

## **THE GRUNE**

### **Baseline Information**

**Start co-ordinate:** 312744, 556234      **Finish co-ordinate:** 314451, 556876

**Total length:** 1.8km      **Defended length:** 0km  
**Sand dunes:** 1.8km

### **Environmental designations:**

- SSSI
- SAC
- SPA
- Ramsar
- AONB

### **Monitoring carried out:**

- 15 beach profiles
- Topographic survey

### **Site overview:**

This section consists of a 2km long shingle spit and dune system formed by the northerly drift of sediment into the Solway Firth.

Historically, the spit was located seaward of its current position, so that it merged with the nearshore sand banks, but following a shift landward of the "Swatchway" Channel over the past century, the spit has narrowed and shortened, and detached from the intertidal sand and mud flats that it once joined. Erosion is thought to be connected with the movement of the zone of erosion following harbour construction at Silloth Bay in the 1850s (Halcrow, 2002).

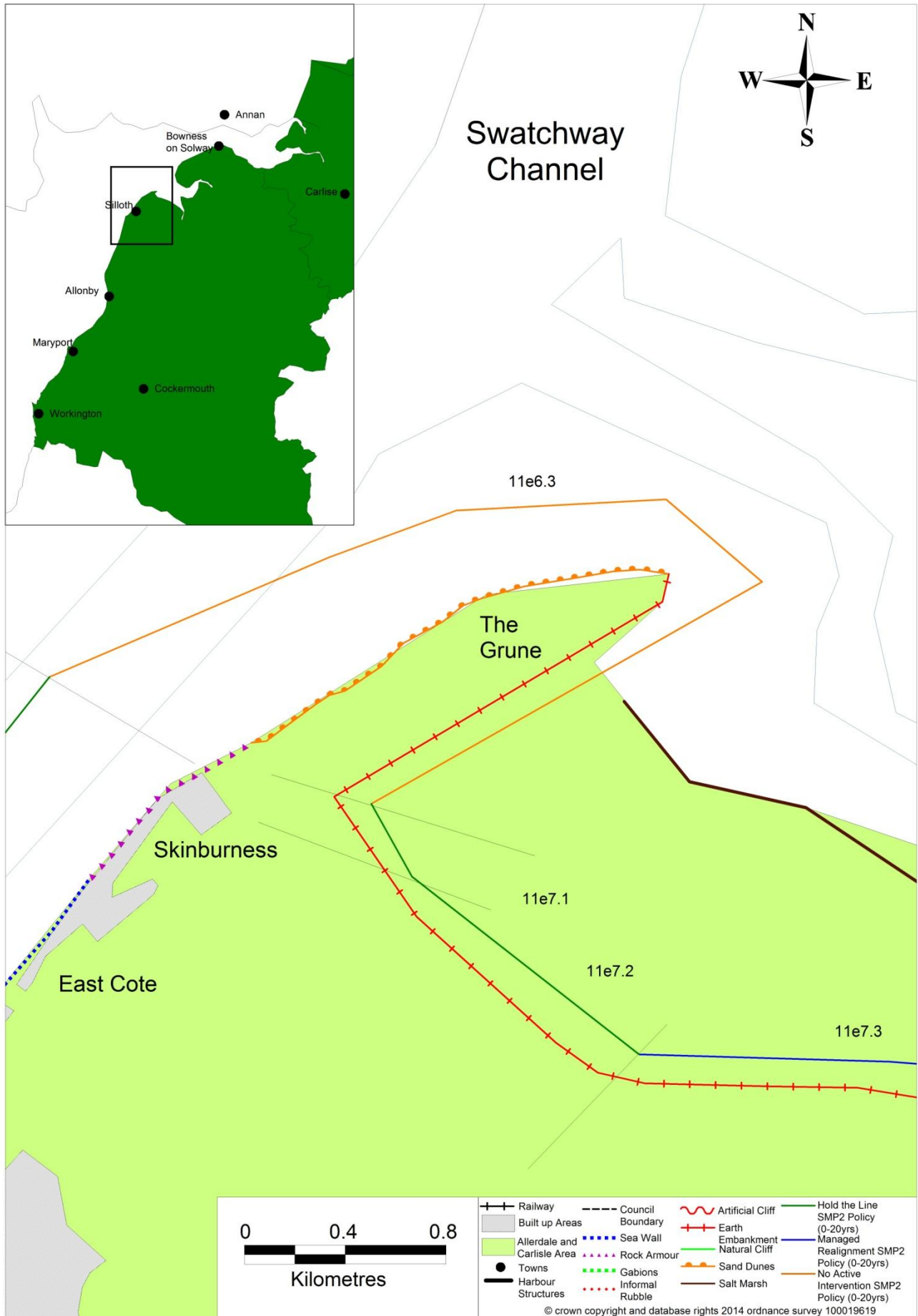
Currently, the Swatchway moves away from the shoreline in this section, increasing the width of the inter-tidal zone. The upper foreshore consists of a steep, sand and shingle bank, with the lower foreshore consisting of sand and mud.

