
<td>Not</td>
<td>Not Determined</td>
</tr>
<tr>
<td>M_WBG_02R</td>
<td>490.91</td>
<td>Not Determined</td>
<td>Not</td>
<td>Not</td>
<td>Not Determined</td>
</tr>
<tr>
<td>M_LTM_01</td>
<td>486.86</td>
<td>482.55</td>
<td>Not</td>
<td>Not</td>
<td>Not Determined</td>
</tr>
<tr>
<td>M_LTM_01R</td>
<td>486.86</td>
<td>Not Determined</td>
<td>Not</td>
<td>Not</td>
<td>Not Determined</td>
</tr>
<tr>
<td>M_LTM_01R2</td>
<td>486.86</td>
<td>Not Determined</td>
<td>Not</td>
<td>Not</td>
<td>Not Determined</td>
</tr>
<tr>
<td>M_LTM_02</td>
<td>504.66</td>
<td>483.43</td>
<td>6.7</td>
<td>390</td>
<td>Fresh</td>
</tr>
<tr>
<td>M_LTM_03</td>
<td>511.86</td>
<td>486.67</td>
<td>6.6</td>
<td>440</td>
<td>Fresh</td>
</tr>
<tr>
<td>M_LTM_04</td>
<td>494.79</td>
<td>480.82</td>
<td>7.0</td>
<td>35000</td>
<td>Saline</td>
</tr>
<tr>
<td>M_LTM_05</td>
<td>512.67</td>
<td>484.91</td>
<td>7.1</td>
<td>500</td>
<td>Fresh</td>
</tr>
<tr>
<td>M_LTM_06</td>
<td>535.87</td>
<td>501.51</td>
<td>7.1</td>
<td>520</td>
<td>Marginal</td>
</tr>
</tbody>
</table>

### Table 2.3 – Summary of bore hole details for Beebyn

<table>
<thead>
<tr>
<th>Drill Hole</th>
<th>Ground Level (mRL)</th>
<th>Water levels (Nov 2009) (mRL)</th>
<th>Final pH</th>
<th>Salinity (mg/L TDS)</th>
<th>Salinity</th>
</tr>
</thead>
<tbody>
<tr>
<td>B_WB2_01</td>
<td>517.79</td>
<td>488.76</td>
<td>8.6</td>
<td>1400</td>
<td>Marginal</td>
</tr>
<tr>
<td>B_WB2_02</td>
<td>541.04</td>
<td>491.24</td>
<td>7.6</td>
<td>950</td>
<td>Marginal</td>
</tr>
<tr>
<td>B_WB2_03</td>
<td>525.36</td>
<td>489.80</td>
<td>7.1</td>
<td>670</td>
<td>Marginal</td>
</tr>
</tbody>
</table>
### Table 2.4 – Pit lake levels over time

<table>
<thead>
<tr>
<th>Beebyn</th>
<th>Madoonga</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time post mining (yr)</td>
<td>Pit lake water level (m RL)</td>
</tr>
<tr>
<td>1</td>
<td>373</td>
</tr>
<tr>
<td>2</td>
<td>387</td>
</tr>
<tr>
<td>5</td>
<td>412</td>
</tr>
<tr>
<td>10</td>
<td>437</td>
</tr>
<tr>
<td>25</td>
<td>480</td>
</tr>
</tbody>
</table>

During mining of Beebyn and Madoonga, fresh rock will be exposed to the atmosphere with the surfaces becoming oxidised and thus generating soluble metal-bearing salts. Where pit lakes form, these metal bearing salts can be released into the systems becoming biologically available and have the potential to increase acidification.

The salinisation and acidification of a pit lake has the potential to impact the local and regional groundwater. The extent of this impact is dependent on the local hydrology and whether the pit will act as a sink or a flowthrough.

The final water quality within the SMC pit lake is dependent on a host of factors including the oxygen status, pH, composition of wall rock, concentration through evaporation (evaporation), biological activity and hydrothermal inputs (Water and Rivers Commission 2003). SMC understands that the pit lakes will increase in salinity, but have not quantified the water quality of the pit lakes over time.

In situ assay data from drilling completed by SMC confirms that the geology of the pits has the potential to contain lead, arsenic, copper and zinc. SMC has not undertaken testing to understand the existing state of the metals, the stability or the potential effects of pH buffering and salinity will have on mobility. However, the way in which quality will alter over time within pit lakes is difficult to predict as there is little research into the processes and a large number of variables within any given system.
There are two potential impacts arising for the formation of pit lakes at Beebyn and Madoonga:

- impact to fauna and
- potential efflux of saline water into the surrounding water table due to a change in the hydraulic head reversal.

