LENDLEASE BUILDING PTY LTD | 97 000 098 162

TWEED VALLEY HOSPITAL – STAGE 2

SEDIMENT AND EROSION CONTROL MANAGEMENT PLAN

20/09/2019 | Revision No: 5.0

Plan Revision Status				
Date	Revision (in numbers)	Purpose and Summary of Amendments	Reviewed by	Approved by
30/01/17	2	General update including LLB GMR and legislative amendments.	Tracey Wallbridge	Brian Falls
09/07/19	3.0	Project Specific – Preliminary	Monique Windley	Luis Biaggini
12/07/19	3.1	SSD Requirements Added	AW	Luis Biaggini
05/09/19	4.0	Minor Changes for EIS Submission	MW	Luis Biaggini
20/09/2019	5.0	EIS Submission Finalisation	MW	Luis Biaggini

*Note that all printed paper/hard copies of this document remain uncontrolled. The controlled copy of this document is found either in the project collaboration tool, within the Project Management Plan section, or other project specific database/server approved by the Regional EHS Manager / Head of EHS Integrated Project.

1. OVERVIEW

1.1 Overview

On the 11 June 2019 the Minister for Planning and Public Spaces granted approval for the Concept Plan and Stage 1 Early and Enabling Works for the new Tweed Valley Hospital (SSD 18_9575) located at 771 Cudgen Road, Cudgen (Lot 11 DP1246853).

The Environmental Impact Statement (EIS) has been prepared to assist in the State Significant Development (SSD) Stage 2 Application for the Tweed Valley Hospital which will be assessed under Part 4 Division 4.1 of the Environmental Planning and Assessment Act. This, along with supporting documentation, will provide a clear outline of the Stage 2 Application.

The Tweed Valley Hospital Project broadly consists of:

- Delivery of the Tweed Valley Hospital; a new Level 5 major regional referral hospital to provide the health services required to meet the needs of the growing population of the Tweed-Byron region (in conjunction with the other hospitals and community health facilities across the region);
- Delivery of the supporting infrastructure required for the Tweed Valley Hospital, including green space and other amenities, roads and car parking, external road upgrades and connections, utilities connections, and other supporting infrastructure.

1.1.1 Concept Proposal and Stage 1 Early and Enabling Works

The Concept Proposal and Stage 1 Early and Enabling Works were approved for the new Tweed Valley Hospital (SSD 18_9575) by the Minister of Planning and Public Spaces on 11 June 2019. All documents relating to the Concept Proposal and Stage 1 Early and Enabling Works can be found on the project website at https://www.planningportal.nsw.gov.au/major-projects/project/10756

1.1.2 Stage 2 Hospital Delivery - Main Works and Operation

The Stage 2 SSD component will seek consent for the Main Works and Operation of the Tweed Valley Hospital, including:

- **Construction of Main Hospital Building**
  - Main entry and retail area
  - Administration
  - Community health
  - In-Patient units
  - Outpatient clinics and day only units
  - Child and Adolescent Services
  - Intensive Care Unit
  - Mental Health Unit
  - Maternity Unit and Birthing Suites
  - Renal Dialysis
  - Pathology
  - Pharmacy
  - Radiation Oncology as part of integrated Cancer Care
  - Emergency Department
  - Perioperative Services
  - Interventional Cardiology
  - Medical Imaging
  - Back of House services
  - Rooftop Helipad
- **Construction of Support Building, referred to as the 'Health Hub', containing**:
  - Oral Health
  - Community Health
  - Aboriginal Health
  - Administration
  - Education, Training and Research
- **Internal Roads and carparking, including multi-deck parking for staff, patients and visitors;**
- **External road infrastructure upgrades and main site access**
- **Environmental and wetland rehabilitation, including rehabilitation of existing farm dam as outlined in the Biodiversity Development Assessment Report (BDAR) prepared for the Concept Proposal and Stage 1 works**
- **Site landscaping**

- Mortuary
- Education, Training, Research

- **Signage**
- **Utility and service works**

Plans for Stage 2 Main Works and Operation are attached in Appendix B of the EIS. Approval of Stage 2 will enable the new Tweed Valley Hospital to be built which will provide a much-needed contemporary health service facilities for the surrounding region.

1.1.3 Potential Future Expansions

Any subsequent stages or modifications to the proposal would be subject to separate applications as required including the potential future expansion of the facility.

2. SSD REQUIREMENTS

State Significant Development Conditions	
Name of this Plan (as per SSD Conditions): N/A	
B21. The Stage 2 application must be supported by a long-term Biodiversity Management Plan (BMP) including the following;	
(i) a water quality management plan including the water quality monitoring techniques to be adopted to ensure that the water quality targets to be achieved for the Site are always maintained (except large flood events);	Refer to 4. Implementation of The Plan; and APPENDIX F: Water Monitoring Locations and Sampling
B28. The Stage 2 application must include an Agricultural Offset Plan with a strategy of physical works and / or implementation plans and programmes addressing how the development will offset the adverse agricultural impacts on the State Significant Farmland (SSF) of Cudgen Plateau and the land use risks associated with the siting of the hospital adjoining the agricultural uses (as identified in the Land Use Conflict Assessment Report prepared by Tim Fitzroy and Associates dated 18 October 2018). The Agricultural Offset Plan must include (but not be limited to):	
(d) details of feasibility of reuse of the existing topsoil in the landscaped areas of the Site; **(e) details of the feasibility to reuse the remaining top-soil (if any) on other sites for agricultural purpose;**	The top soil will be stockpiled until the commencement of the landscaping works. The topsoil will be spread across the landscaped areas of site and or formed into landscaped mounds as part of the Stage 2 Main Works Refer to 4. Implementation of Plan - Erosion and Sediment Control During Construction for details of Stockpile management prior to use in Landscaping works.
B31. The Stage 2 application must be accompanied by:	
(b) Stormwater Management Plans with the details of drainage infrastructure including the following: **(vii) demonstrate that the proposed development would not significantly impact on the quality of surface and groundwater flows to and from the adjacent coastal wetland;**	Refer; 3. Scope of Project and Plan – Summary of Site Controls 4. Implementation of The Plan - Stormwater Detention and Dewatering APPENDIX J: Proposed Groundwater Monitoring Wells

3. SCOPE OF PROJECT AND PLAN

Project Details	
Scope of the Plan	This Stormwater, Erosion and Sedimentation Management Plan provides strategies and mitigation measures to manage disturbed areas of the site. It outlines appropriate measures to ensure that activities including excavated soil, stormwater, erosion, and sedimentation are managed appropriately during site establishment and construction of the project. It describes measures to be implemented during relevant construction activities and defines discharge protocols and treatment procedures that enable control of the impacts of the construction activities on potentially affected areas of adjacent water bodies.
Objectives of the Plan	• To avoid erosion, contamination and sedimentation occurring, resulting from construction activities with a concentration on controls to minimise dust and vehicular mud-tracking. • To control the quality of stormwater leaving the construction site, so that no unacceptable impact will intrude upon the natural watercourses and/or stormwater drains. • To minimise disturbance of the surrounding hydrological regime • To maximise opportunities for stormwater recycling on site. • To effectively manage the bulk excavation and associated dewatering activities to minimise impact on any adjacent water bodies. • Erosion and sediment controls are to be effective and properly maintained always. • Water treatment procedures to treat collected /retained stormwater to achieve acceptable water quality criteria. • To monitor the effects of activities and the effectiveness of mitigation measures • Align control measures with sediment and erosion plans prepared by consultants • Include items raised in the Biodiversity Management Plan
Scope of Works	This Plan has been prepared based on the following scope of works: • Site establishment including ATF, fixed temporary fence and hoarding installation, office and compound setup; • Civil Works, including carparks and roads for Stage 2; • Monitoring and maintenance of existing Sedimentation Basins;

