



# New Goitre School HMA

## Clean Water Hydraulic Modelling Assessment

| Action:                               | Sign Off:          | Date:      |
|---------------------------------------|--------------------|------------|
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## 1. Introduction

This document will cover the assessment of a new connection onto DCWW's network. The purpose of the connection is to supply a development consisting of a new 500 pupil school on Goitre Lane. The proposed development is located within LCA Gurnos East (1PWN8M15) and will be supplied from Pengarnddu Old SRV. The location of the proposed development is shown in *Figure 1* below.



*Figure 1 - Proposed development location*

DCWW have an existing hydraulic model for this area, therefore, to understand the potential effect on the network the 'N10\_MDD\_4.9.5' model was utilised incorporating the proposed development demand calculations. *Appendix 1*. This model was calibrated and verified before adding the scenario. This will allow DCWW to determine whether the available head of pressure at the development is sufficient to provide the development with adequate pressure and not causing detriment to the supplying network.

## 2. Methodology

The hydraulic model of the network was used to assess the impact of the proposed connection under maximum day demand conditions. This allows DCWW to be confident that the network will perform as desired during periods of high demand and provides a worst-case scenario model. Therefore, the lowest potential pressures and high potentials flows, velocities and head losses can be observed. The demand applied to the model was supplied as profiles by DCWW. The demand for the development will be applied in the model for the proposed connection, with the daily demand pre-calculated to achieve the required peak flow. The total demand for the profiles in the development can be seen in **Appendix 1**. All existing flows, pressures, velocities, and head losses will be observed and compared against the scenario to determine the potential impacts to the network.

The demands applied to the model were calculated using normalised industry standard demand profiles.

Any changes to the demand will result in a requirement for additional Hydraulic Modelling assessment.

The network will be assessed in line with DCWW's preferred operating parameters for potable water mains, as shown in **Table 1**.

| Hydraulic Measure | DCWW'S Hydraulic Standards                                                                                                                           |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pressure          | Minimum pressures of 15m at the customer's property.<br>Maximum pressures in distribution areas of 70m.<br>Note pressure ranges of greater than 20m. |
| Headloss          | Maximum headloss gradient 5.0m/km.                                                                                                                   |
| Velocity          | Minimum mains velocities 0.3m/s.<br>Ideal mains velocities 0.6-0.8m/s.<br>Maximum mains velocities 1m/s.                                             |

