DUNDALK FLOOD RELIEF SCHEME

Overview

Poster 15

BACKGROUND

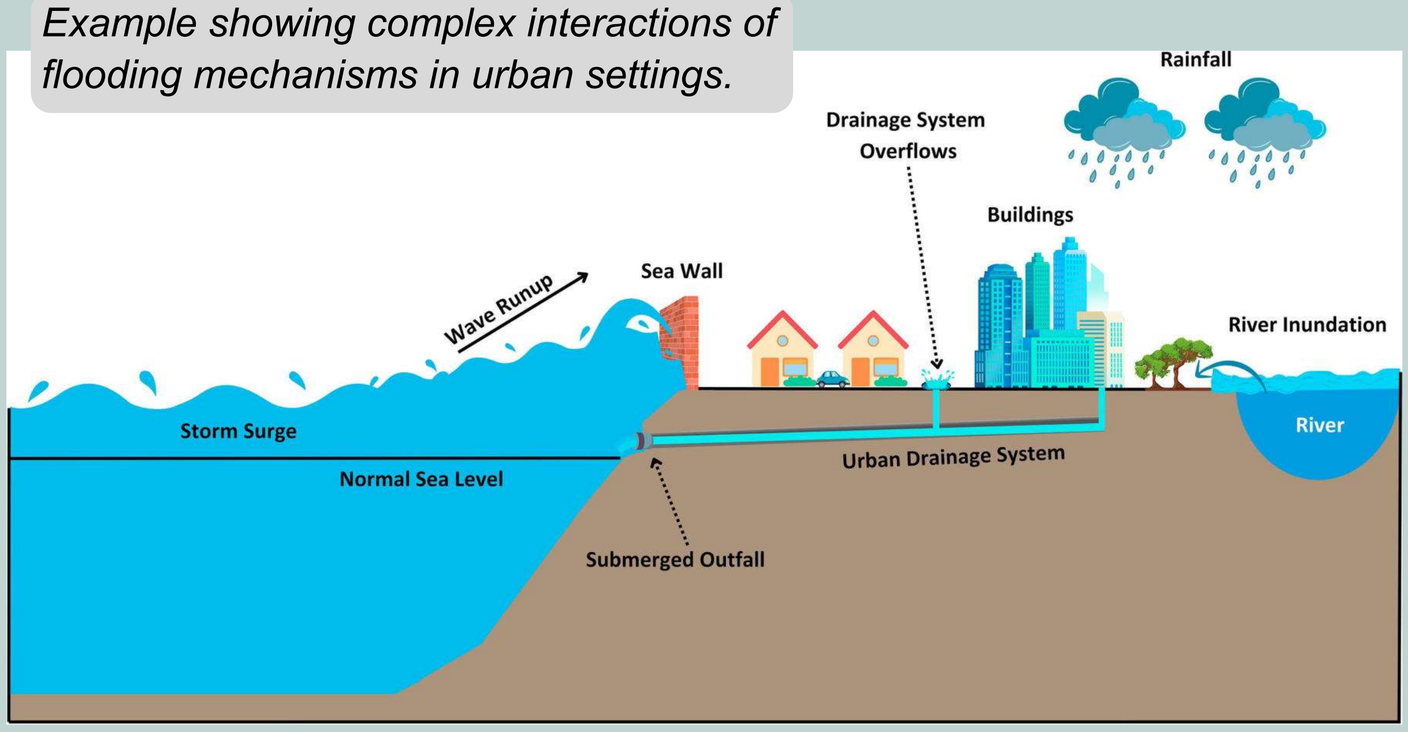
Blackrock town is at risk from both river (fluvial) and coastal flooding.

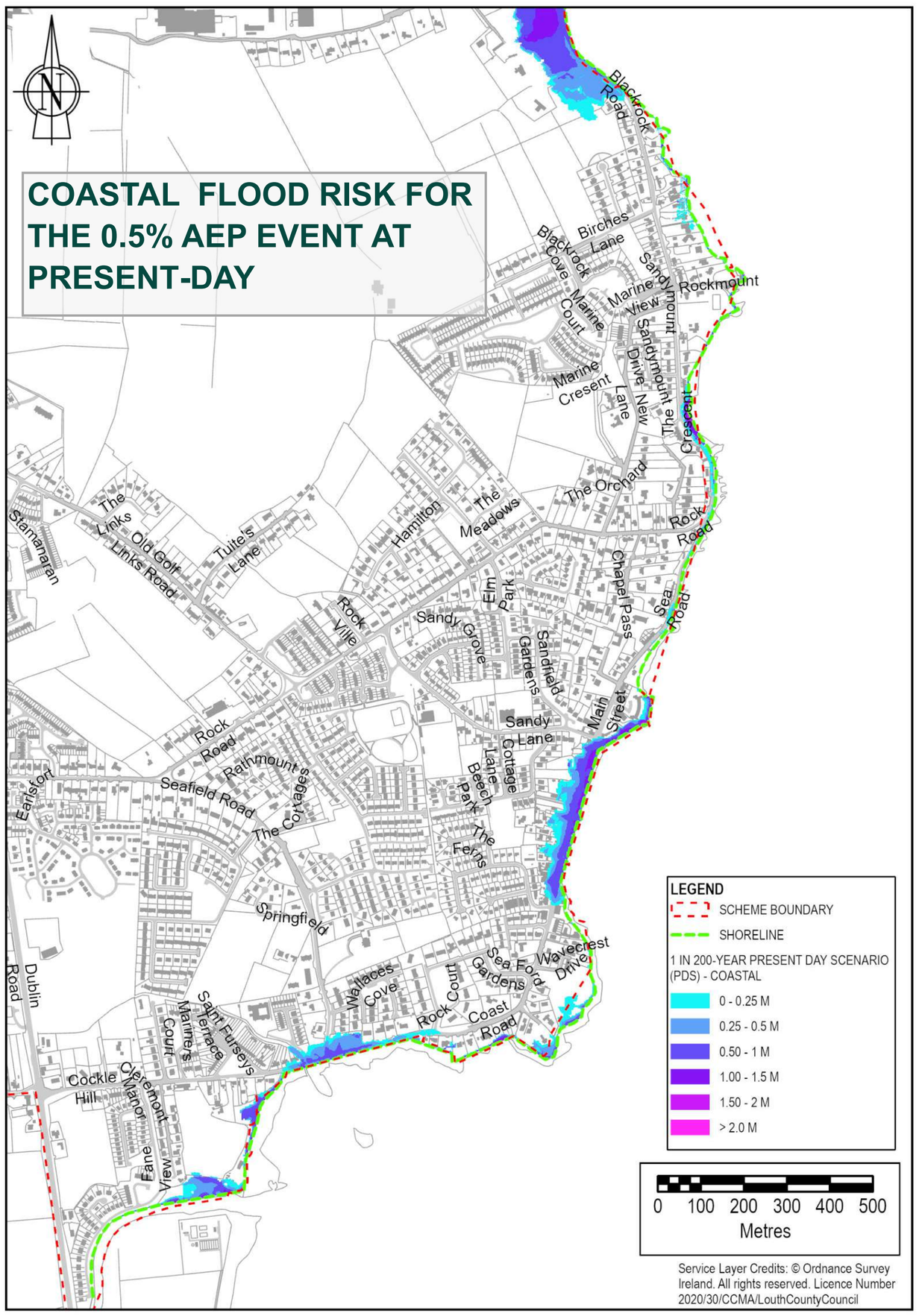
Coastal flooding occurs when seawater reaches land and built-up areas along the coast. This typically happens during storms when high tides and large waves combine to raise sea levels and increase wave energy at the coast.

In urban coastal areas, flooding can occur when waves overtop coastal defences, allowing water to flow into streets, public spaces, and low-lying areas behind the shoreline.

The following sections focus on flooding caused by waves occurring at the same time as high tides, which can result in overtopping of the existing coastal defences and flooding of the urban area.

Example showing complex interactions of flooding mechanisms in urban settings.





Coastal flood extents

As part of this Scheme, coastal modelling was undertaken to assess the flood extents.

The target Standard of Protection (SoP) against coastal flooding is the 0.5% Annual Exceedance Probability (AEP) event —commonly known as a 1 in 200-year flood. This means there is a 1 in 200 chance of such a flood occurring in any given year (on average).

The flood map to the left shows flood extents for the 0.5% AEP event at Present-Day, which confirms that— even today— significant areas of the coastline are at risk and require intervention.

Scheme options were developed to mitigate flood risk at the affected areas.

Planning for Climate Change

Future sea level rise will increase flood risk. Adaptability of the solutions proposed for the Scheme will be key.

Two climate change scenarios are considered in the Scheme and will be addressed in a Climate Adaptation Plan to identify the appropriate adaptation pathways for the Preferred Option. These scenarios are:

✓ The Mid-Range Future Scenario (MRFS) – with an estimated sea level rise of +500mm

✓ High-End Future Scenario (HEFS) – with an estimated sea level rise of +1,000mm

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DUNDALK FLOOD RELIEF SCHEME

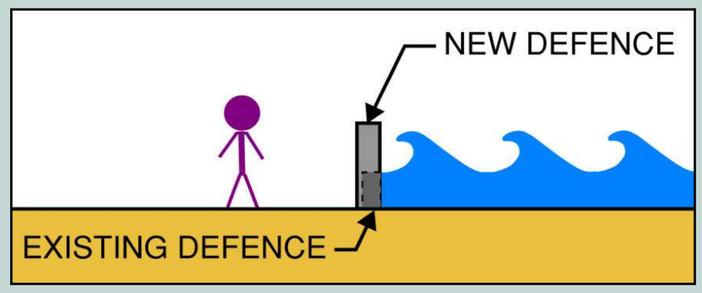
Coastal Flood Risk Management Policies

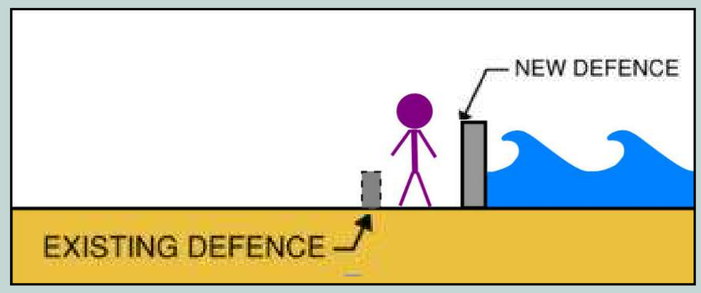
Poster 16

COASTAL FLOOD RISK MANAGEMENT POLICIES

Coastal flood risk management policies broadly fall into the following categories.

Do Nothing	This policy involves a decision not to invest in a flood risk management scheme.
Do Minimum	This policy involves undertaking minor maintenance and repairs to any existing defences, by carrying out the minimum work required to maintain the current or restore a previous standard of protection.
Hold the Line	Maintain or improve the existing coastal defences to protect the current shoreline position. This typically involves maintaining, strengthening or raising existing defences.
Advance the Line	This policy involves the construction of new defences seaward of the existing defence alignment, creating additional space between the sea and assets at risk.
Managed Retreat	Managed retreat allows the coastline to move naturally (Set-Back) by establishing a buffer zone between the sea and the assets at risk. This could be done either by realigning an existing coastal defence or by retreating landward in areas where no established defences exist. This can create additional space for the development of new intertidal areas that act as flood risk control mechanism.





Applicability

Different coastal management policies provide different ways to manage flood risk depending on environmental constraints, available space, and the level of protection required.

For Blackrock Town, the ‘Do Nothing’ and ‘Do Minimum’ policies were not considered suitable as they would not provide the required Standard of Protection.

As a result, options development focused broadly on Hold the Line, Advance the Line, and Managed Retreat policies.

