**WATERNSW**

# DEVELOPMENTS IN THE SYDNEY DRINKING WATER CATCHMENT – WATER QUALITY INFORMATION REQUIREMENTS

**June 2018**

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## Document Control

| Version | Published date | Document administrator |
|---|---|---|
| Revision 1 | August 2010 | Planning and Assessments, Sydney Catchment Authority (now WaterNSW) |
| Revision 2 | August 2011 | Planning and Assessments, Sydney Catchment Authority (now WaterNSW) |
| Revision 3 | June 2018 | Catchment Assessments, WaterNSW |

# Contents

# 1. Introduction

'Developments in the Sydney drinking water catchment – Water Quality Information Requirements' describes the information required as part of your development application to demonstrate that your proposal can achieve a neutral or beneficial effect on water quality. It describes the different reports and modelling you need to include with a development application, and how they vary for different types and scales of development.

## 1.1 WaterNSW

WaterNSW's responsibilities include ensuring that the declared Sydney catchment area and water management works in such areas are managed and protected to promote water quality, the protection of public health and public safety, and the protection of the environment, and the management of bulk water across the State. WaterNSW has a statutory function to protect and enhance the quality of water in the catchment.

The Sydney drinking water catchment covers approximately 16,000 $km^2$ and supplies drinking water to around five and a half million people in Sydney, the Blue Mountains, the Illawarra, Shoalhaven and the Southern Highlands (Figure 1).

## 1.2 Neutral or beneficial effect on water quality

Development in the Sydney drinking water catchment is regulated by State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 (the SEPP). Under the SEPP, proposed developments in the Sydney drinking water catchment that need consent under a council's local environmental plan cannot be approved unless the consent authority is satisfied the development would have a neutral or beneficial effect (NorBE) on water quality. In addition, the SEPP states that:

- any development or activity proposed to be carried out on land to which this Policy applies should incorporate Water NSW's current recommended practices and standards
- if any development or activity does not incorporate Water NSW's current recommended practices and standards, the development or activity should demonstrate to the satisfaction of the consent authority or determining authority how the practices and performance standards proposed to be adopted will achieve outcomes not less than those achieved by Water NSW's current recommended practices and standards.

A neutral or beneficial effect on water quality means development that:

- has no identifiable impact on water quality, or
- will contain any water quality impact on the development site and stop it from reaching any watercourse, waterbody or drainage depression on the site, or
- will transfer any water quality impact outside the site where it is treated and disposed of to standards approved by the consent authority.

The 'Neutral or Beneficial Effect on Water Quality Assessment Guideline 2015' (NorBE Guideline, WaterNSW, 2015a) provides advice about the meaning of the neutral or beneficial effect, how to show it, and how to assess an application against the NorBE test. If you are unsure how to categorise your proposed development or activity, contact WaterNSW's Catchment Assessments team via environmental.assessments@waternsw.com.au.

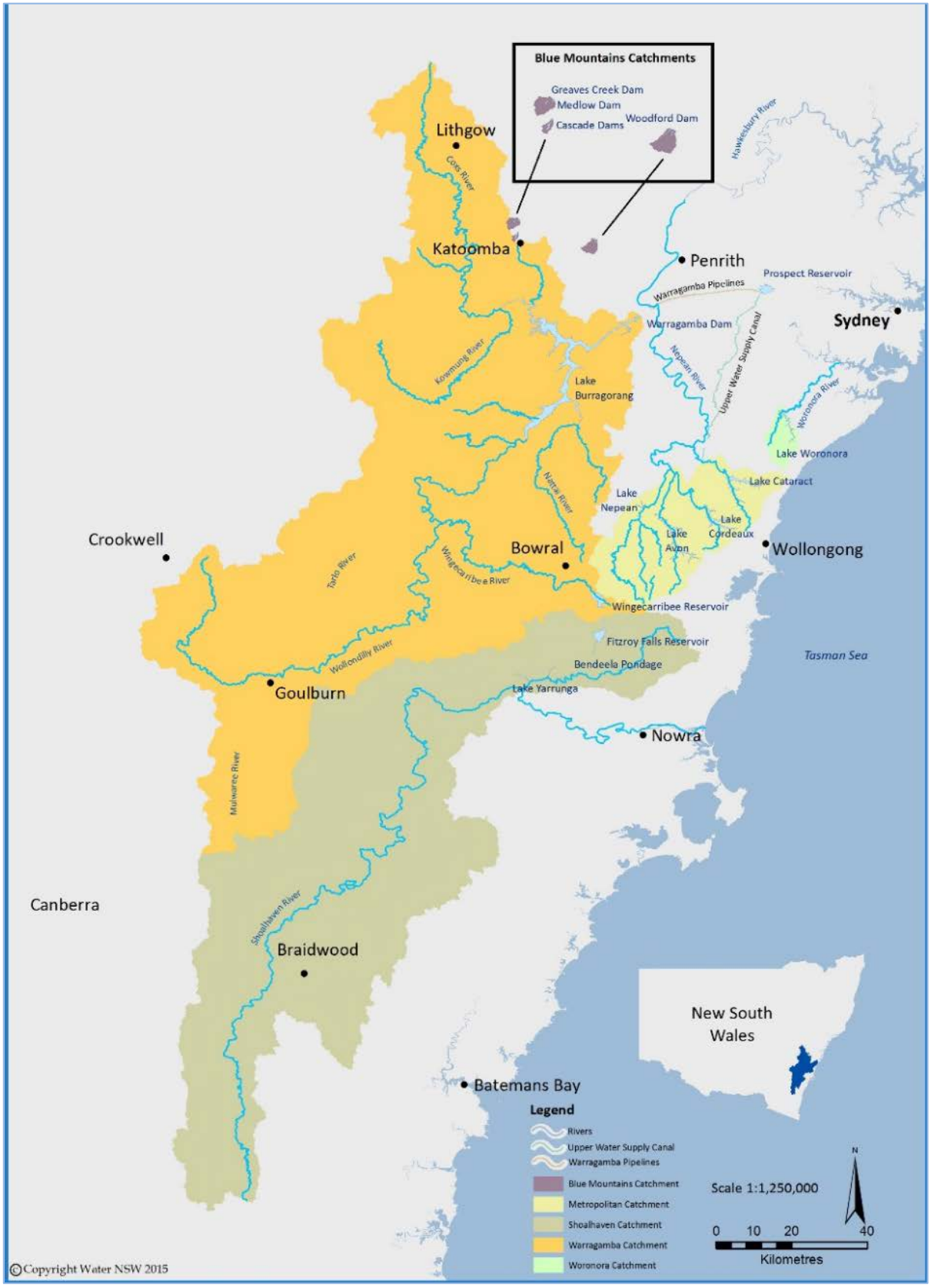
Councils and WaterNSW use the NorBE test to assess development applications in the Sydney drinking water catchment. Developments are sorted into 5 Module Groupings based on development types and the level of potential risk from the development (see Table A1 of the NorBE Guideline). For example, Module 1 developments usually involve a sewered new single dwelling or multidwelling, considered to be a lower risk to water quality. Module 4 developments are considered a high risk to water quality and are typically rural subdivisions with construction of dwellings, subdivision roads and on-site wastewater disposal.

