Ellendale 4 Diamond Project, West Kimberley

Kimberley Diamond Company NL

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
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Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
17/01/05	**Intention to set Level of Assessment of EPS advertised**	
16/03/05	**Draft Proponent EPS document submitted**	**9**
08/06/05	**Final Proponent EPS document submitted**	**12**
13/06/05	**EPA report to the Minister for the Environment**	**1**

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Contents

Page

1. Introduction 1

2. The proposal 1

3. Consultation 7

4. Relevant environmental factors 7

5. Other Advice 15

6. Conclusions 15

7. Recommendations 16

Table

Table 1 Key Characteristics of the Proposed Ellendale 4 Diamond Mine and Processing Plant

Figures

Figure 1 : Project locality map

Figure 2: Project site layout

Figure 3: Processing plant layout

Appendices

1. References
2. Recommended Environmental Conditions and Proponent's Consolidated Commitments

1. Introduction

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment on the environmental factors relevant to a proposal by Kimberley Diamond Company NL (KDC) to develop a deep open cut pit and processing plant for the production of diamonds.

The EPA was advised of the proposal in December 2004. Based on the information provided, the EPA considered that while the proposal had the potential to have an effect on the environment, the proposal could be readily managed to meet the EPA's environmental objectives. Consequently it was notified in *The West Australian* newspaper on 17 January 2005 that, subject to preparation of a suitable Environmental Protection Statement (EPS) document, the EPA intended to set the level of assessment at EPS.

The proponent has prepared the EPS which accompanies this report (*Ellendale 4 Diamond Project, West Kimberley Region, Western Australia, Kimberley Diamond Company NL, 2005*). The EPA considers that the proposal described can be managed in an acceptable manner subject to the EPA's recommended conditions and the proponent's commitments being made legally binding.

The EPA therefore has determined under Section 40 (1) that the level of assessment for the proposal is EPS, and this report provides the EPA advice and recommendations in accordance with Section 44 (1).

2. The proposal

The proponent already operates an open cut diamond mine and processing operation (Ellendale 9) 15 kilometres north-west of the Ellendale 4 site. The present proposal is for a new mine pit and processing plant at the Ellendale 4 site on Mining Lease 04/372. The proposal is described in detail in Section 3 of the proponent's "*Ellendale 4 Diamond Project, West Kimberley Region, Western Australia*" document (EPS). Figure 1 Project locality map shows the location of the proposal. The proposal is for the development of a deep open cut mine and construction of a processing plant at the Ellendale 4 site. Mining will take place below the groundwater table and dewatering of the pit will be required. It should be noted that the proposal area does not extend into the adjacent Devonian Reef (Oscar Range) Conservation Park. The potential for impacts to the groundwater and surface water in the Oscar Range Park is addressed in Section 4.1 and 4.2 of this report.

Table 1 lists the key characteristics of the proposal. Figures 2 and 3 show the location of the key components of the proposal.

Dimensions of major components of the proposal are:

- Approximately 514 hectares of vegetation disturbance;
- Open pit to 110 metres below ground surface and area of approximately 68 hectares (including bunds);
- Waste dumps of approximately 68 hectares;

- Coarse tailings dump of approximately 33 hectares;
- Tailings storage facility for fine tailings of approximately 180 hectares to hold approximately 20.4 million tonnes of tailings; and
- Water collection pond of approximately 34.5 hectares.

Table 1: Key Characteristics of the Proposed Ellendale 4 Diamond Mine and Processing Plant

Element	Description
Life of project (mine production)	6 years (continual operation)
Size of orebody: • Inferred (this proposal) • Defined • Waste	 25.5 million tonnes 15 million tonnes 11.5 million tonnes
Depth of mine pit	110 metres below ground surface
Area of disturbance (including pit, associated infrastructure and access)	514 hectares
Mine operation	24 hours per day, 7 days per week
List of major components: • Open cut pit • Run of Mine (ROM) pad • Topsoil, low grade, oversize and lights stockpiles • Two waste dumps (11.49 million tonnes) • Coarse tailings waste dump • Processing plant with crushing, washing and screening circuits • Power station and fuel farm • Process and raw water ponds • TSF for thickened fine tailings • Water collection pond (tailings water and runoff) • Production borefield adjacent to the southern mining lease boundary • Dewatering and monitoring bores • Haul roads and other access roads • Laydown areas • Mine administration offices and contractor's workshops • Recovery room for X-ray sorting • Cattle exclusion fences around the entire E4 operation • Borrow pits for construction	Refer to Figures 2 (mine layout) and 3 (processing plant layout). Refer to Figures 2 (mine layout) and 3 (processing plant layout).

Element	Description
materials	
Processing:	
• Design rate	600 tonnes per hour
• Annual rate	4.4 million tonnes per annum
• Dense Medium Separation (DMS)	Ferrosilicon medium
• Process circuit water requirement	1,950 kilolitres of water (at any given time)
• Make-up water requirement	306 to 380 kilolitres per hour
Tailings:	
• Fine (less than1.6mm)	Disposed in central thickened TSF 20.4 million tonnes (13.6 million cubic metres) design capacity
• Coarse (1.6 to 14mm)	Disposed in waste dump 6.88 million tonnes (4.7 million cubic metres)
• Primary recovery rejects.	44,000 tonnes per annum - may be reprocessed
Waste rock dumps:	
• North Dump	2.9 million loose cubic metres (19 hectares footprint)
• South Dump	4.9 million loose cubic metres (49 hectares footprint)
Height	Maximum 30 metres
Slope batters	15°
Lifts	10 metres
Water supply:	
• Source	Grant aquifer, 8 production bores
• Annual requirement	3.3 gigalitres per annum
Pit dewatering (of Ellendale 4 lamproite aquifer):	
• Method	4 dewatering bores and in-pit sumps
• First year of dewatering	600,000 kilolitres
• Ongoing (after first 21 months)	150,000 kilolitres per annum
Power supply:	
• Power station	6 x 1 megawatt diesel powered generating sets (11 kilovolt power supply at each transformer)
• Borefield	Stand-alone diesel generators at each bore site
Fuel quantity used	Estimated 11 million litres per annum

