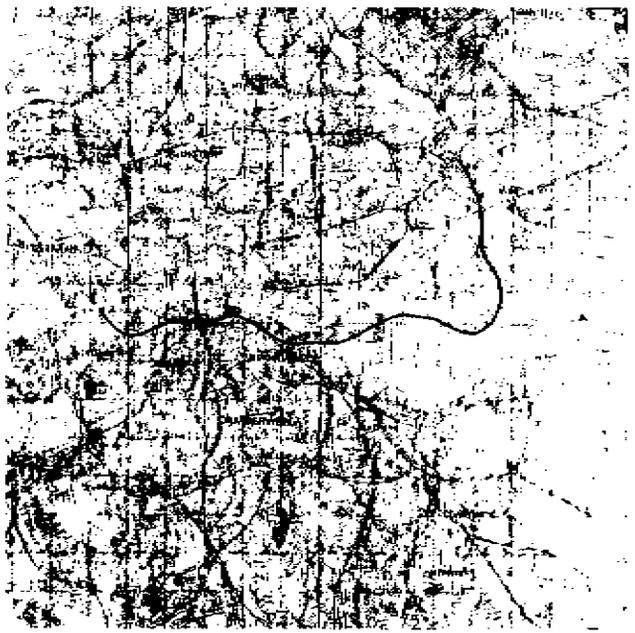
ADDENDUM REPORT

London Underground Limited



Jubilee Line Extension, North Greenwich Option:
Environmental Statement Addendum

May 1990

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ADDENDUM REPORT

London Underground Limited

Jubilee Line Extension, North Greenwich Option: *Environmental Statement Addendum*

May 1990

CONTENTS

THE NORTH GREENWICH OPTION

1. INTRODUCTION

This report has been prepared for London Underground Limited (LUL) as an Addendum to the Jubilee Line Extension (JLE) Environmental Statement. It identifies the environmental implications associated with an alternative alignment of the section on the eastern part of the line between Canary Wharf and Canning Town. The impacts predicted for the alternative alignment are then compared with the impacts associated with the original scheme (via Brunswick) identified in the main Environmental Statement for the JLE. The general objectives of the study and the approach to impact assessment are described in the introduction to the main report.

The structure of this addendum is as follows:

- Section 1 is an introduction.
- Section 2 describes the proposed alternative route alignment.
- Section 3 describes the existing conditions along the route section and includes particulars of other construction programmes planned to run concurrently with the LUL development.
- Section 4 describes the work sites required during the construction of the route section.
- Section 5 describes the principal environmental impacts which may result from development of the proposed alternative alignment.
- Section 6 provides a comparative assessment between the environmental impacts associated with the North Greenwich route alignment and those of the original East Brunswick option.
- Section 7 is a summary of the principal findings of this addendum.

2. THE PROPOSED ALIGNMENT

LUL is examining an alternative alignment of the JLE between Canary Wharf and Canning Town; the North Greenwich Option (see Figure Add.2(a)). On this alignment, the line deviates from the route described in the original Bill Scheme east of Canary Wharf Station, runs southward beneath the Thames to pass under the Greenwich Peninsula, recrosses the Thames, and rejoins the original route alignment south of the proposed Canning Town Underground Station.

The North Greenwich Option begins in tunnel east of the Canary Wharf work site, and passes south eastwards at about 25m depth, crossing the Thames between Drawbridge Jetty and Delta Wharf. The route then continues north eastwards across the Greenwich Peninsula, under the northbound bore of the Blackwall Tunnel, and rises to about 10m depth at the proposed North Greenwich Station. The route then heads north eastwards recrossing the Thames at a depth of about 25 metres and continues northwards, along the route of the London Docklands Railway before rejoining the original route at Canning Town. This last section, north of the Thames, gradually rises from a depth of 24 metres adjacent to the river to reach the surface about 750m south of Canning Town BR station.

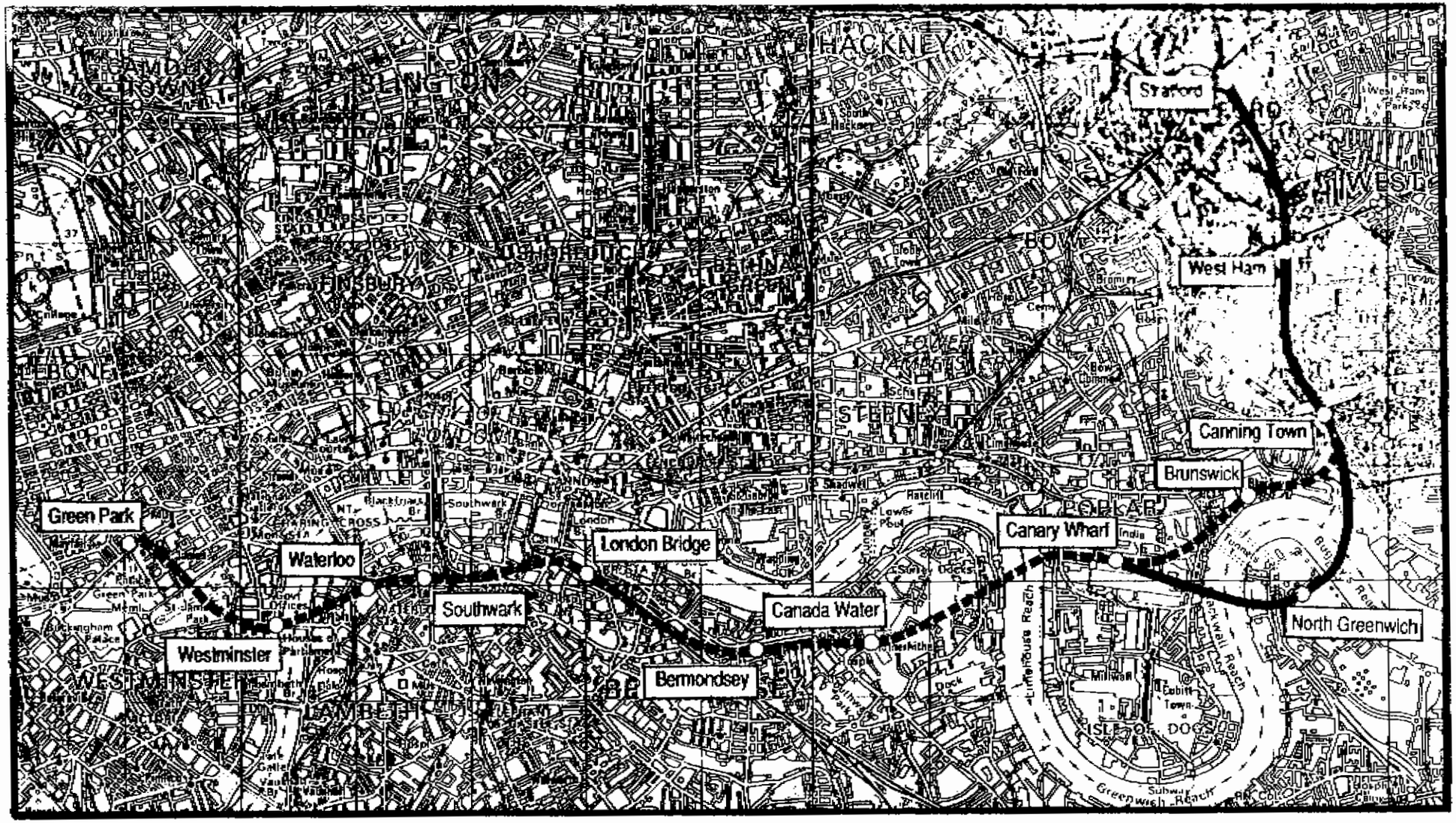


Figure Add. 2 (a)
North Greenwich Option

- Stations
- Line Underground
- Line at Surface
- Proposed Greenwich Option

Permanent surface structures required by this alternative route section comprise:

- o two ventilation and emergency escape shafts, one at Preston's Road and a second at a site, yet to be finalised, adjacent to the proposed Lower Lea Crossing at Canning Town;

- o access points to a sub-surface station at North Greenwich.