	• Construction of the multi-level Main Works Stage. This new build will include a new emergency department, helipad, IPUs, ICU, MAU, expanded rehab and ambulatory care facilities and operating theatres • Landscaping
Key Issues and Risks	The site is situated along Cudgen Road, Kingscliff. The site is positioned directly north of the TAFE Kingscliff Campus. The site topography consists of a plateau adjoining Cudgen Road and a steep fall towards the northern wetland. The soil is generally a silty clay with ballast rock underground at low depth. The site generally drains quickly to the north boundary. Large sedimentation ponds have been constructed on the site (by others). The works required on site will involve significant ground disturbance creating the potential for erosion, sedimentation, runoff and environmental pollution, if appropriate controls are not implemented and maintained. The activities with the greatest potential to impact on the local environment and community from a stormwater, erosion and sedimentation perspective are: • Site establishment and operation including storage areas; • Stockpiling; • The loading and haulage of materials off-site; • Stormwater and groundwater detention and dewatering; and • Waste disposal (spoil, sediment and water). The impacts of these works may include: • Cause of potential flow into stormwater system and/or adjacent surface water bodies from sediment laden water originating from the site. • Pollution of local ecosystems and waterways due to uncontrolled site runoff; • Pollution associated with the discharge of sediment laden or contaminated water during dewatering activities; • Vehicles exiting construction site potentially depositing dust/dirt/mud on public roads after rain periods. • Localised flooding during high intensity storm events.
Legislation and Guidelines	**Federal/National:** • The 'Blue Book' (Managing Urban Stormwater Soils and Construction) – Landcom, Fourth Edition (2004)

- ‘White Books’ - IECA 2008. Best Practice Erosion and Sediment Control. Books 1-6. International Erosion Control Association (Australasia)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000
- Australian Guidelines for Water Quality Monitoring and Reporting 2000

State: NSW

- NSW Water Quality Objectives for the Tweed River Catchment for Aquatic Ecosystems (Tweed 2006)

Local:

- Local Government Act 1993

Lendlease Requirements:

- GMR: 4.13 Degradation or Pollution of the Environment
- GMR: 4.15 Uncontrolled Release of Stored Energy (non-electrical))
- Lendlease Building Workplace Delivery Code (WDC)

Summary of Site Controls	Site specific controls, monitoring, reporting and performance measurements have been identified in this Plan to prevent or minimise the impacts of construction on the environment and community. These include but are not limited to: ● Preventing erosion through minimal ground disturbance; ● The installation of erosion and sedimentation controls; ● Covering of stockpiles; ● The use of controls to trap sediment close to its source and prevent migration off site; ● The control and maintenance of site access and egress points to prevent tracking and off-site pollution; and ● The identification of acceptable detention, testing, treatment and dewatering processes. A Stormwater, Erosion and Sedimentation Management Diagram (EMD) will be prepared prior to any site activities commencing including clearing and earthworks. Construction stage stormwater, erosion and sedimentation requirements must be included in relevant specifications, contract agreements, quality assurance documents, and subcontractor work method statements. Site inspections, monitoring and reporting will be undertaken by Lendlease and subcontractors as detailed in the following implementation table.
Wet Weather Site Preparation	In the event of upcoming severe wet weather or other meteorological event a notification will be issued by the Regional EHS Representative to all Site Managers. It will be the Site managers responsibility to hold inform the EHS Committee with subcontractor representatives of this alert and ensure that a meeting is held to address all risks and adequality prepare the site for this event. Prior to the event the Site Manager will inspect the area of each trade and document mitigation measures within their site diary and response back to the site manager. In preparation for the wet weather event activities that will likely include, but are not limited the following: - Pumping out of Sedimentation Basins - Covering of Stockpiles - Inspections and repair of all Silt Fences and other control devices - Protection of materials and adequate storage of chemicals.

Flocculant	Refer to Appendix D for approved Flocculant to be used to treat water on site.
Sedimentation Bains Maintenance	Refer to Appendix E for details on the maintenance regime of the Sedimentation Basins.
Water Monitoring Program	Refer to Appendix F for water monitoring locations, frequency and parameters (to be confirmed during tender process and after initial testing).
Groundwater Locations	Extracted from *Morrison Geotechnic* Geotechnical Report, the below tables detail the groundwater levels encountered during geotechnical boring activities. Refer to Appendix I for location of boreholes.

Borehole	Groundwater Depth (m)	Groundwater Level (RLm)
BH1	11.2	12.0
BH6	12.2	14.8
BH7	11.4	14.0
BH25	14.4	11.4

Additional wells to be installed during soil investigation works to gauge and identify contamination of groundwater. Details in Appendix J.

4. IMPLEMENTATION OF THE PLAN

Control Measure	Timing	Methodology	Responsibility	Monitoring and Reporting	Performance Measurement
Planning and Site Establishment					
Include information in the Site Induction about the risks and potential impacts of stormwater runoff, erosion and sedimentation on the local environment and community.	Prior to works commencing and ongoing	Revise Lendlease standard induction package to include site specific information. Deliver induction material.	CM SM	WMS prepared by subcontractors to address stormwater, erosion and sedimentation	Site induction delivered to all workers on site.
Establish stable site exit points, parking areas, internal roads and turning areas to prevent the tracking of material off-site onto public roads.	Prior to works commencing. Maintain always	Retain existing hard surfaces where possible. Construct stable site entry/exit points and roadways using appropriate materials. Obtain clearance certificates for any imported (stabilising) material before receiving it on site.	SM Foreman	Daily surveillance and maintenance. Weekly/monthly inspection checklist. Inspection of imported materials.	No tracking onto public roads or dust. Clearance certificates for all imported materials.
Install a vehicle/wheel wash bay or shaker facility at the site exit.	Prior to construction commencing	Assess requirement in IHRA. Maintain shaker grid/wheel wash or employ high pressure drive-thru wash bay for site heavy duty plant. WMS to be prepared by subcontractor including a maintenance program.	SM/Foreman	Daily surveillance. Weekly/monthly inspection checklist.	No mud/silt tracked onto roadways.

		Engage sweeper. Limited hosing of hard surfaces only.			
Erosion and Sediment Control During Construction					
Maintain erosion and sediment controls in an operable condition including maintenance and monitoring existing sedimentation ponds.	At all times and after rain events	Check the condition of controls. Remove accumulated sediment and debris and dispose. Undertake maintenance as required. Install new controls as new work areas open.	SM/Foreman	Daily surveillance. Weekly/monthly inspection checklist. Post rain inspections. EMD updated.	Silt collected at base of fence. No breach of fence line.
Maintain stormwater pipes, pits and other controls (eg plugs).	At all times	WMS prepared by subcontractor. Check the condition and operation of stormwater infrastructure and controls. Remove debris and sediment and dispose. Monitor for blockages.	SM/Foreman	Daily surveillance. Weekly/monthly inspection checklist.	Free flowing pipes capable of discharging maximum flows.
Cover all loads leaving site to minimise the potential for spillage and tracking.	At all times	WMS prepared by subcontractor to address covering of loads and prevention of tracking. Loads and the condition of trucks/tailgates checked by subcontractor before leaving site.	SM/Foreman	Daily surveillance. Weekly/monthly inspection checklist	No uncovered loads No non-conformances identified.

