

Technical Note

Project Title	Mobuoy Remediation Project				
Project No.	787-B030252				
Title	Mobuoy Groundwater Flow Review				
Date	31/03/2026	Revision	2	Status	Final
Prepared by	■■■■	Checked by	■■■■	Approved by	■■■■

1.0 Introduction

Tetra Tech Limited (Tetra Tech) were appointed by Northern Ireland Environment Agency (NIEA), an executive Agency within the Department of Agriculture Environment and Rural Affairs (DAERA) to undertake a comprehensive review of groundwater flow for the Mobuoy site as part of the Mobuoy Remediation Project. A site location plan is shown on Figure 1.

1.1 Background

The Mobuoy Remedial Project herein referred to as the 'site' is located on the outskirts of the city of Derry/Londonderry on the Mobuoy Road. It encompasses an area of approximately 46ha and currently consists of two distinct parcels of land either side of Mobuoy Road identified as City Industrial Waste (CIW) and Campsie Sand and Gravels (CS&G) as shown on Figure 2. Due to the historic presence of significant volumes of illegally deposited waste, the site has been subject to extensive investigation and assessment.

In June 2023, a Draft Remediation Strategy was prepared and subsequently released for public consultation from 13th June 2025 to 2nd October 2025. Following this consultation, which outlined proposed remediation solutions, it is recognised that further detailed design work is required. This report focuses on the review of current groundwater flow conditions at the site.

1.2 Objectives

The key objectives of this document are to:

- Review previously completed groundwater flow modelling;
- Assess site conditions that may influence groundwater flow;

- Review all available groundwater level data available to present day; and
- Undertake updated groundwater flow modelling for current site conditions.

1.3 Terms and Conditions

Tetra Tech's Terms and conditions are available within Appendix A.

2.0 Groundwater Flow Modelling

2.1 Previous Groundwater Flow Modelling

Previous characterisation of groundwater flow conditions was based on hydrogeological monitoring data collected during the site investigation works for the Tetra Tech DQRA (reference: 787- B030252, dated October 2022). Groundwater standing levels were corrected to metres above ordnance datum (mAOD) using surveyed well elevations. Flow mapping presented in the TT DQRA demonstrated a general westward flow direction toward the River Faughan, consistent with earlier assessments (including WYG PRA 2016; Sirius DQRA 2017). A minor southerly component was observed locally, particularly at the southern boundary of the CIW site and the south-eastern area of the CS&G site, indicating some flow toward adjacent tributaries. However, the principal flow direction remained westward. Within the shallow aquifer, groundwater flow was predominantly westward toward the River Faughan, with local variations influenced by the river as the dominant hydrogeological feature.

2.2 Current Groundwater Flow Modelling

Since the completion of the previous groundwater modelling in 2022, no substantive modifications to the site have been identified. As such, the hydrogeological conditions controlling groundwater flow are considered to have remained largely unchanged. Additional groundwater monitoring data collected since 2022, covering the period from 2015 to present, has been reviewed to assess current flow conditions. As before, groundwater standing levels were compensated to mAOD using surveyed well elevations.

Groundwater flow mapping was conducted using GroundWater Spatiotemporal Data Analysis Tool¹ (GWSDAT) providing spatiotemporal model analysis plots, with results presented in the GWSDAT plots (see Appendix B). These plots display blue arrows indicating the estimated direction and relative hydraulic gradient of groundwater flow at monitoring points across the site. Review of the groundwater flow data from 2015 to 2026 confirms that the predominant direction of groundwater movement remains toward the west. Although minor variations in groundwater contours are observed, there are no significant deviations from the overall westward trend. These findings indicate a stable hydrogeological regime, with no evidence

¹ <https://gwmdat.net/home/>

of major shifts in flow direction over the monitoring period. The data therefore support the conclusion that groundwater flow at the site has remained consistently oriented to the west throughout the years assessed.

2.2.1 GWSDAT Groundwater Flow Calculation

For each model output interval, GWSDAT estimates groundwater flow strength and direction using available groundwater level and well coordinate data. The model operates on the principle that local groundwater flow follows the direction of steepest hydraulic gradient, as determined by neighbouring wells identified through Delaunay triangulation. This algorithm is applied to each well with a recorded groundwater level for every model output interval.

2.2.2 Well Redundancy

The Well Redundancy Analysis was implemented to systematically remove various combinations of wells from the dataset and assess the resultant impact on the overall analysis. The primary objective of this approach is to identify wells that exert the greatest influence on the hydrogeological interpretation and to demonstrate that the key conclusions remain robust even when certain wells are omitted. Wells with limited data availability, as well as those situated in close proximity to other wells, were prioritised for removal to minimise redundancy and potential data overlap. This process provides additional confidence that the analytical outcomes are not unduly dependent on any single well or closely clustered group of wells, thereby supporting the reliability and representativeness of the groundwater flow assessment.

3.0 Conclusions and Recommendations

Groundwater flow at the Mobuoy Remediation Project site has remained generally westward toward the River Faughan from review of the groundwater dataset between the period of 2015 to 2026, as confirmed by GWSDAT flow mapping. Minor local variations exist, but the overall hydrogeological regime is stable, with no significant shifts in the principal flow direction. Well redundancy analysis confirms that these conclusions are robust and not dependent on any single well or closely spaced group of wells. Based on this review we can conclude that the information presented within the previous modelling works undertaken for the DQRA is relevant with no significant deviations

As part of the proposed future detailed design works it is recommended that assessment of the regional flow, particularly along the Faughan River Valley toward the River Foyle, is included to fully evaluate offsite migration pathways. The assessment should be undertaken synthesising all available data into a calibrated 3D groundwater flow such as The U.S. Geological Survey Modular Ground-Water Model—the Ground-Water Flow Process (MODFLOW²) and contaminant transport model such as Modular Three-Dimensional Multi-Species Transport Model (MT3DMS³) and Reactive Transport in 3-Dimensions (RT3D⁴) to provide the detailed information and assessment required for the remediation design and ongoing review during the remediation works.

² Harbaugh, A.W. (2005) A modular three-dimensional finite-difference ground-water flow model (MODFLOW-2005): the U.S. Geological Survey modular ground-water model — documentation of the ground-water flow process. U.S. Geological Survey Techniques and Methods 6-A16.

³ Zheng, C. and Wang, P.P. (1999) MT3DMS: A modular three-dimensional multispecies transport model for simulation of advection, dispersion, and chemical reactions of contaminants in groundwater systems: documentation and user's guide.

⁴ Clement, T.P. (1997) RT3D — A modular computer code for simulating reactive multi-species transport in 3-dimensional groundwater aquifers. Pacific Northwest National Laboratory Report PNNL-11720

Appendix A – Report Conditions

Figure 1. Site Location Plan



Legend

- City Industrial Waste
- Campsie Sand Gravel

Note:

Drawn by: ■

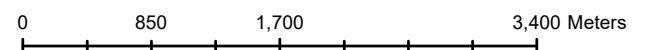
Checked by: ■

Office: Belfast

Revision: No.1

Client: NIEA

Project: B030252 - Mobyuoy Road Remediation

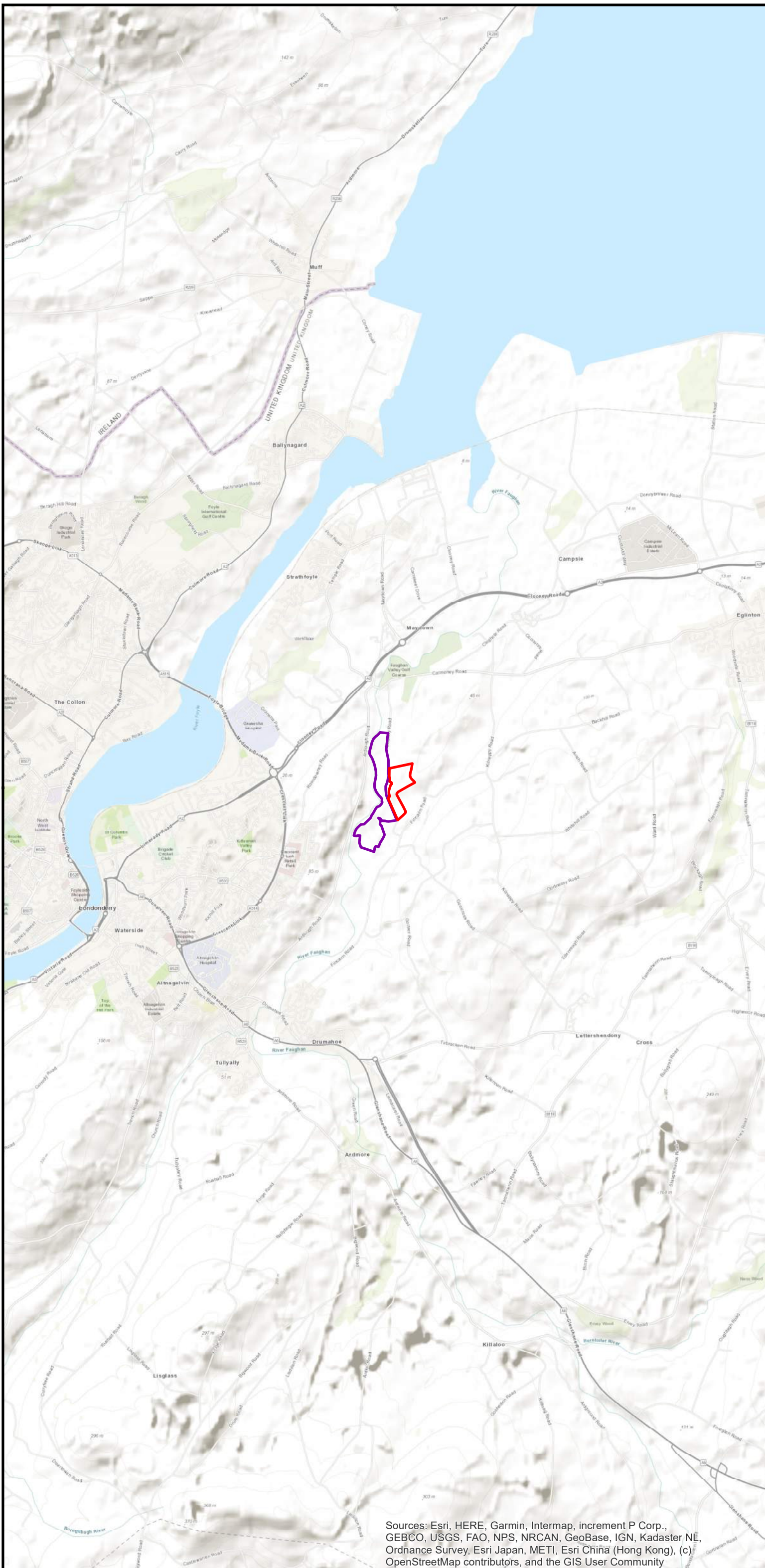


Date: 30/06/2022



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Sources: Esri, HERE, Garmin, Intermap, increment P Corp.,
 GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL,
 Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c)
 OpenStreetMap contributors, and the GIS User Community



This report is produced solely for the benefit of NIEA and DAERA and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to TTech. In time improved practices, fresh information or amended legislation may necessitate a re-assessment. Opinions and information provided in this report are on the basis of TTech using due skill and care in the preparation of the report.

This report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections. Environmental conditions can vary, and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

This report is limited to those aspects reported on, within the scope and limits agreed with the client under our appointment. It is necessarily restricted, and no liability is accepted for any other aspect. It is based on the information sources indicated in the report. Some of the opinions are based on unconfirmed data and information and are presented as the best obtained within the scope of this report.

Reliance has been placed on the documents and information supplied to TTech by others but no independent verification of these has been made and no warranty is given on them. No liability is accepted, or warranty given in relation to the performance, reliability, standing etc. of any products, services, organisations or companies referred to in this report.

Whilst skill and care have been used, no investigative method can eliminate the possibility of obtaining partially imprecise, incomplete or not fully representative information. Any monitoring or survey work undertaken as part of the commission will have been subject to limitations, including for example timescale, seasonal and weather-related conditions.

