

*Honouring the past
by securing the future*

**Erosion and Sedimentation Control Plan
for the conservation and adaptive re-use
of the Quarantine Station**

Fourth Draft

May 2005



Mawland Quarantine Station Pty Ltd (ACN 107 088 157)
North Head Scenic Drive
Manly NSW 2095, AUSTRALIA
Correspondence:
Box 50, 145 Sydney Rd
Fairlight NSW 2094, AUSTRALIA
Telephone: (61) 2 99775145 Facsimile: (61) 2 9977 6680
Email: info@q-station.com.au. Website: www.q-station.com.au

Declaration and approval

This Erosion and Sedimentation Control Plan has been prepared to meet: the requirements of Condition 197 of the Conditions of Planning Approval for the conservation and adaptive reuse of the North Head Quarantine Station.

Prepared by: Kristian Butcher, Construction Manager, Mawland Hotel Management and Q-Station Pty Ltd

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In preparing and granting approval for this Erosion and Sediment Control Plan all efforts have been made to comply with the Conditions of Planning Approval and relevant legislation. However, in the event of an inconsistency with this plan and any requirements of the Conditions of Planning Approval or relevant statutes; the Conditions of Planning Approval or the relevant statutes will prevail. Furthermore, the granting approval for this plan does not relieve the co-proponents of the obligation to obtain all other approvals from relevant authorities required under any other legislation.

This plan was presented to the Quarantine Station Community Committee at its meeting on 16 December 2004.

This plan was approved by:

Tony Fleming, Deputy Director-General, Parks and Wildlife Division on behalf of the Department of Environment and Conservation on 2005; and

Robert Black, Director, Urban Assessment Branch on behalf of the Department of Infrastructure, Planning and Natural Resources on2005.

Acknowledgments

This Draft Plan was prepared by Kristian Butcher (Mawland Hotel Management).

Reviews and valuable input was provided by Simon McArthur (Mawland), and is expected from Sian Waythe, Quarantine Station Environmental Manager (NSW NPWS) and Robert Black (Department of Infrastructure, Planning and Natural Resources).

1. Introduction

The following plan addresses erosion and sediment control initiatives for the adaptive reuse of the Quarantine Station. The first three chapters relate to the overall adaptation and ongoing operation that will take place on the Quarantine Station. The last chapter specifically addresses construction related activities. In a tabulated format; activities, objectives, actions, milestones/reviews and finally responsibility for implementation, are described in a highly practical manner.

1.1 Approval condition requirements

The Quarantine Station Approval Condition 197 requires, as part of the Environmental Management Plan, the preparation and implementation of an Erosion and Sedimentation Control Plan (ESCP). The plan is to provide strategies that minimise potential construction runoff and control possible sediment flows during the ongoing operation. More specifically including:

1. identification of erosion and sediment control restraints, and how these will be addressed during the works;
2. details of mitigation measures or structures; and
3. measures to minimise the potential of erosion
 - diversion of up-stream run off in exposed areas
 - installation of geo-textile filter fencing, in 'valleys' and other velocity controls
 - undertaking construction works in sensitive areas during dry weather where possible
 - using of one or two methods of sediment control at storm water run off flow zones to demonstrate a positive initiative for hazard risk minimisation.

Key milestones and reviews the plan makes mention to include:

- Pre-construction ESCP works implemented where warranted.
- Retain in effective operational condition until stabilised.
- Monitor and review effectiveness of any ESCP works ensuring noted in Daily Site Diary and recorded in the Monthly Construction Report.

The plan also identifies implementation responsibility for each activity

2 Background information

This chapter outlines the existing stormwater conditions at the Quarantine Station, assesses the stormwater impacts associated with the Proposal and suggests stormwater management techniques to minimise these impacts.

2.1 Local Rainfall and Catchment Area

The average annual rainfall in the proposed lease area is approximately 1,220 millimetres, with an average of 133 rain days. The catchment area of North Head can be generally divided into east and west sub catchments, the latter of which contains the Quarantine Station. The west sub catchment has an area of approximately 120 hectares from Collins Beach to The Old Mans Hat.

An assessment of the rainfall runoff conditions for each local sub catchment affected by the proposal has been carried out for the one year average recurrence interval event.

The sub catchments of the proposed lease area can be divided into those which run into Quarantine Beach, Store Beach and Collins Beach of Spring Cove, and the headland area between Quarantine Head and Cannae Point. The latter sub catchment involves dispersed runoff and was not considered

further. The sub catchment area draining to The Old Mans Hat is not affected by the proposed lease area.

