Cumulative Impacts

18.1. Introduction	52
18.2. Methodology	52
18.2.1. Identification of Relevant Projects	52
18.2.2. Review of Existing Information	52
18.2.3. Limitations of Study	52
18.2.4. Assessment of Impacts	52
18.3. Description of Related Projects	53
18.3.1. Santos Facility	53
18.3.2. BHPB Desalination Plant and	
Return Water Discharge	53
18.3.3. Port Bonython Fuel Storage Facility	53
18.3.4. Whyalla Port Facility	53

18.4. Assessment of	
Cumulative Impacts	534
18.4.1. Water Resources	534
18.4.2. Terrestrial Ecology	534
18.4.3. Transport	534
18.4.4. Visual Amenity	536
18.4.5. Socio-Economic	536
18.4.6. Cultural Heritage	537
18.4.7. Climate Change and Greenhouse Gases	537
18.4.8. Marine Environment	537
18.4.9. Hazard and Risk	538
18.5. Mitigation Measures	539

18. CUMULATIVE IMPACTS

18.1. Introduction

This Chapter describes the cumulative impact of the Port Bonython Bulk Commodities Export Facility (BCEF) in conjunction with the other projects that exist or are planned within the study area. It builds on earlier assessments undertaken as part of this Environmental Impact Statement (EIS) which identified residual impacts that remain significant after mitigation has been applied. These impacts related to social, economic and environmental issues.

Cumulative Impacts can be defined as 'the sum of the project's impacts when added to those of other past, present or future projects' (Morris & Therival, 1995). Cumulative impacts may result from a number of activities with similar impacts interacting with the environment in a region. In order to understand cumulative impacts, it is necessary to appreciate the interrelationships between impacts. Interactive effects arise where effects from one element bring about changes in another environmental element.

There is no guidance at a federal or state level available for undertaking cumulative impact assessment.

The aim of this assessment is to:

- >> Identify other projects in the area that are relevant to the BCEF
- >> Understand the potential impacts of these projects or proposals
- » Consider the combined effect of these impacts with the residual impacts identified for the BCEF.

18.2. Methodology

18.2.1. Identification of Relevant Projects

The EIS Guidelines require the following projects to be considered when assessing cumulative impacts of the project:

- » The current Santos liquids fractionation plant at Port Bonython
- » The existing Port Bonython jetty and associated shipping facility
- » The approved Port Bonython diesel fuels storage facility
- » Expansion or addition to the Whyalla port facility
- The approved BHP Billiton (BHPB) desalination plant and return water discharge into the marine environment off Point Lowly.

Typically only existing projects or those that have planning approval are included in a cumulative impact assessment. No other relevant projects were identified.

18.2.2. Review of Existing Information

The following environmental reports from other projects in the region were reviewed to identify cumulative impacts:

- » Olympic Dam Expansion Environmental Impact Statement; Draft Main Report Volume One and Two (BHPB, 2009), Supplement (BHPB, 2011a) and Assessment Report (Minister for Mineral Resources Development and Minister for Urban Development, Planning and the City of Adelaide 2011)
- Environmental Impact Statement for Port and Terminal Facilities at Stony Point - South Australia; Draft (Social and Ecological Assessment Pty Ltd., 1981), Supplement (Social and Ecological Assessment Pty Ltd. 1981) and Assessment (Department of Environment and Planning, 1981)
- » Port Bonython Fuels Project Planning Report (main document only; no appendices available), Port Bonython Fuels, 2009.

18.2.3. Limitations of Study

An assessment should also be based on publically available planning documents that clearly identify impacts of the project. Recent information for the Santos Facility and jetty, the Port Bonython Diesel Fuels Storage Facility (PBDFSF) and the Whyalla Port Facility (WPF) were not publically available. For this reason, cumulative impacts assessed in this EIS are limited as the impacts of other projects are not able to be identified.

Other limitations are:

- Differences in methodologies and assessment criteria exist between this report and other reports prepared for other projects, which may compromise the validity of the impact comparison
- Few of the projects considered for this assessment have been built, so the real impact is unknown at this point.

18.2.4. Assessment of Impacts

Given the limited information available to undertake this assessment, the cumulative impacts have only been identified as beneficial or adverse and not assessed on a significance scale from negligible to high.