The questions and thresholds used to assess development applications are included in the NorBE assessment tool, a web application that helps councils decide whether a development has a NorBE on water quality and whether WaterNSW has a concurrence role. The NorBE Tool also records the decision process for each development application. The SEPP makes it mandatory for councils to use the NorBE Tool to undertake their NorBE assessments for all modules.

The NorBE Tool can also be used by consultants to prepare a NorBE assessment to submit to council with the development application. Council then either checks the assessment, and if required, forwards it to WaterNSW for concurrence.

You can find more information about the SEPP and the NorBE guideline on WaterNSW's website at www.waternsw.com.au.

**Figure 1: Sydney Drinking Water Catchment**



# 2. The water cycle management study

All development applications in the Sydney drinking water catchment should include a water cycle management study (WCMS) or equivalent information depending upon the development to help council and WaterNSW assess whether the development will have a NorBE on water quality.

The study must include information, reports and modelling appropriate to the type of development and the risks the development has for water quality. Higher risk proposals require more in-depth studies. The WCMS must also include information about erosion and sediment control, and detailed information and reports about stormwater management and wastewater management in any unsewered area.

Table 1 is a guide to the information requirements for water cycle management studies for each Module. The SEPP requires that any development or activity proposed to be carried out on land within the Sydney drinking water catchment should incorporate Water NSW's current recommended practices and standards and can satisfy that the carrying out of the proposed development would have a neutral or beneficial effect on water quality. For a comprehensive outline of requirements in line with current recommended practices and standards, please refer to the Neutral or Beneficial Effect on Water Quality Assessment Guideline (WaterNSW, 2015a).

**Table 1 – Possible information requirements for water cycle management studies**

| Development type | Information required in the WCMS |
|---|---|
| Minor developments of very low risk to water quality - limited to very minor changes and additions to residential houses in sewered areas. | An assessment, consistent with the 'Neutral or Beneficial Effect on Water Quality Assessment Guideline 2018', of whether the development will have any identifiable potential impact on water quality - if there are any potential impacts, the development must include the information outlined in Module 1. |
| **Module 1** | |
| Less complex developments that are a minor risk to water quality - typically includes new single dwellings, dual occupancy or townhouses, multi-dwelling housing (three dwellings or less), subdivisions (three lots or less), or changes and additions to existing dwellings, in sewered areas. | Stormwater quality modelling where required using a stormwater quality modelling program such as the model for urban stormwater improvement conceptualisation (MUSIC) or the small-scale stormwater quality model (S3QM), depending on the size of the impervious area.<br>Conceptual erosion and sediment controls to be used during construction. |
| **Module 2** | |
| Less complex developments that are a medium risk to water quality - typically includes new single dwellings, dual occupancy or townhouses, or changes and additions to existing dwellings, in unsewered areas. | Stormwater quality modelling where required using a stormwater quality modelling program such as MUSIC or S3QM, depending on the size of the impervious area.<br>Conceptual erosion and sediment controls to be used during construction.<br>On-site wastewater management report. |
| **Module 3** | |
| Moderately complex developments that are a medium to high risk to water quality – typically includes multi-dwelling housing (more than three dwellings) and residential subdivisions (more than three lots) in sewered areas. | Stormwater quality modelling where required using a stormwater quality modelling program such as MUSIC or S3QM, depending on the size of the impervious area.<br>Conceptual erosion and sediment control plan or a more detailed conceptual soil and water |

| Development type | Information required in the WCMS |
|---|---|
| | management plan.<br>Seek information from council (or relevant sewer authority) and include a statement and details about the existing reticulated sewerage system including pipes, pumping stations and sewerage treatment plant having adequate capacity to accommodate increased wastewater flows. |
| **Module 4** | |
| Moderately complex developments that are a high risk to water quality – typically includes multi-dwelling housing and residential subdivisions in unsewered areas.[1] | Stormwater quality modelling where required using a stormwater quality modelling program like MUSIC or S3QM, depending on the size of the impervious area.<br>Conceptual erosion and sediment control plan, primary erosion and sediment control plan or a more detailed conceptual soil and water management plan.<br>On-site wastewater management report. |
| **Module 5** | |
| Highly complex or non-standard developments that are the highest risk to water quality - typically major industrial and commercial developments, agriculture developments such as intensive livestock farms and intensive plant growing, extractive industries, and tourism and recreational developments. | Stormwater quality modelling where required using a stormwater quality modelling program like MUSIC or S3QM, depending on the size of the impervious area.<br>Conceptual soil and water management plan or erosion and sediment control plan.<br>On-site wastewater management report (if relevant).<br>Development specific pre- and post-development pollutant assessment requirements. |

Since 2015, Councils have assumed the concurrence role for Module 1 and 2 development types via a clause 64 notice. For such developments, Council's assessment must satisfy that the development can achieve NorBE on water quality. As such, Module 1 and 2 developments are not referred to WaterNSW unless concurrence is triggered during the NorBE assessment.

