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Ports North

CAIRNS SHIPPING DEVELOPMENT PROJECT

Revised Draft Environmental Impact Statement

APPENDIX T: Landscape and Visual – Existing Environment Report (2016)

Landscape and Visual – Existing Environment

Cairns Shipping Development Project - Revised Draft EIS

WE16066

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1 Introduction

1.1 Background

This study forms part of a suite of documents in support of the Revised Draft EIS with respect to the 'Existing Situation' of the Cairns Shipping Development Project (CSD Project). Originally conceived to upgrade the infrastructure for the Port of Cairns to accommodate larger cruise ships and future expansions of HMAS Navy base operations, a Draft EIS was referred to the Queensland Government in support of this (2014).

The revised EIS refers to assessment of the recalibrated project based on s.1.4 of the EIS Overview which proposes land based placement options for dredge spoil in addition to redefining the extent of channel dredging and dredge volumes.

This visual assessment report builds on the Draft EIS chapter B12 'Landscape and Visual'' assessment undertaken for Ports North and assesses the recalibrated project with respect to the possible options for land placement of capital dredge material options in response to the relevant Terms of Reference section 5.2.2 ('Scenic amenity and lighting'). Specifically, this report identifies the existing landscape and scenic attributes of the area, including the Outstanding Universal Values (OUVs) of the Great Barrier Reef World Heritage Area (GBRWHA), and preliminary viewshed mapping will help inform a constraints-based site planning process and the next stage of the Revised Draft EIS study (Impact Assessment).

1.2 Project Description

The original CSD Project (2012-2014) was recalibrated in 2015 to redefine the extent of channel dredging by considering changes to target cruise ships and assessing the impact on channel design to reduce dredge volumes and costs. A dredge material placement options study was undertaken to expand the land base placement options assessed in the draft EIS, and recommended nominal sites within two placement precincts should be assessed by the Revised Draft EIS. The locations of sites within the two placement precincts (described as Dredge Material Placement Areas (DMPAs) are shown in Figure 1-1 and referred to as:

> Northern Sands: on the Captain Cook Highway, this site is an existing void in the Barron River delta used as a sand and gravel extraction area and landfill (Figure 1-2 to Figure 1-5); and
> East Trinity:this site is an undeveloped area comprising three possible material placement areas referred to as East Trinity site A, B and C (Figure 1-6).

The recalibrated CSD project will also involve land based infrastructure during construction and operations, including pipelines, tailwater treatment infrastructure, bunding, and ancillary structures and buildings. Although the placement of dredge material will be via pipelines (the alignment of which has yet to be confirmed) it is probable that, where stiff clay is present, an alternative to pumping, transport and placement techniques will be required.

For the purposes of this Existing Situation assessment, the following project details are assumed.

> A slurry consisting of dredged material and a large volume of seawater will be pumped ashore from an off-shore pump-out facility via a pipeline that will run above ground once it leaves the ocean. In the case of Northern Sands, the pipeline will run across the Barron Delta as shown on Figure 1-2 (Aquis Option), using one of the routes shown or a variation of these Figures 1-3 to 1-5, Intermediate booster stations will be required whatever route is selected.
> At Northern Sands the proposal is to discharge the dredge spoil into the existing water-filled void (expanded if necessary).
> At East Trinity, the pump-out facility will be in Trinity Inlet (locations generally at the seaward end of the inlet pipelines shown) and the pipeline will deliver the slurry to the sites as shown on Figure 1-6. Perimeter bunding will be required to constrain and treat the material and tailwater, as well as withstand tidal storm levels and significant storm events.
> The proposed final form will be a void that will either be filled to a level below existing water level or, if filled to ground level; capped and revegetated. There will be temporary visual impacts during construction e.g. pipelines, tailing ponds, etc.
> The conceptual design of perimeter and internal bunds proposed as part of the 2014 EIS (section S.5.2.3 of Part D for the East Trinity site) is relied upon for the purposes of this assessment:

- Bund walls to be constructed with an impermeable clay barrier with 1:3 side slopes and a 'crest' width of 5m at a level of 3.5m AHD to withstand a high tide level of 2m HAT and storm surge; and
- Dredge material fill height allowance 3.2m AHD.

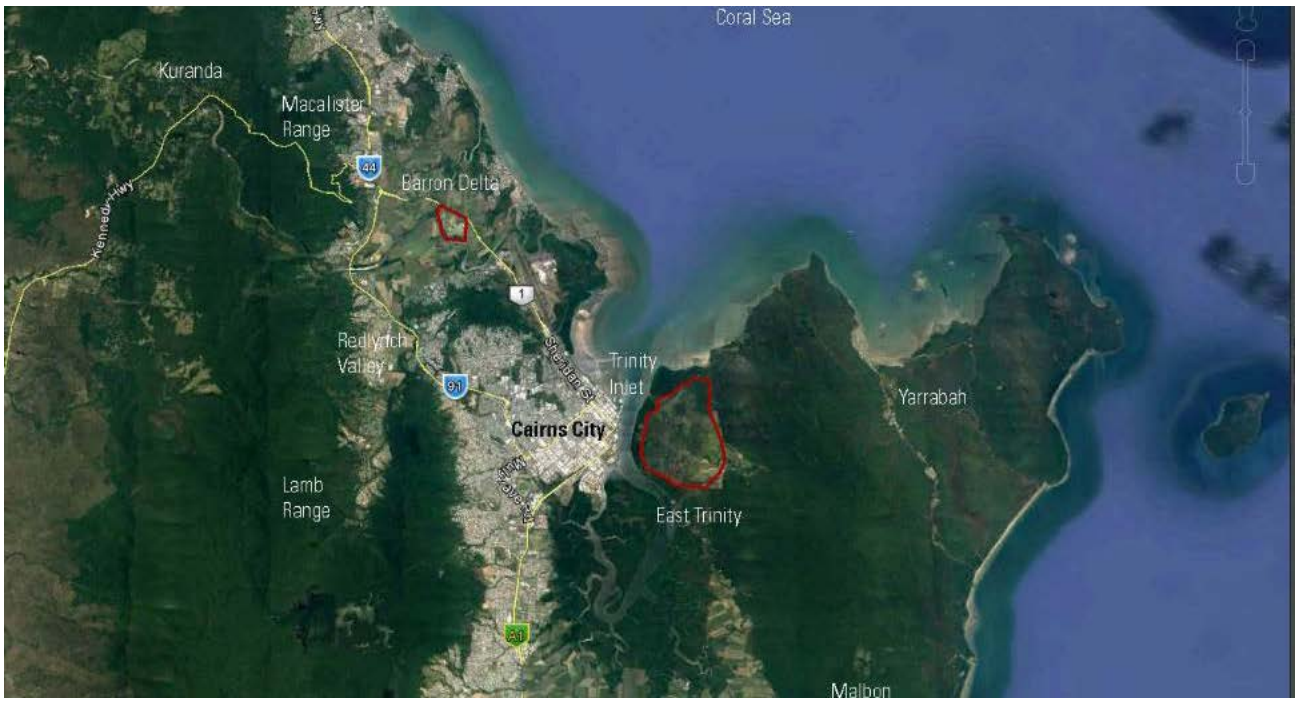


Figure 1-1 Site Location

Figure 1-2 Northern Sands – Northern Sands - Aquis possible pipeline option (ocean based booster pump)

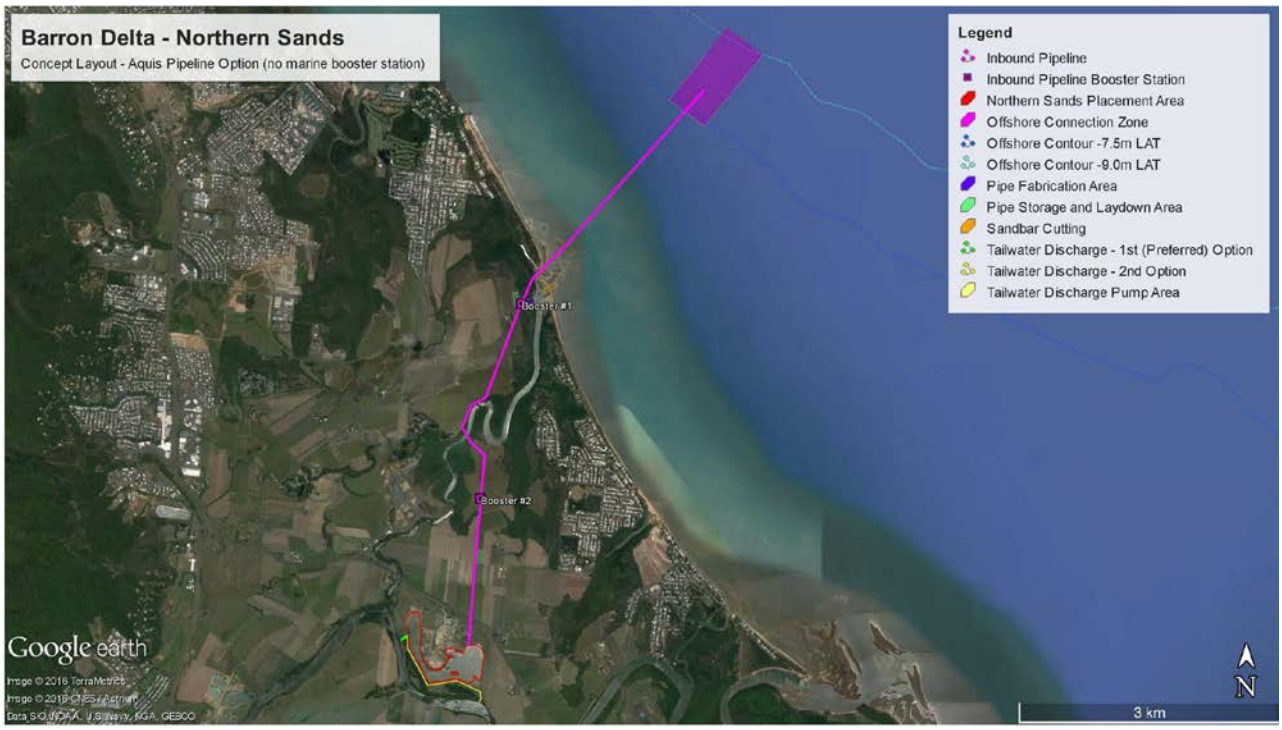


Figure 1-3 Northern Sands - Aquis possible pipeline option (land based booster pump)

Figure 1-4 Northern Sands – Machans Beach possible pipeline option

Figure 1-5 Northern Sands –Yorkeys Knob possible pipeline option

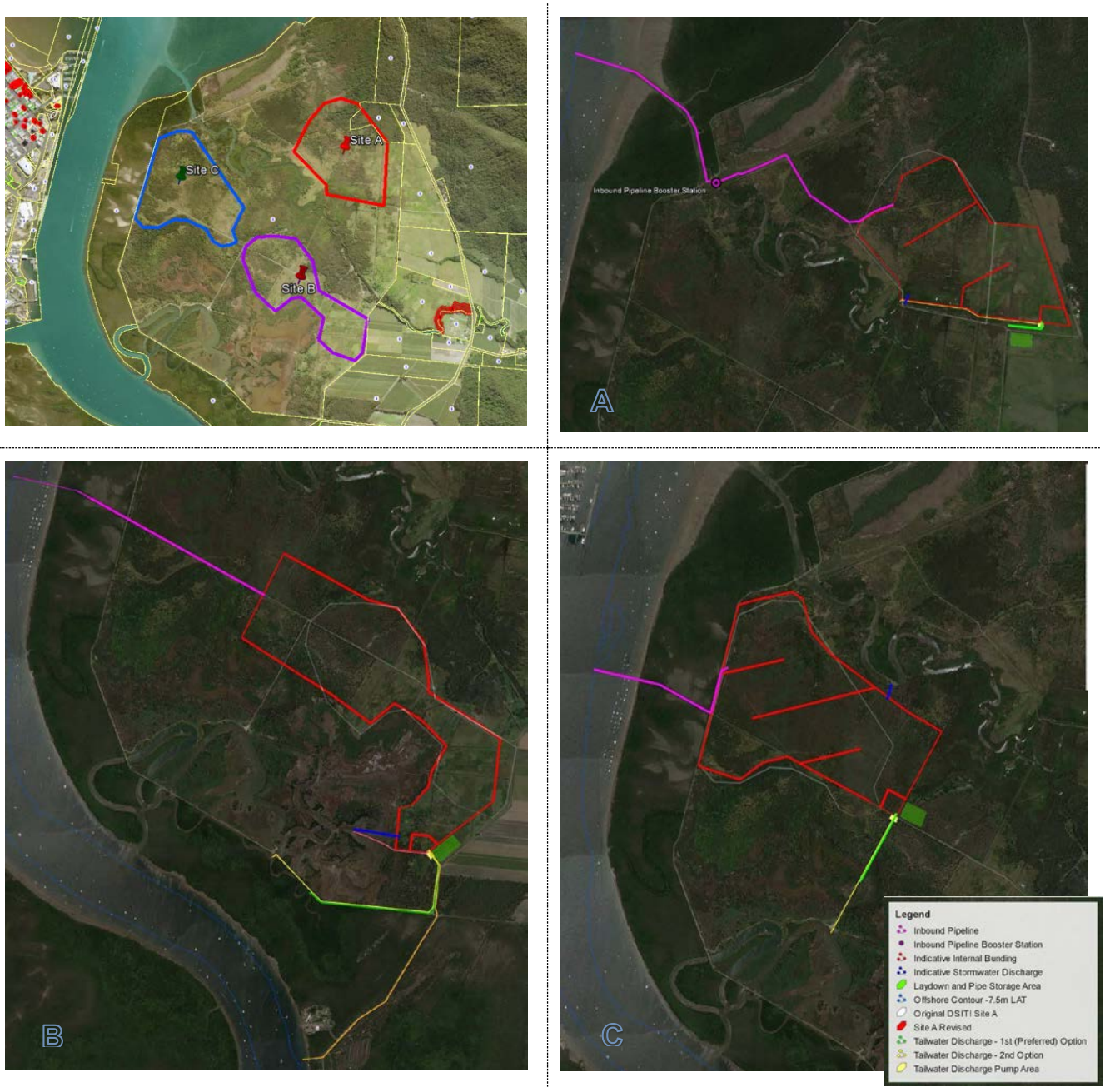


Figure 1-6 East Trinity (top left) (including possible sites 2A, 2B and 2C)

1.3 Visual Impact Assessment Study Area

The study area for the visual and landscape assessment is similar to the EIS Study area (Figure 1-7) and includes the township of Cairns, surrounding lands, farms and residences, and extends offshore into Trinity Inlet, Trinity Bay and the nearshore and offshore waters of the Great Barrier Reef Marine Park and World Heritage Area.

