



Olympus-1 and Bianchi-1 Environment Plan Summary

CONTENTS

1. INTRODUCTION	3
1.1 Schedule.....	3
1.2 Compliance.....	3
2. LOCATION OF THIS ACTIVITY	4
3. DESCRIPTION OF THE RECEIVING ENVIRONMENT	6
3.1 Physical Environment	6
3.2 Biological environment	6
3.3 Socio-economic environment.....	7
4. DESCRIPTION OF THE ACTION	8
4.1 Drilling activities.....	8
4.2 Abandonment activities	8
5. MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS	9
6. MANAGEMENT APPROACH	10
7. CONSULTATION	11
8. CONTACT DETAILS	12
9. ENVIRONMENTAL ASPECTS, IMPACTS AND CONTROLS.....	13
10. REFERENCES	24

1. INTRODUCTION

Apache Energy Ltd (Apache) proposes to drill exploration and appraisal wells within the Zola prospect permit areas (Permit areas, WA-49-R, WA-450-P) in Commonwealth Waters, using a semi-submersible drill rig, in order to carry out its obligations under the permit and to appraise potential hydrocarbon resources.

Apache is the operator of the WA-450-P permit, with its subsidiary Apache Northwest Pty Ltd holding a 75% share, and its Joint Venture (JV) partners holding the following:

- Japan Australia LNG (MIMI) Downstream services Pty Ltd (20%) and
- Finder No.4 Pty Limited (5%)

Apache is also the operator of the WA-49-R permit, with its subsidiary Apache Northwest Pty Ltd holding a 30.25% share, and its Joint Venture partners holding the following:

- Santos Offshore Pty Ltd (24.75%),
- OMV Australia Pty Ltd (20%),
- JX Nippon Oil and Gas Exploration (Australia) Pty Ltd (15%), and
- Tap (Shelfal) Pty Ltd (10%)

1.1 Schedule

The drilling activity is scheduled to commence December 2012, and will take approximately 150 days. Therefore, completion of these wells is expected May 2013. The schedule may vary however depending on weather delays.

1.2 Compliance

The Olympus-1 and Bianchi-1 EP has been prepared to comply with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGG (E)) under the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGG Act) (Cmlth). The EP has been reviewed and accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

This EP summary has been prepared as per the requirements of Regulation 11 (7) and (8) of the referenced OPGGG(E) Regulations.

2. LOCATION OF THIS ACTIVITY

The Olympus-1 well is approximately 74 km west of Barrow Island and 88 km southwest of the Montebello Marine Park. The Bianchi-1 well is approximately 61 km west of Barrow Island and 77 km southwest of the Montebello Marine Park. Olympus-1 is in approximately 641 m depth and Bianchi-1 in 237 m depth. The seabed surface locations for the wells is summarised in **Table 2-1** and surface location in relation to regional features is shown in **Figure 2-1**.

Table 2-1: Seabed Surface location for Olympus-1 and Bianchi-1 wells

Well Name	Parameter	Location
Olympus-1	Seabed surface location (GDA 94 Zone 50)	20° 43' 18.40" S 114° 36' 33.16" E 251,016.00E 7,706,804.00N
Bianchi-1*	Seabed surface location (GDA 94 Zone 50)	20° 45' 39.14" S 114° 43' 55.66" E 263,883.00E 7,702,660.00N

