The Great Grid Upgrade

Sea Link

Sea Link

Volume 7: Other Documents

7.11.1 Design Approach Document - Suffolk

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Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5(2)(q)

nationalgrid

Revision Log

Revision	Date	Notes
A	14/03/25	STATUS FINAL
B	14/11/25	Updates to diagrams in Section 3, updates to renders in Section 6, development of Section 7

Contents

EXECUTIVE SUMMARY

Executive Summary

The design approach has been split across two documents to allow the responses to the site context, requirements and consultation feedback, to be more site specific whilst acknowledging there are many shared constraints and opportunities that apply to both locations:

- **Application Document 7.11.1 Design Approach Document - Suffolk** (this document); and
- **Application Document 7.11.2 Design Approach Document - Kent**.

Both documents follow the same structure.

The site analysis indicates that the proposed converter station will impact the location in terms of visual amenity and sensitivity to nearby existing uses. By examining the surrounding areas, particularly the local vernacular, colours, and textures, a clearer understanding emerges of how the converter station can blend with or be effectively integrated into its environment.

The section on Generic Design Parameters outlines the distinct components of the illustrative converter station massing. Understanding the various buildings helps to define the scale, size, and function of key facilities, including the two main converter halls, the spare parts building, and other structures essential for the operation and maintenance of the converter station.

The Design Evolution section shows how the designs have developed through the pre-application process including how the design approaches have responded to the design feedback from the Statutory Consultation exercises, how it was developed to be presented for the Design Review Panel (DRP) and how the comments in the DRP report have been addressed.

The Design Approaches and Case Studies section includes the four design approach themes identified following the Statutory Consultation and Design Review Panel;

- Conventional Industrial / Agricultural (Baseline);
- Enhanced Cladding;
- Enhanced Roof Form; and
- Fragmented Form.

The case studies, categorised into other converter stations, relevant local development and design inspiration, have been developed to test these design approaches and apply them within the site context.

The Design Responses to Design Principles section shows illustrations of how the different design approaches can work with the Site-Specific Design Principles (SSDPs) in Table 3.1 of **Application Document 7.12.1 Design Principles - Suffolk**. This exercise has also been used as a means of testing how the design principles are structured and have informed how they are worded.

The River Fromus Crossing section is specific to the Suffolk site, it includes analysis of the design identifying the focus areas of the design as being materials and colour palette, the bridge span design, the abutment wall design and the design approach to the parapets. The section includes case studies which have informed the design approach some of which have been suggested by the DRP and some by LPA technical officers. This section also includes illustrative views to show how the worst case height option looks in the landscape setting. This section addresses the mitigation commitment that can be found in **Application Document 7.5.3.2 CEMP Appendix B Register of Environmental Actions and Commitments** (REAC).

Friston substation is addressed within Appendix A - Architectural Design Assessment East Anglia TWO Limited and East Anglia ONE North Limited Friston, East Suffolk, which also covers the National Grid substation which is colocated there. This document informs and responds to the Key Design Principles in Table 4.1 of **Application Document 7.12.1 Design Principles - Suffolk.**

INTRODUCTION

1.0

1.0 Introduction

1.1 Introduction

The Sea Link Project (hereafter referred to as the 'Proposed Project') is a proposal by National Grid Electricity Transmission plc (hereafter referred to as National Grid) to reinforce the transmission network in the South East and East Anglia. The Proposed Project is required to accommodate additional power flows generated from renewable and low carbon generation, as well as accommodating additional new interconnection with mainland Europe.

National Grid owns, builds and maintains the electricity transmission network in England and Wales. Under the Electricity Act 1989, National Grid holds a transmission licence under which it is required to develop and maintain an efficient, coordinated, and economic electricity transmission system.

This would be achieved by reinforcing the network with a High Voltage Direct Current (HVDC) Link between the proposed Friston substation in the Sizewell area of Suffolk and the existing Richborough to Canterbury 400kV overhead line close to Richborough in Kent.

National Grid is also required, under Section 38 of the Electricity Act 1989, to comply with the provisions of Schedule 9 of the Act. Schedule 9 requires licence holders, in the formulation of proposals to transmit electricity, to:

Schedule 9(1)(a) '…have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest;' and

Schedule 9(1)(b) '…do what [it] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects'.

The purpose of this document is to:

- Present the site-specific design approaches and illustrative potential solutions for above ground elements of the Suffolk Onshore Scheme, including how site-specific design principles have been derived following analysis of the site constraints and opportunities.

It covers the Saxmundham converter Station, river Fromus crossing, and the Friston substation within Appendix A - Architectural Design Assessment East Anglia TWO Limited and East Anglia ONE North Limited Friston, East Suffolk, which also covers the National Grid substation which is colocated there.

- Demonstrate how the design approaches for the above have evolved in response to ongoing design development, feedback from the statutory consultation, further Local Planning Authority (LPA) consultation and the Design Review Panel (DRP).

Application document 7.11.2 Design Approach Document - Kent has been prepared separately to cover the site-specific design approaches and illustrative potential solutions for above ground elements of the Kent Onshore Scheme.

1.2 The Proposed Project

The Proposed Project would comprise the following elements:

The Suffolk Onshore Scheme:

- A connection from the existing transmission network via Friston Substation, including the substation itself. Friston Substation already has development consent as part of other third-party projects. If Friston Substation has already been constructed under another consent, only a connection into the substation would be constructed as part of the Proposed Project.
- A high voltage alternating current (HVAC) underground cable of approximately 1.9 km in length between the proposed Friston Substation and a proposed converter station (below).
- A 2 GW high voltage direct current (HVDC) converter station (including permanent access from the B1121 and a new bridge over the River Fromus) up to 26 m high plus external equipment (such as lightning protection, safety rails for maintenance works, ventilation equipment, aerials, similar small scale operational plant, or other roof treatment) near Saxmundham.
- A HVDC underground cable connection of approximately 10 km in length between the proposed converter station near Saxmundham, and a transition joint bay (TJB) approximately 900 m inshore from a landfall point (below) where the cable transitions from onshore to offshore technology.
- A landfall on the Suffolk coast (between Aldeburgh and Thorpeness).

The Offshore Scheme:

- Approximately 122 km of subsea HVDC cable, running between the Suffolk landfall location (between Aldeburgh and Thorpeness), and the Kent landfall location at Pegwell Bay.

The Kent Onshore Scheme:

- A landfall point on the Kent coast at Pegwell Bay.
- A TJB approximately 800 m inshore to transition from offshore HVDC cable to onshore HVDC cable, before continuing underground for approximately 1.7 km to a new converter station (below).
- A 2 GW HVDC converter station (including a new permanent access off the A256), up to 28 m high plus external equipment such as lightning protection, safety rails for maintenance works, ventilation equipment, aerials, and similar small scale operational plant near Minster. A new substation would be located immediately adjacent.
- Removal of approximately 2.2 km of existing HVAC overhead line, and installation of two sections of new HVAC overhead line, together totalling approximately 3.5 km, each connecting from the substation near Minster and the existing Richborough to Canterbury overhead line.

The Proposed Project also includes modifications to sections of existing overhead lines in Suffolk (only if Friston Substation is not built pursuant to another consent) and Kent, diversions of third-party assets, and land drainage from the construction and operational footprint. It also includes opportunities for environmental mitigation and compensation. The construction phase will involve various temporary construction activities including overhead line diversions, use of temporary towers or masts, working areas for construction equipment and machinery, site offices, parking spaces, storage, accesses, bellmouths, and haul roads, as well as watercourse crossings and the diversion of public rights of way (PROWs) and other ancillary operations.

1.3 Structure of the Design Approach Document - Suffolk (DAD)

The design approach has been split across two documents:

- **Application Document 7.11.1 Design Approach Document - Suffolk** (this document); and
- **Application Document 7.11.2 Design Approach Document - Kent**.

Both documents follow the same structure:

1. Introduction - About the project, purpose of document and document structure;
2. Site Analysis - Site location, baseline analysis, local character;
3. Generic Design Parameters - illustrative converter station massing and layout used as the basis for design approaches;
4. Design Evolution - statutory consultation, design review presentation, and DRP report responses;
5. Design Approaches and Case Studies - baseline/conventional approach, enhanced cladding approach, enhanced roof approach, fragmented form approach;
6. Design Responses to Design Principles - testing of the four design approaches;
7. (Suffolk only) River Fromus Crossing - location and illustrative drawings, critical dimensions (options), bridge case studies, focus areas of design approach, key views; and
8. Summary and Conclusions.

The design approach document has been split into two documents to allow the responses to the site context, requirements and consultation feedback, to be more site specific, whilst acknowledging there are many shared constraints and opportunities that apply to both locations.

The level of development of the design approaches is limited by the indicative nature of the site layouts which retain flexibility to allow for designs to accommodate the specific requirements of the preferred suppliers equipment and building layouts. As such the design approaches are intended as guidance to how the Key Design Principles in Table 3.1 of **Application Document 7.12.1 Design Principles - Suffolk** could be applied to the selected converter station layout.

This document only covers the Proposed Project, with considerations of colocation covered in the **Application Document 7.10 Coordination Document** and in particular Appendix A NGV Coordination Suffolk Masterplan. National Grid Ventures (NGV) who are promoting the other two projects have been consulted with in developing the design principles and design approaches. They will develop their own design approaches for those projects informed by their specific requirements and the work undertaken on the Proposed Project.

This document has been prepared and should be read in conjunction with:

- **Application Document 7.1 Planning Statement**, which provides an assessment of the compliance of the Proposed Project with planning policies relevant to good design; and
- **Application Document 7.3 Design Development Report**, which provides an overview of how the form and design of the Proposed Project has evolved iteratively and how it has been influenced by feedback received from engagement with stakeholders.

The design approach for the Friston substation masterplan has been jointly undertaken by National Grid and Scottish Power Renewables as a coordinated design approach for all three substations. Friston substation is addressed within Appendix A - Architectural Design Assessment East Anglia TWO Limited and East Anglia ONE North Limited Friston, East Suffolk, which also covers the National Grid substation which is colocated there. This document informs and responds to the Key Design Principles in Table 4.1 of **Application Document 7.12.1 Design Principles - Suffolk.**

This document is primarily focused on the design of the Suffolk converter station and it's relationship to the access road and landscape mitigation proposals around it. As the crossing of the River Fromus requires a bridge that will impact representative views in the LVIA, as well as heritage views from Hurts Hall section seven addresses the mitigation commitment that can be found in **Application Document 7.5.3.2 CEMP Appendix B Register of Environmental Actions and Commitments** (REAC).

For the purposes of this document references to the site is to mean the area local to the proposed Suffolk converter station, with the proposed Friston National Grid substation covered in Appendix A, and not the wider Suffolk Onshore Scheme.

SITE ANALYSIS

2.0

2.0 Site Analysis

2.1 Site Location

East Suffolk

The site is located to the east of Saxmundham, a settlement of approximately 4,800 people within East Suffolk. Saxmundham is located approximately 8.8 km from the east coast and is to the east of the A12.

Key

Parish Boundary	
East Suffolk Wards	

The analysis in this document has been developed to inform the architectural design constraints and opportunities. Further more detailed analysis relating to specific disciplines can be found in the relevant Environmental Statement chapters.

(Not to Scale).

2.1 Site Location

Saxmundham

The site of the converter station, is a large field belonging to Wood Farm to the east of the edge of the built up area of Saxmundham. The northern part of the field is in Saxmundham Parish, whereas the southern part of the field, where the converter station is proposed to be located, is in the Parish of Benhall and Sternfield.

The Order Limits shown cover the area of the Suffolk Onshore Scheme converter station including part of the route to the substation in Friston, leading towards the landfall location between Aldeburgh and Thorpeness. This area and part of the scheme is not covered by the analysis in this document.

Key

Surrounding East Suffolk Parishes

Order Limits

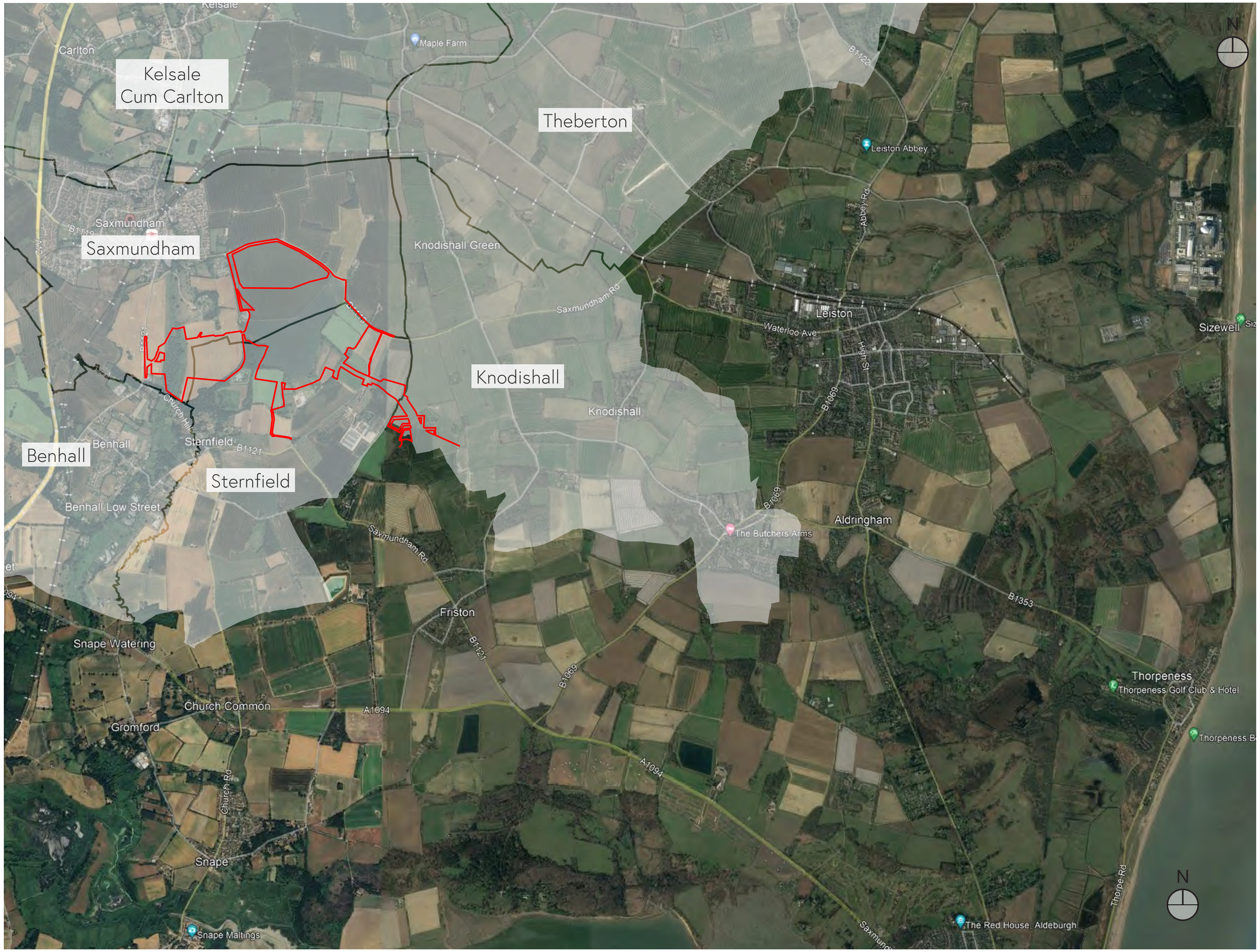


Image: Location Map, Google Earth (not to scale).

2.1 Site Location

Coverage

The site is an arable field to the east of Wood Farm house, which is located to the southeast of Saxmundham, and bounded to the north by the B1119.

The site extends towards the B1121 to the west where the permanent access road is proposed to connect across to the south of Hurts Hall, including a bridge over the Fromus river.

The aerial photograph adjacent shows this site and identifies some of the key features in the local area.

Key	
Order Limits	(red line)

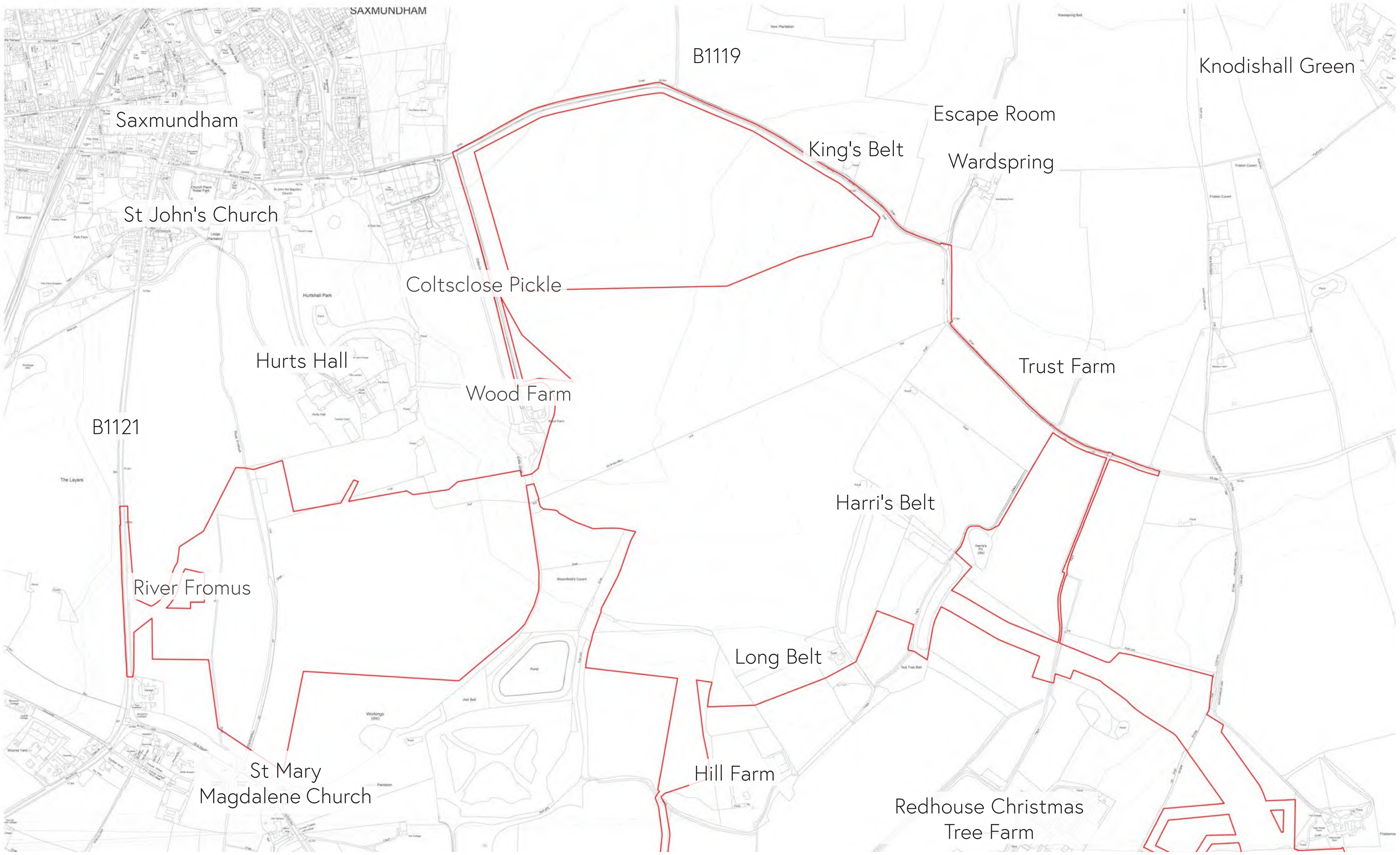
Image: Location Map, Google Earth (not to scale).

2.2 Baseline Analysis

Order Limits

The plan shown on this page is based on Ordnance Survey information. The red line shows part of the Order Limits local to the converter station site. These include any land that may be required for delivery of the Suffolk Onshore Scheme by developers in this area, such as the converter station, permanent and temporary access, associated infrastructure such as drainage and services connections, landscape and ecology mitigation proposals and temporary construction compounds.

Whilst the field has been identified as a location for up to three converter station projects the Order Limits shown are only for the Suffolk Onshore Scheme. Separate Order Limits will be developed to suit the requirements of those other projects.



Key	
Order Limits	(red line)

(Not to Scale).

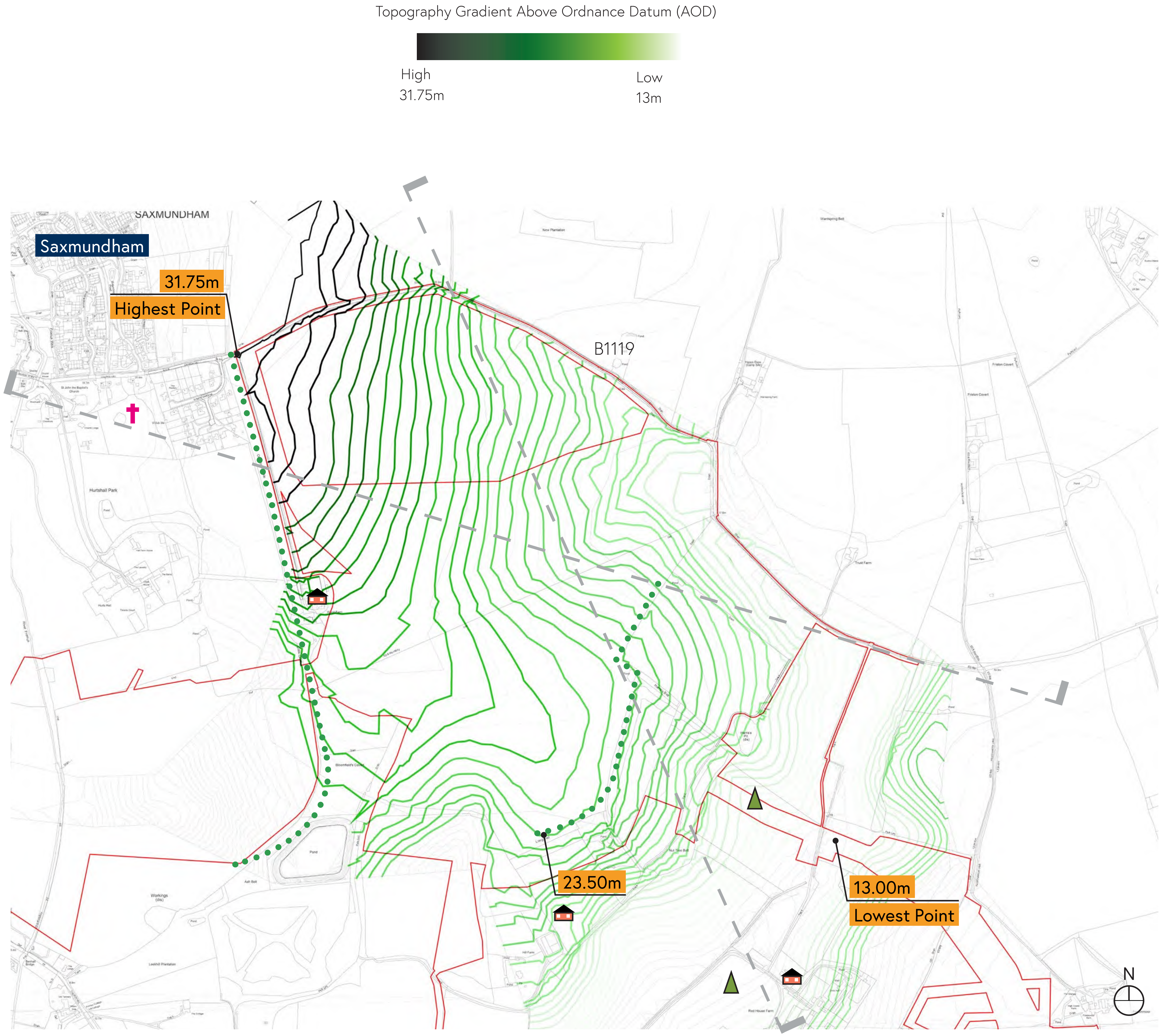
2.2 Baseline Analysis

Topographical

The location comprises open, gently sloping farmland punctuated with occasional hedgerows and small areas of woodland. The selected site for the Suffolk Onshore Scheme converter station takes the form of a plateau located to the southeast of Saxmundham, adjacent to Wood Farm. The surrounding land slopes down approximately 13 m to a track that runs north to south between the B1119 and Redhouse Christmas Tree Farm before the land gently rises again further to the east.

Key

- St Johns Church
- Redhouse Christmas Tree Farm
- Existing Screening
- Farm Houses / Barns
- Indicative section line
- Order Limits
- Spot Elevation



(Not to Scale).

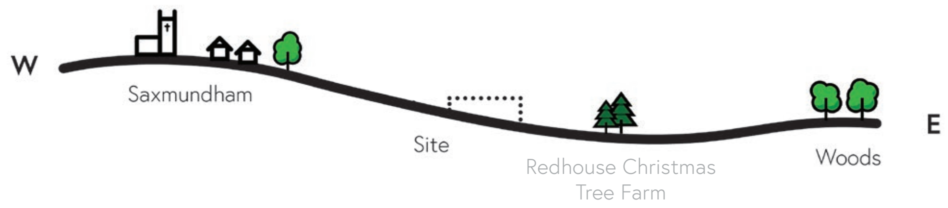
2.2 Baseline Analysis

Site Section West to East

The site section on this page provides an impression of the topography of the selected site and an indication of the relationship between the topography and landscape features, such as trees, hedgerows and buildings.

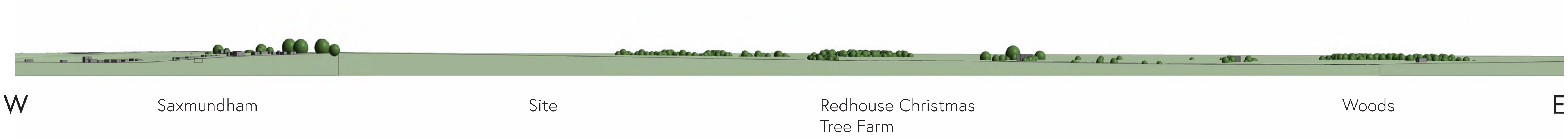
Saxmundham is to the west of the proposed site. St John's Church is located on high ground which drops across the site in a gentle rolling gradient down towards the east side of the site which is currently a Christmas tree farm. There are areas of existing screening trees to the west and east. The slope is such that if the converter station is located towards the east side of the site it will tend to be lower in the landscape and have less impact on the majority of views.

(These cross sections are not to scale and are intended to give an impression of the overall lie of the land and key relationships.)



Indicative Section Diagram

Imagery: Mixar, Microsoft. 2024 (not to scale).

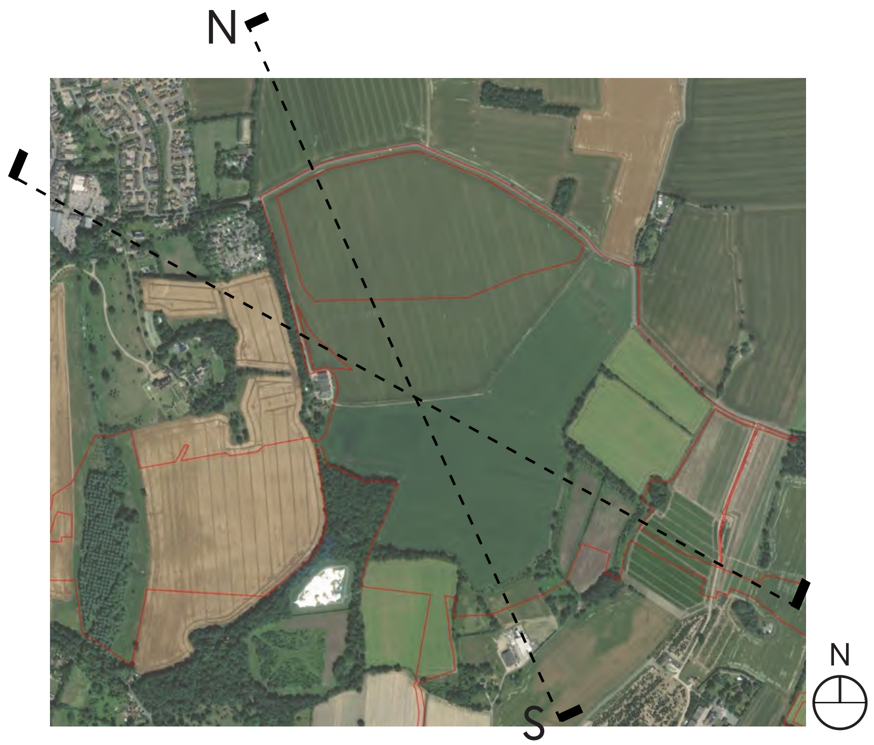


2.2 Baseline Analysis

Site Section North to South

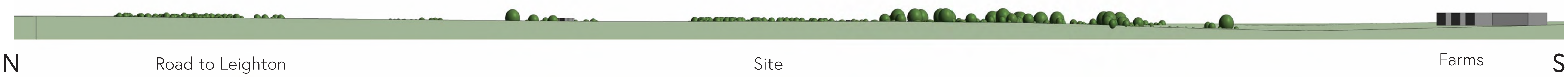
The land tends to slope from a higher level to the north and a lower level to the south. The northern boundary of the site is very open in large parts with limited roadside hedgerows. Further north and sitting slightly higher is the railway line. The southern edge of the site has several lines of mature tree belts with several farm buildings beyond including farm houses and larger barns. The slope is such that if the station is located towards the south side of the site it will tend to be lower in the landscape and have less impact on the majority of views.

Indicative Section Diagram



Imagery: Mixar, Microsoft. 2024 (not to scale).

(These cross sections are not to scale and are intended to give an impression of the overall lie of the land and key relationships.)



2.2 Baseline Analysis

Visual Amenity

ES Representative Viewpoint Locations

The adjacent map indicates viewpoint locations established within the Landscape and Visual Impact Assessment (LVIA). For further details refer to the **Application Document 6.3.2.1.D Visual Amenity Baseline and Assessment.** These cover the whole of the Suffolk Onshore Scheme.

Viewpoints 1, 2, 4, 5, 15, 19, and 21 are regarded as key to the converter station design and are described in further detail in this document. As subset of these viewpoints, 1, 2, and 4 are considered as being of strategic importance to the converter station design as they are the closest and most publicly accessible.

Suffolk LVIA Viewpoint Locations

Key Converter Station Design Viewpoint Locations

Image: Location Map, Google Earth (not to scale).

2.2 Baseline Analysis

Strategic Design View Points: ❶ ,❷, ❹

The adjacent map indicates the location of key views as described within the **Application Document 6.3.2.1.D Visual Amenity Baseline and Assessment.** Three key views affect the selected site which, are summarised below:

❶ This view is located on the B1119 looking south-east towards the site. The view will mainly affect car users as the lack of a footpath along this section of road is likely to discourage pedestrian use. The open nature of the landscape and lack of hedgerows and trees along the section of the B1119 that runs along the northern edge of the site enables clear views across the site between viewpoints 1 and 4.

❷ This viewpoint is located on the B1121 and looks east towards the site. A gap in the trees permits views of the selected site which can be seen in context with Hurts Hall, a Grade II Listed Building and the River Fromus.

❹ A small, wooded area along the B1119 creates a tree-tunnel which, when approaching west to east emerges towards viewpoint 4 to the east of the selected site. As with viewpoint 1, approaching Saxmundham from the east (Leiston and Coast) affords relatively clear views of the site and surrounding area due to the lack of trees, hedgerows and buildings. The view towards the selected site looks uphill, therefore, any potential impact on visual amenity will need to be mitigated.

Key

Order Limits

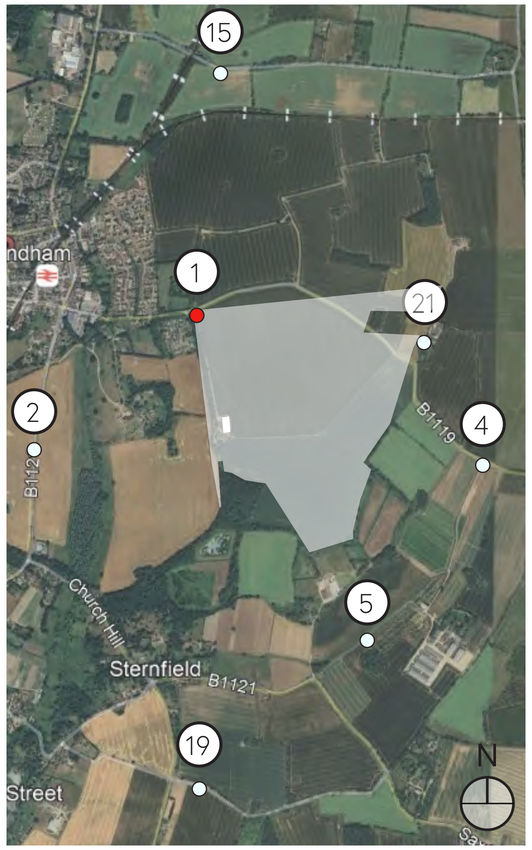
Imagery: Mixar, Microsoft. 2024 (not to scale).

2.2 Baseline Analysis

Visual Amenity - Viewpoint 1

The photograph shown is taken from the B1119 to the east of Saxmundham looking south east into the main Wood Farm field. The open nature of the landscape and downward slope permit views of the selected site and wider landscape setting. The view point is an elevated position, circa 33.30 m, relative to the proposed location of the converter station at 24.50 m. This document will study methods of mitigating the impact on visual amenity through the potential application of cladding and roofing materials and colours, appropriate building form, and their relationship to bunding and screen planting.

The view is from the north so colours and textures could get lost in silhouette. Care will be needed regarding sheen off pale metal low pitch roofs. It is suggested that proposals could be tested in this view in different lighting conditions to see how this affects the design outcomes in comparison to the intent.



Imagery: Google Maps. 2024 (not to scale).

2.2 Baseline Analysis

Visual Amenity - Viewpoint 2

This view is from the B1121 looking east towards the selected site. The site is partially screened from view by existing established woodland although a gap in the trees will permit partial views of the site. The topography rises towards the site and, therefore, consideration will need to be given to mitigate any impact on visual amenity and where reasonable aiming to avoid locating taller buildings in line with the gap in the existing tree screening.

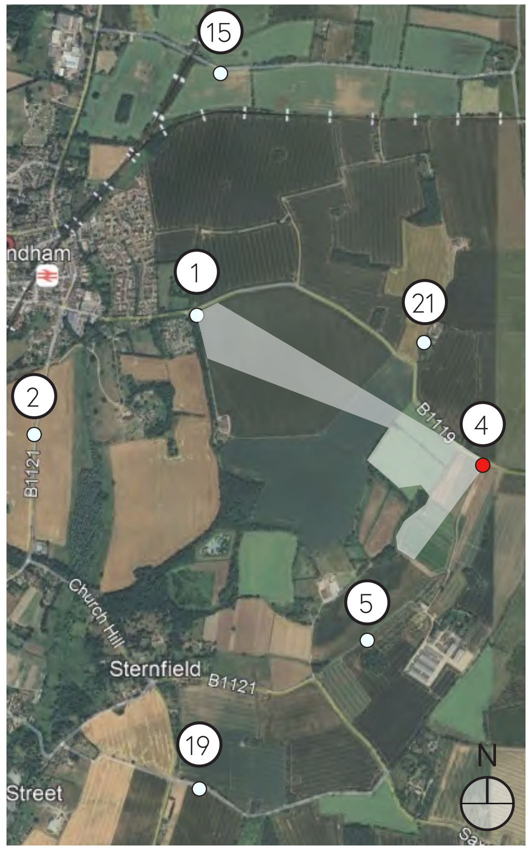
For revision B updated winter photography has been used. This includes the removal of the plantation trees.

Imagery: Google Maps. 2024 (not to scale).

2.2 Baseline Analysis

Visual Amenity - Viewpoint 4

Viewpoint 4 is from the B1119 looking west towards the selected site. This view will predominantly be afforded to car users emerging from the tree 'tunnel' to the east, where enclosed views suddenly open up to wide vistas. The selected site is on higher ground and, due to the open nature of the road and adjacent fields, risks creating a dominant presence within the landscape. As such, the screening methods as previously described will be explored to mitigate the impact on visual amenity. Also key is the location being as far south (left in this view) as reasonable in order to avoid appearing more central and prominent in the view.

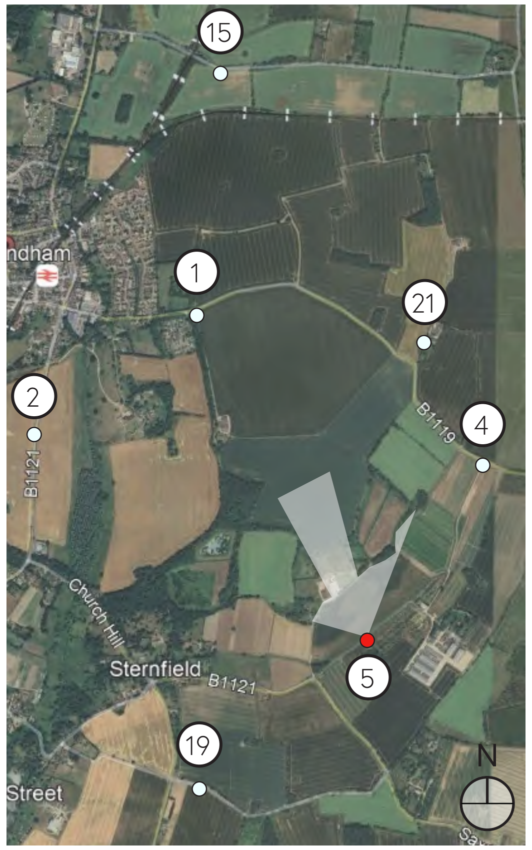


Imagery: Google Maps. 2024 (not to scale).

2.2 Baseline Analysis

Visual Amenity - Viewpoint 5

The barns in the middle ground beyond the field are part of Hill Farm, and the farmhouse is hidden by trees to the left. This is the closest sensitive receptor to the proposed converter station. The trees in the middle ground on the right are part of Long Belt, which is a wide but short band providing limited screening. Nut Tree Belt, which is more established and offers more screening is to the right of this. The existing barn has pale green cladding using a conventional 32 by 1000 mm sheet. It is a much smaller scale than the proposed converter station buildings.

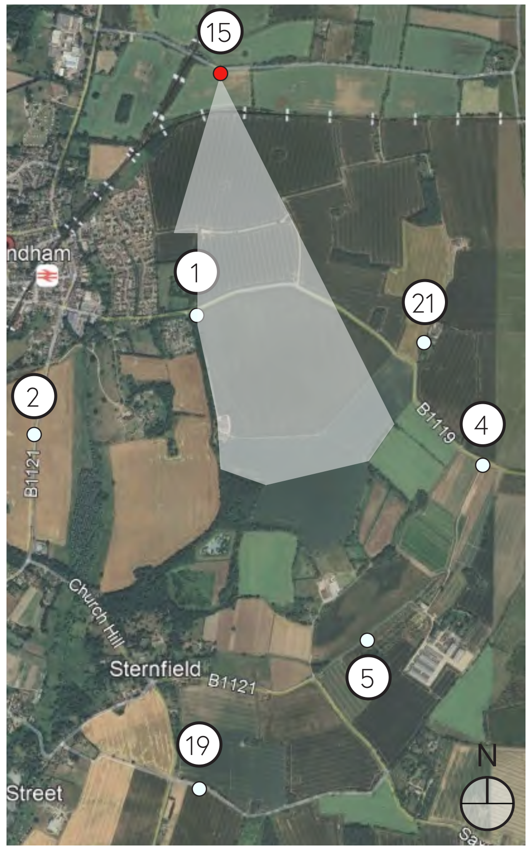


Imagery: Google Maps. 2024 (not to scale).

2.2 Baseline Analysis

Visual Amenity - Viewpoint 15

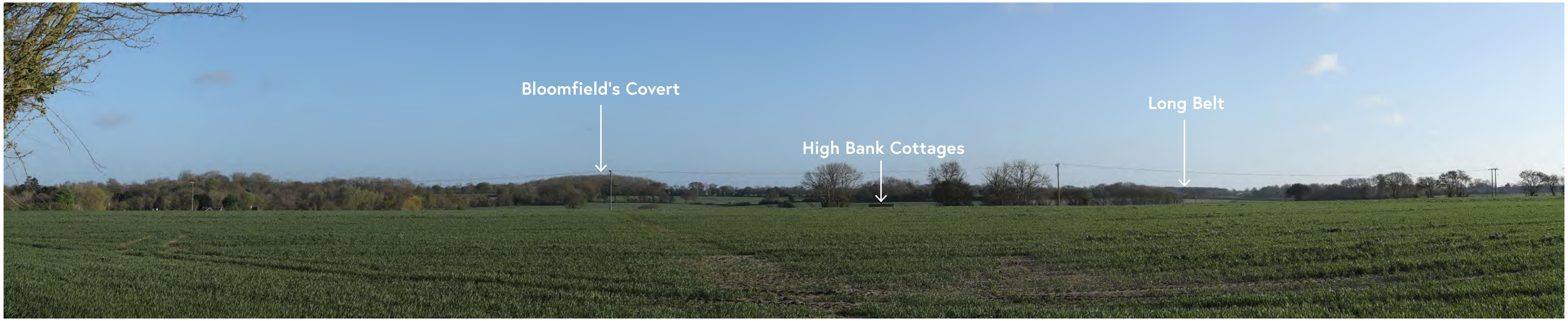
This is one of the more elevated viewpoints of the site, yet the top of the tallest proposed buildings are still expected to be above the tree canopy line. The visibility/prominence of the site is related to the maintenance of the hedgerow along the road, when cut back visibility is increased. The trees in the foreground are north of the B1119, along field margins and the railway. The view is from the north so colours and textures could get lost in silhouette. Care will be needed regarding sheen off pale metal low pitch roofs.



Imagery: Google Maps. 2024 (not to scale).

2.2 Baseline Analysis

Visual Amenity - Viewpoint 19

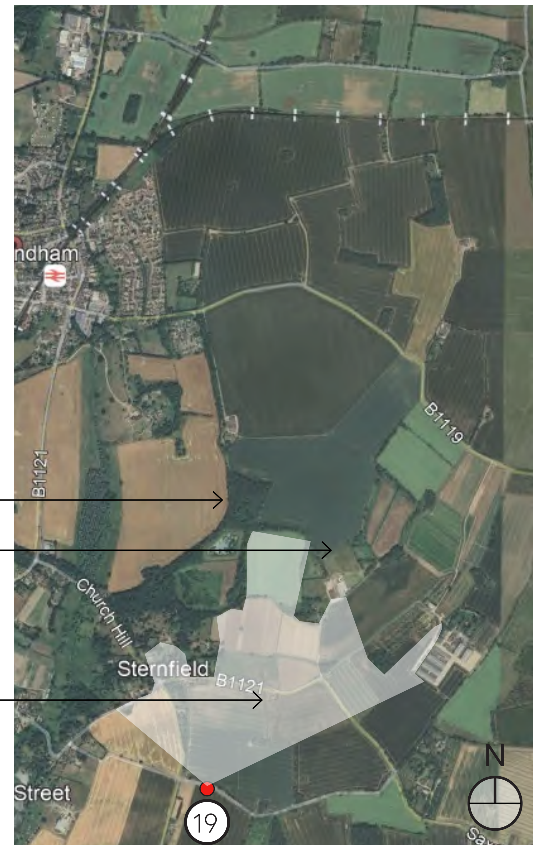


The fields in the foreground in front of the site are rolling with the roof of High Bank Cottages barely visible in a valley trough. There are several tree and hedgerow lined field margins layering up to the proposed converter station location. The belt between Bloomfield's Covert (taller trees on left) and Long Belt on right are sparser and offer less screening potential. It is proposed in the OLEMP to reinforce these tree belts with new planting. This viewpoint is from the south, so how the cladding responds to bright sunlight needs to be considered.

Bloomfeild's Covert

Long Belt

High Bank Cottages



Imagery: Google Maps. 2024 (not to scale).

2.2 Baseline Analysis

Visual Amenity - Viewpoint 21

The sides of the B1119 are completely open without hedgerows. New hedgerows are proposed to create new screening. The taller area of trees on the right is Bloomfield's Covert; a useful area of existing screening. It is anticipated that the tallest buildings of the proposed converter station may appear above the tallest trees in the backdrop. The proposed mitigation screen planting around the northern edge of the site will help create a setting for the buildings. As a view from the north any articulation and colouring is likely to appear more muted due to lack of direct sunlight to create depth of shadows.

Imagery: Google Maps. 2024 (not to scale).

2.2 Baseline Analysis

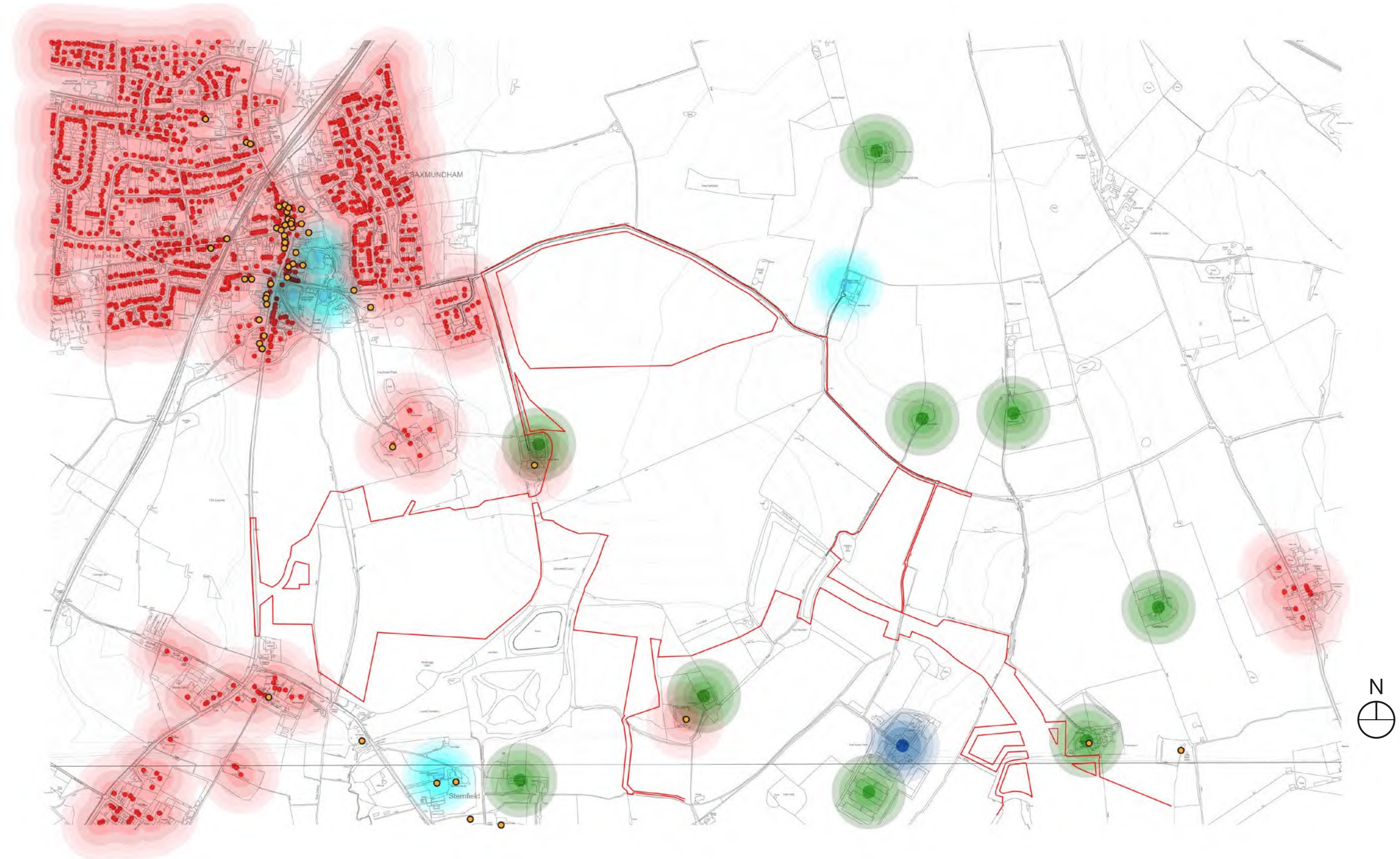
Proximity to Sensitive Land Uses

By the nature of the Order Limits boundary and the scale of development, the Suffolk Onshore Scheme will affect existing nearby uses. The adjacent plan identifies the location of uses which may be sensitive to development and require mitigation.

Saxmundham is located to the northwest of the selected site and predominantly comprises low-rise dwellings. Existing dwellings to the east of the settlement currently benefit from views of the countryside and will be sensitive to any potential noise generated.

Wood Farm is a Grade II Listed Building and residence situated close to the selected site. It has been damaged by fire, which is likely to have an impact on its value. Due to this proximity, mitigation measures regarding visual amenity and noise will need to be taken into consideration.

To the west of Wood Farm is Hurts Hall, also a Grade II Listed Building located within a soft landscaped and partially wooded setting. The proposed access road crosses fields to the south of Hurts Hall and therefore consideration will be given to its setting.



Key
- Residential
- Leisure/ Cultural/ Institutional
- Agricultural/Industrial
- Other business's
- Grade II Listed Buildings
- Acoustic Sensitivity
- Order Limits

(Not to Scale).

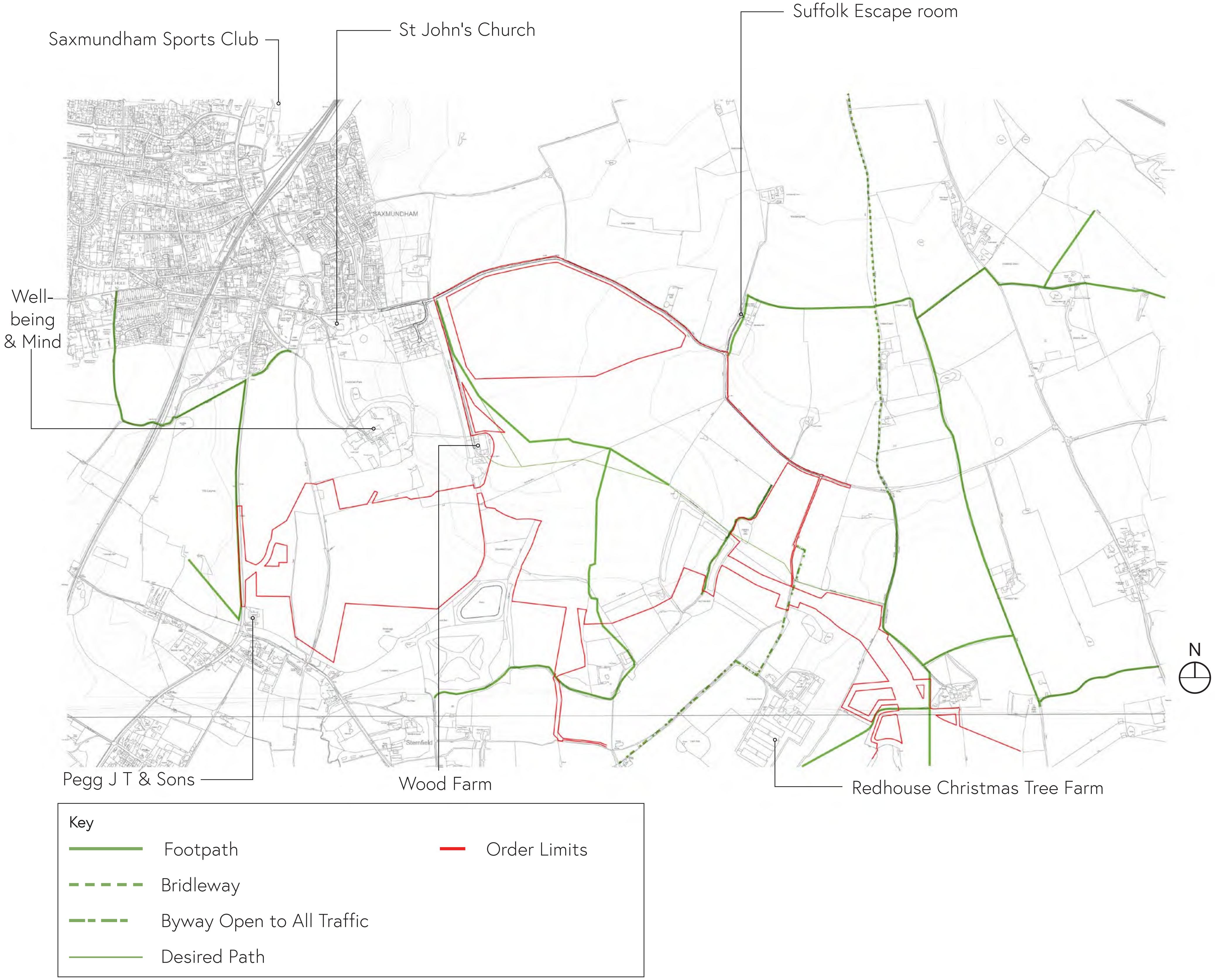
2.2 Baseline Analysis

Private and Community Assets

Community facilities within Saxmundham itself will not be directly affected by the development. However, there is a small number of facilities adjacent to the selected site, located to the south and east of the settlement. These include places of worship, a beauty salon located with Hurts Hall, a Grade II Listed Building, an escape room located on the B1119 to the northeast of the selected site and an engineering business located on the B1121 to the southwest of the site.

Access to these facilities will not be adversely affected. Please refer to **Application Document 6.2.2.10 Part 2 Suffolk Chapter 10 Socio-economics, recreation and tourism** for further details on the potential for severance effects and **Application Document 6.2.2.11 Part 2 Suffolk Chapter 11 Health and Wellbeing** for further details on impacts from noise, air quality, visual and traffic effects on the amenity of private, community, recreational and tourism assets

It is probable that the Redhouse Christmas Tree farm will be directly affected by the laying of new high voltage alternative current (HVAC) and high voltage direct current (HVDC) cable routes. Minimising the impact on this facility will be a key consideration of the development and the location of the converter station and cable routes.



(Not to Scale).

2.2 Baseline Analysis

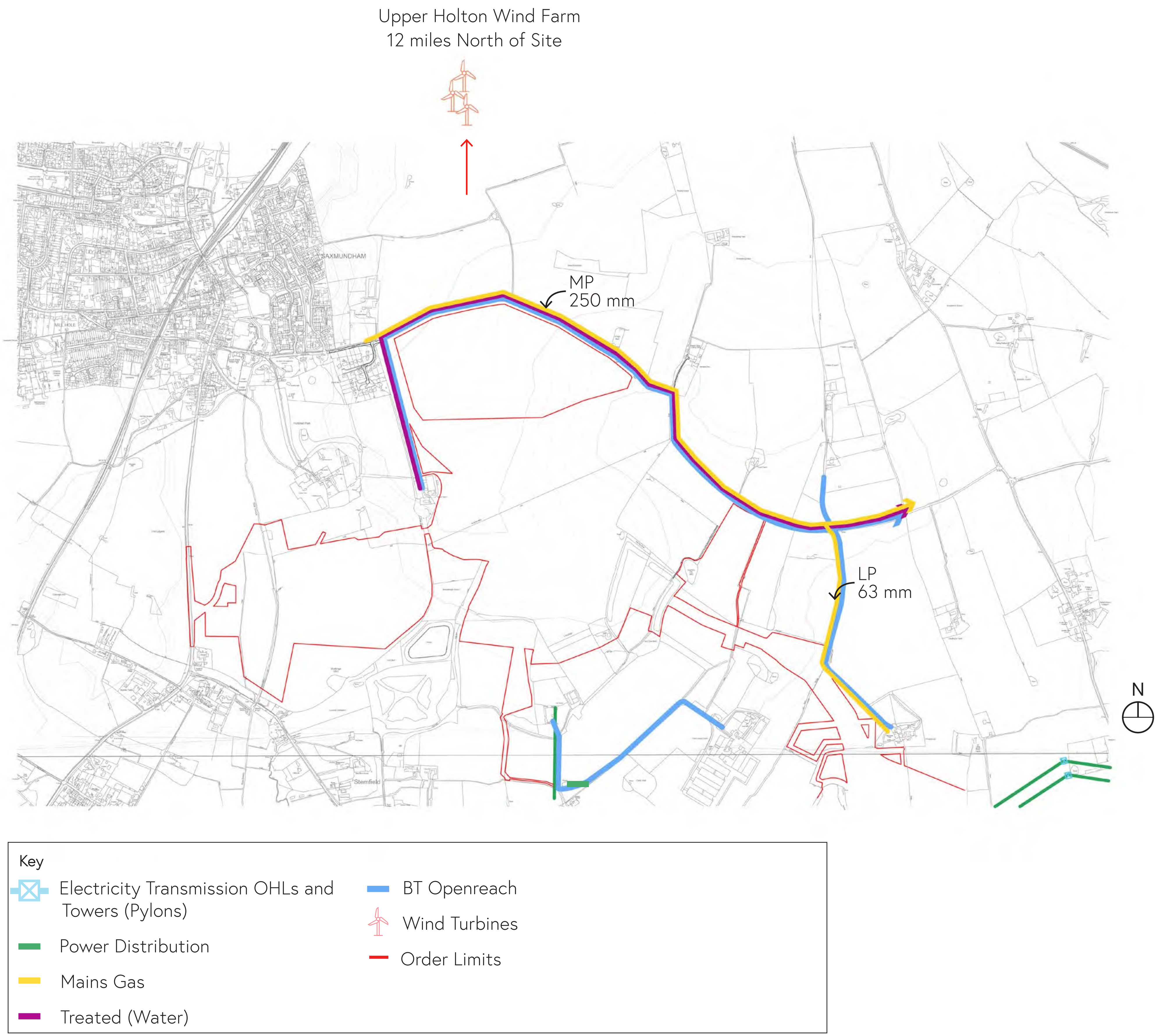
Existing Utilities

The Wood Farm main field, which is the proposed site for the Suffolk converter station, has a long history of use for arable farming and records do not show any utilities running across it. There are several pipes and cables that follow the B1119 along the northern edge of the field. There are connections to the Wood Farm house that follow the access track linking up to Church Hill (B1119). Proposed connections to serve the converter station will come from this direction as can be seen in **Application Document 2.5.1 Works Plans - Suffolk**.

The properties to the south of the site are served by network distribution near Sternfield to the south.

The National Grid transmission lines seen in the bottom right segment of the map are those that run through Friston and to which the Friston substation will be connected.

The Upper Holton Wind Farm is located 12 miles to the north. It cannot be seen from the site.

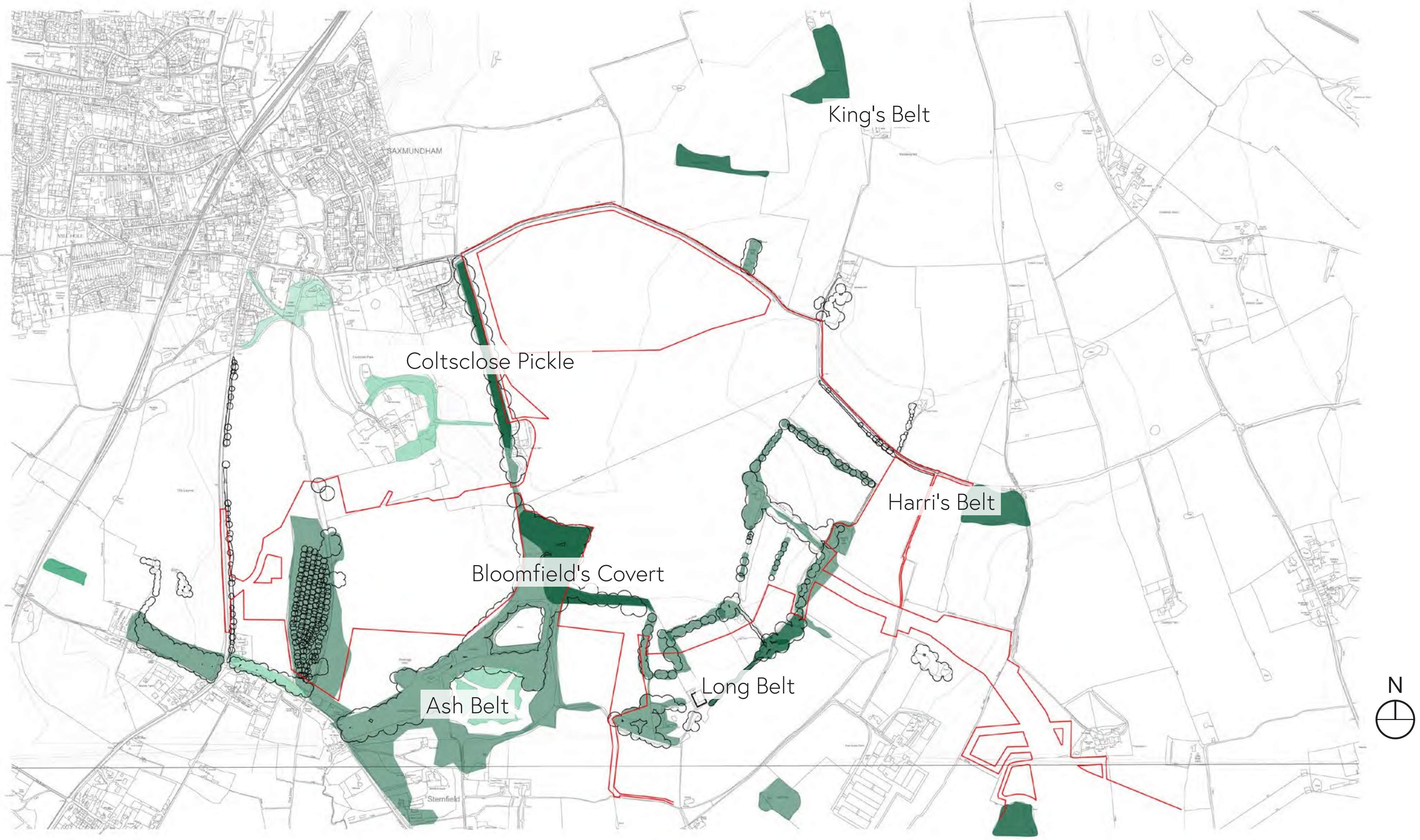


(Not to Scale).

2.2 Baseline Analysis

Tree Belts and Screening

The selected site comprises mostly open countryside with some hedgerows and tree groupings located to the east of Saxmundham and south of the site. The wooded areas to the southwest of the site offer the opportunity to provide some screening of the site, particularly when viewed from the B1121. However, to fully mitigate the impact on visual amenity this screening will need to be enhanced with additional planting provided to screen the development from the west and the northeast along the B1119.



Key

Approximate Tree Heights

- 20M +
- 15-20M
- 10-15M
- 5-10M
- 1.75-5M
- Order Limits

(Not to Scale).

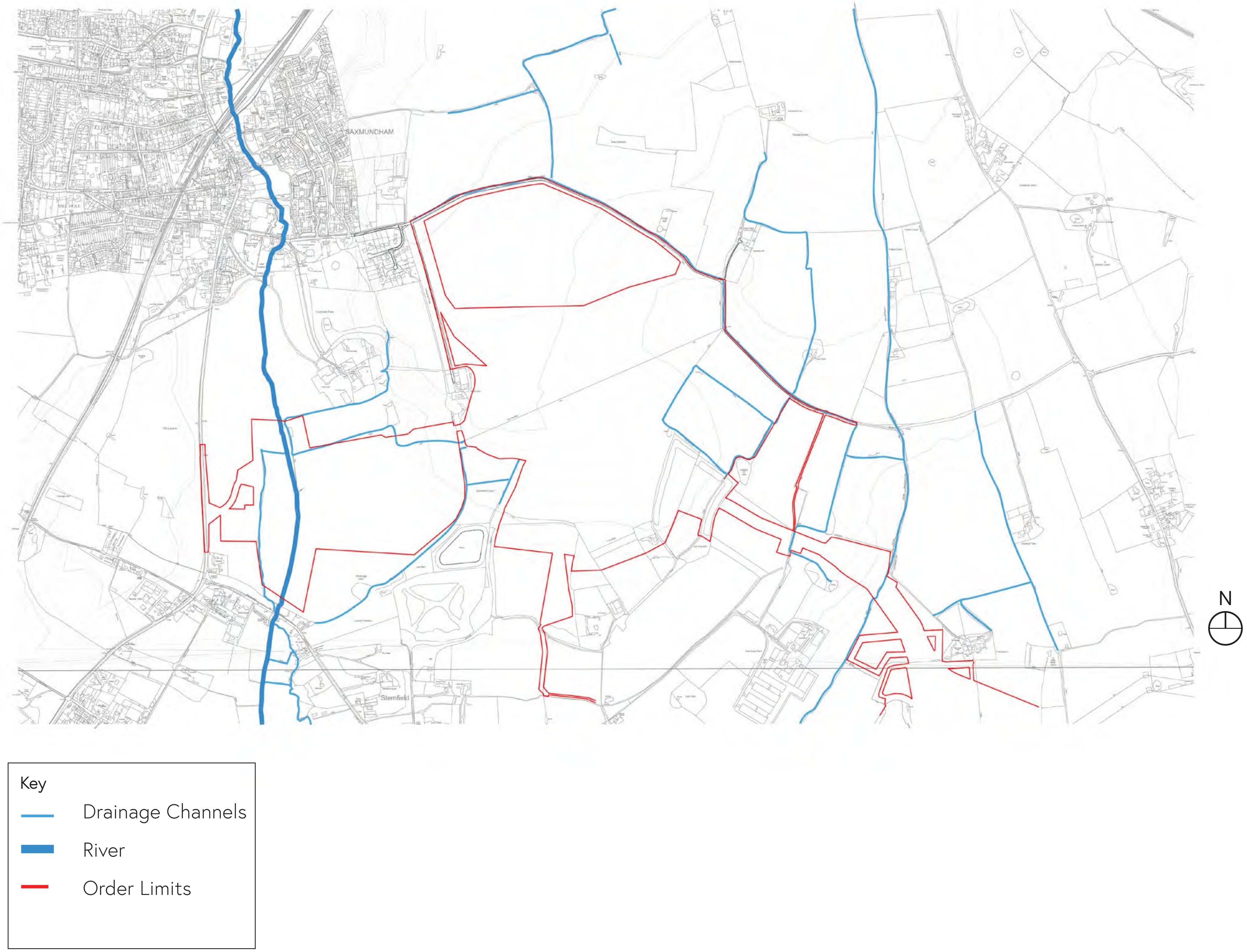
2.2 Baseline Analysis

Watercourses

River Fromus is located to the west of the selected site and has a history of flooding as described on the Environment Agency Flood Map. A section of this waterway is included within the Order Limits for the Suffolk Onshore Scheme and will need to be bridged to facilitate vehicular and pedestrian access from the B1121, as currently proposed.

Drainage channels existing within the site some of which include channels that run parallel with adjacent roads.

The river is prone to flooding but the site is outside of the flood plain as identified in **Application Document 6.8 Flood Risk Assessment.**



(Not to Scale).

2.2 Baseline Analysis

Road/ Street Hierarchy

Local Road Network

The surrounding road network around the site is the A12 with B Roads connecting to the residential roads around Saxmundham.

A12-

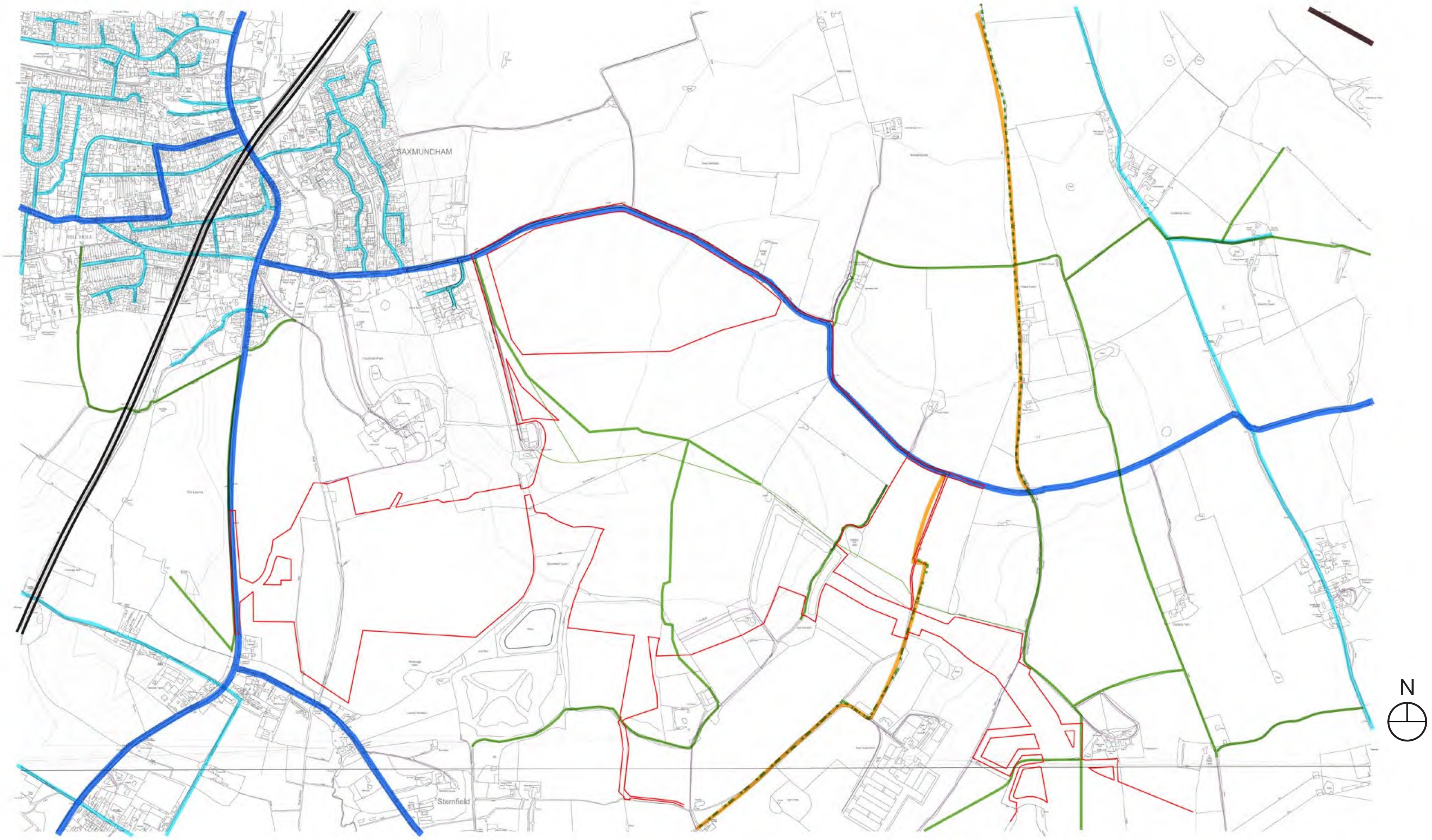
Is a major road running from north-east/ south-west between London and coastal town of Lowestoft in the north-eastern corner of Suffolk.

B1119-

Is a rural B-road in east Suffolk that directly passes the North edge of the site. It starts on the A1120 in Saxtead Green at a triangular junction opposite the famous windmill. It heads east through Framlingham, where there's a short multiplex with the B1116, and Rendham before the road crosses the A12 Saxmundham bypass via a staggered junction.

B1121-

The B1121 is a B-road with spur in east Suffolk. Starts on the A12 at Dorley's Corner and heads south through Saxmundham and Bigsby's Corner to meet the A12 again at Benhall Green.



Key

- Railway Line
- B Roads
- Wider than 4 m
- Residential
- Footpath
- Bridleway
- Byway Open to All Traffic
- Desired Path
- Order Limits

(Not to Scale).

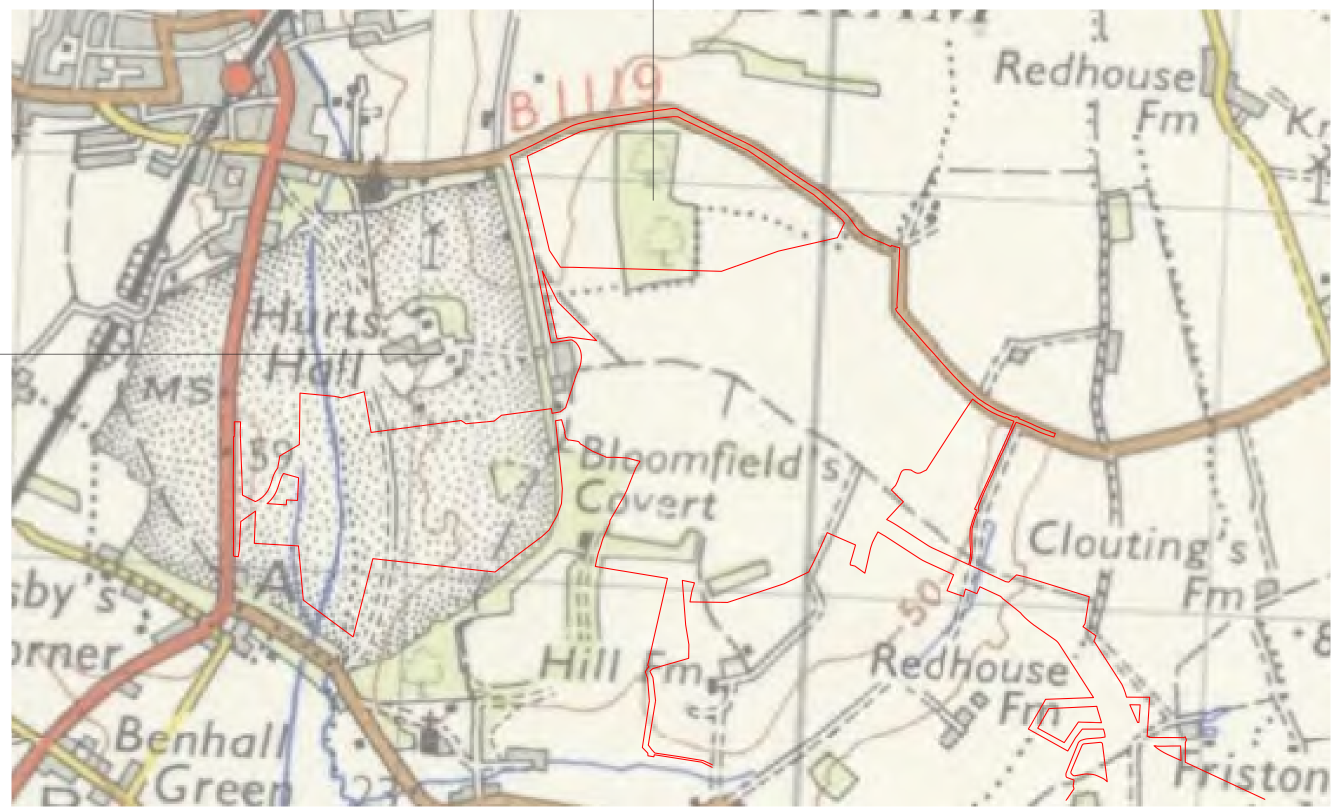
2.2 Baseline Analysis

Historic Map

The historic maps included within this section of the document are dated 1888-1913 and 1955-1961 and provide evidence of the expansion of Saxmundham and the loss of woodland to agriculture, particularly Great Wood which was located to the north of the site, east of the settlement, and was cleared in the latter half of the twentieth century. The importance of the setting of listed buildings, in particular Hurts Hall is also evident.

1888-1913

1955-1961



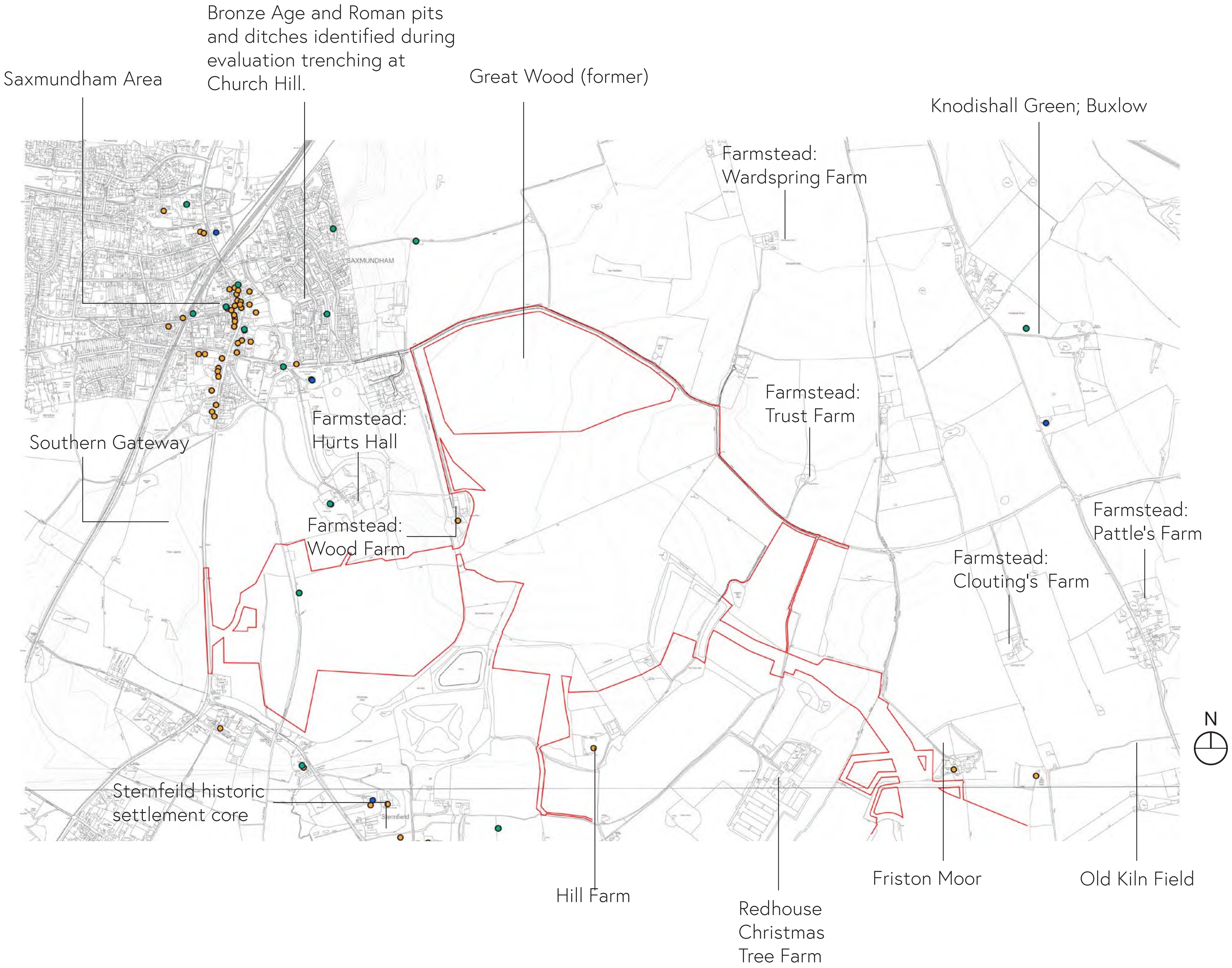
Key
— Order Limits

2.2 Baseline Analysis

Key Heritage Data

Heritage Constraints

Key
- Scheduled Monuments
- Grade II Listed Building
- Grade II* Listed Building
- Order Limits



(Not to Scale).

2.2 Baseline Analysis

Summary & Conclusions

This section of the document has provided a baseline analysis of the selected site for the Suffolk converter station. The selected site is located to the southeast of Saxmundham, a settlement 8.8 km from the North Sea coast.

The Order Limits boundary for the Proposed Project is included and have been developed to accommodate the converter station, access routes and associated infrastructure. The site for the proposed Converter Station is positioned on a plateau within a gently sloping rural setting. As there are no severe landscape features within the location, the selected site offers practical benefits for its construction.

Due to the nature of the site, the proposed converter station will have an impact on their location in terms of visual amenity. Key viewpoints have been identified and the potential impact and the requirement for mitigation measures included as part of the baseline analysis. The selected site will be visible from a number of key locations within the local road network including, the B1119 which runs along the northern edge of the site and, the B1121 to the west in addition to buildings located to the southeast of Saxmundham. Due to the topography, the site will be raised when viewed from certain locations and will also affect the setting of listed buildings. The requirement for a considered approach to the building design and landscape mitigation has been identified and will be explored in more detail separately.

There are sensitive uses within the location which are identified within the baseline analysis. These uses include residential dwellings, predominantly located to the west of the site, with agricultural and community uses also potentially affected. Listed buildings are also included within the analysis. A requirement for mitigation measures to address

Key

Multiple Constraints Overlay
- Higher
- Medium
- Lower

Indicative Suffolk Converter Station Location

(Not to Scale).

2.2 Baseline Analysis

Summary & Conclusions (continued)

noise levels, the impact on visual amenity and the potential effect on the setting of listed buildings have been identified.

Community facilities, including some business premises, exist around the location of the selected site. In addition to those that are located within Saxmundham itself and will not be adversely affected by the development, a small number of facilities are located to the edge or outside the settlement Limits to the south and east. These have been identified within the analysis and include places of worship together with a beauty salon located within Hurts Hall, an escape room and an engineering business. Longer term, the impact on these facilities will be limited to visual amenity. The Redhouse Christmas Tree Farm will be directly impacted by the laying of underground cables and the required mitigation measures will need further, detailed consideration.

Based on an initial appraisal, there are limited services and utility infrastructure that affect the site. The transmission OHLs are located to the south (Friston) but with several fields in between will not affect the converter station site. This can be seen in **Application Document 2.5.1 Works Plans - Suffolk**.

Outside of the developed area of Saxmundham, the location is predominantly open land with limited hedge planting and some wooded areas, mostly to the south, east and west, with the northern side more open. This will provide some screening to the selected site, particularly that which is located to the southeast of the settlement but, to mitigate the impact on visual amenity, a requirement for additional tree and hedge planting has been identified.

The River Fromus runs north/south to the west of the site, between Hurts Hall on the near side and the B1121 on the far side. This distributor road is currently proposed to provide access to the converter station which will require a crossing to the river. The river is prone to flooding but the site is outside of the flood plain as identified in **Application Document 6.8 Flood Risk Assessment**. The site also features drainage channels some of which run along the side of adjacent roads. In general, other than the requirement to bridge the River Fromus and associated flood risks and limited surface water flooding, the site is not adversely constrained by waterways.

The road network within the location comprises distributor roads (B1119 and B1121) which, lead to and from Saxmundham and connect to a network of secondary roads, mostly within the town itself. A network of public footpaths and Public Rights of Way (PRoWs) exist within the site, including within the area selected for the converter stations. The strategy for PRoW diversions can be found in **Application Document 7.5.9.1 Outline Public Rights of Way Management Plan Suffolk**.

