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Project name:
NZT

Project ref:
60657467

From:
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Date:
24 September 2021

To:
Net zero Teeside
BPbp

CC:
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Michael Blakely

AECOM Ground,Energy & Transaction Solutions

Memo

Subject: Buried Objects-Geophysics-V3

The following technical memo will detail a re-interpretation of the time-domain electromagnetics (TDEM) data collected over the Net Zero Teesside (NZT) site at Redcar by the AECOM geophysics team between 16th November and 4th of December 2020. Details of that survey and further findings, methodology and equipment specification can be found in the "Net Zero Teesside-Geophysical investigation" report[1].

Historical data and maps were obtained from AECOM's "Net Zero Teesside- STDC 'Main Site' Geotechnical and Geo-Environmental Desk Study"[2]

Processing Methodology :

A suite of processing trials were undertaken to enhance the imaging of the TDEM data collected. The final processing flow used in this interpretation is as follows:

- Levelling of each individual data set (corresponding to survey day) to ensure a (unitless) dynamic data range of all data sets between 0-1
- Subtracting of normalized Channel 3 (bottom coil, gate 706µs) from Channel 4 (top coil, gate 706µs)
- Kriging gridding, utilizing 1m grid cells

Georeferenced historic building maps and satellite images were added to the map for reference and to assist with interpretation/classification of the data.

[1] Net Zero Teesside-Geophysical investigation, revision 01. 11.06.2021
[2] 60559231-CTR005-003 GEO-002, April 2020

Interpretation:

After identification of current surface infrastructure (roads, railway tracks, structure, visible concrete/asphalt slabs) the following object categories were chosen based on a combination of geophysical response, intrusive data and features on current and historical maps:

- (Reinforced) concrete slabs
- Former building walls
- Buried railway tracks/remains
- Buried pipes/utilities
- Unidentified features
- Existing roads/buildings/surface features (not mapped)

Only spatial extent of features could be identified, depth estimates of features did not yield any reliable and non-unique values.

The interpretation is based on geophysical (TDEM) responses only, with the historic building and infrastructure outline maps used to classify different categories only. No prior knowledge of the actual use/purpose of the buildings or the construction material used for the different elements was included.

It is advised to validate a selected number of features from each category by trenching/trial pits to validate the features highlighted and update the results of this interpretation.

The interpreted features have been drawn as polygons on the gridded TDEM data, examples of the different categories have been included below.

Slabs:

Rectangular high signal responses that are likely to indicate (reinforced) concrete floor slabs and foundations of demolished buildings. Most of the responses correlate to the location of former buildings Only high signal responses are traced rather then complete building footprints. It is likely some of the building floors will have been removed during demolition or have a different construction.

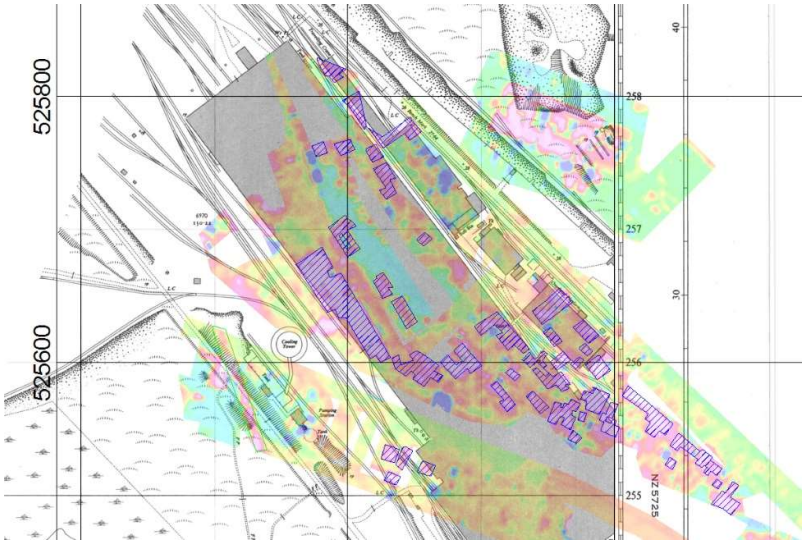


Figure 1: Example slabs (blue) overlain on 1952 OS Map

Former building walls:

Narrow, linear high signal responses correlating with the outlines of historical buildings. These features could relate to building rubble and foundations.

