



Guideline Document

Asset Protection Guidelines

Protection of Greater Western Water Assets

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Guideline Document

Table of Contents

DISCLAIMER.....5

APPROVAL5

1. GENERAL6

 1.1 Introduction6

 1.2 Safety - Your Responsibility6

 1.3 Understanding Greater Western Water Assets7

 1.1.1 Water supply pipelines 7

 1.1.2 Sewer pipelines 8

 1.1.3 Pipeline locations 8

 1.1.4 Pipeline condition 8

 1.1.5 Pipeline material..... 9

 1.1.6 Pipeline fittings and structures 9

 1.1.7 Other assets (Sites) 10

 1.4 Duty of Care.....10

 1.5 Recovery of Cost10

2. PIPE PROTECTION ENVELOPES NEAR A GWW ASSET..... 11

 2.1 No Go Zone.....11

 2.2 One Metre – Buffer Zone12

 2.3 Zone of Influence13

3. PROTECTION OF ASSETS FROM CONSTRUCTION ACTIVITIES... 14



Guideline Document

3.1	Clearance to Asset.....	14
3.2	Minimum depth of cover.....	16
3.3	Cut and Fill in or over the trench backfill	17
3.4	Safe excavation near existing assets.....	18
3.5	Hydro-Vacuum Excavation.....	18
3.6	Mechanical Excavation.....	19
	2.4.1 Pre-proved excavation method	19
	2.4.2 Prove as you go excavation method	21
3.7	Compaction above GWW Asset.....	24
3.8	Protection of GWW Assets from Surface Loads	24
3.9	Protection of GWW Assets from Vertical Boring and Piles.....	26
3.10	Directional Drilling.....	27
3.11	Planting trees near existing assets.	29
3.12	Protection of GWW Assets from Ground Anchors	30
3.13	Protection of GWW Assets during Pipe Sliding.....	31
	2.4.3 Design Considerations	32
3.14	Protection of GWW Assets from Vibration	33
3.15	Protection of GWW Assets from Ground Movement.....	34
4.	RESTORATION OF SITE.....	36
4.1	Backfill	36
4.2	Appurtenances.....	36
	4.2.1 Valves	36
	4.2.2 Hydrants.....	37
	4.2.3 Property Connections.....	37
4.3	Contact	37
5.	DEVIATIONS TO STANDARDS	38
6.	REFERENCES	38
7.	SUPERSEDED	38
8.	REVIEW PROCESS.....	38
9.	VERSION CONTROL TABLE.....	39
	APPENDIX A. ABBREVIATIONS.....	40



Guideline Document

APPENDIX B. DEFINITIONS41
APPENDIX C. MRWA REFERENCES42

Table of Figures

Figure 1 - Pipe No Go Zone..... 11
Figure 2 - Zone of Influence..... 13
Figure 3 - Concrete cover slab..... 16
Figure 4 - Protection of assets from surface loads 25
Figure 5 - Protection of assets from vertical boring 26
Figure 6 - Requirements for HDD above an existing GWW asset (section view) 27
Figure 7 - Requirements for HDD below an existing GWW asset (section view)..... 28
Figure 8 - Requirements for HDD near GWW assets (plan view)..... 28
Figure 9 - Ground anchor..... 30
Figure 11 - Ground anchor clearance to embedment zone 30
Figure 11 - Pipe slinging principles (elevation view) 32
Figure 12 - Pipe slinging principles (plan view)..... 32
Figure 13 - Trench Backfill Zone from MRWA-W-202..... 36



Guideline Document

DISCLAIMER

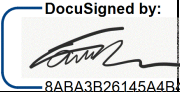
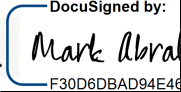

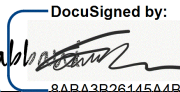
The attached document is a guideline used for construction and excavation works on and near Greater Western Water's (GWW's) existing infrastructure only. GWW reserves the right to alter or deviate from the requirements in the document to suit the specific site conditions. These guidelines apply to assets that are in good condition and pose a low failure risk. Assets determined by GWW to be in poor condition, or pose a high failure risk, or be difficult to maintain following works, shall be renewed. The extent of renewals shall not leave any sections of isolated poor condition assets (e.g. old pipe).

The document has been produced with the aim of providing greater clarity of the requirements for working near GWW's existing assets and hence any user of this document agrees to indemnify GWW against any loss or liability in connection with the use of this document.

GWW reserves the right to modify, amend, delete or withdraw this document without notice.

The use of this document does not relieve any person from their obligations to complete "Before You Dig" (BYDA) enquiries and ensure industry best practises are adopted for identifying, locating and constructing near existing GWW assets.

APPROVAL

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1. GENERAL

1.1 Introduction

This document has been provided by Greater Western Water (GWW) as a reference for standard conditions and requirements when working in close proximity to GWW's existing water and sewer assets.

This document does not remove the requirement to satisfy conditions found in the *Guidelines for Proposed Works Over / Adjacent to Water Corporation Assets up to and including 225mm Diameter* which provides an outline of the requirements which need to be considered when planning to construct structures over a GWW easement or within 1.0 metre of a sewer or water asset within a private property¹.

It is important that you contact your GWW representative to discuss with them what works will be occurring to ensure that the information within this document is relevant to your works.

This document provides additional guidance for works affecting;

- assets larger than 225mm or,
- assets of any diameter located in public spaces such as a road reserve or,
- assets located in any site or facility operated by Greater Western Water.

All information within this document is general in nature and you must receive written permission to undertake any works within 3m of an asset. GWW does not guarantee the accuracy of our plans or the mitigation methods described within this document. Your professional engineer as defined under the Victorian Government's Professional Engineers Registration Act 2019 shall review any technical information provided by GWW and take full responsibility for its use.

GWW will not be made accountable for any damage done while practicing the methods described.

1.2 Safety - Your Responsibility

At all times the safety of the general public, your employees and GWW employees is paramount and remains your responsibility.

You therefore have to determine how to best conduct the work in consideration of the information provided in this guideline, while ensuring that you maintain a safe system of work at all times.

¹ Document is available at https://www.gww.com.au/sites/default/files/2022-07/guidelines_for_proposed_works_over_assets_1.pdf



Guideline Document

1.3 Understanding Greater Western Water Assets

We operate an extensive network of water, non-drinking water and wastewater assets throughout our licenced area.

There are many different types of assets in use but those that are at greatest risk of damage are our buried pipelines. Our pipelines have different functions, criticalities, sizes, depths and materials. Many pipes operate at high pressures and flow rates. Pressurised pipelines present greater risks than pipelines that flow by gravity.

The main types of pipelines include:

1.1.1 Water supply pipelines

The definitions below apply for both the potable and non-drinking water networks. All supply pipelines operate under pressure.

Transfer main	A water main that interconnects source(s), treatment works, reservoir(s) and/or supply areas, normally without direct consumer connections.
Distribution main	A water main serving as the principal distributor within the supply area, normally without direct Property Service Connection. Distribution mains are generally sized greater than DN 280mm
Water reticulation	A water main that connects a distribution main with Property Service Connection. Reticulation mains are generally sized DN 100mm to DN 280mm and connect to multiple sources of supply.
Property Service Connection	A water pipe that supplies water from the reticulation main to the consumer. The portion of the service pipe under the control of a Water Agency generally terminates at the water meter, or in the case of fire services, the isolating valve of the fire protection system



Guideline Document

1.1.2 Sewer pipelines

The definitions below apply for sewer assets.

Trunk sewers	A network of pipes nominally DN 975 and greater that connect the branch sewers and transport sewage to a treatment facility
Branch sewers	A network of pipes nominally DN 280 to DN 975 that connect the reticulation pipes within a reticulation area or a group of reticulation areas. Property connection sewers are not generally connected directly to branch sewers.
Reticulation sewers	A network of pipes including property connection sewers nominally up to and including DN 280 that receives sewage from customer properties (residential, commercial and industrial).
Property connection	A pipe that connects the customer sanitary drain to the reticulation / branch sewer. It includes a junction on the main sewer, a property connection fitting, in some cases a vertical riser, and sufficient straight pipes to ensure the property connection fitting is within the lot to be service
Rising sewer / pressure main	A pipeline that operates under pump pressure. This includes sewer pipelines that operate under vacuum.

1.1.3 Pipeline locations

Our pipelines are located in road reserves, public open space and in private property. Sewers are the most common type of pipeline located in private property however occasionally sewer pressure mains, water pipelines can also be found in private property.

1.1.4 Pipeline condition

Our pipelines vary in age and condition; they can be new and in as-new condition or over 140 years old and in poor condition. Where work is to take place near a GWW asset, the project owner should confirm the condition of the asset with GWW. GWW may ask for the condition of the asset to proven by the project owner prior to the work being undertaken and monitored during works.

GWW may also ask for the asset condition to be confirmed after the works have been completed. An example of this would be a pre and post CCTV inspection of a sewer pipe.

Where the pipeline is old or in poor condition, Works may not be able to proceed with replacement or protection of the pipeline having been undertaken first to ensure the GWW continues to service the community as stated in the Water Act 1989 and as directed by the Essential Services Commission.



Guideline Document

1.1.5 Pipeline material

Our older pipelines are typically constructed from asbestos cement (AC), cast iron (CI), vitreous clay (VC), reinforced concrete (RC).

Common materials for newer pipelines include polyvinyl chloride (PVC), polyethylene (PE), glass reinforced plastic (GRP), ductile iron (DI / EcoPur / DucPur), mild steel (MS / MSCL).