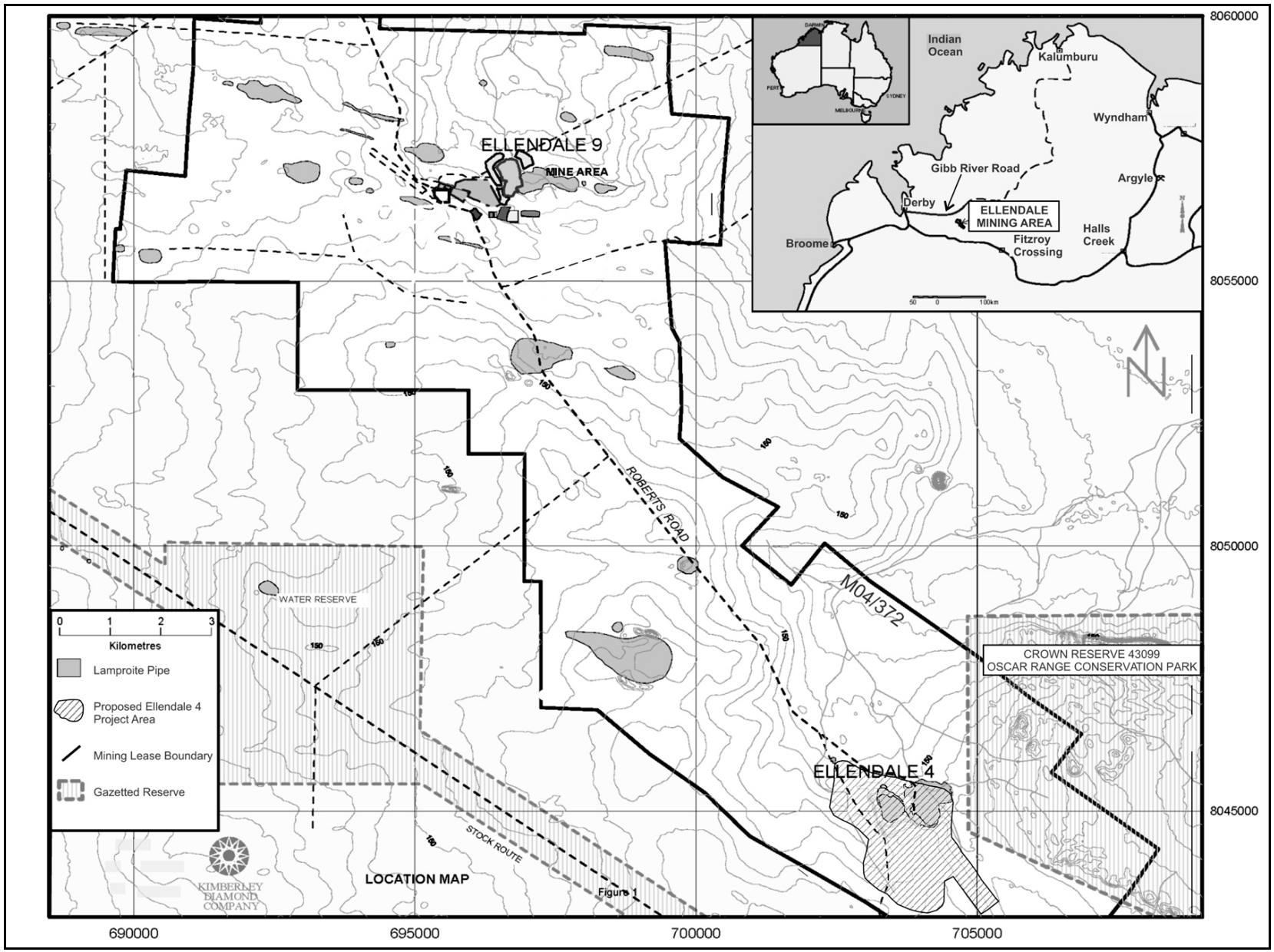

Figure 1: Project locality map (Kimberley Diamond Company NL, 2005)

Figure 2: Project site layout (Kimberley Diamond Company NL, 2005)

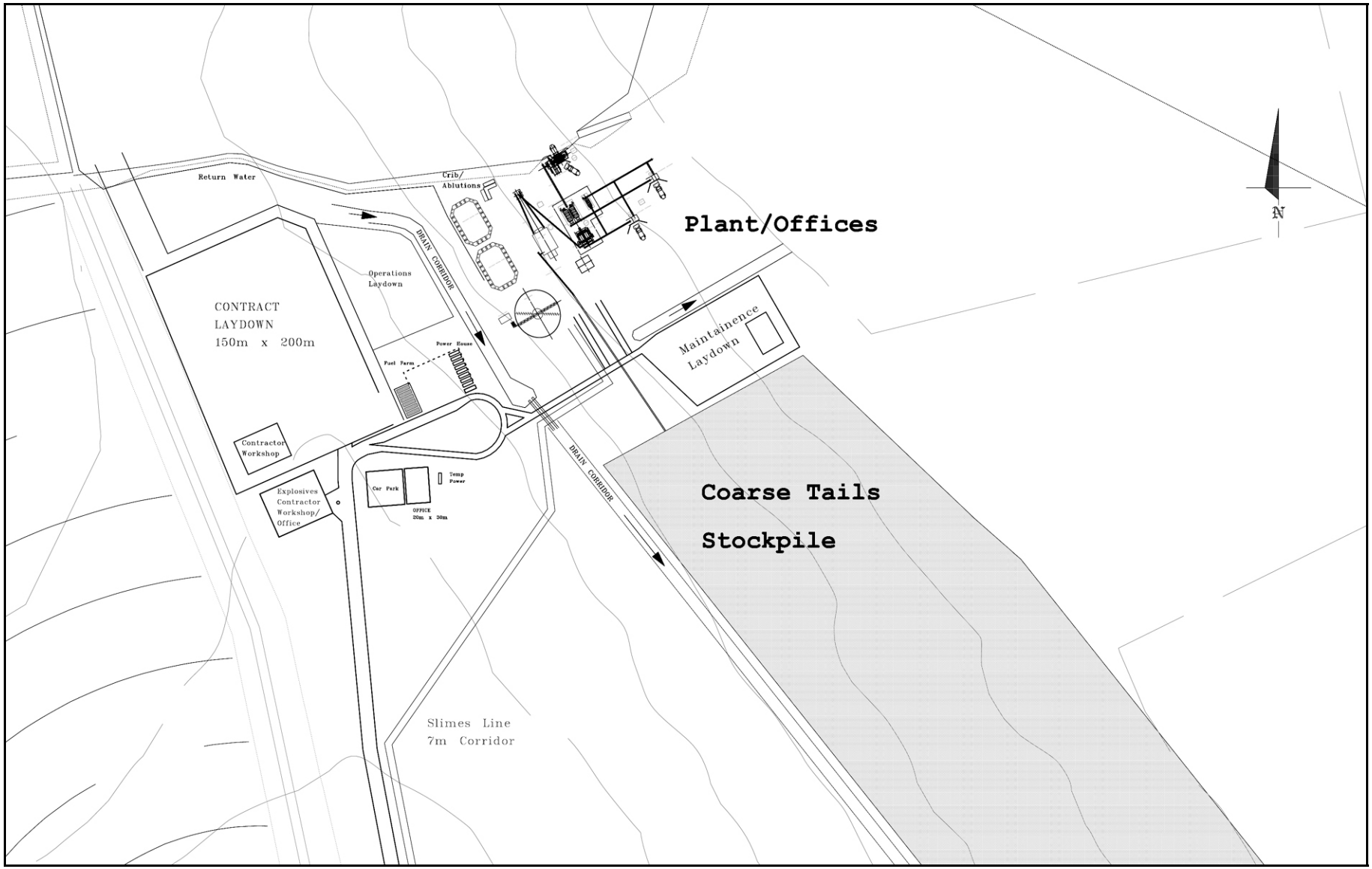

Figure 3: Processing plant layout (Kimberley Diamond Company NL, 2005)

3. Consultation

During the preparation of the EPS, the proponent has undertaken consultation with government agencies, Aboriginal groups and pastoralists with a direct interest in the project and other key groups. The community was also invited to comment on the proposal via advertisements in the local paper and *The West Australian* newspaper. The organisations consulted, the comments received and the proponent's response are included in Section 7 of the EPS (*Ellendale 4 Diamond Project, West Kimberley Region, Western Australia, Kimberley Diamond Company NL, 2005*).

4. Relevant environmental factors

The summary of all of the environmental factors and their management is outlined in Table 2.2 of the EPS (*Ellendale 4 Diamond Project, West Kimberley Region, Western Australia, Kimberley Diamond Company NL, 2005*).

In the EPA's opinion the following are the environmental factors relevant to the proposal:

a) Groundwater and stygofauna;

b) Surface water;

c) Terrestrial fauna; and

d) Rehabilitation and Closure.

There were a number of other factors which were very relevant to the proposal, but the EPA considers that the proponent's proposed management of the issues will ensure that the EPA's objectives are not compromised. Aboriginal heritage is one such factor. However, the one Aboriginal heritage site identified in the project area has, in consultation with Aboriginal advisers and with the permission of the Minister for Indigenous Affairs, already been salvaged and moved to another location. Two other sites not directly impacted by mining will be protected during the mining operation.

