

Loch Ness Regional WTW



Loch Ness Regional WTW
Project Office
Forestry Access
Invermoriston
IV63 7YE

Value of our contract (£)
£9 million

Date of Completion
July 2022

Client Name
ESD (Galliford Try, Binnies
and MWH Treatment joint venture)

Client Representative
Kelton Bennett

Client Representative Contact
kabennett@esd.scot

Representative Address
Loch Ness Regional WTW
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Project Overview

RSE was contracted to build an off-site modular nanofiltration (NF) membrane plant, with an output of 1MLD.

The plant included various components such as duty/standby raw water Bollfilter skid and basket strainers (1.8mm), carbon dioxide pH correction system, raw water buffer tank, three separate streams for membrane feed and recirculation, NF membranes, permeate pumps, chlorine dosing, chlorine contact pipe, remineralisation system, relift pump skid, chloramination dosing, mono-sodium phosphate dosing, sodium hydroxide dosing, and associated carrier water system.

The modular construction comprised of 12No. transportable modules measuring 18m x 4.1m each, along with 4No. roof modules.

Monitoring systems for pH, chlorine, turbidity, phosphate, and dissolved organic carbon (DOC) were installed throughout the plant. Two sets of duty/standby high lift pumps were provided to supply water to Invermoriston and Fort Augustus reservoirs. Surge vessels were also included to provide protection for the Invermoriston and Fort Augustus rising mains.

The modular construction comprised of 12No. Transportable Treatment Units (TTUs) measuring 18m x 4.1m each, along with 4No. roof modules.

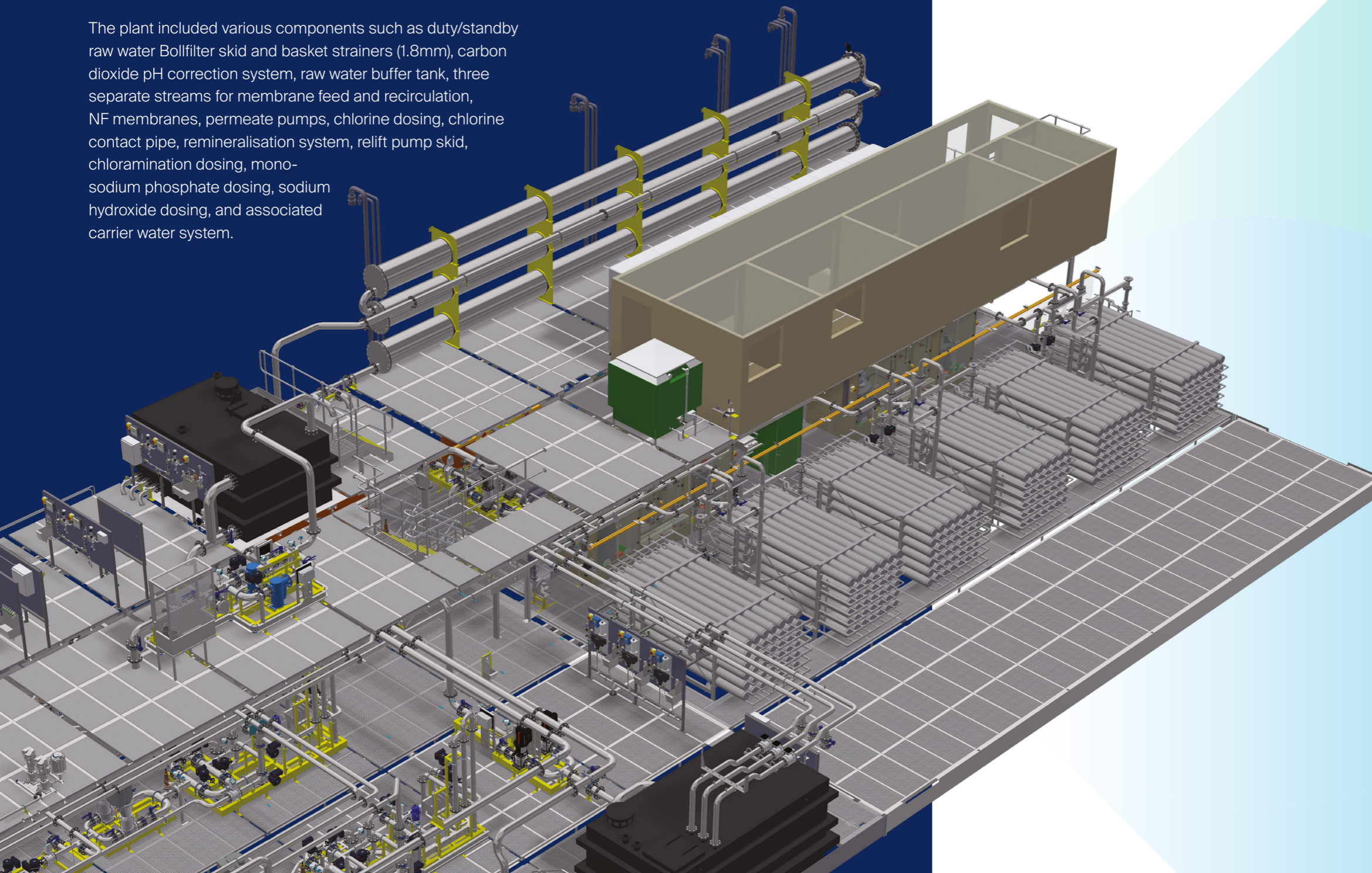
Furthermore, the project involved the implementation of a fully integrated and sophisticated PROFIBUS network and SCADA system, which was developed and installed in-house.