3. EXISTING CONDITIONS

The proposed alternative alignment runs beneath an area of North Greenwich which is at present mostly vacant, the site of former gas and chemical works. A development company, Port Greenwich Ltd. (PGL) is planning substantial developments in this area and the station at North Greenwich is being considered as an integral part of this development. Plans for the area, developed by PGL in consultation with the London Borough of Greenwich planning authorities, include the construction of 5000-6000 housing units together with office space and industrial and leisure developments. PGL estimates that this will provide for 10,000 to 11,000 permanent residents and about 3,500 jobs. The intention at present is to locate a station within this scheme in an area of mixed commercial, office and residential developments.

Annex 1 shows the plan extracted from the draft planning brief developed by the Borough of Greenwich in consultation with British Gas in 1988. This brief was the basis for the present Master Plan being prepared by PGL.

4. WORK SITES

The proposed alternative alignment is shown in Figures Add.4(a) and (b). Work sites required for the alignment are expected to be as follows:

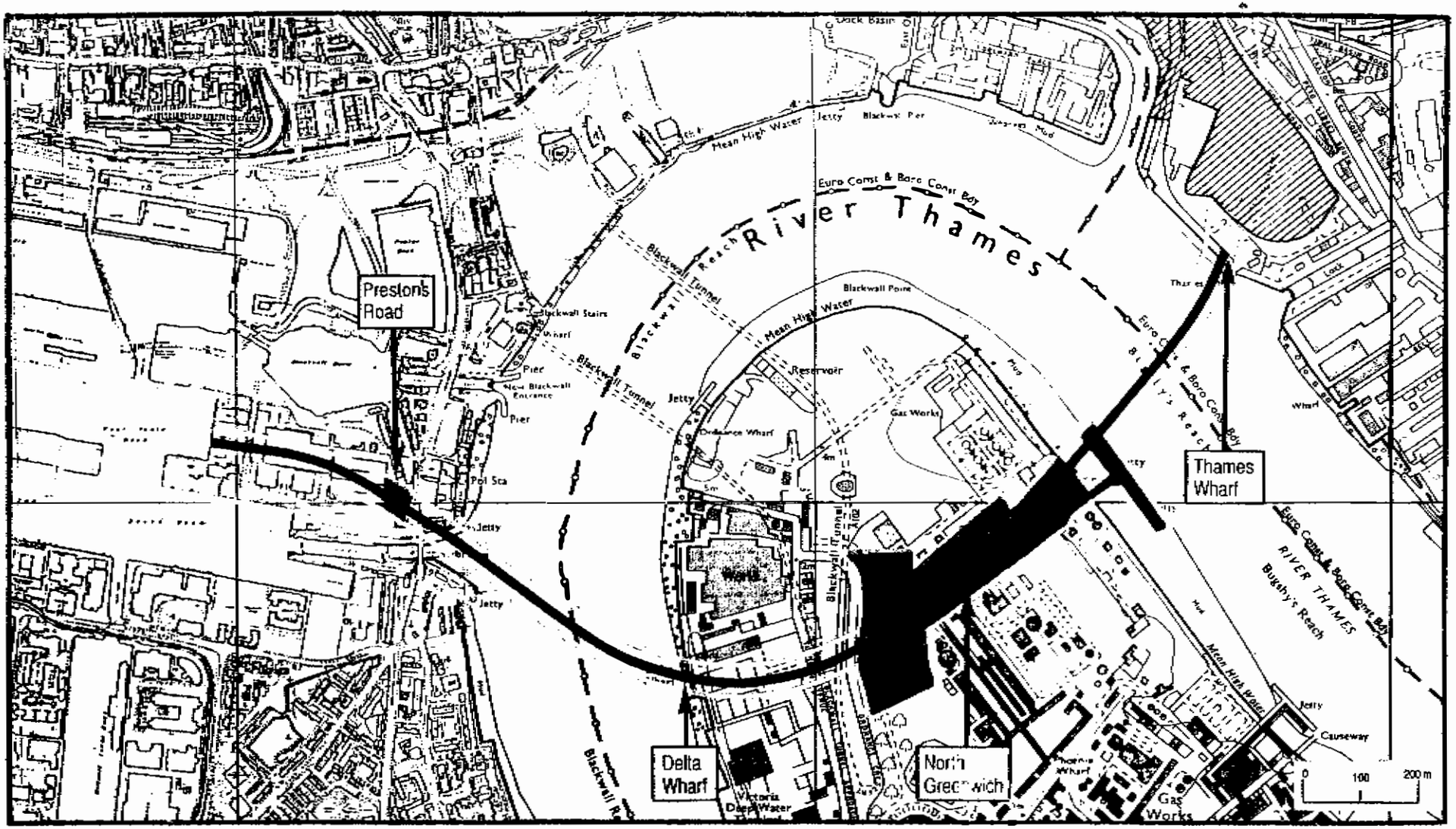
- o **Preston's Road.** One small area of land additional to that to be acquired under the Bill scheme will be acquired - a block of about 0.25ha at West India Dock west of Preston's Road (see Figure Add.4(c)). This will be used for the construction of a ventilation and emergency escape shaft, the major works for which are expected to take up to 2 years.

- o **North Greenwich.** The works will require land extending about 300m north to south, at the eastern edge of Ordnance Crescent, on the Greenwich Peninsula, narrowing to about 100m across the rest of the Peninsula including the disused jetty at its eastern edge and covering a total area of about 6.3ha (see Photograph).

  The western portion of the site, an area of about 2.8ha, will be used, primarily for tunnel driving activities and vehicle storage; part of this area will be set aside for a permanent car park, the exact location of which is yet to be established. The remainder of the worksite comprises the station site and, at the eastern edge, a further area set aside for tunnel driving activities. The station will be underground, constructed by cut and cover methods. Permanent structures, in addition to the car park, will be limited to station entrances and draught relief shafts. The jetty is intended to be used for importation of building materials for the works and spoil to be used for the reclamation schemes on the peninsula, and the exportation of unsuitable spoil.

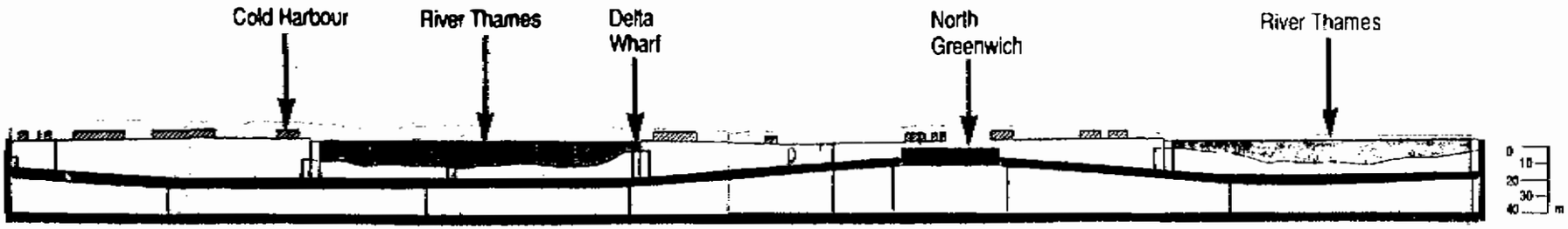
  Major works at this site are expected to take 3½-4 years.

