

Wicklow Wastewater Upgrade Bundle

Kilcoole, Kilpedder & Redcross WwTPs: extensive design and installation upgrade package to trio of Irish Water treatment plants

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County Wicklow is situated on the east coast of Ireland, south of Dublin. Kilcoole WwTP is located off Sea Road and the surrounding topography is agricultural farmland. The WwTP at Kilpedder is bordered by woodlands and private dwellings, while access to Redcross WwTP is by a caravan park in Redcross. All three sites are under the control of the Local Authority/Irish Water (LA/IW) and serve a combined population equivalent (PE) of 4400. FLI Water was commissioned by Irish Water to undertake a €550,000 programme of work. The expansive, thorough contract included assessment, design, supply, installation, testing and commissioning. At all three sites the work carried out was within the boundaries of the existing wastewater treatment plant.



Examples of the lift-out aeration grid system at Kilcoole and Redcross - Courtesy of FLI Water

Existing facilities

The three wastewater treatment plants serve population equivalents ranging from 600-3000.

Kilcoole WwTP: The existing facility comprised 2 (No.) 6mm fine screens, followed by secondary treatment in a 867m³ aeration tank and humus settlement in 2 (No.) 167m³ concrete tanks. The design criterion was initially 3,000 PE with a 20/30 (BOD:SS) effluent standard and the treatment plant was initially designed for carbonaceous BOD removal only. A phosphorus removal plant was installed in 2013. The main components of the WwTP were:

- 600mm gravity inlet sewer.
- 1 (No.) WAM spiral fine screen, capacity 100l/s.
- 1 (No.) 867m³ aeration tank, incorporating:
 - ▲ 1 (No.) 18kW surface aerator.
 - ▲ 1 (No.) 7.5 kW venturi aerator.
- Phosphorus removal plant.

- 2 (No.) final settlement humus tanks.
- 1 (No.) RAS/WAS pumping station.
- 1 (No.) picket fence thickener.
- Control panel and HMI system in the existing control building.

Kilpedder WwTP: The existing works featured a 6mm fine screen, followed by secondary treatment in a 138m³ packaged aeration and humus settlement tank. The design criterion was 600 PE with a 20/30 (BOD:SS) effluent standard. The main components of the existing WwTP were:

- 225mm gravity inlet sewer.
- 1 (No.) Haigh ACE 490 screen, capacity 20l/s.
- 1 (No.) Forward feed pumping station.
- 1 (No.) 138m³ aeration tank, incorporating:
 - 1 (No.) brush aerator.
- 1 (No.) 15m³ final clarifier.
- Control panel, in the existing control building.



Lift-out grid at Kilcoole - Courtesy of FLI Water



Sludge return pipework at Kilpedder - Courtesy of FLI Water



New screen and sludge tank at Kilpedder - Courtesy of FLI Water



New walkway at Redcross - Courtesy of FLI Water

Flow enters the plant via a sewer network from the village. Two 2.2kW pumps discharge into a DN80 rising main. There was no stormwater holding tank installed on-site. Stormwater overflows from the existing inlet works through a chamber directly to the adjacent river.

Redcross WwTP: The existing works comprised a 6mm fine screen followed by secondary treatment in a 239m³ aeration tank and humus settlement in 71.6m³ concentric final clarifier. The design criterion was 800 PE with a 20/30 (BOD:SS) effluent standard. The main components of the existing WwTP were:

- 225mm gravity inlet sewer.
- 1 (No.) Haigh ACE 590 screen, capacity 40l/s.
- 1 (No.) storm overflow pumping station.
- 1 (No.) 143m³ aeration tank, incorporating:
 - ✦ 1 (No.) venturi aerator.
 - ✦ 1 (No.) concentric final clarifier.
- Control panels, and HMI system in the existing control building and tertiary treatment control room.

There is a stormwater holding tank currently installed at the site. Stormwater overflows from the existing inlet works and flow enters the plant via the village's sewer network.

Scope of work

FLI had to collaborate with both the client (Irish Water) and operator (Wicklow County Council) to understand the challenges and develop the agreed solution. Work commenced on 7 March 2016 and took over nine months. All three projects required a diverse range of upgrading, to achieve compliance and meet increased capacity flows. In each site, FLI Water and its subcontractors undertook all electrical, mechanical, automation/control, building, civil engineering work and any other work necessary for the successful completion, commissioning and testing of the finalised works. The key participants involved in the projects were:

FLI Water Ltd (<i>Main contractors</i>)	David Dunne Controls (<i>MCC & electrical installation</i>)
Wexford Piping Installations (<i>mechanical installations</i>)	SIRIS Environmental Ltd (<i>flume measurement</i>)
Aerzen (<i>blowers</i>)	Bilfinger (<i>screens</i>)
Seepex (<i>pumps</i>)	Jäger (<i>diffusers</i>)
Siemens (<i>flow meters</i>)	Carlow Precast (<i>concrete tanks</i>)

FLI Water assessed the existing system and installed and commissioned new solutions at each of the sites.

