Rochdale AMP5 UIDs

delivery of a catchment solution using integrated catchment modelling and an efficient all inclusive team approach

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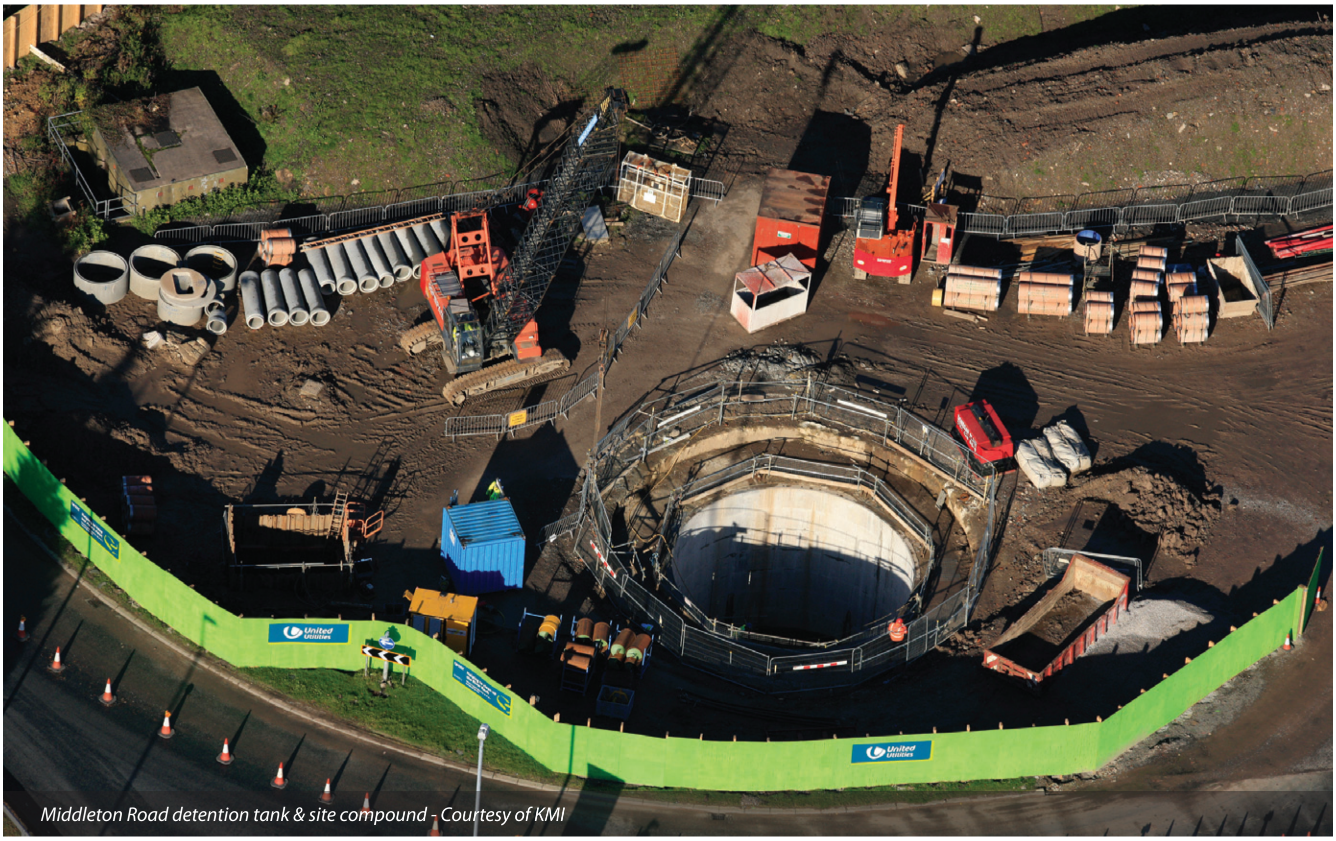
United Utilities has nine Combined Sewer Overflows located in the Rochdale area that have been deemed as unsatisfactory by the Environment Agency and therefore required improvement during AMP5. The improvement works for each of these have been combined into a single Rochdale Unsatisfactory Intermittent Discharge programme of works to maximise opportunities for efficient delivery. The Rochdale catchment serving Rochdale WwTW covers a total contributing area of 3,611Ha and serves a total residential population of 154,760. The topography in the catchment ranges from Pennine moorland in the north falling rapidly via steep sided narrow valleys to the urban areas of Rochdale. The river Roch is the main river in the area and flows in a north east to south west direction from Littleborough through Rochdale to Heywood before discharging to the River Irwell in Whitefield.