Design

Paul McCloskey, Design Lead

During the design process, RSE collaborated with the client providing the design and RSE playing a crucial role in supplying key interface details, such as slab loadings for the Water Treatment Works (WTW) building and the coordinates for the slab penetration positions.

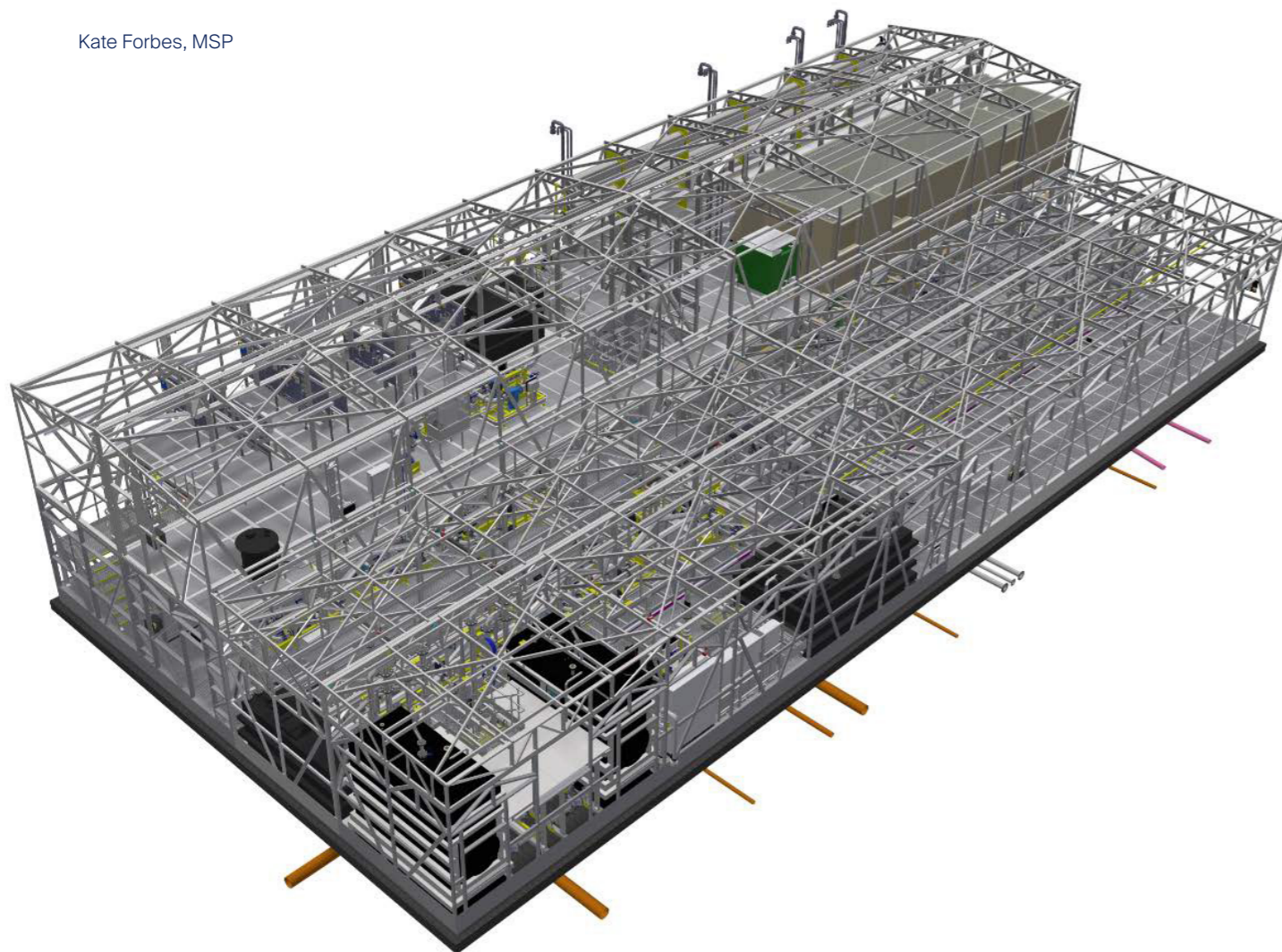
RSE took responsibility for all hydraulic design associated with the WTW and conducted a surge analysis for the Invermoriston and Fort Augustus rising mains on behalf of the client. All modular buildings were meticulously 3D modeled, and structural analysis was performed to ensure the overall structure could withstand extreme wind loadings. In addition to the mechanical aspect, RSE delivered the electrical design, covering power and communications within the scope. Furthermore, RSE played a pivotal role in the ICA (Instrumentation, Control and Automation) by developing the FDS (Functional Design Specification), control philosophy, and control software.



“It’s fantastic to see some of the cutting edge work that is taking place in the Highlands through Scottish Water’s partnership with RSE. Precision engineering is being carried out by a highly skilled team in Muir of Ord to deliver a vital service to communities in the Great Glen. In the process, the work is making a valuable long-term contribution to both local economies.

The benefits are not just local, with Highland expertise already being put to use across much of the country, from Shetland to Stirling. There are exciting opportunities to continue building on this success, both within Scotland and beyond.”

Kate Forbes, MSP



To ensure a seamless transition during the commissioning phase, RSE created a commissioning plan that facilitated coordination with client installations, including the new RWI (Raw Water Intake) and SRs (Service Reservoirs). The plan was integrated into Hazcomms, streamlining the overall process. RSE addressed challenges presented by the soft water source of Loch Ness, which could impact water quality due to its low mineral content. To overcome this, a complex limestone contact remineralisation system with a semi-automated cleaning system was designed and implemented. Another obstacle was the restricted site footprint, allowing for only a compact modular building. As a solution, the WTW building was designed over two levels which, although optimised the space of the site, created hydraulic design challenges in ensuring there was no unnecessary pumping. Overall, these efforts and solutions contributed to a successful and efficient design process.