# 3. General information requirements

General information needed to properly assess a development application includes (if applicable), but is not limited to:

- a clear and complete description of the proposal, including the likely nature of any future uses, and suitably scaled site plan(s) with site constraints
- site features including surface and subsurface hydrology, existing erosion control measures and any constraints or opportunities for water cycle management
- copies of either a statement of environmental effects or an environmental impact statement
- an accurate description of the current situation showing the management of existing drainage in relation to contours or topography
- site land use changes, including an accurate description of the changes from the development, including buildings, vegetation clearing and hardstand areas

[1] The application should also have consideration for the Water Sensitive Design Guide for Rural Subdivisions

- a site contamination report, if relevant
- the flood assessment and associated planning level for the development site, if relevant
- a statement and details about the existing reticulated sewerage system including sewer mains, pumping stations and sewerage treatment system(s) having adequate capacity to accommodate the increased wastewater flows from urban subdivisions and multi-housing developments – as confirmed by council or other appropriate agency. The design capacity of the sewerage infrastructure shall be consistent with the Gravity Sewerage Code of Australia (Water Services Association of Australia, 2014) (or other appropriate standard applied by the sewerage authority)
- a summary and location of the proposed on-site wastewater management as part of the development in unsewered area
- a summary and location of the stormwater quality improvement device(s) proposed as part of the development
- other information that must be supplied with a development application under current planning provisions.

### 3.1 Certification

A development application should include a signed statement by the relevant consultant for each WCMS that certifies as applicable to the development:

**Generally**

- that the WCMS addresses the scale and nature of ALL potential water quality impacts from the proposed development and suitable measures are proposed to address such impacts, whether related to stormwater, wastewater, soil disturbance, flooding, and/or contamination
- adequacy of the capacity of the existing sewerage system
- that the study addresses and includes where appropriate WaterNSW endorsed current recommended practices
- that the study has a statement, based on the information included, about whether the development will have a neutral or beneficial effect on water quality, consistent with the 'Neutral or Beneficial Effect on Water Quality Assessment Guideline 2015' (WaterNSW, 2015a).

**Stormwater**

- that the type, design, size, location and ownership and maintenance responsibilities for all proposed stormwater quality improvement devices are in the report and can be practically implemented at the nominated locations
- that the report meets all the requirements of this document, as outlined in section 5 and is consistent with WaterNSW's 'Using MUSIC in Sydney's Drinking Water Catchment – A Sydney Catchment Authority Standard' (Sydney Catchment Authority, 2012a) where relevant.

**Wastewater**

- that the type, design, size and location of the proposed wastewater treatment and effluent management area (EMA) are in the report and can be practically implemented on the site
- meets all the requirements of this document, as outlined in section 6
- is consistent with the guideline 'Designing and Installing On-site Wastewater Systems' (Sydney Catchment Authority, 2012b).

## 4. Erosion and sediment control measures

Depending on the size of the development proposal, a WCMS must include either:

- a plan for standard erosion control measures consistent with the 'Blue Book Volume 1' (Landcom, 2004) where the construction area of a proposed development is less than 250 $m^2$ **OR**
- a level one conceptual erosion and sediment plan (ESCP), which addresses erosion and sediment control of a proposed development during a construction phase where 250 to 2,500 $m^2$ of land will be disturbed (note: the construction of most dwellings will involve disturbing an area greater than 250 $m^2$ and would therefore require an ESCP). The plan does not address ongoing or permanent control of pollutants. The ESCP must be consistent with the 'Blue Book Volume 1' (Landcom, 2004) and the 'Blue Book Volume 2' (DECC, 2008), **OR**
- a conceptual soil and water management plan (SWMP) that describes what will be done at the development site to control soil erosion (including sedimentation) and pollutant movement to downslope lands and receiving waters during and after development. It also includes all the information included in an ESCP. There must be a SWMP for all developments where the disturbed area will be more than 2,500 $m^2$. The SWMP must be consistent with the 'Blue Book Volume 1' (Landcom, 2004) and the 'Blue Book Volume 2' (DECC, 2008), as required or as relevant, **OR**
- a multi-part ESCP (comprising primary and progressive plans) allows for operational flexibility to plan appropriate control measures.

# 5. Stormwater requirements

The information requirements about stormwater must be addressed using a stormwater quality modelling program such as MUSIC or S3QM and submitting either an outputs report of a completed S3QM or electronic copy of MUSIC using the latest versions of the model and associated report.

## 5.1 Small-Scale Stormwater Quality Model (S3QM) and certificate

The small-scale stormwater quality model (S3QM) estimates stormwater pollutant generation and the performance of stormwater quality improvement devices from proposed development for smaller, less complex development proposals. The S3QM can be used for Modules 1 and 2. The S3QM and associated User Guide is freely available at www.s3qm.com.au and available via a link on WaterNSW's website.

WaterNSW will also accept an S3QM model, in place of a MUSIC model, for Modules 3, 4 and 5 where the total proposed impervious area is less than 2,500 square metres.

