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R784 Rev 1

July 2016

Mid West Sands

Southgate Dunes
Management & Decommissioning Plan

marinas
boat harbours
canals
breakwaters
jetties
seawalls
dredging
reclamation
climate change
waves
currents
tides
flood levels
water quality
siltation
erosion
rivers
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K1339, Report R784 Rev 1
Record of Document Revisions

Rev	Purpose of Document	Prepared	Reviewed	Approved	Date
A	Draft for MRA review	B Smith	C Doak	C Doak	23/6/16
0	Issued for Client use	B Smith	C Doak	C Doak	24/6/16
1	Inclusion of City of Greater Geraldton Comments	B Smith	C Doak	C Doak	12/7/16

Form 035 18/06/2013

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1. Background

Mid West Sands currently extract sand from the Southgate dunes located approximately 7 km south of Geraldton town centre along Brand Highway. The location of Southgate dunes is shown in Figure 1.1.

Figure 1.1 Southgate Dunes Location

Current sand extraction operations are limited to the northern portion of the Southgate dunes in Lot 2453, Cape Burney and involve the removal of sand for a range of agricultural and industrial uses. The volume of sand extracted is dictated by demand from farmers and other users and therefore varies from year to year. Figure 1.2 shows the approximate extent of the current extraction area.

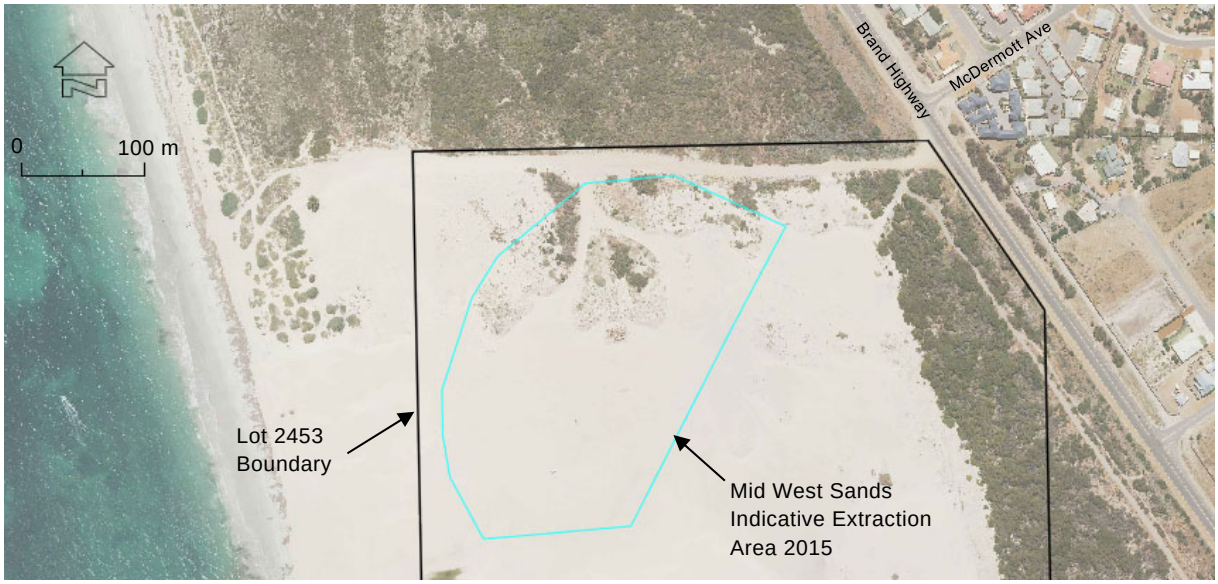

Figure 1.2 Indicative Sand Extraction Area

Sand extraction activities by Mid West Sands have helped to reduce the northwards movement of the Southgate dunes, which are threatening Brand Highway and residential properties in the area (further details are provided in the following section).

Mid West Sands are proposing to continue sand extraction within Lot 2453. This includes expanding operations to the eastern flank of the lot, focusing on a large, untouched sand dune front which is moving towards Brand Highway.

This Management Plan for the expanded extraction operations provides the following details, as required under the City of Greater Geraldton's Extractive Industry Local Planning Policy (EILPP).

- Review of the historical movement of the Southgate dunes.
- Plans showing the location of proposed extraction activities and site constraints.
- Details of the proposed sand extraction methodology.
- A rehabilitation and decommissioning plan.

