ATTACHMENT 1

LOT 54 ON SP292874 BONNIE DOON ROAD, KILLALOE
RESPONSE TO REQUEST FOR INFORMATION

General Items:

1. Provide further details of the filling exercise to take place i.e volume of fill to be placed on the land, type and number of vehicles to be used, hours of operation, access to the fill site (using unconstructed road reserve) and other details relevant to the works.

The approximate volume of fill to be placed on site is approximately 45,000m^3.

It is proposed to undertake the filling works using various types of truck including a mixture of semi tippers, truck and dogs and body trucks.

Approximately 7-10 vehicle are expected to be carting material each day. The expected hours of operation will be between 6:30am and 6pm, Monday to Saturday, if approved by Council.

Access to the site will use Captain Cook Highway, Bonnie Doon Road and the unconstructed site access as per Figure 1 – Proposed Haul Route.

Truck symbol signs will be erected at Bonnie Doon Road and on the highway at entrances to both sites as additional traffic management, over and above abiding by the posted speed limits and general traffic rules. Both turning points on the roads have good visibility in both directions for entering and exiting from public road formation. Call points will be established as trucks are entering and exiting both sites via the UHF radio so that positive communication is maintained.

2. Provide contour plans that clearly illustrate existing and proposed ground levels.

Refer to drawing 1134-001 (attached).

3. Provide an assessment of the proposal against the relevant codes of the planning scheme.

As per the planning scheme the site is located with the Rural Areas & Rural Settlements Locality.

Rural Settlements Code generally refers to buildings/structures being constructed on the site, including hillslope sites. No buildings/structures are proposed within the operational works.

Please refer to the attached assessment.

4. The site is low lying and contained within the Acid Sulfate Overlay Map. Provide supporting information and advice from an appropriately qualified person that the filling exercise will not give rise to environmental impacts associated with the displacement and / or disturbance of acid sulfate soils.

The site is below RL20m AHD and is covered by the Douglas Shire Council Acid Sulfate Soils Overlay. The area of proposed works has previously been disturbed through farming and or farm improvement works over time. We understand that these previous works have not given rise to the disturbance of acid sulfate soils. Excavation on the site is limited to stripping of topsoil and therefore the risk of displacement or disturbance of acid sulfate soils is reduced.

Filling of the site is unlikely displace/disturb acid sulfate soils.

Geotechnical investigations were undertaken by ETS Geotechnical confirm that the earthworks proposed will not give rise to environmental impacts associated with the displacement and or disturbance of acid sulfate soils.

Please refer ETS report attached.

5. Nominate the haul route and undertake a condition assessment of the public road to be used to ensure that at the completion of the work, any damage to Council controlled roads as a consequence of transporting the material can be determined.

Please find Figure 1 identifying the proposed haul route from the Captain Cook Highway to the site.

A condition assessment has been undertaken on the specified roads. Attached is advice indicating the current road condition of the Captain Cook Highway and Bonnie Doon Road prior to undertaking the works.

Figure 1 - Proposed Haul Route

6. Provide sufficient evidence and investigations that the proposed filling works will not adversely impact on the surrounding properties not only from a drainage perspective but also having regard to the salt content of the fill material to be used

Defined drainage corridors exist both to the north and south of the site. These corridors convey upstream flows from the western side of Bonnie Doon Road. The proposed fill area is outside of these corridors and will not impede upstream flows.

From existing contour information, the low point on Bonnie Doon Road is immediately south of the site. Major storm event flows are anticipated to cross here and traverse south through the neighbouring allotment.

The area proposed for fill already has levels in the order of 3.5m and therefore it can be demonstrated that the area proposed for filling is not used for stormwater conveyance.

An existing farm drain is present just west of the filling area, which intercepts runoff between Bonnie Doon Road and the fill area. It is intended that this corridor not be disturbed or impeded.

With regard to the content of the material, Oakdare advised that investigation and testing in relation to the quality of dredged material have been undertaken by an external party. Due to the size of this document, Oakdare can arrange for a copy to be provided to Council for file.

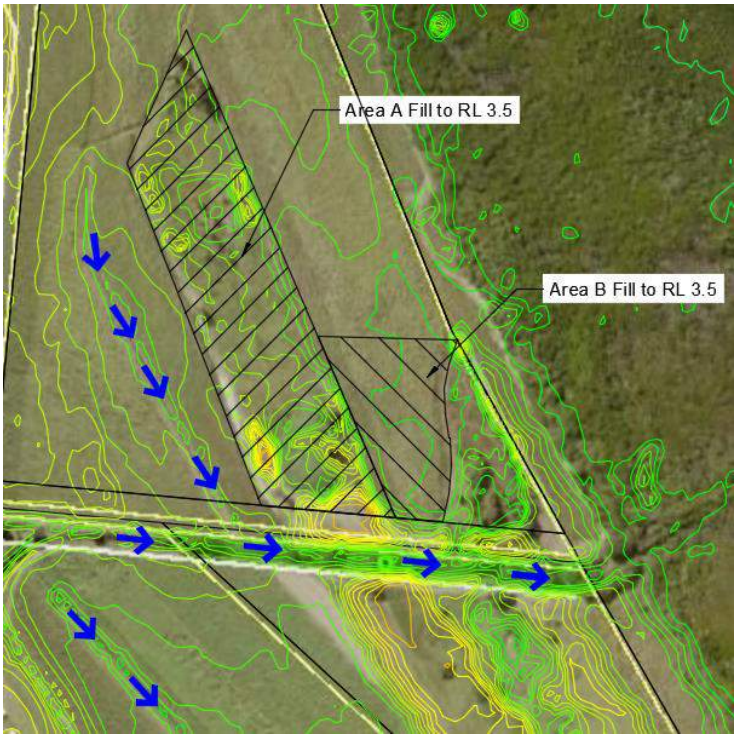


Figure 2 - Existing Drainage Paths

7. Please advise if top soil will be placed over the dredge spoil once placed on the site and if the nominated finished surface level provides for this.

   Finished surface levels include the replacement of topsoil over the disturbed area.

Response to Performance Outcomes - Codes for Planning Areas.

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
P1	The establishment of uses is consistent with the outcomes sought for the Rural Planning Area.	A1.1	Uses identified as inconsistent uses in the Assessment Table are not established in the Rural Planning Area.	✓	*The development proposes earthworks only which does not alter the intended land use.*
P2	GQAL is only used for agricultural uses and primary production purposes.	A2.1	Agricultural land is used for agricultural uses in accordance with the classifications of the Agricultural Land Classes identified in the Shire and the requirements of State Planning Policy 1/92 – Development and the Conservation of Agricultural Land.	✓	*The development does not alter the intended land use.*
P3	A buffer is provided to separate agricultural activities that create odour, excessive noise or use agricultural chemicals, (including Aquaculture and Intensive Animal Husbandry), from residential development.	A3.1	A buffer is provided in accordance with the requirements of State Planning Policy 1/92 and Planning Guidelines – Separating Agricultural and Residential Land Uses (DNR 1997).	✓	*Existing buffer is maintained.*
P4	Buildings/structures are Setback to: ▪ maintain the rural character of the area; and ▪ achieve separation from neighbouring Buildings and from Road Frontages.	A4.1	Buildings/structures are Setback not less than: ▪ 40 metres from the property boundary adjoining a State Controlled Road; or ▪ 25 metres from the property boundary adjoining the Cape Tribulation Road; or ▪ 20 metres from the property boundary fronting any other Road; and ▪ 6 metres from the side and rear property boundaries of the Site.		*N/A*
P5	Rural activities north of the Daintree River are screened to protect the Scenic Amenity of the area.	A5.1	A 10 metre Setback on rural land adjacent to any Road Frontage north of the Daintree River including Dense Planting of the setback area.		*N/A*
P6	Buildings/structures are designed to maintain the rural character of the area.	A6.1	White and shining metallic finishes are avoided on external surfaces of Buildings located in prominent view.		*N/A*

Response to Performance Outcomes - Codes for Planning Areas.

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
P7	Native vegetation existing along Watercourses and in or adjacent to areas of environmental value or areas of remnant vegetation of value is protected.		No Acceptable Solution (Information that the Council may request to demonstrate compliance with the Performance Criteria is outlined in Planning Scheme Policy No 10 – Report and Information the Council May Request, for code and impact assessable development).	✓	*The development does not encroach into existing native vegetation. Buffer provide to existing watercourse vegetation.*
P8	Building/structures are designed and sited to be responsive to the constraints of sloping Sites.	A8.1	Building/structures are Erected on land with a maximum slope not exceeding 15%. OR Development proposed to be Erected on land with a maximum slope between 15% and 33% is accompanied by a Geotechnical Report prepared by a qualified engineer at development application stage. OR Development proposed to be Erected on land with a maximum slope above 33% is accompanied by a Specialist Geotechnical Report prepared by a qualified engineer at development application stage which includes signoff that the Site can be stabilised. AND Any Building/structures proposed to be Erected on land with a maximum slope above 15% are accompanied by an additional Geotechnical Report prepared by a qualified engineer at building application stage. (Information that the Council may request as part of the Geotechnical Report are outlined in Planning Scheme Policy No 10 – Reports and Information the Council May Request, for code and impact assessable development.)		*N/A*

Response to Performance Outcomes - Codes for Planning Areas.

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
P9	The building style and construction methods used for development on sloping Sites are responsive to the Site constraints.	A9.1	A split level building form is utilised.		*N/A*
		A9.2	A single plane concrete slab is not utilised.		*N/A*
		A9.3	Any voids between the floor of the Building and Ground Level, or between outdoor decks and Ground Level, are screened from view by using lattice/batten screening and/or Landscaping.		*N/A*
P10	Development on sloping sites minimises any impact on the landscape character of the surrounding area.	A10.1	Buildings/structures are sited below any ridgelines and are sited to avoid protruding above the surrounding tree level.		*N/A*
P11	Development on sloping sites ensures that the quality and quantity of stormwater traversing the Site does not cause any detrimental impact to the natural environment or to any other Sites.	A11.1	All stormwater drainage discharges to a lawful point of discharge and does not adversely affect downstream, upstream, underground stream or adjacent properties.		*N/A*
P12	A House sited on hillside land is sited in an existing cleared area, or in an area approved for Clearing.	A12.1	A House is sited in an existing cleared area or in an area approved for Clearing under the Local Law – Vegetation Management but which is not cleared until development occurs. The Clearing is limited to a maximum area of 800 m^2 and is sited clear of the High Bank of any Watercourse. EXCEPT In the World Heritage Areas and Environs Locality and the Settlement Areas North of the Daintree River Locality where the maximum clearing is limited to 700m^2. (The 800m^2/700m^2 area of Clearing does not include an access driveway.)		*N/A*

Response to Performance Outcomes - Codes for Planning Areas.

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
		A12.2	The approved area for the Clearing of the House is not cleared until a Building Permit is issued.		
P13	A House sited on hillside land is sited and designed so that it is subservient to the surrounding natural environment.	A13.1	A House is effectively screened from view by existing native trees in designated Setback area/s, or by the planting of additional native trees endemic to the local area.		*N/A*
P14	The exterior finishes of a House complements the surrounding natural environment.	A14.1	The exterior finishes and colours of Building/s are non reflective and complement the colours of the surrounding vegetation and viewshed. AND For self assessable development the exterior colours of Buildings/structures are chosen from the following list of Colourbond Colours: ▪ Jasper ▪ Sandbank ▪ Paperbark ▪ Dune ▪ Windspray ▪ Woodland Grey ▪ Bushland ▪ Pale Eucalypt ▪ Wilderness ▪ Cottage Green ▪ Plantation ▪ Blue Ridge and ▪ Ironstone.		*N/A*
P16	Any filling and excavation work does not create a detrimental impact on slope stability, erosion potential or Visual Amenity of the Site or the surrounding area.	A16.1	The height of cut and/or fill, whether retained or not, does not exceed 2 metres in height.	✓	*Development does not propose filling which exceeds 1.5m. Batters proposed are 1V:10H to reduce erosion potential.*

Response to Performance Outcomes - Codes for Planning Areas.

