AD Railway Corridor – Erosion and Sediment Control Criteria

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Hancock Prospecting Pty Ltd

Alpha Coal Project (Rail) Supplementary Environmental Impact Statement

Erosion and Sediment Control Criteria

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1. Introduction

1.1 Purpose and Objectives of the Framework

This framework for Erosion and Sediment Control (ESC) management has been developed to outline the key working principles for managing erosion and sediment control issues over the extent of the rail line. This framework will form the basis for an Erosion and Sediment Control Plan which will first be required as a conceptual plan, and then a detailed plan that will have to be agreed with DERM and put in place prior to the start of construction.

The objectives of this framework are to:

- Outline the principles of ESC management during rail construction
- Outline required testing and monitoring for ESC during construction

This management framework is based on the information presented in the preceding chapters of this EIS. This framework is not intended to be a detailed management plan for the project but rather an outline of the management principles. It is intended that, as the project progresses and more data is gathered, a more detailed investigation and management plans will be developed to incorporate all aspects of the project including earthworks, construction of the embankments and the rail infrastructure.

1.2 What is Erosion?

Erosion is the detachment and movement of soil or rock by water, wind or other factors such as ice and gravitational creep (SSSA, 1984). Whilst erosion is a natural process, man-made disturbances can result in accelerated erosion and cause rapid detrimental effects to the environment. Construction projects are no exception to this whereby land clearing, earthworks, and alterations to hydrology can cause gross loss of soil resulting in sediment accumulation of sediment in undesirable places (e.g. drainage lines, waterways, other land, etc) and water pollution.

Water erosion of landforms is dependent upon a number of factors including:

- Climate, in particular rainfall frequency, intensity, and duration
- Topography, including slope and hydrological conditions of the land form (run-on and run-off)
- Soil erodibility and cover

The susceptibility of soil to erosion (soil erodibility) is the ease at which soil particles may be detached and transported from the soil surface. Fine-textured soils high in clay content typically have low soil erodibility levels because the clay particles firmly attach to each other and not easily separated by force. Once disturbed these small clay particles clay can be easily detached by water and transported in suspensions. Coarse-textured soils high in sand are more easily detached than clays; but are not as easily eroded by water because infiltration is often higher resulting in less runoff; plus the large and heavily particles settle more readily. Medium-textured soils high in silt and fine sand are the most erodible because infiltration rates are typically lower than sands, resulting in higher runoff rates that can easily entrain the silt and fine sand sized particles.

1.3 Relevant Guidelines

Erosion and Sediment Control is required to be managed with reference to the following guidelines:

- *Best Practice Erosion and Sediment Control*. International Erosion Control Association (Australasia) (IECA 2008)
- *Managing Urban Stormwater: Soils and Construction.* Landcom, New South Wales Government. (Landcom, 2004)
- *Soil Conservation Measures – Design Manual for Queensland.* Department of Environment and Resource Management, Queensland Government (DERM, 2004)
- *Institute of Engineers Australia, Queensland Division (I.E. Aust – 1996), Soil Erosion and Sediment Control Engineering Guidelines for Queensland,* Prepared in Association with – The Queensland Branch of the Australian Institute of Agricultural Scientists and the Commonwealth Department of Primary Industries and Energy – National Soil Conservation Program
- *Road Drainage Manual,* Department of Transport and Main Roads (DTMR, 2010)

The required Erosion and Sediment Control Plan will be required to be developed in accordance with IECA 2008.

Development of these ESC plans will be required; these will be in the following forms:

- Concept ESC Plan – Required for approval applications
- Detailed ESC Plan – Required prior to commencement of earthworks

These ESCP's will be required to be prepared in accordance with IECA 2008

1.4 Legislative Requirements

A person or persons conducting land-disturbing development must conduct such development in accordance with the requirements of relevant environmental legislation (e.g. *Environmental Protection Act 1994*, and the associated *Environmental Protection (Water) Policy 2009*); and the Sustainable Planning Act 2009. Relevant portions of these Acts are listed below.

