

STRUCTURE HH Bray Head

Stephen Bateson Principal Engineer Structures

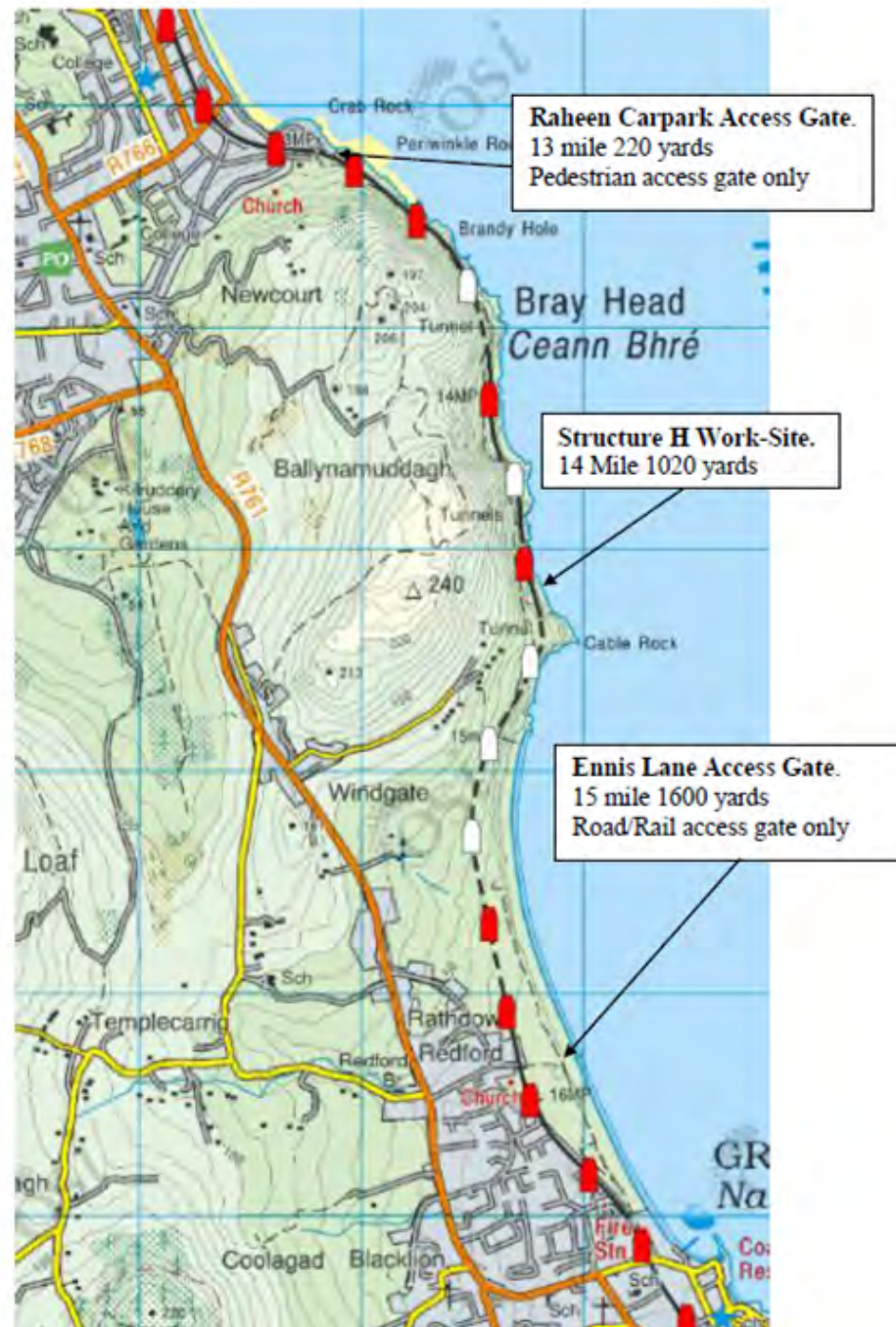
Thomas Carolan Project Engineer

STRUCTURE HH Bray Head

Background

Site Location

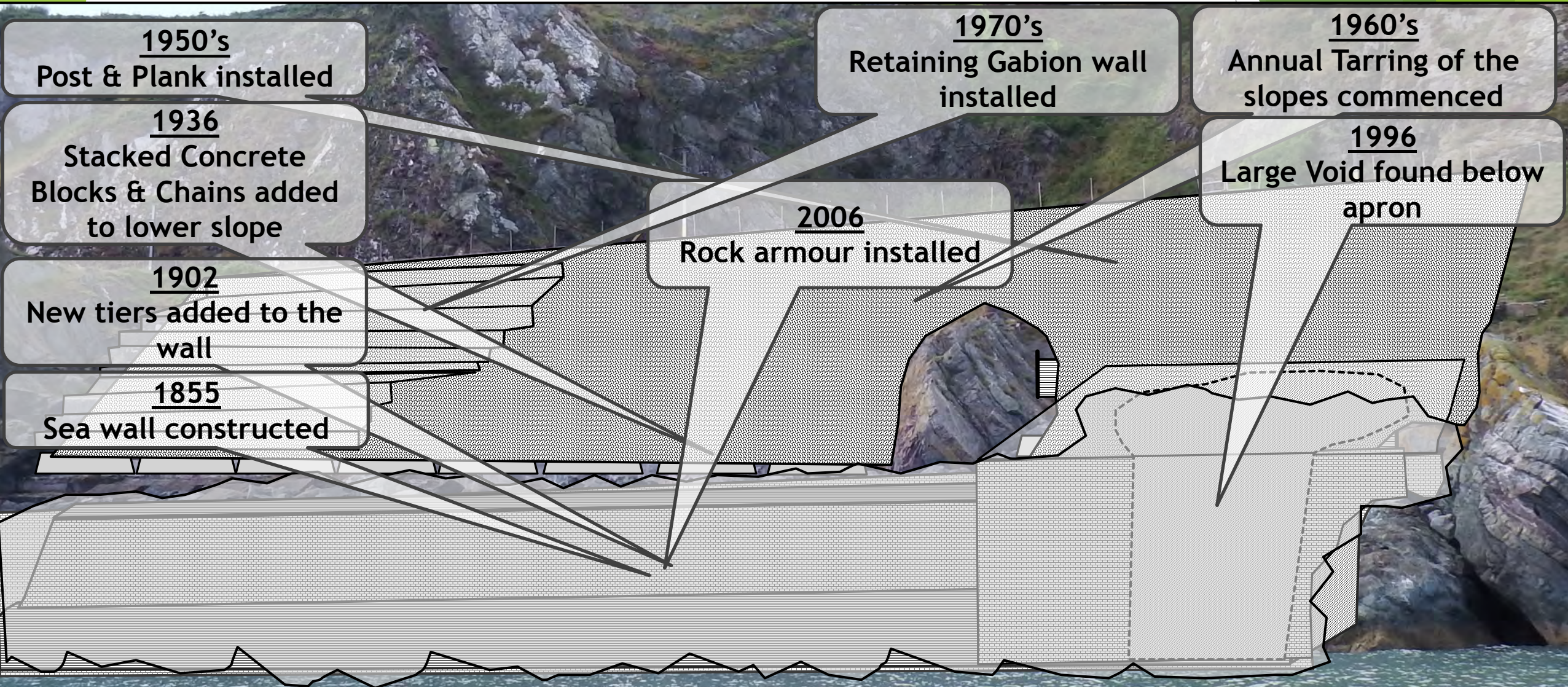
- Structure H is located at 14 mile 1020 Yards on the Dublin To Wexford Railway Line - Bray Head.
- Single Line Track - Bi Directional.
- Remote location between Bray and Greystones.
- Structure H - retaining structure on a steep embankment 14 meters below track level.