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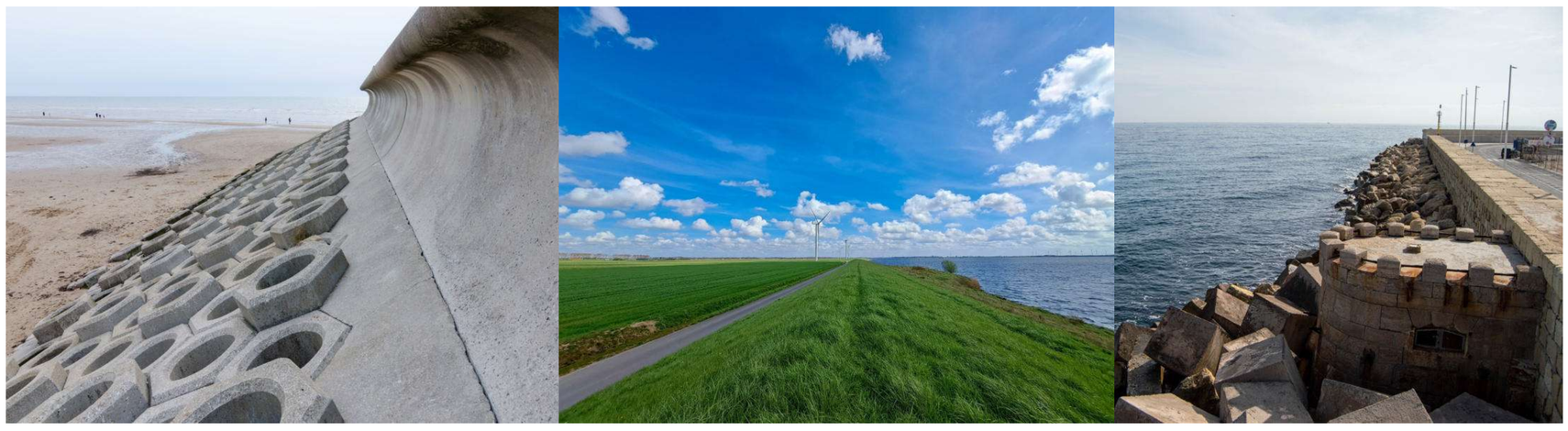
Example coastal defence measures

Poster 17

Coastal flooding measures are potential solutions to address wave and tidal flooding. Not all measures are applicable to all policies, and neither are all measures applicable to all areas of coastline so a screening process was carried out to screen out some measures.

FLOOD PROTECTION MEASURES include measures that physically reduce the flood risk. These include:

A, B, C. Sea walls, embankments, stone or rock armour revetments (either new or upgrading existing) which provide a direct barrier to wave overtopping.



D. Breakwaters, which reduce incoming wave heights

E. Flood storage measures, such as storage tanks or ponds.

F. Groynes — used to trap sediment and form a buffer to wave action

G. Saltmarsh restoration, which also provides a buffer zone to waves

H. Beach management, including beach nourishment, beach reprofiling and dune management.

I. Demountable Defences — temporary flood defences that are erected as required.

J. Individual Property Protection, such as flood doors & barriers, air brick covers, repointing, pumping systems.

FLOOD PREVENTION MEASURES, may also be included in Flood Relief Schemes. These include measures that aim to avoid placing people and properties at risk, such as:

K. Sustainable Planning and Development Management, which involves integrating long term– flood risk considerations into development strategies.

L. Land Use Management and Natural Flood Risk Management Measures, which involve the restoration of floodplains or wetlands by removing artificial or natural barriers

M. Voluntary Home Relocation, aimed at reducing long-term flood risk by encouraging property owners to relocate away from high-risk flood zones

N. FLOOD PREPAREDNESS MEASURES, which are enacted in combination and include forecasting and warning systems, informed by flood data collection programmes. These can be used in developing emergency response action plans, and implementing public awareness programmes to promote community resilience to flooding.

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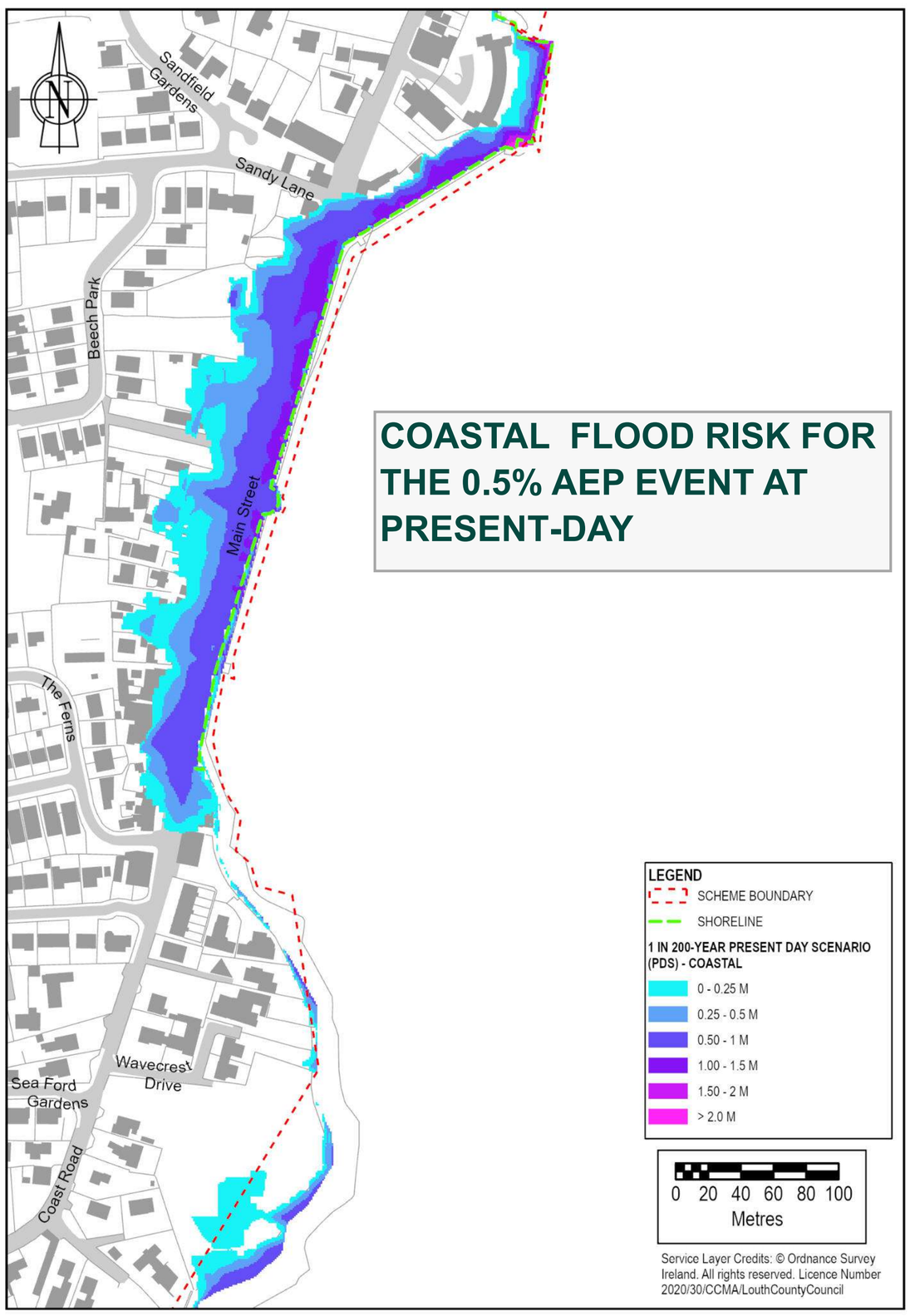
DUNDALK FLOOD RELIEF SCHEME

Applicable Coastal Flood Risk Management Policies at Blackrock Town

Poster 18

BLACKROCK TOWN FRONTAGE OVERVIEW

The Blackrock town frontage stretches approximately 650m along the seafront, with intertidal sandflats and a sandy beach making up the shoreline. The existing coastal structures comprise primarily of concrete slopes with short wave walls on the top, interrupted by access points allowing entry to the beach.



COASTAL FLOOD RISK FOR THE 0.5% AEP EVENT AT PRESENT-DAY

COASTAL FLOOD RISK

The map to the left shows predicted flood depths along the Blackrock town frontage due to coastal flooding for the 0.5% AEP event at the Present-Day scenario. These extents confirm the need for interventions to mitigate flood risk to the community.

COASTAL FLOOD RISK MANAGEMENT POLICIES

Do Nothing' and 'Do Minimum' policies were deemed to not meet the objectives of the Dundalk Flood Relief Scheme as they would not provide the required standard of protection. A 'Managed Realignment' scheme is also not applicable as the existing sea walls are not formal flood defences.

Hold the Line, Managed Retreat and Advance the Line policies were brought forward to the longlist stage and options were developed for each.

CONSTRAINTS

Despite their distinct advantages and limitations, all policies at this location are significantly constrained by the environmentally designated areas seaward of the promenade and the established town frontage landward of it, limiting the available space for intervention.

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Blackrock Town— Emerging Options

Poster 19

MEASURES APPLICABLE TO BLACKROCK

Applicable coastal flood risk managed measures (Poster 17) under each policy were assessed and developed into a longlist of potential options. Embankments (Measure B) were not considered appropriate for Blackrock Town as this type of measure is not compatible with the existing town frontage and urban character. Saltmarsh restoration (Measure G) is also not applicable as there is none along this area. There is insufficient space to implement a land use management plan (Measure L) and sustainable planning and development measures (Measure K) are only applicable to planned developments. Property Relocation (Measure M) and property level protection measures (Measure J) are not considered to meet the technical requirements of the scheme. The remaining measures outlined in Poster 17 were combined or brought forward singly to form the longlist of options.

BLACKROCK LONGLIST

The following options were assessed against the project objectives to determine which should be shortlisted and which should be discounted from further consideration.

No.	Proposed Option	Decision
1	Wall on concrete slope **(Measure A & C)**	**Discounted—**High crest level required, which would result in significant change to the character of the frontage
2	Wall on concrete slope with groynes along the beach to increase foreshore levels **(Measure A, C & F)**	**Discounted—**High crest level required, and would require land-take in environmentally designated areas. Option is not adaptable to climate change.
3	Wall on stepped revetment with promenade **(Measure A & C)**	**Discounted—**High crest level required, which would result in significant change to the character of the frontage
4	Wall on concrete slope with promenade & groynes **(Measure A, C & F)**	**Discounted—**High crest level required. Option is not adaptable to climate change.
5	Rock armoured revetment **(Measure C)**	**Shortlisted**
6	Seawall with rock mound **(Measure A & C)**	**Discounted—**High crest level required, which would result in significant change to the character of the frontage
7	Vertical seawall **(Measure A)**	**Discounted—**High crest level required, which would result in significant change to the character of the frontage
8	Stilling wave basin comprising two walls and water retaining tanks **(Measures A & E)**	**Shortlisted**
9	Offshore breakwaters **(Measure D)**	**Discounted**—Unlikely to eliminate flood risks in isolation. Option is expected to have the largest footprint within the SAC/SPA.

APPLICABLE POLICIES

The policies discussed in Poster 16 are applicable to each option as follows:

Option	Compatible policies	Decision
Option 5	**i. Hold the Line**	Shortlisted
	ii. Managed Retreat	Shortlisted
	iii. Advance the Line	**Discounted** - offers no obvious advantage compared to other options
Option 8	**Advance the Line**	Shortlisted

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DUNDALK FLOOD RELIEF SCHEME

Blackrock Town Option 5i

Poster 20

Example: Lahinch Town, County Clare, Ireland

ROCK ARMOUR REVETMENT WITH WAVE WALL

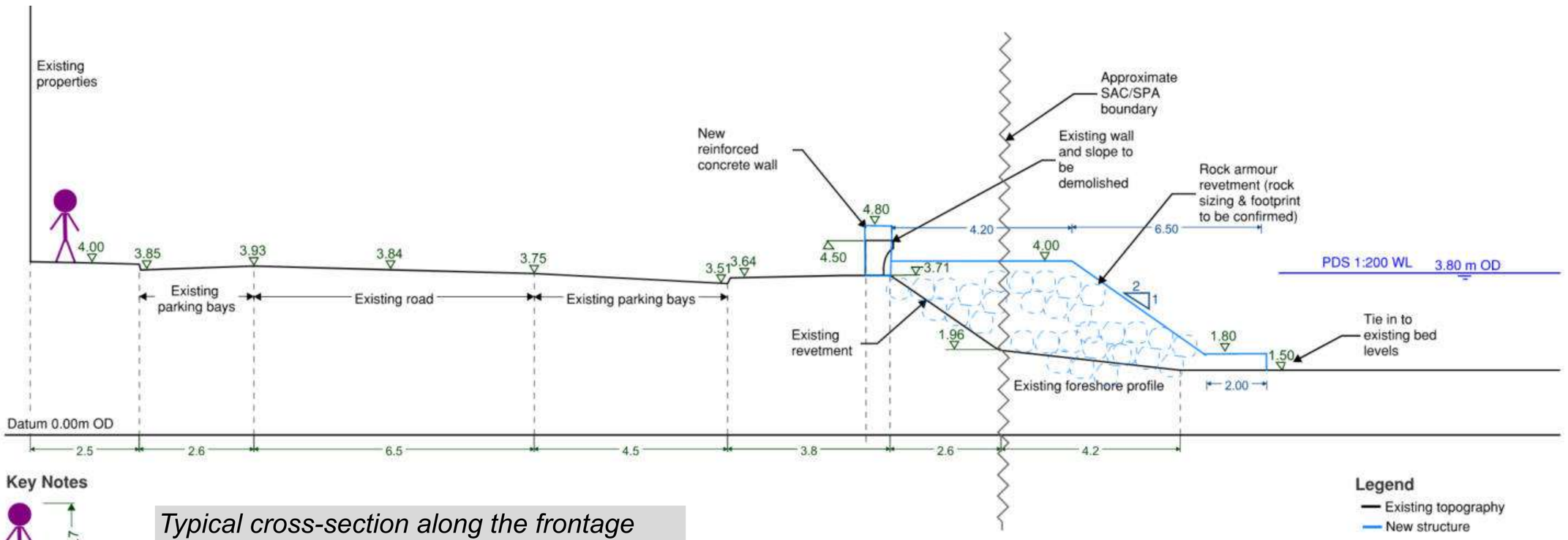
A new rock armour revetment may be developed either along the existing alignment (Hold the Line Policy Option 5i) or along a set back alignment (Managed Retreat Policy Option 5ii.a and Option 5ii.b).

