Design Risk Assessment for Water Infrastructure Codes of Practice

Connections and Developer Services

Design and Construction Requirements for Self-Lay Developments
July 2020 (Revision 2)

Document IW-CDS-5020-04

UISCE ÉIREANN : IRISH WATER

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Background

Technical Documentation has been developed by Irish Water's Connection and Developer Services (CDS) which outlines Irish Water's requirements for water services infrastructure within developments.

The Technical Documentation comprises Codes of Practice and Standard Details. These provide Irish Water's requirements to developers in the provision of water and wastewater infrastructure that is to be installed by Self-Lay methods in developments, and that will be connected to Irish Water's networks and subsequently vested in Irish water.

The Technical Documentation outlines design and construction requirements to ensure consistency in the provision of materials, equipment, workmanship, etc. They will also provide the basis for developers detailed design proposals for water and wastewater infrastructure, leading to the provision of infrastructure that is suitable for connection to Irish Water's networks and easy operation and maintenance.

The Technical Documents are based on best practice within the water industry. They take account of the experience of Local Authorities in the provision of these services to new developments.

The Standard Details for Water (IW-CDS-5020-01) and its associated Design Risk Assessment (IW-CDS-5020-02) are available at www.water.ie. The Code of Practice for Water Infrastructure (IW-CDS-5020-03) is available also at www.water.ie.

This Design Risk Assessment (DRA) (IW CDS-5020-04) has been prepared to outline the residual health and safety responsibilities of developers and their designers/contractors in the provision of infrastructure in accordance with the Code of Practice for Water Infrastructure (IW-CDS-5020-03). The residual risks outlined herein shall be taken into account in the detailed design of water infrastructure.

Design Risk Assessment for the Code of Practice for Water Infrastructure

The Code of Practice for Water Infrastructure describes acceptable requirements and provides guidance on the minimum standards that are required by Irish Water for the provision of water pipes and related infrastructure in Self-Lay developments which are to be connected to the Irish Water Network. The water supply pipes and related infrastructure to be put in place within Self-Lay developments shall comply fully with the Code of Practice for Water Infrastructure. The Code of Practice for Water Infrastructure shall be used in conjunction with this Design Risk Assessment which identifies the risks that designers shall take into account in the detailed design of the water pipes and related infrastructure. Ultimate responsibility (including, but not limited to, any losses, costs, demands, damages, actions, expenses, negligence and claims) for the detailed design, construction and provision of such pipes and related infrastructure shall rest entirely with the Developer, his/her Designer(s), Contractor(s) or other related parties. Irish Water assumes no responsibility for and gives no guarantees, undertakings or warranties in relation to the pipes and related infrastructure to be provided in accordance with the Code of Practice for Water Infrastructure.

Revision	Reason for Revision	Approved By	Issue Date
0	Initial Issue	T. O'Connor	18/04/2017
1	Updated for Code of Practice Rev. 1 Dec. 2017	T. O'Connor	23/04/2018
2	Updated for Code of Practice Rev. 2 July 2020	T. O'Connor	17/07/2020

