

# STORMWATER DRAINAGE DESIGN GUIDELINES FOR SUBDIVISIONS

## General

Stormwater drainage systems are required to provide for effective disposal of stormwater and all drainage designs shall comply with appropriate industry design standards such as:

- *Australian Rainfall and Runoff', the Institution of Engineers, Australia, 1977.*
- *Gross Pollutant Trap Guidelines, Department of the Environment, Land & Planning, Department of Urban Services, April 1992.*
- *Stormwater Drainage Design in Small Urban Catchments: a handbook for Australian practice, Australian Road Research Board, Special Report No. 34, Argue J.*
- *Local Government Guidelines for Subdivisional Development October 2017.*

Developers are required to submit stormwater management plans to the Town of Port Hedland including the followings.

1. Detailed stormwater management design including the location and design of swales, integrating major and minor flood management capability, landscape plants for the swales as related to stormwater function, specific details of local geotechnical investigations, local climate conditions and their impact on stormwater design.
2. Detail measures to reduce velocity of stormwater discharge to prevent erosion and sediment transportation.
3. Management of sub-divisional works (stabilising soil, dust, erosion, sediment)

All stormwater drainage designs and calculations shall be carried out by a qualified person experienced in hydrologic and hydraulic design.

The objectives of the stormwater management approach are as follows

## Small Rainfall Events

Stormwater runoff within the first 6 minutes, up to 15mm rainfall from impervious areas should be retained/detained on-site. Retention areas to be designed to prevent rainfall runoff into receiving water bodies by holding it in a retention storage area. Managing stormwater from a small rainfall event can be done by Implementing one or more of the following structures/systems.

1. Vegetated verge and median swales within the road reserve or abutting POS area
2. Underground infiltration trenches, infiltration cells, soakwells and porous base catchpits.
3. Pervious paving.
4. Tree pits.
5. Biofilters.

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## Minor Rainfall Events

Developers are expected construct sufficient infrastructure to manage runoff and discharge stormwater to designated drainage compounds. Scour protection at culvert, pipe system and outlets shall be constructed in accordance with Town of Port Hedland Stormwater Disposal Specifications. Refer Drawing No TOPH 1.0 and TOPH 2.0

## Major rainfall event

Developers to provide a detail design showing flood levels, peak flow rates and flood storage volumes. Developer shall mitigate breeding of disease vector and nuisance insects by designing and maintaining stormwater management systems to contain no standing water for more than 96 hours. Finish ground level of the Lots shall be above 100 year flood level.

## Recommendations

Open drains and swales shall be designed unless otherwise specified by the Technical Services Unit. The designer shall meet the requirements in current Australian Standards in drainage network designs using a recurrence interval of 5 years except in the case of arterial drains and compensating basins where a recurrence interval of 100 years.

Additionally, the designer shall provide for the adequate discharge of flood flows between the intervals mentioned above and in order that the floor level of all buildings shall be 500 mm above the 100 year flood level and all non-habitable areas shall be minimum of 300mm above the 100 year flood level to ensure adequate flood protection during the cyclonic climate conditions.

It is the responsibility of the Consulting Engineer to examine the total catchment area of which a particular subdivision may form a part, to ensure that any arterial drainage that may pass through the particular subdivision is capable of carrying the ultimate design flow from the upstream catchment. If the capacity of the existing downstream catchment is inadequate to handle the design run-off, the surplus water either be retain within the subdivision in an approved manner or existing downstream drainage catchment shall be upgraded to accommodate additional discharge from the proposed Lots.

Creating drainage low points adjacent to residential properties will not be approved and designers shall ensure that there are overflow surface runoff routes to parks or other drainage basins which will mitigate localised flooding.

A Stormwater Drainage Management Plan will be required for each subdivision.

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## Drainage Easement

Under common law and the Local Government Act 1995, it is not permitted to allow overflow onto neighbouring properties. In inevitable cases where stormwater is discharged onto private land at downstream of a subdivision or development, arrangements shall be made by the subdivider with the owner(s) of the downstream land to provide an easement in favour of Town of Port Hedland over the route of the drain and to construct and / or improve the drainage outlet to the requirements of the Technical Services unit.