For the factor of European heritage, the proposal does not impact upon Eighty One Mile Vent which is listed as a heritage place by the National Trust. The location of one "Lonely grave" is unknown and may possibly be in the project area. If the grave is discovered KDC will seek advice from relevant authorities on the management of the site.

Vegetation and weed management are also relevant factors but can be managed by the proponent's commitment to incorporate environmental management actions into the operational procedures to ensure mitigation of impacts on the environment. No threatened ecological communities or declared rare or priority flora have been found in the area to be cleared. Most of the plant communities recorded in the Ellendale Diamond survey area are well represented in the regional context. The disturbance to these communities by mining activity within the survey area is therefore expected to have minimal impact on conservation of these vegetation communities in the wider regional area.

Some vegetation communities within the Ellendale lease area were considered to be locally significant. These were restricted to small isolated specific sites or moister habitat preferences on the Ellendale lease. One small clay pan area subject to seasonal inundation is within the Ellendale 4 project area. The vegetation of this area is not indicative of a semi-aquatic floral assemblage as in other seasonally inundated areas and is not considered to be locally significant.

Eight species were found outside their known range. Four of the species are widespread and the range extension is on the fringe of their occurrence. The other four species are less well researched within the region. The discovery of these species outside of their know range may be due to the paucity of vegetation surveys conducted in the survey area and the surrounding area. None of the range extensions occur only in the Ellendale 4 area.

KDC has designed the project to avoid the Oscar Range Conservation Park and committed to management actions to prevent unnecessary access to the Park by its employees.

Short-range endemic invertebrate fauna (eg landsnails, millipedes) may be present on the sandstone ridge in the project area. Impact on the sandstone ridge, particularly the south face where short-range endemics are most likely, has been minimised. With the implementation of dust control measures, the potential for impact on any short-range endemics that may inhabit the ridge is minimal.

Greenhouse gas emissions are estimated to be 27 500 tonnes per annum of carbon dioxide from fuel use and there will also be loss of carbon sink function due to vegetation clearing. This is not considered to be a significant greenhouse gas impact.

4.1 Groundwater and stygofauna

Description

Groundwater quantity

The proposal involves the dewatering of the mining pit situated in the Ellendale 4 lamproite pipe and the supply of process water from the Grant aquifer. Potential environmental issues resulting from the use of groundwater are as follows:

- drawing water from the Grant aquifer will lower groundwater levels and reduce groundwater reserves in the aquifer which may affect pastoral water supplies;
- dewatering the Ellendale 4 lamproite pipe may affect water levels in the adjoining Satellite Pipe aquifer and will affect stygofauna inhabiting the Ellendale 4 aquifer; and
- lowering of groundwater levels may affect natural springs in the Oscar Range.

Rockwater Pty Ltd have undertaken a range of studies on the groundwater in the area and modelling of the anticipated effects of water abstraction. The results of these investigations are summarized in Appendix 2.2 of Volume 2 of the EPS (*Ellendale 4 Diamond Project, West Kimberley Region, Western Australia, Kimberley Diamond Company NL, 2005).*

Stygofauna

Preliminary stygofauna surveys were carried out by Kimberley Diamond Company in the Satellite Pipe and Oscar Range Park in 2002 and 2003. In 2003, 2004 and 2005 four additional sampling rounds, under the direction of MBS Environmental and Dr Brenton Knott of the University of Western Australia, were carried out on the Ellendale 4 pipe, the Satellite pipe, the faultline and the limestones of the Oscar Range. All species found in the Ellendale 4 deposit were found in the Satellite pipe and Oscar Range limestone except for one specimen, thought to be an *Ostracoda* species. Identification of this species was not possible due to the specimen being incomplete and in an advanced stage of decomposition.

Groundwater quality
Water in the Grant aquifer is of good quality and suitable for drinking water. Groundwater quality could be impacted by:

- the leaching of contaminants from waste dumps; or
- the pit lake formed at the cessation of mining affecting the groundwater quality.

The processing of the ore is primarily a physical separation process and with no addition of large quantities of chemicals. The only chemical which may have a potential environmental impact is the flocculant used to thicken the tailings, which contains a hydrocarbon solvent. Some of the hydrocarbon solvent will be recycled in reclaimed water from the thickening process. The remainder will bind to the tailings or precipitate out in the water containment pond. Any solvent that may seep from the tailings storage facility is unlikely to have any measurable impact on the quality of water in the Grant aquifer as the aquifer is approximately 40 m below groundlevel in this area and contaminants will be attenuated by the soil. The depth and volume of the aquifer will dilute any contaminants that reach the water table.

Any low levels of metals that may leach from the tailings or waste dumps will similarly be attenuated by the underlying sands and diluted if they reach as far as the aquifer. Studies have shown that the waste will not produce acid drainage (Appendix 1.5 of *Ellendale 4 Diamond Project, West Kimberley Region, Western Australia, Kimberley Diamond Company NL, 2005)*.

It is predicted that the pit lake, formed after the cessation of mining, will function as a through-flow cell to the north-west where the pit wall will intersect the Grant formation. Salinity of the pit water is expected to increase to 900 –1000 milligrams per litre (mg/L) Total Dissolved Solids (TDS). Modelling predicts that a localised plume of higher salinity water (400-600 mg/L TDS) may extend down-gradient of the final void in the Grant formation. After 100 years, the plume of higher salinity water in expected to extend up to 250 m north-west of the pit (Appendix 2.2 of Volume 2 of the EPS: *Ellendale 4 Diamond Project, West Kimberley Region, Western Australia, Kimberley Diamond Company NL, 2005).*

Assessment
The area considered for assessment of this factor is the area affected by the drawdown in groundwater levels caused by pit dewatering and abstraction of water for mine use and the area down gradient of the final void affected by the localised plume.

The EPA's environmental objectives for this factor are: to maintain the quantity and quality of groundwater so that existing and potential uses, including ecosystem maintenance, are protected and to maintain the abundance, species diversity and geographical distribution of subterranean fauna.

Groundwater quantity
The EPA notes that the following conclusions have been drawn from the groundwater studies that have been undertaken:

- A hydraulic barrier is interpreted to exist between the Grant formation and the limestone formation to the east of the Oscar Fault. Therefore lowering the groundwater levels in the Grant aquifer will not impact on groundwater levels of the Oscar Range Park;
- The calcrete aquifer in the Ellendale 4 lamproite pipe is isolated from the Grant formation by quartzite rims formed through contact metamorphism. The water level in the pipe aquifer is some 30m higher than the level of the Grant aquifer;

- There is no connection between the aquifer in the Ellendale 4 lamproite pipe and the Satellite pipe where water levels are approximately 13m higher. However, in the north-east section where the Ellendale 4 pipe overlaps the Oscar fault it is in hydraulic connection with the limestone formation. During the wet season there is flow from shallow karstic material in the limestone which allows water to channel across the Satellite aquifer and probably to infiltrate to the Ellendale 4 aquifer. Therefore dewatering the Ellendale 4 aquifer will not impact the Satellite Pipe aquifer, but stygofauna may be able to move from the Satellite pipe to Ellendale 4 to recolonise the aquifer;
- Stygofauna studies have indicated that the stygofauna of the Ellendale 4 aquifer are widespread and common within the Ellendale 4 and Satellite Pipe areas, adjoining limestones and Oscar Range.
- Approximately 50% of the Ellendale 4 aquifer will be dewatered leaving a refuge for stygofauna in the remaining 50% of the aquifer in localized basins;
- The springs and the water table in the Oscar Ranges have a water level approximately 10 to 15m higher than the Ellendale 4 aquifer and are not expected to be affected by dewatering of the Ellendale 4 aquifer;
- The lowering of water levels in the Grant aquifer will not impact on vegetation as the impacted area of the Grant aquifer lies between 45m and 9m below ground level. It is unlikely that vegetation in the drawdown area is groundwater dependent;
- The lowering of water levels in the Grant aquifer has been modelled and is not expected to substantially impact on pastoral bores. The closest pastoral bore that potentially draws water from the Grant aquifer is 6 km from the borefield and the calculated drawdown at the bore is 1.3m after ten years of water abstraction;
- It is estimated that water abstracted from both the Ellendale 9 and Ellendale 4 borefields will be about 5% of groundwater flow through in the aquifer per year. Pastoral water supplies should not be affected;

On the basis of these investigations the EPA concludes that it is unlikely that significant adverse impacts will occur on the Oscar Range springs. Based on groundwater modelling no significant adverse effect is expected on pastoral bores after ten years of water abstraction. Nevertheless should monitoring show that significant impacts are occurring, the proponent should have in place contingency plans which can be implemented to reduce or avoid these impacts. Condition 6 is recommended to this effect.

