

107-129 Seven Sisters Road

April 2013



Need Case

**National Grid Substation
with Residential and Commercial Development**

Need case for a new National Grid substation at 107 – 129 Seven Sisters Road

1 Executive Summary

Over the next 20 years the way we produce and use energy in the UK will change radically as the country works to achieve its CO₂ emissions targets. These changes will have a significant impact on the nation's electrical transmission and distribution networks, and the London area will be more affected than most during this period. In addition to these changes there is also the forecast load growth and the need to replace ageing assets as part of the system management.

In response to these drivers of change, National Grid and UK Power Networks continuously collaborated closely to plan for the future. The challenge is always to determine the best way of providing an electricity network suitable for the future power supply needs of north London whilst maintaining system reliability, including the decommissioning of assets which have reached the end of their serviceable life.

In order to maximise system flexibility during the transition and reduce the risks to system security, it has been concluded that a new connection between the national transmission system and the local distribution network is the most appropriate solution for the currently projected need. Through options analysis it has been determined that the UKPN Islington (Lough Road) substation is the most appropriate connection point for the system reconfiguration necessary for the future load demands.

With all of the existing National Grid substations in the area unable to supply this new connection either because they do not have sufficient physical space or electrical supply capacity, it has been concluded that a new substation will be required. An investigation has been undertaken to determine the most suitable site to meet the requirements of a new substation.

Through an examination of existing substation sites and suitable site availability in the area it was concluded that a new transmission substation at 107-129 Seven Sisters Road, Islington, connected to the UK PN substation at Lough Road via a cable tunnel is the most appropriate solution.

This solution provides the necessary electrical infrastructure to support the essential network changes, whilst reducing disruption and environmental impact in London and providing best value for electricity consumers.

2 Introduction

2.1 National Grid

National Grid owns and operates a portfolio of gas and electrical infrastructure assets across the world. It is the owner and system operator of the electricity transmission system in England and Wales and therefore is responsible for ensuring the stability and security of the electrical power system. It owns and manages over 7,000km of high voltage overhead line, over 700km of underground cable and 338 substations located at 242 sites. A diagram of the supply routes is shown in Figure 1 below.

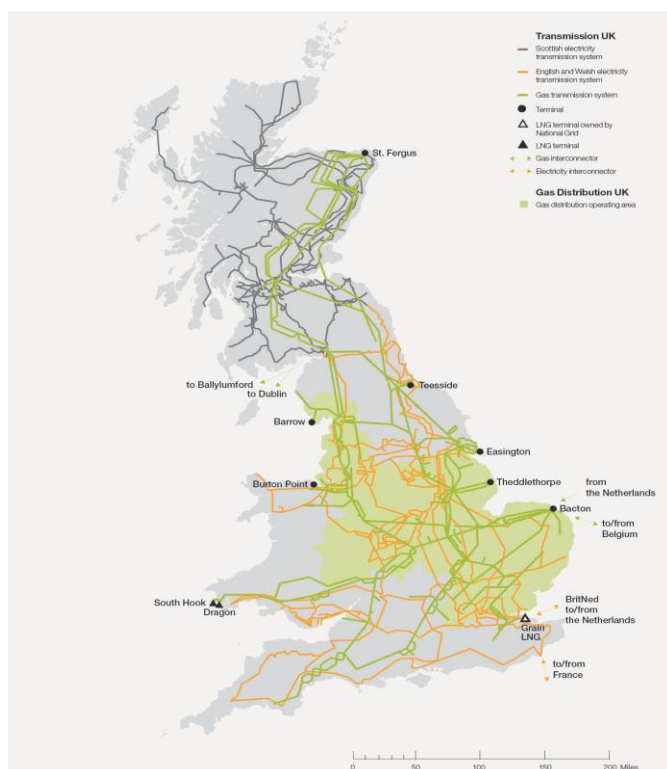


Figure 1: National Grid's assets in England and Wales.

2.2 Need case overview

This need case has been developed in response to load growth in the London area and the replacement of ageing system assets. National Grid and UK Power Networks, the local Distribution Network Owner (DNO) (See Appendix 1) have collaborated closely on the production of this need case to ensure London has a safe and secure electricity supply for the future, capable of supporting the impact of the carbon dioxide reduction targets and the economic growth of London, whilst reducing disruption to the city as a whole, reducing environmental impact and reducing costs to the electricity user.

The aim of the need case is to:

- Demonstrate that there is an increased power requirement (Section 3 refers)

- Demonstrate that UK PN need a new connection point and that it should be at the UKPN Islington (Lough Road) Substation (Section 4 refers)
- Demonstrate that there is a need for a new substation to feed the new Islington connection (Section 5 refers)
- Demonstrate that the 107 – 129 Seven Sisters Road site is the best site for the substation. . (Section 6 refers)

3 Power Requirement

3.1 Future of the UK Electricity network

The UK is committed to achieving an 80% reduction in carbon dioxide emissions by 2050. In order to achieve this, the way electricity is generated, transmitted, distributed and used will be transformed. This process has already started, and will accelerate over the next twenty years, in order to hit the interim target of a 60% reduction by 2030.

This will require:

- the closure of carbon dioxide producing coal fired power stations largely situated in the Midlands and northern England, with replacement by, amongst other sources, wind powered generation constructed off the east coast of England;
- a switch from petrol and diesel vehicles to electric ones, requiring charging overnight from the electricity network;
- a substantial switch from the use of natural gas to heat homes to the use of ground sources heat pumps powered by electricity;
- energy efficiency measures, such as home insulation and smart metering.
- greater interconnectivity with Europe, to create a pan-continent transmission network.

These changes will cause significant modifications to the demand and usage profiles throughout the national transmission and local distribution networks. National flows of electricity will change from a general north to south movement to one that carries electricity from east to west. Peak usage, particularly in urban areas, will switch from day-time to night-time, and this peak will be larger than at present. This will be most prominent in large urban areas, such as London, which is expected to have a higher than average take-up of electric vehicles.

It is against this back-drop that large investments are planned in the transmission and distribution networks to ensure they are able to support the essential changes in usage and generation required to achieve the UK's carbon dioxide emissions reduction targets.

3.2 Load Changes

Load changes at specific sites can occur for a variety of reasons including load growth (e.g. more consumers or more usage by consumers), large scale infrastructure improvement projects such as Crossrail and London Underground upgrade works and system reconfiguration (how reliability and flexibility are managed and controlled). These changes can either be initiated by the Distribution Network Operator (DNO) or National Grid (NG). In London the DNO, UK Power Networks (UKPN) have historically been experiencing a load

growth of typically 4% per year and forecasts indicate that while the rate might decrease, load growth is anticipated for the foreseeable future (See Appendix 2). Without increases in electricity supply capacity in the north London area, these developments, which are essential to the sustainable, economic health of London, will not be possible.

4 The need for a new National Grid connection to the UKPN Islington (Lough Road) substation

4.1 Asset Replacement

Many of the most critical assets in the Islington area were installed in the early 1950s and several UKPN substations in the area will require asset replacement and upgrading in the coming years due to expiring system life. A number of the existing cable routes will also require replacing as they are nearing the end of their asset life. A traditional “like-for-like” replacement approach would be more disruptive to the local communities, take longer to complete, be more expensive and not provide the additional capacity required.

4.2 The solution

The challenge has been to determine the best way of meeting the forecast load growth, maintaining system reliability and decommissioning assets at the end of their serviceable life. To meet this challenge UKPN have concluded that a new connection from the National Grid system will be required to their existing Islington substation at Lough Road, and for this substation to supply other existing UKPN sites such as St Pancras. Islington Substation [Lough Road] is the only UKPN site with the necessary space availability to feed these upgraded substations. It also has good existing interconnecting infrastructure with nearby sites, through its link to Holloway. It has been considered better to develop an existing UK PN site, such as the Lough Road site, rather than create a new one.

This strategy brings environmental benefits through the decommissioning of fluid filled cables and maintains the quality of supply through the decommissioning of ageing assets. It provides the additional capacity required to ensure secure electrical supplies required for future economic development and Regulatory compliance. Other UKPN sites in the area do not have the space available for such a connection, nor are they as well connected to other UKPN sites (See Appendix 3).

4.3 Connection Application

This solution was discussed jointly between UKPN and NG and UKPN then formally submitted a Connection Application for the new supply. NG has a regulatory obligation to provide a quotation to UKPN and upon acceptance, a supply, in accordance with its operating licence. This formal request initiates the investigation of suitable supply options.

5 New National Grid Substation to feed the Islington Connection Point

5.1 Constraints

In determining a suitable location for supplying a new connection point National Grid examined their current substation sites in the vicinity of the UKPN substation at Lough Road. These are St John's Wood; City Road and Hackney. All other sites were considered to be too remote from the UKPN site to provide a cost effective solution.

For an existing site to be suitable it must have sufficient space to locate up to four super grid transformers (SGT) including all associated switchgear and ancillary equipment. The total load at the site must not exceed 1500MW as this would require a complete upgrade of the site to meet Regulatory requirements for additional safeguards to prevent major power outages.

The UKPN connection requirements were requested to be provided in three phases: Two SGTs to be commissioned in 2016; a third SGT to be commissioned 2017 with provision for a fourth SGT likely to be commissioned in 2025. This is in line with the increasing load growth and UKPN asset replacement strategy.

5.2 Consideration of existing sites

St Johns Wood has insufficient electrical capacity or physical space for the new equipment necessary to provide a supply point to UKPN. There is already an identified future need to transfer load away from this site to maintain reliability of supply of electricity to north London. The substation is bounded by well developed areas and a canal so expansion of this site is not possible.

City Road has insufficient electrical capacity or physical space for the new equipment necessary to provide a supply point to UKPN. There is already an identified future need to transfer load away from this site to maintain reliability of supply of electricity to north London. The substation is bounded by well developed areas and a canal basin so has restricted space for expansion.

Hackney has the electrical capacity but does not have the physical space for the additional equipment necessary to provide a supply point to UKPN. This substation is bounded by other developments and protected parklands which preclude the expansion of the site.

In conclusion, the additional UKPN connection point at Islington cannot be supplied via existing National Grid sites since they are either physically too small or have insufficient available electrical capacity. Fuller analysis of these three sites can be found in appendix 4. Therefore a new National Grid substation is required at a new site to supply the new connection point at Islington.

6 Criteria for site selection for new Substation

In selecting a site for the new substation, National Grid must consider a number of criteria as part of the assessment process. These include:

6.1 Space

Although technology improvements and innovation in recent years have seen reductions, substation equipment by its very nature is large and requires significant space to be installed, operated and maintained. National Grid's approach has been to consider the requirements for forecast growth to 2025 in its site selection, to ensure the site is suitable for the future.