1.4.1 Environmental Protection Act 1994

All persons have a legal duty under the *Environmental Protection Act 1994* (s319) to take all reasonable and practicable measures to minimise or prevent environmental harm. Such harm can be caused if sediment from construction activities enters waterways. Stormwater run-off must be managed so that it is not released into waters a state that results in the build-up of earth. Under s443 of the *Environmental Protection Act 1994* a person must not cause or allow a contaminant to be placed in a position where it could reasonably be expected to cause serious or material environmental harm or environmental nuisance (e.g. placing a stockpile adjacent a waterway).

In addition, people who are concerned with management in a corporation have an additional duty under the *Environmental Protection Act 1994* to ensure their corporation complies with the Act. This means supervisors need to take reasonable and practicable steps to ensure that the people under their control do not breach environmental laws.

People who become aware of environmental harm in association with their work (e.g. loss of sediment from their site into a watercourse) have a legal duty under the *Environmental Protection Act 1994* to notify DERM.

1.4.2 Environmental Protection (Water) Policy 2009

This policy sits under the Environmental Protection Act 1994. The *Environmental Protection (Water) Policy 2009* provides environmental values and water quality objectives for Queensland waters. These are utilised when determining environmental harm and to inform other statutory and non-statutory decisions. The water quality objectives assist in identifying whether the environmental values are protected. These values and objectives should be utilised when determining risk of environmental harm from water releases or run off and appropriate erosion and sediment controls implemented.

1.4.3 The Sustainable Planning Act 2009

The Sustainable Planning Act 2009 is the mechanism for assessing all developments within Queensland. This act establishes the process for sustainable planning and development assessment in an ecologically sustainable way. Under the Sustainable Planning Act 2009 it is a serious offence to breach development conditions i.e. those dealing with erosion and sediment control or stormwater quality.

2. Erosion Consideration

2.1 Guiding Principles

The guiding principles for Erosion and Sediment Control are as follows and have been adopted from the *Best Practice Erosion and Sediment Control Guideline* (IECA 2008).

- Appropriately integrate the development into the site
- Integrate erosion and sediment control issues into site planning and construction planning
- Develop effective and flexible Erosion and Sediment Control Plans based on anticipated soil, weather, and construction activities
- Minimise the extent and duration of soil disturbance
- Control water movement through the site
- Minimise soil erosion
- Promptly stabilise disturbed areas
- Maximise sediment retention on the site
- Maintain all ESC measures in proper working order at all times
- Monitor the site and adjust ESC practices to maintain the required performance standard

Vegetation clearing and earthworks along the rail line easement will expose the land to varying levels of erosion due to the combined effects of surface slope and form, soil type, surface run-on/run-off potential and wind erosion over time.

2.2 Staging of Works

The most effective manner to stabilise the soil surface and mitigate erosion potential is to minimise the time period that soil surfaces are exposed and bare. Hence an effective erosion mitigation strategy is to reduce the time between clearing and rehabilitation with stable surface cover.

Construction activities need to consider climatic erosion risk ratings and soil erosion potential when scheduling works and considering appropriate erosion controls. Areas of with *high–moderate* soil erosion potentials will need a more elevated level of planning control than those with *low* erosion potentials. In a similar manner seasonality and periods of moderate *high-moderate* climate erosion risk ratings will also need a greater degree of controls than those with *low* climatic risk ratings. Field investigations and review of geotechnical information is required to confirm the areas of moderate to high risk, for effective consideration of these guidelines and requirements during the construction phase.

2.3 Rainfall Erosivity

Rainfall erosivity is a measure of the ability of rainfall to cause erosion. It is a product of the total energy and the maximum intensity for each storm. When other factors are constant, the potential for soil disturbance from rainfall are directly proportional to the product of the total kinetic energy of the storm times its maximum 30-minute intensity. Rainfall erosivity is an indication of the two most important characteristics of a storm determining its erosivity being the amount of rainfall; and peak intensity sustained over an extended period.

