Dredging of Denham Channel, Bar Flats and the Slope Island Shipping Berth, Freycinet Estuary, Shark Bay

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Shark Bay Salt Joint Venture

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
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Summary and recommendations

Shark Bay Salt Joint Venture proposes to dredge the existing shipping channel in Freycinet Estuary, Shark Bay. The channel is used for the transport of salt from the proponent's ship loading facility at Slope Island. The proposal involves maintenance dredging and some capital dredging. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage 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 environmental factors relevant to the proposal required detailed evaluation in the report:

(a) World Heritage Values;

(b) Salinity and Water Flow Regime, and;

(c) Introduction of Exotic Marine Organisms or Diseases by the Dredging Vessels.

Conclusion

The EPA has considered the proposal by Shark Bay Salt Joint Venture to dredge the existing shipping channel in Freycinet Estuary, Shark Bay.

The EPA notes that the proposal involves maintenance and capital dredging of the existing shipping channel through Denham Channel and Bar Flats and the Slope Island shipping berth. The key findings are that the increase in the size of the shipping channel is expected to produce an insignificant change to the salinity and water flow regime of Freycinet Estuary and that the proponent's Salinity Monitoring Plan is designed to confirm this expected outcome. The potential for the introduction of exotic marine organisms or diseases by the dredging vessels can be managed through a condition requiring an independent inspection of the vessels before they enter into Shark Bay.

Other environmental issues associated with this proposal (ballast water from general shipping and oil spill contingency planning) can be addressed through existing Ministerial conditions or proponent commitments.

The EPA has therefore concluded that it is most unlikely that the EPA's objectives would be compromised provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2 and summarised in Section 9.

Recommendations

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

1. That the Minister notes that the proposal being assessed is for Dredging of Denham Channel, Bar Flats and the Slope Island Shipping Berth, Freycinet Estuary, Shark Bay;
2. That the Minister considers the report on the relevant environmental factors as set out in Section 6;
3. That the Minister notes that the EPA has concluded that it is most unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2, and summarised in Section 9; and,
4. That the Minister imposes the conditions and procedures recommended in Appendix 2 of this report.

Conditions

Having considered the proponent's commitments and information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Shark Bay Salt Joint Venture to dredge the existing shipping channel in Freycinet Estuary, Shark Bay is approved for implementation. These conditions are presented in Appendix 2. Matters addressed in the conditions include the following:

(a) That the proponent shall fulfill the condition to prepare and implement a Salinity Monitoring Plan to confirm that the salinity and water flow regimes in Freycinet Estuary will not be significantly affected by the proposal;

(b) In the event that a significant environmental impact on the salinity or water flow regimes in Freycinet Estuary is detected, the proponent shall immediately inform the Department of Environmental Protection and prepare a plan for remedial works;

(c) The proponent shall implement the remedial works plan;

(d) That the proponent shall, at least 48 hours prior to the arrival of the dredge in Shark Bay, fulfill the condition to arrange for an inspection to ensure that there is no sediment in the dredging equipment; that ballast water (if any) in the dredging equipment (or other associated vessels) does not contain living organisms; and that there are no fouling organisms on the dredge or other associated vessels or equipment; and,

(e) That the proponent shall fulfill the condition to appropriately dispose of any sediment or organisms found in the inspection.

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Appendices

1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment and Heritage on the environmental factors relevant to a proposal by Shark Bay Salt Joint Venture to carry out dredging of the existing shipping channel through Denham Channel and Bar Flats and within the Slope Island shipping berth area, Freycinet Estuary, Shark Bay (A map of the proposal area is located in Appendix 3).

The EPA was originally advised of the proposal in August 1999. As the proposal is located partly within the Shark Bay World Heritage Area, joint discussions took place between the Department of Environmental Protection (DEP), Environment Australia (EA) and the proponent. The proponent applied for a Sea Dumping Permit under the Commonwealth's *Environment Protection (Sea Dumping) Act 1981*. A detailed environmental assessment was carried out under the Act, including consultation with the Shark Bay World Heritage Property Scientific Advisory Committee (SAC) and other stakeholders. A Commonwealth Sea Dumping Permit was issued on 9 September 2001. The present report complements the Commonwealth's sea dumping assessment process and addresses those environmental issues not covered by that process.

Based on the information provided, the EPA considered that while the proposal had the potential to have an effect on the environment, the proposal could be readily managed to meet the EPA's environmental objectives. Consequently it was notified in *The West Australian* newspaper on 29 April 2002 that the EPA intended to assess the proposal through Assessment on Referral Information (ARI).

The proponent has prepared a Salinity Monitoring Plan which constitutes the referral information and accompanies this report. The EPA considers that the proposal described can be managed in an acceptable manner subject to the recommended conditions being made legally binding.

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

2. The proposal

The proposal is described in the proponent's "*Sea Dumping Application – Application for Maintenance and Capital Dredging in Shark Bay*" document. The proposal involves maintenance and capital dredging of the existing shipping channel through Denham Channel and Bar Flats and the Slope Island shipping berth. Maintenance dredging refers to dredging to the originally approved depth under the *Shark Bay Solar Salt Industry Agreement Act 1983*, whereas capital dredging refers to dredging beyond the previous approval. The key components of the proposal are:

- Dredging of Denham Channel and Bar Flats from the existing depth of, at most, 10.21m down to a depth of 11.00m,
- Widening of the shipping channel from 130m to 150m,
- Dredging of the shipping berth basin at Slope Island from the existing depth of 10.80m down to a depth of 12.10m and the area adjacent to the shipping berth from the existing depth of 10.21m to a depth of 10.90m.