Based on preliminary designs it was ascertained that to build a standard substation with all equipment installed on one level, that a plot size of 4600m² would be required.

6.2 Shape

The footprint of 4600m² is based on a regularly shaped rectangular site, allowing a logical layout of the equipment, and able to support on-going operations and maintenance requirements. If the site is not of this shape then it is likely that this footprint would need to be increased.

6.3 Timescales

In order to ensure availability of electricity does not limit growth, and in order to protect security of supply, National Grid and UK Power Networks have obligations to provide the additional capacity by October 2016, and so any site selected must allow for safe construction within this timeframe.

6.4 Least disruption to London.

National Grid has assessed the possible sites and solutions, looking for an option that causes least disruption to London as a whole.

6.5 Least cost to the electricity user.

Through the regulatory regime, National Grid is obligated to select options that provide the best value for money for the electricity users. Ofgem, the industry regulator reviews the decisions that National Grid make in order to ensure that this is the case.

6.6 Availability of 400kV supply

In the development and review of options, National Grid considered the availability of a 400kV supply required to feed a new substation.

At the time of the connection request from UK Power Networks, National Grid were developing the London Power Tunnels scheme and recognised that an integrated solution with this project would be key to achieving the above criteria.

London Power Tunnels is a programme of work to renew and upgrade the electricity transmission network in north London by replacing cables at the end of their design life with new cables installed in tunnels over 30m below the streets of London. This deep-buried solution has been selected by National Grid in order to minimise the disruption to London. (See Figure 2). At the time of the Connection Application, the route of the tunnel had been largely fixed, and would pass within 700m of the Islington site.

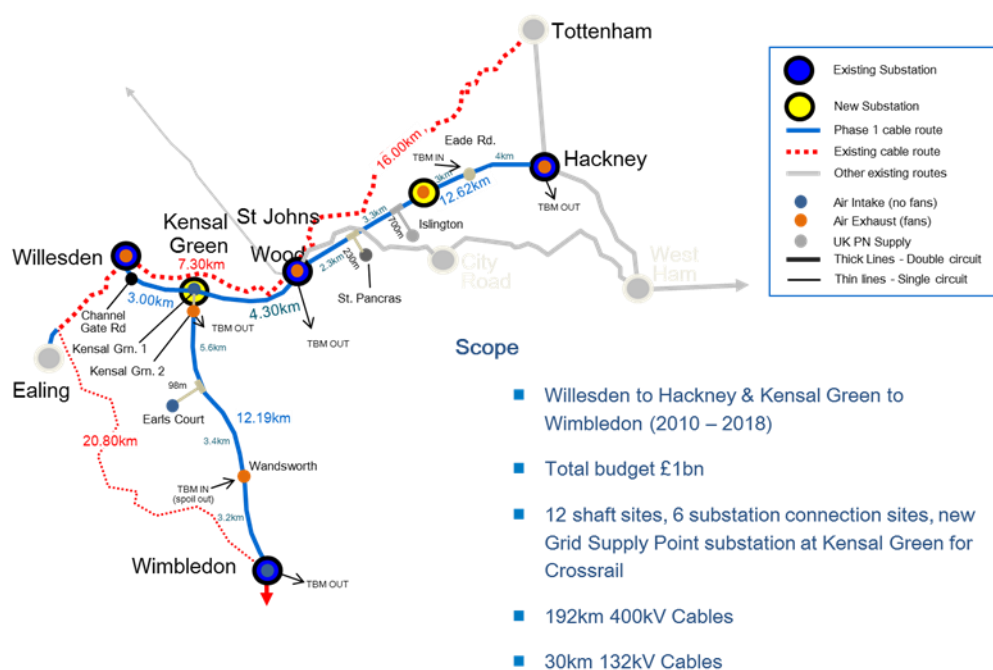


Figure 2 – London Power Tunnels Programme

6.7 Proximity to the main road network

During construction, the road network in the area of the substation must be suitable for all construction and delivery traffic, including the transformer deliveries. Transformers are moved under a Special Order from the Highways Agency (the load plus trailer weight are in excess of 150te) on a vehicle that has an overall length of approximately 70m.

6.8 Current Land Use

This will determine the suitability for development as a substation site. Land that is currently allocated for parks or leisure is less desirable for the construction of a substation than land that is currently empty or allocated for development.

6.9 Site Selection

Using the above criteria, a search was conducted along the length of the tunnel near to the Islington substation [Lough Road] to establish the availability of any suitable site (Appendix 5 refers). In addition to this the areas surrounding land secured by National Grid for the tunnel head house construction and land currently owned by UKPN were also examined to establish suitability.

6.10 Conclusion

Following the steps identified above, very few viable sites were identified. However, the following four options were acknowledged as deserving further investigation and analysis:

- Option 1 - UKPN Islington Substation [Lough Road]
- Option 2 - A combination of UKPN Islington Substation [Lough Road] and a site at Hillmarton Road
- Option 3 – 107 – 129 Seven Sisters Road
- Option 4 - Eade Road

The analysis (see appendix 6) revealed that the option 1 was not constructible within the project timeframe; option 2 was operationally restrictive and option 4, required significant business relocation to allow parallel construction of the tunnel and substation. Option 3 was therefore selected as the most suitable location.

6.11 Subsequent review

Subsequent to the original analysis leading to the selection of the Seven Sisters Road site, an additional search for sites further removed from the main tunnel alignment was undertaken using a systematic scored approach. Details of how this was done are contained in Appendix 7. This analysis did not identify any further sites worthy of additional consideration.

7 Conclusion

Through effective collaboration and analysis National Grid and UKPN have arrived at a strategy for future power supply in north London and a site for the Grid Supply Point and Connection which reduces disruption, reduces environmental impact and reduces costs to consumers.

The 107-129 Seven Sisters Road site was selected as most suitable because:

- It has the space to fit all the equipment now and that required up to 2025.
- It has the space to facilitate the construction of the substation at the same time as the tunnelling works, therefore reducing the risk of late completion.
- Part of the site was vacant, and was previously in commercial use.
- It is the option that required the least relocation of businesses and demolition of commercial premises.
- It required only the demolition of a small number of low quality housing units.
- It is in close proximity to an existing planning consent for the tunnel head house building.

In the opinion of National Grid, the site provides the best solution of the future electricity demands of north London whilst minimising disruption to the local community and best value for money for electricity users.



Figure 3 - 107-129 Seven Sisters Road site.

Appendix 1: Distribution Network Operators

Electrical Distribution Network Operators (DNOs) operate and maintain the electrical supply system in particular areas, as shown in Figure 4. These systems obtain power from the National Grid transmission system through Grid Supply Points, and transform and distribute the electrical power to various consumers at an appropriate voltage.



Figure 4: Distribution Network Owner areas in the United Kingdom.

London Power Networks is DNO for the London area (See Figure 5) and is owned by UK Power Networks (UKPN), following the sale of these assets by EDF Energy in 2010.

The London network is almost exclusively underground and covers an area of 665 sq km with cables stretching over 30,160km.

Hub 1 London

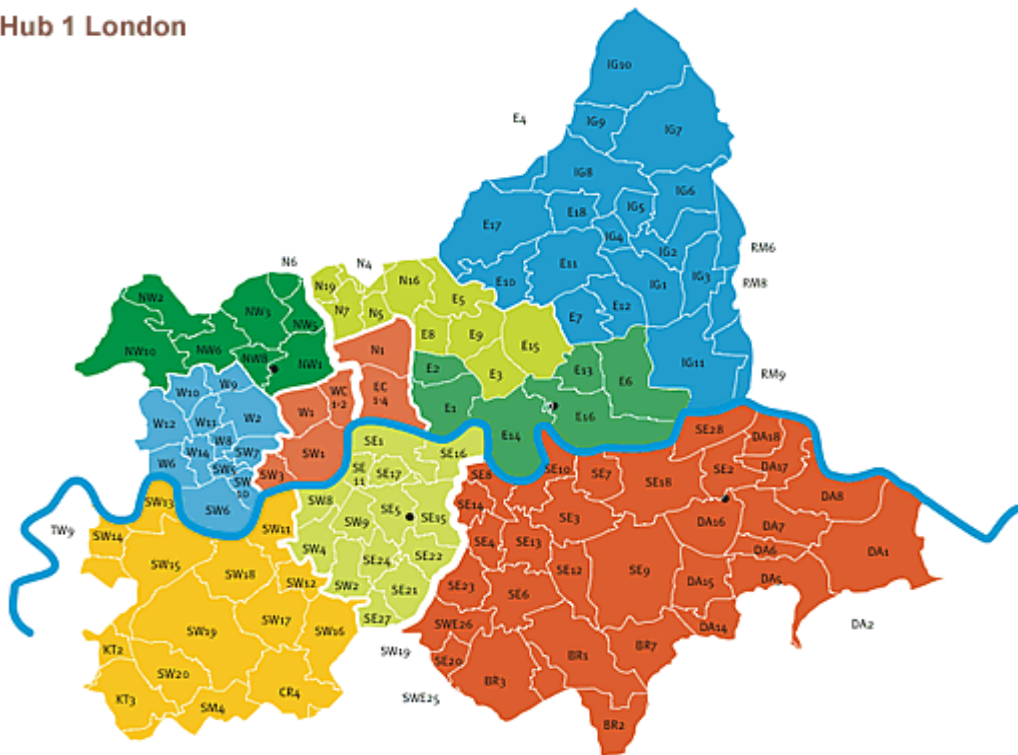
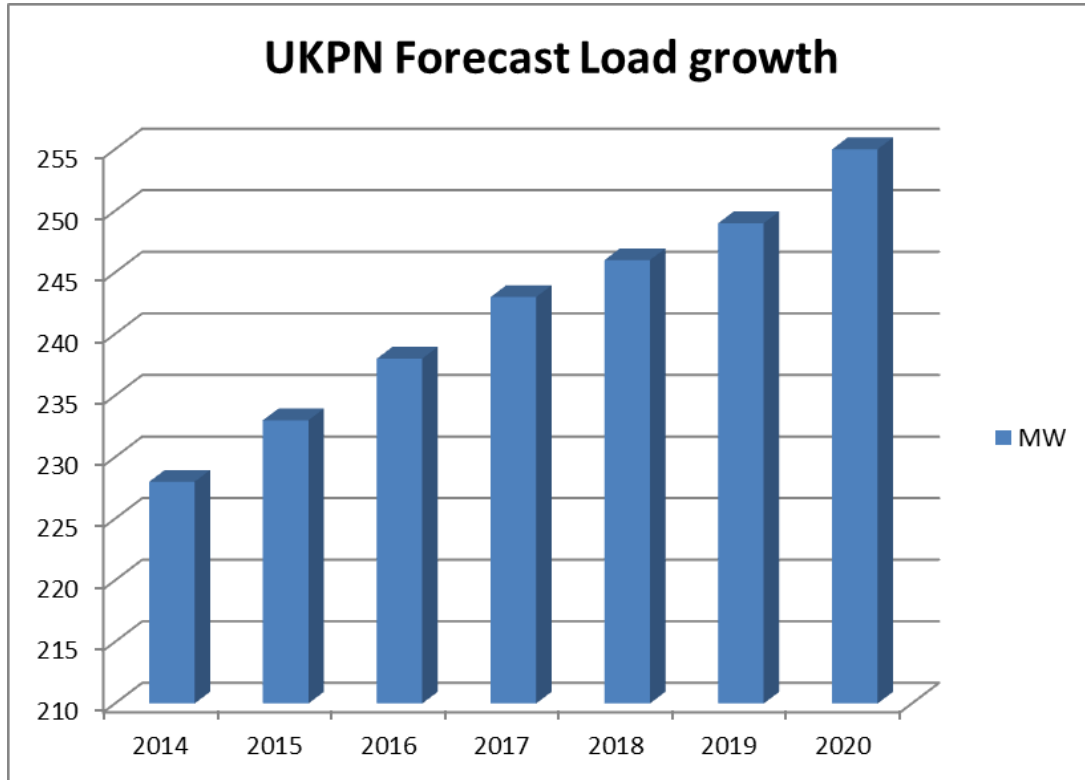


