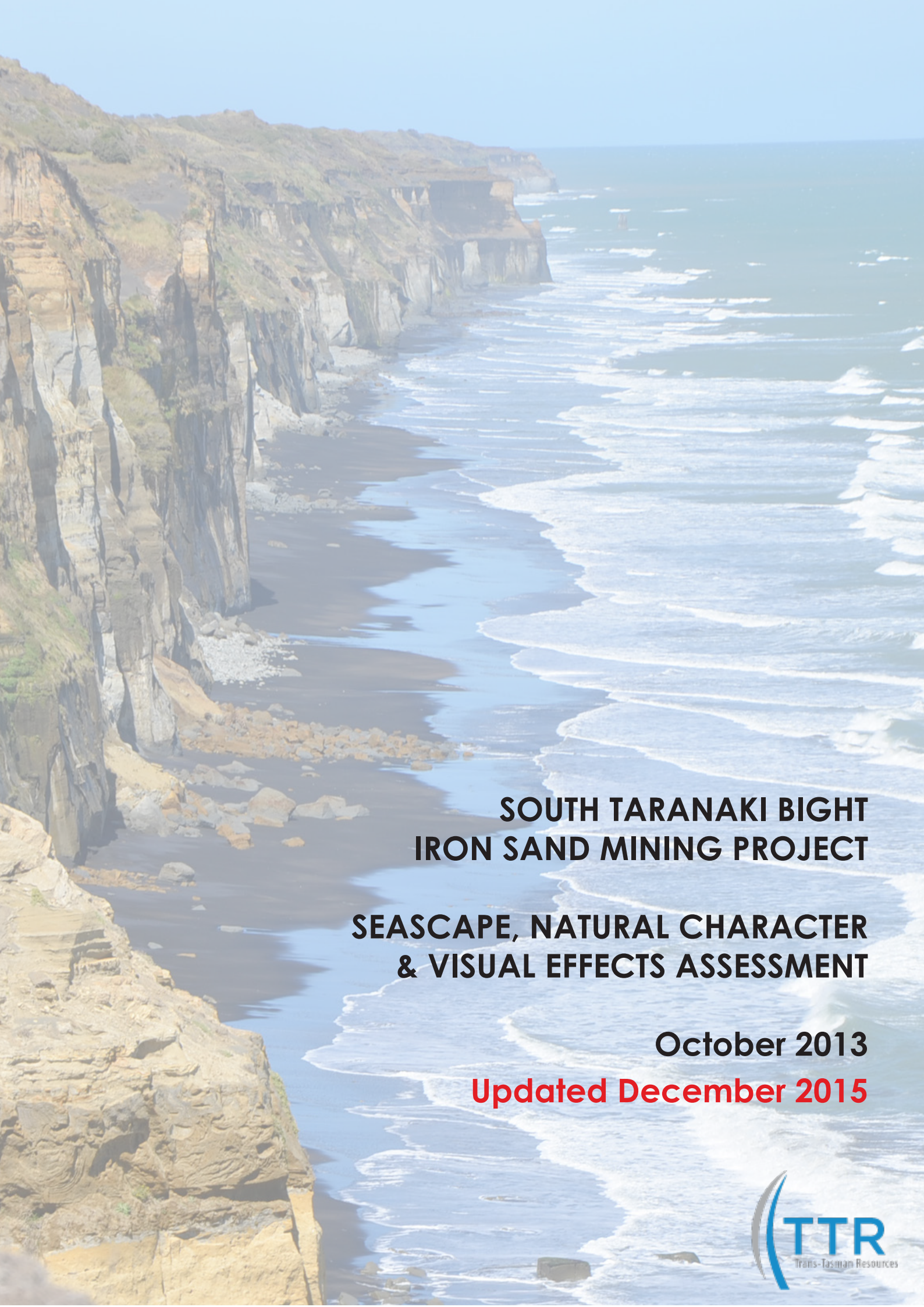

# SOUTH TARANAKI BIGHT IRON SAND MINING PROJECT

# SEASCAPE, NATURAL CHARACTER & VISUAL EFFECTS ASSESSMENT

October 2013

Updated December 2015

TTR
Trans-Tasman Resources

# Trans Tasman Resources Limited

## South Taranaki Bight Iron Sands Mining Project

Seascape, Natural Character and Visual Effects Assessment

**December 2015 Update**

We have been provided with information relating to TTR's additional scientific work relating to plume modelling and optical effects undertaken since 2014 and can confirm that the conclusions reached in our October2013 report and 17 February 2014 Statement of Evidence presented to the Board remain valid. In our opinion the effects will in fact be less than we had previously assessed.

Prepared by Boffa Miskell Ltd
October 2013
**Updated December 2015**

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# Executive Summary

## Background

Trans-Tasman Resources Limited (TTR), a privately owned New Zealand company, is seeking marine consents under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act) to undertake iron ore extraction and processing operations in an area covering 35.65 square kilometres ($km^2$) located between 22 and 36km (12-19 nautical miles) offshore in the South Taranaki Bight.

In January 2013 TTR engaged Boffa Miskell Limited (BML) to investigate and review natural character, landscape/seascape and visual amenity matters with respect to the potential effects of the proposed Offshore Iron Sand Mining and Processing Project (the Project).

## Seascape

Based on the 2004 Inventory of Regional and Locally Significant Coastal Areas prepared by the Taranaki Regional Council (TRC), and the Landscape Character Areas defined in the 1996 Whanganui District Landscape and Ecology Report, 20 seascape character areas have been identified in the coastal environment between Manaia and Whanganui. The identified seascape character areas and sites of regional or local significance within the Taranaki region were evaluated by the Taranaki Regional Council in terms of amenity, recreation, cultural/historical and ecological/scientific significance. Based on field observations it is clear that the overall ratings for these areas and sites would be in the moderate to high range particularly within regard to amenity, recreation and scientific/ecological considerations.

## Natural Sediment Plumes

In the context of the South Taranaki Bight seascape, natural sediment plumes are a particular feature within all of the identified Character Types and Character Areas, even though the plumes vary considerably in their appearance, patterns, their overall extent, and their consistency and frequency of occurrence. The plume patterns generally appear to relate to natural processes such as would be expected at river mouths, in the vicinity of eroding sea cliffs and the patterns associated with tides, currents, wave and weather conditions. Notwithstanding these variations, the natural sediment plumes within the Character Type and Character Areas are distinctive features that contribute to the high visual, recreational and amenity values of the South Taranaki Bight seascape.

## Context of Effects Assessment

In the context of the Project, the effects on seascape, natural character and visual amenity, while interrelated, can be categorised as follows –

i) Visual effects from specific viewpoints and viewing audiences.

ii) Effects on natural features and natural landscapes (being defined and/or special or significant landscapes/seascapes and features).

iii) Effects on natural elements, natural patterns and natural processes (the natural character of the coastal environment).

## Visual Effects

While the visibility of the Floating Processing Storage and Offloading vessel (FPSO) will be high from marine areas within 10-15km of the vessel itself, the visual effects are assessed as being low overall and are unlikely to be perceived as being visually intrusive or adverse. Even though the FPSO is large and its associated and smaller support vessels will also be present, and in some cases may be visible from the coastline for extended periods of time, the surface marine activities associated with the Project are considered to be minor overall and where visible, will likely be seen as an "appropriate" working seascape activity.

From the areas identified in the TRC Inventory Report (2004), the visibility of the Project will vary and where visible, will be seen as a distant and background offshore activity within an expansive seascape setting. The visual effects of the surface marine activities are assessed as being low and will not be adverse nor will they appear to be visually intrusive from the recreation and amenity areas identified by the TRC.

## Natural Features, Landscapes/Seascapes

In terms of the New Zealand Coastal Policy Statement (NZCPS) Policy 15(a), which seeks the avoidance of adverse effects on outstanding natural features, landscapes/seascapes in the coastal environment, the Project by its remote offshore location effectively avoids direct adverse effects on the identified outstanding natural features, landscapes and seascapes in the South Taranaki Bight. In addition, and with respect to NZCPS 15(b) which seeks to "avoid significant adverse effects and avoid, remedy or mitigate other adverse effects in the coastal environment", the Project achieves these objectives. Indeed, the Project through its ongoing iterative scoping and design phases has sought to avoid or minimise adverse effects particularly in terms of confining the seabed mining footprint, reducing operational sediment discharges, and minimising the re-deposition of de-ored sands to previously disturbed seabed area.

## Sediment Plumes

While there will be increases in suspended sediment concentrations as a result of the Project, these levels are relatively low and will for the most part not be visually apparent from land-based viewpoints. From time to time there may, however, be differences in naturally occurring plume patterns that may be visible. However, these differences are likely to be in the near-shore natural plume patterns and sea surface colour rather than the colour of the plumes, as a consequence of sediment contribution appearing to be generated from an offshore activity. Notwithstanding this, the potential visual effects of mining derived sediment plumes along the Taranaki/Whanganui coastline from land-based viewpoints will be relatively insignificant.

Visual effects of sediment plumes from recreational boats will be evident and highly variable depending on weather conditions and the offshore location of the vessels. There will, however, be observable visual effects in terms of surface sea colour change and pattern in the distant offshore waters in the immediate vicinity and to the east of the mining activity in what is currently a dark blue-green water area. The colour

range within the plume will range from dark blue-green to a lighter blue-green colour extending over a distance of some 35-40km to the east of the mine site. From this point, which is approximately 10-15km offshore, the plume then will become a 'milky' colour until it blends into the background offshore levels to the east off Waiinu Beach to a more brown-green colour as it extends towards the Whanganui River mouth area.

While the size and pattern (scale) of the sea surface colour change will be extensive and significant in its seascape context, its significance in terms of recreational/amenity values is likely to be lower, given the relatively low levels of recreational activity that occurs within the affected marine area. Notwithstanding this, the visual effect of the mine derived sediment plume is considered to be moderate to high overall from marine-based locations within, or in close proximity (3-5km) of, the plume. The sediment plume will, however, only be evident during the mining activity and accordingly this effect in the blue-green marine area is reversible.

Visual effects from recreational and commercial aircraft will be the most visually apparent, and while these effects will be variable and dependant on weather conditions, they will tend to be experienced by transient viewers who in many instances will have no direct relationship with the area. In many instances, the visibility and the offshore pattern of the mining-derived sediment plumes are likely to be seen as a feature and focal point in the South Taranaki Bight seascape. While the overall appearance and scale of the mining-derived sediment plume will be most apparent from aircraft, given the characteristics of the viewing audience, the visual effects are assessed as being generally in the moderate to low range.

In terms of visible cumulative effects, the mining derived sediment will not add appreciably to the natural or background levels within the inshore and near-shore marine areas. There will however, be increased visual effects in terms of the offshore and distant offshore marine areas where currently there are no visible sediment plumes under most conditions. From the coastline cumulative effects are not likely to be particularly visible. From some marine areas, cumulative effects may be apparent, however, given the limited extent of views and the variability of the plume, cumulative effects are not likely to be perceived as being significant or adverse. From aircraft cumulative effects will be most apparent and are likely to be widespread in extent.

## Natural Character

Natural character in its RMA context is a term used to describe the "naturalness" of the coastal environment in terms of its natural elements, natural patterns and natural processes. Unlike the terrestrial environment which has been modified by land use and development activities, the marine environment has undergone little physical change or modification and consequently displays high levels of natural character both in terms of its biophysical and visual attributes.

From a visual perspective there are few modifications to the marine component of the South Taranaki Bight seascape other than the harbour training walls at the mouths of the Whanganui and Patea Rivers and relatively isolated and contained beach settlements. The Kupe platform which is beyond the Coastal Marine Area (CMA), is particularly visible from parts of the coastline on clear days. Accordingly, the seascape in visual terms is relatively consistent and "pristine like" in appearance, other than where it

adjoins the coastline in several locations. Notwithstanding this, in its biophysical context there are however, distinctive natural patterns and processes occurring throughout the marine environment.

While the marine related biophysical matters listed in NZCPS Policy (2)(b) have been addressed by others, this assessment incorporates the relevant findings and conclusions reached by other experts in order to make an informed judgment on natural character effects overall.

## Conclusions

In order to summarise the levels of significance in an RMA context, framework based on the four topic areas noted in Section 11, the following four point scale where major and moderate are representative of significant effects and minor and negligible are representative of effects which are not significant, has been adopted:

- Major
- Moderate
- Minor
- Negligible

## Offshore Vessels

Given the distance between the viewing points and the vessels, in conjunction with the contextual nature of the surface water activities, the overall significance of the offshore above water activity is judged to be minor.

## Natural Features and Landscapes/Seascapes

Based on the identified amenity and recreational activities that occur on the coast and within the inshore/near-shore areas of the CMA, the overall significance of effect is judged to be minor.

## Sediment Plumes

While mining-derived sediment plumes in coastal locations will not generally be visible, sediment plumes in the distant offshore South Taranaki Bight area will, as a result of the iron sand mining operation, be evident in the dark blue-green surface waters that area currently free of sediment plumes. Given the variability of the plumes and the restricted transient nature of experiencing them, the overall significance of effect is judged to be moderate.

## Natural Character

Excluding the biophysical/ geomorphological component of natural character, the overall significance of effect is judged to be in the minor category. The exceptions to this are the effects related to NZCPS Policy 13(2)(b) “biophysical, ecological, geological and geomorphological aspects” which include the direct effects of the mine pits and mounds on the sea floor and the time frames in which this area is predicted to recover. While there will be negligible effects on the inshore and near-shore coastal waters or the

coastline as a result of the offshore mining activity, the effects at and in the vicinity of the mine site are likely (subject to what mitigation measures are developed) to be major.

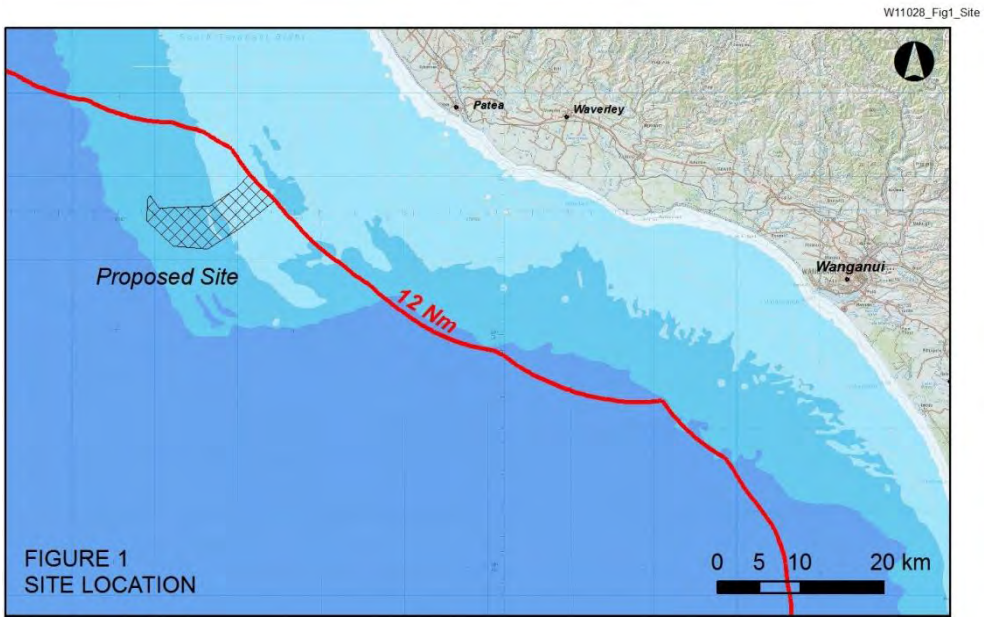
# 1 Background

1.1 Trans-Tasman Resources Limited (TTR), a privately owned New Zealand company, is seeking marine consents under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act) to undertake iron ore extraction and processing operations in an area covering 35.65 square kilometres (km2) located between 22 and 36km (12-19 nautical miles) offshore in the South Taranaki Bight (Figure 1).

1.2 The TTR Offshore Iron Sand Mining and Processing Project (the Project), involves the excavation of up to 18 million cubic metres per year (up to 50 million tonnes) of seabed material containing iron sand, for processing on a Floating Processing Storage and Offloading Vessel (FPSO). Approximately 10% of the extracted material will be processed into iron ore concentrate for export, with all residual material de-ored being returned to the seabed areas previously excavated via a controlled discharge below the FPSO.

1.3 Processing on the FPSO involves the separation of the ore from the seabed material using gravity and magnetic processes, and does not involve the addition of chemicals or other products. Processed ore will be transferred from the FPSO to a Floating Storage and Offloading Vessel (FSO) and from there to purpose-built export vessels, which will transport the iron ore to world markets for steel production.

1.4 In January 2013 TTR engaged Boffa Miskell Limited (BML) to investigate and review natural character, landscape/seascape and visual amenity matters with respect to the potential effects of the proposed Offshore Iron Sand Mining and Processing Project.



# 2 Project Description

2.1 The relevant components of the project, relative to this assessment, are summarised below, with a more detailed description of the Project contained in the Marine Consent Application.

