JACOBS

BRB (Residuary) Ltd
Major Works Programme 2004/2007

VAR9-1220 BE4 ASSESSMENT PROGRAMME

ASSESSMENT AND INSPECTION REPORT

BENTON ROAD, ILFORD

BRIDGE REF: NPB 719

February 2005

JACOBS

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Client: BRB (Residuary) Ltd
Project: Major Works Programme 2004/2007 Job No: J24110GA –NPB719
Title: VAR 9 –1220 BE4 Assessment Programme

	Prepared by	Reviewed by	Approved by
ORIGINAL	NAME [redacted]	NAME [redacted]	NAME [redacted]
DATE **19 Jan 2005**	SIGNATURE	SIGNATURE	SIGNATURE

REVISION **Final Report**	NAME [redacted]	NAME [redacted]	NAME [redacted]
DATE **16 Feb. 05**	SIGNATURE [redacted]	SIGNATURE [redacted]	SIGNATURE

REVISION	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

REVISION	NAME	NAME	NAME
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Contents

1 Introduction

1.1 Remit

Jacobs was appointed by BRB(R) to conduct the site survey at NPB/719 in sufficient detail to provide data for BE4 assessment work or information for remedial works contracts.

Structural Soils Ltd excavated an inspection pit on the bridge deck to determine typical deck construction and to examine the top flange of one of the internal girders.

2 General Description and Structural Details

2.1 Location

Bridge NPB 719 carries Benton Road, Ilford, a class "C" urban distribution road over the track bed of the former Newbury Park Branch at track mileage 8m 38ch (Photograph No.1). The carriageway is 8.17m wide with paved footways about 2.05m wide on both sides (Photograph No.2). The road is subject to a 30 mph speed limit.

The OS grid reference is TQ 448 874. The bridge is located within the London Borough of Redbridge.

2.2 Construction type

The structure comprises nine spanning wrought iron riveted plate girders with brick jack arch construction between the girders. All girders have the same construction, with 27" web depth, 14" flange width and 3½ x 3½ x ½" angles. The central section of the girders has two ½" flange plates top and bottom reducing to one plate at 2'-6" from the support. The deck is square to the abutments with clear span measured at 25'-3" (7.71m). Girder spacing is 62" (1580mm). (Figures 1 and 2: Appendix F.)

The brick jack arches are covered with concrete to the level of the girder top flanges. Infill above the concrete under the footway consists of gravely sand and medium sand.

The abutments and wingwalls are brick construction. The girders span onto sandstone bearing blocks, which are built in to the brick abutments. There appears to be a metal bearing plate between the bearing block and the girder bottom flange.

The parapets are brick. There are end pilasters capped with stone copings.

Date of construction is stated as 1903.

2.3 Assessment summary

2.3.1 BE4 Assessment

The bridge is calculated to have full C&U capacity, according to the BE4 assessment code.

3 Existing Information Search

3.1 Service Search

Documentation to be obtained from Structural Soils Ltd

3.2 SI Results

A trial pit was undertaken as part of the survey. This was located in the north footway at approximately mid-span and exposed the top flange of the first internal girder. Data on the trial pit is included in appendix C. (Photograph No.8).

A metal sample was taken from the south edge girder.

3.3 Existing Drawings

No drawings have been found for the bridge. Limited dimensional and construction information was available from old assessments.

4 Structure Condition

4.1 General

The inspection for BE4 assessment was undertaken on Wednesday 12 January 2005. Weather on the day of inspection was dry and sunny with temperature being about 8°C.

The bridge is partially infilled. Access was possible via a gap in the fence on the south side of the road. There is approximately 1.4m headroom under the girders. There has been extensive fly tipping under the bridge.

For the purposes of recording inspection data the girders are numbered from south to north, No.1 being the south edge girder. The jack arches are referred to as 1/2 etc. this being the jack arch between girder 1 and girder 2.

4.2 Main Superstructure

4.2.1 External Girders

Girder No. 1 (South edge girder)

The face of the girder is in fair condition, with only slight breakdown of the paint system. (Photograph No. 3)

The bottom flange displays slight laminar expansive over most of its length, but between 2 and 3.5m from the west abutment there is more extensive corrosion of the bottom flange plates. In this zone, the lower plate can only be considered effective over the centre part of the flange between the lines of the rivets owing to extensive corrosion and the upper plate also displays some section loss. It is estimated that approximately 30% of the bottom plate remains effective and 80% of the upper plate.

The exposed edge of the top flange also displays extensive expansive corrosion. At mid-span it appears to have expanded by up to 50mm and this may have lifted the parapet wall causing a vertical fracture. An attempt to control this corrosion appears to have been made by plastering the laminating edge of the flanges with an epoxy sealant.

Girder No.9 (North edge girder)

There is extensive laminar corrosion of both the bottom and top flanges throughout their length, having expanded to two or three times their original thickness. The expansion appears to have caused a crack in the parapet similar to that in the south parapet. At about 2.5m from the west abutment there is an exceptional bulge of corrosion in the outer leg of the bottom flange. In general, the outer section of the top flange beyond the rivet line must be considered as ineffective. The lower plate of the bottom flange is considered only 30% effective and the upper plate 70%. (Photograph 4)

The web displays considerable loss of the paint system and surface corrosion.

4.2.2 Internal Girders

Girder No.2

There is severe laminar corrosion of the bottom flange of the girder from the east end of the second plate to mid-span (Photograph 5). The upper plate is estimated to be only 60% effective and the lower plate 30%.

Girder No.3

The bottom flange of the girder is in fair condition. Maximum corrosion occurs in a zone 1m long, 2.5m from the west abutment. The two flange plates are estimated to be 90% effective.

Girder No.4

In fair condition apart from a zone from the west abutment to quarter span west, where there is moisture emanating from the adjacent jack arch causing active corrosion. The upper plate is taken as 95% effective and the lower plate 70%. Elsewhere the bottom flange is estimated to be 90% effective.

Girder No.5

In a 2m section, 2.5m from the west abutment, there is deep corrosion resulting from active moisture ingress. Most of the rivet heads have been lost in this zone. The lower plate is assumed to be only 50% effective. Elsewhere 90% effectiveness is estimated.

Girder No.6

In fair condition, estimated to be 95% effective apart from a 0.5m long section 2.5m from the west abutment where there is deep corrosion including loss of the rivet heads. 50% loss of the lower plate is estimated in this zone.

Girder No.7

Similar to girder No.6 but with a longer corrosion zone, 1.5m long centred 2.5m from the west abutment; with 50% loss of the bottom plate and loss of all rivet heads.

Girder No.8

This is similar to girder No. 7, but has an additional corrosion zone 2.5m from the east abutment. The top flange of Girder No.8 was exposed by the trial hole. This flange appeared to be in near perfect condition.

4.2.3 Tie rods

Only two tie straps remain on the entire bridge. These appear to have been 2½" by ¼" flats riveted to the underside of the bottom flange of the girder and these remaining ones are highly corroded. The tails of the other straps are still visible at their girder connections. There is evidence that both the edge girders have moved outwards by 5 – 10mm, through repaired damage to the south east cheek wall (Photograph No.7) and cracks at the ends of the outer jack arches.

4.2.4 Jack Arches

(a) Outer Bays

Jack Arch 1/2

The arch is generally in fair condition. There is mortar loss to about 25mm depth throughout and spalling brickwork up to 10mm deep in a patch 1 – 2m from the east abutment. The semicircular infill wall at the east end has a vertical crack 5 to 10mm wide and there are some wide joints in the crown of the arch. This may indicate spreading of the arch as a consequence of lack of tie restraints. There is one tie still in position in this jack-arch located at the east third point.

Jack Arch 8/9

The arch displays extensive mortar loss with open joints 25mm deep. There are signs of slight water ingress at the east end. The semi-circular infill walls, at both ends, display vertical, 5-10mm wide cracks, indicating spreading of the arch.

(b) Inner Bays

Jack arch 2/3

The arch is in fair to good condition with only slight mortar loss.

Jack arch 3/4

The arch is in generally fair condition with slight mortar loss. There is a wet patch close to the west abutment, where water is dripping and mortar loss in this area is 25mm or more.

Jack arch 4/5

There is a wet patch adjacent to girder No.4 about 2m from the west abutment. There are calcareous deposits and open joints 25mm deep in this region. Otherwise it is in fair condition with slight mortar loss.

Jack arch 5/6

Good condition. No significant defects.

Jack arch 6/7

Good condition generally. Small areas with open joints near the abutments. There is one tie-strap remaining in this arch.

Jack arch 7/8

Generally in good condition. There is some moisture ingress at the crown of the arch at the east end resulting in open joints.

4.2.5 Bearings

There appear to be metal bearing plates between the bearing blocks and the bottom flanges of the girders. Only the front edge can be seen. This appears to be lightly corroded, but there is no expansive corrosion as seen on the girder flanges.

4.3 Abutments

The abutment walls are in good condition. There is no sign of settlement or cracking.

4.4 Wingwalls

Wingwalls splay at 45° from the corners of the abutments. At the north side they have been totally infilled. On the south side they are infilled to within 1.5m of the top. The exposed surfaces appear to be in satisfactory condition. There are occasional missing bricks on the SW newel post.

4.5 Parapets

There is a substantial solid brick parapet on both sides of the bridge supported on the edge girders. On both parapets, at approximately one third-span, there are near vertical cracks emanating from the top of the girder and continuing through to the copings. The cracks are wider at the top than the bottom; typically 10mm wide at the top (Photograph No. 6). The pattern of the crack suggests the wall is being lifted upwards at the middle of the span. This could be attributable to the expansive corrosion of the top flange of the supporting beam.

4.6 Road Surface

The road surface is in good condition. There are signs that there may have been settlement behind the abutments which has been infilled. The road in these areas has been recently resurfaced with red asphalt with an imitation brick pattern. It is uncertain whether this was done purely to achieve the decorative effect, or was prompted by repairs to surface defects.

4.7 Formation

The bridge has been infilled to within 1.4m of the girder soffit level with soil fill. There has been extensive fly-tipping under the bridge.

5 Summary Condition

The metalwork of the main girders is in poor condition and this will need to be taken into account in the assessment. The expansive laminar corrosion of the top flanges of the edge girders may have already caused damage to the parapet walls.

The top flanges of the internal girders appear to be in very good condition. It is assumed that the webs of the internal girders, which are embedded in concrete, will also be close to their original condition.

Based on estimation of flange plate loss, the following percentages represent effective flange plate size for use in the assessment:

	Mid-span Top flange	Mid-span Bottom flange	Third span Top flange	Third span Bottom flange
South edge girder 1	50%	55%	50%	50%
Internal girder 2	100%	45%	100%	45%
Internal girder 3	100%	90%	100%	80%
Internal girder 4	100%	90%	100%	80%
Internal girder 5	100%	90%	100%	70%
Internal girder 6	100%	95%	100%	70%
Internal girder 7	100%	95%	100%	70%
Internal girder 8	100%	95%	100%	70%
North edge girder 9	50%	50%	50%	50%

Table 5-A Effective area of flanges as % of original area (Combined figures for both plates)

The jack arches are in reasonably good condition and are probably kept intact by the backing concrete. The absence of tie bars (or tie straps in this case) will result in a failure in the empirical assessment method. There is evidence that there has been some outward movement of the edge girders.

The exposed up parts of the abutments are in good condition. Qualitative assessment concludes that they are adequate for the imposed loads.

6 Assessment to BE4 1967

6.1 Structural Parts checked to BE4

The internal and external girders and the jack arch were assessed according to BE4-1967 and BS 153: Parts 3B & 4: 1958.

6.2 Methodology

The internal and external girders were assessed according to the quick assessment method as outlined in BE4-1967 (clause 303 c).

The external girders were checked under dead load only as there is a girder between the edge girders and the carriageway. Compression buckling of the top flange of the edge girders was considered based on the girders being partially restrained against lateral bending. The internal girders were considered fully restrained by the concrete infill.

The jack arches were assessed based upon the empirical method described in Bridgeguard 3 Current Information Sheet No 22 (Pro-forma for the empirical assessment of brick, masonry and concrete jack arches and associated ties.)

6.3 Results

Following the assessment of the internal and external girders, the girders are found to have full C&U capacity and the use of the bridge should be unrestricted to all the vehicles complying with the Construction and Use Regulations (1967). However, the missing ties from the external jack arches results in their failure because of insufficient lateral restraint. (See Appendix F)

Summary of calculations

Element: Internal Girder (No5)

Action	Location	Dead load effect	Full C&U load effect	Total load effect	Assessed resistance	Live load capacity
Bending	Mid-span	101.4 ton.ft	72.6 ton.ft	174.0 ton.ft	330.0 ton.ft	24 tons C&U
Bending	1/3 span	90.4 ton.ft	72.6 ton.ft	163.0 ton.ft	227.2 ton.ft	24 tons C&U
Shear	Support	15.8 ton	11.6 ton.ft	27.4 ton	40.8 ton	24 tons C&U

Element: Edge girder

Action	Location	Dead load effect	Full C&U load effect	Total load effect	Assessed resistance	Live load capacity
Bending	Mid-span	94 ton.ft	0 ton.ft	94 ton.ft	99.2 ton.ft	Pass
Bending	1/3 span	<94 ton.ft	0	<94 ton.ft	99.2 ton.ft	Pass
Shear	Support	14.6 ton	0	14.6 ton	40.8 ton	Pass

Element: 1st Internal Girder (South)

Action	Location	Dead load effect	Full C&U load effect	Total load effect	Assessed resistance	Live load capacity
Bending	Mid-span	103.9 ton.ft	36.3 ton.ft	140.2 ton.ft	225.1 ton.ft	24 tons C&U
Bending	1/3 span	By inspection			225.1 ton.ft	24 tons C&U
Shear	Support	By inspection				24 tons C&U

Element: tie-rods to edge girders

Based on an empirical assessment in accordance with Bridgeguard 3 Information Sheet 22, the external jack arches are failing due to their missing tie bars. The internal jack arches are laterally restrained by the concrete infill and the adjacent jack arches and they pass the empirical assessment.

7 Recommendations

The bridge does not serve any particular purpose, the track-bed being partly infilled with soil at the north end and with school built on it to the south. The bridge is easily accessible from the road side and may be being used by the homeless and drug addicts as a shelter (based on the fly-tipping material). The fact that the bridge is located in front of a school playground may create a risk for the children. Infilling should be considered, unless there is an objection from the local council.

While the girders supporting the carriageway have adequate reserves of strength, the edge girders are close to their required capacity and any further corrosion could lead to failure.

If the bridge is retained, the extent of the corrosion of the WI girders makes repair work unrealistic. The bottom flanges could be scraped down to their effective metal parts and a high-build paint should be applied to prevent further corrosion. Tie-bars should be installed at the edge jack arches to stop the lateral movement of the edge girders. There is continuous water leakage through the soffit contributing to the active corrosion of the girders, installation of waterproofing is probably not justified considering a 25 year design life.

Minor brickwork repairs and repointing should be undertaken on the outside faces of the parapet walls and stitching of the vertical cracks. The wingwalls are mainly infilled however repairs should be undertaken to their visible parts.

Appendix A - Photographs

1. South elevation of bridge

2. Benton Road over bridge looking west

3. South edge girder

4. North edge girder

5. Laminar expansive corrosion of Girder No.2

6. Crack in south parapet wall

7. SW Pilaster showing repair to side wall believed to have been caused by outward movement of the girder from lack of tie restraint

8. Trial Pit showing top flange of girder No.8

Appendix B - Services Search

EDF ENERGY

Structural Soils Ltd
The Potteries
Pottery street
Castleford
West Yorks
WF10 1NJ

Our Ref: NS/COMP LON/2005/198470
Your Ref:47101
28 January 2005

Dear Mr [redacted]

Bridge over Benton Road Seven Kings Redbridge

Thank you for your recent enquiry regarding the above works. Please find enclosed copies of our mains records plans showing the position of our equipment within your indicated area of interest.

If you have asked questions regarding any of the following subjects a copy of your request has been sent to the appropriate department who will contact you in due course. The Plan Provision team is not able to answer these questions and any further contact should be with the department concerned.

London area Wayleaves Tel. 0208 298 8672
Diversions including budgetary estimates Tel. 08701 964599. Fax. 08456 500248.
For network loading KVA etc. Send all details by Fax only to 08456 500248.
New Connections 08456 500247.
General Enquiries, London area 08701 963090
Supply Fault Information (Power cut help line) 08000 280247.

Any work near overhead plant represents a serious risk to life if safe clearances are not maintained. All work should be carried out in accordance with the Electricity at Work Regulations and the Health and Safety Executive guidance document GS6. Work shall not commence on site until we have agreed the necessary safety precautions in writing. GS6 site visits can be arranged via our General Enquiries Line on 08701 963090.

Service cables and Street lighting cables are not always shown on plans for the London area. These cables must be assumed to exist to any nearby property or street lights/road signs in the vicinity. The contractor is held responsible for locating these cables by hand before using any machinery and for any of the damage caused to our network. EDF Energy DO NOT offer an on site cable location service to contractors.

Yours sincerely

[redacted]
Networks Service

EDF Energy
Plan Provision
Fore Hamlet
IPSWICH
Suffolk
IP3 8AA
Tel 08701 963797
Fax 08701 963782

EDF ENERGY

Plot Description: 198470 LV
BENTON ROAD IG1

Plotted On: 28/01/2005 Plotted By: Lynn Thorn

CSS/ERMS REF Scale 1:500

Plot Layer: sssi Page unset of 1

SAFETY

The position of the apparatus shown on this drawing is believed to be correct but the original landmarks may have been altered since the apparatus was installed. The exact position of the apparatus should be verified by the use of a suitable cable location device prior to excavation using suitable hand tools.
A separate record is kept for each service cable but its route is not necessarily shown on this record.
It must be assumed that there is a service cable into each property, lamp column and street sign, etc.
All cables must be treated as being live unless proved otherwise by a EDF Energy Supervisor.
The information provided must be given to all people working near the London Electricity apparatus.

IF IN DOUCT – ASK! PHONE 08701 963797

This plan has been issued for saftey purposes in relation to the Electricity Network.
Do not use for excavation purposes more than 3 months after the Issue Date

PRIMARY CABLES
EXTRA HIGH VOLTAGE CABLES (EHV) 22,000 TO 132,000 Volts

Depth normally 750mm cover in carriageway & 600mm cover in footway.
S---S---S---S---S---S---S---S---S---S---S
Indicates part of route where cover is less than normal.

Before digging within one metre of these cable routes

Telephone 08701 963797

Inorder that the Companys apparatus may be located on site and any necessary protection works agreed.