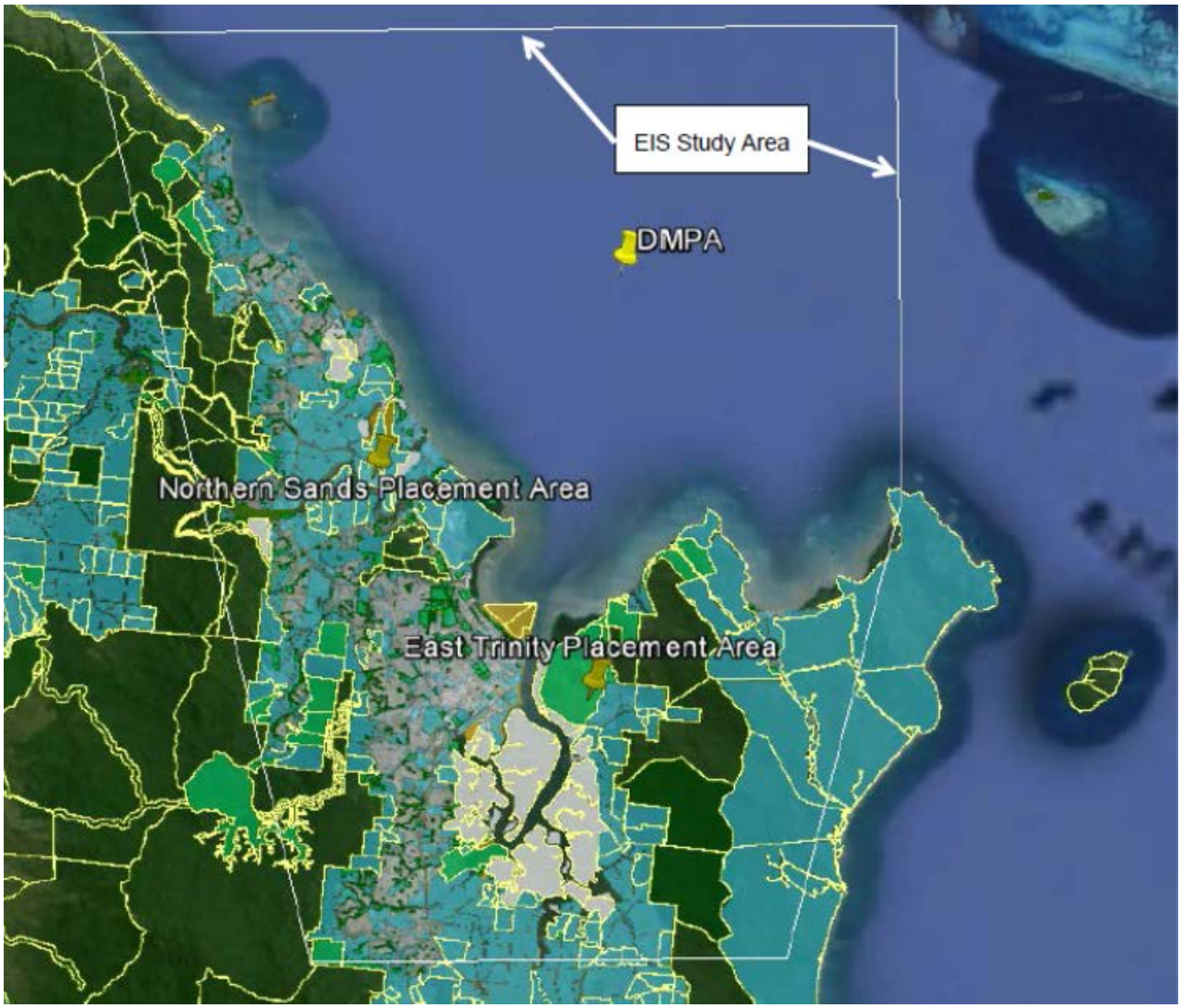


Figure 1-7 Study Area (Figure A2-1 from Flanagan Consulting)

2 Approach and Methodology

2.1 Introduction

As required by the Terms of Reference, this study describes and identifies the existing landscape and visual character of the landscape and the general impression that would be obtained while travelling through and around it in terms of major views, viewsheds, outlooks and features contributing to the amenity of the area, scenic integrity and landscape character values, as well as the aesthetic values of the GBRWHA.

This study forms part of a suite of technical studies on the Existing Situation of the DMPA options and considers the resources, values, threats, opportunities and constraints in terms of the existing visual environment.

The existing visual environment is considered in a local, district and regional context, including scenic values, landscape character, views, view corridors and landscape sensitivity, which are analysed to identify site opportunities and constraints for the possible project areas. This assessment will contribute to the identification of the preferred CSD project location, concept and is based on a combination of desktop review of air photos, topographic data and information from previous studies undertaken in the region, and validated or amended by field inspection of the area.

Additional documents reviewed for this study include:

> CSD Project Draft EIS (Ports North, 2014);
> Cairns Regional Council CairnsPlan 2016 Version 1.0 (Cairns Regional Council, 2016);
> Cairns Region Scenic Amenity Study (Cardno Chenoweth, 2012);
> Operational Guidelines for the Implementation of the World Heritage Convention (UNESCO, 2015);
> Defining the Aesthetic Values of the Great Barrier Reef: Final Report for SEWPaC (Context, 2013);
> Reef 2050 Long-Term Sustainability Plan (Commonwealth of Australia, 2015);
> Great Barrier Reef Region Strategic Assessment: Strategic assessment report (Great Barrier Reef Marine Park Authority (GBRMPA), 2014);
> State of Queensland 2013, Great Barrier Reef Coastal Zone Strategic Assessment: strategic assessment report (State of Queensland, 2013); and
> Great Barrier Reef Coastal Zone Strategic Assessment 2014: supplementary strategic assessment report (State of Queensland 2014).

2.2 Viewshed Modelling and View Corridors

The selection of an appropriate method has been influenced by the scope of the proposal and the characteristics of the placement sites and surrounding topography. Both sites are typically low and flat, adjoining watercourses in rural or industrial areas and separated from residential areas. In terms of sensitive visual receptors (major roads, public areas, tourist places and residences) there are several elevated places which will have views over either Northern Sands or East Trinity. Elevated lookouts such as from Skyrail and Henry Ross Lookout will have views over Northern Sands (East Trinity is unlikely to be visible), while some of the taller buildings in the Cairns CBD might have views across the inlet into East Trinity, and taller cruise ships, docked at the wharf, might also have views across (depending on their size). Planes either departing from or arriving at the Cairns airport, will invariably have views to Sites 1 and 2, given the close proximity of the airport to both sites. However the visibility of the sites from land-based viewpoints generally depends on intervening hills, buildings and/or vegetation. Such lines of sight are more effectively analysed by a view corridor approach, in addition to analysing the viewsheds of selected viewpoints.

This approach is similar to the Draft EIS landscape and visual assessment, and relies on preliminary desktop analyses in identifying the visibility and visual sensitivity of the project sites and receptors. However, the availability of Light Detection And Ranging (LiDAR) data for this study enables mapping of areas within view of the project sites, and areas within important view corridors, through digital contour information to prepare a Digital Surface Model (DSM) of the project sites and the Cairns Region. A DSM uses a combination of LiDAR, Digital Elevation Models (DEM) and Digital Terrain Models (DTM) derived from 10m and 5m contours.

The DTM includes both terrain plus heights of vegetation and buildings (see Figure 1 Appendix A) and provides a more accurate model for viewshed and other mapping than the Draft EIS assessment.

This Zone of Visual Influence (ZVI) modelled the visibility from a number of visibility points on each site (including Trinity Inlet sites A, B and C), and shows places within view of all visibility points. This hypothetical ZVI was then checked by field survey including checking views from important (public) viewpoints. Photographs were also taken from various locations for analysis, and for the possible preparation of photomontages of the proposed built form for subsequent assessment during the impact assessment stage.

Following the fieldwork and analysis of photos taken previously, a number of representative view corridors were selected for detailed assessment in the DTM-based modelling of the existing situation. These are:

1. Caravonica and Red Peak estates.
2. Skyrail on the Macalister Range.
3. Walking trails on Mt Whitfield.
4. Scenic routes and sections of the Captain Cook Hwy.
5. Views from East Trinity near Yarrabah Range.
6. Cairns City.
7. Offshore views from Trinity Inlet and Trinity Bay and offshore waters of the GBRWHA.

Additional viewpoints were also inspected and photographed as reference points for assessment of visibility and visual impacts, sampling the direction and distance of affected views including the East Trinity shoreline, along the Barron Delta, and at various points along the Captain Cook Highway. Archived photographs from previous studies in the region were also relied upon including from offshore tourist ferry routes to Green Island, from the Kuranda train, Skyrail and aerial photos from aircraft flying into or out of the Cairns airport.

Although the ToR (s.5.2.2) requires assessment from private residences, preliminary modelling and inspections indicated that the selected view corridors were representative of public places or areas of importance or sensitivity. While there are potentially several houses with views to either Site, these residences were not individually inspected but views from the road were selected and photographed as representative of such views as it provides similar elevation and distance to the site.

2.3 Visual Sensitivity

In order to test the sensitivity of material placement for each site, the study areas were modelled together with their ZVI, including the proposed 3.5m high bunds proposed at East Trinity. This assessment enabled a comparison between the visibility of each site indicating the level of sensitivity each location has ‘naturally’ without mitigation.

This helped inform preferred site decision-making and determine if one site is more tolerant than others for the DMPA, if it is visible from sensitive viewpoints or significant view corridors, or from the GBRWHA and the Wet Tropics World Heritage Area.

The landscape sensitivity of a site/s can constrain any proposed use, with the site sensitivity analysis helping guide recommendations for a preferred site location, or help inform recommendations to modify design or mitigate impacts in subsequent stages of this assessment.

3 Policy Context and Legislative Framework

The policy and legislative context in which the project is located was included in Section B12.1.2 of the Cairns Shipping Development Project Draft EIS. The following section provides an overview of legislation and policy that has been introduced or changed following the preparation of the CSD Project Draft EIS.

3.1 Great Barrier Reef

The aesthetics of the Great Barrier Reef are addressed to varying degrees in a number of government documents (Table 3-1). Each of these make reference to the Outstanding Universal Values of the Great Barrier Reef World Heritage Area, in particular Criterion (vii) which relates to aesthetic quality as described in Section 5.4.

Table 3-1 Great Barrier Reef Related Policy

Document	Applicability to Project and Values Present
Reef 2050 Long-Term Sustainability Plan (2015)	The Reef 2050 Long-Term Sustainability Plan provides an overarching strategy for management of the Great Barrier Reef and was prepared in response to the 2011 World Heritage Committee request for a coordinated and comprehensive long-term plan for the Great Barrier Reef. The plan is an overarching strategy for the management of the Great Barrier Reef with funding for its implementation provided by the Australian and Queensland governments. One of the principles of decision making is *Maintaining and enhancing outstanding universal value in every action*, incorporating: > *Protecting the outstanding universal value of the World Heritage Area is the prime consideration when planning development and management decisions are made; and* > *Economic growth is sustainable and consistent with protecting outstanding universal value.*
Great Barrier Reef Region Strategic Assessment – Strategic Assessment Report (2014)	This Strategic Assessment Report has been prepared in conjunction with the State Coastal Zone Strategic Assessment to improve *effectiveness in managing existing and emerging risks to the Great Barrier Reef*. This report addresses aesthetics of the marine component of the Great Barrier Reef linking it with community benefits of the environment. Port activities are identified as activities adjacent to the region with the report identify potential impacts to the marine environment from port and associated activities include *diminished aesthetic values for users and nearby communities*. Impacts on the values of the region are addressed more fully in Section 6 of the report and in particular for aesthetics, Section 6.7 Impacts on community benefits of the environment. These include: *The benefits derived by people understanding, appreciating, enjoying and admiring the Region's environment are most affected by those impacts that significantly affect key values - in particular… the land and seascapes …* *The aesthetic values of the Region may be diminished by development activities. For example the building of structures, industrial and port developments, and coastal reclamation could affect the natural scenic values of the coastal areas. Marine debris, along with oil and chemical spills, also affects the aesthetic value of seascapes and islands. Coastal reclamation may affect aesthetic qualities of the landscape and seascape. Increased turbidity diminishes the Region's underwater aesthetic values. Artificial light and noise pollution associated with coastal development and increased shipping activities and anchorage areas may diminish aesthetic attributes such as tranquillity, solitude and remoteness.* Table 7.8 addresses current condition and trend of community benefits of the environment and identifies aesthetics as being good which represents that there is *a valuable contribution to the wellbeing of local communities and the nation. The Region contributes to regional and national economies, and is valued, understood and enjoyed by catchment residents, the nation and the world community.*

Document	Applicability to Project and Values Present
Great Barrier Reef Coastal Zone Strategic Assessment – Strategic Assessment Report (2013)	This report along with the Great Barrier Reef Region Strategic Assessment, together informed the Reef 2050 Long-Term Sustainability Plan and *is a broad systems and landscape scale assessment of Queensland Government's policies, plans or programs that relate to the management and protection of matters of national environmental significance*.

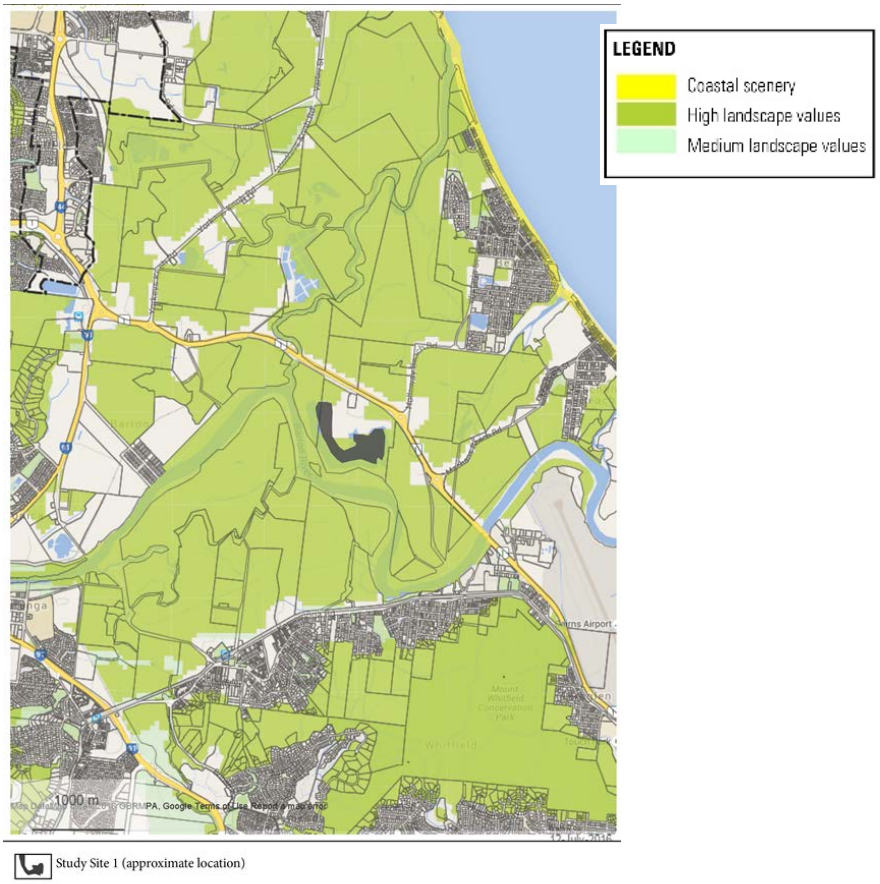
3.2 Cairns Regional Council

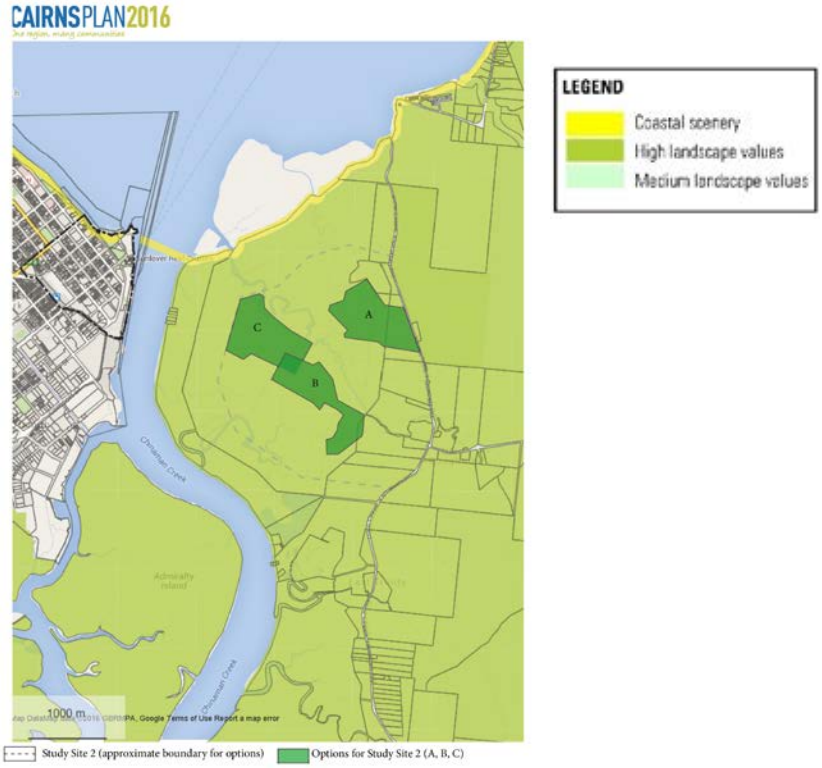
3.2.1 CairnsPlan 2016

CairnsPlan 2016 commenced on 1 March 2016 and incorporates specific provisions and an overlay relating to scenic amenity. For this project CairnsPlan 2016 relates directly to the proposed material placement areas being considered, however is not applicable for the Strategic Port Land on which the port related infrastructure is proposed to be located. The landscape and scenic amenity provisions of CairnsPlan 2016 applicable to the project are contained in Table 3-2.

