

Island of Benbecula

new STW & sewerage for Scots island township

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Balivanich is the main township on the island of Benbecula and contains approximately 250 properties. A large number of these were constructed by the Ministry of Defence in the 1970s to house military personnel and their families. There were several different sewerage systems in Balivanich, each discharging treated sewage via outfalls on to the beach. Very little of the sewage was treated to an acceptable standard and this obviously had an adverse effect on the environment in the area. There were also several private septic tanks in Balivanich that also discharged poorly treated sewage onto the beach.



New STW at Balivanich on Benbecula (courtesy Scottish Water)

In 1999, the Defence Housing Executive (DHE) approached the North of Scotland Water Authority (now Scottish Water) requesting that the water authority adopt the water mains and sewerage systems serving the MoD houses. It became apparent that this would be an ideal opportunity to significantly improve the environment by upgrading the foul and surface water sewers and providing a new sewage treatment works and outfall. Agreement was reached with the DHE and as the existing pitch fibre sewers and cast iron water mains were in poor condition a significant contribution was made by them towards the costs of the project.

As part of the construction of a new hospital in Balyvanich, the Western Isles Health Board also made a contribution towards the costs of the improvements.

The project consisted of the following main elements:

- * replacement of 2,000m of pitch fibre foul sewers and 95 manholes;

- * replacement of 3,150m pitch fibre surface water sewers and 85 manholes;
- * replacement of 1,650m of cast iron water main;
- * construction of 2490m of connecting sewers and sewage pumping mains;
- * replacement of sewage pumping station at Tuzo Close and Tindall Road and the construction of an additional pumping station next to the Coastguard Station;
- * construction of a sewage treatment works and alterations to the existing sludge treatment plant;
- * construction of a new long sea outfall..

External consultations

In 1998, the local council (Comhairle nan Eilean Siar) and Western Isles Enterprise were instrumental in preparing and publishing The Balyvanich Enhancement Plan. This consisted of several proposals and recommendations that, when implemented, would considerably improve the environment for residents in, and visitors to Balyvanich. The plan made reference to the provision of

a new sewage treatment works and NoSWA were able to meet the particular aims of it by locating the treatment works as recommended in the Plan.

Similarly, the Comhairle had purchased the majority of the former DHE properties and had earmarked certain areas for re-use as housing or office accommodation. Also, to match supply and demand, several blocks of houses had been identified for demolition. Consultations with the Comhairle's housing department were carried out before and during construction of the project and replacement sewers and water mains have been provided to address the need for such services arising from changes in the housing.

Also, in conjunction with Scottish Natural Heritage (SNH), programming of the works was scheduled to avoid construction works in a particular area known to be frequented by migrating corncrakes. The construction of pumping mains and sewers in an area designated by SNH as a proposed Special Protection Area (pSPA) adjacent to the Tindall Road and to Tuzo Close pumping stations was carried out at such a time that the corncrakes and their habitat were safeguarded.

Consultations with local residents and businesses were essential to ensure that the inevitable disruption and inconvenience arising from the construction works, particular the sewer renewals, and water mains replacement could be kept to a minimum.

Wastewater & sludge treatment

The location of the treatment works had been largely dictated by provision in the Balyvanich Enhancement Plan and as such there were a number of constraints that required engineering solutions.

The extremely poor ground conditions in the area meant that consideration had originally been given to using an infilled cofferdam construction over several areas of the site, *Uist Builders (Construction) Ltd.*, the main contractor, had considerable experience of construction works in this particular area and an assessment of the ground conditions in the area suggested that it was extremely likely that running sand would be encountered at a depth of approximately 1500mm below ground level. The project Engineer *Allen, Gordon & Co.*, in conjunction with the contractor then made a more detailed assessment of various alternative options as part of a Value Engineering exercise. It was determined that a more cost effective solution would be the use of reinforced concrete ground slabs together with partially elevated primary settlement tanks (PST) and significant savings in time and cost were achieved using this alternative arrangement.

Further negotiations with the local planning authority also ensured that the proposed development continued to meet their needs and expectations.

To ensure durability in what is an extremely harsh marine environment, the contractor and their M & E sub-contractor, *Varis Engineering Ltd.*, proposed that the elevated PSTs be fabricated from stainless steel and the access platforms, stairways and handrailings be fabricated from hot-dipped galvanised steel.

The partially elevated nature of the PSTs means that sewage must be pumped from a wet well to the mechanical spiral inlet screen. It then flows by gravity through the PSTs into a second wet well. The effluent is then pumped back to the head of the gravity outfall that discharges to tidal water below MLWS.

The basic level of treatment is sufficient to ensure compliance with the quality standard of 100mg/l suspended solids set by SEPA.



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Settled sludge from the PSTs is then transferred to the adjacent sludge treatment works for dewatering. Bursts of compressed air are used to airlift plugs of sludge to a chamber adjacent to the PSTs from where it flows by gravity to sludge storage tanks which are also used to store screened imported sludge. From these tanks the sludge is drawn and dewatered using polymer dosing and *Huber Rotamat* dewaterer to approximately 30-35% tds.

When sterilised by mixing with lime, the by-product is being used on a trial basis to stabilise fragile wind blown machair land at Hosta in North Uist. The sludge is seeded with a grass mix specially designed in conjunction with SNH and the Scottish Agricultural College SAC, to prevent further erosion of the land by the wind.

Consultations with SEPA, SNH, the SAC and local grazing committees were carried out before this trial took place. Initial indications, along with similar trials at Barvas, Lewis, suggest a suitable and sustainable alternative to disposing of the material to landfill or transportation to the mainland for incineration.

Conclusion

The provision of a new sewage treatment works will ensure that the treated sewage meets the quality standards set by SEPA. Similarly, the construction of a new sea outfall will enable the treated sewage to be discharged beyond MLWS, therefore minimising any effects on the marine environment on the nearby beach.

The cost of the project was £1.8m and local contractor *Uist Builders (Construction) Ltd* in conjunction with their M & E sub-contractor *Varis Engineering Ltd* carried out the construction works as part of a £1.47m contract. Consulting Engineers *Allen, Gordon and Co.*, was responsible for design and supervision of the works. ■

Note: *The author of this article, Iain Mackinnon, is Project Manager with Scottish Water.*



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