

APPENDIX ONE: DATA DICTIONARY FOR DIGITAL MAPPING

A1.1 Introduction

This appendix provides metadata for the vector GIS layers created to record the results of this project. All files produced are ESRI shapefiles, created using Arcview 3.2a, projected in the Universal Transverse Mercator (UTM) system using the Map Grid of Australia (MGA) co-ordinate system (Zone 55), and based on the GDA94 datum.

A1.2 Data Models

Shapefile: 1957_rochesveglimit_gda.shp, GDA94 datum

Type: Line

Description: Line position represents shoreline location (defined as seawards vegetation limit) at Roches Beach and adjacent rocky shorelines in 1957, and fixed reference features used to determine ortho-photo position error margins, digitised by drawing line over 1957 ortho-rectified air photos (Ortho-images 326-40 & 326-80; See Appendix Two). Shoreline is dune front scarp or incipient dune front in sandy areas, and landwards limit of regular wave-wash on rocky or artificial shorelines. In this theme, recorded attributes are based on air photo interpretation and comparison with 2006 ground truth data where appropriate.

Field	Type	Width	Attributes	Comments
<i>Feature</i>	string	50	Class of feature: <ul style="list-style-type: none"> shoreline vegetation limit fixed reference feature 	Broadly identifies whether mapped feature is a part of the shoreline whose movement is being monitored, or is a fixed reference feature whose position should not change over time
<i>Descrip</i>	string	100	More specific description of what the feature is.	e.g., road edge, building edge, dune-front scarp, etc
<i>Substrate</i>	string	50	Shoreline substrate <u>at</u> the vegetation limit (= shoreline): <ul style="list-style-type: none"> bedrock colluvium dune sand etc 	Recorded where possible.
<i>Condition</i>	string	1	Alphabetical qualitative classification of shoreline condition in terms of erosion or otherwise.	Recorded where possible. See attribute table in Section (A1.3)
<i>Artificial</i>	string	50	Artificial feature types present at shoreline vegetation limit, if any.	Recorded where possible.
<i>Notes</i>	string	200	Verbal comments as appropriate	
<i>Source</i>	string	100	Source of line position data	For this theme = Ortho-photo numbers 326-40 & 326-80
<i>Date</i>	string	10	Date line position data obtained, in format: DD/MM/YYYY	Date image taken.

Shapefile: 1977_rochesveglimit_gda.shp, GDA94 datum

Type: Line

Description: Line position represents shoreline location (defined as seawards vegetation limit) at Roches Beach and adjacent rocky shorelines in 1977, and fixed reference features used to determine ortho-photo position error margins, digitised by drawing line over 1977 ortho-rectified air photo (Ortho-image 708-3; See Appendix Two). Shoreline is dune front scarp or incipient dune front in sandy areas, and landwards limit of regular wave-wash on rocky or artificial shorelines. In this theme, recorded attributes are based on air photo interpretation and comparison with 2006 ground truth data where appropriate.

Field	Type	Width	Attributes	Comments
<i>Feature</i>	string	50	Class of feature: <ul style="list-style-type: none"> shoreline vegetation limit fixed reference feature 	Broadly identifies whether mapped feature is a part of the shoreline whose movement is being monitored, or is a fixed reference feature whose position should not change over time
<i>Descrip</i>	string	100	More specific description of what the feature is.	e.g., road edge, building edge, dune-front scarp, etc
<i>Substrate</i>	string	50	Shoreline substrate <u>at</u> the vegetation limit (= shoreline): <ul style="list-style-type: none"> bedrock colluvium dune sand etc 	Recorded where possible.
<i>Condition</i>	string	1	Alphabetical qualitative classification of shoreline condition in terms of erosion or otherwise.	Recorded where possible. See attribute table in Section (A1.3)
<i>Artificial</i>	string	50	Artificial feature types present at shoreline vegetation limit, if any.	Recorded where possible.
<i>Notes</i>	string	200	Verbal comments as appropriate	
<i>Source</i>	string	100	Source of line position data	For this theme = Ortho-photo number 708-3
<i>Date</i>	string	10	Date line position data obtained, in format: DD/MM/YYYY	Date image taken.

Shapefile: 1987_rochesveglimit_gda.shp, GDA94 datum

Type: Line

Description: Line position represents shoreline location (defined as seawards vegetation limit) at Roches Beach and adjacent rocky shorelines in 1987, and fixed reference features used to determine ortho-photo position error margins, digitised by drawing line over 1987 ortho-rectified air photo (Ortho-image 1092-240; See Appendix Two). Shoreline is dune front scarp or incipient dune front in sandy areas, and landwards limit of regular wave-wash on rocky or artificial shorelines. In this theme, recorded attributes are based on air photo interpretation and comparison with 2006 ground truth data where appropriate.

Field	Type	Width	Attributes	Comments
<i>Feature</i>	string	50	Class of feature: <ul style="list-style-type: none"> • shoreline vegetation limit • fixed reference feature 	Broadly identifies whether mapped feature is a part of the shoreline whose movement is being monitored, or is a fixed reference feature whose position should not change over time
<i>Descrip</i>	string	100	More specific description of what the feature is.	e.g., road edge, building edge, dune-front scarp, etc
<i>Substrate</i>	string	50	Shoreline substrate <u>at</u> the vegetation limit (= shoreline): <ul style="list-style-type: none"> • bedrock • colluvium • dune sand • etc 	Recorded where possible.
<i>Condition</i>	string	1	Alphabetical qualitative classification of shoreline condition in terms of erosion or otherwise.	Recorded where possible. See attribute table in Section (A1.3)
<i>Artificial</i>	string	50	Artificial feature types present at shoreline vegetation limit, if any.	Recorded where possible.
<i>Notes</i>	string	200	Verbal comments as appropriate	
<i>Source</i>	string	100	Source of line position data	For this theme = Ortho-photo number 1092-240
<i>Date</i>	string	10	Date line position data obtained, in format: DD/MM/YYYY	Date image taken.

Shapefile: 2001_rochesveglimit_gda.shp, GDA94 datum

Type: Line

Description: **Baseline shoreline position map, used as the standard baseline against which to compare all earlier and later imagery and mapping of shoreline position.** Line position represents shoreline location (defined as seawards vegetation limit) at Roches Beach and adjacent rocky shorelines in 2001, and fixed reference features used to determine ortho-photo position error margins, digitised by drawing line over 2001 ortho-rectified air photos (LIST Digital Urban Series Ortho-images 1342-46 & 1342-48; See Appendix Two). Shoreline is dune front scarp or incipient dune front in sandy areas, and landwards limit of regular wave-wash on rocky or artificial shorelines. In this theme, recorded attributes are based on air photo interpretation and comparison with 2006 ground truth data where appropriate.

Field	Type	Width	Attributes	Comments
<i>Feature</i>	string	50	Class of feature: <ul style="list-style-type: none"> • shoreline vegetation limit • fixed reference feature 	Broadly identifies whether mapped feature is a part of the shoreline whose movement is being monitored, or is a fixed reference feature whose position should not change over time
<i>Descrip</i>	string	100	More specific description of what the feature is.	e.g., road edge, building edge, dune-front scarp, etc
<i>Substrate</i>	string	50	Shoreline substrate <u>at</u> the vegetation limit (= shoreline): <ul style="list-style-type: none"> • bedrock • colluvium • dune sand • etc 	Recorded where possible.
<i>Condition</i>	string	1	Alphabetical qualitative classification of shoreline condition in terms of erosion or otherwise.	Recorded where possible. See attribute table in Section (A1.3)
<i>Artificial</i>	string	50	Artificial feature types present at shoreline vegetation limit, if any.	Recorded where possible.
<i>Notes</i>	string	200	Verbal comments as appropriate	
<i>Source</i>	string	100	Source of line position data	For this theme = Ortho-photo numbers 1342-46 & 1342-48
<i>Date</i>	string	10	Date line position data obtained, in format: DD/MM/YYYY	Date image taken.

Shapefile: 2005_rochesveglimit_gda.shp, GDA94 datum

Type: Line

Description: Line position represents shoreline location (defined as seawards vegetation limit) at Roches Beach and adjacent rocky shorelines in 2005, and fixed reference features used to determine ortho-photo position error margins, digitised by drawing line over 2005 rectified QuickBird satellite image (see Appendix Two). Shoreline is dune front scarp or incipient dune front in sandy areas, and landwards limit of regular wave-wash on rocky or artificial shorelines. In this theme, recorded attributes are based on image interpretation and comparison with 2006 ground truth data where appropriate.

Field	Type	Width	Attributes	Comments
<i>Feature</i>	string	50	Class of feature: <ul style="list-style-type: none"> shoreline vegetation limit fixed reference feature 	Broadly identifies whether mapped feature is a part of the shoreline whose movement is being monitored, or is a fixed reference feature whose position should not change over time
<i>Descrip</i>	string	100	More specific description of what the feature is.	e.g., road edge, building edge, dune-front scarp, etc
<i>Substrate</i>	string	50	Shoreline substrate <u>at</u> the vegetation limit (= shoreline): <ul style="list-style-type: none"> bedrock colluvium dune sand etc 	Recorded where possible.
<i>Condition</i>	string	1	Alphabetical qualitative classification of shoreline condition in terms of erosion or otherwise.	Recorded where possible. See attribute table in Section (A1.3)
<i>Artificial</i>	string	50	Artificial feature types present at shoreline vegetation limit, if any.	Recorded where possible.
<i>Notes</i>	string	200	Verbal comments as appropriate	
<i>Source</i>	string	100	Source of line position data	For this theme: QuickBird satellite image
<i>Date</i>	string	10	Date line position data obtained, in format: DD/MM/YYYY	Date image taken. (For this theme = 2 nd May 2005)

Shapefile: 2005roches1_6mbuffergda.shp
 1987_roches_2mbuffer_gda.shp
 1977_roches_2mbuffer_gda.shp
 1957_roches_2mbuffer_gda.shp

Type: Polygon

Description: Buffer envelopes around measured apparent shoreline positions for 2005, 1987, 1977 & 1957 (*rochesveglimit* line shapefiles, see above), representing position error margins determined as described in text. The buffers represent the areas within which the shoreline for each epoch could potentially lie, given the measured position error margins for each ortho-rectified air photo (see Appendix Two). Buffer shapefiles generated automatically in Arcview, based on the shoreline position line theme to which each buffer envelope file relates.