Table 3-2 CairnsPlan 2016

Planning Scheme		Applicability to Project and Values Present
Strategic Framework		
Strategic intent		***Provisions*** The Strategic Intent, Section 3.2, envisages that in 2031 '*the Cairns region is internationally renowned for its natural beauty….*' This is reflected in the strategic outcomes of the settlement pattern theme which identifies that the region grows and evolves in a way that '*(m) maintains and enhances the scenic amenity, tropical character and identity of the region*'
Settlement pattern theme	Element – Rural Areas	**Provisions** For Rural areas the specific outcomes include that '*Rural areas that provide an inter-urban break or have scenic landscape value are retained in their form for that purpose*'.
Natural areas and features theme	Strategic Outcomes	***Provisions*** Under the strategic outcomes of the natural areas and features theme ' *(2) The region's internationally renowned tropical landscapes incorporating the hillslopes and foothills, marine and freshwater wetlands, beaches, headlands, streams and rivers, rural lands and open spaces are valued economically, aesthetically, culturally and socially and are protected from development that diminishes their ecological, social and economic value.* *(5) Development within the region's World Heritage Areas is sustainable and planned to conserve the ecological and scenic values of the area.*
	Element - Landscapes	***Provisions*** The Strategic Framework contains an element relating specifically to landscapes (Section 3.4.4.1). The specific outcomes are: *(1) Development protects, maintains and enhances the region's landscape values.* *(2) Rural and inter-urban breaks are protected from visual intrusion.* *(3) Major scenic routes and scenic outlooks are protected from both the detrimental visual impacts of development and inappropriate vegetation clearing that may detract from the scenic qualities of the scenic route or outlook.* *(4) The hillslopes are retained as the scenic backdrop to the region and the ecological values and landscape character of the hillslopes are protected from inappropriate development.* *(5) Development on hillslopes and potential landslip hazard areas responds to the constraints of the land including vegetation, gradient and slope stability.*
	Element – Coastal Areas	***Provisions*** Specific Outcomes *(2) The scenic amenity of the coastal areas is protected from inappropriate development that is visually dominant or visually intrusive.*

Planning Scheme	Applicability to Project and Values Present
Landscape Values Overlay	
Application	This code applies to assessing development within the Landscape values overlay. **Placement Sites** Northern Sands – part High Landscape Value (showing site overlayed)  East Trinity – High Landscape Value (showing Site options overlayed)

Planning Scheme	Applicability to Project and Values Present
	
Purpose	***Provisions*** *The purpose of the Landscape values overlay code is to ensure that development protects, maintains and enhances the landscape values within the Cairns region.*
Criteria for Assessment	Landscape values overlay code – assessable development High landscape value areas Development within the coastal scenery zone
Planning scheme policy – Landscape values	
Purpose	The purpose of policy is to provide guidance about the assessment required to satisfy the planning scheme requirements relating to properties affected by the Landscape values overlay code.

3.2.2 Region Scenic Amenity Study

The Cairns Region Scenic Amenity Study (Cardno Chenoweth 2012) mapped and assessed the landscape attributes of the Cairns Regional Council area (excluding Yarrabah), and identified places and features of regional significance for either scenic amenity. This study formed the basis of the landscape values provisions included within CairnsPlan 2016 as addressed above.

The study identified a number of Landscape Character Types:

> Forested mountains - including the uplands of the Macalister Range which forms the backdrop to the northern beaches, also in views from offshore;
> Grassy hillsides;
> Lowland areas - coastal and river plains and valley floors which are not used for sugar cane;
> Canefields - lowlands used for the production of sugar cane;
> Coast including beaches, bays, mangroves and inshore ocean. Some of the beaches have an 'iconic' combination of white sand, fringing vegetation, and long views over the Coral Sea;
> Inland watercourses including the Barron, Russell, Mulgrave, Mowbray and Daintree Rivers, plus the associated gorges and waterfalls and the many tributary creeks; and
> Urban areas - including Cairns and its outer suburbs (including the Northern Beach suburbs) as well as Mossman, Gordonvale, Port Douglas and smaller towns.

The study identifies significant landscape features which of applicability to the project, and the material placement areas, being the Barron River and Trinity Inlet which are both identified as *Scenic Places - Watercourses, waterfalls and wetlands*.

The study also identifies generally desirable and undesirable forms of development for coastal foreshores and headland being:

Desirable Development

> Natural beaches, foreshore vegetation and headlands dominate the coastal scenery, with built form scattered, screened, sensitively integrated and visually subordinate i.e. Not intrusive from onshore (e.g. Foreshores and headlands) and offshore (water) views.
> Unobstructed views to bays, islands and the Coral Sea.

Undesirable Development

> Visually prominent buildings and infrastructure on headlands and above the height of foreshore vegetation.
> Jetties, breakwaters or industrial port facilities intrude on ocean views.

4 Existing Landscape and Visual Conditions

4.1 Regional Landscape Values

The Cairns Region in tropical north-east Queensland is a coastal band of varying width, framed by the mountains and rainforests of the Great Dividing Range (Macalister and Lamb Ranges) the Daintree in the north, and the Malbon Thompson, and Bellenden Ranges to the south, and the Coral Sea to the east (Figure 1). The Russell, Mulgrave, Barron, Mowbray and Daintree Rivers are the main river systems within the region with the Bloomfield River forming the northern boundary. To the east of the City of Cairns is the Murray Prior Range and the Malbon Thompson Range.

In between the mountain ranges and the shoreline, a narrow terrestrial band of fertile lowlands is intensively farmed, punctuated by mangrove inlets and headlands along the coastline, and by nodes of urban development. The city of Cairns is on the coast at Trinity Inlet, with its suburbs nestling in to the foothills of the Ranges to the west, while the Captain Cook Highway and the Barron Delta provide inter urban breaks between Cairns and the northern beach settlements.

Prior to European settlement, it is likely to have been a mosaic of lowland rainforest, wetlands and coastal dune vegetation, with much of the area periodically inundated. The mouth of the Barron River and other creeks would have been estuarine areas of mangroves, similar to parts of Trinity Inlet. These fertile low lying plains were suitable for agriculture and grazing, and early settlement was associated with clearing and drainage of extensive areas close to the growing towns and ports such as Cairns.

As the City of Cairns developed and expanded, several small coastal settlements to the north of the city grew in popularity as residential suburbs, driven by the desire for a beach lifestyle within easy driving distance to the City along the Captain Cook Highway. The city has also expanded westwards and northwest, and suburban development can be seen to nestle into the foothills of the ranges, evidence of people's desire to maximise views across the coastal plains to the waters of the Great Barrier Reef in the distance.

Expansion north is limited by the Barron Delta, which separates Cairns from its northern beach suburbs (Machans Beach to Palm Cove) with an interurban break of largely rural land. Similarly, to the south, the valley of the Mulgrave River catchment provides another inter urban break separating Cairns from Gordonvale and rural townships further south. Most of these inter urban breaks including the Barron Delta is dominated by rural production and cane, which still characterise the coastal plains in Far North Queensland. This combination of canelands set against a backdrop of rainforest and mountain ranges, coastline, rivers and creeks form particularly attractive patterns of rural and natural landscapes, and significantly contribute to the character and scenic landscape qualities of the region generally.

The region also offers a world-class scenic driving experience with panoramic views of the Coral Sea from many roads and lookouts along the Captain Cook and Kennedy Highways (to name a few) featuring ocean views on one side and rainforested mountains on the other, representing a unique juxtaposition of two World Heritage Areas – the Wet Tropics, and the Great Barrier Reef. This dramatic combination of geomorphology and rainforest creates a diverse and spectacular landscape, and a high scenic quality which contributes in part to its popularity as a major tourist and visitor destination in Far North Queensland.

4.2 Landscape Character and Scenic Amenity Values

As mentioned in Section 3.2.2, a landscape character and scenic amenity assessment was undertaken in the region as part of the Cairns Region Scenic Amenity Study (Cardno Chenoweth 2012). This identified places and features of regional significance in terms of their contribution to either scenic amenity or their character contribution to the identity of the region.

Distinguishing features of the region include combinations of tropical-forested mountain ranges as a background 'frame' to the coastal plains, the river deltas and the tracts of caneland, and the iconic combination of white, sandy coastal beaches and the clear waters of the Great Barrier Reef. These characteristics (in combination with other more common character types such as 'urban' areas, grassy hillsides and lowland areas or watercourses) formed the base Landscape Character Types (LCTs) used in the Study to help map and quantify the value or scenic preference of visual elements.

This Study also identified the regional significance of views *"of rural landscapes which also include canefields, rivers or coastline with forested hills in the background are also a distinctive and attractive combination. Places and features which show or help define these elements and their edges, such as gateways, lookouts and view corridors are significant for scenic amenity and character and require consideration in planning and development contro*l".

The Cairns Region Scenic Amenity Study (Cardno Chenoweth 2012) identifies the two sites accordingly:

> Northern Sands – mapped as 'canefield' adjoining the 'Inland Creeks and Watercourses' LCT of the Barron River and Thomatis Creek; and
> East Trinity – Sites 2B and 2C are mapped as 'canefield' and adjoins the 'coastal' zone and the 'Inland Creeks and Watercourses' LCTs of Hills Creek and Chinaman Creek. East Trinity (site A) is partly within the 'lowland' and 'canefield' LCTs.

Northern Sands is also identified as a 'significant landscape feature' under *Gorges and Semi Secluded Valleys* and the crossing of the Captain Cook Highway over the Barron River is identified as a 'gateway' and is locally significant at a finer scale of mapping. Both sites were assessed as exhibiting High Landscape Values. However, given the disturbance of the site and previous and current land uses such a designation is due to the mapping scale and does not reflect the specific landscape characteristics of the site. However, the coastline and offshore waters are highly rated both as landscape features and in terms of scenic amenity values, and any offshore booster pumps, coastal earthworks or marine pipelines will potentially impact on these features depending on their form, proximity to the shoreline and visibility from the ocean.

East Trinity (including all three options) is identified as forming an 'attractive/characteristic landscape feature' as part of a locally significant view corridor from the Cairns CBD. However, as Yarrabah is outside the Cairns regional LGA this Study did not assess the significance of views looking back across East Trinity from the elevated slopes of the Trinity Forest Reserve. The options for pump outs, pipeline routes and discharge areas for each East Trinity A, B and C will all potentially impact on the 'attractive landscape features' of East Trinity.

In terms of scenic amenity (SA) rating (a combination of visual exposure and scenic preference) the Northern Sands site is assessed and mapped as low scenic amenity (Rating 1-5), notwithstanding that the Barron Delta was modelled as having generally high visual exposure. However this is misleading as the 2012 visual exposure modelling was based on topography alone (the DTM used in 2012 did not include trees and vegetation), and conservatively modelled the flat delta area close to the Captain Cook Highway as highly visible. Field survey confirms that most long views from the highway across the delta (and indeed Northern Sands) are screened by roadside vegetation, except for a gap at the entrance, and some opportunistic glimpses through planting. East Trinity is mapped as high scenic amenity (rating 8-10). As mentioned above, the coast and coastal zones are also mapped as high scenic amenity (9-10).

The 2012 study identified regionally significant scenic routes (including the Captain Cook Highway north of Palm Cove and the Kennedy Highway to Kuranda) and also important 'gateways' (such as the Barron River bridge), but the section of Captain Cook Highway past Northern Sands does not form part of any designated scenic route.

4.3 The Barron Delta

The Barron River is the largest river in the Cairns region, passing through the Barron Gorge to meet the sea at its estuary 15 kilometres north of Cairns near the airport. The low-lying area around the Barron River and between the coastline and the Macalister Ranges is known as the Barron Delta, which provides an inter-urban break between Cairns and the northern beach settlements. Barron is also a suburb on the northern reaches of the River, inland from the northern beach suburbs of Machans and Holloways Beach. The Barron Delta covers a large area from Kamerunga at the foot of the range, to the coastline between Yorkeys Knob in the north, and Ellie Point to the south. Thomatis Creek, a distributary of the Barron River) snakes across the Barron Delta in a north-easterly direction towards the coast between Holloways Beach and Yorkeys Knob.

The alluvial lowlands of the Barron Delta are typically characterised by rural production areas, specifically cane growing, but there are also a number of other commercial operations including the Ponderosa Prawn Farm, Go-kart tracks and sand and gravel extraction activities such as the Pioneer North and landfill operations at Barron Sands (Lemura Sand Co, Lake Placid Road) and the Northern Sands extraction and landfill area.

The scenic qualities of the distinctive cane fields along the Delta contribute to the iconic character and appeal of the region generally (Plate 1 and 2) with sprawling farm houses and sheds associated with the landscape character of the area. On higher ground, pockets of urban development have proliferated along the foothills of the hillslope suburbs of Stratford, Freshwater and Caravonica, affording long views over the coastal plains of the Delta. The riparian vegetation along the banks of the River includes tall littoral rainforest in parts, and helps to trace the meandering course of the River from long distance views. The broad flat expanse of the Barron Delta, and its pattern of existing land uses, is best appreciated from elevated viewpoints such as Skyrail, as well as from planes approaching or departing Cairns Airport and is also visible from Henry Ross Lookout on the Kuranda Range on a clear day.

Plate 1 - View over the Delta from Kuranda track (arrow indicates existing Pioneer Quarry and Lemura operations) ***(Source**: Google maps: https://plus.google.com/photos/photo/ retrieved 3 August 2016)*

Plate 2 – Canfields in the Barron Delta with Barron Gorge in the background

4.4 East Trinity and Trinity Inlet

The estuarine fringe of East Trinity defines the edge between land and water and separates the city of Cairns from Yarrabah. Mudflats and mangroves characterise the Inlet at low tide and form a distinctive foreground view from the city. While the forested mountains of the Great Dividing Range (Macalister and Lamb Range) form the background frame to the city of Cairns, the Murray Prior Range, False Cape and the Malbon Thompson Range distinguish Cairns from Yarrabah, and provide a landmark frame for East Trinity.