Figure 5: London Power Networks distribution area.

Appendix 2: Load Growth Forecast Data



Forecast load growth submitted with the UKPN connection application.

Appendix 3: Why is Islington Substation (Lough Road) the best site for UK PN to connect a new supply from National Grid?

Many of the most critical assets in the Islington area were installed in the early 1950s. Several UKPN substations, such as St Pancras, Islington, Holloway and King Henry's Walk will require asset replacement in the coming years due to expiring system life. A number of the existing cable routes will also require replacing as they are nearing the end of their asset life. To ensure on-going reliability, many of these assets must be replaced in the next regulatory period. The key issue is how to use the new GSP to best advantage?

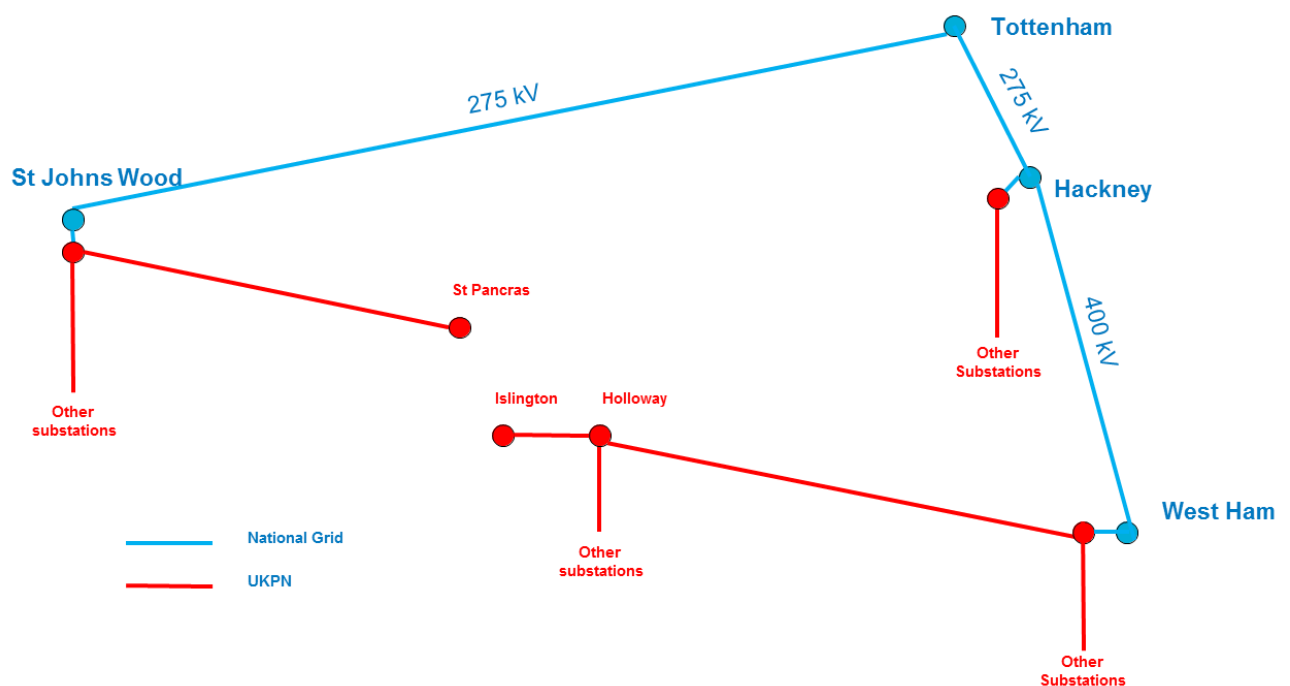


Figure 6 shows the current high level network configuration in the Islington area.

The St Pancras to St Johns Wood UKPN cable is nearing the end of its serviceable life. In addition some assets at St Pancras and King Henry's Wharf substations need replacing. The London Power Tunnels programme will see the replacement of the 275kV cable from Tottenham to St Johns Wood, with a higher capacity 400kV cable from Hackney to St Johns Wood.

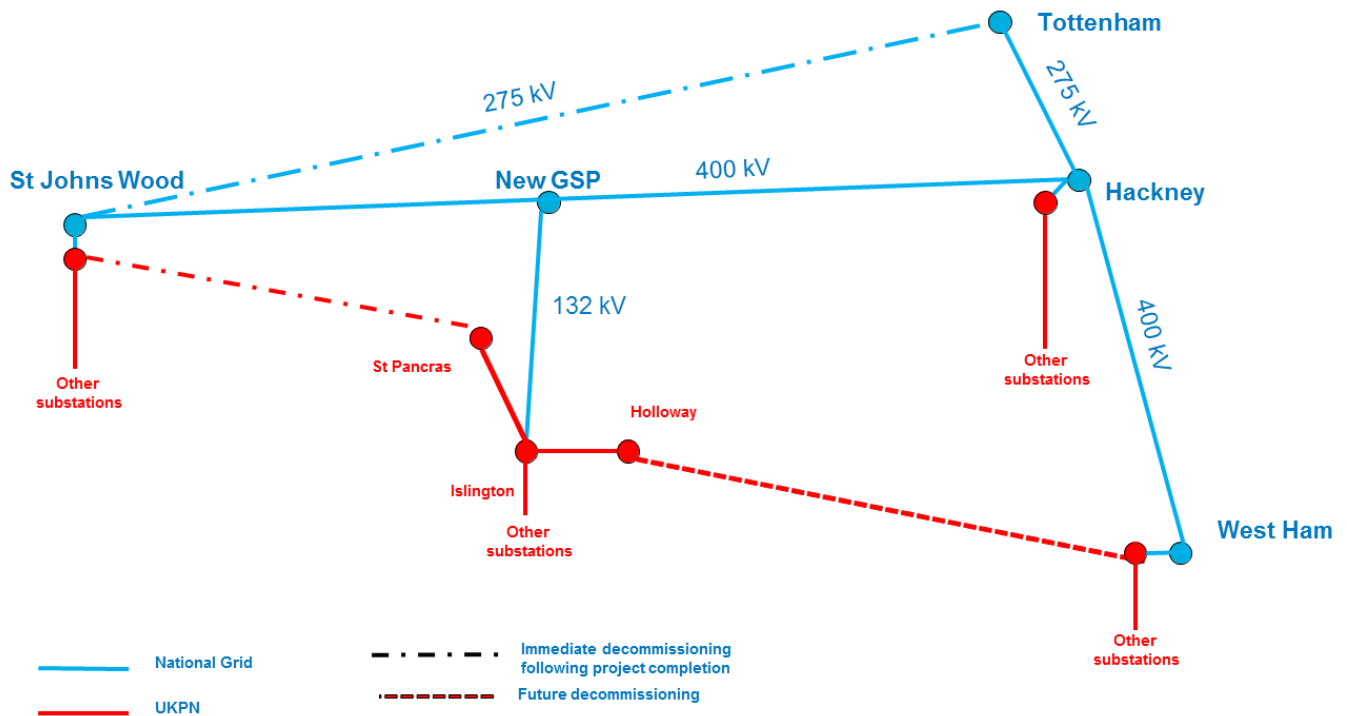


Figure 7: Proposed future network configuration

The proposal (See Figure 7) is to replace the assets at St Pancras and other nearby substations with modern, higher capacity equipment. Islington Substation is the only UKPN site with the necessary space availability to feed these upgraded substations. It also has good existing interconnecting infrastructure with nearby sites, through its link to Holloway. It has been considered better to develop an existing site, such as Islington, rather than create a new one.

This strategy brings environmental benefits through the decommissioning of fluid filled cables and maintains the quality of supply through the decommissioning of ageing assets. It removes the requirement for the replacement of several 66kV cables in north London. Studies have shown that this strategy is economically the optimum solution compared to like for like replacement and local reinforcement. It also facilitates future interconnection between the new GSP and existing GSPs to further improve the resilience of the network.

