

INNOVATION, SUSTAINABILITY + DIGITAL IN PRACTICE

ISDIP

ISDIP 108 Settlement Monitoring Dashboard

Date	Oct 2025
Business Unit	FCC
Project & Region	Eastern Busway Alliance - Auckland
ISC Themes	<ul style="list-style-type: none">Management and GovernanceInnovation

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1 What Happened?

On the Eastern Busway Alliance (EBA) project in Auckland, managing embankment settlement was identified as critical to the programme. To track ground settlement on a large newly constructed embankment, the project team installed multiple monitoring instruments – specifically 2 profilometers, 7 settlement plates, 21 settlement points, and 3 piezometers across different locations.

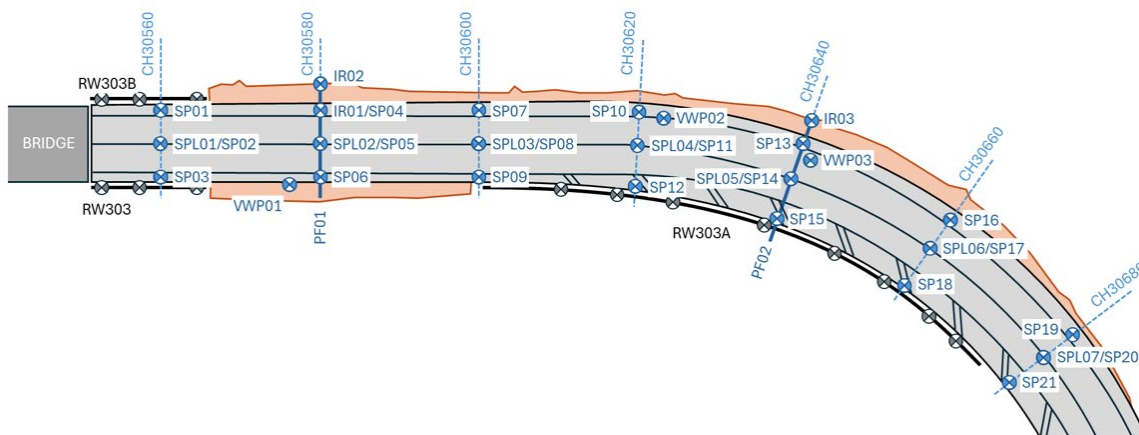


Image: Layout of the embankment monitoring devices profilometers (PF), settlement plates(SPL), points(SP) and piezometers(VWP).

However, data collection and analysis were originally fragmented and manual. Field and laboratory readings from each device were gathered separately and stored in a range of Excel sheets and PDF reports. This meant engineers had to manually compile data and look at static graphs for each instrument, making it difficult to get a complete picture. There was no centralised system to visualise or correlate all the settlement data in real-time. The project lacked an integrated, up-to-date dashboard for these critical geotechnical measurements, which posed a risk to efficient *Management and Governance* of the project's progress. The team at EBA came up with an innovative solution to improve data management and decision-making.

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2 What Are We Doing Differently?

To address this challenge, the EBA project team took a novel, data-driven approach: rather than continue with siloed spreadsheets, they built a unified, interactive “Settlement Monitoring Dashboard” using Microsoft Power BI. This meant centralising all instrument readings into a single source and providing dynamic visualisations for easy analysis.

Key steps and innovations in our approach:

- **Unified Data Input:** First, we created one master Excel spreadsheet to serve as a single source of truth for all settlement data. Data from every profilometer, plate, point, and piezometer are now entered or imported into this one file (replacing multiple disparate files). We also standardised the raw data format using consistent Excel formulas, ensuring that readings from the lab and field are directly comparable and ready for analysis.
- **Integration of External Data:** We innovated by incorporating rainfall data from Auckland Council’s databases into our dataset. By correlating rainfall with piezometer pressure changes, the dashboard can explain natural spikes or dips in pore pressure (i.e. heavy rain causing higher groundwater pressure). Previously, such context would have required manual cross-referencing of weather reports; now it’s built in.
- **Dashboard Development and Prototyping:** We then developed an interactive dashboard in Power BI to visualise the data. We started with a prototype for one chainage for which we combined a subset of devices (e.g. 1 profilometer + 1 settlement plate + 3 points + 1 piezometer at that chainage) to ensure the concept worked end-to-end. We validated that the dashboard correctly showed weekly settlement trends, calculated settlement rates, displayed fill height progress, and plotted pore pressure against rainfall over time as intended.
- **Scaling Up Across All Sections:** After successful prototyping, we replicated the dashboard structure for all remaining chainage sections of the embankment. We built seven interlinked dashboard pages – one for each major embankment segment. The Power BI dashboard is designed with a main overview page (intro) and navigation buttons for each chainage. This means a user can click the button and immediately jump to a detailed view of all data for that section.
- **Real-Time Visualisation and Alerts:** The finished **Settlement Monitoring Dashboard** updates as new data is entered, enabling near real-time tracking of settlement. It displays multiple insights on one screen – for example, one can see the weekly settlement curve for a given plate, alongside the calculated settlement rate (slope of the curve) and the current fill height at that location, all on one timeline. If rainfall influences a piezometer, the effect is visible immediately by the concurrent rainfall graph. By having all device types together, the team can spot if a settlement plate is indicating something different than a nearby settlement pin – signalling a potential anomaly that needs investigation. This interactive, consolidated view is a major change from the old static reports, dramatically improving project awareness.