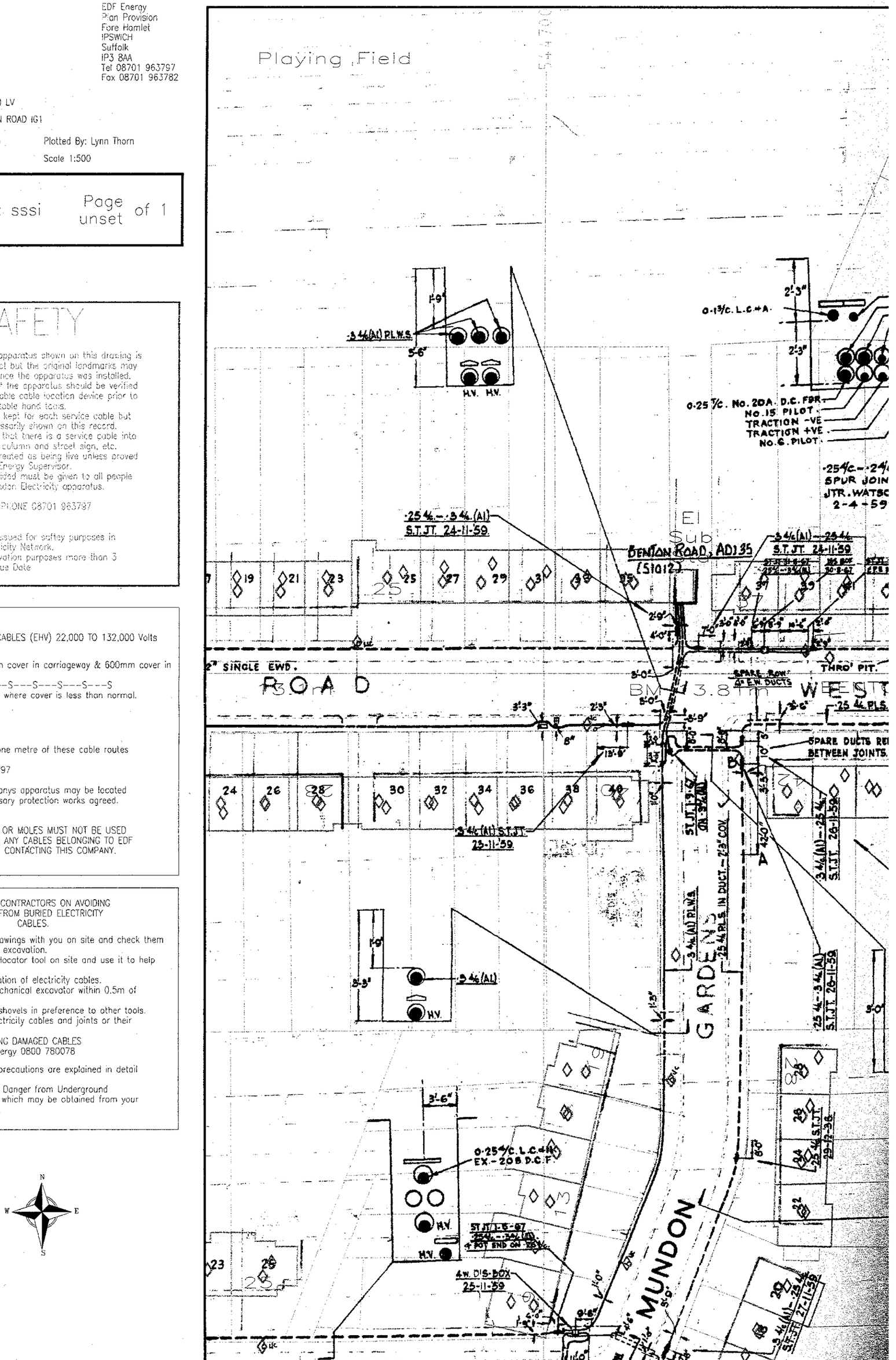
N.B. THRUST BORDERS OR MOLES MUST NOT BE USED WITHIN THE VICINITY OF ANY CABLES BELONGING TO EDF ENERGY WITHOUT FIRST CONTACTING THIS COMPANY.

ADVICE TO CONTRACTORS ON AVOIDING DANGER FROM BURIED ELECTRICITY CABLES.

1) Do have cable drawings with you on site and check them before you start the excavation.
2) Do have a cable locator tool on site and use it to help you.
3) Mark out the location of electricity cables.
4) Do not use a mechanical excavator within 0.5m of electricity cables.
5) Use spades and shovels in preference to other tools.
6) Never disturb electricity cables and joints or their protective covers.

REPORTING DAMAGED CABLES
EDF Energy 0800 780078

These basic safety precautions are explained in detail in the HSE booklet.
HS(G)47 – Avoiding Danger from Underground Services, a copy of which may be obtained from your supervisor or HMSO.



CHARTER AVENUE

BM 14.25m

·34C. AL. ST. JT. JTR. WATSON 31-3-59.

·34C. AL. P.L.W.S.

·34C. AL. P.L.W.S.

·34C. - ·34C. AL. ST. JT. JTR. WATSON. 1-4-59.

·34C. AL. P.L.W.S.

P.L.
0·25 4/C. L.C.4 H. EX. IIE. D.C.F.
0·4 7/C. L.C. No.15 D.C.F.
No.11. PILOT.
0·5 7/C. L.C. No.11. D.C.F.
0·4 7/C No.6. D.C.F.

·34C. AL.

0·25 4/C. ST. JT. 12-7-58.

31·5M | 5·0M | 11·0M

240W (5-6-96)

THRO' PITS. 0·25 4/C. L.C.4 H. IN 3½" SINGLE EWD THRO' PIT.

187400

SPARE 4" E.W. DUCT LINE

BRIDGE WAY

·25 4/c P.L.S.

·1 8/c MV/DC ·25 4/c P.L.S.

·5 4/c (Al) P.L.W.S.

H.V.

·25 4/c P.L.S.

H.V.

·25 4/c P.L.S.

H.V.

H.V. H.V.

64 to 72

73 to 80

46 to 63

81 to

Allotment Gardens

SECTION BETWEEN A & B.

3-WAY HENLEY BOX JTR. BRABY. 21-11-52

EDF Energy
Plan Provision
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EDF ENERGY

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PRIMARY CABLES
EXTRA HIGH VOLTAGE CABLES (EHV) 22,000 TO 132,000 Volts

Depth normally 750mm cover in carriageway & 600mm cover in footway.
S---S---S---S---S---S---S---S---S---S---S
Indicates part of route where cover is less than normal.

Before digging within one metre of these cable routes

Telephone 08701 963797

Inorder that the Companys apparatus may be located on site and any necessary protection works agreed.

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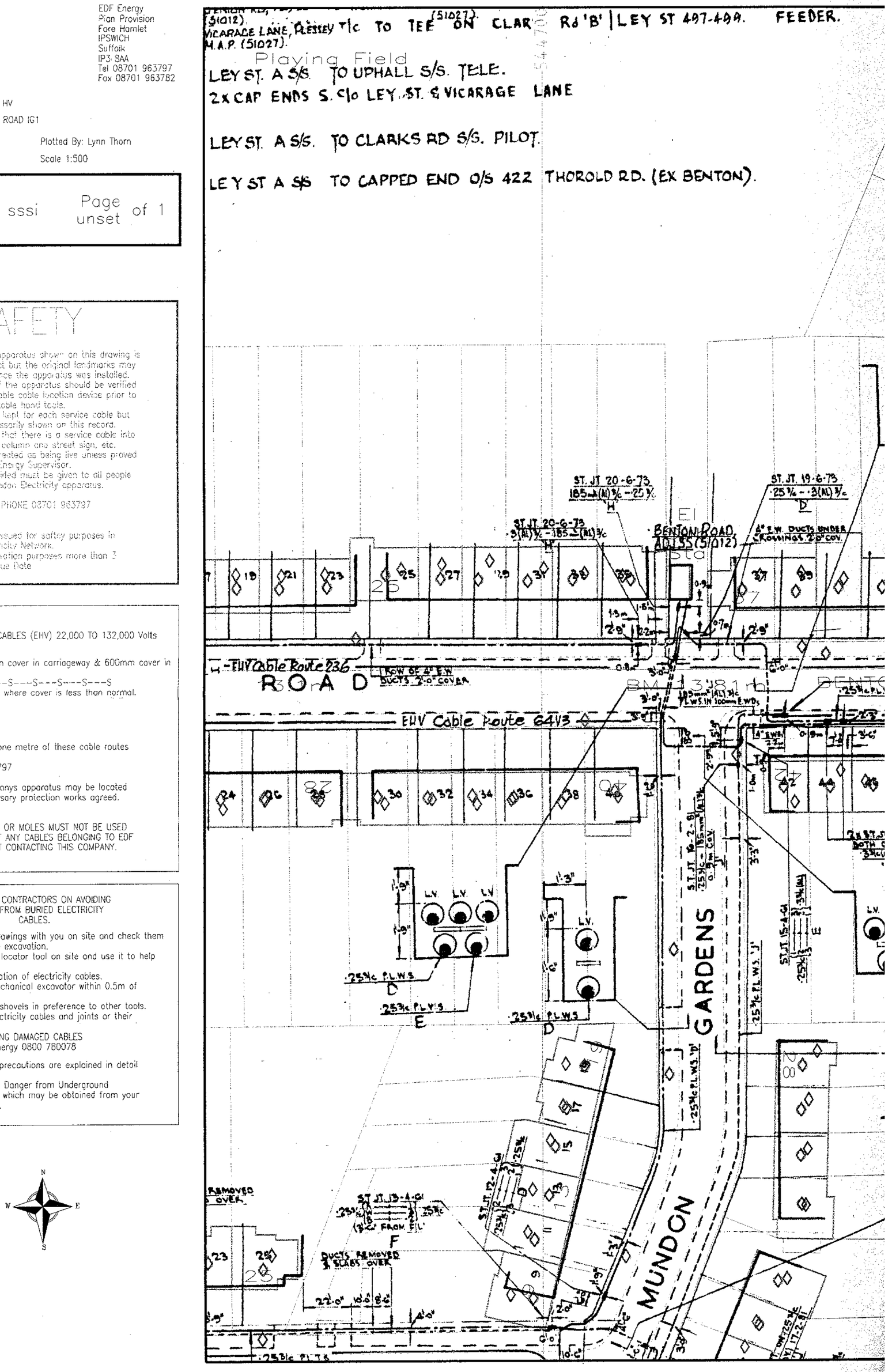
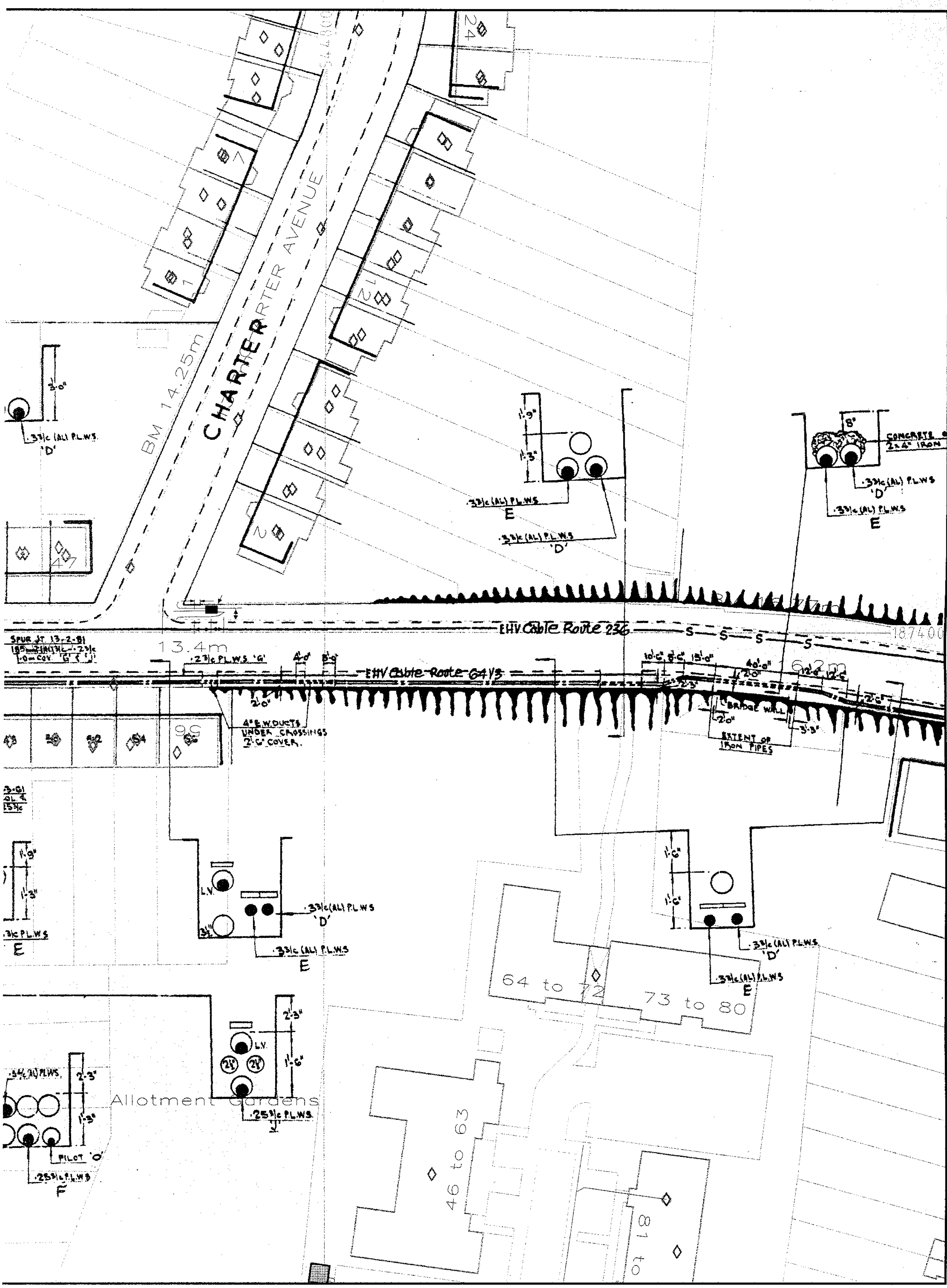




CUSTOMER SERVICE
FORE HAMLET
IPSWICH
SUFFOLK IP3 8AA TEL:08701 963797

SYMBOLS USED ON LPN CABLE RECORDS.

THIS SYMBOL KEY IS INTENDED AS A GENERAL GUIDE ONLY. SOME VARIATIONS TO THESE SYMBOLS MAY BE FOUND.

WHEN TWO OR MORE MAPS ARE SUPPLIED FOR THE SAME AREA, THE MAPS MUST BE READ IN CONJUNCTION WITH EACH OTHER, AND THIS SYMBOL SHEET.

IF IN DOUBT ASK!

MAINS RECORDS	DESCRIPTION
SCENERY	
	100 grains Ordnance Survey grid line (on 10 based maps only.)
	Property fence line
	Building line
	Kerb line
	Kerb line on majority of ways & mains
	Cable Tunnel or Subway
	Borough or City Boundary
	Borough or City Boundary and L.E Boundary
	L.E Boundary or Electrical Boundary
HV DISTRIBUTION CABLES	
Route 259	London Electricity cable route (11,000 , 22,000 to 132,000 volts)
S S	Part of London Electricity cable route where cover is less than normal.
SECONDARY DISTRIBUTION CABLES	
.3 (AL)X .15 X .3 (AL)½	HV cable (Up to 11kV)
100 X	LV cable (400/230 volts)
.0225½	1 or 2 phase LV cable (230V or 400/230V)
3/S .1 .05 .1	3 Singles 2 phase LV cables (415/240 volts)
	Pilot or Telephone cable, often not shown in plan if running with other cables
	HV or LV in duct
	Duct routes not containing live cables

CABLE TERMINOLOGY	
P.I.	Paper Lead.
P.L.S.	Paper Lead Served.
P.L.A.	Paper Lead Armoured.
P.L.T.S.	Paper Lead Tape Served.
P.L.D.T.	Paper Lead Double Tape.
P.L.W.S.	Paper Lead Wire Served.
P.L.D.W.	Paper Lead Dright Wire.
L.C & H.	Lead Covered & Hessian.
L.C & A.	Lead Covered & Armoured.
L.C & D.A.	Lead Covered & Dright Armoured.
D.S.T.A.	Double Steel Tape Armoured.
S.T.A.	Steel Tape Armoured.
S.W.A.	Steel Wire Armoured.
Al.	Aluminium.
Cu.	Copper
W.V.	Waveconal.
C.S.	Consac.
PVC.	Polyvinyl Chloride.
EPR.	Ethylene Propylene Rubber.
XLPE.	Cross Linked Polyethylene
SOLIDAL	Solid Aluminium.

SIZE ABBREVIATIONS	
½	Single Core.
⅝	Concentric Cores.
½ or T/cc.	Triple Concentric Cores.
¼	Four Cores.
⅜ (cm)	Three Cores And Concentric Neutral Not of the Waveconal type.
⅔	Two Cores.
⅝	Split Concentric Cores.
⅜	Three Cores.
DC	Direct Current.
P	Pilot.
Pr.	Number of Telephone Pairs.

RECORD MANAGEMENT SYSTEM	MAINS RECORDS	DESCRIPTION
CABLE DUCTS	Extent of Duct	
		Single Empty Ducts
		Cluster Of Empty Ducts (two or more)
	A B	Cable in Single Duct
		Group of Cables Shown in a Cluster of Ducts, Plus One Or More Empty (Shown By Section)
	Extent of Duct	Ex Western "Ways" maps: This symbol indicates one or more ducts
		On City of London area maps "extent of ducts" symbols are not in general use as most duct runs are between pits or boxes.

CAUTION

IF IT DOES NOT FOLLOW THAT IF THE NUMBER OF CABLES SHOWN IN THE CROSS SECTION HAVE BEEN LOCATED, THAT ALL LIVE CABLES HAVE BEEN FOUND. YOU MAY HAVE FOUND AN UNRECORDED CABLE OR A CABLE BELONGING TO ANOTHER AUTHORITY.

SYMBOLS FOUND ON SECONDARY DISTRIBUTION MAPS

	.3X(39)	Cable size and year laid
CE	CE	Cable capped end
3	3 PE	Cable pressure (or pot) end /signal end.
SE	SE	
	E	Pressure end & earth electrode
		Earth rod (vertical)
E		Earth rod (horizontal)
	E	Earth plate.
		Earth plate or end.
.1X	.1X	Cable destination or termination not known
		Dolita or trouser joint or combined Crutch & Pressure End. (CPE)
MAIN SERV	JL JI	Straight joints.
MAIN SERV		Tee joints.
SERV		Crutch (or spur) joints (CJ) Straight & Crutch Joints Combined (S&CJ).
		Double Crutch (or spur) Joint.
		Sleeve.
		Four way underground disconnecting boxes(DB)
		Link boxes(LB)
		Network boxes(NB) or (NWB)
		4 way 6 entry.
		6 way box.
		6 way 8 entry.
		Split bus-bar.
Number in Attribute box	LB.23.	Unit box with identification number.

RECORD MANAGEMENT SYSTEM	MAINS RECORDS	DESCRIPTION
SYMBOLS FOUND ON SECONDARY DISTRIBUTION MAPS – cont.		
	or	3 way underground disconnecting boxes
	or	2 way underground disconnecting boxes
		1 way underground disconnecting boxes
Details in Attribute box		Feeder pillars
		Split bus-bar Distribution pillar.
		Double bus-bar Distribution pillar.
		Blind pit
		Pit with access.
	or	Transformer chambers (T/C) & transformer compounds.
	or	
		Underground transformer chamber
		Underground tank
Service Record Card.	12 14 ROYAL MEWS 29 29	Indicates service between opposite consumers/ buildings is looped.
		Jointing schedule numbers.

SERVICES

		To consumers
Service Record Card.	W	Single phase service
	I	Connected to 1 core & neutral.
	II	Connected to red core & neutral.
		Three phase service
	4	Connected to inner & outer cores of triple core cable.
	5	Connected to middle & outer cores of triple core cable.
	3	Connected to all three cores of triple core cable.
Service Record Card.	2 12 14 ROYAL MEWS	Existence of a service with its core connection shown in circle.
		To street furniture
LC	P.L.S.261 S.L.261	Public Lighting. Street Lighting.
WB	WB	Wall Bracket.
TC	TC	Traffic Light Control.
	FB	Flashing Beacon.
TS	TS	Traffic Sign.
	TGP	Bollard/Illuminated Guard Post.
TK , TC	TK TCB TK.TC FP	Telephone Kiosk , Traffic Controller, Feeder Pillar.

SYMBOLS USED IN CROSS SECTIONS

RECORD MANAGEMENT SYSTEM	MAINS RECORDS	DESCRIPTION
		Cable laid direct
		Cable laid in duct
		Blocked duct (sometimes used for unidentified cables)
		Single earthenware duct
2½"S.P.D.		Single steel pipe
		Square cable duct.
		Group of circular ducts.
		Group of circular ducts. (Sykes)
		Group of square ducts. (Doulton)
	or	Cable trough.
		Bitumen casing (Crompton).
		Bitumen filled iron trough. (Trunks)
		Bitumen casing (Tri-case).
		Protective slab.
		Tiles.
		Concrete slabs.
		Steel plate.
	T/T	Plastic like tape.
		Timber.

ABBREVIATIONS USED IN CROSS SECTIONS

EW.	E.W.D(s) or EW.	Earthenware ducts
F	F.P or F or F.D	Fibre duct
A	ASB or A	Asbestos
P	P	Plastic or pitch fibre
S	S.P or S	Steel
C	C.I or C or C.I.P	Cast iron
W.I	W.I	Wrought iron pipe
F	F or F.D	Fibre duct
PRD	PRD	Plastic rigidduct
D.N.K	D.N.K or D&NR	Depth not known.
N.R	N.R or (N.R)	No record.
E.V	E.V.P or E.V	Everlis pipe
	3/62 or NOV 79 ADCD etc	Date cable laid. H.V cable destination (See section sheet H.V ref)

Please note
Ducts are assumed to be 4"/100mm earthenware unless shown otherwise.

SAFETY

The position of apparatus shown on the attached map(s) is believed to be correct but the original landmarks may have altered since the apparatus was installed.

The exact position of the apparatus should be verified by the use of a suitable cable location device prior to excavation using suitable hand tools.

