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Item 10

CAPITAL PROGRAMME 12/13 – BUDGET MONITORING REPORT (Quarter 1)

EXECUTIVE MEMBER: Councillor Gillian Troughton

LEAD OFFICER: Darienne Law, Head of Corporate Resources

REPORT AUTHOR: Leanne Barwise, Senior Accounting Officer

WHY HAS THIS REPORT COME TO THE EXECUTIVE?

To inform Executive of progress on delivering the projects in the agreed 2012/13 capital programme and outline changes to the programme to be recommended to Council in September.

To provide the summary budget position for the capital programme 2012/13 at 30th June 2012 and provide a forecast outturn position at year end.

RECOMMENDATIONS:

I. Note the quarter 1 position on spend and on receipts as set out in this report.

II. Recommend a revised capital programme for 2012/13 for consideration by Council, which
   a. includes the Gillfoot shaft work,
   b. removes the land management contingency,
   c. as no business case exists, as the Council does not have a property where a suitably sized installation can be provided economically nor will the feed in tariff that the Council will be eligible for generate enough income to offset the cost of the installation, therefore omit the investment in photo voltaic system, see paragraph 4.4 and
   d. recognises the changes to the programme timings for the Millom Cemetery expansion investigative work and the works at Rottington beck .

III. Recommends the funding for Gillfoot shaft works as outlined in section 5 of this report.

IV. Agrees the PID for Gillfoot shaft, as detailed in section 5 of this report and at Appendix B, subject to Council's approval to include in the capital programme for 2012/13

V. Approves the capital spend of £30,000 on Kells to be funded from the capital receipt generated as per paragraph 6.3

1.0 INTRODUCTION

1.1. This report provides the monitoring of the capital programme both in terms of capital expenditure and capital income, ensuring that anticipated expenditure is in line with budget;

and that the whole capital programme is fully funded, either by financing the project externally or through use of our own resources from capital receipts.

1.2. This report aims to provide Executive with an update at quarter 1 and of any anticipated variation to either income or expenditure i.e. the potential for under spend, the risk of not achieving the expected capital receipts in year, or the need for the inclusion of other projects which require capital funds.

1.3. The monitoring of the capital programme is undertaken monthly and reported to the Executive quarterly. This report also provides the monitoring position at the end of the first quarter of 2012/13 (April-June) and provides a forecast of expenditure to year-end. The report provides narrative in relation to exceptions only.

2.0 REVISIONS TO THE CAPITAL PROGRAMME 2012/13

2.1 The Capital programme for 2012/13 and the gross Capital Programme budget of £1,543,649 was approved by Council on 23rd February 2012.

2.2 An addition to the Capital programme of £80,000 (which is fully externally funded) in relation to the Moor Row Play Area was approved at Executive on 27th March 2012 bringing the revised gross Capital Programme budget to £1,623,649.

2.3 This was further amended due to carry forwards of £303,707 from 2011/12 budget to complete projects and was detailed in the Capital Outturn Report presented to Full Council 14th June 2012, bringing the amended budget to date to £1,927,356.

3.0 EXPENDITURE TO DATE AND FORECAST YEAR END POSITION

3.1 The gross capital programme budget for 2012/13 is £1,927,356 with external income of £310,000 for the provision of Disabled Facilities Grants and £80,000 for Moor Row Play Area giving a total external income budget of £390,000 in the year and a net capital programme cost of £1,537,356.

3.2 The forecast position at 30th June 2012 for financial year 2012/13 is gross capital expenditure of £1,637,589. This results in a forecast expenditure variance against budget of £289,767 as detailed in Table 1 over the page.

Table 1: Spend & external income receipt to date and forecast for year as at Quarter 1 2012/13

	Gross budget	Spend/ Income to date (period 3)	Forecast period 4-12	Total gross forecast	Variance
2012/13 Expenditure	1,927,356	220,047	1,417,542	1,637,589	-289,767
2012/13 External Income	-390,000	-274,500	-126,500	-401,000	-11,000
TOTAL	1,537,356	-54,453	1,291,042	1,236,589	-300,767

3.3 The forecast for external income as at 30th June 2012 is £401,000 compared to a budget of £390,000. This is due to additional monies received from Department of Communities & Local Government (DCLG) which is ring-fenced solely for awarding Disabled Facilities Grants (DFG's). This additional income will reduce the need to call upon our own reserves by £11,000 in support of the Housing capital programme.

3.4 The overall net position on the capital programme as quarter 1 shows a variance of £300,767 being, £289,767 underspend on the programme and £11,000 over achievement of income.

4.0 PROGRESS AND MATERIAL VARIANCES AT QUARTER 1 – 30th June 2012

4.1 North Country Leisure Energy Efficiencies – A Project Initiation Document (PID) has not been agreed by the Executive and we are awaiting an update from the project manager on the future plans for this project but it is assumed that the forecast outturn spend will be to budget at £39,500.

4.2 Copeland Reception – A Project Initiation Document (PID) has not been agreed by the Executive and we are awaiting an update from the project manager on the future plans for this project but it has been assumed the forecast outturn spend will be on budget at £150,000.

4.3 Millom Cemetery – Searches for suitable land have so far been unsuccessful, the Property Department have recently expanded their search area to cover another possible 30 options without success. This work will continue, but it is unlikely that we will find a suitable site in quarter two therefore there will be some slippage on this project. Some of the costs which were to be covered by this capital project relate to the testing of land to ensure the site would meet DEFRA standards and other set up arrangements, but until a suitable site is found, none of this work will commence and it is highly unlikely that the total budget of £149,216 will be utilised in this year. The forecast includes an estimated 50% spend by year end.

4.4 Photo Voltaic System – After completion of a feasibility study in May it was concluded that there was no business case for the £32,800 project as the Council does not have a property

where a suitably sized installation can be provided economically nor will the feed in tariff that the Council will be eligible for generate enough income to offset the cost of the installation. These capital monies are therefore available to be re-allocated.

4.5 Land Management – This was a £50,000 contingency agreed within the public buildings budget for the purpose of addressing any land management costs identified throughout the year and to date there has been nil spend.

4.6 Rottington Beck – The majority of this funding is required to be carried forward into the next financial year.

4.7 Table 2 below summarises the anticipated under spend position:

Table 2: Projected underspends/carry forwards as at Quarter 1 2012/13

Project Description	Projected underspend/carry forward (where stated)
Millom Cemetery anticipated cfwd	£74,500
Land Management Contingency	£50,000
Photo Voltaic System	£32,800
Other Projects – Minor variances	£ 9,701
Anticipated cfwd Rottington Beck	£23,477
Anticipated cfwd Housing DFG's	£99,289
TOTAL	**£289,767**

HOUSING SERVICES

4.8 Housing Services this year have a total budget of £638,289. Of this, £138,289 was carried forward from 2011/12 to fund commitments made in that year, leaving £500,000 available to commit in the current year. The current estimate for full in year commitments stands at £442,468, which together with the £138,289 brought forward, gives an estimated total commitment of £580,757. Members are asked to note that these figures are subject to change as it is impossible to predict with certainty either the number or value of referrals that may be received before the financial year end.

4.9 Of the estimated total forecast commitment of £580,757 and based on an extrapolation of the first 3 months spend, forecast spend in year is approximately £539,000.

4.10 Members are asked to note that DFGs are not an annual programme. They are a responsive statutory duty that rolls over year on year to qualifying people who are referred from Occupational Therapy at any time as and when their need arises. This results in the majority of spend occurring at end of each individual project so spend subsequently follows the date the commitment was granted. This will necessitate the £99,697 (identified in the table at 4.7 overleaf) to be carried forward into 13/14 to complete projects.

4.11 The details of spend and commitment is illustrated in table 3 over page, with the commitments continuing to be reviewed by Housing and Finance staff on a monthly basis:

Table 3: Housing budget and spend as at Quarter 1 2012/13

Housing Budget & Spend 2012/13	£	£
EXPENDITURE BUDGET		
Budget brought forward from 2011/12	138,289	
New budget 2012/13	500,000	
Total budget 2012/13		**638,289**
FUNDING OF EXPENDITURE BUDGET		
UCRR (£328,289 original budget reduced by £11k DCLG)	(317,289)	
External income from DCLG (as per budget)	(250,000)	
Additional external income from DCLG (not budgeted)	(11,000)	
Cumbria County Council (as per budget)	(60,000)	
Total funding of expenditure budget		**(638,289)**
SPEND		
Actual paid at 30th June 2012	(129,592)	
Forecast spend July – 31st March 2013	(409,000)	
Total expected spend 2012/13		**(538,592)**
FUNDING OF EXPECTED SPEND		
Useable Capital Receipts Reserve		217,592
External income from DCLG		261,000
Additional income from Cumbria County Council		60,000
Total funding of expected spend		**538,592**
Total forecast underspend		**99,697**
Estimated to be carried forward 2013/14 for commitments awarded 2012/13		42,165
Estimated funds not yet committed at Quarter 1		57,532
		99,697

5 New Commitments - Gillfoot Shaft

5.1 Concerns were raised to Copeland Borough Council in August 2011 of suspected subsidence of the ground in a piece of land adjacent to Gillfoot shaft, owned by the Council. An initial study and review of document archived at Whitehaven records office was carried out by the Contracts and Property team. The findings of the study included evidence of mining in the area in reasonably close proximity to the ground level and a mine shaft located on the land.

5.2 A number of investigations have been carried out by various companies (please see attached PID for full details). The result of these investigations is the recommendation from Atkins Ltd that the Council should drill on and around the location of the shaft. It is unknown if the shaft has been treated but the initial drilling will establish this. If it found that the shaft has not been treated, remedial work will be required to make the shaft safe and prevent collapse. It is proposed that the Council appoints a single contractor to undertake this work under the supervision of Atkins Ltd as a specialist consultant. The work would be undertaken using a phased approach with progression to the second phase only being required if treatment of the shaft cannot be confirmed.

5.3 An invitation to tender for this work has resulted in the following costs shown in Table 4 below: (Please see PID for full details)

Table 4: Cost of works for Gillfoot shaft

Detail	Cost £
Phase 1 – Investigative Drilling	29,320
Phase 2 – Treatment of shaft	66,880
Professional Fees	8,650
Current year costs funded from revenue	117
10% contingency	10,485
TOTAL	115,452

5.4 The total cost of the work and current commitment for this financial year is £115,452

5.5 The costs incurred to date (shaded in the table above) has been classified and funded as revenue but as a result of the investigations, the work that needs to be carried out is of a capital nature and therefore all costs associated are eligible for capital funding. It is proposed that the costs previously recognised as revenue are reclassified as capital in year. The total capital funding requirement for 2012/13 is therefore estimated at £115,452. Please see table at 5.3 above.

5.6 These works require capital funding allocation from within the current programme budget and therefore any agreed spend will require a reprioritisation of the agreed programme and reallocation of capital budget.

5.7 Council on the 23rd February 2012, as part of its budget setting process approved in principal £180,000 for public building maintenance and a further £52,800 for energy efficiencies. Executive approved the detailed programme of work for these capital budgets on 24th April 2012.

5.8 The approved allocation of the £52,800 energy efficiencies budget included £32,800 for the provision of a photo voltaic system and insulation upgrades at a suitable Council property subject to a feasibility study to be carried out by the Contracts and Property department.

5.9 The feasibility study was completed in May 2012 and concluded that there was no business case for the installation of the photo voltaic system, and so therefore remains uncommitted.

5.10 Executive also approved on 24th April 2012 the allocation of the public buildings budget of £180,000 within which was £50,000 for “land management”, which at the moment remains uncommitted.

5.11 As detailed in paragraph 4.3 of this report, it is anticipated that part of the Millom Cemetery project will not be completed this year and so the budget will not be fully spent within this financial year. The total budget of £149,216 is however, vital to the completion of the project in 2013/14 and so priority should be given to this project in the setting of the 2013/14 capital programme budget, ensuring that after re-profiling that the total budget is replenished.

5.12 Executive are asked to recommend to Council the following identified budgets shown in Table 5 below are re-allocated from their original purpose and utilised to fund the costs of Gillfoot shaft:

Table 5: Proposed funding for works at Gillfoot shaft

Detail	Budget available within current capital programme £
Energy Efficiencies	(38,000)
Public Building Land Issues	(50,000)
Land at Millom re-profile	(27,452)
TOTAL FUNDING AVAILABLE	**(115,452)**
Estimated cost of Gillfoot shaft works	**115,452**

5.13 Executive are asked to note that the proposed spend of £115,452 for Gillfoot shaft is NOT INCLUDED in the current forecast figure, so approval will increase the anticipated out turn from £1,637,589 to £1,653,041, and reduce the total variance from £300,767 to £185,315.

6 CAPITAL RECEIPTS

6.1 Capital receipts as detailed in the Budget report to Council on 23rd February 2012, were estimated to be £3,639,000 for 2012/13.

6.2 Due to the prevailing market conditions the properties that make up the £3.6m above will not now be actively marketed during 2012/13 and as a consequence of this, their receipt is now forecast for 2013/14. This will however be revisited throughout the course of the year but any rescheduling is unlikely to affect the value of receipt in 2012/13. The forecast receipts for 2012/13 total £856,842 and consist mainly of Kells building plots that did not complete in 2011/12.

6.3 In order to sell 4 of the Kells building plots and realise a capital receipt included in the £856,842 above it will be necessary to carry out remedial works to take down and rebuild leaning sections of the retaining wall and carry out pointing on the entire length of the wall at a cost of approximately £24,000 and to install a drainage run and connect to the existing surface water manhole at an approximate cost of £6,000. These costs will be eligible capital expenditure and it is proposed they be met from sales proceeds which will therefore be netted down to £826,842.

6.3 Of the forecast of £826,842 above, actual disposal proceeds received at 30th June 2012 amount to £750.

6.4 Elsewhere on the agenda a report to Executive seeks release from a reserve to carry out demolition and clearing works on two pieces of land at Newland Avenue and Haverigg Community Centre. Following these works a total receipt of £65k is anticipated, this is not currently included in the £826,842 above as it may not be received in this year.

6.5 Members are reminded that the timing and value of the capital receipts are critical to the funding of the capital programme. Should the £826,842 detailed above not be achieved it will be necessary to increase the level of "borrowing" from the preserved right to buy element on the Useable Capital Receipt Reserve, as with the exception of the schemes

detailed paragraph 4.7, all other funds within the 2012/13 capital programme have been committed.

7.0 FINANCING

7.1 Table 6 below shows how the 2012/13 Capital Programme will be funded. It is important that the funding of the Capital Programme is fully understood and can be demonstrated, though the monitoring returns, and in particular, the identification of external resources to support capital expenditure. This will contribute to improving the quality of the Financial Accounts, and on-going budget management.

7.2 The current forecast 2012/13 capital programme expenditure (excluding Gillfoot shaft) of £1,637,589 is planned to be financed as shown below:

Table 6: Financing of the 2012/13 Capital Programme

Funded by:	**£**
Useable Capital Receipts	(919,601)
Useable Capital Receipts - Preserved right to buy sales (post stock transfer)	(316,988)
External Funding	(401,000)
TOTAL FINANCING	**(1,637,589)**

8. CONCLUSION

8.1 The capital programme will be funded by utilising part of the Useable Capital Receipts Reserve that originated from the sale of the housing stock. It is identified, however, that there remains a risk that we may not realise all of the forecast capital receipts this financial year as they are dependent on market conditions. This will be continually reviewed and Members updated accordingly.

8.2 The work at Gillfoot shaft, subject to this report being approved, will be funded from slippage and underspends on current projects as detailed within this report and therefore has no impact on the Budget for 2012/13.

8.3 The revised spending profile will require Council to approve the changes in policy use for the capital programme.

8.4 The capital programme will continue to be robustly monitored over the coming months with the next report to Executive at quarter 2.

9. STATUTORY OFFICER COMMENTS

9.1 The Monitoring Officer's comments are: The Monitoring Officer's comments are: None other than to confirm recommendation (ii) requires confirmation by Council.

9.2 The Section 151 Officer's comments are: Included in this report.

9.3 EIA Comments: EIA Completed as part of the budget setting process.

9.4 Policy Framework:

9.5 Other consultee comments, if any: Contained within the report

10. WHAT ARE THE LEGAL, FINANCIAL AND HUMAN RESOURCES IMPLICATIONS?

10.1 It is imperative that all budgets are monitored monthly with exceptions reported through Corporate Leadership Team and Executive so that management action can be taken to ensure the effective use of resources as planned by the Council.

10.2 The capital programme will continue to be monitored monthly with the next report to Executive being at quarter 2. The budget monitoring process continues to be refined to provide members and officers with the up-to-date financial information needed to make key decisions on resource allocations during the year to feed into the Council's budget process.

10.3 The budget monitoring process is fully integrated into the planning process to ensure that Council objectives and priorities as outlined in the Corporate Plan are fully resourced as planned.

10.4 The capital programme assumes funding from the sale of assets. Generation of capital receipts presents risks in terms of the timing and value of receipt. The Development Surveyor and Financial Management and Treasury Accountant meet quarterly and review asset sales.

List of Appendices: Appendix A – Budget Model Report Quarter 1 (to 30th June 2012)
Appendix B – PID for Gillfoot shaft

APPENDIX A

CAPITAL REPORT QUARTER 1 2012/13

Cost Centre Description	Income/Expenditure	Detail	Detail Description	Current Approved Budget 2012/13	Current Net Expenditure	Profiled Budget	Year-End Forecast	Capital Underspend Pd 3	Capital C/F Pd 3	Total Capital Variance at Pd 3
Website Development	**Expenditure**	0211	Contract Works - Other	23,844	6,702	23,844	23,844	0	0	0
New Financial Management System	**Expenditure**	0211	Contract Works - Other	17,710	0	17,710	17,710	0	0	0
Crematorium - New Cremators	**Expenditure**	0211	Contract Works - Other	0	(1,585)	0	0	0	0	0
Energy Efficiency Public Buildings	**Expenditure**	0211	Contract Works - Other	7,897	6,897	7,897	6,897	1,000	0	1,000
		0398	Voltage Optimisation	10,000	0	10,000	10,000	0	0	0
		0399	Photo Voltaic System	32,800	0	32,800	0	32,800	0	32,800
		0400	Moresby Rooflights	10,000	0	10,000	10,000	0	0	0
Energy Efficiency Public Buildings Total				**60,697**	**6,897**	**60,697**	**26,897**	**33,800**	**0**	33,800
Public Building Condition Survey Backlog	**Expenditure**	0211	Contract Works - Other	47,000	46,115	47,000	46,115	885	0	885
		0390	Moresby Depot - Windows	15,700	0	15,700	15,700	0	0	0
		0391	Moresby Depot - Surfacing	50,000	45,654	50,000	50,000	0	0	0
		0392	St Bees Toilets Rooflights	7,000	0	7,000	7,000	0	0	0
		0393	C/Moor Sq Car Park	23,147	44	23,147	23,147	0	0	0
		0394	Lancashire Rd Car Park	17,240	0	17,240	17,240	0	0	0
		0395	Land Issues	50,000	0	50,000	0	50,000	0	50,000
		0396	Tamalder Nursery Roofing	10,000	7,918	10,000	10,000	0	0	0
		0397	Moresby Depot Pipework	6,913	0	6,913	6,913	0	0	0
Public Building Condition Survey Backlog Total				**227,000**	**99,731**	**227,000**	**176,115**	**50,885**	**0**	50,885
Cliff Stabilisation Nailing	**Expenditure**	0211	Contract Works - Other	100,000	1,557	100,000	100,000	0	0	0
Moresby Vacated Accom	**Expenditure**	0211	Contract Works - Other	25,000	351	25,000	25,000	0	0	0
Valuation Data Transfer	**Expenditure**	0211	Contract Works - Other	20,000	0	20,000	20,000	0	0	0
Copeland Reception	**Expenditure**	0211	Contract Works - Other	150,000	0	150,000	150,000	0	0	0
Regeneration Software	**Expenditure**	0211	Contract Works - Other	40,912	0	40,912	40,912	0	0	0
Data Capture	**Expenditure**	0211	Contract Works - Other	33,673	9,846	33,673	33,673	0	0	0
Rottington Beck	**Expenditure**	0211	Contract Works - Other	128,281	42,586	128,281	101,941	2,863	23,477	26,340
Whitehaven Cemetery Extension	**Expenditure**	0211	Contract Works - Other	1,655	0	1,655	1,655	0	0	0
Cemeteries & Play Areas - Condition Report	**Expenditure**	0211	Contract Works - Other	40,883	0	40,883	40,883	0	0	0
Millom Cemetery Land Purchase	**Expenditure**	0211	Contract Works - Other	149,216	0	149,216	74,716	74,500	0	74,500
Whitehaven Cemetery	**Expenditure**	0211	Contract Works - Other	8,200	7,000	8,200	8,200	0	0	0
Whitehaven Market Lights	**Expenditure**	0211	Contract Works - Other	1,500	0	1,500	1,500	0	0	0
Moor Row Play Area	**Expenditure**	0211	Contract Works - Other	80,000	0	80,000	80,000	0	0	0
Fuel Tank Moresby	**Expenditure**	0211	Contract Works - Other	16,996	12,043	16,996	16,043	953	0	953
Fleet Replacement	**Expenditure**	0211	Contract Works - Other	111,000	0	111,000	111,000	0	0	0
Dev Mgt E-Access	**Expenditure**	0211	Contract Works - Other	10,000	0	10,000	9,000	1,000	0	1,000
Whitehaven - Mount Pleasant Park	**Expenditure**	0211	Contract Works - Other	3,000	0	3,000	0	3,000	0	3,000
NCL (Energy Efficiencies)	**Expenditure**	0211	Contract Works - Other	39,500	0	39,500	39,500	0	0	0
Housing Grants	**Expenditure**	2601	Mand.Dis.Fac.Owner/Occupier	638,289	173,760	638,289	539,000	0	99,289	99,289
				1,927,356	358,888	1,927,356	1,637,589	167,001	122,766	289,767

Cost Centre Description	Income/Expenditure	Detail	Detail Description	Current Approved Budget 2012/13	Current Net Expenditure	Profiled Budget	Year-End Forecast	Capital Underspend Pd 3	Capital C/F Pd 3	Total Capital Variance at Pd 3

APPENDIX B CAPITAL REPORT QUARTER 1 2012/13

PUBLIC BUILDINGS MAINTENANCE – CAPITAL EXPENDITURE 2012/13 PROPOSED REALLOCATION OF CAPITAL FUNDS

This report set out details of a proposed amendment to the capital programme for 2012/13 and seeks agreement from the Executive for the reallocation of capital funds.

The proposed amendment to the capital programme will ensure the delivery of a key project to protect public safety and the interests of the council. The original work identified has been reprioritised to accommodate this essential work.

WHY HAS THIS REPORT COME TO THE EXECUTIVE?

Council on the 23rd February 2012, as part of its budget setting process pre-approved the following a capital budgets:- £180,000.00 for public building maintenance, and a further £52,800.00 for energy efficiencies .

The detailed capital work programme was approved by Executive on 24/04/2012.

RECOMMENDATIONS:

This report sets out proposals for the reallocation of capital funds for the 12/13 financial year to ensure that the Gillfoot shaft is treated, public safety is maintained and the council's liabilities are reduced.

Executive is asked to approve the proposed reallocation of capital funds and provision of additional funding at paragraph 2.2.

1. INTRODUCTION

Financial

1.1 Council on the 23rd February 2012, as part of its budget setting process pre-approved the following a capital budgets:- £180,000.00 for public building maintenance, and a further £52,800.00 for energy efficiencies.

1.2 Executive approved on the 24th April 2012 the detailed programme of work and capital spends allocation.

1.3 The approved allocation of the £52,800.00 energy saving budget included £32,800.00 for the provision of a photo voltaic system and insulation upgrades at a suitable council property which was deemed to be suitable by a feasibility study carried out by the contracts and property department.

1.4 The feasibility study was completed in May 2012 and concluded that the council does not have a property where a suitably sized installation can be provided economically. In addition the amount of feed-in tariff that that the council will be eligible for will reduce as of the 1st August 2012 and will not generate as much income to offset the cost of the installation therefore the payback would be greatly increased. It was therefore intended that the sum allocated would be returned to the central reserves.

Gillfoot Shaft

1.3 Concerns were raised to Copeland Borough Council in August 2011 of suspected subsidence of the ground in a piece of land in the location of Gillfoot shaft, owned by the council. An initial study and review of document archived at Whitehaven records office was carried out by the contracts and property team. The findings of the study included evidence of mining in the area in reasonably close proximity to the ground level and a mine shaft located on the land.

1.4 Atkins Ltd were commissioned on the 4th August 2012 initially to undertake a preliminary desk study review *Appendix A*. The report produced confirmed the councils concerns with the possibility of a mine shaft and potential instability due to undermining. Further investigations were recommended by Atkins including monthly monitoring of the ground level and a geophysical survey.

1.5 Atkins was appointed by the council to carry out monthly monitoring of the ground level to ensure that the ground was not subsiding as a result of the relatively shallow undermining. The result have shown very little movement in the first 6 months of monitoring *Appendix B*.

1.6 Minerex Geophysics were appointed by Atkins Ltd on behalf of the council to carry out further investigation using EM31 ground conductivity, 2D-Resistivity, Ground Penetrating Radar, magnetic, seismic refraction and MASW techniques. The further investigation identified the location of the mine shaft on the councils land. Although the shaft was located the data could not prove that the shaft has been treated. This report was supplied to the council on the 10th February 2012 *Appendix C*.

1.7 A meeting was held with Atkins Ltd and M Morton (Contracts and Property Surveyor) to discuss the results of the investigations and agree on an appropriate course of action. Atkins recommendations are that drilling should take place on and around the location of the shaft to investigate any treatment media or capping that might be present in the shaft. It is unknown if the shaft has been

treated therefore the initial drilling will establish this. If it is found that the shaft has not been treated remedial work will be required to make the shaft safe and prevent collapse. It is proposed that the council appoints a single contractor to undertake this work under the supervision of Atkins Ltd as a specialist consultant. The work would be undertaken using a phased approach with progression to the second phase only being required if treatment of the shaft cannot be confirmed.

1.8 An invitation to tender for the investigation and shaft treatment was sent to 3 contractors who all returned tenders. A tender evaluation report has been produced by Fathful+Gould (a sister company of Atkins Ltd) – *Appendix D* the costs are as follows:

- Phase 1 – Investigative drilling £29,320.00
- Phase 2 – treatment of the shaft £66,880.00
- Total Phase 1 & Phase 2: £96,200.00
- Professional Fees (Atkins offer letter 3) £8,650.00
- Total £104,850.00

1.9 Total invoiced in 12/13 financial year: £116.95

1.10 A 10% contingency is considered necessary at £10,485.

1.11 The total cost of the work and current commitment for this financial year is £115,452.00

2. PROPOSALS

2.1 It is proposed that the council instructs the contractor to proceed with phase 1 and phase 2 (if required) of the work.

2.2 Funding has been identified for £115,452 from existing approved budgets. Please see capital report section 5 for full details of funding available.

3. ALTERNATIVE OPTIONS TO BE CONSIDERED

3.1 Alternative Option A

The council does nothing. This is not considered to be in the best interests of the council as a mine shaft that has not undergone appropriate treatment can fail which could cause injury and potentially death to a member of the public.

3.2 Alternative Option B

The council does not carry out the work as proposed however ensures that the land remains permanently closed by erecting a security fence around the perimeter of the land and around the mine shaft location. This would cost a considerable amount of money due to the size and the council would retain a

duty to inspect and maintain the fencing. Option B is not considered to be feasible.

4. CONCLUSIONS

4.1 The proposed capital allocation has been amended to address a priority project.

4.2 The total funding of £115,452 can be reallocated by reprioritization of the current capital programme.

4.3 Upon completion of the remedial work to the shaft no further expenditure is expected.

5. STATUTORY OFFICER COMMENTS

5.1 The Monitoring Officer's comments are:

5.2 The Section 151 Officer's comments are:

5.3 EIA Comments – Awaiting Comment.

5.4 Other consultee comments, if any:

6. HOW WILL THE PROPOSALS BE PROJECT MANAGED AND HOW ARE THE RISKS GOING TO BE MANAGED?

6.1 The projects will be managed by the contracts and property team who will adopt various project management techniques to ensure successful delivery of the project.

6.2 Risks will be managed as they develop any issues or deviations from the scope identified above will identified to council.

7. WHAT MEASURABLE OUTCOMES OR OUTPUTS WILL ARISE FROM THIS REPORT?

7.1 The allocation of funding will be amended to suit the council's priorities.

7.2 The project will be managed effectively ensuring that they are delivered within the reallocated budget to an agreed time scale and quality.

7.3 The area will be made safe and can be reopened to the public.

List of Appendices

Appendix A - Atkins Initial Desk Study
Appendix B - Atkins Monthly Monitoring
Appendix C - Minerex Geophysics Survey
Appendix D - Faithful+Gould Tender Report

List of Background Documents:

- Contracts and property project files
- Copeland Borough Council asset management plan 2011 – 2012

ATKINS

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Your ref:
Our ref: 5103536.012

Martyn Morton
Copeland Borough Council
The Copeland Centre
Catherine Street
Whitehaven
Cumbria
CA28 7SJ

12 Mar 2012

Dear Martyn,

Egremont Mining Instability - Review of Results of Geophysical and Level Monitoring Survey

1. Introduction

Further to the recommendations made in Atkins Egremont Mining Instability Preliminary Desk Study Review of 2nd September 2011, a geophysical survey was undertaken by Minerex Geophysics Ltd on the 30-31st January 2012 and a level monitoring survey is ongoing at the Egremont site. This letter outlines the findings of the geophysical survey and topographic survey results to date, and makes further recommendations and should be read in conjunction with the memo of 2nd September 2011. Some additional published information has also been collected and is discussed below.

2. Geophysical Survey

A geophysical survey comprising ground conductivity, 2D resistivity, ground penetrating radar (GPR), magnetic, seismic refraction (p-wave) and MASW (s-wave) techniques was undertaken in 2012. The geophysical survey report (MGX Project Number 5597, MGX File Ref: 5597f-005.doc dated 27th February 2012) is attached to this Memo.

The aim of the survey was to locate a mine shaft (Pit 2) which was shown on mine abandonment plans to the rear of 28/29 Howbank Road and to investigate an area of possible subsidence within the southern part of the site.

No interpretation of the geophysical survey data has been made by Atkins. The comments within this memo rely on the interpretation by Minerex.

2.1. Results of Geophysical Survey

An area to the north of Howbank Road, in the vicinity of the Bowling Green was surveyed which revealed what was described in the Geophysical Report as 'complex geology'. As no particular problems with subsidence have been reported in this area, and it is not within the vicinity of Pit 2 it is not discussed below.

2.1.1. Pit 2

From the geophysical survey there are indications that the shaft (Pit 2) is in the location shown on the various mine abandonment plans, under the boundary fence between 28 and 29 Howbank Road. In particular:

* The ground penetrating radar data which in survey lines G2 and G3 show buried flat features 3-4m wide which may be associated with a shaft.

* A small v-shaped resistivity anomaly was identified within survey line R1 on the fence line to the rear of 28 Howbank Road which may be associated with backfill to the pit.

* The magnetic and conductivity survey picked up the metal boundary fence which may have masked signals derived from the pit or associated equipment.

While not proven conclusively, the evidence from the geophysical survey concurs with the location of the shaft shown on the abandonment plans.

2.1.2. Area of Reported Subsidence

The area of subsidence appears to be limited to an area of approximately 20m by 40m, to the rear of 36/37 North Road near the southeast field boundary. It has been reported by local people that there has been a noticeable change in topography in the past three years in this area. The geophysical survey does not identify any particular mechanisms which would lead to surface subsidence in the area, however, a small scale void migrating upwards through the rock causing subsidence of the superficial deposits cannot be ruled out. The geophysical survey did report that, "Under the area of subsidence some strong and abrupt resistivity changes exist that may be an indication of the subsidence or of a fault that would accelerate subsidence. Rapid changes between mineralized layers and clean limestone have been found at the area of subsidence".

The geophysical survey did however identify a linear feature, probably a pipe or service running from the rear of 35 Howbank Road in a northeast direction towards North Road. The pipe is shown on the geophysical survey as approximately 1.2m below ground level, which is at the depth a service would be expected. The geophysical survey shows the linear feature to be buried in sand and gravel. If the feature was a leaking water pipe, water flowing into the surrounding sand and gravel may wash out the sand fraction of the deposit causing subsidence or induce subsidence within migrating voids associated with mine workings..

3. Level Monitoring Survey

Following the recommendations made within the Preliminary Desk Study Review periodic level monitoring surveys are being undertaken. A plan showing the location of the monitoring stations and a graph showing the interim results of the survey are attached.

A total of nine monitoring visits were made between the 27th October 2011 and 1st March 2012 and no ongoing trends in movement are apparent at this stage.

4. Additional Published Information

Following recommendations within the Preliminary Desk Study, the British Geological Survey and Coal Authority were approached for published information, however, as the mine was not a coal mine these bodies held no additional records and suggested contacting the Mineral Valuer of the Valuation Office of the Inland Revenue. On enquiry it appears that the Valuation Office holds no records for this site and it was suggested that the local archive be consulted.

A visit was made to the Whitehaven Archive and Local Studies Centre, Scotch Street, Whitehaven on 29th February 2012 to research mining in the area. A number of references to the Gillfoot and Wyndham mine were reviewed with the most significant discussed below.

Ref 1: Survey of Iron Ore Resources of West Cumbria, Cumberland Development Council Ltd., 30 Roper Street, Whitehaven, 1930 p74-79. This document described the location of the six pits associated with the Gillfoot mine and described their condition as,

> *"Gillfoot Park No. 4 Shaft is open.*
>
> *All the other shafts are filled in.*
>
> *Surface subsidence is slight.*
>
> *The mines are flooded."*

On initial inspection of the document it would appear that the shaft to the rear of 28/29 Howabank Road (Gillfoot No. 2 Shaft) was infilled. However, speaking to staff at the Florance Mining Museum, Egremont, this may refer to the shaft only being infilled to a shallow depth, with a void remaining in the majority of the shaft below. It should be noted that from the above evidence, Pit 1 was treated in the same way to Pit 2 but was subject to collapse recently. Evidence within this document concurs with the evidence discussed in Section 4.5 of the previous Memo that the pit is around 262ft deep.

Ref 2: Iron & Steel Industry of West Cumberland, An Historical Survey by J.Y. Lancaster & D.R. Wattleworth p 160. This document stated that the Gillfoot Mine, owned by The Wyndham Mining Co. was abandoned in 1924.

Ref:3 Special Reports on the Mineral Resources of Great Britain, Volume VIII, Iron Ores – Haematites of West Cumburland, Lancashire and the Lake District. Bernard Smith, MA, ScD. H.M. Stationary Office 1924 p78. This document lists information including the phrase "Standing since Feb 1924" of the Gillfoot Mine, which is presumably the status of the mine, as 'working', and the Wyndham Mine as 'pumping'.

5. Summary and Recommendations

A number of the recommendations from the Preliminary Desk Study Review have been carried out including a geophysical survey and a further search of published data. A summary of the findings of this memo and recommendations are given below:

- The geophysical survey did not identify any particular mechanisms which would lead to surface subsidence in the south east part of the site however, a linear feature was identified.
- The geophysical survey, did not prove the location of Pit 2 conclusively, however the results presented suggest that the location of the shaft shown on the abandonment plans is likely to be correct.
- Literature from the Whitehaven Archive indicated that Pit 2 has been filled in but it is not known to what depth. The mine is flooded and that the pit was probably abandoned around 1924.
- A level monitoring survey of the site has detected no ongoing trend of surface movement.

The origin of the reported subsidence to the rear of 36/37 North Road is unknown at this stage and if left untreated could develop a sudden collapse which may affect the public and the structural integrity of the houses in the vicinity. It is recommended that the linear feature is investigated to determine whether it is a service and whether water could be leaking from it. The level and condition of the service may also indicate whether that part of the site has undergone subsidence. It is also recommended that a borehole is drilled to obtain cores within the middle of the area of subsidence to determine whether collapse or voiding is present at depth.

Uncertainty remains regarding the treatment of Pit No.2 of the Gillfoot Mine and if left untreated could develop a sudden collapse which may affect the public and structural integrity of the houses in the vicinity. It is recommended that the site of Pit 2 is investigated by probe drilling to determine whether the shaft has been infilled to the base or only the surface portion capped. A decision can then be made on the future of the site. This shaft is likely to pose a significant risk to the adjacent properties if left untreated.

At the request of Copeland Borough Council a preliminary budget quotation for the drilling work associated with Pit No. 2 has been obtained from a contractor. This quotation is attached, along with the contractor's standard terms and conditions. If this work is to be carried out, a Ground Investigation Specification should be produced and a formal quotation obtained.

In the covering email to the quote the, contractor pointed out the following, "The shaft is likely to be at greatest risk of collapse when the infill material is disturbed (by drilling). If the located shaft is to be left untreated then the client will be responsible for erecting and maintaining sufficient secure fencing around the shaft to protect the public against any possible collapse in the future".

In summary, the attached quotation includes for establishment of equipment on site and the drilling of up to 100 No.10m deep probe holes to locate the shaft for a total of £ 9,400. From the quote it can be inferred that to drill a hole to the base of the shaft to prove whether it has been loosely back filled would cost an additional £1340. It should be noted that the quotation is a

preliminary budget price which should be confirmed following the production of the Ground Investigation Specification.

A budget quotation for the treatment of the shaft was included at the request of the contractor which amounts to a further £16,450 which assumes that the shaft has been loosely backfilled to the base, an allowance has been made to grout this loose infill to provide a column of grouted material. This quotation does not constitute a recommendation by Atkins on the suitability of the Contractor's proposals for treating the shaft. If Copeland Borough Council wish to pursue options for treating the shaft, an engineering design can be developed by Atkins and quotations for treatment obtained.

Yours sincerely

J. Haddon

Jon Haddon

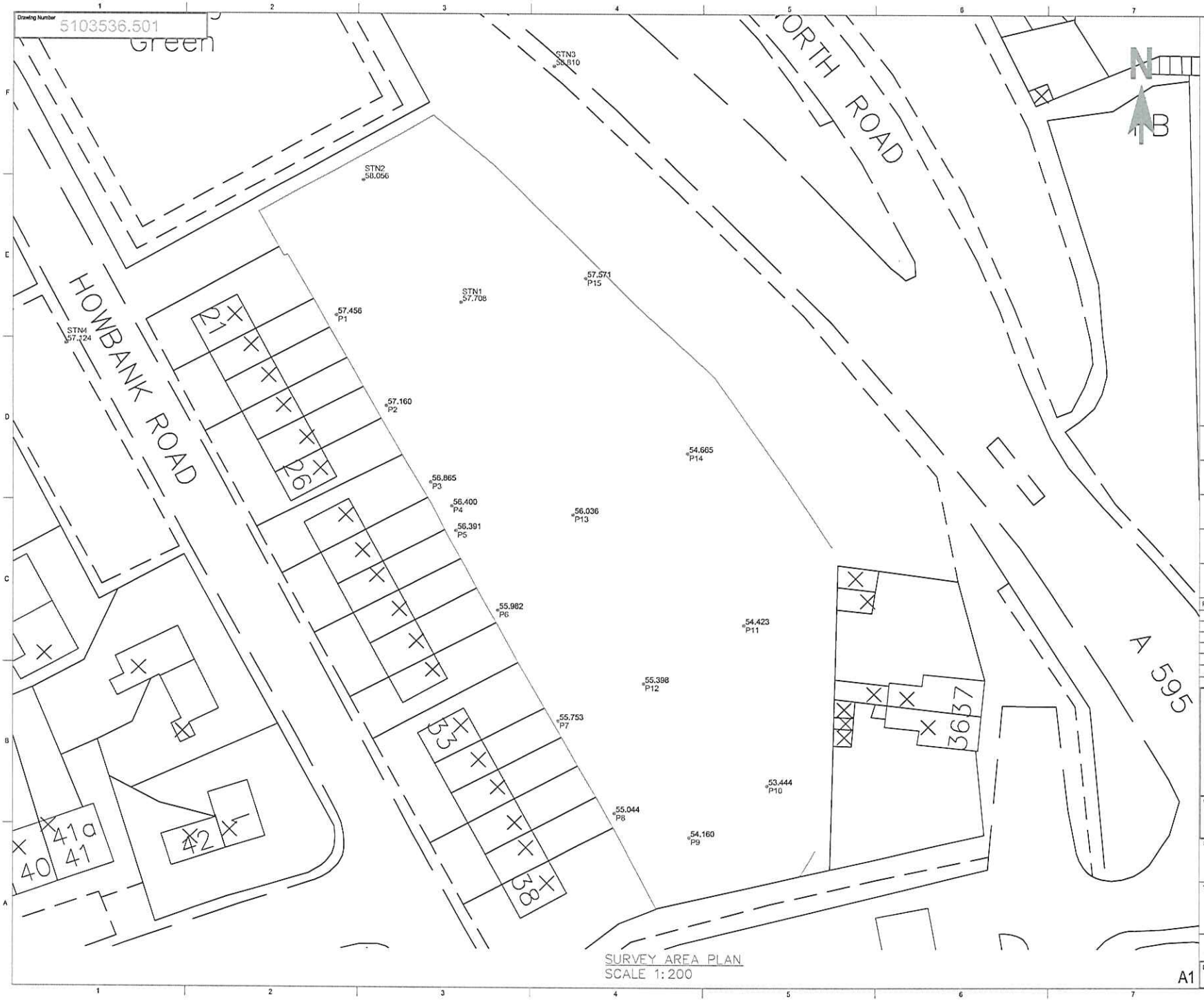
Senior Engineering Geologist

Attachment 1

Minerex Geophysical Report

Attachment 2

Interim Results of Level Monitoring



NOTES

Rev	Modifications	By	Date	Checked	Auth

Purpose of Issue	Date	Authorised

ATKINS
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Moor Row, Cumbria, CA24 3JZ.

INVESTOR IN PEOPLE

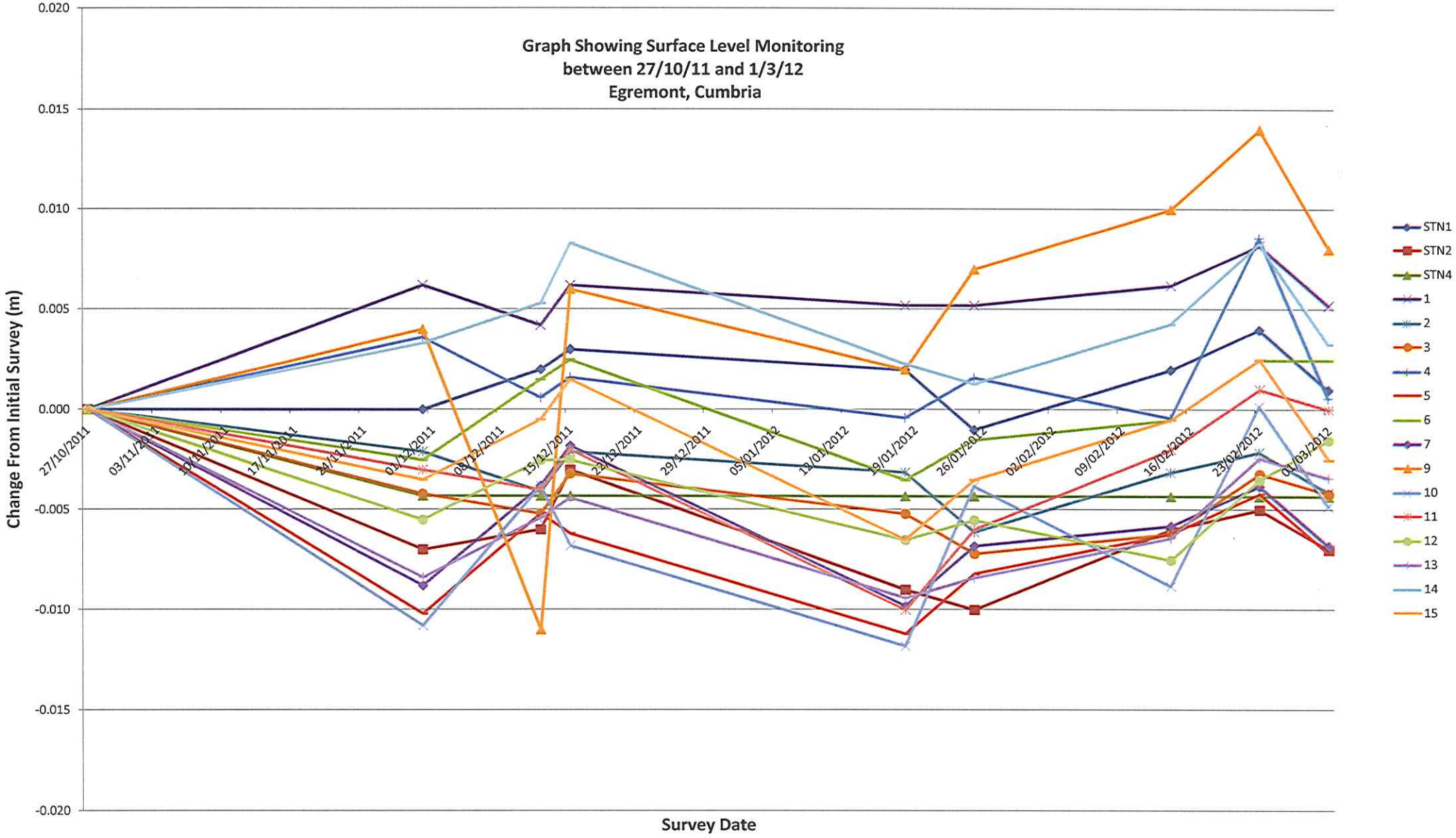
Client
COPELAND BOROUGH COUNCIL

Project
EGREMONT REMEDIAL WORKS

Title
GROUND MONITORING POINTS
INITIAL GROUND LEVELS

Scale	Drawn	Checked	Authorised
	Date	Date	Date

Drawing Number 5103536.501 Rev P1


Graph Showing Surface Level Monitoring
between 27/10/11 and 1/3/12
Egremont, Cumbria
Change From Initial Survey (m)
0.020
0.015
0.010
0.005
0.000
-0.005
-0.010
-0.015
-0.020
27/10/2011
03/11/2011
10/11/2011
17/11/2011
24/11/2011
01/12/2011
08/12/2011
15/12/2011
22/12/2011
29/12/2011
05/01/2012
12/01/2012
19/01/2012
26/01/2012
02/02/2012
09/02/2012
16/02/2012
23/02/2012
01/03/2012
Survey Date
STN1
STN2
STN4
1
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14
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Attachment 3

Budget Quote from Drilling Contractor

EMAIL TRANSMISSION

M&J DRILLING SERVICES LTD.
Unit 44, Coneygree Industrial Estate
Tipton, WEST MIDLANDS DY4 8XP
Telephone: 01902 885241
Fax No: 01902 887257
E-Mail: enquiry@mandjdrilling.com
Website: www.mandjdrilling.com

Atkins
Chadwick House
Birchwood Park
Warrington
WA3 6AE

6th March 2012
DW/IEM

QUOTATION No. 9764

CUMBRIA
MINESHAFT LOCATION

ITEM	DESCRIPTION	QTY	UNIT	RATE	TOTAL
A	**General**				
1.	Establish drill rig & ancillary equipment to site and return on completion		Item		3,400.00
2.	Establish safety platform to site and return on completion		Item		1,000.00
3.	Welfare facilities	2	Week	300.00	600.00
4.	Water supply		Item		500.00
5.	Maintain plant and working areas	2	week	750.00	1,500.00
6.	Standing time for reasons beyond our control (RATE ONLY)	-	Hr	180.00	-
					7,000.00
B	**Mineshaft location**				
1.	Set up at each probe hole location	100	No.	3.00	300.00
2.	Drill probe holes	1000.00	m	2.00	2,000.00
3.	Backfill probe holes	1000.00	m	0.10	100.00
					2,400.00
C	**Mineshaft treatment**				
1.	Set up drill rig and safety platform over shaft for primary borehole	1	No.	200.00	200.00
2.	Set up drill rig and safety platform over shaft for secondary borehole	1	No.	100.00	100.00
3.	Drill in shaft infill material for primary borehole	76.00	m	15.0	1,140.00
4.	Drill in shaft infill material for secondary borehole	76.00	m	15.0	1,140.00
5.	Establish grout plant to site and return on completion		Item		2,200.00

Continued .....

Atkins

Quotation No. 9764
Cumbria – mineshaft location

ITEM	DESCRIPTION	QTY	UNIT	RATE	TOTAL
6.	Provide PFA to site	230.00	Tonne	15.00	3,450.00
7.	Provide O P Cement to site	23.00	Tonne	130.00	2,990.00
8.	Mix & inject grout to shaft	253.00	Tonne	10.00	2,530.00
9.	Form grout plug over shaft	1	No.	2700.00	2,700.00
10.	Excess bulk material removed by others or at cost + 12.5%				
					16,450.00

ESTIMATED COST OF WORKS **£25,850.00**
Excluding VAT

TERMS AND CONDITIONS ATTACHED

Notes:

a) Site unseen, assumes suitable access and working area for all plant and materials
b) No allowance made for reinstatement
c) No allowance made for gaining access and fencing grouting compound

M & J DRILLING SERVICES LIMITED
TERMS AND CONDITIONS

GENERAL

Unless stated to the contrary, the following General Terms and Conditions apply to all works and services provided by M & J Drilling Services Limited (the "***Contractor***"):

1. **Payment**

1.1 The Contractor has made no allowance for either retention or Main Contractor's Discount and none is to be deducted.

1.2 At the commencement of the contract the Client is to provide full contact details including where applications should be sent for payment.

1.3 The Contractor will submit to the Client applications for interim payment on a monthly basis. The application shall provide details of the value of the work or service carried out and any materials delivered by the Contractor.

1.4 The due date for payment of each interim application is 7 days after the date of the application and the final date for payment of each interim application is 21 days from the due date.

1.5 Not later than 5 days after the due date, the Client shall give notice to the Contractor specifying the amount of the payment which the Client proposes to make. The notice shall specify to what the payment relates and the basis on which that amount is calculated. In default of a notice by the Client the amount of the Contractor's application shall be due and payable.

1.6 Prior to withholding any payment the Client shall give notice to the Contractor no later than 10 days before the final date for payment of the relevant application specifying the amount proposed to be withheld and the ground for withholding payment or, if there is more than one ground, each ground and the amount attributable to it, provided that the Client shall not be entitled to withhold payment as a result of the Contractor exercising its right under clause 9.3.

1.7 The Contractor is entitled to charge interest from the final date for payment until the Client pays. Interest shall be calculated in accordance with the Late Payment of Commercial Debts (Interest) Act 1998 and at the relevant reference rate plus the statutory rate of interest.

1.8 The Client will pay any VAT properly due to the Contractor on any amount due to the Contractor.

2. **Value Added Tax**

2.1 All rates quoted exclude VAT. VAT will be charged additionally at the current rate, as directed by HM Revenue & Customs.

3. **Quotations**

3.1 Quotations are open for acceptance for 3 months from the date of issue. Unless otherwise stated all costs are based upon remeasurement on completion. Works or services are to be carried out in a single visit.

3.2 Commencement of works or services on acceptance of a quotation is subject to the availability of plant, labour and materials at the time of the Client's instruction to start.

3.3 If for any reason the Contractor is not able to start works or services within 60 days of the Client's acceptance of the quotation, the Contractor reserves the right to re-negotiate the rates.

3.4 Except where an alternative basis for payment is agreed, the rates in the quotation accepted by the Client for the works and/or services shall apply to any varied or additional works and/or services requested by the Client and shall be subject to remeasurement on completion.

4. **Priced Unseen**

4.1 The Client shall provide the Contractor with all relevant information relating to the site including but not limited to access and working areas, the site's overall dimensions and obstructions (e.g. slopes, steps, sensitive surfaces and subsurface conditions) on the site.

4.2 Unless otherwise stated, the Contractor has not visited the site and all quotations and allowances have been made based on the information provided by the Client

5. **Contractors Obligations**

5.1 All work to be carried out by the Contractor shall be carried out in a good and proper workmanlike manner.

5.2 In carrying out any service (including any design responsibilities) the Contractor shall exercise all the reasonable skill and care to be expected of a professional consultant as if such professional consultant had been employed independently by the Client to provide the service.

5.3 All materials and goods used or provided by the Contractor shall be of sound and satisfactory quality suitable in all respects for the purposes of the works and/or services and in accordance with relevant British Standards and Codes of Practice.

6. **Utility Services**

6.1 The location of all statutory undertakers' underground services within the site must be fully researched by the Client or his representative prior to commencement.

6.2 The Contractor does not accept responsibility for loss or damage however arising resulting from its equipment hitting services at positions not shown on the information provided by the Client.

6.3 Where drilling takes place close to an existing property with a cellar the Contractor will, before commencing work, require confirmation from the Client that the cellar does not extend beyond the building line.

7. **Party Wall Agreement**

7.1 Unless agreed otherwise in writing by a director of the Contractor, the Contractor is not responsible for Party Wall Agreements or to notify neighbouring owners or occupiers of works or services to be undertaken on the site.

7.2 Where there is a likelihood of works or services proceeding within 6 metres (measured horizontally) to neighbouring structures or walls on a site boundary the Client must have a Party Wall Agreement in place with the neighbouring owners or occupiers and provide a copy to the Contractor prior to the start of any works or services on the site.

8. **Access**

8.1 Where the Client is not the land owner, permission for access must be confirmed to the Contractor in writing prior to start of any works or services on the site.

8.2 The Contractor has made no allowance for payment of wayleaves, for reinstatement or for compensation of unavoidable damage.

8.3 The Contractor will endeavour to keep disruption to a minimum, however the Contractor shall not be responsible for any unavoidable rutting arising from the Contractor's plant accessing or leaving the site or any damage to concrete drives or paving slabs as result of the weight of the Contractor's plant.

9. **Copyright and Third Party Rights**

9.1 Copyright in all reports and other information produced by the Contractor relating to any drilling and/or grouting remains with the Contractor.

9.2 The report and all other information produced are private and confidential between the Client and the Contractor except for the purposes of making Planning and Building Control applications and sending a copy of the final report to the Coal Authority as part of the consent process.

9.3 The Contractor shall be entitled to withhold all reports and other information from the Client until full payment for the works or services has been received.

9.4 All reports and other information produced by the Contractor relating to any drilling and/or grouting shall not be relied upon by any other party without the prior written consent of the Contractor.

9.5 Any person who is not the Client or the Contractor has no right under the Contracts (Rights of Third Parties) Act 1999 to enforce any term of these Terms and Conditions.

10. **Water**

10.1 The Client shall ensure that a hydrant water supply (or similar) is available within 100m of the site for use for the duration of the works or services. The Contractor will make arrangements to acquire a licensed standpipe from the appropriate water authority. .

11. **Highway**

11.1 The Contractor has made no allowance for works on the highway or work close enough to the highway to require traffic management.

12. **Contaminated Land**

12.1 Unless otherwise stated, the Contractor has made no allowance for working on sites which could be potentially hazardous to its employees or plant.

12.2 Where a site is designated a BDA RED category then an additional charge will be levied for protective clothing, safety equipment and decontamination facilities.

13. **Reinstatement**

13.1 The Contractor has made no allowance for site clearance or removal of surplus bulk materials from the site.

13.2 Unless the Client notifies the Contractor of the condition of the site within 4 weeks of the Contractor departing the site, the Contractor shall have no liability to or for any costs or losses suffered or incurred by the Client to reinstate and/or clear up the site.

14. **Standing Time**

14.1 The Client shall pay the Contractor for standing time for plant and crew for any delays beyond the control of the Contractor at the rate stated in the quotation.

15. **Coal Authority**

15.1 The consent of the Coal Authority is required before the Contractor can commence any drilling into coal seams and mineworkings on the site.

15.2 Unless otherwise stated, the Client shall obtain and pay for the requisite consent from the Coal Authority.

16. **Soil Parameters**

16.1 Where the Contractor undertakes rotary percussive drilling (rock drilling technique) to explore solid geology and mineworkings, the Contractor is not responsible for the provision of accurate and quantitative evaluation of superficial deposits. The Contractor may provide the depth and a general indication of the composition of the deposit.

17. **Material Deliveries**

17.1 All prices for bulk deliveries (e.g. pulverised fuel ash, sand) are based on minimum 20 tonne loads, with the quantity delivered chargeable.

17.2 For bulk deliveries, the Client must ensure that suitable access is available for rigid 4 axle 32 tonne lorries.

17.3 For bagged deliveries of cement or pre-blended grouts, the quantity consumed shall be charged (rounded up to the nearest tonne). For specialist grouts a minimum order size may be charged

18. **Exclusion and Limitation of Liability**

18.1 Except as specifically provided in these Terms and Conditions, neither the Client nor the Contractor shall have any liability to the other in contract tort or otherwise for any loss of profit, loss of opportunity, economic loss, loss of use, loss of contribution or any equivalent loss arising as a result of the works or services or regardless of the cause of such loss.

18.2 The Contractor's liability for defective work or service (including any defective survey) shall be limited to the rectification of such defective work or service by the Contractor at its own expense.

18.3 If the Contractor fails to rectify the defective work or service within a reasonable time of notice, provided that notice in writing of defects has been given to the Contractor within 3 years from the date of completion of the works and/or services, the Client is entitled to carry out or employ others to carry out the rectification of the defective work or service and thereafter recover the costs incurred from the Contractor.

18.4 The respective rights, obligations and liabilities of the Client and the Contractor as provided for in these Terms and Conditions shall to the extent permitted by law be exhaustive of the rights, obligations and liabilities of each to the other arising out of or in connection with the works and/or services, whether such rights, obligations and liabilities arise in relation to a breach of contract or of statutory duty or a tortuous or negligent act or omission which gives rise to a remedy at common law.

19. **Disputes**

19.1 If any dispute arises concerning this contract, either the party may at any time give notice to the other party requiring the dispute to be referred to adjudication in accordance with the Scheme for Construction Contracts (England and Wales) Regulations 1998.

20. **Governing Law and Jurisdiction**

20.1 These Terms and Conditions shall be governed by and in accordance with the law of England and Wales.

20.2 The parties submit to the exclusive jurisdiction of the Courts of England and Wales save for the enforcement of any judgement of those Courts.

SPECIAL

Unless stated to the contrary, in addition to the General Terms and Conditions, the following Special Terms and Conditions apply where M & J Drilling Services Limited provides the following works or services:

21. **Location and Treatment of Mineshafts**

21.1 Shaft Caps

21.1.1 Where in the course of the works or services, it becomes apparent that the full treatment of a mineshaft or adit requires the construction of an approved reinforced concrete cap ("additional works"), the Contractor will provide the Client with a quotation for the additional works.

21.2 Mine Entry Locations

21.2.1 Prior to the commencement of drilling works, the Client shall obtain expert advice on the interpretation of the available archive information and the subsequent surveying to establish whether there are any discrepancies between the 'best' plot position and 'actual' mineshaft (or adit) location.

21.2.2 The Client is responsible for establishing the stand off distances of proposed development from shafts set by Local Authorities or the NHBC in the relevant region.

22. **Grouting Sewers, Tunnels and Cellars**

22.1 **Survey**

22.1.1 The Client shall before any sewer is grouted, in order to determine accurately the volume of grout and reduce the risk of grout escape into 'live' systems or open waterways, commission a condition survey (CCTV/physical) to establish the size, integrity and if there are any connections along the section to be infilled. The Contractor does not accept any responsibility for and the Client shall indemnify and hold harmless the Contractor from any loss or damage the Contractor suffers as a result of loss of grout due to leakage through headwalls or unknown connections along the sewer run.

22.2 Headwalls

22.2.1 Where grouting is to be confined to a defined length of sewer, the Client shall procure the construction of a sealed cut off at either end to contain the grout until it sets. The Client is responsible for ensuring that any construction required by this clause is undertaken sufficiently in advance of the Contractor's personnel mobilising to site and that the headwalls or bungs are strong enough to resist the hydrostatic pressure of the placed grout.

22.2.2 The Client shall if required procure the placement of injection pipes as part of the headwall construction. The Contractor shall provide details after site inspection.

22.3 **Manhole Entry**

22.3.1 The Contractor will not enter into a manhole, sewer or other confined space until the Client has provided all the relevant safety equipment on site.

22.3.2 To enable confined space entry, the Client shall provide a tripod, winch, harness, escape set and gas monitor and a top man to operate the winch.

22.3.3 The Contractor's personnel will have the appropriate level of certification. If the quotation does not specifically included manhole entry, this will be an additional cost.

22.4 Grout Quantities

22.4.1 The rate for grouting a linear distance of known diameter includes for sufficient mixed volume of grout to refill the theoretical volume of the hole. If the volume of grout to fill a known void is reached before total removal of the void, then the Contractor will require a written instruction to continue. A further charge will be made for the additional materials and time required.

23. **Rotary Site Investigation (including Geothermal Investigations and Geothermal Borehole Loops Works)**

23.1 **Reports and Records**

23.1.1 The Contractor is entitled to pass borehole records onto the British Geological Survey for purpose maintaining a national archive.

23.2 **Backfilling**

23.2.1 Backfilling rates are based on placing sufficient material to fill the drilled volume of the borehole only.

23.2.2 The Contractor does not accept any responsibility for controlling the escape of ground water from the top of the borehole or any temporarily decolourisation of the surrounding area with fine cuttings.

COPELAND BOROUGH COUNCIL

Egremont Mining Instability Investigation

Tender Report

12 July 2012

Contents

Disclaimer

Copyright

1.0 INTRODUCTION

1.01 Faithful+Gould were appointed through Atkins on 10th July to provide a Tender Report on the Egremont Mining Instability project. The project's scope of works comprises firstly locate a mine shaft by probe drilling, then investigate the shaft infill by drilling to the base, followed immediately by shaft treatment utilising the investigation borehole to inject grout or pea gravel.

1.02 The Purpose of this report is to provide a full evaluation of tenders received.

2.0 TENDER ARRANGEMENTS

2.1 The following contractors were selected to provide tenders:-

- Forkers Ltd
- M&J Drilling Services Ltd
- Van Elle Total Foundation Solutions Ltd

2.2 Tenders were invited on 27th June 2012. The deadline for return of tenders was set at 5pm on 4th July 2012. This was extended to 5pm on 6th July 2012.

2.3 One tender clarification note was issued during the tender period.

3.0 TENDERS RECEIVED

3.1 Tenders were returned electronically by all Contractors.

3.2 The value of the tenders received in ascending order is as follows:-

Forkers Ltd	£89,600.00
Van Elle Ltd	£103,943.70
M&J Drilling Ltd	£121,749.00

3.3 The tender of Forkers Ltd did not have a total, merely a list of prices.

3.4 All of the above figures exclude VAT.

3.5 The overall spread of the tenders is quite high at around 36%.

4.0 ACTIONS TAKEN FOLLOWING RECEIPT OF TENDERS

4.1 A Tender Comparison is included in Appendix A and has been adjusted to take account of errors, clarifications and exclusions. An appraisal of the tenders highlighted the following notable terms:-

Forkers Ltd

- Standard terms and conditions included with tender based around an amended version of the ICE Conditions of Sub-contract.
- Allowance for standing time for rotary drilling plant, equipment and crew priced at item C19 as zero. This requires confirmation from the Contractor.
- No allowance made for hard-copy photographs.
- Bill of Quantities states a two week period for maintaining equipment at item A2. A lump sum figure of £6,100 has been included but it is uncertain whether this is for one week or two. This requires clarification from the Contractor.
- Forkers have priced both supply of pea gravel and the mix and injection of materials at items B4c and B5 as zero. It is assumed that these are included in item B1 however this requires confirmation from the Contractor.
- The Contractor has followed the Employer's Bill of Quantities format but has not provided an overall tender sum.

M&J Drilling

- Bespoke terms and conditions provided by the Contractor.
- The breakdown of the Contractor's tender generally did not follow the Employer's Bill of Quantities and therefore proved difficult to assess and allocate against the relevant items.
- No allowance for item B6 form grout plug over shaft.
- No allowance made for Item D1 as-constructed records/factual report.
- No allowance for hard-copy photographs.
- No allowance for C19 standing time for rotary drilling plant, equipment and crew.
- Item C33 backfill rotary drill-hole cost based on an incorrect quantity of 1,000m rather than 1,170m.

Van Elle Ltd.

- Bespoke terms and conditions provided by the Contractor.
- Rate of £55/T included for item B4c but not monied out. This requires confirmation from the Contractor.
- 479T used for item B5 (mix and inject materials) instead of the Employer's total of 2,283T. This requires confirmation from the Contractor.

5.0 CONCLUSIONS

5.1 The Tender Comparison included in Appendix A shows the submission of Forkers Ltd to be the best value for money. Subject to acceptable explanation of those items listed in section 4.0 of this report it is recommended that the tender of Forkers Ltd be accepted in the sum of £89,600 or such sum suitably amended following clarification.

APPENDIX A

TENDER COMPARISON

Egremont Mining Instability

Tender Comparison

				Forkers		M&J Drilling		Van Elle		
Number	**Item description**	**Unit**	**Quantity**	**Rate**	**Amount £**	**Rate**	**Amount £**	**Rate**	**Amount £**	**Comments**
	SHAFT TREATMENT									
A	***General***			***£***		***£***		***£***		
A1	Mobilise equipment and plant for grouting works	item	1	9100.00	9100.00	3400.00	3400.00			
A2	Maintain equipment and plant for grouting works	week	2	6100.00	6100.00	750.00	1500.00	40680.00	40680.00	
A3	Maintain welfare facilities	week	2	400.00	800.00	375.00	750.00			
A4	Standing time	hour	rate only	140.00	rate only	180.00	rate only	200.00	rate only	
A	***TOTAL***				***£16,000.00***		***£5,650.00***		***£40,680.00***	
Number	**Item description**	**Unit**	**Quantity**	**Rate**	**Amount £**	**Rate**	**Amount £**	**Rate**	**Amount £**	
B	***Shaft treatment***			***£***		***£***		***£***		
B1	Set up safety platform, grouting works equipment and plant at location of primary injection borehole	item	1	23000.00	23000.00	200.00	200.00	750.00	750.00	M&J is the sum of A10 & A11
B2	Set up safety platform, grouting works equipment and plant at location of secondary injection borehole	item	rate only	300.00	rate only	75.00	rate only	750.00	rate only	
B3	Drill in shaft infill material to form secondary boreholes (maximum depth 80m)	m	rate only	24.00	rate only	15.00	rate only	35.00	rate only	
B4a	Supply of materials - PFA	t	440	25.00	11000.00	15.00	6600.00	26.45	11638.00	
B4b	Supply of materials - cement	t	39	120.00	4680.00	130.00	5070.00	128.80	5023.20	
B4c	Supply of materials - pea gravel (10mm shingle)	t	1804	0.00	0.00	26.00	46904.00	55.00	0.00	Forkers have priced as zero; Van Elle have not extended the rate out
B5	Mix and inject materials	t	2283	0.00	0.00		31850.00	35.00	16765.00	Forkers have priced as zero; M&J Have priced mix & inject grout and inject gravel separately; adjusted by taking the mean price of both; Van Elle have used the wrong quantity
B6	Form grout plug over shaft	item		7200.00	7200.00	missing	missing		3000.00	No allowance made by M&J
B	***TOTAL***				***£45,880.00***		***£90,624.00***		***£37,176.20***	
Number	**Item description**	**Unit**	**Quantity**	**Rate**	**Amount £**	**Rate**	**Amount £**	**Rate**	**Amount £**	
C	***Testing***			***£***		***£***		***£***		
C1	Take set of 6 (six) 100mm concrete cubes	set	10	10.00	100.00	45.00	450.00	30.00	300.00	
C2	Crush testing of 100mm concrete cube in UKAS approved laboratory	test	50	10.00	500.00	12.50	625.00	included	included	
C3	Construct borehole in treated area by open-holing technique for permeability testing	m	80	24.00	1920.00	15.00	1200.00	22.45	1796.00	
C4	Carry out permeability testing at 5m vertical intervals by grout injection	number	14	120.00	1680.00	10.00	140.00	50.00	700.00	
C	***TOTAL***				***£4,200.00***		***£2,415.00***		***£2,796.00***	
Number	**Item description**	**Unit**	**Quantity**	**Rate**	**Amount £**	**Rate**	**Amount £**	**Rate**	**Amount £**	
D	***Reporting***			***£***		***£***		***£***		
D1	As-constructed records / factual report (daily journals, drawings/diagrams showing works carried out including grout volumes and mix injected)	item	1	800.00	800.00	missing	missing	included in prelims	included in prelims	No allowance made by M&J
D	***TOTAL***				***£800.00***		***£0.00***		***£0.00***	
	SHAFT TREATMENT TOTAL				***£66,880.00***		***£98,689.00***		***£80,652.20***	

Egremont Mining Instability

Tender Comparison

				Forkers		M&J Drilling		Van Elle		
	SITE INVESTIGATION									
Bill A	**General items, provisional services and additional items**									
A1	Offices and stores for the contractor	sum	1	0.00	0.00	200.00	200.00		incl in item A above	M&J item A9
A2	Establish on site all plant, equipment and services for a Green category site	sum	1	9600.00	9600.00	8360.00	8360.00		incl in item A above	M&J items A1, A2, A3, A5, A6, A7, A8
A6	Appropriate storage, transport and off-site disposal of contaminated arisings and any PPE equipment, excluding laboratory testing	provisional sum	1	400.00	400.00	4000.00	4000.00		incl in item A above	M&J item A4
A7.3	Provide Experienced Ground Engineer	p.day	10	90.00	900.00				incl in item A above	
A8	Establish the location and elevation of the ground at each exploratory hole	sum	1	900.00	900.00	4250.00	4250.00		incl in item A above	M&J items A10, A11
A9	Preparation of Health and safety documentation and Safety Risk Assessment	sum	1	100.00	100.00	included	included		incl in item A above	
A17	One master copy of the Final Factual Report	sum	1	800.00	800.00	50.00	50.00		incl in item A above	
A18	Additional copies of the Final Factual Report	nr	2	0.00	0.00	included in A17	included in A17		incl in item A above	
A26	Hard-copy photographs	nr	20	missing	missing	missing	missing		incl in item A above	No allowance made by Forkers and M&J
BILL A	***TOTAL***				***£12,700.00***		***£16,860.00***		***£0.00***	
Bill C	**Rotary Drilling**									
	Rotary drilling with and without core recovery									
C15	Move rotary drilling plant and equipment to the site of each exploratory drillhole and set up	nr	102	15.00	1530.00		700.00	included	included	M&J have costed this as two separate prices; included as a lump sum
C19	Standing time for rotary drilling plant, equipment and crew	h	15	0.00	0.00	missing	missing	200.00	3000.00	No allowance made by M&J. Forkers priced at zero.
	Drilling without cores									
C21	Rotary drill in materials other than hard strata at the specified diameter, from which cores are not required, between existing ground level and 10m depth	m	1000	5.00	5000.00	2.00	2000.00	5.00	5000.00	
C27	Rotary drill in hard strata at the specified diameter, from which cores are not required, between existing ground level and 10m depth	m	20	12.00	240.00	15.00	300.00	22.45	449.00	
C27a	As Item C27 but between 10m and 20m depth	m	20	12.00	240.00	15.00	300.00	22.45	449.00	
C28	As Item C27 but between 20m and 30m depth	m	20	12.00	240.00	15.00	300.00	22.45	449.00	
C28a	As Item C27 but between 30m and 40m depth	m	20	12.00	240.00	15.00	300.00	22.45	449.00	
C29	As Item C27 but between 40m and 50m depth	m	20	12.00	240.00	15.00	300.00	22.45	449.00	
C30	As Item C27 but between 50m and 60m depth	m	20	12.00	240.00	18.00	360.00	22.45	449.00	
C30a	As Item C27 but between 60m and 70m depth	m	20	12.00	240.00	18.00	360.00	22.45	449.00	
C31	As Item C27 but between 70m and 80m depth	m	20	12.00	240.00	18.00	360.00	22.45	449.00	
C31a	As Item C27 but between 80m and 90m depth	m	10	12.00	120.00	18.00	180.00	22.45	224.50	
C33	Backfill rotary drillhole with cement/bentonite grout or bentonite pellets	m	1170	1.00	1170.00		500.00	7.50	8775.00	M&J have costed based on incorrect value of 1000m rather than 1170, corrected estimate accordingly
BILL C	***TOTAL***				***£9,740.00***		***£5,960.00***		***£20,591.50***	
Bill D	**Pitting and trenching**									
	Inspection Pits									
D1	Excavate inspection pit by hand to 1.2m depth	nr	2	80.00	160.00	60.00	120.00	150.00	300.00	
D2	Extra over Item D1 for breaking out surface obstructions	h	2	60.00	120.00	60.00	120.00	200.00	400.00	
Bill D	***TOTAL***				***£280.00***		***£240.00***		***£700.00***	
	SITE INVESTIGATION TOTAL				***£22,720.00***		***£23,060.00***		***£21,291.50***	

Egremont Mining Instability

Tender Comparison

	Forkers		M&J Drilling		Van Elle	
TENDER TOTAL		**£89,600.00**		**£121,749.00**		**£101,943.70**
ADJUSTMENTS						
Forkers						
Maintain equipment for 2 weeks instead of 1 at item A1.		6100.00				
Rate for hard copy photographs missing at A26. Cost assumed.		500.00				
M&J Drilling						
Form grout plug over shaft at B6. Cost assumed				7200.00		
As constructed factual records at D1. Cost assumed				800.00		
Rate for hard copy photographs missing at A26. Cost assumed.				500.00		
Standing time for rotary drilling plant as C19 assumed zero.				0.00		
Correction of C33 to 1,170m				85.00		
Van Elle						
At item B4c rate only inserted. Adjustment 1,804T @ £55/t						99220.00
Correction of quantity at item B5 from 479T to 2,283T						63140.00
ADJUSTED TENDER TOTAL		**£96,200.00**		**£130,334.00**		**£264,303.70**
POSITION		**1st**		**2nd**		**3rd**

AUTHORISATION
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CONSTRUCTIVE EXPERTISE

FGOULD.COM

Egremont Mining Instability

Copeland Borough Council

Geophysical Survey

Report Status: Final

MGX Project Number:5597

MGX File Ref: 5597f-005.doc

27th February 2012

Confidential Report To:

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Minerex
Geophysics Limited

Subsurface Geophysical Investigations

EXECUTIVE SUMMARY

1. Minerex Geophysics Ltd. (MGX) carried out a geophysical survey consisting of EM31 ground conductivity, 2D-Resistivity, Ground Penetrating Radar (GPR), magnetics, seismic refraction (p-wave) and MASW (s-wave) surveying for the ground investigation of the Egremont mining instability.
2. The main objectives were to locate Pit 2 and to investigate the subsidence of ground happening in the southern part of the field.
3. Other objectives of the survey were to determine ground conditions, estimate the depth to rock and overburden thickness, establish a geological model of the site and detect underground objects or anomalies.
4. The survey describes a complex geological ground model that is drawn on Figure 2.
5. The overburden geology consists of a distinct clean sand/gravel body that is well defined in shape and extent on profiles R1 – R3. Outside this body the overburden is gravelly clay.
6. The bedrock geology is complex and various layers have been outlined in the interpretation based on resistivities and seismic velocities. Notable is the rock getting shallower to the north (R5) and a large fold or fault indicated by the up doming of a possible mineralized layer.
7. Under the area of subsidence some strong and abrupt resistivity changes exist that may be an indication of the subsidence or of a fault that would accelerate subsidence. Rapid changes between mineralized layers and clean limestone have been found at the area of subsidence.
8. The clean sand/gravel body has a very loose – loose compaction and low shear strength. This indicates that this body might not stand up to an upward migrating cavity or be able to bridge and support the ground against upward migrating cavities. It has excellent water permeability allowing water to percolate vertically which is a factor that can aggravate subsidence. It was noted that the field at the lowest areas is quite dry and that there is no visible water drainage.
9. If drilling in the field at the area of subsidence is intended than some drill targets can be taken from this survey.
10. Shallow resistivity, conductivity and GPR anomalies at the rear of houses 28 and 29 should be investigated by excavation and careful documenting all findings. The anomalies may not be Pit 2 but can contain clues to its existence.
11. A linear underground pipe/object/cable was noted running east to west through the field. The nature of this should be first established with utility companies. The object may be under risk itself from subsidence or, if it is a water pipe leaking, it may aggravate the subsidence.

CONTENTS

List of Tables, Maps and Figures:

1. INTRODUCTION

1.1 Background

Minerex Geophysics Ltd. (MGX) carried out a geophysical survey for the ground investigation of the Egremont Mining Instability. The survey consisted of EM31 ground conductivity, 2D-Resistivity, Ground Penetrating Radar (GPR), Magnetic, seismic refraction (p-wave) and MASW (s-wave) measurement. The survey was commissioned by Atkins acting on behalf Copeland Borough County.

The two main objectives were to investigate the existence of indications for Pit 2 and to investigate the ground around the subsidence in the field closest to Pit 2. A longer resistivity profile (R5) was done in the only location that allowed a longer profile to be surveyed and it was done to take a look at the deeper geology.

The pre-existing information is laid out in a Memo by Atkins (Atkins 2011). This memo should be read prior to reading this report in order to understand the background to this project.

1.2 Objectives

The main objectives of the project are:

- The location, depth and conditions of the mine shaft Pit 2
- The base of the sand and gravel
- The presence of voids migrating to the surface
- The location and depth of the mine working

The limitations of the survey to address the objectives were intensively discussed among the project team prior to the survey and the two main objectives for the geophysical survey were as stated in 1.1.

1.3 Site Description

The site is located between North Road and Howbank Road. The main investigation focus was on the field where most of the mining works and robbed pillars are located, but a further interest exists in the area between the bowling green and the roundabout in the North.

The location of Pit 2 based on the desk study by Atkins (2011) is visible on Map 1 and the pit is located at the boundary of the back gardens houses 27 – 30. The back gardens are quite small and heavily congested with plants, sheds, fences, posts and garden furniture. There was no access to the gardens for the survey, and given the congestion of the garden is would seem doubtful that meaningful geophysical surveying could have been done inside the gardens.

The adjacent field, i.e. the field bordering on houses no 21-38 Howbank Road and 36 and 37 North Road, has been subject to subsidence and the lowest part of the field occurs in the SE corner close to houses 36 and 37 North Road. It is notable that there is no surface water drainage, neither is the field wet at the lowest

point, therefore water drainage through the ground must be excellent. The lowest points occur at the southern end of R2 – R4.

1.4 Geology

The geological background is described in the Atkins Memo. The overburden is either sand/gravel of clay-rich sediments. The bedrock consists of limestone that is either clean with a potential for karstification or has shaley and muddy components. There is substantial iron ore mineralisation that led to the mining in historical times. Faulting and folding are common under the site and have been a major factor in the mineralisation.

Under the field in question, where the subsidence occurred, the Gillfoot mine was extracting iron ore at a level of 40 to 60 m bgl. and possibly over three levels. Therefore the combined thickness of iron ore extracted may be in the order of 5 – 15.

1.5 Report

This report includes the results and interpretation of the geophysical survey. Maps, figures and tables are included to illustrate the results of the survey. More detailed descriptions of geophysical methods and measurements can be found in GSEG (2002), Milsom (1989) and Reynolds (1997).

The client provided background maps of the site and these were used as the background map in this report. Elevations were surveyed and are included in the vertical sections.

The interpretative nature and the non-invasive survey methods must be taken into account when considering the results of this survey and Minerex Geophysics Limited, while using appropriate practice to execute, interpret and present the data, give no guarantees in relation to the existing subsurface.

2. GEOPHYSICAL SURVEY

2.1 Methodology

The methodology consisted of using a range of geophysical methods that would relate to the objectives of the survey.

The methods of EM31 Ground Conductivity, 2D-Resistivity and Seismic Refraction are mainly done to gather information about the geological background while MASW yields some geotechnical parameters. From these surveys a ground model is developed.

Methods like EM31 ground conductivity, Ground Penetrating Radar (GPR) and Magnetics are done to detect objects that may be directly related to the existence of a pit or shaft.

All geophysical surveys are acquired, processed and reported in accordance with British Standards BS 5930:1999 +A2:2010 'Code of Practice for Site Investigations'.

The survey locations are indicated on Map 1. 2D-Resistivity (R1 – R5) and Seismic Refraction (S1 – S4) profiles are indicated while MASW was done on the seismic refraction layouts. The GPR survey, initially only intended for the immediate area close to Pit 2, was also used scanning through the field and along all back gardens on the field side. For the GPR survey only the three anomalous areas are shown that can be found on Figure 3. The EM31 and magnetic survey was done over the whole field area, and the EM31 was also done over the grass area to the north of the bowling green.

2.2 EM31 Ground Conductivity

The EM31 ground conductivity survey was carried out on lines nominally 3 m apart. Along each line a reading of ground conductivity was taken every 0.5 second while walking along, thereby resulting in a survey grid of nominally 3 x 1 m. The locations were measured with a sub-meter accuracy SERES DGPS system attached to the EM31 and all data was jointly stored in a data logger. The conductivity meter was a GEONICS EM31 with Allegro data logger and NAV31 data acquisition software. The instrument was checked at a base station, the readings were stable and no drift occurred.

EM31 ground conductivity determines the bulk conductivity of the subsurface over a typical depth between 0 and 6 m bgl. and over a radius of approx. 5m around the instrument. When looking for clay, silt and water infill within rock occurring at relatively shallow depth the EM31 can find anomalous rock zones with a vertical extent of approx. 3m. The measurements are disturbed by metal and other conductive objects within the range of the instrument and therefore no geological interpretations can be made in the vicinity of such man-made objects. Either readings were not taken near sources of interference in the first place or notes were taken by the operator in order to account for these in the interpretation.

2.3 2D-Resistivity

During 2D-Resistivity surveying data is acquired in the form of linear profiles using a suite of metal electrodes. A current is injected into the ground via a pair of electrodes while a potential difference is measured across a second pair of electrodes. This allows for the recording of the apparent resistivity in a two-dimensional arrangement below the profile. The data is inverted after the survey to obtain a model of subsurface resistivities. The generated model resistivity values and their spatial distribution can then be related to typical values for different geological materials.

Five 2D-Resistivity profiles with electrode spacing of 3 or 5 m were surveyed at the locations shown on Map 1. The readings were taken with a Tigre Resistivity Meter and Imager Cables.

The presence of metal underground services like water or gas pipes running along the survey line may influence the results of the survey.

2D-Resistivity has proven zones of anomalous rock/karstified rock with lateral extents of 5 m and more.

2.4 Seismic Refraction

In the seismic refraction survey method a p-wave is generated by a source at the surface resulting in energy travelling through surface layers directly and along boundaries between layers of differing seismic wave velocities. Processing of the seismic data allows geological layer thicknesses and boundaries to be established.

The seismic survey consisted of p-wave seismic refraction profiling. Each of the four profiles consisted of 24 geophones with 3 m spacing, resulting in lengths of 69m per profile. The recording equipment consisted of a 24 Channel GEOMETRICS ES-3000 engineering seismograph with 4.5 Hz vertical geophones. The seismic energy source consisted of a hammer and plate. A zero delay trigger was used to start the recording. Up to 7 shot points per p-wave profile were used.

Seismic Refraction generally determines the depth to horizontal or near horizontal layers where the compaction/strength/rock quality changes with an accuracy of 10 – 20% of depth to that layer. Where low velocity layers are present or where layers dip with more than 20 degrees angle the accuracy becomes much less.

2.5 MASW (Multichannel Analysis of Surface Waves)

The seismic shear wave velocity was determined by active MASW surveying. MASW (Multi-Channel Analysis of Surface Waves) determines the bulk seismic shear wave velocity versus depth. The velocities are used to determine the small strain shear modulus and to compute other geotechnical parameters. As the seismic p-wave velocities are measured along some of the same profiles the density can be estimated and other elastic parameters like Poisson ratio and young's modulus can be computed.

The MASW method was acquired along with the seismic refraction survey though the shots were done individually with a larger time window. The MASW used 24 geophones with 3 m spacing and a length of 69m per profile. The shot points were located at the ends of each profile.

2.6 Ground Penetrating Radar

The methodology for the Ground Penetrating Radar survey consisted of scanning with 100 and 400MHz antenna. Initially only an area around Pit 2 was to be surveyed but a wider area in the field, especially along the row of houses 21-38 was scanned.

The GPR survey was carried out with a SIR3000 system. The data was collected in the time domain and where anomalies were found on the screen some data examples were recorded.

The depth penetration of the EM pulse emitted by the Ground Penetrating Radar is predominantly dependent on the electrical conductivity of the ground beneath the antenna. A clay rich soil will have a higher conductivity and therefore lower resistivity and allow less penetration than a clean dry sand/gravel or limestone.

2.7 Magnetics

A search of the immediate area around Pit 2 with a magnetic gradiometer was initially intended but then widened over the whole field as there was some indication in discussion with the engineers that the field may have been used to dump cars or waste in deeper pits. This was found to be not the case. The magnetic gradient was determined with a walking magnetic gradiometer at a line spacing of 3 m and at 0.5 sec intervals. The position was determined by GPS.

2.8 Site Work

The data acquisition was carried out on the 30th and 31st of January 2012. The weather conditions were fair throughout the acquisition period. Health and safety standards were adhered to at all times.

The locations and elevations were surveyed with a TRIMBLE RTK-GPS to accuracy < 0.02m.

3. RESULTS AND INTERPRETATION

The interpretation of geophysical data was carried out utilising the known response of geophysical measurements, typical physical parameters for subsurface features that may underlay the site, and the experience of the authors.

3.1 EM31 Ground Conductivity

The EM31 ground conductivity values were merged into one data file for each survey area and contoured and gridded with the SURFER contouring package. The contours are created by gridding and interpolation and care must be taken when using the data. The contour map is overlaid over the location and base map (Map 2) and the values in milliSiemens/metre (mS/m) are indicated on the colour scale bar.

Low conductivities would indicate either shallow bedrock or dry sandy and gravely overburden while higher conductivities would indicate deeper bedrock, zones of bedrock mineralisation/karstification and clay-rich overburden. Very high or very low conductivities indicate noise from man made metal objects. High interference typically occurs along field boundaries.

The undisturbed readings in the field range from about 2-15 mS/m. The lower readings can be seen in cyan colours at the north western part of the field and they indicate clean sand/gravel sediments. Towards the eastern and southern direction the readings slowly increase and indicate a transition to clay-rich overburden. The subsequent interpretation of the seismic data shows that the bedrock is deep enough to deduce that all EM31 ground conductivities represent the overburden rather than the rock.

The low resistivities in the field indicate the presents of a substantial clean sand/gravel body. Some readings taken in the grass landscaped area to the north of the bowling green indicate that average readings of 8 – 12 mS/m are present that indicate gravelly clay as the main overburden type north of the bowling green.

There is a strong linear anomaly running through the field from the corner of property 37 North Road towards the back of house 35 on Howbank Street. This is interpreted as a metal pipe or large metal cable. The existence of this underground utility should be checked against the records of utility providers.

3.2 2D-Resistivity Profiles

The 2D-Resistivity data was positioned and inverted with the RES2DINV inversion package. The programme uses a smoothness constrained least-squares inversion method to produce a 2D model of the subsurface model resistivities from the recorded apparent resistivity values. Three variations of the least squares method are available and for this project the Jacobian Matrix was recalculated for the first three iterations, then a Quasi-Newton approximation was used for subsequent iterations. Each dataset was inverted using seven iterations resulting in a typical RMS error of < 3.0%. The resulting models were colour contoured with the same scale for all profiles and they are displayed as cross sections (Figure 1).

The resistivities cover an extremely wide range of values that can represent any geological material from mineralised ore bodies (low resistivity) to clean limestone (high resistivities). The resistivities reflect the

complex geology of the area with rapid changes within the bedrock and indications for faulting and folding. The main overburden feature is the shallow sand/gravel body in the field visible on R1 – R3. On R4 this clean sand/gravel is absent and replaced by gravelly clay. The high resistivities tie in with the low conductivities of the EM31 survey and clearly outline the sand/gravel body.

There were some very low resistivities recorded at depth and at various places across the site that are interpreted as possible mineralisation. The resistivity values are such small that they are below the range of values that can be expected for the limestone, shale or mudstone that may underlie the site. The interpretation on Figure 2 shows the geological model.

A small v-shaped low resistivity anomaly within the higher resistivity sand/gravel body at the back of the house 28 could be related to backfill in relation to Pit 2 and is recommended for further testing by excavation.

3.3 Seismic Refraction Data

The seismic refraction data was positioned and processed with the SEISIMAGER software package to give a layered model of the subsurface. The numbers of layers has been determined by analysing the seismic traces and 4 layers were used in the models. All seismic profiles were subject to a standardised processing sequence which consisted of a topographic correction which was based on integrated elevation data, first break picking, tomographic inversion, travel-time computation via ray-tracing and velocity modelling. Residual deviations of typically 0.8 to 1.7 msec RMS have been obtained for each profile. Following each processing stage QC procedures were adhered to. The resulting layer boundaries are shown as thick lines overlaid on the 2D-Resistivity cross sections (Figure 1). The seismic velocities obtained within the layers are annotated on the sections in bold red letters.

3.4 Interpretation Resistivity and Seismic Refraction

Table 1 summarises the interpretation. The compaction/strength/rock quality has been estimated from the seismic velocity.

Interpreted cross sections are shown in Figure 2. The interpretation has been made from all available information. For overburden layers and the top of the rock the seismic refraction data has been used as seismic refraction is the best method to delineate layer boundaries. The resistivity models have been used to delineate two generalised types of rock and to indicate rock head where no seismic refraction data was acquired. Resistivity data is better suited to show rock types and features within the rock while seismic refraction velocities are indicating the change of compaction/stiffness/rock quality with depth. Along short profile parts where only one data type is available an interpolation for the interpreted layers was made. On profile R5 no seismic data was present and the interpretation made from the resistivities alone use the terminology corresponding to seismic layers 2 and 4.

Table 1: Summary of Results and Interpretation

Layer	General Seismic Velocity Range (km/sec)	General Resistivity Range (Ohmm)	Compaction/ Strength/ Rock Quality	Interpretation
1a	0.2	> 500	Loose	Sand and Gravel (Overburden)
1b	0.2	< 500	Soft	Gravelly Clay (Overburden)
2a	0.4 – 0.6	> 500	Loose-dense	Sand and Gravel (Overburden)
2b	0.4 – 0.8	< 500	Firm	Gravelly Clay (Overburden)
3a	2.0	50 - 500	Poor – Fair	Weathered Rock (Shaly Limestone)
3b	2.0	< 50	Poor - Fair	Weathered Rock (pos. Mineralisation)
3c	2.0	> 500	Poor - Fair	Weathered Rock (Clean Limestone)
4a	3.8 – 4.0	50 - 500	Poor – Fair	Strong Rock (Shaly Limestone)
4b	3.8 – 4.0	< 50	Poor - Fair	Strong Rock (pos. Mineralisation)
4c	3.8 – 4.0	> 500	Poor - Fair	Strong Rock (Clean Limestone)

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3.5 MASW

The MASW profiles were positioned and processed with the SEISIMAGER/SW software package. The objective is to obtain a profile of shear wave velocity versus depth and to calculate the small strain shear modulus (stiffness) from the velocities. Following processing steps are done to achieve this:

1. Edit the shot point geometry and display the two opposed shot points for each profile
2. A dispersion curve (phase velocity versus frequency plot) is computed
3. The maximum amplitudes of the dispersion curve are selected, truncated and smoothed
4. An initial model of shear-wave velocity versus depth V_s is computed
5. An inversion is carried out to create the final V_s curve
6. The results for the two shot points for each profile are compared
7. For stable repeatable results the average shear wave velocity for a layer (as interpreted from the p-wave refraction) is extracted and entered into Table 2.

Good results for profile S1 – S3 were obtained for a depth level that represents the sand/gravel body. No useful s-wave could be extracted for S4 where the ground changes and the rock is shallower.

P-and S-waves for the sand/gravel body on S1 – S3 are relatively small and indicate a loose to dense compaction. The low level of compaction of these sediments would make them liable to subsidence as they have little strength to withstand an upwards migrating cavity. It is likely that these sediments slowly subside into underlying voids.

Table 2: MASW Results

Profile	**Depth Range (m)**	**P-wave velocity (m/s)**	**S-Wave Velocity (m/s)**
S1	2 – 6	600	155 – 295
S2	2 – 6	500	166 – 300
S3	2 – 6	400	160 - 270

3.6 GPR Data

The GPR data was displayed as an example for the anomalies marked G1 – G3 on the maps. The examples are indicated on Figure 3. A small anomaly was found and marked at G1 and it is likely that this is a geological feature or cause by moisture change or a small man-made object buried below the ground.

Anomalies G2 and G3 are more interesting as there are some flat lying zones 3 – 4 m wide where the reflection pattern changes. While these are unlikely direct indications of the Pit 2 they may be related to activities taken place around a former pit/shaft and it is recommended to excavate the area in the search for Pit 2.

3.7 Magnetics

The magnetic gradient map of the survey in the field indicates the presence of ferrous magnetic metal. Around the edges of the field the high positive or negative anomalies indicate the presence of fences. Within the field many small anomalies exist as can be seen by the red/blue bipolar pattern. These would be underlain by small ferrous metal objects below the field. A faint line of anomalies can be seen along the pipe/cable found on the EM31 data. The large red anomaly at the end of this line at the rear of house 34 is due to a burned out mattress. The main anomalies are in the north-east corner of the field in close proximity to the North Road. It is interpreted that most of these objects are scattered metal parts associated with building the North Road or other waste parts.

The interpretation based on the size of the anomalies yields that there are no buried large objects like cars or landfills under the field. One theory stated that the subsidence in the lower southern part of the fields is due to former excavations and backfill with cars or waste. This theory can be ruled out as there are no large enough anomalies in the field to indicate large metal objects.

It is interesting to notice that the unknown pipe/cable crossing the field does only have a faint magnetic anomaly which is probably due to backfill rather than the object itself. Therefore is can be said that the object is made from electrically conductive metal but not magnetic ferrous metal. Such material could be copper or lead.

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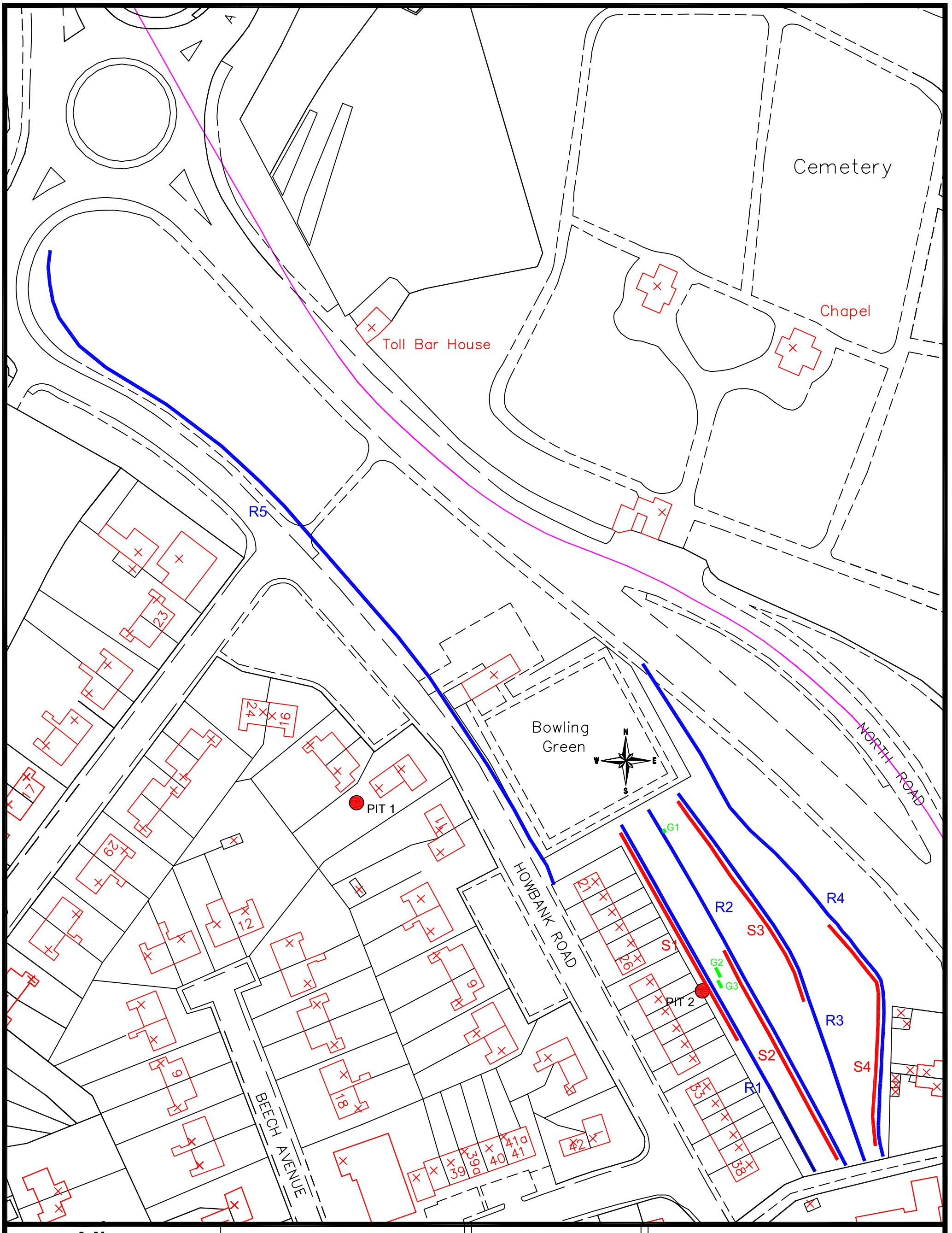
4. REFERENCES

1. **Atkins 2011**. Memo on Egremont Mining Instability Preliminary Desk Study Review. Ref 5103536.011. 31st August 2011.

2. **GSEG 2002.** Geophysics in Engineering Investigations. Geological Society Engineering Geology Special Publication 19, London, 2002.

3. **Milsom, 1989.** Field Geophysics. John Wiley and Sons.

4. **Reynolds, 1997.** An Introduction to Applied and Environmental Geophysics. John Wiley and Son.



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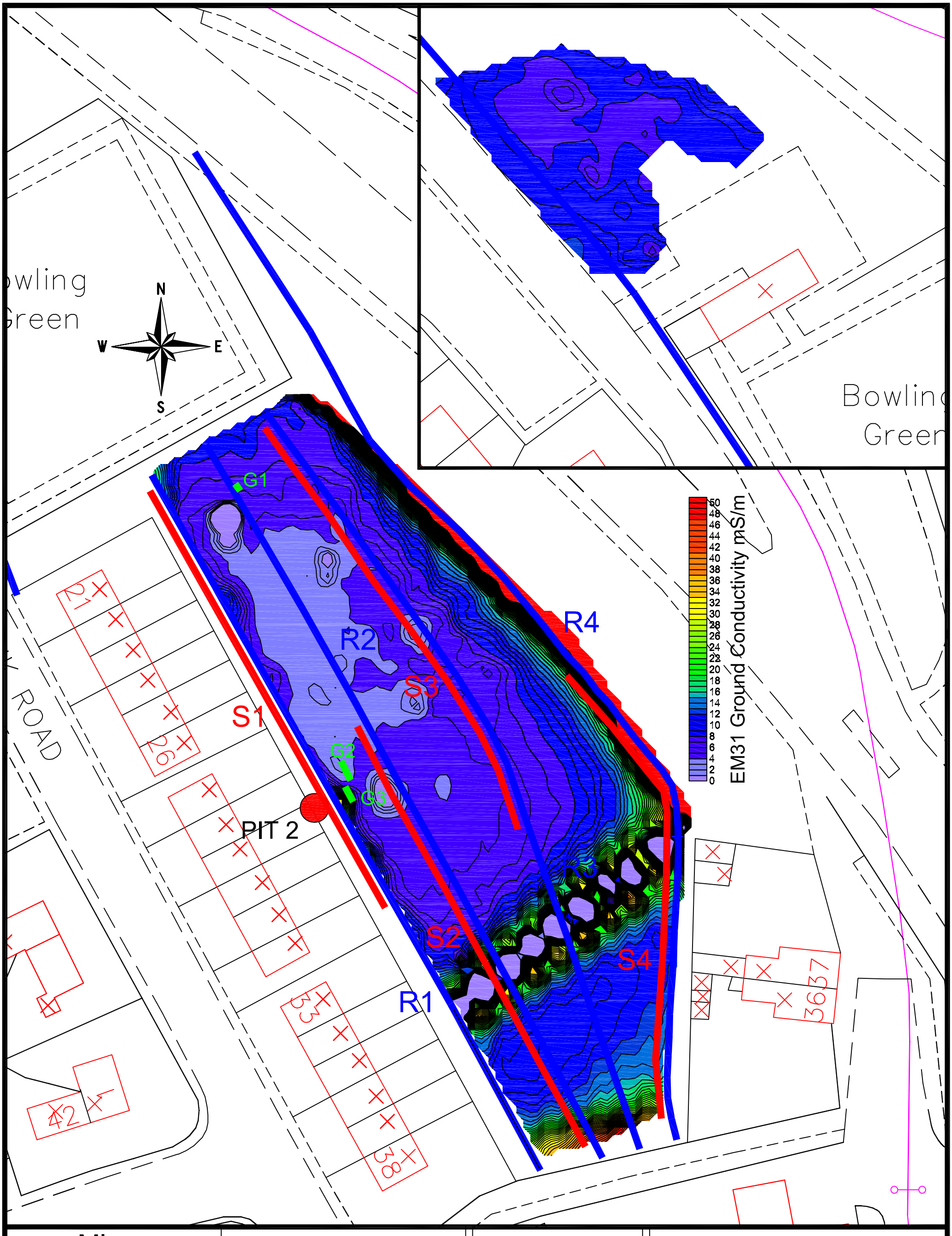
CLIENT	Copeland Borough Council Atkins
PROJECT	Egremont Mining Instability Geophysical Survey
TITLE	Map 1: Geophysical Survey Location Map

SCALE:	1:1000 @A3
PROJECT:	5597
DRAWN:	HK
DATE:	08/02/2012
MGX FILE:	5597f_Maps.dwg
STATUS:	Final

LEGEND:

- Seismic Refraction Profile
- 2D-Resistivity Profile
- Ground Penetrating Radar (GPR) Anomaly
- Possible Pit 2 Location



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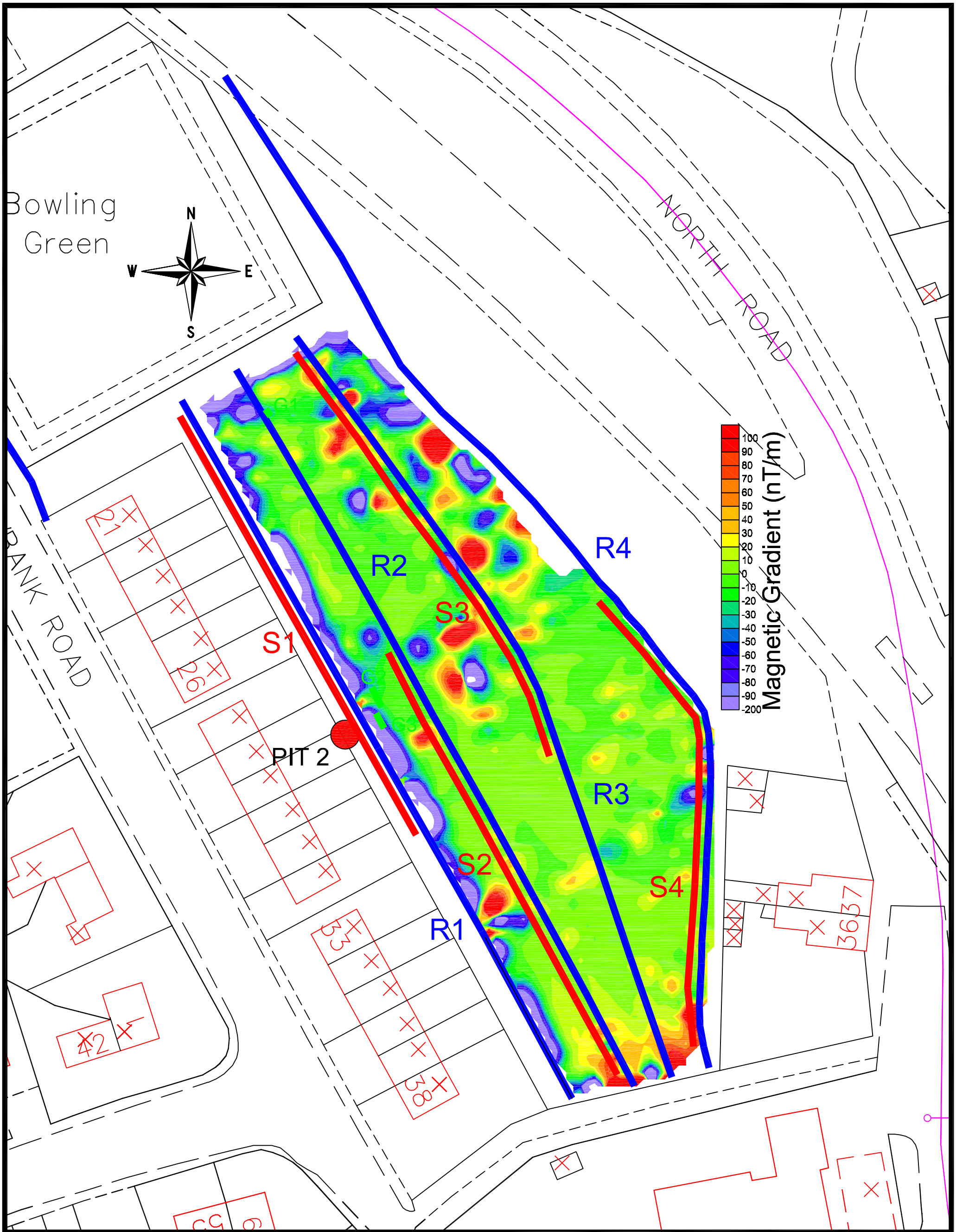
CLIENT	Copeland Borough Council Atkins
PROJECT	Egremont Mining Instability Geophysical Survey
TITLE	Map 2: EM31 Ground Conductivity Contour Map

SCALE:	1:500 @A3
PROJECT:	5597
DRAWN:	HK
DATE:	08/02/2012
MGX FILE:	5597f_Maps.dwg
STATUS:	Final

LEGEND:

The contour maps indicate the measured EM31 ground conductivity that represent the average ground conductivities between 0 - 6 m depth. The colour scale indicates the conductivities in mS/m.



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CLIENT	Copeland Borough Council Atkins
PROJECT	Egremont Mining Instability Geophysical Survey
TITLE	Map 3: Magnetic Gradient Countour Map

SCALE:	1:500 @A3
PROJECT:	5597
DRAWN:	HK
DATE:	08/02/2012
MGX FILE:	5597f_Maps.dwg
STATUS:	Final

LEGEND:

The contour maps indicate the measured magnetic field gradient between two sensors 0.8m vertically apart. The colour scale indicates the gradient in nT/m.

Bowling Green

N
W
E
S

NORTH ROAD

BANK ROAD

G1
G2
G3

R1
R2
R3
R4

S1
S2
S3
S4

PIT 2

21
26
33
38
42
36
37

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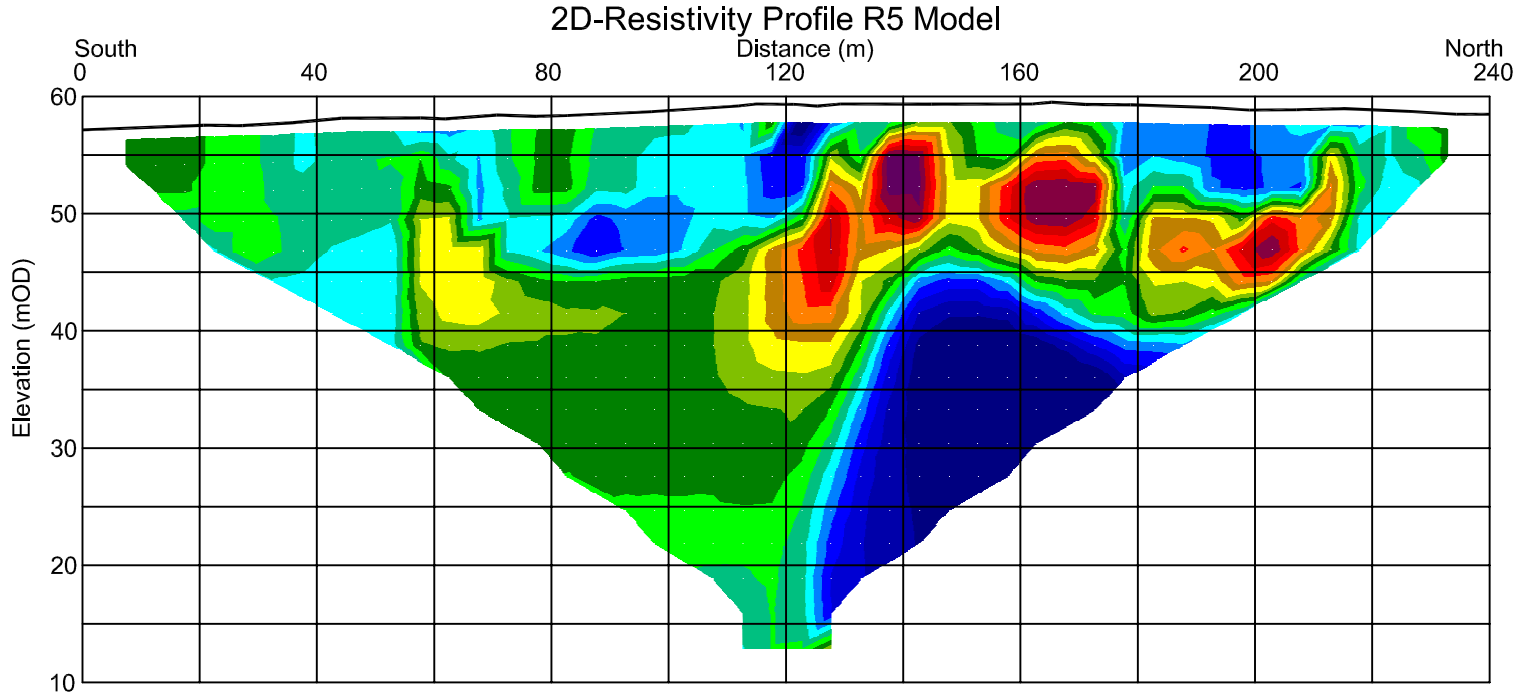
CLIENT	Copeland Borough Council Atkins
PROJECT	Egremont Mining Instability Geophysical Survey
TITLE	Map 4: Interpretation Map

SCALE:	1:500 @A3
PROJECT:	5597
DRAWN:	HK
DATE:	08/02/2012
MGX FILE:	5597f_Maps.dwg
STATUS:	Final

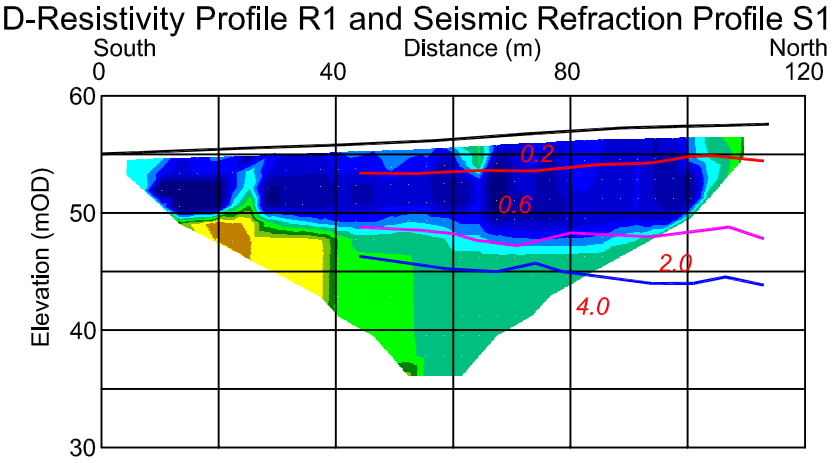
LEGEND:

- Seismic Refraction Profile
- 2D-Resistivity Profile
- Ground Penetrating Radar (GPR) Anomaly
- Possible Pit 2 Location
- Unknown Underground Pipe
- Anomalies (Pos. Pit 2) at Houses 28/29

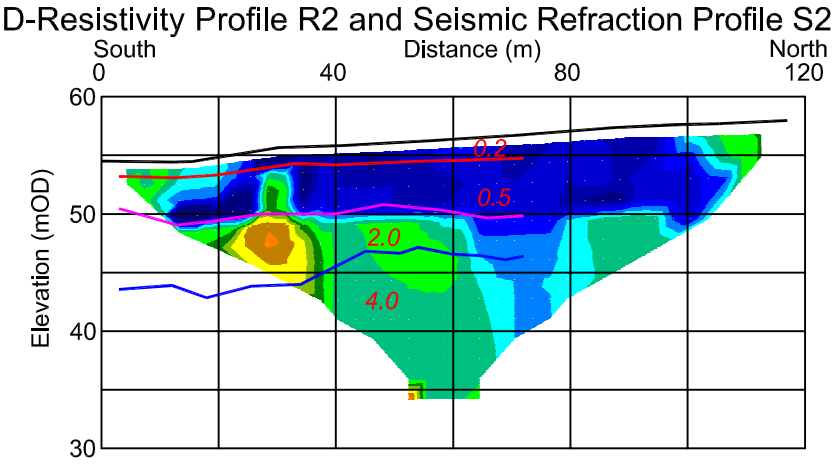
2D-Resistivity Profile R5 Model



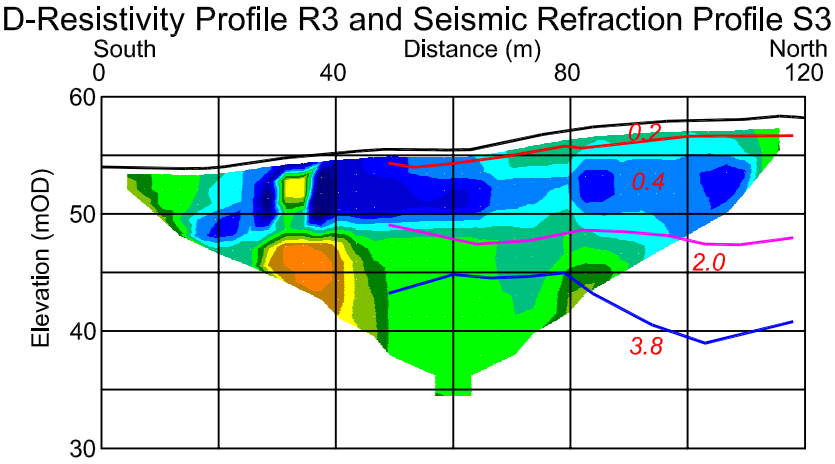
2D-Resistivity Profile R1 and Seismic Refraction Profile S1 Model



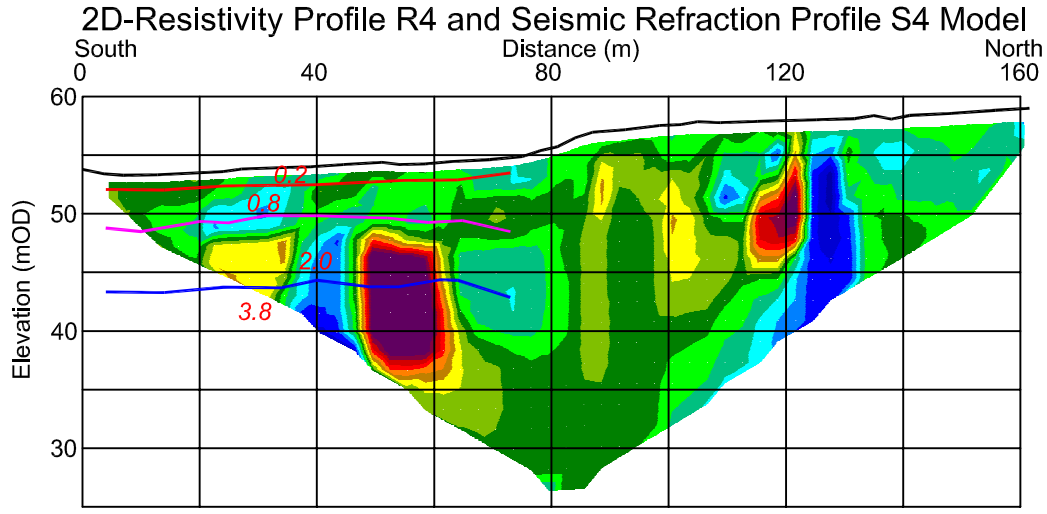
2D-Resistivity Profile R2 and Seismic Refraction Profile S2 Model



2D-Resistivity Profile R3 and Seismic Refraction Profile S3 Model



2D-Resistivity Profile R4 and Seismic Refraction Profile S4 Model



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CLIENT	Copeland Borough Council Atkins
PROJECT	Egremont Mining Instability Geophysical Survey
TITLE	Figure 1: Results of 2D-Resistivity and Seismic Refraction Data

SCALE:	NTS, VE x 2
PROJECT:	5597
DRAWN:	HK
DATE:	08/02/2012
MGX FILE:	5597f_Figs.dwg
STATUS:	Final

LEGEND:

1.5 Seismic Velocity km/s

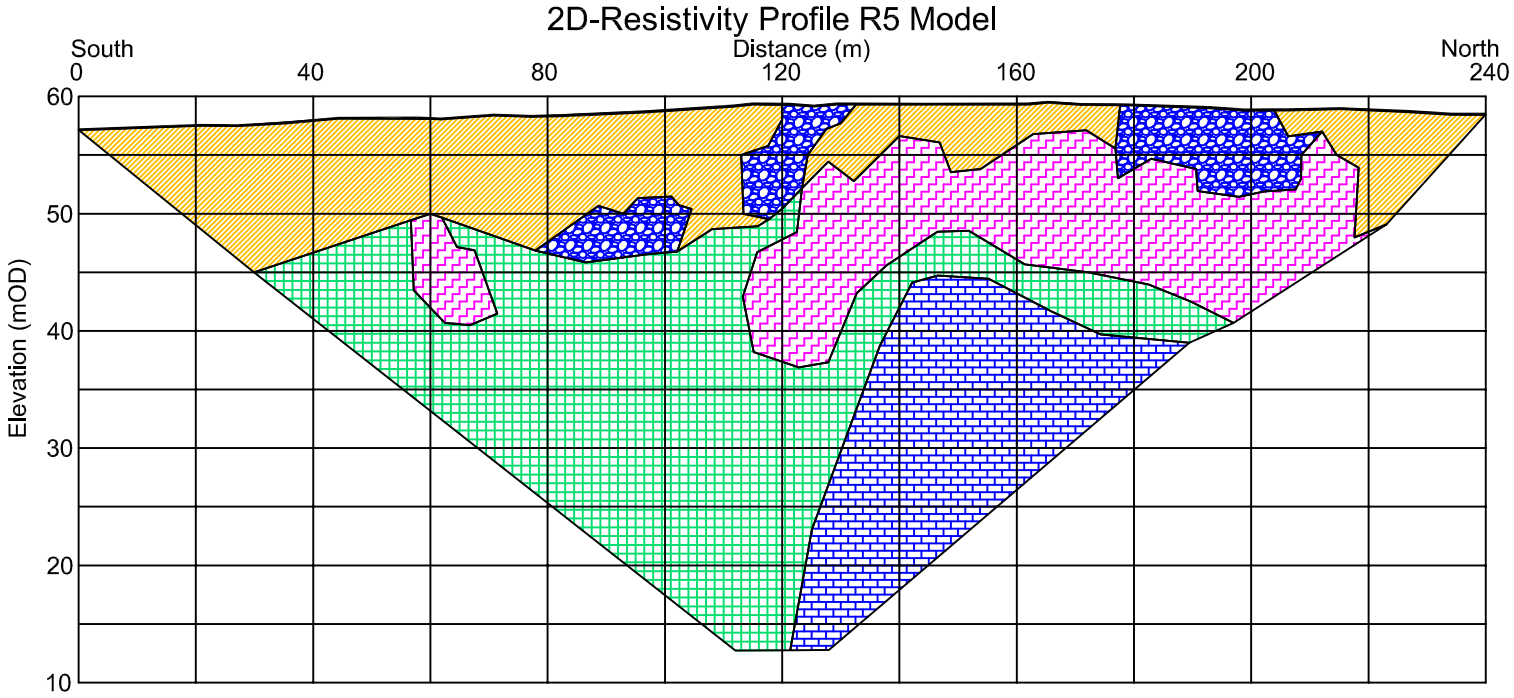
Layers from Seismic Refraction Model:

- Ground Surface/Top of Layer 1 (0.2 km/s) Loose/soft Overburden
- Top of Layer 2 (0.4 - 0.6 km/s) Loose-dense/firm Overburden
- Top of Layer 3 (2.0 km/s) Weathered Rock
- Top of Layer 4 (3.8-4.0 km/s) Strong Rock

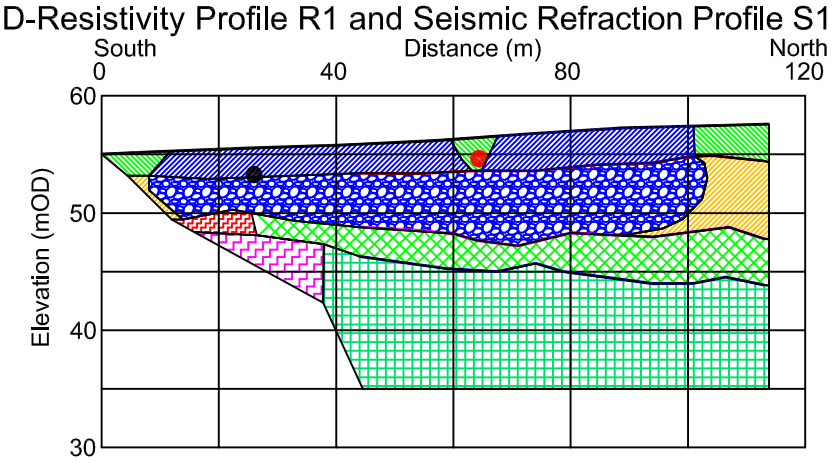
Model Values 2D-Resistivity (Ohmm)

5.00 11.3 25.3 57.0 128 288 649 1460

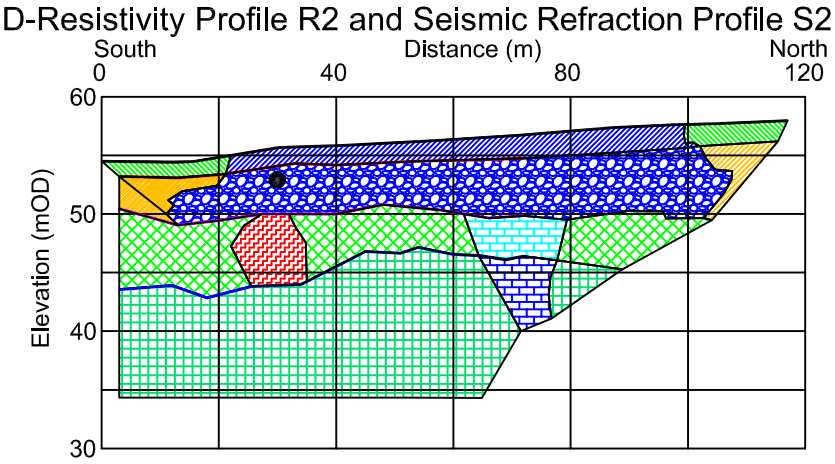
2D-Resistivity Profile R5 Model



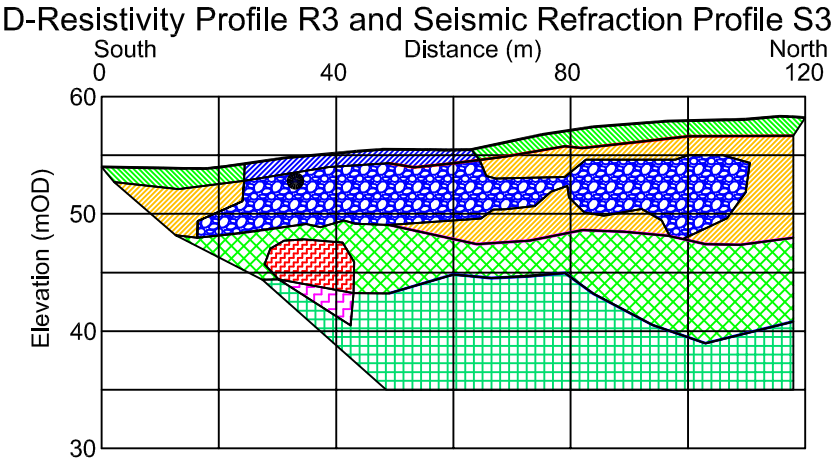
2D-Resistivity Profile R1 and Seismic Refraction Profile S1 Model



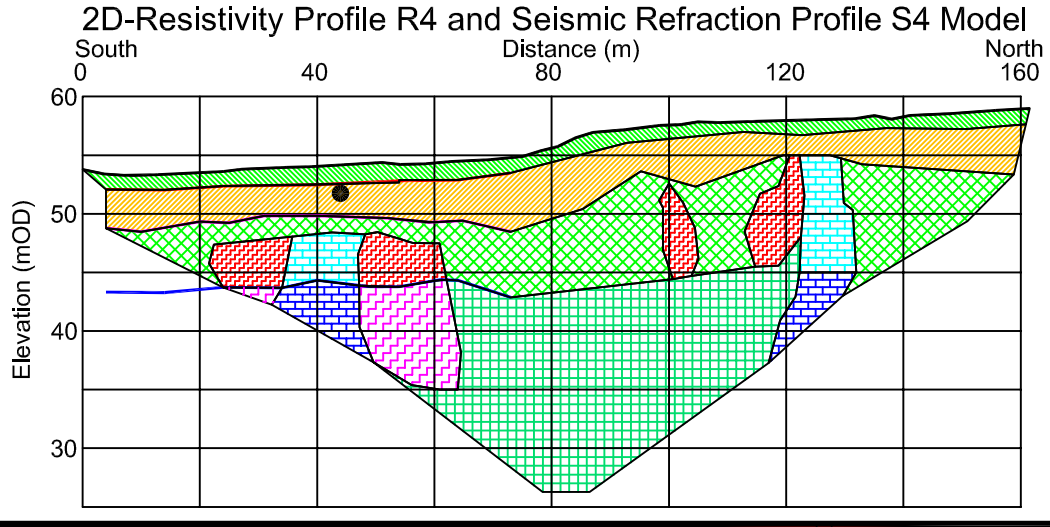
2D-Resistivity Profile R2 and Seismic Refraction Profile S2 Model



2D-Resistivity Profile R3 and Seismic Refraction Profile S3 Model



2D-Resistivity Profile R4 and Seismic Refraction Profile S4 Model



Combined Interpretation:

- Layer 1a Loose Sand and Gravel (Overburden)
- Layer 1b Soft gravely Clay (Overburden)
- Layer 2a Loose-dense Sand and Gravel (Overburden)
- Layer 2b Firm gravely Clay (Overburden)
- Layer 3a Weathered Rock (Shaly Limestone)
- Layer 3b Weathered Rock (Pos. Mineralisation)
- Layer 3c Weathered Rock (Clean Limestone)
- Layer 4a Strong Rock (Shaly Limestone)
- Layer 4b Strong Rock (Pos. Mineralisation)
- Layer 4c Strong Rock - Clean Limestone

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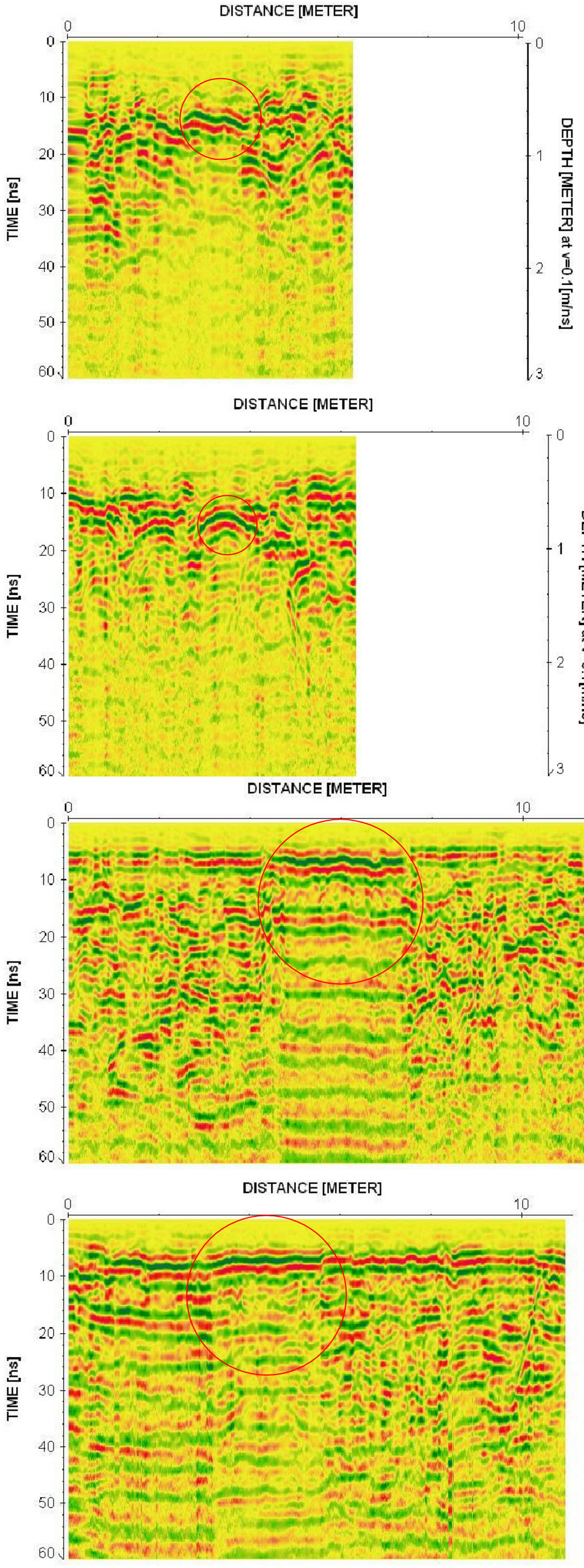
CLIENT	Copeland Borough Council Atkins
PROJECT	Egremont Mining Instability Geophysical Survey
TITLE	Figure 2: Interpretation of 2D-Resistivity and Seismic Refraction Data

SCALE:	NTS, VE x 2
PROJECT:	5597
DRAWN:	HK
DATE:	08/02/2012
MGX FILE:	5597f_Figs.dwg
STATUS:	Final

LEGEND:

- Possible Metal Pipe in Field (See Map 4)
- Resistivity Anomaly near Pit 2 Location



G1 West to East

G2 South-North

G2 South-North

G3 North-South

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CLIENT	Copeland Borough Council Atkins
PROJECT	Egremont Mining Instability Geophysical Survey
TITLE	Figure 3: GPR Images of Anomalous Scans

SCALE:	NTS
PROJECT:	5597
DRAWN:	HK
DATE:	08/02/2012
MGX FILE:	5597f_Figs.dwg
STATUS:	Final

LEGEND:

The images show GPR reflection sections with the distance on top and the depth on the right axis. Anomalies are circled. G1 is a smaller type anomaly that could be derived from a combination of geolgical materials. G2 and G3 are flat anomalies stretching a few meter in width and this could from ground movement associated with a possible pit or shaft.The GPR wave velocity used to strech the sections to depth is 0.1 nm/s.