Figure 1 illustrates the sub catchment areas affected by the proposed development at the North Head Quarantine Station.

Peak flows and volumes are estimated for each sub catchment for the one year average recurrence interval rain event and shown in **Table 1**. Peak flows were estimated using the probabilistic Rational Method for the 1year ARI event and Australian Rainfall and Runoff rainfall estimation techniques (AR&R, 1987).

Table 1: Existing Catchment Conditions, one year average recurrence interval

Sub catchment	Area	Approx. Peak Flow	Approx. Volume
Quarantine Beach	26 ha	1.7 m ³ /s	2,700 m ³
Store Beach	31 ha	1.9 m ³ /s	3,300 m ³
Collins Beach	37 ha	2.2 m ³ /s	4,100 m ³

2.2 Runoff areas

The proposed lease area currently has numerous buildings, paved areas, roads and other infrastructure associated with the original Quarantine Station, including a Wharf.

Rainfall runoff from the roofs of several existing buildings discharges directly onto the ground downhill of the building. This water would either infiltrate into the soil or run off as overland flow into Spring Cove.

The proportion of roof runoff that enters the piped stormwater drainage system is unknown.

Soils in the proposed lease area are shallow, overlay Hawkesbury Sandstone, and have a high soil erosion hazard. The soils generally exhibit good permeability. (Chapman et. al., 1989)

2.3 Stormwater Drainage System

Maps or plans of the existing stormwater drainage system are not available, therefore certain assumptions have been made concerning the location and size of drainage infrastructure based on site inspection.

The proposed lease area is drained by a myriad of stormwater pipes and culverts that appear to mostly discharge through a large concrete pipe, approximately 0.6 metres in diameter, onto Quarantine Beach. This is fed by a main concrete pipe and cobble stone lined open channel system that runs down the road, on the eastern edge of the escarpment, which accesses the Wharf.

At the top of this road, adjacent to the sewer pumping station and chlorination plant, there are a number of stormwater pipes and open channels that feed the main pipe, which are assumed to collect stormwater runoff.

Observations made during the site visit indicated that stormwater is collected from the roofs of many existing buildings and directed into the stormwater system via the roof gutter, down pipes and pipe/open channels to the outlet pipe.

It was noted that many of the gutters and down pipes are in poor condition, blocked and may need replacing or maintenance.

2.4 Legislative requirements

The *Protection of the Environment Operations Act, 1997* (POEO Act) repealed the Clean Waters Act 1970 and establishes regulatory procedures for discharges into aquatic environments and defines licensing conditions. The stormwater discharge must meet the requirements of Section 120 which states:

(1) Prohibition on polluting

A person must not pollute any waters.

(2) Prohibition on causing pollution

A person must not cause any waters to be polluted.

(3) Prohibition on permitting pollution

A person must not permit any waters to be polluted.

(4) Offence

A person who contravenes this section is guilty of an offence.

In the design of the car park, Section 120 was considered and the following features were incorporated to minimise any water pollution:

1. Grass swales; and

2. Infiltration trenches.

Water discharges from the car park would not require licensing under the POEO Act as it is not scheduled under the Act and is unlikely to cause significant pollution.

2.5 Proposed Situation

The Proposal is unlikely to introduce any significant change to current stormwater systems and runoff.

The main stormwater element to be changed by the proposal is the introduction of new impervious surfaces. Such impervious surfaces are limited to the upgrading of the existing road network and provision of turning circles for vehicles adjacent to building S2 and near the upper reservoir. This represents a negligible increase in the impervious area in the catchment.

The new car park areas would have a gravel surface with a compacted base and would therefore have limited permeability. The changes in run off conditions from these areas have been assessed assuming they are effectively impervious to be conservative. It should be noted that each of the car parks will be subject to detailed design, including layouts and drainage systems. The area of each car park has been estimated (**Table 2**) from preliminary plans of the development produced for Mawland. The total area of new car parks is less than 900 m², which is approximately 0.1% of the affected catchment area.

Upgrading of the existing road network would involve repairing the currently broken edges of bitumen and the provision of road widenings in two areas along the existing road alignment. However, both these works would not significantly increase the impervious area of the roads. Road widenings would include replacement of the currently broken edges of bitumen.

2.6 Car Parks

An estimate has been made of the increased quantity of runoff expected over an average year from each car park area.

