Construction of additional crystallizer ponds, Useless Loop, Shark Bay

Shark Bay Salt Joint Venture

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 934
March 1999

ISBN. 0 7309 8138 X
ISSN. 1030 - 0120
Assessment No. 1193

Summary and recommendations

This report provides the Environmental Protection Authority's (EPA's) advice to the Minister for the Environment on the proposal by Shark Bay Salt Joint Venture (SBSJV) to construct additional crystallizer ponds at the existing salt works in Useless Loop, Shark Bay.

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.

Relevant environmental factors

In the EPA's opinion, the following are the environmental factors relevant to each component of this proposal:

(a) Seagrass - impacts through direct and indirect disturbance;

(b) Marine water quality - contamination through increased turbidity and bitterns disposal;

(c) Increased shipping - potential impacts from hydrocarbon spills, disposal of wastes and introduction of exotic species from ballast water; and

(d) Shark Bay World Heritage Property/Marine Reserve - impacts on the values of these conservation reserves as a result of the proposal.

Conclusion

The EPA has considered the proposal by SBSJV to construct additional crystallizer ponds at the mouth of Useless Loop, Shark Bay.

The EPA notes that the proposal will result in the loss of approximately 60 ha of seagrass (predominantly *Posidonia australis*). However, the EPA considers that, given the fact that seagrass in the Shark Bay area covers some 4 325 km^2 (SBSJV, 1998a) and has generally been given a high degree of protection due to the extensive areas covered by the Marine Reserve and the World Heritage listings, the loss of 60 ha of seagrass associated with this proposal is unlikely to result in significant impacts on the ecological function, species diversity and geographic distribution of seagrasses in the area.

However, the EPA notes that a large area (approximately 155 ha) of seagrass within and adjacent to the mining lease area has been lost as a result of historical bitterns discharge. The EPA considers that the proponent should facilitate research into the rehabilitation of seagrass and trial methods for rehabilitation of seagrass in this area.

The EPA has also given considerable attention to the issue of introduction of exotic species from ballast water. The EPA considers that the management of ballast water requires close attention to reduce the potential for the introduction of exotic species, and therefore considers that the proponent should prepare a Ballast Water Management Plan which details how Australian Quarantine and Inspection Service (AQIS) guidelines will be enforced and what additional measures will be adopted to minimise the risk of introduction of exotic species.

The EPA considers that the proposal is unlikely to cause direct disturbance to the Shark Bay World Heritage Property, and the potential for indirect disturbances to the Property will not significantly increase as a result of the proposal. The EPA therefore considers that it is unlikely that the proposal will affect the conservation values, biodiversity or ecosystem functions of the Shark Bay World Heritage Property/Marine Reserve

The EPA has concluded that the proposal can be managed in a manner such that the proposal does not impose an unacceptable impact on the environment, provided that the conditions recommended in Section 4, and set out in formal detail in Appendix 1, are imposed.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes that the project being assessed is adjacent to the environmentally sensitive Shark Bay World Heritage Property/Marine Reserve;
2. The EPA recommends that the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. The EPA recommends that the Minister notes that the EPA has concluded that the proposal can be managed in a manner such that the proposal does not impose an unacceptable impact on the environment, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 1, including the proponent's commitments; and
4. The EPA recommends that the Minister imposes the conditions as set out in Appendix 1 of this report.

Conditions

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions which the EPA recommends should be imposed if the proposal by SBSJV to construct additional crystallizer ponds in Useless Loop, Shark Bay, is approved for implementation. These conditions are presented in Appendix 1. Matters addressed in the conditions include:

(a) the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 1;

(b) the proponent shall prepare a Ballast Water Management Plan which details how AQIS guidelines will be enforced, what additional measures will be adopted to minimise the risk of introduction of exotic species and monitoring measures that will be implemented to identify the introduction of any exotic species;

(c) the proponent shall prepare a Seagrass Research Strategy which outlines reasonable and practical research into the rehabilitation of seagrass to be facilitated by the proponent. Based on this research, the proponent shall develop a practical and reasonable plan for rehabilitation trials in areas previously affected by the salt works;

(d) in order to manage the relevant environmental factors and the EPA's environmental objectives contained in this bulletin and subsequent conditions and procedures authorised by the Minister for the Environment, the proponent shall demonstrate that there is in place an environmental management system (EMS) which includes the following elements:

    1. An environmental policy and corporate commitment to it;

    2. Mechanisms and processes to ensure:
        - planning to meet environmental requirements;
        - implementation and operation of actions to meet environmental requirements;
        - measurement and evaluation of environmental performance; and

    3. A mechanism for continuous review and improvement of environmental outcomes.

Contents

Tables

Figures

Appendices

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 the proposal by Shark Bay Salt Joint Venture (SBSJV), the proponent, to construct additional crystallizer ponds at the existing salt works in Useless Loop, Shark Bay (Figure 1).

The SBSJV solar salt project was constructed in 1965, with the first shipments of salt exported in 1967. SBSJV operates the Shark Bay salt field under the Shark Bay Solar Salt Industry Agreement Act 1983. The salt field consists of a number of condenser ponds in Useless Inlet which are connected to pickle and crystallizer ponds in Useless Loop. Loading facilities for the export of salt are located to the north of Useless Loop.

The proposal to construct an additional condenser pond (PM1) in Useless Inlet was assessed by the EPA at the level of Public Environmental Review. Approval for the construction of PM1 was given in 1996, and the pond has recently been constructed. SBSJV now proposes to construct a new series (F series) of crystallizer ponds at the northern edge of the existing Useless Loop salt field (Figure 2). Construction of the new series of ponds will enclose approximately 125 hectares of shallow marine environment up to the boundary of Mineral Lease 260SA. SBSJV has indicated that construction of the additional crystallizer ponds in Useless Loop is necessary so that the salt in the increased pickle production generated by the new condenser pond in Useless Inlet can be crystallized out.

The EPA's decision to assess the proposal at the level of a Consultative Environmental Review (CER) was based on two main factors, namely the loss of 60 ha of seagrass resulting from the project, and the fact that the proposed crystallizer ponds are located approximately 1.5 km outside the boundary of the Shark Bay World Heritage Property.

Further details of the proposal are presented in Section 2 of this Report. Section 3 discusses environmental factors relevant to the proposal. The Conditions and procedures to which the proposal should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 presents the EPA's Conclusions and Section 6, the EPA's Recommendations.

Appendix 1 contains the recommended environmental conditions and the proponent's commitments; people and organisations that made submissions are listed in Appendix 2; and references are listed in Appendix 3. The summary of public submissions and the proponent's response is included in Appendix 4 as a matter of information only and do not form part of the EPA's report and recommendations. Issues arising from this process and which have been taken into account by the EPA appear in the report itself.

2. The proposal

SBSJV proposes to construct a new series (F series) of crystallizer ponds at the northern edge of the existing Useless Loop salt field (Figure 2). Creation of these additional crystallizer ponds involves the construction of a 2 km long seawall which would enclose an area of approximately 125 ha of shallow marine environment.

The seawall would be constructed using an estimated 300 000 m^3 of calcareous borrow, and will be rock-armoured on the seaward side. Fill material would be dumped by a dozer and grader, and the embankment shaped with excavators. Rock armour would be installed by a combination of dumping and placement. Both rock and general fill would be taken from an existing borrow pit near the construction site. Access to the construction site would be via existing haul roads and the existing causeway across the mouth of the Loop.

At completion of construction, ponds would be repeatedly flooded with bitterns (a by-product of salt production containing high concentrations of salts other than sodium chloride) which will act to seal the floor of the ponds. Pickle (highly concentrated saline water) would then be introduced into the ponds. Once the pickle has crystallized, salt would then be harvested, washed and stockpiled. Salt would then be exported from the existing shipping facilities at Slope Island, which is located on the northern point of Useless Loop.

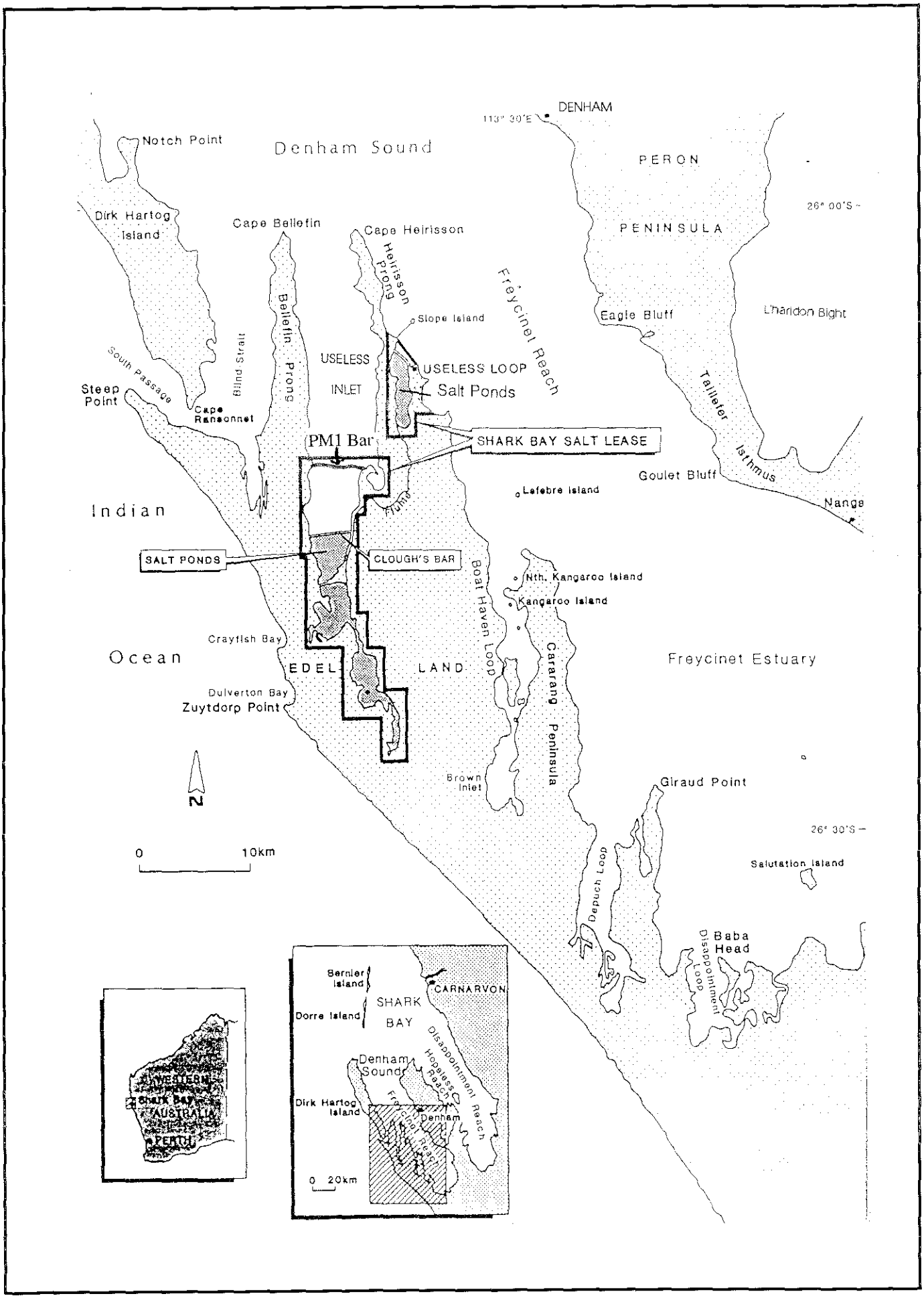


Figure 1. Map of Shark Bay showing location of the salt works at Useless Loop and Useless Inlet.

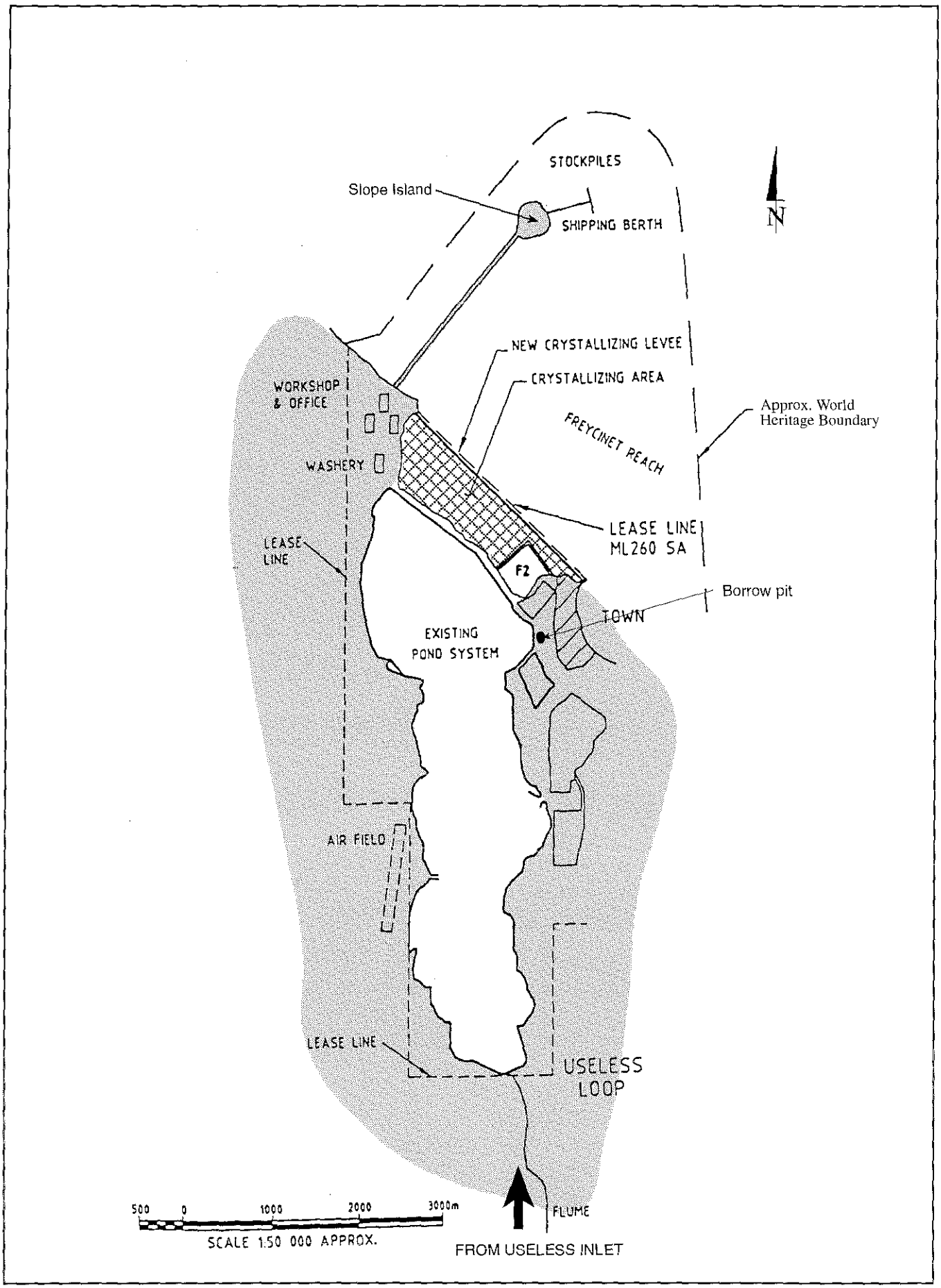


Figure 2. Location of Existing and Proposed Crystallizer Ponds in Useless Loop.

Bitterns will initially be discharged into ponds for sealing pond floors. Long term disposal of bitterns will be by use in sealing ponds and/or by filtration in purpose-constructed impoundments in the salt field, such as the existing bitterns channel.

Existing infrastructure associated with the salt works, including washdown facilities, stockpiles, loading facilities and staff accommodation is located near the mouth of Useless Loop. Additional facilities will not be required to accommodate the additional volume of salt generated from the expansion of crystallisers at Useless Inlet.

As a result of the expansion of the salt works, the quantity of salt exported from the salt works is expected to increase from approximately 0.9 Mt to 1.6 Mt per annum. Under current shipping practices, this will increase the number of shipping cargoes from 55 to 75 per annum. However, the proponent has advised that it is possible that larger ships may be used rather than increasing the number of ship voyages.

A summary of the key characteristics of the proposal is presented in Table 1. A detailed description of the proposal is provided in Section 4 of the CER (SBSJV, 1998a), hereafter referred to as the 'CER'.

Table 1: Summary of key proposal characteristics

Element	Description
Area of disturbance	Approximately 150 hectares.
Area of seagrass directly lost	Approximately 60 hectares.
Seagrass type	Predominantly *Posidonia australis.*
Seawall	2 km long seawall with calcareous fill and rock armour on the seaward side.
Construction material	Approximately 300 000 m^3 of inert calcareous material for seawall construction and fill. Rock armour.
Source of construction material	Existing borrow pit near F2 and Useless Loop township, which contains both rock and finer material.
Period of construction	Approximately four months.
Life of project	More than 20 years.
Bitterns discharge	Initially disposal into ponds for sealing pond floors. Long term disposal by use in sealing ponds and/or by infiltration into groundwater through purpose constructed impoundments in the salt field. Bitterns will not be discharged directly into the marine environment.
Salt export	Expected to increase from ~0.9 Mt to ~1.6 Mt per annum.
Shipping	Under current shipping practices, cargoes are expected to increase from 55 to 75 per annum.