Field	Type	Width	Attributes	Comments
<i>Bufferdis</i>	numerical	16	Buffer distance in metres around central apparent shoreline position.	Buffer distance is 1.6m either side of apparent shoreline position for 2005, and 2.0m for 1987, 1977 and 1957 files

Shapefile: *tasmarcgda.shp*, GDA94 datum

Type: Point

Description: Positions of State Permanent Markers (SPM) installed by DPIWE surveyors during 2005 for the Tasmanian Shoreline Monitoring and Archiving (TASMARC) project, benchmarks for beach profile monitoring surveys. Positions of SPM markers determined by accurate GPS surveys conducted by DPIWE surveyors.

Field	Type	Width	Attributes	Comments
<i>Tasmarc</i>	string	7	TASMARC benchmark number	Mark number assigned for TASMARC Project.
<i>Spm</i>	string	16	State Permanent Marker (SPM) number	Assigned by DPIWE
<i>Eastgda</i>	number	16 (3 decimal places)	Metric easting (Map Grid of Australia (MGA), based on GDA94 datum)	Determined by DPIWE GPS survey; metric coordinate quoted to 3 decimal places by surveyors.
<i>Northgda</i>	number	16 (3 decimal places)	Metric northing (Map Grid of Australia (MGA), based on GDA94 datum)	Determined by DPIWE GPS survey; metric coordinate quoted to 3 decimal places by surveyors.

Shapefile: *tasmarcrochesveglimit_gda.shp*, GDA94

Type: Line

Description: Line positions representing shoreline location (defined as dune scarp = seawards vegetation limit) at three locations adjacent TASMARC / SPM markers, obtained by ground-based TASMARC surveys. Surveys based on tape and theodolite measurements from SPM benchmarks.

Field	Type	Width	Attributes	Comments
<i>Feature</i>	string	50	Class of feature: <ul style="list-style-type: none"> • shoreline vegetation limit • fixed reference feature 	Broadly identifies whether mapped feature is a part of the shoreline whose movement is being monitored, or is a fixed reference feature whose position should not change over time
<i>Descrip</i>	string	100	More specific description of what the feature is.	e.g., road edge, building edge, dune-front scarp, etc
<i>Substrate</i>	string	50	Shoreline substrate <u>at</u> the vegetation limit (= shoreline) : <ul style="list-style-type: none"> • bedrock • colluvium • dune sand • etc 	
<i>Condition</i>	string	1	Alphabetical qualitative classification of shoreline condition in terms of erosion or otherwise.	Based on photos taken by TASMARC volunteer surveyors. See attribute table in Section (A1.3)
<i>Scarphtm</i>	number	4 (2 decimal places)	Height of erosion scarp where present, in metres	Based on photos and survey records by TASMARC volunteer surveyors. Automatically records as zero (0.00) where no erosion scarp present
<i>Artificial</i>	string	50	Artificial feature types present at shoreline vegetation limit, if any.	
<i>Notes</i>	string	200	Verbal comments as appropriate	
<i>Source</i>	string	100	Source of line position data	
<i>Date</i>	string	10	Date line position data obtained, in format: DD/MM/YYYY	Date survey conducted.

Shapefile: 2006_rochescondition_gda.shp, GDA94

Type: Line

Description: Geomorphic condition (erosion status, etc) of Roches Beach shoreline (defined as seawards vegetation limit) at 11th – 14th August 2006, determined by field surveys by C. Sharples. Shoreline is the seawards vegetation limit, i.e., the dune front scarp or incipient dune front in sandy areas, and landwards limit of regular wave-wash on rocky or artificial shorelines. The line position is based on 2001_rochesveglimit_gda.shp; hence whilst condition data attributes are accurate for 2006, line position is *not* necessarily accurate for 2006.

Field	Type	Width	Attributes	Comments
<i>Feature</i>	string	50	Class of feature: <ul style="list-style-type: none"> shoreline vegetation limit fixed reference feature 	Broadly identifies whether mapped feature is a part of the shoreline whose movement is being monitored, or is a fixed reference feature whose position should not change over time
<i>Descrip</i>	string	100	More specific description of what the feature is.	Verbal description of types, e.g., road edge, building edge, dune-front scarp, etc
<i>Substrate</i>	string	50	Shoreline substrate <u>at</u> the vegetation limit (= shoreline): <ul style="list-style-type: none"> bedrock ± soil colluvium ± soil dune sand boulder wall etc 	Verbal description of types.
<i>Condition</i>	string	1	Alphabetical qualitative classification of shoreline condition in terms of erosion or otherwise.	See attribute table in Section (A1.3)
<i>Scarphtm</i>	string	9	Height of erosion scarp where present, in metres, recorded in half-metre ranges (e.g., "0.5 – 1.0")	"0.0" where no scarp present, or old bedrock scarp is considered stable (see attribute table in Section A1.3).
<i>Artificial</i>	string	50	Artificial feature types present at shoreline vegetation limit, if any. Includes: "no" – no artificial features	Verbal description of types.
<i>Notes</i>	string	200	Verbal comments as appropriate	
<i>Date</i>	string	10	Date condition data obtained, in format: DD/MM/YYYY	Date survey conducted, etc.

Shapefile: 1957_2005_mindetactable_change.da.shp, GDA94

Type: Line

Description: LIST HWM line with attributes summarising the minimum shoreline position changes that can be demonstrated to have occurred at Roches Beach between 1957 and 2005, based on measuring the separation between the outer edges of the position error envelopes for the shoreline positions determined for those epochs from analysis of ortho-rectified air photos. Also provides numbering of shoreline accretion and recession zones defined in this project for convenience in describing patterns of change.

Field	Type	Width	Attributes	Comments
<i>change</i>	string	16	Measured 1957 to 2005 position error envelope separations, in 2 metre increments.	Net recession indicated by '-' figures, net accretion by '+' figures.
<i>zone</i>	string	16	Recession or accretion zone name, or "no change" where no net detectable shoreline movement between 1957 and 2005 can be demonstrated.	

Shapefile: *fixedfeatures_gda.shp*, GDA94 datum

Type: Point

Description: This theme identifies the positions of fixed reference features visible in both the 1957 air photo ortho-images and in the 2001 air photo ortho-images, and records the actual ortho-rectification errors (apparent feature movement) between the 2001 and 1957 ortho-images. The outlines of the same fixed reference features have been digitised as lines in *1957_rochesveglimit_gda.shp* and in *2001_rochesveglimit_gda.shp*, and are identified with the same feature labels in those shapefiles. The point positions recorded in this theme are positions roughly halfway between the 1957 and 2001 positions of the part of each fixed feature used to measure the apparent movement (ortho-rectification error) between the 2001 and 1957 ortho-images. The position errors recorded in this theme were determined in Arcview by measuring the distance between the position of each identical fixed feature in the *1957_rochesveglimit_gda.shp* and *2001_rochesveglimit_gda.shp* themes. The position errors recorded in this theme are in all cases recorded as the distance and direction from the 2001 position of each feature to the 1957 position of the same feature. The accuracy of the position errors determined in this way is estimated to be ± 0.5 metre, which is the pixel size of both ortho-images.

Field	Type	Width	Attributes	Comments
<i>Fixedfeat</i>	string	4	Feature number	Feature label, as used for same features in the <i>1957_rochesveglimit_gda.shp</i> and <i>2001_rochesveglimit_gda.shp</i> themes.
<i>Eastgda</i>	number	6	MGA easting of fixed feature location point, GDA94 datum	Feature position mid-way between the 1957 and 2001 positions of the part of each fixed feature used to measure the apparent movement (ortho-rectification error) between the 2001 and 1957 ortho-images
<i>Northgda</i>	number	7	MGA northing of fixed feature location point, GDA94 datum	As above
<i>Northm</i>	number	1 + 2 decimal places	Apparent movement of feature in northwards direction, in metres.	Apparent movement of feature <u>from</u> the 2001 image position <u>to</u> the 1957 image position.
<i>Southm</i>	number	1 + 2 decimal places	Apparent movement of feature in southwards direction, in metres	As above.
<i>Eastm</i>	number	1 + 2 decimal places	Apparent movement of feature in eastwards direction, in metres	As above.
<i>Westm</i>	number	1 + 2 decimal places	Apparent movement of feature in westwards direction, in metres	As above.
<i>Offshorem</i>	number	1 + 2 decimal places	Apparent movement of feature in offshore direction, in metres	As above. Movement normal to shoreline.
<i>Onshorem</i>	number	1 + 2 decimal places	Apparent movement of feature in onshore direction, in metres	As above. Movement normal to shoreline.
<i>Notes</i>	string	200	Notes or comments	

A1.3 Attribute Table ("Lookup Table")

Shoreline Condition (Condition)

Used in shapefile/theme: 2006_rochescondition_gda.shp

Field name: Condition

Field type: String

Field width: 1

Explanation: Qualitative classification of shoreline condition (at the seawards vegetation limit) in terms of the degree of erosion evident or otherwise. Determined by subjective field classification by C. Sharples on 11th – 14th August 2006.

NOTE that for the purposes of this attribute, "erosion" refers to recent or accelerated (last few years or decades) erosion; bedrock shores showing shoreline scarps with no evidence of recent accelerated erosion are considered stable shorelines, albeit they are obviously erosional over longer time-frames.

Attribute summary:

Characters	Shoreline condition (<i>Condition</i>)
A	Active erosion – Fresh vertical erosion scarp, unvegetated, little slumping or rounding of scarp.
B	Recent erosion – Erosion scarp mainly vertical and unvegetated, with some slumping or rounding over.
C	Inactive erosion – Old erosion scarp, significantly collapsed or rounded over and with some vegetation growth, but generally no significant incipient dune formed to seawards of old erosion scarp.
D	Sand accretion – Significant fresh incipient dune with some vegetation growth (partly buried old erosion scarp may still be evident to landwards in some cases).
E	No erosion scarp: Artificial shores – Artificially protected shores showing no active erosion scarp behind or under protective structure. (If erosion scarp is evident despite artificial structure, shoreline segment classified A, B or C as appropriate).
F	Stable shoreline: natural shores - Natural shores (rocky or sandy, etc) showing neither recent accelerated erosion nor accretion of sand).
U	Unclassified – Shoreline condition unknown or unclassified.

