

To: Agencies/ Developers/ Qualified Persons/ Contractors

PUB (WSN)/ PUB (CWD) ADVISORY NOTE- PREVENTION OF DAMAGE TO WATER PIPES (REVISED EDITION – MAY 2024)

Our records show that there are existing and/or proposed water pipes within and in the vicinity of your development lot/worksite. The Qualified Person (QP) / contractor is required to notify/obtain a written clearance from PUB before carrying out any earth work/ piling work/ building work at the site, satisfying all the Conditions and Requirements set hereunder.

- i. For work activities within the protection corridor of water pipes < 300mm diameter, a notification to PUB will suffice. If the work activities satisfy the setback clearance requirement for water pipes < 300mm diameter, there is no necessity to await PUB's response upon notification with the required declaration and supporting documents (1.A to 1.E) before commencement of work within the protection corridor of water pipes < 300mm diameter.
- ii. For work activities within the protection corridor of water pipes \geq 300mm diameter, the QP/contractor shall make a submission and obtain PUB's approval prior to the commencement of the work activities. PUB will review the submission within 14 working days, and if the submission is in order, grant a written clearance for the work activities. **No work activities are to commence until clearance has been granted by PUB(WSN) for Potable, NEWater and Industrial water pipes and PUB (CWD) for Raw water pipes.**

Penalties under the Public Utilities Act (PUA)/ Regulations

We would like to draw your attention to Section 57 of the Public Utilities Act which stipulates a duty to enquire on water mains if any person wishes to carry out any work in the vicinity of any water pipes. We wish to highlight that under Section 47A of the Public Utilities Act, any person who, whether wilfully or otherwise, removes, destroys or damages or causes or permits to be removed, destroyed or damaged, any water pipes belonging to or under the management or control of the Board, shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$40,000 or to imprisonment for a term not exceeding 3 months or to both; or if the water pipes is 300 mm or more in diameter, to a fine not exceeding \$200,000 or to imprisonment for a term not exceeding 3 years or to both.

Under the Public Utilities (Protection of Water Pipes Infrastructure) Regulations 2017, which stipulates that for any water pipes smaller than 300mm (proposed or existing), the QP/PE/contractor shall notify PUB before commencement of the works. No approval by PUB is needed. For any water pipes equal to or larger than 300mm (proposed or existing), the QP, PE or contractor shall submit an application to PUB and obtain PUB's approval before commencement of works. Any person who is guilty of an offence under the Regulation shall be liable on conviction to a fine not exceeding

\$10,000 and, in the case of a continuing offence, to a further fine not exceeding \$250 for every day or part of the day during which the offence continues after conviction.

For more information of the Public Utilities Act and Regulations, please refer to <http://sso.agc.gov.sg/Act/PUA2001>. QR code to the Public Utilities Act below.



Mandatory requirement before commencement of work activities

The QP/contractor shall purchase a copy of the **Water Services Plan (WSP)** to check for any water pipes that would be affected by the work activities. The latest copy of the **WSP** is available on SLA’s INLIS portal: <https://www.sla.gov.sg/INLIS>. QR code to the INLIS portal below.



Where the work activities are to be carried out within a water pipe corridor, the QP/contractor shall make a submission to PUB before the carrying out of any work activities.

The below documents are to be submitted to PUB(WSN)/PUB (CWD) for carrying out work activities within the water pipe corridor:

1.A	Clear Layout and Section Plan indicating the lateral and vertical clearances from the affected water pipes based on the trial trenches results.
1.B	Detailed method statement and drawings for the construction works, details of the machinery/equipment used with analyses / assessment to demonstrate that the construction method proposed will not cause any impact or damage to the water pipe. Include PE endorsed design for the support of water pipe and joints in case of the necessity to exposure the water pipes (see para 6. G).
1.C	Construction Impact Assessment Report (CIAR) – The QP is to carry out a construction impact assessment of the construction effects of the works on the water pipes in the vicinity of the works and submit the report to PUB. Refer to para 6. B for detail.
1.D	Instrumentation and monitoring plan of all the water pipes that in the QP’s view are likely to be affected by the works. Refer to para 8. A to H for detail.