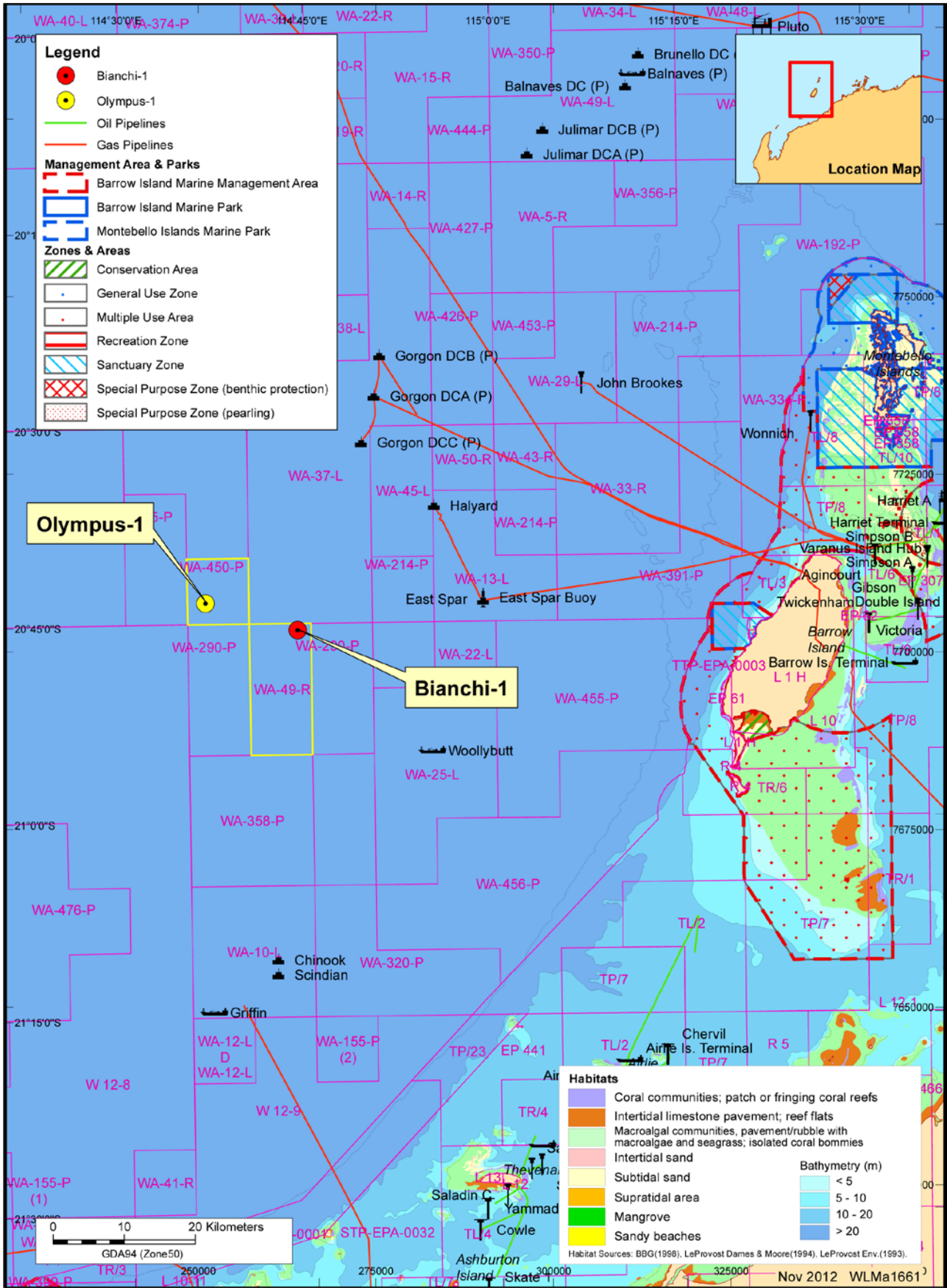


Figure 2-1: Location Map for Olympus-1 and Bianchi-1

3. DESCRIPTION OF THE RECEIVING ENVIRONMENT

3.1 Physical Environment

The proposed Olympus – 1 and Bianchi – 1 wells are located in the North West Shelf (NWS). NWS waters are usually thermally stratified with a marked change in water density at approximately 20 m (SSE, 1993). Surface temperatures vary annually, being warmest in March (32°C) and coolest in August (19°C). Vertical gradients are correlated to sea surface temperatures, and are greatest during the warm-water season (SSE, 1991). Near bottom water temperature is approximately 23°C, with no discernible seasonal variation.

Wind shear on surface waters generates local-scale drift currents that can persist for extended periods (hours to days). During summer (October–March) and the proposed drilling period, the prevailing non-storm winds are from the southwest, west and northwest at an average speed of less than 10 knots, peak average speeds of 15–25 knots, and maximum speeds of 30 knots. Winds from the south-east to north-east quadrant are experienced at a frequency of less than 10% over summer.

The wave climate is generally composed of locally generated wind waves (seas) and swells that are propagated from distant areas (WNI, 1995; 1996). In summer, seas typically approach from the west and southwest. Mean sea wave heights of less than 1 m with peak heights of less than 2 m are experienced in all months of the year (WNI, 1995). Mean swell heights are low at around 0.4–0.6 m in all months of the year. Tropical cyclones have generated significant swell heights of up to 5 m in this area, although the predicted frequency of swells exceeding 2 m is less than 5% (WNI, 1995). In the open ocean, sustained winds result in wind-forced currents of approximately 3% of the wind speed (Holloway and Nye, 1985).

Sea surface currents over the NWS are generated by several components, including tidal-forcing, local wind-forcing and residual drift. Tidal and wind-forcing are the dominant contributions to local sea surface currents. The orientation and degree of drop off of the continental shelf slope influences the oceanography of the area. The tides of the NWS have a strong semi-diurnal signal with four tide changes per day (Holloway and Nye, 1985) and a spring tidal range of 1.9 m and a highest astronomical tide of 2.9 m (Chevron Australia, 2010). Peak tidal flows are from the north-northwest on the ebb, and to the south-southeast on the flood (Holloway and Nye, 1985; SSE, 1993; King, 1994). Measurements of tidal currents mid shelf are predicted to attain average speeds of approximately 0.25 knots during neap tides and up to 0.5 knots during spring tides (NSR, 1995; WNI, 1995).

Offshore drift currents are represented as a series of interconnected eddies and connecting flows that can generate relatively fast (1–2 knots) and complex water movement. These offshore drift currents also tend to persist longer (days to weeks) than tidal current flows (hours between reversals) and thus will have greater influence upon the trajectory of slicks over time scales exceeding a few hours (APASA, 2012).

3.2 Biological environment

Benthic habitats within the Zone of Potential Impact (ZPI) include soft sediments and benthos, coral reefs, macroalgae and seagrasses as well as shoreline habitat types of sandy beaches, rocky shorelines and intertidal zones.

Benthic surveys in deeper waters (50 m, 100 m and 150 m) of the Exmouth region using van Veen grab samples indicated that polychaetes and crustaceans dominated in terms of species and individual abundances. While there were few detectable patterns of distribution of individual species across the depth profile, at least one species of tanaid was found at 150 m water depth and sponges and cnidarians were only found at 50 m water depth. Most other species were spread sporadically over the three depths. These assemblages are typical of infauna samples from these depths on the NWS (Woodside, 2005).

The EPBC Act Protected Matters Database (DSEWPaC, 2012a) identified 10 species of marine fauna found in the ZPI area listed as threatened species (endangered or vulnerable) under the EPBC Act, all of which are migratory, a further 7 migratory species were also identified. The species listed included 3 Fish, 8

Cetaceans, 5 turtles and 1 seabird. Within the Ningaloo ZPI, the same 10 species of marine fauna were identified as threatened (endangered or vulnerable), and a further 6 migratory species. The timing of the activity overlaps with the southern migration of blue whales (November-December) and turtle nesting season (November to January). The nearest turtle nesting sites to the drilling activity are located in the Montebello Islands, Lowendal Islands and Barrow Island (>61 km east of the proposed drilling location).

3.3 Socio-economic environment

A valuable and diverse commercial fishing industry is supported by both the offshore and coastal waters in the NWS Region, mainly dominated by the Pilbara fisheries. The major fisheries in the Pilbara region target tropical finfish, large pelagic fish species, crustaceans (prawns and scampi) and pearl oysters (Woodside, 2006; AFMA, 2011; AEL, 2010; DoF, 2011).