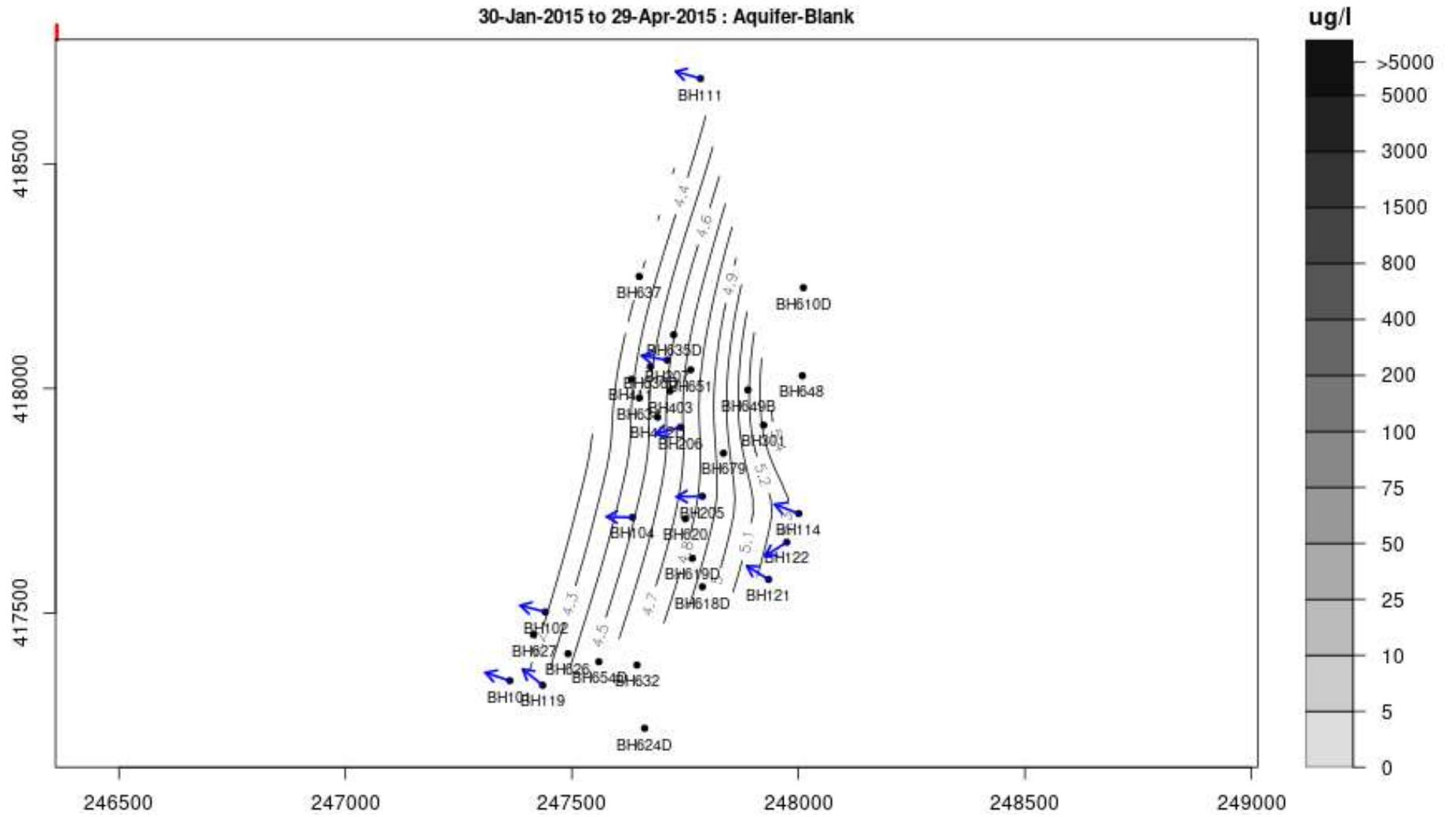
Although care is taken to select monitoring and survey periods that are typical of the environmental conditions being measured, within the overall reporting programme constraints, measured conditions may not be fully representative of the actual conditions. Any predictive or modelling work, undertaken as part of the commission, will be subject to limitations including the representativeness of data used by the model and the assumptions inherent within the approach used. Actual environmental conditions are typically more complex and variable than the investigative, predictive and modelling approaches indicate in practice, and the output of such approaches cannot be relied upon as a comprehensive or accurate indicator of future conditions.

The potential influence of our assessment and report on other aspects of any development or future planning requires evaluation by other parties involved.

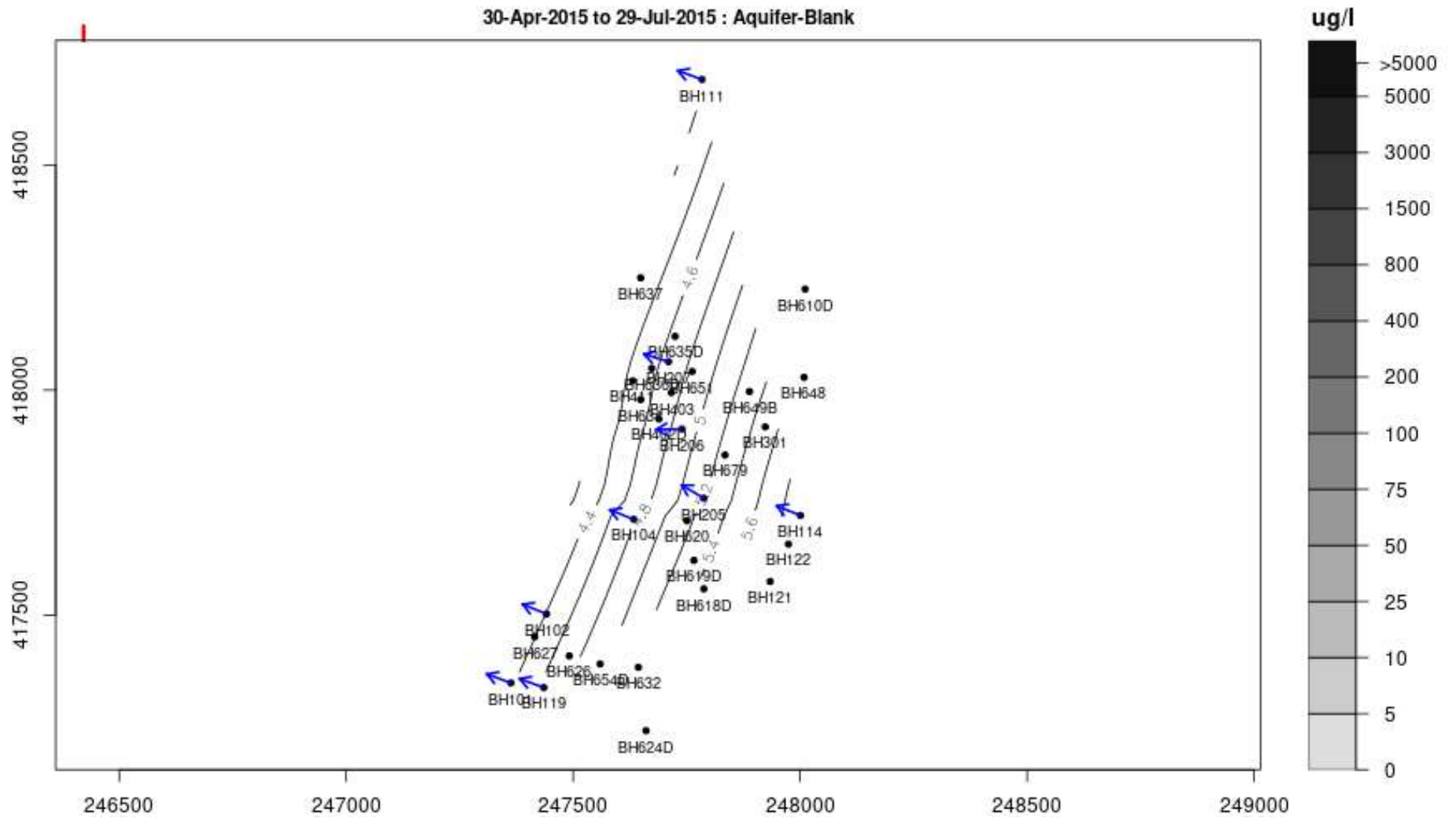
The performance of environmental protection measures and of buildings and other structures in relation to acoustics, vibration, noise mitigation and other environmental issues is influenced to a large extent by the degree to which the relevant environmental considerations are incorporated into the final design and specifications and the quality of workmanship and compliance with the specifications on site during construction. TTech accept no liability for issues with performance arising from such factors.