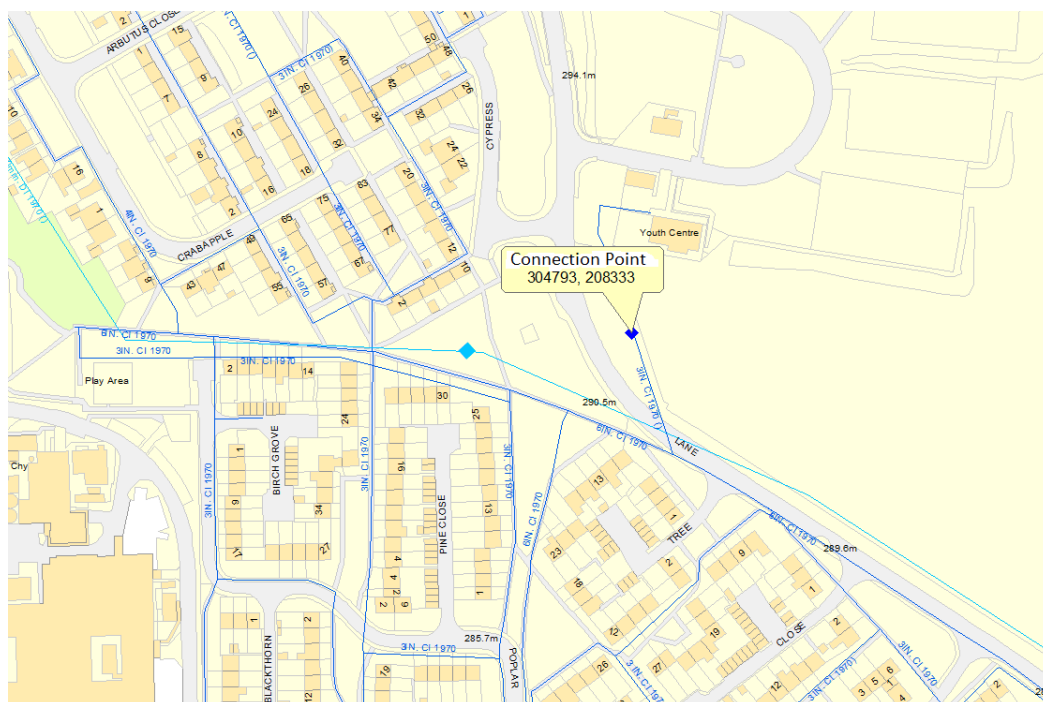
**Table 1 - Hydraulic Standards**

### 3. Scenario Assessment

One potential scenario has been identified, the following sections describe the impact of the connection option, and any require mitigation measures to maintain the current level of service.

#### Connection Option 1 - Network Analysis

When looking for viable connection options for this site one was immediately accessible and has been highlighted as Connection Point, shown in **Figure 2**, details for this can be viewed below:



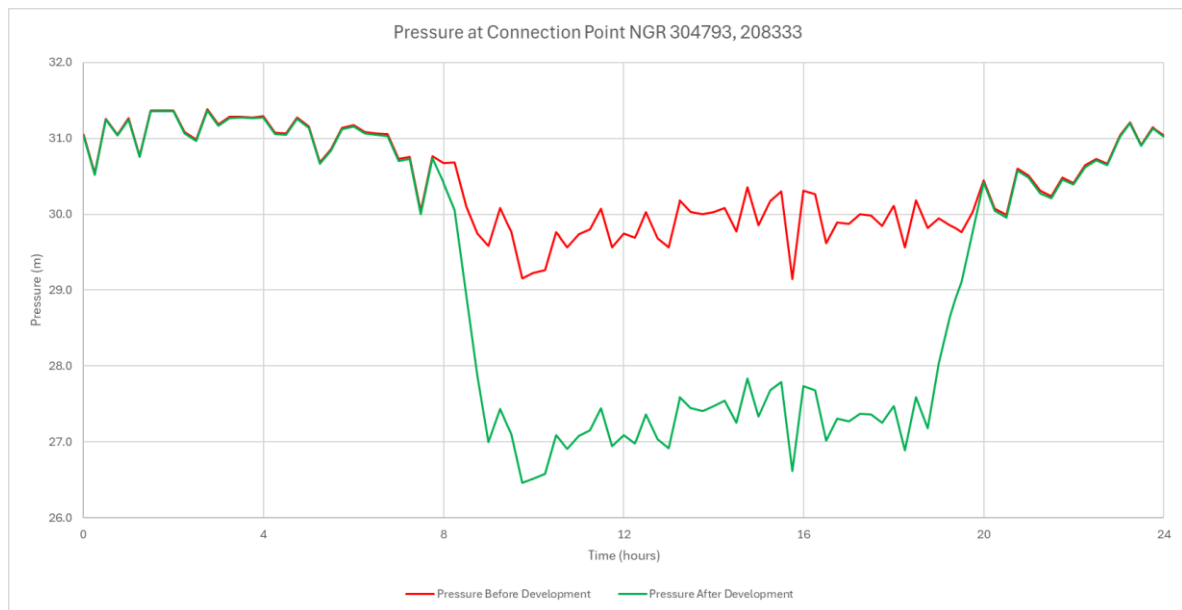
*Figure 2 - Location of demand added to model in relation to development location.*

Proposed Connection Point - This utilises the current 3" CI main in Goitre Lane at an approximate NGR of 304793, 208333.

When adding the additional demand to LCA 1PWN8M15, there is no significant effect to the existing pressures within the LCA or to any downstream LCAs.