Irish Water

Connection and Developer Services

Design Risk Assessment associated with Code of Practice for Water Infrastructure

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Enter the Activity	Enter the hazard	List persons or groups at risk	Give details of existing control measures in place	1-5 (select from list\)	1-5 (select from list\)	Prob. x Conseq.	Low, Medium or High	Give details of additional control measures proposed	1-5 (select from list)	1-5 (select from list)	Prob. x Conseq.	Low, Medium, High
WATER CODE OF PRACTICE						0					0	#N/A
Water Supply Works	Contamination of Water Supplies	The Public	**Section 1.5 Protection of Water Quality** The Developer undertaking the Works shall: • adhere to all appropriate hygiene procedures to ensure that the infrastructure installed is fit for use as water supply works for the delivery of wholesome or potable water, fit for human consumption, • where an employer is aware of any person employed on the Works known to have a waterborne disease or gastric disorder, the employee shall immediately cease involvement in the installation of the Works and shall not return until granted a medical clearance; • ensure that all materials in contact with water intended for human consumption shall achieve compliance with Statutory Instrument 122 of 2014, European Union (Drinking Water) Regulations 2014 and shall be: (i) included in the latest "List of Approved Products for use in Public Water Supply in the United Kingdom" published by the Drinking Water Inspectorate (DWI) for England and Wales. Documentary evidence that the substance or product has been specifically approved under the DWI system, or equivalent approval system shall be provided to Irish Water for acceptance; or (ii) listed in the current edition of the Water Fittings and Materials Directory published by the Water Regulations Advisory Scheme (WRAS). To demonstrate compliance under this scheme, a letter from WRAS shall be provided outlining the scope of the approval. • ensure that pipework, materials, fittings and installations used in connection with the Distribution System and use of water within the Curtilage of the premises should also be suitable for conveyance of water fit for human consumption; • ensure that the water Distribution System has been disinfected, pressure tested and water samples taken and the results of which have indicated that the Main is suitable for conveying water intended for human consumption. Installation, testing and commissioning (flushing, cleaning, disinfection, scouring, etc.) of the Works shall be carried out and water quality tests undertaken prior to connection to the Irish Water's Network. If a water sample taken prior to the final connection does not meet the parametric standards laid down in Statutory Instrument 122 of 2014, European Union (Drinking Water) Regulations 2014, a new sample shall be taken and tested. A connection shall not be provided until the bacteriological tests are satisfactory. If the connection is not made within 14 calendar days of the sample date which yielded a satisfactory result, a new sample shall be taken and tested and the disinfection process repeated, if required. The 14-day period may, in exceptional circumstances, be extended to no more than 28 days subject to a comprehensive risk assessment and only with the express written approval of and authorised person in Irish Water. Service Connections shall only be made once the supply pipework has been confirmed to have passed the sampling tests indicating compliance with Statutory Instrument 122 of 2014, European Union Drinking Water Regulations 2014 (the DWRs).	2	3	6	**Medium**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will also vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Carrying out works on water supply infrastructure	Contamination of Water Supplies	The Public	**Section 1.5 Protection of Water Quality** During construction, the Developer and his contractor/sub-contractor shall be mindful that any contamination of a water supply could create dangers to public health and in this respect every precaution shall be taken to prevent contamination. The Developer and his contractor/sub-contractor shall: • arrange for all personnel operating in and around the Development to be screened by a medical facility for all water transmittable diseases and maintain records of these screenings, no person shall be allowed to commence work in or around the Water Main installation works until screenings are completed and the successful results, as issued by a medical advisor, are provided to Irish Water. • ensure that operatives, while working on potable water supply systems, have completed a recognised Drinking Water Supply Hygiene Course. (The Local Authorities Services National Training Group (LASNTG), Water Services Training Group offers a training course, leading to a certificate award, on drinking water supply hygiene for water services personnel & contractor staff who work with water services.) • ensure that staff working on water supply infrastructure have a copy of Drinking Water Supply Hygiene Course certificate at all times while on the site installing or repairing the water mains and present it to Irish Water personnel on request. If any staff employed by the contractor/sub-contractor contracts illness, such as infective jaundice, gastro-enteritis, persistent diarrhoea or prolonged unexplained fevers, the employee shall immediately cease involvement in the installation of the works and shall not return until granted a medical clearance, This must be reported through the Developer to Irish Water immediately. Infected people will not be permitted to work on the activities relating to Water Main, water service installation or subsequent repair works of this infrastructure. Infected people will not be allowed to enter the water installation works site without first obtaining authorisation from an appropriate medical authority. The Developer's contractor/sub-contractor shall ensure that he has sufficient chlorine wipes available at all times to maintain an appropriate level of cleanliness for his tools, equipment, pipe, fittings, etc. All fittings shall be kept within sealed wrappings and must not be stored on the floor of vans or warehouses at any time. When the Developer's contractor/sub-contractor suspects that a contamination incident has occurred, he shall notify Irish Water immediately and the necessary action will be determined.	2	3	6	**Medium**	It is the responsibility of the Developer and/or designer to obtain all current information on the location of other existing utility or service providers' apparatus prior to the design being carried out. During installation, due diligence should be used when making excavations for water mains and services and care shall be taken to protect and support all existing services (water, gas, telecommunications, drainage, electricity, etc.) and other works so as not to interfere with the working arrangements and integrity of such utilities. All available records should be used to identify the location of utility ducts, cables, pipes, etc. Proprietary cable locators shall be used by CSCS trained personnel prior to excavation taking place to locate and mark these utilities. Due diligence shall be taken when making excavations for water mains and services. Care shall also be taken to protect and support all existing services (water, sewers, gas, telecommunications, electricity, etc.) and other works so as not to interfere with the working arrangements of the services. Appropriate hygiene precautions shall be taken to prevent contamination of the infrastructure being installed.	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Acceptance of completed works	Insufficient standard for safe operation and maintenance	Public Operation & Maintenance Personnel Other Utility Providers	**Section 1.7 Application for a Conformance Certificate** Irish Water's Field Engineers will undertake final site inspections on the Works in line with the Quality Assurance Field Inspection Requirements attached to the Connection Agreement during and throughout the construction of the Works. The Developer's site staff shall retain on the site of the Works a Quality Assurance Folder to include information on, as well as on-site quality assurance records of the Works installation. The document shall be updated as required and made available to the Irish Water Field Engineer for inspection. This document shall be used to facilitate the collation of the Final Documents as referred to below. Final inspections will be carried out after the submission by the Developer of an application for the issuing of a Conformance Certificate. The Conformance Certificate is a document that will be issued to the Developer by Irish Water indicating compliance of the Works with Irish Water's requirements following: • Inspection of the constructed infrastructure confirming that it is constructed in accordance with the Code of Practice and Standard Details. (If minor corrections are required to the infrastructure (snags) a 'Defects Report' will be issued with the Conformance Certificate outlining these minor defects); and • The Developer's submission of Final Documents and Irish Water indicating satisfaction with same following their inspection. The issuing of a Conformance Certificate marks the commencement of the Defects Liability Period. The Final Documents shall comprise at least but not limited to the following suite of documentation: • Confirmation by a Chartered Engineer in writing that the Works has been installed in accordance with the design submitted in the Connection Application; • Confirmation by a Chartered Engineer in writing that the Works has been installed in accordance with the Code of Practice and Standard Details; • Confirmation by a Chartered Engineer in writing and test result certificates indicating that the Works have undergone appropriate on-site testing, off-site testing and commissioning and provision of associated . The requisite site tests for the Works include, but are not limited to, the following: (i) Pressure Tests on Ductile Iron Water Mains (if appropriate) with a hard copy printout from the data logger as proof of the outcome of the test; (ii) Pressure Test Records of polyethylene pipes (if appropriate) with a hard copy printout from the data logger (in the required format) of the relaxation curve as proof of the outcome of the test. (iii) Testing completion results of Pumping Plant (if appropriate); (iv) Disinfection of Water Mains (including cleaning, scouring, swabbing and disposal of disinfection water); (v) Commissioning & testing of Works including water quality sampling and testing of water from the commissioned works; (vi) A printout of the joint details, with a GPS location of each joint; •"As-Constructed" drawings and records of the installed Works in hard and soft copy (to be delivered to the Irish Water Field Engineers) in accordance with Sub-Section 1.7.15 below; • "As-Constructed" record to be included in the drawings of service pipe installation completion (including link to House Numbers within the Development); • A Safety File in accordance with the current Safety and Health Construction Regulations; • Operation and Maintenance Manuals for pumping plant (if such provided) including full pump details, performance curves and power ratings, estimate of energy use, parts replacement schedule, maintenance requirement (as well as estimated costs of these), etc., and all warranty documentation for the installed equipment as well as drawings of the pump station; • Deeds of Grant of Easement and associated PRA Compliant Map(s) in accordance with the Connection Agreement; • Proof of ownership of the Development in the form of Deed/Solicitor let; • Confirmation of compliance with a Fire Safety Officer Report; • Confirmation by a Chartered Engineer of compliance with the Building Regulations and the Building Control (Amendment) Regulations, in particular evidence of compliance with the Building Regulations to ensure plumbing systems compliance and no risk of backflow contamination; • A construction stage hydraulic model (if relevant); • As Constructed Record Drawings in hard copy and digital format shall show the location layout plans, longitudinal sections and details of the Works and Development in full. Plan scales should be in common use, i.e. 1:200, 1:500, 1:1000 or 1:2500 as appropriate. Drawings should be prepared using an electronic system and submitted in standard "CAD compatible (dwg/dxf)" file format. These drawings shall contain the following information: - Locations of all valves, hydrants, scour valves or washout hydrants, meters, ducts, tapping locations, Water Main and service pipes, Boundary Boxes, etc., complete with legends to Irish Water's requirements; - Detailed pipe material types, sizes, connection detailed plans of pipe branches, showing valve locations, etc.; - Locations of assets are to be to +/- 100mm accuracy in the horizontal plane to the centre of the asset, with dimensions relating to fixed Irish National Grid (ING) co-ordinates; - Cover level for Water Main fittings and intermittent Water Main invert levels relating to fixed Ordnance Survey Datum (Malin Head) to an accuracy of +/- 20mm; - Longitudinal sections, to an exaggerated vertical scale, showing installed levels, (such as 1:1000 horizontal and 1:100 vertical) completed ground levels, invert levels, pipe sizes, bedding, haunch and surround details, backfill details, together with Chamber locations, chainages, gradients, pipe materials, etc. All Chambers for water supply fittings shall be identified and provided with location co-ordinates to Irish National Grid (ING); - Details of any services and structures on the site, especially those in close proximity to the Works including offset measurement to the water supply system; - Dwelling and building numbers; - Construction details of pump station as well as mechanical, electrical and instrumentation equipment details; Details of services and structures on the site, existing and proposed, especially those in close proximity to the Works including offsets measurements to the Works. Necessary updates of the As-Constructed record drawings shall be provided on completion of the Development Works along with the Final Documents and prior to occupation of the premises. Where Works are being carried out in a phased manner, an agreed method of submitting the "as built" records shall be agreed with Irish Water. As a minimum, updated drawings shall be submitted to Irish Water every 6 months or when new elements of a Works have been made live.	3	3	9	Medium	All connections of the new mains to the Irish Water Network will be made by Irish Water personnel or its agents. The final connection of the main shall only be allowed following: • A satisfactory pressure test; • Satisfactory disinfection of the water main; • Satisfactory bacteriological analysis results; • Provision of as-constructed drawings and records; • Installation of marker posts, plates, etc.; • Confirmation that the installation is completed in accordance with all design documentation etc. • IW Field Engineers will inspect all documentation & installed water supply infrastructure & if adequate, will make a recommendation for issue of a Conformance Certificate. Final connection to the water distribution system shall be carried out within 14 days of a successful bacteriological analysis being achieved. Further testing will be required if this period is exceeded.	2	2	4	**Low**
Remedial Work	Contamination of Water Supplies	Public Construction Personnel	**Section 1.12 Hygiene Requirements During Defects Liability Period & Remedial Work** All pipework components, fittings, equipment and tools used during repair the elements of the Works during the Defects Liability Period shall be clean. All components, equipment and tools shall be disinfected. A solution containing 1% of available chlorine (e.g. 10% chloros or other commercial hypochlorite solution) shall be used. Contact time shall comply with the EPA Disinfection Manual requirements. The equipment shall be rinsed or flushed with Mains water to prevent excessive corrosion. Portable test equipment, which may be used in contact with potable water, shall be kept clean. Any equipment which is in an uncertain condition or which is contaminated shall be cleaned and disinfected before use. A high degree of cleanliness shall be maintained throughout the repair of the Works. If necessary, all parts around the section of pipe or service Main repair shall be treated with solution as above. Spraying equipment shall be used where possible. All new pipe sections, equipment, fittings, etc. shall be chlorinated immediately before installation with a solution, as above. Sufficient welfare arrangements shall be provided at each work location by the Developer's contractor and sub-contractor to ensure sufficient hygiene standards are met by their workforce. The contractor/sub-contractor shall pay particular attention to working in or around areas with high risk sources of contamination. The Contractor shall also pay particular attention when transmittable diseases may be present and implement suitable appropriate additional hygiene standards in such situations. The provisions of Section 1.5 above shall be observed also in relation to hygiene during the advancement of remedial works and in particular Sub-Sections 1.5.6 to Sub-Section 1.5.8 above. Similar hygiene precautions shall be applied during the commissioning of Water Mains described in Section 4.10 below. See also Section 1.5 "Protection of Water Quality" in this document & in particular, that the Developer's contractor/sub-contractor working on potable water supply systems shall have undertaken training of their staff on a recognised drinking water supply hygiene training course. The Local Authorities Services National Training Group (LASNTG), Water Services Training Group offers a training course, leading to a certificate award, on drinking water supply hygiene for water services personnel and contractor staff who work with water services. The Developer's contractor/sub-contractor's staff working on water supply infrastructure must have completed a Water Services Training Group (WSTG) Drinking Water Hygiene Course and will be required to have a copy of this course certificate at all times while on the site installing or repairing the water mains and present it to Irish Water personnel on request.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. Design to be vetted by IW CDS Design Team and installation of infrastructure will be inspected by IW Field Engineers. Final installed infrastructure will be assessed by IW Field Engineers prior to vesting. Remedial work will be inspected by IW Field Engineers following remediation. Appropriate hygiene precautions shall be taken to prevent contamination of the infrastructure being remediated (refer to Section 1.5 of the Code of Practice for Water Infrastructure).	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Maintenance and other works being carried out on the system	Inadequate or non-existent consents / permissions	Operation & Maintenance Personnel Contractors carrying out works in the future	**Section 1.16 - Statutory and Other Consents** The Developer shall obtain all necessary Requisite Consents and other permissions for the proposed Development including the Works.	2	4	8	Medium	Developers are required to have all necessary consents in place and CDS Design Team will carry out a vetting of each submission to ensure compliance.	2	2	4	**Low**
Designing of water supply infrastructure	Non compliance with Fire Authority requirements Cross contamination of the public water supply in the event of the fire fighting storage water being fed into the system.	The Public in the event of insufficient water supply for fire fighting. The Public in the event of cross contamination of the potable supply from the fire storage. Irish Water Assets in the event of cross contamination from the storage supply for fire fighting. Operation & Maintenance Personnel	**Section 1.17 Fire Authority Liaison** The Local Fire Authority shall be consulted by the Developer on all details of Self-Lay Works to ensure compliance with their requirements. The Developer or his/her designer shall be responsible for all liaisons with the Fire Authority and agreeing all arrangements for the provision of fire flow for fire fighting purposes. Irish Water shall be made aware of and provided with relevant documentation arising from such consultation / liaison. Irish Water may carry out a modelling assessment (if an appropriate calibrated model is available) of the existing Network and based on the known demands at the time advise the Developer of the theoretical flow and pressures at the proposed connection point in the Network. Alternatively, an in-situ flow & pressure test may be carried out at the expense of the Developer by an approved person / organisation in conjunction with Irish Water to identify the actual flow & pressure available in the network at a particular point in time. It should be borne in mind that the theoretical results from the modelling and the actual results from the in-situ tests cannot be guaranteed by Irish Water. Where a Developer requests increased fire flow capacity in the water supply network to meet fire flow requirements, Irish Water will review the existing network and may offer to carry out network upgrades, at the expense of the Developer. In such instances, Irish Water can not guarantee that the flow rates and residual pressures will meet the requirements of the Fire Authority. Irish Water shall be contacted if the Fire Authority requires measure that affects the design of the Network, e.g. a requirement to have more than one connection serving a development. Irish Water can not guarantee that its Network in any location will have the capacity to deliver a particular flow rate and associated residual pressure to meet the requirements of the relevant Fire Authority. Where the existing Network does not have capacity to provide the Fire Authority fire flow requirements and / or if no Network infrastructural improvements are planned by Irish Water, the Developer shall provide adequate fire storage capacity or an alternative source within the Development to satisfy the Fire Authority's fire flow requirements. This fire water storage infrastructure shall be provided with facilities to ensure that no cross contamination is possible of the potable water within Works. This necessary works to prevent cross contamination shall be provided to the agreement of Irish Water. Fire flow provision shall have regard to Irish Water policies for private side revenue metering. Where separate fire mains are provided off of Irish Water's Network, a dedicated bulk flow meter, with a make and model specified by Irish Water, and associated telemetry system shall be provided at the Developer's cost. The connection arrangement shall be provided with a non-return valve to prevent backflow into the Water Network system.	3	3	9	Medium	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Design will be vetted by IW CDS Design Team and installation of infrastructure will be inspected by IW Field Engineers. Final installed infrastructure will be assessed by IW Field Engineers prior to vesting.	2	2	4	**Low**
Design & Construction	Failure to appoint competent bodies to undertake design & construction activities.	Construction Personnel Public Operation & Maintenance Personnel	**Section 2.2 General Design Requirements** The design shall incorporate a design risk assessment to ensure that risks to both the local community and operators of the Works are minimised. The provisions of the Safety, Health and Welfare at Work Act 2005 and associated Safety, Health and Welfare at Work (Construction) Regulations shall apply in respect of the appointment of a competent designer, Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS). The Developer or his/her designer shall certify that the design complies with the Code of Practice and Standard Details and accepts liability for compliance through their professional indemnity insurance, which shall be kept in place for a period of 6 years after the issue of the Completion Certificate. The Developer shall ensure that this professional indemnity insurance is retained and that evidence of this is available if requested by Irish Water in accordance with the requirements of the Connection Agreement. The design responsibilities and liabilities shall not be discharged by Irish Water after the design passes a satisfactory inspection and issue of a Statement of Design Acceptance, if a design submission is provided in advance of a Connection Application, or by a de-facto Statement of Design Acceptance via the Connection Agreement, if the design submission is provided as part of the Connection Application.	3	4	12	High	It is the responsibility of the Developer/Client to ensure that competent bodies are appointed as PSDP and PSCS outlined in legislation. IW CDS Design Team will vet the submitted design and may require its amendment if deemed inadequate.	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
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Design & Construction	Inadequate design.	Construction Personnel IW Operation & Maintenance Personnel Public Contractors carrying out works in the future.	**Section 2.4 - Drawings, Calculations and Design Information** Drawings and calculations shall be supplied for the Works, including elements that are not to be vested in charge by Irish Water, i.e. Pipes that are not within the Attendant Grounds of the Development. Layout plans shall be prepared with standard legends and symbols as required by Irish Water's Drawing Standard and at least with water services industry norms. The drawings submitted by the Developer should show the precise layout as dictated by the local topography and all necessary detailed information required for guidance. The drawings should show the site boundary, existing utility apparatus, North point, Ordnance Grid reference for the centre of the site, Ordnance Grid reference for the proposed Connection Point(s), etc. Location and layout plans, longitudinal sections and details should show the water supply system and Development in full. Plan scales are required to be shown at either 1:200, 1:250, 1:500, 1:1000 or 1:2500 as appropriate, for A1 sheet size. Drawings should be prepared in a digital format using "CAD (dwg/dxf)" file format and submitted in PDF. Details to larger scales should be provided where necessary. The drawings submitted should also show the following: • The location of the Development on an Ordnance Survey Map with the site outlined in red; • Layout of roads and properties including plot numbers, phasing of Development (if relevant) to include the overall development plan layout intended to be constructed and delivered in phases indicating phase lines and control breaks; • Line and layouts of Water Mains, hydrants, valve Chambers, meter boxes, scour Main systems, air valves, details of all associated features and external property details; • Detailed information on the proposed Water Mains including Main size, pipe material, class of pipe, pressure rating, etc., including details of existing services in the case of infill or brownfield sites; • Locations of service pipes, showing size of service pipe if above 25mm diameter. Locations of Boundary Boxes, manifold boxes and meter Chambers; • Details of type of Service Connections and meter arrangements for apartment and multi occupancy units to allow water supply metering of individual properties; • Any fire flow storage capacity arising from Fire Authority requirements as well as associated fire network and accessories; • Clear demarcation showing the water infrastructure to be installed by the Developer as opposed to that to be constructed by Irish Water; • Details of over ground and underground structures within the Attendant Grounds and especially those that are to be vested in Irish Water, including appropriate vehicular access to these structures. • Contours of existing ground levels, proposed Development ground levels and property floor levels relative to Ordnance Datum (Malin Head); • Longitudinal sections, to an exaggerated vertical scale, showing proposed levels, existing ground levels, existing or proposed buried services crossing the pipes, invert levels, pipe sizes, bedding, haunch and surround details, thrust blocks associated with the Water Mains, backfill details, together with Chamber locations, chainages, gradients, pipe sizes, pipe materials, etc. All Chambers should be given unique sequential numbers/letters for identification; • Locations of all natural features, such as trees, streams, rivers, springs, etc., which are in the vicinity of the proposed Works; • Location of manmade features, such as existing structures, buildings, roads, bridges, made ground, engineered ground or fill zones, etc., which are in close proximity to the proposed water network system; • An integrated utility layout plan showing the layout of all utility infrastructure (ESB Networks, Gas Networks Ireland's Networks, telecommunication provider ducting, etc.) and indicating the relative separation distances between the various utility infrastructure, which shall be in accordance with Irish water's separation distance requirements; • Layout taking into account possible future developments; • Location of Ordnance Survey (OS) Benchmarks and their value to Malin Head Datum; • Information and details of water management infrastructure within the Development as required under Section 3.29 of the Code of Practice for Water Infrastructure. The design should be clear and unambiguous outlining the water demand requirements based on the type and number of units served, occupancy rate of the units, per-capita demand, etc. The design should outline the average day peak week demand, peak flow factor, headroom allowance, etc. The Works should be modelled and designed using an approved software package where required which provides a network model, pipe flow, pressures, etc. in it's output. The design shall be deemed to cover all associated and ancillary works such as pipe supports, beds, surround, backfill, surface restoration, access arrangements, etc. See also Section 1.7 in this document "Application for a Conformance Certificate".	3	4	12	High	IW CDS Team will vet the submitted design and may require its amendment if deemed inadequate. Developer/ Controller/Designers to ensure adequate designs are carried out and provided to IW for review. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will inspect Final Documents (including as-constructed drawings) & will assess them for adequacy as outlined in Section 1.7 of the Code of Practice for Water Infrastructure. All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP.	2	2	4	**Low**