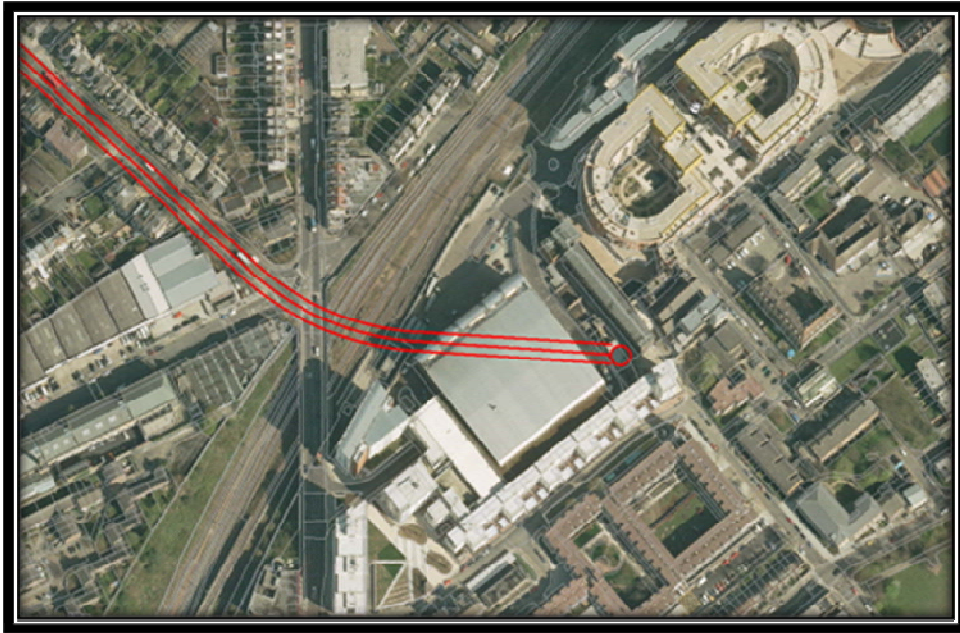


Figure 8: Lough Road, Islington, showing the cable tunnel route and location of the NG Headhouse

To conclude, a new GSP is required in the area and the Islington Substation [Lough Road] (See Figure 8) is the right UKPN substation to connect it to. In order to facilitate this UK PN have requested from NG 3 x 240MVA supplies at Islington in 2016, with provision for a 4th likely to be required in 2025.

Appendix 4: Consideration of Existing National Grid Sites

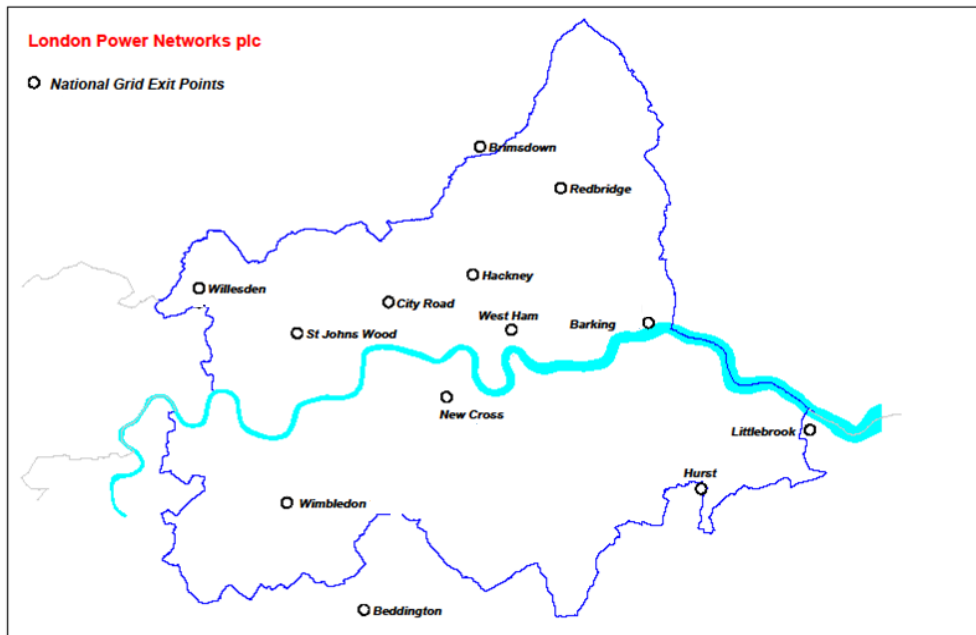


Figure 9: Location of Grid Supply points

UK PN receives supplies from National Grid at a number of key “exit points” or **Grid Supply Points** in north London. The main National Grid GSPs relevant to this connection request are St Johns Wood, City Road and Hackney (See Figure 9). The others shown on the diagram are too far away to be relevant to this application.

UKPN has requested 720MW of additional supplies from NG by 2016 with a further 240MW by 2025.

1. St Johns Wood (See Figure 10)

This site currently supplies a load of 1400MW to the surrounding area. This load is forecast to exceed 1500MW during 2013/14. This would require a complete upgrade of the site. Regulatory requirements state that at more than 1500MW, additional safe guards are required to prevent major power outages. The site is full. There is an identified future need to transfer load away from this site to maintain the reliability of supply of electricity to north London. The site is bounded by a canal on one side and roads and housing. It would not be possible to house all the equipment required on this site.

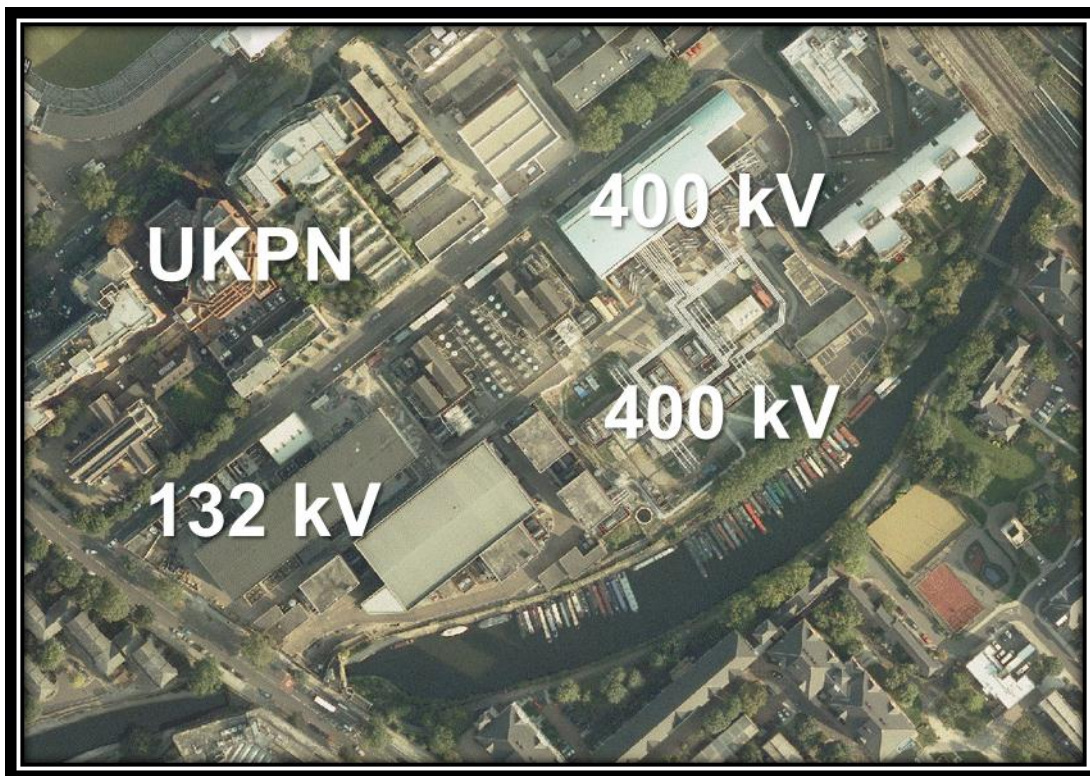


Figure 10: St Johns Wood Grid Supply Point

2. City Road (See Figure 11)

This site currently supplies 1100MW of power into north and central London. This load is forecast to grow to 1450MW by 2016. There is no spare capacity to take additional load from St Johns Wood, or any additional growth. The space to the north of the site is insufficient for the required expansion to upgrade the site to >1500MW i.e. complete replant. In addition, there is no existing cable route between City Road and Islington.

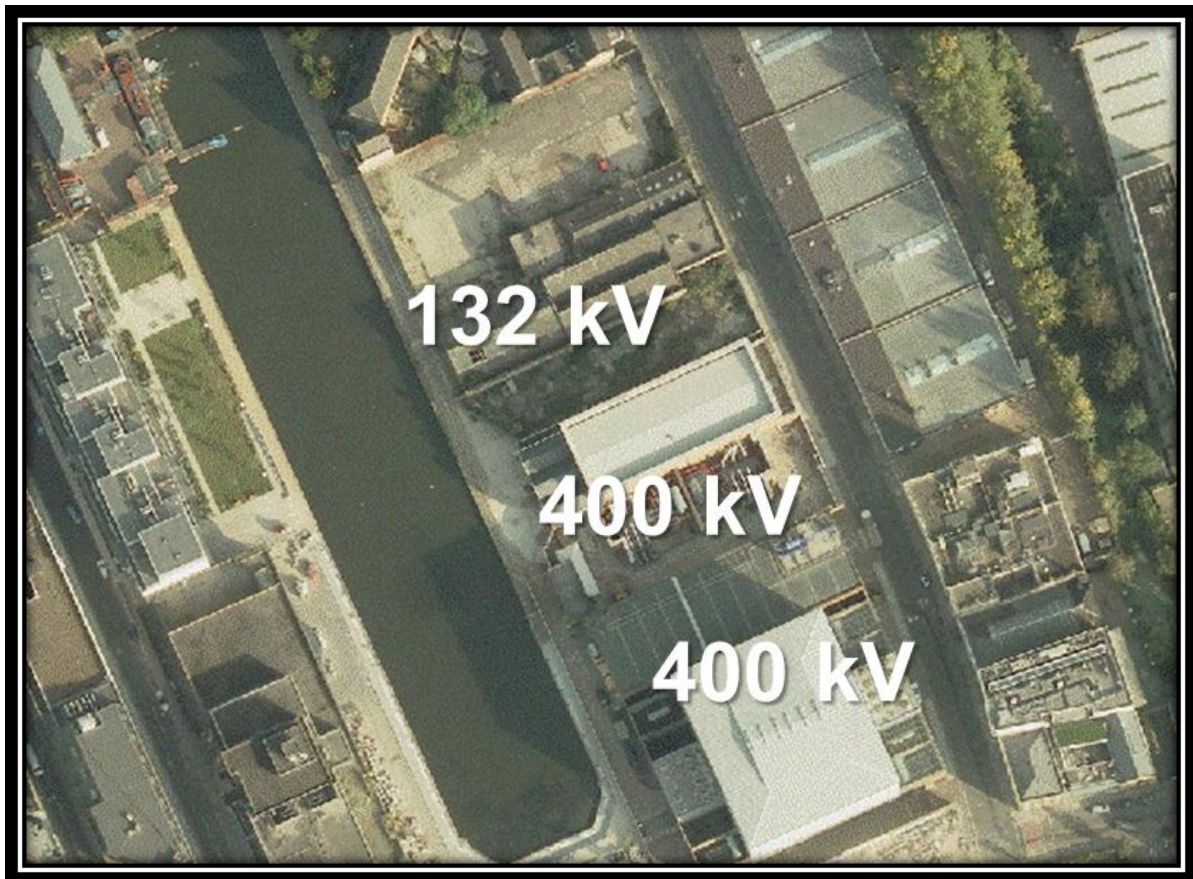


Figure 11: City Road Grid Supply Point

3. Hackney (See figure 12)

This site currently supplies a 530MW load, but the site is full. No space available for addition equipment required for major shift of demand from other two sites, even below 1500MW.