1.E	PUB would require the owner/developer/contractor to install surveillance cameras for works within water pipe setback distance (see para 3. B) for water pipes \geq 900mm diameter (see para 9. A and B).
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Who to make the submissions for the proposed works to PUB

Before commencement of works, the owner/developer shall engage a QP to undertake the design, make and endorse all submissions to PUB.

For activities requiring BCA approval

- the QP is the Professional Engineer (PE) appointed by the contractor/person carrying out activity

For activities not requiring BCA approval

- the QP is the PE appointed by the contractor/person carrying out activity, or
- contractor/person carrying out activity where PUB has dispensed the need for PE

The PE shall be registered with the PE Board, Singapore and possess a valid practicing certificate.

How to make the submissions for the proposed works to PUB(WSN)/PUB(CWD)

Submissions shall be made via PUB's Online Submission Portal, Protection of Water Pipes and Sewers (POWS). POWS serves as a centralised portal for processing of submissions by Qualified Persons/Professional Engineers/Contractors prior to carrying out specified activities near water pipes and public sewers.

- The link to the POWS portal is as follows:
<https://www.eservices.pub.gov.sg/bpp/account>. QR code to the POWS portal below.
- Singpass or Corppass login is required to access the portal.



Contact for Enquires on the submission to PUB(WSN)/PUB(CWD)

5. A For submissions/enquiries on protection of water pipes, you may send an email or call the following officers:

- Potable Water/NEWater/Industrial Water pipelines at Northern & Eastern areas – Mr Aman Fikri at aman_fikri_anuar@pub.gov.sg or 91114963
- Potable Water/NEWater/Industrial Water pipelines at Central & Western areas – Mr Firdaus Azmi at firdaus_azmi@pub.gov.sg or 92222064
- Raw Water pipelines – Mr Fattah Danial/Foo Zhen Lin at fattah_danial_amin@pub.gov.sg / foo_zhen_lin@pub.gov.sg or 92229625/97562935

Appendix 1

Duty and Responsibility to locate and positively identify PUB water pipes

2. A The information of the water pipes on the WSP is valid as at date plotted and is given without any liability for any error, mis-statement or omission therein. Positions of water pipes as shown in the plan are **approximate** only. Smaller submains and connections to customers' premises /properties are not indicated in the WSP.

2. B The exact locations and depths of all water pipes (including the smaller submains and connections), must be positively identified by the contractor on site by means of trial holes conducted using manual excavation. Water pipes could also be embedded within reinforced concrete (e.g. thrust block, pavement slab, box drain slab etc). When the contractor encounters and requires to remove the reinforced concrete in the trial holes, additional mitigating measures shall be proposed and subjected to PUB's approval prior to commencement of the work. The presence of water meters near the work zone is an indication of the presence of water pipes, and these water pipes shall be positively identified on site by trial holes. The alignment of the water pipes must be pegged on site, so that the alignment is clearly visible and appropriate protection measures can be adopted. The below table shows the requirements for the marking of water pipes and appurtenances within construction sites.

Type of Water pipes /Appurtenances	Pegging Requirements	Remarks
Water pipes < 1200mm dia	To mark out the centre alignment of the water pipe	See standard drawings to mark out the centre alignment of water pipes in Appendix 4
Water pipes \geq 1200mm dia	To mark out the centre alignment and the 2 edges of the water pipe	See standard drawings to mark out the centre alignment and the 2 edges of water pipes in Appendix 4
Water Appurtenances like valve chambers	To mark out the location of the appurtenances	See standard drawings to mark out water appurtenances in Appendix 4

***Where it is not feasible to put in the markers as set out in Appendix 4 (i.e on carriageway), the contractor may consult PUB(WSN)/PUB (CWD) and propose the use of alternatives for the marking of water pipes and appurtenances .**

2. C Do have proper protection for our existing and/or proposed water pipes during excavation. PUB's water pipes are not to be exposed, suspended or otherwise interfered with without prior approval from PUB. All exposed water pipes should have a PE's

certification on the design for supporting the existing and/or proposed water pipes. Any exposed water pipe joint shall be rigidly restrained (i.e via joint restrainers or encapsulation clamp etc) to prevent the water pipe joint from being dislodged.