A certificate from an assessment completed using the S3QM submitted can be generated that demonstrates whether NorBE is satisfied. The certificate will show the pre-development and post-development loads for Total Suspended Solids, Total Phosphorus and Total Nitrogen associated with the development and proposed stormwater quality improvement devices. NorBE is satisfied if the post-development load of each of these parameters is less than the pre-development load to demonstrate NorBE on water quality, and proposals should aim for at least a 10% improvement.

## 5.2 MUSIC Stormwater quality modelling and report

A stormwater quality model such as the model for urban stormwater improvement conceptualisation (MUSIC) can be used for more complex developments that are a medium to high risk to water quality. These include larger urban sewered

subdivisions, rural subdivisions in unsewered areas, and developments with a large impervious area of greater than 2,500 $m^2$.

The report should include details of the site and development, and details about the proposed stormwater management and offset measures. The report should also include a statement of the assumptions used in the MUSIC model and implications for the neutral or beneficial effect on water quality test. Key assumptions about land use change, such as retaining native vegetation, should be included, as well as any proposed maintenance and protection measures.

The MUSIC model should use climatic data provided by WaterNSW (see the climate zone key maps on the WaterNSW website) relevant to the location of the proposed development. If this data is not available for the proposed location, you may use five years of six-minute rainfall data for a nearby location that has at least 20 years of records. The five years must include a number of average years as well as the wettest year on record.

The model needs to realistically represent the site before and after development, and use appropriate source and treatment nodes for the land uses being simulated, including appropriate pollutant concentrations and realistic impervious area percentages. It must use design parameters for treatment nodes based on appropriate hydraulic sizing and treatment effectiveness. An electronic copy of the MUSIC model (in .sqz format) must be submitted as part of the application.

Note: Users of the MUSIC model must refer to 'Using MUSIC in Sydney's Drinking Water Catchment – A Sydney Catchment Authority Standard' (Sydney Catchment Authority, 2012a) for a complete description of the information needed. Any changes to the recommendations in the guide, including using any non-default parameters in the model, must be clearly explained and justified.

## 5.3 Site development details

Site and development details include:

- information about surrounding land uses where this may impact on stormwater management or it has high environmental value
- an accurate description of the location, size and imperviousness of each land use change, how future drainage will be configured and where discharges will happen
- the location of all proposed stormwater quality improvement devices and flow lines, and any offset measures such as erosion gully rehabilitation
- any potential future water quality or quantity issues including impacts on watercourses and riparian zones.

## 5.4 Proposed stormwater management

The report must include all details about the proposed stormwater management measures, including the following information:

- the proposed stormwater management measures that are appropriate for the site and soil, the scale and nature of the development, and the location of the measures to maximise the volume of stormwater treated
- details of the specific design elements, including the hydraulic basis for sizing and levels to ensure they can treat most runoff from the site before discharge, and cross sections of the proposed stormwater quality improvement devices (SQIDs)

- whether the proposed SQIDs can be practically implemented in the proposed location on the development site, including adequate space, appropriate location, and site levels so that stormwater can flow to the SQIDs to facilitate treatment. They should not impact on, or be impacted on, by the operation of the site or their need for maintenance
- appropriate design parameters to ensure the sizing, functioning and detention times are hydraulically sound
- clear identification of who will be responsible for the ownership and maintenance of proposed SQIDs in the immediate and long term (for example, will the SQIDs be dedicated to Council after a maintenance period by the developer)
- the life span and ongoing management, maintenance and costs to ensure they will not require excessive and unrealistic maintenance from those responsible for ongoing management eg road reserve gross pollutant traps that are often dedicated to councils
- any specific requirements to protect proposed SQIDs.

### 5.5 Proposed offset measures

The report should include all details about any proposed offset management measures to address any residual impacts after the application of impact avoidance and minimisation measures, including:

- the nature, size, location and timing of these measures, including revegetation of pasture land or erosion gully rehabilitation, and how their success is ensured eg survival rate of plantings
- the specific measures needed to maintain and protect offset measures.

### 5.6 Modelling results

The modelling results must compare annual pollutant loads before and after development for Total Suspended Solids, Total Phosphorus and Total Nitrogen. They should aim for an improvement of at least 10% to ensure the neutral or beneficial effect on water quality requirement can be met given the uncertainty in the modelled outcomes.

The modelling results must compare cumulative frequency curves of pollutant concentrations before and after development. They must show that pollutant concentrations after development will be better or equal to previous pollutant concentrations for 50-98% of the time.

## 6. Wastewater requirements

The information requirements about wastewater that should be addressed include the following:

- the specific details of the proposed wastewater treatment and effluent disposal system being applied for, including the proposed site of the effluent management area (EMA). For unsewered dwellings you cannot provide an options report that shows a range of treatment systems and EMAs but does not recommend a specific system, although options are acceptable for subdivisions
- the appropriateness of the proposed system for the frequency of use, availability of power, slope, soils and other site constraints as specified below

- a site map showing the site constraints and the site of the proposed wastewater treatment system and EMA in relation to key constraints and buffers
- consideration of the physical practicality of a proposed gravity-fed system given the site slope and grade and whether a pump well may be needed
- Appendix 2 of the Department of Local Government's 'On-site Sewage Management for Single Households' (the 'Silver Book') provides an appropriate template for wastewater reports. The report should refer to current references and standards eg 'AS/NZS 1547:2012 On-site Domestic Wastewater Management'
- For solar powered sites proposing a wastewater treatment system that requires continuous power for normal operation (such as aerated wastewater treatment systems), a detailed analysis is required outlining the power consumption of the system's normal operation (including power consumption of the pumps etc) in relation to the proposed power source and power storage capacity. The aerated wastewater treatment system must have a constant, and preferably, dedicated power source.