A separate record is kept for each service cable but its route is not necessarily shown on these maps. It must be assumed that there is a service cable into each property, lamp column, street sign, etc.

All cables must be treated as being live unless proved otherwise by a 24seven representative.

When excavations are to be carried out near Extra High Voltage cables, further details must be obtained before commencement of work.

N.B THRUST BORERS OR MOLES MUST NOT BE USED WITHIN THE VICINITY OF ANY CABLES BELONGING TO LPN/EPR WITHOUT FIRST CONTACTING THESE COMPANIES

Cables owned by other authorised electricity operators are not normally shown, for example National Power, LUL, UN, etc.

THE INFORMATION PROVIDED MUST BE GIVEN TO ALL PEOPLE WORKING NEAR LPN/EPR APPARATUS.

IN CASES OF DOUBT PLEASE TELEPHONE: 0208 290 8511.

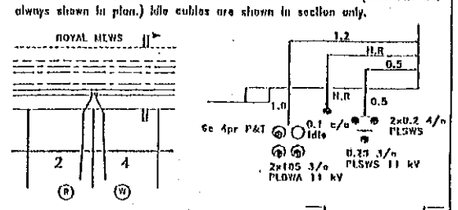
IN CASE OF CABLE DAMAGE OR SUSPECTED DAMAGE TELEPHONE;
HV CONTROL: 08701 902964.
LV CONTROL: 08701 902957.

CAUTION

IF DOES NOT FOLLOW THAT IF THE NUMBER OF CABLES SHOWN IN THE CROSS SECTION HAVE BEEN LOCATED, THAT ALL LIVE CABLES HAVE BEEN FOUND. YOU MAY HAVE FOUND AN UNRECORDED CABLE OR A CABLE BELONGING TO ANOTHER AUTHORITY.

TYPICAL REPRESENTATION

Cables shown in cross section viewed in direction of arrow. (kerb line not always shown in plan.) Idle cables are shown in section only.



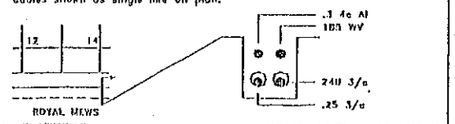
CITY OF LONDON RECORDS

Some cross sections may be written instead of drawn.

e.g 1–5 way Trifurcate
2–2½ steel pipes
1–6 way Doulton
.4½ (L.V. cable)

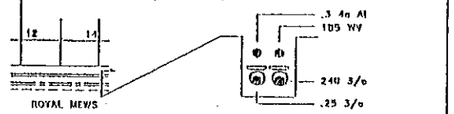
SINGLE LINE REPRESENTATION

Cables shown as single line on plan.



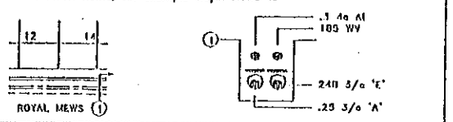
MULTI-LINE REPRESENTATION

All cables are shown on plan and represented in section.



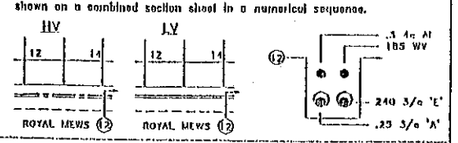
MULTI-LINE REPRESENTATION (TOWER HAMLETS RECORDS)

All cables are shown on plan with a separate section sheet referenced under street name, for example–Royal Mews 1.



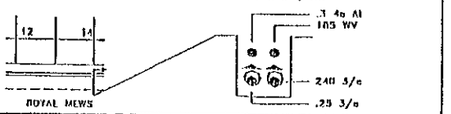
H.V AND L.V RECORDS

H.V and L.V cables are shown on separate plan sheets and sections are shown on a combined section sheet in a numerical sequence.



TUDSBURY & SHORTDITCH

Only the top two cables that are shown in the section are the cables that appear in the plan. Notice that the two cables that appear in ducts are not shown in plan.



ENQUIRY REFERENCE

MAP SCALE:-.....

OURS:-..... YOURS:-.....

O:\ODD_JOBS\LESYM 17/05/02.

to Civil Contractors on Avoiding Danger

oads and Street Works Act 1991 has required since August 1997 that at least one erson be present on a street work site while work is in progress. This information meant as a substitute for proper accreditation, but does however provide guidance precautions that should be adopted before any work is carried out on the public foot way. Please note: At least one member of the working party should be streetworks and have this Accreditation available for inspection, if required to produce it

lents occur when underground cables are damaged during the course of excavation. IVE electricity cables can result in an explosion, which can cause serious injury or

footpath in major towns and cities has one or more electricity cables beneath it. your attention is drawn to the following points:

le drawings with you on site and check them before you start the evacuation work. Some cables may not belong to the regional electricity company (EDF Energy East of London) and therefore will not be shown on the drawings. All records are guide ay not be accurate due to geographical changes e.g. foot path level being creased.

ble location device on site e.g. CAT, and use this to help you survey the site before digging. If you don't know how to use a Cable Avoidance Tool, then please refer to pervisor or supplier/ manufacturer, in order to gain training in the competent use of idance tools before work commences, if you have not received adequate training, ban cable detection being abandoned.

the location of electricity cables in accordance with the signals that are obtained location tool. *Remember that*:

he cable locator, in the 'power' mode will not always detect the presence of all cables specially if they are not carrying any current at the time.
hen the cable locator is used along with the signal generator, or in the 'radio' mode, is more likely that cables not carrying current will be detected.

ound you see if there is anything nearby that would have an electricity service, such olumns, phone boxes, bus shelters, traffic light control boxes etc. These all will mall service cable running to the, which can be easily damaged.

to use the locator during the entire excavation process – you may be only inches m a live cable!

use a mechanical excavator within 0.5m of the known presence of an electricity if one is used at any time keep everyone clear of the bucket while it is digging.

7. Use spades and shovels with insulated handles, and preference to other tools such as forks and picks and NEVER throw or spike tools forcibly into the ground.

8. If forks and picks have to be used, then tools with short blunted chisel ended times should be used. This may be the case if the ground is very hard and the surface needs to be broken up first.

9. If any cables are suspected of being embedded in the concrete that you need to excavate, DO NOT start work until:
   - The cables have been made dead, (likely to require EDF Energy attendance to site) OR
   - A representative of EDF Energy has established and communicated to you an agreed alliterative safe system of work

10. *Never* assume that cables follow a straight line or that they run at the same depth.

11. *Never* disturb electricity cables and joints or their protective covers.

12. *Always* ensure that all exposed cables are adequately supported, e.g. house brick etc, and never use cables or joints as hand holds or steps for gaining entry/exit to an excavation. If necessary protect cables using sandbags, timber shuttering etc.

In the event that a cable is damaged, or that you suspect a cable is damaged (*no matter how slight):*

- Mark the location
- Keep people at a safe distance
- Telephone EDF Energy using one of the following numbers:

When calling, you will need to describe the incident and its exact location, giving the name, address and telephone number of you company. No charge will be made for cable damage site visits where cable repairs are not required.

Emergencies & Electricity supply faults London area:
Residential customers 0800 096 9000 Business customers 0800 096 2255

Emergencies & Electricity supply faults East of England Area: 0800 783 8838

PLEASE NOTE: the basic precautions and advice given here are explained in more detail in the HEALTH AND SAFETY EXECUTIVE PUBLICATION, HS(G) 47-'Avoiding Danger from Underground Services' priced at £7.50 (ISBN 0-7176-7176-1744-0) – available from HSE books and HMSO.
ISBN

ADS Sewer Map Key

If you have any queries about the symbols on this key call the relevant number below:

Asset Location Team: 0118 923 6664

Commercial Drainage & Water Team: 0118 923 6652

Common public sewers

Foul:
A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water:
A sewer used to convey surface water (eg: rain water from roofs, yards and car parks) to watercourses or rivers.

Combined:
Both surface water and foul sewage flow in the same pipe.

Other public sewers

- Joint
- Trunk Foul
- Trunk Surface Water
- Trunk Combined
- Abandoned
- Storm Relief
- Bio-Solids (Sludge)
- Vent Pipe
- Trade Effluent
- Proposed
- Culverted Watercourse
- Gallery
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Sludge Rising Main
- Other

Sewer Fittings

A feature in a sewer that does not affect the flow of liquid in the pipe.
Example: a Vent is a fitting as the function of a vent is to release excess gas.

AV	Air Valve	LH	Lamp Hole
BS	Blind Shaft	LS	Lifting Shaft
CP	Catch Pit	ME	Meter
DC	Dam Chase	RE	Rodding Eye
DF	Double Flushing Tank / Chamber	PT	Test Point
SF	Single Flushing Tank / Chamber	VC	Vent Column
GP	Gauging Point	VT	Vent
GU	Gulley	XX	Other (specified on plan)
HB	Hatch Box		

Operational Controls

A feature in a sewer that changes or diverts the flow of liquid in the sewer.
Example: A hydrobrake limits the flow of liquid passing downstream.

BB	Baffle Board	HY	Hydrobrake
BD	Backdrop Manhole	PI	Petrol Interceptor
BV	Butterfly Valve	PS	Penstock
CL	Clough	RV	Reflux Valve
DB	Dam Board	ST	Step
DP	Drop Pipe	SV	Sluice Valve
DS	Drop Shaft	TA	Tank
FL	Flume	WB	Weir Board
FV	Flap Valve	WW	Weir
HW	Headwall	XX	Other (specified on map)

NOTES:

1) All levels associated with digital plans are to Ordnance Datum Newlyn.
2) All measurements on digital maps are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) For symbols referred to as 'Other' on this key, please see digitised plan for further information.
5) Most private pipe work is not shown on our maps, as in the past, this information has not been recorded.

End Items

An end symbol is what happens at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, and Outfall on a surface water sewer indicates that pipe empties into a stream or river.

STW	Effluent Discharge		Undefined End
	Soakaway		Inlet
	Outfall		

Other Symbols

Symbols used on maps which do not fall under other general categories.

	Sewage Treatment Works		Summit
	Pumping Station		Change of characteristic indicator (C.O.C.I)
IL	Invert Level		

Areas

Lines denoting areas of underground surveys, etc.

	Building over Case (BOC *No.*) or Low Lying Land (LLL *No.*)		Licence Area
	Drawing Area		Survey Area
	Sewage Treatment Works or Pumping Station		Area under Adoption
	Retention Tank area		Other Area (Specified on plan)

Private Sewer Types

- Foul
- Surface Water
- Combined
- Highway Drain
- Culvert

6) -9999.00 or 0 on manhole level indicates that data is unavailable.
7) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. When cover and invert levels appear on a plan they are clearly prefixed by 'CL' and 'IL'. If you are unsure about any text on the plan, please contact the relevant team on the number at the top of this key.

02920325 10/2002
8

ADE/222479

BAT/5780/NPB/719
ONE CALL UK - [redacted] 20/12
29th December 2004

MOLESEYE LTD
WASHINGTON COURT
WASHINGTON LANE
EDINBURGH
EH11 2HA

Dear Sirs,

>CHARTER AVE NEWBURY PARK ILFORD REDBRIDGE

In response to your enquiry dated 17th December 2004 concerning the above property, I am able to comment as follows:-

Please find enclosed a map on which the approximate position of this companies sewers are shown. If you require further information please phone 0845 9200 800 or alternatively our Service desk on 0845 8502777.

*** EMERGENCY NUMBER IF YOU SHOULD HIT OUR PIPEWORK: 0845 9200 800***
Please also use this number if you require a site visit from this Company.

With regard to fresh water supply, this site falls within the boundaries of another water company. For your information, their address is provided below:

Essex and Suffolk Water PLC
Hall Street
Chelmsford
Essex
CM2 0HH Tel: 0845 7820 111

The replies contained in this letter are given following inspection of the public service records available to this Company. No responsibility can be accepted for any error or omission in the replies.

Yours faithfully,

(

[redacted]

Asset Location Services.

ALS/222479 SEWER

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

100 metre intervals

EAGLE hardcopy facility - Normal Map.
The plot is centred on (544857 , 187397), which is in TQ4487SE. Printed on 21 December 2004 at 20:43:48 by LANGELL.

Comments:
CLEAN WATER SUPPLIED BY ESSEX AND SUFFOLK WATER

nded GIS print

Printbox (544663,187203) -> (545051,187591)
ntral Mapsheet : TQ4487SE
er : LANGELL
me : Tue Dec 21 20:43:49 2004

position of apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and
lished on site before any works are undertaken.

Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no survey information is available.

t (545028,187349) there is a MANHOLE with SHORT NUMBER=0301 COVER= 13.38 INVERT= 10.79
t (545026,187347) there is a MANHOLE with SHORT NUMBER=0302 COVER= 13.46 INVERT= 11.60
t (545043,187568) there is a MANHOLE with SHORT NUMBER=0501 COVER= 13.83 INVERT= 11.98
t (545043,187567) there is a MANHOLE with SHORT NUMBER=0502 COVER= 13.83 INVERT= 12.43
t (544835,187258) there is a MANHOLE with SHORT NUMBER=8201 COVER= 13.10 INVERT= 8.48
t (544801,187259) there is a MANHOLE with SHORT NUMBER=8202 COVER= 13.01 INVERT= 8.44
t (544898,187240) there is a MANHOLE with SHORT NUMBER=8203 COVER= 14.41 INVERT= 12.27
t (544894,187241) there is a MANHOLE with SHORT NUMBER=8204 COVER= 14.42 INVERT= 12.03
t (544833,187292) there is a MANHOLE with SHORT NUMBER=8205 COVER= 13.47 INVERT= 10.87
t (544811,187293) there is a MANHOLE with SHORT NUMBER=8206 COVER= 13.54 INVERT= 11.52
t (544858,187281) there is a MANHOLE with SHORT NUMBER=8207 COVER= 13.30 INVERT= 9.94
t (544820,187295) there is a MANHOLE with SHORT NUMBER=8209 COVER= 13.55 INVERT= 12.26
t (544830,187295) there is a MANHOLE with SHORT NUMBER=8210 COVER= 13.42 INVERT= 12.21
t (544882,187272) there is a MANHOLE with SHORT NUMBER=8211 COVER= 13.31 INVERT= 11.98
t (544847,187252) there is a MANHOLE with SHORT NUMBER=8212 COVER= 13.00 INVERT= 8.56
t (544809,187396) there is a MANHOLE with SHORT NUMBER=8301 COVER= 14.63 INVERT= 11.75
t (544835,187310) there is a MANHOLE with SHORT NUMBER=8302 COVER= 13.17 INVERT= 11.38
t (544810,187493) there is a MANHOLE with SHORT NUMBER=8401 COVER= 13.91 INVERT= 12.09
t (544806,187493) there is a MANHOLE with SHORT NUMBER=8402 COVER= 13.94 INVERT= 12.63
t (544816,187571) there is a MANHOLE with SHORT NUMBER=8501 COVER= 14.38 INVERT= 12.51
t (544814,187568) there is a MANHOLE with SHORT NUMBER=8502 COVER= 14.35 INVERT= 12.92
t (544911,187222) there is a MANHOLE with SHORT NUMBER=9201 COVER= 14.21 INVERT= 8.70
t (544971,187207) there is a MANHOLE with SHORT NUMBER=9202 COVER= 12.05 INVERT= 8.80
t (544914,187296) there is a MANHOLE with SHORT NUMBER=9205 COVER= 13.05 INVERT= 11.40
t (544999,187272) there is a MANHOLE with SHORT NUMBER=9206 COVER= 12.77 INVERT= 10.93
t (544912,187298) there is a MANHOLE with SHORT NUMBER=9207 COVER= 13.03 INVERT= 11.75
t (544998,187275) there is a MANHOLE with SHORT NUMBER=9208 COVER= 12.78 INVERT= 11.30
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t (544986,187379) there is a MANHOLE with SHORT NUMBER=9302 COVER= 13.78 INVERT= 11.38
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t (544881,187279) there is a MANHOLE with SHORT NUMBER= COVER= -9999.00 INVERT= -9999.00
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t (545014,187223) there is a MANHOLE with SHORT NUMBER= COVER= 0.00 INVERT= 0.00
t (545014,187243) there is a MANHOLE with SHORT NUMBER= COVER= 0.00 INVERT= 0.00
t (544988,187542) there is a MANHOLE with SHORT NUMBER= COVER= 0.00 INVERT= 0.00
t (544946,187590) there is a MANHOLE with SHORT NUMBER= COVER= 0.00 INVERT= 0.00
t (545039,187367) there is a MANHOLE with SHORT NUMBER= COVER= 0.00 INVERT= 0.00
t (545019,187259) there is a MANHOLE with SHORT NUMBER= COVER= 0.00 INVERT= 0.00
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t (544727,187232) there is a MANHOLE with SHORT NUMBER=7202 COVER= 12.06 INVERT= 8.29
t (544774,187243) there is a MANHOLE with SHORT NUMBER=7203 COVER= 13.89 INVERT= 8.38
t (544705,187276) there is a MANHOLE with SHORT NUMBER=7204 COVER= 12.16 INVERT= 10.19
t (544717,187221) there is a MANHOLE with SHORT NUMBER=7205 COVER= 11.92 INVERT= 10.50
t (544708,187228) there is a MANHOLE with SHORT NUMBER=7206 COVER= 11.82 INVERT= 10.75
t (544717,187233) there is a MANHOLE with SHORT NUMBER=7207 COVER= 11.82 INVERT= 10.49
t (544728,187229) there is a MANHOLE with SHORT NUMBER=7208 COVER= 12.13 INVERT= 10.03
t (544766,187240) there is a MANHOLE with SHORT NUMBER=7209 COVER= 13.67 INVERT= 9.92
t (544781,187231) there is a MANHOLE with SHORT NUMBER=7210 COVER= 11.90 INVERT= 9.92
t (544767,187263) there is a MANHOLE with SHORT NUMBER=7211 COVER= 0.00 INVERT= -9999.00
t (544702,187277) there is a MANHOLE with SHORT NUMBER=7212 COVER= 0.00 INVERT= -9999.00
t (544709,187302) there is a MANHOLE with SHORT NUMBER=7301 COVER= 12.44 INVERT= 11.06
t (544720,187333) there is a MANHOLE with SHORT NUMBER=7302 COVER= 12.82 INVERT= 11.13
t (544723,187335) there is a MANHOLE with SHORT NUMBER=7303 COVER= 12.84 INVERT= 10.51
t (544723,187350) there is a MANHOLE with SHORT NUMBER=7304 COVER= 12.97 INVERT= 10.59
t (544713,187398) there is a MANHOLE with SHORT NUMBER=7306 COVER= 13.28 INVERT= 11.31
t (544770,187399) there is a MANHOLE with SHORT NUMBER=7307 COVER= 13.40 INVERT= 11.62
t (544711,187395) there is a MANHOLE with SHORT NUMBER=7308 COVER= 13.26 INVERT= 12.38
t (544765,187395) there is a MANHOLE with SHORT NUMBER=7309 COVER= 13.36 INVERT= 12.25
t (544680,187418) there is a MANHOLE with SHORT NUMBER= COVER= -9999.00 INVERT= -9999.00
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t (544697,187293) there is a MANHOLE with SHORT NUMBER= COVER= -9999.00 INVERT= -9999.00
t (544730,187389) there is a MANHOLE with SHORT NUMBER= COVER= -9999.00 INVERT= -9999.00
t (544782,187446) there is a MANHOLE with SHORT NUMBER= COVER= -9999.00 INVERT= -9999.00
t (544795,187406) there is a MANHOLE with SHORT NUMBER= COVER= -9999.00 INVERT= -9999.00

ended GIS print

Printbox (544663,187203) -> (545051,187591)
Central Mapsheet : TQ4487SE
User : LANGELL
Time : Tue Dec 21 20:43:49 2004

position of apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and blished on site before any works are undertaken.

Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no survey information is available.

```
At (544783,187409) there is a MANHOLE with SHORT NUMBER=          COVER=     -9999.00 INVERT=     -9999.00
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At (544730,187376) there is a MANHOLE with SHORT NUMBER=          COVER=     -9999.00 INVERT=     -9999.00
At (544727,187320) there is a MANHOLE with SHORT NUMBER=          COVER=     -9999.00 INVERT=     -9999.00
At (544715,187268) there is a MANHOLE with SHORT NUMBER=          COVER=     -9999.00 INVERT=     -9999.00
At (544682,187293) there is a MANHOLE with SHORT NUMBER=          COVER=     -9999.00 INVERT=     -9999.00
At (544703,187244) there is a MANHOLE with SHORT NUMBER=          COVER=         0.00 INVERT=         0.00
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At (544806,187430) there is a MANHOLE with SHORT NUMBER=          COVER=         0.00 INVERT=         0.00
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At (544789,187506) there is a MANHOLE with SHORT NUMBER=          COVER=         0.00 INVERT=         0.00
At (544795,187506) there is a MANHOLE with SHORT NUMBER=          COVER=         0.00 INVERT=         0.00
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```

Atkins Telecoms
PO Box 290
220 Aztec West
Park Avenue
Almondsbury
BRISTOL BS32 4SY

Tel: 01454 288808
Fax: 0870 2403012
Email: osm.enquiries@atkinsglobal.com

MOLESEYE
WASINGTON COURT
WASHINGTON LANE
EDINBURGH
EH11 2HA

Our Ref: NRSWA/544/51/0622
Your Ref: BAT/5780/NPB/719

Attention: [redacted]

Date: 8/12/04

Dear Sirs,

New Roads and Street Works Act 1991
C2 Plant Enquiry – Plant Not Affected

Thank you for your correspondence dated 6/12/04 regarding a Plant Enquiry/C2 Diversionary Works Enquiry at CHARTER AVENUE for proposed WORKS.

51 Degrees Limited do not have apparatus in the vicinity of your proposed scheme.

Yours Faithfully,

OSM, UK and Ireland
Acting as Agent for and on behalf of 51 Degrees Limited.

Please note. To enable us to process your application as quickly as possible, please ensure that you include a post code and/or an Ordnance Survey Grid Reference. Thank you for your co-operation.

PRINTING PROCESS ACTIVATED
SELECT YOUR OPTIONS FROM THE PRINT DIALOG
(THIS WINDOW WILL CLOSE AUTOMATICALLY)

Linesearch.org

Thank you for your enquiry: LS-1061343-118

This enquiry result is valid for 28 days only from the date of enquiry and is based on the confirmed information you entered. If the location of the work changes then a further enquiry must be made. Should the work not be undertaken within 28 days of the enquiry then a further enquiry must be made.

Enquirer details

Name: [redacted]

Company: Moleseye One Call

Email: [redacted]@moleseye.com

Enquiry details

Location: OS grid reference (544842, 187453)

Estimated start date: 17-01-2005

Type of work: Development projects - Commercial/industrial

Distance covered: 500 meters

This enquiry is not in the zone of interest of any of the following Operators:

* **BPA**	NOT IN ZONE OF INTEREST
* **Esso Petroleum Company Limited**	NOT IN ZONE OF INTEREST
* **Government Pipelines & Storage System**	NOT IN ZONE OF INTEREST
* **Manchester Jetline Limited**	NOT IN ZONE OF INTEREST
* **Mainline Pipelines Limited**	NOT IN ZONE OF INTEREST

*Please quote the Linesearch enquiry reference number in *all* correspondence*

BGCL Reference : ENQ5720
Your Reference :

Moleseye Ltd
Washington Court
Washington Lane
Edinburgh
EH11 2HA

02 December 2004

Dear [redacted]

Thank you for your enquiry regarding the location of our plant and/or services in relation to :

Bat/5780/ Npb/719 *
Bat/6810/ Cls/14
Bat/2470/ Rso/58

20/12

I can confirm that 'British Gas Connections Ltd' does not have plant and/or services in the area indicated in your letter.

I would suggest that you contact 'BG Transco' who may have plant in the area.

Yours faithfully,

[redacted]
Asset Manager

GTC
Gas Transportation Company
Woolpit Business Park
Woolpit, Bury St Edmunds
Suffolk IP30 9UQ
Sales & Administration: Tel: 01359 240363 Fax: 01359 240138
Operations: Tel: 01359 244066 Fax: 01359 244046

PLANT ENQUIRY RESPONSE 11928

Dear Sirs

In reply to your communication reference number BAT/5780/NPB/719 dated 27/11/04 of your intention to execute works. GTC has no apparatus in the vicinity of your proposed works.

Please note other Gas Transporters may have apparatus in this area and you should ensure that all transporters have been consulted.

Yours faithfully

The Gas Transportation Company Ltd

[redacted]

Planning Assistant

thus™

FAX

Date	*December 2, 2004*
Number of pages including cover sheet	*1*

TO *Moleseye Ltd*

Washington Court
Washington Lane
Edinburgh
EH11 2HA

Phone *0845 140 0271*
Fax Phone *0131 539 7310*

FROM: [redacted]
Plant Protection & Streetworks Co-ordination Group
Pavilion 4
1 - 2 Berkeley Square
99 Berkeley Street
Glasgow G3 7HR
Email [redacted]@thus.net
Phone *0141 566 3434*
Fax Phone *0141 566 3954*

REMARKS: ☐ *Urgent* ☐ *For your review* ☐ *Reply ASAP* ☐ *Please Comment*

FAO [redacted] 20/12

RE- BAT/4605/LCB/2, BAT/3935/HIW/4, BAT/5780/NPB/719, BAT/4715/MOL1/3

After consulting our GIS System, I am unaware of any Thus plant which would be affected by your works.

Regards,

[redacted]

5269

Plant Information Request View

moleseye

Plant Information Request		
Transaction No : BAT/5780/NPB/719	**Project Ref :**	**Status : In Progress**
Name Moleseye One Call	**Company** Moleseye One Call	**Address** Washington Court, Washington Lane, Edinburgh EH11 2HA
Phone No 0131 539 7300 Ext	**Fax No** 0131 539 7310 **Email Address**	
Respond By Date 20/12/2004	**Response Required** Plans Required	**Date Of Issue** 27/11/2004 12:32:00

Map

Location of Works

Charter Avenue, Newbury Park, ILFORD, REDBRIDGE

Specific Location	**Start East**	**Start North**
bridge over dismantled railway south east off Charter Avenue and north off Benton Road	544785	187540
	End East	**End North**
	544925	187390

Please Send Plant Information To

Name	**e-mail**	**Address**
Moleseye One Call		Washington Court, Washington Lane, Edinburgh EH11 2HA
Phone No	**Fax No**	
0131 539 7300 Ext		

Comments

Proposed Works	**Comments**
Excavation of inspection pit by hand in the verge. (0.50m by 0.50m)	All service plans required.

Signed:..... Date:.....

connect

Ocean Park House
East Tyndall Street
Cardiff CF24 5GT
Tel: 029 2031 4000
Fax: 029 2031 4030

Ref No: 5269

With regard to your enquiry, I confirm that Independent Pipelines Ltd or Quadrant Pipelines Ltd do not have any apparatus within the immediate proximity of your proposed works.

If you require any further assistance please do not hesitate to contact me on 029 2031 4000 Ext. No:.....4163.....

1/12/04

Transport for London
Street Management

Your ref: BAT/5780/NPB/719
Our ref: TASS/AD/NRSWA/ENQ/14

Moleseye One Call
Washington Court
Washington lane
Edinburgh
EH11 2HA

20/12

Street Management
Windsor House
42-50 Victoria Street
London SW1H 0TL
Phone 020 7343 5000
www.tfl.gov.uk

6 December 2004

Dear Sir / Madam

PLANT ENQUIRY: Charter Avenue, Newbury Park, Ilford, Redbridge

Thank you for your facsimile dated 2 December 2004.

Our records show no traffic control equipment within the site of your anticipated works.

Should you vary the location of the works please inform us so that further checks can be made.

If you require further information, please contact [redacted] on (020) [redacted]

Yours faithfully

[redacted]
pp. [redacted]
NRSWA Systems Manager
TfL STREET MANAGEMENT
Email: [redacted]@streetmanagement.org.uk
Direct line: (020) [redacted]
Fax: (020) 7027 9760

A division of Transport for London
whose principal place of business is
Windsor House
42-50 Victoria Street
London SW1H 0TL
VAT number 756 2769 90

Our Ref: TW/TNN/38143
Dealt By: [redacted]
Contact Number: (08708) 883137
Your Ref:

Date: 04-Jan-05

Telewest Broadband

TNN Plant Enquiries, Scimitar Park, Courtauld Road, Basildon, Essex, SS13 1ND

Tel: 0870 888 3137
Fax: 01268 468155
Email: twsegenadmin@telewest.co.uk

BAT/5780/NPB/719
20/12

[redacted]
Moleseye One Call
Washington Court
Washington Lane
Edinburgh
EH11 2HA

Location - Charter Avenue

Thank you for your enquiry dated 16 December 2004 regarding the above location.

Telewest plant should not be affected by your proposed work and no strategic additions to our existing network are envisaged in the immediate future.

However you should be aware that elements of our network are built in response to customer orders so this situation can change.

This information is only valid on the date of issue. If your start date is 3 months or more from the date of this letter, please re-apply for updated information.

Yours faithfully

[redacted]
TNN Plant Enquiries, Administration Centre SE

Plant Information Request View

moleseye

Plant Information Request		
Transaction No : BAT/5780/NPB/719	**Project Ref :**	**Status : In Progress**
Name Moleseye One Call	**Company** Moleseye One Call	**Address** Washington Court, Washington Lane, Edinburgh EH11 2HA
Phone No 0131 539 7300 **Ext**	**Fax No** 0131 539 7310 **Email Address**	
Respond By Date 20/12/2004	**Response Required** Plans Required	**Date Of Issue** 27/11/2004 12:32:00

Map

Location of Works

Charter Avenue, Newbury Park, ILFORD, REDBRIDGE

Specific Location	**Start East**	**Start North**
bridge over dismantled railway south east off Charter Avenue and north off Benton Road	544785	187540
	End East 544925	**End North** 187390

Please Send Plant Information To

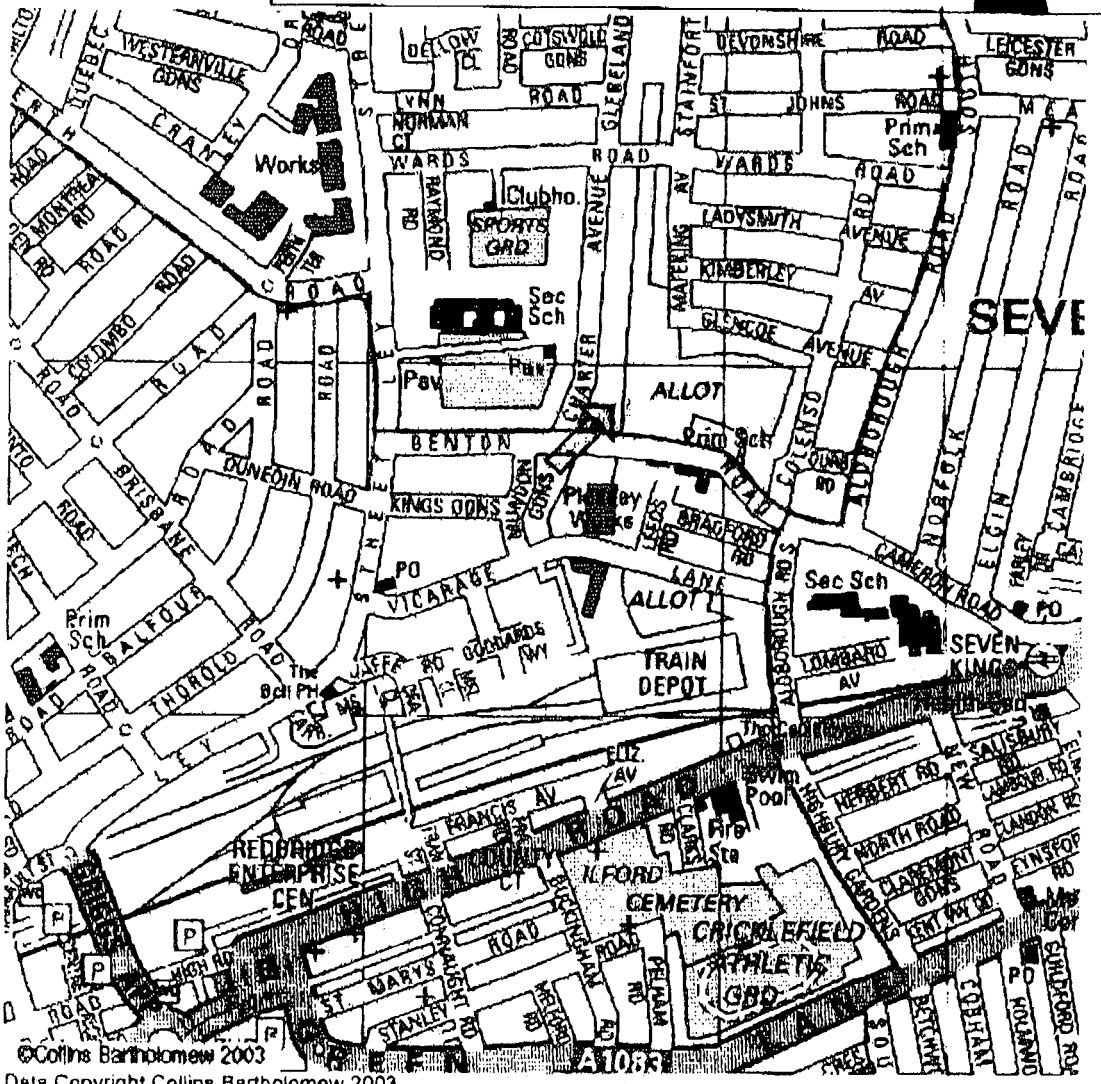
Name	**e-mail**	**Address**
Moleseye One Call		Washington Court, Washington Lane, Edinburgh EH11 2HA
Phone No 0131 539 7300 **Ext**	**Fax No**	

Comments

Proposed Works	**Comments**
Excavation of Inspection pit by hand in the verge. (0.50m by 0.50m)	All service plans required.

14/12/04

BAT/5780/NPB/719



Map Data Copyright Collins Bartholomew 2003

SIGMATEK

Sigmatek Limited
Suite 1
New Road Business Estate
New Road
Ditton, Aylesford
Kent ME20 6AF
Tel: +44 (0) 1732 874422
Fax: +44 (0) 1732 229430

FAX

To:	Moleseye One Call Washington Court Washington Lane	**From:**	Level 3 Communications Ltd Plant Protection C/O Sigmatek Ltd
Fax:	0131 539 7310	**Pages:**	1 of 1
Phone:	0131 539 7300	**Date:**	01 December 2004

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** x **Please Recycle**

Your Ref.: BA1/5780/NPB/719

Our Ref.: 0412 035

Attn: [redacted]

RE: Plant Enquiry at Charter Avenue, Newbury Park, Ilford, Redbridge

Level 3 Communication Limited is a licensed Statutory Utility.

We have reviewed your plans and have determined that Level 3 Communications has No Apparatus In the areas concerned.

If you have any further queries, please do not hesitate to call.

Plant Information Request View

moleseye

Plant Information Request

Transaction No : BAT/5780/NPB/719	**Project Ref :**	**Status : In Progress**
Name Moleseye One Call	**Company** Moleseye One Call	**Address** Washington Court, Washington Lane, Edinburgh EH11 2HA
Phone No 0131 539 7300 Ext	**Fax No** 0131 539 7310 **Email Address**	
Respond By Date 20/12/2004	**Response Required** Plans Required	**Date Of Issue** 27/11/2004 12:32:00

Map

Location of Works

Charter Avenue, Newbury Park, ILFORD, REDBRIDGE

Specific Location bridge over dismantled railway south east off Charter Avenue and north off Benton Road	**Start East** 544785	**Start North** 187540
	End East 544925	**End North** 187390

Please Send Plant Information To