- o **The Thames Wharf and The Limmo.** Land take to the north of the Thames begins at Thames Wharf and extends along the remaining length of the route option, to the proposed Canning Town Underground Station, an area of approximately 8.5ha. In addition, the Station worksite at the northern end of the site, requires an area of c. 3ha (see main ES, Section A3.6.4). This area is required for the provision of a junction to accommodate a possible



Thames Wharf and Limmo Peninsula Site of Metropolitan Importance for Nature Conservation

Figure Add.4.(a)
Work Sites on theNorth Greenwich Option



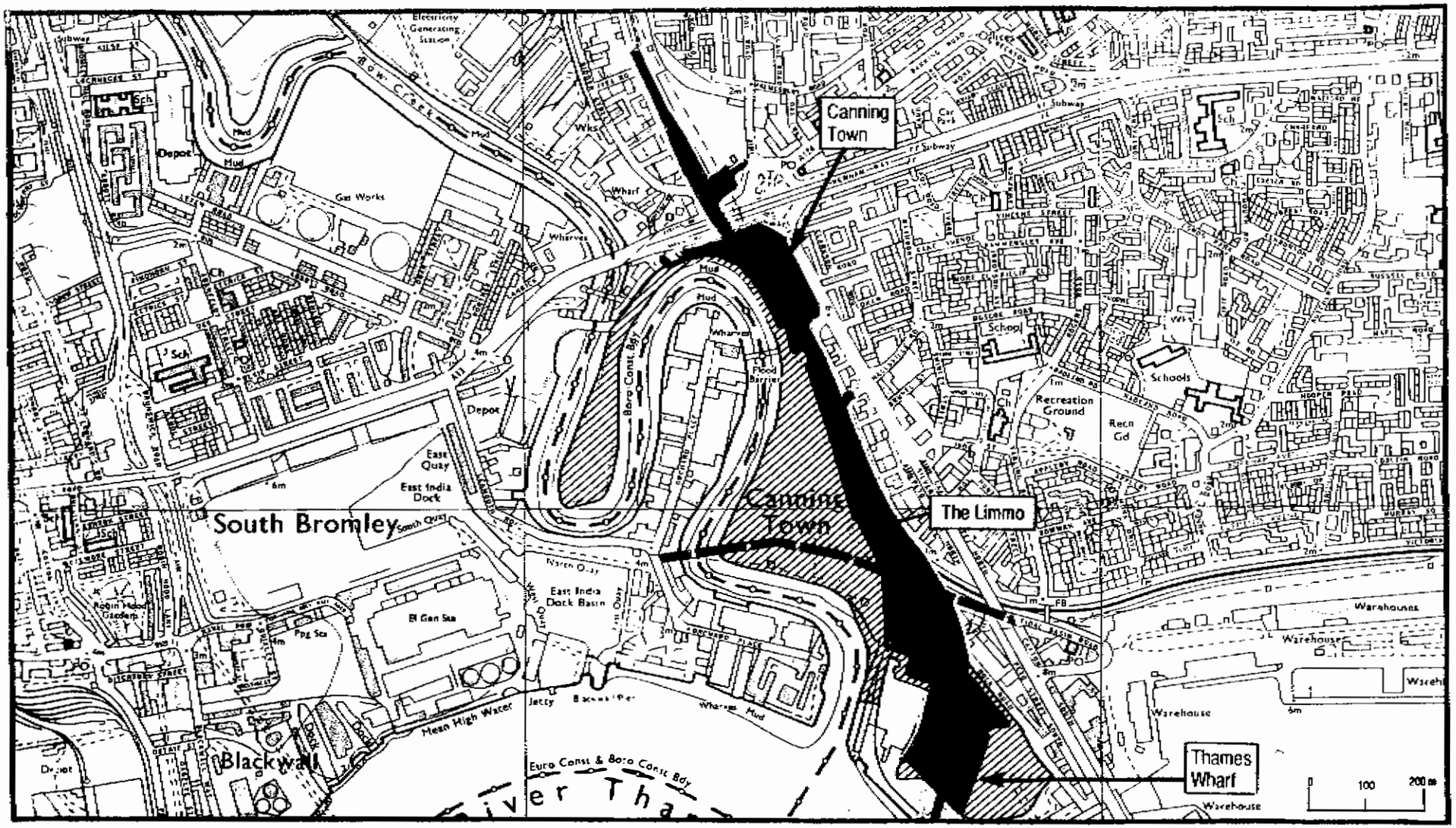
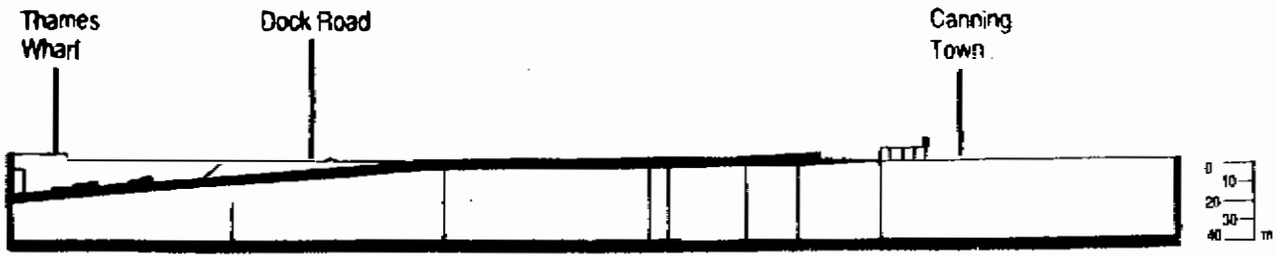


Figure Add. 4.(b)
Work Sites on the North Greenwich Option (cont.)



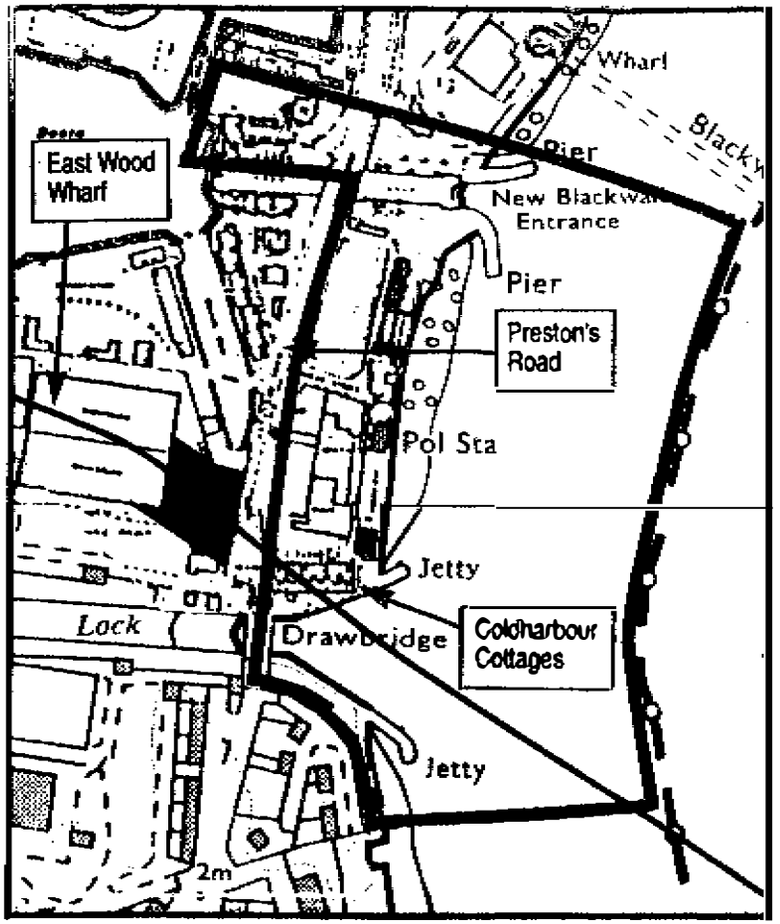


Figure Add. 4.(c)
Preston's Road Work Site

future connection with an extension to the Jubilee Line running east to Thamesmead; this may be built using cut and cover methods. A ventilation and emergency escape shaft will also be constructed in the same area adjacent to the course of the proposed Lower Lea crossing. The remaining land is required for the cut and cover construction of the final section of tunnel and portal work (see Figure Add.4(d) and the accompanying Photograph).