The East Trinity site is low-lying land that is predominantly undeveloped, although a network of dirt roads and some ancillary sheds are evidence of clearing associated with previous attempts at growing cane on the site. In the 1960s the area was a natural wetland covered by mangroves and samphire flats with Melaleucas on the freshwater edges. A number of creeks and watercourses mark the area, the largest being Hills Creek, with smaller creeks including Chinaman Creek, George Creek and Seelee Creek in the south.

In the 1970s the Colonial Sugar Refining Company developed the East Trinity site for growing sugar cane. A levee (the bund wall) was built around the entire site to exclude salt water. Tidal gates were installed to enable water to leave the site (but not to enter) and drainage systems were constructed to lower the water table and remove the salt. However, as the waterlogged soil dried out and was exposed to oxygen in the air, the naturally occurring iron sulfides in the acid sulfate soils oxidised to produce sulfuric acid and heavy metals, and the sugar cane failed to thrive. Eventually cane farming was abandoned and the site was purchased by the Queensland Government in 2001. Broad-scale ASS testing and remediation works at the Reserve have since been undertaken, and a diversity of Mangrove species have shown to be gradually re-colonising the site and the fringing inlet.

East Trinity is accessible from Cairns by private boat passage across the Inlet, or by car via the Bruce Highway and Pine Creek Yarrabah Road, approximately a 30 km one way trip. Existing roadside vegetation along Pine Creek Yarrabah Road prevents most views in, although there are some clearings which allow some views across East Trinity to the highrise buildings of Cairns CBD in the distance, similar to the view from the site's access track (Plate 3).

Plate 3 – View from Pine Creek Yarrabah Road looking across East Trinity with Cairns CBD in the background

Plate 4 – View from level 4/5 of building located on the corner Esplanade and Wharf Streets overlooking the inlet and East Trinity with Malbon Thomson Range in the background

There are two accessible beaches (and a boat ramp) along Pine Creek Yarrabah Road (Rolling Bay) and Bessie Point, which also look across mangroves of East Trinity towards buildings along the Cairns Esplanade.

The diverse range of mangroves and mountains lends to high scenic qualities of the East Trinity area, which is mainly appreciable as part of the driving experience along Pine Creek Yarrabah Road. However, it can also be seen from elevated parts of the Cairns CBD (**Plate 4**) and potentially from large cruise liners docked at the Cairns Wharf. Views from the many medium to high rise apartments and hotel buildings along the Esplanade and Trinity Inlet and cruise ships docked at the port, take in an expansive panorama overlooking the harbour and the mangroves of East Trinity and mountains behind, while moored boats in the Inlet contribute to an idyllic tropical landscape character and high scenic appeal. Views from Cairns towards East Trinity are therefore a significant view corridor.

4.5 World Heritage and National Heritage

In relation to National and World Heritage Values, the Cairns region includes the GBRWHA and the Wet Tropics World Heritage Area both of which are listed on Australia's National Heritage List and the World Heritage List. Sites 1 and 2 adjoin or are viewed from parts of the Wet Tropics World Heritage Area, with the Kuranda Range being the background to Northern Sands, and the mountain ranges of Yarrabah framing East Trinity. East Trinity also adjoins the inshore waters of the GBRWHA.

5 Visibility of the Material Placement Sites

5.1 Visibility Modelling

The visibility of the two possible material placement project sites to external viewers is modelled as a ZVI, in the DTM using LiDAR data for the Cairns area and surrounding the East Trinity and Barron Delta areas. Although Northern Sands does not require bunding, East Trinity site was modelled with a 3.5m AHD perimeter bund conceptually proposed to both constrain and treat the dredge material as well as provide storm surge protection. This model does not (at this Stage) include the detailed pipeline options, or associated pumps, booster stations options and laydown areas for each Study site, nor temporary construction details such as tailing ponds etc, however, this infrastructure will be assessed assuming relative ground or sea level heights.

To model the ZVI for each site, a number of visibility points have been located within the material placement sites and their associated bunds. Full size versions of the visibility modelling outcomes are attached in Appendix A. This analysis indicates that the low lands of both possible sites (including A, B and C of East Trinity) are likely to be seen from relatively limited areas, depending on existing vegetation, and elevation of views.

5.2 Northern Sands – (Barron Delta)

5.2.1 Views from Lookouts

While the Barron Delta is visible as an expansive panorama from many locations, the Northern Sands site is mainly visible from only the most elevated viewpoints as part of a much wider panorama of the coastal plain. Northern Sands is visible from the Henry Ross lookout on the Kennedy Highway and also from the Kuranda Scenic Rail line (Plate 5) and above the tree tops of the Skyrail Cableway (Plate 6 and 7). Both the rail line and the cableway are popular tourist attractions, as well as the Henry Ross Lookout on the Kennedy Highway. Rising up to 430m above sea level, the panoramic views across the Delta extend from Palm Cove to Cairns taking in the backdrop of the Macalister Ranges and Yarrabah in the southeast, with the Great Barrier Reef in the distance.

From these viewpoints, a mosaic of land uses along the floodplain of the Delta are visible along with clusters of varying land uses, including the urban sprawl of Smithfield and Cairns City in the background, rural coastal plain with canefields, the airport, extractive industry (including Northern Sands), and the forested bulk of Mt Whitfield. The tall riparian vegetation along the Barron River meanders through the plains and provides a sense of place and orientation from elevated views, forming a distinctive part of this pattern. As the viewpoint lowers, however, such as seen from the cableway, the mosaic is less distinct and vegetation screens much of the development. Canefields and vegetation dominate the patterning, although the mountain backdrop remains in focus. The study site is screened from view by layered bands of riparian vegetation (where the river forms a double ox-bow).

Mt Whitfield conservation reserve is a popular hiking and recreational reserve that offers three main walks. A number of viewing platforms offer views across the region, to Cairns, and some limited glimpses across the Delta are also available, from Mt Lumley on one of the circuits.

As indicated by the arrows in the Plates 5 - 7, and supported by the modelling attached in Appendix A, the Northern Sands site is visible from elevated viewpoints. Although Figure 1 in Appendix A indicates that most elevated parts of Caravonica and Kamerunga have views to the site, most of the points are not ground level but are in fact tree tops, however, there are some residences with views such as from the suburb of Caravonica.

None of the proposed pipeline options (Aquis, Machans, Yorkeys) will be visible from the elevated views and lookouts described above due to their low elevation. However, some of the associated infrastructure such as the pumps, and the predicted 2-4 booster pumps required for disposal in Northern Sands, will potentially be visible, although not particularly noticeable at these distances. Any marine-based infrastructure is more likely to be noticeable on the surface of the water.

Northern Sands will be visible from aerial views from some landing or departing aircraft (Plate 9). The visibility of the site will depend on the direction of travel

Plate 5 – View from Kuranda rail cabin (2011) (Arrow denotes approximate location of Northern Sands)

Plate 6 – View from Skyrail (2011) (Arrow denotes approximate location of Northern Sands)

Plate 7 – View from Skyrail (lower elevation) (2011) (Arrow denotes approximate location of Northern Sands)

5.2.2 Views from Captain Cook Highway

North of the Barron River, the Captain Cook Highway is on the flat coastal plain but well separated from the coastline. Canefields dominate these views either side of the Highway, providing long open views depending on the growth or phase of cultivation of sugar cane. Although the speed limit is generally 80-100 km/h, between the Barron River and Smithfield, a series of large roundabouts slow down traffic and provide turnoffs to the Beach suburbs, with speed limits at these points slowing to 40km/h.

Although the modelling (Figure 2 in Appendix A) indicates that the study site is visible from the highway through narrow gaps in screening vegetation, field inspection shows that existing vegetation screens most views from the highway, particularly for southbound traffic.

Northern Sands is located just after a roundabout, however, it is screened from view by vegetation planted along the perimeter of the site a couple of years ago. Although there are some glimpses between gaps in vegetation, there are no open views into the site until arrival at the entrance. Even then, the depth of view is limited by vegetation on site, and, unless a vehicle is actually entering the site, the view is fleeting for northbound traffic.

Similarly, although view corridor analysis indicated potential views from the Barron River Bridge (identified as an important 'Gateway' in the 2012 Cairns Scenic Amenity study) looking northwest, field inspection indicates that, although the larger trees and riparian vegetation along the River and Thomatis Creek bounding the Northern Sands area is visible above the cane, the project site per se is not. When cane is fallow, the combination of boundary planting on the existing perimeter bund on the south of the extraction area (abutting the lake) and the intervening farmhouse prevent views into the site from the Bridge.

Viewshed Analysis from Captain Cook Highway (Figure 4 in Appendix A) indicates that some parts of the highway will potentially have views of the pipelines and boosters regardless of pipeline option (ie. Aquis, Machans Beach and Yorkeys Knob option), however, these are low and generally viewed at speed, and will only be visible when cane is fallow.

5.2.3 Views from Public Beaches

The proposed DMPA at Northern Sands will not be visible from the coastline, although the inbound pipeline and the pumps and booster stations will be most noticeable at the land/water interface, such as from Yorkeys Creek beach (Aquis Pipeline option), Machans Beach (Machans Beach option), and Yorkeys Beach (Yorkeys Knob option). In addition to the pipeline and pumps, the proposal to connect the pipe fabrication area with the storage area will increase the perception of disturbance when viewed from the beach. Similarly, the marine-based booster station proposed as part of the Aquis pipeline option will also be visible from Machans Beach, and will potentially be within view of parts of Yorkeys township. The alternative option proposes land-based booster pumps only (i.e. no marine booster) the first of which is setback behind the foreshore dune, so is potentially screened from beach views by dune vegetation.

5.2.4 Views from Cairns

Although Cairns CBD is reasonably flat and low along the mudflats of Trinity Inlet, there are some expansive views from the foreshore and the Esplanade, as well as from the marina, and the boardwalk along Trinity Inlet and the Cairns Wharf. From these viewpoints, the stretch of mangrove coastline of East Trinity is visible as part of a scene including the marina in the foreground, piled moorings in the mid-ground, and the ranges of Yarrabah in the background (Figure 3 in Appendix A). The mangroves form a distinctive edge between the study site and the water, and, at approximately 400-500m wide, help to screen ground level views into the Site from Cairns looking across the Inlet, and from boats cruising the inlet.

More elevated views, however, including from larger cruise liners, will experience some views into the site depending on their height. Viewshed analysis undertaken from elevated locations of buildings along the eastern edge of the city (at 30m AHD) indicate that the East Trinity site will be visible, notwithstanding the screening capabilities of the mangroves from ground level and lower levels (Figure 3 in Appendix A). Not surprisingly, due to its closer proximity, East Trinity (site C) (Figure 6 in Appendix A) will be comparatively more visible than the alternate sites A and B (Figures 4 and 5 in Appendix A), with tall city buildings overlooking the site.

The ZVI analysis indicates that places such as the Convention Centre, Trinity, Pullmans Hotel, the Hilton and the new Wharf will potentially be within view of all three potential material placement sites at East Trinity A, B and C (Figure 3 in Appendix A). Modelling also indicates that buildings to the south of Wharf Street (where it turns into Kenny Street) will be within view of sites A and 2 (and to a lesser extent 2B) however, field inspection shows that most of these buildings or structures are tanks or old warehouses associated with the Port and therefore are potentially less sensitive to Port activity.

With regard to the pipeline and associated booster pumps associated with the East Trinity options, there will be some views from elevated areas of the city, however there are limited viewing opportunities from close proximity due to the existing vegetation and lack of road access. The proposed location at which the pipeline will enter Trinity Inlet is located further to the north of Site B and C options and will be visible to moored vessel and those entering and exiting the marina.

The nightscape of the Barron Delta region (around Northern Sands) is punctuated by clusters of lights from farms and security lighting from nearby urban conurbations such as Smithfield, the airport and commercial operations such as the landfill/extraction operations. The East Trinity area (East Trinity) is comparatively dark, with no lighting visible at night (from Cairns) apart from boat craft and beacons in the Inlet.

5.2.5 Yarrabah and Offshore Views

From the Yarrabah side of the Inlet, ZVI modelling (Figure 3 in Appendix A) indicates that there will be potential views from Pine Creek – Yarrabah Road looking west across the site. The modelling indicates that, with the exception of East Trinity (site A), most of the road is screened from view by roadside vegetation (or intervening vegetation). East Trinity (A) is more visible than the other sites given its (conceptual) location immediately adjacent to the road. The ZVI mapping shows that there are some sections of the road (and Hamilton Road) within view of East Trinity (B) and (C), however, field inspection indicates that these are generally 'glimpses' through roadside vegetation, which are viewed from vehicles at speed (100km/hr limit) with no option of stopping. There are therefore no prolonged or open viewing opportunities until First Beach, at which point the road changes direction. There are only two buildings located along this Road (a house and the *Mandingalbay*

reserve site office) both of which will have views of the material placement sites, with clear views from the house across to East Trinity (A).

With regard to the pipeline and associated booster pumps associated with the East Trinity options, there will be limited viewing opportunities from close proximity due to the existing vegetation and lack of road access. The proposed location at which the pipeline will enter Trinity Inlet is located further to the north of East Trinity (B) and (C) options and will be visible to moored vessels and those entering and exiting the marina.

East Trinity is also visible from offshore, including from ferry routes which depart from the marina, heading to Green Island and Fitzroy Island, however, there will no views into the site due to the surrounding mangroves, although some views of the pipelines might be available.

East Trinity will be visible from aerial views from landing or departing air craft (Plate 9) again depending on the direction of travel.

5.2.6 Long Range Views

The mountain ranges that frame Cairns also provide opportunities for views towards the East Trinity sites (Appendix A). The foothills of the Lamb Range and Macalister Ranges include the hillside suburbs of Mt Sheridan, Bayview Heights and Kanimbla, while the southern slopes of Mt Whitfield and the suburb of Edge Hill are also elevated with potential views to East Trinity. Although the ZVI shows that Sites B and C are potentially within view from these hillslopes, most of the areas indicated in the ZVI are treetops, not houses or public places. Notwithstanding this, there will be some houses on the upper slopes of Bayview Heights, such as Falcon Street or Hillcrest Street, with views to the study site, despite the 8 km distance.

The ZVI indicates that there are potential views from the southern slopes of Mt Whitfield, approximately 6 km northwest of East Trinity. Although most of these points are tree tops, there are a number of outlooks available from Mt Whitfield's Blue Arrow Circuit and some elevated residences at Edge Hill, where elevated views overlooking the CBD also take in the East Trinity sites.

5.3 Summary of Visibility of Sites 1 and 2

Based on the combination of ZVI and viewshed analyses undertaken for Northern Sands and East Trinity (including sites A, B and C) the visibility and sensitivity (and potential for visual impacts) can be summarised as follows:

5.3.1 Northern Sands

> Most of the visibility points along the flat coastal plains of the Delta are located within canefields rather than residences.

> Most of the views from the Highway to the DMPA will be screened by roadside and other intervening vegetation, although narrow arcs of view will potentially allow some views through from some parts of the Captain Cook Highway. However, as operations will be limited to discharging slurry under the water of the existing lake, there will potentially only be pipelines or pumps visible.

> The ZVI indicates widespread visibility from the surrounding hillslopes, including Caravonica (Fig Tree Drive, Red Peak Boulevard and surrounding estate) Kamerunga (Lomandra and Terminalis Close and surrounding estates) and the northern foothills of Mt Whitfield, including the suburbs of Stratford and Freshwater. Although most of the ZVI is forested tree tops, or roof tops, some houses will also be within view of any DMPA. Viewing distances between houses and the Northern Sands site vary; from approximately 3.5 kms between Caravonica and Kamerunga, and 1.5 km from Stratford.