Kilcoole: At Kilcoole, the project included removing the existing 6mm automatic screen from the inlet works and modifying the inlet works itself, to form a continuous channel. A new GRP flume meter was installed in the inlet works and upgrades were made to the existing aeration system.

The corroded mild steel access decking on the walkway over final sedimentation tanks was replaced and safety hand railings were included on the walkways. The corroded hydrostatic pipework in the sedimentation tanks was also renewed. A permanent GMS access stairway was installed to the picket fence thickener.

There were also modifications to the control panel, HMI and PLC. Controls, alarms and interlocks were installed to tie in to the existing control system.

Kilpedder: On the Kilpedder project, enhancements included refurbishing the existing inlet works, which consisted of decommissioning the existing screen and replacing it with a new stainless steel inlet chamber with automatic spiral screen rated for 100l/s and 25mm manual bypass screen.

A new RAS/WAS system was installed which consisted of the sludge return pumps and 36m³ sludge holding tank and associated pipework. The packaged plant was drained down to seal the sludge return slot in the clarifier and install four penetrations for sludge draw off pipework.

Further enhancement such as stormwater handling and ferric dosing system were installed. The stormwater handling system consisted of 36m³ precast concrete storage tank, storm pump and interconnecting pipework. The ferric dosing consisted of 1,200l bunded tank, dosing pumps and emergency shower unit.

The existing control panel was removed and a new panel was installed to incorporate the existing and new equipment. New flow monitoring equipment was installed at the inlet, RAS, WAS and outlet which further improved the plants automation capabilities.

Redcross: At Redcross, part of the refurbishment works was similar to Kilpedder. Work on the existing inlet works consisted of decommissioning the existing screen and replacing it with a new stainless steel inlet chamber with automatic spiral screen rated for 100l/s and 25mm manual bypass screen.

Also, the existing control panel was removed and a new panel was installed to incorporate the existing and new equipment. New flow monitoring equipment was installed at the inlet, RAS, WAS and outlet which further improved the plants automation capabilities.

The main part of the works was to improve the plants process by upgrading the existing aeration system and installing a new sludge return system. The existing jet venture aerator was removed and a new fine bubble diffuser lift-out grid system was installed. The sludge return system consisted of sludge turn pump, scum removal system and commissioning of the existing precast concrete sludge storage tank.

Lift-out aeration grid system

As part of the Wicklow Bundle upgrading work, FLI Water designed and manufactured off-site a bespoke, lift-out aeration grid system for both the Kilcoole and Redcross sites. The lift out aeration system was employed to assist with operation and future maintenance within the single ASP tank. In this way, it was easy to keep the two plants on-line throughout the process.

An off-site build solution helped reduce health and safety risks, with less time spent on site during installation and associated programme benefits.

Stormwater handling system

FLI Water's technical team also designed a stormwater handling system in Kilpedder. This had to be incorporated into the existing system in a very small footprint, which made the solution challenging in terms of value and operational efficiency. As a standard, energy efficient blowers and pumps on VSDs were deployed as part of the projects. FLI also set up a temporary treatment system, when draining down the aeration tanks.

Orchestrating these operational sites itself presented working issues, including health and safety coordination and a reduced treatment capacity. Throughout the work, all three sites remained operational and achieved required standards.

Conclusion

The three projects successfully delivered the client's outcomes. By working collaboratively with Irish Water and the operators Wicklow CC, the challenges of working on operational constrained assets with single stream treatment capacity were overcome. FLI Water was able to utilise its engineering capability to solve the issues and then implement a range of off-site solutions including lift out aeration systems with new high efficiency aeration and PLC controls to deliver improved process control and energy management.

During the agreed upgrade programme, additional works were required. These were delivered and the contracts were completed in January 2017, with all plants consistently achieving the client's licensed requirements.

This was FLI Water's first project in Ireland and these works have proved to be useful in developing a relationship and understanding of Irish Water's delivery requirements. Irish Water is pleased with the projects' results and their success has resulted in FLI securing future work, in a larger scheme at Enniskerry in Wicklow.

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New stairs at Kilcoole
Courtesy of FLI Water



Examples of the lift-out aeration grid system at Kilcoole and Redcross - Courtesy of FLI Water