The Thames Wharf and The Limmo work site will be occupied for major works for 3½-4 years.

5. THE IMPACTS

5.1 Introduction

The possible impacts arising from construction and operation of the Jubilee Line Extension are identified in checklists given in the main Environmental Statement (Tables A 2.3(b) and A 2.4(a)).

The following sections present the potential impacts arising from the North Greenwich Option. Information on the more general short and long term impacts of the entire JLE is given in Part B of the Environmental Statement, together with the measures suggested to remedy or mitigate them.

5.2 Impacts of Tunnelling

Two issues have been considered in relation to tunnelling:

- **Noise and Vibration.** The assessment indicates that noise and vibration from tunnelling operations will not normally be perceptible in properties above the tunnel in this section.

The North Greenwich Work Site

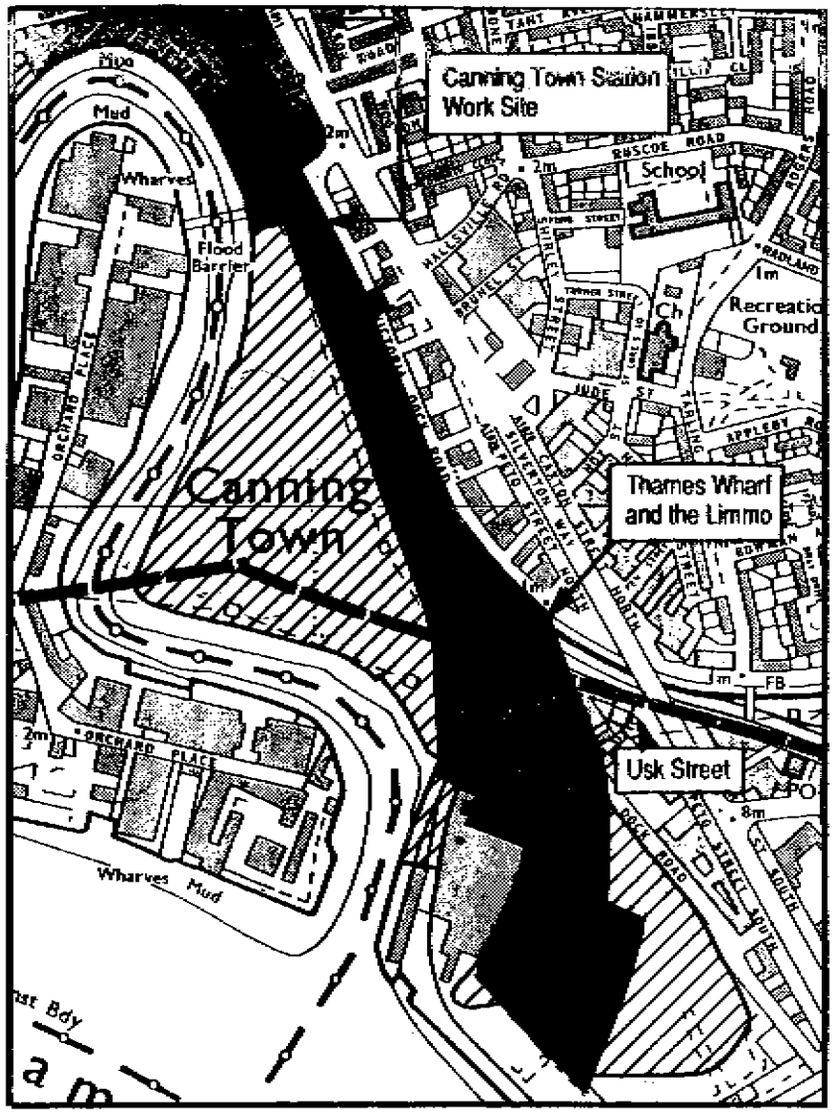
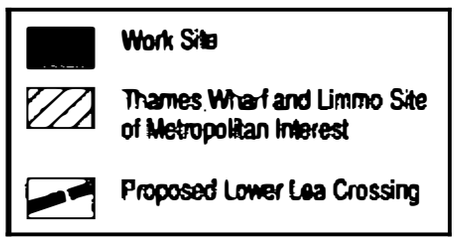