APPENDIX TWO: AERIAL AND SATELLITE IMAGERY METADATA

This Appendix provides relevant metadata for imagery (including ortho-rectified air photos and a satellite image) used to produce the mapping provided with this report. The imagery is copyright data, copies of which cannot be provided as outcomes of this report, but upon which the outcomes provided with this report are based. Users wishing to view and use such imagery will need to obtain their own copies from the relevant copyright holders in each case.

2001 Ortho-rectified Air Photo Images

Imagery name: LIST Digital Urban Series Ortho-images 1342-46 & 1342-48

Copyright holder: Information & Land Services (ILS), Department of Primary Industries & Water, Hobart, Tasmania

Brief description & coverage: Scanned and ortho-rectified 2001 colour air photo images of Roches Beach, Lauderdale, southeast Tasmania (North Roches Beach: 1342-46, South Roches Beach: 1342-48)

Used for: *2001_rochesveglimit_gda.shp* (used to digitise baseline 2001 shoreline (seawards vegetation limit) position); Refer Appendix A1.2 Data Models.

Format & Mapping Standards: Supplied in ERmapper .ecw format, GDA94 datum, MGA Zone 55 co-ordinate system, UTM projection.

Image Capture date: 4th January 2001

Image & Camera details: Colour Aerial Photography Project No. A135HD, Film no. 1342, Run No. 15S, Frames 46 & 48, flown 4/01/2001, Lens 153mm, Scale 1:24,000

Rectification: Ortho-rectification process controlled by control point transfer from existing controlled photography used to produce 1:5,000 Urban Ortho Photo Series and 5m contour data from that series.

Pixel size (resolution): 0.50 metre

Absolute horizontal accuracy (positional error margins) relative to actual feature positions, as quoted by supplier: Accuracy generally in the order of ± 2 metres, but can be ± 5 metres in some places (includes the "pointing error" determined by pixel size limitations). When projected in Arcview, there is a 4 - 5 m (approx) north-south offset and 1.5m (approx) east-west offset between identifiable features in the shoreline region of each image, in the area of overlap between the two images. Since the shoreline runs N-S in the area of overlap, this amounts to a 1.5m (approx) offset in the shoreline position in the onshore-offshore direction. The northern part of *2001_rochesveglimit_gda.shp* was digitised from 1342-46, and southern (main) from 1342-48 (as attributed in *2001_rochesveglimit_gda.shp*), hence this offset will be inherent in a slight difference between the two.

Relative horizontal accuracy: These 2001 images are the baseline maps (images) used to compare all other images with for the purposes of this project. Hence for these purposes the "absolute" accuracy of these 2001 images with respect to actual feature locations on the ground is ignored, and the horizontal accuracy (error margin) for these 2001 images is taken to be only the "pointing error", which is the accuracy with which any feature can be pointed at on the images. This error is determined by the pixel size (0.5m).

1957 Ortho-rectified Air Photo Images

Imagery name: ILS Ortho-images 326-40 & 326-80

Copyright holder: Information & Land Services (ILS), Department of Primary Industries & Water, Hobart, Tasmania.

Brief description & coverage: Scanned and ortho-rectified monochrome 1957 air photo images of Roches Beach, Lauderdale, south east Tasmania (North Roches Beach: 326-80, South Roches Beach: 326-40).

Used for: *1957_rochesveglimit_gda.shp* (line map of 1957 shoreline (seawards vegetation limit) position); Refer Appendix A1.2 Data Models.

Format & Mapping Standards: Supplied in ERmapper .ecw format, GDA94 datum, MGA Zone 55 co-ordinate system, UTM projection.

Image Capture date: 30th January 1957

Image & Camera details: Black & White Aerial Photography, Hobart Project, Film no. 326, Run 4 Frame 40 and Run 5 Frame 80, flown 30/01/1957, Lens 152mm, Scale 1:14,000.

Rectification: Ortho-rectified by ILS using common detail (ground control) points measured from 2001 ortho-images 1342-46 and 1342-48 (described above).

Pixel size (resolution): 0.50 metre

Relative horizontal accuracy (positional error margins) quoted by supplier: Relative difference between the 2001 baseline control images (ortho-images 1342-46 & 1342-48) and 1957 ortho-images 326-40 & 326-80 is ± 2 metres in some areas (includes the "pointing error" determined by pixel size limitations).

Relative horizontal accuracy (positional error margins) estimated by comparison of fixed reference features with baseline image (2001 ortho-photo): Accuracy of ± 1.9 metres in directions normal to the shoreline for features on and adjacent Roches Beach, relative to the baseline 2001 ortho-photos (Ortho-images 1342-46 & 1342-48 described above).

(Positional error margins were determined by C. Sharples using ESRI Arcview 3.2a software. The edges of a total of 20 fixed reference features clearly visible in both the 1957 and the 2001 ortho-photo images were plotted against each image, and their apparent displacements between the two images were measured using the Arcview measuring tool. Fixed reference features used were mainly building edges, fences and rock outcrop features at the shoreline. Features were chosen distributed along the entire length of the study area (including both of the 1957 ortho-images), most are within 100 metres horizontally and less than 5 metres vertically of the shoreline, and all features used are within 135 metres horizontally and 15m vertically of the shoreline. The features used are digitised as line segments in the accompanying shapefiles *1957_rochesveglimit_gda.shp* and *2001_rochesveglimit_gda.shp*. Maximum apparent displacement in any direction of any point features (corners, etc) between the 1957 and 2001 ortho-photo images was 3.0m, however all but 3 of the 20 features compared were displaced less than 2.3m and 14 of the 20 were displaced less than 2.0m in any direction. This is reasonably consistent with the supplier's quoted accuracy of ± 2 metres, with only a few features being displaced 2.0 – 3.0m and none greater than 3.0m. Maximum apparent displacement of features in either direction normal to the adjacent part of the shoreline was 1.9m, however most apparent displacements in directions normal to the shoreline were less than 1.5m. Apparent displacement of features in the 1957 images relative to the 2001 baseline images occurred variously in both onshore and offshore directions.)

1977 Ortho-rectified Air Photo Image

Imagery name: ILS Ortho-image 708-3

Copyright holder: Information & Land Services (ILS), Department of Primary Industries & Water, Hobart, Tasmania.

Brief description & coverage: Scanned and ortho-rectified monochrome 1977 air photo image of Roches Beach, Lauderdale, south-east Tasmania.

Used for: *1977_rochesveglimit_gda.shp* (line map of 1977 shoreline (seawards vegetation limit) position); Refer Appendix A1.2 Data Models.

Format & Mapping Standards: Supplied in ERMapper .ecw format, GDA94 datum, MGA Zone 55 co-ordinate system, UTM projection.

Image Capture date: 4th February 1977

Image & Camera details: Black & White Aerial Photography, Revision 1977 Project, Film no. 708, Run 6 Frame 3, flown 04/02/1977, Lens 153mm, Scale 1:30,000.

Rectification: Ortho-rectified by ILS using common detail (ground control) points measured from 2001 ortho-images 1342-46 and 1342-48 (described above).

Pixel size (resolution): 0.5 metre

Relative horizontal accuracy (positional error margins) quoted by supplier: Relative difference between the 2001 baseline control images (ortho-images 1342-46 & 1342-48) and 1977 ortho-image 708-3 is ± 2 metres in some areas (includes the "pointing error" determined by pixel size limitations).

Relative horizontal accuracy (positional error margins) estimated by comparison of fixed reference features with baseline image (2001 ortho-photo): Accuracy of ± 1.8 metres in directions normal to the shoreline for features on and adjacent Roches Beach, relative to the baseline 2001 ortho-photos (Ortho-images 1342-46 & 1342-48 described above).

(Positional error margins were determined by C. Sharples using ESRI Arcview 3.2a software. The edges of a total of 25 fixed reference features clearly visible in both the 1977 and the 2001 ortho-photo images were plotted against each image, and their apparent displacements between the two images were measured using the Arcview measuring tool. Fixed reference features used were mainly road kerbs, building edges, fences and rock outcrop features at the shoreline. Features were chosen distributed along the entire length of the study area, most are within 100 metres horizontally and less than 5 metres vertically of the shoreline, and all features used are within 240 metres horizontally and 10m vertically of the shoreline. The features used are digitised as line segments in the accompanying shapefiles *1977_rochesveglimit_gda.shp* and *2001_rochesveglimit_gda.shp*. Maximum apparent displacement in any direction of any point features (corners, etc) between the 1977 and 2001 ortho-photo images was 2.75m, however all but 2 of the 25 features compared were displaced 2.0m or less in any direction. This is consistent with the supplier's quoted accuracy of ± 2 metres, with only 2 features being displaced >2.0 m and none greater than 2.75m. Maximum apparent displacement of features in either direction normal to the adjacent part of the shoreline was 1.8m, however most apparent displacements in directions normal to the shoreline were less than 1.5m. Apparent displacement of features in the 1977 images relative to the 2001 baseline images occurred variously in both onshore and offshore directions.)

1987 Ortho-rectified Air Photo Image

Imagery name: ILS Ortho-image 1092-240

Copyright holder: Information & Land Services (ILS), Department of Primary Industries & Water, Hobart, Tasmania.

Brief description & coverage: Scanned and ortho-rectified monochrome 1987 air photo image of Roches Beach, Lauderdale, south-east Tasmania.

Used for: *1987_rochesveglimit_gda.shp* (line map of 1987 shoreline (seawards vegetation limit) position); Refer Appendix A1.2 Data Models.

Format & Mapping Standards: Supplied in ERMapper .ecw format, GDA94 datum, MGA Zone 55 co-ordinate system, UTM projection.

Image Capture date: 30th October 1987.

Image & Camera details: Black & White Aerial Photography, M727 Project, Film no. 1092, Run 3 Frame 240, flown 30/10/1987, Lens 153mm, Scale 1:28,000.