Rock armour revetments are sloped coastal defences whose performance relies on a wide rock face that dissipates wave energy before it reaches the promenade. While the rock armour significantly reduces overtopping, a wave wall above the revetment is required to manage any remaining overtopping.

Option 5i—HOLD THE LINE

The Hold the Line policy involves raising the height of the existing wave wall to provide the required Standard of Protection (SoP), with the revetment occupying part of the existing beach area.

This option maintains the existing layout on the landward side of the defence. As the revetment is located within the designated SAC/SPA areas, any works would be subject to detailed environmental screening as part of the statutory approval process.



Typical cross-section along the frontage

Advantages

- Minimal disruption on the landward side of the defence and existing amenities would be retained.
- Defence crest height required to achieve the present-day SoP is expected to integrate well with the existing seafront and remain visually acceptable.
- Presence of rock may be beneficial for foreshore levels.

Limitations

- Revetment would **encroach into environmentally** designated areas and reduce the width of the beach.
- Adapting the defence in the future to account for climate change may require additional wall raising (0.2m—1.0m) and further rock protection (1.0m—2.0m). This could result in the defence extending further seaward into designated areas and may lead to higher crest levels that have greater visual presence.

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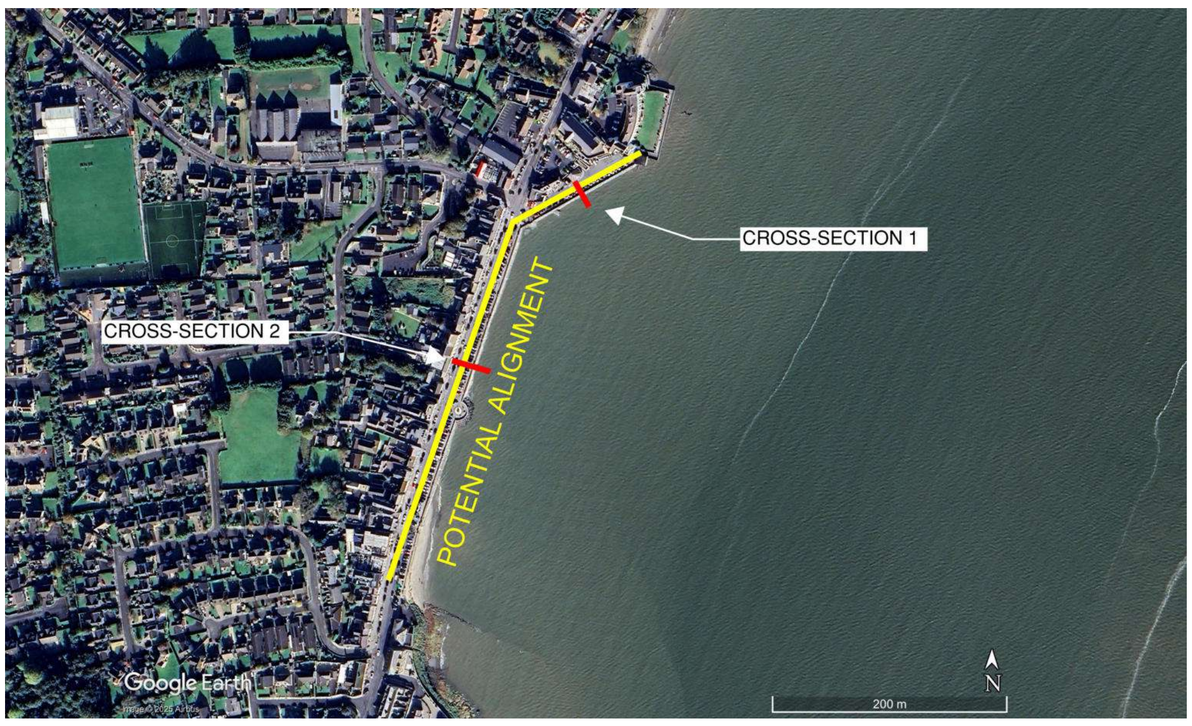
Blackrock Town Option 5ii.a

Poster 21



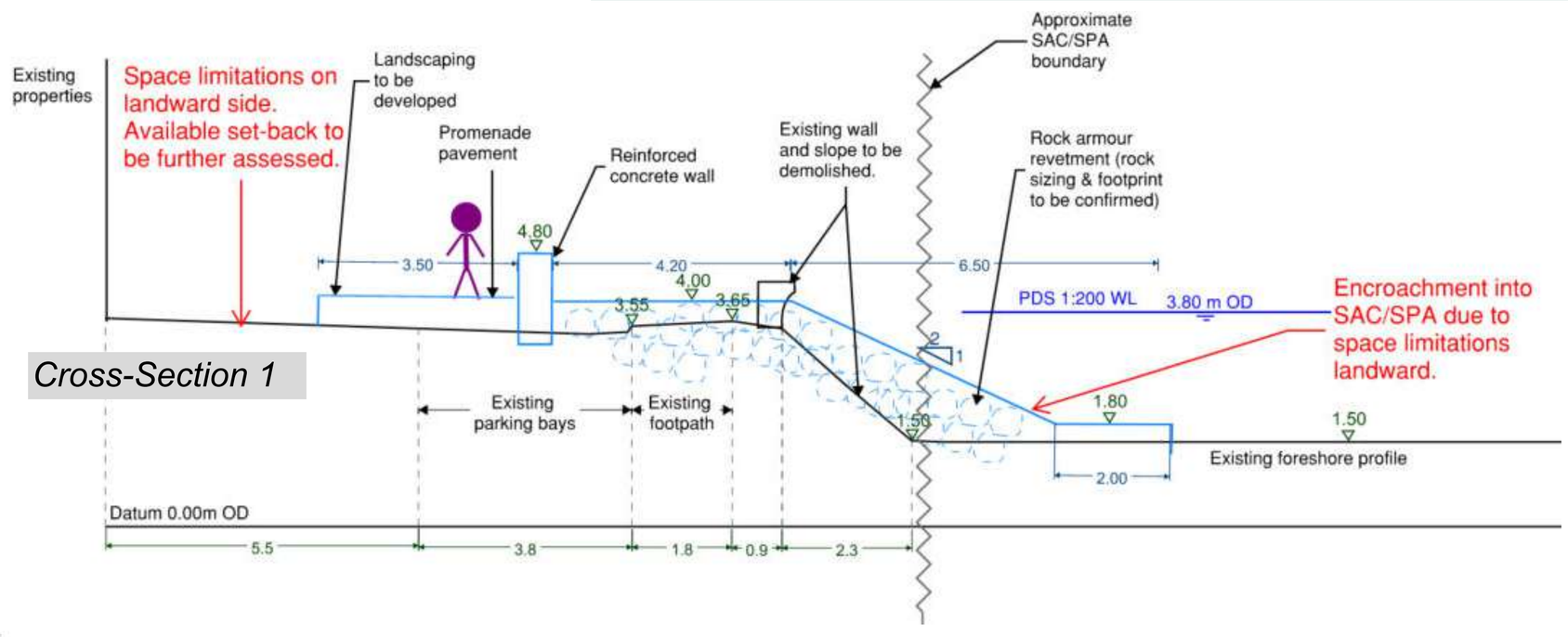
Approximate locations of cross-sections shown below.

Option 5ii.a—MANAGED RETREAT

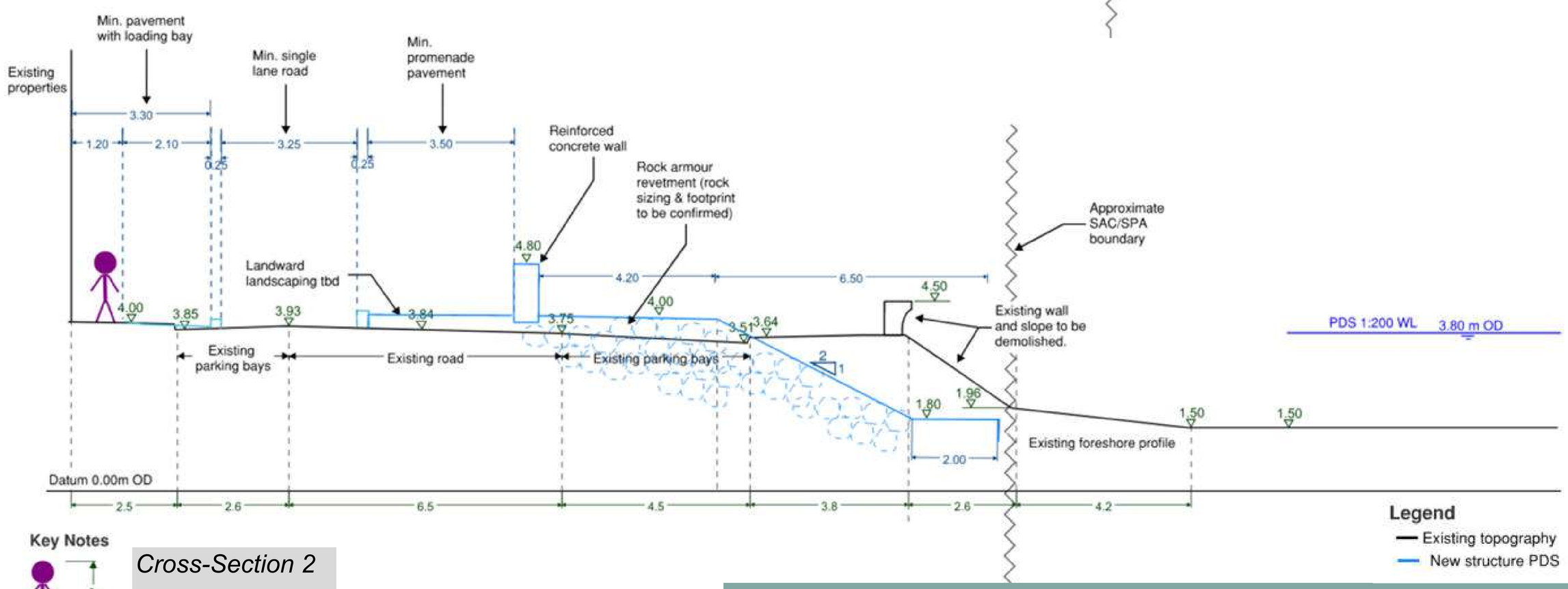
Under the Managed Retreat policy, a new defence would be constructed at a set-back, requiring reconfiguration of the existing promenade layout.

In some sections, the revetment could remain largely within the footprint of the existing built frontage, potentially reducing environmental impacts compared with alternative options. However, space along the northern end of the promenade is limited (see Cross-Section 1), and the revetment would need to extend further seaward. This option would require single-lane traffic and reduce the promenade width.

Option 5ii.a is a Managed Retreat alignment that seeks, where possible, to avoid placing new works within environmentally designated areas.



Cross-Section 1



Cross-Section 2

Advantages

- Impacts on environmentally designated areas may be reduced in sections of the promenade where the revetment would be constructed within the footprint of the existing built frontage.
- Presence of rock may help stabilise foreshore levels and reduce local erosion.

Limitations

- Significant loss of amenities on the landward side, with a restriction of the road to **single lane traffic and no parking spaces**.
- **Encroachment into environmentally designated** areas (4.0m-5.0m) towards the northern end of the stretch (approx. 200m).
- Adaptation options would require further encroachment into designated areas (1.0m—2.0m) along the entire frontage and walls with greater visual presence (0.2m—1.0m) which could be challenging in a constrained seafront setting.