Appendix B – GWSDAT Spatial Plots

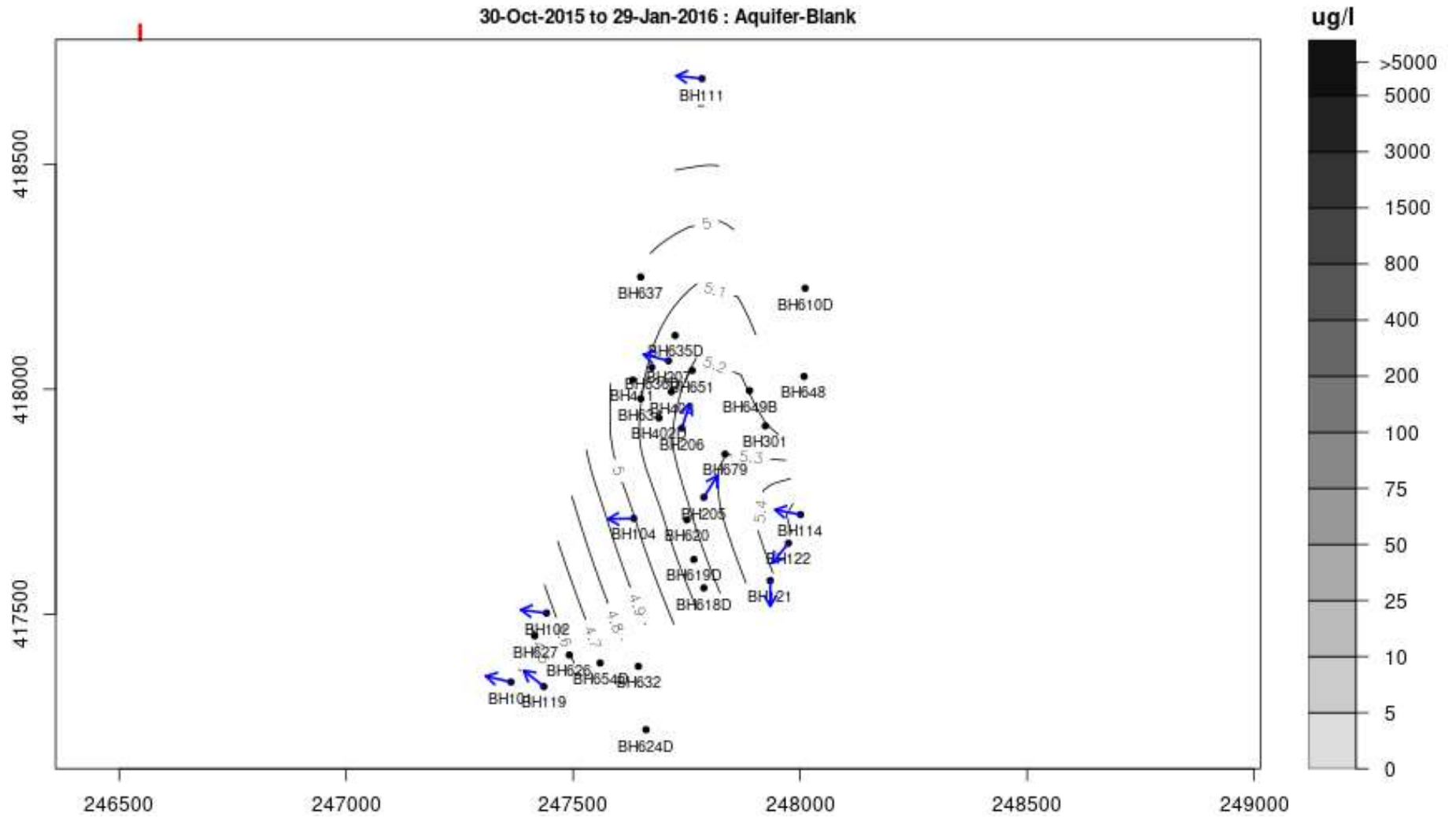
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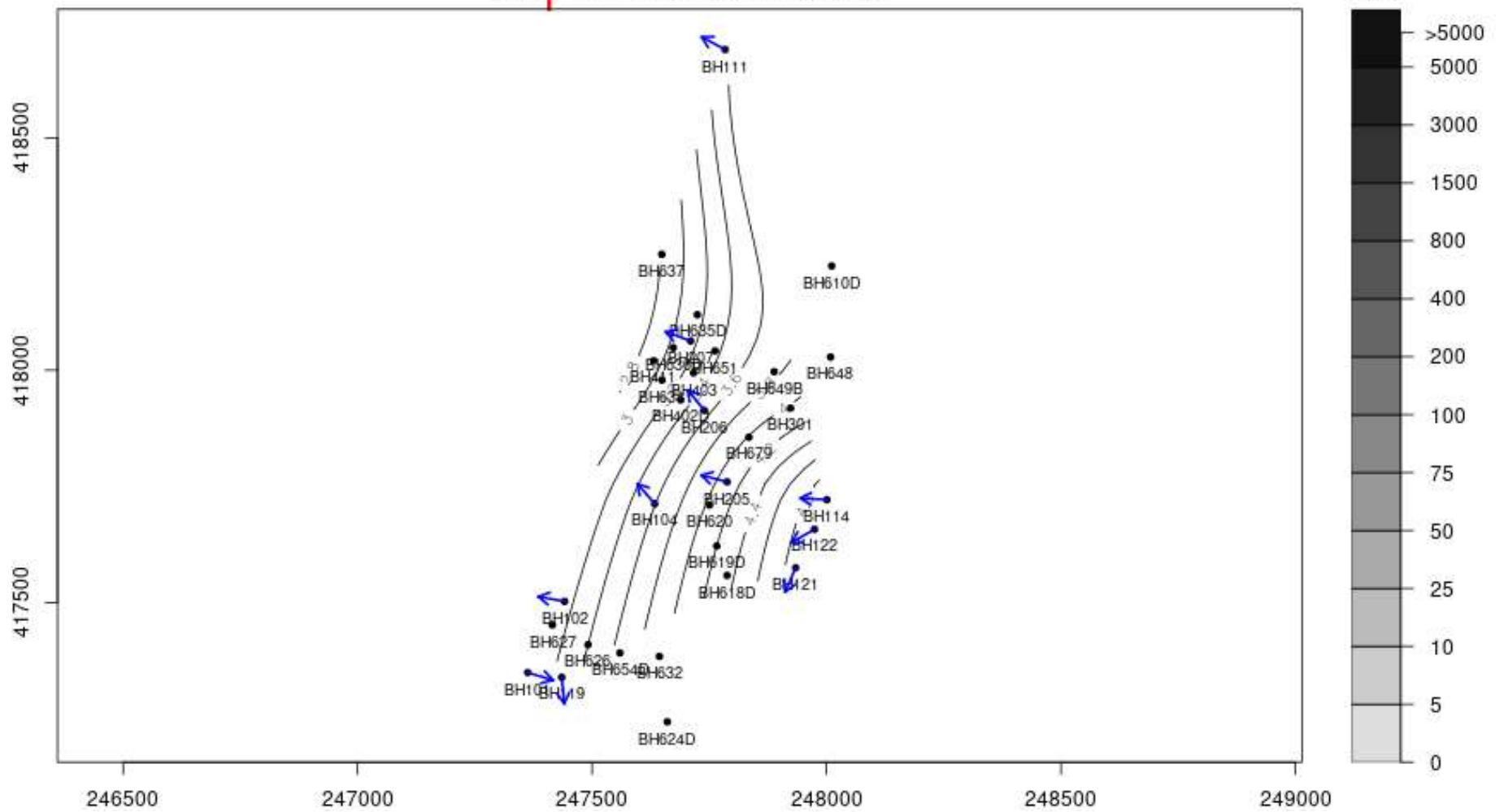
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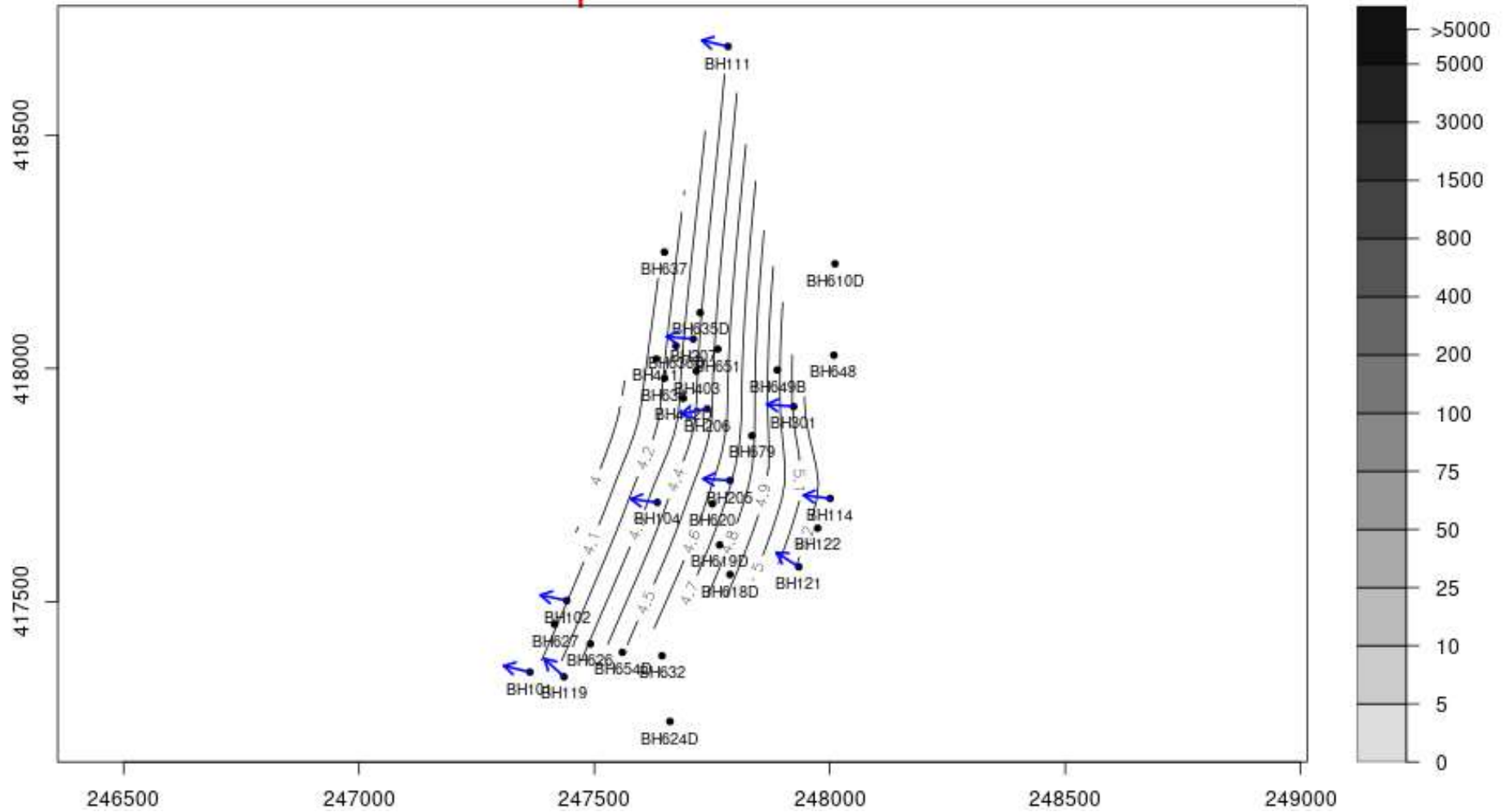
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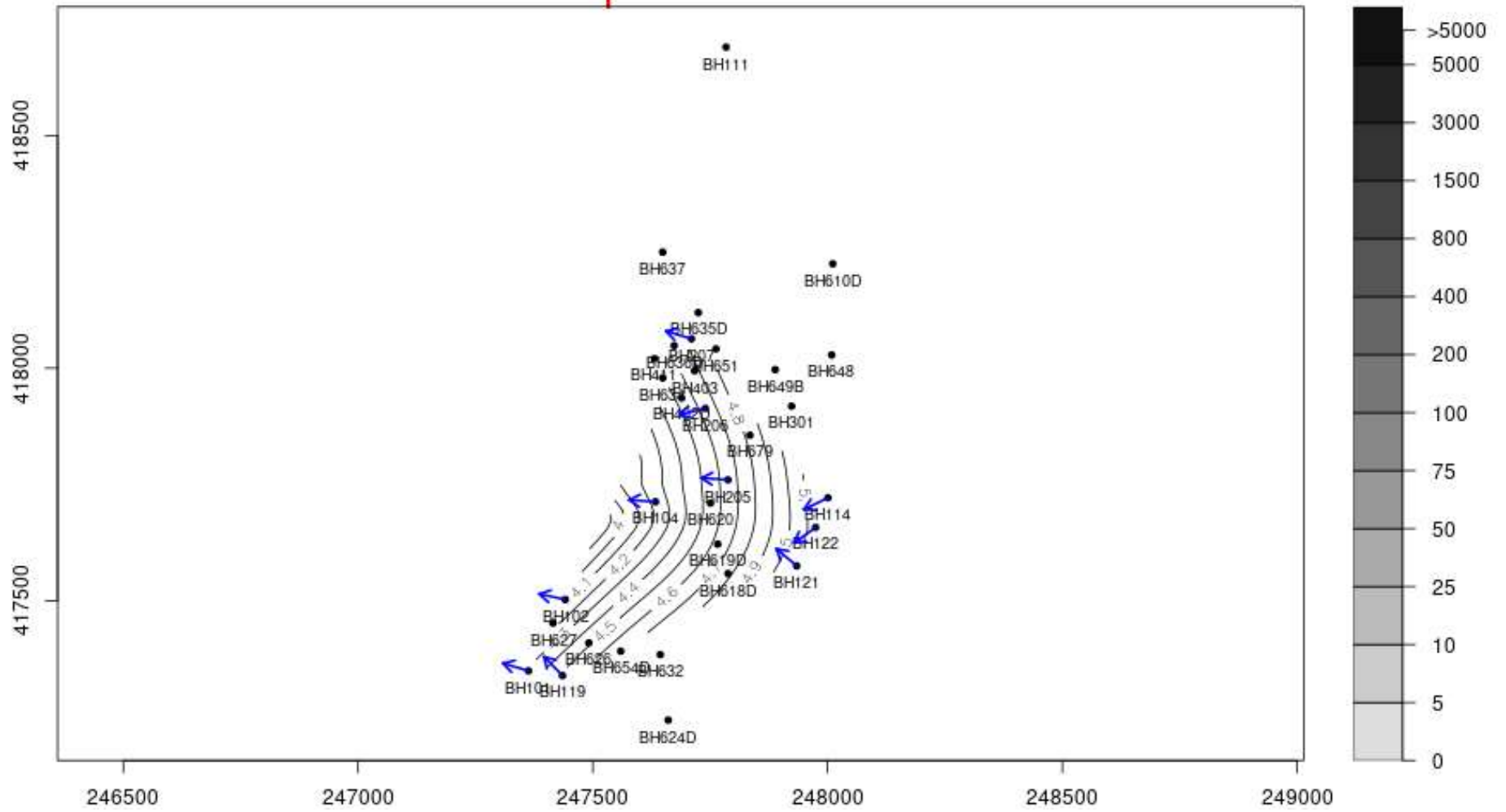