Rectification: Ortho-rectified by ILS using common detail (ground control) points measured from 2001 ortho-images 1342-46 and 1342-48 (described above).

Pixel size (resolution): 0.5 metre

Relative horizontal accuracy (positional error margins) quoted by supplier: Relative difference between the 2001 baseline control images (ortho-images 1342-46 & 1342-48) and 1987 ortho-image 1092-240 is ± 2 metres in some areas (includes the "pointing error" determined by pixel size limitations).

Relative horizontal accuracy (positional error margins) estimated by comparison of fixed reference features with baseline image (2001 ortho-photo): Accuracy of ± 1.9 metres in directions normal to the shoreline for features on and adjacent Roches Beach, relative to the baseline 2001 ortho-photos (Ortho-images 1342-46 & 1342-48 described above).

(Positional error margins were determined by C. Sharples using ESRI Arcview 3.2a software. The edges of a total of 27 fixed reference features clearly visible in both the 1987 and the 2001 ortho-photo images were plotted against each image, and their apparent displacements between the two images were measured using the Arcview measuring tool. Fixed reference features used were mainly road kerbs, building edges, fences and rock outcrop features at the shoreline. Features were chosen distributed along the entire length of the study area, most are within 100 metres horizontally and less than 5 metres vertically of the shoreline, and all features used are within 180 metres horizontally and <10m vertically of the shoreline. The features used are digitised as line segments in the accompanying shapefiles *1987_rochesveglimit_gda.shp* and *2001_rochesveglimit_gda.shp*. Maximum apparent displacement in any direction of any point features (corners, etc) between the 1987 and 2001 ortho-photo images was 2.7m in one anomalous case, however all other 26 of the 27 features compared were displaced 2.0m or less in any direction. This is consistent with the supplier's quoted accuracy of ± 2 metres, with only 1 feature being displaced >2.0m and none greater than 2.7m. Maximum apparent displacement of features in either direction normal to the adjacent part of the shoreline was 1.9m, however most apparent displacements in directions normal to the shoreline were less than 1.0m. Apparent displacement of features in the 1987 images relative to the 2001 baseline images occurred variously in both onshore and offshore directions.)

2005 Rectified QuickBird Satellite Image

Imagery name: Clipped portion of Sinclair Knight Merz (SKM) Greater Hobart QuickBird Imagery Pilot Project Image Catalogue ID 1010010004354500

Copyright holder: DigitalGlobe Inc (QuickBird satellite imagery rectified and supplied by Sinclair Knight Merz to University of Tasmania).

Brief description & coverage: Clipped image portion covering Roches Beach, Lauderdale, south-east Tasmania.

Used for: *2005_rochesveglimit_gda.shp* (line map of 2005 shoreline (seawards vegetation limit) position); Refer Appendix A1.2 Data Models.

Format & Mapping Standards: Supplied in GeoTIFF format, GDA94 datum, MGA Zone 55 coordinate system, UTM projection.

Image Capture date: 2nd May 2005 (GMT 00h 23m 27s), orbit 19870.

Image & Camera details: QuickBird satellite providing images with 61cm panchromatic resolution and 2.44m multi-spectral resolution.

Rectification: Ortho-rectified by SKM using Hobart Urban Ortho Series ground control points (as used for 2001 Ortho-images 1342-46 & 1342-48 described above).

Pixel size (resolution): 0.6 metre

Relative horizontal accuracy (positional error margins) quoted by supplier: Accuracy of ± 3 metres quoted by SKM, based on use of Urban Ortho Series control points.

Relative horizontal accuracy (positional error margins) estimated by comparison of fixed reference features with baseline image (2001 ortho-photo): Accuracy of ± 1.6 metres in directions normal to the shoreline for features on and adjacent Roches Beach, relative to the baseline 2001 ortho-photos (Ortho-images 1342-46 & 1342-48 described above).

(Positional error margins were determined by C. Sharples using ESRI Arcview 3.2a software. The edges of a total of 38 fixed reference features clearly visible in both the 2005 QuickBird image and the 2001 ortho-photo images were plotted against each image, and their apparent displacements between the two images were measured using the Arcview measuring tool. Fixed reference features used were mainly concrete road kerbs (flat, sharp-edged features), and a few building edges, fences and rock outcrop features at the shoreline. Features were chosen distributed along the entire length of the study area, most are within 100 metres horizontally and less than 5 metres vertically of the shoreline, and all features used are within 200 metres horizontally and 50m vertically of the shoreline. The features used are digitised as line segments in the accompanying shapefiles *2005_rochesveglimit_gda.shp* and *2001_rochesveglimit_gda.shp*. Maximum apparent displacement in any direction of any point features (corners, etc) between the QuickBird and 2001 ortho-photo images was 2.6m (consistent with the supplier's quoted accuracy of ± 3 metres), and most apparent displacements were less than 1.5m in any direction. Maximum apparent displacement of features in either direction normal to the adjacent part of the shoreline was 1.6m, however most apparent displacements in directions normal to the shoreline were less than 1.0m. Apparent displacement of features in the 2005 QuickBird image relative to the 2001 baseline images occurred variously in both onshore and offshore directions.)

APPENDIX THREE: ROCHES BEACH REFERENCE PHOTOS 2006

This appendix provides details of a series of ground-based photos of Roches Beach that were captured during August 2006 by Chris Sharples (and some photos of SPM markers captured during February 2006). These images are provided as a set of digital images (JPEG format) accompanying this report. The purpose of these photos is to serve as a set of reference photos documenting the condition of the shoreline at Roches Beach during August 2006, which should provide useful base line information for future comparison. Photos of three State Permanent Marker (SPM) survey markers used for beach profile monitoring in the TASMARC program have also been included as reference features, partly to assist in identifying the precise location of those features on air photo and satellite imagery.

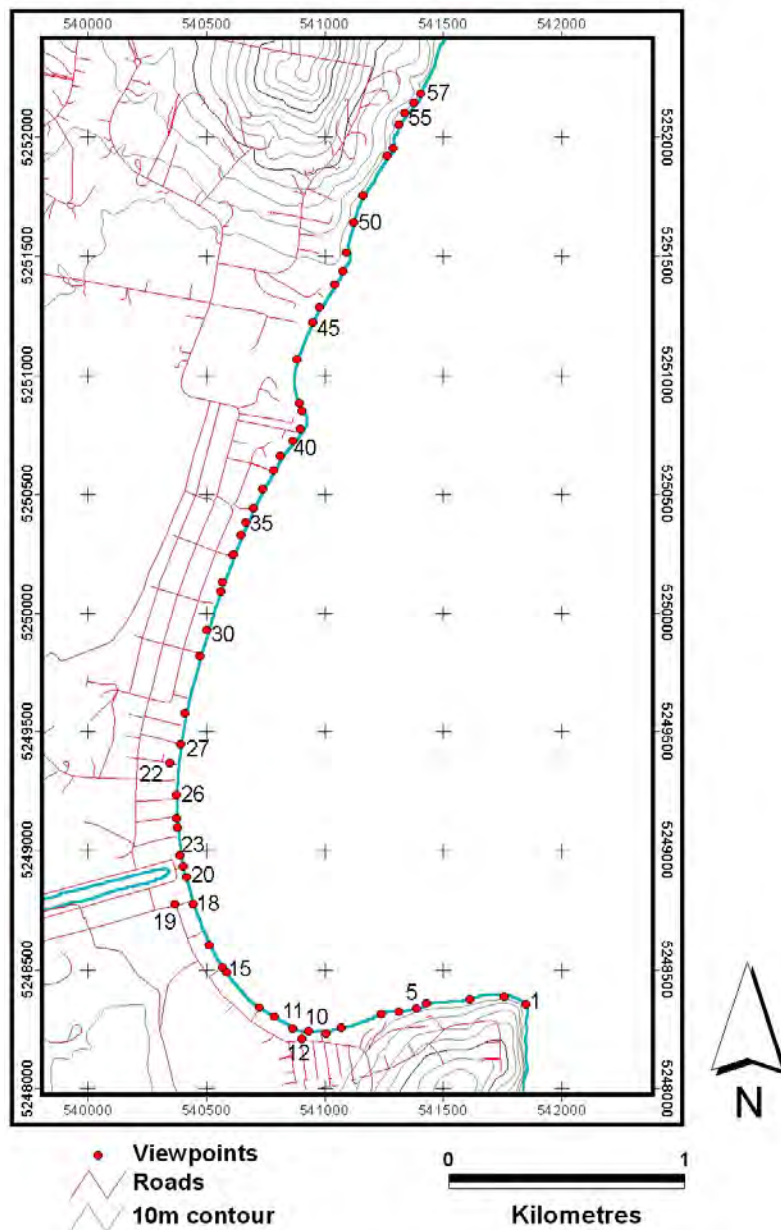


Figure 26: Location of photo viewpoints at Roches Beach, southern Tasmania, as detailed in Table 1 following. Not all photo viewpoints are numbered on this map; however the viewpoints are numbered consecutively from south to north, with the exception of the State Permanent Marker (SPM) photo viewpoints numbered 12, 19 and 22. Map grid is MGA Zone 55 (GDA94 datum).

Table 1 below provides map grid references specifying the viewpoint from which each photo was taken. These are metric UTM projection Map Grid of Australia (MGA Zone 55) co-ordinates based on the GDA94 datum. Note however that the grid references were obtained with a hand-held Garmin Etrex GPS unit having an estimated positional error of 4 metres or more. Also, some photos were taken from a few paces away from the quoted location, hence these grid references should be considered only as approximate photo viewpoints (likely positional errors of ± 5 metres or so).

A selection from the photos is provided as figures in the latter part of this appendix.

Table 1: Details of reference photos captured at Roches Beach (southern Tasmania) by C. Sharples during August 2006 (and a few photos of SPM markers captured during February 2006).

