A high-speed photograph of a water droplet falling into a pool of water. The droplet is captured mid-fall, just above the surface, and is perfectly spherical. Below it, the water surface is disturbed, creating a crown-shaped splash that is perfectly symmetrical and reflects the light. The background is a solid, light blue color, providing a clean and minimalist aesthetic.

North East Water
Engineering Guidelines for
Subdivisions and
Development Standards
PART 5 Sewerage Reticulation
September 2009

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Appendices

- A Sewer Capacity Grading Table

Part 5 - Sewer Reticulation

1. Introduction

This Part of The Corporation's "Engineering Guidelines for Subdivisions and Developments" is related to sewerage reticulation. Reference to the Authority/Corporation will include reference to North East Water as the Sewerage Corporation.

The Design and Construction of sewerage reticulation shall generally be in accordance with the latest version of the Water Services Association of Australia (WSAA) "Sewerage Code of Australia (WSA02)". **HOWEVER this part of The Corporation's "Engineering Guidelines" takes precedence over the WSAA Standards.** (i.e. these are The Corporation's requirements which may be different to WSA 02).

The other Parts of the Engineering Guidelines for Subdivisions and Development are as follows:

- Part 1 - General Requirements
- Part 2 - Guidelines for Design of Roads (not used)
- Part 3 - Guidelines for Design of Drainage (not used)
- Part 4 - Guidelines for Design of Water Reticulation
- Part 5- Guidelines for Design of Sewerage Reticulation**
- Part 6 Guidelines for Landscaping, and Measures for Erosion, Sedimentation and Pollution Control (not used)
- Part 7 - Guidelines for Testing.

This part of the "Engineering Guidelines" is set out in the same order as WSA 02 for ease of cross-referencing.

2. General

2.1 **Scope** *(refer WSA 1.1)*

The design of sewage pumping stations (SPSs) is addressed in the Corporations Standard Design and in WSA 04 2001 Sewage Pumping Station Code of Australia. The Corporation has an objective of minimising the number of pump stations to reduce ongoing maintenance costs and liabilities. Pump station and rising mains shall be in accordance with the Corporation Standards. Refer to the Corporation prior to commencement of any design work on pump stations to confirm the Corporations requirements. These standards encourage a consistent approach to telemetry, electrical, pumps and maintenance issues throughout the system.

This Part of The Corporation's "Engineering Guidelines for Subdivisions and Developments" is related to sewer reticulation. Reference to the Corporation will include reference to North East Water as the Water Corporation.

3. System Planning *(refer WSA 2)*

3.1 **Assessment of future loads** *(refer WSA 2.3.2)*

4. Flow Estimation *(refer WSA 3)*

4.1 **Design Flow Estimation Method** *(refer WSA 3.2)*

Flow estimation assumptions shall be given in the Concept Plan.

4.1.1 **Traditional Design Flow Estimation Method** *(refer WSA 3.2.2)*

The method for determining the design flow shall be in accordance with the methodology specified by the water agency.

5. Detail Design

5.1 Detail Design Considerations *(refer WSA 4.2)*

5.1.1 Catchment Design *(refer WSA 4.2.1)*

Where future development has the potential to occur beyond the estate, estate sewer reticulation is to be consistent with a catchment master plan. In the absence of a master plan prepared by the Corporation a master plan must be prepared by the developer to an extent necessary to determine sewerage component sizing and location within the estate so that orderly development can occur.

Estate sewerage reticulation shall be extended through the estate to service future upstream catchments. Sewer extension to service the upstream catchment shall be subject to Corporation approval in accordance with the Essential Service Commission Guidelines for the allocation of costs. Easements shall be created as part of an approved estate master plan to enable sewer construction that is not dependent and restricted by estate staging and lot release. Construction may be either directed by the Corporation or alternatively constructed by the Corporation or its representatives.

5.1.2 Design Accuracy *(refer WSA 4.2.2)*

Location on plan shall be referenced to AHD and MGA coordinates.

