

**Appendix C**  
**Cliff Top Survey**

**Staithes**

Twenty ground control points have been established at Staithes (Appendix C- Map 1). The maximum separation between any two points is nominally 100 m.

The cliff top surveys at Staithes are undertaken bi-annually. Measurements are taken from a fixed ground control point along a fixed bearing to the edge of the cliff top.

Table C1 provides baseline information about these ground control points and results from the September 2010 survey showing the position from the ground control point to the edge of the cliff top along the defined bearing and changes in position since the November 2008 baseline survey.

**Table C1 – Cliff Top Surveys at Staithes**

Ground Control Point Details					Distance to Cliff Top (m)			Total Erosion (m)		Erosion Rate (m/year)
Ref	Easting	Northing	Level (mODN)	Bearing (°)	Baseline Survey (Nov 2008)	Previous Survey (Feb 2010)	Present Survey (Sept 2010)	Baseline (Nov 2008) to Present (Sept 2010)	Previous (Feb 2010) to Present (Sept 2010)	Baseline (Nov 2008) to Present (Sept 2010)
1	477228	518769	60.587	320	1.9	1.8	1.7	-0.2	-0.1	-0.1
2	477334	518798	57.543	0	10.9	10.7	10.8	-0.1	0.1	-0.1
3	477487	518789	54.861	350	7.1	8.3	8.3	1.2	0.0	-
4	477594	518801	53.636	340	5.9	5.3	5.3	-0.6	0.0	-0.3
5	477683	518911	48.371	350	8.4	8.2	8.3	-0.1	0.1	-0.1
6	477792	518867	47.422	30	8.6	8.4	8.5	-0.1	0.1	-0.1
7	477891	518828	44.602	60	7.7	7.6	7.6	-0.1	0.0	-0.1
8	477959	518873	39.974	350	8.7	8.8	8.7	0.0	-0.1	0
9	478088	518950	37.281	350	7.6	8.1	8.4	0.8	0.3	-
10	478191	519023	42.655	340	8.4	10.7	9.9	1.5	-0.8	-
11	478237	519007	39.990	60	6.9	6.8	6.8	-0.1	0.0	-0.1
12	478213	518988	37.169	150	6.1	6.4	6.5	0.4	0.1	-
13	478501	518809	50.260	15	11.4	9.3	9.3	-2.1	0.0	-1.1
14	478624	518807	55.345	20	7.5	7.6	7.5	0.0	-0.1	0
15	478737	518858	56.017	60	6.1	6.1	6.1	0.0	0.0	0
16	478823	518757	50.237	60	8.0	8.8	8.8	0.8	0.0	-
17	478944	518671	46.764	30	9.3	9.6	9.7	0.4	0.1	-
18	479052	518630	47.026	20	9.2	9.1	9.1	-0.1	0.0	-0.1
19	479147	518610	47.108	0	14.2	14.4	14.4	0.2	0.0	-
20	479274	518618	44.243	20	11.4	11.5	11.5	0.1	0.0	-

**Note:** It is assumed that the accuracy of cliff top monitoring using this technique is  $\pm 0.1\text{m}$ . Therefore observed changes have been altered by this amount prior to calculation of an erosion rate. Erosion rates are not calculated where the cliff line shows advance. This is likely to be the product of differing survey interpretation, and far less likely to be a toppling cliff edge.

**Robin Hood's Bay**

Thirteen ground control points have been established at Robin Hood's Bay (Appendix C- Map 2). The maximum separation between any two points is nominally 100 m.

The cliff top surveys at Robin Hood's Bay are undertaken bi-annually. Measurements are taken from a fixed ground control point along a fixed bearing to the edge of the cliff top.

Table C2 provides baseline information about these ground control points and results from the September 2010 survey showing the position from the ground control point to the edge of the cliff top along the defined bearing and changes in position since the March 2010 baseline survey.



**Table C2 – Cliff Top Surveys at Robin Hood’s Bay**

Ground Control Point Details					Distance to Cliff Top (m)			Total Erosion (m)		Erosion Rate (m/year)
Ref	Easting	Northing	Level (mODN)	Bearing (°)	Baseline Survey (Mar 2010)	Previous Survey (Mar 2010)	Present Survey (Sept 2010)	Baseline (Mar 2010) to Present (Sept 2010)	Previous (Mar 2010) to Present (Sept 2010)	Baseline (Mar 2010) to Present (Sept 2010)
1	495800	506002	65.437	130	11.6	11.6	11.4	-0.2	-0.2	-0.4
2	495549	505807	77.314	135	9.3	9.3	9.3	0.0	0.0	0
3	495456	505740	76.778	130	5.0	5.0	5.1	0.1	0.1	-
4	495390	505684	73.900	140	6.3	6.3	6.2	-0.1	-0.1	-0.2
5	495259	505343	55.041	130	11.3	11.3	11.1	-0.2	-0.2	-0.4
6	495231	505316	53.693	95	5.9	5.9	5.8	-0.1	-0.1	-0.2
7	495185	505211	44.946	85	6.4	6.4	6.2	-0.2	-0.2	-0.4
8	495206	505153	34.093	75	5.0	5.0	4.9	-0.1	-0.1	-0.2
9	495288	505061	20.932	80	4.3	4.3	4.4	0.1	0.1	-
10	495188	504709	43.446	70	3.1	3.1	3.3	0.2	0.2	-
11	495226	504616	44.665	120	3.8	3.8	3.6	-0.2	-0.2	-0.4
12	495298	504380	44.859	80	11.0	11.0	10.9	-0.1	-0.1	-0.2
13	495350	504193	45.630	55	3.7	3.7	3.7	0.0	0.0	0