Stygofauna

With respect to stygofauna, the EPA concludes that the hydraulic connection via the shallow aquifer between the Ellendale 4 and Satellite Pipe area makes it very unlikely that any unique species exists in the Ellendale 4 Pipe.

Groundwater quality

The EPA notes that the majority of the chemicals that are added to the process raise no environmental concern in small quantities. The hydrocarbon solvent in the flocculant is not expected to have a detectable impact on water in the Grant aquifer.

With respect to the post closure pit lake, the EPA notes that a localised plume of higher salinity water of 400-600 mg/L TDS is predicted. The plume has been modelled to reach 250m down gradient of the pit after 100 years. The plume's salinity level is still within accepted limits for drinking water and stockwater.

The limestone of the Oscar Range is expected to act as an aquatard and there should be no groundwater flow from the mine site area into the Park.

A Groundwater Operating Strategy is required under a licence for groundwater abstraction. The monitoring and managing of groundwater quality with respect to contamination caused by seepage from the tailings storage facility can also be addressed through licensing under Part V of the *Environmental Protection Act 1986*.

The EPA considers the factors of groundwater and stygofauna have been adequately addressed and can meet the EPA's objectives for this factor provided that contingency plans are in place for any unanticipated adverse impact of pit dewatering and groundwater abstraction.

4.2 Surface Water

Description

Possible impacts on the quality of surface water are:

- Run-off from waste dumps may contain sediment and low levels of metals;
- Water discharged from the tailings storage facility may contain low levels of metals, processing chemicals and flocculant; and
- Water quality in the pit lake may not be meet ecological protection guidelines.

Studies of the hydrology of the area have shown that Ellendale 4 is located on the divide between the Lennard and Fitzroy Rivers. Most of the site drains to the north-west to Mt North Creek and the Lennard River, with the exception of 57 hectares in the eastern part of the site that drains south-west via Mt Wynne and Mt Hartman Creeks. The relatively small area of disturbance to the area of catchments will not impact water flows to the rivers.

The catchment upstream of the project area drains to a well-defined line (Satellite Creek) adjacent to and east and north of the ore-body. Drainage from the Oscar Range is intercepted and diverted to the north-west by this drainage line. Drainage from the project area will drain to the north-west, to the pit, to Satellite Creek or (for the area in the Fitzroy catchment) to an eastwards draining valley. Drainage from the project site, therefore, should not flow into the Oscar Range Conservation Park.

Silt traps will be utilised to reduce sediment in run-off and management actions will be taken to prevent erosion, such as stabilisation of bare areas and design of surface water management structures to prevent erosion. The leachable concentrations of metals in the waste materials are relatively low and it is unlikely that run-off from waste dumps would contain levels of metals that would adversely impact the environment.

Water in the pit after the cessation of mining is predicted to increase in salinity to 900-1000 mg/L TDS. This is at the upper limits of acceptable drinking water quality. It is predicted that the pit will be a through-flow system with wet season recharge acting to flush the pit. Convective overturn currents in the pit lake are predicted to oxygenate the water, precipitate dissolved iron and remove some of any remaining minor contaminants.

Assessment

The area considered for assessment of this factor is the area of the Ellendale 4 project and downstream areas receiving surface water from the project area.

The EPA's environmental objective for this factor is: to maintain or improve the quality of surface water to ensure that existing and potential uses, including ecosystem maintenance, are protected.

The EPA concludes from the information provided that the Oscar Range Park will not be impacted by the project as drainage from the project site does not flow to the Park.

The EPA notes that water should not be discharged to the environment from the tailings storage facility or water storage dam unless testing confirms that it contains no levels of contaminants that would affect ecological systems. The discharge of water from the tailings storage facility and water containment dam associated with the tailings facility can be managed by licensing under Part V of the *Environmental Protection Act 1986*.

The EPA notes that it is predicted that the quality of water in the pit lake, while being at the upper limits of acceptable drinking water quality, is expected to meet the ANZECC/ARMCANZ Guideline levels for the protection of freshwater aquatic ecosystems.

The EPA considers the issue of surface water has been adequately addressed and can meet the EPA's objectives for this factor provided that any discharge of water from the tailings storage facility and associated water containment dam to the environment is managed under the Part V provisions of the *Environmental Protection Act 1986*.

4.3 Terrestrial Fauna

Description

Fauna surveys were undertaken in May 1980 (dry season), May 2001 (dry season) and December 2002 (wet season). The project area has the potential to support 27 species of terrestrial fauna, consisting of eight mammals, two reptiles and 17 birds, protected under State and Commonwealth legislation. Sixteen of these species are considered to have a relatively high probability of occurrence. Of these only two mammals and seven birds have been recorded in surveys of the area. The Lakeland Downs Mouse (*Leggadina lakedownensis*) is a Priority 4 species and prefers clay-based soils for its habitat and was recorded in all three fauna surveys, but only in the Oscar Range Park in the 2002 survey. Areas that will be destroyed by infrastructure in the Ellendale 4 area are mostly sandy, which is not the Lakeland Downs Mouse preferred habitat, but there are smaller areas of clay based soils which may support the Lakeland Downs Mouse.

The other protected mammal inferred, by the observation of a burrow system north of the project area, to be in the project area is the Bilby (*Macrotis lagotis*) which is listed under the *Environment Protection and Biodiversity Conservation Act 1999* as Vulnerable and in Schedule 1 Division 1 of the State *Wildlife Conservation Act 1950*. In addition six migratory birds, protected under international treaties, have been recorded in the project area.

The fauna surveys initially undertaken in 1980, 2001 and 2002 contained few sampling sites located in the area to be impacted by the Ellendale 4 project. The proponent considered that many of the vegetation communities in the total Ellendale Project Area reflect the local variation in plant communities of subtle differences over small scales. It was concluded that these minor shifts in some dominant plant species within the vegetation communities were too subtle for many vertebrate fauna species to recognise and a large proportion of the animals

recorded would occur in most of them. Many of the vertebrate fauna species tend to depend on the flowering and/or seed set of the plants and therefore their occurrence in various vegetation communities would shift with different seasons and different flowering events. The presence of many invertebrates would also follow a similar shift during different seasons. Based on this, the proponent considered that the coverage of the fauna habitats within the total Ellendale Project Area was adequate for establishing a seasonal inventory of vertebrate species in the total Ellendale project area.

However, as the 2001 and 2002 fauna surveys consisted of only one sampling site in the actual area to be impacted by the Ellendale 4 mine site and not all the different vegetation communities within the Ellendale 4 project area were systematically sampled for fauna, the EPA considered it was necessary that a further fauna survey be undertaken during the preparation of the EPS document, with sampling in the area to be impacted at sites representing the land systems and major fauna habitats in the area of disturbance. Further sampling sites at a similar lamproite pipe were also included to confirm the presence of fauna at other locations outside the area of disturbance.

