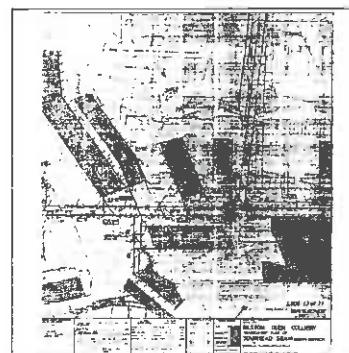
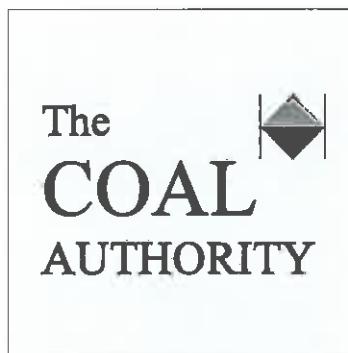


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DRAFT



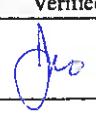
International Mining Consultants Limited



Report
on
Bilston Glen Colliery
Rising Minewater

for

The Coal Authority

Prepared By	Checked By	Verified By	Status	Date	Issue No
	K.R.W.			09.7.98	1

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RISING MINEWATER - BILSTON GLEN COLLIERY

1.0 SCOPE OF THE WORK

This study was undertaken on behalf of The Coal Authority following discussion with Scottish Environmental Pollution Agency. The brief was as follows:-

- a) prepare a short overview of the potential for rising minewater to reach the surface in this area of the coalfield.
- b) undertake a review of the treatment of the shafts in order to assess the potential for useful monitoring of rising minewater.

2.0 THE SITE

The area studied (see figure 1) comprises the take of Bilston Glen colliery at Loanhead to the south-west of Dalkeith, situated in the Midlothian Coalfield south-east of Edinburgh which closed in 1989. The study area lies within the low lying ground formed by the North and South Esk valleys with topography generally below 150m. To the south and east the ground rises to 250m whilst 4.5 km to the west of Bilston Glen lies Allemuir Hill rising to 500m.

3.0 GEOLOGY AND HYDROGEOLOGY

3.1 Structure

This part of the Midlothian Coalfield (see figures 2 and 3) comprises a north-eastward trending syncline with very steep dips ($50 - 70^\circ$) on the western limb and considerably flatter (less than 20°) to the east. The area is separated from workings to the north from Monktonhall, Gilmerton, Dalkeith and Woolmet collieries by the Sherrifhall fault, which downthrows to the north some 200m.

3.2 Superficial Deposits

Superficial deposits comprise principally boulder clay with river terraces of sand and gravel and alluvial deposits.

3.3 Solid Geology

The principal stratigraphic units comprise from the base of the coalfield up; Limestone Coal Group, Upper Limestone Group, Passage Grit and Productive Coal Measures (see figure 4). Below the base of the Limestone Coal Group is the Lower Limestone Group which comprises mudstones and thin limestones which may locally reach 20m in thickness.

The Limestone Coal Group comprises cyclic Coal Measure type sequences becoming increasingly arenaceous towards the top. The Upper Limestone Group comprises sandstones with thin limestones and occasional thick mudstone beds whilst the overlying Passage Grit is made up of sandstones, grits and pebble beds becoming increasingly argillaceous upward. The Productive Coal Measures comprise intercalated sandstones, mudstones and coals. Hence, the workable coals of the Limestone Coal Group and the Productive Coal Measures are separated by approximately 500m of barren measures.

3.4 Hydrogeology

The Lower Limestone Group, Limestone Coal Group and Productive Coal Measures are not considered to comprise significant aquifers although limited interflows may occur locally. The Upper Limestone Group and Millstone Grit are potentially significant aquifers although again argillaceous horizons serve to restrict flows vertically. The nature of jointing and cementation of strata is not known.

The rivers North and South Esk flow through the area in a north-east and northerly direction respectively, predominantly within narrow alluvial gorges. Considerable fluvial deposits are present and it is likely that significant interflows between the rivers and underlying strata may occur subject to head gradients.

4.0 MINING TO THE SOUTH AND WEST OF DALKEITH

Prior to nationalisation of the mining industry in 1947 mining in this area was divided into three parts. Ramsay, Burghlee and Roslin collieries worked the Limestone Coal Group in the western limb of the syncline and Arniston, Lingerwood and Easthouses collieries working these seams to the east. Polton and Whitehill worked the upper Productive Coal Measures seams in the centre of the syncline. Following nationalisation the eastern collieries began to exploit deeper coal towards the centre of the syncline from the east whilst Bilston Glen was sunk to exploit the Limestone Coal Group seams to the west with the older collieries closing. Whitehill and Polton collieries only worked the upper seams until closure.

4.1 Inter colliery connections

Refer to figure 2. The Roslin, Burghlee and Ramsay collieries may be taken as a single unit although connections between them are generally at shallow depths in the nineteenth century workings. Due to proximity of workings from Burghlee and Bilston Glen, especially in the Great and Stairhead seams where a 37m barrier exists, flows in the order of 100gpm through the relatively high permeability coal barriers may have been expected when Bilston Glen was operating and pumping.

The collieries in the core of the syncline are believed to be connected to a drainage level surfacing at Elginhaugh, discharge number S140052.

To the east the crop workings are more laterally extensive as the dip is shallower on this side of the syncline. Numerous interconnected shallow workings exist with a large number of

shafts which are connected by in-seam drainage levels to two Day Levels. Bryans Day Level at 10200 ft AMD reaching the surface at Ochre Burn, Newbattle, and Newmills/Junkies Day Level at approximately 10150 ft AMD which surfaces at the known discharge at Old Fordell, number S140070.

Connections below the drainage levels occur at Easthouses Pumping Pit, connecting the Parrot seam workings at the base of the shaft which are in turn connected to Lingerwood workings, with the Great seam workings from Easthouses at 9960 ft AMD. Lingerwood and Lady Victoria are interconnected at many levels and worked as one unit.

Easthouses Colliery Great seam workings are connected to the Newbattle Docks in Lady Victoria Colliery Splint seam leading to the north Parrot district by two steep drifts. Dams at levels of 8300 ft AMD and 8570 ft AMD are shown on the Easthouses Great seam abandonment plan (C/A ref. No. S675) which notes that they were constructed to withstand heads of 400 and 500 ft respectively.

In-seam connections between Bilston Glen Colliery and Easthouses Great seam workings were constructed at 8350 ft AMD and 8514 ft AMD presumably for water drainage purposes, the lowest point of the syncline being within Easthouses workings. There is no record of these connections being dammed.

No other connections have been located within Bilston Glen workings. However parts of the take including areas of Easthouses and Lady Victoria workings are located beneath Polton or Whitehill workings and vertical migration of minewater may be taking place through strata breaks. The quantity is likely to be very small considering the vertical distances involved.

South of Lingerwood is Arniston Colliery. No connections have been located between these collieries although shallow connections may exist in old workings close to the crop. To the south, workings in the Parrot seam are connected to workings from Vogrie and the known discharge at Gorebridge (number S140071) is likely to include Arniston water. A number of mine entries are known to exist approximately 30m lower down the valley side than this, such as the Arniston day levels, but are not known to discharge into Gore Water.

4.2 Outfalls

Known outfalls exist in the area at Old Fordell (S140070), Elginhaugh (S140052) and Vogrie (S140071). These discharges have been sampled by IMC (see appendix 3).

Following closure of Bilston Glen and as minewater level recovers, flow through the coal barriers from Burghlee Colliery workings would decrease. Depending on the relative inflows into Roslin, Burghlee and Ramsay workings with Bilston Glen the head difference between the two ponds would remain approximately constant with discharge to surface expected first from the old collieries. However, due to restricted catchment at outcrop and the low relief it is possible that surface discharge may not occur. Any outfall to surface would be expected at the lowest mine entrance, probably being one of the Burghlee shafts or adits located in Bilston Burn now under Bilston Glen tip.

Polton Colliery workings are known to discharge into the River North Esk at Elginhaugh via drainage levels.

On the eastern limb of the syncline old shallow workings water may be assumed to drain via the in-seam drainage levels and Day Levels to discharge at Ochre Burn and Old Fordell. A discharge at the former has not been identified, being culverted for much of its length, but an ochreous discharge is visible at the latter site, see appendix 2.

It can be assumed that the waters of Bilston Glen, Easthouses, Lady Victoria and Lingerwood will combine at some point, either when the dams at the Newbattle Dooks fail or at 9960 ft at Easthouses pumping shaft. Quantities pumped at the various collieries are reported to be (from abandonment plans) 500 gpm at Easthouses, 350 gpm from Lingerwood/Lady Victoria and 1115 gpm from Bilston Glen at closure. This quantity will reduce as the head difference reduces but is likely to remain a significant flow. As this pond continues to rise it will combine with the shallow workings water at 10150 and 10200 ft AMD with likely discharge to Ochre Burn and Old Fordell as above.

Arniston water can be assumed to be currently discharging at Vogrie.

4.2.1 Comments on Results of Analyses

Four samples were received from Elginhaugh, Old Fordell and Vogrie. All four are on the acidic side of neutral, contain high concentrations of hardness salts and sulphur compounds and low concentrations of sodium and chloride.

The two samples from Old Fordell are almost identical. The water has a similar composition to that from Vogrie with calcium and magnesium sulphates being 55-60% of total salts. The Vogrie water has a lower total concentration of dissolved solids (720mg/l) than that from Junkies Level (900mg/l). In both cases the total iron concentration is less than 10mg/l and should be easily settled out after minimal aeration. It is most likely that these waters originate in shallow workings.

The sample from Elginhaugh has a much higher concentration of dissolved solids (2000mg/l) of which calcium and magnesium sulphates comprise 80%. The sulphate concentration is sufficiently high to be aggressive to concrete. The iron concentration is high. The proportion in solution at the sampling point is not known. The alkalinity should be sufficient for the iron to be removed by aeration, but this would need to be confirmed by experiment. It would probably involve more than one stage to reduce the concentration to a value acceptable in an effluent.

5.0 MONITORING LOCATIONS

Research into the condition of shafts for monitoring purposes was undertaken at Mining Reports at Bretby. Whilst a considerable number of shafts were registered the information regarding these shafts is somewhat scarce. Examination of British Coal archives has revealed considerably more information and suggests that any known disused shafts were infilled

during the late 1970's / early 1980's. These in particular include Ramsay, Burghlee, Polton, Arniston, Lady Victoria/Lingerwood amongst many others. Exceptions to this general rule are air shafts connected to the day levels which were preferentially capped. Mining Reports does report that the Bilston Glen shafts were capped at 6m and 16m over 6m reinforced concrete plugs, the quantity of steel precluding the option of drilling the plugs out. It is very unlikely that any shafts will prove useful for monitoring purposes.

Because the collieries are split into four separate entities it is recommended that separate monitoring locations are required for each group.

- 1) The time scale since closure of the western side collieries would suggest that surface discharge should be occurring. An inspection of the North Esk and Bilston Burn has not revealed any ochreous discharges and suggests that this is not currently the case. It is reported that the major Burghlee adits and shafts are filled and although a number of registered mine entries have not been reportedly treated these are located beneath Bilston Glen Tip. The Ramsay shafts and Roslin adits are also reportedly filled and therefore any monitoring of these waters would be by borehole access if deemed necessary.
- 2) It is likely that Polton workings are already discharging to surface at Elginhaugh. Discharge is occurring over a length of 20m of riverbank, not a single point source. A number of shafts are reportedly open and capped in the Eskbank area with access to the drainage adit, according to BCC archives. Monitoring by v-notch weir of the major discharge is recommended.
- 3) The waters of Bilston Glen, Easthouses, Lady Victoria and Lingerwood should represent a single body if levels have reached the connections reported above. A number of shafts with potential for monitoring purposes exist in the Kippilaw area but they all intersect the drainage levels at 10150 - 10200 ft AMD that connect with the day levels. Any monitoring would probably only indicate a constant level, that of the drainage adits. Exceptions to this are Easthouses Pumping Pit and a further relatively deep shaft to the Parrot seam registered on open land nearby. Surveying of these shafts has revealed that the former is situated in gardens of residential properties whilst the latter is on open ground and has been pegged (see drawing 3425-05). Further existing monitoring locations are limited with Lady Victoria and Lingerwood shafts known to be filled and Bilston Glen shafts capped at 6m and 16m over 6m reinforced concrete plugs. Should monitoring of the above mentioned shaft prove not to be feasible monitoring of water levels will require several boreholes to access the two systems. Sites for boreholes have not been investigated.

The potential outfall from the Bilston Glen system at Old Fordell should be monitored by v-notch weir to assess variations in flow and chemistry, and correlation with rainfall events. Ochreous discharge has not been located at the second site at Ochre Burn but regular visits are recommended to confirm this.

- 4) It is likely that Arniston workings are already discharging to surface at Vogrie. If required, monitoring could take the form of a v-notch weir but considerable building

work would be required. It is not recommended that flows are monitoring at this location at this time.

6.0 CONCLUSIONS

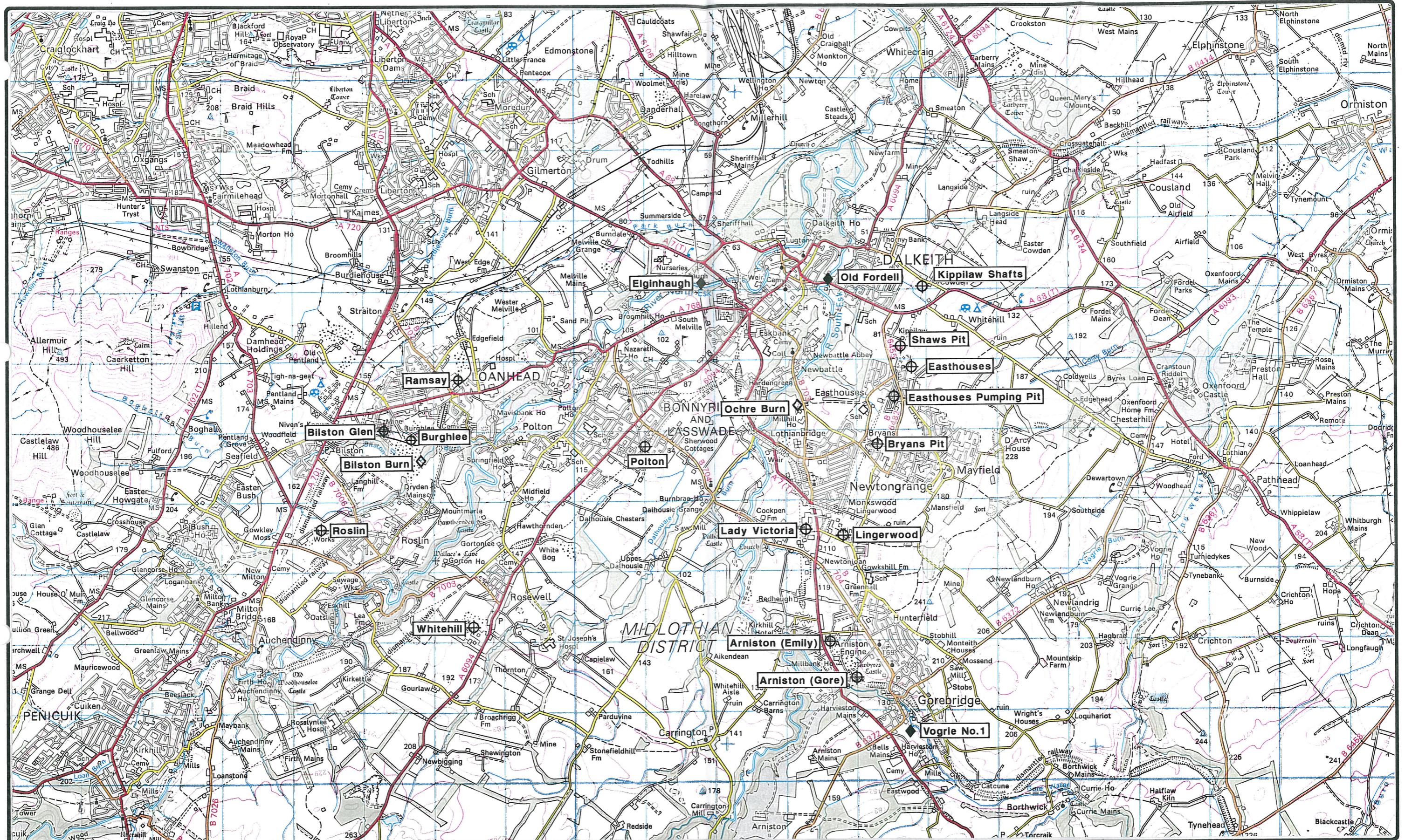
- The Bilston Glen area comprises four discrete minewater systems.
- Polton colliery water is known to be currently discharging to surface at Elginhaugh.
- Burghlee, Ramsay and Roslin waters are likely to discharge into Bilston Burn beneath Bilston Glen tip from old Burghlee mine entrances or into the North Esk from Ramsay. No ochreous discharges have been reported to or have been located by IMC.
- Ochreous water is currently discharging from Junkies Day Level into the South Esk at Old Fordell. No ochreous discharge has been reported to or has been located by IMC at Ochre Burn.
- Arniston Colliery minewater is discharging at Vogrie.
- The combined minewaters of Bilston Glen, Easthouses, Lady Victoria and Lingerwood are likely to discharge into Ochre Burn or the South Esk from the Day Levels.
 - Monitoring may be possible from a shaft at Easthouses.

7.0 RECOMMENDATIONS

Natural Monitoring

1. Discharges at Elginhaugh and Old Fordell should be monitored. The possible future discharges at Bilston Burn and Ochre Burn should be regularly inspected.
6 monthly
2. All discharge monitoring to take the form of v-notch weirs and measurement troughs, with the agreement of SEPA. *Old Fordell, not Elginhaugh - practical reasons too diverse*
3. Daily rainfall data on a monthly basis should be acquired for the area. *- to begin -*
4. A micro-gravity survey of the shaft at Easthouses be undertaken to locate and ascertain whether it is capped or filled. *Prise.*
5. Boreholes should be drilled into the takes of Easthouses and Lady Victoria/Lingerwood.

LOCATION PLAN



PROJECT

BILSTON GLEN - RISING MINEWATER

TITLE

LOCATION PLAN

ENGINEER JD



TRACED BY JG

CHECKED BY


DATE JUNE 1998

APPROVED BY

DRG. No. 3425-01

PLAN OF WORKINGS IN THE GREAT AND PARROT SEAMS

DRAFT

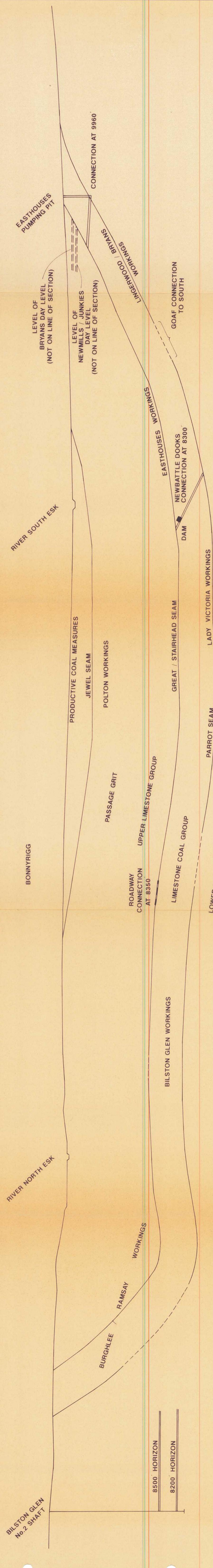


EAST WEST SECTION FROM BILSTON GLEN TO EASTHOUSES

DRAFT

EAST - WEST SECTION FROM BILSTON GLEN TO EASTHOUSES

Scale 1:10,000



GENERALISED SECTION

WESTPHALIAN

NAMURIAN

DINANTIAN

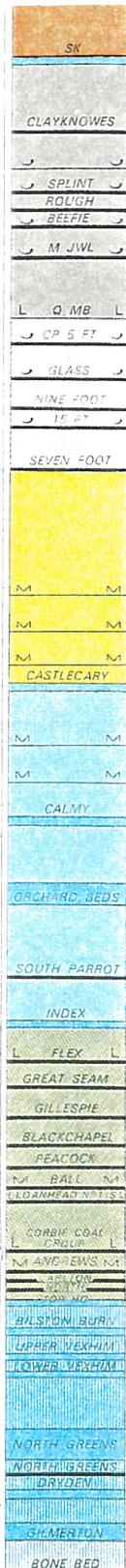
**PRODUCTIVE COAL
MEASURES (385m)**

PASSAGE GRIT (200m)

**UPPER LIMESTONE
GROUP (315m)**

**LIMESTONE COAL
GROUP (265m)**

**LOWER LIMESTONE
GROUP (230m)**



JEWEL

GREAT

PARROT

PROJECT

BILSTON GLEN RISING MINEWATER

TITLE

GENERALISED SECTION

Scale 1 : 7000

ENGINEER

JD

TRACED BY

KJB

CHECKED BY

DATE June 1998

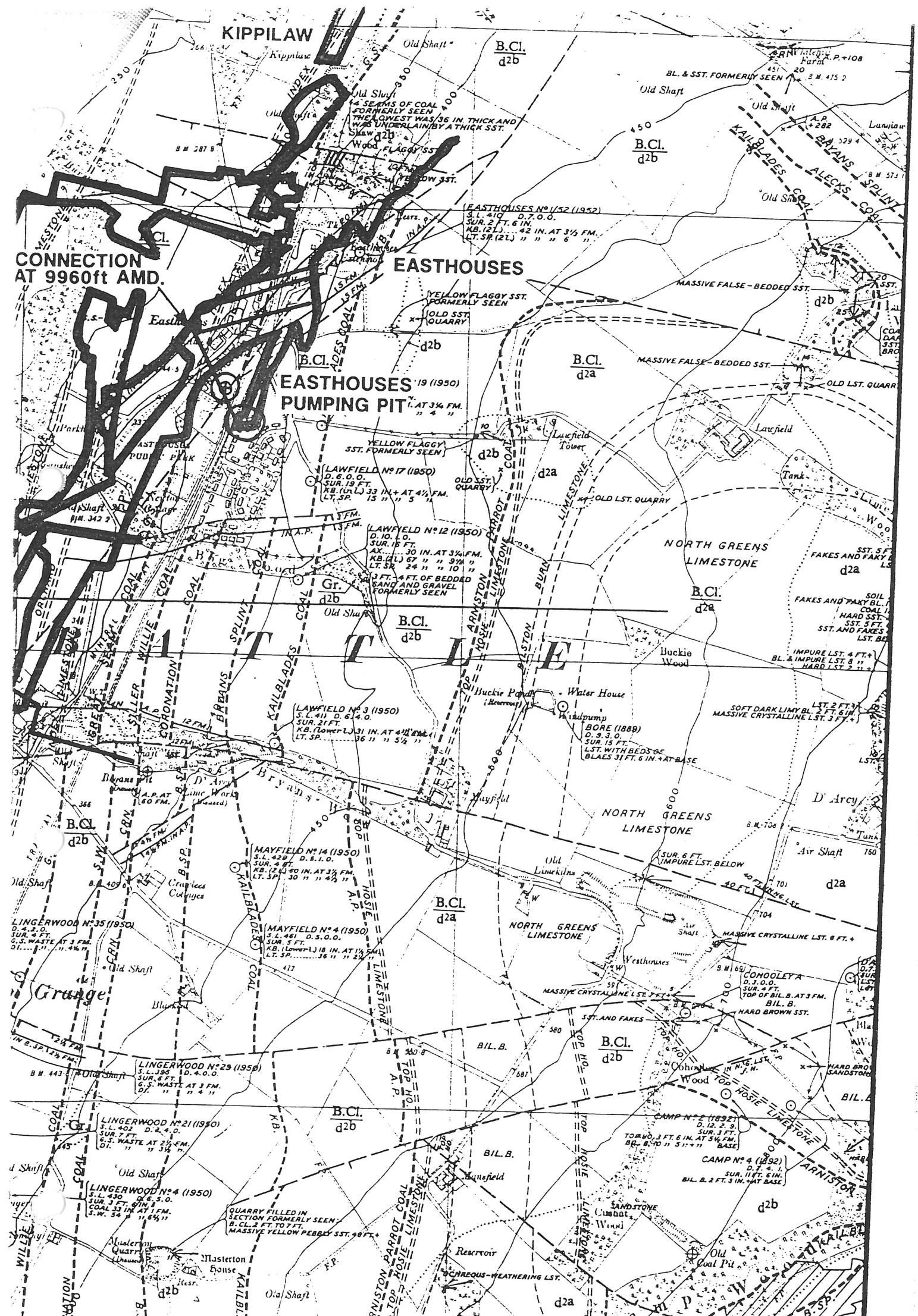
APPROVED BY

DRG. No. 3425-4



SURFACE PLAN OF EASTHOUSES PUMPING PIT

DRAFT



APPENDIX 1

C/A Cat No.	Colliery	Seam
S427	Arniston	Coronation Great Kaleblades Little Splint Parrot Siller Willie Splint Wee
S4312	Arniston	Day Levels
4936	Vogrie	Kaleblades Parrot Splint
S491	Lady Victoria	Splint
S779	Lady Victoria	South Parrot
S517	Lady Victoria	Coronation
S692	Lady Victoria	South
S733	Lady Victoria	Smithy
S734	Lady Victoria	Kaleblades
S580	Lingerwood	Great
S583	Bilston Glen	Craigie
S672	Bilston Glen	Peacock
S4791	Bilston Glen	Shafts
S904	Bilston Glen	Great
S905	Bilston Glen	Stairhead
S906	Bilston Glen	Craigie
S907	Bilston Glen	South
S908	Bilston Glen	Parrot

S3820	Easthouses	Great
S675	Easthouses	Great
S3817	Burghlee	South Parrot Splint
S3952	Burghlee	Great
S536	Burghlee	Stairhead
S3488	Bryans Shaws Easthouses	Coronation Fireclay Great Little Splint Parrot Smithy Splint
S2908	Bryans Day Level Bryans Newbattle Area Carsons Penmans	Parrot
S3149	Bryans	Arniston Parrot Siller Willie

APPENDIX 2



Easthouses Pit Yard.



Easthouses Tip.

Ochre Burn.
Upstream Culvert.



Ochre Burn.
Downstream Culvert.



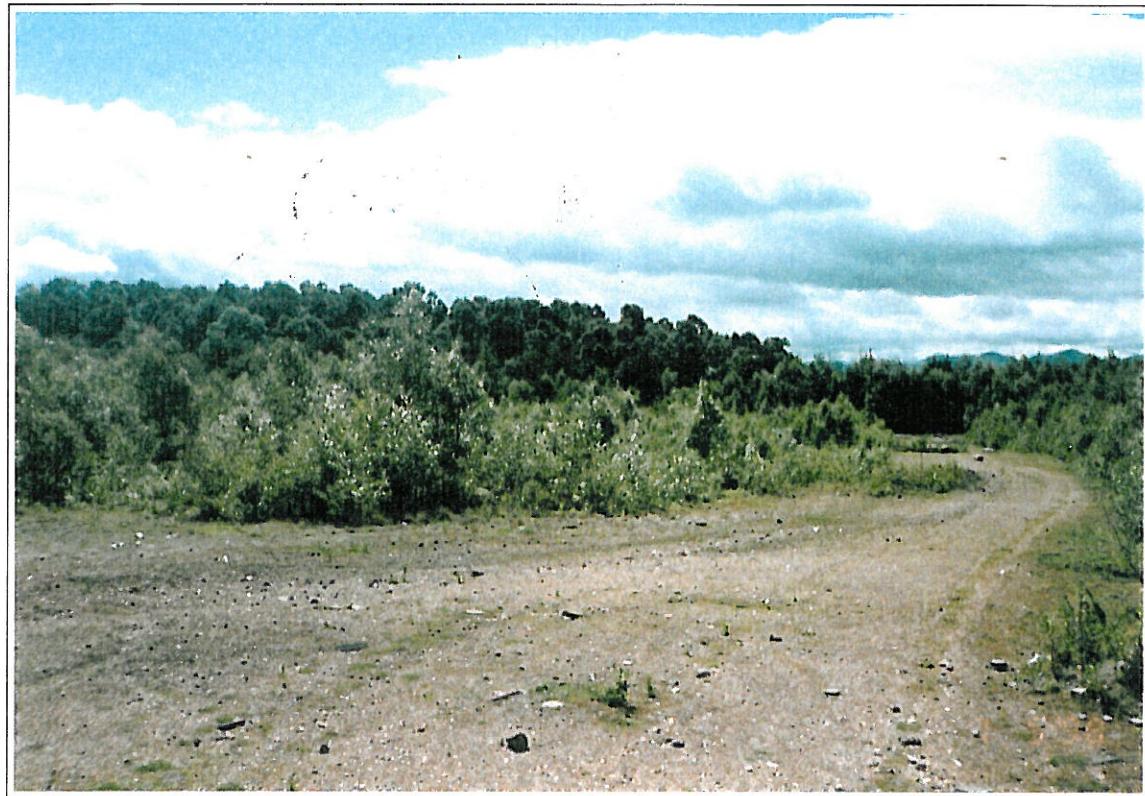
Elginhangh Adit.



Elginhangh Adit.



Elginhangh Discharge
into River North Esk.



Arniston (Emily).



Arniston (Gore).



Polton
Colliery Site.



Ramsay
Colliery Site.



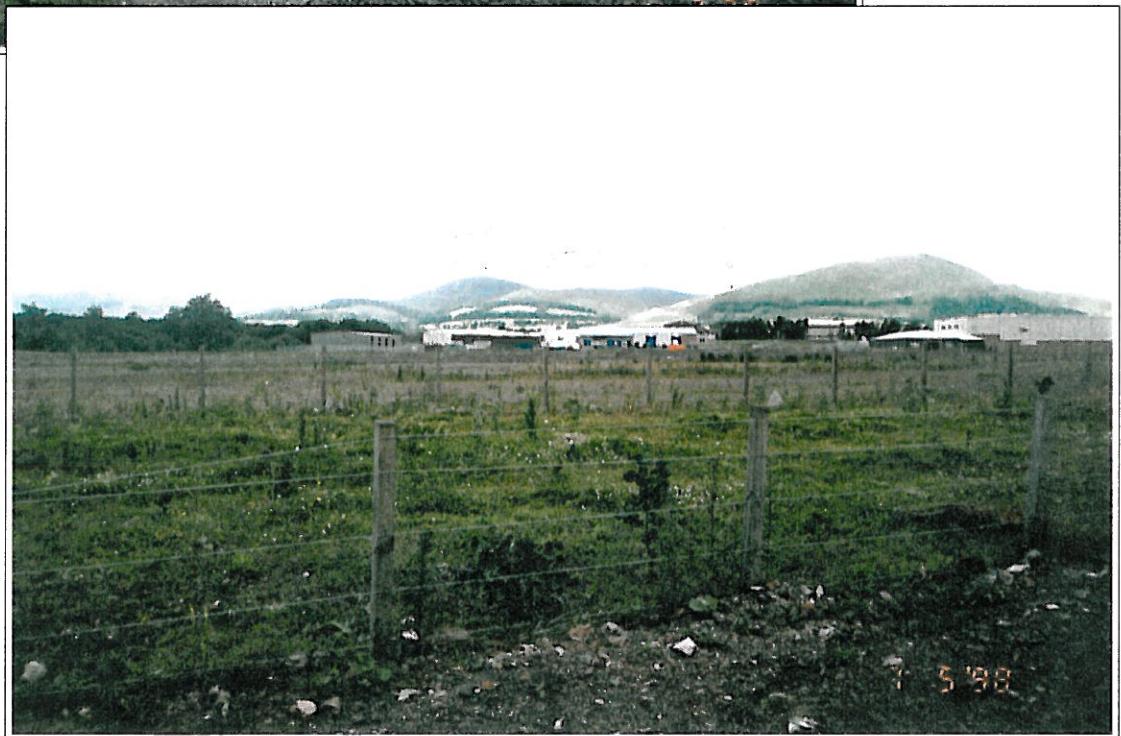
Ramsay Pit
Yard.

Roslin -
Possible Drift
Entrance.



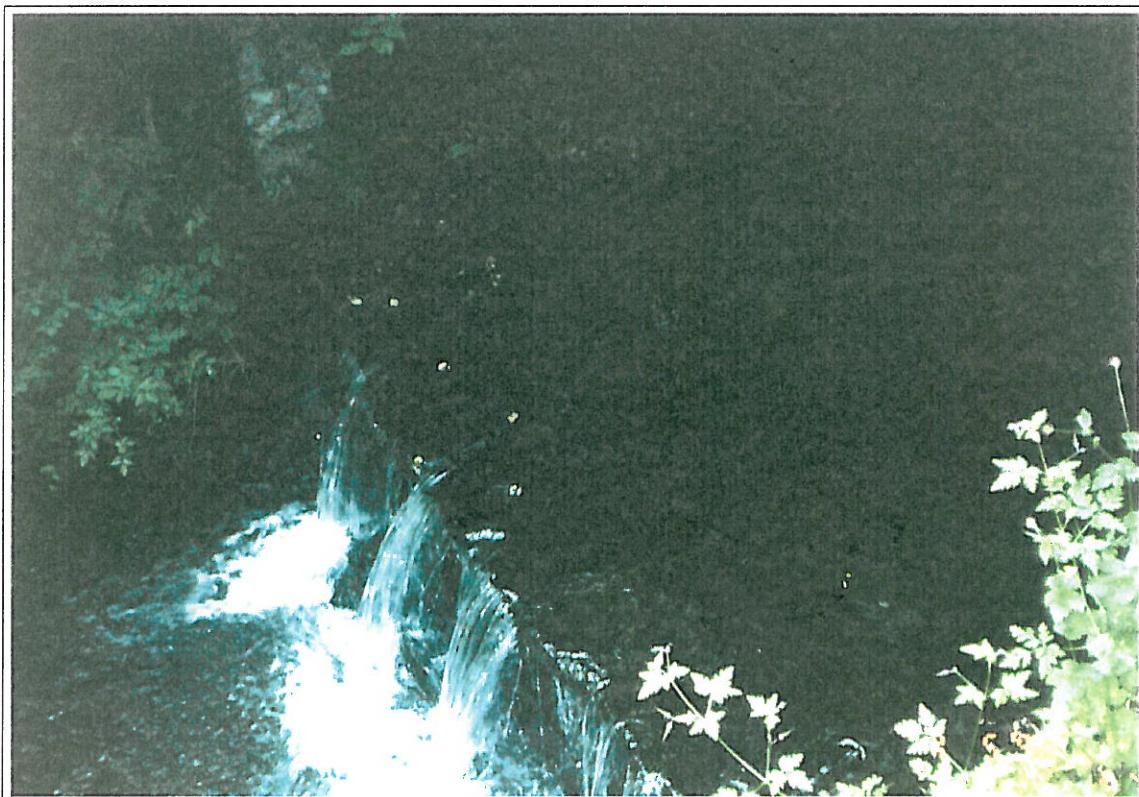
Burghlee.

Bilston Glen
Colliery Site.





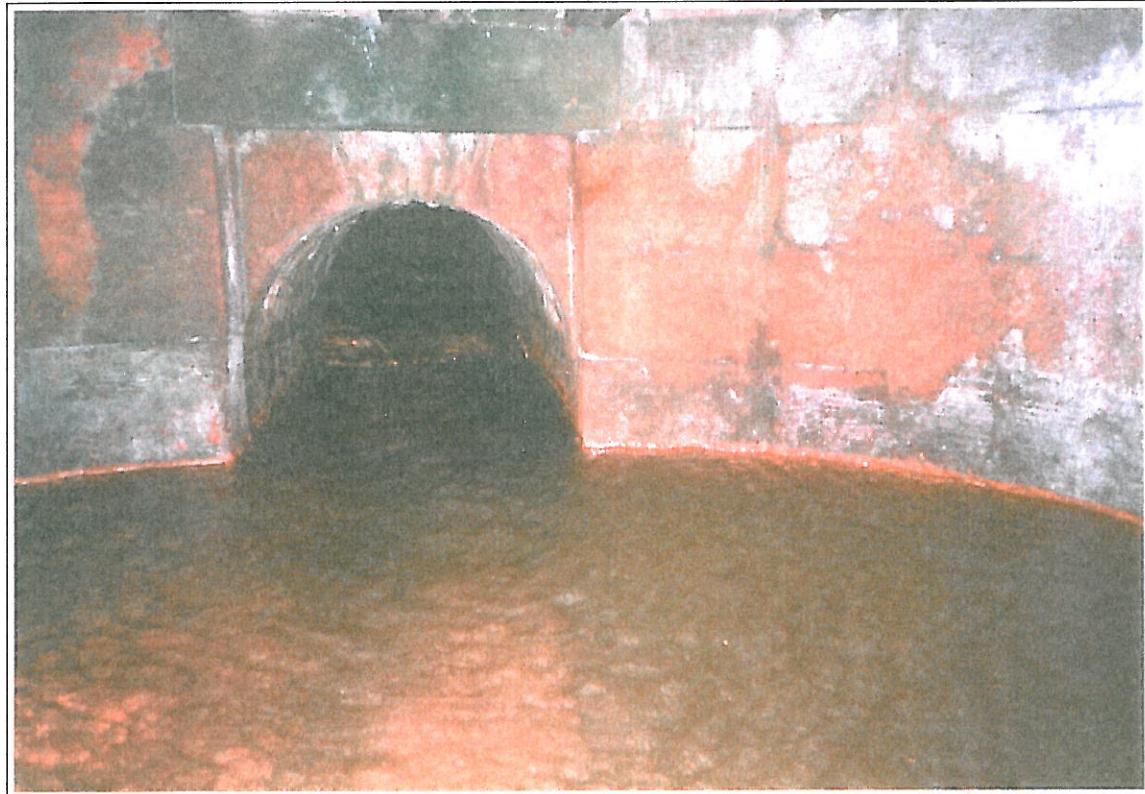
Bilston Burn.



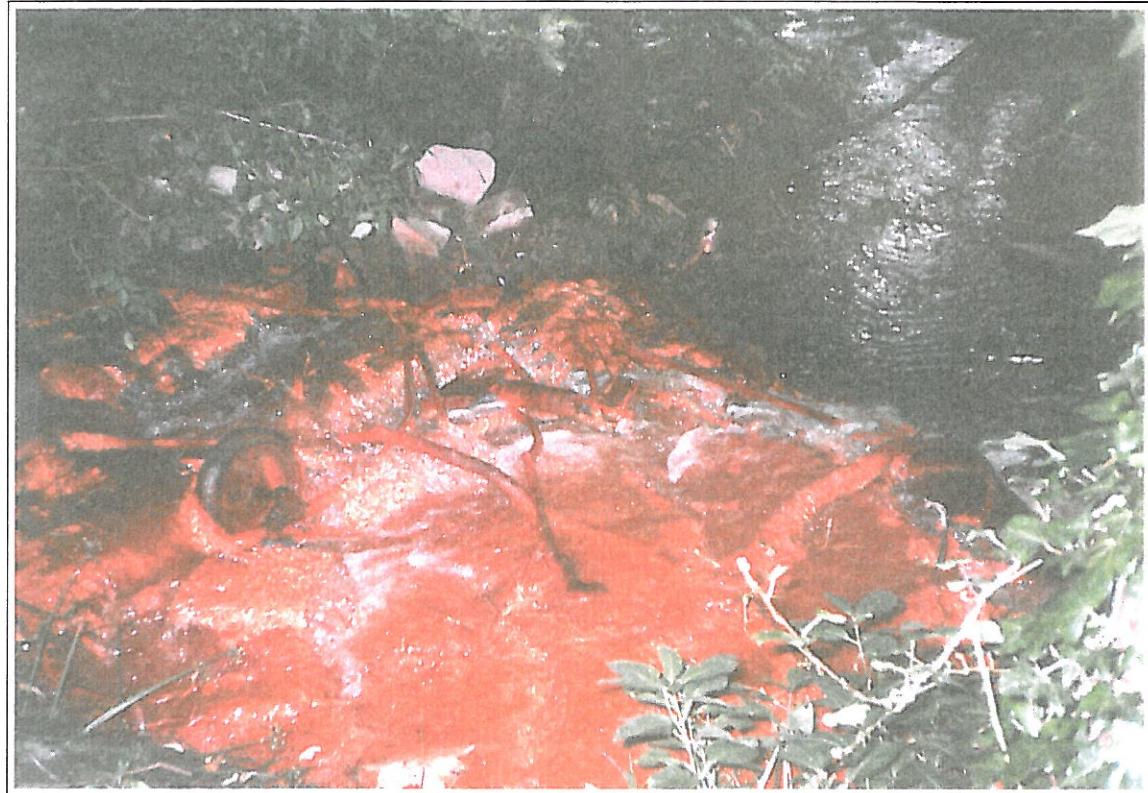
Bilston Burn.



Ferruginous Discharge to River Esk at Junkies Day Level
Situated Downstream of Newmills Bridge, Dalkeith.



Junkies Day Level - Chamber Behind Outlet
Where Water Discharges to River Esk.



Junkies Day Level - Ferruginous Deposits Prior to Water Entering River Esk.



Junkies Day Level - Ferruginous Water Downstream of Junkies Day Level.



Ferruginous Water Issue in Field at Birkenside.
Gorebridge from Vogrie Shaft Water Discharges into Gore Water.



Ferruginous Water Issue in Field at Birkenside Discharging into Gore Water.
Discharge is Above Culvert.

APPENDIX 3

TES

Bretby

TEST REPORT

WATER SAMPLE ANALYSIS



TES Report No. W/EXR/982883

Site: S140052 ELGINHAUGH

IMCL
 PO Box 18
 Common Road
 Huthwaite
 Sutton-in-Ashfield
 NG17 2NS

The Sample described in this report was scheduled for analysis by TES Bretby on Wednesday, 15 July 1998. The analysis was completed by Friday, 17 July 1998.

Tests marked as 'not UKAS accredited' and any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by TES Bretby laboratories.

The following tables are contained in this report:

Table 1 Sample Descriptions
 Table 2 Main Analysis Results

On behalf of
 TES Bretby : A.J. Smith
 P Thompson Project Co-ordinator

Date of Issue: 27/07/98

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.
 TES Bretby accepts no responsibility for the sampling related to the above results.

TES Bretby, P.O. Box 100, Burton-on-Trent, DE15 0XD Telephone: 01283 554400 Fax: 01283 554422
 TES Bretby is a division of Environmental Services Group Limited Registered in England Number 2880501

TES Bretby
Report Number
W/EXR/982883
Control Page
Sheet 1/1

TES

Bretby

TEST REPORT

WATER SAMPLE ANALYSIS



IMCL
PO Box 18
Common Road
Huthwaite
Sutton-in-Ashfield
NG17 2NS

TES Report No. W/EXR/982883

Client: IMCL
Site: S140052 ELGINHAUGH

Page No	ID No. W/EX/		Sample Date
1	9815347	Discharge	04/07/98

Date of Issue: 27/07/98
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Report Number
W/EXR/982883
Table 1
Sheet 1 / 1

TES

Bretby

TEST REPORT

WATER SAMPLE ANALYSIS



IMCL
PO Box 18
Common Road
Huthwaite
Sutton-in-Ashfield
NG17 2NS

TES Report No. W/EXR/982883

Client: IMCL
Site: S140052 ELGINHAUGH

Sample Reference		Discharge
Sample Date		04/07/98
TES Bretby ID Number	W/EX/..	9815347
UKAS accredited		
pH units	WSLM3	6.5
Conductivity uS/cm @ 25C	WSLM2	1580
Suspended Solids	WSLM10	21
Total Alkalinity as CaCO3	WSLM12	196
Total Acidity as CaCO3	WSLM17	0
Total Hardness as CaCO3	WSLM15	1360
Chloride as Cl	WSLM1	30
Total Sulphur as SO4 (Total)	ICPPWW13	1280
Calcium as Ca (Total)	ICPPWW13	251
Magnesium as Mg (Total)	ICPPWW13	177
Sodium as Na (Total)	ICPPWW13	19.0
Potassium as K (Total)	ICPPWW13	9.46
Iron as Fe (Total)	ICPPWW13	57.6
Aluminium as Al (Total)	ICPPWW13	0.10
Ammoniacal Nitrogen as N	ANOMA40	0.4

Results expressed as mg/l unless stated, for the sample as received

Date of Issue: 27/07/98

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 in the UKAS Accreditation Schedule for our laboratory.
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Report Number
W/EXR/982883
Table
2
Sheet
1 / 1

TES

Bretby

TEST REPORT

WATER SAMPLE ANALYSIS



TES Report No. W/EXR/983040

Site: S140 VOGRIE

IMCL
PO Box 18
Common Road
Huthwaite
Sutton-in-Ashfield
NG17 2NS

The Sample described in this report was scheduled for analysis by TES Bretby on Friday, 17 July 1998. The analysis was completed by Friday, 24 July 1998.

Tests marked as 'not UKAS accredited' and any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by TES Bretby laboratories.

The following tables are contained in this report:

Table 1 Sample Descriptions
Table 2 Main Analysis Results

On behalf of
TES Bretby : A. M. Smith
P Thompson Project Co-ordinator

Date of Issue: 27/07/98

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.
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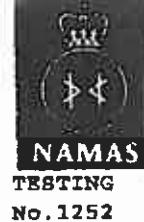
TES Bretby
Report Number
W/EXR/983040
Control Page
Sheet 1/1

TES

Bretby

TEST REPORT

WATER SAMPLE ANALYSIS



IMCL
PO Box 18
Common Road
Huthwaite
Sutton-in-Ashfield
NG17 2NS

TES Report No. W/EXR/983040

Client: IMCL
Site: S140 VOGRIE

Page No.	ID No. W/EX/		Sample Date
1	9815561	Discharge above culvert	15/07/98

Date of Issue: 27/07/98
 Tests marked 'not UKAS accredited' in this report are not included
 in the UKAS Accreditation Schedule for our laboratory.
 TES Bretby accepts no responsibility for the sampling related to the above results.

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Report Number
W/EXR/983040
Table 1
Sheet 1/1

TES

Bretby

TEST REPORT

WATER SAMPLE ANALYSIS



IMCL
PO Box 18
Common Road
Huthwaite
Sutton-in-Ashfield
NG17 2NS

TES Report No. W/EXR/983040

Client: IMCL
Site: S140 VOGRIE

Sample Reference	Sample 01
Sample Date	15/07/98
TES Bretby ID Number	9815561
W/EX/..	
UKAS accredited	Test No. 9815561
pH units	WSLM3 6.4
Conductivity $\mu\text{S}/\text{cm} @ 25^\circ\text{C}$	WSLM2 880
Suspended Solids	WSLM10 11
Total Alkalinity as CaCO_3	WSLM12 168
Total Acidity as CaCO_3	WSLM17 0
Total Hardness as CaCO_3	WSLM15 473
Chloride as Cl	WSLM1 38
Total Sulphur as SO_4 (Total)	ICPPWW13 290
Calcium as Ca (Total)	ICPPWW13 98.2
Magnesium as Mg (Total)	ICPPWW13 55.1
Sodium as Na (Total)	ICPPWW13 26.6
Potassium as K (Total)	ICPPWW13 4.19
Iron as Fe (Total)	ICPPWW13 6.17
Aluminium as Al (Total)	ICPPWW13 0.13
Ammoniacal Nitrogen as N	ANMKA40 0.3

Results expressed as mg/l unless stated, for the sample as received
 Sample 01: Discharge above culvert

Date of Issue: 27/07/98

Tests marked 'not UKAS accredited' in this report are not included
 in the UKAS Accreditation Schedule for our laboratory.
 TES Bretby accepts no responsibility for the sampling related to the above results

TES Bretby, P.O. Box 100, Burton-on-Trent, DE15 0XD Telephone: 01283 554400 Fax: 01283 554422
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TES

Bretby

TEST REPORT

WATER SAMPLE ANALYSIS



TES Report No. W/EXR/982921

Site: S140 JUNKIES LEVEL

IMCL
PO Box 18
Common Road
Huthwaite
Sutton-in-Ashfield
NG17 2NS

The 2 Samples described in this report were scheduled for analysis by TES Bretby on Friday, 17 July 1998. The analysis was completed by Friday, 24 July 1998.

Tests marked as 'not UKAS accredited' and any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by TES Bretby laboratories.

The following tables are contained in this report:

Table 1 Sample Descriptions
Table 2 Main Analysis Results

On behalf of
TES Bretby : A.J. Smith
P Thompson Project Co-ordinator

Date of Issue: 27/07/98

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Bretby

TEST REPORT

WATER SAMPLE ANALYSIS



IMCL
 PO Box 18
 Common Road
 Huthwaite
 Sutton-in-Ashfield
 NG17 2NS

TES Report No. W/EXR/982921

Client: IMCL
Site: S140 JUNKIES LEVEL

Page No.	ID No. W/EX/		Sample Date
1	9815559	Sample 1 Old Fordell	15/07/98
1	9815560	Sample 2 Old Fordell	15/07/98

Date of Issue: 27/07/98

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Bretby

TEST REPORT

WATER SAMPLE ANALYSIS



IMCL
PO Box 18
Common Road
Huthwaite
Sutton-in-Ashfield
NG17 2NS

TES Report No. W/EXR/982921

Client: IMCL
Site: S140 JUNKIES LEVEL

Sample reference Sample Date TES Bretby ID Number	W/EX/..	Sample 01 15/07/98 9815559	Sample 02 15/07/98 9815560		
UKAS accredited		Test No.	9815559	9815560	
pH units	WSLM3	6.8	6.8		
Conductivity $\mu\text{S}/\text{cm} @ 25^\circ\text{C}$	WSLM2	1030	1030		
Suspended Solids	WSLM10	22	18		
Total Alkalinity as CaCO_3	WSLM12	237	247		
Total Acidity as CaCO_3	WSLM17	0	0		
Total Hardness as CaCO_3	WSLM15	606	599		
Chloride as Cl	WSLM1	34	34		
Total Sulphur as SO_4 (Total)	ICPPWW13	340	341		
Calcium as Ca (Total)	ICPPWW13	151	148		
Magnesium as Mg (Total)	ICPPWW13	55.7	55.5		
Sodium as Na (Total)	ICPPWW13	23.9	16.2		
Potassium as K (Total)	ICPPWW13	5.10	4.65		
Iron as Fe (Total)	ICPPWW13	6.99	7.72		
Aluminium as Al (Total)	ICPPWW13	0.10	0.05		
Ammoniacal Nitrogen as N	AMMKA40	0.2	0.2		

Results expressed as mg/l unless stated, for the sample as received

Sample 01: Sample 1 Old Fordell

Sample 02: Sample 2 Old Fordell

Date of Issue: 27/07/98

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Report Number
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