## The Mining Area

2.2 The three mining sites included in this application cover an area of approximately 35.65 $km^2$. All three sites are located outside the Coastal Marine Area (CMA), in the Exclusive Economic Zone (EEZ) in depths of water ranging from 21 to 40m. The extent of the ore resource within the mining area is widely dispersed and shallow in depth. In order to minimise re-deposition of the de-ored sand into unworked seabed areas, and to control both the Subsea Sediment Extraction Device (SSED) and the FPSO, the direction of each extraction corridor within the mine sites is parallel to the prevailing wind/wave direction and perpendicular to the prevailing direction of the long-shore currents.

## Remote Subsea Sediment Extraction Device (SSED).

2.3 The remote SSED, a self-propelled seabed located extraction device with a submersible pump and skewing boom, will operate on the seabed and will be controlled remotely from the FPSO, providing for rapid deployment and retrieval as well as mining at variable depths. Sediment from the SSED will be transported as a slurry to the processing plant aboard the FPSO. The SSED will be fitted with an acoustic seabed navigation and imaging system, and will extract sediment by systematically advancing along a predetermined corridor. The remote SSED will connect to the FPSO via an umbilical delivery tube that will be lowered by cables to the seabed by way of an inclined ramp at the stern of the FPSO.

2.4 The remote SSED will extract sand in 300m x 300m blocks to the base of the mineralisation, and will extract the full depth of the face (being approximately 2 to 11m) during each extraction sequence. Based on current estimates, the remote SSED will have an annual capacity of up to 50 million tonnes all of which will be extracted and transported to the FPSO. After processing on the FPSO, de-ored sand will be pumped into previously extracted areas as part of the SSED/FPSO operating sequence. The re-deposition process defines the length of each mining run which will be a function of the FPSO length (300m). At the end of each cut the remote SSED will turn $180^o$ and mine the adjacent strip. While the total width of each mining cut is approximately 12m, the effective cut is 10m which allows for a 1m overlap on both sides of the total cut to minimise losses.

2.5 The FPSO will follow the SSED at an advance rate of 70m per hour. Extracted sediment is delivered from the SSED to the FPSO via a 700-800mm diameter rubber hose at a design delivery rate of 8,000 tonnes per hour of solids, resulting in each 300m x 300m mining block being depleted in approximately 5 days. The mooring system, which spans a 600m x 300m area, allows for a period of 10 days between each mooring move.

## Floating Processing Storage and Offloading Vessel (FPSO).

2.6 The FPSO will receive sediment from the SSED, process it to extract ore concentrate, and then return the de-ored sand to a previously worked area whilst moored on continuously relocated, four point, dynamic positioning-assisted anchoring. Once processed, the ore concentrate will be transferred from the FPSO to the FSO. The FPSO will be in the order of 180,000 tonnes deadweight in capacity with a length of 330m, a beam of 55m and a maximum draft of 12m.

2.7 The process methodology of extracting iron ore from the source material (beneficiation), briefly involves the following:

- The extracted sediment, pumped from the SSED to a reception tank on the FPSO, is diluted to a slurry density of 31.5% solids, prior to an initial screening process.
- Following the initial screening the sediment is fed into water agitated water tanks where it will undergo the first stage of magnetic separation. The oversize material is then transferred to the de-ored sand handling area for re-deposition on the seabed.
- From the first stage magnetic separation process the ore is then ground to smaller particle sizes prior to being subjected to a further (intermediate) magnetic separation phase.
- From the intermediate magnetic separation process, the ore concentrate is gravity fed to a second stage grinding. Waste product from this phase is transferred to the de-ored sand handling area for subsequent seabed deposition.
- Following the second stage grinding, the liberated titano magnetite is fed into the third and final “cleaner” magnetic separation process from where the concentrate is further dewatered prior to being transferred to the FSO by way of a floating slurry line.
- All residual coarse and fine sand from the beneficiation process is dewatered prior to being discharged under gravity via a de-ored sand deposition pipe to the seabed, nominally at a constant height of 4m above the seabed.

## Floating Storage and Offloading Vessel (FSO)

2.8 The iron ore concentrate from the FPSO is then transferred to the FSO in a freshwater slurry where it will be dewatered and stored ready for transfer to world markets. The concentrate

unloading operation involves the FPSO being equipped with a bow offloading system connected to the bow of the FSO by floating flexible hoses. The distance between the FPSO and the FSO will be in a the order of 70-110m for safe loading operations. The FSO will be equipped with dynamic positioning capability in order to enhance operability and to facilitate transfer operations whilst not disrupting sand extraction and deposition operations. The FSO will be a built-for-purpose, self-loading vessel with a cargo capacity of 60,000 tonnes, a length of 230m, a beam of 32m and a draft of 13m.

## Export Vessel

2.9 Once the FSO is fully loaded with concentrate, it will detach from the FPSO and sail to a waiting Cape-size[1] Export Vessel. When arriving at the transfer location, the FSO will moor adjacent to the Cape-size Export Vessel in a conventional side by side arrangement facilitated by the Export Vessel being moored in an area relatively protected from waves and currents. Generally, transfer will take place near the Project area, although during adverse weather conditions transfer will take place in sheltered locations elsewhere in the general South Taranaki Bight area.

## Anchor Handling Tug

2.10 The Project also includes the provision of an 80 tonne bollard pull Anchor Handling Tug to assist with the provisioning of the FPSO and the FSO, assistance with the connection of floating hoses and anchor moving. The Anchor Handling Tug will also provide refuelling assistance and be equipped to assist in the case of any fuel spillage or fire.

[1] Cape-size ships are commonly defined as vessels of 100,000-180,000 tonnes deadweight and drafts of approximately 17m. The name derives from their size being too large for the Panama or Suez canals thereby requiring these ships to voyage around Cape Horn or the Cape of Good Hope.

# 3 Effects Assessment Context

3.1 As the project is located in the EEZ, marine consents are required under the EEZ Act and the effects on the environment of allowing the activity are to be assessed under the EEZ Act, in particular section 59.

3.2 In considering an application for a marine consent, section 59 requires the EPA to take into account the effects on the environment of allowing the activity, which in addition to effects in the EEZ, also includes effects that may occur in New Zealand[2] and effects that are not regulated under the EEZ Act[3]. The EPA must also take into account the "nature and effect" of other marine management regimes[4]. The Resource Management Act 1991 (**RMA**) is a marine management regime[5] which applies in the coastal environment.

3.3 Therefore, as the Project is taking place in the EEZ, but the marine/seascape related effects of the Project will be apparent both within the EEZ and the CMA, the RMA provides helpful and relevant guidance to assist in assessing the effects that will occur in the New Zealand coastal environment. In that respect, the "nature and effect" of the RMA and RMA documents is that they do not provide tests that the Project is bound by, however they do provide guidance in assessing the effects of the Project that occur in the coastal environment.

3.4 With respect to the nature and scope of the Project the likely effects will primarily be offshore and will include:

(i) Character effects in terms of the marine/seascape resource, and

(ii) Amenity effects including visual effects within the coastal/marine area.

3.5 In addition to the provisions set out above, other provisions in the EEZ Act relevant to the assessment of marine/seascape effects that the EPA must take into account include:

- Section 59(a)(i) – cumulative effects;
- Section 59(d) – the importance of protecting biological diversity and integrity of marine species, ecosystems, and processes;
- Section (e) – the importance of protecting rare and vulnerable ecosystems and the habitats of threatened species; and

[2] section 59(2)(a)(ii) and section 59(2)(b)(ii)

[3] section 59(2)(b)(i)

[4] section 59(2)(h)

[5] section 7(2)(l)

- Section (m) – any other matter the EPA (Environmental Protection Agency) considers relevant and reasonably necessary to determine the application.

3.6 With regard to marine/seascape effects overall, the relevant Resource Management provisions that provide guidance to the assessment of effects, but are not binding on this application, include:

(i) Resource Management Act (RMA):

- Section 6(a) – Preservation of the natural character of the coastal environment ...
- Section 6(b) – Protection of outstanding natural features and landscapes ...
- Section 7(c) – the maintenance and enhancement of amenity values.
- Section 7(f) – maintenance and enhancement of the quality of the environment.

(ii) New Zealand Coastal Policy Statement (NZCPS 2010)

- Policy 13 – Preservation of natural character
- Policy 15 – Natural features and natural landscapes

(iii) Relevant planning provisions in the following Regional and District Plans:

- Taranaki Regional Council
- South Taranaki District Council
- Horizons Regional Council
- Wanganui District Council

## The Coastal Environment

3.7 While the inland extent of the coastal environment is not specifically defined in the RMA or the NZCPS, the inland boundary of the coastal environment varies from location to location and is primarily influenced by the nature and characteristics of the particular coastline. Given the nature of the South Taranaki/North Wanganui coastline (the South Taranaki Bight), and the anticipated effects of the proposed Offshore Iron Sands Project, the inland extent of the coastal environment, relative to this assessment, has been defined as the immediate land/sea interface which is characterised by the steep coastal escarpment or beach and coastal sand dunes.

3.8 While the seaward extent of the coastal environment in RMA terms extends to 12 nautical miles (22.2km) from mean high water springs, in the context of this assessment, the seascape in terms of the coastal environment, extends beyond the CMA and includes New Zealand's

Territorial Sea as and where appropriate (i.e. when and where visible from elevated terrestrial locations). Beyond this, activities in the EEZ are regulated under the EEZ Act rather than the RMA.

3.9 Notwithstanding the above, in taking into account the landscape/seascape matters under section 59 of the EEZ Act, the provisions of the EEZ Act, the RMA, the NZCPS 2010 and the specific provisions of the relevant Regional and District Plans all provide guidance in assessing the effects of the project on the coastal environment. Given the Project's distant offshore location, its likely effects will be primarily confined to offshore areas. Accordingly, this assessment will largely focus on surface seascape considerations, supported as appropriate by sub-surface science based assessments by other experts.

## Natural Character

3.10 While natural character is not defined in the RMA or the NZCPS, the working and generally accepted definition initially developed by the Ministry for the Environment (MfE) in 2002, and subsequently confirmed by the Department of Conservation (DoC) in 2011 states that:

> *Natural character is the term used to describe the natural elements of all coastal environments. The degree or level of natural character within an environment depends on:*
>
> *1) The extent to which the natural elements, patterns and processes[6] occur;*
>
> *2) The nature and extent of modifications to the ecosystems and landscape/seascape.*
>
> *The degree of natural character is highest where there is least modification.*
>
> *The effect of different types of modification upon natural character varies with context and may be perceived differently by different parts of the community.*

3.11 In seeking to "preserve the natural character of the coastal environment and to protect it from inappropriate subdivision, use and development", Policy 13(2) of the NZCPS 2010 acknowledges that:

> *Natural character is not the same as natural features and landscapes or amenity values and may include such matters such as:*
>
> *(a) natural elements, processes and patterns;*
>
> *(b) biophysical, ecological, geological and geomorphological aspects;*

[6] For the purpose of interpreting the NZCPS, Policy 13.2 elements, patterns and processes means biophysical, ecological, geological and geomorphological aspects of natural landforms, such as headlands, peninsulas, cliffs, dunes, wetlands, reefs, freshwater springs and surf breaks, and the natural movement of water and sediment.

(c) *natural landforms such as headlands, peninsulas, cliffs, dunes, wetlands, reefs, freshwater springs and surf breaks;*

(d) *the natural movement of water and sediment;*

(e) *the natural darkness of the night sky;*

(f) *places or areas that are wild or scenic;*

(g) *a range of natural character from pristine to modified; and*

(h) *experiential attributes, including the sounds and smell of the sea, and their context and setting.*

In addressing some of the relevant natural character matters noted above, the opinion of other coastal and marine experts will be sought.

3.12 In stating that natural character (Policy 13) and natural features and natural landscapes or amenity values are not the same as natural character (Policy 15), the NZCPS 2010 appears to support the proposition that natural character exists irrespective of its visibility or the human experience of it. Natural features and natural landscapes (including seascapes) and amenity values incorporate community and stakeholder values supported by plan clarifications and/or specific policy provisions, relative to the acknowledgement of the distinctiveness of particular natural features, landscapes and seascapes.

## Seascape

3.13 In New Zealand seascape matters where relevant have largely been considered in broad terms as part of landscape character and/or natural character assessments. While landscape, in general terms, refers to areas lying to the landward side of mean high water, and seascape to the coastal and marine areas seaward of mean high water, the area located between high and low water levels can be either considered part of the landscape or the seascape or indeed within both areas depending on the scope or purpose of the assessment.

3.14 In the UK there has been considerable attention given to defining seascapes and the way they are assessed. For example, Natural England[7], in its 2010 position paper 'All Landscapes Matter', defines seascape as:

> *An area of sea, coastline and land, as perceived by people, whose character results from the actions and interactions of land with sea, by natural and/or human factors.*

3.15 With respect to effects of change, the UK Marine Policy Statement (2011) records that:

[7] Natural England is an executive Non-departmental Public Body responsible to the Secretary for Environment, Food and Rural affairs. Its purpose is to protect and improve England's natural environment and encourage people to enjoy and get involved in their surroundings.

*The effects of activities and developments in the marine and coastal area of the landscape, including seascape, will vary on a case by case basis according to the type of activity, its location, and its setting.*

and that in relation to seascape:

*...references to seascape should be taken as meaning landscapes with views of the coast or seas, and coasts and other marine environments with cultural, historical and archaeological links with each other.*

3.16 While seascape is not defined in the NZCPS, the common interpretation of seascape is that it is a view that incorporates a large expanse of the sea. Notwithstanding this, both the NZCPS (Policy 13) and Natural England consider seascape considerations to involve more than perceived and visually experienced associations with the sea and can incorporate natural and cultural/social associations. In regard to this broader interpretation and application of seascape, Natural England also note that the purpose for undertaking any assessment of seascape be "clear at the outset as this will have a significant influence on the overall scope of the assessment, the nature of the approach and the outputs developed."[8]

3.17 Given the context and potential effects of the Project are likely to be more relevant to offshore and marine considerations rather than landscape considerations as such, the character of seascape in its wider coastal environment context is of particular importance and will be the focus of this assessment.

3.18 Notwithstanding the spirit or intent of Policies 13 and 15, this assessment of the proposed Offshore Iron Sands Project is guided by the following interpretation of these policies:

i) That the natural character of the coastal environment includes the relevant natural elements, natural patterns and natural processes within the terrestrial environment as well as those within both the surface and subsurface marine environments, and that the natural character within specified character areas exists irrespective of whether this is seen or experienced by people. While Policy 13 also requires the identification of areas of outstanding natural character and the mapping of at least areas of "high natural character", this classification is interpreted as being a level of naturalness based on a continuum from pristine to totally modified. Outstanding natural character would be at or near a pristine condition rather than being representative of visually derived or perceived amenity considerations.

ii) That the identification and classification of outstanding or significant natural features and natural landscapes including underwater features and landscapes, is based on relative community and stakeholder values attached to particular natural areas

[8] Page 17, An Approach to Seascape Assessment, Natural England, 11 October 2012.

and/or features. Accordingly, where plans and other statutory documents identify outstanding, significant or special natural features or landscapes, the relevant provisions of Policy 15 provide applicable guidance.

## Outstanding Natural Features and Landscapes

3.19 Although not required for this project that is being assessed under the EEZ Act, under the RMA s6(b) it is necessary to identify outstanding natural features and landscapes in order to assess how they may be affected by a specific project or activity. In addition to this, Policy 15(a) of the NZCPS requires the avoidance of adverse effects on outstanding natural features and landscapes in the coastal environment. With regard to other natural features and natural landscapes in the coastal environment, Policy 15(b) requires the avoidance of significant adverse effects and the avoidance, remedying or mitigation of other adverse effects.

3.20 In the context of the Project, the provisions of Policy 15(a) guide the assessment of effects under the EEZ Act in that the policy requires that in order "to protect natural features and landscapes (including seascapes)" adverse effects must be avoided, whereas with regard to other natural features and landscapes (Policy 15(b)), the requirement is to "avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on other natural features and natural landscapes in the coastal environment."

## Amenity Values

3.21 Amenity values are defined in the RMA as meaning –

> *"those natural or physical qualities and characteristic of an area that contributes to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes."*

3.22 While RMA s7(c) makes specific reference to the "maintenance and enhancement of amenity values", Policy 15(c) (IV) of the NZCPS makes reference to "the protection of natural features and natural landscapes (including seascapes)" and in doing so having regard to "aesthetic values including memorability and naturalness." Likewise, RMA s7(f) seeks the "maintenance and enhancement of the quality of the environment."

## Visual Amenity

3.23 While visual amenity considerations are integral to the RMA definition of amenity, the Guidelines for Recreational Water Quality and Aesthetics[9] refers to the passive use of

[9] National Water Quality Management Strategy. Australia and New Zealand Guidelines for Fresh and Marine Water Quality. October 2000. Australia and New Zealand Environment and Conservation Council, and Agriculture and Resource Management Council of Australia and New Zealand.

waterbodies as being “pleasant places to be near or to look at and where there is no body contact with the water.” In this regard the guidelines seek to protect the aesthetic or visual amenity of waterbodies, particularly in terms of their visual clarity and colour. While the guidelines appear to be more relevant to rivers and clear water bodies, they do acknowledge the important of the appearance of surface waters and the potential effects to these from visible sediment plumes. Sections 107(1)(c) and (d) of the RMA also make reference to the effects of suspended materials and any conspicuous change in the colour or visual clarity of coastal waters.

