

# ACAPS

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**Close Interval Potential Survey (CIPS)**  
**of**  
**Pannal to Brackenthwaite**  
**for**



| <b>ACAPS Job No. 172-001-1</b> | <b>Name</b>  | <b>Date</b> |
|--------------------------------|--------------|-------------|
| Approved by                    | D. McCarthy  | 08/11/2021  |
| Prepared by                    | J. Greatorex | 08/11/2021  |

Rev. 0

## **Introduction**

ACAPS were contracted by Northern Gas Networks to undertake a Close Interval Potential Survey (CIPS) on the buried high-pressure pipework between Pannal AGI and Brackenthwaite AGI. The survey was completed 20 October 2021 by Jason Greatorex and Daniel McCarthy.

The cathodic protection (CP) system for Pannal to Brackenthwaite is provided by a bond to Burley Bank – Harewood pipeline at Brackenthwaite AGI. The Transformer Rectifier Unit (TRU) for Burley Bank – Harewood was interrupted for the duration of this survey.

## **Summary of Findings**

The recorded IR free potentials measured w.r.t. a calibrated copper/copper sulphate reference electrode (CSE) are more positive than the -0.85V minimum OFF criteria (NGN/PM/ECP/2 Section 6.6.1) at 1853m, 1973m, 2114m and 2189m, suggesting protection is not being afforded at these locations. The remaining pipework is compliant with the criterion laid out in ECP/2.

## **Methodology**

Pipe potential readings were taken and recorded at approximate 1.5 metre increments along the pipe length, the results being recorded and stored on an Allegro QX Field Computer. All potentials were measured with respect to calibrated copper/copper sulphate reference electrodes (CSE). Allowable tolerance between reference electrodes is +/- 5 mV.

A static MiniLog 2.0 is positioned at a test post within 2.5km of the section being surveyed to capture stray currents and/or Transformer Rectifier (TR) output fluctuations which may affect results captured on the moving logger. The results of the static and moving loggers can then be compared to determine whether dips in potentials are caused by defects or externally influenced.

## Comments and Recommendations

The graphical results shown in Appendix I show a number of defects in the levels of CP applied to the pipeline.

There are a total of:

- 1 P1 defect (both ON & OFF potentials are more positive than -0.85V)
- 3 P2 defects (OFF potential is more positive than -0.85V, ON potentials remain more negative than -0.85V)
- 8 P3 defects (significant dip in ON & OFF potential but both remain more negative than -0.85V)

Given the number and regularity of defects along the pipeline it is recommended a Direct Current Voltage Gradient (DCVG) survey is scheduled for the full length of the pipeline to size and assess the severity of the defects highlighted during the CIPS.

There appears to be a significant drain towards Pannal AGI where the CP readings begin to shift more positive 200m from the AGI. Initial testing concluded the isolation join (IJ) at Pannal is not at fault.

Pannal AGI has recently had the new ISS fencing installed around the site which is the only notable change since the poor readings were first reported to NGN. A few possible reasons for the drop in potentials could be damage to the pipeline during excavations for the new fence footings, metallic contact with the rebar in the new footings/upgraded earthing system or interaction with the site CP system.

Additional testing will be required at Pannal to rule out each of the possible causes for the drain mentioned above. DCVG, Pipeline Current Mapping (PCM) and interaction testing will be required to gain a better understanding of what is responsible for the reduction in potentials at Pannal AGI.

During testing at Brackenthwaite AGI it was observed that the bond between Pannal to Brackenthwaite and Burley Bank – Harewood appears to be resistive despite no resistors being found in the bond post. The mainline has a more negative potential than the Pannal spur despite the bond appearing to be direct.

The bond current measured 252mA at the bond post. With a temporary second bond cable between the Burley Bank mainline and the Pannal pipeline an additional 51mA current is transferred.

With protection levels being close to, and even below criteria at points during the CIPS, it is recommended that the bond at Brackenthwaite is reinstated with suitably sized conductors along with the facility to alter the bond resistance should it be required.

Other notable observations made during the CIPS are a new tree plantation over the main at 1229m and large trees growing over the main at 1517m.

The pipework should continue to be monitored in accordance with the requirements of NGN/PM/ECP/2 & NGN/PR/MAINT/5003.