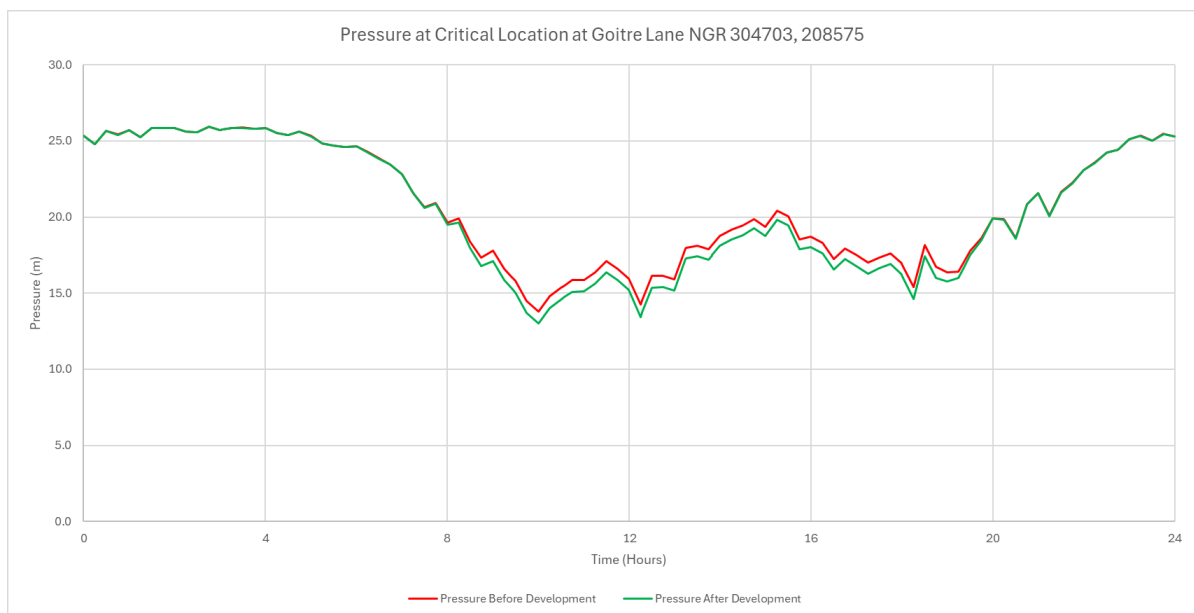
All nodes in LCA 1PWN8M15 experience a pressure drop of between 0.2m-2.68m, and all nodes in LCA 1PWN8M13 experience a pressure drop of 0.005m. All downstream LCA pressures experience no change.