Figure Add. 4.(d)
Thames Wharf and the Limmo Work Sites

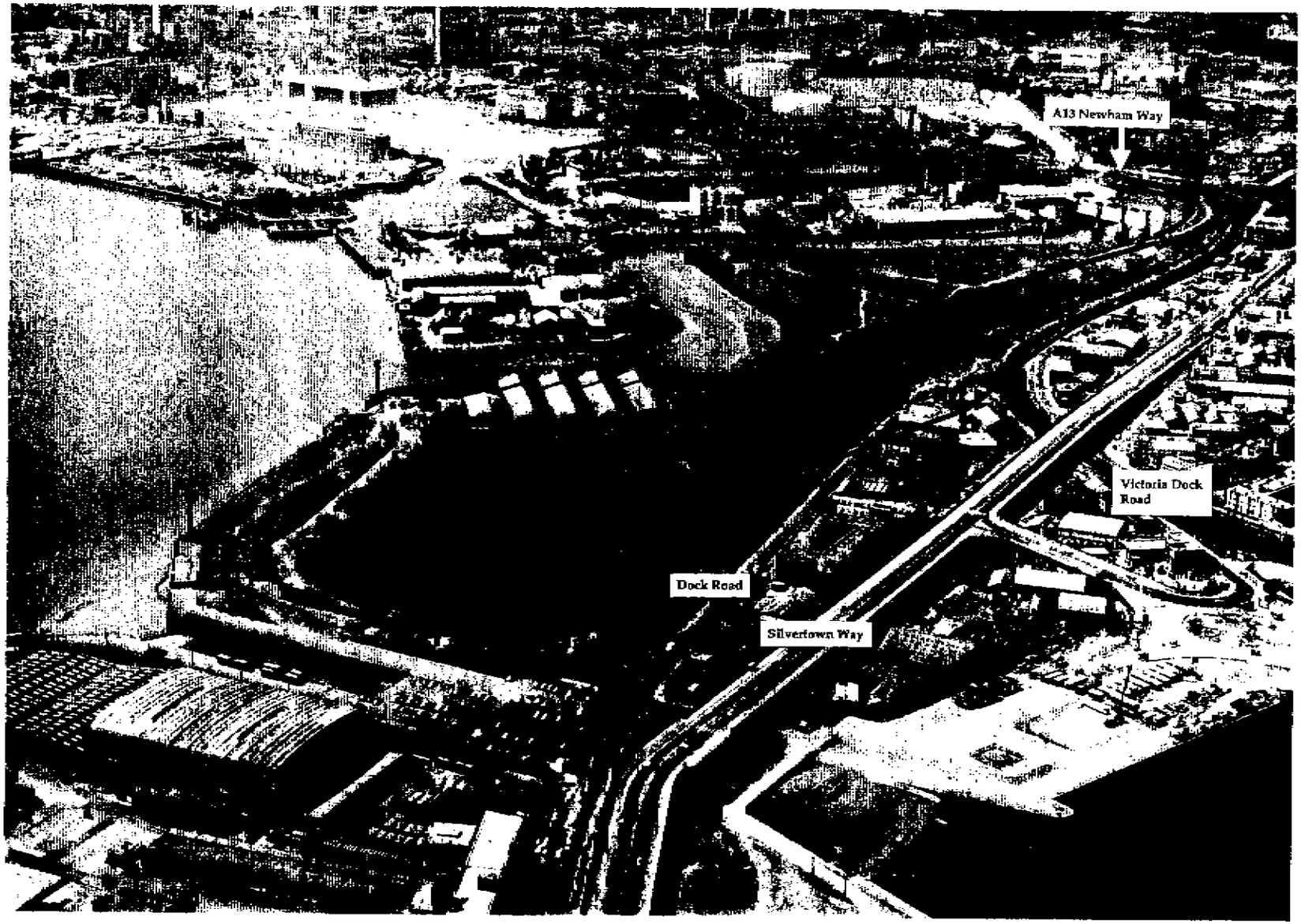


There is, however, a possibility of exceptional soil properties being encountered along the route, which could lead to some noise and/or vibration affecting sensitive buildings. The likelihood of this cannot be assessed at this stage, but geotechnical investigations should be carried out over the course of detailed design, which will provide further information (see also section 5.4).

- **Settlement.** The assessment has identified buildings and other structures which may be subject to some settlement as follows:

  - West India Dock Walls;
  - Mercury Earth Station, Eastwood Wharf;
  - warehousing at Eastwood Wharf;
  - cottages on Coldharbour;
  - river wall at the South Dock entrance;
  - Civil and Marine mooring dolphin;
  - river wall at Delta Wharf;
  - Delta Wharf low rise offices;
  - Northbound Blackwall Road Tunnel;
  - Old Floodgate building;
  - Bugsby's Reach river wall;
  - former British Gas jetty;
  - Thames Wharf river wall;
  - Courts Steel works;
  - retaining wall on Thames Wharf;
  - proposed Lower Lea Crossing structures and embankment;
  - electricity pylons on the Limmo Site.

Use of appropriate tunnelling techniques and good working practices will minimise the degree of settlement. Where necessary, protective measures such as ground stabilisation and underpinning techniques should be used. The detailed design will identify the extent and details of such measures. All sensitive structures should be monitored on a regular basis to detect any departure from predicted behaviour and enable corrective action to be implemented at the earliest



The Thames Wharf and the Limmo Work Sites
(Canning Town Station Work Site in Background)

opportunity. At this stage of design the risk of damage to most buildings is considered to be slight and limited to superficial cracking which may be easily repaired.

Services in this area may also be subject to disturbance and settlement from the station and tunnel construction. Critical and sensitive services will need to be diverted before construction starts. Elsewhere, regular monitoring should be adequate to detect excessive settlement and enable protective works to be carried out before damage occurs.

5.3 Land and Property

5.3.1 Introduction

The land which is required by the North Greenwich option consists mainly of underused or derelict land.

The land uses at surface work sites are as follows:

- **Preston's Road**

A temporary work site of about 0.3ha will be required for the construction of a ventilation and emergency escape shaft, which will occupy an area of about 45m^2 permanently. The area is currently vacant, former light industrial land. The Coldharbour Conservation Area lies approximately 30m to the east of the site, on the eastern side of Preston's Road.

- **North Greenwich**

A total area of about 12.5 ha will be required as a temporary work site. Permanent landtake will be limited to the small areas required for access to the underground station and draught relief shafts. The land east of Ordnance Crescent on the peninsula is the site of a former gasworks owned by British Gas plc. Much of this is derelict, the remainder is rented out on short term leases for light industrial purposes.

- **The Thames Wharf and The Limmo**

An area of about 8.5ha will be required for the cut and cover construction of the tunnel, tunnel portals and, possibly, a future junction. A ventilation and emergency escape shaft will also be constructed at this site, requiring a permanent landtake of approximately 45m^2. An area of approximately 3ha will be required for the construction of Canning Town Station, the impacts of which are considered in Section A3.6.4 of the main ES.

The land required includes:

- about 5ha of open land, part of the Limmo Peninsula and Thames Wharf Site of Metropolitan Interest for Nature Conservation (see Section 5.7 below);
- British Rail non-operational land including disused railway sidings;
- about 0.2ha of industrial land near Dock Road. About 60% of this land is already vacant and the remainder is subject to compulsory purchase orders in connection with the planned River Lea Crossing road scheme.

5.3.2 Impacts

Most of the land affected is vacant or presently occupied by transient, industrial users. None of the property which will be required is residential and much is already in the possession of British Gas and either already vacant or rented on short term leases.

No listed buildings are situated within any of the work sites, nor do any lie within the limits of deviation of the route; good site practice should ensure that the Coldharbour Conservation Area is not affected by works at the Preston's Road site.

Table Add.5.4(a) **Estimated Construction Site Noise Levels**

Site and Site Use	Neighbouring Land Uses	Distance from Site Perimeter (m)	Approximate Construction Period (months)	Approximate Day-time Background Noise Level (L_{90}) dB(A)	Estimated Facade Noise Levels (Period L_{eq} dB(A)) Mean Case				Worst Case			
					Phase 1	2	3	4	Phase 1	2	3	4
Preston's Road (Ventilation shaft site)	Dwellings	30	Up to 2 years	48	68	60	53	51	74	67	59	58
North Greenwich Station	Impact from station construction and tunnel driving not considered significant in comparison with construction activity of proposed development.											
Usk Street (Thames Wharf) (Estimated ventilation shaft site)	Dwellings	100	Up to 2 years	56	60	53	46	44	62	55	48	46

Phase 1: site clearance and preparation
Phase 2: preliminary works
Phase 3: main construction
Phase 4: main construction (no lorries)

Impacts on land and property holders will therefore be slight and no significant impact on the cultural heritage is expected.

5.4 Noise and Vibration

5.4.1 Noise and Vibration During Surface Construction

The Preston's Road ventilation and emergency escape shaft site is considered to be the only site with the potential for significant noise impact from construction activities. It can be seen in Table Add.5.4(a) (see preceding page) that worst case facade noise levels at buildings 30m from the site perimeter may rise above the 70dB(A) L_{eq} day-time criterion during site clearance and noise reduction measures may be necessary during this period. These noise levels are principally due to emissions from large diesel plant at the surface. Once work moves below ground, levels are expected to fall to acceptable values.

5.4.2 Noise and Vibration During Operation

During operation of the line, noise levels which could give rise to complaints from residents may be experienced at 12 properties. These are on Cold Harbour at the entrance to West India Docks.

Vibration from train movements may be perceptible, but is not expected to reach levels of annoyance or evoke adverse comment (see ES, Section B2.5.3, page 180).

5.4.3 Impacts on Planned Developments on the Greenwich Peninsula

The Port Greenwich Development includes the building of residential properties within the limits of deviation of the southern route. Table Add.5.4(b) gives the corridor width along the route where the proposed noise criterion is likely to be exceeded; east of North Greenwich Station dwellings within a 50m corridor above the centre-line of the proposed route may receive noise levels in excess of the proposed 40dB(A) noise criterion.