Following concerns being expressed about the possible presence of the Bilby or other specially protected fauna in the project area, a further search was undertaken for Bilby or other significant species. This involved a one-off search for tracks, burrows or animals. No protected species were identified in the Ellendale 4 area by this search.

Assessment

The area considered for assessment of this factor is the area of the Ellendale 4 project.

The EPA's environmental objective for this factor is to maintain the abundance, species diversity and geographical distribution of terrestrial vertebrate fauna (mammal, birds and reptiles).

The additional 2005 survey confirmed that the results of the 2001 and 2002 surveys of the total lease area were representative of the fauna and the habitats in the Ellendale 4 area. There were no species present in the Ellendale 4 area that were dependent upon any single habitat in that area. The 2005 survey found no rare, threatened or vulnerable species in the Ellendale 4 area, including the Lakeland Downs Mouse.

The EPA considers that some impact on the Lakeland Downs Mouse may be possible but that the scale of the impact is not significant. No signs of Bilby have been found in the project area. It is therefore unlikely that there is any significant population of Bilby in the project area although the lack of discovery of the presence of the species does not conclusively prove that there are no individuals in the area. The EPA notes that it is the intention of the proponent to clear vegetation from the inside to the outside of the project area, giving fauna more chance of leaving the area ahead of clearing. The EPA also notes that the proponent intends to implement feral animal programmes and minimise the use of barbed wire to protect the Ghost Bat (*Macroderma gigas*).

Birds and migratory birds in the area are unlikely to be impacted as the area of vegetation clearing is small in the context of the area of similar vegetation and habitat for birds.

The EPA considers that the impact upon terrestrial fauna will not be so severe as to endanger the survival of any species and that good management will reduce the impacts on terrestrial

species. A condition requiring a management plan for fauna that may become trapped in open pits, holes and trenches has been recommended (Condition 7).

The EPA concludes that the factor of terrestrial fauna can be managed to meet the EPA's objective for this factor, provided the management actions as described in the EPS document (*Ellendale 4 Diamond Project, West Kimberley Region, Western Australia, Kimberley Diamond Company NL, 2005)* are incorporated into operational procedures as committed to by the proponent and a fauna management plan to avoid or reduce impacts on fauna that may be trapped in pits or trenches is in place.

4.4 Rehabilitation and Closure

Description

The amount of vegetation to be cleared for this project is approximately 514 hectares. It is planned to rehabilitate 463 hectares of the vegetation disturbance, with the remaining 51 hectares being the pit lake.

The pit lake is likely to be a long term impact from the project, unless further mining in the future leads to a different rehabilitation option. The resource is considered to be "open at depth" and at this stage there is no proposal for the back-filling of the pit as this would prevent further mining of the resource.

Assessment

The area considered for assessment of this factor is the Ellendale 4 project area.

The EPA's environmental objective for this factor is: to ensure that the impacted area is rehabilitated to an acceptable standard that is compatible with the intended land use and to protect threatened fauna and priority fauna species and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950* and the *Environment Protection and Biodiversity Conservation Act 1999*.

The EPA considers that the proponent needs to ensure that the pit lake is designed for long term stability and that the lake shoreline or pit wall should be competent, stable and safe in the long term when exposed to wave action and stock and allow for the egress of animals. The EPA notes that the proponent has amended the proposal to include a safe and stable slope on the north side of the pit and ramps on the southern side of the pit for fauna egress. Long term stability of the pit walls should be address by the Department of Industry and Resources in its requirements. It is recommended that the standard condition requiring preliminary and final closure plans is imposed, including plans for the long term management of the pit (condition 8).

The proponent has provided a draft rehabilitation and closure plan which is considered to be a good basis for developing a more detailed plan. The EPA notes that although the proponent intends to carry out phased rehabilitation work, the draft rehabilitation and closure plan assumes that no work will be carried out during "Life of Mine" operations. A condition requiring that a more detailed phased rehabilitation plan be prepared within two years is recommended (condition 9). The detailed plan should include a timetable for rehabilitation, completion criteria and identification of species to be used in each area, plans for the sourcing of seed and consultation with stakeholders.

The EPA also notes that the tailings facility and waste dumps will consist mainly of magmatic lamproite and lamproitic tuff material which is expected to weather rapidly. This material is not the origin of the natural topsoils in the area. Therefore, all the vegetation species of the project area may not grow on the waste. The proponent should undertake trials to determine which species will grow and to try to replicate habitat and food availability for local fauna species. The aim of rehabilitation should be to create a self-sustaining ecosystem.

The EPA considers the issue of rehabilitation and closure has been adequately addressed and can meet the EPA's objectives for this factor provided that the recommended condition requiring a phased rehabilitation plan within two years and subsequent implementation of the plan is imposed. The standard condition requiring preliminary and final closure plans is also recommended.

5. Other Advice

The lamproite pipes represent an unusual geological feature in the area. One lamproite pipe, 81 Mile Vent, is listed by the National Trust. Another, the Satellite pipe, is within the Oscar Range Park. Soils above the pipes do not fit the description of the profiles of the land systems within which they fall. In addition the pipes may contain a superficial aquifer distinct from the deeper regional aquifer.

Regional mapping of land-systems and vegetation highlights the strong links between the underlying landforms, soils and vegetation. While none of the associated mapped plant communities is unique several are confined to localized habitats. In future proposals for the mining of the lamproite pipes the management of these restricted communities and the cumulative impact of mining should be addressed. Detailed plant community mapping in the region is very limited and places some uncertainty on the ability to define the regional significance of plant communities, especially on surfaces with restricted distribution such as those associated with diamond pipes. Additional surveys targeted to determine the regional significance of these plant communities are recommended prior to further mining expansion. The regional significance of species found outside their known ranges should also be investigated.

Cumulative impacts on groundwater, fauna and geological heritage from mining should also be considered. Future proposals to mine the lamproite pipes in this area should include consideration of the number of remaining pipes and the number that will be preserved as representative of an unique landform.

6. Conclusions

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

The EPA considers the factors of groundwater and stygofauna have been adequately addressed and can meet the EPA's objectives for this factor provided that contingency plans are in place for any unanticipated adverse impact of pit dewatering and groundwater abstraction.

The EPA considers the issue of surface water has been adequately addressed and can meet the EPA's objectives for this factor provided that any discharge of water from the tailings storage facility and associated water containment dam to the environment is managed under the Part V provisions of the *Environmental Protection Act 1986*.

The EPA concludes that the factor of terrestrial fauna can be managed to meet the EPA's objective for this factor, provided the management actions as described in the EPS document (*Ellendale 4 Diamond Project, West Kimberley Region, Western Australia, Kimberley Diamond Company NL, 2005)* are incorporated into operational procedures as committed to by the proponent and a fauna management plan to avoid or reduce impacts on fauna that may be trapped in pits or trenches is in place.

The EPA considers the issue of rehabilitation and closure has been adequately addressed and can meet the EPA's objectives for this factor provided that the recommended condition requiring a phased rehabilitation plan within two years and subsequent implementation of the plan is imposed. The standard condition requiring preliminary and final closure plans is also recommended.

7. Recommendations

The EPA considers that the proponent has demonstrated, in the EPS document, that the proposal can be managed in an environmentally acceptable manner and provides the following recommendations to the Minister for the Environment:

1. That the Minister notes that the proposal being assessed is for the Ellendale 4 Diamond Project, West Kimberley.
2. That the Minister considers the report on the relevant environmental factors as set out in Sections 4.1-4.4.
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions and proponent commitments as set out in Appendix 2.
4. That the Minister imposes the conditions and procedures recommended in Appendix 2 of this report.