Structure H-H

Time-line of construction



2013

Movement monitoring
commences by STSE staff

2013

Settlement in a 28m section of
the track was noted

2013

Sink holes & Depression
discovered

2014

Rock armour started to show signs
of settlement

2017

Lower Post & Plank collapsed

2018

Rock armour shows further signs
of settlement & wall is breached

2018

Movement monitoring detects
increase in settlement



Survey Pre-works

- ▶ Topographical Survey
 - ▶ Yielded limited results - needed further onsite checking
- ▶ Geophysical survey with Dynamic Probing
 - ▶ Fill material on top of rock
 - ▶ Rock Depth approx. 5 m below existing ground level.
- ▶ Drone Survey
- ▶ Difficult location to access and to undertake the works



Survey Pre-works



Drone Survey



STRUCTURE HH Bray Head

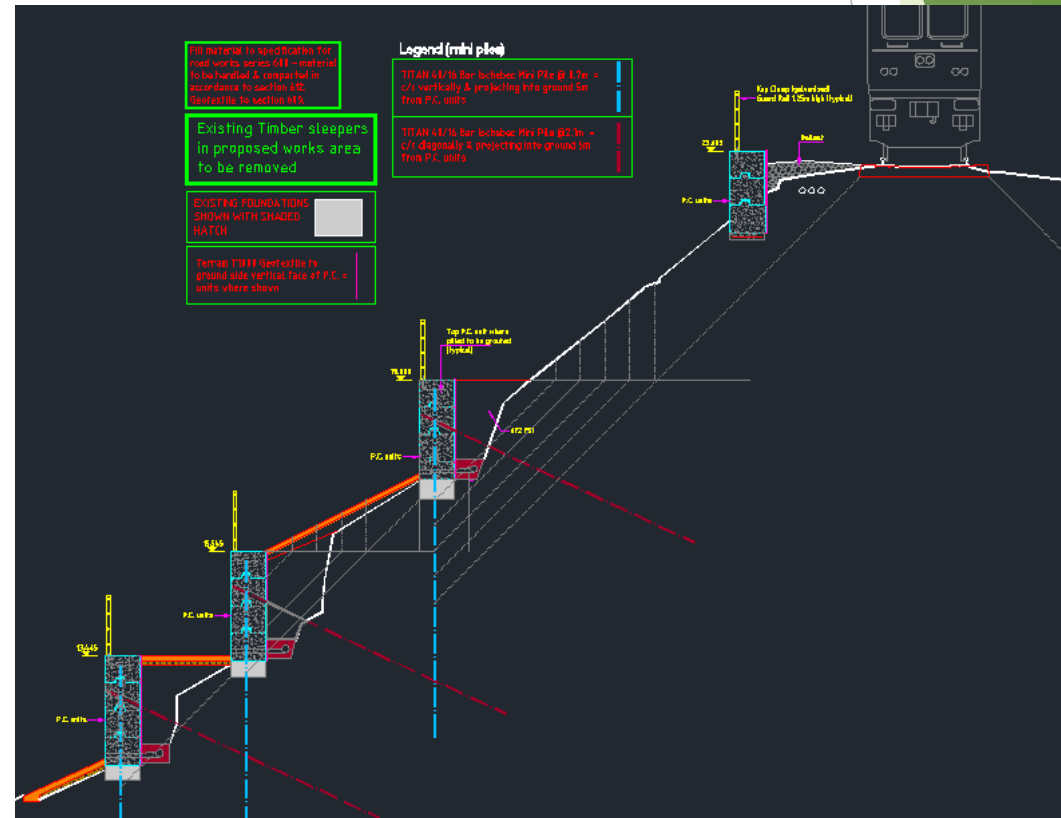
Design Solution

Design Solution

- ▶ The existing structure was a “King Post” structure with rails and timber sleepers. This structure was no longer fit for purpose.
- ▶ For the designer it was important to consider
 - ▶ How the structure was to perform?
 - ▶ How the structure could be constructed for and in this location?
 - ▶ How the structure would look and could it be made to suit its environment?
- The design solution was a gravity retaining wall using Titan 40 mm Ishebeck anchors to provide additional capacity.
- These wall units were manufactured in modular form and were finished to the colour and texture of weathered masonry walls.
- The solution provides for a durable solution that will be low maintenance.
- Early contractor and supplier involvement was important to confirm the availability and buildability of the initial concept.

Design Solution

- Solution to replace with Gravity Retaining wall.
- Wall not directly supporting the track
 - Outside the track support zone
 - Providing support to the material outside the TSZ.
 - Reduces the steepness of the slope
 - Widened cess at the top of the bank.