Photo number	Capture Date	View-Point No.	Viewpoint easting (MGA, GDA94)	Viewpoint northing (MGA, GDA94)	View description
RB2006_1	11/08/2006	1	541847	5248355	View to northwest from Mays Point, along rocky shore towards Roches Beach.
RB2006_2	11/08/2006	2	541755	5248385	View to west along cobble shore with soil erosion scarp at back.
RB2006_3	11/08/2006	3	541611	5248376	View to west along sand + cobble shore with soil/bedrock backshore.
RB2006_4	11/08/2006	3	541611	5248376	View to east along sand + cobble shore with soil/bedrock backshore.
RB2006_5	11/08/2006	4	541427	5248357	View to west along sand + cobble beach with soil erosion scarp & artificial wall backing beach.
RB2006_6	11/08/2006	5	541387	5248338	View to east with soil erosion scarp behind ineffective artificial wall.
RB2006_7	11/08/2006	6	541310	5248324	View to west along pebble + sand beach.
RB2006_8	11/08/2006	7	541236	5248313	View to west along broad sand beach with low partly vegetated incipient dune.
RB2006_9	11/08/2006	8	541068	5248255	View to east along broad sand beach with low incipient dune. Drain outlet to right hand side flows onto beach.
RB2006_10	11/08/2006	8	541068	5248255	View to west along sand beach without incipient dune. Minor cobbles at back of beach.
RB2006_11	11/08/2006	9	541004	5248231	View to east along broad sand beach.
RB2006_12	11/08/2006	9	541004	5248231	View to west along narrower sand beach.
RB2006_13	11/08/2006	10	540930	5248240	View to east along dune scarp. Seagrass abundant on beach in this area.
RB2006_14	11/08/2006	10	540930	5248240	View to west along sand beach and dune front. Seagrass abundant on beach in this area.
RB2006_15	11/08/2006	11	540864	5248251	View to southeast along dune scarp (artificial cutting through dune at right hand side of view).

					View includes location of southern TASMARC profile based on Mark 3 (SPM 9532RM1). Seagrass abundant on beach in this area.
RB2006_16	11/08/2006	11	540864	5248251	View to northwest along boulder wall and sand beach.
RB2006_17	03/02/2006	12	540901	5248209	View to south (from path to beach) to State Permanent Mark SPM 9532RM1 (red-painted mark in gutter). Grid reference refers to SPM position determined by Etrex GPS (position error ~3.8m by comparison with surveyed SPM position). (Arrow added to indicate SPM)
RB2006_18	03/02/2006	12	540901	5248209	View to northwest to State Permanent Mark SPM 9532RM1 (red-painted mark in gutter). Grid reference refers to SPM position determined by Etrex GPS (position error ~3.8m by comparison with surveyed SPM position). (Arrow added to indicate SPM)
RB2006_19	03/02/2006	12	540901	5248209	View to east-southeast to State Permanent Mark SPM 9532RM1 (red-painted mark in gutter). Grid reference refers to SPM position determined by Etrex GPS (position error ~3.8m by comparison with surveyed SPM position). (Arrow added to indicate SPM)
RB2006_20	11/08/2006	13	540787	5248302	View to southeast, to concrete boat ramp, showing beach level with respect to end of ramp (red notebook = 180mm high).
RB2006_21	11/08/2006	13	540787	5248302	View to northwest along boulder wall and beach.
RB2006_22	11/08/2006	14	540721	5248340	View to southeast to concrete steps (red notebook 180 mm high for scale)
RB2006_23	11/08/2006	14	540721	5248340	View to northwest along boulder wall and beach.
RB2006_24	11/08/2006	15	540584	5248487	View to northwest to dune scarp behind boulder wall.
RB2006_25	11/08/2006	15	540584	5248487	View to southeast along boulder wall and beach.
RB2006_26	11/08/2006	16	540567	5248509	View to southeast to dune erosion scarp behind boulder wall.
RB2006_27	11/08/2006	16	540567	5248509	View to northwest to boulder wall, concrete steps and concrete ramp (red notebook 180 mm high for scale).
RB2006_28	11/08/2006	17	540510	5248603	View south to north end of boulder wall, showing dune front eroded back ~5m at end of boulders.
RB2006_29	11/08/2006	17	540510	5248603	View north looking past north end of boulder wall, showing dune front eroded back ~5m

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					immediately beyond end of boulders.
RB2006_30	11/08/2006	18	540445	5248775	View south along dune scarp (obscured by marram grass but fairly fresh in many parts)
RB2006_31	11/08/2006	18	540445	5248775	View north along dune scarp (higher than to south of viewpoint)
RB2006_32	05/02/2006	19	540367	5248774	View eastwards to State Permanent Mark SPM 10906 (red-painted mark on kerb). Grid reference refers to SPM position determined by Etrex GPS (position error ~2.74m by comparison with surveyed SPM position). (Arrow added to indicate SPM)
RB2006_33	05/02/2006	19	540367	5248774	View east-northeast - wards to State Permanent Mark SPM 10906 (red-painted mark on kerb). Grid reference refers to SPM position determined by Etrex GPS (position error ~2.74m by comparison with surveyed SPM position). (Arrow added to indicate SPM)
RB2006_34	11/08/2006	20	540414	5248887	View south along dune front scarp. Note wooden posts isolated seawards of scarp.
RB2006_35	11/08/2006	20	540414	5248887	View north along dune front (with low wooden structure).
RB2006_36	11/08/2006	20	540414	5248887	View north along beach showing both training walls at canal end, and low wooden structure on dune front south of canal.
RB2006_37	11/08/2006	21	540401	5248933	View to south along beach front showing low wooden wall and south training wall, from canal road access.
RB2006_38	11/08/2006	21	540401	5248933	View to north along beach showing north training wall, from canal road access.
RB2006_39	11/08/2006	21	540401	5248933	View northwards to north training wall, from canal road access.
RB2006_40	12/08/2006	22	540 344	5249 367	View west to SPM 10904 (red mark) from path to beach. Grid reference refers to SPM position determined by Etrex GPS (position error ~1.5m by comparison with surveyed SPM position). (Arrow added to indicate SPM marker).
RB2006_41	12/08/2006	22	540 344	5249 367	View east to SPM 10904 (red mark), with back of foredune beyond. Grid reference refers to SPM position determined by Etrex GPS (position error ~1.5m by comparison with surveyed SPM position). (Arrow added to indicate SPM marker).
RB2006_42	12/08/2006	23	540 388	5248 979	View south along low fence.

RB2006_43	12/08/2006	23	540 388	5248 979	View north along older dune scarp.
RB2006_44	12/08/2006	24	540 375	5249 095	View south along old erosion scarp.
RB2006_45	12/08/2006	24	540 375	5249 095	View north along fresher erosion scarp.
RB2006_46	12/08/2006	25	540 373	5249 133	View south.
RB2006_47	12/08/2006	25	540 373	5249 133	View north.
RB2006_48	12/08/2006	26	540 372	5249 234	View south.
RB2006_49	12/08/2006	26	540 372	5249 234	View north, including undermined tree stump (sawn off).
RB2006_50	12/08/2006	27	540 390	5249 445	View south.
RB2006_51	12/08/2006	27	540 390	5249 445	View north.
RB2006_52	12/08/2006	28	540 408	5249 577	View south, showing exposed tree roots and collapsing tree exposed in foredune scarp.
RB2006_53	12/08/2006	28	540 408	5249 577	View north.
RB2006_54	12/08/2006	29	540 470	5249 816	View south.
RB2006_55	12/08/2006	29	540 470	5249 816	View north.
RB2006_56	12/08/2006	30	540 500	5249 925	View south.
RB2006_57	12/08/2006	30	540 500	5249 925	View north.
RB2006_58	12/08/2006	31	540 558	5250 090	View south.
RB2006_59	12/08/2006	31	540 558	5250 090	View north.
RB2006_60	12/08/2006	32	540 568	5250 131	View south.
RB2006_61	12/08/2006	32	540 568	5250 131	View north.
RB2006_62	12/08/2006	33	540 614	5250 248	View south.
RB2006_63	12/08/2006	33	540 614	5250 248	View north.
RB2006_64	12/08/2006	34	540 644	5250 329	View south.
RB2006_65	12/08/2006	34	540 644	5250 329	View north.
RB2006_66	12/08/2006	35	540 666	5250 381	View south.
RB2006_67	12/08/2006	35	540 666	5250 381	View north.
RB2006_68	12/08/2006	36	540 697	5250 439	View south.
RB2006_69	12/08/2006	36	540 697	5250 439	View north.
RB2006_70	12/08/2006	37	540 736	5250 520	View south.
RB2006_71	12/08/2006	37	540 736	5250 520	View north to rocky point (Bambra Reef).
RB2006_72	12/08/2006	38	540 782	5250 601	View south.
RB2006_73	12/08/2006	38	540 782	5250 601	View north to rocky point (Bambra Reef).
RB2006_74	12/08/2006	39	540 812	5250 658	View south.
RB2006_75	12/08/2006	39	540 812	5250 658	View north to rocky point (Bambra Reef).
RB2006_76	12/08/2006	40	540 864	5250 723	View south.
RB2006_77	12/08/2006	40	540 864	5250 723	View north along artificial boulder wall at rocky point (Bambra Reef).
RB2006_78	12/08/2006	41	540 894	5250 771	View south along artificial boulder wall at rocky point (Bambra Reef).
RB2006_79	12/08/2006	41	540 894	5250 771	View north beyond boulder wall at small rocky point(Bambra Reef).
RB2006_80	12/08/2006	42	540 903	5250 849	View south along small erosion scarp behind beach and rocky shore platform (Bambra Reef).
RB2006_81	12/08/2006	42	540 903	5250 849	View north from rocky point (Bambra Reef) to sand accretion area.
RB2006_82	14/08/2006	43	540 891	5250 882	View south to rocky point (Bambra Reef).