Appendix 1

References

Ellendale 4 Diamond Project, West Kimberley Region, Western Australia, Kimberley Diamond Company NL, 2005 Prepared by MBS Environmental, May 2005.

Appendix 2

Recommended Environmental Conditions

and Proponent's Commitments

Statement No.

RECOMMENDED CONDITIONS AND PROCEDURES

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

ELLENDALE 4 DIAMOND PROJECT, WEST KIMBERLEY

Proposal: The construction and operation of a diamond mine, power station and processing plant within Mining Lease 04/372 in the West Kimberley area 140 kilometres east of Derby to process approximately 4.4 million tonnes per annum of ore, as documented in schedule 1 of this statement.

Proponent: Kimberley Diamond Company NL

Proponent Address: 12 Walker Avenue, West Perth Western Australia 6005

Assessment Number: 1571

Report of the Environmental Protection Authority: Bulletin 1181

The proposal referred to above may be implemented by the proponent subject to the following conditions and procedures:

1 Implementation

1-1 The proponent shall implement the proposal as documented in schedule 1 of this statement subject to the conditions of this statement.

2 Proponent Commitments

2-1 The proponent shall implement the environmental management commitments documented in schedule 2 of this statement.

3 Proponent Nomination and Contact Details

3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.

3-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate

documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.

3-3 The nominated proponent shall notify the Department of Environment of any change of contact name and address within 60 days of such change.

4 Commencement and Time Limit of Approval

4-1 The proponent shall substantially commence the proposal within five years of the date of this statement or the approval granted in this statement shall lapse and be void.

Note: The Minister for the Environment will determine any dispute as to whether the proposal has been substantially commenced.

4-2 The proponent shall make application for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement to the Minister for the Environment, prior to the expiration of the five-year period referred to in condition 4-1.

The application shall demonstrate that:

1 the environmental factors of the proposal have not changed significantly;

2 new, significant, environmental issues have not arisen; and

3 all relevant government authorities have been consulted.

Note: The Minister for the Environment may consider the grant of an extension of the time limit of approval not exceeding five years for the substantial commencement of the proposal.

5 Compliance Audit and Performance Review

5-1 The proponent shall prepare an audit program and submit compliance reports to the Department of Environment which address:

1 the status of implementation of the proposal as defined in schedule 1 of this statement;

2 evidence of compliance with the conditions and commitments; and

3 the performance of the environmental management plans and programs.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986,* the Chief Executive Officer of the Department of Environment is empowered to monitor the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement.

5-2 The proponent shall submit a performance review report every three years after the start of operations, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, which addresses:

1 the major environmental issues associated with the project; the targets for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those targets;

2 the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable;

3 significant improvements gained in environmental management, including the use of external peer reviews;

4 stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and

5 the proposed environmental targets over the next three years, including improvements in technology and management processes.

5-3 The proponent may submit a report prepared by an auditor approved by the Department of Environment under the "Compliance Auditor Accreditation Scheme" to the Chief Executive Officer of the Department of Environment on each condition/commitment of this statement which requires the preparation of a management plan, programme, strategy or system, stating that the requirements of each condition/commitment have been fulfilled within the timeframe stated within each condition/commitment.

6 Groundwater Abstraction (Supply and Dewatering)

6-1 Prior to the commencement of groundwater abstraction from the pit area or borefield, the proponent shall prepare and implement a Groundwater Level Monitoring Plan to monitor levels in the aquifers affected by groundwater abstraction and dewatering and in the adjacent springs in the Oscar Range, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

6-2 Prior to water abstraction activities, the proponent shall have in place contingency plans in the event that a significant change to the water levels of the Oscar Range springs is detected and which result from groundwater abstraction or dewatering by the proponent, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority

6-3 Prior to water abstraction activities, the proponent shall have in place contingency plans in the event that changes to water levels and flows in the Grant aquifer, likely to affect pastoral water supplies, are detected and which result from groundwater abstraction or dewatering by the proponent, to the

requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

6-4 The proponent shall implement the contingency plans required by condition 6-2 and 6-3 as necessary.

7 Fauna Management Plan for Pits and Trenches

7-1 The proponent shall manage fauna to avoid or reduce fauna deaths in pits and trenches in accordance with a Fauna Management Plan prepared to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority. The plan shall address:

1 length of trench open at any time;
2 procedures for inspection of pits and trenches;
3 frequency and timing of inspection of pits and trenches; and
4 a register of animal capture and deaths.

7-2 The proponent shall implement the Fauna Management Plan, required by condition 7-1.

7-3 The proponent shall make the Fauna Management Plan publicly available.

8 Decommissioning/Closure Plans

8-1 Prior to construction, the proponent shall prepare a Preliminary Decommissioning/Closure Plan, 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.

The Preliminary Decommissioning/Closure Plan shall address:

1 rationale for the siting and design of plant and infrastructure as relevant to environmental protection, and conceptual plans for the removal or, if appropriate, retention of plant and infrastructure;

2 long-term management of ground and surface water systems affected by the tailings storage facility, waste rock dumps and pit;

3 design of the pit and shoreline to ensure long term stability and protection of fauna;

4 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;

5 a conceptual plan for a care and maintenance phase; and

6 management of noxious materials to avoid the creation of contaminated areas.

8-2 At least 12 months prior to the anticipated date of decommissioning/closure, or at a time agreed with the Environmental Protection Authority, the proponent shall prepare a Final Decommissioning/Closure 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.

The Final Decommissioning/Closure Plan shall address:

1 removal or, if appropriate, retention of plant and infrastructure in consultation with relevant stakeholders;

2 long-term management of ground and surface water systems affected by the tailings storage facility, waste rock dumps and pit;

3 long-term management of the pit lake, formed at the cessation of mining, including stability of the pit walls;

4 rehabilitation of all disturbed areas to a standard suitable for the agreed new land use(s); and

5 identification of contaminated areas, including provision of evidence of notification and proposed management measures to relevant statutory authorities.

8-3 The proponent shall implement the Final Decommissioning/Closure Plan required by condition 8-2 until such time as the Minister for the Environment determines, on advice of the Environmental Protection Authority, that the proponent's decommissioning/closure responsibilities have been fulfilled.

8-4 The proponent shall make the Final Decommissioning/Closure Plan required by condition 8-2 publicly available.

9 Phased Rehabilitation Plan

9-1 Within two years following the formal authority issued to the decision making authorities under Section 45(7) of the *Environmental Protection Act 1986*, the proponent shall prepare a Phased Rehabilitation Plan incorporating :

1 proposed final land use;
2 rehabilitation objectives and completion criteria, including plant diversity as well as density;
3 trials to determine which native species, including those found outside their known ranges, will grow on waste dumps for the purpose of replacing, as far as possible, fauna habitat and food sources and to create a self-sustaining ecosystem;
4 timetable for phased rehabilitation of impacted areas;
5 identification of species to be used in each area and plans for sourcing of seed;

6 control and management of the spread of non indigenous plants and animals; and
7 consultation with stakeholders,

to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Note: In the preparation of advice to the Minister, the Environmental Protection Authority expects to obtain advice from the Department of Conservation and Land Management and the Department of Industry and Resources.

9-2 The proponent shall make the Phased Rehabilitation Plan required by condition 9-1 publicly available.

9-3 The proponent shall implement the Phased Rehabilitation Plan required by condition 9-1.

9-4 The proponent shall review and revise the Phased Rehabilitation Plan required by condition 9-1 at intervals of not exceeding two years.

