



ACID SULPHATE SOIL MANAGEMENT PLAN

Southern Links Stage 1

Southern Residential Block and Northern Industrial Block

Hamilton, Waikato

Prepared by	Swiftsure Consultants Ltd
Date	30 August 2026
Revision	1
Status	Final for Release

This document establishes a project-specific framework for managing potential acid sulphate soils during earthworks. It is not an acid sulphate soil investigation report.



Document Control

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Basis of Plan

This plan has been prepared using the site-specific information contained in the Swiftsure contaminated land investigations and management plans for the Southern Residential and Northern Industrial components of Southern Links Stage 1. It also draws on the acid sulphate soil risk information identified by Waikato Regional Council and established acid sulphate soil technical guidance.

Source Documents

- Swiftsure Consultants Ltd, Detailed Site Investigation: Southern Links Stage 1 - Residential, 6 August 2026.
- Swiftsure Consultants Ltd, Contaminated Soils and Remediation Action Plan: Southern Links Stage 1 - Residential, 6 August 2026.
- Swiftsure Consultants Ltd, Detailed Site Investigation: Southern Links FTA Industrial (Northern Block), 6 August 2026.
- Swiftsure Consultants Ltd, Contaminated Soils Management and Remediation Plan: Southern Links FTA Industrial (Northern Block), 6 August 2026.
- Waikato Regional Council, Waikato Region Acid Sulfate Soils Preliminary Risk Assessment, Technical Report 2023/24.
- Waikato Regional Council - Waikato Regional Plan (Rule 5.2.3.6).
- Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines. 2014.
- CMW Geosciences, Southern Links 1 – Industrial Development. Geotechnical Investigation Report: Version 4. 17 July 2026.
- CMW Geosciences, Southern Links 1 – Residential Development. Geotechnical Investigation Report. Revision 3. 15 July 2026.

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1 Purpose and Application

This Acid Sulphate Soil Management Plan (ASSMP) applies to earthworks undertaken as part of the Southern Links Stage 1 Southern Residential Block and Northern Industrial Block. It is intended to sit alongside the project Construction Environmental Management Plan (CEMP), erosion and sediment control measures, contaminated soils management plans and construction methodology.

The plan addresses naturally occurring potential acid sulphate soil (PASS) and actual acid sulphate soil (AASS). It does not replace the separate requirements for managing anthropogenic soil contamination identified by the Swiftsure contaminated land investigations.

1.1 Management Objectives

- Minimise disturbance and oxidation of potentially sulfidic natural soils.
- Manage acidic runoff, leachate or dewatering water from leaving controlled work areas.
- Provide a practical method for identifying and segregating suspect ASS during earthworks.
- Ensure confirmed ASS are treated, reburied, encapsulated, reused or disposed of in a controlled manner.
- Protect drains, stormwater systems, wetlands, groundwater and downstream surface-water receptors.
- Comply with regulatory requirements.
- Establish clear hold points for environmental review before high-risk works proceed; and
- Maintain sufficient records/monitoring to demonstrate how ASS risk was managed during construction.

2 Project and Site Context

2.1 Southern Residential Block

The Southern Residential Block is located south of Saxbys Road, Deanwell, Hamilton and forms the residential component of Southern Links Stage 1. The current development concept provides for approximately 938 residential units together with roads, open spaces, waterbodies, stormwater and riparian networks, and associated infrastructure.

Published geology identifies Late Pleistocene river deposits comprising pumiceous sand, silt and gravel with interbedded peat. The area is low lying and includes one headwater system and a network of farm drains. The project geotechnical information records groundwater from near surface to greater depths depending on location (up to 16.2m below ground level (bgl)).

Waikato Regional Council resources records the site and surrounding area as having a high probability of acid sulphate soil occurrence. The principal construction risk is therefore associated with exposing or draining potentially sulfidic natural soils during earthworks.

2.2 Northern Industrial Block

The Northern Industrial Block includes land at 160 Higgins Road and 16, 16A and 24 Wickham Street, Hamilton. The proposed development comprises industrial land, roads and stormwater infrastructure within the wider Southern Links Growth Cell.

The existing geotechnical and contaminated land reports describe the site to include low-lying ground underlain by Holocene peat, Hinuera Formation sands and silts, and deeper Walton Subgroup materials. The regional groundwater table is reported to be generally within approximately 3 m of the ground surface. Existing fill, gravel yards and large areas of disturbed ground are also present.

