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## 1. Purpose<sup>1</sup>

This technical note has been prepared to provide supporting guidance to bridging structures over Unitywater sewerage infrastructure crossing stormwater pipes in order to prevent damage to the sewerage pipelines and to avoid adverse effects to the operation of the infrastructure.

## 2. Scope

The scope of this technical note applies to stormwater pipes crossing sewer pipes for any new buildings and structures, or modification to existing building foundations and any works that affect the existing ground.

This technical note does not apply to the following pipes.

- For a pipe less than 300mm diameter, minimum clear distance between sewer and stormwater pipes exceeding 900mm and no collars (or joints) within zone of influence.
- Stormwater (or sewer) pipe located out of zone of influence.

## 3. Requirements

### 3.1 Zone of influence

The zone of influence is determined based on the angle of repose and a registered geotechnical engineer (RPEQ) shall assess the type of soil and determine an adequate angle of repose. Typical angles of repose for sand and clay soil type are shown in Figure 1.

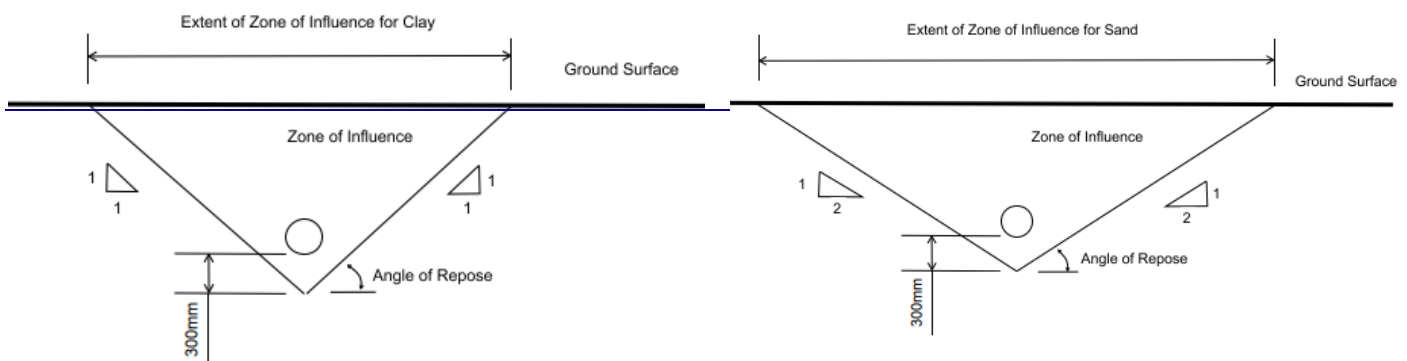


Figure 1: Typical zone of influence for clay and sand over sewer

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The zone of influence in Figure 1 is shown for flat ground. If a sewerage pipe is on a sloping site, the zone of influence may greatly vary, and the slope of land should be considered when assessing the zone of the influence based on an angle of repose.

### 3.2 Bridging structure

Sewer pipes crossing stormwater pipes or within the zone of influence other than exempted piping layout defined in Section 2 of this document shall be supported on a bridging structure which shall be designed and certified by a structural RPEQ engineer.

The edge of bored piers or screw piles shall be located at least 1m horizontally clear of the edge of the sewer (Figure 2). Shallow bored piers shall be founded to a depth which is below the zone of influence (Figure 3).

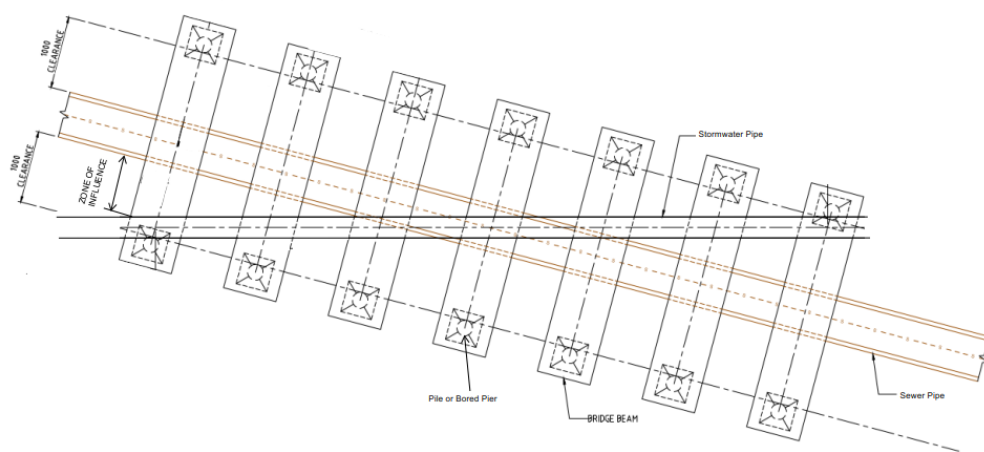


Figure 2: Piled bridge over sewerage (screw pile or bored pier)