There are four Commonwealth fisheries overlapping the area of the drilling activity: the North West Slope Trawl Fishery, the Western Tuna and Billfish Fishery (North of 34° South), Southern Bluefin Tuna Fishery and the Western Skipjack Tuna Fishery. In addition, seven State managed fisheries have boundaries that overlie or are in close proximity to part or all of the drilling location (Woodside, 2006; AEL, 2011; DoF, 2011): the Onslow Prawn Managed Fishery, Mackerel Managed Fishery (Area 2), Pearl Oyster Managed Fishery, Pilbara Demersal Scalefish Fishery (Trap only), Marine Aquarium Fish Managed Fishery, Beche-de-mer Fishery and Specimen Shell Managed Fishery.

In addition to commercial fisheries, recreational fishing is a very popular activity in the region, occurring along the majority of the coastline along the eastern and western side of NWS, especially from Onslow to Broome in winter (AEL, 2010; Woodside, 2006). Recreational fishing is also an important social activity within the ZPI area at Ningaloo. In addition, recreational fishing is likely to be undertaken offshore in the greater ZPI near the drilling location.

The drilling location and surrounding waters are also used for petroleum exploration and development. The nearest production activity is the Apache operated East Spar development including a gas pipeline located in permit area WA-13-L, 26 km to the east of drilling activity. Chevron's Gorgon development is under construction and is also located approximately 28 km NE of the drilling location. Olympus-1 and Bianchi-1 are approximately 13 km apart.

There are no recognised shipping routes through the drilling location. There is a shipping route heading northeast approximately 40 km to the northwest of the proposed drilling location, however, a relatively low number of vessels use this (AEL, 2010; Woodside 2006).

There are no listed Commonwealth Heritage Places or National Heritage Places within, or in the immediate vicinity of the drilling location. No registered Aboriginal heritage sites are located within or in close proximity to the proposed drilling location. The nearest shipwreck is the *Trial* shipwreck and is approximately 90 km northwest of the proposed drilling location, the shipwreck is not in a protected zone.

4. DESCRIPTION OF THE ACTION

The objective of drilling the Olympus-1 and Bianchi-1 wells are to evaluate potential hydrocarbon bearing formations. Commencement of drilling for Olympus-1 and Bianchi-1 wells is scheduled to commence in December 2012, and is expected to take approximately 150 days. The *Ocean America* semi-submersible drilling rig, operated by Diamond Offshore will be used to undertake the Olympus-1 and Bianchi-1 wells. Two support vessels sourced from Farstad Shipping will be used to supply fresh water, food, bulk drilling fluid materials and transportation of the equipment used during the drilling activity. Helicopter transfers, operated by Bristow Australia, will transfer personnel between the rig and Karratha airport.

Once the drill rig has arrived at well location and anchored, drilling activities will commence. Drilling operations are conducted 24hours a day, seven days a week.

4.1 Drilling activities

The first stage of the drilling programme will be to drill a 914 mm (36") hole to approximately 60m below the seabed using seawater and sweeps with returns to the seabed. The 762 mm (30") conductor will then be run and cemented in place and a Low Pressure Wellhead Housing (LPWHH) will be set at the mud line.

Next a 660 mm (26") hole will be drilled with seawater and sweeps with returns to the seabed into a competent formation to provide sufficient shoe strength (for Bianchi-1 the shoe will be set in the Toolonga and for Olympus-1 the Gearle). Following this 508 mm (20") casing will be run and cemented. At the top of the 508mm casing will be a high pressure wellhead housing (HPWHH) onto which the subsea blow-out preventer (BOP) will be latched.

After installation of the BOP and riser and subsequent successful testing the shoe of the 508 mm (20") casing will be drilled out and a formation test carried out.

The wellbore will then be displaced to a Water Based Mud (WBM) in preparation for drilling the 444 mm (17 ½") hole. The 444 mm (17 ½") hole will be drilled with WBM with returns to the rig for processing and disposal. This section will be drilled into the Flacourt formation to isolate the normally pressured sands above. A 346 mm (13 ⅝") casing string will then be run and cemented in place.

Prior to drilling out the 346 mm shoe, the mud will be changed out to synthetic-based mud (SBM) and a cuttings dryer will be utilised to minimise the residual OOC.

After drilling out the 346 mm shoe, the formation will be tested and a 311 mm (12 ¼") hole drilled to the base of the Malouet formation. While drilling this section, the formations will be logged with logging while drilling (LWD) tools. Any hydrocarbon bearing formations may be further evaluated with wireline tools. A 244 mm (9 ⅝") casing/liner string will then be run and cemented in place. The 244 mm casing/liner will be drilled out with a 216mm (8 ½") bit using the SBM from the previous hole section and the formation tested. The 216 mm (8 ½") hole will then be drilled to total depth, evaluating sands in the Mungaroo Formation. Any hydrocarbon bearing formations will be evaluated using wireline tools and VSP.

4.2 Abandonment activities

Following evaluation the wells will be permanently abandoned below the seabed in accordance with Apache and government regulations. Casing will then be cut and retrieved and all seabed obstructions will be removed. The rig will then pull anchor and move off location. Abandonment operations will be completed in accordance with the semi-submersible's Safety Case and the Apache Drilling and Completions Barrier Standard (Document No: AE-91-ID-004, Section 11). As the wells will be abandoned, no infrastructure is left on the seabed.

5. MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS

Apache undertook an environmental risk assessment for routine and non-routine events for Olympus-1 and Bianchi-1 drilling activities around a hazard identification workshop attended by a subset of Apache's environmental scientists and drilling personnel, held on 17 September 2012. The purpose of the risk assessment was to understand and identify the potential environmental risks to ensure they are reduced to As Low As Reasonably Practicable (ALARP) utilising Apache's management and mitigation actions which have been developed from experience in the environmental management of offshore exploration in Australia and are based on Australian petroleum industry best practice environmental management guidelines, as defined by the APPEA Code of Environmental Practice (2008).