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
P17	The bulk and scale of a House is not visually obtrusive and does not compromise the Visual Amenity of the site and the surrounding area.	A17.1	The Gross Floor Area of the House does not exceed 250m^2.		*N/A*

Response to Performance Outcomes – Acid Sulfate Soils Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
P1	The release of acid and associated metal contaminants into the environment are avoided either by: ▪ not disturbing Acid Sulfate Soils; or by ▪ preventing the potential impacts of any disturbance through appropriate Site planning, treatment and ongoing management.	A1.1	The disturbance of Acid Sulfate Soils is avoided by: ▪ not excavating or removing more than 100 m3 of material identified as containing or potentially containing Acid Sulfate Soils; ▪ not permanently or temporarily extracting groundwater that results in the aeration of previously saturated Acid Sulfate Soils; and ▪ demonstrating that any filling in excess of 500 m3 of material to depths greater than an average depth of 0.5 metres will not result in ground water extrusion from Acid Sulfate Soils and the aeration of previously saturated Acid Sulfate Soils from the compaction or movement of those soils.	✓	*Excavation is limited to stripping of topsoil and surface vegetation prior to placement of fill.* *Advice provided by geotechnical engineer indicates that filling is unlikely to create ground water extrusion.*
		A1.2	Site planning, treatment and ongoing management are undertaken so that: ▪ acid and metal contaminants are not generated and acidity is neutralised; ▪ untreated Acid Sulfate Soils are not taken off-Site unless this is to an alternative location for treatment; and ▪ surface and groundwater flows from areas containing Acid Sulfate Soils do not release leachate containing acid or metal contaminants into the environment.	✓	*Contractor is to manage the site works during filling operations and implement an acid sulfate management plan if required.*
P2	The location and extent of Acid Sulfate Soils are identified on the development Site and appropriately management so as to avoid the release of acid and associated metal contaminants into the environment.	A2.1	No Acceptable Solution (Information that the Council may request to demonstrate compliance with the Performance Criteria is outlined in Planning Scheme Policy No 9 – Reports and Information the Council May Request, for code and impact assessable development).	✓	*Geotechnical advice indicates that an ASS management plan is not required.*

Response to Performance Outcomes – Cultural Heritage and Valuable Sites Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
P1	Cultural Heritage Features of National and State Cultural Heritage Significance are protected and enhanced.	A1.1	No Acceptable Solution. (Information that the Council may request to demonstrate compliance with the Performance Criteria is outlined in Planning Scheme Policy No 10 – Reports and Information the Council May Request, for code and impact assessable development).	✓	*No evidence of cultural heritage features, however Contractor has a duty of care during filling operations.*
P2	Valuable Conservation Features and Valuable Sites identified on a Cultural Heritage and Valuable Sites Overlay on any Locality Map are identified, recognised, recorded and retained, wherever possible and the form, appearance and integrity of Valuable Conservation Features and Valuable Sites is not adversely affected by new development.	A2.1	Buildings, structures, places or Sites containing Valuable Conservation Features and Valuable Sites, which are to be demolished, removed or altered are recorded prior to demolition, removal or alteration by means of photographs, maps and Site records with the material submitted to Council in accordance with Planning Scheme Policy No 4 – Cultural Heritage and Valuable Sites.		*N/A*
		A2.2	Where a Building, structure, place or Site containing Valuable Conservation Features and Valuable Sites is to be redeveloped and it is proposed to retain the Valuable Cultural Features and Valuable Sites, various provisions of the relevant Land Use Code, Planning Area Code or Locality Code may be relaxed to accommodate the retention of the Valuable Conservation Features and Valuable Sites. PROVIDED Development/redevelopment is in accordance with the requirements of The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance, detailed in Planning Scheme Policy No 4 – Cultural Heritage and Valuable Sites.		*N/A*

Response to Performance Outcomes – Filling and Excavation Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
P1	All filling and excavation work does not create a detrimental impact on the slope stability, erosion potential or visual amenity of the Site or the surrounding area.	A1.1	The height of cut and/or fill, whether retained or not, does not exceed 2 metres in height. AND Cuts in excess of those stated in A1.1 above are separated by benches/terraces with a minimum width of 1.2 metres that incorporate drainage provisions and screen planting.	✓	*Development does not propose filling which exceeds 1.5m. Batters proposed are 1V:10H to reduce erosion potential.*
		A1.2	Cuts are supported by batters, retaining or rock walls and associated benches/terraces are capable of supporting mature vegetation.	✓	*No cutting is proposed on the site.*
		A1.3	Cuts are screened from view by the siting of the Building/structure, wherever possible.		*N/A*
		A1.4	Topsoil from the Site is retained from cuttings and reused on benches/terraces.	✓	*Topsoil is to be stripped and respread upon completion of filling.*
		A1.5	No crest of any cut or toe of any fill, or any part of any retaining wall or structure, is located closer than 600 mm to any boundary of the property, unless the prior written approval of the adjoining landowner and the Council, has been obtained.	✓	*Filling works are intended to not encroach within 2 metres of an adjoining boundary.*
		A1.6	Non-retained cut and/or fill on slopes are stabilised and protected against scour and erosion by suitable measures, such as grassing, Landscaping or other protective/aesthetic measures.	✓	*Disturbed areas are to be revegetated upon completion of filling operations.*
P2	Filling and excavation are carried out in such a manner that the visual/scenic amenity of the area and the privacy and stability of adjoining properties is not compromised.	A2.1	The extent of filling or excavation does not exceed 40% of the Site area or 500 m2 whichever is the lesser. EXCEPT THAT A2.1 does not apply to reconfiguration of 5 lots or more.	✓	*Filling is proposed over approximately 30% of the site, however exceeds the 500m2 threshold.* *The area proposed for filling is generally limited to the extent of existing coastal dune and fill levels proposed are similar heights to the existing dune levels.* *The site is currently zoned Rural under the Council planning scheme and the site along with majority of adjoining properties are predominately used for*

Response to Performance Outcomes – Filling and Excavation Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
					agricultural purposes (eg. farming of sugar cane). *We consider that the proposed works are unlikely to impact the scenic amenity of the area, nor comprise stability of adjoining properties, and complies with the intent of the filling and earthworks code.*
		A2.2	Filling and excavation does not occur within 2 metres of the Site boundary.	✓	*It is proposed that filling does not encroach within 2m of a site boundary.*
P3	Filling and excavation does not result in a change to the run off characteristics of a Site which then have a detrimental impact upon the Site or nearby land or adjacent Road reserves.	A3.1	Filling and excavation does not result in the ponding of water on a Site or adjacent land or Road reserves.	✓	*Filling has been designed not to result in ponding of water.*
		A3.2	Filling and excavation does not result in an increase in the flow of water across a Site or any other land or Road reserves.	✓	*Filling does not result in an increase of impervious area and will not result in an increase of water across the site.*
		A3.3	Filling and excavation does not result in an increase in the volume of water or concentration of water in a Watercourse and overland flow paths.	✓	*Filling does not result in an increase of impervious area and will not result in an increase in volume of water across the site.*
		A3.4	Filling and excavation complies with the specifications set out in the Planning Scheme Policy No 6 – FNQROC Development Manual.	✓	*Filling works are to be undertaken in accordance with the design intent and specification of the FNQROC Development Manual.*
P4	Filling and excavation does not result in a reduction of the water quality of receiving waters.	A4.1	Water quality is maintained to comply with the specifications set out in the Planning Scheme Policy No 6 – FNQROC Development Manual.	✓	*Filling works do not intend to alter the water quality. ESC measures are to be implemented by the contractor prior, during and upon completion of the project.*

Response to Performance Outcomes – Natural Areas and Scenic Amenity Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
P1	Where a development within a DDA triggers this Code, the natural and environmental values of the areas of Remnant Vegetation and/or Watercourse/s are protected from inappropriate development.	A1.1	Buildings/structures Access Roads/car parking, infrastructure and landscape/recreation facilities are constructed within the DDA identified on a Site Plan drawn to scale.		*N/A*
		A1.2	Where internal Roads are required to service the development, the Roads are located within a DDA identified on a Site Plan drawn to scale. (Information that the Council may request to demonstrate compliance with the Performance Criteria is outlined in Planning Scheme Policy No 8 – Natural Areas and Scenic Amenity and Planning Scheme Policy No 10 – Reports and Information the Council May Request, for code and impact assessable development).		*N/A*
P2	Development does not adversely impact on the natural and environmental values and Scenic Amenity of areas identified as Remnant Vegetation and/or Watercourse/s.	A2.1	Where development occurs, it is located on that part of the Site which poses the least threat to the natural and environmental values and Scenic Amenity, for example: ▪ adjacent to existing development; ▪ within an existing cleared area; ▪ within a disturbed area with little potential for rehabilitation; ▪ within an area close to an Access Road; ▪ removed from an identified area of important habitat.	✓	*Current imagery indicates the site is generally clear of vegetation.* *The site is easily accessible via an unformed road reserve.* *Proposed works are approximately 30m from the adjacent watercourse (south) and more than 30m from remnant vegetation (east).* *We consider that the proposed filling works will not adversely impact on the natural and environmental values of the site.*
		A2.2	Development within the DDA is sited to minimise visual intrusion on the Site and the surrounding landscape.	✓	*Upon completion of site works, disturbed areas will be revegetated.*
		A2.3	No continuous boundary fence lines or barriers are Erected on an approved development Site within a DDA identified on a Site Plan drawn to scale.		*N/A*
		A2.4	Infrastructure, such as water mains, sewers, electricity and telecommunication services, is sited		*N/A*

Response to Performance Outcomes – Natural Areas and Scenic Amenity Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
			underground, wherever reasonable, to protect Scenic Amenity, and is located within a DDA on a Site Plan drawn to scale.		
		A2.5	Internal Roads associated with the development are designed and constructed to achieve a low speed environment.		*N/A*
		A2.6	Roads and infrastructure services do not cross the Setback area/riparian corridor; or if this is not possible, the number of crossings is minimised.		*N/A*
		A2.7	Setback areas/riparian corridors are provided in accordance with A4.1, A4.2, A4.3 and A4.4 below; AND The lowest intensity of development occurs adjacent to any Setback area/riparian corridor, and in the case of reconfiguration, larger lots are located adjacent to any Setback area/riparian corridor.	✓	*Filling works are not proposed within 30m of the adjacent watercourse. Revegetation of disturbed areas will occur upon completion of works. Vegetation outside the scope of works is to be retained.*
		A2.8	There is no fragmentation or alienation of any Remnant Vegetation.	✓	*No disturbance of remnant vegetation to occur.*
		A2.9	Any natural, environmental or Scenic Amenity value of any balance area outside the DDA is protected.	✓	*No works to occur outside the development footprint.*
P3	Any development involving filling and excavation minimises detrimental impacts on any aquatic environment.		No Acceptable Solution. (Information that the Council may request to demonstrate compliance with the Performance Criteria is outlined in Planning Scheme Policy No 8 – Natural Areas and Scenic Amenity and Planning Scheme Policy No 10 – Reports and Information the Council May Request, for code and impact assessable development).	✓	*The proposed works are not likely to impact the aquatic environment.*
P4	Setback areas/riparian corridors adjacent to Watercourses are provided/maintained or re-established and revegetated with species endemic to the local area.	A4.1	For residential reconfiguration (Residential 1, Residential 2 or Rural Settlement Planning Area), Aquaculture, Tourist Activities, Industrial Activities and other large scale developments or development likely to have an impact on water quality of adjacent Watercourse/s any degraded sections of the Setback area/riparian corridor are revegetated	✓	*No disturbance to adjacent watercourses are proposed.*

Response to Performance Outcomes – Natural Areas and Scenic Amenity Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
			with endemic species typical of the riparian corridor in the area.		
		A4.2	Revegetation occurs in accordance with a Landscape Plan prepared by a suitably qualified professional in compliance with the requirements of Planning Scheme Policy No 8 – Natural Areas and Scenic Amenity, Landscaping Code and Planning Scheme Policy No 7 – Landscaping.	✓	*Revegetation is limited to drill seeding of disturbed areas.*
		A4.3	The minimum width of the Setback area/riparian corridor, measured out from the shoulder of each high bank, for the respective categories of Watercourses, where a riparian corridor of vegetation already exists is: ▪ Category 1 – Major Perennial Watercourse – 30 metres ▪ Category 2 – Perennial Watercourse – 20 metres ▪ Category 3 – Minor Perennial – 10 metres, AND buildings are sited clear of the Setback area/riparian corridor, in accordance with the relevant Setbacks outlined above. OR The minimum width of the Setback area/riparian corridor, measured out from the shoulder of each high bank, for the respective categories of Watercourses, where no riparian corridor of vegetation already exists is: ▪ Category 1 – Major Perennial Watercourse – 10 metres ▪ Category 2 – Perennial Watercourse – 5 metres ▪ Category 3 – Minor Perennial – 2.5 metres, AND	✓	*30m setback proposed.*

Response to Performance Outcomes – Natural Areas and Scenic Amenity Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
			buildings are sited clear of the Setback area/riparian corridor, in accordance with the relevant Setbacks above.		
		A4.4	Native vegetation within the Setback area/riparian corridor, other than identified noxious and environmental weeds, is retained.	✓	*No clearing within the setback area is proposed.*
P5	Any use of a Setback area/riparian corridor does not adversely affect the integrity of the Setback area/riparian corridor.	A5.1	Only low key, passive, low impact recreational facilities, including pedestrian and cycle paths or boardwalks, are located within the Setback area/riparian corridor.	✓	*No new use of the setback area is proposed.*
			The location of low key, passive, low impact recreational facilities, including pedestrian and cycle paths or boardwalks within the Setback area/riparian corridor, does not affect the connectivity function and landscape/environmental or Scenic Amenity values of the Setback area/riparian corridor.		*N/A*
P6	Any development sited wholly or partially on land with a slope greater than 15% protects the Scenic Amenity values of the land from inappropriate and visually prominent development		Land with a slope greater than 15% and including Remnant Vegetation remains undeveloped and in its natural state.		*N/A*
			Any development remains unobtrusive and sited below the tree line and ridge line. (Information that the Council may request to demonstrate compliance with the Performance Criteria is outlined in Planning Scheme Policy No 8 – Natural Areas and Scenic Amenity and Planning Scheme Policy No 10 – Reports and Information the Council May Request, for code and impact assessable development).		*N/A*

Response to Performance Outcomes – Natural Hazards Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
P1	Development does not compromise the safety of people or property from bushfire.	A1.1	Any development on land identified as High Risk Hazard on any Natural Hazards Overlay on any Locality Map complies with the relevant requirements of State Planning Policy 1/03 – Mitigating the Adverse Impacts of Flood, Bushfire and Landslide. AND Development complies with a Bushfire Management Plan prepared for the site.	✓	*Site is identified as a low risk hazard.*
P2	Development maintains the safety of people and property by: ▪ avoiding areas of High or Medium ▪ Risk Hazard; or ▪ mitigating the risk through: - lot design and the siting of - Buildings; and - including firebreaks that provide adequate: ○ Setbacks between Building/structures and hazardous vegetation, and ○ Access for firefighting/other emergency vehicles; - providing adequate Road Access for firefighting/other emergency vehicles and safe evacuation; and - providing an adequate and accessible water supply for fire-fighting purposes	A2.1	Development is located on a Site that is not subject to High or Medium Risk Hazard. OR For all development (if development is proposed to be located on a Site that is subject to High or Medium Risk Hazard), then: Buildings and structures on lots greater than 2500 m2: ▪ are sited in locations of lowest hazard within the lot; and ▪ achieve Setbacks from hazardous vegetation of 1.5 times the predominant mature canopy tree Height or 10 metres, whichever is the greater; and ▪ 10 metres from any retained vegetation strips or small areas of vegetation; and ▪ are sited so that elements of the development least susceptible to fire are sited closest to the bushfire hazard. Building and structures on lots less than or equal to 2500 m2, maximise Setbacks from hazardous vegetation. AND	✓	*Site is identified as a low risk hazard.*

Response to Performance Outcomes – Natural Hazards Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
			For uses involving new or existing Buildings with a Gross Floor Area greater than 50 m2 each lot has: ▪ a reliable reticulated water supply that has sufficient flow and pressure characteristics for firefighting purposes at all times (minimum pressure and flow is 10 litres a second at 200 kPa); or ▪ an on Site water storage of not less than 5000 litres (eg. accessible dam or tank with fire brigade tank fittings, swimming pool).		
		A2.2	For development that will result in multiple Buildings or lots (if development is proposed to be located on a Site that is subject to High or Medium Risk Hazard), then: Residential lots are designed so that their size and shape allow for: ▪ efficient emergency Access to Buildings for firefighting appliances (eg. by avoiding long narrow lots with long Access drives to Buildings); and ▪ Setbacks and Building siting in accordance with 2.1 (a) above. AND Firebreaks are provided by: ▪ a perimeter Road that separates lots from areas of bushfire hazard and that Road has: - a minimum cleared width of 20 metres; and - a constructed Road width and all-weather standard - complying with Council standards. OR ▪ Where it is not practicable to comply with fire break provisions above, maintenance trails are located as close as possible to the boundaries		*N/A/*

Response to Performance Outcomes – Natural Hazards Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
			of the lots and the adjoining bushland hazard, and the fire/maintenance trails: - have a minimum cleared width of 6 metres; and - have a formed width and gradient, and erosion control devices to Council - standards; and - have vehicular Access at each end; and - provide passing bays and turning areas for fire fighting applicants; and - are either located on public land, or within an Access easement that is granted in favour of the Council and Queensland Fire Rescue Service (QFRS). AND ▪ sufficient cleared breaks of 6 metres minimum width in retained bushland within the development ▪ (eg. creek corridors and other retained vegetation) to allow burning of sections and Access for bushfire response. AND Roads are designed and constructed in accordance with applicable Council and State government standards and: ▪ have a maximum gradient of 12.5%; and ▪ exclude cul-de-sac, except where a perimeter Road isolates the development from hazardous vegetation or the cul-de-sac are provided with an alternative Access linking the cul-de-sac to other through Roads.		