> Apart from glimpses of view from short range viewpoints (such as the Highway) there are no mid-range views, and most of the longer-range viewpoints are from elevated viewpoints (houses or Skyrail etc) where the Northern Sands site forms a small part of a mosaic of varying land uses in various stages of development or disturbance, with the GBRWHA in the background.

> All possible pipeline alignments will be visible and create some level of disturbance at the beaches where the pipes come to shore. Views from Yorkeys Creek, Machans Beach and Yorkeys Beach will see the pipe at close range. The proposed alignment of the pipelines for the Machans Beach and Yorkeys Beach option is located closer to urban development of the beachside suburbs, with booster pump and laydown areas similarly close to urban estates. The Aquis option is located outside of urban conurbations.

5.3.2 East Trinity

> Parts of the East Trinity sites (A, B and C) will be visible from CBD buildings and residences located at higher elevations (at least 30m AHD in height). Viewshed analysis indicates the East Trinity (site A) is less visible than sites B and C from city views from the west, and is the furtherest site from these receptors, such as the Convention Centre.

> The location of East Trinity (A) abutting the Pine Creek-Yarrabah Road is shown to be partially visible from the road frontage, and potentially from the residence across the road. However the views are concentrated to an area in the southwest of the site, and the view arcs indicate that most of these views are from the north of the site. This area will likely be seen from southbound vehicles, at speed.

> The proposed location at which the pipeline will enter Trinity Inlet (all options) will be visible to moored vessels and other vessels using the inlet.

> There will be limited viewing opportunities from close proximity due to the existing vegetation and lack of road access.

5.4 Scenic and Aesthetic Values of the GBRWHA

East Trinity abuts GBRWHA waters and can be seen by GBRWHA visitors, hence the aesthetic attributes which form part of the OUV of the Great Barrier Reef are relevant considerations. The UNESCO Guidelines define the concept of OUV as "*cultural and/or natural significance, which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity*." The Great Barrier Reef has OUV and has been World Heritage-listed because it meets all four of the natural environment criteria, including the aesthetic criterion (vii) "containing superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance".

The seven Criterion (vii) attributes recorded in the World Heritage citation of the Great Barrier Reef (GBRMPA, 2011) are that:

"The Great Barrier Reef provides some of the most spectacular scenery on earth and is of exceptional natural beauty. The World Heritage values include:

1. *The vast extent of the reef and Island systems which produces an unparalleled aerial vista:*

   The vast mosaic patterns of reefs, islands and coral cays produce an unparalleled aerial panorama of seascapes comprising diverse shapes and sizes. It is one of a few living structures visible from space, appearing as a complex string of reefal structures along Australia's northeast coast;

2. *Islands ranging from towering forested continental Islands complete with freshwater streams, to small coral cays with rainforest and unvegetated sand cays:*

   The rugged vegetated mountains and lush rainforest gullies that are periodically cloud-covered on Hinchinbrook Island;

3. *Coastal and adjacent Islands with mangrove systems of exceptional beauty:*

   The vast mangrove forests in Hinchinbrook Channel;

4. *The rich variety of landscapes and seascapes including rugged mountains with dense and diverse vegetation and adjacent fringing reefs:*

   The Whitsunday Islands provide a magnificent vista of green vegetated islands and spectacular sandy beaches spread over azure waters;

5. *The abundance and diversity of shape, size and colour of marine fauna and flora in the coral reefs:*

   Superlative natural beauty above and below the water. Beneath the ocean surface, there is an abundance and diversity of shapes, sizes and colours; for example, spectacular coral assemblages of hard and soft corals, and thousands of species of reef fish provide a myriad of brilliant colours, shapes and sizes. Other superlative natural phenomena include the annual coral spawning. The internationally renowned Cod Hole near Lizard Island is one of many significant tourist attractions;

6. *Spectacular breeding colonies of seabirds and great aggregations of over-wintering butterflies:*

   On some continental islands, large aggregations of over-wintering butterflies periodically occur;

7. *Migrating whales, dolphins, dugong, whale sharks, sea turtles, seabirds and concentrations of large fish:*

   Other superlative natural phenomena include the migrating whales, nesting turtles, and significant spawning aggregations of many fish species. On many of the cays there are spectacular and globally important breeding colonies of seabirds and marine turtles, and Raine Island is the world's largest green turtle breeding area."

However as noted in the 2013 Context Report (Defining the Aesthetic Values of the Great Barrier Reef) when reviewing the application of aesthetic criteria to 23 different World Heritage properties, most aesthetic attributes are defined with reference to other natural criteria (superlative natural phenomena) rather than aesthetic criteria per se, and justification of exceptional natural beauty and aesthetic importance relies mainly on "… *the rhetorical power of description of the attributes*". The 2013 Context Report also notes that terrestrial parts of World Heritage Areas are generally described in terms of scenic beauty, while marine components are "… described – and experienced – at a variety of scale or through distinct lenses – underwater, at water level and panoramic." The authors recommend an approach which is more experiential (including the concept of response to place), and that "…*a reversion to a narrower visual and seen landscapes approach should be avoided*." Accordingly, consideration of the existing visual environment on and around a specific project site considers not only the specific listed aesthetic attributes of the GBRWHA, but also the more holistic 'response to place' aspects.

In the Cairns region, the iconic coral reefs and marine life of the Great Barrier Reef are experienced by (and presented to) tourists and World Heritage visitors mainly at offshore facilities such as Green Island and to a lesser extent Fitzroy Island, at several reef lagoons and on boats. To the extent that the mainland is part of this World Heritage visitor experience, it is seen from the ferry routes to these island tourist attractions, looking back towards Cairns and the background mountains. In this context, the Cairns Region coastline is part of the mainland which visitors use as a base, and 'leave behind' in order to visit a distant Great Barrier Reef island, where they will experience the GBRWHA. The DMPAs are not part of the World Heritage experience for GBRWHA visitors. In the section of North Queensland coastline abutting the GBRWHA, there are several places where the mainland contributes to Great Barrier Reef scenery (for example Hinchinbrook Channel, Conway Peninsula and the Daintree area), but the urban area of Cairns makes little contribution. The city is a node of development, with tall buildings visible from offshore boats. At night, the Cairns CBD building and Airport are the main light sources visible from a distance, plus a sprinkling of lights associated with hillside housing in elevated areas such as Smithfield and Buchans Point.

5.4.1 Applicability to Northern Sands

The Barron Delta site is not visible to GBRWHA visitors, except when they be traveling through the area by vehicle or as seen from Skyrail looking to the east. However, as it is located almost 2.5 km inland from the waters of the GBRWHA, and proposed material placement will be low, it is not considered that this site in any way contributes to the aesthetic attributes and OUV of the GBR and will not be assessed in terms of OUV.

5.4.2 GBRWHA Aesthetic Attributes - Trinity Bay and Inlet

East Trinity at East Trinity directly abuts the GBRWHA and Trinity Bay and Trinity Inlet form part of the World Heritage Area (Plate 9), though it is outside of the Great Barrier Reef Marine Park, being Port waters.

Plate 9 – Aerial View of Trinity Bay and Cairns (2014)

The seven aesthetic attributes and their presence or representation on the East Trinity sites and surrounding land and water, relative to places within the GBRWHA (where these attributes are distinctively present), are addressed in Table 5-1.

Table 5-1 GBRWHA Aesthetic Attributes represented near East Trinity

GBRWHA Aesthetic Attributes	Representation near East Trinity
1. The vast extent of the reef and Island systems which produces an unparalleled aerial vista:	There are no aerial vistas of reef and lagoon systems immediately offshore from East Trinity including Trinity Bay. The closest reefs which form the distinctive Great Barrier Reef patterns of reefs, lagoons and passages occur 25 - 30 km offshore, extending from Green Island northwards to Batt Reef.
2. Islands ranging from towering forested continental Islands complete with freshwater streams, to small coral cays with rainforest and unvegetated sand cays:	There are no islands immediately offshore from East Trinity, and the closest island is Fitzroy Island (approximately 9 km over the Yarrabah Range from East Trinity) and Green Island (25 km offshore). These two islands are visited by tourists and others for appreciation of GBRWHA scenery and underwater experiences of coral cays on offer.
3. Coastal and adjacent Islands with mangrove systems of exceptional beauty:	The project site includes regenerating and established mangroves on Hills Creek and Firewood Creek and along the Inlet, which are part of a more extensive conservation reserve and Estuarine Protection Zone of the GBR Coast Marine Park (state). However in terms of extent and universal aesthetic value, the history of ASS on the site means that the mangrove system is mainly regrowth and is therefore not representative of Attribute 3.

GBRWHA Aesthetic Attributes	Representation near East Trinity
4. The rich variety of landscapes and seascapes including rugged mountains with dense and diverse vegetation and adjacent fringing reefs:	The vegetated mountains of the Malbon Thompson Range offers dense and diverse vegetation, combined with a variety of fringing mangroves and the waters of the Inlet. However, there are no adjacent fringing reefs or 'rugged' mountains *per se* which represent the '*rich variety of landscapes and seascapes*' of Attribute 4.
5. The abundance and diversity of shape, size and colour of marine fauna and flora in the coral reefs:	The marine flora and fauna in the creeks, and in waters offshore from East Trinity and Trinity Bay, do not exhibit " .. *abundance and diversity of shape, size and colour .."* as are often seen associated with coral reefs. In fact, the riverine and near-shore waters are usually turbid and the local beaches are not consistent with expectations of waters associated with the Great Barrier Reef.
6. Spectacular breeding colonies of seabirds and great aggregations of over-wintering butterflies:	Similarly, there are no breeding colonies of seabirds or known aggregations of butterflies recorded on or near the project site.
7. Migrating whales, dolphins, dugong, whale sharks, sea turtles, seabirds and concentrations of large fish	Marine megafauna and large fish are most likely present in Trinity Bay and Trinity Inlet and offshore from this location.

6 Options Assessment and Recommendation

The description of the existing visual environment of the Barron Delta area and East Trinity is the basis for assessment of the future environment and subsequent landscape and visual impact assessment of the next stage of studies for the Revised Draft EIS.

The findings of the assessment of each of the sites and the associated pipeline alignment options are provided in Table 6-1.

Table 6-1 Options Assessment

Site	Summary of Site Assessment	Pipeline Option	Summary of Pipeline Option Assessment
Northern Sands	Based on the 'Existing Situation' and the combination of ZVI and viewshed analyses described above we consider that the preferred site with respect to visual amenity and landscape character for the following reasons: > The Northern Sands site is an existing area of disturbance (extraction and landfill), and has been for some time, so expectations for aesthetic improvement are low. > The site forms a part of an overall mosaic of disturbance or cultivation (ie. the Delta is not pristine). > There are views from urban residential estates and sites, however, there will not be any noticeable difference between the existing situation and the proposed dredge material placement activity and infrastructure, particularly when seen as a panorama over the Delta. > There are ample opportunities to successfully screen views into the site by supplementary or infill planting around the site given that most receptors are either glimpses from the Highway, or distant viewpoints.	Aquis Option	> The pipeline alignment heads north from the site crossing the Barron River before heading to the coast. The land component passes predominately through rural land and coastal landscapes. > Visibility of the land-based component of the pipeline is limited with the crossing of the Captain Cook Highway being key point where it will be viewed by people travelling along the highway. > The alignment will be visible from the air, however it sits within a mosaic of disturbance or cultivation and will not be a significant feature given its location and temporary nature.. > The ocean component of the pipeline and the associated booster pump will be visible both from the waters of the GBRWHA and the mainland. > A land based option for the booster pump is preferable in terms of its potential to be able to be screened by foreshore or intervening vegetation (existing or proposed), and reducing the perception of marine impacts when people from offshore or looking out to the GBR. > This is a preferred option with respect to visual amenity and landscape character.
		Yorkeys Option	> As with the Aquis Option the alignment heads north from the site, however no crossing of Barron River is proposed. > The visibility of this pipeline is similar to the Aquis Option, however only a marine booster is proposed. However, as only a marine booster is proposed, there may be a greater perception of change, than the Aquis Option, on the landscape/marine character particularly for those seeking a world heritage experience.
		Machans Beach Option	> This option proposes a more easterly alignment which bring it closer to the urban development at Machans Beach.

Site	Summary of Site Assessment	Pipeline Option	Summary of Pipeline Option Assessment
			> The proposed Booster No. 2 is located within close proximity to residences and will be visible from these. > The ocean component of the pipeline extends from Machans Beach and will be visible from ocean from properties and the beach. > This is the least preferred option with respect to visual amenity and landscape character.
East Trinity	East Trinity is least preferred (generally) given its: > High visual exposure, particularly from some CBD buildings along Wharf Street and adjacent to the Inlet (particularly to East Trinity (C). > East Trinity (A) proposes a visible abutment to the Pine Creek-Yarrabah Road frontage, however, if it was to be set back from the road, or screening provided some mitigation would be achieved. It is the preferred option for East Trinity as it is less visible from elevated buildings in the CBD and is furtherest away. > The landscape character and high landscape values of the East Trinity site is protected in the Planning Scheme.	With respect to visual amenity and landscape character there is little difference between the three proposed options. With the selection of the preferred site considered to be more important that the associated pipeline alignment.	
		Site A Option	> Site A option alignment passes through the low coastal landscape characteristic of this location. > While there are views of this alignment from elevated areas there is limited viewing opportunities from close proximity due to the existing vegetation and lack of road access. > The proposed location at which the pipeline will enter Trinity Inlet is located further to the north of Site B and C options and will be visible to moored vessel and those entering and exiting the marina.
		Site B Option Site C Option	> The alignments proposed for Site B and Site C follow a very similar alignment with the same point in which it will exit the site and extend to Trinity Inlet. > Visibility of this alignment is limited from points close to the site however the point at which the pipeline enters Trinity Inlet will be temporarily visible to vessels moored within close proximity and from elevated areas.

7 References

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State of Queensland 2013, *Great Barrier Reef Coastal Zone Strategic Assessment: strategic assessment report*, Department of State Development, Infrastructure and Planning, Brisbane.