Red area is construction lay down to be handed back. Rest of the site is full, and bounded on one side by a park, and on the other by new flats. No space for increased capacity on existing land or opportunity to buy additional land.

Temporary laydown – to be handed back as park land

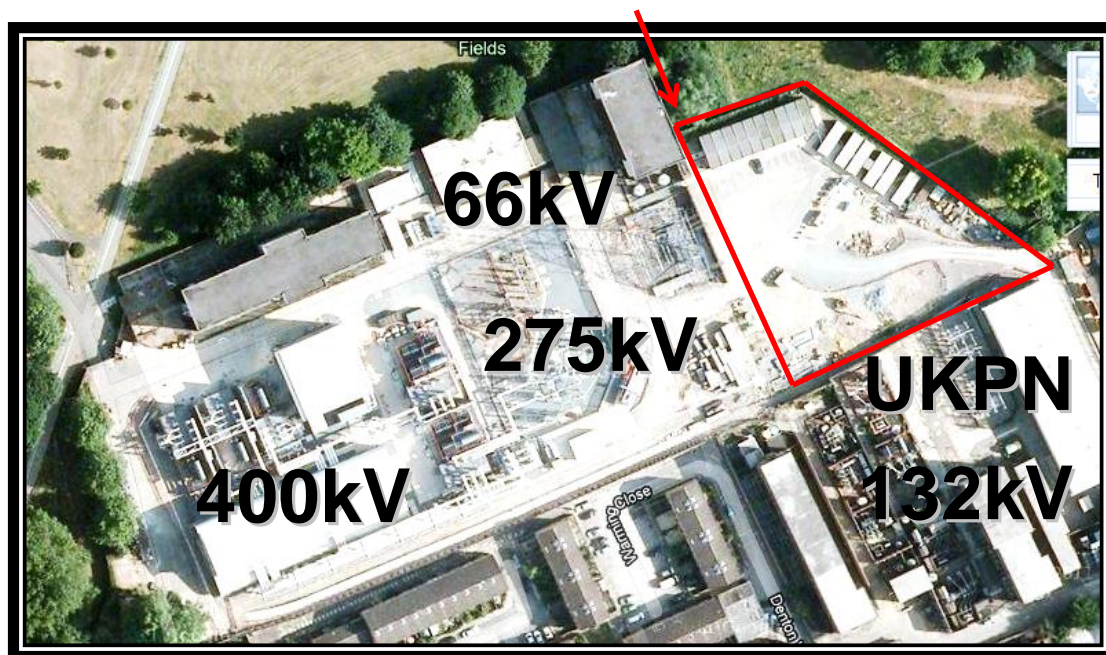


Figure 12: Hackney Grid Supply Point

4. Conclusion

UKPN require additional supplies in North London to maintain security of supply. The required load cannot be supplied via existing National Grid sites due to existing load capacity constraints versus predicted growth and insufficient available space. Load needs to be transferred away from existing sites to maintain security of supply. Therefore a new Grid Supply Point substation is required.

Appendix 5 – Investigation of Others Sites

In early assessment of possible sites was undertaken by reviewing the land use along the route of the London Power Tunnels programme.

1. Stamford Hill Rail – Finsbury Park Station

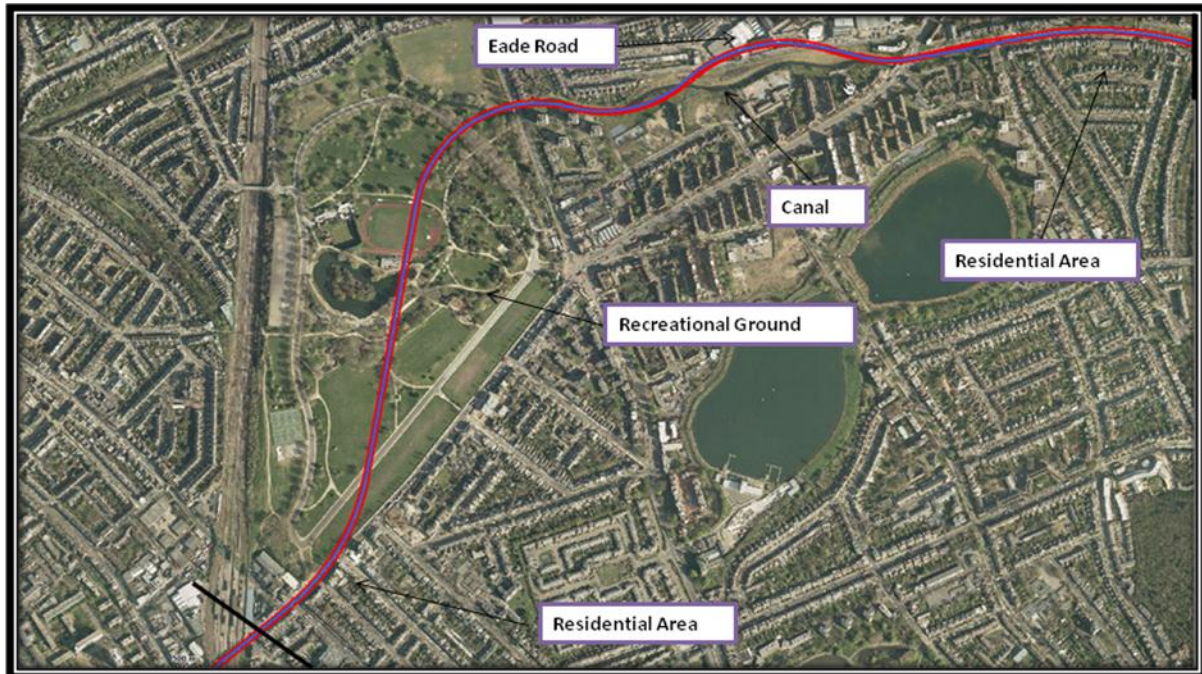


Figure 13

2. Finsbury Park Station – Eburne Road

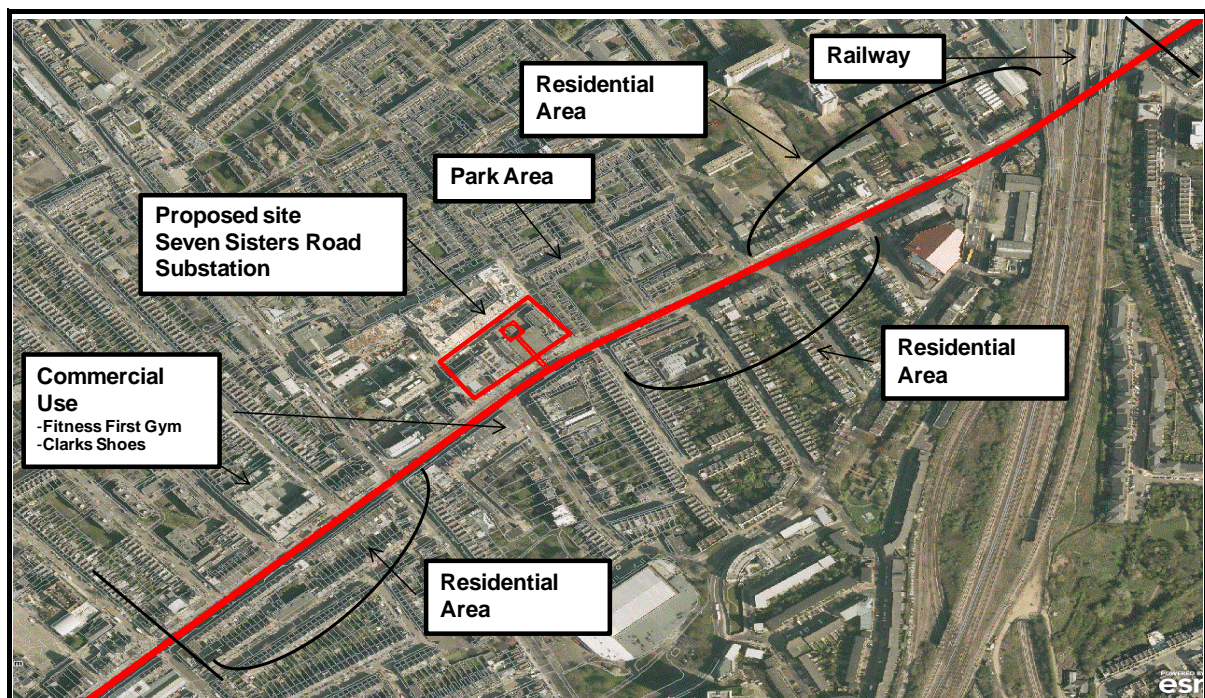


Figure 14

3. Eburne Road – Dalmeny Avenue

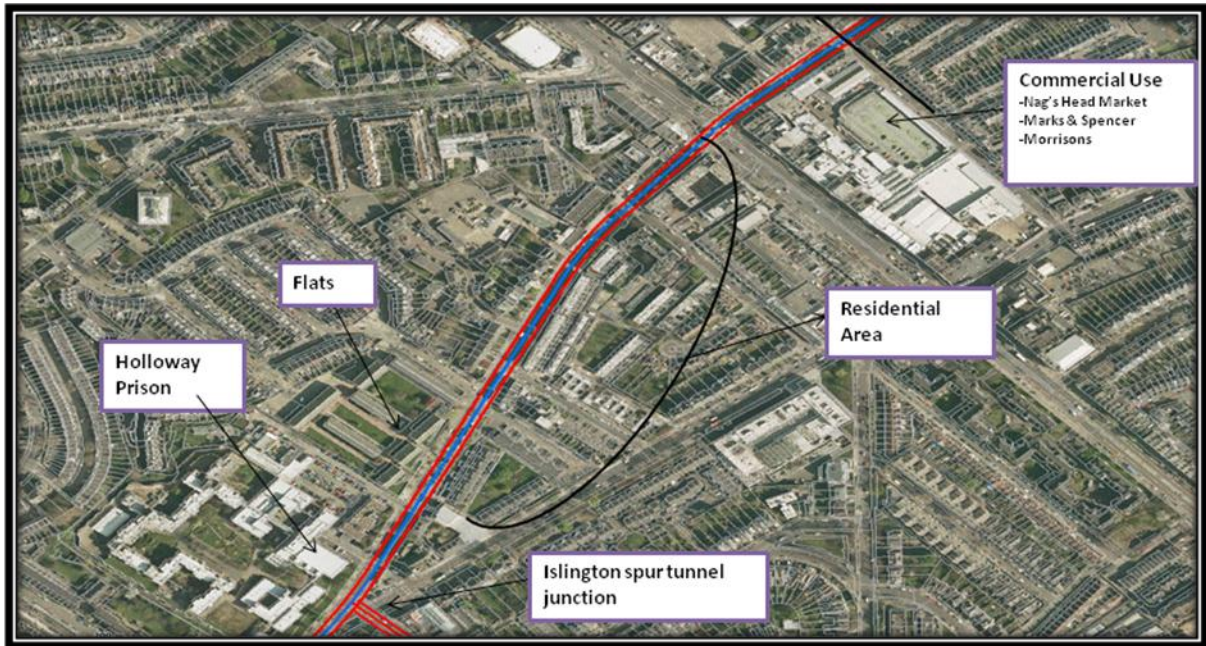


Figure 15

Conclusion

From reviewing the route, it can be concluded that no other site in the area was suitable for consideration or shortlisting.

