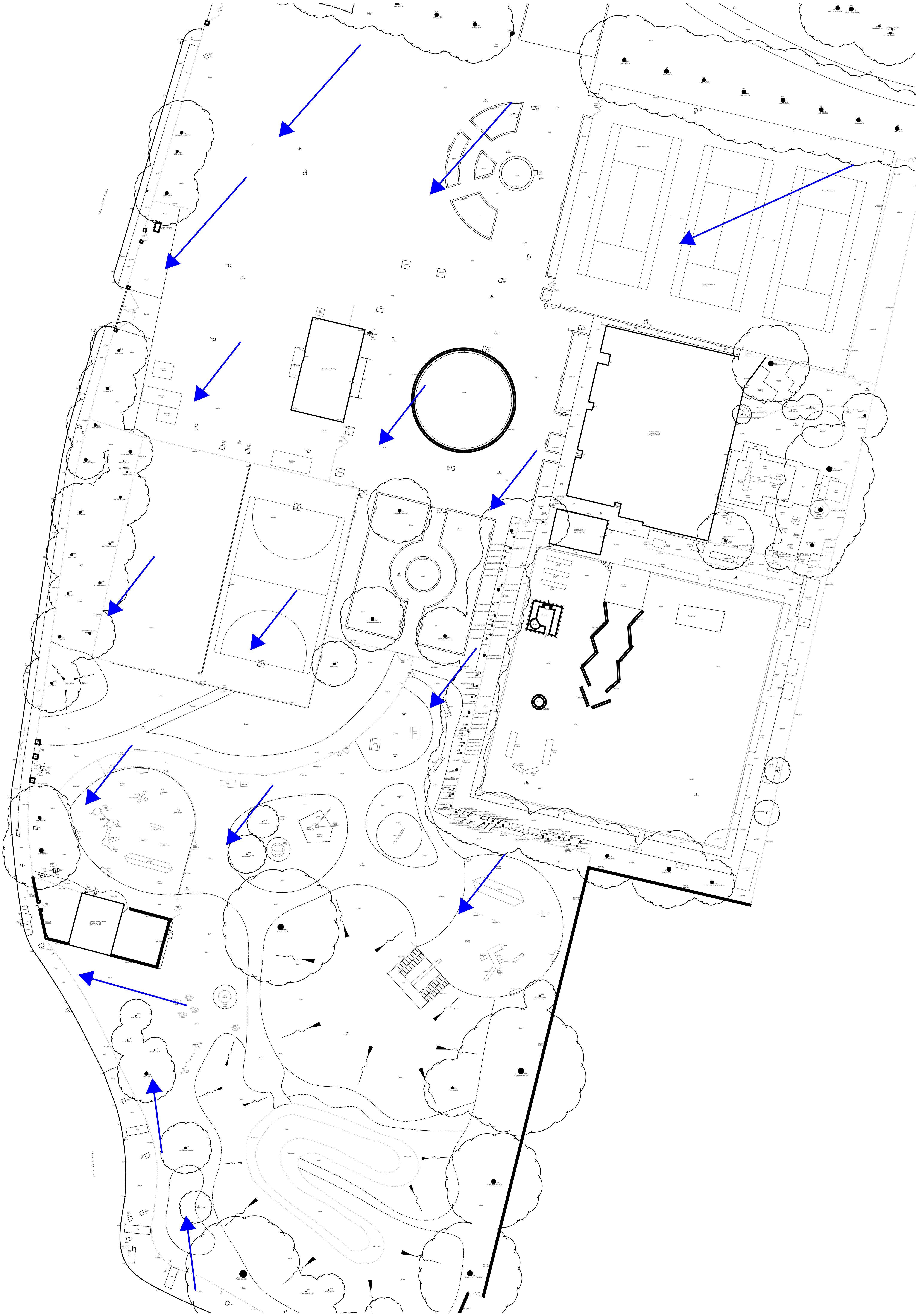




E. Borehole Logs



Ground and Environmental Services Limited

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**Down Lane Park
Adjacent to Park View Road & Ashley Road
Tottenham Hale
London
N17 9AU**

Geo-Environmental Investigation Report

On behalf of Ebsford Environmental Ltd



Document Reference: 12230/GEI

October 2019

air quality assessment contaminated land ecology environmental audits noise assessment
environmental impact assessments flood risk assessments geotechnical engineering ground investigation
hydrogeology noxious weeds remediation design risk assessments waste management

Site: Down Lane Park, Adjacent to Park View Road & Ashley Road, Tottenham Hale, London, N17 9AU

Document Reference No: 12230/GEI

Quality Management

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Date	October 2019
Revision	0

Table of Contents

1	INTRODUCTION	1
2	SITE LOCATION AND LAYOUT.....	1
3	SITE HISTORY	5
4	ENVIRONMENTAL SETTING	6
4.1	GEOLOGY.....	6
4.2	GROUNDWATER.....	7
4.4	RADON.....	7
4.5	OTHER ENVIRONMENTAL INFORMATION.....	7
5	INTRUSIVE INVESTIGATION.....	9
5.1	FIELDWORK	9
5.2	GROUNDWATER.....	10
6	LABORATORY TESTING.....	12
6.1	GENERAL	12
6.3	ANALYTICAL TESTING.....	12
7	SUMMARY OF GROUND CONDITIONS	14
8	ENGINEERING DESIGN.....	16
8.1	OUTLINE FOUNDATION DESIGN	16
8.1.1	Other Foundation Options.....	17
8.2	GROUND FLOORS	18
8.3	TEMPORARY WORKS	18
8.4	SOAKAWAYS	18
8.5	CHEMICAL ATTACK ON BURIED CONCRETE.....	18

9	GROUND CONTAMINATION ASSESSMENT	19
9.1	SOIL QUALITY	19
9.1.1	Toxic Metals	20
9.1.2	Phytotoxic Metals	20
9.1.3	Organic Compounds.....	20
9.1.4	Inorganic Compounds	21
9.1.5	Asbestos.....	22
9.2	SOIL GAS.....	22
9.3	WATCHING BRIEF AND DISCOVERY STRATEGY	23
10	CONTAMINATION RISK ASSESSMENT	24
10.1	CONTAMINANT SOURCES.....	25
10.2	RISK TO HUMAN HEALTH.....	26
10.3	RISKS TO WATER RESOURCES.....	28
10.3.1	Risks to Groundwater.....	28
10.3.2	Risks to Surface Water	29
10.4	RISKS TO PLANTS.....	29
10.5	RISKS TO BUILDINGS & SERVICES	29
10.6	GAS RISK ASSESSMENT	30
10.7	WASTE DISPOSAL.....	31
11	CONCEPTUAL SITE MODEL	32
12	CONCLUSIONS AND RECOMMENDATIONS.....	35

Figures

1. Exploratory Hole Location Plan
2. SPT v Depth Profile

Appendices

1. Historical Maps
2. Envirocheck Data
3. Trial Pit Logs and Photographs
4. DG365 Soakage Test Results
5. Window Sample Logs and Installation Details
6. Soil Gas and Groundwater Monitoring Results
7. Laboratory Test Results
8. Analytical Test Results
9. Guidelines on Contaminant Levels
10. PAH Source Indicator Ratio Sheet

1 INTRODUCTION

Ground and Environmental Services Ltd (GES) was commissioned by Ebsford Environmental on behalf of Haringey London Borough Council to undertake a Geo-Environmental Investigation on a proposed restoration project at an existing public area known as Down Lane Park, located adjacent to Park View Road and Ashley Road, Tottenham Hale, London.

It is understood that the Northern section of the park is unlikely to undergo any major changes to its current layout although it is proposed to improve the drainage in this area and that the use of swales, ditches, wet woodland, or other SUDS systems may be likely.

The southern section of the park is likely to undergo a much more radical re-design; there is a possibility that the existing buildings will be demolished and a new community building constructed along the edge of the park, with some significant earth works possibly required to install new pathways where there is currently a large earth mound, and further works to install new play areas, planting and potentially further SUDS systems.

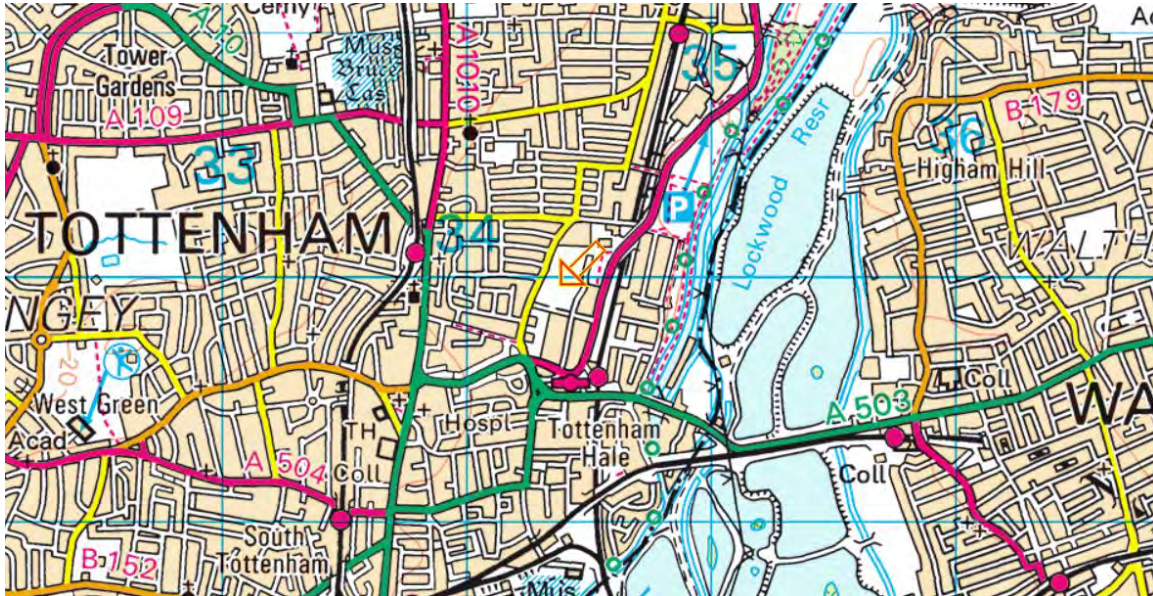
The purpose of the ground investigation was to determine the ground profile and to provide guideline recommendations for the design of foundations for new structures to be constructed on site.

In addition, this report uses the finding of the walkover survey, contamination testing and a soil gas survey to generate a current conceptual site model thereby allowing a risk assessment to be carried out and a suitable remediation strategy for any proposed redevelopment of the site to be proposed based on current Contaminated Land Legislation.

2 SITE LOCATION AND LAYOUT

Down Lane Park is located in Tottenham Hale Ward on the eastern side of the London Borough of Haringey, north London and is centred on approximate Ordnance Survey Grid Reference TQ 343 898. The park has an area of approximately 7 hectares and is situated between Ashley Road and Park View Road, close to Tottenham Hale Rail Station, Tottenham Marshes and the Lee Valley Regional Park. The park is designated as Significant Local Open Land and is a Site of Local Importance for Nature Conservation.

Down Lane Park, Ashley Rd, Tottenham Hale, London Geo-Environmental Investigation



The site was accessed via a secure vehicular access off Park View Road to the west, albeit several other pedestrian access routes were available along both Park View Road to the west and Ashley Road to the east.

Down Lane Park currently consists of a large green sports field which accommodates two adult sized football pitches, much used by different local football teams at weekends, and a path network heavily used by joggers and walkers. Available online public consultations show that the park is used regularly by local residents and is a popular cut through to local shops and by commuters travelling to and from Tottenham Hale Station.



View of park area across northern part of the site

Down Lane Park, Ashley Rd, Tottenham Hale, London *Geo-Environmental Investigation*



In the southern section of the park there is a refurbished playground, two tennis courts, a basketball court and an old bowling green, which is currently used as an open area for a local Café. The park has a community centre which accommodates a children's nursery, changing facilities and toilets (not open to the public). The park is also the location for the councils' maintenance depot and a former small public car park which is now closed to the public.



View of southern portion of site with tennis courts in foreground and existing council depot to the right – Looking south



View of existing nursery building



View of existing earth mound within southern part of the site

No obvious signs of significant potentially polluting or contaminative activities were noted on the site during the time of the GES walkover.

The following features surround the site:

- To the North, by a large Municipal Services Depot, beyond which are predominantly residential properties with some commercial units to the north-east;
- To the East, the northern part of the site is bounded by Ashley Road, beyond which is the Harris Academy building, the A1055 Watermead Way, and industrial/commercial estate. The southern portion of the site is bound by industrial/commercial units;
- To the South, by Hale Road (A503) and various industrial/commercial units. Tottenham Hale Railway and Underground Stations are located approximately 300m to the south-east;
- To the West, by Park View Road, beyond which are predominantly residential properties.

3 SITE HISTORY

A map search was carried out for the site and extracts of the following Ordnance Survey maps were obtained covering the period between 1864 and 2019.

These are presented in Appendix 1 and the relevant historic details are summarised as follows:

Mapping Date Range	On Site	Surrounding Area
1864	The site comprises a farm complex and part of a residential garden in the southern tip, with the remainder of the site comprising open fields.	The site is bound to the west by a road, beyond which are fields. A gravel pit is noted approximately 100m north east of the site. A railway line is noted approximately 100m east of the site. Residential properties bound the site to the south. Pumping station approximately 100m south east.
1896	No significant development is noted on site.	Residential development immediately south west of the site. Plant nursery approximately 150m south.
1913	The farm complex in the southern part of the site is no longer shown. A school is now in the southern part of the site.	A refuse destructor is noted immediately north of the site. East, the site is bound by a braid and bootlace factory, a woollen factory, and a pencil factory. Residential development is noted approximately 100m north of the site. And approximately 100m west.
1915	No significant development is noted on site.	No significant development is noted in the surrounding area.
1936	Additional school buildings in the southern part of the site. Northern part of the site is recreation ground with athletics ground and pavilion.	Woollen factory immediately east of the site is now a dry battery factory. Railway sidings are noted approximately 60m north of the site, associated with the refuse destructor.
1955-1956	Site appears unchanged from the previous map.	Development has taken place at the refuse destroyer, with addition of several buildings and ramps. Factories immediately south east of the site are noted now as Dry Battery, Printing Ink & Varnish, and Rubber works.
1961-1975	No significant development noted on site.	Factories to the south east are now just noted as works.
1991	Southern part of the site is occupied by tennis courts and soft landscaped areas. The northern part of the site appears unchanged.	Railway sidings no longer immediately north of the site. Refuse destructor is no longer shown to the north: area now noted as a depot.

Online information pertaining to the history of the site confirmed that Down Lane Park was part of a larger landscape of arable land and common grazing land until the railway was built in 1840, which severed the land from its surroundings.

Down Lane Park covered an area of 19.5 acres and was formerly a part of the Lammas Land (common grazing land) in the area. It was purchased in 1900 by the Council and was opened as Down Fields Recreation Ground on the 11th May 1907. The park developed as a popular local resource with a running track and tennis courts. Down Lane School was built to the lower west side of the park and opened in 1911. It is unclear if the school used the park for recreation but following a reorganisation of schools, Down Lane School was closed in 1967 and demolished in the 1980's. The school land was given over to the park and an equivalent area of land was removed from the upper park in 1989 to allow for Ashley Road and the adjacent business park to be developed. The gate piers, fencing and caretakers house are all that remains of the old school. By 1990 the park occupied the same area of land that we see today.

4 ENVIRONMENTAL SETTING

4.1 GEOLOGY

Reference to the British Geological Survey 1:50,000 scale geological map of the area indicates that the geology underlying the site is the London Clay Formation, with superficial deposits of the Enfield Silt Member.

The geological memoir for the area described these strata as follows:

Enfield Silt Member – Clay and Silt

Varies from silt to clay, commonly yellow-brown and massive. The Enfield Silt rests on River Terrace Deposits

River Terrace Deposits

River Terrace Deposits in this area, and flanking the rivers draining into the Thames consist of gravels and sandy gravels commonly clayey in the higher terraces. The gravels component is predominantly flint with subordinate quartz and rare 'exotic' clasts.

London Clay – Clay, Silt and Sand

The London Clay mainly comprises bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation. At the base, and at some other levels, thin beds of black rounded flint gravel occurs in places. Glauconite is present in some of the sands and in some clay beds, and white mica occurs at some levels.

4.2 GROUNDWATER

Reference to the British Geological Survey 1:50,000 scale Aquifer Designation Dataset, shows the site to be set upon Unproductive Strata within both the superficial and bedrock deposits.

Unproductive Strata are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

The site is situated within an Environment Agency-designated Groundwater Source Protection Zone 2 (Outer Protection Zone). This is defined by either 25% of the source area or a 400 day travel time whichever is greater.

4.3 SURFACE WATER

There are no surface water features on site or in the immediate vicinity.