Response to Performance Outcomes – Natural Hazards Code

PERFORMANCE CRITERIA		ACCEPTABLE SOLUTIONS		RESPONSE	COMMENT
P3	Public safety and the environment are not adversely affected by the detrimental impacts of bushfire on hazardous materials manufactured or stored in bulk.		Development complies with a Bushfire Management Plan prepared for the site.	✓	*Proposed filling works do not alter the existing land use.*

ETS GEOTECHNICAL

OAKDARE HOLDINGS PTY LTD

ACID SULFATE SOILS SITE INVESTIGATION

LOT 54 (SP292874) BONNIE DOON ROAD, KILLALOE
PROPOSED FILL AREA

REPORT No. GT17-289-001R Rev 1

SEPTEMBER 2017

Revision 1

ETS Geo Pty Ltd
PO Box 587
Redlynch QLD 4870

Telephone: 07 4047 8600
Facsimile: 07 4047 8699
Email: admin@etsgeo.com.au

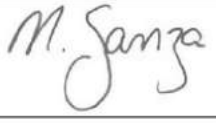
Document Status							
Revision No.	***Author***	***Reviewer***	***Reason for Issue***	***Approved for Issue***			
				Name	***Signature***	***Date***	***RPEQ No***
1	L. Jones	M. Ganza	Final	M. Ganza		14/09/2017	4449

TABLE OF CONTENTS

1.0 INTRODUCTION

This report presents the results of an acid sulfate soils investigation for a proposed fill area at Lot 54 Bonnie Doon Road, Killaloe.

ETS Geo Pty Ltd (ETS) have been commissioned by Oakdare Holdings Pty Ltd to conduct an acid sulfate soil investigation of the area and to provide recommendations for the management of acid sulfate soils for this project.

2.0 SCOPE OF GEOTECHNICAL SERVICES

As detailed in our proposal GT17-289-001P dated 24th July 2017, the objective of the services provided by ETS was to establish the nature and type of subsurface material to allow for an acid sulfate soils (ASS) assessment of the site to determine whether or not an ASS Site Management Plan will be required in accordance with the State Planning Policy 2/02 *"Planning and Managing Development Involving Acid Sulfate Soils"*.

3.0 PROPOSED DEVELOPMENT

It is understood that the proposed fill area comprises an area of approximately 4.5 hectares. The site is located on the eastern side of Bonnie Doon Road, and is a gently sloping site with a ground surface elevation generally around RL 2.0. It is noted that a recently constructed residence and building pad had been constructed in the southern extent of the proposed fill area.

It has been advised by the Client that the expected volume of fill for this development would be approximately 45,000m³.

A copy of the proposed fill area depicted on Trinity Engineering & Consulting's Drawing Number SKETCH 1134-001, Rev.B, is appended.

4.0 GEOTECHNICAL INVESTIGATION

4.1 Field Investigation

Subsurface conditions at the site were investigated by excavating and sampling nine (9) boreholes to depths of 2.0m.

Disturbed samples were taken over the entire depth of the investigated soil profile in each borehole.

The soil classification descriptions, field and laboratory testing were completed in accordance with the following:

- AS 1726 – 1993 Geotechnical Site Investigations;
- AS 1289 Methods for Testing Soils for Engineering Purposes;
- Queensland Acid Sulfate Soils Investigation Team (QASSIT) *"Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland"* October 1998.

The detailed borehole record sheets are included in Appendix B.

4.2 Subsurface Conditions

The subsurface profile encountered in the boreholes consisted of clayey sands and sands. The groundwater table was also encountered in numerous boreholes and has been noted on the borehole logs.

5.0 LABORATORY TESTING

The following laboratory testing, involving two (2) stages for the acid sulfate soil investigation was undertaken for the project.

5.1 Preliminary Screening Tests

The first stage consisted of the initial qualitative screening of the disturbed samples collected from the nine (9) boreholes. This was conducted using the field pH (pH_f) and oxidised (pH_{fox}) test method, which is a quick, qualitative assessment of the existing and potential acidity of the soil. The results of these screening tests were used to select which of the soil samples should be further assessed by quantitative laboratory testing.

Laboratory test results for the pH_f / pH_{fox} screening are presented in Appendix B. Thirty-six (36) samples were submitted to SGS Environmental Services for further laboratory analysis using the Chromium Reducible Sulfur (CRS) test.

5.2 Quantitative Analysis

The second stage of the laboratory testing was performed by SGS Environmental (Cairns) on a selection of thirty-six (36) samples showing the most severe indication of acid sulphate soil, i.e. those showing low pH and large change between the pH_f and the pH_{fox} readings. The second stage testing consisted of Chromium Reducible Sulfur (CRS) tests, and Total Actual Acidity (TAA) tests, and where the sample showed pH < 4.5 the retained acidity was also measured. The CRS test provides data on sulfuric acids, without influence from organic acids, and is generally used for low acidic sandy soils and/or soils with some organic material.

Full results of the testing are summarised below in Table 1, and the SGS Environmental test report is included in Appendix C.

TABLE 1 QUANTITATIVE ANALYSIS RESULTS SUMMARY

Borehole No.	Sample Depth (m)	Soil Description (Texture)	S_{CR} (%S)	TAA (mol H^+/t)	S_{KCl} (%S)
1	0.25-0.5	Coarse	<0.005	<5	<0.005
1	0.75-1.0	Coarse	<0.005	25	<0.005
1	1.25-1.5	Coarse	<0.005	6	<0.005
1	1.75-2.0	Coarse	<0.005	15	<0.005
2	0.0-0.25	Coarse	<0.005	7	<0.005
2	0.5-0.75	Coarse	<0.005	<5	<0.005
2	1.25-1.5	Coarse	<0.005	<5	<0.005
2	1.75-2.0	Coarse	<0.005	<5	<0.005
3	0.0-0.25	Coarse	<0.005	<5	<0.005
3	0.5-0.75	Coarse	<0.005	<5	<0.005
3	1.0-1.25	Coarse	<0.005	<5	<0.005
3	1.5-1.75	Coarse	<0.005	<5	<0.005
4	0.0-0.25	Coarse	<0.005	<5	<0.005
4	0.75-1.0	Coarse	<0.005	<5	<0.005
4	1.0-1.25	Coarse	<0.005	<5	<0.005
4	1.5-1.75	Coarse	<0.005	<5	<0.005
5	0.0-0.25	Coarse	<0.005	<5	<0.005
5	0.5-0.75	Coarse	<0.005	<5	<0.005
5	1.25-1.5	Coarse	<0.005	<5	<0.005
5	1.75-2.0	Coarse	<0.005	6	<0.005

Borehole No.	Sample Depth (m)	Soil Description (Texture)	S_{CR} (%S)	TAA (mol H^+/t)	S_{KCl} (%S)
6	0.0-0.25	Coarse	<0.005	<5	<0.005
6	0.75-1.0	Coarse	<0.005	<5	<0.005
6	1.25-1.5	Coarse	<0.005	<5	<0.005
6	1.5-1.75	Coarse	<0.005	<5	<0.005
7	0.0-0.25	Coarse	<0.005	<5	<0.005
7	0.75-1.0	Coarse	<0.005	<5	<0.005
7	1.25-1.5	Coarse	0.006	<5	<0.005
7	1.75-2.0	Coarse	<0.005	<5	<0.005
8	0.0-0.25	Coarse	0.008	<5	<0.005
8	0.75-1.0	Coarse	<0.005	<5	<0.005
8	1.25-1.5	Coarse	<0.005	<5	<0.005
8	1.75-2.0	Coarse	<0.005	<5	<0.005
9	0.0-0.25	Coarse	<0.005	<5	<0.005
9	0.5-0.75	Coarse	<0.005	<5	<0.005
9	1.25-1.5	Coarse	<0.005	<5	<0.005
9	1.75-2.0	Coarse	0.032	<5	<0.005

6.0 ACTION CRITERIA

Three (3) different soil types and their correlating action criteria are specified in Appendix 5, Table 6 of the "State Planning Policy 2/02 Guideline". The criteria are used to define when ASS disturbed at a site will need to be treated and managed. The action criteria use the sum of the existing plus potential acidity (e.g. s-TAA + S_{CR}; both expressed as % w/w of S units) to set a trigger level for different soil texture types and amounts of material disturbed. Considering the soil type (coarse texture) and the quantity of soils likely to be disturbed (1-1000 tonnes), the following action criteria apply:-

- Equivalent Sulfur (%S) 0.03%
- Equivalent Acidity (TAA) 18 mol H^+/tonne

7.0 ACID SULFATE SOIL ASSESSMENT

The threshold values for TAA were exceeded for one of the samples tested according to the soils texture type (BH1 at 0.75-1.0m). This soil comprises what is considered to be low levels of actual acidity, however, as the pH_{KCl} was greater than 4.5 and the measured S_{KCl} was also less than the specified action criteria; it indicates that the acidity present in the soil is not sulfuric acidity. Therefore the soil is not considered to be acid sulfate soil. This non sulfuric acidity encountered is less harmful and less mobile than the products of ASS. As the local environment is adapted to these soils in their undisturbed condition and the proposed filling activities will not disturb these soils, no further action is required in this circumstance.

In addition, the threshold values for SCR were also exceeded for one of the samples tested according to the soils texture type (BH9 at 1.75-2.0m). Similarly, the level of potential sulfuric acidity (SCR) present in this soil is considered to be low. Fill embankments and structures built over soils will create loads on the underlying soils which can result in shear failure and the consequent upward heave of soils adjacent to the load. The upward heave of soils adjacent to the loads can raise PASS soils into aerobic conditions above the groundwater level and allow the development of sulfuric acid. It is expected that the encountered soils (i.e. Sand / Clayey Sand) will not settle significantly and are not prone to shear failure and heaving. Therefore, it is anticipated that the encountered PASS material at BH9 is not likely to be displaced above the groundwater.

Based on the results of the ASS investigation detailed above, **an Acid Sulfate Soil Management Plan is not required** for the earthworks associated with this development. However, it is recommended that the following is adopted for the project:

1. The depth of fill placed across the nominated fill area is not greater 1.5 metres in total height;

2. The embankment batter angle is to be no steeper than 1 in 10 metres.

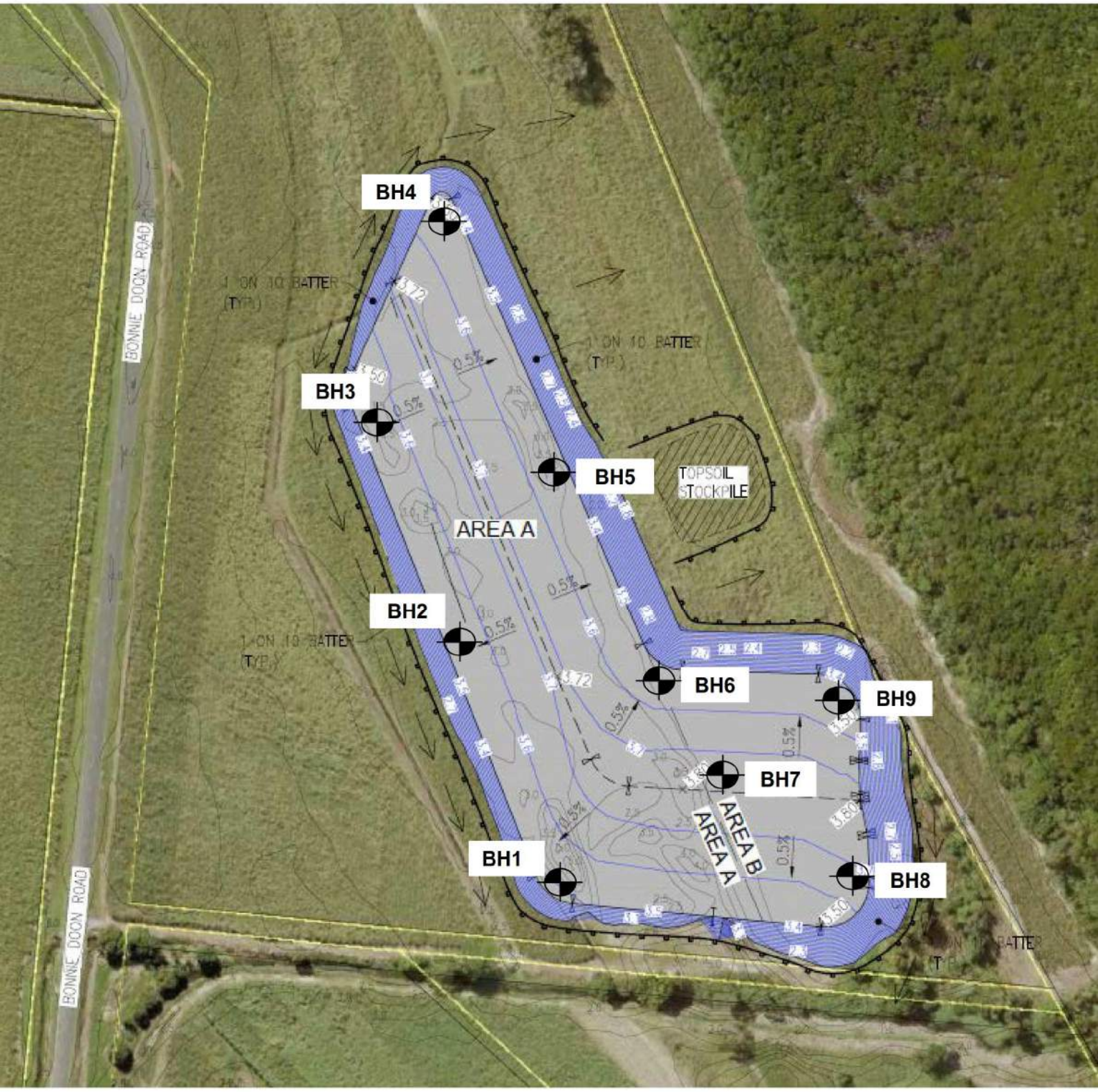
Should the depth of fill be greater than 1.5 metres in height, it is recommended that an additional deeper geotechnical and acid sulfate soils investigation is undertaken.