The additional run off volume estimates from the proposed car parks are shown in **Table 2**. They have been calculated assuming an impervious surface, as the level of base compaction is not known and would not be known until the detailed design stage. Therefore, these run off volumes are conservative as some infiltration is likely to occur with a gravel car park surface.

Table 2: Additional run off volume estimates from proposed car parks

Car Park	Location	No. of Spaces	Area (approx.)	Run off Volume* (ARI 1yr)
Car park 1	Gatehouse	120 Cars	3050 m2	22 m3
Car park 5	Accommodation Area (Nth)	56 Cars (Hotel Guests only)	1450 m2	10.5 m3

* this is a conservative estimate of runoff volume based on impervious car park areas.

The increased areas as a result of the Proposal are not expected to have a substantial impact on the quantity or quality of stormwater leaving the site.

The proposed design of the stormwater system for each car park would mean that the majority of rainfall events would infiltrate, or be discharged as dispersed overland flow into the surrounding bushland. As a result, an insignificant additional load on the existing drainage system in terms of water quantity and quality would result from the Proposal.

The CP4 car park drains to Quarantine Beach, and CP1 to Collins Beach. The relative increase in impervious area and volumetric runoff as a result of the new car parks would be approximately 0.1 percent. Therefore, the impact of the Proposal in terms of stormwater quantity and quality would be negligible and there would be a negligible impact on flooding.

It is recommended that the car park designs incorporate such best practices, with the following features:

- Side collection of dispersed low flow runoff, with gently sloped (up to two percent) grass swales;
- An infiltration system with a permeated 'perforated pipe', buried in an excavated channel filled with aggregate along the grass swale collection areas, which would provide treatment of low flow storm events and in low lying areas which do not currently drain well. The aggregate should be encapsulated in a suitable geotextile material to filter fine sediments and prevent the clogging of the perforated pipe;
- The majority of low flow stormwater runoff should infiltrate into the grass swale area and be effectively reused by the ground cover and any vegetation incorporated into the landscape design;
- Treatment provided by the grass swale and infiltration medium should avoid the need for grease/oil traps to be installed given the relatively small car park areas contributing to stormwater runoff;
- Any treated low flow run off collected by the perforated pipe should be discharged as dispersed overland flow over an established grass swale downstream of the car park, ultimately discharging to the surrounding bushland areas;

- Runoff from higher rainfall events should discharge from the car park areas by means of overland flow over the grass swales and spoon drains in the pavement. These flows should be discharged onto the same grass swales as the low flows, downstream of the car park area; and
- The grass swale and infiltration system should provide treatment of the stormwater, and remove the majority of pollutants to an acceptable level prior to discharge to the surrounding environment.

The detail design of the car parks will need to consider the implications to wildlife habitat such as the Bandicoot. Some of the indicative design features recommended above which accommodate the Bandicoot are the side collection and dispersed low flow run off along grass swales and Bandicoot feeding areas.

The technique of stormwater management described above is in line with the overall National Parks and Wildlife Service objectives of managing sites in an environmentally sustainable manner. Construction of the recommended water quality treatment measures as the first priority would ensure the treatment of stormwater runoff during the construction phase of the new car parks is in accordance with the requirements of the Department of Housing, Soils and Construction: Managing Urban Stormwater (1998) handbook, known as the Blue Book. Appropriate erosion and sediment controls will be implemented such as silt fences and hay bales downstream of any earth works while the carparks, the grass swales and infiltration trenches are being constructed.

The retention of pollutants via these method is expected to range from 50 to 75 percent for nitrogen and phosphorus, 25 to 80 percent for heavy metals, 71 to 80 percent for suspended solids, and 75% for oils and grease. This is based on pollutant retention figures published by the EPA for infiltration trenches and filter strips/grassed swales. The filter strips require a residence time of at least 9 minutes to achieve the above pollutant removal (Environment Protection Authority, 1997). This criteria needs to be incorporated into the detailed design works. Therefore, the car park drainage design recommendations would treat the added pollutant load and is also likely to improve the existing situation for pollutants such as suspended solids and hydrocarbons.

While the retention of stormwater run off does not form part of the proposed development, such proposal may be considered in the future to reduce the water supply requirements. The detail design of the car park drainage systems should consider the direction of overland flows towards landscaping and vegetated areas. The collection of stormwater from building roofs for re-use as landscape watering or toilet system would provide a net benefit to stormwater management.

