

Technical Note No. 10

Open Drains

Description

Open drains range from hard armoured structures conveying stormwater at high velocity to swales that can replace traditional street kerbs and channels with visually attractive gullies and water features that mimic the natural environment. Some drains such as swales allow stormwater runoff to be slowed, reduced and cleaned before it outfalls.

Application and function

Any development, especially in urban areas can result in a significant increase in the level of impermeable surfaces and subsequent increase in volumes and velocities of stormwater to be conveyed by the stormwater drainage system. When designing stormwater drainage systems consideration should be given to maintaining the natural or pre-development hydrologic regime as much as possible. To ensure volumes and velocities are correctly catered for in an open drain, design should only be undertaken by qualified personnel. This will ensure that the drain does not erode and is not detrimental to the surrounding environment.

Limitations

Correctly constructed open drains with maximum 1(V):4(H) batters require a greater cross section and therefore a slightly larger area of land is required.

Alternatives

Piped drainage systems.

Advantages

Open drains have the advantage of providing filtering of nutrients and the incorporation of dissipation devices within the drain prior to outfall.

Construction

There are a number of aspects which need to be considered when constructing open drainage. These include:

- Open drains should be constructed with either parabolic or trapezoidal shape and with batters less than 1(V):4(H).
- Low flows have the potential to scour the invert of grass lined drains or to exclude access for maintenance (mowing) due to sodden conditions. Drainage of low flows either by subsoil drainage or constructed concrete inverts should be considered at design stage.
- When installing concrete inverts care must be taken to avoid flow running along the side of the invert which will cause scouring of material adjacent to the constructed invert.

- Changes in grade should be identified and grade stabilising structures such as drop structures should be incorporated as required. (See Technical Note No: 5 Drop Structures).
- Grass lined drains should be widened to accommodate top soil installation. Forward planning must be undertaken to ensure uniform grass establishment is achieved prior to the drain accepting full flows.
- Catch drains divert and convey run-on from batters or construction sites. Catch drains are generally only recommended for temporary use in the tropical regions and should be removed and subsequently rehabilitated at the completion of works. Design calculations should take into consideration peak flows and discharge. Should catch drains be necessary as a permanent drainage solution, drains should be lined and surrounds permanently stabilised, diversion banks may be an alternative permanent solution.
- Linings for open drains will vary with location, soil type and expected volumes and velocities. Linings can consist of dryland grass, cellular confinement systems, turf reinforcement, geotextile and hard armour such as stone/rock pitching, rock, rock mattresses and concrete.

Examples of linings and application:

Type of lining:	Application:	Velocity range:
Grass	Alternative to hard linings	Low to medium
Reinforced Grass	Alternative to hard/armoured linings	Medium to high
Geotextile	Areas requiring quick establishment	Medium to high
Rock	Temporary and permanent	Medium
Rock mattress	Areas with turbulent flow or high velocity. May be used as a permanent measure	High/turbulent
Impervious linings		High

- Energy dissipaters and erosion protection measures should be provided at outlets from all formed drainage systems.

Maintenance

Access for maintenance should be considered in the design stage and local government authorities should be consulted for specifications. Open grass lined drains require batters to be traversed by machinery such as mowers or slashers.

Open lined drains correctly designed and constructed should not require expensive or major works. Regular inspections should be undertaken to identify any erosion or sediment deposition. The inspection should identify the cause of the erosion and source of sediment and works should be undertaken to rectify the problem. Any areas where grass coverage has reduced should be revegetated. Once vegetation is established there is no need for grading

Contact details

For further information contact the Vegetation and Land Management Branch in your region. Additional Technical Notes and Erosion and Sediment Control Guidelines are available on the website:

www.nt.gov.au/nreta/naturalresources/

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