2. D Our water pipes and appurtenances must be accessible for maintenance and repairs at all times. All chambers and appurtenances within the construction site should be clearly demarcated, suitably protected and hoarded up. Under no circumstances, shall any earth spoil or debris or any construction activities cover our chambers and appurtenances. All other necessary precautions must be taken by the contractor to safeguard and to avoid the damage to the water pipes.

2. E The alignment of the water pipes must be pegged on site, so that the alignment is clearly visible and appropriate protection measures can be adopted. You shall reconfirm the alignment of the water pipes before reapplying missing or faded pegs and surface markers on the ground or inside trench.

2. F You shall update the peggings / markings at the worksite after the carrying out of any water pipe diversion, decommissioning of water pipes or commissioning of new water pipes. You shall brief all worksite personnel of the new positions of the water pipes.

2. G Trial trenches conducted may not locate the water pipes, as shown on the plan. This does not mean that the water pipe is not there. The water pipe may be the deeper than the depth of the trial holes. The Developer/ Contractor shall then undertake geophysical or other methods to positively identify and locate all the water pipes, shown on the plan.

2. H Please contact PUB officer in-charge for assistance if you are unable to detect the exact locations of the water pipes on site.

General Requirements

3. A No structure, including rigid pavement either permanent or temporary shall be erected over our water pipes. Our buried water pipes require a minimum cover of one metre, and you must not at any time increase, reduce or remove this, without our approval. The Developer/ Contractor is required to provide adequate protection for our water pipes.

3. B No structure either permanent or temporary shall be erected over or within the below minimum setback distance from the water pipe.

WATER PIPE SETBACK DISTANCE CLEARANCE REQUIRED

Water pipe Diameter (mm)	Nett Clearance Required
100 to 600 (depth ≤ 3m)	1.0m from outer edge of any structure to centreline of water pipe
100 to 600 (depth > 3m to 5m)	1.5m from outer edge of any structure to centreline of water pipe
150 to 600 (depth > 5m)	2.0m from outer edge of any structure to centreline of water pipe
> 600 to 1500	2.5m from outer edge of any structure to outer edge of water pipe
> 1500 to 2200	3.0m from outer edge of any structure to outer edge of water pipe
> 2200, Tunnels or Tunnelled pipes	4.0m from outer edge of any structure to outer edge of water pipe

3. C All services must undercross our water pipes. Services undercrossing our water pipes shall be protected throughout the entire width of the undercrossing section and a minimum clearance of 1 metre all-round the pipe must be provided.

3. D No heavy machinery or vehicles shall be driven over PUB water pipes. Where vehicles need to cross any existing and/or proposed water pipes, adequate protection would have to be installed e.g. use of steel plates over the ground with sufficient earth cover of 1m minimum, above the pipes for load distribution during construction access. There shall be no stacking and storage of materials or parking of vehicles directly above the water pipes.

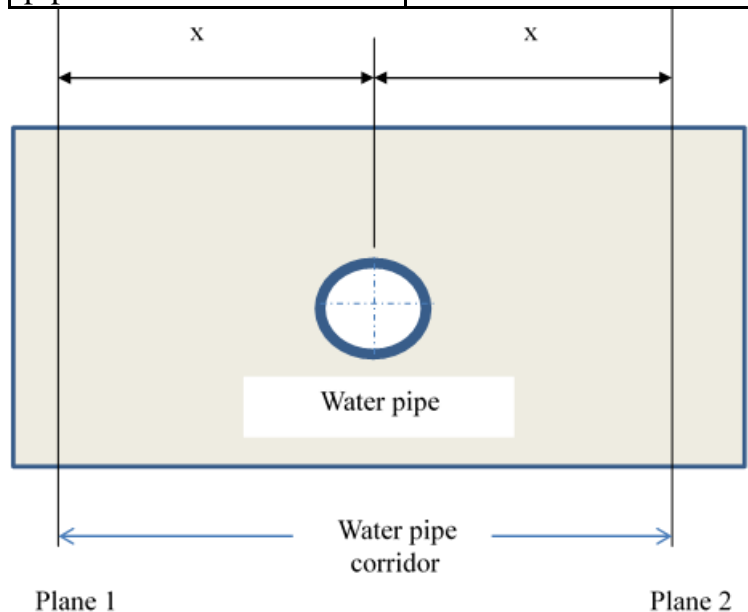
3. E PUB will not be held responsible for any damage or injury caused to any persons, property, road, etc as a result of water pipe leakage due to the Developer/Contractor's works. The Developer/Contractor shall be fully liable for any damage caused to adjacent property whether public or private as a result of any leakage from the water pipe due to his works. The Developer/Contractor shall undertake all repairs to the adjacent property at his own costs and reimburse the owners directly for any consequential claims or expenses claimed by them. The Developer/Contractor will also be required to indemnify PUB against all losses and claims arising from damage to water pipes.