Operational noise levels from train passage at existing residences on Cold Harbour and on the Greenwich Peninsula are predicted to constitute a significant impact. This may be mitigated either by design of the trackform to reduce noise at source (see Environmental Statement, Section B2.4.2, page 179) and/or design of the new housing to reduce its susceptibility to noise/vibration.

Table Add.5.4(b) Noise and Vibration Impact Corridor

	Maximum Corridor Width (metres)	
	Vibration Perception	40dB(A) Ground-borne Noise
Concordia Wharf	110	135
East of Greenwich Station	-	50
Dock Road	90	120

5.5 Traffic and Transport

5.5.1 Construction Period

- **Preston's Road.** Lorry movements at the site during the peak construction period will be about 5-15 movements per day, which is not expected to result in significant impacts.

- **Greenwich Peninsula.** Construction material should be imported onto the Greenwich Peninsula, where possible, by barge using the existing jetty. This will avoid congestion and noise nuisance on local roads leading onto the development site. Spoil generated by the tunnelling and excavation of the station site should not be removed by road in order to avoid causing further congestion in the Blackwall Tunnel or on local roads. The material should, where suitable be used as fill on the PGL development site and thus be disposed of locally using dedicated haul roads. Contaminated soil (see 5.6 below) or unsuitable spoil should be removed by barge, where practicable.

- **The Thames Wharf and The Limmo.** It is anticipated that the site will be accessed from Victoria Dock Road and/or Dock Road. Peak vehicle movements are expected to be in the order of 140 per day, which is not expected to result in significant traffic impacts.

5.5.2 Operational Period

Because of the limited number of routes available to travellers wishing to cross the river from the Greenwich Peninsula to Blackwall and the Isle of Dogs, and in view of the congestion on the existing routes, most notably on the approaches to the Blackwall Tunnel, the North Greenwich Station can be expected to attract travellers from a large catchment.

A potentially significant impact arising from these considerations is the congestion caused by travellers leaving cars parked in the vicinity of the new underground station. In mitigation of this it is recommended that a park and ride facility is provided of a size to be decided in consultation with the local authorities. This contravenes the planning policies of the London Borough of Greenwich which seek to discourage private transport and to promote public transport. However the Borough has indicated that park and ride should be provided at North Greenwich in recognition of the unique circumstances at the site (namely: the close proximity to the river, the paucity of existing public transport options, and the lack of spare capacity in the Blackwall Tunnel - the only alternative public transport route to the North at present).

Traffic studies commissioned by PGL indicate that the LUL station with a park and ride facility will avoid creating significant traffic impacts on the peninsula.

5.6 Spoil Disposal and Soil Contamination

5.6.1 Spoil Quantities and Disposal

Twin tunnel drives to the east and to the west will originate from the Greenwich Peninsula. These will generate about 190,000m^3 of excavated spoil. It is estimated that in total (i.e. including station box excavation and associated workings) 300,000m^3 material will be excavated from the tunnel and station on the Greenwich Peninsula, of which approximately 20,000 m^3 is likely to be contaminated by materials associated with former gas works activities. As indicated above, it is recommended that the inert spoil is used in the reclamation works to be carried out on the peninsula, and that unsuitable and contaminated material is disposed of by barge via the onsite jetty where possible. Disposal of uncontaminated spoil is also discussed in Section B4.2 of the main report.

5.6.2 Soil Contamination

The proposed North Greenwich station site was the location of retort houses of the former gas works. Here contamination of the ground mass, to an average depth of 2.5m and extending to over 5m in part, has taken place. Principal contaminants are:

- tar wastes, including a range of coal tar derivatives and phenols;
- spent oxide and lime together with cyanides and sulphates;
- ash, coke and clinker associated with coal tars and heavy metals.

Potential impacts associated with contaminated land may arise from:

- o exposure of the workforce and after users of a site to harmful or hazardous substances;
- o chemical attack of substances in the soil on building materials;
- o difficulties in disposal of contaminated spoil and groundwater;
- o migration of contaminants within groundwater.

5.6.3 **Mitigation of Potential Impacts**

An assessment of the potential impacts has been made by reference to trial pit logs, site plans and chemical data supplied by PGL. Since limited information is available for the site of the station itself, a detailed site investigation is recommended prior to commencement of construction work. Contaminated areas away from the immediate station construction site are expected to be developed within the same time frame by PGL. The local authority has negotiated a range of measures to enhance worker and end-user safety and protect groundwater, and LUL's precautions should take these into consideration.

General mitigation measures to avoid impacts to workers and residents are detailed in section B.4.3.5 of the main Environmental Statement. Additional considerations relevant to the Greenwich Peninsula site in particular are:

- o **Avoiding contamination of groundwaters.** Perched water tables above the clay are likely to be affected by contact with contaminated soils. A vertical barrier may therefore be necessary to prevent cross contamination of underlying groundwaters and the migration of pollutants within the perched water table during the construction phase.
- o **Disposal of contaminated water.** Disposal of groundwater during excavation will be dependent upon the level of contamination. Disposal to foul sewer or to the river, or on site treatment should be by prior agreement with the National Rivers Authority and Thames Water.
- o **Fire hazards.** Waste materials present such as coal, organic wastes, spent oxide, etc. are capable of supporting combustion if an ignition source and sufficient oxygen is present. Prevention of smoking and lighting of surface fires should lower potential for emission of toxic or hazardous gases from this source.

It has been noted that the site is underlain by a peat horizon which is capable of producing methane and carbon dioxide. Typical levels of gas production in the peat bands concerned are low, however, and gas emission rates are unlikely to be significant.

5.7 **Sites of Wildlife and Nature Conservation Interest**

5.7.1 **Sites Affected: General**

Two principal sites supporting urban wildlife habitat are affected by the works for the North Greenwich Option. These are:

- o A part of the former Greenwich Town Gasworks site on the Greenwich Peninsula.
- o The area of open ground collectively know as the Thames Wharf and Limmo Peninsula site, extending along the east side of Bow Creek from the A13 trunk road in the north to the site of the former Thames Wharf itself in the south (see Figure Add.4(d)). This area has been designated as a Site of Metropolitan Importance for Nature Conservation (SMINC) by the London Ecology Unit.

Both of the sites are wasteland sites with ruderal plant communities (see Environmental Statement, Section B7.1, page 221), rough grassland and scrub.

5.7.2 Greenwich Peninsula

At present the site is divided into two areas, a tenanted area in the northern part of the site, and a fenced off wild area in the southern part. The tenanted area is used for various light industrial purposes, mostly connected with transport or scrap metal. It is almost completely devoid of vegetation, though ruderals occur sparsely. The remainder of the site was abandoned and cleared of buildings about 9 years ago.

The north-western corner of the wild area to the west of the boundary road appears to have relatively fertile and perhaps uncontaminated soil. This small area supports neutral grassland dominated by tall tussock-forming grasses, together with broad-leaved herbs. There is an avenue of London Plane trees along the road. To the east side of the boundary road there is a dense stand of semi-mature birch trees, which have established naturally.

The remainder of the site is occupied by very open dry grassland with ruderals, in which woody species, (principally buddleia, birch and willow) have become widely but sparsely established. Vegetation cover is generally much lower than would be expected after so long a period of colonisation, almost certainly because of the nutrient-poor and excessively free-draining substrates (mainly clinker-like material) and because of soil contamination from gasworks operations (tars, phenols etc.).