3. Relevant environmental factors

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 the conditions, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

It is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in this report:

(a) Seagrass - impacts through direct and indirect disturbance;

(b) Marine water quality - contamination through increased turbidity and bitterns disposal;

(c) Increased shipping - potential impacts from hydrocarbon spills, disposal of wastes and introduction of exotic species from ballast water; and

(d) Shark Bay World Heritage Property/Marine Reserve - impacts on the values of these conservation reserves as a result of the proposal.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the CER document and the submissions received, in conjunction with the proposal characteristics (including the significance of the potential impacts), the adequacy of the proponents response and commitments. On this basis the EPA considers that the preliminary factors: marine fauna; seabirds; terrestrial fauna; declared rare and priority flora; foreshore; recreation; heritage; and other issues raised in submissions do not require further evaluation by the EPA. The identification process is summarised in Table 2.

Detail on the relevant environmental factors and their assessment is contained in Sections 3.1 - 3.4. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor. A summary of the assessment of the relevant environmental factors is presented in Table 3.

3.1 Seagrass

Description

The Marine and Freshwater Research Laboratory, Murdoch University, carried out a seagrass survey of the project area, and reported the findings of the survey in Appendix B of the CER (SBSJV, 1998a). Twelve species of seagrass have been identified in Shark Bay, and are estimated to cover approximately 4 325 km^2 (Walker et al, 1998). The report outlines that seagrass in the project area is predominantly monospecific beds of *Posidonia australis*. Outside the mining lease the seagrass changes to mixed beds of *P. australis* and *Amphibolis antarctica* and monospecific beds of *A. antarctica* (SBSJV, 1998a). The distribution of seagrass in the vicinity of the project area is illustrated in Figure 3.

The proposal will result in the direct loss of 60 ha of seagrass in Useless Loop. There is also the potential for indirect loss of seagrass to occur as a result of increased turbidity and discharge of bitterns.

Direct loss

The construction of additional crystallizer ponds in Useless Loop will result in the direct loss of approximately 60 ha of seagrass, predominantly monospecific beds of *P. australis* (SBSJV, 1998a). In response to submissions, the proponent has advised that an alternative pond configuration, to reduce the amount of seagrass directly lost as a result of the project, is not viable given the existing salt pond formation and the area remaining in the Mining Lease. Re-configuration of the Mining Lease is also considered unfeasible, given that the only areas of bare nearshore flats in the vicinity of the existing salt field are within the World Heritage Property, and are therefore unlikely to be considered suitable for inclusion in the Mining Lease (SBSJV, 1998b).

Results of engineering studies undertaken by W S Andrew for SBSJV are reported in Appendix C of the CER. The report outlines that under cyclonic conditions, which are experienced in the Shark Bay area once every two or three years, waves greater than three metres will break out from the seawall and may cause localised damage to seagrass and the seabed adjacent to the wall (SBSJV, 1998a). However, such cyclonic conditions are expected to occur infrequently and for short durations, and are therefore considered unlikely to result in significant impacts on adjacent seagrass beds (SBSJV, 1998a).

Turbidity

Turbidity is discussed further below in Section 3.2 Marine water quality. Results of engineering studies suggest that, during construction, turbidity generated from earthwork activities is unlikely to travel more than 200 metres from the dumping point under rising tides or east winds (SBSJV, 1998a). Sediment is expected to largely settle within one hour, and is

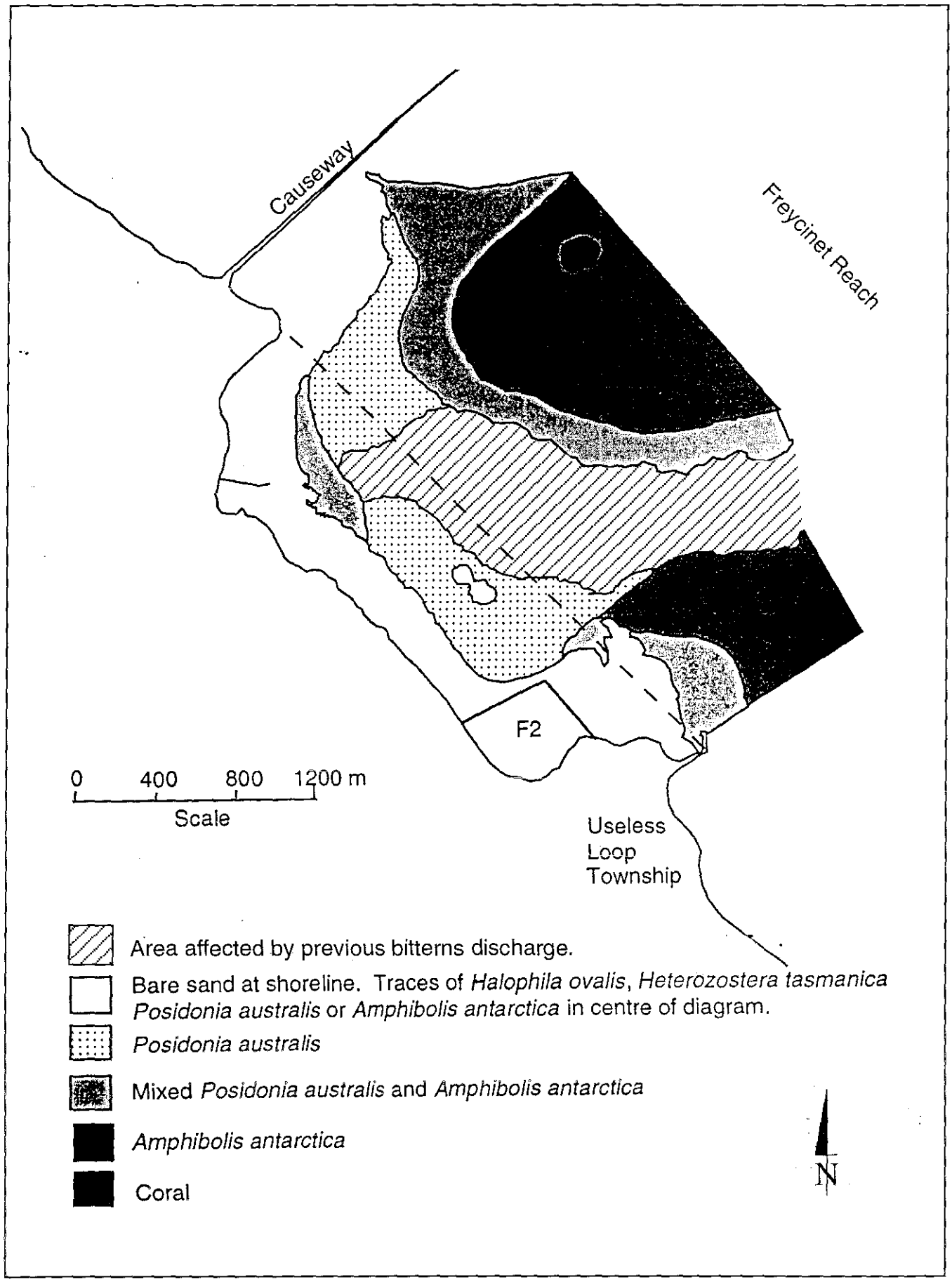


Figure 3. Distribution of seagrass species in the vicinity of the proposed crystallizers.

Table 2: Identification of Relevant Environmental Factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
BIOPHYSICAL			
Seagrass	Seagrass in the project area is predominantly *Posidonia australis* meadows. Outside the mining lease the seagrass changes to mixed beds of *P.australis* and *Amphibolis antarctica* and monospecific beds of *A.antarctica.* The proposal will result in the direct loss of 60 ha of seagrass. Coastal engineering studies suggest that impacts resulting from increased turbidity associated with construction and operation of the additional crystallizers will be insignificant, and that it is considered that additional indirect loss of seagrass resulting from the proposal is unlikely. Historically, an estimated 155 ha of seagrass at the mouth of Useless Loop has been lost as a result of bitterns discharge.	• The construction of the original causeway across the mouth of Useless Loop has resulted in the formation of an artificial foreshore and intertidal zone that is devoid of seagrass growth. The likelihood of this occurring with the construction of the new sea-wall has not been discussed. Should this occur, an area larger than the predicted 60ha of seagrass would be lost. • Seagrass beds are productive habitats which play an important part in the life history of many fish species. The loss of seagrass and therefore productive fish habitat must inevitably permanently reduce the fisheries resources at Shark Bay. • The CER does not consider the biological processes, productivity and biodiversity of the seagrass communities within the mining lease. There has been no consideration of other species that inhabit the communities, and the role of this area as a recruitment (or nursery area) for species that inhabit the wider marine environment. • Seagrass has a role in modifying the physical, chemical and biological environment as well as the geology of the bay. The role of seagrass in Useless Loop beyond the immediate site does not appear to be considered. • Given that there has been historical loss of seagrass in the area resulting from the salt project, the proponent should identify the cumulative loss of seagrass in Useless Loop resulting from the construction of the salt project in this location. • Completing a once-off field inspection of the seagrass meadows in June is inadequate. Many of the 12 species of seagrass which occur in Shark Bay are tropical species and are only found during the hotter summer months when water temperature in the shallow embayments is much warmer.	**Considered to be a relevant environmental factor.**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Marine fauna	The area is infrequently inhabited by dugongs and turtles. It is considered that the area is not used for dugong feeding given the seagrass species found in the area are not favoured by dugongs. The proposal will result in the loss of approximately 125 ha of near-shore marine habitat.	• No mention is made of arrangements for finding and relocating marine fauna that inhabit the project area. • The CER does not assess invertebrates which would no doubt occur in this area. • The fish fauna of this area is likely to be species rich with a diverse assemblage of seagrass fishes (including juveniles using it as a nursery) as well as a range of species that invade the shallows over the sand flats at high tide. Adequate fish fauna surveys do not appear to have been undertaken, therefore the CER should not make comment on this aspect of the ecosystem. • A limited two day inspection of the site is not sufficient to determine the relative importance of this site to dugong. • CALM understands that commercial beach seine fishermen use the current beachfront to net whiting and mullet.	The loss of approx 125 ha of marine habitat is not considered significant, as this habitat is widely replicated in the region. The proponent advises that the area is infrequently used for fishing, and that comparable sites exist in other areas outside the mining lease. The proponent outlined in the CER that, in the event of dugong or turtle activity in the construction area, the proponent will ensure that fauna are not trapped in ponds or threatened by construction works. **Potential impacts are not regarded as significant, therefore this is not considered to be a relevant environmental factor.**
Seabirds	Small numbers of seabirds frequent the project area. Flocks of migratory bird species do not utilise the area. The existing foreshore along Useless Loop (which was artificially created with the construction of the existing crystallizers) will be lost through construction of the additional crystallizer ponds, resulting in the loss of seabird habitat.		The area appears to support few seabirds. The proponent has outlined that the lost habitat is artificial and will be partly recreated on the outer side of the proposed seawall. The habitat of the project area is considered to be well represented in the Shark Bay region. The loss of this small area of habitat is therefore not considered significant. **The area is not significant for seabirds, this is therefore not considered to be a relevant environmental factor.**
Terrestrial fauna	A small area of land will be affected by the expansion of an existing borrow pit, with minor clearing of vegetation proposed. The area is highly disturbed and is not known to support significant numbers of terrestrial fauna.		The existing borrow pit is partly cleared and highly disturbed and appears to support little terrestrial fauna. It is unlikely that the proposed expansion of the borrow pit will result in any significant impacts on terrestrial fauna. **Because of prior disturbance this is not considered to be a relevant environmental factor.**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Declared Rare and Priority Flora	No DRF has been identified in surveys of comparable communities in the area, and the proponent considers that DRF is unlikely to be found at the borrow pit. A small area of land will be affected by the expansion of an existing borrow pit, with minor clearing of vegetation proposed. The existing borrow pit is partly cleared and highly disturbed.	• The report states that the existing borrow pit is partly disturbed with some remaining vegetation, however no indication of the area of this remaining vegetation that will be disturbed is provided. There is no commitment in this CER to rehabilitate this pit or any former pits.	The small area of disturbed vegetation which will be affected by the proposal is unlikely to support any declared rare and priority flora species. The proponent has made a commitment (commitment 3) to undertake a flora survey in areas prior to disturbance. There is an established program for the progressive rehabilitation of all disturbed areas associated with the salt project, which the proponent has made a commitment to continue to implement (commitment 6). Results of this program will be reported in annual and triennial reports. **With the commitments made by the proponent, this is not considered to be a relevant environmental factor.**
Foreshore	Foreshore in the project area includes foreshore along the mouth of Useless Loop, which was artificially created with the construction of the existing crystallizers, and a small area of natural foreshore which exists on the western side of Useless Loop. The foreshore across the mouth of the Loop will be lost, as it will be replaced by the sea-wall of the new crystallizer ponds. The area of natural foreshore to the west will also be affected, as the new ponds will border this area. The foreshore in the vicinity of the Loop may also be modified by the construction of a new sea-wall.	• The CER does not adequately consider the impacts on the biota of the intertidal sandflats. The intertidal sandflats are likely to contain a high diversity of invertebrate species. An investigation of the biodiversity, biological processes and productivity of the sandy intertidal flats, similar to that proposed for the seagrass communities, is required to enable adequate assessment of the proposal.	The foreshore habitat that is lost as a result of the proposal will largely be replicated by the new sea wall of the crystallizer complex. The proponent advises that the foreshore of the project area is well represented in the Shark Bay region. The loss of this small area of habitat is therefore not considered to be significant **Only a small area will be affected by the proposal, therefore this is not considered to be a relevant environmental factor.**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
POLLUTION MANAGEMENT			
Marine water quality	Potential impacts on marine water quality from increased turbidity and from contamination resulting from bitterns discharge. Turbidity is likely to be generated during the construction of the crystallizer ponds. Engineering studies of the proposal indicate that turbidity generated from earthwork activities is unlikely to travel more than a few hundred metres. Shark Bay Salt Joint Venture has not discharged bitterns directly into the marine environment since 1987. Bitterns will be discharged into ponds where they will evaporate and filter into groundwater.	**TURBIDITY** • The turbidity plume created during levee construction is likely to extend well beyond the construction site, affecting seagrass meadows within the World Heritage Area. Further investigation is required into the conditions that influence the turbidity plume, and high risk weather conditions must be clearly identified before construction • Audit reports from turbidity monitoring of the construction of the bar at Useless Inlet and the F2 crystalliser should be used to support the claims that there will be no significant impacts on seagrass resulting from turbidity associated with the current proposal. • The report does not adequately address the potential impacts on corals and sponges outside the project area resulting from increased turbidity. • Considering its exposure to wave activity and possible cyclonic conditions, the slope of the levee should be closer to the natural slope of 1:15 to reduce the loss of sediments through wave activity. **BITTERNS** • More information is required about the potential for bitterns leakage from ponds. How will this be managed/reduced? • There has been no scientific interpretation of the results of the previous foreshore monitoring during the use of F2 to demonstrate that bitterns seepage is having no significant impact on water quality. Given that there has been historical loss of seagrass in the area due to inappropriate discharge of bitterns, the proponent should assess the future indirect loss of seagrass that may result from the disposal of bitterns from these additional crystalliser ponds. • It is not described how bitterns will be disposed of in the long term, given that, in the long term, the proposed F series ponds will be used for crystallisers not for bitterns discharge.	**Considered to be a relevant environmental factor.**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Increased shipping	Under current shipping practices, the number of cargoes will increase from 55 to 75 per annum. Larger ships may be used rather than increasing the number of ship voyages. Quantity of salt exported expected to increase from ~0.9 Mt to ~1.6 Mt per annum. Associated increase in ballast water discharges expected to increase from ~300 000 t to ~500 000 t per annum. The proponent requires shipping companies to follow AQIS ballast guidelines. These guidelines require ballast water to be exchanged at sea.	• The increase in shipping has not been fully described. Will channels need to be dredged to accommodate larger vessels? What impacts will this have on World Heritage areas? • What were the circumstances surrounding the recent grounding of the vessel Pine Trust in Shark Bay? What specific management measures have been put in place to avoid a repeat of this incident? Does the proponent require pre-qualification of ships servicing the project? • The document states that the AQIS voluntary guidelines for ballast water are imposed on shipping. The adequacy of these guidelines to prevent the introduction of exotics from ballast are questioned. • Does the proponent have a written oil spill contingency plan? Has this been provided to the State Oil Spill Combat Committee and the DEP? • Has monitoring for TBT contamination of sediments in the area where ships berth been carried out? What has monitoring shown? • What arrangements are in place for disposal of solid/domestic wastes from shipping?	**Considered to be a relative environmental factor.**
SOCIAL SURROUNDINGS			
Shark Bay World Heritage Area/Marine Reserve	The project area is located approx 1.5km from the border of the Shark Bay World Heritage Property. Direct impacts on the World Heritage Property are unlikely. Potential indirect impacts as a result of reduced water quality, resulting from increased turbidity and bitterns contamination.	• It is of concern that the proponent appears to assume their proposal has no impact on the Shark Bay World Heritage Property because it is located outside the Property boundary. Inadequate consideration is given to impacts on the biological processes that connect the area included in the mining lease with the adjacent environment.	**Considered to be a relative environmental factor.**
Recreation	The proponent has advised that recreational activities (including recreational fishing) rarely occur in the project area.		The area is isolated, and few recreational activities occur in the area. **Not considered to be a relevant environmental factor.**
Heritage	No sites of cultural or historical significance are found in the project area.		The proposal will not impact upon any significant cultural or historic sites. **Not considered to be a relevant environmental factor.**