**Survey Information**

|                   |                                   |                  |                          |            |
|-------------------|-----------------------------------|------------------|--------------------------|------------|
| <b>SURVEYORS:</b> | Jason Groatorex & Daniel McCarthy |                  | <b>DATE:</b>             | 20/10/2021 |
| <b>JOB No:</b>    | 172-001-1                         | <b>PIPELINE:</b> | Pannal to Brackenthwaite |            |

| LOCATION | START COORDINATES |            | END COORDINATES |            |
|----------|-------------------|------------|-----------------|------------|
|          | EASTING           | NORTHING   | EASTING         | NORTHING   |
|          | 425217            | 450787     | 427986          | 451237     |
|          | LATITUDE          | LONGITUDE  | LATITUDE        | LONGITUDE  |
|          | 53.95257          | -1.6172335 | 53.956472       | -1.5749998 |

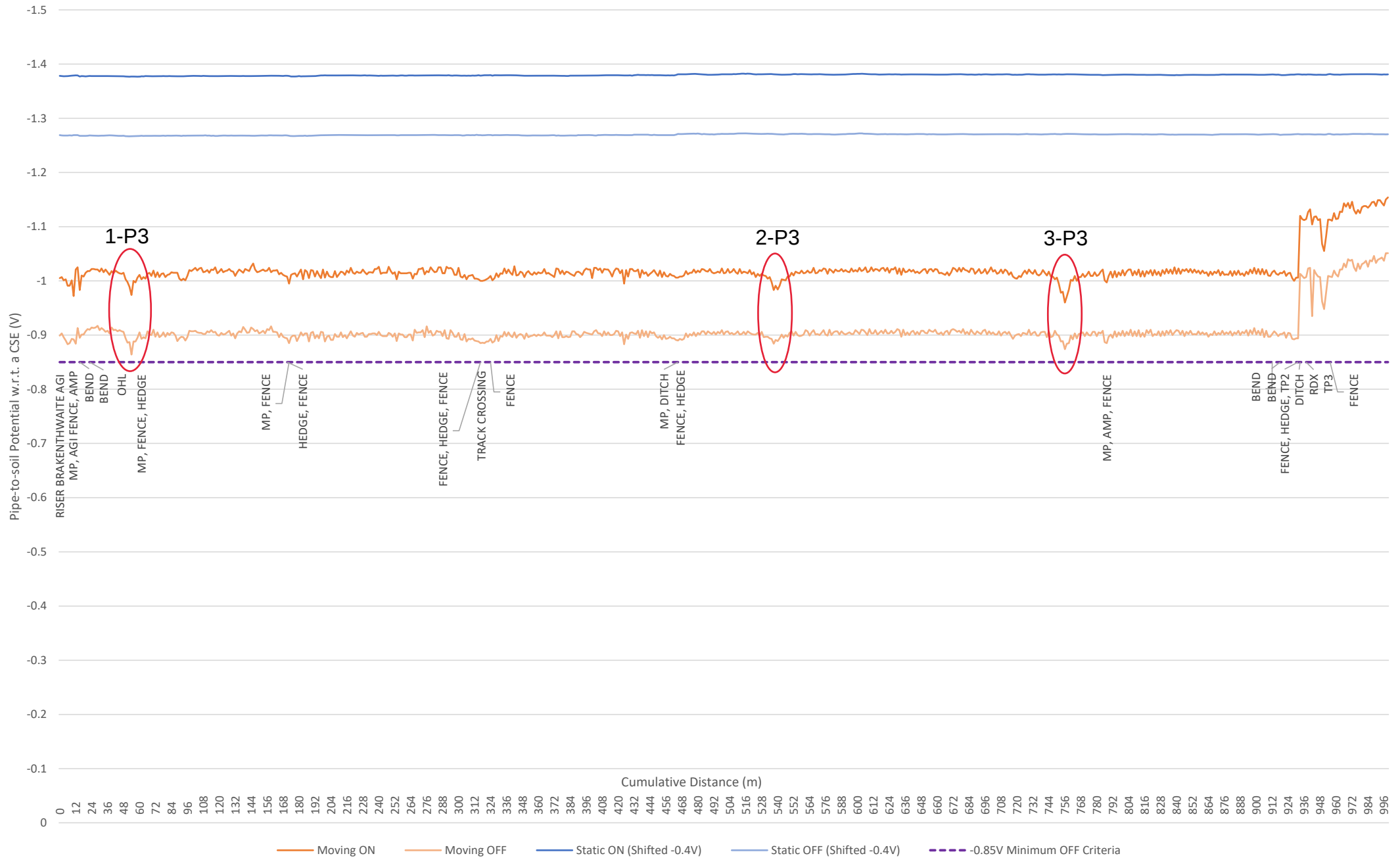
|                                                                             |                      |                     |                              |
|-----------------------------------------------------------------------------|----------------------|---------------------|------------------------------|
| SURVEY TYPE:                                                                | Interrupted          | SWITCHING CYCLE:    |                              |
| STATIC:                                                                     | Applied              | Seconds on:         | 0.8                          |
|                                                                             |                      | Seconds off:        | 0.2<br>(120ms capture delay) |
| CP SYSTEM TYPE:                                                             | Impressed Current    |                     |                              |
| EQUIPMENT APPLIED:                                                          | Allegro QX (moving)  | Serial No. 227076   |                              |
|                                                                             | MiniLog 2.0 (Static) | Serial No. 31001613 |                              |
| CRITERIA:                                                                   |                      |                     |                              |
| 1. To locate areas below the minimum protection level -0.850V w.r.t. a CSE. |                      |                     |                              |
| 2. To determine areas of stray current interference or effects.             |                      |                     |                              |
| 3. To establish if over-protection is occurring.                            |                      |                     |                              |