The key environmental hazards and control measures to be applied to the Olympus-1 and Bianchi-1 drilling activities are shown in **Section 9**. These are consistent with Apache corporate and project specific performance objectives, standards and criteria. All commitments associated with these will be used to reduce environmental risk to ALARP and will be of an acceptable level.

6. MANAGEMENT APPROACH

The Olympus-1 and Bianchi-1 drilling activity will be managed in compliance with the *Olympus-1 and Bianchi-1 Drilling Environment Plan (EA-00-RI-212/1)* accepted by NOPSEMA under the OPGGS(E) Regulations, other environmental legislation and Apache's Management System (e.g. Apache Environmental Management Policy).

The objective of the EP is to ensure that potential adverse environmental impacts associated with the Olympus-1 and Bianchi-1 drilling activity during both routine and non-routine activities, are identified and assessed and to stipulate mitigation measures to avoid and/or reduce any adverse impacts to the marine environment to ALARP.

The EP details for each environmental impact identified (and assessed in the Environmental Risk Assessment) specific performance objectives, standards and procedures and identifies the range of controls to be implemented (consistent with the standards) (**Section 9**) to achieve the performance objectives and also identifies the specific measurement criteria and records to be kept to demonstrate the achievement of each performance objective.

The goal of the environmental implementation strategy, detailed in the EP, is to direct, review and manage activities so that environmental impacts and risks are continually being reduced to ALARP, and performance objectives and standards are met over the duration of the drilling activity. It includes the following:

1. Details on the systems, practices and procedures to be implemented
2. Key roles and responsibilities
3. Training and competencies for all personnel (Apache and contractors)
4. Monitoring, auditing, management of non-conformance and review
5. Incident Response including Oil Spill Contingency Plan
6. Record Keeping

The reporting requirements for routine activities and environmental incidents (recordable and reportable) and reporting on overall compliance of the activity with the EP (e.g. close out reports submitted to NOPSEMA within 4 months of drilling completion) are also detailed.

7. CONSULTATION

Relevant interested parties for consultation of the proposed drilling activity were identified based on the extent of the modelled zone of potential impact (ZPI) and identified sensitive resources. Email notification is regarded as the most appropriate and favoured form of communication with stakeholders. Email communications were complimented by briefing (phone or meeting) on request.

Further to the consultation strategy adopted Apache has commenced with issuing quarterly updates to relevant stakeholders (Table 7-1). These updates consist of details for the ongoing, plus proposed upcoming activities on the NWS for the next 3-6 months. This update provides the stakeholders with information inclusive of proposed activity, activity location and the activity duration, and gives the stakeholders an opportunity to request additional information on the specific activities that may be of interest to them. The first quarterly update was issued in October 2012 and included details on of the proposed Olympus-1 and Bianchi-1 activity.

Table 7-1: Summary of the environmental resources and representative organisations notified for Olympus-1 and Bianchi -1 drilling activity

Resource	Relevant Person
Commercial fishing in Commonwealth Waters including North West Slope Trawl, Western Tuna and Billfish fishery, Skipjack Tuna, Onslow Prawn Managed Fishery, Beche-de-Mer and Mackerel Managed Fishery	Australian Fisheries Management Authority; Commonwealth Fisheries Association (CFA); Jaclan Marine consultants (representing various commercial fishers).
Commercial fishing in State Waters	Department of Fisheries; WAFIC.
Recreational fishing in WA	WA Fisheries Industry Council, Recfishwest.
Marine fauna/ Marine reserves/parks	SEWPaC; DEC; DoT.
Marine Safety and Defence	AMSA, Department of Defence, Department of Mines and Petroleum.

8. CONTACT DETAILS

Further information about the Olympus-1 and Bianchi-1 drilling activity can be obtained from:

Libby Howitt

Environment Manager

Apache Energy Limited

100 St Georges Terrace, Perth, Western Australia, 6000

Phone: 08 6218 7181

Email: libby.howitt@apachecorp.com

9. ENVIRONMENTAL ASPECTS, IMPACTS AND CONTROLS

The following tables (**Table 9-1** and **Table 9-2**) provide a summary of potential environmental impacts that could be expected from the drilling of Olympus-1 and Bianchi-1Hurricane-3. It lists the activities which might give rise to the environmental impact and controls and measures which eliminate or ensure the residual risk is reduced to ALARP.

Table 9-1: Environmental risk summary for operational activities for Olympus – 1 and Bianchi – 1

Hazard	Cause	Potential Impacts	Risk Treatment
			Avoidance, Mitigation & Management Measures
Seabed disturbance	Rig positioning, anchor/chain drag or retrieval Support Vessel Anchoring	Localised disturbance to seabed, resulting in loss of or change in benthic habitat.	<ul style="list-style-type: none"> The rig moved to and positioned on location in accordance with Ocean America Operations Manual (Rev 8, Sep 2004). This procedure is reviewed and approved by Apache prior to its use. Mooring analysis approved by AEL Drilling Engineer, Projects and Diamond Offshore, to minimise movement. Detailed records of equipment lost overboard will be recorded Planned maintenance undertaken on lifting equipment. Site survey indicates that there is a raised seabed scarp which will not interfere with the rig's anchor placement and there are no other raised seabed features or geological formations of concern for the safe anchoring of the rig. A ROV survey of the seabed will be completed at the end of the drilling activity to check for and retrieve dropped objects.
Artificial light	Lighting required for safety purposes on the rig and vessels.	Attraction of fauna such as migratory birds, leading to possible increased predation.	<ul style="list-style-type: none"> Lighting is kept to a minimum safe operational level in line with the Ocean America HSE Safety Case, Diamond Offshore GEMS Marine Operations Procedures – 9.03 and AMSA (marine order part 30 – prevention of collisions) navigation requirements during the duration of the drilling activity. Non-essential lighting will be switched off when possible without compromising safety.
Noise	Standard drilling operations – drill bit motion and vessel propellers and helicopter rotors; VSP activities if hydrocarbons encountered.	Potential negative physiological or behavioural effects to some threatened marine fauna.	<ul style="list-style-type: none"> All vessels will adhere to the DEH Australian National Guidelines for Whale and Dolphin Watching (2005) and Part 8 of the EPBC regulation (2000). The management strategies to be in place to mitigate acoustic disturbance from VSP on whales will be: Adoption of DEWHA EPBC Act Policy Statement 2.1 – Interaction between Offshore Seismic Exploration and Whales (2008). Sightings of marine mammals are to be reported and then recorded in Apache's Marine Fauna Sighting Database. All personnel will receive an induction that includes information on VSP operations and marine mammal species identification and requests personnel to record sightings.
Vessel and Helicopter Movements	The physical presence of support vessel and helicopters within the 500 m exclusion zone	Death or injury to marine fauna from vessel/helicopter strike and behavioural disturbance.	<ul style="list-style-type: none"> The use of support vessels and helicopters during drilling activity is unavoidable and their use cannot be eliminated. Drilling activity timing does not overlap with whale migration, low numbers may occur during drilling period and may transit through the drilling location. Drilling location devoid of key sensitive habitats, e.g. no major seabird roosting/nesting area within 500 m exclusion zone