4.4 RADON

Reference to the National Radiological Protection Board's "Radon Atlas of England and Wales" indicated that less than one percent (<1%) of houses within the 5 km square which includes the site have radon concentrations above the action level of 200 Bq/m³.

The site is therefore not located within a "Radon Affected Area" and therefore no special measures need be incorporated into buildings.

4.5 OTHER ENVIRONMENTAL INFORMATION

Reference was made to the environmental database landmark, extracts from which are provided in Appendix 2. Relevant information relating to the sites environmental sensitivity is summarised as follows:

Dataset		On-site	Nearest significant off-site feature
Agency & Hydrological	Discharge Consents	None	359m south east. Sewage discharge.
	Local Authority Pollution Prevention and Controls	None	20m north. General waste incineration processes < 1 tonne an hour.
	Nearest Surface Water Feature	None	382m north east.
	Pollution Incidents to Controlled Waters	None	335m north east. 08/04/97 – Sewage – Minor Incident.
	Substantiated Pollution Incident Register	None	422m south east. 04/04/16 – Oils – Significant water impact.
	Water Abstractions	None	248m south east. Dewatering.

Down Lane Park, Ashley Rd, Tottenham Hale, London
Geo-Environmental Investigation



Dataset		On-site	Nearest significant off-site feature
	OS Water Network Lines	None	365m north. Inland river on ground surface.
Waste	Historical Landfill Sites	None	248m north east. Deposited waste including inert and industrial waste.
	Licensed Waste Management Facilities	None	17m north. Household Waste Amenity site.
	Local Authority Landfill Coverage	Yes	
	Registered Waste Transfer Sites	None	20m north. Civic amenity.
	Registered Waste Treatment or Disposal Sites	None	599m south. Treatment.
Geological	Potential for Collapsible Ground Stability Hazards	Very low	
	Potential for Compressible Ground Stability Hazards	No hazard	
	Potential for Ground Dissolution Stability Hazards	No hazard	
	Potential for Landslide Ground Stability Hazards	Very low	
	Potential for Running Sand Ground Stability Hazards	No hazard	
	Potential for Shrinking or Swelling Clay Ground Stability Hazards	Very low-moderate	
Industrial Land Use	Contemporary Trade Directory Entries	None	4m east. Shop fittings manufacturers. Inactive.
	Fuel Station Entries	None	52m, south. Open.
	Underground Electrical Cables	None	196m west. Pilot (communication).
Sensitive Land Use	Areas of Adopted Green Belt	None	223m east.
	Nitrate Vulnerable Zones	None	107m east. Surface Water.
	Ramsar Sites	None	496m east. Lee Valley.
	Sites of Special Scientific Interest	None	496m east. Walthamstow Reservoirs.
	Special Protection Measures	None	496m east. Lee Valley.

5 INTRUSIVE INVESTIGATION

5.1 FIELDWORK

The site works for this intrusive investigation were carried out between the 30th July and the 27th August 2019 and comprised the following:

- Excavation of 12 No. Machine Excavated Trial Pits (TP1-TP12) to depths of between 2.4m – 4.0mbgl;
- DG365 Soakage Testing;
- Drilling of 8 No. Window Sampling Boreholes to depths of between 1.0m - 4.0mbgl;
- Soil Gas and Groundwater Monitoring.

The positions of the above works on the site are also indicated on Figure 1, Exploratory Hole Location Plan.

When considering the sampling strategy for this supplementary investigation, GES consulted current guidance as stipulated within British Standard BS10175 – '*Investigation of Potentially Contaminated Sites – Code of Practice*'.

GES aimed to obtain a thorough representation of soils from across the entire site area, however the locations were generally governed by the specification information provided by the client. It was noted that access to the former bowling green area was not permitted and therefore this area of the site was not investigated, however external areas were investigated as close as possible.

Trial Pitting

Trial Pits TP1 – TP12 were excavated to depths of between 2.4m and 4.0m using a JCB 3CX excavator. During excavation, the trial pits were logged by a geo-environmental engineer from GES.

Trial Pit Logs and associated photographs are presented in Appendix 3.

DG365 Soakage Tests

Soakage testing was undertaken within trial pits TP1-TP4, located within the northern section of the park and were excavated to depths of between 2.4m and 2.7m.

The infiltration tests were carried out in accordance with BRE DG365:2016 guidelines and comprised discharging water into trial excavations and monitoring the fall in water level against time. The soakage potential is discussed below in Section 8.4.

The results of the tests and logs of the Soakage Pits are presented in Appendix 4.

Window Sample Holes

Eight window sample holes (WS1 to WS8) were excavated using a Premier 110 window sampling rig to depths ranging between 1.0m and 4.0m. It was noted that WS1 was terminated prematurely upon solid, potentially concrete obstructions, and therefore WS1a was subsequently excavated in the vicinity.

The soils and materials encountered in the holes were logged and representative samples recovered for laboratory analysis.

Upon completion of window sample holes WS1a, WS2, WS4, and WS8, a 35mm diameter dual purpose soil gas and groundwater monitoring standpipe were installed.

Window sample hole logs and installation details are presented in Appendix 5.

Soil Gas and Groundwater Monitoring

A soil vapour survey was undertaken across the site and comprised the monitoring of the atmosphere within the standpipes within the window sample standpipes installed as part of this current investigation. Portable gas monitoring equipment (GA 5000) was used to monitor the boreholes for concentrations of carbon dioxide (CO₂), methane (CH₄) and oxygen (O₂).

In addition, photo-ionisation detection (PID) equipment was used to monitor concentrations of total volatile hydrocarbon compounds. The depth to groundwater present was measured using a standard dip meter.

The gas monitoring results, and ground water level readings are presented in Appendix 6.

5.2 GROUNDWATER

The depths to the underlying groundwater was fairly consistent across the site, unless excavations were undertaken upon a raised soil mound, and was encountered across the site, where the gravel band was encountered, generally between 2-3m below existing ground levels.

Groundwater levels identified post fieldwork, during the subsequent monitoring visits, are displayed in the table below.

WS Ref.	31/07/2019	13/08/2019	27/08/2019
	Depth to Water (mbgl)	Depth to Water (mbgl)	Depth to Water (mbgl)
WS1a	Dry	Dry	Dry
WS2	2.17	2.73	2.71
WS4	3.45	3.42	3.42
WS8	1.94	2.07	1.98

It should be noted that groundwater levels may vary due to seasonal fluctuations in rainfall, but in the shorter term, can be affected by antecedent weather conditions or other causes.

Due to the unstable nature of the gravel strata encountered which ultimately determined the depth of the response zone of the standpipe installations, and due to the depth of the groundwater, it was not possible to retrieve sufficient groundwater samples for laboratory analysis during any of the monitoring rounds.

During the investigation and subsequent monitoring however, there was no evidence of any hydrocarbon contamination based on visual and olfactory methods.

6 LABORATORY TESTING

6.1 GENERAL

During the intrusive investigation, excavated soils were subjected to PID screening techniques in order to determine the presence of Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs) which is considered an appropriate screen for organic contamination.

Confirmatory soil samples were taken from all trial pit and window sample holes. Headspace analysis to determine VOC concentrations was carried out using a PID on all soil samples retrieved as part of this investigation. The results of the screening indicated that VOC concentrations were generally low and at concentrations of <100 ppm within all soil samples retrieved as part of this investigation, with the majority of soil samples containing concentrations of <10ppm.

6.2 GEOTECHNICAL TESTING

Geotechnical testing was limited to the soil samples taken from WS1-WS4 located along the southern edge of the park, as this is the likely location for the proposed community building.

The following range of laboratory tests were scheduled and the results are presented in Appendix 7.

- i.* Determination of Natural Moisture Content (3 No.).
- ii.* Determination of Liquid and Plastic Limit (3 No.).
- iii.* Determination of Particle Size Distribution (4 No.).
- iv.* Determination of pH (4 No.). See Appendix 8.
- v.* Determination of water-soluble sulphate (4 No.). See Appendix 8.

6.3 ANALYTICAL TESTING

Fourteen soil samples were selected and scheduled for chemical analysis which was undertaken by DETS Ltd. All soil samples were analysed for a general screening suite of contaminants considered appropriate to the current usage and past history of the site and surrounding area.

Toxic Metals	Phytotoxic Metals	Inorganic Compounds	Organic Compounds
Arsenic Barium Beryllium Cadmium Chromium Lead Mercury Nickel Selenium Vanadium	Water Soluble Boron Copper Nickel Zinc	Water Soluble Sulphate pH Asbestos	Total Polyaromatic Hydrocarbons (PAH) Mineral oils Total Petroleum Hydrocarbons (TPH)

In addition, two composite samples were prepared and submitted for analysis in accordance with the Environment Agency's waste acceptance criteria for the off-site disposal of soils, one from across the southern portion of the site and one from the grass mound.

Soil samples were stored in appropriate containers as specified within BS10175. The containers comprised of 1 kg capacity plastic containers with fitted lids.

Where organic compounds were to be determined, inert containers, which prevent loss by absorption, or volatilization, i.e. wide-mouthed amber glass containers, were used.

Samples were stored in appropriately cooled cool boxes and were transported to the laboratory as quickly as possible in order to minimize any potential for chemical and biological changes to take place.

The results of the analytical testing for the soil samples are presented in Appendix 8.

7 SUMMARY OF GROUND CONDITIONS

The soils encountered during this investigation are described in the appended trial pit and window sample hole logs.

The ground investigation found Made Ground over a superficial geology consisting of Enfield Silt and River Terrace Deposits. The underlying London Clay Formation was not found during this ground investigation.

Made Ground

Made Ground was found at all test locations. The trial pits and window sample holes (TP1-TP4, TP11-TP12, WS5-WS8) which were located over the northern half of the site found Made Ground to depths ranging between 0.4m and 0.8m.

The trial pits and window sample holes (WS1-WS4, WS1A, TP5-TP10) excavated on the southern half of the site found significantly greater thicknesses of Made Ground with thicknesses generally ranging between 0.7m and 2.3m. At the location of TP9, which was excavated at the top of one of the raised mounds Made Ground was found to the full depth of excavation of 4.0m. At the location of WS1 a concrete obstruction was met at 1.0m which forced abandonment of the hole.

The Made Ground materials across the site generally comprised a thin layer of turf over slightly gravelly slightly clayey sand. The gravel component within the Made Ground materials comprised variable quantities of brick, flint, coal and concrete. Locally asphalt and metal fragments were also encountered. Within the mound materials were plastic and glass fragments.

Enfield Silt

Underlying the Made Ground at all test locations, with the exception of WS1 and TP9, were soils typical of the Enfield Silt stratum. The soils comprised a slightly gravelly sandy silty clay and were found to depths ranging between 0.8m and 1.8m over the northern half of the site with thicknesses ranging between 0.4m and 1.7m.

The Enfield Silt soils were found to a greater depth at the southern end of the site. The soils were found to depths ranging between 1.6m to 3.65m with the greatest depths found in WS3 and WS4 which were located at the southern extent of the site.

In situ SPT tests carried out in WS1A-WS4 within the Enfield Silt recorded N values in a range between 22 and 37 blows per 300mm penetration (stiff to very stiff). See Figure 2 for plot of SPT N Value v Depth.

Classification testing found clays of low, intermediate and high plasticity with plasticity indices in the range 9 to 45%.

River Terrace Deposits

Soils typical of River Terrace Deposits were found beneath the Enfield Silt at all locations. The River Terrace Deposits soils predominantly comprised very sandy gravel with subordinate gravelly sand horizons and were found to depths upto 4m at the location of WS3. The base of the River Terrace Deposits was not found at any of the test locations.

In situ SPT tests carried out in the boreholes within the River Terrace Deposits recorded N values in a range between 34 and 63 blows per 300mm penetration (dense to very dense). See Figure 2 for plot of SPT N Value v Depth.

Classification tests on samples recovered from the River Terrace Deposits recorded very sandy gravel with silt/clay fractions in the range 2.7 to 9.3%.

For preliminary design purposes the following parameters are recommended

SPT N Value: 30

Angle of Shearing Resistance $\phi = 36^\circ$ (lower bound)

Anecdotal Information

From a review of the borehole records of the area held by the British Geological Survey cable percussion boreholes drilled to the east of the site gravel to depths ranging between 4.6m and 5.5m at which depth soils of the London Clay Formation were found.

8 ENGINEERING DESIGN

8.1 OUTLINE FOUNDATION DESIGN

At the time of reporting no structural loads were known however it was understood that the proposed development may comprise the construction of a new community building on the south western part of the site. For preliminary design purposes column loads up to 300kN have been assumed.

In deliberation of suitable foundation options consideration was given to the geotechnical hazards and risks as presented below:

Geotechnical Hazard	Qualitative Risk & Consequences	Possible Risk Reduction Measures
Existing underground structures such as footings to neighbouring structures, service runs and old footings/basements from previous development on the site.	Medium to High Implication for foundation depth and economic feasibility of shallow foundations.	New foundations to be constructed in undisturbed ground or alternatively disturbed ground to be removed and replaced with suitable engineering fill.
Variations in stiffness of ground below foundation depth that could give rise to unacceptable total and differential settlement.	Low to Medium Large span buildings would be particularly sensitive to differential settlement. Would result in cracking of superstructure if conventional brickwork or brick cladding is used.	Calculate likely magnitude of settlement and determine if within acceptable tolerances. Make foundations act as reinforced beams. Consider ground treatment to improve ground conditions or adopt deep foundation.
Shrinkage/swelling of foundation soils due to action of tree roots.	Low Foundation movement and cracking of brickwork.	None required

The Made Ground and the Enfield Silt stratum are considered unsuitable materials for founding upon given the potential for high total and differential settlement.

For preliminary design purposes consideration was therefore given to pad footings founded within the dense sands and gravels of the River Terrace Deposits.

Pad Foundations

Consideration was given to pad foundations founding within the sands and gravels of the River Terrace Deposits. The depth to the top of the River Terrace Deposits stratum varied between 1.1m and 3.4m although was predominantly found between 1.6m and 2.3m. For preliminary design purposes an average foundation depth of 2.0m has been adopted.

Based upon an SPT 'N' of 30 (dense) for the River Terrace Deposits stratum preliminary design calculations indicate a net safe bearing capacity of 300 kN/m² for a pad foundation ranging in size between 1.0 m square and 3.0 m square. The net safe bearing pressure incorporates a factor of safety of 3 against bearing failure in the sands and gravels beneath the footing.

In order to limit differential settlement pad size would normally be varied such that a similar foundation bearing pressure would result for varying column loads. A preliminary settlement analysis was conducted for a range of pad sizes with a net increase in foundation loading of 300 kN/m² using the method of Burland and Burbridge. A lower bound SPT 'N' value of 25 blows for sands and gravels was adopted in the calculations. The results of the calculations are tabulated below:

Preliminary Settlement Analysis				
	1.0 m x 1.0 m Pad		2.0 m x 2.0 m Pad	
	Estimated Immediate Construction Settlement (mm)	Estimated Post Construction Settlement (mm)	Estimated Immediate Construction Settlement (mm)	Estimated Post Construction Settlement (mm)
Best Estimate	6	<5	9	<5
Lower Limit	<5	<5	<5	<5
Upper Limit	12	6	20	9

Based upon the values of predicted settlement, the use of pad foundations constructed within the dense River Terrace Deposits stratum is considered feasible. It should be noted that the magnitude of settlement in well graded granular materials is often lower than for uniformly graded sands, therefore the predicted upper limit value is considered conservative for this site.

It should be noted that existing structures were present on the site at the time of the ground investigation. Should the existing footings be at a greater depth than the average foundation depth of 2.0m below existing ground level, as adopted above, then foundation depths for the proposed development would need to be increased due to past disturbance of the ground.

Other forms of disturbance that may affect founding depths are:

the removal of disused services

the relocation of existing services

the removal of other underground obstructions

8.1.1 Other Foundation Options

Based upon the findings of this ground investigation the use of shallow foundations is considered feasible however the thickness and density of the River Terrace Deposits should be proven to ensure the zone of influence from the foundation loads is contained within the granular soils.

Should the River Terrace Deposits be too thin an alternative foundation solution would be piled foundations founding within the underlying London Clay Formation. Additional ground investigation using cable percussion drilling techniques would be required to obtain design parameters at depth for the London Clay Formation.

8.2 GROUND FLOORS

The NHBC guidance advises that suspended ground floors should be adopted when the plasticity index (PI) of the founding soils is greater than 10%. In addition where the depth of fill would be greater than 600mm within a self-contained area, the floor construction over the whole of that area is required to be self-supporting and independent of the fill.

Based upon the findings of this ground investigation it is recommended that suspended floors are adopted.

8.3 TEMPORARY WORKS

Excavations in excess of 1.2 m depth will be required in connection with the proposed development on this site. If there is a requirement for personnel to enter into excavations, then the need for trench side support should be considered for any depth of excavation and, therefore, appropriate equipment should be available on site prior to excavation proceeding. A site specific risk assessment should be carried out where man entry into excavations is required.