**Note:** It is assumed that the accuracy of cliff top monitoring using this technique is  $\pm 0.1\text{m}$ . Therefore observed changes have been altered by this amount prior to calculation of an erosion rate. Erosion rates are not calculated where the cliff line shows advance. This is likely to be the product of differing survey interpretation, and far less likely to be a toppling cliff edge.

**Scarborough South Bay**

Thirteen ground control points have been established at Scarborough South Bay (Appendix C- Map 3). The maximum separation between any two points is nominally 300 m.

The cliff top surveys at Scarborough South Bay are undertaken bi-annually. Measurements are taken from a fixed ground control point along a fixed bearing to the edge of the cliff top.

Table C3 provides baseline information about these ground control points and results from the September 2010 survey showing the position from the ground control point to the edge of the cliff top along the defined bearing and changes in position since the March 2010 baseline survey.

**Table C3 – Cliff Top Surveys at Scarborough South Bay**

Ground Control Point Details					Distance to Cliff Top (m)			Total Erosion (m)		Erosion Rate (m/year)
Ref	Easting	Northing	Level (mODN)	Bearing (°)	Baseline Survey (Mar 2010)	Previous Survey (Mar 2010)	Present Survey (Sept 2010)	Baseline (Mar 2010) to Present (Sept 2010)	Previous (Mar 2010) to Present (Sept 2010)	Baseline (Mar 2010) to Present (Sept 2010)
1	504339	487887	53.707	70	7.0	7.0	7.0	0.0	0.0	0
2	504422	487604	52.670	80	4.8	4.8	4.9	0.1	0.1	-
3	504535	487318	64.346	40	15.1	15.1	15.2	0.1	0.1	-
4	504730	487138	56.299	55	9.6	9.6	9.6	0.0	0.0	0
5	504923	486838	61.272	60	8.8	8.8	8.3	-0.5	-0.5	-1.0
6	505071	486652	68.935	75	3.8	3.8	3.8	0.0	0.0	0.0
7	505284	486480	68.091	35	7.0	7.0	6.9	-0.1	-0.1	-0.2
8	505598	486363	56.836	30	8.6	8.6	8.5	-0.1	-0.1	-0.2
9	505759	486005	61.483	45	9.1	9.1	9.1	0.0	0.0	0
10	505896	485890	60.324	15	14.8	14.8	14.7	-0.1	-0.1	-0.2
11	505990	485657	60.520	80	4.7	4.7	4.6	-0.1	-0.1	-0.2
12	506025	485422	69.863	55	6.1	6.1	6.0	-0.1	-0.1	-0.2
13	506036	485315	78.327	90	7.0	7.0	6.2	-0.8	-0.8	-1.6

**Note:** It is assumed that the accuracy of cliff top monitoring using this technique is  $\pm 0.1$  m. Therefore observed changes have been altered by this amount prior to calculation of an erosion rate. Erosion rates are not calculated where the cliff line shows advance. This is likely to be the product of differing survey interpretation, and far less likely to be a toppling cliff edge.

## Cliff Top Survey

### Cayton Bay

Eight ground control points have been established within Cayton Bay (Appendix C- Map 4). The maximum separation between any two points is nominally 300m.

The cliff top surveys at Cayton Bay are undertaken bi-annually. Measurements are taken from a fixed ground control point along a fixed bearing to the edge of the cliff top.

Table C4 provides baseline information about these ground control points and results from the September 2010 survey showing the position from the ground control point to the edge of the cliff top along the defined bearing and changes in position since the November 2008 baseline survey.

**Table C4 – Cliff Top Surveys at Cayton Bay**

Ground Control Point Details					Distance to Cliff Top (m)			Total Erosion (m)		Erosion Rate (m/year)
Ref	Easting	Northing	Level (mODN)	Bearing (°)	Baseline Survey (Nov 2008)	Previous Survey (Mar 2010)	Present Survey (Sept 2010)	Baseline (Nov 2008) to Present (Sept 2010)	Previous (Mar 2010) to Present (Sept 2010)	Baseline (Nov 2008) to Present (Sept 2010)
1	506325	484850	32.079	50	4.0	3.5	3.3	-0.7	-0.2	-0.4
2	506459	484716	28.227	65	5.0	-0.1	-0.2	-5.2	-0.1	-2.8
3	506597	484539	28.204	65	5.0	6.3	6.2	1.2	-0.1	-
4	506778	484345	38.944	21	9.0	9.0	9.0	0.0	0.0	0
5	507019	484222	38.816	342	7.7	8.1	8.0	0.3	-0.1	-
6	507242	484122	46.544	2	7.4	7.5	7.4	0.0	-0.1	0
7	507518	484008	69.549	25	7.5	7.8	7.3	-0.2	-0.5	-0.1
8	507819	484006	80.135	1	5.5	6.0	5.9	0.4	-0.1	-

**Note:** It is assumed that the accuracy of cliff top monitoring using this technique is  $\pm 0.1$ m. Therefore observed changes have been altered by this amount prior to calculation of an erosion rate. Erosion rates are not calculated where the cliff line shows advance. This is likely to be the product of differing survey interpretation, and far less likely to be a toppling cliff edge.