Table 3: Summary of Assessment of Relevant Environmental Factors

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVE	EPA ASSESSMENT	EPA ADVICE
Seagrass	The Shark Bay region.	Ensure that there is no significant impact on the ecological function, abundance, species diversity and geographic distribution of seagrasses.	• Approximately 60 ha of seagrass (predominantly *Posidonia australis*) will be directly lost as a result of the project. • Coastal engineering studies suggest that impacts resulting from increased turbidity associated with construction will be insignificant (see 'marine water quality' below). The proponent has made a commitment to monitor turbidity during construction and halt work when sediment plumes might threaten seagrass (commitment 1). • Water quality monitoring undertaken by SBSJV has shown no impacts from current bitterns disposal methods. Current disposal methods and monitoring will continue to be implemented by SBSJV to monitor potential impacts from future bitterns disposal (commitments 2 & 4). • Given the above, indirect loss of seagrass is considered unlikely. • The EPA notes that seagrass extends over some 4 325 km^2 in the Shark Bay area and has generally been given a high degree of protection due to the extensive areas covered by the Marine Reserve and the World Heritage listings. The EPA therefore considers that the loss of 60 ha of seagrass associated with this proposal is unlikely to result in significant impacts on the ecological function, species diversity and geographic distribution of seagrasses in the area. • Approx 155 ha of seagrass has been lost as a result of historical bitterns discharge. The EPA considers that the proponent should undertake research and investigation into the rehabilitation of seagrass and attempt to regenerate seagrass in this area.	Having particular regard to: • the fact that the loss of 60 ha of seagrass associated with the proposal is not significant relative to the extensive area of seagrass contained within the Shark Bay Marine Reserve and World Heritage Property; • the fact that indirect impacts on seagrass in the vicinity of the project are considered unlikely; • the fact that impacts on seagrass within the World Heritage Property are highly unlikely; and • the proponent's commitments regarding monitoring of turbidity and bitterns (commitments 1, 2 and 4); it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for the environmental factor 'Seagrass'. However the EPA recommends that the proponent should facilitate research into the rehabilitation of seagrasses in an attempt to regenerate seagrass in the areas previously affected by bitterns discharge.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVE	EPA ASSESSMENT	EPA ADVICE
Marine water quality	Freycinet Reach	Maintain or improve the quality of marine water consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993).	Potential impacts on marine water quality include impacts from increased turbidity and contamination from bitterns. **TURBIDITY** • coastal engineering studies of the proposal indicate that, during construction, turbidity generated from earthwork activities is unlikely to travel more than a few hundred metres. • Direction of turbidity plume is predicted to be alongshore rather than offshore. • The recent experience during construction of the PM1 pond in Useless Inlet supports these predictions. Monitoring during construction of PM1 found that measurable turbidity generally extended only a few tens of metres from the work site. Turbidity levels remained relatively low and, at the levels recorded, were not considered to be significant in terms of threat to seagrass. • Post construction, it is anticipated that only small amounts of turbidity will be generated, with turbidity increasing during cyclonic events. • The proponent has made a commitment to monitor turbidity during construction and halt work when sediment plumes might threaten seagrass (commitment 1). **BITTERNS** • Historically, direct bitterns discharge to the marine environment resulted in loss of seagrass in the shallow nearshore environment of Useless Loop. Shark Bay Salt has not discharged bitterns into the sea since 1987. Bitterns are currently disposed of by use in sealing ponds or disposed of by discharge into the highly saline groundwater through the floor of an existing channel within the salt works. SBSJV has made a commitment to continue disposing of bitterns using the current methods, and will not discharge bitterns directly into the marine environment (commitment 4). • SBSJV has an established water-quality monitoring program, involving monitoring seawater densities and chemical composition, at the mouth of Useless Loop. Water quality monitoring has shown no impacts from bitterns discharge to date. This program will continue to be carried out to monitor potential impacts from bitterns discharge from the proposed crystallizer ponds (commitment 2).	Having particular regard to the: • results of coastal engineering studies and recent experience in the area which indicate that turbidity generated from construction of the seawall is likely to extend only a few tens to hundreds of metres from the work site; • fact that any increases in turbidity will be temporary and localised; • fact that post construction turbidity is expected to be negligible; • fact that bitterns will not be discharged directly into the marine environment, though will be discharged into the groundwater via ponds, as is current practice (commitment 4); • fact that monitoring of the nearshore environment of Useless Loop has identified no changes in seawater composition resulting from current bitterns discharge practices; • the proponent's commitment to monitor turbidity during construction and halt work when sediment plumes might threaten seagrass (commitment 1); and • the proponent's commitment to continue water quality monitoring of the nearshore marine environment of Useless Loop (commitment 2), it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for the environmental factor 'Marine water quality'.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVE	EPA ASSESSMENT	EPA ADVICE
Increased shipping	The Shark Bay region	Ensure that the increase in shipping activities resulting from the project does not adversely impact the environment.	• Under current shipping practices, the number of cargoes is expected to increase from 55 to 75 per annum. Larger ships may be used rather than increasing the number of ship voyages. • Currently ~900 000 tonnes (t) salt exported with current ballast disposal estimated at ~300 000 t per annum. At full capacity the expanded salt field will export ~1.6 Mt, which will increase ballast discharge to ~500 000 t per annum. • The proponent requires shipping companies to follow AQIS ballast guidelines. Ballast is currently not tested due to ship design, however the proponent has advised that ballast testing and monitoring of the port for exotics is currently being considered. • The EPA considers that the proponent should develop a Ballast Water Management Plan which details how AQIS requirements will be enforced and what additional measures will be adopted to minimise the risk of introduction of exotic species. • SBSJV has an oil spill contingency plan, with DOT spill-management equipment and facilities stored on site ready for immediate deployment. • Waste and sewage are required to be retained onboard while ships are in the area.	Having particular regard to the: • fact that the proponent currently requires shipping companies to follow AQIS ballast guidelines, and will continue to encourage awareness of and compliance with AQIS guidelines (commitment 5); • fact that the proponent has an existing oil spill contingency plan; and • fact that waste and sewage must be retained during arrival, loading and departure of ships. it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for the environmental factor 'Increased shipping', provided that the proponent prepares a Ballast Water Management Plan which details how AQIS requirements will be enforced and what additional measures will be adopted to minimise the risk of introduction of exotic species.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVE	EPA ASSESSMENT	EPA ADVICE
Shark Bay World Heritage Property/Marine Reserve	The Shark Bay World Heritage Property/Marine Reserve.	Protect the conservation values, biodiversity and ecosystem functions of the Shark Bay World Heritage Property/Marine Reserve.	• The project area is located approx 1.5km from the border of the Shark Bay World Heritage Property. • Direct impacts on the World Heritage Property are unlikely. • Indirect impacts from reduced water quality, resulting from increased turbidity and bitterns contamination, are also considered unlikely. Bitterns are not discharged directly into the marine environment, and turbidity plumes are expected to extend only a few tens to hundreds of metres from the work site (see 'Marine Water Quality' above). • Potential for introduction of exotic species from ballast is discussed in 'Increased shipping' above.	Having particular regard to the: • fact that, given the project area is located approximately 1.5 km from the Shark Bay World Heritage Property, direct impacts on the Property resulting from the project are considered unlikely; • results of coastal engineering studies and recent experience in the area which indicate that turbidity generated from construction of the seawall is likely to extend only a few tens to hundreds of metres from the work site; • fact that bitterns will not be discharged directly into the marine environment. Current bitterns discharge practices, which have not resulted in the loss or degradation of seagrass, will continue to be used (commitment 4); • fact that the proponent has an existing Oil Spill Contingency Plan; • fact that the proponent requires shipping companies to follow AQIS ballast guidelines (commitment 5); and • proponent's commitments regarding the monitoring of turbidity (commitment 1) and nearshore marine water quality (commitment 2), it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for the environmental factor 'Shark Bay World Heritage Property/Marine Park', provided that the proponent prepares a Ballast Water Management Plan which details how AQIS requirements will be enforced and what additional measures will be adopted to minimise the risk of introduction of exotic species.

expected to leave a thin layer of fine sediment on the seafloor rather than settle on raised surfaces, such as seagrass (SBSJV, 1998a).

The recent experience during construction of the PM1 pond in Useless Inlet supports these predictions. Monitoring during construction of PM1 found that measurable turbidity generally extended only a few tens of metres from the work site. Turbidity levels remained relatively low and, at the levels recorded, were not considered to be significant in terms of threat to seagrass (SBSJV, 1998b).

The proponent has made a commitment (commitment 1) that turbidity will be monitored during the construction of the additional crystallizer ponds, and that the proponent will cease construction operations under adverse weather and tide conditions. Turbidity monitoring, including settlement on seagrass blades and criteria for ceasing construction operations, will be set out in a turbidity management and monitoring plan prior to the commencement of construction.

Post construction, it is anticipated that small amounts of turbidity will be released over the first one or two years as the seawall berm flattens, with increased turbidity expected under cyclonic conditions (SBSJV, 1998a). Under cyclonic conditions, it is expected that damage to the seawall will be minimal given the fact that the seawall will be constructed with an armour of one tonne armour stone (SBSJV, 1998a).

Bitterns

Bitterns are the by-product of salt production and contain high concentrations of salts other than sodium chloride. Historically, direct bitterns discharge to the marine environment resulted in loss of seagrass in the shallow nearshore environment of Useless Loop. An estimated 155 ha of seagrass (likely to be mixed beds of *P. australis* and *A. antarctica.*) has been lost as a result of previous bitterns discharge practices.

SBSJV has not discharged bitterns into the sea since 1987. Bitterns are currently disposed of by use in sealing ponds. In the long term, the proponent has made a commitment (commitment 4) that bitterns will continue to be disposed of by use in sealing ponds and/or by infiltration in purpose constructed impoundments within the Shark Bay Salt field, and will not be discharged directly into the marine environment without prior consultation with the EPA and CALM (SBSJV, 1998b).

SBSJV has an established water quality monitoring program, involving monitoring seawater densities and chemical composition, at the mouth of Useless Loop. To date, water quality monitoring has shown no impacts from current bitterns disposal methods, ie disposal of bitterns to ponds (SBSJV, 1998a). The proponent has made a commitment (commitment 2) to continue to implement the program to monitor potential impacts of future bitterns disposal.

Submissions

Concerns were raised in public submissions that the previous construction of the original causeway across the mouth of Useless Loop resulted in the formation of an artificial foreshore and intertidal zone that is devoid of seagrass growth, and that the likelihood of this occurring with the construction of the new sea-wall should be discussed.

It was considered that completing a once-off field inspection of the seagrass meadows in June is inadequate due to the fact that many of the 12 species of seagrass which occur in Shark Bay are tropical species and are only found during the hotter summer months when water temperature in the shallow embayments is much warmer.

It was also considered that the proponent did not give sufficient consideration to the biological processes, productivity and biodiversity of the seagrass communities within the mining lease.

Submissions raised the concern that the role of seagrass in modifying the physical, chemical and biological environment, as well as the geology of the bay, did not appear to be considered. The lack of consideration regarding the loss of habitat, the role of the area as a recruitment or nursery area for other species and the role of seagrass in Useless Loop beyond the immediate site was also raised.

The cumulative loss of seagrass in the area resulting from the Shark Bay salt works was also raised in public submissions. Given that there has been historical loss of seagrass in the area resulting from the salt project, it was considered that the proponent should identify the cumulative loss of seagrass in Useless Loop resulting from the construction of the salt project in this location.

Assessment

The area considered for assessment of this factor is the Shark Bay region (Figure 4).

The EPA's environmental objective for this factor is to ensure that there is no significant impact on the ecological function, abundance, species diversity and geographic distribution of seagrasses.

Construction of the additional F series crystallisers at Useless Loop will result in the direct loss of 60 ha of seagrass, predominantly *P. australis*. The proponent has outlined that, based on experience from the construction of other infrastructure in the area, including the original causeway across the mouth of Useless Loop, the PM1 bar and the causeway to Slope Island, there is no reason to believe that construction of the proposed crystallizer embankment will result in the creation of intertidal flats devoid of seagrass to the seaward side of the embankment (SBSJV, 1998b).

Coastal engineering studies predict that indirect impacts resulting from increased turbidity associated with construction will be insignificant. The proponent has made a commitment to monitor turbidity during construction and halt work when sediment plumes might threaten seagrass (commitment 1). Furthermore, water quality monitoring undertaken by SBSJV has shown no impacts from current bitterns disposal methods. This program will continue to be implemented to monitor potential impacts from future bitterns disposal (commitment 2).

Post construction, coastal engineering studies predict that minor levels of turbidity will be released over the first one or two years as the seawall berm flattens (SBSJV, 1998a). Increased turbidity is expected to be released under cyclonic conditions, however results of engineering studies indicate that there is a very low risk of major damage to the seawall given the fact that large armour stones will be used in seawall construction (SBSJV, 1998a). Under cyclonic conditions, it is expected that waves greater than three metres will break out from the seawall, which may cause localised damage to adjacent seagrass beds, however, such events are expected to occur infrequently and for short durations (SBSJV, 1998a).

Given the results of engineering studies, results of water quality monitoring undertaken to date and the proponent's commitments, the EPA considers that it is unlikely that the proposal will result in significant indirect impacts on seagrass.

The EPA recognises that seagrasses perform a number of important ecological functions in the marine environment, including providing organic matter as a food source, providing nursery areas and habitat for flora and fauna and also in storing and recycling nutrients in the marine environment, as well as playing a part in stabilising the ocean floor (EPA, 1998).

The EPA notes that seagrass extends over some 4 325 km^2 in the Shark Bay area and has generally been given a high degree of protection due to the extensive areas covered by the Marine Reserve and the World Heritage listings. The EPA therefore considers that the loss of 60 ha of seagrass associated with this proposal is unlikely to result in significant impacts on the ecological function, species diversity and geographic distribution of seagrasses in the area.

However, the EPA notes that a large area (approximately 155 ha) of seagrass within and adjacent to the mining lease area has been lost as a result of historical bitterns discharge. The EPA considers that the proponent should facilitate research into the rehabilitation of seagrass and trial methods for the rehabilitation of seagrass in this area.