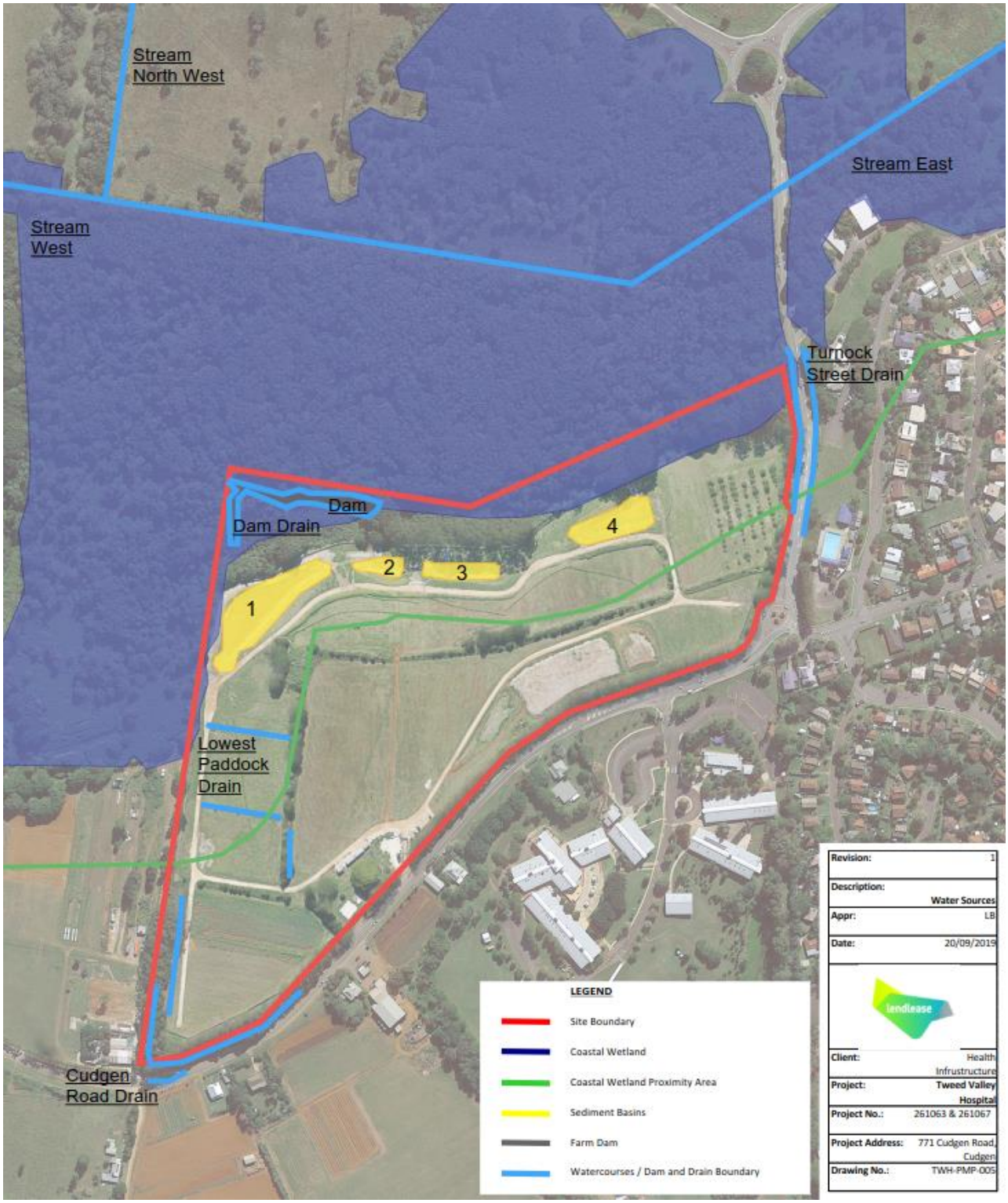
Locate stockpiles away from drainage lines, watercourses, sensitive ecosystems and flood prone areas.	At all times	Stockpile locations identified on EMD diagram. WMS prepared by subcontractor addresses stockpile management.	SM/Foreman	Daily surveillance. Weekly inspection checklist.	No uncontrolled stockpiles. No stockpiled material runoff into the stormwater system.
Cover soil stockpiles and provide bunding and sediment controls around the base.	At all times	WMS prepared by subcontractor to address. Subcontractor to implement as part of soil management and monitoring on site.	SM/Foreman	Weekly/monthly inspection checklist.	Pre-construction check. No release of material.
Stabilise stockpiles with a soil binder, sealant or sterile cover crop (grass).	Maximum 1 month after stockpile placement (if the material is remaining on site)	Establish appropriately located and sized stockpiles in designated areas only. Stabilise in accordance with manufactures specifications and application procedures. Stabilise or cover stockpiles left for >4 weeks.	SM/Foreman	Weekly/monthly inspection checklist.	No erosion or dust generated from stockpiles.
Maintain erosion and sediment controls until the potential for erosion and sedimentation has been eliminated.	At all times	Maintain controls in accordance with SESC diagram. Do not remove controls prior to any area being deemed stable.	SM/Foreman/EHS	Weekly/monthly inspection checklist Inspections during rain events.	Controls effective and in good condition. No uncontrolled discharges of sediment off-site or into waterways.

Regular monitoring of weather and news updates to ensure site is adequately managed.	During Construction	Set up alert notification.	SM	Daily review and if necessary notification in daily builder's briefs.	Minimal impacts during adverse meteorological conditions and extraordinary events
Stormwater Detention and Dewatering					
Inspect basins/tanks, detention facilities and stormwater treatment devices and remove any build-up of debris.	Ongoing. Within 24hrs of a rain event	Retain capacity in detention facilities for storm events. Inspect the site within 24hrs of a 1 in 5-year Average Recurrence Interval (ARI) event including sediment basins/detention areas and stormwater treatment devices. WMS to be prepared by sub-contractor to address inspection, testing and dewatering.	SM	Inspection within 24hrs of nominated rain event. Weekly/monthly inspection checklist.	Detention areas and capacity of facilities maintained in operational condition. No uncontrolled discharges under design conditions.
Test, treat and reuse collected stormwater on-site for dust suppression, truck and plant washing (in designated areas only).	Ongoing	WMS prepared by subcontractor to address this option. Undertake water quality testing and treatment of stormwater. Meet required water quality criteria prior to reuse.	CM	Metering and recording of stormwater reused on site. Water quality test results from a NATA accredited laboratory.	Water treatment and dewatering undertaken in accordance with documented site procedure and Workplace Delivery Code. No discharge to exceed authority criteria.