8.0 LIMITATIONS

We have prepared this report for the use of **OAKDARE HOLDINGS PTY LTD** for design purposes in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for use by parties other than **OAKDARE HOLDINGS PTY LTD** or their design consultants, i.e. Architect & Civil/Structural Engineers. It may not contain sufficient information for purposes of other parties or for other uses.

Your attention is drawn to the document - "Understand the Limitations of Your Geotechnical Report", which is included in Appendix D of this report. This document has been prepared to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimise the risks associated with the ground works for this project. The document is not intended to reduce the level of responsibility accepted by ETS, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

APPENDIX A – LOCALITY PLAN



7
QLD 4870

: (07) 4047 8600
(07) 4047 8699

hin@etsgeo.com.au

TITLE:

ACID SULFATE SOIL INVESTIGATION – FIGURE 1

LOT 54 BONNIE DOON ROAD
KILLALOE

CLIENT: OAKDARE HOLDINGS PTY LTD

PRO

DRA

APPENDIX B - PASS SCREENING TEST RESULTS (CONDUCTED BY ETS CAIRNS LABORATORY) AND BOREHOLE LOGS

Engineering Testing Services Pty Ltd
Phone: 07 4047 8600 - Fax: 07 4047 8699
Unit 1, 220 Scott St Cairns Qld 4870
PO Box 252 Bungalow Qld 4870
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 71 882 809 386
NATA Accreditation No: 1833

Engineering Testing Services (Townsville) Pty Ltd
Phone: 07 4774 4135 - Fax: 07 4774 4357
Unit D 26-30 Lorna Court Bohle Qld 4818
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 89 119 263 366
NATA Accreditation No: 2694

Borehole Log Report

Customer:	Oakdare Holdings Pty Ltd	**Report Number:**	GT17-289-001 LOG
Job Number:	GT17-289	**Report Date:**	13-Sep-17
Project:	Acid Sulfate Soils Investigation	**Order Number:**	*
Location:	Lot 54 Bonnie Doon Road, Killaloe		**Page 1 of 9**

BOREHOLE NO: 1

Depth (m)	Description of Subsoil	Consistency	Moisture Condition	Ground Water Level (m)	Sample Type & Depth (m)
0.0 - 1.0	SAND (SW) fine - medium grained sand, grey-brown, trace of low plasticity fines.	Loose	Dry	Free Ground Water Not Encountered	Refer to GT17-289 PH report for sampling performed.
1.0 - 1.25	SAND (SW) fine - medium grained sand, grey, trace of low plasticity fines.	Loose - Medium Dense	Moist		
1.25 - 2.0	Clayey SAND (SC) fine - medium grained sand, pale yellow, low plasticity clay fines, trace of coarse sand.	Medium Dense	Moist		
2.0	Borehole Terminated				

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

Engineering Testing Services Pty Ltd
Phone: 07 4047 8600 - Fax: 07 4047 8699
Unit 1, 220 Scott St Cairns Qld 4870
PO Box 252 Bungalow Qld 4870
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 71 882 809 386
NATA Accreditation No: 1833

Engineering Testing Services (Townsville) Pty Ltd
Phone: 07 4774 4135 - Fax: 07 4774 4357
Unit D 26-30 Lorna Court Bohle Qld 4818
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 89 119 263 366
NATA Accreditation No: 2694

Borehole Log Report

Customer:	Oakdare Holdings Pty Ltd	**Report Number:**	GT17-289-001 LOG
Job Number:	GT17-289	**Report Date:**	13-Sep-17
Project:	Acid Sulfate Soils Investigation	**Order Number:**	*
Location:	Lot 54 Bonnie Doon Road, Killaloe		**Page 2 of 9**

BOREHOLE NO: 2

Depth (m)	Description of Subsoil	Consistency	Moisture Condition	Ground Water Level (m)	Sample Type & Depth (m)
0.0 - 0.25	SAND (SW) fine - medium grained sand, dark brown, trace of low plasticity fines.	Loose	Dry	Free Ground Water Not Encountered	Refer to GT17-289 PH report for sampling performed.
0.25 - 1.0	SAND (SW) fine - medium grained sand, grey, trace of low plasticity fines.	Loose - Medium Dense	Moist		
1.0 - 1.5	SAND (SW) fine - medium grained sand, yellow/orange, trace of coarse grained sand, trace of low plasticity fines.	Medium Dense	Moist		
1.5 - 2.0	Clayey SAND (SC) fine - medium grained sand, grey, pale yellow mottling, low plasticity clay fines, trace of coarse sand.	Medium Dense	Moist		
2.0	Borehole Terminated				

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

Engineering Testing Services Pty Ltd
Phone: 07 4047 8600 - Fax: 07 4047 8699
Unit 1, 220 Scott St Cairns Qld 4870
PO Box 252 Bungalow Qld 4870
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 71 882 809 386
NATA Accreditation No: 1833

Engineering Testing Services (Townsville) Pty Ltd
Phone: 07 4774 4135 - Fax: 07 4774 4357
Unit D 26-30 Lorna Court Bohle Qld 4818
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 89 119 263 366
NATA Accreditation No: 2694

Borehole Log Report

Customer:	Oakdare Holdings Pty Ltd	**Report Number:**	GT17-289-001 LOG
Job Number:	GT17-289	**Report Date:**	13-Sep-17
Project:	Acid Sulfate Soils Investigation	**Order Number:**	*
Location:	Lot 54 Bonnie Doon Road, Killaloe		**Page 3 of 9**

BOREHOLE NO: 3

Depth (m)	Description of Subsoil	Consistency	Moisture Condition	Ground Water Level (m)	Sample Type & Depth (m)
0.0 - 0.5	SAND (SW) fine - medium grained sand, grey-brown, trace of low plasticity fines.	Loose	Dry	Free Ground Water Not Encountered	Refer to GT17-289 PH report for sampling performed.
0.5 - 1.75	SAND (SW) fine - medium grained sand, off-white, trace of low plasticity fines.	Loose - Medium Dense	Moist		
1.75 - 2.0	Clayey SAND (SC) fine - medium grained sand, pale yellow, off-white mottling, low plasticity fines, trace of coarse grained sand, trace of fine size gravel.	Medium Dense	Moist		
2.0	Borehole Terminated				

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

Engineering Testing Services Pty Ltd
Phone: 07 4047 8600 - Fax: 07 4047 8699
Unit 1, 220 Scott St Cairns Qld 4870
PO Box 252 Bungalow Qld 4870
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 71 882 809 386
NATA Accreditation No: 1833

Engineering Testing Services (Townsville) Pty Ltd
Phone: 07 4774 4135 - Fax: 07 4774 4357
Unit D 26-30 Lorna Court Bohle Qld 4818
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 89 119 263 366
NATA Accreditation No: 2694

Borehole Log Report

Customer:	Oakdare Holdings Pty Ltd	**Report Number:**	GT17-289-001 LOG
Job Number:	GT17-289	**Report Date:**	13-Sep-17
Project:	Acid Sulfate Soils Investigation	**Order Number:**	*
Location:	Lot 54 Bonnie Doon Road, Killaloe		**Page 4 of 9**

BOREHOLE NO: 4

Depth (m)	Description of Subsoil	Consistency	Moisture Condition	Ground Water Level (m)	Sample Type & Depth (m)
0.0 - 0.25	SAND (SW) fine - medium grained sand, dark grey-brown, trace of low plasticity fines.	Loose	Dry	Free Ground Water Encountered @ 0.85m	Refer to GT17-289 PH report for sampling performed.
0.25 - 0.75	SAND (SW) fine - medium grained sand, grey-brown, trace of low plasticity fines.	Loose - Medium Dense	Moist		
0.75 - 2.0	SAND (SW) fine - medium grained sand, off-white, trace of coarse grained sand, trace of low plasticity fines.	Medium Dense	Moist - Wet		
2.0	Borehole Terminated				

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

Engineering Testing Services Pty Ltd
Phone: 07 4047 8600 - Fax: 07 4047 8699
Unit 1, 220 Scott St Cairns Qld 4870
PO Box 252 Bungalow Qld 4870
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 71 882 809 386
NATA Accreditation No: 1833

Engineering Testing Services (Townsville) Pty Ltd
Phone: 07 4774 4135 - Fax: 07 4774 4357
Unit D 26-30 Lorna Court Bohle Qld 4818
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 89 119 263 366
NATA Accreditation No: 2694

Borehole Log Report

Customer:	Oakdare Holdings Pty Ltd	**Report Number:**	GT17-289-001 LOG
Job Number:	GT17-289	**Report Date:**	13-Sep-17
Project:	Acid Sulfate Soils Investigation	**Order Number:**	*
Location:	Lot 54 Bonnie Doon Road, Killaloe		**Page 5 of 9**

BOREHOLE NO: 5

Depth (m)	Description of Subsoil	Consistency	Moisture Condition	Ground Water Level (m)	Sample Type & Depth (m)
0.0 - 0.5	SAND (SW) fine - medium grained sand, grey, trace of coarse grained sand, trace of low plasticity fines.	Loose	Dry	Free Ground Water Encountered @ 0.85m	Refer to GT17-289 PH report for sampling performed.
0.5 - 1.75	SAND (SW) fine - medium grained sand, grey-brown, trace of coarse grained sand, trace of low plasticity fines.	Loose - Medium Dense	Moist - Wet		
0.75 - 2.0	Clayey SAND (SC) fine - medium grained sand, pale brown, low plasticity clay fines, trace of coarse grained sand.	Medium Dense	Wet		
2.0	Borehole Terminated				

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

Engineering Testing Services Pty Ltd
Phone: 07 4047 8600 - Fax: 07 4047 8699
Unit 1, 220 Scott St Cairns Qld 4870
PO Box 252 Bungalow Qld 4870
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 71 882 809 386
NATA Accreditation No: 1833

Engineering Testing Services (Townsville) Pty Ltd
Phone: 07 4774 4135 - Fax: 07 4774 4357
Unit D 26-30 Lorna Court Bohle Qld 4818
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 89 119 263 366
NATA Accreditation No: 2694

Borehole Log Report

Customer:	Oakdare Holdings Pty Ltd	**Report Number:**	GT17-289-001 LOG
Job Number:	GT17-289	**Report Date:**	13-Sep-17
Project:	Acid Sulfate Soils Investigation	**Order Number:**	*
Location:	Lot 54 Bonnie Doon Road, Killaloe		**Page 6 of 9**

BOREHOLE NO: 6

Depth (m)	Description of Subsoil	Consistency	Moisture Condition	Ground Water Level (m)	Sample Type & Depth (m)
0.0 - 0.25	SAND (SW) fine - medium grained sand, dark grey-brown, trace of low plasticity fines.	Loose	Dry	Free Ground Water Encountered @ 1.0m	Refer to GT17-289 PH report for sampling performed.
0.25 - 1.75	SAND (SW) fine - medium grained sand, grey, trace of coarse grained sand, trace of low plasticity fines.	Loose - Medium Dense	Moist - Wet		
0.75 - 2.0	Clayey SAND (SC) fine - medium grained sand, grey, yellow mottling, low plasticity clay fines.	Medium Dense	Wet		
2.0	Borehole Terminated				

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

Engineering Testing Services Pty Ltd
Phone: 07 4047 8600 - Fax: 07 4047 8699
Unit 1, 220 Scott St Cairns Qld 4870
PO Box 252 Bungalow Qld 4870
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 71 882 809 386
NATA Accreditation No: 1833

Engineering Testing Services (Townsville) Pty Ltd
Phone: 07 4774 4135 - Fax: 07 4774 4357
Unit D 26-30 Lorna Court Bohle Qld 4818
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 89 119 263 366
NATA Accreditation No: 2694

Borehole Log Report

Customer:	Oakdare Holdings Pty Ltd	**Report Number:**	GT17-289-001 LOG
Job Number:	GT17-289	**Report Date:**	13-Sep-17
Project:	Acid Sulfate Soils Investigation	**Order Number:**	*
Location:	Lot 54 Bonnie Doon Road, Killaloe		**Page 7 of 9**