The historic maps included within the analysis provide an indication of the expansion of Saxmundham, the loss of woodland between the late 18th Century and mid-20th Century and importance of the setting of Hurts Hall. Of note is the loss of Great Wood to agriculture in the mid 20th Century. The aspiration to provide screening to the converter stations offers the opportunity to reinstate some of these historic losses as can be seen in **Application Document 7.5.7.1.1 Figure 1 Saxmundham Converter Station Outline Landscape Mitigation**. There are a number of listed buildings within the location and, whilst the buildings will not be directly affected by the development, consideration will be required to minimise the impact on the setting of heritage assets as can be seen in **Application Document 6.2.2.3 Environmental Statement Part 2 Suffolk Chapter 3 Cultural Heritage**.

In terms of developing an important infrastructure project, the nature of the topography and the open, rural character of the selected site offers a viable and practical location for the construction of the Suffolk Onshore Scheme. The impact on the adjacent settlement, the local road network, key views, the natural environment and other local constraints can be mitigated through considered design development.

2.3 Local Character

Vernacular

Saxmundham Town

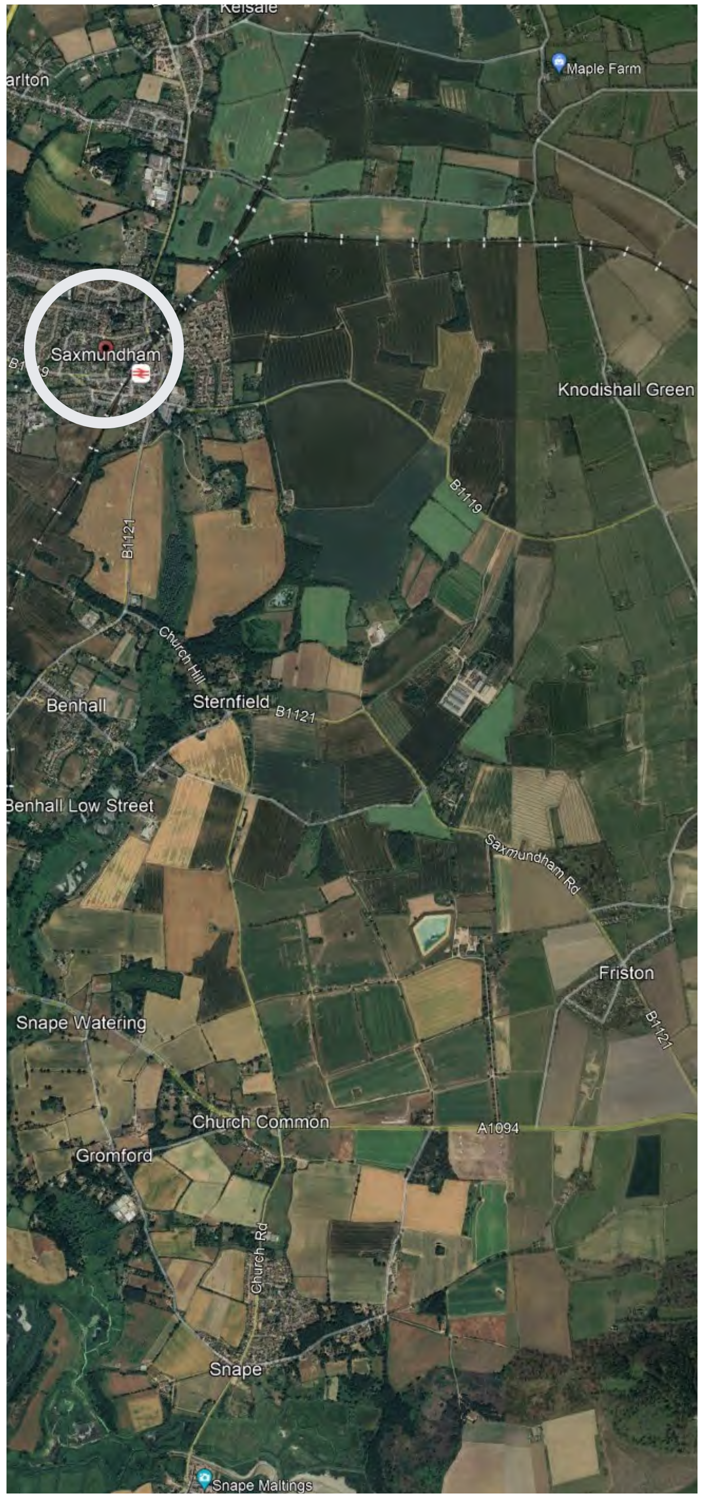


Image: Location Map, Google Earth (not to scale).

2.3 Local Character

Friston Area








Image: Location Map, Google Earth (not to scale).

2.3 Local Character

Church Hill Area

Photograph to left is from the B1121 near Benhall and Sternfield to the south of the site.

Image: Location Map, Google Earth (not to scale).

2.3 Local Character

Colour

Colour, Texture & Pattern

In this section research on colours, patterns and materials, used in the surrounding areas in Suffolk, is developed through the seasons. In this research, the understanding of what makes the local area distinctive and how it can inform the design principles becomes clearer.

The landforms, flora and architecture will form how new grading and planting can be used to give a sense of place to the proposal. Also, from this research, a palette is established from the colours and patterns that can inform of the kind of cladding schemes that will relate well. The idea is to form a design that belongs to the local environment so that it works with the surrounding landscape and architecture, whether it be to blend in or respond in other ways.

This research is split into three sections, Nature, Traditional Architecture and Agricultural, Industrial and Infrastructure. Looking at the site locations, it will mostly be nature that surrounds the building; however, it is important to understand the local architecture and structures as well. In each section, the photographs selected are prominent in the local area and have subtracted specific colours or patterns from these.

Agricultural, Industrial and Infrastructure

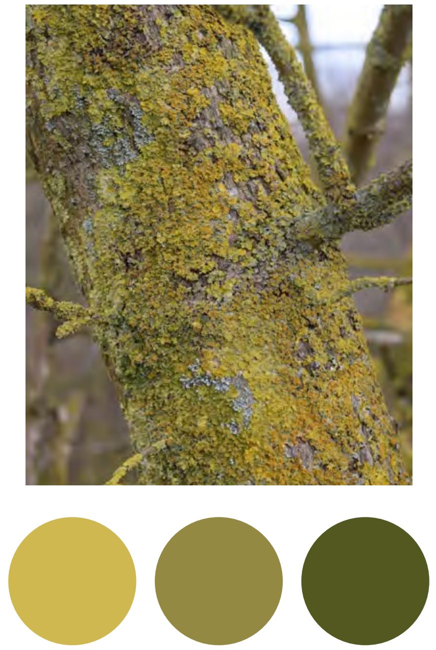
Traditional Architecture

Nature

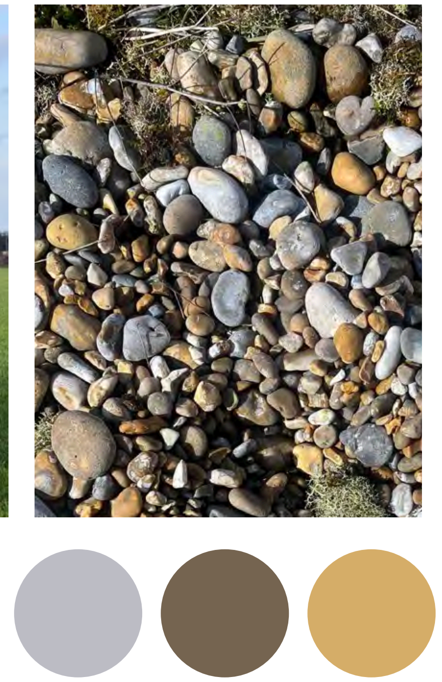
2.3 Local Character

Colour - Local Nature







The photographs selected here have been taken in two different seasons, Summer, and Winter. It shows how the natural colour tones change, establishing which colours remain through all the seasons. Some photography includes brighter berries, however, have not included these as they do not represent the typical colour tones of the Landscape.

The colour majority here are greens and earthy brown tones. It's interesting to see the variety of green tones portrayed in these photographs from lush greens to cooler green/greys.

2.3 Local Character

Colour - Local Traditional Architecture










These photographs represent the local traditional architecture. This included historic churches, mills, and houses. From these photographs there is an understanding of what the typical building material is and its colour tones. From this research, the architecture is warm brick or stone but in some instances there's cooler render or dark timber cladding. The colours selected also consider the context that the building is located including the sky above which brings in the blues, greens, and greys.

2.3 Local Character

Colour - Local Agricultural, Industrial and Infrastructure





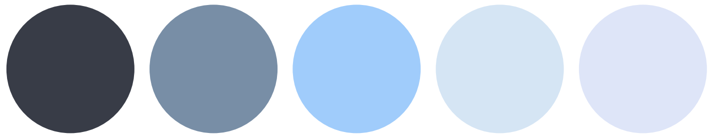
These photographs represent the local traditional architecture. This included farm houses and agricultural typologies. From these photographs there is an understanding of what the typical building material is and its colour tones. The research shows a lot of this architecture is warm brick or stone but in some instances there's cooler render or dark timber cladding. The colours selected also consider the context that the building is located including the sky above which brings in the blues, greens, and greys.

2.3 Local Character

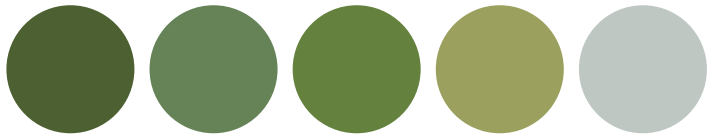
Colour Summary

To summarise the colour research, typical colours used in the surrounding areas are picked out and categorised below. Industrial architecture typically uses powder coated cladding on the facades, so also shown on the right are a few selected colours from Tata Steel's Standard range to show how these work with the colour's tones from the local environment. This is developed further and incorporated within patterns and textures to produce facade design options.

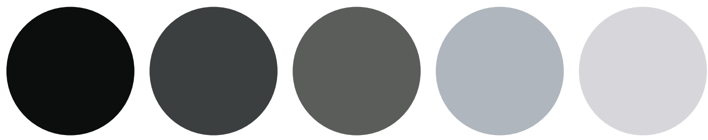
Blue



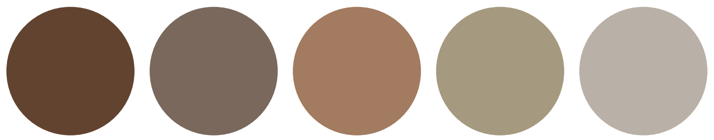
Green



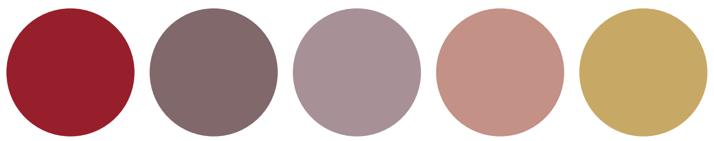
Cool Neutral

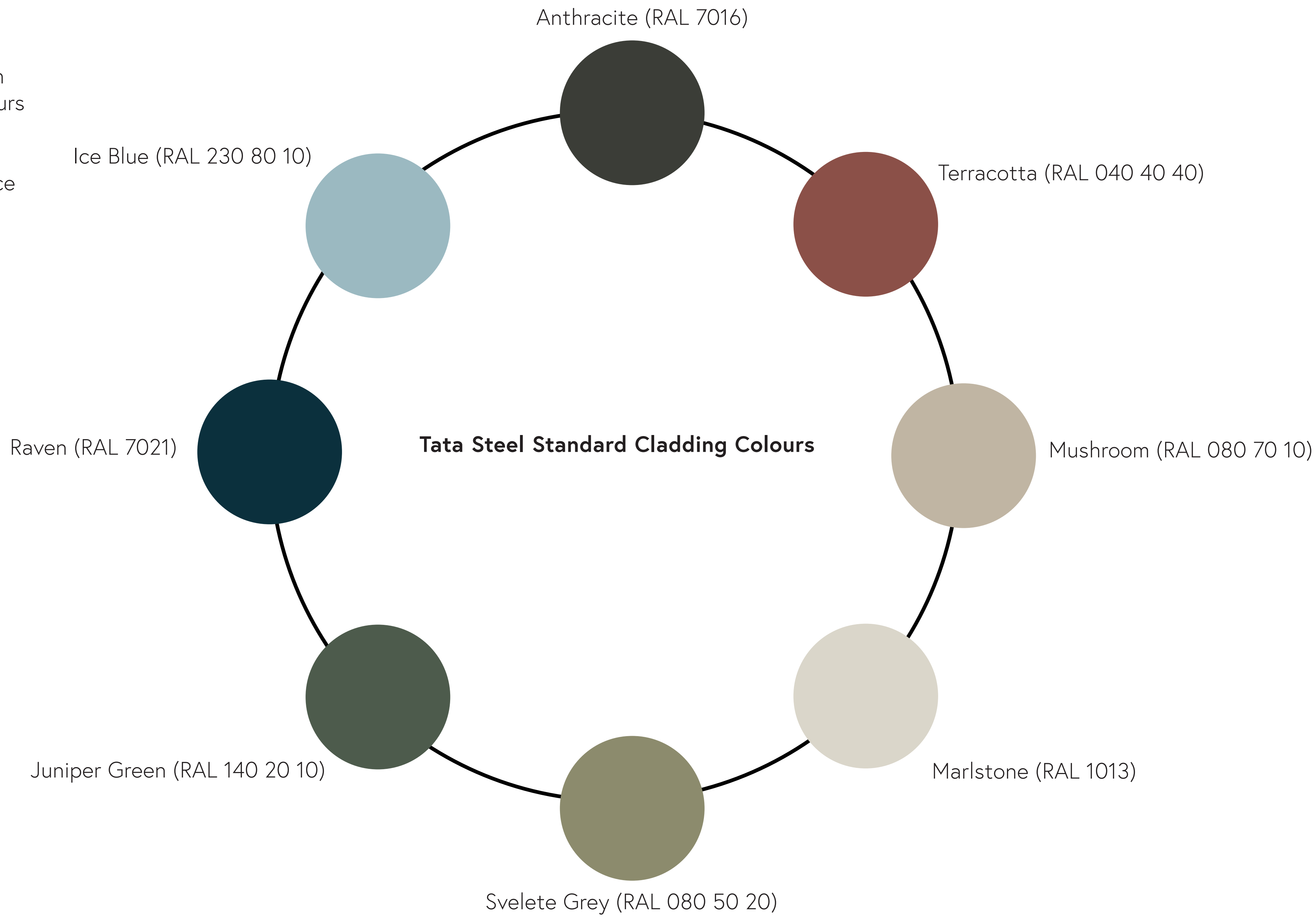


Warm Neutrals



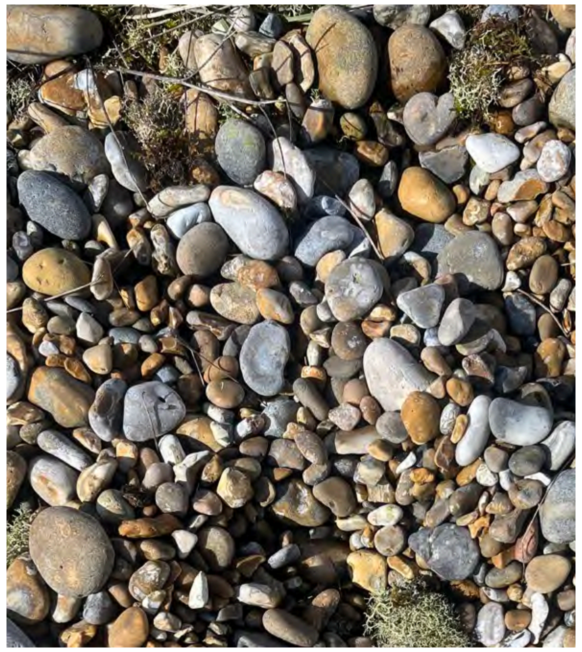
Other

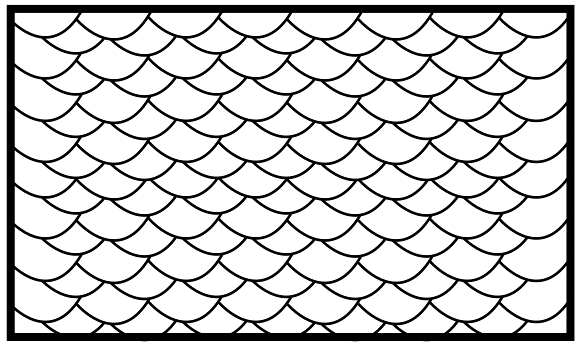
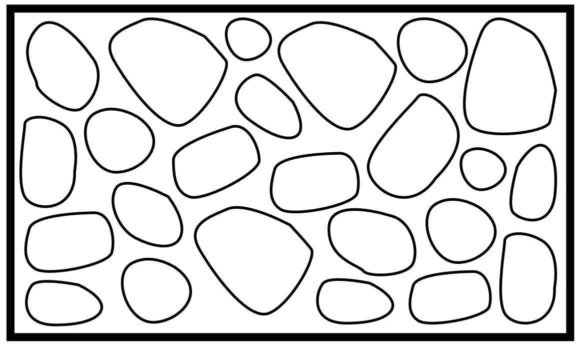
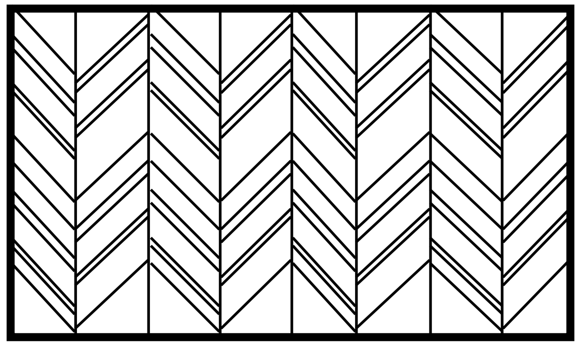
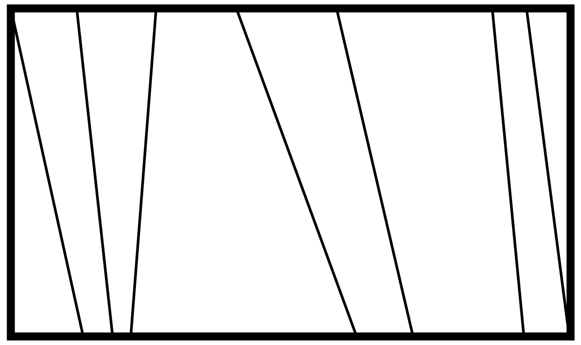




2.3 Local Character

Local Texture

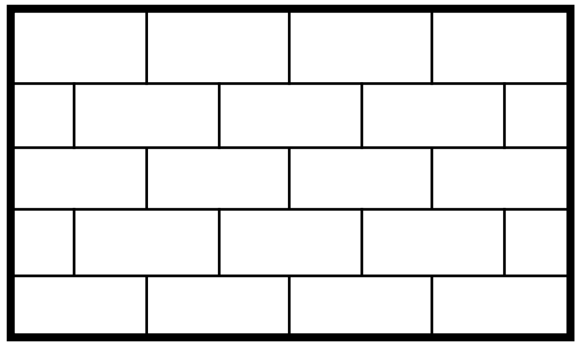
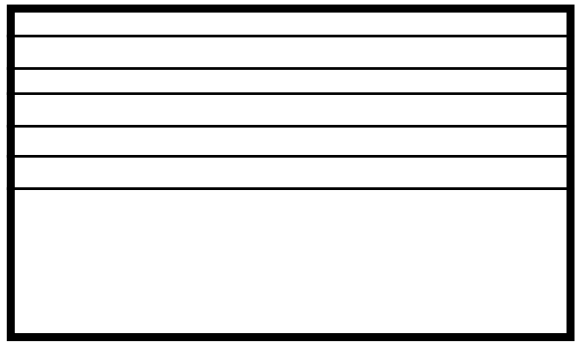
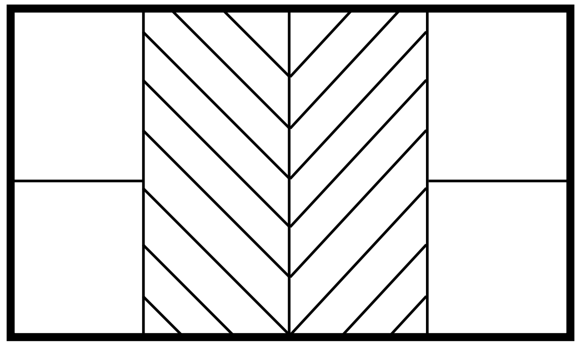
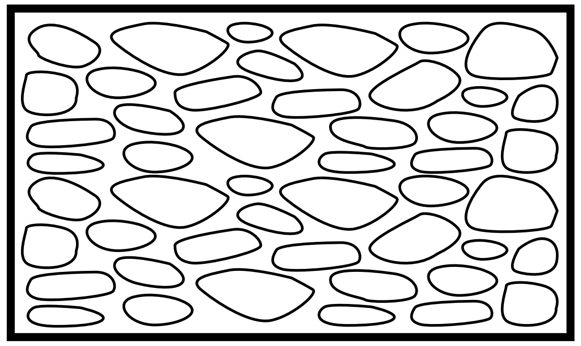
Form patterns are based on photographs in the three sections, Nature, Traditional Architecture and Agricultural, Industrial and Infrastructure. The photographs in the next few slides have been selected as they show various patterns and textures from the surrounding areas which can provide inspiration for the building facade.

Looking at the Local Nature photographs, all three images form linear patterns that are either vertical or angled. The pattern that stands out amongst them is inspired from the Christmas trees in the third photograph. This pattern still has angled lines, repeated in a rhythmic manner. The first and second photographs bring in curves into the patterns. These patterns are pretty consistent through the year, the only one that would change is the fourth photograph where leaves would start to grow changing the outer pattern.

2.3 Local Character

Texture - Local Traditional Architecture



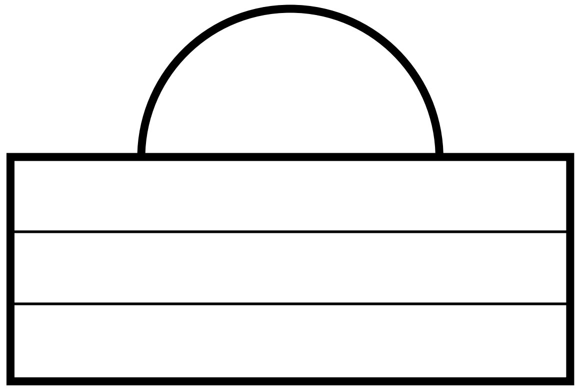






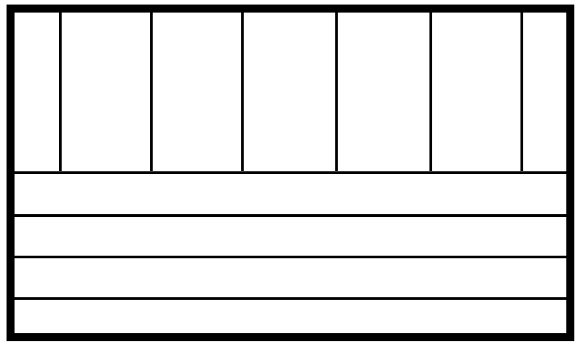
Looking closer at the details for the Traditional Architecture, inspiration can be taken from the regular traditional brickwork to the varied medieval brickwork on the fourth photograph. Timber slats on the outer walls of the houses in the area in a simple linear pattern to a chevron shape is particularly interesting.

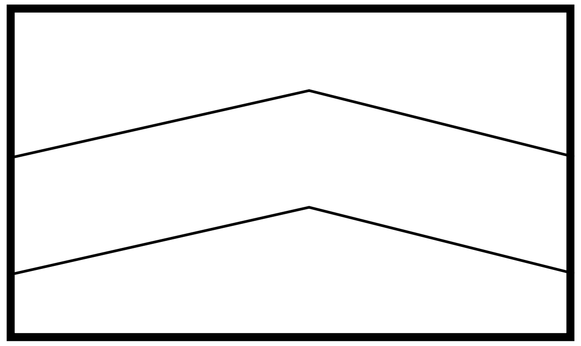
Currently these patterns are in 2D, but it's easy to see how some of these patterns can be pulled out to form a 3D facade which would create more depth. What's interesting with these patterns is that they are very different in style, some feel very traditional, for example the pattern that has been created from the window photograph, and some feel contemporary such as the wall pattern.

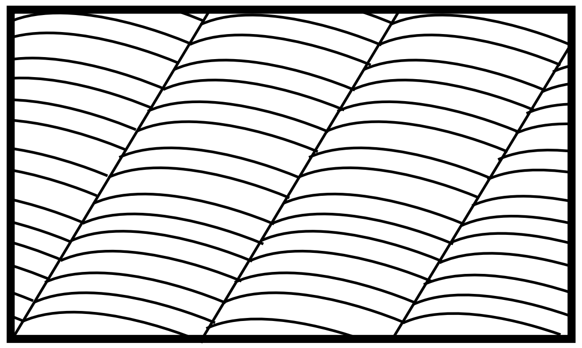
2.3 Local Character

Texture - Local Agricultural, Industrial and Infrastructure







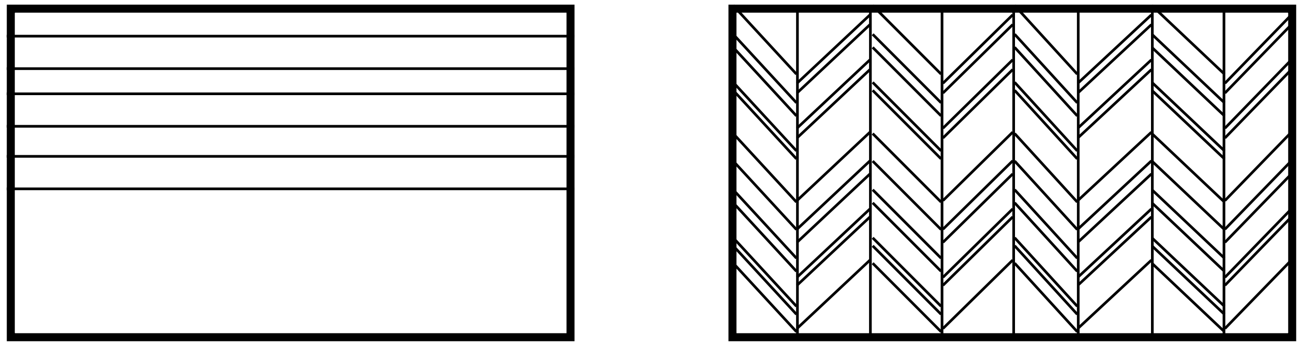


2.3 Local Character

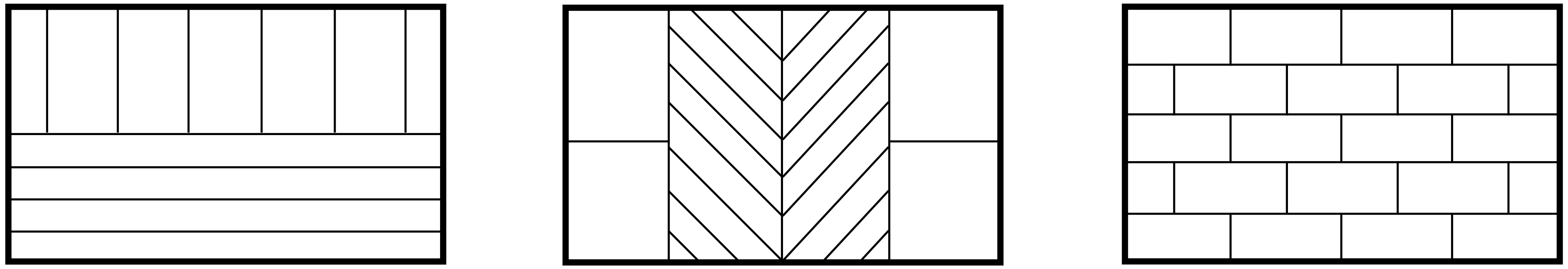
Local Texture Summary

To summarise the texture research, there are a range of patterns that have been inspired from photographs taken in the local areas. These have then been split into Linear, Grid and Patterned, as shown below. Each of these patterns could be used on the facade. The idea is to discover how the building could blend or be integrated well in with its surrounding area.

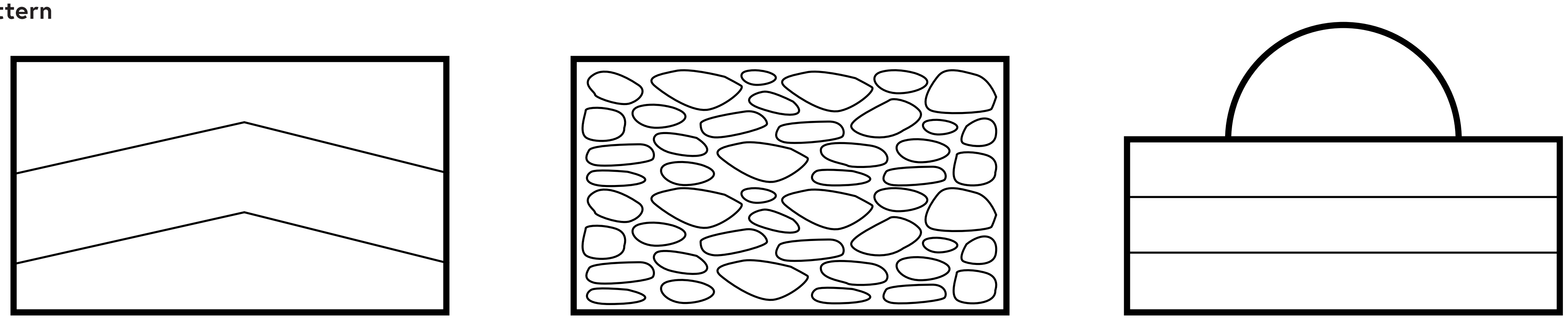
Linear



Grid



Pattern



GENERIC DESIGN PARAMETERS

3.0

3.0 Generic Design Parameters

3.1 Converter Station

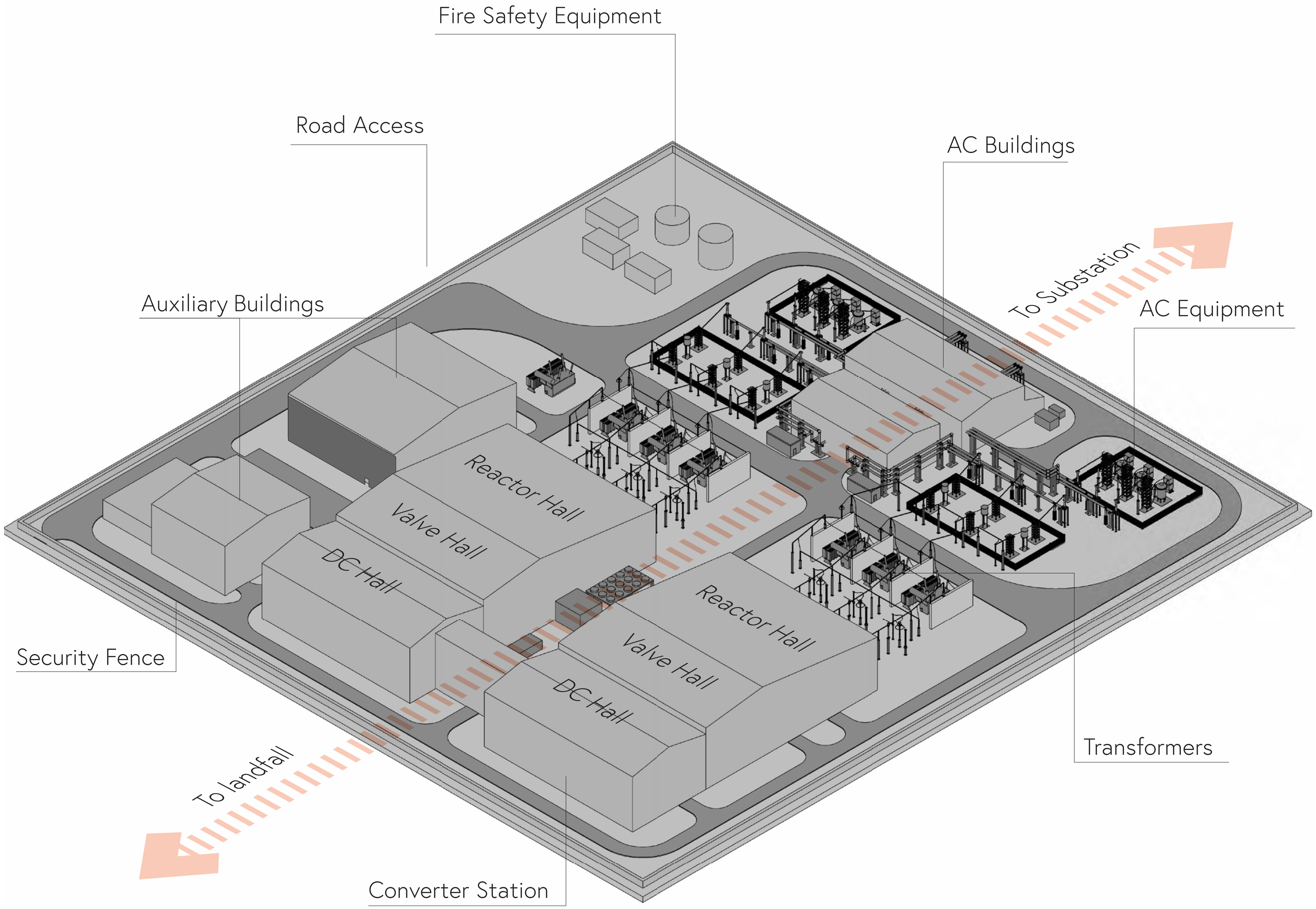
Defining area Types

The converter station sites comprise multiple buildings including the two main converter halls, spare parts building, Pre- Insertion Resistor (PIR) building, Gas Insulated Switchgear (GIS) building, service building and others that help to run and maintain the stations. The largest are the 2 main converter halls that could be up to 26m high. The following key facilities are described within this section of the document:

- Direct Current (DC) Halls;
- Transformers;
- Alternating Current (AC) Equipment and Buildings;
- Ancillary Buildings and Equipment; and
- Vehicle Circulation.

Depending on the selected equipment provider, and subject to detailed design, the disposition of these area types within the site and the exact length and width of the compound may vary. This requirement for design flexibility has been allowed for in the Limits of deviation defining the potential extents of the converter station.

The diagrams in this section have been updated in revision B to better align with the indicative layouts in Application Document 2.13 Design and Layout Plans. This involved in a minor change to the circulation layout to suit the indicative access point, and position of ancillary buildings within the site in response.



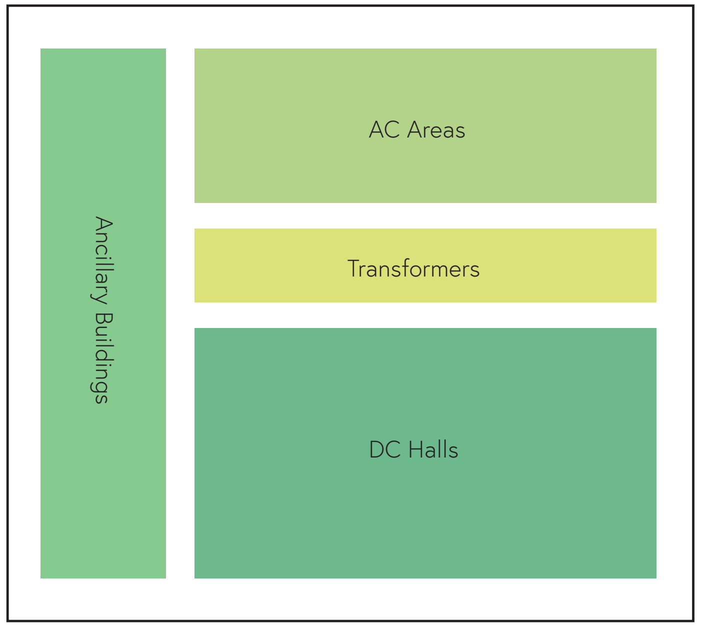
3.1 Converter Station

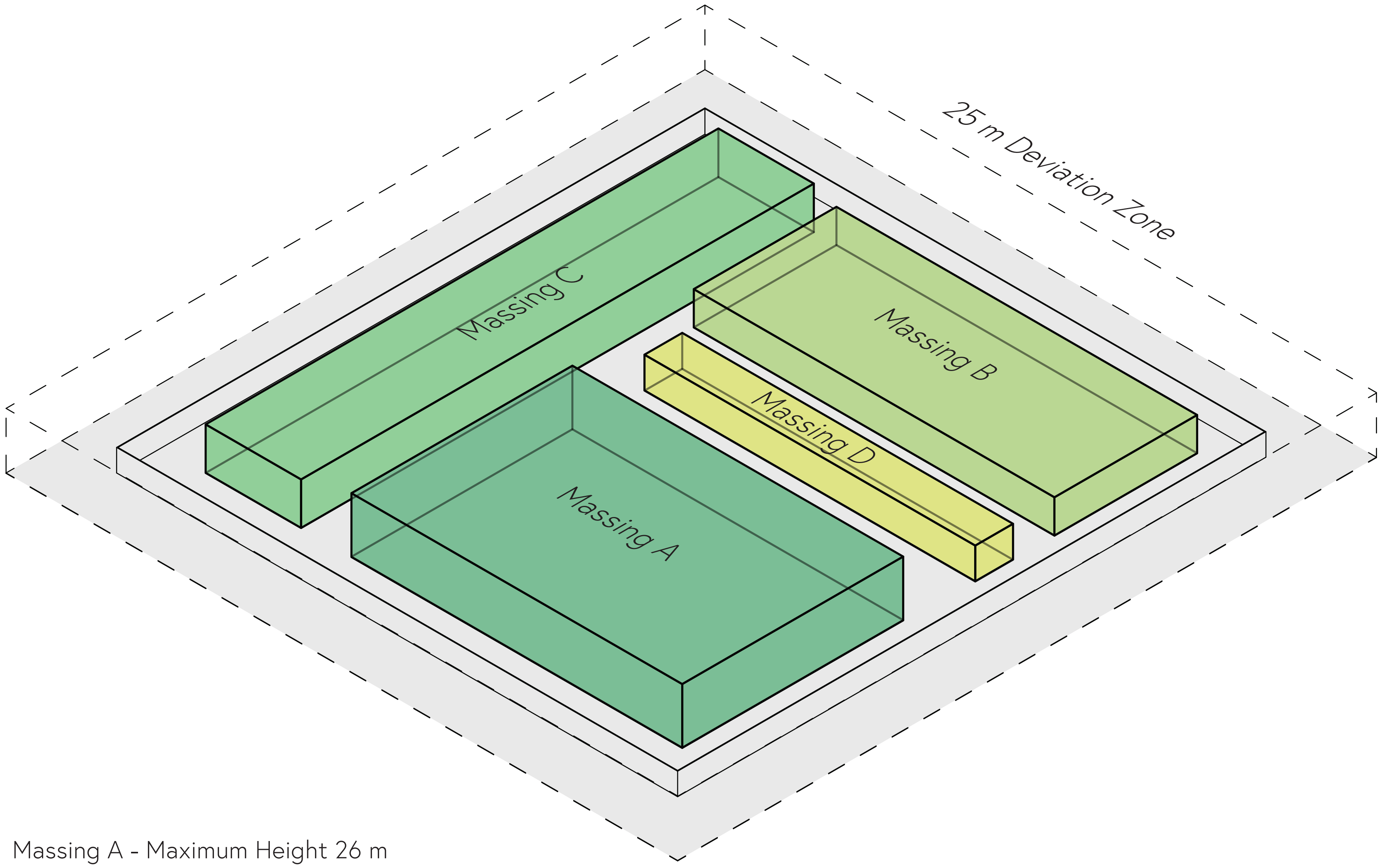
Heights

The overall scale and arrangement of the buildings are determined by the site's technical requirements. The challenge is to design the buildings in a way that minimises their visual impact on local area.

Unless restricted by ground conditions, drainage, flood risk, or other technical constraints, the converter station development plateau should be kept as low as possible, while also seeking to balance cut and fill on the site. This is to mitigate visual impact by keeping the project's overall height above ordnance datum (AOD) as low as possible. This principle needs to be addressed in conjunction with those relating to the Nature and Built Form sections of the Converter Station Design Principles in Table 3.1 of **Application Document 7.12.1 Design Principles - Suffolk**, such as using the cut and fill balance to create bund screening.

Within the technical Limits of the function and design of the buildings, it should be demonstrated that the overall height has been kept to a minimum, while also considering the articulation of the buildings.





Massing A - Maximum Height 26 m

Massing B - Indicative Height 18 m

Massing C - Indicative Height 15 m

Massing D - Indicative Height 14 m

25 m lateral Limits of Deviation (LoD) Zone

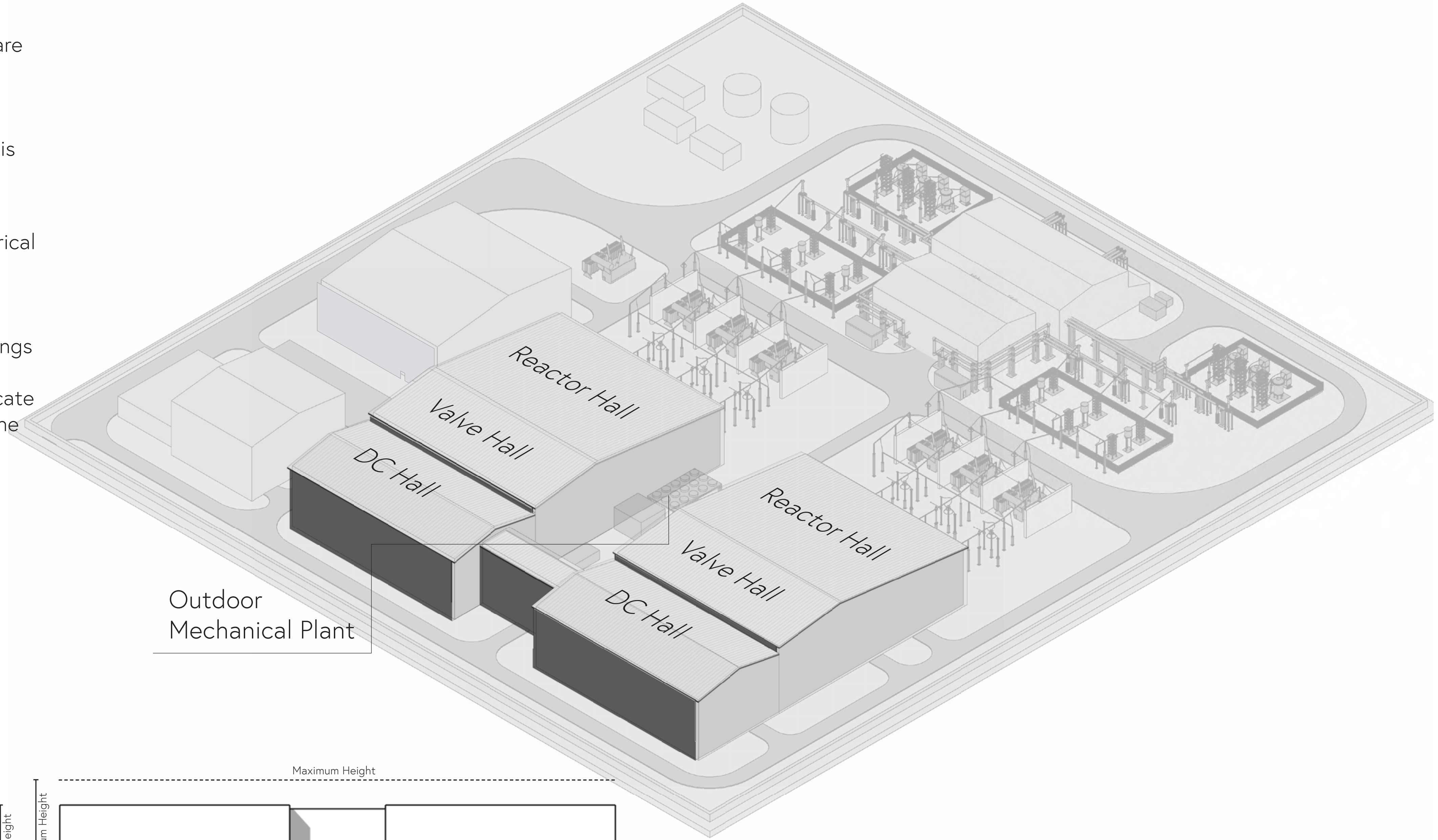
3.1 Converter Station

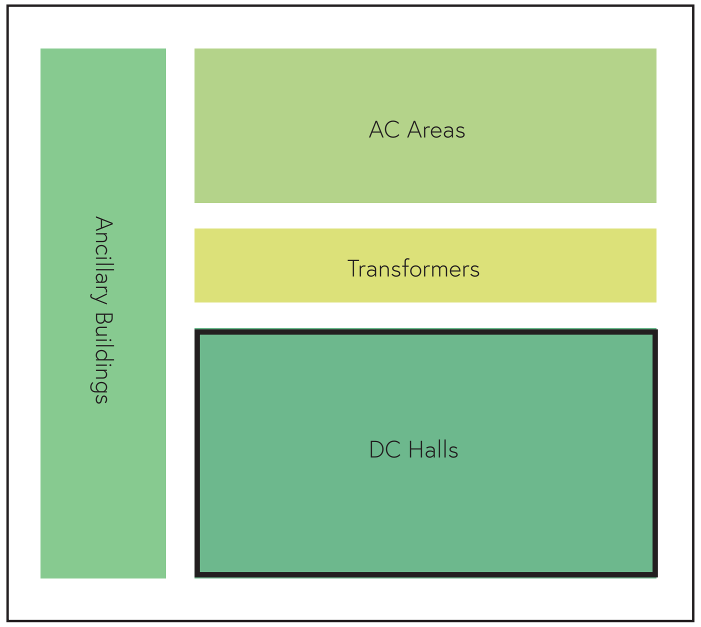
DC Halls

The DC equipment requires a controlled environment hence the need to be located inside buildings. There are two sets of identical halls, one for each pole. A HVDC cable enters into each DC Hall, adjacent to which is a Valve Hall, and adjacent to that is a Reactor Hall from which three-phase HVAC goes out/in (as the process is reversible).

These are the largest footprint and tallest buildings within the converter station. They tend to be symmetrical as each pole requires the same sequence of adjoined halls. They tend to be located at one end of the site and have outward facing elevations and inward facing elevations between the two sets of halls. These buildings require areas of outdoor mechanical plant to maintain the internal environment. The design should aim to locate this equipment between the two sets of halls, using the buildings to screen it from view.

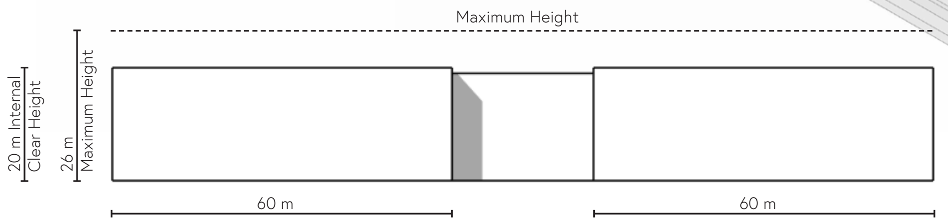
The standard halls may have a 20 m internal clear height for the electrical equipment inside and a 26 m maximum height.

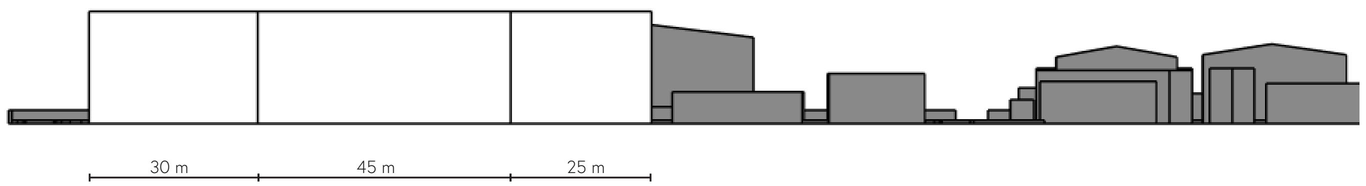




(Not to scale)

Enclosed DC equipment with outdoor mechanical plant.



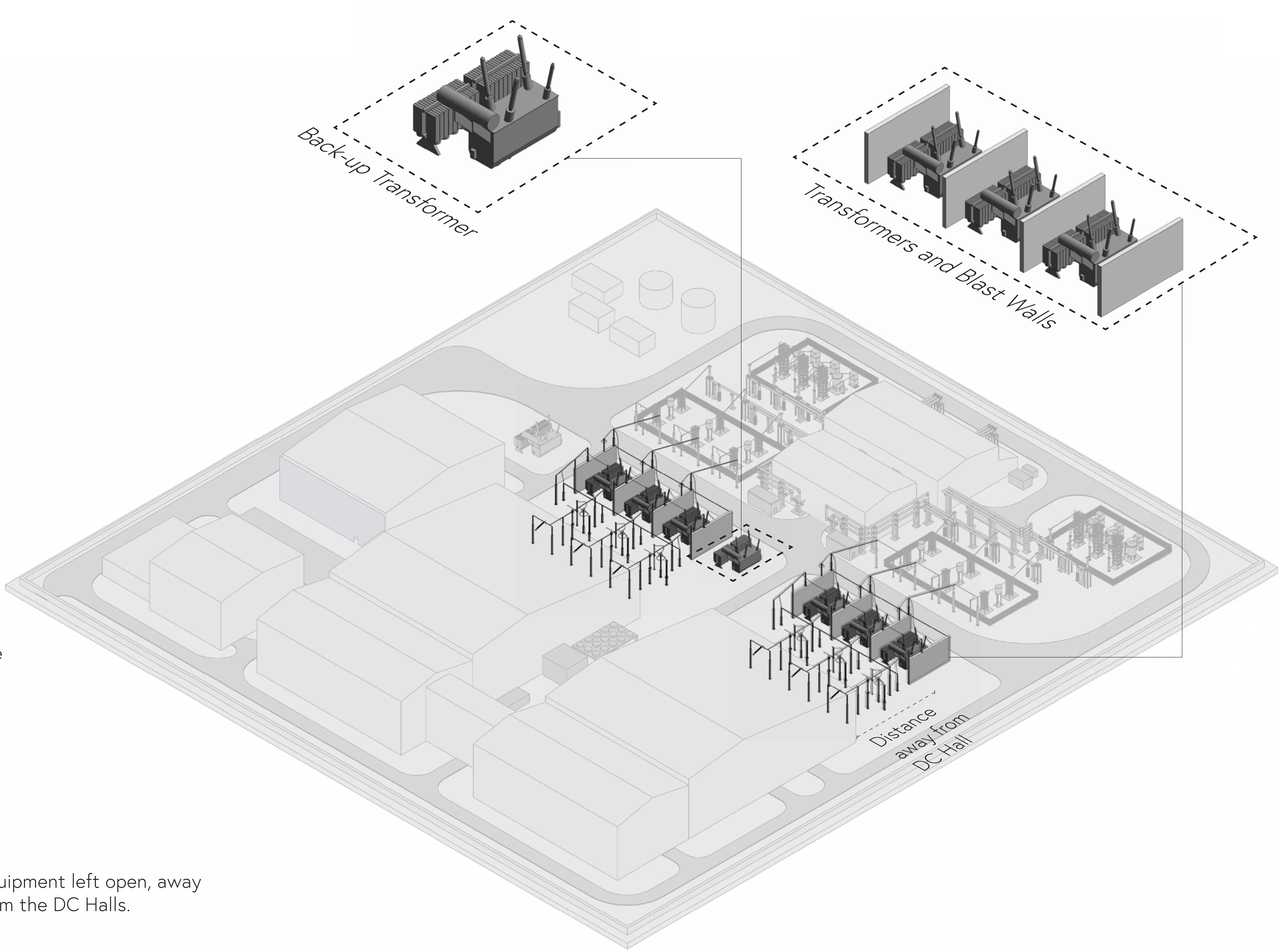


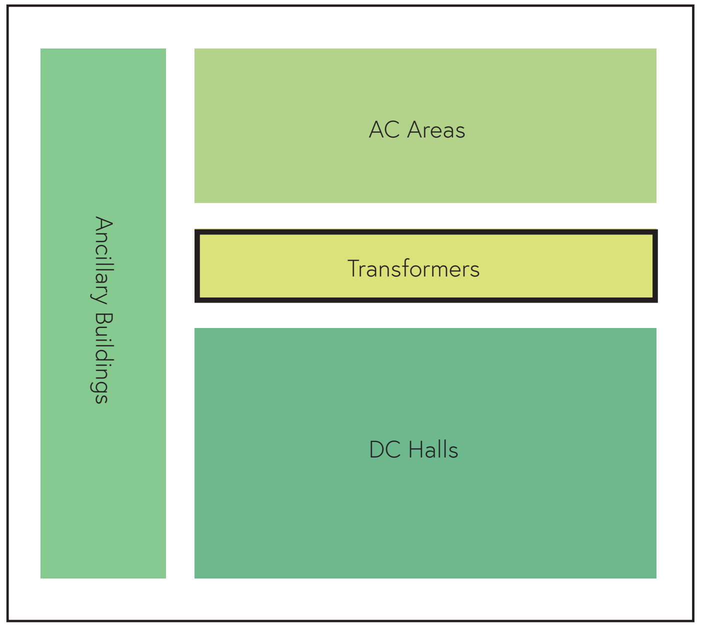
3.1 Converter Station

Transformers

The HVAC current from the Reactor Hall is stepped down to the voltage required to feed into the substation. There is a transformer for each AC cable, two sets of three-phase making six, plus a spare. The transformers have particular needs in terms of blast protection and noise that sets them apart from the rest of the AC equipment.

These are positioned between the DC Halls and the AC Areas. The current design convention is to position them away from the DC Halls to reduce the risk of damage in the event one fails. They are arranged in a set of three for each pole, with six in total plus, a spare that is not connected. Protective concrete blast walls are needed between each of the transformers, and these define the effective building height in this area. Subject to noise mitigation requirements there may be a need to enclose the six connected transformers in an acoustic attenuation enclosure. In this case, the detailed design should consider how the external envelop fits in with the scheme of the rest of the buildings.





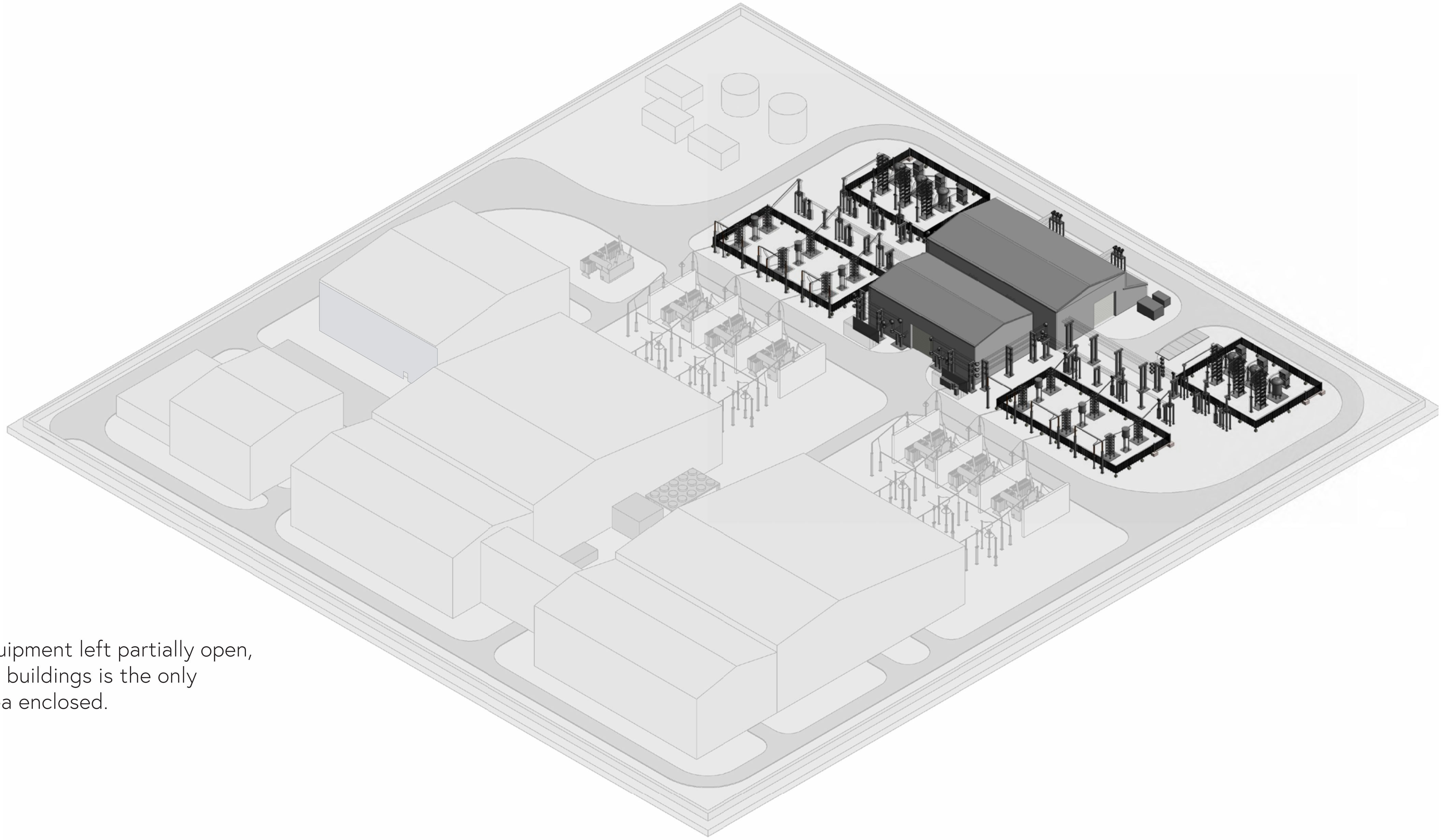
Equipment left open, away from the DC Halls.

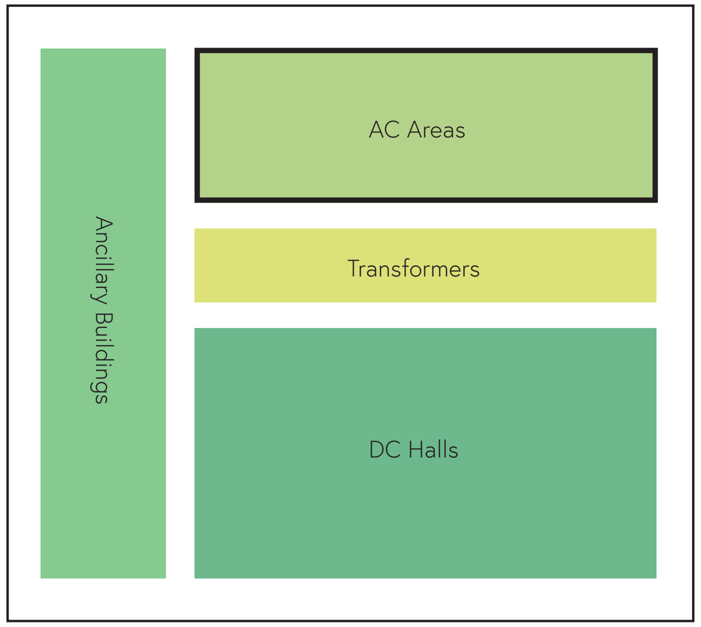
(Not to scale)

3.1 Converter Station

AC Equipment and Buildings

Most of the AC equipment can be located outside with a limited number of buildings. This equipment is mostly for cleaning up the current from the transformers and making sure it is ready to be put back into the wider grid. As most of the equipment is external there is limited architectural scope for this area.





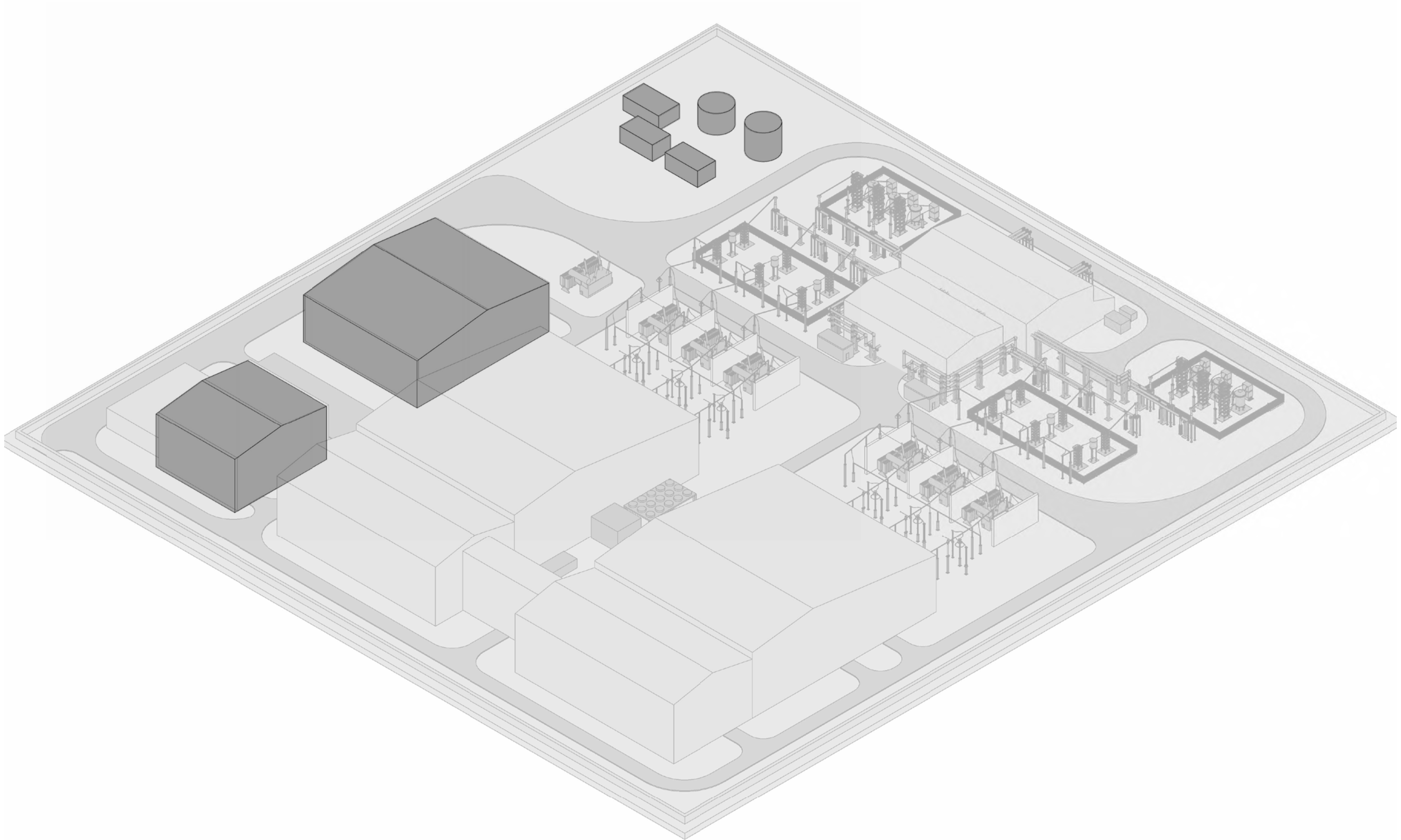
Equipment left partially open, AC buildings is the only area enclosed.

(Not to scale)

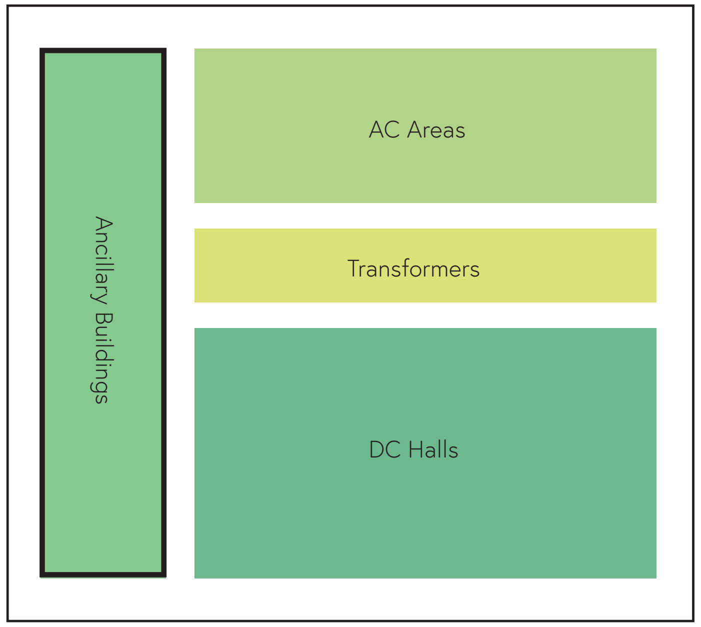
3.1 Converter Station

Ancillary Buildings and Equipment

There is a functional sequence to the other three area types that determines how they need to be arranged. However, within reason there is more flexibility of where the ancillary buildings such as the Spare Parts, Control, Security Office and others can go to suit the design intent for the site. There is also fire safety equipment such as water tanks and emergency generators which can be located to suit.



Enclosed buildings, with fire handling units located towards edge of the site



(Not to scale)

3.1 Converter Station

Vehicular Circulation

Within the converter station's fence line there will be a requirement for a perimeter road providing safe access for maintenance, equipment replacement and firefighting. This will set the buildings back from the perimeter. Within the site road access there is a requirement for a loop with larger radii. This is to allow the abnormal long load vehicles, primarily for replacing transformers, to circuit.

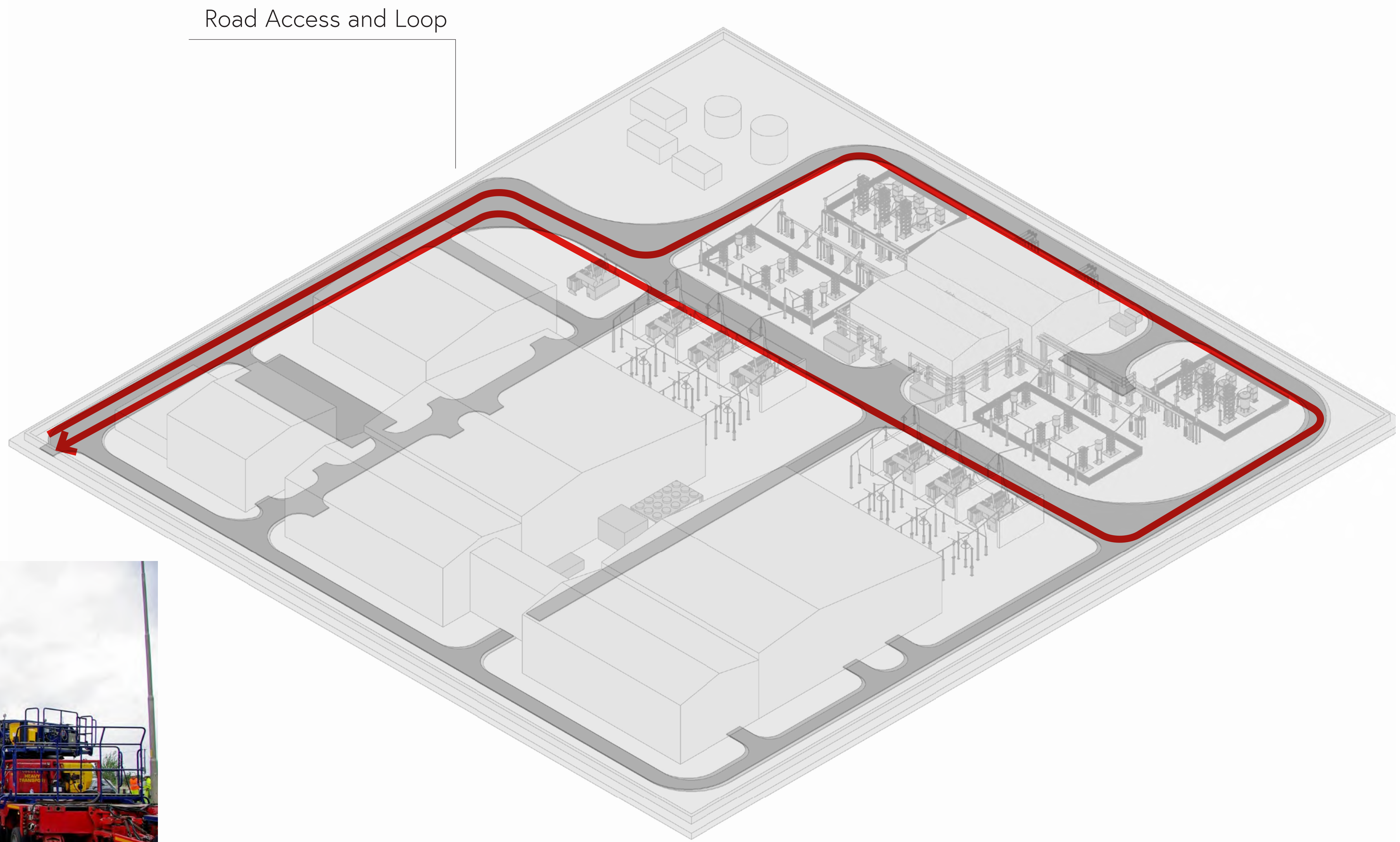


Image of large transformer being delivered to site on the abnormal indivisible load (AIL) vehicle.

nationalgrid.com/new-electricity-transformer-worcestershire-substation

DESIGN EVOLUTION

4.0

4.0 Design Evolution

4.1 Statutory Consultation

Engagement

Sessions have been held with the Local Planning Authorities (LPAs) to discuss the structure and content of the design principles, design approaches and masterplan. Where feedback from the LPAs has relevance to the wider approach, and not just the local geographical area, this has been applied to the design documents for both the Suffolk and Kent Onshore Schemes.

Feedback from the non-statutory and statutory consultation exercises is summarised in **Application Document 7.3 Design Development Report**, with detailed feedback provided in **Application Document 5.1 Consultation Report**. Where this feedback relates to converter station design, it has been considered in the development of the design principles and the design approach.

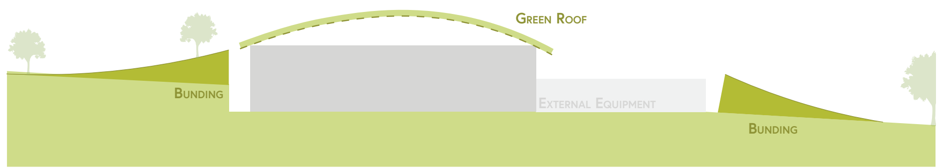
Six Architectural Approach options were prepared for use in the Statutory Consultation to help gather LPA and public opinion on what would be considered most appropriate for the site and locality. This included simple sectional/elevational diagrams that were prepared for the event banners, and a supplementary document available online, Converter station design – background to potential architectural approaches, which includes further information about the design approaches and illustrative computer-generated imagery (CGIs) of how they might look.

There have also been thematic meetings with LPAs that cover the converter station design principles and the colocation masterplan for Saxmundham. It is suggested that these are continued through the development of detailed designs ahead of the submission of statements and drawings for demonstration of compliance with the design principles.

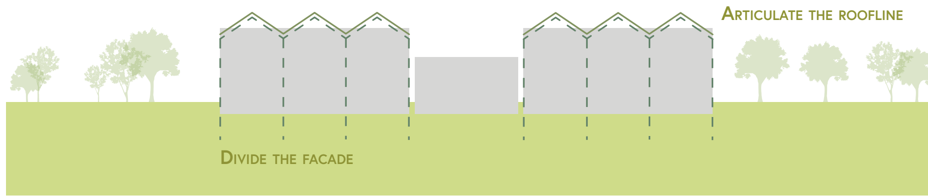
Enhanced Elevations

Colour

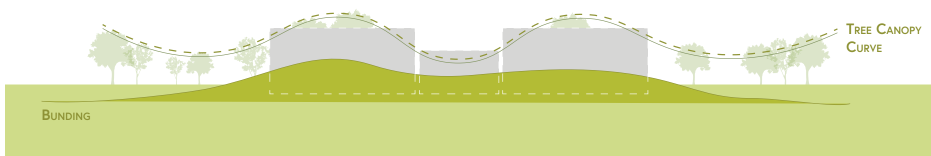
Green Roof



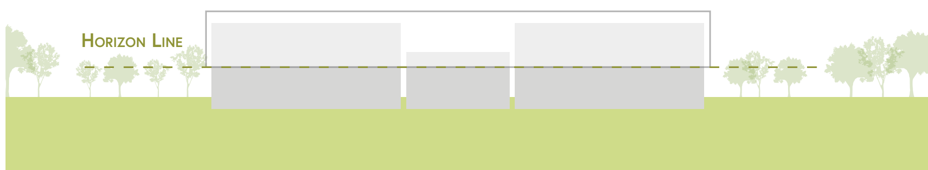
Agricultural Barns



Colour & Curve



Kinetic



4.1 Statutory Consultation

6 different architectural design approaches were presented during the statutory consultation in October 2023 for feedback.

It included the images below. The location of the CGI is not related to a specific key view.

Six Design Approaches

Vertical Banding

This approach uses vertical bands of differing shades and colours to visually divide the building form into smaller parts reducing the impact of the mass. The colour palette can be drawn from context to help blend into the background. This would take green/brown hues from the marsh and farmland in different seasons, and pale blues and greys from the wide skies of the open countryside.

Precedent

This approach has been used on a previous converter station project in Hunterston, western Scotland (image below). The vertical banding divides the long facade, breaking the mass into smaller, more distinct sections The context also means the building is mostly seen against the sky and not the landscape hence the paler grey colour palette.

Design Development

The visual (right) shows this cladding treatment applied to a form derived from the simplest structural solution with ridges, gables and eaves lines. It could equally be applied to other building forms with different roof profiles. The cladding in the image is flat however profiles could be applied to add texture.

A plinth section could be added to help connect the building to the ground. This could have darker colours allowing the upper section to be paler to relate more to the sky. As such features of the different approaches could be combined for best effect.

copyright Virtual Hunterston

Strengths

- Clean simple and established detailing and does not add to the building mass;
- Reduces the apparent length of facade; and
- Orientation works with viewing from different heights with varying relationship to the horizon.

Weaknesses

- Doesn't offer a means of transition between a connection with the ground and the sky unless combined with other techniques; and
- When viewed obliquely from the north, sheen on the flat cladding can override the colours.

4.1 Statutory Consultation

6 different architectural design approaches were presented during the statutory consultation in October 2023 for feedback.

It included the images below. The location of the CGI is not related to a specific key view.

Horizontal Banding

This approach uses horizontal bands of colour in a gradient that transitions between the darker green/brown colours of the ground and tree line, to the paler greys and blues of the wide open skies of the marsh. It is a common strategy for tall buildings in the landscape that break the horizon line.

Precedent

The recently constructed Viking Link converter station at Bicker Fen in Lincolnshire uses three bands of green, fading from dark at the base to light at the top. This is effective in the context as the site is so remote it is generally seen from very long distances and blends into the background of flat fenland and big skies. The green colour also works well with the style of agricultural buildings found in the area.

Design Development

The visual (right) shows this cladding treatment applied to a simplified form with parapets, which on reflection is not the most appropriate solution. It could equally be applied to other massing solutions which would probably do more to add articulation and reduce the apparent building form. Consideration needs to be given to how other features could stand out against flat areas of cladding, and whether a more contextual approach is required given the more complex setting.

Copyright Siemens Bickerfen

Strengths

- Can effectively transition between the colours of the ground, middle distance, and sky; and
- Common infrastructure cladding strategy (NEMO Link, Viking Link, consented Hornsea 4 substation).

Weaknesses

- The colour gradient works best where there is a consistent relationship with the horizon which is not the case in this location;
- Does not divide up the length of the massing; and
- Can look flat in the landscape.

4.1 Statutory Consultation

Green Roof

This approach aims to fold the roof down over the walls to reduce the height and impact of the elevations. The intention would be to combine this with a green roof and bunding of the landscape to give the impression of an artificial hill. There would be less reliance on selecting cladding colours as the planting would do the job of blending into the landscape.

Precedent

A similar concept was applied to Adnams distribution centre, to minimise the visual impact. It is roughly 17 km northeast of Site 3 near Saxmundham so is relatively local to that project.

Green roofs have been applied to Energy from Waste facilities (notably CopenHill, Copenhagen) and a substation near Ghent, but to do so on a converter station is unprecedented at this point in time. Therefore further technical assessment is required to determine suitability and flush out risks.

Design Development

In this location there is an opportunity for cut and fill however not as extreme as the CGI to the right. (This is a visual representation of the impact of green roofs on the landscape). The roofs of the DC Halls are likely too tall to offer visual amenity unless the roof is sloped into view.

Green roofs can have other benefits, such as habitat creation, even if not visible. Blue roofs (which don't have to be green) need to be flat to retain water for attenuation so would not work for the hill form.

Other technical concerns include irrigation to prevent die-back in dry weather and creating a fire spread risk. Typically green roofs need to be accessed (potentially mown) twice a year.

Copyright Aukett Swanke

6 different architectural design approaches were presented during the statutory consultation in October 2023 for feedback.

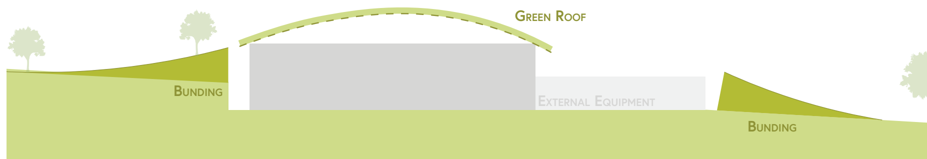
It included the images below. The location of the CGI is not related to a specific key view.

Strengths

- Green roofs could be used to provide habitats;
- Green/blue roofs could be used to provide additional attenuation of surface water run-off; and
- Green roofs could potentially protect the roof covering and reduce solar gains in the building.

Weaknesses

- Untested as a solution for a converter station and requires detailed design to demonstrate viability;
- Concern over regular access for maintenance; and
- Would add to the roof loading on long spans and add thickness (height) to the roof.



4.1 Statutory Consultation

6 different architectural design approaches were presented during the statutory consultation in October 2023 for feedback.

It included the images below. The location of the CGI is not related to a specific key view.

Vernacular / Gables

To break up the form of the building by articulating a collection of gable forms giving the impression of a cluster of barns.

Precedent

The area has examples of farm courtyards with large clusters of barns and outbuildings. The roofs have an organic composition that is hard to replicate in a single facility without contrivance, especially when the clear height and internal layouts need to retain flexibility.

Design Development

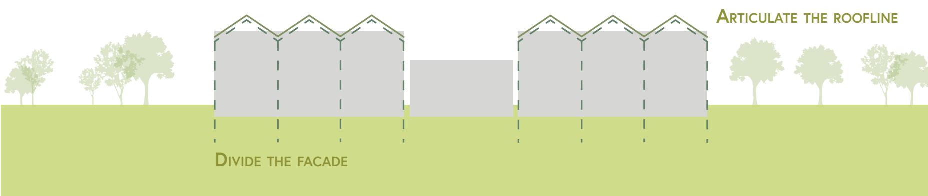
The visual shows the apparent height of the buildings reduced by placing an earth bund in front. This is unlikely to be viable without importing a lot of material to site (adding traffic and CO_2 impacts). Without this it is hard to relate the mass to agricultural buildings which are only half as tall.

However the use of sinusoidal and half-round cladding profiles could be applied to the plinth level of the buildings to create a base more connected to the ground and a background to screen planting.

Given the height of the DC Halls, having the gables formed in dark material would create a more impactful silhouette on the skyline. This would be counter to the preference for forming background development that blends into the landscape.

Strengths

- Breaks up the form into smaller parts that are easier to relate to vernacular buildings such as barns.



Weaknesses

- Clear internal height requirements limit the range of the roof pitch without ridge heights exceeding the maximum;
- Valley gutters are unsuitable for this type of building limiting the scope of the form;
- Natural materials are not suitable for a building of this height, would need to be metal; and
- Very dark cladding runs the risk of fading over time and attracting heat gains requiring more cooling.

4.1 Statutory Consultation

6 different architectural design approaches were presented during the statutory consultation in October 2023 for feedback.

It included the images below. The location of the CGI is not related to a specific key view.

Curved Profile

This approach uses curvature of the roof and the top edge of the elevations to soften the form of the building and help the profile blend in with the context.

The elevations also feature a pattern and texture which could be adapted to blend in and break up the flat surfaces.

Precedent

Curved forms are more associated with Energy from Waste facilities, such as the Ardley ERF in Oxfordshire (picture below). This is because the taller elements can be gathered towards the centre of the mass. This is more difficult with the DC Halls in a converter station. This type of expression tends to making landmarks which draw attention, something to void in this instance.

Design Development

The visual (right) shows the curving forms alongside rolling tops of earth bunds. It is unlikely that bunds of this scale will be viable in this location. The cladding shows a means by which the vertical and horizontal banding can combined to create a more textural surface that could transition between the ground and sky as well as creating variation along the length of the building. This would reduce the visual impact of items like rainwater pipes and louvres.

Depending on how this cladding surface was constructed, the top edge could be feathered as shown to make a lighter connection to the sky and hide the roof plane.

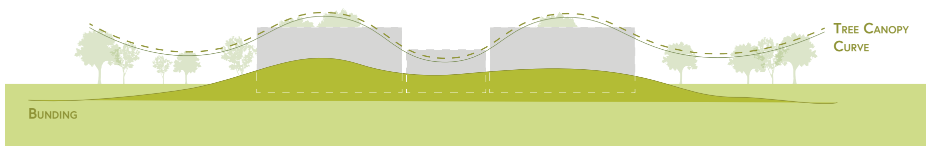
Copyright University of Oxford

Strengths

- Opportunity for a softer, more natural edge where the building meets the sky;
- Cladding design provides a more organic pattern breaking up the form; and
- Could be combined with a green roof.

Weaknesses

- Clear internal height requirements limit the range of roof curvature without exceeding the maximum height; and
- Barrel vaults tend to create large gable elevations, whereas 3D curves complicate the large space structure.



4.1 Statutory Consultation

6 different architectural design approaches were presented during the statutory consultation in October 2023 for feedback.

It included the images below. The location of the CGI is not related to a specific key view.

Overcladding

This approach uses a separation of the underlying technical box from the decorative cladding to allow more freedom in how the building is articulated without compromising performance. Gaps or perforations in the top layer could add depth and variation reducing the flatness of the form.

Precedent

On the coast east of Saxmundham there are plans for a nuclear power plant on the Sizewell site. Early plans for Sizewell C project includes multiple ways of overcladding. This concept comprises prefabricated panels that expresses geometric shapes that are pressed into it and contains various colours to create a complex facade. The design is a sensitive response to the surrounding landscape by creating variations in relief, tone, colour and texture.

Design Development

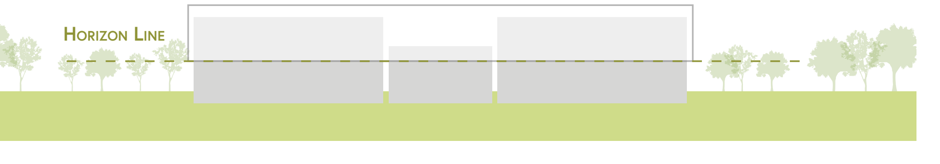
The visual (right) shows the overcladding wrapping around to simplify the building form. This may work better with the pattern but risks adding bulk to the massing.

The pattern shown features loosely fitted metallic tiles that can flutter in the wind. This kinetic pattern would add natural moving shadows and highlights on the surface. The intention being that the movement replicate clouds in the sky and the rustling of leaves on trees in the wind. The reflectiveness of the surface would need to be considered in respect of glare with a less polished coating being in more keeping with the context.

Copyright EDF Energy

Strengths

- More choice of cladding colours, profiles and textures compared to standard cladding systems;
- Can create depth in the envelope with shading reducing the flatness of standard cladding; and
- Can be used to hide gutters, pipes, and louvres.



Weaknesses

- More complex cladding system, need to consider a hanging system that doesn't compromise the weather/air tightness of the envelope; and
- Introduction of kinetic or reflective elements would require bespoke analysis and testing for glare, degradation, noise based on previous experience.

4.2 Design Review Panel Presentation

Design Review Panels

The use of an independent design review panel (DRP) is recommended on several levels:

- It is encouraged in NPS EN-1;
- It is suggested in the NIC Design Group's handbook on project level design principles as a means of providing 'evidence how design principles have directly informed decision making';
- It is recommended by the Institute of Civil Engineers (ICE) as part of the design governance structure; and
- Is supported by the host LPAs

The usual process is for the LPA to refer applicants for significant projects, in terms of scale and impact, to arrange a voluntary DRP. East Suffolk Council (ESC) did so in the period after Statutory Consultation, and in the interest of ensuring both ends of the project get equal treatment, National Grid suggested to Thanet District Council (TDC) that the same be done for the Kent converter station as well.

Both ESC and TDC have affiliations with Frame Projects, an independent design review body operating across England. This was advantageous as by working with Frame it was possible to organize an overlap in the panel members for both reviews for consistency.

Each DRP was undertaken over the course of a day, using an established formal structure from Frame but with additional time allowed for:

- A longer site visit (morning session), given the wide area covered by key views; and
- A longer briefing session, for both LPA and National Grid, to allow the DCO process to be explained and set the scope for discussion.

For Suffolk the LPA briefing session was led by the case officer from ESC with technical officers from Suffolk County Council in attendance as observers.

The DRP presentations made use of work in progress on the design approaches as a means of guiding discussion of how the design principles could be applied. The design principles themselves were not included in the discussion directly, as the preparation and panel discussion time allocated would not cover going into such detail.

The DRP days were two weeks apart (23 October 2024 and 5 November 2024) with Kent first and Suffolk second. The presentation and responses to the Suffolk panel report are included in section 4.2.

It has been recommended that further DRPs be undertaken for both Suffolk and Kent at a point to be confirmed when a preferred design approach addresses the selected equipment supplier's arrangements and building sizes. It was suggested that these could be done as a shorter Chair's Review, a format with just the Chair and no other panel members, given a Formal Review, with the Chair and a panel of four further experts, has already taken place.

4.2 Design Review Panel Presentation

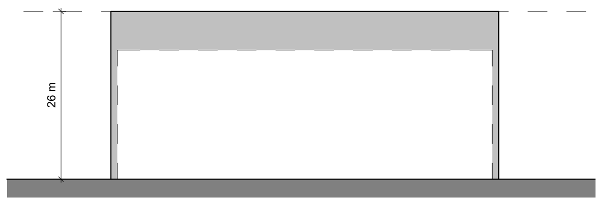
Panel Presentation

Reducing Apparent Height (Conventional Roof Forms)

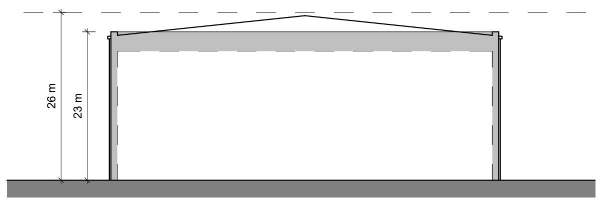
- The massing and locations of buildings within the limits of deviation (LOD) of the converter station compound will be determined by the supplier with very limited scope for this to be adapted to reduce impact as there are restrictive criteria for the function of the facility;
- These design explorations have focused on the opportunities to adapt the cladding of the elevations to create patterns of colour and texture which could help blend into the background;
- Opportunities are being explored, to take the function of the facility and use it as inspiration for the cladding design; and
- This design exploration is not for the purposes of creating a concept design. It is intended to inform the Site Specific Design Principles so they can define the design requirements for the post-consent designers.

The Design Review Panel was held on 5 November 2024 in the Fromus Centre in Saxmundham following a site visit taking in a selection of the representative views used in the LVIA and also used to demonstrate the design approaches.

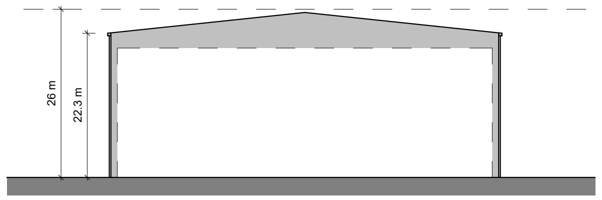
Baseline (Maximum)



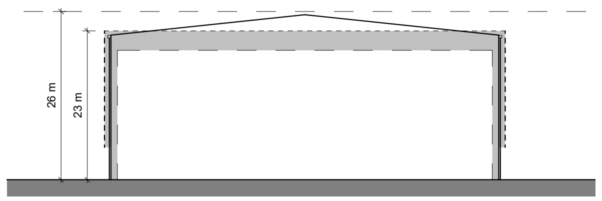
Hipped with Low Parapets



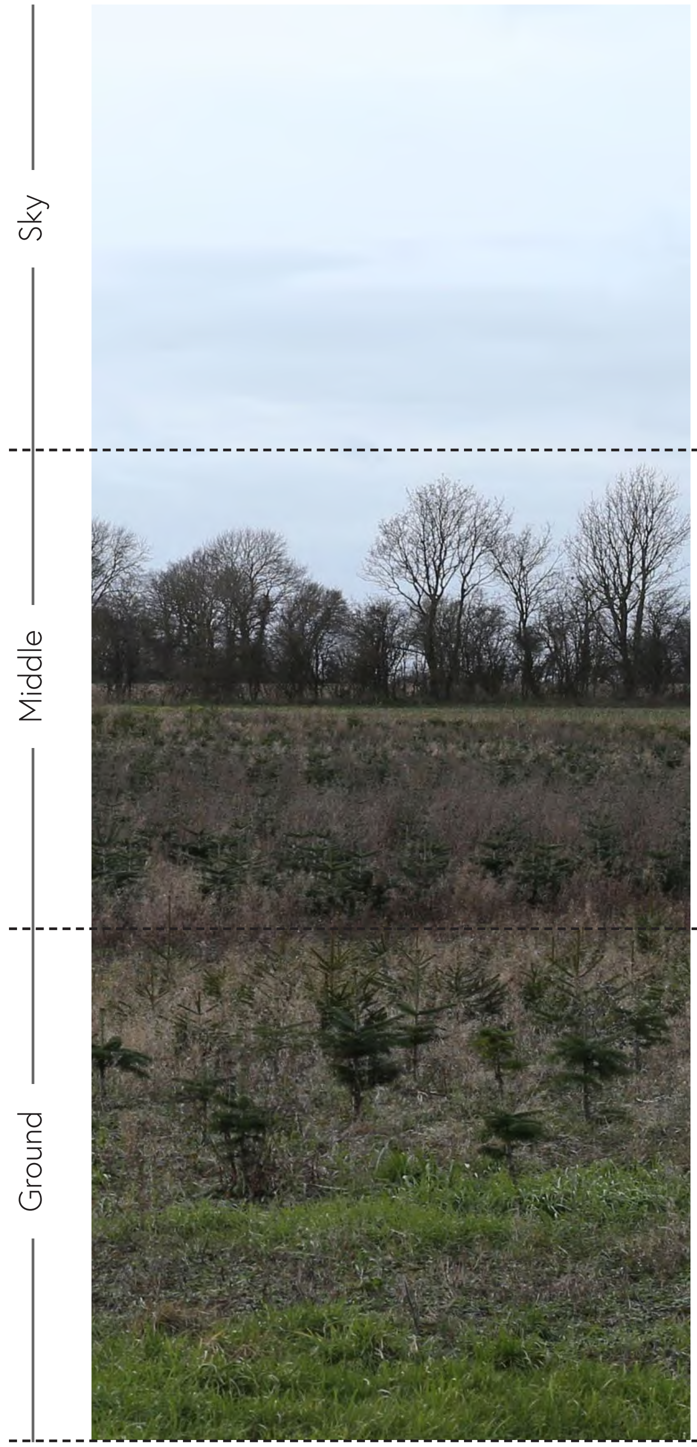
Typical Gable (6 degree roof)



Hipped with Eaves and Overcladding



Landscape / Context



Elevation Treatment

- Sky tends to change in colour and texture throughout the year.
- Clear skies would have more lighter blue tones.
- Grey skies during the colder and wet seasons.
- Clouds add texture and shadows, adding white and grey tones to this section.

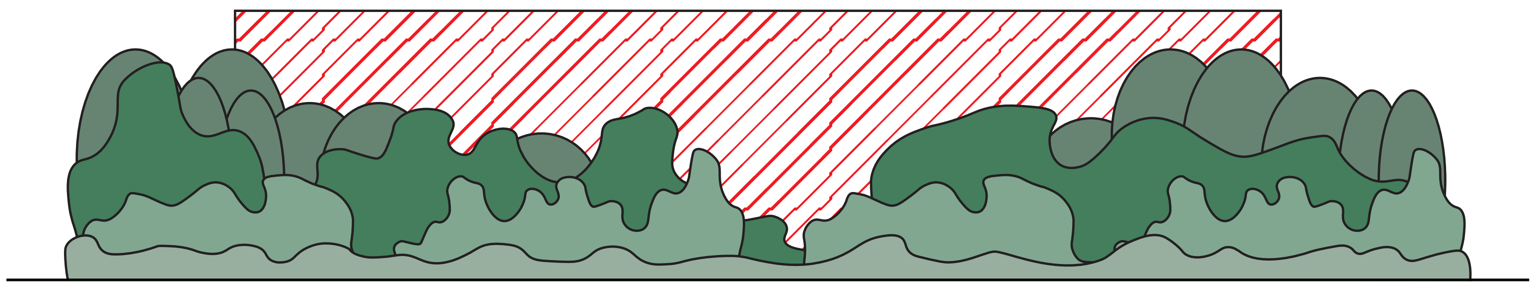
- In this section you will find trees, greenery and other existing infrastructure
- There are varying colours and textures from leaves, branches, flower.
- The way the sun hits these elements will cause more variation in the shades and colours.
- These natural elements cause varying depths and textures.

- The ground has more solid earthier tones.
- Colours vary throughout the year, however stay shaded with darker tones.
- When stood looking at this angle shadows are most prominent in this area.
- A solid base with earthy tones would represent the Ground most appropriately.

4.2 Design Review Panel Presentation

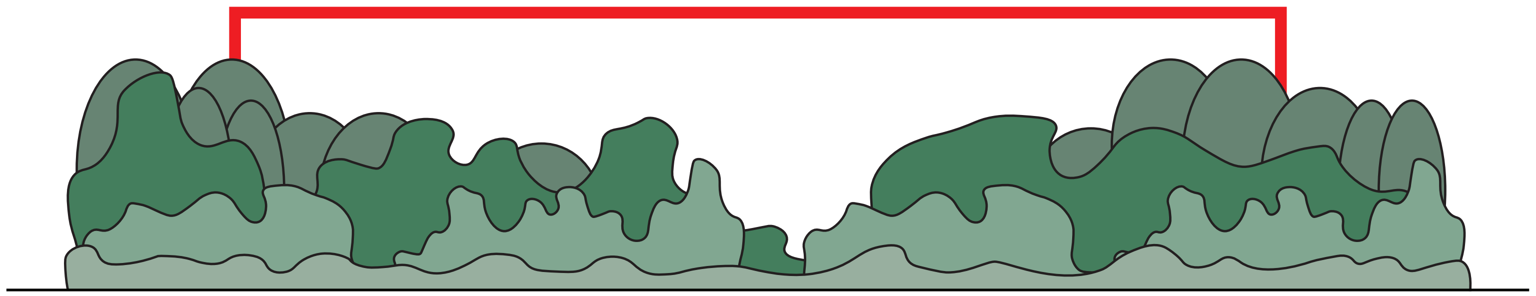
Scale and Massing

The scale and massing is driven by the space requirements of the equipment. This will be determined by the selected supplier and there is limited opportunity for the design team to influence this. The design principles require that opportunities get taken with a view to reducing height, and positioning the mass in a way that reduces impact. This should be demonstrated through rendering the proposal in the key views. This would happen after the DCO submission through engagement with the request for proposal (RfP) process. Assumptions cannot be taken on what can be achieved therefore the Rochdale Envelope has to be what is consented.



Hard, Straight Edges

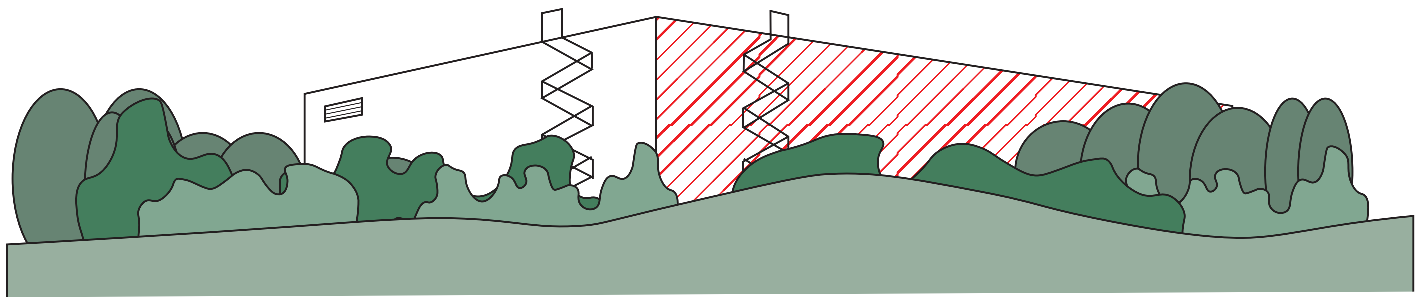
The large internal clearances, and stringent requirements for weather and air-tightness tend towards very simple volumes that do not describe the complexity of the equipment within. The selected suppliers will not accept untested forms and articulation that differ from their standards. This is due to the sensitivities of electrical equipment to layout and spacing. The design principles require that opportunities are sought to soften the edges without compromising the technical box. There may be limited opportunities regarding roof pitches, arrangement of ancillary buildings and articulation of a decorative outer layer of cladding whilst the inner part remains very simple.



4.2 Design Review Panel Presentation

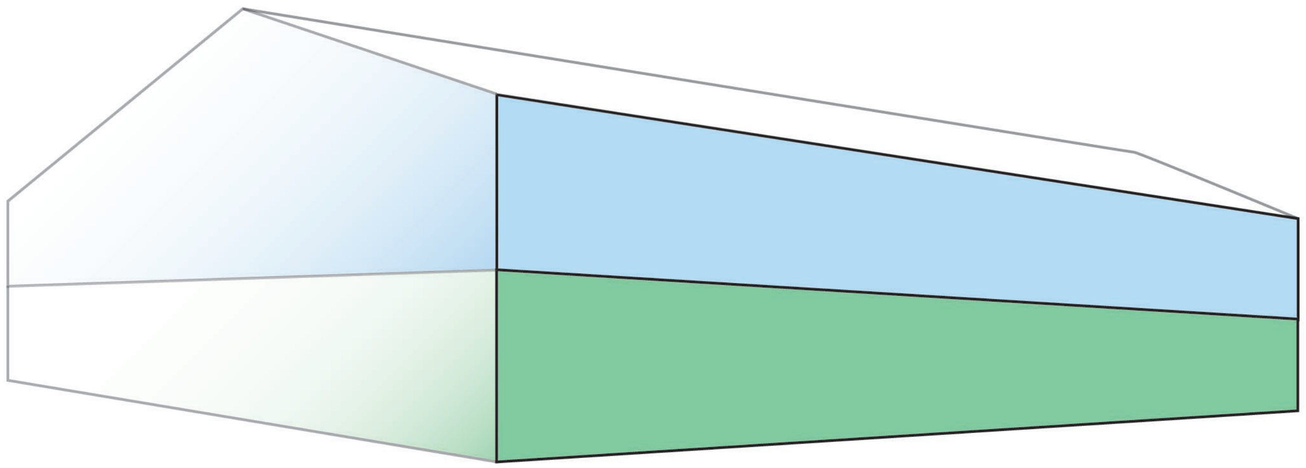
Flat Surfaces

Conventional cladding for this type of building is trapezoidal built-up or composite systems with powder coated steel. At distance these profiles tend to look flat which makes them stand out against the softer textures of the landscape setting. However these systems are tested and offer the performance guarantees required for a sensitive facility where asset protection is a consideration in addition to the Building Regulations focus on protection of life. There are carrier panel systems that, in theory, would allow the inner technical envelope to remain standard whilst a more bespoke outer layer can be designed to address visual impact. The design principles should set out a requirement to design a more textured surface using this strategy. The other issue with these flat surfaces is that they make other features like louvres or access ladders conspicuous.



Sheen on Powder Coated Finishes

Conventional cladding systems tend to be powder coated steel. Even if avoiding the glossiest coatings the sheen on this cladding can result in unintended consequences for visual impact in relation to the apparent colour of envelope. Oblique surfaces will tend to pick up sheen which masks colour variations and makes the cladding appear a single coloured surface. Visible low pitch roofs can be appear very bright as they catch the sunlight, especially when a viewed form the north side which puts the elevation in silhouette. The lesson here is that showing colour compositions in elevation alone, without showing them with real world lighting is insufficient. Design strategies that reduce the sheen on the surfaces need to be employed and mandated through the design principles. Perforation of the top coat is one method of reducing the sheen by reducing the reflective surface area. It should be used over a dark technical box to avoid moire interference patterns from shadows in direct sunlight. The other is to use sheen to create shading by angling the top layer of the cladding. Used together these techniques can be a proxy for how the tree canopy creates a softer texture within the landscape. Apart from Autumn leaf colours are fairly consistent and are similarly glossy to cladding panels. The variation comes from the gaps between them and the changing angles.



4.2 Design Review Panel Presentation

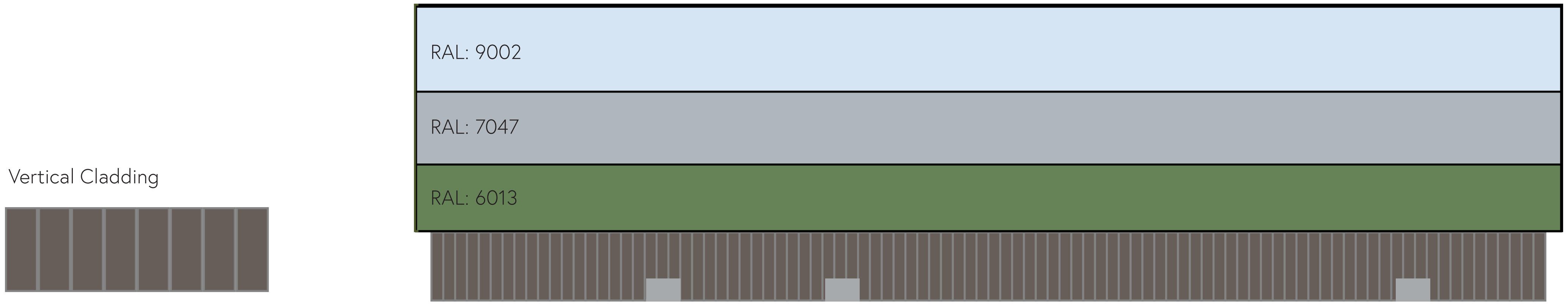
Colour Gradients

Gradient of colours from the context

Based on the colour research in the baseline analysis, these colours can be used to design a facade that is site specific.

Simplifying the colour gradient (Cladding)

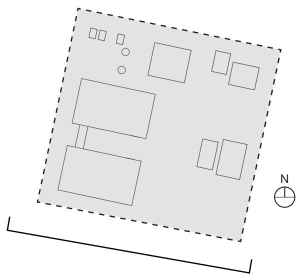
The number of bands, colours and transition heights would be adapted to the context. However this strategy can be less effective where the horizon and background varies.

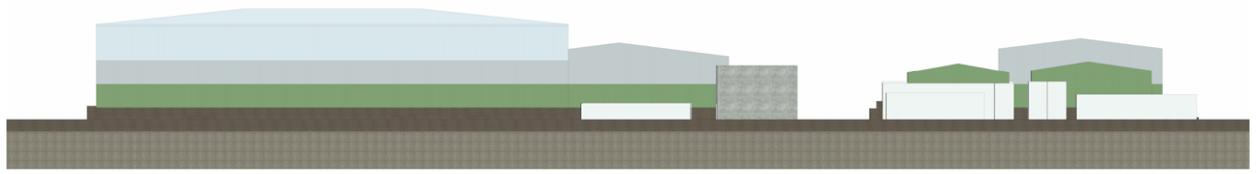


4.2 Design Review Panel Presentation

Facade Exploration: Horizontal Articulation

This is one of the most common and simple methods deployed for helping tall infrastructure/industrial buildings blend into the landscape. The balance of the gradient and mix of colours would be adapted to suit the context. Testing this approach also gives a benchmark by which the value added through more complex designs can be evaluated.





Viewpoint 2

Viewpoint 4

Viewpoint 1

4.2 Design Review Panel Presentation

Facade Exploration: Horizontal Articulation

Viewpoint 15

Viewpoint 5

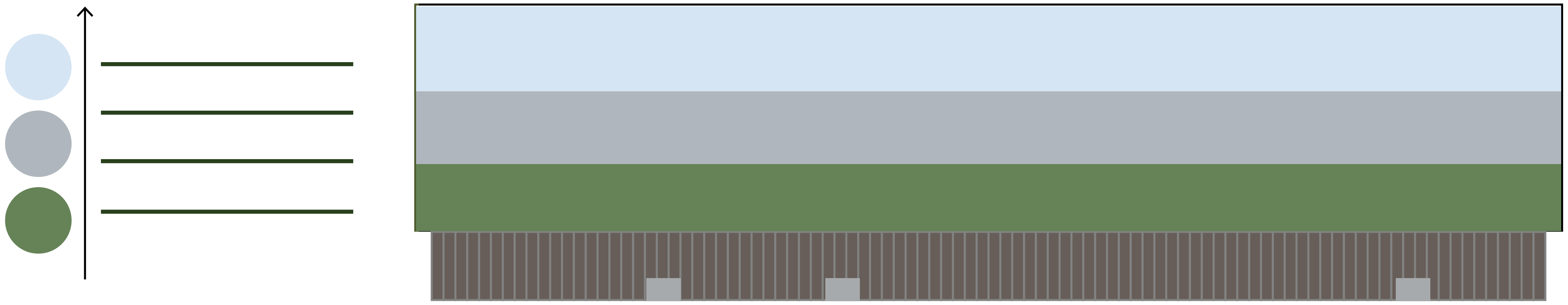
Viewpoint 19

Viewpoint 21

4.2 Design Review Panel Presentation

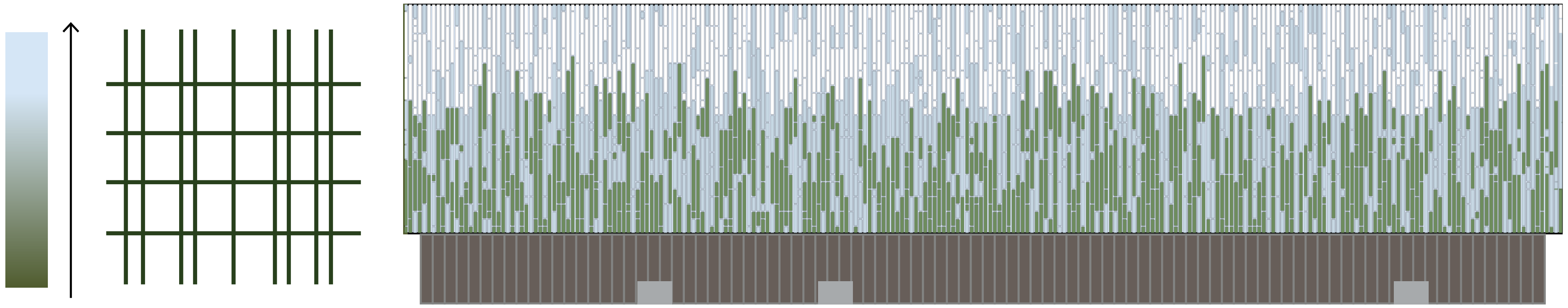
Facade Development: Horizontal and Vertical Articulation

Horizontal Articulation



This adaptation of the horizontal banding introduces a vertical rhythm to break up the strong horizontal lines and relate more to the soft edges of the natural landscape. It allows the height of each band to be adapted to suit the tree line as seen from each side.

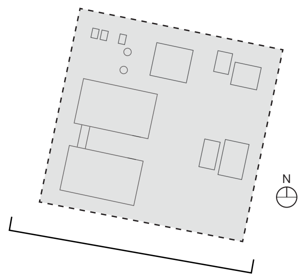
Combining Horizontal and Vertical Articulation

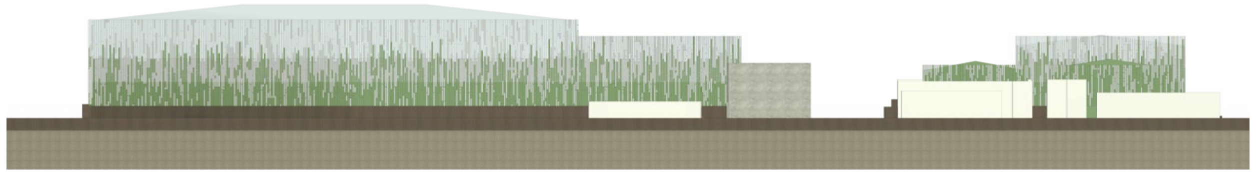


4.2 Design Review Panel Presentation

Facade Development: Horizontal and Vertical Articulation

A staggered panel placement can introduce a higher level of complexity to the facade, resulting in a more dynamic interplay of shadows and variations in colour. This arrangement not only adds visual interest but also enhances the building's aesthetic by creating depth and a sense of movement across its surface.





South Elevation of Converter Station (Not to Scale)

Viewpoint 2

Viewpoint 4

Viewpoint 1

4.2 Design Review Panel Presentation

Facade Development: Horizontal and Vertical Articulation

Viewpoint 15

Viewpoint 5

Viewpoint 19

Viewpoint 21

4.2 Design Review Panel Presentation

Facade Exploration: Enhanced Facade

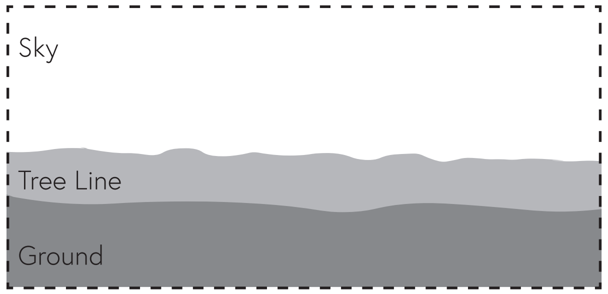
The enhanced facade design will incorporate a more site specific design, where important site views are used to distinguish a pattern gradient on the face. Using panels of a exterior facade, colours and reflections can be tested to see how this affects the visual impact of the converter station.

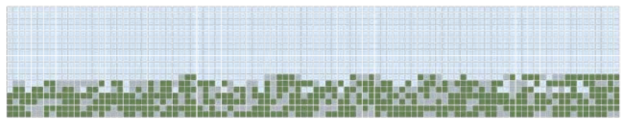
1, 2 and 4 are important viewpoints that need to be considered when looking at the facade.

Viewpoint 1

Above the Horizon. The blend of the colours in this view need to flow from the ground to the sky effortlessly. There is a prominent tree line that could be translated into the facade.

Indicative Facade Pattern

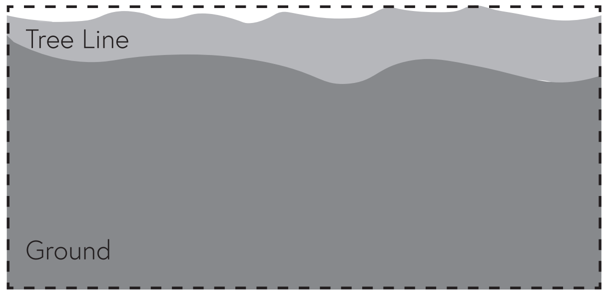


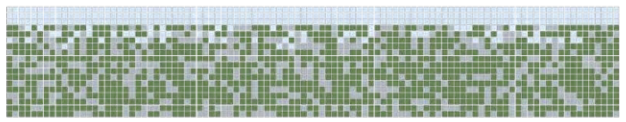


Viewpoint 2

Below the Horizon. Ground and Tree colours in this view need to be more prominent.

Indicative Facade Pattern

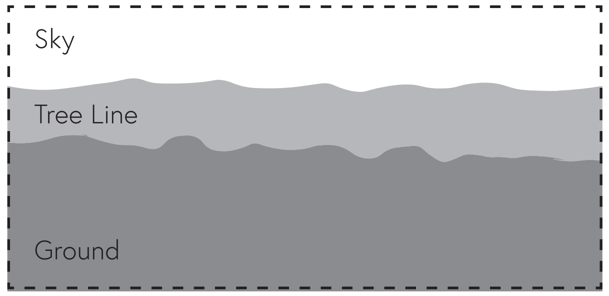


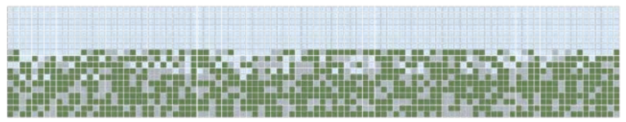


Viewpoint 4

Above the Horizon, but behind trees and other greenery. Could have more sky or tree colours.

Indicative Facade Pattern



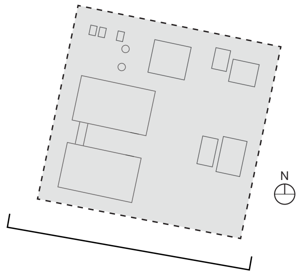


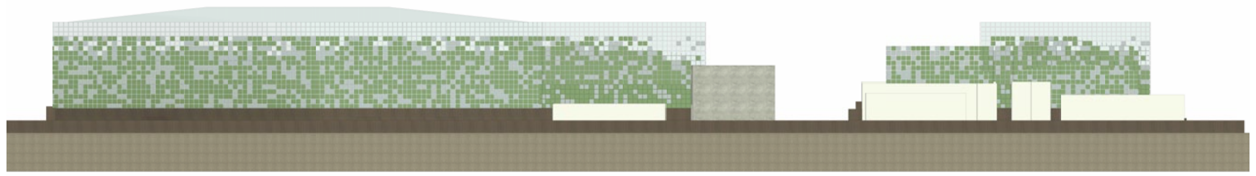
4.2 Design Review Panel Presentation

Facade Exploration: Enhanced Facade

The enhanced facade design will incorporate a more site specific design, where important site views are used to distinguish a pattern gradient on the face. Using panels of a exterior facade, colours and reflections can be tested to see how this affects the visual impact of the converter station.

VP 4, 8, 10 and H3 are important viewpoints that need to be considered when looking at the facade.





South Elevation of Converter Station (Not to Scale)

Viewpoint 2

Viewpoint 4

Viewpoint 1

4.2 Design Review Panel Presentation

Facade Exploration: Enhanced Facade

Viewpoint 15

Viewpoint 5

Viewpoint 19

Viewpoint 21

4.2 Design Review Panel Presentation

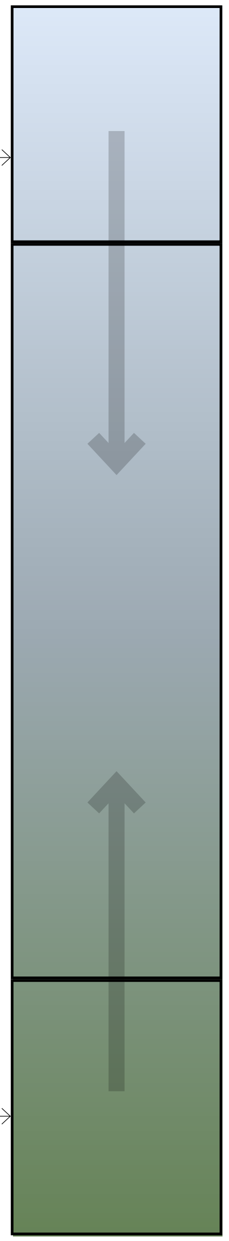
Facade Exploration: Developed Enhanced Facade

One way to add variation to the surface is to use rainscreen panels over a simple carrier panel envelope. The rainscreen is more free for design expression as it no longer needs to be weathertight. By introducing different angles into the cladding sheen on the surface can be used to create more natural variation. The introduction of shadow gaps and openings into the cladding panels can add depth which is in keeping with the texture of the tree canopy.

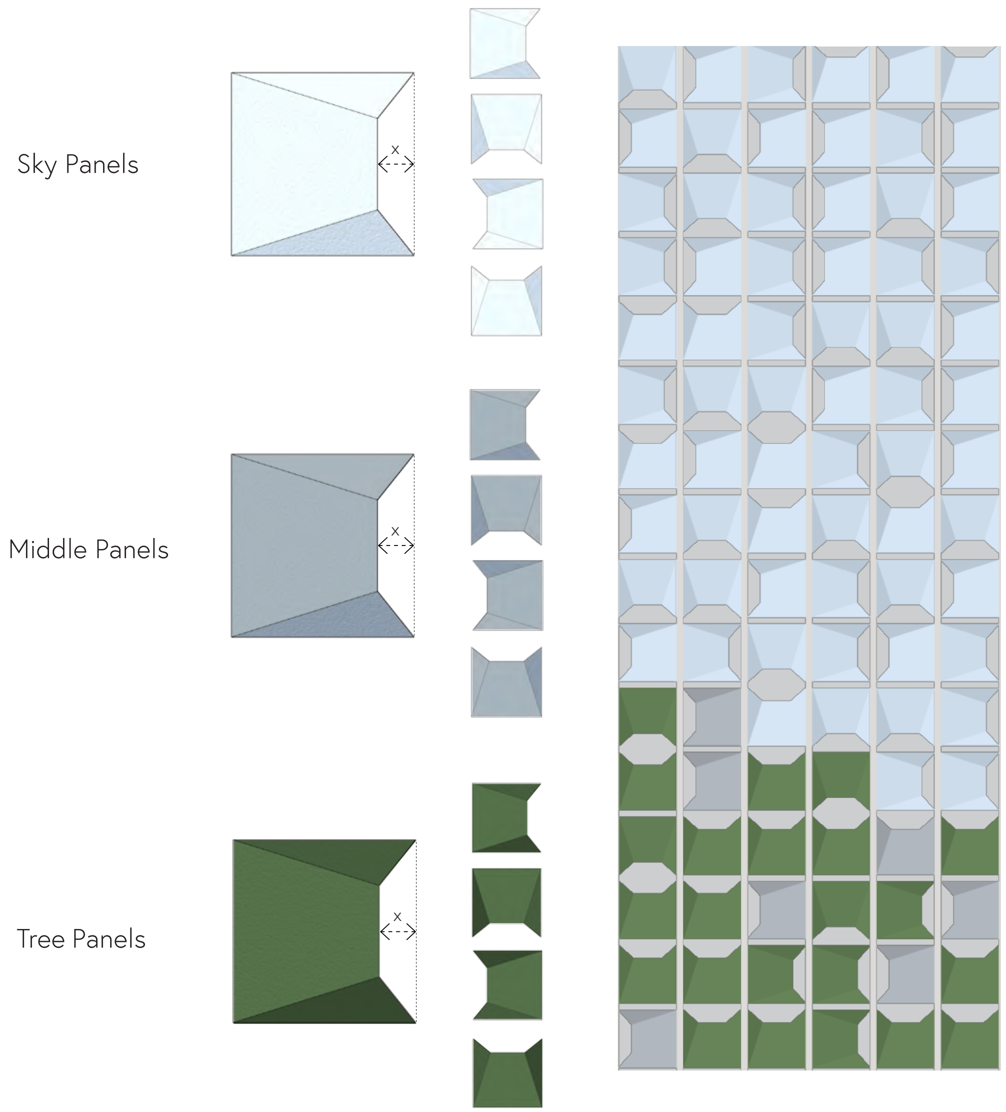
3 panel types, each with a distinct colour from the chosen site colours, will be distributed similarly to the Enhanced facade above. Each panel type will be rotated by 90 to 180 degrees, increasing the variety of panel designs. The shadows cast by the panels will produce a greater range of shades and colours.

Setting

Colour Gradient



Panel Design / Rotations



Sheffield 'Cheesegrater'

Copyright mcmedia

Sizewell C

Copyright EDF Energy

4.2 Design Review Panel Presentation

Facade Exploration: Developed Enhanced Facade

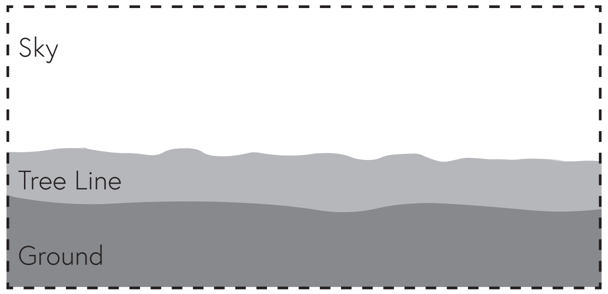
This developed enhanced facade will incorporate the same principles as the previous design. These important site views are used to distinguish a pattern gradient on the face.

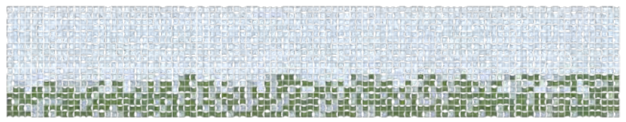
1.2 and 4 Are important viewpoints that need to be considered when looking at the facade's elevations.

Viewpoint 1

Above the Horizon. The blend of the colours in this view need to flow from the ground to the sky effortlessly. There is a prominent tree line that could be translated into the facade.

Indicative Facade Pattern

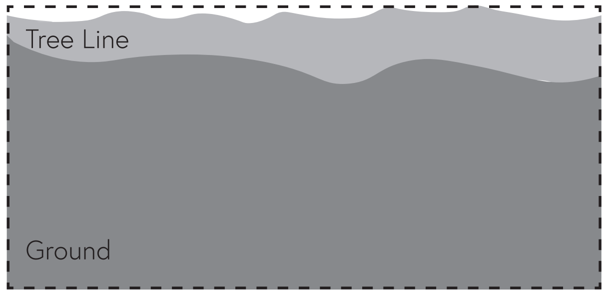


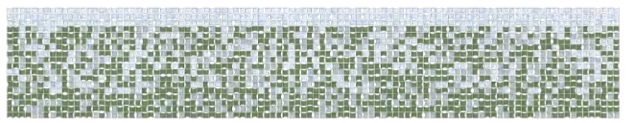


Viewpoint 2

Below the Horizon. Ground and Tree colours in this view need to be more prominent.

Indicative Facade Pattern

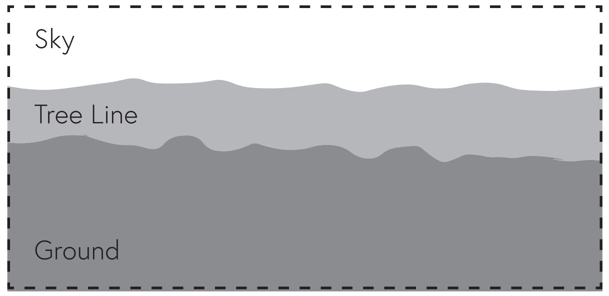


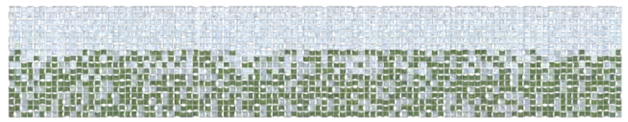


Viewpoint 4

Above the Horizon, but behind trees and other greenery. Could have more sky or tree colours.

Indicative Facade Pattern

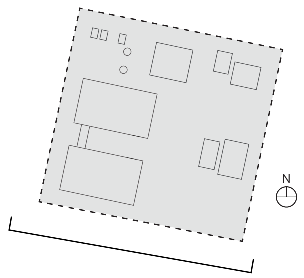


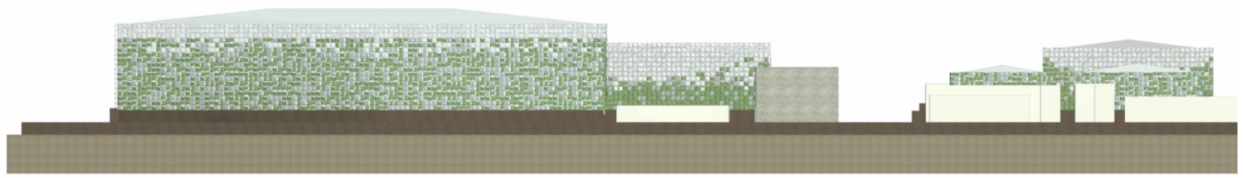


4.2 Design Review Panel Presentation

Facade Exploration: Developed Enhanced Facade

This method could be used to blend the facade into the surroundings by distributing the panels in a way that mimics the natural and organic tree lines, creating a gradient or irregular pattern that reflects the varying heights and textures of the trees.





South Elevation of Converter Station (Not to Scale)

Viewpoint 2

Viewpoint 4

Viewpoint 1

4.2 Design Review Panel Presentation

Facade Exploration: Developed Enhanced Facade

Viewpoint 15

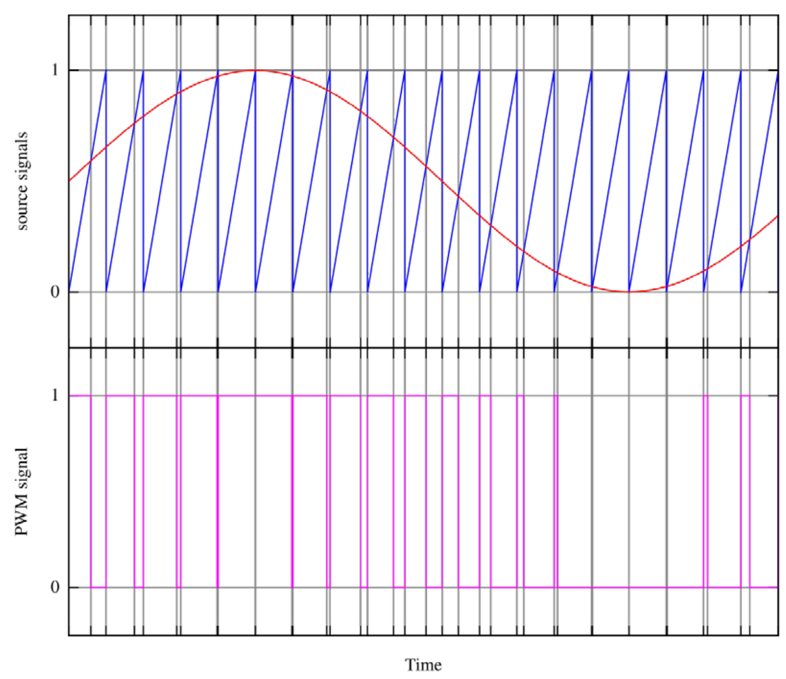
Viewpoint 5

Viewpoint 19

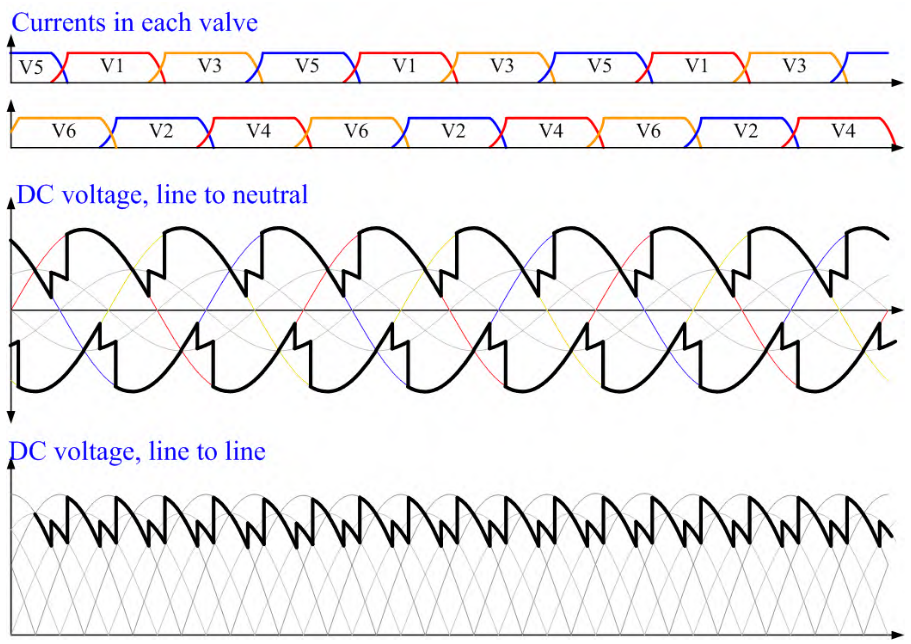
Viewpoint 21

4.2 Design Review Panel Presentation

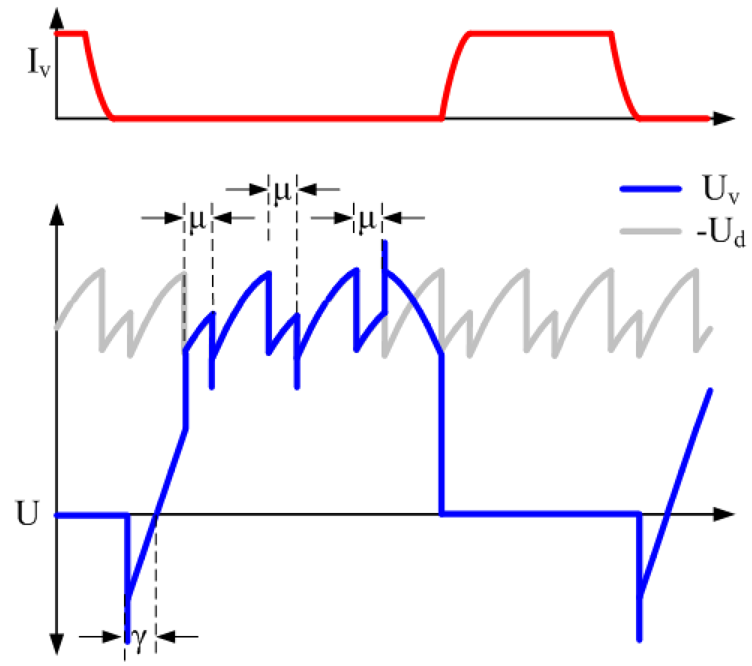
Pulse Width Modulation (PWM) Graph



Rectifier Graphs



Inverter Valve Voltage and Current Graph



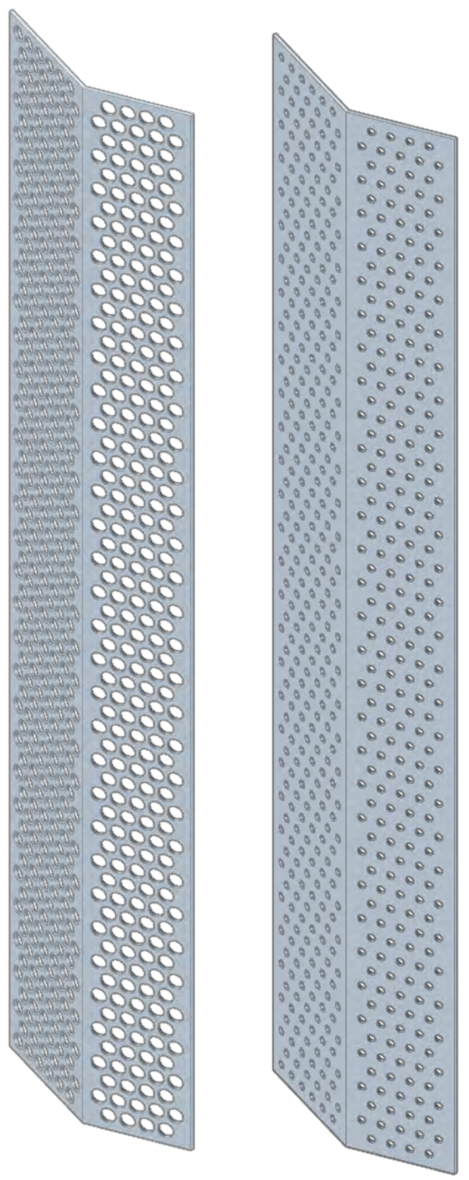
The graphs above illustrate aspects of the conversion process from alternating current (AC) to direct current (DC) within the converter station. In this section, patterns within these graphs are tested on how they relate to a panel system on the facade of the converter station. This connection creates a more visually specific link to the processes occurring inside the converter station's valve halls, where the AC to DC conversion takes place. By integrating these graphical patterns into the facade design, the exterior reflects the technical activity and energy transformation happening inside.

NordLink Interior view of the Valve Hall

4.2 Design Review Panel Presentation

Facade Exploration - Perforated and Textured Panels - Staggered Facade

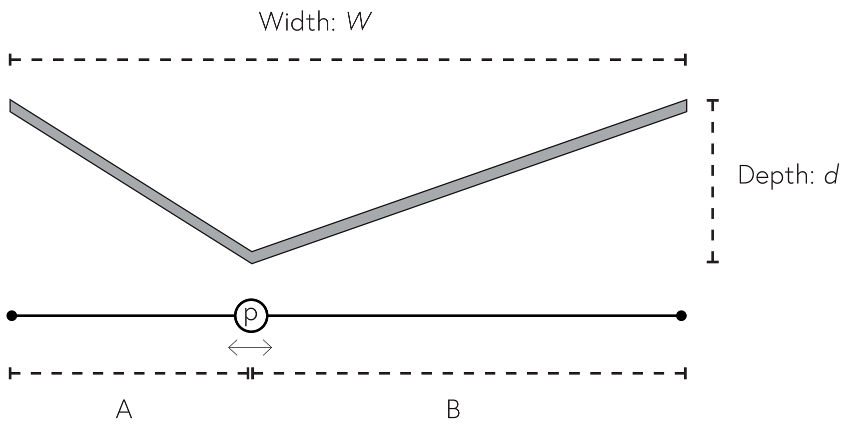
Panel Types



Panel Type 1

Panel Type 2

Plan View of Panel (Not to Scale)

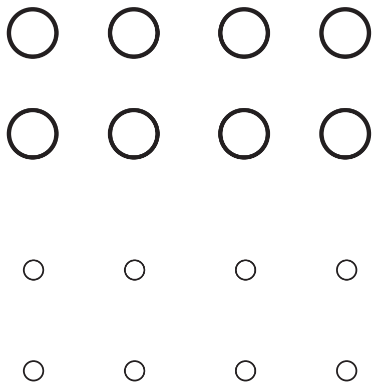


Parameters that can be altered:

Width (*W*)	= 3000mm
Depth (*d*)	= 100mm
Position of point p on *W*	= 40%

= 40% → Length of A = 1200mm; Length of B = 1800mm

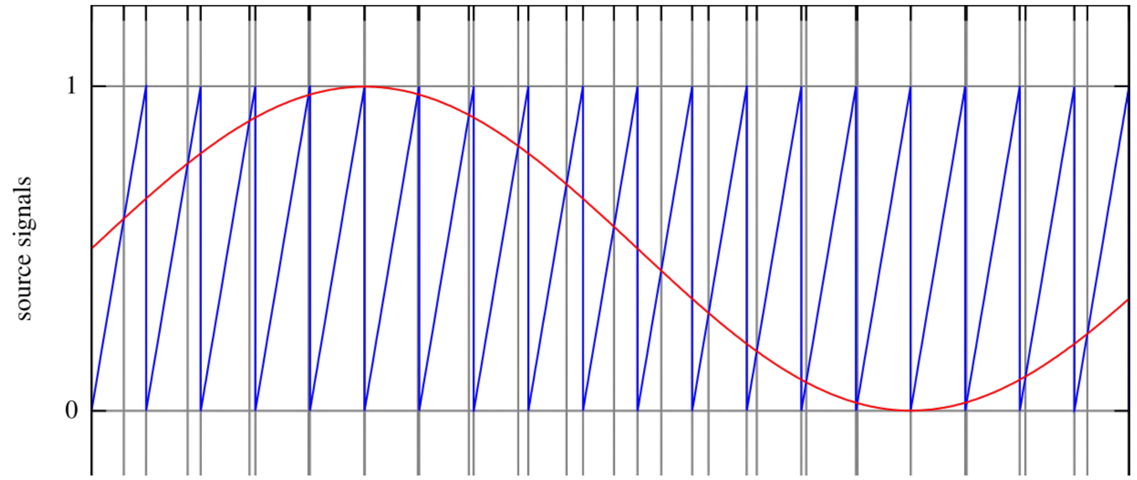
Perforations (Not to Scale)



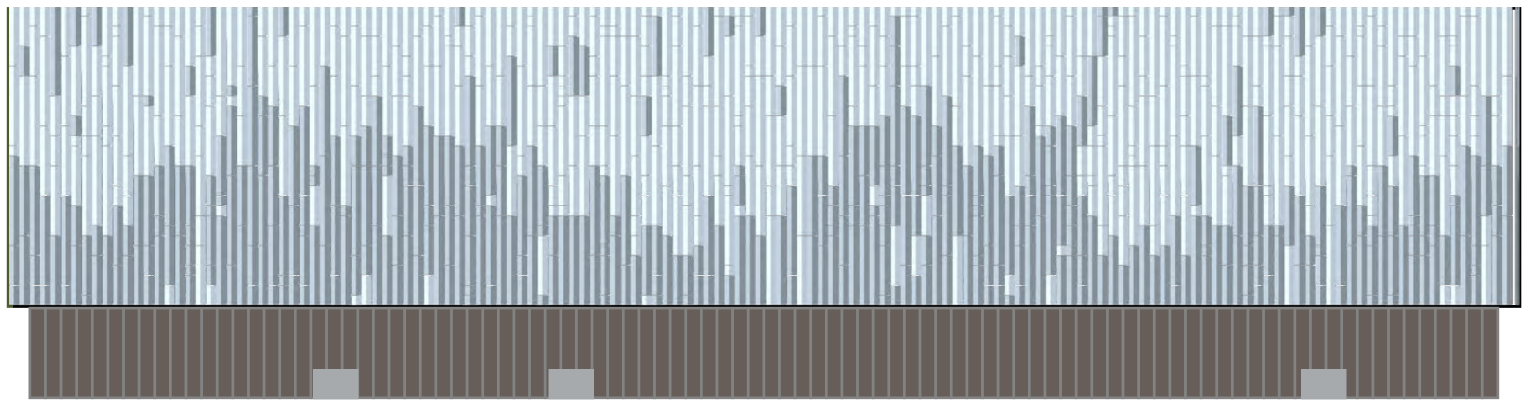
Radius = 20mm

Radius = 10mm

Staggered Panel showing the AC- DC Conversion Process



Panel Type's 1 & 2 Distributed

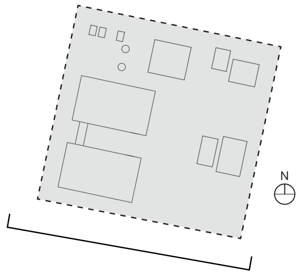


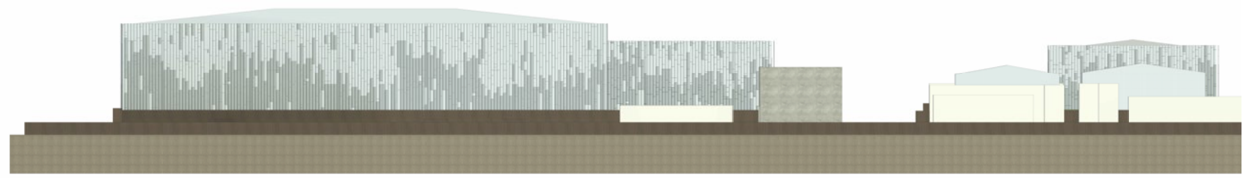
4.2 Design Review Panel Presentation

Facade Exploration - Perforated and Textured Panels - Staggered Facade

The staggered placement of the 2 types create a organic pattern, blending in with the tree scape whilst creating a visual link to the processes occurring inside the building.

The perforations and the subtle fold of the panels create light and dark tones of same colour of blue. Although the panels only contains one colour, the way the light hits the facade creates varied colours, tones and textures.





South Elevation of Converter Station (Not to Scale)

Viewpoint 2

Viewpoint 4

Viewpoint 1

4.2 Design Review Panel Presentation

Facade Exploration - Perforated and Textured Panels - Staggered Facade

Viewpoint 15

Viewpoint 5

Viewpoint 19

Viewpoint 21

4.3 Design Review Panel Report and Responses

The DRP Report was issued two weeks after the panel was held. It covers a wide range of topics that relate to matters covered in other application documents, such as the landscape mitigation proposals. The report has been shared with the rest of the project team and where required the response refers to which application document addresses the comment.

ID	DRP Report	Response
Summary		
D.1	The panel thanks the design team for bringing the scheme to review. This is a nationally significant infrastructure project that will have a huge and particular impact on the Saxmundham area. As a result, it is essential that the buildings and landscape created are exemplary, set within a rigorous masterplan that can deal effectively both with this project and any future development on the wider site.	A masterplan has been provided as part of **Application Document 7.10 Coordination Document** in Appendix A - NGV Coordination Suffolk Masterplan. This document sets out the extent to which coordination has been undertaken and how it is planned to continue.
D.2	The emphasis so far appears to be on hiding the structures as far as possible, but it is inevitable, given their scale, that they will be visible. The design team should therefore be bolder and less apologetic in their approach, to ensure that the buildings are designed to be seen.	This comment has been addressed in the writing of the **Application document 7.12.1 Design Principles - Suffolk** in the Context section of narrative for the Converter Station Design Principles for Suffolk. It acknowledges that there needs to be design integrity but respect needs to be given to public and LPA feedback requesting that the converter station is not treated as a landmark but as background development.
D.3	The landscape is currently quite degraded and there is considerable scope for improvements that create visual and physical amenity for Saxmundham, that create a sympathetic setting for the buildings, and that bring significant biodiversity net gain. However, for these public benefits to be realised, a greater extent of land needs to be brought into the red line, with these interventions seen as necessary parts of delivering a successful scheme.	The Order Limits can only contain land which is necessary to delivery of this project and this includes the extent of landscape mitigation. This is demonstrated through the **Application document 7.5.7.1 Outline Landscape and Ecological Management Plan - Suffolk**. National Grid is committed to playing its part in halting and reversing the decline of biodiversity in the UK and to achieving 10% biodiversity net gain (BNG) on major projects. National Grid has made this commitment on a voluntary basis in advance of the requirement being mandatory for Nationally Significant Infrastructure Projects. The initial approach taken to BNG on the Proposed Project is explored in **Application Document 6.12 Biodiversity Net Gain Feasibility Report** submitted with the application. National Grid will explore how this can be delivered through a combination of on-site measures, off-site measures and credits will be determined when the detailed design of design is complete and the final effects and potential for delivering BNG on site is clear.
D.4	As a key part of the energy transition that will achieve net zero for the UK, the scheme itself should perform exceptionally well in environmental terms. Onsite generation of electricity to power the converter station's operations and the use of sustainable materials in its structure should be prioritised. These requirements, along with the architectural and landscape qualities envisaged, should be secured within clear and robust site-specific design principles, as part of a two-stage process that can ensure oversight of the quality of the scheme as it is delivered.	This is covered in the **Application document 7.12.1 Design Principles - Suffolk** as a Project Level Design Principle (CL.1 in Table 2.2). On-site renewables are covered in Key Design Principle R.1 in Table 3.1. Table 3.1 includes a description of the information that could be associated with the design principle.

4.3 Design Review Panel Report and Responses

ID	DRP Report	Response
Strategic Approach		
D.5	The panel feels that the design team should be less apologetic and defensive in its approach. This is significant national infrastructure that deserves to be celebrated through exemplary landscape and building design. The project offers an opportunity for elegant, confident design, that can repair a fundamentally degraded landscape. The ambitions for the project should reflect those of the grand infrastructure projects of the Victorian era.	The option for a celebratory design approach was included in the statutory consultation and the feedback was a preference for design approaches that were more recessive in the landscape rather than creating a landmark. The guiding narrative of the Identity section (3.2) of the Converter Station Design Principles Suffolk, in **Application document 7.12.1 Design Principles - Suffolk** has been further developed to address the need for a coherent design language in service of being visually recessive.
D.6	While their visual impact can be softened though landscape interventions, the buildings themselves are too big to be hidden and must be good enough to be seen, particularly the taller elements. Attempts to camouflage them through facade treatments will be unsuccessful. The aim therefore should be to break down the mass and deliver a collection of excellent contemporary buildings that sit comfortably within a reconstituted landscape.	The design development leading up to and included in the DRP presentation (section 4.2 of this presentation) and further development since the DRP (covered in sections 5 and 6) addresses the limitations of what can be achieved through facade treatments, and sets out a range of design approaches based on relevant case studies focusing on what cladding techniques are appropriate for use on converter station buildings. This includes opportunities for breaking down the mass, however it is noted that how this mass can be broken down is dependent on the layout and internal clear height requirements of the selected supplier, information that is not available yet. At present there is a requirement to retain flexibility and this design approach is purely an illustration of how this could be applied.
D.7	The buildings will inevitably be seen from many locations around the site, but the panel feels strongly that they should not be visible in the gap in the tree line created by the access road, within the view of Hurts Hall from the B1121.	In **Application document 7.12.1 Design Principles - Suffolk**, Key Design Principle CO.2 - Height, scale, and massing response to context - in Table 3.1 addresses this view specifically (VP02). It sets out the tallest massing should be kept as far south as is practical to reduce the impact on this view.
Planning process and design oversight		
D.8	The panel recognises the constraints within which National Grid team are working but notes the local authorities' legitimate concerns about the loss of design oversight within the DCO process. It feels that National Grid should set out a two-stage process that does not slow delivery but that provides reassurance that the project will result in a high-quality development.	The requirements for design quality have been set out in the **Application document 7.12.1 Design Principles - Suffolk**. Table 3.1 of Converter Station Design Principles includes information on potential information that could be associated with each Key Design Principle.
D.9	The panel notes that the design principles are effectively a design code, and it would like to see site-specific design principles developed, as part of a two- stage process, against which detailed proposals can be assessed.	**Application document 7.12.1 Design Principles- Suffolk** has been developed in consultation with the LPAs, with Project Level Design Principles setting the narrative and providing guidance and the Converter Station Design Principles in Table. 3.1 set out Key Design Principles, in the manner of a design code, that are associated with discharge of Requirement 3 of the DCO.

4.3 Design Review Panel Report and Responses

ID	DRP Report	Response
D.10	The site-specific design principles should to be clearly articulated, in terms that are not restricted to colour and pattern, so that the design intention of the proposals will be reflected in the scheme delivered.	The site-specific design principles in Table 3.1 of **Application document 7.12.1 Design Principles - Suffolk** have been developed in consultation with the LPAs to get to the point of having a clear and concise set of design principles that cover the full extent of the converter station design. It has used the characteristic headings in the National Design Guide to ensure this is.
Masterplan		
D.11	Given the possibility of additional converter infrastructure on the wider site, it is important that the Proposed Project sets a high benchmark for what is acceptable in design terms. The design principles established for the Proposed Project should also be applied to subsequent applications.	The design principles developed for the Proposed Project have been shared for consultation with NGV who are promoting the other colocating projects. They are preparing their own design principles that will relate to the specific requirements of their projects and to the LPA consultation that has already taken place on the Proposed Project's design principles, as well as future consultation that they are yet to undertake.
D.12	The masterplan will be critical to ensuring that the wider campus retains coherence and quality, and the panel feels strongly that it should include expectations around design.	A masterplan has been provided as part of **Application Document 7.10 Coordination Document** in Appendix A - NGV Coordination Suffolk Masterplan. The focus of the masterplan is to demonstrate that the Proposed Project's converter station design caters for the two following projects promoted by NGV. As these projects are not controlled by National Grid, and fall outside of the DCO it is not possible to determine their design. The design principles developed for the Proposed Project includes principles, at wider project and converter station specific level, for coordination with NGV who have been consulted with.
D.13	The masterplan does not currently map onto the red line boundaries of the site, implying that more can be delivered than the site enables.	The red line boundary shown in the masterplan is the Order Limits for the Proposed Project's DCO. The other projects will have their own Order Limits which will map onto the land required for their delivery. These may overlap with the Proposed Project Order Limits and the coordination of these overlapping areas will be an important area of design development.
D.14	To justify the project in terms of the masterplan and necessary landscape mitigation, the panel feels strongly that the project requires more land than is currently envisaged, beyond that needed for simply the functional requirements of the technical infrastructure.	The masterplan shows an indicative landscape and ecological mitigation area for the three projects. It would be for NGV to determine the extent of landscaping required for either or both of their projects through the design process and assessment process at PEIR and EIAR along with supporting management plans.
D.15	The additional land-take could be justified by the requirements of the planning process. For example, achieving sufficient biodiversity net gain will require a larger, more contiguous area than the current red line allows.	National Grid is committed to playing its part in halting and reversing the decline of biodiversity in the UK and to achieving 10% biodiversity net gain (BNG) on major projects. National Grid has made this commitment on a voluntary basis in advance of the requirement being mandatory for Nationally Significant Infrastructure Projects. The initial approach taken to BNG on the Proposed Project is explored in **Application Document 6.12 Biodiversity Net Gain Feasibility Report** submitted with the application. National Grid will explore how this can be delivered through a combination of on-site measures, off-site measures and credits will be determined when the detailed design of design is complete and the final effects and potential for delivering BNG on site is clear.

4.3 Design Review Panel Report and Responses

ID	DRP Report	Response
Landscape		
D.16	The landscape interventions needed as part of the delivery of the scheme require a larger canvass than the current red line implies, particularly to deliver the landscape and planting that is to be used to screen the buildings.	Justification for the land take can be found in the **Application document 7.5.7.1 Outline Landscape and Ecological Management Plan - Suffolk**. This includes a depth of screening whereby it will remain effective when not in leaf.
D.17	The panel notes that the historic landform of the site comprised over 40 fields. It feels that this mosaic pattern could helpfully inform the overall landscape approach.	The landscape proposals have been developed in line with the technical constraints of the development, the limits of deviation for the converter station, access road ,and cable corridors, and to meet the screening and ecological mitigation requirements of the proposals. Doing so leaves limited scope for reintroducing the historic field pattern however existing tree belts will be reinforced to improve screening.
D.18	While the buildings will necessarily be visible in the landscape, the panel recognises the importance of screening them as far as possible. The panel would like to see the creation of a new woodland for Saxmundham, into which the converter station could be enmeshed.	The landscape proposals have focused on reinforcing existing woodlands and creating new woodland areas to provide a screening function whilst creating a recreational and biodiversity resource. The PRoW diversions go through these new woodland areas and the converter station is effectively surrounded as far as possible.
D.19	The panel feels that the cable corridor would benefit from a more sinuous alignment, both to create a more interesting landscape and to enhance the screening of tree cover to the facility.	**Application Document 7.5.7.1.1 Saxmundham Converter Station Outline Landscape Mitigation** shows an update to the illustration of the landscape proposals including a softened edge to the woodland along the cable corridor. The alignment of the cables is defined by Limits of Deviation to allow for design around unforeseen constraints.
D.20	The panel welcomes the commitment to tree planting, including the restoration of hedgerow along the B1119. However, it notes that the intention is to plant whip trees, which will be wholly insufficient in the short to medium term as a landscape intervention. It urges the design team to specify trees of a range of ages, to provide short term cover and to create a more naturalistic woodland.	The outline landscape design contained in the oLEMP outlines the landscape function and the mechanisms that will be put in place to achieve the desired landscape outcomes. The most common type of tree used for planting areas of woodland is either bare rooted 'whips' or plug grown stock (Forest Research) which will root and grow more vigorously than larger plant material which carry a higher risk of failure especially in areas prone to drought. Woodland and hedgerow planting will be supplemented with a smaller percentage of slightly larger trees (feathered or standards) to provide an initial height structure to some of the woodland and hedgerow planting. This approach is supported by ESC Landscape Officer based on planting experience within East Suffolk.
D.21	The panel notes that the attenuation ponds shown in the plan are rectilinear, and it asks that these be more naturalistically formed.	The outline proposals show the indicative pond sizes and locations, the final shape will be determined in the detailed proposals post-consent. There is an allowance for different edge profiles to create a range of habitats and the detailed landscape and engineering design will allow for naturalised forms which contribute positively to the landscape and biodiversity resource.

4.3 Design Review Panel Report and Responses

ID	DRP Report	Response
Access		
D.22	The proposed access bridge over the River Fromus will be very visible within a sensitive view, alongside the listed Hurts Hall. It should therefore be designed to be an attractive addition to its parkland setting. The panel suggests that referring to bridges designed by Moxon would offer a good precedent.	Section 7 in this document addresses the Fromus crossing specifically. The Gairnshiel Jubilee Bridge by Moxon has been added to these case studies that have informed the further development of the design approach for the bridge.
D.23	The panel notes that there is an ancient tree close to the proposed access route. The potential impact of the access road on this tree must be rigorously assessed and the route and crossing relocated if there is the potential for any harm to it.	The crossing has been moved further north to avoid the veteran tree. This was presented at further engagement consultation in November 2024
Architectural expression		
D.24	The panel feels that the presentation of the scheme in terms of the Rochdale Envelope is unhelpful, as it exaggerates the likely scale of the structures. Showing indicative images of the likely forms of the buildings themselves, even if the exact forms cannot be known at this stage, would be preferable, so that more realistic assessment can be made of the impact of the proposals.	The Rochdale Envelope is an established means of assessing the worst case in terms of the three dimensional limits of deviation for the converter station. This flexibility is required as it is not possible at this stage to determine the exact location of buildings within the converter station compound. Further illustrative images, based on a generic converter station layout, have been provided to demonstrate the different design approaches in the same key views as the Rochdale Envelope for a more realistic assessment.
D.25	The architecture of the buildings, and the design principles that govern their ultimate design, should emphasise an elegant and recessive language, with less reliance on colour and pattern on the facades. Equivalent attention should be given to how the buildings will appear as is currently being given to how to hide them.	The presentation to the DRP was a point in time where assessment of the design approaches had come to the conclusion that colour patterns have limited effectiveness in real world settings compared to drawings. The further development of the four design approach strategies explored in sections 5 and 6 of this document have taken this a step further.
D.26	The design team could think in terms of a series of thresholds, carefully layering planting, landscape, fence line and buildings. For example, ancillary buildings could be designed as a composition of different sized forms as part of the screening, enhancing the appearance of the facility at the lower level. The panel suggests Lasdun's teaching wall and student accommodation buildings at UEA offer a useful reference.	The layering of planting, fence line and buildings has been captured in Key Design Principle ID.1 - Meeting the ground - in Table 3.1 of **Application document 7.12.1 Design Principles - Suffolk**. The scope for using the ancillary buildings as 'stepping stones' in layering the massing is also explored in sections 5 and 6 of this document. The scope for this will become clearer post-consent when the formats and relationships between the buildings is better known.

4.3 Design Review Panel Report and Responses

ID	DRP Report	Response
Environmental performance		
D.27	The Proposed Project is critical to the delivery of net zero and should be best in class in terms of its own environmental performance. For example, the potential for providing PVs on the roof of the structures, to power the onsite energy demands, should be fully explored.	This has been captured in the Key Design Principles in Table 3.1 in **Application Document 7.12.1 Design Principles - Suffolk**. It will be subject to assessing how suitable PVs are for meeting the power needs of the converter station and what areas of roof are suitable for use. This would be undertaken by bidding main contractors who will need to demonstrate how they achieve environmental performance standards.
D.28	Given the degraded nature of the existing landscape, there is a huge opportunity for biodiversity net gain and the panel would like to see greater ambition in terms of the extent and nature of the landscape interventions.	National Grid is committed to playing its part in halting and reversing the decline of biodiversity in the UK and to achieving 10% biodiversity net gain (BNG) on major projects. National Grid has made this commitment on a voluntary basis in advance of the requirement being mandatory for Nationally Significant Infrastructure Projects. The initial approach taken to BNG on the Proposed Project is explored in **Application Document 6.12 Biodiversity Net Gain Feasibility Report** submitted with the application. National Grid will explore how this can be delivered through a combination of on-site measures, off-site measures and credits will be determined when the detailed design of design is complete and the final effects and potential for delivering BNG on site is clear.
D.29	The panel would support the addition of green roofs, where the technical constraints allow, to enhance biodiversity net gain.	This has been captured in **Application document 7.12.1 Design Principles - Suffolk**, Key Design Principle N.2 - Potential for planting within the converter station compound - in Table 3.1. It could be associated with submission of a technical statement to ensure it doesn't conflict with any functional, operational or safety constraints. It has also been appraised within this DAD document in section 6.
D.30	The structures themselves should be as sustainable as possible, with less carbon-intensive materials used where technical constraints allow.	This has been captured in **Application document 7.12.1 Design Principles - Suffolk**, in the Project Level Design Principles, V.3 - Sustainable construction and the circular economy - in Table 2.2. It has been noted that conventional building systems such as steel frame and cladding can be highly recyclable.
D.31	The panel would like to see options explored for reusing waste heat from the facility, particularly given its proximity to Saxmundham. This could both improve the scheme's environmental performance and represent a genuine public benefit of the project for the local area.	This has been captured in **Application document 7.12.1 Design Principles - Suffolk**, Key Design Principle R.1 - On-site renewable energy generation - in Table 3.1. This could include submission of an energy strategy technical statement that includes investigating opportunities for reuse of waste heat. A concern raised by the project engineer is that the supply of heat may not be constant, and thus unreliable, as the converter station poles (two, one for each DC Hall) may be switched off to regulate supply or for maintenance.

4.3 Design Review Panel Report and Responses

ID	DRP Report	Response
Public Benefit		
D.32	The benefits of the project are national, but the impacts are intensely local, with few of the employment or other benefits of projects such as Sizewell. The scheme should therefore make a legacy offer to compensate the local community for the necessary disruption and intrusion that this important project will bring.	The provision of community benefits sits outside the planning process. National Grid are exploring other ways in which this can be achieved and can then be agreed with LPAs and community groups outside the DCO where appropriate.
D.33	Given the importance of the facility's contribution to the national energy transition, the panel feels that the project represents an opportunity for public engagement around its function and its role in delivering net zero. This could include a visitor centre.	As a regulated business there are limits to what public benefits can be offered by National Grid. National Grid will look to engage locally during the construction to provide information into the purpose of the converter station and will look to engage with local education providers to provide STEM outreach.
D.34	The potential for connecting the internal function of the buildings with their external expression should be fully explored.	This has been incorporated into the narrative of the guidance in the Identity part of Section 3.2 in **Application document 7.12.1 Design Principles - Suffolk**. The enhanced facades design approach in section 6 of this document explores opportunities for doing so whilst avoiding making the buildings more conspicuous.
Next Steps		
D.35	The panel would welcome the opportunity to review the scheme again, as part of a two-stage process of design oversight. Ideally, this should include consideration of the proposed design principles.	**Application document 7.12.1 Design Principles - Suffolk** identifies a commitment to undertaking a further DRP a point in time when a preferred design approach has been developed to suit the selected supplier's layout and design. The suggestion is to use the same organisation for continuity.

CASE STUDIES AND REFINED DESIGN APPROACHES

5.0

5.0 Case Studies and Refined Design Approaches

5.1 Design Approach Themes

Throughout the design development process case studies have been gathered to provide references for the design approaches that could be developed and applied to the Project. The focus has mostly been on completed converter stations in the UK and in Europe, as the techniques should be reasonably transferable excepting for differences in national standards. As the pool of converter station references is fairly limited, a few examples of similar building types have been included where a particular feature may be relevant to the design approaches being considered.

Feedback on the six design approaches included at statutory consultation, and from the DRP and LPA engagement since, has been filtered through the prism of these case studies to consolidate into four design approach themes:

- Conventional industrial/agricultural (Baseline);
- Enhanced cladding;
- Enhanced roof forms; and
- Fragmented forms.

The following pages explore the case studies that relate to these different approaches and the lessons that can be taken and adapted to a suit of design approaches for the converter station.

These are arranged in three different categories, with different lessons drawn from each in terms of:

1. Other Converter Stations, examples from UK and Europe showing comparable schemes addressing similar functional and technical constraints;
2. Relevant Local Development, whether comparable in scale or demonstrating a response to context; and
3. Design Inspiration, from a broader set of project types and locations that may translate to a converter station.

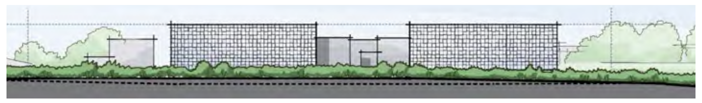
The converter station precedents have been instructive when defining the design principles. The onerous functional constraints have tended to lead to the delivery of conventional industrial type designs, particularly in the UK. Any move away from this needs to be done with caution to avoid untested design strategies conflicting with the Critical Design Constraints set out in Table 1.1 of **Application Document 7.12.1 Design Principles - Suffolk**.

Some of these case studies have been referred to the project team through the consultation process, including the DRPs. Further precedents within these categories may come to light and it would be worth updating this set of references as the design progresses.

Case studies for the River Fromus crossing are included within section 7 of the **Design Approach Document - Suffolk (Application document 7.11.1)** (this document), that covers the approach to the bridge design.

Conventional industrial/ agricultural (Baseline)

Enhanced Cladding



Enhanced Roof Forms

Fragmented Forms

5.2 Conventional Industrial/ Agricultural (Baseline)

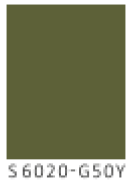
All completed UK converter stations in the UK fall into this category, with most projects across Europe taking a similar approach.

It uses the most efficient building forms and cladding systems for this type and scale of building and as such will tend to be the approach with the smallest built form.

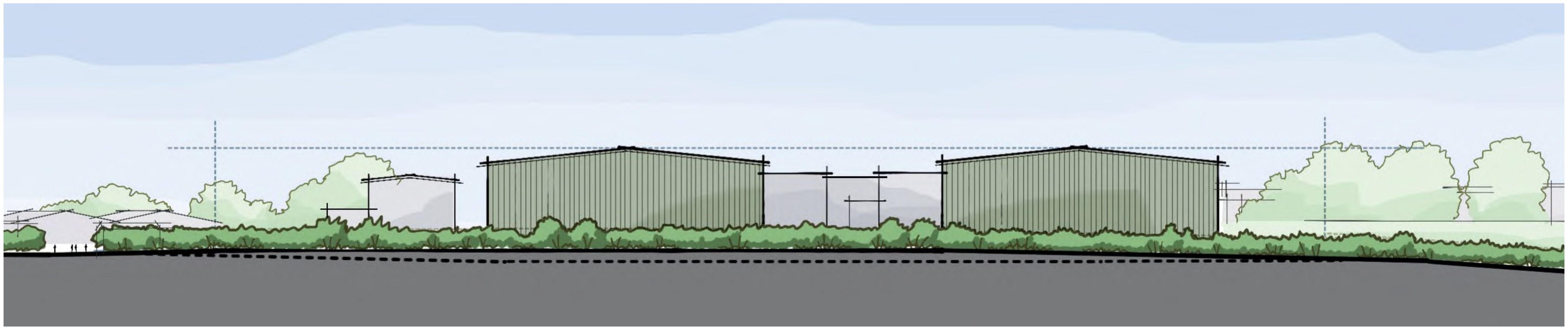
This type of approach is commonly associated with powder coated trapezoidal cladding and roofing systems. The colour options for these systems can be limited and as has been noted in feedback, the reliance on varying colours, whether in bands or other patterns, can be of limited effectiveness in terms of mitigating visual impact.

This type of approach has been included as a baseline by which the other enhanced design approaches can be compared to see if they are reducing the visual impact.

The green colour shown has been taken from the Suffolk Coast & Heaths Area of Outstanding Natural Beauty - Guidance on the selection and use of colour in development. A single green colour has been used based on feedback preferring this to the use of colour bands or patterns.



From the AONB "Guidance on the selection and use of colour in development document" Waygood Colour (2018)

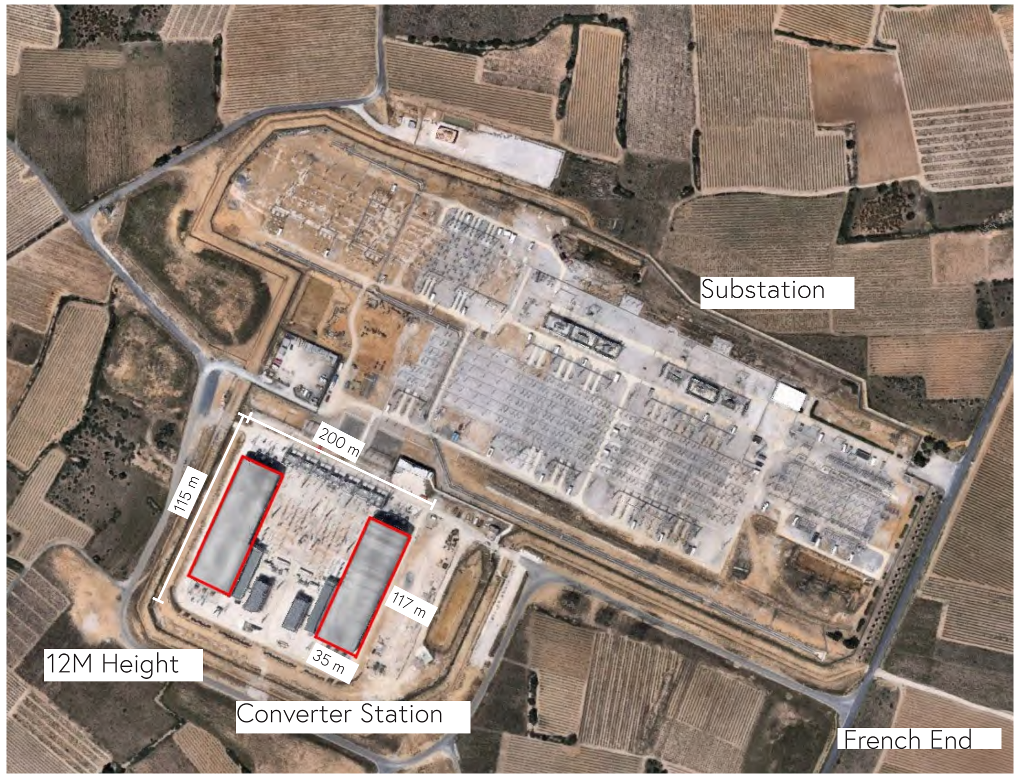


5.2 Conventional Industrial/ Agricultural (Baseline)

France to Spain INELFE, Baixas end (Colour)

INELFE link plays a vital role in strengthening the power grid interconnection between France and Spain, facilitating energy exchange, and supporting the integration of renewable energy into both countries' grids.

The converter station in Baixas encompasses a curved form that softens the typical industrial box style.



Lessons Learned

2.0 GW (bi-pole). 320kV HVDC. Supplier Siemens. System activated 2015.

- Baixas (french) converter station site is 200 m by 115 m with a large substation on the periphery;
- The Baixas DC Halls are long and slender and relatively low height (17m after consultation) making them more recessive in the landscape;
- The shade of green combined with the curved roof form blends with the landscape, softening the industrial look;
- The DC Halls are spaced far apart with equipment located between;
- Distance from Coast is around 11.8 Miles; and
- Green Facade changes colour depending on the intensity and direction of the sun.

global.toshiba/ww/company/energy/topics/transmission/italy-power-transmission.html

briv.me/index.php/projects/15-projects/special-purpose-buildings/50-toshiba

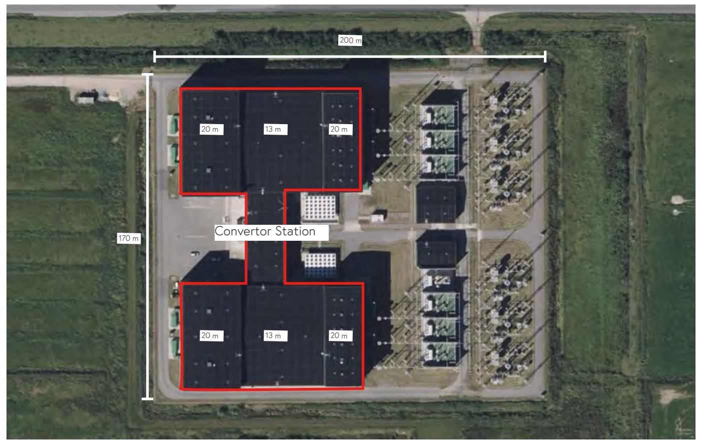
5.2 Conventional Industrial/ Agricultural (Baseline)

Nordlink, Tonstad to Wilster, Germany

NordLink is the first interconnector to provide a direct link between the Norwegian and German energy markets.

NordLink is a high voltage direct current (HVDC) transmission system connecting Germany and Norway, spanning a total distance of 623 km, with 516 km of it as a submarine cable. Given the extensive length, direct current (DC) is utilised for electricity transmission through both cables (positive and negative poles), linked to converter stations at each terminus. DC is particularly suitable for long-distance and large-scale power transmissions.

NordLink has a capacity of 1,400 megawatts (MW), enough to supply renewable energy to over 3.6 million German households. This capacity is comparable to the power generated by 466 wind turbines, each producing 3 MW. Therefore, the interconnector's capacity slightly exceeds that of a large conventional power station.



Lessons Learned

The design of the NordLink converter station incorporates a green façade to blend with the landscape and employs a compact spatial strategy for efficient site navigation.

- The converter station's capacity is 1.4 Gigawatts. The whole site is only 170 m by 200 m;
- The Green facade mimics the colour of the landscape that it's on, however no colour variation is used, so could be quite invasive to the area when seasons change;
- No screening is used on site, with the converter station situated directly next to the main road. This may be because the country views converter stations as essential infrastructure and has accepted their presence without the need for additional concealment;
- Facade seems to have a reflective surface; and
- Black roof is unusual due to it potentially prone to over heating, with black being a high conductor of heat.

arcsom.com/en/cases/alegro

tennet.eu/de/projekte/nordlink

lincolnshirelive.co.uk/news/local-news/bicker-fen-siemens-electricity-power-4757306

lincsonline.co.uk/spalding/news/key-pieces-of-major-viking-link-project-in-place-9286084/

eifo.dk/en/knowledge/news/765-km-long-electricity-link-enables-more-effective-use-of-renewable-energy-in-denmark-and-the-uk/

5.2 Conventional Industrial/ Agricultural (Baseline)

Viking Link, Bicker Fen, UK

Viking Link is a new high voltage direct current (DC) electricity interconnector between the substation Revsing in southern Jutland, Denmark, and Bicker Fen in Lincolnshire, Great Britain

This is the UK side of the connector located in Bicker Fen in Lincolnshire. The facade of the building uses a green colour scheme that matches the surrounding area. The change in colour from green up to the light colour, blends the building in the landscape from ground to sky.

Viking Link Trailer video:

youtube.com/embed/QncH6IlLB2c?autoplay=1&start=0&rel=0&enablejsapi=1&mute=1&version=3

It is interesting to note that different technical standards have been applied than at the UK end. With the concrete bund walls on the Transformer side stopping below the metal parapet and not having external gutters and down pipes.

Lessons Learned

The design of this converter station has informed the colour bands design approach.

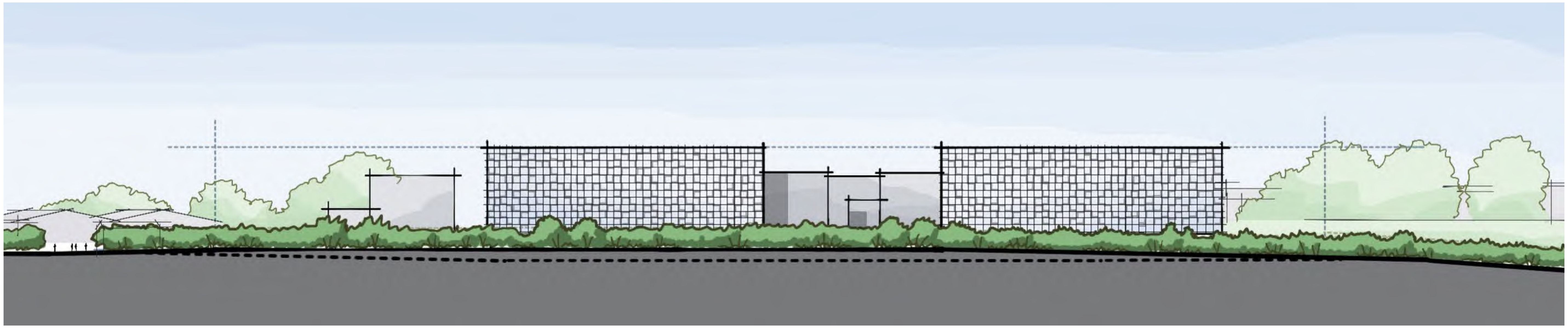
- The colour banding is relatively successful at blending in with the landscape as the building is generally seen at a long distance, (for example from the A17 where is off to one side and hard to pick out even when aware of it), with the location being very sparsely populated;
- The green bands relate well to the prevalent colour of agricultural buildings in the local area;
- The strategy and design is best suited to long distances and lacks sophistication when seen close up;
- With the transformers tight up to the Reactor Halls the resultant concrete blast wall leaves no scope for architectural treatment;
- The transformers being tightly placed next to the reactor halls means a smaller area of the site is occupied;
- Control buildings are not scattered around the site, could be found in the main control centre between the DC Halls;
- Viking Link is a 1.4 GW high voltage direct current electricity link; and
- Situated northwest from a residential development, it is vital that the building is screened or blends in with the landscape to lessen the visual and acoustic impact.

5.3 Enhanced Cladding

This design approach is focused on how the appearance of the walls can be enhanced to reduce the visual impact compared to conventional cladding systems.
It typically uses a decorative overcladding layer applied on top of a technical background cladding layer to add depth and give more flexibility for design options. It can also be used to hide features such as rainwater goods and louvres that might otherwise detract from the design.

It is also common for this approach to use a parapet detail with a flatter roof type so the roof can be hidden. This allows roof based equipment and access safety systems to be hidden as well.

This approach creates scope for the cladding design to incorporate decorative themes that include local cultural references or relate to the function of the facility.
Generally the enhanced cladding is focused on those areas with greatest visual impact, i.e. The taller parts of buildings which can be seen from key viewpoints, with more conventional cladding applied to lower levels and inward facing elevations.



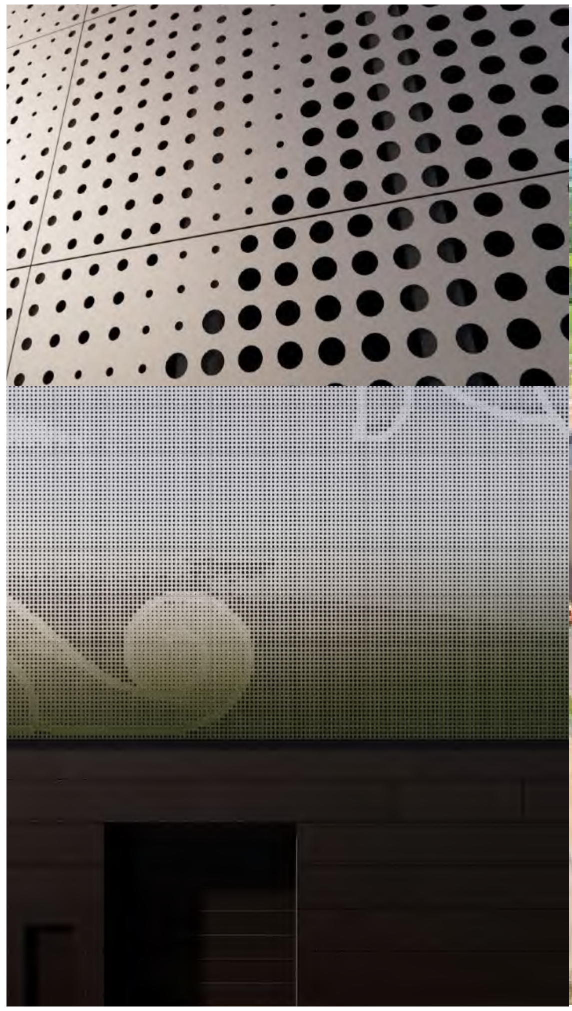
5.3 Enhanced Cladding

Viking Link, Revsing, Denmark

This is the Danish end of the Viking Link to the UK. The DC Halls are clean volumes with wrap around parapets and all rainwater goods hidden behind the rain-screen.

The metal cladding features perforated patterns with the designs inspired by traditional Viking knot patterns.

It is interesting to note that different technical and design standards have been applied than at the UK end, which is a more conventional building.



Lessons Learned

1.4 GW (bi-pole). The HVDC is 525 kV. Supplier Siemens. System activated 2023.

- The DC Halls are split into two sections. The lower part (crica 7-8 m) has simple dark brown cladding, (which also wraps the transformers), and the upper part (14-16 m) has metallic rainscreen cladding;
- The rainscreen cladding features perforation designs depicting local traditional knot work. It is fixed over a simple technical box using vertical cladding rails (see image below of removed panels);
- The use of a rain screen has allowed a very clean building volume with parapets, low pitch single ply roofing, and hidden rainwater goods. It would be challenging to replicate this in England and Wales without derogations to the NG Technical Standards. The effect is slightly spoilt by the transformer bund walls; and
- Bunding is used to screen the buildings from the farm houses situated near by.

eifo.dk/en/knowledge/news/765-km-long-electricity-link-enables-more-effective-use-of-renewable-energy-in-denmark-and-the-uk/

viking-link.com/cables/

5.3 Enhanced Cladding

Sizewell C - Turbine Halls

Lessons Learned

- The rainscreen cladding features a slight fold that expresses a geometric shape. The sun bounces of the panel creating shadows and varying shades; and
- These panels are then rotated to create variations on the flat facade, adding a complex elevation that encompasses varying shades breaking up the large facade, and fading it into the environment.

7.11 **Conventional island concept**

7.11.1 One of the driving concepts for Sizewell C is expressed through the bold simplified geometry of the turbine halls in combination with the operational service centre and the linking skybridge elements which together will comprise a formal set-piece.

7.11.2 This group of 'focal' structures would be constructed as pure orthogonal elements, which relate to the existing Sizewell A and B platonic built forms. Parallels with Sizewell A and B power stations can also be drawn in terms of the use of detailing to manipulate the perceived scale of certain elements, as described in Chapter 6 of this statement. The structures will also be treated with a consistent material approach which would have a high-quality durable finish and behave sensitively to complement the surrounding landscape of the area.

7.11.3 In order to achieve the required high-quality finish within a marine environment, anodised aluminium has been selected for the external cladding panels. This lightweight, easily formed material is corrosion resistant and will retain its finish. The electrochemical process of oxidising the surface of the metal creates an integral layer, which is chemically stable, tough, brittle and acts as an electrical insulator. It is possible to colour the surface of the aluminium by combining metal salts within the anodic skin of the panels, the colour is created by light absorption and reflection from the surface as an optical effect. The selected colour will be from a fade free range.

DETAILED BUILT DEVELOPMENT PRINCIPLE WITHIN MAIN PLATFORM 55.

The turbine halls and operational service centre will comprise a formal set-piece with a consistent material **finish. The silhouette of these structures would be identifiable as a clean simple profile from coastal views.**

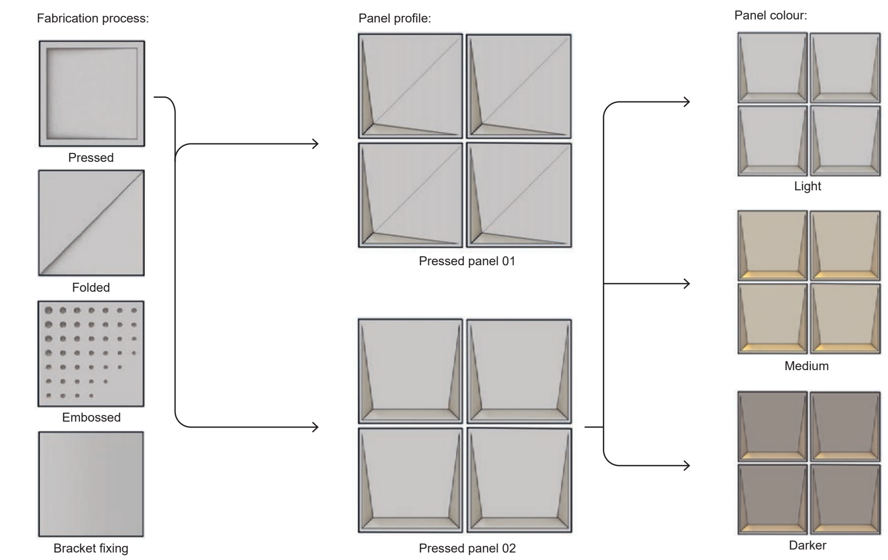


Figure 7.28: Cladding panel profile development

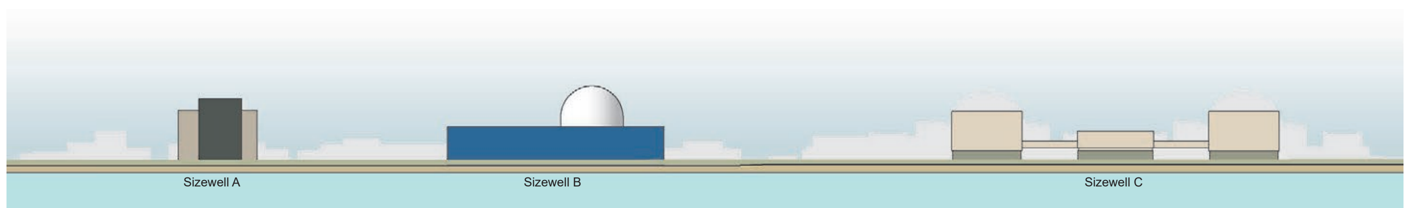


Figure 7.29: Coastal elevation illustrating sequence of contrasting Sizewell A, Sizewell B and Sizewell C forms

7.11.4 The panelised facade treatment of the turbine halls would perform as the external expression of the power station. It is designed to provide a sensitive response to the surrounding landscape by using a regular cladding module in different orientations across the facade to create graduated variations in relief, tone, colour and texture. This system will also deliver a maintainable facade with a layered skin to allow for panel replacement and will meet rigorous acoustic and safety requirements in accordance with the UK EPR™ generic design technical requirements. A dark recessed shadow gap will be visible between panels to define the framework and modularity of the facade.

7.11.5 The cladding panels would be applied to a 1.5m facade grid and would be profiled to accentuate variation across the turbine hall facades. The profiles explored have included etched, embossed, folded and pressed surfaces, several of the design options explored are illustrated within Figure 7.28, each of the profiles offers the opportunity to rotate the panels through four alternative orientations. The pressed profile has resulted the greatest variation in surface colour and tone, providing the greatest visual effect when orientated in different directions. Currently two different pressed panel variants are being considered, one of these is pressed in on the corner and the other is pressed into the side as illustrated by Figure 7.28 and Figures 7.30 - 7.35.

7.11.6 The resulting variation across the surface of the turbine halls could be applied randomly or modified to create gradients and patterning to the façade. Each individual panel would become like a pixel forming part of a broader picture in conjunction with the context the buildings sit within. This has been explored to create a subtle gradation from the base of the building towards the top edge where panels will be angled up in greater numbers to reflect the sky and dissipate into the light beyond. Similarly, towards the bottom of the façade grid panels are angled down towards the ground in greater numbers in order to reflect the ground conditions. Centrally located panels are randomly placed with the largest numbers orientated east and west. The overall effect is a gradation from darker colour tones at the base to lighter at the top creating the appearance of a dynamic skin which is responsive to its surroundings.

DETAILED BUILT DEVELOPMENT PRINCIPLE WITHIN MAIN PLATFORM 56.

The turbine halls cladding (material above the base plinth) will **seek to provide a responsive surface treatment which changes** in colour and tone, subject to surrounding lighting and climatic **conditions and will be made of a material and panel profile/s agreed with East Suffolk Council. The colour palette, material and panel profile will be discussed and agreed with East Suffolk Council in** consultation with the AONB Partnership and the National Trust as part of pre submission discussion/ design review and align with the colour information and study outcomes recorded in the Design and **Access Statement Section 7:11 and within a range of light to darker** bronze. The information will include details of the manufacturer's **maintenance specification for external facing cladding.**

Figure 7.30: Geometric form visible beyond the site: Option 01

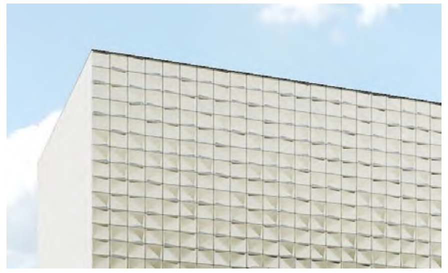


Figure 7.31: Cladding modules at mid-distance views: Option 01

Figure 7.32: Panel detail perceptible at close range: Option 01

Figure 7.33: Geometric form visible beyond the site: Option 02

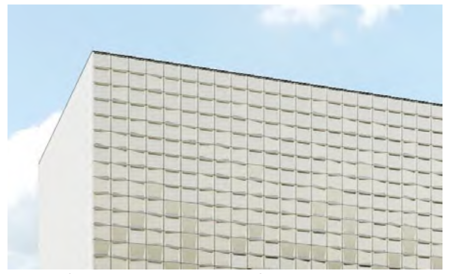


Figure 7.34: Cladding modules at mid-distance views: Option 02

Figure 7.35: Panel detail perceptible at close range: Option 02

| 123

5.3 Enhanced Cladding

Brent Cross Substation

Largest permanent public artwork in the UK. The substation is wrapped in a 52 m long and 21 m high artwork designed by London- based artist Lakwena and IF_DO Architects.

This installation sits in a prominent location, within a busy junction of the M1 and can be seen from the North Circular Road.

arup.com/projects/brent-cross-town-substation/

Lessons Learned

- Scale of the panels will have a significant effect on the further viewpoints. Smaller panels tend to be washed away in the distance;
- Various folds and angles of the panels could be used to vary the colour and shades when light hits the surface;
- Spacing between the panels is significant enough so that the effect of the panels is not lost; and
- Shape of the curve soften the square substation by creating a wrap around the substation.

5.4 Enhanced Roof Forms

This design approach is focused on using the roof form as a means of softening the profile of the buildings in the landscape compared to the conventional pitched roof and gable forms.

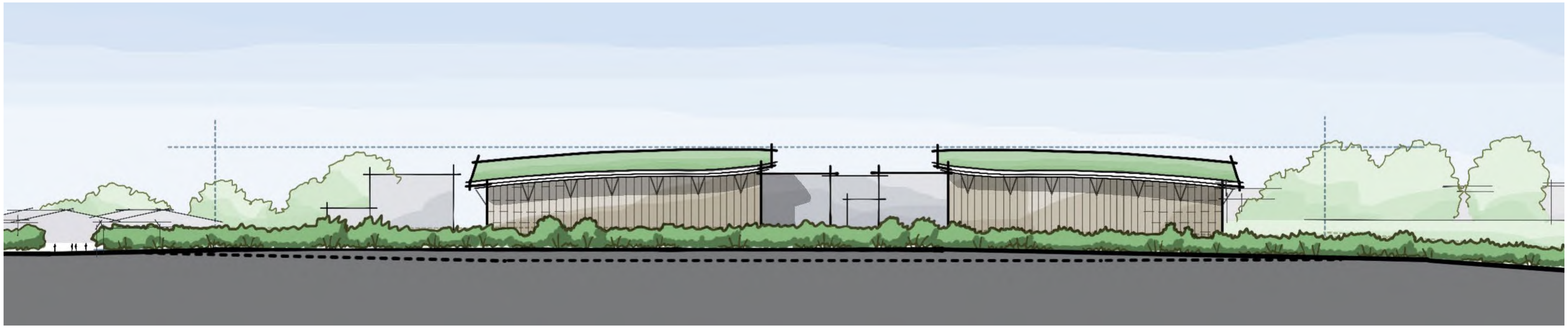
It typically uses a curving profile with deep oversailing eaves to reduce the apparent height of the walls and push the wall cladding into the background as a secondary feature.

The way the roof forms are articulated depends on the preferred elevations for gables or eaves, for simpler 2D curves, with more complex 3D curves allowing all sides to have lower eaves.

Roofs of smaller buildings can be tilted to face outwards and screen the elevations of taller buildings.

As the intention is for the roof to be more prominent, the choice of finishing material is critical. This form and approach would be well suited to applying a planted green roof.

However it is noted that the only converter station case study that has been found, which includes a green roof, was cancelled after planning stage. So this part of the approach remains untested.

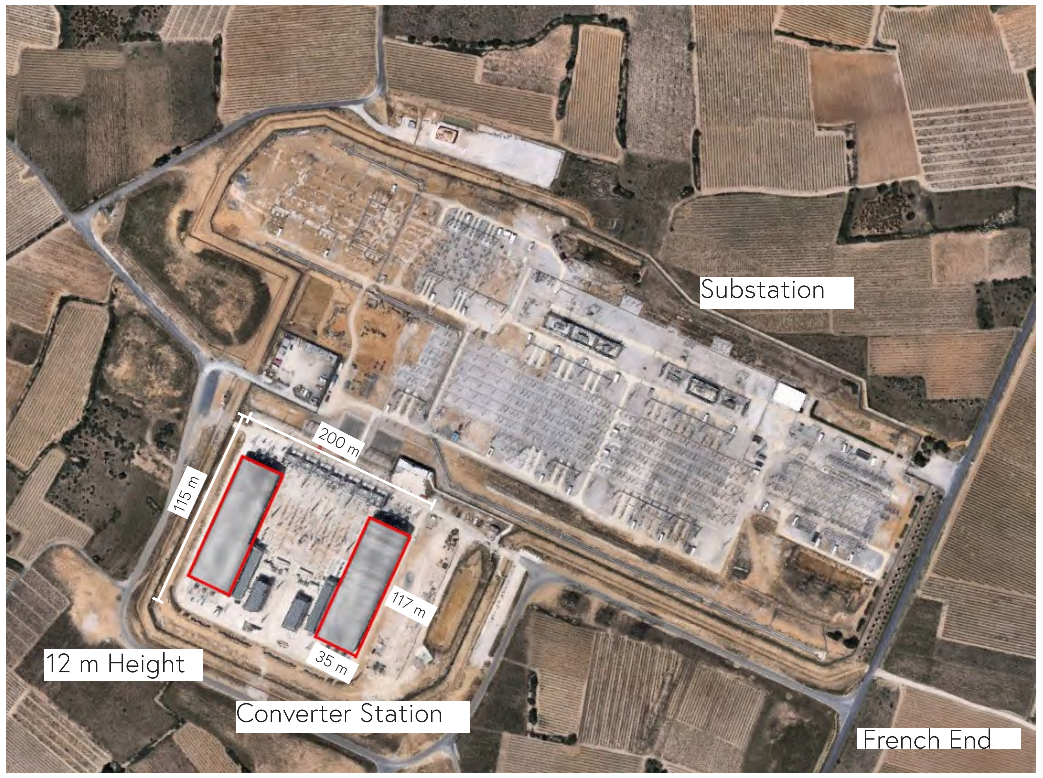


5.4 Enhanced Roof Forms

France to Spain INELFE, Baixas end

INELFE link plays a vital role in strengthening the power grid interconnection between France and Spain, facilitating energy exchange, and supporting the integration of renewable energy into both countries' grids.

The converter station in Baixas encompasses a curved form that softens the typical industrial box style.



Lessons Learned

2.0 GW (bi-pole). 320 kV HVDC. Supplier Siemens. System activated 2015.

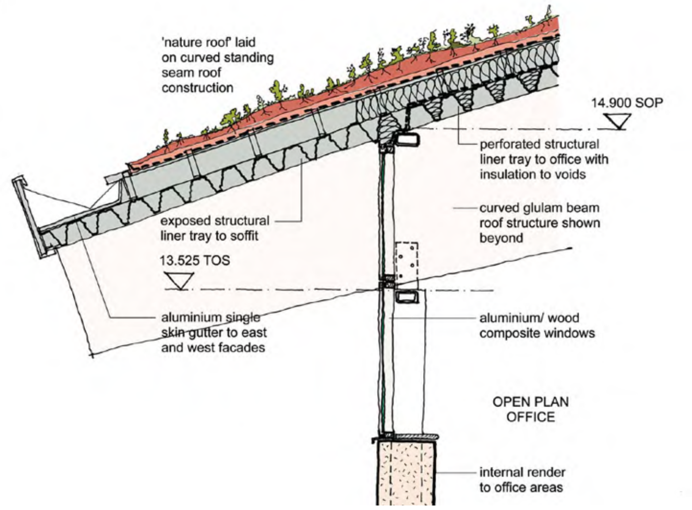
- Baixas (French end) converter station site is 200 m by 115 m with a large substation on the periphery;
- The Baixas DC Halls are long and slender and relatively low height (17 m after consultation) making them more recessive in the landscape;
- The curved form reduces material usage and distributes loads efficiently. Increases durability by minimising stress points;
- The shade of green combined with the curved roof form blends with the landscape, softening the industrial look; and
- The DC Halls are spaced far apart with equipment located between.

global.toshiba/ww/company/energy/topics/transmission/italy-power-transmission.html

briv.me/index.php/projects/15-projects/special-purpose-buildings/50-toshiba

5.4 Enhanced Roof Forms

Adnams Distribution Centre - Southwold, Suffolk

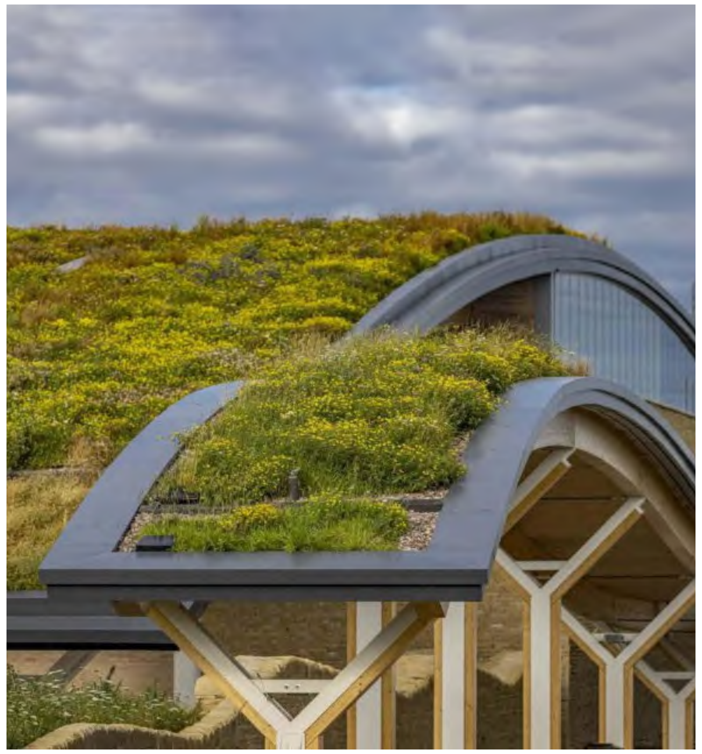


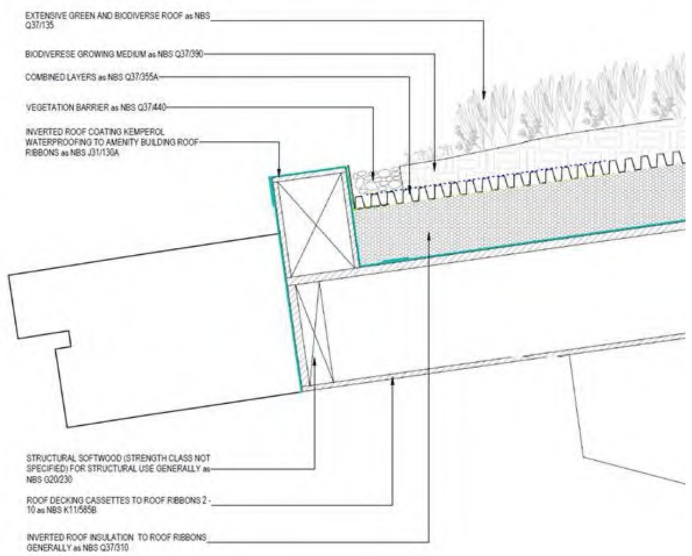
Lessons Learned

- Curved Green roof minimises the visual intrusion of the large development.
- "Softens the mass into the landscape"
- The sedum green roof adds insulation for the building and enhances the natural habitat for local green species.

aukettswanke.com/projects/adnams-distribution-centre/

Skelton Lakes, Leeds





Lessons Learned

- Rural locations can benefit from the introduction of green roofs and cladding as it helps the building to blend into it's surroundings;
- Key considerations are watering and maintenance access, Skelton Lakes features a meadow mix tailored to the local ecosystem. This could be adapted to either of the Suffolk or Kent sites. It needs to be mown twice a year so consideration should be made for safe access and disposal;
- An integral irrigation system will be required. In order to establish the planting it will need to be watered heavily. The roof will naturally tend to reduce the run-off from the building so it contributes to the overall site SuDs. Rainwater harvesting could be used for irrigation; and
- Drought resistant planting would be selected and the intention would not be to have this roof lush and green when surrounding fields have turned yellow/brown. However some background irrigation will be required to prevent die-back. A dead dried out green roof or wall can pose a fire spread risk.

5.4 Enhanced Roof Forms

Rabobank Datacenter, Boxtel, Utrecht

Lessons Learned

- Surface area of the building is 6500 m^2 and a sloping green roof was added over the entire building;
- The green roof slopes above the roof's plant to cover the buildings services;
- Building is split into 3 different sections, but the green roof is connected through the lowest point where the building touches the landscape; and
- The landscape is connected to the sloping roof.

Imagery: Google Maps. 2024 (not to scale).

5.4 Enhanced Roof Forms

North Connect, Peterhead

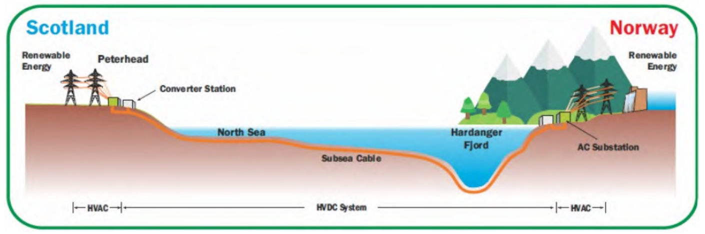
This is a 1.4 GW proposed interconnector between Scotland's electricity network and Norway.

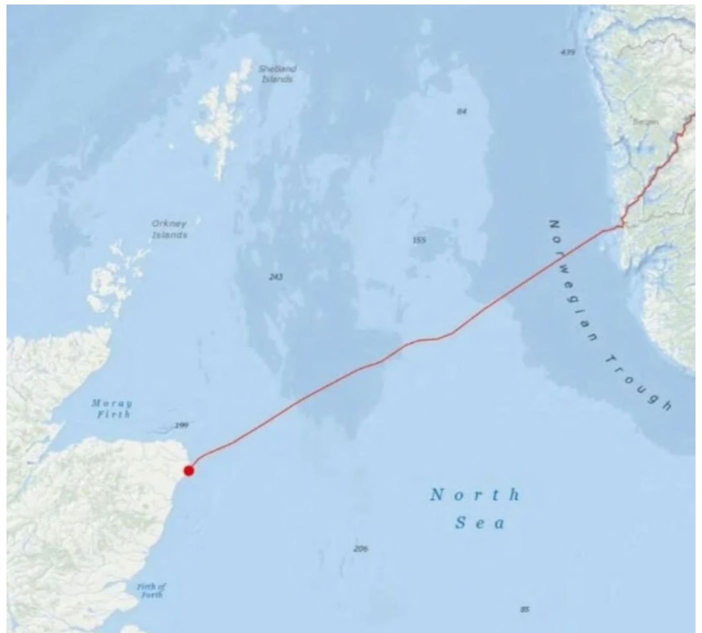
The Scottish side's converter station was to be located in Peterhead, an example of a converter station design incorporating a curved massing with a green roof.

This gained full planning permission, unfortunately the license application was refused by the Norwegian Ministry of Petroleum and Energy in 2022.

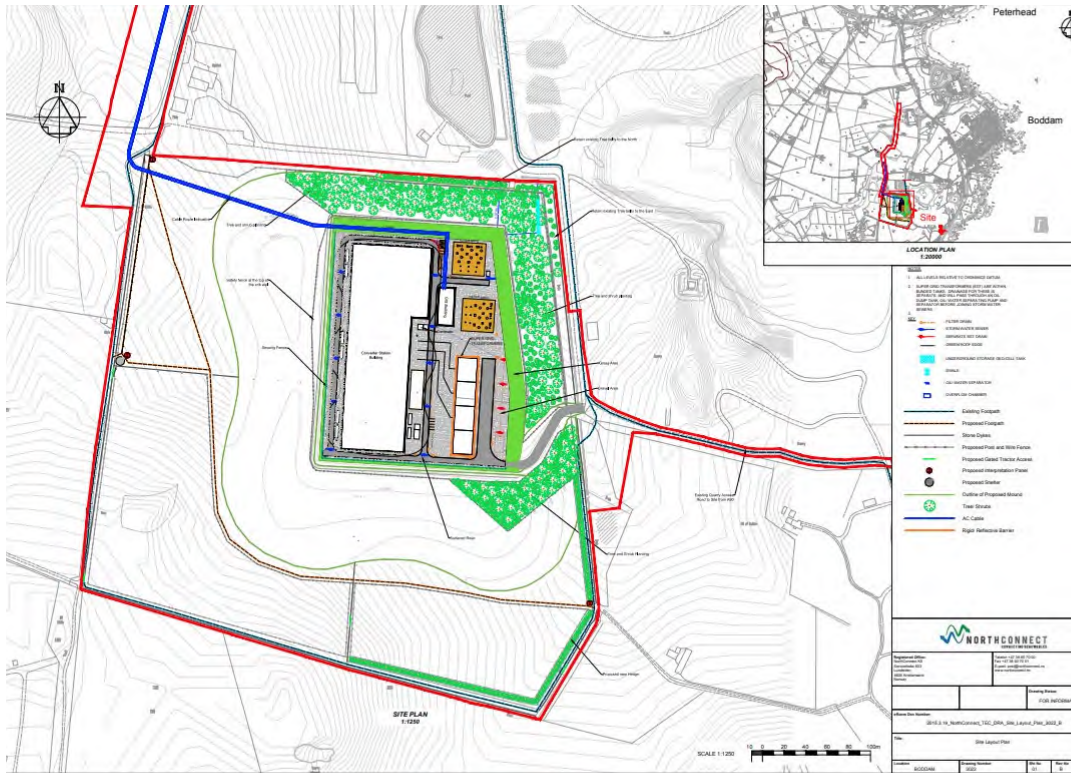
Lessons Learned

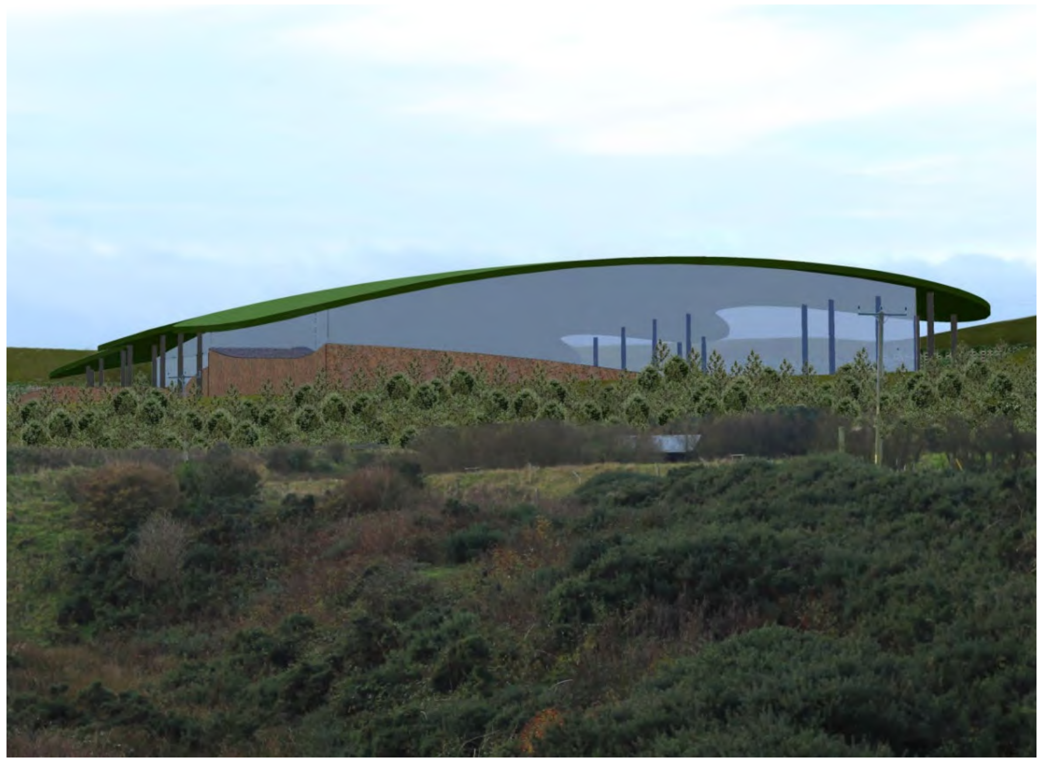
- 1.4 GW HVDC.
- Converter Station site is sloping gently from southwest to northeast between approximately 63 m to 82 m above sea level.
- Green Roof with Sloping Eaves to reduce the visual impact.
- Bunding is brought up to follow the curve of the green roof.
- Unknown as to why glazing was used for the design.
- Can learn through their planning process as permission was granted for the proposal.





current-news.co.uk/1-4th-scotland-norway-interconnector-refused-license-by-norwegian-government/



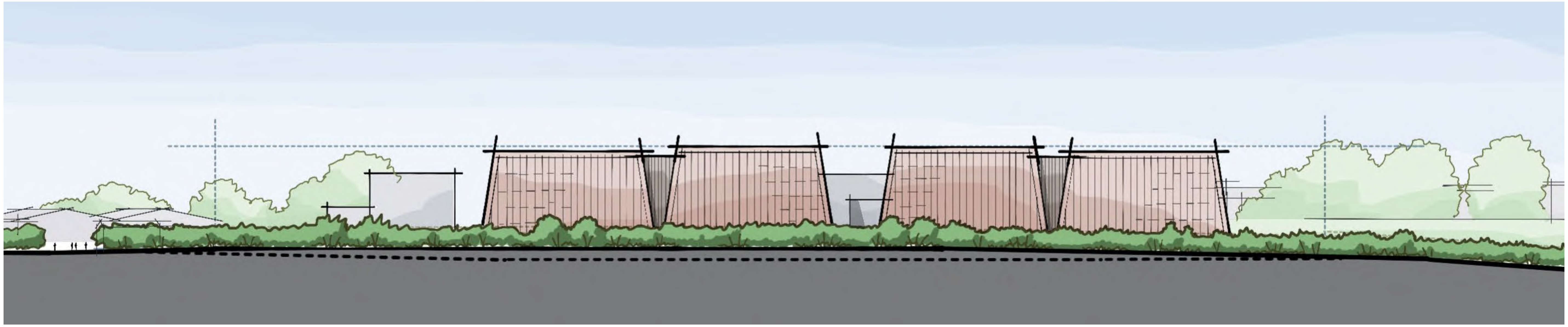


5.5 Fragmented Forms

This design approach is focused on breaking up the mass of the large buildings into segments and articulating them as a series of smaller forms.

The intention is that the forms can step up and down in scale to suit the internal space requirements instead of an overall simpler flexible envelope. A key challenge in developing this approach is that the internal height requirements are at present unknown, whereas the case studies have the benefit of working to a known equipment design.

By breaking up the forms into smaller parts there is less reliance on using colour and pattern to break up large flat surfaces. Part of the strategy can use smaller buildings to form a composition of layered massing to break up the height of taller elevations

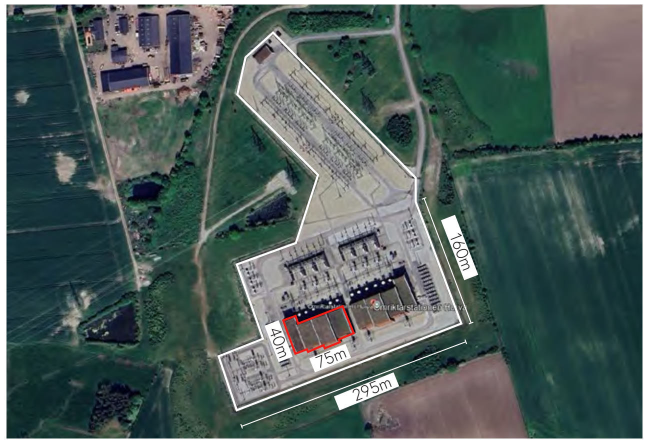


5.5 Fragmented Forms

South-West Link (SydVastlanken) Hurva (Sweden)

SydVästlänken (English: South–West Link) is a project aimed at strengthening the power grids in Southern Sweden and the Oslo region in Norway. The project is to be carried out by the national grid operators Svenska kraftnät of Sweden and Statnett of Norway.

The unique architectural design of the SydVästlänken converter station showcases a combination of modern industrial architecture and thoughtful environmental integration. The structures are characterised by their strong, utilitarian forms, strategic verticality, and use of durable materials, while incorporating aesthetic measures to harmonise with their surroundings.



Lessons Learned

1.2 GW (bi-pole). 300 kV HVDC. Supplier Alstom. System activated 2021.

- The design of this converter station features a stepped structure, creating an articulated vertical form breaking up the mass of the building. It is unclear how these steps in height relate to or are driven by the internal clearance requirements;
- The natural variations in the Corten cladding panels and staggered pattern aids in blending the building with the surrounding environment, breaking the large facade up;
- The whole site is about 6.82 hectares including the AC Equipment located North of the site;
- Required additional acoustic measures post-completion after complaints about noise. (note external transformers in photographs); and
- It appears that a significant amount of the equipment (possibly including the HVDC Reactors) is outdoor. This reduces the mass of building.

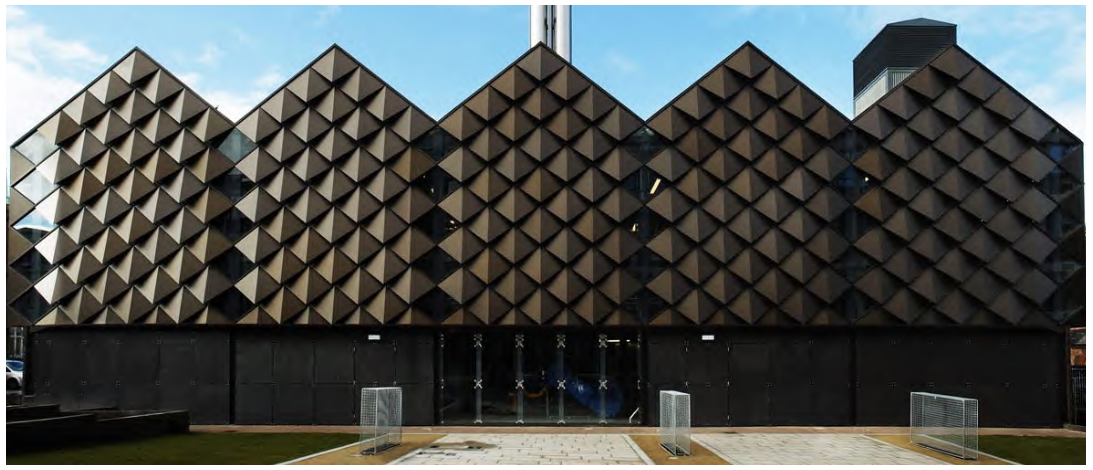
hd.se/artikel/sydvastlanken-forsenas-annu-en-gang/

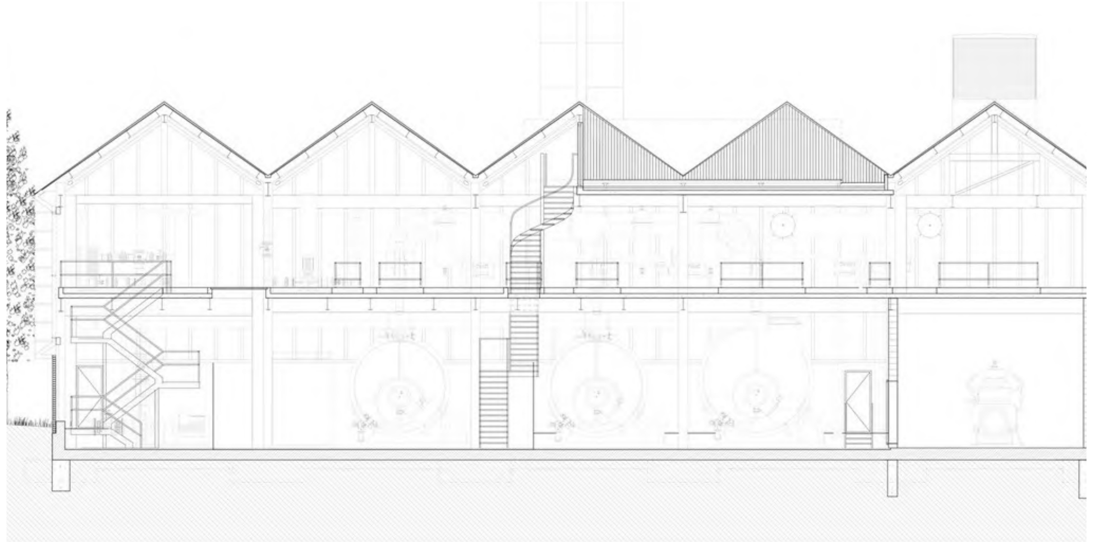
5.5 Fragmented Forms

Heating Infrastructure Building, Liverpool

An infrastructure building which has a formal arrangement achieving symmetry where the texture of the cladding corresponds to the roof form and pattern of the building.

Designed by Levitt Bernstein Architects





Lessons Learned

- A strong definition of simple dark plinth and articulated upper form;
- Use of texture in the cladding to use varying shading instead of mixing colours to add interest to the surface;
- The very geometric and regimented form would make it stand out in the landscape whereas a less repetitive format would be better at blending into the landscape pattern; and
- The creation of valley gutters would be considered a risk of future leaks into the DC Halls.

archdaily.com/53867/heating-infrastructure-building-levitt-bernstein-associates

5.5 Fragmented Forms

Biomass Plant, Sheffield, BDP

The dark cladding responds to the historic industrial landscape. The visually striking orange colour creates a landmark beacon, illuminated from the interior in the evenings.

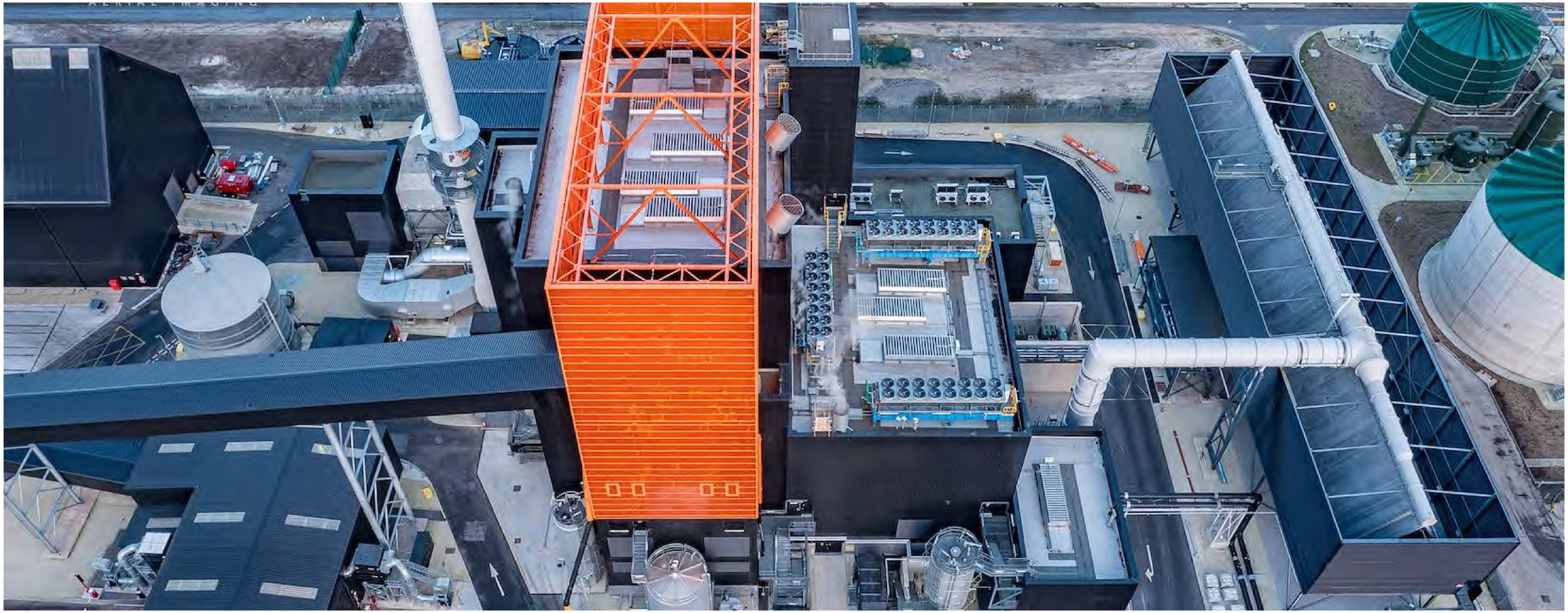
The technical equipment inside could be wrapped with a translucent weather proof material obscuring it's form and allowing for architectural design of the exterior.

The translucency can be used to blend into the skyline reducing the impact of the building.

Lessons Learned

- The overall massing has been reduced by designing the form around the function in different areas; and
- The facility replaces a previous landmark pair of cooling towers so there was an appetite to create a new landmark. That is not the case in Saxmundham.

bdp.com/en/projects/a-e/blackburn-meadows-biomass-plant/



DESIGN RESPONSES TO DESIGN PRINCIPLES

6.0

6.0 Design Responses to Design Principles

6.1 Development of the Design Approaches

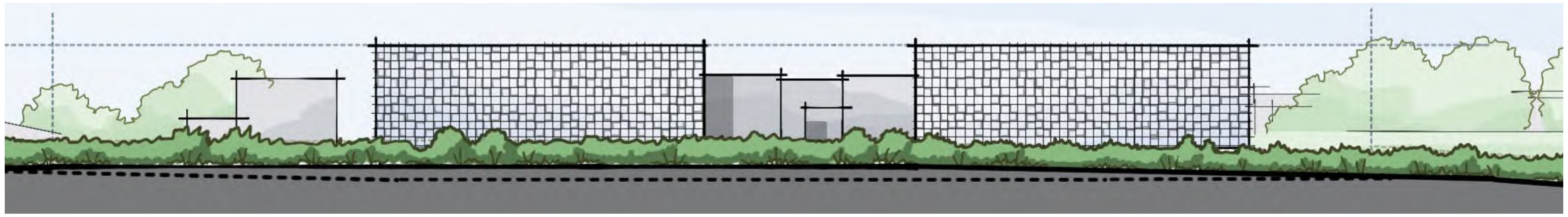
This section shows how the four different design approaches have been developed in tandem with the design principles in **Application document 7.12.1 Design Principles - Suffolk**, taking on board lessons learned from the case studies and the feedback on previous LPA and DRP engagement. The site-specific design principles in section 3.2, and in particular Table 3.1, of the design principles document have been written in such a way that any of these design approaches (or a combination of them) can be used. This allows the most appropriate to be selected to suit the designs put forward once a supplier has been selected.

Correspondingly these design approaches have been developed as a means of testing how these design principles work and of demonstrating how they might be applied. These are not intended to show design solutions and are for illustration purposes only.

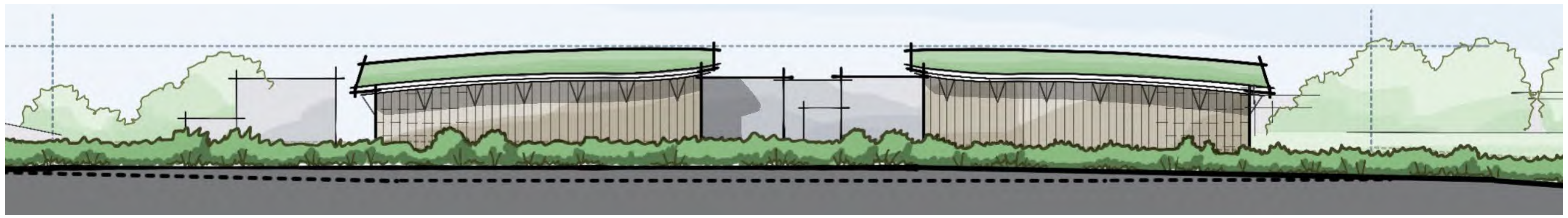
Each design approach is accompanied by a set of diagrams explaining what the strategy is addressing and the methodology of how they might be applied to the generic converter station massing. At the end of each design approach section there are some illustrative renders of the design approach applied in a selection of the representative views. These are not verified in terms of position or lighting and are intended as a means of assessing the relative merits of the design approach.

Conventional Industrial/Agricultural (Baseline)

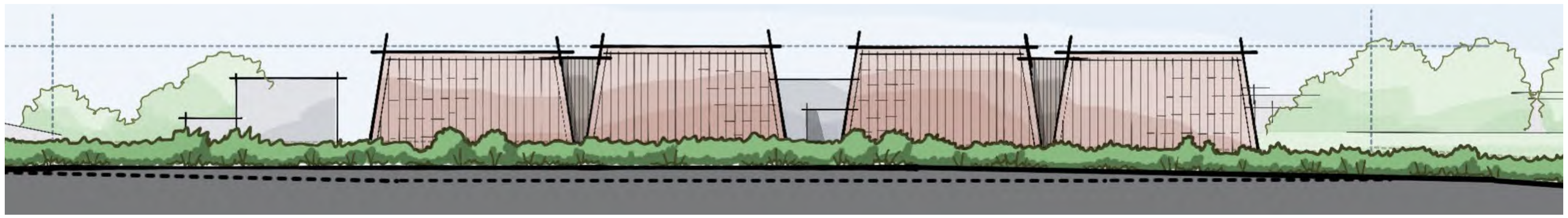
Enhanced Cladding



Enhanced Roof Forms



Fragmented Form



6.2 Conventional Industrial/Agricultural (Baseline)

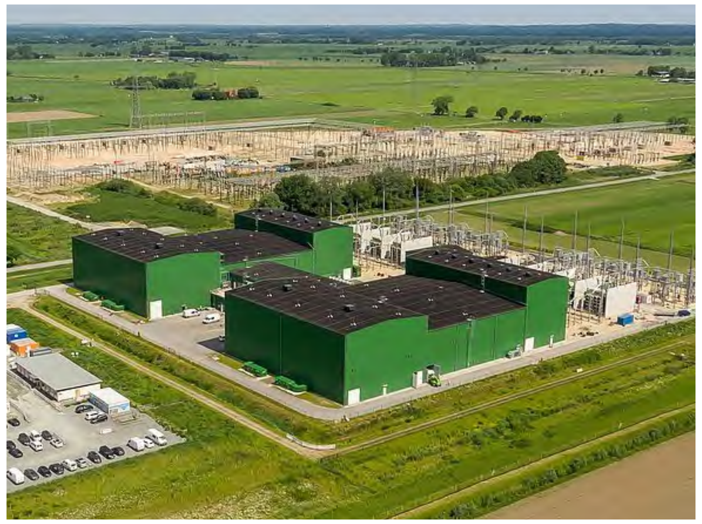
Design Approach Premise

The building forms have been taken directly from the generic converter station layout massing and elevations included in the DCO drawings. It is based on 6 degree roof pitches which are standard for conventional sheet roofing.

Revision B of this document includes updated illustrations of the baseline design approach (using Olive Green cladding) for viewpoints 1, 2 and 4. These include two versions alongside indicative tree planting:

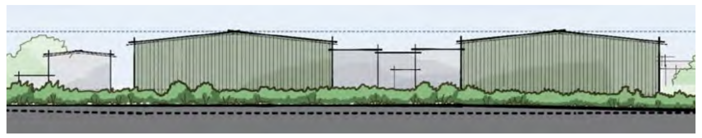
- Winter Year 1
- Summer Year 15

These have replaced the images included in revision A.



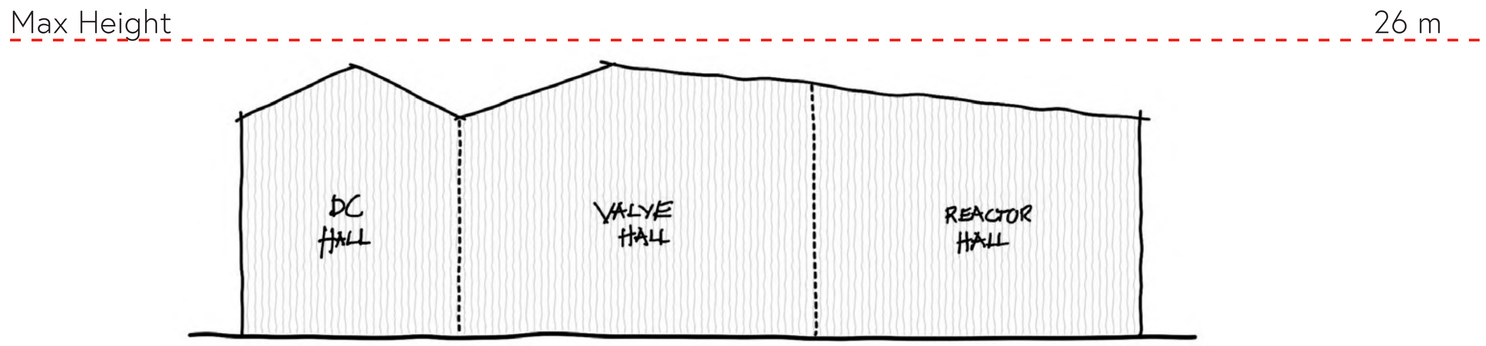
NordLink Converter Station

tennet.eu/de/projekte/nordlink

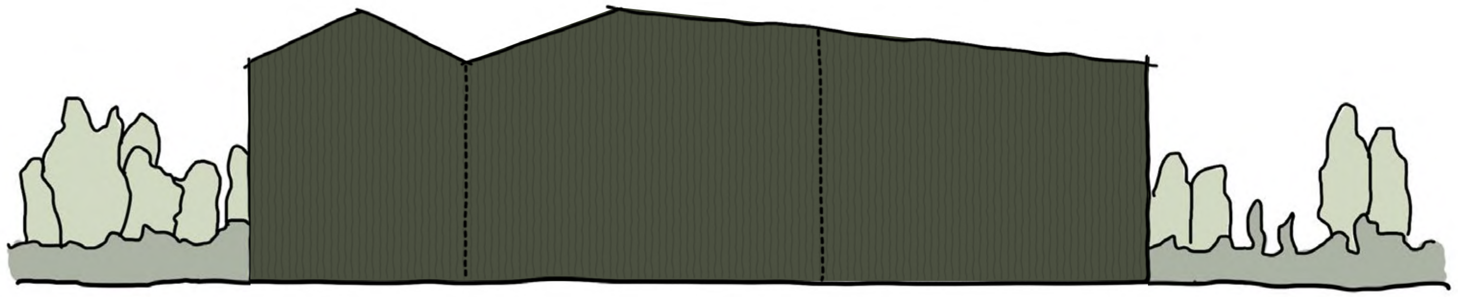


Conventional Industrial/Agricultural (Baseline)

DC Halls Heights



DC Halls Colour



Svelete Grey (RAL 080 50 20)

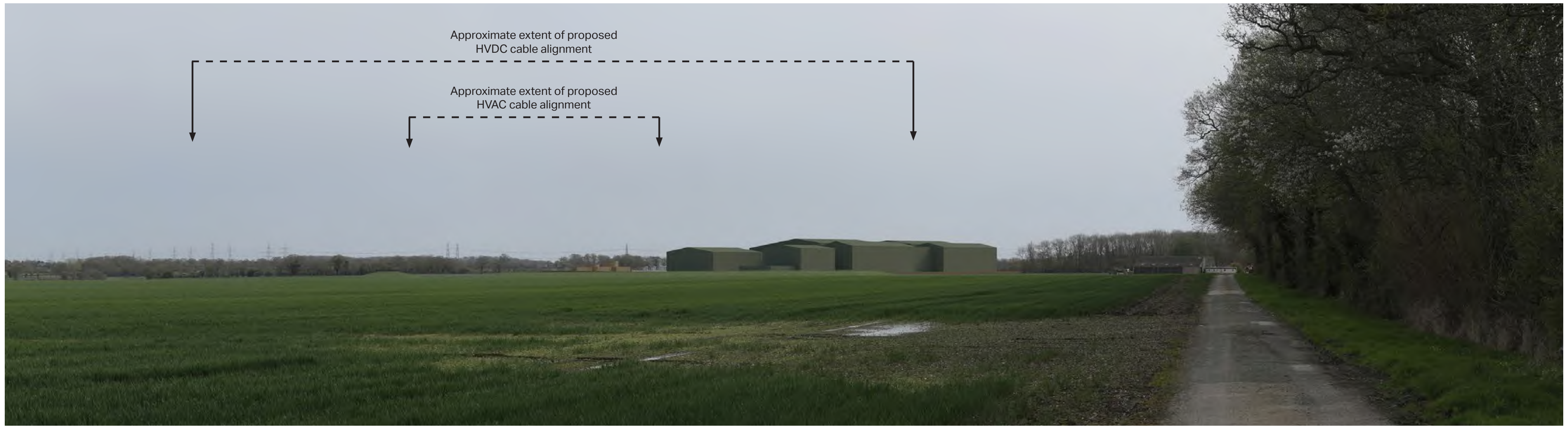
From the Tata Steel Standard Cladding Colours.
tatasteeluk.com/construction/key-products/colorcoat

Olive Green (RAL 140 30 10)

6.2 Conventional Industrial/Agricultural (Baseline)

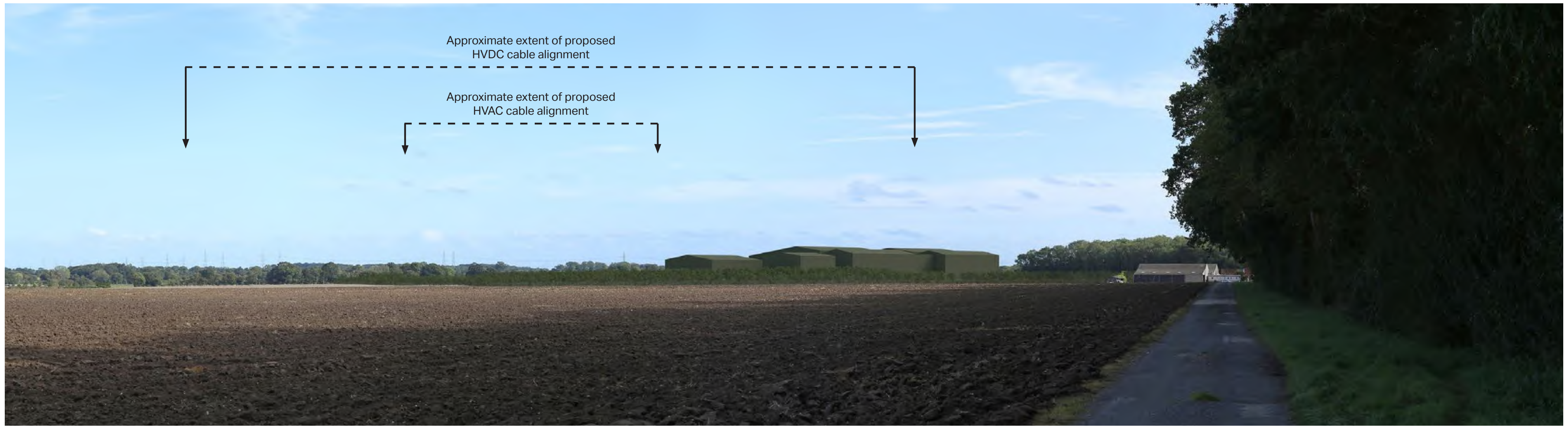
Viewpoint 1 - Winter Year 1

- The apparent height and massing of the buildings is similar to Bloomfield's Covert, the adjacent woodland.
- The green colour is not too bright and can still blend reasonably well with bare tree branches.
- The full height of buildings is apparent whilst the tree planting is yet to establish. The perimeter fencing will also be more visible.
- The colour of the field and foreground will vary depending on whether it has been ploughed or planted.



Viewpoint 1 - Summer Year 15

- The growth of the tree planting helps to connect the buildings to the ground.
- The height of the trees helps to reduce the apparent height of the buildings.
- The colour relates well to the tree canopy in leaf.



6.2 Conventional Industrial/Agricultural (Baseline)

Viewpoint 2 - Winter Year 1 (6 m Bridge)

- Most of the converter station buildings are hidden behind Bloomfield's Covert, an area of tall woodland.
- The green colour blends well with the bare tree branches.
- The bridge is shown as the worst case height. See Section 7 for more information on the design approach for the bridge.
- The same colour green has been used on the bridge metalwork as for the converter station buildings.

Viewpoint 2 - Summer Year 15 (6 m Bridge)

- The cladding's colour aligns well with the surrounding landscape, evoking a sense of cohesion.
- The building's form is somewhat 'blocky' and stands out in the gap between the trees, as it fails to echo the natural rhythm of the tree line.
- The appearance of the massing will shift with changing sunlight, making the form more pronounced at different times of the day.
- The bridge is less prominent when the crops in the field are taller.

6.2 Conventional Industrial/Agricultural (Baseline)

Viewpoint 4 - Winter Year 1

- The massing appears as part of the tree belt. Whilst the height is equivalent the straight lines stand out against the soft edges of the trees.
- The colour blends well with the bare branches.
- In some light conditions the roof could appear paler.

Viewpoint 4 - Summer Year 15

- The massing is mostly hidden behind the trees.
- The colour blends well with the trees in leaf.
- Most of the screening effect is provided by existing mature tree belts and is less reliant on establishment of the new planting.

6.2 Conventional Industrial/Agricultural (Baseline)

Viewpoint 5

- This view is one of the original renders produced for revision A of the document. It does not include any landscape mitigation and uses Svelete Grey (RAL 080 50 20) on the cladding which is a paler grey-green alternative to the Olive Green.
- If a darker green cladding were used the contrast between the converter station and the existing agricultural building.
- In this view, the massing's colour works effectively, serving as a neutral intermediary between the shed in the foreground and the tree line, allowing the building form to 'situate' more naturally into the scene.
- The form appears less imposing in this context, aided by the presence of the shed in front, which helps to scale the building appropriately within its environment.
- This perspective is largely successful, driven by the relationship between the existing structures and not the form itself.

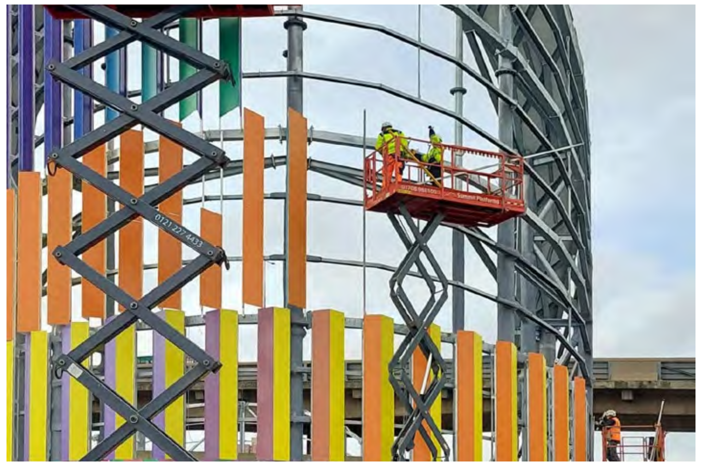
6.3 Enhanced Cladding

Design Approach Premise

Using enhanced cladding can provide a way to enclose the technical box, creating a decorative facade that sensitively responds to the surrounding area. This approach allows for variations in texture, colour, and tone, offering an expression of depth that complements the environment.

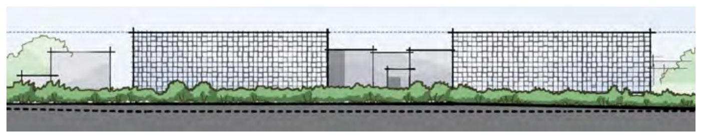
As this is a secondary skin for the technical box of the converter station, it can effectively conceal gutters, pipes, and louvres.

The design approach has been developed in line with the Limits of Deviation and within the Rochdale Envelope (26 m).



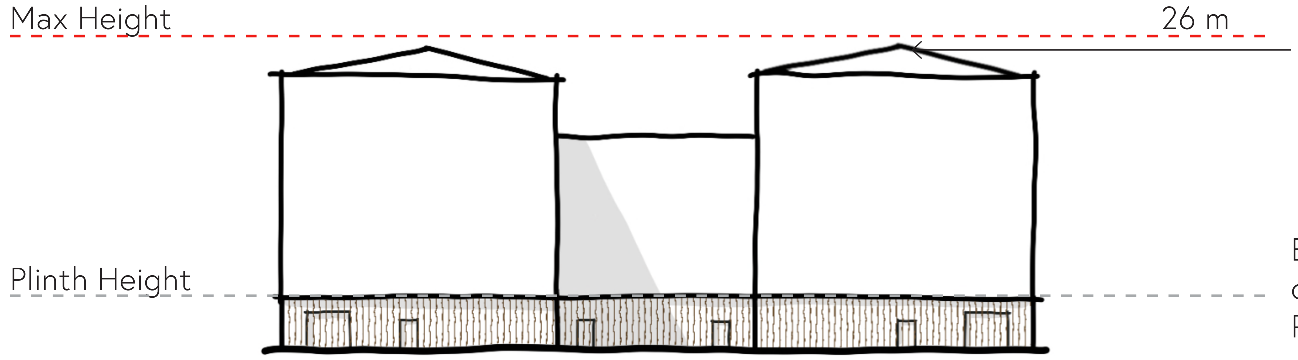
Brent Cross Substation

arup.com/projects/brent-cross-town-substation/

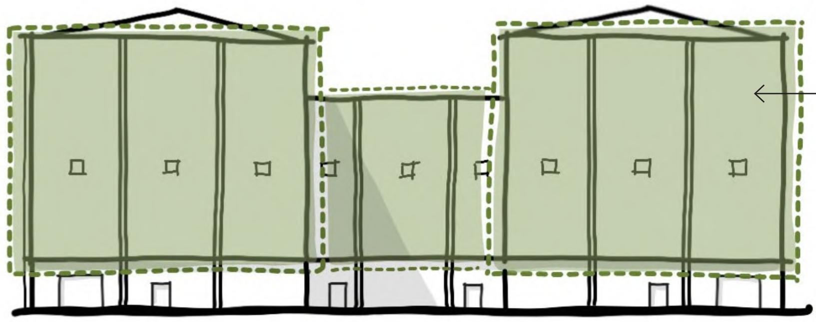


Enhanced Cladding

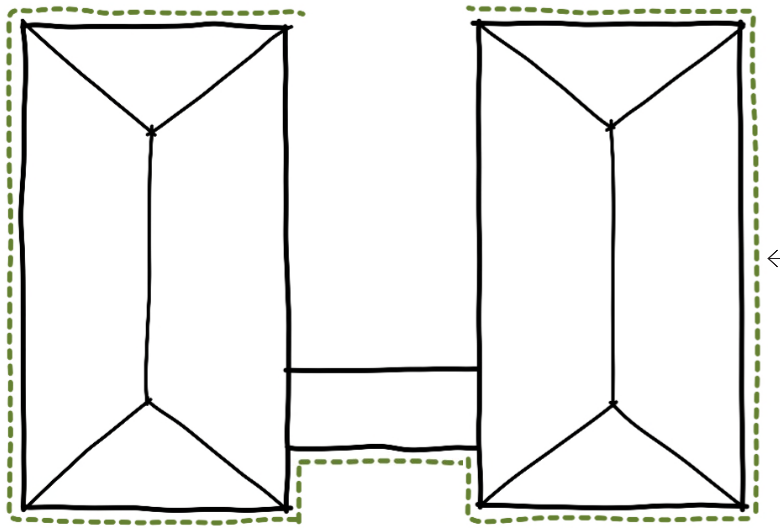
DC Halls Heights



Secondary Skin Elevation



Secondary Skin Plan



6.3 Enhanced Cladding

Key Elements

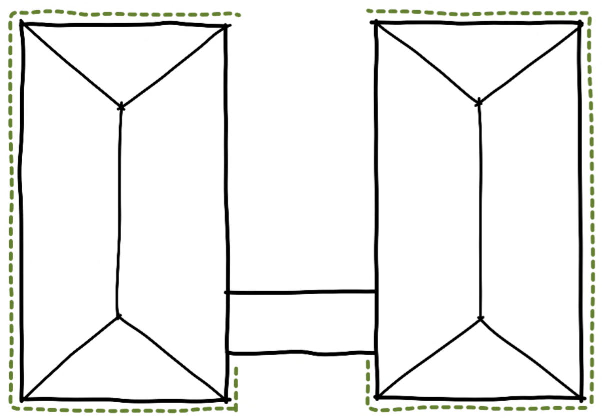
This integrates three key strategies: Softening Edges, Stepping Corners, and Panelisation.

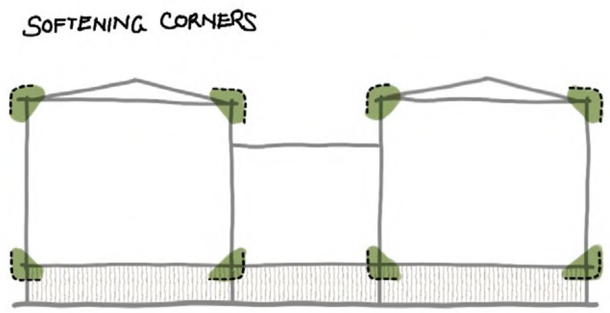
Softening Edges: The cladding curves over the roofline, blending with the landscape by mimicking natural contours. This reduces visual impact and creates a seamless transition between the structure and its surroundings.

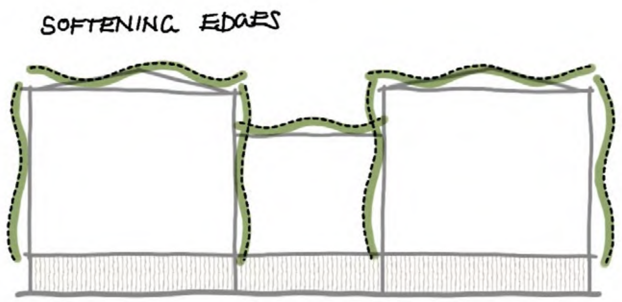
Stepping Corners: A freeform mesh wraps the building, with varying cladding density to create depth and texture. This interplay of light and shadow enhances the organic feel, echoing patterns found in nature.

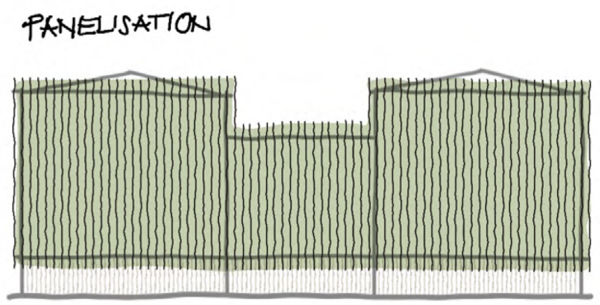
Panelisation: Varying the cladding height along the facade reflects the rhythm of the treeline, breaking down scale and adding an organic, dynamic quality to the elevation.

Perimeter covered by panels on the DC Buildings







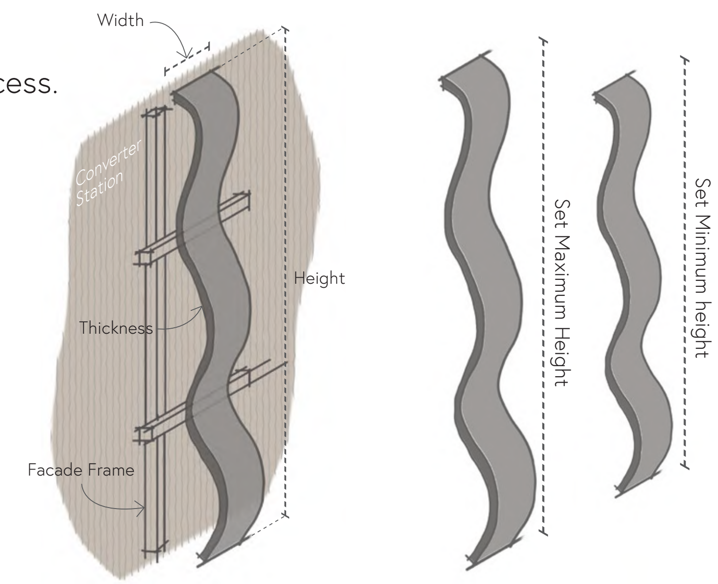


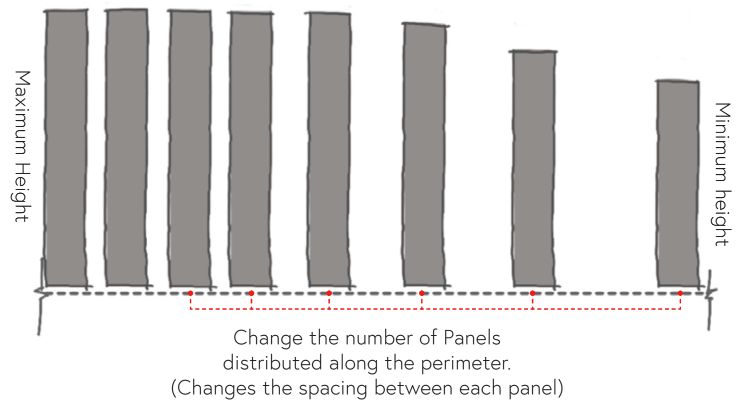
Organic curve along the face of the technical box.

Using parametric modelling, the facade is generated through a set of adjustable parameters, enabling an iterative design process. The enhanced facade adapts to individual design changes and site conditions through these parameters.

Individual parameters that can be changed:

- Height / Width / Thickness of the panel.
- The curvature of the panel.
- Set the number of panels along the perimeter of the technical box. (Changes the spacing between the panels).
- The maximum and minimum heights of the panels when distributed along the perimeter.





6.3 Enhanced Cladding

These are proposed views without the planting.

Viewpoint 1

- This approach enhances the facade to reduce its visual impact compared to conventional cladding systems.
- A decorative overcladding layer adds depth and flexibility, allowing for a more refined integration with the surroundings while concealing technical elements.
- The detailed design will require far greater refinement and respond to the final engineering layout in order to capture the intended design benefits of this strategy.

Viewpoint 2

- Colour of the technical box is important as it blends into the enhanced facade, in this case a brown earth tone becomes more prominent.
- In this view the tallest buildings are below the horizon line. The building blends into the fields behind.

6.3 Enhanced Cladding

These are proposed views without the planting.

Viewpoint 4

- In this view, the DC building is seen through the break in the trees.
- At this scale the shape of the building remains very sharp despite the curving of the edges through the enhanced cladding.

Viewpoint 5

- The building remains a dominant presence. The softening of the edges through the curved panels is more prominent.
- There is a contrast between the straight edges of the technical boxes to the organic "wave" the panels create through its curvature.

6.4 Fragmented Forms

Design Approach Premise

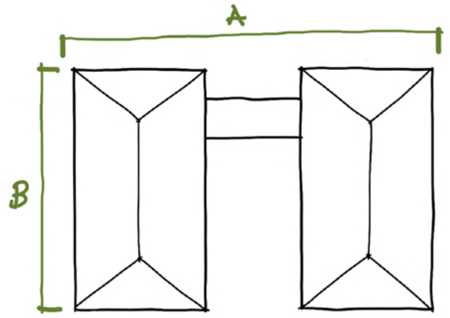
The Rochdale Envelope defines a maximum building height of 26 metres. This height allows for the anticipated height of building required to enclose the internal equipment allowing for air insulation, service zones, structure and reasonable roof forms. It may be that elements of the buildings can vary in height or depth, due to different clear height requirements, allowing fragmentation of the form to break up the bulk and flatness of the massing into smaller parts, to help mitigate the visual impact.

Dividing the facade into three main blocks highlights the three primary areas of the DC block: the DC Hall, Valve Hall, and Reactor Hall. This approach not only enhances the architectural design but also visually represents the flow of electricity through the DC Halls.

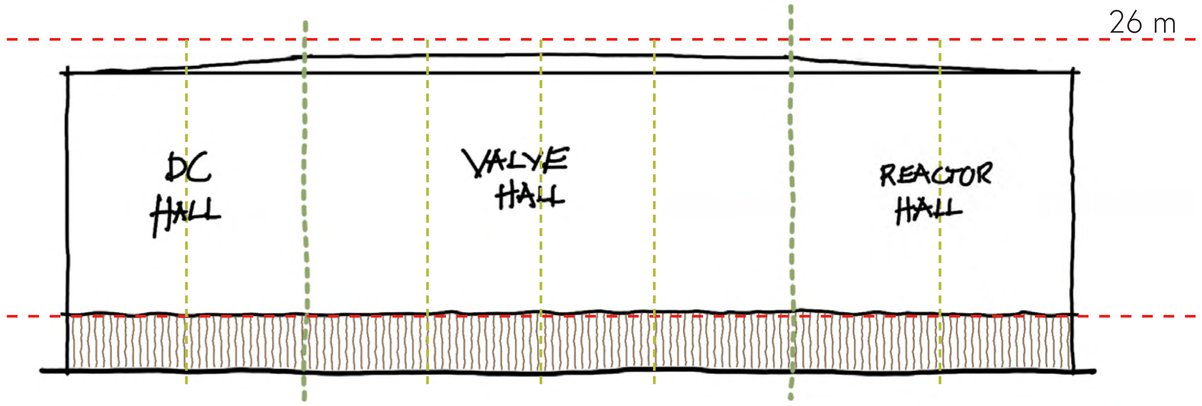
South- West Link (SydVastLanken Hurva Sweden.
hd.se/artikel/sydvastlanken-forsenas-annu-en-gang/

Fragmented Form

DC Halls Plan View



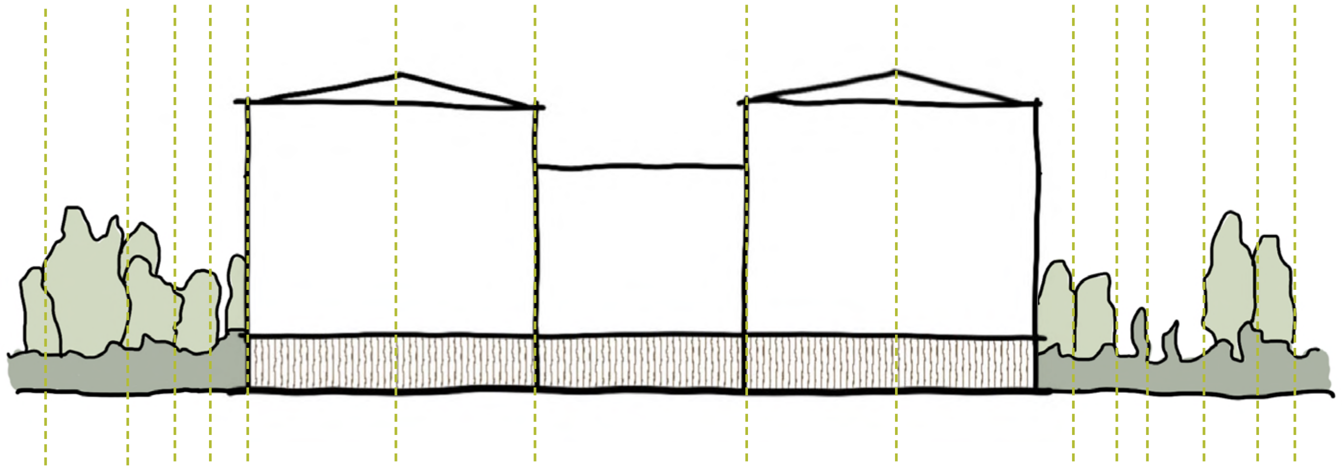
DC Halls Elevation A



Entrances are concealed within the Plinth Level

DC Hall Elevation B

Fragmenting Sections



6.4 Fragmented Forms

Key Elements

Fragmented Form 1

Taking the principle of breaking up the facade into 3 main blocks. The elevation is broken up into bigger and smaller blocks with a shadow gap emphasising the lines that break the facade up. This creates an irregular rhythm, symbolising the irregularity of the tree line and topography.

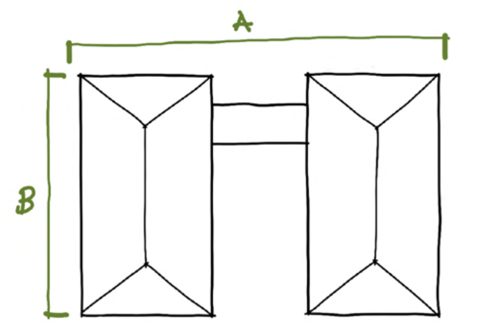
Fragmented Form 2

This takes fragmented form 1 further by softening the sharp edges of the articulated mass by cutting away the corners, with the adjustments tailored to the equipment inside each block. The angle at which the block is cut depends on the height of the mass. For the lower blocks, a larger angle is used, resulting in less material being removed to ensure sufficient clear height for the equipment inside. The variation in height breaks up the mass's skyline, reflecting the irregularity of the tree line

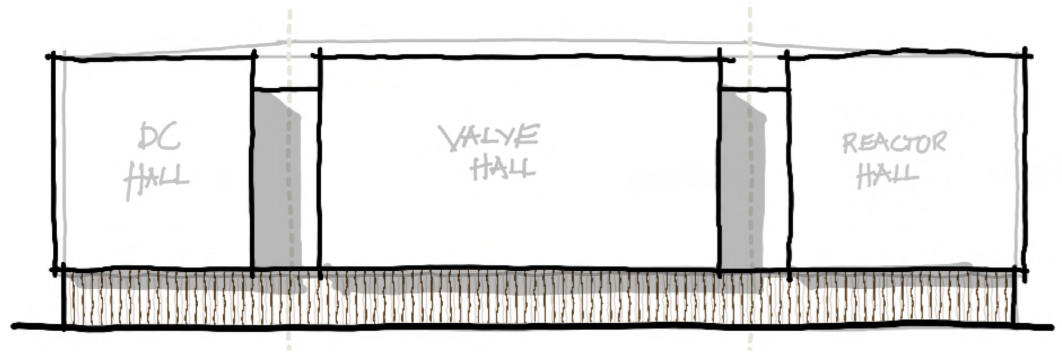
Fragmented Form 3

This form further fragments the mass while maintaining the concept of dividing the facade into three main blocks to represent the primary areas of the DC block. These three blocks are then further subdivided into secondary fragments, breaking up the flat facade even more to better integrate with the organic landscape. Each block features a sloped roof, creating a staggered elevation for added visual interest.

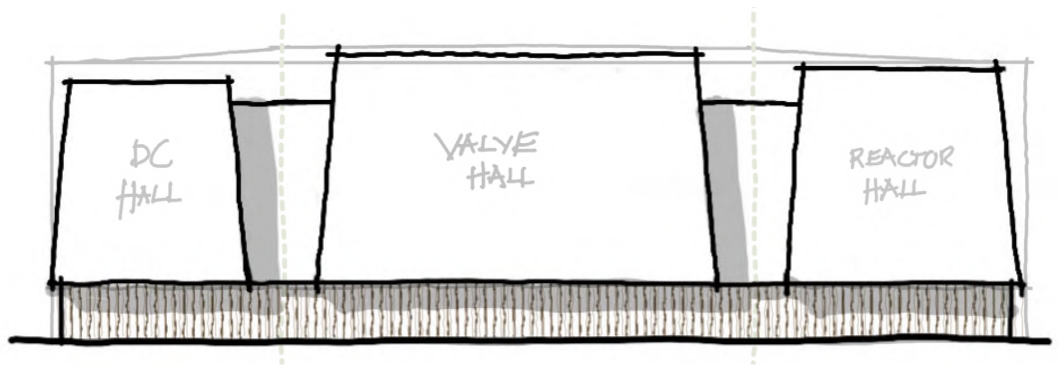
DC Halls Plan View



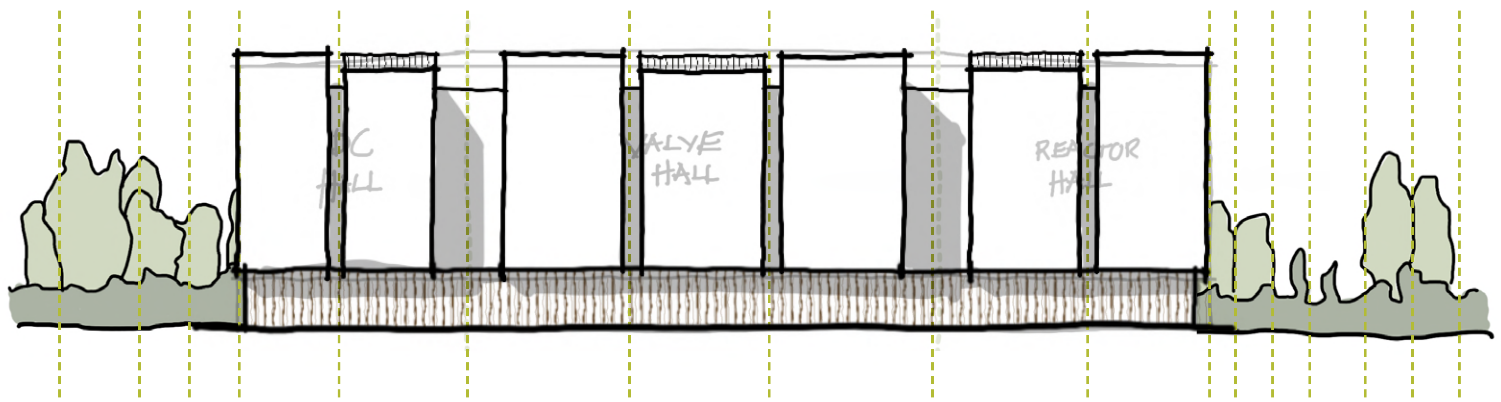
Fragmented Form 1 Elevation B



Fragmented Form 2 Elevation B



Fragmented Form 3 Elevation B



6.4 Fragmented Forms

Viewpoint 1

- Sharp edges are cut away through the sloping edges- Overall softening the profile.
- Shadow gaps accentuate the articulation, breaking up the long facade
- Depending on the clear heights of the equipment, the various heights of the blocks could be taken further, elaborating the stepping up and down from the ground, and following the tree line behind.
- The Green of the facade sits well within the surrounding.

Viewpoint 2

- In this particular view the break between the tree line exposes the top corner of the converter station. Sloping the profile of these blocks helps minimise the visual impact.
- The Green colour of the converter station sits well within the multiple shades of green found in the treescape.
- The stepping up from the ancillary building to the DC Block helps with the converter station to follow the stepping up of the tree line to the right side.

6.4 Fragmented Forms

Viewpoint 4

- Shadow gaps help to break up the buildings into multiple blocks. Minimising the perception of a long flat facade.
- Electrical equipment, mainly the transformers and blast walls can be seen from this view.
- The stepping up of the blocks help with the nature of the ground sloping up, this could be taken further depending on the clear heights of the equipment in its interior.
- An ancillary building is also in this view, there is a potential to extend the language of articulation to the other buildings.

Viewpoint 5

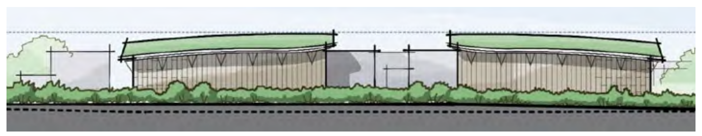
- The AC yard area is a prominent feature in this view, emerging above the Long Belt trees.
- The slight sloping of the roof helps to minimise the profile of the DC Hall overall keeping down the visual impact.
- The green of the converter station is a darker shade to the Hill Farm agricultural Barn.

6.5 Enhanced Roof Forms

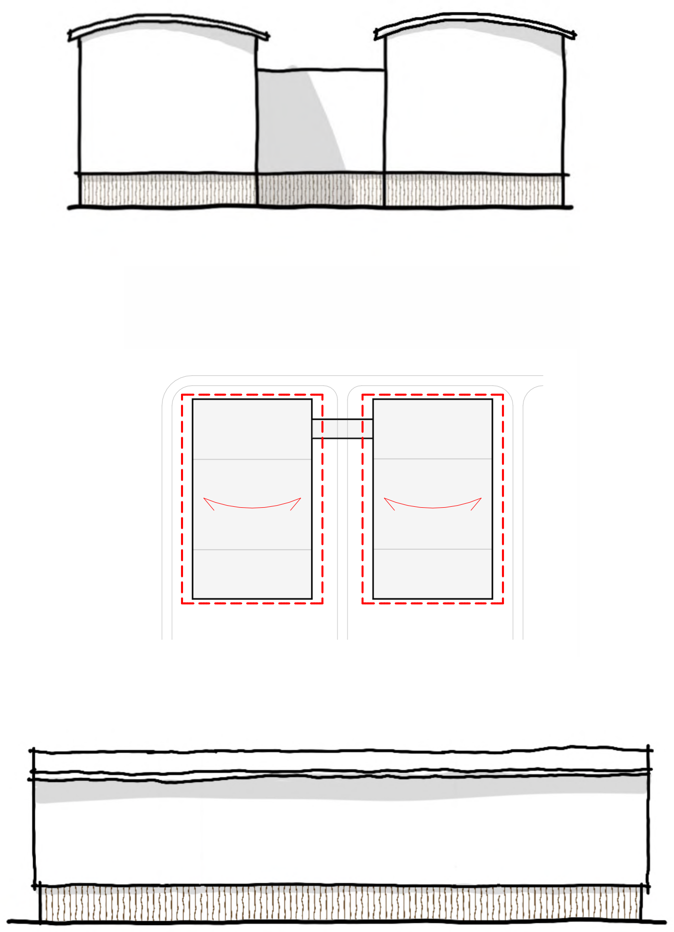
Design Approach Principles

A curved roof on a converter station significantly reduces its visual impact by softening the sharp edges typically associated with industrial buildings. This smoother, flowing form creates a more organic silhouette, helping the structure blend more seamlessly into its surroundings. Compared to angular or flat-roofed designs, the curved roof reduces the perception of bulk, making the building appear less imposing from a distance.

Adnams Distribution Centre - Southwold, Suffolk
aukettswanke.com/projects/adnams-distribution-centre/

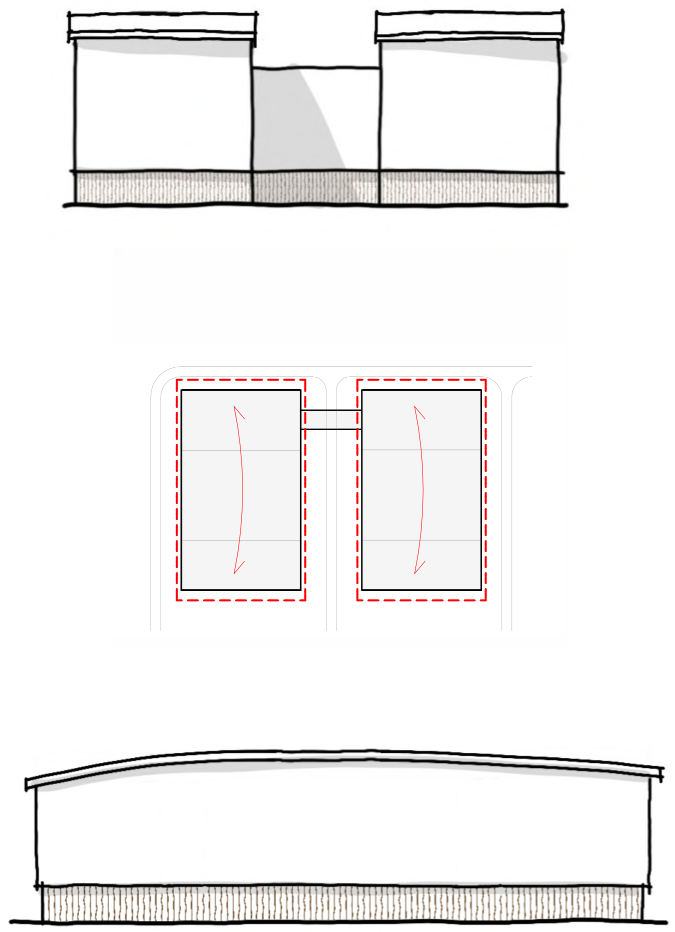


Enhanced Roof



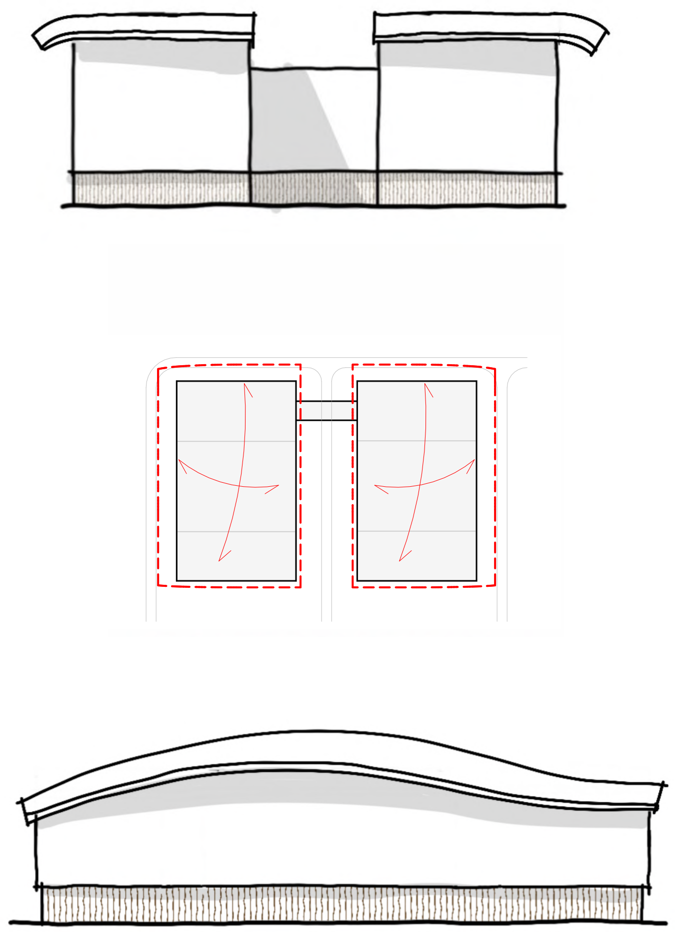
Single Curve (Y)

One option is a single curve in the Y direction, which spans the shorter side of the converter station. This is a conventional approach that maintains the same height across all three parts of the building. While simple and efficient, this design creates a uniform profile that softens the overall form without differentiating between the internal spaces.



Single Curve (X)

Another approach is a single curve in the X direction, spanning the longer side of the station. This method introduces varied heights across the DC Hall, Valve Hall, and Reactor Hall, reflecting their differing functional requirements. By emphasising these variations, the design gains a more dynamic and layered appearance while maintaining a conventional approach.



Asymmetrical Double Curve

For a more expressive and context-sensitive design, an asymmetric double curve offers a profile that spans in all directions. This option introduces an irregular, flowing form with varying heights for each part of the building. The asymmetric profile is complemented by extended eaves, which help integrate the roof's curves into the natural context. This approach creates a visually striking and organic design that further softens the edges and reduces the building's impact on its surroundings.

6.5 Enhanced Roof Forms

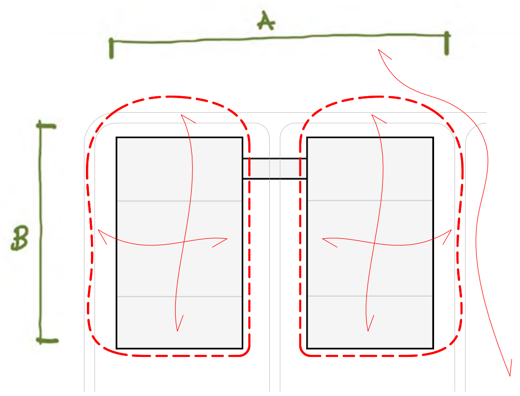
Key Elements

Freeform Double Curve

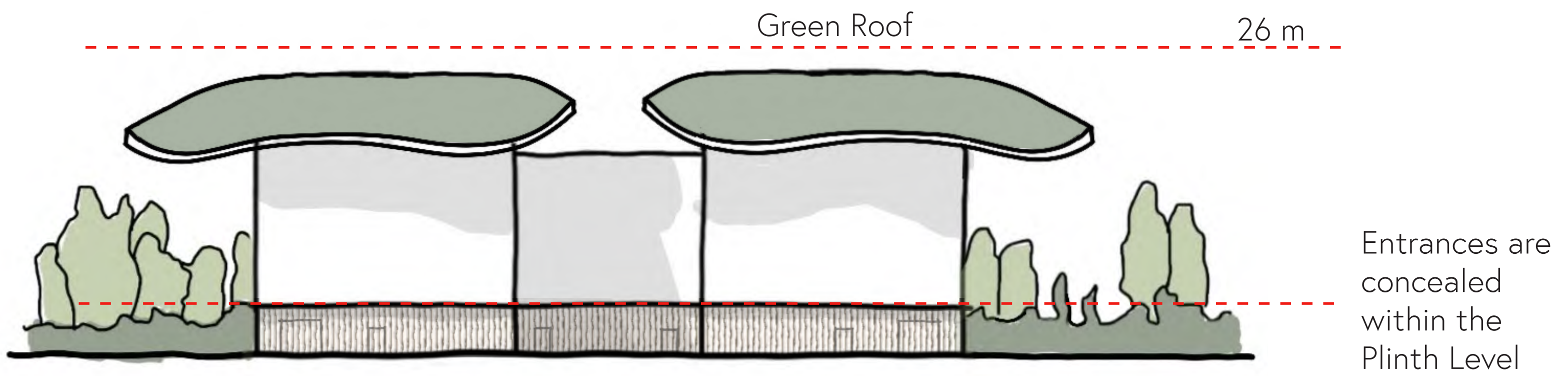
A curved roof on a converter station significantly reduces its visual impact by softening the sharp edges typically associated with industrial buildings. With a free-form profile across all directions, the roof introduces an organic irregularity, creating a flowing form that feels more in harmony with its surroundings. This reduces the perception of bulk, making the building appear less imposing and more visually integrated into the landscape.

In the context of a green area, the curved roof's significant outer eaves cantilever over the bunding, helping the structure blend with the natural contours of the site. Dynamic roof edges and an exaggerated roof expression add architectural interest while enhancing the overall silhouette. By incorporating a green roof, the building further mirrors the colours and textures of the surrounding vegetation, reducing its prominence and promoting biodiversity by providing habitat opportunities for plants and wildlife.

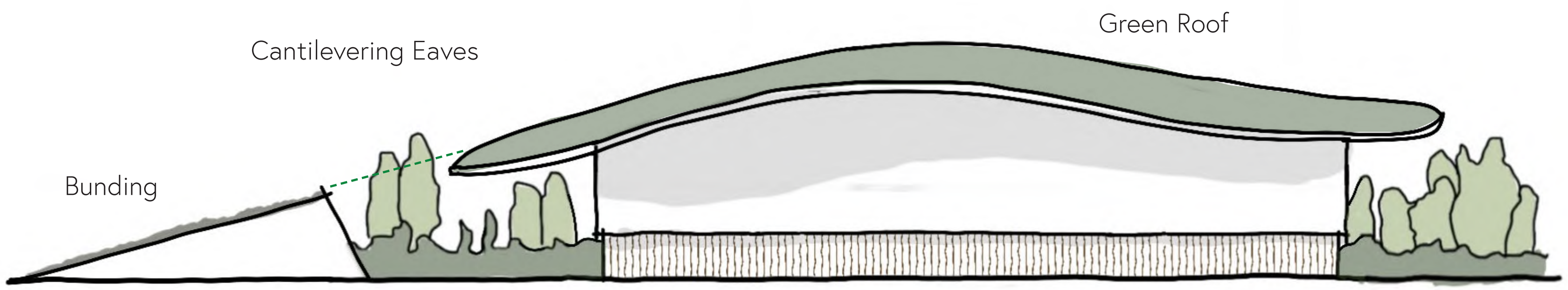
DC Halls Plan View



Freeform Double Curve Elevation A



Freeform Double Curve Elevation B



6.5 Enhanced Roof Forms

Viewpoint 1

- The 'stepped' curves in this design help integrate the surrounding greenery with the rooflines of the DC blocks, softening the otherwise bleak verticality of the facade.
- The deliberate 'split' between the two roofs, coupled with the large overhanging eaves, mirrors the rhythm of the distant tree line, casting a continuous line of shadow that flows through both the landscape and the buildings.
- The main roof of the DC block extends the natural landscape across the rooftops, gently mitigating the harsh angles typically found in standard building designs.
- While the large scale of the roofs might initially seem imposing within the landscape, they effectively 'rescale' the DC building, making it appear more proportionate and visually comfortable within its environment.

Viewpoint 2

- The curve of the roof serves to minimise the impact of a typical 'boxy' structure within the landscape, softening the harsh edges that become more pronounced in distant views.
- The expansive overhanging eaves not only draw the tree line over the building, but also cast dynamic shadows on the vertical walls below. These shadows, shaped by the eaves, could blend into the larger landscape, enhancing the organic feel of the environment.

6.5 Enhanced Roof Forms

Viewpoint 4

- The substantial overhangs cast shadows on the brown facade of the building, working with the surrounding vegetation.
- The green roofs introduce a 'grass canopy' that fills the visual gap in the existing vegetation, helping to combine with the natural environment.
- There is potential for the curved roofs to evolve in form (maintaining the same core principles), to better mirror and complement the surrounding landscape.

Viewpoint 5

- While any structure might seem imposing from this viewpoint, the expansive roofs give the impression that the DC building is smaller than it is.
- The oversized eaves, however, can amplify the building's scale. To mitigate this effect, bunding could be strategically introduced to soften the visual impact of the large eaves.

FROMUS BRIDGE

7.0

7.0 Fromus Bridge

7.1 Illustrative Design Approach to the Indicative River Fromus Crossing

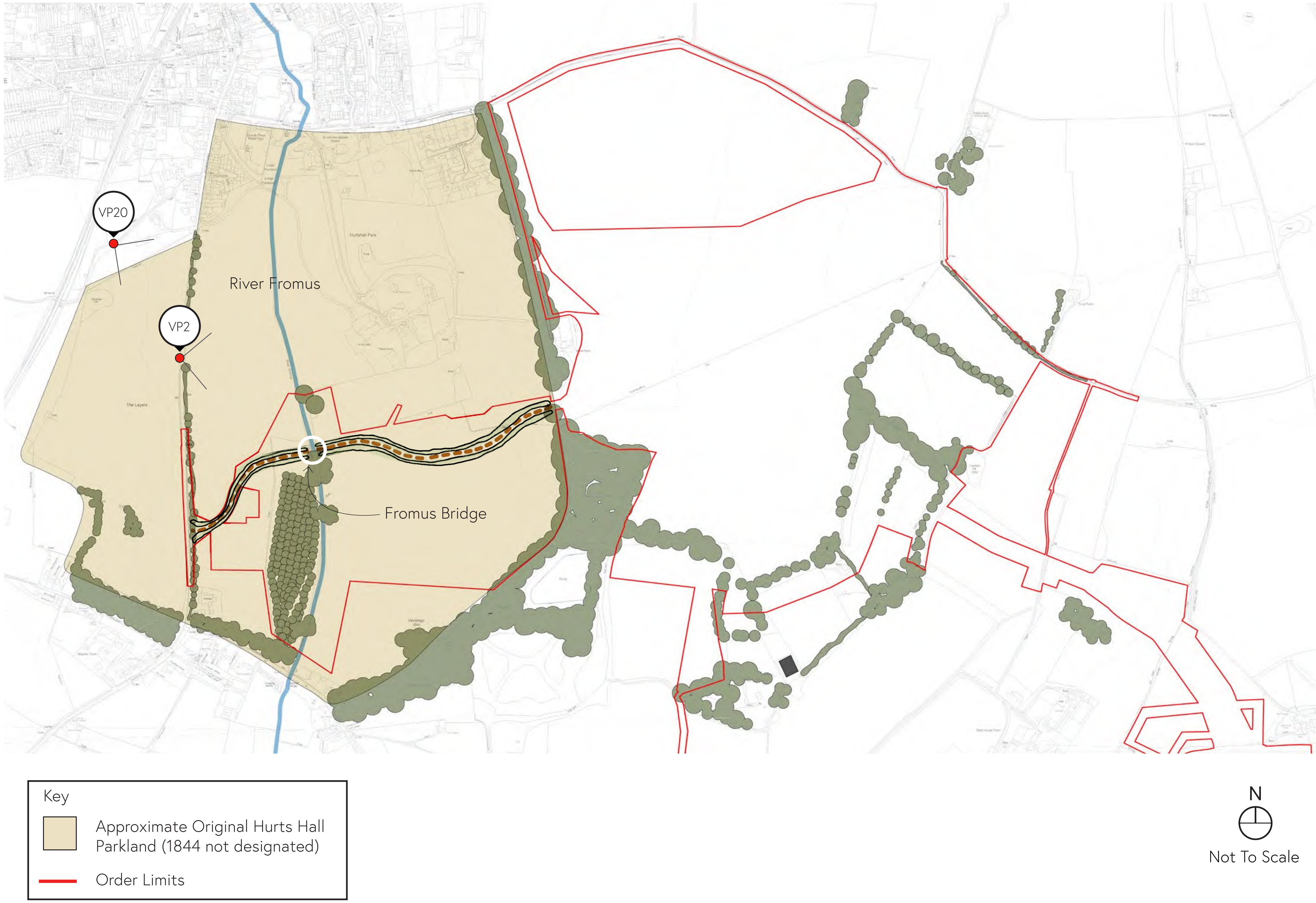
The haul road, and permanent access, comes into the site from the west from the B1121 and across the River Fromus. This illustrative design approach has been developed to show how the indicative crossing proposal shown in **Application Document 2.14.1 Indicative General Arrangements Plans - Suffolk**, and **Application Document 2.13 Design and Layout Plans,** could be designed in line with the design principles committed to in **Application Document 7.5.3.2 CEMP Appendix B Register of Environmental Actions and Commitments (REAC)**.

The purpose of this section of the DAD is to provide a narrative to how the illustrative bridge crossing design could be developed in compliance with the design principles and the site constraints in such a way to reduce the visual impact of the bridge. This includes:

- demonstrating how the design approach would address the critical dimensions;
- Review of the illustrative bridge crossing drawings, including comments from LPAs and DRP;
- a review of case study bridges;
- identifying the key focus areas of the design approach;
- material and colour palette;
- design approach to the bridge span;
- design approach to the abutment walls;
- design approach to the parapet; and
- illustrations of the design approach in key views.

The section has been updated in revision B to make use of further illustrative material prepared for LPA engagement during pre-examination.

Illustrative Location Plan of Indicative River Fromus Crossing



7.2 Location

Viewpoint 2 (From an opening in the hedgerows of the B1121, East of Site)

Viewpoint 20 (Public footpath south of Saxmundham)

7.3 Critical Dimensions

Key Design Drivers

The bridge needs to be designed for the AIL which transports transformers to the converter station site. This vehicle can be up to 74 m and the combined weight of the vehicle and the transformer could be up to 500 tonnes. The maximum gradient of the ramps is 1:16 which determines the length of ramp. The indicative carriageway width is 5.5 m with an overall width of the bridge of 6 m. A parapet height of 1 m has been allowed for in the approximate heights.

The assumed river channel width is approximately 8 m and the abutment walls (including facing materials) need to be set back a minimum of 8 m from the top of banks. This results in an indicative clear span of 24 m and bridge structure 26 m long.

The indicative depth of the bridge structure is approximately 2.5 m.

Preferred Option

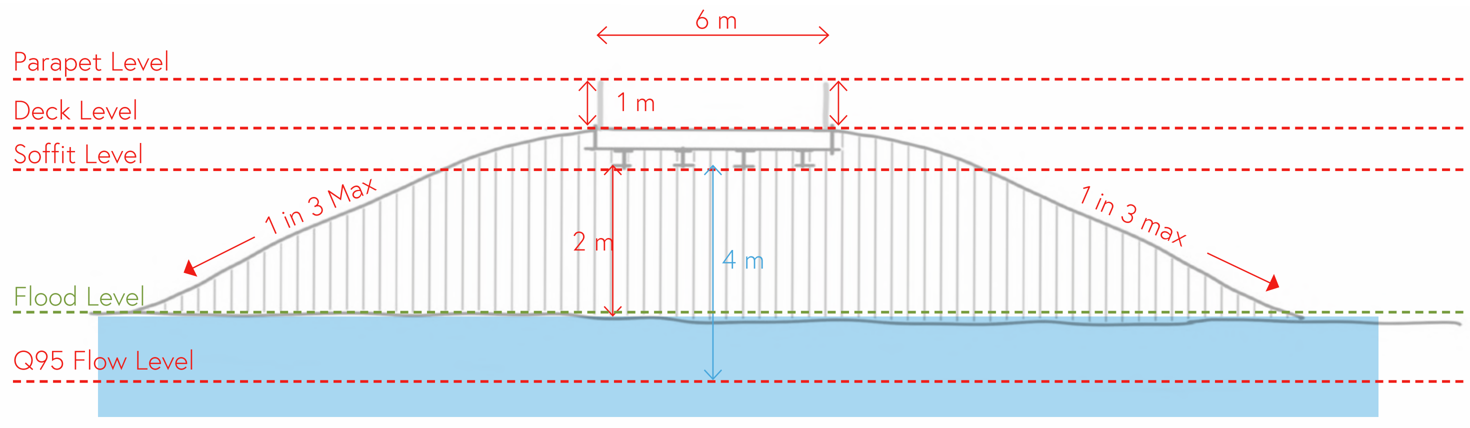
The key driver behind the minimum clearance is providing access to a rising main on the western bank of the river. This option would result in a reduced visual impact of the crossing. The footprint of the ramps would also be smaller reducing the impact on existing vegetation.

Constraints:

- Clearance from top of bank to the soffit should be a minimum of 2 m;
- Top of parapet shall be a maximum of 4.0 m above the ground level at the abutments;
- (Q95 level plus 4 m); and
- (42 m long approach ramps at 1:16).

Sketch Section across River Fromus through the Bridge

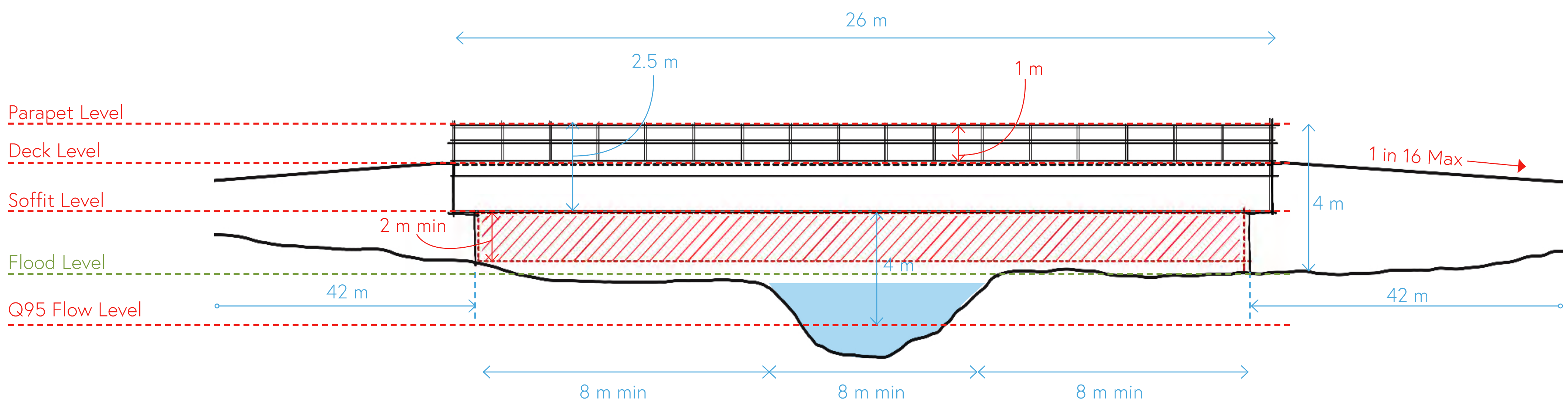
Not to Scale



Key
- Critical Dimensions and Levels
- Approximate / Inferred Dimensions

Sketch Long Section across the bridge through River Fromus

Not to Scale



Indicative Illustration (Not to Scale)

7.3 Critical Dimensions

EA Requested Option

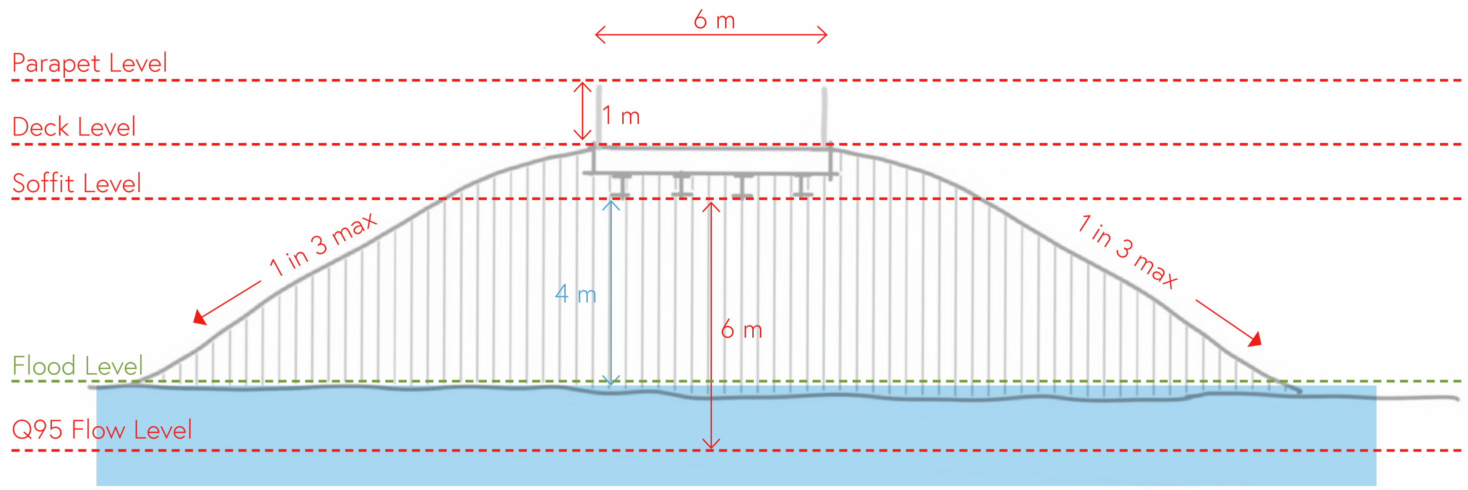
The key driver behind the increased height in this option is an Environment Agency (EA) request to provide a minimum clearance under the bridge for migration of flying invertebrates. This is stated as 6 m clearance from the Q95 flow level. This level is approximately 2 m below the banks of the river hence the resultant 4 m height of soffit from top of bank. This 6 m clearance would only be required over the width of the channel. This option results in larger ramps that are both wider and longer, increasing the impact on existing vegetation. It also increases the visual impact by making the crossing more prominent in key views. As this option is the worst case for visual impact the illustrations of the design approach will focus primarily on this option.

Constraints:

- clearance from top of bank to the soffit should be a minimum of 4 m;
- clearance from Q95 flow level to soffit should be a minimum of 6 m (driver is water framework directive and clear space for migration of invertebrates along the river course;
- Top of parapet shall be a maximum of 6.0 m above ground level at the abutments;
- (Q95 level plus 6 m); and
- (62 m long approach ramps at 1:16).

Sketch Section across River Fromus across the Bridge

Not To Scale

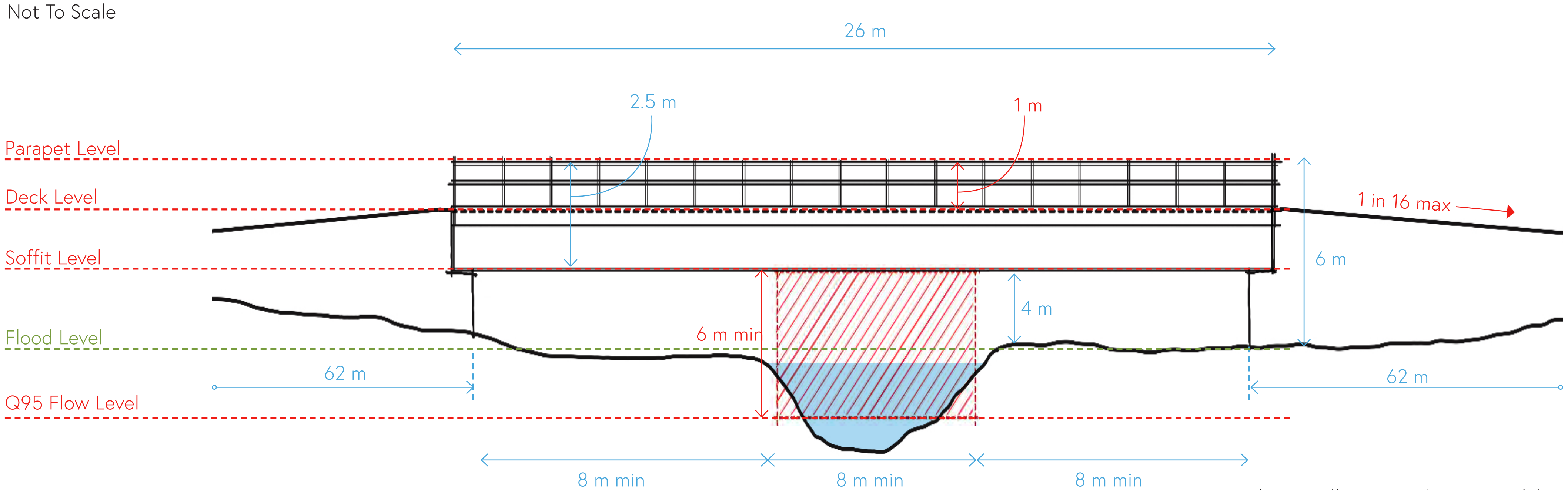


Key

- Critical Dimensions and Levels
- Approximate / Inferred Dimensions

Sketch Long Section across the bridge through River Fromus

Not To Scale



Indicative Illustration (Not to Scale)

7.3 Critical Dimensions

Compromise Option

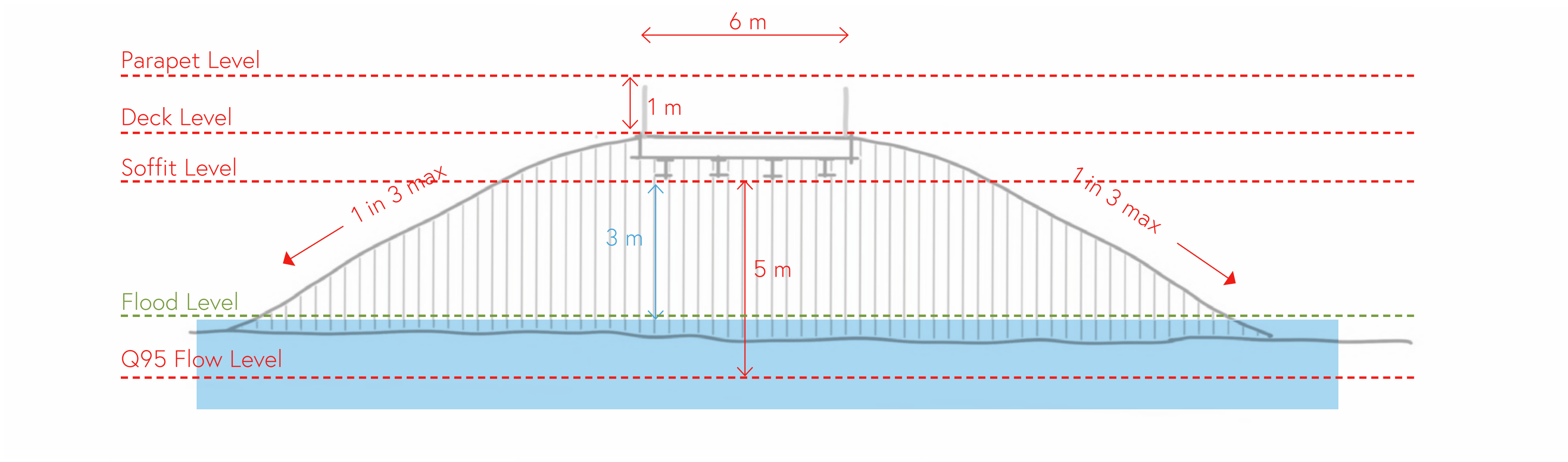
This option splits the difference between the height requested by the Environment Agency (EA) and the preferred option. The clearance under the soffit would be 5 m from the Q95 flow level. This level is approximately 2 m below the banks of the river hence the resultant 3 m height of soffit from top of bank. This 5 m clearance would only be required over the width of the channel.

Constraints:

- clearance from top of bank to the soffit should be a minimum of 3 m;
- clearance from Q95 flow level to soffit should be a minimum of 5 m (driver is water framework directive and clear space for migration of invertebrates along the river course;
- Top of parapet shall be a maximum of 6.0 m above ground level at the abutments, but this option would allow the parapet to be approximately 1 m lower than the maximum height.

Sketch Section across River Fromus across the Bridge

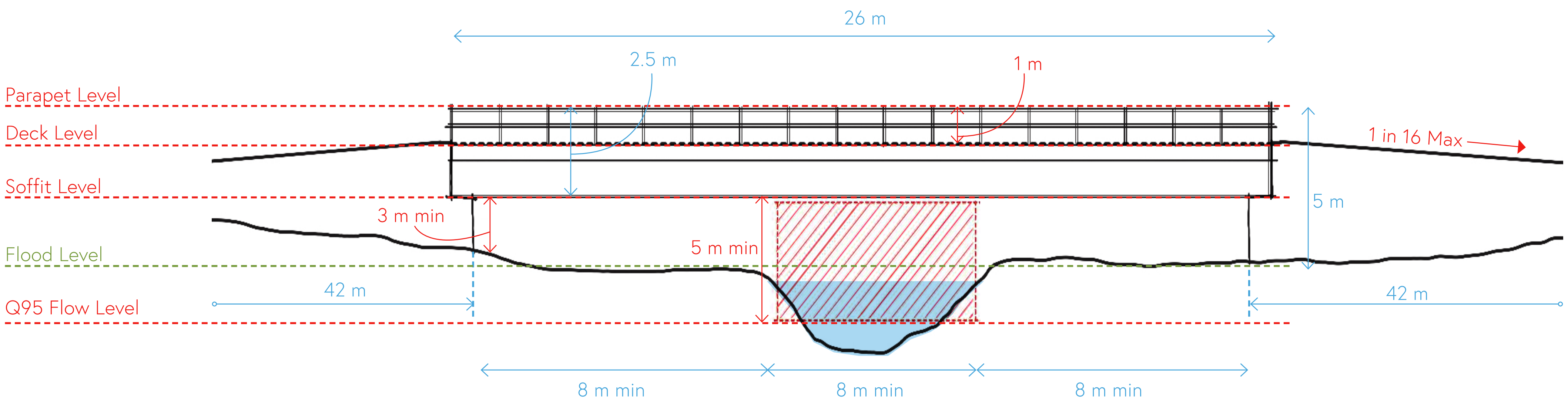
Not To Scale



Key
- Critical Dimensions and Levels
- Approximate / Inferred Dimensions

Sketch Long Section across the bridge through River Fromus

Not To Scale



Indicative Illustration (Not to Scale)

7.4 Review of the Illustrative Crossing Plans

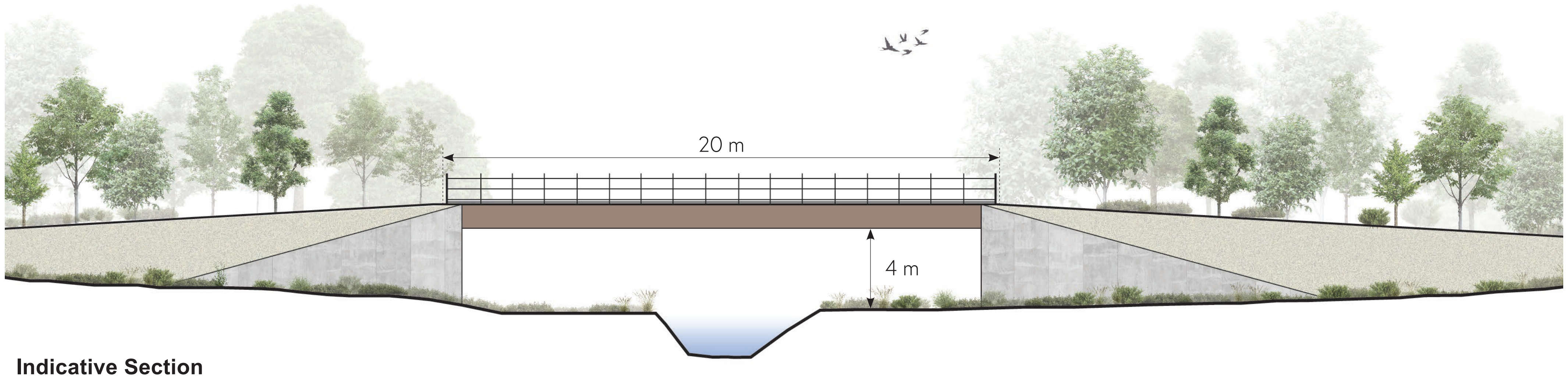
4m clear version

To assist the discussion of the bridge design approach with the LPAs and at DRP the illustrative drawings of the elevation and section of the crossing were developed to add a wider context with suggestions of colour and planting. These focused on the EA requested option as it is the worst case in terms of visual impact.

The steel girder option was illustrated as it would be the preferred option for the design approach. The reasons being:

- The depth of structure required could be slightly reduced by comparison
- The girders are shown recessed further from the edge reducing the apparent thickness of the fascia edges and making the bridge appear more elegant
- There is more scope for enhancing the steel compared to concrete including coating colours.

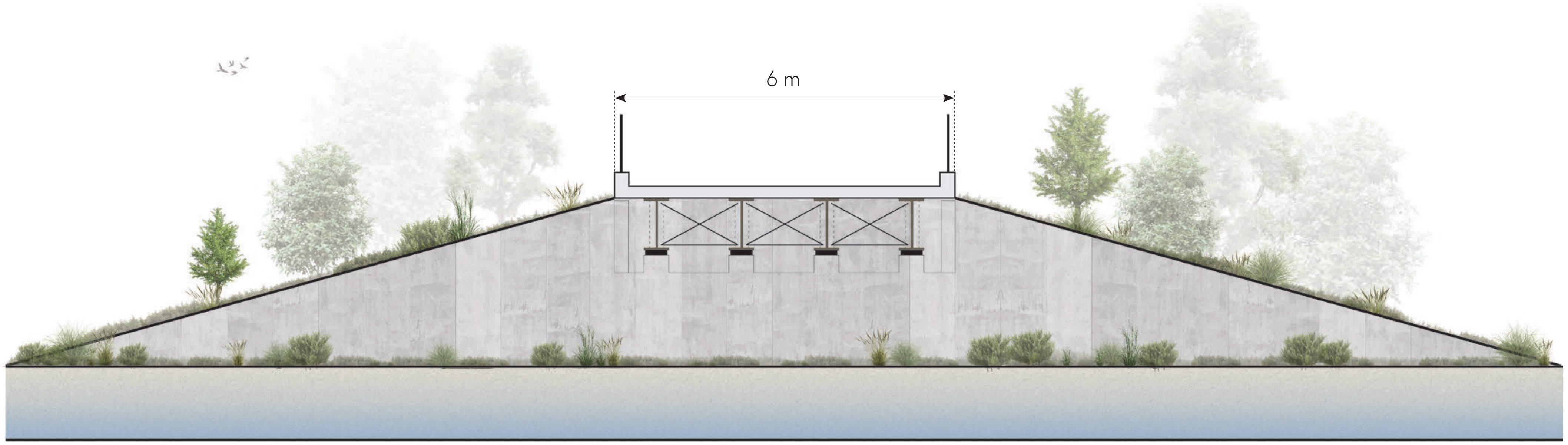
Refer to the table in Section 4.3 Design Review Panel Report and Responses



Indicative Section

Illustrative long section along the bridge across the river and the native hedgerow tree planting.

1:200 @ A3



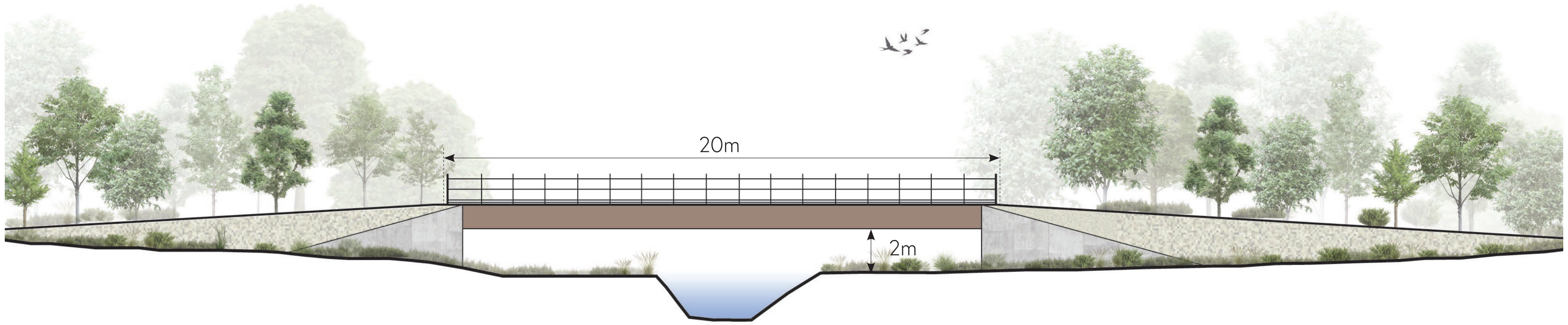
Indicative Section

Illustrative section through the bridge along the river.

1:100 @ A3

7.4 Review of the Illustrative Crossing Plans

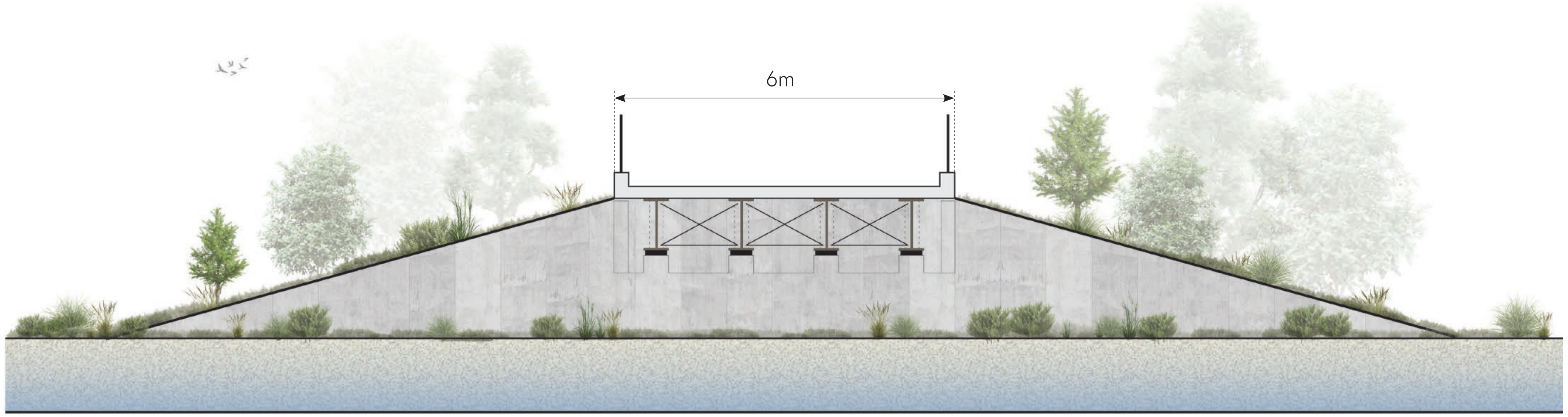
2m clear version



Indicative Section

Illustrative long section along the bridge across the river and the native hedgerow tree planting

1:200 @ A3



Indicative Section

Illustrative section through the bridge along the river.

1:100 @ A3

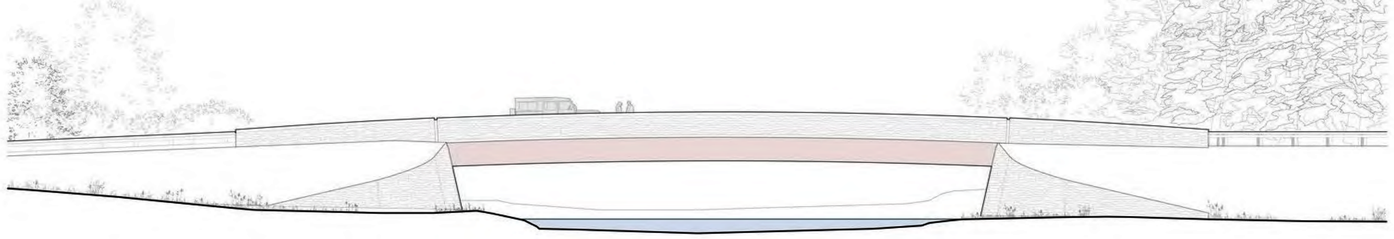
7.5 Bridge Case Studies

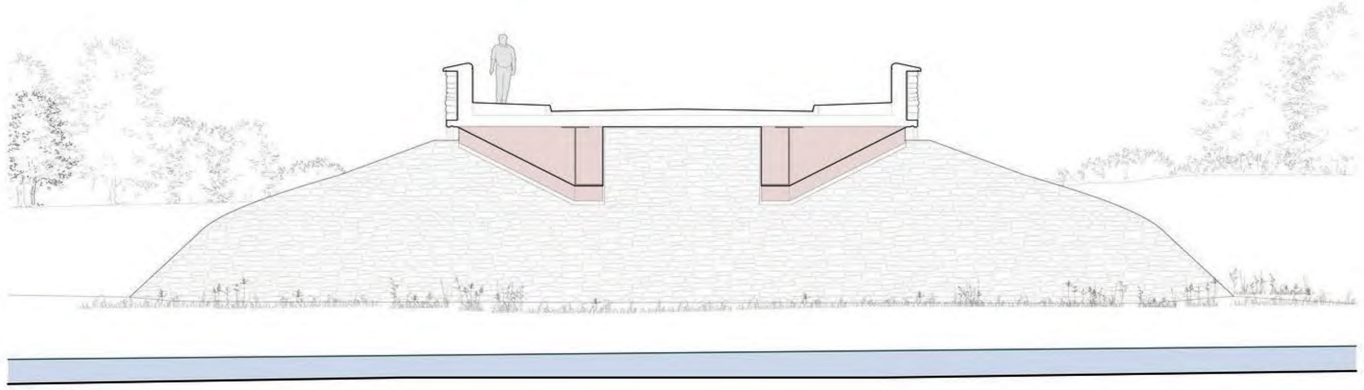
Jubilee Bridge, Gairnshiel, Moxon Architects

Situated in rural Aberdeenshire, the Jubilee Bridge is a vital north to south connection for travellers between Deeside and Speyside.

The design of the bridge respects its environment and addresses three key site considerations:

- River Flood Levels: A single clear span ensures the bridge remains unaffected by rising water levels.
- Low Highway Alignment: The bridge's slender profile in elevation harmonises with the surrounding landscape and maintains a low visual impact.
- Sculptural and Robust Form: The structure's design reflects the natural character of the glen, creating a bold yet sensitive addition to its setting.





archdaily.com/1008053/gairnshiel-jubilee-bridge-moxon-architects

7.5 Bridge Case Studies

Fen Bridge over River Stour

The bridge features a simple structure with the girders having a slight arch to them to soften the line. The upright posts of the railings are steel, painted to match the girders and the infill of the railings is in timber.

These two bridges have been selected as relatively local examples. They are both for lighter traffic and therefore the proposed crossing will require a bulkier structure to support the circa 500 tonnes of AIL required for transporting the transformers.

dedhamvale-nl.org.uk/2022/10/20/new-fen-bridge-over-river-stour-opens/

Homersfield Bridge

Situated across the River Waveney between Norfolk and Suffolk. Part of the bridge is in the parishes of Alburgh and Wortwell, Norfolk and partly in Homersfield Suffolk.

The structure is a single 15 m span consisting of wrought iron frame encased in concrete, with cast iron balustrades decorated with Adair monograms.

The composite construction of the bridge is an early example of a reinforced concrete structure.

On the blue plaque, it states that this bridge is "*the oldest concrete bridge in Great Britain*".

riverwaveneytrust.org/homersfieldpocketpark/

7.5 Bridge Case Studies

New Pooley Bridge, Knight Architects

The old Grade II listed 3 span stone arch bridge was situated in the northern gateway into the Lake District National Park, a critical link for the community until it was destroyed by the floods of 2015.

A new open- spandrel arch bridge spanning 40 m holding a single road lane and two pavements with a varying width between 7.5, and 9.5 m, was installed. The design consists of composite stainless steel and concrete structure.

The slender design of the railings have a potential to be utilised in the design of the Fromus bridge. The combination of the smaller spacing between the slender stainless steel railing allows views to project through the openings, minimising the visual impact of the bridge.

knightarchitects.co.uk/bridges/new-pooley-bridge

7.5 Bridge Case Studies

Bridge Parapet Style

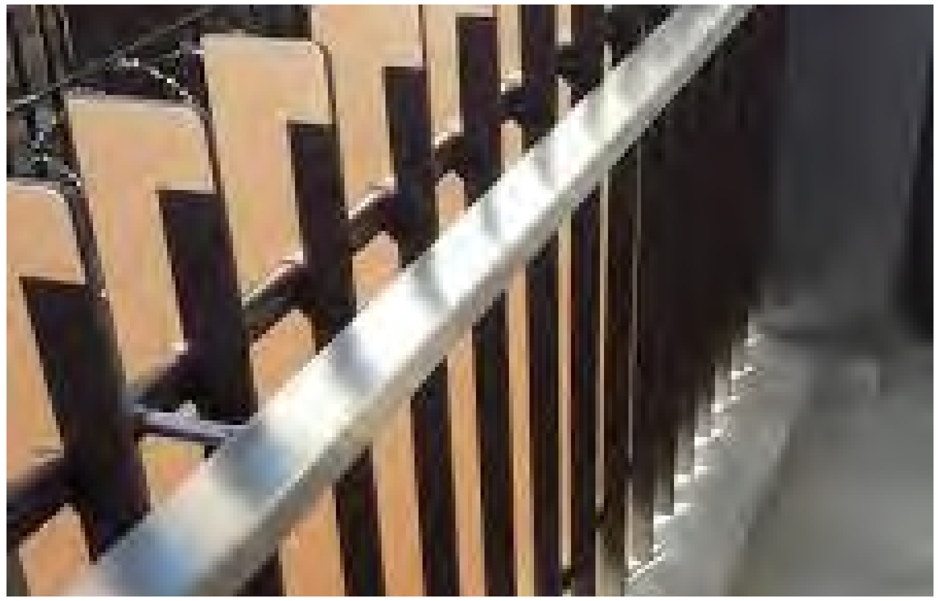
These parapet railing designs are examples of the 'blade' style that is suggested as an approach that is in line with the design principles.

The key design features are:

- Colour can be selected to blend into the background
- With close centres the railings prevent falls and offer more screening of the road surface
- The blades create a texture and soften the appearance of the railings
- A more cohesive aesthetic can be achieved by side fixing the railings to hide the side of the structure
- The linking horizontal railings would be located on the inside to retain the vertical clarity on the outside

https://www.archdaily.com/617812/vlm-bridge-and-re/552748b4e58ececd82000226-photo_by_joao_soares-jpg

https://www.instagram.com/100steelfabrication/



https://www.fencingandgate.com.au/products/blade-fencing/

Potential for Noise

During LPA engagement a query was raised as to whether this type of railing design risks creating nuisance noise in windy conditions.

The project acoustician has been consulted and the risk has been assessed as being low for a number of reasons:

- The relatively low wind speeds near the ground compared to those of high-rise buildings (where issues have been recorded)
- A very specific set of conditions would need to occur in terms of wind speed and direction.
- The large distance to sensitive receptors would need the noise to be very loud to carry far enough in the unlikely circumstance it were to occur.

There are mitigations that could be applied through the detailed design to reduce the risk including;

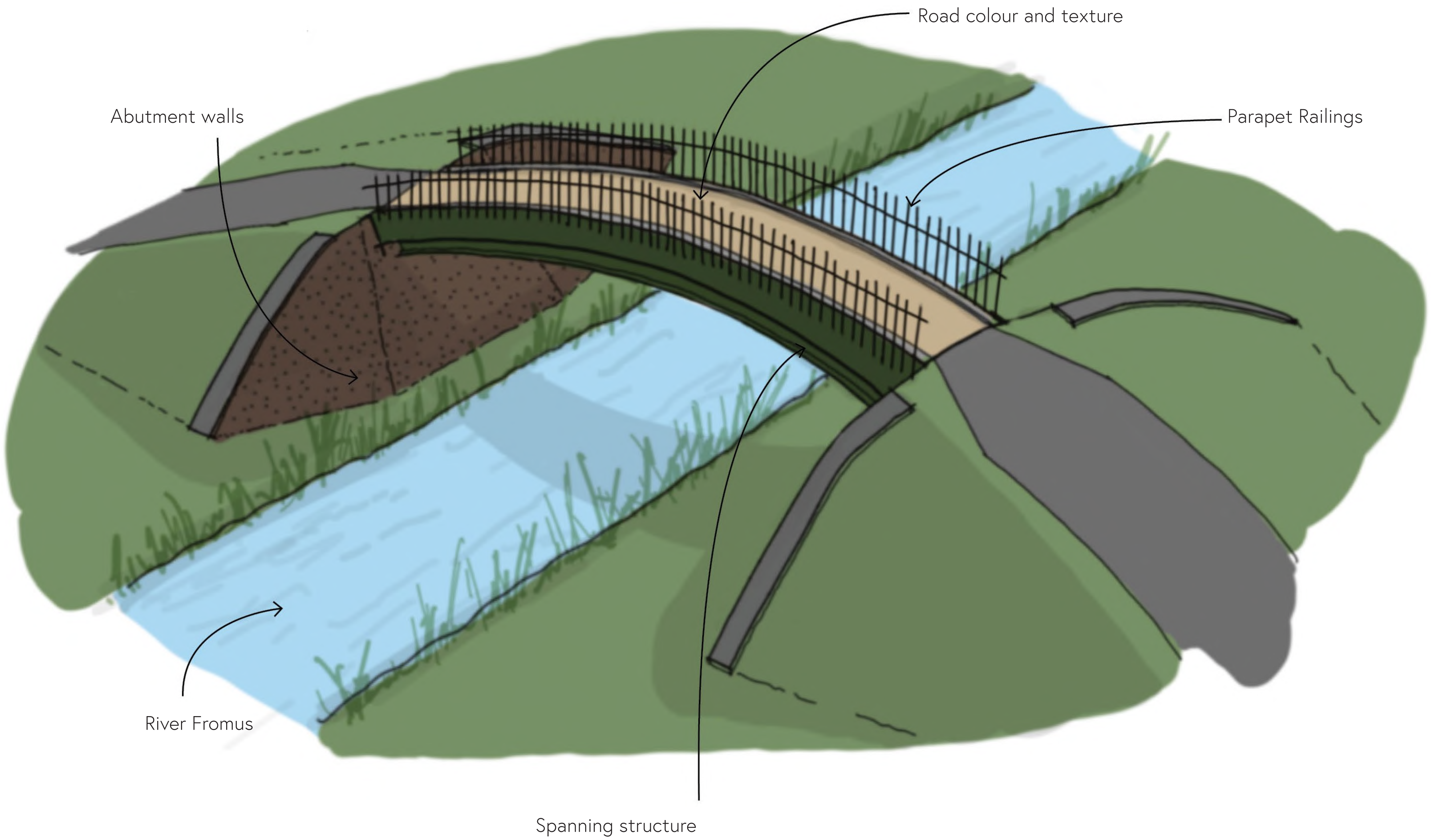
- softening edges (which would also reduce the risk of injury),
- adapting the spacing of the blades, and
- installing a backing panel to stop the wind blowing through.

7.6 Focus Areas of Design Approach

By reviewing the case studies, and considering the constraints and requirements of the design, the following key areas will be the focus for development of the illustrative design approach options shall be:

- options for the spanning structure design;
- developing an illustrative material palette for facing materials of the abutments, the bridge structure and parapet railings;
- options for the abutment wall design; and
- options for the parapet railing design.

The options being explored are intended to give an illustration of how the detailed design could be developed in compliance with the design principles.



7.6 Focus Areas of Design Approach

7.6.1 Materials and Colours

Abutment Walls

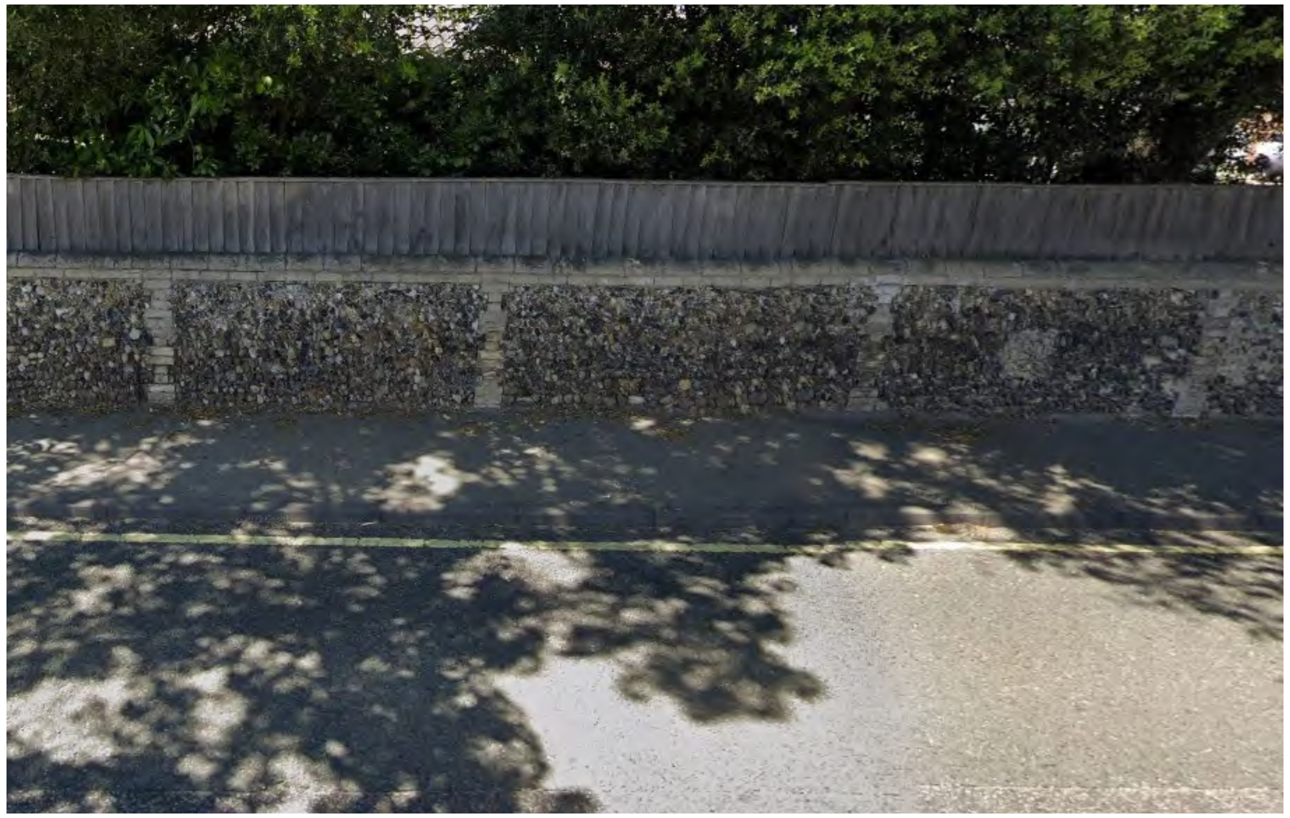
The key driver for developing the material and colour palette for the crossing to blend in with the landscape setting as far as possible to reduce visual impact.

The illustrative plans for the crossing do not give any indication of facing materials for the abutment walls. It is assumed that the walls will need a reinforced concrete retaining structure. The height of the ramps means that the size and prominence of these walls is significant, especially on the EA preferred option.

The structural walls could be unfaced structural concrete. Specialist/bespoke formwork could be used to create texture to reduce the flatness of surface. The concrete could be tinted to soften the grey colour.

The concrete walls could be faced in masonry using material relating to the setting. It is considered that the red brick colour of Hurts Hall (top left) is very striking and matching this would result in the crossing competing with the house and not blending into the landscape setting as intended. There are several notable buildings in Saxmundham that feature buff brick including Benhall Bridge (middle left) to the south of the site, some of which show a darkened and varied patina that has developed over time (bottom left).

There are examples of the use of stone walling in the local area. An old boundary wall on the B1121 (bottom right), opposite the recently built gates to Hurts Hall access road, features flint. Flint is also the main material for St John's Church (top right) near to the site. Flint has been used on some notable modern houses to help create a relationship between the building and the site. This could be used as a means of adding more texture to the wall that would attract patina more rapidly helping it to blend into the landscape.



Imagery: Google Maps. 2025.

7.6 Focus Areas of Design Approach

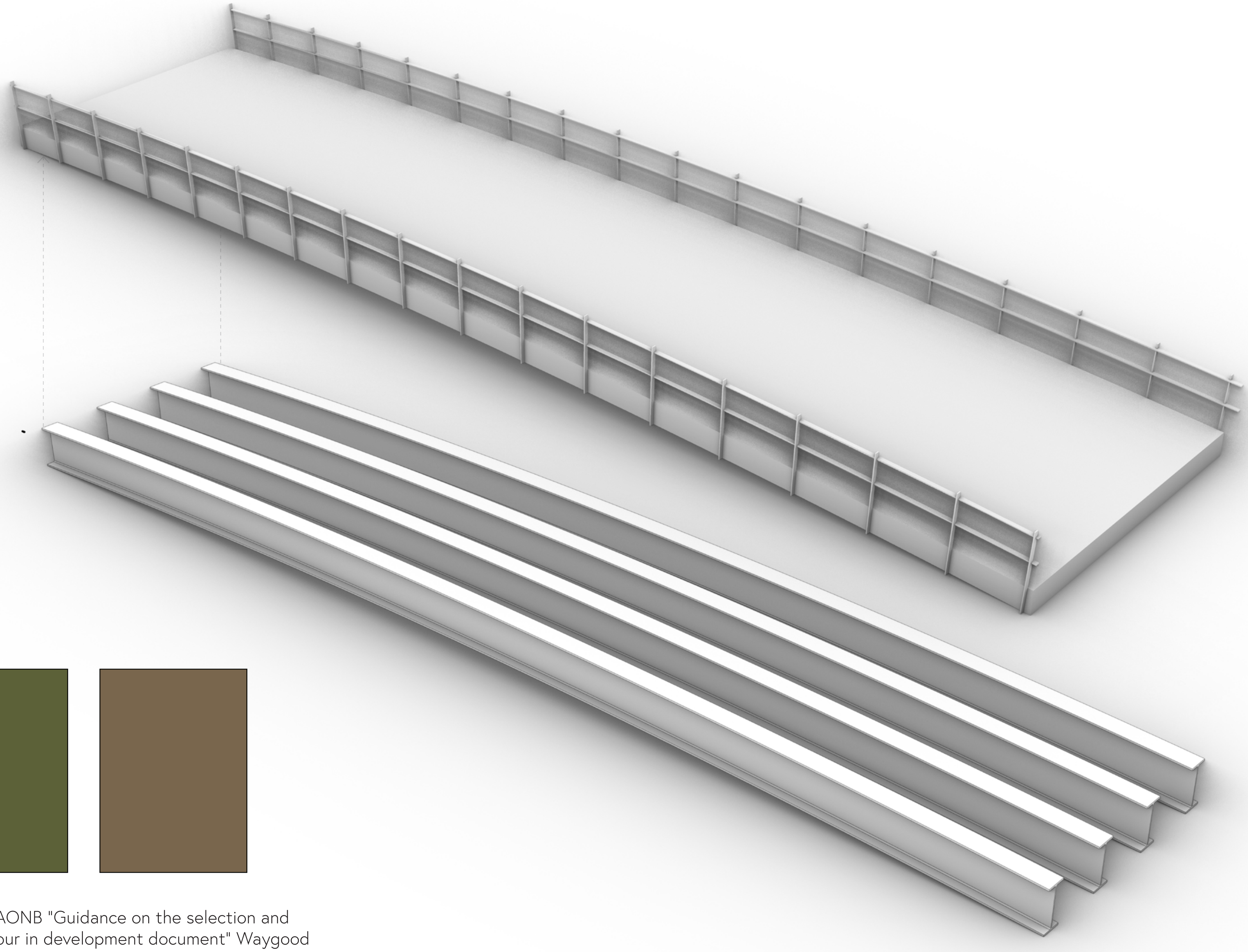
Spanning Structure

The preference, where possible, is for the beams to be steel girders and for these to be set back from the face of the bridge deck to make the bridge look more slender. The could be painted in a muted colour following the Suffolk Coast & Heaths Area of Outstanding Natural Beauty - Guidance on the selection and use of colour in development. The two main colour options would be a similar green to the Fen Bridge or a dull brown. Either of these colours would reference the historic use of the parkland as a military training ground.

The illustrative plans for the bridge anticipates a pre-cast deck sat on top of the girders. The expectation is that this would be left as a natural cement/concrete colour. There is the potential for the parapet railings to be used to decorate the face of the deck.

Parapet Railings

The assumption is that the parapet railings will be steel and that the colour selection process would be the same as that for the steel girders. The railings and girders could be colour matched or different colours as per the example of Fen Bridge. The railing colour is important as how well they blend into the context will be a key factor in the apparent height of the crossing.



Homersfeild Bridge

From the AONB "Guidance on the selection and use of colour in development document" Waygood Colour (2018)

7.6 Focus Areas of Design Approach

7.6.2 Spanning Structure Design

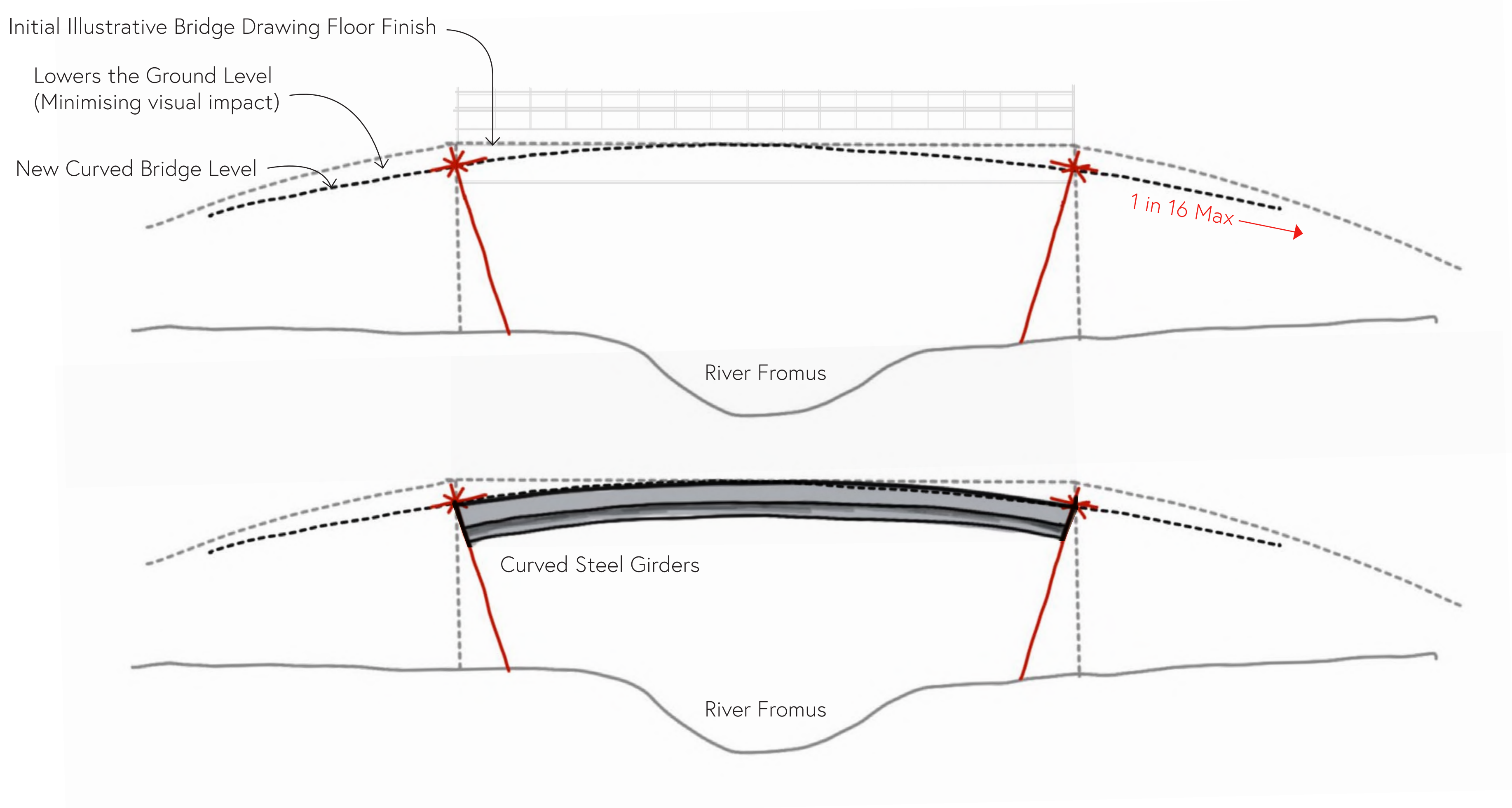
Using the initial illustrative bridge drawing as a baseline, the design of the spanning structure could be optimised to minimise the bridge's visual impact. By setting the initial floor finish as the maximum level, curving the spanning structure could marginally reduce the height of the top of ramps and soften the profile in the landscape.

Further consideration of the design parameters of the Abnormal Indivisible Load (AIL) vehicle tracking note that any curvature of the span would need to be limited to avoid the long vehicle grounding over the top of the bridge.

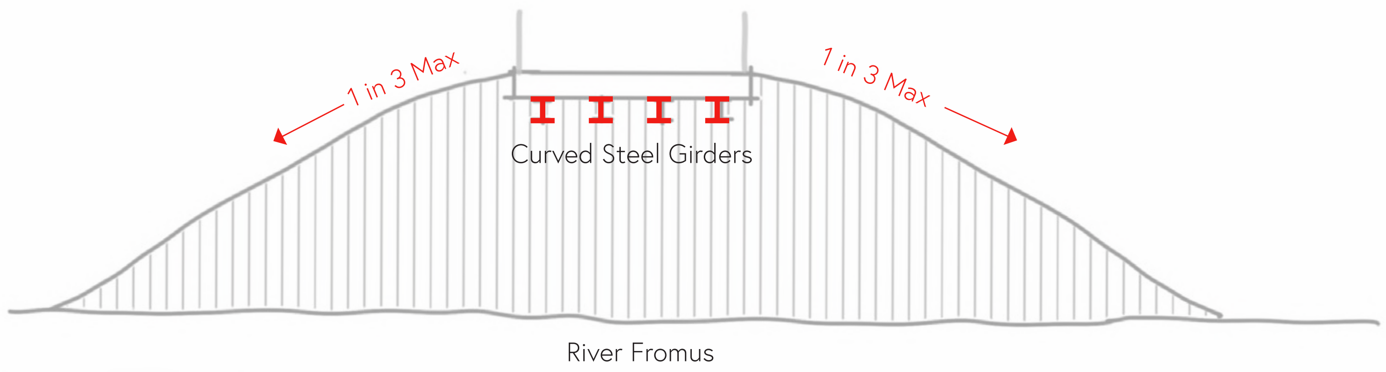
The intention is that single girders would be used to span the full width, which is towards the limits of what is viable. This will result in a sleeker profile without spliced sections. These girders can be recessed from the edge of the bridge to reduce the apparent thickness.

Further consideration has suggested that tilting back the abutment walls would have marginal effect on the key views as they tend to be face on rather than along the river. The preference is therefore to not include this feature as it risks increasing the span over the threshold of what can be achieved with a single section.

Sketch Long Section across the bridge through River Fromus



Sketch section across Fromus River through the Bridge



7.6 Focus Areas of Design Approach

7.6.3 Abutment Walls

https://www.wcp-architects.com/suffolk-private-chapel-wins-prestigious-stonework-award/

https://www.flintman.co.uk/projects/the-flint-house/

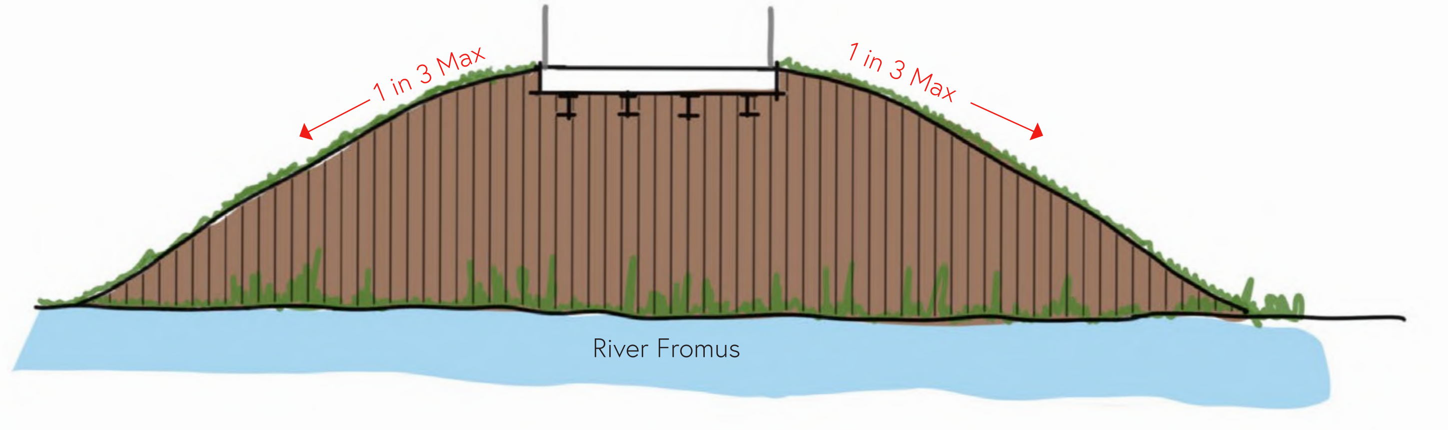
The shape of the abutment walls could be gently curved in plan in a similar way to the Galashiels case study, however leaning back would increase the span and risks the elegance of the spanning structure.

Flint is the suggested material that would perform best as a means of blending into the landscape, and that improving over time as the rough material develops patina of moss and lichen.

Flint can be edged in a variety of ways, with historical examples using a pale contrasting stone. This is not the preferred solution as it could create a bright contrasting edge that is more prominent in the landscape. The suggestion is that the edging should be quite minimal potentially using a thin slate that protects the top of the wall but also allows the grass to grow over and further soften the edge.

Sketch Model of Abutment Wall

Sketch section across River Fromus through the Bridge



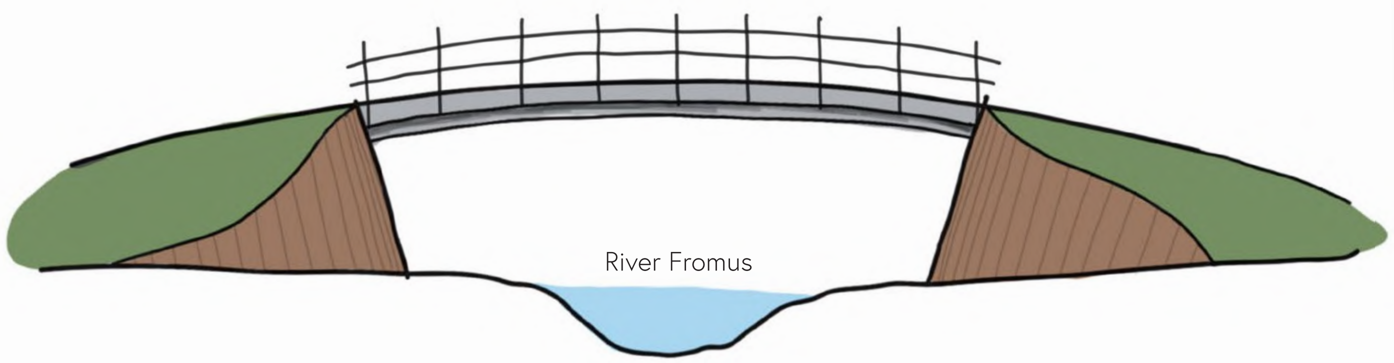
7.6 Focus Areas of Design Approach

7.6.4 Parapet Railings

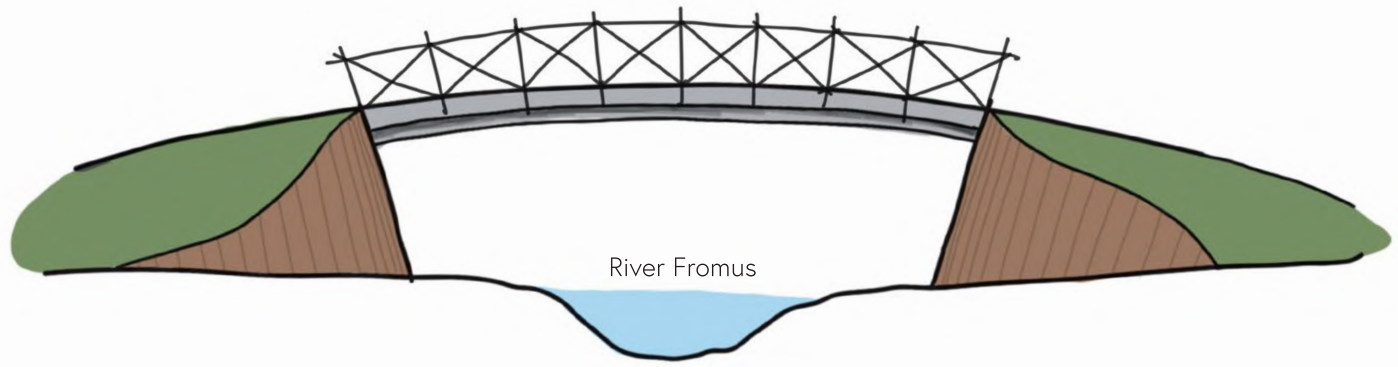
The design of the parapet railings should minimise the visual impact of the bridge on its surrounding viewpoints. Wider spacing between the railings would enhance transparency, making the bridge appear lower and less obtrusive. This section explores various approaches to designing the parapet in alignment with the curvature of the bridge, ensuring both functionality and visual harmony.

Further consideration during recent engagement has highlighted that closer railings that restrict visibility of the road surface have the advantage of screening what could be a paler and hence more visually detracting element of the bridge.

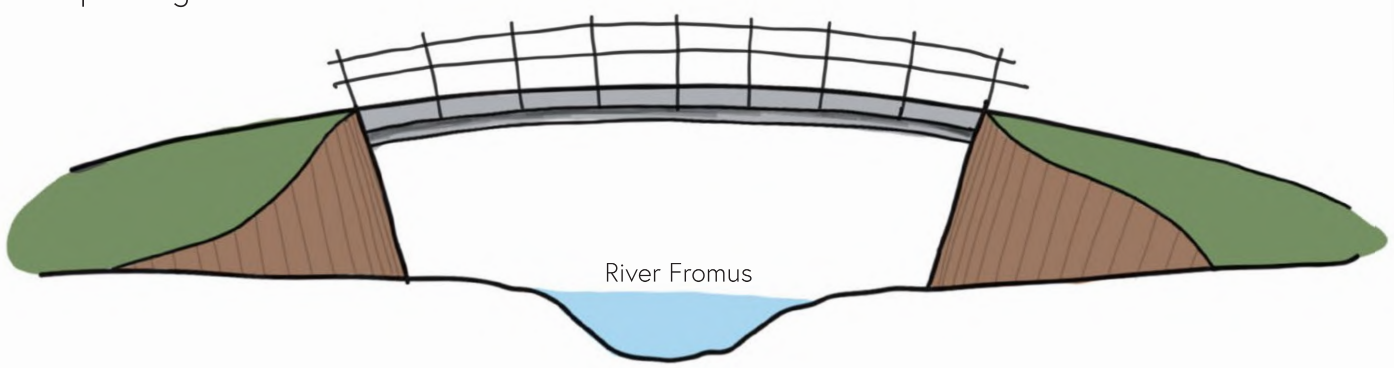
Railings perpendicular to flat bridge



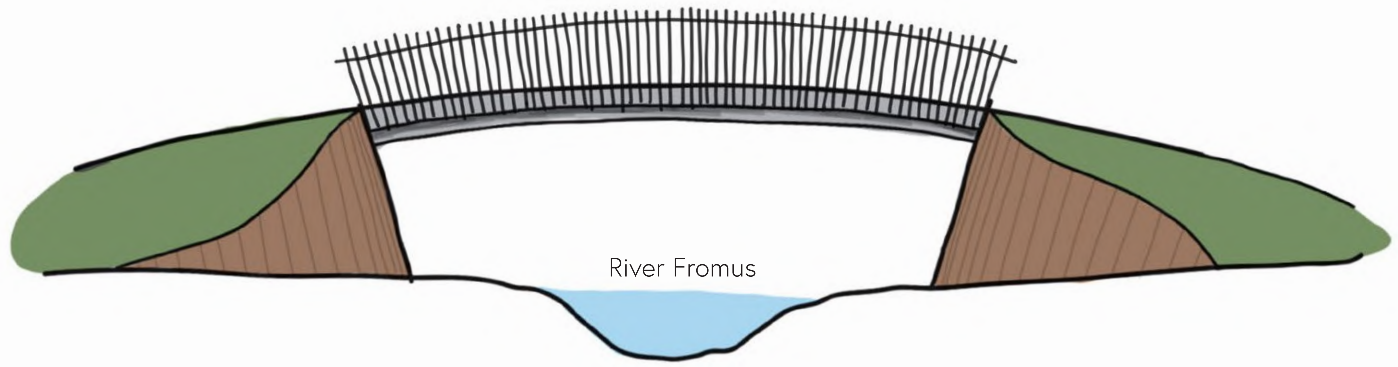
Railings perpendicular to spanning structure with lattice



Railings perpendicular to spanning structure



Slender railings perpendicular to the spanning structure



7.6 Focus Areas of Design Approach

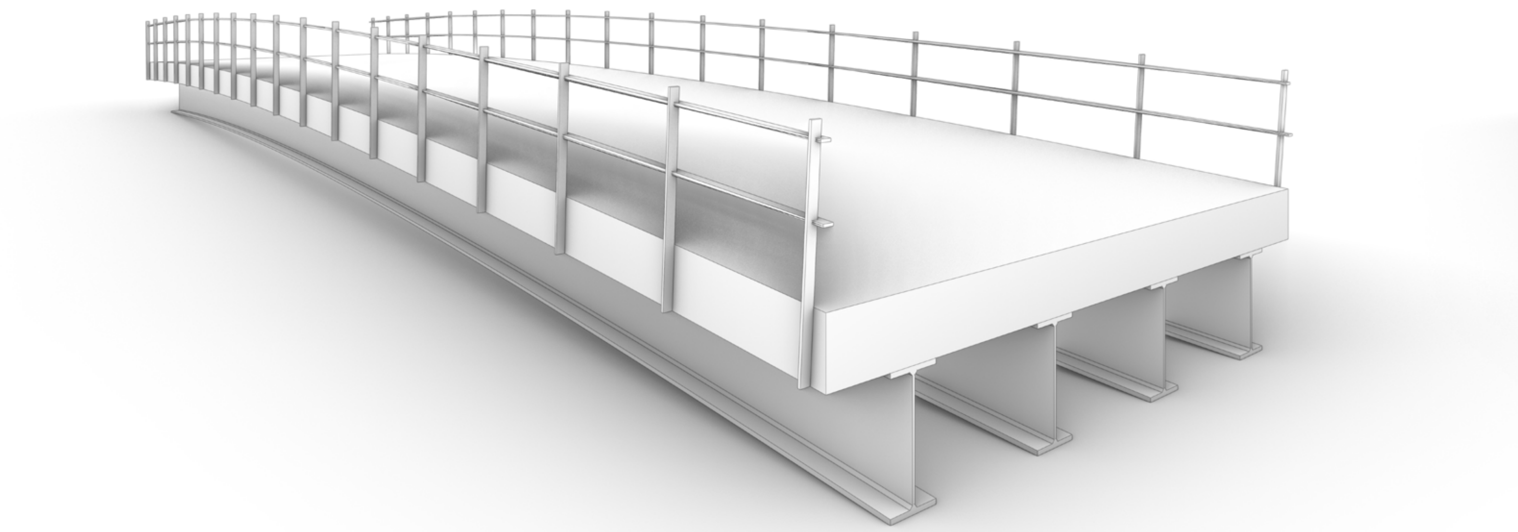
Railings perpendicular to spanning structure

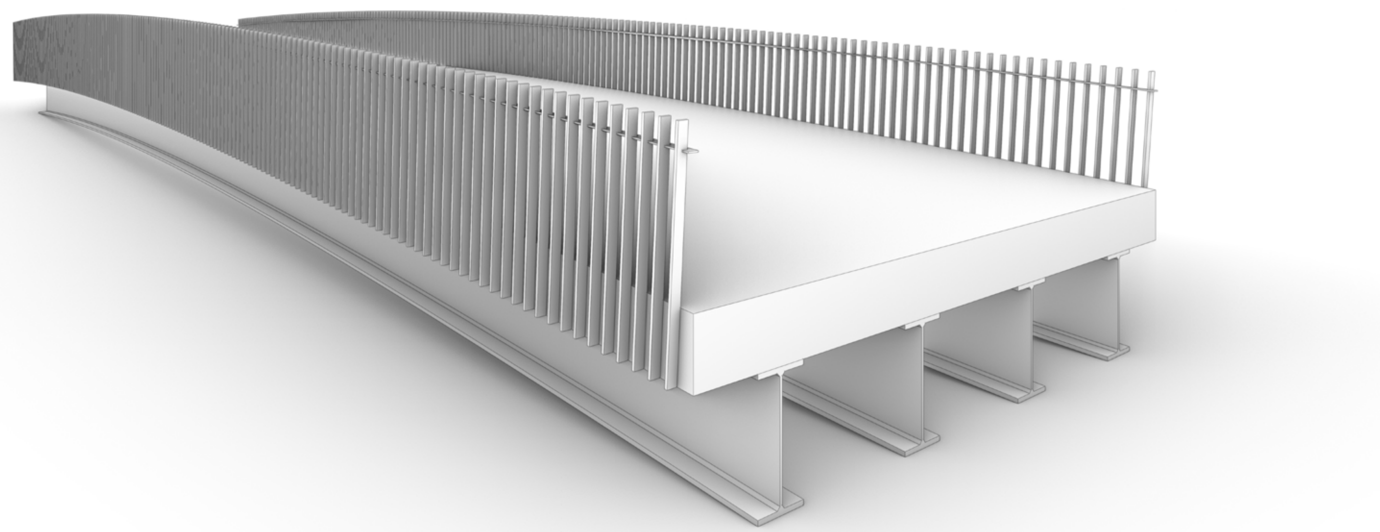
This parapet railing design closely resembles the initial illustrative bridge. The spacing ensures transparency while maintaining safety standards. Each railing is positioned perpendicular to the tangent at its respective point on the curve, aligning seamlessly with the bridge's overall geometry.

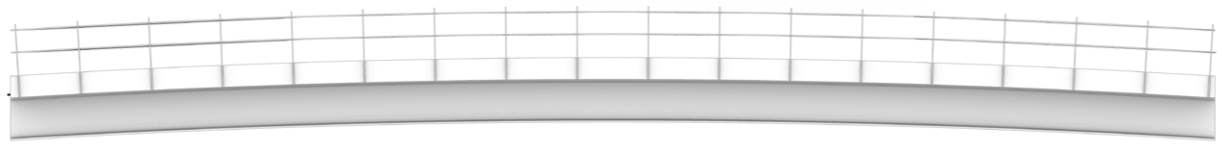
Slender railings perpendicular to the spanning structure

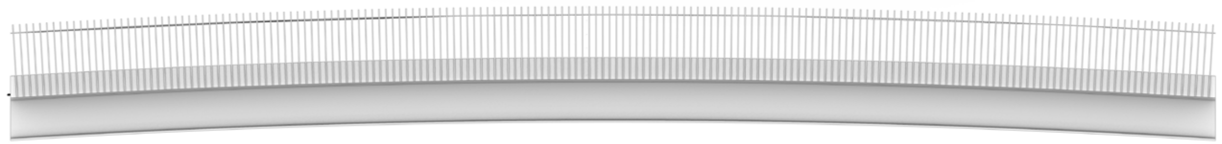
The intention is that the slender blades create a texture that merges together and screens the road surface from view. The parapet designs are based on the height required for pedestrian traffic.

The blades would be side fixed so they could also screen the fascia of the concrete deck, appearing more integrated with the bridge. The linking rail could be set below the top and offset to the inside edge to produce a soft feathered edge.









7.6 Focus Areas of Design Approach

Metalwork Colour Analysis

The suggestion is that the spanning structure and the railings could be the same colour, and that variation would come from shading and highlights.

A sample study was undertaken on the site taking photographs of colour coatings in different orientations. It was noted that the north faces were much darker and that it is the north side of the bridge which is more prominent in the key views.

Olive Green has been used in the revision B illustrative renders of the bridge as this darker grey/green colour tends to blend quite well with the background trees.

Other colours that were suggested through further LPA engagement include Olive Grey (RAL 7002). This is a paler green similar to Khaki. In line with the design principles the detailed designs should include renders of the proposed colours and take into consideration how their appearance is affected by light conditions and aspect.

Khaki green

This next series of shades of green were inspired by the landscape. The darker shades were inspired by large fields of peas crops while lighter shades are associated with various hedgerows, trees or wildflower leaves.

North (South facing) | South (North facing) | East (West facing) | West (East facing)

Olive green

This next series of shades of green were inspired by the landscape. Darker shades were inspired by large fields of peas crops while lighter shades are associated with various hedgerows, trees or wildflower leaves.

North (South facing) | South (North facing) | East (West facing) | West (East facing)

Quartz grey

Although named Grey, this colour has green/beige undertones. Facing south, it blends with the wheat fields, while appearing darker on the north elevation.

North (South facing) | South (North facing) | East (West facing) | West (East facing)

7.7 Illustrative Design Detail

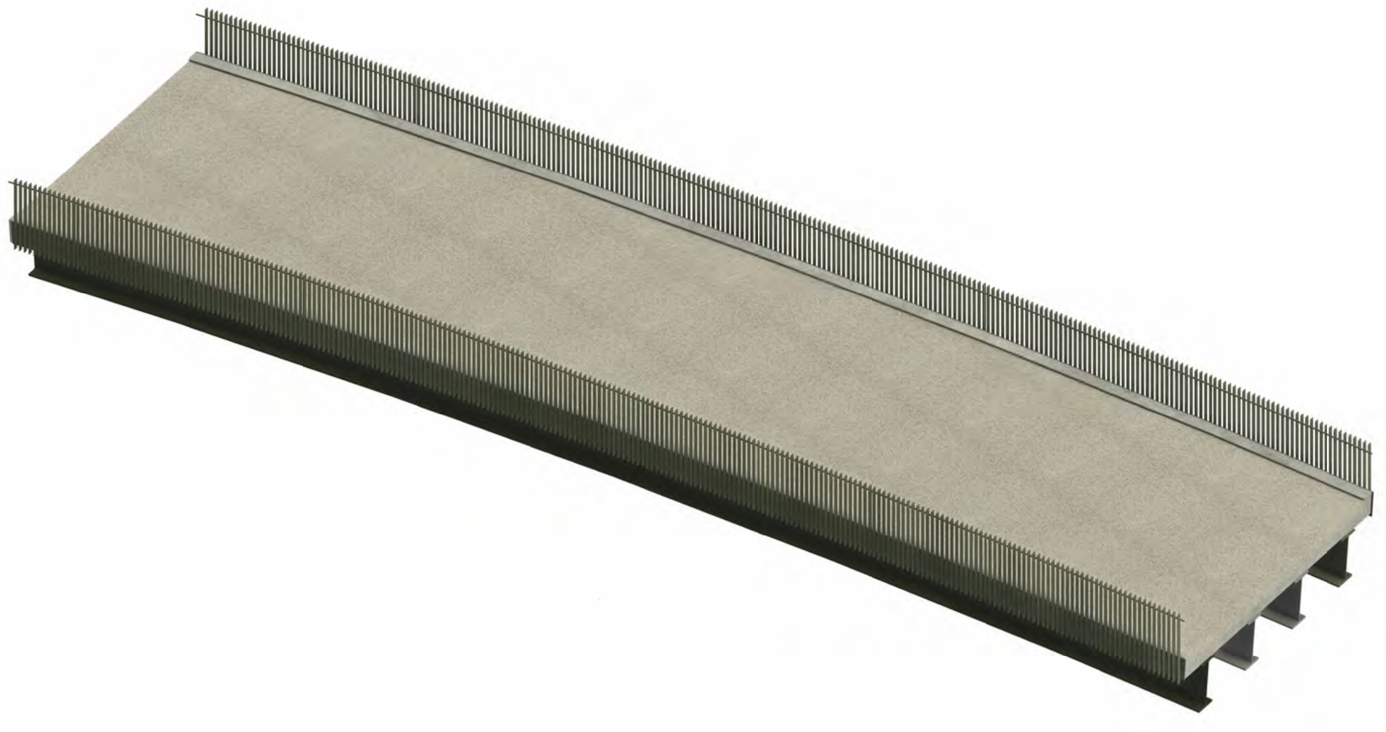
How the focus areas could be combined

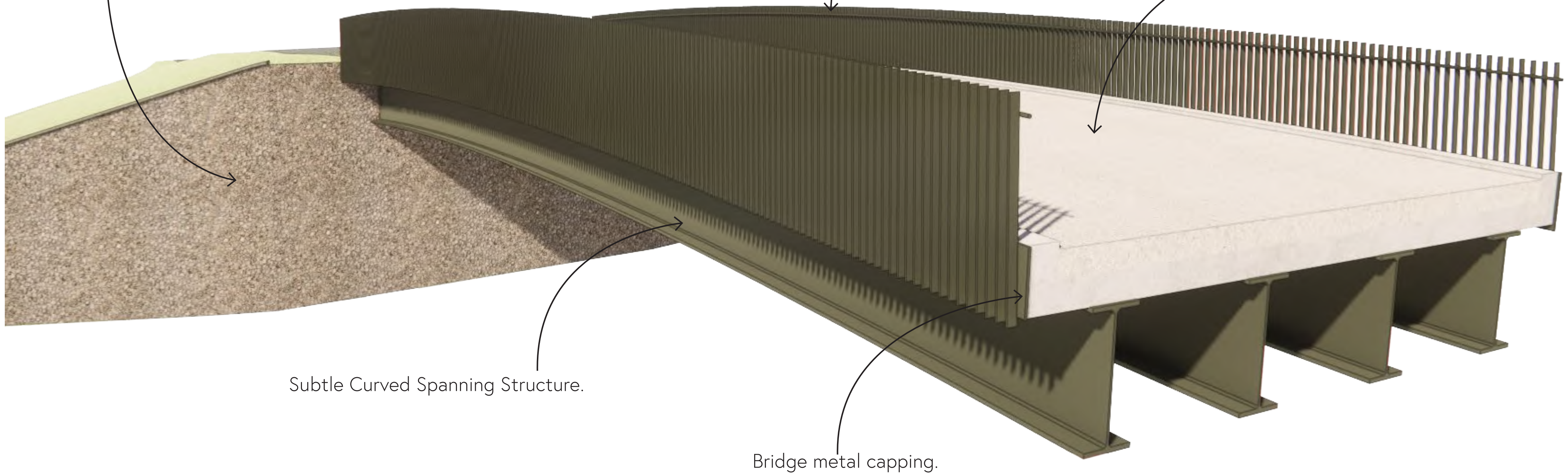
These are close up details of the model that has been used in the illustrative renders in the key views.

The top down view shows the pale colour and rough texture, similar to the self-binding gravel used for the Hurts Hall approach road, that has been specified for the top surface of the bridge (not required for the ramps or access road) to make it contrast with the water as much as possible. This is to avoid polarotactic insects laying eggs on the road.

The cutaway view shows the relationship between the metalwork, structure and abutment walls, particularly how the railings hide the road surface.

The intention is to use high quality design in the service of harmonising with the landscape rather than creating a landmark that draws attention, competing with Hurts Hall and St John's Church.





7.8 Illustrative Key Views

This view is from an opening in the hedgerow alongside the B1121, east of the site. It looks towards the eastern abutment wall and shows the north side of the bridge obliquely. This is the most prominent version of the bridge and the most prominent viewing position assessed.

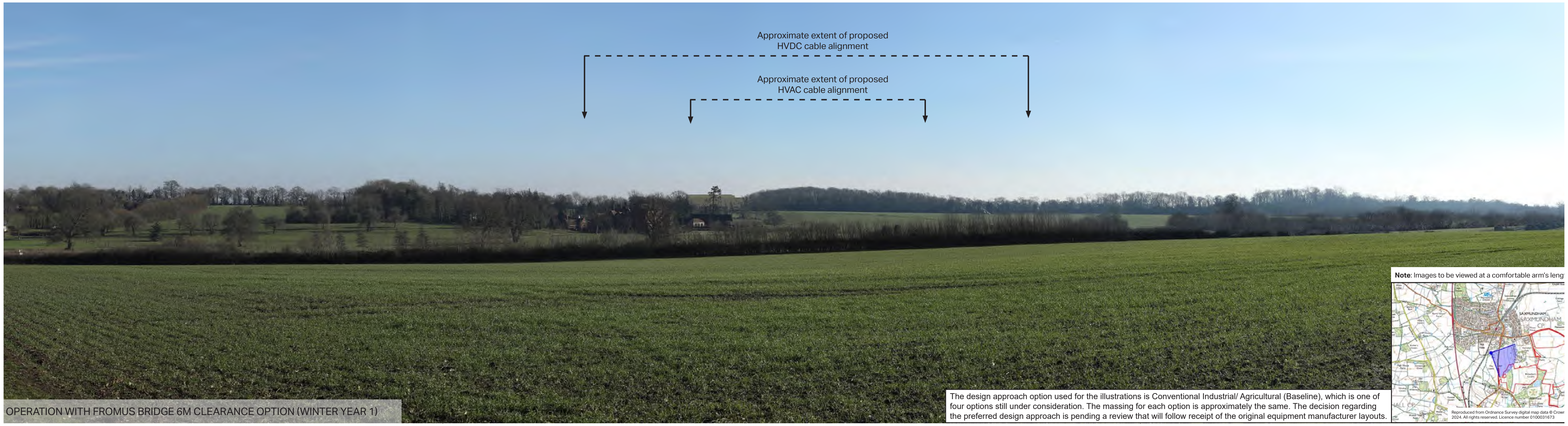
Viewpoint 2 - Winter Year 1 (6 m Bridge) - (Baseline Option in Distance)

Detail of Viewpoint 2

7.8 Illustrative Key Views

This view is from further north and west in 'The Layers' and uses the same worst case options. The rolling landscape hides most of the bridge with only the tops of the railings visible above the vegetation alongside the road and river.

Viewpoint 20 - Winter Year 1 (6 m Bridge) - (Baseline Option in Distance)



Detail of Viewpoint 20 (bridge in centre of image)

SUMMARY & CONCLUSIONS

8.0

8.0 Summary & Conclusions

This document has been developed in stages as the design approach has evolved. It addresses key milestones in the development of the design approaches, such as the statutory consultation and the Design Review Panel. At each stage the design approach has been refined as more information and feedback has become available. The last step of development has resulted in four potential design approaches that could be applied individually or in combination in accordance with the design principles.

The four potential design approaches are as follows:

Conventional Industrial/Agricultural (Baseline) - This design approach has the advantage of simplicity but is more limited in terms of how the design could be adapted to address visual impact. The potential weaknesses are the scale of flat facades and the hard edges against a rural landscape setting. The suggestion in response to feedback on the versions included at statutory consultation is that the use of colour bands and patterns is not the preferred solution and this is validated by analysis that shows reliance on colour for breaking up the massing has limited effectiveness in this situation. This design approach has been referred to in the design principles as a baseline, required to be presented alongside any preferred design approach when submitting for compliance, as a means of checking that the preferred design approach shows the intended reduction in visual impact.

Enhanced Cladding - This design approach has the advantage of not being reliant on complicating the building forms or structures with the decorative layer added over the top of a more conventional envelope. The emphasis is on using parapets to hide the roofs, and this has the potential benefits of hiding any roof based equipment or glancing sun reflecting off roofs and the associated visual impact. The layering of the facade can be used to soften the edges and add depth to the surface, but care will be required to avoid adding bulk to the massing. The intention is for the enhancement to be limited to the taller parts of outward facing elevations where it will have the most benefit. Separate design principles cover the manner in which the buildings should meet the ground. The design approach explores options for how the fabrication and patterns of the decorative outer layer could be developed to make reference to the purpose of the Project and create the types of shading and texture which would relate to the tree belts in the background. These are purely illustrative and how this detail is articulated would be for the post-consent design team to develop in line with the technical and fabrication requirements.

Enhanced Roof Forms - This design approach has the advantage of softening the profile of the building against the sky. The early version of this approach included at statutory consultation included an assumption of large scale bunding which the site constraints and further topographical surveys have demonstrated to not be achievable. However by bringing the roof eaves down closer to the screening can reduce the apparent height of the buildings. The exploration includes different versions of curves, with simpler two-dimensional curves creating a hierarchy of eaves and gables, and more complex three-dimensional curves allowing the eaves to drop lower on each side. By projecting the eaves outwards the roof can be pulled down the walls but this may be limited by structural constraints. The form of the roof may also be constrained by the requirements of lifting beams, etc, within the DC Halls. By placing more emphasis on the roof the finish will be of greater importance. The suitability of materials will relate to the maximum and minimum slopes and also the complexity of the form, for example a standing seam roof finish is better suited to two-dimensional curves. This design approach would lend itself to having a green planted roof applied to the curved forms if that were to prove to be technically feasible.

Fragmented Forms - This design approach has the advantage of breaking up the large forms of the DC Halls into smaller parts, avoiding the large flat surfaces and straight edges that can make the buildings stand out against the rural landscape setting. The form of the buildings would require close coordination with the internal space requirements and this may limit the effectiveness and ability to step the massing down where height requirements prove to be less. To reduce the bulkiness of the DC Halls recessed shadow gaps have been introduced between the pattern of forms. Care will be required to avoid complicating the roof form, especially avoiding valley gutters over the clear space spaces. The version of this design approach included at statutory consultation was based on a regular rhythm of barn gables. The feedback suggested a preference for avoiding regular patterns and black cladding as it made the building more prominent in the landscape. The illustrations included in this section show a less formal arrangement that is better suited to the context.

It is anticipated that these design approaches could be applied in combination, for example the enhanced cladding approach could be applied to the taller DC Halls, with the enhanced roof form approach being used to help integrate the lower buildings with the landscape proposals and provide a setting for the larger buildings. The Key Design Principles in Table 3.1 of **Application Document 7.12.1 Design Principles - Suffolk** cater for this so the post-consent design team has a toolkit by which an architectural design can be developed to suit the detailed engineering solution. The design principles have been developed in response to the analysis presented in this document but the ways in which they are interpreted are not limited to the illustrations included in section 6 of this document. It would be for the post-consent design team to develop their own response using this document as guidance.

Glossary

For a full list refer to **Application Document 1.6 Glossary and Acronyms.**

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Appendices

Appendix A Architectural Design Assessment East Anglia TWO Limited and East Anglia ONE North Limited Friston

ARCHITECTURAL DESIGN ASSESSMENT

East Anglia TWO Limited and East Anglia ONE North Limited
Friston, East Suffolk

Client: Scottish Power Renewables

Date: April 2024

Revision No: A

Document ref.: 211585_EA1N2cond_ADA

nationalgrid

ScottishPower Renewables

open optimised environments

PART OF SLR

DOCUMENT CONTROL

Issue	Revision	By	Approved	Date
01	First issue	JN	DF	27/05/2024
02	Second issue	JN	DF	24/06/2024

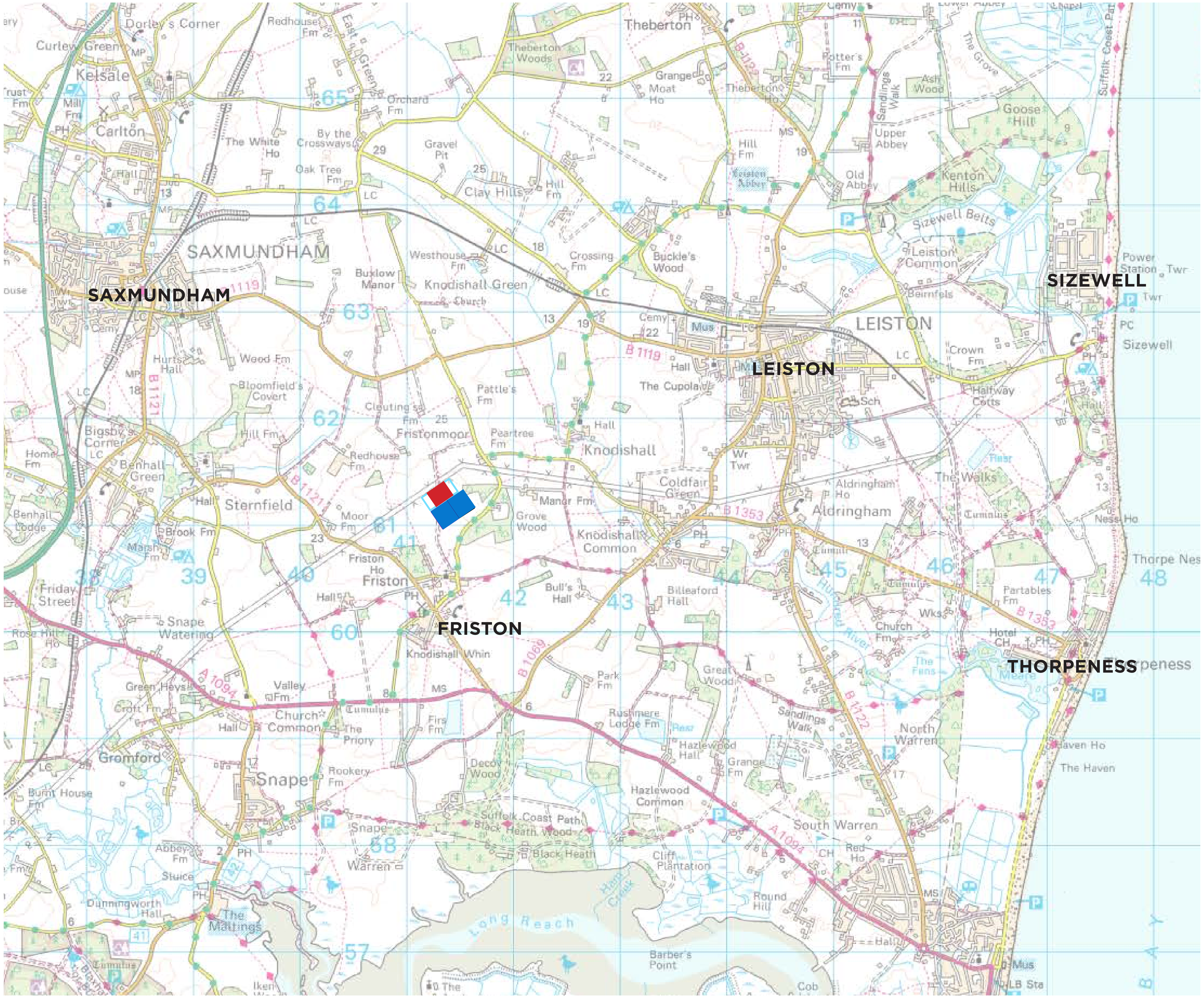
CONTENTS

01
INTRODUCTION

nts N

East Anglia TWO Limited and East Anglia ONE North Limited, wholly owned subsidiaries of ScottishPower Renewables (SPR), were awarded a Development Consent Order (DCO) by the Secretary of State, Department of Business, Energy and Industrial Strategy on 31st March 2022 for the East Anglia TWO Offshore Windfarm (EA TWO) and East Anglia ONE North Offshore Windfarm respectively, under the Planning Act 2008. The DCOs granted consent for the development of an offshore windfarm and associated infrastructure, including project-specific substations and also a National Grid Electricity Transmission (NGET) Substation. These substations, comprising buildings and associated equipment within fenced compounds will be located north of the village of Friston, East Suffolk. The DCO for each project requires that aspects of detailed design are submitted to and approved by the Local Planning Authority, East Suffolk Council, prior to commencement of development at these locations.

This document sets out the architectural design approach taken in considering the detailed design, in particular the cladding treatments for the building elements of both the SPR and NGET substations, and culminates in an architectural proposal for the cladding of the buildings on this site, with a view to discharging DCO requirements for substation detailed design.



SPR substations

NGET substations

1.2 BACKGROUND

The location and specific positioning of the substations on their site is already established, so that aspect is taken as a given and does not form part of this design study.

The size and general form and mass of the buildings is generated specifically as a technical response to the engineering equipment accommodated within the facility. The scale and forms generated by the buildings' external envelopes relate to the spatial requirements necessary to install, operate and maintain the equipment within. [Include here detailed building plans and sections when available to demonstrate spatial arrangement.] As such, this study does not seek to alter the fundamental size and shape of proposed buildings, but rather to inform the nature and precise articulation of the cladding treatment.

SPR substations

National Grid substation

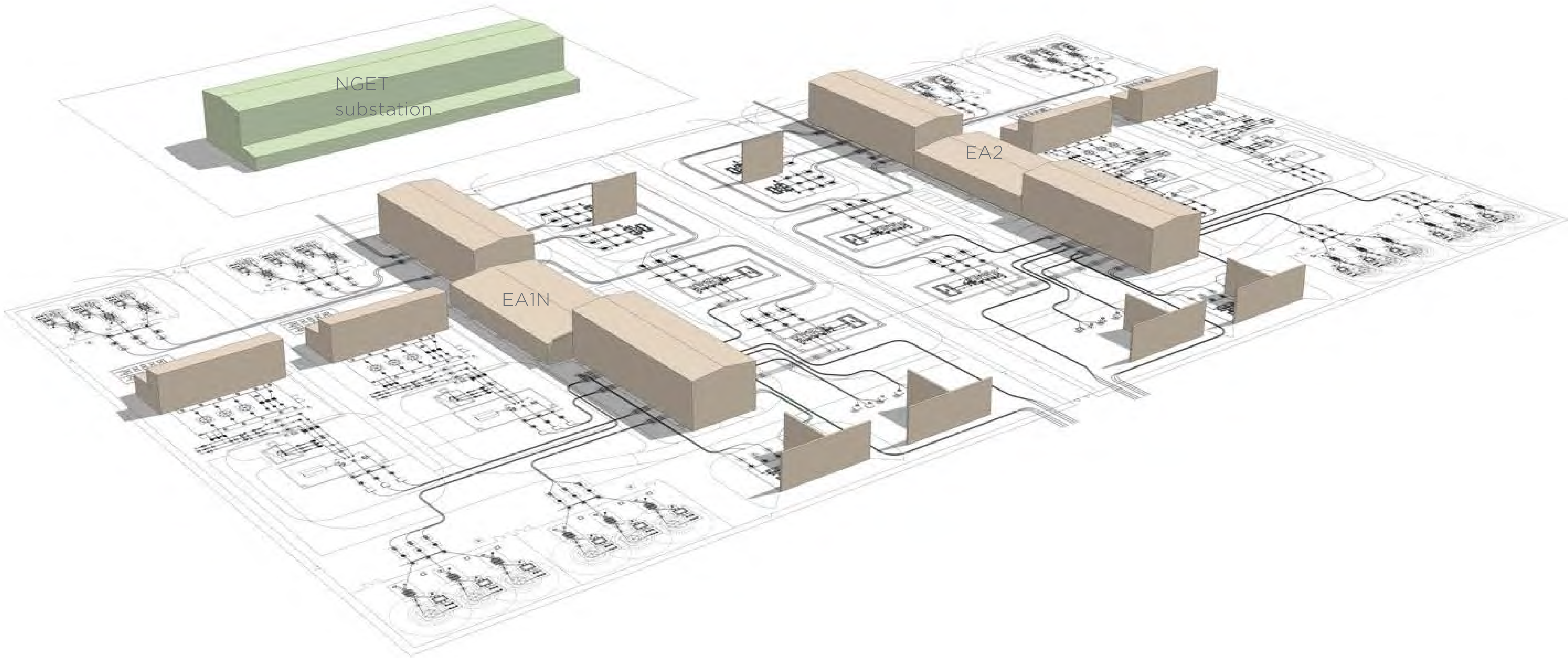
Existing Public Right of Way paths

New public Right of Way and supplementary paths

1.3 BASIC MASSING MODEL OF NGET, EA1N AND EA2 VIEWED FROM SOUTH

SPR substations

NGET substation



1.4 APPROACH

When considering architectural cladding treatment for a new building in a landscape setting there are two fundamental options: to stand out, make a bold statement, celebrate the design; or to camouflage and blend in.

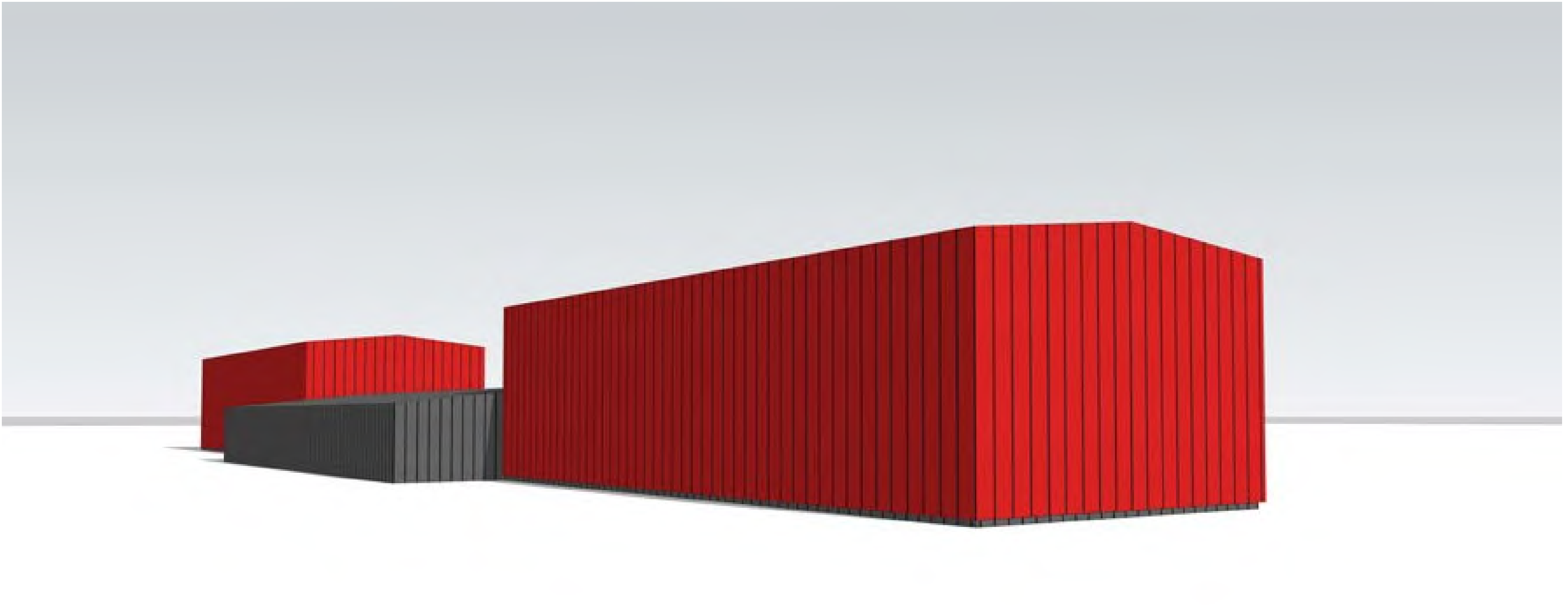
Stand out, make a bold statement, celebrate the design.

This is not considered to be a suitable approach in this instance. The buildings are very large, even when compared to large agricultural building groups in the surrounding countryside, and the local rural vernacular comprises modest domestic scale, soft warm natural masonry and render tones, and rich textures. Such characteristics can not readily be applied on a large scale. Standing out need not necessarily mean an expensive cladding treatment – the building could, as an extreme example, be covered in the cheapest cladding in a bright red colour and this would clearly stand out and make a bold statement. Nor could this building stand out as a result of architectural form – even if that were appropriate, which is not the case here, it is not possible as the minimal form to accommodate the necessary equipment is already established, as described above, and to further articulate this in any meaningful way would inevitably result in making the forms even larger.

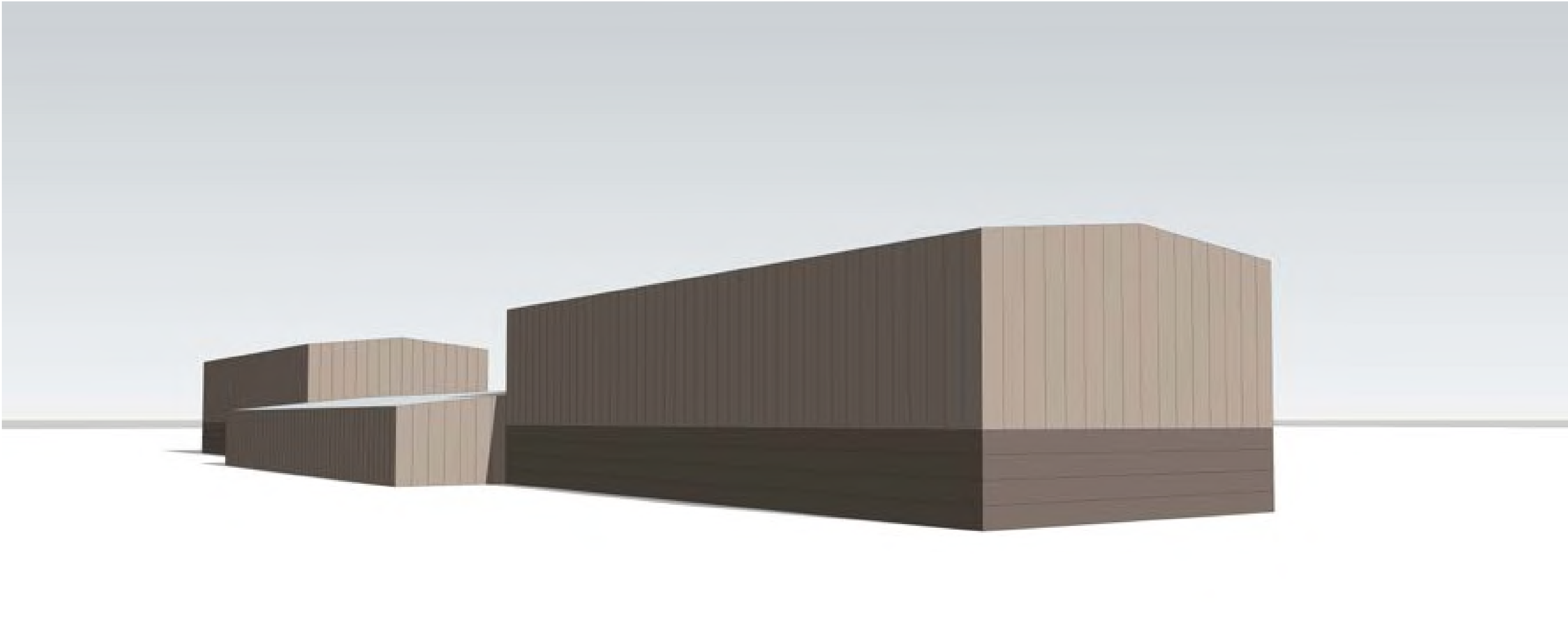
There is strong and vocal opposition within the local community to the proposed substations. Even this alone is a sufficient reason for not standing out any more than is necessary, for not celebrating the design, but added to the points above it makes a conclusive case for design developing a solution that does not try to stand out as a bold statement.

Camouflage, blend in.

The proposed substation buildings vary in size, but the larger of them are of a significant scale, larger than any other existing buildings in the landscape context. When we talk about blending in, therefore, or camouflage, it is not with the intention of making the buildings disappear in the landscape – that would be wholly unrealistic – but rather of how best to let them relate to their landscape setting as far as is practically possible. For them not to deliberately catch the eye in one's peripheral vision, but to be as complementary as possible to predominant landscape forms, patterns and colour tones.



Stand out, make a bold statement, celebrate the design



Camouflage, blend in

02

ANALYSING THE CONTEXT

COMPOSITION LAYERS

All relevant views of the site will generally be from human eye level. The landscape is predominantly flat or gently rolling, with very limited natural elevated vantage points and no tall buildings of any scale from which aerial viewpoints are offered. When considering views in and around the site and its context then there is quite a formulaic general landscape composition.

Distant landscape views in and around the site are generally made up from a horizontally layered composition comprising three distinct elements:

A foreground of agricultural fields. Throughout the seasons appearance varies from fresh ploughed furrows, through lush waving mature crop growth, to harvested stubble. A single predominant block colour, changing through the seasons, is a common perception. For much of the year a strong horizontal linear pattern of ploughed furrows dominates this foreground element. Of the overall landscape colour composition this foreground base typically provides the mid tones.

A clear horizontal band of dense natural growth in the middle or far distance. Sometimes hedgerows, sometimes tree banks, sometimes mature ancient woodland. Often, especially out-with summer months, the verticality of tree trunks and branches provides a textured pattern to this band. The band is sometimes layered comprising a subtle differentiation of densities, textures and colours within this single element. Within the landscape colour composition this band typically provides the darker tones.

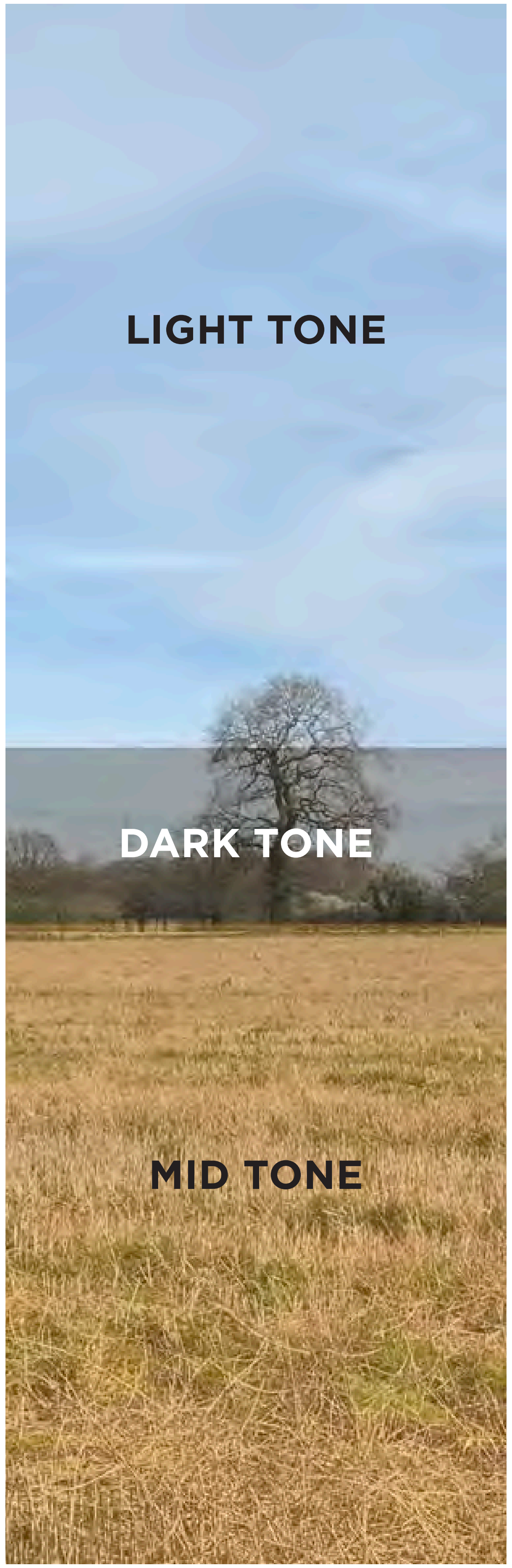
An upper sky layer. Colours can vary dramatically from vivid blues to cold whites and greys and even through to warm yellows and oranges. The predominant colours are greys and light blues, especially during daylight hours. Sky patterns also vary from uniform clear skies, to uniform overcast skies to intricate and bold cloud formations. On clear days the relative proximity to London results in regular aeroplane jet trails raking across the sky. Within the overall landscape composition the sky typically provides the lightest tones of the layered views.

Actual view

Abstract interpretation view

2.2 ANALYSING THE LANDSCAPE

INDIVIDUAL LAYER ELEMENTS




Sky soft tones


Sky pylon lines


Sky cloud formations, jet trails


Density, verticality


Woods


Texture

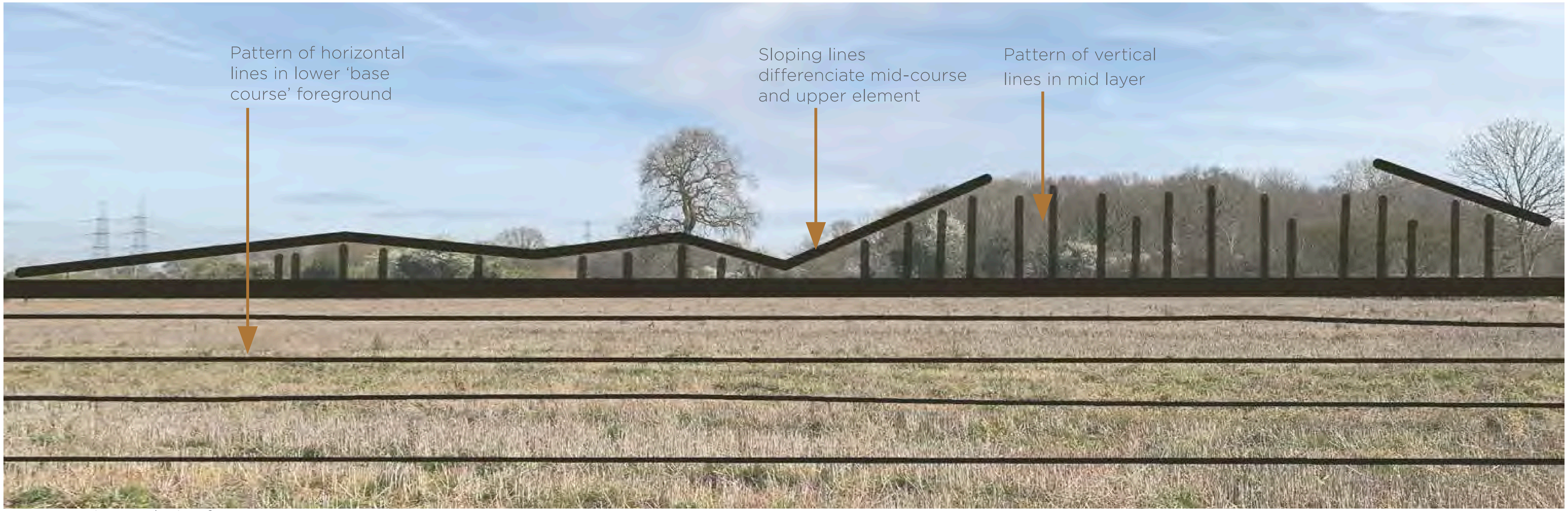

Fields


Hedgerows


Ground cover

PATTERNS AND FORMS

Actual view



Interpretative analysis of patterns

PATTERNS AND TEXTURES


Striking diagonal jet trails


Sweeping overhead power lines


Crisp horizons, definition between fields


Plowed furrows


Uniform texture of arable land


Verticality of trees

2.5 ANALYSING THE LANDSCAPE

LAYERING: PERCEVED DENSITIES

2.6 ANALYSING ARCHITECTURAL CHARACTER - FRISTON


Soft tones, pitched roofs


Dark cladding, pitched roofs


Soft tones, pitched roof, rich texture


Dark cladding, bold contrasts


Soft tones, pitched roof


Bold landmark, textures


Soft tones, definition of base and roof courses


Pitched roof, cldding textures


Dark cladding, bold contrasts

2.7 ANALYSING ARCHITECTURAL CHARACTER - WIDER AREA


Soft heritage tones


Dark cladding, pitched roofs, bold contrasts


Brick colours and textures, pitched roof


Soft tones,pitched roof


Rich natural textures, pitched roof

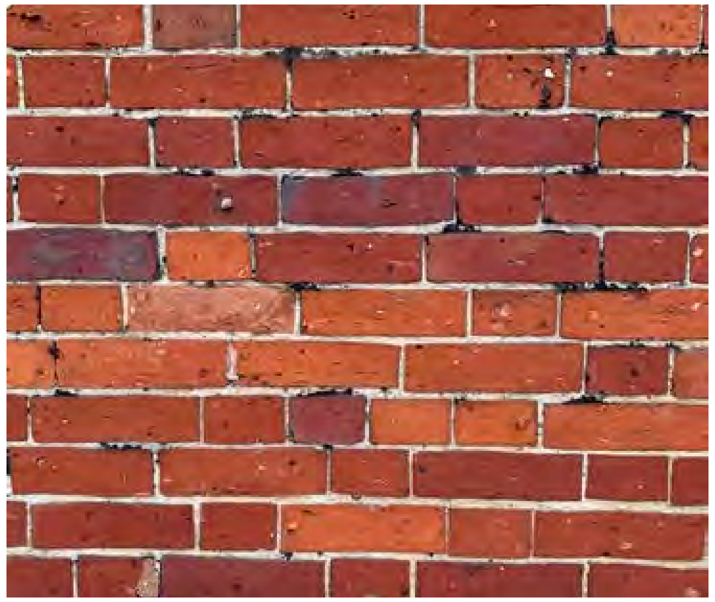

Soft tones, pitched roof, rich textures


Dark cladding, pitched roof


Soft tones, pitched roofs, rich textures

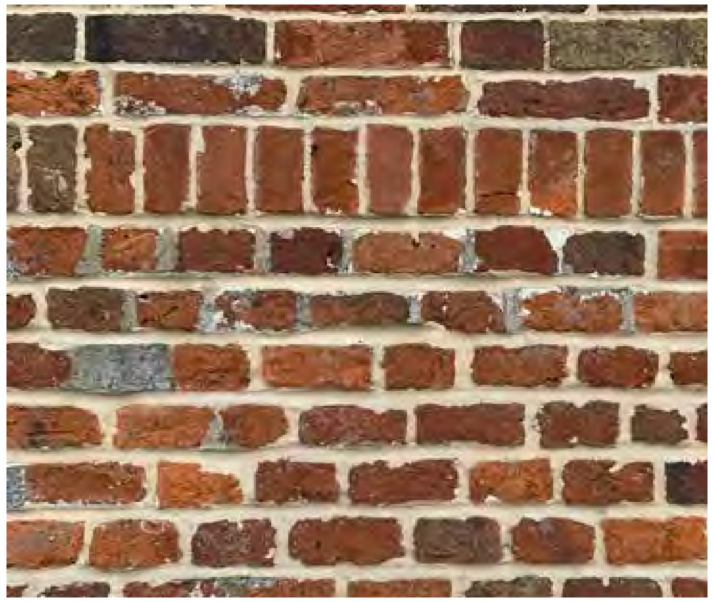

Warm, natural tones, rich textures, pitched roofs

TEXTURES, PATTERNS, COLOURS





Almost without exception, all built forms around the site area are characterised by warm colour tones and rich textures/ patterns. The exception to this may be some of the larger and more commercial of agricultural sheds, but these are not necessarily aspirational examples of local character.

03

COLOUR ANALYSIS

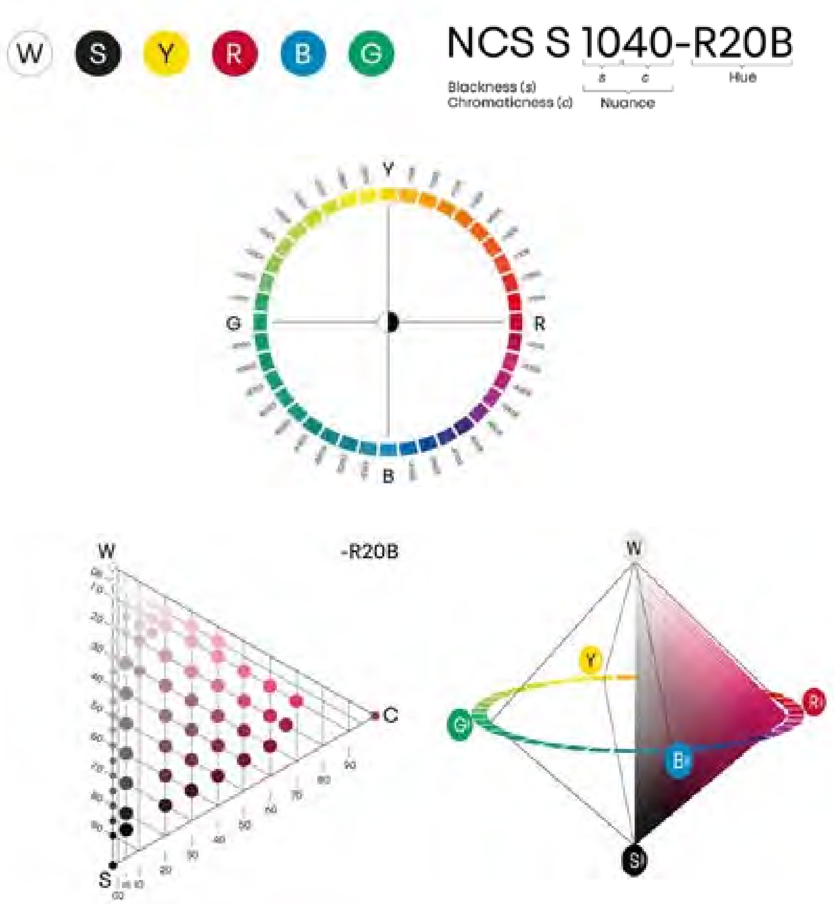
The Natural Colour System (NCS) is a global colour system used by designers and manufacturers to standardise the definition of colour. It is a system that has been developed by the Swedish Colour Foundation since 1964 and is different from other colour systems, such as CMYK and RGB, as it is based on human perception and the visual appearance of colours, rather than the physical mixing of colours.

The NCS Colour Circle sets out the four chromatic elementary colours of yellow, red, blue and green at the north, east, south and west points, respectively, as shown in the diagram to the right. The circumference between two of the chromatic elementary colours is occupied by the nine different hues which are made by mixing specific amounts of the two chromatic elementary colours. For example, between yellow and red there are nine hues that range from a predominance of yellow over red to red over yellow. The nomenclature for each hue denotes the percentage of each chromatic elementary colour used to create the hue, for example Y10R denotes 90% yellow and 10% red (although only the percentage of red is specified).

The NCS Colour Triangle then uses each of the four chromatic elementary colours and 36 hues as the apexes from which nuances of each colour or hue are developed, as shown in the diagram below. This is done by adding specific amounts of black and / or white. The nomenclature for each nuance denotes the percentage of black, colour or hue, and white, for example 1040 denotes 10% blackness, 40% colour or hue, and 50% whiteness (although only the percentage of blackness and colour or hue are specified).

The NCS Colour Space is formed by the amalgamation of all the NCS Colour Triangles set out around the colour wheel with the black apex extending in one 3 dimensional direction and the white apex extending in the opposite 3 dimensional direction, as shown in the diagram below. The colour space presents a total of 2,052 colours, although can be used to describe all 10 million colours detectable by humans. NCS is the system favoured by colour experts undertaking ECAs as it presents globally recognised system with a broad range of colours that relate well to the colours found in both the natural and built environment.

An important part of undertaking the site work involved matching colours, hues and nuances observed in the local context with the colours, hues and nuances on the NCS swatches. The NCS was also used to develop the colour palette through the testing of different colours, hues and nuances and the relationship between them, compared to other colour systems available, such as RAL.



Disclaimer

Due to variation on devices such as mobile screens, tablets and desktop monitors, as well as lighting sources used to view this document, the colours shown may appear different to those in an NCS swatch catalogue. The colours presented in this document are a CMYK reproduction and are therefore intended as a guide only. These will appear most similar to the NCS specfication on printed paper. For the exact colours referenced please use the NCS catalogue in conjunction with this document.

Whilst our current methodology follows the requirements set out in the Landscape Institutes Environmental Colour Assessment (ECA 18-4), and follows current UK best practice, we appreciate that this is a rapidly changing field of evaluation; with successes shown in adapting also to assist in the otherwise less quantifiable factors associated with assessing colour across different environs (Montero-Parejo et al., 2016). With this in mind, we appreciate that our rigorous analysis uses the best techniques available, whilst accepting that in there is always room for new and evolving technologies to better evaluate the colours of the landscape in the future.

3.2 APPROACH TO COLOUR ANALYSIS

The site and its surrounding context was visited on 26th March 2024 with the specific purpose of assessing and recording site colours. The Landscape Institute's Environmental Colour Assessment guidelines recommends winter light as being optimal for colour studies, so whilst this visit was not mid-winter it was still considered suitable and valuable. Weather conditions were still, bright and clear.

Earlier within this document we describe the approach to analysing the landscape context, and discuss our interpretation of the landscape in an elemental way: perceived distinct bands of foreground fields; mid-distant hedgerows and woodland; an uppermost sky layer. This same approach has been applied to our sampling of site colours, referencing these and other distinct layers and using our judgement to assess NCS colour matches for the fundamental different elements. In some cases photographs were taken with a particular NCS colour swatch selection identified in the context of the specific landscape element. It should be noted that this is a subjective process and, also, the published photographs do not necessarily accurately reflect the colours perceived in the flesh on site. It is, nonetheless, of great value and relevance to record as objectively as possible the range of individual colours present in the landscape context, on this given day.

3.3 SKY COLOURS

Taken 26th March 2024, Late Morning

NCS S 1050-R90B

NCS S 0530-R80B

NCS S 1020-R80B

NCS S 1510-R80B

NCS S 2010-R70B

NCS S 2005-B


Taken 26th March 2024, Noon

NCS S 6010-Y30R
NCS S 3010-Y30R


Taken 26th March 2024, Noon

NCS S 4005-Y50R
NCS S 3010-Y40R
NCS S 4050-Y30R


Taken 26th March 2024, Noon

NCS S 6020-G10Y


Taken 26th March 2024, Noon

NCS S 3040-G60Y


Taken 26th March 2024, Noon

NCS S 7005-Y50R
NCS S 5005-Y50R
NCS S 3060-Y10R


Taken 26th March 2024, Noon

NCS S 6020-G10Y
NCS S 4030 Y50R
NCS S 4030-Y30R

3.5 SITE BACKDROP COLOURS

Taken 26th March 2024, Late Morning

NCS S 7005-Y50R

NCS S 5005-Y50R

NCS S 6020-Y70R

NCS S 2005-Y50R

NCS S 3010-Y30R

NCS S 3010-Y40R

NCS S 5040-G40Y

Taken 26th March 2024, Late Morning

NCS S 3010-G80Y

NCS S 3010-Y20R

Taken 26th March 2024, Late Morning

NCS S 1070-G80Y

NCS S 1070-Y

Taken 26th March 2024, Late Morning

NCS S 4010-Y30R

NCS S 7005-Y50R

Taken 26th March 2024, Late Morning

NCS S 3040-G70Y

NCS S 4010-G90Y

NCS S 4010-Y30R

Taken 26th March 2024, Late Morning

NCS S 2005-G80Y

NCS S 4005-G80Y

Taken 26th March 2024, Late Morning

NCS S 6020-G50Y

NCS S 5040-Y10R

NCS S 2005-Y20R

Taken 26th March 2024, Late Morning

NCS S 2030-Y20R

NCS S 4020-G50Y

3.7 GROUND COLOURS ON SITE


Taken 26th March 2024, Late Morning

NCS S 1050-Y10R
NCS S 1030-G90Y
NCS S 3010-Y30R


Taken 26th March 2024, Late Morning

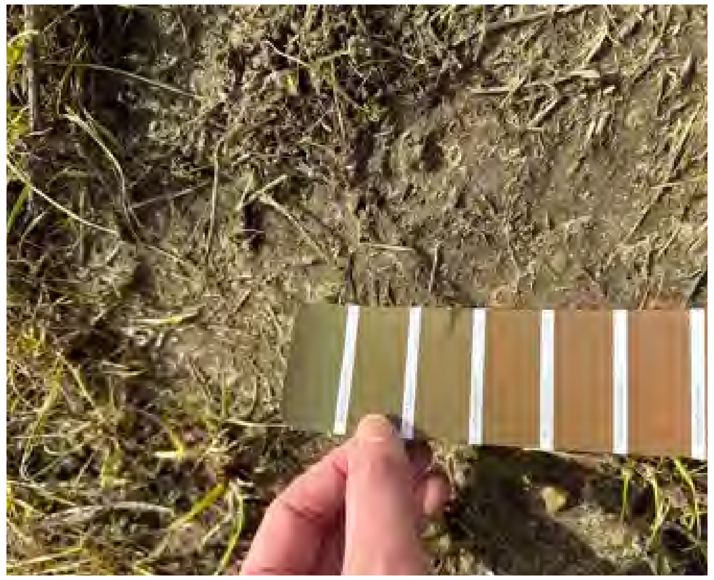
NCS S 5040-G40Y


Taken 26th March 2024, Late Morning

NCS S 6005-G80Y
NCS S 2010-Y20R
NCS S 3030-Y30R


Taken 26th March 2024, Late Morning

NCS S 6010-Y30R
NCS S 6010-Y10R
NCS S 7005-Y50R


Taken 26th March 2024, Late Morning

NCS S 6020-Y10R


Taken 26th March 2024, Late Morning

NCS S 4030-Y50R
NCS S 4030-Y70R
NCS S 3010-Y40R


Taken 26th March 2024, Late Morning

NCS S 2005-Y50R


Taken 26th March 2024, Late Morning

NCS S 3560-Y50R
NCS S 4550-Y40R


Taken 26th March 2024, Late Morning

NCS S 2010-Y10R
NCS S 3005-Y50R
NCS S 3005-R20B

3.8 LOCAL ARCHITECTURE COLOURS

Taken 26th March 2024, Late Morning

NCS S 4502-Y
NCS S 4005-Y50R
NCS S 7502-B
NCS S 2002-Y
NCS S 8505-R80B
NCS S 4030-R

Taken 26th March 2024, Late Morning

NCS S 0505-Y30R
NCS S 3060-Y70R
NCS S 8500-N

Taken 26th March 2024, Late Morning

NCS S 5005-Y50R
NCS S 1030-R

Taken 26th March 2024, Late Morning

NCS S 4020-Y20R
NCS S 1005-G80Y
NCS S 6010-Y30R

Taken 26th March 2024, Afternoon

NCS S 1510-Y70R
NCS S 2010-G80Y
NCS S 5502-G

Taken 26th March 2024, Early afternoon

NCS S 4040-Y90R
NCS S 5040-Y10R

3.9 SITE COLOURS COLLAGE

Sky Elements

NCS S 1050-R90B, NCS S 0530-R80B, NCS S 1020-R80B, NCS S 2005-B, NCS S 1510-R80B, NCS S 2010-R70B

Ancient Woodland Elements

NCS S 4005-Y50R, NCS S 5005-Y50R, NCS S 7005-Y50R, NCS S 6020-G10Y, NCS S 3040-G60Y, NCS S 3010-Y30R, NCS S 3010-Y40R, NCS S 6010-Y30R, NCS S 4030 Y50R, NCS S 4030-Y30R, NCS S 4050-Y30R, NCS S 3060-Y10R

Site Backdrop Elements

NCS S 5040-G40Y, NCS S 7005-Y50R, NCS S 5005-Y50R, NCS S 2005-Y50R, NCS S 3010-Y30R, NCS S 3010-Y40R, NCS S 6020-Y70R

Site Growth Elements

NCS S 7005-Y50R, NCS S 6020-G50Y, NCS S 4020-G50Y, NCS S 3040-G70Y, NCS S 1070-G80Y, NCS S 1070-Y, NCS S 5040-Y10R, NCS S 2030-Y20R, NCS S 3010-Y20R, NCS S 4010-Y30R, NCS S 4010-G90Y, NCS S 4005-G80Y, NCS S 3010-G80Y, NCS S 2005-G80Y, NCS S 2005-Y20R

Ground Elements

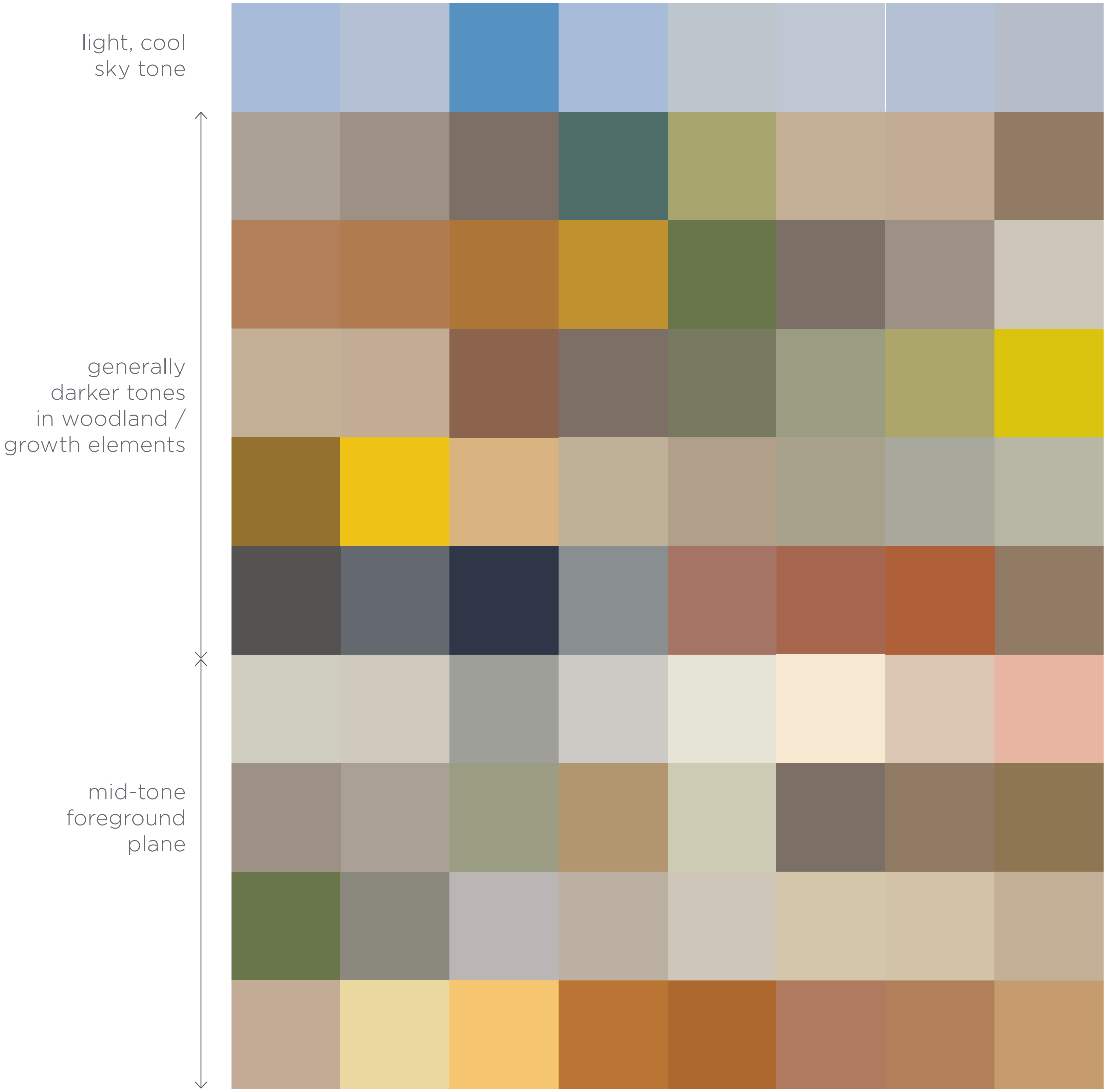
NCS S 7005-Y50R, NCS S 6010-Y30R, NCS S 6020-Y10R, NCS S 5040-G40Y, NCS S 6005-G80Y, NCS S 3005-R20B, NCS S 3005-Y50R, NCS S 2005-Y50R, NCS S 2010-Y10R, NCS S 2010-Y20R, NCS S 3010-Y30R, NCS S 3010-Y40R, NCS S 1030-G90Y, NCS S 1050-Y10R, NCS S 4550-Y40R, NCS S 3560-Y50R, NCS S 4030-Y70R, NCS S 4030-Y50R, NCS S 3030-Y30R

Local Architecture Elements

NCS S 8500-N, NCS S 8505-R80B, NCS S 7502-B, NCS S 5502-G, NCS S 4502-Y, NCS S 2002-Y, NCS S 1005-G80Y, NCS S 0505-Y30R, NCS S 1510-Y70R, NCS S 1030-R, NCS S 4030-R, NCS S 4040-Y90R, NCS S 3060-Y70R, NCS S 6010-Y30R, NCS S 5005-Y50R, NCS S 4005-Y50R, NCS S 5040-Y10R, NCS S 4020-Y20R, NCS S 2010-G80Y

3.10 SITE COLOURS OBSERVATIONS

- Predominance of warm colours and tones across all landscape and architecture elements. Only sky colours introduce cool hues.
- Consistency of warm browns and greys through landscape and architecture elements. (This in some part due to the time of year: there will be more colours in the landscape during summer months.)
- Ancient woodland elements generally darker than other landscape elements.
- Layering of light / dark / mid tones clear across all elements.
- Commonality between landscape and architecture.
- Overall impression of harmony.



04

CLADDING DESIGN

CONSIDERATIONS:

Sustainability
All materials should be responsibly manufactured from sustainable sources. Ideally products and materials should be from local sources and suppliers, but given both the site location and the extent of cladding required local sourcing is not a viable option. Instead consideration is given to sustainable criteria such as raw materials, manufacturing process, long lifespan and low maintenance.

Availability
Cladding should be tried and tested products readily available to enable accurate design, cost planning, construction and, if necessary, future replacement.

Buildability
Cladding design should be readily buildable by an appropriate competent contractor / subcontractors, in unit lengths readily transportable to site and without a need for complicated or unusual temporary works or particularly specialist skills which would limit contractor availability / competition.

Durability
Cladding should be durable, resistant to corrosion and appropriate for the site climate.

Maintenance
Cladding should be maintenance free, as far as possible. This is not to say that occasional periodic works should not be in order, for example to clean out gutters, or inspect certain fixings, but cladding materials or products with known maintenance requirements should be avoided to minimise works on site and promote sustainability.

Ease of replacement (damage, fault)
Cladding products and construction methodology should, as far as possible, enable replacement of individual components without wholesale dismantling. Products should be capable of being re-procured to match the original, for example avoiding products which are not capable of being replicated, or which will noticeably weather due to exposure on site and therefore contrast in appearance if replaced as new.

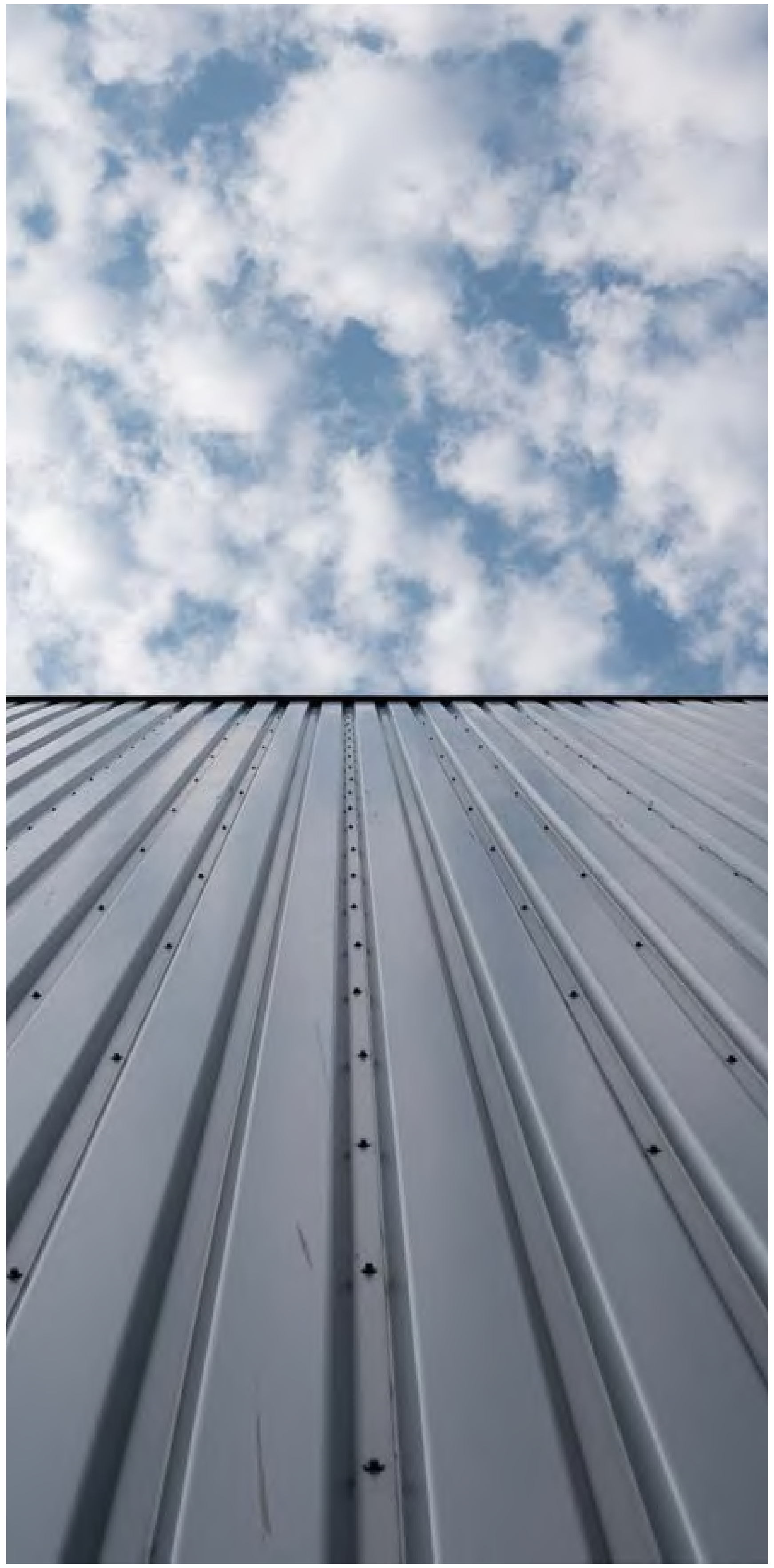
Reflectivity
It is considered that surfaces should generally be matt finish in order to best represent chosen colours, to lessen as far as possible variance under different light conditions, and to avoid sharp points of glint and glare in bright sunlight. However, there may be a case to be made for aspects of the building's envelope to reflect their surroundings to a degree so as to appear more dynamic, echo subtle movement of foliage and cloud formations, and thereby relate more closely to their immediate context.

Texture
It would be preferable for cladding to have a texture, as opposed to being totally flat/smooth. No elements of local landscape, and very few elements of local buildings, are completely smooth and texture-free so texture could play a role in helping the buildings to sit more comfortably in their setting. Even a basic linear pattern of panel corrugations would be better than no texture at all. Texture could be particularly important as the buildings will be viewed not just from great distances but more often from public rights of way only several hundreds of meters away.

Colour
Colour is a key consideration for building cladding. A site specific colour assessment has been undertaken to inform the proposals, and this included as a separate section within the document.

Economy
The square meter area of building to be clad is very large, and so realistically the cladding materials have to be financially economical. To give an extreme example, even if it happened to be aesthetically suitable it would be wholly inappropriate to clad the building in, say, stone. Not only is the material expensive, but so are the processes required to transport, handle and construct it. Materials chosen to clad the substations should be economically suitable for the buildings' scale and location.

Material Options
In assessing potential cladding materials it is worth briefly considering and testing the merits of all fundamental options.



4.2.1 MATERIAL OPTIONS: MASONRY

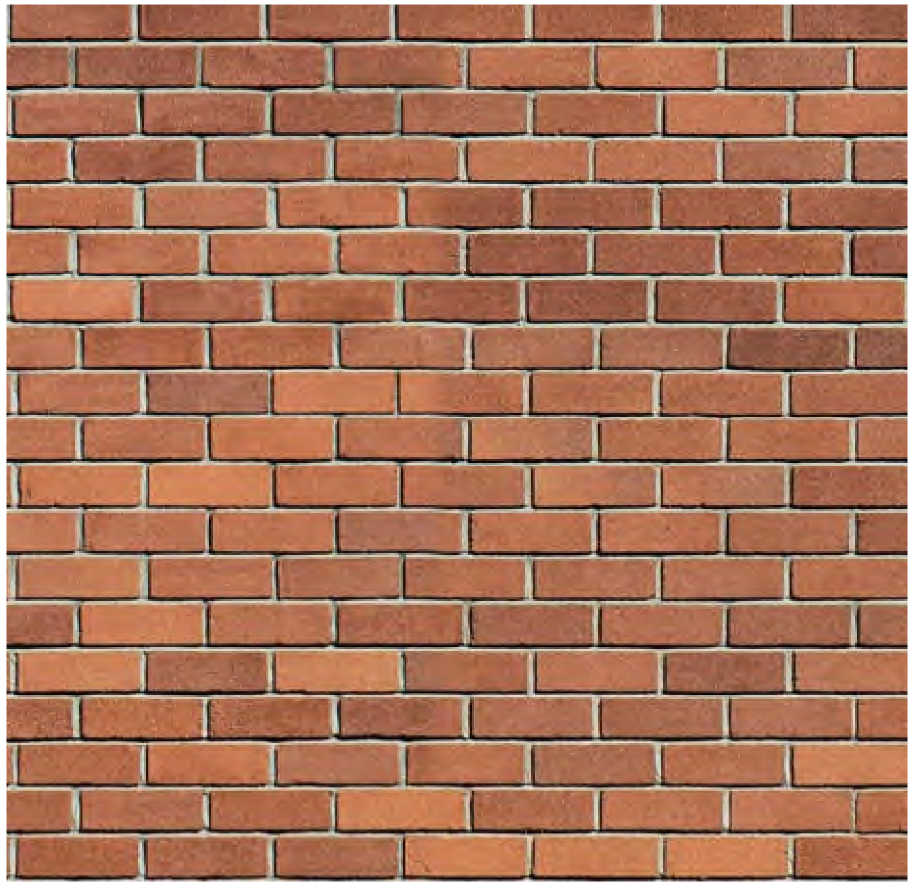
Masonry: stone, brick, block
Such large expanses of masonry walling would be highly unusual, and incongruous in this landscape setting, especially when relatively devoid of detail/articulation, as they would be. The time required to construct masonry walling would greatly extend construction programme and hence duration of works on site. It would also be weather dependant to a degree, as masonry can not be laid below certain temperatures.

The quantity of materials required would be likely to result in procurement challenges.

The extent of walling to be built would be likely to result in difficulty procuring the required skilled labour.

Costs would be high.

It is considered that masonry is inappropriate as a predominant wall cladding material for this project, although consideration could be given to its use in local areas as a base course material.



4.2.2 MATERIAL OPTIONS: RENDER

Render
Render does not necessarily require a 'solid' wall as a base, and could readily be applied as an external finish to lightweight cladding board.

Its uniform appearance and 'solid' block colour over such large wall areas could be incongruous in this landscape setting.

The extent of walling to be built could be likely to result in difficulty procuring the required skilled labour, and in achieving consistency over such large areas.

Render could be prone to cracking and staining.
It is considered that render is inappropriate as a predominant wall cladding material for this projectmaterial.

4.2.3 MATERIAL OPTIONS: GLAZING

Glazing
Natural lighting is not a key requirement for the buildings.

It is not desirable for views into the buildings to be available from outside, for reasons of both security and aesthetics.

Glazing could present overheating problems for the buildings.

Glazing would present an ongoing maintenance responsibility and burden.

The use of such large extents of glazing where not required is highly unsustainable.
Costs would be high.

It is considered that glazing is inappropriate as a predominant wall cladding material for this project.

4.2.4 MATERIAL OPTIONS: TIMBER

Timber
Timber is a warm and tactile material offering appropriate texture, colour and visual interest.

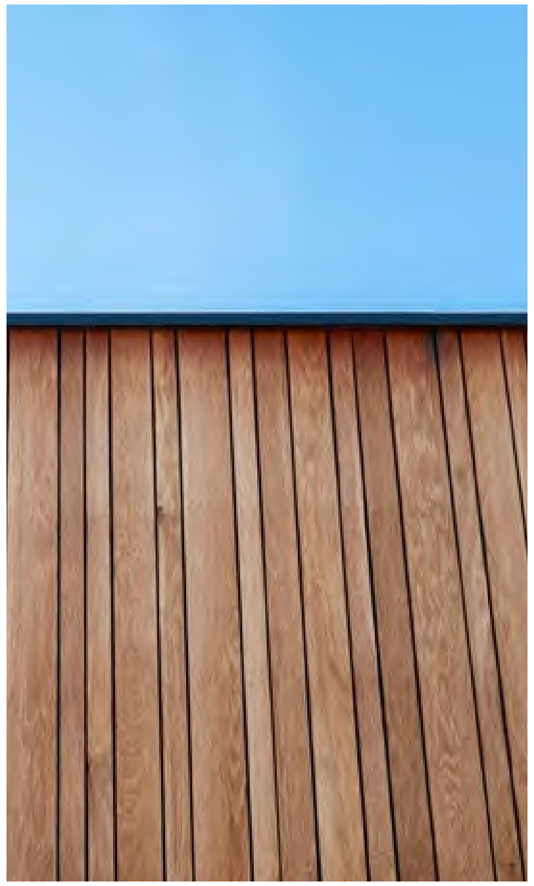
It could be readily procured from sustainable sources, however the large quantities necessary here may present procurement problems.

It could be relatively maintenance free if design and constructed carefully, however, it would be prudent to anticipate a degree of maintenance over the lifespan of the building.

It could be more labour intensive to apply timber cladding that for other larger format cladding systems.

Such large expenses of timber cladding would be relatively unusual, and therefore perhaps incongruous.

Timber would present a homogeneous appearance to buildings rather than breaking mass down with different colours, which is not necessarily the desired visual effect. The breaking down of mass could be achieved via different timber cladding shapes and sizes (more labour intensive) or different stain colours (likely to require re-staining every 5-10 years to maintain the effect).



4.2.5 MATERIAL OPTIONS: FIBRE CEMENT

Fibre cement
Fibre cement panels work as the outer skin of a rainscreen system.

They are lightweight, sustainable, available in flat panel or corrugated form.

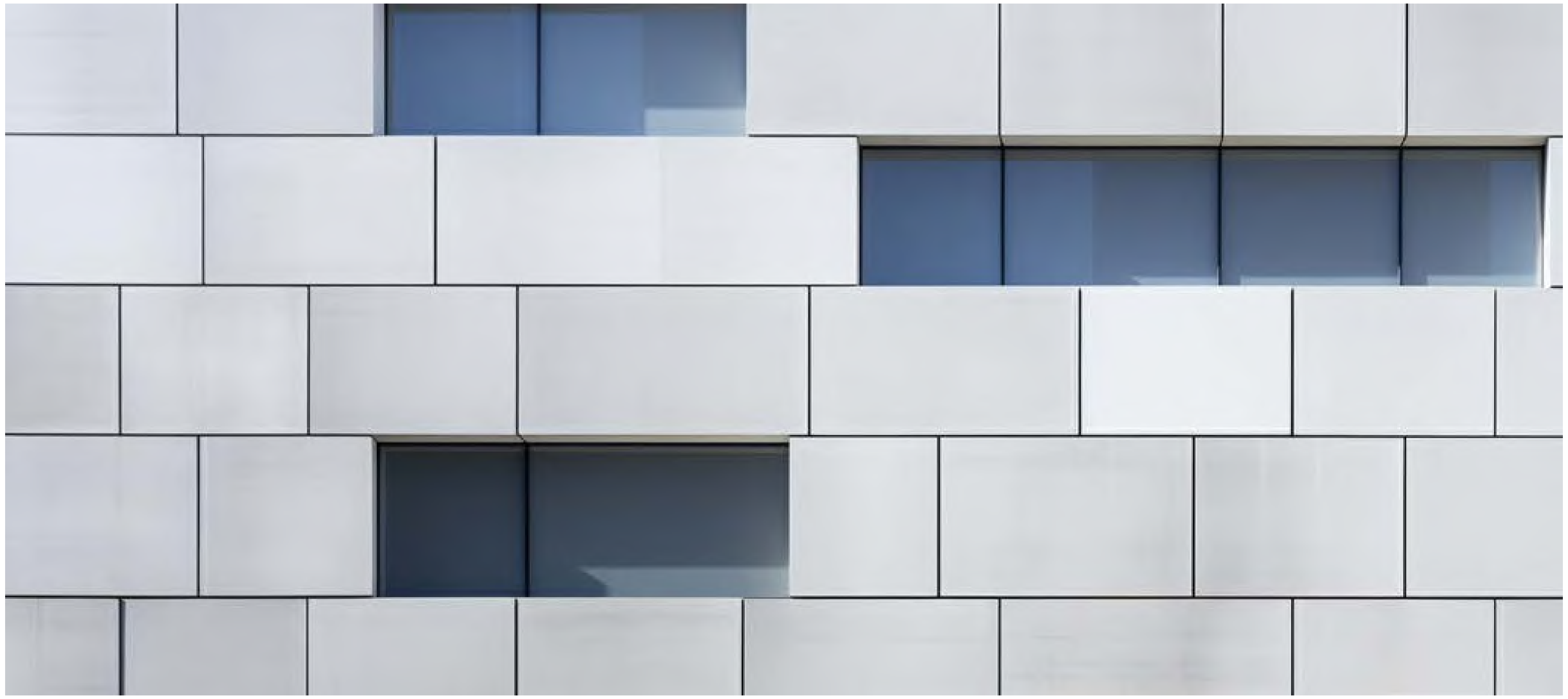
Long lasting, maintenance free.

They have traditionally been used in corrugated for to clad large agricultural sheds therefore their appearance in the landscape is not necessarily unfamiliar.

Fibre cement has a matt surface with generally no discernible texture, other than the linear pattern from corrugated versions.

They are seen as quite a basic product. Standard components and accessories, eg flashings, are limited.

Available in a fairly limited range of colours.



4.2.6 MATERIAL OPTIONS: METAL

Metal
A variety of sheet applied forms available, including composite (insulated) panels, flat sheet, profiled sheet, large format, small format, expanded mesh.

Lightweight, so economical for supporting structure.

Readily available from UK sources.

Simple and quick to install.

Long lasting.

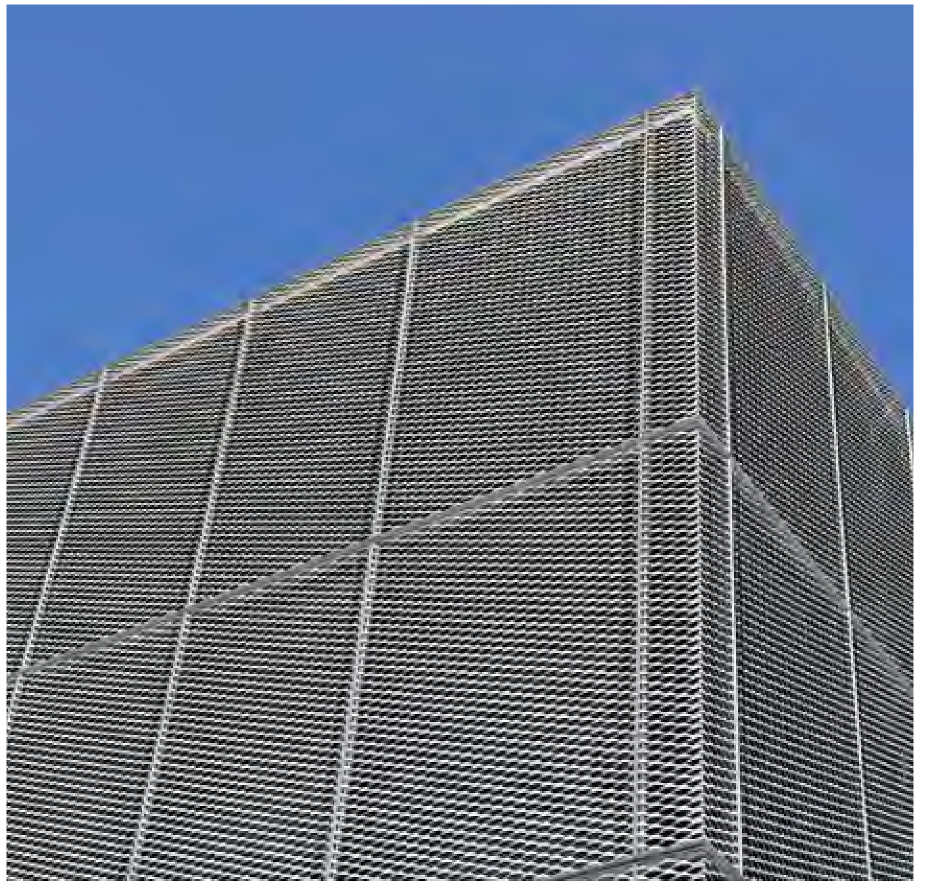
Maintenance free.

Little to no weathering or patination (for most options) meaning that replacement panels would be readily achievable.

Wide range of colour and finish options.

Economical in cost terms.

It is considered that metal panels offer the most appropriate solution for the predominant cladding of the substation buildings.



4.3 CLADDING THE BUILT FORMS: APPLYING SITE ANALYSIS TO THE DESIGN

Accepting that overall mass and form of the substations are a relative given, there are, aesthetically, 4 basic components to potential cladding solutions:

- Scale
- Pattern
- Texture
- Colour

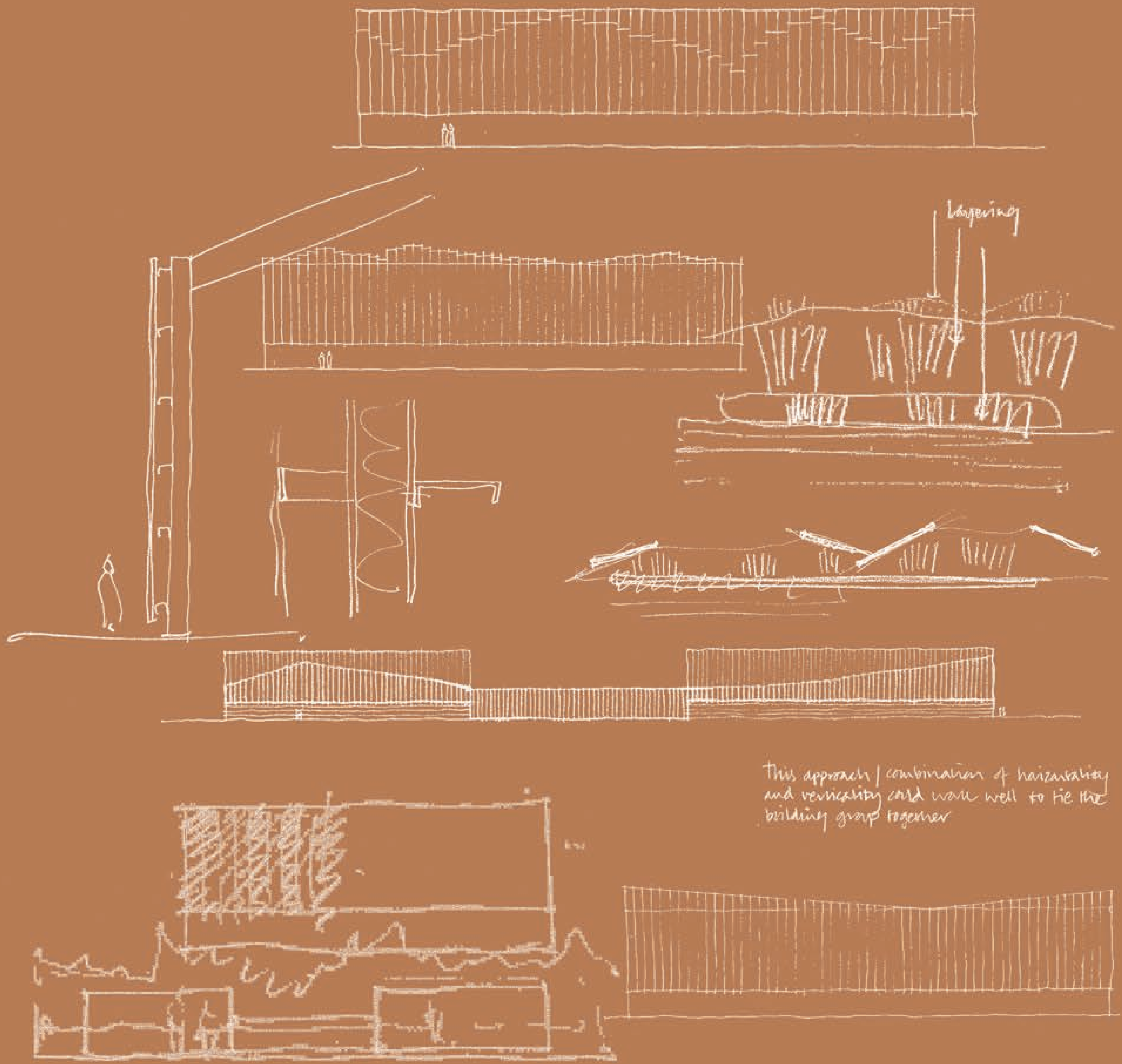
We see from analysis of the landscape context that it is generally characterised by bold patterns, bands of consistent texture, and warm colour tones. These textures and patterns provide visual interest and a sense of scale to large elements such as foreground fields and woodland belts: such elements are never viewed as wholly consistent, flat colours and textures.

We see from analysis of the architectural context that general townscape design, and the better of individual buildings and groupings, are generally characterised by cladding patterns, rich textures and warm colour tones. Larger areas of walls and roof typically comprise small scale components such as bricks or tiles or planks.

There is, therefore, a commonality between the surrounding landscape and surrounding built forms in that both elements echo similarities of patterns, textures, colours, and the scale of perceived surface finishes. The large substation forms can never replicate the richness and intricacy of a village or townscape grouping, nor a landscape vista or tree belt, and neither should they, but the visual impact of the large building forms can be mitigated by referencing contextual surface finishes, patterns, textures and colours in a considered way.

Of all of the fundamental cladding material options, metal emerges as the preferred solution. In various forms it can achieve all of the various practical considerations of sustainability, availability, buildability and low maintenance, plus it is readily adaptable in terms of delivering different scale, pattern, texture and colour.

The following pages go on to explore in diagrammatic form different ways in which appropriate metal cladding treatments might be design developed.

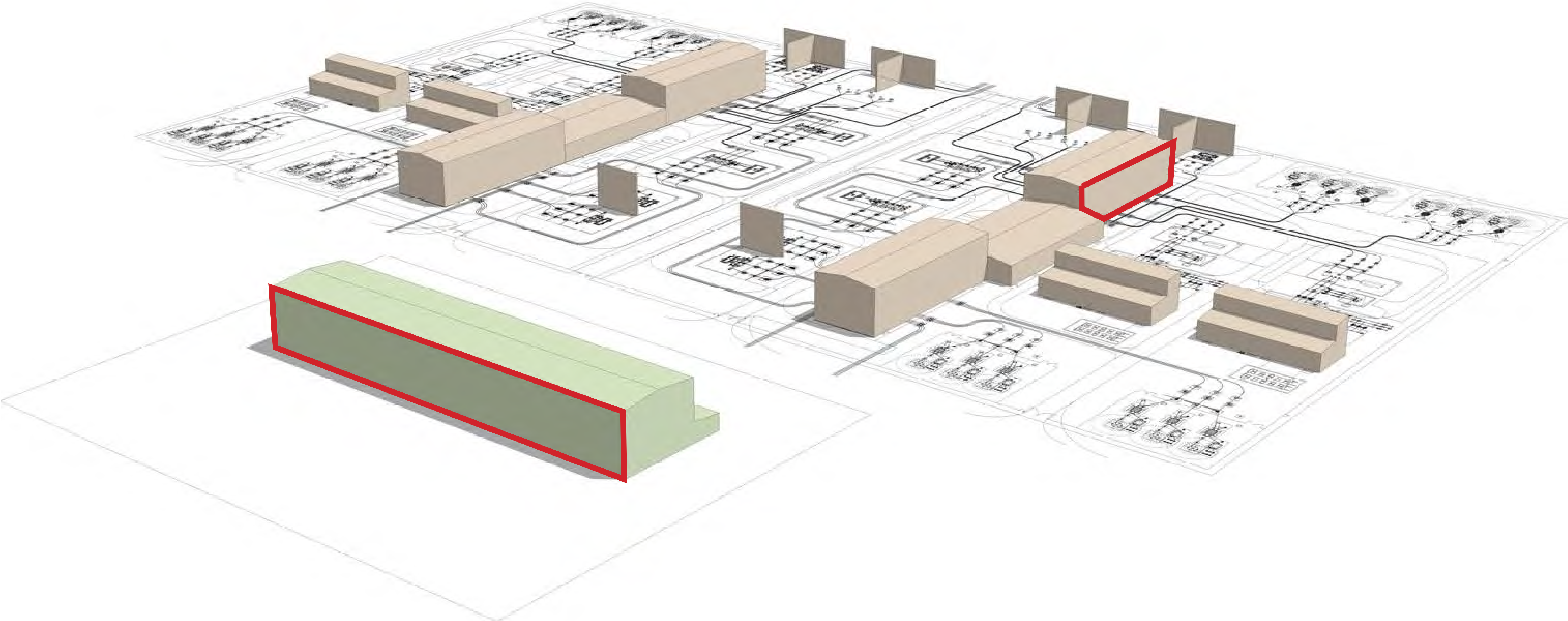


DIAGRAMATIC CLADDING OPTIONS

The SPR substations comprise a grouping of buildings, across two compounds. To test and demonstrate fundamental different metal cladding approaches clearly and legibly in the first instance we communicate the different design treatments via an elevation extract of the single largest building façade. In all options the cladding is based on a readily achievable cladding panel width of 1m, which although not necessarily the eventual final solution is a realistic and deliverable starting point. The most economical cladding system would be a composite (insulated) cladding panel, such as Kingspan Insulated Panels, and all of the initial options shown here could be achieved with that. Such composite panels are, however, perceived as the most basic of cladding solutions being very commonly used for warehousing and industry, and so we go on to explore in Option 10 how an extent of 'rainscreen' cladding instead / in combination with composite panels could lift the perceived quality of the buildings and offer more design-focused possibilities. This approach could be applied to any of the options, but has maximum impact for Option 10.

SPR substations

NGET substation

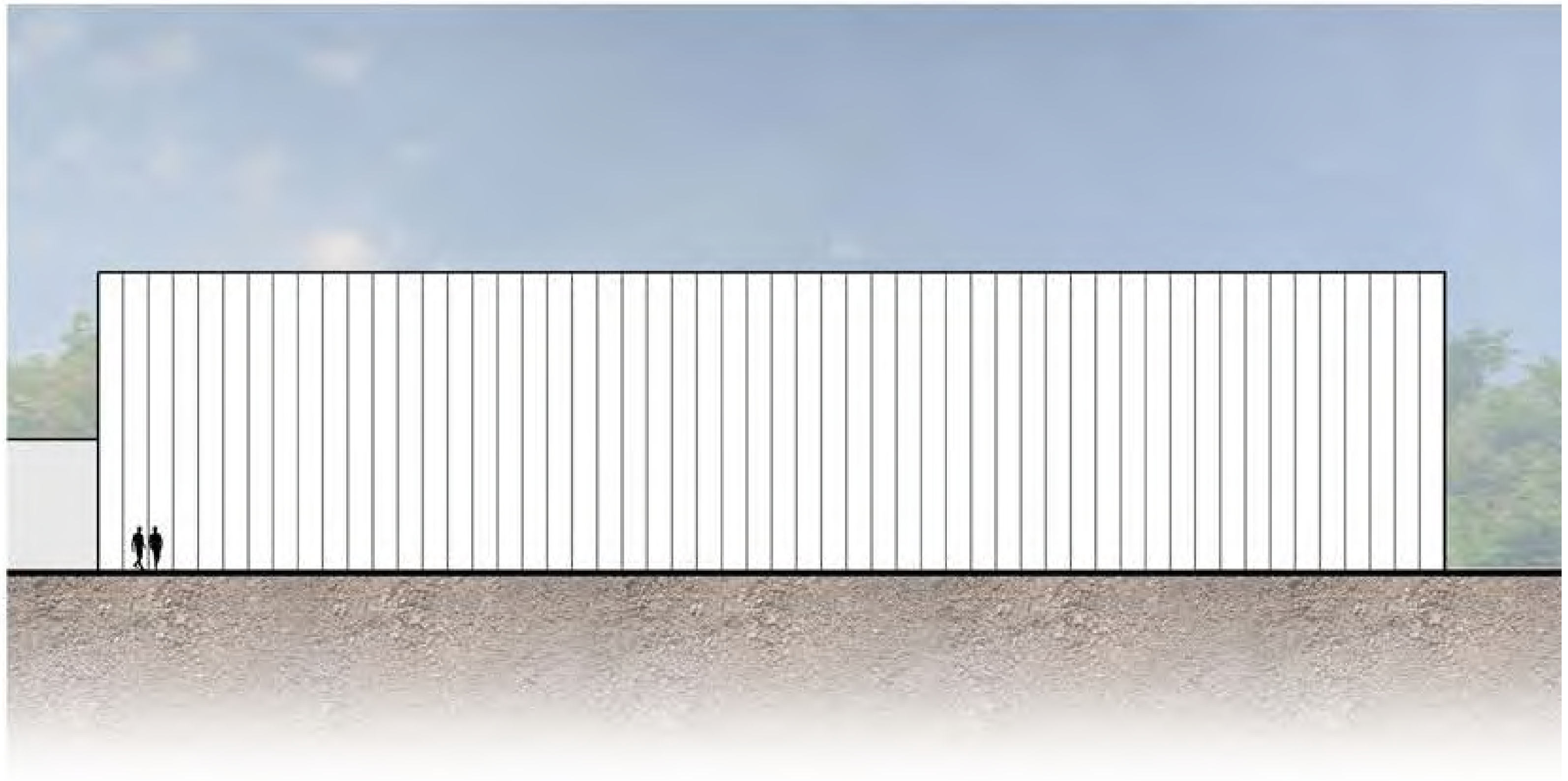


DIAGRAMATIC CLADDING: OPTION 1

Consistent, uniform, vertical cladding panels.

+ Economical
+ Readily achievable

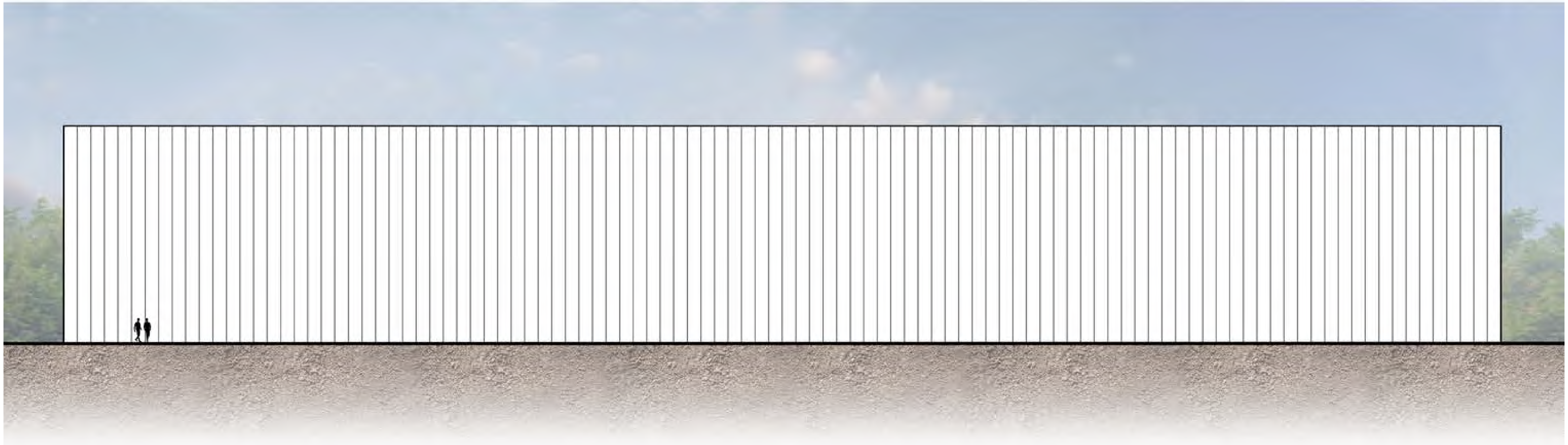
- Minimal visual interest: possible perception of being too basic / bland
- Doesn't break perceived mass of building down
- Uniform verticality gives perception of taller building



SPR largest facade

Scale 1:300 @ A3

N 0m 2m 4m 6m 8m 10m



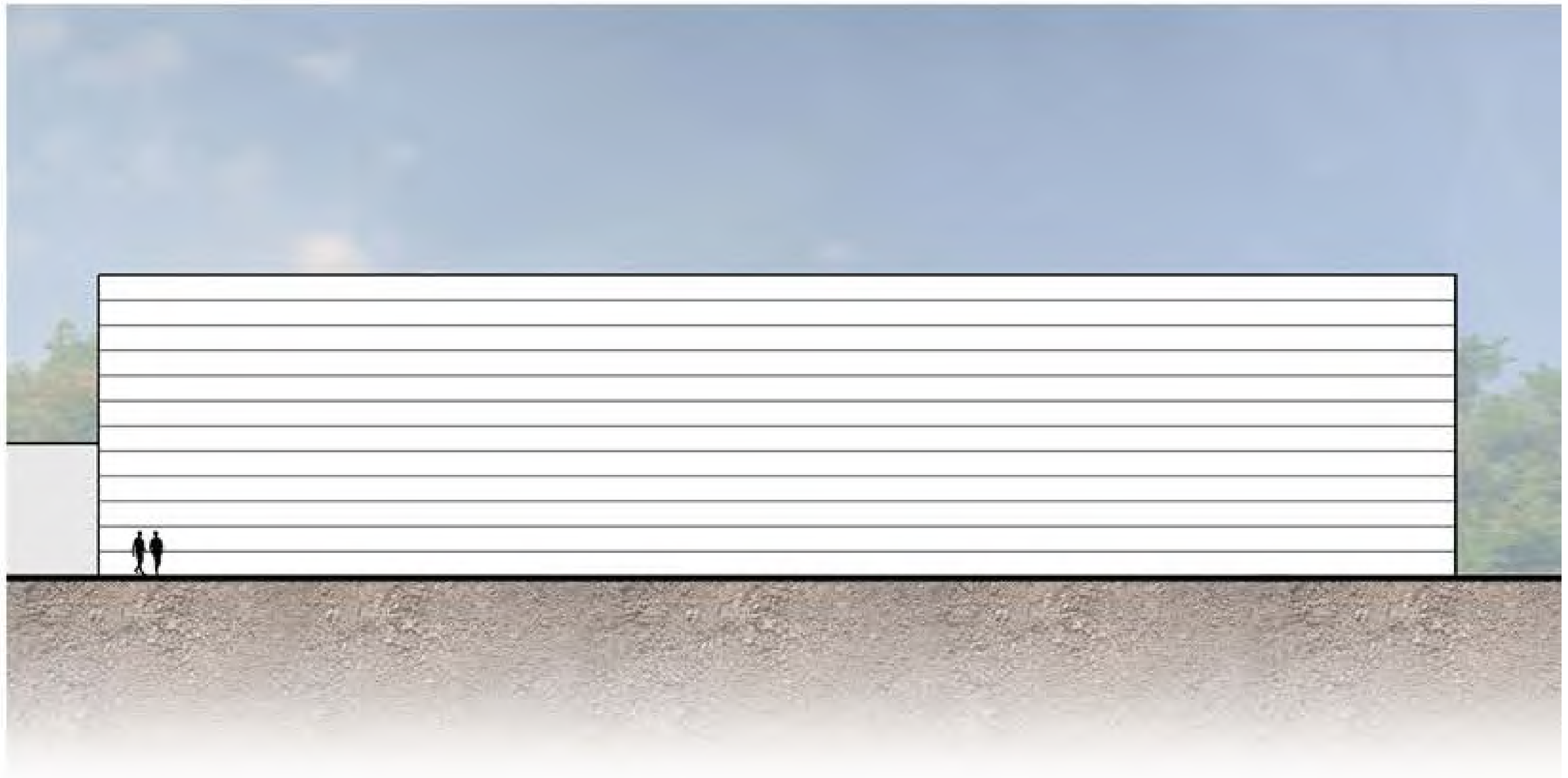
NGET largest facade

DIAGRAMATIC CLADDING: OPTION 2

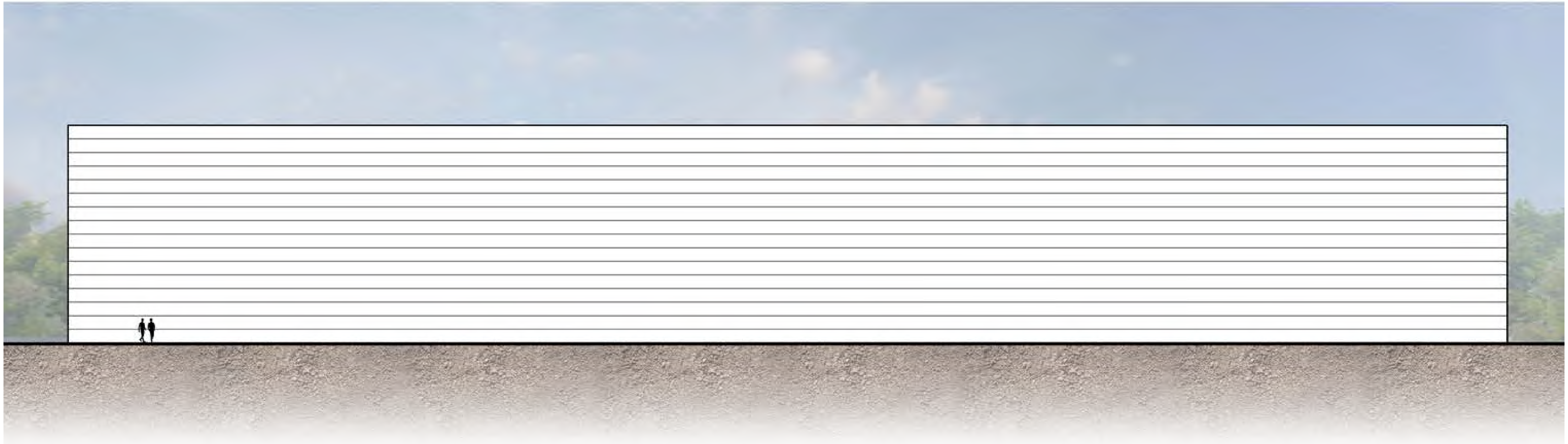
Consistent, uniform, horizontal cladding panels.

+ Economical, although horizontal cladding typically requires more secondary structure to construct
+ Readily achievable
+ Uniform horizontality gives perception of lower building

- Minimal visual interest: possible perception of being too basic / bland
- Doesn't break perceived mass of building down



SPR largest facade



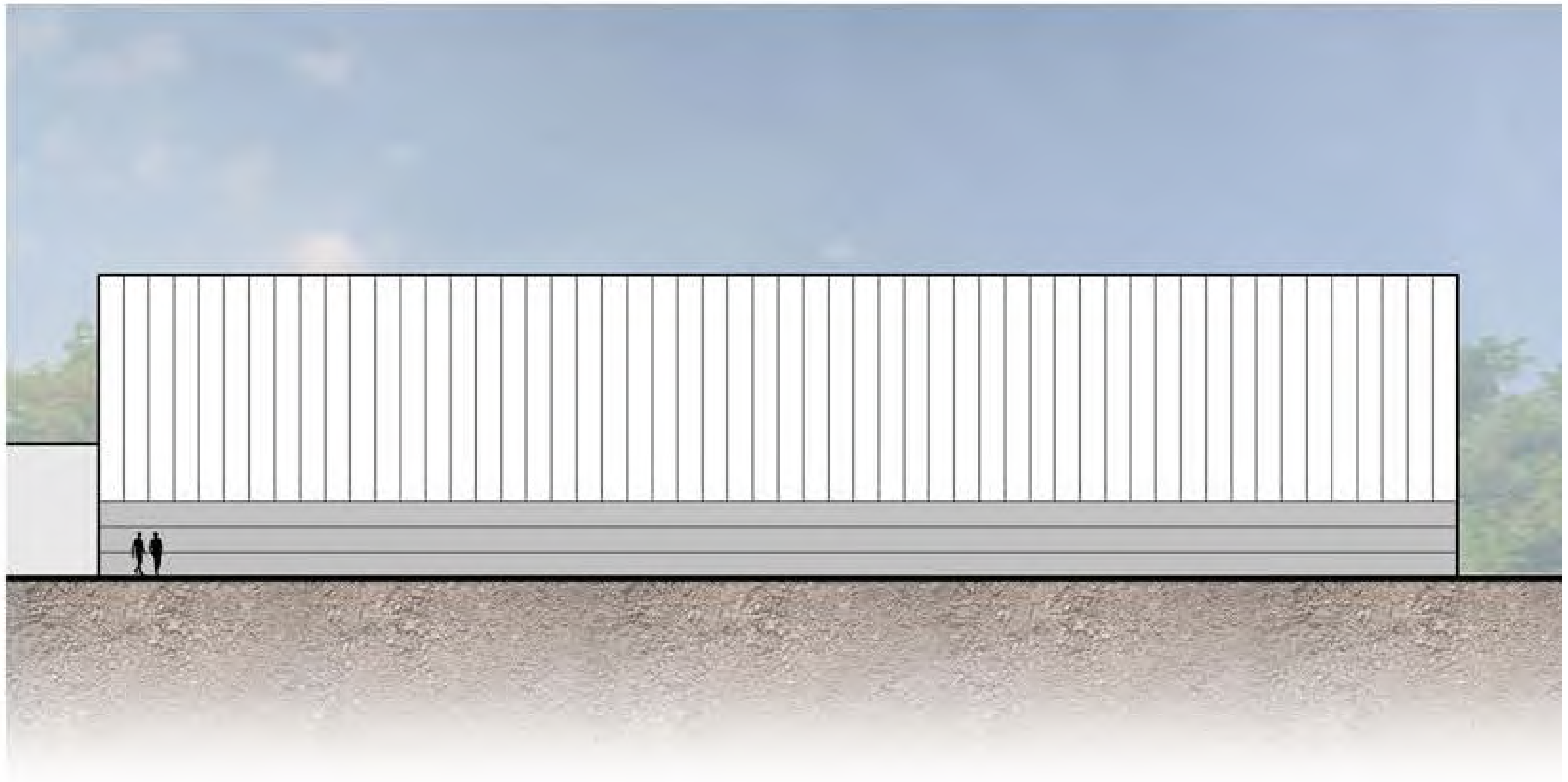
NGET largest facade

DIAGRAMATIC CLADDING: OPTION 3

Horizontal base course with vertical cladding above

+ Economical
+ Readily achievable
+ Different cladding elements help break up building mass
+ Horizontal base course with vertical upper echoes general landscape context composition of horizontal foreground patterns and mor vertical backdrop patterns

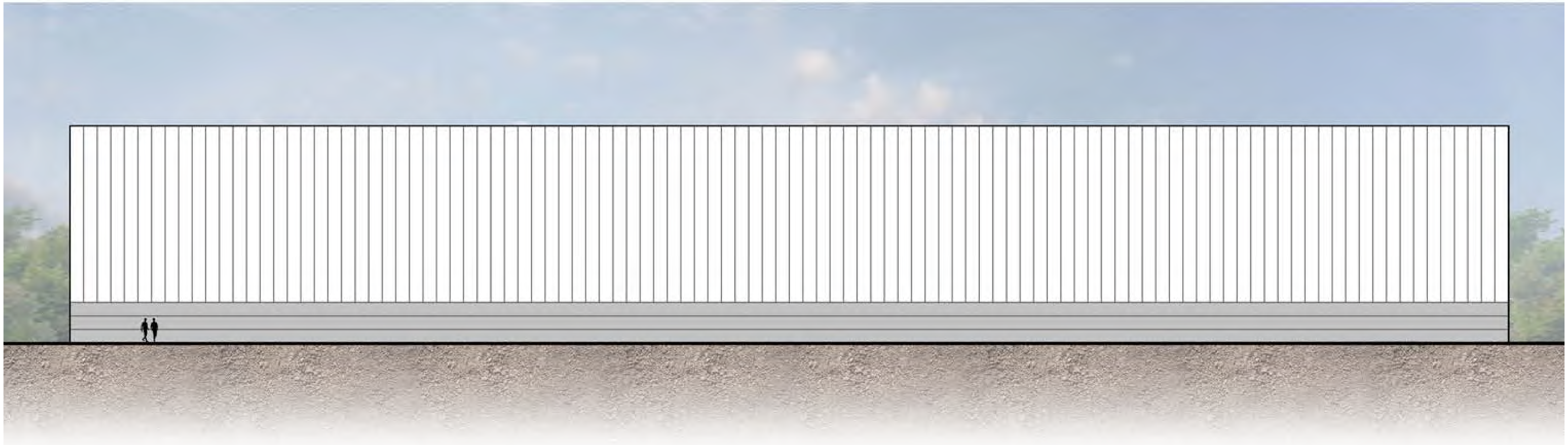
- The majority of the building still presents a relatively basic, simplistic mass.



SPR largest facade

Scale 1:300 @ A3

N 0m 2m 4m 6m 8m 10m



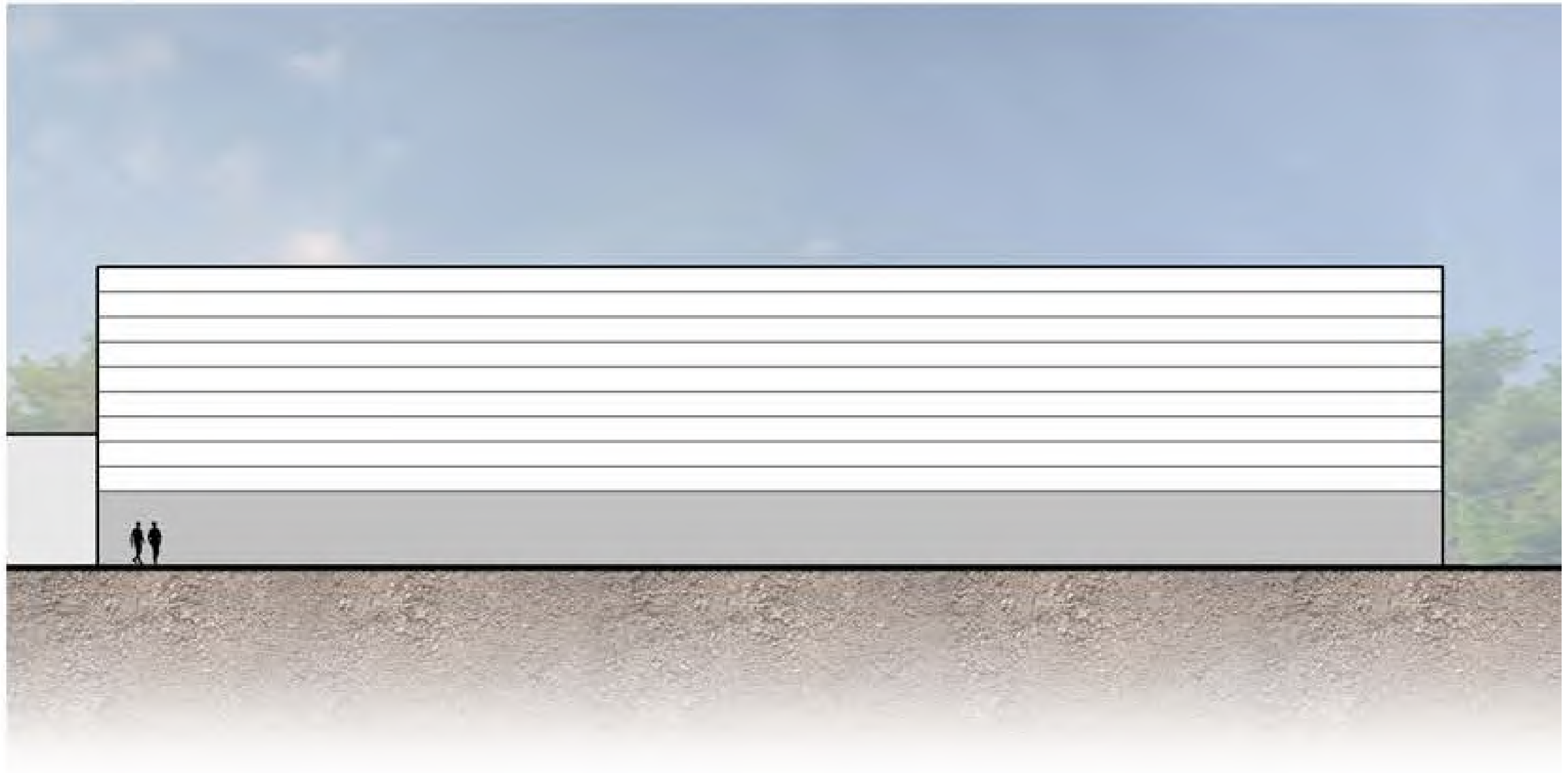
NGET largest facade

DIAGRAMATIC CLADDING: OPTION 4

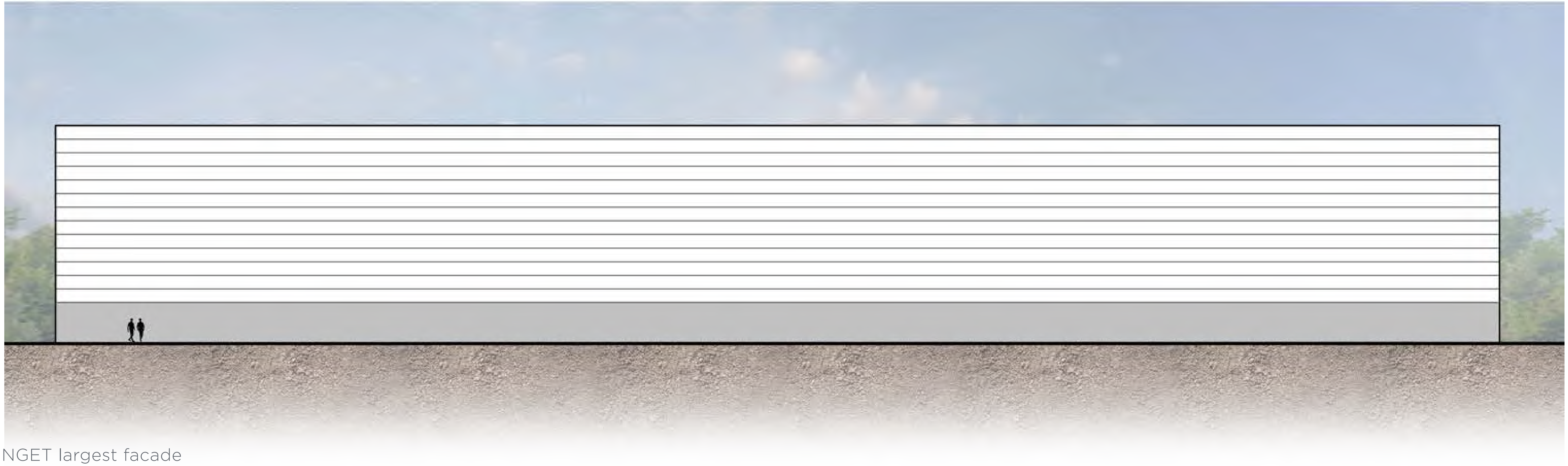
As for Option 3, but there could be an alternative of constructing the base course from something other than metal panels: brick / block / render

+ Readily achievable
+ Different cladding elements help break up building mass

- Not so economical
- 'Wet' construction for base element (brick / block / render) more expensive and longer to construct
- No real need for the robustness / security that a masonry basecourse is typically provided for?
- The majority of the building still presents a relatively basic, simplistic mass.



SPR largest facade

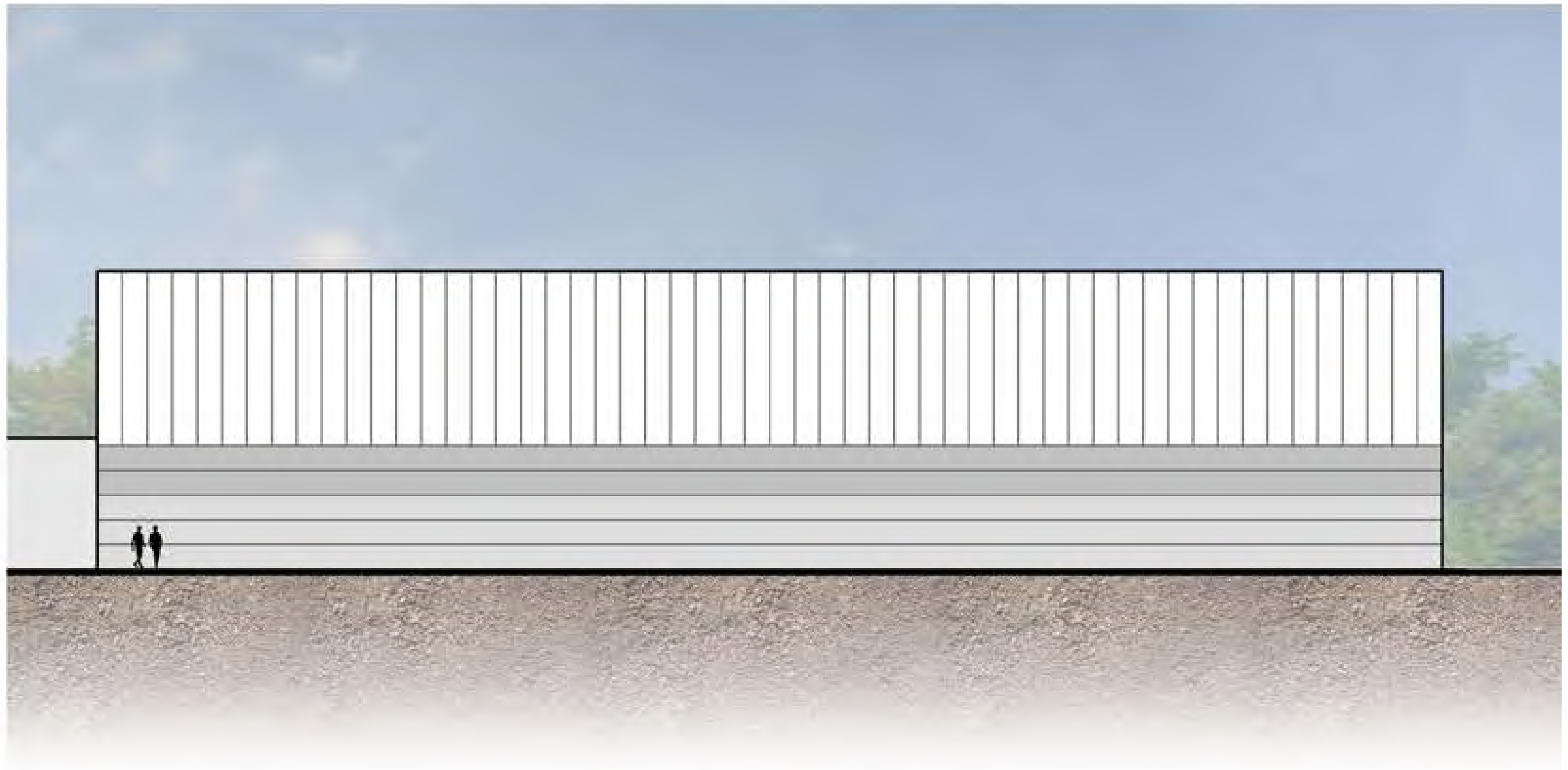


NGET largest facade

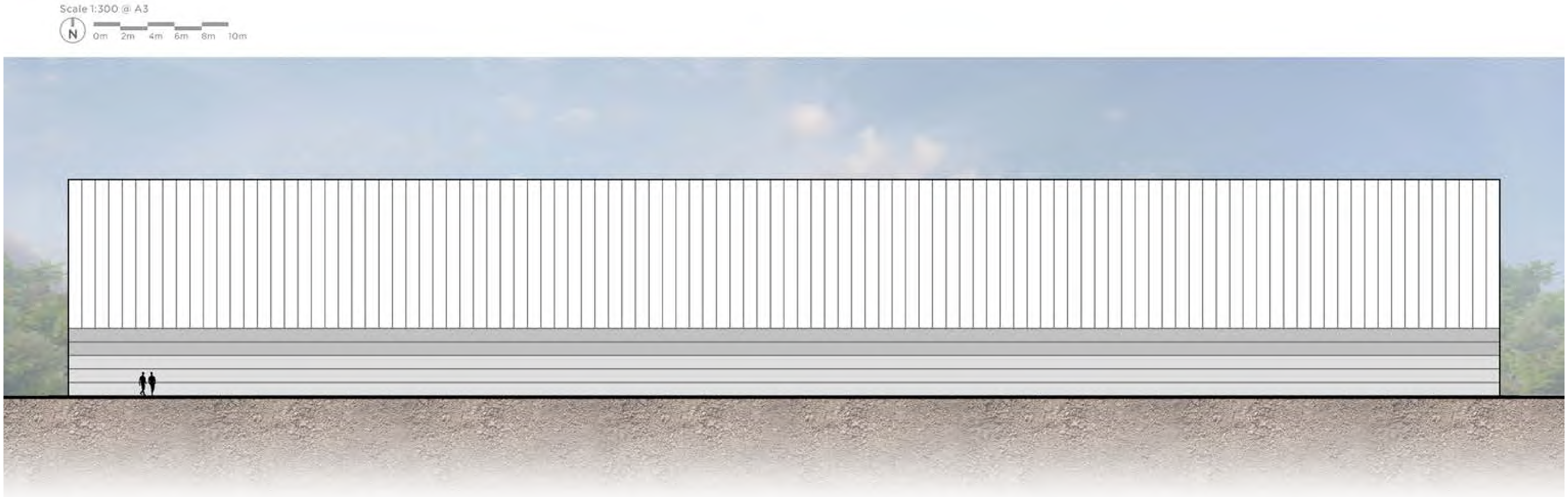
Horizontal base course bands with vertical cladding above

+ Economical
+ Readily achievable
+ Different cladding elements help break up building mass
+ Horizontal base course with vertical upper echoes general landscape context composition of horizontal foreground patterns and more vertical backdrop patterns
+ Further compositional articulation of 3 distinct cladding zones echoes 3 perceived
landscape composition zones identified in landscape analysis

- The majority of the building still presents a relatively basic, simplistic mass



SPR largest facade



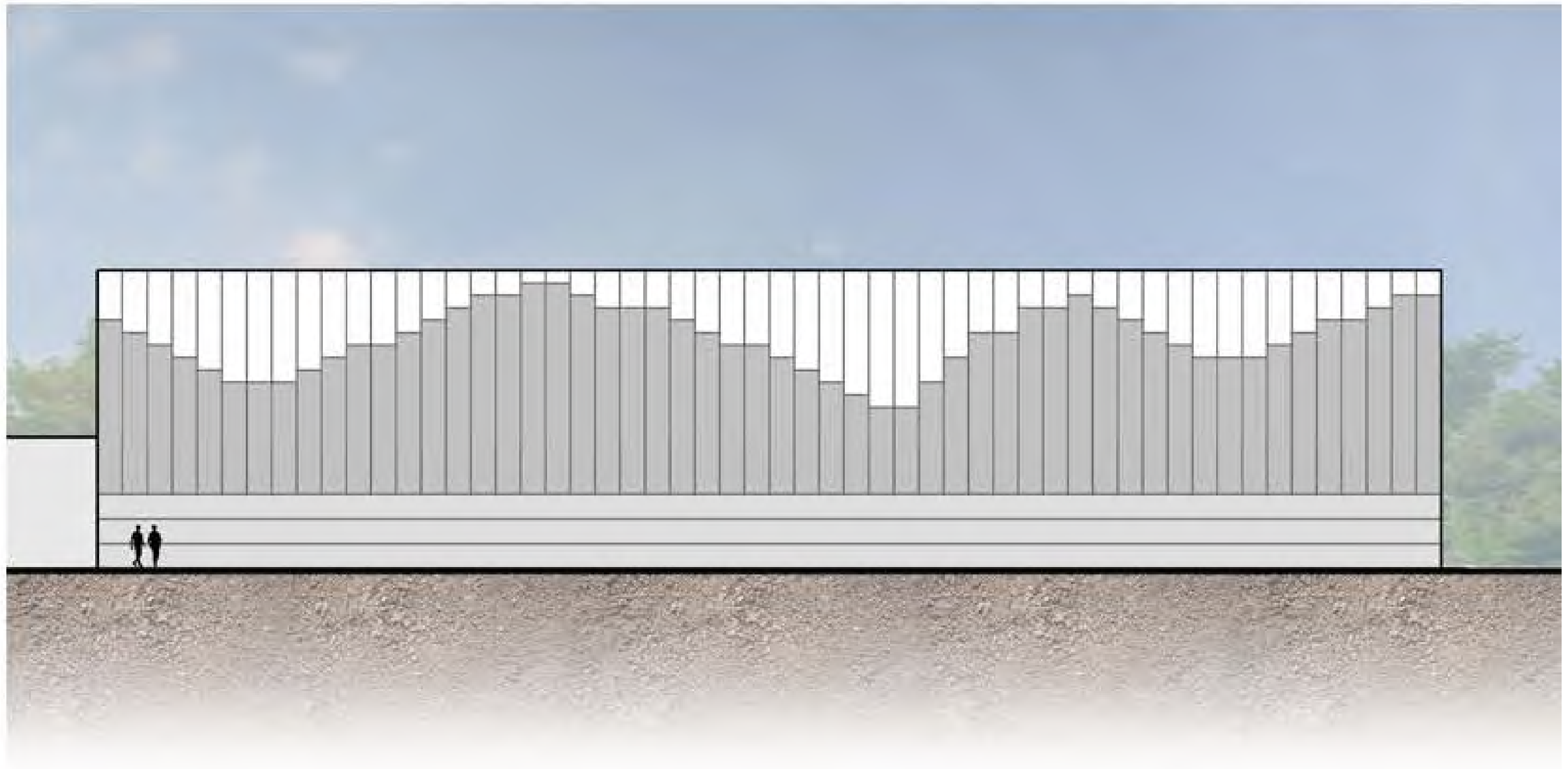
NGET largest facade

DIAGRAMATIC CLADDING: OPTION 6

Horizontal base course, with vertical cladding above forming a varying pattern through use of two different colours

+ Economical
+ Readily achievable
+ Different cladding elements help break up building mass
+ Horizontal base course with vertical upper echoes general landscape context composition
  of horizontal foreground patterns and more vertical backdrop patterns
+ Varying pattern of upper element reflects contextual landscape backdrop of woodland belts against skyline

- Possibly too 'busy' / eye catching?

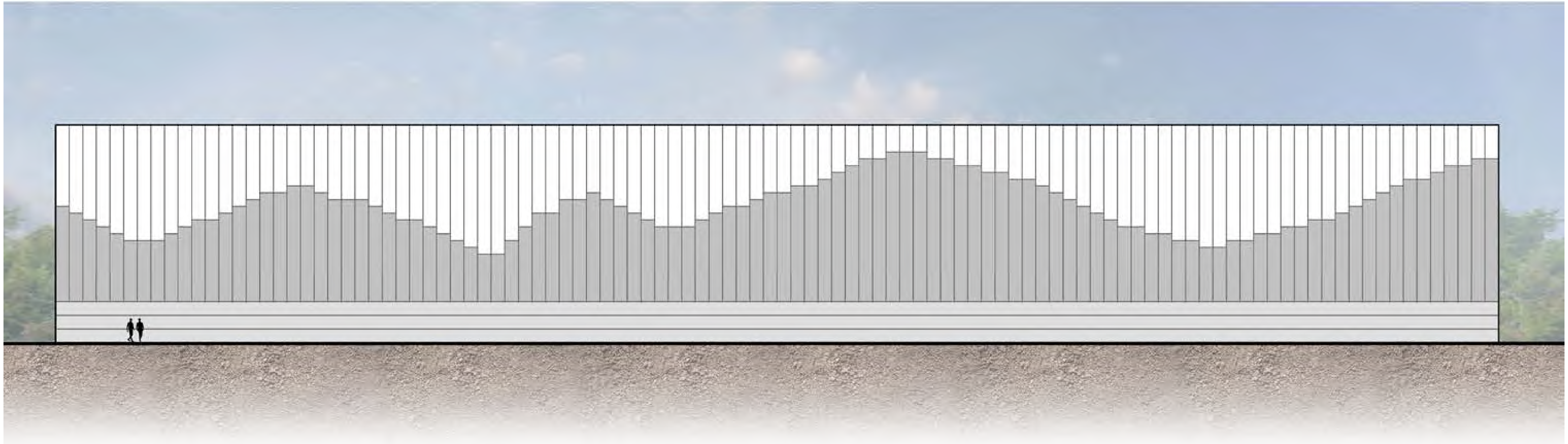


SPR largest facade

Scale 1:300 @ A3

N

0m 2m 4m 6m 8m 10m

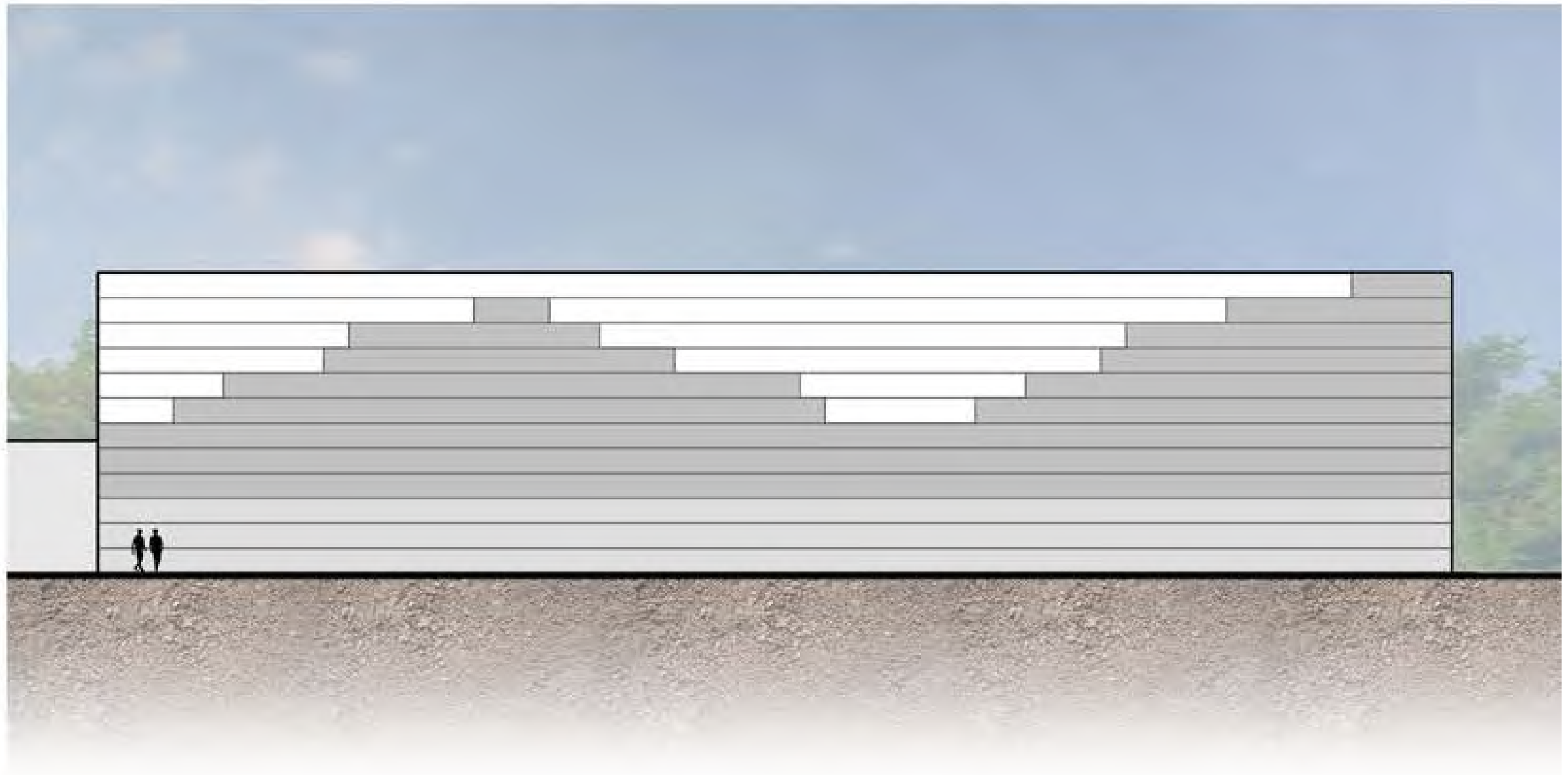


NGET largest facade

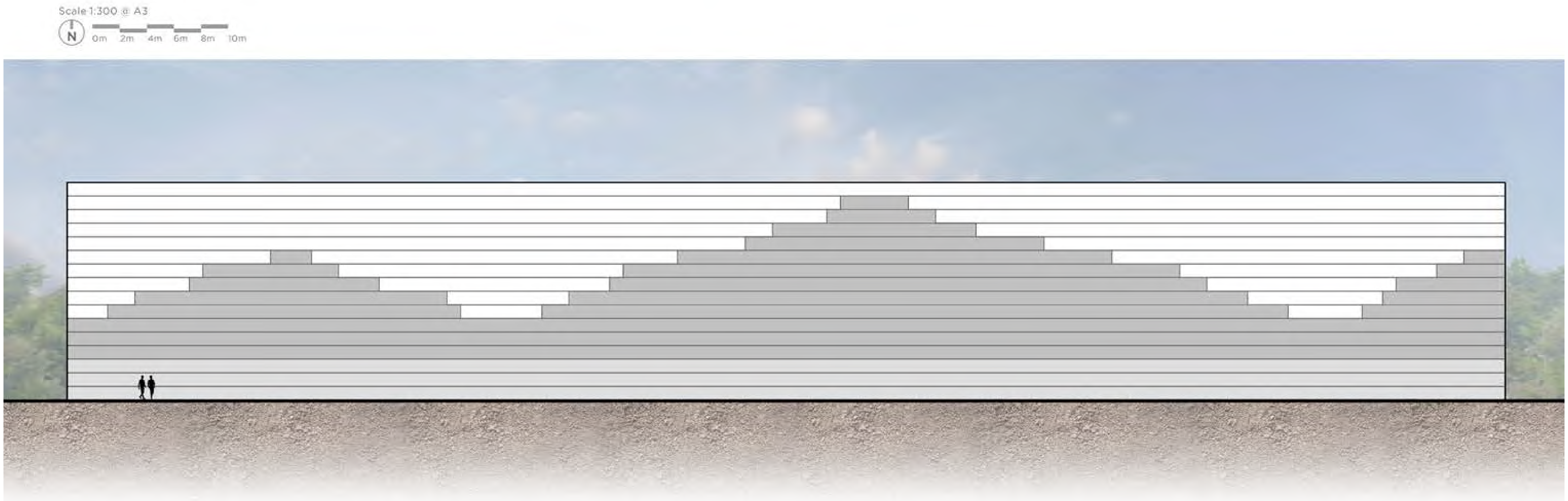
Horizontal cladding throughout articulated into base and upper courses through colour variation, with added variety of pattern on upper elements through use of two different colours

+ Readily achievable
+ Different cladding elements help break up building mass
+ Horizontal base course with vertical upper echoes general landscape context composition of horizontal foreground patterns and more vertical backdrop patterns
+ Varying pattern of upper element reflects contextual landscape backdrop of woodland belts against skyline

- Not so economical
- Possibly too 'busy' / eye catching?



SPR largest facade

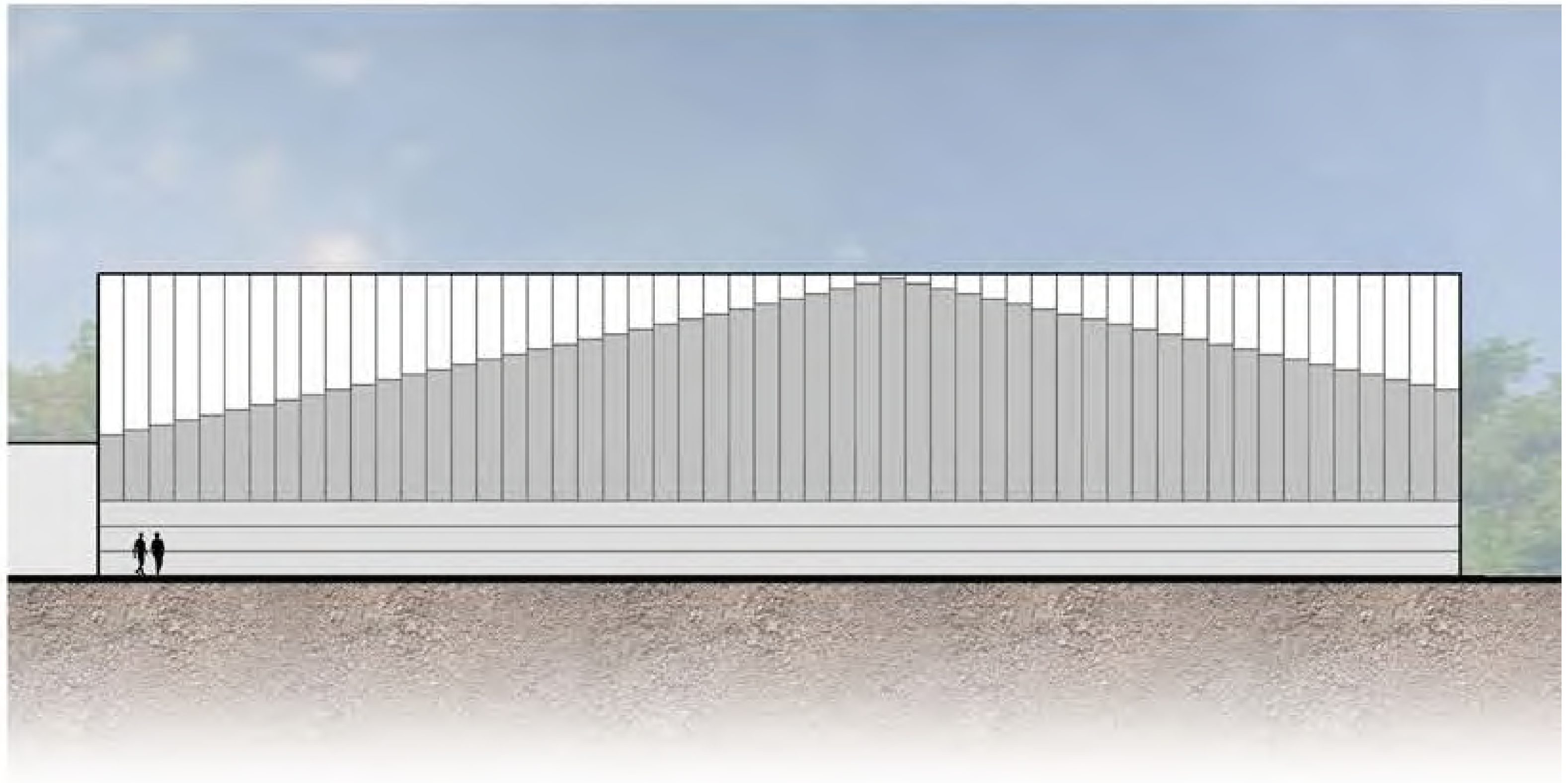


NGET largest facade

DIAGRAMATIC CLADDING: OPTION 8

Horizontal base course, with vertical cladding above forming a varying pattern through use of two different colours

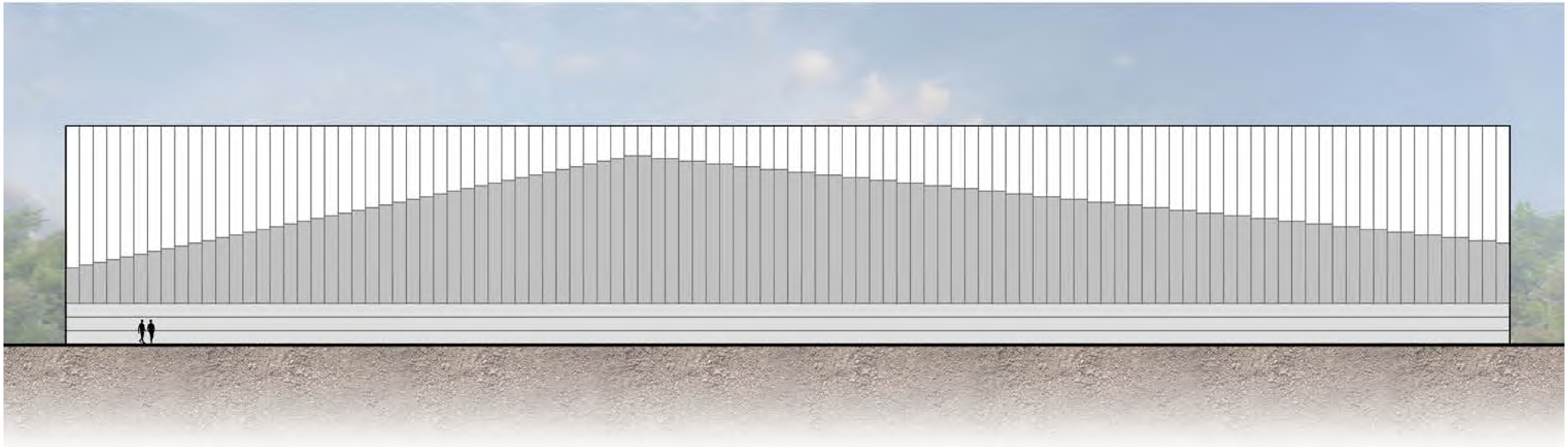
+ Economical
+ Readily achievable
+ Different cladding elements help break up building mass
+ Horizontal base course with vertical upper echoes general landscape context composition of horizontal foreground patterns and more vertical backdrop patterns
+ Varying pattern of upper element reflects contextual landscape backdrop of woodland belts against skyline



SPR largest facade

Scale 1:300 @ A3

N 0m 2m 4m 6m 8m 10m



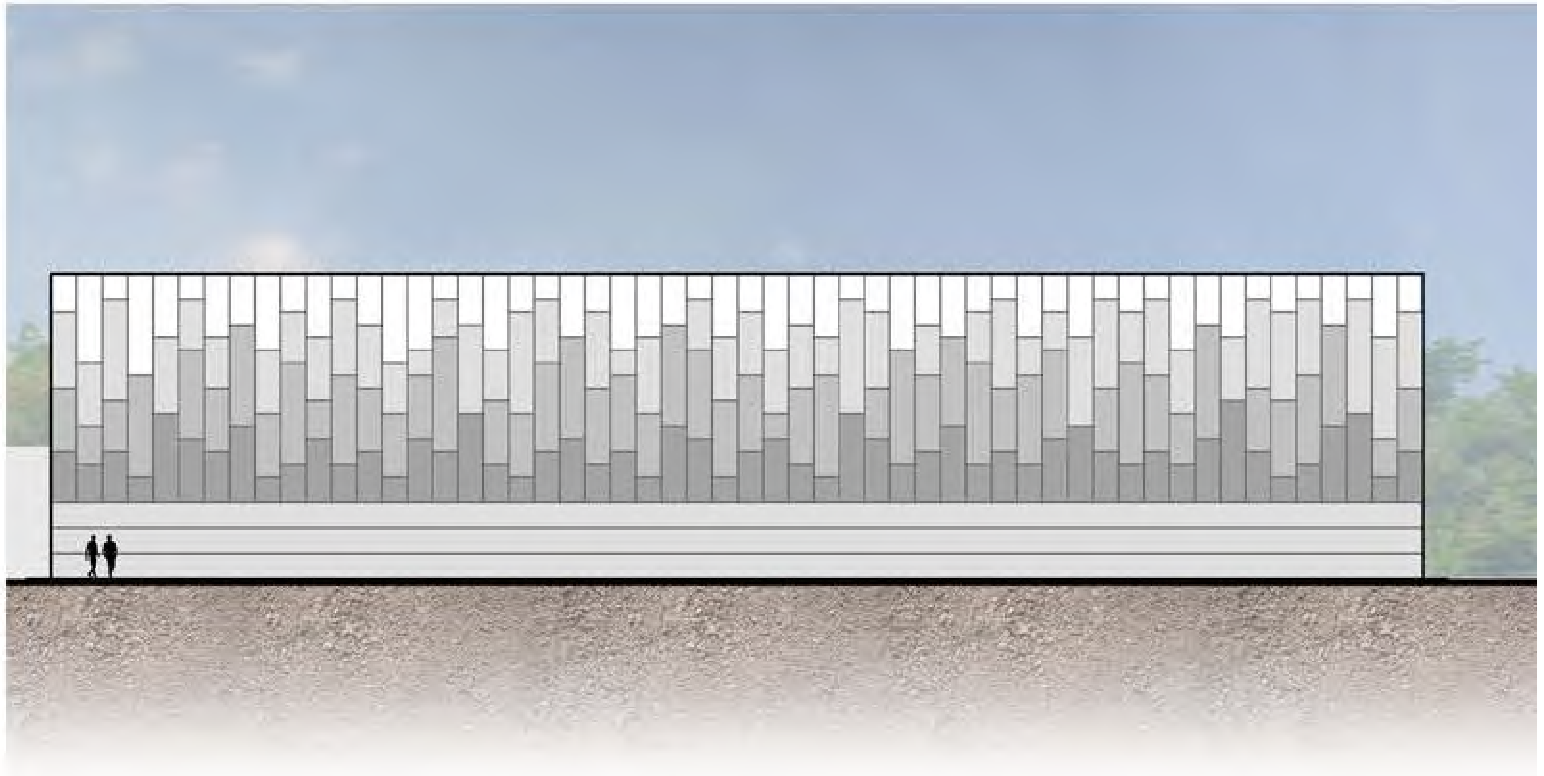
NGET largest facade

DIAGRAMATIC CLADDING: OPTION 9

Horizontal base course, with vertical cladding above forming a varying pattern through use of two different colours

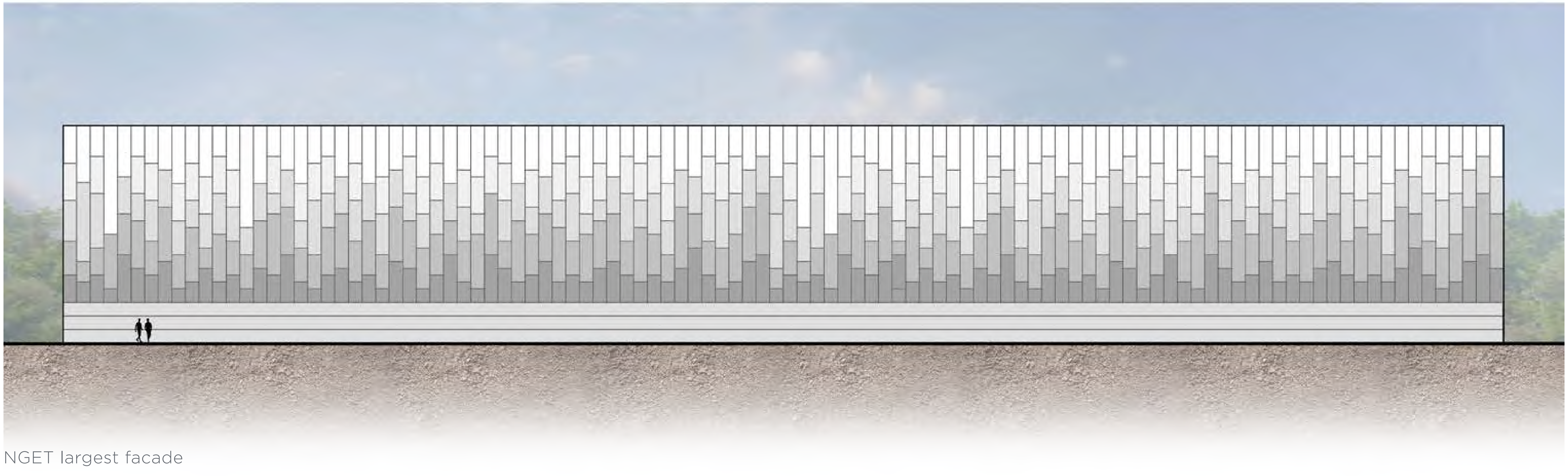
+ Readily achievable
+ Different cladding elements help break up building mass
+ Horizontal base course with vertical upper echoes general landscape context composition of horizontal foreground patterns and more vertical backdrop patterns
+ Varying pattern of upper element reflects contextual landscape backdrop of woodland belts against skyline

- Perhaps not quite so economical due to variety of panel sizing / support
- Possibly too 'busy' / eye catching?



SPR largest facade

Scale 1:300 @ A3
N 0m 2m 4m 6m 8m 10m



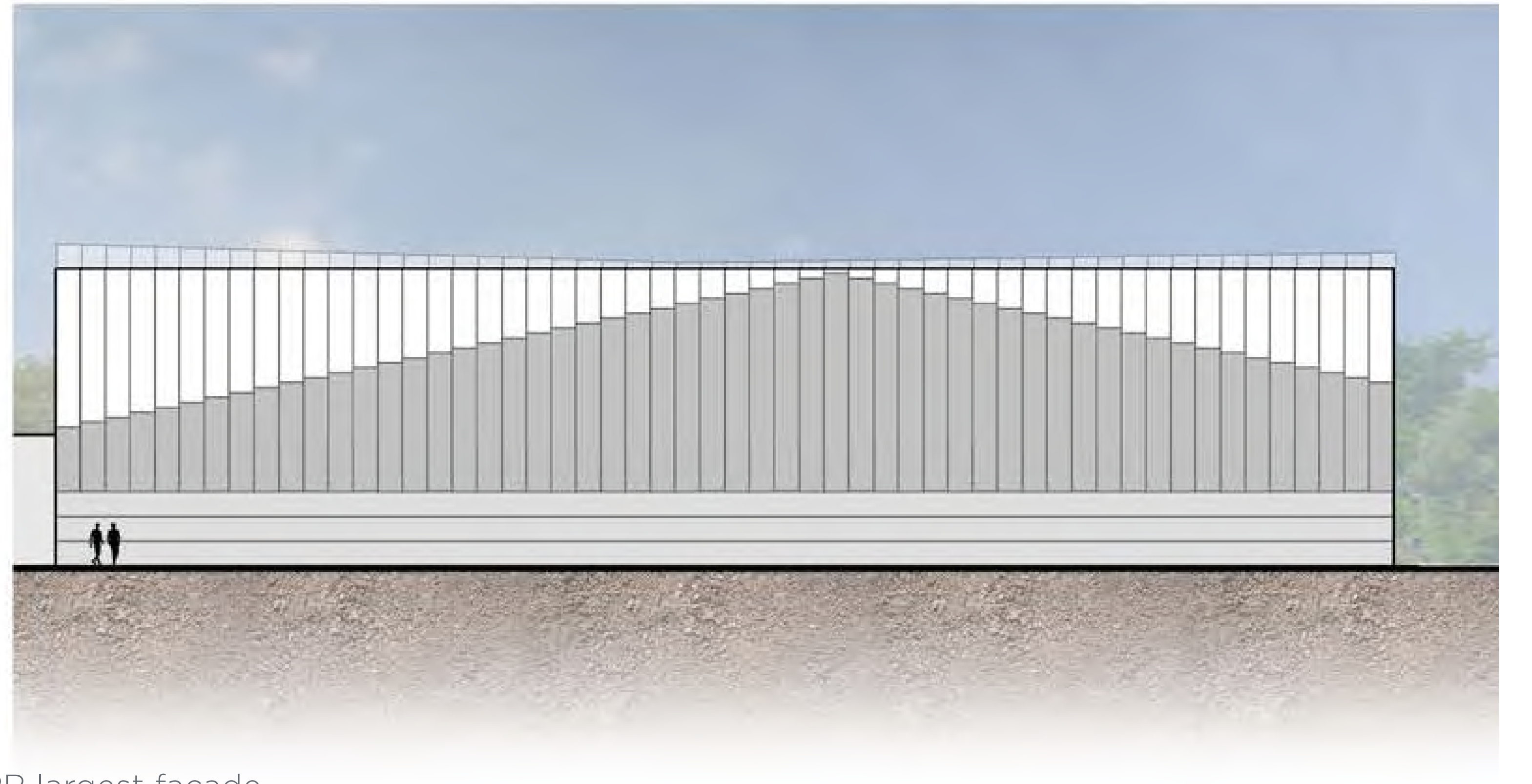
NGET largest facade

DIAGRAMATIC CLADDING: OPTION 10

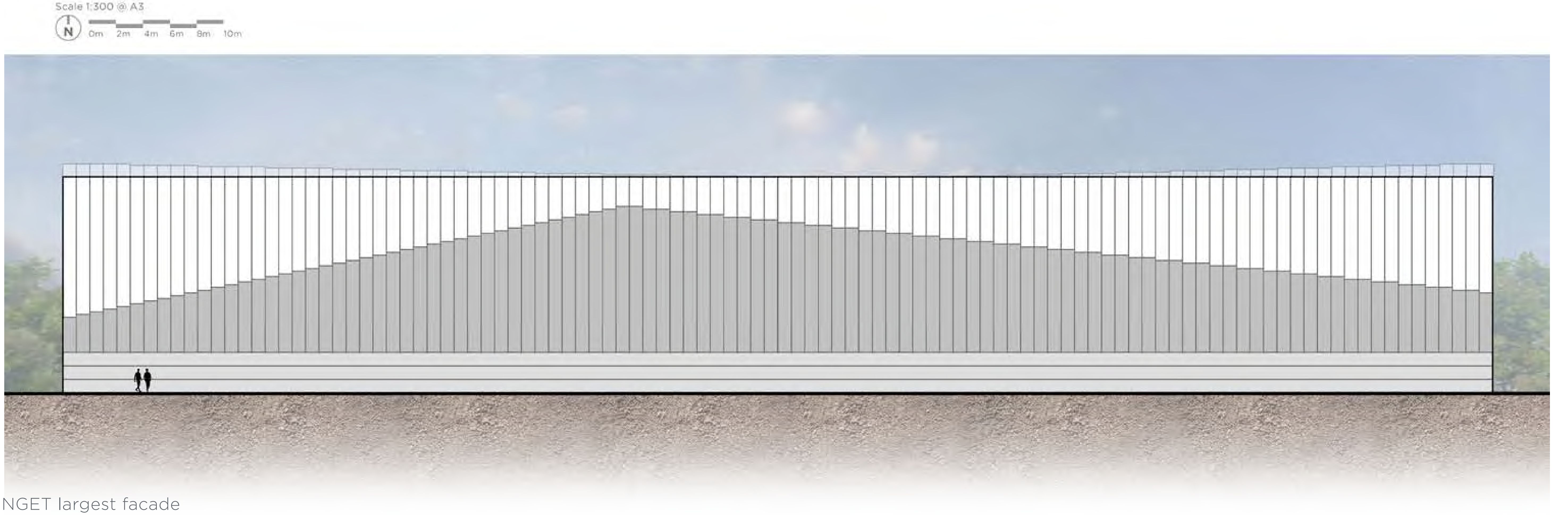
Horizontal base course, with vertical cladding above forming a varying pattern through use of two different colours.
Note: this option suggests use of an expended metal mesh for upper elements: a 'rainscreen' system as opposed to simpler composite cladding.

+ Readily achievable
+ Different cladding elements help break up building mass
+ Horizontal base course with vertical upper echoes general landscape context composition of horizontal foreground patterns and more vertical backdrop patterns
+ Varying pattern of upper element reflects contextual landscape backdrop of woodland belts against skyline
+ Expanded mesh rainscreen cladding has the benefit of texture which will visually soften the buildings' surfaces, especially when see from closer vantage points
+ Cantilevering the mesh cladding vertically beyond the wall head in certain areas will soften the abrupt visual transition of the building roofline against the sky.

- Not so economical



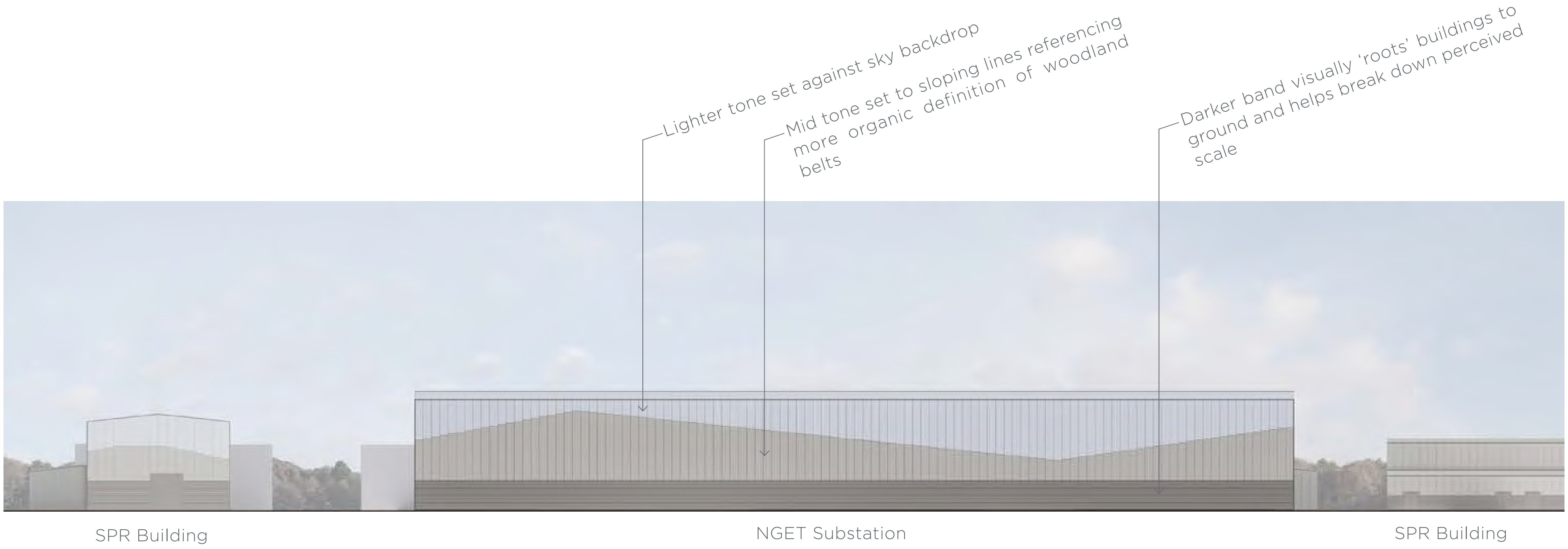
SPR largest facade



NGET largest facade

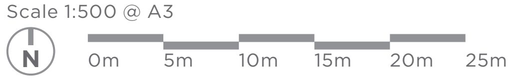
4.4 NGET COMPOSITE PANEL OPTION: FACADE ELEVATION

NGET Substation: Compound elevation to north west in diagramatic context (with SPR buildings in background)



Note that the context shown here is for graphic effect only to demonstrate proposed design principles, and does not at this point portray actual site backdrop. Accurate montage visuals will follow at a later date as part of a separate exercise, and will in fact also act as a design tool in informing precise proposed cladding configurations.

Scale 1:500 @ A3



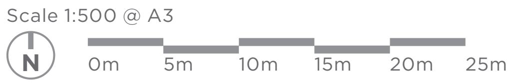
NGET COMPOSITE PANEL OPTION : FACADE ELEVATION

NGET Substation: Compound elevation to south west in diagramatic context (with SPR buildings to the right)

NGET Substation

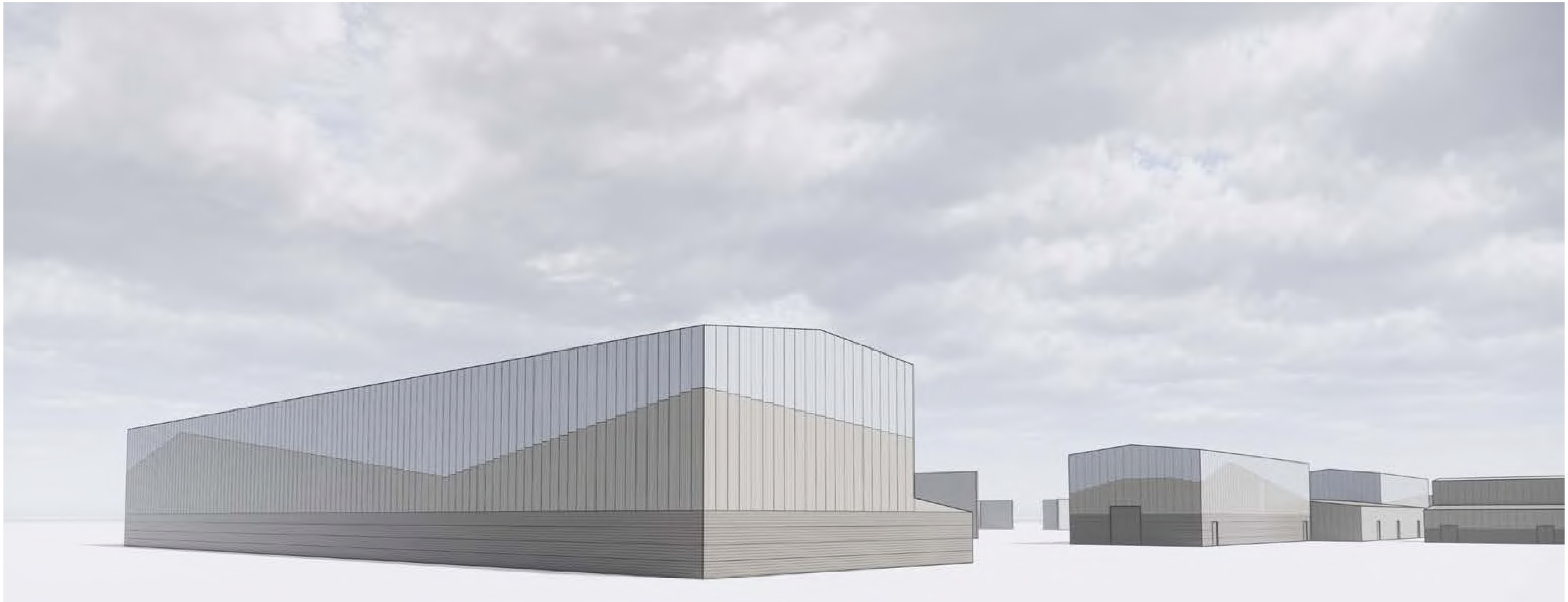
SPR GIS Building

Note that the context shown here is for graphic effect only to demonstrate proposed design principles, and does not at this point portray actual site backdrop. Accurate montage visuals will follow at a later date as part of a separate exercise, and will in fact also act as a design tool in informing precise proposed cladding configurations.



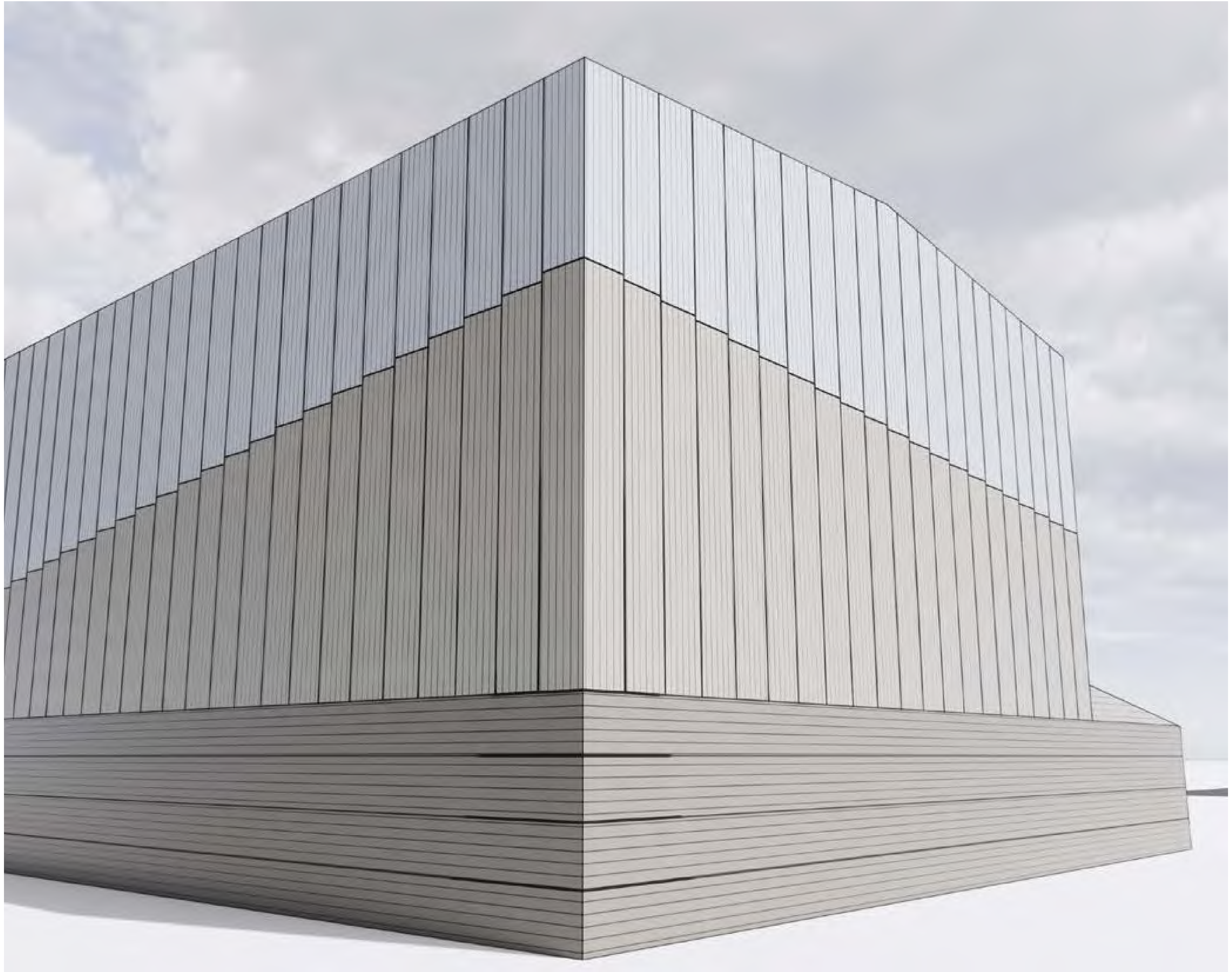
NGET COMPOSITE PANEL OPTION: MODEL VIEW

NGET Substation: View to compound from west



NGET COMPOSITE PANEL OPTION: MODEL VIEW

NGET Substation: Close view to compound from west



NGET COMPOSITE PANEL OPTION: PART FACADE IN DIAGRAMATIC CONTEXT

- All cladding formed in composite insulated panels, eg Kingspan QuadCore KS1000RW.

- Vertical orientation to upper panels relates to verticality of woodland backdrops in landscape compositions. Horizontal orientation to base panels references horizontal patterns in landscape foregrounds.

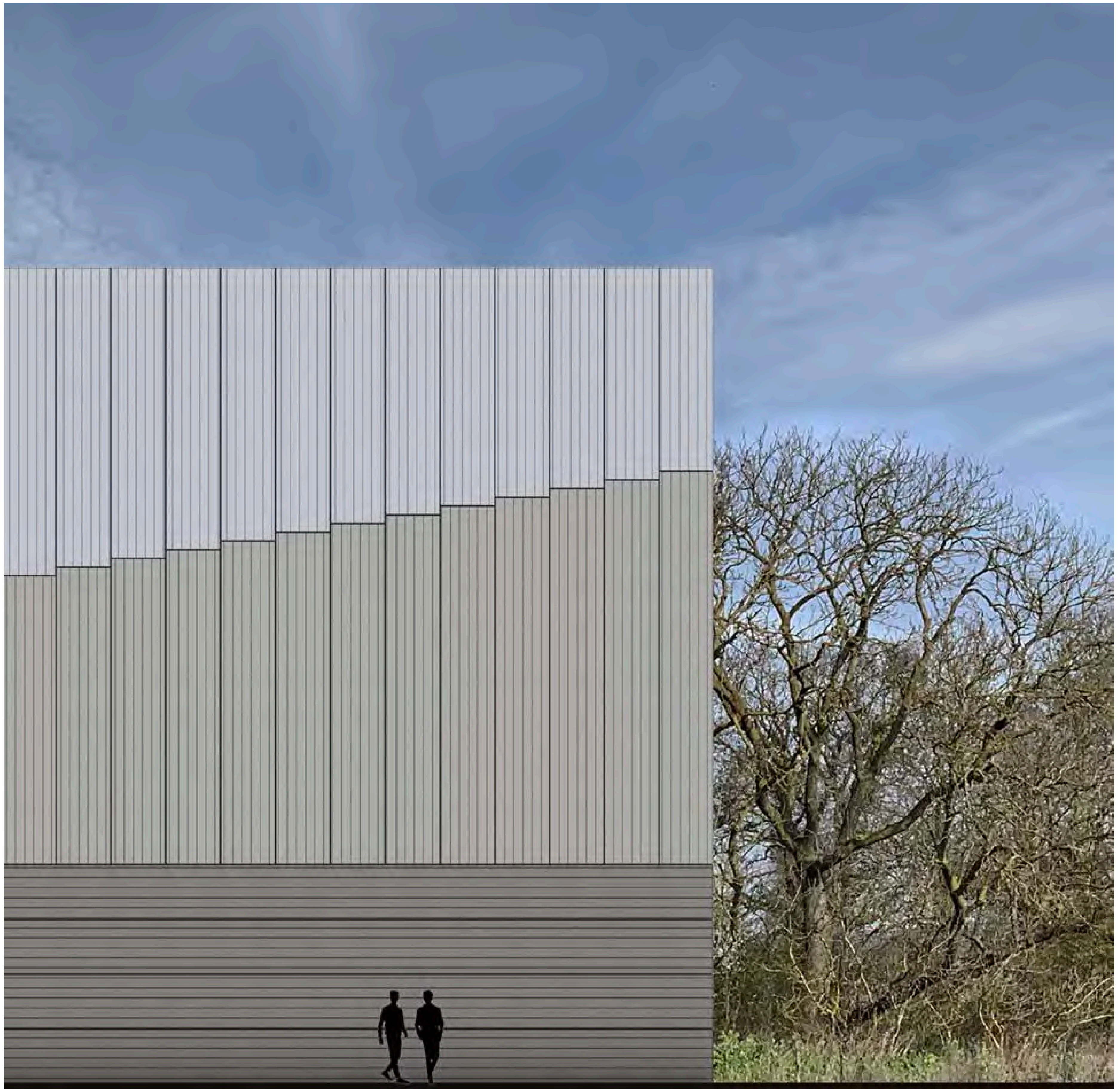
- The switch from horizontal to vertical is readily achieved via a further layer of secondary support framing internally.

- The sweeping 'diagonal' pattern formed by use of different panel colours is achieved via square-ended panels stepping incrementally in length, which is likely to require a degree of additional support framing.

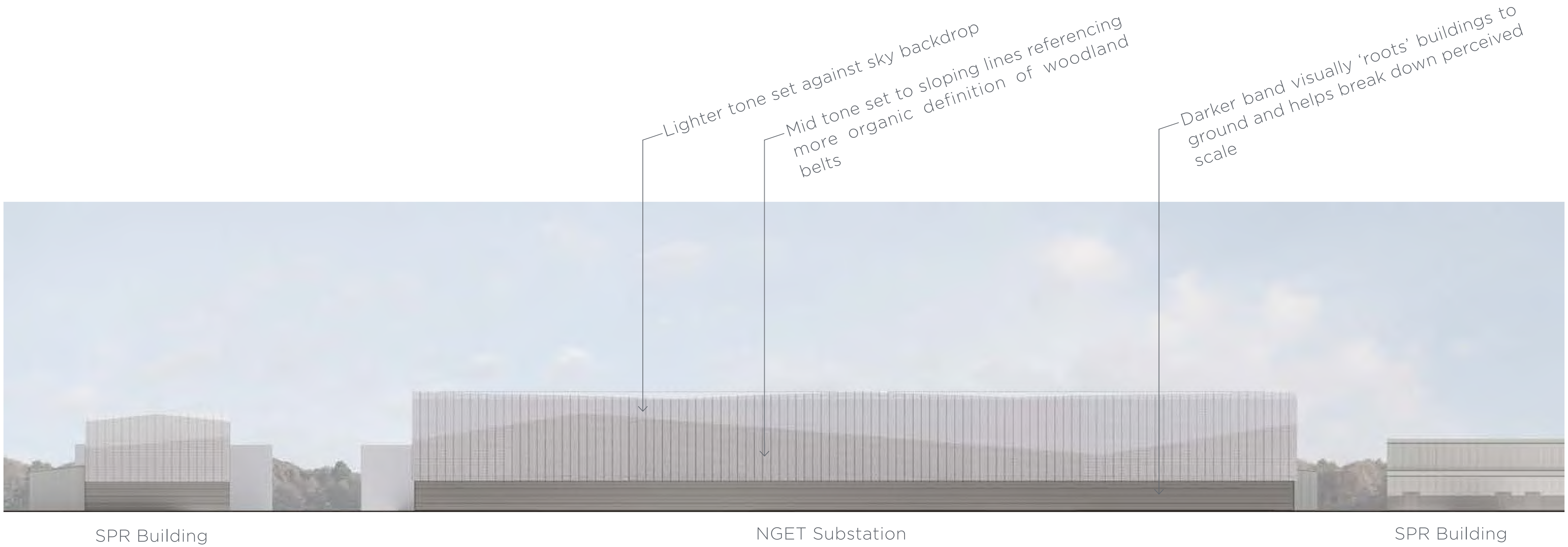
- Lighter coloured panels echo sky tones.

- Mid tone coloured panels reference woodland backdrops.

- Base panels are darker in colour and tone, helping visually root the building to the ground and to break up overall perceived mass.



NGET Substation: Compound elevation to north west in diagramatic context (with SPR buildings in background)



Note that the context shown here is for graphic effect only to demonstrate proposed design principles, and does not at this point portray actual site backdrop. Accurate montage visuals will follow at a later date as part of a separate exercise, and will in fact also act as a design tool in informing precise proposed cladding configurations.

Scale 1:500 @ A3

N 0m 5m 10m 15m 20m 25m

NGET EXPANDED MESH RAINSCREEN OPTION: FACADE ELEVATION

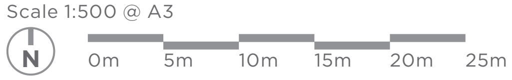
NGET Substation: Compound elevation to south west in diagramatic context (with SPR buildings to the right)

NGET Substation

SPR GIS Building

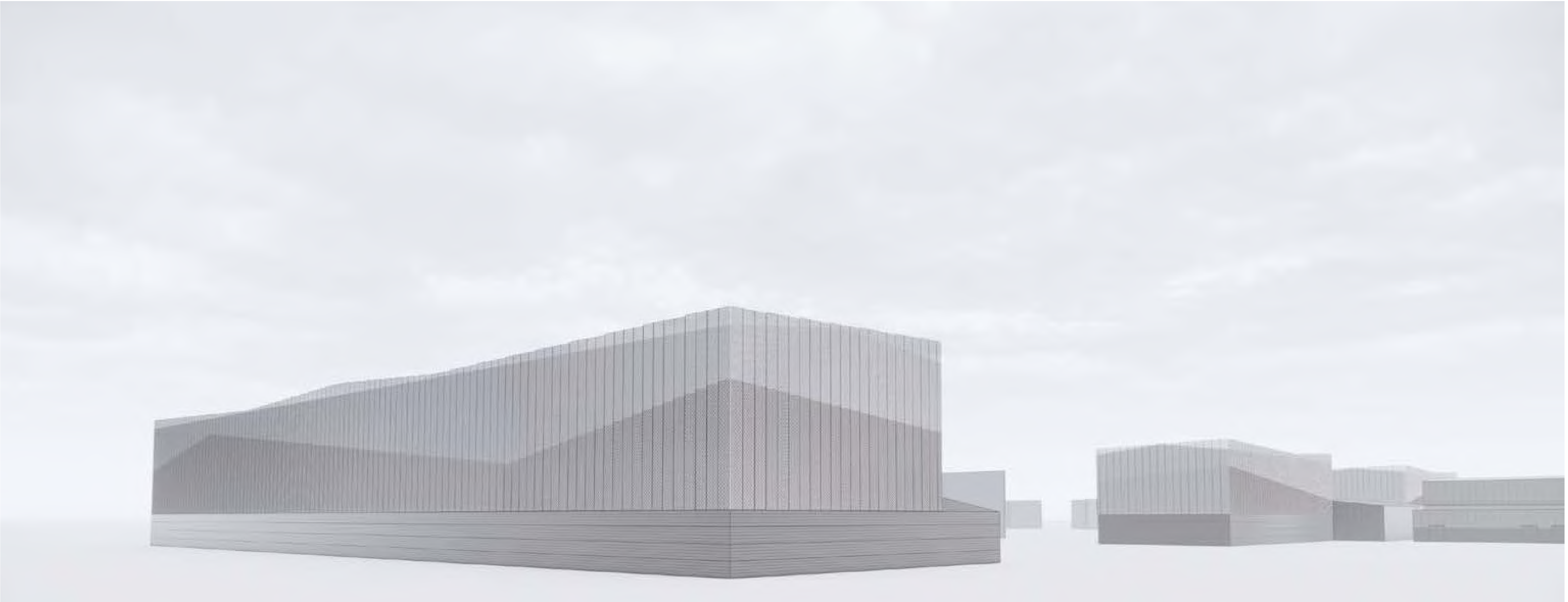
Note that the context shown here is for graphic effect only to demonstrate proposed design principles, and does not at this point portray actual site backdrop. Accurate montage visuals will follow at a later date as part of a separate exercise, and will in fact also act as a design tool in informing precise proposed cladding configurations.

Scale 1:500 @ A3



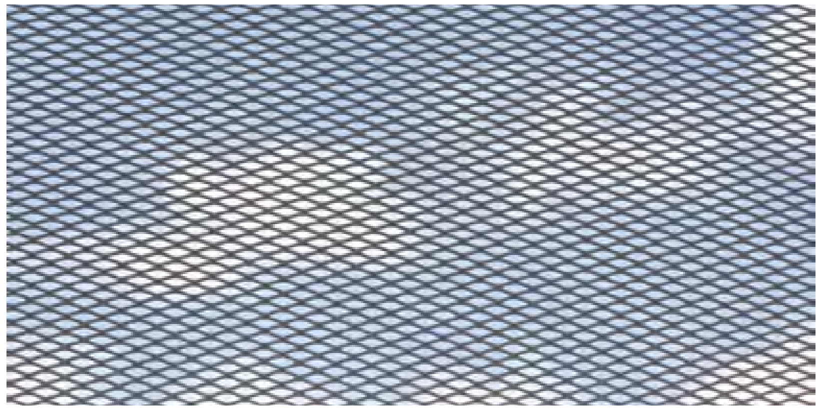
NGET EXPANDED MESH RAINSCREEN OPTION: MODEL VIEW

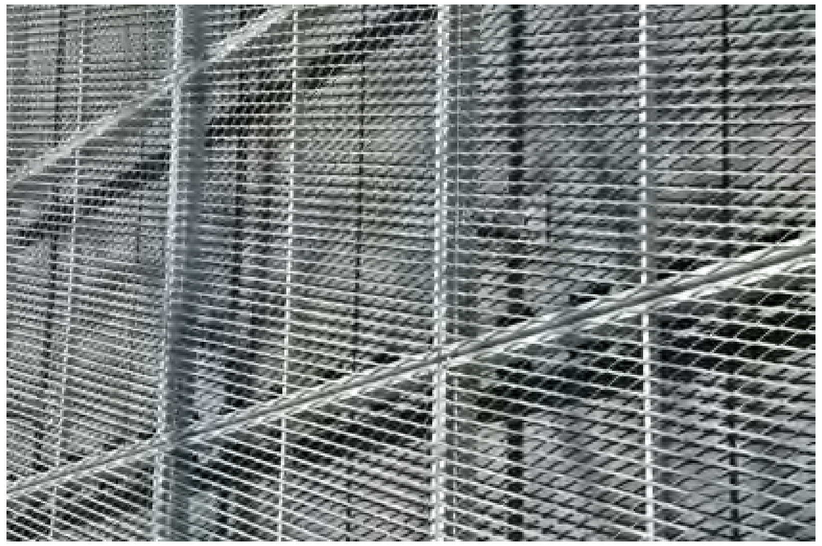
NGET Substation: View to compound from west

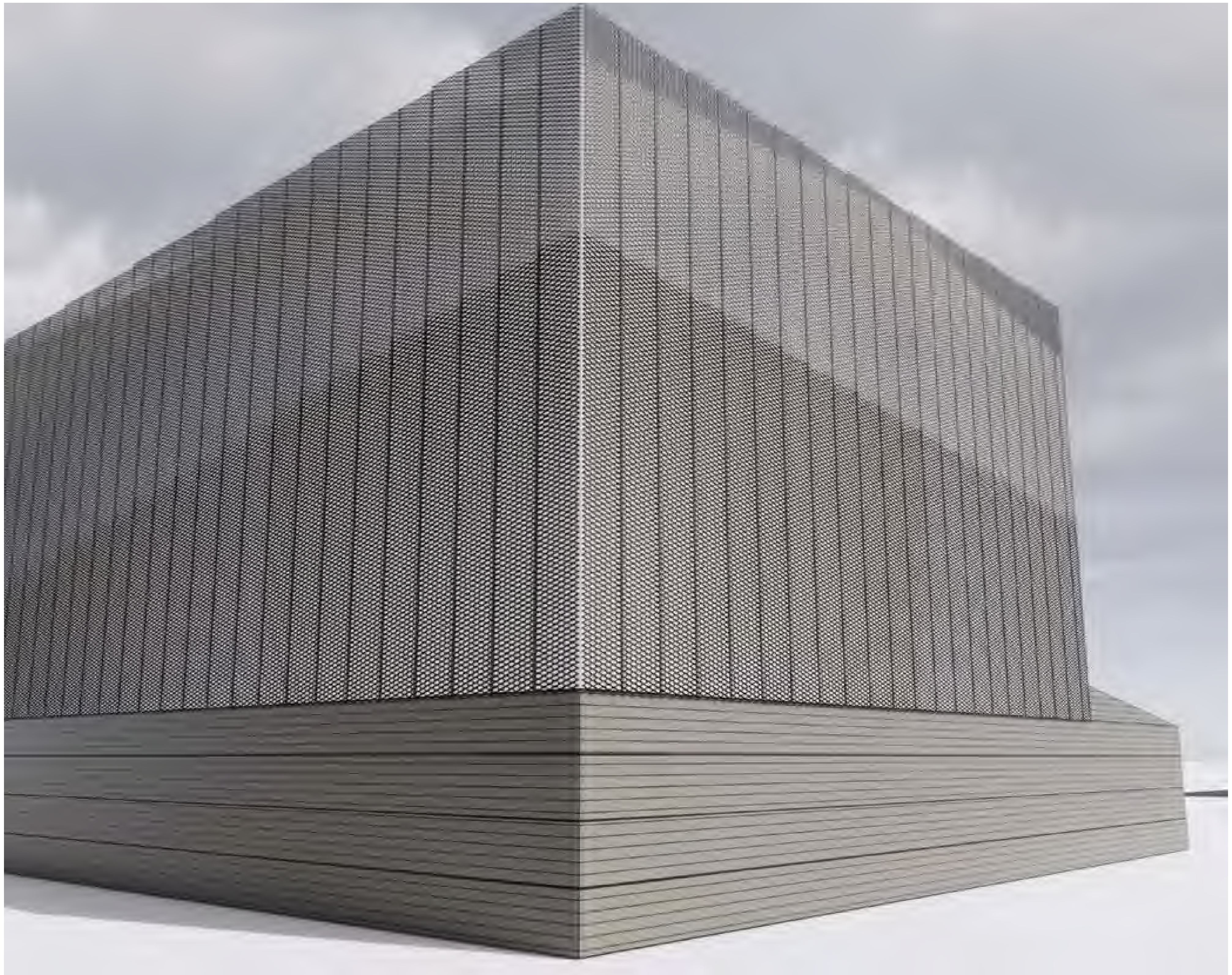


NGET COMPOSITE PANEL OPTION: MODEL VIEW

NGET Substation: Close view to compound from west







NGET COMPOSITE PANEL OPTION: PART FACADE IN DIAGRAMATIC CONTEXT

- All cladding formed in composite insulated panels, eg Kingspan QuadCore KS1000RW.

- Vertical orientation to upper panels relates to verticality of woodland backdrops in landscape compositions. Horizontal orientation to base panels references horizontal patterns in landscape foregrounds.

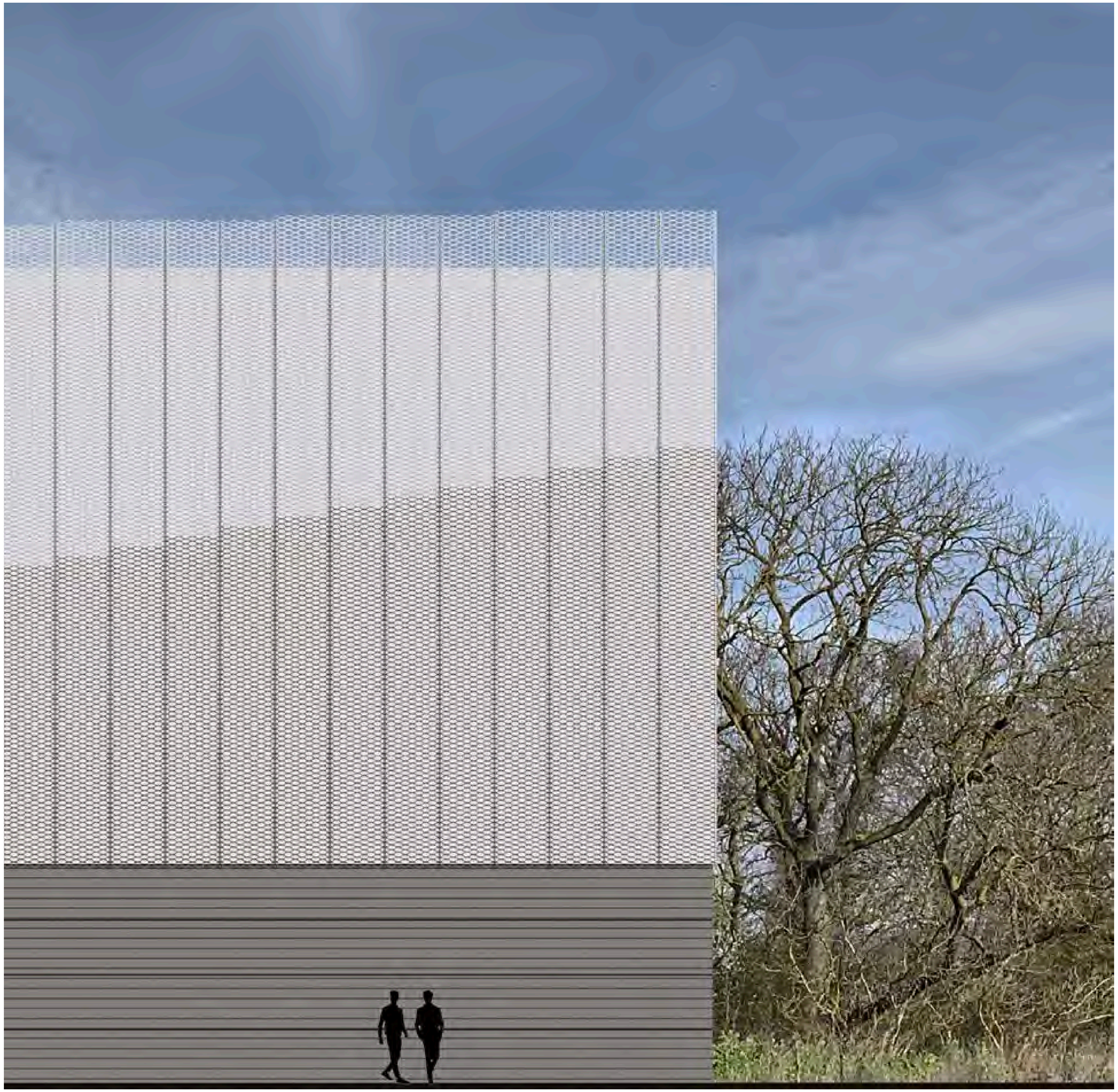
- The switch from horizontal to vertical is readily achieved via a further layer of secondary support framing internally.

- The sweeping 'diagonal' pattern formed by use of different panel colours is achieved via square-ended panels stepping incrementally in length, which is likely to require a degree of additional support framing.

- Lighter coloured panels echo sky tones.

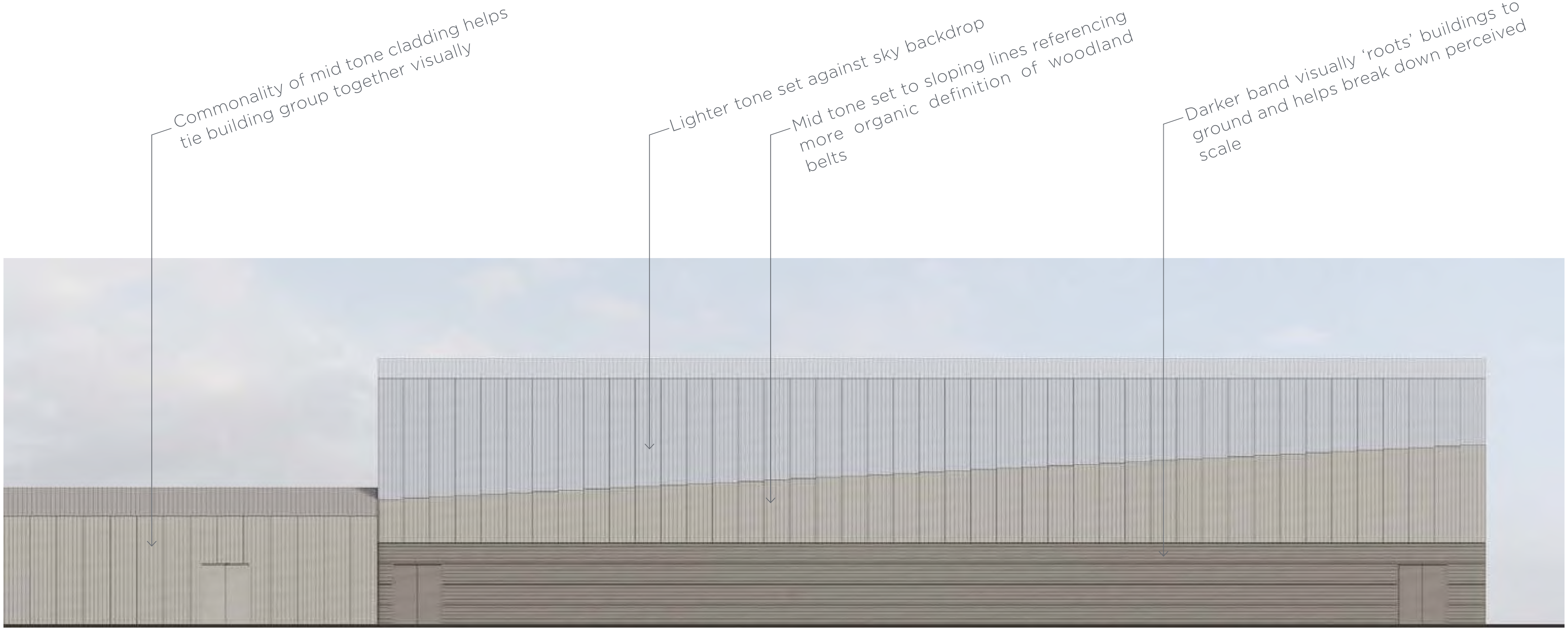
- Mid tone coloured panels reference woodland backdrops.

- Base panels are darker in colour and tone, helping visually root the building to the ground and to break up overall perceived mass.



4.6 SPR EA1N & EA2 COMPOSITE PANEL OPTION

East Anglia ONE North: Part elevation to south west applying cladding approach



GIS Building

Scale 1:200 @ A3

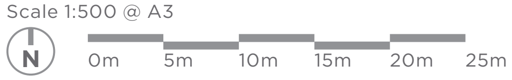
0m 2m 4m 6m 8m 10m

SPR EA1N & EA2 COMPOSITE PANEL OPTION : FACADE ELEVATION

East Anglia ONE North: Compound elevation to south west in diagramatic context

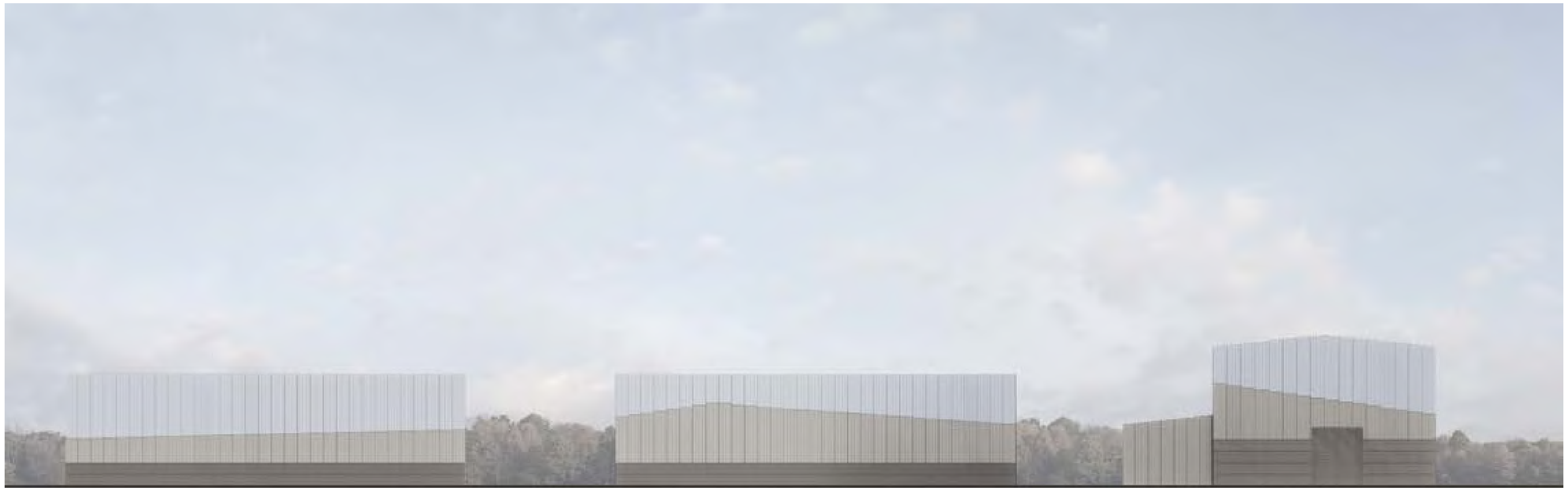
Note that the context shown here is for graphic effect only to demonstrate proposed design principles, and does not at this point portray actual site backdrop. Accurate montage visuals will follow at a later date as part of a separate exercise, and will in fact also act as a design tool in informing precise proposed cladding configurations.

Scale 1:500 @ A3



SPR EA1N & EA2 COMPOSITE PANEL OPTION: FACADE ELEVATION

East Anglia ONE North: Compound elevation to south east in diagramatic context



STATCOM STATCOM GIS Building

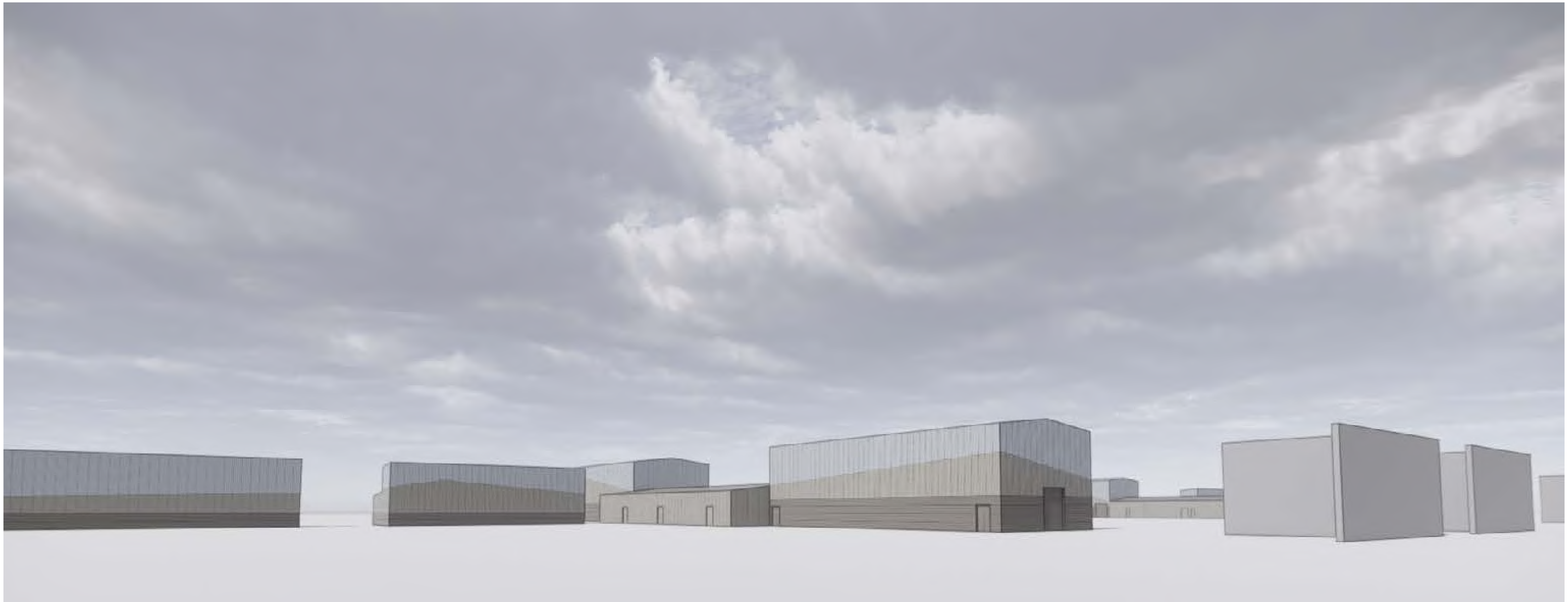
Note that the context shown here is for graphic effect only to demonstrate proposed design principles, and does not at this point portray actual site backdrop. Accurate montage visuals will follow at a later date as part of a separate exercise, and will in fact also act as a design tool in informing precise proposed cladding configurations.

Scale 1:500 @ A3

N 0m 5m 10m 15m 20m 25m

SPR EA1N & EA2 COMPOSITE PANEL OPTION: MODEL VIEW

East Anglia ONE North: View to compound from south



Close view on East Anglia 1 compoud from south west

SPR EA1N & EA2 COMPOSITE PANEL OPTION: PART FACADE IN DIAGRAMATIC CONTEXT

- All cladding formed in composite insulated panels, eg Kingspan QuadCore KS1000RW.

- Vertical orientation to upper panels relates to verticality of woodland backdrops in landscape compositions. Horizontal orientation to base panels references horizontal patterns in landscape foregrounds.

- The switch from horizontal to vertical is readily achieved via a further layer of secondary support framing internally.

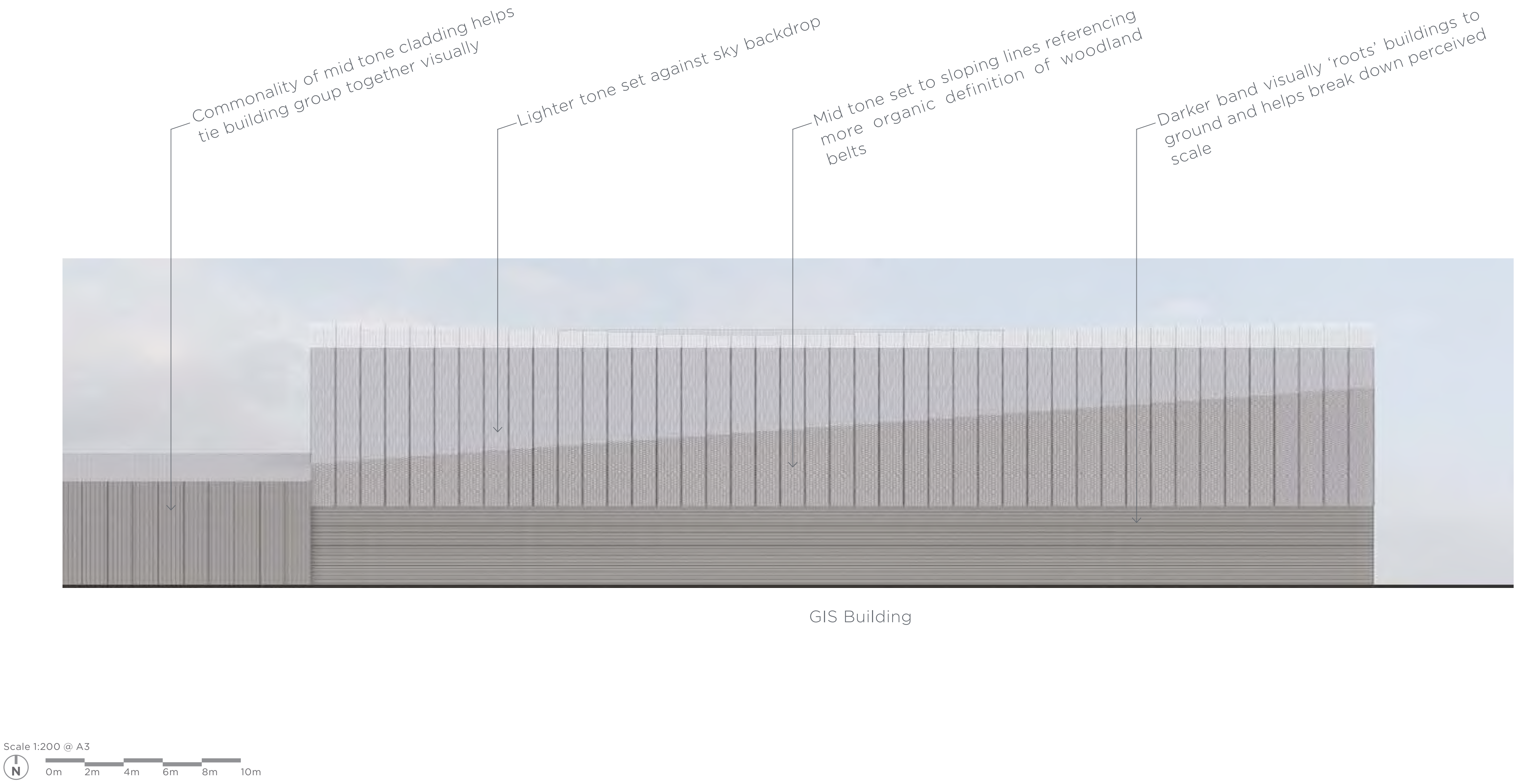
- The sweeping 'diagonal' pattern formed by use of different panel colours is achieved via square-ended panels stepping incrementally in length, which is likely to require a degree of additional support framing.

- Lighter coloured panels echo sky tones.

- Mid tone coloured panels reference woodland backdrops.

- Base panels are darker in colour and tone, helping visually root the building to the ground and to break up overall perceived mass.

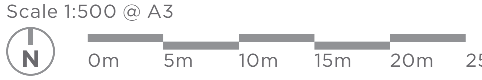
East Anglia ONE North: Elevation to south west



SPR EA1N & EA2 EXPANDED MESH RAINSCREEN OPTION: FACADE ELEVATION

East Anglia ONE North: Compound elevation to south west in diagramatic context

Note that the context shown here is for graphic effect only to demonstrate proposed design principles, and does not at this point portray actual site backdrop. Accurate montage visuals will follow at a later date as part of a separate exercise, and will in fact also act as a design tool in informing precise proposed cladding configurations.

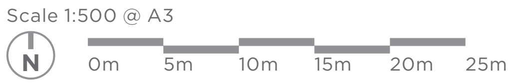


SPR EA1N & EA2 EXPANDED MESH RAINSCREEN OPTION: FACADE ELEVATION

East Anglia ONE North: Compound elevation to south east in diagramatic context

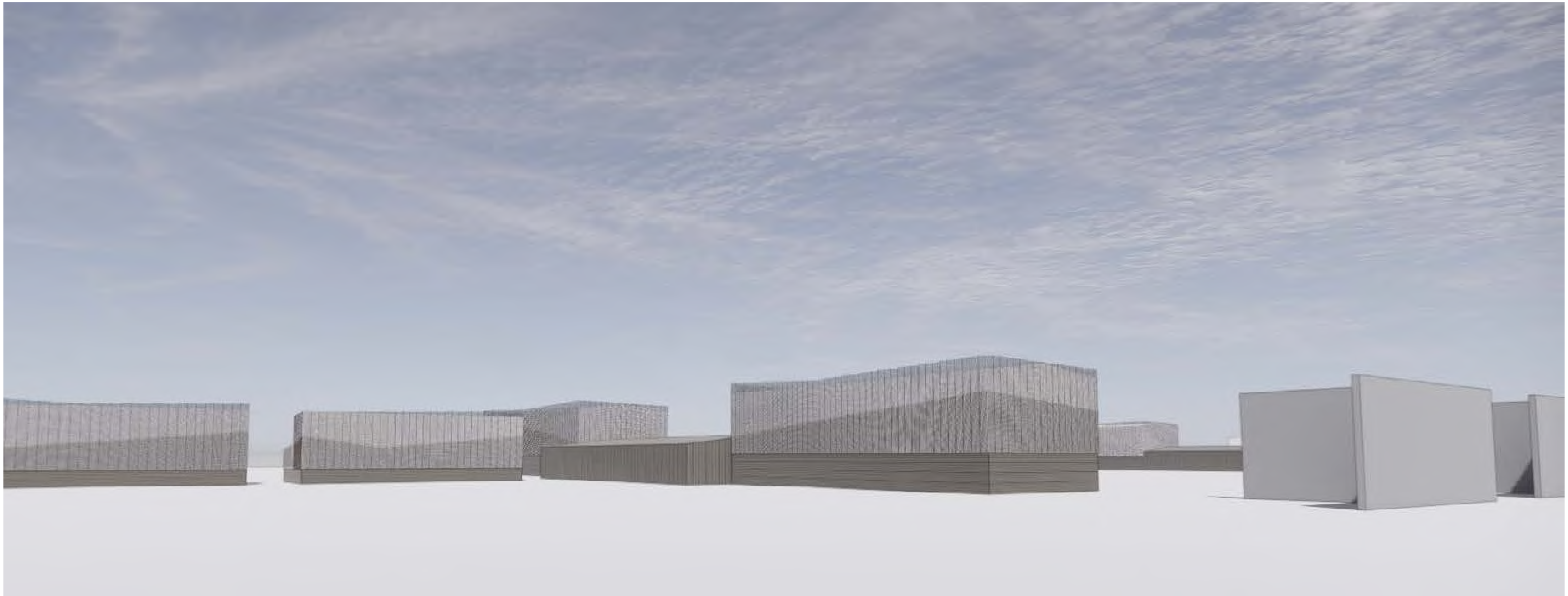
STATCOM STATCOM GIS Building

Note that the context shown here is for graphic effect only to demonstrate proposed design principles, and does not at this point portray actual site backdrop. Accurate montage visuals will follow at a later date as part of a separate exercise, and will in fact also act as a design tool in informing precise proposed cladding configurations.



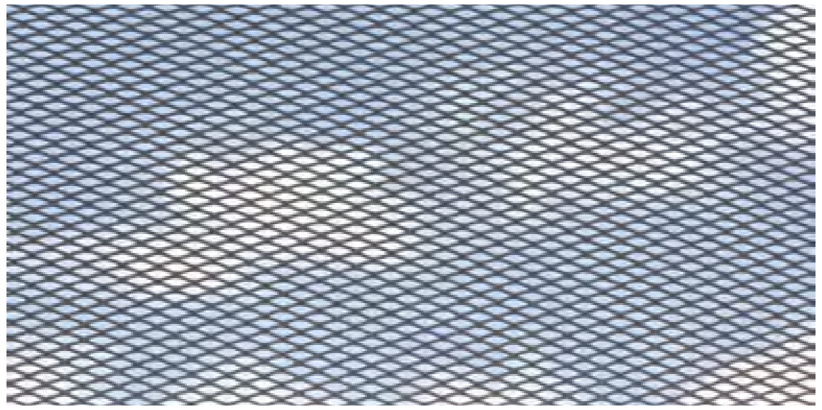
SPR EA1N & EA2 EXPANDED MESH RAINSCREEN OPTION: MODEL VIEW

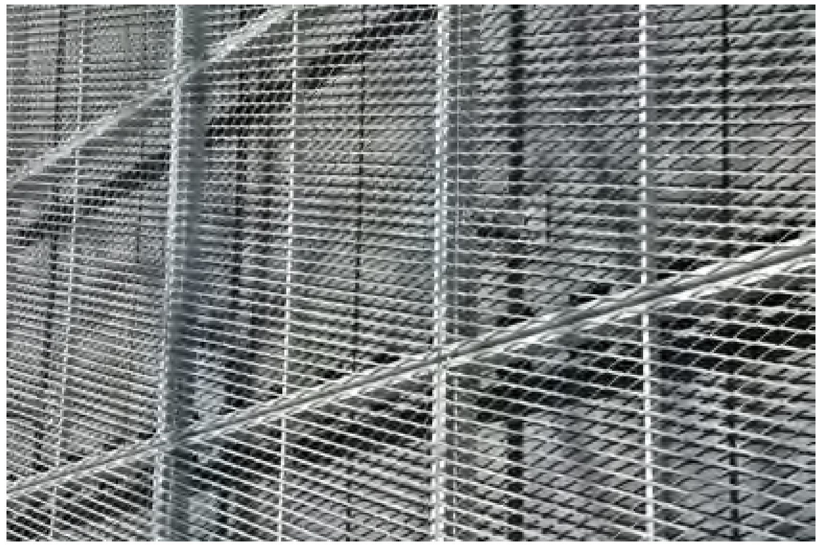
East Anglia ONE North: View on coumpound from south

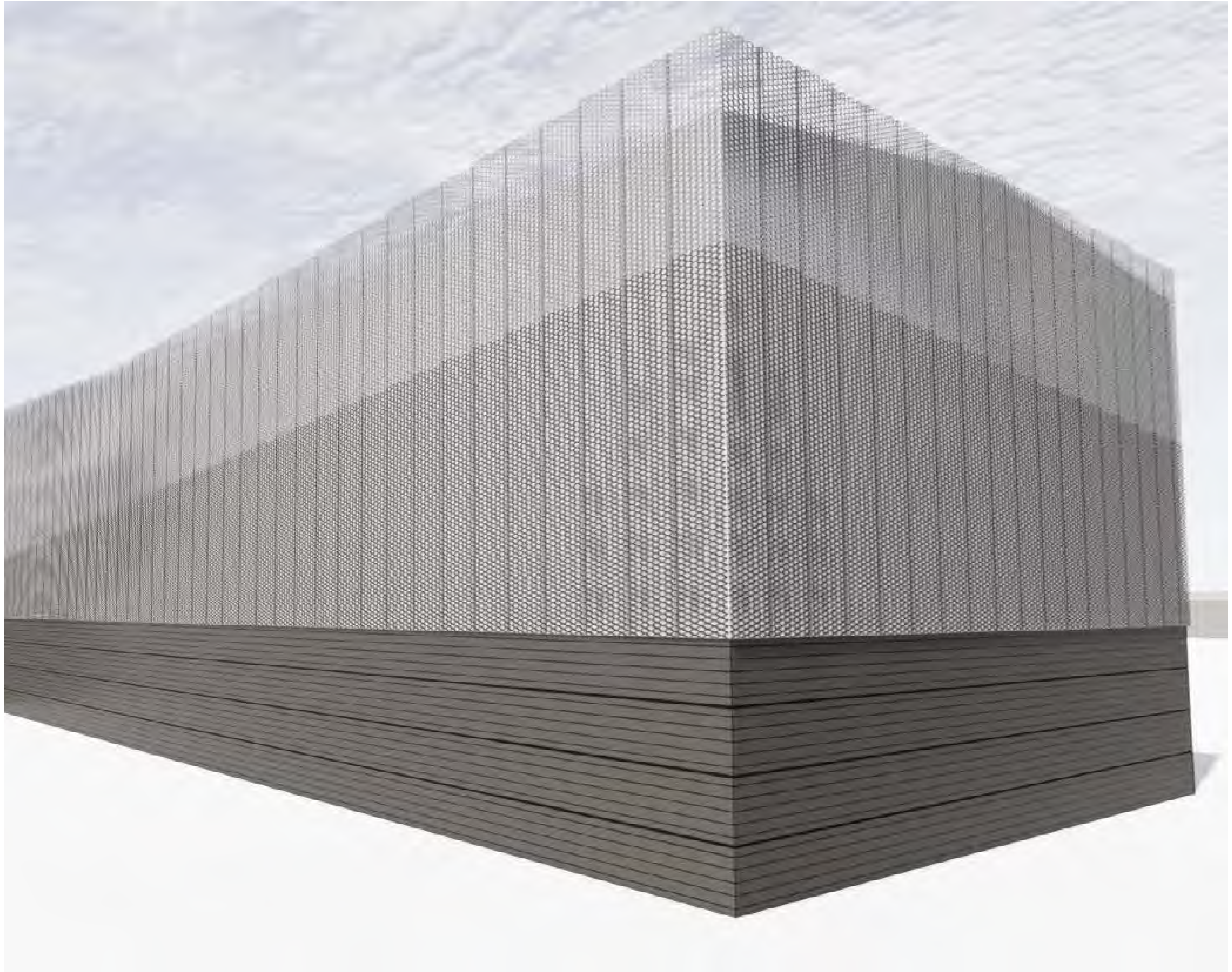


SPR EA1N & EA2 EXPANDED MESH RAINSCREEN OPTION: MODEL VIEW

Close view on East Anglia 1 compound from south west







SPR EA1N & EA2 EXPANDED MESH RAINSCREEN: PART FACADE IN DIAGRAMATIC CONTEXT

- Cladding comprises a simple composite cladding panel to the base element, eg Kingspan QuadCore KS1000RW, with expended mesh rainscreen to the upper elements: this could comprise Taylor Maxwell Anvil Expanded Mesh Cladding applied over Rainspan by Euroclad insulated base panels. The Rainspan panels are a very basic insulated composite product often used as an internal substrate on which to apply better quality outer finishes. The Expanded Mesh outer cladding is a very basic product, manufactured by Taylor Maxwell in England and so very sustainable, however its use as cladding in this way 'elevates' the perceived quality of the façade beyond that of a merely industrial aesthetic achieved with a composite panel.

- The expanded mesh cladding has an inherent texture to it, so sits more comfortably in the context of a landscape backdrop where all elements also have texture as opposed to being visually flat.

- The expanded mesh could have a natural aluminium and/or anodised finish, which is subtly more reflective and reactive to light meaning that the facades will subtly vary through different light conditions producing a more dynamic effect.

- From the closer vantage points on Public Rights of Way the texture of the mesh will be readily discernible, lifting the perceived quality of the buildings beyond that of standard industrial units.

- The nature of the mesh cladding offers a degree of visibility through it, meaning that the panels can be extended vertically beyond building wall-head lines thereby blurring the otherwise harsh line separating building from sky, reminiscent of the uppermost branches of woodland belts providing a similarly 'soft' line between woodland and sky.

- Vertical orientation to upper panels relates to verticality of woodland backdrops in landscape compositions. Horizontal orientation to base panels references horizontal patterns in landscape foregrounds.

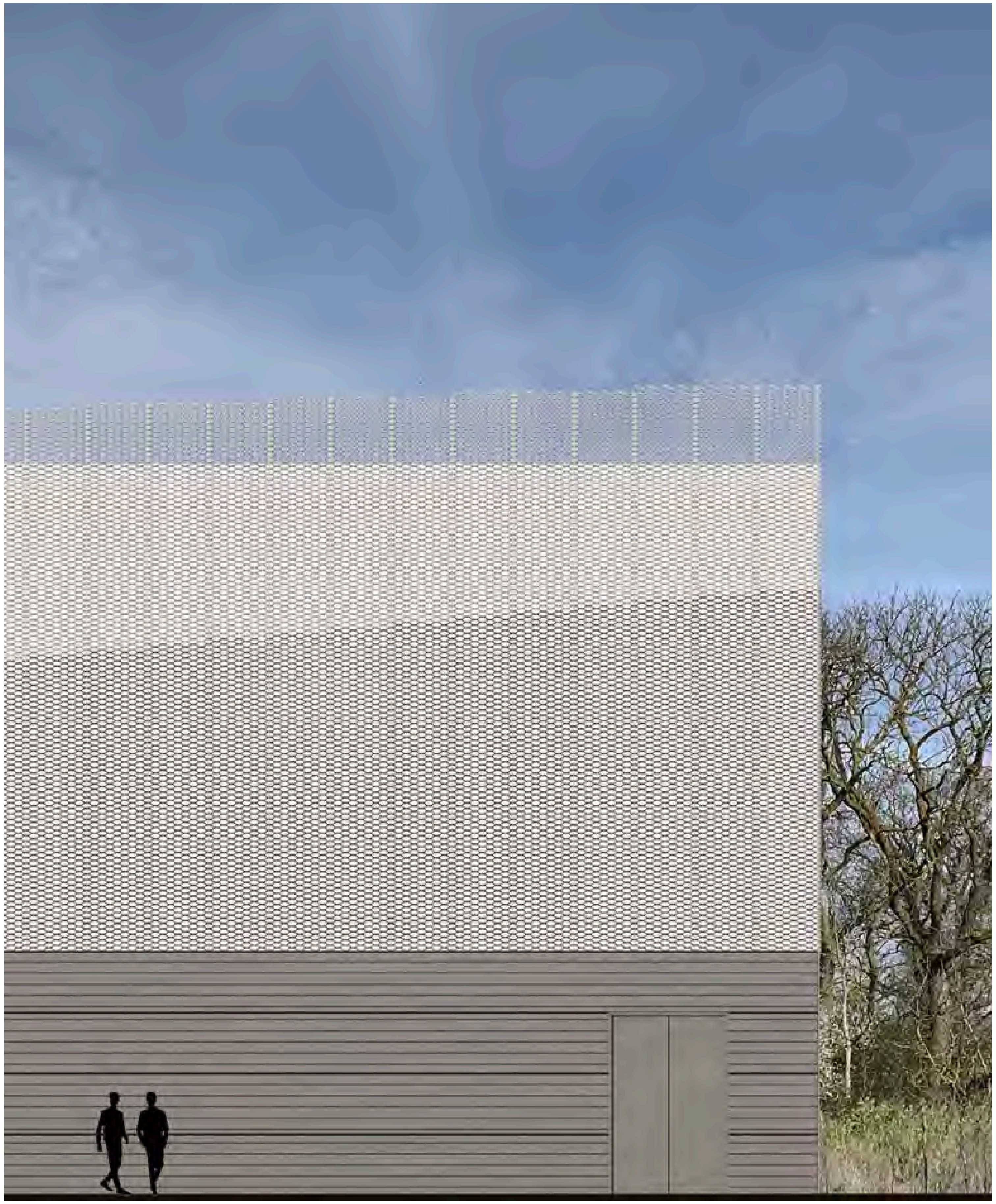
- The switch from horizontal to vertical is readily achieved via a further layer of secondary support framing internally.

- The sweeping 'diagonal' pattern formed by use of different panel colours is achieved via square-ended panels stepping incrementally in length, and this will be very readily achieved with the mesh panel fixings.

- Lighter coloured panels echo sky tones.

- Mid tone coloured panels reference woodland backdrops.

- Base panels are darker in colour and tone, helping visually root the building to the ground and to break up overall perceived mass.



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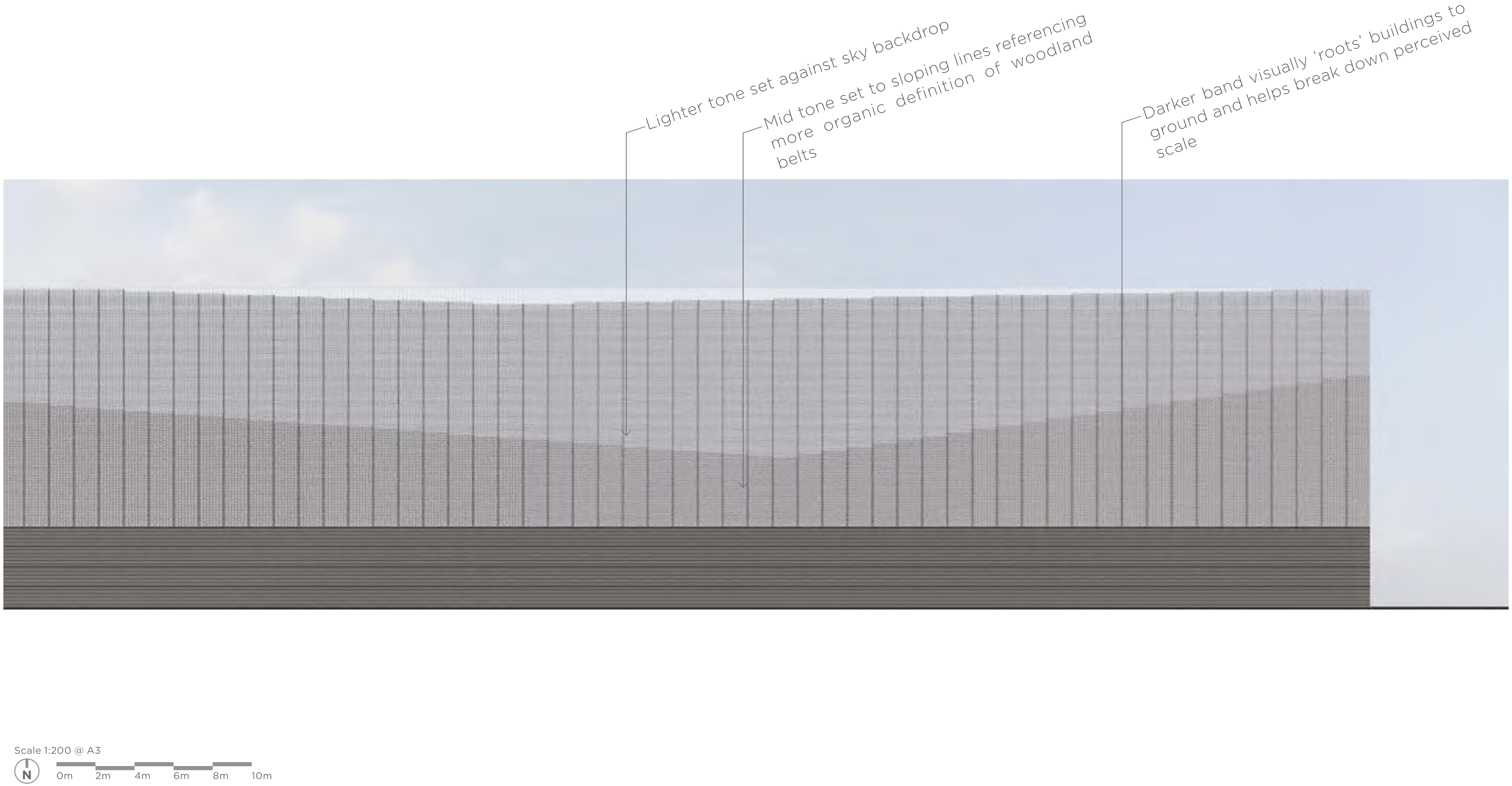
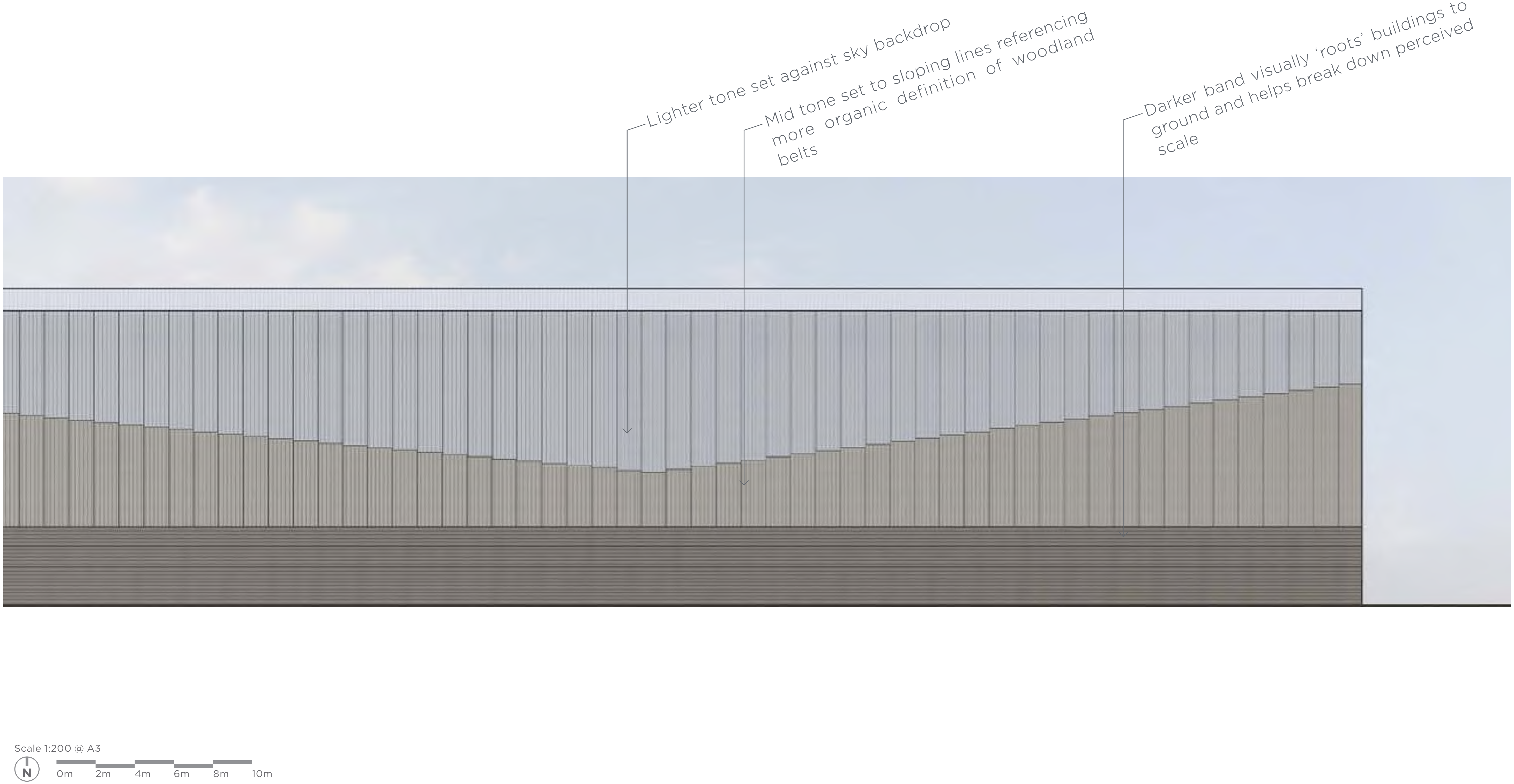
4.8 NGET COMPOSITE PANEL OPTION

NGET Substation: Part elevation to north east applying cladding approach



4.9 NGET COMPOSITE PANEL OPTION

NGET Substation: Part elevation to north east applying cladding approach



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