Buried railway tracks/remains:

Irregular, linear features corresponding to historic railway or tramway lines. The responses might be indicative of existing (buried) metallic tracks, remnants of demolished tracks or ore/slag waste. These signatures are characterized as fragmented high responses over a broad area.

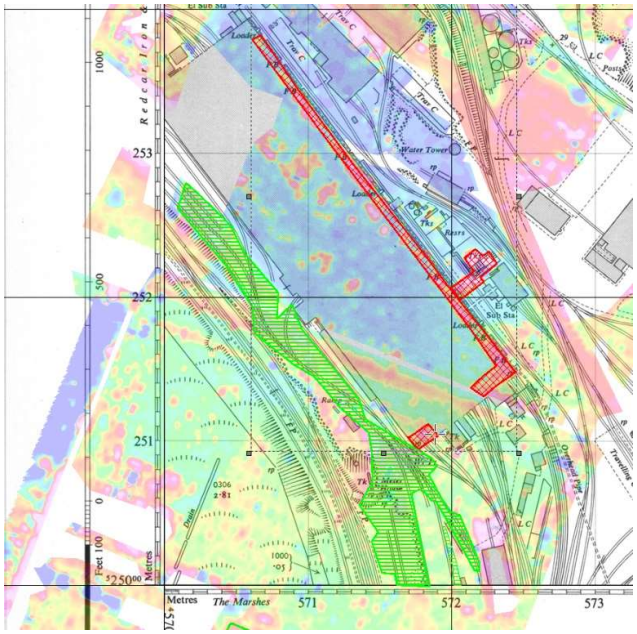


Figure 2: Example steel mill wall (red) buried tracks response (green) overlaying 1952 OS Map tile

Buried pipes/utilities:

Linear high signal response features corresponding to the location of known utilities (as per STATS from Nov 2020).

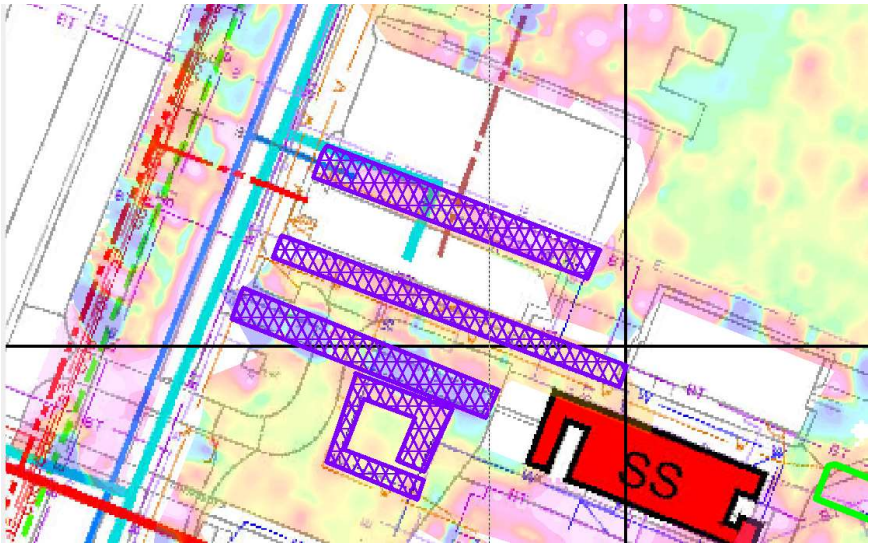


Figure 3: Example known buried utilities (purple), overlaying Buried Services drawing

Unidentified Features

A mixture of high and low responses, not correlating to known features on historic maps.