3.24 In terms of aesthetic values, including memorability and naturalness (also noted in Policy 15 of the NZCPS), aesthetic effects will primarily be experienced as visual effects in the context of seascape character.

3.25 Visual effects occur in direct response to the visibility of an object or an activity. In this regard visibility and visual effect, while related are two quite different matters. Visibility is measurable, whereas visual effects which are judgement-based, can create different responses from different people and accordingly can be perceived as being positive, neutral (benign) or negative.

3.26 In the case of the Project, the visibility of aspects of the Project will vary accordingly to a variety of viewer characteristics and ephemeral effects including:

- Distance and elevation of the viewer;
- The size and number of offshore vessels;
- Night time effects of lighting;
- Weather and lighting conditions;
- Sea conditions.

3.27 In this regard, primary visual effects will be associated with the appearance of shipping activity, albeit some 22km plus offshore, and also the effect of sediment plumes associated with the extraction and re-deposition process which are likely to extend into the CMA and are visible in part from some land based locations. Views from the sea and the air are also relevant considerations.

# 4 Relevant RMA Planning Provisions

4.1 As the marine/seascape effects of the Project are likely to extend in part along the coastline, south of Ohawe to the mouth of the Whanganui River, in addition to the RMA and NZCPS provisions that provide guidance to an assessment of effects on this part of the coastline, the following Regional District Plans have been reviewed with respect to landscape/seascape, natural character and visual amenity considerations as they relate to an assessment of effects under the EEZ Act in the coastal environment and the CMA in particular –

- Taranaki Regional Coastal Plan (1997)
- South Taranaki District Plan
- Horizons One Plan
- Wanganui District Plan

4.2 Figure 2 shows the context of the Project Site, and the jurisdictions of the relevant regional and district plans.

## Taranaki Regional Coastal Plan (1997)

4.3 The Taranaki Regional Coastal Plan (1997) prepared by the Taranaki Regional Council, seeks to promote the sustainable management of the natural and physical resources of the Taranaki Coast. In the context of the Regional Coastal Plan, the area most likely to be affected by the Project extends from mean high water springs seaward to a distance of 12 nautical miles (22.2km) being the seaward boundary of the CMA with the EEZ.

4.4 With regard to the CMA, the Plan notes that the recognition of coastal processes, natural values and uses of the coastal marine area are important considerations. In this regard the relevant objectives are -

***Objective 1(a)***

*To manage the coastal marine area in a way that promotes the sustainable management of natural and physical resources by recognising and providing for different coastal processes, natural values and uses of the coastal marine area.*

***Objective 1(b)***

*To recognise and provide for the preservation of the natural character of the coastal marine area, to protect that character from inappropriate use or development of the coastal marine area and to restore or rehabilitate the natural character of the coastal marine area where practicable.*


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FIGURE 2
IRON SANDS MINING PROJECT
SITE CONTEXT

4.5 With respect to the management of the CMA, Policy 1.1 classifies the coast into four coastal management areas based on each area's particular landscape/seascape characteristics. The four coastal management areas noted in the Plan are –

- Area A – Areas of outstanding coastal value
- Area B – Estuaries (other than those identified as outstanding) that are permanently open to tidal movements.
- Area C – Open coastline
- Area D – Port Taranaki (a highly modified coastal area)

4.6 In addition to the management of coastal processes and natural values, the Plan also deals with the protection of social and cultural values. In this regard the relevant objectives are –

***Objective 3(a)***

*To maintain and enhance the natural character and amenity values of the coastal environment.*

***Objective 3(b)***

*To recognise the heritage values of sites, buildings, places or areas and to provide protection of these values from adverse effects of use or development of the coastal marine area.*

4.7 In terms of the objectives listed above in Sections 4.3 and 4.5, the Plan identifies a group of areas where amenity values are classified as being of regional importance. The classification includes 3 areas that may be affected by the proposed Project. These areas are:

(i) Ohawe Beach

(ii) Waverley Beach

(iii) Waiinu Beach

4.8 Integral to the purpose of promoting the sustainable management of the coastal marine area (Objective 1(a)), the Plan identifies areas of outstanding natural features and landscapes, significant habitats or marine or birdlife, and significant or unmodified areas of natural character. In this regard Objective 4 seeks –

*To protect those parts of the coastal marine area that have significant conservation values from the adverse effects of development.*

4.9 With respect to Objective 4, Policy 4.1 identifies specific areas/sites of outstanding coastal value that are to be managed in a way that gives priority to the avoidance of adverse effects on the

outstanding coastal values of each area. Within the Taranaki Region there are five sites within the potential effects area that are identified in the Plan as being of outstanding coastal value. These sites along with their attached values are:

(i) **Whenakura Estuary**

- Relatively unmodified estuary;
- Habitat of threatened Caspian tem and rare variable oyster catcher;
- Part of route for migratory birds;
- Whitebait spawning on northern bank.
- North and South Traps
- Large seaweed (Ecklonia) forests, diverse and abundant marine life;
- Unusual feature on sandy coast.

(ii) **Waverley Beach**

- Outstanding natural landscape;
- Eroding stacks, caverns and tunnels produce unique landforms at land/sea interface;
- Blow holes.

(iii) **Waitotara Estuary**

- Unmodified, representative estuary;
- Adjacent to existing conservation area, which is the habitat of threatened Australian bittern, NZ shoveller, black swan;
- Stopover for migratory wading birds (royal spoonbill, banded dotterel) and international migrant birds (eastern bar-tailed godwit);
- Sub-fossil totara stumps in estuary;
- Whitebait spawning area in Waiau Stream.

(iv) **Waiinu Reef**

- Limestone rock outcrops extending from mean high water springs to 500m offshore;
- Hard rock platform contains many well-preserved fossils;
- Abundance of marine life forms.

4.10 Figure 3, sourced from the Taranaki Regional Coastal Plan, shows the general location and classification of the Coastal Management Areas, including the Areas of Outstanding Coastal Value identified in the Regional Coastal Plan.

4.11 In January 2004 an inventory of regional and locally significant coastal areas was compiled by the Taranaki Regional Council in association with the New Plymouth District Council, the South Taranaki District Council and the Department of Conservation[10]. The inventory report incorporates relevant published information on the identified sites including their amenity, recreational, cultural/historical and ecological values. The report also notes whether public access to the sites is available and the land tenure of each site.

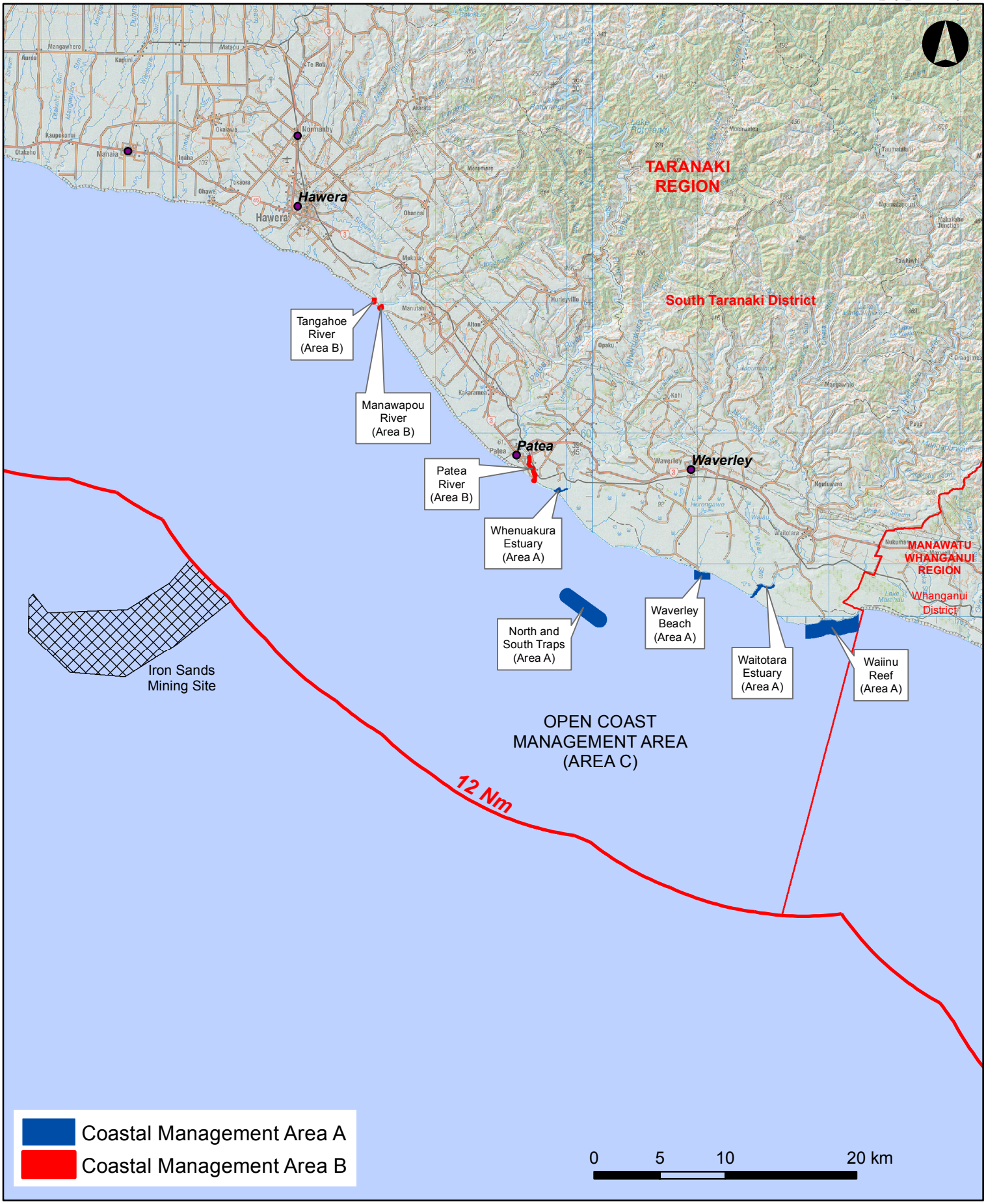
4.12 While the inventory report identifies 69 specific sites in total, the report acknowledges that "many features and values that make a site significant occur along the whole Taranaki coastal area and are not only confined to sites included in the inventory." The report also notes that in order to be included in the inventory as a significant site, the area or site must be ranked high in relation to one or more of the following attributes, namely amenity values, recreational values, cultural/historical values and ecological/scientific values. While public access was also recorded, it was not included in the overall values matrix.

4.13 Of the 69 sites identified and listed in the inventory, 11 occur within the area that could be potentially affected by the proposed Offshore Iron Sands Mining Project. The 11 sites along with their ascribed values and ratings are listed in Table 1 below –

**Table 1: Inventory Significant Coastal Sites within the Potential Effects Area**

| Site | Area | Amenity | Recreation | Cultural/ Historical | Ecology/ Scientific | Public Access |
|---|---|---|---|---|---|---|
| 55 | Ohawe Beach | High | High | High | High | Excellent |
| 56 | Waihi Beach | High | High | High | High | Excellent |
| 58 | Marawapou/Tangahoe | High | Moderate | High | Moderate | Good |
| 61 | Kakaramea Beach | Moderate | Moderate | High | Moderate | Poor |
| 62 | Patea Beach | Moderate | High | High | High | Excellent |
| 64 | Whenuakura Estuary | Moderate | Moderate | High | High | Poor |
| 65 | North & South Traps | Moderate | Moderate | Unknown | High | Poor |
| 66 | Waipipi Dunelands | High | Moderate | Moderate | High | Poor |
| 67 | Waverley Beach | High | High | Unknown | High | Excellent |
| 68 | Waitotara Estuary | High | Moderate | High | High | Good |
| 69 | Waiinu Beach | High | High | High | High | Excellent |

[10] Inventory of Coastal Areas of Local or Regional Significance in the Taranaki Region. Taranaki Regional Council Document 609786, October 2009




*Source : Taranaki Regional Council*

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FIGURE 3
TARANAKI REGIONAL COUNCIL
COASTAL MANAGEMENT AREAS

4.14 While the coastal sites listed in Table 1 lie within the potential effects area, there are other areas within the coastal environment of similar value that may also be potentially affected. As previously noted, the inventory of significant sites was selective and does not cover the full extent of the Taranaki Region's coast or the wider coastal area incorporating the Whanganui-Manawatu coastal area.

## South Taranaki District Plan

4.15 While the South Taranaki District Plan does not spatially identify important coastal sites, it contains specific objectives with regard to the coastal environment, the preservation of natural character, the protection of outstanding natural features and landscapes, public access and amenity values, the Plan acknowledges on page 12 that the –

> *"Objectives and policies contained in the Regional Coastal Plan address matters at the coast including the protection of ecological values, natural character, heritage values and areas of outstanding coastal value, natural hazards and public areas."*

4.16 With regard to the identification and protection of outstanding natural features and landscapes the Plan also notes on page 26 that –

> *"A landscape assessment of the district has not been carried out but will be undertaken. This will identify the landscape features which are significant to the community, provide an indication of the susceptibility of these landscapes to the adverse effects of activities, and identify levels of protection and enhancement for management purposes. After completion of the assessment the results will be included in the District Plan."*

4.17 Although the Plan does not spatially define the coastal environment as such, it does identify a Coastal Protection Area, which it describes as "the area defined along the coastline by location, landscape and topography as part of the natural environment which is particularly susceptible to damage from the adverse effects of activities. It is also the area most affected by natural coastal processes including the erosion of the costal cliffs". Within the Coastal Protection Area the Plan requires the avoidance of adverse impacts on outstanding natural features and coastal landscapes and the adoption of measures to avoid, remedy or mitigate adverse effects on natural or cultural features in the coastal area.

4.18 Given the South Taranaki District Council participated in the 2004 study that identified regional and locally significant coastal areas of significance in the Taranaki Region, and the South Taranaki District Council appear to defer to the Taranaki Regional Council with respect to other matters to do with the South Taranaki coastal environment and in particular the CMA, the Regional Coastal Plan is, therefore, considered to be the appropriate and relevant planning

document with respect to the assessment of the landscape/seascape effects of the proposed Offshore Iron Sands Project on the Taranaki Regional coastline.

## Proposed Horizons One Plan

4.19 In Chapter 9 of the Horizons One Plan the coastal environment in the Manawatu – Whanganui Region is defined as "the CMA together with an area landward of MHWS where coastal qualities and influences predominate." The Plan describes the region's coastline, which covers some 120kms from Waiinu Beach in the north to Waikawa Beach to the south, as being "characterised by narrow sandy beaches backed by sea cliffs in the north, and sandy beaches backed by a dynamic dune system from Whanganui southwards. The coast is a high energy shore, with wave heights commonly exceeding 3 metres. The dominant climatic feature is the wind, which is predominantly westerly, and which has had a major effect on the physical shape of the west coast."

4.20 The Plan also notes that the key objective in managing the CMA, is to ensure that the natural character and ecosystem processes are maintained whilst still allowing activities and development to occur (Page 9.3). In this regard, the significant resource management issues are noted as being the integrated management of the coastal environment, the appropriate protection and use of the CMA and the management of water quality.

4.21 While the Plan does not specifically identify significant areas or sites that may be affected by the proposed Offshore Iron Sands Project, those areas/sites north of the Whanganui River have been identified and classified (as part of this assessment) on a similar basis to that which was carried out in the 2004 Inventory of Coastal Areas of Local or Regional Significance in the Taranaki Region. These areas are identified and further discussed in Section 5 of this report.

## Whanganui District Plan

4.22 Notwithstanding the District Plan is currently being reviewed, Environment Issue 3 – Protection of Natural Environment Areas of Particular Significance notes that the district's coastline is identified for protection in the Regional Policy Statement. In this regard the natural character of the Coastal Environment Special Management Zone is to be preserved. The Plan also notes the particular importance of significant or threatened habitats or ecological areas, and outstanding and significant landscapes, seascapes and landforms.