Climatic erosion risk ratings based on monthly rainfall erosivity intensities are published in the IECA, 2008. The closest locations to the rail line route included are Bowen, Collinsville, Glenden and Alpha. These locations are provided in Table 1**.**

Table 1 Climatic Erosion Risk Ratings Based on Average Monthly Rainfall (IECA, 2008)

Month	Bowen	Collinsville	Glenden	Alpha
Jan	High	High	Medium	Medium
Feb	High	High	Medium	Medium
Mar	High	Low	Medium	Medium
Apr	Medium	Low	Very Low	Low
May	Medium	Low	Very Low	Very Low
Jun	Low	Low	Very Low	Low
Jul	Very Low	Very Low	Very Low	Very Low
Aug	Low	Very Low	Very Low	Very Low
Sep	Very Low	Very Low	Very Low	Very Low
Oct	Very Low	Low	Low	Low
Nov	Medium	Medium	Medium	Medium
Dec	High	Medium	Medium	Medium

2.4 Soil Erodibility

Several different soil types will be traversed as part of this project. Each of these soil types will have differing erodibility characteristics. The tables below provide a brief overview of the soil types expected to be encountered, and the associated erodibility rating.

Table 2 Soil Erodibility Ratings (DTMR, 2002)

Soil Types and ASC	Description of Erodibility Characteristics	Erodibility Rating
Uniform sands and sandy loams – *Rudosols and Tenosols*	Incoherent sand, loamy and sand and clayey sand and coherent sandy loam with single grained massive structure. Coarse textured surface layers are generally either loose or incoherent or firm and weakly coherent. Raindrop splash can easily detach the soil particles. Subsoils are also susceptible to detachment.	Moderate (3)
Uniform loams and clay loams Massive - *Kandasols*	Coherent loams, sandy clay loams and clay loams with massive to strong structure. The medium texture results in these soils being moderately permeable regardless of structure. Significant energy is required to detach such	Very Low (1)

Soil Types and ASC	Description of Erodibility Characteristics	Erodibility Rating
Structured – *Rudosols, Tenosols and Dermosols*	soils.	
Uniform non-cracking Clays - *Dermosols*	Light to heavy clays with strong structure: fine aggregates – the high clay content is offset by the strong structure and moderate permeability due to the fine aggregates coarse aggregates – similar erodible characteristics to the uniform cracking clays	Very Low (1) Low (2)
Uniform cracking clays – *Vertosols*	Light medium to heavy clays that shrink and crack open when dry and swell when wet, Gilgai micro relief common. Moderate to strong structure but generally coarse aggregate below the surface resulting in slow to very slow permeability. Soils are erodible under considerable energy.	Low (1)
Sandy Gradational Soils – *Kandosols*	Texture gradually increases from a sandy surface to sandy clay loam or sandy light clay with depth; single grain to massive structure. Similar erodible characteristics to the uniform sands and sandy loams.	Moderate (3)
Loamy Gradational Soils – *Dermosols and Kandosols*	Texture gradually increases from a loamy surface to sandy clay loam or clay with depth; massive to strong structure. These soils have a coherent medium textured surface that grades into clay subsoil. The soils are moderately permeable regardless of subsoil structure and require considerable energy to detach. The high proportion of clay sized particles makes them susceptible to erosion by running water.	Low (2)
Texture Contrast Soils (non dispersive) - Chromosols	Sandy or loamy surface abruptly overlaying non dispersive and generally friable clay subsoil. The erodibility of the surface and subsurface varies from moderate for the sandy layers to low for the loamy layers. The structure of the clay subsoil varies and profile permeability varies from slow to moderate. The clay particles in the subsoil are not prone to dispersion but their lightweight renders them very susceptible to erosion by running water.	Moderate (3)
Texture Contrast Soils (dispersive) – *Chromosols and Sodosols*	Sandy or loamy surface abruptly overlying a hard, dispersive clay subsoil If soil is sodic (ESP 6-14) and/or Ca:Mg <0.5 If soil is strongly sodic (ESP >15) and/or Ca:MG <0.1	High (4) Very High (5)
Waterlogged Soils - Hydrosols	Uniform sands, uniform clays, gradational soils and texture contrast soils that saturated with water for several months of the year. Within saline waterlogged soils, if the soils are drained and leached the removal of soluble salts generally results in sodic profiles and thus increases the erodibility rating to a moderate to high.	Very low (1)