18.3. Description of Related Projects

18.3.1. Santos Facility

The existing hydrocarbons Facility construction was completed in 1982 to implement the Cooper Basin Producers' Liquids Development Scheme that was designed to assist with the exporting of hydrocarbon based fuels from the Cooper Basin in South Australia. The Santos Facility was established for the separation, treatment and shipment of hydrocarbons for export as part of this scheme. Exports first commenced in 1983.

The Santos plant receives hydrocarbons via pipeline before separating the feedstock into propane, butane, naphtha and stabilised crude oil. During 1984 the Santos Facility first began producing LPG on site and today exports approximately 70 percent via the 2.4km jetty located at Port Bonython. The Port incorporates road tanker loading facilities as well as offshore ship loading. Approximately 30 ships of 110,000t capacity vessels, are loaded per year.

The Santos site is approximately 100 hectares located on the eastern side of Weeroona Bay. The site was originally selected due to access to deep water, a sheltered loading port and the availability of skilled workers in Whyalla. Due to the hazardous nature of the operations at the Facility, there is a buffer zone surrounding the development as indicated in **Figure 18.3a**. The proposed development is to be located approximately 2km west of the Santos Facility.

The establishment of the Santos Facility prompted the need for an emergency access route in the event of an explosion at the Facility, as an alternative to Port Bonython Road. This route is a t-junction that branches off from Port Bonython Road at a location on the northern boundary of the Santos Facility.

The EIS undertaken for the project (Social and Ecological Assessment Pty Ltd. 1981) identified the following key impacts will occur as a result of the project:

- » Potential for oil spills to impact on the littoral and sublittoral ecosystems of the Spencer Gulf
- Impacts of planned discharges of effluent from the plant, for example treated ballast water and atmospheric emissions
- >> Health and safety risks associated with the storage and loading of liquefied petroleum gas (LPG); for this reason, a buffer zone was provided
- Impact on the recreational use of Weeroona Bay and surrounds which have been closed to the general public
- The impact on the social environment of Whyalla from additional personnel associated with construction and operation of the plant.



Figure 18.3a: Santos Facility and associated buffer zone

Environmental Impact Statemen

18.3.2. BHPB Desalination Plant and Return Water Discharge

As part of the BHPB Olympic Dam Expansion, a desalination plant and associated pumping facilities were proposed to be constructed on a site area of approximately 20 hectares at Point Lowly, as illustrated in **Figures 18.3b** and **18.3c**. The project was granted approval in 2010, however BHPB have since announced that this project is on hold and the desalination plant has not yet been constructed.

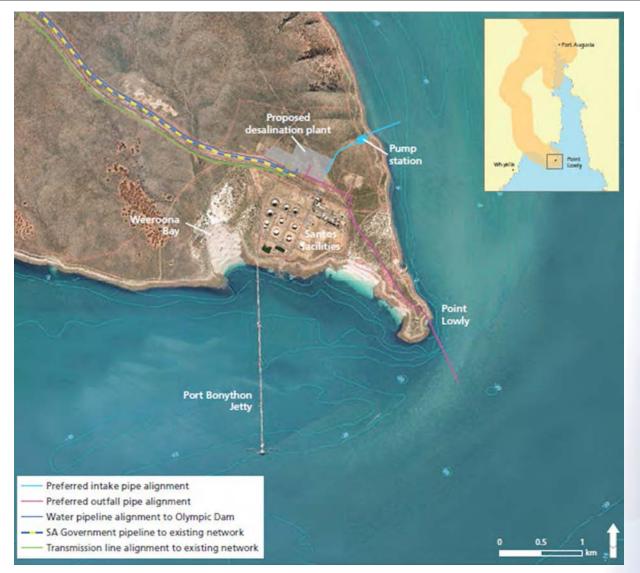
The plant will extract saline water from the Spencer Gulf where it will pass through reverse osmosis membranes to produce low salinity product water and a high saline brine stream. The brine stream will be discharged offshore in deep water, via a submarine pipeline constructed by tunneling.

As stated in BHPB (2009), the low salinity product water will be pumped to Olympic Dam via a proposed 320km pipeline.