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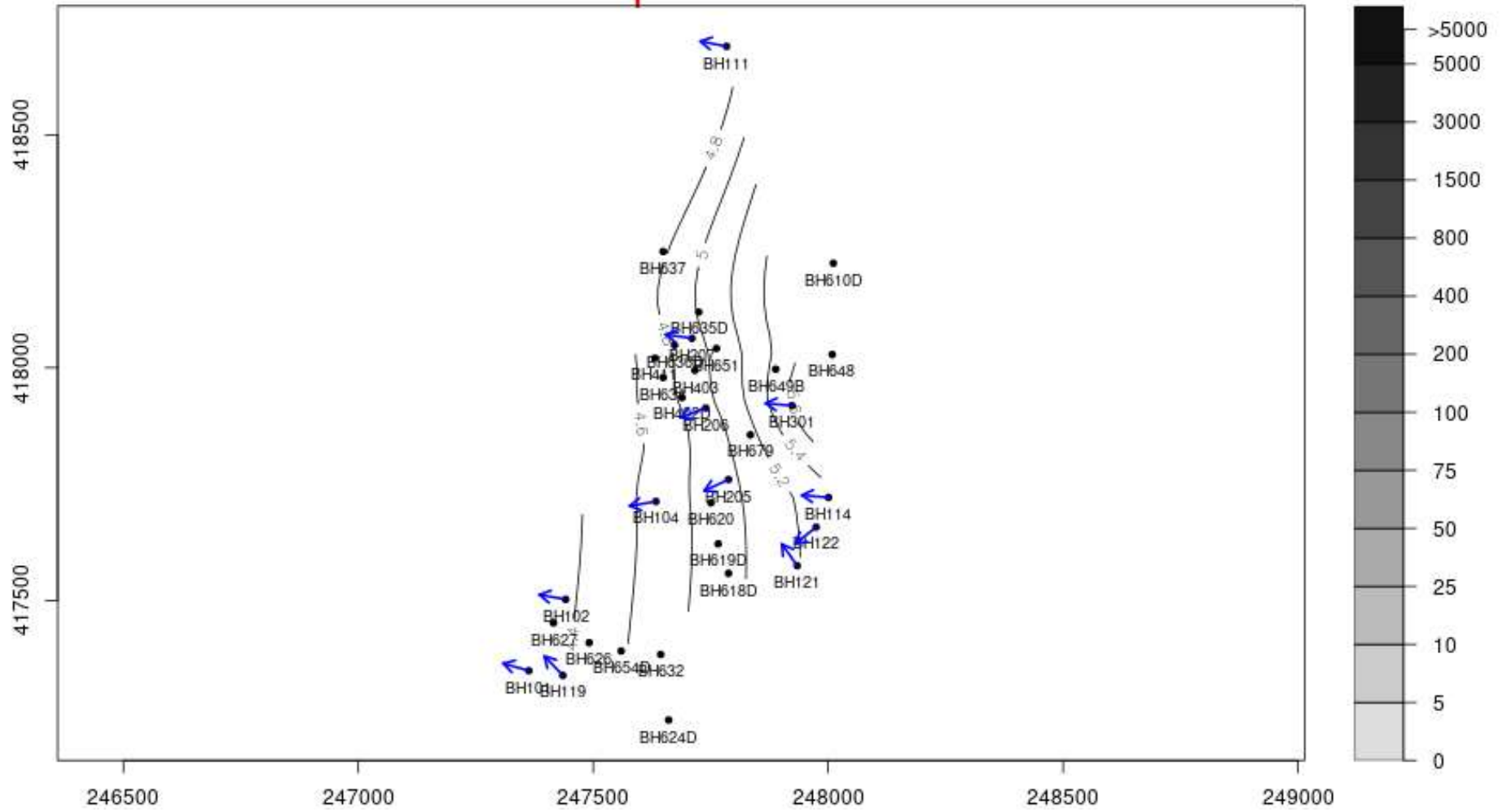
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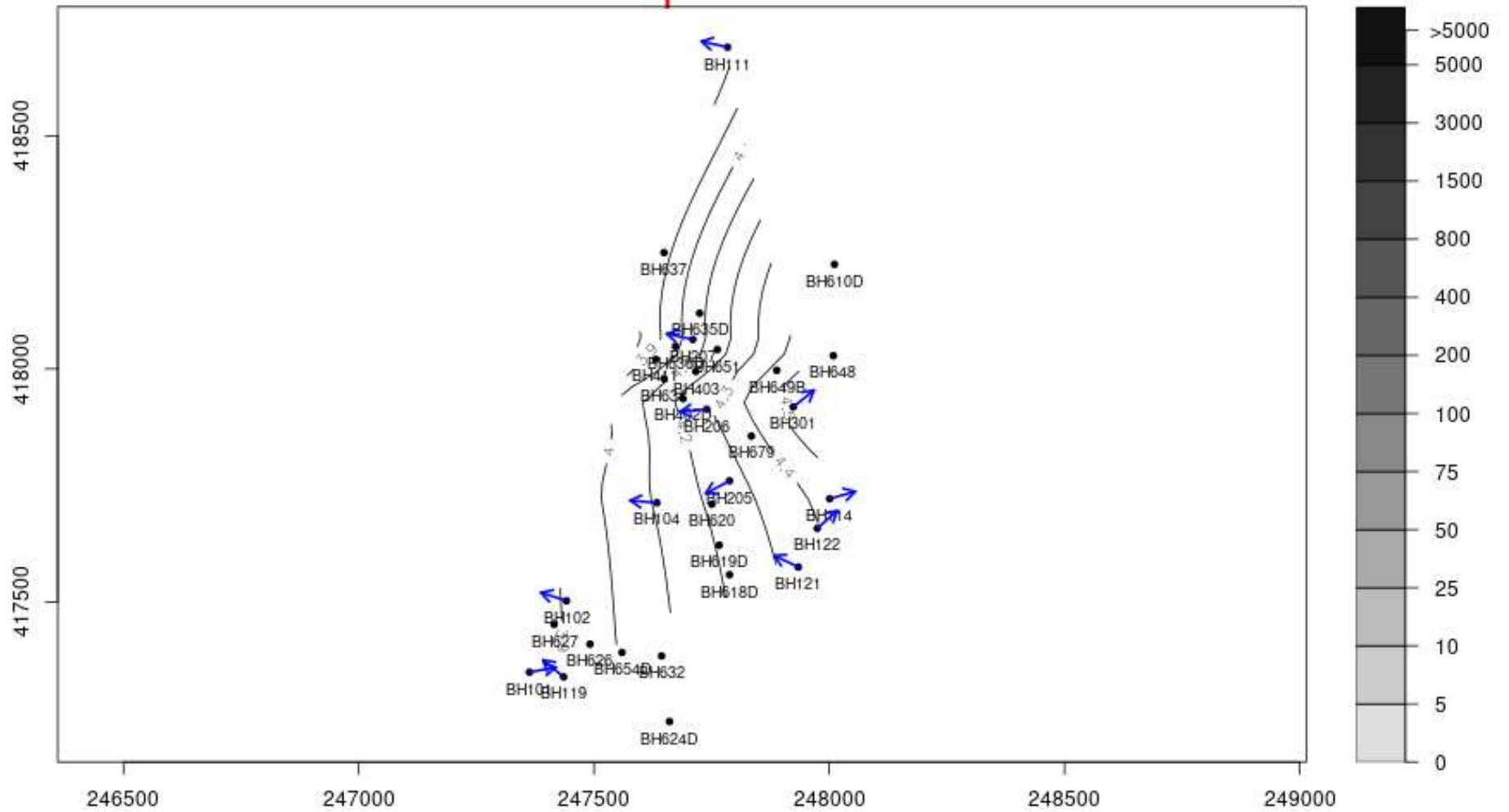
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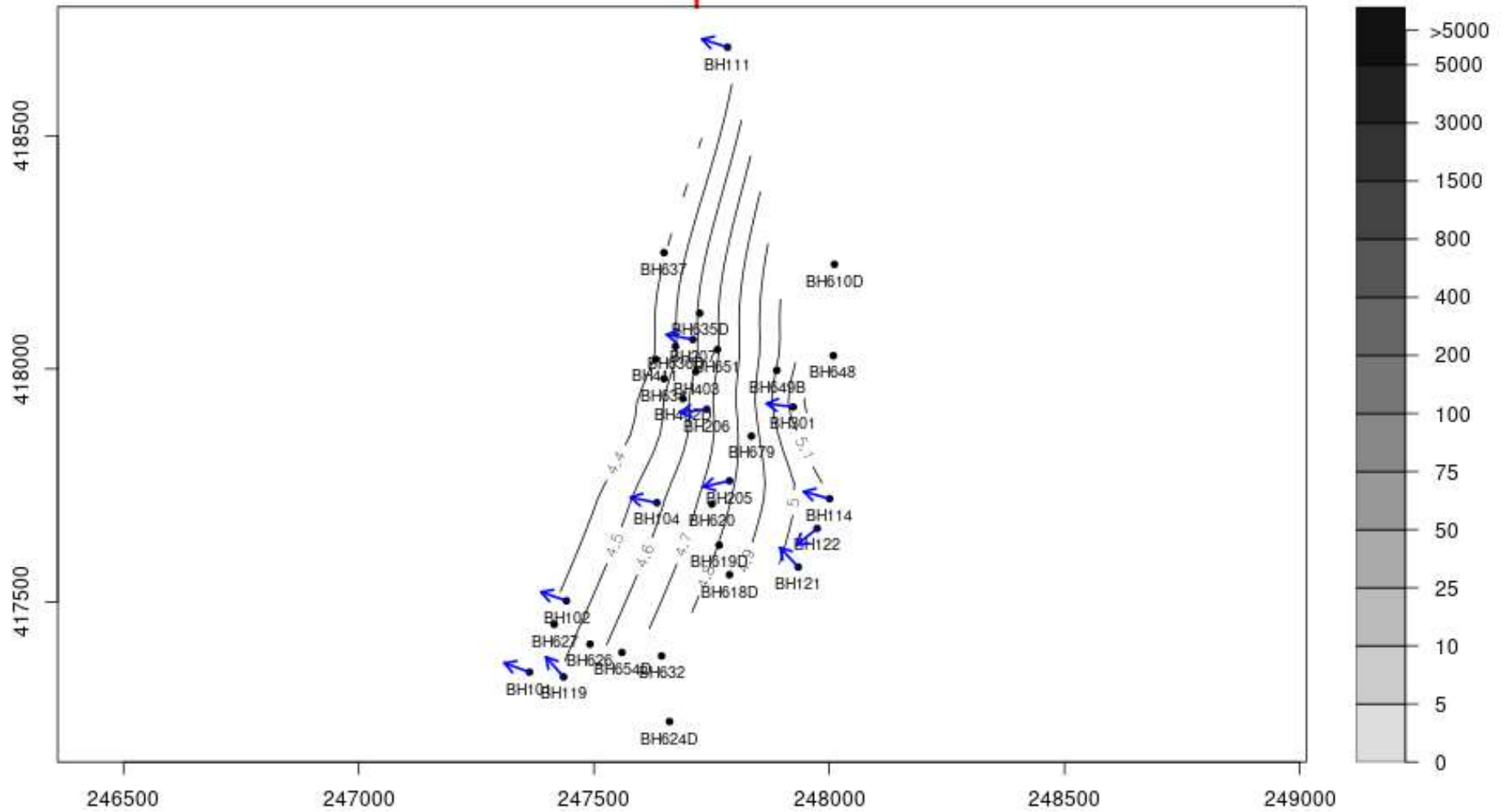
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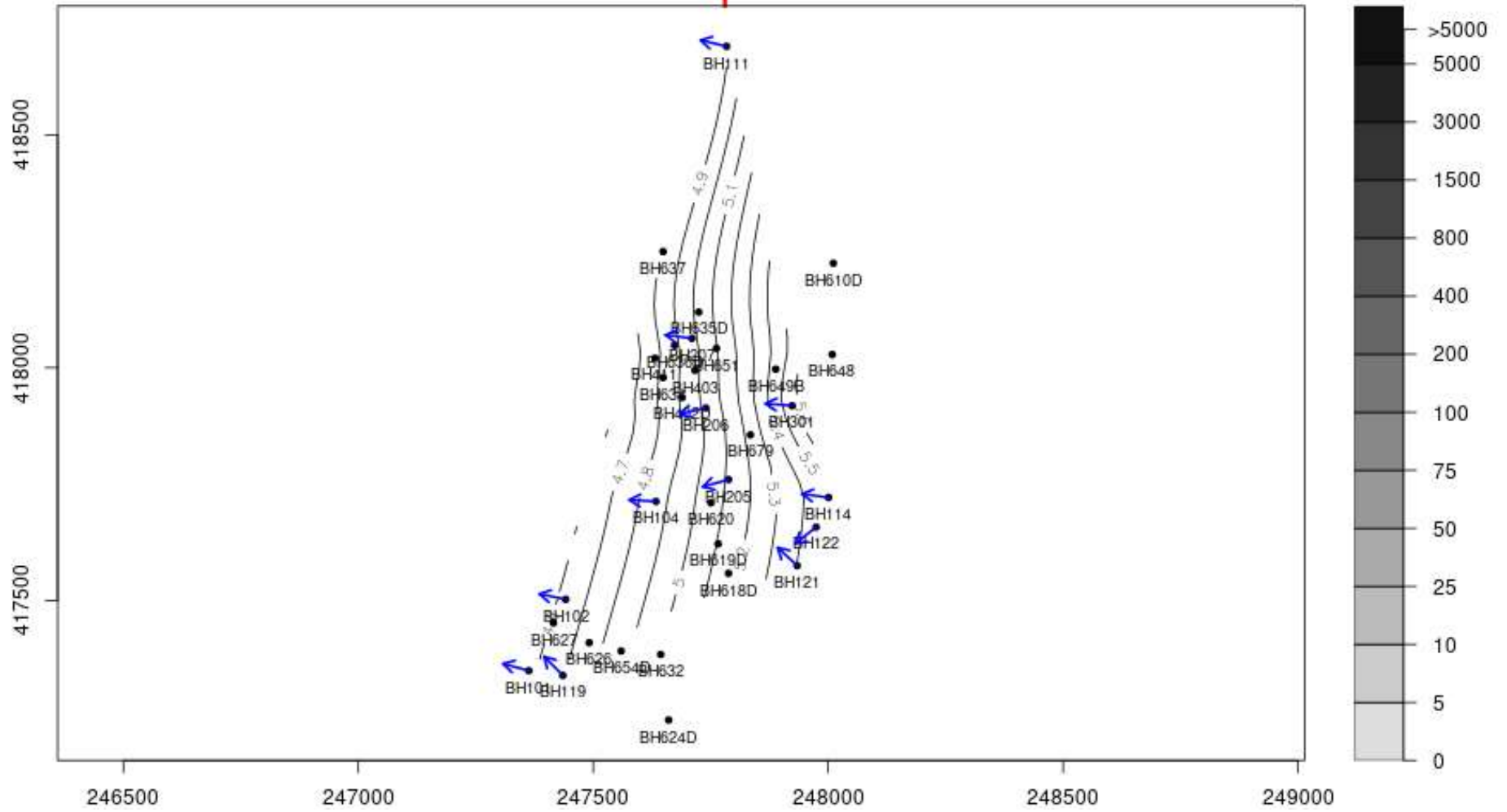