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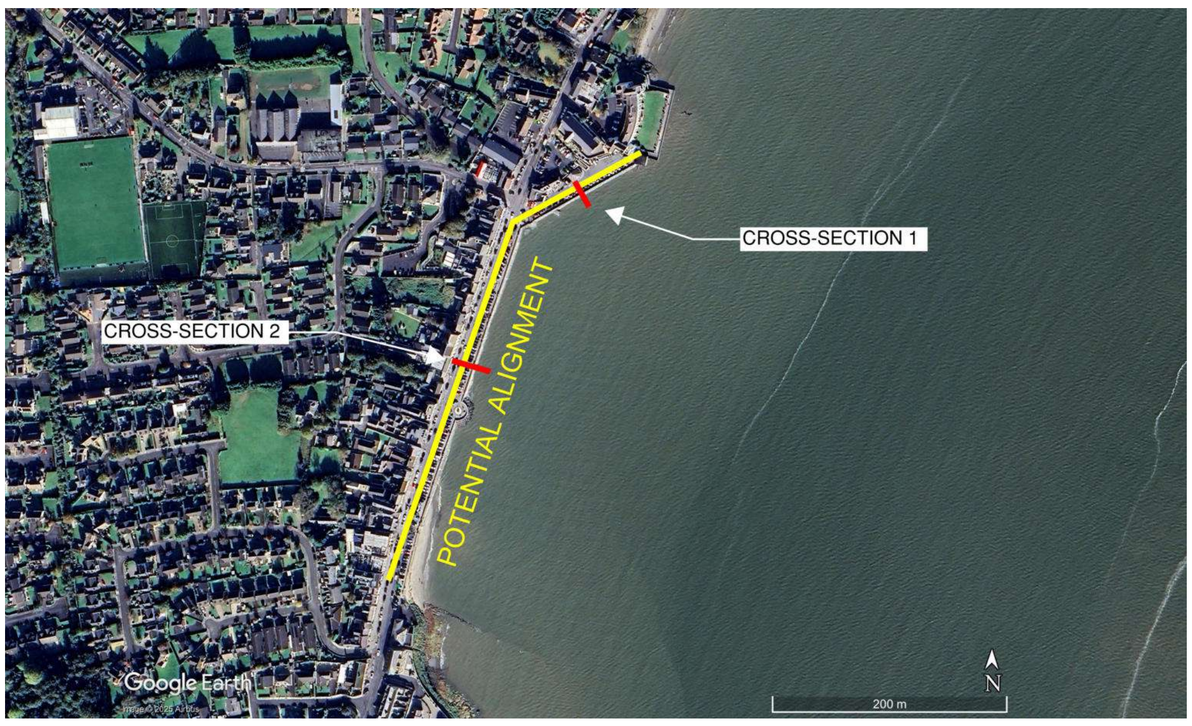
Blackrock Town Option 5ii.b

Poster 22



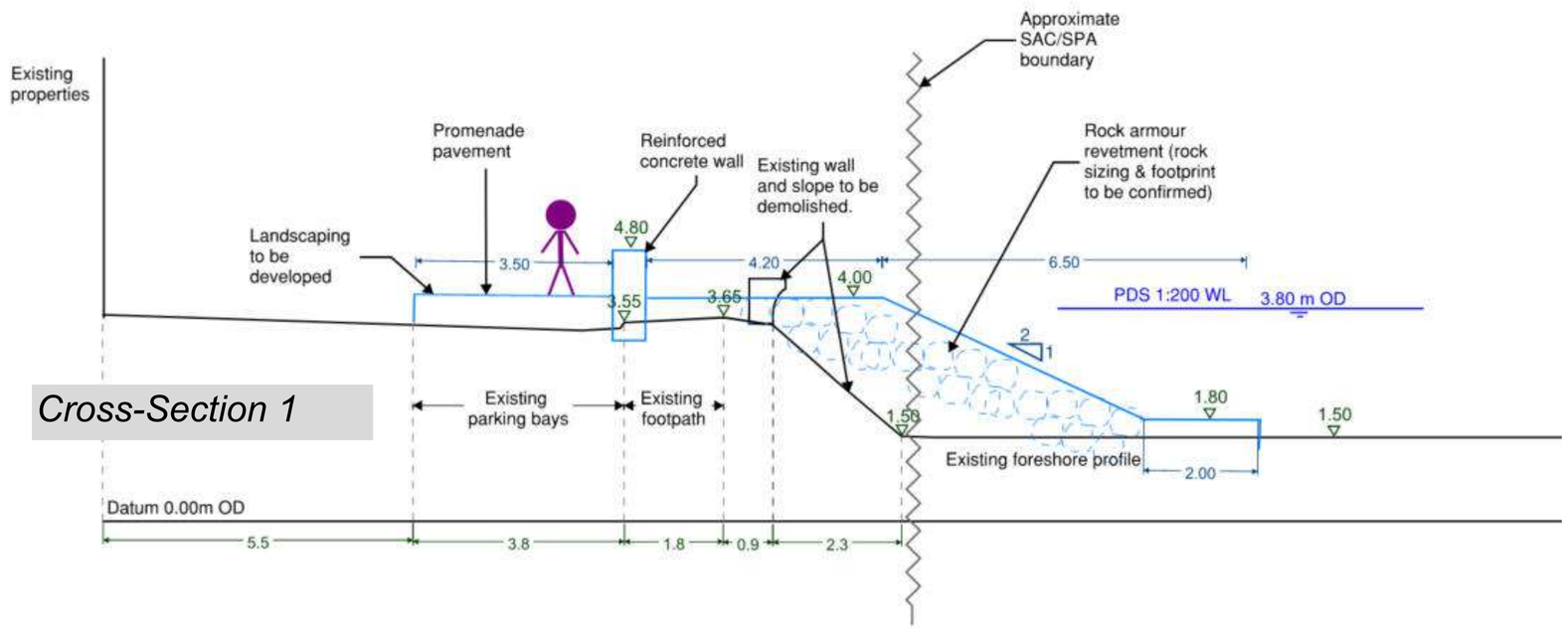
Approximate locations of cross-sections shown below.

Option 5ii.b—MANAGED RETREAT

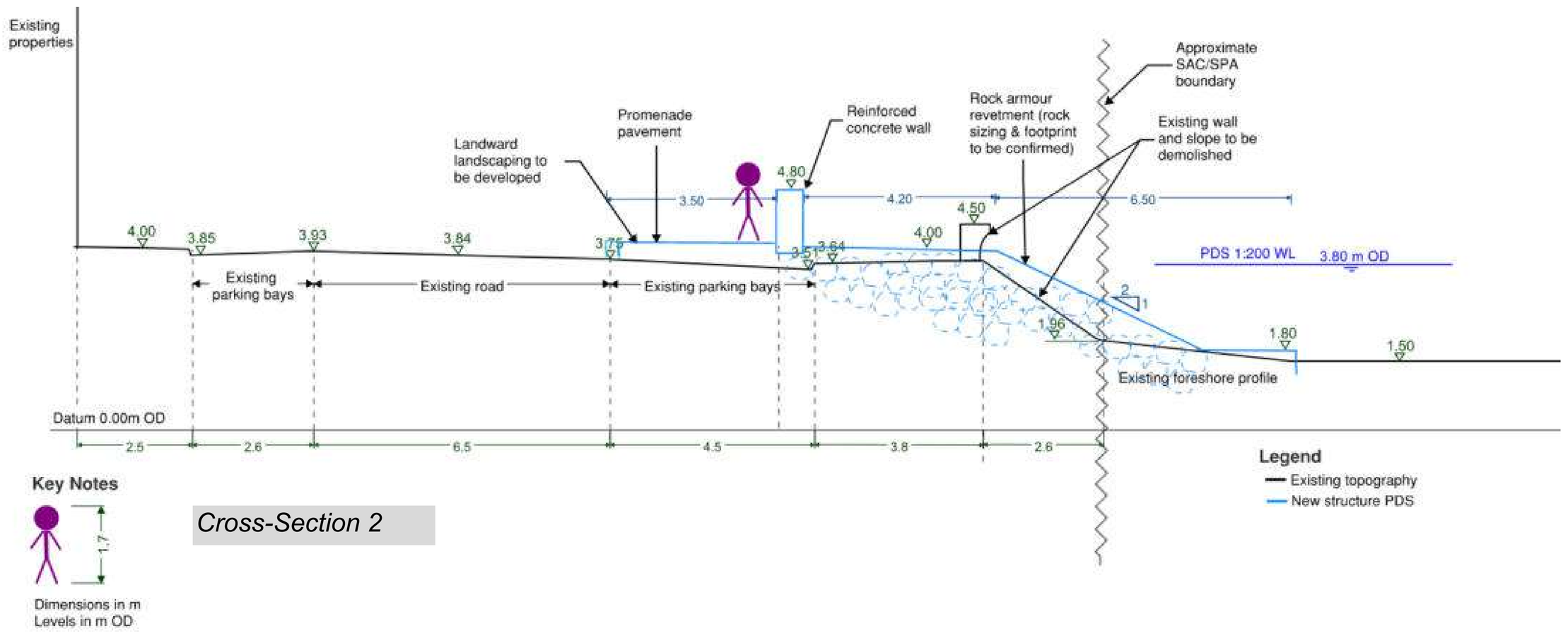
An alternative Managed Retreat alignment would relocate the promenade into the footprint of the existing car parking spaces along the frontage.

This would reduce the extent of revetment required within the environmentally designated area compared to Option 5ii.a while maintaining two-way road traffic (see Cross-Section 2). Towards the northern end, the difference between Options 5ii.a and 5ii.b becomes less pronounced due to local space constraints (see Cross-Section 1).

Compared to Option 5i (see Poster 20) this alternative Managed Retreat alignment would reduce the width of the revetment within the designated area by approximately 3.5m—4.5m along the 400m of the stretch which may help facilitate statutory consent. However, this option is likely to significantly impact local amenities.



Cross-Section 1



Cross-Section 2

Advantages

- Impacts on environmentally designated areas may be reduced in sections of the promenade where the revetment would be constructed within the footprint of the existing built frontage.
- Presence of rock may help stabilise foreshore levels and reduce local erosion.

Limitations

- Significant loss of amenities on the landward side **removing all parking spaces** along the frontage.
- **Encroachment into environmentally designated** areas along the entire length of the promenade.
- Adaptation options would require further encroachment into designated areas (1.0m —2.0m) along the entire frontage and walls with greater visual presence (0.2m—1.0m) which could be challenging in a constrained seafront setting.

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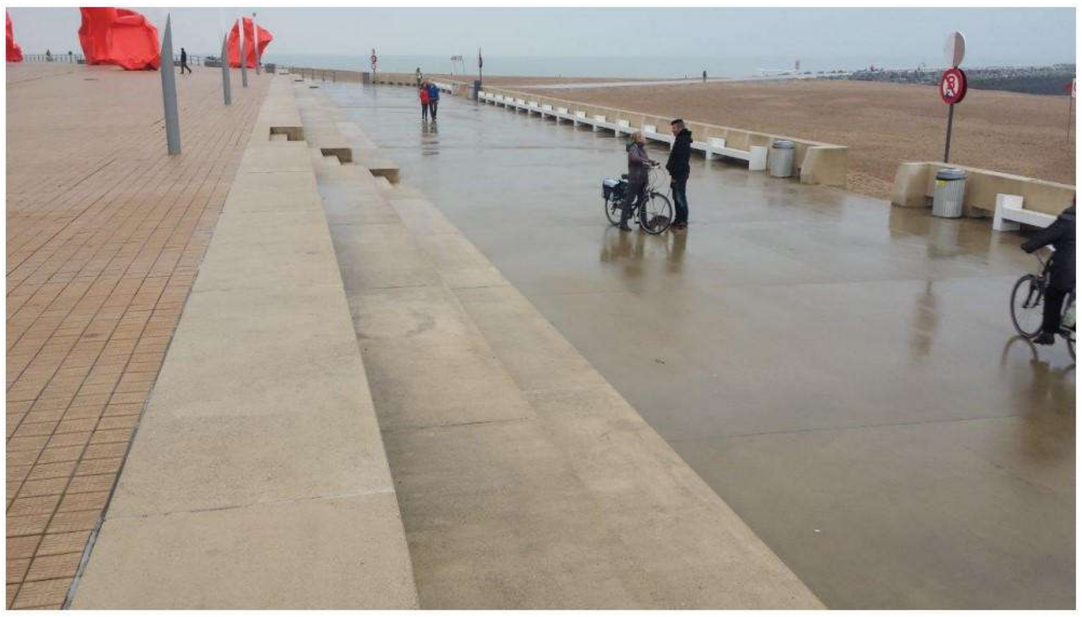
DUNDALK FLOOD RELIEF SCHEME

Blackrock Town Option 8

Poster 23



Stilling wave basin at Oostende, Belgium – designed to reduce wave energy and protect the urban waterfront during coastal storms.