Name Moleseye One Call	**e-mail**	**Address** Washington Court, Washington Lane, Edinburgh EH11 2HA
Phone No 0131 539 7300 Ext	**Fax No**	

Comments

Proposed Works Excavation of inspection pit by hand in the verge. (0.50m by 0.50m)	**Comments** All service plans required.

The Corporation of London have no plant in this area

[redacted]

2/12/04

E.S.PIPELINES LIMITED

2nd December 2004

Attn. One Call Dept

Moleseye Ltd
Washington Court
Washington lane
Edinburgh
EH11 2HA

Dear Sir/Madam,

I refer to your New Roads and Street Works Act 1991 submissions for your proposed works at the following locations:

Ref	Grid	Site
AF7/5600/D4452	524150, 524330, 181270, 181345	Ladbroke Grove Station
AF7/5780/D4764	544910, 545110, 190600, 190720	Forest Road, Hainault Road, Ilford, Redbridge
BAT/4606/LCB/2	405265, 405425, 280427, 280252	Pershore Road, Bournville, Birmingham, West Midlands
BAT/3936/HIW/4	417520, 417695, 188857, 188692	Kingsdown Road, Swindon, Swindon Borough Coucil
BAT/5780/NPB/719	544785, 544925, 187540, 187890	Charter Avenue, Newbury Park, Ilford, Redbridge
BAT/2470/RSO/58	492535, 492745, 300645, 300467	High street Morcott, Rutland UA
BAT/4715/MDL1/3	422570, 422855, 420250, 420082	Calder Road, Ravensthorpe, Dewsbury, Kirklees
BAT/6810/CLS/14	249230, 249415, 362210, 362010	A4085 – Caethro roundabout, waunfawr, Gwynedd

I can confirm that E S Pipelines Ltd have no plant in the vicinity of your proposed works at these locations.

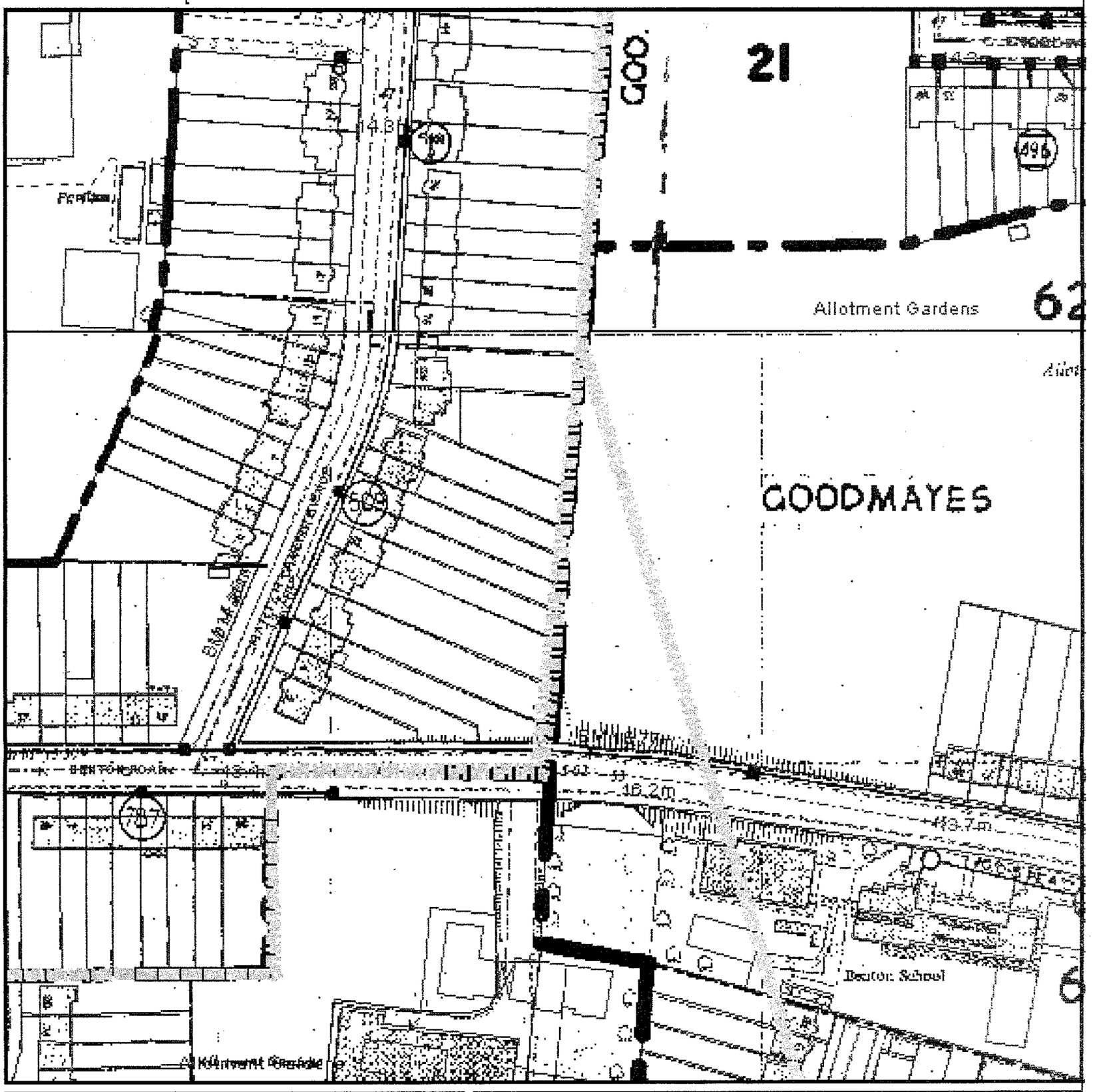
If you wish to discuss this matter further please contact me on [redacted] or [redacted]

Yours faithfully

[redacted]

ES Pipelines Limited Old Pump House Elmer Works Hawks Hill Leatherhead Surrey KT22 9DA
Tel: 01372 227560 Fax: 01372 377996 Email: info@espipelines.com Website: www.espipelines.com
Registered Number: 3822878 in England

BT Maps by email Plant Information Reply



IMPORTANT WARNING:
Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

FOR FREE ON SITE LOCATION & MARKING SERVICE CALL DIAL BEFORE YOU DIG 0800 917 3993

KEY TO BT SYMBOLS

- UNDERGROUND PLANT
- OVERHEAD PLANT (A/C D/W/U or W)
- JOINT BOX
- DISTRIB'N POINT
- MANHOLE
- POLE
- CABINET
- BURIED JOINT
- JOINTING POST
- PROPOSED U/G
- PROPOSED O/H (A/C D/W/U or W)
- PROPOSED BOX

Other proposed plant is shown using dashed lines. BT symbols not listed above may be disregarded. Existing BT plant may not be recorded. Information valid at the time of preparation.

BT ref: WNK13404L
Map reference (centre): TQ4485087450
Issued: 27/11/04 13:43:56

Atkins Telecoms
PO Box 290
220 Aztec West
Park Avenue
Almondsbury
BRISTOL BS32 4SY

Tel: 01454 288808
Fax: 0870 2403012
Email: osm.enquiries@atkinsglobal.com

Moleseye One Call
SRWR Operations Centre
Washington Court, Washington Lane
Edinburgh
EH11 2HA

24/12

Our Ref: NRSWA/544/243094
YourRef: BAT/5780/NPB/719

F.A.O:

Date: 30 November 2004

Dear Sirs,

New Roads and Street Works Act 1991
C2 Plant Enquiry re: Highway Land only - Plant Affected

Thank you for your enquiry regarding works at CHARTER AVENUE, for proposed WORKS.

Cable and Wireless UK have apparatus in the vicinity of your proposed scheme. We have enclosed plans showing the approximate position of the apparatus, please note the disclaimer on the plans.

A copy of the current special requirements guidance process OSM.060, relating to the protection of external network apparatus when working in it's vicinity, is available upon request.

Diversionary works may be necessary if the existing line of the highway / railway or it's levels are altered, where apparatus is affected.

Where apparatus is affected and requires diversion, you must submit draft details of the proposed scheme with a written request for a 'C3 Budget Estimate' to the address below. These estimates should be provided normally within 20 working days from receipt of your written request. Please quote our reference above when requesting a C3 Budget Estimate. Failure to submit your request to the address below may lead to delays in processing it.

'C3 Diversionary Works Budget Estimates Coordinator'
Atkins Telecoms
PO Box 290
220 Aztec West
Park Avenue
Almondsbury
BRISTOL BS32 4SY

Please note: If your enquiry relates to works affecting rail transport authority land, we have assumed that only apparatus in the highway may be affected. Please resubmit your enquiry clearly stating that the works affect railway, in order that we can check against apparatus records for the railway.

Yours Faithfully,

OSM, U.K. and Ireland
Acting as agent for and on behalf of Cable and Wireless UK

Please note. To enable us to process your application as quickly as possible, please ensure that you include a post code and/or an Ordnance Survey Grid Reference. Thank you for your co-operation.

CABLE & WIRELESS COMMUNICATIONS PLANT NETWORK

DRAWING TITLE:
CHARTER AVENUE

PROJECT TITLE:
bat/5780/npb/719

OS 1250 ref. tq4487ne

C&W Ref. tq48nw/050

NOTES:

The information shown on this plan is for indication only. No warranty is made as to its accuracy. This plan must not be relied upon in the event of excavation or other works carried out in the vicinity of Cable & Wireless UK Ltd plant. No liability of any kind whatsoever is accepted by Cable & Wireless UK Ltd., its servants, or agents, for any error or omission in respect of information contained on this plan. The actual position of underground services must be verified and established on site before any mechanical plant is used.

CABLE & WIRELESS
Cable & Wireless UK Ltd.
Great Park Road
Almondsbury
Bristol
BS32 4QW

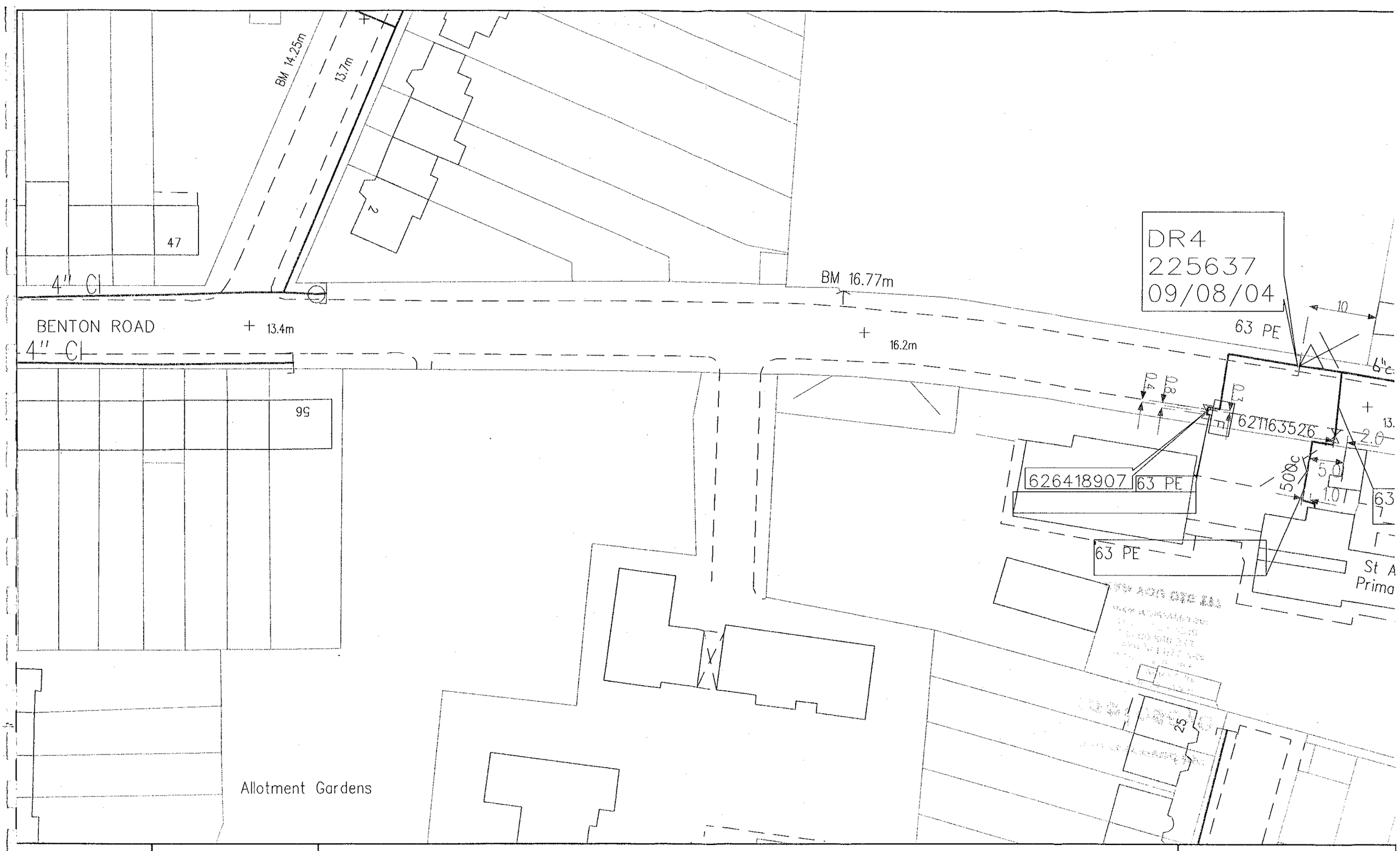
SCALE 1 : 2500 ON A3

DRAWING NO:

Sheet: __of__

ISSUE: ...

Printed by PARK8546 on 30-11-2004 12:01:43



SCALE: 1 : 500

USER ID: cb049

DATE: 27/01/2005

NRSWA RESPONSE

GRID REFERENCE : 544840, 187383, TQ4487

LP MAINS
MP MAINS
IP MAINS
LHP MAINS
NHP MAINS

0m 20m

Approximate scale 1 : 500 printed on A3 Colour Landscape

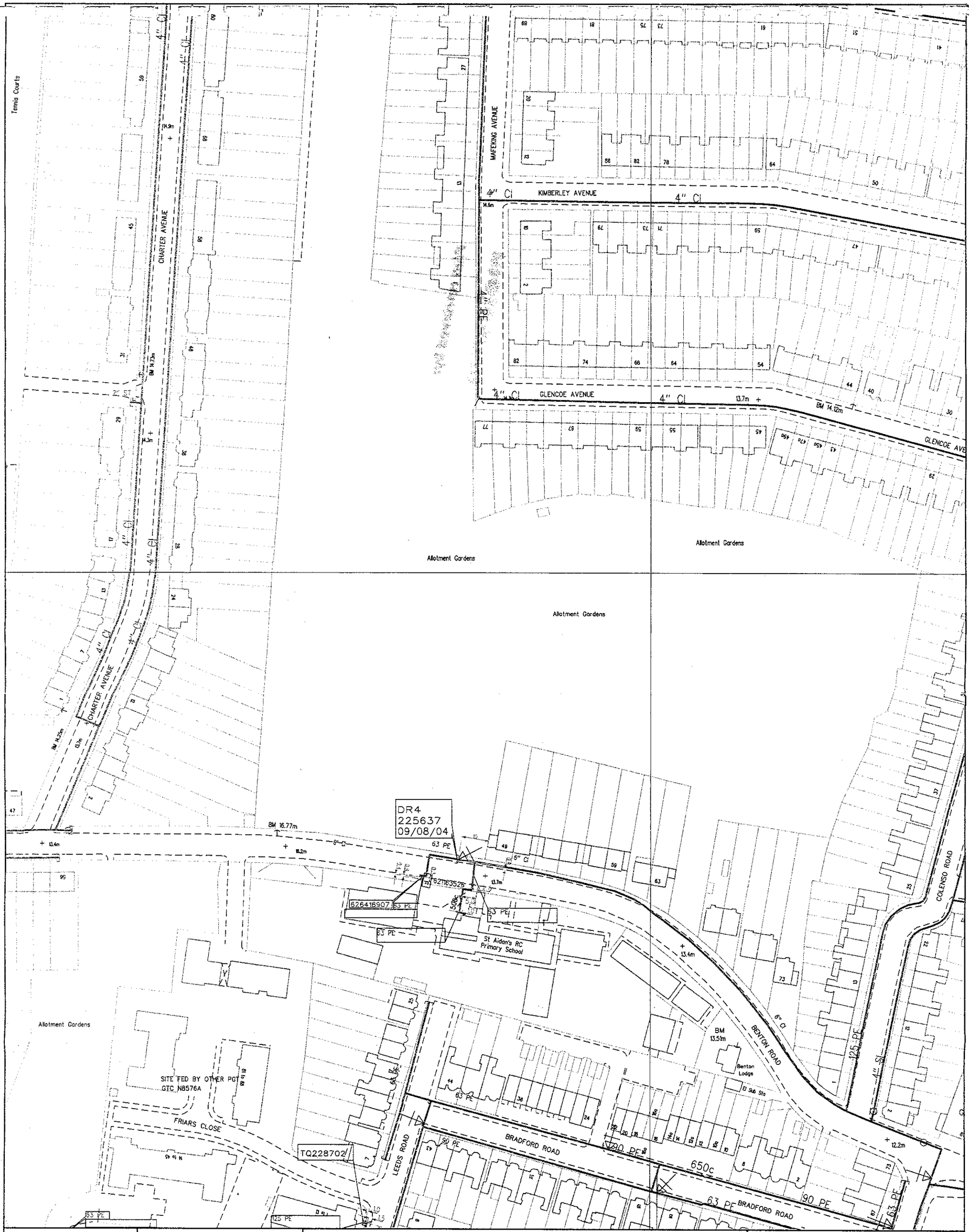
Some examples of Plant Items:

Valve | Depth of Cover | Syphon | Diameter Change | Material Change

This plan shows those pipes owned by Transco plc or the relevant Gas Distribution Network in their roles as Licensed Gas Transporters (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections, etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Transco plc, the relevant Gas Distribution Network, or their agents, servants or contractors for any error or omission. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Desktop MAPS Version 4.3.0

Hutton



SCALE: 1 : 1250	LP MAINS
USER ID: KK005	MP MAINS
DATE: 26/01/2005	IP MAINS
NRSWA RESPONSE	LHP MAINS
GRID REFERENCE : 544938, 187484, TQ4487	NHP MAINS

0m 50m

Approximate scale 1 : 1250 printed on A3 Colour Portrait

Some examples of Plant Items:

Valve | Depth of Cover | Syphon | Diameter Change | Material Change

This plan shows those pipes owned by Transco plc or the relevant Gas Distribution Network in their roles as Licensed Gas Transporters (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections, etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Transco plc, the relevant Gas Distribution Network, or their agents, servants or contractors for any error or omission. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Desktop MAPS Version 4.3.0

Hutton

Appendix C - Trial Pit and Metal Test Results

STRUCTURAL
SOILS LTD

BRIDGE INVESTIGATION

BE4 ASSESSMENT PROGRAMME

CONTRACT NO. 47101

BRIDGE NPB/719

Site Description

The investigation on Bridge NPB/719 was carried out for and on the instructions of Jacobs. The bridge is located on Benton Road, Seven Kings, Redbridge, London at National Grid Reference TQ448874.

The bridge carries Benton Road over a dismantled railway and comprises of single spanning longitudinal steel girders with brick jack arches. The investigation was carried out to provide information for the structural assessment of the bridge.

Sitework was undertaken on 12th January2005.

Fieldwork

1 no. inspection pit was excavated by hand to locate the top flange of a steel girder and 1 no. metal sample, <25mm x 25mm in size, was taken from a position specified by Jacobs. The sample was labelled and sent to a UKAS accredited laboratory for testing.

Laboratory Testing

The chemical composition and grading of the sample was determined using combustion and ICP OES techniques. The results are presented overleaf.

STRUCTURAL SOILS

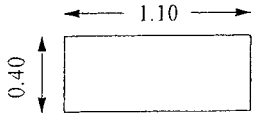
TRIAL PIT LOG

Contract	Client	Trialpit No
BE4 Bridges - NPB/719	Jacobs	TP01

Job No	Date	Ground Level (m AOD)	Co-Ordinates	Sheet
47101	12.1.05	---	---	1 of 1

Samples and In-situ Tests				Water	Description of Strata	Depth (Thickness)	Legend
Depth	No	Type	Results				
					MADE GROUND : Concrete paving.	0.05	
					MADE GROUND : Brown slightly silty fine to coarse SAND.	0.23	
					MADE GROUND : Brown slightly silty to silty fine to coarse SAND and sub angular to rounded fine to coarse GRAVEL of flint. Occasional cobbles of brick. Occasional pockets of sandy clay.	0.69	
					MADE GROUND : Asphalt sealant.	0.72	
					Trial Pit ends at 0.72m on top flange.		

Plan (Not to Scale)



No Bearing Taken

General Remarks

1. Groundwater : None Encountered
2. Stability : All sides stable.
3. Similarity : All sides similar.
4. Excavation : Easy by hand.
5. Top flange located 1.30m from parapet, width of flange 356mm.

All dimensions in metres Scale 1:25	Method Hand Dug	Logged By	Checked By	AGS

SHEFFIELD
TESTING LABORATORIES
50 - 56 Nursery Street, Sheffield, S3 8GP. U.K.
Telephone: 0114 272 6581 Fax: 0114 272 3248 e-mail: hq@sheffieldtesting.com

TEST CERTIFICATE

UKAS TESTING
0136

Date. 28 January 2005

Serial No. 5010680

ORDER NO. 60/MD/3087 **OUR REF AB/AJH**

CLIENT: STRUCTURAL SOILS LTD
THE POTTERIES
POTTERY STREET
CASTLEFORD
WEST YORKSHIRE
WF10 1NJ

Results of Chemical Analysis of Sample,

STL Test No.	A694
Sample Identification	NPB/719
	Mass %
Carbon	0.085
Silicon	0.11
Manganese	0.30
Phosphorus	0.29
Sulphur	0.055
Chromium	<0.02
Molybdenum	<0.02
Nickel	0.06

Determined by Combustion & ICP OES Techniques.

Sample A694 is wrought iron with unusually high manganese.

Certified [redacted]

Authorised Signatory [redacted]

Appendix D - Form AA

FORM 'AA' (BRIDGES) **GC/TP0356**

Appendix: 4

ELR/ Bridge No NPB/719 Issue: 1

Revision: B (Nov 2000)

APPROVAL IN PRINCIPLE FOR ASSESSMENT

Bridge/Line Name: Benton Road, Ilford / Newbury Park Branch

ELR/Bridge No. NPB/719

Brief Description of Existing Bridge:

(a) Span Arrangement

A single span simply supported bridge, clear square span 7.71 m, with zero skew.

(b) Superstructure Type

The deck consists of 9 No. longitudinal wrought iron riveted plate girders at 5'-2" (1580mm) centres with brick jack arches spanning between the girders.

(c) Substructure Type

Abutments and wingwalls are constructed in brick. The girders are supported on discrete sandstone bearing blocks. The bridge has been infilled to soffit level on the north side and to within 1.4m of the underside of the girders on the south side

(d) Planned highway works/modifications at this site

None

(e) Road designation class and whether classed as a heavy load route

The bridge carries a class "C" urban road. Carriageway width is 8.17m with kerbed pavements each side approximately 2.05m wide.

The bridge was given an abnormal load rating of 110 tons in a 1970 assessment, but it is not known if the road is currently classed as a heavy load route.

(f) Any other requirements

None

Assessment Criteria

(a) Loadings and Speed