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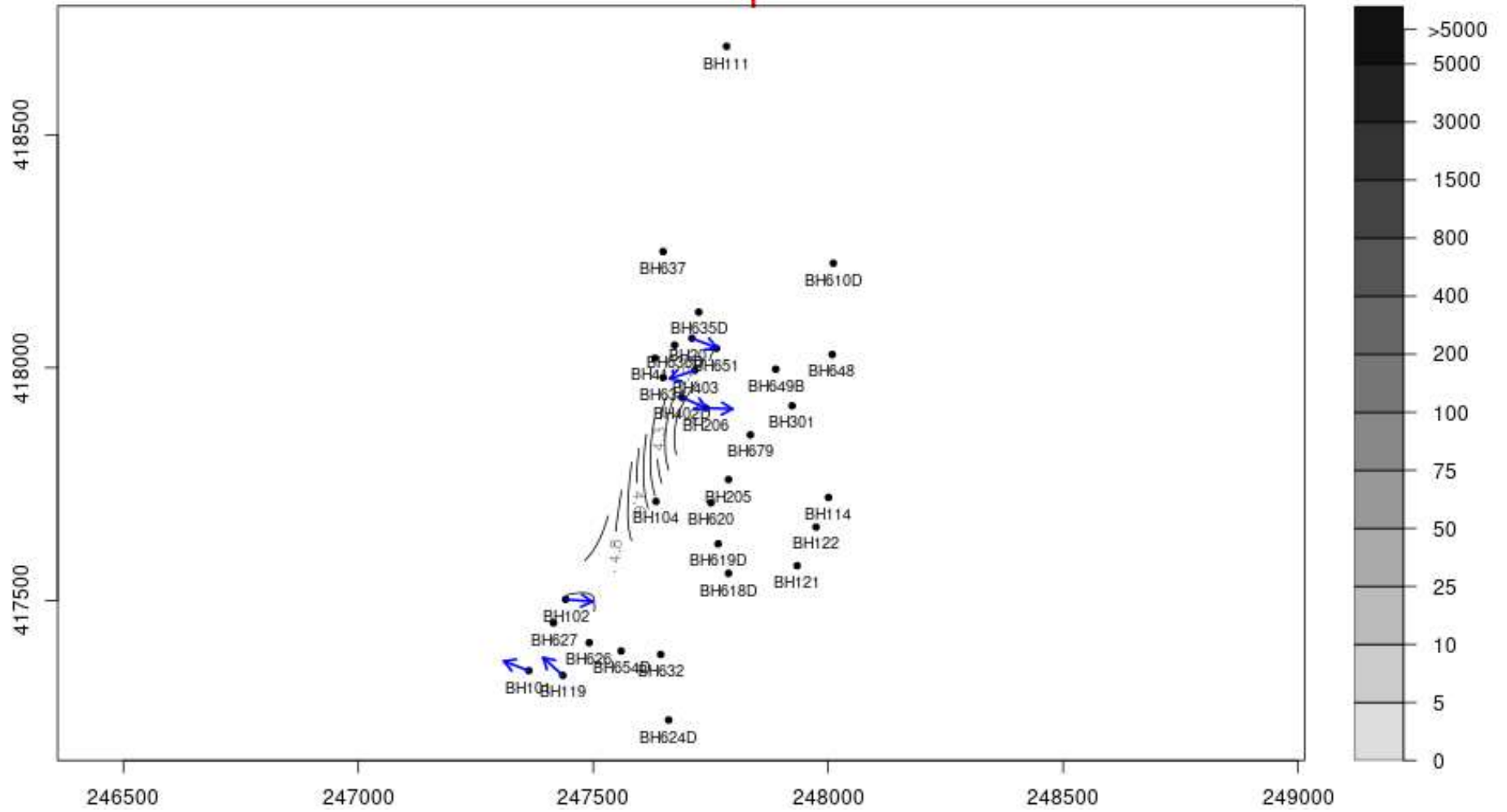
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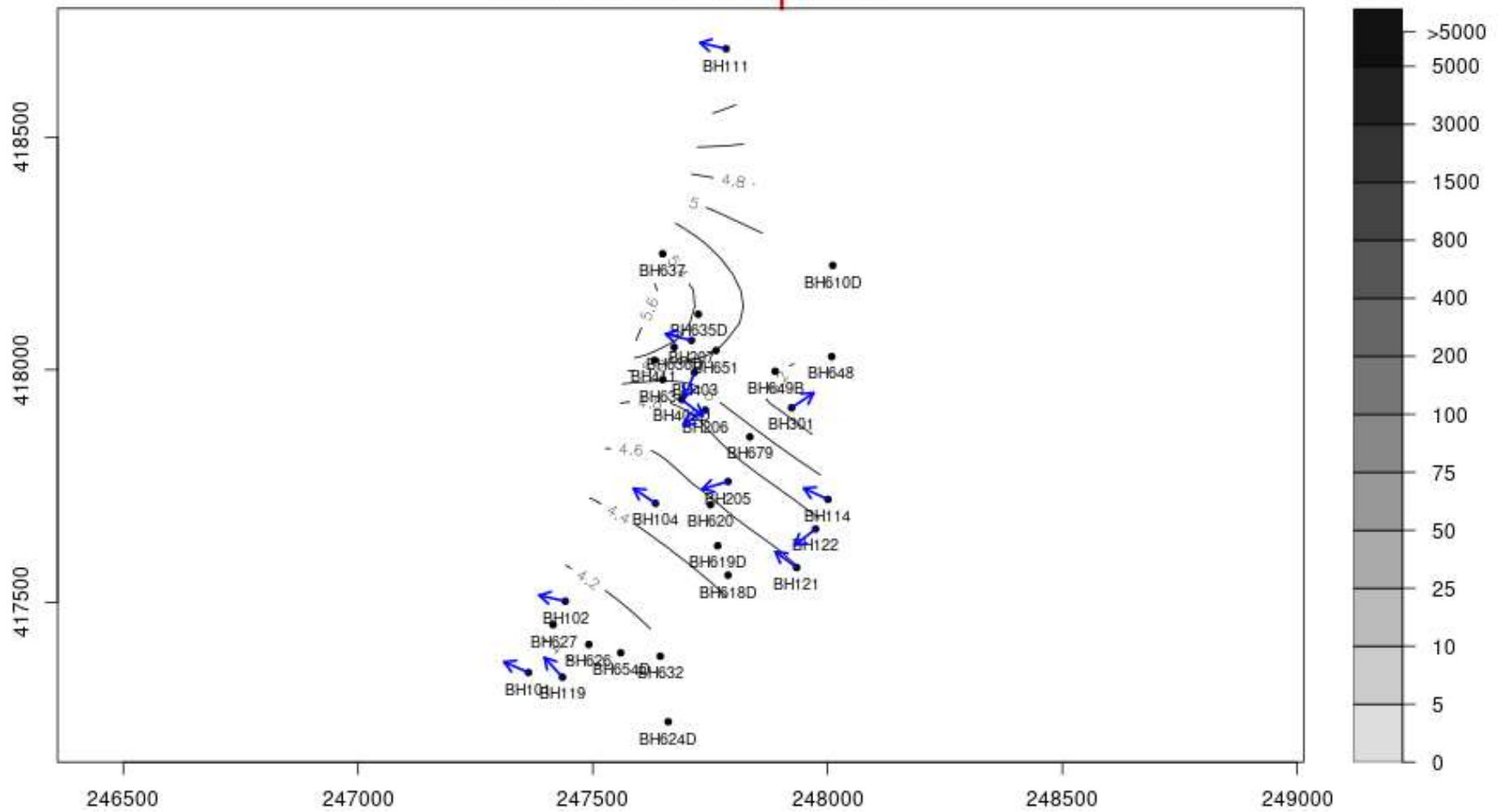
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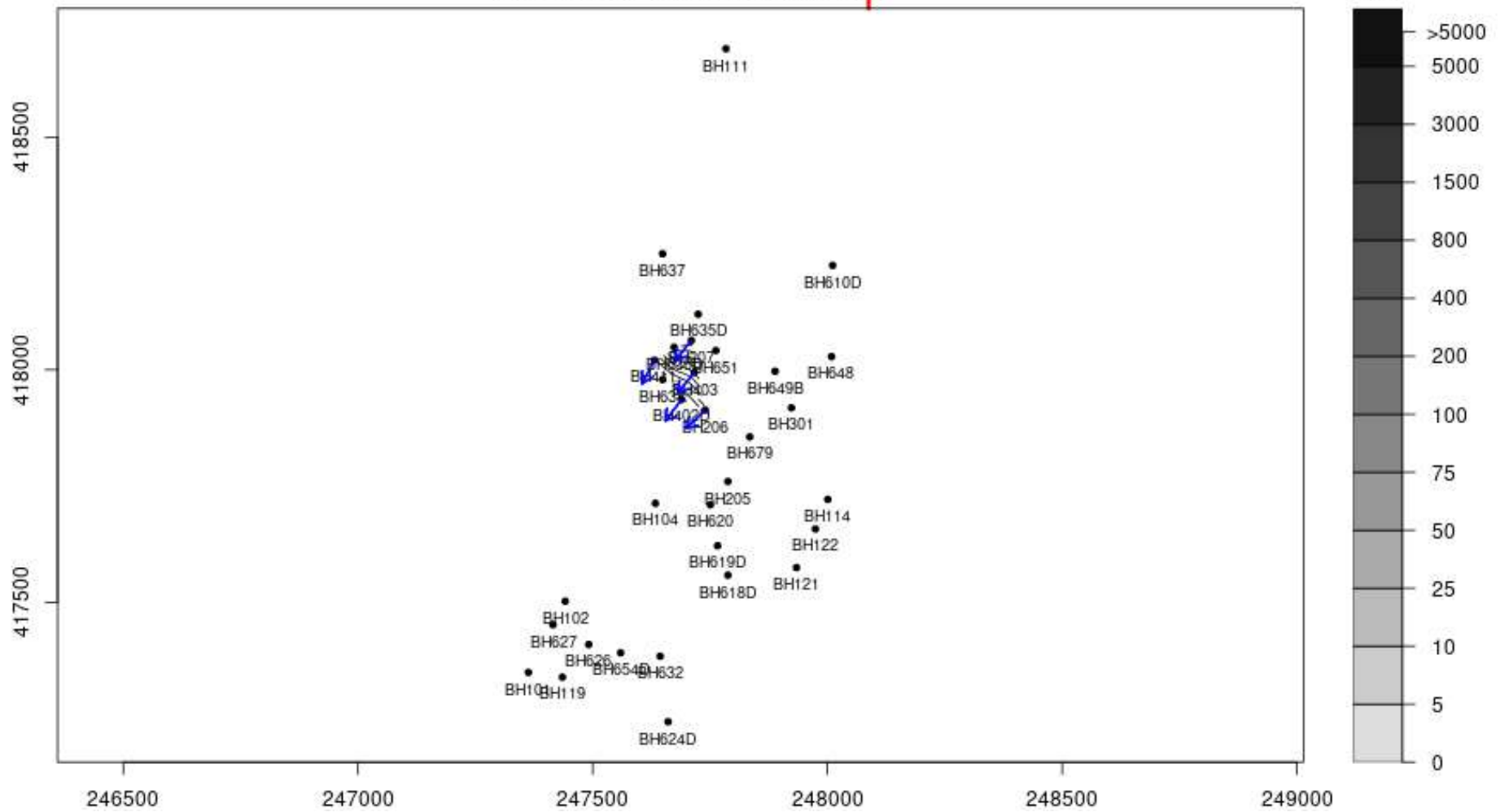
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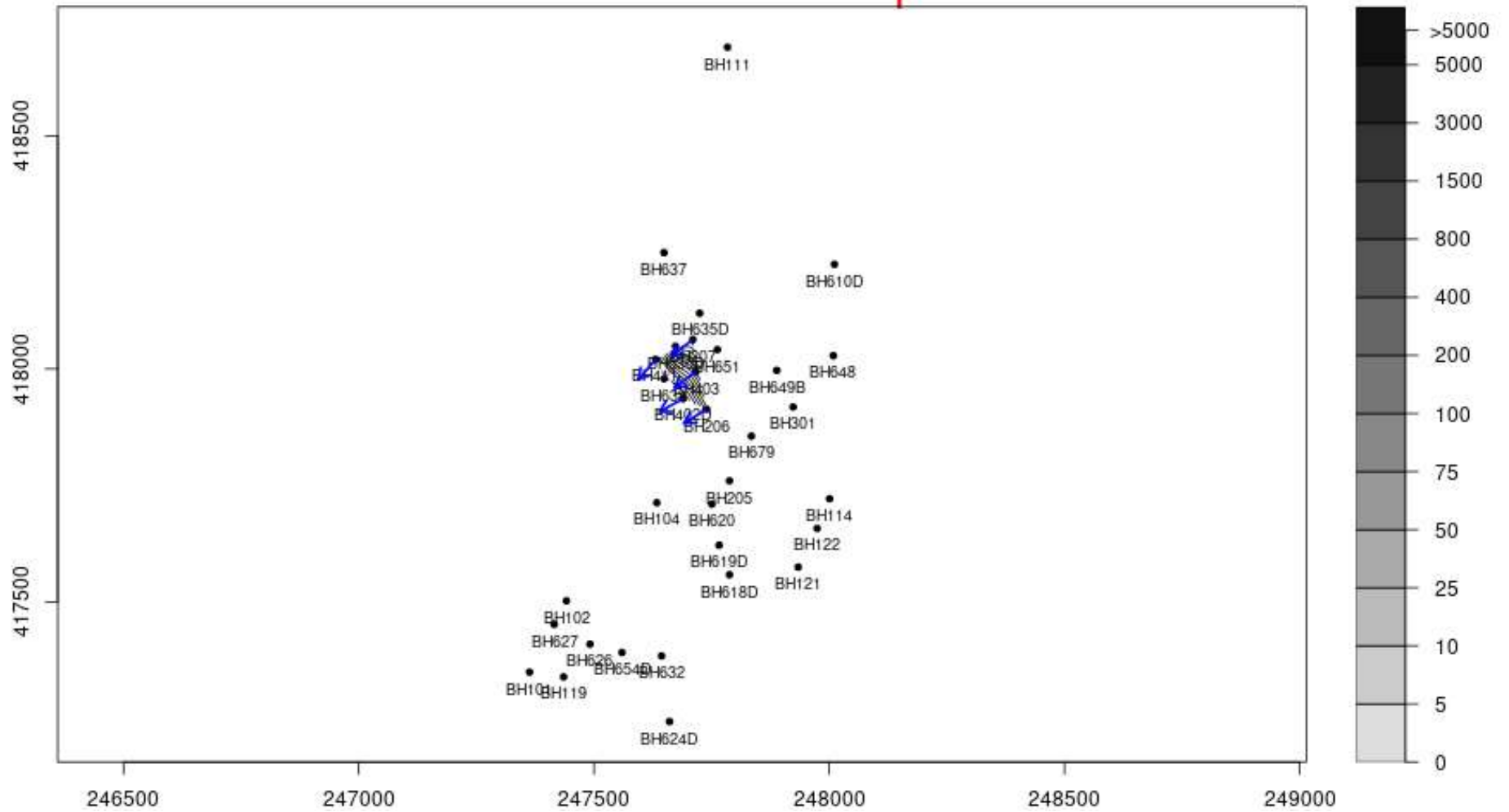