5.1.3 Easements *(refer WSA 4.2.5)*

Where common or shared titles occur that may include owners corporation or titles under section 12 (2) of the Subdivision Act, The Corporation's sewer responsibility ends at the property connection point (typically where the property vertical is located as visible on site / MH inside the boundary line of the property). Typically there will be one connection to service the combined community lots. The Corporation may require an easement to be created over part or the entire infrastructure. Refer also public and private property *(refer WSA 4.3.4)*.

The desirable width of sewer easement shall be 3.00 metres. The absolute minimum width of sewer easement shall be 2.0 metres.

On property boundaries the easement width is 1.00m from centre of the sewer main. When the main is not near the boundary the easement shall be 3 metres wide.

Typically the main is located 1.5 metres from the property boundary.

5.2 Horizontal Alignment of Sewers *(refer WSA 4.3)*

Road Crossings are perpendicular to the road centreline unless otherwise approved.

5.2.1 Public and Private Property *(refer WSA 4.3.4)*

Sewers located in property other than owned by The Corporation or Council are to be reviewed by the Corporation for determination of the need for an easement. Where an easement is required it shall be in favour of The Corporation. The Developer is responsible for obtaining this easement; the release of the Deposited Plan of Subdivision is subject to the creation of this easement. The Developer is to transfer to

The Corporation sewer easements provided in the subdivision and execute a transfer and grant of easement in favour of The Corporation

Development that requires the submission of a development application to the Council for approval will require the provision of an easement over existing sewer infrastructure.

5.2.2 All changes in direction using MH (refer WSA 4.3.5)

An internal MH through drop between inlet pipe and outlet pipe is required as follows:

| <i>Deflection Angle</i> | <i>Drop (mm)</i> |
|-------------------------|------------------|
| 0° to 45° | 30 |
| 46° to 90° | 50 |
| 91° to 120° | 100 |

Deflections between 91° to 120° are by approval only. Deflections greater than 120° through maintenance holes are not permitted. On a case by case basis The Corporation may give consideration to greater deflections with the use of an internal drop within the manhole.

5.2.3 Horizontal Curves in Sewers (refer WSA 4.3.7)

Typically not accepted but The Corporation may approve curved sewers on a case by case basis.

5.3 Obstructions and Clearances (refer WSA 4.4)

Sewer mains located within lots adjacent to stormwater drainage lines shall be a minimum of 0.75 metres clear of the stormwater pipe.

Commercial or industrial development that requires replacement or realigning of sewers shall have junctions that are accessible.

The Corporation has a preference that buildings not be located over sewer mains. Where this is unavoidable subject to approval of The Corporation, buildings may be constructed over sewer reticulation mains provided they are constructed so that no load from the structure is transmitted to the sewer main and the portion of the main under the building (and for a distance outside of the building shall be 2 metres minimum) is laid in cement lined sulphate resistant ductile iron pipe equivalent to Class PN 35. Refer to standard drawing. Class 18 uPvc DIOD (ductile iron outside diameter compatible) This concession is made primarily for buildings in established areas and will not be extended to new subdivisions unless special circumstances prevail. Other materials may be accepted at the discretion of the Corporation.

5.4 Pipe Sizing and Grading *(refer WSA 4.5)*

5.4.1 General *(refer WSA 4.5.1)*

Sewers shall be designed for PWWF capacity. The maximum and minimum allowable loadings for various pipe diameters are as shown in Appendix of these standards.

5.4.2 Minimum pipe sizes for maintenance purposes *(refer WSA 4.5.4)*

The minimum sewer main diameter is 150 mm.

5.4.3 Minimum grades for sewers *(refer WSA 4.5.7)*

At the ends of lines the minimum grade is 1 in 80.

5.4.4 Minimum grades for self cleansing *(refer WSA 4.5.7)*

The maximum grade of reticulation sewer is limited to 1 in 10 unless otherwise approved by the Corporation.