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RB2006_83	14/08/2006	43	540 891	5250 882	View south-west up ephemeral creek mouth.
RB2006_84	14/08/2006	43	540 891	5250 882	View north to accretion area.
RB2006_85	14/08/2006	44	540 882	5251 067	View south.
RB2006_86	14/08/2006	44	540 882	5251 067	View north.
RB2006_87	14/08/2006	45	540 947	5251 221	View south.
RB2006_88	14/08/2006	45	540 947	5251 221	View north.
RB2006_89	14/08/2006	46	540 975	5251 284	View south-west across mouth of ephemeral creek.
RB2006_90	14/08/2006	46	540 975	5251 284	View north to next rocky point.
RB2006_91	14/08/2006	47	541 041	5251 381	View south.
RB2006_92	14/08/2006	47	541 041	5251 381	View north to bedrock backshore.
RB2006_93	14/08/2006	48	541 075	5251 436	View south.
RB2006_94	14/08/2006	48	541 075	5251 436	View north across rocky point.
RB2006_95	14/08/2006	49	541 091	5251 514	View south across rocky point.
RB2006_96	14/08/2006	49	541 091	5251 514	View north.
RB2006_97	14/08/2006	50	541 120	5251 641	View south.
RB2006_98	14/08/2006	50	541 120	5251 641	View north.
RB2006_99	14/08/2006	51	541 161	5251 754	View south.
RB2006_100	14/08/2006	51	541 161	5251 754	View north.
RB2006_101	14/08/2006	52	541 261	5251 921	View south.
RB2006_102	14/08/2006	52	541 261	5251 921	View north.
RB2006_103	14/08/2006	53	541 288	5251 952	View north from Jurassic dolerite/Permian siltstone contact (siltstone to north in foreground)
RB2006_104	14/08/2006	54	541 310	5252 051	View north.
RB2006_105	14/08/2006	54	541 310	5252 051	View south.
RB2006_106	14/08/2006	55	541 337	5252 101	View south.
RB2006_107	14/08/2006	55	541 337	5252 101	View north.
RB2006_108	14/08/2006	56	541 377	5252 143	View south over northernmost end of sandy beach.
RB2006_109	14/08/2006	56	541 377	5252 143	View north from northernmost end of sandy beach.
RB2006_110	14/08/2006	57	541 402	5252 182	View south.
RB2006_111	14/08/2006	57	541 402	5252 182	View north.



Figure 27: Photo RB2006_6 (Viewpoint 5). An old erosion scarp is evident in places behind this southern part of Roches Beach, eroded into (partly) colluvial soil over weathered bedrock. The artificial wall seen here is evidently ineffective in stopping erosion, however only a small amount of net erosion has occurred here over the last 50 years, insufficient to be detectable as net recession on air photos.



Figure 28: Photo RB2006_8 (Viewpoint 7). The shoreline in this short section of southern Roches Beach has accreted in recent times, as indicated by the small incipient dune present in front of the larger established foredune on this part of the beach; however this section of the shore has shown no detectable net change between 1957 and 2005. Only a few southern and northern sections of Roches Beach show evidence of sand accretion at the present.



Figure 29: Photo RB2006_20 (Viewpoint 13). This view shows a concrete boat ramp in the boulder wall along part of the southern area of Roches Beach. Lowering of the beach surface below the lip of the ramp is probably a result of recent stormy conditions. The surface will probably grow (accrete) upwards during long calm weather periods, however it is likely that some degree of net lowering of the beach surface has occurred since the boulder wall was constructed in 1988, due to increased wave reflection off the hard wall. Red notebook is 180mm high.



Figure 30: Photo RB2006_26 (Viewpoint 16). This view of the boulder wall (revetment) shows foredune erosion above and behind a section of the wall, indicating that storm waves have begun to overtop and erode behind the boulder wall in this area.



Figure 31: Photo RB2006_28 (Viewpoint 17). View southwards from the northern end of the boulder wall along part of the southern area of Roches Beach. This photo shows a shoreline (dune – front) net recession of about 5 metres at this point since the boulder wall was constructed during 1988.



Figure 32: Photo RB2006_49 (Viewpoint 26). View north along Roches Beach erosion scarp, several hundred metres north of the canal. The sawn stump of a large eucalypt tree whose roots became exposed by erosion in the period 2001 – 2006 is visible. This view is in the area referred to as recession zone RZ3 in this report.



Figure 33: Photo RB2006_71 (viewpoint 37). View north along the large active erosion scarp in the northerly part of Roches beach. This view looks along the area referred to as recession zone RZ5 in this report.



Figure 34: Photo RB2006_81 (viewpoint 42). View north showing Accretion Zone AZ1, immediately north of the small rocky point (Bambra Reef) at the north end of the main part of Roches Beach. This is one area where net detectable shoreline accretion has occurred at Roches Beach between 1957 and 2005. It is unlikely that the visible fence has been a major factor in the accretion, which is probably due to the location of this area on the down-drift (north) side of Bambra Reef.



Figure 35: Photo RB2006_86 (viewpoint 44). View north showing part of Accretion Zone AZ2 with low incipient foredune development. This is an area where net detectable shoreline accretion has occurred at Roches Beach between 1957 and 2005.



Figure 36: Photo RB2006_103 (viewpoint 53). View north along part of the northernmost end of Roches Beach, where the beach is backed by a rising bedrock slope with little dune development. There is little potential for shoreline recession here, although beach lowering and loss may result from sea level rise.

APPENDIX FOUR: TASMARC SURVEY DATA (2005)

This appendix provides copies of survey data related to State Permanent Marker (SPM) benchmarks installed at Roches Beach, and the initial TASMARC shoreline monitoring project survey data based on those benchmarks, as discussed in report Section (4.5).

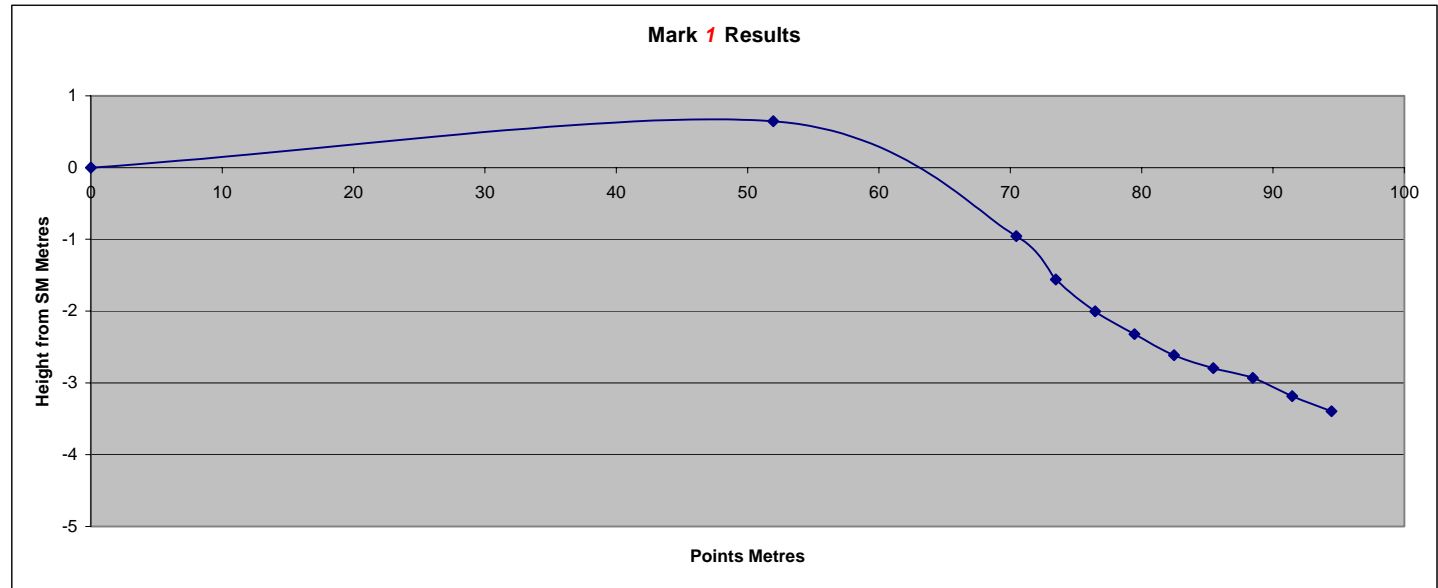
(A) Locations of SPM benchmarks installed by DPIWE surveyors on 17th August 2005, and initial profiles measured from the benchmarks to the beach by the surveyors on that date. Notes in red italics are annotations by C. Sharples.

Chainage	Point	MGA East	MGA North	AHD83 Ht	Code	Remarks
730/01	<i>Mark 1</i>					Lauderdale
0.000	SPM10906	540364.412	5248773.101	2.973	NS001	Profile based on SPM 10906 and starts at Chainage 52.05,
52.054	101	540414.432	5248787.511	3.466	NS001	offset approx 1.0m north of pathway.
69.266	102	540431.102	5248791.797	3.200	NS001	
69.808	103	540431.623	5248791.944	3.005	NS001	
70.275	104	540432.090	5248791.923	1.891	NS001	
74.269	105	540435.930	5248793.021	1.222	NS001	
83.195	106	540444.444	5248795.702	0.244	NS001	
730/02	<i>Mark 2</i>					Lauderdale
0.000	SPM10904	540344.149	5249368.498	2.285	NS002	Profile based on SPM 10904 and produced along
24.926	202	540368.762	5249364.561	3.586	NS002	line of southern kerb of Coolahra Street
28.474	203	540372.296	5249364.240	3.910	NS002	
30.567	204	540374.348	5249364.651	1.767	NS002	<i>Dune scarp at approx. 29.5 metres indicated</i>
34.390	205	540378.163	5249364.408	1.248	NS002	
41.653	206	540385.422	5249364.148	0.355	NS002	
730/03	<i>Mark 3</i>					Lauderdale
0.000	SPM9532RM1	540903.562	5248211.835	1.795	NS003	Profile based on SPM 9532RM1, along north side of pathway.
7.318	302	540903.719	5248219.151	1.856	NS003	
19.419	303	540904.081	5248231.247	2.275	NS003	
24.726	304	540903.064	5248236.456	2.297	NS003	
27.003	305	540902.996	5248238.732	1.730	NS003	
27.416	306	540903.153	5248239.113	1.042	NS003	
28.068	307	540903.145	5248239.765	0.960	NS003	
38.142	308	540902.597	5248249.824	0.577	NS003	
45.450	309	540903.959	5248257.004	0.009	NS003	