2. Sediment Transport

Specialist coastal engineers, M P Rogers and Associates Pty Ltd (MRA), completed a study of the dunes as part of the approvals process for the proposed development of the area by the landholder Bayform Holdings. Details are provided in the report *Southgate Dunes – Sediment Feed Analysis* (MRA 2013).

The area known as the Southgate dunes system is essentially a large mobile sand sheet that is migrating in a northerly direction through the action of the prevailing southerly winds (MRA 2013). The dunes were originally formed by sand blowing north from the beach adjacent to the Greenough River mouth (Short 2006). Figure 2.1 taken from MRA (2013) shows the position of the dune in 1942, 1975 and 2012.

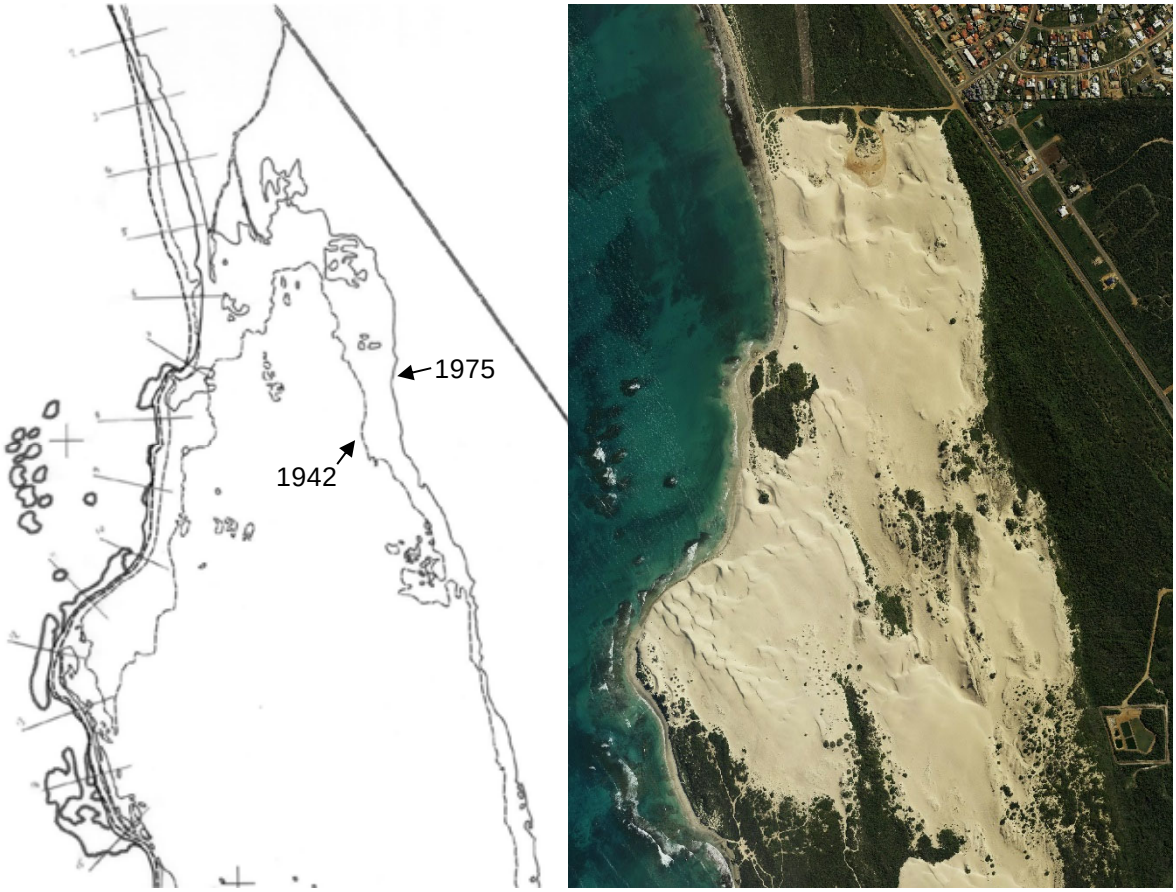

Figure 2.1 Extent of Southgate Dunes in 1942, 1975 (Left) and 2012 (Right)

Figure 2.1 shows that the dunes are a mobile feature, with both the northern and southern edges moving in a northerly direction. Analysis of rectified aerial photography suggests that the northern edge of the dunes moved approximately 100 m between 2001 and 2010 (MRA 2013). This is a rate of around 11 m/yr to the north.

Mid West Sands have been extracting sand from the northern area of Southgate dunes for a number of years. In the period from 2009 to 2013 Mid West Sands extracted between 50,000 and 80,000 m^3/year from the area. In recent years, the sand extraction volume has increased to around 100,000 m^3/year.