The minimum grades are shown in WSA

The values of Colebrook White roughness to be used in the design of gravity sewers are:

Table 1 Values of Colebrook White roughness

| Nominal Pipe Size (mm) | Full Flow - for estimation of Peak Hydraulic Capacity | Partial Flow - for estimation of Self-Cleansing Flows |
|------------------------|---|---|
| 150-300 | k = 0.6 mm | k = 1.5 normal k = 3.0 for control lines |
| 375-600 | k = 0.6 mm | k = 3.0 mm |
| Above 600 | k = 1.5 mm | k = 0.6 mm |

Note: Control Lines are those lines that affect the overall depth of the system.

Minimum grades for property sewers is 1 in 60.

5.4.5 Minimum Cover over sewers *(refer WSA 4.6.3)*

In accordance with WSA

5.4.6 Minimum Depth of Sewer Connection Point *(refer WSA 4.6.5)*

The depth of the junction is to be such that any location within the lot can be drained to it via a pipe with a minimum 300 mm of cover laid at a grade of 1 in 60. The pipe is to be located parallel to boundaries and account for raft slab construction.

5.4.7 Depth of Connection Point (*refer WSA 4.6.5.4*)

Table 2 Property sewers **North East Water**

| | |
|--|--------------------------------|
| Maximum depth to invert | 1.5 metres |
| Termination of sewers that provide for future connection | Mark with tape and marker post |

5.4.8 Vertical Curves (*refer WSA 4.6.7*)

Not accepted.

5.4.9 Compound Curves (*refer WSA 4.6.8*)

Not accepted.

6. Property Connection *(refer WSA 5)*

6.1 Limitation of Connection to Sewers *(refer WSA 5.2)*

Written approval is required from the Corporation for connection to the existing Corporation sewerage system. All work is to be carried out by the developers' sewer contractors at the developers' expense. Seven days prior notice is required. All materials are to be supplied by the Developer.

All work conducted on live sewers is to be in accordance with the relevant Occupational Health And Safety Regulations And Confined Spaces Regulations.

6.2 Methods of Property Connection *(refer WSA 5.3.1)*

Table 3 Methods of Property Connection **North East Water**

| | |
|--|----------------------|
| WSA 5.3.3 Buried interface method (type A) | Approved. |
| WSA 5.3.2 IO interface method | Not approved |
| Reference | NEW standard drawing |

6.3 Location Of Connection Points *(refer WSA 5.6.)*

Where an unsewered dwelling is located on land that is being developed, the Developer shall connect the dwelling to the sewerage reticulation at his cost as part of the subdivision work. The Developer shall be responsible for the removal of any septic tanks and backfilling of the excavation to the satisfaction of Council. All new sewer mains and MHs must be tested prior to the dwelling being connected.

6.4 Y Property Connections *(refer WSA 5.7)*

Not accepted.

7. Maintenance Structures *(refer WSA 6)*

7.1 Types of Maintenance Structures, *(refer WSA 6.1)*

- a) Maintenance Holes Accepted.
- b) Maintenance Shafts Not accepted
- c) Termination Maintenance Shafts Accepted

7.2 Spacing of Maintenance Structures *(refer WSA 6.3)*

MH maximum spacing is 100 metres.

TMS maximum length from MH is 50 metres.

Dead ends will only be allowed where future extensions are approved.

Table 6.1 summarises maintenance structure options for reticulation sewers. MS options for reticulation sewers. These are not accepted.

7.3 Maintenance Holes *(refer WSA 6.6)*

Maintenance holes are required at the end of sewer lines exceeding 50 metres in length. Sewer mains (referred to as junction and lead) that exceed 10 metres in length are sidelines that require a MH with a 150 mm connection where they enter the main at the downstream end. MHs are not to be located in road carriageways without specific approval of the Corporation.

Where the development is utilising existing sewer mains or junctions, the mains, MHs or junctions must be upgraded to meet the current guideline requirements and the junctions exposed to verify their locations.

Types of MH construction *(refer WSA 6.6.2)*

Cast insitu or precast units are to be as approved by the Corporation.

PE and other plastics are not accepted.

MH are to be constructed as fully cast insitu or fully precast assemblies with the exception of the base which can be cast insitu or precast.

7.3.1 Ladders, Step irons and Landings. *(refer WSA 6.6.8)*

Landings are not required.

7.4 Maintenance Shafts (MS). *(refer WSA 6.7)*

MS not accepted, TMS accepted.

8. Ancillary Structures *(refer WSA 7)*

8.1 Water Seals, Boundary Traps and Water Sealed MH's *(refer WSA 7.2)*

Not required.

8.2 Gas check MH's *(refer WSA 7.3)*

Not required.

8.3 Inverted Syphons *(refer WSA 7.8)*

Not accepted.

9. Structural Design *(refer WSA 8)*

9.1 Products and Materials *(refer WSA 8.2)*

Reticulation Pipes and Fittings must be in accordance with the manufacturers and relevant Standards. The following materials are approved for use:

Table 4 Approved materials for use **North East Water**

Gravity sewer reticulation pipelines may be constructed from uPVC non pressure pipe and fittings (AS 1260) minimum class SN8 and are to be solid walled pipe.

Gravity sewer reticulation pipelines may be constructed from polyethylene and polypropylene profile walled non pressure pipe and fittings (AS 5065) minimum class SN10 (prior approval from the Corporation is required).

Ductile Iron, PN35, lining type to be confirmed with the Corporation. NOTE: Portland cement concrete lining is not acceptable.

Other materials may be considered, however these materials will require approval on a case-by-case basis.

All pipes should be rubber ring jointed.

10. Standard Drawings

The following North East Water standard drawing takes precedence over WSAA.

Table 5 Corporation Standard Drawings

| Drawing No. | Description | North East Water Requirements |
|--------------------|-----------------------------|--------------------------------------|
| SEW-1107 | Property Connection Details | NEW Standard drawing |

These noted North East Water exceptions apply to the following WSAA standard drawings.

Table 6 WSAA Standard Drawings

| Drawing No. | Description | North East Water Exceptions |
|--------------------|--|------------------------------------|
| SEW-1108 | Property Connection Details Y Branch | Not accepted |
| SEW-1316 | Maintenance Shafts and TMS Connection and Installation | Maintenance shafts not accepted |
| SEW-1303 | Maintenance Holes Sewer -< DN 300 Changes in Level Details | Only internal drops accepted |
| SEW-1306 | Maintenance Holes Alternative Drop Connections | Only internal drops accepted |