OPTION 8—STILLING WAVE BASIN COMPRISING TWO WALLS AND A WATER RETAINING TANK

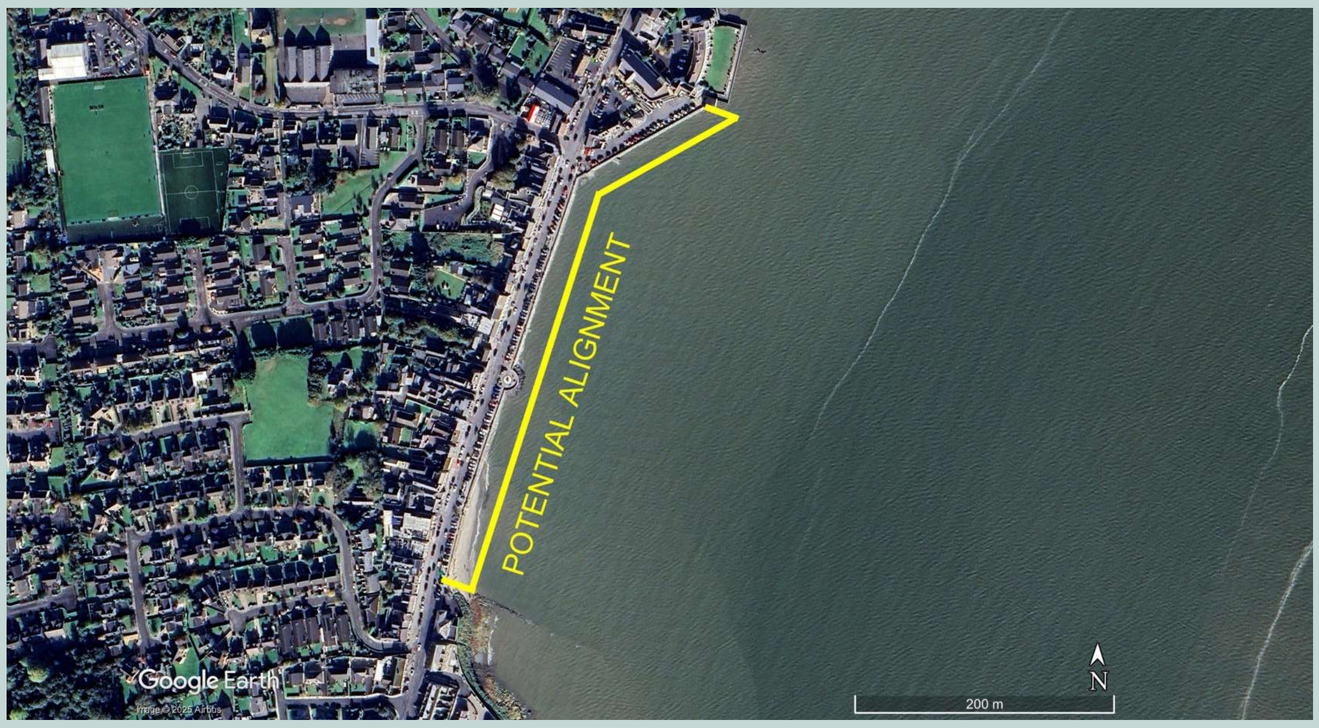
A stilling wave basin is a hybrid coastal defence solution that involves the development of a set-back area that helps absorb wave energy before it reaches the main defences.

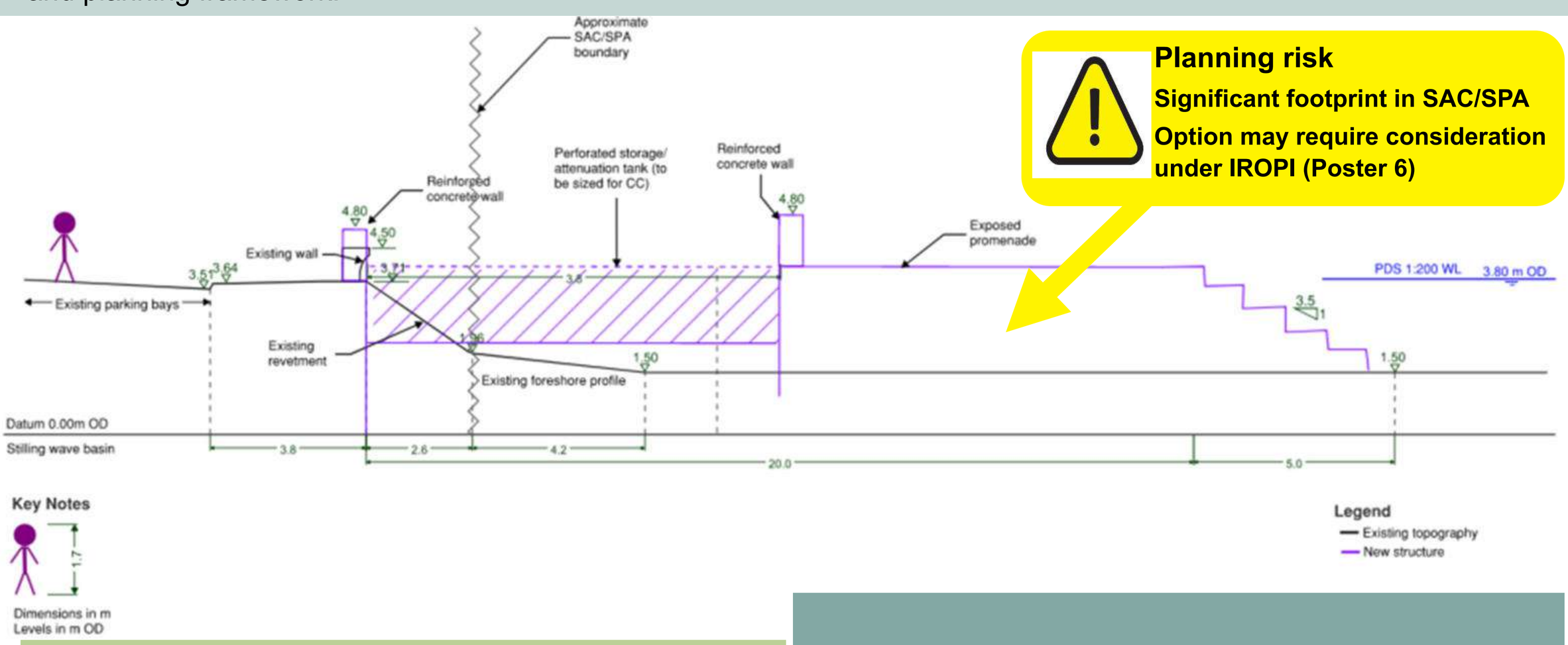
By allowing waves to break and spread out, it reduces pressure on coastal structures and helps minimise overtopping.

ADVANCE THE LINE

Under this policy, a new defence would extend seaward onto the existing foreshore.

The existing landward layout would be maintained and a new promenade would be constructed in front of the existing promenade wall. However, it would require the largest footprint within environmentally designated areas among the identified Emerging Options. Given the availability of less impactful alternatives, this option is unlikely to receive statutory approval under the current environmental and planning framework.





Planning risk

Significant footprint in SAC/SPA

Option may require consideration under IROPI (Poster 6)

Advantages

- Minimal disruption to existing amenities landward of the defence. Some scope for landscaping and public realm opportunities.
- Technically robust solution with climate change adaptation measures considered under the current Scheme.

Limitations

- Largest footprint within environmentally designated areas compared with alternative Emerging Options alignments, making **statutory approval unlikely** under the current legal framework.
- This option is likely to have the highest capital cost and the longest delivery programme which could make it unviable.

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DUNDALK FLOOD RELIEF SCHEME

Blackrock North— Emerging Options

Poster 24

BLACKROCK NORTH OVERVIEW

The Blackrock North frontage extends approximately 1.7 km north of Blackrock town and consists largely of salt marsh, with sections of sandy beach and rocky outcrops.

Present-day flood risk to properties is limited to a small number of properties, with some potential flooding of the coastal road. As a result, flood protection measures in this area are expected to be localised.

MEASURES APPLICABLE TO BLACKROCK NORTH

The following measures were not considered applicable for this stretch of the scheme:

Measures	Applicability to Blackrock North
Voluntary Home Relocation (M)	Properties at low risk of deep flooding - unlikely to be written off so relocation not required.
Land Use Management (L) / Sustainable planning and development management (K)	Insufficient land between properties and designated sites to implement.
Flood Water Storage (E)	Insufficient land between properties and designated sites to implement.
Beach Management (H) / Groynes (F)	Area seaward of defences is marshland, no significant area of beach.
Embankment (B), revetments (C), breakwater (D)	Short length required, meaning larger structures are not justifiable.
Saltmarsh Restoration (G)	Short lengths of protection required meaning large-scale restoration not required to address flooding.

BLACKROCK NORTH LONGLIST

The following options were developed from the applicable coastal measures and assessed against the project objectives.

Item	Proposed Options	Decision
1	Flood wall at 4No properties (directly on the beach). **(Measures A & J & N)** Flood gates along R172 where beach access is provided.	**Shortlisted**
2	Property level protection combined with flood warning system. Flood gates along R172 where beach access is provided. **(Measures J & N)**	**Discounted—**does provide sufficient protection for the scheme.

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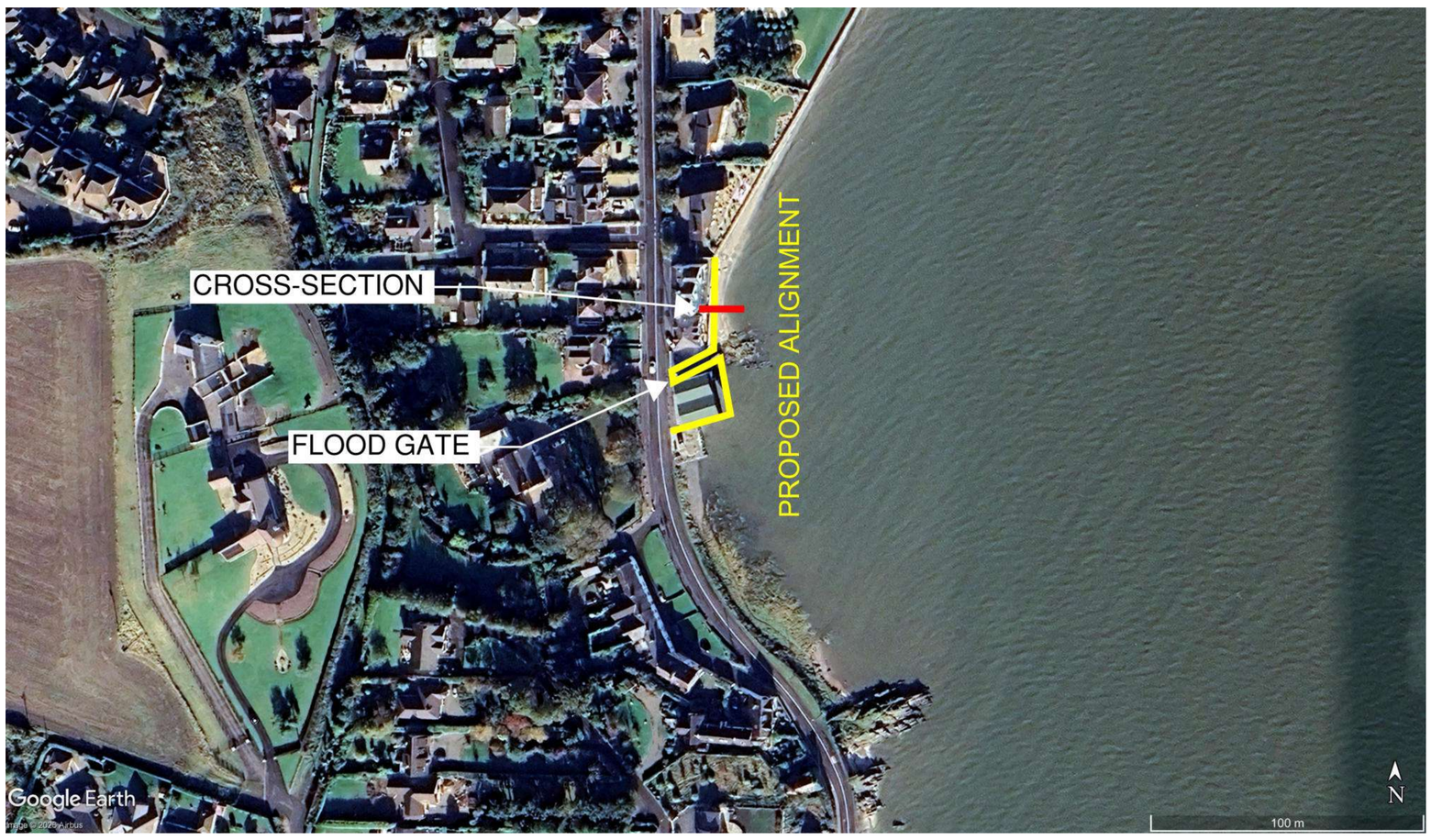
DUNDALK FLOOD RELIEF SCHEME

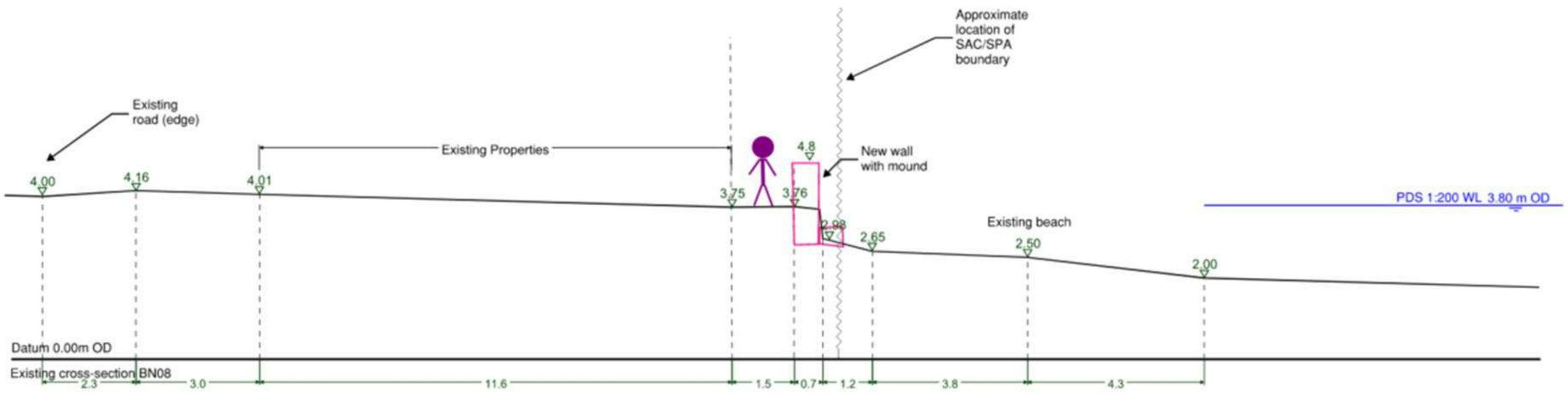
Blackrock North— Emerging Options

Poster 25

OPTION 1—NEW FLOOD WALL IN FRONT OF AFFECTED PROPERTIES

A small number of properties (three residential and one commercial) are at risk of flooding within Blackrock North area in present-day conditions. This option involves constructing a short flood wall in front of these properties.