5.7.3 Thames Wharf and The Limmo Peninsula

The works proposed would affect the whole of the eastern side of the SMINC, including the former Thames Wharf site (also known as the Dock Road section) in the south (see Figure Add.4(d)). This part of the site contains the following habitat components:

- Scrub and rough grassland with ruderal species on mounds of tipped soil covering the greater part of the site. It consists mainly of birch and willow scrub, and in places this is fairly mature (largely shading out plants in the field layer). Even in the more open spots scrub development is more advanced than it is in the central and northern sections of the site.

- A tidal ditch with species-poor eutrophic grassland and a fringe of reeds.

- Dry grassland on well-drained gravelly substrates forming a level raised platform on either side of the ditch. The area is dominated by grass together with broad-leaved herbs. Bare ground is visible, and mosses are dominant in the more open spots, together with small annual grasses (Vulpia species).

- Ruderal vegetation on new mounds of soil and recently burnt areas alongside Dock Road.

The London Wildlife Trust has identified the Thames Wharf section as the most floristically rich part of the site. In particular there are two locally uncommon species associated with the tidal ditch, viz. Apium graveolens (wild celery) and Potamogeton pectinatus (fennel pondweed).

The site supports birds typical of urban wasteland, although the variety is extensive for an inner London site. A list of species recorded by ERL is given in Table Add.5.7(a). Most of these are resident breeders, though some, e.g. Meadow Pipit, Moorhen, probably use the site on a more casual basis. The site is one of the few areas of rough habitat remaining close to the River Thames, and it is likely to attract other casual visiting species.

The site also supports brown rat, rabbit and fox.

Table Add.5.7(a) Ornithological Data

Species recorded during ERL visit to the Thames Wharf and The Limmo work site area, 17.1.1990. Species considered to be resident breeders are denoted "RB"; other species are likely to be casual visitors only.

N.B.: Great Tit and Moorhen were not previously recorded for this site (London Wildlife Trust, 1985).

Moorhen	
Wood Pigeon	RB
Meadow Pipit	
Wren	RB
Dunnock	RB
Blackbird	RB
Song Thrush	RB
Blue Tit	RB
Great Tit	
Magpie	RB
Carrion Crow	(Nest only)
House Sparrow	RB

5.7.4 Predicted Impacts and Evaluation

o Greenwich Peninsula

At this site the area affected lies mainly within the tenanted area where no ecological impacts would arise. However, the Limits of Deviation include a narrow strip (about 10m wide) inside the northern edge of the wild area. This would entail the loss of a small percentage of the open grassland and sparse scrub vegetation. In addition an area about 40m by 40m in the north-western corner lies within the Limits of Deviation. This would entail the loss of about 30% of the neutral grassland which is a ubiquitous kind of vegetation, and 30% of the dense stand of birch. So far as we are aware no uncommon species would be affected. Since the losses would all be at the northern edge of the wild area there would be no fragmenting effect on remaining wildlife habitat. The area has no existing amenity use for nature conservation purposes, and its potential for such use is limited because of the soil contamination which poses a safety problem. For these reasons, and because of the very large areas of similar habitat remaining outside the Limits of Deviation the losses would not be regarded as a significant.

o The Thames Wharf and The Limmo

The western part of the Thames Wharf section of the site, approximately 40% by area of this section and 10% of the whole SMINC, would be temporarily lost; the worksite area could feasibly be restored to wildlife habitat after the works are completed. This consists mainly of mature scrub, sparser scrub and rough grassland on mounds of tipped soil. This part of the site has no existing amenity use for nature conservation purposes.

In the central section of the site the whole of the disused railway sidings area supporting species-rich dry grassland and stress tolerant ruderal communities would be lost. In the northern section of the site there would be some loss of rough grassland and ruderal communities on mounds of tipped soil.

All sections of the site except for the Limmo Peninsula are affected, and the two most botanically valuable parts of the site would be severely affected - totally lost in the case of the railway sidings area, and substantially affected in the case of the Thames Wharf part of the site. This would probably lead to the loss of some species from the site as a whole. Parts of the central section of the site would be lost under the present proposals for the Lower Lea Crossing and Docklands Light Railway, but

the Thames Wharf site would not. This would therefore be a significant ecological impact in the London context, but it should be recognized that the planning situation is complex and these impacts may be pre-empted by other developments.

5.7.5 Mitigation and Related Measures

Measures to avoid, ameliorate or compensate for adverse ecological impacts are discussed in the main Environmental Statement, Section B7.4). Those particularly pertinent to the proposal now under consideration include fencing of working areas, and control of dust and site run-off.

5.8 Summary

5.8.1 Impacts of Surface Works

Table Add.5.8 is a summary of the environmental impacts resulting from occupation of, and construction activity at, the surface worksites for the North Greenwich option.

5.8.2 Operational Impacts

Potentially significant environmental impacts arising during operation comprise:

- ground-borne noise nuisance to 12 residences on Cold Harbour;
- ground-borne noise nuisance to residences, yet to be constructed, on the Greenwich Peninsula;
- contaminants in soil attacking buried building materials at the North Greenwich Station site on the Greenwich Peninsula.

Table Add.5.3 Impacts of Construction: North Greenwich Option

Work Sites	
Preston's Road This construction site is situated adjacent to East Wood Wharf, west of Preston's Road and comprises a block of about 0.3ha of vacant land. It is required for construction of a ventilation and emergency escape shaft. Major works at the site will take up to 2 years.	
Land and Property Impact	The presently vacant area will be temporarily lost to the site. There will be a permanent loss of a small area within the site, about 45m^2, to a ventilation and emergency escape shaft.
Noise and Vibration	The facade noise levels at dwellings within 30m of the site perimeter may rise above the 70dB(A) L_{eq} criterion during the first phase of construction activity. This could cause temporary disturbance at the nearest dwellings; noise reduction measures may be necessary during the first phase of construction.
Dust and Visual Impacts	Strict standards of construction practice should be adopted to minimise dust impacts. Visual impacts should be minimised by appropriate screening.
Access and Traffic Impacts	The site will be accessed from Preston's Road. Peak lorry movements are expected to be about 5-15 movements per day, which is not expected to result in significant impacts.
Cultural Resources	Strict on and off site controls should be adopted to avoid adverse effects to the Coldharbour Conservation Area.
North Greenwich	The site is located on land owned by British Gas plc, and forms part of the PGL development site. The currently vacant plot is the site of a former gas works. The site will be occupied for major works for a period of 3½-4 years.
Land and Property Impact	The presently vacant development area will be lost to the site. There will be permanent loss of a small area to station access points and draught relief shafts. The extent of land contamination should be assessed by a site investigation. Comprehensive measures to remedy the impacts of contaminated land should be co-ordinated with the local authority and contaminated spoil should be removed by barge, wherever practicable.

Table Add.5.8	Impacts of Construction: North Greenwich Option (Continued)
Noise and Vibration	No impacts are expected from construction noise.
Dust and Visual Impacts	No impacts are expected.
Access and Traffic Impacts	Bulk construction material will be imported by barge. Spoil will be utilised, where possible, as fill in other developments planned for the area; unsuitable material may be exported by barge. Materials and services supplies may require approximately 50 vehicle movements per day at peak; this is not expected to cause significant traffic impacts.
Cultural Resources	There are no listed buildings or Conservation Areas within the site or the surrounding area.
Thames Wharf and The Limmo	This site covers about 8.5ha between Thames Wharf and Canning Town BR Station. The present uses comprise open land and disused BR railways sidings.
Land and Property Impact	The site will be required for construction of the tunnel and tunnel portals by cut and cover methods and for the surface line into Canning Town. Approximately 45m² will be permanently lost to a ventilation and emergency escape shaft. About 30% of the area of the Limmo and Thames Wharf Site of Metropolitan Interest for Nature Conservation will be temporarily lost.
Noise and Vibration	Daytime background noise levels at residences in the Thames Wharf area are around 56dB(A), and are expected to reach approximately 62dB(A) as a worst case during construction works, which is not expected to result in noise disturbance.
Dust and Visual Impacts	Strict standards of construction impacts should be adopted to reduce dust emissions at the eastern edge of the site near Dock Road. Visual impacts should be minimised by the use of appropriate screening.
Access and Traffic Impacts	It is anticipated that the site will be accessed from Victoria Dock Road and/or Dock Road. Peak vehicle activity is expected to be of the order of 140 movements per day, which is not expected to result in significant traffic impacts.
Cultural Resources	No listed buildings or Conservation Areas are in the vicinity of the site.