Appendix 6: Why locate the new Grid Supply Point substation at Seven Sisters Road?

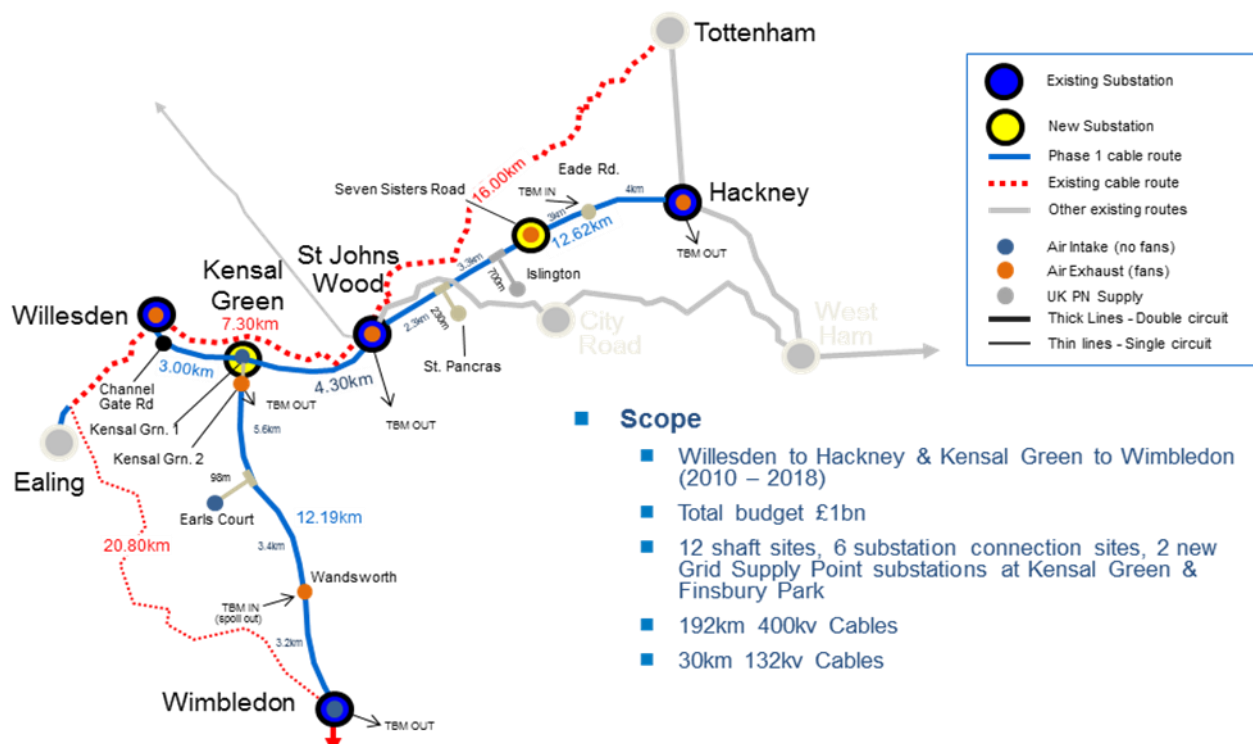


Figure 16 – London Power Tunnels Programme

National Grid's London Power Tunnels programme (See Figure 16) is a collection of projects which together will see the replacement and upgrade of the transmission system across north London. Given the new cables pass close to the Hornsey Street, Islington site, it is logical to put the new substation on or near the new tunnel alignment, and ideally adjacent to an existing head house site. The new cables have sufficient capacity to meet the supply needs, and making use of an existing head house site reduces the overall impact on London.

The timeline for this programme of works, including the new substation is as follows:

- 2011/12 – Work starts on NG London Power Tunnels.
- 2013/14 - St Johns Wood full and future load growth must be supplied from City Road and West Ham on a temporary basis. Construction of tunnels and shafts.
- 2013/14 - Build new GSP and install cables.
- 2015 - Test new cables and substation.
- 2016 – Energise first two supplies to Islington UK PN substation from the new GSP – re-distribute loads.

- 2017 – Energise third supply to Islington UK PN substation from the new GSP – further re-distribute loads.

N.B. 2016 is the forecast date at which National Grid would fail to meet Regulatory SSQS requirements without a new GSP. i.e. One or both St Johns Wood and City Rd at or above 1500MW.

Four options were considered as viable configurations for the new substation.

Option 1: All at the Islington connection point

Construction of a new 400kV double busbar substation, with the cables looped into the substation from the tunnel circuits. The substation building would need to house the NG 400kV equipment, the 132kV UKPN substation and three SGTs within composite building.

This option was rejected because:

- Not constructible within project timeframe
- Limited space for construction
- No room for the fourth SGT required to meet the SQSS requirements after 2025
- Security of supply issues with NG and UKPN assets in a single building

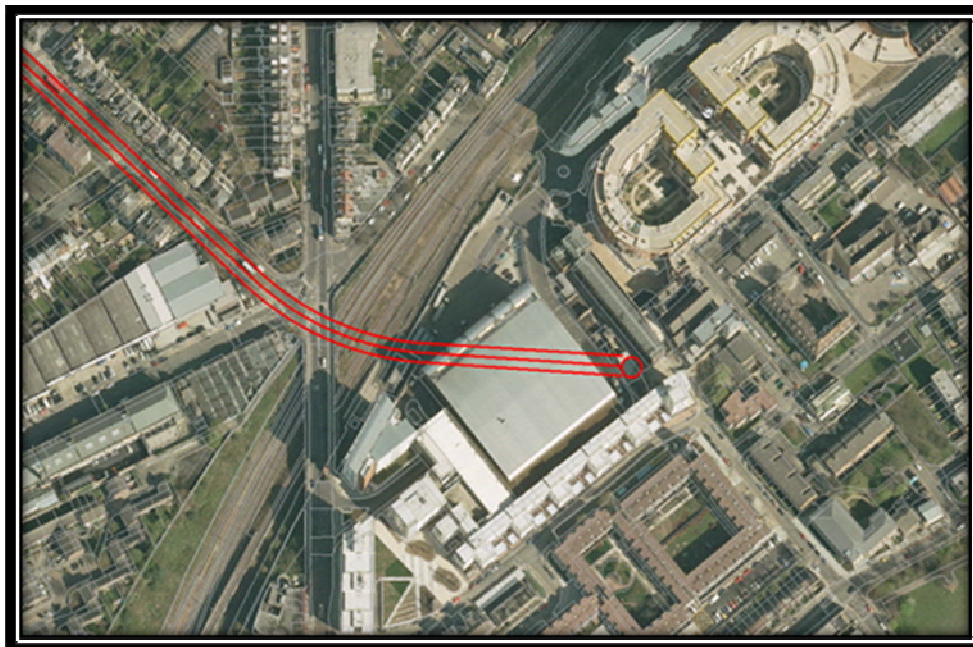


Figure 14: Hornsey St, Islington, showing the cable tunnel route and location of the NG Headhouse

Option 2: Islington & Hillmarton Rd

Construction of a 400kV single mesh substation with a two SGT arrangement at Islington and supplemented by a 3rd SGT connection at the satellite location of Hillmarton Rd

Reasons for rejection:

- Construction at Islington remains problematic
- Required assets to be split between Islington (2 SGTs) and Hillmarton Rd (1 SGT) - less operational flexibility
- Holloway site has limited space too
- No room for the fourth SGT required to meet the SQSS requirements after 2025.

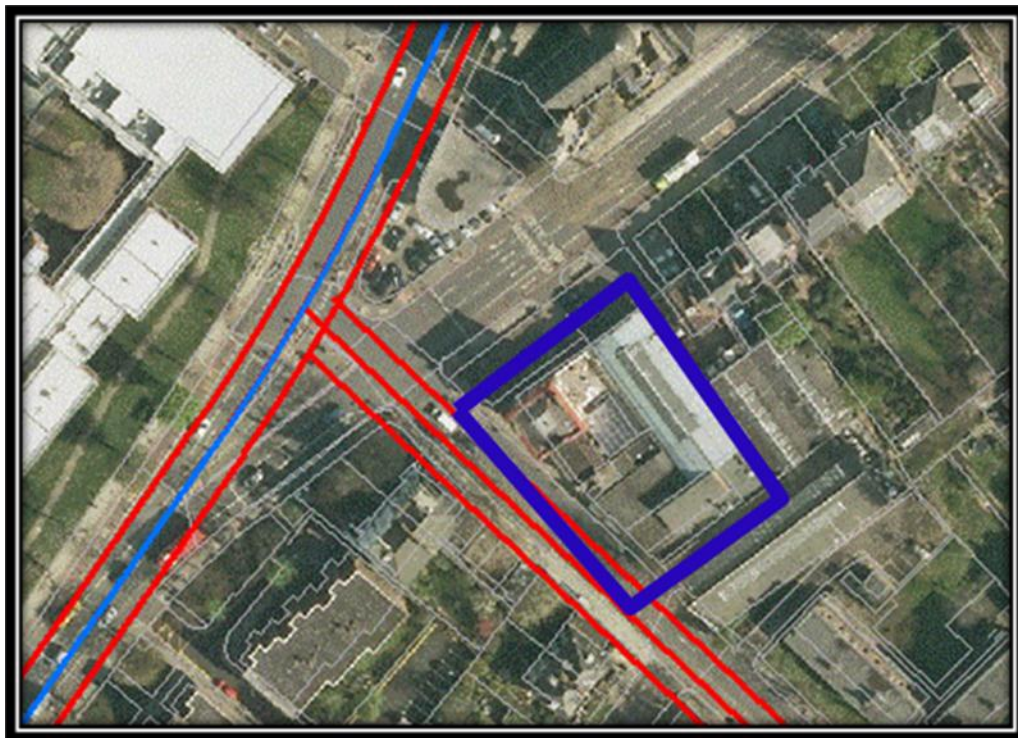


Fig15: Hillmarton Road / Camden Road, N7.