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Measures
	during routine operations.		<ul style="list-style-type: none"> The Australian Guidelines for Whale and Dolphin Watching (2005) for sea-faring activities will be implemented. <i>Ocean America</i> and support vessel cetacean observations recorded on the Apache's marine fauna sighting datasheet and logged in Apache's Marine Fauna database with records sent to DSEWPaC on a monthly basis. <i>Ocean America</i> and support vessel personnel will complete the environmental induction that details marine fauna interaction mitigation measures. While no speed restrictions are in place within 500 m exclusion zone, it is common practise to maintain a slow vessel speed (< 5 knots) within the 500 m exclusion zone
Discharge of WBM drill cuttings and fluids	Routine drilling activity from rotation of drill bit through seabed.	Temporary and localised water column turbidity and seabed deposition causing benthic fauna smothering.	<ul style="list-style-type: none"> Biodegradable water based muds are used wherever practicable and are considered to have the least environmental impact. Through Apache's Fluid Selection Process the most appropriate fluid is selected based on known properties of the formation. For the topholes of this drilling activity, WBM is considered the best option. Low-toxicity seawater and high viscosity gel sweeps are used for the completion of the top sections of the wells where the formations have much better stability, therefore the volume of WBM utilised is decreased. <p><u>Chemical Selection</u></p> <ul style="list-style-type: none"> Apache uses a risk based approach to select drilling chemical products ranked under the OCNS. Most of the drilling fluids that are proposed are CHARM rated Gold and Silver, or non-CHARM rated E and D. To achieve these rankings, the chemicals have the least environmental impact in terms of ecotoxicity, biodegradation and bioaccumulation. The drilling fluids that may be used and that are not CHARM rated Gold and Silver, or non-CHARM rated E and D have been risk assessed as per the Apache chemical risk assessment process, and determined to be environmentally acceptable. Drill cuttings shaker and centrifuge system maintenance included in <i>Diamond</i> Offshore Planned Maintenance System in <i>Diamond's</i> GEMS. Drilling fluids use recorded in daily WBM report which is checked and signed by the Apache fluid coordinator daily and records: Regular inspections of onboard cuttings management equipment specifically: Shaker screen selection is made by the Consultant Mud Engineer on location and reviewed by the Apache Fluid Coordinator daily. Screens are inspected a minimum of once a day during drilling operations once BOP and riser are in place to check for wear and tear. When drilling with WBM, Apache will use a shaker and centrifuge system (on board cuttings management system) to significantly reduce the concentration of WBM fluid on cuttings prior to cuttings being discharged to the seabed and maximise reuse (Apache Procedure DR-91-ID-001).
Discharge of	Routine drilling	Temporary and	<ul style="list-style-type: none"> Disposal of the cuttings to the sea following treatment on board the drill rig is deemed to involve the

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Measures
SBM drill cuttings, base oil and SBM drilling fluids	activity from rotation of drill bit through formations sensitive to WBM, tank cleaning.	localised water column turbidity and seabed deposition causing benthic fauna smothering Toxic effects on marine fauna	<p>lowest environmental impact for the disposal of drill cuttings and drilling fluids, especially (as in this case) where products have been specifically selected to pose minimal risk to the marine environment.</p> <ul style="list-style-type: none"> • Low-toxicity seawater and high viscosity gel sweeps and WBM are used for the completion of the top sections of the wells, instead of SBM for drilling where the formations have much better stability, therefore the volume of SBM utilised is decreased. <p><u>Chemical Selection</u></p> <ul style="list-style-type: none"> • Apache uses a risk based approach to select drilling chemical products ranked under the OCNS. Most of the drilling fluids that are proposed are CHARM rated Gold and Silver, or non-CHARM rated D/E. To achieve these rankings, the chemicals have the least environmental impact in terms of ecotoxicity, biodegradation and bioaccumulation. The drilling fluids that may be used and that are not CHARM rated Gold and Silver, or non-CHARM rated D/E have been risk assessed as per the Apache chemical risk assessment process, and determined to be environmentally acceptable. • The SBM proposed is classified as slightly toxic to non-toxic drilling fluid, does not contain any aromatic hydrocarbons (known to contribute to biological toxicity) and has low water solubility. • Through the installation of a riser the SBM will not be discharged direct to sea without treatment during drilling. SBM will be discharged to sea following treatment onboard the rig through the centrifuges and cuttings dryers to ensure oil on cuttings is <10%. To isolate the disposal of cuttings, they could be skipped and shipped to shore, however this is not considered a viable option. • Drilling fluids use recorded in daily SBM report which is checked and signed by Apache fluid co-ordinator daily. <p><u>Oil on Cuttings</u></p> <ul style="list-style-type: none"> • The ratio of SBM/ base oil on cuttings is monitored daily to ensure it does not exceed the performance criteria of <10% OOC for the drilling interval. • When SBM and base oil tanks are required for other purposes, (e.g. for mixing WBM) the SBM and/or base oil will be backloaded to supply vessels and the tanks and mixing and transfer lines will be cleaned. • In compliance with discharge requirements (<10% oil on cuttings (OOC)), any residual cuttings and settled mud solids (e.g. barite) in the tanks will be treated through the centrifuge and/or cuttings dryer and included in OOC calculations or will be shipped back to shore for appropriate onshore disposal. • SBM stored in bunded areas where collected liquids will be vacuumed and primarily re-used within the muds system, or directed for treatment and appropriate disposal. Where feasible, SBM may be stored on the rig for re-use in subsequent wells. • Locking of overboard dump valves on mud pits to prevent accidental discharge and a Permit to Work required in order to unlock the valves. • Plugging of deck drains whilst using SBM to prevent any direct losses from the drill floor and a rig floor flood test undertaken with water prior to using SBM to identify and repair any leaks • Approved contractors will control the storage and handling of drilling fluid chemicals in conjunction with