A dedicated ASS assessment was not undertaken for the Northern Block. For this plan, the combination of peat, alluvial sediments and shallow groundwater is treated as a potential ASS risk where natural saturated soils are to be excavated, drained or exposed for extended periods.

2.3 Site Conditions Relevant to ASS

Condition	Southern Residential Block	Northern Industrial Block	Management Significance
Natural geology	Alluvial river deposits with interbedded peat	Peat over Hinuera sand/silt and Walton Subgroup	Natural saturated fine-grained and organic soils require attention when disturbed.
Groundwater / drainage	Variable groundwater; low-lying areas and farm drains	Groundwater generally within about 3 m; artificial drains present	Dewatering or drainage can increase oxygen exposure and promote oxidation.
Development activities	Earthworks to form roads, ponds/wetlands, services	Earthworks to form roads, stormwater devices, services	Earthwork excavations, drainage works and wet excavations present the greater ASS risk.
ASS status	WRC resources identify high probability of occurrence	WRC resources identify high probability of occurrence	Use precautionary controls where trigger conditions are met.

3 Acid Sulphate Soil Risk Model

PASS contains reduced sulphur compounds that can remain relatively stable while saturated and not in contact with oxygen. PASS when left undisturbed does not typically present a risk to receiving environments. However, when PASS is excavated/exposed, drained or otherwise exposed to oxygen, sulphide oxidation can generate acidity and convert the material to AASS. Acidification can also mobilise iron, aluminium and other metals.

3.1 Trigger Activities

- Excavation below the groundwater table.
- Disturbance of peat, organic silt, grey reduced silt/sand or other saturated natural soils.
- Pond, wetland, swale, culvert or deep stormwater excavation.
- Deep service trenching or foundation excavation.
- Groundwater lowering or dewatering.
- Placement of wet natural soil into aerated stockpiles or fill; or
- Changes to permanent drainage that could lower groundwater around potentially sulfidic soil.

3.2 Potential Receptors and Effects

- Farm drains, wetlands and downstream receiving waters.
- Groundwater and shallow subsurface drainage pathways.
- Aquatic ecosystems affected by low pH or metal mobilization.
- Vegetation in low-lying areas.
- Concrete, steel and buried infrastructure susceptible to corrosive conditions; and
- Future site users where untreated acidic material is left in an accessible or unstable condition.

4 Management Framework and Hold Points

ASS risk will be managed using a staged approach. The level of control is based on the nature of the material encountered and the construction activity rather than treating all soil across the development as ASS.

4.1 Pre-start Planning

- Review final cut/fill plans, drainage depths, wetland/pond excavations and dewatering areas.
- Identify locations where works extend into peat, saturated alluvium or below groundwater.
- Confirm where targeted ASS screening or laboratory testing is required before excavation.
- Identify a suitable controlled area for temporary storage or treatment if ASS is encountered.
- Include ASS response requirements in relevant work method statements and toolbox talks.

4.2 ASS Management Categories

Category	Typical Condition	Required Response	Release / Hold Point
A - Low indication	Dry topsoil, engineered fill or natural soil with no ASS indicators and no groundwater interaction	Manage under normal earthworks and contaminated soils controls. Continue observations.	No ASS hold point.
B - Suspect ASS	Saturated peat/organic silt, grey reduced soil, sulphurous odour, iron staining, low field pH or significant pHFOX response	Segregate, minimise exposure, field screen and obtain CLS direction. Laboratory testing where management depends on classification.	HP1 - CLS review before unrestricted reuse or disposal.
C - Confirmed PASS/AASS	Laboratory results or strong field evidence confirm acid-generating material	Implement treatment, controlled reburial/encapsulation or approved disposal. Manage associated water.	HP2 - verification required before release.
D - Acidic water / dewatering impact	Low pH water, iron-rich seepage or water affected by suspect/confirmed ASS	Contain, investigate source, treat if necessary and verify discharge criteria.	HP3 - no discharge until environmental approval.

4.3 Hold Points

HP1 Suspect ASS must not be mixed into general fill, removed from the controlled area or disposed of as ordinary soil until the CLS has confirmed the management pathway.

HP2 Treated or otherwise managed ASS must not be released for unrestricted reuse until the specified verification requirements have been met.

HP3 Water influenced by suspect or confirmed ASS must not be discharged from the controlled work area until the discharge is consistent with the relevant consent/CEMP requirements and has been approved by the Site Environmental Representative.