Procedures

1 Where a condition states "to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority", the Environmental Protection Authority will provide that advice to the Department of Environment for the preparation of written notice to the proponent.

2 The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice to the Department of Environment.

3 Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Department of Environment.

Notes

1 The Minister for the Environment will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environment over the fulfilment of the requirements of the conditions.

2 The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the *Environmental Protection Act 1986*.

3 Within this statement, to "have in place" means to "prepare, document, implement and maintain for the duration of the proposal".

Schedule 1

The Proposal (Assessment No. 1571)

The proposal is to mine diamonds on Mining Lease M04/372, approximately 140 kilometres east of Derby in the West Kimberley region of Western Australia. The coordinates of the project area are:

	Latitude	Longitude
North West	-17° 39' 44"	124° 54' 25"
North East	-17° 40' 00"	124° 55' 40"
South East	-17° 41' 26"	124° 56' 20"
South West	-17° 41' 15"	124° 54' 52"

The proposal involves the development of a deep open cut mine and construction of a processing plant at the Ellendale 4 site. Mining will take place below the groundwater table and dewatering of the pit will be required. Table 1 lists the key characteristics of the proposal. Figures 2 and 3 show the location of the key components of the proposal.

Dimensions of major components of the proposal are:

- Approximately 514 hectares of vegetation disturbance;
- Open pit to 110 metres below ground surface, and area of approximately 68 hectares (including bunds);
- Waste dumps of approximately 68 hectares;
- Coarse tailings dump of approximately 33 hectares;
- Tailings storage facility for fine tailings of approximately 180 hectares to hold approximately 20.4 million tonnes of tailings; and
- Water collection pond of approximately 34.5 hectares.

Table 1: Key Proposal Characteristics

Element	Description
Life of project (mine production)	Approximately 6 years (continual operation)
Size of orebody: • Inferred (this proposal) • Defined • Waste	 Approximately 25.5 Million tonnes Approximately 15 Million tonnes Approximately 11.5 Million tonnes
Depth of mine pit	Approximately 110 metres below ground surface
Area of disturbance (including pit, associated infrastructure and access)	Approximately 514 hectares
Mine operation	24 hours per day, 7 days per week
List of major components:	Refer to Figures 2 (mine layout) and 3

Element	Description
• Open cut pit • Run of Mine (ROM) pad • Topsoil, low grade, oversize and lights stockpiles • Two waste dumps (11.49 million tonnes) • Coarse tailings waste dump • Processing plant with crushing, washing and screening circuits • Power station and fuel farm • Process and raw water ponds • Tailings Storage Facility for thickened fine tailings • Water collection pond (tailings water and runoff) • Production borefield adjacent to the southern mining lease boundary • Dewatering and monitoring bores • Haul roads and other access roads • Laydown areas • Mine administration offices and contractor's workshops • Recovery room for X-ray sorting • Cattle exclusion fences around the entire operation • Borrow pits for construction materials	(processing plant layout).
Processing:	
• Design rate	600 tonnes per hour
• Annual rate	Approximately 4.4 Million tonnes per annum
• Dense Medium Separation (DMS)	Ferrosilicon medium
• Process circuit water requirement	1,950 kilolitres of water (at any given time)
• Make-up water requirement	306 to 380 kilolitres per hour
Tailings:	
• Fine (less than 1.6mm)	Disposed in central thickened Tailings Storage Facility 20.4 Million tonnes (13.6 million cubic metres) design capacity
• Coarse (1.6 to 14mm)	Disposed in waste dump approximately 6.88 Million tonnes (4.7 million cubic metres)
• Primary recovery rejects.	44,000 tonnes per annum - may be reprocessed

Element	Description
Waste rock dumps: • North Dump • South Dump Height Slope batters Lifts	 Approximately 2.9 million loose cubic metres (19 hectares footprint) Approximately 4.9 million loose cubic metres (49 hectares footprint) Maximum 30 metres, or as required by Department of Industry and Resources. 15° , or as required by Department of Industry and Resources. 10 metres, or as required by Department of Industry and Resources.
Water supply: • Source • Annual requirement	 Grant aquifer, 8 production bores 3.3 Gigalitres per annum
Pit dewatering (of Ellendale 4 lamproite aquifer): • Method • First year of dewatering • Ongoing (after first 21 months)	 4 dewatering bores and in-pit sumps 600,000 kilolitres 150,000 kilolitres per annum
Power supply: • Power station • Borefield	 6 x 1 Megawatt diesel powered generating sets (11 kilovolt power supply at each transformer) Stand-alone diesel generators at each bore site
Fuel quantity used	Estimated 11 Million litres per annum

Figures (attached)

Figure 1 – Project locality map
Figure 2 – Project site layout
Figure 3 – Processing plant layout