Option 3: Seven Sisters Road Substation

Construct a 400kV double busbar substation and three 400/132kV SGTs at Seven Sisters Road Substation with space for a fourth.

- Partially empty site
- Deliverable to original timeframe – not a drive site and can be constructed in parallel with the tunnel construction
- More technically efficient solution
- Sufficient room for the fourth SGT required to meet the SQSS requirements after 2025
- More cost efficient
- Least overall disruption to communities



Figure 16: 107 Seven Sisters Road

Option 4: Eade Road

Construct a 400kV double busbar substation and three SGTs at Eade Road with space for a 4th.

Reasons for rejection:

- Will not fit on land currently owned by NG and vacant, as the site is a tunnel drive site too (Red area - simplified).
- Area in Yellow will need to be vacated and demolished to build substation AFTER tunnelling completed – high risk of missing required dates
- Area in Blue would be required as well in order to construct the substation in parallel with the tunnelling activities.
- Requires longer cables than Seven Sisters Road.
- More expensive to electricity customers than Seven Sisters Road.

Special employment zone – area has already suffered demolition and relocation of businesses for use as a drive site. Would result in loss / relocation of more viable jobs and businesses than Seven Sisters Rd site.

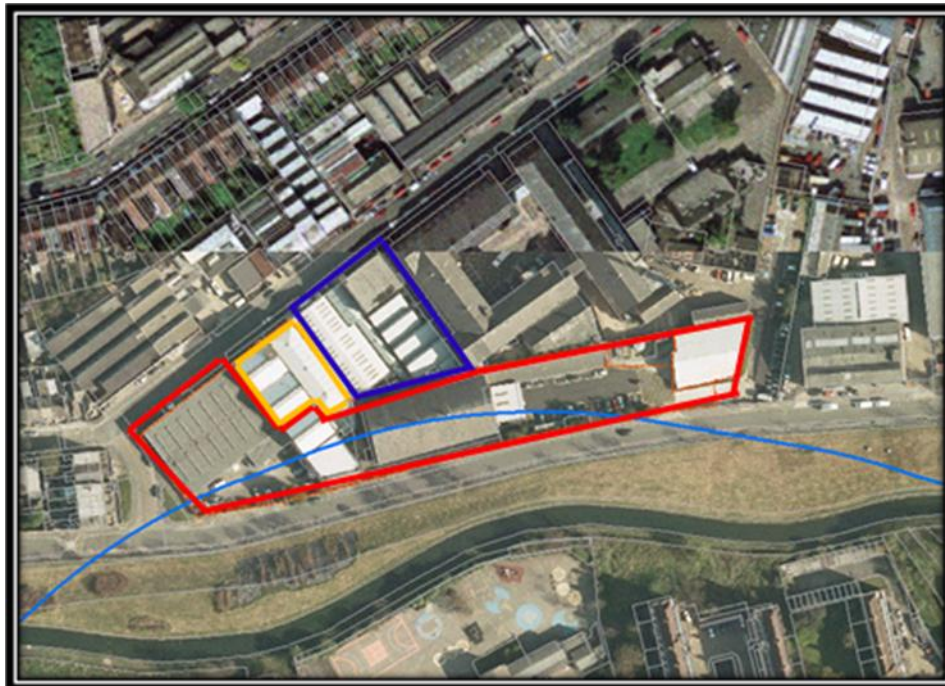


Figure 17: 85-169 Eade Road, N4

Appendix 7

Need Case Site Review

Preliminary designs indicated that a plot of land of at least 4600m² was suitable for the construction of a substation to meet the needs for the connection of Islington. The shape of the plot is important as there are restrictions on the physical layout of some of the equipment. Also, both above and below ground access to the site is essential to permit deliveries and allow connection to the rest of the NG system. The above ground access has to be suitable for the delivery of the transformers which are abnormal indivisible loads and require special vehicles.

An electronic desk top search was conducted along a 1600m corridor centred on the tunnel for a plot of land that met the 4600m². All the identified plots were assessed against the determined criteria to ascertain its suitability for use as a substation. The assessment criteria were:

Shape of Plot

- A rectangular plot (nearing square) was scored 1
- a long thin rectangular plot scored 2
- a non-linear plot scored 3

Tunnel Access to Plot

- In line with tunnel scored 0
- Two separate road accesses scored 1 (minimal easements under existing properties)
- One road access to plot scored 2 (some easements under existing properties)
- No discernible road access scored 3 (easements under all existing properties)

Road Access to Plot

- Delivery routes for construction and AIL vehicles scores 1
- Delivery routes for construction and AIL vehicles through residential areas scores 2
- No delivery route for AIL scores 3

Current Use

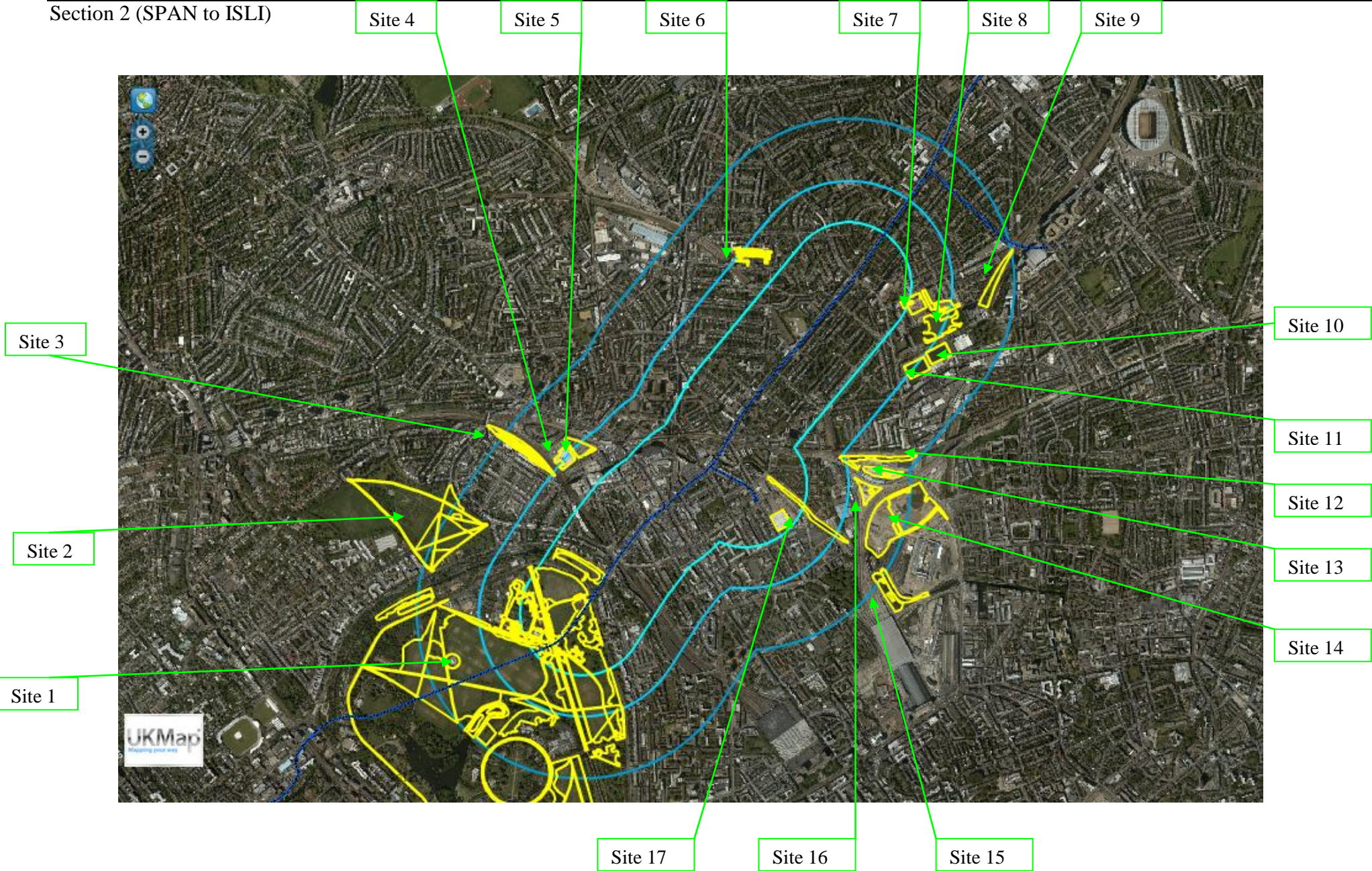
- Existing 0
- Empty 1
- Construction 2
- Commercial 3
- Green or Leisure 4

Section 1 (SJOW to SPAN)