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Measures
			<p>National Code for the control of Workplace Hazardous Substances.</p> <ul style="list-style-type: none"> A PVT (pit volume totaliser) measures the volumes of SBM within the system components, individual components also fitted with volume measuring devices
Discharge of cement	<p>Drilling of cement downhole, or liquid or semi liquid cement returned to surface Disposal of bulk cement during or at the end of a well. Cementing surface pipe when riserless, returns to the seabed. During tank or pipework cleaning</p>	<p>Temporary and localised water column turbidity and seabed deposition causing benthic fauna smothering. Toxic effects to marine fauna</p>	<p><u>Cement disposal during drilling</u></p> <ul style="list-style-type: none"> Disposal onto the seabed Prior to installation of the riser, cement will be discharged at the seabed as there is no alternative. The amounts will be minimal as most of the cement will remain downhole. Once the riser is installed, any cement returned to surface is treated through the shale shakers before being directed overboard. Shale shakers are described in the EP. Disposal of the cement to the sea following treatment on board the drill rig is deemed to involve the lowest environmental impact for the disposal of residual volumes of cement, especially (as in this case) where products have been specifically selected to pose minimal risk to the marine environment. <p><u>Bulk Cement Disposal</u></p> <ul style="list-style-type: none"> Bulk cement will not be discharged overboard except in an emergency, it will either be left onboard for the next drilling campaign, returned to a supply vessel for re-use or will be sent back to shore for storage or appropriate onshore disposal. Through inventory control and well planning, left over product will be minimised. <p><u>Chemical Selection</u></p> <ul style="list-style-type: none"> Apache uses a risk based approach to select chemical products ranked under the OCNS. Most of the cementing chemicals that are proposed are CHARM rated Gold and Silver, or non-CHARM rated D/E. To achieve these rankings, the chemicals have the least environmental impact in terms of ecotoxicity, biodegradation and bioaccumulation. If proposed chemicals are not CHARM rated Gold and Silver, or non-CHARM rated D/E a risk assessment is undertaken as per the Apache fluid selection process, and the products determined to be environmentally acceptable, or achieve impacts considered ALARP. Only the required volume of cement will be brought on board the rig (plus allowable contingency) in accordance with the cement program. When using SBM, liquid or semi liquid cement that returns to surface or is flushed during tank/pipe cleaning will be diverted and appropriately disposed. In the event that this is not possible it will be diverted overboard and OOC measurements will be taken and included in the interval totals. If liquid or semi-liquid cement is returned to the surface during the use of WBM, it will be diverted overboard. Left-over bulk dry cement materials will not be disposed overboard unless in an emergency, they will be returned to a supply vessel for re-use or will be sent back to shore for storage or appropriate onshore disposal Hard cement which returns to surface and is removed at the shale shakers will be diverted overboard, the OOC will be measured and included in the interval totals

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Measures
Planned discharges	<p>Non-hazardous discharges that will enter the marine environment during the drilling activity include cooling water, brine, anti-scalant, sewage and greywater, putrescible food waste and deck drainage.</p> <p>Discharges will be intermittent and dependent on rainfall, persons on board and machinery activity.</p>	<p>Non-hazardous discharges will reduce the quality of receiving marine waters within approximately 100 m of the rig.</p> <p>Reduction in water quality will affect surface waters (<5 m) only, and the duration of reduced water quality will be short-term (hours).</p>	<ul style="list-style-type: none"> • Cement additives stored in bunded areas where collected liquids will be vacuumed and primarily re-used within the muds system, or directed for treatment and appropriate disposal. • Equipment is arranged to minimise likelihood of discharge overboard (i.e. permanent rotating machinery (engines, generators) in bunded/enclosed areas). • Potable water is purified through the use of ultraviolet disinfection therefore no biocides are required and hypersaline water produced through reverse osmosis is not an issue, therefore waste brines are not produced by the <i>Ocean America</i>. The system is sampled on a weekly basis to ensure levels of chlorine are suitable for human consumption. Further quarterly testing on water quality is completed by a certified laboratory and compared to Australian water standards. • The use of an open-loop cooling system segregated from hydrocarbons ensures no hydrocarbons are discharged with the cooling water. • The drill floor/rotary table is fitted with a drip tray/pan to collect mud spillages during drilling activities. • Daily work area inspections by <i>Ocean America</i> personnel will ensure that main deck areas are clean of spillages and accumulations of oil/grease and chemicals, and that all spills and leaks are reported. • Spills on decks are isolated through the use of spill clean-up materials. The <i>Ocean America</i> and support vessels will have fully stocked and maintained oil spill kits stored at strategic locations to immediately mop up any spills • The sewage treatment plants are maintained in accordance with the procedures and schedule of the respective vessels' Planned Maintenance System. • All food waste will be macerated prior to discharge (regardless of the distance from shore). The macerator will be maintained in accordance with the Planned Maintenance System. In the event of macerator failure, all food waste will be bagged and shipped to shore for disposal until remediation of the macerator. • All non-food galley wastes will be bagged and shipped to shore for recycling or disposal in accordance with Environmental Protection (Controlled Waste) Regulations 2004. • Untreated sewage will not be discharged within 12 nm of any coastline. • Contaminated drainage from decks, machinery spaces or bunded areas will be collected through a closed drain system and processed to ensure discharge water has less than 15 ppm oil-in-water (OIW). An alarm system sounds if 15 ppm limit is exceeded (MARPOL 73/78 Annex I Appendix 5 - Discharges from fixed or floating platforms for the <i>Ocean America</i> and Chapter 3, - Requirements for machinery spaces of all ships for support vessels). • Drainage from rig drill floor, moon pool and pipe deck areas whilst using SBM will be managed via the closed drain system, i.e. drained into a holding tanks for appropriate onshore disposal. • All <i>Ocean America</i> personnel to complete the Apache/<i>Ocean America</i> environmental induction that includes information on waste management practices