## **Cliff Top Survey**

### **Filey Bay**

Twenty-three ground control points have been established within Filey Bay (Appendix C- Map 5). The maximum separation between any two points is nominally 300 m.

The cliff top surveys at Filey Bay are undertaken bi-annually. Measurements are taken from a fixed ground control point along a fixed bearing to the edge of the cliff top.

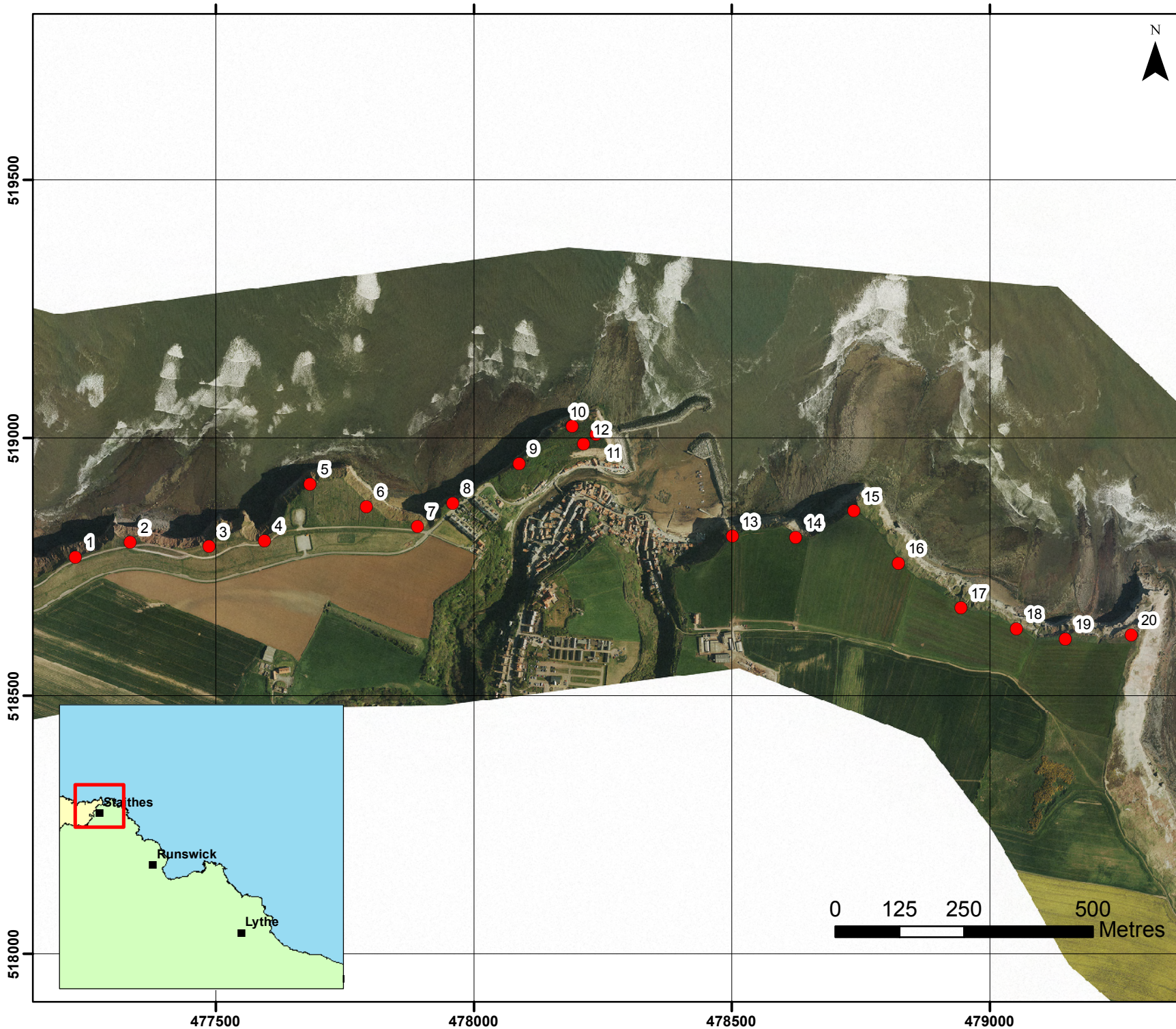
Table C5 provides baseline information about these ground control points and results from the September 2010 survey showing the position from the ground control point to the edge of the cliff top along the defined bearing and changes in position since the November 2008 baseline survey.