## Pressure



*Figure 3- Pressure at the Site Connection point of the network*

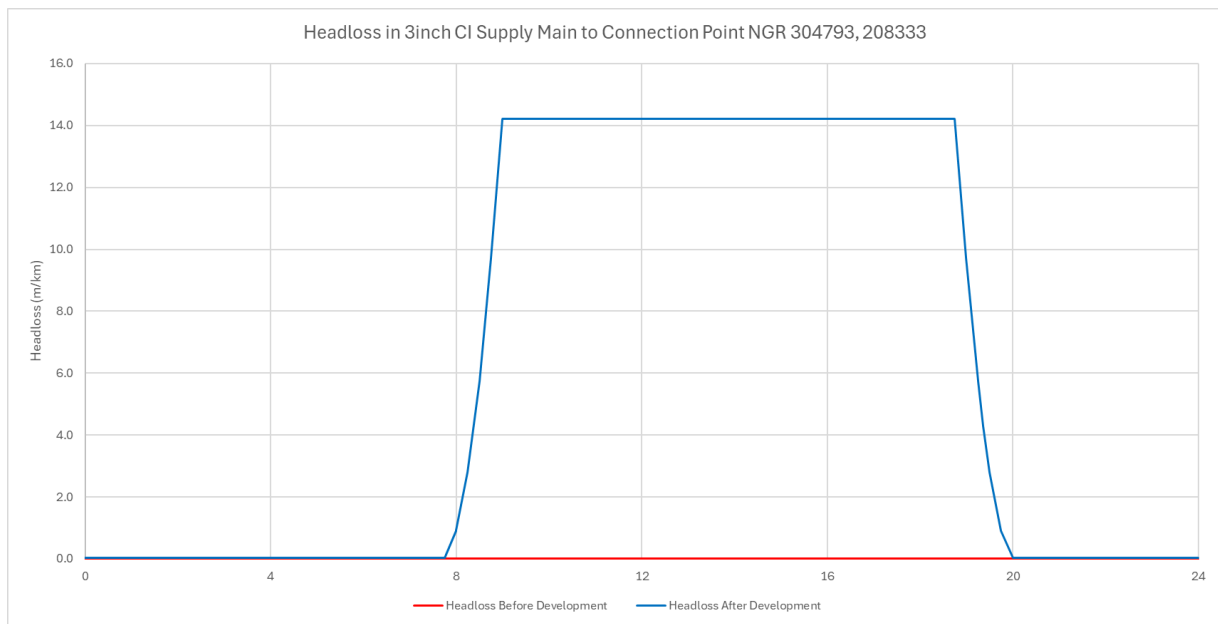
**Figure 3** shows at the connection point NGR 304793, 208333 with the development applied onto the network, a minimum pressure decrease from 29.15m to 26.46m is observed causing a loss of 2.68m. This is only a minimal loss to the network and is within DCWW's serviceability levels.



*Figure 4 – Pressure at the Critical point*

**Figure 4** shows the critical point of the network NGR 304703, 208575 can maintain a minimum pressure of 12.98m down from 13.80m showing a decrease of 0.82m. This is below DCWW's serviceability levels. However, this can be resolved by servicing and increasing the outlet setting of the PRV at the inlet meter NGR 305346, 208386 from 16m to 18m.