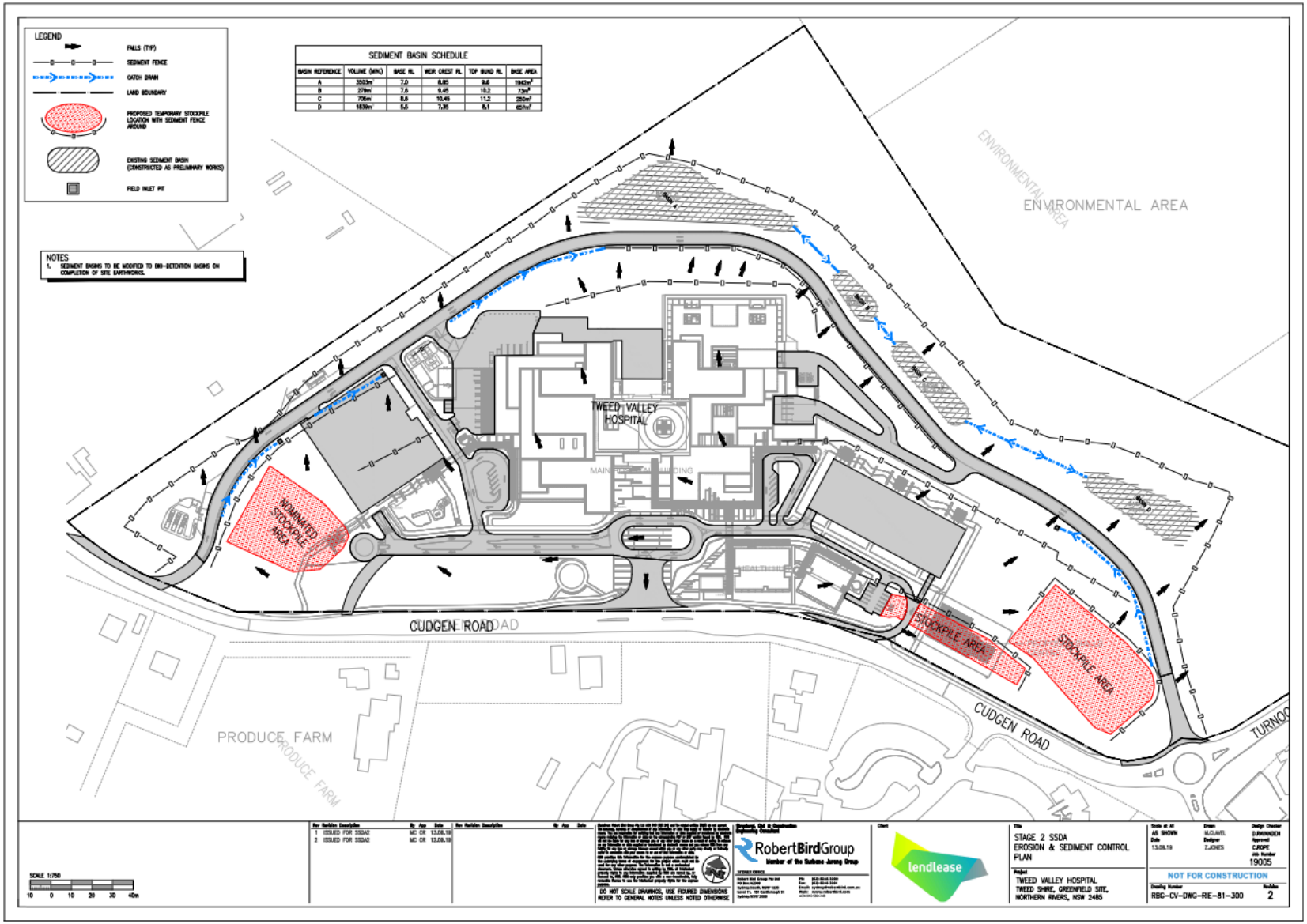
Test, treat and discharge collected stormwater off-site if it cannot be reused on site.	Ongoing	WMS prepared by subcontractor to address this option. Confirm that water quality testing, treatment and dewatering methods satisfy the requirements of the relevant statutory authority. Undertake water quality testing and treatment of stormwater. Meet specified water quality criteria prior to discharge. As a minimum: No chemical contamination and water quality must comply with any specific requirements of the Statutory Authority criteria. Water quality must meet the following criteria: • pH is between 8.5 and 6.5 • Suspended solids are less than 50 mg/L, To discharge to offsite / stormwater system	SM Sub-contractor	Water quality test results from a NATA accredited laboratory. Dockets for off-site disposal where the water is not acceptable for discharge.	Water treatment and dewatering undertaken in accordance with documented site procedure and Workplace Delivery Code. No discharge of non-compliant water or off-site pollution.
To avoid any potential changes in pH and impacts on threatened aquatic species, other commercially available flocculants that work as effectively as a gypsum replacement yet do not create	When treating the Sediment basins	Contractor responsible for maintenance of basins is to submit product data sheets to Lendlease for approval prior to use.	CM/SM/SE	Regular inspections of product use and monthly water monitoring.	Zero change in pH Reduced impact on aquatic species.

the large changes in pH will be used on the Site.					
Site Stabilisation					
Implement site stabilisation works and landscaping progressively to rehabilitate disturbed ground.	Progressively during construction	Stabilise and seal disturbed areas in accordance with the design/engineering/landscape plans and scope of works.	CM/SM/EHS	Weekly/monthly inspection checklist Project planning and design meetings.	Stabilisation of all disturbed work areas. No uncontrolled runoff containing sediment or contaminants.

APPENDIX A: WATER SOURCES DIAGRAM



APPENDIX B: SEDIMENT AND EROSION PLAN



APPENDIX C: NOT USED

APPENDIX D – APPROVED FLOCCULANT – SDS TURBICLEAR

SDS Turbiclear™

turbid WATER SOLUTIONS

SAFETY DATA SHEET - Turbiclear™

ABN: 49 158 485 039

PO Box 199 |Peregian Beach QLD 4573
Unit 7, 8 Grebe St | Peregian Beach QLD 4573

t 07 5471 2290| f 07 5302 6680
e info@turbid.com.au |w turbid.com.au

1. IDENTIFICATION OF MATERIAL AND SUPPLIER

Product Name:	**Turbiclear**
Chemical Name:	**Aluminium chlorohydrate, ACH (83-85% basic)**
Supplier	**TURBID PTY LTD**

Emergency Contact Information

Telephone	(07) 5471 2290
Fax	(07) 5302 6680
Email	info@turbid.com.au
Address	7/8 Grebe St, Peregian Beach QLD 4753
Poisons Information Centre	Phone 13 11 26 from anywhere in Australia

2. HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

Classified as:	NOT HAZARDOUS according to the criteria of Safe Work Australia
Classified as	NON-DANGEROUS GOODS by the criteria of Australian Dangerous Goods Code (ADG Code) for transport by road and rail.
Risk phrases:	Not Hazardous – No criteria found
Safety phrases:	S23: Do not breathe mist, S25 Avoid contact with eyes, S36 Wear suitable protective clothing
ADG Classification:	None allocated. Not a Dangerous Good according to Australian Dangerous Goods (ADG) Code, IATA or IMDG/IMSBC criteria.
UN Number:	None allocated
None allocated	NONE. Not hazardous.
HAZARD STATEMENT:	H335: May cause respiratory irritation.
PREVENTION	P102: Keep out of reach of children. P262: Do not get in eyes, on skin, or on clothing. P281: Use personal protective equipment as required.
RESPONSE	P362: Take off contaminated clothing and wash before reuse. P301+P330+P331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P302+P352: IF ON SKIN: Wash with plenty of soap and water. P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P332+P313: If skin irritation occurs: Get medical advice. P337+P313: If eye irritation persists: Get medical advice.

RESPONSE (cont)	P370+P378: Not combustible. Use extinguishing media suited to burning materials
STORAGE	P403+P233: Store in a well-ventilated place. Keep container tightly closed.
DISPOSAL	P501: If they can not be recycled, dispose of contents to an approved waste disposal plant and containers to landfill (see Section 13 of this SDS).

3. COMPOSITION/ INFORMATION ON INGREDIENTS

Reference in AICS: YES

Name	CAS Number	Proportion	TWA (mg/m^3)	STEL (mg/m3)
Aluminium chlorohydrate ACH	1327-41-9	40 to 60 %	2	Not set
Water	7732-18-5	To 100%	Not set	Not set

This is a commercial product whose exact ratio of components may vary slightly. Minor quantities of other non hazardous ingredients are also possible.
The SWA TWA exposure value is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. The STEL (Short Term Exposure Limit) is an exposure value that may be equalled (but should not be exceeded) for no longer than 15 minutes and should not be repeated more than 4 times per day. There should be at least 60 minutes between successive exposures at the STEL. The term "peak "is used when the TWA limit, because of the rapid action of the substance, should never be exceeded, even briefly.