The Olympic Dam Project Draft EIS (BHPB, 2009) identifies the following potential impacts of the desalination plant:

- » A long-term increase in salinity at Point Lowly of 0.07g/L which is considered to be within seasonal variation limits
- A zone of ecological affect was identified where water dilution is less than the safe level
- The return water will not affect the Australian Giant Cuttlefish or the aquaculture leases present in Fitzgerald Bay
- The zone of ecological affect for fisheries will extend no more than 100m from the outfall
- » Entrapment of marine organisms in the intake pipe is not expected to result in any long-term population decrease to the extent that a species will decline
- » Construction of the desalination intake and outfall will impact an area of cuttlefish breeding habitat less than 400m²
- Some visual impact on coastal homes to the south of the proposed landing facility, which will impose an industrial element into the landscape.
- » Exceedance of noise limits at approximately 13 coastal homes south of the landing facility during barge unloading activities.

Figure 18.3b: Proposed location for Olympic Dam mine expansion's seawater desalination plant at Point Lowly (BHPB, 2009)





18.3.3. Port Bonython Fuel Storage Facility

Port Bonython Fuels (Senex Energy (formerly Stuart Petroleum)) received planning approval in 2010 for a diesel storage and refinery facility to be located adjacent the existing Santos Facility, as illustrated in **Figure 18.3d.** The Facility has yet to be constructed, although the Planning Report (Port Bonython Fuels, 2009) nominated a construction commencement timeframe of 2010, with the facility being operational by 2011.

The project will involve construction of a tank farm which will receive diesel from ships unloaded at the existing Port Bonython jetty and delivered via steel pipeline from the unloading point to the Fuels Terminal site. Diesel will then be trucked from the fuels terminal to regional markets. Additional storage facilities and a crude oil distillation facility will be constructed in a second phase of the project.

The Planning Report is mostly qualitative and impacts are not assessed to the level they will be in an EIS. It does conclude the following:

- There are no noise, air quality or lighting impacts expected as a result of the project
- » Up to 70ha of vegetation clearance is necessary, which will be offset in accordance with government requirements
- There is no identified aboriginal cultural heritage sites or material within the project site
- An upgrade of the existing Port Bonython Road intersection is required for safe access to the site

- The development will involve an additional ten to 12 ships per year berthing at the existing Port Bonython jetty
- The location of the facility is sufficiently separated from the Santos Plant to minimise risks to personal associated with any hazardous event involving those facilities.

18.3.4. Whyalla Port Facility

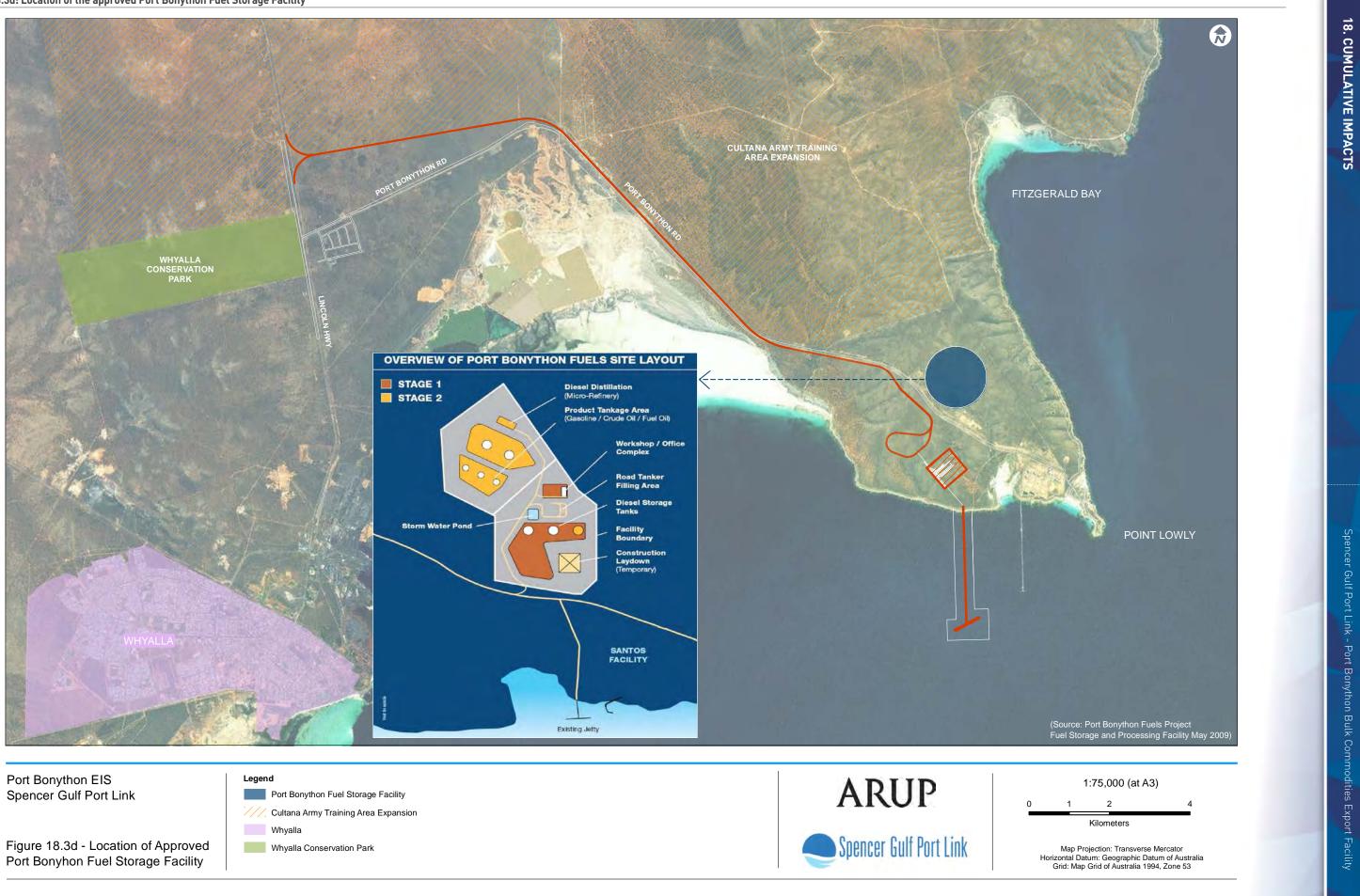
There is very limited data available on this facility. It is believed that the existing Whyalla Port Facility is currently being upgraded to expand iron ore export up to 13Mtpa from a current capacity of 6Mtpa. This is expected to result in approximately 22 additional ship movements per annum. This involves:

- » Connection to the main Port Augusta and Middleback rail lines
- » Installation of:
 - Additional iron ore storage sheds
 - A temporary bulk products berth
 - A new bulk products berth as an extension of the existing wharf
 - Additional Cape-size vessel transshipment point.

Any environmental impacts of this project have not been identified, therefore the expansion of the Whyalla Port Facility is not considered further in this assessment.

Environmental Impact Statemen

Figure 18.3d: Location of the approved Port Bonython Fuel Storage Facility





18. CUMULATIVE IMPACTS

It is possible that the cumulative release of pollutants (i.e. oil, chemicals etc.) from all projects could result in deterioration in water quality parameters, particularly during rain events. It is expected that each project will install water protection measures and monitoring to limit pollutants released from site via surface water similar to those proposed for the BCEF, therefore a long-term impact on surface water discharged to the Upper Spencer Gulf is not anticipated.

18.4.2. Terrestrial Ecology

18.4.1. Water Resources

The cumulative projects considered in this Chapter are likely to contribute to an overall loss of habitat around the Point Lowly area; however the exact amount is unable to be quantified due to lack of information on other projects. When considered in a spatial and temporal context it is noted that the region around Point Lowly has been historically used for grazing and has experienced associated impacts. This is now changing, with much of the region now managed by the Department of Defence as part of the Cultana Training Area. This will remove the impacts of grazing and is likely to improve habitat quality in the region. Regionally, much of the habitat that will be affected by the developments at Point Lowly is common and extensive (e.g. chenopod shrubland).

The increased movement of personnel and equipment into Point Lowly, along with the disturbance due to development creates the potential for weed introduction and spread. Although the arid environment of the area is unsuitable for many of the environmental weeds that threaten South Australia, there are emerging issues with drought tolerant weed species, such as cacti, that need to be monitored and managed as appropriate.

Increased development at Point Lowly could also lead to cumulative impacts due to increased background noise and artificial light, decreasing the suitability of habitat for some species beyond what is removed through clearance.

The BCEF, and presumably any other proposed development in the area, will be required to prepared a comprehensive Construction Environmental Management Plan (CEMP) and Operation Environmental Management Plan (OEMP) prior to construction which will contain mitigation measures for some of the cumulative impacts discussed, such as:

- >> Weeds
- » Noise
- » Artificial light
- » Bushfires.