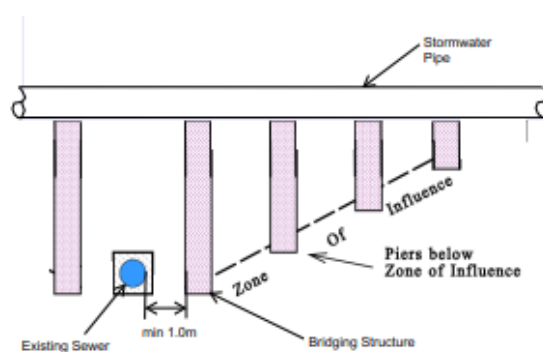


Figure 3: Bored pier depth requirement

The edge of driven piles shall be located at least 5m horizontally clear of the edge of sewer. Where this requirement is not met, pre-boring or bored piles are recommended to protect sewerage infrastructure. A competent geotechnical engineer shall assess the details of pre-boring.

The underside of the bridging beam shall be at least 300mm clear of the top of the sewer (or stormwater) as shown in Figure 4 and the space shall be packed with bedding sand.

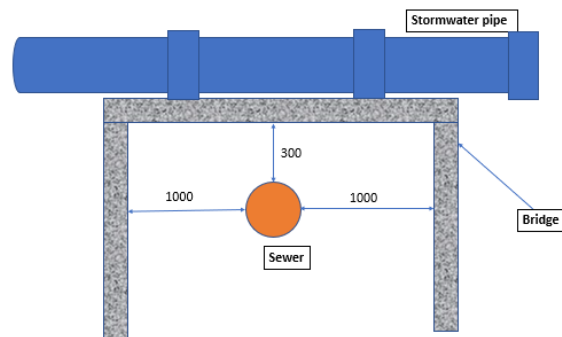


Figure 4: Clearance requirement

For a bridge structure supported on friction piles or shallow bored piers, a layer of compressible material underneath the bridging beam or slab should be applied to minimise the surcharge pressure potentially induced over a pipe due to settlement. A minimum thickness of 50mm compressible material is recommended. The bridging beam or slab may be made of precast units for removal. A competent structural engineer shall prepare design and construction details.

The concrete design including strength, serviceability and durability shall comply with the current edition of AS3600 for a 50-year design life (or AS5100.5 for a 100-year design life) and AS2159. The steel design shall comply with the current edition of AS4100.

### 3.3 Construction loadings

Buried pipes can be subject to construction vehicle loadings during construction phase. The pipes shall be protected from the construction loadings. The position of the pipes shall be located on site prior to commencing any site work and extreme care shall be undertaken.

General guidelines are as follows and engineering assessment for acceptance shall be undertaken.

**Shallow Pipes:** For pipes with soil cover less than 600mm, no construction loadings should be allowed within the zone of influence. If a contractor needs to traverse the pipe, a contractor shall put protection measure in place.

**Light Construction Loading:** For pipes with soil cover more than 600mm, light construction loadings such as forklifts and small excavators are allowed, i.e. 600mm minimum cover for 5 tonnes GVM and 900mm minimum cover for 10 tonnes GVM.

**Deep Pipes:** For pipes with soil cover more than 1200mm, wheel load not exceeding 80 kN (or axle load not exceeding 160 kN) is allowed. Heavier construction loadings should not be allowed to traverse the pipe or be positioned within the zone of influence. If a contractor needs to place heavy construction plant above the pipe, a comprehensive engineering assessment and a work method statement shall be prepared for acceptance.

### 3.4 Design responsibility

The design of bridging structures depends on site conditions, the method of construction and structural materials. A structural engineer (RPEQ) shall design and certify a bridging structure complying with the relevant Australian Standards and Statutory Regulations.

## 4. Definitions

Table 1: Definitions, abbreviations and acronyms

| Term              | Meaning  |
|-------------------|--|
| Angle of Repose   | Steepest angle of descent or slope relative to the horizontal plane  |
| RPEQ              | Registered Professional Engineer of Queensland   |
| Shall             | States a mandatory requirement   |
| Should            | States a recommendation  |
| Zone of Influence | Area extending both horizontally and longitudinally along a pipeline which is affected by loads from buildings or structures |

## 5. References and resources

Table 2: References and resources

| Source   | Reference  |
|----------|--|
| External | <a href="#">Queensland Development Code MP1.4</a>  |
|          | <a href="#">Building Regulation 2021 (Qld)</a>   |
|          | AS2159 - 2009 Piling - Design and Installation   |
|          | AS3600 - 2018 - Concrete Structures  |
|          | AS4100 - 2020 - Steel Structures   |
| Internal | AS5100.5 - 2017 - Bridge Design Part 5 Concrete  |
|          | <a href="#">OP9692</a> - Building Over and Adjacent to Assets Policy                         |
|          | <a href="#">Pr9688</a> - BOAA Technical Standard Category A                                  |
|          | <a href="#">Pr9689</a> - BOAA Technical Standard Category B                                  |
|          | <a href="#">Pr9691</a> - Building Over and Adjacent to Assets - Unitywater Assessment Manual |