Design Solution



- ▶ Modular Block
 - ▶ “Lego” block construction.
 - ▶ All 700 mm wide with varying heights and lengths.
 - ▶ Maximum size base on Crane Capacity.
 - ▶ Colour and Texture to suit Location.
 - ▶ Ashlar masonry finish.
 - ▶ Charcoal and Mahogany pigment used.

Design Solution

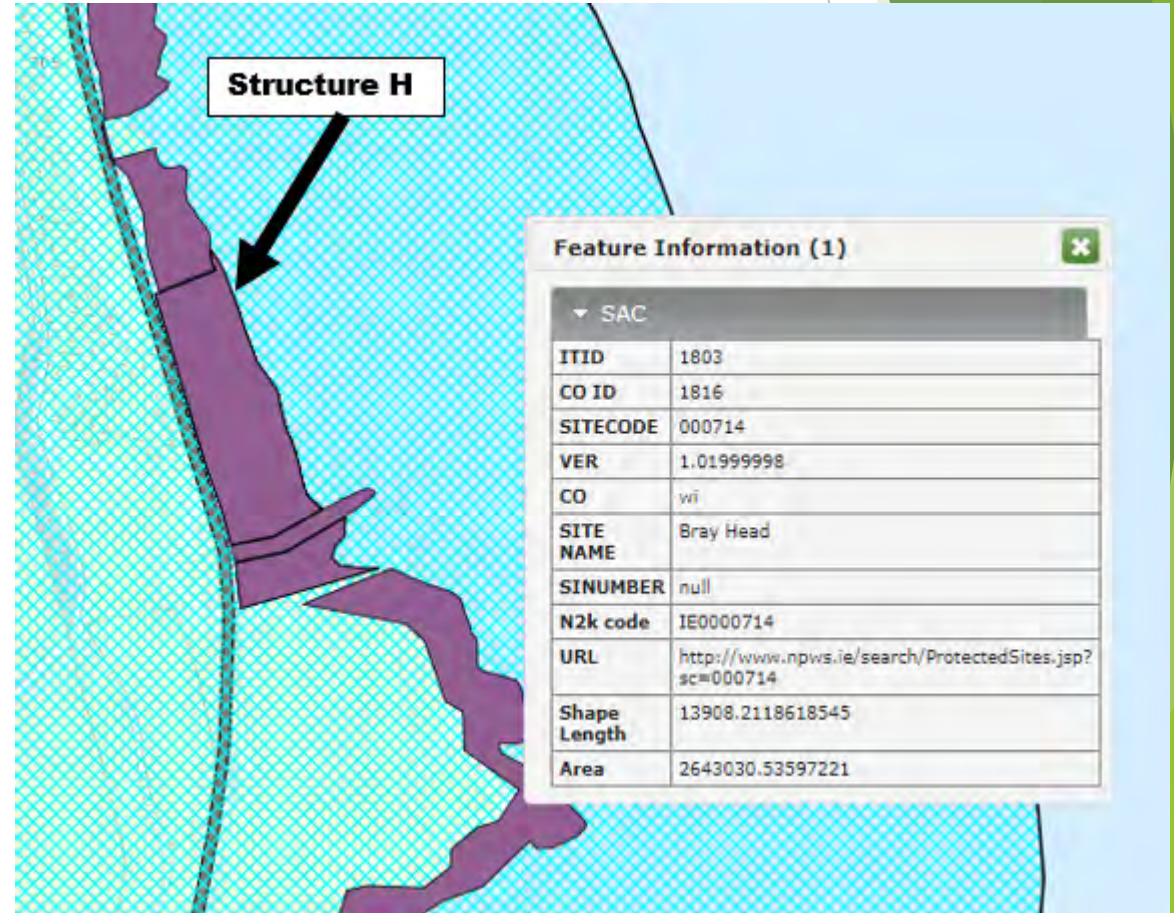


Assessment

Structure H: Located within Bray Head SAC

Article 6 of EC Habitats Directive triggers “Appropriate Assessment”

An assessment of the **potential adverse effects of a plan or project** (in combination with other plans or projects) :
on Special Areas of Conservation and Special Protection Areas.