Figure 2.2 shows the approximate extent of Mid West Sands current sand extraction area. Figure 2.2 also shows the position of the vegetation line in 2001, 2010, 2012 and 2015.

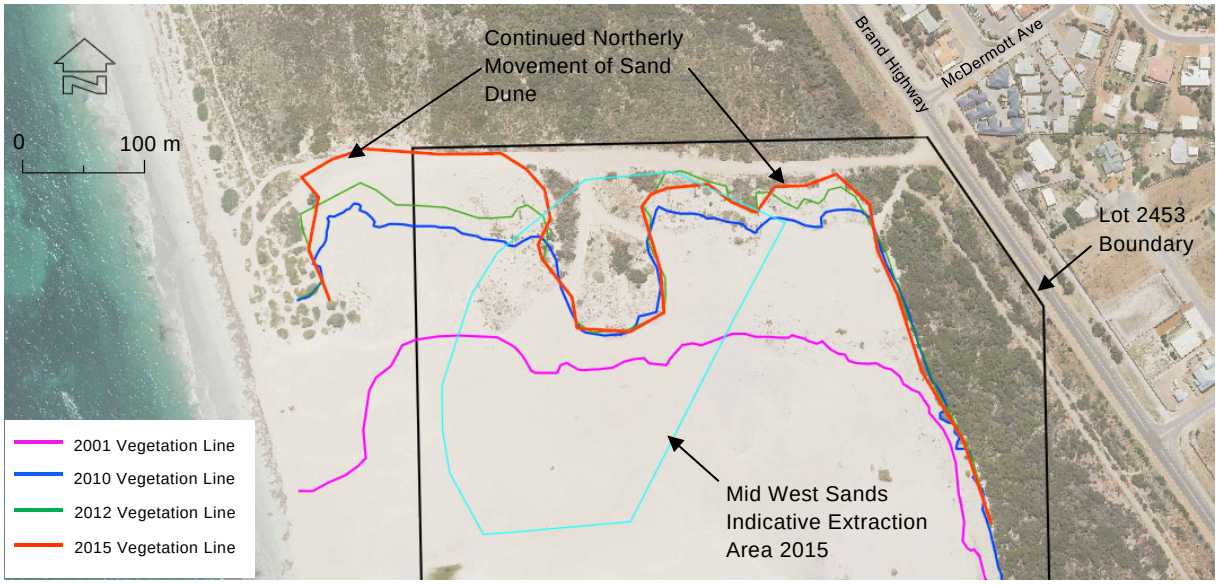

Figure 2.2 Existing Sand Extraction Area & Sand Dune Movement

Figure 2.2 highlights that the dune front to the east and west of the existing extraction area has continued to move to the north at a rate of around 5 to 10 m/yr, covering parts of the dune access road. The central portion of the northern dune face, influenced by the sand extraction, has seen minimal northerly transport between 2010 and 2015.

It is important to note that the movement of the dune front is highly dynamic. On-site experience suggests that the dune front can move up to 10 m in a matter of months depending on the prevailing winds and level of the dunes (pers com Doug Wilson, Mid West Sands 23/6/16).

The dune front to the east and west of the sand extraction area is likely to continue moving to the north at around 5 to 10 m/yr unless sand is removed from these areas. Without management, the dune front could start impacting Brand Highway within 10 years. Therefore, an expansion of the extraction area to the east would benefit both the City and the broader community.

3. Extraction Operations

3.1 Access & Constraints

As noted previously, the Southgate dunes are located approximately 7 kilometers south of the Geraldton town center. The existing and proposed sand extraction is to occur on Lot 2453, Cape Burney. The lot is accessed from a dune access road located off Brand Highway, approximately 50 m south of McDermott Avenue. Public access to the dunes has not been granted by the landowner, however members of the public do access the site from time to time. The Extraction Plan contained in Appendix A shows the dune access road and lot boundary for the site.

A Registered Aboriginal Heritage site (ID 5287 Southgates Burial Site) is located in the center of the lot. This site was identified in the Department of Aboriginal Sites (1990) report and is shown on the Extraction Plan in Appendix A. No excavation is proposed within this area.

Contours of the sand dune were extracted from ortho-imagery as part of MRA's work on the sand dune dynamics (MRA 2013). The 2012 contours are the most recently available data. Given the dynamic nature of the sand dunes, the contours provide an indication of the general ground levels in the dunes, with today's levels likely to be different. The contours are shown on the Extraction Plan in Appendix A.