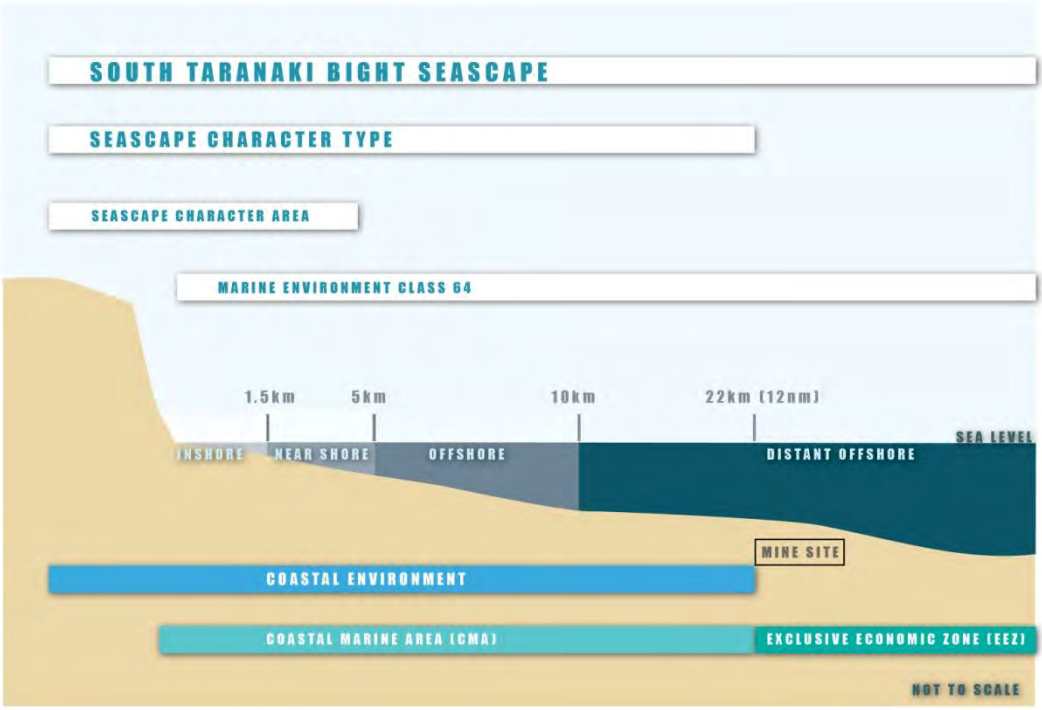
4.23 Environment Policy 4, which refers to the identification of the landscape character of the district, notes that Council has limited information on the characterisation of the district, other than what was carried out as the first phase of a 1995 Landscape and Ecological Study[11]. The Plan

[11] Whanganui District Landscape and Ecology. Proposed for Whanganui District Council – February 1996 by Boffa Miskell Ltd.

notes “an assessment building on the 1995 study, which ascribes values to the landscape may be undertaken at some time in the future.”

4.24 The 1995 study identified three landscape character areas along the coast north of the Whanganui River mouth. These areas were identified as Whanganui West which included the Castlecliff coastal margin, Mowhanau which incorporates the Kai Iwi coastal settlement area, with the balance of the northern coastal area being within what was identified as the Marahau landscape character area. While the 1995 study identified and described the landscape character areas, it did not evaluate these areas in terms of their particular values or significance. The character areas identified are, however, well defined and are an appropriate basis for the identification of seascape character types and seascape character areas, which are discussed in Section 5.

4.25 In the context of this report, the not-to-scale diagram below illustrates the terms and classifications referred to in this assessment.



# 5 Seascape Character Classification

5.1 Just as landscape character assessments provide a basis for the definition, classification and assessment of landscape change, seascape character classifications can provide a similar context for understanding the effects of change in coastal and offshore marine environments. Seascape character derives from the distinctive elements, patterns and processes that make one seascape different from another, rather than better or worse than another. Landscape and seascape characterisation is usually carried out within a framework of character types and character areas where –

- Seascape character types comprise those areas that are homogeneous in nature that may occur in different locations. However, wherever they occur they share broadly similar combinations of geology, bathymetry, ecology, human influences, perceptual and aesthetic attributes.
- Seascape character areas are single unique geographical areas within a particular seascape character type that have their own individual character and identity, even though they may share the same generic characteristics with other seascape character types.

5.2 Notwithstanding the open and expansive nature of the South Taranaki Bight marine area, and the broad similarity of its sub-surface character attributes, particularly on the seaward side of the intertidal area, an indicative spatial classification for the South Taranaki Bight seascape has been developed for this assessment. This classification adopts the following scales and classifications:

i) National – New Zealand Marine Environment
ii) Regional – Seascape Character Types
iii) Local – Seascape Character Areas

## Marine Environment

5.3 The New Zealand Marine Environment Classification[12] is a comprehensive spatial framework developed for the structured and systematic management of the New Zealand marine environment. This classification, which subdivides the marine area into distinctive units having similar environmental and biological characteristics, is based on a 20-level classification of the marine environment. The Project lies within the area classified as Class 64 covering the coastal waters along the west coast of central New Zealand, including the South Taranaki Bight. Generally this area is relatively shallow with mean water depths of 36m. While the Class 64 area extends from the coastline to some 10-20km beyond the CMA/EEZ boundary, this national

[12] New Zealand Marine Environment Classification: Ministry for the Environment 2005.

classification provides a broad context and framework for the regional seascape character types, which are more directly influenced and defined by coastal shoreline features.

## Seascape Character Types

5.4 In order to protect natural features and natural landscapes (including seascapes) in the coastal environment from adverse effects, Policy 15(c) of the NZCPS makes specific reference to land typing as being an important consideration. Based on information developed by NIWA and available on their Coastal Explorer website,13 along with area and site visits between January and April 2013, the South Taranaki Bight seascape has been classified into three broad regional character types based on the nature of the coastal margin and their associated beach sediment characteristics. The seascape character types include:

(i) **Dunes and Low Cliffs**. Referred to as Rising Ground in NIWA's Coastal Explorer, this character type has sandy beaches and associated sand dunes and/or low landforms and sea cliffs. The two coastal areas where this occurs are located between the Whanganui River mouth and the Patea River mouth. The larger of the areas occurs at Waiinu Beach and extends north to the Patea River mouth, with the smaller area being to the south along the Castlecliff foreshore.

(ii) **Fossil Sea Cliffs**. This relatively small area extends for approximately 1.5km to the north of Castlecliff near the mouth of the Whanganui River and is characterised by stable hard rock cliffs backing sandy beaches.

(iii) **Eroding Sea Cliffs**. These extensive areas extend from north of the fossil cliffs near Castlecliff to a point south of Waiinu Beach and from the mouth of the Patea River to Ohawe and beyond. These actively eroding steep sea cliffs, which extend along 70% of the coastline in the potential effects area, contain narrow beaches where the sediment material comprises a mixture of sand and gravel with areas of soil deposited from the actively eroding escarpment face.

5.5 While the bathymetry and other marine patterns and processes are broadly similar in character within the CMA, the defining elements and features for the regional seascape types has been primarily influenced by the nature and character of the visually prominent coastal margin. In terms of the NZCPS the South Taranaki Bight coastline has not been formally assessed in terms of its natural character levels. However, the coastal escarpment, dune systems and associated beaches, which have been sculptured and shaped by past and ongoing erosion processes, clearly display very high and near pristine levels of natural character throughout most of the South Taranaki/North Whanganui coastal environment. The seascape character types identified in the South Taranaki Bight are illustrated in the accompanying photographs.

[13] www.NIWA.co.nz/Coasts & Oceans/Coastal Explorer

## Seascape Character Areas

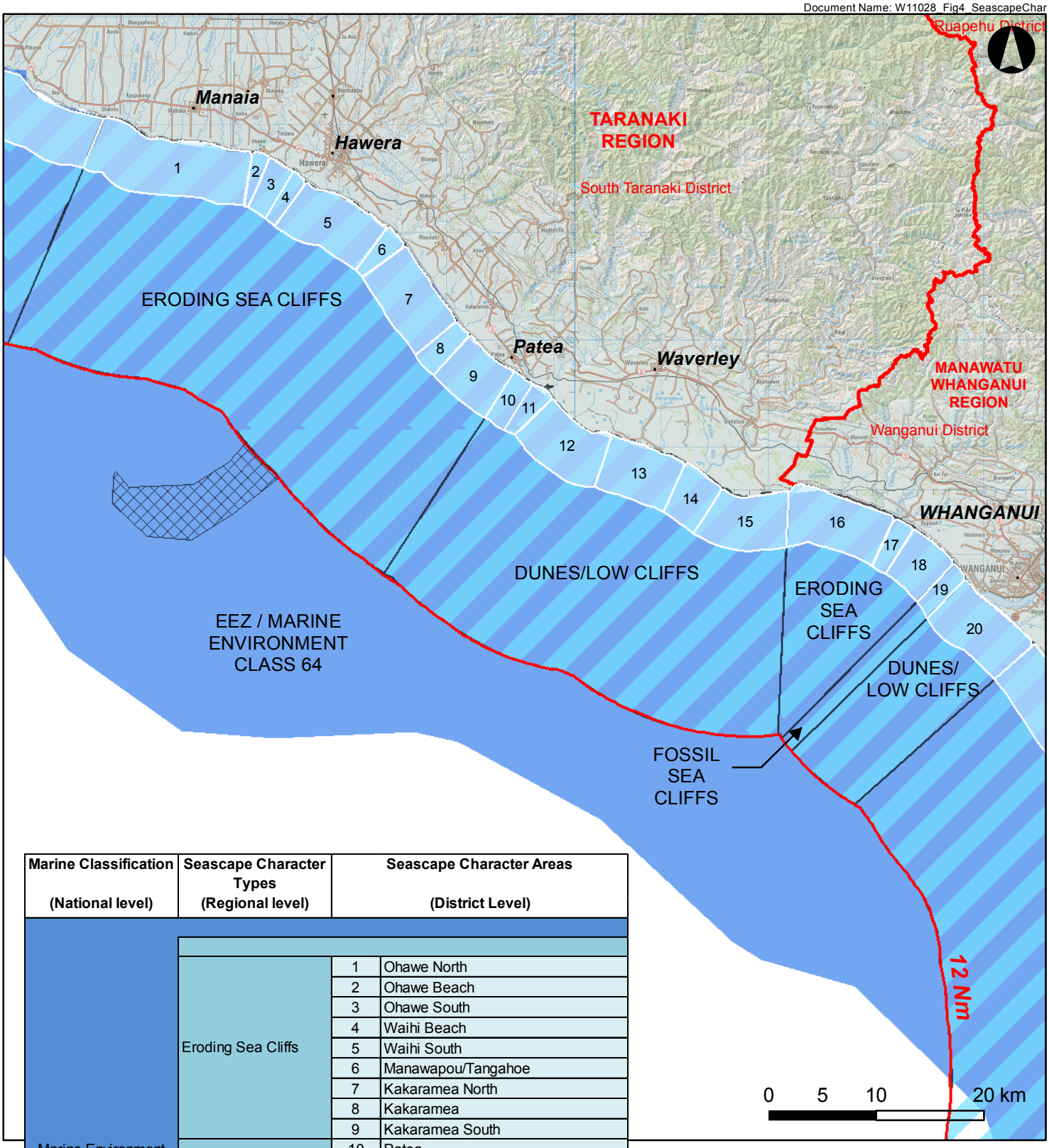
5.6 Based on the 2004 Inventory of Regional and Locally Significant Coastal Areas prepared by the Taranaki Regional Council, and the Landscape Character Areas defined in the 1996 Whanganui District Landscape and Ecology Report, 20 seascape character areas have been identified in the coastal environment between Manaia and Whanganui. The spatial relationship between the national, regional and district seascape scales defined for this assessment are shown in Table 2 and illustrated in Figure 4.

5.7 While the identified seascape character areas and sites of regional or local significance within the Taranaki region were evaluated by the Taranaki Regional Council in terms of amenity, recreation, cultural/historical and ecological/scientific significance, the comparable seascape character areas/sites within the Whanganui region have not previously been evaluated in similar terms. Notwithstanding this, based on field observations carried out as part of this assessment, it is clear that the overall ratings for these areas and sites would be in the moderate to high range particularly within regard to amenity, recreation and scientific/ecological considerations. While access was not rated in the Taranaki values matrix, access to the Whanganui seascape character areas in general, (using the TRC Classification) is assessed as being in the good to excellent category.

**Table 2: South Taranaki Bight Seascape Character Classifications**

| **Marine Classification** (National level) | **Seascape Character Types** (Regional level) | **Seascape Character Areas** (District Level) |
|---|---|---|
| **Marine Environment Class 64** | Eroding Sea Cliffs | Ohawe North<br>Ohawe Beach<br>Ohawe South<br>Waihi Beach<br>Waihi South<br>Manawapou/Tangahoe<br>Kakaramea North<br>Kakaramea<br>Kakaramea South |
| | Dunes/Low Cliffs | Patea<br>Whenuakura Estuary<br>Waipipi<br>Waverley Beach<br>Waitotara Estuary<br>Waiinu Beach |
| | Eroding Sea Cliffs | Kai Iwi North<br>Kai Iwi Beach<br>Kai Iwi South |
| | Fossil Sea Cliffs | Castlecliff North |
| | Dunes/Low Cliffs | Castlecliff Beach/Whanganui South |

*Note: The North and South Traps occur within the Dunes and Low Cliffs Character Type and more specifically within the Waipipi Character Area.*




| Marine Classification (National level) | Seascape Character Types (Regional level) | | Seascape Character Areas (District Level) |
|---|---|---|---|
| Marine Environment Class 64 | Eroding Sea Cliffs | 1 | Ohawe North |
| | | 2 | Ohawe Beach |
| | | 3 | Ohawe South |
| | | 4 | Waihi Beach |
| | | 5 | Waihi South |
| | | 6 | Manawapou/Tangahoe |
| | | 7 | Kakaramea North |
| | | 8 | Kakaramea |
| | | 9 | Kakaramea South |
| | Dunes/Low Cliffs | 10 | Patea |
| | | 11 | Whenuakura Estuary |
| | | 12 | Waipipi |
| | | 13 | Waverley Beach |
| | | 14 | Waitotara Estuary |
| | | 15 | Waiinu Beach / Reef |
| | Eroding Sea Cliffs | 16 | Kai Iwi North |
| | | 17 | Kai Iwi Beach |
| | | 18 | Kai Iwi South |
| | Fossil Sea Cliffs | 19 | Castlecliff North |
| | Dunes/Low Cliffs | 20 | Castlecliff Beach/Wanganui South |

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FIGURE 4
SEASCAPE CHARACTER CLASSIFICATIONS

Eroding Sea Cliffs seascape character type - Hawera coast (12 March 2013 2:35pm)

Fossil Cliffs seascape character type - north of Castlecliff Beach (source: Lloyd Homer c1995)

Sand Dunes and Low Cliffs seascape character type - Waipipi Beach (12 March 2013 11:30am)

Sand Dunes and Low Cliffs seascape character type - Waiinu Beach (11 February 2013 12:24am)

## Seascape Characteristics

5.8 In addition to the distinctive coastline features that define and characterise the Seascape Character Types and the Character Areas, which are further defined by the TRC's Inventory of Significant Sites and Areas, a particularly distinctive feature of the near-shore seascape (up to 5km offshore) is the appearance of suspended sediment plumes. While the appearance, extent and pattern of these plumes vary considerably, they are a characteristic feature of the South Taranaki Bight seascape. The sediment plumes are largely derived from river and stream deposited material, active shoreline erosion processes and the re-suspension of bottom sediments as a consequence of sea current and wave action. The accompanying photographs illustrate the general appearance and pattern of natural sediment plumes along the South Taranaki Bight.

## Natural Sediment Plumes

5.9 As part of the biogeophysical investigations commissioned by TTR, NIWA have undertaken field work to measure the natural inshore suspended sediment concentrations (SSC) to assist in the assessment of the potential effects of the Project. The NIWA study14 involved, in part, the deployment of measuring instruments at six inshore locations along the coast between Whanganui and Hawera. These instruments took SSC readings every 15 minutes during the entire period (up to nine weeks) they were deployed. The instrument sites, their offshore location and the time they were deployed are outlined in Table 3 below.

**Table 3: Suspended Sediment Measurement Sites**

| Site* | Location | Distance Offshore | Time Period | Duration |
|---|---|---|---|---|
| 11 | Whanganui | 1450m | 26 Feb – 1 May 2013 | 9 weeks |
| 12 | Kai Iwi | 1250m | 26 Feb -1 May 2013 | 9 weeks |
| 13 | Waitotara | 960m | 26 Feb -2 April 2013 | 7.5 weeks |
| 14 | Patea | 1590m | 27 Feb - 2 May 2013 | 9.0 weeks |
| 15 | Manawapou | 800m | 27 Feb -8 April 2013 | 5.8 weeks |
| 16 | Ohawe | 508m | 27 Feb -2 May 2013 | 9 weeks |

** Site numbers are those used in the NIWA study.*

5.10 During the period the measuring sites were operational, a series of aerial and land-based photographs of the instrument locations were taken to provide a visual basis for the assessment of the visual effects of the existing natural and the proposed mining-generated plumes in the inshore seascape. (Figure 5.1 in the attached Graphic Supplement shows the Suspended Sediment Site Locations). Photographs of the instrument sites and the SSC readings for these areas at specified dates and times are shown in Figures 5.2-5.26 of the attached Graphic Supplement. In addition to the static instrument site observations, where obtainable, additional

[14] Near Shore Optical Water Quality in the South Taranaki Bight. NIWA May 2013

data from NIWA's synoptic boat surveys carried out on March 11 and 12 2013 are included and are illustrated in Figures 5.12 and 5.13 in the Graphic Supplement.