Section sizes used to calculate dead loads obtained from site measurements with reference to previous assessments. (See Jacobs report "VAR9-1220 BE4 Assessment Programme – Assessment and

Inspection Report – Bridge Ref.: NPB/719"). Vehicle loading obtained from and applied in accordance with BE4. Standard BE4 loading representative of 24 ton vehicles will be assessed.

(b) Codes to be used

BE4 - "The Assessment of Highway Bridges for Construction and Use Vehicles" Ministry of Transport, 1967 (with amendments to 1969).

BS 153: Parts 3B & 4: 1958 "Steel Girder Bridges" British Standards Institution (with amendments to 12 Sept. 1968).

(c) Proposed Method of Structural Analysis

Capacities will be calculated using estimates of reduced section sizes where corrosion is present, in particular the effective girder flange areas identified in Table 5A of the Inspection Report. Consequently, a general condition factor is not applied.

The bridge complies with the construction types listed in BE4 Clause 303 (c) (i.e jack arches), which allows the quick assessment method to be used. However, additional checks may be required on the internal girders close to one third span, because this is where corrosion is most prevalent.

The external girders will be checked under dead load only as there is a girder between the edge girders and the carriageway. Compression buckling of the top flange of the edge girders will be considered based on the girders being partially restrained against lateral bending. (Full details of the girder end arrangement are not available.) The internal girders are considered to be fully restrained by the concrete infill.

Determination of the adequacy of the jack arches will be based upon the empirical method described in Bridgeguard 3 Current Information Sheet No 22 (Pro-forma for the empirical assessment of brick, masonry and concrete jack arches and associated ties.)

BRB (Residuary) Limited | Group Standard

FORM 'AA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: B (Nov 2000)

ELR/ Bridge No NPB/719

APPROVAL IN PRINCIPLE FOR ASSESSMENT

Senior Civil Engineer's Comments

None

Proposed Category for Independent Check .....

Superstructure ..... I .....

Substructure ..... I .....

Name of Checker suggested if Cat 2 or 3 .....

Category 1

The above assessment, with amendments shown, is approved in principle:

Signed .....[redacted]

Title .....

Date ..... 24/1/05 .....

Category 2 and 3

The above assessment, with amendments shown, is approved in principle:

Signed .....

Title .....

Date .....

Signed .....

Title .....

Date .....

Appendix E - Form BA

FORM 'BA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A (Feb 1993)

ELR/ Bridge No NPB/719

CERTIFICATION FOR ASSESSMENT CHECK

Assessment Group: Jacobs Infrastructure

Bridge/Line Name: Benton Road, Ilford / Newbury Park Branch

Category of Check: 1

ELR/ Bridge No: NPB/719

We certify that reasonable professional skill and care have been used in the assessment of the above structure with a view to securing that:

(1) It has been assessed in accordance with the Approval in Principle (where appropriate) as recorded on Form AA approved on 24 January 2005.

(2) It has been checked for compliance with the following principal British Standards, Codes of Practice, BRB (Residuary) Limited technical notes and Assessment standards:

BE4 - "The Assessment of Highway Bridges for Construction and Use Vehicles" Ministry of Transport, 1967 (with amendments to 1969).

BS 153: Parts 3B & 4: 1958 "Steel Girder Bridges" British Standards Institution (with amendments to 12 Sept. 1968).

List any departures from the above and additional methods or criteria adopted, with reference and justification for their acceptance.

None

Category 1

Name	Signature	Date	
[redacted]	[redacted]	16/02/05	Assessor
		16/2/05	Assessment Checker
		28.2.05	Authorised signatory of the firm of Consulting Engineers to whom Assessor/Checker is responsible.

FORM 'BA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A (Feb 1993)

ELR/ Bridge No NPB/719

CERTIFICATION FOR ASSESSMENT CHECK

Category 2 and 3 (Note: Category 1 check must also be signed)

(a) Assessment

Name	Signature	Date	
			Assessor
			Assessment Checker
			Authorised signatory of the firm of Consulting Engineers to whom Assessor/Checker is responsible.

(b) Check

Name	Signature	Date	
			Assessor
			Assessment Checker
			Authorised signatory of the firm of consulting engineers to whom Assessor/Checker is responsible.

This Certificate is accepted by..... [redacted] .

4/3/05.

FORM 'BAA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A (Feb 1993)

ELR/ Bridge No NPB/719

CERTIFICATION FOR ASSESSMENT CHECK

Notification of Assessment Check

Assessment Group	Jacobs Infrastructure
Bridge Name/Road No.	Benton Road, Ilford
Line Name	Newbury Park Branch
ELR Code/Structure No.	NPB/719

The above bridge has been assessed and checked in accordance with Standards which are listed on the appended Form BA. A summary of the results of the assessment in terms of capacity and restrictions is as follows:-

STATEMENT OF CAPACITY

Internal Girders below carriageway	24tons C&U
Internal Girders below footway:	24tons C&U
Edge Girder (dead load only)	Pass
Tie rods and Jack arches	Fail

Based on an empirical assessment in accordance with Bridgeguard 3 Information Sheet 22, the external jack arches fail due to their missing tie bars. The internal jack arches are laterally restrained by the concrete infill and the adjacent jack arches and they pass the empirical assessment.

Recommended Loading Restrictions

None subjected to the installation of the tie bars to the external jack arches.

Description of Structural Deficiencies and Recommended Strengthening

- Extensive corrosion to the exposed flanges of the edge girders and first internal girders.
- Extensive corrosion to the bottom flange plates of the internal girders at the third points.
- Loss of almost all the tie straps
- Cracking in the parapets, probably due to expansive corrosion of the top flanges of the edge girders
- Damage to abutment side walls from lateral movement of edge girders.

The bridge appears to be a candidate for infilling. If the bridge is retained:

- replace tie-straps to outer girders
- remove corrosion and apply paint system to arrest further corrosion.
- Minor brickwork repairs to jack arches, parapets and wingwalls.

FORM 'BAA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A (Feb 1993)

ELR/ Bridge No NPB/719

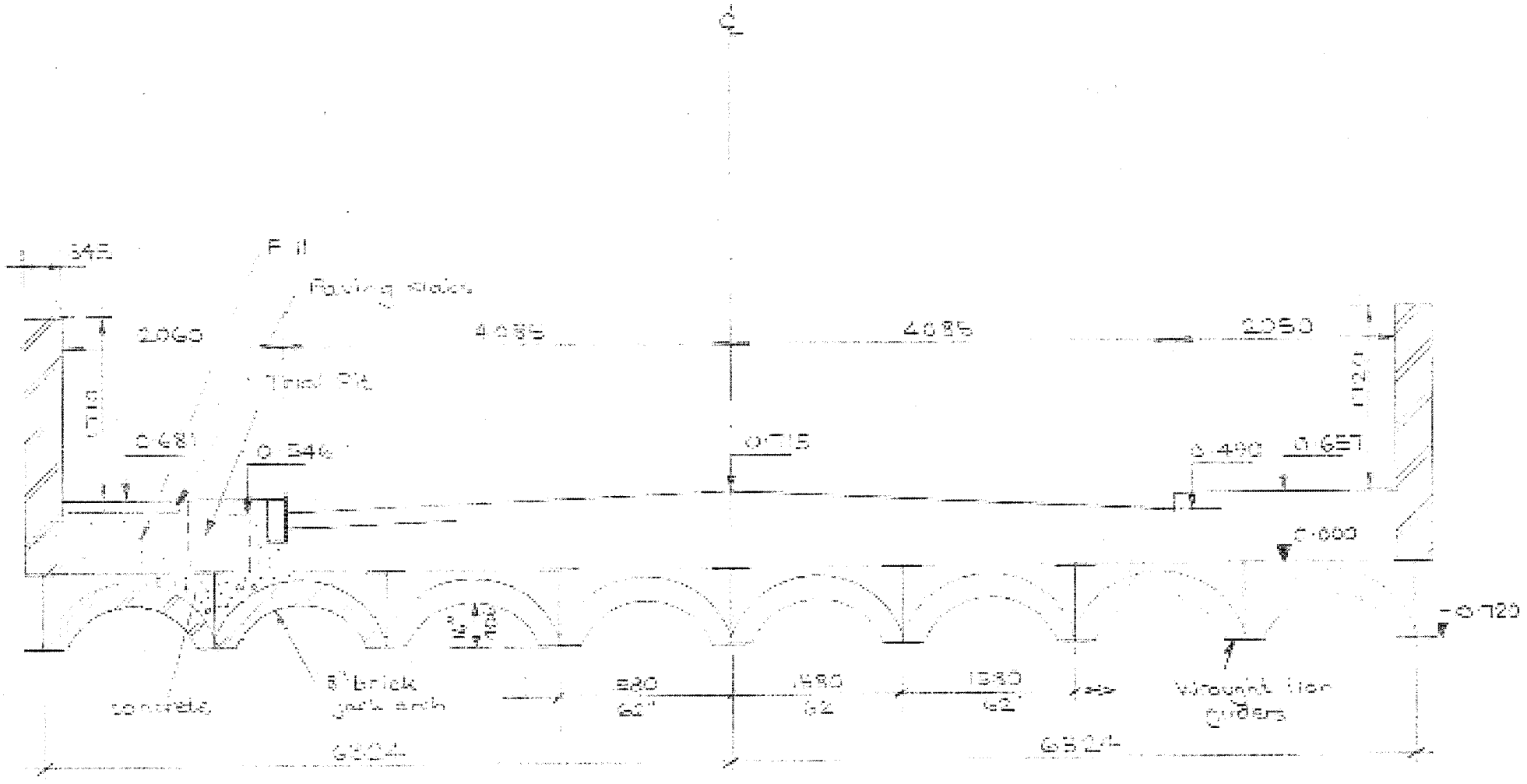
CERTIFICATION FOR ASSESSMENT CHECK

Name	Signature	Date	
[redacted]	[redacted]	16/02/05	Assessor
		16/2/05	Assessment Checker
		28.2.05	Authorised signatory of the firm of Consulting Engineers to whom Assessor/Checker is responsible.

This Certificate is accepted by..... [redacted] ..... [redacted] ....

4/3/05.

Appendix F - Calculations



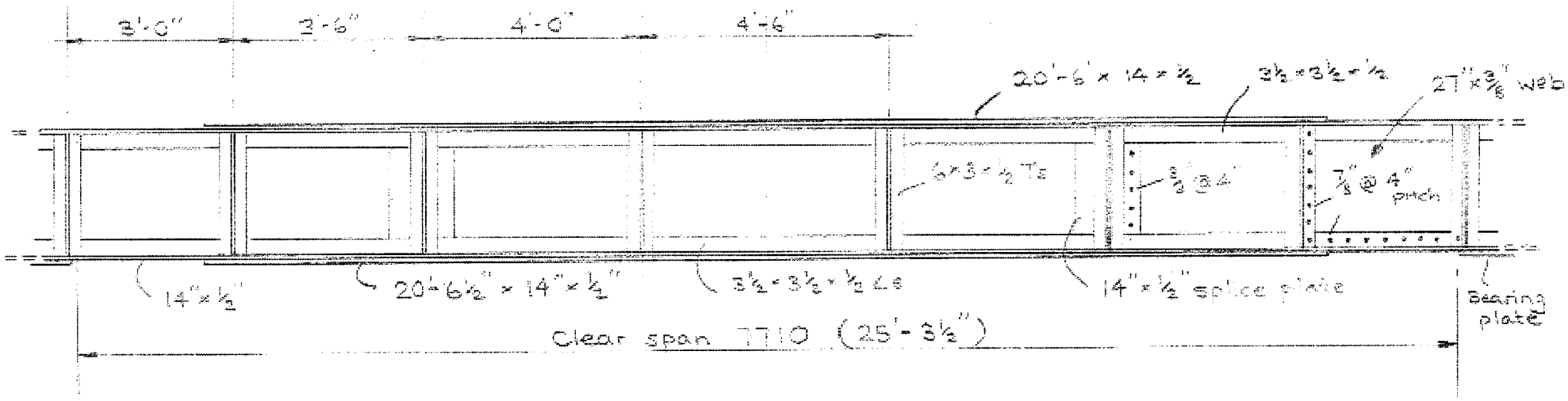
Scale 1:50

NPB|719 BENTON ROAD

CROSS-SECTION

BEA Survey - Jan. 2005

Figure 1



NPB 719 BENTON ROAD

EDGE GIRDER DETAILS

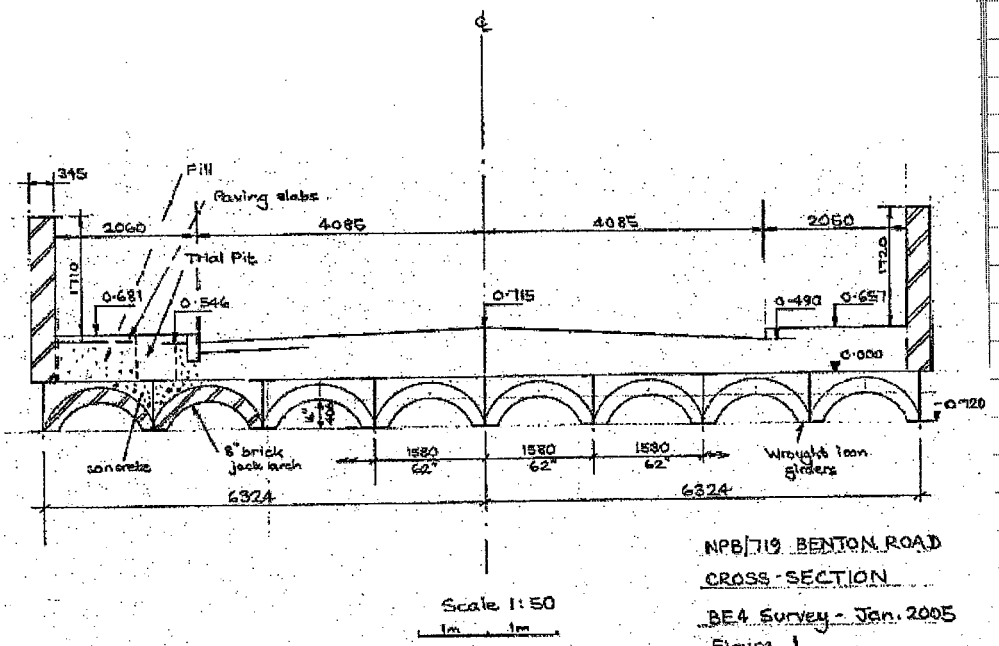
BE4 Survey Jan. 2005

Figure 2.

CALCULATION SHEET

JACOBS

Project Title: BE4 assessment				Sheet No:	1
Subject: NPB 719 Edge girders BM assessment,				Calc No:	39.1
Job No: J24110GA				File:	R6
Made By: [redacted]		Date: Feb 05	Revised By:		Date:
Checked By: [redacted]		Date: 2/05	Checked By:		Date:



Scale 1:50
1m 1m

NPB 719 BENTON ROAD
CROSS-SECTION
BE4 Survey - Jan. 2005
Figure 1

Both external girders are not loaded with traffic loading. The pedestrian pavements are wider than the spanning of the jack arches, hence the external girders should be assessed only for dead loading.

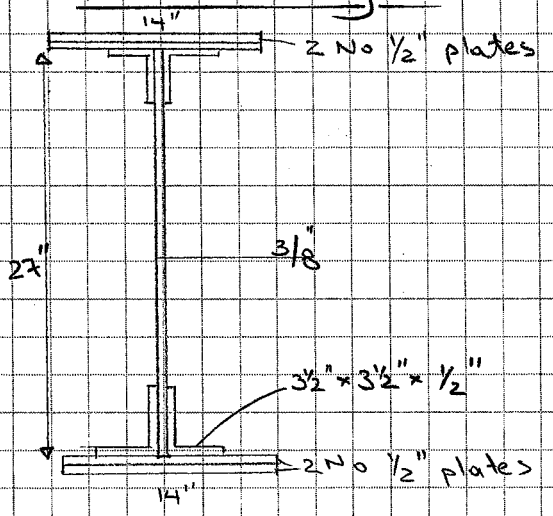
The most corroded North edge girder will be assessed at mid span. If it adequate for the loading then the South span by inspection is adequate to support the loading.

CALCULATION SHEET

JACOBS

Project Title: BE4 assessment		Sheet No:	2
Subject: NPB 719		Calc No:	39.1
Job No: J24110GA		File:	R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By: [redacted]	Date: 2/05	Checked By:	Date:

Dead loading



Self weight = TF = 2 × 14" × ½" = 14 in²

Angles = 4 × (3½" × ½" + 3" × ½") = 13 in²

Web = 27" × ⅜" = 10.125 in²

BF = 2 × 14" × ½" = 14 in²

Total area = 51.125 in² = 0.355 ft²

Add 10% for stiffeners, bolts, rivets

BE4-1967 SW = 0.355 × 1.1 × 480 = 187.5 lb/ft = 0.08 ton/ft ✓

Parapet - Loading

Area = 345 × (1710 + 681) = 824895 mm² = 8.88 ft² ✓

BE4-1967 Parapet weight = 8.88 × 140 = 1243.1 lb/ft ✓

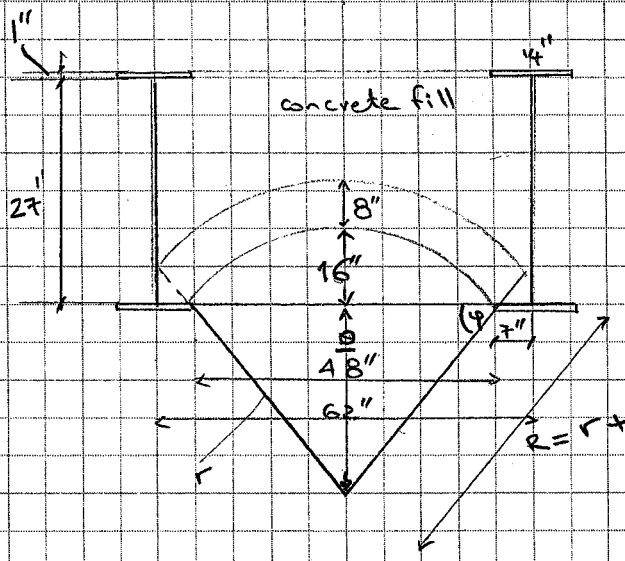
= 0.555 ton/ft ✓

CALCULATION SHEET

JACOBS

Project Title: BE4 assessment				Sheet No:	3
Subject: NPB 719				Calc No:	39.1
Job No: J24110GA				File:	R6
Made By: [redacted]		Date: Feb 05	Revised By:		Date:
Checked By:		Date: 2/05	Checked By:		Date:

Jack Arch



$r = o + 16$

$r^2 = o^2 + 24^2$

$\Rightarrow \quad o^2 + 16^2 + 32o = o^2 + 24^2 \Rightarrow$

$o = \frac{24^2 - 16^2}{32} = 10 \text{ in}$

$\therefore \quad r = o + 16 = 10 + 16 = 26 \text{ in}$ ✓

$\tan\varphi = \frac{o}{24} = \frac{10}{24} \Rightarrow \varphi = 22.6°$

$\theta = 180 - (2 \times \varphi) = 180 - 2 \times 22.6 = 135°$

Area of total sector $\equiv$ ◔ $= \frac{135}{360} \times \pi \times r^2 =$

$= 797 \text{ in}^2$

Area ▽ $= \frac{10 \times 48}{2} = 240 \text{ in}^2$

Area void ⌓ $\equiv$ ◔ − ▽ $= 797 - 240 = 557 \text{ in}^2$

CALCULATION SHEET

JACOBS

Project Title: BE4 assessment			Sheet No: 4
Subject: NPB 719			Calc No: 39.1
Job No: J24110GA			File: R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By: [redacted]	Date: 2/05	Checked By:	Date:

Area brick $= \frac{\theta}{360} \times \pi \times (R^2 - r^2)$

$= \frac{135}{360} \times \pi \times ((26+8)^2 - 26^2) = 266 \text{ in}^2$

$= 4.01 \text{ Ft}^2$

BE4-1967 Ring weight $= 4.01 \times 140 = 562 \text{ lb/ft}$

$= 0.25 \text{ ton/Ft}$ ✓ OK.

Concrete Infill

Area of concrete jack arch infill

$= 28'' \times 62'' -$ area of sector $-$ area of ring

$= 1736 - 797.1 - 557'$

$= 382.0 \text{ in}^2 \equiv 2.6 \text{ ft}^2$

Concrete infill weight $= 2.6 \times 150 = 390 \text{ lb/ft}$

$= 0.17 \text{ ton/ft}$

Pedestrian footpath

p.1 Area concrete $= \frac{681}{25.4} \times \left(\frac{62}{2} - \frac{345}{25.4} \times \frac{1}{2} \right) = 649.1 \text{ in}^2$ (345 = parapet width)

$= 4.51 \text{ ft}^2$

Footpath weight $= 4.51 \times 150 = 676.1 \text{ lb/ft}$

$= 0.30 \text{ ton/ft}$

CALCULATION SHEET

JACOBS

Project Title: BE4 assessment		Sheet No:	5
Subject: NPB 719		Calc No:	39.1
Job No: J24110GA		File:	R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

Clear span of girder = 25' 3½" ✓

BE4 -1967 303 a)iii)

Effective span = 25'-3½" + 2 × ($\frac{1}{3}$ × $\frac{1}{4}$ × 28")

= 308.17 in = 25.68 ft ✓

Total dead loads = 0.08 (wroughtiron girder) + 0.555 (parapet) + 0.25/2 (footpath)

+ $\frac{0.17}{2}$ (infill) + 0.30 = 1.14 ton/ft

M dead loads = $\frac{wL^2}{8}$ = $\frac{1.14 \times 25.68^2}{8}$ = 94. ton ft ✓

CALCULATION SHEET

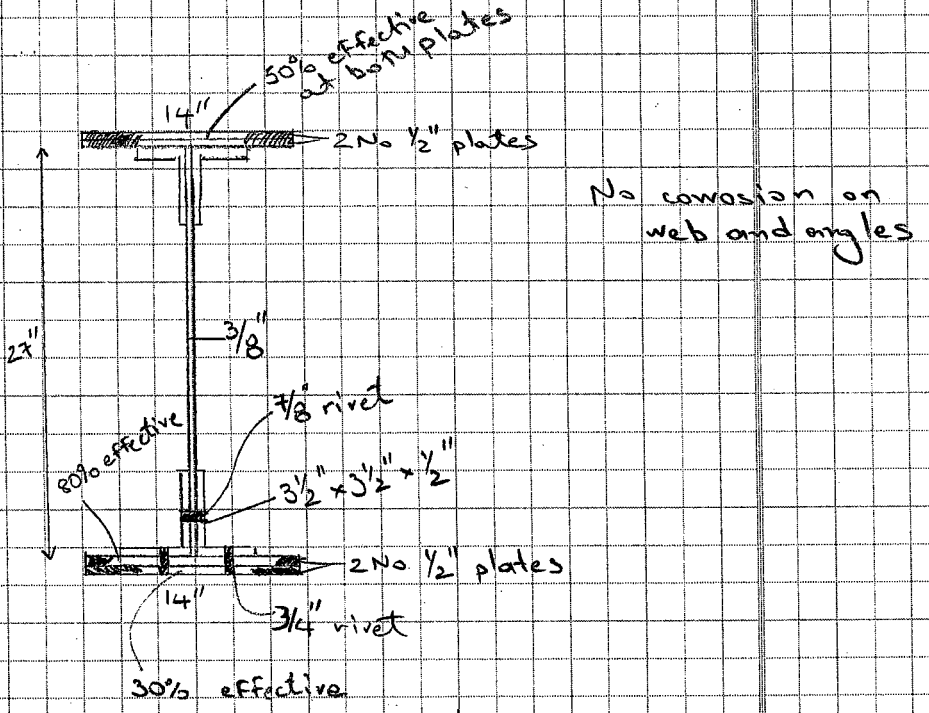
JE JACOBS

Project Title: BE4 assessment		Sheet No:	6
Subject: NPB 719		Calc No:	39.1
Job No: J24110GA		File:	R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By: [redacted]	Date: 2/05	Checked By:	Date:

Section properties

Mid-span

Following the descriptive external girder condition at Jacobs's "assessment and inspection report" - Feb 05



	Area (in²)	y (in)	A·y (in³)
TF	14 × 1 × 50% = 7	28.5	199.5
2× Angles	2 × 3.5 × ½ = 3.5	27.75	97.125