The base of foundation excavations should be inspected and any soft loose, organic or otherwise deleterious material at foundation level removed and replaced with lean mix concrete. The soils encountered will be liable to softening/loosening when exposed to surface water infiltration. In order to avoid deterioration of the prepared formation the base of foundations should be blinded with concrete as soon as practical after excavation and particularly if there is delay before placing foundation concrete.

8.4 SOAKAWAYS

The results of the BRE 365 soakage testing undertaken in trial pits TP1 to TP4 recorded infiltration rates in the range 1.32×10^{-5} to 5.36×10^{-6} m/s indicating a low to moderate potential. It should be noted that at all trial pit locations the infiltration rates calculated were estimated by extrapolation of the test data due to the infiltration rate recorded.

8.5 CHEMICAL ATTACK ON BURIED CONCRETE

The results of the chemical testing indicated a concentration of water soluble sulphate of in the range <10 to 475 mg/l as SO₄ in soil samples. pH values were slightly alkaline and ranged from 6.8 to 8.4 pH units.

In accordance with BRE Special Digest (SD1) entitled 'Concrete in Aggressive Ground' a design sulphate class for the site of DS-1 is recommended. Using SD1 an ACEC (Aggressive Chemical Environment for Concrete) class of AC-1 is recommended.

9 GROUND CONTAMINATION ASSESSMENT

The current guidelines used for this contamination assessment are presented within Appendix 9.

Given that the site will continue to be in use as public open space, the contaminant concentrations encountered as part of this investigation have been compared against either Land Quality Management Generic Assessment Criteria (LQM GAC) for a commercial development, the Chartered Institute of Environmental Health's (CIEH) Suitable for Use Levels (S4USL), or where available against newly published Category 4 Screening Levels (C4SLs) for a Public Open Space (Public Park) end use. Where neither guidelines have limit values, Contaminated Land Exposure Assessment (CLEA) framework guideline limit values have been assessed.

Category 4 Screening Levels (C4SLs) have currently been published for six substances as per the table below.

Substance	Residential (with home- grown produce)	Residential (without home- grown produce)	Allotments	Commercial	Public Open Space _{resi}	Public Open Space _{park}
Arsenic	37	40	49	640	79	170
Benzene	0.87	3.3	0.18	98	140	230
Benzo(a)Pyrene	5.0	5.3	5.7	77	10	21
Cadmium	22	150	3.9	410	220	880
Chromium VI	21	21	170	49	21	250
Lead	200	310	80	2300	630	1300

All concentrations expressed in mg/kg

This table should be read in conjunction with the Final C4SL R&D Report

9.1 SOIL QUALITY

In terms of any proposed continued public open space redevelopment of the site, the results of the analysis of the selected soil samples recovered during the site investigation indicated that the concentrations of *metals and metalloids* considered to be potentially toxic to humans were below the respective guideline values in all samples tested.

In respect of the analytical testing undertaken as part of this investigation *Organic contamination* was also generally low, however certain near surface soil samples did contain slightly elevated Total PAH concentrations.

Asbestos containing material was generally not encountered with the exception of within a single soil sample analysed from the grass mound material, albeit at a significant depth.

A comprehensive description of the soil quality as measured as part of the intrusive site investigation is given below.

9.1.1 Toxic Metals

Concentrations of toxic metals arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium, and zinc were all below their respective soil guidance values for either a commercial development under the CLEA/LQM GAC guidelines and the C4SL/S4USL guideline values for public open space (public park) end use where appropriate in all samples tested.

9.1.2 Phytotoxic Metals

Concentrations of phytotoxic metals copper, zinc and nickel were compared against the maximum permissible concentration in the Sewage Sludge (Use in Agriculture) Regulations 1989.

Nickel concentrations were found to be below the maximum permissible concentration for the relevant pH level in all of the analysed soil samples.

- *Copper* – concentrations were above the 200 mg/kg sewage sludge limit within the soil samples retrieved from WS6 (0.3-0.4m), and within southern section WAC composite sample with respective concentrations of 504 mg/kg, and 365 mg/kg.
- *Zinc* – concentrations were above the 450 mg/kg sewage sludge limit within the soil samples retrieved from TP10 (0.4-0.5m), WS6 (0.3-0.4m), and within the southern section WAC composite sample with respective concentrations of 468 mg/kg, 721 mg/kg, and 617 mg/kg.

9.1.3 Organic Compounds

Polycyclic Aromatic Hydrocarbons (PAH)

Concentrations of total PAH were generally low and were found to be below the inert waste acceptance criteria of 100 mg/kg as detailed in the Landfill (England and Wales) (Amended) Regulations 2004 in all of the samples tested, with the exception of the soil samples retrieved from WS4 (0.3-0.4m), and WS6 (0.3-0.4) which had respective total PAH concentrations of 200 mg/kg, and 129 mg/kg.

Benzo(a)pyrene (B(a)P)

All soil samples had B(a)P concentrations below the C4SL guideline limit value of 21 mg/kg for a park public open space setting.

Speciated PAH Compounds

All other speciated PAH compounds were also below their relevant guideline values.

Total Petroleum Hydrocarbons

Organic contamination in the form of total petroleum hydrocarbons (TPH) was generally not detected with the exception of the single soil sample retrieved from WS4 (0.3-0.4m) which was in excess of the inert waste acceptance criteria of 500 mg/kg as detailed within the Landfill (England and Wales) Regulations 2004 and also within the UK Water Industry Research (UKWIR).

All soil samples tested were analysed for TPH based on the fraction approach outlined by the TPH Criteria Working Group (TPHCWG) in order to characterise the nature of hydrocarbon contaminants on the site. Significant levels of organic contamination were not noted in samples retrieved from across the site within any of the window sample or trial pits excavated on site during this investigation based on olfactory or visual evidence.

A review of the speciated TPH data indicates a relatively consistent composition of TPH on the site. In the samples where elevated concentrations were recorded, there is a predominance of longer chain fractions.

The highest TPH levels recorded were in soils retrieved from WS4 (0.3-0.4m), where the total (C₈-C₃₅) petroleum hydrocarbon concentration was 782 mg/kg.

Notwithstanding the above, Generic Assessment Criteria (GAC) for total petroleum hydrocarbons according to both their molecular weight and chemical structure and also for a range of soil organic matter (SOM) content values have been derived using CLEA software. The LQM CIEH GACs are presented according to their soil organic matter content and proposed end use of the land.

Comparison of the measured TPH data with the worst-case scenario constituent compounds and their GAC limit values was made to provide a conservative assessment of the organic contamination. As mentioned above the maximum TPH concentration recorded on site during the site investigation was 782 mg/kg total TPH comprising of 503 mg/kg, 256 mg/kg, 23 mg/kg, <1 mg/kg, and <1 mg/kg within the C₂₁-C₃₅, C₁₆-C₂₁, C₁₂-C₁₆, C₁₀-C₁₂, and C₈-C₁₀ fractions recorded respectively, all of which did not exceed the respective limit values.

Mineral Oil concentrations were generally low with the highest concentration of 99 mg/kg recorded within the soil sample retrieved from WS1a (0.6-0.8m).

9.1.4 Inorganic Compounds

Concentrations of water-soluble sulphate ranged from below the analytical detection limit of 10 mg/l to 475 mg/l (as SO₄). The pH values were generally neutral to alkaline with values of 6.8 to 8.4 units.

9.1.5 Asbestos

Asbestos screening of the soil samples did generally not identify any Asbestos Containing Material (ACM).

The single exception to this was the soil sample retrieved from TP9 (3.0-3.2m). TP9 was excavated upon the large grass covered mound located within the southern portion of the site.

Details of the asbestos is recorded in the table below.

Excavation ID:	Depth (mbgl)	Asbestos Type	Material Type	Asbestos Quantification (%)
TP9	3.0-3.2	Amosite	Present in Bundles	0.002

A copy of the asbestos quantification results is also presented within Appendix 8.

It was noted that a secondary sample taken from a shallower depth of between 1.0-1.2m from within TP9 did not reveal any asbestos containing material.

9.2 SOIL GAS

Three gas monitoring visits were undertaken between the 2nd August and the 27th August 2019.

During the visits, a soil vapour survey was undertaken across the site and comprised the monitoring of the atmosphere within the Window Sample Hole standpipes installed as part of the current investigation. Portable gas monitoring equipment (GA 5000) was used to monitor the standpipes for concentrations of carbon dioxide (CO₂), methane (CH₄) and oxygen (O₂).

For determining the gas protection measures which may be required in low rise buildings with a beam and block floor there is published guidance from the NHBC for use on residential developments which utilises a traffic light system of classification. For larger buildings the guidance in CIRIA 665 and BS8485 is used.

Reference has also been made to the British Standard Code of Practice BS8485:2015, *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings* and regard has been given to the recommendations presented therein. The processes set out in BS8485 represent good practice and is based on the CIRIA C665 document.

In addition CIRIA document C735, *Good practice on the testing and verification of protection systems for buildings against hazardous ground gases* has also been referenced.

The results obtained from the short-term soil gas monitoring undertaken indicated that no significantly elevated concentrations of carbon dioxide in excess of the relevant action level of 5% was recorded within the voids tested during the monitoring period. The soil gas results are attached at Appendix 6. Similarly, no elevated methane concentrations were recorded.

Measurement of both borehole pressure and gas emission rates indicates that no significant gas flows are present. The maximum gas flow rate measured on site was below the gas analyser detection limit of 0.1 l/hr.

The levels of photoionisable compounds measured in the monitoring wells were below the analytical detection limit of 10 ppm across all monitoring rounds.

9.3 WATCHING BRIEF AND DISCOVERY STRATEGY

Whilst, in general, significantly elevated contaminant concentrations were not encountered as part of this site investigation, given the potential sources of contamination identified on-site, should discreet hotspots be encountered, which were not previously detected, during the site groundworks, these should be dealt with accordingly, by informing all parties involved with the site and drafting new contamination proposals if necessary. A number of options are available for handling any such material, which include:

- The removal from site and disposal to a suitably licensed landfill of all material suspected of being contaminated.
- Short-term storage of the suspected material while undertaking verification testing for suspected contamination. The storage area should be a contained area to ensure that contamination does not migrate and affect other areas of the site. Depending upon the amounts of material under consideration, this could be either a skip or a lined area.
- Treatment of the identified contamination as discussed above.
- Having a suitably experienced Environmental Engineer either on-call or with a watching brief for the visual and olfactory assessment of the material, and sampling for verification purposes.

Should a new source of contamination be suspected or identified then the relevant local authorities would be informed. A report indicating the nature of contamination and how this is to be dealt with would be submitted to their department and for their agreement. Any necessary remediation would then be detailed and verified in a supplementary remediation statement.

GES can confirm that such a watching brief should exist on this site during any demolition/restoration/site preparatory works and should any contamination or potentially contaminative sources be discovered during the proposed enabling works all site works would cease and suitably competent consultants/engineers will attend site.

10 CONTAMINATION RISK ASSESSMENT

This risk assessment has been undertaken with due regard to the advice relating to groundwater as provided in the Environment Agency's "Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources", the advice provided in the Contaminated Land (England) Regulations 2000, and the associated statutory guidance. The guidance defines contaminated land as any land that is in such a condition that by reason of substances in, on or under the land:

- significant harm is being caused or there is a significant possibility of such harm being caused; or
- pollution of controlled water is being, or is likely to be caused.

This definition is based on the principles of risk assessment defined as a combination of the probability (or frequency) of occurrence of a defined hazard and the magnitude (including the seriousness) of the consequences. Central to the risk assessment process is the concept of pollutant linkage, that is a linkage between a contaminant and a receptor by means of a pathway.

Statutory definitions relating to pollution linkage.	
Contaminant	"a substance which is in, on or under the land and which has the potential to cause harm or to cause pollution of controlled waters."
Receptor	"a living organism, a group of living organisms, and ecological system or a piece of property" which meets given criteria. "controlled waters which are, or could be, polluted by a contaminant".
Pathway	"one or more routes or means by, or through, which a receptor: • is being exposed to, or affected by, a contaminant, or • could be so exposed or affected".

The relationship between these components is discussed below in order to identify the existence of any source-pathway-receptor linkage on the site, and hence the potential risks associated with any contamination.

This risk assessment is based on the proposed restoration project at the existing park, with plans for the use of the site to remain as is, albeit some demolition/construction works may be incorporated within the development proposals.

The significance of the risks to the receptors/targets identified is based on an evaluation of the potential pathways between the contaminant source and receptors based on a public open space/commercial end use.

Potential receptors/targets at the site and in the area in which the site is located include:

- the general public;
- construction/maintenance workers;
- groundwater and surface water resources;
- underground services in and around the site;
- plants in soft landscaped areas.

10.1 CONTAMINANT SOURCES

Online information pertaining to the history of the site confirmed that Down Lane Park was part of a larger landscape of arable land and common grazing land until the railway was built in 1840, which severed the land from its surroundings.

Down Lane Park covered an area of 19.5 acres and was formerly a part of the Lammas Land (common grazing land) in the area. It was purchased in 1900 by the Council and was opened as Down Fields Recreation Ground on the 11th May 1907. The park developed as a popular local resource with a running track and tennis courts. Down Lane School was built to the lower west side of the park and opened in 1911 and demolished in the 1980's. By 1990 the park occupied the same area of land that we see today.

The prime potential contaminant source across the site is the infilling of soils from unknown sources.

No significant sources of on-going contamination were noted during the walkover survey of the site.

The site investigation did, in general, not identify any significantly elevated contaminant concentrations. Asbestos screening of the soil samples identified small quantities of asbestos containing material within a single soil sample retrieved at depth from the large mound.

The following potential contaminant sources have been identified at the site and in the surrounding area:

Potential Source	Source Description	Principal Contaminants of Concern
Current and Historic Site Use	Near surface in-fill/ reworked material of unknown origin used to raise areas across the site.	PAH, TPH, Metals, ACM
	Demolition waste.	
	Former agricultural/commercial use of the site as common grazing land followed by a school and sports ground.	Metals, PAH, TPH, ACM
Current and Historic Surrounding Land Use	Potential Landfill operations.	Ground Gases (Methane and Carbon Dioxide)

The risks associated with the contaminant sources and the contamination encountered as part of this investigation are discussed below.

10.2 RISK TO HUMAN HEALTH

Toxic Metals

Concentrations of toxic metals arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium, and zinc were all below their respective soil guidance values for a public open space/commercial end use in all samples tested in this site investigation, therefore the risks to human health from these contaminants is considered to be low.

Organic Compounds

Concentrations of the organic compounds including PAH, and total TPH were generally low across the site and would therefore not be considered to pose a significant risk of significant harm to human health.

Elevated total PAH concentrations were however encountered within the made ground soil samples retrieved from WS4 (0.3-0.4m) and WS6 (0.3-0.4m) as part of this investigation. The PAH ratios of anthracene (A), chrysene (C), fluoranthene (F), and pyrene (P) can be used as source apportionment tools to determine the likely source of the elevated PAH concentration encountered within the above stated soil samples. By calculating the ratios of A:C versus F:P and plotting the results, the resultant ratios indicate that the likely source of the elevated PAH concentration encountered in the Made Ground samples from WS4 and WS6 is coal ash. It is likely therefore that some of this material has been incorporated into the respective samples tested at the laboratory. A copy of the PAH source indicator ratios is attached to this report as Appendix 10.

As previously identified, in terms of human health, TPH concentrations were not significantly elevated.

As such, soils across the site would be considered suitable to remain on site.

It is noted that suitable growth media for any newly proposed soft landscaping areas is unlikely to be present on site following site preparatory works and therefore such would need to be imported. In order to maintain site levels, the soils currently present across the site including in any newly proposed soft landscaped areas would have to be removed prior to development. This will allow for the depth of growth media required. This would effectively sever any potential pathway between the contaminated soils and future receptors.

Inorganic Compounds - Asbestos

Asbestos as amosite bundles has been detected in a single made ground soil sample retrieved from TP9 which was excavated upon the large grass covered mound present in the southern portion of the site.

Quantification of the asbestos content within the sample has been calculated at 0.002% meaning that there were no unusually high levels which would indicate that the presence of this concentration is not a suitable measure of the soil material asbestos content.

In addition, the asbestos containing material was present at a depth of 3.0m below the existing ground level at the top of the mound, therefore the likelihood that this material would come into contact with any sensitive receptors, i.e. construction workers or future site users is considered to be very low. The risks posed to human health from the isolated asbestos material encountered within the mound is therefore considered insignificant.

In the event that further ACM is encountered during any proposed site enabling works then the extent of such will be delineated under the supervision of a suitably competent consultant/engineer and the material will be removed from site in accordance with the hazardous waste regulations. Should any such material be encountered it is considered likely that a single dedicated skip provided by a suitably licensed asbestos handling company would prove sufficient. If further asbestos-containing material is found on site, then all the documentation regarding its remediation including duty of care and waste transfer notes would be forwarded to the appropriate authorities.