Advantages

- Affected properties already have property boundary walls on the seaward side. Wall height required to achieve the target Standard of Protection at present-day is likely to be visually acceptable.

Limitations

- Wall stabilisation and erosion protection works would be required locally with footprint within the environmentally designated areas.
- Wall raising and additional layers of rock within the environmentally designated areas would be required for future scenarios.

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DUNDALK FLOOD RELIEF SCHEME

Blackrock South— Emerging Options

Poster 26

BLACKROCK SOUTH OVERVIEW

The Blackrock South area lies south of the Blackrock town frontage stretching approximately 1.2km along the coast to the mouth of River Fane. The coastline in this area comprises of long stretches of rocky outcrops interspersed with areas of marsh.

MEASURES APPLICABLE TO BLACKROCK SOUTH

From initial screening, the following measures were not applicable to the Headlands/ Blackrock South Area:

Measures	Applicability to Blackrock South
Land Use Management (L) / Sustainable planning and development management (K)	Insufficient land between properties and designated sites to implement.
Embankment (B), breakwater (D)	Short length required, meaning larger structures are not justifiable.
Flood Water Storage (E)	Insufficient land between properties and designated sites to implement.
Beach Management (H) / Groynes (F)	Area seaward of defences is marshland, no significant area of beach.
Saltmarsh Restoration (G)	Short lengths of protection required meaning large-scale restoration not

BLACKROCK SOUTH LONGLIST

The following options were developed from the applicable coastal measures and assessed against the project objectives.

Item	Proposed option	Decision
1	New localised flood walls at affected properties (landward side of R172 and on the coast) **(Measure A)**	**Shortlisted**
2	New revetment with a berm **(i)** or flood wall **(ii)** along seaward end of R172 and at affected properties on the coast **(Measure A & C)**	**Shortlisted**
3	New flood wall and revetment along seaward end of R172 and at affected properties on the coast, with wall alignment along exposed top of natural slope **(Measure A & C)**	**Shortlisted**
4	Property Level Protection (PLP) for shallow flooding and flood walls for deep flooding (**Measure A & J)**	**Discounted**—Encroachment into SAC, not adaptable to climate change and PLP measures do not meet objectives.
5	Flood wall on seaward side of R172 and Property Level Protection (PLP) at the coast **(Measure A & J)**	**Discounted**—Encroachment into SAC, not adaptable to climate change and PLP measures do not meet objectives.

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DUNDALK FLOOD RELIEF SCHEME

Blackrock South Overview and Area 1

Poster 27

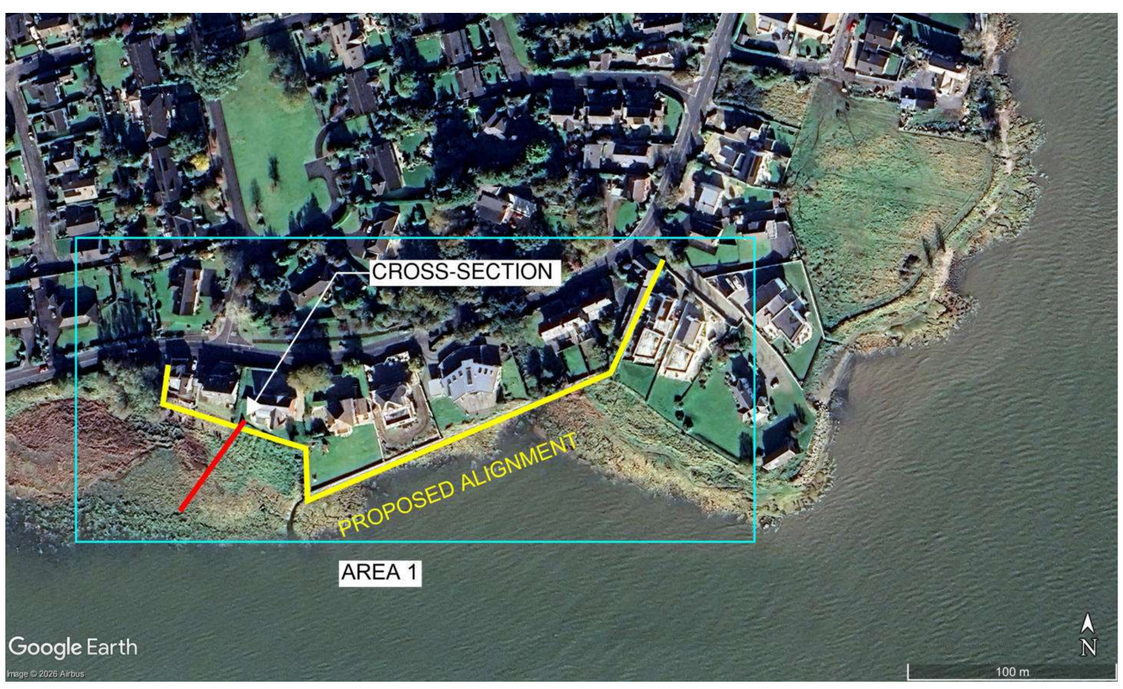
ALIGNMENTS

The potential alignments at Blackrock South vary across the different policies, depending on the area of the defence. Within Area 1 and 3, there is only one balanced alignment for a wall/ revetment due to the position of the coastal properties, therefore all options at these locations are the same.

Within Area 2, the alignment varies across the three different options, between two different Hold the Line alignments and a Managed Retreat alignment (see Posters 28, 29).

AREA 1: OPTION 1

In all cases, this involves construction of a new rock revetment, backed by a new wave wall along the exposed coast. At the eastern and western ends of the proposed alignment (in yellow below) standard flood wall protection is considered.

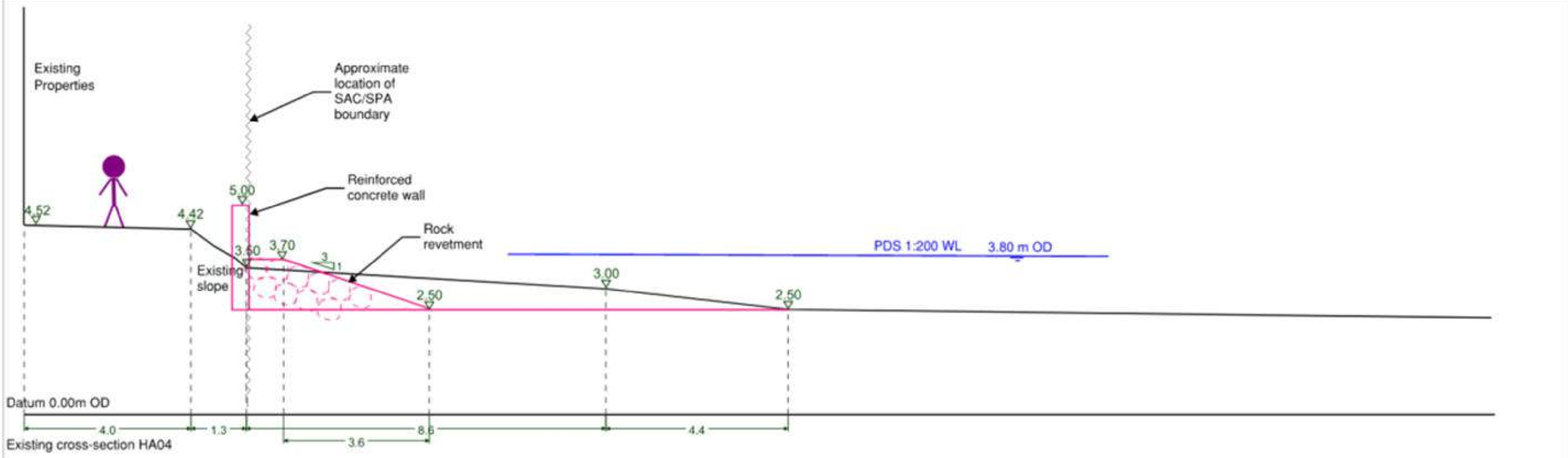


Advantages

- Wall height required to achieve the target Standard of Protection at present-day is likely to be visually acceptable.
- Presence of rock may help increase foreshore levels.
- Affected residential properties already have property boundary walls on the seaward side.

Limitations

- Wall stabilisation and erosion protection works would be required locally with footprint within the environmentally designated areas.
- Wall raising and additional layers of rock would be required within environmentally designated areas for future scenarios.



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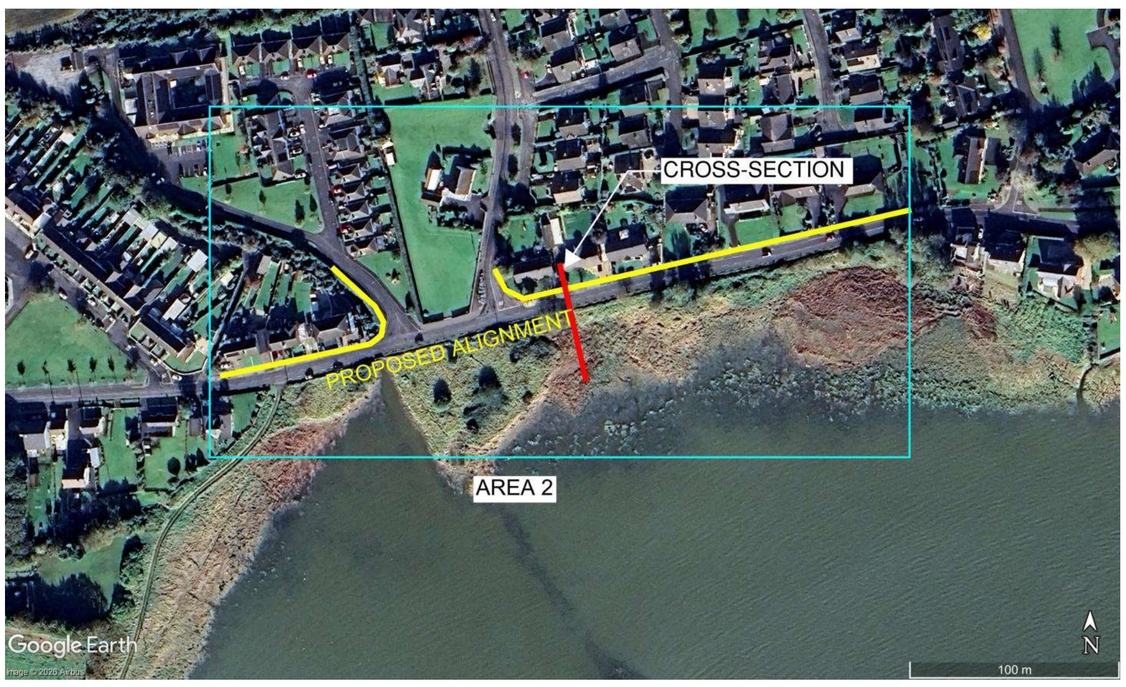
Blackrock South Area 2

Poster 28

AREA 2: OPTION 1

This option involves new flood walls along the property boundaries landside of the R172 road.