Localised rock armour defences were constructed around the slipway access to Grune House in 2008.

### **The Current (SMP2) Policy:**

- **The Grune:** No Active Intervention in the short term (0-20yrs), medium term (20-50yrs) and long term (50-100yrs).

The plan overleaf summaries the above information graphically:



### **Summary of behaviour**

The construction of hard defences between Silloth Harbour and Skinburnessbank is effectively holding the shoreline in advance (to seaward) of the natural position it would wish to adopt if no defences existed. As a result increased terminal erosion has taken place immediately to the north of the defences and across the southerly half of the Grune.

The existing coastal defences and harbour structures at Silloth have historically, and are continuing at the present, to restrict the natural drift of material along the shoreline towards the Grune. The consequences of this have been changes to the conditions along the Grune i.e. changes in the locations of the offshore banks and channels, landward movement of low and high water marks particularly across the southern half of the frontage. The shoreline and the low water marks diverge from roughly opposite Grune House. The wider foreshore to the north provides for more effective energy dissipation across the foreshore with a consequence that conditions are more stable across the northern half of the Grune.

The following key points arise from analysis of the contemporary monitoring data:

#### ***Offshore Wave Climate:***

- No relevant data available

#### ***Wind Climate:***

- No relevant data available

#### ***Sea Levels:***

- Maximum tide level recorded at Workington in the last 20 years = +5.76 (m ODN) in February 1997, which equates to approximately a 1 in 50 return period; and
- The following predicted extreme tide levels apply (m ODN):

Return Period (years)	Workington	Grune Point
10	5.49	6.33
100	5.84	6.93
1000	6.18	7.58

#### ***Foreshore & Shoreline Changes:***

- Erosion of backshore and upper beach at western end but stability/accretion at northern end;
- All beach areas have suffered losses over the past two years, since 2013;
- Trend in beach volume change in area F of -1,000m<sup>3</sup> per year, based on 2011-2015 data;
- Trend in beach volume change in area G of -4,700m<sup>3</sup> per year, based on 2011-2015 data;
- Trend in beach volume change in area H of -2,100m<sup>3</sup> per year, based on 2011-2015 data;
- Trend in beach volume change in area I of -67,000m<sup>3</sup> per year, based on 2011-2015 data; and
- Overall out of a total of 13 cross shore profiles recorded since 2004/05, 21% – accretion, 14% – erosion, and 66% – no change.

This behaviour is illustrated graphically on the plan overleaf.

Note: Where profile change is shown for individual profiles on the pictorial summaries, beach gain or loss is identified, where the magnitude of change in cross sectional area is greater than 2%. Where the magnitude of change is less than or equal to 2% this is denoted as no change. Beach volume trends < 1,000 m<sup>3</sup> in magnitude are identified as no change.



### **Risk Assessment**

The primary risks arising from the behaviour of coastal forcing processes (wind, waves and tides) and the reaction of the shoreline (beach and cliff changes, artificial defence conditions) across this frontage are:

- Overtopping of artificial defences causing flooding of the hinterland; and
- Breaching of artificial coastal defences, causing erosion of the shoreline.