3.2 Extraction Methodology

Sand is extracted from a number of dune faces using bulldozers and front end loaders. The dune face is generally flattened by the bulldozer with the loader working at the base, as shown in Figure 3.1.

Figure 3.1 Typical Sand Extraction Methodology (Mid West Sands)

If the sand is clean the loaders are able to place the sand directly into waiting road trains (typically 50 t) with the aid of loading ramps that have been set up on site. If there are no waiting road trains, the sand is stockpiled near the loading ramps.

Figure 3.2 Loading Sand Directly into Waiting Road Trains (Mid West Sands)

When the sand is not clean, due to the presence of dead vegetation or rocks, the sand is passed through a screening plant. The typical screening plant is shown in Figure 3.3.

Figure 3.3 Screening Equipment

When required, sand is typically stockpiled close to the ramps or the screen for ease of loading. The screen location and stockpile area is shown in Appendix A.

Dead vegetation that has been covered by the advancing sand sometimes needs to be excavated. The Department of Environment Regulation has confirmed that a clearing permit is not required for the extraction of this dead and buried vegetation (Pers Comm James Widenbar at DER, 4/7/16).

The sand extraction methodology outlined above is proposed to be used in the future for the expanded extraction area detailed in the following sections.

3.3 Mine Site & Traffic Management

Mid West Sands have prepared a Mine Site Management Plan (MSMP) which has been approved by the Department of Mines and Petroleum. The MSMP covers safety management and all mine site internal signage. All plant operators and truck drivers are inducted prior to being allowed on site. Inductions cover potential safety hazards and risk mitigation, as well as the mine road rules, speed and safety.

The emergency muster point and staff car park area are shown on the plan contained in Appendix A.

With regards to public safety, the aim of the MSMP is to keep the public away from mining as much as possible. Signage is placed at the northern entrance to the private lot (Lot 2453), as

shown in Figure 3.4 and Appendix A. Members of public are directed towards the beach, while trucks are diverted to the loading area.

Figure 3.4 Entrance Signage (Mid West Sands)

Mid West Sands predict around 50 to 60 road trains (typically 50 t) may enter and leave the site each day during the peak export season from January to March. Outside of this peak season, around 20 road trains may enter and leave the site each day. A range of trucks are used to haul sand, including B-double and double road trains. Figure 3.5 shows a double road train hauling sand away from site.

Figure 3.5 Typical Double Road Train at Southgate Dunes (Mid West Sands)

The road trains head in both directions along Brand Highway, with the route taken dependent on the final destination. Mid West Sands estimate that around half the trucks head north and half the trucks head south along Brand Highway. Ultimately, the number, size and route taken by the trucks will depend on demand for the sand by farmers and other users.

Mid West Sands operate six days per week (Monday to Saturday) from 6:00 am to 6:00pm. Where possible, works are not completed on public holidays to avoid heavy public interaction.

3.4 Proposed Expansion Details

The extraction area is proposed to be expanded to the east and south to allow access to a greater area of sand material. A total extraction area of around **25 ha** is required to allow for efficient movement of trucks and bulldozers. This is shown as the green line on the Extraction Plan contained in Appendix A.

In the coming few years, it is anticipated that extraction will occur from the pink area shown in Appendix A. This area is around 7.5 ha in size and does not extend into the Aboriginal Heritage site. Bulldozers may be required to work to the south of the pink line, which is why a larger extraction area of 25 ha (green line) has been proposed. Extraction may also occur in previously mined areas, which is shown in light blue in Appendix A.

The volume of sand extracted from year to year is dependent on user demand. However, Mid West Sands have confirmed that, at the most, between 120,000 and 150,000 tonnes of material would likely be extracted. Nevertheless, in some years the sand extraction could be as low as 10,000 to 50,000 tonnes.

Over the coming twelve months, sand will be extracted from the expanded area using a minimum of two loading ramps; one on the southern dune front and one on the eastern front. Mid West

Sands have noted they will focus on the eastern front first given the proximity of the dune front to the Brand Highway. The Extraction Plan in Appendix A shows the expanded area.

Sand is to be extracted above the +3 mAHD contour across the site. This maximum excavation depth ties in with the approximate level of the vegetation on the western side of the lot. In reality, excavation is likely to remain higher than +3 mAHD on the eastern flank given the level of the surrounding land. Recent excavations have extended to a depth of around +5 mAHD on the dune faces.