Construction **Michael Agolini, Project Manager**

Throughout the delivery of the project, RSE seamlessly managed the design, build, installation and commissioning of the modular WTW building to ensure a smooth and efficient process. Each of the 12No. TTUs were expertly fabricated in RSE’s Muir of Ord production facilities, with a corrosion-resistant paint coating applied to all bare steel surfaces. The stainless steel pipework was additionally fabricated in Muir of Ord, while the fit-out of the TTUs took place in RSE’s specialised assembly facility. The dosing skids were manufactured by RSE’s Chemical Dosing division in Dalgety Bay and subsequently transported to Muir of Ord for installation prior to delivery to site.

The MCC (Motor Control Centre) was manufactured by RSE’s subsidiary control systems specialist, Saftronics, and delivered to Muir of Ord for installation within the modular buildings. Individual I/O panels were provided to facilitate localised cabling within each module, reducing the need for extensive cable strip-out during transportation. RSE’s electricians handled the installation of all power and communication cabling, ensuring seamless integration with the building services. RSE’s software engineers were responsible for the software integration.

To ensure a smooth transition and minimise any on-site complications, the modular building underwent comprehensive commissioning in the workshop before being delivered to site. This approach allowed for advance identification and rectification of any defects. Once on-site, the WTW underwent a thorough commissioning process, including interface coordination with client scopes, such as the new raw water pumping station and the Invermoriston and Fort Augustus SRs. The design and commissioning of the telemetry systems for the WTW, RWI, and SRs were subcontracted to ID Systems.

Throughout the commissioning phase, regular manual jar testing was conducted, enabling the calculation of the Langelier Saturation Index. This ensured that the index remained within the agreed limits, guaranteeing compliance with the water quality standards.

Other Key Notes

The success of the project was evident in the consistently high water quality achieved, meeting the performance criteria set for the plant. One of the notable challenges faced during the construction phase was the impact of COVID-19 restrictions. However, RSE successfully navigated this obstacle by promptly resuming site works through the implementation of specific RAMS (Risk Assessment and Method Statement) and modifications to traditional working procedures, ensuring compliance with government regulations.

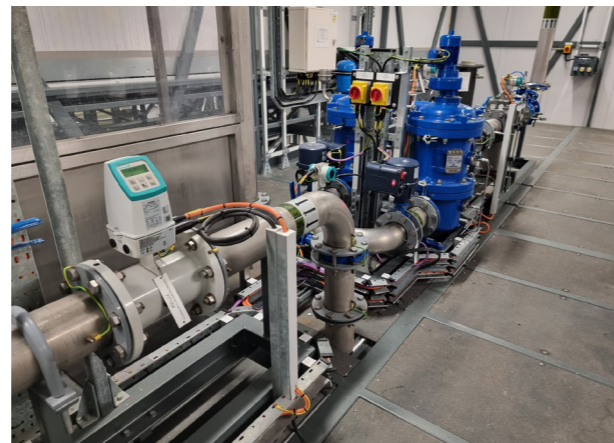
To minimise disruption to client operations, the new plant was built in isolation from the existing WTW, allowing operations to continue unhindered until the switch over to the new facility. Operator training was provided throughout the commissioning phase, guaranteeing a smooth transition and seamless operation. RSE proactively engaged with the Community Council by providing detailed route plans for the large modular buildings. This early stakeholder engagement and management allowed for constructive feedback to be received from the council, resulting in amendments to the route to better suit the community's needs.

The project yielded tangible and measurable benefits. The offsite manufacturing of the modular water treatment plant not only improved water quality but also ensured certainty in terms of time, cost, resources, logistics, and reduced CO2 emissions. Furthermore, by completing the M&E (Mechanical and Electrical) fabrication and installation predominantly in RSE's workshop facilities, only 15% of the total project hours were spent on-site. This significantly enhanced health and safety as well as quality performance, and reduced the number of vehicle movements to site and subsequently minimised travel related carbon emissions. The project was completed without any accidents or incidents. The project also provided valuable training opportunities, with 26 different apprentices working on the construction of the project, contributing over 8,000 working hours in total.

Below:
External Loch Ness WTW Modular Building

Membrane Recirculation System

Opposite:
Raw Water Bollfilter Skid





For more information and contact details visit

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