The issue of hydraulic head reverse due to osmosis is a pertinent question. SRK’s experience in similar climatic scenarios indicates that pit lake water degradation due to evaporation is a process that occurs in the order of hundreds of years.

In determining the potential impacts, SMC is restricted given the above timeframe, the limited information of the hydraulic system and the limited understanding on hydraulic head reversal in pit lake scenarios. Monitoring information, which is to be gained from the proposed monitoring program, will allow the hydrological system of the area to be better understood to a level that will allow SMC to make determinations on what impacts may occur and the potential scale.

During the hydrological investigations SRK identified a significant palaeochannel in the “Gap” area adjacent to the Madoonga pit. This palaeochannel is responsible for most of the movement of groundwater between the two areas north and south of the Weld Range (SRK, 2010). Figure 2.7 illustrates a conceptual flow direction of the Project area.

To understand the impacts of efflux of saline water into the surrounding water table, potential sensitive receptors require identification regarding where they are located and the expected route of water flow. At Madoonga the most sensitive receptor is the “food bowl” area. If saline pit lake water at Madoonga was to enter the groundwater it would most likely flow into the Gap palaeochannel in a southerly direction away from the food bowl. Saline water may also travel to the south of the pit due to the local and groundwater flow. It should also be noted that the water in the palaeochannel is saline with a TDS of around 35,000.

If pit lake water at Beebyn was to enter the surrounding groundwater, it would flow in a southerly direction as the local and regional groundwater flows from north to south. Given the direction of groundwater flow, with the exception of stock bores, there are no known sensitive receptors in this area.

SMC as part of the PER and response to submissions (page 39) discussed that initially the pit lakes will represent an additional water source to fauna inhabiting Weld Range. An increase in density and number of introduced fauna is a likely result. This has the potential to negatively impact surrounding vegetation over the long term if the number of herbivores increases and increased predation on native and non-native herbivores is possible as well.

As discussed above there is the potential for the efflux of saline water, a process which is driven by the increased density of the salinity of the pit water pit against the apparent hydraulic gradient. It is considered unlikely that saline water would discharge from the pit due to the head of pressure required for this to occur.

The discharge of saline water into the groundwater is not considered to cause impacts to groundwater as the surrounding water is already saline. In the event that saline water was leaching into the surrounding groundwater, it would be returned to the system from which it came i.e. the system is closed and no net increase in salinity would occur. In addition, the recharge would occur deep within the groundwater.
Management

Management measures of the pit lakes include:

- Pit abandonment control measures have been developed and will be detailed in the conceptual closure plan (pg 29 RTS) and the Groundwater Management plan and Ground water operation strategy (31 RTS). Further to this Commitment 4 of the PER states that SMC will prior to dewatering activities, a Groundwater Management Plan will be developed and implemented in consultation with the DEC and DoW. The GMP will include a groundwater monitoring program, including monitoring of pit lakes.

- SMC has committed to fencing of the pits and constructing pit abandonment bunds to prevent access to water in mine voids by the feral fauna population upon closure (page 75 RTS documentation).

Monitoring

SMC committed to closure monitoring of the groundwater aquifer surrounding the pit will be monitored under the following periods as detailed in Table 3.2 of the Response to Submission documentation. Parameters measured will include salinity, pH and leachate of contaminants. Monitoring will cease when two consecutive results indicate a stable and acceptable environment similar to that identified prior to mining as defined in the Ground Water Operating Strategy.

Table 2.5 – Monitoring for salinity, pH and leaching of contaminants for pit lakes

<table>
<thead>
<tr>
<th>Monitoring Timescale</th>
<th>Period post closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly</td>
<td>Closure (0 years) to 4 years</td>
</tr>
<tr>
<td>Every 5 years</td>
<td>Year 5 to 25 years</td>
</tr>
</tbody>
</table>
Figure 2.7 – Regional Hydrology
2.5 Priority Ecological Community (PEC)  

Information should be provided on Priority Ecological Community (PEC) distribution, the cumulative impact of PEC loss and PEC communities in secure reserves.

2.5.1 Potential Future Mining at Weld Range

Current detailed mining evaluation, planning and a bankable feasibility study have been completed for the Beebyn (Lens ID W7, W8, W9, W10, W11 and W12) and Madoonga (W14 and W25) deposits (illustrated in Figure 2.9). On-going exploration has identified a further nine iron deposits which may eventually develop into a mine with subsequent impact on the environment. Calculations have been completed to quantify the likely range of disturbed area these other deposits may cause.