BOREHOLE NO: 7

Depth (m)	Description of Subsoil	Consistency	Moisture Condition	Ground Water Level (m)	Sample Type & Depth (m)
0.0 - 0.25	SAND (SW) fine - medium grained sand, dark grey-brown, trace of low plasticity fines.	Loose	Dry	Free Ground Water Encountered @ 1.0m	Refer to GT17-289 PH report for sampling performed.
0.25 - 1.75	SAND (SW) fine - medium grained sand, grey, trace of coarse grained sand, trace of low plasticity fines.	Loose - Medium Dense	Moist - Wet		
0.75 - 2.0	Clayey SAND (SC) fine - medium grained sand, grey, yellow mottling, low plasticity clay fines.	Medium Dense	Wet		
2.0	Borehole Terminated				

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

Engineering Testing Services Pty Ltd
Phone: 07 4047 8600 - Fax: 07 4047 8699
Unit 1, 220 Scott St Cairns Qld 4870
PO Box 252 Bungalow Qld 4870
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 71 882 809 386
NATA Accreditation No: 1833

Engineering Testing Services (Townsville) Pty Ltd
Phone: 07 4774 4135 - Fax: 07 4774 4357
Unit D 26-30 Lorna Court Bohle Qld 4818
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 89 119 263 366
NATA Accreditation No: 2694

Borehole Log Report

Customer:	Oakdare Holdings Pty Ltd	**Report Number:**	GT17-289-001 LOG
Job Number:	GT17-289	**Report Date:**	13-Sep-17
Project:	Acid Sulfate Soils Investigation	**Order Number:**	*
Location:	Lot 54 Bonnie Doon Road, Killaloe		**Page 8 of 9**

BOREHOLE NO: 8

Depth (m)	Description of Subsoil	Consistency	Moisture Condition	Ground Water Level (m)	Sample Type & Depth (m)
0.0 - 0.65	SAND (SW) fine - medium grained sand, dark grey, trace of low plasticity fines.	Loose - Medium Dense	Dry - Moist	Free Ground Water Encountered @ 0.65m	Refer to GT17-289 PH report for sampling performed.
0.65 - 0.75	SAND (SW) fine - medium grained sand, dark grey, trace of low plasticity fines.	Medium Dense	Wet		
0.75 - 1.0	SAND (SW) fine - medium grained sand, grey, trace of coarse grained sand, trace of low plasticity fines.	Medium Dense	Wet		
1.0 - 2.0	SAND (SW) fine - medium grained sand, off-white, trace of coarse grained sand, trace of low plasticity fines.	Medium Dense	Wet		
2.0	Borehole Terminated				

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

Engineering Testing Services Pty Ltd
Phone: 07 4047 8600 - Fax: 07 4047 8699
Unit 1, 220 Scott St Cairns Qld 4870
PO Box 252 Bungalow Qld 4870
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 71 882 809 386
NATA Accreditation No: 1833

Engineering Testing Services (Townsville) Pty Ltd
Phone: 07 4774 4135 - Fax: 07 4774 4357
Unit D 26-30 Lorna Court Bohle Qld 4818
info@engineeringtesting.com.au
www.engineeringtesting.com.au
ABN: 89 119 263 366
NATA Accreditation No: 2694

Borehole Log Report

Customer:	Oakdare Holdings Pty Ltd	**Report Number:**	GT17-289-001 LOG
Job Number:	GT17-289	**Report Date:**	13-Sep-17
Project:	Acid Sulfate Soils Investigation	**Order Number:**	*
Location:	Lot 54 Bonnie Doon Road, Killaloe		**Page 9 of 9**

BOREHOLE NO: 9

Depth (m)	Description of Subsoil	Consistency	Moisture Condition	Ground Water Level (m)	Sample Type & Depth (m)
0.0 - 0.7	SAND (SW) fine - medium grained sand, pale grey-brown, trace of low plasticity fines.	Loose - Medium Dense	Dry - Moist	Free Ground Water Encountered @ 0.7m	Refer to GT17-289 PH report for sampling performed.
0.7 - 1.5	SAND (SW) fine - medium grained sand, pale grey-brown, trace of low plasticity fines.	Medium Dense	Wet		
1.5 - 1.75	SAND (SW) fine - coarse grained sand, pale grey, trace of low plasticity fines.	Medium Dense	Wet		
1.75 - 2.0	Clayey SAND (SC) fine - coarse grained sand, grey, low plasticity clay fines, with shell grit.	Medium Dense	Wet		
2.0	Borehole Terminated				

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

HEAD OFFICE – CAIRNS
ETS GEO PTY LTD
ABN: 16 121 817 794
07 4047 8600
07 4047 8699
admin@etsgeo.com.au
PO Box 587
REDLYNCH QLD 4870

1/220 Scott Street
Cairns QLD 4870

ACID SULFATE SOILS FIELD TESTING REPORT

pH and pH Fox Results

Client: Oakdare Holdings Pty Ltd	**Report No: GT17-289 PH**
Project: Lot 54 Bonnie Doon Road, Killaloe	**Order No:**
Sampled By: DK Sampled Date: 28.08.17	**Tested By: GD Site or Lab: Lab** **Tested Date: 29.08.17**

BOREHOLE NO: 1

Field Test No.	Description	Depth	pH F	pH FOX	Reaction*
1	Refer to Borehole Logs	0 – 0.25	5.01	5.31	x
2		0.25 – 0.5	5.06	5.48	x
3		0.5 – 0.75	5.11	5.45	x
4		0.75 – 1.0	4.88	5.40	x
5		1.0 – 1.25	4.28	4.49	x
6		1.25 – 1.5	4.27	4.58	x
7		1.5 – 1.75	4.45	4.48	x
8		1.75 – 2.0	4.61	4.34	x

- Rate reaction with peroxide: X = low, XX = medium, XXX = high, XXXX = extreme

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

HEAD OFFICE – CAIRNS
ETS GEO PTY LTD
ABN: 16 121 817 794
07 4047 8600
07 4047 8699
admin@etsgeo.com.au
PO Box 587
REDLYNCH QLD 4870

1/220 Scott Street
Cairns QLD 4870

ACID SULFATE SOILS FIELD TESTING REPORT

pH and pH Fox Results

Client: Oakdare Holdings Pty Ltd	**Report No: GT17-289 PH**
Project: Lot 54 Bonnie Doon Road, Killaloe	**Order No:**
Sampled By: DK Sampled Date: 28.08.17	**Tested By: GD Site or Lab: Lab** **Tested Date: 29.08.17**

BOREHOLE NO: 2

Field Test No.	Description	Depth	pH F	pH FOX	Reaction*
1	Refer to Borehole Logs	0 – 0.25	5.34	5.13	x
2		0.25 – 0.5	5.24	5.40	x
3		0.5 – 0.75	4.81	5.18	x
4		0.75 – 1.0	4.92	5.32	x
5		1.0 – 1.25	4.58	4.67	x
6		1.25 – 1.5	4.76	5.26	x
7		1.5 – 1.75	5.20	4.95	x
8		1.75 – 2.0	5.18	4.56	x

- Rate reaction with peroxide: X = low, XX = medium, XXX = high, XXXX = extreme

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

HEAD OFFICE – CAIRNS
ETS GEO PTY LTD
ABN: 16 121 817 794
07 4047 8600
07 4047 8699
admin@etsgeo.com.au
PO Box 587
REDLYNCH QLD 4870

1/220 Scott Street
Cairns QLD 4870

ACID SULFATE SOILS FIELD TESTING REPORT

pH and pH Fox Results

Client: Oakdare Holdings Pty Ltd	**Report No: GT17-289 PH**
Project: Lot 54 Bonnie Doon Road, Killaloe	**Order No:**
Sampled By: DK Sampled Date: 28.08.17	**Tested By: GD Site or Lab: Lab** **Tested Date: 29.08.17**

BOREHOLE NO: 3

Field Test No.	Description	Depth	pH F	pH FOX	Reaction*
1	Refer to Borehole Logs	0 – 0.25	6.04	5.01	x
2		0.25 – 0.5	5.70	5.31	x
3		0.5 – 0.75	5.59	4.68	x
4		0.75 – 1.0	5.31	4.50	x
5		1.0 – 1.25	5.08	5.05	x
6		1.25 – 1.5	4.67	4.63	x
7		1.5 – 1.75	4.79	4.80	x
8		1.75 – 2.0	4.73	4.51	x

- Rate reaction with peroxide: X = low, XX = medium, XXX = high, XXXX = extreme

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

HEAD OFFICE – CAIRNS
ETS GEO PTY LTD
ABN: 16 121 817 794
07 4047 8600
07 4047 8699
admin@etsgeo.com.au
PO Box 587
REDLYNCH QLD 4870

1/220 Scott Street
Cairns QLD 4870

ACID SULFATE SOILS FIELD TESTING REPORT

pH and pH Fox Results

Client: Oakdare Holdings Pty Ltd	**Report No: GT17-289 PH**
Project: Lot 54 Bonnie Doon Road, Killaloe	**Order No:**
Sampled By: DK Sampled Date: 28.08.17	**Tested By: GD Site or Lab: Lab** **Tested Date: 29.08.17**

BOREHOLE NO: 4

Field Test No.	Description	Depth	pH F	pH FOX	Reaction*
1	Refer to Borehole Logs	0 – 0.25	5.50	2.50	xx
2		0.25 – 0.5	4.86	2.33	xx
3		0.5 – 0.75	5.17	4.56	x
4		0.75 – 1.0	4.83	4.10	x
5		1.0 – 1.25	4.86	4.77	x
6		1.25 – 1.5	4.92	4.94	x
7		1.5 – 1.75	5.37	5.29	x
8		1.75 – 2.0	5.56	5.46	x

- Rate reaction with peroxide: X = low, XX = medium, XXX = high, XXXX = extreme

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

HEAD OFFICE – CAIRNS
ETS GEO PTY LTD
ABN: 16 121 817 794
07 4047 8600
07 4047 8699
admin@etsgeo.com.au
PO Box 587
REDLYNCH QLD 4870

1/220 Scott Street
Cairns QLD 4870

ACID SULFATE SOILS FIELD TESTING REPORT

pH and pH Fox Results

Client: Oakdare Holdings Pty Ltd	**Report No: GT17-289 PH**
Project: Lot 54 Bonnie Doon Road, Killaloe	**Order No:**
Sampled By: DK Sampled Date: 28.08.17	**Tested By: GD Site or Lab: Lab** **Tested Date: 29.08.17**

BOREHOLE NO: 5

Field Test No.	Description	Depth	pH F	pH FOX	Reaction*
1	Refer to Borehole Logs	0 – 0.25	6.35	4.64	xx
2		0.25 – 0.5	5.97	4.66	xx
3		0.5 – 0.75	5.45	4.80	x
4		0.75 – 1.0	5.56	4.75	x
5		1.0 – 1.25	5.41	5.45	x
6		1.25 – 1.5	5.69	5.44	x
7		1.5 – 1.75	5.45	5.07	x
8		1.75 – 2.0	4.55	3.95	xx

- Rate reaction with peroxide: X = low, XX = medium, XXX = high, XXXX = extreme

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

HEAD OFFICE – CAIRNS
ETS GEO PTY LTD
ABN: 16 121 817 794
07 4047 8600
07 4047 8699
admin@etsgeo.com.au
PO Box 587
REDLYNCH QLD 4870

1/220 Scott Street
Cairns QLD 4870

ACID SULFATE SOILS FIELD TESTING REPORT

pH and pH Fox Results

Client: Oakdare Holdings Pty Ltd	**Report No: GT17-289 PH**
Project: Lot 54 Bonnie Doon Road, Killaloe	**Order No:**
Sampled By: DK Sampled Date: 28.08.17	**Tested By: GD Site or Lab: Lab** **Tested Date: 29.08.17**

BOREHOLE NO: 6

Field Test No.	Description	Depth	pH F	pH FOX	Reaction*
1	Refer to Borehole Logs	0 – 0.25	6.05	2.83	xxx
2		0.25 – 0.5	6.35	3.47	xx
3		0.5 – 0.75	6.74	4.59	xx
4		0.75 – 1.0	6.54	3.34	xxx
5		1.0 – 1.25	5.37	5.03	x
6		1.25 – 1.5	5.27	4.22	xx
7		1.5 – 1.75	5.28	4.74	xx
8		1.75 – 2.0	5.64	5.20	x

- Rate reaction with peroxide: X = low, XX = medium, XXX = high, XXXX = extreme

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

HEAD OFFICE – CAIRNS
ETS GEO PTY LTD
ABN: 16 121 817 794
07 4047 8600
07 4047 8699
admin@etsgeo.com.au
PO Box 587
REDLYNCH QLD 4870

1/220 Scott Street
Cairns QLD 4870

ACID SULFATE SOILS FIELD TESTING REPORT

pH and pH Fox Results

Client: Oakdare Holdings Pty Ltd	**Report No: GT17-289 PH**
Project: Lot 54 Bonnie Doon Road, Killaloe	**Order No:**
Sampled By: DK Sampled Date: 28.08.17	**Tested By: GD Site or Lab: Lab** **Tested Date: 29.08.17**

BOREHOLE NO: 7

Field Test No.	Description	Depth	pH F	pH FOX	Reaction*
1	Refer to Borehole Logs	0 – 0.25	6.09	3.28	xxx
2		0.25 – 0.5	6.28	4.69	xx
3		0.5 – 0.75	6.27	5.08	xx
4		0.75 – 1.0	6.27	4.97	x
5		1.0 – 1.25	5.65	4.55	x
6		1.25 – 1.5	5.00	4.24	xx
7		1.5 – 1.75	4.95	4.59	x
8		1.75 – 2.0	5.00	4.57	x

- Rate reaction with peroxide: X = low, XX = medium, XXX = high, XXXX = extreme

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

HEAD OFFICE – CAIRNS
ETS GEO PTY LTD
ABN: 16 121 817 794
07 4047 8600
07 4047 8699
admin@etsgeo.com.au
PO Box 587
REDLYNCH QLD 4870

1/220 Scott Street
Cairns QLD 4870

ACID SULFATE SOILS FIELD TESTING REPORT

pH and pH Fox Results

Client: Oakdare Holdings Pty Ltd	**Report No: GT17-289 PH**
Project: Lot 54 Bonnie Doon Road, Killaloe	**Order No:**
Sampled By: DK Sampled Date: 28.08.17	**Tested By: GD Site or Lab: Lab** **Tested Date: 29.08.17**