**Table C5 – Cliff Top Surveys at Filey Bay**

Ground Control Point Details					Distance to Cliff Top (m)			Total Erosion (m)		Erosion Rate (m/year)
Ref	Easting	Northing	Level (mODN)	Bearing (°)	Baseline Survey (Nov 2008) (Sept 2010)	Previous Survey (Mar 2010)	Present Survey (Sept 2010)	Baseline (Nov 2008) to Present (Sept 2010)	Previous (Mar 2010) to Present (Sept 2010)	Baseline (Nov 2008) to Present (Sept 2010)
1	512445	481631	42.536	130	8.7	8.9	8.8	0.1	-0.1	-
2	512307	481490	37.536	144	7.6	7.7	7.6	0.0	-0.1	0
3	512154	481235	34.607	122	8.3	8.5	8.5	0.2	0.0	-
4	512029	480960	33.034	112	7.4	7.6	7.6	0.2	0.0	-
5	511895	479888	28.755	89	7.1	1.5	1.6	-5.5	0.1	-3.0
6	511908	479597	31.804	48	6.7	6.9	6.9	0.2	0.0	-
7	511991	479310	29.201	69	6.7	7.0	6.5	-0.2	-0.5	-0.1
8	512083	478981	27.177	66	10.2	10.3	10.4	0.2	0.1	-
9	512121	478786	30.903	76	8.3	8.5	8.5	0.2	0.0	-
10	512226	478548	32.958	74	7.5	7.4	7.3	-0.2	-0.1	-0.1
11	512471	478153	11.301	53	6.6	6.3	6.3	-0.3	0.0	-0.2
12	512559	477902	20.254	66	7.7	7.7	7.8	0.1	0.1	-
12A	512656	477822	11.336	67	13.7	-	-	-	-	-
13	512698	477719	20.216	34	4.2	4.2	-	-	-	-
14	512939	477401	31.736	66	8.0	7.3	7.4	-0.6	0.1	-0.3
15	513157	477193	27.613	51	5.2	5.3	5.1	-0.1	-0.2	-0.1
16	513299	477025	27.972	30	7.7	7.8	7.8	0.1	0.0	-
17	513508	476821	36.784	34	10.7	10.8	10.8	0.1	0.0	-
18	513721	476602	39.676	31	7.2	7.4	7.3	0.1	-0.1	-
19	513917	476354	48.852	51	6.6	6.6	6.7	0.1	0.1	-
20	514175	476179	41.826	32	7.0	7.2	7.1	0.1	-0.1	-
21	514472	475966	43.232	66	7.6	7.7	7.6	0.0	-0.1	0
22	514656	475729	56.553	101	8.1	8.1	8.2	0.1	0.1	-
23	514889	475538	68.497	60	9.1	9.1	9.1	0.0	0.0	0
24	512604	481666	41.900	14	19.8	-	-	-	-	-
25	512607	481649	42.514	184	17.2	-	-	-	-	-

**Note:** It is assumed that the accuracy of cliff top monitoring using this technique is  $\pm 0.1$ m. Therefore observed changes have been altered by this amount prior to calculation of an erosion rate. Erosion rates are not calculated where the cliff line shows advance. This is likely to be the product of differing survey interpretation, and far less likely to be a toppling cliff edge.

Reference locations 12A, 24, & 25 are newly added in September 2010, and no measurement was possible at location 13 in September 2010.



● Ground Control Points

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix C - Map 1  
 Scarborough  
 Borough Council Frontage**