Verification of Proposed Works within Water pipe Corridor

4. A After positively identifying existing and/or proposed water pipes on site (including its depth and alignment), the Developer/ Contractor shall assess whether if the proposed works lie within the water main corridor, as indicated in the Table below.

4. B The water main corridor as set by PUB, is the distance between two vertical planes, on either side of the centreline of any water pipe, as specified in the table below.

Water Pipe	Distance X on either side from the centreline
<900 mm Diameter	10 metres
≥ 900mm Diameter	20 metres
Tunnels and Tunnelled pipes	40 metres



Water pipes Diversion for Proposed Works within Water pipe Corridor

5. A The Developer / Contractor shall consult PUB at the earliest opportunity during the design stage on the handling of the affected water pipe. The Developer / Contractor shall arrange for site meetings with PUB to seek PUB's comments on whether the affected water pipe should be diverted or remain in its original position with adequate protection measures implemented. If deemed necessary by PUB, the affected water pipe shall be diverted out of the water pipe corridor and the Developer / Contractor shall be responsible for engaging a Licensed Plumber / Contractor to carry out the diversion works according to PUB's pipe-laying specifications. If PUB deems that diversion of

the affected water pipe is not feasible, the Developer / Contractor shall make necessary modifications or design changes to his works such that the water pipe is either no longer affected or adequately protected by appropriate measures.

5. B If PUB deems that that the proposed works (whether within or outside of the water pipe corridor) impose risks or constraints on the future operation, maintenance or repair of the water pipe, PUB may direct the Developer/ Contractor to divert the water pipe or make necessary modifications or designs changes to his works.

5. C The cost of all abovementioned diversions, modifications and design changes to proposed works, as PUB may direct, shall be borne by the Developer / Contractor.

Responsibilities Required from Qualified Persons

6. A The developer/contractor's QP shall submit for the information of PUB the procedures and methods for all excavation and other construction works within the entire corridor of the water pipes to prevent damage to the water pipes during the work. See para 1. A to 1. E.

6. B Construction Impact Assessment Report (CIAR) - The QP is to carry out a construction impact assessment of the construction effects of the works on the water pipes in the vicinity of the works and submit the report to PUB. The report shall include the following details:

- (i) The ground conditions, geotechnical profiles and relevant borehole logs.
- (ii) The proposed construction equipment and methods, and sequencing of construction.
- (iii) Assessments on the use of the proposed construction equipment /methodology on the existing and/or proposed water pipe, vibrations, ground displacements and groundwater draw downs and how the impacts would be mitigated to meet requirements. (See para 6. C to F)
- (iv) The damage potential and risks to the water pipes.
- (v) Preventative and precautionary measures to protect the water pipes from damage and remedial measures to be taken in the event of damage/incidents.

6. C Equipment Vibrations - Construction activities such as piling, excavation, soil improvement, diaphragm wall and retaining wall construction etc and the use of construction equipment such as piling/boring machine etc shall not subject the water pipe to a peak particle velocity (PPV) exceeding 15 mm/s at any frequency. The QP shall provide a detailed impact assessment that clearly demonstrates the vibration attenuation for each of the equipment proposed to be used at the development site and in similar ground conditions to show that this vibration limit would not be exceeded on the existing and/or proposed water pipes.