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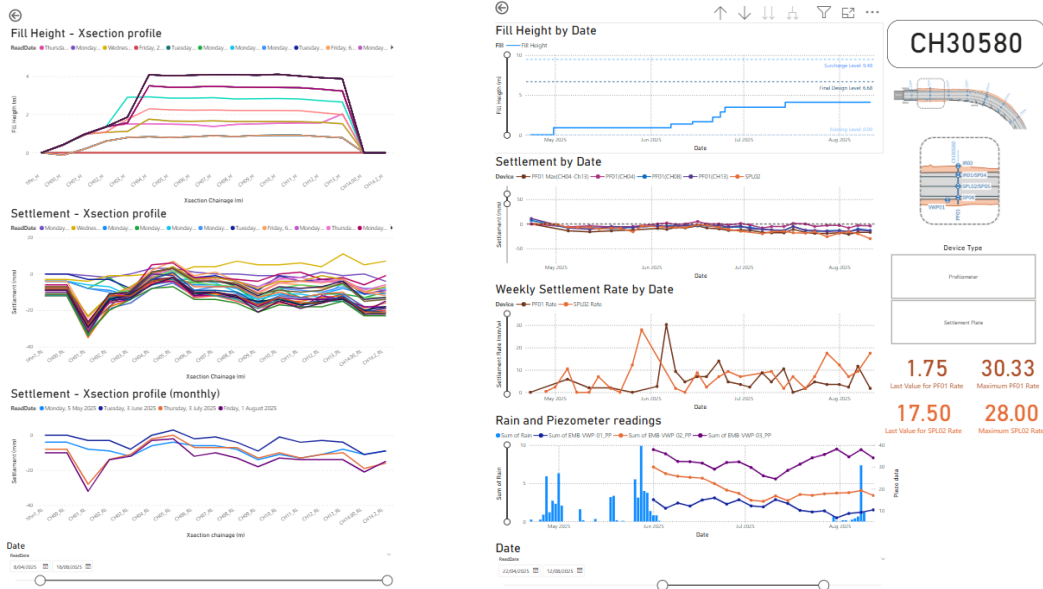


Image: Screen Shots of the new Settlement Dashboard.

What makes this approach innovative and different is not the use of any one new tool, but the way we combined data and technology to solve a long-standing problem. Rather than accept the traditional siloed monitoring process, the team applied *cross-functional thinking*: geotechnical engineers, surveyors, and data specialists collaborated to create a solution that works for all. The dashboard exemplifies the *Innovation* theme by introducing a custom digital solution into our construction monitoring. It also strongly supports *Management and Governance* by providing project leaders with timely, accurate information for decision-making (e.g. determining if construction can proceed or if waiting is necessary for settlement to stabilise). All of this was achieved with readily available software (Excel and Power BI), showcasing how smart use of data and tools can yield significant improvements without large costs.

As a result of doing things differently, the project team now has a powerful interactive dashboard that wasn't available before. Key outcomes include *faster identification of settlement issues*, the ability to compare different instrument readings side-by-side for better insights, and improved communication of ground performance to all alliance members and forecasting the outcomes so that the programme can be adjusted to the anticipated outcomes. In effect, the EBA team has a single source of truth for settlement monitoring, accessible to engineers, managers, and stakeholders alike. This has made decision-making both quicker and more confident, as everyone can literally be "on the same page" (the dashboard) when assessing embankment behaviour. This data-driven approach is now being looked at as a template for future projects, demonstrating how we can leverage digital dashboards to enhance project controls and sustainability outcomes.

3 More Information

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