It is stressed that no actual evaluation of the projects other than Beebyn and Madoonga has been carried out. All of the ‘other deposits’ still require significant a exploration work to be completed before detailed mining evaluation and infrastructure planning can be completed or assessed, and whether they will ever be economically exploited is unknown. It is considered unlikely that the further exploration work will substantially increase these other deposits.

The methodology undertaken was to pro-rata the areal ground disturbance against the predicted mineable reserve, primarily based on the available data in the Hampton Hill Joint Venture Pre-Feasibility study (HHJV-PFS), or where not available ‘rule of thumbs’ based on the analogous available geology. This approach does not include any allowance for constructing roads as scope is too variable to make a meaningful estimate. A detailed breakdown of the estimate is shown in Table 2.6.

The likelihood of discovering additional deposits at Weld Range is considered moderate. However no new large (>50 MT Beebyn or Madoonga) scale deposits are expected to be found on the existing tenure, due to the nature of the iron mineralisation which is a function of surficial weathering of the BIF coupled with structural influences. Although most of the other deposits are not closed off along strike, the surface expression restricts the potential away from existing drilling. Economic limitations also restrict the depth extent of most of the mineralisation at Weld Range, which also restricts the areal extent. With the methodology used being based on Beebyn and Madoonga, it is likely that the pro-rata allocation of surface disturbance is overstated as both deposits are considerably deeper than the other resources and therefore these are likely to have smaller footprints.

2.5.2 PEC Communities in Secure Reserves

The PEC at Weld Range lies within the Wilgie Mia Reserve, a secure reserve 51 km² in size. Approximately 13.9% of the PEC is located within the Wilgie Mia Reserve. The extent of the Wilgie Mia Reserve and the PEC at Weld Range is shown in Figure 2.8.

SMC is in the final stages of signing a Mining Agreement with the Traditional Owners of Weld Range, the Wajarri Yamatji. An Exploration Agreement is currently used to manage Aboriginal heritage sites in conjunction with exploration activities at Weld Range. The current draft of the Mining Agreement and the existing Exploration Agreement both preclude SMC from exploring or mining with the Wilgie Mia reserve. The Wilgie Mia reserve is located centrally in the range (Figure 2.8) and is managed by the Aboriginal Lands Trust (ALT).
Access to the reserve is controlled by the ALT and a permit is required to conduct any activities in this area. SMC is not aware of any other reserves over the Weld Range.

Given the above agreements by SMC with the Wajarri People and the reserve status afforded by the ALT, SMC has no intention to mine with the reserve. SMC’s tenure over the reserve covers approximately 80%.
Figure 2.9 – Location of Potential Iron Ore Deposits at Weld Range
Table 2.6 – Predicted Disturbance on the PEC from Future Potential Mining at Weld Range

<table>
<thead>
<tr>
<th>Tenure</th>
<th>Deposit</th>
<th>Total Mineralisation</th>
<th>Geol Type</th>
<th>Resource-Reserve Conversion</th>
<th>Reserves</th>
<th>Area (H)</th>
<th>% PEC</th>
<th>% PEC (cumulative)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>+50%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>+54%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Actual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Predicted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>Predicted</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pit Dumps TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Existing Application</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMC</td>
<td>Beebyn North (W30, W31, M3, W45)</td>
<td>30,785</td>
<td>4,792</td>
<td>57%</td>
<td>17,600</td>
<td>17,600</td>
<td>61</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>W38/W39</td>
<td>3,206</td>
<td>1,858</td>
<td>57%</td>
<td>1,833</td>
<td>6</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>W44*</td>
<td>673</td>
<td>W30</td>
<td>57%</td>
<td>385</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Additional SMC Tenure Potential</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMC / HHM JV</td>
<td>W6</td>
<td>20,439</td>
<td>2,069</td>
<td>19%</td>
<td>3,812</td>
<td>13</td>
<td>22</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>W29*†</td>
<td>4,440</td>
<td>391</td>
<td>W6</td>
<td>828</td>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>W15</td>
<td>9,117</td>
<td>1,513</td>
<td>W14</td>
<td>6,200</td>
<td>21</td>
<td>36</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>W17</td>
<td>4,263</td>
<td>1,922</td>
<td>W14</td>
<td>1,500</td>
<td>5</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>W19*†</td>
<td>1,549</td>
<td>447</td>
<td>W30</td>
<td>886</td>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>
### Total Additional SMC Tenure Potential

<table>
<thead>
<tr>
<th></th>
<th>3,995</th>
<th>3,159</th>
<th>2,836</th>
<th>10</th>
<th>16</th>
<th>26</th>
<th>0.13%</th>
<th>9.78%</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20‡</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Total Additional Potential (excludes Beebyn and Madoonga, and sub-economic deposits)

<table>
<thead>
<tr>
<th></th>
<th>123</th>
<th>208</th>
<th>331</th>
<th>1.63%</th>
<th>9.78%</th>
</tr>
</thead>
</table>

*Currently viewed as sub-economic (insufficient tonnes).