5 Field Recognition and Verification

5.1 Field Indicators

Field observations are used to identify material that requires further assessment. They are not, by themselves, a substitute for laboratory confirmation where a treatment rate, reuse decision or disposal classification depends on the result.

Indicator	PASS - typical indications	AASS / oxidised material - typical indications
Soil appearance	Wet or saturated peat; dark grey/blue-grey reduced silt or sand; black organic material	Yellow/orange or red mottling; jarosite-like staining; bleached horizons; iron oxide accumulations
Odour	Hydrogen sulphide / rotten egg odour may be present	Sulphurous odour may remain; acidic material may have little odour
Field pH	Often above pH 4 before oxidation	Field pH below about 4 is a strong indicator of AASS
Peroxide response	Marked reaction and a substantial pH reduction after oxidation can indicate latent acidity	May already be acidic before peroxide testing
Water / seepage	Waterlogged soils; dark seepage; iron bacterial films can occur	Low-pH seepage, iron staining, unusual clear or milky water, vegetation stress

5.2 Field Screening

Where suspect material is encountered, the CLS or suitably trained environmental representative may use field pH and peroxide oxidation screening (pHFOX) to inform immediate management.

5.3 Laboratory Confirmation

All laboratory analysis should be undertaken by an IANZ accredited laboratory. Laboratory analysis is required where the result will determine treatment quantities, long-term placement or a significant off-site disposal decision. Samples should be collected to minimise oxidation and sent promptly to an IANZ-accredited laboratory. The analytical suite



should be selected by the CLS and may include Chromium Reducible Sulphur, current pH, Titratable Actual Acidity, Acid Neutralising Capacity and Particle Size Analysis.

Sampling locations and depths should target the actual construction footprint and extend through the materials that will be disturbed. Where possible, investigation should be completed before high-risk bulk excavation begins.

6 Earthworks and Soil Handling Controls

6.1 Excavation and Segregation

- Minimise the area and duration of exposed saturated natural soil.
- Excavate in manageable stages so suspect material can be assessed before large volumes are generated.
- Keep suspect/confirmed ASS separate from topsoil, general clean natural soils and potentially contaminated fill.
- Where practicable, complete excavation and subsequent treatment/reburial during suitable weather; and
- If suspect material cannot be assessed or treated promptly, place it in a controlled area and cover it to reduce rainfall infiltration and oxidation.

6.2 Stockpiling

- Locate stockpiles away from open drains and overland flow paths.
- Use a low-permeability base or liner where acidic leachate could be generated.
- Provide perimeter bunding and a means of collecting runoff/leachate.
- Label each stockpile with source location, date, approximate volume and ASS status.
- Cover inactive suspect or confirmed ASS stockpiles.
- Inspect stockpiles and containment after rainfall and during active ASS works; and
- Do not combine treated/verified soil with untreated material.

6.3 Reuse, Reburial and Encapsulation

The preferred management option should minimise oxidation and long-term environmental discharge risk. Depending on the material and construction design, options may include treatment and reuse, return to a suitably saturated/anaerobic location, controlled encapsulation, or off-site disposal. Permanent reburial or encapsulation requires CLS and design-team approval and must be documented on as-built plans so the material is not inadvertently exposed by future works.

6.4 Off-site Disposal

ASS is not to be sent off site as standard cleanfill on the basis that it is naturally occurring. The receiving facility must confirm that it can accept the material and any required analytical data must be provided.

7 Treatment and Neutralisation

7.1 Treatment Design

Where neutralisation is selected, the required dose is to be calculated from the measured or estimated net acidity of the soil, the neutralising value and fineness of the lime product, the volume or mass of soil, and an appropriate factor of safety. The treatment rate is to be confirmed by the CLS rather than applying a single generic project-wide dose.

7.2 Neutralising Agent

Fine agricultural lime (calcium carbonate) is the preferred routine neutralising agent because it provides controlled buffering and is safer to handle than highly caustic lime products. Product quality and neutralising value are to be confirmed before use. Hydrated or quick lime is not to be used for routine soil treatment unless specifically designed and approved for a particular application.

7.3 Treatment Method

1. Place the soil on a dedicated treatment area with a stable, low-permeability working surface and contained runoff.
2. Spread the soil in thin lifts that can be mixed effectively by the available plant. As a guide, lifts should generally not exceed about 300 mm unless the treatment method demonstrates equivalent mixing.