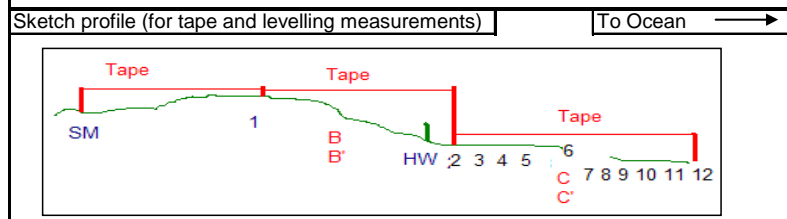
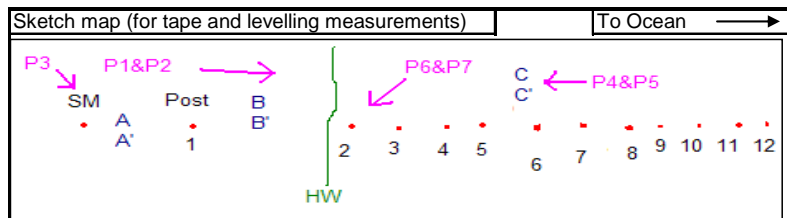
Shoreline Change at Roches Beach

SM	0	0
1	51.96	0.645
2 (HW)	70.46	-0.955
3	73.46	-1.56
4	76.46	-2.005
5	79.46	-2.32
6	82.46	-2.615
7	85.46	-2.795
8	88.46	-2.93
9	91.46	-3.185
10	94.46	-3.395

Scarp 70.46m seawards of SM (Mark 1 benchmark)



Tasmanian Shoreline monitoring and Archiving Project		Front
Date 6/11/2005	Sheet no. for this site 1	TASMARC
Time start 15:55	Time end 16:30	
Observers:- Michael Hovington, Susanne Hovington, John Hunter, etc		Circle as appropriate:
Site name:- Sand Dune Court	Weather	sunny cloudy rain windy
Survey mark (SM) I.D:- Marker No.2 (SPM 10904)	Wave height: (at breaking)	flat calm 0-1 metre > 1 metre
Camera serial no.		
If applicable:		
Level serial no.		
Staff serial no.		
Staff type		



Notes	Photo no.	Full photo I.D.
Low tide @ 7.25pm 0.56m		

Please return form to: John Hunter, Private Bag 80, Hobart Tasmania 7001
Ph 03 6226 7849 john.hunter@acecrc.org.au

Tasmanian Shoreline monitoring and Archiving Project	Back
--	------

Horizontal Measurements

Point from	Point to	Distance (metres)
SM	1	25.8
1	(HW)	-0.46
1	3	4.31
2	4	3
2	5	6
2	6	7.5
2	7	8
2	8	8.5
2	9	9
2	10	12
2	11	15
2	12	18

Enter all horizontal measurements (i.e. for survey mark, SM, for high water mark and for all staff positions)

Fill in one (and only one) row for each staff position.
One row should contain the reading(s) for:
. one foresight, or
. one backsight, or
. one foresight and one backsight, or
. one intermediate sight.

To Ocean ↓

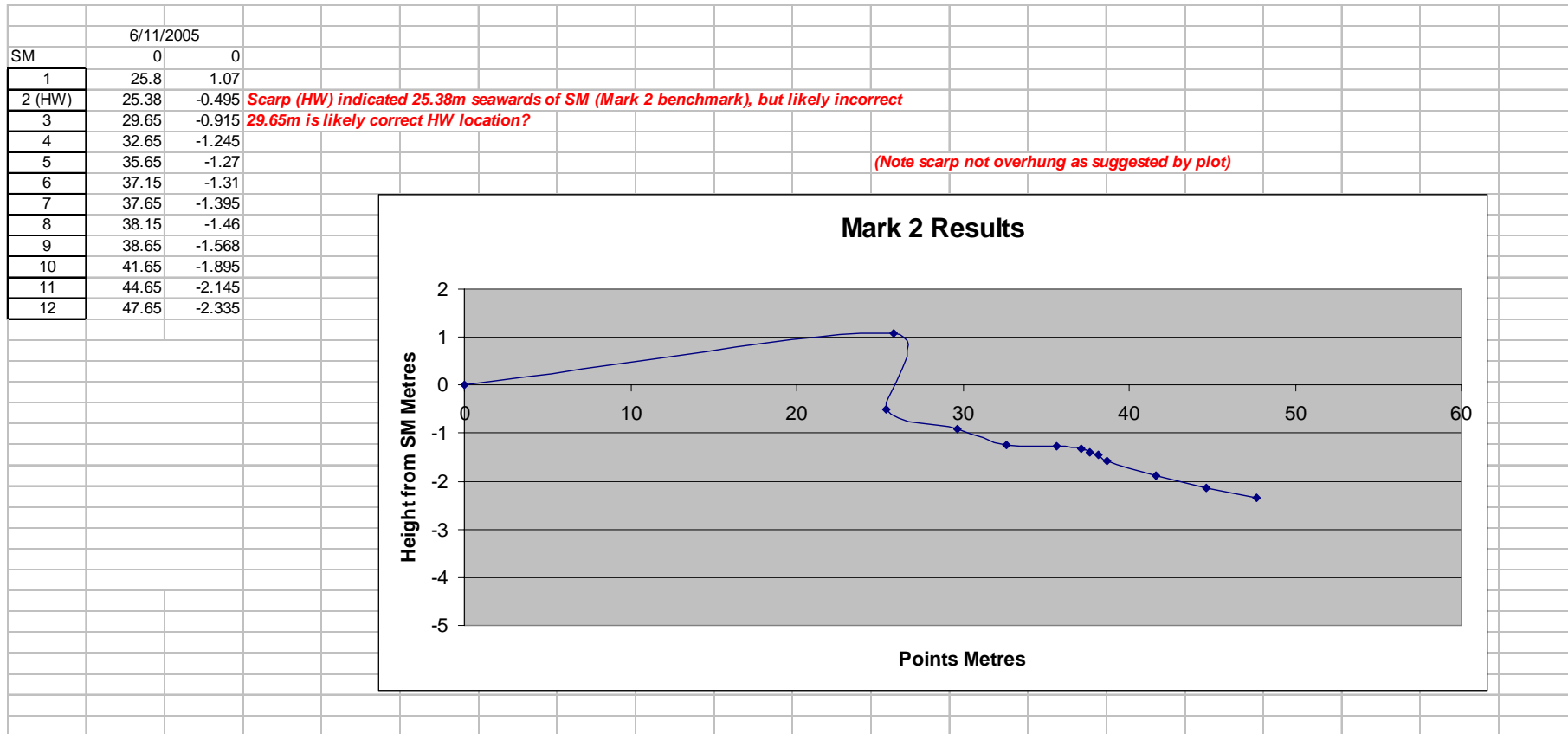
Levelling Measurements

Locations (see sketch map and profile)		Staff readings			Height above survey mark (SM) (metres)
Tripod	Staff	Backsight (metres)	Intermediate Sight (metres)	Foresight (metres)	
A	SM	1.660			0.000
A, A'	1	0.650		0.590	1.070
A'	SM			1.735	-0.015
	Total	2.310		2.325	-0.015
B	1	0.025			1.070
C, B'	2	0.740		1.590	-0.495
C	3		1.160		-0.915
C	4		1.490		-1.245
C	5		1.515		-1.270
C'	6		1.555		-1.310
C'	7		1.640		-1.395
C'	8		1.705		-1.460
C'	9		1.813		-1.568
C	10		2.140		-1.895
C	11		2.390		-2.145
C, C'	12	2.495		2.580	-2.335
C', B'	2	3.270		0.650	-0.490
B'	1			1.710	1.070
	Total	6.530		6.530	0.000

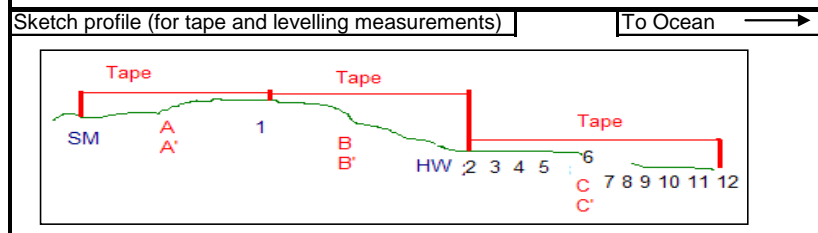
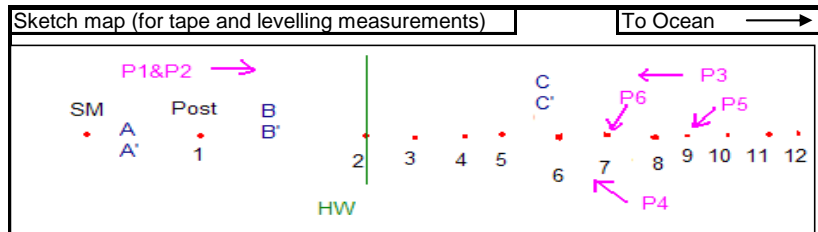
To Ocean ↓

If you need more space, use the back of another log sheet, remembering to fill in the date, site name, survey mark I.D. and sheet number on the front.

Shoreline Change at Roches Beach



Tasmanian Shoreline monitoring and Archiving Project		Front
Date	6/11/2005	Sheet no. for this site 1
Time start	17:00	Time end 17:35
Observers:- Michael Hovington, Susanne Hovington, John Hunter, etc		TASMARC
Circle as appropriate:		
Site name:- Sand Dune Court	Weather	sunny cloudy rain windy
Survey mark (SM) I.D.:- Marker No.3 (SPM 9532M1)	Wave height: (at breaking)	flat calm 0-1 metre > 1 metre
Camera serial no.		
If applicable:		
Level serial no.		
Staff serial no.		
Staff type		



Notes	Photo no.	Full photo I.D.
Low tide @ 7.25pm 0.56m		

Please return form to: John Hunter, Private Bag 80, Hobart Tasmania 7001
Ph 03 6226 7849 john.hunter@acecrc.org.au

Tasmanian Shoreline monitoring and Archiving Project		Back
Horizontal Measurements		
Point from	Point to	Distance (metres)
SM	1	25.8
1	2 (HW)	4.45
1	3	7
1	4	10
1	5	12.9
1	6	13.7
1	7	15
1	8	18
1	9	21
1	10	24
1	11	27
1	12	30

Enter all horizontal measurements (i.e. for survey mark, SM, for high water mark and for all staff positions)

Fill in one (and only one) row for each staff position.
One row should contain the reading(s) for:
. one foresight, or
. one backsight, or
. one foresight and one backsight, or
. one intermediate sight.