5.11 Table 4 summarises the SSC readings, taken every 15 minutes over the entire instrument deployment period, for each of the six sites for March 7 and March 12, 2013 and for the deployment period in total. In this regard the highs, lows and median SSC levels are provided.

**Table 4: Suspended Sediment Concentration Measurements**

| Location | Period | Minimum | Maximum | Median |
|---|---|---|---|---|
| **Site 11 Whanganui** | March 7, 2013 | 4.0 | 10.1 | 6.0 |
| | March 12, 2013 | 2.4 | 10.7 | 4.2 |
| | Entire Period | 1.9 | 118.2 | 5.5 |
| **Site 12 Kai Iwi** | March 7, 2013 | 4.5 | 10.9 | 5.6 |
| | March 12, 2013 | 5.1 | 8.8 | 6.1 |
| | Entire Period | 1.9 | 87.6 | 5.4 |
| **Site 13 Waitahora** | March 7, 2013 | 6.5 | 14.2 | 8.2 |
| | March 12, 2013 | 3.8 | 27.2 | 8.6 |
| | Entire Period | 2.2 | 49.3 | 6.6 |
| **Site 14 Patea** | March 7, 2013 | 6.6 | 13.6 | 8.6 |
| | March 12, 2013 | 4.9 | 20.8 | 7.7 |
| | Entire Period | 2.6 | 70.1 | 9.4 |
| **Site 15 Manawapou** | March 7, 2013 | 7.9 | 27.3 | 14.5 |
| | March 12, 2013 | 9.7 | 44.3 | 18.3 |
| | Entire Period | 3.2 | 119.4 | 13.3 |
| **Site 16 Ohawe** | March 7, 2013 | 5.4 | 21.4 | 9.5 |
| | March 12, 2013 | 11.5 | 52.4 | 27.1 |
| | Entire Period | 2.4 | 82.7 | 16.1 |

5.12 Based on the SSC measurements summarised in Table 4, the instrument photography (Figures 5.2-5.26), and field observations made over a number of occasions during the early part of 2013 in the South Taranaki Bight area, the appearance, pattern and extent of the naturally derived SSC plumes vary considerably within and between sites on a daily basis and over varying periods of time. It is interesting to note that the period over which the NIWA measuring instruments were deployed was unusually dry, with low river flows and low river sediment inputs to the coast.

## Summary

5.13 In the context of the South Taranaki Bight seascape, natural sediment plumes are a particular feature within all of the identified Character Types and Character Areas, even though the plumes vary considerably in their appearance, patterns, their overall extent, and their consistency and frequency of occurrence. While there are occasions and instances where the natural plumes appear as unnatural patterns, the plume patterns generally appear to relate to natural processes such as would be expected at river mouths, in the vicinity of eroding sea cliffs and the patterns associated with tides, currents, wave and weather conditions. Notwithstanding these variations, the natural sediment plumes within the Character Type and Character Areas are distinctive features that contribute to the high visual, recreational and amenity values of the South Taranaki Bight seascape.

Natural suspended sediment plumes at the Patea River mouth (12 March 2013 10:47am)

Natural suspended sediment plumes adjacent to Hawera golf course (12 March 2013 10:40am)

Natural suspended sediment plumes off Patea Beach (12 March 2013 3:00pm)

Natural suspended sediment plumes off Waihi Beach (12 March 2013 1:54pm)

Natural suspended sediment plumes at mouth of Whanganui River (12 March 2013 11:40am)

# 6 Context of the Effects Assessment

6.1 Given the distinctive characteristics of the Offshore Iron Sands Project, its distance offshore and the nature of any adverse effects that are likely to be evident in terms of natural character, seascape and visual amenity considerations, the principle effects are likely to be more perceptual rather than biophysical. Notwithstanding this, it is acknowledged that there are particular relationships between biophysical and perceptual considerations. While the NZCPS provides the primary framework for the assessment of potential seascape effects, the relevant provisions of the RMA, Regional Policy Statements, Regional Plans and District Plans have been considered, particularly with regard to the areas identified as being of outstanding coastal value and/or as having particular coastal amenity values.

6.2 As previously stated, natural character in its RMA context is the term used to describe the "naturalness" of the coastal environment in terms of its natural elements, natural patterns and natural processes. The NZCPS, proposed under the RMA, sets out in detail the policies relative to achieving the purpose of the RMA as being –

> *The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use and development.*

6.3 While natural character is not defined in the RMA or the NZCPS, it is best understood as being a "condition", whereas natural features and natural landscapes (including seascapes), relate to specific areas or places, albeit in their natural condition.

6.4 In the context of the Project, the effects on seascape, natural character and visual amenity, while interrelated, can be categorised as follows –

(i) Visual effects from specific viewpoints and viewing audiences.

(ii) Effects on natural features and natural landscapes (being defined and/or special or significant landscapes/seascapes and features).

(iii) Effects on natural elements, natural patterns and natural processes (the natural character of the coastal environment).

6.5 The wider seascape-related effects of the Project are discussed in the following sections of the report under the following headings -

- Section 7 – Visual Effects of Offshore Surface Vessels
- Section 8 – Visual Effects of Sediment Plumes
- Section 9 – Effects on Natural Features, Landscapes/Seascapes
- Section 10 – Natural Character Effects

# 7 Visual Effects – Offshore Surface Vessels

## Visibility Mapping

7.1 In order to determine the visibility of the operational shipping associated with the Project, visibility mapping using Zone of Theoretical Visibility (ZTV) maps was prepared. The ZTV maps developed for this assessment are based on line of sight and only take into account the screening effects of intervening topography, and accordingly do not take into account any screening effects of coastal vegetation or structures in the landscape. Given the Project's operational vessels will be located at a minimum distance of some 22km offshore, the need for other than shoreline and inland contour data was not considered to be necessary. The ZTV maps do however, take into account the earth's curvature and light refraction (the CR factor). ZTV maps do not show how an object or activity will appear, nor do they show or indicate the magnitude of visual effects – they simply show the extent and pattern of potential visibility.

7.2 As noted in Section 2, the largest shipping vessel will be the FPSO (Floating Processing Storage and Offloading Vessel) being in the order of 330m in length, with an overall height above sea level of 55m. For the purpose of the ZTV mapping, the two heights that have been used for the assessment are to the height of the ship's deck above sea level (15m), and to the highest above deck element, being the funnel at 55m above sea level.[15] The ZTV mapping has also assumed a viewer height of 2.0m above ground or sea level to simulate the eye height of a person on a recreational boat or standing on the beach or escarpment.

7.3 As the FPSO will be at different locations at the mining site over the operational phase of the Project, the two locations selected for the ZTV mapping have been the closest position to the shore (22.2km), and at the centre of the proposed mining site (28km offshore). Using the height above sea level to the top of the deck and height to the highest point on the vessel, Figures 7.1 and 7.2 in the Graphic Supplement show the potential visibility of the FPSO from a location just outside the CMA, with Figures 7.3 and 7.4 showing the FPSO in a more central location within the mining site area. As the Kupe Platform is located immediately to the north and central to the Project site, a ZTV of the platform has also been carried out on the basis of the platform being 30m above sea level.[16] This is shown in Figure 7.5.

7.4 While the ZTV maps show the difference between the potential visibility of a 15m object and a 55m object is quite apparent from sea based viewpoints, the views from the land relative to the

[15] While the current thinking is for a 20m deck height above sea level when empty, the design range allows for a height of 12-20m. For the purpose of the ZTV mapping a 15m height has been adopted.

[16] The Kupe application documents state that the platform and the helicopter pad will be 35m above the lowest astronomical tide. For the purpose of the ZTV mapping, a height of 30m above sea level has been adopted.

two FPSO positions are overall quite similar in extent and pattern. This is primarily due to the increased elevation of the viewing positions from the land based viewpoints beyond the immediate beach areas. This is evident from both the 22km and the 28km FPSO locations in all figures. Notwithstanding this, the distance between the FPSO and potential viewing positions on the land also has an effect on visibility and visual effect. For example, while the ZTV shows an object or part of an object being visible from a distance of 50km, the reality of what one would actually see needs to be kept in perspective particularly in terms of coming to conclusions on visual effects. As stated previously, visibility and visual effect are not the same. Likewise, a ZTV map simply shows the extent and pattern of potential visibility. It is not an effects based map.

7.5 With regard to potential and actual visibility, particularly in seascape settings, the ZTV analysis of the Kupe Platform provides a useful "as built" example to illustrate the effects that atmospheric conditions can have on visibility. While the ZTV map of the Kupe Platform (Figure 7.5) shows the offshore structure (at a height of 30m) being potentially visible from many coastal locations between Waipipi Beach to the north of Ohawe Beach, in reality the platform is not visible at all from many of these locations other than under very favourable weather conditions. In general the Kupe Platform is not visible from the Patea Beach, Waihi Beach or Ohawe Beach areas. Accordingly, the ZTV mapping, while technically accurate in terms of potential visibility, tends to overstate actual visibility particularly in seascape locations.

## Assessment Areas and Sites

7.6 The coastal areas and sites identified by the Taranaki Regional Council as being of particular significance are outlined in Section 4 of this report. In summary these areas and sites include the following:

i) Coastal management areas (Policy 1.1)

ii) Areas where amenity values are of high importance (Policy 3.2)

iii) Areas or sites of outstanding coastal value (Policy 4.1), and

iv) Areas of local or regional significance (Inventory of Coastal Areas of Local or Regional Significance in the Taranaki Region).

These areas and sites have been selected for the assessment of potential effects. Coastal Management Areas are addressed separately below, the areas referred to in (ii) to (iv) are addressed under Areas of Regional and Local Significance.

## Coastal Management Areas

7.7 With regard to the Project, the three relevant coastal management areas identified by the TRC (refer Figure 3) are:

- Area A – Areas of outstanding coastal value.
- Area B – Estuaries (other than those identified as outstanding) permanently open to tidal movements.
- Area C – Open coastline.

7.8 While the ZTV maps (Figures 7.1 and 7.2) show the visibility mapping of the FPSO from its closest position to the coastline to be relatively extensive, the visual effects of the FPSO from the specific Coastal Management Areas A & B identified by the TRC will be low, due largely to distance. In addition, the visual bulk of the FPSO vessel, being the area below a deck level of 15m, will not generally be visible from Coastal Management Areas A & B. From other site specific locations at or in close proximity to these identified features, while the upper elements of the FPSO may be visible, the visual effects will also be low and will only be experienced under favourable weather and atmospheric conditions.

7.9 As the Open Coast Management Area extends over the entire CMA area the shipping vessels and in particular the FPSO, will be clearly visible from some locations. Figures 7.1 to 7.4 show the extent of the FPSO's visibility within its 'open sea' context from both FPSO locations and for the two heights being to the top of the deck (15m) and to the highest element above the deck (55m). While the FPSO may be clearly visible from locations within 10-15km of the vessel, the visual effects in the context of the wider seascape setting will be relatively low.

7.10 While visibility from aircraft has not been specifically modelled, it is likely that these occasional and intermittent views will not be significant and the operational vessels will likely be viewed as a focal point and feature in the seascape. The visual effects of the plumes associated with the mining activity are discussed in Section 9.

## Areas of Regional and Local Significance

7.11 The areas and sites listed and shown in Figures 7.1 to 7.5 in the Graphic Supplement also include all of the locations identified by the TRC as areas of high amenity value (Policy 3.2), areas and sites of outstanding coastal value[17] (Policy 4.1) and areas identified in the 2004 Inventory of Coastal Areas of Regional or Local Significance (as noted in Section 7.6 (i) to (iv)). This assessment is based on the FPSO being at its closest point to the coast being 22.2km (Figures 7.1 and 7.2), as this represents the 'worst case' relative to coastline visibility from the two locations mapped.

7.12 **Ohawe Beach**. This beach settlement adjacent to the mouth of the Waingongoro River is approximately 8km west of Hawera and is a popular recreational area. Four Mile Reef is

[17] These are the five sites outlined in Sections 4.8.

located approximately 6.5 km offshore. Given the local topography in this area, distant views of the FPSO will in part be partially screened. From the beach, views of the FPSO are unlikely to be obtained other than under favourable weather and atmospheric conditions. The visual effects from the Ohawe Beach area in general, and from the Four Mile Reef area (which is approximately 12km offshore to the southwest of Ohawe Beach), will be low.

7.13 **Waihi Beach**. With direct access, Waihi Beach is located approximately 4km west of Hawera. From the main carpark and picnic areas on Denby Road, views to the FPSO are likely to be screened by coastal landforms and existing vegetation. From the stony beach, views of the FPSO may be possible under ideal conditions. The visual effect of the FPSO when visible will be minor from this general location.

7.14 **Tangahoe/Manawapou**. The focus of these two river mouth areas, approximately 9 km to the south of Hawera, is the expansive escarpment views out over the South Taranaki Bight seascape. From the escarpment the FPSO is likely to be visible under favourable weather and atmospheric conditions. While views of the FPSO from the beach area may also be possible under good conditions, it is likely that views will be limited due to distance and the low (near sea level) position of the viewer. The visual effects of the FPSO from these river mouth locations will be low.

7.15 **Kakaramea Beach**. This area, which is characterised by a series of 25m high coastal cliffs that extend some 50m out into the sea with small bays in between, is approximately 20km south of Hawera and 5 km north of Patea. Public access to the area is restricted due to land tenure. The area also incorporates the site of one of the first hydroelectric power stations established in New Zealand. The power station was destroyed in the early 1920s when the dam at the top of the cliff collapsed. While this site is possibly one of the closest land based areas to the FPSO, at 22.2km offshore, the visibility of the vessel will be low and the visual effects under favourable conditions will also be low.

7.16 **Patea Beach and River Mouth**. While the river mouth area has been extensively modified as a result of past port operations, the area is acknowledged by the Department of Conservation as having high landscape values and is a popular location for recreational activities. The area, which contains a camping facility is also spiritually important to the Nga Rauri Iwi. From coastal locations in this general area the FPSO, being in excess of 22km offshore, will only be visible under favourable weather and atmospheric conditions. The ZTV map (Figure 7.1) showing the visibility of the FPSO up to deck level (15m) confirms that the lower and more visually bulky part of the vessel will not generally be visible from the coastal margin, including the immediate beach area and will tend to be more visible (under favourable conditions) from higher dune and escarpment elevations. Notwithstanding this, the visual effects of the FPSO from the Patea beach and river mouth areas will be relatively low.

7.17 **Whenuakura Estuary**. Located 3.5 km to the south of Patea, this small and relatively unmodified estuary is difficult to publicly access. The 2004 TRC Inventory Report rates the cultural/historical and ecological/scientific values of the area as being high, with the amenity and recreation values rated as being moderate. While the ZTV map (Figure 7.1) shows the 15m FPSO deck level as not being visible, the visibility of the more upright elements of the vessel (Figure 7.2) will, in part, be visible from the general estuary area. The visual effects from this location will be low.

7.18 **Waipipi Dunelands**. Located on the coast approximately 5km to the southwest of Waverley, the dunelands have been identified by the TRC as being a significant natural area, and an area of high amenity (albeit part of the area has previously been modified by ironsand mining activities). The 2004 TRC Inventory Report describes the 40km coastal site as being an "area of small wet sand dune flats, low dunes of less than 4m, and dunes extending inland to taller (15m) more stable relic foredunes." While Figure 7.2 indicates that potential views of the upper deck elements of the FPSO may be visible from the beach and low dunes, Figure 7.1 shows that the lower and more bulky component of the vessel will not be visible from the foreshore area and the lower beach dunes. Given the FPSO will be in excess of 30km to the west of the Waipipi Dunelands site, the visual effects will be low.

7.19 **North & South Traps**. These sites, which are characterised by tall underwater pinnacles on two adjoining reef systems, are located approximately 6km offshore from Waipipi Beach. The TRC Inventory Report, which describes the traps as being an "unusual feature on a sandy coast", notes that both sites are popular for recreational diving and fishing. While part of the upper structure of the FPSO may be visible under favourable conditions from the traps area, the visual effects from this location will be low.

7.20 **Waverley Beach**. Waverley Beach, which is classified in the Regional Plan as being an area of outstanding coastal value is also categorised as an outstanding natural landscape (Policy 4.1). This unique coastal landscape is made up of a series of caverns, ravines, blowholes and eroding cliffs extending for approximately 8km along the coast. The TRC Inventory Report identifies this landscape as being a regionally important amenity, exhibiting high landscape and recreational values with excellent public access. From Waverley Beach FPSO will not be visible, however from the 13-15m high cliffs above the beach, elements of the upper structure of the FPSO may in part be visible under very favourable weather and atmospheric conditions. The FPSO vessel will be in excess of 30kms from Waverley Beach. The visual effects on amenity and landscape values will be low.

7.21 **Waitotara Estuary**. Located approximately 10km to the south of Waverley the FPSO will not be visible from the Waitotara Estuary or its associated sand dunes, due to distance. There will be no visual effects from this location.

7.22 From **Waiinu Beach** and **Kai Iwi Beach** in the Whanganui Region, the FPSO will not be visible and accordingly there will be no visual effects from the locations.

## Night Lighting

7.23 There will be two types of night lighting associated with the offshore vessels, namely navigational safety lighting and operational lighting.