3. Erosion and Sediment Control Management Strategies

3.1 Construction Considerations

Appropriate planning and installation of erosion and sediment control measures is required to ensure that significant detrimental impacts on the surrounding environment do not occur as a result of the land disturbances associated with the railway corridor, ancillary pipeline facilities, access tracks and construction sites. Erosion along the project corridor generally cannot be eliminated completely, but implementation measures will help minimise erosion and reduce sediment loss from disturbed areas.

The performance criteria for erosion and sediment control during construction arte included in (Table 3).

Table 3 Erosion and Sediment Control Strategy (adopted from IECA, 2008)

Issue	Stormwater Quality Management – Construction Phase
Purpose:	To provide a set of Best Practice site management procedures to control the severity and extent of soil erosion and pollutant transport during the earthworks and construction phase.
Objective	To minimise the impacts on surface water and drainage during construction activities; To implement and maintain suitable erosion and sediment control measures; To minimise the extent of disturbed land at any one time; To minimise the impacts on surface water and drainage particularly from sediment carried via stormwater flow; and To comply with all statutory and approval requirements.
Performance Criteria:	Water discharged from the site is to comply with the legislative requirements listed in *Section 1.4: Legislative Requirements* within this Erosion and Sediment Control Strategy. Adherence to these requirements is to ensure that detrimental impacts on water quality and the environment do not occur during the construction phase. Water quality is expected to be highly variable across the receiving waterways. The guidelines stipulated below may not be applicable to all receiving waters as flow regime and water quality within each of the catchments will have varying impacts on the background conditions of the watercourses. Discharge of overland inflow impacted on by construction activities into receiving waters is to meet the relevant approval conditions. In the absence of stipulated approval conditions, criteria are to be established in consultation with DERM relevant to the receiving waters, in order to not cause degradation of the background water quality It is likely that *Type C, Type D / Type F* sediment basins will be used along the rail line corridor. *Unless otherwise stipulated by the regulatory authority, the design flow rate (Q) for a Type C Sediment Basin must be 0.5 times the peak discharge for the 1 in 1 year ARI storm event (IECA, 2008). This can be increased to a 1 in*

Issue	Stormwater Quality Management – Construction Phase
	5 year ARI design storm event if there is available space for a larger basin. Type F and D basins are to be sized for a 5 day, 80th percentile rainfall event. Design for all basins is to be in accordance with IECA, 2008. In the absence of set approval conditions, or establishment of criteria relevant to receiving waterways, the following guidelines, taken from the *Queensland Water Quality Guidelines 2009* (DERM, 2009) , may apply. ***Coarse Sediment -*** Retain coarse sediment on site. ***Fine Sediment -*** Take all reasonable and practicable measures to collect all run-offs from the disturbed areas and drain to a sediment basin. Site discharge during sediment basin dewatering is to comply with a Total Suspended Solids concentration of less than 50 mg / L up to the design event. In storms greater than the design event, take all reasonable and practicable measures to minimise erosion and sediment export. Site specific discharge criteria may be established in consultation with DERM. ***Turbidity -*** Release waters from approved discharge point(s) to have turbidity less than 10% above the receiving waters turbidity measured immediately upstream of the site. ***Nutrients (N and P) -*** Manage through sediment control. ***pH -*** Site discharge to be within 6.5 to 8.5. ***Litter or other waste*** – Prevent litter and waste from entering waterways. ***Hydrocarbons*** – Prevent from entering waterways.
Responsibility:	The Construction Contractor will be responsible for the implementation of the Erosion and Sediment Control Plan (ESCP) during the course of all construction activities.
Implementation Strategy:	A detailed Erosion and Sediment Control Plan (ESCP) must be developed prior to site establishment and commencement of vegetation clearing or soil disturbance within each stage of construction.
Site Inspection:	Site inspection and monitoring requirements can be developed following a risk based approach, which will take into account things like location, type of works, stage of works and receiving environment. In the absence of this risk based approach, then the following schedule stipulated in the IECA, 2008 guidelines applies. 1. All ESC measures must be inspected: ◗ At least daily when rain is occurring. ◗ At least weekly (even if work is not occurring on-site) ◗ within 24 hrs of expected rainfall ◗ within 18 hrs of a rainfall event of sufficient intensity and duration to cause run-off on the site. 2. All site monitoring data including rainfall records, dates of water quality testing, testing results and records of controlled water releases for the site, must be kept in an on-site register. The register is to be maintained up to date for the duration of the approved works and be available on-