BOREHOLE NO: 8

Field Test No.	Description	Depth	pH F	pH FOX	Reaction*
1	Refer to Borehole Logs	0 – 0.25	6.51	3.14	xxx
2		0.25 – 0.5	6.24	3.92	xxx
3		0.5 – 0.75	6.12	4.83	xx
4		0.75 – 1.0	6.19	4.68	xx
5		1.0 – 1.25	6.24	4.93	x
6		1.25 – 1.5	6.47	4.77	x
7		1.5 – 1.75	6.86	5.52	x
8		1.75 – 2.0	7.44	5.83	x

- Rate reaction with peroxide: X = low, XX = medium, XXX = high, XXXX = extreme

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

HEAD OFFICE – CAIRNS
ETS GEO PTY LTD
ABN: 16 121 817 794
07 4047 8600
07 4047 8699
admin@etsgeo.com.au
PO Box 587
REDLYNCH QLD 4870

1/220 Scott Street
Cairns QLD 4870

ACID SULFATE SOILS FIELD TESTING REPORT

pH and pH Fox Results

Client: Oakdare Holdings Pty Ltd	**Report No: GT17-289 PH**
Project: Lot 54 Bonnie Doon Road, Killaloe	**Order No:**
Sampled By: DK Sampled Date: 28.08.17	**Tested By: GD Site or Lab: Lab** **Tested Date: 29.08.17**

BOREHOLE NO: 9

Field Test No.	Description	Depth	pH F	pH FOX	Reaction*
1	Refer to Borehole Logs	0 – 0.25	6.91	7.20	xxxx
2		0.25 – 0.5	7.28	7.62	xxxx
3		0.5 – 0.75	7.22	6.55	xxx
4		0.75 – 1.0	6.50	6.42	xx
5		1.0 – 1.25	6.48	6.38	xx
6		1.25 – 1.5	6.66	6.02	x
7		1.5 – 1.75	6.69	5.99	x
8		1.75 – 2.0	6.99	5.91	xx

- Rate reaction with peroxide: X = low, XX = medium, XXX = high, XXXX = extreme

SIGNATURE:

SIGNED BY: Leigh Jones
POSITION: Geotechnical Associate
DATED: 13/09/2017
ETS Regional Laboratory: Cairns

APPENDIX C - LABORATORY TEST RESULTS (CONDUCTED BY SGS ENVIRONMENTAL)

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Darren Koch	Manager	Jon Dicker
Client	ETS GEO PTY LTD	Laboratory	SGS Cairns Environmental
Address	PO BOX 587 REDLYNCH QLD 4870	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 7 4047 8600	Telephone	+61 07 4035 5111
Facsimile	(Not specified)	Facsimile	+61 07 4035 5122
Email	darrenk@etsgeo.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**GT17-289 - T E & C**	SGS Reference	**CE129215 R0**
Order Number	**GEO-159**	Date Received	30 Aug 2017
Samples	36	Date Reported	07 Sep 2017

COMMENTS

Accredited for compliance with ISO/IEC 17025- Testing. NATA accredited laboratory 2562(3146)

SIGNATORIES

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number: CE129215.001 Sample Matrix: Soil Sample Date: 28 Aug 2017 Sample Name: Borehole 1 - 0.5m	CE129215.002 Soil 28 Aug 2017 Borehole 1 - 1.0m	CE129215.003 Soil 28 Aug 2017 Borehole 1 - 1.5m	CE129215.004 Soil 28 Aug 2017 Borehole 1 - 2.0m
Moisture Content Method: AN002 Tested: 30/8/2017						
% Moisture	%w/w	0.5	**2.5**	**5.4**	**10**	**12**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 4/9/2017						
pH KCl	pH Units	-	**6.3**	**5.8**	**5.4**	**4.8**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	**1.2**	**0.31**	**0.74**
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	**25**	**6**	**15**
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	**0.04**	**0.01**	**0.02**
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 4/9/2017						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5
HCl Extractable S, Ca and Mg in Soil ICP OES Method: AN014 Tested: 6/9/2017						
Acid Soluble Sulfur (SHCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Suite Net Acidity Calculations Method: AN220 Tested: 7/9/2017						
s-Net Acidity	%w/w S	0.01	<0.01	**0.04**	**0.01**	**0.02**
a-Net Acidity	moles H+/T	5	<5	**26**	**7**	**15**
Liming Rate	kg CaCO3/T	0.1	<0.1	**2.0**	NA	NA
Verification s-Net Acidity	%w/w S	-20	**0.00**	**0.00**	**0.00**	**0.00**
a-Net Acidity without ANCBT	moles H+/T	5	<5	**26**	**7**	**15**
Liming Rate without ANCBT	kg CaCO3/T	0.1	<0.1	**2.0**	NA	NA

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE129215.005 Soil 28 Aug 2017 Borehole 2 - 0.25m	CE129215.006 Soil 28 Aug 2017 Borehole 2 - 0.75m	CE129215.007 Soil 28 Aug 2017 Borehole 2 - 1.5m	CE129215.008 Soil 28 Aug 2017 Borehole 2 - 2.0m
Moisture Content Method: AN002 Tested: 30/8/2017						
% Moisture	%w/w	0.5	**3.8**	**6.8**	**9.9**	**12**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 4/9/2017						
pH KCl	pH Units	-	**5.4**	**6.0**	**6.1**	**5.7**
Titratable Actual Acidity	kg H2SO4/T	0.25	**0.37**	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	**7**	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	**0.01**	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 4/9/2017						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5
HCl Extractable S, Ca and Mg in Soil ICP OES Method: AN014 Tested: 6/9/2017						
Acid Soluble Sulfur (SHCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Suite Net Acidity Calculations Method: AN220 Tested: 7/9/2017						
s-Net Acidity	%w/w S	0.01	**0.01**	<0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	**9**	<5	<5	**6**
Liming Rate	kg CaCO3/T	0.1	NA	<0.1	<0.1	NA
Verification s-Net Acidity	%w/w S	-20	**0.00**	**0.00**	**0.00**	**0.00**
a-Net Acidity without ANCBT	moles H+/T	5	**9**	<5	<5	**6**
Liming Rate without ANCBT	kg CaCO3/T	0.1	NA	<0.1	<0.1	NA

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE129215.009 Soil 28 Aug 2017 Borehole 3 - 0.25m	CE129215.010 Soil 28 Aug 2017 Borehole 3 - 0.75m	CE129215.011 Soil 28 Aug 2017 Borehole 3 - 1.25m	CE129215.012 Soil 28 Aug 2017 Borehole 3 - 1.75m
Moisture Content Method: AN002 Tested: 30/8/2017						
% Moisture	%w/w	0.5	**2.2**	**8.4**	**11**	**6.4**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 4/9/2017						
pH KCl	pH Units	-	**5.9**	**6.0**	**5.6**	**5.4**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 4/9/2017						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5
HCl Extractable S, Ca and Mg in Soil ICP OES Method: AN014 Tested: 6/9/2017						
Acid Soluble Sulfur (SHCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Suite Net Acidity Calculations Method: AN220 Tested: 7/9/2017						
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	<5	<5	**6**
Liming Rate	kg CaCO3/T	0.1	<0.1	<0.1	<0.1	NA
Verification s-Net Acidity	%w/w S	-20	**0.00**	**0.00**	**0.00**	**0.00**
a-Net Acidity without ANCBT	moles H+/T	5	<5	<5	<5	**6**
Liming Rate without ANCBT	kg CaCO3/T	0.1	<0.1	<0.1	<0.1	NA

Parameter	Units	LOR	Sample Number: CE129215.013 Sample Matrix: Soil Sample Date: 28 Aug 2017 Sample Name: Borehole 4 - 0.25m	CE129215.014 Soil 28 Aug 2017 Borehole 4 - 1.0m	CE129215.015 Soil 28 Aug 2017 Borehole 4 - 1.25m	CE129215.016 Soil 28 Aug 2017 Borehole 4 - 1.75m
Moisture Content Method: AN002 Tested: 30/8/2017						
% Moisture	%w/w	0.5	**11**	**17**	**17**	**15**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 4/9/2017						
pH KCl	pH Units	-	**5.5**	**5.8**	**5.8**	**6.0**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 4/9/2017						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5
HCl Extractable S, Ca and Mg in Soil ICP OES Method: AN014 Tested: 6/9/2017						
Acid Soluble Sulfur (SHCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Suite Net Acidity Calculations Method: AN220 Tested: 7/9/2017						
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	<5	<5	<5
Liming Rate	kg CaCO3/T	0.1	<0.1	<0.1	<0.1	<0.1
Verification s-Net Acidity	%w/w S	-20	**0.00**	**0.00**	**0.00**	**0.00**
a-Net Acidity without ANCBT	moles H+/T	5	<5	<5	<5	<5
Liming Rate without ANCBT	kg CaCO3/T	0.1	<0.1	<0.1	<0.1	<0.1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE129215.017 Soil 28 Aug 2017 Borehole 5 - 0.25m	CE129215.018 Soil 28 Aug 2017 Borehole 5 - 0.75m	CE129215.019 Soil 28 Aug 2017 Borehole 5 - 1.5m	CE129215.020 Soil 28 Aug 2017 Borehole 5 - 2.0m
Moisture Content Method: AN002 Tested: 30/8/2017						
% Moisture	%w/w	0.5	**9.8**	**17**	**13**	**14**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 4/9/2017						
pH KCl	pH Units	-	**5.8**	**5.8**	**6.2**	**5.4**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	**0.31**
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	**6**
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	**0.01**
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 4/9/2017						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5
HCl Extractable S, Ca and Mg in Soil ICP OES Method: AN014 Tested: 6/9/2017						
Acid Soluble Sulfur (SHCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Suite Net Acidity Calculations Method: AN220 Tested: 7/9/2017						
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	<0.01	**0.01**
a-Net Acidity	moles H+/T	5	<5	<5	<5	**7**
Liming Rate	kg CaCO3/T	0.1	<0.1	<0.1	<0.1	NA
Verification s-Net Acidity	%w/w S	-20	**0.00**	**0.00**	**0.00**	**0.00**
a-Net Acidity without ANCBT	moles H+/T	5	<5	<5	<5	**7**
Liming Rate without ANCBT	kg CaCO3/T	0.1	<0.1	<0.1	<0.1	NA

Parameter	Units	LOR	Sample Number: CE129215.021 Sample Matrix: Soil Sample Date: 28 Aug 2017 Sample Name: Borehole 6 - 0.25m	CE129215.022 Soil 28 Aug 2017 Borehole 6 - 1.0m	CE129215.023 Soil 28 Aug 2017 Borehole 6 - 1.5m	CE129215.024 Soil 28 Aug 2017 Borehole 6 - 1.75m
Moisture Content Method: AN002 Tested: 30/8/2017						
% Moisture	%w/w	0.5	**11**	**9.6**	**14**	**13**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 4/9/2017						
pH KCl	pH Units	-	**5.7**	**6.1**	**5.7**	**5.8**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 4/9/2017						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5
HCl Extractable S, Ca and Mg in Soil ICP OES Method: AN014 Tested: 6/9/2017						
Acid Soluble Sulfur (SHCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Suite Net Acidity Calculations Method: AN220 Tested: 7/9/2017						
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	<5	<5	<5	<5
Liming Rate	kg CaCO3/T	0.1	<0.1	<0.1	<0.1	<0.1
Verification s-Net Acidity	%w/w S	-20	**0.00**	**0.00**	**0.00**	**0.00**
a-Net Acidity without ANCBT	moles H+/T	5	<5	<5	<5	<5
Liming Rate without ANCBT	kg CaCO3/T	0.1	<0.1	<0.1	<0.1	<0.1

Parameter	Units	LOR	Sample Number: CE129215.025 Sample Matrix: Soil Sample Date: 28 Aug 2017 Sample Name: Borehole 7 - 0.25m	CE129215.026 Soil 28 Aug 2017 Borehole 7 - 1.0m	CE129215.027 Soil 28 Aug 2017 Borehole 7 - 1.5m	CE129215.028 Soil 28 Aug 2017 Borehole 7 - 2.0m
Moisture Content Method: AN002 Tested: 30/8/2017						
% Moisture	%w/w	0.5	**3.0**	**16**	**14**	**11**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 4/9/2017						
pH KCl	pH Units	-	**5.5**	**5.8**	**5.5**	**5.8**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 4/9/2017						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	**0.006**	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5
HCl Extractable S, Ca and Mg in Soil ICP OES Method: AN014 Tested: 6/9/2017						
Acid Soluble Sulfur (SHCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Suite Net Acidity Calculations Method: AN220 Tested: 7/9/2017						
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	**0.01**	<0.01
a-Net Acidity	moles H+/T	5	<5	<5	**9**	<5
Liming Rate	kg CaCO3/T	0.1	<0.1	<0.1	NA	<0.1
Verification s-Net Acidity	%w/w S	-20	**0.00**	**0.00**	**0.01**	**0.00**
a-Net Acidity without ANCBT	moles H+/T	5	<5	<5	**9**	<5
Liming Rate without ANCBT	kg CaCO3/T	0.1	<0.1	<0.1	NA	<0.1

Parameter	Units	LOR	Sample Number: CE129215.029 Sample Matrix: Soil Sample Date: 28 Aug 2017 Sample Name: Borehole 8 - 0.25m	CE129215.030 Soil 28 Aug 2017 Borehole 8 - 1.0m	CE129215.031 Soil 28 Aug 2017 Borehole 8 - 1.5m	CE129215.032 Soil 28 Aug 2017 Borehole 8 - 2.0m
Moisture Content Method: AN002 Tested: 30/8/2017						
% Moisture	%w/w	0.5	**10**	**13**	**14**	**12**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 4/9/2017						
pH KCl	pH Units	-	**5.6**	**6.1**	**6.3**	**9.2**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 4/9/2017						
Chromium Reducible Sulphur (Scr)	%	0.005	**0.008**	<0.005	<0.005	<0.005
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	<5
HCl Extractable S, Ca and Mg in Soil ICP OES Method: AN014 Tested: 6/9/2017						
Acid Soluble Sulfur (SHCl)	%w/w	0.005	<0.005	<0.005	<0.005	<0.005
Chromium Suite Net Acidity Calculations Method: AN220 Tested: 7/9/2017						
s-Net Acidity	%w/w S	0.01	**0.01**	<0.01	<0.01	<0.01
a-Net Acidity	moles H+/T	5	**9**	<5	<5	<5
Liming Rate	kg CaCO3/T	0.1	NA	<0.1	<0.1	<0.1
Verification s-Net Acidity	%w/w S	-20	**0.01**	**0.00**	**0.00**	**0.00**
a-Net Acidity without ANCBT	moles H+/T	5	**9**	<5	<5	<5
Liming Rate without ANCBT	kg CaCO3/T	0.1	NA	<0.1	<0.1	<0.1