6. COMPARATIVE ASSESSMENT OF THE GREENWICH AND BRUNSWICK ALIGNMENTS

The significance of the environmental impacts associated with the North Greenwich option has been assessed in comparison with those of the Brunswick route option - described in Route Section 5 of the Environmental Statement - Canary Wharf to Canning Town. The significant differences between the options are summarised in Table Add.6.1.

7. SUMMMARY

General, route-wide mitigation measures are provided in Table A.3.1 in the Environmental Statement.

Special requirements for mitigation for the North Greenwich Option have been identified as follows:

- o prior investigation of the Greenwich Peninsula work site to establish the nature and extent of contaminated soils requiring special treatment (see Section 5.6.2);
- o measures to avoid the harmful effects of contaminated soil. Such measures should be agreed with the local authority (Environmental Statement, Section B4.3.5);
- o provision of a park and ride facility with the North Greenwich Underground Station to avoid potential parking congestion on roads within the future development area (Section 5.5.2);
- o attention to controls on work site practices on the Limmo and Thames Wharf site to limit damage to the adjacent nature conservation site (see Environmental Statement, Section B7.4).

The key issue associated with this option is considered to be the treatment of contaminated land and spoil disposal on the Greenwich Peninsula.

Table Add6.1 Comparison of Environmental Impacts of Alternative Route Alignments

	BRUNSWICK	NORTH GREENWICH OPTION
Effects on land and property	Not significant - temporary occupation of vacant sites.	Not significant. Use of vacant and derelict sites, displacement of some light industry.
Noise and Vibration (operational)	Vibration perception criterion exceeded at 82 residential properties. Noise complaint criterion exceeded at 72 properties.	Vibration perception criterion exceeded at 12 residential properties. Noise complaint criterion exceeded at 12 properties.
Access and Traffic	Possible increased congestion in the Blackwall Way during construction.	No significant impacts expected.
Spoil disposal and soil contamination	High likelihood of contaminated land with coal dust, coal ash, mineral oils, asbestos, PCB's, methane gas. Unknown volume of contaminated spoil likely to be comparatively small.	Very high likelihood of highly contaminated land with ash, clinker, solid fuel residues and other gas works contaminants. Significant volume (c. 20,000m^3) of contaminated spoil.
Dust Impacts	Strict standards of construction practice needed at Blackwall Way and Canning Town.	Strict standards of construction practice needed at Preston's Road and Canning Town.
Effects on natural resources and ecology	Loss of part of the northern section of the Thames Wharf and Limmo Peninsula Site of Metropolitan Interest for Nature Conservation (SMINC) about 10% of the total.	Loss of part of the southern, central and northern part of the Thames Wharf and Limmo Peninsula SMINC - about 30% of the total.
Cultural Resources	Need for good working practices at Blackwall Way and Brunswick Station to avoid damage to 10 statutorily Listed Buildings (Grade II) and 14 locally listed buildings.	Need for good working practices at Preston's Road site to avoid effects on Coldharbour Conservation Area.

ANNEX 1

PLAN FOR THE GREENWICH PENINSULA SITE

Plan for the Greenwich Peninsula Site

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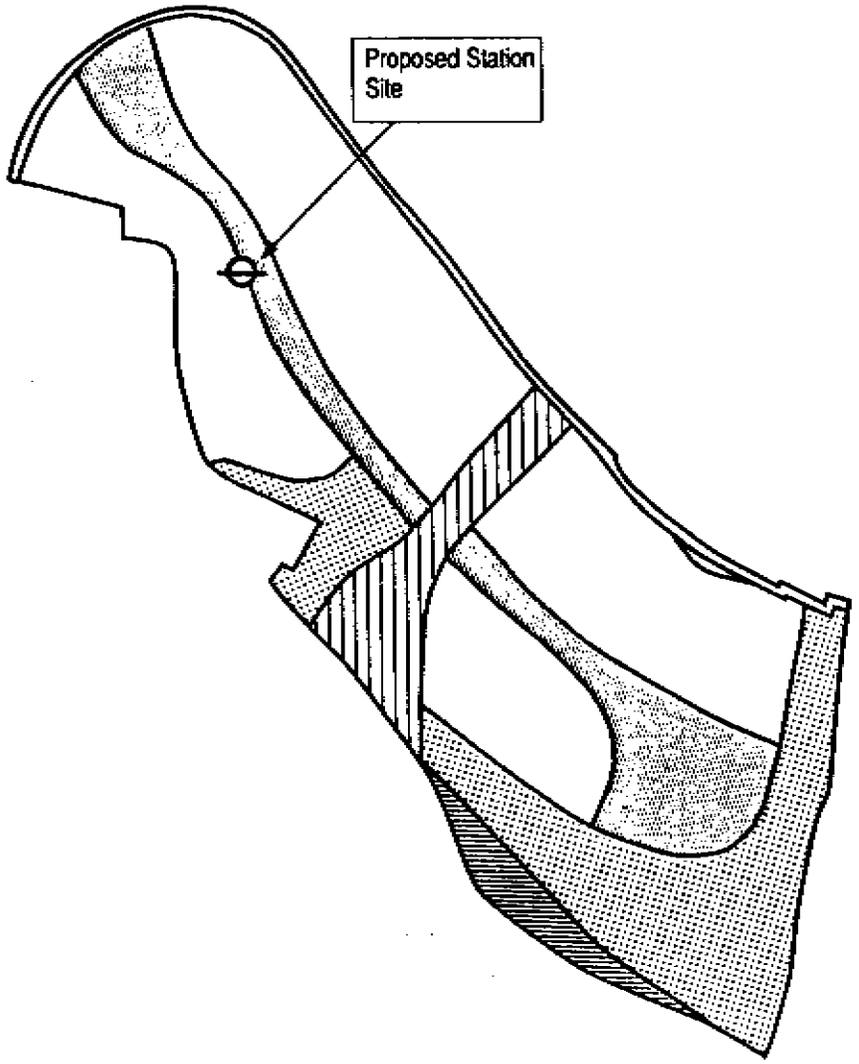
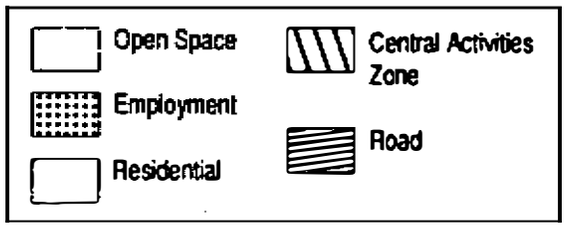
Extracted from the draft planning brief developed by the Borough of Greenwich in consultation with British Gas.

This is the basis for the present Master Plan.





HIGHWAYS AGENCY

TOLLGATE HOUSE

ENVIRONMENT & LANDSCAPE
Environmental Statement

JUBILEE LINE EXTENSION (NORTH GREENWICH OPTION) ENVIRONMENTAL STATEMENT ADDENDUM 05/90