Issue	Stormwater Quality Management – Construction Phase
	site for inspection by the Assessing Authority on request. 3. Sediment basin water quality samples must be taken at a depth no greater than 200 mm above the top surface of the settled sediment within the basin. 4. If water runoff from the construction site is not captured within a sediment basin, then in-stream monitoring will be required to ascertain level of impact on the receiving environment. Samples should be taken from upstream and downstream of the entry point. 5. A system is to be implemented and maintained for monitoring and recording site compliance and non-compliance with the ESC approval requirements. This system must as a minimum incorporate regular site audits. An audit schedule will be based on performance, and will be done every 1 to 3 months dependant on performance. Such audits must be: ◗ Undertaken by a person suitably qualified and experienced in erosion and sediment control that can be verified by an independent third party. This person must not be an employee or agent of the principal contractor ◗ Conducted at intervals between one to three calendar month commencing from the day of site disturbance until all disturbed areas have been adequately stabilised against erosion to the acceptance of the Assessing Authority ◗ Conducted using an approved site inspection checklist

4. Summary

A person or persons conducting land-disturbing development must conduct such development in accordance with the requirements of relevant environmental legislation (e.g. *Environmental Protection Act 1994*, and the associated *Environmental Protection (Water) Policy 2009*); and the Sustainable Planning Act 2009.

Appropriate Erosion and Sediment Control management will be required to meet the relevant legislative requirements. ESC management will be required to be implemented throughout the construction phase of the Alpha Rail Project.

Development of ESC plans will be required, these will be in the following forms:

- Concept ESC Plan – Required for approval applications
- Detailed ESC Plan – Required prior to commencement of earthworks

These ESCP's will be required to be prepared in accordance with the following guidelines:

- International Erosion Control Association, 2008, Best Practice in Erosion and Sediment Control
- Soil Erosion and Sediment Control – Engineering Guidelines for Queensland Construction Sites (IE Aust. 1996)

Appropriate planning and installation of erosion and sediment control measures is required to ensure that significant detrimental impacts on the surrounding environment do not occur as a result of the land disturbances associated with the railway corridor, ancillary pipeline facilities, access tracks and construction sites. Erosion along the project corridor generally cannot be eliminated completely, but implementation measures will help minimise erosion and reduce sediment loss from disturbed areas.

Vegetation clearing and earthworks along the ralline easement will expose the land to varying levels of erosion due to the combined effects of surface slope and form, soil type, surface run-on/run-off potential and wind erosion over time. The following guiding principles for Erosion and Sediment Control will be required.

- Integrate erosion and sediment control issues into site planning and construction planning
- Develop effective and flexible Erosion and Sediment Control Plans based on anticipated soil, weather, and construction activities
- Minimise the extent and duration of soil disturbance
- Diverting water from upstream of the construction area through or around the site without being impacted on by the construction works. Capturing water impacted on by the construction works and directing it to treatment areas, prior to discharge into the environment.
- Minimise soil erosion
- Promptly stabilise disturbed areas
- Maximise sediment retention on the site
- Maintain all ESC measures in proper working order at all times
- Monitor the site and adjust ESC practices to maintain the required performance standard

5. References

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