**Additional Data**

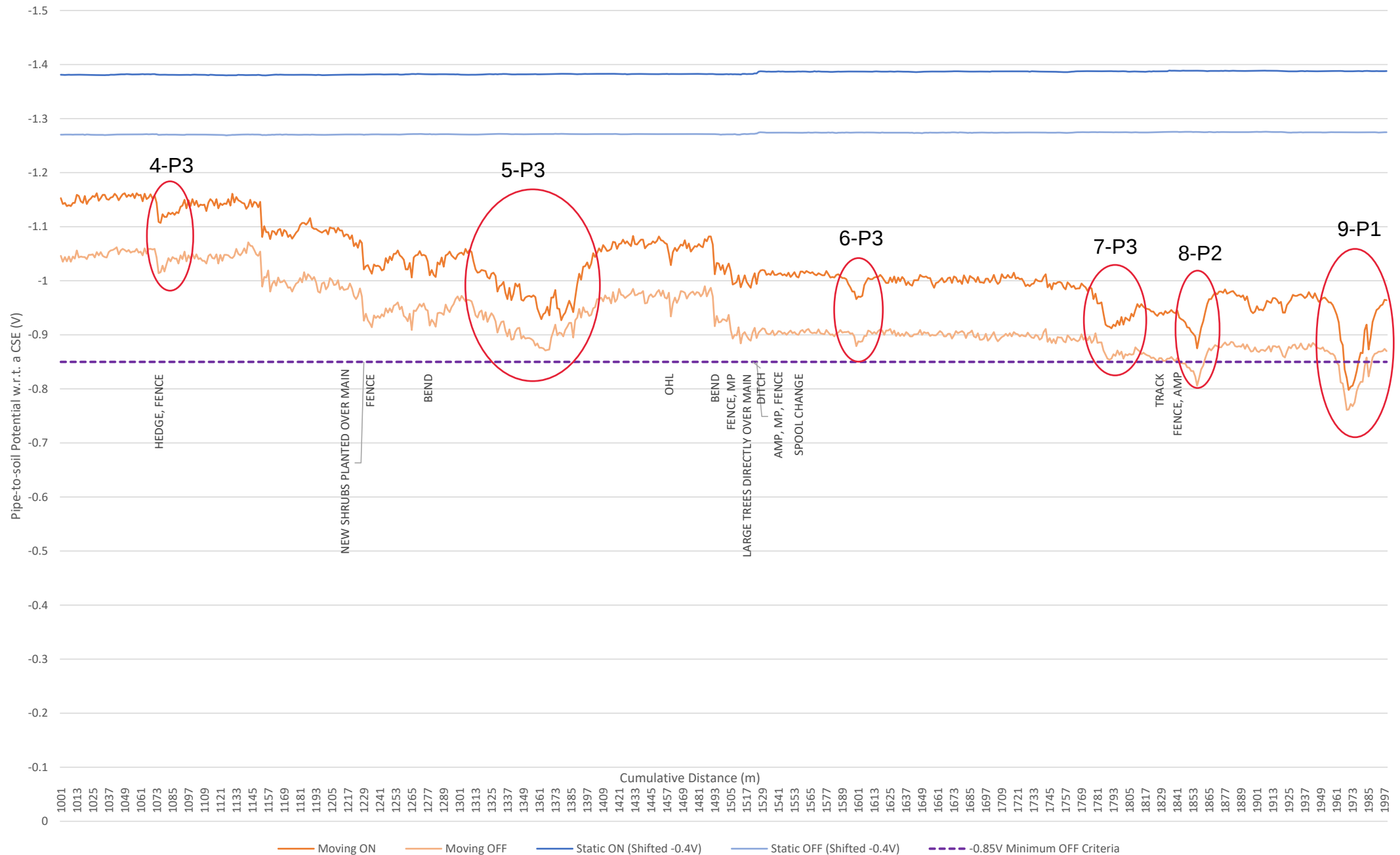
| TRUs Interrupted for the Survey | Voltage | Current | Variac Setting |
|---------------------------------|---------|---------|----------------|
| New York Farm TR                | 14.63V  | 2.94A   | 30%            |

**APPENDIX I – CIPS Data Graph**

172-001-1  
Pannal to Brackenthwaithe CIPS



172-001-1  
Pannal to Brackenthwaithe CIPS



172-001-1  
Pannal to Brackenthwaithe CIPS

