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## **WATER QUALITY, DRAINAGE, EROSION AND SEDIMENTATION**

### **Purpose**

To design and carry out the work in a planned process to attempt to prevent pollution to water and avoid erosion, contamination and sedimentation.

To control the quality of surface water leaving the construction site to minimise unacceptable impact occurs to adjoining wetlands and waterways.

### **Objective**

Any discharges of pollutants including sediment into waters must be within the limits imposed by statutory, local authorities, licenses, permits, approvals and environmental protection legislation.

Site procedures are to include an emergency recovery system to ensure there is minimal environmental harm or residual contamination.

### **Key Issues:**

Construction works have the potential to adversely impact:

- Water quality or receiving wetlands and waterways
- Hydrology and flooding
- Soil resources

The following list indicates the pre-defined level of environmental risk, which shall be considered as a potential effect of contamination. Class 1 risk being the highest level of risk and Class 3 risk being the lowest level.

- Site contamination through the potential for an overflow of fuel or from chemical storage containers and from equipment and plant repairs. (environmental class 1 risks).
- Wetland, downstream waterway and groundwater contamination from remediation works (environmental class 1 risk).
- Sediment laden water from the construction site may potentially flow into the stormwater inlets and thus nearby waterbodies could be affected, reducing water quality (environmental class 2 risk).
- Stormwater with excessively high or low pH values could run-off from the selected stockpile stabilisation areas (environmental class 3 risk).
- Site cut-off drains eroding and increasing site water sediment loads (environmental class 3 risk).
- Vehicles leaving the construction site depositing dirt / mud on public roads after rain periods (environmental class 3 risk).
- Removal of bulk off site escaping from vehicles and polluting roadways (environmental class 3 risk).

## **Procedure**

### **Site Investigation**

Prior to commencing on site and during the project-planning phase, a site investigation analysis will take place. This analysis will assess all current reports to help in planning and thus reduce the potential risk of water contamination and its subsequent environmental damage.

Results from this process will facilitate the prevention, control, maintenance and the required monitoring of relevant environmental issues.

The site Investigation analysis will consider: -

- All reports issued by local or statutory authorities,
- Past uses of the development site and its immediate surrounding area (ie-local topography),
- Geotechnical reports on ground conditions,
- Detailed land surveys covering all services locations crossing the site
- Any visual investigations.

Resulting from the analysis of this site investigation, an evaluation of the environmental risks can be determined. From this classification the risk level and the type of environmental controls required during the construction and rehabilitation phase of the project will be established.

With this background knowledge, an environmental protection plan shall be designed. The environmental protection plan will be shown in a drawing format identifying all the necessary control methods.

The following text compliments and further explains the type of controls used to run and maintain the environmental plan.

#### **Project Planning**

The prevention of soil erosion by water and wind and by sediment pollution is an essential component of the project environmental plan in the preservation of water quality.

Where class 1 & 2 environmental risks are identified or determined water samples will be taken, analysed and a report given prior to commencement on site or the erection of any environmental controls

An erosion and sedimentation plan will be prepared and implemented before site establishment and bulk earthworks. The erosion and sediment plan will be designed in accordance with the following principles and considerations:

- ensure existing drains within the construction area operate effectively;
- existing drains that are to remain are required to be protected with sediment controls, such as straw bales and geotextile filter fabric;
- existing drain lines running through the site to be removed should be capped immediately to ensure that no contamination to this line is allowed to occur;
- construct erosion and / or sediment control works as might become necessary to ensure the desired protection is given to wetlands;
- ensure rehabilitated lands after completion have effectively reduced the erosion hazard;
- maintain erosion and sediment control measures in a functional condition through the construction period;
- Remove temporary soil conservation structures as a last activity in rehabilitation program.

## **Erosion and Sediment Control**

Where possible, limit land disturbance only to the area needed, especially in the vicinity of wetlands or existing stormwater drainage;

Sediment fences and straw bales will be positioned where erosion is most severe. This technique will dissipate stormwater velocity and collect moving solids.