To Ocean ↓

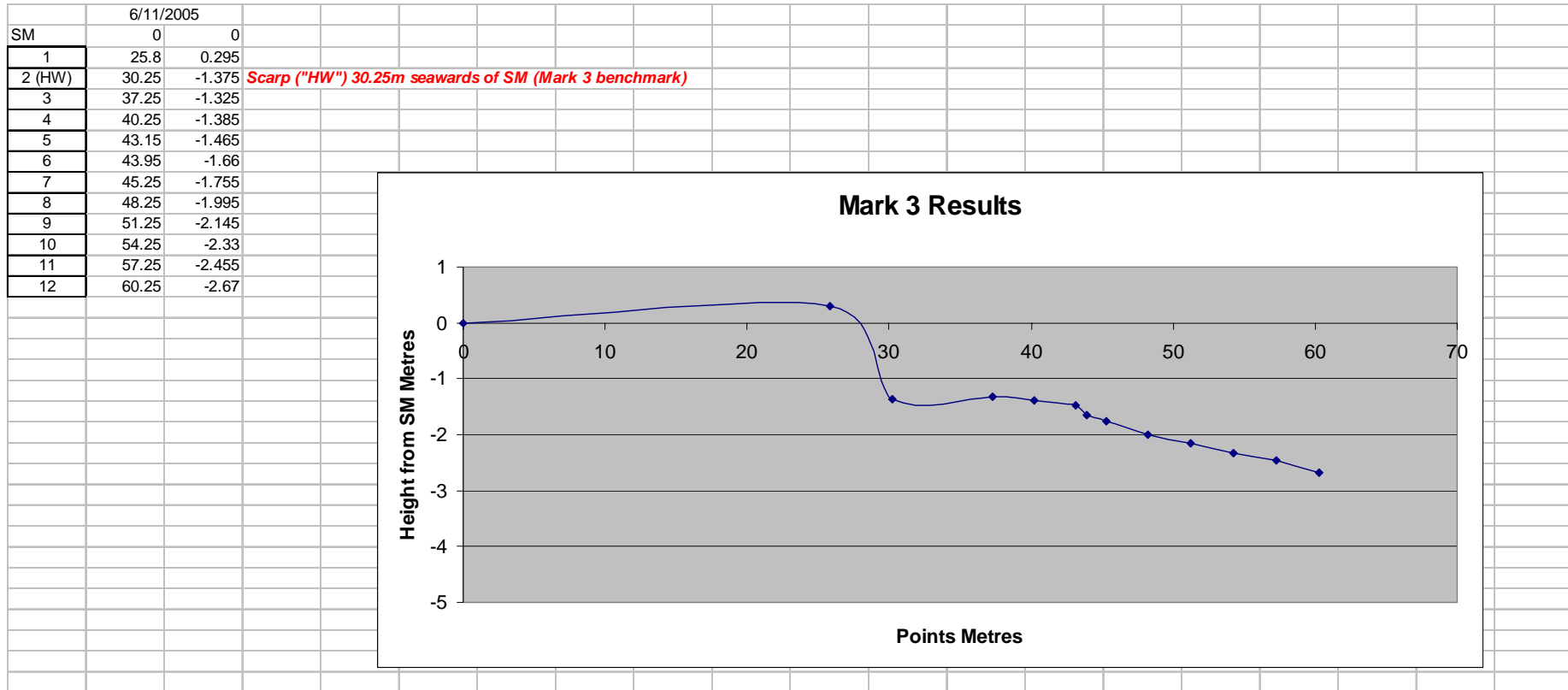
Levelling Measurements		Staff readings			Height above survey mark (SM) (metres)
Locations (see sketch map and profile)		Backsight (metres)	Intermediate Sight (metres)	Foresight (metres)	
Tripod	Staff				
A	SM	1.115			0.000
A, A'	1	1.205		0.820	0.295
A'	SM			1.970	-0.470
	Total	2.320		2.790	-0.470
B	1	0.010			0.295
B	2 (HW)		1.680		-1.375
B	3		1.630		-1.325
B	4		1.690		-1.385
B	5		1.770		-1.465
B	6		1.965		-1.660
B	7		2.060		-1.755
B	8		2.300		-1.995
B	9		2.450		-2.145
B	10		2.635		-2.330
B	11		2.760		-2.455
B', B	12	3.375		2.975	-2.670
B'	1			0.405	0.300
	Total	3.385		3.380	0.005

To Ocean ↓

On Seaweed
On Seaweed
On Seaweed

If you need more space, use the back of another log sheet, remembering to fill in the date, site name, survey mark I.D. and sheet number on the front.

Shoreline Change at Roches Beach



APPENDIX FIVE: SHORELINE MOVEMENT SUMMARY CHART

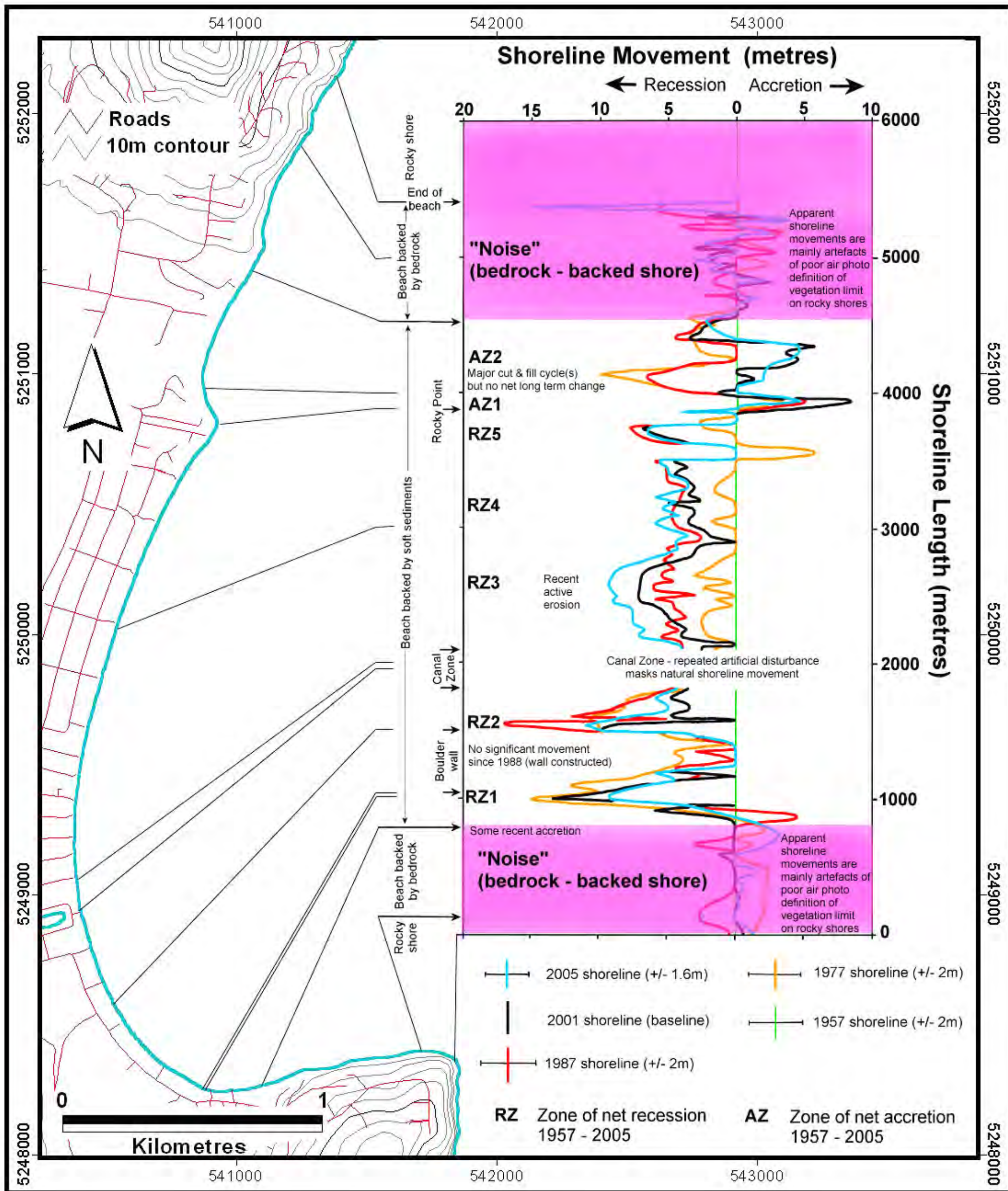


Figure 37: Shoreline Movement at Roches Beach from 1957 – 2005: Summary Chart. This chart depicts *apparent* shoreline positions along Roches Beach at 5 epochs from 1957 to 2005, which have been determined as described in report Section (4.0). For ease of comparison, the 1957 shoreline is depicted as a straight line, with later shoreline positions measured relative to the 1957 position. The coloured lines represent the *apparent* shoreline positions at each epoch; however these are not the minimum *detectable* shoreline change positions, which would be represented by the separation between shoreline position error envelopes. See also Figure 19, which depicts the minimum detectable shoreline position changes along Roches Beach between 1957 – 2005, and which is based on the separation between the error envelopes. Error envelopes for each shoreline position are represented on this figure by bars on the figure key. Nonetheless, the *apparent* shoreline positions depicted here represent the centre of the position error envelopes, and therefore represent the most *likely* shoreline positions at each epoch. The shaded portions of the shoreline movement graph are those areas in which sandy beach is backed by bedrock; in those areas shoreline position could not be reliably determined by the method used in this project due to poor definition of the vegetation limit on air photos in areas of dark-toned bedrock and bedrock-derived soil backshores. The map grid is the MGA (Zone 55) grid (GDA94 datum). Note that the scale of the "Shoreline Length" axis on the graph is not the same scale as the map. This is an enlarged version of text Figure 18.