Further information can be found in the guideline for Designing and Installing On-site Wastewater Systems (Sydney Catchment Authority, 2012b).

The Wastewater Effluent Model (WEM) is available for use through the NorBE Tool to allow effluent plume modelling and appropriate sizing of wastewater treatment and disposal systems. A report including effluent plume modelling map can be generated from the tool and can accompany the wastewater report. For access to the NorBE tool, email environmental.assessments@waternsw.com.au.

## 6.1 Wastewater loading

For a proposed dwelling (including dual occupancies), or residential subdivision, the report should include a design wastewater loading determined using the 'Neutral or Beneficial Effect on Water Quality Assessment Guideline' (WaterNSW, 2015a) based on:

- the number of potential bedrooms. For a residential subdivision, design should be based on a minimum of four bedrooms for each proposed lot
- the nature of the water supply ie whether the dwelling is connected to town/ bore water or is supplied by tank water
- the wastewater loading per potential bedroom based on the nature of the water supply (Table 2)

For dual occupancies, the design wastewater loading should be initially calculated for **each** dwelling and then the loadings combined if they are using a common wastewater treatment and disposal system.

For a non-dwelling proposal, the report should include appropriate wastewater loading based on:

- AS/NZS 1547:2012 On-site Domestic Wastewater Management
- Sewage Management Facility Vessel Accreditation Guideline (NSW Health, 2016)
- Sewage Management Facility, Sewage Treatment Accreditation Guideline' (NSW Health, 2005)
- Septic Tank and Collection Well Accreditation Guideline (NSW Health, 2001), and/or

- other reference source endorsed by WaterNSW.

For more information on wastewater requirements for non-dwelling developments and activities, please consult with WaterNSW via environmental.assessments@waternsw.com.au.

The minimum septic tank size for residential developments is 3,000 litres. Larger tank capacities must be based on design wastewater loading detailed in the tables in Appendix J of AS/NZS1547:2012 or other reference source endorsed by WaterNSW. Where a spa bath is proposed as part of a development, the minimum septic tank size must be increased by 500 litres.

**Table 2: Wastewater loading calculations**

| | 1-2 bedrooms | 3 bedrooms | 4 bedrooms | 5 or more bedrooms |
|---|---|---|---|---|
| Tank water supply | 400 L/day | 600 L/day | 800 L/day | 100 L/day extra for each additional bedroom |
| Reticulated / bore supply | 600 L/day | 900 L/day | 1,200 L/day | 150 L/day extra for each additional bedroom |

Greywater systems are treated the same as other wastewater systems, however for greywater-only systems a value of 65% of the total design wastewater load calculated above should be used.

## 6.2 Site constraints map

The report should include a site map identifying all surface constraints, including:

- the drainage network, including watercourses, drainage depressions and dams, roadside and other open drains (that are treated the same as drainage depressions). In unsewered village areas this may need to be discussed with WaterNSW
- vegetation and shading/exposure
- orientation
- any poor drainage/wet seepage areas and springs
- river flats/ floodplains or flood planning level
- any existing or proposed groundwater bores located within 100 metres of the EMAs and their licensed use
- existing wastewater management structures and EMAs and whether they are to be retained or decommissioned
- slope (percentage or degrees)
- general landform
- areas of run-on
- rock outcrop and geology
- stormwater quality improvement devices
- all existing and proposed structures including buildings, access ways or roads, livestock yards
- buffer distances (see 6.7 for details)
- exposed soil / erosion potential / fill etc.

## 6.3 Soil information

The report should include soil profiles of up to at least one metre (where possible) taken at the specific locations of the proposed EMAs, consistent with 'AS/NZS 1547:2012 On-site domestic wastewater management'. Photos of soil core profiles and the proposed EMA should also be included.

The report must describe:

- the soil texture and structure with depth using standard soil descriptions as per AS/NZS 1547:2012 - weathered and decomposing rock of the C Horizon is not considered part of the soil profile for effluent disposal consideration
- the dispersibility (soil with an Emerson aggregate test class 1 are not generally suitable for effluent disposal (Van de Graff and Patterson, 2001)
- other relevant chemical or physical characteristics that could impact on sustainable effluent disposal – eg impeded drainage, as identified in the Silver Book or AS/NZS 1547:2012.

The report should also include the following where they are relevant to the site:

- electrical conductivity/salinity (soil with more than 8 dS/m are not suitable for effluent disposal unless the soil is treated)
- sodicity (soils with more than 10% exchangeable sodium percentage (ESP) are not suitable for effluent disposal unless the soil is treated)
- for permeable sandy or granitic soils, weighted phosphorus sorption values for the soil profile, but only where effluent irrigation or an amended soil mound is proposed
- monthly rainfall and evaporation data.

Available soil data is broad scale and should be confirmed with soil testing.

## 6.4 Climatic information

You must consider rainfall and evaporation data for the site and the implications for the nature and size of the EMA. This information is available on WaterNSW's website at www.waternsw.com.au, and in the guideline 'Designing and Installing On-Site Wastewater Systems' (Sydney Catchment Authority, 2012b).

You should also consider the impact of severe and prolonged frost where relevant.

## 6.5 General evaluation

Where an existing system will be upgraded or augmented, the location, nature, size/capacity, condition, and disposal area, of the existing on-site wastewater system should be clearly specified. For example, this would include the size and condition of the septic tank, inspection and access ports, vents, and pipe connections, baffle wall and inlet and outlet baffles, the septic tank's current state in terms of sludge depth, scum level, and the number, length, width and state of the absorption trenches and inspection ports.

Where tanks or EMAs do not meet current standards, they should be replaced.