Stabilisation of the dune is not feasible given the rapid movement of the sand dunes. To minimise the impact of sand drift and nuisance dust on the public, no excavation will occur within 20 m of the lot boundary or 40 m of a road or watercourse. Excavation of the sand on the eastern flank will actually help to reduce wind-blown sand impacting the Brand Highway and adjacent residential lots.

4. Rehabilitation & Decommissioning Plan

The Southgate dunes is a highly mobile dune system, moving to the north at approximately 10 m/yr (refer to Section 2 for more details). The sand dunes are expected to continue to move into the extraction area for the foreseeable future. Attempts at stabilisation and revegetation of the extraction area are therefore likely to be very difficult and could prove to be unsuccessful, as on-going passage of dune fronts would cover any stabilised or revegetated areas.

The rehabilitation and decommissioning plan will therefore aim to return the extraction site to a natural dune state at the end of the works. The following actions are proposed for the decommissioning of the extraction site.

- Very high or unstable excavation faces will be battered and flattened off to reduce potential collapse. It should be noted that steep dune faces are likely to form naturally due to wind forces over time. This process currently occurs naturally within Southgate dunes.
- All of the screened debris and vegetation will be removed from the site and disposed of at an appropriate landfill site.
- All facilities and equipment will be removed from site at the end of the works. This includes all earthmoving equipment, screen, ramps and equipment storage areas.

The Decommissioning Plan in Appendix B shows the proposed decommissioning approach.

5. Benefits to Community

An expansion of the sand extraction area would have a number of benefits to the local community and to the City of Greater Geraldton. These are outlined below.

- Economic benefit with direct employment of 10 Mid West Sands employees and indirect employment of around 100 other people from truck drivers to farm hands.
- Improved soil conditions on farms which have the lime sands applied.
- Reduced management of wind blown sand onto Brand Highway required by the City of Geraldton.

The expanded sand extraction area will help Mid West Sands continue to provide the Mid West region with a low cost source of lime sands into the future.

6. References

Department of Aboriginal Sites, 1990. *An archaeological and ethnographic survey of the proposed Geraldton Mid-West Development Authority Sand Pit at Southgate Beach, Geraldton.* Western Australia.

MRA, 2013. *Southgate Dunes – Sediment Feed Analysis,* R386 Rev 0. Prepared for Bayform Holdings.

Short, A.D., 2006. *Beaches of the Western Australian Coast: Eucla to Roebuck Bay*. Sydney University Press, University of Sydney.

7. Appendices

Appendix A **Extraction Plan**

Appendix B **Decommissioning Plan**

Appendix A Extraction Plan

N

0 25 50 75 100 125m

SCALE 1:2500 AT ORIGINAL SIZE

SOUTHGATE DUNES ACCESS ROAD

RESTRICTED ACCESS SIGNAGE

McDERMOTT AVE

BRAND HWY

INDIAN OCEAN

LOT 2453 BOUNDARY

EARTHMOVING EQUIPMENT STORAGE

MUSTER POINT & STAFF CAR-PARKING

TYPICAL SCREENING & STOCKPILE AREA

INDICATIVE EXTENT OF CURRENT EXTRACTION AREA

20m BUFFER

MID WEST SANDS WILL FOCUS EXTRACTION IN THIS AREA GIVEN PROXIMITY TO BRAND HIGHWAY

SAND EXTRACTION TO REMAIN OUTSIDE OF ABORIGINAL HERITAGE SITE (ID 5287). REFER NOTE 1.

PROPOSED EXTENT OF EXTRACTION AREA (~25 ha) TO A MAXIMUM DEPTH OF +3 mAHD

LEGEND:

- PROPOSED EXTRACTION AREA ~25ha
- INDICATIVE EXTRACTION AREA IN COMING 1-2 YEARS ~7.5ha
- 2015 EXTRACTION AREA
- MUSTER POINT & STAFF CAR-PARKING
- ABORIGINAL HERITAGE SITE

NOTES:

1. ABORIGINAL HERITAGE LOCATION BASED ON GENERAL EXTENT PRESENTED IN DEPARTMENT OF ABORIGINAL SITES REPORT (JANUARY 1990). NO SAND EXTRACTION WILL BE COMPLETED WITHIN THIS AREA.
2. AERIAL PHOTOGRAPH: NOVEMBER 2015 FROM LANDGATE
3. 1m CONTOURS: 2012 EXTRACTED FROM ORTHO-IMAGERY BY SURVEY GRAPHICS