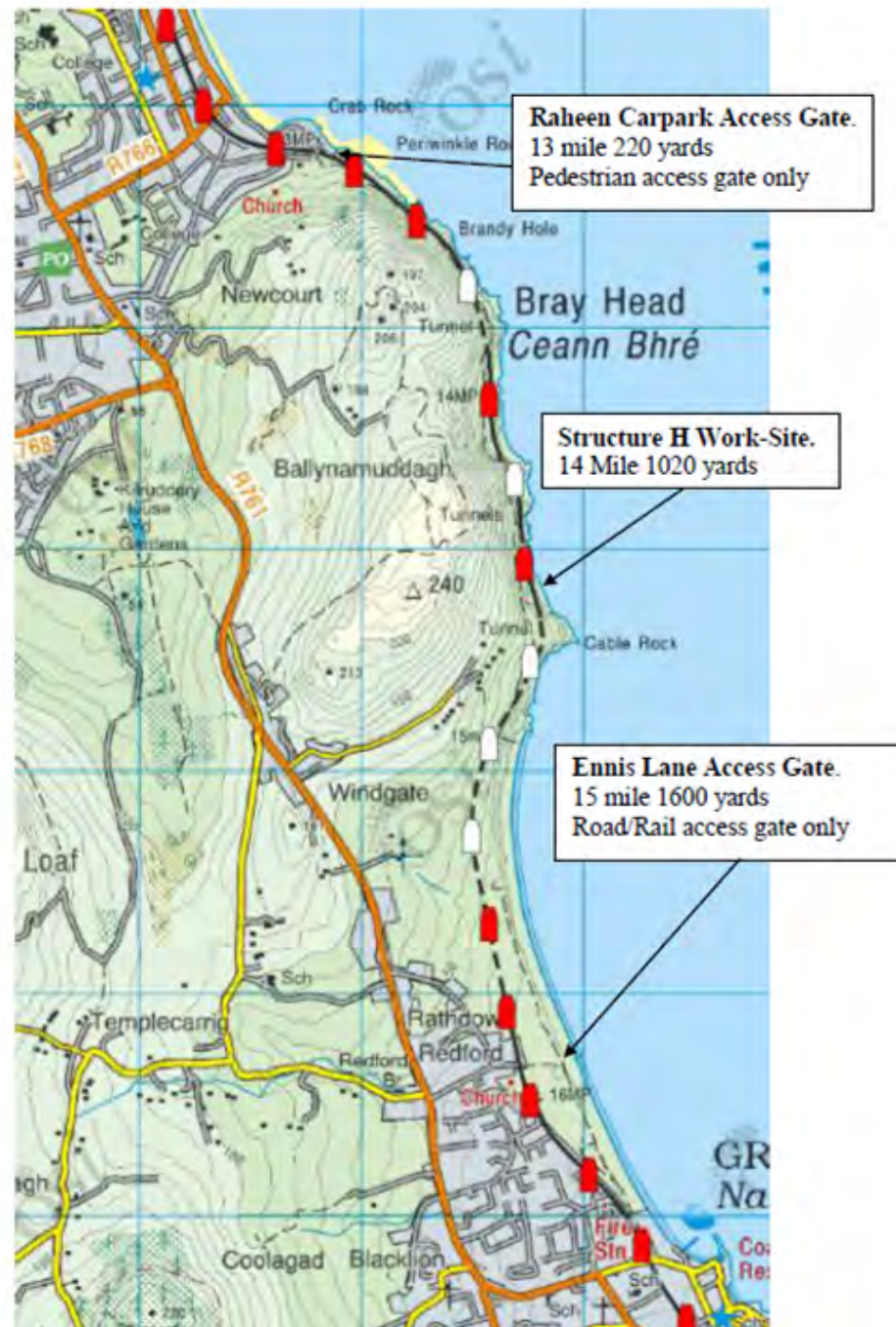


STRUCTURE HH Bray Head

Construction Solution

Site Limitations

- Structure H is located at 14 mile 1020 Yards on the Dublin To Wexford Railway Line - Bray Head.
- Single Line Track - Bi Directional.
- OHLE - 4.4 meters above top of rail level.
- Plant access point known locally as 'Ennis Lane' Greystones located 2.2 km south of Structure H.
- Pedestrian access point at 'Raheen Carpark' Bray located 2.4 km north of Structure H.
- Tunnel 3 (189 m) and Tunnel 4 (1007 m) located between 'Ennis Lane' and Structure H.
- Structure H - retaining structure on a steep embankment 14 meters below track level.