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Measures
Air emissions	Operation of machinery and engines	Temporary and localised decrease in air quality. Global contribution to greenhouse effect.	<ul style="list-style-type: none"> • Incineration of waste on board the rig or support vessels will not be permitted during the drilling activity. • Use of marine-grade diesel only, which has low sulphur content, thereby minimising the generation of SOx. • Regular maintenance of equipment and machinery will be undertaken and will comply with MARPOL 73/78. • The rig Barge Engineer (or similar) will monitor equipment fuel consumption to ensure equipment efficiency is maintained. • Rig and support vessels will hold current International air pollution prevention certificate (IAPPC) in accordance with MARPOL 73/78 Annex VI and Marine Orders – Part 97 (Marine Pollution Prevention – Air Pollution)
Interference with other users of the sea	500m exclusion zone.	Temporary loss of fishing area or inconvenience to fishing practices. Fishing gear snags or equipment damage. Navigational hazard and vessel collision.	<ul style="list-style-type: none"> • The exclusion zone will be patrolled by support vessels to ensure commercial fishers do not enter the exclusion zone. • A 'Notice to Mariners' advising of the presence of the drilling rigs will be issued through AMSA. • Stakeholder consultation with commercial fishing industry representatives has been undertaken and consultation has confirmed that it is unlikely commercial fishing operators will be in this area during the drilling activity. • Support vessels will undertake ongoing communication with other users in the area.

Table 9-2: Environmental risk assessment summary for unplanned events for Olympus – 1 and Bianchi – 1

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Measures
Solid waste discharges	Waste not properly contained.	Marine pollution. Injury or death of marine fauna through ingestion (e.g. flatback turtles) or entanglement	<ul style="list-style-type: none"> • All recyclable and general wastes to be collected in labelled, covered bins (and compacted where possible) for appropriate onshore disposal. Apache’s Waste Management Contractor (Toxfree) will dispose of these to an approved landfill disposal site (general wastes) or to appropriate recycling facilities for segregated wastes • All scrap metal to be collected in bins for appropriate onshore disposal. • Left-over bulk drilling solids (e.g., barite, bentonite, cement) will not be disposed overboard unless in an emergency situation (e.g. cyclone avoidance) whereby they may have to be vented overboard to enable the rig to move off location. • Apache and Ocean America’s (Diamond Offshore waste management procedures <i>EMS 12.09 and 12.12.03</i>) waste management procedures implemented. • MARPOL 73/78 Annex V requires Garbage Management Plan and Garbage Record Book. • All Ocean America personnel to complete the Diamond offshore/Apache environmental induction that includes information on waste management practices. • The volume of concrete mixed will be calculated to ensure only that which is necessary for drilling requirements is mixed
Spillage of hydrocarbons from machinery, engines and tanks to the sea	Equipment malfunction, corrosion, inadequate bunding	Short-term impact to water quality Impact on pelagic fauna	<ul style="list-style-type: none"> • Use of marine-grade diesel • Equipment maintained in accordance with Planned Maintenance System. • Chemicals and hydrocarbons stored within continuously bunded areas. • Spills cleaned up immediately and clean up material contained, and not washed overboard. • Weekly inspection of spill kits is undertaken and recorded to ensure they are intact, clearly labelled and contain adequate quantities of absorbent materials. • Implement the <i>Ocean America’s</i> refuelling procedures as described in the Marine Operations Procedures approved by Apache • <i>Ocean America</i> and support vessel International Oil Pollution prevention Certificates are valid • Spill exercises conducted quarterly and recorded on daily report. • Drip trays used under portable equipment and when refuelling portable equipment. • Rig decks bunded. Scupper plugs available to prevent liquid discharges from decks. • Spill kits placed strategically around <i>Ocean America</i> and support vessel work areas. • The proposed oil response strategies that may be used in the event of a hydrocarbon spill during drilling activities are provided in <i>Olympus-1 and Bianchi-1 Drilling OSCP</i> (EA-00-RI-212/2).