The cumulative impacts mentioned above, if properly managed through comprehensive CEMP and OEMP should pose a low risk.

18.4.3. Transport

In addition to an assessment of the BCEF during and immediately after construction, it is important to determine the cumulative impact of the BCEF along with traffic growth caused by new and /or higher density development in the region. Guidelines from Austroads Guide to Traffic Management Part 12 (2009) recommend that the impact be assessed at ten years after opening, to identify whether the development will use up any space capacity in the surrounding transport network, bringing forward the need for improvements.

As the exact traffic impact of other proposed developments in the region was not able to be ascertained, its effect was modelled through the use of a three percent per annum growth rate in background traffic on all roads in the area.

An assessment of the future traffic impact of the operation of the BCEF at several intersections within the study area was completed to determine which intersections require detailed assessment. Guidance from Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development (2009) suggests that a traffic assessment should be completed where the amount of additional traffic generated by a development exceeds 5percent of background volumes.

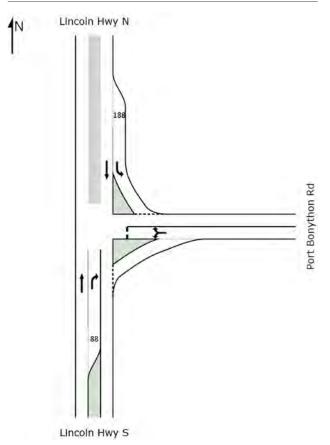
A comparison of additional traffic generated by the operation of the BCEF to the background traffic at intersections within the study area was made to determine whether the development generated traffic is greater than 5 percent of the background traffic. A summary of this assessment is presented in **Table 18.4a**.

	Percentage Increase in Traffic Caused by Operations		
Intersection	Morning peak hour	Evening peak hour	
Lincoln Highway / Eyre Highway	0%	0%	
Lincoln Highway / Port Bonython Road	12%	9%	
Lincoln Highway / Norrie Avenue Extension	2%	3%	

Table 18.4a: Summary of intersection traffic increases due to operation of Stage Two

The results above indicate that the traffic impact of the BCEF is limited to the Lincoln Highway / Port Bonython Road intersection. The Lincoln Highway / Port Bonython Road intersection is currently priority controlled, with segregated turn lanes. An indicative layout of the intersection is shown in **Figure 18.4a**.

Figure 18.4a: Lincoln Highway / Port Bonython Road intersection layout



The results of the SIDRA assessment for the operation phase are presented in **Table 18.4b**. As the intersection is unsignalised, the key assessment criterion is that the degree of saturation should be lower than 80 percent to achieve an acceptable level of service.

The above results show that the intersection will operate with an acceptable level of service in the design horizon. It is noted that the queue on Port Bonython Road (1m in both peak periods) is unlikely to obstruct the operation of the level crossing.

In addition to an assessment of the intersection capacity, an assessment of the right turn treatment was conducted based on Austroads guidelines. The results of this assessment are summarised in **Figure 18.4b**.

The results of the assessment indicate that treatment is required for the intersection based on predicted traffic volumes at the ten year design horizon. This treatment is proposed to be built during construction of the BCEF, and as such, no further works are required to mitigate the cumulative impact at the design horizon.

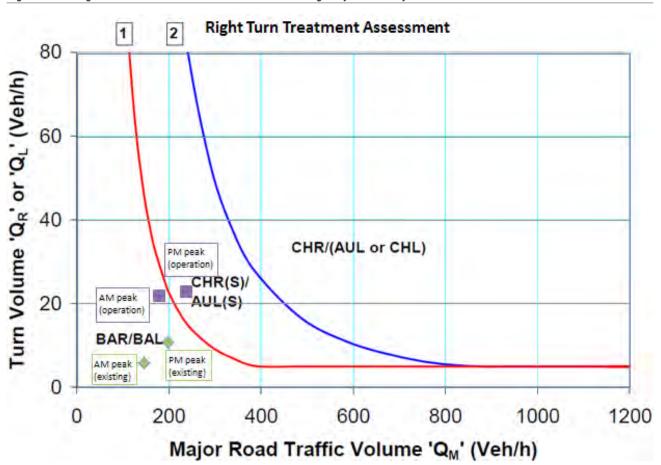
The results of the cumulative assessment indicate that the cumulative impact of the BCEF at the ten year design horizon can be accommodated without any further intersection upgrades. As such, no further mitigation is required to accommodate the cumulative traffic impact.