2×	2 × 3 × ½ = 3	26.0	78.0
web	(27 − 7/8) × 3/8 = 9.8	14.5	142.1
2× Angles	2 × (3.0 − 7/8) × ½ = 2.125	3.0	6.375
2×	2 × (3.5 − 3/4) × ½ = 2.75	1.25	3.438
BF	(14 − 6/4) × ½ × 80% = 5.0	0.75	3.75
	(14 − 6/4) × ½ × 30% = 1.875	0.25	0.469

CALCULATION SHEET

JACOBS

Project Title: BE4 assessment		Sheet No:	7
Subject: NPB 719		Calc No:	39.1
Job No: J24110GA		File:	R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

$\sum_{AREA} = 35.05 \text{ in}^2$

$\sum A \times y = 530.76 \text{ in}^3$

$\bar{y} = 530.76 / 35.05 = 15.14 \text{ in}$

$I_{xx} = \sum \frac{bd^3}{12} + A \times (\bar{y} - y)^2$

TF $= \frac{7 \times 1^3}{12} + 7(28.5 - 15.14)^2 = 1250.01$

Angle $= 2 \times \frac{3.5 \times 1/2^3}{12} + 3.5(27.75 - 15.14)^2 = 556.62$

$= 2 \times \frac{1/2 \times 3^3}{12} + 3(26.0 - 15.14)^2 = 356.07$

web $= \frac{3/8 \times (27 - 3/8)^3}{12} + 9.8(14.5 - 15.14)^2 = 561.22$

Angle $= 2 \times \frac{1/2 \times (3 - 3/8)^3}{12} + 2.125(3 - 15.14)^2 = 313.98$

$= 2 \times \frac{(3.5 - 3/4) \times 1/2^3}{12} + 2.75(1.25 - 15.14)^2 = 530.62$

BF $= \frac{(14 - 6/4) \times 80\% \times 1/2^3}{12} + 5.0(0.75 - 15.14)^2 = 1035.46$

$= \frac{(14 - 6/4) \times 30\% \times 1/2^3}{12} + 1.875(0.25 - 15.14)^2 = 415.75$

$I_{xx} = 5019.73 \text{ in}^4$

$= 0.242 \text{ ft}^4$

$Z_{TOP} = \frac{5019.73}{29 - 15.14} = 362.17 \text{ in}^3$ $Z_{BOT} = \frac{5019.73}{15.14} = 331.55 \text{ in}^3$

CALCULATION SHEET

JE JACOBS

Project Title: BE4 assessment		Sheet No:	8
Subject: NPB 719		Calc No:	39.1
Job No: J24110GA		File:	R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By: [redacted]	Date: 2/05.	Checked By:	Date:

p. 5

M dead loads = 94.0 ton ft

Dead load stress, $\sigma_{DL} = \frac{M}{MIN(Z1,Z2)} = \frac{94.0}{331.55} \times 12$

$\sigma_{DL} = 3.4$ ton/in^2 ✓

EDGE GIRDER BENDING CAPACITY AT MID-SPAN

Section properties

Ref p.6

$I_{yy\,TF} = \frac{1 \times 7^3}{12}$ = 28.58

$I_{yy\,ANGLES} = \left[2 \times \frac{1/2 \times 3.5^3}{12} + 3.5\left(\frac{3.5}{2} + \frac{3/8}{2}\right)^2\right] \times 2$ = 33.42

$= \left[2 \times \frac{3 \times 1/2^3}{12} + 3\left(\frac{1/2}{2} + \frac{3/8}{2}\right)^2\right] \times 2$ = 1.27

$I_{yy\,web} = \frac{27 \times (3/8)^3}{12}$ = 0.12

$I_{yy\,BF} = \frac{1/2 \times (14 \times 80\%)^3}{12}$ = 58.54

$= \frac{1/2 \times (14 \times 30\%)^3}{12}$ = 3.09

I_{yy} = 125.02 in^4

CALCULATION SHEET

JACOBS

Project Title: BE4 assessment				Sheet No: 9
Subject: NPB 719				Calc No: 39. 1
Job No: J24110GA				File: R6
Made By: [redacted]	Date: Feb 05	Revised By:		Date:
Checked By:	Date: 2/05	Checked By:		Date:

The edge girder is not considered to be adequately restrained.

Hence BS:153:Part 3B:1978 cl 28b is applicable.

BS:153 cl 21 a)) l = span = 25.68 ft

But the loading from the parapet is applied directly on the compression flange and both the load and the flange are free to move laterally

Hence, an increase up to 20% is applied.

The % is depending on the ratio of the parapet loading to the total load.

p.5 $\therefore \frac{\text{weight of parapet}}{\text{total loads}} = \frac{0.555}{1.14} = 0.487$ or 48.7%

So we will increase the eff. span by

$48.7\% \times 20 = 9.73\%$

Hence, eff length of compression flange for buckling $= L + 9.73\% \times L = 25.68 \times \left(\frac{9.73}{100} + 1\right)$

$= 28.18$ ft.

CALCULATION SHEET

JACOBS

Project Title: BE4 assessment		Sheet No:	10
Subject: NPB 719		Calc No:	39. 1
Job No: J24110GA		File:	R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

$I_{xx} = 5019.73 \text{ in}^4$

$I_{yy} = 125.02 \text{ in}^4$

$\Big\}\ I_{xx} > I_{yy}$

∴ BS 153 : 3B clause 2 8 b applies

$$C_s = \frac{170000}{(l/r_y)^2}\sqrt{1 + \frac{1}{20}\left(\frac{l}{r_y}\frac{T}{D}\right)^2}$$

T = eFF. thickness of comp. Flange = 1 in

t = web thickness = 3/8 in

$\frac{T}{t} = \frac{1}{3/8} = 2.67 > 2.0$ (Do not increase by 20%)

D = overall depth of girder = 29 in

$r_y = \sqrt{\frac{I_{yy}}{A_{gross}}} = \sqrt{\frac{125.02}{35.05}} = 1.889$ in ✓

p.7

$l = 28.18 \text{ ft} = 338.16 \text{ in}$

$$\therefore C_s = \frac{170000}{\left(\frac{338.16}{1.889}\right)^2}\sqrt{1 + \frac{1}{20}\left(\frac{338.16}{1.889} \times \frac{1}{29}\right)^2}$$

$= 9.04 \text{ ton/in}^2$ ✓

Table 8 BS 153 — p_{bc} For steel to BS15 and BS2762 = 3.912 ton/in²

Table 1 — Enhance, by 25%, $p_{bc} = 3.912 \times 1.25 = 4.89 \text{ ton/in}^2$ ✓

CALCULATION SHEET

JE JACOBS

Project Title: BE4 assessment				Sheet No:	11
Subject: NPB 719				Calc No:	39. 1
Job No: J24110GA				File:	R6
Made By: [redacted]		Date: Feb 05	Revised By:		Date:
Checked By: [redacted]		Date: 2/05.	Checked By:		Date:

cl 25 table 3

d_1 = distance between angles = $27 - 2 \times \frac{1}{2} = 26$ in

$t = 3/8$ in

$\frac{d_1}{t} = \frac{26}{3/8} = 69.3 < 75$

hence from table 3 $\rightarrow P_{bc}' = 10$ ton/in^2

Use the lowest value, hence

$P_{bc} = 4.89$ ton/in^2

Converting P_{bc} to wrought iron value

$P_{bc} = \frac{10.35}{16} \times 4.89 = 3.29$ ton/in^2 ✓

Allowable bending moment

In tension:

$M_{TENSION} = \frac{P_{bt} \times I_{xx}}{y} = \frac{8.4 \times 5019.73}{15.14} = 2785.1$ ton.in

$= 232.1$ ton ft

In compression:

$M_{COMPR} = \frac{P_{bc} \times I_{xx}}{29 - 15.14} = \frac{3.29 \times 5019.73}{13.86} = 1189.9$ ton.in

$= 99.2$ ton ft

p. 5 $M_{comp} = 99.2$ ton ft $>$ $M_{dead\ loads}$ (94 ton ft) ✓

OK

By inspection the BM capacity at 1/3 span is adequate for the imposed loading

CALCULATION SHEET

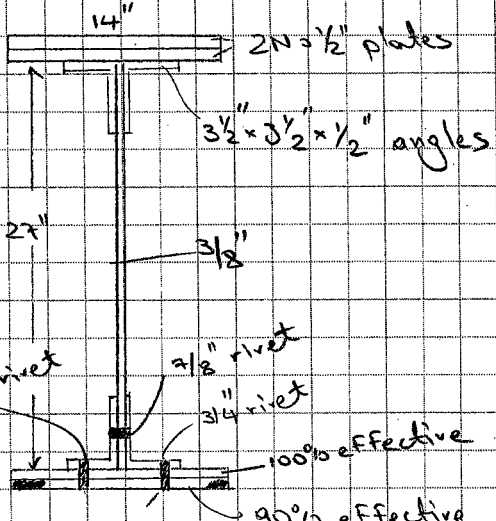
JACOBS

Project Title: BE4 assessment			Sheet No: 1
Subject: NPB 719	Internal girders		Calc No: 39.2
Job No: J24110GA			File: R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

Internal girders

Girders No 3 to 7 are fully loaded with live loading. The girder with the worst corrosion, according to Jacobs's report, is girder No 5. Girder No 5 will be assessed at both mid-span and 1/3 span.

Section properties of girder No 5 - Mid-span



	Area (in²)	y (in)	A × y (in³)
Ref p. 6 calcs 39.1 TF	14 × 1 = 14	28.5	399.0
angles	3.5	27.75	97.125
	3.0	26.0	78.0
web	9.8	14.5	142.1
angles	2.125	3.0	6.375
	2.75	1.25	3.438
BF	(14 − 6¼) × ½ = 6.25	0.75	4.688
	6.25 × 90% = 5.625	0.25	1.406

Σ AREA = 47.05 in²

Σ Ay = 730.132 in³

$\bar{y} = \frac{730.132}{47.05} = 15.56$ in

CALCULATION SHEET

JE JACOBS

Project Title: BE4 assessment			Sheet No: 2
Subject: NPB 719			Calc No: 39. 2
Job No: J24110GA			File: R6
Made By: RT	Date: Feb 05	Revised By:	Date:
Checked By: GRR	Date: 2/05	Checked By:	Date:

$$I_{xx} = \sum \frac{bd^3}{12} + A(\bar{y} - y)^2$$

TF	$= \frac{14 \times 1^3}{12}$	+	$14(28.5 - 15.56)^2$	=	2345.4
Angle	$= 2 \times \frac{3.5 \times 1/2^3}{12}$	+	$3.5(27.75 - 15.56)^2$	=	520.16
	$= 2 \times \frac{1/2 \times 3^3}{12}$	+	$3(26.0 - 15.56)^2$	=	329.23
web	$= \frac{3/8 \times (27 - 1/8)^3}{12}$	+	$9.8(14.5 - 15.56)^2$	=	568.22
Angle	$= 2 \times \frac{1/2 \times (3 - 7/8)^3}{12}$	+	$2.125(3 - 15.56)^2$	=	336.03
	$= 2 \times \frac{(0.5 - 3/4) \times 1/2^3}{12}$	+	$2.25(1.25 - 15.56)^2$	=	563.19
BF	$= \frac{(14 - 6/4) \times 1/2^3}{12}$	+	$6.25(0.75 - 15.56)^2$	=	1370.98
	$= \frac{(14 - 6/4) \times 1/2^3}{12} \times 90\%$	+	$5.625(0.25 - 15.56)^2$	=	1301.43

$I_{xx} = 7334.61 \text{ in}^4$ ✓

$= 0.354 \text{ ft}^4$

$Z_{TOP} = \frac{7334.61}{29 - 15.56} = 545.73 \text{ in}^3$ ✓

$Z_{BOT} = \frac{7334.61}{15.56} = 471.38 \text{ in}^3$ ✓

CALCULATION SHEET

JE JACOBS

Project Title: BE4 assessment			Sheet No: 3
Subject: NPB 719			Calc No: 39. 2
Job No: J24110GA			File: R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By: [redacted]	Date: 2/05	Checked By:	Date:

Dead loading of Girder No 5

Ref p.1 calcs 39.1

Carriageway loading - Assume 100mm tarmac

$$\text{Area} = \frac{715-100}{25.4} \times 62 = 1501.2\ m^2 \equiv 10.42\ Ft^2$$

Fill weight $= 10.42 \times 135 = 1406.7$ lb/Ft

$= 0.63$ ton/Ft

Tarmac

$$\text{Area} = \frac{100}{25.4} \times 62 = 244.1\ m^2 \equiv 1.695\ Ft^2$$

Tarmac weight $= 1.695 \times 144 = 244.1$ lb/ft

$= 0.11$ ton/ft

Total dead loads = wrought iron SW + jack arch + concrete jack arch in fill + Fill material + tarmac

$= 0.08 + 0.25 + 0.16 + 0.63 + 0.11 = 1.23$ ton/ft ✓

$$M \text{ dead loads}_{GS} = \frac{1.23 \times 25.68^2}{8} = 101.4 \text{ ton ft}$$ ✓

$$\text{Dead load stress} = \frac{101.4}{471.38} \times 12 = 2.58\ ton/in^2$$ ✓

Basic permissible stress $= 8.4\ ton/in^2$ ✓

Available stress for LL $= 8.4 - 2.58 = 5.82\ ton/in^2$ ✓

Available Moment for LL $= 5.82 \times 471.38 = 2742.9$ ton in.

$= 228.6$ ton ft ✓

CALCULATION SHEET

JE JACOBS

Project Title: BE4 assessment			Sheet No: 4
Subject: NPB 719			Calc No: 39. 2
Job No: J24110GA			File: R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

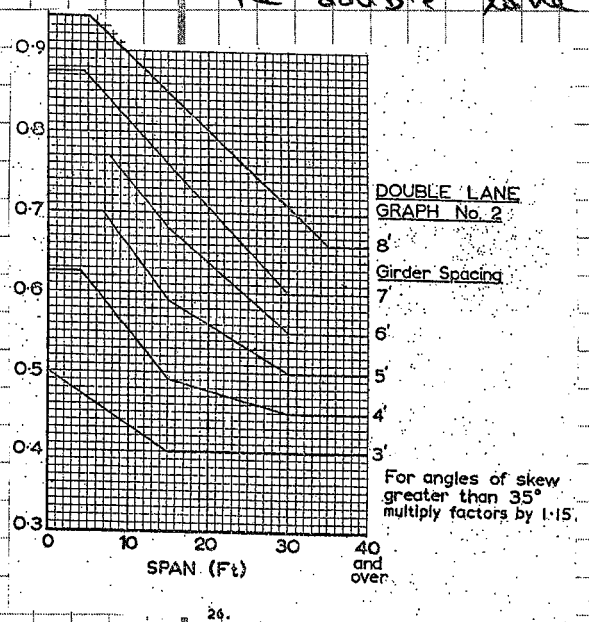
Live loading —

The quick assessment method as indicated in Part II section 3 is applicable according to BE4 - cl 303 (c) For jack arches and zero skew bridge.

Since carriageway width = 8.17 m ≈ 26.8 Ft > 18 ft, the double lane graphs are applicable ✓

Span = ~~26.8~~ 25.6 ft

girder spacing = 62" = 5.16 ft



using graph No 2

K = 0.53 ✓

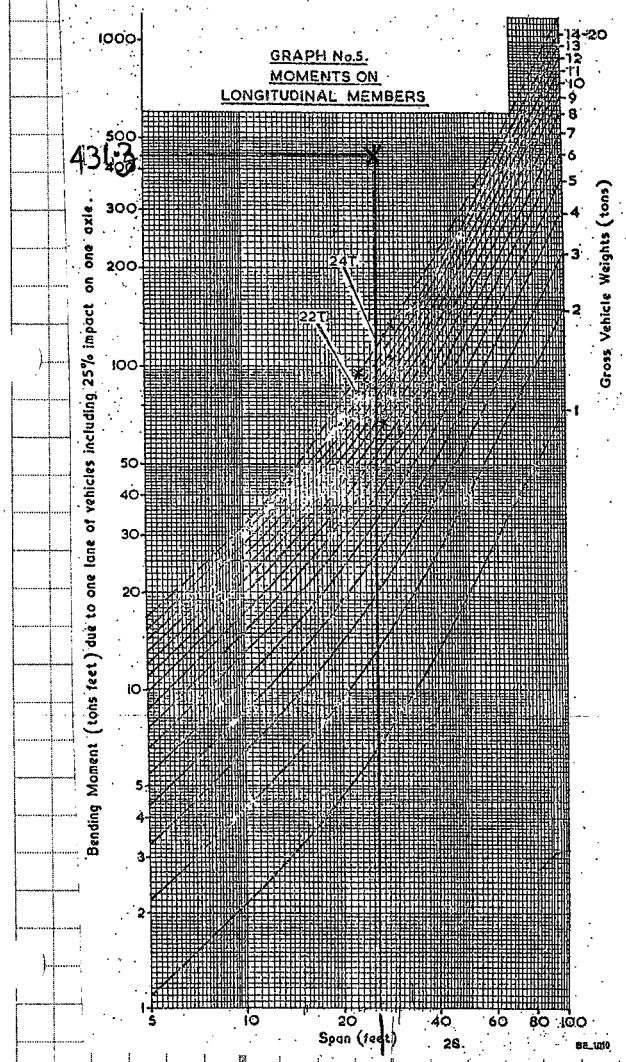
LL Moment = Available moment LL (p.3) / K

= 228.6 / 0.53 = 431.3 tonF ✓

CALCULATION SHEET

JE JACOBS

Project Title: BE4 assessment			Sheet No: 5
Subject: NPB 719			Calc No: 39. 2
Job No: J24110GA			File: R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By: [redacted]	Date: 2/05	Checked By:	Date:



From graph No 5

∴ Gross vehicle weight is 24 tons (full standard) on

26.8 Ft

Girder assessed bbl Resistance = $8.4 \times \frac{471.38}{12} = 330$ tonFt

Full Cond U load effect = 137 tonft × 0.53 = 72.6 tonFt

CALCULATION SHEET

JE JACOBS

Project Title: BE4 assessment			Sheet No: 6
Subject: NPB 719			Calc No: 39. 2
Job No: J24110GA			File: R6
Made By: [redacted]	Date: Feb05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

Internal girder – 1/3 span –

There is plenty capacity (see p.5) From graph 5 For the mid-span bending moments. By inspection, the girder with only 20% extra corrosion on the bottom 1/2" plate can be assessed as adequate For the 24 ton loading. An approximate and conservative approach could be adopted by assuming that the corroded section exists at Mid span instead.

Ref p.1

BF $6.25 \times .70\% = 4.375\ in^2$

$y = 0.25 \rightarrow Ay = 1.094\ in^3$

$\bar{y}$ = remains almost unchanged = 15.56 in

$I_{xx\ OF} = \frac{(14-6\frac{1}{4})\times \frac{1}{2}^3}{12} \times 0.7 + 4.375\,(0.25 \times 15.56)^2 = 1026\ in^4$

$I_{xx\ TOTAL} = 7334.61 + 1026 - 1301.43$ (p.2) $= 7059\ in^4$

$Z_{top} = \frac{7059}{29-15.56} = 525.2\ in^3$

$Z_{bot} = \frac{7059}{15.56} = 453.7\ in^3$

"The difference is less than 5%"

CALCULATION SHEET

JE JACOBS

Project Title: BE4 assessment			Sheet No: 7
Subject: NPB 719			Calc No: 39.2
Job No: J24110GA			File: R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

Dead load stress = $\frac{90.4^{*}}{453.7} \times 12 = 2.39$ ton/in² (permissible stress)

Available moment for LL = $(8.4 - 2.39) \times 453.7$

= 2726.3 ton.in

= 227.2 ton ft

Ref p.4 $K = 0.53 \rightarrow$ LL Moment = $\frac{227.2}{0.53} = 428.7$ ton ft

From graph No.5 ∴ The girder can support full (24 tons) standard traffic loading

* Reaction = $\frac{1.23 \times 25.68}{2} = 15.8$ ton

M at 1/3 span (@ 8.6m) = $15.8 \times 8.6 - \frac{1.23 \times 8.6^2}{2}$

= 90.4 ton ft

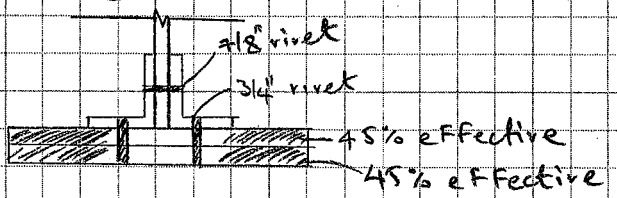
CALCULATION SHEET

JACOBS

Project Title: BE4 assessment			Sheet No: 8
Subject: NPB 719			Calc No: 39.2
Job No: J24110GA			File: R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

1ST internal girder (South)

The 1st internal girder (south side) is reported with 55% corrosion at the bottom flange at the midspan and 1/3 span. Section properties from p.1 remain unchanged except for the BF



	Area (in²)	y (in)	A y (in³)
BF 1ST	6.25 × 45% = 2.8125	0.75	2.11
2nd plate	2.8125	0.25	0.70

Σ AREA = 40.8 in²

Σ A y = 726.85 in³

$\bar{y} = \frac{726.85}{40.8} = 17.8$ in

CALCULATION SHEET

JACOBS

Project Title: BE4 assessment			Sheet No: 9
Subject: NPB 719			Calc No: 39.2
Job No: J24110GA			File: R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

$$I_{xx} = \sum \frac{bd^3}{12} + A(y-\bar{y})^2$$

TF $= \frac{14 \times 1^3}{12} + 14(28.5 - 17.8)^2 = 1604.0$

Angle $= 2 \times \frac{3.5 \times 1/2^3}{12} + 3.5(27.75 - 17.8)^2 = 346.6$

$= 2 \times \frac{1/2 \times 3^3}{12} + 3.0(26 - 17.8)^2 = 203.97$

web $= \frac{3/8 \times (27 - 7/8)^3}{12} + 9.8(14.5 - 17.8)^2 = 663.9$

Angle $= 2 \times \frac{1/2 \times (3 - 9/8)^3}{12} + 2.125(3 - 17.8)^2 = 466.3$

$= 2 \times \frac{(3.5 - 3/4) \times 1/2^3}{12} + 2.75(1.25 - 17.8)^2 = 753.3$

BF $= \frac{(14 - 6/4) \times 45\% \times 1/2^3}{12} + 2.8125(0.75 - 17.8)^2 = 817.7$

$= \frac{(14 - 6/4) \times 1/2^3 \times 45\%}{12} + 2.8125(0.25 - 17.8)^2 = 866.3$

$$I_{xx} = 5722 \text{ in}^4$$

$$Z_{TOP} = \frac{5722}{29 - 17.8} = 510.9 \text{ in}^3$$

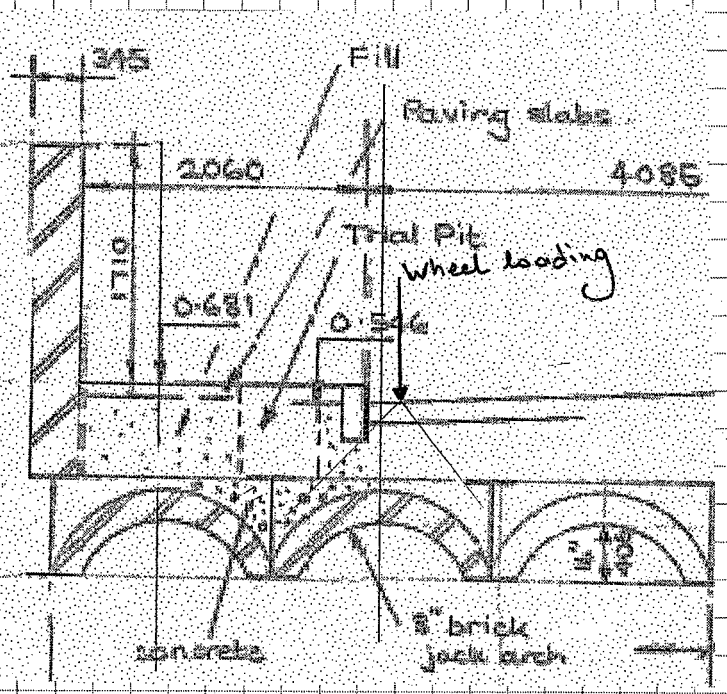
$$Z_{BOT} = \frac{5722}{17.8} = 321.5 \text{ in}^3$$

CALCULATION SHEET

JE JACOBS

Project Title: BE4 assessment			Sheet No: 10
Subject: NPB 719			Calc No: 39.2
Job No: J24110GA			File: R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

Loading effects



The traffic loading is spread equally to both 1st and 2nd internal girders (conservative)

The dead loading on the 1st internal girder is similar to the edge girder

Hence

DL = SW + brickwork + concrete fill + Footpath

= 0.08 + 0.25 + 0.16 + 0.77 = 1.26 ton/ft

P.5 calcs 39.1

calcs 39.1 p.4 $W_{Footpath} = \frac{681}{25.4} \times 62 \times \frac{1}{12^2} \times 150 = 1731.5 \text{ lb/ft} = 0.77 \text{ ton/ft}$

CALCULATION SHEET

JE JACOBS

Project Title: BE4 assessment		Sheet No:	11
Subject: NPB 719		Calc No:	39. 2
Job No: J24110GA		File:	R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

M dead load = $\frac{1.26 \times 25.6^2}{8}$ = 103.9 ton Ft

Dead load stress = $\frac{1039}{321.5} \times 12$ = 3.88 ton/in²

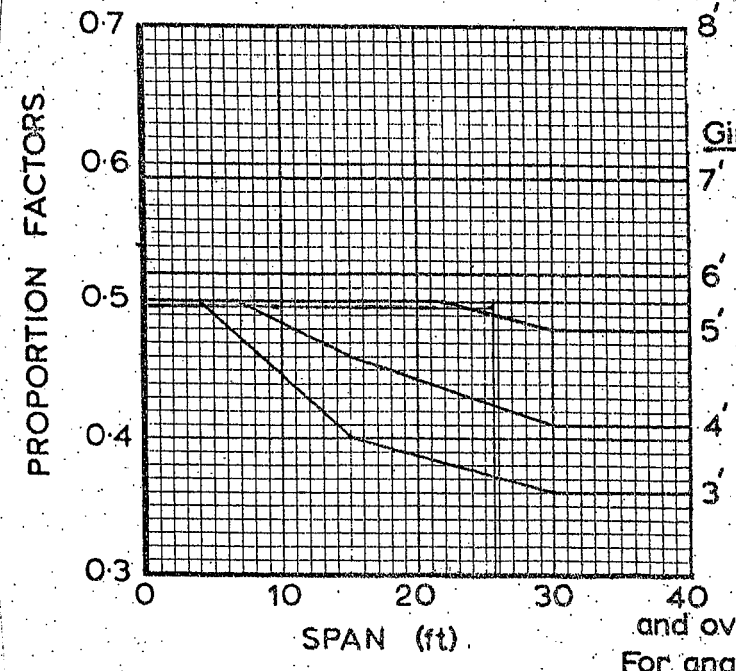
Basic perm. stress = 8.4 ton/in²

Available stress for LL = 8.4 - 3.88 = 4.52 ton/in²

Available moment for LL = 4.52 × 321.5 = 1454 ton in

= 121.2 ton ft

Treat the girder as an external girder since it's only loaded with ~~50%~~ part of the traffic loading.



DOUBLE LANE GRAPH No.4.

Girder spacing.

and over

For angles of skew greater than 35° multiply factors by 1·15

Ref P.4

span = 25.6 Ft

Girder spacing = 7.16 Ft

K = 0.495

∴ LL Moment = $\frac{121.2}{0.495}$

= 244.8 ton f

From graph No 5 Ref p 5

∴ Gross vehicle weight is 24 tons (Full standard)

CALCULATION SHEET

JACOBS

Project Title: BE4 assessment				Sheet No:	1
Subject:	NPB 719	Shear Stress Calculations		Calc No:	39. 3
Job No: J24110GA		Internal Girders		File:	R6
Made By: [redacted]		Date: Feb 05	Revised By:		Date:
Checked By:		Date: 2/05	Checked By:		Date:

From BS 153 : Part 3B : 1958, table 3 (Parts in shear), the average permissible shear stress is $F_q = 6.0 \text{ ton/in}^2$

Enhanced stress $= 6.0 \times 1.25 = 7.5 \text{ ton/in}^2$

Converting F_q to wrought iron value

$\therefore F_q = 7.5 \times \frac{10.75}{16} = 5.04 \text{ ton/in}^2$

cl 29 a Part 3B BS 153

$$P_q = 6\left[1.3 - \frac{b/t}{250\left(1 + \frac{1}{2}\left(\frac{b}{a}\right)^2\right)}\right]$$

$a = 29 - 2 \times \frac{1}{2} = 28 \text{ in} < (270t) = 101.25 \text{ in}$

$b = 28 \text{ in} < (180t) = 67.5 \text{ in}$

hence

$$P_q = 6\left[1.3 - \frac{28/\frac{3}{8}}{250\left(1 + \frac{1}{2} \times 1^2\right)}\right]$$

$= 6.61 \text{ ton/in}^2$

(Conservatively we ignored the effect of the stiffeners on the girders)

$F_q < P_q$, hence use $F_q = 5.04 \text{ ton/in}^2$

CALCULATION SHEET

JE JACOBS

Project Title: BE4 assessment			Sheet No: 2
Subject: NPB 719	Shear Stress Calculations		Calc No: 39. 3
Job No: J24110GA	Internal Girder		File: R6
Made By: [redacted]	Date: Feb 05	Revised By:	Date:
Checked By:	Date: 2/05	Checked By:	Date:

P. 3
Calcs 39.2

Dead load reaction at supports

$= \frac{1.23 \times 25.68}{2} = 15.8$ tons

shear stress on girder web

$q = \frac{R}{A} = \frac{15.8}{t \times b} = \frac{15.8}{\frac{3}{8} \times 27} = 1.56$ ton/in²

Available shear stress For live loading

$= 5.04 - 1.56 = 3.48$ ton/in²

Capacity $= 3.48 \times 10.125 = 35.2$ tons

$A = t \times b = \frac{3}{8} \times 27 = 10.125$ in²

BE4:1967 Part I, 305, a) Table 1

Compare the available live load capacity to the values from table 1

Table 1

Span ft:	Shear Value Tons
15 and below	10
20	11
25 25.68 ft	11.64 11.5
30	tons 12.5
35	14
40	15.5
50	17.5
60	20.5

Live load shear stress capacity inner beams

$= 35.2$ tons > Live load effect = 11.60 tons on

CALCULATION SHEET

JACOBS

Project Title: BE4 assessment				Sheet No:	3
Subject:	NPB 719	Shear Stress Calculations		Calc No:	39. 3
Job No: J24110GA		Parapet girders		File:	R6
Made By:	[redacted]	Date: Feb 05	Revised By:		Date:
Checked By:	[redacted]	Date: 2/05	Checked By:		Date:

The parapet girders by inspection are adequate for the shear stresses induced by the parapet loading, since the dead loading of the parapet girder is less than the DL of the inner girders. Also the 1st internal girders carry only part of the traffic loading and therefore by inspection are adequate to withstand the shear stresses.

It should be noted that no corrosion on the web was recorded.

PRO FORMA FOR EMPIRICAL ASSESSMENT OF BRICK, MASONRY AND CONCRETE JACK ARCHES AND ASSOCIATED TIES
(To be included with the Assessment Report Calculations)

BRIDGE NAME:	Benton Road / Newbury Park Branch
RAILTRACK NO:	NPB 719

Assessment should include completion of all three Sections even where Section 1 has shown the bridge deck to be non-compliant.

SECTION 1 CHECKS FOR COMPLIANCE WITH 24 T CONFIGURATION REQUIREMENTS

	Compliant Yes/No
What is maximum clear span of the arch 1.575 m *Non-compliant if greater than 2.0m*	Yes
Do jack arches spring from bottom flanges of beams? Y *If not, non compliant*	Yes
What is the beam spacing? $b := 1.219\ m$ What is the rise of the arch? $r_c := 0.406\ m$ Gross aspect ratio $\frac{b}{r_c} = 3.002$ *Non-compliant if greater than 10*	Yes
What is the arch barrel thickness (including concrete fill above) and how is it derived ie from record drawings or site investigation? $d := 305\ mm$ Site investigation *Non-compliant if thickness less than 220*	Yes

SHEET No 1
CALC No 39.4
FILE R6
JOB No J2411OGA
MADE BY [redacted]
CHECKED BY

PRO FORMA FOR EMPIRICAL ASSESSMENT OF BRICK, MASONRY AND CONCRETE JACK ARCHES AND ASSOCIATED TIES
(To be included with the Assessment Report Calculations)

BRIDGE NAME:	Benton Road / Newbury Park Branch
RAILTRACK NO:	NPB 719

Assessment should include completion of all three Sections even where Section 1 has shown the bridge deck to be non-compliant.

SECTION 2 CHECKS FOR DEFICIENCY

Type No	Deficiency	Pass/ Fail
1	What is the backing material? Is it structural? concrete (~~friable~~) ✓	Yes
	Does the structural backing extend to at least the crown level of the arch extrados? *If not, then fail (1) (4)* ✓	Yes
	Height of structural fill above crown $d_f := 715$ mm	
	What is effective shear depth of deck? (= arch rise + barrel thickness + depth of structural fill above crown of extrados) $D_s := r_c + d + d_f$ $D_s = 1.426 \cdot 10^3$ mm ✓	Pass
	Is $D_s \geq$ "minimum requirements of Fig 1 " Fail if < Fig 1	

$\alpha = 450\,mm < D_s$ OK

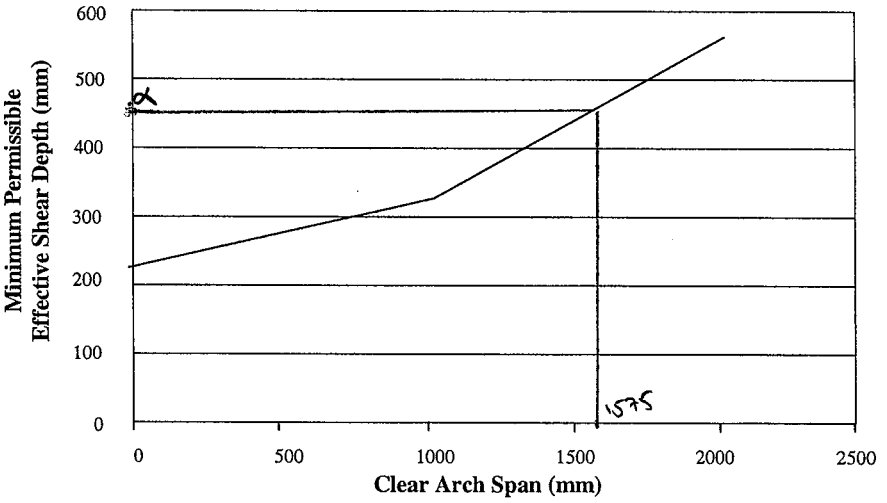


Figure 1

SHEET No 2
CALC No 39.4
FILE R6
JOB No J24110GA
MADE BY [redacted]
CHECKED BY

2	Do jack arches span longitudinally (eg in half through girder construction) or transversely between longitudinal girders? -Transversely- ✓ For longitudinal spanning jack arches, ignore following questions on ties/lateral restraint and state N/A. Are ties provided in edge bays of transversely spanning jack arches? No ✓ *If yes, go to 3a/3b* *If not, fail unless edge bay is 'hard' (see 5)*	Fail ✓
3a CI	What is the cross sectional area of one tie? (allowing for corrosion losses) Diameter of tie $Dia := \blacksquare\ mm$ Therefore Area $A := \pi \frac{(Dia)^2}{4}$ $A = \blacksquare\ mm^2$ What is number of ties per beam length? $n := 2$ What is the clear skew span? $L := \blacksquare\ m$ Specific area of tie $A_s := \frac{(n+1)\cdot A}{L}$ $A_s = \blacksquare\ \frac{mm^2}{m}$ *Non-compliant if less than 260mm²/m* What is maximum tie spacing? $S := \blacksquare\ m$ *Non-compliant if greater than 2.5m for cast iron*	
3b WI/ST	What is the cross sectional area of one tie? (allowing for corrosion losses) Diamensions of the tie $dt1 := \blacksquare\ mm$ $dt2 := \blacksquare\ mm$ Therefore Area $A := dt1 \cdot dt2$ $A = \blacksquare\ mm^2$ What is number of ties per beam length? $n := 4$ What is the clear skew span? $L := 8.04\ m$ Specific area of tie $A_s := \frac{(n+1)\cdot A}{L}$ $A_s = \blacksquare\ \frac{mm^2}{m}$ *Non-compliant if less than 260mm²/m* What is maximum tie spacing? $S := \blacksquare\ m$ *Non-compliant if greater than 3.0m for wrought iron/steel*	
4	Are ties located within crown of external arch? *If so, then fail CI or possible fail for WI/steel*	
5	Does external bay construction provide alternative lateral restraint? (ie not soft edge)? *If so, pass.If not, are ties provided in first Jack Arch bay? if yes,treat as 3a (or 3b). otherwise fail.*	No ✓

Notes: (1) Results also in loss of D/d (composite action) for cast iron beams
(4) A trial hole should be undertaken to confirm the existence of structural backing if there is any doubt.

SHEET No 3
CALC No 39.4
FILE R6
JOB No J2411OGA
MADE BY [redacted]
CHECKED BY [redacted]

PRO FORMA FOR EMPIRICAL ASSESSMENT OF BRICK, MASONRY AND CONCRETE JACK ARCHES AND ASSOCIATED TIES
(To be included with the Assessment Report Calculations)

BRIDGE NAME:	Benton Road / Newbury Park Branch
RAILTRACK NO:	NPB 719

Assessment should include completion of all three Sections even where Section 1 has shown the bridge deck to be non-compliant.

SECTION 3 CHECKS FOR DEFICIENCY

Type No	Defect	Empirical Assessment		Pass/ Fail
		CI Decks	WI/Steel Decks	
6	Rotation of supporting beam	Fail	Fail	No indication
7	Horizontal displacement of supporting beam Dispaced brickwork indicating dispacement of the edge girders due to missing ties	Fail	Fail	Fail
8	Inadequate support to springings eg corrosion of bottom flange of supporting beam over a significant length, missing bedding mortar	Possible Fail	Possible Fail	Possible Fail
9	Transversely bowed bottom flange of supporting beam	Fail	Fail	No indication
10	Cracking at crown of arch owing to spreading of springings (other than 12, 13)	Fail	Fail	No indication
11	Distortion and any associated cracking of jack arch barrel	Fail	Fail	No indication
12	Arch crack resulting in substructure crack	Fail	Fail (5)	No indication
13	Substructure crack or other distress resulting in crack to jack arch	Possible Fail (3)	Possible Fail (3) (5)	No indication

Notes: (3) 'Substructure renovation' or 'Monitoring' as appropriate; 'Repair of arch' (if appropriate)
(5) Not applicable in general to longitudinally spanning arches.

SHEET No 4
CALC No
FILE
JOB No
MADE BY
CHECKED BY [redacted]