10.1.1.1 Appendix A

Sewer Capacity Grading Table

| Grade | Pipe size 150 | | | Pipe size 225 | | | Pipe size 300 | | | Pipe size 375 | | Pipe size 450 | | Pipe size 525 | | Pipe size 600 | | Grade |
|-------|------------------|-----------|------------|------------------|------------|------------|------------------|------------|------------|------------------|------------|------------------|-------------|------------------|-------------|------------------|-------------|-------|
| | Tenements | | | Tenements | | | Tenements | | | Tenements | | Tenements | | Tenements | | Tenements | | |
| | Min K (in mm) | Max | | Min K (in mm) | Max | | Min K (in mm) | Max | | Min K (in mm) | Max | Min K (in mm) | Max | Min K (in mm) | Max | Min K (in mm) | Max | |
| 1 in | 1.5 | 3.0 | 0.6 | 1.5 | 3.0 | 0.6 | 1.5 | 3.0 | 0.6 | 3.0 | 0.6 | 3.0 | 0.6 | 3.0 | 0.6 | 3.0 | 0.6 | 1 in |
| 80 | 1 | 1 | 221 | | | | | | | | | | | | | | | 80 |
| 90 | 3 | 2 | 208 | | | | | | | | | | | | | | | 90 |
| 100 | 6 | 4 | 196 | 11 | 8 | 609 | | | | | | | | | | | | 100 |
| 110 | 9 | 7 | 186 | 15 | 11 | 580 | | | | | | | | | | | | 110 |
| 120 | 13 | 10 | 178 | 20 | 15 | 553 | 28 | 22 | 1225 | | | | | | | | | 120 |
| 130 | 18 | 14 | 170 | 25 | 20 | 530 | 33 | 27 | 1175 | | | | | | | | | 130 |
| 140 | 23 | 18 | 164 | 31 | 25 | 510 | 38 | 32 | 1129 | 39 | 2081 | | | | | | | 140 |
| 150 | 30 | 24 | 158 | 36 | 30 | 492 | 43 | 36 | 1089 | 44 | 2007 | | | | | | | 150 |
| 160 | 35 | 30 | 152 | 41 | 35 | 475 | 49 | 41 | 1053 | 49 | 1941 | 58 | 3188 | | | | | 160 |
| 180 | 48 | 41 | 143 | 52 | 45 | 446 | 61 | 52 | 989 | 61 | 1825 | 71 | 3000 | | | | | 180 |
| 200 | <u>65</u> | <u>56</u> | <u>135</u> | 66 | 57 | 422 | 76 | 65 | 936 | 75 | 1727 | 86 | 2839 | 98 | 4313 | | | 200 |
| 220 | | | | 83 | 71 | 401 | 92 | 79 | 890 | 90 | 1642 | 103 | 2703 | 116 | 4104 | | | 220 |
| 250 | | | | 113 | 97 | 374 | 120 | 105 | 832 | 117 | 1536 | 131 | 2527 | 146 | 3840 | 163 | 5511 | 250 |
| 300 | | | | <u>186</u> | <u>161</u> | <u>339</u> | 184 | 159 | 755 | 172 | 1395 | 188 | 2296 | 207 | 3492 | 227 | 5013 | 300 |
| 350 | | | | | | | 269 | 234 | 695 | 242 | 1287 | 259 | 2118 | 281 | 3222 | 305 | 4627 | 350 |
| 400 | | | | | | | <u>389</u> | <u>340</u> | <u>648</u> | 332 | 1199 | 347 | 1975 | 370 | 3006 | 396 | 4316 | 400 |
| 450 | | | | | | | | | | 448 | 1120 | 454 | 1855 | 475 | 2826 | 504 | 1060 | 450 |
| 500 | | | | | | | | | | 602 | 1066 | 585 | 1757 | 600 | 2674 | 628 | 3843 | 500 |
| 550 | | | | | | | | | | 809 | 1013 | 747 | 1670 | 748 | 2544 | 773 | 3656 | 550 |
| 600 | | | | | | | | | | <u>1191</u> | <u>967</u> | 953 | 1596 | 926 | 2430 | 940 | 3494 | 600 |
| 650 | | | | | | | | | | | | 1226 | 1531 | 1138 | 2331 | 1134 | 3351 | 650 |
| 700 | | | | | | | | | | | | 1630 | 1471 | 1400 | 2242 | 1362 | 3222 | 700 |
| 750 | | | | | | | | | | | | <u>2829</u> | <u>1420</u> | 1732 | 2162 | 1628 | 3109 | 750 |
| 800 | | | | | | | | | | | | | | 2185 | 2089 | 1948 | 3006 | 800 |
| 850 | | | | | | | | | | | | | | <u>2925</u> | <u>2024</u> | 2341 | 2926 | 850 |
| 900 | | | | | | | | | | | | | | | | 2850 | 2825 | 900 |
| 1000 | | | | | | | | | | | | | | | | <u>3668</u> | <u>2673</u> | 1000 |

— *Absolute limiting grade for pipe line designed to be cleansed by gravity flows*
Note: Min. Grades for Self Cleansing See 5.4.4





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Document Status

| Rev No. | Author | Reviewer | | Approved for Issue | | |
|---------|-----------|-----------|---|--------------------|---|---------|
| | | Name | Signature | Name | Signature | Date |
| 0 | J Ellwood | C Elliott |  | C Elliott |  | 1/12/08 |
| 1 | J Ellwood | C Elliott |  | C Elliott |  | 2/09/09 |
| | | | | | | |