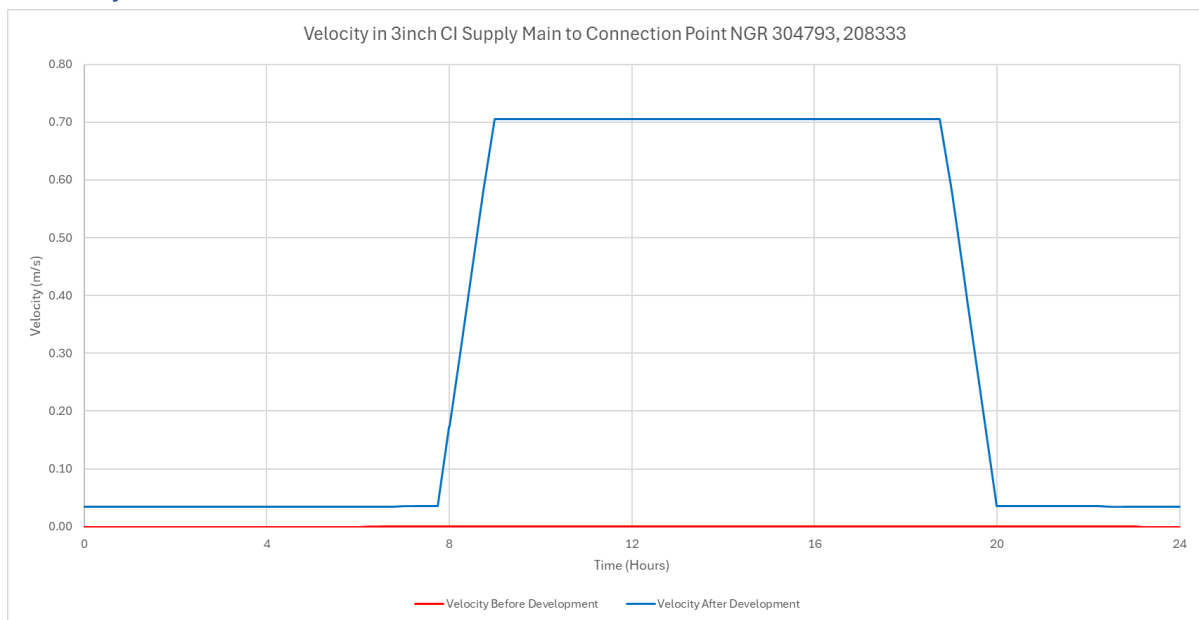
## Head loss



*Figure 5-Head loss along Mains from SRV*

**Figure 5** shows that with the development added onto the network head losses peak from a max of 0.001m/km to 14.21m/km in the 3inch CI supply main to the connection point NGR 304793, 208333. This is above DCWW's hydraulic standard of 5m/km. However, this is a relative short section of main and the velocity and pressure losses remain below the hydraulic standards.

## Velocity



*Figure 6-Velocity along mains from SRV*

**Figure 6** shows that the peak velocities on the supply pipework with the development applied a maximum of 0.71m/s from a peak of 0.001m/s in the 3inch CI supply main to the connection point NGR 304793, 208333. Peak velocities are below DCWW's acceptability levels of 1m/s maximum.

## 4. Fire Flow

This section is for information only.

Fire protection is the responsibility of the appropriate regional Fire Services.

DCWW is not responsible for fire protection or for providing suitable fire flows.

Fire flows were tested with the system set up to the build out options discussed in section 3 and in line with guidelines set out for housing developments in the 3rd Edition of the *National Guidance Document on the Provision of Water for Fire Fighting* published by the Local Government Association and Water UK.

Further Information can be found [Here](#).

## 5. Conclusions, Risks & Reinforcement

### 5.1 Conclusions

- The assessment has determined that there is one single connection point immediately available to this development. To connect anywhere else would require crossing private land or installing long lengths of main.
- The 500-pupil new school development off Goitre Lane can be supplied from the 3" CI main in Goitre Lane within LCA 1PWN8M15 without causing any pressure issues.
- The critical point of the network NGR 304703, 208575 can maintain a minimum pressure of 12.98m down from 13.80m showing a decrease of 0.82m. This is below DCWW's serviceability levels. However, this can be resolved by servicing and increasing the outlet setting of the PRV at the inlet meter NGR 305346, 208386 from 16m to 18m.
- With the development added onto the network head losses peak from a max of 0.001m/km to 14.21m/km in the 3inch CI supply main to the connection point NGR 304793, 208333. This is above DCWW's hydraulic standard of 5m/km. However, this is a relative short section of main and the velocity and pressure losses remain below the hydraulic standards.

### 5.2 Risks

- Due to increased flow rates throughout the network, there is a possibility for discolouration.
- This HMA is a valid assessment up to the stated expiry date.