2.7 Road Upgrade

The turning circle adjacent to building S2 would not significantly affect stormwater runoff as there currently exists a large sealed area at that location as a result of the junction of four roads. Stormwater runoff from the turning circle pavement would feed into the existing stormwater system at that location. The upgrade of the existing roads would result in an improvement in the quality of stormwater as a result of decreasing the area of disturbed soil along the edge of the road, thereby reducing soil erosion and sedimentation downstream of the road verge.

2.8 General litter and water quality

Increased use of the site is likely to generate an increase in general litter found across the site.

Increased litter has the potential to adversely impact on the water quality of stormwater discharges at Quarantine Beach.

The control of litter across the site would be best controlled with the appropriate location of rubbish bins throughout the site, regular inspection and collection, and signage. Should these management measures not prove to be effective, then the installation of gross pollutant traps may be considered.

2.9 Mitigative Measures

The following section provides an action plan to address specific objectives related to various activities.

In general the mitigative measures include:

- Implementing and maintaining erosion and sediment control practice pre-construction, during construction and in the restoration period as appropriate;
- Providing measures for sensitive or at risk areas, namely those adjacent to ocean bound stormwater flows;
- A silt fence to be erected below all excavations greater than 10m² and on slopes with a gradient exceeding 1 in 10 or 10% throughout the site;
- Implementing measures prior to any earth works commencing, and maintaining them in good condition throughout the works in which they are operational for;
- Not removing preventative structures until their works catchment area has been successfully stabilised by landscaping or hard works;
- Providing minor selective measures as required in low risk areas.

3 Conclusion

The Proposal would represent little difference from the existing situation with regard to stormwater runoff. Some changes to the existing stormwater flows would occur in the new car park areas. However, these areas only represent 0.1 percent of the affected catchment area and this is not expected to have a substantial impact on the quantity or quality of stormwater leaving the proposed lease area. Upgrading of the internal road network would result in a minor improvement in the quality of stormwater as a result of decreasing the area of disturbed soil along the road edge, thereby reducing soil erosion and sedimentation downstream.

Reference:

Chapman, G.A. and Murphy, C.> (1989), *Soil Landscapes of the Sydney 1:100 000 sheet*. Soil Conservation Service of NSW, Sydney.4. Erosion and Sediment Control Plan for the Construction Phase of the Project.

Table 3: Erosion and Sediment Control Plan for the Construction Phase of the Project – Site preparation prior to excavation

Activity	Site preparation prior to excavation				
Objective	Avoid erosion / sedimentation issues during construction, through adequate pre-construction site preparation				
Preventative and corrective actions required to achieve objective	Key Milestones and reviews	Responsibility to implement	Timeframe	Compliance Record [#]	Ongoing Audit Requirement
ES1. Before commencing earthworks on any part of the site, make available on site sufficient materials to suitably protect against erosion.		MHM Construction Manager	Prior to commencement of construction	Procurement records	No
ES2. Clean runoff from areas upstream of disturbed areas to be diverted around the works using diversion structures if necessary. Avoid using drains.		MHM Construction Manager	Prior to commencement of construction	Construction plans	Yes until earthworks are complete
ES3. Install silt fences above and below sites in any flow channel directing water across the works area.		MHM Construction Manager	Prior to commencement of construction	Construction plans	Yes until earthworks are complete
ES4. Install erosion and sediment control measures in sensitive or at risk areas prior to construction works and maintain until after works have been completed.		MHM Construction Manager	Prior to commencement of construction	Construction plans	Yes until earthworks are complete
ES5. Heavy plant is to have restricted use in areas waterlogged after rain.		MHM Construction Manager	Prior to commencement of construction	Environmental Audit Reports	Yes
ES6. Grates or gravel beds to be installed near areas of major excavation or ground disturbance to prevent the transport of dirt/mud onto internal and off-site roads.		MHM Construction Manager	Prior to commencement of construction	Construction plans	Yes until earthworks are complete

Suggestion only. Other documentary evidence may be used to substantiate compliance.