**Navigational Lighting:** The nominal range generally shown on navigational charts is the maximum distance at which a light can just be seen by a normal observer at night when the actual (or meteorological) visibility is 10 nautical miles (approximately 18km). While navigational lights can be on permanently or intermittently, it is unlikely the navigational lights, in most instances, would be visible from the coastline. The red lights on the Kupe Platform which are located at a height of 15m above sea level have a nominal range of 10 nautical miles (approximately 18km).

**Operational Lighting:** This safety lighting will be continuous and will be more apparent from coastal locations due in part to its extent, its elevation and the need to adequately ensure safe onboard operational activity. While specifics of the lighting or its intensity is not currently available, it will largely be above the 15m deck level and under favourable weather conditions it is likely to be visible from some coastal locations in the Patea to Hawera area. There are however, few public roads or residences located on the coast where operational lighting will be seen to be particularly, or intrusively, visible.

## Summary

7.24 While the visibility of the FPSO will be high from marine areas within 10-15km of the vessel itself, the visual effects are assessed as being low overall and are unlikely to be perceived as being visually intrusive or adverse. Even though the FPSO is large and its associated and smaller support vessels will also be present, and in some cases may be visible from the coastline for extended periods of time, the surface marine activities associated with the Project are considered to be minor overall and where visible will likely be seen as an “appropriate” working seascape activity.

7.25 From the areas identified in the TRC Inventory Report (2004), the visibility of the Project will vary and, where visible, will be seen as a distant and background offshore activity within an expansive seascape setting. The visual effects of the surface marine activities are assessed as being low and will not be adverse nor will they appear to be visually intrusive from the recreation and amenity areas identified by the TRC.

# 8 Visual Effects of Sediment Plumes

8.1 As noted in Section 5, coastal sediment plumes in the South Taranaki Bight are a distinctive seascape feature throughout the CMA, even though the appearance, patterns, extent and frequency vary considerably over any particular day and over particular periods of time. Suspended sediment concentrations measured between 500-1600m offshore by The National Institute of Water and Atmospheric research (NIWA), show maximum daily variations (on March 12, 2013) of between 5.1mg/L - 8.8mg/L (median 6.1mg/lL at Kai Iwi; 3.8mg/L – 27.2mg/L (median 8.6mg/L) at Waitotara; and 11.5mg/L – 52.4 mg/L (median 27.1 mg/L) at Manawapou. March 12, 2013, being one of the days aerial photography of the instrument sites was undertaken, occurred during an extended dry period typical of summer conditions where sediment plumes would not be overly influenced by silt laden river discharges.

## Plume Modelling

8.2 As part of the biogeophysical investigations being carried out for TTR, NIWA has also undertaken the modelling of the natural concentration and deposition rates of the levels of sediment released from the Project, and to model these.[18] Modelling data developed by NIWA (in particular the modelling of existing sediment conditions), the likely sediment generated by the Project and the combined plume modelling of the natural and mine-generated sediment, along with photographic records and field observations have provided the background for the visual assessment of sediment plumes in the South Taranaki Bight seascape.

8.3 Based on the NIWA sediment modelling maps, more detailed maps relative to the significant amenity, recreation sites and areas identified by the TRC have been prepared. These maps which are contained in the Graphic Supplement (Figures 9.1 to 9.6) show the naturally derived sediment concentration patterns, the mining-derived sediment concentration patterns and the combined natural and mining-derived sediment patterns expressed as median values (Figures 9.1-9.3) and as 99 percentile values (ie the value exceeded for 1% of the time, being 3.65 days per year on average) on Figures 9.4-9.6.

8.4 Each of the sediment plume Figures show the wider pattern and extent of the sediment plume in its South Taranaki Bight seascape and a more detailed map showing the areas and sites identified by the TRC as being of particular amenity, recreational, scientific or cultural significance. While the NIWA modelling included two indicative mine locations within the mining site, Figures 9.1-9.6 are based on the mine occurring at its closest point to the CMA boundary and the coastline. While an alternative mining location at the western most end of the site was also modelled by NIWA, the visual effects of the sediment plumes from this location were not

[18] South Taranaki Bight Iron Sand Extraction Sediment Plume Modelling. Phase 3 Studies. NIWA July 2013.

assessed in detail as the visual effects were considered to be less than those from the closest mining site adjacent to the CMA. These sediment plume maps are included in the Graphics Supplement as Figures 9.7 to 9.10. The 'worst case' location close to the coastline was selected for the visual effects assessment.

8.5 Distance bands from the coast at 1.5km (inshore), 5km (near-shore) and 10km (offshore) are also shown on the plume modelling maps. These distances were selected based on distances up to 1.5km being representative of foreground views, 1.5 to 5km being middleground views and 5 to 10km being representative of background views. Views to distances beyond 10km from the coastline are considered to be relatively indistinguishable in terms of sediment plume patterns and colour. The horizon line from the beach is generally in the order of 5km distant.

8.6 Based on the plume modelling results Tables 5 and 6 have been prepared. These tables summarise the NIWA-modelled suspended sediment values for each of the identified significant sites and areas on the coast between Ohawe and Whanganui. In addition to values for each area or site at the distance zones noted in paragraph 9.5, the values for the naturally-derived sediment, the mining-derived sediment and the natural and mining combined values are given for both median values (Table 5) and 99$^{th}$ percentile values (Table 6).

8.7 NIWA advise that where there are minor difference in the higher natural sediment concentration levels compared to the lower combined sediment concentrations this difference can be attributed to the following factors[19]:

- The sediments in the model affects the currents, though normally by a small amount, by altering the water density and also the bottom roughness (which affects bottom drag). Any change, however small, in a model like this, then affects the transport processes, which can have a large effect on the concentration at any given point in space and time. In the sense the model – like the real world – displays "chaotic" behaviour.
- The different sediments, once deposited on the bottom, then compete with each other during resuspension. It appears that overall (and with exceptions) the introduction of mining-derived sediment tends to reduce the concentration of suspended natural sediments.

8.8 The median suspended sediment values within the 1.5km inshore zone vary, with the influence of river inputs being evident in the naturally derived sediment plume maps (Figures 9.1 and 9.4). While specific values at the 1.5km band vary from 8.7mg/L off Waiinu Beach , they increase further north with the highest values (17.1mg/L) occurring adjacent to Kakaramea Beach, to the north of Patea. Mining-derived sediment within the 1.5km area is low with values generally

[19] South Taranaki Bight from Sand Extraction Sediment Plume Modelling. Phase 3 Studies NIWA. August 2013

being below the 0.6mg/L Level. Within the 1.5km zone the combined natural and mining-derived sediment does not vary greatly, with the median values at the 1.5km distance band being less than those for the naturally-derived sediment levels.

8.9 At the 5km distance band, the median natural sediment values range from 2.5mg/L to 7.1mg/L, with mining derived contributions ranging from 0.1mg/L offshore from Ohawe Beach to a maximum of 0.7mg/l at the North and South Traps.

8.10 At 10km offshore where the natural sediment values vary from 1.0mg/Lto 4.4mg/L, mining derived values of up to 1.2mg/L offshore of Waipipi Dunelands occur. Table 5 also shows that at 10km offshore all sites between Castlecliff Beach and Kakaramea Beach the mining derived sediment plumes show an increase of between 0.5mg/L (Waihi Beach) to 1.9mg/L (Waitotara Estuary) over natural levels. Based on the appearance of these plumes, relative to colour differentiation, the visual effects of the differences between natural and the combined levels of suspended sediment will be minor and in most cases difficult to detect. Figures 5.2 to 5.26 in the Graphic Supplement, showing photographs of the variations in the appearance of sediment plumes, confirm this.

8.11 Table 6, which shows the 99 percentile values for the same distance zones, displays higher suspended sediment concentration levels than the median levels for the same distance zones. While these increases of up to 7.2mg/L above natural sediment levels may be visually apparent, based on the NIWA modelling these events are likely to be relatively few and could occur or be exceeded 1% of the time, being 3.65 days per year on average. The photographs of natural plumes (Figures 5.2-5.26 in the Graphic Supplement) confirm this.

**Table 5 Sediment Plume Modelling – Median Values**

| Location | 1.5km (Inshore) | | | 5km (Near-shore) | | | 10km (Offshore) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Natural | Mining | Combined | Natural | Mining | Combined | Natural | Mining | Combined |
| Ohawe Beach | 13.4 | 0.2 | 12.5 | 4.9 | 0.1 | 4.3 | 4.4 | 0.2 | 3.9 |
| Waihi Beach | 14.2 | 0.2 | 13.1 | 5.5 | 0.2 | 5.0 | 4.3 | 0.2 | 3.9 |
| Tangahoe/Manawapou | 14.8 | 0.2 | 13.8 | 7.1 | 0.2 | 6.3 | 4.1 | 0.3 | 3.9 |
| Kakaramea Beach | 17.1 | 0.3 | 15.7 | 4.2 | 0.3 | 4.2 | 2.2 | 0.7 | 3.1 |
| Patea Beach | 14.6 | 0.4 | 13.8 | 3.9 | 0.4 | 4.1 | 1.6 | 1.1 | 3.1 |
| Whenuakura Estuary | 13.7 | 0.4 | 12.8 | 3.7 | 0.5 | 4.0 | 1.6 | 1.1 | 3.0 |
| Waipipi Dunelands | 9.2 | 0.4 | 8.6 | 3.3 | 0.6 | 3.7 | 1.3 | 1.2 | 2.9 |
| North/South Traps | - | - | - | 2.9 | 0.7 | 3.6 | - | - | - |
| Waverley Beach | 12.1 | 0.6 | 11.3 | 3.2 | 0.6 | 3.7 | 1.0 | 0.9 | 2.1 |
| Waitotara Estuary | 10.5 | 0.6 | 9.9 | 2.7 | 0.6 | 3.2 | 0.8 | 0.9 | 1.9 |
| Waiinu Beach | 8.7 | 0.6 | 8.5 | 2.5 | 0.5 | 2.8 | 0.9 | 0.7 | 1.8 |
| Kai Iwi Beach | 10.1 | 0.7 | 9.6 | 3.2 | 0.5 | 3.3 | 1.4 | 0.7 | 2.1 |
| Castlecliff Beach | 10.4 | 0.7 | 10.2 | 2.7 | 0.5 | 3.0 | 1.1 | 0.7 | 1.7 |

Source of SSC values – NIWA sediment modelling

Notes:

- All values expressed as mg/L.
- Shaded values are those where the mining derived values are the same or higher than the pre-mining natural sediment values.
- The suspended sediment concentration (SSC) data, sourced from the NIWA Plume Modelling Report, is based on consecutive 12 hour averages from the modelling generated over the 2011-2013 period.
- The median concentration value in mg/L represents typical values.

**Table 6 Sediment Plume Modelling – 99 Percentile Values**

| Location | 1.5km (Inshore) | | | 5km (Near-shore) | | | 10km (Offshore) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Natural | Mining | Combined | Natural | Mining | Combined | Natural | Mining | Combined |
| Ohawe Beach | 115.2 | 1.9 | 110.6 | 43.5 | 1.5 | 41.5 | 30.3 | 1.9 | 29.8 |
| Waihi Beach | 109.4 | 1.8 | 107.5 | 38.0 | 1.5 | 36.7 | 28.5 | 2.0 | 29.0 |
| Tangahoe/Manawapou | 129.4 | 2.0 | 129.0 | 41.0 | 1.5 | 38.6 | 27.7 | 2.7 | 25.9 |
| Kakaramea Beach | 111.9 | 2.3 | 108.8 | 29.1 | 2.5 | 27.5 | 17.1 | 4.9 | 16.3 |
| Patea Beach | 80.8 | 2.6 | 83.6 | 23.9 | 3.3 | 21.8 | 13.9 | 7.9 | 15.3 |
| Whenuakura Estuary | 92.8 | 2.8 | 94.2 | 23.7 | 3.4 | 21.8 | 14.0 | 7.9 | 15.2 |
| Waipipi Dunelands | 56.0 | 2.8 | 56.7 | 21.1 | 4.0 | 19.6 | 13.7 | 8.4 | 15.0 |
| North/South Traps | - | - | - | 20.4 | 4.2 | 14.5 | - | - | - |
| Waverley Beach | 98.4 | 3.8 | 100.0 | 22.1 | 3.5 | 21.3 | 13.8 | 8.0 | 15.3 |
| Waitotara Estuary | 84.7 | 3.7 | 86.0 | 19.2 | 3.7 | 19.7 | 12.4 | 7.6 | 14.3 |
| Waiinu Beach | 106.8 | 4.6 | 110.7 | 18.9 | 3.4 | 18.5 | 13.6 | 5.7 | 15.2 |
| Kai Iwi Beach | 93.4 | 3.7 | 95.8 | 43.1 | 3.6 | 44.9 | 16.0 | 4.3 | 17.1 |
| Castlecliff Beach | 110.1 | 3.4 | 117.3 | 32.8 | 3.4 | 33.1 | 13.8 | 4.6 | 15.3 |

Source of SSC values – NIWA sediment modelling

Notes:

- All values expressed as mg/L.
- Shaded values are those where the mining derived values are the same or higher than the pre-mining natural sediment values.
- The suspended sediment concentration (SSC) data, sourced from the NIWA Plume Modelling Report, is based on consecutive 12 hour averages from the modelling generated over the 2011-2013 period.
- The median concentration value in mg/l represents typical values.
- The 99 percentile value represents the value that is exceeded 1% of the time (ie for 3.65 days per year on average).

8.12 The most noticeable difference between the two tables is where the median values for the 1.5km distance zone show a decrease in the combined sediment values relative to natural sediment values. While a similar difference occurs in the 99 percentile figures for areas to the north of Kakaramea Beach, to the south the combined sediment values increase by up to 7.2mg/L over natural sediment values. At the 5km distance band the combined sediment values to the north of Waverley Beach are generally greater than the natural sediment values, while at 10km, other than offshore from Waihi Beach, the natural sediment values north of Kakaramea Beach are less than those of the combined values.

8.13 While the appearance of surface sediment plumes relative to water colour, particularly when viewed from boats or aircraft is difficult to simulate, optical water quality studies carried out by NIWA[20], have produced an indicative surface water colour palette in the form of Maunsell colour gradations based on median suspended sediment concentration values. Figures 9.11 to 9.13 in the Graphic Supplement show the position of three sea transects, and the relevant surface colour patches for particular locations along the transects. Each colour patch is divided into two, with the lower section of the patch being representative of the natural or background surface water colour, and the upper section being a surface water colour representation of a combination of the natural and the mining derived sediment condition.

8.14 In the alongshore transect (Figure 9.11), the combined mining and natural sediment colours, which are in the light green to light brown range, are generally indistinguishable from the natural background conditions. This essentially tends to confirm that the offshore iron sand mining activity will have little visible effect on the inshore and near-shore waters (ie within 5km of the coastline).

8.15 In the south to north transect (Figure 9.12), there appears to be a trend from a deep blue surface water colour to the south of the proposed mine site, to a light brown at the inshore coastal margin of the transect. The most apparent level of colour change along this transect occurs in the area approximately 22km offshore, which is immediately adjacent to the proposed mine. From this point, the colour difference becomes less apparent due to the natural background levels of suspended sediment.

8.16 In the west to east transect (Figure 9.13), the difference between the natural background suspended sediment levels and the combined natural and mining derived levels are the most apparent, particularly around the 20-22km offshore area in the vicinity of the proposed mine. In this case the mining-derived sediment changes the water colour from a dark blue-green colour to a light blue-green colour. This colour difference becomes less apparent closer to the coastline where both the natural background surface water colour and the natural and mine

[20] Near-shore Optical Water Quality in the South Taranaki Bight. NIWA, August 2013

derived colours tend to become more “milky” and merge into light brown-green colours closer to the coastline.

8.17 The suspended sediment measurements, the plume modelling work and the optical water quality assessment, along with field observations and analysis, confirm that the visual effects of the mining-derived sediments will not generally be apparent from land-based locations along the South Taranaki Bight coastline. The most noticeable effects in terms of changes in water colour, as a result of the offshore mining activity will occur some 15-25km offshore and will tend to extend offshore, in a westerly direction towards Whanganui. As a consequence, visual effects in terms of visible sediment plumes, surface water and colour change will be more apparent from marine locations and aircraft.

## Marine Locations

8.18 The coastal marine area of the South Taranaki Bight has been identified as a regionally important tourism and recreation setting[21]. As noted in the Recreation and Tourism report, the recreational activity is based on the main public access and activity points located at Ohawe Beach, Waihi Beach, the mouths of the Tangahoe and Manawapou Rivers, Patea, Waipipi, Waiinu, Kai Iwi and Castlecliff, and the fishing and crayfishing resource up to 20km offshore. While the level of shellfish gathering along the coast is unclear, it is considered to be an important activity. The report also notes that tourism activity in the area is largely limited to the six beach camp sites and three fishing charter operations – two operating from Patea and one from Whanganui.