4. FIRST AID MEASURES

Eye contact:	Flush with water for 15 minutes. Seek medical attention.
Skin contact:	Irritation unlikely, However if irritation does occur, flush with lukewarm, gently flowing water for 5 minutes
Inhalation:	Remove from source of mist, allow patient to stabilize breathing in fresh air. If symptoms persist seek medical attention.
Ingestion:	Rinse mouth with water. Do not induce vomiting. If in doubt seek medical advice.

5. FIRE FIGHTING MEASURES

Extinguishing media:	Compatible with water, foam, CO2 and dry chemical. Fires can be attacked with extinguishers to suit local flammable/combustible materials
Flash point (°C):	Material is non-flammable and non-combustible.
Auto ignition point (°C):	Not applicable.
Explosion Limits In Air (% by volume):	Not applicable.
Special Procedures:	None.
Unusual hazards:	None known.
Conditions to avoid:	None known.
Materials to avoid:	May emit some chlorine gas when in contact with very strong oxidizing agents; some heat liberated when in contact with strong acids.
Decomposition products:	Severe overheating may produce hydrogen chloride gas and aluminium oxide once water has been driven off.
Hazardous polymerization	Will not occur.

6. ACCIDENTAL RELEASE MEASURES

General Response:	Personnel involved in the clean-up should wear appropriate protective clothing as listed in section 2. Slippery when spilt.
Clean Up Procedure:	Spillage into waterways will result in some lowering of the pH and the formation of aluminium hydroxide, which has a very low toxicity. Prevent drain or sewer contamination with absorbent such as sand or sawdust etc. Collect for disposal.

7. HANDLING & STORAGE

Handling:	Observe good personal hygiene practices and recommended procedures. Wash thoroughly with soap and water after handling.
Storage:	Do not store in metal containers other than stainless steel. When storing in stainless steel, Store in a cool, dry, well-ventilated area.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

National Exposure Standards	None Established
Engineering Controls:	Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations
Personal Protective Equipment:	None required
Respiratory Protection:	General exhaust ventilation should be adequate.
Eye Protection:	Safety Glasses
Skin and body protection:	Disposable latex gloves, overalls or apron as appropriate. Rubber boots can be used in wet conditions but mainly as protection from the water

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear to slightly hazy aqueous solution
Odour:	None
Boiling point (°C):	100-110ºC
Melting point (°C):	Not available
Specific Gravity (H_2O = 1):	1.36 - 1.39 at 25°C
pH	3.0 – 3.5 at 25ºC
Vapour pressure (kPa):	Not applicable
Relative vapour density:	Not applicable
Volatile by weight (%):	Roughly 50 (prolonged drying leads to product change)
Solubility in water:	Completely miscible
Evaporation rate:	Not applicable

10. STABILITY AND REACTIVITY

Chemical Stability	Stable
Conditions to avoid:	Oxidizing agents may cause exothermic reactions. Keep containers tightly closed
Decomposition products:	Severe overheating may produce hydrogen chloride gas and aluminium oxide once water has been driven off.
Hazardous polymerization:	Will not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:

Oral:	LD50/oral/rat > 3311 mg/Kg
Inhalation:	Product is not volatile
Irritation:	
Skin:	Mild skin irritant. May cause skin irritation with prolonged contact
Eyes	Irritation and redness.
Chronic Toxicity:	No chronic effects
Threshold limit value:	2 mg/m3 based on Al (roughly 0.25 mg/m3 based on actual product (Ref.: ACGIH, soluble Aluminium salts)
Target organs:	There is no date to hand indicating any particular target organs.

12. ECOLOGICAL INFORMATION

Environmental fate and distribution:

Aluminium compounds are common in most soils and are the principle components of Bauxite and Gibbsite, which are common, naturally occurring minerals. When diluted by copious quantities of water (for example, to the point that the concentration is less than about 100 grams per cubic meter), this product will hydrolyze rapidly to form aluminium hydroxide, which can be expected to become a part of the natural soil profile if not recovered. Turbiclear should be stored in a location that if a leakage occurs the product will not lead directly to a natural water way to minimise any potential risk.

Ecotoxicity:

Direct Toxicity Assessment

Whole of Effluent Ecotoxicity Testing undertaken on construction site water treated with Turbiclear in 2017 indicated no effect to either the Australian freshwater flea or Eastern Rainbowfish at full concentration.

For the 48-hr acute toxicity test using the freshwater cladoceran Ceriodaphnia dubia the EC50 = >100% (at 100% concentration, no affect was observed).
For the 96-hr fish imbalance toxicity test using the eastern rainbowfish Melanotaenia splendida splendida the EC50 = >100% (at 100% concentration, no affect was observed).

Effective Concentration Method Assessment

Aquatic toxicity carried out by others on Aluminium Chlorohydrate solution indicated that:
For the 48-hr acute toxicity test using the freshwater flea *Daphnia magna* the LC50 = 397mg/L
For the 96- hr acute toxicity test using the freshwater fish *Pimelphales promelas* the LC50 = 832mg/L

Bioaccumulative Potential:

Does not bio accumulate.

13. DISPOSAL CONSIDERATIONS

Waste disposal method:
Refer to local waste disposal authority. This product can be neutralized with alkali to form a mixture of aluminium hydroxide and the chloride salt of the alkali. The resulting mixture is non- hazardous provided the resulting pH is between roughly 5 and 10.

14. TRANSPORT INFORMATION

This product does not carry a Dangerous Goods classification as corrosion tests have verified that it is not corrosive to either skin or to metals.

15. REGULATORY INFORMATION

This product is to be found in the public AICS database.

16. OTHER INFORMATION

This SDS was prepared in accordance with the Code of Practice for the Preparation of Safety Data Sheets for Hazardous Chemicals.

Acronyms:
ADG Code Australian Code for the Transport of Dangerous Goods by Road and Rail (7th edition)
AICS Australian Inventory of Chemical Substances
SWA Safe Work Australia, formerly ASCC and NOHSC
CAS Number Chemical Abstracts Service Registry Number
Hazchem code Emergency action code of numbers and letters that provide information to emergency services especially firefighters
IARC International Agency for Research on Cancer
NOS Not otherwise specified
NTP National Toxicology Program (USA)
R-Phase Risk Phrase
SUSMP Standard for the Uniform Scheduling of Medicines & Poisons
Un Number United Nations Number

References cited:

1. American Conference of Governmental Industrial Hygienists (ACGIH), Documentation of the Threshold Limit Values and Biological Exposure Indices, 6th Edition, ACGIH, Cincinatti, Ohio, 1991.
2. Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:1003(1995)]
3. Registry of Toxic Effects of Chemical Substances (RTECS)
4. Sax's, Dangerous Properties of Industrial Materials, Edition 8, Ed. RJ Lewis Sr., van Nostrand Reinhold.

Revision 12: Issued 16/01/2019

This SDS summarizes to our best knowledge of health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this SDS and consider the information in the context of how the product will be handled and used in the workplace including in conjunction with other products. Please contact the company if any further information is required.

turbid
WATER SOLUTIONS

TURBICLEAR™

SEDIMENT BASIN COAGULANT

Turbiclear™ is a high quality, environmentally friendly, rapid acting coagulant for application to sediment basins. Turbiclear™ is an Aluminium Chlorohydrate-based product, manufactured to drinking water specifications with no cost penalty, i.e. very low impurities and it does not add heavy metals into treated water like some coagulants which are very low quality and contain heavy metals. Some key advantages are:

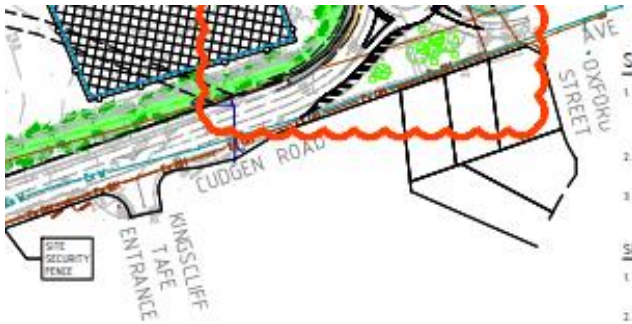
- Concentrated and 2 to 3 times more effective than other coagulant agents. Lower dosing required
- Easy to apply liquid - no dust like gypsum
- Can be automatically dosed using the Turbid's range of treatment systems
- Excellent treated water clarity
- Settles quickly
- Works over a wide pH range (6-9) without needing correction
- Reduced alkalinity consumption compared to other agents, therefore, very little pH drop
- Significantly lower aluminium residuals than other agents in the treated water
- Very low levels of trace elements
- Forms inert sludge, re-useable on site
- Non Dangerous Good- not corrosive to skin
- Contains no sulfates
- Available in 200L drums or 1000 IBC tanks

Turbiclear™ is 100% Australian made from Australian products, and represents the best in the industry for producing highly effective treatment while maintaining environmentally friendly attributes. Aluminium compounds are common in most soils and are the principal components of Bauxite and Gibbsite, which are common, naturally occurring minerals. When diluted by copious quantities of water, this product will hydrolyse rapidly to form aluminium hydroxide, which can be expected to become a part of the natural soil profile if not recovered. Get in touch with Turbid today to purchase this product.

ENVIRONMENTALLY FRIENDLY STORMWATER TREATMENT

07 5471 2290 | info@turbid.com.au | turbid.com.au

APPENDIX E: SEDIMENTATION BASIN INSPECTIONS AND MAINTENANCE (EXTRACTED FROM BONACCI SEDIMENT AND EROSION CONTROL PLAN)



SOIL AND WATER MANAGEMENT NOTES

1. IT HAS BEEN ASSUMED THAT HOARDINGS/SILT FENCING WILL BE PROVIDED TO THE STAGE BOUNDARY SUFFICIENT TO PREVENT SEDIMENT RUNOFF FROM LEAVING SITE (EXCEPT IN THE CASE OF ENTRY/EXIT LOCATIONS WHERE TEMPORARY CONSTRUCTION ENTRY/EXIT SEDIMENT TRAP ARE PROVIDED). IF THIS IS NOT THE CASE, PROVIDE SEDIMENT FENCE TO STANDARD DETAIL BELOW AS REQUIRED TO PREVENT SEDIMENT FROM LEAVING SITE, DIRECT RUNOFF TO SEDIMENT BASIN.
2. ALL SEDIMENT CONTROL MEASURES TO BE INSTALLED IN ACCORDANCE WITH LANDCOM MANAGING URBAN STORMWATER "BLUE BOOK".
3. SEDIMENT CONTROL FOR LANDSCAPED WORKS DOWNSTREAM OF THE BUILDING TO INCLUDE A SILT FENCE AND SANDBAGS AS REQUIRED. INSTALL BUND TO DIVERT UPSTREAM CATCHMENT AWAY FROM DISTURBED SOIL AREA. TO BE MANAGED AT A RATE OF +++ L/S PER HA BY THE CONTRACTOR ON SITE.

SEDIMENT CONTROL CONDITIONS

1. SEDIMENT FENCES WILL BE INSTALLED AS SHOWN AND ELSEWHERE AT THE DISCRETION OF THE SITE MANAGER TO CONTAIN COARSER SEDIMENT FRACTIONS INCLUDING AGGREGATED FINES) AS NEAR AS POSSIBLE TO THEIR SOURCE.
2. SEDIMENT REMOVED FROM ANY TRAPPING DEVICE WILL BE RELOCATED WHERE FURTHER POLLUTION TO DOWNSLOPE LANDS & WATERWAYS CANNOT OCCUR.
3. STOCKPILES WILL BE PLACED WHERE SHOWN ON DRAWING OR ELSEWHERE AT THE DISCRETION OF THE SITE MANAGER AND NOT WITHIN 5m OF HAZARD AREAS INCLUDING LIKELY AREAS OF HIGH VELOCITY FLOWS SUCH AS WATERWAYS, PAVED AREAS & DRIVEWAYS.
4. WATER WILL BE PREVENTED FROM DIRECTLY ENTERING THE PERMANENT DRAINAGE SYSTEM WITH INLET FILTERS (SEE DETAILS) UNLESS IT IS SEDIMENT FREE.
5. TEMPORARY SEDIMENT TRAPS WILL BE RETAINED UNTIL AFTER THE LANDS THEY ARE PROTECTING ARE COMPLETELY REHABILITATED.
6. CONTRACTOR TO DESIGN/SIZE/CONSTRUCT TEMPORARY SEDIMENT BASIN, WATER SHOULD BE ALLOWED TO SETTLE BEFORE DISCHARGE. CONTRACTOR MUST VERIFY THAT WATER QUALITY MEETS AUTHORITIES REQUIREMENTS PRIOR TO DISCHARGE. ACCUMULATED SEDIMENT SHOULD THEN BE REMOVED & DISPOSED OF IN ACCORDANCE WITH ENVIRONMENTAL MANAGEMENT PROCEDURES.

SITE INSPECTION & MAINTENANCE CONDITIONS

THE SITE MANAGER WILL INSPECT THE SITE AT LEAST WEEKLY AND WILL:

1. ENSURE THAT DRAINS OPERATE PROPERLY & TO EFFECT ANY NECESSARY REPAIRS.
2. REMOVE SPILLED SAND OR OTHER MATERIALS FROM HAZARD AREAS, INCLUDING LANDS CLOSER THAN 5m FROM AREAS OF LIKELY CONCENTRATED OR HIGH VELOCITY FLOWS ESPECIALLY WATERWAYS & PAVED AREAS.
3. REMOVE TRAPPED SEDIMENT WHENEVER LESS THAN DESIGN CAPACITY REMAINS WITHIN THE STRUCTURE.
4. ENSURE REHABILITATED LANDS HAVE EFFECTIVELY REDUCED THE EROSION HAZARD AND TO INITIATE UPGRADING OR REPAIR AS APPROPRIATE.
5. CONSTRUCT ADDITIONAL EROSION AND/OR SEDIMENT CONTROL WORKS AS MIGHT BECOME NECESSARY TO ENSURE THE DESIRED PROTECTION IS GIVEN TO DOWNSLOPE LANDS AND WATERWAYS.
6. MAINTAIN EROSION & SEDIMENT CONTROL MEASURES IN A FULLY FUNCTIONING CONDITION UNTIL ALL EARTHWORK ACTIVITIES ARE COMPLETED AND THE SITE IS REHABILITATED.
7. REMOVE TEMPORARY SOIL CONSERVATION STRUCTURES AS THE LAST ACTIVITY IN THE REHABILITATION PROGRAM.

AS PART OF THE STATUTORY 'DILIGENCE OF CARE' RESPONSIBILITIES, THE SITE MANAGER WILL KEEP A LOGBOOK MAKING ENTRIES AT LEAST WEEKLY, IMMEDIATELY BEFORE FORECAST RAIN AND AFTER RAINFALL. ENTRIES WILL INCLUDE:

1. THE VOLUME & INTENSITY OF ANY RAINFALL EVENTS
2. THE CONDITION OF ANY SOIL & WATER MANAGEMENT WORKS
3. THE CONDITION OF VEGETATION & ANY NEED TO IRRIGATE
4. THE NEED FOR DUST PREVENTION STRATEGIES
5. ANY REMEDIAL WORKS TO BE UNDERTAKEN

THE BOOK WILL BE KEPT ONSITE & MADE AVAILABLE TO ANY AUTHORISED PERSON ON REQUEST. IT WILL BE GIVEN TO THE PROJECT MANAGER AT THE CONCLUSION OF WORKS.

SEDIMENT BASIN SPECIFICATIONS

BASIN	VOL REQ.(m3)	BASE RL	WEIR CREST RL	TOP BUND RL	BASE AREA (m2)
1	3440	7	8.85	9.6	1942
2	413	7.6	9.45	10.2	73
3	835	8.6	10.45	11.2	250
4	1769	5.5	7.35	8.1	657

NOTES:

1. CONSTRUCTION OF SEDIMENT BASINS ARE TO BE IN ACCORDANCE WITH THE LANDCOM "BLUEBOOK".
2. PROJECT SITE SHALL BE VEGETATED BY GRASS SEEDING THE SITE.
3. ALL DISTURBED SURFACE AREAS ARE TO BE TOPSOILED AND TURFED AND MADE GOOD UPON COMPLETION OF WORKS.
4. NO WORKS TO ENCROACH ON THE COASTAL WETLAND
5. NO WORKS ARE PERMITTED PAST THE TREE PROTECTION ZONE

APPENDIX F: WATER MONITORING LOCATIONS AND SAMPLING

Routine

Surface water quality monitoring was performed monthly during Early Works and Enabling works, as this work required large amounts of excavation works. The frequency of water quality will be determined prior to construction of Stage 2 works in consultation with the Ecologist and Civil consultant.

Water Quality sampling will be performed prior to any controlled discharge of the sediment basins and after any uncontrolled release.

Location

Monthly Routine Sampling

- **Upstream Creek (West)**
  - Upstream of the wetland stream/drain to the west, along Tweed Coast Rd (background quality).
- **Upstream Creek (North-West)**
  - Water flowing through the wetland stream/drain from the river and urban catchment.
- **Downstream Creek (East)**
  - Upstream of the wetland stream/drain, to the east along Turnock street (background quality).
- **Dam**
  - Catchment for on Site/off Site drains, water diverted from wetland.
- **Dam Drain**
  - To assess water entering the dam - upstream/paddock run off.

Controlled Event Sampling (Discharge Basins)

- **Discharge Point of Sediment Basin 1**
- **Discharge Point of Sediment Basin 2**
- **Discharge Point of Sediment Basin 3**
- **Discharge Point of Sediment Basin 4**

Uncontrolled Event Based Sampling

The 9 locations listed above, as well as:

- **Cudgen Road Drain**
  - To assess stormwater runoff entering the Site (upstream, background quality).
- **Lowest Paddock Drain**
  - To assess runoff from the site.
- **Turnock St Drain**
  - Assess upstream water entering the wetland.

Note: Sampling at the dam will be removed from scope after the decommissioning works.

Sampling

A summary of the proposed sampling analytes is provided below:

Field

- pH
- Turbidity
- Electrical Conductivity (EC)
- Dissolved Oxygen (DO)
- Temperature
- Oxidation Reduction Potential (ORP)
- Oil and grease

Laboratory

- Total Suspended Solids (TSS)
- Total Dissolved Solids (TDS)
- Major Cations & Hardness
- Ammonia
- Chlorophyll-a
- Filterable Reactive Phosphorus
- Nitrate
- Oxides of Nitrogen
- Total Nitrogen
- Total Phosphorus
- Aluminium (pH > 6.5) filtered
- Arsenic (filtered)
- Boron (filtered)
- Cadmium (filtered)
- Chromium (filtered)
- Copper (filtered)
- Cobalt (filtered)
- Lead (filtered)
- Manganese (filtered)
- Mercury (filtered)
- Nickel (filtered)
- Selenium (filtered)
- Silver (filtered)
- Zinc (filtered)
- Benzene
- Toluene
- Ethylbenzene
- Xylene - Total
- Naphthalene
- Total Recoverable Hydrocarbons (TRH)
- Organochlorine Pesticides (OCP)
  - 4.4'-DDE
  - 4.4'-DDT
  - Aldrin
  - g-BHC (Lindane)
  - Chlordane
  - Dieldrin
  - Endosulfan
  - Endrin
  - Heptachlor
  - Toxaphene
- Organophosphorus Pesticides (OPP)
  - Azinphos-methyl
  - Chlorpyrifos
  - Demeton-S
  - Diazinon
  - Dimethoate
  - Fenitrothion
  - Malathion

If a sample returns detectable concentrations of the analytes presented in Table 1, additional analyses may be required to enable comparison against additional trigger criteria or trace potential sources of contaminants. It is cost prohibitive to analyse these parameters unless required.

Table 1 Additional Analysis Requirements

Analyte	Additional Analysis
Total Recoverable Hydrocarbons	TRH Silica-gel Clean-up
Arsenic (filtered)	Arsenic (III) (filtered) Arsenic (V) (filtered)
Chromium (filtered)	Chromium (CrVI) (filtered)

Note: After the completion of early works, the suite of proposed analytes will be evaluated to determine if any of the items can be removed as they were not detected during prior testing.

APPENDIX G: WATER MONITORING SAMPLING PARAMETERS

Analyte		Trigger Criteria	
Field	Unit	Tweed (2006)	ANZECC (2000) 95% species protection
pH	pH Units	7.0 - 8.5	6.5 - 8.5
Turbidity	NTU	0.5 - 10	6.0 - 50
Electrical Conductivity (EC)	mS/cm	30 - 2,200	N/A
Dissolved Oxygen (DO)	%	80 - 110	85 - 110
Temperature	^{o}C	N/A	N/A
Oxidation Reduction Potential (ORP)	mV	N/A	N/A
Oil and grease	Visual observation	N/A	N/A
Laboratory			
Total Suspended Solids (TSS)	mg/L	N/A	N/A
Total Dissolved Solids (TDS)	mg/L	N/A	N/A
Major Cations & Hardness	mg/L	N/A	N/A
Ammonia	µg/L	15	20
Chlorine	mg/L	N/A	N/A
Chlorophyll-a	µg/L	4	5
Filterable Reactive Phosphorus	µg/L	N/A	20
Nitrate	µg/L	N/A	N/A
Oxides of Nitrogen	µg/L	15	40
Total Nitrogen	µg/L	300	350
Total Phosphorus	µg/L	30	25
Aluminium (pH >6.5)	µg/L	N/A	55
Arsenic (III) (filtered)	µg/L	N/A	24
Arsenic (V) (filtered)	µg/L	N/A	13
Boron (filtered)	µg/L	N/A	370
Cadmium (filtered)	µg/L	5.5	0.2
Chromium (CrVI) (filtered)	µg/L	4.4	1.0
Copper (filtered)	µg/L	1.3	1.4
Cobalt (filtered)	µg/L	1.0	N/A
Lead (filtered)	µg/L	4.4	3.4
Manganese (filtered)	µg/L	N/A	1,900
Mercury (filtered)	µg/L	0.4	0.6

Analyte		Trigger Criteria	
Nickel (filtered)	µg/L	70	11
Selenium (filtered)	µg/L	5	11
Silver (filtered)	µg/L	1.4	0.05
Zinc (filtered)	µg/L	15	8.0
Benzene	mg/L	N/A	0.95
Toluene	mg/L	N/A	N/A
Ethylbenzene	mg/L	N/A	N/A
Xylene - Total	mg/L	N/A	0.95
Naphthalene	mg/L	N/A	0.016
Total Recoverable Hydrocarbons (TRH)	mg/L	N/A	N/A
TRH Silica-gel Clean-up	mg/L	N/A	N/A
Organochlorine Pesticides (OCP)			
4.4'-DDE	µg/L	N/A	0.03
4.4'-DDT	µg/L	N/A	0.01
Aldrin	µg/L	N/A	0.001
g-BHC (Lindane)	µg/L	N/A	0.2
Chlordane	µg/L	N/A	0.08
Dieldrin	µg/L	N/A	0.01
Endosulfan	µg/L	0.01	0.2
Endrin	µg/L	0.02	0.02
Heptachlor	µg/L	N/A	0.09
Toxaphene	µg/L	N/A	0.2
Organophosphorus Pesticides (OPP)			
Azinphos-methyl	µg/L	N/A	0.02
Chlorpyrifos	µg/L	0.009	0.01
Demeton-S	µg/L	N/A	0.04
Diazinon	µg/L	N/A	0.01
Dimethoate	µg/L	N/A	0.15
Fenitrothion	µg/L	N/A	0.2
Malathion	µg/L	N/A	0.05

APPENDIX H: VOLUME OF PRELIMINARY WORKS SEDIMENTATION BASIN

Windley, Monique

From: Colin Rope <colin.rope@robertbird.com.au>
Sent: Tuesday, 21 May 2019 11:02 AM
To: Sue Folliott
Cc: Hughes, Lee; Windley, Monique; simon waterworth; Emily Windle
Subject: [EXT]:RE: Sed basin calc
Attachments: RBG-CV-REF-RIE-0000003 SURVEY.dwg

Hi Sue,

We have used the as-built survey of the sediment basins to determine the capacity of each up to the existing overflow spillway and the full capacity to the top of the basin walls (ie. if the spillway was to be filled in). Basin A is the western basin, then B, C and D going east. The below figures have been calculated using 12 software for detailed analysis.

I have also attached the survey file in case anyone should wish to carry out their own independent check to verify these figures.

Basin	To spillway level	To top of basin wall
A	4,630 m3	6,898 m3
B	379 m3	689 m3
C	993 m3	1,490 m3
D	2,009 m3	3,050 m3

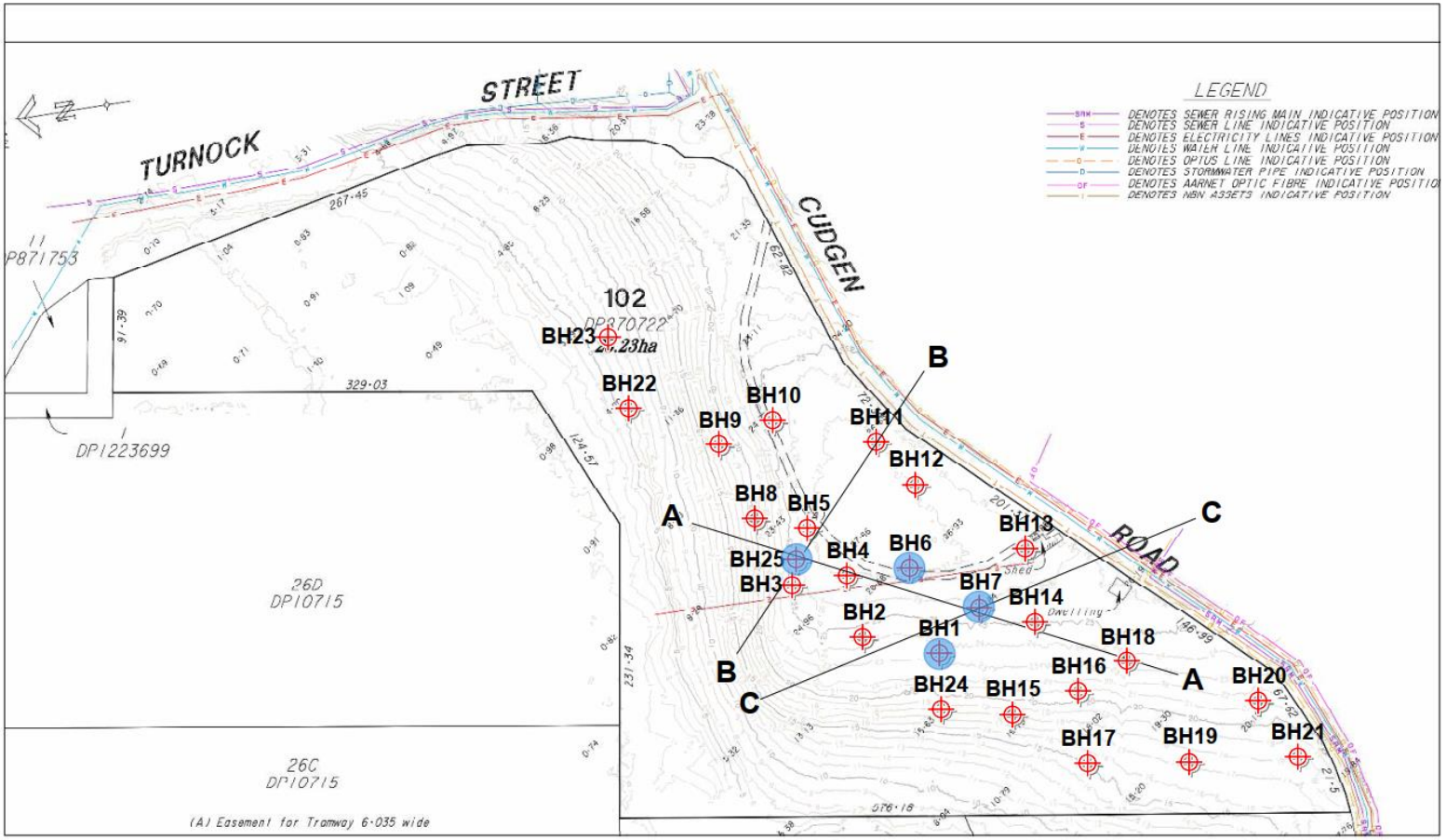
Regards,

Colin

Colin Rope
Senior Associate

Level 11, 151 Castlereagh St
Sydney, NSW 2000, Australia
p +61 (0) 2 8246 3200| f +61 (0) 2 8246 3201
w www.robertbird.com | m +61 (0) 437 008 375

APPENDIX I: LOCATION OF GEOTECHNICAL BOREHOLES – GROUNDWATER ENCOUNTERED



MORRISON GEOTECHNIC

ABN: 51 009 878 899
Unit 1/5 Brendan Drive Nerang 4211 Ph: 5596 1599
Email: goldcoastlab@morrisongeo.com.au Fax: 5527 2027
Engineers: D.Riley, J.Daly, D.Dragun & B.Elsmore
Geologists: L.Bexley & R.Howchin

Map Description :	SITE PLAN AND BOREHOLE LOCATION		
Client :	WOOD & GRIEVE ENGINEERS		
Project :	TWEED HOSPITAL, KINGSCLIFF		
Project No :	GE18/144	Date: 16/08/18	Scale : 1:4000 (A4)

APPENDIX J: GROUNDWATER MONITORING WELLS

Area of Concern	Proposed Groundwater Scope
Farm pit	3 No. Monitoring wells installed to ~ 15m
Farm Shed	1 No. Monitoring Well, installed to ~ 15m
Rubbish Deposit	1 No. Monitoring Well, installed to 10m.
Farm Dam	1 No. Monitoring Well, installed to 10m.
Farm House	Nil