Middleton Road detention tank & site compound - Courtesy of KMI

Background

The majority of United Utilities sewerage systems are made up of combined sewers. Combined sewers transport wastewater from homes and industry as well as carrying surface water run-off from gutters, drains and some highways. Heavy or prolonged rainfall can rapidly increase the flow in a combined sewer until the volume becomes too much for the sewer to carry and excess storm water is then discharged to a water course, via the CSO.

A well designed CSO acts as an essential relief valve, preventing overloading to the sewer which could otherwise lead to flooding of properties and sewage treatment works. However, older CSOs, some of which were built in Victorian days, were designed to a much lower standard than is now considered acceptable and do not comply with the current European Legislation and are classed by the EA as UIDs.

Each of the schemes has been clustered to form four individual projects based on an assessment of their location, interdependencies,

Unsatisfactory CSOs in the Rochdale catchment

Name	Driver(s)	Receiving Watercourse
Middleton Road, Heywood	A/W	Whittle Brook
Belfield Lane	A/W	Stanney Brook
Corporation Road	W	River Roch
Smithy Bridge Road	A/W	River Roch
Heywood (Botany) STW	W	River Roch
Field west of Ashes Lane	W	River Beal
Shaw Road	A/W	River Beal
Middleton Road PS	A/W	Whittle Brook
Rochdale WwTW Storm Tanks	W	River Roch

Key to Drivers: A = Aesthetic W = River Impact

Middleton Road pipeline auger bore - Courtesy of KMI

Middleton Road pipeline auger bore - Courtesy of KMI

Ashes Lane detention tank - Courtesy of KMI

receiving watercourse, model analysis and milestone dates. All this, when combined with Integrated Catchment Modelling has helped to form a catchment wide solution. The sewer modelling for the study was undertaken in accordance with the general guidance of the UU standard processes, utilizing InfoWorks (v. 11.5) and DUFLOW.

The following describes the solutions to the first five schemes.

CLUSTER 1 - Middleton Road

Existing CSO	Screens	Scumboard	Spills/year
Benched weir type overflow	No	No	55

The network model showed that to meet the permitted water quality spill frequency (1 spill/summer) a new screened CSO was required along with a 312m^3 storm storage tank. Detailed analysis showed that the spill weir on the new CSO could be raised to a level which would avoid the need for the tank without impacting on the level of service of the sewerage network.

The solution comprised the abandonment of the existing CSO chamber and the construction of a new CSO with a static screen and a much shorter section of new outfall pipe. The Ovivo static screen is sized for flows of up to 400l/s.

The new CSO chamber was constructed as an in situ reinforced concrete structure within a sheet piled cofferdam. Due to the location of the CSO and the services to be crossed, the interconnecting pipework was constructed using no-dig techniques. The spill pipework which crossed Middleton Road was constructed as a twin pipe auger bore to minimise traffic disruption. The upstream and downstream connections to the existing sewer were constructed within timber headings which enabled bends to be placed within the timber heading, eliminating the requirement for manholes at changes of direction and the need to divert existing services.

CLUSTER 1 - Middleton Road Pumping Station - traffic island off junction 19 of the M62

Existing CSO	Screens	Scumboard	Spills/year
Hole in the wall type in the wet well of the pumping station	No	No	75

The EA initially classed this as an Emergency Overflow and so was required to achieve no spills (up to a 1 in 30 year event). However a case was submitted to the EA to demonstrate that the frequency of overflows meant it had always operated as a CSO and that it should have the same permit as the Middleton Road CSO, just 250m downstream discharging to the same watercourse.

This was accepted by the EA and negated the need for 8,500m^3 of storm storage. Network modelling had identified that 1,000m of surface water from Middleton Road drained to the pumping station and so a low carbon solution was established to separate out this road run-off which required a storage volume required to 1,000m^3 and a static screen sized for flows up to 40l/s, a 1 in 5 year event.

The 12.5m diameter 12m deep segmental shaft detention tank was caissoned through the made ground into the glacial tills containing alternating layers and lenses of clay and water bearing sands. Floatation resistance was provided through the weight of the structure and an under reamed base to increase the mobilisation of spoil to resist upthrust.