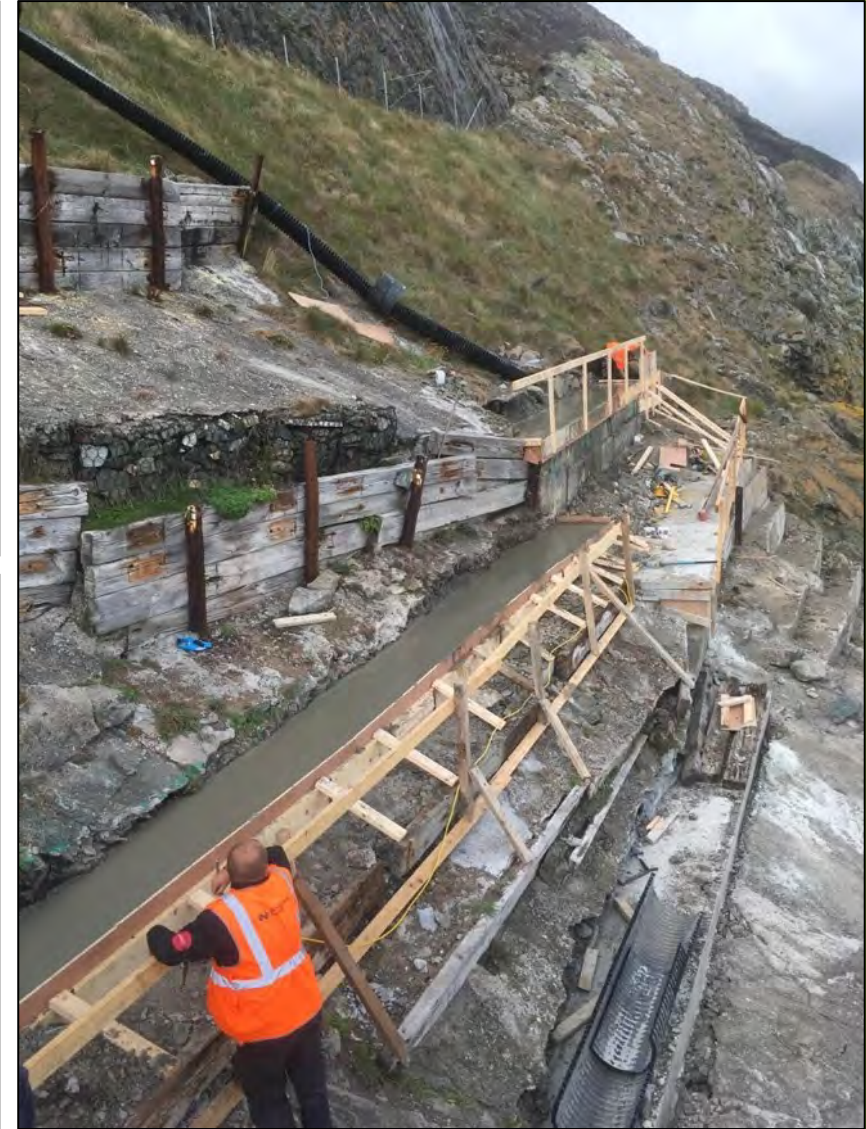
Phase 1 - Compound Construction and Delivery of Materials to Site

- Compound Construction using 6F2 capping, hauled by rail from Ennis Lane during overnight possessions - Day crew levelled and compacted stone.
- Ballasting of Track to allow for unrestricted movement of non rail mounted machinery
- Delivery of Precast Concrete (154 units) via flatbed engineering train loaded in North Wall Freight Depot.
- Delivery of Stone for backfilling (6f2, cl.804 etc). All stone in 1 tonne bags delivered via spoil train loaded in North Wall Freight Depot. Bags lifted in pairs of spoil train using specially made lifting frame - to save time during possession.
- **Permanent Way, Production Department, Operations Dept. & Plant Hire Contractor - Duffy's**