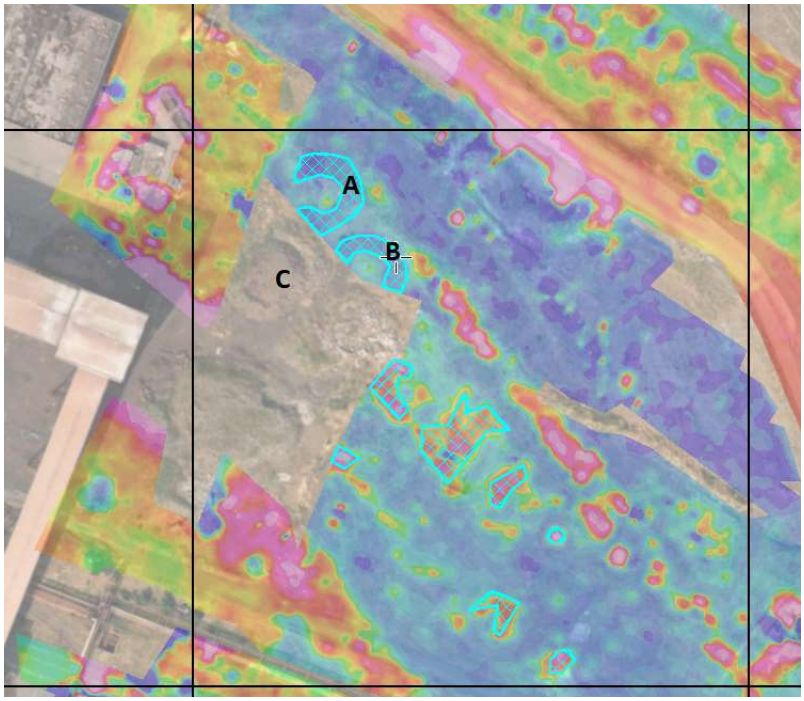


Figure 4: Example Unidentified features

A special mention needs to be made with regards to features A,B and C as identified in Figure 4. The circular mound or rubble “C” as visible on the satellite image has corresponding features (with similar shape & diameter) as very low responses identified as “A” and “B” in figure 4.It is unknown what the origin of mound C is, or if there is any relation between the features. The geophysical survey site team had no recollection of anything present on site, nor is there any feature identifiable on the historic drawings.

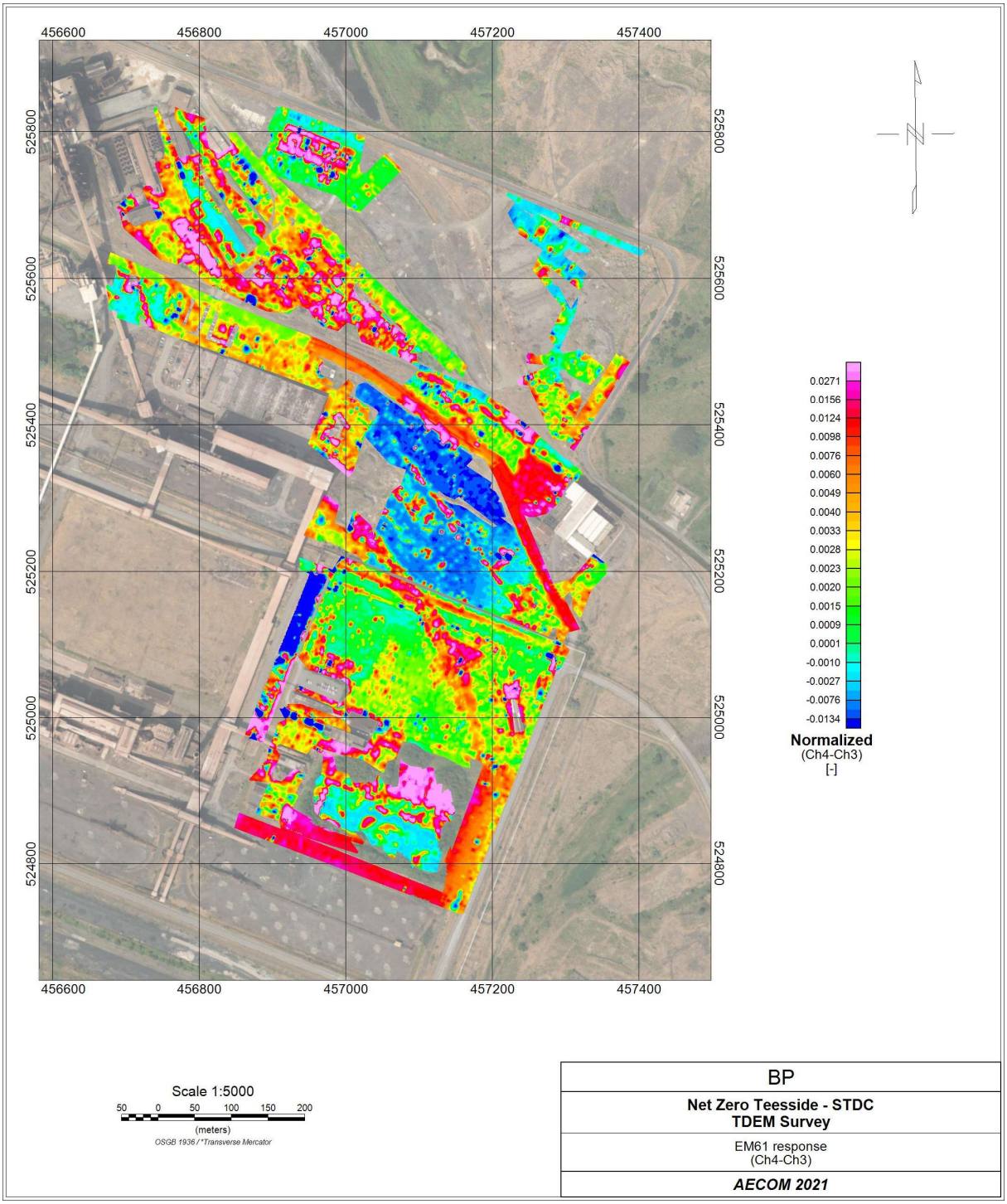
Existing roads/buildings/surface features:

Typically, high responses correlating with surface features from Microsoft Azure satellite imagery. It is likely these signatures are responses to reinforced concrete road and building slabs. These features have been excluded from this assessment and therefore not been highlighted as polygons.

Results:

Identified and classified features will be presented in maps attached to this memo. A digital delivery is also included for inclusion in the 3D geotechnical model consisting of:

- **NZT_TDEM_proc.grd:** An Oasis Montaj georeferenced (OSGB36) gridfile of the processed TDEM dataset as presented and used in this analysis
- **JPG** image files of each of the interpretive maps
- A set of ARCView polygon files with the interpreted georeferenced shapes have also been provided
    - **NZT_tracks:** responses likely related to former tracks/trackbed (based on historical maps)
    - **NZT_walls:** responses likely related to former building walls (foundations below walls?)
    - **NZT_slabs:** responses likely related to (partially) buried reinforced concrete slabs, either building floors or outside hardstanding
    - **NZT_other:** responses of unknown origin
- **NZT_utilities:** responses likely related to buried utilities as identified on the available STATS drawing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TDEM Survey
EM61 response
(Ch4-Ch3)
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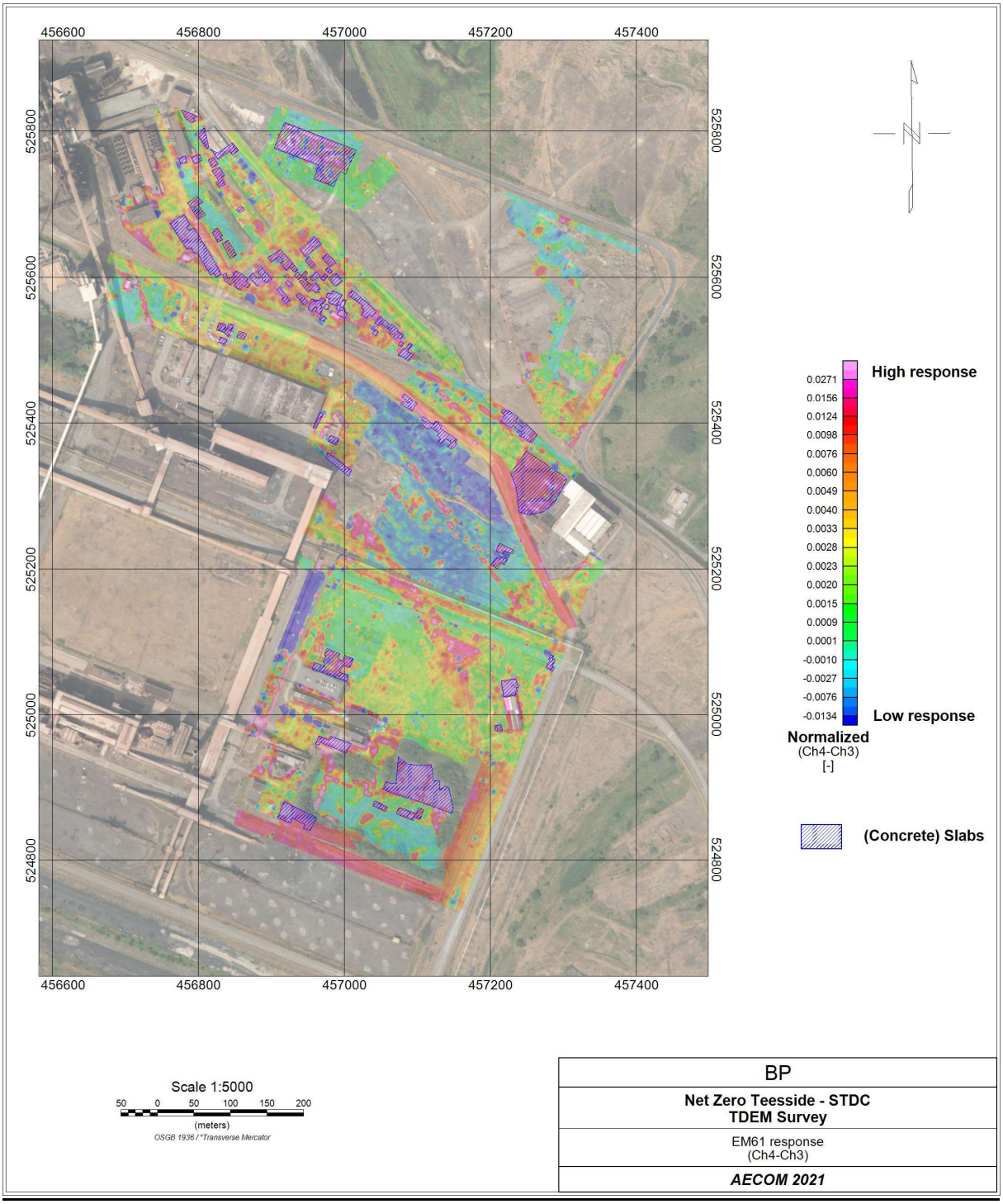
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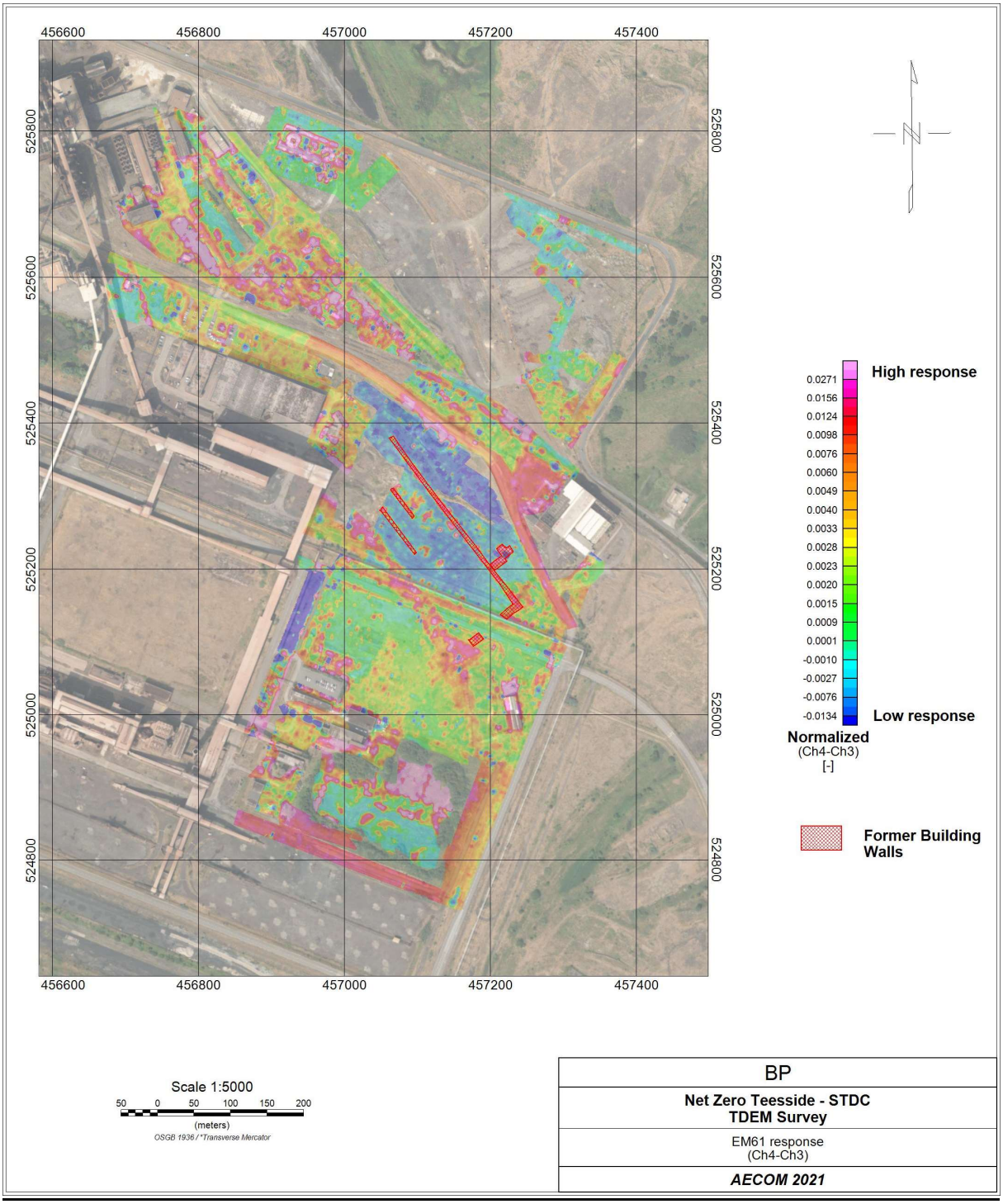