Parameter	Units	LOR	Sample Number: CE129215.033 Sample Matrix: Soil Sample Date: 28 Aug 2017 Sample Name: Borehole 9 - 0.25m	CE129215.034 Soil 28 Aug 2017 Borehole 9 - 0.75m	CE129215.035 Soil 28 Aug 2017 Borehole 9 - 1.5m	CE129215.036 Soil 28 Aug 2017 Borehole 9 - 2.0m
Moisture Content Method: AN002 Tested: 30/8/2017						
% Moisture	%w/w	0.5	**13**	**20**	**15**	**17**
TAA (Titratable Actual Acidity) Method: AN219 Tested: 4/9/2017						
pH KCl	pH Units	-	**9.5**	**9.6**	**9.4**	**9.5**
Titratable Actual Acidity	kg H2SO4/T	0.25	<0.25	<0.25	<0.25	<0.25
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	<5	<5	<5	<5
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	<0.01	<0.01	<0.01	<0.01
Sulphur (SKCl)	%w/w	0.005	<0.005	<0.005	<0.005	**0.008**
Chromium Reducible Sulphur (CRS) Method: AN217 Tested: 4/9/2017						
Chromium Reducible Sulphur (Scr)	%	0.005	<0.005	<0.005	<0.005	**0.032**
Chromium Reducible Sulphur (Scr)	moles H+/T	5	<5	<5	<5	**20**
HCl Extractable S, Ca and Mg in Soil ICP OES Method: AN014 Tested: 6/9/2017						
Acid Soluble Sulfur (SHCl)	%w/w	0.005	<0.005	**0.009**	<0.005	**0.010**
Chromium Suite Net Acidity Calculations Method: AN220 Tested: 7/9/2017						
s-Net Acidity	%w/w S	0.01	<0.01	<0.01	<0.01	**0.03**
a-Net Acidity	moles H+/T	5	<5	<5	<5	**20**
Liming Rate	kg CaCO3/T	0.1	<0.1	<0.1	<0.1	**1.5**
Verification s-Net Acidity	%w/w S	-20	**0.00**	**0.00**	**0.00**	**0.03**
a-Net Acidity without ANCBT	moles H+/T	5	<5	<5	<5	**20**
Liming Rate without ANCBT	kg CaCO3/T	0.1	<0.1	<0.1	<0.1	**1.5**

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Chromium Reducible Sulphur (CRS) **Method: ME-(AU)-[ENV]AN217**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chromium Reducible Sulphur (Scr)	LB049069	%	0.005	<0.005	0 - 29%	88%
Chromium Reducible Sulphur (Scr)	LB049069	moles H+/T	5	<5		

TAA (Titratable Actual Acidity) **Method: ME-(AU)-[ENV]AN219**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH KCl	LB049068	pH Units	-	5.9	0 - 2%	101%
Titratable Actual Acidity	LB049068	kg H2SO4/T	0.25	<0.25	0%	NA
Titratable Actual Acidity (TAA) moles H+/tonne	LB049068	moles H+/T	5	<5	0%	92%
Titratable Actual Acidity (TAA) S%w/w	LB049068	%w/w S	0.01	<0.01	0%	92%
Sulphur (SKCl)	LB049068	%w/w	0.005	<0.005	0%	82%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN014	This method is for the determination of soluble sulfate (SO4-S) by extraction with hydrochloric acid. Sulphides should not react and would normally be expelled. Sulfur is determined by ICP.
AN217	Dried pulped sample is mixed with acid and chromium metal in a rapid distillation unit to produce hydrogen sulfide (H2S) which is collected and titrated with iodine (I2(aq)) to measure SCR.
AN219	Dried pulped sample is extracted for 4 hours in a 1 M KCl solution. The ratio of sample to solution is 1:40. The extract is titrated for acidity. Calcium, magnesium, and sulfur are determined by ICP-AES.
AN220	Chromium Suite: Scheme for the calculation of net acidities and liming rates using a Fineness Factor of 1.5.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
		NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.

APPENDIX D - UNDERSTAND THE LIMITATIONS OF YOUR GEOTECHNICAL REPORT

GEOTECHNICAL & MATERIALS TESTING

UNDERSTAND THE LIMITATIONS OF YOUR GEOTECHNICAL REPORT

This report has been based on project details as provided to us at the time of the commission. It therefore applies only to the site investigated and to a specific set of project requirements as understood by Engineering Testing Services.

If there are changes to the project, you need to advise us in order that the effect of the changes on the report recommendations can be adequately assessed. Engineering Testing Services cannot take responsibility for problems that may occur due to project changes if they are not consulted.

It is important to remember that the subsurface conditions described in the report represent the state of the site at the time of investigation. Natural processes and the activities of man can result in changes to site conditions. For example, ground water levels can change or fill can be placed on a site after the investigation is completed. If there is a possibility that conditions may have changed with time, Engineering Testing Services should be consulted to assess the impact on the recommendations of the report.

The site investigation only identifies the actual subsurface conditions at the location and time when the samples were taken. Geologists and engineers then extrapolate between the investigation points to provide an assumed three-dimensional picture of the site conditions. The report is based on the assumption that the site conditions as identified at the investigation locations are representative of the actual conditions throughout an area. This may not be the case and actual conditions may differ from those inferred to exist. This will not be known until construction has commenced. Your geotechnical report and the recommendations contained within it can therefore only be regarded as preliminary.

In the event that conditions encountered during construction are different to those described in the report, Engineering Testing Services should be consulted immediately. Nothing can be done to change the actual site conditions which exist but steps can be taken to reduce the impact of unexpected conditions. For this reason, the services of Engineering Testing Services should be retained through the development stage of a project.

Problems can occur when other design professionals misinterpret a report. To help avoid this, Engineering Testing Services should be retained for work with other design professionals to explain the implications of the report.

This report should be retained as a complete document and should not be copied in part, divided or altered in any way.

It is recommended that Engineering Testing Services is retained during the construction phase to confirm that conditions encountered are consistent with design assumptions. For example, this may involve assessment of bearing capacity for footings, stability of natural slopes or excavations or advice on temporary construction conditions.

This document has been produced to help all parties involve recognise their individual responsibilities.

Trinity Engineering and Consulting
design | consult | manage

7 July 2017

Douglas Shire Council
PO Box 723
Mossman QLD 4873

Attention: Neil Beck

Dear Neil,

MOSSMAN FILL SITES
REQUEST FOR INFORMATION - ROAD CONDITION ASSESSMENT
BONNIE DOON ROAD, KILLALOE

Trinity Engineering has been engaged by Oakdare Holdings Pty Ltd to assist with the preparation and lodgement of an Operational Works Application to Douglas Shire Council for approval to place dredged material on Lot 54 on SP292874 Bonnie Doon Road

In response to the initial application a Request for Information (RFI) was issued by Council. The RFI required nomination of the haul route and to undertake a condition assessment of the public road, which can be used to ensure that at completion of the work, any damage to the Council roads as a consequence of transporting the material can be determined. The following information aims to address this request.

The nominated haul route can be seen in *Figure 1*.

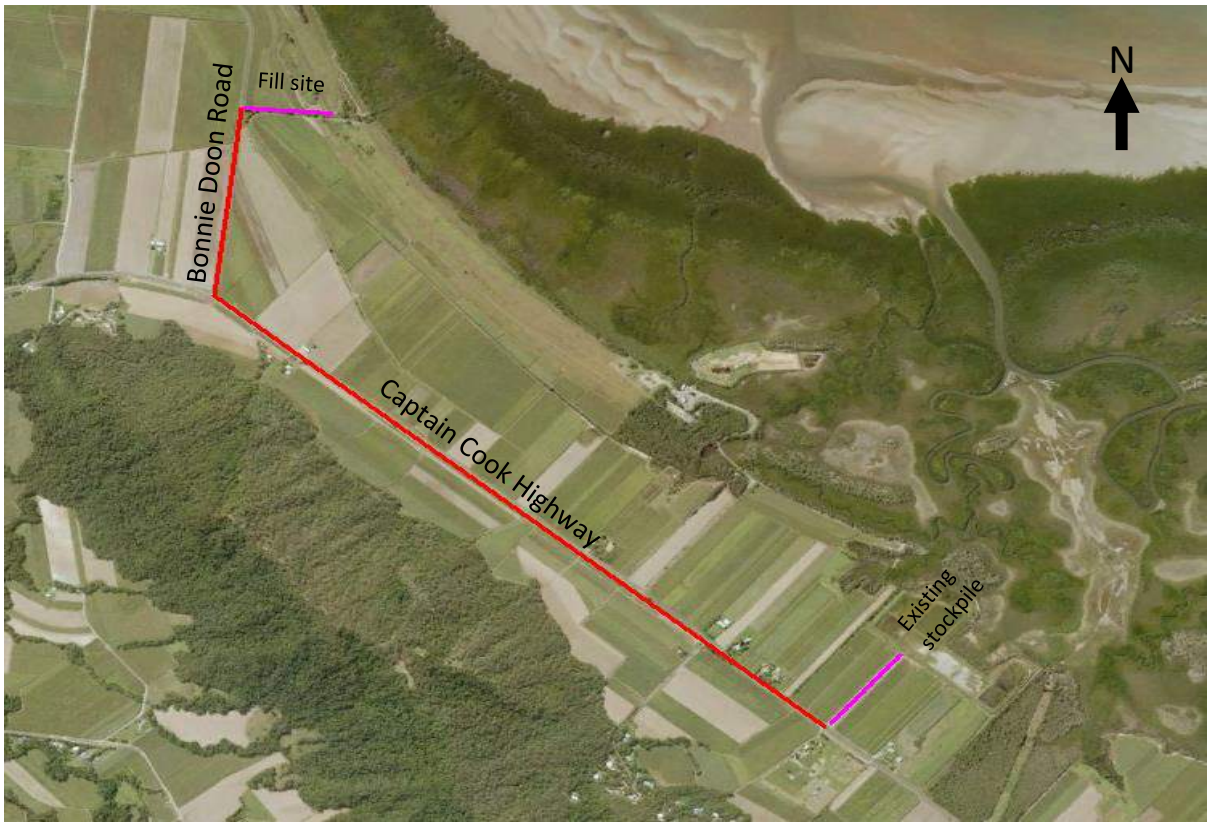


Figure 1: Nominated Haul Route

The haul route begins at the entrance to lot 3 of SP183025 along the Captain Cook Highway approximately 1300m north of the Coolalinga Drive intersection. The route continues north bound along the Captain Cook Highway until the Bonnie Doon Road intersection. The haul route follows

Bonnie Doon Road for approximately 850 m until the entrance of the fill site. The haul route then continues along the unformed road to the fill site located on Lot 54.

An inspection from the intersection of the existing stockpile location with the Captain Cook Highway to the intersection of the unformed road fronting Lot 54 was carried out on 5th July 2017, to allow the condition assessment to be conducted and documented. The route was driven in both directions with a camera mounted to the bonnet allowing 4K video to be recorded of the route. In addition, notes were taken identifying any notable issues with the existing condition of the road. Snippets from the video showing the notable defects and the comments are documented below.

Notable Defects on the Northbound Lane (Chainage starting at driveway of collection point)

- Longitudinal rutting found at: 900m, 1500m, 1700m, 1800m, 3700m
- Flushing found at: 2100m
- Pavement deformation (possible previous pipe replacement) at 2800m
- Longitudinal cracking found at 3000m

Longitudinal Rutting at 900m

Longitudinal Rutting at 1500m

Longitudinal Rutting at 1700m

Longitudinal Rutting at 1800m

Longitudinal Rutting at 3700m

Longitudinal Cracking at 3000m

Pavement Deformation (road crossing trench) at 2700m

Flushing at 2100m

Notable Defects on the Southbound Lane (Chainage starting at driveway of drop off point)

Longitudinal rutting found at: 100-200 m

Flushing found at: 900-1000 m, 1400 m, 1600 m

Pavement deformation (road crossing trench) at 900 m

Longitudinal Rutting at 100-200m

Longitudinal Rutting at 100-200m

Flushing found at: 900-1000m

Flushing found at: 900-1000m

Flushing at 1400m

Flushing at 1600m

Pavement Deformation at 900m

Note: Drop off at site entrance may cause road to break away under heavy vehicle loads.

SUMMARY

The route was observed to be in good condition at the time of inspection.

The most noticeable defects have been presented in this document. Video footage can also be obtained on request and will be kept by Trinity Engineering and Consulting until after the project completion.

Yours sincerely
TRINITY ENGINEERING AND CONSULTING

Scott Christensen
Project Manager

Trinity Engineering and Consulting
design | consult | manage

19 July 2017

Douglas Shire Council
PO Box 723
Mossman QLD 4873

Attention: Neil Beck

Dear Neil,

BONNIE DOON ROAD OPERATIONAL WORKS
STORMWATER DRAINAGE INVESTIGATIONS

Trinity Engineering and Consulting Pty Ltd has been engaged by Oakdare Pty Ltd in relation to operational works (bulk earthworks) at Lot 54 on SP292874 (the site), Bonnie Doon Road. This advice seeks to inform Council in relation to stormwater drainage pertaining to the site.