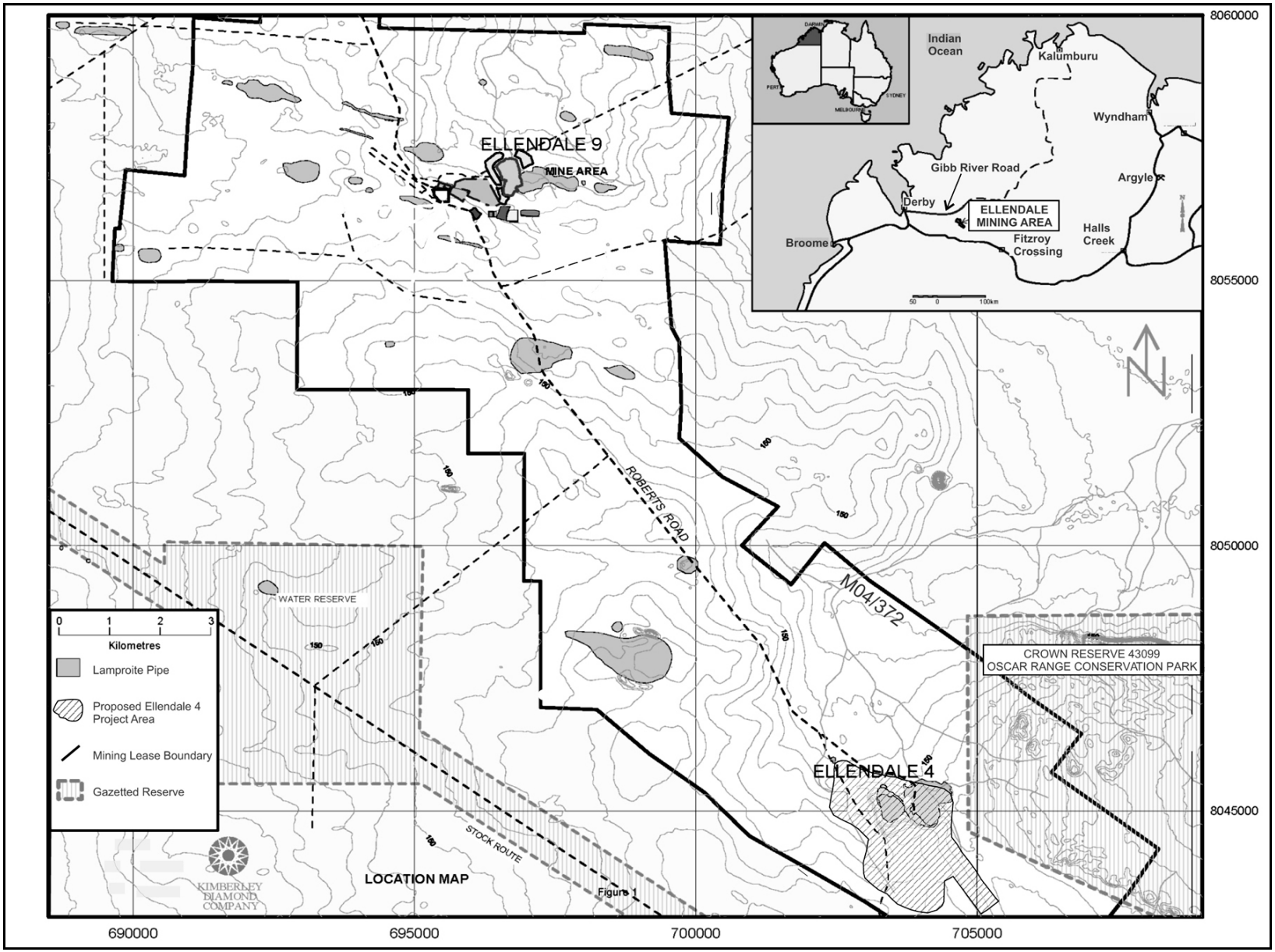

Figure 1: Project locality map

Figure 2: Project site layout

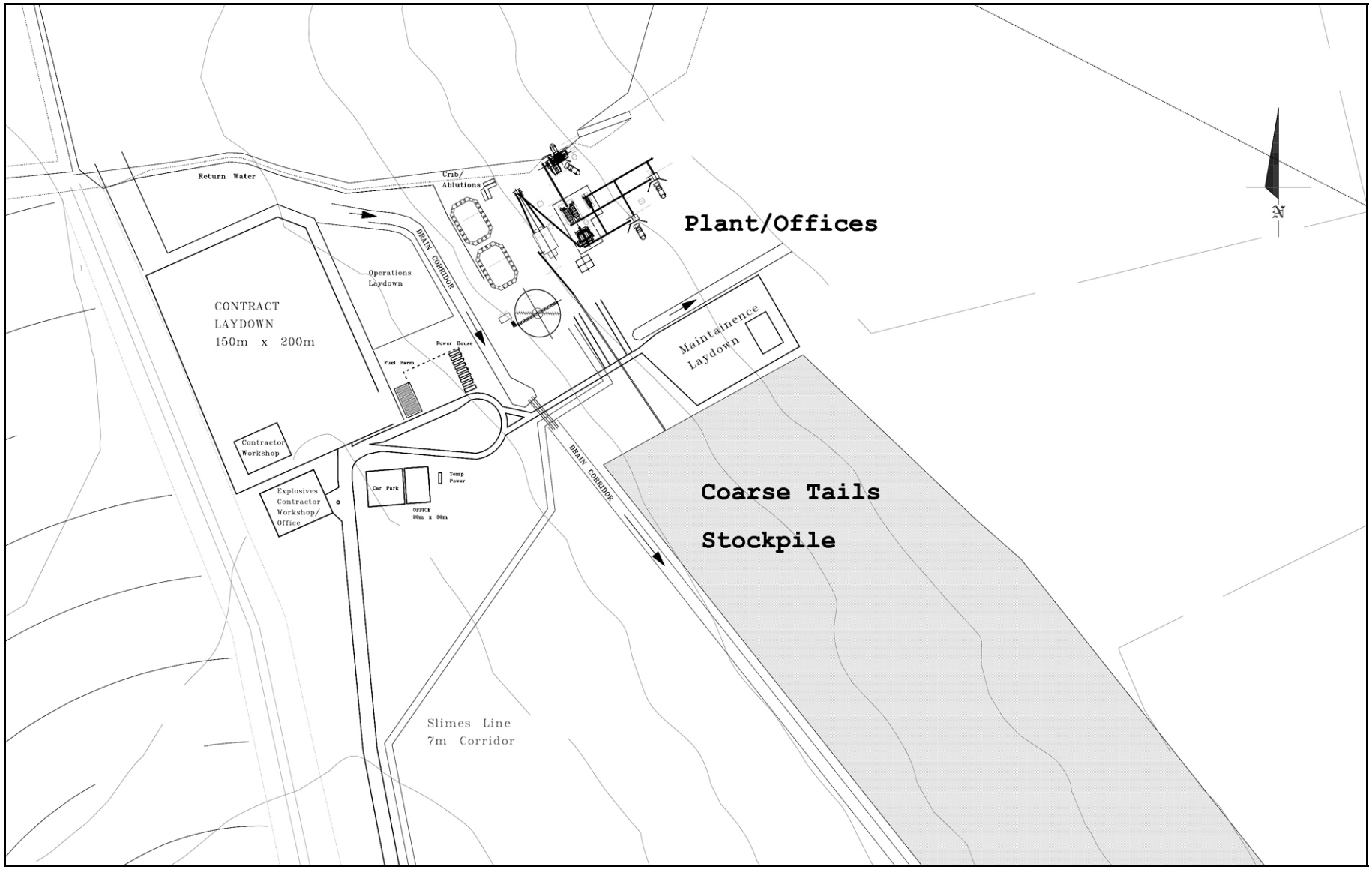

Figure 3: Processing plant layout

Schedule 2

Proponent's Environmental Management Commitments

June 2005

Ellendale 4 Diamond Project, West Kimberley

(Assessment No. 1571)

Kimberley Diamond Company NL

Proponent's Environmental Management Commitments – June 2005

ELLENDALE 4 DIAMOND PROJECT, WEST KIMBERLEY(Assessment No. 1571)

Note: The term "commitment" as used in this schedule includes the entire row of the table and its six separate parts as follows:

- a commitment number;
- a commitment topic;
- the objective of the commitment;
- the 'action' to be undertaken by the proponent;
- the timing requirements of the commitment; and
- the body/agency to provide technical advice to the Department of Environment.

No.	Topic	Objective	Action	Timing	Advice
1	Environmental Management	To avoid, minimise or mitigate impact to the environment	Amend existing Project Management Plan to include operational procedures for the construction of the project. The procedures will address the management or avoidance of impacts on the environment such as impacts on: 1 Groundwater quantity and quality 2 Surface water 3 Vegetation and flora, 4 Fauna, 5 Conservation areas, 6 Air, including dust impact, 7 Heritage, 8 Surrounding land use. And the management of:	Prior to Construction	Department of Industry and Resources, Department of Conservation and Land Management.

			1 Weeds, 2 Noise, 3 Waste, and 4 Dangerous and hazardous substances		
2	Environmental Management	To avoid, minimise or mitigate impact to the environment	The above operations procedures will be reviewed by an independent auditor.	Prior to Construction	
3	Environmental Management	To avoid, minimise or mitigate impact to the environment	The above Project Management Plan will be implemented	During Construction	
4	Environmental Management	To avoid, minimise or mitigate impact to the environment	Environmental performance achieved as a result of the Project Management Plan will be audited, and procedures reviewed as necessary.	During Construction	
5	Environmental Management	To avoid, minimise or mitigate impact to the environment	Amend existing Project Management Plan to include operational procedures for the operation of the project. The procedures will address the management or avoidance of Operation impacts on the environment such as impacts on: 1 Groundwater quantity and quality 2 Surface water 3 Vegetation and flora, 4 Fauna, 5 Conservation areas, 6 Air, including dust impact, 7 Heritage, 8 Surrounding land use. And the management of: 1 Weeds, 2 Noise, 3 Waste, and	Prior to Operation	Department of Industry and Resources, Department of Conservation and Land Management.

			4 Dangerous and hazardous Operation substances		
6	Environmental Management	To avoid, minimise or mitigate impact to the environment	The above operations procedures will be reviewed by an independent auditor.	Prior to Operation	
7	Environmental Management	To avoid, minimise or mitigate impact to the environment	The above Project Management Plan will be implemented	During Operation	
8	Environmental Management	To avoid, minimise or mitigate impact to the environment	Environmental performance achieved as a result of the Project Management Plan will be audited, and procedures reviewed as necessary.	During Operation	