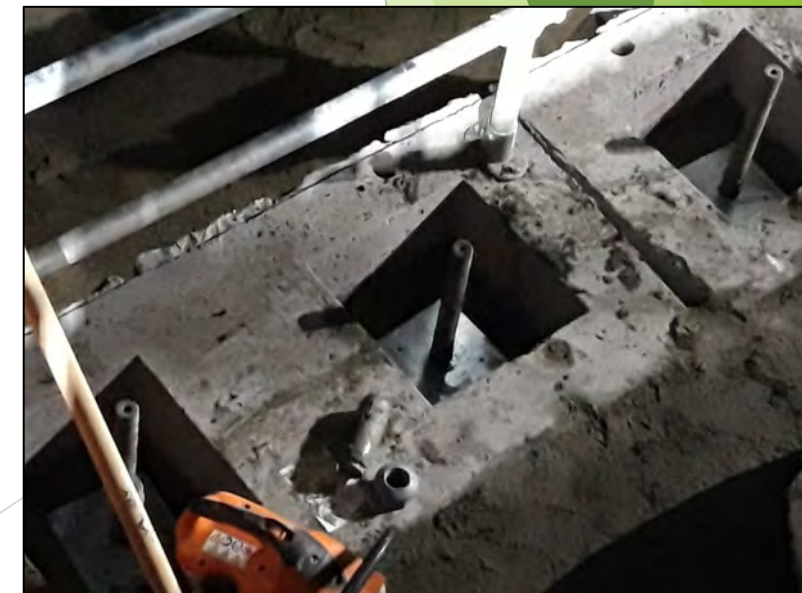
Phase 2 Enabling Works Contract

- Excavate, Shutter and Pour concrete strip foundations for walls A, B & C.
- Both contractor and per way staff transported to and from site via Dart - to avoid walking 2.4 km trackside to and from site on a daily basis.
- Both contractor and per way staff self sufficient on-site - Canteen/Toilet facilities onsite.
- Day Time working under 'Red Zone'. 1 no. TSC & 2 no. Lookout
- Contractor mixed concrete on-site using material previously transported to site during overnight possession.
- 'Half pipe slide' used to manoeuvre concrete from track level, down steep slope to shuttered foundations.
- **Civil Engineering Contractor - Triur Construction Ltd, Permanent Way, Safety Department, Operations Department.**



Phase 3 Renewal Works Contract

- **76 hr T3 Disruptive Possession and Isolation - October Bank Holiday Weekend**
- Construct precast walls A, B & C - 109 precast units
- Install 61 no. 40/16 Ischebeck Titan mini piles/anchors. (42 no. vertical piles & 19 no. horizontal anchors)
- Backfill precast walls with 6F2, cl. 804 stone and compact in 300 mm layers
- Pressure grout all piles/anchors. Erect galvanised key-clamp handrail and pour concrete surfacing between precast walls.
- **52 hr T3 Disruptive Possession and Isolation - Weekend of the 10th / 11th of November**
- Excavate, blind and construct precast wall D at track level - 45 no. precast units
- Erect handrail, and backfill wall with 6f2 stone and ballast
- Demobilise from site
- **Permanent Way, OHLE, Triur Construction, McNally / Windhoist, Duffy Plant Hire**



Specialised Crane - CWE 525 Tracked Knuckleboom

- Tracked Knuckleboom Crane from McNally / Windhoist.
- Length of 5070 mm, Width of 2070 mm & Height of 2775 mm. Max wait of 22.5 TN.
- Ideal for transportation on the back of a standard road/rail trailer under OHLE wires.
- 1.6 tonne at 21.6 meter radius (capable of lifting 600 kg at 29 meter radius)
- Heaviest precast block 1.4 tonne landed at 20.5 meter radius. Trial Lift held in North Wall Freight Depot to confirm the capacity of crane prior to disruptive possession.
- Remote Control
- Excellent technical assistance from McNally / Windhoist.