Analytical Report 3  
 'Full Measures' Survey 2010

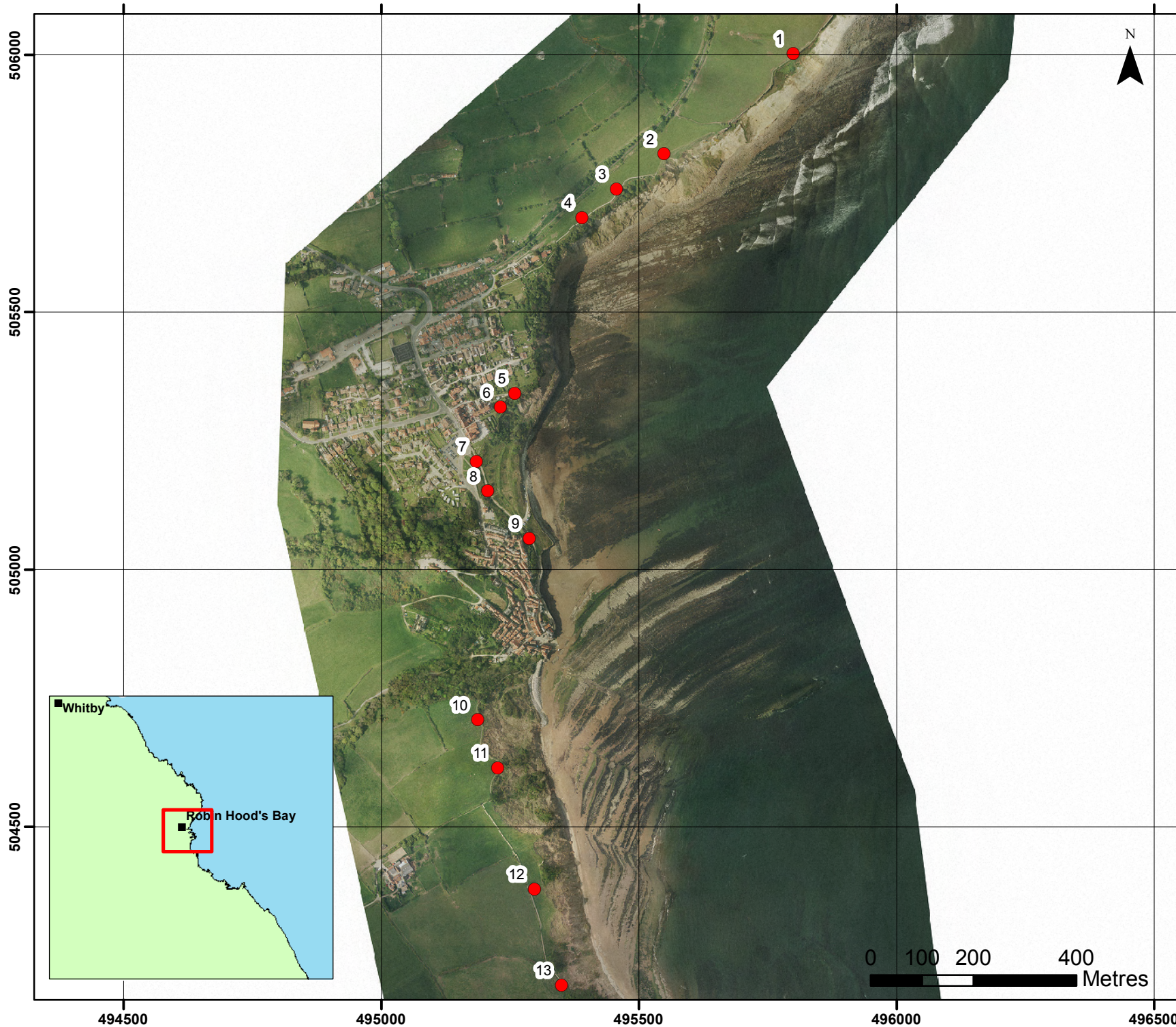
Drawing Scale 1:10,000 at A4

Drawn by: AW	Date: 01/12/2010
Checked by: RJ	Date: 01/12/2010
Approved by: RJ	Date: 01/12/2010

 <p><b>ROYAL HASKONING</b>        Royal Haskoning        Marlborough House        Marlborough Crescent        Newcastle upon Tyne        NE1 4EE</p>	 <p><b>Halcrow</b>        Halcrow Group Ltd        Lyndon House        62 Hagley Road        Edgbaston        Birmingham        B16 8PE</p>
<p>Tel: +44 (0)191 211 1300        Fax: +44 (0)191 211 1313        www.royalhaskoning.com</p>	<p>Tel: +44 (0)121 456 2345        Fax: +44(0)121 456 1569        www.halcrow.com</p>

Photography courtesy of North East Coastal Observatory  
[www.northeastcoastalobservatory.org.uk](http://www.northeastcoastalobservatory.org.uk)





● Ground Control Points

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix C - Map 2  
 Scarborough  
 Borough Council Frontage**