The primary consequences of this behaviour are:

- Damage to and/or loss of property and infrastructure; and
- Damage to environmental habitats.

The table below shows the overall risk rating(s) that apply within this section of frontage. Overall risk is defined from the probability of conditions/behaviour occurring and the consequences the conditions/behaviour would have.

<b>The Grune Overall Risk Rating</b>					
<b>Policy Unit (11e)</b>	<b>Section of Frontage</b>	<b>Exposure</b>	<b>Probability Index</b>	<b>Consequence Index</b>	<b>Overall Risk Rating</b>
6.3	The Grune	Medium	Medium	Medium/High	Medium

### **Current Behaviour**

Analysis of the monitoring data collected in 2015 provides the following key points:

#### ***Offshore Wave Climate:***

- No new data available for analysis.

#### ***Wind Climate:***

- No new data available for analysis.

#### ***Sea Levels:***

- Maximum tide level recorded on Workington tide gauge = +5.164 (m ODN) on 22<sup>nd</sup> February 2015, equivalent to a level that would be expected to be exceeded once every 1 to 2 years.

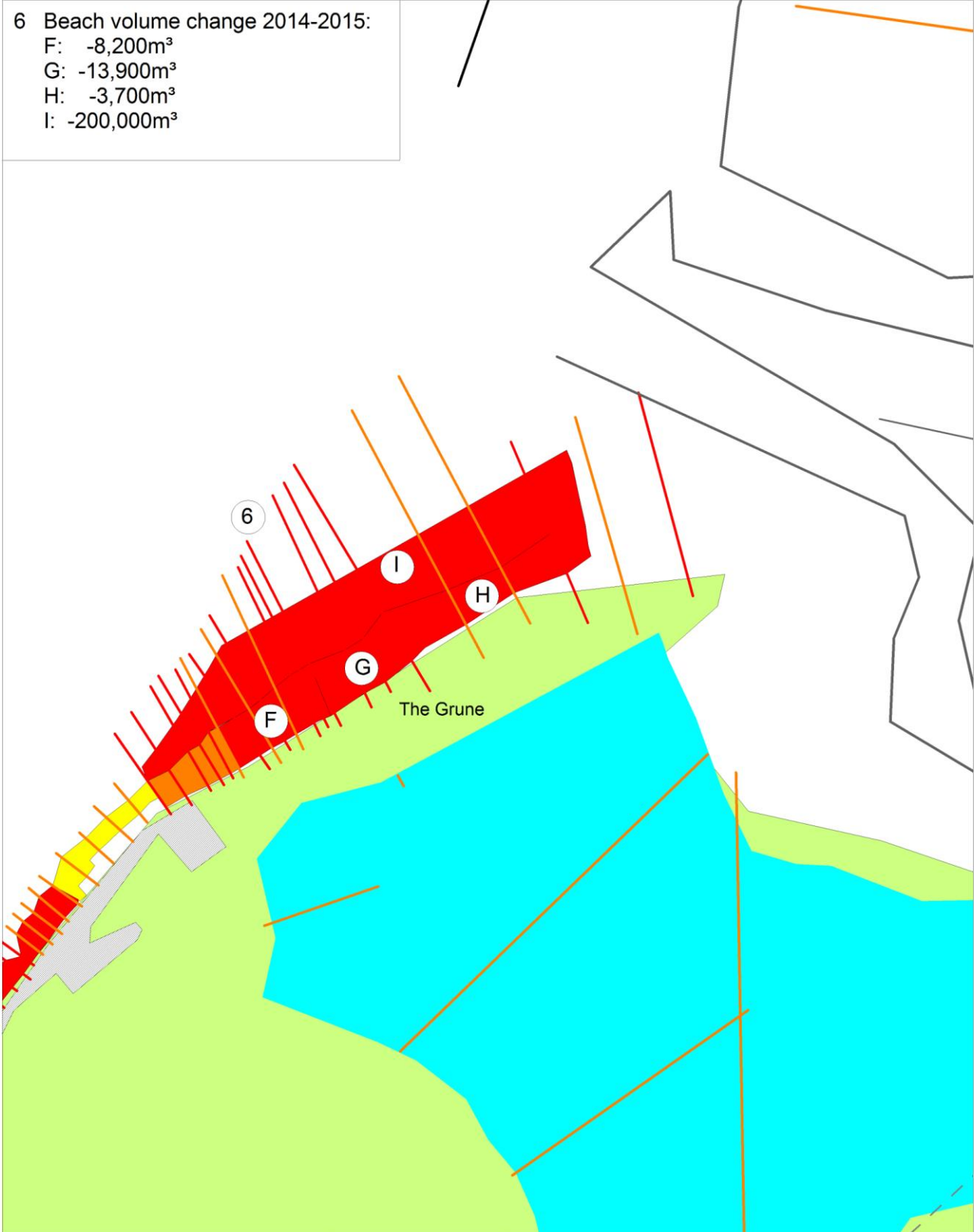
#### ***Beach Changes:***

- Beach loss across both upper and lower sections of beach;
- Beach volumes decreased in area F by 8,200m<sup>3</sup>;
- Beach volumes decreased in area G by 13,900m<sup>3</sup>;
- Beach volumes decreased in area H by 3,700m<sup>3</sup>;
- Beach volumes decreased in area I by 200,000m<sup>3</sup>; and
- Overall out of a total of 14 cross shore profiles recorded, 3% –accretion, 34% – erosion, and 62% – no change.

Note: Where profile change is shown for individual profiles on the pictorial summaries, beach gain or loss is identified, where the magnitude of change in cross sectional area is greater than 2%. Where the magnitude of change is less than or equal to 2% this is denoted as no change. Beach volume gains/losses < 1,000 m<sup>3</sup> in magnitude are identified as no change.