Newer pipeline materials are considered to be more robust than older pipe materials which are typically more brittle or more likely to be in worse condition, therefore more easily damaged.

Identifying the material and its age is critical to understanding how interactions with the pipe should be managed. As an example: the interaction with an asbestos cement pipe must comply with all relevant safety guidelines and GWW policies. Interactions with cast iron asset will be focused around ground movement and interactions with metallic mains may require an electrical safety assessment.

1.1.6 Pipeline fittings and structures

There are many different fittings and structures associated with our pipelines. These fittings and structures are essential for pipeline operation and delivery of services to the community.

Common fittings and structures include:

- thrust and anchor blocks
- cathodic protection test points
- flushing, injection and sampling points
- maintenance structures (such as access chambers, manholes, maintenance shafts)
- valves
- water hydrants
- flow measurement devices (such as water and smart meters)
- Backflow devices and non-return valves

Some of these fittings will be identifiable by indicators on the surface, such as covers and lids, while other fittings will be below ground and will not be visible.

Buried fittings may be located at different depths than the pipeline or may be offset from the centre of the pipeline and therefore do not always accurately indicate the pipeline location. For example, air valves extend from the top of a pipeline, while scour valves extend from the bottom and are usually offset to the side.

Similarly, maintenance structures can also be offset from the centreline of the pipe.



Guideline Document

1.1.7 Other assets (Sites)

Other GWW assets include pumping stations, service reservoirs and treatment plants. These assets are usually in dedicated reserves or landholdings, but this isn't always the case.

If a GWW site is located near the proposed works, GWW must be contacted immediately. This includes abandoned assets, as many are still connected to live assets.

1.4 Duty of Care

It is the responsibility of the project owner and any person(s) engaged by the project owner (including, but not limited to; architect, building surveyor, consulting engineer, contractor, developer) to ensure that GWW's assets are protected from the impact of any works. This includes maintaining accessibility for GWW operational personnel (e.g. valves should not be covered from construction activities and be accessible for use to enable repairs and maintain customer service in the event of a burst).

It is solely the responsibility of the project owner or person(s) constructing the works to:

1. obtain 'Before You Dig' plans showing GWW's assets in the vicinity of the proposed works no more than 30 days prior to the commencement of works
2. seek further detailed information to identify an assets horizontal and vertical position.
3. locate all underground assets that may be damaged or interfered with by the proposed works via non-destructive digging (NDD) or hand excavation, prior to the commencement of works to confirm the assets horizontal and vertical position.

NDD must not occur on GWW's assets DN150 or greater without GWW permission. NDD can strip protective coatings from sewer & water mains, dislodge thrust restraints and remove the ground stabilisation for un-secured pipeline. Therefore, when undertaking NDD, the Contractor shall ensure that reduced pressure is applied once close to GWW assets refer to section 3.5 for guidance.

Contact the appropriate GWW Officer:

- For Capital Works or Major Government Works - the GWW Project Manager assigned to the project, Or
- For all other works, contact Other Authorities Works (OAW) via email oaw@gww.com.au.

GWW's Officer for OAW must be contacted via email at least 14 days prior to any works in the vicinity of water and/or sewer mains 280mm or greater in diameter as additional work conditions may apply.

1.5 Recovery of Cost

If any damage is caused to GWW's assets due to works undertaken by the Contractor, or if any of GWW's assets are interfered with (i.e. built-over, buried, altered or removed, including any cover or supports) without GWW's written consent, GWW will seek to recover costs of repairing such damage or interference under the Water Act 1989.

There are statutory offences under the Water Act 1989 and the Road Management Act 2004 for damaging or interfering with GWW's assets without prior written consent. In the

event that damage is caused to GWW's assets, please contact GWW's **Faults & Emergencies on 13 44 99 immediately.**

2. PIPE PROTECTION ENVELOPES NEAR A GWW ASSET

2.1 No Go Zone

The No Go Zone is an area which equates to the embedment zone surrounding a single pipe. The embedment zone offers protection to the pipe and should not be impacted by any activity near the pipe.

The size of the embedment zone differs based on the diameter and type of service being provided.

It is assumed that water pipes have:

- been laid without sharing the trench with other services; or
- that potable and non-drinking water have not been placed in the same trench.

If a trench has been shared contact Greater Western Water to confirm the extent of the No Go Zone.

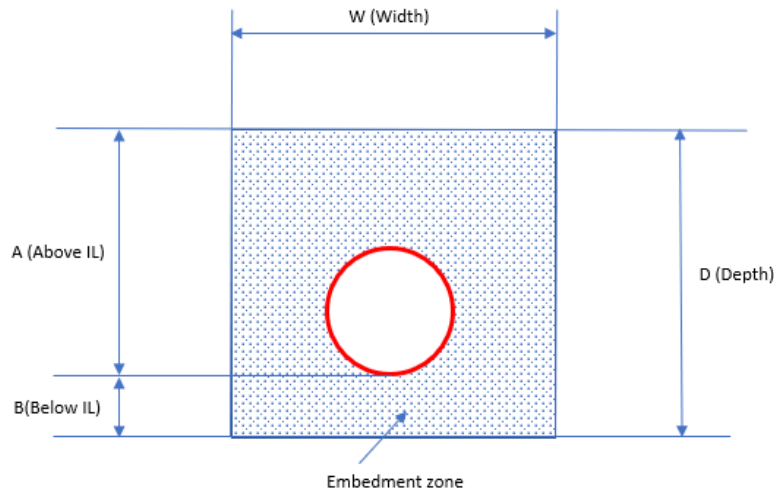


Figure 1 - Pipe No Go Zone

Table 1 below provides dimensions for the No Go Zone for sewer and water respectively.



Guideline Document

Nominal Diameter	Width	Depth	CL to Edge (1/2 width)	Top of zone above IL (A)	Bedding Depth (B)
100	800	550	400	400	150
150	850	600	400	450	150
225	1025	725	500	525	200
300	1100	800	500	600	200
375	1275	875	600	675	200
450	1350	950	600	750	200
525	1525	1075	700	825	250
600	1600	1150	800	900	250
750	1750	1300	900	1050	250
900	1900	1450	1000	1200	250

Table 1 - No Go Zone dimensions for sewer and water

2.2 One Metre – Buffer Zone

Activity within a one (1) metre buffer around No Go Zone may be approved by GWW. The requesting body must provide information on the clearance to the asset and details on how the asset will be protected. Works within the buffer zone will only be considered should there be no reasonable alternative.

2.3 Zone of Influence

A zone of influence is an area either side of a buried pipe where:

- Loads from buildings or structures on the surface may have an impact on the buried pipe.
- Loads from construction activities on the surface may have an impact on the buried pipe.

There are safety risks when working within the zone of influence of an asset e.g., collapse of trench wall into trench.

The zone of influence is calculated as described below:

1. Determine the depth to bottom of the pipe no go zone.
2. From the lower edge of the no go zone draw a line at a ratio 1:1 to the surface.
3. The zone of influence is the area above this line to the surface.

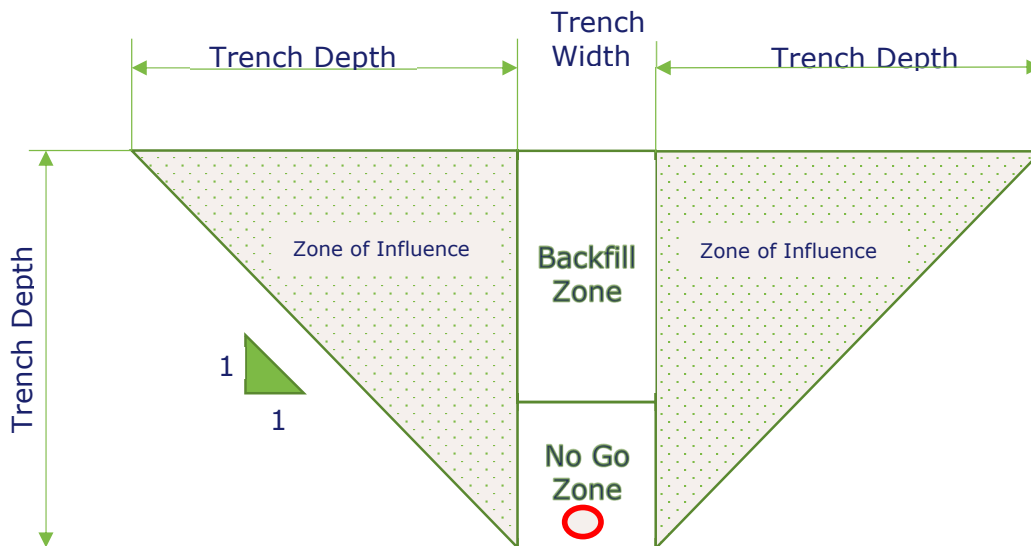


Figure 2 - Zone of Influence

GWW assume a ratio 1:1 (45 degrees). Sand, filled ground, loam soils may require a different ratio. Geotech should be consulted to confirm the ratio to be used for non clay soil.

Works within the zone of influence requires approval from GWW.



Guideline Document

3. PROTECTION OF ASSETS FROM CONSTRUCTION ACTIVITIES

3.1 Clearance to Asset

Where GWW approves the location of an asset within the One Metre Buffer Zone the clearances described in the tables below shall be used. The clearances shall be taken from the GWW asset to the other underground service. In most cases this will be from edge of pipe to edge of pipe however the minimum clearances will apply from the outer edge of maintenance structures and concrete encased pipe. The diameters are based on nominal diameters with the exception of PE.