## Stormwater Drainage (box culvert/pipe)

- The size of the stormwater pipes/box culverts at the crossovers, verge and roads shall be obtained from the TOPH Technical Services.
- Box culverts shall be installed under all road pavements.
- Reinforced concrete pipes or box culverts in classes appropriate to loadings and cover heights shall be installed at crossovers.
- The velocity in pipes shall be limited to the range 0.8 m/sec-1.2 m/sec. The possibility of a scour shall be considered at outfalls in soil classed clayey sands and scour protection steps to be taken to eliminate it where it may occur.
- Manholes / soak wells shall be provided at each change in direction and at a maximum spacing of 90 metres. Step irons shall be constructed for all pits and manholes where the difference in levels between the base and the surface level exceeds 1.0 metre.

All outlets to pipe/box culvert drainage systems (and inlets in the case of open ended culverts) shall have concrete headwalls with concrete aprons, and shall have anti-scour cemented rock bedding for a minimum distance of 2.0m beyond the edge of aprons and 500mm on sides.

All trenches for pipes laid under road pavements shall be backfilled to the pavement subgrade surface with compacted cement stabilised sand or road base course material. The material shall be placed in even layers not exceeding 225mm in thickness and each layer shall be compacted with a minimum of four (4) passes of a vibratory plate compactor having a minimum static mass of 50kg. Care shall be taken to ensure that the material fills all voids under the haunches and that no damage occurs to the pipe whilst compacting material next to and immediately over the pipe. The cement stabilised sand shall preferably be supplied from a central batch mixing plant.

Any areas where piped drainage is used to discharge stormwater to Town's drainage system shall be installed with gross pollutant traps, a structure designed to intercept and retain sediment transported by water flow. (Refer Drawing No TOPH1.0)

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## Crossovers at Open Drains

Piped culvert cross-overs are required at the entrance of the new properties, crossing over an open drain to meet the requirements of a subdivision being drained and filled to the satisfaction of the Town of Port Hedland. All culverts shall have appropriate size concrete headwalls, reinforced concrete pipes and open drains with scour protection as per Town of Port Hedland Crossover Policy 9/005. Subdividers shall design culverts required at the proposed crossovers over open drains and submit the final designs to the Town of Port Hedland.

## Swales and Drain Batters

Swales located within road verges or within footpaths must consider the standard location for services (such as sewers and underground electricity). In general, a swale should not be in the line of other services.

The most important design consideration for a swale is the longitudinal slope. A flow of less than 1.0 metres/second for the 100 year ARI is recommended to avoid scouring. Swales and buffer strips can use a variety of vegetation types. Vegetated swales shall be planted with local native plant species to enhance biodiversity, reduce the need for watering and reduce the spread of weed species to receiving environments via runoff.

Maximum side slopes of unfenced open drains/swales shall be 1 in 6 and 1.0 m wide base. Flow rates in open drains shall be controlled by engineering controls if surface flows will exceed 1m/s. In areas where soils are subject to scouring and drains shall be lined with suitable type of hessian matting to prevent scouring on banks and bases of the swales. Cement mortared stone pitching shall be provided in open drains at the junctions and bends greater than 22.5 degrees.

Table drains at un-kerbed roads shall be sized so that the top water level in a drain does not rise to within 200mm of the edge of the shoulder for the design recurrence interval flow.

## Stone Pitching

Stone Pitching shall consist of sound durable rock not less than 100mm thick, properly bedded on approved loam or sand and mortared to present a uniform surface. The exposed surface of each stone or block shall be approximately flat and not less than 0.05 square metres in area. Spaces between adjacent stones or blocks shall not exceed 20mm in width.

Where road pavements are designed for direct stormwater runoff to adjacent swales, kerb openings shall be located at low points of road pavements and cemented stone pitched

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stormwater spoon drains shall be installed in accordance with the Drawing TOPH 2.0. Angle of the kerb openings shall be designed to direct stormwater flow towards the swale.

## Sumps

Sumps having side slopes steeper than 1:6 and a maximum depth of 6.0m shall be fenced with no public access.