Analytical Report 3  
 'Full Measures' Survey 2010

Drawing Scale 1:10,000 at A4

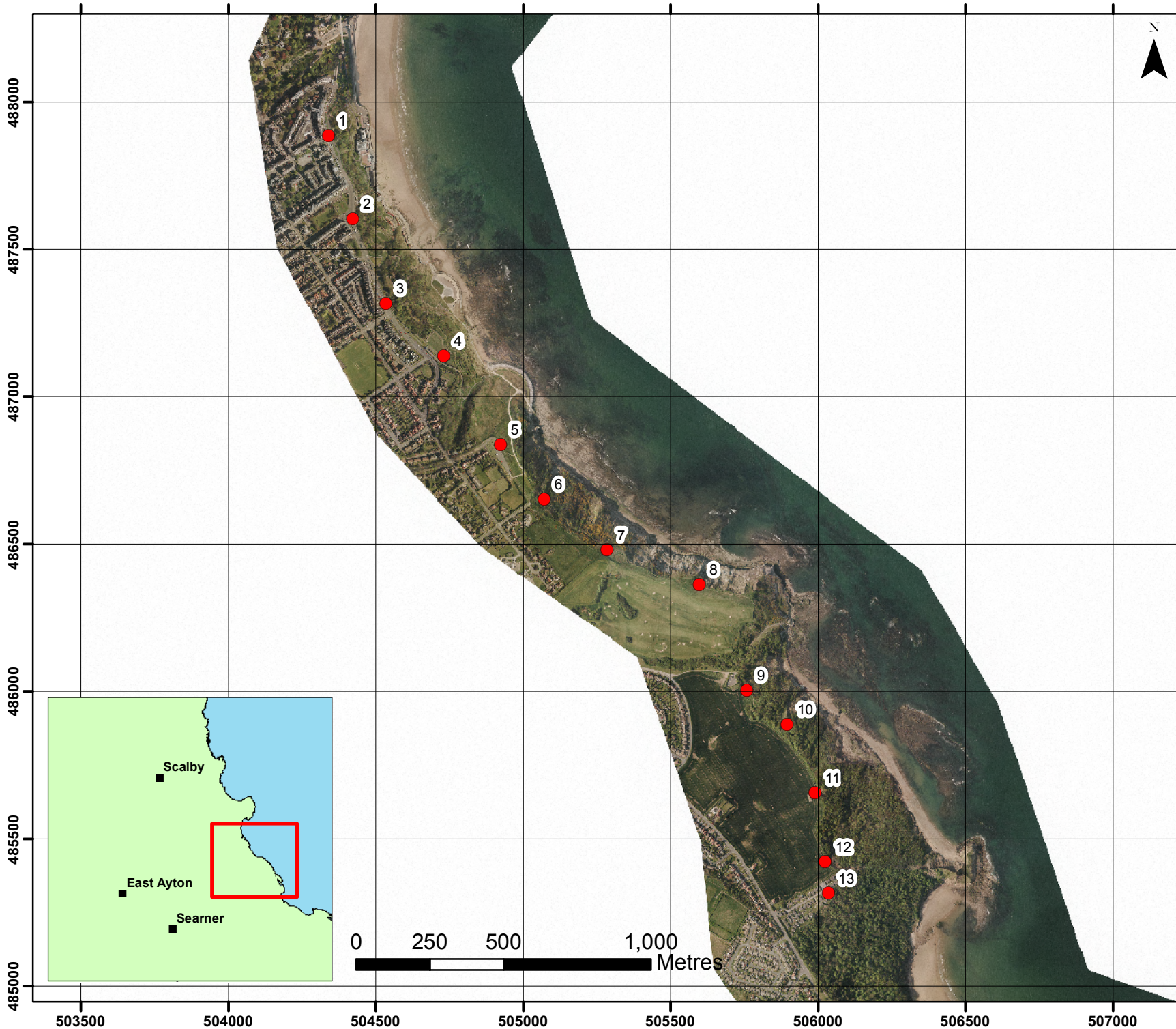
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Checked by: RJ	Date: 01/12/2010
Approved by: RJ	Date: 01/12/2010

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● Ground Control Points

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix C - Map 3  
 Scarborough  
 Borough Council Frontage**

Analytical Report 3  
 'Full Measures' Survey 2010

Drawing Scale 1:17,500 at A4

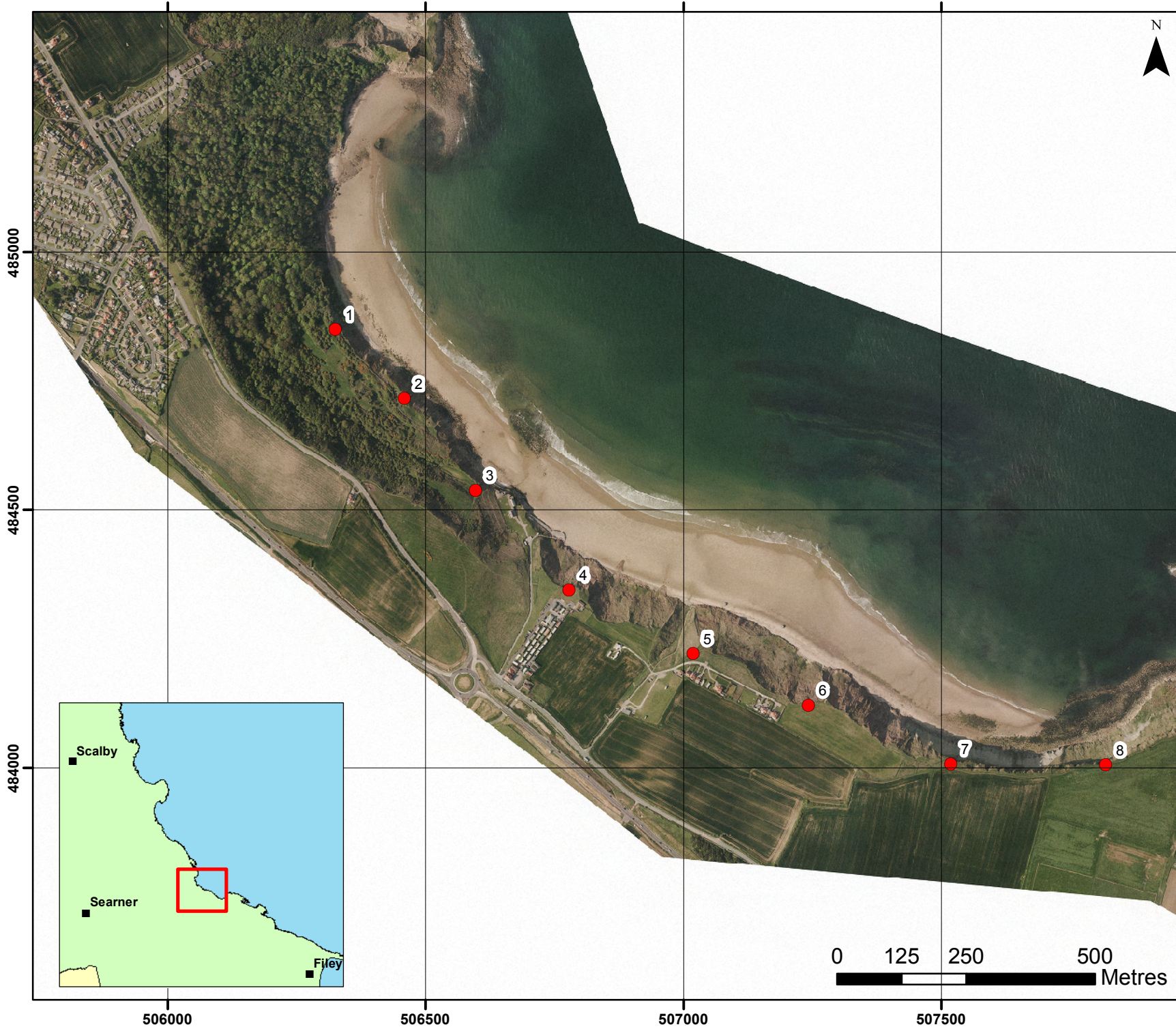
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Checked by: RJ	Date: 01/12/2010
Approved by: RJ	Date: 01/12/2010

