

Appendix 3.2

Coal Mining Risk Assessment

GLENMUCKLOCH TO GLENGLOSS REINFORCEMENT PROJECT KIRKCONNEL, DUMFRIES & GALLOWAY



Contents

- 1.0 INTRODUCTION 1
- 2.0 GEOLOGICAL SETTING 3
- 3.0 MINERAL ASSESSMENT AND RECOMMENDATIONS 4
 - 3.1 Remediation of Shallow Mineworkings 10
 - 3.2 Mine Entries 11
- 4.0 CONCLUSIONS 12

- Appendix A: Site Location Plan
- Appendix B: LUC Tower Location Drawings
- Appendix C: E12293/0901A, Mineral Assessment Drawing

COAL MINING RISK ASSESSMENT

September – revised December 2022

150 St John's Road Edinburgh, EH12 8AY Tel 0131 334 0765 Fax 0131 316 4540 E-Mail drme@davidmurray.co.uk	10 Eyre Place Edinburgh, EH3 5EP Tel 0131 556 5155 Fax 0131 556 9147 E-Mail drmc@davidmurray.co.uk	20 Viewfield Terrace Dunfermline, KY12 7HZ Tel 01383 726075 Fax 01383 730605 E-Mail drmd@davidmurray.co.uk
--	--	--

1.0 INTRODUCTION

SP Energy Networks are looking to reinforce their existing electricity supply infrastructure through the provision of overhead line (OHL) on steel lattice towers between the existing Glenglass substation and a new substation located at Glenmuckloch in Dumfries and Galloway, Appendix A.

The Glenmuckloch to Glenglass Reinforcement Project (GGRP) would therefore see the delivery of a new sub-station facility at Glenmuckloch, located to the north-west of Kirkconnel, and 40 steel lattice towers and associated access infrastructure.

The proposed route of the new infrastructure is set within an undulating and varied landscape. Ground levels at Glenglass at the southern end of the route are of the order of 300m AOD with ground levels at Glenmuckloch being around 240m AOD. In between these two end points land rises across moorland with levels decreasing within shallow valleys containing various water courses, and, within the northern third the wider valley of the River Nith within which the A76 and the Ayr to Gretna railway line are located.

Given that the northern part of the proposed route is located within a Coal Authority consultation area, LUC, on behalf of SP Energy Networks have requested the provision of a coal mining risk assessment report as part of the wider planning application associated with the GGRP.

Within the northern area coal seams have been subject to historic extraction underground. Available mine plan data has been reviewed, however, there is also the potential that extraction may have taken place before the statutory requirement to maintain records. It is apparent however that more recent open cast extraction of coal and subsequent reinstatement of these workings has been undertaken across much of the area to the south of the River Nith, whilst open cast extraction has occurred in an area to the north of the River Nith over the last decade or so.

The removal of coal seams and any older underground workings and associated mine entries by open cast methods should largely have removed any potential mineral stability risk. Some consideration of the nature and compaction of materials used to backfill the open cast works would however be required as part of any future detailed design stage by SP Energy Networks's engineers.

Outwith the areas subject to opencasting, an assessment on the potential for old abandoned mineworkings to be present was required and DRM have been retained in this regard.

The aim of the assessment is therefore to highlight the requirement for further investigation and, where necessary, advise on measures to mitigate any potential stability risks identified in advance of the construction and operation of the GGRP.

With regard to mineral stability the most critical infrastructure to be considered are the towers themselves, in addition to the new substation infrastructure at Glenmuckloch at the northern end of the study area. As noted above, 40 towers are proposed. The numbering of these, as detailed in the LUC drawings provided in Appendix B, are referred to in this mineral stability assessment.

Following the issue of the original report in September 2022 some minor changes to the proposed access routes to the future towers have been made. Whilst these have no impact upon the mineral stability assessment and recommendations, the drawings within this report have been updated to reflect these minor changes.

This report has been prepared for the use of LUC and SP Energy Networks and their representatives.

2.0 GEOLOGICAL SETTING

The natural superficial deposits largely consist of glacial till deposits largely comprising firm to stiff consistency clays, with glacial sands and gravels and more recent alluvial soils along the River Nith water course. Sporadic peaty deposits are present within areas of higher ground and within the lower-lying valleys whilst bedrock is likely to be present close to ground surface in the areas of higher ground particularly within the southern portion of the study area. As noted previously, more extensive thicknesses of made ground expected to comprise largely of reworked rock is likely to be associated with the reinstated former open cast coal mines.

In general terms, solid strata underlying the drift deposits within the northern part of the study area belong to the Carboniferous age Coal Measures Formation. The Upper Coal Measures therefore underlie the northernmost portion of the study area largely between towers 40 and 35. The Middle Coal Measures occupy a broad east to west oriented swathe of land stretching from an area around 400m to the north of Kirkconnel to an area around 1 kilometre to the south of this settlement. With regard to the study area, these rocks underlie an area broadly between towers 35 and 28. Between towers 28 and 20 strata of Lower Coal Measures age are present below the drift materials.

A geological unconformity is present just to the south of tower 20 with strata of the much older Kirkcolm Formation of Ordovician age present below the remainder of the study area between towers 20 and 1.

The Kirkcolm Formation comprises a general sequence of quartz-rich greywacke sandstones interbedded with siltstones and mudstones.

Both the Lower and Middle Coal Measures strata comprise cyclic sequences of sandstone, siltstones and mudstones interbedded with numerous coal seams and seat earth earths. Many of the coal seams were of former economic thicknesses and have been exploited extensively for many years. Coal seams within the Upper Coal Measures are generally thin and are seldom worked in Scotland.

Strata have been affected by folding and faulting and the regional dip of the Coal Measures strata in the study area is towards the north, secondary folding has created a number of more localised anticlinal and synclinal features. Within the northern portion of the study area strata tend to dip in a more north-easterly direction. Ordovician strata to the south dip steeply in a southerly direction.

The Coal Measures strata have been disrupted by numerous west north-west to east south-east trending faults, albeit the throw of these is generally only a few metres.

3.0 MINERAL ASSESSMENT AND RECOMMENDATIONS

Given their age of deposition, the Ordovician Strata which underlie the southern half of the study area do not contain coal seams. Whilst the greywackes have been locally quarried underground (coal) mining is not expected. Towers 1-19 are underlain by these strata. The mineral stability beneath these areas is considered to be satisfactory and, other than any standard due diligence investigations to establish ground conditions at these towers, no further assessment of mineral stability is necessary.

Numerous coal seams, some of which are of former economic thickness, are present within the strata of the Lower and Middle Coal Measures that underlie the central area of the study area. Within the northern portion of the study area the strata of the Upper Coal Measures are present below the drift deposits, however, as previously noted, any coal seams within this sequence tend to be thin and not of any previous economic value to a warranted consideration for extraction.

A number of coal seams of former economic thickness outcrop at rockhead within the central and northern portions of the study area and therefore underlie the route of the OHL at shallow to moderate depth below rockhead. The BGS (Sheet NS71 SW) record the general sequence of strata in the area as shown in Table 1.

Table 1: Stratigraphic Sequence of Mineral Seams Beneath the Site

Seam	Recorded Thickness from BGS borehole information	Approximate Depth Below Previous seam based upon BGS stratigraphic section
Target Coal	0.38m	-
Creepie Coal (3 leaves)	0.97m – 1.47m	15.60m
Calmstone Coal (2 leaves)	1.14m – 1.65m	12.0m
Twenty Inch Coal	0.48m	15.60m
Daugh Coal	0.36m	22.80m
Parrot Coal	(thin)	10.8m
Kirkconnel Splint	1.35 – 1.52	21.6m
Swallowcraig coal (10 leaves)	Numerous thin seams generally not exceeding 0.60m	12.0m

The Swallowcraig Coals are therefore present at rockhead a little to the north of tower 21 where they are located within a small 'dished' synclinal structure. The other seams above this within the sequence outcrop at rockhead increasingly further to the north with the Target Coal outcropping at rockhead around Rigg Farm in the vicinity of tower 31.

In general terms these seams are present at ever greater depths below rockhead heading northwards through the study area.

Mine plan data has been obtained from the Coal Authority which confirms extensive extraction within the Creepie Coal, Calmstone Coal and Kirkconnel Splint Coal with these being the thickest seams present within the sequence. These workings are generally present at greater depths below the site area. Within the Libry Moor area workings in the Kirkconnel Splint, Calmstone Coal and Creepie coal would have had the potential to be present at shallow depth, however, subsequent opencast extraction within and around Libry Moor would have removed these workings and any previously unworked coals.

More generally, there is also the potential that some of the smaller seams may have been subject to more localised and shallow unrecorded extraction before there was a statutory requirement to keep records of mining activities, in particular within the Swallowcraig Coals to the south of Corserig close to the area of tower 22. The Target coal is likely to thin to have even been subject to unrecorded working although this cannot at the present time be entirely discounted.

It is generally considered that the risk to surface development from shallow open/partial extraction mine workings arises principally from collapse of the roof of the workings between supports or as a result of the failure of these supports themselves. Other modes of collapse can occur but are relatively uncommon. In any event, they cannot be evaluated without detailed information on the spacing and sizes of the pillars (stoops) which is only available where abandoned mine plans exist, and, even then, such evaluation cannot be fully relied upon as stoops were often removed post abandonment.

In most cases, progressive roof failure causes the mine void to migrate towards the surface and the hazard results from collapse of the ground surface into the void. Commonly such collapse features are identified as shallow depressions at ground surface called sits or plump holes.

It is common practice to allow for a safe ratio of rock cover thickness to worked seam thickness of 10:1, therefore, where ratios are less than this there is the potential for voids caused by any belated collapse/settlement of mineworkings to be able to migrate to ground surface.

For example, a 1.0m thick seam would require a minimum of 10m of rock cover if it had been worked. Whilst the thickness of coal seams across any coalfield would be variable the thickest of the coal seams recorded within a previous borehole is the Calmstone coal which is up to 1.65m therefore at least 16.5m of rock cover would be required if the seam consistently attained this thickness.

Although most seams in the area are less than 1.50m in thickness, for the purposes of the assessment, it is considered that 20m of intact rock cover should be allowed for over the mineral workings present below the central and northern portions of the study area.

For this coal mining risk assessment, we have considered individual tower locations with respect to the coal mining geology underlying them. A summary drawing, E12293/0901A, is provided in Appendix C and should be referenced in association with this report.

Towers 1-19

As noted previously, these towers and Glenglass substation are underlain by non-coal bearing strata and as such the mineral stability with regard to coal mining is satisfactory with no further assessment or intrusive investigation necessary to prove/confirm the coal mining risk.

It is expected that the designers of the towers would undertake their own due diligence investigation at each of the tower locations to assess ground conditions and the bearing characteristics of the natural soils/bedrock strata with regard to preparation of a suitable foundation design.

Towers 20-21

These locations are underlain by the lowermost beds of the Lower Coal Measures.

Review of the stratigraphic section and BGS maps indicates that these tower positions are located below the crop of the Swallowcraig coals. Whilst some minor coal seams may be present, they would be thin and not worked, particularly given that more economic coal seams are readily available in the immediate area.

The mineral stability with respect to any coal mining legacy beneath these towers is considered to be satisfactory.

As above, it is expected that the designers of the towers would undertake their own due diligence investigation at each of the tower locations to assess ground conditions and the bearing characteristics of the natural soils/bedrock strata with regard to preparation of a suitable foundation design.