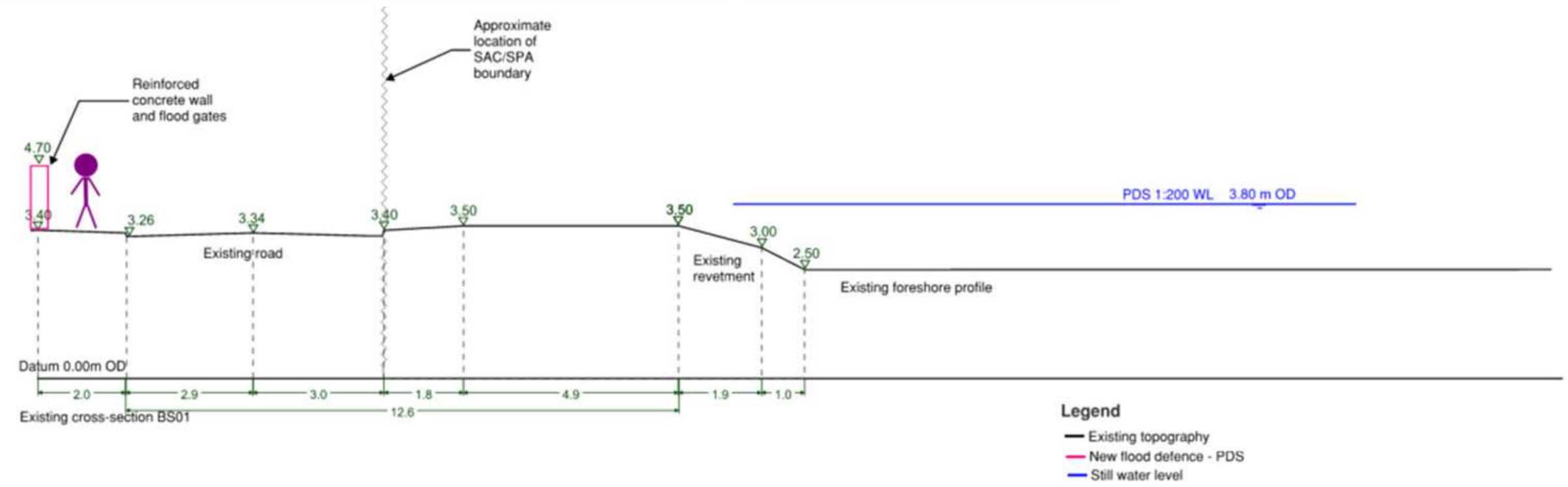


Advantages

- Reduced encroachment into the SAC/SPA compared to alternatives.
- Likely acceptable crest height at present-day conditions.

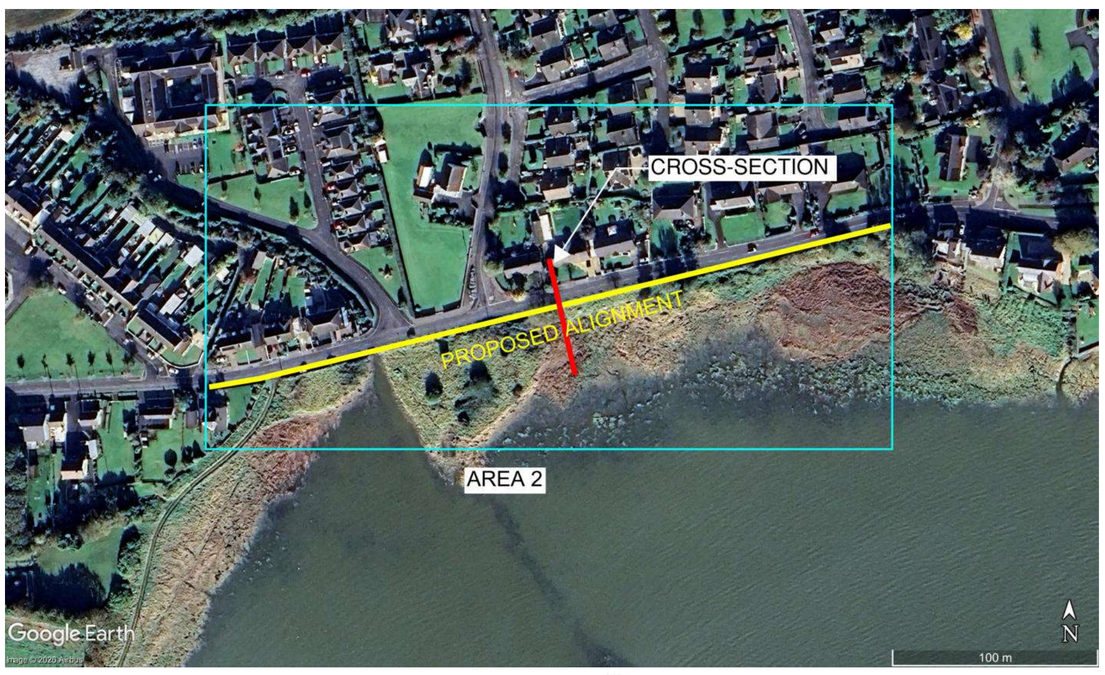
Limitations

- Flooding risks to R172 remain.
- Wall raising and rock revetment would be required for future scenarios.



AREA 2: OPTION 2i

This includes construction of new berm and revetment

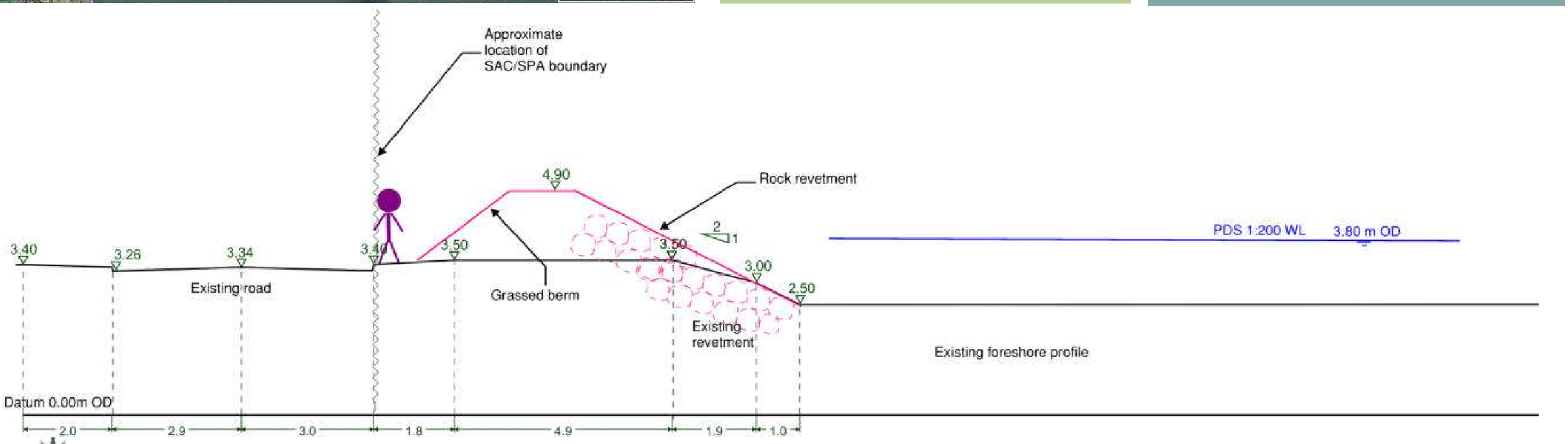


Advantages

- Grassed embankment option may integrate well with the existing landscape. Acceptable crest height at present-day conditions.
- Presence of rock may help control marsh erosion.
- Reduces the risk of flooding to the R172.

Limitations

- Footprint of defence at the SAC/ SPA boundary.
- Defence raising and additional layers of rock would be required for future scenarios meaning further encroachment into SAC/ SPA and greater visual presence.



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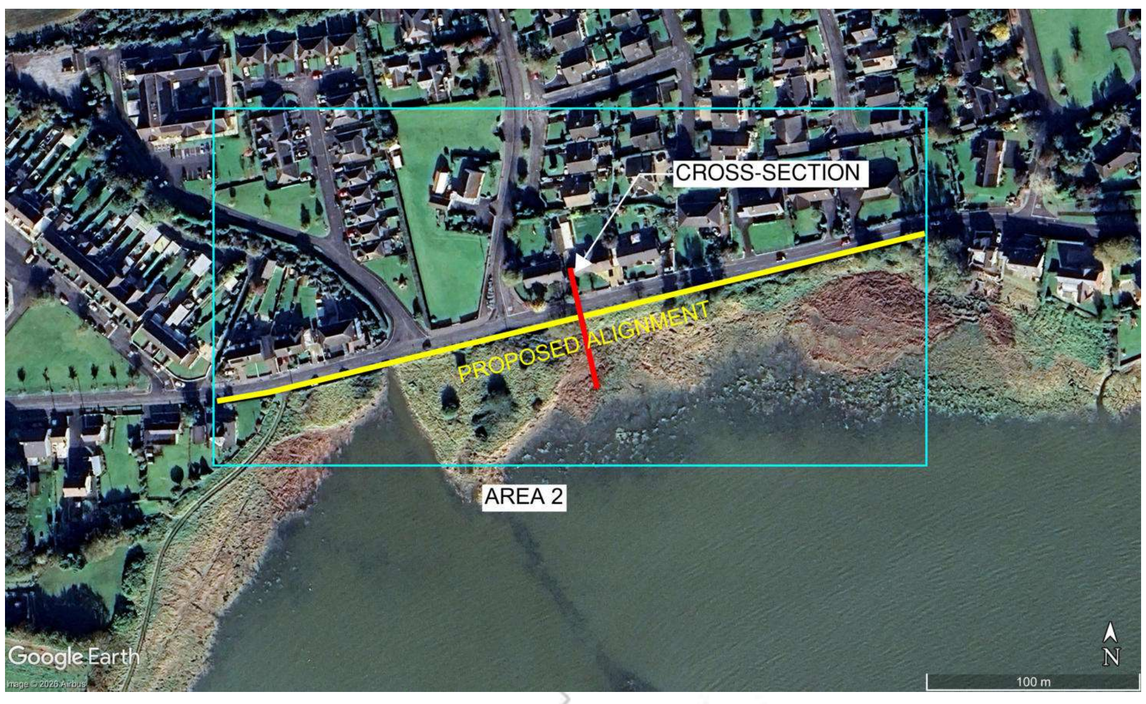
DUNDALK FLOOD RELIEF SCHEME

Blackrock South Area 2

Poster 29

AREA 2: OPTION 2ii

This includes construction of new walls and revetment along the seaward side of the R172.

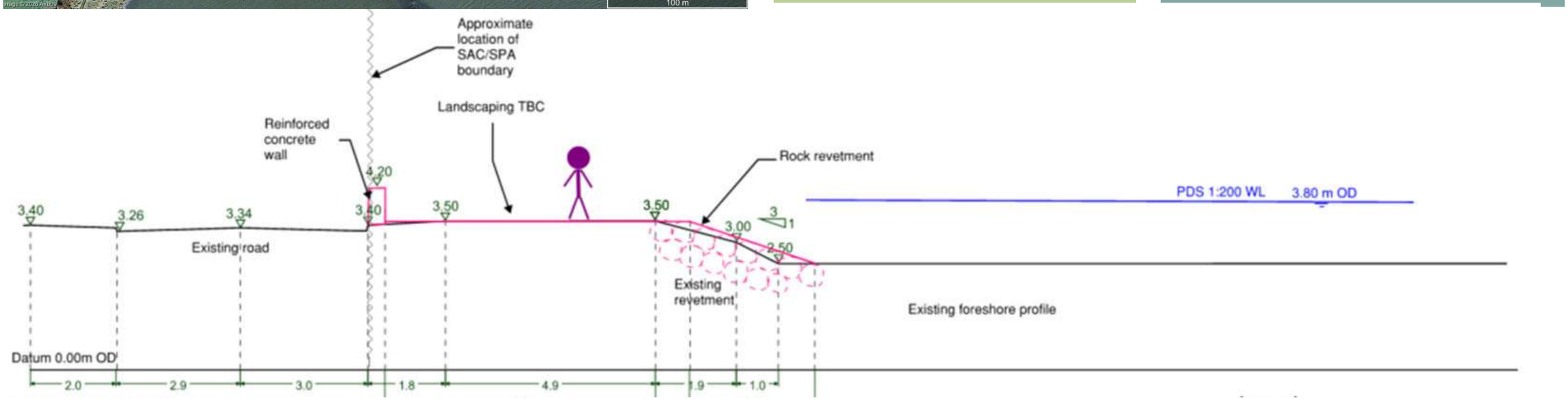


Advantages

- Acceptable crest height at PDS. Minimal footprint requirements.
- Presence of rock may help control marsh erosion.
- Reduces the risk of flooding to the R172.