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APPENDIX A
VIEWSHED AND ZVI MAPPING

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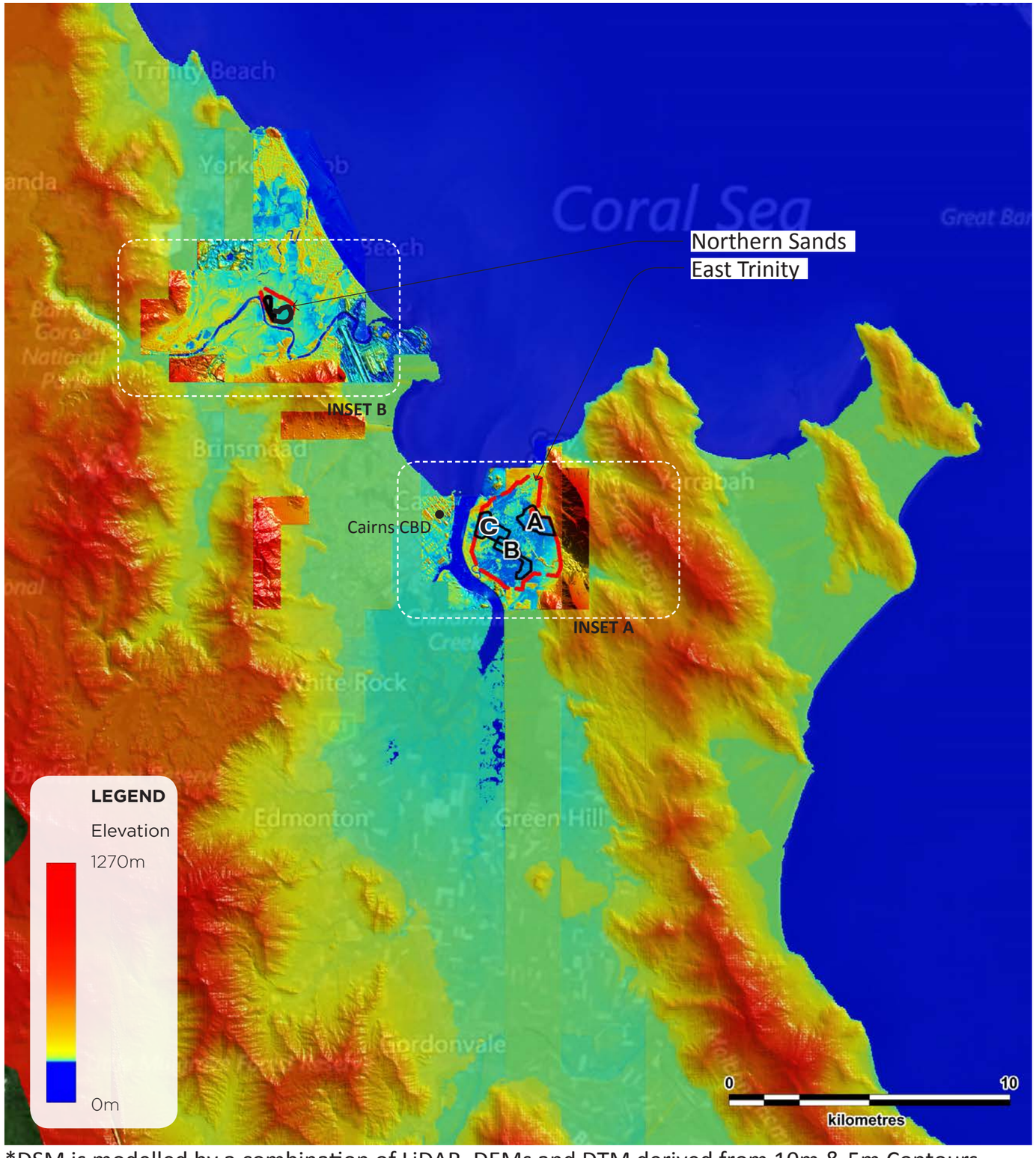
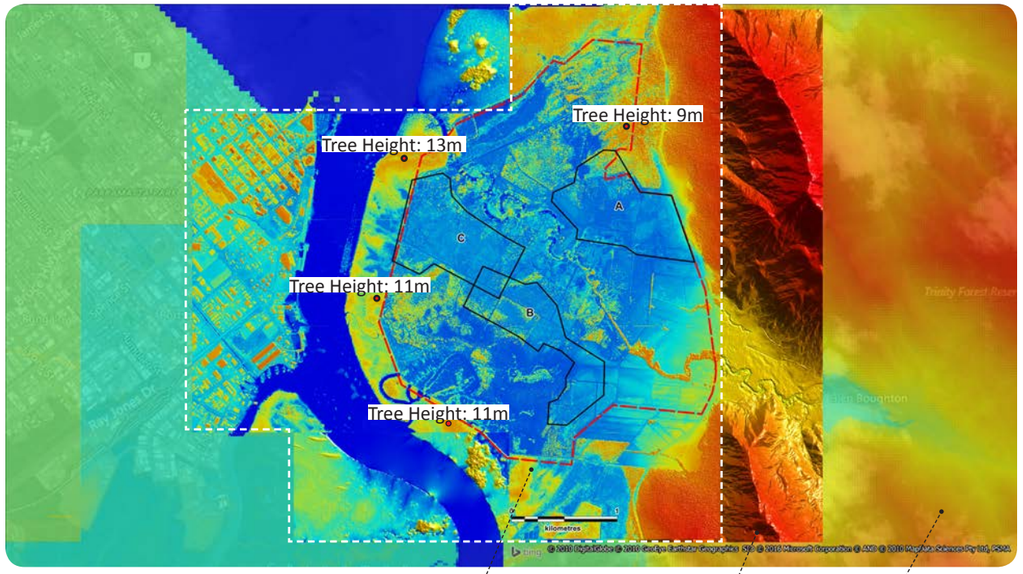
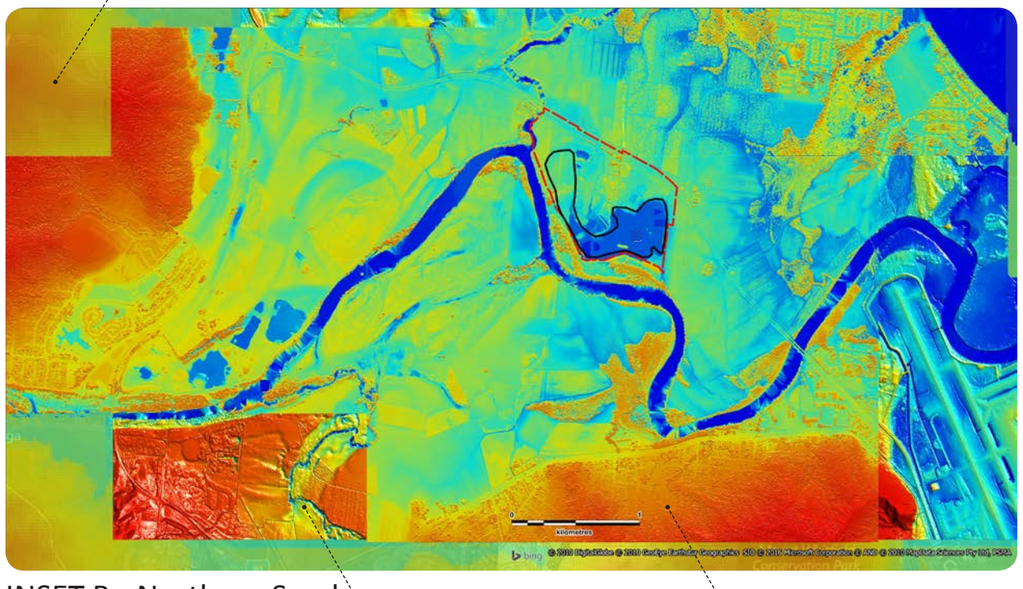




INSET A - East Trinity

DSM DEM DTM

DTM



INSET B - Northern Sands

DEM DSM

*DSM is modelled by a combination of LiDAR, DEMs and DTM derived from 10m & 5m Contours.

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Digital Surface Model (DSM) | **Figure 1**

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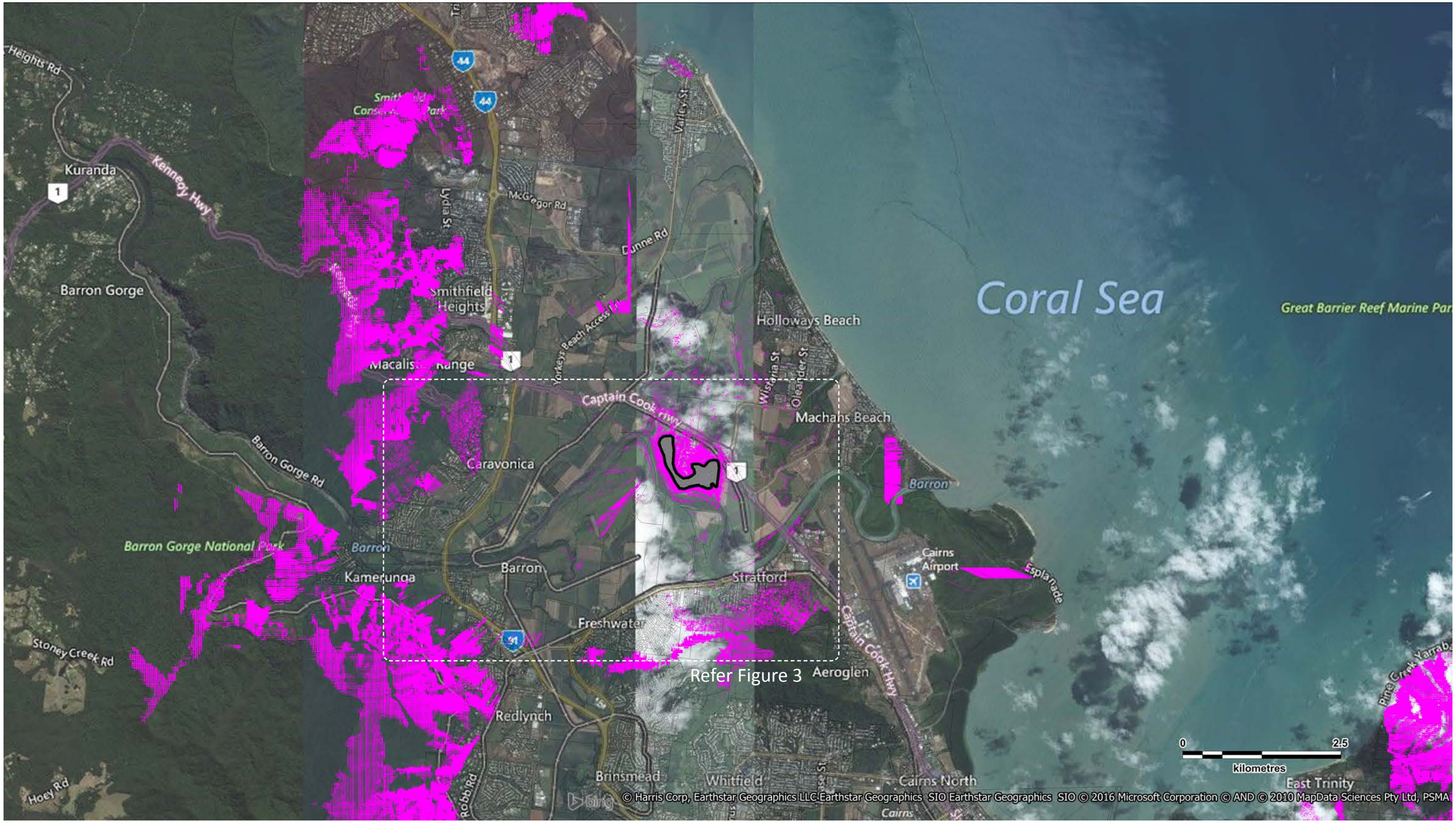

LEGEND

ZVI of Northern Sands site

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Zoomed In- Zone Of Visual Influence - Proposed Fill Placement on Northern Sands | **Figure 2**

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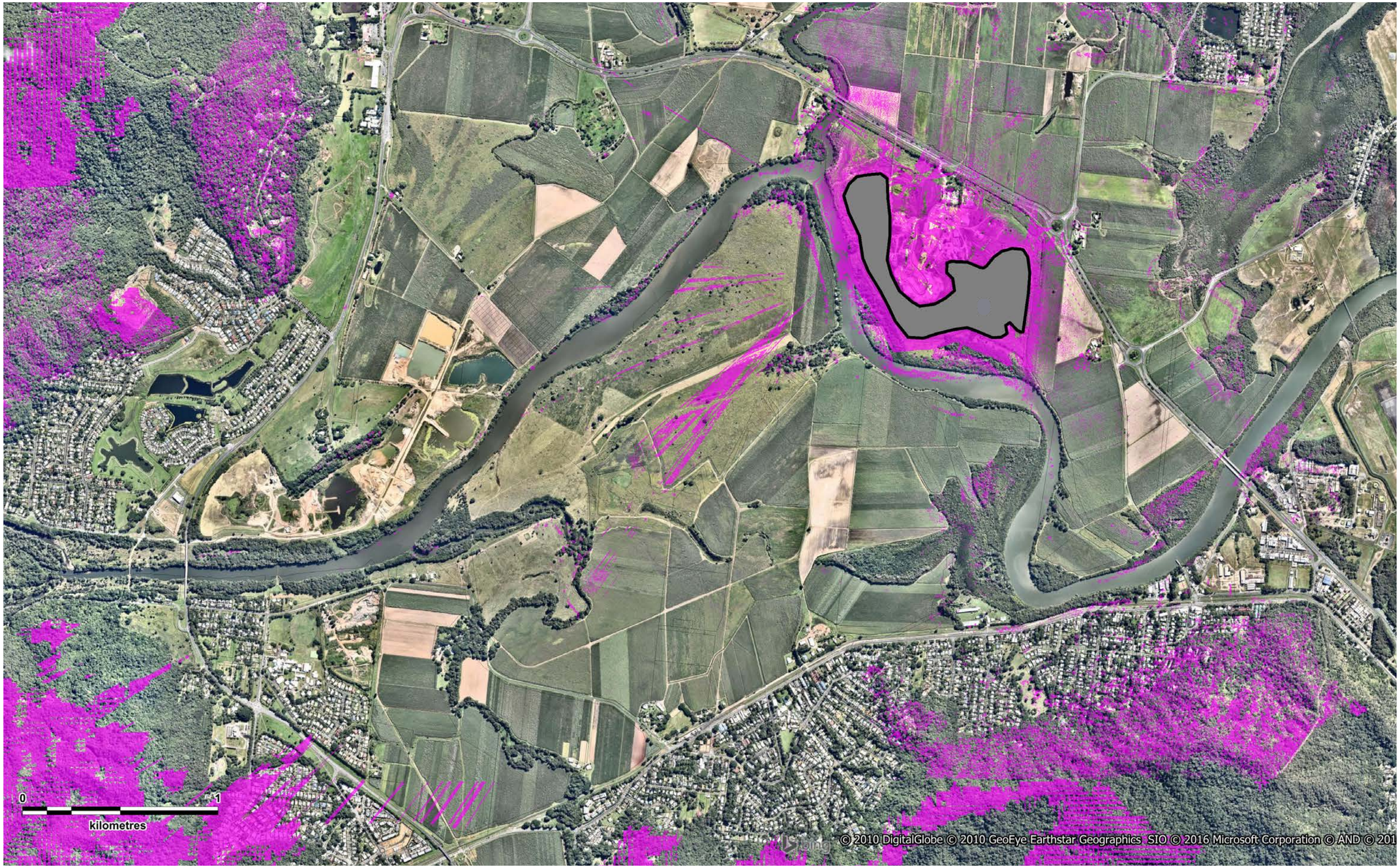

LEGEND

Visibility of Northern Sands site

Zoomed In- Zone Of Visual Influence - Proposed Fill Placement on Northern Sands | **Figure 3**

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Viewshed Analysis from Captain Cook Highway | **Figure 4**