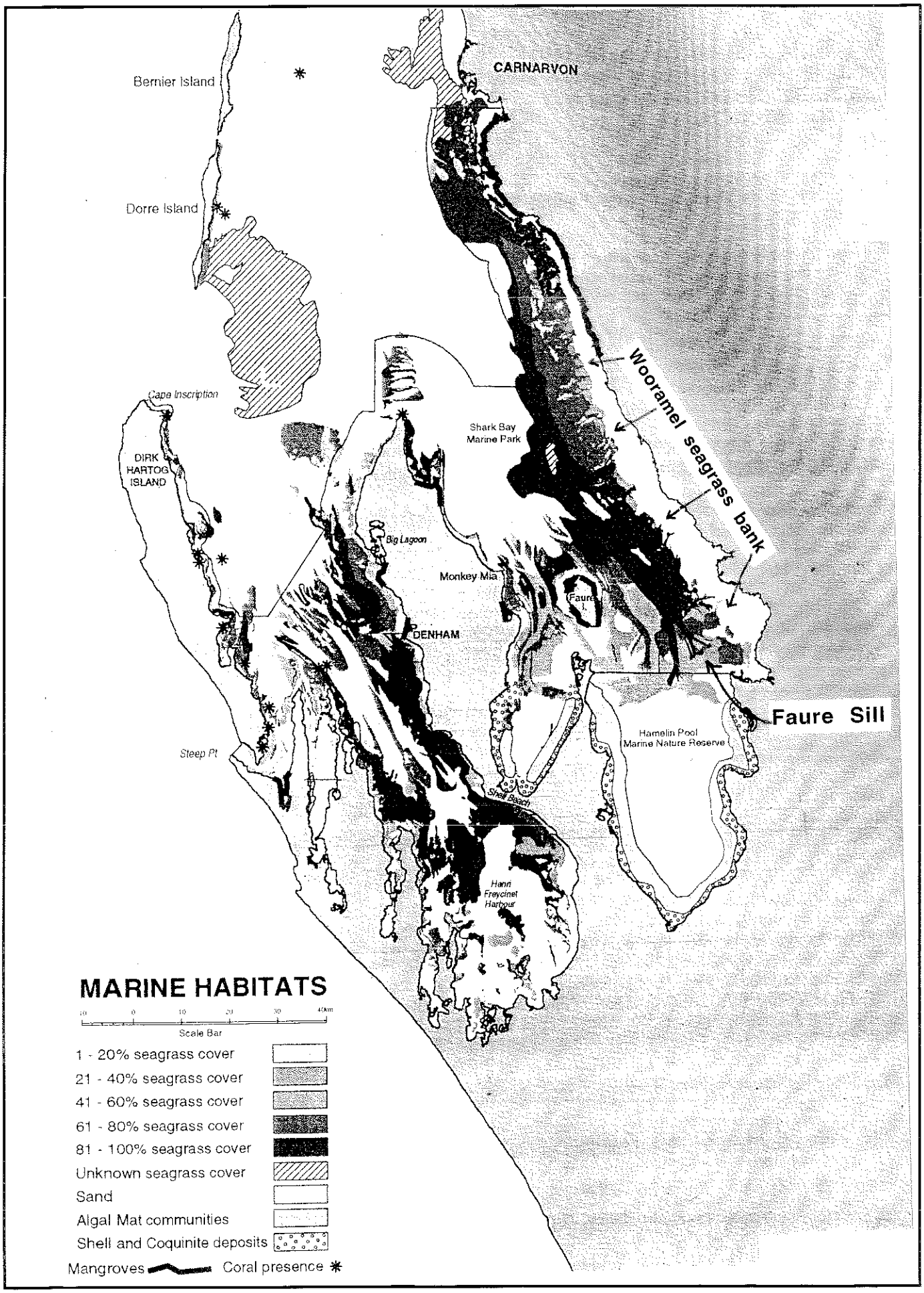


Figure 4. Seagrass Distribution in the Shark Bay Region.

Summary

Having particular regard to:

(a) the fact that the loss of 60 ha of seagrass associated with the proposal is not significant relative to the extensive area of seagrass contained within the Shark Bay Marine Reserve and World Heritage Property;

(b) the fact that indirect impacts on seagrass in the vicinity of the project is considered unlikely;

(c) the fact that impacts on seagrass within the World Heritage Property are highly unlikely; and

(d) the proponent's commitments regarding monitoring of turbidity and impacts of bitterns discharge (commitments 1, 2, 4 and 7);

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for the environmental factor 'Seagrass'. However, as outlined above, the EPA recommends that the proponent should prepare a Seagrass Research Strategy which outlines research into the rehabilitation of seagrass to be facilitated by the proponent. Based on this research, the proponent should develop a plan for rehabilitation trials in areas previously affected by the salt works.

3.2 Marine water quality

Description

Increased turbidity and contamination from bitterns discharge associated with the proposal have the potential to impact marine water quality in the vicinity of the project area.

Turbidity

Turbidity is likely to be generated during the construction of the crystallizer ponds.

Results of engineering studies undertaken by W S Andrew for SBSJV are reported in Appendix C of the CER. This report outlines that samples of construction material were put into suspension and allowed to settle to give an indicative measure of the proportion of material which is fine enough to cause a turbid plume, as well as a measure of the time it takes to settle from the water column (SBSJV, 1998a). Results indicate that only a small proportion of the construction material is fine enough to cause a turbid plume. This fine material cleared from the water surface and formed a floc on the bottom in 20 minutes, with full transparency restored in one to two hours (SBSJV, 1998a).

Given the above results, the report indicates that construction of the seawall is likely to produce localised turbidity, which will be contained to within 200 metres of the dumping point under rising tides or east winds (SBSJV, 1998a). The turbidity plume could reach up to one kilometre alongshore during a falling tide with a strong southerly wind (SBSJV, 1998a). Under cyclonic conditions during construction, turbidity is likely to increase. However, the proponent considers that the amount of turbidity generated under such conditions will be minimised by the fact that rock armour will be progressively placed on the seawall to strengthen and protect the wall during construction (Peter Newstead, Shark Bay Resources, *pers comm*).

In the response to public submissions, the proponent outlined that the recent experience during construction of the PM1 condenser pond in Useless Inlet supports these predictions. Monitoring during construction of PM1 found that measurable turbidity generally extended a few tens of metres from the work site. Turbidity levels remained relatively low and, at the levels recorded, were not considered to be significant in terms of threat to seagrass (SBSJV, 1998b).

The proponent has made a commitment (commitment 1) to develop a turbidity management and monitoring plan which outlines proposed turbidity monitoring and criteria for ceasing construction due to adverse conditions.

The coastal engineering report outlines that the seawall berm is designed at 1:6 grade, which is close to the 1:8 'stable' slope of moderately protected ocean beaches (SBSJV, 1998a). Post construction, it is anticipated that small amounts of turbidity will be released over the first one or two years as the seawall berm flattens, with increased turbidity expected under cyclonic conditions (SBSJV, 1998a). Under cyclonic conditions, the engineering report outlines that waves will tend to shape the berm towards the 'stable' 1:15 slope (SBSJV, 1998a). However, it is expected that damage to the seawall will be minimal given the short duration of cyclonic conditions and the fact that the seawall will be constructed with an armour of one tonne armour stone (SBSJV, 1998a).

Bitterns

Bitterns are the by-product of salt production, and contain high concentrations of salts other than sodium chloride.

Historically, bitterns discharge into Useless Loop has resulted in the loss of approximately 155 ha of seagrass. SBSJV has not discharged bitterns directly into the marine environment since 1987, and has advised that there are no plans to recommence discharge directly into the marine environment (SBSJV, 1998b).

The proponent has outlined that bitterns are currently disposed of by use in sealing ponds, re-establishing floors in old ponds or disposed of by discharge into the highly saline groundwater through the floor of an already existing channel within the current crystallizer complex. SBSJV has made a commitment (commitment 4) to continue using these methods to dispose of bitterns rather than dispose bitterns directly into the marine environment (SBSJV, 1998b).

Submissions

Concerns were raised in public submissions that the turbidity plume generated during construction would extend beyond the construction site, affecting seagrass meadows, corals and sponges within the World Heritage Property. Submissions suggested that further investigations into the conditions that influence the turbidity plume, and high risk weather conditions, be undertaken prior to construction, and that experience gained from the construction of the PM1 and F2 ponds be used to support claims regarding generation of turbidity associated with the current proposal.

It was also considered that, given its exposure to wave activity and possible cyclonic conditions, the slope of the seawall should be closer to the natural slop of 1:15 to reduce the loss of sediments through wave activity.

The potential for bitterns leakage from ponds was also raised in public submissions. Concern was raised that there has been no scientific interpretation of the results of the previous foreshore monitoring during the use of F2 to demonstrate that bitterns seepage is having no significant impact on water quality. Furthermore, given that the proposed F series ponds will be used for crystallizers, not for bitterns discharge, it was considered that further details regarding long term disposal of bitterns are required.

Assessment

The area considered for assessment of this factor is Freycinet Reach (Figure 1).

The EPA's environmental objective for this factor is to maintain or improve the quality of marine water consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993).

As outlined above, increased turbidity and contamination from bitterns discharge associated with the proposal have the potential to affect marine water quality in the vicinity of the project area.

Turbidity

Results of coastal engineering studies of the proposed seawall indicate that turbidity generated during and post construction is unlikely to be significant. These findings are consistent with the results of monitoring during the construction of the PM1 seawall in Useless Inlet. Notwithstanding these results, the proponent has made a commitment to monitor turbidity during construction and halt work when sediment plumes might threaten seagrass (commitment 1).

Given the results of the engineering studies, the proponent's recent experience in the construction of the PM1 seawall and the proponent's commitment regarding turbidity monitoring, the EPA considers that the turbidity generated from the current proposal is likely to be of a temporary and localised nature, and is unlikely to significantly affect biota in the vicinity of the proposed seawall.

Bitterns

The EPA notes that historical discharge of bitterns directly into Useless Loop has resulted in the loss of approximately 155 ha of seagrass. However, Shark Bay Salt has not discharged bitterns into the sea since 1987, and currently disposes of bitterns by use in sealing ponds, re-establishing floors on old ponds or disposal by discharge into the highly saline groundwater through the floor of an already existing channel within the current crystallizer complex. In response to public submissions, the proponent outlined that it is intended to continue using the current discharge methods, and that bitterns will not be discharged directly into the marine environment without prior consultation with the EPA and CALM (commitment 4).

SBSJV has an established water quality monitoring program, involving monitoring seawater densities and chemical composition, at the mouth of Useless Loop. To date, this water quality monitoring has shown no impacts from current bitterns discharge. The proponent has made a commitment (commitment 2) to continue to implement this monitoring program in order to identify any impacts resulting from bitterns discharge associated with the additional crystallizer ponds.

The proponent has also made a commitment (commitment 7) to monitor groundwater quality adjacent to the bitterns disposal areas to identify and monitor any changes in groundwater composition resulting from bitterns discharge disposal.

Given the proponent's commitments, the fact that ongoing marine water quality monitoring has identified no impacts from current bitterns discharge methods, and that the proponent will continue to use these methods of bitterns disposal and monitoring, the EPA considers that it is unlikely that bitterns discharge associated with the proposed crystallizers will affect the adjacent marine environment.

Summary

Having particular regard to the:

(a) results of coastal engineering studies and recent experience in the area which indicate that turbidity generated from construction of the seawall is likely to extend only a few tens to hundreds of metres from the work site;

(b) expectation that any increases in turbidity will be temporary and localised;

(c) predictions that post construction turbidity will be negligible;

(d) proponent's commitment that bitterns will be discharged into groundwater via ponds, as is current practice, and will not be discharged directly into the marine environment without prior consultation with the EPA and CALM (commitment 4);

(e) results of previous monitoring of the nearshore environment of Useless Loop, which has identified no changes in seawater composition resulting from current bitterns discharge practices;

(f) proponent's commitment to develop a turbidity management and monitoring plan (commitment 1);

(g) proponent's commitment to continue water quality monitoring of the nearshore marine environment of Useless Loop (commitment 2); and

(h) proponent's commitment to monitor groundwater quality adjacent to bitterns disposal areas (commitment 7),

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for marine water quality.

3.3 Increased shipping

Description

SBSJV currently exports approximately 0.9 million tonnes (Mt) of salt per annum from their ship loading facility located on Slope Island, directly north of Useless Loop. The current proposal to construct additional crystallizer ponds will allow SBSJV to utilise the brines generated by the newly completed primary pond (PM1) in Useless Inlet. The addition of PM1 and the proposed crystallizer ponds is expected to increase the quantity of salt exported from the Shark Bay Salt works from approximately 0.9 Mt to 1.6 Mt per annum.

Under current shipping practices, this additional volume of salt will increase the number of shipping cargoes from approximately 55 to 75 per annum. The proponent has outlined that it is possible that larger ships may be used rather than increasing the number of ship voyages.

The major issue associated with the expected increase in shipping is the potential for the introduction of exotic organisms from ballast water. It has been estimated that over 27 exotic species have been introduced into Western Australia via ballast water and hull fouling from shipping (Furlani, 1996).

It is estimated that the quantity of ballast water discharge associated with the expansion of the salt field will increase from approximately 300 000 t to 500 000 t per annum. The Australian Quarantine and Inspection Service (AQIS) has introduced a set of voluntary guidelines aimed at minimising the risk of introduction of exotic species (AQIS, 1995). The proponent has advised that shipping companies are required to follow AQIS ballast guidelines, which include the requirement that ballast water is exchanged at sea. SBSJV has made a commitment (commitment 5) to encourage awareness of and compliance with these AQIS guidelines.

Other issues associated with increased shipping include disposal of wastes and increased potential for hydrocarbon spills.

SBSJV has advised that ships are required to retain all waste and sewage onboard while ships are in the port (SBSJV, 1998b).

In response to public submissions, the proponent stated that the responsibility for management of oil spills in Shark Bay lies with the Department of Transport (DOT) and the Carnarvon Port Authority, and that SBSJV makes its facilities and personnel available to DOT as a local area Combat Authority (SBSJV, 1998b). The proponent has also advised that DOT spill management equipment and facilities are stored on site ready for immediate deployment in the case of a spill (SBSJV, 1998a). In addition to DOT management measures, the proponent has advised that SBSJV has an existing oil spill contingency plan for its own response to local emergencies, which complements DOT procedures and requirements.

Submissions

A number of submissions raised concerns regarding the potential for the introduction of exotic species from ballast water. Particularly, the adequacy of adopting AQIS voluntary guidelines for ballast water management was questioned.

Existing and potential tributyltin (TBT) contamination of sediments in the vicinity of the shipping berth, the risk and management of oil spills and the management and disposal of solid/domestic wastes from shipping were also raised in submissions.

A number of submissions also raised the issue of future dredging which may be required to accommodate larger vessels associated with the salt field expansion. The potential impact of such dredging on the World Heritage area was questioned.

The recent grounding of the salt cargo vessel the 'Pine Trust' was also raised. The submitter requested information as to what management measures have been put in place to avoid a repeat of this incident, and also raised questions regarding pre-qualification of ships servicing the project.

Assessment

The area considered for assessment of this factor is the Shark Bay region (Figure 1).

The EPA's environmental objective for this factor is to ensure that the increase in shipping activities resulting from the project does not adversely impact the environment.

The export of salt from shipping facilities on Slope Island, Useless Loop, is an existing operation associated with the salt works at Useless Loop. As outlined above, Shark Bay Salt Joint Venture has estimated that the proposed expansion of the salt works will increase the number of shipping cargoes from approximately 55 to 75 per annum.

Shark Bay Salt Joint Venture has a number of management measures in place to ensure that the potential impacts associated with current shipping practices are managed, including the management of ballast water, oil spills and waste disposal. These measures will continue to be implemented by the proponent.

The proponent has advised that shipping companies are required to follow AQIS ballast guidelines, and has made a commitment to encourage awareness of and compliance with the AQIS guidelines (commitment 5). One of the guidelines is that ballast water is exchanged at sea. SBSJV has advised that nothing but open-ocean ballast water may be discharged while ships are arriving, loading or departing Useless Loop (SBSJV, 1998a). While ship logs attesting to open-sea ballast exchange cannot be physically verified, the proponent considers that the falsification of AQIS records are unlikely due to significant penalties for offences and the fact that only reputable shipping companies are used for salt export operations. Ballast is currently not tested due to ship design, however the proponent has advised that ballast testing and monitoring of the port for exotics is currently being considered (SBSJV, 1998b). The EPA considers that a Ballast Water Management Plan detailing how AQIS guidelines are enforced and outlining additional measures which will be implemented to minimise the risk of introduction of exotic species, such as prequalification of shipping companies, should be developed by the proponent. The Management Plan should also provide details of monitoring which will be undertaken by the proponent to identify the presence of any exotic species.

Given that there will be no discharge of wastes or sewage from ships, the EPA considers that it is unlikely that disposal of discharges associated with this proposal will affect the marine environment in the vicinity of the project area. The proponent has also advised that SBSJV has an existing oil spill contingency plan which addresses the current shipping operations associated with the existing salt works. Taking these existing oil spill contingency plans into consideration, the EPA considers that it is unlikely that the additional shipping associated with the proposal will significantly increase the risk of oil spills.

In response to public submissions, the proponent has outlined that SBSJV has held preliminary discussions with involved agencies (including the DEP) regarding future dredging of the shipping channel. The proponent advises that the shipping channel will require maintenance dredging in the near future regardless of whether larger ships are used for salt export (SBSJV, 1998b). Any proposals to undertake dredging and spoil dumping are required to be submitted to State and Commonwealth agencies for approval. As a general requirement, analysis of sediments for contaminants, including TBT, is required prior to approval for dredging and dumping operations. SBSJV therefore proposes to conduct TBT analysis in conjunction with any future dredging programme (SBSJV, 1998b).

The recent grounding of the cargo vessel the 'Pine Trust' was the first incident associated with the Shark Bay salt operation (SBSJV, 1998b). SBSJV has advised that the incident was caused by pilot and crew error and has resulted in the amendment of procedures involving the checking-off of waypoints through the shipping channel, and a revision of incident response protocols (SBSJV, 1998b). The proponent also outlined that each ship arriving at Useless Loop is approved in advance by SBSJV, based on Australian standards, and that SBSJV employs a private pilot with considerable experience (SBSJV, 1998b). The EPA notes the additional management measures incorporated since the grounding of the 'Pine Trust' in 1997 and considers that it is unlikely that the additional shipping associated with the salt field expansion will significantly increase the risk of shipping incidents.