AT CORRECT SCALE THIS IS 100 mm

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SOUTHGATE DUNES - EXTRACTION PLAN

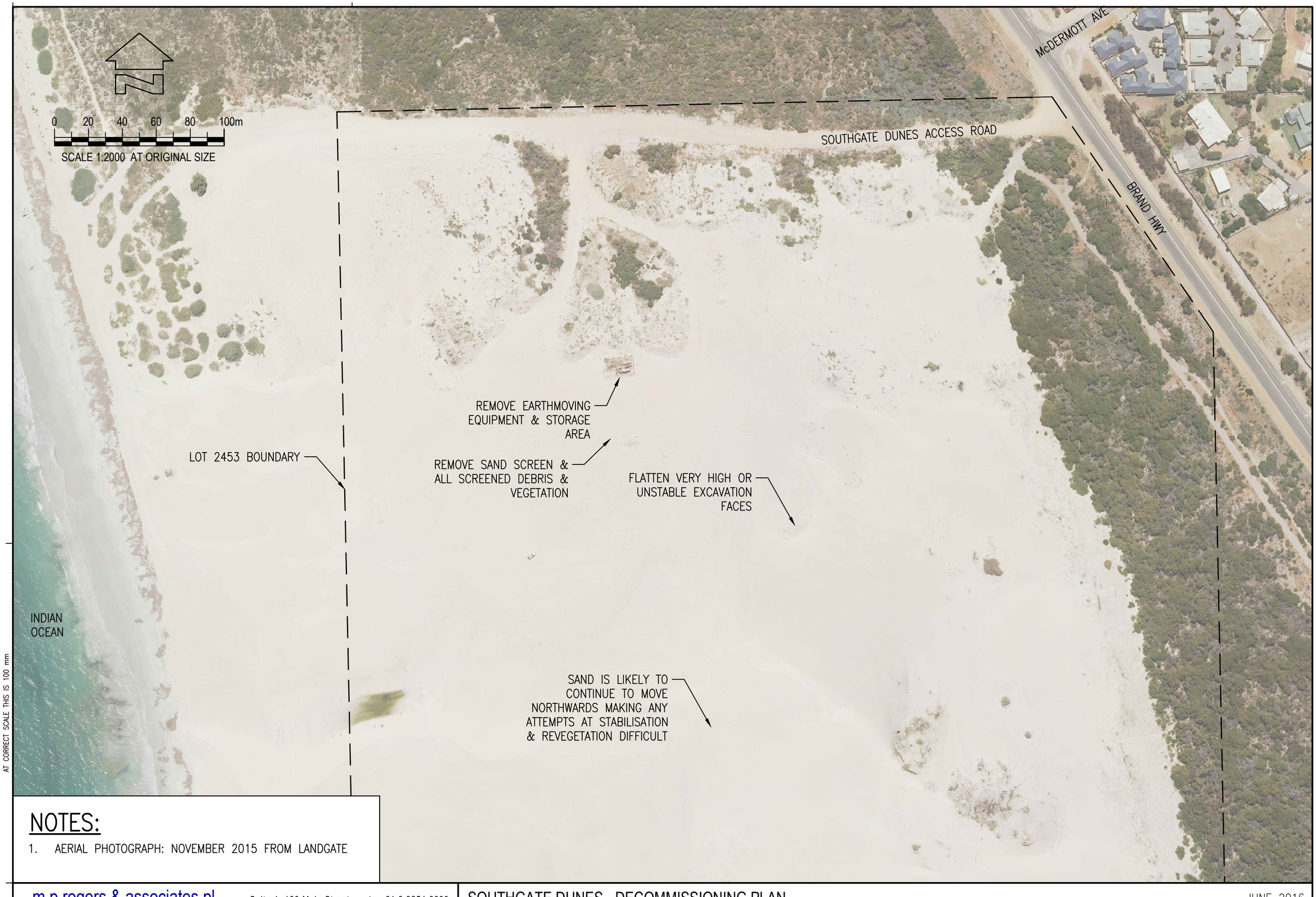
MID WEST SANDS APPROVALS

SCALE AT A3 1:2,500

JULY 2016

SK1339 8/6/16 2B

Appendix B Decommissioning Plan



AT CORRECT SCALE THIS IS 100 mm

NOTES:

1. AERIAL PHOTOGRAPH: NOVEMBER 2015 FROM LANDGATE

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SOUTHGATE DUNES - DECOMMISSIONING PLAN

MID WEST SANDS APPROVALS

SCALE AT A3 1:2,000

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