Operation	Reliability of water supply system	Public IW Operation & Maintenance Personnel Construction Personnel Contractors carrying out works in the future.	**Section 3.2 - Reliability and Design Objectives** The Works shall be designed and constructed to reliably convey the water flows that are required of the Development including fire flow requirements by the Fire Authority. The size of the Water Mains within new Developments is to be governed by: • The requirement that they have adequate hydraulic capacity to deliver Development's demands at all times; • They reserve the wholesome water quality; • They avoid excessive retention or travel times • They ensure adequate turnover of water and prevent stagnation in the system. The Water Main layout shall provide efficient and flexible operation of the Works with minimum control points and surface assets to mitigate future maintenance and operation costs. Pipes shall be free from defects or other features that might give rise to blockage, airlocks or otherwise impede the water flow. The range of flow velocity within the water supply Mains shall lie between 0.3 m/sec and 1.5m/sec, and preferably in the middle of this range. The pipework should be selected to ensure that the head loss in the pipework does not exceed 3m/km.	3	3	9	Medium	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design c-ordination required by a competent PSDP. IW CDS Design Team will vet the submitted design and may require its amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW Field Engineers will vet the final installed infrastructure and examine the Final Documents prior to vesting.	2	2	4	**Low**
Location of pipes	Water supply infrastructure not installed with adequate regard for location, ease of access, operation and maintenance	Operation & Maintenance Personnel Public Construction Personnel	**Section 3.5 Layout of Works** The following general requirements apply to the locations of Water Mains in new Developments that are covered by this Code of Practice: • Water Mains shall preferably be laid under footpaths or grass margins if possible, otherwise they may be laid on the roadway, subject to locating them a safe distance away from the footpath / grass margin kerb with any hydrants and air valves located on footpaths or other vehicular free areas; • No new Water Main up to and including 150mm in diameter shall be laid within 3m of an existing or proposed building structure without the express approval of Irish Water; • No new Water Main between 200mm and 600mm in diameter shall be laid within 5m of an existing or proposed building structure without the express approval of Irish Water; • No new Water Main in excess of 600mm in diameter shall be laid within 8m of an existing or proposed building structure without the express approval of Irish Water; • In addition to the foregoing, no new Water Main up to and including 150mm in diameter shall be located within 1m of the boundaries of premises; • Water Mains shall not be located under walls, in areas designated for trees, shrubs or flowers. Trees should not be planted in the immediate vicinity of the Water Main unless tree root intrusion protection is provided. The separation distances between the Water Main and the trees / shrubs will be dependent on the species type and on the level of tree root intrusion protection that is provided. • Water Mains shall be laid in common areas and not through individual private gardens.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Design will be vetted by IW CDS Design Team and installation of infrastructure will be inspected by IW Field Engineers. Final installed infrastructure will be assessed by IW Field Engineers prior to vesting. Construction operations to be co-ordinated by a competent PSCS.	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Flushing of system	Water quality issue arising from inability to flush effectively	Public IW Operation & Maintenance Personnel	**Section 3.5 Layout of Works** a) Water main layouts shall be arranged in loops or rings so as to avoid "dead ends" or terminal points. All mains shall terminate in a loop or ring to accommodate one-directional flushing of the network. The loop pipe size shall match the size of the spur Main to which it is connected. Loops shall have a minimum of four connected houses and one hydrant. b) Water mains should be laid to provide the optimum circulation in the local water network. Water mains may terminate in a dead end only with Irish Water approval, in which case a duck-foot washout hydrant, located within a Chamber or kiosk, shall be provided at the dead end. c) Valves shall be arranged at junctions and spine Water Mains in such a manner so as to ensure that a water shut-down will affect no more than 40 properties at any one time. d) Water mains greater than 300mm in diameter laid under heavily trafficked roads shall be ductile iron. e) Looped water mains shall return to the spur Main downstream of a sluice valve to allow for one directional flushing.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. Design will be vetted by IW CDS Design Team and installation of infrastructure will be inspected by IW Field Engineers. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Location of fire hydra	Inability to use hydrant in an emergency scenario.	Public Fire Department Personnel	**Section 3.5 Layout of Works** a) The location of hydrants should be such that they can be accessed in an emergency. Hydrants should not be located in roads or parking areas. Off-line hydrants shall have dead end pipe lengths of 3.0m or less; b) Where possible, a hydrant should be located within 20m of each junction. c) No domestic property within a Development shall be more than 46m from a hydrant. Hydrant details and locations shall be subject to the approval of the relevant Fire Authority. This requirement should not take account of dead-end or wash-out hydrants which are used for operational flushing. A hydrant shall not be closer than 6m to a property. d) The location of branch valves, hydrants or other apparatus shall be to the agreement of Irish Water.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. Design will be vetted by IW CDS Design Team and installation of infrastructure will be inspected by IW Field Engineers. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Watermain location	Inability to carry out repairs due to access	Operation & Maintenance Personnel Public Construction Personnel Other Utility Providers	**Section 3.5 Layout of Works** a) Where a water main is located in an area of restricted access such as under motorways, canals, railways, rivers etc., a duplicate Water Main (or a sleeve with a replacement Main) shall be installed to maintain water supply in the event of a problem with the live Main until access is available to carry out repairs. The second Main shall be the same as the first Main in regards to material, diameter and flow capacity. Isolation valves shall be provided on both sides of the inaccessible area to allow the water supply to be redirected between the live main and the duplicate Main. b) Where a Water Main is to be located within a structure such as a bridge or culvert, the Developer shall consult with Irish Water to establish if the Water Main is be duplicated. In most instances Irish Water may require that the Mains are placed within sleeves to facilitate easy replacement of the pipe. In general, however, Irish Water discourages the construction of Water Mains within bridge or culvert structures and the installation of the Mains across the watercourse adjacent to the bridge/culvert structure is preferred; c) Surface water attenuation tanks shall not be constructed over Water Mains. d) Water Mains shall be laid in common areas and not through individual private gardens or driveways etc. e)Water Main bends and road crossings should be kept to an absolute minimum.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. Design will be vetted by IW CDS Design Team and installation of infrastructure will be inspected by IW Field Engineers. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Pressure control during operation	Excessive pressure	Public Operation & Maintenance Personnel Construction Personnel Other Utility Providers	**Section 3.5 Layout of Works** Pressure control shall be provided at the take-off point of the new connection if required to control high pressures by way of a pressure reducing valve (PRV). Where possible their need shall be determined in advance, but in some cases Irish Water may require these to be installed after the Main is made live. The cost of this work shall be borne by the Developer. The need for PRVs shall be agreed with Irish Water. Pressure sustaining valves (PSV) may be required in specific exceptional circumstances and only by agreement with Irish Water. The PRVs and PSVs will be chosen and supplied by Irish Water for installation in Developer supplied Chambers.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. Design will be vetted by IW CDS Design Team and installation of infrastructure will be inspected by IW Field Engineers. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Control of flow	Repairs causing a large number of houses to be without water	Public Operation & Maintenance Personnel	**Section 3.5 Layout of Works** Branch pipes off spine Mains should have isolation valves installed to separately control all of the flows downstream of the pipe junction. Three valves to a junction are required to allow the flow of water to be directed in both directions. The need for additional 'in-line' valves is dependent on the housing density and operational requirements such as step testing relating to active leakage control. Sluice valves should be situated to ensure that water flow can be shut off affecting no more than 40 properties at any one time.	3	3	9	Medium	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. Design will be vetted by IW CDS Design Team and installation of infrastructure will be inspected by IW Field Engineers. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Cleaning / Flushing	Inability to effectively clean out main resulting in water quality issues	Public Operational & Maintenance Personnel	**Section 3.5 Layout of Works** Water Mains should be laid to provide the optimum circulation in the local water network. Water Mains may terminate in a dead end only with prior Irish Water approval, in which case a duck-foot washout hydrant, located within a Chamber or kiosk, shall be provided at the dead end. Mains should extend no more than 1.2m beyond the final Service Connection to mitigate dead-end Mains, unless this is absolutely necessary to locate an end hydrant in a suitable location. Valves and washout hydrants should be located, as far as is practicable, in footpaths or verges to facilitate access, for safety reasons and to guard against the impact of traffic, surface water and silting of Chambers. The location of fire hydrants should be such that they are accessible in an emergency. Fire hydrants should only be located on paths or open spaces or approved areas. Where a Water Main is located in a road, the hydrant should be legged off-line in to the nearest suitable path or open space and connected to the Water Main with an 80mm spur Main. In some Local authority areas, such legged off hydrants may require the inclusion of a separate valve on the tee piece of the Main where the Main is 200mm or greater in diameter. The provision of such valves shall only be incorporated subject to the approval and knowledge of the Fire Authority.	3	3	9	Medium	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. Design will be vetted by IW CDS Design Team and installation of infrastructure will be inspected by IW Field Engineers. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. On completion of construction and before any disinfection, internal surfaces shall be cleansed thoroughly by swabbing. Foam swabs shall be used and recovered following swabbing. The swabs should be used only once. On completion of the pressure test, a foam swab shall be passed through the main for final cleansing a sufficient number of times to achieve clear wash water. All pipelines shall be disinfected with water having a minimum concentration of 20mg/l of free available chlorine. This can be achieved using a sodium hypochlorite solution. Typical products on the market contain 10 – 14% available chlorine by solution and the dose rate is dependent on the strength of the solution and the volume of water required in the water main.	2	3	6	**Medium**
Separation Distances	Inability to maintain Assets Interference with other utility services	Operation & Maintenance Personnel Public Construction Personnel	**Section 3.6 Separation Distances** A storm water sewer or a wastewater sewer should generally not be installed to cross over a Water Main. Where crossing over a water main is unavoidable, joints in the Water Main shall not be located directly below surface water or Wastewater Sewer crossings. This requirement also applies to power and telecommunication utilities oil filled cable systems. No other utility service should be laid longitudinally directly above the line of the Water Main. Pipe/ducts, cabinets, poles, junction boxes or Chambers shall not be constructed on top of a Water Main. Any proposed pipe crossing of the Water Main shall do so at right angles, or as near to as possible, to avoid prolonged envelopes of influence between the services. Crossings should be located midway between the Water Main joints with a minimum vertical clear distance of at least 300mm and up to 500mm in some instances between the pipe and the Water Main. All such crossings shall be to Irish Water approval and shall not be undertaken until Irish Water or its agents has examined the work at the crossing point and deemed it fit for backfilling. There should be a minimum clear horizontal distance of at least 300mm between the Water Main and other utilities running parallel to it, as well as to cabinets, poles, junction boxes or Chambers. The following minimum horizontal clearances to other services running parallel to the Water Main shall apply: • 300mm to Water Mains of less than 300mm diameter, • 500mm to trunk Mains between 300mm and 450mm diameter, • 3.0m to arterial Water Mains of greater than 450mm diameter. There shall be a minimum vertical distance of 300mm between the Water Main and other utilities laid parallel to it, subject to the specific spatial distance requirement of the utility provider. There shall be a minimum vertical clearance between the Water Main and any other service crossing over it as follows: • 300mm to Water Mains of less than 300mm diameter, • 500mm to trunk/arterial Water Mains of diameter greater than 300mm. Over and above the foregoing, all crossings shall be positioned such that they are at least 500mm away from any Water Main fitting or joint. The location of the water Mains relative to other services, structures and obstructions for a particular Development shall be shown on plan and cross section as part of the design submission pack, with clearance dimensions clearly identified. Drawings showing any revisions, during the tendering and construction phase of the Development should be submitted to Irish Water for approval. No infrastructure installation shall be advanced without the prior written clearance of Irish Water. The separation distances outlined above are minimum requirements. Specific separation clearance distances in excess of these minima shall be provided for services such as gas, electricity, fibre-optic or oil filled cables as the case may be. The particular utility providers shall be consulted to determine these minimum separation distances and evidence of this consultation, with the specified separation distances, shall be provided to Irish Water at design submission stage. For example, the minimum separation distances for Gas Networks Ireland infrastructure shall be in accordance with IS329 'Gas Distribution Mains' and IS328 'Code of Practice for Gas Transmission Mains' as amended/updated. In the case of installations to be constructed in close proximity to existing Water Mains, specific approval of Irish Water shall be obtained. In the case of existing network pipework, alternative minimum horizontal distances shall be maintained between pipes / ducts, cabinets, poles, manholes, junction boxes, chambers, etc., as outlined in Section 3.25 of the Code of Practice for Water Infrastructure.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. Design will be vetted by IW CDS Design Team and installation of infrastructure will be inspected by IW Field Engineers. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. It is the responsibility of the Developer and/or designer to obtain all current information on the location of other existing utility or service providers' apparatus prior to the design being carried out. During installation, due diligence should be used when making excavations for water mains and services and care shall be taken to protect and support all existing services (water, gas, telecommunications, drainage, electricity, etc.) and other works so as not to interfere with the working arrangements and integrity of such utilities.	2	3	6	**Medium**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Design, Construction, Operation	Insufficient water supply capacity	Operation & Maintenance Personnel Public	**Section 3.7 Sizing of Watermains** The size of Water Mains in a new Development will be primarily contingent on the pressure availability on the existing water supply network and on Irish Water's view on the desired long term pressure for the network in the vicinity of the Development. The minimum size of Water Main shall normally be 100mm nominal internal diameter but pipes with a nominal internal diameter of 80mm may be allowed in certain circumstances and only after the prior written permission of Irish Water has been obtained. Water Mains of smaller internal diameter may be allowed in exceptional circumstances where a small number of dwellings are to be supplied. In these instances, a 25mm minimum pipe size may be allowed where a single house supply is required, subject to the length of the service pipe not exceeding 15m. If two dwellings are supplied, the Main size should be 32mm internal diameter may be allowed, again subject to a length of 15m. Reference is to be made to Section 3.5.17 of the Code of Practice for Water Infrastructure for the maximum allowable pipe length for pipe diameters of 32mm and less. A pipe of minimum 50mm internal diameter may be allowed for a supply to house groups of between three and five houses. However, as a guide to the sizing of Water Mains for a given number of properties, the pipe sizes in the Table in Section 3.7 of the Code of Practice for Water Infrastructure should be used. The sizes shown in the Table in Section 3.7 of the Code of Practice are for guidance only and should not be substituted for conducting an adequate hydraulic assessment taking into account all relevant factors, such as domestic demand (including consumption demand, household occupancy, house type, peak demand), fire flow demand, special fittings (such as sprinkler systems), pipe length, friction factors, flow velocity constraints, head-losses, ensuring adequate pressure in the network, etc. Guidance for water pipe sizing for domestic developments is outlined in Section 3.7 of the Code of Practice for Water Infrastructure. Demands for business Developments should be established based on the specific requirements of such properties. This demand will determine the pipe size required. In these instances the peaking factor will not be as high as that used for domestic supplies and will generally be based on the maximum flow requirement from the Development. Supporting Information relating to the peaking factors used that are in variance to the water demand figures in Section 3.7 of the Code of Practice for Water Infrastructure should be submitted to Irish Water for approval prior to internal pipe layout design.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	3	6	**Medium**
Pressure boosting of Water Supplies	Insufficient Pressure Backflow causing contamination High draw-off from Irish Water Asset causing reduced pressure in the network	The Public	**Section 3.13 Boosted Water Supplies** Irish Water may, at its discretion, adjust the pressure in its Network as it sees fit for operational reasons, but with the objective of maintaining an adequate pressure head at the Curtilage of properties. Developments which involve buildings greater than two storeys in height and/or requiring a supply pressure in excess of 15m head at the Curtilage of the property should be made known to Irish Water. The Local Authority for the area where the Development is being undertaken, acting as the Building Control Authority, will have specific requirement for the building's proposed internal pressure boosting arrangements and these requirements shall apply. For any proposed internal or private pressure boosting arrangements, details of the proposed boosting arrangements shall be made known to Irish Water at Design Submission and Connection Application stage for review. The typical Building Control Authority's requirements would generally comprise the following: • Buildings in these Developments should be equipped with balancing tanks and booster pumps on the rising Main to the top storey units to ensure adequate pressure to the premises. • Indirect pressure boosting will only be permitted as this may impact the service provision within the Irish Water supply network for other users, i.e., pumping from a break pressure cistern, supplied from Irish Water's Network. • In line boosting may be acceptable where the required demand does not exceed 10 litres per minute, but this will only be allowed with the written approval of Irish Water. • All booster pumps with a capacity in excess of 10 litres per minute shall be fed from a break tank / cistern. The effective capacity of the break pressure tank / cistern to be decided after consideration of the total water storage requirements and its location within the building, but should not be less than 30 minute pump-out capacity. • Separate break pressure tank compartments may be required for multi-block units and for maintaining supply during cleaning and servicing. The Developer shall be responsible for the maintenance of the break tank/cistern. In this regard, in addition to providing isolation devices and anti-backflow fittings, as described below, a suitable maintenance schedule must be put in place to avoid any contamination, misuse, etc. of the equipment. It is the responsibility of the designer to establish the requirement of the building's water supply system. It is also the role of the designer to ensure that the boosting proposal is sufficient to meet the requirements of the Development, the requirements of the Building Control Authority and subject to requirements that Irish Water may wish to impose in order to protect it,s Network. The designer shall supply the building owner and /or the management company with full details of the booster system and break tank installation. These details shall form part of a maintenance schedule for the system including cleaning of the break cistern, which will be to the requirements of the Building Control Authority. The Developer will retain responsibility for the private side Distribution Systems within premises, including the break pressure tank and booster equipment. Irish Water will not take charge of or be responsible for these Distribution System works. Water quality within the system must be maintained and Irish Water will not be responsible for inadequate water quality arising from private side Distribution Systems. Likewise, an acceptable isolation device shall be provided using a connection via an unrestricted air-gap device (AA Type device, IS EN 1717) to prevent backflow from the internal water Distribution System to Irish Water's Network to prevent the risk of backflow contamination. Before installing booster pump(s) full details of the proposed installation shall be provided to Irish Water and the relevant Local Authority. The effective capacity of the break cistern shall be decided after due consideration of the total water storage requirements and its location within the building, subject to it being not less than 30 minutes pump output as outlined above, unless otherwise approved by Irish Water. The break tank / cistern should be a closed vessel having a tightly fitting access cover, bolted or screwed in position. It shall be suitably maintained, inspected regularly and cleaned when necessary. It shall be coated to preserve the wholesome quality of the water. It shall have an air inlet and overflow pipe or pipes, all suitably screened to prevent vermin access. It shall, where necessary, be insulated against temperature changes and be supplied exclusively from a service pipe with a ball valve. A sampling tap shall be provided on the inlet pipe feed to the break tank / cistern for the use of Irish Water for quality sampling purposes.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. IW New Connections Team will vet the submitted design and may require its amendment if deemed inadequate. It is the responsibility of the designer to establish the requirement of the building's water supply system. It is also the role of the designer to ensure that the boosting proposal is sufficient to meet the requirements of the development, subject to requirements that Irish Water may impose to protect the public water supply. The designer shall supply the building owner and /or the management company with full details of the booster system and break tank installation. These details shall form part of a maintenance schedule for the system including cleaning of the break cistern, which will be to the requirements of the Building Control Authority.	2	3	6	**Medium**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Provision of Service Connection	Inability to safely maintain service connections Insufficient water pressure resulting in poor service standard. Water quality	Public Operation & Maintenance Personnel Other Utility Providers	**Section 3.8 Service Connections to Individual Premises - Sizing and General Requirements** The size of Service Connection to an individual premise is governed by the requirement that there should be adequate supply to meet Developer demand at all times whilst ensuring that water quality is not compromised through the use of oversized pipes. Service Connection pipes should be a minimum of 25mm outside diameter, 20mm inside diameter, and should be provided with appropriately sized fittings. However, service pipes of greater diameter may be required in certain circumstances where a higher than standard demand is required. Irish Water's approval of the diameter of the service pipe shall be obtained in advance of the commencement of the proposed Development. The distribution system within premises, along with the internal water supply pipework, including the overflow pipe from the building's storage tank, shall be suitably sized to accommodate a flow from a 20mm inside diameter service connection. Irish Water requires that every separately occupied premise has an individual Service Connection pipe supply. The use of common service pipes will not be allowed. Neither will Irish Water allow cross connection of supplies, e.g. supply from one service connection providing water supply to another property. Each Service Connection shall be fitted with a Boundary Box, located at the public side of the property curtilage, as close as possible to the property boundary, but separated by at least 225mm from the face of the boundary. The Boundary Box shall be in accordance with Irish Water Guidelines and Specification for Boundary Boxes (See Appendix A) Irish Water will supply the meter and install it within this Boundary Box. The Service Connection between the Boundary Box and the Water Main shall be laid in a public area or an area to be taken in charge. Service Connection pipes should be laid in a straight line from the connection point to the Boundary Box meter location. The service pipe shall be laid without mechanical joints between the Water Main Service Connection tapping point and the Boundary Box. The Distribution System pipe from the Boundary Box to the stop valve within the premises shall also be a continuous pipe length without mechanical connections. Where possible, Service Connections should be installed to enter the right hand side of the premises entrance when viewed looking towards the front elevation of the property, provided that this does not result in the meter box being exposed to repeated traffic movements. Following vesting of the Works, Irish Water will be responsible for the Service Connection between the connection / tapping at the Irish Water Network as far as a point 225mm from the boundary of the Curtilage of the premises, including the boundary meter box. The property owner is responsible for the Distribution System pipe beyond this point and in his/her private property and for all internal plumbing. All business premises shall be provided with an adequately sized Service Connection based on the demand requirements. All commercial premises will be supplied with water via a non-domestic meter. In the case of non-domestic or mixed-use premises (domestic use and non-domestic use), Irish Water is responsible for the Service Connection to within 225mm of the Curtilage boundary of the property. The property owner is responsible for the Distribution System connection beyond this point and for all internal plumbing. Early guidance should be sought from Irish Water for metering requirements for Service Connections to flats or multiple premises. Water meters should be installed in these premises in accordance with Irish Water's policy on metering. Each Service Connection pipe should be installed generally perpendicular to the Main. The service pipe at the take-off point should be installed with a loose slack pipe so that relative movement between the Water Main and the Service Connection pipe can be accommodated. Where practicable, the Service Connection and / or Distribution System pipe should avoid running beneath drives and parking areas where leakage and spillage of fuels and solvents may contaminate the ground, resulting in permeation of the buried pipe, risk to damage of the pipe or taste and odour impact on the water supplied. Where the installation of pipes beneath drives or parking areas cannot be avoided, suitable pipe material should be used to avoid contamination of the water supplied. Service Connection pipes and Chambers should not be laid across third party land, i.e. land not in the ownership of the premises being supplied or a street /road. Only in exceptional cases will Irish Water allow the installation of a Service Connection pipe between the Water Main and the meter box in property other than that which will become public property and taken in charge by the Local Authority. In these circumstances, the Developer shall provide an Easement for the Service Connection pipe with Irish Water named as the assignee. Adequate provision shall be made in the easement documentation to ensure that Irish Water is afforded perpetual rights to enter the strip in order to maintain their infrastructure. Service Connections shall not be taken across roads, except with the prior agreement of Irish Water. In certain circumstances, a rider Main, as outlined in Section 3.5.18 of the Code of Practice for Water Infrastructure, located entirely on public property, may be provided to serve small numbers of houses at the street-side remote from the Water Main. This rider Main shall be looped back to the Water Main. Individual house Service Connections shall be provided off the rider Main. Where a number of adjacent services would be required to cross an existing road, the number of crossings may be minimised by the use of a rider Main, as described above, installed at the side closest to the properties, connected to and looped back into the water supply Main. In some instances, joint service pipe(s) and a meter manifold could be used to minimise the number of Service Connections. This arrangement shall be suitably sized for the number of houses served. Alternatively, a number of service pipes may be installed in a duct to minimise the number of crossings. Service pipes within this duct should be laid as a continuous, un-jointed pipe. In these instances, the service duct should be a blue thermoplastic pipe, laid with slow bends to facilitate installation and/or removal of the service pipes. Where two Service Connection pipes share a common trench, the pipes should be laid no more than 1.0m apart where they cross the street/road. Service pipes should be individually ducted through structures where they enter a property so that they do not rest on or are compressed by the brickwork/block work structure.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require its amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Design, Construction, Operation	Damage to services due to insufficient cover	Operation & Maintenance Personnel Public Construction Personnel	**Section 3.11 Depth of Cover** The desirable minimum depth of cover from the finished ground level to the external crown of a single premise Service Connection pipe shall be 750mm with an absolute minimum of 600mm for short distances (subject to Irish Water agreement). The desirable depth of cover at the Boundary Box should be 600mm +\- 25mm, with a maximum depth of 750mm. The minimum depth of cover from the finished ground level to the external crown of a Water Main shall be 900mm where the pipe is to be located in housing estate roads or on road verges. A greater depth of cover and/or greater strength pipe and/or a higher class of bedding may be required where higher traffic loading is anticipated. Depths may be altered to avoid obstructions, including separation distances between other utility services. The desirable cover for a water main should be 1200mm where practicable and should not exceed 3.0m. The desirable maximum cover for a service connection pipe should be 1200mm, where practicable. The primary approach should be to provide the pipe with the required depth of cover as outlined above. However, if this cannot be achieved due to unavoidable technical reasons, resulting in the depth of cover to the crown of the pipe being less than the values set out above, pipe protection measures shall be provided. Consultation with Irish Water is required in relation to the provision of these measures. In order of precedence, the protection measures, as described in Section 4.8, may be employed, the provision of a reinforced concrete slab designed to spread the imposed traffic load away from the pipe, slab to be a minimum of 150mm thickness and constructed of C20/25 to IS EN 206, or the use of a ductile iron pipe in lieu of the original pipe material for the distance where the depth is below the limits outlined above. A combination or a mix of these additional protection measures may be required and are to be agreed with Irish Water. Any proposals for the reduction in cover to the Pipe shall be accompanied by design calculations to address loading and frost risk as well as any other relevant design issues.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated bya competent PSCS. IW CDS Design Team will vet the submitted design and may require its amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Pipe Selection Design	Pipe of insufficient size to transfer volume demand/pressure of water. Pipe unidentifiable Unsuitable pipe material for use with potable water.	Operation & Maintenance Personnel Public Construction Personnel	**Section 3.9 Materials Selection: Mains and Service Connections** Water Mains suitable for Works and approved by Irish Water shall be either ductile iron (DI) or polyethylene (PE), with PE80 or PE100 rating (MDPE, HDPE or HPPE). All plastic water pipes shall be blue in colour. U-PVC pipes shall not be used on water supply networks, unless a compelling reason is provided for its use. For ease of maintenance, the preferred Water Main materials are indicated below. **Pipe Size (ID) mm** — **Pipe Material** 25 to 80 — HDPE and MDPE (PE-80) 100 to 150 — HDPE, MDPE (PE 80) and DI 200 to 300 — HPPE (PE 100), HDPE, MDPE (PE 80) and DI 350 to 600 — HPPE (PE 100) and DI >600 — DI By exception other materials may be considered but these will require specific Irish Water agreement and written approval. Such materials would include MoPVC and CPE/PVC alloys. The risk of impact of contaminated ground on pipe materials should be a determining factor in the choice of the pipe material selection. • Ductile Iron (DI) pipes shall conform to IS EN 545 and shall have a minimum C40 pressure rating. Ductile Iron fittings shall have 16 bar rating at least. All ductile iron pipework shall be coated internally with a blast furnace cement lining which complies with the requirements of BS 6920. External protection shall include an alloy of zinc and aluminium, with a minimum 15% aluminium, with or without other materials, having a mass of 400 g/m2 complete with a finishing layer of blue fusion bonded epoxy in accordance with IS EN 14901. • MDPE and HDPE pipes shall be of a type PE-80 and have an SDR-11 or SDR-17 rating. They shall conform to IS EN 12201: Part 1 and Part 2 (Plastic Systems for Water Supply, Drainage and Sewerage Under Pressure – Part 1, General, and Part 2, Pipes) and I.S. EN 12201-3 (Plastic Systems for Water Supply, Drainage and Sewerage Under Pressure – Part 3: Fittings). HPPE pipes shall be of a type PE-100 and have an SDR-11 or SDR-17 rating. They shall conform to IS EN 12201: Part 1 and Part 2 (Plastic Systems for Water Supply, Drainage and Sewerage Under Pressure – Part 1, General, and Part 2, Pipes) and I.S. EN 12201-3 (Plastic Systems for Water Supply, Drainage and Sewerage Under Pressure – Part 3: Fittings). Polyethylene pipes shall also conform to the following UK Water Industry Specifications (WIS): • WIS 4-32-08 – Specification for the fusion jointing of polyethylene pressure pipeline systems using PE80 and PE100 materials, • IGN 4-32-18 – The Choice of Pressure Rating for Polyethylene Pipe Systems for Water Supply and Sewerage Systems, 4-32-16 – Specification for Butt Fusion Jointing Machines, • WIS 4-32-19 – Specification for polyethylene pressure pipeline systems with an aluminium barrier layer for potable water supply in contaminated land, • IGN 4-01-03 – Pressure Testing of Pressure Pipes and Fittings for use by Public Water Supplies. In very exceptional circumstances, where specific Irish Water approval is provided to the use of MoPVC pipes, they shall conform to the UK Water Industry Specification No. 4-31-08 and ISO 16422 and manufacturers shall operate a quality system in compliance with BS EN ISO 9001. In very exceptional circumstances, where specific Irish Water approval is provided to the use of CPE/PVC alloy pressure pipes, they shall conform to BS PAS 27. All fittings shall conform to this standard also. Service Connection pipes suitable for Works shall be of MDPE or HDPE (PE80) material with SDR11 or SDR-17 rating. All plastic water Service Connection pipes shall be blue in colour. (HPPE (PE-100) material with SDR-11 and SDR-17 rating may also be used though this pipe is less flexible.) An alternative pipe material, to Irish Water's written approval, shall be provided where pressure in the Works is greater that the performance rating of these materials. The HPPE , HDPE and MDPE service pipes shall comply with IS EN 12201 Part 2 (Plastic Systems for Water Supply, Drainage and Sewerage Under Pressure – Part 2, Pipes) and IS EN 12201 Part 3 (Plastic Systems for Water Supply, Drainage and Sewerage Under Pressure – Part 3: Fittings) and with UK WIS 4-32-08 (Specification for the fusion jointing of polyethylene pressure pipeline systems using PE80 and PE100 materials). The Developer shall determine the Pressure Class of pipe that is required having regard to the pressure at the connection point and the maximum in-service operating pressure. The sizing of service connections to any premises and the approval of fittings for this purpose must be obtained in advance from Irish Water. Jointing of pipes should be carried out in accordance with the requirements of the Standards associated with the pipe material selected.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require its amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. The Developer shall determine the Pressure Class of pipe that is required having regard to the pressure at the connection point and the maximum in-service operating pressure. The sizing of service pipes to any premises and the approval of fittings for this purpose must be obtained in advance from Irish Water. Jointing of pipes should be carried out in accordance with the requirements of the standards associated with the pipe material selected.	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Design, Construction	Leakage due to joint failure Contamination of potable water due to liquid ingress at defective joints	Operation & Maintenance Personnel Public Construction Personnel	**Section 3.10 Pipe Joints** Pipe joints shall be in accordance with the manufacturer's instructions for the pipe material. Pipe joints will generally be one of the following: • Push in rubber ring joint, • Bolted flanged joint, • Flexible mechanical coupling with protective coating, • Fusion welded joints where the site fusion jointing shall be strictly in accordance with UK WIS 4-32-08, 2016 (Specification for Fusion Jointing of Polyethylene Pressure Pipeline Systems Using PE80 and PE100 Materials) and with BS ISO 21307:2017 (Plastic Pipes and Fittings – Butt Fusion Jointing Procedures for Polyethylene (PE) Piping Systems. Equipment used for butt fusion and electrofusion welding shall be in accordance with BS ISO 12176 (Plastic Pipe Fittings – Equipment for Fusion Jointing Polyethylene Pipe Systems – Part 1 Butt Fusion, Part 2 Electro Fusion). • Equipment used for butt fusion and electrofusion welding shall be calibrated on a 6-monthly basis. Bolted flanged joint shall have raised face flanges complete with nuts and bolts to IS EN ISO 898 and metal washers to BS 4320. Nuts, bolts and washers to be protected against corrosion in accordance with WIS 4-52-03. Flange assemblies, including nuts, bolts, washers and gaskets to be designed to meet a working and test pressure of 16 bar and 24 bar respectively. In advance of commencing pipe installation on site, the Developer shall provide a specific method statement to the Irish Water field engineer for review/assessment outlining the butt fusion and electrofusion jointing processes for polyethylene pipes that will be carried out on site.This shall be additional to the requirements for Method Related Statements as set out in Section 2.3.20 above. The Developer shall adopt and follow any and all applicable quality control procedures for all joints on polyethylene pipes for both butt fusion and electrofusion as well as for mechanical jointing systems. In addition, the Developer shall follow the manufacturer's requirements but these shall not take precedence over good site practices. Butt fusion welding and electro fusion jointing of polyethylene pipes shall only be carried out by appropriately trained and experienced operatives in possession of a current relevant Training Certificate. Training should be certified and equivalent to City and Guilds qualifications. Jointing personnel should have a minimum of one year's experience in successfully completing pipe welding under "live" construction conditions. Jointing shall be completed using fully automatic or pre-approved jointing machine / rigs in accordance with the manufacturer's instructions. In relation to electro fusion jointing, the jointing machine shall incorporate a remote inspection / monitoring system, which allows for real time inspection of the weld integrity or a data download facility. The identity of the polyethylene (PE80, PE100) pipeline manufacturer shall be made known to Irish Water prior to commencement of the installation. Certification and testing (including independent third party certification) shall be provided to confirm quality assurance compliance. Each joint shall be clearly marked with the joint logged automatically on the jointing machine, , in a format to the satisfaction of the Irish Water field engineer. A printout of the joint details, with an as-constructed drawing complete with GPS location and geo located photograph of each joint, shall be provided and retained for quality assurance purposes. In addition to the data log report, the welders own record / ledger must also be maintained and provided as part of the quality assurance documentation. All fusion welds shall be undertaken in an enclosure (e.g. tent) to minimise the effects of wind and rain on the jointing process and to prevent contamination from wind borne dust. All personnel carrying out pipe jointing shall have appropriate training in health and safety and shall follow all safety procedures laid down for welding. Prior to the commencement of polyethylene pipe laying works, pipe joint sample testing shall be carried out for all pipe sizes to be used in the Works. One initial sample test butt-fusion weld per designated butt-fusion crew and one initial sample test electro-fusion weld per designated electro-fusion crew shall be cut and taken for testing. These shall be taken for each pipe size per designated crew on pipes that are to form part of the Works. Auditing and testing of welded joints in polyethylene pipelines shall be carried out as outlined in Section 3.10 of the Code of Practice for Water Infrastructure. All tests shall be carried out at the expense of the Developer and this shall include for all costs associated with the taking of, testing, analysis of and transportation of samples as well as the required reporting of the test results. All costs associated with auditing shall also be at the expense of the Developer. The Contractor shall arrange for the selected installed joint samples to be tested in accordance with WIS 4-32-08, IS EN 12201 – Part 5, and with ISO 13953, ISO 13954, ISO 13955 and ISO 13956 (as appropriate and listed above) by an accredited laboratory (accreditation by the Irish National Accreditation Board or equivalent) and a test report, in a format required by Irish Water, shall be provided to Irish Water's field inspectors within 1 week of the sample joint being taken. The report should indicate the test result, the failure mode of samples (Wasted Specimens), the specific joint identification data (Welders Name, Joint Number, Weld Date, Machine I.D, Date that the sample joint was received by Testing Facility) on the test report and results, along with clear photos of the joints prior to sampling with the IW engineers signature present on the pipe, photos of the tested wasted specimens and in addition particular photos of any individual wasted specimens that were classified as a failure. Where welds have failed, the Contractor shall excavate, cut out, and provide the welds carried out immediately before and immediately after the failed joint for additional testing. The Contractor shall note that if the results of any of these two additional weld tests indicate that a weld is not in compliance with WIS 4-32-08, i.e. a weld failure, then the Developer shall be required, at his/her own expense, to remove and replace all welds from the date of the last verifiable weld test found to be in compliance with WIS 4-32-08, performed by the particular welding machine and designated crew who completed the weld that failed. The welding machine and designated crew shall be prohibited from performing further welds until they have undertaken and passed a second site audit. If any additional work undertaken by designated crew is persistently at fault, they shall be prohibited from undertaking further welds until re-training shall be carried out. All butt fusion joints shall be de-beaded and the bead referenced and kept for inspection. Beads shall be examined upon removal for signs of defects or splitting along the length of the bead joint. For butt fusion welding, completed welds shall be de-beaded and the weld bead shall be inspected on site by the welding crew. Beads shall be labelled, bagged and stored by the Developer's contractor and access shall be provided to the Irish Water field engineer to inspect the weld beads when requested. The provision of the sample and all costs associated with their provision including restoring the pipe to service and reinstatement will be borne by the Contractor. Untested sample welds shall be properly catalogued and stored by the Contractor until the end of the Defect Liability Period. The sample welds thus stored shall remain the property of Irish Water and shall be made available to the Irish Water's field inspectors at any time for testing should it be so directed. Pipe coils will only be permitted to be used for pipe diameters of 125mm OD and below. Pipe ovality on coiled pipes can have a detrimental effect on the integrity of electrofusion joints on both socket and saddle type fittings. Hydraulic re-rounding clamps and steel re-rounding inserts must be used to permit a straight length of pipe to be electrofusion jointed to the ends of the coil. The pipe profile within the area of the coil to be jointed shall be re-rounded to within the limits of ovality prescribed by BS EN 1201-3. A coil of PE pipe length with a diameter greater than 100mm OD shall require the use three electrofusion couplers to joint any additional PE coil length to it. Two lengths of straight stick PE pipe (min length 500mm) shall be used to join the coils together. A coupler shall join the straight sticks to the ends of each coil, a third coupler shall then be used to electro fuse the straight sticks sections together. Coils of PE pipe lengths with diameter less than 100mm OD shall be joined by using two electrofusion couplers to joint one length of straight stick PE pipe (min length of 500mm) between them. All pipe joints, fittings and accessories shall be free from lead.	3	4	12	High	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require its amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. Jointing of pipes should be carried out in accordance with the requirements of the Standards associated with the pipe material selected. IW CDS Field Engineers will ensure that procedures outlined in Section 3.10 for auditing & testing of welded joints in polyethylene pipes are applied on site.	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Design, Installation	Insufficient strength Inability to safely maintain Vandalism	Operation & Maintenance Personnel Public Construction Personnel	**Section 3.14 Boundary Boxes** The Boundary Box shall be a telescopic type, self-contained Chamber system with Class B or Class C covers in accordance with BS 5834. Developer shall consult with Irish Water in relation to the approved types of Boundary Boxes. A specification for Boundary Boxes suitable for use in assets to be taken in charge by Irish Water is outlined in Appendix A of the Code of Practice for Water Infrastructure. The Boundary Box shall be located as near as possible to the Curtilage boundary but set back such minimum distance necessary from the face of the boundary to avoid foundation footings, etc. They shall be located on a footway or service strip, off the public road/street and, if possible, sited to avoid vehicle crossing points, drives and parking areas to ensure future maintenance requirements are achievable. Where Boundary Boxes are to be installed close to each other, there should be adequate space (500mm) around them to allow adequate compaction between and around them as well as subsequent reinstatement and possible future repair and replacement.	3	3	9	Medium	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require its amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Design, installation and Maintenance	Insufficient strength Trip hazard Inability to safely maintain Vandalism	Operation & Maintenance Personnel Public Construction Personnel	**Section 3.15.2 Domestic Meters** Domestic connections shall be made "meter ready" by the Developer by the provision of a boundary box on the service connection. Domestic meters will be installed by Irish Water's agents in accordance with Irish Water's metering policy. Domestic meters, where required, will be installed for individual Premises in boundary boxes by Irish Water or its agents and will be to Irish Water's requirements and compatible with the automatic meter reading (AMR) system in use. Meters for apartments and similar properties will be installed internally within the premises in accordance with the Building Control Authority's requirements and subject to review by Irish Water. In high-rise or low-rise multi occupancy Premises, characterised by the requirement for pumping to upper floors and where there is a shared service pipe from the tank/pump to each floor, provision shall be made for meters to be installed in service cupboards along with individual stop valves to isolate the property and meter location. The water service pipe work must be arranged such that each unit can be individually metered. It is the Developer's responsibility to install the manifold (or pipe insert) into the plumbing system which will will facilitate the future installation of the water meter. The meter cupboards should be installed at a height no higher than 1.50m on each floor level and in a location where a meter reader can be comfortably maintained and exchanged (if necessary) in the future.	3	3	9	Medium	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require its amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Design, Installation and Maintenance	Insufficient strength Trip hazard Inability to safely maintain Vandalism	Operation & Maintenance Personnel Public Construction Personnel	**Section 3.15.3 Meters for Commercial Premises** Meters shall be installed by Irish Water or it's agents from the time that any commercial premise derives beneficial use of Irish Water's services. This may only arise following the completion of the commissioning of the Works subsequent to issue of the Conformance Certificate and the connection of the Works to Irish Water's Network. All commercial meters shall be installed in meter boundary boxes or meter chambers to Irish Water requirements and be compatible with the automatic meter reading (AMR) system. The Developer shall provide these Boundary Boxes and Chamber and Irish Water will subsequently install the meters.	3	3	9	Medium	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site supervision and inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Design, Installation and Maintenance	Insufficient strength Trip hazard Inability to safely maintain Vandalism	Operation & Maintenance Personnel Public Construction Personnel	**Section 3.15.4 Bulk Meters** Bulk flow meters will be selected, supplied and fitted by Irish Water or it's agents based on the flow requirements provided by the Developer and they will be installed in meter Chambers provided by the Developer. These meters will be supplied and installed by Irish Water at the expense of the Developer and these meters will remain the property of Irish Water. The Chambers provided by the Developer shall be appropriately sized and incorporating appropriate fittings to allow the installation of the meter, with sufficient space and clearance, especially beneath the meter, to allow fitting replacement and maintenance work to be carried out. Reference shall be made to Irish Water's Standard Detail Drawings in this regard. The meter shall be located with sufficient free-flow straight pipe lengths upstream and downstream of the meter to ensure that flow measurement accuracy is not compromised. The metered connection shall consist of a sluice valve, a straight length of pipework at least 10 times the diameter of the meter in length upstream of the meter, an Irish Water supplied water meter, a straight length of pipework at least 5 times the meter diameter in length downstream of the meter and a sluice valve. An off-line hydrant shall be located on the pipework downstream of an electromagnetic meter chamber along with a sluice valve. The provision of the hydrant and sluice valve is to allow occasional flow testing and checking of the electromagnetic meter. A hydrant is not required downstream of a mechanical meter Chamber but a sluice valve shall be provided.	3	3	9	**Medium**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require its amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Design and Installation of fittings	Inadequate fittings Leakage or malfunction of units Inability to safely maintain	Operation & Maintenance Personnel Public Construction Personnel	**Section 3.16 Fittings** All fittings, including sluice valves, butterfly valves, scour valves, hydrants, air valves and meters shall be operable without the need to enter chambers or other confined spaces. All fittings shall be designed and constructed to the standards outlined within the IW Water Code of Practice for Water Infrastructure, Section 3.16, Fittings. Pressure reducing valves and pressure sustaining valves shall be in accordance with the requirement of the IW Water Code of Practice for Water Infrastructure, Section 3.17, Pressure Reducing / Sustaining Valves.	3	3	9	**Medium**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Design & Construction of Chambers	Inability to safely maintain Manual Handling Injuries Trip Hazard Traffic Hazard	Operation & Maintenance Public Construction Personnel	**Section 3.18 Hydrant, Air Valves, Sluice Valve and Scour Valve Chambers** Hydrants, air valves, sluice valves, scour valves and washout hydrants shall be installed in chambers suitably sized to accommodate the fitting and allow access for inspection and normal maintenance. Chambers for sluice valves, hydrants and air valves shall have a minimum internal plan area of 600mm by 600mm complete with a 900mm by 900mm base slab. Alternative dimensions for sluice valve Chambers of internal plan area of 450mm by 450mm may be allowed, subject to the approval of Irish Water, where the sluice valve Chamber is located on non-trafficked areas, such as footpaths, grass margins, or where, due to utility congestion, it is not possible to provide the larger chamber dimension. In trafficked situations, the base of the chamber shall always be 900mm x 900mm as outlined above, otherwise the base may be reduced to 750mm by 750mm to suite the reduced Chamber unit size in non-trafficked areas. Alternative hydrant Chamber sizes of internal plan area of 450mm by 600mm may be allowed, subject to the approval of Irish Water, where these relate to off-line hydrants and where they are located in non-trafficked areas, such as footpaths, grass margins, or where, due to utility congestion, it is not possible to provide the larger chamber dimension. In trafficked situations, the base of the chamber shall always be 900mm x 900mm as outlined below, otherwise the base may be reduced to 750mm by 900mm to suite the reduced Chamber unit size in non-trafficked areas. All air-valve Chambers shall be provided with an internal plan area of 600mm by 600mm in all cases and no reduction of the Chamber size for air valves is to be applied. Chambers can be constructed of pre-cast concrete or of high density blockwork complete with a base slab of dimensions outlined above for the various chamber sizes and methods of construction. Alternatively, proprietary prefabricated chamber units may also be used, but only subject to the approval of Irish Water. The walls of blockwork Chambers shall be constructed with 215mm, high strength (20N/mm²) solid concrete block, laid on flat, bedded in mortar, of minimum M20 strength to IS EN 998-Part 2, and flush pointed. The block units shall comply with the requirements of IS EN 771 - Part 3. The walls of Chambers can alternatively be formed with reinforced pre-cast concrete units formed with C28/35 concrete, 20mm aggregate size, with steel reinforcement. The units shall be square, composite units, with a minimum wall thickness of 100mm, thickened at each corner. Single height precast units will be acceptable. If modular units are proposed, the pre-cast concrete units shall be bedded in mortar, minimum M30 strength to IS EN 998-Part 2, and flush pointed. The Chamber floors shall be formed with C25/30 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, with a minimum thickness of 100mm, complete with mild steel reinforcement, with a minimum 40mm concrete cover. Alternatively, pre-cast concrete bearing slabs of similar depth may be allowed, subject to Irish water approval. The floor slab plan area shall be not less than 900mm by 900mm in all cases where the Chamber is located on trafficked areas, even where the smaller chamber sized outlined above are used. Smaller floor slab dimensions will be allowed where the chamber is located on footpaths and on non-trafficked areas. The floor slab shall be founded on the granular pipe surround material or on trench granular backfill material. Off-line hydrant and air valve Chambers floor slabs shall be founded on natural material. The floor slab of on-line Chambers shall not be cast against the sluice valve body or the riser pipe to the hydrant and air valves. A drain hole shall be allowed in the base slab to allow free drainage of liquid from the Chamber to the granular material below. In the case of off-line hydrants and air valves, the duck-foot bend supporting the hydrant or air valve shall be seated on the floor slab of the off-line Chambers. Chambers shall be surrounded in Clause 808 material in accordance with the Transport Infrastructure Ireland (formerly National Roads Authority) Specification for Road Works, compacted in 150mm layers, to the underside of the road/footpath structure. The Chamber of sluice valves, scour valves and hydrants shall be complete with a reinforced concrete roof formed with C30/37 concrete, in accordance with IS EN 206, 20mm aggregate size, in accordance with IS EN 12620, of minimum thickness of 20mm aggregate size, of minimum thickness of 150mm, reinforced with high tensile reinforcement to BS 4449, with a minimum 40mm concrete cover. The roof slab shall be designed to carry road traffic. Air valve Chambers will not require a roof slab due to the size of the air valve Chamber cover and frame. Sluice valve and hydrant Chambers shall be covered with approved heavy duty metal surface covers and frames, 445mm by 280mm plan area, to IS 261 and BS 5834, subject to the minimum mass of the cover per m² for Grade A being 250kg/m² and Grade B being 200kg/m². The covers and frames shall be suitable for road and traffic conditions. Third Party Certification shall be provided for all metal surface box covers and frames. Air valve Chambers shall be covered with approved heavy duty iron covers and frames, 600mm by 600mm, to IS EN 124, rating D400, with a minimum frame depth of either 100mm or 150mm. The covers shall be set in position flush with the finished ground surface, whether road, pavement or open ground. The sluice valve, hydrant and air valve cover frames shall be supported on Class B engineering brick to IS EN 771 - Part 2, one course minimum and no more than a maximum of two courses in height, set in mortar, minimum M30 strength to IS EN 998-Part 2:2010. The Chamber cover frame shall be set in rapid hardening cementitious, epoxy resin or polyester resin mortar. The mortar shall have a minimum working time of 15 minutes and shall reach a minimum compressive strength of 30 N/mm2 and minimum tensile strength of 5 N/mm2 within 3 hours of mixing. Concrete blocks of or bricks of lesser strength shall not be permitted. The covers shall be set on the brick in accordance with the manufacturer's instructions to finish in alignment with the road or footway surface. The finish of the road surface around the chamber cover and frame shall be to the requirements of the relevent Roads Authority for the area. Air valve and hydrants covers, where located in grass areas, shall be surrounded by a concrete plinth, 200mm all round and 100mm deep formed with C20/25 concrete, 20mm aggregate size, bedded in Clause 804 material. The plinth shall incorporate mild steel reinforcement links and shall have a bull-nose finish around its external perimeter. The metal covers shall have appropriate identification marks on the cover. Covers for surface boxes on Water Mains shall have either the word "WATER" or the letter "WM" cast on the top surface in 75mm letters. Covers for other applications shall have "FH" (fire hydrant), "ScV" (scour valve), "SV" (sluice valve), "AV" (air valve) and PRV/PSV (pressure reducing or pressure sustaining valve) as appropriate. The colour of the covers and the lettering shall be as outlined in Section 3.23 in the Code of Practice for Water Infrastructure. Covers shall be level with the finished ground level after permanent restoration. Proprietary prefabricated spindle tube units may be used only in special situations. Their use shall be subject to specific Irish Water requirements and written approval. Concrete in all Chambers, etc., shall comply with the requirements of IS EN 206, and granular material in the concrete shall comply with the requirements of IS EN 12620 (See also SR 16). (This provision shall apply to all situations within this Guidance Document where in-situ and structural concrete is required.)	3	4	12	**High**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. Covers shall be selected and designed to prevent the cover falling into the chamber. Covers shall be chosen with appropriate road rating for the traffic environment at their locations where possible. Covers shall be located so as to avoid traffic hazards. The Designer must ensure that the general principles of prevention (as well as all relevant Health and Safety legislation) are taken into account when selecting and designing the chamber covers and frames. Consideration must be given to the following risks relating to cover design: manual handling - means of safely lifting and moving the cover and eliminating / minimising risk of manual handing injury, ope protection (depending on size) access egress - room to safely access , rescue - room to safely rescue and also room to safely set up rescue equipment etc. Proprietary lifting equipment should be provided to allow for safe lifting of chamber covers and this should be consistent to avoid risk of accidents due to misuse.	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Design and Construction of Chambers	Inability to safely maintain Manual Handling Injuries Trip Hazard Traffic Hazard Confined Space	Operation & Maintenance Public Construction Personnel	**Section 3.19 Water Meter Chamber** Bulk flow meters shall be installed in chambers and these shall be suitably sized to accommodate the meter and allow access for maintenance. The chamber internal dimensions will vary depending on the size of the meter to be accommodated. For meters meters between 35mm and 65mm, the internal Chamber dimensions shall be 450mm by 600mm. For meter sizes greater than 65mm and up to 100mm, the internal dimensions shall be 1200mm by 1200mm. For meter sizes greater than 100mm and up to 250mm, the internal dimensions shall be 1500mm by 1500mm. The Chambers shall be provided with ductile iron pipework and fittings. The inlet and outlet pipework shall be built into the walls of the chamber and fully sealed, complete with puddle flanges. The chamber should be located off road, if possible, to allow ease of access and maintenance of the meter. The base and walls of the chamber shall be constructed in C30/37 concrete, complying with the requirements of IS EN 206, 20mm aggregate size, with a minimum thickness of 250mm. The Chamber shall be complete with a reinforced concrete roof formed with C30/37 concrete, 20mm aggregate size concrete of minimum thickness of 225mm, reinforced with high tensile reinforcement to BS 4449. Separate chambers for strainers associated with mechanical meters may be required where there is local evidence of an elevated risk of damage to the meter from particulate matter in the water supply. The requirement for the provision of strainers, and associated Chambers, will be advised by Irish Water. The strainer Chamber construction shall be similar to that outlined below for the meter chamber. The roof slab shall incorporate an opening, 750mm by 750mm for the smaller chamber and 900mm by 900mm for the larger chamber, to allow the visual inspection of the meter. Cast-in recessed lifting lugs shall be provided in each corner of the concrete roof slab to allow it positioning in place. In addition, these lifting lugs shall be used to remove the roof slab for access to the chamber to allow maintenance of the meter and its removal and/or replacement if necessary. The chamber shall be fitted with manhole steps to comply with IS EN 13101, Type D, Class 1, galvanised mild steel and plastic encapsulated. Access to the confined space within the chamber shall not generally be required but when needed this access shall be by way of a safe access plan. The internal dimensions of the chamber shall be sufficient to contain the meter, telemetry data-logger (if not provided in a kiosk) and any associated pipework. The bolts and joints shall be visible and accessible in order to allow for maintenance and for the possible future replacement of the meter without the need for excavation. The depth of the meter chamber shall provide a minimum of 300mm clearance beneath the meter fitting. Sufficient clearance shall be provided between the walls and the meter equipment to allow maintenance activities to be carried out. The cover shall be sufficient size for a 900mm by 900mm opening. It shall be capable of withstanding imposed loads and shall comply with IS EN 124, D400 if located on roadways or footways. The cover shall be double hinged units. Lower load capacity rated covers may be used if the chamber is located off road in green areas, subject to Irish Water approval. The cover frames shall be supported on Class B engineering brick to IS EN 771 - Part 2, one course minimum and no more than a maximum of three courses in height, set in mortar, minimum M30 strength to IS EN 998-Part 2:2010. The Chamber cover frame shall be set in rapid hardening cementitious, epoxy resin or polyester resin mortar. The mortar shall have a minimum working time of 15 minutes and shall reach a minimum compressive strength of 30 N/mm2 and minimum tensile strength of 5 N/mm2 within 3 hours of mixing. Concrete blocks of or bricks of lesser strength shall not be permitted. The covers shall be set on the brick in accordance with the manufacturer's instructions to finish in alignment with the road or footway surface. The finish of the road surface around the chamber cover and frame shall be to the requirmentes of the relevant Roads Authority for the area. Meter chamber covers, where located in grass areas, shall be surrounded by a concrete plinth, 200mm all round and 100mm deep formed with C20/25 concrete, 20mm aggregate size, bedded in Clause 804 material. The plinth shall be complete with bull-nose finish to its perimeter and shall be provided with a mild steel reinforcement link. The Developer shall provide a spool piece in lieu of a meter in the pipe assembly within the meter Chamber. The dimension of the spool piece shall be appropriate for the meter type and size and will be notified by Irish Water. On the fitting of the meter within the meter Chamber, Irish Water will remove the spool piece and fit the meter in its position. Valves associated with the meter may be located in separate valve chambers adjacent to the meter chamber.The valve Chambers shall be similar in size and construction to those described above for hydrants, air valves, sluice valves, scour valves and washout hydrants. (Section 3.18). Irish Water, in specific situations, may allow buried meters. This will be at the sole discretion of Irish Water and will not be the norm.	3	4	12	**High**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Feld Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. Covers shall be selected and designed to prevent the cover falling into the chamber. Covers shall be chosen with appropriate road rating for the traffic environment at their locations where possible and shall be loaded so as to avoid traffic hazards. Provision to be made for the optional removal of the roof of the meter chamber. Means of lifting the roof to be provided during the design and construction stages. Access to the confined space should be by way of a safe access plan. The Designer must ensure that the general principles of prevention (as well as all relevant Health and Safety legislation) are taken into account when selecting and designing the chamber covers and frames. Consideration must be given to the following risks relating to cover design: manual handling - means of safely lifting and moving the cover and eliminating/minimising risk of manual handing injury, ope protection (depending on size) access egress - room to safely access , rescue - room to safely rescue and also room to safely set up rescue equipment etc. Proprietary lifting equipment should be provided to allow for safe lifting of chamber covers and this should be consistent to avoid risk of accidents due to misuse.	2	2	4	**Low**
Design and Construction of Chambers	Inability to safely maintain Manual Handling Injuries Trip Hazard Traffic Hazard Confined Space	Operation & Maintenance Public Construction Personnel	**Section 3.20 Pressure Reducing / Sustaining Valve Chamber** Pressure reducing valve and pressure sustaining valve chambers shall be suitably sized to accommodate the valve and allow access for maintenance. The chamber internal dimensions will vary depending on the size of the valve to be accommodated. For valves between 50mm and 100mm, the internal dimensions shall be 1500mm by 1200mm. For valve sizes greater than 100mm and up to 250mm, the internal dimensions shall be 2200mm by 1500mm. The chambers shall be provided with ductile iron pipework and fittings. The inlet and outlet pipework shall be built into the walls of the chamber and fully sealed, complete with puddle flanges. The chamber should be located off road, if possible, to allow ease of access and maintenance of the valve. The base and walls of the chamber shall be constructed in C30/37 concrete, complying with the requirements of IS EN 206, 20mm aggregate size, with a minimum thickness of 250mm. The chamber shall be complete with a reinforced concrete roof formed with C30/37 concrete, complying with the requirements of IS EN 206, 20mm aggregate size concrete of minimum thickness of 225mm, reinforced with high tensile reinforcement to BS 4449. The roof slab shall incorporate an opening, 1200mm by 600mm for the smaller chamber and 1800mm by 900mm for the larger chamber, to allow visual inspection of the valve and fittings. The valve chamber shall be sufficiently sized to allow the removal of strainers, etc., during maintenance. Valves associated with the pressure reducing or pressure sustaining valve may be located in separate valve chambers adjacent to the chamber. Cast-in recessed lifting lugs shall be provided in each corner of the concrete roof slab to allow positioning of it in place. In addition, these lifting lugs shall be used to remove the roof slab for access to the chamber to allow maintenance of the pressure reducing / sustaining valve and its removal and/or replacement if necessary. The chamber shall be fitted with manhole steps to comply with IS EN 13101, Type D, Class 1, galvanised mild steel and plastic encapsulated. Access to the confined space within the chamber shall not generally be required but when needed this access shall be by way of a safe access plan during the operational life of the unit. The cover shall be capable of withstanding imposed loads and shall comply with IS EN 124, D400 if located on roadways or footways. The cover shall be double hinged units. Lower load capacity rated covers may be used if the chamber is located off road, subject to Irish Water approval. The internal dimensions of the chamber shall be sufficient to contain the valve, the strainer and any associated pipework. The bolts and joints shall be visible and accessible in order to allow for maintenance and for the possible future replacement of the valve without the need for excavation. The depth of the chamber shall provide a minimum of 300mm clearance beneath the pipework fittings. Sufficient clearance shall be provided between the walls and the valve and associated equipment to allow maintenance activities to be carried out. The cover frames shall be supported on Class B engineering brick to IS EN 771 - Part 2, one course minimum and no more than a maximum of three courses in height, set in mortar, minimum M30 strength to IS EN 998-Part 2:2010. The Chamber cover frame shall be set in rapid hardening cementitious, epoxy resin or polyester resin mortar. The mortar shall have a minimum working time of 15 minutes and shall reach a minimum compressive strength of 30 N/mm2 and minimum tensile strength of 5 N/mm2 within 3 hours of mixing. Concrete blocks of or bricks of lesser strength shall not be permitted. The brickwork shall be bedded in C50/60 mortar. The covers shall be set on the brick in accordance with the manufacturer's instructions to finish in alignment with the finished road or footway surface. The finish of the road surface around the chamber cover and frame shall be to the requirements of the relevent Roads Authority for the area. Valve chamber covers, where located in grass areas, shall be surrounded by a concrete plinth, 200mm all round and 100mm deep formed with C20/25 concrete, 20mm aggregate size, bedded in Clause 804 material. The plinth shall be complete with bull-nose finish to its perimeter and shall be provided with mild steel reinforcment link. In the case of small sized pressure reducing valve and pressure sustaining valves, the chambers may be similar in construction to those described above for small sized meter Chambers (Section 3.19).	3	4	12	**High**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. Provision to be made for the optional removal of the roof the valve chamber. Means of lifting the roof to be provided during the design and construction stages. Access to the confined spaces shall be by way of a safe access plan. Covers shall be selected and designed to prevent the cover falling into the chamber. Covers shall be chosen with appropriate road rating for the traffic environment at their locations where possible. Covers shall be loaded so as to avoid traffic hazards The Designer must ensure that the general principles of prevention (as well as all relevant Health and Safety legislation) are taken into account when selecting and designing the chamber covers and frames. Consideration must be given to the following risks relating to cover design: manual handling - means of safely lifting and moving the cover and eliminating / minimising risk of manual handing injury, ope protection (depending on size) access egress - room to safely access , rescue - room to safely rescue and also room to safely set up rescue equipment etc.	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Design and Construction of Chambers	Inability to safely maintain Manual Handling Injuries Trip Hazard Traffic Hazard Confined Space	Operation & Maintenance Personnel Public Construction Personnel	**Section 3.21 Scour Chambers** Scour chambers shall be provided to balance the scour discharge and to collect debris from the scouring operation for separate disposal. Where possible, scour chambers should be located off carriageways and generally in areas only subject to foot traffic. The scour chamber shall be constructed with precast concrete manhole wall units completed with rubber sealing ring gasket between units, complying with the requirements of IS EN 1917 and IS EN 420, complete with a 150mm minimum thickness cast in situ concrete surround, C20/25, 20mm aggregate size, with either precast or cast in-situ concrete base (300mm minimum thick) with a 400mm x 400mm x 200mm deep floor sump located beneath the roof opening. The scour chamber shall have precast or cast in-situ concrete roof slab (200mm minimum thickness), constructed of C30/37, complying with the requirements of IS EN 206, 20mm aggregate size, reinforced with high tensile steel bar reinforcement, with a minimum 40mm concrete cover. Alternatively , approved precast concrete roof slabs may be used subject to Irish Water approval and compliance with IS EN 1917 and IS EN 420. This approach would be the preferable option where precast concrete ring units are used as scour chamber walls. An access opening shall be formed in the chamber roof slabs. The minimum dimensions of the roof opening shall be 600mm by 600mm. Circular manhole opening of 600mm diameter may be used if the scour chamber cover is circular. The scour chamber shall have a minimum internal clear dimension of 1,200mm. Confined space access requirements will apply with planned safe access procedures. The roof slab opening shall be provided with a cover and frame to comply with IS EN 124, Class D400. Frames should be square or circular with a square or circular insert with a minimum clear diameter/ dimension of 600mm and a minimum depth of 100mm, if located in light traffic roads. Heavily trafficked roads will require a 150mm deep frame. All covers shall be of non-rock design and hinged. Two closed keyways shall be provided in each cover. Circular covers shall be hinged and single leafed. The covers shall be set in position flush with the finished ground surface, whether, road, pavement or open ground. The frame cover should be supported on solid engineering brick to IS EN 771 - Part 2, one course minimum and no more than a maximum of three courses in height, set in mortar, minimum M30 strength to IS EN 998-Part 2:2010. The Chamber cover frame shall be set in rapid hardening cementitious, epoxy resin or polyester resin mortar. The mortar shall have a minimum working time of 15 minutes and shall reach a minimum compressive strength of 30 N/mm2 and minimum tensile strength of 5 N/mm2 within 3 hours of mixing. Concrete blocks of or bricks of lesser strength shall not be permitted. The cover frame should be installed and bedded to the manufacturer's instructions. The finish of the road surface around the chamber cover and frame shall be to the requirments of the relevant Road Authority for the area. The scour chamber shall be provided with ductile iron inlet and outlet pipework, built into the walls of the chamber and fully sealed, complete with puddle flanges. The inlet pipe shall be fitted with a cast iron non- return flap valve. The outlet pipe shall be located at a lower level than the inlet pipe. The outlet pipe shall also be fitted with a cast iron non-return flap valve at the outlet headwall location discharge point. Scour valves, scour chambers and outlet pipes for large diameter Mains shall be sized for both rapid emptying time and on the assimilative capacity of the downstream receiving waterway. Where scour pipes discharge to a surface water system, it is essential that the surface water pipe has adequate capacity to receive he scour flow. The discharge point from a scour chamber to a water course shall be provided and located with the approval of the relevant Statutory Authorities. The discharge point shall be provided with a concrete headwall structure, completed with a back wall, side walls and base, constructed in C30/37 concrete. Handrails shall be provided in accordance with a design risk assessment. Each specific location will require the approval of Irish Water and the relevant Local Authority. The chamber shall be fitted with manhole steps to comply with IS EN 13101, Type D, Class 1, galvanised mild steel and plastic encapsulated. Access to the confined space within the chamber shall not generally be required but when needed this access shall be by way of a safe access plan during the operational life of the unit.	3	4	12	**High**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. Covers shall be selected and designed to prevent the cover falling into the chamber. Covers shall be chosen with appropriate road rating for the traffic environment at their locations where possible. Covers shall be loaded so as to avoid traffic hazards. The Designer must ensure that the general principles of prevention (as well as all relevant Health and Safety legislation) are taken into account when selecting and designing the chamber covers and frames. Consideration must be given to the following risks relating to cover design: manual handling - means of safely lifting and moving the cover and eliminating / minimising risk of manual handing injury, ope protection (depending on size) access egress - room to safely access , rescue - room to safely rescue and also room to safely set up rescue equipment etc. Proprietary lifting equipment should be provided to allow for safe lifting of chamber covers and this should be consistent to avoid risk of accidents due to misuse	2	2	4	**Low**
Identification of Network Location	Risk of inadvertently striking a water service during works in the vicinity of the network. Risk of not being able to locate the network and fittings	Operation & Maintenance Personnel Other service utilities Fire services Public Construction Personnel	**Section 3.23 Indicator Marker Plates and Posts** Indicator plates shall clearly identify hydrant, air valve, scour valve, washout hydrant, meter, pressure reducing / sustaining valve and sluice valve locations. They shall be located to the approval of both Irish Water and the Roads Authority for the area. The plates shall be mounted on marker posts at the back of footpaths or on the boundary wall of the public thoroughfare nearest to the hydrant or valve. Hydrant indicator plates and baseboard plates shall comply with BS 3251, with hydrant plates of fixed black letter H on a canary yellow background (colour reference 309 to BS 381C). The plate shall show the diameter of the trunk Main in “mm” and the distance from the marker to the hydrant in “m”. Indicator plates for air valves, sluice valves, scour valves, washout hydrant, pressure reducing / sustaining valves, meters and bulk meters shall also comply with BS 3251 with fixed black letters (AV, SV, ScV, WO, PRV/PSV, Me and BM respectively) on a white background. The plate shall show the diameter of the Main in “mm” and the distance from the marker to the fitting shall be indicated in “m”. Marker plates shall be metal and shall be fixed with stainless steel non-retractable screws. Marker posts shall be of concrete construction, complying with IS EN 206, to conform to IS 162. They shall be set 450mm deep in a 0.06 m³ support base of C25/30 concrete, 20 mm aggregate size. Plastic marker posts and plastic indicator plates shall not be provided under any circumstance.	3	4	12	**High**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co=ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field engineers will undertake site inspections during installation. IWCDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Network Location	Risk of inadvertently striking a water service during works in the vicinity of the network. Risk of not being able to locate the network and fittings. Risk of damage to pipework during excavation works.	Operation & Maintenance Personnel Other service utilities Public Construction Personnel	**Section 3.24 Warning Tape** All pipework shall have a marker tape installed 300mm above the crown of the pipework or above the granular surround material and directly above the centreline of the Main. The marker tape shall be tied to valves at a depth of 350mm. The tape shall be 400mm wide blue polyethylene material, in accordance with IS EN 12613 – Plastic Warning Devices for Underground Cables and Pipelines with Visual Characteristics. Plastic pipes shall have a warning mesh incorporating a polypropylene reinforced band of stainless steel tracer wire. Distribution System and Service Connections shall have a 200mm wide tape laid at the same depths as outlined above (300mm).	3	4	12	**High**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require i'ts amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. It is the responsibility of the Developer and / or designer to obtain all current information on the location of other existing utility or service providers' apparatus prior to the design being carried out. During installation, due diligence should be used when making excavations for water mains and services and care shall be taken to protect and support all existing services (water, gas, telecommunications, drainage, electricity, etc.) and other works so as not to interfere with the working arrangements and integrity of such utilities.	2	3	6	**Medium**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Works in close proximity to Irish Water Networks	Risk of inadvertently striking a water service during works.	External Parties Other utility providers Operation & Maintenance Personnel Public Construction Personnel	**Section 3.27 Working Near Existing Pipes (Notifications and Separation Distances)** Where pipes or ducts are to be laid close to an existing Water Main or sewer in the sole control of Irish Water, notification in writing shall be provided a minimum of 10 working days ahead of the advancement of the work. This requirement shall also apply to the carrying out of trial holes or slit trenches to locate the Main or to gather ground investigation data. In the case of large diameter (350mm or greater) distribution and trunk Water Mains and Sewers, Irish Water must be notified at least one month before the work is advanced. This notification is in addition to any formal procedures detailed elsewhere in this document. The notifications shall apply where work is proposed within the following proximities of Irish Water infrastructure: • 1m at either side of an existing pipes less than 200mm diameter; • 2m at either side of an existing pipes of 200mm to 350mm diameter; • 5m at either side of an existing pipes of 350mm or greater; Developer's shall also comply with any notification requirements associated with other utility providers' infrastructure (ESB Networks, Gas Networks Ireland, telecommunications providers, etc.) that these Utility Companies might have. Detailed proposals, including work method statements, insurance confirmation and details of work completed of a similar nature must be submitted to Irish Water for its consideration before approval will be issued prior to undertaking work in close proximity to Irish Water assets. All such works in the vicinity of Water Mains or sewers of 400mm diameter and greater shall be subject to written agreement with Irish Water before construction commences on site. This agreement shall also include any necessary protection for Water Mains and sewers. The placing of concrete over or around Water Mains is expressly forbidden. In the case of installations in close proximity to existing Water Mains and Sewers, the following minimum horizontal distances shall be maintained between pipes/ducts, cabinets, poles, manholes, junction boxes, chambers, etc. where the depth of the existing infrastructure does not exceed 1.5m: • 600mm at either side of Mains up to and including 150mm diameter • 1m at either side of Mains of 200mm to 250mm diameter • 2m at either side of Mains of 300mm and 375mm diameter • 5m at either side of Mains of 400mm and 450mm diameter • Specific Irish Water advised distances for Mains in excess of 475mm • 600mm at either side of gravity sewer up to and including 225mm diameter; • 1m at either side of gravity sewer of 300mm and up to and including 450 mm diameter; • 1.5m at either side of gravity sewers of 600mm diameter and greater; Specific written permission shall be required from Irish Water for installing infrastructure closer to the Irish Water existing asset than the limits outlined above or where the depth of the existing asset exceeds 1.5m. For strategic fibre optic or oil filled cables the separation distance requirements of the service provider shall apply, Irish Water may require increased clearance separation distances in excess of the specific utility providers requirements. The separation distances between new pipework associated with the Works and between pipework associated with the Works and other utility pipework shall be as set out in Section 3.6 above.	3	4	12	**High**	It is the responsibility of the Developer and / or designer to obtain all current information on the location of other existing utility or service providers' apparatus prior to the design being carried out. During installation, due diligence should be used when making excavations for water mains and services and care shall be taken to protect and support all existing services (water, gas, telecommunications, drainage, electricity, etc.) and other works so as not to interfere with the working arrangements and integrity of such utilities.	2	3	6	**Medium**
Operation of Network	Water Contamination	Public Operation & Maintenance Personnel	**Section 3.29 Water Management and Conservation** Rainwater harvesting systems usually require the option of top up with water from the water supply network during periods of dry weather when rainfall is not sufficient to meet the demands of the system. Any connection to a rainwater harvesting system must be provided via a secure connection where it is not possible for cross contamination and / or backflow to the public or private drinking water supply. An acceptable back up supply to the rainwater harvesting system can be provided using a connection to the high level rainwater storage tank via an unrestricted air-gap device (Type AA device, IS EN 1717). All pipework connected to or from rainwater harvesting systems shall be clearly labelled in accordance with the requirements of EN 16941-1 to avoid misconnection or accidental consumption of non-potable water.The label must carry the clearly identified marking in black text 5mm high on a green background and must be at least 100mm long. The size of the lettering and labels should be increased as the pipe diameter increases.	3	4	12	**High**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS.	2	2	4	**Low**
Transportation, Storage, Handling and Use of Materials	Falls from height of materials and persons Being struck by pipes / materials Traffic Management Failure of slings and ropes.	Public Construction Personnel	**Section 4.2 Transportation, Storage, Handling and Use of Materials** Precautions shall be taken to prevent damage to pipes and fittings during transportation, storage, handling and use of materials. Suitable pipe supports shall be used on vehicles transporting pipes to prevent damage to both internal and external coatings by impact, scratching, abrasion, etc. Purpose made wide fabric slings or suitably designed machines for lifting pipes shall be used during offloading and/or laying of pipes (particularly flexible pipes with concrete or cement-mortar linings) to avoid damage and scratches to coatings as well as damage to pipe ends. Damaged pipes shall not be used in the works. All pipes and fittings shall be stored off the ground in a clean environment to prevent any contamination of the material prior to its use. Timber supports shall be used during transportation and stacking on site. All pipes shall be capped at either end until they are used in the Works to prevent vermin and debris entering them and contaminating the material before their use. All fittings shall be supplied in sealed bags and they shall remain in these bags until immediately prior to installation. All pipes and fittings (and in particular plastic pipes) should be kept clear of fuel oils, and any material which becomes contaminated should be discarded. Materials and components shall be handled in such a manner as to avoid any damage or contamination and in accordance with the applicable recommendations of the manufacturers. Pipes and fittings, including coatings and linings, shall be examined for damage prior to installation in the works. Plastic pipes shall be carefully examined for flaws, in particular for signs of impact damage and scoring. No polyethylene pipe shall be installed with scores or cuts penetrating more than 10% of the wall section thickness. If, after installation, scores or cuts penetrating more than 10% of the wall section thickness are found, the affected pipe length(s) shall be removed and replaced with an undamaged pipe length.	3	4	12	**High**	Risks associated with the transportations, storage, handling and use of materials to be risk assessed at design and construction stage taking into account the particular conditions associated with the site. All works to be carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations. All lifting equipment to be certified in line with legislation. Plant operatives to have appropriate training. All design to be carried out by competent designers. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. All lifting equipment and accessories to be marked with a safe working load (SWL). All lifting equipment and accessories shall be inspected, tested and certified in accordance with current legislation.	2	2	6	**Medium**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Construction of water main	Trench collapse	Construction Personnel	**Section 4.4 Trench Widths** The trench shall be kept as narrow as possible but the width must allow adequate room for pipe jointing as well as placing and compacting pipe bedding, haunch, surround and backfill material. Trench widths at the level of the top of the pipe should allow adequate room as safe working conditions will allow, with a desirable minimum width of 300mm plus the external diameter of the pipe barrel, or a minimum trench width of 500mm. The trench width should not exceed the pipe diameter by more than 500mm. A guideline for trench widths is shown below in the Table in Section 4.4 of the Code of Practice for Water Infrastructure. Normally Water Mains installed in Developments will not exceed 300mm in diameter. In the event that pipe diameters of 350mm, 400mm and 450mm are installed, the trench width will be 900mm.	3	4	12	**High**	Risks associated with the trench works to be risk assessed at design and construction stage taking into account the particular conditions associated with the site, depth of trench, requirement to use trench boxes, stepping back of trench edges, etc. All works to be carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations. All design to be carried out by competent designers. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. Excavations shall be carried out in accordance with the requirements of the HSA booklet "A guide to safety in excavations" and the Safety, Health and Welfare at Work (Construction) Regulations 2006. In particular all excavations shall be assessed and appropriate protection against collapse and falling materials shall be put in place.	2	3	6	**Medium**
Construction of water mains	Failure of rising main under pressure at bends, fittings and accessories.	Construction Personnel Operation & Maintenance Personnel Contractors carrying out works in the future Public	**Section 4.6 Anchor/Thrust/Support Blocks** Appropriate thrust blocks shall be designed and installed on Water Mains where required. Except where welded polyethylene pipelines or self-anchoring joints are used, thrusts from bends and branches in Water Main shall be resisted by concrete thrust blocks cast in contact with undisturbed ground. The thrust blocks shall be designed in accordance with CIRIA Report 128, "Guide to the Design of Thrust Blocks for Buried Pressure Pipelines". The requirement for thrust blocks for polyethylene pipes shall be based on the manufacturer's advice. Anchor/thrust and support blocks shall be constructed of C20/25 concrete, 20mm aggregate size, to IS EN 206. The thrust blocks shall be formed using formwork to provide a rough cast finish. Anchor/thrust blocks shall be provided on Water Mains at dead ends, at tee junctions, at bends of curvature of 11.25 degrees or greater, at end caps, at both sides of sluice valve chambers, at any abrupt change in vertical or horizontal direction, at duck-foot hydrants and at any location where water pressure is likely to distort the pipe line installation or cause disproportionate movement. Plastic and polyethylene pipes shall be wrapped in a compressible filler board, in accordance with IS EN 622-1 and IS EN 622-4, with an outer plastic sheeting having a composition in accordance with BS 6076 before being cast against or into anchor/thrust blocks Concrete support blocks shall be cast to hydrant tees and sluice valve fittings installed on polyethylene pipe lines in order to resist torque forces imposed on the fittings during operation. Anti torque support blocks will only be required on sluice valves associated with ductile iron pipe fittings of 250mm and above. Support blocks shall be cast so as not to interfere with the operation and maintenance of the apparatus. In general support blocks shall not cover pipe or fitting joints. Where this is unavoidable, the fittings/bolts shall be wrapped in protective non-biodegradable tape. All thrust/anchor/support blocks shall be allowed to develop adequate strength before any internal pressure is applied to the pipeline. Support blocks or special pipe support arrangements, including piling, beam supports, etc., are required where pipes are laid in soft ground conditions, as discussed in Section 4.8 of the Code of Practice for Water Infrastructure. Special support blocks are also required to anchor pipes where gradients are 1:6 or greater. Design of supports, piles and ground beams should be provided to Irish Water for assessment and review and additional information may be required to complete this assessment. Pipe joints shall allow for longitudinal movement due to thermal effects and thrusts due to internal pressure. The Developer shall advise and seek review by Irish Water's Connection and Developer Services where it is proposed to install water mains with gradients that are steeper than 1:10. Alternative gradient proposals may be required in such instances. While anchorage is required to resist thrust, it is not necessarily required at junctions or bends where a fully integrated fusion weld PE pipe system is in place. However, the provision of suitable anchors at bends in excess of 22.5 degrees on fully integrated fusion weld PE pipe systems shall be provided in accordance with the pipe manufacturer's recommendations and requirements. Compressible filler board, in accordance with the provisions of IS EN 622, Part 1 to Part 4, wrapped in plastic sheeting having a composition in accordance with BS 6076, shall be provided for protection between the concrete and the polyethylene pipe. Bituminous material shall not be allowed come in contact with polyethylene pipes.	3	4	12	**High**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	3	6	**Medium**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Construction of water main	Trench Settlement Damage to Network	Public Operation & Maintenance Road Users Construction Personnel	**Section 4.8 Pipe Bedding, Haunch and Surrounds** Pipe bedding, to a depth of 150mm at least and up to 200mm for pipes in excess of 250mm diameter, and haunch side fill granular material shall be placed uniformly underneath and on either side of the pipe, in layers not exceeding 100mm, each layer being compacted by hand tamping until the required depth of bedding and side fill has been achieved. Pipe surround shall be placed above the side fill material in a similar fashion to bedding and side fill. Surround material shall be installed to the required depth above the pipe crown, with a minimum depth of 200mm and to a thickness of 300mm where pipes are located in or adjacent to trafficked areas. Care shall be taken that the process of placing the bedding, side fill and surround material does not displace the pipe from its correct line and level. Where the Water Main is installed along roads and footpaths the minimum cover of granular surround material should be 300mm above the crown of the pipe, irrespective of the pipe being either rigid or flexible. The pipe trench above the granular surround in this instance shall be backfilled in accordance with the requirements of Section 4.9 below for road and footpath areas. If a Water Main is installed in a green field area the minimum cover of granular surround material should be 200mm above the crown of the pipe and the Backfill shall be in accordance with Section 4.9 below for green field areas. The recommended minimum depth of cover (the depth comprising the pipe surround above the crown plus backfill and road surface) in roads should be in accordance with Section 3.11 of the Code of Practice for Water Infrasrtructure. The depth shall be increased where heavy traffic is anticipated (See Section 3.11 of the Code of Practice for Water Infrastructure). The recommended minimum depth of cover in a green field area (the depth comprising the pipe surround above the crown plus backfill and topsoil) may be reduced to 750mm. If those depths cannot be achieved, Irish Water shall be consulted to agree any design proposals that would involve cover dimensions below that which is outlined above. Protection measures may be required to address impact from loading in heavily trafficked areas and to address minimum pipe cover situations. The detail of such protection proposals shall be submitted to Irish Water for review and a response is required before advancing with the work. The primary approach should be to provide the pipe with the required depth of cover as outlined in Section 3.11 above. However, if this cannot be achieved due to unavoidable technical reasons, resulting in the depth of cover to the crown of the pipe being less than the values set out in Section 3.11, pipe protection measures shall be provided. Consultation with Irish Water is required in relation to the provision of these measures. The protection measures shall comprise the provision of a reinforced concrete slab designed to spread the imposed traffic load away from the pipe. The protection slab shall be a minimum of 150mm thick and constructed of C20/25 concrete to IS EN 206 and reinforced with high tensile reinforcement to BS 4449. These protection measures shall extend for the distance where the depth is below the depth limits outlined above. In all cases, the depth to the crown of the pipe shall not be less than 750mm. These additional protection measures are to be agreed with Irish Water. Any proposals for the reduction in cover to the Pipe shall be accompanied by design calculations to address loading and frost risk as well as any other relevant design issues. Where soft ground conditions (situations where a California Bearing Ration (CBR) less than 5 exists) are anticipated or encountered, the soft material should be excavated and disposed to an approved disposal area, in accordance with the Waste Management Act. Clause 804 granular material, in accordance with the Transport Infrastructure Ireland (formerly National Roads Authority) Specification for Road Works, shall replace the entire extent of the excavated material. Approved geo-textile wrapping shall be provided to encase this additional backfill. Alternatively, special pipe support arrangements, including piling, beam supports, etc., may be required where the depth of soft material is excessive. Such arrangements relating to soft fill material replacement and / or pipe supports shall be subject to submission to Irish Water of a proposal for review and a response is required before advancing with the work.	3	4	12	**High**	All design to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. Risks associated with pipe bedding, haunch and surrounds to be risk assessed at design and construction stage taking into account the particular conditions associated with the site. All works to be carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations.	2	3	6	**Medium**
Construction of water	Settlement of ground surface above the water main	Injury to public, road users, etc. Construction Personnel	**Section 4.9 Backfill** Backfill material shall be placed above the granular surround material (described in Clause 4.8 of the Code of Practice for Water Infrastructure) up as far as underside of the road construction. The backfill material shall comprise Clause 804 granular material, in accordance the TII "Specification for Road Works", and it shall be used where the Water Main is installed along proposed roadways and footpaths in the Development. If the backfill material is within 500mm of a concrete pipe or structure, Clause 808 material shall be used instead of Clause 804 material. The use of clause 804 / 808 backfill material shall also apply where the trench is in green areas running within 500mm of roadways and footways. The backfill material shall be placed in layers not exceeding 200mm, each layer being compacted to the requirements of the Specification for Road Works. The first layer of backfill above the granular surround shall be compacted in 150mm layers. Mechanical compaction equipment shall not be used until there is a minimum of 450mm of compacted material above the crown of the pipe. Alternative backfill material to that described above (Clause 804 or Clause 808) of the pipe trench will only be allowed by Irish Water where the Roads Authority in whose functional area the Development is located provides written approval to the Developer to the use of such alternative acceptable material. Evidence of this written approval to use alternative acceptable backfill material shall be provided to Irish Water in advance of the commencement of construction on site or in advance of the issue of the Connection Agreement, provided construction has not commenced on site. The relevant Roads Authority should specify this alternative acceptable backfill material and this should require compliance with the definition of "acceptable material" as outlined in Clause 601 of the TII "Specification for Roadworks, Series 600- Earthworks", Table 6/1, with the specific Class of "acceptable material" clearly nominated by the relevant Roads Authority in the written approval. Backfill to the pipe trench above the pipe granular surround material and beneath the road surface in Public Roads shall be to the requirements of "Guidelines for the Opening, Backfilling and Reinstatement of Trenches in Public Roads" Second Edition, or subsequent amendments published by Department of the Transport, Tourism and Sport, unless otherwise specified and to the requirements of the relevant Roads Authority's Road Opening Licence. The opening, backfilling and reinstatement of trenches on National Roads shall be in accordance with the TII "Specification for the Reinstatement of Openings in National Roads" July 2011, unless otherwise specified. In the case of any discrepancy between the Code of Practice for Water Infrastructure and the "Guidelines for the Opening, Backfilling and Reinstatement of Trenches in Public Roads" or the TII "Specification for Road Works" where pipes are located in Public Roads, the Code of Practice and associated Standard Details shall take precedence. Selected excavated material may be used as trench backfill in green-field areas above the granular pipe surround material with the approval of Irish Water. This selected backfill, shall comply with the requirements of "acceptable material" as outlined in Clause 601 of the TII "Specification for Roadworks, Series 600 – Earthworks", Table 6/1, Class 8, Class 2 (Miscellaneous Fill) and is generally referred to as Type B Fill, shall be uniformly compactable material free from clay lumps greater than 75mm, stones greater than 40mm , tree roots, vegetable matter, any kind of building rubbish, etc. This material shall be backfilled in layers not exceeding 300mm in depth and compacted in accordance with the Transport Infrastructure Ireland (formerly National Roads Authority) Specification for Road Works. Where pipelines are installed traversing a public road, the backfill material above the granular surround shall comprise cement bound granular material (CBGM), Category B, in accordance with the NRA "Specification for Road Works", Series 800.	3	4	12	**High**	All design to be carried out by competent designers. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. Risks associated with backfilling the pipe trench to be risk assessed at design and construction stage taking into account the particular conditions associated with the site. All works to be carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations.	2	3	6	**Medium**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Pressure Testing	Catastrophic Failure during testing	Site Operatives Public Road Users Construction Personnel	**Section 4.10.3 Pressure Testing (general)** The entire pipeline shall be pressure tested following installation of Works on site. The pressure tests shall be conducted by the Developer's contractor, who shall be experienced in such testing procedures, in the presence of an Irish Water field engineer or an Irish Water agent's supervisor.. Water Mains shall be tested after they are jointed and before full backfilling commences in as far as practicable. During testing, sufficient backfilling material shall be provided above the pipe crown to resist uplift or buckling movement of the pipe and all joints shall be exposed. Testing shall be carried out between suitably supported blank end pieces. Closed valves shall not be used to isolate new pipework being commissioned from existing operational water mains. Testing between 'live' shut valves will not be accepted. Before testing, valves should be checked and sealed, the section of Main filled with water and the air released. Water used for testing should be obtained from the Irish Water Network. This will be provided, subject to availability, by Irish Water at the Developer's expense. All the exposed parts of the pipeline, including the chambers, shall be visually checked and any leaks or damp spots rectified. The following general requirements are relevant: • To avoid airlocks there must be suitable air valves on the pipeline; • Filling must proceed slowly, preferably from the lower side; • The test must be hydrostatic and shall take place between blank flanges; bolted or welded to pipe ends or end caps fully supported by anchor blocks; • All pressure gauges used for the monitoring of tests must be plate sized pressure gauges or digital loggers with an appropriate pressure range consistent with the pressure being measured, properly calibrated with calibration records available for inspection, to ensure that any losses can be adequately monitored. Any water used for testing shall be disposed of in a safe and environmentally suitable fashion. All water used for testing shall be clean and free from impurities. Discharge of the test water to sewers in the control of Irish Water shall not take place without Irish Water's express approval. Testing of Ductile Iron or PE pipes shall be carried out in accordance with IGN 4 - 01 - 03, Guide to Tests of Pressure Pipes and Fittings for use by Public Water Suppliers.October 2015. A formal test report, to the requirements of Irish Water, shall be submitted to Irish Water field engineers giving the complete details of the test that was carried out in accordance with Section 4 of IGN 4-01-03, regardless of the result of the test. The system test pressure (STP) on the Ductile Iron Rising Main shall be 1.5 times MDP at the lowest point of the pipe. MDP is a pressure equivalent to the sum of the maximum continuous operating pressure of the pipeline plus an allowance for surge pressure. The allowance for surge pressure, where this is not known, shall not be less than 2 bar. The maximum continuous operating pressure of the pipeline may not be known in every case. In any event, the system test pressure on the Ductile Iron Main shall be at least 10 bar. In all instances, the test pressure should not be greater than 1.5 times the maximum pressure of the lowest rated component (the pressure that a component can withstand continuously in service)	3	4	12	**High**	All design to be carried out by competent designers. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting. Risks associated with pressure testing of water mains to be risk assessed at design and construction stage taking into account the particular conditions associated with the site. All works to be carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations. Testing equipment to be calibrated. Tests to be carried out in accordance with IGN 4 - 01 - 03.	2	3	6	**Medium**
Disinfection of water main during commissioning	Water Contamination in the event that the network is not sufficiently disinfected. Chemical risk to operatives during disinfection.	Public Site operatives Construction Personnel	**4.10.5 Disinfection** The Developer shall submit for approval to the Irish Water field engineer a method statement that includes drawings showing the location of the disinfectant insertion point and disinfection sampling points and which outlines the proposed methodology to be used for disinfection. Pipelines shall be filled with potable water and a disinfectant inserted into the main to achieve a minimum free chlorine level of 20mg/l at the beginning of a 24 hour contact period. A maximum free chlorine level of 30mg/l shall not be exceeded at the beginning of the contact time period. Disinfection sample points shall be adjacent to the insertion point(s) and at the ends of the mains being disinfected. All pipelines shall be disinfected. This can be achieved generally using a sodium hypochlorite solution or other disinfectant subject to Irish Water approval which is suitable for drinking water disinfection. Typical products on the market contain 10 – 14% available chlorine by solution and the dose rate is dependent on the strength of the solution and the volume of water required in the Water Main. Service pipes shall be flushed with mains water before use and will generally not require disinfection procedures. Service pipes with an outside diameter greater than 50mm or those where there is a risk that the pipe may have been contaminated shall be swabbed, disinfected, flushed, etc. as outlined above and undergo water quality sampling as outlined below in Section 4.11. Disinfectants shall comply with Section 13 of the 2014 Drinking Water Regulations, SI 122 of 2014, which specifies the quality of treatment, equipment and materials relating to the preparation or distribution of water intended for human consumption. Dosing shall be achieved using a calibrated dosing pump. Chlorine-based solutions and tablets shall not be used after the stated "expiry date". Procedures shall be in place to ensure that diluted chlorine solutions (for use for example in spray chlorination techniques) are also used within a stated time to ensure their effectiveness. Chlorine-based solutions shall only be stored in dedicated and clearly marked containers. Storage sites shall have sufficient bunding to prevent accidental spills affecting a wider area. Containers previously used for the storage of any other products shall not be used. The free chlorine levels shall be tested at the disinfection sample points at the beginning of the contact period using a chlorine comparator test kit to ensure that the above minimum required chlorine levels have been attained. The test results, sample locations, date and time shall be recorded. The chlorinated water shall be left in the Water Main for a minimum contact period of 24 hours for checking of residual chlorine. At the end of the contact period, water shall be sampled from the same points. These samples shall be tested using a chlorine comparator test kit. The test results, sample locations, date and time shall be recorded and the free chlorine levels shall also be recorded. It is a requirement that at the end of the contact period that a minimum free chlorine level of 10mg/l is maintained or that the pre-contact period chlorine level has not been reduced by more that 50%, where the pre-contact free chlorine level exceeds 20mg/l. The test results, sample locations, date and time shall be recorded. If the 10mg/l minimum free chlorine level has not been maintained at the end of the contact period at all sample points, or the 50% reduction in pre contact free chlorine level has been exceeded, the disinfection process shall be repeated. At the end of this process, Irish Water shall be supplied with full details of the disinfection process and the associated samples taken. 4.10.6 Disposal of Water The water used for disinfection should be disposed of in a safe and environmentally responsible fashion. Water used for disinfection shall be de-chlorinated prior to discharge to sewers or to watercourses. Discharge of the water to sewers in the control of Irish Water shall not take place without Irish Water's express approval. The de-chlorination / disposal of the water containing residual chlorine shall be carried out in an approved manner to ensure no damage is caused by shock loading of the sewer or damage to a watercourse. 4.10.7 Flushing Water Mains containing super chlorinated water shall be flushed with normal potable water and scoured so that the water therein achieves a free chlorine level within 5% of the incoming water used for flushing. The free chlorine levels of both the discharged water and the incoming feed water shall be measured to ensure the whole of the main has been adequately flushed. The free chlorine levels shall be tested using a chlorine comparator test kit to ensure that the above minimum required chlorine levels have been attained. The chlorine residuals shall be recorded for audit purposes and provided to the Irish Water field engineer.	3	3	9	**Medium**	All design to be carried out by competent designers. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Field Engineers will undertake site inspections during installation and commissioning. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**

Activity	Related Hazard	Who is at Risk?	Existing Control Measures	Initial Risk				Additional Control Measures	Residual Risk			
				Probability	Consequence	Risk	Ranking		Probability	Consequence	Risk	Ranking
Design	Inappropriate sizing and selection of pumping plant.	Public Operation & Maintenance Personnel Construction Personnel	**Section 5.3 Booster Pump Stations Technical Requirements** The following technical requirements shall apply to booster pumping stations: • A minimum of 1 No. stand-by pump, with a capacity equal to that of a duty pump, shall be provided at each booster pump station. Stand-by pumps shall be installed on-line and be available continually. • All pumps shall be arranged for self-priming and shall be designed to be un-chokeable; • Pumps shall be driven by electric motors (and gearboxes if necessary); • All pump bearings shall be designed for a service life of not less than 100,000 hours; • Pump bearings shall be designed for loading 20% in excess of calculated maximum loading and shall be suitable for reverse rotation; • Pump rotating assemblies shall be statically and dynamically tested and balanced; • All pump sets shall be fitted with both a suction and discharge pressure gauge c/w isolation valve; • All pump sets shall be fitted with both a suction and discharge isolation sluice valve and discharge non-return valves; • All pump sets shall be provided with manufacturer's works test certificates; • Lubrication arrangements shall be designed to avoid any contamination of the pumped liquid; • Net Positive Suction Head (NPSH) requirements of the pumps, based on the 2% output drop criterion shall be at least 1m less than the NPSH available at every working condition; • Water velocities in the pump suction branches shall not exceed 2m/sec and those in delivery branches shall not exceed 3.5m/sec when the pump is operating within its specified duty range; • Within the specified duty range there shall be no discernible noise due to hydraulic turbulence or cavitation within either the pump or it's associated pipework and valves; • The pumps shall have an operating speed of 1,450 r.p.m. If a pump with an operating speed of 1,450 rpm is not available on the market to suit the application, the Developer is required to demonstrate this and only on confirmation of this by Irish Water will an proposed alternative speed pump be considered for the booster pump station; • Pump characteristics shall be stable, non-overloading and shall be such that the pumps shall operate close to maximum efficiency at the design duty point; • All pump/motor couplings shall be laser aligned following final installation of baseplate and pipework All motors must operate at or above the IE 3 efficiency band; A bypass pipe arrangement shall be provided at the booster pump station, to include a sluice valve and a non-return valve (The sluice valve is to be left open during normal operation).	3	3	9	**Medium**	All design to be carried out by competent designers. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Design and Construction	Electrocution Insufficient space for required plant Insufficient space for operation and maintenance	Operation & Maintenance Personnel Construction Personnel	**Section 5.9 Kiosk Requirements** Kiosks shall be provided to house the control panel and associated equipment for booster pump stations. The size of kiosk will be dependent on the plant served by the kiosk. Consultation shall be undertaken with Irish Water with regard to the appropriate size of the kiosk. Kiosks shall be located sufficiently far from carriageway and kerb to prevent damage from vehicles parking or mounting the kerb. Kiosks shall be located to facilitate safe access for maintenance personnel. The kiosk shall not impede foot traffic and if possible be located off the footpath. The kiosk for booster pump stations shall be of a 'non-walk-in' design with open base and one piece roof that slopes to the rear. Kiosks for flow meters, pressure reducing valves, etc. shall be of a 'non-walk-in' design with open base and one piece roof. The roof panel should be removable (bolts) to facilitate backboard replacement. All kiosks shall be supported on a reinforced concrete plinth (C25/30 concrete to IS EN 206) extending 150mm in each direction beyond the external plan dimensions of the kiosk. The plinth shall have a level finish, with 25mm chamfered edges, 150mm above the finished ground level.	3	3	9	**Medium**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require it's amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**
Design and Construction	Electrocution Insufficient space for required plant Insufficient space for operation and maintenance	Operation & Maintenance Personnel Construction Personnel	**5.10 Structure Enclosures** In some instances a permanent structure shall be provided to house plant and control equipment for water supply infrastructure. The structure for the housing of such plant and control equipment shall be constructed of block work, 215mm solid block, laid on flat, bedded in mortar, of minimum M12 strength to IS EN 998-Part 2, and flush pointed. The block units shall comply with the requirements of IS EN 771 - Part 3, with smooth render finish internally and externally (or an alternative finish agreed with Irish Water subject to the requirements of Planning). The block work shall be supported on a reinforced concrete support slab finished 150mm above general finished ground level. The structure shall have a 150mm reinforced concrete roof slab, projecting 150mm outside of the wall, with drip beading, complete with asphalt to provide a weatherproof roof. The structure shall have galvanised steel security doors, twin leaf, opening outward and fitted with furnishing (as outlined in Section 5.7 of the Code of Practice for Water Infrastructure) for the kiosk. Appropriate ventilation, openings, etc. as described above for the kiosk shall be provided to achieve the same environmental parameters as outlined. The structure shall also be equipped with lighting, ventilation, welfare facilities, etc. to allow maintenance and monitoring to be carried out.	3	3	9	**Medium**	All designs to be carried out by competent designers. Design risk assessments to be prepared for all designs. Design co-ordination required by a competent PSDP. Construction operations to be co-ordinated by a competent PSCS. IW CDS Design Team will vet the submitted design and may require its amendment if deemed inadequate. IW CDS Field Engineers will undertake site inspections during installation. IW CDS Field Engineers will vet the final installed infrastructure prior to vesting.	2	2	4	**Low**

Consequence						
	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	**2**	**3**	**4**	**5**
		Probability				

Risk Score	Risk Ranking	Controls Required	Timeline
1 to 4	LOW	Low risk, controlled satisfactorily. No additional controls are required, but activity should be monitored to ensure risk does not increase over time	N/A
5 to 10	MEDIUM	Moderate risk, additional controls may be required. Additional Controls should be put in place to reduce risk.	3 months
12 to 16	HIGH	Serious risk, additional controls must be put in place. Controls should be identified to bring risk level down to as low as is reasonably practicable.	1 week
20 to 25	VERY HIGH	Unacceptable level of risk. The activity should not commence until control measures have been put in place to reduce risk to an acceptable level. Inform relevant business lead immediately	Before works commences / continues

Probability Value	Guidance on each Probability Value
1	**May never happen**. Unlikely to occur - only in exceptional circumstances
2	**Possible**. Considered unlikely – could occur but its doubtful
3	**Probable**. Circumstances can be envisaged when it could happen – some time in the future.
4	**Likely to happen**. Quite conceivable – it probably will occur sometime in the future
5	**Will happen** Likely to occur immediately or within a short period of time; may even be expected to occur frequently.

Consequence Value	Guidance on each Consequence Value	HSQE Element
1	**Insignificant**	
	Minor problem easily handled by normal day to day processes e.g.	
	- injury or ailments not requiring medical treatment	Health & Safety
	- minor errors in systems or processes requiring corrective action, or minor delay without impact on overall operation of a project.	Quality
2	**Minor**	
	Some disruption possible e.g.	
	- minor injury or First Aid Treatment Case.	Health & Safety
	- policy or procedure rule occasionally not met or services do not fully meet needs	Quality
3	**Serious**	
	Significant time and/or resources required e.g.	
	- serious injury resulting in hospitalisation or medical treatment, lost work time and requiring reporting of accident to HSA. General injuries involving employees where a person is injured at a place of work and cannot perform their normal work	Health & Safety
	- one or more key requirements not met. Invonvenient but not detrimental to core IW business or consumer welfare.	Quality
4	**Critical**	
	Operations severely affected or damaged e.g.	
	- life threatening injury or multiple serious injuries causing hospitalisation, leading reporting of dangerous occurance to HSA.	Health & Safety
	- operations consistenty not in line with IW policy or procedures; trends show service is degraded	Quality
5	**Catastrophic**	
	Business survival is at risk or damage e.g.	
	- accident or incident leading to death or multiple life threatening injuries.	Health & Safety
	- critical systems failure, bad policy or on-going non-compliance, IW Business severly affected.	Quality