The main characteristics of the proposal are summarised in Table 1 below.

Table 1. Key Characteristics of the proposal

Characteristics	**Description**
Project Purpose	To dredge Denham Channel, Bar Flats and the Slope Island shipping berth area to accommodate ships of up to 40,000 DWT.
Life of project (channel dredging)	3 Years
Volume of spoil (approx.)	722,000m^3

3. Consultation

During the preparation of the referral information, the proponent has undertaken consultation with government agencies (Department of Fisheries, Department of Conservation and Land Management) and the Shark Bay World Heritage Property Scientific Advisory Committee. These key stakeholders have a direct interest in the project.

4. Previous Assessments under the *Environmental Protection Act 1986*

The Shark Bay Solar Salt Project has been subject to two previous formal assessments under the *Environmental Protection Act 1986*. Most recently the EPA assessed the proposal for "*Construction of Additional Crystallisers, Useless Loop, Shark Bay"*. This proposal was approved in 1999 (Ministerial Statement 513).

5. Commonwealth Sea Dumping Assessment

Previous to this assessment by the EPA, Environment Australia assessed the sea dumping aspects of this proposal under the Commonwealth *Environment Protection (Sea Dumping) Act 1981*. The present assessment is intended to be complementary to the Commonwealth's sea dumping assessment. On 20 July 2001 the Commonwealth determined that the proposal did not require assessment under the *Environmental Protection (Impact of Proposals) Act 1974* on the basis that it would be assessed under the *Environment Protection (Sea Dumping) Act 1981* and under the Western Australian *Environmental Protection Act 1986*.

The environmental management and effects monitoring relevant to the sea dumping aspects of the proposal as required by Environment Australia included the following:

- Turbidity monitoring in seagrass meadows adjacent to spoil dumping;
- A marine pest species survey at the ship berth, including sediment sampling of ballast water;
- An assessment of the potential for imposex in marine species from TBT anti-fouling;
- Monitoring (pre- and post-dredging) of spoil grounds for recolonisation by benthic biota;
- A management action plan to minimise the impact on whales.

The EPA considers that these issues were adequately addressed in the Commonwealth sea dumping assessment process. This assessment included consultation with the Department of Fisheries and the SAC. The following issue was also considered in the Commonwealth sea dumping assessment process:

- Assessment of changes to the salinity structure within Freycinet Reach after the dredging in liaison with the WA Department of Fisheries.

In relation to this issue the Commonwealth required the proponent to prepare a monitoring plan in consultation with the WA Department of Fisheries. This issue is considered further in the present assessment. See section 6.2 below.

6. Relevant environmental factors

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

a) World Heritage Values;

b) Salinity and Water Flow Regime;

c) Introduction of Exotic Marine Organisms or Diseases by the Dredging Vessels.

6.1 World Heritage Values

Freycinet Estuary contains a number of the values for which Shark Bay was listed as a World Heritage Area. These values are

- Unique hydrological structure, banks and sills including the steep salinity gradients and the biotic zone transition in Freycinet Estuary,
- High genetic biodiversity due to steep environmental gradients,
- Seagrass meadows, their species diversity and their role in the evolution of the marine environment,
- Northern limit of transition between temperate and tropical marine environments resulting in high species diversity,
- Abundance of marine fauna.

As was determined during the Commonwealth sea dumping assessment process, there will be no disturbance to seagrass meadows from the actual dredging operation. Potential impacts on seagrass meadows were also considered.

Potential impacts on the hydrological structure and salinity gradients, and the potential for impacts on the ecology and biodiversity of this part of Shark Bay, are considered under section 6.2 below.

6.2 Salinity and Water Flow Regime

The Department of Fisheries and the SAC expressed concern about the potential for the increased channel size to create a significant change in the salinity regime of Freycinet Estuary. These concerns include potential impacts on the Prawn and Snapper Nursery areas in Freycinet Estuary and, more generally, the World Heritage values in this part of the Shark Bay World Heritage Area (as listed in Section 6.1).

The potential for the increased water flow through the estuary to cause greater mixing of the highly saline water of Freycinet Estuary with the less saline water in Denham Sound was the subject of a detailed desk top analysis commissioned by the proponent and carried out by Professor G. Ivey of the Centre for Water Research, University of Western Australia. Professor Ivey's report indicates that the increase in the size of the shipping channel can be expected to produce an insignificant change to the salinity regime of Freycinet Estuary. (Ivey G, Centre for Water Research, University of Western Australia Exchange Flows in Shark Bay, 6 March 2001). This report was subject to peer review by Dr D. Mills, Physical Oceanographer of the EPA Service Unit and Professor C. Pattiaratchi of the Centre for Water Research, University of Western Australia.

At the request of the WA Department of Fisheries, SBSJV has prepared a Salinity Monitoring Plan to confirm Professor Ivey's calculations and to detect any significant impact on the water flow and salinity regime in Freycinet Estuary from the dredging operation. The proponent has acquired advice from Professor Ivey, WA Department of Fisheries and the SAC (in particular Dr B. Logan) supporting the plan. The plan includes the monitoring of salinity and water flow in Freycinet Estuary before and after the dredging. In addition, the EPA recommends that the proponent be required to implement remedial action in the unlikely event that the monitoring detects a significant impact on the salinity regime.