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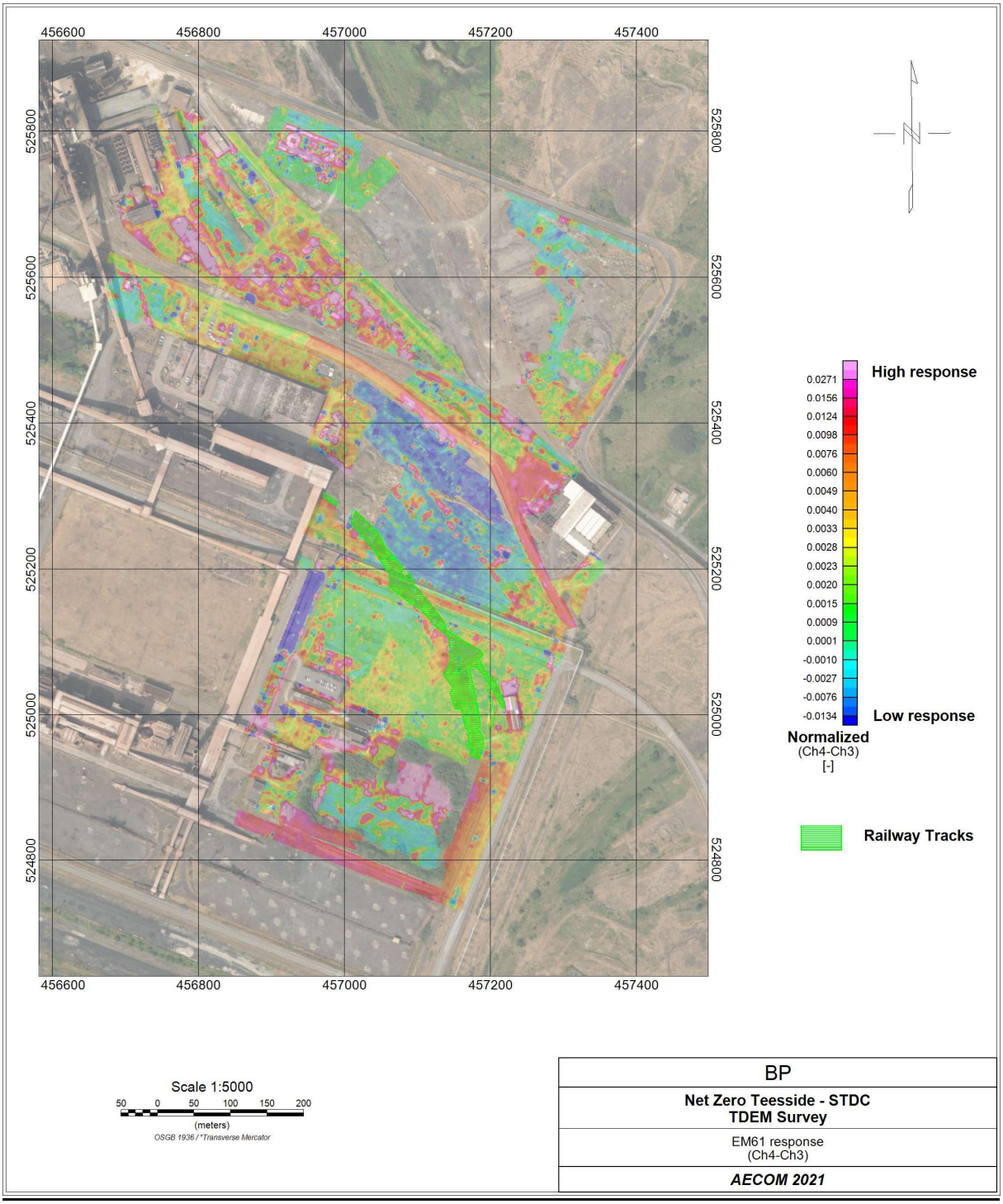
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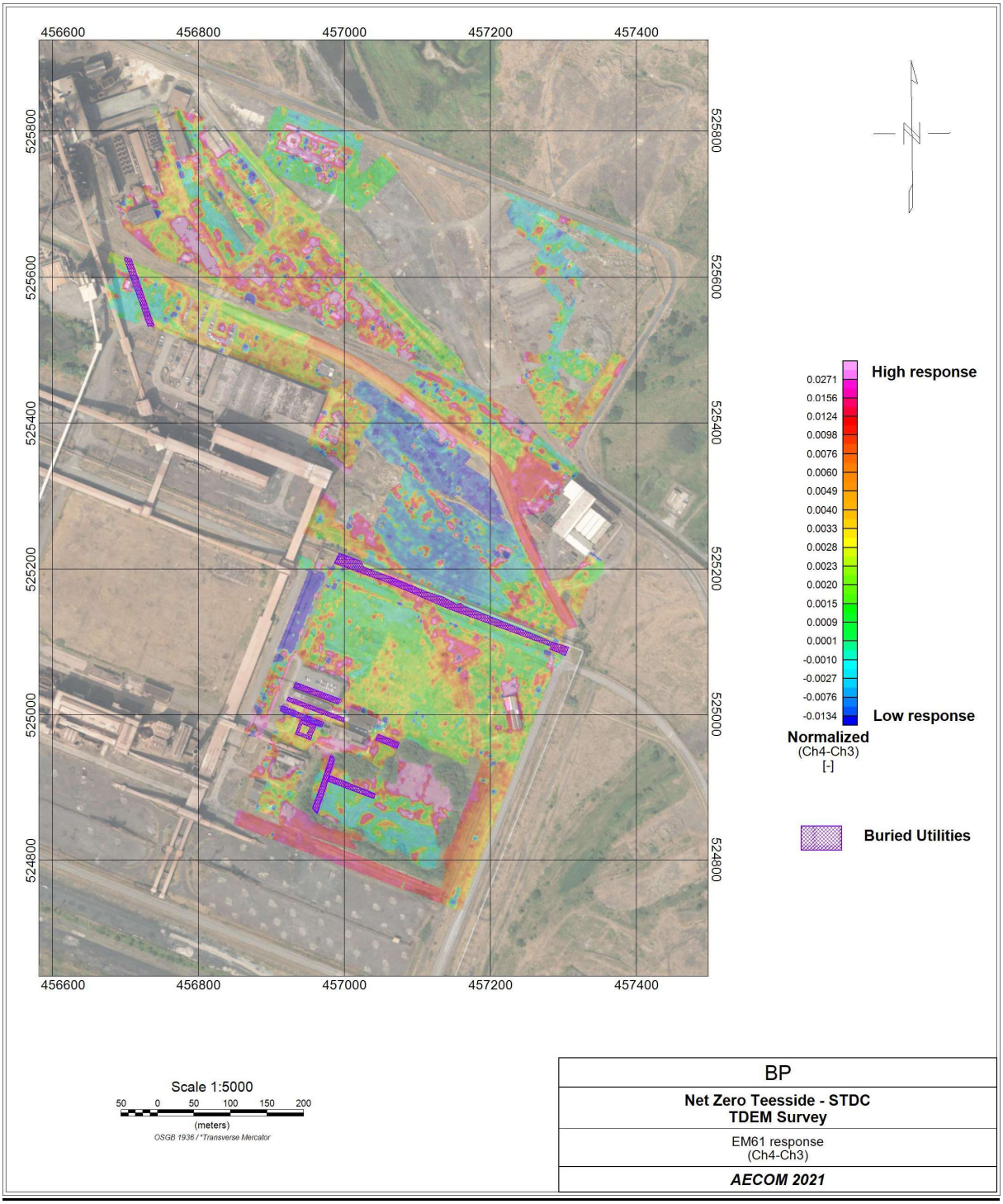
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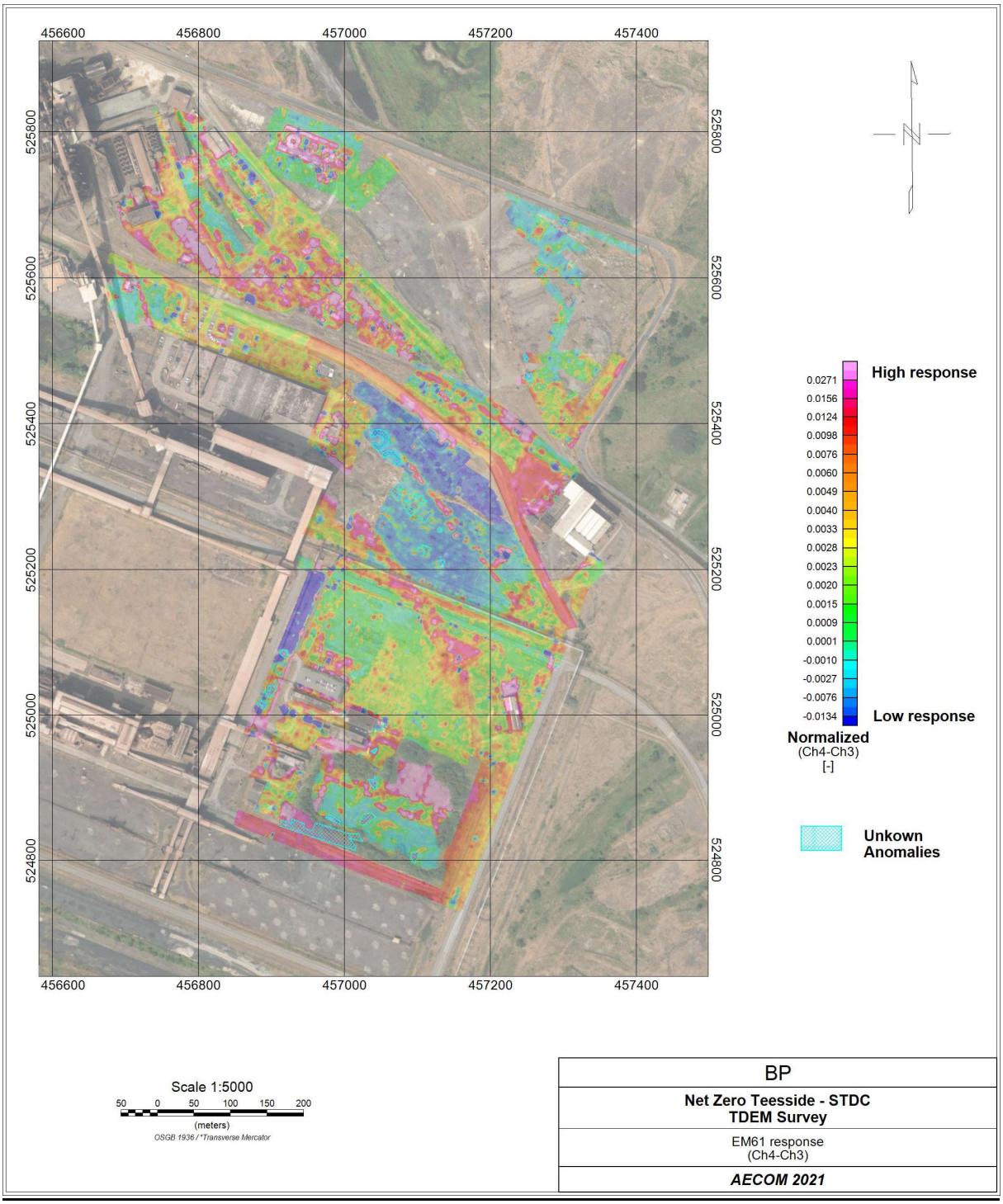
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