8.19 The Recreation and Tourism Assessment report draws the following conclusions with respect to the potential effects of the Project -

> *The mining site is a very low use recreation setting which may be used only rarely for marine fishing. Sites of interest to this assessment of effects are the inshore recreation setting, the nearcoast diving sites and the marine fishing opportunity within 20km of the coast. At a national level, the scale of recreation activity in the relevant coastal setting is relatively slight, with higher levels of activity north of Cape Egmont and south of Patea.*

The report also notes that –

> *Adverse effects of interest to recreation and tourism are therefore likely to be only local to the mining activity, and will relate to exclusive use of the marine setting, local turbidity effects (up to 10km, from the site) and short term effects on habitat on the recently mined seafloor. There appears to be little fishing in the mining site, being so far offshore, and so exclusion from the mining site is unlikely to have any effects at a regional level.*

[21] Recreation and Tourism Assessment of Effects. Rob Greenaway & Associates. August 2013

8.20 While the Recreation and Tourism Assessment report notes that very little recreational fishing occurs more than 20km offshore along the entire west coast of the North Island, and that limited fishing occurs in the immediate vicinity of the proposed mining area, some recreational boating activity will occur within “blue water” which will be subject to increases in suspended sediment levels and surface water colour variations. Water clarity/colour variations affecting seascape generally, and/or visual amenity, relative to the experience of being out on the water is, to a large extent, quite subjective.

8.21 Based on marine views, there are a number of factors that are likely to influence what one may see and experience from a recreational fishing craft. For example, the theoretical visibility of a person in a boat, where their eye level is 1.7m above sea level, is 5km. At an eye height of 2m, the horizontal distance is 5.5km, and at a height of 3m the distance is 6.7km. Accordingly and depending on where one was positioned, the extent of a discernible sediment plume and/or a change in water colour would be limited in extent and conditioned by a person’s ability to actually perceive changes in sea surface patterns and/or colour. The viewing distances noted above are also based on visibility over a flat (or calm) surface, which in the case of most offshore locations will not be often. Therefore, viewing distances may tend to be less and the surface water more disturbed as a result of swells and weather conditions. In addition, the low viewing angle between the sea and observer is likely to create higher levels of reflection, which will lessen the ability to see clear colour variations in the surface water. By comparison, views with greater angles will in most cases result in less reflection and greater visual clarity (as one might obtain from aircraft).

8.22 Based on the number of potential viewers from recreational boats, their elevation (relative to sea level), weather and light conditions, and the likelihood that they are primarily at the particular location for recreational fishing, while there may be the potential for visual effects, these are unlikely to be significant nor are they likely to significantly adversely affect the fishing activity or experience.

## Aircraft Views

8.23 From aircraft and in particular commercial flights, the visibility of the sediment plumes and any associated sea colour variations will be the most apparent, particularly under favourable weather and light conditions. Given the relatively small numbers of people who will experience these transient views, while the effects of the activity will potentially be significant in terms of pattern and scale, the visual effects of the activity are likely to be minor. Rather than being seen as an adverse effect, the plume viewed from aircraft is likely to be seen as a focal point and feature in the South Taranaki Bight seascape.

## Summary

8.24 While there will be increases in suspended sediment concentrations as a result of the Project, these levels are relatively low and will for the most part not be visually apparent from land-based viewpoints. From time to time there may, however, be differences in plume patterns from what had naturally occurred. However, these differences in near-shore natural plume patterns are likely to be sea surface colour as a consequence of sediment contribution as generated from an offshore activity. Notwithstanding this, the potential visual effects of mining-derived sediment plumes along the Taranaki/Whanganui coastline from land-based viewpoints will be relatively insignificant.

8.25 Visual effects of sediment plumes from recreational boats will be evident and highly variable depending on weather conditions and the offshore location of the vessels. There will however be observable visual effects in terms of surface sea colour change and pattern in the distant offshore waters in the immediate vicinity and to the east of the mining activity in what is currently a dark blue-green water area. The modelled mine sediment plume illustrated in Graphic Supplement Figures 9.2 and 9.13 showing an interpretation of indicative patches relative to plume effects, shows the extent of the mining-derived sediment plume in its west to east pattern and the likely sea colour range within the plume. The colour range within the plume ranges from dark blue-green to a lighter blue-green colour extending over a distance of some 35-40 km to the east of the mine site. From this point, which is approximately 10-15 km offshore, the plume then becomes a “milky” colour until it blends into the background offshore levels to the east off Waiinu Beach to a more brown-green colour as it extends towards the Whanganui River mouth area.

8.26 While the size and pattern (scale) of the sea surface colour change as a result of mining activity will be extensive and significant in its seascape context, its significance in terms of recreational/amenity values is likely to be lower, given the relatively low levels of recreational activity that occurs within the affected marine area. Notwithstanding this, the visual effect of the mining-derived sediment plume is considered to be moderate to high overall from marine-based locations within or in close proximity (3-5 km) to the plume. The sediment plume will however, only be evident during the mining activity and accordingly this effect in the blue-green marine area is reversible.

8.27 Visual effects from recreational and commercial aircraft will be the most apparent, and while these effects will be variable and dependant on weather conditions, they will tend to be experienced by transient viewers who in many instances will have no direct relationship with the area. In many instances, the visibility and the offshore pattern of the mining-derived sediment plumes are likely to be seen as a feature and focal point in the South Taranaki Bight seascape. While the overall appearance and scale of the mining-derived sediment plume will be most

apparent from aircraft, given the characteristics of the viewing audience, the visual effects are assessed as being generally in the moderate to low range.

8.28 In terms of visible cumulative effects, the mining-derived sediment will not add appreciably to the natural or background levels within the inshore and near-shore marine areas. There will, however, be increased visual effects in terms of the offshore and distant offshore marine areas where currently there are no visible sediment plumes under most conditions. From the coastline cumulative effects are not likely to be particularly visible. From some marine areas, cumulative effects may be apparent, however, given the limited extent of views and the variability of the plume, cumulative effects are not likely to be perceived as being significant or adverse. From aircraft cumulative effects will be most apparent and are likely to be widespread in extent.

# 9 Effects on Natural Features, Natural Landscapes/Seascapes

9.1 While the RMA and the NZCPS do not define the term outstanding, the regional Council define outstanding as:

> *"a site or area of exceptional value, or of eminent or distinction at a local, regional or national scale."*[22]

In this regard the following areas in the South Taranaki Bight have been classified as outstanding:

- Whenuakura Estuary
- North & South Traps
- Waverley Beach
- Waitotara Estuary
- Waiinu Reef.

9.2 Regional Policy 4.1[23] requires that these areas be managed in a way that gives priority to the avoidance of adverse effects on the outstanding coastal values within each area. The identified values of each of the classified areas are listed in Section 4.8 of this report. While there will be no direct physical effects on the specified outstanding landscapes/seascapes, the outstanding values identified in the TRC Regional Plan and outlined in the 2004 Inventory are assessed below.

9.3 **Whenuakura Estuary**. The particular values of this estuary, which is located approximately 3.5km to the south of Patea are primarily ecological and include the estuary's relatively unmodified state, its habitat for the threatened Caspian tern, rare variable oyster catcher and Royal spoonbill, its path for migratory birds, its whitebait spawning on the northern bank and its dune swale frog populations. The estuary also includes sites of spiritual significance to Iwi including the site of a Maori Kainga (village) and a pa site. There will be little, if any effect of the Project on these identified outstanding values.

9.4 **North and South Traps**. The particular values identified for these two offshore areas are the unusual pinnacle feature on a sandy coast, the large seaweed (Ecklonia) forests and the

[22] Inventory of Coastal Areas of Local or Regional Significance in the Taranaki Region. January 2004. Definitions, Page 10.

[23] iRe; areas and site sites of outstanding coastal value.

abundant and diverse marine life associated with these outstanding marine features. Given the location of the traps it is unlikely there will be any adverse effects on these values or the 'outstandingness' of these features. While there may be variations in suspended sediment plume concentrations from the Project, these are likely to be relatively minor and will not adversely affect the special features and values of the traps. Sediment plumes and their potential effects are discussed further in Section 9.

9.5 **Waverley Beach**. The Waverley Beach coastal landforms have been identified as an outstanding natural landscape. These very distinctive features of caverns, ravines, tunnels and blowholes, which create a unique landscape/seascape feature, extend over a distance of 8km. The proposed Project will have no adverse effect on this outstanding natural seascape feature.

9.6 **Waitotara Estuary**. This relatively unmodified estuary has high natural values and important cultural and historical associations related to early European settlement in the area. The particular natural values of the area include its habitat value for threatened birds including the Australian bittern, New Zealand shoveller and the black swan, migratory wading birds (Royal spoonbill, banded dotterel), and international migratory birds (eastern bar-tailed godwit). Sub-fossil totara stumps in the estuary are a particular feature of the estuary and the area is also an important whitebait spawning area. The Offshore Iron Sands Mining Project will have no adverse effects on this outstanding natural feature or its particular and distinctive estuary values.

9.7 **Waiinu Reef**. The Waiinu Reef is made up of limestone outcrops extending from mean high water springs to several km offshore. The hard rock reef contains many well-preserved fossils of oysters, toheroas, cockles, paua and barnacles. The reef also contains abundant marine life forms and has important cultural associations associated with fishing and gathering kaimoana. The effects of the Offshore Iron Sands Mining Project will have no adverse effect on the outstanding natural feature or its characteristic values.

## Summary

9.8 In terms of NZCPS 15(a) which seeks the avoidance of adverse effects on outstanding natural features, landscapes/seascapes in the coastal environment, the Project by its remote offshore location effectively avoids direct adverse effects on the identified outstanding natural features, landscapes and seascapes in the South Taranaki Bight. In addition, and with respect to NZCPS 15(b) which seeks to "avoid significant adverse effects and avoid, remedy or mitigate other adverse effects in the coastal environment", the Project achieves these objectives. Indeed, the Project through its ongoing iterative scoping and design phases has sought to avoid or minimise adverse effects, particularly in terms of confining the seabed mining footprint, reducing operational sediment discharges, and minimising the re-deposition of de-ored sands to previously disturbed seabed area.

9.9 Where there may be effects as a result of variations of suspended sediment concentrations from offshore-generated plumes from the Project, the effects of these are not likely to be significant in the inshore and near-shore marine areas. The visual and natural character effects of sediment plumes are discussed further in Sections 9 and 10.

# 10 Natural Character Effects

10.1 As noted in Section 3.5, natural character in its RMA context is a term used to describe the "naturalness" of the coastal environment in terms of its natural elements, natural patterns and natural processes. Unlike the terrestrial environment, which has been modified by land use and development activities, the marine environment has undergone little physical change or modification and consequently displays high levels of natural character both in terms of its biophysical and visual attributes.

10.2 From a visual perspective there are few modifications to the marine component of the South Taranaki Bight seascape other than the harbour training walls at the mouths of the Whanganui and Patea Rivers and relatively isolated and contained beach settlements. The Kupe platform, which is beyond the CMA, is particularly visible from parts of the coastline on clear days. Accordingly, the seascape in visual terms is relatively consistent and "pristine like" in appearance, other than where it adjoins the coastline in several locations. In its biophysical context there are, however, distinctive natural patterns and processes occurring throughout the marine environment.

10.3 In line with NZCPS Policy 13(2), which states that "natural character is not the same as natural features and landscapes or amenity values", these aspects, while related, have been considered in Sections 7-9. Accordingly, this Section of the assessment report considers natural character in terms of matters (a) to (h) which are listed in Policy 13(2) particularly as they relate to subsurface marine elements, patterns and processes. The specific matters listed in Policy 13(2) are also listed in this report in Section 3.7. While many of the marine-related biophysical matters listed in NZCPS (Policy 13(2)) are integral to natural character, they are being specifically considered and assessed by others. This section therefore incorporates as and where appropriate, summary conclusions reached by others in order to better inform judgments of natural character effects overall.

## NZCPS – Policy 13(a) and (b)

**Bathymetry**

10.4 The distinctive feature of the bathymetry of the South Taranaki Bight are the Patea Shoals, which are generally defined as being a roughly triangular area encompassing the inland of the 50m isobaths between Manaia and Whanganui. To the north around Cape Egmont and to the south of the Whanganui River, the shoals give way to a steeper sloping sea bed which is clearly evident in the bathymetric contours. The proposed iron sands recovery site is located within the Patea Shoals at a depth of around 30m, with the deposition area being located further to the west in waters in the order of 20-40m in depth. While there are local rocky reefs within the

Patea shoals including Four Mile Reef which is approximately 6.5km offshore of Ohawe Beach, North and South Traps to the south and some 5k, offshore of Patea, and the Waiinu Reef, which is a limestone reef extending from the shoreline out to several kilometres offshore from Waiinu Beach, the sea bed within the shoals area is largely composed of layers of sand and silty muds. Both the North and South Traps and the Waiinu Reef are classified in the Taranaki Regional Coastal Plan as being areas of outstanding coastal value. The North and South Traps are also classified as an outstanding natural feature in the Plan.

10.5 The iron sand operation will result in reasonably extensive changes to the seabed morphology which will generally take the form of elongated "lanes" about 1m deep following the redeposition of de-ored material, with mounts up to 9m in height and pits 10m in depth at the ends of the lanes. NIWA have determined that the 1m deep lanes will have little or no effect on the wave climate. NIWA have also determined that the residual mounds and pits at the ends of the lanes will take some time to return to a condition similar to that of the elongated lanes where redeposition to a 90% level has been achieved. Based on the current mining plan, the time scale for the residual pits to reach the 90% level (ie 1m below the pre-mined level) will be in the order of 100 years or approximately 5 times the life of the mining operation. The time scale for the dispersion of the residential mounts is estimated to be in the order of 50 years.

**Shoreline Stability**

10.6 Other than the natural processes that have and are shaping the coastal margin, most of the shoreline within the potential effects area is unmodified and is in a near pristine state. Apart from coastal settlement areas and river harbours such as the Whanganui and Patea River mouths where some modifications have occurred, it is likely the shoreline, which is influenced by geological and climatic factors, will continue to do what it has done in the past. On the coastal cliffs, which comprise large part of the study area, active erosion of volcanic and sedimentary material occurs throughout the area. Towards the south of the potential effects area where dunes and sand country dominate the shoreline appears to be stable with accretion occurring in many areas.

10.7 NIWA studies confirm that sand extraction offshore will affect the wave climate at the shore to varying degrees depending on the location and scale of the mining seabed modification (pits and mounds). Initial analysis indicates that the effect of sand extraction on waves reaching the shore, suggests that changes in wave characteristics are mostly small, with changes in wave height of the order of around 10cm and change in direction of less than 1 degree. These conditions are likely to have little or no influence on beach state and geomorphic character.[24]

[24] Coastal Stability in the South Taranaki Bight. Phase 2, Potential Effects of the Offshore Sand Extraction on Physical Rivers and Coastal Stability. NIWA 2013.

10.8 Recent and ongoing investigations being carried out by NIWA suggest that the offshore iron sands recovery and deposition activities are unlikely to have adverse effects on coastal beach profiles, or the overall stability of the shoreline beach profiles between Hawera and Whanganui.

**Suspended Sediments**

10.9 Within the South Taranaki Bight, generally from Opunake to the south of the Whanganui River mouth, wave-driven processes tend to transport sediments along the coast towards the southeast, compared to what occurs along the Manawatu coast where suspended sediment transport occurs in a northward direction. Within the 50m isobaths which in part generally defines the Patea Shoal, wave heights vary from a mean of 2m off Cape Egmont reducing progressively southwards, with wave heights in the order of 8m occurring in the spring. While not as strong as tidal currents in Cook Strait, currents up to $0.4ms^{-1}$ occur in the relatively shallow waters off Patea. Peak tidal flows through the study area are generally aligned to the coast with moderate cross shore velocities occurring elsewhere.

10.10 While rivers input the majority of sediment to the Taranaki, Whanganui and Manawatu coasts, the Taranaki coast is generally considered to be sediment starved. Notwithstanding this, large quantities of sediment are transported to the coast during episodic floods and lahar events. These sediments tend to be distributed alongshore and offshore, and are eventually transported south beyond the South Taranaki Bight.

10.11 Throughout the South Taranaki Bight suspended sediments in the form of sediment plumes are evident at all times of the year within the inshore and near-shore coastal waters. While floods generate more extensive and widespread sediment plumes over shorter periods of time, during extended dry periods, such as that experienced during the summer of 2013, more localised plumes generated by the re-suspension of bottom sediments along with contributions from natural coastal erosion processes are apparent and are a distinctive feature within the South Taranaki Bight. Whereas during period of flooding the sediment plumes are more evident at and in the vicinity of the river and stream mouths, during extensive dry periods when the rivers are relatively clean, the visible plumes continue to occur along and adjacent to the steep eroding cliff faces. The pattern of these plumes also varies depending on the influence of tides, wave, currents and the weather conditions.

10.12 Based on investigations carried out by NIWA in 2012, “river derived sediment is confined to a coast-hugging strip about 10 km wide”. Within this area surface suspended sediment concentrations were found to reach values as high as 150 $mg/L^{-1}$ near the mouths of the Whanganui and Manawatu Rivers, with bottom concentrations reaching values in excess of 1,000 mg/L in a narrow strip near the Whanganui River mouth. More recent work by NIWA over the dry summer months of March and April 2013 show surface concentrations of suspended

sediments being in the range of 2.7 to 61.8mg/$L^{-1}$ over a range of sampling sites within the study area over distances of up to 1km from the shoreline.