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Measures
Hazardous liquid (including wastes) discharges	Burst hose during bunkering Tank or pipework failure Human error Hazardous chemicals and waste not properly contained	Marine Pollution Short-term reduction in water quality Toxic effects on marine fauna	<ul style="list-style-type: none"> • All hazardous wastes are stored onboard the rig in closed and secure storage facilities prior to transport back to shore for disposal/recycling/treatment in accordance with local regulations. Disposal of controlled waste will follow local government requirements for transportation and disposal • Hoses are inspected prior to transfer operations. • All chemical, hydrocarbon and waste containers will be adequately labelled. • Any spills or leaks will be cleaned up immediately using absorbent material. • Rig and supply vessel follow bunkering procedures during bunkering operations • Adherence to <i>Ocean America</i> waste management procedures • Diamond Offshore OBM (which includes SBM) Containment Plan (Section 4.03.20 of GEMS) includes an agreed procedure on the handling and use of SBM on Diamond MODUs • <i>Ocean America</i> Oil Record Book is up to date and records waste oil disposal • Compliance with MARPOL 73/78 Annex V to ensure marine pollution is kept to an acceptable level • All hazardous wastes are documented, tracked and segregated from non-hazardous wastes (via waste tracking records and the <i>Ocean America</i> Oil record book is kept up to date and records waste oil disposal • All hoses and equipment used in the discharge and transfer of liquids are maintained and checked as per rig's planned maintenance schedule (PMS) • Spill kits are placed strategically around the <i>Ocean America</i> and support vessel work areas. They are checked on a weekly basis to ensure that they are clearly labelled and contain adequate quantities of absorbent materials and spill exercises conducted quarterly. • Spill response exercises conducted quarterly and recorded on daily report. • Emergency pump stop is available in the event of unforeseen circumstances

Hazard	Cause	Potential Impacts	Risk Treatment
			Avoidance, Mitigation & Management Measures
Spill from ruptured fuel tank	Vessel collision	Surface water diesel slick, with death, physiological or behavioural impacts to marine fauna Decrease in surface water quality	<ul style="list-style-type: none"> • Marine diesel will be the only fuel type used by the support vessels. • Most modern support vessels are double-hulled along the sides of the vessel with fuel tanks located within the double hull arrangement, however, this structural layout does not commonly extend to the bottom of the vessel where tanks may also be located. This arrangement of double-hulled sides and single-hulled bottom is likely to be the case for the support vessels engaged in the drilling activity. • In the event diesel is released from a support vessel due to a ruptured fuel tank, the tier 2 spill response source control activities would be immediately implemented. • The Australian Hydrographic Office publishes Notices to Mariners, which are corrections to Australian Navigational Charts and Australian Nautical Publications to inform mariners of amendments of navigational significance to their chart portfolios. • The proposed oil response strategies that may be used in the event of a hydrocarbon spill during drilling activities are provided in <i>Olympus-1 and Bianchi-1 Drilling OSCP (EA-00-RI-212/2)</i>.
Spill during refuelling	Equipment failure. Loss of hose control during at-sea refuelling. Support vessel runs over refuelling hose.	Widespread surface water diesel slick, with death or physiological impacts on sensitive species such as planktonic crustaceans. Decrease in surface water quality.	<ul style="list-style-type: none"> • Marine diesel will be the only fuel type used by the support vessels. • In the event the refuelling pipe is ruptured the fuel bunkering activity will cease by turning off the pump. • Drains closed in fuel transfer areas to contain spills. • Adequate bunding beneath the refuelling hose connections on the supply vessel and the rig. • Competent marine crew will follow refuelling procedures during transfer operations. • Fully manned operation • Refuelling to occur under suitable weather conditions. • In the event diesel is released due to a vessel refuelling incident, the relevant SOPEP would be implemented. Sorbent materials would be used from the oil spill kits on-board the vessel and rig to mop up any hydrocarbons on deck. • Weekly inspection of spill kits is undertaken and recorded to ensure they are intact, clearly labelled and contain adequate quantities and types of absorbent materials. • Spill exercises are to be conducted quarterly and recorded on daily report. • The proposed tier 1 oil response strategies that may be used in the event of a hydrocarbon spill drilling activities are provided in <i>Olympus-1 and Bianchi-1 Drilling OSCP (EA-00-RI-212/2)</i>.
Spill from loss of well control	BOP failure. Casing failure. Riser failure. Human error. Penetrate gas bearing sand	Release of hydrocarbon into the pelagic environment, with death or physiological impacts to sensitive species. Shoreline exposure to oil.	<ul style="list-style-type: none"> • Apache requires two barriers between the environment and hydrocarbon flow to be maintained during drilling and completion activities, and suspension and abandonment periods. The two barrier philosophy is described in the <i>Apache Drilling and Completions Barrier Standard (Document No: AE-91-ID-004, Section 11)</i>. The two barrier system to be applied when suspending the wells would also be the standard applied when abandoning wells. As such the anticipated environmental impact and risks associated with leaving the wells suspended, in respect to a loss of well control, are equivalent to an abandoned well. • Safety risks associated with a blowout are considered within the Safety case (<i>Ocean America HSE Case, 2011, Rev 1B</i>) which details safety risks associated with a well blowout, that are reduced to ALARP • Offset well data reviews and seismic shallow hazard analysis of the location were undertaken to evaluate the potential presence of shallow gas in the target formations and no indications were found. • The use of drilling mud to overbalance the mud column will be used to reduce the risk of gas release.

Hazard	Cause	Potential Impacts	Risk Treatment Avoidance, Mitigation & Management Measures
		Shallow gas	<ul style="list-style-type: none"> Apache requires all well control equipment and installed casings and wellhead equipment to be tested to a pressure exceeding the Maximum Anticipated Surface Pressure (MASP) in accordance with the DSM, which states when BOP pressure and function testing is undertaken.
Hydrocarbon Spill Response	Spill to marine environment	Increased emissions Reduction in water quality Continued release of hydrocarbon into the pelagic environment, with death or physiological impacts to sensitive species.	<ul style="list-style-type: none"> The OWRP is prepared by Apache using the expertise of wildlife service providers and by requesting advice/instruction from DEC. The OWRP would include: <ul style="list-style-type: none"> - Identification of trained and experienced wildlife response providers to reduce risk of physical injury to turtle hatchlings; - Procedures to ensure that corralled hatchlings are kept under watch and protected from predation and exposure; - Hatchlings are monitored for environmental stress; and - Ensure that when released at the new location the hatchlings are allowed to crawl down the beach to imprint seaward orientation.

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