Utility (New Service)	Minimum Horizontal Clearances (mm)		Minimum Vertical Clearances ^{1,9} (mm)
	Existing Water Main ≤ DN200	Existing Water Main > DN200	
Water Mains ≤ DN375	Refer MRWA-W-202	Refer MRWA-W-202	150/300/500 ²
Water Mains > DN375	Refer MRWA-W-202	Refer MRWA-W-202	300/500 ²
Gas mains	Refer MRWA-W-202	Refer MRWA-W-202	150/300/500 ²
Fuel Pipelines or Gas Transmission Pipelines	3000	3000	3000
Telecommunication conduits and cables	300 ³	600	150/300 ²
Electricity conduits and cables	500 ⁷	1000 ⁷	225/300/1000 ^{2,7}
Stormwater drains	300 ³	600/1000 ¹⁰	150/300/500 ^{2,4}
Sewers – gravity	1000 ⁵ /600	1000 ⁵ /600	500 ⁴
Kerbs	300 ⁶	300 ⁶	Refer MRWA-W-202
Boxing out for Road Pavements	-	-	500
Vertical Drilling	Refer to Section 3.9		
Horizontal Drilling	Refer to Section 3.10		
Planting Trees	Refer to Section 3.11		

Table 2 - Water Main Clearances



Guideline Document

Utility (New Service)	Minimum Horizontal Clearances (mm) ⁹		Minimum Vertical Clearances ^{1,9} (mm)
	< DN300	≥ DN300	
Sewers <DN 300	300	600	150/300 ²
Sewers ≥DN 300	600	600	300/500 ²
Gas mains	300 ³	600	150/300/500 ²
Fuel Pipelines or Gas Transmission Pipelines	3000	3000	3000
Telecommunication conduits and cables	300 ³	600	150/300 ²
Electricity conduits and cables	500 ⁷	1000 ⁷	225/300/1000 ^{2,7}
Stormwater drains ⁸	300 ³	600/1000 ¹⁰	150/300/500 ^{2,4}
Water mains	1000 ⁵ /600	1000 ⁵ /600	500 ⁴
Kerbs	150 ⁶	600 ⁶	N/a
Boxing out for Road Pavements	-	-	500
Vertical Drilling	Refer to Section 3.9		
Horizontal Drilling	Refer to Section 3.10		
Planting Trees	Refer to Section 3.11		

Table 3 – Sewer Main Clearances

NOTES

1. Sewer mains shall always be constructed below water mains
2. A minimum vertical clearance of 300mm applies if the size of the existing sewer or water is > DN300mm or the proposed new utility service is > DN300. If both assets are >DN300 then a clearance of 500mm is required.
3. Clearances can be further reduced to 150 mm for distances up to 2 m where mains are to be laid past installations such as concrete bases for poles, pits and small structures, providing the structure will not be destabilised in the process. The clearance from timber poles should be at least 200 mm and preferably 300 mm.
4. Sewer mains should always cross under water and stormwater drains. For cases where there is no alternative the design shall comply with Details E and F of Drawing MRWA-W-203
5. Where a parallel sewer is at the minimum vertical clearance lower than the water main (500 mm), maintain a minimum horizontal clearance of 1000 mm. This minimum horizontal clearance can be progressively reduced to 600 mm as the vertical clearance is increased to 750 mm.
6. Clearance from kerbs shall be measured from the nearest point of the kerb.
7. A vertical and horizontal clearance of 1m shall be maintained from high voltage electrical installations (50kV for overhead powerlines and 11kV for below ground powerlines) for all pipe types. If the GWW pipe is metallic then Refer to MRWA WSA03 5.4.12 or MRWA WSA02 5.4.3 for more information. A physical barrier (slabbing) should be maintained above the conduits/cables to reduce the likelihood of a third-party asset strike during an emergency repair.
8. A sewer to be constructed under an existing or proposed stormwater pipe or channel ≥DN 375 may be concrete encased. Concrete encased sewers crossing under brick barrel drains or unlined open drain or channel. The concrete encasement shall extend at least 1 m each side of the stormwater pipe or channel. Clearances between the sewer and other services shall be measured from the outer surface of the concrete encasement.
9. Directional drilling or vertical drilling shall not be used within 1m of GWW assets.
10. A horizontal clearance of 1000mm shall be maintained if the drain is greater than DN600.

3.2 Minimum depth of cover

Sewer and water mains shall maintain the following minimum depth of cover as outlined in Table 4. All covers listed are to the obvert (top of pipe).

	Sewer	Water
Tramways	1200	1200
Waterways (unsealed)	2000	2000
Waterways (sealed)	900	600 (\leq DN600) 750 (\geq DN750)
Railway Lines	2000	2000
Non-Trafficable Areas	900	600 (\leq DN600) 750 (\geq DN750)
Local Traffic Streets (i.e. Brown roads in Melways)	1200	600 (\leq DN225) 750 (DN300-DN450) 1000 (\geq DN600)
Major Roadways (i.e. Grey and Orange in Melways)	1200	750 (\leq DN225) 1000 (DN300-DN450) 1200 \geq DN600
VicRoads Roadway/Major Roads/Freeways (i.e. Grey)	1200	1200

Table 4 - Minimum depth of cover

If the minimum cover cannot be provided the use of Type G (Concrete Cover Slab) embedment could be considered as per MRWA-S-202. GWW must approve the use of this embedment.

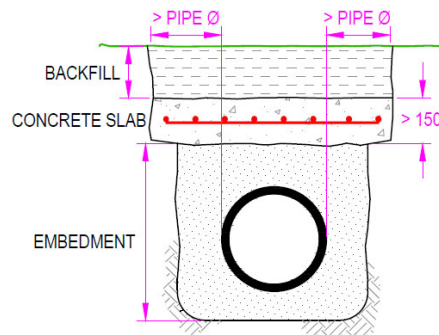


Figure 3 - Concrete cover slab

Consideration shall be given to the use of lifting lugs and limiting the weight of each slabbed section to enable future access to the asset.



Guideline Document

3.3 Cut and Fill in or over the trench backfill

Cut and fill e.g. permanent cut and placing fill for road works, etc., is not permitted in or over the trench backfill zone of a water or sewerage network asset without written approval from GWW.

If approved, adjustment to the level of affected surface fittings (e.g. sewer maintenance structures, valve boxes, fire hydrants, meter pits) may be required.

As a guide, GWW may approve cut and fill in or over the trench backfill zone when the following conditions are met:

Cut	Fill	Cut	Fill
Gravity sewer network		Water main network	
A minimum cover As outlined in Table 4	Sewer depth does not exceed 3500mm in private property.	A minimum cover As outlined in Table 4	Water main depth does not exceed 1500mm.
Sewer property connection		Water property connection	
Not less than 900mm cover in private property. Not less than 900mm cover in the road reserve.	Connection depth must not exceed 2500mm	A minimum cover of 450mm is maintained	Connection depth must not exceed 1500mm

Table 5 - Minimum and maximum depth of cover

The age and condition of the pipe must be considered when determining if the pipe has enough strength to withstand the additional cover (static load) being placed over and surrounding the pipe. The load capacity will be checked against AS2566 for flexible pipes.



Guideline Document

3.4 Safe excavation near existing assets

The following principles should be used when excavating near existing GWW assets:

- Follow the 5 P's of safe excavation (Plan, Prepare, Pothole, Protect, Proceed)/ Refer to the BYDA website for more information (<https://www.byda.com.au/before-you-dig/best-practice-guides/>).
- Ensure a BYDA request has been lodged 1-2 business days prior to the works commencing. Review the BYDA plans and responses and ensure any permits are applied for prior to the works commencing.
- Plan the excavation works prior to commencing and ensure the correct equipment and safety systems have been reviewed, approved and are in place prior to the works commencing.
- Conduct an onsite investigation to identify pit lids, meters, marker posts, overhead powerlines and signs of recent excavations.
- Undertake locating activities via certified locators or inhouse competent locators. Clearly mark up the site with the appropriate colour markings
- Establish the exact location of GWW assets via potholing (hand digging) or non-destructive digging (refer to section 3.5).
- Proceed to expose the assets in accordance with the site safety requirements and refer to section 3.5 and section 3.6 for more details.

3.5 Hydro-Vacuum Excavation

When hydro-vacuum excavation is to be used near existing GWW assets the following procedure is to be used:

- Confirm the expected depth of the asset via Before You Dig (BYDA) and electronic pipe location. The shallowest depth between the two methods shall be considered the expected depth.
- Maximum water pressure of 4000 PSI can be used when greater than 450mm from the assets expected depth.
- Maximum water pressures of 1000 PSI can be used when less than 450mm from the expected depth.
- Root cutting heads shall not be used at any time.



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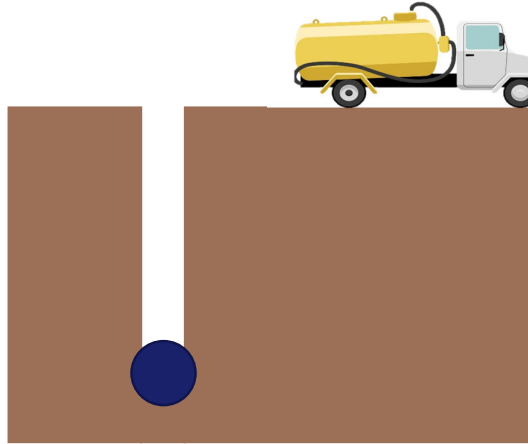
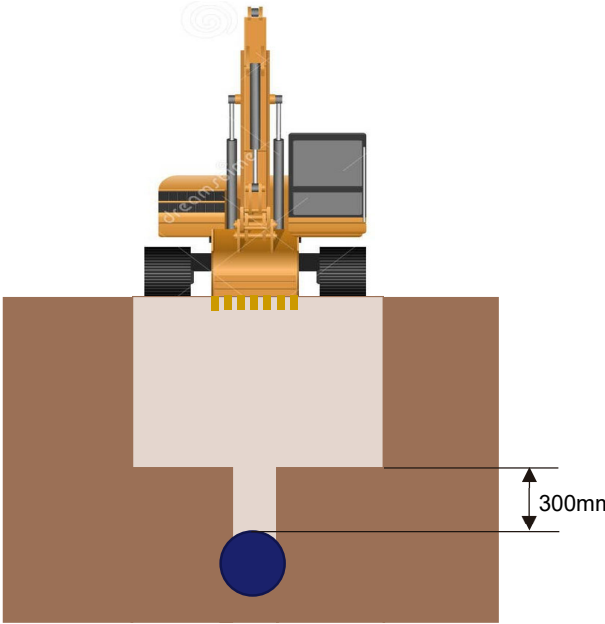

3.6 Mechanical Excavation

There are various mechanical excavation methods that can be used near GWW assets.

Pre-proved excavation method

The following method can be used for pre-proved mains via NDD or hand digging for potholing.

- **Ensure the principles in section 3.4 are applied before excavation has commenced.**
- Physically prove the main via hand digging or NDD prior to mechanical excavation. This is to confirm the exact depth and offset of the main.
- Mechanically excavate until within 300mm of the main.
- Hand dig to expose the main. NOTE – do not enter a deep excavation unless there are shields in place or the trench is benched or battered.

<p style="text-align: center;">1</p> <div style="text-align: center;">  </div> <p>Do not start works until you have:</p> <ul style="list-style-type: none"> • lodged your BYDA enquiry. • Reviewed the plans • Organised the correct equipment for the job (excavators, vac trucks, shields...etc) 	<p style="text-align: center;">2</p>  <ul style="list-style-type: none"> • Locate assets visually and electronically via a BYDA certified locator. • Clearly mark up the site with the appropriate colour markings. • Physically prove the asset via NDD or hand digging.
<p style="text-align: center;">3</p>  <ul style="list-style-type: none"> • Commence excavation and stop within 300mm of the main. 	<p style="text-align: center;">4</p>  <ul style="list-style-type: none"> • Hand dig to expose the main • NOTE – Do not work in an excavation if there is the risk of engulfment or trench collapse unless shields are in place or the trench has been benched or battered. • Ensure WorkSafe is notified for excavations greater than 1.5m


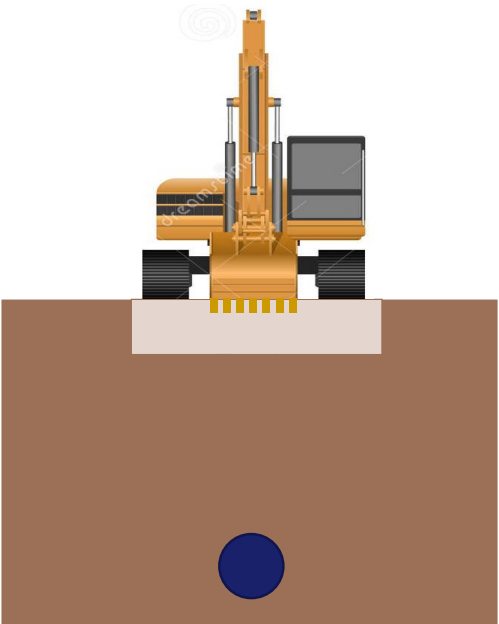
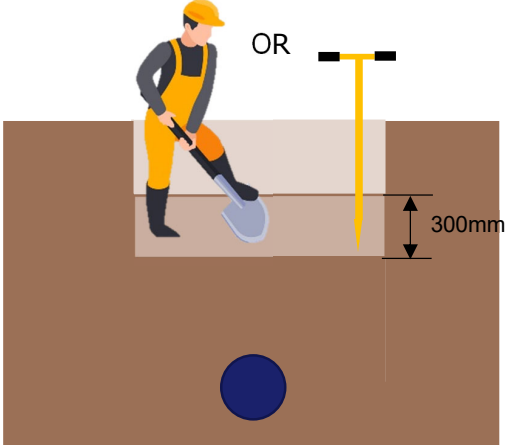
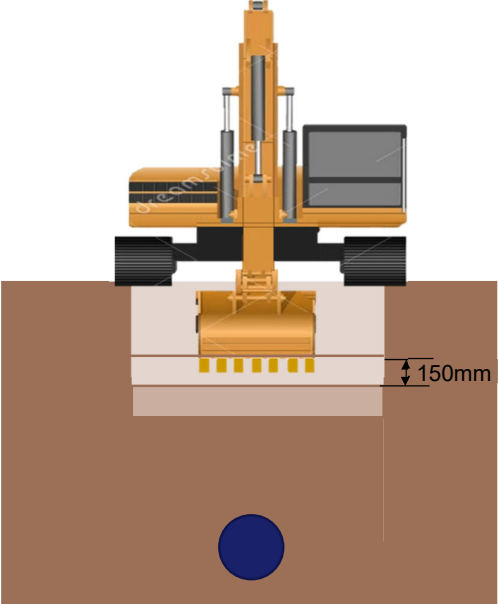


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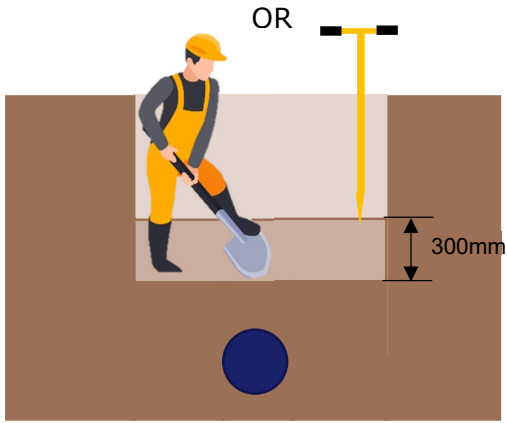
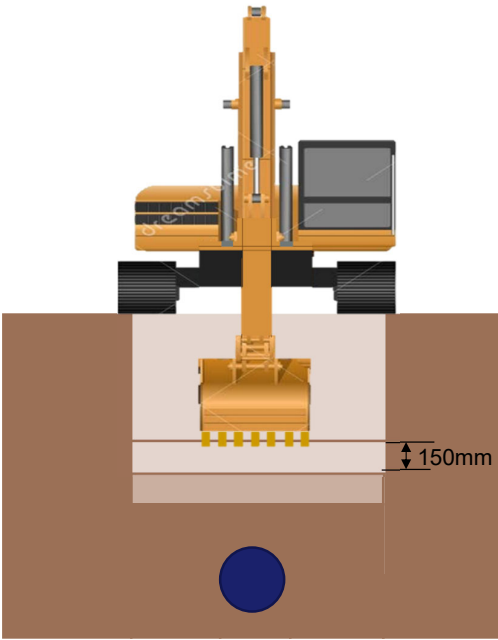

2.4.2 Prove as you go excavation method

The following method can be used for mains that have not been proved upfront with NDD or hand digging.

- **Ensure the principles in section 3.4 are applied before excavation has commenced.**
- Confirm the depth of the main via BYDA plans and electronic location. Assume the main is at the shallowest depth between the two methods.
- Remove any hardstand surfaces.
- Mechanically excavate until you are within 1m of the pipe.
- Step 1 - Physically prove via hand digging or Probe to a depth of 300mm.
- Step 2 - Remove 150mm of spoil via mechanical excavator.
- Repeat Step 1 and 2 until you are expose the main. The main shall be exposed via hand digging the remaining 300mm.
- NOTE – It is recommended to paint the first 300mm of the T-bar a different colour so you have visual confirmation that you have probed at least 300mm deep.

<p>1</p>  <ul style="list-style-type: none"> • lodged your BYDA enquiry. • Review the plans • Organised the correct equipment for the job (excavators, vac trucks, shields...etc) 	<p>2</p>  <ul style="list-style-type: none"> • Locate assets visually and electronically via a BYDA certified locator. • Clearly mark up the site with the appropriate colour markings. • Remove any hardstand surfaces.
<p>3</p>  <ul style="list-style-type: none"> • Commence hand digging or probing in 300mm deep segments. 	<p>4</p>  <ul style="list-style-type: none"> • Once 300mm of spoil has been probed or removed by hand, remove 150mm by mechanical excavation.

Guideline Document

<p style="text-align: center;">5</p>  <ul style="list-style-type: none"> • Continue to hand dig or probe 300mm deeper than the excavator. 	<p style="text-align: center;">6</p>  <ul style="list-style-type: none"> • Continue to excavate in 150mm segments.
<p style="text-align: center;">7</p>  <ul style="list-style-type: none"> • Once the main has been proved by hand or the probe touches the main, hand dig to expose the main. • NOTE – Do not work in an excavation if there is the risk of engulfment or trench collapse unless shields are in place or the trench has been benched or battered. • Ensure WorkSafe is notified for excavations greater than 1.5m 	



Guideline Document

3.7 Compaction above GWW Asset

When undertaking compaction above GWW's underground assets the minimum cover in the table below must always be maintained:

Clearance	Utility Type	Conditions
400mm-750mm	Water and sewer	Depth of cover when operating hand-operated vibrating equipment (e.g. jackhammers/vibrating plates)
>750mm	Water main	Depth of cover when operating mechanical excavators, static and/or vibrating roller equipment etc.
>750mm	Sewer main	Depth of cover when operating mechanical excavators, static and/or vibrating roller equipment etc.
Hand-operated vibrating equipment will be used in the vicinity of fittings and structures on the water and sewer networks.		

Table 6 - Summary of compaction above GWW assets

3.8 Protection of GWW Assets from Surface Loads

Underground assets are designed to withstand static and live loading limits based on their material and installed conditions. Construction equipment (e.g. excavators, heavy rollers etc.) being driven over, along or stationary above the buried pipeline can exceed the pipelines loading limit. In the event of standard or construction vehicles crossing over the existing water assets that are designed for non-trafficable depth of covers (refer to Table 4) or expected surface loads to exceed 400kPa for assets designed for trafficable loads then a load assessment will be required in accordance with AS2566.

Even relatively light loads can crack pipes if the pipe is brittle or has shallow cover. Asbestos cement (AC) and cast iron (CI) pipes are particularly susceptible to damage from loads.

If loading exceeds the capacity of the asset or is changed from the as installed conditions this may result in damage such as cracking, damaged internal lining or leaking joints.

Third parties need to consider:

- Ground conditions (geology and water table)
- Changes to live loading (temporary and permanent)
- Changes to cover depth
- Depth of pipe
- Backfill material
- Pipe material

Guideline Document

An engineering assessment (utilising GWW approved consultant) to verify the loading is acceptable will be required. As part of this assessment GWW will need to understand:

- Native soil modulus (MPa)
- Cover Height (m)
- Embedment soil modulus (MPa)
- Water table height (m)
- Live loading (kPa)
- Surface applied dead load (kPa)

This information will be compared to information in AS2566 to determine if additional protection measures are required to protect the pipe from surface loads.

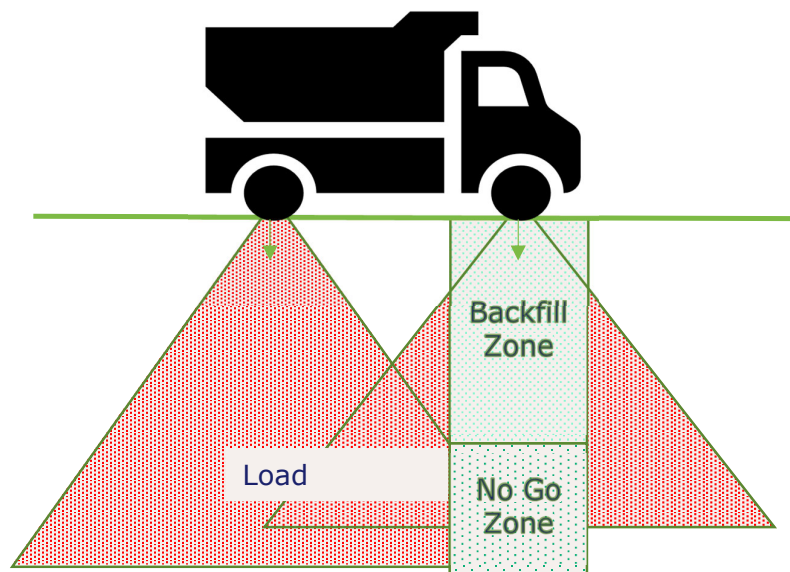


Figure 4 - Protection of assets from surface loads

3.9 Protection of GWW Assets from Vertical Boring and Piles

GWW require that any vertical boring be undertaken with a minimum horizontal clearance as outlined in Table 7. In the event that the vertical boring is for the purposes of installing a structural pile then the design engineer shall provide written confirmation that GWW can excavate up to 600mm (or 1000mm if shields are required) horizontally and 600mm below the pipe without compromising the structural integrity of the pile.

When boring or piling within 2m of a < DN300mm asset or 5m of a ≥ 300 mm asset, NDD to prove the assets location may be required prior to GWW approving the works.

The location of the piling rig must consider load footprint during excavation.

Piles shall be drilled not driven. Pipe Diameter	Depth of Cover	Horizontal Clearance
< DN300	< 1000mm	1000mm
< DN300	> 1000mm	1500mm
\geq DN300	< 1000mm	1500mm
\geq DN300	> 1000mm	2000mm

Table 7 - Minimum Horizontal Clearance for Vertical Boring

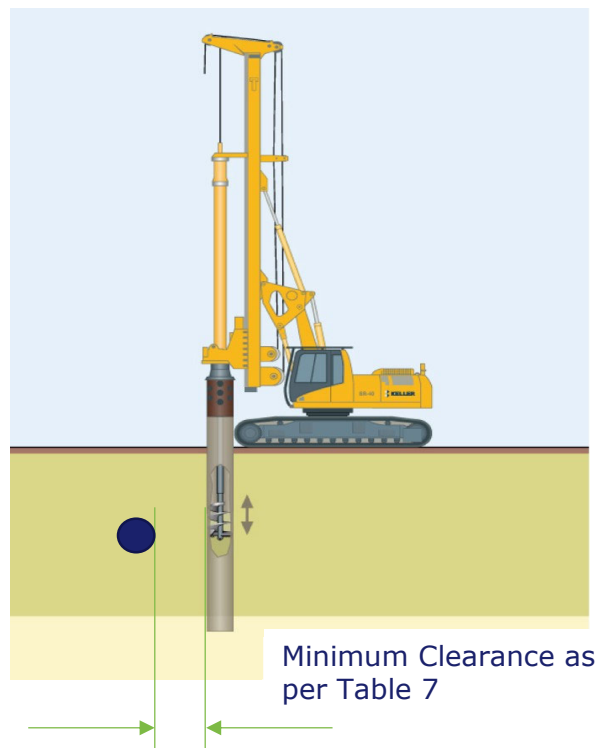


Figure 5 - Protection of assets from vertical boring

3.10 Directional Drilling

When undertaking directional drilling near a GWW asset the location of the asset must be physically proved via hand digging or non-destructive digging prior to the HDD commencing.

Where HDD is to take place within 3m of a < DN300mm asset or 5m of a \geq DN300mm asset, the asset is to be exposed through potholing.

The asset is to remain exposed for the duration of the drilling and backreaming to confirm clearances and monitor drill pathway. Consideration should be made for a slot trench or pilot hole to witness the directional drill position prior to crossing the GWW asset. The slot trench shall extend 1m either side of the bore head. Refer to Figure 6, Figure 7 and Figure 8 for details on drilling over or under an existing GWW asset.

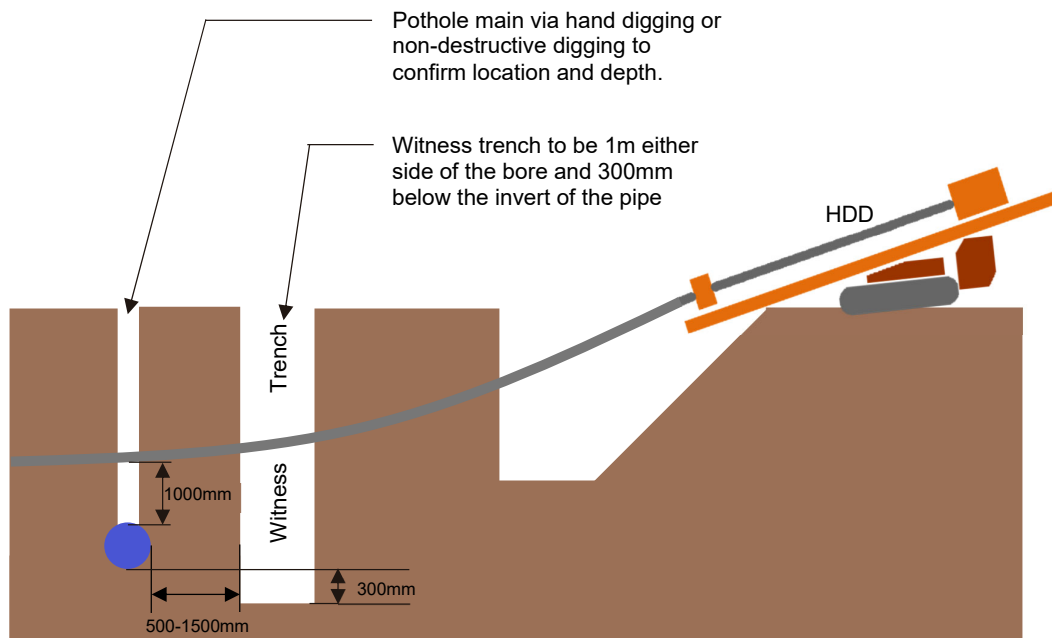


Figure 6 - Requirements for HDD above an existing GWW asset (section view)

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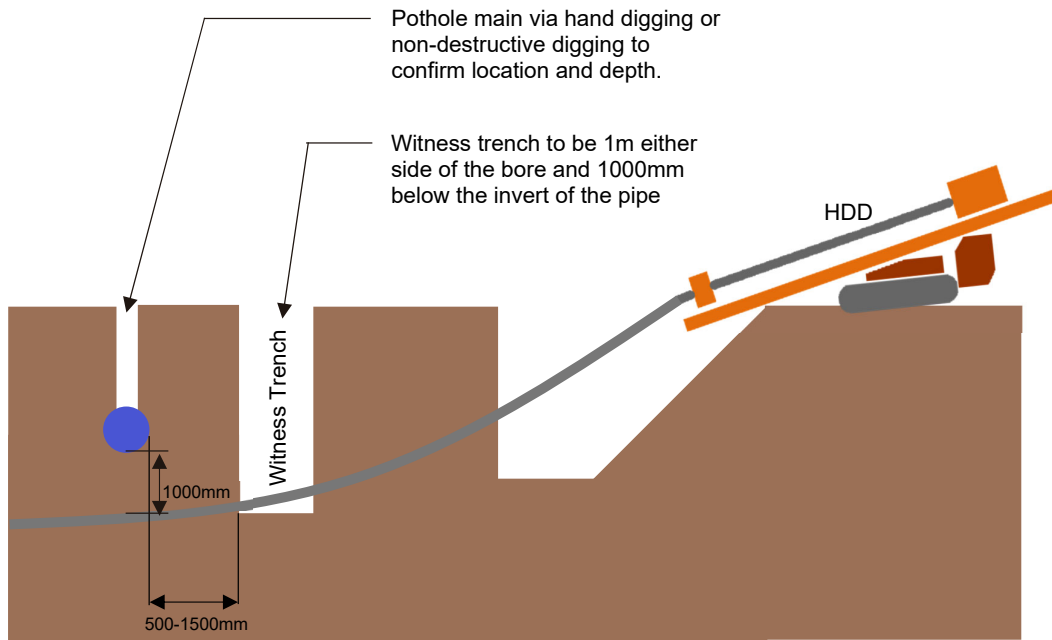


Figure 7 - Requirements for HDD below an existing GWW asset (section view)

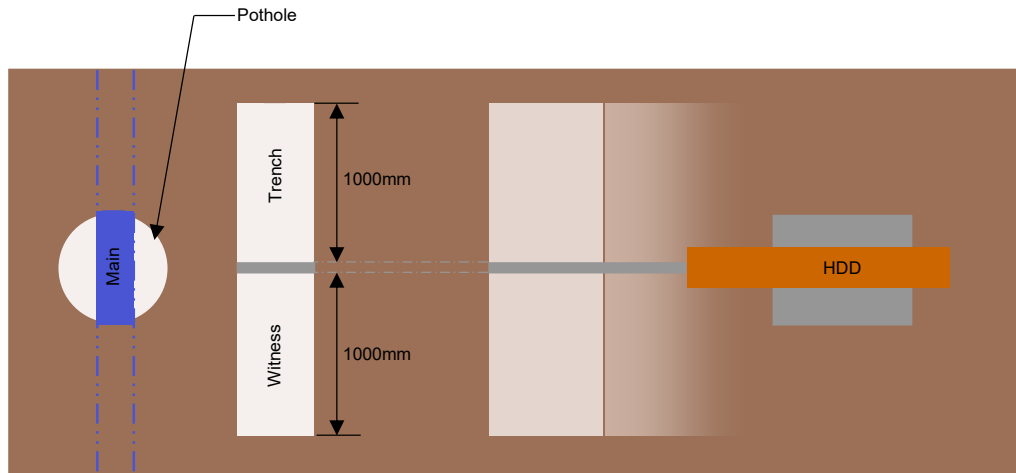


Figure 8 - Requirements for HDD near GWW assets (plan view)



Guideline Document

3.11 Planting trees near existing assets.

It is GWW's preference to maintain a clearance outlined in Table 8 from trees. This is to ensure future access to assets and reduce the likelihood of asset damage as a result of tree roots.

Pipe Diameter	Depth of Cover	Horizontal Clearance
≤ DN300	≤1500mm	750mm
≤ DN300	> 1500mm	1500mm
> DN300	≤ 1500mm	1500mm
> DN300	> 1500mm	1500mm

Table 8 - Horizontal Clearance to Trees

GWW will consider providing a dispensation to these clearances if it can be demonstrated that additional controls are put in place to mitigate any risks of the tree interacting with the existing sewer and water assets. GWW will consider the following factors when determining clearances:

- Provision of a landscaping plan which includes the following detail:
 - Tree species
 - Mature tree height
 - Canopy diameter
 - Root ball diameter
 - Offset from GWW assets
- Provision of physical protection that limits the trees ability to interact with the water assets. These can include:
 - Tree root barriers
 - Planter box

3.12 Protection of GWW Assets from Ground Anchors

A typical ground anchor is shown below.

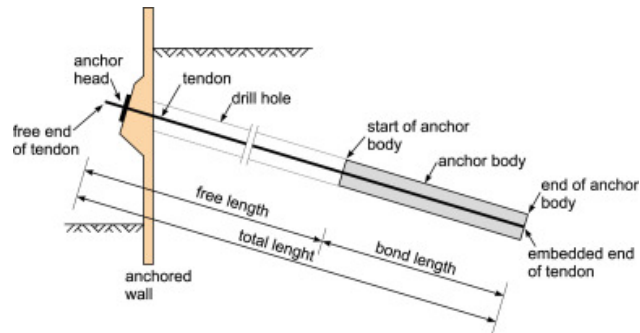


Figure 9 - Ground anchor

The ground anchor must not be installed over the GWW asset and the end of the anchor body must be a minimum of 1.0m clear from the pipe or concrete encasing if type C embedment is used.

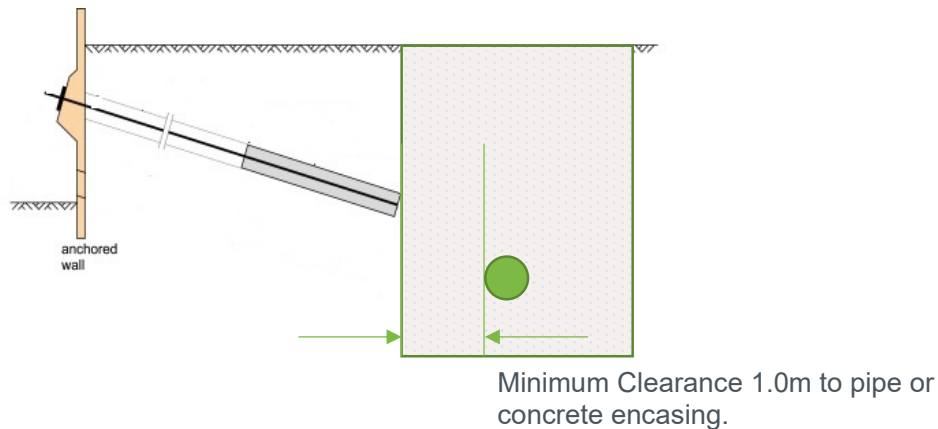


Figure 10 - Ground anchor clearance to embedment zone



Guideline Document

3.13 Protection of GWW Assets during Pipe Sliding

Pipe slinging is a method that may be used as an alternative to HDD. It is used when HDD may not be appropriate or the drilling rig may not be available to meet the project timeline. Pipe slinging is an open trench method of crossing under existing GWW assets. It typically involves wide trenches and as a result, the GWW mains are required to be structurally supported to avoid them collapsing under their own weight. Trenches that will result in a span greater than the lengths listed in Table 9 will require slinging or HDD.

Diameter	Material	Maximum Span ¹
≤ DN225	Steel	2.5m
	Vitrified Clay or Asbestos Cement	0.5m
	Others	2m
> DN300	Steel	2m
	Vitrified Clay or Asbestos Cement ²	-
	Others	1m

Table 9 - Maximum unsupported spans

1. GWW will not allow socket joints or mechanical joints in the exposed trench without prior written consent. Welded Steel and PE joints are acceptable.
2. Asbestos or Vitrified Clay mains shall not be slung and hence the only acceptable methods for these mains are to renew the section of main first with a superior material first (ensure approval is obtained from GWW). The length of the section to be renewed will be worked out by the following formula:

$$\text{Renewal Section} = \text{Proposed Trench Width} + (4 \times \text{Depth of Proposed Excavation})$$

2.4.3 Design Considerations

Figure 11 and Figure 12 below provides a concept design of how to structurally support an asset for slinging. The design of the structural beams is to be signed off by a registered structural engineer. The design shall consider:

1. Stability of the footings and zone of influence.
2. Structural design of the girders
3. Lateral and elevational stability of the pipe.
4. Protection of any pipe coatings from UV and support straps.

GWW will consider a simplified support structure for mains <DN280.

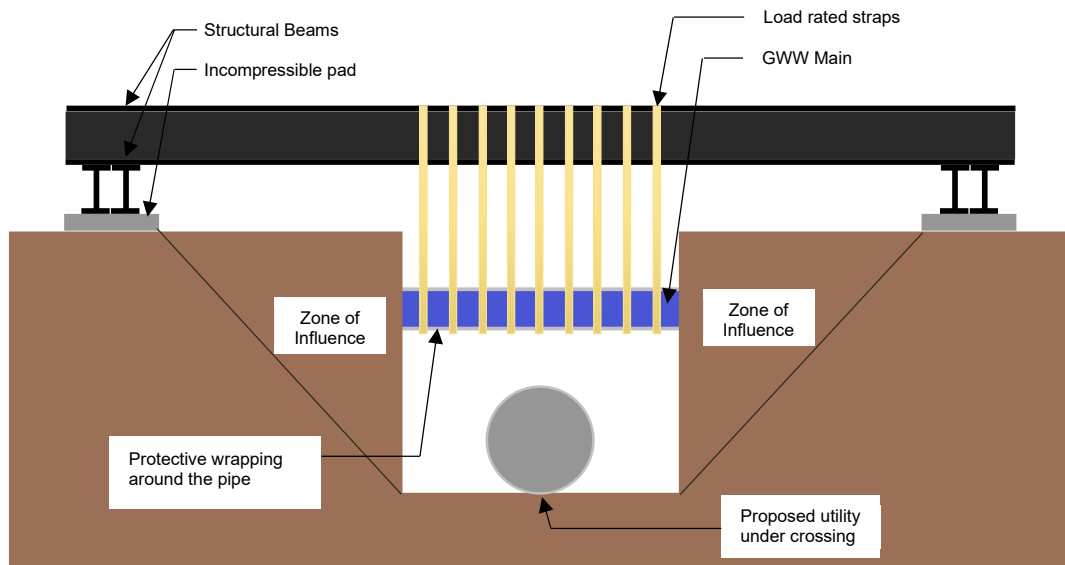


Figure 11 - Pipe slinging principles (elevation view)

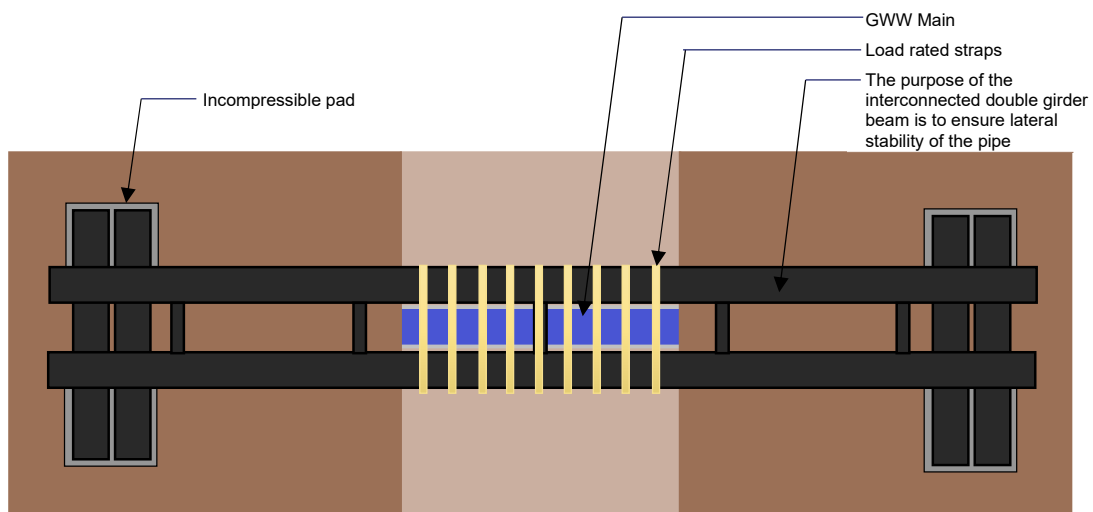


Figure 12 - Pipe slinging principles (plan view)



Guideline Document

3.14 Protection of GWW Assets from Vibration

Construction activity such as tunnelling, piling, rock breaking, etc. within the vicinity of GWW assets, can generate significant vibration putting existing GWW assets at risk. The extent of vibration caused, may depend on the geotechnical conditions. The Contractor undertaking the works shall identify the limits of vibration caused by the proposed works and equipment used.

The following general protection measures should be used to protect the GWW asset:

- Use low vibration work methods
- Control of vibration at the source such as substitution of equipment or methods which cause large amounts of vibration for equipment causing lesser vibration

In the event of significant vibration being unavoidable, prior testing of vibration and confirmation of the asset condition shall be conducted to establish safe limits of vibration.

GWW adopt the following limits based on the age and material of the asset. This table assumes the deterioration of the asset is based solely on age.

Material	Age		
	< 30 years	30-50 years	> 50 years
Cast Iron*	80	40	tbc
Ductile Iron	80	40	15
PVC	50	25	10
MSCL	50	25	10
Concrete	50	25	10
VC	50	25	10
Brick		10	5

Table 10 - Subjective vibration screening criteria (mm/s PPV) by age of asset (Yr)

* Note: Construction activity near cast iron pipe needs to be discussed with GWW.

The project owner should discuss the asset risk with GWW. After the asset risk is determined:

- Desktop analysis is required to confirm asset vibration limits for medium risk works
- Monitoring of vibration and asset condition is needed during high-risk works



Guideline Document

3.15 Protection of GWW Assets from Ground Movement

Construction activities may cause ground settlement around GWW assets. These activities will include but are not limited to open cut excavation, groundwater drawdown and tunnel construction.

The extent of the settlement has the potential to damage our assets. The project owner will need to undertake a settlement assessment to determine whether the predicted results are reasonable for a range of water and sewer assets.

The first stage of the assessment will be to look at the induced slope near our pipes and where the slope exceeds the slopes for Category of Damage – “Moderate” shown in Table 11, the effects of:

- Angular distortion
- Allowable strain (micro strain)
- Joint rotation (degrees)
- Joint pull-out (mm)

on the pipe will need to be assessed.

Category of Damage	Description of potential damage	Utility type	Max slope induced – by age of asset		
			< 30 years	30-50 years	50 years
Negligible	Negligible effects, superficial damage unlikely	Concrete pipe/culvert	< 1/938	<1/1875	<1/3750
		Water PVC pipes	< 1/750	<1/1500	<1/3750
		Sewer PVC pipes	< 1/750	<1/1250	<1/2500
		Water steel & iron	< 1/750	<1/1875	<1/3750
Minor	Negligible effects, superficial damage unlikely	Concrete pipe/culvert	1/938 to 1/625	1/1875 To 1/1250	1/3750 to 1/2500
		Water PVC pipes	1/750 to 1/500	1/1500 to 1/1000	1/3750 to 1/2500
		Sewer PVC pipes	1/750 to 1/500	1/1250 to 1/833	1/2500 to 1/1667
		Water steel & iron	1/750 to 1/500	1/1875 to 1/1250	1/3750 to 1/2500
Moderate	Possible superficial damage, which is unlikely to have significant effect to the structure or function of the utility	Concrete pipe/culvert	1/625 to 1/188	1/1250 to 1/375	1/2500 to 1/750
		Water PVC pipes	1/500 to 1/150	1/1000 to 1/300	1/2500 to 1/750
		Sewer PVC pipes	1/500 to 1/150	1/833 to 1/250	1/1667 to 1/500
		Water steel & iron	1/500 to 1/250	1/1250 to 1/625	1/2500 to 1/1250
Major		Concrete pipe/culvert	1/188	1/375	1/750



Guideline Document

	Expected superficial damage to structures, possible damage to structures, possible damage to rigid utilities	Water PVC pipes	to 1/63 to 1/150 to 1/50	to 1/125 to 1/300 to 1/100	to 1/250 to 1/750 to 1/250
		Sewer PVC pipes	1/150 to 1/50	1/250 to 1/83	1/500 to 1/167
		Water steel & iron	1/250 to 1/130	1/625 to 1/325	1/1250 to 1/650
Severe	Expected structural damage to structure and function of utility	Concrete pipe/culvert	>1/63	>1/125	>1/250
		Water PVC pipes	>1/50	>1/100	>1/250
		Sewer PVC pipes	>1/50	>1/83	>1/167
		Water steel & iron	>1/130	>1/325	>1/650

Table 11 - Induced Slope Screening Criteria

GWW adopt the following limits for angular distortion, allowable strain, joint rotation and joint pull-out.

Limiting criteria item	Utility type	Suggested limit – by age of asset		
		< 30 years	30-50 years	50 years
Angular distortion	Flexible to semi-rigid pipes, i.e., pipes <200 mm	1/40 to 1/140	1/100 to 1/350	1/200 to 1/700
	rigid pipes, i.e., pipes > 200 mm	1/140	1/350	1/700
Allowable strain [micro strain]	tensile & [compressive] strain in VC pipes	80 [400]	48 [240]	24 [120]
	tensile & [compressive] strain in ductile iron pipes	500 [700]	200 [280]	100 [140]
	tensile & [compressive] strain in cast iron pipes	100 [1200]	40 [480]	20 [240]
	tensile & [compressive] strain in PVC – water	11500 [4500]	5750 [2250]	2300 [900]
	tensile & [compressive] strain in PVC – sewer	11500 [4500]	6900 [2700]	3450 [1350]
Joint rotation [degrees]	VC pipes	0.5	0.3	0.15
	lead-yarn joint in sound water mains	1	0.4	0.2
	lead-yarn joint in water mains	1.5	0.6	0.3
	rubber gasket joint in water main	2.5	1	0.5
Joint pull-out [mm]	lead-yarn joint in sound water mains	10	4	2
	lead-yarn joint in water mains	15	6	3
	rubber gasket joint in water main	25	10	5

Table 12 - limits for angular distortion

The results of the assessment shall be presented to the GWW contact.

4. RESTORATION OF SITE

4.1 Backfill

The trench backfill zone for our assets is shown in the standards MRWA-S-201 (sewer) and MRWA-W-202 (water). Typically, the width of the backfill zone matches the width of the no-go zone and extends from the top of the no-go zone to the surface above the pipe.

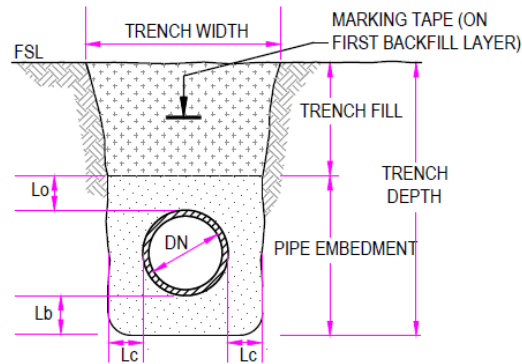


Figure 13 - Trench Backfill Zone from MRWA-W-202

4.2 Appurtenances

4.2.1 Valves

When relocating, installing or conducting works near a valve. Ensure the following items are addressed:

- Valve surround colouring is present and correct as per MRWA-W-301.
- Valve covers have the correct load rating (i.e. trafficable covers) as per MRWA-W-302
- Valve cover arrangement is correct for drinking or non-drinking water as per MRWA-W-302.
- Valve installed within 100-350mm of the finished surface level (FSL) as per MRWA-W-302.
- Valve covers are installed flush with the finished surface level (FSL) and no trip hazards are present.
- Valves are accessible and not buried.

The list above is not an exhaustive list and GWW reserves the right to request additional changes to ensure compliance of the installation.



Guideline Document

4.2.2 Hydrants

When relocating, installing or conducting works near a hydrant. Ensure the following items are addressed:

- “Cats Eyes” are installed in accordance with MRWA-W-301.
- White triangular road marking are installed in accordance with MRWA-W-301.
- Marker Posts are installed as per the design drawings or as required by GWW where the hydrant is deemed difficult to locate. The marker posts shall be installed in accordance with MRWA-W-301.
- Hydrant flushing box colours are correct as per MRWA-W-301.
- Below ground hydrant surface covers are installed flush with the finished surface level (FSL) and no trip hazards are present.
- Below ground hydrant covers have the appropriate load rating as per MRWA-W-303.
- Hydrants are accessible and not buried.
- The Hydrant is located within 100-250mm of the Finished Surface Level (FSL) as per MRWA-W-302.

The list above is not an exhaustive list and GWW reserves the right to request additional changes to ensure compliance of the installation.

4.2.3 Property Connections

When relocating, installing or conducting works near a property connection. Ensure the following items are addressed:

- Service ducts have been correctly marked in accordance with MRWA-W-110.

The list above is not an exhaustive list and GWW reserves the right to request additional changes to ensure compliance of the installation.

4.3 Contact

For further information contact your Major Government Works project manager or oaw@gww.com.au



Guideline Document

5. DEVIATIONS TO STANDARDS

It is the responsibility of the designer and constructor to comply with the requirements of the WSA standards, MRWA standards and the Asset Protection Guidelines. If at any stage throughout the design or construction process, the designer or constructor is required to deviate from the prescribed standards, then GWW shall be formally notified of the request in writing. A failure to formally request a design or construction deviation will be deemed a QA issue and may result in corrective work born by the designer and/or constructor.

6. REFERENCES

Reference	Document
MRWA 04-02-2.1	Water Quality Compliance Specification
MRWA WSA02 2014 3.1 Part 0	Gravity Sewerage Code of Australia – Part 0
MRWA WSA02 2014 3.1 Part 1	Gravity Sewerage Code of Australia – Part 1 – Planning & Design
MRWA WSA02 2014 3.1 Part 2	Gravity Sewerage Code of Australia – Part 2 – Construction
MRWA WSA03 2011 3.1 Part 0	Water Supply Code of Australia – Part 0
MRWA WSA03 2011 3.1 Part 1	Water Supply Code of Australia – Part 1 – Planning & Design
MRWA WSA03 2011 3.1 Part 2	Water Supply Code of Australia – Part 2 – Construction

7. SUPERSEDED

Reference	Document
IRD-178	Protection of Greater Western Water's Water and Sewer Assets - Other Authorities Works

8. REVIEW PROCESS

The document will be reviewed every two years (unless there are legislative changes or GWW internal requirements to do so) by the Major Government Works Team.



Guideline Document

9. VERSION CONTROL TABLE

Version Number	Document Owner's Position Title	Purpose/Change	Date
Vx-0	Insert Document Owner's Position Title	<i>Outline purpose of the change or summary of changes in 1-2 lines. You can also mention section names or numbers that have changed</i>	<i>DD/MM/YYYY</i>
V4.0	Team Lead – Major Government Works	Guideline updates.	20/10/2023
V4.1	Team Lead – Major Government Works	Correction made to Figure 5 to reference the correct table	30/04/2024



Guideline Document

APPENDIX A. ABBREVIATIONS

Term	Definition
AoW	Acceptance of Works
AS	Australian Standard
CCTV	Closed-Circuit Television
CICL	Cast Iron Cement Lined
CP	Cathodic Protection
DI	Ductile Iron
DICL	Ductile Iron Cement Lines
DN	Nominal Diameter
DW	Drinking Water
FSL	Finished Surface Level
GIS	Geographic Information System
GWW	Greater Western Water
GRP	Glass Reinforced Plastic
HDD	Horizontal Directional Drilling
ID	Internal Diameter
IL	Invert Level
IO	Inspection Opening
IS	Inspection Shaft
kPa	Kilopascal
ITP	Inspection and Test Plan
m	Metre
MC	Maintenance Chamber
MGW	Major Government Works
mm	Millimetre
MPa	Megapascal
MRWA	Melbourne Retail Water Association
MS	Maintenance Shaft
MSCL	Mild Steel Cement Lined
NDD	Non Destructive Digging
OAW	Other Authority Works
OD	Outer Diameter
OH&S	Occupational Health & Safety
PE	Polyethylene
PIPA	Plastics Industry Pipe Association of Australia
PPE	Personal Protective Equipment
PVC	Polyvinylchloride
PVC-M	Polyvinylchloride Modified
PVC-O	Polyvinylchloride Oriented



Guideline Document

PVC-U	Polyvinylchloride Unplasticised
SCADA	Supervisory Control and Data Acquisition
VC	Vitrified Clay
WSAA	Water Services Association Australia

APPENDIX B. DEFINITIONS

Term	Definition
Clearance	The distance between two objects as measured from the closest points.
Depth of Cover	Pipe cover from finished surface level to top of pipe.
Easement	Rights over land in favour of the Authority
Excavation	The movement, removal or placement of soil or other ground materials by removing, boring or forcing objects into the ground or earth surface.
Vicinity	Any works within 3m of a <280mm asset or 5m of a >280mm asset.



Guideline Document

TABLE 301-B: HYDRANT FLUSHING BOX COLOURS

SYSTEM	LEVEL	CONNECTED TO	CONNECTED TO
DN	BELOW GROUND	PLAIN (NO COLOUR)	BLACK TOP
DN	ABOVE GROUND	RED TOP	YELLOW
DN	BELOW GROUND	LLUC LID	LLUC L1+YELLOW
DN	ABOVE GROUND	LLUC BELOW RED TOP	LLUC BELOW BLACK TOP

FIGURE 301-C: HYDRANT / FLUSHING BOX COLOURS

TABLE 301-C: VALVE DISC LETTERING

LETTERS	VALVE TYPE
DV	DIVIDE VALVE FOR USE IN MAINS (DN/DN2)
V	OFFTAP OR RETICULATION VALVE
SV	SCOUR CONTROL VALVE
W	WARRANT CONTROL VALVE
RV	REGULATED CONTROL VALVE
BP	BYPASS VALVE
VC	CROSS CONNECTION VALVE
WG	WASHOUT

FIGURE 301-A: MARKER POST INSTALLATION (SECTION VIEW)

FIGURE 301-D: MARKER INSTALLATIONS EXAMPLES (PLAN VIEW)

TABLE 301-B: VALVE SURROUND COLOURING

VALVE TYPE	COLOUR
DRINKING WATER VALVES	Red
NON-DRINKING WATER VALVES	Yellow
OTHER VALVES	Blue

FIGURE 301-E: VALVE MARKER DISCS

FIGURE 301-F: CATS EYE

FIGURE 301-H: ROAD PAVEMENT HYDRANT REFLECTIVE PATCH

FIGURE 301-I: SPINDLE GAP FOR VALVES

FIGURE 301-J: VALVE FASTENING PIN DETAIL

FIGURE 301-K: VALVE FASTENING PIN DETAIL

FIGURE 301-L: VALVE FASTENING PIN DETAIL

NOTES

- For fastening to concrete (kerb or surround) use 316 SS stainless steel pins, pre-drilled with 5mm min. reaming bit.
- For fastening to steel (iron, cast iron, lap frame and flange with 316 SS, UG, 50mm long top head bolts & 316 SS nut and washers).
- For fastening to plastic (covers or surrounds, grid off plastic) use stainless steel pins, pre-drilled with 5mm min. reaming bit.
- For fastening to steel (iron, cast iron, lap frame and flange with 316 SS, UG, 50mm long top head bolts & 316 SS nut and washers).

NOTES REGARDING EXISTING ARRANGEMENTS:

- For fastening to concrete (kerb or surround) use 316 SS stainless steel pins, pre-drilled with 5mm min. reaming bit.
- For fastening to steel (iron, cast iron, lap frame and flange with 316 SS, UG, 50mm long top head bolts & 316 SS nut and washers).
- For fastening to plastic (covers or surrounds, grid off plastic) use stainless steel pins, pre-drilled with 5mm min. reaming bit.
- For fastening to steel (iron, cast iron, lap frame and flange with 316 SS, UG, 50mm long top head bolts & 316 SS nut and washers).

NOTES ON FIGURE 301-I:

- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.

NOTES ON FIGURE 301-J:

- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.

NOTES ON FIGURE 301-K:

- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.

NOTES ON FIGURE 301-L:

- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.
- Apply as per manufacturer's instructions.

MRWA WATER SUPPLY STANDARD DRAWINGS

VALVE AND HYDRANT MARKING DETAILS
(GWW AND SEW ONLY)

MRWA-W-301

ISSUED 2012 VERSION 3

NOT TO SCALE