External Drainage

The site is located on the eastern side of Bonnie Doon Road and is within part of the Cassowary Range catchment. Cooya Beach is located approximately 2km to the north and the Captain Cook Highway 1km to the south. East of the Cassowary Range there are a number of open channel drainage networks, which comprise man-made farm drains and existing gullies. Stormwater flows in the northern part of the Cooya Beach are predominately directed to the Mossman River. Catchments immediately north and south of the site convey stormwater flows to Trinity Bay, as shown on the image below.

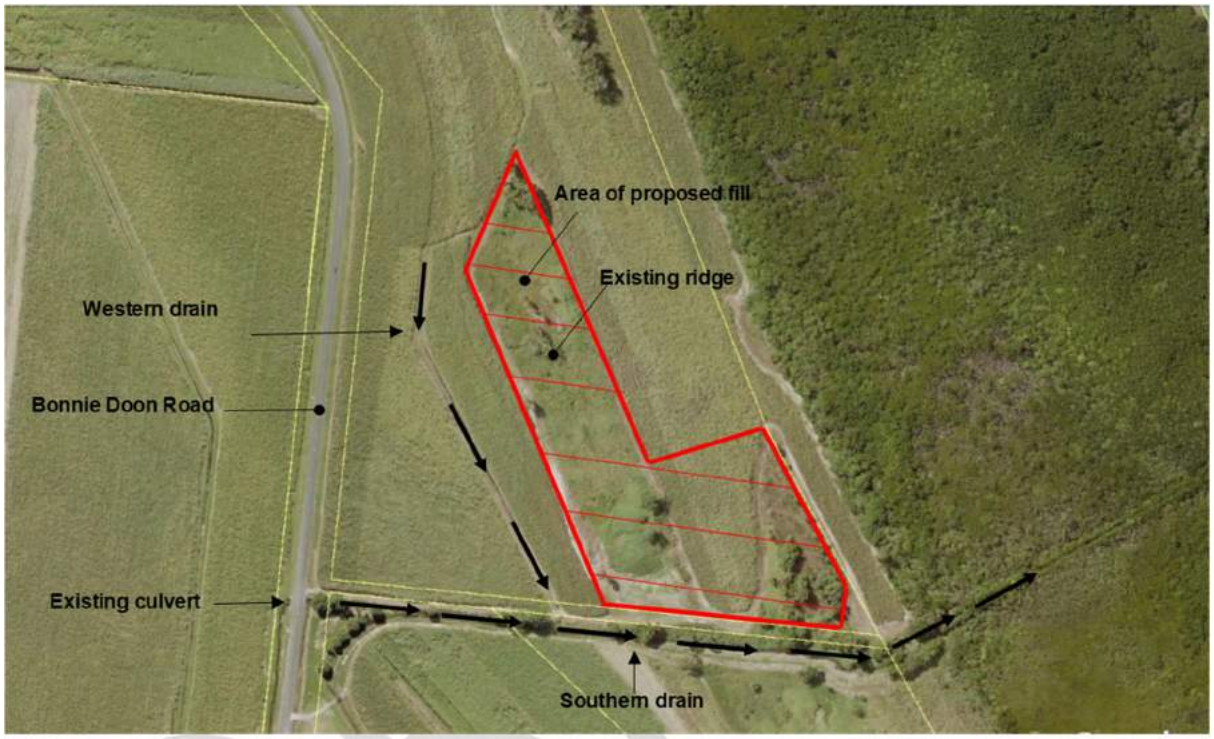
External Drainage Network.

From a stormwater context, the proposed filling would not modify these external drainage networks nor the characteristics of the greater catchment.

Internal Drainage

From site observations and existing contour information, the portion of land proposed for filling is predominately located on an existing ridge. This ridge appears to be the northern most extent of a coastal dune, which runs south to Killaloe Dump Road (see attached). The area of the proposed fill is undulating in the context of the surrounding levels, which reflects that is the tail end of the coastal dune.

The site in its current form is not impervious. Stormwater runoff from the site currently discharges west to a minor open channel drain (farm drain), south to a major open channel drain (gully), and east to the mangroves fronting Trinity Bay. The western and southern open channels discharge immediately east of the site into the mangroves fronting Trinity Bay.



The proposed works are for the placement of fill only and therefore will not increase the impervious area within the catchment. However, as a result of neatly shaping and grading the proposed fill area; there may be a minor decrease in travel time for flows over the filled surface. This decrease will be negligible in the context of the immediate catchment.

Given the existing levels of the proposed fill area, the nature of it being an existing coastal dune and the existing drainage network, it is unlikely that this area is used for stormwater detention. For stormwater flows west of Bonnie Doon Road, stormwater detention will occur until flows overtop Bonnie Doon Road south of the site in line with the existing culvert crossing. Detention east of Bonnie Doon Road will utilise the series of existing open channels before spilling over into the existing cane fields, all of which are generally lower than the area of proposed fill.

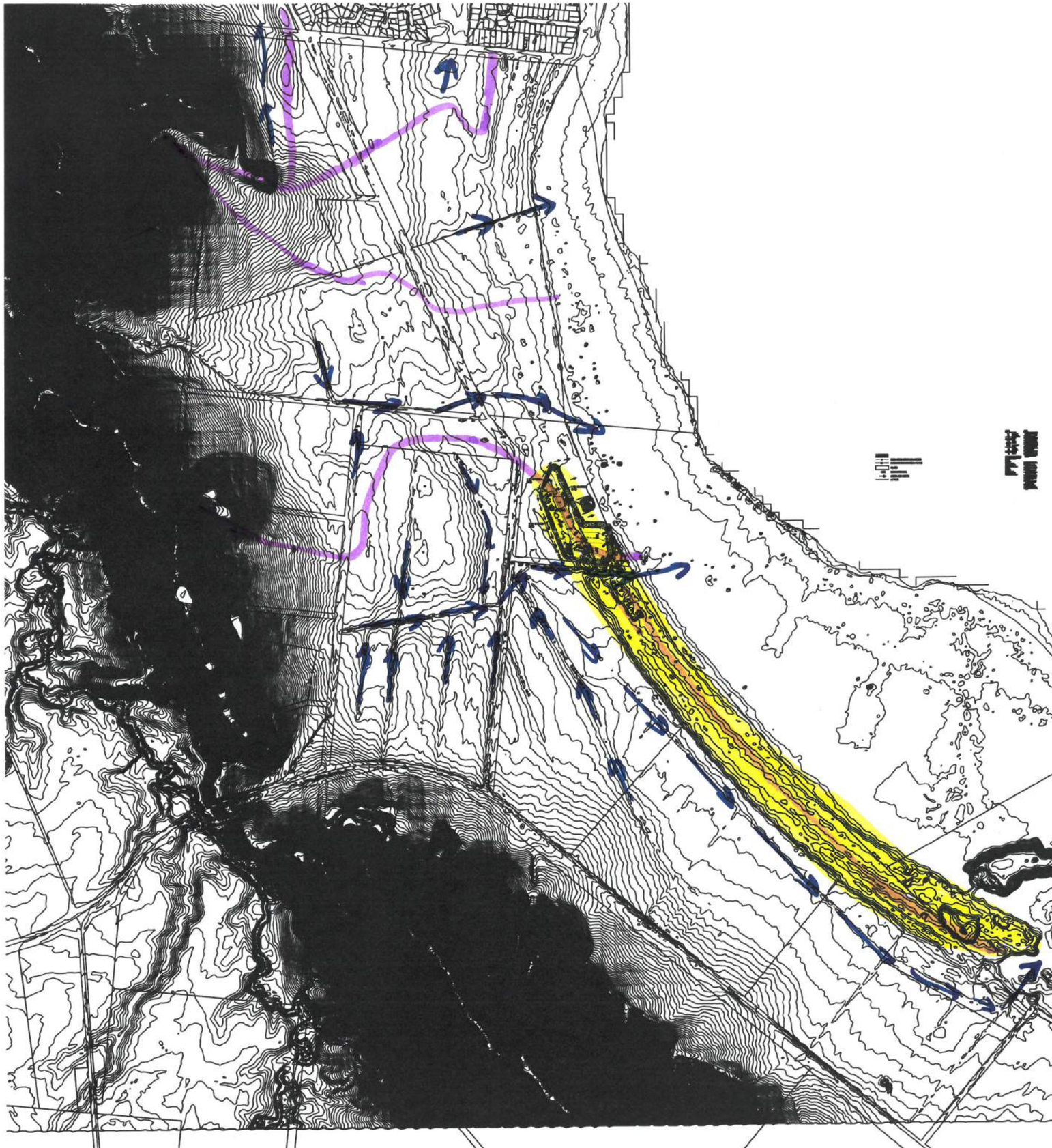
Based on the investigation completed in relation to stormwater drainage, we consider that the proposed works can be accommodated without an appreciable (adverse) impact on adjacent properties.

Yours sincerely
TRINITY ENGINEERING AND CONSULTING

Scott Christensen
Project Manager

Paul Steele
RPEQ

Encl Stormwater Catchment Plan
Sketch 1134-001



FNQROC DEVELOPMENT MANUAL

Council ...Douglas Shire Council
(INSERT COUNCIL NAME)

STATEMENT OF COMPLIANCE
OPERATIONAL WORKS DESIGN

This form duly completed and signed by an authorised agent of the Designer shall be submitted with the Operational Works Application for Council Approval.

Name of Development .....

Location of Development Lot 54 Bonnie Doon Road.....

Applicant Oakdare Pty Ltd.....

Designer Trinity Engineering and Consulting.....

It is hereby certified that the Calculations, Drawings, Specifications and related documents submitted herewith have been prepared, checked and amended in accordance with the requirements of the FNQROC Development Manual and that the completed works comply with the requirements therein, **except** as noted below.

Compliance with the requirements of the Operational Works Design Guidelines	**Non-Compliance refer to non-compliance report / drawing number**
Plan Presentation	
Geotechnical requirements	**Refer ETS Geotechnical Report**
Geometric Road Design	**Not applicable**
Pavements	**Not applicable**
Structures / Bridges	**Not applicable**
Subsurface Drainage	**Not applicable**
Stormwater Drainage	
Site Re-grading	
Erosion Control and Stormwater Management	**Contractor to provide site specific ESC plan to suit fill sequencing**
Pest Plant Management	
Cycleway / Pathways	**Not applicable**

Landscaping	**Limited to revegetation of disturbed areas**
Water Source and Disinfection/Treatment Infrastructure (if applicable)	**Not applicable**
Water Reticulation, Pump Stations and water storages	**Not applicable**
Sewer Reticulation and Pump Stations	**Not applicable**
Electrical Reticulation and Street Lighting	**Not applicable**
Public Transport	**Not applicable**
Associated Documentation/ Specification	**Refer ETS Geotechnical Report**
Priced Schedule of Quantities	**Not applicable**
Referral Agency Conditions	**Not applicable**
Supporting Information (AP1.08)	**Refer supporting documentation in OPW RFI submission**
Other	

Conscientiously believing the above statements to be true and correct, signed on behalf of:

Designer Trinity Engineering and Consulting..... **RPEQ No** .....8462.....

Name in Full Paul Charles Steele.....

Signature . ..... **Date** .15/09/2017.....

NOTES

1. PROPERTY BOUNDARIES SHOWN ARE EXTRACTED FROM QUEENSLAND GLOBE. CONTRACTOR IS TO CONFIRM LOCATION OF PROPERTY BOUNDARIES PRIOR TO COMMENCEMENT OF WORKS.
2. NO WORKS TO COMMENCE ON SITE UNTIL CONTRACTORS EROSION AND SEDIMENT CONTROL PLAN IS APPROVED BY COUNCIL.
3. ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
4. CONTRACTOR TO NOTE REQUIREMENTS AND RESPONSIBILITIES FOR SEDIMENT AND EROSION CONTROL AS PER FNQROC SPECIFICATION.
5. TOPSOIL STOCKPILES TO BE LOCATED AS ADVISED BY SUPERINTENDENT AND SEDIMENT AND EROSION CONTROL MEASURES ARE TO BE APPROVED ACCORDINGLY.
6. MOVEMENT OF CONSTRUCTION EQUIPMENT SHALL BE LIMITED TO THE AREA OF WORK AND EXISTING ROADS.
7. ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE INSPECTED AND MAINTAINED AFTER EACH STORM EVENT AND AT REGULAR INTERVALS.
8. ACCESS TO THE SITE IS VIA A SINGLE ACCESS POINT ONLY UNLESS DIRECTED OTHERWISE BY SUPERINTENDENT.
9. CONTOURS SHOWN ARE NATURAL SURFACE CONTOURS PRIOR TO ANY BULK EARTHWORKS TAKING PLACE.
10. PROVIDE MULCH TO TOP OF BATTERS.
11. CATCH DRAINS AND SEDIMENT TRAPS TO BE CONSTRUCTED PRIOR TO COMMENCEMENT OF WORKS.
12. ALL VEHICLES LEAVING THE SITE MUST EXIT VIA STABILISED EXIT.
13. DEPTHS FOR CLEARING, GRUBBING AND STRIPPING TO BE CONFIRMED DURING THE EARLY STAGES OF SITE CLEARING.

LEGEND

- 3.7 — DESIGN SURFACE CONTOUR (0.1m INTERVAL)
- 3.0 — EXISTING SURFACE CONTOUR (0.5m INTERVAL)
- FILL AREA
- × 3.50 — DESIGN SURFACE LEVEL
- EXTERNAL FLOW DIRECTION
- SILT FENCE

PRELIMINARY ONLY

0 20 40 60 80m
SCALE 1:2000 (A3 SIZE)

Trinity Engineering and Consulting

Trinity Engineering and Consulting Pty Ltd
Ph. (07) 4040 7111
www.trinityengineering.com.au

Level 1, 10 Grafton Street | PO Box 7963
Cairns QLD 4870
Email admin@trinityengineering.com.au

Client	OAKDARE HOLDINGS PTY LTD
Project	LOT 54 BONNIE DOON ROAD
Title	FILL PLAN

JOB No.	Scale (A3 size)	Date	Drawing No.	Revision
1134	1:2000	27 JULY 2017	SKETCH 1134-001	D

Printed: 16 September 2017, 10:49 AM File: T:\1134 Mossman Fill Site\Drawings\SKETCH 1134-001(D).dwg

External References: