YCCCART 2015 / Y2

Manual survey using an electronic, hydryostatic level, (NIVCOMP), at Banwell

YATTON, CONGRESBURY, CLAVERHAM AND CLEEVE ARCHAEOLOGICAL RESEARCH TEAM (YCCCART)

General Editor: Vince Russett

Team YCCCART at Banwell.

Page	Contents

Abstract

The Banwell Society of Archaeology requested that YCCCART undertake geophysical surveys on three fields at Banwell in order to determine the extent of the Roman graveyard & settlement. Following the resistivity survey, (YCCCART 2015/Y5), a manual survey of targeted grids was carried out using an electronic, hydrostatic level (NivComp). A computer programme (Surfer 10, Golden Software) was used to produce contour and 3-dimensional images of the ground, corresponding to the targeted grids. Some surface features appeared to correlate with the resistivity results.

Acknowledgements

A Heritage Lottery Grant allowed YCCCART to acquire a NivComp, electronic, hydrostatic level which provided the data for the "Surfer10" software program, kindly donated by Golden Software Ltd (USA).

This survey would also not have been carried out without the willing permission of the landowner, Mrs Susan Worth and the help and assistance of the Banwell Society of Archaeology.

The authors are grateful for the hard work by the members of YCCCART in performing the surveys, and Vince Russett for editing this report.

Introduction

Yatton, Congresbury, Claverham and Cleeve Archaeological Research Team (YCCCART) is one of a number of Community Archaeology teams across northern Somerset, formerly supported by the North Somerset Council Development Management Team.

Our objective is to undertake archaeological fieldwork to enable a better understanding and management of the heritage of the area while recording and publishing the activities and locations of the research carried out.

Site Location

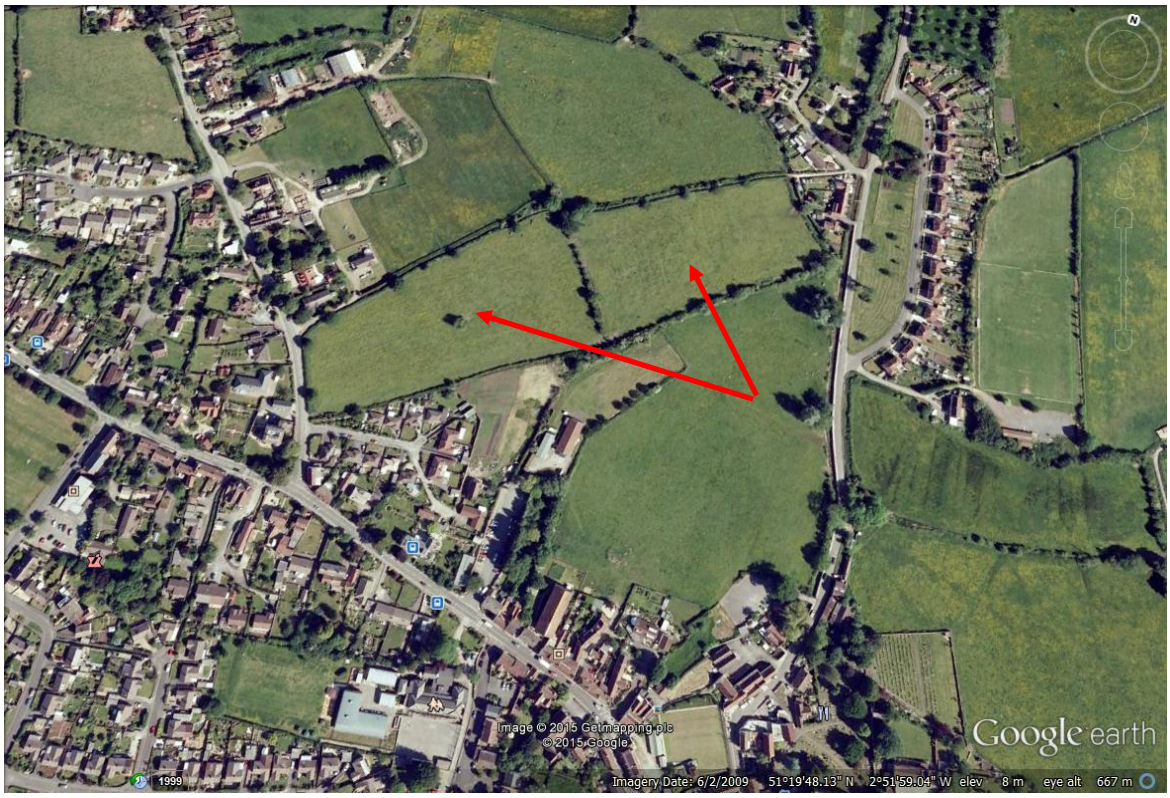


Fig 1: Site location is indicated by the red arrow.

The site locations indicated by the red arrows in Fig 1 (above) show two fields. Since this photo was taken the field on the left has been subdivided by a fence placed around the pipeline excavation area. Hence the survey is said to be over three fields. The hydrostatic level survey was carried out in the lower half of the field on the left.

The field is privately owned.

Land use and geology

The fields are used for grazing.
Geology is the Murcia Mudstone group – Mudstone and Halite stone

Historical & archaeological context

In 2012 Bristol Water PLC, during the construction of a water main from Banwell to Hutton and the former Weston super Mare airfield, employed Border Archaeology to carry out excavations. Border Archaeology have yet to publish their report but further information can be found in the Banwell Society of Archaeology Journal Search No 25.

Survey objectives

The survey, using an electronic, hydrostatic level (NivComp) was undertaken to compare any surface features, in targeted grids, with findings from the resistivity survey, *(YCCCART 2015/Y5).*

Methodology

The surveys were undertaken during March, 2015 by teams from YCCCART. As only limited time was available, Grids 1 and 2 and 4 and 5, Feb 5, were selected from the resistivity survey. Features in these grids had different orientations, and a single linear feature. In Grids 1 and 2, there was a diagonally arranged feature cutting across the two grids (Fig 2, red arrow), and in Grid 5, a linear feature (Fig 2, white arrow), was adjacent to a diagonal, rectangular feature in Grid 4.

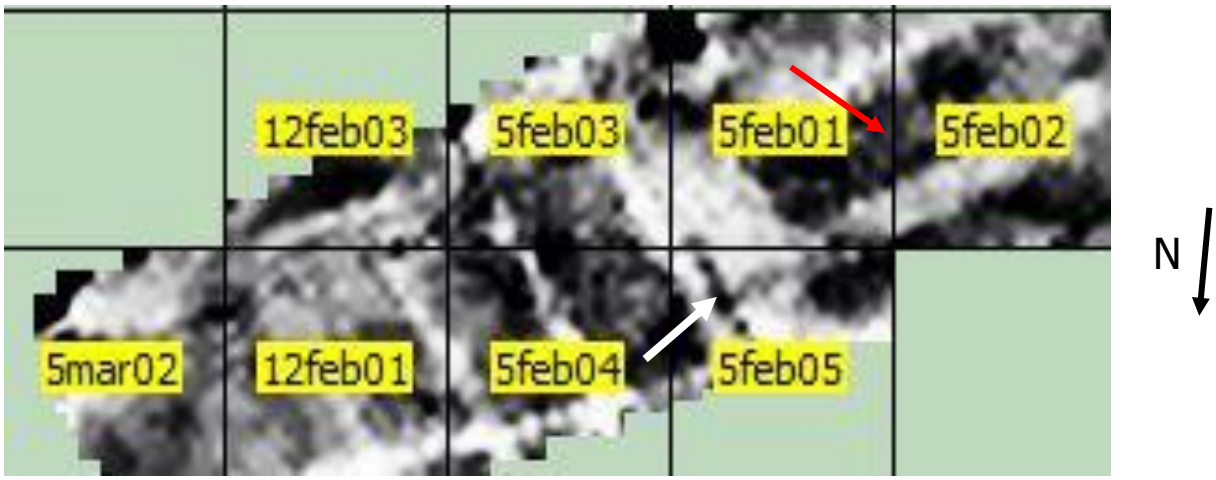


Fig 2: TerraSurveyor file names. Grids are 20m square.

The method was similar to that described previously (*YCCCART 2014/Y19; YCCCART 2014/Y15*). Briefly, in order to show the three-dimensional appearance of the ground, grid surveys using an electronic, hydrostatic level (NivComp), were performed. Tapes were laid relative to baselines established for the RM15 survey *(YCCCART 2015/Y5)*. For each grid, a zero point for the electronic hydrostatic level was established, and the height in millimetres at each point in the grid, above or below the zero point, was recorded on paper.

An appropriate interval of recording was selected, for each feature, which was considered to provide the best representation. The data were entered into an Excel file (Microsoft) and processed using the "Surfer 10" software programme (kindly donated by Golden Software, USA). In addition, contour grids were overlaid onto the corresponding RM15 grids using Microsoft PowerPoint (Fig. 6). Paper and electronic copies of the raw data are preserved in the archives. The surveyed sites are shown in Fig 4.

Results

The ground was relatively flat (Figure 3), with some undulations, and occasional, shallow furrows (drainage channels?). Apart from the furrows, no obvious features were observed.

Fig 3: Generally flat appearance of the field (Grid 1 Feb 5).

1) Grids 1 and 2 Feb 5

The central portions of these 2 grids were surveyed separately (Figure 4) (Appendices 1 and 2). For each individual grid, a tape grid, 20 x 10m, was laid out using the RM15 survey baseline. Heights were measured at 1m intervals along the X axis, westerly (11 columns), and the Y axis, southerly (21 columns). The zero point for both grids was 10m along the western edge, from the southwest corner of Grid 1. The Z axis for both grids was the height above, (+), or below, (-), the zero point in mm. The results were recorded on paper.

Maximum heights above or below the zero point were 173 to -328 mm (Grid 1), and 264 to -108 mm (Grid 2). The two grids were then combined, making the final grid 20 x 20m (Appendix 3). The raw data were processed electronically, and a 3-dimensional image, including contours (Figure 5), was produced. The contour findings were superimposed on the resistivity results (Figure 6). Thus, some, at least, of the features, surveyed using the electronic elevation device, appeared to correspond to the resistivity results. In particular, a line (arrow Fig. 4 and red line, Fig.5) appears to correspond to a low ridge in both surveys.

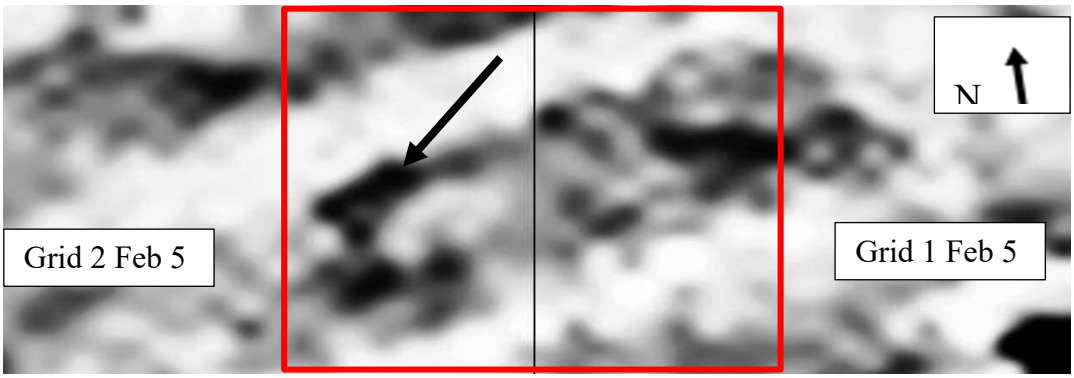


Fig 4: Resistivity result, with outline (in red) of combined Grids 1 and 2 Feb 5. A feature (arrow), appears to correspond to the red line in Fig.5).

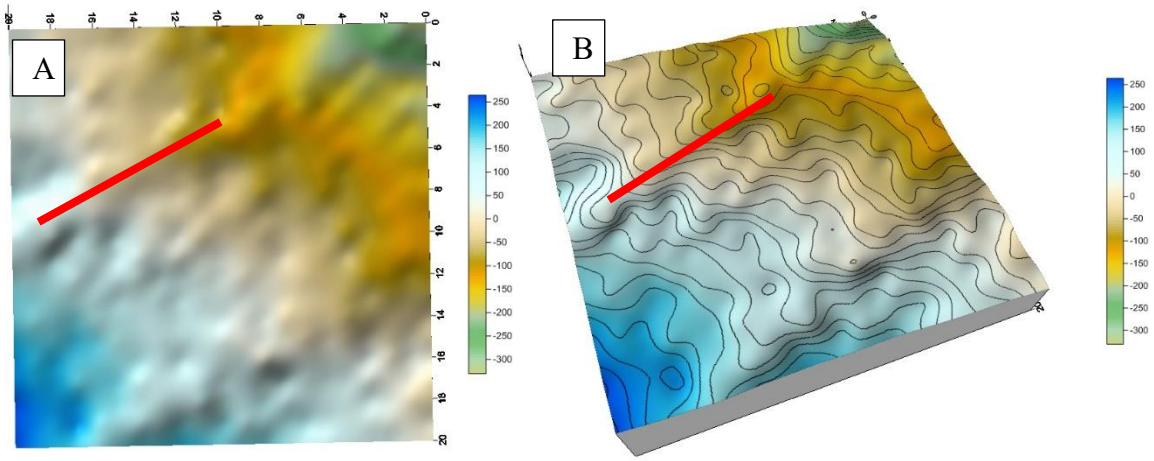


Fig 5: Two, 3-dimensional representations of the surveyed area. A, 3D image in the same orientation as Fig 4: B, 3D image with contours. The red line in both images corresponds to the feature in Fig. 4.

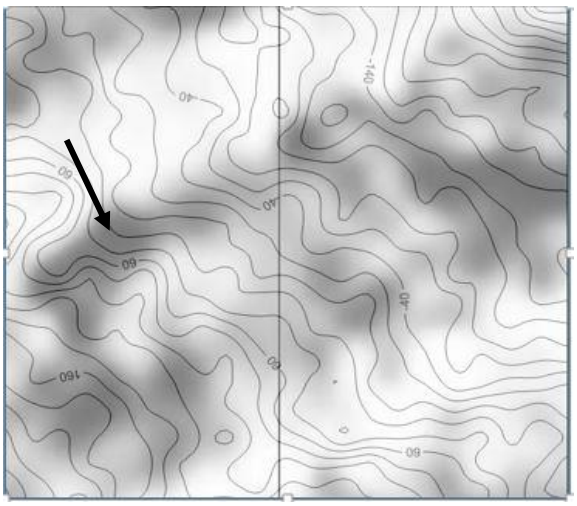


Fig 6: Resistivity grid with contour overlay. The linear feature (arrow, Fig 4 and red lines, Fig 5) appears to correspond in both surveys (arrow).

2) Grids 4 and 5 Feb 5

The central portions of these 2 grids were surveyed separately (Figure 7) (Appendices 3 and 4). For each individual grid, a tape grid, 10 x 10m, (Grid 5 Feb 5) and 12 x 15 m (Grid 4 Feb 5), was laid out using the RM15 survey baseline (appendices 4 and 5, respectively). Heights were measured at 1m intervals in Grid 5 Feb along the X axis, westerly (11 columns), and the Y axis, southerly (11 columns); and in Grid 4 Feb 5, along the X axis, southerly (13 columns), and the Y axis, easterly (16 columns). The zero point for both grids was 10m from the southwestern corner of Grid 4 Feb 5. The Z axis for both grids was the height above, (+), or below, (-), the zero point in mm. The results were recorded on paper.

Maximum heights above or below the zero point were 106 to – 169mm (Grid 4), and 77 to -94 mm (Grid 5). The grids were then combined (by reorienting the grids, and removing lines 0m and 1m of the X axis of grid 4 Feb 5) to make a final grid of 25 x 10m (Appendix 6). The raw data were processed electronically, and a 3-dimensional image, with contours (Fig. 8), was produced. A shallow furrow 'on the ground', matched a clear, linear area in the resistivity survey, (Fig.7, red arrow) and was readily seen in the 3D contour image (red arrow, Fig. 8). The diagonal, dark, rectangular feature, seen in the resistivity survey, (Fig 7, black line), was not appreciated 'on the ground', but was clearly identified in the 3D contour image (Fig 8, black line). The linear feature, observed in Grid 5 in the resistivity survey (Fig 7, red line) could be identified in the 3D contour image (Fig 8, red line), although it was less distinct than the rectangular feature.

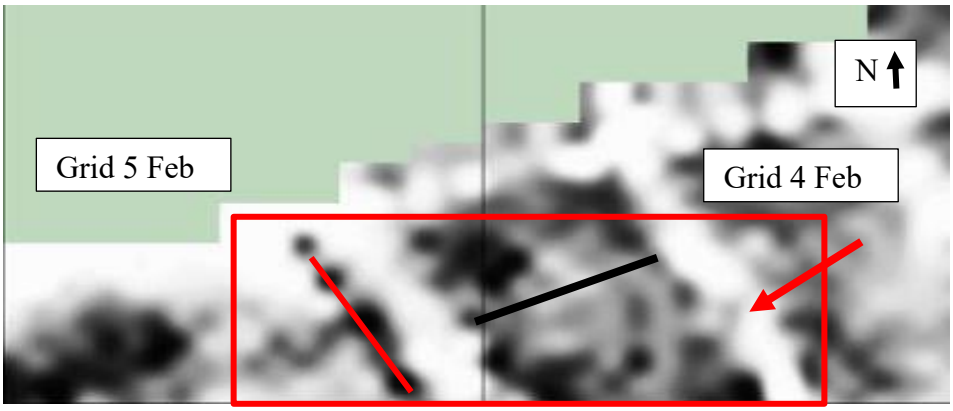


Fig 7. Resistivity result, with outline (in red) of combined Grids 4 and 5, Feb 5. Red line, linear feature; Black line, width of rectangular feature; red arrow, shallow depression.

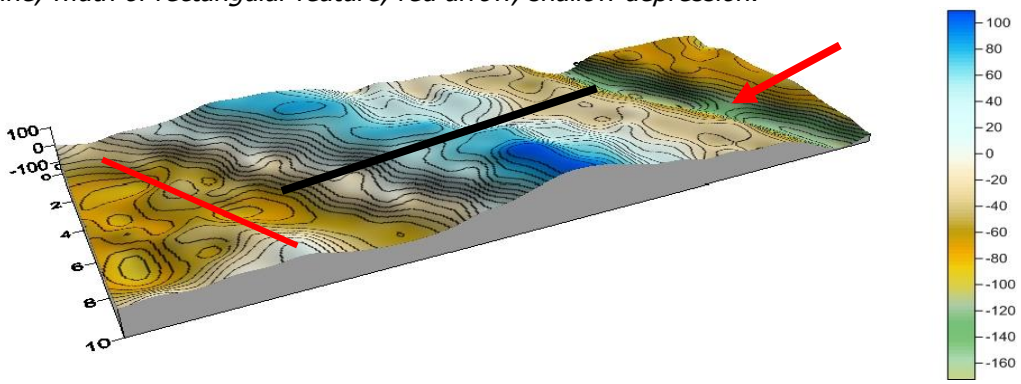


Fig 8. 3-dimensional, contoured, representation of the surveyed area. The shallow furrow (arrow) was appreciated grossly. (Red arrow and black and red lines correspond to those in Fig.7.)

Comments

Using an electronic, hydrostatic level, combined with a computer programme (Surfer 10, Golden Software, USA), three-dimensional images of two areas (20 x 20m and 25 x 10m) of the field were produced. The areas appeared relatively flat, with only occasional furrows. The maximum and minimum heights above zero points on the ground, were 264 to –328 mm (Grids 1 and 2, Feb 5) and 106 to –169 mm (Grids 4 and 5, Feb 5). Thus, the contours represent a maximum range of 592 mm, (approx. 59 cm), (Grids 1 and 2, Feb 5) and 275 mm, (approx. 27 cm), (Grids 4 and 5, Feb 5).

Nevertheless, despite these relatively minor undulations, when the resistivity results were compared with the electronic, hydrostatic level results, (surface features), some correlations were observed. In particular, in Grids 1 and 2, Feb 5, a slightly raised profile was found, corresponding to a rectangular, resistivity feature, which was not observed 'on the field'. In grids 4 and 5, Feb 5, there appeared to be good correlation between the two surveys. In a previous report (Wemberham roman villa, *YCCCART 2014/Y20),* good correlation was found between resistivity results and the electronic hydrostatic level findings, to show that some raised features on the ground corresponded to 'buried' walls. Thus it is possible that the surface findings in the present survey may correspond to 'buried' features, potentially illustrated by the resistivity survey.

In the present study, the contours found with the hydrostatic level may not be random, and may reflect features under the ground as demonstrated previously *(YCCCART 2014/Y20*). Subsequent to these surveys, however, a commercial excavation of the field, for development, planning permission purposes, was carried out at the request of North Somerset Council, but nothing significant was found (V. Russett, *personal observation*). This leaves questions over any correlations that have been drawn in this report. However, until the precise location of the trenches is determined, any relation to the grids, reported herein, is not known.

In conclusion, this report has demonstrated, similar to a previous report (*YCCCART 2014/Y20*) that, in favourable circumstances, it is possible that some geophysical results and surface features, may be correlated. It remains to be shown, however, if they correspond 'on the ground', in the present report. A specifically targeted excavation of the features, illustrated in the resistivity survey, would be required to resolve these findings.

Recommendations

Specific, targeted excavation may help to elucidate any potential correlations between the geophysical survey and a manual survey, using an electronic, hydrostatic level.

References

YCCCART Report, (2014/Y15). *Manual surveys using an electronic, hydryostatic level (NIVCOMP) at Woodspring Priory*.

YCCCART Report, (*2014/Y19)*. *Cadbury Congresbury Hill Fort: Use of an electronic, hydrostatic level as an aid to manual surveying.*

YCCCART Report, (2014/Y20). *Manual survey using an electronic, hydryostatic level (NIVCOMP) at Wemberham Roman Villa.*

YCCCART Report, *(2015/Y5). Gradiometry & Resistivity Surveys at Banwell*.

Authors

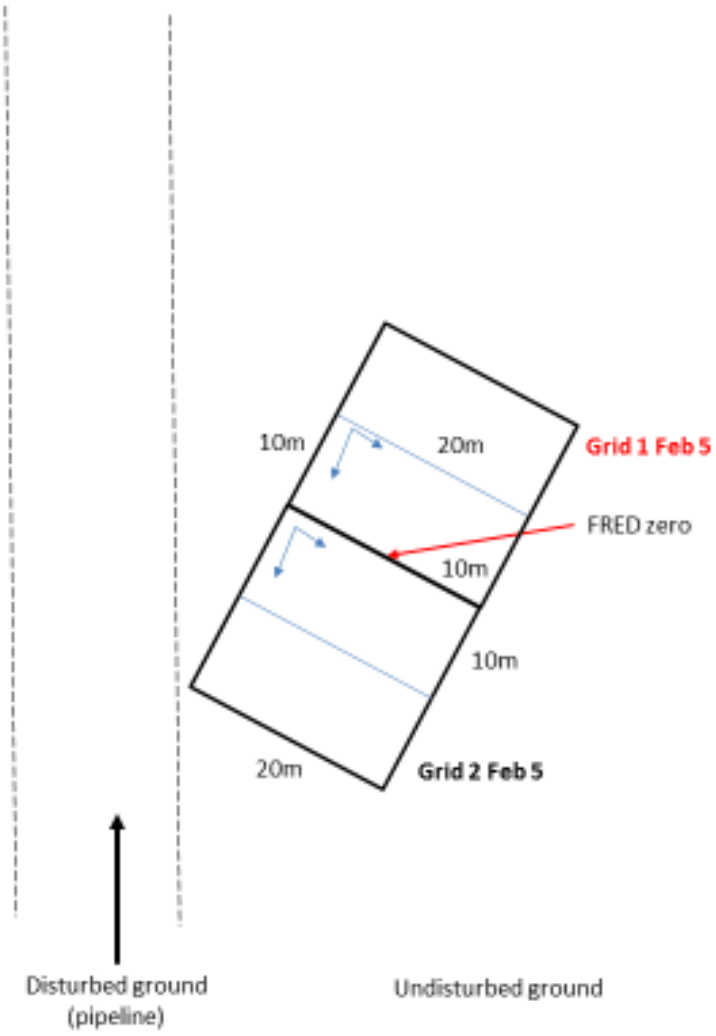
G Pearson and YCCCART members

Appendix 1

Site Record

YCCCART Site Survey Project – Manual survey - Banwell	
Survey date	12-3-15
Location	Wolvershill Road Site 2
Site name	Grid 1 Feb 5
Reference	
Type / Instrument	NIVCOMP electronic hydrostatic level
Survey area	20 x 10 m grid X axis, westerly, 11 columns @ 1 m intervals Y axis, southerly, 21 columns @ 1 m intervals Z axis: height above (+), or below (-) Zero point in mm Zero point: 10 m along western edge from SW corner of grid
Data files	Raw data: Paper copy in Manual Folder Scanned copy in Banwell Surfer: Grid 1 Feb 5.xls Grid 1 Feb 5.rtf Grid 1 Feb 5.grd
Survey team and conditions	
Team	B Wills, G Pearson, A Dimmock
Weather	Cool, windy, cloudy, becoming sunny
Additional information	
Landowner	Mrs. Susan Worth
Tenant	Mr. Keith Raymond.
HER ref	TBC
Site type	Grass
Description	Large open field
Period	
Geology	
Land use	Grazing
Comments	Area of field is undisturbed (ie not known to have been ploughed recently). Grid adjacent to Grid 2 Feb 5; values for line 0, Grid 2,(5-12-15), used for line 10, Grid 1
Report date	24-6-15 (modified following supplementary information added to Grid 2 Feb 5 on 21-4-16)
Author	G R Pearson, B Wills

Plan


10m
20m
Grid 1 Feb 5
FRED zero
10m
10m
20m
Grid 2 Feb 5
Disturbed ground
(pipeline)
Undisturbed ground

Electronic data

From Excel file

See highlighted data below: Grids 1 and 2 share a common line: Grid 1, X 10m and Grid 2, Y 0m. Therefore, values for 'Y' at the 'X' 10m line of Grid 1, comprise Grid 2, 0-4m (data collected on 19-3-15 for grid 2 Feb 5); and 5-20m, (data collected on 5-3-15 for Grid 2, Feb 5), 0-15m.

Xm	Ym	Zmm
0	0	-327
0	1	-284
0	2	-227
0	3	-190
0	4	-201
0	5	-188
0	6	-170
0	7	-137
0	8	-138
0	9	-119
0	10	-120
0	11	-119
0	12	-94
0	13	-70
0	14	-21
0	15	-10
0	16	17
0	17	-8
0	18	-8
0	19	19
0	20	6
1	0	-328
1	1	-266
1	2	-219
1	3	-180
1	4	-194
1	5	-163
1	6	-157
1	7	-136
1	8	-135
1	9	-124
1	10	-124
1	11	-122
1	12	-86
1	13	-65

1	14	-32
1	15	10
1	16	32
1	17	21
1	18	3
1	19	18
1	20	27
2	0	-277
2	1	-262
2	2	-212
2	3	-181
2	4	-171
2	5	-168
2	6	-144
2	7	-131
2	8	-117
2	9	-116
2	10	-104
2	11	-108
2	12	-99
2	13	-73
2	14	-32
2	15	0
2	16	15
2	17	29
2	18	37
2	19	33
2	20	57
3	0	-252
3	1	-231
3	2	-192
3	3	-189
3	4	-162
3	5	-147
3	6	-135
3	7	-117
3	8	-100
3	9	-90
3	10	-81
3	11	-90
3	12	-90
3	13	-58
3	14	-45
3	15	9
3	16	44
3	17	33

3	18	65
3	19	54
3	20	69
4	0	-224
4	1	-215
4	2	-206
4	3	-170
4	4	-161
4	5	-129
4	6	-123
4	7	-92
4	8	-82
4	9	-79
4	10	-87
4	11	-51
4	12	-63
4	13	-66
4	14	-52
4	15	-4
4	16	36
4	17	64
4	18	70
4	19	77
4	20	81
5	0	-187
5	1	-198
5	2	-200
5	3	-173
5	4	-135
5	5	-128
5	6	-107
5	7	-103
5	8	-94
5	9	-64
5	10	-52
5	11	-54
5	12	-50
5	13	-39
5	14	-22
5	15	11
5	16	41
5	17	74
5	18	90
5	19	108
5	20	97
6	0	-160

6	1	-166
6	2	-175
6	3	-175
6	4	-153
6	5	-116
6	6	-96
6	7	-89
6	8	-74
6	9	-60
6	10	-41
6	11	-35
6	12	-32
6	13	-17
6	14	-15
6	15	-1
6	16	37
6	17	76
6	18	107
6	19	139
6	20	122
7	0	-149
7	1	-133
7	2	-140
7	3	-143
7	4	-124
7	5	-104
7	6	-82
7	7	-80
7	8	-65
7	9	-44
7	10	-18
7	11	5
7	12	0
7	13	7
7	14	-3
7	15	17
7	16	36
7	17	103
7	18	112
7	19	145
7	20	147
8	0	-126
8	1	-112
8	2	-124
8	3	-126
8	4	-144

8	5	-120
8	6	-94
8	7	-82
8	8	-80
8	9	-39
8	10	-26
8	11	0
8	12	16
8	13	26
8	14	39
8	15	32
8	16	22
8	17	95
8	18	132
8	19	136
8	20	173
9	0	-126
9	1	-106
9	2	-101
9	3	-119
9	4	-133
9	5	-130
9	6	-88
9	7	-54
9	8	-52
9	9	-45
9	10	-14
9	11	8
9	12	17
9	13	41
9	14	36
9	15	30
9	16	52
9	17	94
9	18	122
9	19	134
9	20	172
10	0	-114
10	1	-7
10	2	-92
10	3	-86
10	4	-77
10	5	-100
10	6	-108
10	7	-81
10	8	-40

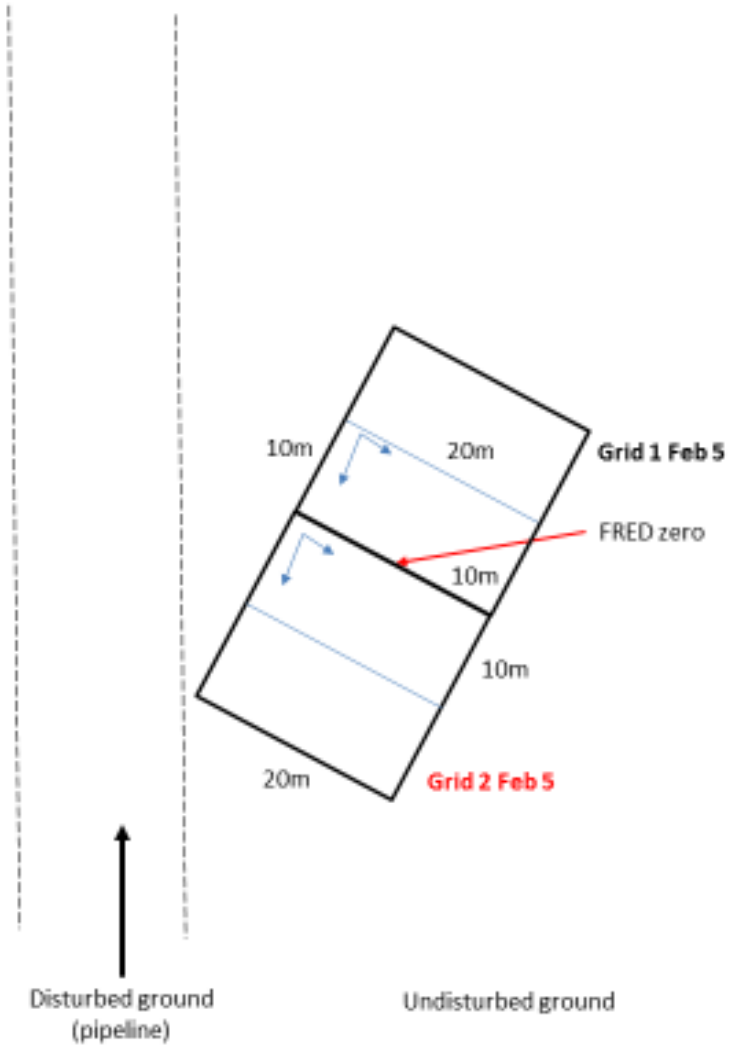
10	9	-25
10	10	0
10	11	30
10	12	44
10	13	49
10	14	60
10	15	45
10	16	70
10	17	107
10	18	127
10	19	162
10	20	168

Appendix 2

Site record

YCCCART Site Survey Project – Manual survey - Banwell	
Survey date	5-3-15, 19-3-15
Location	Wolvershill Road Site 2
Site name	Grid 2 Feb 5
Reference	
Type / Instrument	NIVCOMP electronic hydrostatic level
Survey area	20 x 10 m grid X axis, westerly, 11 columns @ 1 m intervals Y axis, southerly, 21 columns @ 1 m intervals Z axis: height above (+), or below (-) Zero point in mm Zero point: 10 m along eastern edge from SE corner of grid
Data files	Raw data: Paper copy in Manual Folder Scanned copy in Banwell Surfer: Grid 2 Feb 5.xls Grid 2 Feb 5.rtf Grid 2 Feb 5.grd
Survey team and conditions	
Team	5/3/15 B Wills, G Pearson; 19/3/15 B Wills, G Pearson, A Dimmock
Weather	5/3/15, Sunny, mild; 19/3/15, cold, dull
Additional information	
Landowner	Mrs. Susan Worth
Tenant	Mr. Keith Raymond.
HER ref	TBC
Site type	Grass
Description	Large open field
Period	
Geology	
Land use	Grazing
Comments	Area of field is undisturbed (ie not known to have been ploughed recently).
Report date	24-6-15 (Supplementary info added 21-4-16)
Author	G R Pearson, B Wills

Plan



(See supplementary information on the format of this grid after electronic data).

Electronic data

From Excel file

Values 0 -4 along the Y axis at intervals 0 - 10 along the X axis added on 19-3 -15

Xm	Ym	Zmm
0	0	-114
0	1	-77
0	2	-92
0	3	-86
0	4	-77
0	5	-108
0	6	-81
0	7	-40
0	8	-25
0	9	-28
0	10	0
0	11	30
0	12	44
0	13	49
0	14	60
0	15	45
0	16	70
0	17	107
0	18	127
0	19	162
0	20	168
1	0	-78
1	1	-80
1	2	-80
1	3	-81
1	4	-88
1	5	-84
1	6	-86
1	7	-57
1	8	-30
1	9	-6
1	10	-2
1	11	32
1	12	46
1	13	67
1	14	82
1	15	81
1	16	93
1	17	88

1	18	96
1	19	153
1	20	187
2	0	-82
2	1	-85
2	2	-66
2	3	-59
2	4	-44
2	5	-80
2	6	-75
2	7	-38
2	8	-3
2	9	2
2	10	27
2	11	23
2	12	71
2	13	100
2	14	101
2	15	100
2	16	123
2	17	101
2	18	110
2	19	165
2	20	198
3	0	-57
3	1	-66
3	2	-60
3	3	-46
3	4	-36
3	5	-41
3	6	-54
3	7	-30
3	8	3
3	9	8
3	10	22
3	11	46
3	12	84
3	13	91
3	14	103
3	15	110
3	16	119
3	17	113
3	18	112
3	19	140
3	20	185
4	0	-41

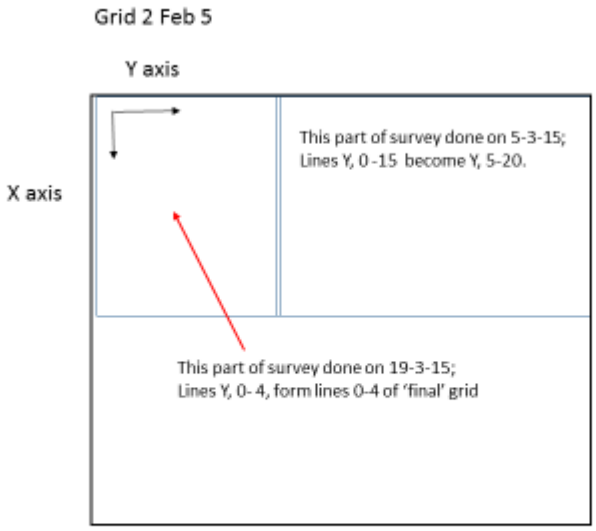
4	1	-33
4	2	-42
4	3	-43
4	4	-32
4	5	-32
4	6	-34
4	7	-30
4	8	8
4	9	33
4	10	48
4	11	50
4	12	71
4	13	106
4	14	121
4	15	130
4	16	145
4	17	125
4	18	133
4	19	132
4	20	182
5	0	-41
5	1	-21
5	2	-31
5	3	-25
5	4	-14
5	5	-15
5	6	-9
5	7	-17
5	8	2
5	9	38
5	10	90
5	11	100
5	12	96
5	13	129
5	14	132
5	15	142
5	16	158
5	17	169
5	18	161
5	19	148
5	20	167
6	0	-25
6	1	-6
6	2	-15
6	3	-23
6	4	3

6	5	-6
6	6	11
6	7	-7
6	8	12
6	9	32
6	10	72
6	11	98
6	12	120
6	13	125
6	14	144
6	15	174
6	16	173
6	17	176
6	18	178
6	19	164
6	20	159
7	0	-10
7	1	0
7	2	4
7	3	25
7	4	17
7	5	19
7	6	28
7	7	50
7	8	39
7	9	50
7	10	97
7	11	107
7	12	111
7	13	141
7	14	171
7	15	191
7	16	184
7	17	180
7	18	215
7	19	222
7	20	187
8	0	1
8	1	1
8	2	17
8	3	25
8	4	28
8	5	28
8	6	57
8	7	100
8	8	86

8	9	49
8	10	58
8	11	131
8	12	136
8	13	149
8	14	164
8	15	182
8	16	205
8	17	210
8	18	218
8	19	213
8	20	201
9	0	22
9	1	41
9	2	11
9	3	38
9	4	43
9	5	41
9	6	74
9	7	101
9	8	112
9	9	69
9	10	76
9	11	109
9	12	143
9	13	160
9	14	160
9	15	187
9	16	198
9	17	213
9	18	231
9	19	233
9	20	226
10	0	33
10	1	47
10	2	38
10	3	47
10	4	43
10	5	40
10	6	69
10	7	105
10	8	143
10	9	125
10	10	94
10	11	112
10	12	157

10	13	171
10	14	179
10	15	206
10	16	226
10	17	236
10	18	263
10	19	258
10	20	264

Supplementary information

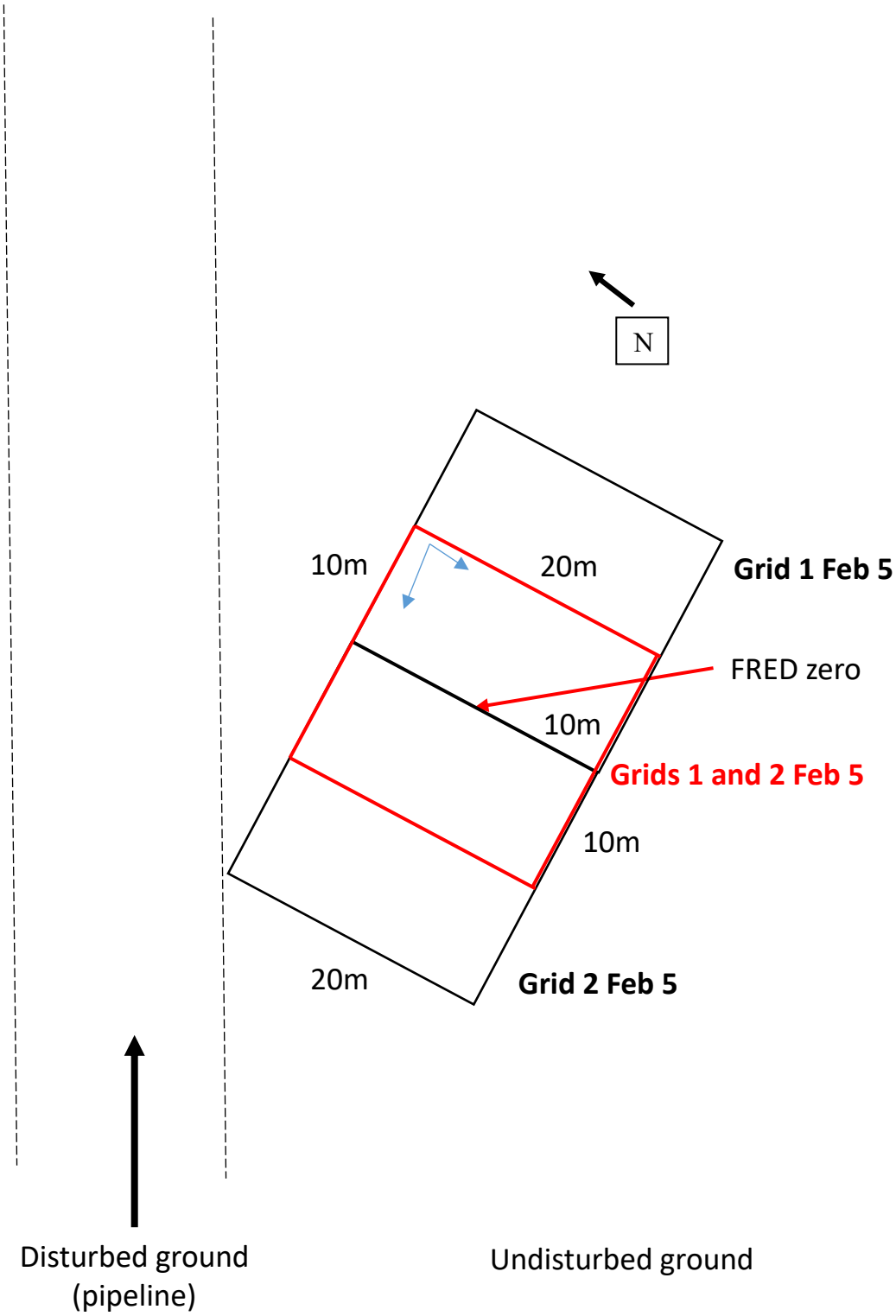


Appendix 3

Site record

YCCCART Site Survey Project – Manual survey - Banwell	
Survey date	5/3/15,12/3/15,19/3/15
Location	Wolvershill Road Site 2
Site name	Grids 1 and 2 Feb 5
Reference	
Type / Instrument	NIVCOMP electronic hydrostatic level
Survey area	20 x 20 m grid X axis, Westerly, 21 columns @ 1 m intervals Y axis, Southerly, 21 columns @ 1 m intervals Z axis: height above (+), or below (-) Zero point in mm Zero point: 10m along the SW line between the two grids
Data files	Raw data: Paper copy in Manual Folder Scanned copy in Banwell Surfer: Grids 1 and 2 Feb 5.xls Grids 1 and 2 Feb 5.rtf Grids 1 and 2 Feb 5.grd
Survey team and conditions	
Team	See individual grids
Weather	See individual grids
Additional information	
Landowner	Mrs. Susan Worth
Tenant	Mr. Keith Raymond.
HER ref	TBC
Site type	Grass
Description	Large open field
Period	
Geology	
Land use	Grazing
Comments	Area of field is undisturbed (ie not known to have been ploughed recently).
Report date	24-4-16 (following addition of supplementary data to Grid 2, Feb 5)
Author	G R Pearson

Plan


N
10m
20m
Grid 1 Feb 5
FRED zero
10m
Grids 1 and 2 Feb 5
10m
20m
Grid 2 Feb 5
Disturbed ground
(pipeline)
Undisturbed ground

Electronic data

X m	Y m	Z mm
0	0	-327
0	1	-284
0	2	-227
0	3	-190
0	4	-201
0	5	-188
0	6	-170
0	7	-137
0	8	-138
0	9	-119
0	10	-120
0	11	-119
0	12	-94
0	13	-70
0	14	-21
0	15	-10
0	16	17
0	17	-8
0	18	-8
0	19	19
0	20	6
1	0	-328
1	1	-266
1	2	-219
1	3	-180
1	4	-194
1	5	-163
1	6	-157
1	7	-136
1	8	-135
1	9	-124
1	10	-124
1	11	-122
1	12	-86
1	13	-65
1	14	-32
1	15	10
1	16	32
1	17	21
1	18	3
1	19	18
1	20	27
2	0	-277

2	1	-262
2	2	-212
2	3	-181
2	4	-171
2	5	-168
2	6	-144
2	7	-131
2	8	-117
2	9	-116
2	10	-104
2	11	-108
2	12	-99
2	13	-73
2	14	-32
2	15	0
2	16	15
2	17	29
2	18	37
2	19	33
2	20	57
3	0	-252
3	1	-231
3	2	-192
3	3	-189
3	4	-162
3	5	-147
3	6	-135
3	7	-117
3	8	-100
3	9	-90
3	10	-81
3	11	-90
3	12	-90
3	13	-58
3	14	-45
3	15	9
3	16	44
3	17	33
3	18	65
3	19	54
3	20	69
4	0	-224
4	1	-215
4	2	-206
4	3	-170
4	4	-161

4	5	-129
4	6	-123
4	7	-92
4	8	-82
4	9	-79
4	10	-87
4	11	-51
4	12	-63
4	13	-66
4	14	-52
4	15	-4
4	16	36
4	17	64
4	18	70
4	19	77
4	20	81
5	0	-187
5	1	-198
5	2	-200
5	3	-173
5	4	-135
5	5	-128
5	6	-107
5	7	-103
5	8	-94
5	9	-64
5	10	-52
5	11	-54
5	12	-50
5	13	-39
5	14	-22
5	15	11
5	16	41
5	17	74
5	18	90
5	19	108
5	20	97
6	0	-160
6	1	-166
6	2	-175
6	3	-175
6	4	-153
6	5	-116
6	6	-96
6	7	-89
6	8	-74

6	9	-60
6	10	-41
6	11	-35
6	12	-32
6	13	-17
6	14	-15
6	15	-1
6	16	37
6	17	76
6	18	107
6	19	139
6	20	122
7	0	-149
7	1	-133
7	2	-140
7	3	-143
7	4	-124
7	5	-104
7	6	-82
7	7	-80
7	8	-65
7	9	-44
7	10	-18
7	11	5
7	12	0
7	13	7
7	14	-3
7	15	17
7	16	36
7	17	103
7	18	112
7	19	145
7	20	147
8	0	-126
8	1	-112
8	2	-124
8	3	-126
8	4	-144
8	5	-120
8	6	-94
8	7	-82
8	8	-80
8	9	-39
8	10	-26
8	11	0
8	12	16

8	13	26
8	14	39
8	15	32
8	16	22
8	17	95
8	18	132
8	19	136
8	20	173
9	0	-126
9	1	-106
9	2	-101
9	3	-119
9	4	-133
9	5	-130
9	6	-88
9	7	-54
9	8	-52
9	9	-45
9	10	-14
9	11	8
9	12	17
9	13	41
9	14	36
9	15	30
9	16	52
9	17	94
9	18	122
9	19	134
9	20	172
10	0	-114
10	1	-77
10	2	-92
10	3	-86
10	4	-77
10	5	-108
10	6	-81
10	7	-40
10	8	-25
10	9	-28
10	10	0
10	11	30
10	12	44
10	13	49
10	14	60
10	15	45
10	16	70

10	17	107
10	18	127
10	19	162
10	20	168
11	0	-78
11	1	-80
11	2	-80
11	3	-81
11	4	-88
11	5	-84
11	6	-86
11	7	-57
11	8	-30
11	9	-6
11	10	-2
11	11	32
11	12	46
11	13	67
11	14	82
11	15	81
11	16	93
11	17	88
11	18	96
11	19	153
11	20	187
12	0	-82
12	1	-85
12	2	-66
12	3	-59
12	4	-44
12	5	-80
12	6	-75
12	7	-38
12	8	-3
12	9	2
12	10	27
12	11	23
12	12	71
12	13	100
12	14	101
12	15	100
12	16	123
12	17	101
12	18	110
12	19	165
12	20	198

13	0	-57
13	1	-66
13	2	-60
13	3	-46
13	4	-36
13	5	-41
13	6	-54
13	7	-30
13	8	3
13	9	8
13	10	22
13	11	46
13	12	84
13	13	91
13	14	103
13	15	110
13	16	119
13	17	113
13	18	112
13	19	140
13	20	185
14	0	-41
14	1	-33
14	2	-42
14	3	-43
14	4	-32
14	5	-32
14	6	-34
14	7	-30
14	8	8
14	9	33
14	10	48
14	11	50
14	12	71
14	13	106
14	14	121
14	15	130
14	16	145
14	17	125
14	18	133
14	19	132
14	20	182
15	0	-41
15	1	-21
15	2	-31
15	3	-25

15	4	-14
15	5	-15
15	6	-9
15	7	-17
15	8	2
15	9	38
15	10	90
15	11	100
15	12	96
15	13	129
15	14	132
15	15	142
15	16	158
15	17	169
15	18	161
15	19	148
15	20	167
16	0	-25
16	1	-6
16	2	-15
16	3	-23
16	4	3
16	5	-6
16	6	11
16	7	-7
16	8	12
16	9	32
16	10	72
16	11	98
16	12	120
16	13	125
16	14	144
16	15	174
16	16	173
16	17	176
16	18	178
16	19	164
16	20	159
17	0	-10
17	1	0
17	2	4
17	3	25
17	4	17
17	5	19
17	6	28
17	7	50

17	8	39
17	9	50
17	10	97
17	11	107
17	12	111
17	13	141
17	14	171
17	15	191
17	16	184
17	17	180
17	18	215
17	19	222
17	20	187
18	0	1
18	1	1
18	2	17
18	3	25
18	4	28
18	5	28
18	6	57
18	7	100
18	8	86
18	9	49
18	10	58
18	11	131
18	12	136
18	13	149
18	14	164
18	15	182
18	16	205
18	17	210
18	18	218
18	19	213
18	20	201
19	0	22
19	1	41
19	2	11
19	3	38
19	4	43
19	5	41
19	6	74
19	7	101
19	8	112
19	9	69
19	10	76
19	11	109

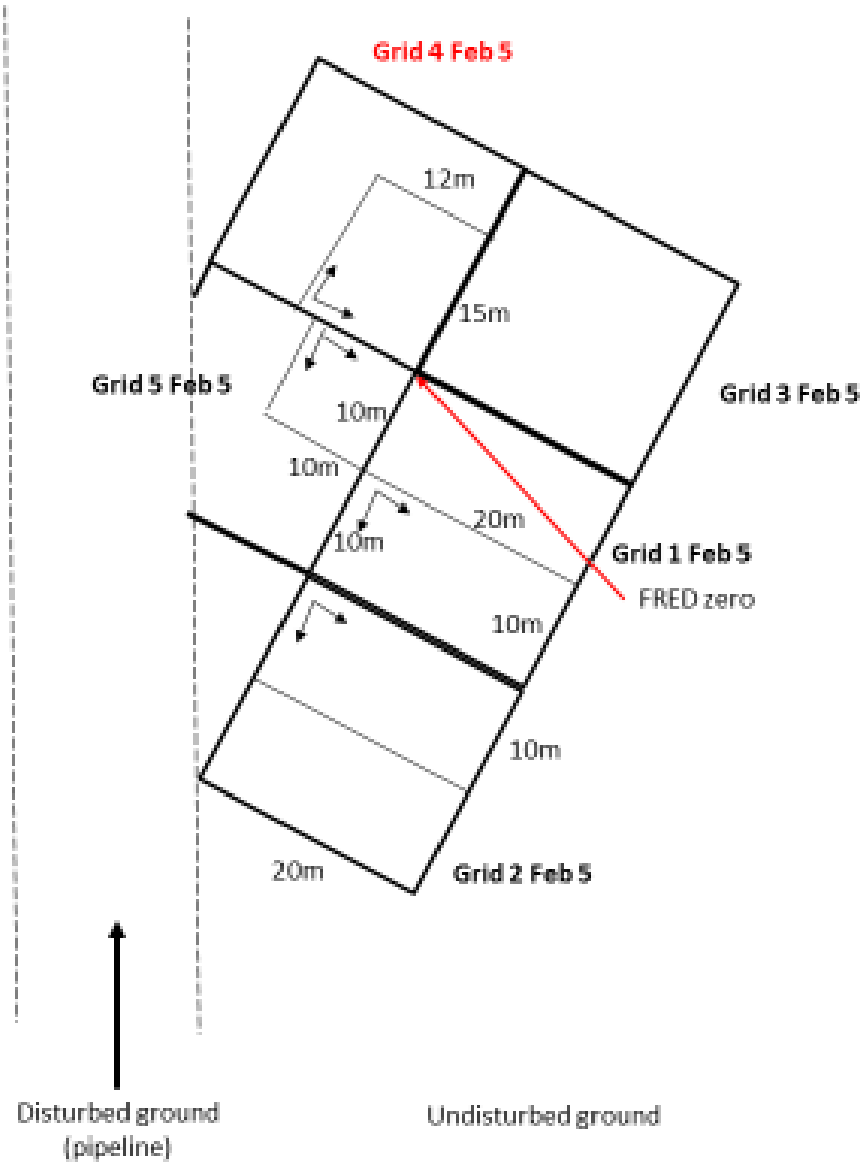
19	12	143
19	13	160
19	14	160
19	15	187
19	16	198
19	17	213
19	18	231
19	19	233
19	20	226
20	0	33
20	1	47
20	2	38
20	3	47
20	4	43
20	5	40
20	6	69
20	7	105
20	8	143
20	9	125
20	10	94
20	11	112
20	12	157
20	13	171
20	14	179
20	15	206
20	16	226
20	17	236
20	18	263
20	19	258
20	20	264

Appendix 4

Site record

YCCCART Site Survey Project – Manual survey - Banwell	
Survey date	26-3-15
Location	Wolvershill Road Site 2
Site name	Grid 4 Feb 5
Reference	
Type / Instrument	NIVCOMP electronic hydrostatic level
Survey area	12 x 15 m grid X axis, Southerly, 13 columns @ 1 m intervals Y axis, Easterly, 16 columns @ 1 m intervals Z axis: height above (+), or below (-) Zero point in mm Zero point: SW corner of grid
Data files	Raw data: Paper copy in Manual Folder Scanned copy in Banwell Surfer: Grid 4 Feb 5.xls Grid 4 Feb 5.rtf Grid 4 Feb 5.grd
Survey team and conditions	
Team	B Wills, G Pearson, D Walker, A Yarde (Banwell)
Weather	Dull, windy
Additional information	
Landowner	Mrs. Susan Worth
Tenant	Mr. Keith Raymond.
HER ref	TBC
Site type	Grass
Description	Large open field
Period	
Geology	
Land use	Grazing
Comments	Area of field is undisturbed (ie not known to have been ploughed recently).
Report date	24-6-15
Author	G R Pearson, B Wills

Plan


Grid 4 Feb 5
12m
15m
Grid 5 Feb 5
Grid 3 Feb 5
10m
10m
20m
10m
Grid 1 Feb 5
FRED zero
10m
10m
20m
Grid 2 Feb 5
Disturbed ground
(pipeline)
Undisturbed ground

Electronic data

From Excel file

Xm	Ym	Zmm
0	0	10
0	1	7
0	2	-8
0	3	-14
0	4	-12
0	5	-51
0	6	-78
0	7	-179
0	8	-114
0	9	-63
0	10	-74
0	11	-82
0	12	-79
0	13	-69
0	14	-80
0	15	-102
1	0	9
1	1	6
1	2	-18
1	3	-18
1	4	-26
1	5	-69
1	6	-32
1	7	-108
1	8	-170
1	9	-119
1	10	-72
1	11	-51
1	12	-70
1	13	-68
1	14	-72
1	15	-94
2	0	28
2	1	7
2	2	-13
2	3	-11
2	4	-27
2	5	-14
2	6	-26
2	7	-70
2	8	-150
2	9	-159
2	10	-85

2	11	-76
2	12	-75
2	13	-70
2	14	-66
2	15	-84
3	0	42
3	1	13
3	2	-19
3	3	-8
3	4	-28
3	5	-36
3	6	-32
3	7	-58
3	8	-95
3	9	-153
3	10	-120
3	11	-61
3	12	-74
3	13	-68
3	14	-72
3	15	-108
4	0	46
4	1	31
4	2	-9
4	3	18
4	4	-20
4	5	-31
4	6	-50
4	7	-39
4	8	-83
4	9	-147
4	10	-140
4	11	-100
4	12	-77
4	13	-69
4	14	-79
4	15	-67
5	0	64
5	1	36
5	2	21
5	3	30
5	4	6
5	5	-26
5	6	-37
5	7	-28
5	8	-63
5	9	-124
5	10	-173

5	11	-128
5	12	-66
5	13	-70
5	14	-65
5	15	-72
6	0	81
6	1	48
6	2	27
6	3	16
6	4	-2
6	5	-25
6	6	-26
6	7	-22
6	8	-44
6	9	-79
6	10	-153
6	11	-164
6	12	-98
6	13	-77
6	14	-65
6	15	-77
7	0	70
7	1	76
7	2	29
7	3	6
7	4	-4
7	5	-17
7	6	-22
7	7	-20
7	8	-29
7	9	-50
7	10	-111
7	11	-168
7	12	-131
7	13	-88
7	14	-67
7	15	-66
8	0	81
8	1	62
8	2	69
8	3	64
8	4	22
8	5	15
8	6	-22
8	7	-31
8	8	-10
8	9	-39
8	10	-66

8	11	-121
8	12	-126
8	13	-113
8	14	-66
8	15	-51
9	0	55
9	1	73
9	2	72
9	3	72
9	4	31
9	5	24
9	6	-4
9	7	1
9	8	-27
9	9	-28
9	10	-49
9	11	-88
9	12	-150
9	13	-145
9	14	-90
9	15	-67
10	0	26
10	1	50
10	2	102
10	3	103
10	4	63
10	5	51
10	6	17
10	7	-6
10	8	-22
10	9	-28
10	10	-28
10	11	-47
10	12	-123
10	13	-162
10	14	-134
10	15	-86
11	0	9
11	1	65
11	2	86
11	3	106
11	4	77
11	5	62
11	6	17
11	7	6
11	8	-10
11	9	-36
11	10	-25

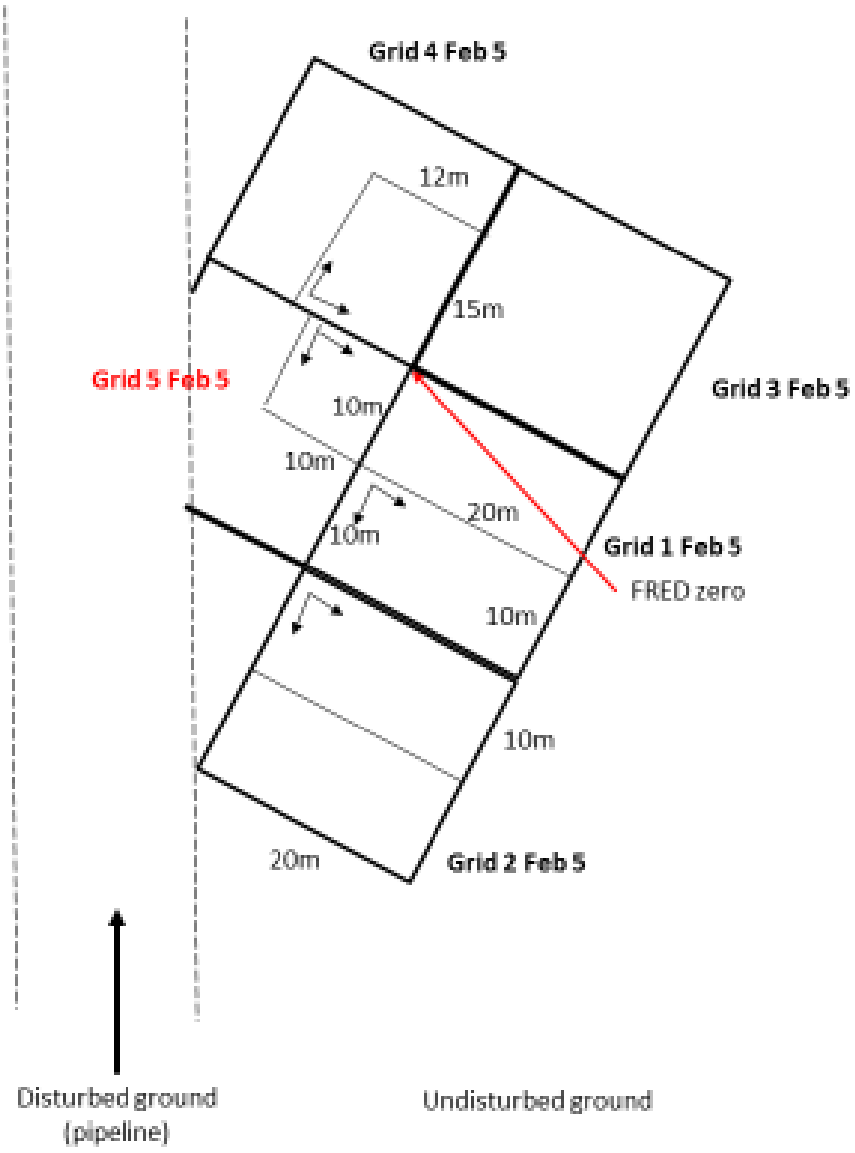
11	11	-43
11	12	-98
11	13	-157
11	14	-150
11	15	-96
12	0	10
12	1	22
12	2	70
12	3	106
12	4	98
12	5	65
12	6	25
12	7	13
12	8	-22
12	9	-14
12	10	-41
12	11	-36
12	12	-71
12	13	-138
12	14	-169
12	15	-128

Appendix 5

Site record

YCCCART Site Survey Project – Manual survey - Banwell	
Survey date	19-3-15
Location	Wolvershill Road Site 2
Site name	Grid 5 Feb 5
Reference	
Type / Instrument	NIVCOMP electronic hydrostatic level
Survey area	10 x 10 m grid X axis, westerly, 11 columns @ 1 m intervals Y axis, southerly, 11 columns @ 1 m intervals Z axis: height above (+), or below (-) Zero point in mm Zero point: SE corner of grid
Data files	Raw data: Paper copy in Manual Folder Scanned copy in Banwell Surfer: Grid 5 Feb 5.xls Grid 5 Feb 5.rtf Grid 5 Feb.grd
Survey team and conditions	
Team	B Wills, G Pearson, A Dimmock
Weather	Cold, dull
Additional information	
Landowner	Mrs. Susan Worth
Tenant	Mr. Keith Raymond.
HER ref	TBC
Site type	Grass
Description	Large open field
Period	
Geology	
Land use	Grazing
Comments	Area of field is undisturbed (ie not known to have been ploughed recently).
Report date	25-6-15
Author	G R Pearson, B Wills

Plan


Grid 4 Feb 5
12m
15m
Grid 5 Feb 5
Grid 3 Feb 5
10m
10m
20m
10m
Grid 1 Feb 5
FRED zero
10m
10m
20m
Grid 2 Feb 5
Disturbed ground
(pipeline)
Undisturbed ground

Electronic data

From Excel file

Xm	Ym	Zmm
0	0	-19
0	1	12
0	2	26
0	3	34
0	4	55
0	5	77
0	6	46
0	7	54
0	8	43
0	9	-3
0	10	0
1	0	31
1	1	48
1	2	70
1	3	67
1	4	69
1	5	73
1	6	46
1	7	34
1	8	-14
1	9	-29
1	10	-25
2	0	57
2	1	73
2	2	83
2	3	63
2	4	63
2	5	50
2	6	-10
2	7	-5
2	8	-7
2	9	-55
2	10	-58
3	0	74
3	1	77
3	2	82
3	3	49
3	4	22
3	5	11
3	6	-8
3	7	-18
3	8	-55
3	9	-54
3	10	-51
4	0	71
4	1	75
4	2	50
4	3	24
4	4	-22

4	5	-18
4	6	-54
4	7	-61
4	8	-58
4	9	-39
4	10	-28
5	0	74
5	1	53
5	2	7
5	3	-3
5	4	-5
5	5	-58
5	6	-77
5	7	-71
5	8	-42
5	9	-3
5	10	9
6	0	29
6	1	17
6	2	3
6	3	-46
6	4	-63
6	5	-48
6	6	-88
6	7	-51
6	8	-29
6	9	-12
6	10	-5
7	0	4
7	1	7
7	2	-51
7	3	-57
7	4	-42
7	5	-56
7	6	-59
7	7	-44
7	8	-64
7	9	-29
7	10	-3
8	0	0
8	1	-26
8	2	-45
8	3	-87
8	4	-62
8	5	-61
8	6	-76
8	7	-52
8	8	-60
8	9	-56
8	10	-25
9	0	-27
9	1	-38
9	2	-63
9	3	-85

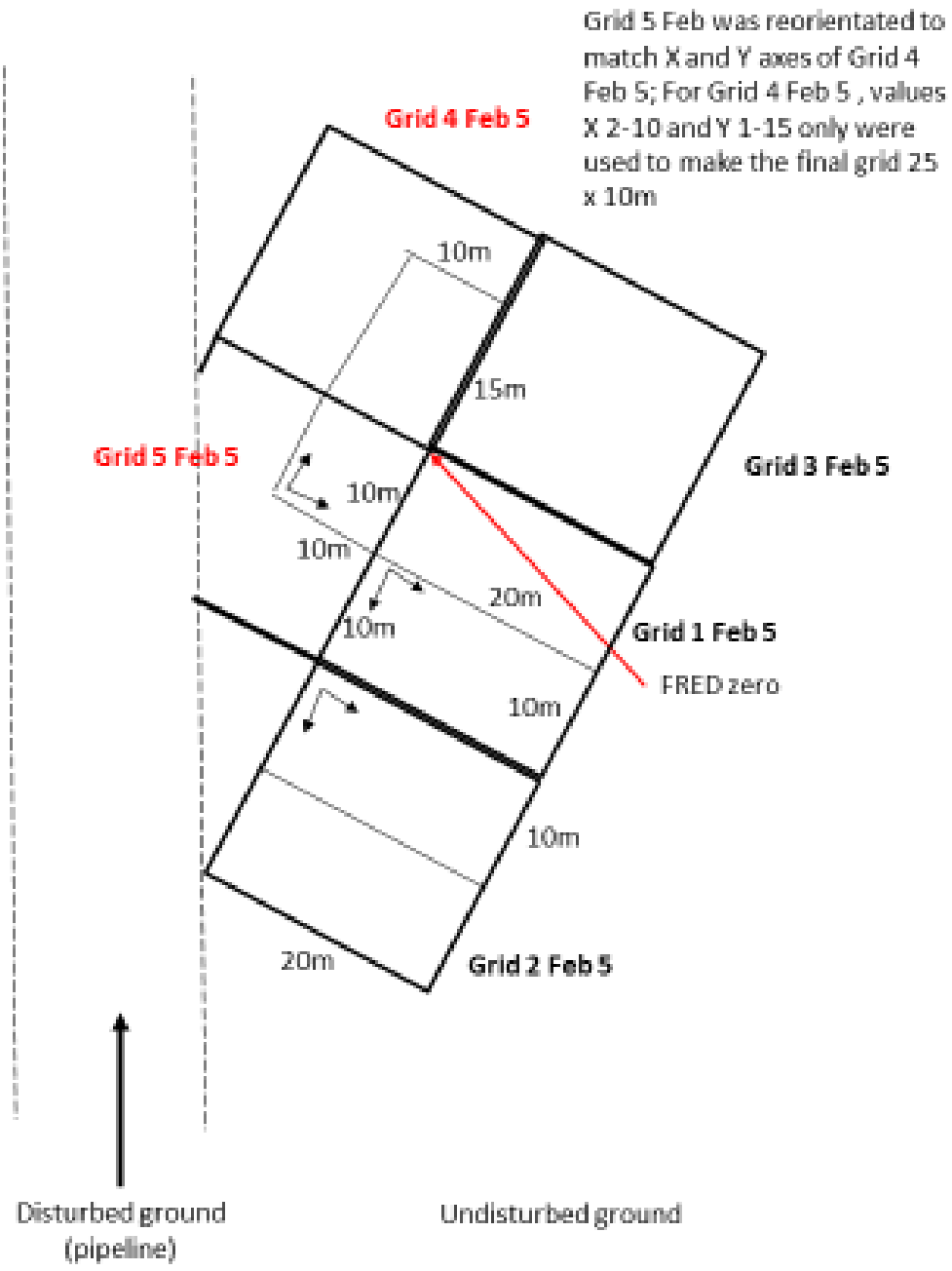
9	4	-76
9	5	-86
9	6	-59
9	7	-92
9	8	-94
9	9	-68
9	10	-9
10	0	0
10	1	-39
10	2	-66
10	3	-77
10	4	-78
10	5	-59
10	6	-76
10	7	-75
10	8	-77
10	9	-56
10	10	-24

Appendix 6

Site record

YCCCART Site Survey Project – Manual survey - Banwell	
Survey date	19-3-15 and 26-3-15
Location	Wolvershill Road Site 2
Site name	Grid 4 and 5 Feb 5
Reference	
Type / Instrument	NIVCOMP electronic hydrostatic level
Survey area	25 x 10 m grid X axis, Southerly, 11 columns @ 1 m intervals Y axis, Easterly, 26 columns @ 1 m intervals Z axis: height above (+), or below (-) Zero point in mm Zero point: SW corner of Grid 4 Feb 5
Data files	Raw data: Paper copy in Manual Folder Scanned copy in Banwell Surfer: Grids 4 and 5 Feb 5.xls Grids 4 and 5 Feb 5.rtf Grids 4 and 5 Feb.grd
Survey team and conditions	
Team	See individual grids
Weather	See individual grids
Additional information	
Landowner	Mrs. Susan Worth
Tenant	Mr. Keith Raymond.
HER ref	TBC
Site type	Grass
Description	Large open field
Period	
Geology	
Land use	Grazing
Comments	Area of field is undisturbed (ie not known to have been ploughed recently).
Report date	31-4-16 (completed using original data)
Author	G R Pearson, B Wills

Plan


Grid 5 Feb was reorientated to match X and Y axes of Grid 4 Feb 5; For Grid 4 Feb 5 , values X 2-10 and Y 1-15 only were used to make the final grid 25 x 10m
Grid 4 Feb 5
10m
15m
Grid 5 Feb 5
Grid 3 Feb 5
10m
10m
20m
10m
Grid 1 Feb 5
FRED zero
10m
10m
20m
Grid 2 Feb 5
Disturbed ground (pipeline)
Undisturbed ground

Electronic data

Xm	Ym	Zmm
0	0	0
0	1	-27
0	2	0
0	3	4
0	4	29
0	5	74
0	6	71
0	7	74
0	8	57
0	9	31
0	10	-19
0	11	7
0	12	-13
0	13	-11
0	14	-27
0	15	-14
0	16	-26
0	17	-70
0	18	-150
0	19	-159
0	20	-85
0	21	-76
0	22	-75
0	23	-70
0	24	-66
0	25	-84
1	0	-39
1	1	-38
1	2	-26
1	3	7
1	4	17
1	5	53
1	6	75
1	7	77
1	8	73
1	9	48
1	10	12
1	11	13
1	12	-19
1	13	-8
1	14	-28
1	15	-36
1	16	-32

1	17	-58
1	18	-95
1	19	-153
1	20	-120
1	21	-61
1	22	-74
1	23	-68
1	24	-72
1	25	-108
2	0	-66
2	1	-63
2	2	-45
2	3	-51
2	4	3
2	5	7
2	6	50
2	7	82
2	8	83
2	9	70
2	10	26
2	11	31
2	12	-9
2	13	18
2	14	-20
2	15	-31
2	16	-50
2	17	-39
2	18	-83
2	19	-147
2	20	-140
2	21	-100
2	22	-77
2	23	-69
2	24	-79
2	25	-67
3	0	-77
3	1	-85
3	2	-87
3	3	-57
3	4	-46
3	5	-3
3	6	24
3	7	49
3	8	63
3	9	67
3	10	34

3	11	36
3	12	21
3	13	30
3	14	6
3	15	-26
3	16	-37
3	17	-28
3	18	-63
3	19	-124
3	20	-173
3	21	-128
3	22	-66
3	23	-70
3	24	-65
3	25	-72
4	0	-78
4	1	-76
4	2	-62
4	3	-42
4	4	-63
4	5	-5
4	6	-22
4	7	22
4	8	63
4	9	69
4	10	55
4	11	48
4	12	27
4	13	16
4	14	-2
4	15	-25
4	16	-26
4	17	-22
4	18	-44
4	19	-79
4	20	-153
4	21	-164
4	22	-98
4	23	-77
4	24	-65
4	25	-77
5	0	-59
5	1	-86
5	2	-61
5	3	-56
5	4	-48

5	5	-58
5	6	-18
5	7	11
5	8	50
5	9	73
5	10	77
5	11	76
5	12	29
5	13	6
5	14	-4
5	15	-17
5	16	-22
5	17	-20
5	18	-29
5	19	-50
5	20	-111
5	21	-168
5	22	-131
5	23	-88
5	24	-67
5	25	-66
6	0	-76
6	1	-59
6	2	-76
6	3	-59
6	4	-88
6	5	-77
6	6	-54
6	7	-8
6	8	-10
6	9	46
6	10	46
6	11	62
6	12	69
6	13	64
6	14	22
6	15	15
6	16	-22
6	17	-31
6	18	-10
6	19	-39
6	20	-66
6	21	-121
6	22	-126
6	23	-113
6	24	-66

6	25	-51
7	0	-75
7	1	-92
7	2	-52
7	3	-44
7	4	-51
7	5	-71
7	6	-61
7	7	-18
7	8	-5
7	9	34
7	10	54
7	11	73
7	12	72
7	13	72
7	14	31
7	15	24
7	16	-4
7	17	1
7	18	-27
7	19	-28
7	20	-49
7	21	-88
7	22	-150
7	23	-145
7	24	-90
7	25	-67
8	0	-77
8	1	-94
8	2	-60
8	3	-64
8	4	-29
8	5	-42
8	6	-58
8	7	-55
8	8	-7
8	9	-14
8	10	43
8	11	50
8	12	102
8	13	103
8	14	63
8	15	51
8	16	17
8	17	-6
8	18	-22

8	19	-28
8	20	-28
8	21	-47
8	22	-123
8	23	-162
8	24	-134
8	25	-86
9	0	-56
9	1	-68
9	2	-56
9	3	-29
9	4	-12
9	5	-3
9	6	-39
9	7	-54
9	8	-55
9	9	-29
9	10	-3
9	11	65
9	12	86
9	13	106
9	14	77
9	15	62
9	16	17
9	17	6
9	18	-10
9	19	-36
9	20	-25
9	21	-43
9	22	-98
9	23	-157
9	24	-150
9	25	-96
10	0	-24
10	1	-9
10	2	-25
10	3	-3
10	4	-5
10	5	9
10	6	-28
10	7	-51
10	8	-58
10	9	-45
10	10	0
10	11	22
10	12	70

10	13	106
10	14	98
10	15	65
10	16	25
10	17	13
10	18	-22
10	19	-14
10	20	-41
10	21	-36
10	22	-71
10	23	-138
10	24	-169
10	25	-128