6. D Groundwater Drawdown – The developer/contractor's QP shall confirm that there will not be any groundwater drawdown in the vicinity of the PUB water pipe. If there is drawdown of groundwater, the developer/contractor's QP shall propose mitigation measures.

6. E For Cement-lined Steel and Cement-lined Ductile Iron pipes:

In general, the allowable limits are as follows:

1. longitudinal deflection – not exceeding $L / 250$ or 20mm whichever is lesser, where L is defined as the calculated length of sagging pipe section, at ends of which there will be no expected horizontal nor vertical movement.
2. diametrical deformation – not exceeding 2% of the pipe diameter
3. The total stress on the pipe at any point (including existing stress and additional stress due to the proposed works) shall not exceed 133 N/mm^2 .

6. F For Cement-lined Cast Iron Pipes (with lead-caulked pipe-joints):

All cast iron pipes are assumed to take zero longitudinal deflection and zero diametrical deformation. This is because existing cast iron pipeline are old and due for replacement. They cannot be subject to any additional loading/ stresses. Development near a cast iron pipeline must be designed to prevent any increase in stress / strain to the pipeline.

6. G If water pipes are required to be exposed and supported to facilitate construction works, QP needs to provide PE endorsed design for the utility support. The water pipe should be supported by box-in structural design that can fix the pipe rigidly on all 4 sides to prevent movement/deflection of the water main, especially at the spigot & socket or welded joint positions. Please provide wooden wedges or rubber shins in between the supports and pipe to further prevent any movement and damages to the pipes once the metal supports are in place. Extra precaution should be taken at the pipe bends due to additional thrust force at pipe bends.

6. H You shall not dig any trial holes in the vicinity of water pipes without the written consent from PUB. You shall comply with any additional requirements that may be imposed by PUB.

6. I The QP shall advise PUB on the likely risk to the water pipe and his proposed mitigating measures for preventing the water mains from damage to the satisfaction of PUB.

6. J If there are changes to the schedule for the carrying out of the work or changes in the work method, the QP shall study the implications, review the earlier impact assessment that had been carried out and promptly notify PUB if there are any changes to such earlier assessment.

Good Practices at Worksite

7. A You should provide full-time site supervisor to monitor the worksite operations for the entire duration of any work. You shall ensure that the site supervisor is familiar with these requirements.

7. B You shall ensure that daily site briefings with all worksite workers are conducted (in languages that are understood by all workers) to remind them about the location of the water pipes and the measures to be taken to prevent damage to the water pipes. You shall keep records of such daily briefings (which shall include but are not limited to date and time, venue and person conducting the briefings, contents of briefings and the list of worksite workers who have attended such briefings). You shall also disallow any worksite worker who has not attended such briefings from being involved with any part of the intended work. New staff must be briefed before they start work.

7. C You shall inform PUB officers of the identity of the Worksite management/ QP(S)/ Provisional Registered Excavator Operator (PREO)/ Registered Excavator Operator (REO), the proposed methods of carrying out of the work and/ or location of the proposed work. You shall also inform PUB officers if there are any changes to the above.

7. D You shall ensure that information on the presence of water pipes in the vicinity of the worksite and all mitigation measures to be taken to prevent damage to such water pipes have been communicated and adhered to by all personnel of all working levels in the project team, including sub-contractors and any third party who are in any way involved with any part if the intended work.

7. E You shall contact PUB if you find any live or abandoned water pipes in the course of carrying out any work at the worksite which have not been shown in the Water Service Plan.

7. F You shall provide adequate lighting if the work are to be carried out at night.

7. G You shall engage only a REO or PREO to operate a powered mechanical excavator.

7. H You shall ensure that powered mechanical excavation is only used, under the close standing supervision of a full time site supervisor, when working near or above any water pipe.

7. I You should implement a PTW system to monitor and ensure that all Earthworks are properly tracked and controlled if such Earthworks are to be carried out in the vicinity of water pipes. Under the PTW system, such Earthwork shall be approved by the manager of the project or his authorised deputy. You shall periodically audit the PTW system for its effectiveness.

Instrumentation and Monitoring

8. A The QP shall include in the monitoring plan of all the water pipes that in his view are likely to be affected by the works.