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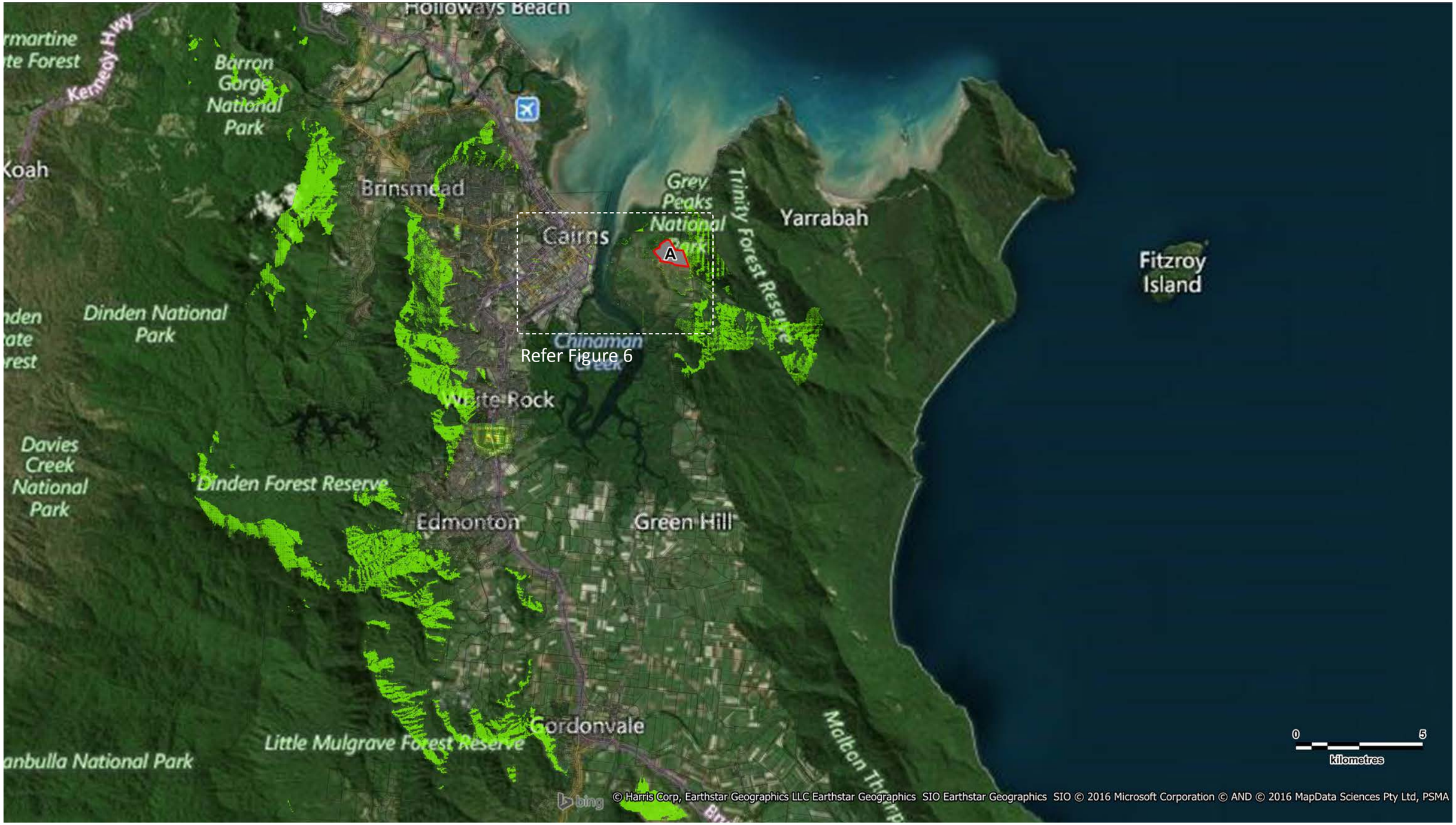

LEGEND

ZVI of Option A

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Zone Of Visual Influence - Proposed Fill Placement on East Trinity - Option A | **Figure 5**

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Zoomed In- Zone Of Visual Influence - Proposed Fill Placement on East Trinity Site - Option A | **Figure 6**

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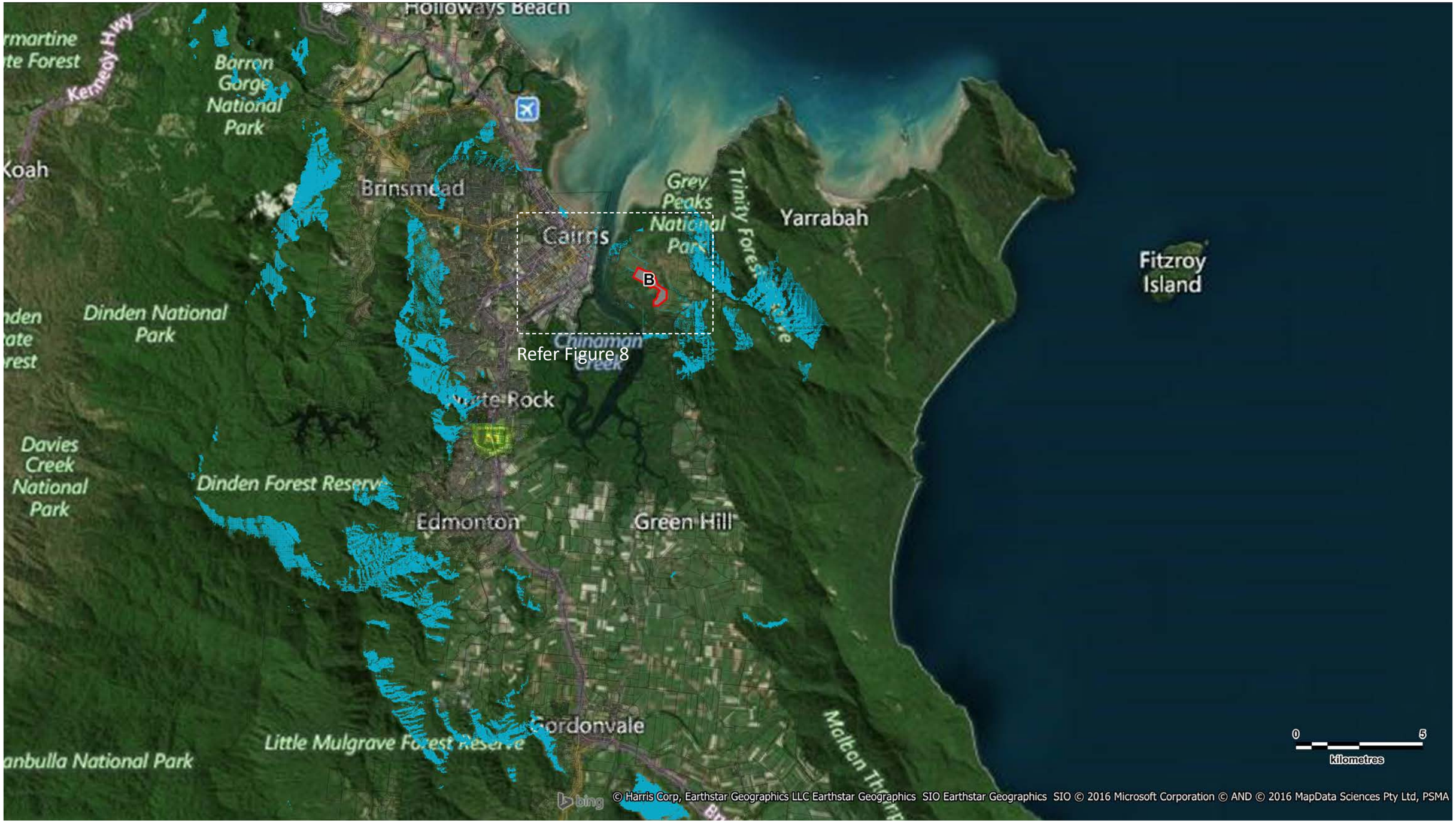

LEGEND

ZVI of Option B

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Zone Of Visual Influence - Proposed Fill Placement on East Trinity Site - Option B | **Figure 7**

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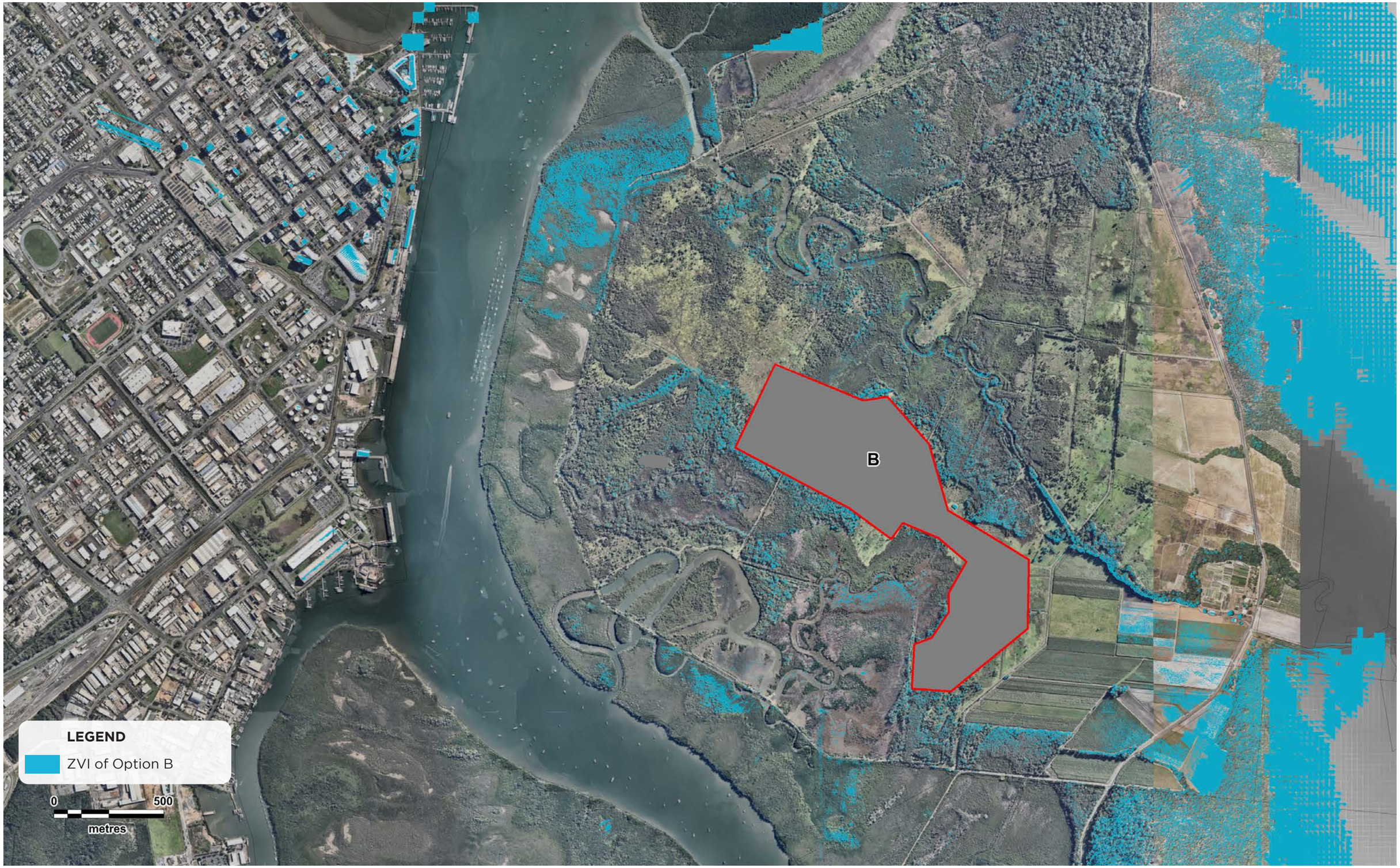

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Zoomed In- Zone Of Visual Influence - Proposed Fill Placement on East Trinity Site - Option B | **Figure 8**

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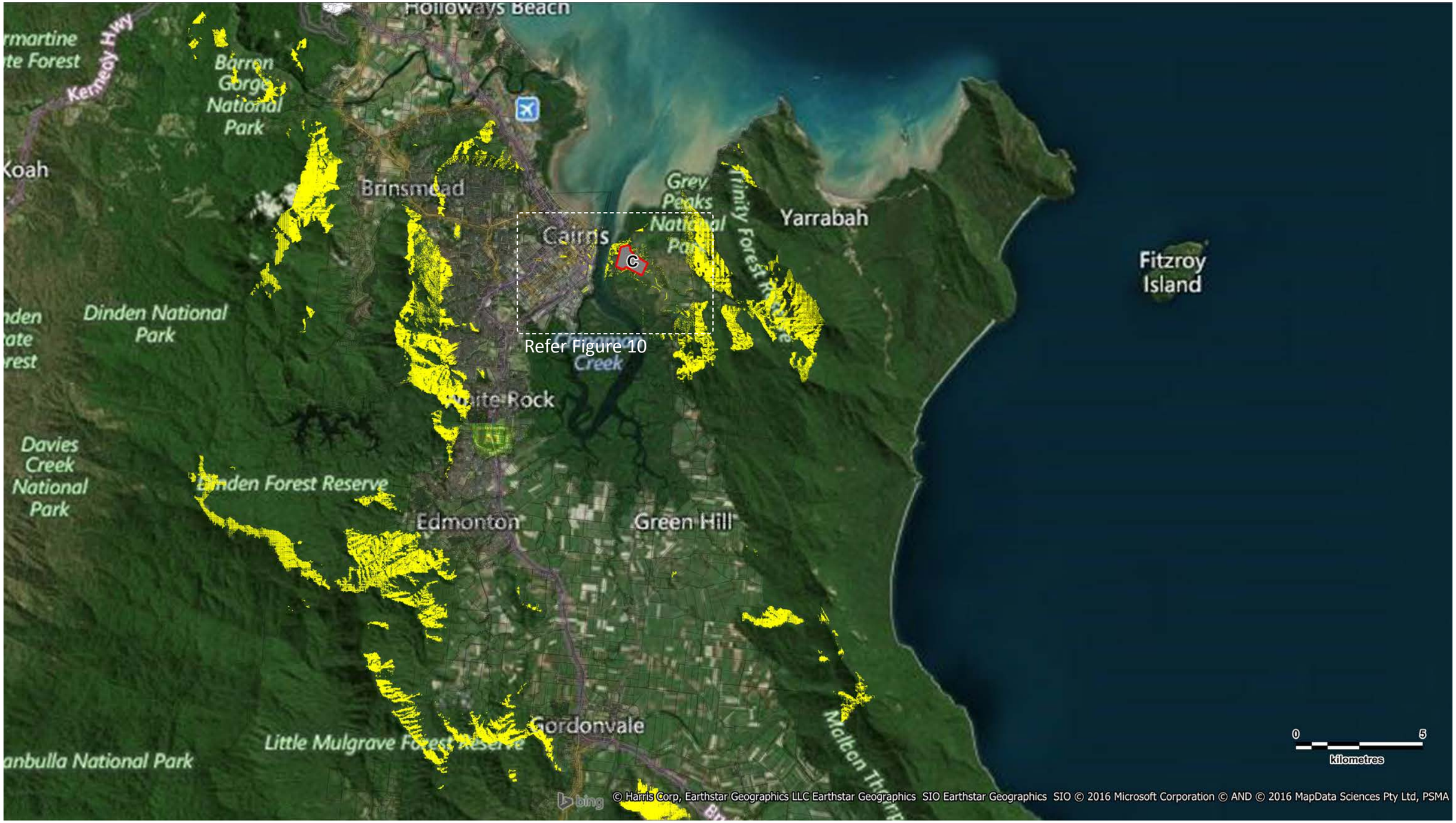

LEGEND

ZVI of Option C

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Zone Of Visual Influence - Proposed Fill Placement on East Trinity Site - Option C | **Figure 9**