The plot overleaf summarises the results from the monitoring data analysis for this section in 2015.

6 Beach volume change 2014-2015:  
 F: -8,200m<sup>3</sup>  
 G: -13,900m<sup>3</sup>  
 H: -3,700m<sup>3</sup>  
 I: -200,000m<sup>3</sup>



0 0.4 0.8  
Kilometres

Silloth Harbour to The Grune  
Geomorphological Change in 2015

<ul style="list-style-type: none"> <li> Railway</li> <li> Built Up Areas</li> <li> Copleand Borough Council Area</li> <li> Towns</li> </ul>	<ul style="list-style-type: none"> <li> Cliff Unknown</li> <li> Beach Gain</li> <li> Dune Gain</li> <li> Marsh Gain</li> </ul>	<ul style="list-style-type: none"> <li> Cliff Stable</li> <li> Beach No Change/No Data</li> <li> Dune No Change/No Data</li> <li> Marsh No Change/No Data</li> </ul>	<ul style="list-style-type: none"> <li> Cliff Eroding</li> <li> Beach Loss</li> <li> Dune Loss</li> <li> Marsh Loss</li> </ul>
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- Tidally Driven Intertidal/Subtidal Sediment Transport
- Primarily Wave Driven Littoral Transport Pathways

- Shoreline Sediment Exchange
- Limited Shoreline Sediment Exchange

- Harbour Walls

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**Uncertainties & Issues**

The following uncertainties have arisen from the data monitoring programme and analysis of the data collected:

- Quantities of sediment arriving on the beach from offshore;
- Wave conditions occurring directly in front of shore currently unknown; and
- Changes to dune habitats.

**Future Management Actions**

The following monitoring and management actions are recommended:

- Continue current monitoring regime;
- Improve additional remote sensing e.g. LiDAR;
- On-going monitoring of condition of artificial defence structures; and
- Carry out remedial works to maintain integrity of defences, as required.

**Linkage(s) to Decision Making**

The monitoring provides information to support:

- Implementation of SMP2 policies.