8. B The QP's method statement shall include the proposed monitoring intervals and all requirements imposed by PUB.

8. C The QP shall be responsible for ascertaining and setting the safe limits (including alert level and work suspension level) of ground movements, vibration levels or other changes for ensuring the structural integrity and proper functioning of all water pipes. He shall provide comprehensive basis for the proposed safe limits. See para 6. C to F.

8. D The QP shall verify and certify by monitoring that the permissible limits set for deformation and vibration are not exceeded.

8. E It shall be clearly understood that the submissions of the instrumentation monitoring results and reports to PUB are only for PUB's information. The QP shall be fully responsible for the analysis and interpretation of all the readings and measurements and for taking all remedial measures where necessary. When abnormal readings or measurements are obtained, QP shall immediately investigate the causes of the abnormalities and take all necessary remedial measures. QP shall promptly inform PUB should such abnormalities be likely to affect the structural integrity of the water pipe.

8. F Instrumentation monitoring regime consists of inclinometers, ground settlement markers, vibration meters, piezometers, strain gauges, rod extensometers, etc. shall be carried out by QP to check whether ground movements & vibration impacts are within allowable limits during the construction works. Records of the instrumentation monitoring regime shall be endorsed by the QP and properly maintained at the site, submitted to PUB or made available for inspection by PUB upon request. See para 6. C to F.

8. G The QP shall monitor and review the instrumentation monitoring results daily, looking out particularly for excessive ground movements that may cause damage to the water pipes. The QP shall submit the instrumentation monitoring records to PUB weekly or at a frequency otherwise stipulated by PUB. QP shall highlight in his submission if there are any excessive ground movements monitored or any other abnormalities.

8. H The QP shall stop the works immediately if the instrumentation monitoring results exceed the allowable limits and inform PUB immediately. The QP shall assess the impact on the water pipe and submit a report and proposed mitigation measures to PUB.

Appendix 2

Additional Requirements for submission prior to Commencement of Works

9. A PUB would require the owner/developer to install surveillance cameras for works within water pipe setback distance (see para 3. B) for water pipes $\geq 900\text{mm}$ diameter:

- (i) Owner/developer shall provide web-based IP surveillance cameras to continuously monitor construction activities in the vicinity of the large diameter ($\geq 900\text{mm}$) water pipe. The number of cameras to be provided shall be approved by PUB and shall be sufficient to **cover the entire corridor of** the water pipes.
- (ii) The surveillance cameras must be able to capture still pictures and perform continuous video recording.
- (iii) The owner/developer shall provide PUB with the Internet website address for centralized viewing of the still picture and video recordings of the construction activities above PUB water pipes captured by the surveillance cameras.

9. B The owner/developer is required to submit their proposed designs and notify / obtain an approval from PUB before commencement of the works.

Protection of Water pipes from Damages

10. A Please inform PUB 24 hours Call Centre at Tel No. 1800-CALL PUB (1800-2255 782) immediately in the event of damage to a water pipes.

10. B You and/ or your workers shall not attempt to repair or modify any damaged water pipe.

10. C Please take all necessary measures to prevent damage to our water pipes and appurtenances in the course of your work. I have attached a copy of the "**DOs and DON'Ts**" (see Appendix 3), which provides the details on the protection requirements for proposed works carried out in the vicinity of our water mains, for your compliance.

10. D PUB shall be entitled to ask you to stop work with immediate effect in the event of non-compliance to this Advisory. PUB shall not be liable to you in any way for any losses, claims or damages arising from or in connection with such stop work requests.

10. E You shall comply with any requirements as reasonably prescribed by PUB in PUB's review and endorsement of the relevant method statement and any other documents submitted by you in relation thereto for the work.

10. F The cost to repair any water pipes damaged as a result of work carried out is to be borne by the party which causes the damage. The party will also be billed for repair of the mains and the estimated quantities of water lost from the damaged main. The party will also be required to indemnify PUB against all losses and claims arising from damage to water pipes.

Other Administrative Notes

11. A These requirements are applicable to all persons who carry out any work and strict compliance is required, unless otherwise permitted in writing to PUB. Please consult PUB, if necessary.

11. B The requirement stated above are not exhaustive. Additional requirements may be issued from time to time by PUB. These additional requirements, together with the requirements in this Advisory, shall form the full list of requirements that must be complied with at all times. You are advised to carry out all necessary assessment and take all necessary precautions to prevent damage to any existing and/or proposed water pipes.

Appendix 3

DOs AND DON'Ts WHILST WORKING IN THE VICINITY OF WATER PIPES

DOs

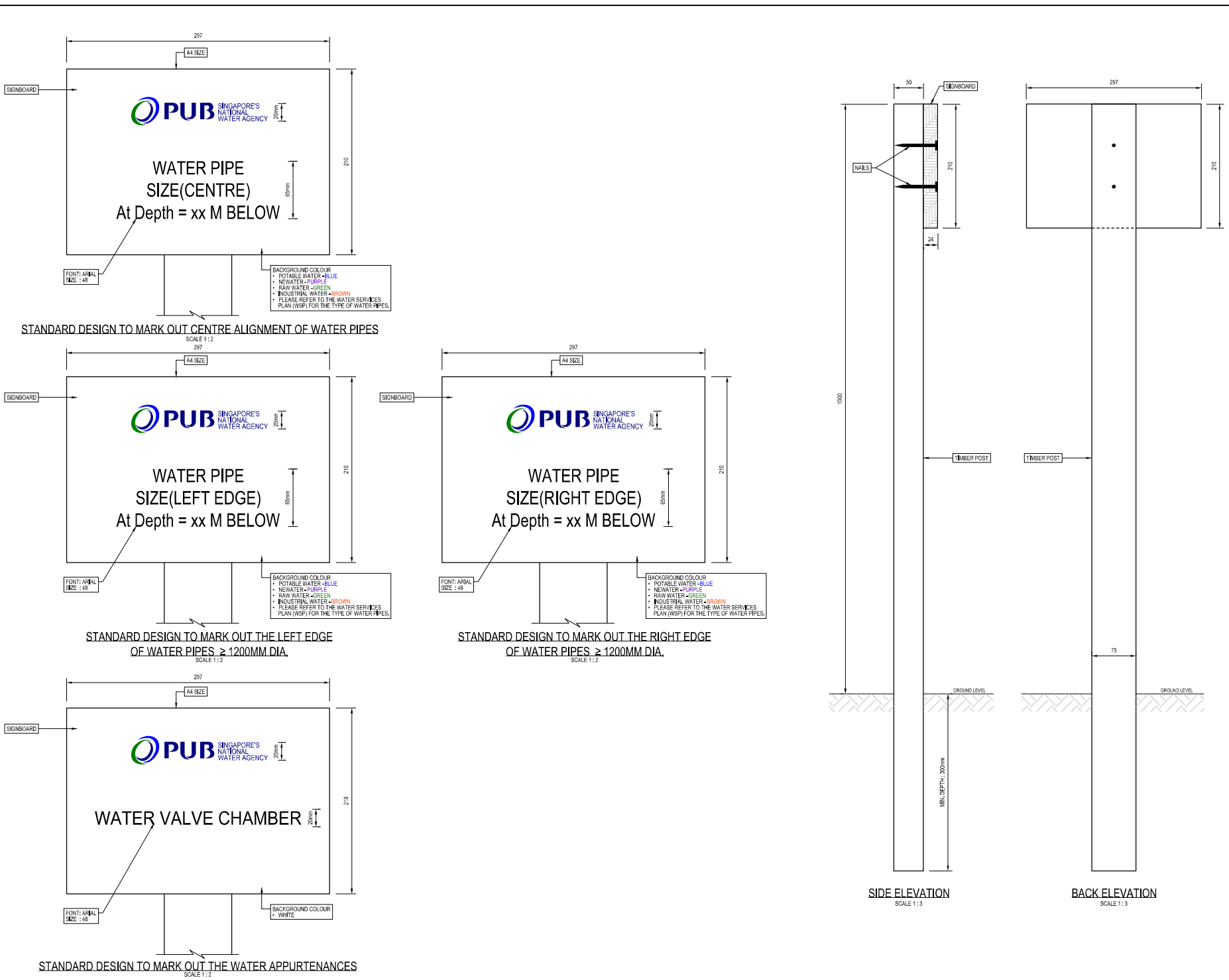
- 1 Do purchase the latest Water Services Plan (WSP) on SLA's website INLIS.
- 2 Do trial holes to identify the exact location of existing and/or proposed water pipes.
- 3 Do use manual excavation especially near water pipes.
- 4 Do propose mitigating measures and obtain PUB's prior approval for the removal of reinforced concrete encountered in the trial holes to locate the water pipes. This is because water pipes could be encased in the reinforced concrete (e.g. thrust block, pavement slab, box drain slab etc).
- 5 Do use pipe locators with the assistance of valve chambers and hydrants to identify the location of existing and/or proposed water pipes.
- 6 Do consult PUB on the location of the existing and/or proposed water pipes when you are unable to locate them.
- 7 Do lay services such as cables, pipes with a separation distance of one meter from PUB existing and/or proposed water pipes.
- 8 Do have proper protection for our existing and/or proposed water pipes during excavation (PE certification on design of supporting existing and/or proposed water pipes is required).
- 9 Do peg the alignment of the water pipes within the worksite clearly with signages/visible markers.
- 10 Do install instrumentation (eg. ground settlement markers, vibration meters to be placed at site to monitor the impact of soil movement/vibration to PUB water mains) for monitoring at the site.

DON'Ts

- 1 Don't allow heavy machinery to move over PUB water pipes without adequate protection (eg steel plate).
- 2 Don't use excavator for trial holes to locate the existing and/or proposed water mains when near them. The last 0.5m must be checked by use of probes and manual excavation.
- 3 Don't lay sewer pipes on top of our existing and/or proposed water pipes.
- 4 Don't construct any structures on top of our existing and/or proposed water pipes.
- 5 Don't allow our valve chambers to be covered over with construction debris especially at worksites. Contact PUB (WSN) for PUB valve chambers at worksites to be raised to prevent them from accidentally

being covered over. Our water pipes and connections must be accessible for maintenance and repair works at all times;

- 6 Don't expose our water pipes without prior approval from us.
- 7 Don't erect any structure either permanent or temporary over or within one metre from our water pipes. Our buried water pipe requires a minimum cover of one metre, and you must provide adequate protection for our main should the cover be removed or reduced by your works.



- NOTES:
- SIGNBOARD: PLYWOOD (24mm THICKNESS).
 - TIMBER POST: 75mm x 50mm SECTION.
 - TIMBER POST SHALL BE DRIVEN TO AN ADEQUATE DEPTH TO ENSURE THE STABILITY OF THE SIGNBOARD.
 - THE ALIGNMENT OF ALL WATER PIPES WITHIN CONSTRUCTION SITES SHALL BE CLEARLY MARKED OUT AT ALL TIMES.
 - THE SIZE(mm) AND DEPTH(m) OF THE WATER PIPES SHALL BE CLEARLY INDICATED ON THE MARKERS. PLEASE REFER TO THE STANDARD DESIGN FOR SUCH MARKERS.
 - THE INTERVAL OF THESE MARKERS SHALL BE AT MOST 3m APART.
 - FOR WATER PIPES ≤ 1200 mm DIA., MARKERS INDICATING THE CENTRE ALIGNMENT OF THE WATER PIPES WILL SUFFICE.
 - FOR WATER PIPES ≥ 1200 mm DIA., THE WATER PIPES SHALL BE MARKED AT EITHER LEFT EDGE OR RIGHT EDGE OF THE PIPE. REFER TO THE STANDARD DESIGN OF THESE MARKERS.

REV	DATE	AMENDMENTS	DRAWN	CHECKED

PUB SINGAPORE'S NATIONAL WATER AGENCY

WATER SUPPLY(NETWORK) DEPARTMENT
NS DIVISION

PROJECT TITLE

STANDARD DRAWINGS

DRAWING TITLE

APPENDIX 4: DETAILS OF MARKERS FOR WATERMANS AND WATER APPURTENANCES

DATE: 29 JUN 2020	SCALE: AS SHOWN
DRAWING NO.	REV: -
THIS DRAWING IS COPYRIGHT	
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