Where an existing EMA will be upgraded the report must clearly identify the proposed upgrade including the extra or expanded area (in square metres) needed.

The report should consider whether the development will need a higher capacity pump if the effluent will be pumped uphill and/or over substantial distances. It should also, for example, nominate a suitable diameter (eg 32 mm) high-pressure poly pipe fitted with non-return valves.

You must consider the location and nature of the effluent pipe from the wastewater treatment system or pumpwell to the effluent disposal area. These pipes should be buried at least 300 mm (500 mm under a heavy traffic access way) and in a way that protects them from mechanical damage or deformation.

Where a proposed effluent irrigation area has separate locations and/or different elevations the report must identify specific hydraulic design requirements to ensure the system will work effectively.

## 6.6 Effluent management area sizing

There is a maximum practical size for all types of EMAs, beyond which they are likely to fail. Table 3 lists the maximum allowable EMAs for dwellings.

**Table 3: Maximum allowable EMA sizes for dwellings**

| Disposal system type | Maximum allowable EMA ($m^2$) |
|---|---|
| Absorption trench | 150 |
| Absorption bed | 200 |
| ETA bed | 250 |
| Sand mound | 250 |
| Amended soil mound | 250 |
| Surface irrigation | 1,500 |
| Sub-surface irrigation | 1,500 |

Absorption trenches and beds, and evapotranspiration absorption (ETA) beds, must be sized based on the design wastewater load and site soil characteristics as per AS/NZS 1547:2012. For primary treated effluent, the conservative design loading rate must be used.

For sand mounds, sizing should be based on J.C. Converse and E.J. Tyler's 'Wisconsin mound soil absorption system: Siting design and construction manual' (University of Wisconsin-Madison, 2000). Simply applying the design loading rates in Table 5.2 of the AS/NZS 1547:2012 is not appropriate to size mounds.

The design area for surface and subsurface effluent irrigation can be based on hydraulic loading with a dedicated nutrient uptake area downslope or around the EMA depending upon the topography of the site. The dedicated nutrient uptake area is the difference in area between the nutrient balance (the larger of the nitrogen or phosphorous balance) and hydraulic balance area. The nitrogen and phosphorus nutrient balance area is sized as per the 'Silver Book' and/or the equation by Daniel Martens as specified in the 'Neutral or Beneficial Effect on Water Quality Assessment Tool: Consultant and Consultant Administrators User Guide' (WaterNSW, 2015b).

Where a proposal involves wastewater loads greater than 10 Equivalent Persons (EP), advice shall be sought from WaterNSW via environmental.assessments@waternsw.com.au.

The phosphorus sorption values used in the phosphorus loading example in the 'Silver Book' must not be used, as the phosphorus sorption value is not typical of most locations in the Sydney drinking water catchment. The weighted phosphorus sorption values relevant to the soil profile at the specific site for the effluent irrigation area must be used to determine the size of the nutrient uptake area based on nutrient balance. Most soils (excluding sandy and granitic soils with a low clay content) will have a phosphorus sorption value in the range 200-600 mg/kg. Highly permeable sandy or granitic soils have phosphorus sorption values in the range of 0-150 mg/kg. For highly constrained sandy soils, phosphorus sorption values determined by an accredited laboratory must be provided. Note that ETA beds will not be permitted on sandy soils.

Phosphorus sorption data in mg/kg is converted to kg/ha by using the following equation:

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.01 | x | Soil depth (m) | x | Bulk density ($kg/m^3$) | x | Psorp (mg/kg) |

For amended soil mounds the size must be decided by the design wastewater load and the design loading rate for the lowest depth soil at the upslope side of the bench for the mound.

## 6.7 Site plan for location of effluent management area

The report must include a site plan that clearly shows the location of the proposed EMAs in relation to:

- buffer distances to watercourses, lakes and the full supply level for all water supply reservoirs (100 metres), and drainage depressions, farm dams, roadside drainage and lot scale stormwater quality improvement devices (40 metres). These drainage features are not simply the blue lines as shown on contour maps, but should be mapped for the site. Open roadside drains should be treated as drainage depressions. In unsewered village areas where sites may be constrained, please contact WaterNSW via environmental.assessments@waternsw.com.au.
- any nearby groundwater bores on the site or nearby adjoining properties. Where a bore is within 100 metres of a proposed EMA it must include a statement from the owner that the bore is not licensed and used for potable domestic water supply or must have a groundwater drawdown analysis done using an appropriate methodology, such as Cromer, Gardner and Beavers, 2001 'An improved viral die-off method to estimate setback distances'.
- setback distance to property boundaries, buildings and other infrastructure (existing and proposed) as per Table 2.4 of the guideline for Designing and Installing On-site Wastewater Systems (Sydney Catchment Authority, 2012b)
- the location of any existing wastewater system tanks, piping and EMA that will be augmented or decommissioned, or where these systems are located close to a new wastewater management system.

The site plan must be sufficiently clear to allow an assessor to accurately locate the proposed EMA, and include the method of effluent disposal and the size of the EMA.

## 6.8 Effluent irrigation

WaterNSW will require subsurface irrigation using either a capillary or wick-based system, or pressure compensating drip emitters with root barriers, if:

- average annual rainfall is more than 1,200 mm
- neighbouring dwellings are close to the EMA
- the EMA slope is more than 7% ($4^0$)
- the effluent irrigation area needs to be regularly mowed to remove nutrients for long-term sustainability
- there are regular severe and prolonged frosts (a summer surface / winter-subsurface hybrid system may be acceptable), or
- council requires subsurface irrigation.

Where surface irrigation is proposed, WaterNSW will not accept moveable hoses, including semi-fixed systems. Developments will need fixed sprinkler points using

pop-up sprinklers (except for lawns or gardens close to the dwelling), or quick coupling valves or similar with sprinklers to be rotated throughout the effluent irrigation area.