Table 4: Erosion and Sediment Control Plan for the Construction Phase of the Project – Excavation of soils

Activity	Excavation of soils				
Objective	Best practice for excavation to minimise the chance of erosion problems on site				
Preventative and corrective actions required to achieve objective	Key Milestones and reviews	Responsibility to implement	Timeframe	Compliance Record [#]	Ongoing Audit Requirement
ES7. Sediment fences to be reused on site where appropriate.	Routine inspections to be conducted ensuring controls are in place and effective operationally. In particular, checks should be made during and after rainfall events to ensure effectiveness and any remedial actions necessary. Any incidents to be noted in a Daily Site Diary and/or site incident register, and recorded in a Monthly Construction Report	MHM Construction Manager	During construction	Induction training notes	No
ES8. Where feasible, avoid excavation beneath tree crowns. Trenches beneath tree crowns with significant root systems that cannot be avoided are to be bored or hand excavated to minimise root damage.		MHM Construction Manager	During construction	Construction plans	Yes until earthworks are complete
ES9. Dispose of excavated fill on site where adverse impacts will not arise.		MHM Construction Manager	During construction	Construction plans	Yes until earthworks are complete
ES10. Keep surface disturbances to a minimum necessary to suitably undertake the works in an efficient manner and minimise the amount of soil exposed at any time.		MHM Construction Manager	During construction	Induction training notes	Yes until earthworks are complete
ES11. Top soil to be separated from sub-soil and reused for landscape works.		MHM Construction Manager	During construction	Environmental Audit Reports	Yes until earthworks are complete
ES12. Complete earthworks and permanent landscape or hardworks restoration placed over exposed soils, as quickly as feasible.		MHM Construction Manager	During construction	Environmental Audit Reports	Yes until earthworks are complete
ES13. Regularly maintain and de-silt any silt fence or sediment basin to lessen adverse risk and maintain structure capacity and effectiveness. Inspect daily in sensitive areas and twice weekly in other areas.		MHM Construction Manager	During construction	Daily inspection records	Yes until earthworks are complete
ES14. Condition 110 requires: Any works requiring the excavation or trenching of areas shall be staged so that the extent of excavation or trenching does not exceed 50 metres at any one time. Any such works shall be undertaken in accordance with condition 159. Condition 159 Any fencing or barriers to be provided for active work areas shall not limit the general movement of fauna across the site. However, sites of specific potential risk to fauna (eg. open excavation) shall include measures to prevent fauna access (eg. limited fencing or covers) and / or to allow their egress / escape (eg. earth ramps).		MHM Construction Manager	During construction	Environmental Audit Reports	Yes until earthworks are complete
ES15. Schedule work to ensure that temporary erosion control works are in place for key at risk sites by the end of work each day, or if heavy rain is imminent.	MHM Construction Manager	During construction	Environmental Audit Reports	Yes until earthworks are complete	

Suggestion only. Other documentary evidence may be used to substantiate compliance.

Table 5: Erosion and Sediment Control Plan for the Construction Phase of the Project – Stockpiles

Activity	Stockpiles				
Objective	Impacts from stockpiles to be minimised				
Preventative and corrective actions required to achieve objective	Key Milestones and reviews	Responsibility to implement	Timeframe	Compliance Record [#]	Ongoing Audit Requirement
ES16. Filter fences are to be installed downslope of stockpiles. Stockpiled material not planned for use within 1 month to be covered with geotextile fabric and to be stored in the stonemason's yard.	Identify stockpile locations to on a construction site plan. Informally monitor stockpiles for any sediment runoff, paying attention to water quality in watercourses and drains downslope of excavated and stockpiled areas.	MHM Construction Manager	Prior to commencement of construction	Construction plans	Yes until earthworks are complete
ES17. Minimise stockpiling of material and keep it away from drainage lines (at least 3m). Inspect stockpiles weekly to check protective measures are effective.		MHM Construction Manager	During construction	Inspection reports.	Yes until earthworks are complete
ES18. Regularly inspect material stockpiles to confirm that their location is not resulting in the generation and uncontrolled transportation of sediment.		MHM Construction Manager	During construction	Inspection reports.	Yes until earthworks are complete
ES19. Generally stockpile only sufficient spoil required for backfilling.		MHM Construction Manager	During construction	Environmental Audit Reports	Yes until earthworks are complete

Suggestion only. Other documentary evidence may be used to substantiate compliance.

Table 6: Erosion and Sediment Control Plan for the Construction Phase of the Project – Erosion and sediment control problems