Summary

Having particular regard to the:

(a) proponent's requirements for shipping companies to follow AQIS ballast guidelines, and the proponent's commitment to continue to encourage awareness of and compliance with AQIS guidelines (commitment 5);

(b) proponent's existing Oil Spill Contingency Plan; and

(c) the requirements for ships to retain waste and sewage during arrival, loading and departure,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for increased shipping, provided that the proponent prepares a Ballast Water Management Plan which details how AQIS guidelines will be enforced, what additional measures will be adopted to minimise the risk of introduction of exotic species and monitoring measures that will be implemented to identify the introduction of any exotic species.

3.4 Shark Bay World Heritage Property/Marine Park

Description

The Shark Bay World Heritage Property was inscribed on the World Heritage List, established under the Convention for the Protection of the World Cultural and Natural Heritage, in 1991 on the basis of its 'natural heritage' values. The Shark Bay Marine Park and the Hamelin Pool Marine Nature Reserve, both gazetted in 1990, lie within the World Heritage Area. The Shark Bay Marine Reserves Management Plan (CALM, 1996) outlines the conservation, cultural, recreational, education and scientific and commercial values of the marine component of the Shark Bay area.

For nomination on the World Heritage List, the area must contain:

- outstanding examples representing the major stages of Earth's evolutionary history;
- outstanding examples representing significant ongoing geological processes, biological evolution and human interaction with the natural environment;
- certain unique, rare or superlative natural phenomena, formations or features of exceptional natural beauty; and
- the most important and significant habitats where threatened species of plants and animals of outstanding universal value from the point of view of science and conservation still survive.

The Shark Bay Marine Reserves Management Plan summarises how the Shark Bay area meets the above criteria: "The region contains an outstanding example of Earth's evolutionary history in the stromatolites and hypersaline environment of Hamelin Pool. There are significant ongoing geological and biological processes in both the marine and terrestrial environments of Shark Bay. The Faure Sill and Wooramel Seagrass Bank (Figure 4) are examples of the many superlative natural phenomena or features to be found in the World Heritage Area. The World Heritage Area provides the habitat of a number of rare and threatened species with many others at the limit of their range. Shark Bay is also noted for its natural beauty and in particular the diversity of its land and seascapes" (CALM, 1996).

The salt lease area was excluded from the area nominated and subsequently declared as a World Heritage Area, and is therefore not considered to be part of the World Heritage Property. The project area is located approximately 1.5 km from the border of the Shark Bay World Heritage Property. The area between the salt lease and the Heritage Property contains the shipping facilities associated with the salt operations, and is vested in the Carnarvon Port Authority (Figure 2).

Reduced marine water quality, which may occur as a result of the proposal, may result in indirect impacts on the World Heritage Area. The potential for the proposal to result in reduced marine water quality is discussed further in Section 3.2.

Coastal engineering studies indicate that turbidity generated by the construction of the seawall is unlikely to travel more than a few tens to hundreds of metres, and is therefore unlikely to affect the Heritage Property (SBSJV, 1998a). Notwithstanding results of these engineering studies, the proponent has made a commitment (commitment 1) to monitor turbidity during construction and halt work when sediment plumes might threaten seagrass.

Water quality monitoring undertaken to date has identified no impacts from current bitterns disposal methods. The proponent has made commitments (commitments 2 and 4) that the current bitterns disposal methods and associated water quality monitoring will continue to be implemented (SBSJV, 1998a).

Potential impacts on the World Heritage Property from increased shipping associated with the proposal, such as hydrocarbon spills and introduction of exotic marine organisms through ballast water discharge, are discussed above in Section 3.3. The proponent has an existing oil spill contingency plan and requires shipping companies to follow AQIS ballast guidelines (commitment 5).

Submissions

Submissions raised concern that the proponent appears to assume that the proposal has no impact on the Shark Bay World Heritage Property because it is located outside the Property boundary. It is considered that inadequate consideration is given to impacts on the biological processes that connect the area included in the mining lease with the adjacent environment.

Assessment

The area considered for assessment of this factor is the Shark Bay World Heritage Property/Marine Reserve.

The EPA's environmental objective for this factor is to protect the conservation values, biodiversity and ecosystem functions of the Shark Bay World Heritage Property/Marine Reserve.

The project area is located approximately 1.5 km from the border of the Shark Bay World Heritage Property. Given the distance between the Property and the project area, the EPA considers that direct impacts on the Property are unlikely.

Indirect impacts from reduced water quality, resulting from increased turbidity and bitterns contamination, are also considered unlikely. Bitterns will not be discharged into the marine environment, and turbidity plumes are expected to extend only a few hundred metres from the work site (SBSJV, 1998a). Bitterns disposal and generation of turbidity are discussed further in Section 3.2 'Marine Water Quality' above.

The potential for the introduction of exotic species from ballast water and the potential for hydrocarbon spills from shipping are discussed in 'Increased shipping' above. The proponent has an existing Oil Spill Contingency Plan and requires shipping companies to follow AQIS ballast guidelines. The EPA considers that the management of ballast water requires close attention to reduce the potential for the introduction of exotic species from ballast water. The EPA therefore considers that the proponent should prepare a Ballast Water Management Plan which details how AQIS requirements will be enforced and what additional measures will be adopted to minimise the risk of introduction of exotic species.

The values of the Shark Bay World Heritage Property are outlined in the Shark Bay Marine Reserves Management Plan (CALM, 1996). The proposal is unlikely to cause direct disturbance to the Shark Bay World Heritage Property, and the potential for indirect disturbances to the Property will not significantly increase as a result of the proposal. The EPA therefore considers that it is unlikely that the proposal will affect the conservation values, biodiversity or ecosystem functions of the Shark Bay World Heritage Property/Marine Reserve.

Summary

The EPA notes that the proposal is adjacent to the environmentally significant Shark Bay World Heritage Property. The EPA recognises that there may be public concern regarding the potential impacts of development proposals on the Property.

Having particular regard to the:

(a) location of the project area, which is approximately 1.5 km from the Shark Bay World Heritage Property. Direct impacts on the Property resulting from the project are therefore considered unlikely;

(b) results of coastal engineering studies and recent experience in the area which indicate that turbidity generated from construction of the seawall is likely to extend only a few tens to hundreds of metres from the work site;

(c) proponent's commitment that bitterns will not be discharged directly into the marine environment without prior consultation with the EPA and CALM. Bitterns will continue to be discharged using current bitterns discharge practices, which have not resulted in the loss or degradation of seagrass (commitment 4);

(d) proponent's existing Oil Spill Contingency Plan;

(e) proponent's requirements for shipping companies to follow AQIS ballast guidelines, and the proponent's commitment to continue to encourage awareness of and compliance with AQIS guidelines (commitment 5); and

(f) proponent's commitments regarding the monitoring of turbidity (commitment 1), nearshore marine water quality (commitment 2) and groundwater quality (commitment 7),

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for the Shark Bay World Heritage Property/Marine Park, provided that the proponent prepares a Ballast Water Management Plan which details how AQIS guidelines will be enforced, what additional measures will be adopted to minimise the risk of introduction of exotic species and monitoring measures that will be implemented to identify the introduction of any exotic species.

4. Conditions and commitments

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.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal, and following discussion with the proponent the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable. They do, however, provide a clear statement of the action to be taken as part of the proponent's responsibility for, and commitment to, continuous improvement in environmental performance. The commitments, modified if necessary to ensure that they are enforceable, then form part of the conditions to which the proposal should be subject if it is to be implemented.

The EPA may, of course, also recommend conditions additional to that relating to the proponent's commitments.

4.1 Proponent's commitments

The proponent's commitments as set in the CER and subsequently modified, as shown in Table 4, should be made enforceable conditions.

4.2 Recommended conditions

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions which the EPA recommends should be imposed if the proposal by Shark Bay Salt Joint Venture to construct additional crystallizer ponds in Useless Loop, Shark Bay, is approved for implementation. These conditions are presented in Appendix 1. Matters addressed in the conditions include:

(a) the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions;

(b) Ballast Water Management Plan which details how AQIS guidelines will be enforced, what additional measures will be adopted to minimise the risk of introduction of exotic species and monitoring measures that will be implemented to identify the introduction of any exotic species;

(c) the proponent shall prepare a Seagrass Research Strategy which outlines reasonable and practical research into the rehabilitation of seagrass to be facilitated by the proponent. Based on this research, the proponent shall develop a practical and reasonable plan for rehabilitation trials in areas previously affected by the salt works;

Table 4: Summary of proponent's commitments

Commitment	Objective	Action	Timing	On advice from	Measurement/ Compliance
1. Turbidity generated by the crystalliser embankment will be monitored.	To protect the adjacent marine environment from increased turbidity generated by the crystalliser embankment.	The proponent will develop a turbidity management and monitoring plan which outlines proposed turbidity monitoring, including settlement on seagrass blades, and criteria for ceasing construction.	Pre-construction	DEP	Report in Annual Environmental Report (AER).
2. Marine water quality in the area adjacent to the crystalliser ponds will be monitored.	To identify and monitor any changes in seawater composition resulting from bitterns disposal. To ensure compliance with draft WA Guidelines for Fresh and marine Waters (EPA, 1993).	The proponent will relocate the established programme for monitoring seawater densities and chemical composition to the seaward side of the new facility.	Operations	DEP	Report immediately to DEP is incident serious; otherwise in AER.
3. A survey for rare and priority flora will be carried out prior to disturbance of any areas.	To ensure that no rare and priority flora are affected by borrow pit activities.	Supplement previous DRF work by examination of areas prior to disturbance.	Pre-construction	CALM	Consult with CALM in the event of doubtful plant identification, and if rare or priority species are discovered.
4. Bitterns will not be discharged directly into the marine environment without prior consultation with the EPA and CALM.	To prevent impacts on the adjacent marine environment as a result of bitterns discharge.	Bitterns will be discharged of by use in sealing ponds and/or by infiltration in purpose constructed impoundments.	Operations	DEP	Report in AER.
5. Ships will comply with Australian Quarantine and Inspection Service (AQIS) guidelines for ballast management.	To reduce the potential for introduction of exotic species from ballast water.	Continue awareness of and compliance with ballast management protocols.	Operations	AQIS, DEP	Report incidents to DEP immediately if serious; otherwise in AER.
6. Borrow pits will be rehabilitated.	Ensure that borrow pits and other disturbed areas are successfully rehabilitated.	Continue to implement the established programme for progressive rehabilitation of all disturbed areas.	Completion of construction.	DEP	Photographic monitoring and success of rehabilitation will be reported in AER.
7. Groundwater quality adjacent to bitterns disposal areas will be monitored.	To identify and monitor any changes in groundwater composition resulting from bitterns disposal.	Proponent will monitor groundwater adjacent to bitterns disposal areas.	Operations.	DEP	Report in AER.

(d) in order to manage the relevant environmental factors and the EPA's environmental objectives contained in this bulletin and subsequent conditions and procedures authorised by the Minister for the Environment, the proponent shall demonstrate that there is in place an environmental management system (EMS) which includes the following elements:

1. An environmental policy and corporate commitment to it;
2. Mechanisms and processes to ensure:
    - planning to meet environmental requirements
    - implementation and operation of actions to meet environmental requirements
    - measurement and evaluation of environmental performance; and
3. A mechanism for continuous review and improvement of environmental outcomes.

5. Conclusions

The EPA has considered the proposal by SBSJV to construct additional crystallizer ponds at the mouth of Useless Loop, Shark Bay.

The EPA notes that the proposal will result in the loss of approximately 60 ha of seagrass (predominantly *P. australis*). However, the EPA considers that, given the fact that seagrass in the Shark Bay area has generally been given a high degree of protection due to the extensive areas covered by the Marine Reserve and the World Heritage listings, the loss of 60 ha of seagrass associated with this proposal is unlikely to result in significant impacts on the ecological function, species diversity and geographic distribution of seagrasses in the area.

However, the EPA notes that a large area of seagrass within and adjacent to the mining lease area has been lost as a result of historical bitterns discharge. The EPA considers that the proponent should facilitate research into the rehabilitation of seagrass and trial methods for rehabilitation of seagrass in this area.

The EPA has also given considerable attention to the issue of introduction of exotic species from ballast water. The EPA considers that the management of ballast water requires close attention to reduce the potential for the introduction of exotic species, and therefore considers that the proponent should prepare a Ballast Water Management Plan which details how AQIS requirements will be enforced and what additional measures will be adopted to minimise the risk of introduction of exotic species.

The EPA considers that the proposal is unlikely to cause direct disturbance to the Shark Bay World Heritage Property, and the potential for indirect disturbances to the Property will not significantly increase as a result of the proposal. The EPA therefore considers that it is unlikely that the proposal will affect the conservation values, biodiversity or ecosystem functions of the Shark Bay World Heritage Property/Marine Reserve

The EPA has concluded that the proposal can be managed in a manner such that the proposal does not impose an unacceptable impact on the environment, provided that the conditions recommended in Section 4, and set out in formal detail in Appendix 1, are imposed.

6. Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes that the project being assessed is adjacent to the environmentally sensitive Shark Bay World Heritage Property/Marine Reserve;
2. The EPA recommends that the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. The EPA recommends that the Minister notes that the EPA has concluded that the proposal can be managed in a manner such that the proposal does not impose an unacceptable impact on the environment, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 1, including the proponent's commitments;
4. The EPA recommends that the Minister imposes the conditions as set out in Appendix 1 of this report.

Appendix 1

Recommended Environmental Conditions and proponent's consolidated commitments

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

CONSTRUCTION OF ADDITIONAL CRYSTALLIZERS, USELESS LOOP, SHARK BAY

Proposal: To construct a new series (F series) of crystallizer ponds at the northern edge of the existing Shark Bay Salt crystallizers in Useless Loop, Shark Bay, as documented in schedule 1 of this statement. Construction of the new series of ponds will enclose approximately 125 hectares of shallow marine environment up to the boundary of Mining Lease 260 SA, of which some 60 hectares is seagrass.

Proponent: Shark Bay Salt Joint Venture

Proponent Address: 22 Mount Street, PERTH WA 6000.

Assessment Number: 1193

Report of the Environmental Protection Authority: Bulletin 933

The proposal to which the above report of the Environmental Protection Authority relates may be implemented subject to the following conditions and procedures:

1 Implementation

1-1 Subject to these conditions and procedures, the proponent shall implement the proposal as documented in schedule 1 of this statement.

1-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

2 Proponent Commitments

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

2-2 The proponent shall implement subsequent environmental management commitments which the proponent makes as part of the fulfilment of conditions and procedures in this statement.

3 Environmental Management System

3-1 In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to construction of the additional crystallizers, the proponent shall demonstrate to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection that there is in place an environmental management system which includes the following elements:

1 An environmental policy and corporate commitment to it;

2 Mechanisms and processes to ensure:

2.1 planning to meet environmental requirements;

2.2 implementation and operation of actions to meet environmental requirements;

2.3 measurement and evaluation of environmental performance; and

3 Review and improvement of environmental outcomes.

3-2 The proponent shall implement the environmental management system required by condition 3-1.

4 Ballast Water Management Plan

4-1 The proponent shall prepare a Ballast Water Management Plan which details how Australian Quarantine and Inspection Service guidelines will be enforced and what additional measures will be adopted to minimise the risk of introduction of exotic species from ballast water. The plan shall be prepared to the requirements of the Environmental Protection Authority on advice of the Australian Quarantine and Inspection Service and the Department of Environmental Protection.

4-2 The proponent shall implement the Ballast Water Management Plan required by condition 4-1.

5 Seagrass Research Strategy

5-1 The proponent shall prepare a Seagrass Research Strategy which outlines reasonable and practical research into the rehabilitation of seagrass to be facilitated by the proponent. The strategy shall be prepared to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

5-2 The proponent shall implement the Seagrass Research Strategy required by condition 5-1.

5-3 Based on the research outlined in the Seagrass Research Strategy, the proponent shall develop a practical and reasonable plan for rehabilitation trials in areas previously affected by the salt works. The plan shall be prepared to the requirements of the EPA on advice of the DEP.

5-4 The proponent shall implement the rehabilitation plan required by condition 5-3.

6 Decommissioning and Rehabilitation Management Plan

6-1 At least six months prior to decommissioning, the proponent shall prepare a Decommissioning and Rehabilitation Management Plan to ensure that the area is rehabilitated to agreed standards, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection, Department of Minerals and Energy, Department of Conservation and Land Management and Fisheries WA.

6-2 The proponent shall implement the Decommissioning and Rehabilitation Management Plan required by condition 6-1 until such time as the Minister for the Environment determines that decommissioning and rehabilitation are complete.

6-3 The proponent shall make the Decommissioning and Rehabilitation Management Plan required by condition 6-1 publicly available, to the requirements of the Environmental Protection Authority.

7 Proponent

7-1 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 in respect of the proposal.

7-2 Any request for the exercise of that power of the Minister referred to in condition 7-1 shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.

7-3 The proponent shall notify the Department of Environmental Protection of any change of proponent contact name and address within 30 days of such change.

8 Commencement

8-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced.

8-2 Where the proposal has not been substantially commenced within five years of the date of this statement, the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment will determine any question as to whether the proposal has been substantially commenced.