Swales and perimeter diversion banks and silt fences will be used to control the flow of run-off within and around the site. Sediment laden run-off collected in swales and perimeter banks will be selectively directed around the site works.

Reduce the erosive energy of water using measures such as temporary storage, dissipaters, level spreaders and grass planting: -

A Sedimentation holding technique positioned ahead of water entering the local drainage system may be deemed required depending on local site conditions.

The discharging from any ground de-watering system shall be directed through a sedimentation holding system.

## **Minimum Controls For Classified Type 3 Environmental Risks**

### **Dispersal Control:**

Site access will be limited to the minimum number of entry and exit points. All approved access points shall be marked before the commencement of construction within that area.

Prevent deposition of sediment on the public road network due to truck / equipment movements to and from the site.

A purpose built wheel shaker facility will be constructed at the exit gates of the site.

Main construction roads on site to be all weather and adequately drained.

### **Fencing:**

Fencing is an effective way to identify areas that require protection in a construction site. Areas selected for protection will be fenced throughout the construction period.

Orange mesh fencing will be used to distinctly protect trees and any other area or object susceptible to being disturbed by machinery or construction activity.

### **Straw Bales:**

Straw bales will be placed in areas where energy dissipation is required. When constructed these systems are commonly known as check dams and are placed in areas where a major flow path exists.

Straw bales filter coarse sediments but tend to be less effective with fine sediments. For this reason, where appropriate, all straw bales will be lined on the upstream side with a geotextile filter fabric where appropriate.

Straw bales will be secured with three stakes and positioned so the bale twine does not degrade due to direct sunlight.

### **Diversion Banks:**

Requirement for diversion banks shall be determined and if required will consist of a compacted earth structure installed between property line and the line of excavation.

### **Stockpiles**

Stockpiles of excavated materials are not to be located within 6 metres of sediment control basins, pump pits, wash down areas, embankments and ramps.

Loss of spoil from stockpiles is minimised using filter barriers and temporary covering or revegetation with hydro-mulching where stockpiles are to be stored for a period of time.

Sediment fences will be placed downstream of stockpiles and disturbed areas. It is important that sediment is collected adjacent to these areas to prevent loss of material downstream.

### **Visiting Vehicles**

Concrete wastes or washing's from concrete mixers, concrete pumps and bituminous plant will not be positioned where the waste or washing's may flow or be washed into stormwater drainage systems.

### **Loam Security**

Trucks transporting excavated material from the construction site shall have their tailgates securely fixed before loading and immediately after unloading. Before leaving site, all loads shall be covered adequately.

## **Minimum Controls For Classified Type 1 Environmental Risks**

### **Construction Plant Storage & Maintenance**

Fuel will not be stored on site unless necessary. Fuelling of vehicles and construction plant must not be carried out in areas from which spilt fuel or oil may be discharged into waters, street gutters or stormwater drainage systems.

Drums and tanks containing fuel, oil or other pollutants will be stored within impervious bunds. Impervious bunds will be constructed around these storage areas to ensure a retention of not less than 110% of the capacity of the tank in each bund.

The maintenance and cleaning of vehicle and construction plants shall not be carried out in areas where oil or washing's may be discharged onto receiving waters, street gutters or stormwater channels. Wastes arising from such activities shall be collected and disposed of to a licensed disposal site.

Fuelling of vehicles and construction plant must not be carried out without an operator or driver being in attendance at all times.

## **Minimum Controls for Classified type 2 environmental risks**

### **Sediment Tanks**

Where required water from within the Site will be directed or pumped into suitable settling/sediment control structures.

The sedimentation system shall be designed to cater for not only the probable storm event, but also for the envisaged seepage of waters through rock profile. The tanks shall be constructed with a minimum depth of 500mm.