Activity	Erosion and sediment control problems have occurred on site.				
Objective	Mitigation and control of erosion problems to avoid recurrence.				
Preventative and corrective actions required to achieve objective	Key Milestones and reviews	Responsibility to implement	Timeframe	Compliance Record [#]	Ongoing Audit Requirement
<p>ES20. If the Table 6 measure appear to be ineffective impacting works should cease until alternative mitigation measures are in place such as:</p> <ul style="list-style-type: none"> Establishing diversion structures e.g. dish drains to intercept and divert clean runoff from adjacent areas to prevent it from washing over any earthworks areas. De-silt regularly by approved techniques such as geo-fabric barriers and absorption trenches. Install silt fences below the disturbed site areas and de-silt regularly by approved techniques. Apply minor selective measures as required in low risk areas. 	<p>Identify adequacy of sediment and erosion control measures and recommend where new more stringent and protective erosion control measures may be required.</p> <p>Observations made during conduct of erosion control inspections should be noted in a Daily Site Diary and recorded in a Monthly Construction Report.</p>	MHM Construction Manager	During construction	Amended construction plans	Yes until construction works are complete
<p>ES21. Prior to earthworks commencing install silt fences to treat sediment-laden runoff, and in place until works are completed.</p>	<p>Sediment control measures including silt fences and detention basins should be inspected on a regular basis and de-silted by approved techniques.</p>	MHM Construction Manager	Prior to commencement of construction	Dated photograph of devices	Yes until construction works are complete
<p>ES22. Regularly remove sediment build up against silt fences before any disturbance to filter effectiveness occurs.</p>	<p>In the event of non-conformance due to poor works practices, personnel on site will be made aware of the problem and instructed to undertake work only in accordance with acceptable work practices as a condition of continued engagement on the project.</p>	MHM Construction Manager	During construction	Environmental Audit Reports	Yes until construction works are complete
<p>ES23. Position sediment fences parallel to the site contours at the downstream interface between disturbed and undisturbed areas.</p>		MHM Construction Manager	During construction	Construction plans	Yes until construction works are complete
<p>ES24. Return captured sediment to the site during final landscaping.</p>		MHM Construction Manager	During construction	Induction training notes	Yes until construction works are complete
<p>ES25. Promptly re-establish groundcover stabilisation including geo-textile / jute mesh initial protection along all affected drainage lines.</p>		MHM Construction Manager	Post construction	Construction plans	Yes until construction works are complete

Suggestion only. Other documentary evidence may be used to substantiate compliance.

Table 7: Erosion and Sediment Control Plan for the Construction Phase of the Project – Erosion and sediment control problems

Activity	Pollution of surface and ground water, creeks & watercourses by construction activities				
Objective	Ensure surface and ground waters are not polluted and no detrimental impact upon the streams and ocean.				
Preventative and corrective actions required to achieve objective	Key Milestones and reviews	Responsibility to implement	Timeframe	Compliance Record [#]	Ongoing Audit Requirement
ES26. Stockpiles of potential water quality pollutants (i.e. construction materials, rubbish, oils, fuel etc.) to be located so as to ensure no potential for pollutants to be washed into groundwater, waterways or drainage lines. Construction oil and fuel to be only stored at Quarantine Station in containers in good condition.	Ensure compliance with applicable erosion and sediment control measures, stockpiles, controlled cleaning out of pipes, sensitive vegetation, clearing and other environmental protection measures Regular inspection of site to identify and clear away any potential material or spills which could be flushed into drainage lines, groundwater or waterways during rainfall events. In the event of non-conformance due to poor works practices, personnel on site will be made aware of the problem and instructed to undertake work only in accordance with acceptable work practices as a condition of continued engagement on the project.	MHM Construction Manager	From commencement	Construction plans	Yes until construction works are complete
ES27. Cleaning of equipment or vehicles used during construction will not be undertaken where runoff can enter the storm water system.		MHM Construction Manager	From commencement	Construction plans	Yes until construction works are complete
ES28. Ensure no materials are used in a manner that may pollute any stream, or groundwater via a porous sandy surface.		MHM Construction Manager	From commencement	Induction training notes	Yes until construction works are complete
ES29. Implementation of temporary sediment and erosion control measures on drainage lines eg. silt fencing..		MHM Construction Manager	Prior to commencement of construction	Environmental Audit Reports	Yes until construction works are complete
ES30. Stage vegetation removal to minimise overall disturbance in any area.		MHM Construction Manager	From commencement of construction	Construction schedule	Yes until construction works are complete
ES31. Conduct works in such a way that there is no detrimental change in hydraulic behaviour causing sedimentation, erosion, reduction in waterway or permanent diversion or pollution of any watercourse, lake, creek, wetland or groundwater. Also conduct operations near waterways in such a manner that will not cause damage or increase the erosion of any adjacent bed and banks.		MHM Construction Manager	From commencement	Induction training notes	Yes until construction works are complete

The location of erosion and sediment control devices is shown on the construction maps in **Figure 2**.

[#] Suggestion only. Other documentary evidence may be used to substantiate compliance.