8-3 The proponent shall make application to the Minister for the Environment for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement at least six months prior to the expiration of the five year period referred to in conditions 8-1 and 8 -2.

8-4 Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years for the substantial commencement of the proposal.

9 Compliance Auditing

9-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit program prepared in consultation between the proponent and the Department of Environmental Protection.

9-2 Unless otherwise specified, the Chief Executive Officer of the Department of Environmental Protection is responsible for assessing compliance with the conditions, procedures and commitments contained in this statement and for issuing formal clearances.

9-3 Where compliance with any condition, procedure or commitment is in dispute, the matter will be determined by the Minister for the Environment.

Note

1 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.

Schedule 1

The Proposal

The proposal is to construct a new series (F series) of crystallizer ponds at the northern edge of the existing Shark Bay Salt crystallizers in Useless Loop, Shark Bay. The additional ponds will be located adjacent to the boundary of Mining Lease 260SA, located approximately 1.5 kilometres from the closest point of the Shark Bay World Heritage Property/Marine Reserve.

A two kilometre long sea-wall will enclose approximately 125 hectares of shallow marine environment, of which 60 hectares is seagrass (predominantly monospecific beds of *Posidonia australis*). Material to construct the seawall will be extracted from an existing borrow pit near the crystallizer ponds.

The key characteristics of the proposal are described in the table below.

Element	Description
Area of disturbance	Approximately 150 hectares.
Area of seagrass directly lost	Approximately 60 hectares.
Seagrass type	Predominantly *Posidonia australis*.
Seawall	2 km long seawall with calcareous fill and rock armour on the seaward side.
Construction material	Approximately 300 000 m^3 of inert calcareous material for seawall construction and fill. Rock armour.
Source of construction material	Existing borrow pit near F2 and Useless Loop township, which contains both rock and finer material.
Period of construction	Approximately four months.
Life of project	More than 20 years.
Bitterns discharge	Initially disposal into ponds for sealing pond floors. Long term disposal by use in sealing ponds and/or by infiltration into groundwater through purpose constructed impoundments in the salt field. Bitterns will not be discharged directly into the marine environment.
Salt export	Expected to increase from ~0.9 Mt to ~1.6 Mt per annum.
Shipping	Under current shipping practices, cargoes are expected to increase from 55 to 75 per annum.

Maps

Figure 1: Location of the crystallizer ponds in relating to existing salt ponds and the Shark Bay World Heritage Area/Marine Reserve.

Figure 2: Cross-section of crystallizer levee wall.

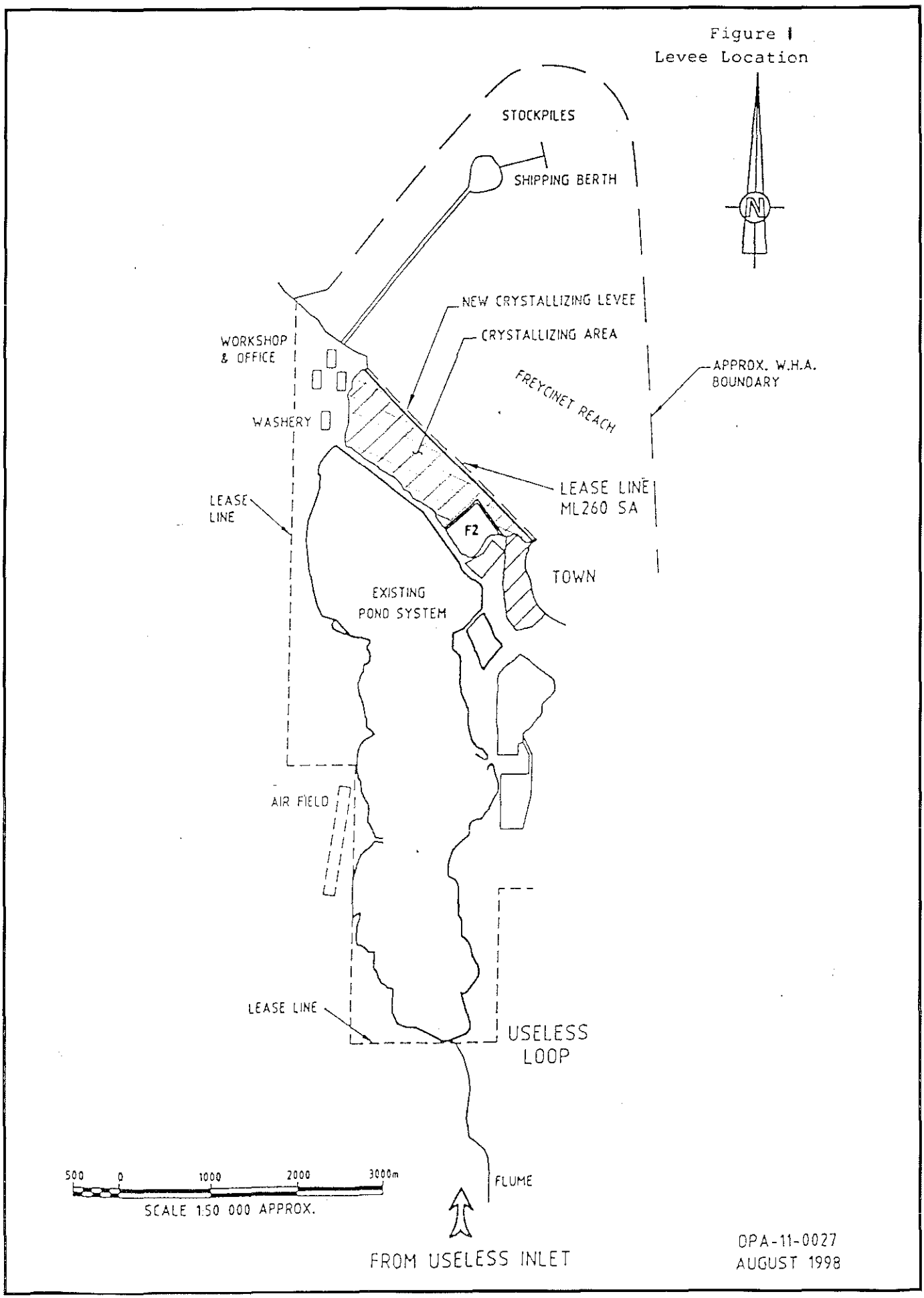
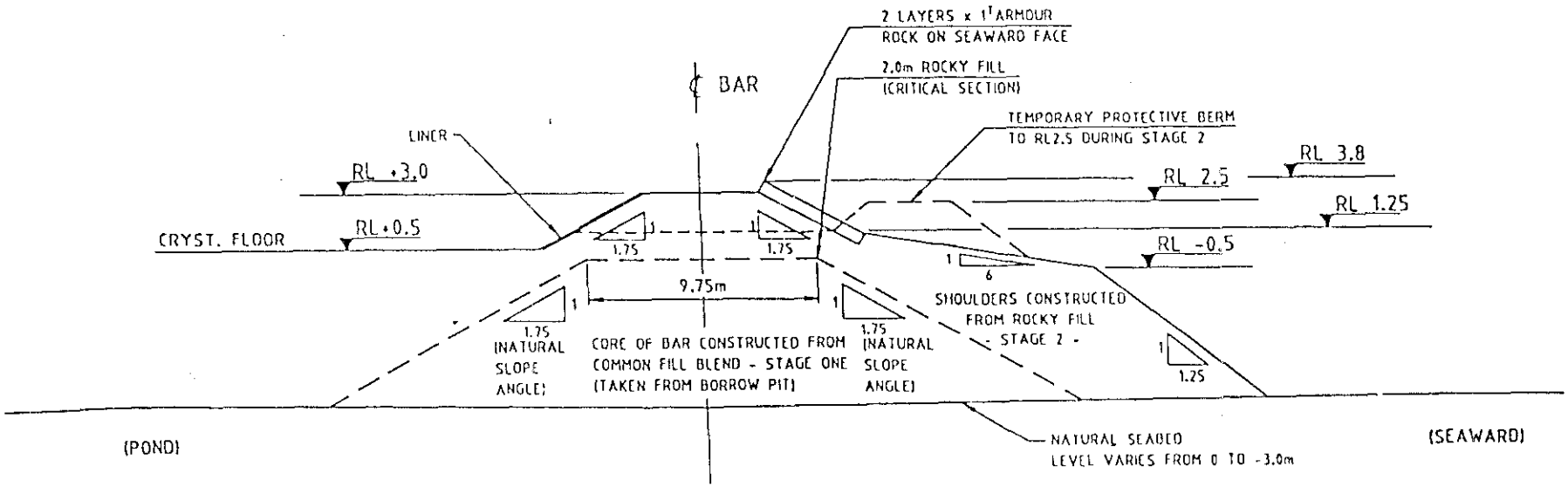


Figure 1. Levee location.



NEW CRYSTALLISERS LEVEE
TYPICAL CROSS SECTION

P-1 DRAWING MODIFIED
FOR FRONT POND

Figure 2. Typical cross-section.

Schedule 2

Proponent's Consolidated Environmental Management Commitments

April 1999

Construction of additional crystallizers,

Useless Loop, Shark Bay (1193)

Shark Bay Salt Joint Venture

CONSTRUCTION OF ADDITIONAL CRYSTALLIZERS, USELESS LOOP, SHARK BAY (1193)

Commitment	Objective	Action	Timing	On advice from	Measurement/ Compliance
1. Turbidity generated by the crystalliser embankment will be monitored.	To protect the adjacent marine environment from increased turbidity generated by the crystalliser embankment.	The proponent will develop a turbidity management and monitoring plan which outlines proposed turbidity monitoring, including settlement on seagrass blades, and criteria for ceasing construction.	Pre-construction	DEP	Report in Annual Environmental Report (AER).
2. Marine water quality in the area adjacent to the crystalliser ponds will be monitored.	To identify and monitor any changes in seawater composition resulting from bitterns disposal. To ensure compliance with draft WA Guidelines for Fresh and marine Waters (EPA, 1993).	The proponent will relocate the established programme for monitoring seawater densities and chemical composition to the seaward side of the new facility.	Operations	DEP	Report immediately to DEP is incident serious; otherwise in AER.
3. A survey for rare and priority flora will be carried out prior to disturbance of any areas.	To ensure that no rare and priority flora are affected by borrow pit activities.	Supplement previous DRF work by examination of areas prior to disturbance.	Pre-construction	CALM	Consult with CALM in the event of doubtful plant identification, and if rare or priority species are discovered.
4. Bitterns will not be discharged directly into the marine environment without prior consultation with the EPA and CALM.	To prevent impacts on the adjacent marine environment as a result of bitterns discharge.	Bitterns will be discharged of by use in sealing ponds and/or by infiltration in purpose constructed impoundments.	Operations	DEP	Report in AER.
5. Ships will comply with Australian Quarantine and Inspection Service (AQIS) guidelines for ballast management.	To reduce the potential for introduction of exotic species from ballast water.	Continue awareness of and compliance with ballast management protocols.	Operations	AQIS, DEP	Report incidents to DEP immediately if serious; otherwise in AER.
6. Borrow pits will be rehabilitated.	Ensure that borrow pits and other disturbed areas are successfully rehabilitated.	Continue to implement the established programme for progressive rehabilitation of all disturbed areas.	Completion of construction.	DEP	Photographic monitoring and success of rehabilitation will be reported in AER.
7. Groundwater quality adjacent to bitterns disposal areas will be monitored.	To identify and monitor any changes in groundwater composition resulting from bitterns disposal.	Proponent will monitor groundwater adjacent to bitterns disposal areas.	Operations.	DEP	Report in AER.

Appendix 2

List of submitters

Organisations:

Department of Environmental Protection Midwest Regional Office
Department of Environmental Protection Marine Management Branch
Department of Resources Development
Fisheries Western Australia
Department of Conservation and Land Management
Department of Transport
Environment Australia (Australian and World Heritage Group)
Shark Bay World Heritage Property Community Consultative Committee
Shark Bay World Heritage Property Scientific Advisory Committee
Marine Parks and Reserves Authority
Australian Marine Conservation Society
Conservation Council of Western Australia

Appendix 3

References

Appendix 4

Summary of public submissions and proponent's response

CONSTRUCTION OF ADDITIONAL CRYSTALLISERS, USELESS LOOP, SHARK BAY (Assessment number 1193)

SHARK BAY SALT JOINT VENTURE

SUMMARY OF SUBMISSIONS

The public submission period for the Consultative Environmental Review (CER) for the Construction of Additional Crystallisers in Useless Loop, Shark Bay proposed by Shark Bay Salt Joint Venture commenced on 31 August for a period of four weeks, ending 28 September 1998.

12 submissions were received by the Environmental Protection Authority (EPA), from the Department of Environmental Protection Midwest Regional Office, Department of Environmental Protection Marine Branch, Department of Resources Development, Fisheries Western Australia, the Department of Conservation and Land Management, the Department of Transport, Environment Australia (Australian and World Heritage Group), Shark Bay World Heritage Property Community Consultative Committee, Shark Bay World Heritage Property Scientific Advisory Committee, Marine Parks and Reserves Authority, Australian Marine Conservation Society, and the Conservation Council of Western Australia.

The proponent is asked to address all issues and questions.

In summary, the principle issues were identified as:

SEAGRASS

- The construction of the original causeway across the mouth of Useless Loop has resulted in the formation of an artificial foreshore and intertidal zone that is devoid of seagrass growth. There does not seem to be adequate discussion of the likelihood of a similar deposition over time seaward from the proposed external pond walls, resulting in the formation of an artificial foreshore with a similar area of bare intertidal flats. If such deposition were to occur over time, a much greater area of seagrass would be lost than the 60 ha predicted in the report.
- It is known that seagrass beds are productive habitats which play an important part in the life history of many fish species. The seagrass survey of the marine area conducted by the Marine and Freshwater Research Laboratory (Murdoch University) noted the presence of commercial species of fish (mullet and whiting), however research which would allow the quantification of the productive contribution of seagrass in this location to the fish resources available to fishermen is unavailable. The loss of seagrass and therefore productive fish habitat must inevitably permanently reduce the fisheries resources at Shark Bay. These resources are currently utilised by both commercial and recreational fishers whose operations will be impacted by the loss of this renewable resource.
- The seagrass investigations of the Marine and Freshwater Research Laboratory were confined to seagrass mapping and biomass cover estimates. The CER does not consider the biological processes, productivity and biodiversity of the seagrass communities within the mining lease. There has been no consideration of other species that inhabit the communities, and the role of this area as a recruitment (or nursery area) for species that inhabit the wider marine environment.
- As highlighted in the Agreement on Shark Bay between the State and Commonwealth Governments, seagrass has a role in modifying the physical, chemical and biological environment as well as the geology of the bay. The role of seagrass in Useless Loop beyond the immediate site does not appear to be considered.

- The report on seagrasses by the Marine and Freshwater Research Laboratory (Murdoch University) outlines that an area of seagrass near pond F2 appeared to be damaged, and that it is possible that the construction of pond F2 affected seagrass in this area either directly through construction or indirectly by changing current or sedimentation processes. It is considered that such impacts are likely to occur during construction of the additional crystallisers, resulting in further seagrass loss.
- The CER claims that the marine origins of the fill material will make it 'unlikely to disturb the local environment for more that a few tidal cycles: it will not settle on seagrass, but on the seabed.' Under adverse conditions it is believed that the potential for turbidity to rob seagrass of light for protracted periods, and for smothering to occur, to be greater than outlined in Appendix C of the CER. Should the project be approved, approval should include constraints on the weather conditions under which fill may take place.
- The cumulative impacts of the proposal should be considered under the Environmental Protection Authority Guidance for the Assessment of Environmental factors - Draft Guidance 22: Seagrass Habitat Protection.
- Given that there has been historical loss of seagrass in the area resulting from the salt project, the proponent should identify the cumulative loss of seagrass in Useless Loop resulting from the construction of the salt project in this location.
- Completing a once-off field inspection of the seagrass meadows in June is inadequate. Many of the 12 species of seagrass which occur in Shark Bay are tropical species and are only found during the hotter summer months when water temperature in the shallow embayments is much warmer.
- The seagrass to be destroyed could be recovered and used for transplanting to rehabilitate areas around the port which has suffered loss of seagrass.

MARINE FAUNA

- No mention is made of arrangements for finding and relocating marine fauna that inhabit the project area (however few they may be). This needs to be addressed. The proponent's recent experience during the construction of the levee across Useless Inlet should be drawn upon in determining appropriate arrangements.
- The CER appears to assess vertebrates only. In the CER, invertebrates are passed off by the words 'there are no corals or sponges in the project area'. These are not the only two groups that should have been considered. Furthermore, although corals would not be expected in this area, sponges are an important feature of the seagrass ecosystem and would no doubt occur in this habitat. This statement demonstrates that no effort was made to assess the invertebrate fauna.
- The statement that 'other than a few fish species (mullet, whiting) that use the project area, few marine fauna was observed' is simplistic in the extreme. The fish fauna of this area is likely to be species rich with a diverse assemblage of seagrass fishes (including juveniles using it as a nursery) as well as a range of species that invade the shallows over the sand flats at high tide. If the CER did not survey the fish fauna then it should have not made comment on this aspect of the ecosystem.
- Dugong have been recorded feeding on *Amphibolus antarctica*. Recent anecdotal evidence suggests that the species may play a more important role in the diet of dugong than first thought. Furthermore, the occurrence of even small amount of *Halophila ovalis* indicates that the site may be frequented by dugongs at different times dependant upon seasons. A limited two day inspection of the site is not sufficient to determine the relative importance of this site to dugong.
- CALM understands that commercial beach seine fishermen do use the current beachfront to net whiting and mullet.