6.3 Introduction of Exotic Marine Organisms or Diseases by the Dredging Vessels

The dredge and associated vessels required as part of this proposal represent a potential pathway for exotic marine organisms or diseases to be introduced into Shark Bay. Exotic marine organisms or diseases may be transported into Shark Bay in sediment or ballast water contained in, or as fouling organisms attached to, the dredging equipment or other associated vessels. Depending on the vessels' last port of call, there is potential for the introduction of organisms or diseases either from overseas or from elsewhere in Australia.

The Commonwealth's sea dumping permit requires the proponent to conduct a marine pest species survey at the Slope Island ship berth which includes sediment sampling for ballast water organisms such as dinoflagellate cysts.

The EPA considers that in addition to this requirement, an inspection should be conducted, by an independent expert (accredited auditor) acceptable to the EPA, at least 48 hours prior to the arrival of the dredge vessels in Shark Bay. This inspection should be conducted to certify that there is no sediment or ballast water contained in

the dredging equipment or other associated vessels or that fouling organisms are not attached to the dredging equipment or other associated vessels.

Any sediment or organisms found during this inspection should be disposed of in accordance with the requirements of the DEP.

7. Other Environmental Issues

This proposal will enable SBSJV to use ships of up to 40,000 dead weight tonnes (DWT) for transportation of salt from the Slope Island shipping berth. Currently, ships ranging from 6,000-30,000 DWT are used. Without this proposal and under full production, SBSJV will require approximately 80 ship visits annually to transport the expected 1.6 million tonnes of salt. But, by being able to use ships of up to 40,000 DWT, SBSJV anticipates that less than 70 ship visits annually will be required. The increase in the size of ships used will require SBSJV to upgrade its existing ballast water management and oil spill contingency planning.

7.1 Ballast Water Management

The EPA considers that the increase in ballast water management required from the use of larger ships can adequately be addressed through the existing Ministerial condition (4-1) for the previously approved project "*Construction of Additional Crystallisers, Useless Loop, Shark Bay (Ministerial Statement 513)*". Under the condition SBSJV has been required to;

- Conduct a risk assessment of previous ports of call for all ships used;
- Pre-qualify ships to ensure that they are capable of reballasting at sea; and,
- Prepare a contingency plan in the event that a ship is unable to re-ballast at sea (due to weather conditions or other operational reasons).

7.2 Oil Spill Contingency Planning

The EPA considers that oil spill contingency planning can adequately be addressed through the existing Proponent commitment (3-2-1) for the previously approved project "*Shark Bay Salt, Pond Expansion, Useless Loop (Ministerial Statement 425)"*. This commitment requires SBSJV to prepare and implement an oil spill contingency plan that is consistent with the Western Australian State Oil Spill Plan.

8. Conclusions

The EPA has considered the proposal by Shark Bay Salt Joint Venture to dredge the existing shipping channel in Freycinet Estuary, Shark Bay.

The EPA notes that the proposal involves maintenance and capital dredging of the existing shipping channel through Denham Channel and Bar Flats and the Slope Island shipping berth. The key findings are that the increase in the size of the shipping channel is expected to produce an insignificant change to the salinity and water flow regime of Freycinet Estuary and that the proponent's Salinity Monitoring Plan is designed to confirm this expected outcome. The potential for the introduction of exotic marine organisms or diseases by the dredging vessels can be managed through a condition requiring an independent inspection of the vessels before they enter into Shark Bay.

Other environmental issues associated with this proposal (ballast water from general shipping and oil spill contingency planning) can be addressed through existing Ministerial conditions or proponent commitments.

The EPA has therefore concluded that it is most unlikely that the EPA's objectives would be compromised provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2 and summarised in Section 9.

9. Recommendations

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

1. That the Minister notes that the proposal being assessed is for Dredging of Denham Channel, Bar Flats and the Slope Island Shipping Berth, Freycinet Estuary, Shark Bay.
2. That the Minister considers the report on the relevant environmental factors as set out in Section 6.
3. That the Minister notes that the EPA has concluded that it is most unlikely that the EPA's objectives would be compromised provided there is satisfactory implementation by the proponent of the recommended conditions and proponent commitments as set out in Appendix 2.
4. That the Minister imposes the conditions and procedures recommended in Appendix 2 of this report.

Appendix 1

References

Shark Bay Salt Joint Venture *Sea Dumping Application – Application for Maintenance and Capital Dredging in Shark Bay*, July 2000.

Ivey G, Centre for Water Research, University of Western Australia *Exchange Flows in Shark Bay*, 6 March 2001.

Shark Bay Salt Joint Venture *Salinity Monitoring Plan*, February 2002.

Appendix 2

Recommended Environmental Conditions

RECOMMENDED CONDITIONS AND PROCEDURES

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

DREDGING OF DENHAM CHANNEL, BAR FLATS AND THE SLOPE ISLAND SHIPPING BERTH, FREYCINET ESTUARY, SHARK BAY

Proposal: Dredging of the existing shipping channel and the Slope Island Shipping Berth used for the transport of salt from the proponent's ship loading facility at Slope Island, Freycinet Estuary, Shark Bay.

Proponent: Shark Bay Salt Joint Venture

Proponent Address: PO Box 7005, Cloister's Square, PERTH WA 6000

Assessment Number: 1429

Report of the Environmental Protection Authority: Bulletin 1049

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

Procedural conditions

1 Implementation and Changes

1-1 The proponent shall implement the proposal as documented in schedule 1 of this statement subject to the conditions 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 and Heritage 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 and Heritage determines, on advice of the Department of Environmental Protection, is not substantial, the proponent may implement those changes upon receipt of written advice.

2 Proponent Commitments

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

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

3 Proponent Nomination and Contact Details

3-1 The proponent for the time being nominated by the Minister for the Environment and Heritage 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 and Heritage has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.

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

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

4 Commencement and Time Limit of Approval

4-1 The proponent shall provide evidence to the Minister for the Environment and Heritage within 5 years of the date of this statement that the proposal has been substantially commenced or the approval granted in this statement shall lapse and be void.

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

4-2 The proponent shall make application for any extension of approval for the substantial commencement of the proposal beyond 5 years from the date of this statement to the Minister for the Environment and Heritage, on advice of the Environmental Protection Authority, prior to the expiration of the 5 year period referred to in condition 4-1. The application shall demonstrate that:

- environmental factors of the proposal have not changed significantly,
- new, significant, environmental issues have not arisen, and
- all relevant government authorities have been consulted.

Note: The Minister may consider the grant of an extension of the time limit of approval not exceeding 5 years for the substantial commencement of the proposal.

Environmental conditions

5 Compliance Audit

5-1 The proponent shall prepare an audit program in consultation with and submit compliance reports to the Department of Environmental Protection that address:

- the implementation of the proposal as defined in schedule 1 of this statement;
- evidence of compliance with the conditions and commitments; and,
- the performance of the environmental management plans and programs.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environmental Protection is empowered to audit the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement. Usually, the Department of Environmental Protection prepares an audit table which can be utilised by the proponent, if required, to prepare an audit program to ensure that the proposal is implemented as required. The Chief Executive Officer is responsible for the preparation of written advice to the proponent, which is signed off by either the Minister or, under an endorsed condition clearance process, a delegate within the Environmental Protection Authority or the Department of Environmental Protection that the requirements have been met.

Salinity and Water Flow

6-1 To confirm that the salinity and water flow regimes in Freycinet Estuary will not be significantly affected by the proposal, prior to the commencement of dredging Denham Channel and Bar Flats, the proponent shall prepare and implement a Salinity Monitoring Plan, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

6-2 In the event that a significant environmental impact on the salinity or water flow regimes in Freycinet Estuary is detected, the proponent shall immediately inform the Department of Environmental Protection and prepare a plan for remedial works to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

6-3 The proponent shall implement the remedial works plan required by condition 6-2 to the requirements of the Minister for the Environment and Heritage.

6-4 The proponent shall make the Salinity Monitoring Plan required by condition 6-1 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

Marine Pests and Diseases

7-1 At least 48 hours prior to the arrival of the dredge in Shark Bay, the proponent shall arrange for an inspection by an appropriately qualified expert (accredited environmental auditor) acceptable to the EPA to ensure that there is no sediment in the dredging equipment; that ballast water (if any) in the dredging vessel (or other associated vessels) does not contain living organisms; and that there are no fouling organisms on the dredge or other associated vessels or equipment. This last requirement shall apply irrespective of whether the last port of call was a domestic or international port.

7-2 The proponent shall dispose of any sediment or organisms found, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

Procedures

1 Where a condition states "to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority", the Chief Executive Officer of the Department of Environmental Protection will obtain that advice for the preparation of written advice to the proponent.

2 The Environmental Protection Authority may seek advice from other agencies, as required, in order to provide its advice to the Chief Executive Officer of the Department of Environmental Protection.

Notes

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

2 Compliance and performance reporting will endeavour to be in accord with the timing requirements of the *Shark Bay Solar Salt Industry Agreement Act 1983*.

Schedule 1

The Proposal (EPA Assessment No. 1429)

The proposal is to dredge the existing shipping channel in Freycinet Estuary, Shark Bay. The channel is used for the transport of salt from the ship loading facility at Slope Island. The proposal involves the dredging of the existing channel to 11.0 metres depth, dredging the shipping berth basin at Slope Island to a depth of 12.10 metres and the area adjacent to the shipping berth to a depth of 10.90 metres. The proposal also, includes widening the shipping channel from 130 metres to 150 metres. Spoil from the dredging is expected to be approximately 720,000 cubic metres, which will be dumped according to the Commonwealth's Sea Dumping permit.

Table 1 - Key Characteristics of the Proposal

Element	**Quantities/Description**
Life of project (channel dredging)	3 years
Final depth of shipping berth basin	12.10 metres
Final depth of the area adjacent to the shipping berth basin	10.90 metres
Final depth of channel	11.0 metres
Final width of channel	150 metres
Volume of spoil (approx.)	722,000 cubic metres
Channel length	1.25 kilometres

Appendix 3

SHARK BAY SALT JOINT VENTURE

SEA DUMPING APPLICATION

Salinity Monitoring Program

PROGRAM

Summary

A Monitoring Program to determine the impact, if any, on the salinity regime of Freycinet Estuary by dredging carried out as is proposed in the Sea Dumping Application, July 2000, submitted by Shark Bay Resources Pty Ltd on behalf of the Shark Bay Salt Joint Venture, and if such impact is demonstrated whether it is of a level likely to be environmentally significant.

Monitoring Locations

There will be three sample locations. The approximate locations are marked on the attached map:

Location 1. The Control Station will be located on Beacon 2, on the western edge of Blind Strait, where the instrumentation will measure ocean waters flowing into Shark Bay.

Location 2. Located off Slope Island, on the salt field ship loader. This Location is adjacent to the dredging proposed for the shipping basin and is well inside Freycinet Estuary.

Location 3. Located on Beacon 9, Denham Channel. This site is in the shipping channel.

MONITORING PROCEDURE - Salinity

The water column at each monitoring location will be tested, prior to base line data collection commencing, to determine whether there are significant differences in salinity down the water column. If there are no such significant differences then salinity will be recorded at a constant depth at each location.

An Odyssey (or similar) salinity sensor and recorder will be installed at each location and set to record salinity once per hour over a period of four to six months to provide a base data set. The sensors will be checked regularly to ensure that they continue to operate as intended and the accumulated data downloaded for processing and evaluation.

If there are significant differences in salinity down the water column at any location, then a supplementary series of readings will be taken down the water column at that location to determine the degree of difference to the readings obtained by the fixed-depth salinity recorder. These supplementary readings will be taken at high tide and taken on a weekly basis until a constant relationship is established after which they will be made once a month, or such other interval as is agreed with the Department of Environmental Protection (DEP). If this supplementary monitoring indicates a significant persistent vertical salinity gradient at a location, then an additional recorder will be installed at an appropriate depth at that location to monitor this.

Data Collection and Analysis

The base line data will be down loaded and characterised prior to the commencement of the dredging program.

The sensors will be in place and operating at least one week prior to the arrival of the dredge on site. Data recorded during dredging and immediately post-dredging will be downloaded two weeks after the completion of the dredging program. The recorders will continue to operate until the requirements of the program have been met.

Program Duration

The program will continue until such time as a steady state has been reached, or until it can be demonstrated that the effect that may be attributed to the dredging can be shown to be statistically insignificant in the context of natural variations in salinity in the area.
The program may be concluded at any time with the approval of the DEP.

MONITORING – Current Flow

Tidal flow at Bar Flats Channel will be monitored to determine whether the direction and velocity through the Bar Flats Channel is modified to any significant degree by the dredging program. A sensor will be sited at Location 3), to measure and record current velocity and direction (ebb or flood) of flow in the Denham Channel.

The sensor will be set to record flow details once per hour. If timing permits, the sensor will be installed to record a two-month period of winter tides and a two-month period of summer tides prior to the commencement of dredging. As a minimum the sensor will be installed to record two months of tidal cycles prior to the commencement of the dredging program so as to provide baseline data.

Data Collection and Analysis

The base line data will be down loaded and characterised prior to the commencement of the dredging program.

Data will be downloaded and processed at the end of each of the recording intervals.

PROGRAM CONTINUATION

The Department of Fisheries shall have the option to take over and continue the monitoring program in the event that the Department wishes to maintain the continuity of data.

REPORTING

The Proponent will report as follows to the DEP:

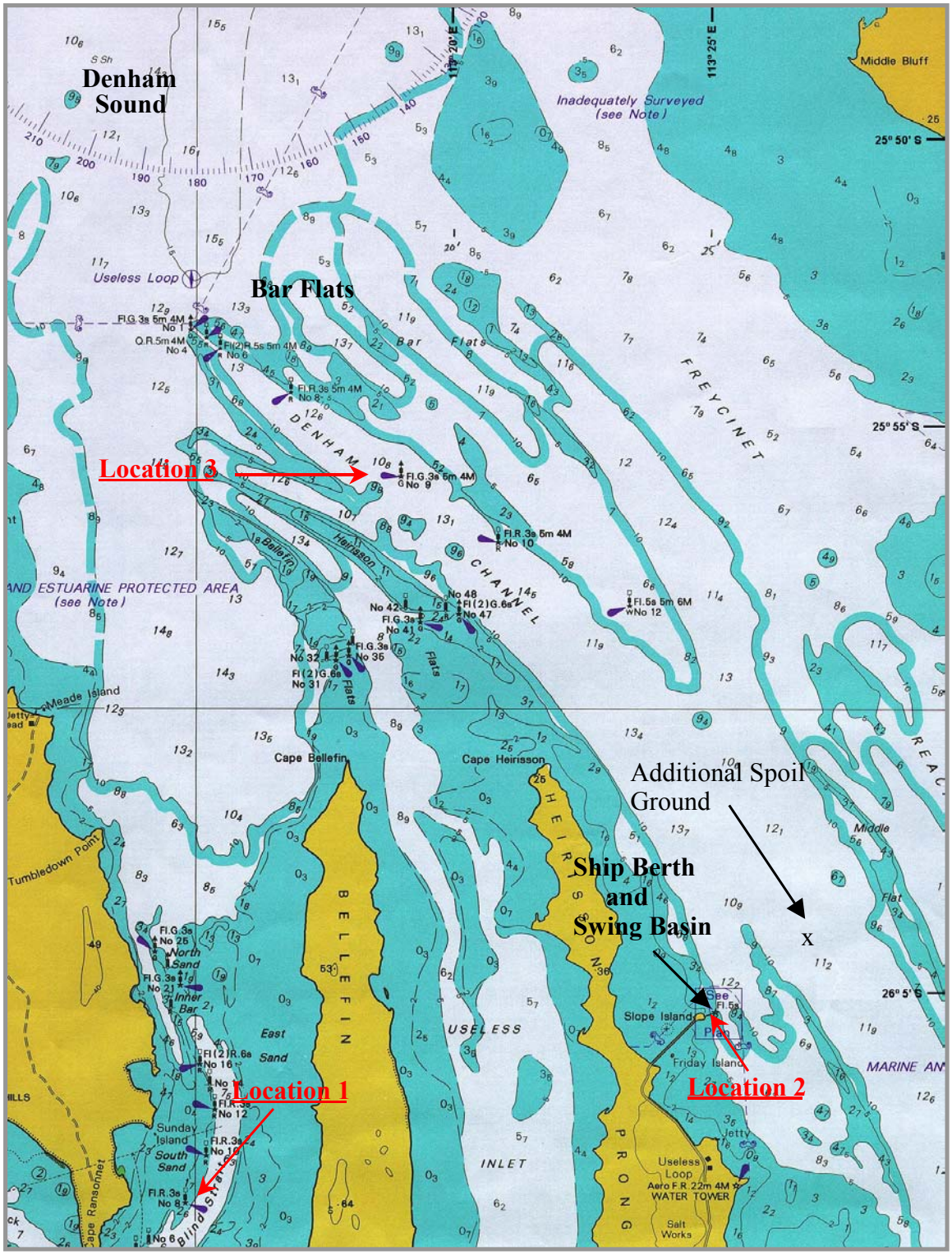
1. Report on Baseline and Dredging Program Data
   A Post-Dredging Report will be prepared comparing the baseline data with that collected during the dredging program and the two weeks immediately following its completion. This report will be compiled as soon as practicable, after the data is collected and processed, and will be forwarded to the DEP on completion.

2. Annual Report
   An Annual Report will be compiled and forwarded to the DEP for each calendar year of the Program. An Annual Report will not be required in the first year if the year-end is within four months of the completion of dredging.

3. Final Report
   A Final Report will be compiled, once the objectives of the Program have been met, incorporating all the data collected during the program and its interpretation. This Report will conclude the Program.

4. Sundry
   Additional reporting within the Program period will be undertaken should there be significant variations in the data recorded.

Figure 1: Location Map –Monitoring Points – Approximate Locations



Note: Chart Datum WGS84

Appendix 4

SHARK BAY RESOURCES

ENVIRONMENTAL PROTECTION (SEA DUMPING) ACT 1981

SEA DUMPING PERMIT

COMMONWEALTH MINISTER FOR ENVIRONMENT AND HERITAGE

20 July 2001

AUSTRALIA

SHARK BAY RESOURCES

ENVIRONMENT PROTECTION (SEA DUMPING) ACT 1981

SEA DUMPING PERMIT

I, Conall O'Connell, a delegate of the Minister for the Environment and Heritage, acting under Section 19 of the *Environment Protection (Sea Dumping) Act 1981*, grant a sea dumping permit to Shark Bay Resources, 22 Mount St, Perth, Western Australia, 6000, to load, for the purposes of dumping, and to dump, up to 722 000 cubic metres of dredge spoil, derived from capital dredging and maintenance dredging within Shark Bay, Western Australia, for a period commencing on the date of signature of this permit, and extending for three years, subject to conditions which are described and specified in Appendix 1.

DATED.....9th.....day of.....September.....2001

CONALL O'CONNELL
Delegate of the Minister

This Permit comprises 10 pages, being the Authorisation and Conditions with Annexes (Appendix 1).

Appendix 1

CONDITIONS FOR DUMPING AT SEA OF SPOIL DERIVED FROM CAPITAL DREDGING AND MAINTENANCE DREDGING

Definitions

1. In this permit:

"Act"	means the *Environment Protection (Sea Dumping) Act 1981;*
"capital dredging"	means dredging to increase the dimensions of Denham Channel and the Slope Island Ship Berth and Swing Basin within Shark Bay;
"compliance monitoring"	means the monitoring undertaken to demonstrate that the conditions of the permit are met;
"dumping activities"	includes all activities associated with the dumping permitted under this permit, including, but not limited to, (i) the dumping of the material, and (ii) the loading of material for the purpose of dumping;
"environmental risk"	means any risk to the environment resulting from an occurrence or event associated with the dumping activities that has occurred or appears likely to occur;
"guidelines"	means the ANZECC Interim Ocean Disposal Guidelines, December 1998;
"maintenance dredging"	means dredging to maintain the dimensions of Denham Channel and the Slope Island Ship Berth and Swing Basin as required by Clause 18(3) of the Shark Bay Solar Salt Industry Agreement Act 1983;
"MWD"	means the Marine and Water Division (as represented by the Marine and International Section), Environment Australia within the Commonwealth Department of the Environment and Heritage;

"SBR"	means Shark Bay Resources, 22 Mount St, Perth, Western Australia, 6000;
"the vessel"	means any vessel or vessels used for, or in connection with, the dumping activities.

2. Except so far as the contrary intention appears, terms and expressions used in this permit have the same meaning as such terms and expressions in the Act.

General Conditions:

3. The grant of this permit does not absolve SBR of the obligation to fulfil any requirements relating to the transport, loading or handling of dredge spoil which, under this permit, is permitted to be dumped, or relating to the operation of vessels, that may lawfully be imposed by Commonwealth or State departments or agencies.

4. SBR is responsible for the conception, design, execution, enforcement and reporting of such precautions and long term strategies as are necessary for the protection and/or safeguarding of relevant parts of the environment, and of the statutory rights of other agencies and individuals from the consequences of their dumping activities.

Material to be Dumped

5. Subject to this permit, SBR may only dump up to 722 000 cubic metres of dredge spoil, over the term of this permit, being dredge spoil derived from capital dredging and maintenance dredging, in accordance with dimensions specified in Annex A.

6. The loading for the purposes of dumping of any spoil derived from capital dredging and maintenance dredging is subject to any additional measures as set out in Annex B.

Location of Dump Site

7. SBR must ensure, so far as practical, that the dredge spoil authorised to be dumped at sea under this permit is only dumped, and any associated washing out of the vessel only occurs, within the areas defined by the following World Geodetic Spheroid (WGS84) co-ordinates:

   Existing Spoil Ground (receiving spoil from capital dredging and maintenance dredging of Denham Channel):

NW	25° 51.775'S	113° 15.300'E
NE	25° 51.775'S	113° 15.700'E
SE	25° 51.425'S	113° 15.700'E
SW	25° 51.425'S	113° 15.300'E

Additional Spoil Ground (receiving spoil from capital dredging and maintenance dredging of the Slope Island Ship Berth and Swing Basin):

NW	26° 03.360'S	113° 27.780'E
NE	26° 03.220'S	113° 27.930'E
SE	26° 03.600'S	113° 28.360'E
SW	26° 03.730'S	113° 28.210'E

8. Dumping is to be in accordance with any additional measures as set out in Annex B.

9. SBR must establish (for example, by GPS) that, immediately prior to dumping, the vessel is within the authorised dump site.

Condition of Vessels and Equipment

10. SBR must ensure that the vessel and any other equipment used in connection with the dumping activities are seaworthy, in good condition and capable of transporting the dredge spoil to the dump site in accordance with the permit.

Escape or Release of Material Other than in Accordance with this Permit

11. SBR must ensure that there is no escape or release of dredge spoil, into the sea, otherwise than in accordance with the permit.

12. In the event that any escape or release of dredge spoil occurs, otherwise than in accordance with the permit, SBR shall take appropriate remedial measures *as soon as possible*, and shall report in writing to MWD, no later than the next working day following the event, giving details of the escape or release.

Monitoring

13. SBR is to undertake the monitoring and additional measures as set out in Annex B.

Reporting

14. SBR is required to provide the following reports, as set out in Annex C:
    - pre-dumping;
    - post dumping;
    - contingency;
    - International Maritime Organisation.

Environmental Risk

15. In its management of dumping activities, SBR shall seek overall to minimise harmful effects on the marine environment.

Contingencies

16. If at any time during the course of dumping activities, an unanticipated environmental risk is identified, all reasonable measures must be taken immediately by SBR to mitigate the risk, and the situation must be reported immediately to MWD with complete details of the risk, the measures taken, the success of those measures in addressing the risk and any additional measures proposed to be taken.

Access for Observers

17. Up to two Commonwealth Government nominees are to be afforded access to witness, inspect or examine any part of the operations, including any monitoring activity, the vessel or any other equipment, and are to be provided with any necessary assistance in carrying out their duties.

18. If the duties referred to in condition 17 require the Commonwealth Government nominees to go to sea, SBR must arrange for the nominees to be returned to a convenient Australian port upon completion of their duties.

Inform all Parties of Obligations

19. SBR is to ensure that all persons engaged in the dumping activities authorised under this permit, including the owner(s) and person(s) in charge of the vessel, comply with this permit and the requirements of the Act.

Annex A

TARGET DEPTHS FOR DENHAM CHANNEL AND SLOPE ISLAND SHIP BERTH AND SWING BASIN

LOCATION	APPROX AREA (m^2)	AV. DEPTH 1998 (m)	REQUIRED AV. DEPTH (m)		ESTIMATED VOLUME (m^3)	
			MAINT	CAPITAL	MAINT	CAPITAL
Berth Basin	17 400	10.80	10.80	12.10	145 000	181 000
Adjacent to Berth	162 000	10.21	10.25	10.90		
Beacon No. 9	26 000	10.80	10.80	11.00	36 000	11 000
Bar Flats	210 000	10.27	10.80	11.00	229 000	120 000
				Totals	**410 000**	**312 000**

COMPLIANCE MONITORING

SBR is to provide the following information to MWD.

- Either weekly plotting sheets or a certified extract of the ship's log which detail:
  - the time and date of the commencement of each dumping run;
  - the position of the vessel (eg by GPS) at the beginning and end of each dumping run;
  - the depth of water in which each dumping run takes place; and
  - the amount of dredge spoil dumped on each run.
- Results of visual monitoring of the dredge plume.
- A bathymetric survey of the disposal areas on completion of the dumping operations with copies to be provided to the RAN Hydrographer, Locked Bag 8801, South Coast Mail Centre, NSW, 2500.

MANAGEMENT AND EFFECTS MONITORING

Methods for the following monitoring programmes and investigations must be developed by SBR and submitted to MWD for approval. Written approval for implementation of the programmes and investigations must be received from MWD prior to the commencement of dredging. Reports containing the results of all programmes and investigations must be provided to MWD at the end of each phase of monitoring. Unless otherwise advised in writing by MWD, the monitoring programmes and investigations must include the following.

- Monitoring of the light climate at seagrass meadows adjacent to the two spoil grounds before, during and after disposal. SBR's programme must include justification for the proposed number and locations of the monitoring sites and of the frequency of monitoring. Relevant sea state and tidal flow parameters for determining the likelihood of damage to seagrass beds from sediment plumes should be determined in consultation with the Western Australian Department of Environment and Water Catchment Protection and MWD during field observation of initial spoil dumping operations. SBR should propose criteria levels of light attenuation or turbidity that, if exceeded, will trigger management action from the dredging contractor.

- A marine pest species survey at the ship berth, including sediment sampling for ballast water organisms such as dinoflagellate cysts. SBR should provide justification for the number and locations of proposed sampling sites within the ship berth. If marine pest species are identified,

then remedial actions will need to be proposed by SBR, accepted in writing by MWD, and implemented before any loading of the material for dumping is undertaken.

- Assessment of any species, if present at the ship berth or additional spoil ground (disposal location for sediments from the ship berth), that could display imposex as a result of the presence of TBT. SBR must provide justification for the intensity of proposed sampling and define their criteria for assessing whether or not a species could be prone to imposex. If such species are identified, and if post-dumping levels of TBT in the spoil ground sediments exceed the guideline screening level (5 ng Sn/g), then monitoring of imposex levels in the species is to be undertaken by SBR. Monitoring should continue until such time as the TBT levels within the spoil ground sediments fall to below the guideline screening level (see below)

- Pre-dredging sampling of benthic fauna at both spoil grounds to establish baseline measures of abundance and diversity, against which recolonisation of sediments by benthic fauna can be monitored. Sampling of benthic fauna should also be undertaken at two reference sites where characteristics of the sediment and biophysical environment are similar to those of the spoil grounds, but which are remote from the influences of dredging operations. SBR must provide justification for the number and locations of proposed sampling sites and for the proposed level of taxonomic detail to be adopted.

- Post-dredging sediment sampling over time (immediate post-dumping; one year post-dumping; three years post-dumping) at both spoil grounds and both reference sites to monitor recolonisation of spoil ground sediments by benthic fauna.

- Post-dredging sediment sampling over time at the additional spoil ground to monitor TBT levels until natural degradation reduces levels to below the guideline screening level. SBR must provide justification for the number and locations of proposed sampling sites and the proposed frequency of monitoring.

- Assessment of any changes to the salinity structure within Freycinet Reach post-dredging, with appropriate ongoing monitoring. SBR must provide justification for the number and locations of proposed monitoring sites and of the proposed frequency of monitoring. SBR should liaise with Fisheries WA in determining the proposed scope of the salinity monitoring profile.

If any whales are detected in the area during dredging operations, then SBR must conduct the operation in a manner that minimises impacts on the whales. A management action plan must be approved in writing by MWD prior to the commencement of dredging.

REPORTING

All Reports required under this permit should be submitted on or before the required date to:

Assistant Director
Marine and International Section
Marine and Water Division
Environment Australia
GPO Box 787
CANBERRA ACT 2601

Tel: (02) 6274 1765
Fax: (02) 6274 1006

Pre-Dumping Reports

SBR shall report to MWD, immediately prior to the commencement of a dumping operation, on the following:

- the nature, source (including co-ordinates of channel reaches dredged) and quantities of all dredge spoil permitted to be dumped at sea;
- the location of proposed dumping;
- a pre-dumping bathymetric survey of the proposed dump site;
- the proposed period/date(s) of dumping;
- methods of dumping to be used;
- the names and owners of vessel to be used in dumping operation; and
- relevant Compliance and Management and Effects Monitoring information as specified in Annex B.

Post-Dumping Reports

SBR shall report to MWD, at the end of each dumping operation, on the following:

- the quantities of all dredge spoil dumped during a dumping program;
- the cumulative total of all matter dumped under the current permit;
- the location of dump site used;
- a post-dumping bathymetric survey of the dump site;
- relevant Compliance Monitoring information as specified in Annex B.

Contingency Report

SBR shall report to MWD, as required under condition 16 of Appendix 1, when, and if, an incident occurs and shall include the following:

- nature of incident and type of risk associated with incident, including (where appropriate) volume, nature and chemical composition of substances released;

- measures taken to mitigate the risk;
- the success of the measures undertaken; and
- proposed future monitoring.

International Maritime Organisation Report

SBR shall report to MWD, by 31 December each year, on the nature and quantities of all matter permitted to be dumped, and the location, time and method of dumping.

For the purposes of this permit, SBR's report to MWD should include:

1. Issued by, Department of the Environment and Heritage;
2. Period;
3. Country, port of loading;
4. Material, derivation;
5. Form;
6. Quantity;
7. Frequency of dumping;
8. Chemical composition;
9. Solubility, density and pH;
10. Packaged;
11. How released;
12. Tank washing;
13. Dump site;
14. Monitoring;
15. Remarks.