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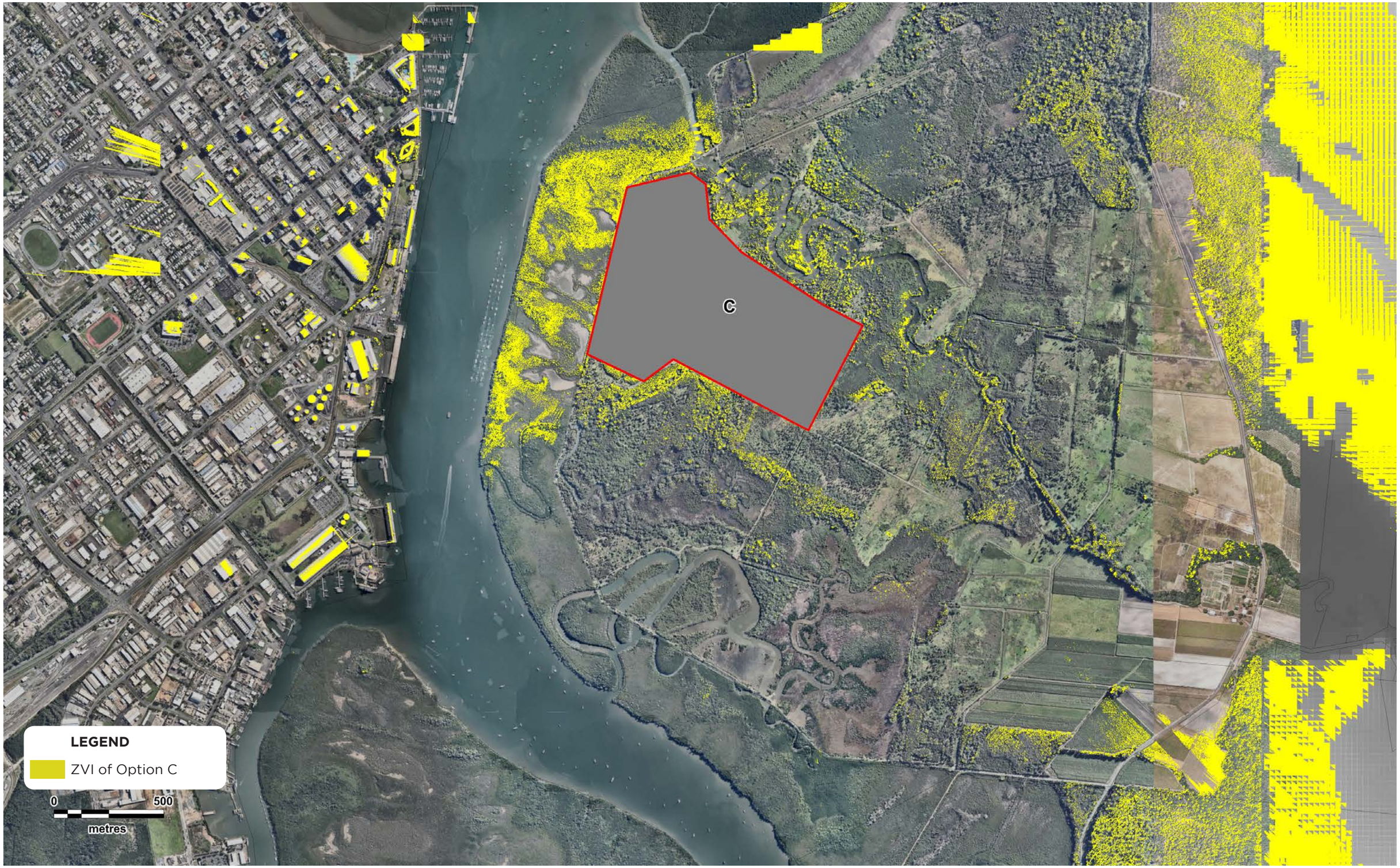

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Zoomed In- Zone Of Visual Influence - Proposed Fill Placement on East Trinity Site - Option C | **Figure 10**

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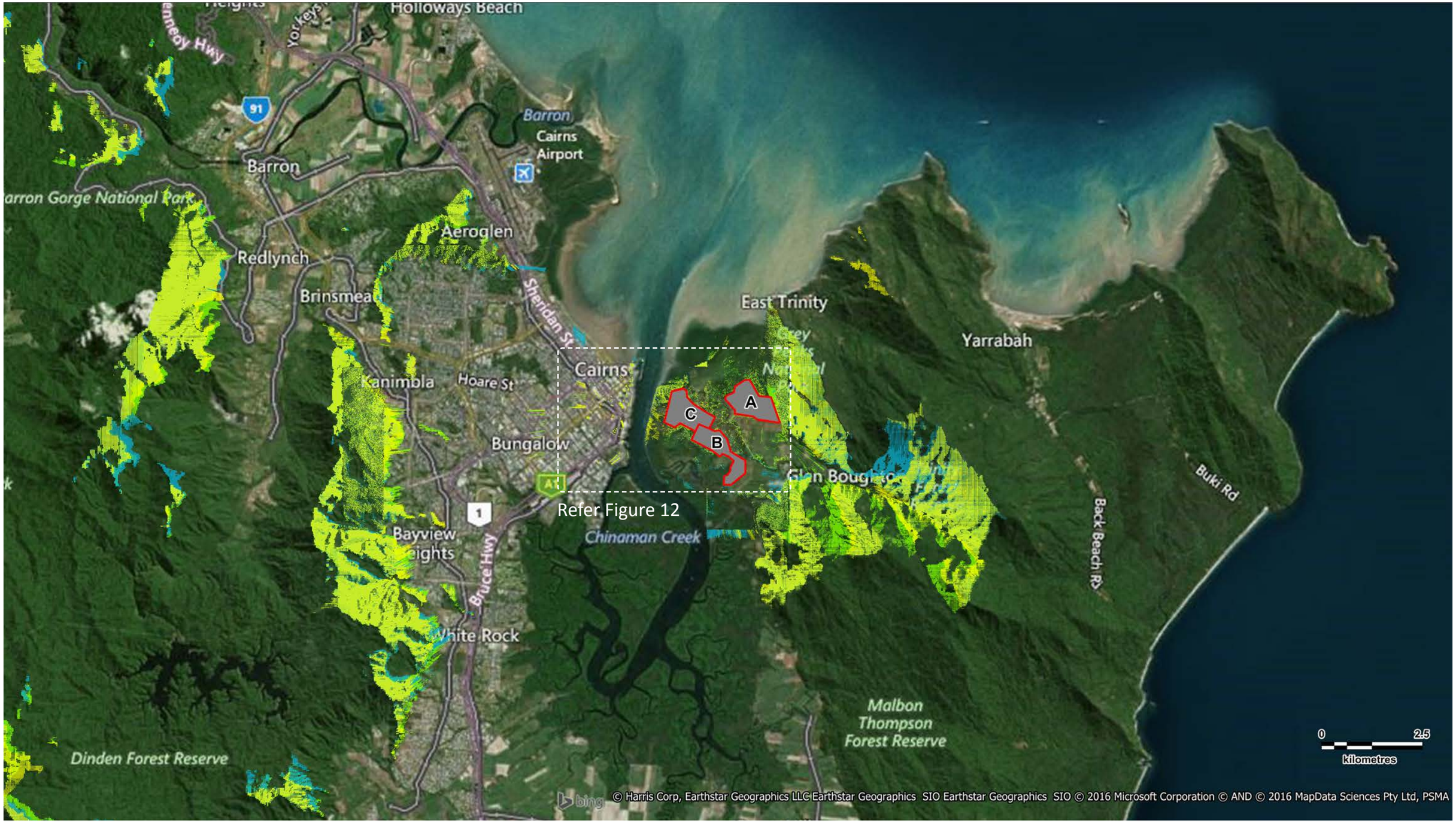

LEGEND

- ZVI of Option A
- ZVI of Option B
- ZVI of Option C

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Combined Zone Of Visual Influence - Proposed Fill Placement on East Trinity Site - Options A,B & C | **Figure 11**

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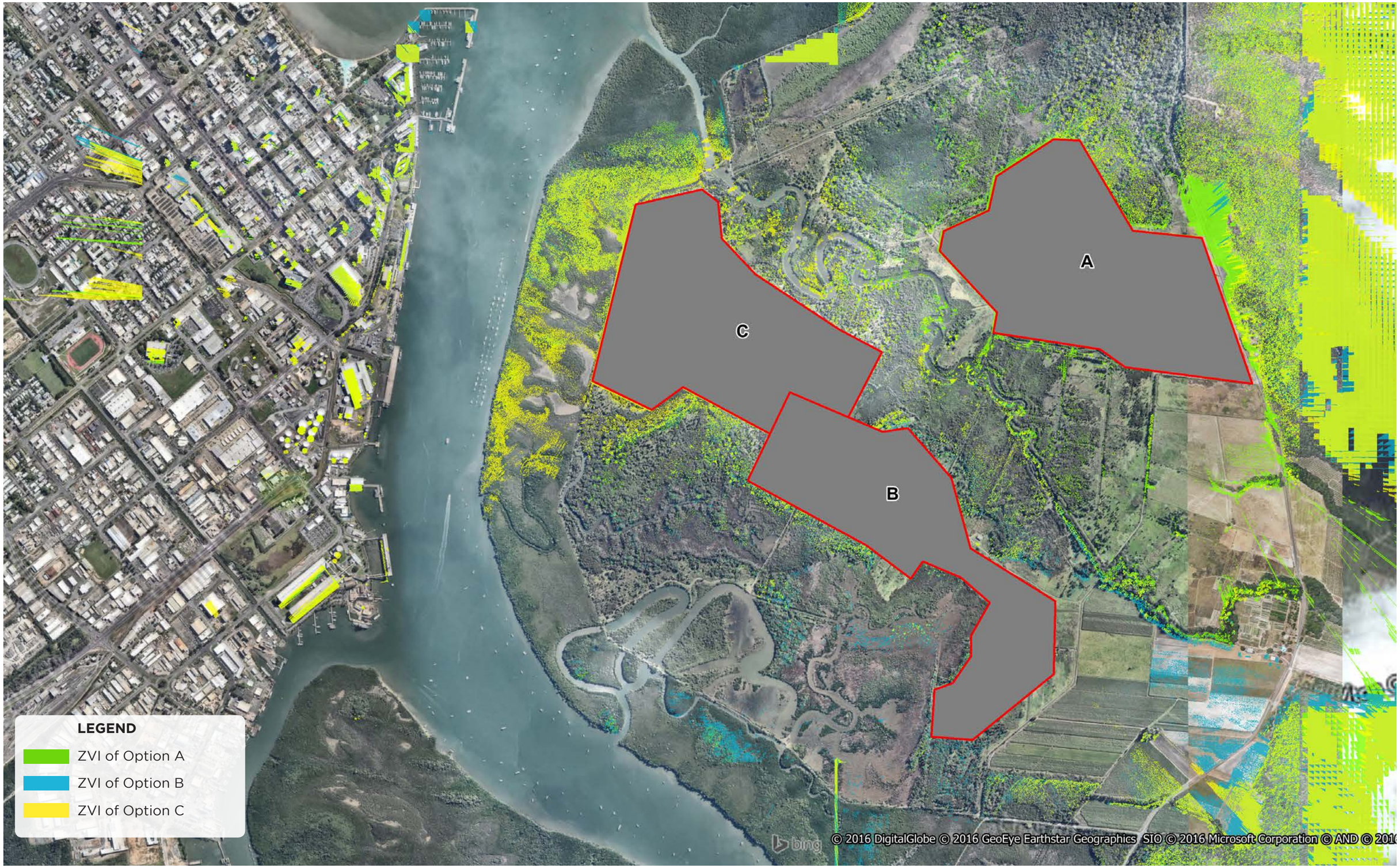

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Zoomed In- Zone Of Visual Influence - Proposed Fill Placement onEast Trinity Site - Options A,B & C | **Figure 12**

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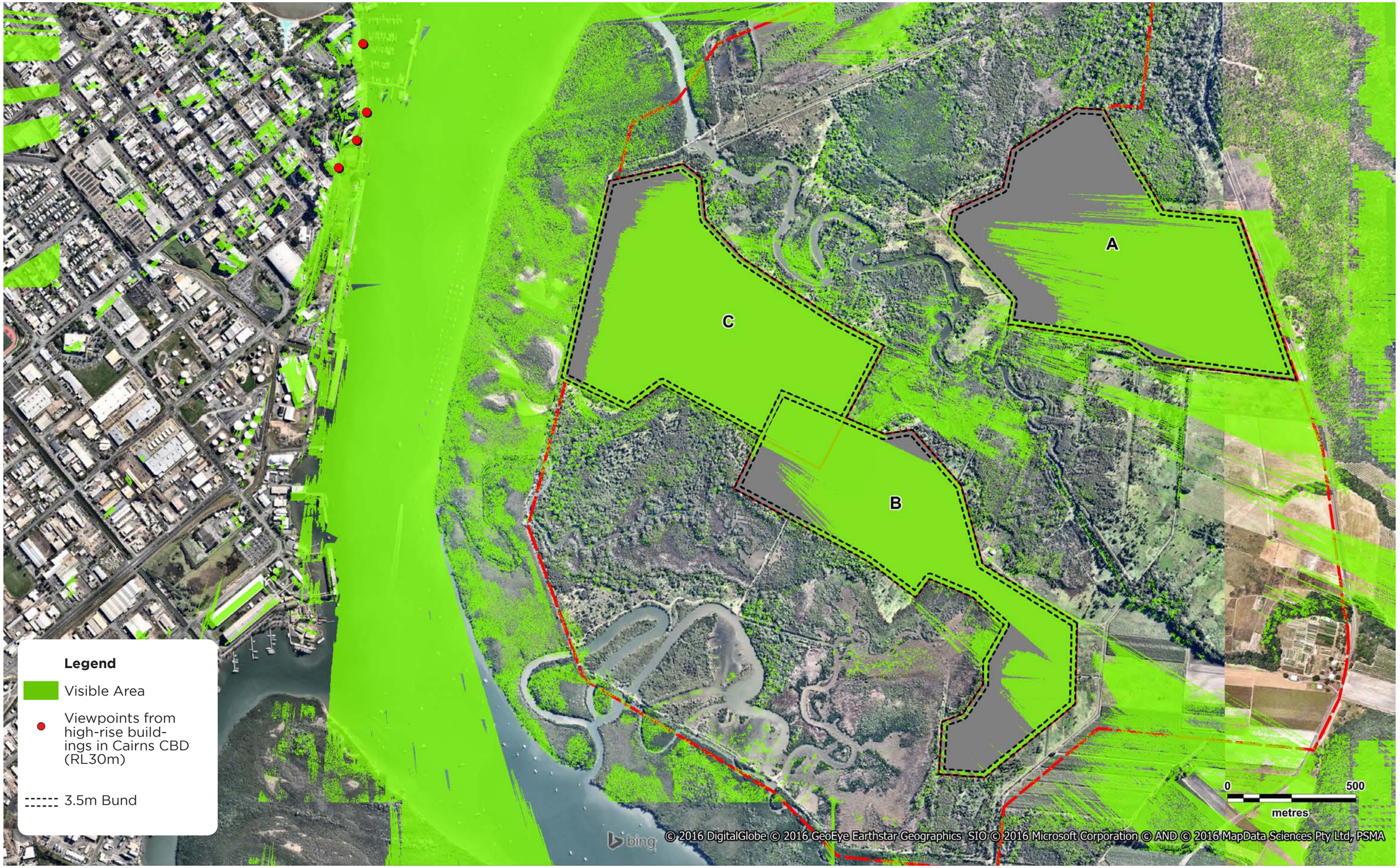

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Viewshed Analysis from Elevated Locations in Cairns CBD | **Figure 13**

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A

C

B

Legend

Visible Area

Viewpoints along Yarrabah Rd

0 1

kilometres

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Viewshed Analysis From Pine Creek- Yarrabah Road | **Figure 14**

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