The sedimentation system shall allow for the treatment of all run-off water containing or likely to contain sediment including discharge from de-watering and truck wash activities.

The discharge from the sedimentation system shall be directed to stormwater systems. Pump discharge shall not be permitted in road kerbs.

The sediment tanks will be flocculated if required to achieve performance levels, before the discharge of the water by pumping to the existing permanent stormwater system. Gypsum will be used as the flocculating agent as per "Soil and Water Management for Urban Development" written by the NSW Department of Housing.

It should also be noted that the sediment tanks shall not operate at less than 70% of their design capacity. Sediment is to be removed from the ponds when 110% capacity is trapped in the settling zone. All collected sediment is to be removed from site.

## **Monitoring:**

All sediment control measures shall be maintained in a satisfactory working order throughout the works. Water samples from the discharge point will be taken after all major storm events and a minimum of weekly during the construction process when an environmental risk 1 & 2 classification is determined.

The earthworks contractors shall inspect all sediment control measures weekly during the excavation phase of the project and immediately after all major storm events. The system shall be inspected for structural damage, clogging by silt or other debris and prompt repairs or replacement will be carried out. This process will ensure: -

- control measures are operating effectively
- spilled material is removed from areas near sediment control ponds, wash down areas, construction exits and roadways
- gravel or other filter materials are clean and have been reinstated or replaced to maintain effective performance
- drains operate effectively
- removal of spilled soil
- additional erosion and / or sediment control works are constructed or upgraded to ensure the desired protection level is maintained;
- removal of trapped sediment from catch drains, pits, sediment fences etc;

### **Rehabilitation:**

On completion of works;

- remove temporary sediment traps by removing all silt material from the base of the trap, removing the trap wall and filling the trap with compacted fill;
- Grade diversion drains to match surface levels.
- Maintain temporary silt traps or sediment control devices for topsoiling and grassing, until stabilisation of disturbed area is complete.
- Continue maintenance of rehabilitated areas until vegetation is well established.

### **Reporting:**

The Site Manager will keep records and comments on the condition of existing erosion and run-off controls (drains, silt fences, catch drains etc) and any site instruction issued to subcontractors to undertake remedial works.

Rainfall data on site and records of poor drainage areas will be recorded by the Site Supervisor.

### **Performance Measures:**

Reports on performance will be measured against: -

- Control structures established and operational prior to earthworks commencing
- All site drains unobstructed
- All major site drains adequately stabilised
- All controls maintained and functional
- All stockpiled material adequately stabilised and protected
- No complaints being received for mud or organic debris on the surrounding public roads to the site.

**Corrective Actions:**

The subcontractor shall advise the Site Manager by way of the non-conformance report procedure and the corrective action taken to correct any non-conformance.

The Site Manager will review and analyse the cause of detected non-conformance and approve the corrective action.

Any contamination causing an alleged effect to the quality of the water system and discharged water from the sedimentation system, shall be sampled and analysed for:

- Oil and grease in accordance with APHA 5520
- pH in accordance with APHA 4500 – H+
- NFR in accordance with AS3550.4 (1990)
- Selected species in accordance with APHA Standard methods 1989, 17th Edition.
- Compliance with "Restricted Substances in the Clean Waters Regulations 1972".

Results will be reported to the Project Manager. Visual inspections will also be done at time of sampling. Abnormal non-compliance events will be notified to the Construction Manager with recommendations for corrective action.

A log book, or other suitable records will be kept by the Site Supervisor or Subcontractor and entries made at least weekly and as soon as practicable after rainfall events and/or site closure. Records will be made of the following;

- The volume of any rainfall events
- The condition of any soil management works
- Application of flocculating agents to sediment tanks
- Non-filtering residue (NFR) in milligrams per litre of water in the sediment basin(s).
- Volumes of water discharged from sedimentation system.

The records will form part of the Project Quality records and be made available to any officer of the EPA or other authorised person on request.