		Degree of Saturation		Average Delay (s)		95 th Percentile Queue (m)	
Approach	Movement	AM	РМ	AM	РМ	AM	РМ
Lincoln Highway (South)	Through	6%	7%	0	0	0	0
	Right	2%	2%	9	9	1	1
Port Bonython Road	Left	4%	3%	9	9	1	1
	Right	4%	3%	11	9	1	1
Lincoln Highway (North)	Left	0%	0%	8	8	0	0
	Through	4%	7%	0	0	0	0
Overall		6%	7%	2	2	1	1

Table 18.4b: Lincoln Highway / Port Bonython Road intersection assessment results during operation in the ten year design horizon (Stage Two)



Figure 18.4b: Right Turn Treatment Assessment for Lincoln Highway / Port Bonython Road intersection



18.4.4. Visual Amenity

The cumulative impact on visual amenity as a result of these additional projects is discussed below for view impacts that were considered to have a residual impact as a result of the BCEF. Note that the Santos Facility has already been included in the visual impact assessment (refer to **Chapter 9, Visual Amenity**) as it is part of the existing environment.

18.4.4.1. Point Lowly

The combined effect of these projects on views to the proposal from Point Lowly will result in a reduction in the visual impacts identified for the Proposal. This is due to the further industrialisation of the views in this area.

The cumulative impact of these projects overall is a reduction in the quality of views from Point Lowly.

18.4.4.2. Port Bonython Road

The combined effect of these projects on views from Port Bonython Road and Fitzgerald Bay Road where the main BCEF will be visible, results in a reduction in the visual impacts identified for the Proposal. This is due to the further industrialisation of the views in this area.

The cumulative impact of these projects overall is a reduction in the quality of views from Port Bonython Road.

18.4.4.3. Lincoln Highway

In views from the Lincoln Highway there is no visibility of the proposed projects and therefore there will be no combined effects with the Proposal. The cumulative impact of these projects is therefore a neutral effect on the quality of views from the Lincoln Highway.

18.4.5. Socio-Economic

As discussed in **Section 18.4.4**, increased industry in local area will result in more industralised views when accessing the coastal settlements which will impact the amenity of the area for locals and visitors. That said this change in land use is consistent with zoning for the area.

Potential disruption to access and people's way of life has been highlighted as a residual impact associated with the construction of the BCEF. Should another project's construction period overlap with the BCEF's construction period there is the likelihood that these impacts could be exacerbated. As timing for construction of the other projects listed in **Section 18.2.1** is not known, this is an issue that needs to be monitored.

18.4.6. Cultural Heritage

The impact of the proposed development on Aboriginal cultural heritage requires further investigation and progression of the processes available under the relevant legislation.

SGPL will continue to liaise with Development Assessment Commission (DAC), the South Australian Department of Premier and Cabinet, Aboriginal Affairs and Reconciliation Division (DPC-AARD) and the Crown Solicitor's Office (CSO) in regard to consultation and negotiation with Aboriginal stakeholders; this will include consideration of any cumulative impact on Aboriginal cultural heritage.

18.4.7. Climate Change and Greenhouse Gases

Greenhouse gases will be generated from both the BCEF and other regional projects, which will contribute to an increase in SA's total greenhouse gas emissions if no reduction measures are applied or offsets sought. It is not possible to quantify this impact with the information available.

Climate change will also be expected to potentially have an impact on each protect, but the effects are not considered interactive.

18.4.8. Marine Environment

From the above Sections, and with regard to cumulative effects, the major impacts/stressors are expected to be:

- » Changes in water quality, including temperature, salinity, nutrients and algae growth and turbidity
- » Increase in shipping movements
- >> Underwater noise
- » Potential oil spills
- » Introduced species.

18.4.8.1. Water Quality

Temperature and Salinity

The Project will not affect water temperature or salinity which will add to or exacerbate the predicted effects of the approved BHPB Olympic Dam Expansion Project, which includes the Desalination Plant at Point Lowly. Although this Project has been put on hold, it is still appropriate consider the anticipated effects of the desalination plant return water discharge. For the current Project, of particular interest are the potential toxicity of the elevated salinities and the dispersion of the discharge plume in relation to the proposed BCEF. In the Supplementary Environmental Impact Statement (BHPB, 2011a) it was concluded that a dilution factor of 1:70 could be applied to protect 99 percent of species.

The Assessment Report concludes that a dilution factor of 1:70 beyond 100m of the diffuser should be used as the design criterion for the diffuser. Modelling indicated that dilutions greater than 1:70 at 100m from the diffuser will be achieved under all tidal scenarios. The 1:70 contour will not intersect the proposed jetty but will be approximately 1km east of the Santos Jetty.

Turbidity

Any sediment released during the construction phase of the BCEF will be minor and localised. The other future project which may increase turbidity of the marine environment is the Desalination Plant return water discharge. Construction is expected to produce some minor and temporary turbidity, with effects experienced up to 200m from the construction site (BHPB, 2011a). The recovery of the marine environment is expected to be rapid. In addition, construction will not occur during the breeding season of the Australian Giant Cuttlefish, therefore is not expected to have an impact on this iconic species.

During operation, in the vicinity of the jetty head and tug wharf propellor wash may cause the re-suspension of a small amount of sediments, locally increasing turbidity; this is expected to be minimised through operational controls however and is not of sufficient volume that it will have a significant impact on the already relatively high turbidity of the study area. Ship movements (propellor wash) associated with the existing Santos Facility and the future Port Bonython is expected to have some minor impact on turbidity, however the extent of this impact is not able to be confirmed based on existing available information. Any impact is likely to be localised, and there is not expected to be a significant cumulative impact on turbidity within the study area.

18.4.8.2. Ship Strike

The potential for ship strike again relates to increase numbers of ships entering Upper Spencer Gulf as a result of the BCEF and other future projects/expansions.

Historical ship movement data for the existing port in the Upper Spencer Gulf are outlined in **Table 18.4c**.

Table 18.4c: Ship Movements from existing ports in the Upper Spencer Gulf

Port	2006	2007	2008	2009	2010	2011	2012
Port Bonython (Santos)	27	25	23	31	25	21	28
Whyalla	101	100	83	81	85	89	60
Port Pirie	66	54	54	66	65	54	59
Total	194	179	160	175	175	164	147

The number of ship movements varies from year to year, but averages at 170 per annum. An additional 277 ship movements are anticipated as a result of the Project to achieve the 50Mtpa option; refer to **Chapter 14, Marine Ecology** for a discussion on the potential impacts of these additional ships. A further 32 ship movements could occur as a result of the Whyalla Port expansion and the Port Bonython Fuels project.

As discussed in **Chapter 14, Marine Ecology**, there are relatively low numbers of whales that visit Upper Spencer Gulf and there are low numbers of ship strike reported in Australian waters. Although the likelihood of ship strike will increase with increased ship movements, it is still considered to be a very unlikely and uncommon event.

18.4.8.3. Underwater Noise

Currently, the port area around Port Bonython is characterised as having a relatively high background noise due to several factors including:

- » Existing ship movements to Port Pirie, Port Bonython and Whyalla
- The narrow width of the Upper Spencer Gulf that does not allow underwater sound to escape to deeper water
- » Relative high energy of the coastline.

While marine fauna in the region will be familiar with existing ship noise which will not increase in volume, the additional cumulative vessel movements will mean that the background noise contribution from ships will be sustained for longer.

Noise associated with ships can cause avoidance and behavioural changes in marine fauna as discussed in **Chapter 14**, **Marine Ecology.** Given the limited number of whales that use the Upper Spencer Gulf however, this is not expected to have a significant impact on the viability of whale species.

18.4.8.4. Introduced Species

Marine pests pose a threat to the marine environment and the unique conditions of the Upper Spencer Gulf creates the possibility of invasion of tropical pest species. As discussed in **Chapter 14, Marine Ecology**, the main threats of pest introduction are through ballast water and biofouling associated with international shipping movement. The increased numbers of ships entering Upper Spencer Gulf as a result of the BCEF and other operations in the area potentially increases the risk of marine pest introduction, unless managed appropriately. As discussed in **Chapter 14, Marine Ecology** Ballast water management and biofouling of international vessels is controlled through the Australian Quarantine Inspection Service.

18.4.8.5. Australian Giant Cuttlefish Aggregation

Cumulative impacts on the Australian Giant Cuttlefish relate to some of the aforementioned cumulative impacts. Noise as a result of increased shipping activity is not expected to impact the cuttlefish utilising the inshore subtidal reef during the aggregation period. Marine noise modelling (refer **Chapter 15**, **Underwater Noise**) indicates that at approximately 1200m, the noise from ships will become imperceptible to cuttlefish on the reef. Shipping from other projects will be further away and so also has a negligible effect.

The potential for increases in turbidity in the aggregation area as a result of propellor wash at the wharf is expected to be low, particularly because of the distance to the reef and long shore currents. The Santos terminal has low shipping volumes, and is located further away.

18.4.9. Hazard and Risk

Potential cumulative health and safety hazards and risks arising from the Santos and Fuel Storage projects are related to hazardous materials and dangerous goods, and include:.

- » Loss of containment of hydrocarbon (LPG or crude oil)
- » Crude oil/diesel release
 - On land
 - On water
- » LPG vapour release, with
 - Onsite ignition
 - Offsite ignition
- » Ignition of hydrocarbon (LPG, diesel or crude oil), leading to fire.

No credible risk scenarios were considered to be presented by the Olympic Dam Desalination Plant due to the lack of large quantities of hazardous materials and dangerous goods expected to be held at this facility.

It is considered an extremely low risk that simultaneous oil spills will occur at multiple facilities; therefore no further management procedures are considered.

Environmental Impact Statemen

18.4.9.1. Emergency at The Santos Facility

Santos has provided the hydrocarbon fractionation facility's 'Port Bonython Emergency Plan Version Nine' (Santos, 2013) for the purposes of preparation of this EIS. The plan outlines:

- » How Santos deals with an emergency
- » The role of external agencies in an emergency
- » The basic procedures for dealing with an emergency
- » The emergency facilities at Port Bonython.

As the Santos Port Bonython fuel storage facility will be located adjacent to the hydrocarbon fractionation facility, it is considered reasonable to assume that any Port Bonython Fuel Storage Emergency Plan will contain similar procedures should it become operational. The Port Bonython Fuel Project Planning Report states that the Facility will be sufficiently distant to the Santos Facility that there will be no interactive health and safety risks should an incident occur. This assessment is therefore based on the existing Santos 'Port Bonython Emergency Plan'.

For the purpose of their emergency plan, Santos has defined an emergency as:

- » A fire
- » A vapour release
- » An explosion
- » A bomb threat
- » An oil or product spill
- » An aircraft incident
- » An act of terrorism
- » A loss of business / disruption to customers.

Fire

A credible scenario for a fire at the Santos Facility due to a LPG release is a jet fire from one of the 20,000m³ propane tanks. This situation has been modelled with a program called Phast 6.7.

The New South Wales Hazardous Industry Planning Papers (HIPAP), 2011 defines a heat radiation with "significant chance of fatality for people exposed instantaneously" as 35kW/m² (HIPAP, 2011). The model shows that this intensity is less than 90 metres from the leak source. Therefore, it is unlikely that there will be any significant impact to the BCEF. A credible scenario in the event of loss of containment of crude oil is a pool fire. Crude oil is less volatile and more likely to pool than LPG, and if provided an ignition source will ignite, forming a pool fire.

The model shows that the intensity of a pool fire of an intensity of 12.6kW/m² that could cause a fatality for a person exposed for greater than 20 seconds is less than 30m. It can be assumed that the impact will remain with Santos site boundaries and not impact the Port Bonython BCEF.

Vapour Release

A vapour release could occur from either piping or tanks at the Santos site. The considerable distance from site – over 1500m south west and over 2300m north west, indicate that a very large release will be necessary to have an impact on the health and safety of BCEF personnel. Emergency planning will address this scenario.

Explosion

Although highly unlikely, a catastrophic rupture of a 20,000m3 LPG tank could occur. This means that the entire contents of the tank explodes at once. This is considered the worst case scenario of a major accident at the Santos Facility.

Based on the overpressure impacts table taken from HIPAP 2011, it is unlikely that a fatal impact will be felt outside of the Santos site boundary. There will be some impact at the BCEP, which is at closest 1500m from the closest Santos tank, however it is considered highly unlikely that a fatality will be experienced at the BCEF.

18.5. Mitigation Measures

Specific responses will be planned in the event of an emergency at the Santos Facility or other facilities, should they be constructed. An Emergency Response Plan will be developed that considers:

- >> Communications
- » Assessment of risk to property or persons
- >> Evacuation procedures.