†Deleterious element issues (phosphorous) currently exclude this material from being mined.

‡Cultural sensitivities likely to impact the potential to exploit this deposit W20.
2.6 Offset Programme

The offset programme should be further discussed with the Office of the EPA and the Department of Environment and Conservation to address long term environmental benefits, monitoring and measurability and success criteria.

SMC has continued discussion with the Office of the EPA and the Department of Environment and Conservation (DEC) regarding the offset programme for the Weld Range Iron Ore Project (Table 2.7). The current offset package is outlined in Table 2.8.

Table 2.7 – SMC’s Government Consultation regarding the Offset Programme

<table>
<thead>
<tr>
<th>Consultation</th>
<th>Discussion</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office of the EPA</td>
<td>• Discussion of Key Residual Impacts&lt;br&gt;• Discussion of relevant example project offsets&lt;br&gt;• Discussion of offset options and alternatives&lt;br&gt;• Direction from EPA to consult DEC Environmental Management Branch to develop appropriate offsets.</td>
<td>06/03/2012</td>
</tr>
<tr>
<td>DEC and Office of the EPA</td>
<td>• Discussion of Key Residual Impacts&lt;br&gt;• Discussion of offset options and alternatives&lt;br&gt;• General agreement on proposed offsets</td>
<td>14/03/2012</td>
</tr>
</tbody>
</table>

It is proposed that contributing offsets include the removal of feral goats control and de-stockling of an area covering approximately 18,000 ha over Weld Range. Fencing will also be put in place to prevent access to water in mine voids by the feral fauna population upon closure.

Monitoring

The objectives of monitoring performance are as follows:

- Evaluating the effectiveness of the implemented measures and determining whether additional measures are required;
- Monitoring the improvement of the native vegetation / fauna habitat within the Project Area over time; and
- Assessing progress towards meeting the success criteria.
Performance of the offsets will be evaluated against the success criteria. All performance monitoring will be undertaken by qualified SMC personnel or suitably qualified consultants.

**Table 2.8 – Proposed offsets, benefits, monitoring and measurability for the Weld Range Iron Ore Project**

<table>
<thead>
<tr>
<th>Proposed Offset</th>
<th>Long Term Environmental Benefits</th>
<th>Monitoring</th>
<th>Measurability</th>
<th>Success Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destocking of feral goats and livestock over 18,000 ha at Weld Range</td>
<td>Increased diversity and abundance of native vegetation</td>
<td>Conduct a baseline survey to determine the initial numbers of goats</td>
<td>Numbers of animals</td>
<td>Improvement in numbers of native plants per hectare</td>
</tr>
<tr>
<td></td>
<td>Increased diversity and abundance of native fauna</td>
<td>Record monthly inspections of sightings and evidence of goats on site and around areas such as water bodies</td>
<td>Numbers and conditions of tracks</td>
<td>Amount of faecal matter</td>
</tr>
<tr>
<td></td>
<td>Reducing erosion</td>
<td>Monitoring of vegetation at permanent photographic monitoring points</td>
<td>Evidence of grazing</td>
<td>Evidence of grazing</td>
</tr>
<tr>
<td></td>
<td>Reduction of animal pests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priority Flora Investigation</td>
<td>Further knowledge and understanding of regional populations of Priority Flora around Weld Range and the Midwest, leading to successful conservation of native flora and vegetation</td>
<td>Permanent flora quadrats</td>
<td>Number of priority flora</td>
<td>Increase in the knowledge of priority flora</td>
</tr>
<tr>
<td></td>
<td>A priority flora surveys undertaken by an expert environmental consultant.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In consultation with the DEC, SMC will monitor feral goat populations to determine whether the control strategy is effective in conserving vegetation. Goat populations will be monitored using fauna monitoring sites before the commencement of site clearing operations. The program will continue throughout operations until mine closure has successfully been achieved.
Monthly inspections will be undertaken to record the conditions of all water sources within the project area. The site environmental officer will be responsible for recording any sightings or evidence of feral animals, particularly goats.
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REFERENCES


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Appendix A

SRK REPORT