The 450mm diameter surface water separation pipework was laid through fields adjacent to Middleton Road to depths of up to 8m using a combination of open cut, auger boring and pipe jacking techniques. The pipework was constructed, terminating with a connection to the M62 surface water drainage at the motorway slip road. The layers and lenses of clay and water bearing sands required deep well dewatering to control.

The connection to the existing motorway surface water sewer within the slip road off the M62 was constructed as a pipe jack utilising a 1,500mm diameter oversized steel liner pipe into which a 450mm diameter product pipe was placed and connected to the existing sewer surface water sewer.

CLUSTER 2 - Belfield Lane, Rochdale

Existing CSO	Screens	Scumboard	Spills/year
Single sided weir type overflow	No	Yes	94

Following analysis of the network model, the required water quality could be achieved without the need for a 150m^3 off-line storm storage tank by constructing a new CSO with a static screen (sized to screen flows up to 162l/s) and outfall pipe, 400m downstream of the existing CSO. The new reinforced concrete CSO chamber with Ovivo static screen was constructed within a sheet piled cofferdam at a more accessible location in public open space. Open cut techniques were used for the interconnecting pipework.

CLUSTER 2 - Field west of Ashes Lane - Milnrow, Rochdale

Existing CSO	Screens	Scumboard	Spills/year
Double sided weir type overflow	Yes (raked)	No	34

To meet the permitted water quality the network model required constructing a new CSO with a powered screen (sized for flows up to 1,260l/s), 800m^3 of storage and a new outfall pipe.


Shaw Road CSO - Courtesy of KMI


Ashes Lane detention tank - Courtesy of KMI

Middleton Road Pipeline - Courtesy of VJ Donegan Civil Engineering

The detention tank was a 12.5m diameter 12m deep segmental shaft underpinned through the mudstone. Floatation resistance was provided through the weight of the structure and an under reamed base to increase the mobilisation of spoil to resist upthrust.

As there was insufficient space on site to enable the new works to be built off line the new in situ CSO chamber was constructed upstream of the existing CSO and the Longwood *Stormguard* screen was installed and commissioned prior to demolishing the existing CSO chamber. The interconnecting pipework was upsized online, using open cut techniques. During the installation of the pipework, an existing concrete culvert constructed using brown asbestos as permanent formwork was identified, which had to be removed under licence by a specialist asbestos contractor.

CLUSTER 2 - Shaw Road (A663) at the junction with Gordon St

Existing CSO	Screens	Scumboard	Spills/year
Stilling pond type overflow	No	Yes	7

The extremely constrained nature of the site and the associated traffic on one of the main feeder routes to the M62 meant that off-line storm storage was not feasible. However, by retrofitting a static screen into the existing chamber, highway disruptions would be kept to a minimum, and the permitted standards would be met.

To enable the static screen to operate hydraulically within the existing chamber, the soffit level of the chamber needed to be raised by 300mm and the capacity of the existing spill pipe increased. To raise the soffit level and minimise the disruption caused by the works, a replacement cover slab with integral raising wall was precast off site. Once on site, the existing brick built chamber was propped internally before the existing precast concrete cover slab was diamond saw cut and lifted clear from the chamber. The Ovivo static screen was fixed prior to the replacement cover slab being installed and the road surface reconstructed.

To increase the capacity of the existing spill pipe from the chamber, a section of spill pipe adjacent to the chamber was twinned with an additional pipe laid directly above the existing pipe which enabled the utilisation of the existing MH chambers. A further section of the existing spill pipe was twinned off line adjacent to the watercourse.

Conclusion

For complex catchments the design team needs to work closely with the network modellers to understand the relationships between the different UIDs and how the solutions can impact on one another in delivering an integrated catchment solution. A small amount of extra time spent developing an optimum unified solution can drive significant overall savings.

OPEX was minimised with the use of static screens, removal of storm storage tanks and the use of surface water separation. The continuous involvement of Operations and on-going appropriate input from the Process Partner and their detailed designer is essential for both selecting and defining possible solutions. Stakeholder management is essential to achieve acceptable, buildable solutions that minimise the impact on the local community both during and after construction.

At the time of writing (July 2013) four of the outputs have been successfully delivered in advance of their regulatory date, with the remaining five in construction, once again scheduled to be delivered early.

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Middleton Rd detention tank & site compound - Courtesy of KMI