FORESHORE/INTERTIDAL SANDFLATS

- The CER refers to a "small area of natural foreshore" and that "the loss of a small area of this few hundred metres of foreshore will be of little significance". These statements provide no hard data to assess the significance of the loss of foreshore. The CER does not consider the impacts on the biota of the intertidal sandflats. The intertidal sandflats are likely to contain a high diversity of invertebrate species. An investigation of the biodiversity, biological processes and productivity of the sandy intertidal flats, similar to that proposed for the seagrass communities, is required to enable adequate assessment of the proposal.
- The CER identifies that the existing nearshore environment at Useless Loop has been altered due to the previous levee construction. It is apparent that a new nearshore flat will develop on the seaward shore of the proposed levee. This point does not appear to be acknowledged and taken into consideration in the CER. If the proposal proceeds and a nearshore flat developed comparable to the existing one adjacent to the causeway and area of seagrass approximately equivalent to that within the mining lease will disappear. Therefore, the area of seagrass to be lost by this proposal is approximately double that identified in the CER.

SHARK BAY WORLD HERITAGE PROPERTY

- It is of concern that the proponent appears to assume their proposal has no impact on the Shark Bay World Heritage Property because it is located outside the Property boundary. Inadequate consideration is given to impacts on the biological processes that connect the area included in the mining lease with the adjacent environment.

TURBIDITY

- The turbidity plume created during levee construction is likely to extend well beyond the construction site, affecting seagrass meadows within the World Heritage Area. To accurately gauge the proposal's likely impact on the World Heritage Area during construction, further investigation is required into the conditions that influence the turbidity plume. High risk weather conditions must be clearly identified before construction. The expected distribution of the turbidity plume expected during south, southwesterley and westerly winds on both in-going and out-going tides is required. Further detail is also required on how differing wind strengths will affect the distribution of sediment transport.
- The CER claims that, based on experience with the recent construction of the bar in Useless Inlet and the F2 crystalliser, the proponent is confident that there will be no significant impacts on seagrass resulting from turbidity. No evidence is provided to support this claim. What have the audit reports on this construction shown? What information is available from monitoring of turbidity plumes?
- The report does not adequately address the potential impacts on corals and sponges outside the project area resulting from increased turbidity.
- The current design of the levee is considered to be inadequate. Considering its exposure to wave activity and the possible occurrence of cyclonic conditions the slope of the levee should be closer to the natural slope of 1:15. This would reduce the loss of sediments through wave activity.

BITTERNS

- The construction of F2 utilised a plastic membrane in the walls of the pond to ensure that bitterns seepage was into the floor of the pond to seal the bed. There is no commitment to construct the new ponds in this manner. More information is required about the potential for leakage from ponds. How will this be managed/reduced?

- There has been no scientific interpretation of the results of the previous foreshore monitoring during the use of F2 to demonstrate that bitterns seepage is having no significant impact on water quality. Given that there has been historical loss of seagrass in the area due to inappropriate discharge of bitterns, the proponent should assess the future indirect loss of seagrass that may result from the disposal of bitterns from these additional crystalliser ponds.
- It is not described how bitterns will be disposed of in the long term, given that, in the long term, the proposed F series ponds will be used for crystallisers not for bitterns discharge.

BORROW PITS

- The location of the borrow pits for the construction material has not been identified in the report. Some 300 000 m^3 of material will be required for the levee, but this aspect of the project is not described in terms of management and operation.
- The report states that the existing borrow pit is partly disturbed with some remaining vegetation, however no indication of the area of this remaining vegetation that will be disturbed is provided. SBSJV has only committed limited resources to rehabilitation of borrow pits, and there is no commitment in this CER to rehabilitate this pit or any former pits. SBSJV should be required to develop a comprehensive strategy to rehabilitate pits and tracks on their mining lease. The strategy should include topsoil replacement, soil stabilisation, vermin control, eradication of weed species and regrowth generation.
- The CER does not address the visual amenity impacts, particularly aerial, of the removal of 300 000 m^3 of basic raw materials.
- The new crystallisers require rock armour on the outer wall. There is no description of where this is to be sourced or the impacts associated with its extraction.

SHIPPING

- The increase in shipping in the bay has not been fully described. Will there be a need for channels to be dredged to accommodate the larger vessels, given that much of the bay is very shallow? What impacts will this have on World Heritage areas? Will the larger vessels require tugs to assist in manoeuvring?
- What were the circumstances surrounding the recent grounding of the vessel Pine Trust in Shark Bay? What specific management measures have been put in place to avoid a repeat of this incident? Does the proponent require pre-qualification of ships servicing the project?
- The document states that the AQIS voluntary guidelines for ballast water are imposed on shipping. Is the proponent able to check that ships log re-ballasting records are accurate? What contingency measures are in place in the event that a ship is unable to reballast at sea? What quantities of ballast water are currently discharged into Shark Bay? What are the projected increases in ballast discharges? What are the main sources of ballast water (source ports)? What are the implications in terms of introduction of exotic marine organisms, micro-organisms or pathogens? Has a specific risk assessment been carried out? (Refer AMEEF occasional paper No 10). Is any testing of ballast water done while ships are docked at the Useless Loop loading facility? Will the proponent monitor the port area for introduced species? Will the proponent take responsibility in the event that an exotic organism is introduced and becomes established in Shark Bay?
- Does the proponent have a written oil spill contingency plan? Has this been provided to the State Oil Spill Combat Committee and the DEP? Will the proponent make a commitment to make good any environmental damage in the event of an oil spill from shipping associated with the project? Does the proponent have adequate oil spill clean-up insurance?
- Has monitoring for TBT contamination of sediments in the area where ships berth been carried out? What has monitoring shown?
- What arrangements are in place for disposal of solid/domestic wastes from shipping?

ALTERNATIVES TO THE PROPOSAL

- In the CER limited attention and detail is given to alternative options to the proposal. Alternatives that require further evaluation include:- (a) develop ponds over the bare nearshore flats within the mining lease only, which would allow for development over approximately 50% of the area requested; (b) develop ponds over the bare nearshore flats north and south of the Slope Island causeway (currently outside the mining lease); and (c) utilise ex-gypsum mine sites south of Useless Loop.
- The suggested alternative of using an area within the World Heritage Property is considered totally unacceptable.

OTHER

- The proposed site of construction exists within an area of Narrow Inlet habitat type of the Edel Land province. There are six such inlets that form a distinct habitat type, which is only found in Edel Land, within the Shark Bay region. Existing salt mines within Useless Inlet have already removed 17% of the Narrow Inlet habitat type. Before a further area of this habitat type is encroached upon a detailed study is required, in particular surveying the genetic biodiversity of the area. The biological survey conducted for the CER was inadequate for such a unique and potentially significant habitat type.
- There is no assessment of impact on the visual resource in the CER. Shark Bay has unique coastal scenery and shallow embayments that are key World Heritage values. The CER should address the impact the sea wall and the 300 000 m^3 borrow pit will have on these visual values.
- The construction of the additional crystallisers would require works approval under Part V of the *Environmental Protection Act 1986* (if approval was granted through Part IV).
- The existing hydrocarbon storage facilities are considered inadequate to safeguard the environment. SBSJV have plans to upgrade the facility, and it is considered that the facilities should be upgraded before further capital is spent on increasing the capacity of the salt field.
- The proponent should provide details of the pond configuration proposed for the new pond series. Explanation of why such a configuration is required should be provided to justify the pond design.
- The proponent has not provided details of what amount of additional evaporative area is required. This amount, and the amount of area that would be provided by the proposed additional ponds, should be provided.
- Does Shark Bay Salt Joint Venture have an environmental policy? Does the company operate under an EMS? Has the existing operation been subject to independent environmental audit by an accredited environmental auditor?

Shark Bay Salt Joint Venture –

F-series Crystallisers at Useless Loop

RESPONSE TO QUESTIONS RAISED DURING THE PERIOD OF PUBLIC COMMENT ON THE CER

Introduction

The questions raised during the period of public comment on the CER are responded to below in the same sequence as they were summarised by the Department of Environmental Protection (DEP).

SEAGRASS

1. Construction of the original causeway across the mouth of Useless Loop did not involve loss of seagrass. The shallows that now exist to the seaward side of the causeway were pre-existing, and the causeway was constructed over part of those shallows.

   Based on the experience with the construction of the PM1 bar in Useless Inlet, the causeway to the salt stockpile and loading area and the F2 crystalliser, there is no reason to believe that construction of the proposed crystalliser embankment will result in the creation of seagrass-devoid intertidal flats to the seaward side of the embankment. In the examples noted above, where water depths are comparable with those involved in construction of the crystalliser embankments, impacts on seagrass have been restricted to areas within only a few metres from the structures.

2. The fact that the seagrass survey by the Marine and Freshwater Research Laboratory (MFRL) noted the presence of fish species which are fished commercially in the Shark Bay region should not be taken to imply that commercial quantities of these species exist in the area of the proposed development. Shark Bay Salt Joint Venture (SBSJV) knows there is only limited and irregular commercial activity in the area.

3. It is considered that the biological and ecological processes of the affected area of seagrass are no different from those in other areas of seagrass in the region. It is accepted and recognised that the proposal will result in a loss of seagrass ecosystem but, as noted in Section 5.1 of the CER, that loss represents 0.014% of the total area of seagrass resource within the Shark Bay region.

4. The role of seagrass in Useless Loop beyond the immediate area of the proposal is, as noted in the preceding response, considered to be the same as that in the other large areas of seagrass in the Shark Bay region. There is no reason to believe that seagrass ecosystems in the project area are different from those in the broader region.

   The 60 hectare area of seagrass affected by this proposal is a considerable distance from the Shark Bay World Heritage Area (WHA). As noted elsewhere in these responses (see, eg, 1 above), experience at Useless Loop leads to the strong expectation that impacts outside the project area will be inconsequential.

5. The area of seagrass (near the F2 crystalliser) which appears according to MFRL to have the tops of leaves ripped of (MFRL, Section 4.2) is not difficult to explain. The tops of this area of seagrass are exposed at very low tide, and dehydrate. The dehydrated section of the blade then dies. There has been no significant erosion of the F2 embankment since its construction, and it has had no observable effect on adjacent seagrass beds

6. The view that turbidity impacts on seagrass are unlikely to be significant is supported by the coastal engineering evaluation prepared by Dr Bill Andrew – see Appendix C of the CER; Page 3, Paragraph 3, and Page 4, Paragraph 1.

   The findings of the Andrews Report have been discussed with Ms. Jennifer Hale, of the Marine and Freshwater Research Laboratory (MFRL), at Murdoch University. MFRL carried out the seagrass study on the area for the joint venture and is familiar with the conditions there. Ms. Hale is of the opinion that the Andrews Report shows that the proposed construction method and material represent little danger to the seagrass beds on the seaward side of the proposed construction. Ms Hale advises that the seagrass in the area is able to tolerate much higher turbidities than have been suggested as likely by the Andrews Report.

   The Joint Venture has had relevant comparable experience with the construction of the causeway to the salt-loading island and the PM1 bar. These constructions, which took place in higher energy environments did not create plumes that damaged adjacent seagrass beds.

   As noted in Section 5.1 of the CER, SBSJV has committed to monitor turbidity during construction and halt works when sediment plumes might threaten seagrass. It is noted here that during the six-month period of construction of the PM1 bar in 1997/1998, turbidity increases measured as part of regular monitoring were restricted to an distance of at most a few tens of metres from the work site. The levels were insignificant and at no time was it necessary to cease construction operations.

   Currents during PM1 bar construction were much higher than those which can be expected in this case, as tidal movements there were magnified, because of the greater size of the new primary pond, as the distance to closure lessened. This effect will be negligible in this construction.

   Tests conducted on the materials to be used in the F-series construction show that it settles quickly in seawater, so extended periods of turbidity are unlikely. It is noted that normal weather conditions frequently generate greater and more widespread turbidity than does bar construction.

   The method of turbidity monitoring considered most appropriate can be formulated in consultation with The Marine and Freshwater Research Laboratory, and with the Government Department responsible for monitoring the environmental aspects of the construction.

7. Under the terms of the EPA's *Guidance for the Assessment of Environmental Factors – Draft Guidance 22: Seagrass Habitat Protection*, it is arguable that the appropriate protection category for the seagrass to be affected by this proposal is Category C – "Areas within State jurisdiction such as ports or industrial complexes and not identified as having high conservation significance ...". The location of the affected meadows – within a designated salt-field, within a long-established mining lease and within a port area – is the primary basis for this judgement. The judgement is supported by the fact that the species composition of the meadow is well replicated elsewhere in the region.

   The Category C protection objective set out by the EPA is: *"Development proposals should conform with the operational objectives of preventing the avoidable destruction of seagrass habitat, and cumulative (total) losses should be kept within strict limits ..., whilst recognising uses designated prior to the formulation of this guidance."*

   In this context, it is noted that salt production is a long-established "prior use" within the mining lease held by the SBSJV.

   In relation to cumulative impacts, previous losses in the area adjacent to Useless Loop have been restricted to those associated with construction of the Slope Island causeway and the Town jetty, and with the discharge of bitterns prior to 1987 (in the seagrass-depauperate area several hundred metres seaward of the mouth of the Loop). In the cases of the causeway and jetty, seagrass losses outside the footprint of the structures have clearly been restricted to distances of at most a few metres from them.

   The project area has long been identified for use in salt production, and its development is necessary to realise the production flowing from the construction of the new seal wall. The loss of seagrass caused by the project is unfortunate. However, it is minor and will have little impact of ecological significance on the regional seagrass resource. There is nothing to suggest that the biological impact on the World Heritage Area of the loss of the seagrass within the construction will have any affect at all of ecological significance.

8. Historical losses of seagrass in the SBSJV project area are limited. Most seagrass losses in Useless Inlet pre-dated the SBSJV operation, and have been attributed to pearling activities; a small area was lost during the construction of the PM1 bar, and was restricted to the small portion of the total area of the bar footprint that covered seagrass.
   Within Useless Loop, there have been small historical losses of seagrass in the area affected by bitterns disposal prior to 1987. The existing causeway across the Loop was constructed over sandy tidal flats, and the F2 crystalliser was constructed clear of seagrass. Further seawards, outside Useless Loop there was some direct loss beneath the island causeway.

The only seagrass lying within Useless Loop itself lies at the very mouth of the Loop, commencing on the seaward side of the Loop's intertidal sand flat. This seagrass extends beyond the lease out into the open waters of the Bay. In the context of the mining lease areas only the approximately 60 ha. Lies within the proposed crystallizer area. Since the seagrass fringes the mouth of the Loop it is more appropriate to view the seagrass subject to this proposal in relation to that existing in the waters surrounding Topper Island and the shipping facilities and extending back to the lease boundary. This area includes an estimated 800ha. of seagrass of which the 60 ha. affected by this proposal represents some 7.5%. The seagrass beds continue both northwards and southwards along the coast and out into Freycinet Estuary.

If the seagrass is to be considered in relation to a management area, the area it must be considered in relation to is, at the very least, that associated with Freycinet Estuary as this is the area to which it is connected. The negative impact of the seagrass loss flowing from this proposal will not be ecologically significant in terms of the ongoing health of that area.

9. A once-off field inspection of seagrass in the proposed project area is judged to be adequate because there is no reason to believe that the seagrass areas to be affected are not typical of comparable and much larger areas in the region. It is also noted that dugongs and turtles are rarely seen in the project area, which also has relatively low fish populations.

   It is acknowledged that this area of seagrass will be lost, but the study conducted by the MFRL has shown that the dominant seagrass species are the most common in the Shark Bay region. There is no evidence to suggest that the loss of this area will have any ecological significance on the wider area.

10. The use of seagrass from the project area for transplanting programmes in other areas is not considered practicable. The feasibility of such transplanting is unproven and, moreover, the area to be affected is small.

MARINE FAUNA

11. Existing procedures and arrangements with CALM will be applied to the management of marine fauna, recognising the need to protect such species. Techniques have been established for the removal of dugongs and turtles, and the frequency of human activity in the area is sufficiently large, and the area involved sufficiently small, to ensure that prompt detection and action will occur.

12. No attempt has been made to survey marine invertebrates in the project area, as there is no reason to believe that the area is different from the much larger seagrass and sand-flat resource in the region. Again, the area affected is small.

13. The relatively low fish species richness and diversity of the project area is based as much on local residents' knowledge as it is on the observations made by MFRL. The fact that both commercial and recreational fishing in the area is minimal reflects that judgement. The statement was made to aid those considering the proposal.

14. While it may be true that dugongs feed on *Amphibolis antarctica*, the fact remains that dugongs are rarely observed in or near the project area. Note also that the level of survey is relatively high, albeit casual, because of the proximity of the project area to the Township of Useless Loop and to the frequently-travelled causeway across Useless Loop.

15. Beach seine fishing for whiting and mullet on the sandy flats adjacent to the existing causeway across Useless Loop is a low-frequency occurrence: two or three times a year. Comparable sites exist at other locations. It is arguable that use of the area by local fishermen is not a matter for consideration in the CER; the State has defined salt production as the land use for the area.

FORESHORE/INTERTIDAL SANDFLATS

16. It is acknowledged that the area of intertidal sandflats between the existing causeway and the proposed crystalliser embankment will be lost. However, and as noted in 13 above, the fish species and richness and diversity of this area are considered to be low. The main support for this belief comes from local residents' knowledge as well as the observations made by MFRL. The fact that commercial and recreational fishing in the area is minimal, and that bird activity is also minimal, supports that judgement. Moreover, there are large areas of comparable habitat in the region.

    Despite this loss, it is considered appropriate to note SBSJV's environmental commitment and performance: the low-impact PM1 construction, including the avoidance of impacts on mangroves and corals; ongoing rehabilitation work, including the use of exclosures to minimise rabbit impacts; involvement in the Biosphere project on Herrison Prong.

17. The creation of the intertidal flats noted in the CER pre-dates the salt field and is evidenced by aerial photography. It is a natural phenomenon, not a result of salt-field development. It was noted in Appendix C of the CER to illustrate the nature of sediment transport processes in the area, not as an indication of effects of salt field operations. Similar flats occur along the coast to both the north and south of Useless Loop.

    It is most improbable that construction of the F-series crystalliser embankment will result in the creation of an extensive nearshore intertidal flat. Firstly, the existing intertidal flat is a natural, pre-existing one – not one created by the establishment of the existing causeway. Secondly, the proposed embankment is to be built in relatively deep water and, based on the experience with the island causeway, the F2 crystalliser and the PM1 bar, impacts are considered likely to be restricted to an area within a few tens of metres of the structure.

SHARK BAY WORLD HERITAGE PROPERTY

18. It is not accurate to state that inadequate consideration has been paid to the impacts of the proposal on the biological processes that connect the project area with the adjacent environment. The CER addressed likely impacts of sediments generated during construction and operations, it is noted that the seagrass areas to be lost are typical of the much larger resource in the region, and the relatively low species richness and diversity of the intertidal flats has been noted.

    SBSJV's confidence in predicting low and localised impacts is based on its experience with the island causeway, the PM1 bar and the F2 crystalliser. These are not inconsiderable experiences. Moreover, the project area is too small, and too remote from the WHA, for impacts on biological processes in the WHA to be detected.

    It is entirely possible to postulate biological processes, the effects of which extend to World Heritage Area. There is nothing in any of the information that the Joint Venture has collected since it commenced operations, to suggest that a biological process of this nature exists such that its loss would be of any ecological significance. The habitat is well represented on the coastline immediately to the north and to the south of the proposal as well as being common elsewhere in the bay. A sense of proportion should be maintained in considering the importance of the biological strands connecting this area with the World Heritage Area.

TURBIDITY

19 The likely impacts of turbidity created during levee construction are discussed in detail in Appendix C of the CER. That coastal engineering study notes the likely small impact of turbidity, and is supported by the experience with other construction projects, as is referred to in 18 above – turbidity effects during other embankment construction programmes were minor.

    Turbidity was extensively monitored during the PM1 construction project, and it was found that measurable turbidity generally extended for only a few tens of metres from the work site. Turbidity was not generated away from the work face. When measurable, levels remained insignificant in terms of threat to seagrasses. Turbidity tube readings were commonly less than 10Ntu. Secci Disc measurements were also generally low. A very high Secci Disc reading 100 metres seaward of the workface would be 0.8 metres, and this would not persist. Measurements were generally greater than 2.4 metres.

    The turbidities generated in the construction of PM1 were not significant, particularly in terms of threat to seagrasses. The energy regime in the proposal area is much lower and turbidity effects will be lower also.

    That monitoring work was reported to, and audited by State agencies both during and after construction.

21. The corals and sponges nearest to the proposed work area are several hundred metres distant. Based on the PM1 and other comparable experiences, where turbidity plumes extended only a few tens of metres from the work site, it is reasonable to assume that those corals and sponges are unlikely to be affected by the operation.

22. The engineering adequacy of crystalliser embankment design is fully addressed in Appendix C of the CER. Moreover, the experience with the PM1 bar and the F2 crystalliser embankment provides confidence in the design.

BITTERNS

23. The use of bitterns to seal the new crystalliser complex is a means of preventing seepage of valuable product, and is a proven technique.

Should some seepage into the groundwater occur during the early stages of pond sealing the relatively high density of the bitterns would ensure that they occupy lower regions of the saline groundwater aquifer. The existing programme for monitoring seawater densities and chemical composition on the seaward side of Useless Loop will be continued outside the new shore profile. Monitoring to date has revealed no impacts on these seawater parameters, despite the extensive use of bitterns to seal ponds within the Loop.

It should also be noted that MFRL note that "natural" elevated salinities are common in the shallow embayments of the area and region. Thus, higher-than-normal and fluctuating salinities are a characteristic of region.

The monitoring of near-shore salinity and seawater composition has shown no significant variation. There is thus no need for complex scientific interpretation.

24. The brines in question are in fact an asset; there is an economic cost to their loss, and the design aim is to retain them. Bitterns discharge prior to 1987 did affect an area of seagrass several hundred metres offshore, but the effect was restricted to relatively shallow areas, prior to dilution of the bitterns. This is not a proposal to discharge bitterns. The likelihood of brine seepage affecting the adjacent waters is low (see #24 above) There will be no bitterns discharge from the ponds.

The loss of seagrass seaward of the proposed crystalliser dates back to before 1987. Since 1987, there has been no bitterns discharge to open water, and there are no plans to so do.

Given that bitterns have long been used to seal ponds within Useless Loop, that no recent loss or degradation of seagrass has been noted, and that the near-shore monitoring has shown no change in seawater composition, there is no reason to believe that the F-crystallisers will cause salinity-related impacts. The modified near-shore monitoring programme (relocated seawards from its current site so that it is outside the new structure) is aimed at ensuring that outcome.

25. In the long term, bitterns will continued to be disposed of by use in sealing ponds and/or by infiltration in purpose-constructed impoundments in the Useless Loop area. The near-shore monitoring of seawater composition is aimed at ensuring the integrity of those operations.

Shark Bay Salt Joint Venture has not discharged bitterns to the open sea since 1987, in order to minimise any possible impact upon the marine environment. Where bitterns are not used for lining new pond systems (for example those the subject of the CER), or re-establishing floors on old ponds, they are disposed of by discharge into the highly saline groundwater through the floor of an already existing channel within the current crystallizer complex.

BORROW PITS

26. The borrow pit for the crystalliser construction is an existing pit located immediately SE of the 1996-constructed F2 crystalliser. The means of extraction, haulage and placement of the borrow is detailed in Section 4 of the CER.

27. The area of the existing borrow pit has highly disturbed vegetation and landform, as it is located in an area used in the past for lay-down of construction and operational equipment, minor access for Useless Loop traffic (vehicular and pedestrian) and workshop areas.

SBSJV has committed extensive resources to borrow pit and other disturbed-land rehabilitation: fencing to control rabbits, use of surface stabilisers to control wind-blows, salvage and re-application of topsoil, collection and seeding of local native plants, use of prunings for surface stabilisation, soil testing and fertiliser applications. Perhaps the best example is the recent rehabilitation of the borrow pit used to supply construction materials for the recently-completed PM1 bar.

There is an established programme for progressive rehabilitation of all disturbed areas, together with photographic monitoring of success and reporting of results in annual and triennial environmental reports to the State.

28. The visual impact of the borrow pit will be small, as it lies adjacent to existing crystallisers. It is not located in an undisturbed area.

29. The rock armour for the F-series crystalliser wall will be sourced from the borrow pit, which contained a mixture of rocky and finer materials. This area is within the SBSJV mining lease, and area designated for salt production and ancillary works.

SHIPPING

30. The current capacity of the salt field is about 1.1m tonnes, involving approximately 55 cargoes. To increase to 1.6m tonnes suggests an additional 20 cargoes if the current shipping practices are followed. If larger vessels can be used at the Loop, this would reduce the number of ship movements proportionately.

The precise requirements for shipping increasing production from Useless Loop are difficult to predict. Larger ships clearly have a commercial cost-effectiveness, but their use cannot be predicted. SBSJV is committed to managing shipping to practicably minimise its impacts.

The shipping channel will in any event require maintenance dredging over time. Such dredging must be conducted in accordance with the relevant Commonwealth and State requirements. Any dredging programme which may be required is expected to be carried out without compromising the World Heritage values of the bay. These values are important to the proponent also. There has been no need for tugs to be used at Useless Loop to date, and no future requirement has been identified.

31. The grounding of the Pine Trust was a result of pilot and crew error and the Joint Venturers have moved to minimise the likelihood of it happening again.

The incident has resulted in amendment of procedures involving the careful checking-off of waypoints through the shipping channel. Government agencies have been involved in the review and amendment of procedures, including the refinement of response protocols in the unlikely event that a similar event should occur in the future.

It is noted that the Pine Trust incident was the first one associated with the SBSJV operation. The absence of serious consequences of the grounding reflects the relatively low risks associated with the sandy bottoms along the channels.

Each ship arriving at Useless Loop is approved in advance by the SBSJV, based on Australian standards. Most of the vessels are repeat loaders, so that considerable experience has been accumulated. Importantly, SBSJV employs a private pilot with considerable experience.

32. While SBSJV invokes the AQIS protocols for ballast water management, it cannot physically verify, for example, that ship-log entries attesting to open-sea ballasting are accurate. However, it is noted that the penalties for offences of log falsification are significant and likely to be a significant deterrent. Moreover, only reputable shipping companies and crews are involved in salt-shipping from Useless Loop.

The management of ballast water is covered by Government regulation and overseen by Government representatives in respect of individual ship movements. The salt field operators have no formal standing in these matters, but do reinforce AQIS requirements through their shipping-related documentation and loading instructions.

The quantities of ballast water involved at Useless Loop are not logged. However, on the basis that some 900,000 tonnes of salt are shipped each year, a figure of 300,000 tonnes could be taken as an indicative estimate. Increases in shipped tonnage will increase ballast water proportionately.

The question of ballast-water management is an ongoing one, covered by the State Agreement and addressed in annual environmental reports. This proposal does not affect the principles involved.

The ports of origin of ships coming to Useless Loop are various, although mainly SE and E Asian. Note, however, that all are required to re-ballast on the open sea.

The implications of the introduction of exotic species are well known and recognised. It is for this very reason that the AQIS protocols are enforced by SBSJV.

There is currently no testing of water in ballast tanks of ships berthed at Useless Loop, since current ship design does not facilitate such sampling. SBSJV is however considering how such a testing programme might be conducted.

Similarly, there is no existing monitoring programme, but the feasibility of one is under consideration.

Specific risk analysis has not been carried out.

The question of liability in the event of introduction of an exotic species is a hypothetical, legal one. The SBSJV's focus is on prevention, and the pro-active meeting of all Australian requirements.

33. Responsibility for management of oil spills in Shark Bay lies with the Department of Transport (DOT) and the Carnarvon Port Authority. SBSJV makes its facilities and personnel available to DOT as a local-area Combat Authority, to work as directed by DOT.

SBSJV has a written plan for its own response to local emergencies, and this plan is being reviewed to complement DOT procedures and requirements.

The question of liability for any oil spill is a complex legal one, and probably beyond the scope of this CER process. Similarly, insurance cover for damage resulting from an oil spill is not germane to the present discussion; however, vessel owners do have extensive insurance cover.

34. No monitoring for TBT has been conducted in the sediments near the ship berths at Useless Loop. Discussions with environmental consultants indicate that the small number of ship movements associated with the salt field operation mean the site is very low risk in terms of possible TBT contamination. It is proposed to conduct TBT analyses in conjunction with any future dredging programme that may be required to maintain the shipping channel to the required depths. Ships stop at Useless Loop for but a day or two. Discussions with technical experts suggest that TBT levels would be at their highest at the loading jetty, but that even there levels are expected to be well within allowable tolerances.

35. Vessels using Useless Loop normally spend but a few days in the port. During that time, no wastes may be discharged from the vessels, other than ballast water.

ALTERNATIVES TO THE PROPOSAL

36. The area of bare nearshore flats at the mouth of Useless Inlet is too small to allow a cost-effective addition to salt-producing facilities.

The bare nearshore flats to the north of Slope Island are in the World Heritage Area, and have thus not been considered.

The old gypsum mine-sites to the south of Useless Loop are not within the Mining Lease. Moreover, they are not suitable for development as salt ponds. The salt field is designed to incorporate crystallisers at the end of the chain at the mouth of Useless Loop

37. The view that establishment of salt-producing facilities in the World Heritage waters is unacceptable is noted. This fact is one of the reasons for the proposal to utilise the area within the mining lease.

OTHER

38. The "narrow inlet" habitat type associated with Useless Loop has been highly modified and now forms the current crystallizer system. The area proposed for the new crystallizers, to the east of the existing bar is not "narrow inlet" type habitat. It is more typical of the intertidal sand flats which are replicated in quantity along the coast both to the north and to the south of the present proposal as well as being common elsewhere in the bay.

39. The visual impact of the borrow pit has been discussed in 28 above. The visual impact of the salt fields themselves is in the eye of the beholder; many do not find the engineered levees unattractive. There can be an unfortunate tendency to extend World Heritage values beyond the WHA boundaries. That the salt field was excluded from the WHA was a clear indication that its operation and development was expected to continue.

40. Should it be required, a Works Approval under the provisions of the *Environmental Protection Act 1986* will be sought by SBSJV.

41. The existing hydrocarbon-storage and-management systems at Useless Loop meet all required standards. Indeed, a drainage-management system aimed at preventing even low-level hydrocarbon losses is in place.

Hydrocarbon management is a key element of the licence issued by DEP under the provisions of the *Environmental Protection Act 1986*.

42. The salt field pond layout can be considered theoretically as a funnel with large areas of evaporation of low salinity waters at the beginning funnelling down to smaller areas of higher salinity evaporation at the crystallizers. The increase in evaporative area at the beginning of the system requires that the concentrator and crystallizer areas be increased proportionally. Some of this increase is incorporated within the existing pond systems ie. by moving some systems upstream and converting concentrators to crystallizers.

However, there needs to be an increase in evaporative area at the crystallizer end of the system and this is accommodated in the proposed construction of the 'F' Series crystallizers. The 'F' Series construction, together with other options within the system are expected to be sufficient to crystallize the additional production. In the event that operating practice indicates that further crystallizers may be required in the future, we will incorporate them within the concentrator/crystallizer and peripheral disturbed areas within our present lease boundaries.

43. This is covered in Paragraph 42. We expect that the construction of the 'F' Series crystallizer will provide the additional crystallizer capacity to crystallize the additional salt production. If additional areas are required, they are expected to be minor and their development would be within the leasehold area and within the current crystallizer/concentrator pond area.

44. The Shark Bay Salt Joint Venture operates under the Solar Salt (Shark Bay) Industry Agreement Act 1983. This requires the Joint Venture to operate in an environmentally responsible manner. It is required to provide the Minister with an Annual Environmental Report on the operations, with a major environmental report required triennially. The Joint Venture includes in that report the information the Government Departments with environmental responsibility will require to form an opinion on the environmental performance of the salt field operation. The report is examined by the responsible Government Departments and comments referred back to the Joint Venture. These comments are then used to fine tune the environmental management procedures.

The Minister is able to give such direction in respect of environmental management as he sees fit.

Environmental approvals for major construction within the system, ie construction of the new sea wall, have environmental management requirements attached to them which are audited separately. The Joint Venture has always discharged these responsibilities completely and their performance is audited by the responsible Government Departments. In most cases this is the Department of Environmental Protection.

The Joint Venture is governed by the Act rather than an EMS. The auditing which has taken place so far relates to department review and comment on the Annual and Triennial Environmental Reports to the Minister. In addition the company is audited when environmental approvals for construction such as the new sea wall require particular environmental procedures to be followed and goals to be achieved.

The purity of the local seawater is considered to be one of SBSJV's key assets, and its environmental programmes include preserving that purity.

On the positive side, the SBSJV salt-field provides an extensive water-bird habitat that would otherwise not exist. The local community also participates in the Heirrison Prong Biosphere Programme. The Clough Group has for 17 years provided a ranger at Steep Point to minimise damage to the environment by others.