Sprinkler kits and hoses supplied by most aerated wastewater treatment system manufacturers are not suitable or acceptable.

## 6.9 Special considerations

WaterNSW will require all EMAs, including nutrient uptake areas, to be fenced off from livestock or vehicles. Where it is on a house block that livestock cannot access, the EMA must still be protected from vehicles which means measures other than fencing may be acceptable.

WaterNSW will not accept:

- a trench system with a total length of more than 200 metres, without a pressure dosing system and a flow splitter system
- absorption systems where there is less than 0.75 metres of soil, or where the soil is a medium to heavy clay unless a detailed design is provided, including soil modification and soil permeability testing
- trenches more than 20 metres long, except where they are made of two separate inline trenches with a central feeder or where trenches are pressure dosed from a pump well (in these cases, the applicant should consider absorption beds)
- amended soil mounds on slopes of more than 7% ($4^0$). WaterNSW may, in exceptional circumstances, consider amended soil mounds for slopes that are more than 7-10.5% ($4\text{-}6^0$) if the mound bench is built up with topsoil and is not cut into the slope, or if deep soils are present on the site
- ETA beds on gravel or sandy soils or where the soils are less than 0.75 metres in depth
- reed bed systems to treat and dispose of effluent except in exceptional circumstances. This will only be considered on a case-by-case basis. If the design is based on peak loads, the calculated size of the reed beds would be too large for sustainable vegetation growth in the drier parts of the drinking water catchment. The nutrient uptake of the vegetation is less in colder climates, and in high rainfall areas system overflows can be a problem
- pump-out systems for domestic situations, except where a location will be sewered in the near future. Pump out systems are not sustainable and are often the worst performing on-site systems due to misuse and poor practices. They may be considered in exceptional circumstances, however this will only be on a case-by-case basis where effluent disposal on a heavily constrained site, such as a manned pumping station on the steep banks of a river, is not practicable, or where council does not allow on-site effluent disposal below a certain lot size, or the area is not and will not be serviced by a reticulated sewerage system. Where pump-out systems are approved, they must be:
  - large enough for the development (minimum tank size for domestic systems/residential purposes of 4,500 litres). Collection wells for an effluent pump-out system that relies on total water harvesting must be sized according to Table 4. Wells that rely on reticulated or bore water supply must be sized according to Table 5 (BMCC, ‘Better Living DCP’)
  - appropriately designed and/or anchored, eg tank and lid have an appropriate weight that ensures no tank buoyancy problems

- equipped with an indicator for wastewater level and an alarm for excess wastewater levels
- equipped with a readily accessible pump-out stand with a 'Kamlock' (or similar) cover
- equipped with a small spillage well with a valve for the pump-out pipe
- pumped out regularly by a pump-out contractor.

**Table 4: Collection well sizes – water harvesting (based on fortnightly pump-outs)**

| Number of bedrooms | Collection well size (L) |
|---|---|
| 3 | 10,000 |
| 4 | 14,000 |
| 5 | 16,000 |
| 6 | 18,000 |

**Table 5: Collection well sizes – reticulated or bore water (based on fortnightly pump-outs)**

| Number of bedrooms | Collection well size (L) |
|---|---|
| 3 | 16,000 |
| 4 | 21,000 |
| 5 | 24,000 |
| 6 | 26,000 |

System-specific limitations are detailed in Table 6 below:

**Table 6: System and site limitations**

| System/Disposal Method | Limitations (system not suitable) |
|---|---|
| **Wastewater systems** | |
| AWTS | • Intermittent loads |
| **Effluent disposal system** | |
| ETA | • Slope > 20%<br>• Soil depth < 0.75 m |
| Sand Mound | • Slope > 15% |
| Amended Soil Mound | • Slope > 7% |
| Absorption trenches | • Slope > 20%<br>• Soil depth < 0.75 m |
| Absorption beds | • Slope >20%<br>• Soil depth <0.75 m |
| Surface Irrigation | • Lot size < 2000 $m^2$<br>• Slope > 7%<br>• Annual Rainfall > 1,200 mm<br>• Severe frosts<br>• Soil depth <0.25 m |
| Sub-surface irrigation | • Slope > 20%<br>• Soil depth <0.25 m |

Where an existing wastewater treatment system is to be decommissioned, it must be done according to the NSW Health Advisory Note No 3 (dated January 2017) for 'Destruction, Removal or Reuse of Septic Tanks, Collection Wells, Aerated

Wastewater Treatment Systems (AWTS) and other Sewage Management Facilities (SMF)' (www.health.nsw.gov.au).

Applicants should also be aware of council requirements for wastewater disposal.

## 7. More information

WaterNSW and councils will use information from the WCMS to assess the proposal and set conditions. Where necessary, WaterNSW and councils will assess proposed unsewered developments using WaterNSW's wastewater effluent model to ensure that effluent can be contained on-site and will not intersect with the drainage network.

Modelling results may require relocation of an EMA or an alternative treatment and/or disposal system.

For more information and assistance, please contact WaterNSW's Catchment Assessments Team at environmental.assessments@waternsw.com.au.