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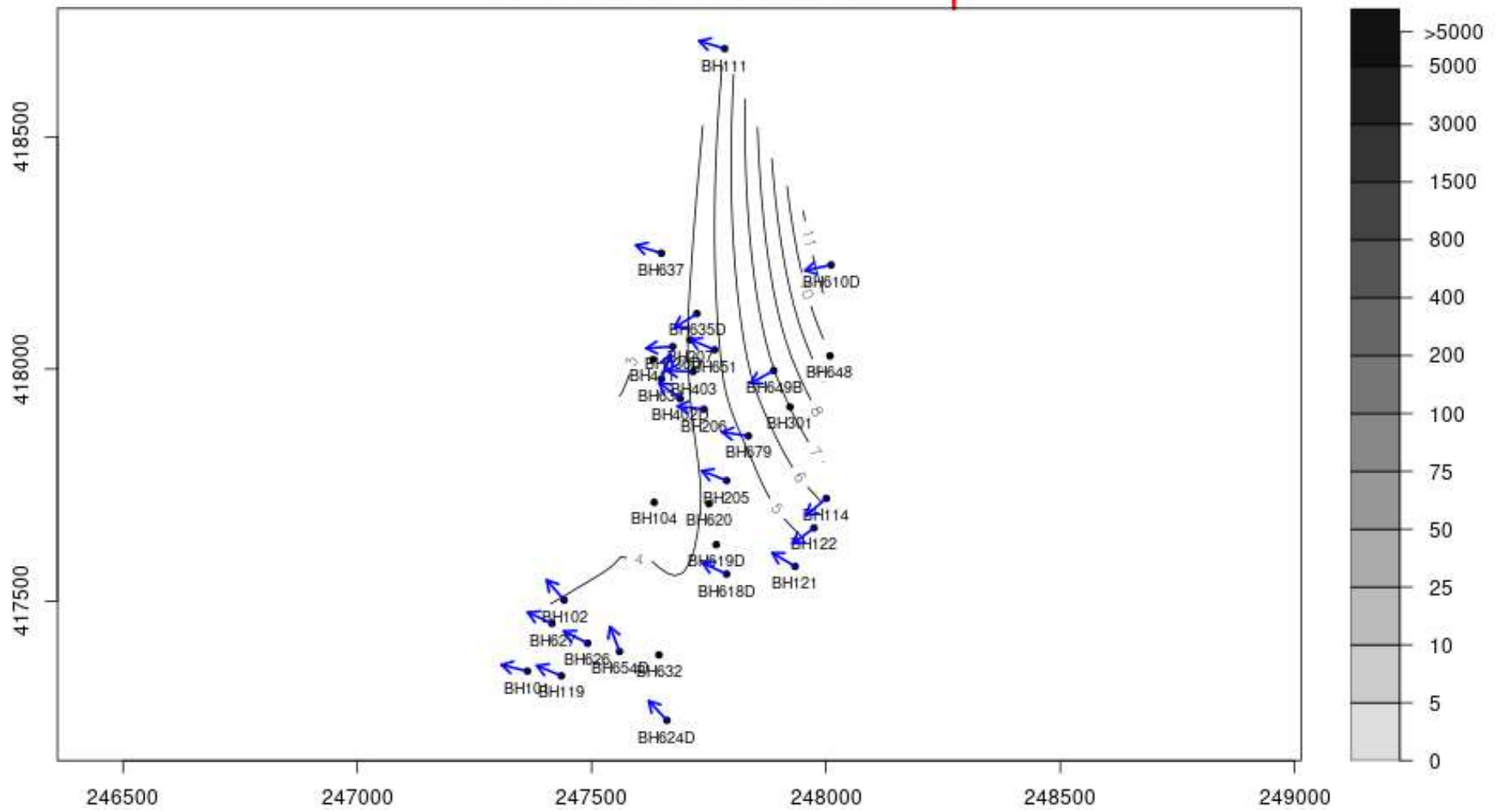
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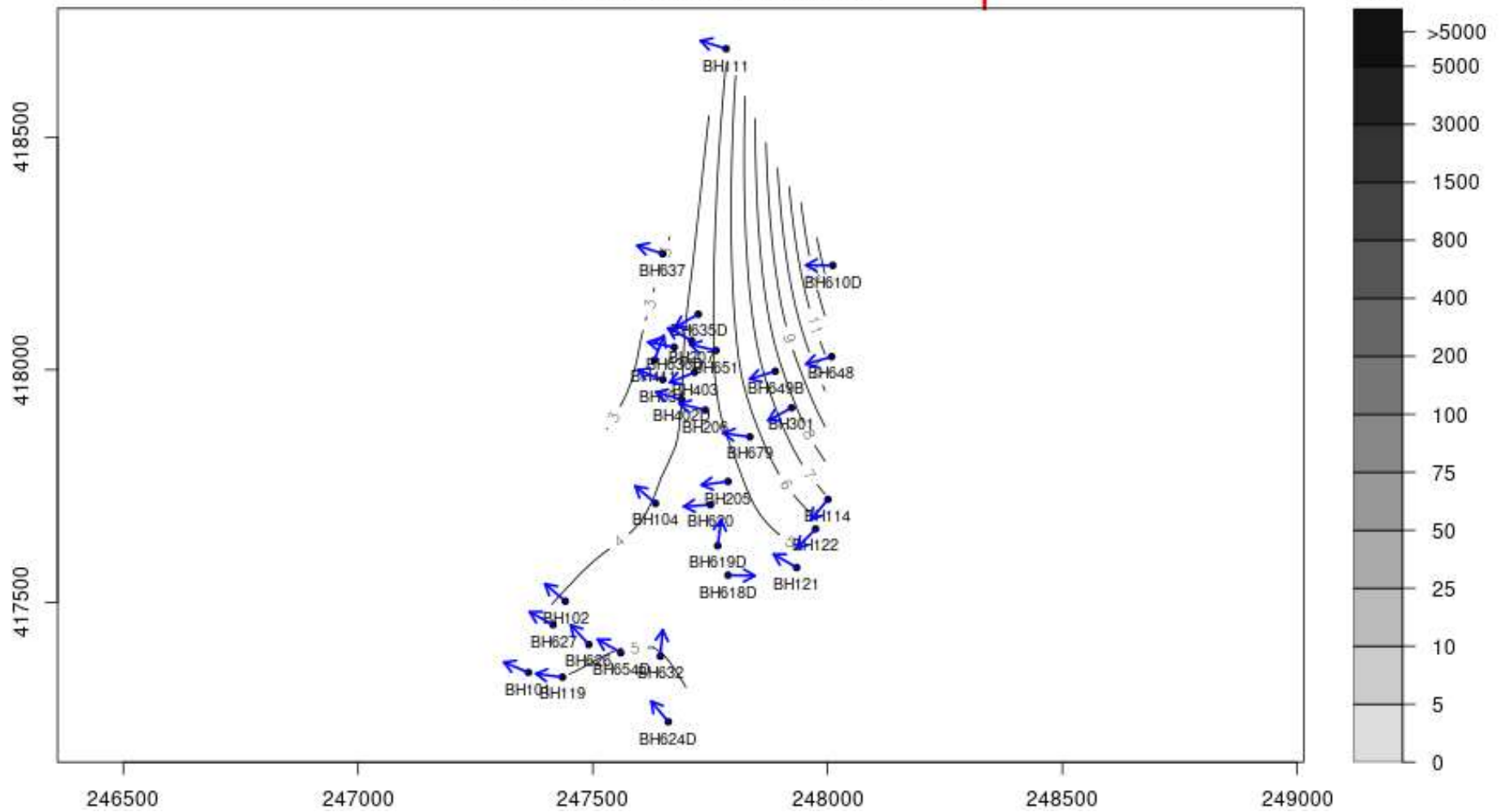
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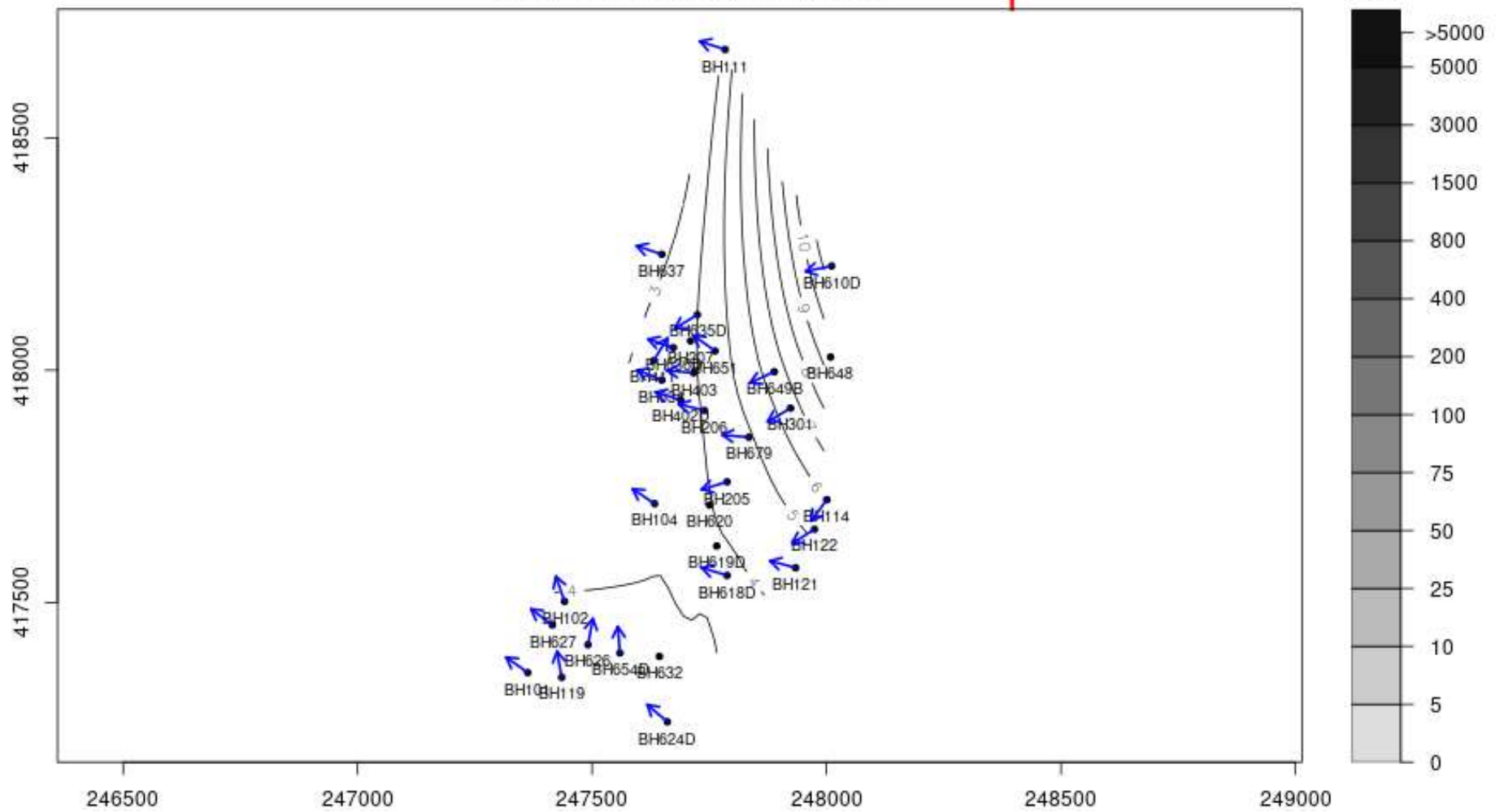
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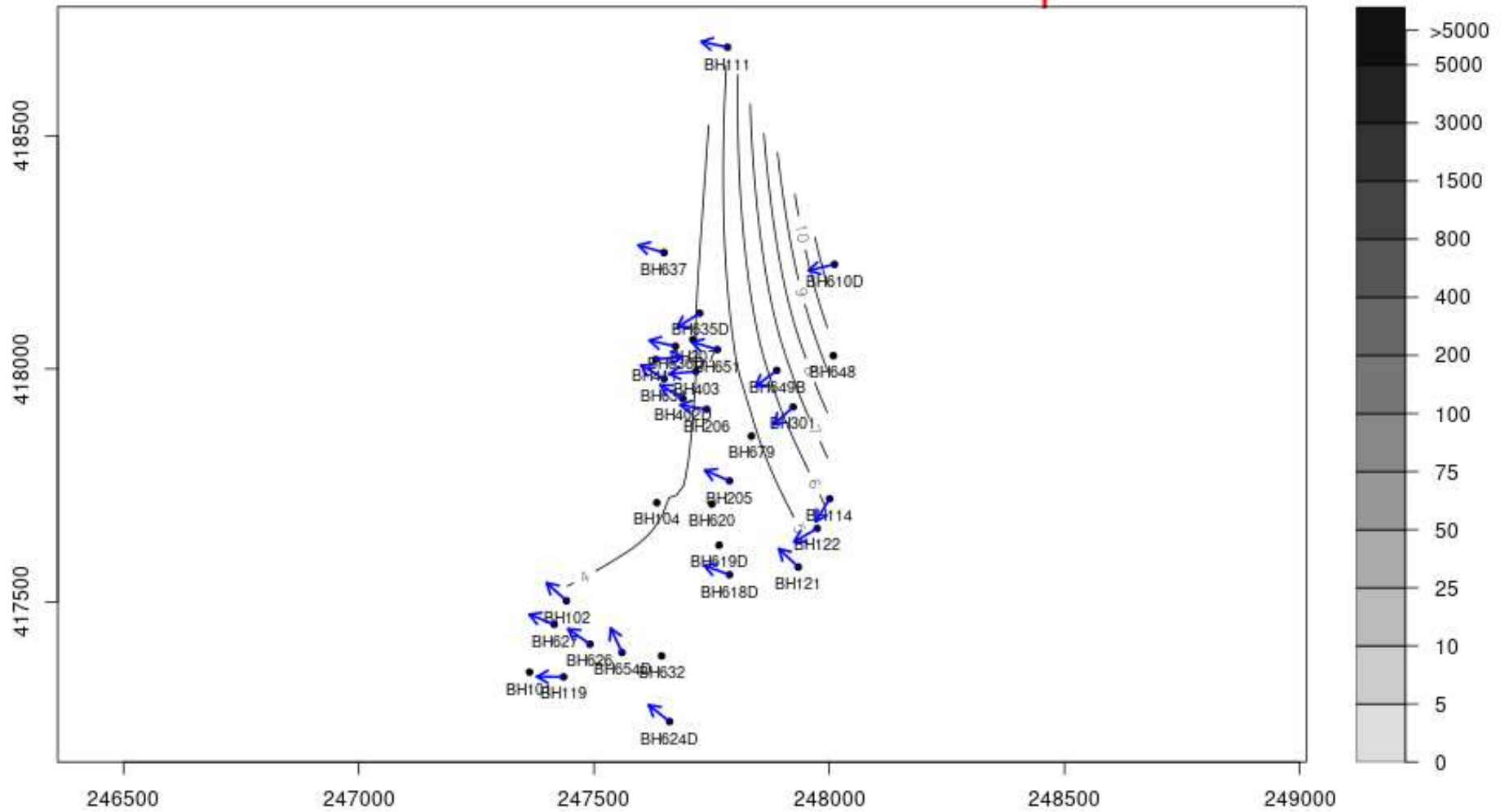