10.13 The visual effects of the modelled sediment plumes from the proposed Offshore Iron Sands Mining activity were reviewed in Section 9. The conclusions reached in that section do not take into account potential biophysical effects. Relevant biophysical effects are reviewed below.

**Benthic Invertebrates**

10.14 While recent investigations carried out by NIWA[25] indicate there are no nationally endangered or at risk benthic macrofaunal specifies within the mining site area, the Department of Conservation describes the Waitotara Estuary, Waiinu Reef, Waverley Beach, the North and South Traps, Whenuakura Estuary and the Whanganui River Estuary as all being "outstanding natural areas". Notwithstanding the outstanding nature of these areas, NIWA found that in general within the study area there is a low abundance of benthic organisms in both the subtidal and intertidal zones compared to other coastal areas in New Zealand. The possible reasons given for the low species richness and abundance in the sandy habitat were the high energy environment and frequent bed resuspension resulting in very mobile sediments, sand inundation of reefs, sand scouring of reef habitats and sustained high water turbidity in near shore areas. The NIWA investigations also found that species numbers and diversity tended to increase towards the shore, within the highest numbers occurring in the inshore areas.

**Reefs**

10.15 With regard to reefs NIWA[26] report that rocky outcrops within the broader South Taranaki Bight region mostly occur beyond the range of the predicted plume. At least 10 outcrops (including the North and South Traps) occur in an area predicted to be only lightly affected by suspended sediment deposition. Outcrop-associated species, especially bryozoans, erect sponges and large canopy-forming species, such as kelps and seaweeds, however, are likely to be susceptible to small increases in suspended sediment deposition. In contrast, turf-forming macroalgae (such as filamentous reds) have sediment-trapping morphologies that enable them to dominate space under high depositional conditions.

10.16 One of the two mudstone outcrops lies within an area predicted to be lightly affected by suspended sediment deposition. The other occurs in a predicted high deposition area, adjacent to the Whanganui coast. This outcrop is already draped in fine depositional sediment and supported very few macrobenthic organisms – mostly small patches of turf-forming red macroalgae. However, surface films of benthic diatoms were common on both the adjacent rippled sediments, and to a lesser extent on the outcrop itself.

[25] South Taranaki Bight Factual Baseline Environmental Report. NIWA Client Report, September 2011.

[26] Benthic Habitats, Macrobenthos & Surface Sediments of the Near-shore South Taranaki Bight. NIWA 2013.

10.17 Given the relatively low sediment deposition rates, the adverse effects on reefs are likely to be low.

**Freshwater Springs**

10.18 There are no known freshwater springs in the vicinity of the project area.

**Ocean Productivity**

10.19 Initial reviews and investigations by NIWA[27] indicate that within the South Taranaki Bight chlorophyll values are very high throughout the year and that the area is biologically productive in terms of mesozooplankton (mid-sized). While this species' composition is largely confined to the near seashore, it is strongly influenced by the oceanography of the wider regional coast. Biomass estimates in the South Taranaki Bight are considered to be among the highest recorded relative to other coastal regions around New Zealand.

10.20 **Reef Fish:** The South Taranaki Bight has a moderately diverse reef fish fauna. None of the modelled species are nationally rare or threatened. However, two species, common conger eel and tarakihi, are predicted to be rare in the region, occurring at low abundance on just a few coastal reefs. Additionally, six other species are likely to have restricted distributions, predicted to occur at fewer than 50% of the reef sites in the region. All other 29 species are predicted to be much more widespread occurring at the majority (24 species) or all (5 species) reefs within the region.[28]

10.21 **Demersal Fish:** The richness of this assemblage of species is moderate on a New Zealand scale with 51 species occurring within the region. While a few species are very widespread and abundant, most species are common only within a restricted depth range. Species that occur within the immediate study area include anchovy, blue cod, angel rays, red gurnard, golden mackerel, leather jacket, lemon sole, snapper, rig and trevally. None of the reef fish, demersal fish and pelagic fish are nationally rare or threatened.[29]

10.22 **Commercial Fisheries:** The assessment of potential impacts on commercial fishing[30] notes that the South Taranaki Bight is an exposed area, which supports a productive and diverse range of valuable inshore fisheries. The main commercial fisheries in the immediate area of the proposed TTR operation are a mixed bottom trawl fishery and a set net fishery. Nearby fisheries include a coastal rock lobster fishery and, on the seaward side of the mining site, a mid-water trawl fishery for jack mackerel and a small bottom longline fishery.

[27] South Taranaki Bight Factual Baseline Environmental Report. NIWA Client Report, September 2011.

[28] South Taranaki Bight Fish & Fisheries NIWA Client Report. January 2013

[29] South Taranaki Bight Fish & Fisheries NIWA Client Report. January 2013

[30] South Taranaki Bight Iron Sand Mining Proposal. Assessment of Potential Impacts on Commercial Fishing. Fathom Consulting Ltd. Draft Report May 2013.

10.23 Although trawling effort occurs year round, the species taken show a distinct seasonality, with catches of many species peaking during the summer months. Four set net vessels fish out of New Plymouth, often operating in all three target fisheries at different times of year, and several other vessels travel up from the South Island.

10.24 While the proposed mining operation overlaps with the bottom trawl fishery and the set net fishery, the commercial fishing assessment reports that the extent of spatial displacement of the trawl fishery is likely to be minor as trawling effort is mainly concentrated beyond the 50m depth contour seaward of the mining site. The mining operation will also displace set net catch and effort for school shark. The overall proportion of school shark taken from the mining area is likely to be small. However, even a minimal amount of displacement may be considered significant by the affected fishers due to the history of spatial exclusion in the near-shore parts of the set net fishery where rig and blue warehou are targeted.

10.25 As the amount of displaced catch in both the trawl and set net fisheries will be small, it is unlikely that there will be any wider negative impacts on the commercial fishing industry – in particular, no negative impacts on quota value, downstream businesses, or fish stock sustainability are anticipated.

10.26 The report also notes that aside from spatial exclusion, commercial fisheries may be affected by changes in distribution or abundance of commercially fished species either in the mined area, or in adjacent waters or coastal reefs as a result of the mining. In the mining-derived area, key considerations are whether the seafloor will be restored to its current state and how quickly it will be re-colonised by commercially fished species. Further out in the EEZ the mining operation is unlikely to have any negative effects on the mid-water trawl and bottom longline fisheries as the target fish species can migrate out of any areas affected by sediment dispersal. The degree of impact on fisheries along the Taranaki coast, including the valuable rock lobster fishery and the developing shellfish fisheries, will depend on the amount of sediment that is introduced into the reef environment. With appropriate management of sediment dispersal, no significant off-site impacts on commercial fisheries are anticipated.

10.27 **Whales and Dolphins:** There appears to have been relatively few sightings of cetaceans within the northern and southern Taranaki Bight area. However, three endangered or critically endangered species do frequent the area, namely the Maui dolphin, killer whale and southern right whale. The New Zealand population of these species is considered to be extremely low. As a result of extensive aerial surveys (approximately 7000km of transects), Cawthorn & Associates have observed that during the course of their surveys a pod of common dolphin (6-8) were observed in the October 2012 survey. A variety of other fauna were also observed

including seabirds, fish (usually mullet or kahawai) and sharks. Overall, the abundance of marine cetaceous in the area was found to be very low.[31]

10.28 NIWA[32] also report that the proposed mining sites in the South Taranaki Bight appear to be of low suitability for all three species of threatened cetaceans. Areas of increased habitat suitability for Hector's dolphins and southern right whales lie close inshore and may be increasingly used as the New Zealand populations of these species recover. An area of average to above average habitat suitability for killer whales begins approximately 8km seaward of the proposed mining site.

**Sea Birds**

10.29 Within the South Taranaki Bight there is a modest range of coastal bird species including blue penguin, shags, gulls and tems. In addition, albatross and petrel, which tend to be more pelagic and widespread in their distribution area, are also likely to be found in the study area. While the area does not support large breeding colonies for any species, a number of the estuary areas including the Waikirikiri Lagoon and the Whanganui, Whangaehu, Turakina, Manawatu and Rangitikei river estuaries are of significant value to coastal shore, wading and migratory bird species. There are unlikely to be any adverse effects on sea birds.

## NZCPS – Policy (2)(c)

10.30 While natural landforms such as headlands, peninsulas, cliffs, dunes, and reefs have been discussed in terms of their respective TRC classifications, there are unlikely to be any adverse effects on the natural character of these features. There are no freshwater springs in the vicinity of the proposed mine and the Recreation and Tourism report confirms that changes in wave patterns onshore are likely to be slight and very unlikely to change surfing amenity.

10.31 Effects on surf breaks arise from changes in the wave climate. The changes in wave directions mostly follow the changes in wave heights. Given the location over 20km offshore of the closest breaks, it is likely to be insignificant. Due to the process of refraction over this distance, wave crests will likely be realigned to the seabed contours offshore of the breaks to a similar direction as they would without the presence of the seabed modifications.

10.32 The changes in wave height along the coast at the 10m contour area less than 100mm for waves 3m high. Therefore impacts on wave heights are considered insignificant with respect to impacts on surfing quality.[33]

[31] Cetacean Monitoring Report. Cawthorn & Associates Ltd. July 2013

[32] Habitat Models of Southern Right Whales, Hector's Dolphin & Killer Whales in New Zealand, NIWA Client Report. May 2013.

[33] Potential Effects of Trans-Tasman Resources Mining Operations on Surfing Breaks in the Southern Taranaki Bight. Ecoast Marine Memo 21 July 2013.

## NZCPS – Policy (2)(d)

10.33 The overall conclusion from scenario-based on modelling by NIWA[34] is that waves by refracting (bending the wave direction) and shoaling (changing the wave height) as they pass over the modified seabed. The changes in both wave height and direction will be very small. Accordingly, the natural movement of water sediment will not be affected by the Project.

## NZCPS – Policy (2)(e)

10.34 While there will be potential effects on the darkness of the night sky, these effects are likely to be relatively minor given the distance offshore being in excess of 22km and the limited number of night-time viewing points that are available and likely to be adversely affected. Lighting on the vessels will focus on deck level operations on the deck of FPSO to ensure a safe 24 hour working environment. Lighting will be planned and designed to minimise light spill.

## NZCPS – Policy (2)(f)

10.35 Most of the coastal seascape is both 'wild and scenic' and as noted previously it generally displays high levels of natural character, due largely to the lack of the development and change in the coastal environment. Given the nature and scale of the project and its distant offshore location, the effects of the Project on the wild and scenic values of the South Taranaki Bight seascape will be low.

## NZCPS – Policy (2)(g)

10.36 As noted in Section 5, the natural character of the South Taranaki Bight ranges from pristine to modified, and the seascape, in general, is assessed as being high overall. There are, however, several locations such as at the mouths of the Whanganui and Patea Rivers where there have been significant river and port-related modification within the CMA. There are likely to be no changes to the natural character of the area's classifications as a result of the proposed Project.

## NZCPS – Policy (2)(h)

10.37 Experiential responses to the Project and its potential effects will likely vary depending on people's personal attitude and response to the Project. Notwithstanding this, the "sounds and smell of the sea" will not change and while the activity may be visible from time to time and from some sea locations within 5-10km of the activity, the context and setting of the South Taranaki Bight seascape will not be compromised or adversely affected by the proposed Offshore Iron Sands Mining Project.

[34] Coastal Stability in the South Taranaki Bight – Phase 2 Potential Effects of Offshore Sand Extraction on Physical Rivers and Coastal Stability – NIWA 2013.

## Summary

10.38 Excluding the biophysical/ geomorphological component of natural character, the overall significance of effects is judged to be relatively low. The exception to this are the effects related to NZCPS Policy 13(2)(b) “biophysical, ecological, geological and geomorphological aspects” which include the direct effects of the mine pits and mounds on the sea floor and the time frames in which this area is predicted to recover. While there will be no adverse effects on the inshore and near-shore coastal waters or the coastline as a result of the offshore mining activity, the effects at and in the vicinity of the mine site are likely (subject to what mitigation measures are developed) to be significant.

# 11 Significance of Effects

11.1 In Section 6 of this report, the framework for the effects assessment is outlined and discussed in detail in Sections 7 to 10. While there is scope for interpretation, relative to aspects of the NZCPS, this report has sought to be clear and transparent in its approach to the identification and assessment of the effects of the proposed Offshore Iron Sands Mining Project. Accordingly, the methodology adopted for the assessment follows to a large extent the Best Practice Guidelines prepared by the UK Landscape Institute[35]. While the planning framework and some of the terminology differs from what is appropriate in the New Zealand context, the guidelines provide a useful framework for the South Taranaki Bight seascape assessment.

11.2 The four specific topic areas identified for this assessment are –

i) Visual effects of offshore vessels (Section 7);

ii) Visual effects of sediment plumes (Section 8); and

iii) Effects on natural features, landscapes/seascapes (Section 9);

iv) Natural character effects (Section 10).

11.3 Throughout this report these topic areas are discussed in terms of the nature of the proposed activity and its magnitude of effect (size/scale, duration/reversibility and cumulative effects). The sensitivity of the receiving environment in terms of viewer characteristics, and environmental conditions relative to the project and its effects, are also discussed. The combination of the magnitude of the project relative to the sensitivity of the "receptors" (people and the biophysical resources) provides the basis for the significance of effects assessment.

11.4 Within the framework of the topics noted in 11.2 above, the significance of effects has been assessed using a word scale rather than a numerical scoring or the weighting of criteria. The seven point scale, developed by the New Zealand Institute of Landscape Architects[36] (NZILA), has been adopted as the basis for the assessment. The seven categories of significance are:

- Extreme
- Very High
- High
- Moderate
- Low

[35] Guidelines for Landscape and Visual Impact Assessment 3rd Edition (2013). Produced jointly by the Landscape Institute and the Institute of Environmental Management and Assessment and supported by the English Heritage, Scottish Natural Heritage and Natural Resources Wales.

[36] Best Practice Note 10.1: Landscape Assessment and Sustainable Management (2010). NZILA Education Foundation.

- Very Low
- Negligible

11.5 Based on the magnitude of effect relative to the sensitivity of the receptors, the significance of effects are judged to be as follows[37]

**(i) Visual Effects from Offshore Vessels**

- During the day: - Very low
- At night - Low

**(ii) Natural Features Landscapes/Seascapes**

- Seascape - Low
- Outstanding Natural Features - Low
- Amenity Values - Negligible
- Visual Amenity - Very low

**(iii) Visual Effects of Sediment Plumes**

- Coastal locations: - Negligible
- Marine locations - Moderate/High
- Aircraft - Moderate/low
- Cumulative effects - Low

**(iv) Natural Character**

- Elements, patterns and processes - Moderate
- Biophysical/geomorpological - High/Very High
- Landforms, reefs/surf breaks - Low
- Movement of water/sediment - Negligible
- Darkness of night sky - Low
- Wild and scenic values - Negligible
- Pristine/modified range - Very low
- Experiential attributes - Negligible.

[37] The significance of effects rankings are based on the information available as at 13 September 2013.

# 12 Conclusions

12.1 In order to summarise the levels of significance based on the four topic areas noted in Section 11, the following four point scale, where major and moderate are representative of significant effects and minor and negligible are representative of effects which are not significant, has been adopted:

- Major
- Moderate
- Minor
- Negligible

## Offshore Vessels

12.2 Given the distance between the viewing points and the vessels, in conjunction with the contextual nature of the surface water activities, the overall significance of the offshore above water activity is judged to be **minor**.

## Natural Features and Landscapes/Seascapes

12.3 Based on the identified amenity and recreational activities that occur on the coast and within the inshore/near-shore areas of the CMA, the overall significance of effect is judged to be **minor**.

## Sediment Plumes

12.4 While mining-derived sediment plumes in coastal locations will not generally be visible, sediment plumes in the distant offshore South Taranaki Bight area will, as a result of the iron sand mining operation, be evidence in the dark blue-green surface waters that area currently free of sediment plumes. Given the variability of the plumes and the restricted transient nature of experiencing them, the overall significance of effect is judged to be **moderate**.

## Natural Character

12.5 Excluding the biophysical/ geomorphological component of natural character, the overall significance of effect is judged to be in the minor category. The exception to this are the effects related to NZCPS Policy 13(2)(b) “biophysical, ecological, geological and geomorphological aspects” which include the direct effects of the mine pits and mounds on the sea floor and the time frames in which this area is predicted to recover. While there will be no negligible effects on the inshore and near-shore coastal waters or the coastline as a result of the offshore mining

activity, the effects at and in the vicinity of the mine site are likely (subject to what mitigation measures are developed) to be **major**.[38]

[38] While the effects on the sea bed are not visible, nor are they likely to have significant effects beyond the immediate vicinity of the mine, the effects on natural character are likely to be perceived by some as a significant perceptual issue.