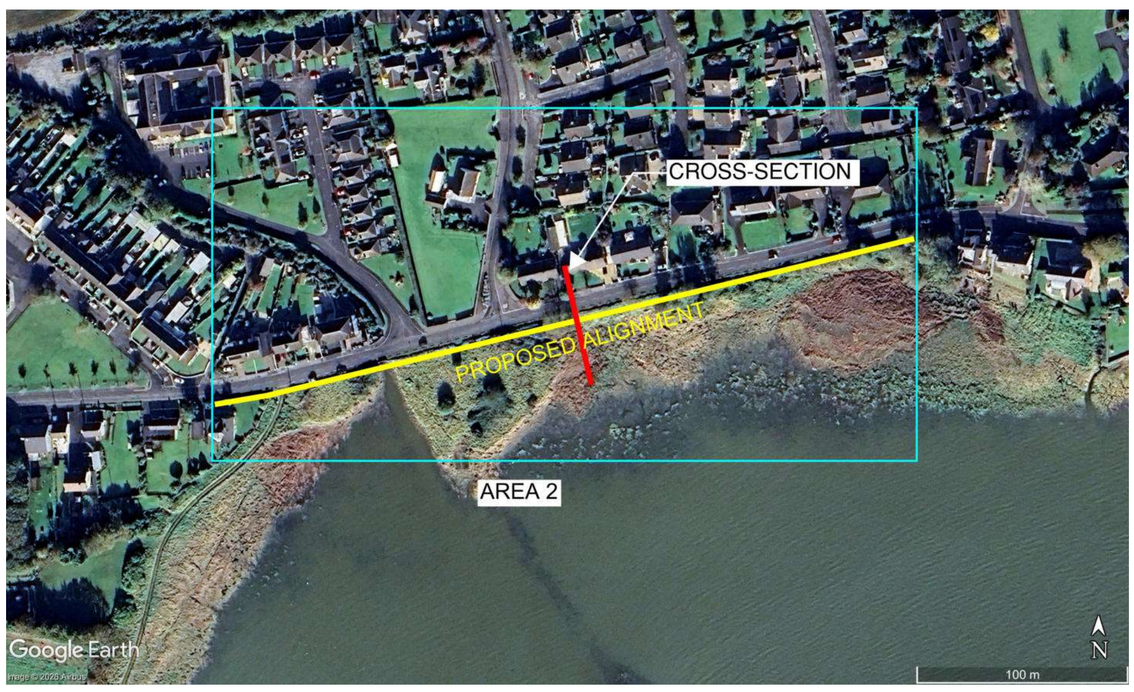
Limitations

- Footprint of defence at the SAC/ SPA boundary.
- Defence raising and additional layers of rock would be required for future scenarios meaning further encroachment into SAC/SPA and greater visual presence.



AREA 2: OPTION 3

This option involves the construction of walls and revetment on top of the natural slope, seaward of the R172.

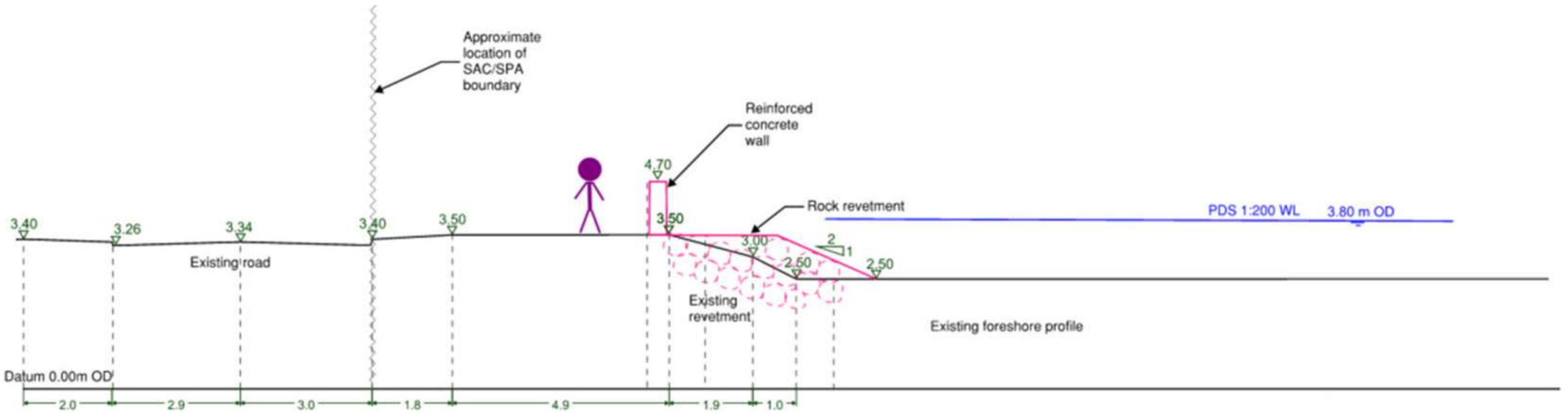


Advantages

- Minimal impact to the landside landscape.
- Presence of rock may help control marsh erosion.
- Reduces the risk of flooding to the R172.

Limitations

- Footprint of defence at the SAC/ SPA boundary.
- Defence raising and additional layers of rock would be required for future scenarios meaning further encroachment into SAC/SPA and greater visual presence.



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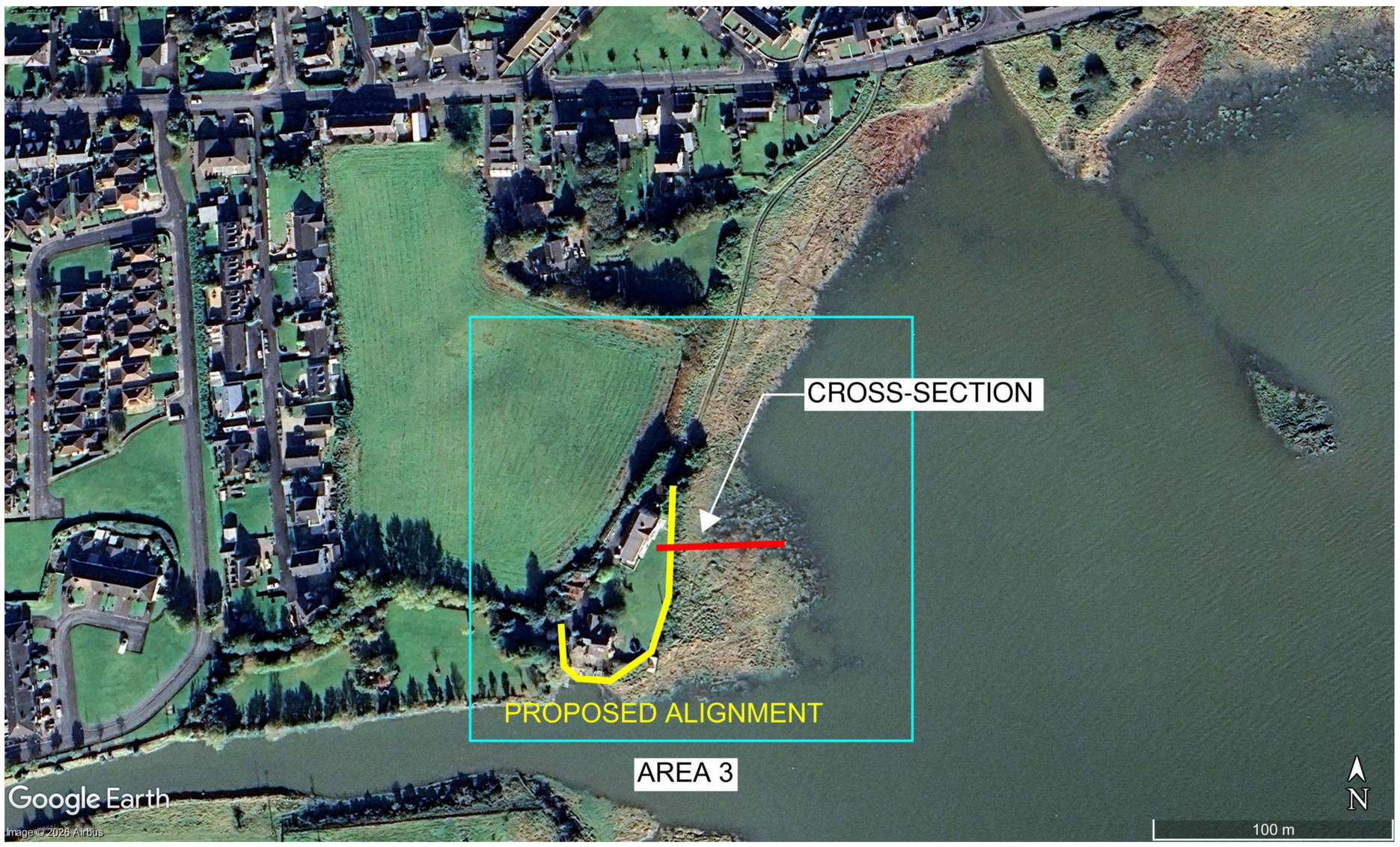
DUNDALK FLOOD RELIEF SCHEME

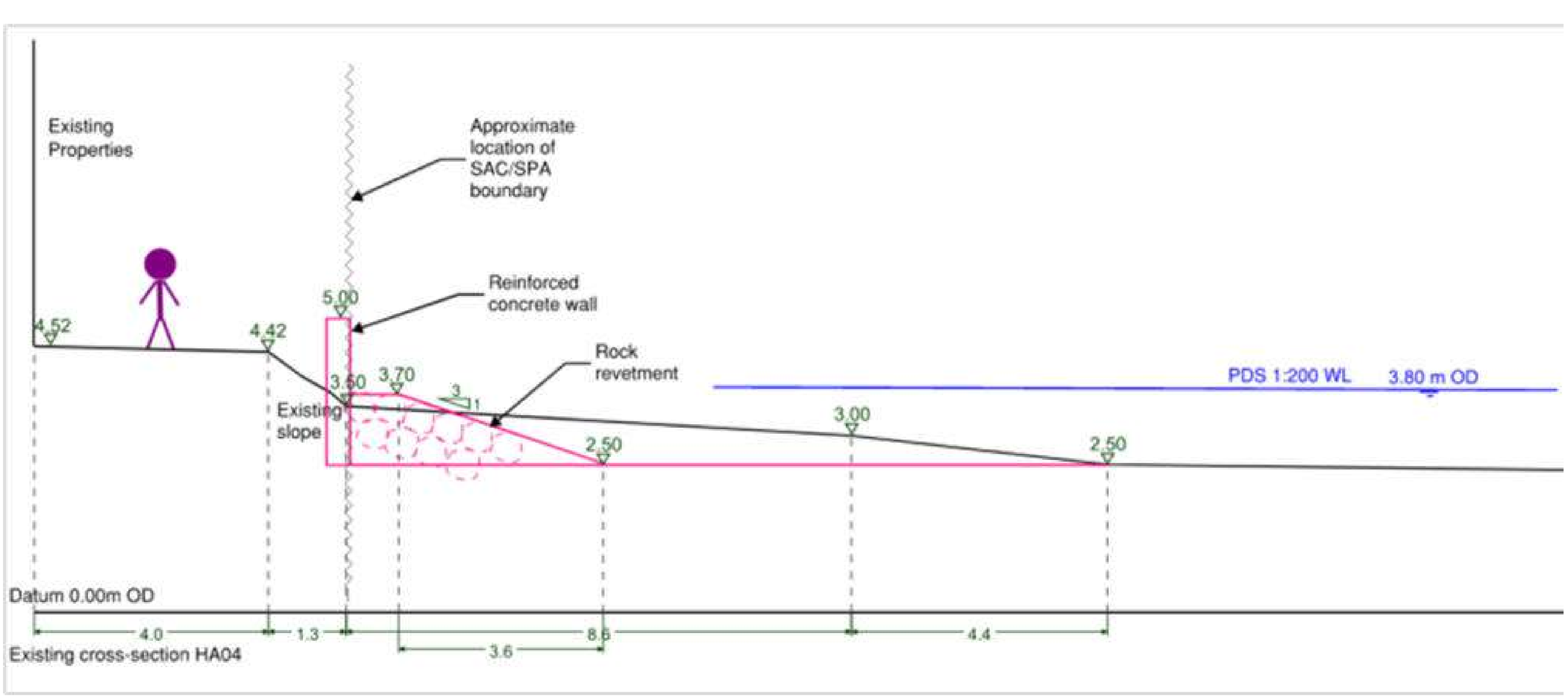
Blackrock South Area 3

Poster 30

AREA 3: OPTION 1

In all cases, this involves construction of a new sea wall around the coastal properties at the southern end of the scheme. The proposed alignment is along the alignment shown below in yellow.





Advantages

- Affected residential properties already have property boundary features on the seaward side. Wall height required to achieve the target Standard of Protection at present-day is likely to be visually acceptable.

Limitations

- Wall stabilisation and erosion protection works would be required locally with footprint within the environmentally designated areas.
- Wall raising and additional layers of rock would be required within the environmentally designated areas for future scenarios.

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