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● Ground Control Points

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix C - Map 4  
 Scarborough  
 Borough Council Frontage**

Analytical Report 3  
 'Full Measures' Survey 2010

Drawing Scale 1:10,000 at A4

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Checked by: RJ Date: 01/12/2010

Approved by: RJ Date: 01/12/2010



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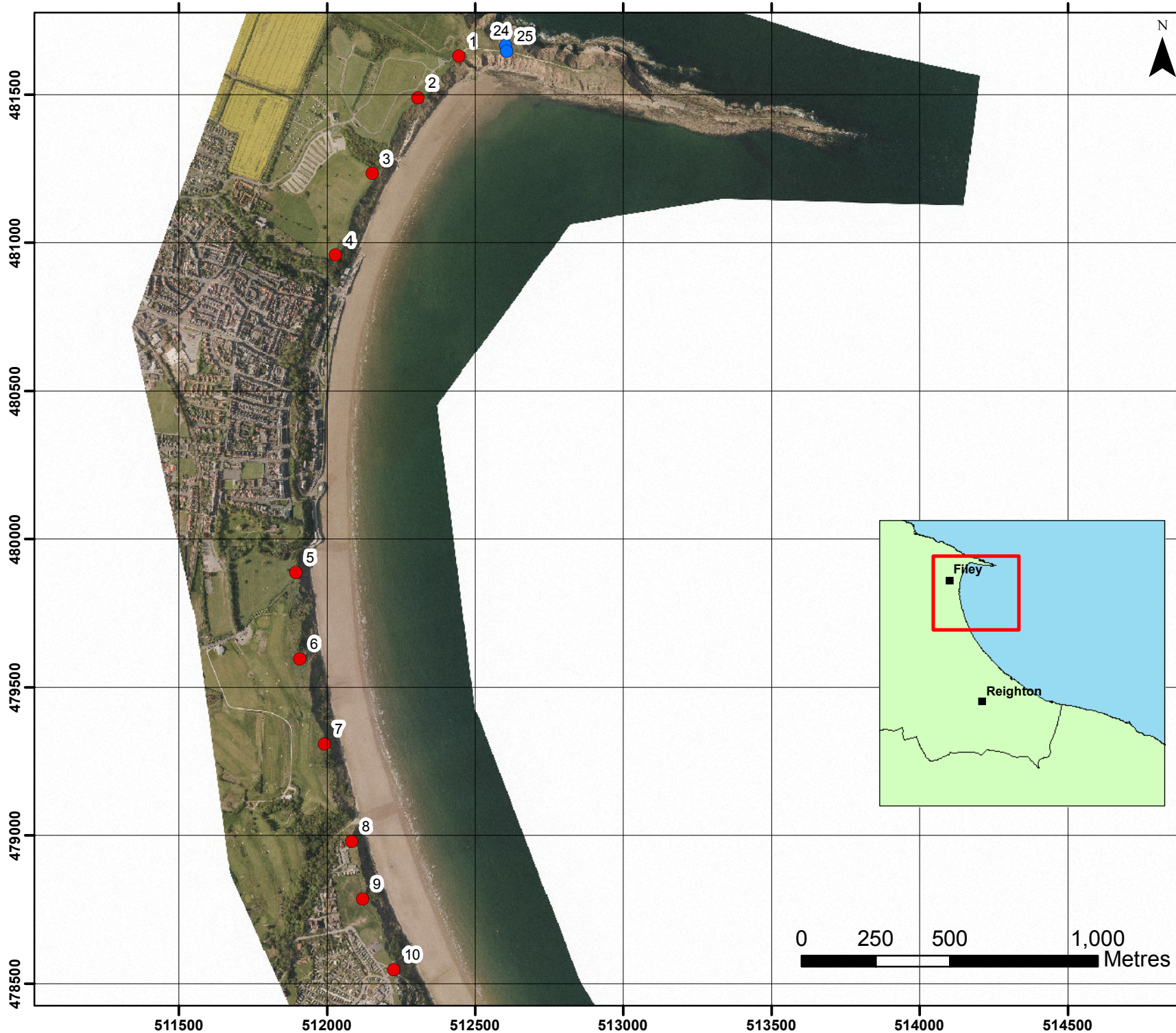
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**Ground Control Points**

- Established Nov 2008
- Established Sept 2010

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix C - Map 5a  
 Scarborough  
 Borough Council Frontage**

Analytical Report 3  
 'Full Measures' Survey 2010

Drawing Scale 1:17,500 at A4

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Approved by: RJ	Date: 01/12/2010

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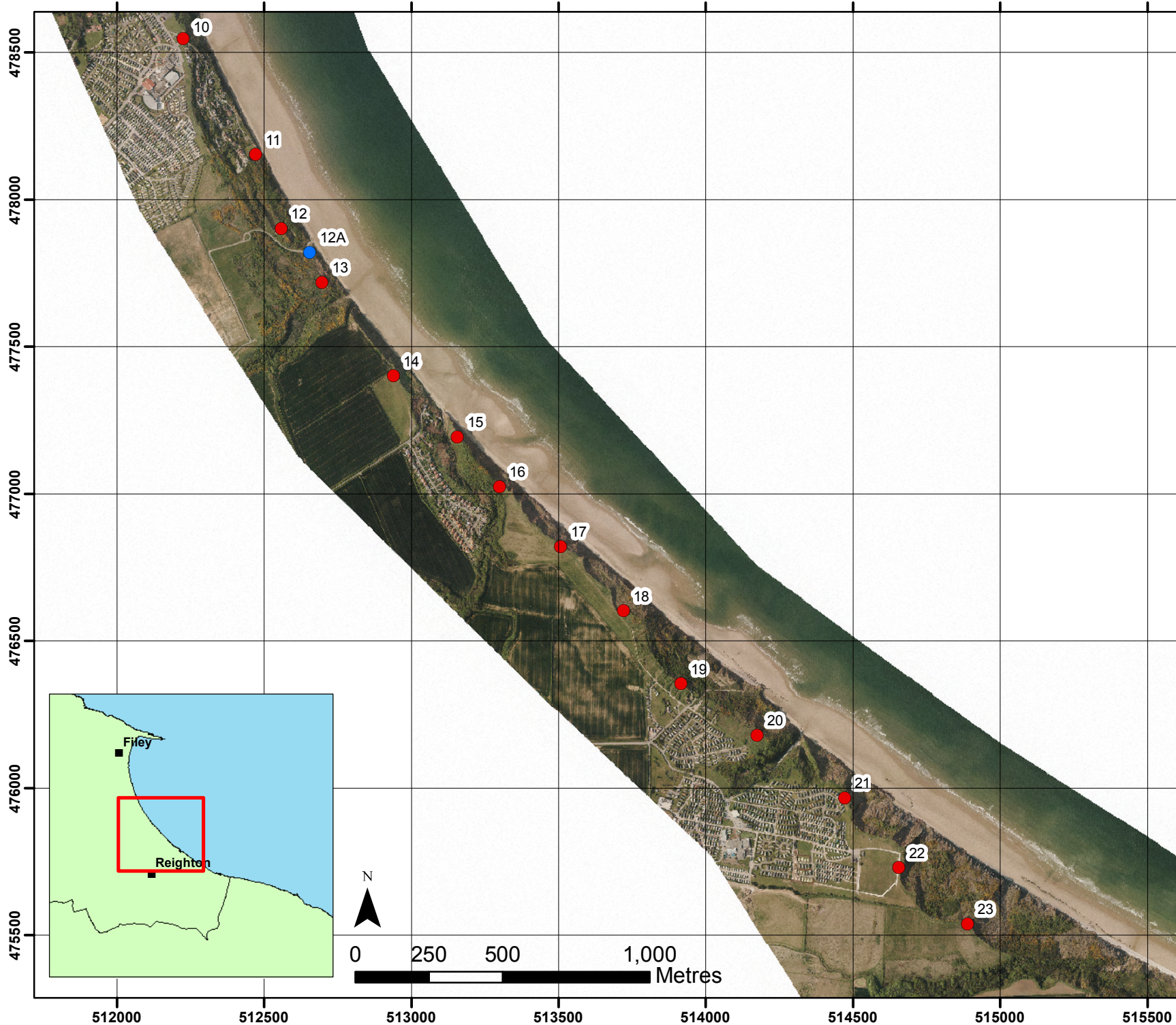
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## Ground Control Points

- Established Nov 2008
- Established Sept 2010

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

## Appendix C - Map 5b Scarborough Borough Council Frontage

Analytical Report 3  
'Full Measures' Survey 2010

Drawing Scale 1:17,500 at A4

Drawn by: AW Date: 01/12/2010

Checked by: RJ Date: 01/12/2010

Approved by: RJ Date: 01/12/2010

  
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