On the balance of the toxicological risks posed by the ground contamination encountered as part of the intrusive investigation undertaken by GES, it is considered that the potential risks to site workers and future occupants could be adequately controlled as follows:

Site Workers

- Provision of appropriate personal protective equipment and hygiene facilities.
- Good working practice in line with current legislation when safely handling and disposing of any asbestos material.

- Provision of appropriate dust suppression, to minimise the generation of potentially contaminated suspended particulates during site works.

Future Occupants

Elevated levels of contaminants which could potentially pose a health risk to future occupants of the site were generally not identified during the intrusive investigation, therefore no further remedial works, in terms of contaminated soils, is required upon the site.

Notwithstanding the above, should any new areas of soft landscaping be incorporated into the development, i.e. areas of the southern section of the park currently covered by hardstanding, it is noted that given the absence of such on site, suitable growth media would need to be imported into these areas of the site. Any such imported growth media would require analytical testing to confirm its suitability as growth media and its compliance with their relevant SGVs. Typically, 150 mm topsoil over approximately 450 mm clean free draining subsoils would generally be considered sufficient. Where deep rooting shrubs / trees are proposed in any landscaping it may be necessary to locally deepen the clean cover to accommodate a healthy root bowl. No such clean cover has been laid on site yet and will not be brought to site and placed until the construction phase is completed to avoid over compaction by site plant.

In addition, given the sensitive nature of the site in terms of the potential excavating within the RPAs of certain trees, the appropriate care and attention must be taken when any excavation work and any importation of soils is undertaken within any such areas.

10.3 RISKS TO WATER RESOURCES

10.3.1 Risks to Groundwater

The site is underlain by unproductive strata within both the superficial deposits and within the bedrock London Clay Formation. The site is located within an outer groundwater source protection zone however there are no potable groundwater abstractions within 500m from the site.

Significant levels of potentially soluble and therefore mobile organic contaminant sources were not measured on site within the soil samples tested.

It is therefore considered that the risks to groundwater resources are considered to be classed as low.

10.3.2 Risks to Surface Water

The closest surface water receptor is located 382m north-east of the site therefore given that the on-site soils contained low levels of organic contaminant concentrations, the risks of any contamination migrating towards the surface water body is considered to be negligible.

In addition, historic River Quality data in the vicinity of the site is generally considered to be fair.

10.4 RISKS TO PLANTS

Whilst significantly elevated concentrations of phytotoxic metals which could be considered harmful to plants were generally not encountered on site, certain isolated significantly elevated copper and zinc concentrations were encountered across the site.

Notwithstanding the above, there are no signs of phytotoxic stress in any of the vegetation noted across the site.

Should any new trees or plants be introduced to the site as part of any development proposals, it may be prudent to import clean suitable soils to the corresponding areas of the site.

Any material imported to site for use in any such areas would require chemical testing to confirm its suitability for use.

This action would ensure any contamination is isolated below the rooting zone of plants, and therefore unavailable for uptake, thus ensuring any source receptor pathways are severed. The risk to plant health posed by the contaminants identified would be considered to be low following implementation of the remedial strategy.

10.5 RISKS TO BUILDINGS & SERVICES

Whilst significantly elevated levels of organic contaminants were generally not detected at depths corresponding to likely service run depths across the site, certain PAH and TPH concentrations did exceed stringent UKWIR target concentrations. The risk to services from contamination degrading pipes is considered low to moderate. It is therefore considered prudent to protect services, notably potable water, on this site, should the need for any arise.

Suitable systems include barrier pipe, iron ductile pipework or placement in trenches backfilled with clean imported material. It is recommended that the advice of the service provider is sought regarding the most suitable options for the site.

10.6 GAS RISK ASSESSMENT

The levels of soil gas underlying the site have been monitored as part of a short-term soil gas monitoring programme carried out across the site during August 2019.

The results obtained from the soil gas survey indicate that elevated levels of soil gas, which may require gas protection measures to be incorporated into any new buildings incorporated into the proposed development, are not present on site. No elevated gas flow rates were recorded during the monitoring. Furthermore, significant biodegradable material was not encountered in any of the window sample holes or trial pits excavated at the site.

The highest carbon dioxide concentration encountered on site during this current investigation was measured in WS8 at 3.4% which is below the relevant guideline limit of 5%. Methane concentrations were below the detection limit of the monitoring equipment and therefore well below the relevant guideline limit of 1%.

Measurement of both borehole pressure and gas emission rates indicates that no significant gas flows are present. In order to allow for a worst-case scenario, GES have used a gas flow rate across the site of 2.0 l/h in the following calculations. It should be noted that the maximum gas flow rate detected on site during the short-term gas monitoring was less than 0.1 l/h which was measured directly with a built-in flow meter.

Based on BS 8485:2015 and C716, we have assessed the site based on the gas monitoring undertaken as part of the site investigation in order to calculate a Characteristic Gas Situation (CS).

Based on the worst-case gas characteristic situation, the worst case implied CS derived by combining the maximum observed concentrations from different window sample standpipes during any monitoring event and a worst case flow rate of 2.0 l/h are as follows.

Flow Rate (l/h)	CH4 (%)	CO2 (%)	GSV – CH4 (l/h)	GSV – CO2 (l/h)	Implied CH4 CS	Implied CO2 CS
2.0	0.0	3.4	0.00	0.068	1	1

On the basis of the measurements in the table above, the GSV is taken to be 0.068 l/h, which is the worst case for methane and carbon dioxide. A GSV of 0.068 l/h lies within the GSV values for **CS1** (<0.07 l/h) which has a very low hazard potential.

BS 8485:2015 enables the minimum level gas protection (score) for the site or zones to be determined based on the determined CS and the type of proposed building. Given the proposed end use of the site, a medium to high risk Type B building has been used for calculating the appropriate gas protection score.

Given that the site has an implied CS1, the minimum gas protection score required for a Type B building is 0, which means that gas protection measures would not be required as part of any proposed development across the site based on current gas concentrations.

10.7 WASTE DISPOSAL

Should an excess volume of soil be required to be disposed of off-site then a waste classification may be required.

For a waste classification to be undertaken, materials may need to be subjected to chemical testing which would give an indication to the contaminants present and, therefore those most toxic to the environment in the waste. Following the assessment of the waste as hazardous or non-hazardous waste acceptance criteria leachate testing allows the appropriate disposal pathway to a suitably licensed disposal facility to be further determined.

Waste acceptance criteria (WAC) leachate testing was carried out on two composite soil samples from site, one of soils from the southern portion of the site, and one from the large grass covered mound. The results are attached at Appendix 8 and show that the leachable content for antimony was in excess of the inert limit value for both samples. With regard to antimony it is noted that its presence in trace concentrations is ubiquitous in made ground from such town sites. Soil based antimony is considered to have low mobility and be predominantly partitioned to the solid phase.

The common thought process when dealing with soils which have been contaminated with asbestos or other contaminant is generally to dispose of the material to a landfill site as hazardous waste. However, The Hazardous Waste (England & Wales) Regulations 2005, require any soils with asbestos content greater than 0.1% is classified as hazardous waste. Any soils with asbestos content below 0.1%, as per the soils encountered on this site, can be classified as non-hazardous so long as other hazardous contaminants are not present.

As a preliminary waste assessment and based on the results of materials tested to date, it is considered that the majority of any surplus soils requiring off-site disposal would be classified as EWC 17 05 04 non-hazardous and may be acceptable at a waste facility licensed to accept inert material, however, due to the asbestos present within the soils from the large mound, these soils would not be acceptable at a waste facility licenced to accept inert material. In addition, due to significant concentrations of lead across parts of the site, a proportion of the soils could be classified as hazardous. However, this would ultimately be at the discretion of the intended Waste Transfer Site.



11 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a system diagram identifying contaminant sources, routes of exposure (pathways), and which receptors are affected by contaminants moving along those pathways.

The model is produced to identify the zones of the site with different potential contaminations characteristics (e.g. whether contaminants in the soil are likely to be on the surface or at depth, distributed over an entire area or in localised 'hot spots').

The conceptual site model presented in the table below is based on the findings of the site investigation undertaken.

Down Lane Park, Ashley Rd, Tottenham Hale, London
Geo-Environmental Investigation



Source	Pollutant		Pathway	Hazard		Receptor	Observations/ Recommendations	Assessed Risk
Contaminated ground	Metals, organic (hydrocarbons) could be present	➔	Direct contact, ingestion, inhalation.	Health risks including skin irritation.	➔	Humans: site workers	Normal health and safety precautions. No significantly elevated contaminant concentrations encountered.	Low, based on proposed site use.
			Surface run off.	Lateral movement to surface watercourses.	➔	Aquatic resources, ecology and subsequent users including humans.	Significant contamination not encountered on site.	Low
			Leaching/ Dispersion.	Downward migration to groundwater.	➔	Aquatic resources – Groundwater, abstraction wells) / surface waters.	Significant mobile contamination not encountered on site.	Low
			Uptake by plants	Phytotoxic effects	➔	Soft landscaped areas / plants	Elevated contaminant concentrations generally not present in soils and no evidence of any phytotoxic stress. Placement of clean topsoil required in any proposed new areas of planting.	Low
			Direct contact	Aggressive chemical attack	➔	Building structures and services	It is considered that protection of services is likely to be required on this site however advice should be sought from Statutory Providers especially as to whether potable water pipes should be protected.	Low-Moderate

Down Lane Park, Ashley Rd, Tottenham Hale, London

Geo-Environmental Investigation



Source	Pollutant	Pathway	Hazard	Receptor	Observations/ Recommendations	Assessed Risk
Liquid contaminant sources	Diesel, Petrol and Oils.	→ Direct contact; ingestion, inhalation.	Health risks including skin irritation. Lateral and vertical migration of contaminants.	→ Humans: site workers. Groundwater and surface water.	No liquid contamination sources were identified on site. No significantly elevated concentrations encountered	Low, based on proposed site use
Asbestos	Asbestos fibres from old buildings and waste on site	→ Inhalation.	Health risks including asbestosis, mesothelioma, and lung cancer.	→ Humans: site workers and future occupants.	Asbestos has been identified within a single soil samples retrieved on site within the mound material however concentrations were found at low levels. Samples were from depth where unlikely to come into contact with site users unless extensive excavation works are to be undertaken. Appropriate PPE should be worn during site works.	Low-Moderate
Landfill, made ground,	Ground Gases (CO ₂ , CH ₄)	→ Inhalation and ingress into buildings	Asphyxiation and explosions	→ Buildings/humans/ future site users	Elevated ground gases have not been noted on site. Gas protection measures are not recommended in any new development.	Low
Redundant Waste, Demolition Waste		→ Dermal Contact/ingestion. Potential for migration via surface water run-off	Health Risks	→ Humans: Site workers	All waste on site is to be removed from site during site preparatory works and disposed of in accordance with current legislation. Normal health and safety precautions.	Low

12 CONCLUSIONS AND RECOMMENDATIONS

Based on the site investigation, intrusive works and subsequent data assessment, the following conclusions and recommendations have been drawn in respect of the site known as Down Lane Park located between Park View Road and Ashley Road, Tottenham Hale, London.

Geotechnical

- At the time of reporting no structural loads were known however it was understood that the proposed development may comprise the construction of a new community building on the south western part of the site. For preliminary design purposes column loads upto 300kN were assumed.
- The soil sequence found in the trial pits and window sample holes comprised Made Ground overlying Enfield Silt and River Terrace Deposits. Due the density of the River Terrace Deposits the underlying London Clay Formation was not found.
- With respect to foundation options it has been considered that conventional strip type foundations would not be appropriate for the site given the proposed development and also the variable depths of Made Ground and Enfield Silt. An alternative option of pad type foundations was considered.
- Pad type foundations would need to be founded within the River Terrace Deposits which were found at depths ranging between 1.1m and 3.4m although was predominantly found between 1.6m and 2.3m. For preliminary design purposes an average foundation depth of 2.0m has been adopted.
- An allowable bearing pressure of 300 kN/m² was recommended. Structural loads were not known at the time of reporting although a preliminary settlement analysis was carried out for a range of pad sizes.
- To confirm the feasibility of adopting pad foundations the density and thickness of the River Terrace Deposits would need to be proven. Pile type foundations are an alternative option with piles founded within the London Clay formation. In either case additional ground investigation would be required.
- Suspended ground floor slabs are recommended.
- The results of the BRE 365 soakage testing recorded infiltration rates in the range 1.32×10^{-5} to 5.36×10^{-6} m/s indicating a low to moderate potential. It should be noted that the infiltration rates calculated were estimated by extrapolation of the test data.
- In accordance with BRE Special Digest 1 (SD1) a design sulphate class for the site of DS-1 and an ACEC Class of AC-1 is recommended.

Environmental

- Online information pertaining to the history of the site confirmed that Down Lane Park was part of a larger landscape of arable land and common grazing land until the railway was built in 1840, which severed the land from its surroundings. Down Lane Park covered an area of 19.5 acres and was formerly a part of the Lammas Land (common grazing land) in the area. It was purchased in 1900 by the Council and was opened as Down Fields Recreation Ground on the 11th May 1907. The park developed as a popular local resource with a running track and tennis courts. Down Lane School was built to the lower west side of the park and opened in 1911 and demolished in the 1980's. By 1990 the park occupied the same area of land that we see today.
- The prime potential contaminant source across the site is the infilling of soils from unknown sources.
- No significant sources of on-going contamination were noted during the walkover survey of the site.
- The site is underlain by unproductive strata within the bedrock London Clay Formation. The site is located within an Environment Agency defined Groundwater Source Protection Outer Zone.
- Concentrations of all analysed toxic metals were found to be below their respective soil guideline values for a continued public open space end use.
- No significantly elevated PAH compound concentrations were encountered across the site and therefore these contaminants are not considered to pose a significant risk of significant harm to human health.
- Concentrations of TPH were generally low across the site and would therefore not be considered to pose a significant risk of significant harm to human health.
- Therefore, based on the continued public open space end use, no further remedial works, in terms of contaminated soils, is required upon the site.
- Asbestos Containing Material (ACM) has been noted in a single soil sample retrieved from a depth of 3.0m within the large grass mound within the southern section of the site. The asbestos was encountered at a depth where it is unlikely that it would come into contact with future site users. Good working practice should be adhered to, along with appropriate PPE, in line with current legislation when safely handling and disposing of any asbestos material. For the asbestos a negligible risk has been calculated from the cumulative exposures to a child receptor resulting in excess lifetime risk of asbestos related diseases. Therefore, it is recommended that measures to reduce the potential for tracking back of soil and dust from existing made ground are appropriate.
- The risks posed to workers involved in any future redevelopment of the site are not considered significant providing standard health and hygiene practices are adopted.



- The risk to flora on site is considered to be low based on the healthy appearance and absence of any phytotoxic stress upon the existing flora. Should any new trees or plants be introduced to the site as part of any development proposals, it may be prudent to import clean suitable soils to the corresponding areas of the site. Any material imported to site for use in any such areas would require chemical testing to confirm its suitability for use.
- If appropriate, based on development proposals, it is considered likely that any new services, in particular potable water, will require protection, however it is advisable to seek service provider confirmation of this.
- Based on gas monitoring results, the site has been given a classification of CS1 which has a very low hazard potential and therefore no gas protection measures would need to be incorporated into any new buildings constructed on the site.
- The risks to groundwater in the underlying unproductive strata are generally considered to be low due to the lack of any significant mobile organic contamination.
- The majority of any surplus soil material to be removed off site is likely to be classified as non-hazardous and may or may not be acceptable at a facility licensed to accept inert waste. In addition, due to significant concentrations of lead across isolated parts of the site, a proportion of the soils could be classified as hazardous. This would ultimately be at the discretion of the intended Waste Transfer Site.
- It is recommended that a watching brief is implemented on this site during enabling works and should any contamination or potentially contaminative sources be discovered during the works, all site works would cease and suitably competent consultants/engineers will attend site to agree a formal remediation strategy.

Based on the principles and definitions outlined under section 57 of the Environment Act 1995, the site would not be considered to be “Contaminated Land” based on its proposed continued use as an area of public open park space following implementation of the above remedial measures, where appropriate.