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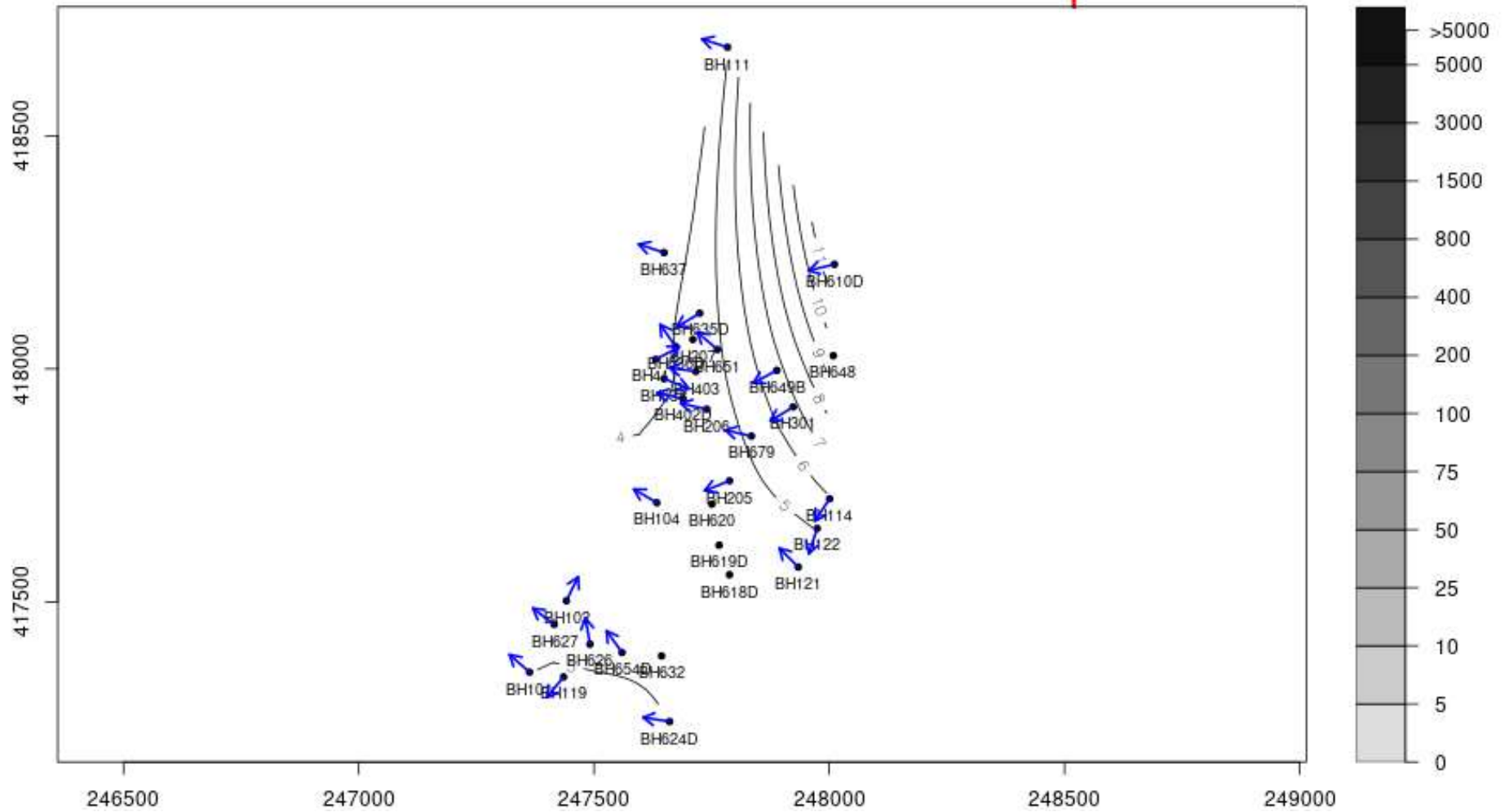
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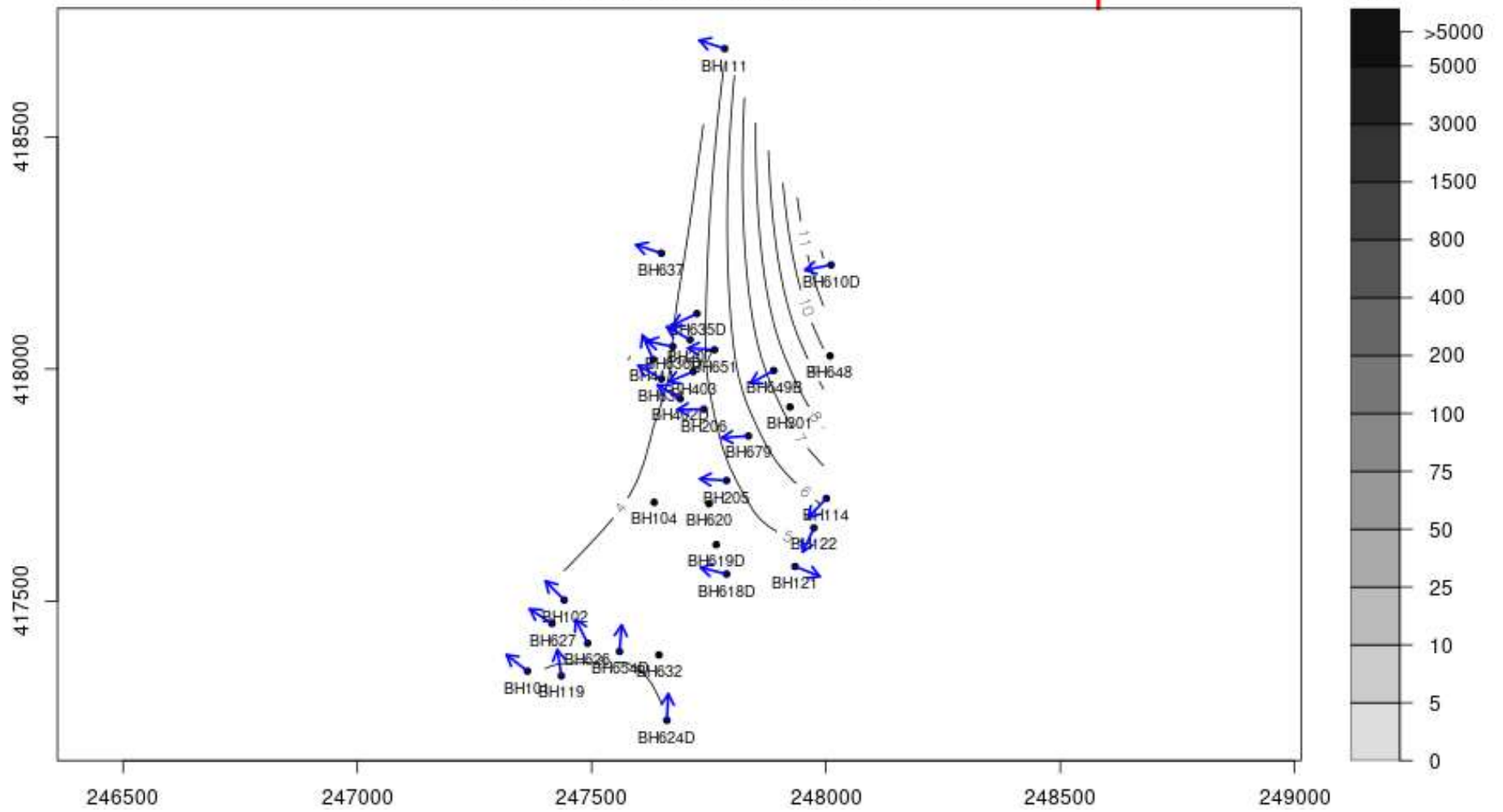
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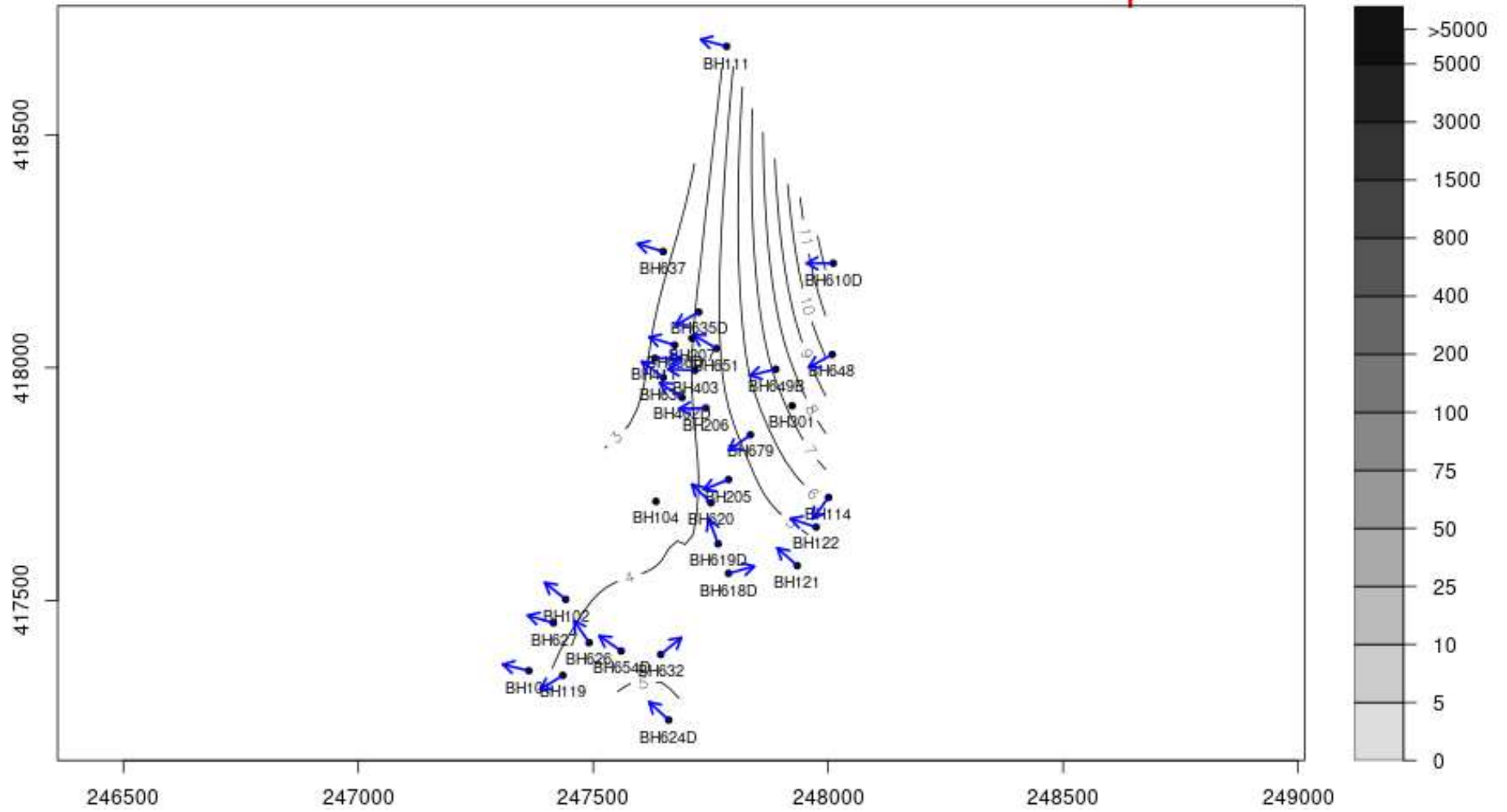
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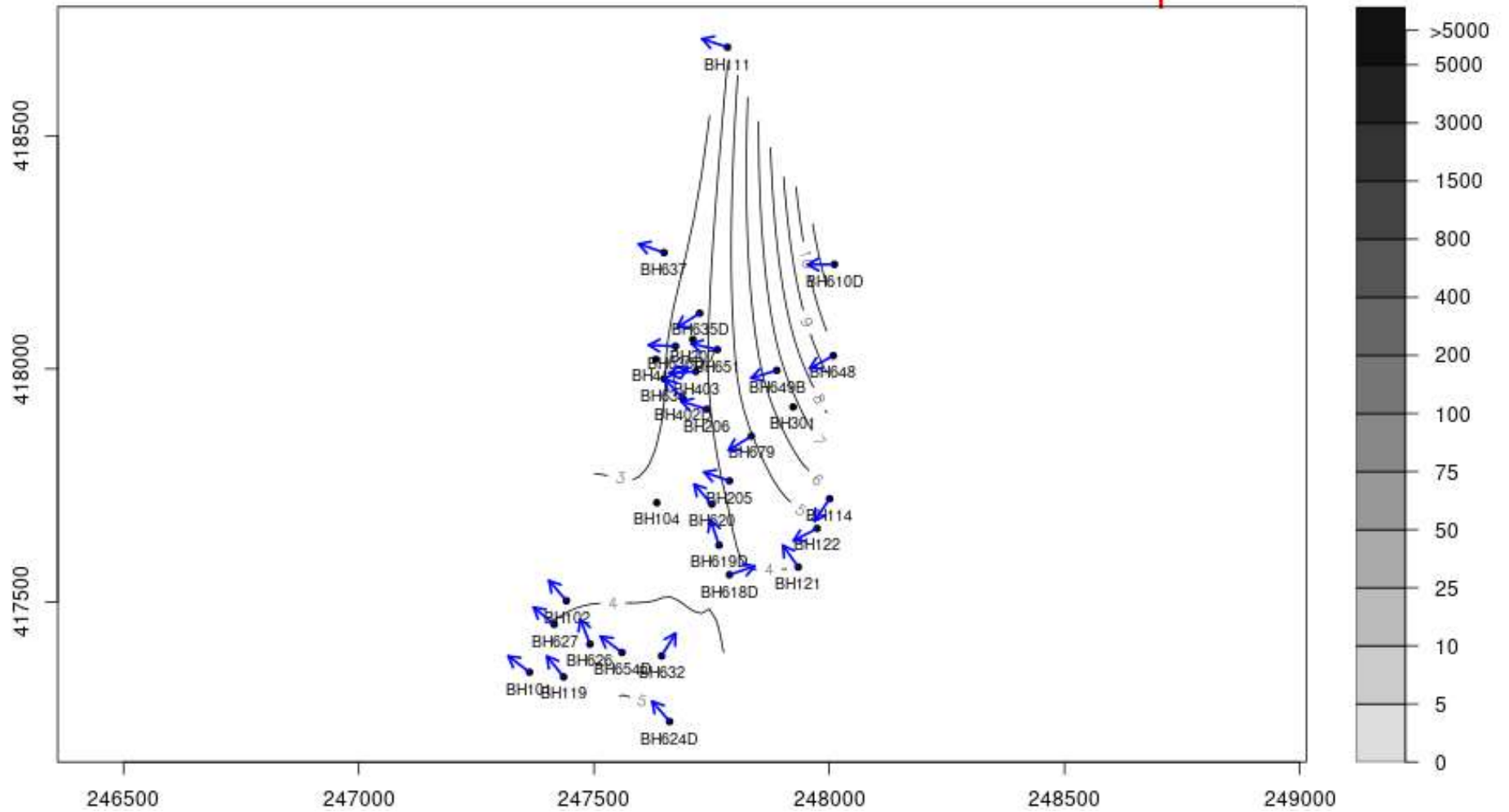
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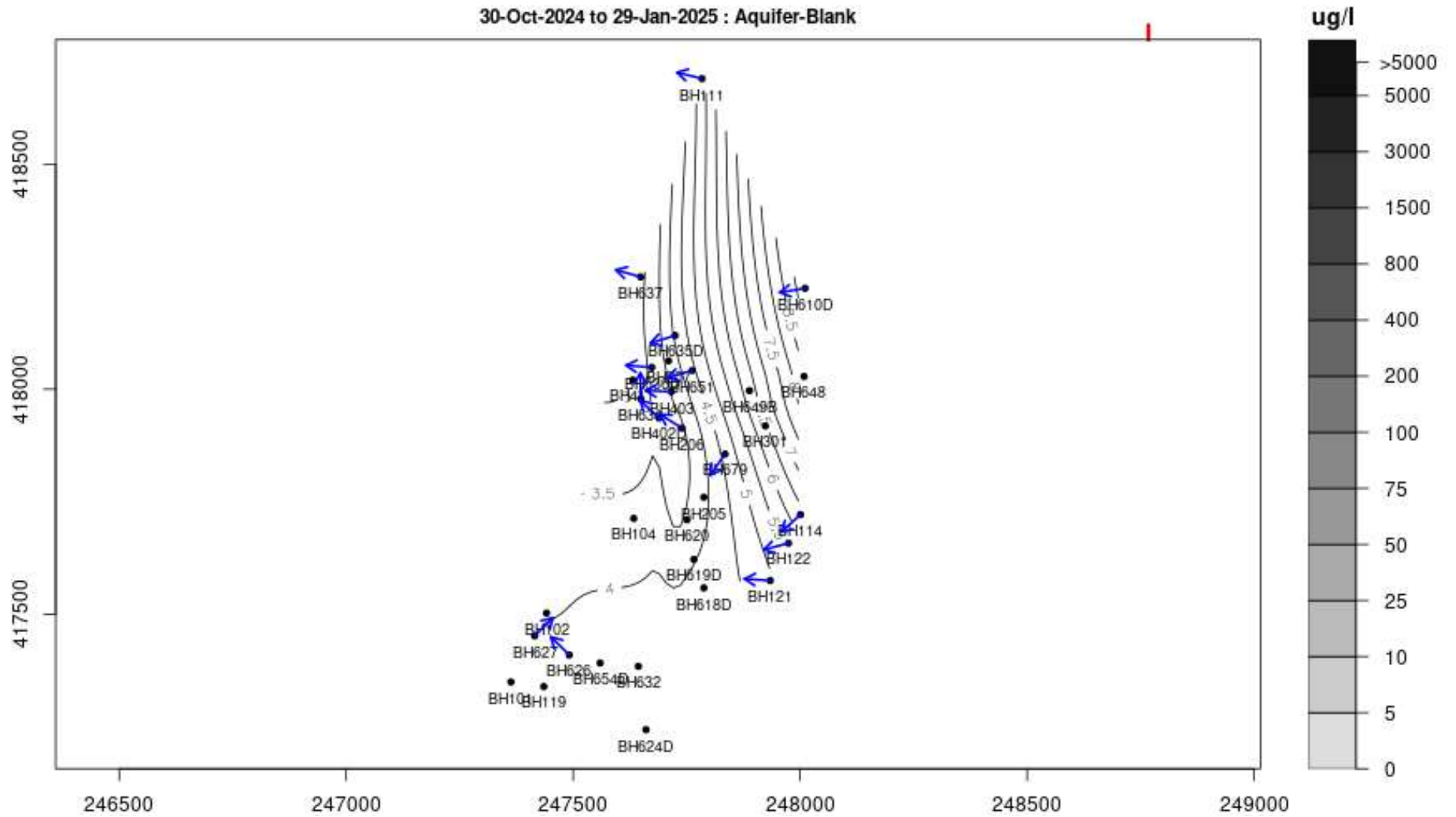