Tower 22

This tower is located a little to the west of the outcrop of the Swallowcraig Coals and as such the mineral stability is likely to be satisfactory. An extract from a plan supplied by the Coal Authority is pasted below which confirms that extraction of these seams is known to have occurred. However, these are close to ground surface and any extraction would likely have occurred on an ad hoc basis over many years prior to the requirement to keep records.



Extract of Coal Authority Plan No. S1370

Based upon the recorded outcrop of the Swallowcraig Coals tower 22 should be located outwith any area of previous extraction, however, outcrop locations are often estimated based upon available information and may be subject to some variation in the ground.

The designers of the towers would be undertaking their own due diligence investigation at each of the tower locations to assess ground conditions and the bearing characteristics of the natural soils/bedrock strata with regard to preparation of a suitable foundation design. It is considered in this instance that some allowance for a rotary borehole should be made at the location of the tower to confirm that this position is not underlain by shallow unrecorded workings within the Swallowcraig Coals

Towers 23-30

Workings within the Kirkconnel Splint, Calmstone and Creepie coals are known to have been present within this area. However, it is understood that later open cast extraction of these seams as well as any associated thinner seams (Parrott, Daugh and Twenty Inch) has occurred. As previously noted, areas of deep made ground comprising compacted rock would be expected in this area, although the exact extents of extraction are not known.

On this basis the potential risk posed by shallow mineworkings would no longer exist as the coal seams and any associated workings and mine entries would have been removed where they were formerly present at shallow depth.

Some assessment on the depth and nature of compaction of the backfilled materials will be required by the designers of the towers. Some of these investigations may involve rotary drilling. If any of these investigations indicate rock to be present at shallow depth locally or more widely, it would imply that deep opencast extraction has not occurred. In such instances, if confirmed, shallow mineworkings may still be present below individual towers and as such any investigation should seek to establish the depth to and condition of any coal seams present. In this regard particular attention should be paid to the locations of towers 28 and 29.

Towers 31-34

These are located within an area where shallow coal seams are present and, in the case of towers 34 and 31, there is the potential for unrecorded workings to be present.

The shallowest coal below towers 31 and 34 is the Target coal. As previously noted, this is a relatively thin seam and the potential for unrecorded extraction is limited. As part of any future due diligence site investigation by the tower designers to assess ground conditions more generally however, rotary investigations should be undertaken to confirm the depth to and condition of both the Target Coal and the Creepie Coal, albeit this latter seam may have adequate rock cover over it.

Towers 32 and 33 are located below the horizon of the Target coal and would be underlain at much shallower depth by the Creepie coal which is of greater economic thickness. As for towers 31 and 34 rotary investigation should be carried out at the locations of the towers 32 and 33 to confirm the depth to and condition of the Creepie Coal as part of the wider investigations into ground conditions.

Towers 35-40

These towers and Glenmuckloch Substation are underlain by recorded coal workings within the Creepie coal, Calmstone coal and Kirkconnel Splint coal. These workings are however present at much greater depth with at least 30m of rock cover over the Target coal and greater thicknesses still over the three thicker coals for which mine plan information is available and has been reviewed.

The thickness of rock cover over the workings below towers 35-40 and Glenmuckloch sub station itself is such that even if belated settlement did occur within the workings, it would not have any impact upon stability at ground surface.

More extensive extraction of coal seams by open cast methods is known to have occurred to the west of this area, however, it would appear from the information reviewed that extraction has not extended below towers 35-40 or the proposed Glenmuckloch sub station site.

The mineral stability with respect to any coal mining legacy beneath these towers and the substation is considered to be satisfactory.

It is expected that the designers of the towers and the substation would be undertaking their own due diligence investigation to assess ground conditions and the bearing characteristics of the natural soils/bedrock strata with regard to preparation of a suitable foundation design for the towers and sub-station.

3.1 Remediation of Shallow Mineworkings

Should any of the rotary drilling investigations recommended in the foregoing sections of this report identify any evidence of shallow abandoned mineworkings these would require to be consolidated by grout injection.

Prior to undertaking the works the consolidation design proposals and drawings would need to be to the Coal Authority for review as part of the due diligence permit application process. A permit application would also have to be made to the Coal Authority in advance of the rotary investigation works.

In general terms, consolidation works involve the drilling of 50mm diameter infill holes at 3.50m centres beneath areas of proposed built development where shallow workings have been identified. In this instance any treatment would be within and outwith the footprints of the tower foundations.

These holes would be cased to rockhead and taken to a 1.0m depth below the pavement of the coal seam to be treated. Once the holes have been drilled to the desired depth, a 1:12 mix cement/grout would need to be pumped into the holes until refusal (when voids/grout holes have been filled and will not take any more grout).

The efficacy of the consolidation works is confirmed by undertaking pressure tests at locations determined by the engineer. The supervising engineer would then provide a completion report for submission to the local authority and the Coal Authority. Once an area is grouted and tested development activity can generally be undertaken within a month or so.

The above noted remediation methodologies are commonly utilised on proposed development sites in former mining areas within the Central Belt of Scotland and throughout the UK.

3.2 Mine Entries

Numerous former mine entries have been identified from review of the Coal Authority archive information. Their approximate locations are plotted on Drawing No. E12293/0901A, Appendix C. A number of these are inclined adits which were used to access the coal seams directly along the banks of the small water courses in the area.

As previously confirmed, within areas of open cast extraction the mine entries would have been removed and would no longer exist at the positions shown in the above noted drawing.

Outwith the areas of opencast extraction, the entries would still be present and, in most cases, would not have been subject to any form of stabilisation/treatment.

None of the mine entries are located close to, or in the vicinity of, the towers or new sub station proposed and as such would not have any impact upon the stability of these. There is the potential that former mine entries may be present close to the proposed access track that would service tower 26. If it is confirmed that this is within a reinstated area former opencast area the entries would not longer be present. If the original ground conditions remain unchanged, some consideration and further assessment would need to be considered for the access track. The track itself is not an adopted carriageway and as such it may be possible to design a suitably robust geogrid and place this below the access track subbase materials. In the event of any future settlement, the geogrid should be designed to span any potential void to remove the potential for a catastrophic collapse. Remediation in the form of grout injection could thereafter be undertaken.

Alternatively, and subject to further assessment, the route of the track could be amended such that it avoids any mine entries altogether.

As noted above the foregoing would only be necessary if the mine entries were not removed as a result of previous opencast coal extraction.

Although no mine entries are recorded beneath or in the vicinity of the towers proposed, as with all sites located within former mining areas particular attention should be paid during site works to ground variations, which may suggest the presence of unrecorded mine entries.

If mine entrances are encountered, they too would require to be secured by grout injection, tested and capped. No build stand-off zones equivalent to the thickness of drift deposits adjacent to the mine entry would require to be incorporated into the development design.

4.0 CONCLUSIONS

SP Energy Networks are looking to reinforce their existing electricity supply infrastructure through the provision of new mounted electrical cables between the existing Glenglass substation and a new substation located at Glenmuckloch, Dumfries and Galloway.

A new sub-station facility at Glenmuckloch, located to the north-west of Kirkconnel, and 40 steel lattice towers and associated access infrastructure are proposed.

Some of the towers are located within a designated Coal Authority consultation area and as such a Coal Mining Risk Assessment was required.

Review of archive data has confirmed that a little under 70% of the proposed towers are located in areas where economic coal seams are either not present or are so deep that they would not have any impact upon stability at ground surface.

Elsewhere within the study area shallow mining of coal seams has occurred or is likely to have occurred although records are incomplete given that some of the workings suspected would have taken place prior to the statutory requirement to maintain records.

Notwithstanding the foregoing, later opencast extraction of coal seams would have removed all workings and residual coal at shallow depth across a reasonably extensive portion of the remaining study area. Excavations would have been backfilled with reworked rock overburn compacted back into place. Although these activities would have removed the potential mineral stability risks in the affected areas, some investigation into the competency of the reinstated materials (involving soils boreholes and rotary boreholes) is anticipated to be required by the designers of the tower bases.

Locally, outwith the reinstated areas, there is the potential that shallow abandoned mineworkings may remain and it is recommended that these be investigated by rotary drilling methods following consultation with the Coal Authority.

The locations requiring further investigation and appraisal are detailed within Section 3 of this report.

Available archive information has indicated that there are no former mine entries within influencing distance of any the towers proposed.

Should any of the rotary investigations proposed identify the presence of residual shallow abandoned mineworkings, likely to represent a future risk to ground stability, consolidation of the workings by pressure grouting would be required beneath areas of proposed built development. Designs would require to be prepared and forwarded to the Coal Authority for review as part of the standard consultation and permit application procedures.

Although no mine entries are recorded beneath or in the vicinity of the towers proposed, as with all sites located within former mining areas particular attention should be paid during site works to ground variations, which may suggest the presence of unrecorded mine entries.

If mine entrances are encountered, they too would require to be secured by grout injection, tested and capped. No build stand-off zones equivalent to the thickness of drift deposits adjacent to the mine entry would require to be incorporated into the development design.

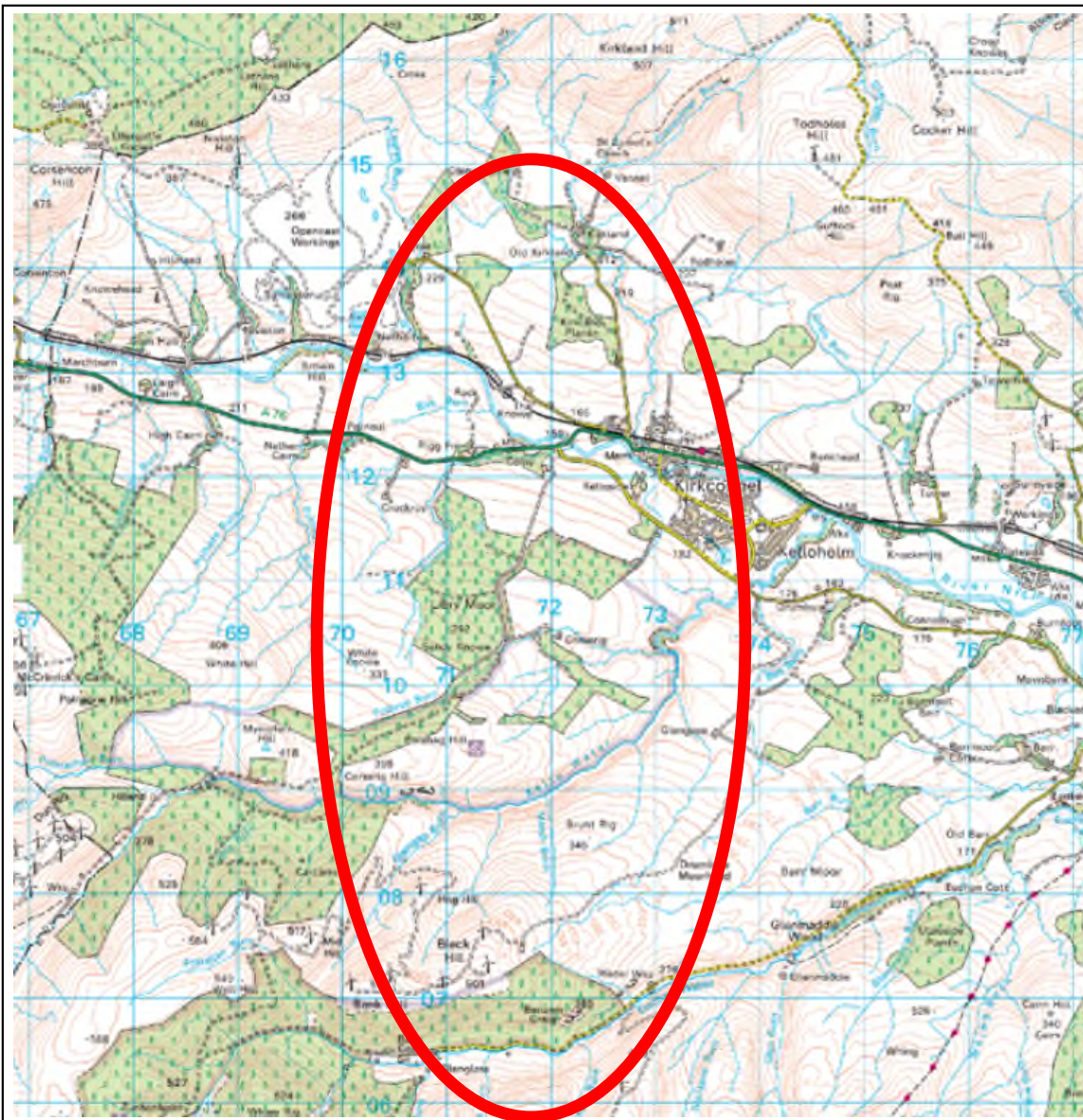
Author: S. Ryce	Checked: N. Henderson	Approved: N. Henderson
-----------------	-----------------------	------------------------

150 St John's Road
Edinburgh, EH12 8AY
Tel 0131 334 0765
Fax 0131 316 4540
E-Mail drme@davidmurray.co.uk

10 Eyre Place
Edinburgh, EH3 5EP
Tel 0131 556 5155
Fax 0131 556 9147
E-Mail drmc@davidmurray.co.uk

20 Viewfield Terrace
Dunfermline, KY12 7HZ
Tel 01383 726075
Fax 01383 730605
E-Mail drmd@davidmurray.co.uk

Appendix A: Site Location Plan



SITE LOCATION PLAN

Glenmuckloch to Glenglass

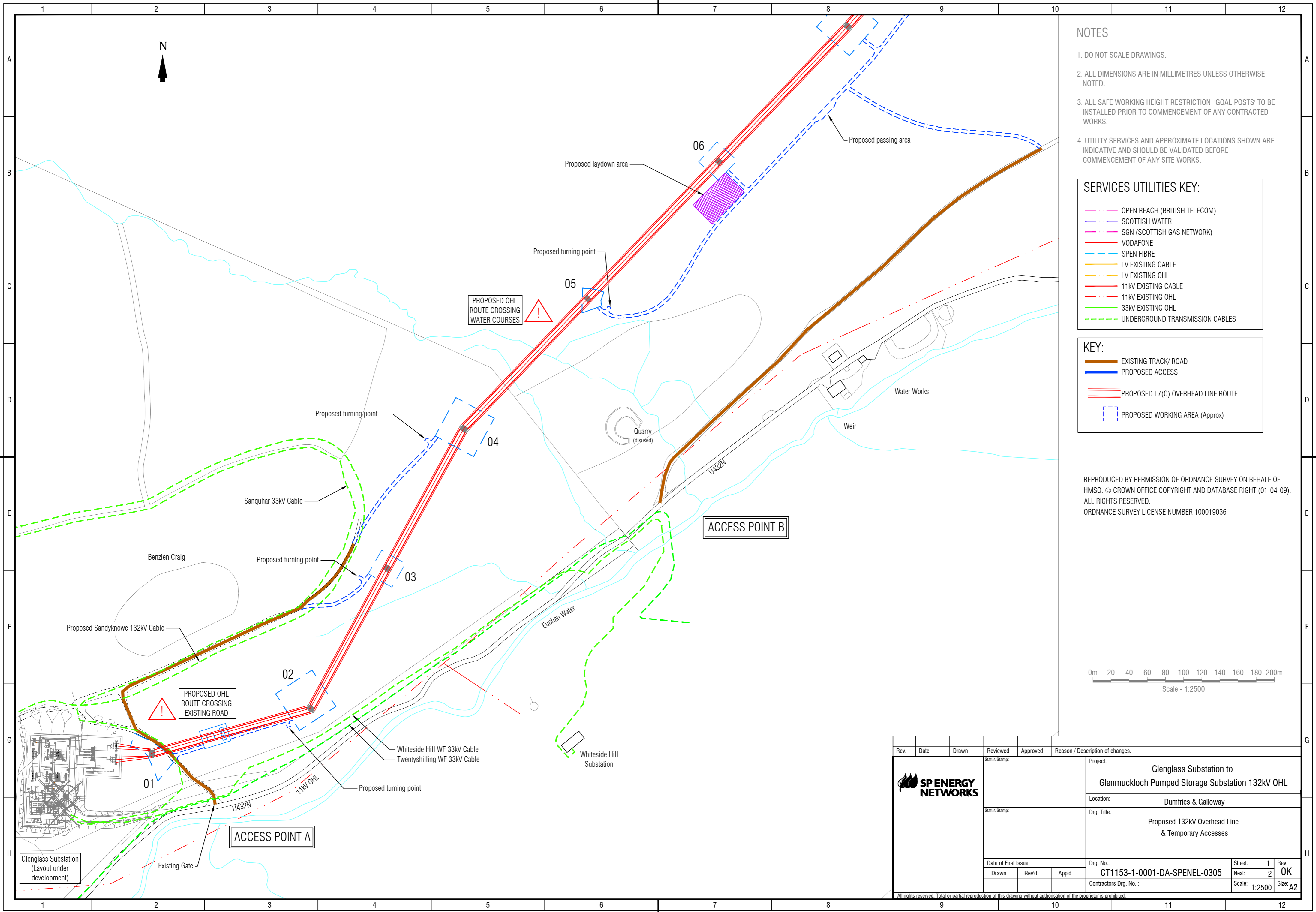
E12293

**DAVID R MURRAY & ASSOCIATES
CONSULTING ENGINEERS**





Appendix B: LUC Tower Location Plans



NOTES

- DO NOT SCALE DRAWINGS.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
- ALL SAFE WORKING HEIGHT RESTRICTION 'GOAL POSTS' TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY CONTRACTED WORKS.
- UTILITY SERVICES AND APPROXIMATE LOCATIONS SHOWN ARE INDICATIVE AND SHOULD BE VALIDATED BEFORE COMMENCEMENT OF ANY SITE WORKS.

SERVICES UTILITIES KEY:

- OPEN REACH (BRITISH TELECOM)
- SCOTTISH WATER
- SGN (SCOTTISH GAS NETWORK)
- VODAFONE
- SPEN FIBRE
- LV EXISTING CABLE
- LV EXISTING OHL
- 11kV EXISTING CABLE
- 11kV EXISTING OHL
- 33kV EXISTING OHL
- UNDERGROUND TRANSMISSION CABLES

KEY:

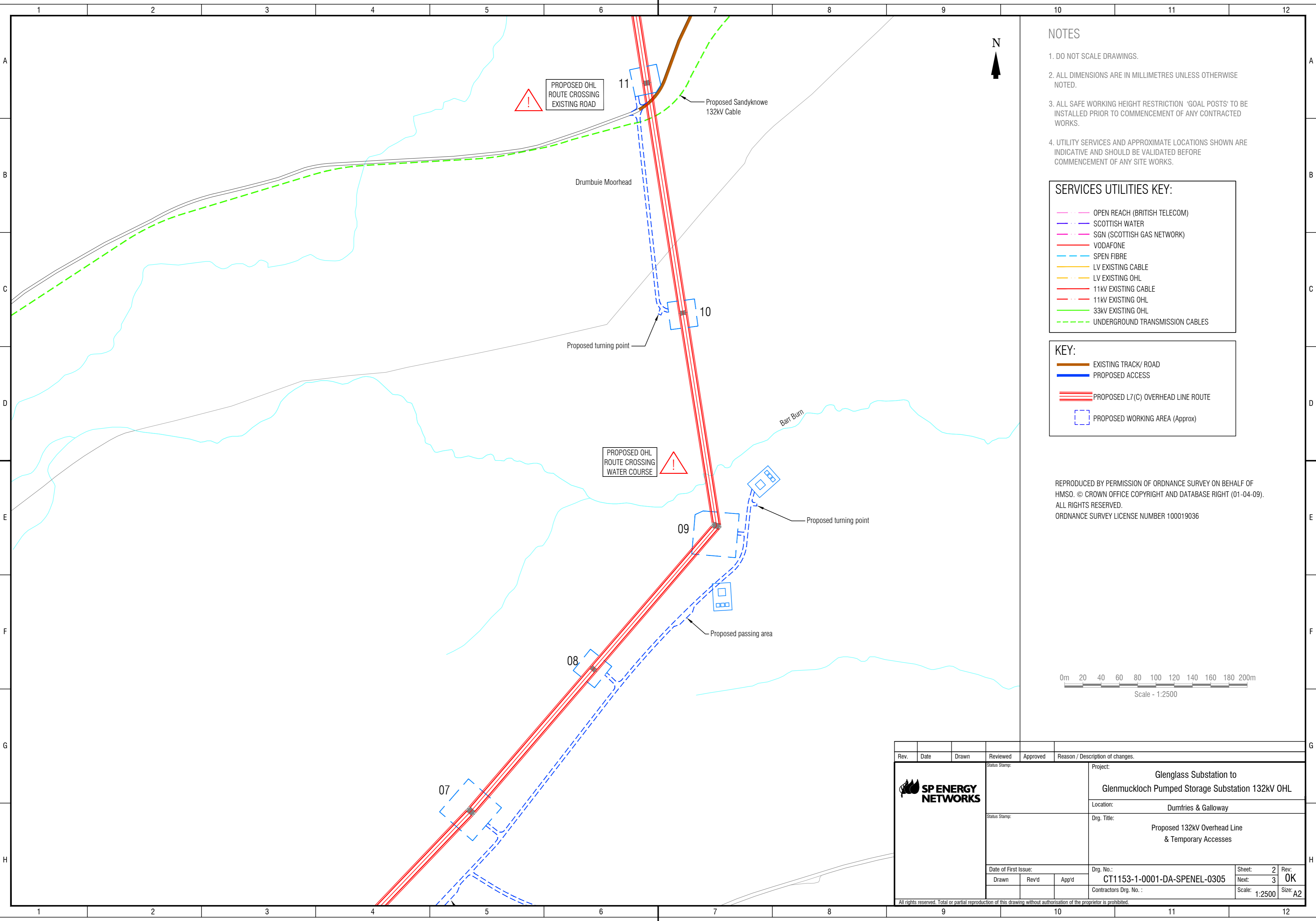
- EXISTING TRACK/ ROAD
- PROPOSED ACCESS
- PROPOSED L7(C) OVERHEAD LINE ROUTE
- PROPOSED WORKING AREA (Approx)

REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN OFFICE COPYRIGHT AND DATABASE RIGHT (01-04-09). ALL RIGHTS RESERVED.
 ORDNANCE SURVEY LICENSE NUMBER 100019036



Rev.	Date	Drawn	Reviewed	Approved	Reason / Description of changes.
			Status Stamp:		Project: Glenmuckloch Pumped Storage Substation 132kV OHL
Status Stamp:			Location: Dumfries & Galloway		Drg. Title: Proposed 132kV Overhead Line & Temporary Accesses
Date of First Issue:			Drg. No.: CT1153-1-0001-DA-SPENEL-0305		Sheet: 1 Next: 2 Scale: 1:2500
Drawn:			Rev'd:		App'd:
Contractors Drg. No. :			Date of Issue:		Rev: OK Size: A2

All rights reserved. Total or partial reproduction of this drawing without authorisation of the proprietor is prohibited.



- NOTES**
- DO NOT SCALE DRAWINGS.
 - ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 - ALL SAFE WORKING HEIGHT RESTRICTION 'GOAL POSTS' TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY CONTRACTED WORKS.
 - UTILITY SERVICES AND APPROXIMATE LOCATIONS SHOWN ARE INDICATIVE AND SHOULD BE VALIDATED BEFORE COMMENCEMENT OF ANY SITE WORKS.

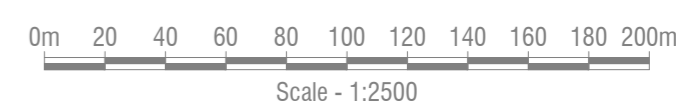
SERVICES UTILITIES KEY:

	OPEN REACH (BRITISH TELECOM)
	SCOTTISH WATER
	SGN (SCOTTISH GAS NETWORK)
	VODAFONE
	SPEN FIBRE
	LV EXISTING CABLE
	LV EXISTING OHL
	11kV EXISTING CABLE
	11kV EXISTING OHL
	33kV EXISTING OHL
	UNDERGROUND TRANSMISSION CABLES

KEY:

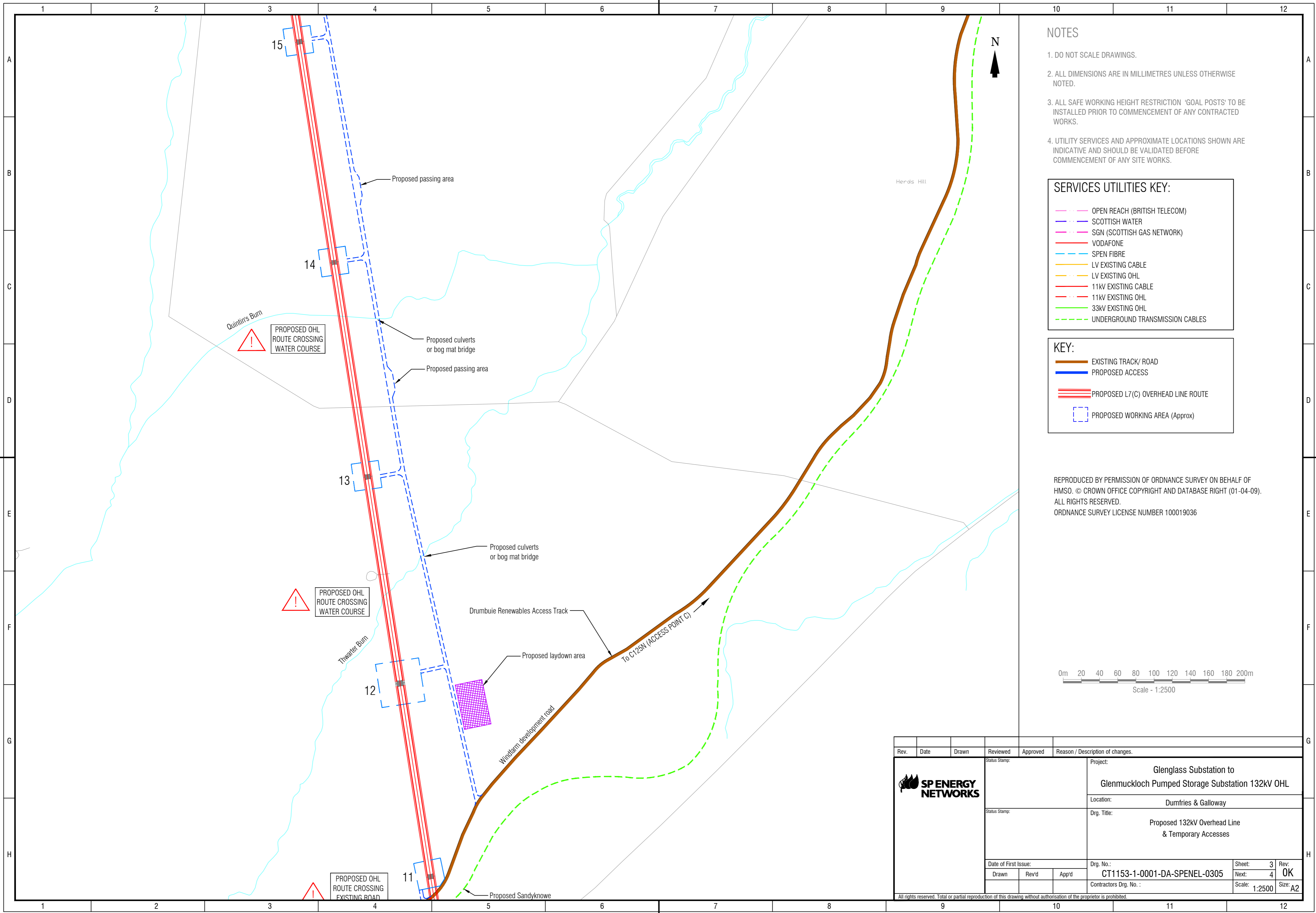
	EXISTING TRACK/ ROAD
	PROPOSED ACCESS
	PROPOSED L7(C) OVERHEAD LINE ROUTE
	PROPOSED WORKING AREA (Approx)

REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN OFFICE COPYRIGHT AND DATABASE RIGHT (01-04-09). ALL RIGHTS RESERVED.
 ORDNANCE SURVEY LICENSE NUMBER 100019036



Rev.	Date	Drawn	Reviewed	Approved	Reason / Description of changes.
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> </div> <div style="width: 40%;"> <p>Status Stamp:</p> </div> <div style="width: 40%;"> <p>Project: Glenglass Substation to Glenmuckloch Pumped Storage Substation 132kV OHL</p> <p>Location: Dumfries & Galloway</p> <p>Drg. Title: Proposed 132kV Overhead Line & Temporary Accesses</p> </div> </div>					
Date of First Issue:			Drg. No.:		Sheet: 2
Drawn	Rev'd	App'd	CT1153-1-0001-DA-SPENEL-0305		Next: 3
Contractors Drg. No. :				Scale: 1:2500	Rev: OK
					Size: A2

All rights reserved. Total or partial reproduction of this drawing without authorisation of the proprietor is prohibited.



- NOTES**
- DO NOT SCALE DRAWINGS.
 - ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 - ALL SAFE WORKING HEIGHT RESTRICTION 'GOAL POSTS' TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY CONTRACTED WORKS.
 - UTILITY SERVICES AND APPROXIMATE LOCATIONS SHOWN ARE INDICATIVE AND SHOULD BE VALIDATED BEFORE COMMENCEMENT OF ANY SITE WORKS.

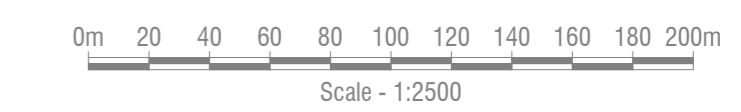
SERVICES UTILITIES KEY:

- OPEN REACH (BRITISH TELECOM)
- SCOTTISH WATER
- SGN (SCOTTISH GAS NETWORK)
- VODAFONE
- SPEN FIBRE
- LV EXISTING CABLE
- LV EXISTING OHL
- 11kV EXISTING CABLE
- 11kV EXISTING OHL
- 33kV EXISTING OHL
- UNDERGROUND TRANSMISSION CABLES

KEY:

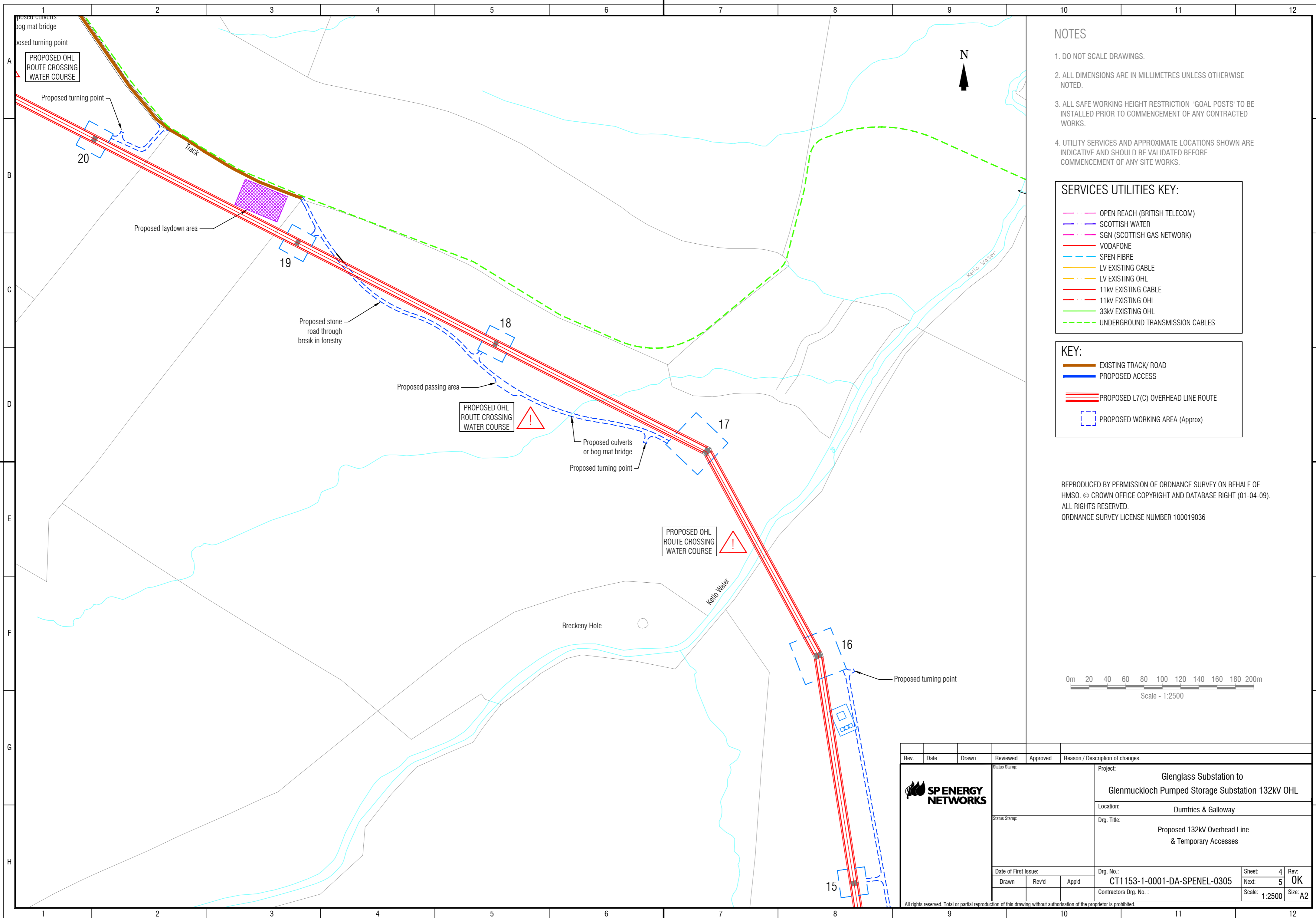
- EXISTING TRACK/ ROAD
- PROPOSED ACCESS
- PROPOSED L7(C) OVERHEAD LINE ROUTE
- PROPOSED WORKING AREA (Approx)

REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN OFFICE COPYRIGHT AND DATABASE RIGHT (01-04-09). ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENSE NUMBER 100019036



Rev.	Date	Drawn	Reviewed	Approved	Reason / Description of changes.
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> </div> <div style="width: 60%;"> <p>Project: Glenglass Substation to Glenmuckloch Pumped Storage Substation 132kV OHL</p> <p>Location: Dumfries & Galloway</p> <p>Drg. Title: Proposed 132kV Overhead Line & Temporary Accesses</p> </div> <div style="width: 20%; text-align: right;"> <p>Sheet: 3 Rev: OK</p> <p>Next: 4</p> <p>Scale: 1:2500 Size: A2</p> </div> </div>					
<p>Date of First Issue:</p>			<p>Drg. No.: CT1153-1-0001-DA-SPENEL-0305</p>		
<p>Drawn</p>			<p>Contractors Drg. No.:</p>		

All rights reserved. Total or partial reproduction of this drawing without authorisation of the proprietor is prohibited.



- NOTES**
- DO NOT SCALE DRAWINGS.
 - ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 - ALL SAFE WORKING HEIGHT RESTRICTION 'GOAL POSTS' TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY CONTRACTED WORKS.
 - UTILITY SERVICES AND APPROXIMATE LOCATIONS SHOWN ARE INDICATIVE AND SHOULD BE VALIDATED BEFORE COMMENCEMENT OF ANY SITE WORKS.

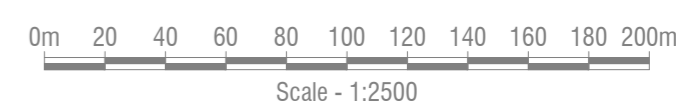
SERVICES UTILITIES KEY:

—	OPEN REACH (BRITISH TELECOM)
—	SCOTTISH WATER
—	SGN (SCOTTISH GAS NETWORK)
—	VODAFONE
—	SPEN FIBRE
—	LV EXISTING CABLE
—	LV EXISTING OHL
—	11KV EXISTING CABLE
—	11KV EXISTING OHL
—	33KV EXISTING OHL
—	UNDERGROUND TRANSMISSION CABLES

KEY:

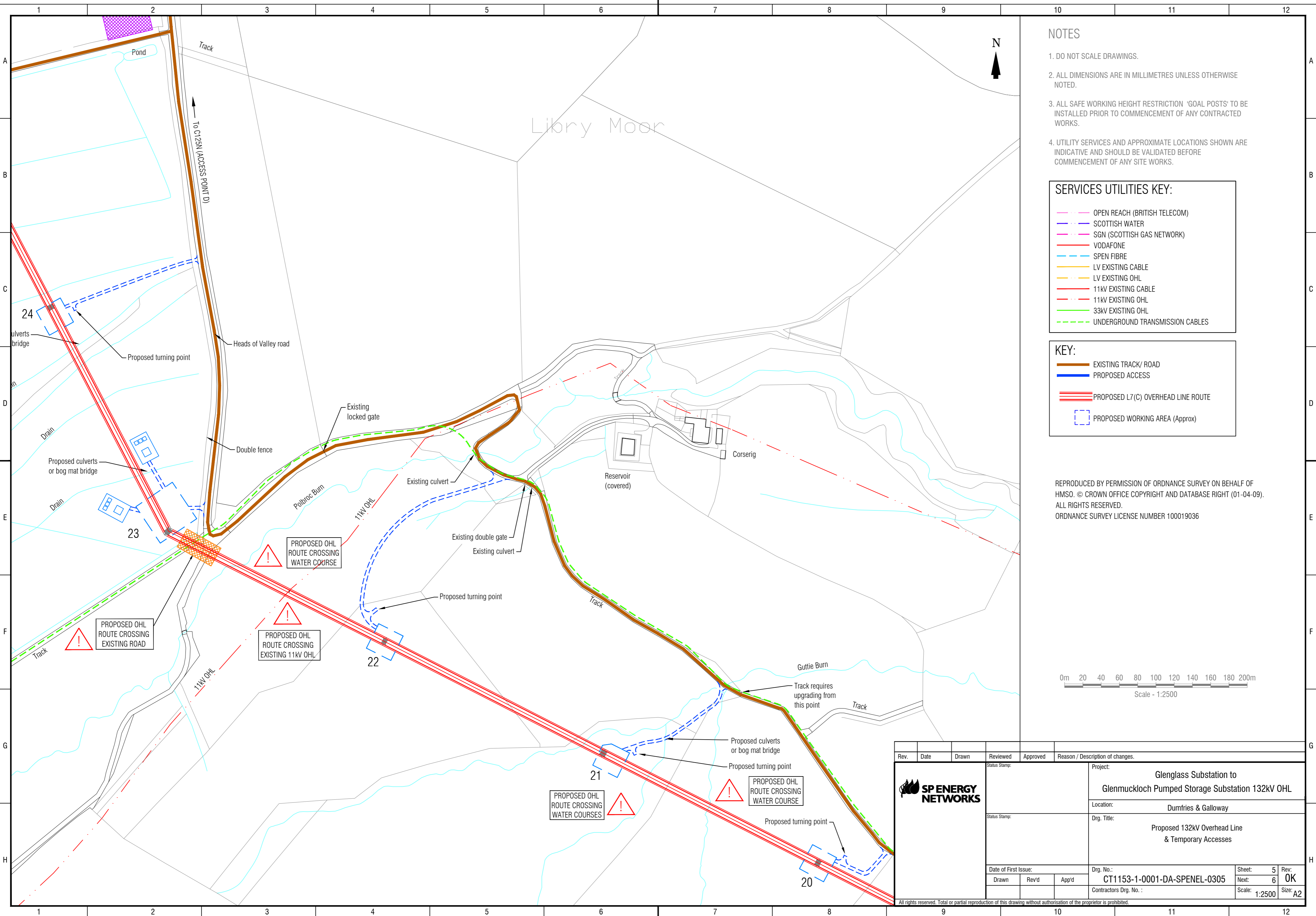
—	EXISTING TRACK/ ROAD
—	PROPOSED ACCESS
—	PROPOSED L7(C) OVERHEAD LINE ROUTE
—	PROPOSED WORKING AREA (Approx)

REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN OFFICE COPYRIGHT AND DATABASE RIGHT (01-04-09). ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENSE NUMBER 100019036



Rev.	Date	Drawn	Reviewed	Approved	Reason / Description of changes.
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> </div> <div style="width: 40%;"> <p>Status Stamp:</p> </div> <div style="width: 40%;"> <p>Project: Glenglass Substation to Glenmuckloch Pumped Storage Substation 132kV OHL</p> <p>Location: Dumfries & Galloway</p> </div> </div>					
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>Status Stamp:</p> </div> <div style="width: 40%;"> <p>Drg. Title: Proposed 132kV Overhead Line & Temporary Accesses</p> </div> <div style="width: 40%;"> <p>Drg. No.:</p> </div> </div>					
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>Date of First Issue:</p> </div> <div style="width: 40%;"> <p>Drg. No.:</p> </div> <div style="width: 40%;"> <p>Sheet: 4 Rev: OK</p> </div> </div>					
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>Drawn</p> </div> <div style="width: 20%;"> <p>Rev'd</p> </div> <div style="width: 20%;"> <p>App'd</p> </div> <div style="width: 20%;"> <p>Contractors Drg. No. :</p> </div> <div style="width: 20%;"> <p>CT1153-1-0001-DA-SPENEL-0305</p> </div> <div style="width: 20%;"> <p>Next: 5</p> </div> </div>					
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>Scale: 1:2500</p> </div> <div style="width: 20%;"> <p>Size: A2</p> </div> </div>					

All rights reserved. Total or partial reproduction of this drawing without authorisation of the proprietor is prohibited.

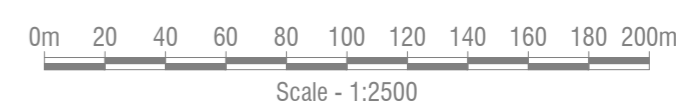


- NOTES**
- DO NOT SCALE DRAWINGS.
 - ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 - ALL SAFE WORKING HEIGHT RESTRICTION 'GOAL POSTS' TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY CONTRACTED WORKS.
 - UTILITY SERVICES AND APPROXIMATE LOCATIONS SHOWN ARE INDICATIVE AND SHOULD BE VALIDATED BEFORE COMMENCEMENT OF ANY SITE WORKS.

- SERVICES UTILITIES KEY:**
- OPEN REACH (BRITISH TELECOM)
 - SCOTTISH WATER
 - SGN (SCOTTISH GAS NETWORK)
 - VODAFONE
 - SPEN FIBRE
 - LV EXISTING CABLE
 - LV EXISTING OHL
 - 11kV EXISTING CABLE
 - 11kV EXISTING OHL
 - 33kV EXISTING OHL
 - UNDERGROUND TRANSMISSION CABLES

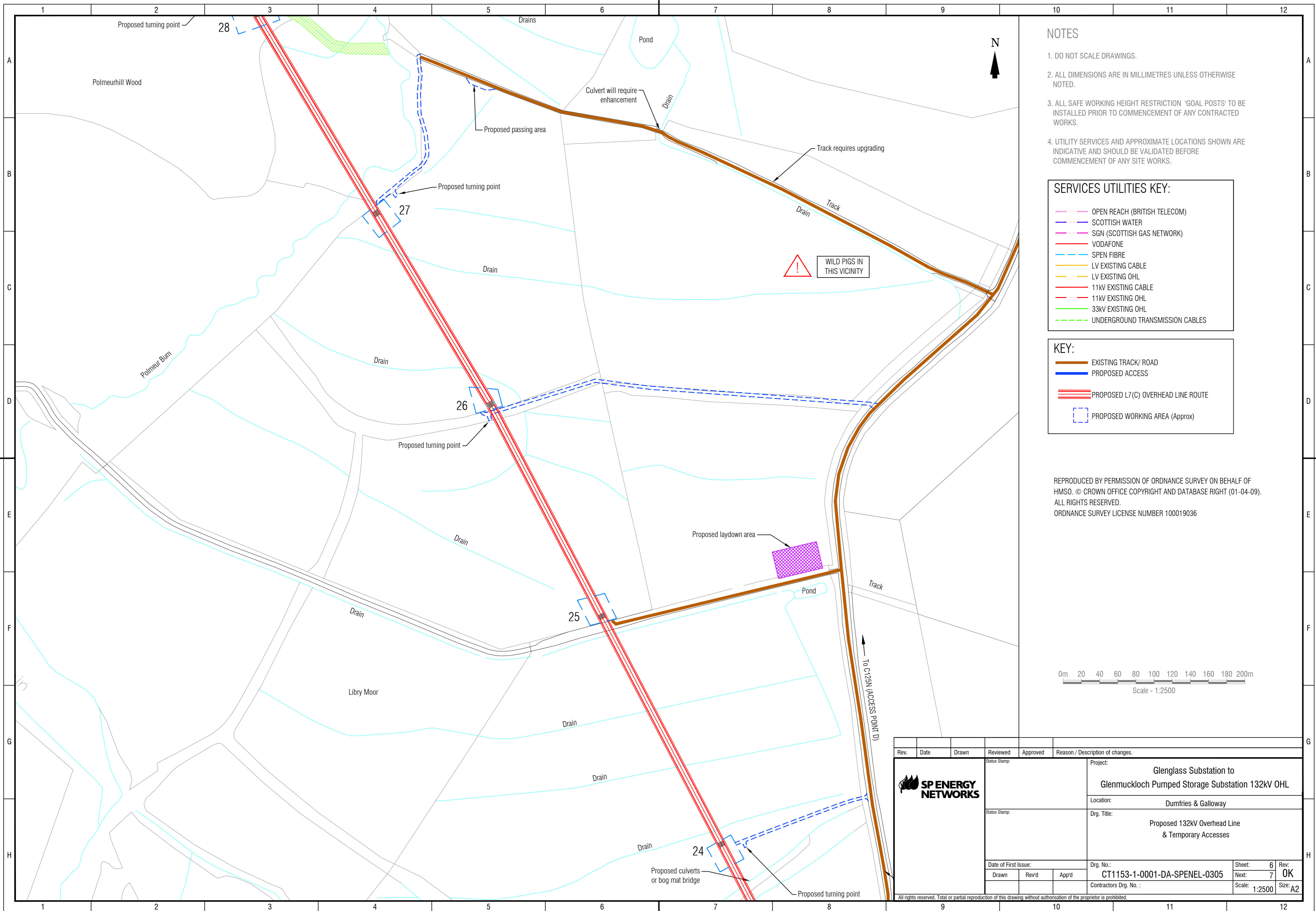
- KEY:**
- EXISTING TRACK/ ROAD
 - PROPOSED ACCESS
 - PROPOSED L7(C) OVERHEAD LINE ROUTE
 - PROPOSED WORKING AREA (Approx)

REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN OFFICE COPYRIGHT AND DATABASE RIGHT (01-04-09). ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENSE NUMBER 100019036



Rev.	Date	Drawn	Reviewed	Approved	Reason / Description of changes.
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> </div> <div style="width: 40%;"> <p>Project: Glenglass Substation to Glenmuckloch Pumped Storage Substation 132kV OHL</p> <p>Location: Dumfries & Galloway</p> <p>Drg. Title: Proposed 132kV Overhead Line & Temporary Accesses</p> </div> <div style="width: 20%;"> <p>Sheet: 5</p> <p>Rev: OK</p> </div> </div>					
<p>Date of First Issue:</p>			<p>Drg. No.: CT1153-1-0001-DA-SPENEL-0305</p>		
<p>Drawn</p>		<p>Rev'd</p>	<p>App'd</p>	<p>Contractors Drg. No. :</p>	
			<p>Scale: 1:2500</p>	<p>Size: A2</p>	

All rights reserved. Total or partial reproduction of this drawing without authorisation of the proprietor is prohibited.



NOTES

1. DO NOT SCALE DRAWINGS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
3. ALL SAFE WORKING HEIGHT RESTRICTION 'GOAL POSTS' TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY CONTRACTED WORKS.
4. UTILITY SERVICES AND APPROXIMATE LOCATIONS SHOWN ARE INDICATIVE AND SHOULD BE VALIDATED BEFORE COMMENCEMENT OF ANY SITE WORKS.

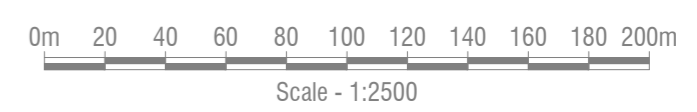
SERVICES UTILITIES KEY:

	OPEN REACH (BRITISH TELECOM)
	SCOTTISH WATER
	SGN (SCOTTISH GAS NETWORK)
	VODAFONE
	SPEN FIBRE
	LV EXISTING CABLE
	LV EXISTING OHL
	11KV EXISTING CABLE
	11KV EXISTING OHL
	33KV EXISTING OHL
	UNDERGROUND TRANSMISSION CABLES

KEY:

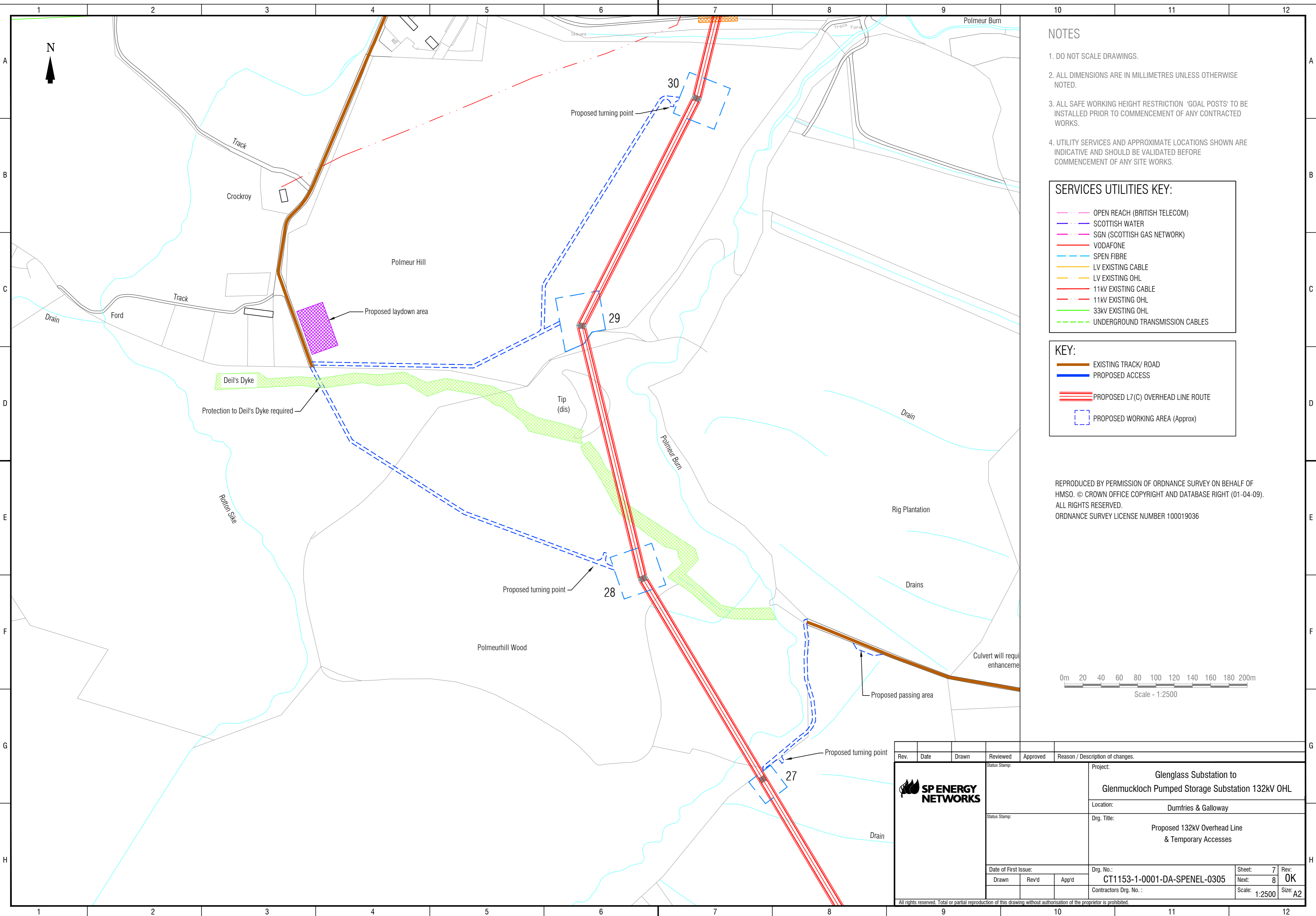
	EXISTING TRACK/ ROAD
	PROPOSED ACCESS
	PROPOSED L7(C) OVERHEAD LINE ROUTE
	PROPOSED WORKING AREA (Approx)

REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN OFFICE COPYRIGHT AND DATABASE RIGHT (01-04-09). ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENSE NUMBER 100019036



Rev.	Date	Drawn	Reviewed	Approved	Reason / Description of changes.
<p>SP ENERGY NETWORKS</p>					
<p>Status Stamp:</p>			<p>Project: Glenglass Substation to Glenmuckloch Pumped Storage Substation 132kV OHL</p>		
<p>Status Stamp:</p>			<p>Location: Dumfries & Galloway</p>		
<p>Date of First Issue:</p>			<p>Drg. Title: Proposed 132kV Overhead Line & Temporary Accesses</p>		
Drawn	Rev'd	App'd	<p>Drg. No.: CT1153-1-0001-DA-SPENEL-0305</p>		<p>Sheet: 6</p>
<p>Contractors Drg. No. :</p>			<p>Scale: 1:2500</p>		<p>Rev: OK</p>
<p>Size: A2</p>					

All rights reserved. Total or partial reproduction of this drawing without authorisation of the proprietor is prohibited.



NOTES

1. DO NOT SCALE DRAWINGS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
3. ALL SAFE WORKING HEIGHT RESTRICTION 'GOAL POSTS' TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY CONTRACTED WORKS.
4. UTILITY SERVICES AND APPROXIMATE LOCATIONS SHOWN ARE INDICATIVE AND SHOULD BE VALIDATED BEFORE COMMENCEMENT OF ANY SITE WORKS.

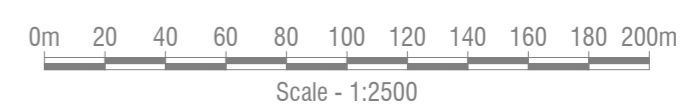
SERVICES UTILITIES KEY:

	OPEN REACH (BRITISH TELECOM)
	SCOTTISH WATER
	SGN (SCOTTISH GAS NETWORK)
	VODAFONE
	SPEN FIBRE
	LV EXISTING CABLE
	LV EXISTING OHL
	11kV EXISTING CABLE
	11kV EXISTING OHL
	33kV EXISTING OHL
	UNDERGROUND TRANSMISSION CABLES

KEY:

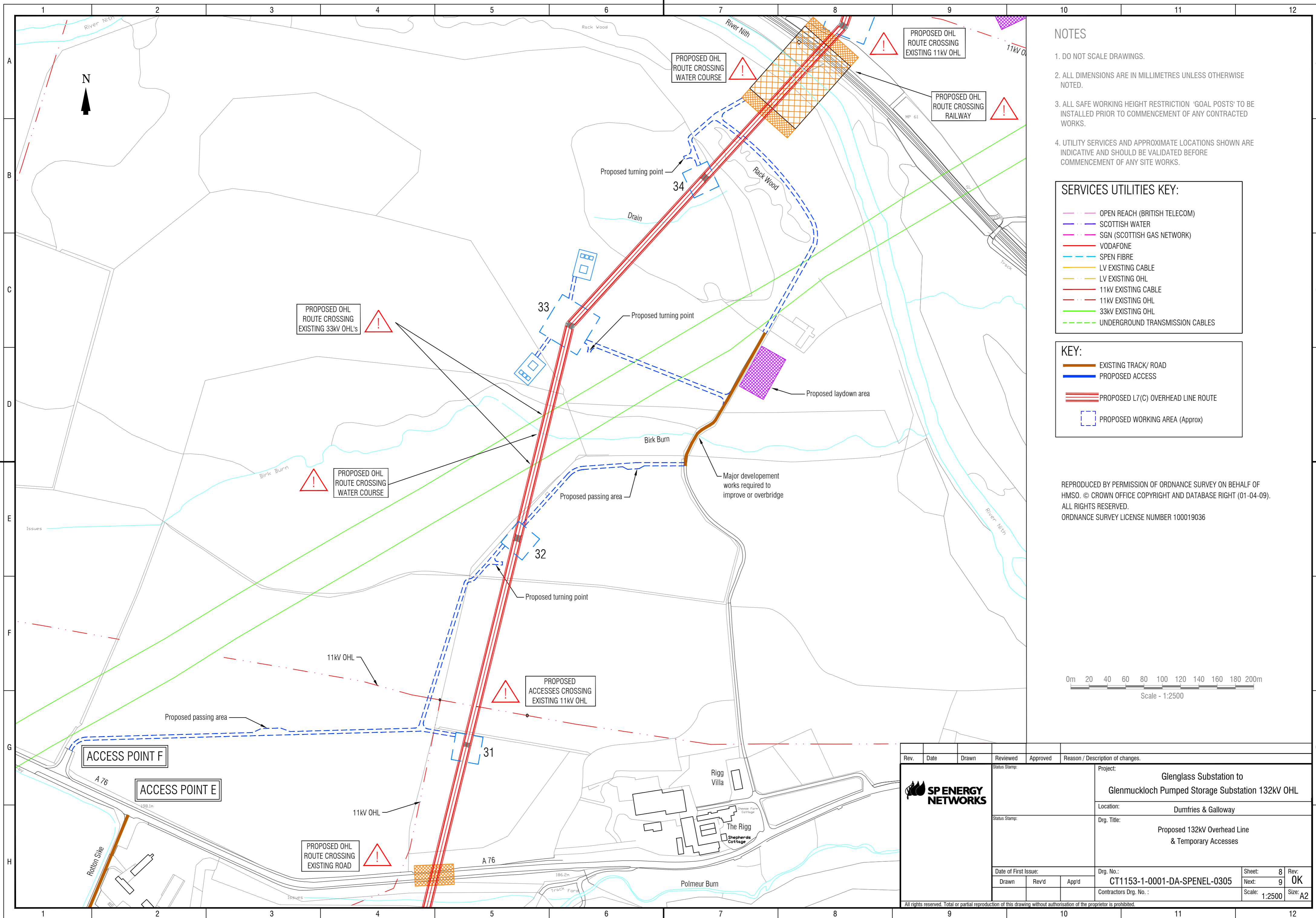
	EXISTING TRACK/ ROAD
	PROPOSED ACCESS
	PROPOSED L7(C) OVERHEAD LINE ROUTE
	PROPOSED WORKING AREA (Approx)

REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN OFFICE COPYRIGHT AND DATABASE RIGHT (01-04-09). ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENSE NUMBER 100019036



Rev.	Date	Drawn	Reviewed	Approved	Reason / Description of changes.
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> </div> <div style="width: 40%;"> <p>Status Stamp:</p> </div> <div style="width: 40%;"> <p>Project: Glenglass Substation to Glenmuckloch Pumped Storage Substation 132kV OHL</p> <p>Location: Dumfries & Galloway</p> </div> </div>					
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>Status Stamp:</p> </div> <div style="width: 40%;"> <p>Drg. Title: Proposed 132kV Overhead Line & Temporary Accesses</p> </div> <div style="width: 40%;"> <p>Drg. No.: CT1153-1-0001-DA-SPENEL-0305</p> <p>Contractors Drg. No. :</p> </div> </div>					
Date of First Issue:			Sheet: 7 Rev: OK		
Drawn	Rev'd	App'd	Next: 8		Scale: 1:2500
					Size: A2

All rights reserved. Total or partial reproduction of this drawing without authorisation of the proprietor is prohibited.

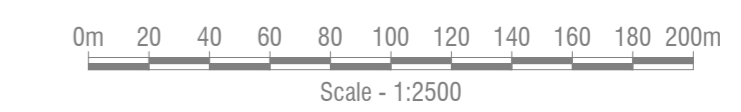


- NOTES**
- DO NOT SCALE DRAWINGS.
 - ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 - ALL SAFE WORKING HEIGHT RESTRICTION 'GOAL POSTS' TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY CONTRACTED WORKS.
 - UTILITY SERVICES AND APPROXIMATE LOCATIONS SHOWN ARE INDICATIVE AND SHOULD BE VALIDATED BEFORE COMMENCEMENT OF ANY SITE WORKS.

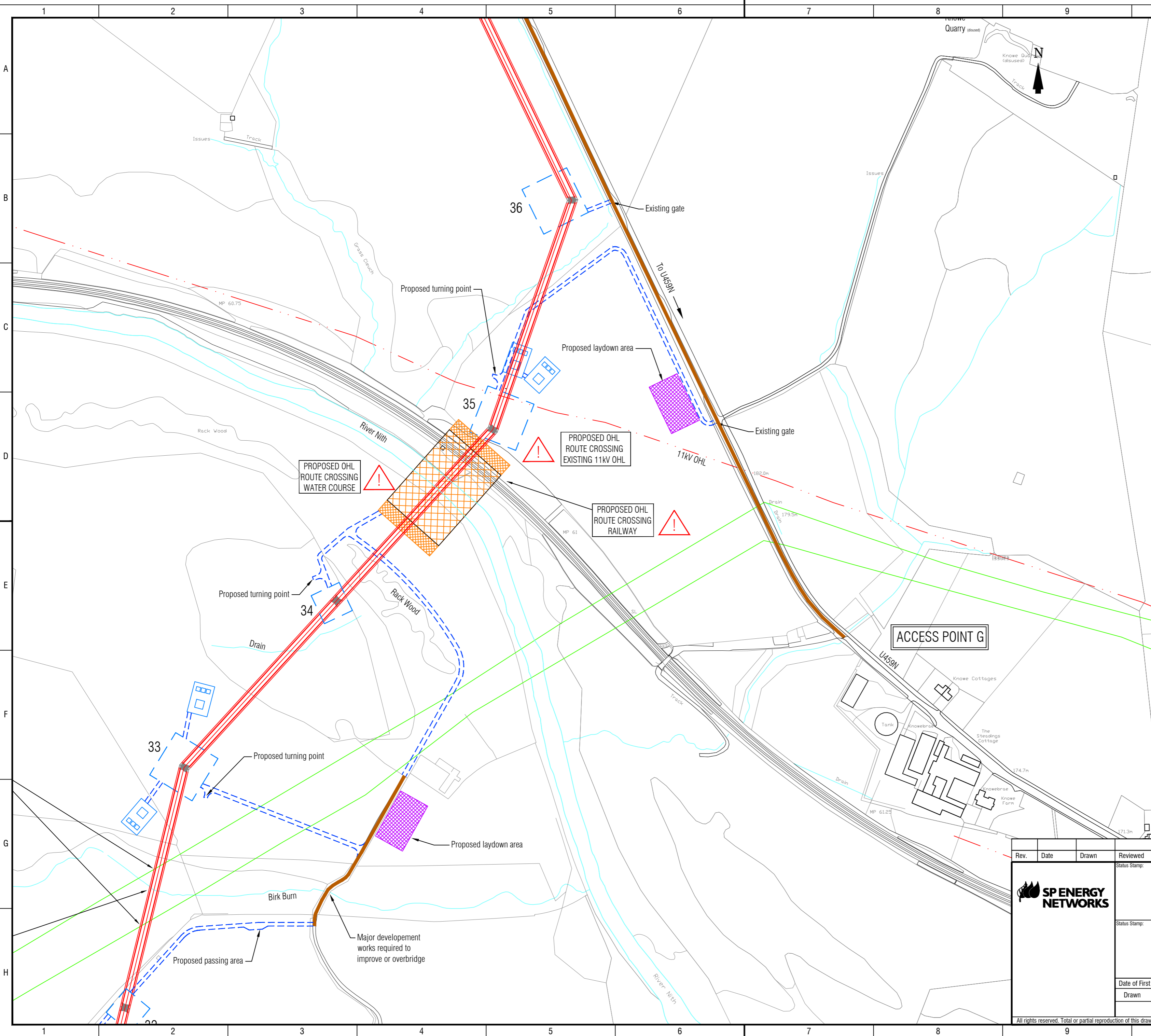
- SERVICES UTILITIES KEY:**
- OPEN REACH (BRITISH TELECOM)
 - SCOTTISH WATER
 - SGN (SCOTTISH GAS NETWORK)
 - VODAFONE
 - SPEN FIBRE
 - LV EXISTING CABLE
 - LV EXISTING OHL
 - 11kV EXISTING CABLE
 - 11kV EXISTING OHL
 - 33kV EXISTING OHL
 - UNDERGROUND TRANSMISSION CABLES

- KEY:**
- EXISTING TRACK/ ROAD
 - PROPOSED ACCESS
 - PROPOSED L7(C) OVERHEAD LINE ROUTE
 - PROPOSED WORKING AREA (Approx)

REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN OFFICE COPYRIGHT AND DATABASE RIGHT (01-04-09). ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENSE NUMBER 100019036



Rev.	Date	Drawn	Reviewed	Approved	Reason / Description of changes.
			Status Stamp:		Project: Glenglass Substation to Glenmuckloch Pumped Storage Substation 132kV OHL
Status Stamp:			Location: Dumfries & Galloway		
Date of First Issue:			Drg. No.: CT1153-1-0001-DA-SPENEL-0305		Sheet: 8 Next: 9 Scale: 1:2500
Drawn	Rev'd	App'd	Contractors Drg. No.:		Rev: OK Size: A2
<small>All rights reserved. Total or partial reproduction of this drawing without authorisation of the proprietor is prohibited.</small>					



NOTES

1. DO NOT SCALE DRAWINGS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
3. ALL SAFE WORKING HEIGHT RESTRICTION 'GOAL POSTS' TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY CONTRACTED WORKS.
4. UTILITY SERVICES AND APPROXIMATE LOCATIONS SHOWN ARE INDICATIVE AND SHOULD BE VALIDATED BEFORE COMMENCEMENT OF ANY SITE WORKS.

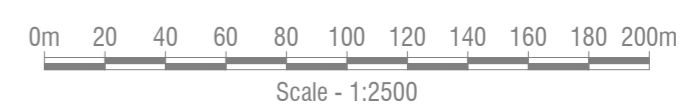
SERVICES UTILITIES KEY:

- OPEN REACH (BRITISH TELECOM)
- SCOTTISH WATER
- SGN (SCOTTISH GAS NETWORK)
- VODAFONE
- SPEN FIBRE
- LV EXISTING CABLE
- LV EXISTING OHL
- 11KV EXISTING CABLE
- 11KV EXISTING OHL
- 33KV EXISTING OHL
- UNDERGROUND TRANSMISSION CABLES

KEY:

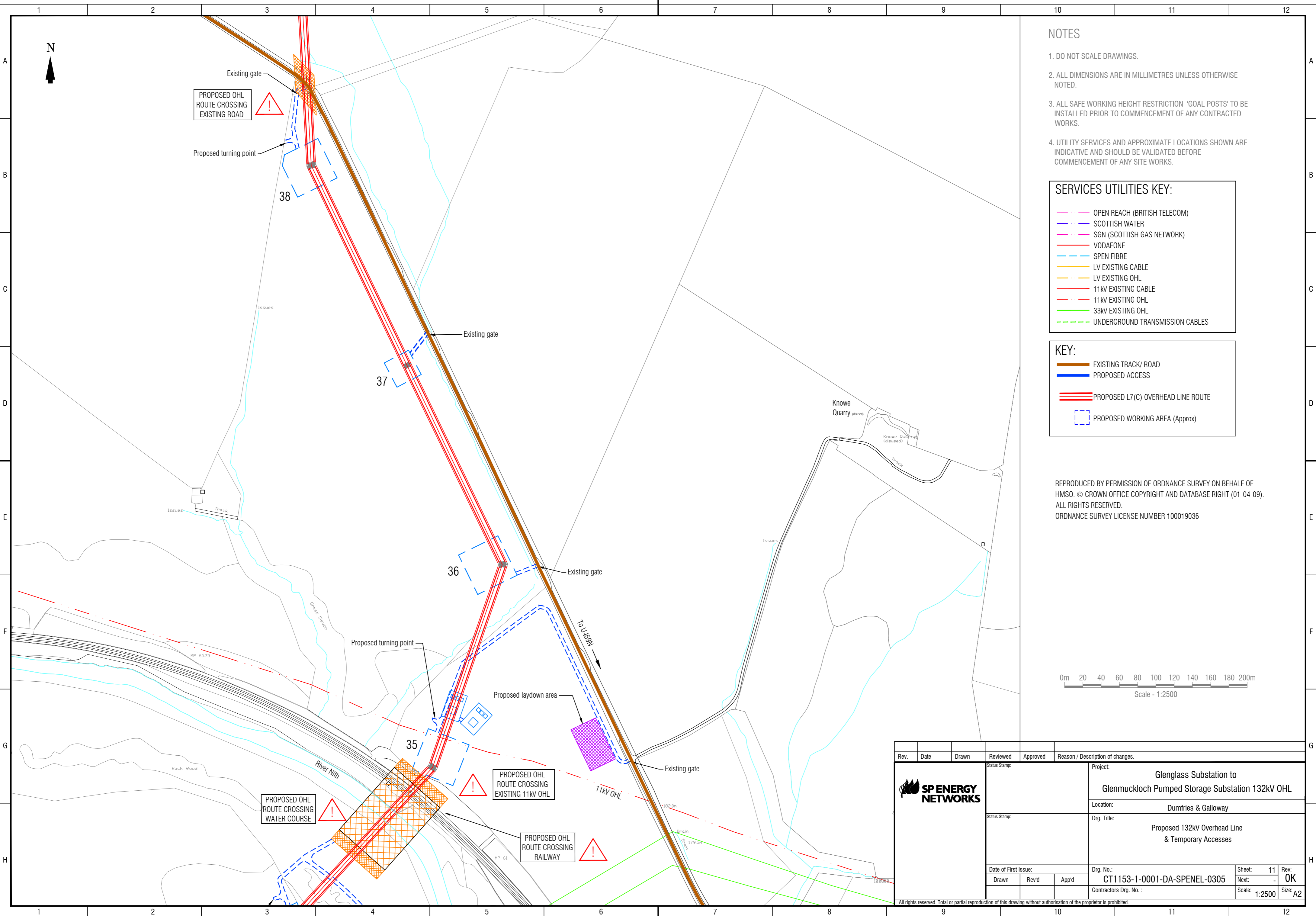
- EXISTING TRACK/ ROAD
- PROPOSED ACCESS
- PROPOSED L7(C) OVERHEAD LINE ROUTE
- PROPOSED WORKING AREA (Approx)

REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN OFFICE COPYRIGHT AND DATABASE RIGHT (01-04-09). ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENSE NUMBER 100019036



Rev.	Date	Drawn	Reviewed	Approved	Reason / Description of changes.
<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> </div> <div> <p>Status Stamp:</p> </div> </div>					
<p>Project: Glenglass Substation to Glenmuckloch Pumped Storage Substation 132kV OHL</p>					
<p>Location: Dumfries & Galloway</p>					
<p>Drg. Title: Proposed 132kV Overhead Line & Temporary Accesses</p>					
<p>Date of First Issue:</p>			<p>Drg. No.: CT1153-1-0001-DA-SPENEL-0305</p>		<p>Sheet: 9</p>
<p>Drawn</p>	<p>Rev'd</p>	<p>App'd</p>	<p>Contractors Drg. No. :</p>		<p>Next: 10</p>
<p>Scale: 1:2500</p>					<p>Rev: OK</p>
<p>Size: A2</p>					

All rights reserved. Total or partial reproduction of this drawing without authorisation of the proprietor is prohibited.



- NOTES**
- DO NOT SCALE DRAWINGS.
 - ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 - ALL SAFE WORKING HEIGHT RESTRICTION 'GOAL POSTS' TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY CONTRACTED WORKS.
 - UTILITY SERVICES AND APPROXIMATE LOCATIONS SHOWN ARE INDICATIVE AND SHOULD BE VALIDATED BEFORE COMMENCEMENT OF ANY SITE WORKS.

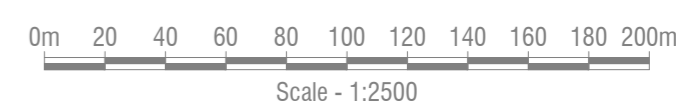
SERVICES UTILITIES KEY:

	OPEN REACH (BRITISH TELECOM)
	SCOTTISH WATER
	SGN (SCOTTISH GAS NETWORK)
	VODAFONE
	SPEN FIBRE
	LV EXISTING CABLE
	LV EXISTING OHL
	11KV EXISTING CABLE
	11KV EXISTING OHL
	33KV EXISTING OHL
	UNDERGROUND TRANSMISSION CABLES

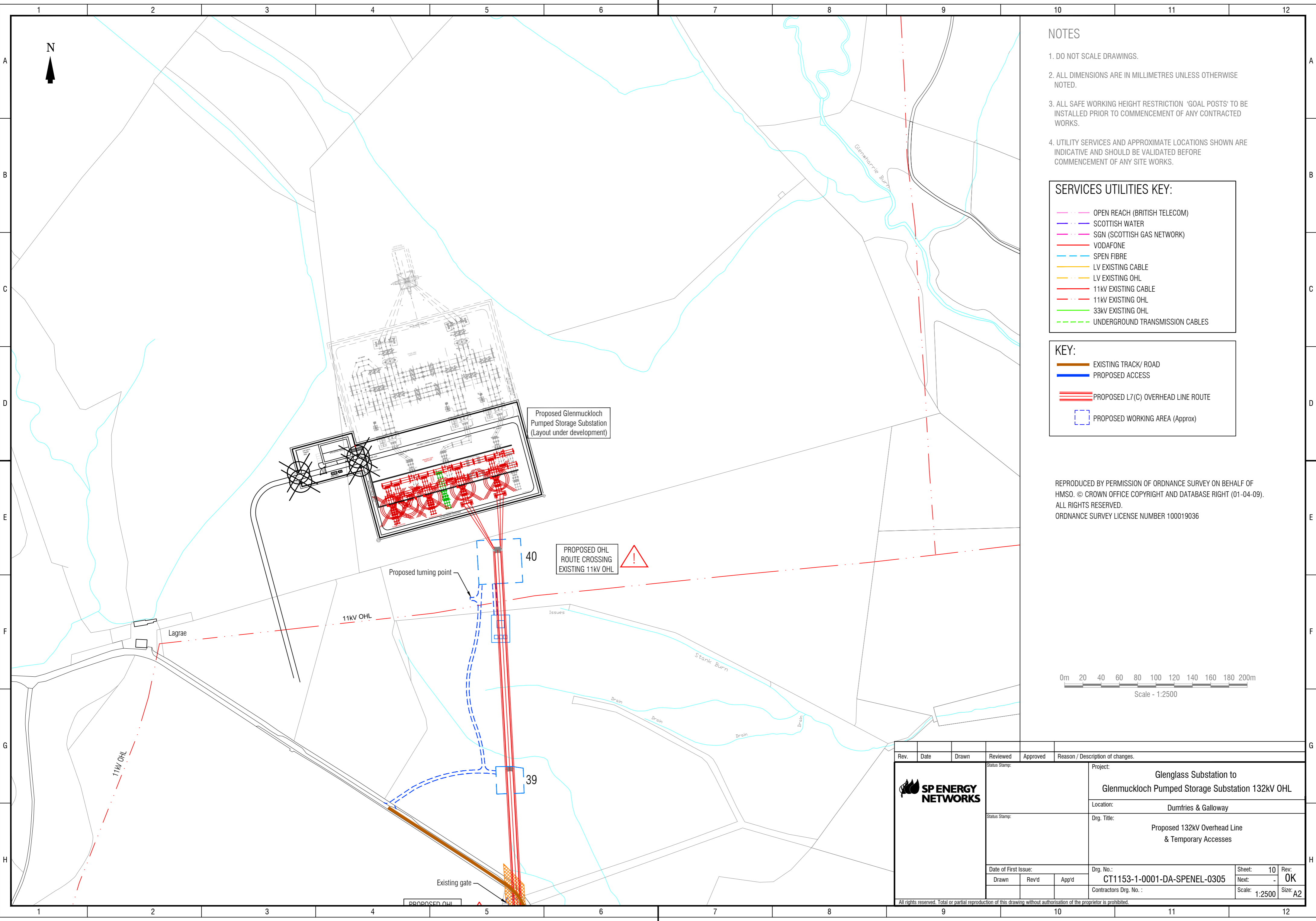
KEY:

	EXISTING TRACK/ ROAD
	PROPOSED ACCESS
	PROPOSED L7(C) OVERHEAD LINE ROUTE
	PROPOSED WORKING AREA (Approx)

REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN OFFICE COPYRIGHT AND DATABASE RIGHT (01-04-09). ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENSE NUMBER 100019036



Rev.	Date	Drawn	Reviewed	Approved	Reason / Description of changes.
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> </div> <div style="width: 60%;"> <p>Status Stamp:</p> </div> <div style="width: 20%;"> <p>Project: Glenglass Substation to Glenmuckloch Pumped Storage Substation 132kV OHL</p> <p>Location: Dumfries & Galloway</p> <p>Drg. Title: Proposed 132kV Overhead Line & Temporary Accesses</p> </div> </div>					
Date of First Issue:			Drg. No.:		Sheet: 11
Drawn	Rev'd	App'd	CT1153-1-0001-DA-SPENEL-0305		Next: -
Contractors Drg. No. :				Scale: 1:2500	Size: A2
<small>All rights reserved. Total or partial reproduction of this drawing without authorisation of the proprietor is prohibited.</small>					



NOTES

1. DO NOT SCALE DRAWINGS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
3. ALL SAFE WORKING HEIGHT RESTRICTION 'GOAL POSTS' TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY CONTRACTED WORKS.
4. UTILITY SERVICES AND APPROXIMATE LOCATIONS SHOWN ARE INDICATIVE AND SHOULD BE VALIDATED BEFORE COMMENCEMENT OF ANY SITE WORKS.

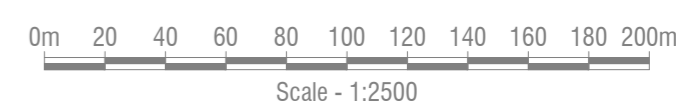
SERVICES UTILITIES KEY:

	OPEN REACH (BRITISH TELECOM)
	SCOTTISH WATER
	SGN (SCOTTISH GAS NETWORK)
	VODAFONE
	SPEN FIBRE
	LV EXISTING CABLE
	LV EXISTING OHL
	11kV EXISTING CABLE
	11kV EXISTING OHL
	33kV EXISTING OHL
	UNDERGROUND TRANSMISSION CABLES

KEY:

	EXISTING TRACK/ ROAD
	PROPOSED ACCESS
	PROPOSED L7(C) OVERHEAD LINE ROUTE
	PROPOSED WORKING AREA (Approx)

REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN OFFICE COPYRIGHT AND DATABASE RIGHT (01-04-09). ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENSE NUMBER 100019036



Rev.	Date	Drawn	Reviewed	Approved	Reason / Description of changes.
Status Stamp:			Project: Glenlass Substation to Glenmuckloch Pumped Storage Substation 132kV OHL		
Status Stamp:			Location: Dumfries & Galloway		
Date of First Issue:			Drg. Title: Proposed 132kV Overhead Line & Temporary Accesses		
Drawn	Rev'd	App'd	Drg. No.: CT1153-1-0001-DA-SPENEL-0305		Sheet: 10 Rev: OK
Contractors Drg. No. :			Scale: 1:2500		Size: A2

All rights reserved. Total or partial reproduction of this drawing without authorisation of the proprietor is prohibited.