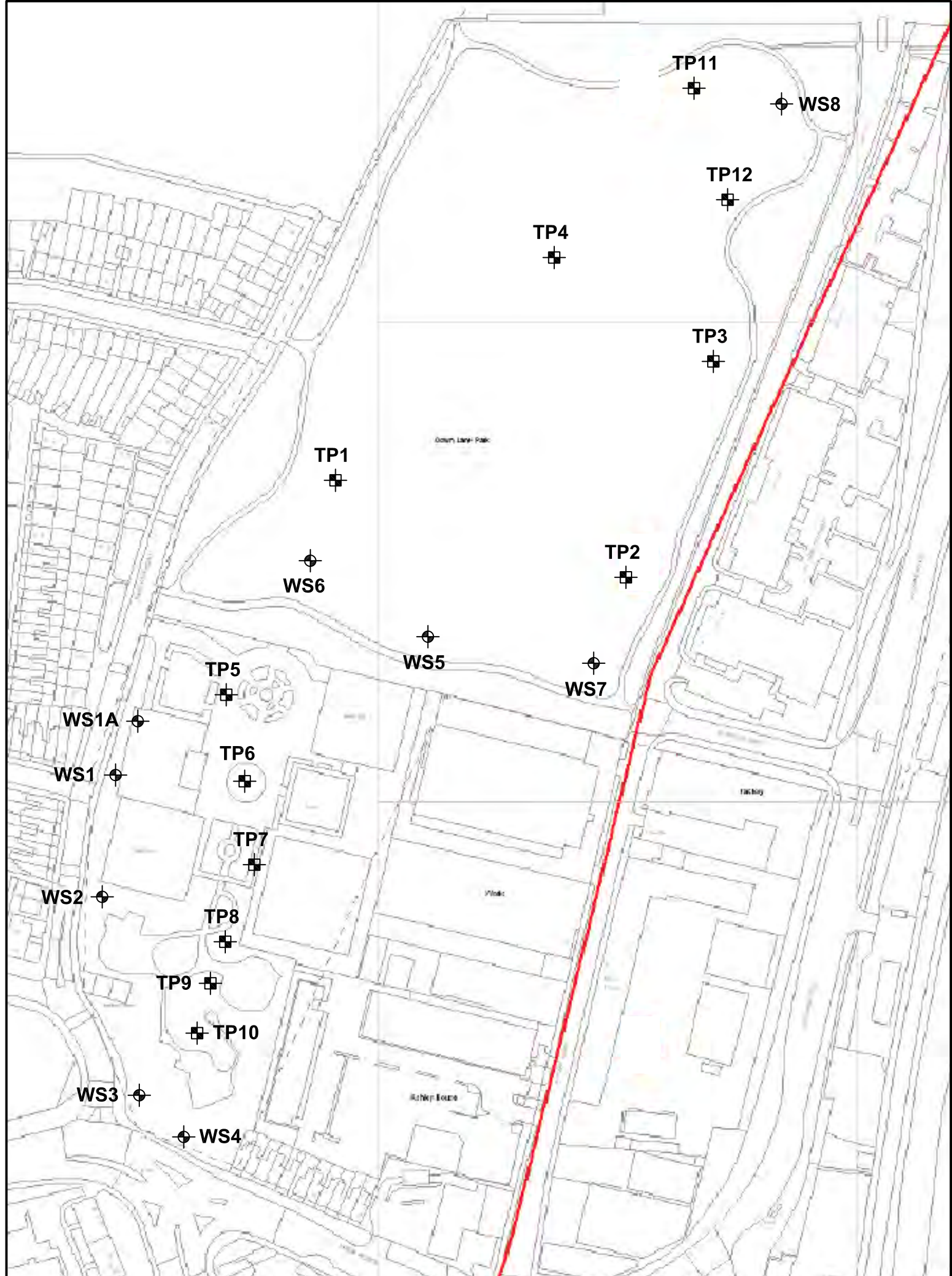
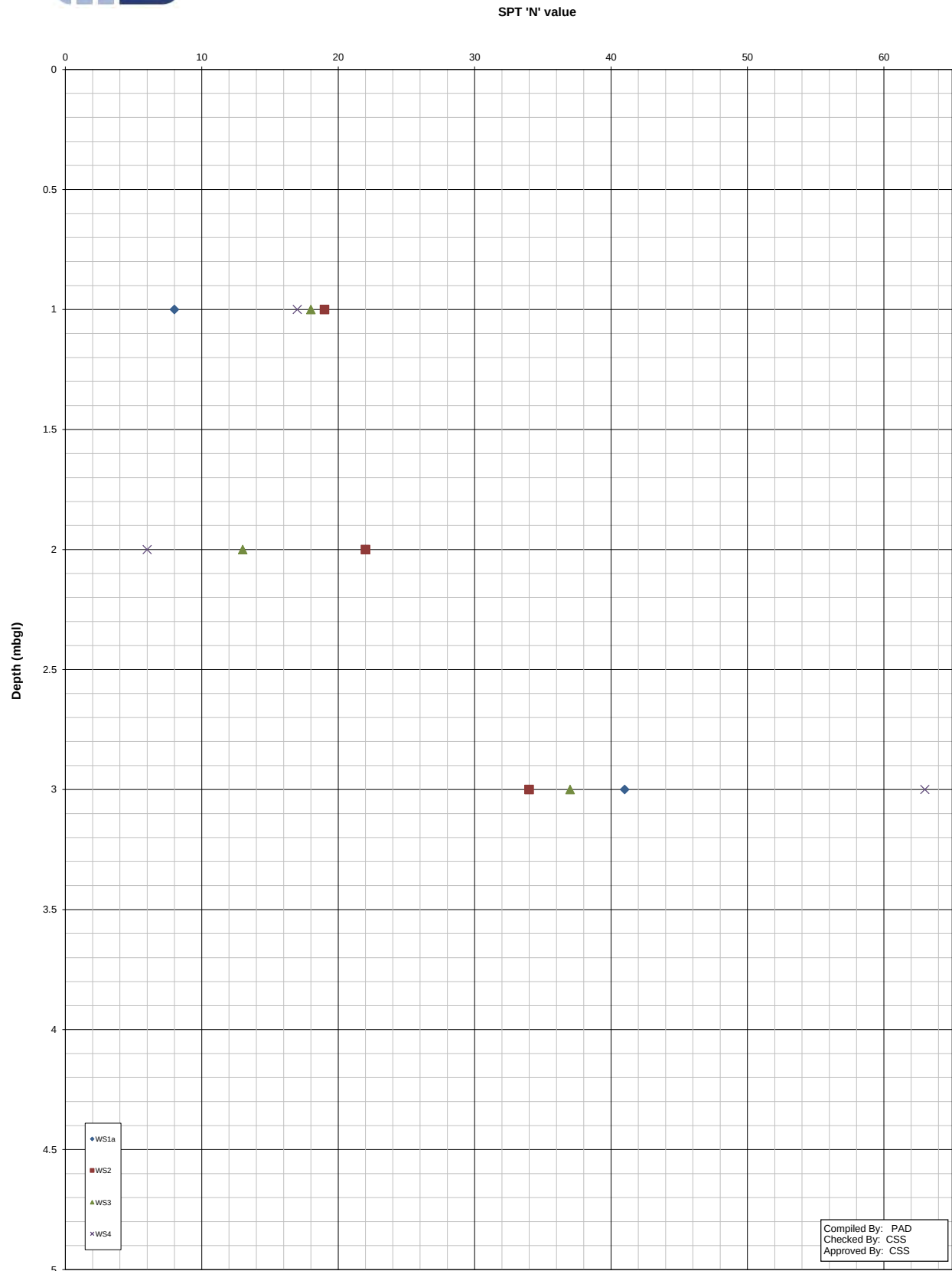




Figure 2: Down Lane Park, Tottenham Hale, London
SPT N-Depth Profile

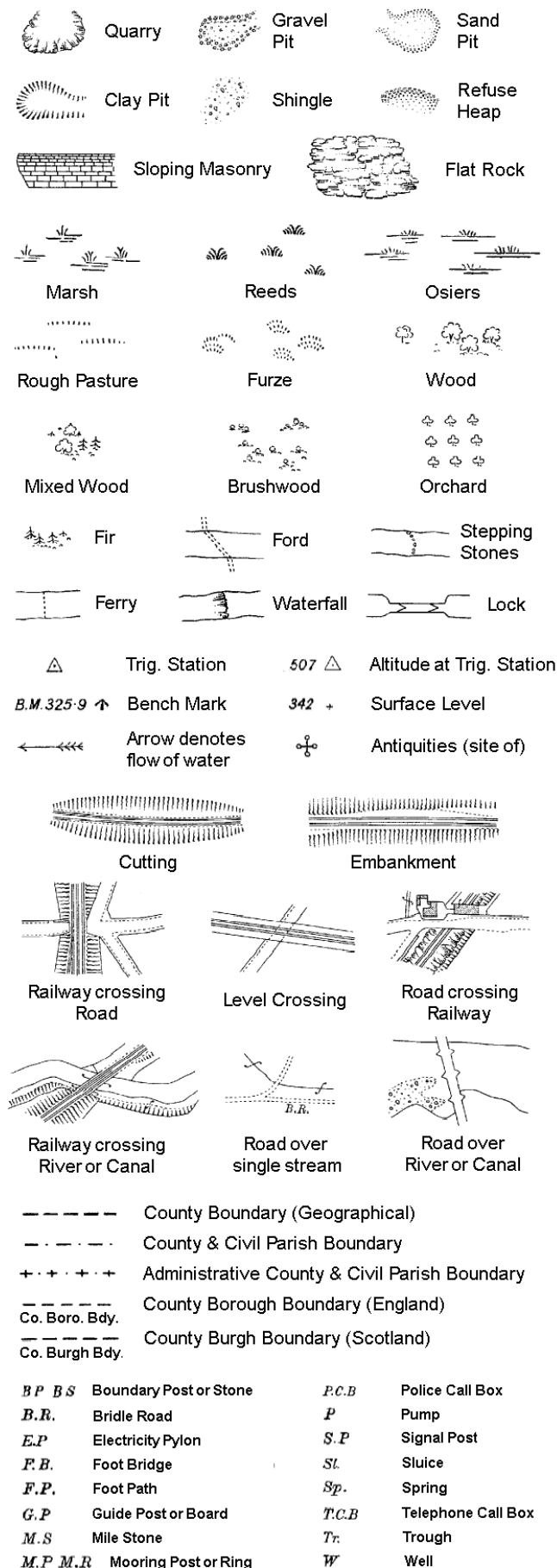




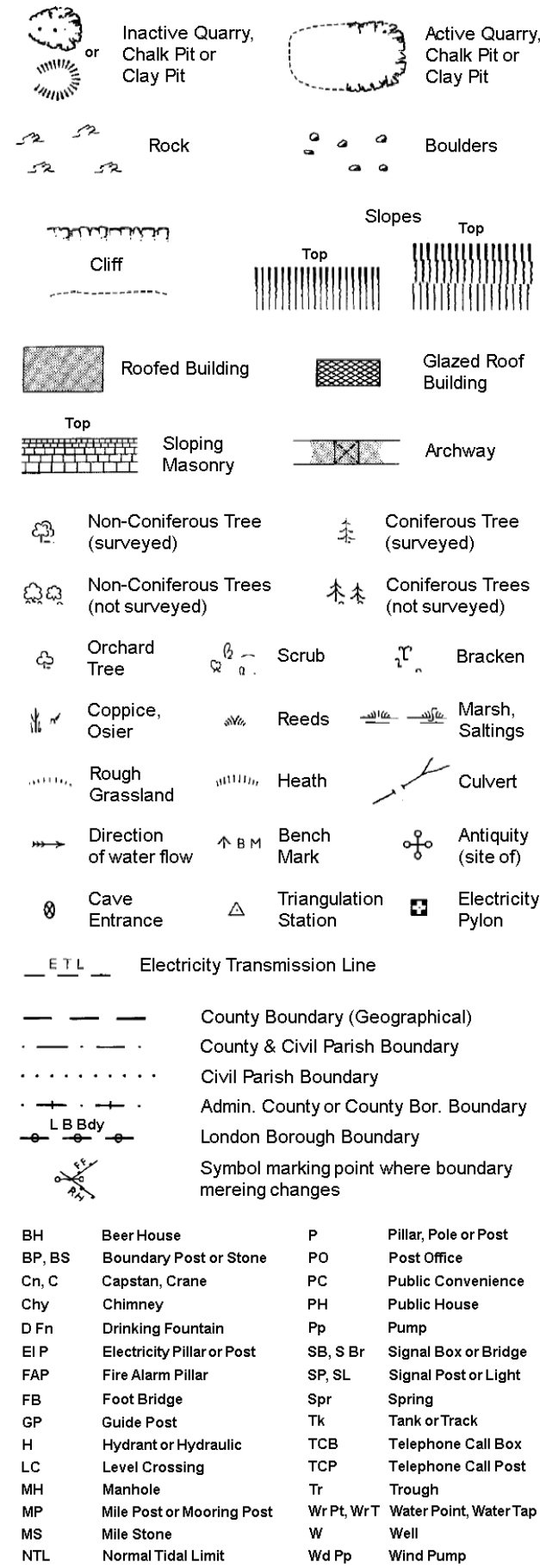
APPENDIX 1
HISTORICAL MAPS

Historical Mapping Legends

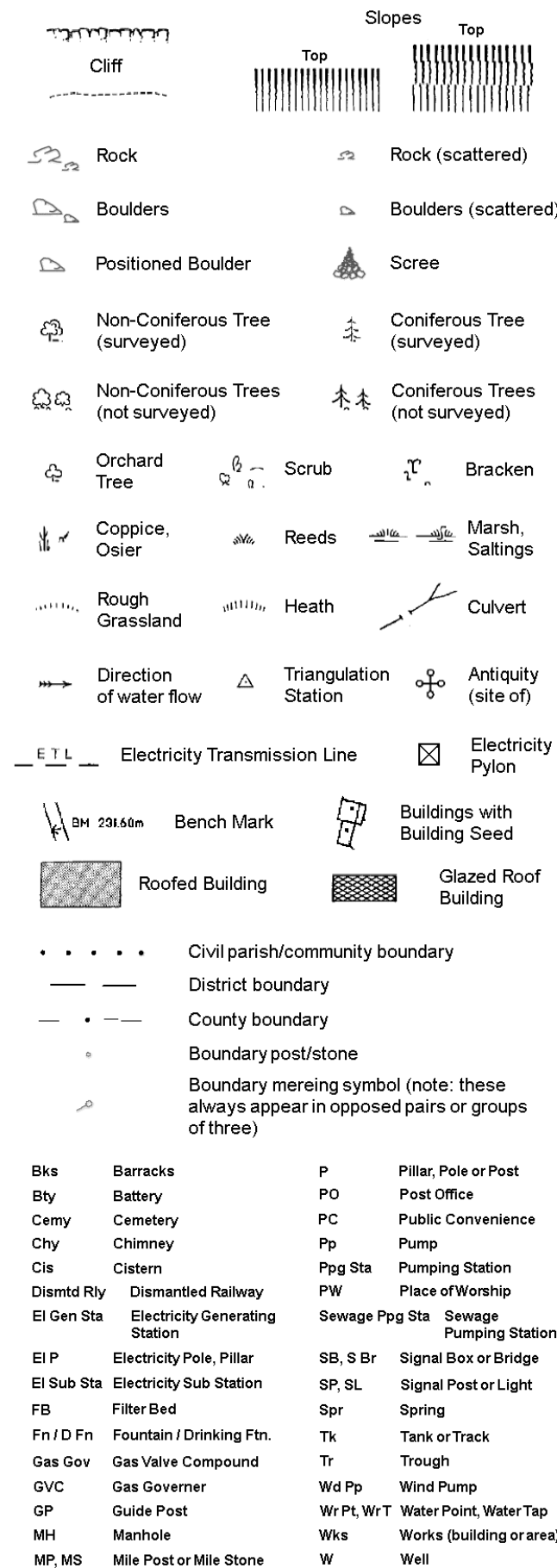
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



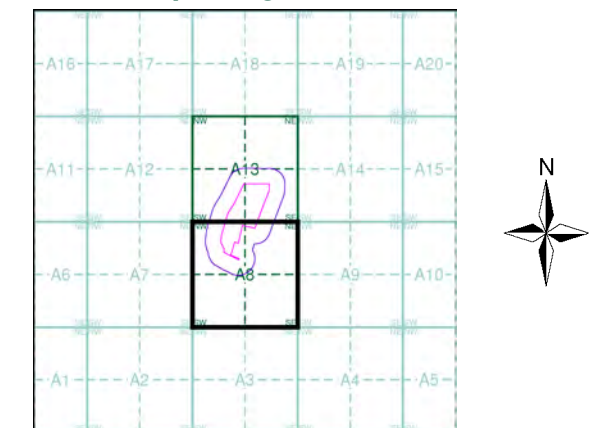
Large-Scale National Grid Data 1:2,500 and 1:1,250



Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Middlesex	1:2,500	1864	2
Essex	1:2,500	1865 - 1880	3
London	1:2,500	1896	4
Middlesex	1:2,500	1913	5
Essex	1:2,500	1915	6
Essex	1:2,500	1936	7
Ordnance Survey Plan	1:1,250	1955	8
Ordnance Survey Plan	1:2,500	1955	9
Additional SIMs	1:2,500	1955	10
Ordnance Survey Plan	1:1,250	1961 - 1975	11
Ordnance Survey Plan	1:1,250	1972 - 1989	12
Additional SIMs	1:1,250	1977 - 1986	13
Additional SIMs	1:1,250	1979 - 1989	14
Large-Scale National Grid Data	1:1,250	1991	15
Large-Scale National Grid Data	1:1,250	1991 - 1994	16
Large-Scale National Grid Data	1:1,250	1992 - 1994	17
Large-Scale National Grid Data	1:1,250	1995	18

Historical Map - Segment A8



Order Details

Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



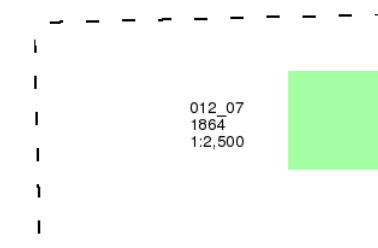
Middlesex

Published 1864

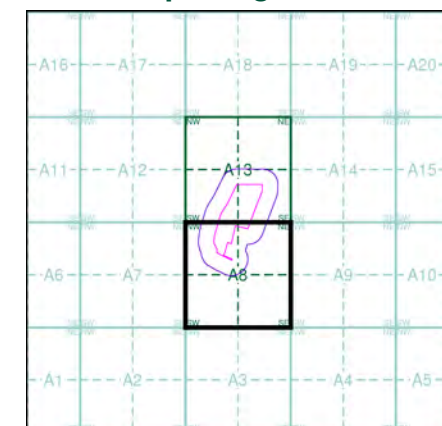
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

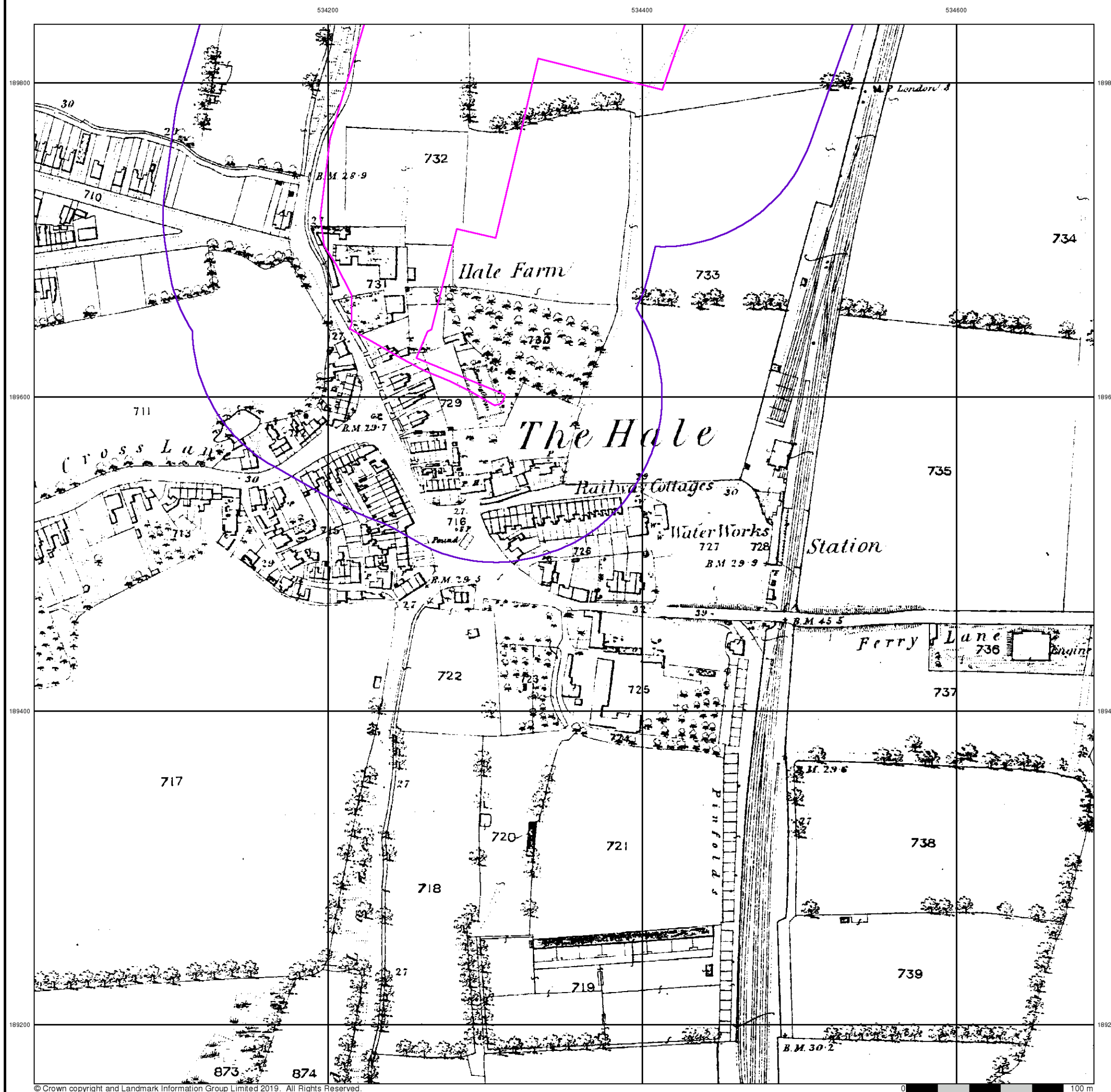
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Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

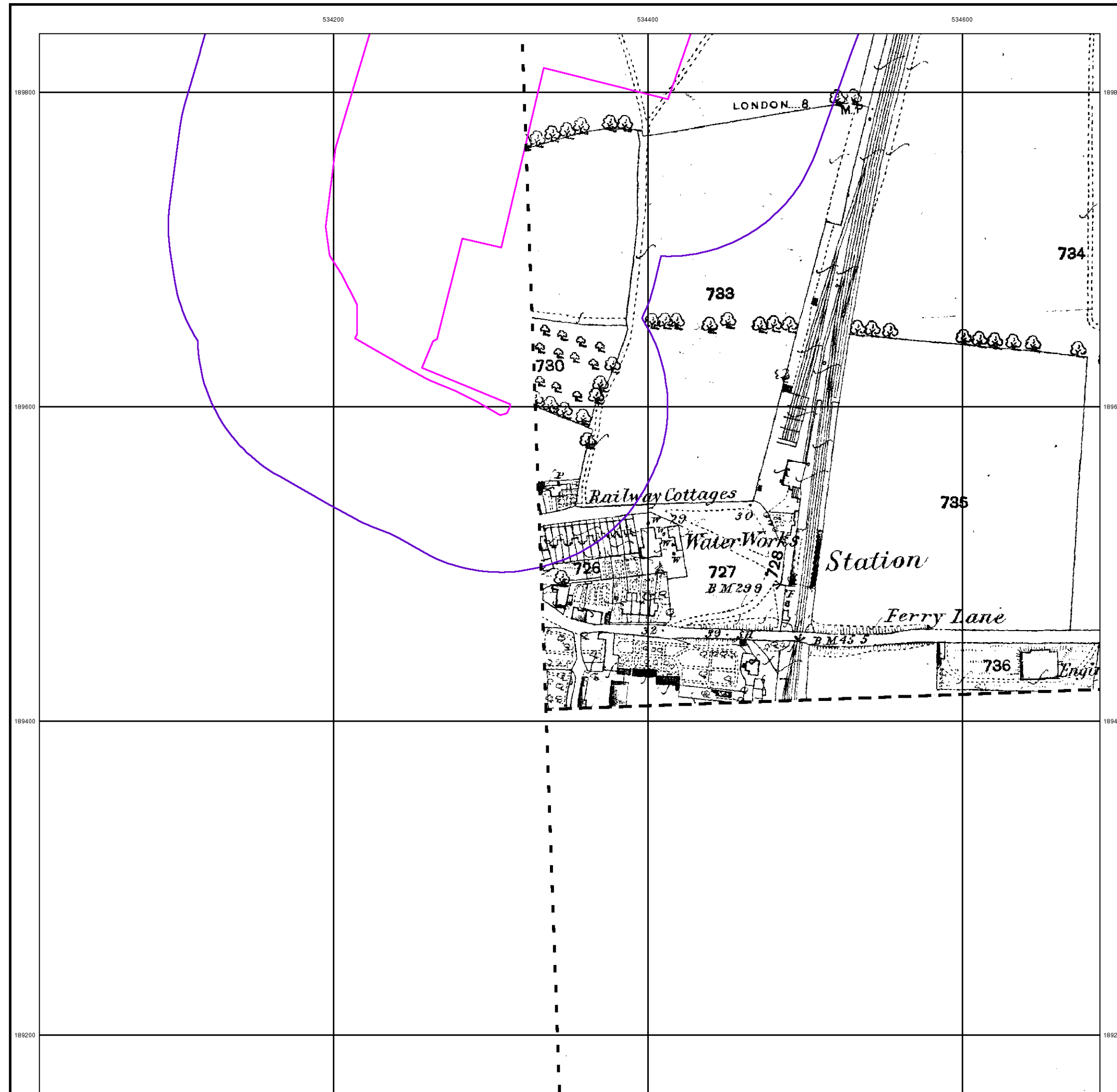
Site Details

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Essex

Published 1865 - 1880

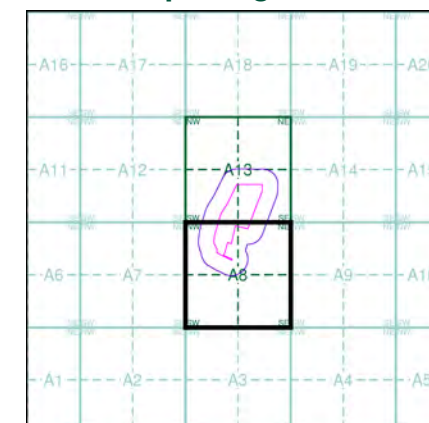
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

065_09
1880
1:2,500
065_13
1865
1:2,500

Historical Map - Segment A8



Order Details

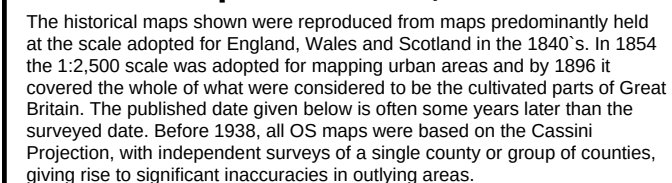
Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ



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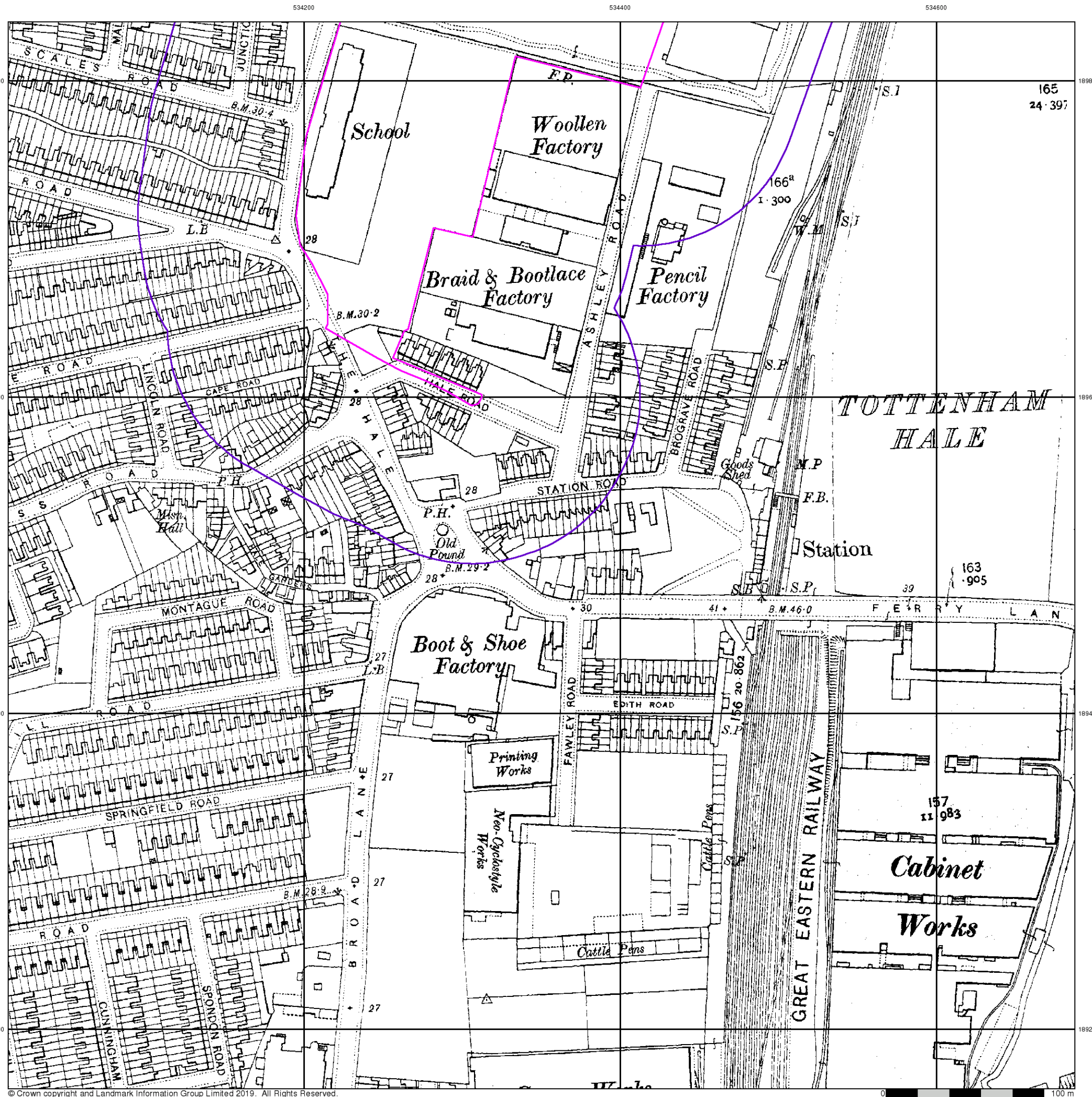
013 00
1896
1:2,500



Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



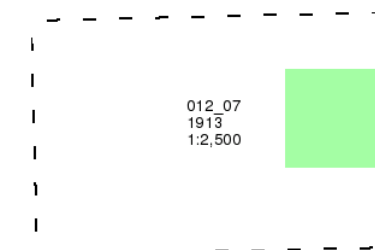
Middlesex

Published 1913

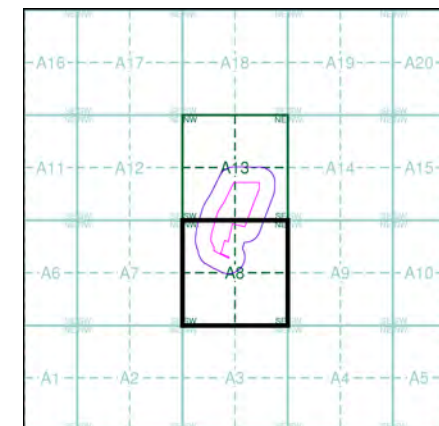
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

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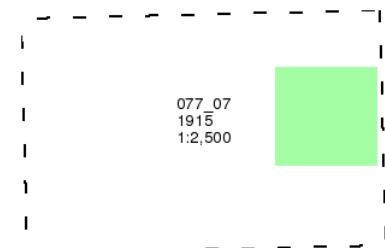
Essex

Published 1915

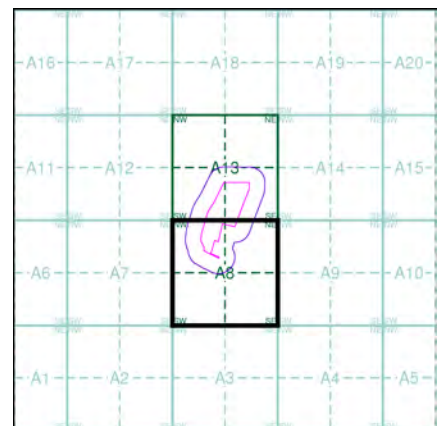
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