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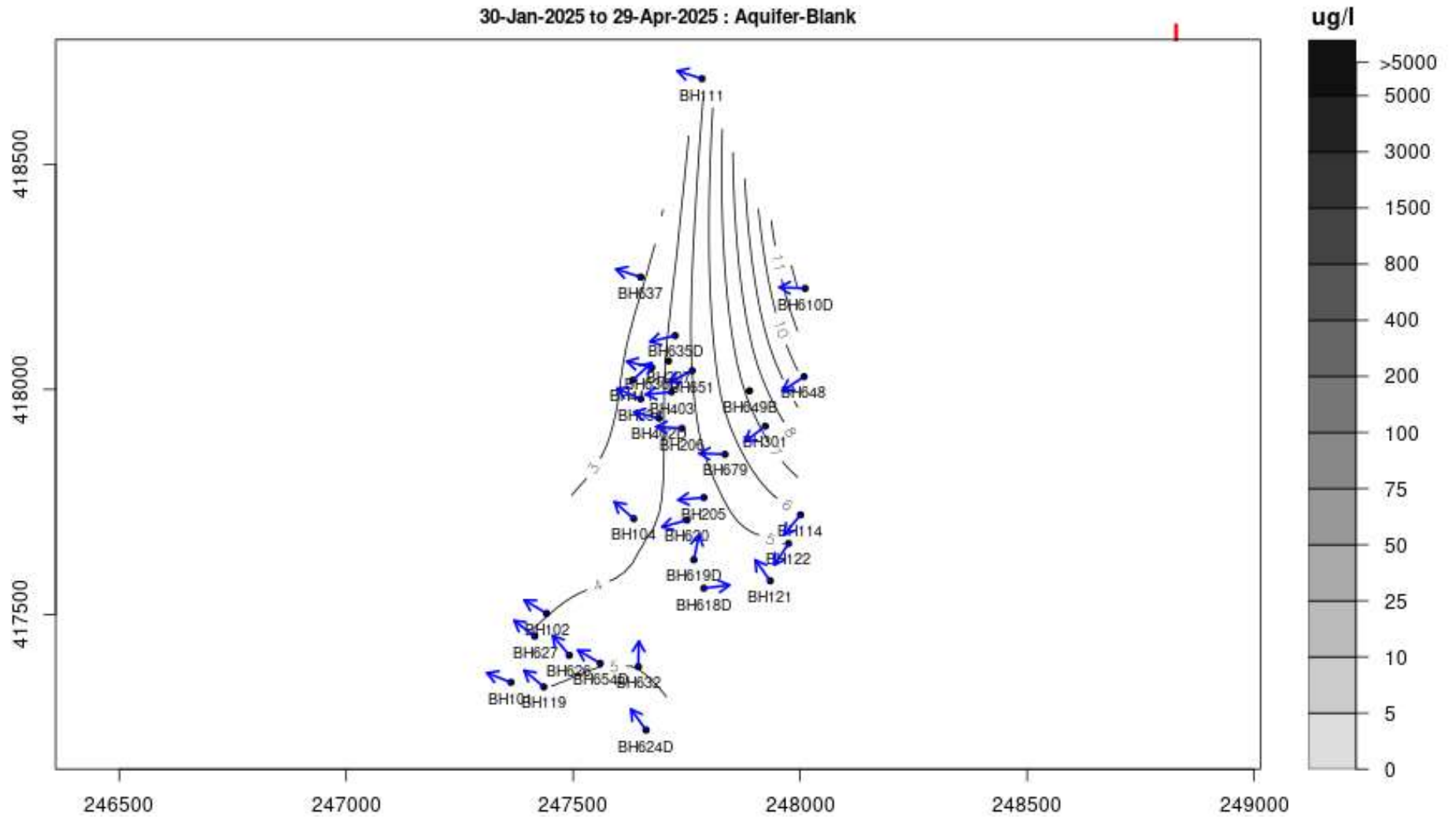
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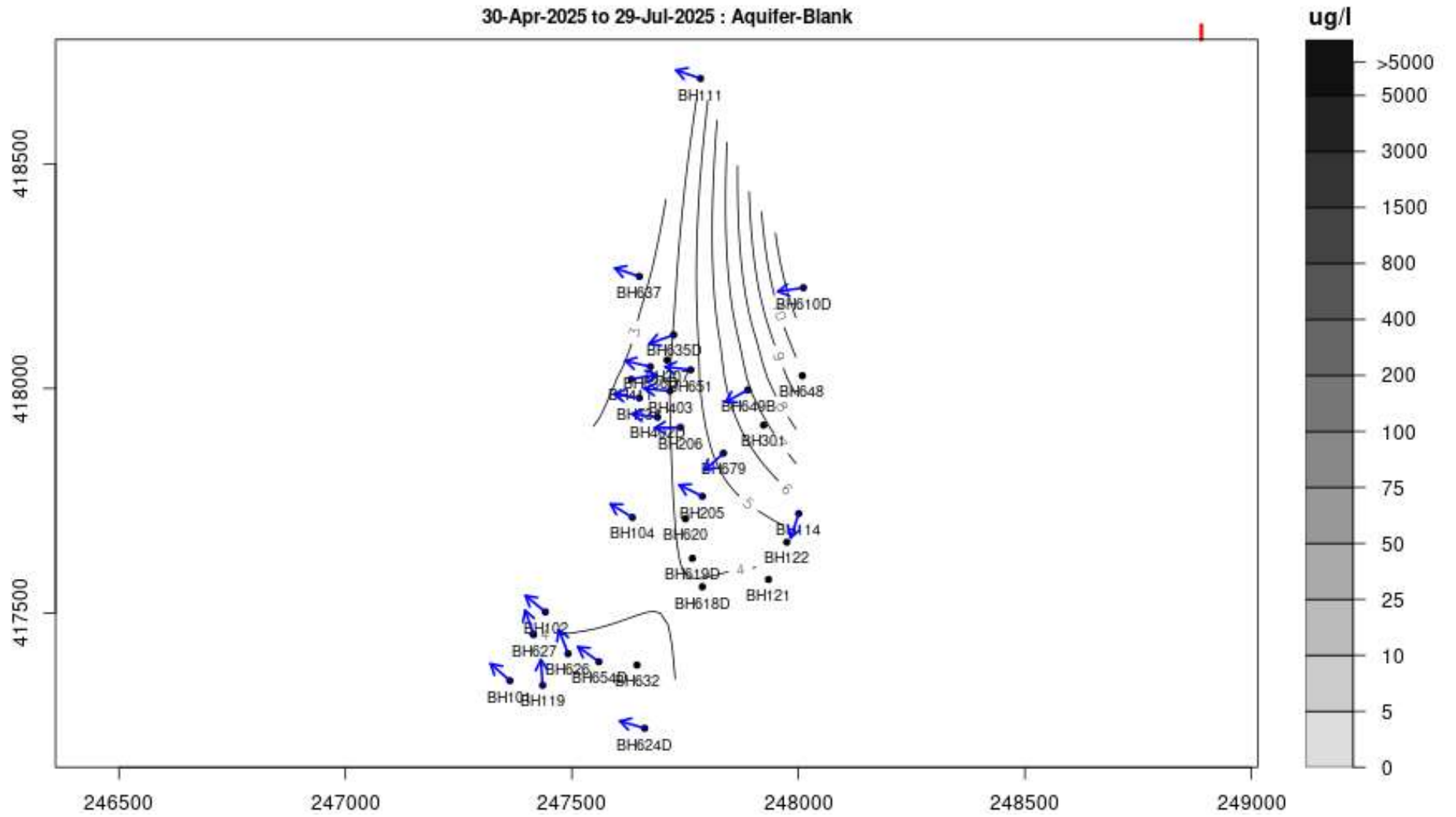
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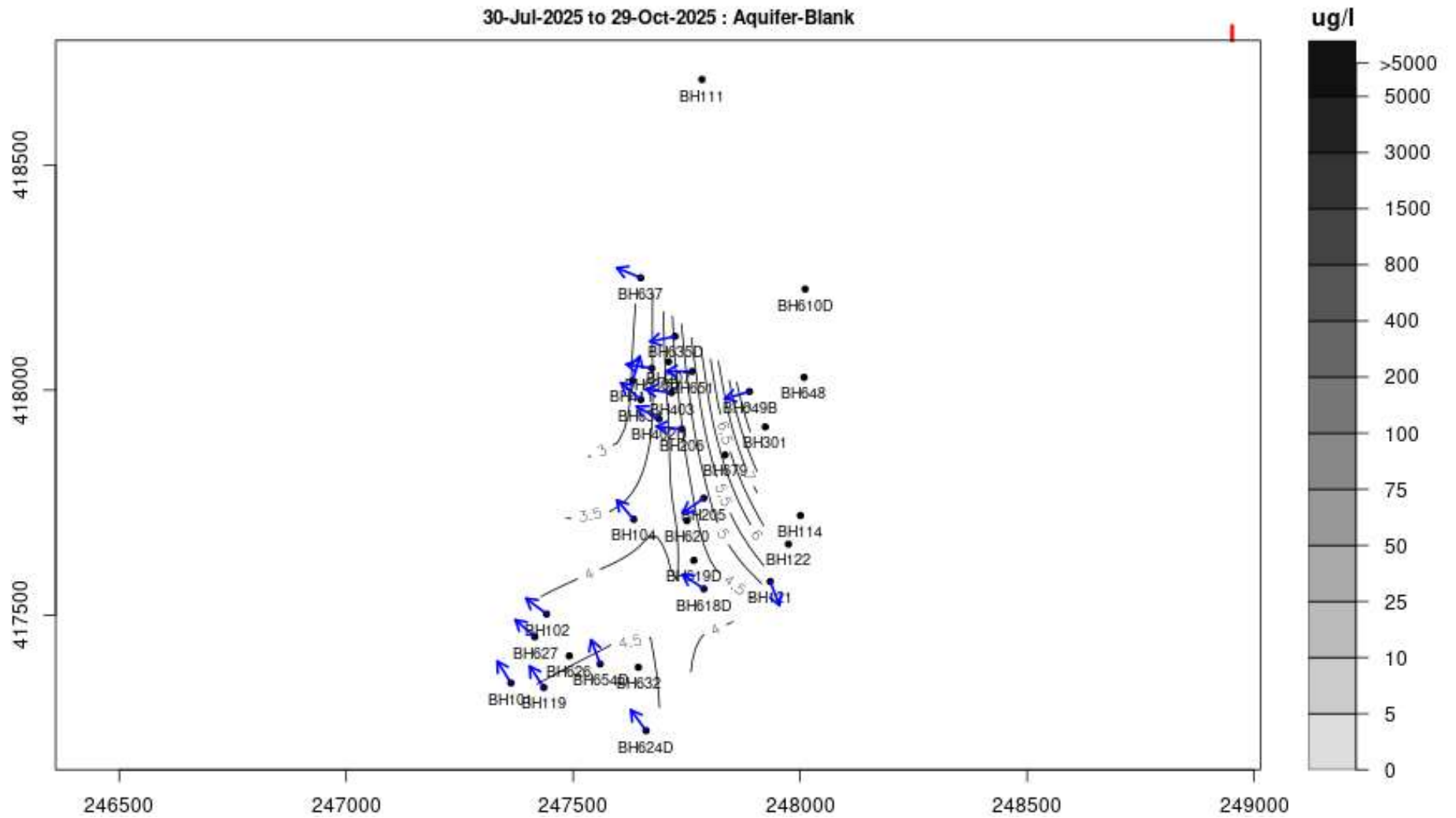
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