Before & After

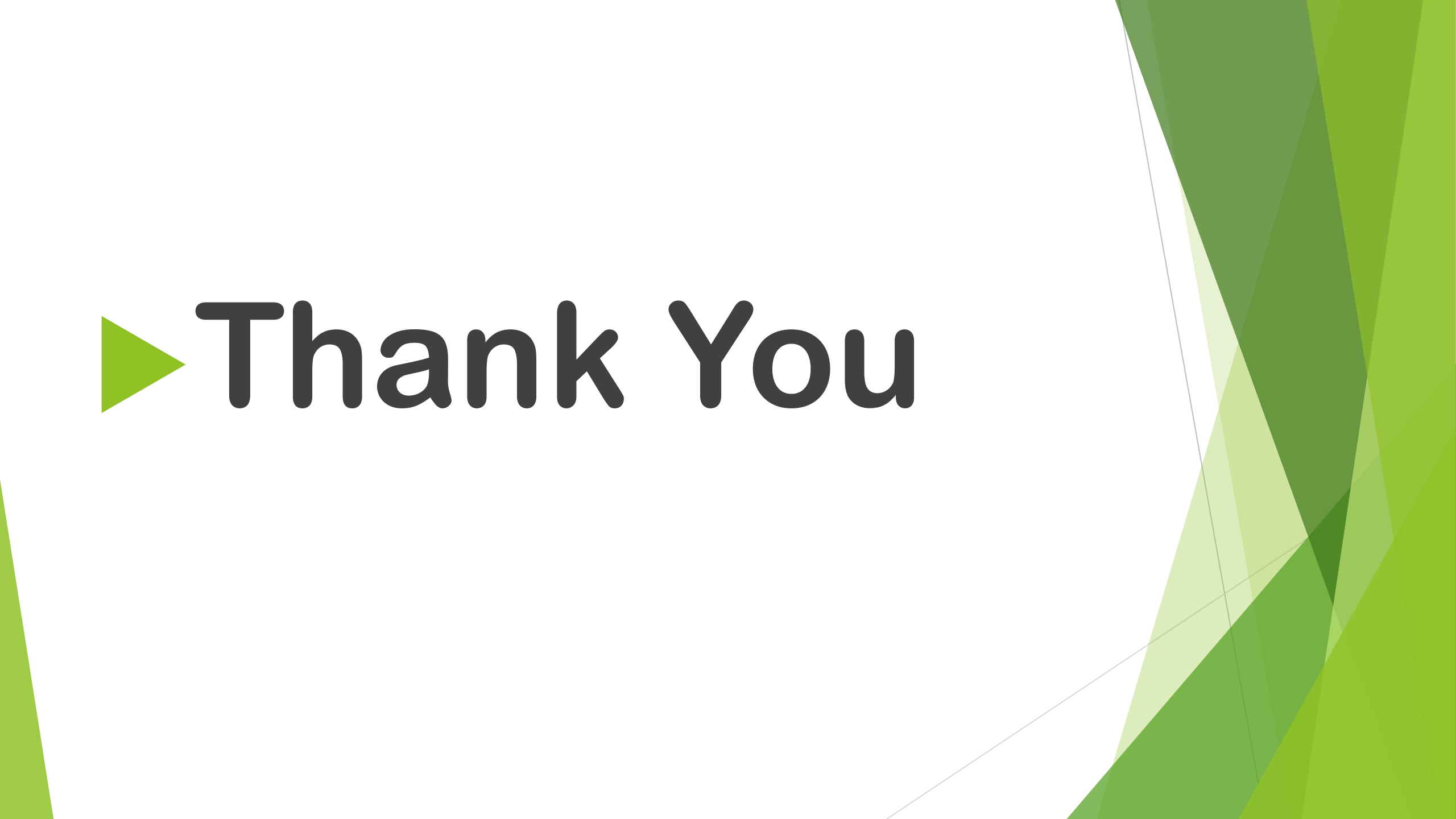


Conclusion



Finished Drone Survey



The background features abstract geometric shapes in various shades of green, primarily on the right side, creating a modern and dynamic feel.

▶ Thank You