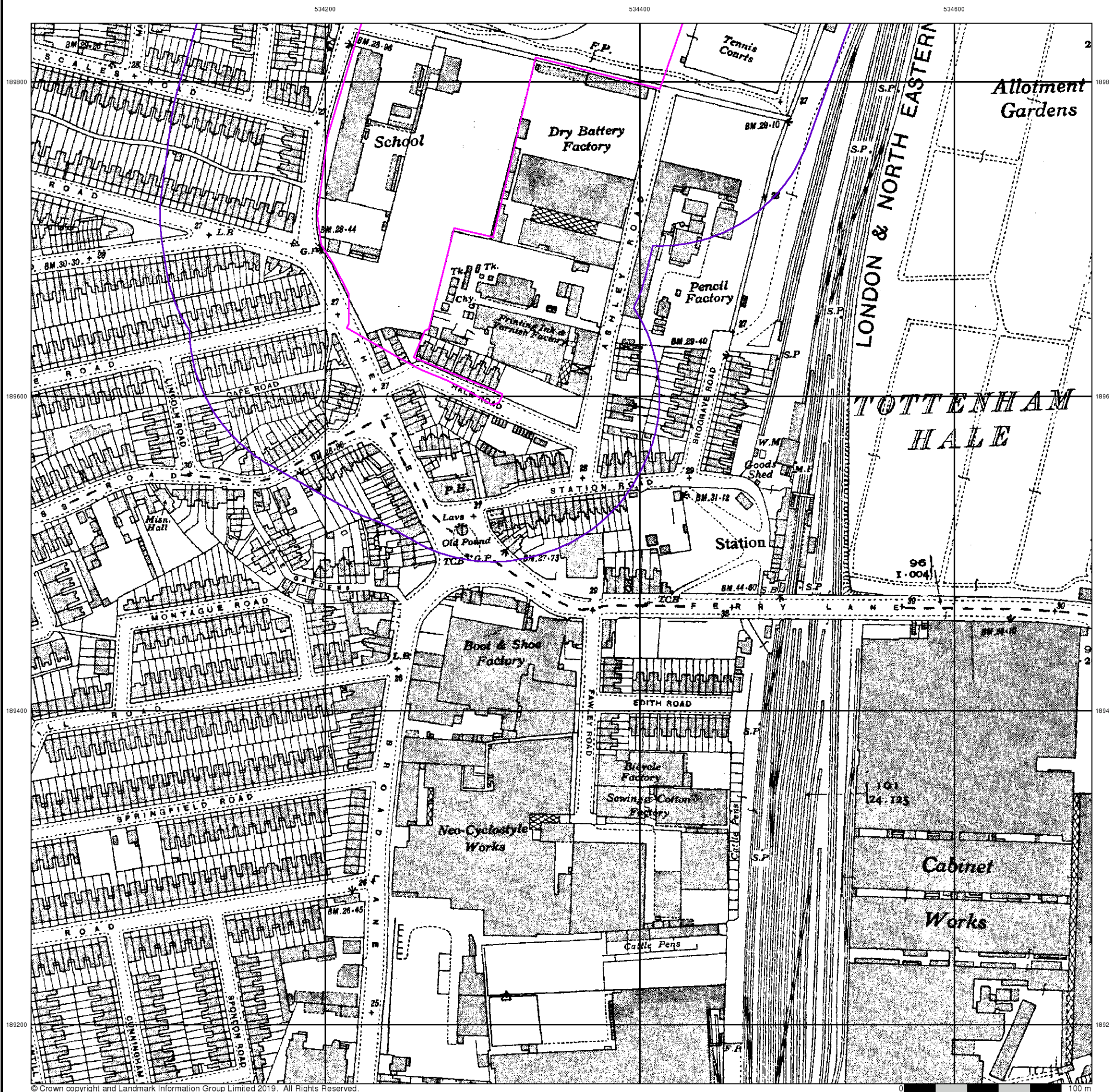
Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

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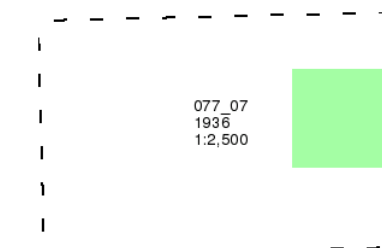
Essex

Published 1936

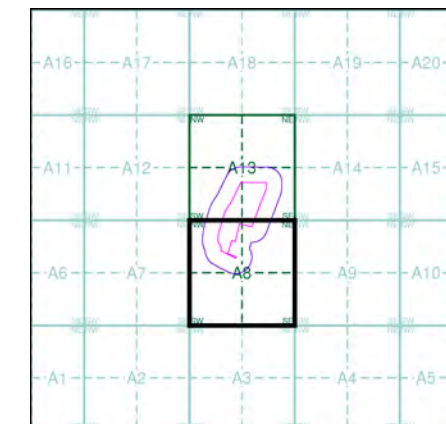
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ

Landmark
INFORMATION GROUP

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Ordnance Survey Plan

Published 1955

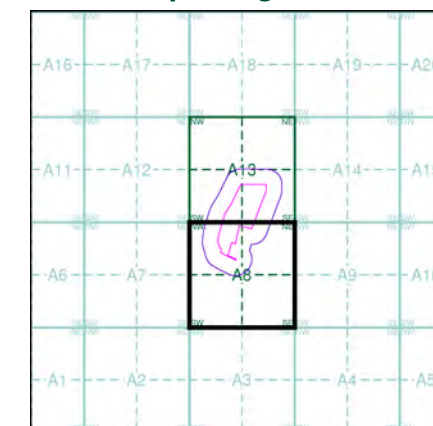
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

TQ3489NW	TQ3489NE
1955	1955
1:1,250	1:1,250
TQ3489SW	TQ3489SE
1955	1955
1:1,250	1:1,250

Historical Map - Segment A8



Order Details

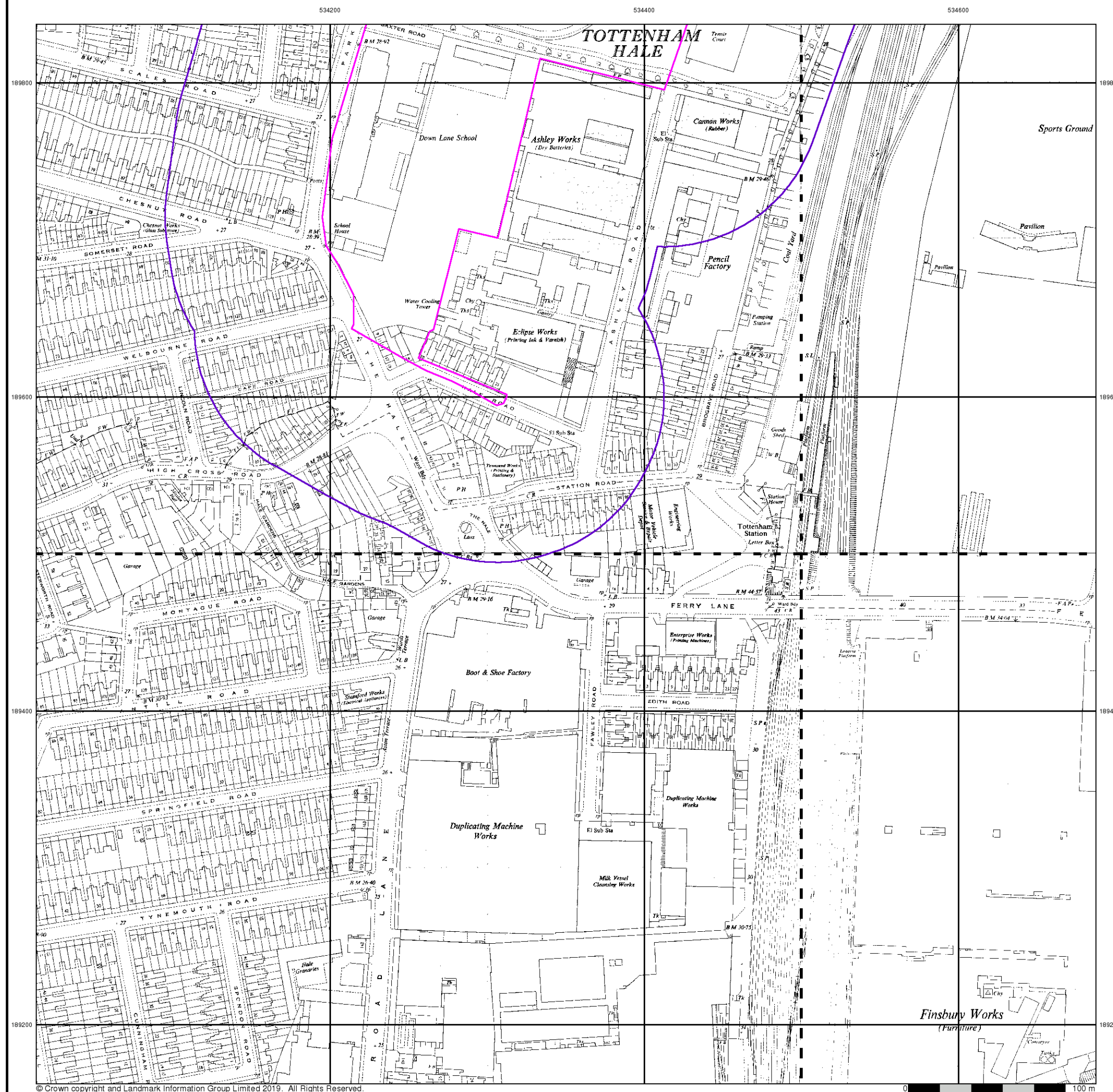
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Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

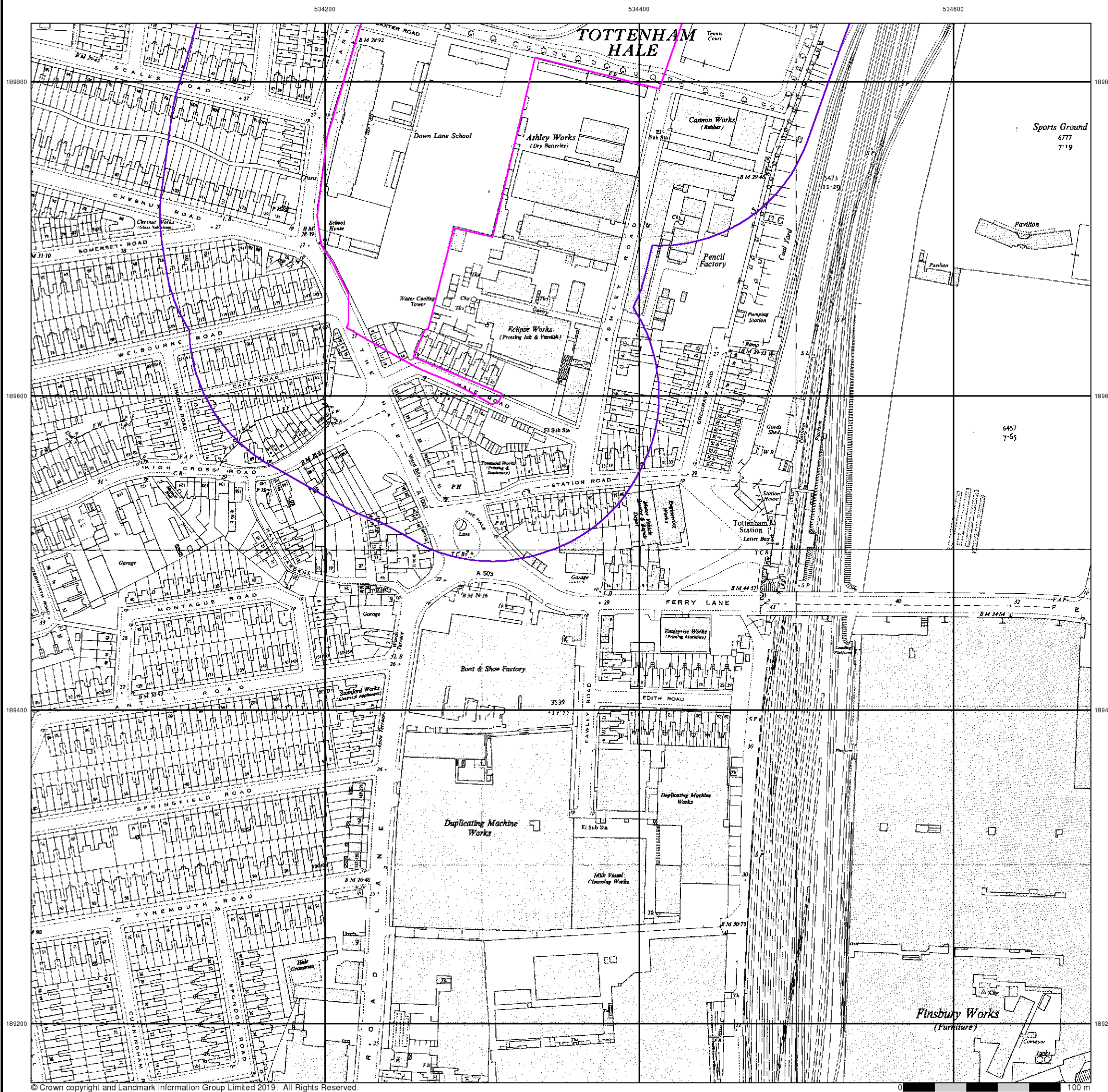
Site Details

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ



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Fax: 0844 844 9951
Web: www.envirocheck.co.uk





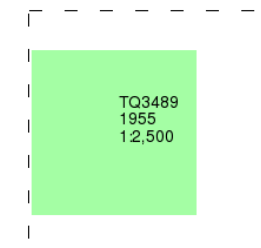
Ordnance Survey Plan

Published 1955

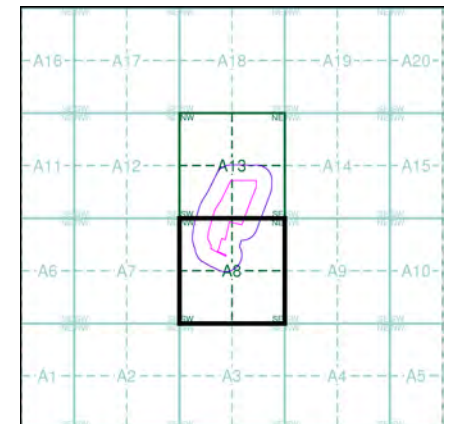
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

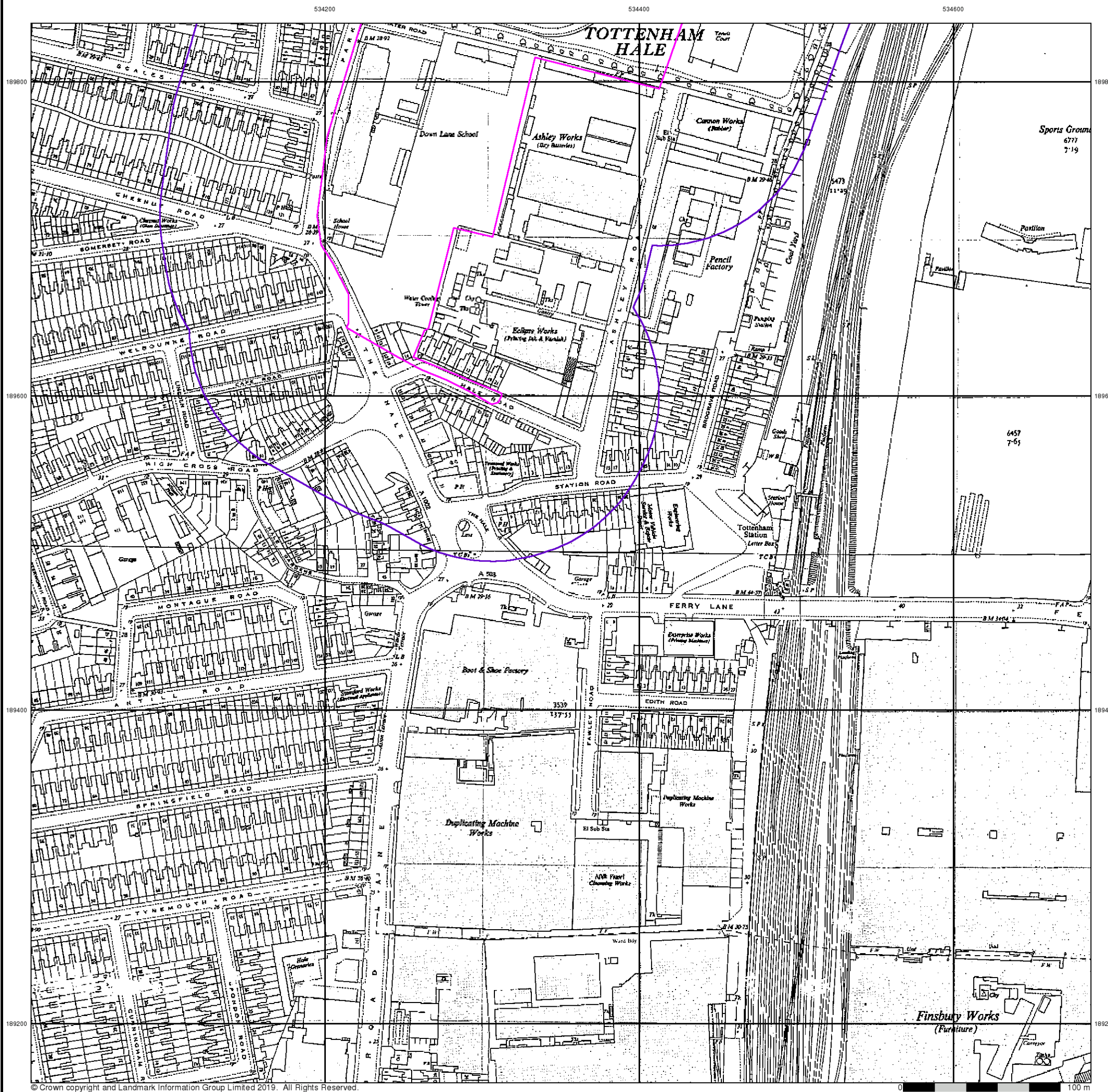
Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ



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Fax: 0844 844 9951
Web: www.envirocheck.co.uk



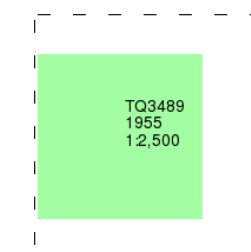
Additional SIMs

Published 1955

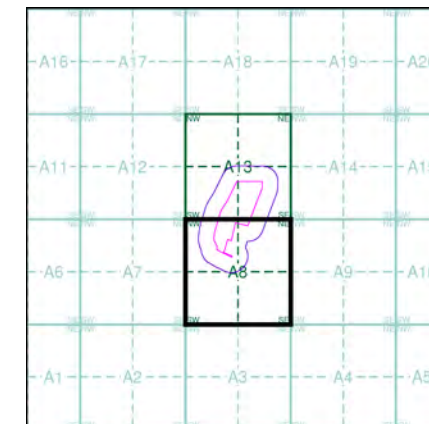
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Ordnance Survey Plan

Published 1961 - 1975

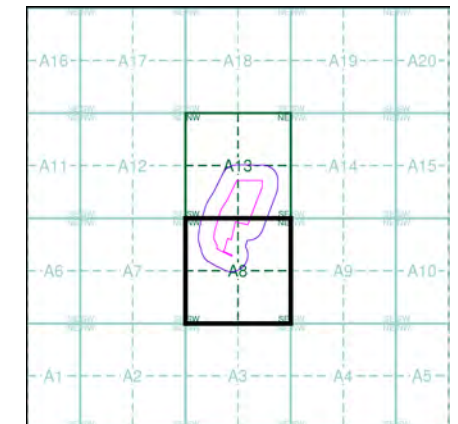
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

TQ3489NW 1961 1:1,250	TQ3489NE 1961 1:1,250
TQ3489SW 1965 1:1,250	TQ3489SE 1975 1:1,250

Historical Map - Segment A8



Order Details

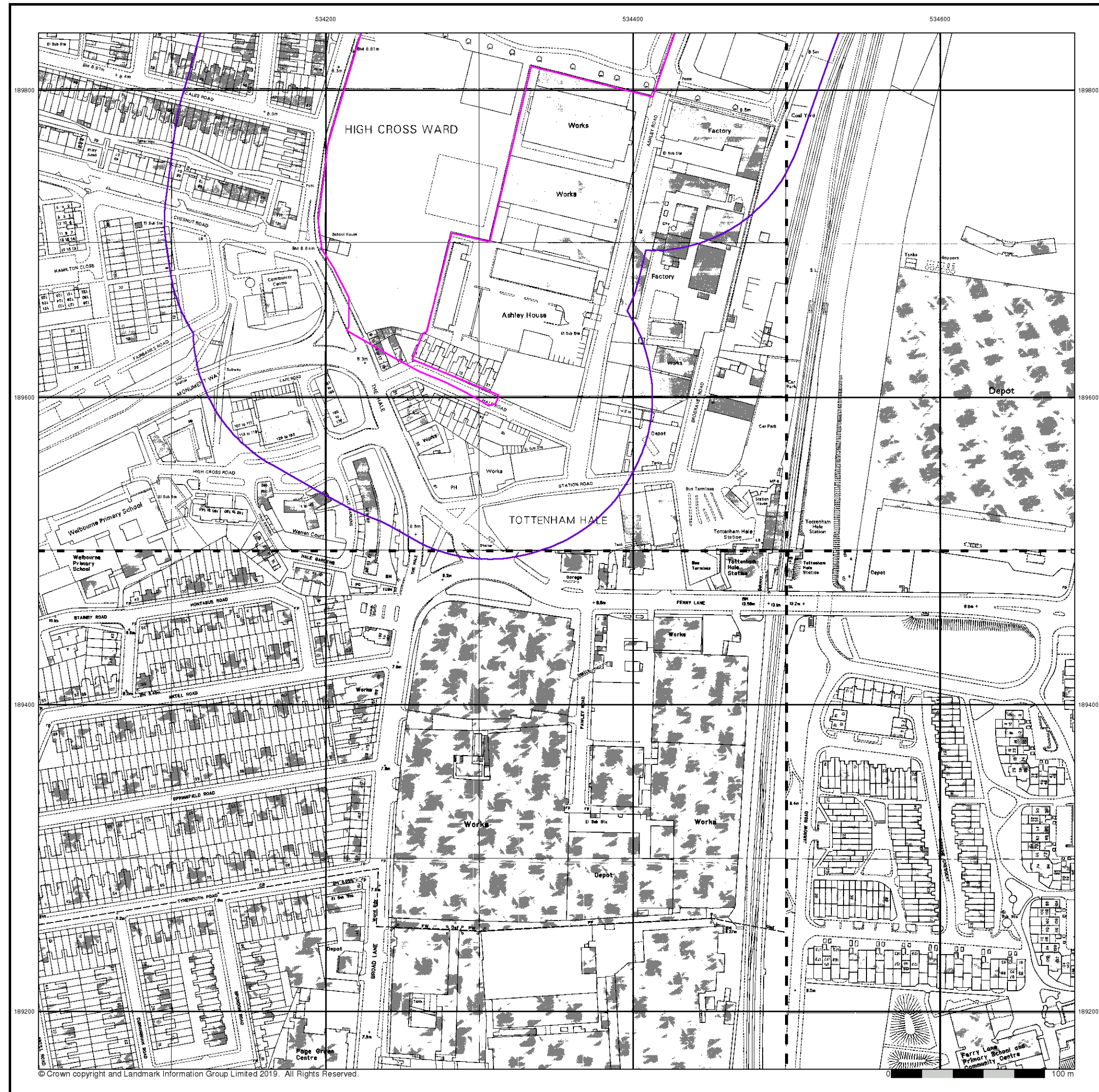
Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



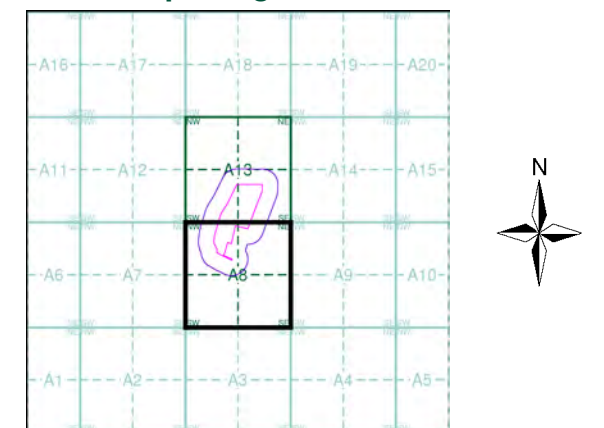
Ordnance Survey Plan
Published 1972 - 1989
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

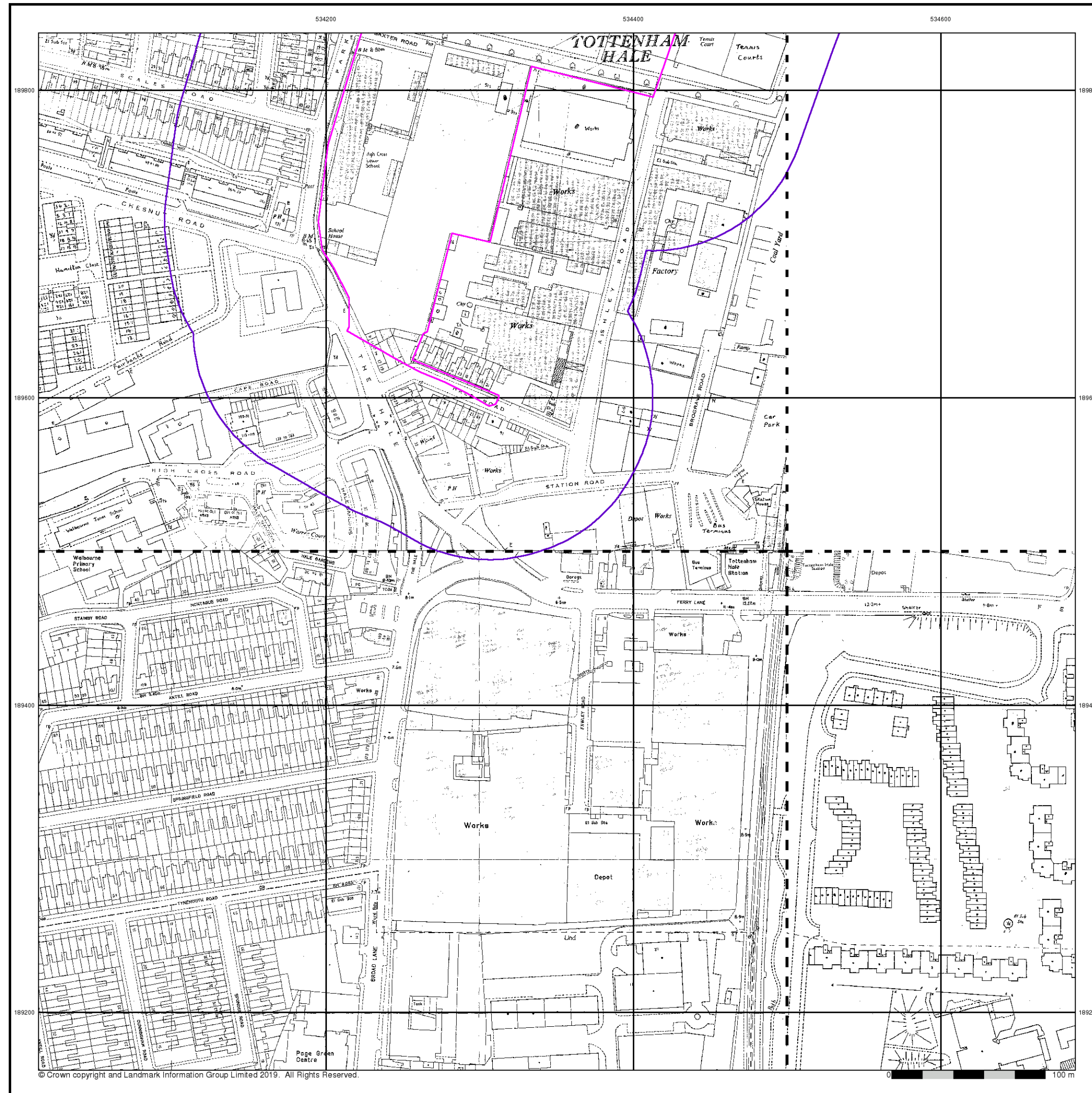
TQ3489NW	TQ3489NE
1989	1972
1:1,250	1:1,250
TQ3489SW	TQ3489SE
1979	1981
1:1,250	1:1,250

Historical Map - Segment A8



Order Details
Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details
Down Lane Park, Tottenham Hale, LONDON, N17 9LJ



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Additional SIMs

Published 1977 - 1986

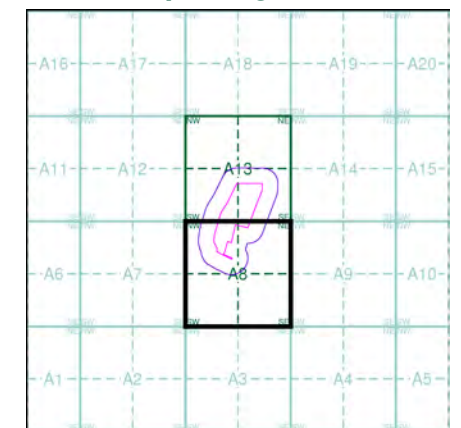
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

TQ3489NW	
1977	
1:1,250	
TQ3489SW	TQ3489SE
1986	1977
1:1,250	1:1,250

Historical Map - Segment A8



Order Details

Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ



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Additional SIMs

Published 1979 - 1989

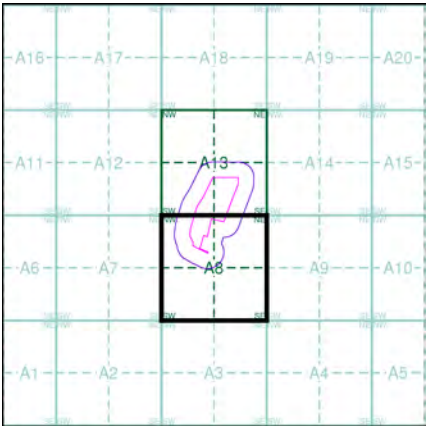
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

TQ3489NW	
1985	
1:1,250	
TQ3489SW	TQ3489SE
1989	1979
1:1,250	1:1,250

Historical Map - Segment A8



Order Details

Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ



Tel: 0844 844 9952
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Web: www.envirocheck.co.uk



Large-Scale National Grid Data

Published 1991

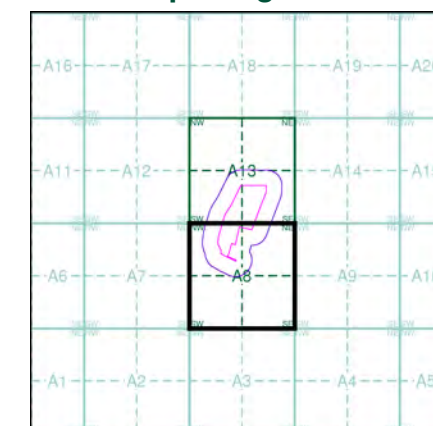
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

TQ3489NW	TQ3489NE
1991	1991
1:1,250	1:1,250
TQ3489SW	TQ3489SE
1991	1991
1:1,250	1:1,250

Historical Map - Segment A8



Order Details

Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ



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Large-Scale National Grid Data

Published 1991 - 1994

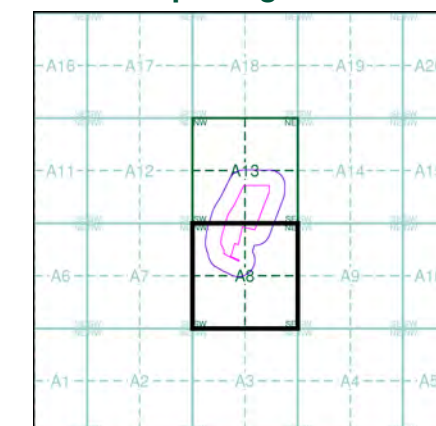
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

TQ3489NW	TQ3489NE
1991	1992
1:1,250	1:1,250
TQ3489SW	TQ3489SE
1991	1994
1:1,250	1:1,250

Historical Map - Segment A8



Order Details

Order Number: 211490600_1_1
Customer Ref: 12230
National Grid Reference: 534350, 189860
Slice: A
Site Area (Ha): 7.01
Search Buffer (m): 100

Site Details

Down Lane Park, Tottenham Hale, LONDON, N17 9LJ



Tel: 0844 844 9952
Fax: 0844 844 9951
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Large-Scale National Grid Data

Published 1992 - 1994

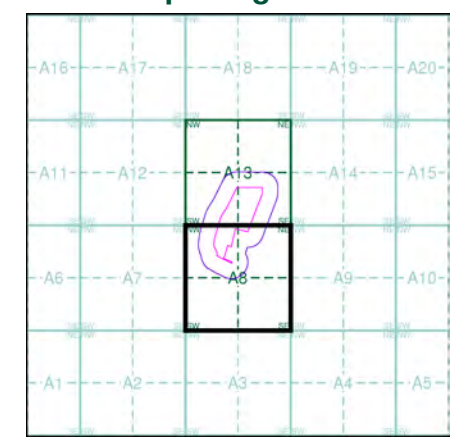
Source map scale - 1:1,250

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Map Name(s) and Date(s)

TQ3489NW	1992	1:1,250
TQ3489SW	1994	1:1,250
TQ3489SE	1994	1:1,250

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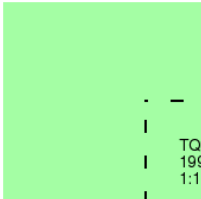
Large-Scale National Grid Data

Published 1995

Source map scale - 1:1,250

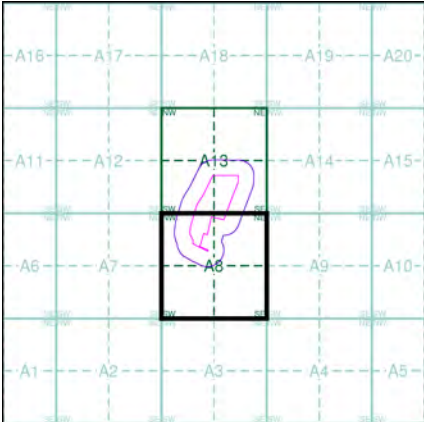
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Map Name(s) and Date(s)



TQ3489SE
1995
1:1,250

Historical Map - Segment A8



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A Landmark Information Group Service v50.0 17-Jul-2019 Page 18 of 18