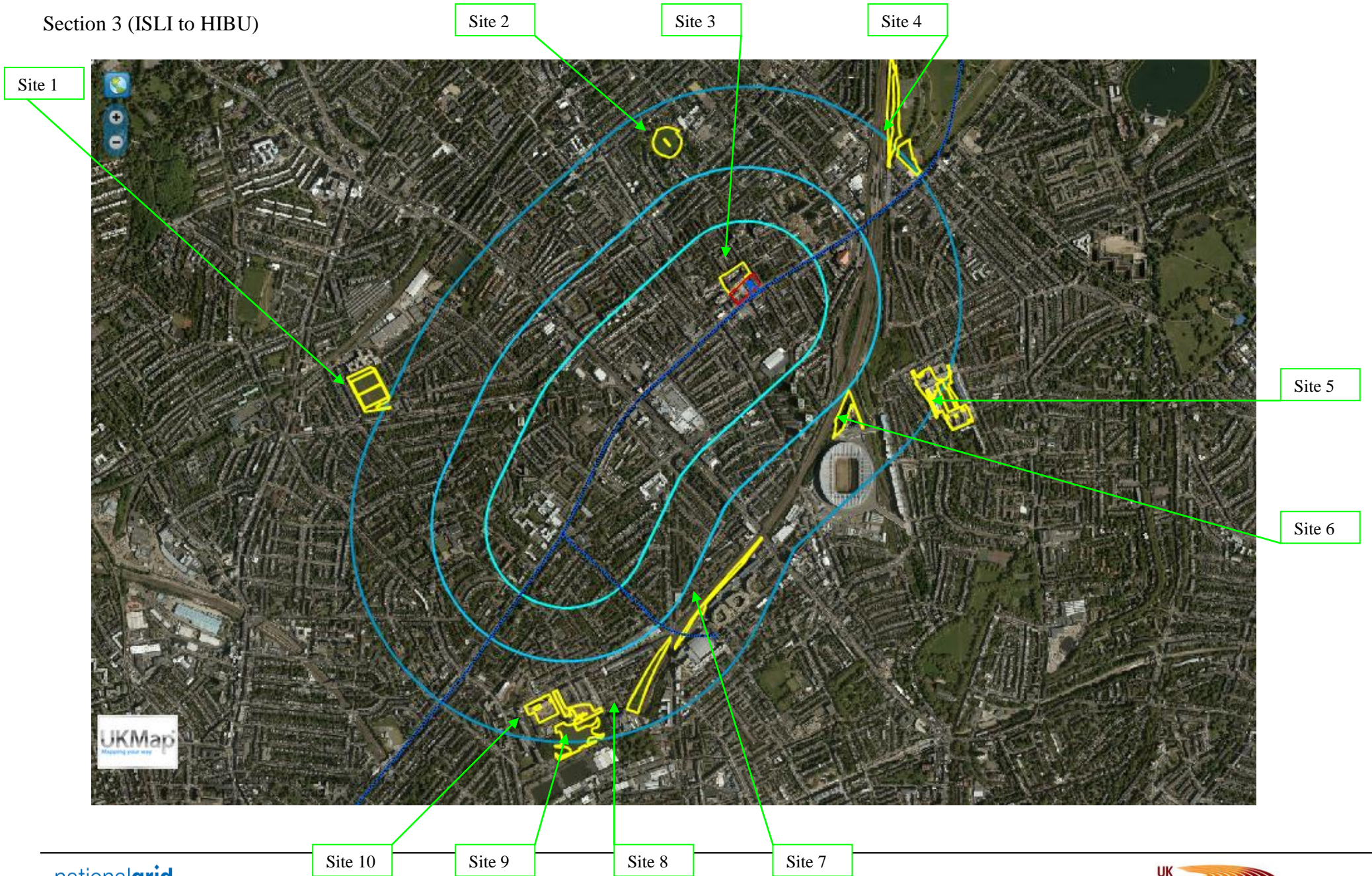


Need Case

Section 2 (SPAN to ISLI)

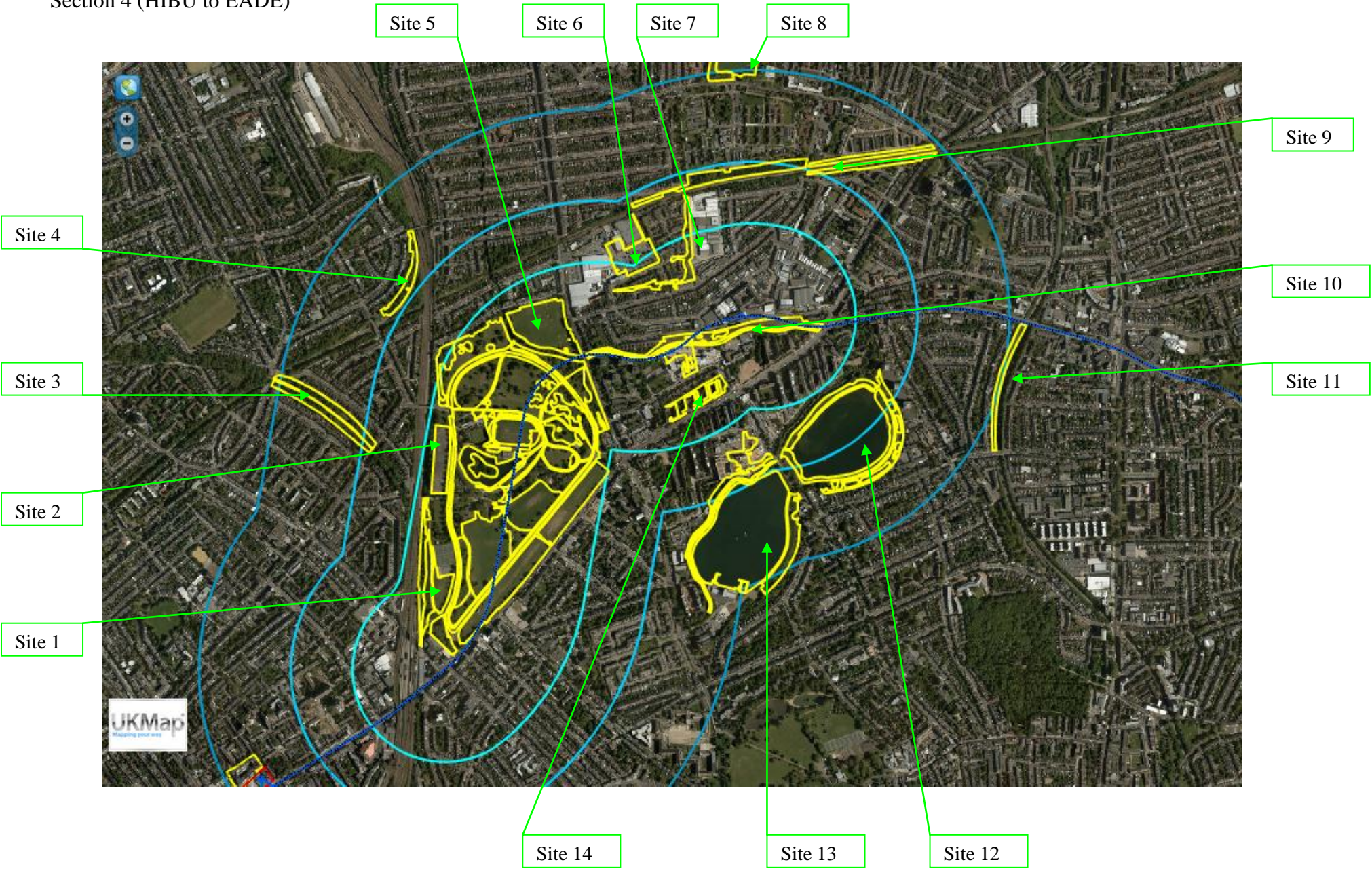


Section 3 (ISLI to HIBU)



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Section 4 (HIBU to EADE)



Section 5 (EADE to HACK)



SITE SCORING

Site	a Shape	b Tunel Access	c Road Access	d Current Use	(a+b+c)*d Total	
1.1	Recreational Space	2	3	2	4 *	28
1.2	Cricket Ground	1	2	1	4	16
1.3	Cricket Ground	1	2	1	4	16
1.4	Recreational and Leisure	1	2	1	4	16
1.5	Recreational and Leisure	1	2	2	4	20
1.6	Recreational and Leisure	1	0	2	4	12
1.7	Canal	2	1	1	4	16
1.8	Commercial Site	1	3	1	3 *	15
1.9	Recreational and Leisure	1	3	2	4 *	24
1.10	Roads	2	3	1	4 *	24
1.11	Canal	2	3	1	4 *	24
1.12	Substation	1	0	1	0	0
2.1	Recreational and Leisure	1	0	2	4	12
2.2	Recreational and Leisure	1	2	2	4	20
2.3	Railways	2	3	2	3	21
2.4	Retail Distribution	1	3	2	3	18
2.5	Retail Distribution	1	3	2	3	18
2.6	Residencies	1	3	3	4	28
2.7	Under Development	1	3	2	2	12
2.8	Recreational and Leisure	1	3	2	4	24
2.9	Railways	2	3	2	3	21
2.10	Football Ground	1	3	2	4	24
2.11	Football Ground	1	3	2	4	24
2.12	Railways	2	3	2	3	21
2.13	Industrial Site	2	3	3	2	16
2.14	Under Development	1	3	3	2	14
2.15	Recreational and Leisure	2	3	2	4	28
2.16	Construction Site	2	3	3	2	16
2.17	River	2	3	3	4	32
3.1	Football Ground	1	3	3	4	28
3.2	Cricket Ground	1	3	3	4	28
3.3	Construction Site	1	2	1	2	8
3.4	Railways	2	2	3	3	21
3.5	Construction Site	1	3	3	2	14
3.6	Railways	2	2	3	3	21
3.7	Railways	2	2	3	3	21
3.8	Railways	2	3	2	3	21
3.9	Recreational and Leisure	1	3	2	4	24
3.10	Under Development	1	3	2	2	12
	Islington Substation	1	0	1	0	0
4.1	Recreational and Leisure	2	1	2	4	20
4.2	Recreational and Leisure	1	1	2	4	16
4.3	Woodland and Scrub	2	3	3	4	32
4.4	Railways	2	3	2	3	21
4.5	Recreational and Leisure	1	1	2	4	16
4.6	Retail Distribution	1	3	2	3	18

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Site	Shape	Tunnel Access	Road Access	Current Use	Total
4.7 Recreational and Leisure	3	3	2	4	32
4.8 Recreational and Leisure	1	3	2	4	24
4.9 Railways	2	3	2	3	21
4.10 Recreational and Leisure	2	1	3	4	24
4.11 Railways	2	3	2	3	21
4.12 Reservoir	1	3	3	4	28
4.13 Reservoir	1	3	3	4	28
4.14 Residencies	3	3	1	4	28
Eade Road - Head House	2	0	1	2	6
5.1 Recreational and Leisure	2	1	2	4	20
5.2 Recreational and Leisure	3	3	2	4	32
5.3 Railways	2	3	2	3	21
5.4 Railways	2	3	2	3	21
5.5 Railways	3	3	2	3	24
5.6 Reservoir	1	3	3	4	28
5.7 Scrub Land	1	1	3	4	20
5.8 Permanent Pasture	1	2	3	4	24
5.9 Industrial Sites	1	1	3	3	15
5.10 Hackney Substation	1	0	1	0	0
5.11 Residencies	1	2	2	4	20
5.12 Railways	3	3	2	3	24

* These sites were discounted as 4m diameter tunnel stops at St John's Wood

Conclusions

The five lowest scoring sites comprise existing National Grid substation sites and sites in the vicinity of the proposed head houses at Eade Road and Seven Sisters Road. No new sites were identified as suitable for further analysis.