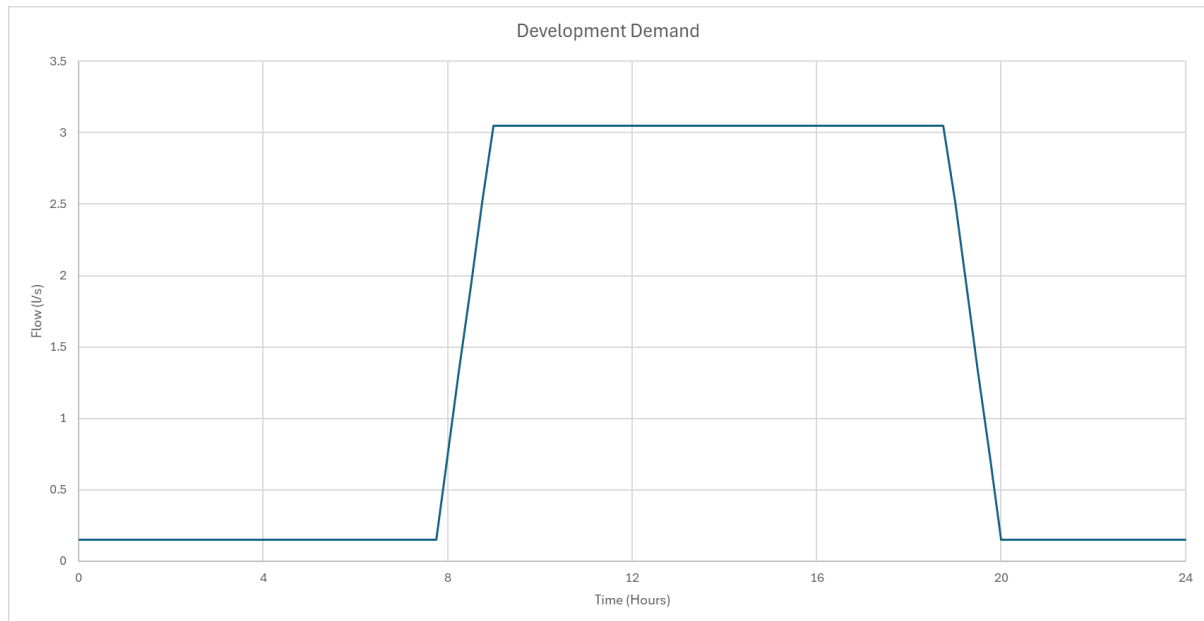
### 5.3 Reinforcement

- As the proposed connection point is to a 3" CI main, it is recommended that the condition of this main is assessed prior to connection. Robust flushing of the main is recommended to prevent discolouration.

## Appendix

### 1. Demand Profiles

To calculate a worst-case peak flow a pupil consumption of 250 litres per person per day has been assumed. 500 pupils' results in an average daily flow of 1.45 l/s. This has been used in the model against the Q04 10hour metered customer profile to create the following demand.



*Demand created for 500 pupil school.*

## 2. Glossary

| <u>Clean Water mains</u> |                                  | <u>Assets</u> |                           |
|--------------------------|----------------------------------|---------------|---------------------------|
| AC                       | Asbestos Cement                  | CK            | Check Valve               |
| CIBL                     | Cast Iron Bitchumen Lined        | TF            | Tank Fill                 |
| DI                       | Ductile Iron                     | SV            | Sluice Valve              |
| DIBL                     | Ductile Iron Bitchumen Lined     | PRV           | Pressure reducing Valve   |
| DICL                     | Ductile Iron Clement Lined       | PSV           | Pressure Sustaining Valve |
| DIEL                     | Ductile Iron Epoxy Lined         | BV            | Boundary Valve            |
| GRP                      | Glass Reinforced Plastic         | VF            | Flow Regulator            |
| PE                       | Polyethylene                     | VQ            | Flow Modulator            |
| SI                       | Spun Iron                        | SRV           | Service Reservoir         |
| SIBL                     | Spun Iron Bitchumen Lined        | FH            | Fire Hydrant              |
| SICL                     | Spun Iron Clement Lined          | WO            | Wash Out                  |
| SIEL                     | Spun Iron Epoxy Lined            |               |                           |
| ST                       | Steel                            |               |                           |
| STBL                     | Steel Bitchumen Lined            |               |                           |
| STCL                     | Steel Clement Lined              |               |                           |
| STEL                     | Steel Epoxy Lined                |               |                           |
| UPVC                     | Unplasticized Polyvinyl Chloride |               |                           |
| MDPE                     | Medium Density Polyethylene      |               |                           |
| SDR                      | Standard Dimensional Ratio       |               |                           |

| <u>Other</u> |                                |
|--------------|--------------------------------|
| DMA          | District Meter Area            |
| LCA          | Leak Control Area              |
| WQZ          | Water Quality Zone             |
| NGR          | National Grid Refence          |
| AOD          | Above Ordinance Data (Newlyn)  |
| HGL          | Hydraulic Grade Line           |
| OD           | Outside Diameter               |
| ID           | Intern Diameter                |
| DCWW         | Dwr Cymru Welsh Water          |
| HMA          | Hydraulic Modelling Assessment |
| MDD          | Max Day Demand                 |
| CP           | Critical Point                 |
|              |                                |