# 8. Glossary

| | |
|---|---|
| **Catchment** | An area of land where water from rain and melting snow or ice drains downhill into a body of water, such as a river, lake, reservoir or wetland. |
| **Conceptual erosion and sediment control plan** | A conceptual ESCP addresses erosion and sediment control during a construction phase where 250 to 2,500 $m^2$ will be disturbed. It contains the methods to be used and their location. |
| **Conceptual soil and water management plan** | A conceptual SWMP addresses erosion and sediment control during a construction phase where more than 2,500 $m^2$ will be disturbed. It contains the methods to be used, their location, size and timing. |
| **Consent authority** | (In the EP&A Act), in relation to a development application or an application for a complying development certificate, means:<br>(a) the council having the function to determine the application, or<br>(b) if a provision of this Act, the regulations or an environmental planning instrument specifies a Minister or public authority (other than a council) as having the function to determine the application—that Minister or public authority, as the case may be. |
| **Development** | (a) the use of land, and<br>(b) the subdivision of land, and<br>(c) the erection of a building, and<br>(d) the carrying out of a work, and<br>(e) the demolition of a building or work, and<br>(f) any other act, matter or thing that may be controlled by an environmental planning instrument. |
| **Development application** | An application for consent under Part 4 of the EP&A Act to carry out development but does not include an application for a complying development certificate. |
| **Drainage depression** | A low point that carries water during rainfall events, but dries out quickly once rainfall has ceased. A gully or incised drainage depression is considered to constitute a watercourse. |
| **Equivalent Persons** | Equivalent persons (EP) is a measure of the demand or loading a development will have on infrastructure in terms of the average water consumption or average sewage discharge for an average person. |
| **Potential bedroom** | Generally, a room with a closable door, at least one window and a minimum of eight square metres. A room in a separate building such as a studio could be considered if it has a toilet and washing facilities or close access to same. A room that could reasonably be used as a bedroom. |

| | |
|---|---|
| **Primary erosion and sediment control plan** | The primary ESCP is a broad-based framework that outlines the intentions and fundamental principles that will be followed in planning and implementing control measures for an entire project. The primary ESCP is prepared as a document and usually includes standard drawings of control measures that are suitable for the site(s) and to be used in the project. It is often supplemented with a series of subordinate 'progressive' ESCPs ('Blue Book' Vol.s 2C and 2D). |
| **Progressive erosion and sediment control plan** | Progressive ESCPs detail the specific location and type of individual erosion and sediment control measures along the project. These should be consistent with the approach outlined in the primary ESCP, referencing standard drawings in the primary ESCP as appropriate ('Blue Book' Vol.s 2C and 2D). |
| **Quality of water** | Quality of water refers to the surface water and groundwater quality of the catchments, and does not just mean quality for drinking purposes. Issues of concern extend beyond *Cryptosporidium* and *Giardia*; water quality can be affected by chemical, biological and physical factors.<br><br>In undertaking an environmental impact assessment, assessment of the potential impacts of the development on the quality of water refers to the existing water quality of receiving waters, whether degraded or not. As water quality varies, existing water quality is usually reflected as an average or range of measurements taken over time. In some cases, because of insufficient background information, it may be prohibitively costly (in terms of time and money) to scientifically determine the existing water quality. The assistance of specialist agencies such as WaterNSW and OEH may be drawn on in such cases. |
| **Sediment** | Material of varying size that is being, or has been moved from its site of origin by the action of wind, water or gravity and comes to rest on the earth's surface, including within waterbodies. |
| **Severe frosts** | Areas of severe frost are defined as those where the overnight minimum air temperatures (Stephenson screen) are regularly below $-3^0$C, corresponding to a ground temperature of approximately $-5^0$C. Note that frost hollows and areas of cold air drainage may result in localised areas where frost is more severe than indicated by temperature records for the region. |
| **Silver Book** | The Department of Local Government's On-site Sewage Management for Single Households (1998) is commonly referred to as the 'Silver Book'. |
| **Site** | The site of a proposed development means the area of land described in the development application. |
| **Stormwater** | Rainwater running off a surface. |
| **Waterbody (artificial)** | An artificial body of water, including any constructed waterway, canal, inlet, bay, channel, dam, pond, lake or artificial wetland, |

but does not include a dry detention basin or other stormwater management construction that is only intended to hold water intermittently.

**Waterbody (natural)** A natural body of water, whether perennial or intermittent, fresh, brackish or saline, the course of which may have been artificially modified or diverted onto a new course, and includes a river, creek, stream, lake, lagoon, natural wetland, estuary, bay, inlet or tidal waters (including the sea).

**Watercourse** Any river, creek, stream or chain of ponds, whether artificially modified or not, in which water usually flows, either continuously or intermittently, in a defined bed or channel, but does not include a waterbody (artificial).

**Weighted Psorp value** The weighted value is similar to an arithmetic mean, but each data point contributes equally to the final value.

Example of weighted average of phosphorus sorption of soil profile

| Soil Depth (cm) | Psorption (mg/kg) | Psorption / soil layer |
|---|---|---|
| 0-10 | 150 | 10 x 150 = 1,500 |
| 10-30 | 200 | 20 x 200 = 4,000 |
| 30-100 | 400 | 70 x 400 = 28,000 |

$$\text{Weighted Psorp} = \frac{(1{,}500 + 4{,}000 + 28{,}000)}{10 + 20 + 70} = 335 \text{ mg/kg}$$

# 9. Acronyms

| | |
|---|---|
| **CRP** | Current recommended practice |
| **DCP** | Development control plan |
| **DLR** | Design loading rate |
| **EP&A Act** | *Environmental Planning and Assessment Act 1979* |
| **EMA** | Effluent management area |
| **ESCP** | Erosion and sediment control plan |
| **FPL** | Flood planning level |
| **LEP** | Local environmental plan |
| **MUSIC** | Model for urban stormwater improvement conceptualisation |
| **NorBE** | Neutral or beneficial effect (on water quality) |
| **OEH** | Office of Environment and Heritage |
| **SEPP** | State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 |
| **S3QM** | Small-scale stormwater quality model |
| **SWMP** | Soil and water management plan |
| **WCMS** | Water cycle management study |
| **WEM** | Wastewater effluent model |

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