3. Apply the calculated quantity of agricultural lime evenly across the material.
4. Mix thoroughly through the full soil lift using sufficient passes to avoid untreated pockets, paying particular attention to wet or cohesive soils.
5. Allow the material to equilibrate before verification. Re-treat areas that remain acidic or fail the verification criteria.
6. Retain treatment records showing soil source, volume/mass, lime product, application rate, mixing date and verification results.

7.4 Verification of Treated Soil

The verification programme will be set by the CLS to reflect the quantity and intended end use of the treated soil. As a minimum, field pH should be stable and not indicate residual acidity. A field pH of approximately 6 or greater is generally expected following successful lime treatment, but laboratory confirmation may be required for higher-risk or larger-volume material. Treated soil remains subject to HP2 until the verification requirements have been satisfied.

8 Water Management and Dewatering

Water management is a critical part of ASS control because drainage can both promote oxidation and provide a pathway for acidic leachate to reach sensitive receptors.

8.1 Dewatering Controls

- Plan dewatering so is limited to the area and duration needed for construction.
- Avoid unnecessary long-term lowering of groundwater in peat or other potentially sulfidic soils.
- Collect water from suspect ASS excavations separately where practicable.
- Monitor pH and visual indicators during active dewatering in ASS-potential areas.
- Check for iron staining, acidic seepage or changes in water appearance around the excavation; and
- Coordinate dewatering with the erosion and sediment control and discharge requirements for the project.

8.2 Acidic Water Response

If water from an excavation, stockpile or treatment area is suspected of being affected by ASS, it is to be contained and the source investigated. Water may require neutralisation and settlement before discharge. The neutralising method, monitoring frequency and discharge acceptance criteria are to be agreed with the Site Environmental Representative and CLS and must be consistent with the relevant consent conditions and CEMP.

Water with evidence of ASS is not to be pumped directly to open drains, wetlands, stormwater systems or other receiving waters.

9 Unexpected Discovery Procedure

The following procedure applies where previously unidentified material is suspected to be PASS or AASS during earthworks.

Step	Action
STOP	Stop disturbing the suspect material and keep plant movements to the minimum needed to make the area safe.
ISOLATE	Segregate the material from general soils. Cover or contain it if it will remain exposed, and prevent runoff entering or leaving the area.
NOTIFY	Advise the Site Environmental Representative and CLS. Record the location, depth and nature of the material.
ASSESS	Describe the soil and undertake field screening. Collect laboratory samples where classification or treatment design requires confirmation.
MANAGE	The CLS will confirm whether the material is to be treated, reburied/encapsulated, reused under controlled conditions or disposed of off site.
VERIFY	Complete the required verification and update the material tracking record before releasing the area or soil.
RESUME	Normal earthworks may recommence once the hold point has been released.

10 Monitoring, Records and Reporting

10.1 Routine Monitoring

Activity	What to Check	Frequency	Trigger for Action
ASS-active excavation	soil type, moisture, odour, staining, groundwater/seepage	during excavation / daily	new suspect indicators or acidic seepage
Suspect/confirmed stockpiles	cover, bunding, runoff, labels, visible oxidation	daily while active and after significant rain	containment failure, acidic runoff, exposed material
Treatment area	mixing quality, lime application, runoff containment, verification status	each treatment batch	incomplete mixing or failed verification
Dewatering / water containment	pH, visual condition, discharge route and containment	as specified in dewatering method; more frequently if conditions change	pH decline, iron staining, unusual water appearance
Permanent placement / encapsulation	location, cover and protection from future disturbance	at placement and close-out	design or cover not achieved

10.2 Records

- ASS field observations and screening results.
- Sample locations, chain-of-custody documentation and laboratory reports.
- Excavation source, approximate volume/mass and destination of suspect/confirmed ASS.
- Stockpile identifiers and status.
- Lime product certificates, quantities and treatment calculations.
- Treatment and verification records.
- Dewatering and water monitoring records.
- Photos of suspect material, treatment areas and permanent placements.
- Unexpected discovery and non-conformance records; and
- As-built location of any permanently reburied or encapsulated ASS.

10.3 Completion Reporting

At completion of ASS-related works, the project environmental file should summarise the areas where ASS was encountered, the management method used, treatment and verification results, water management undertaken, final soil destination and any permanent management constraints. This information can be incorporated into the relevant construction or environmental completion report.

11 Roles, Training and Communication

Role	ASS Responsibilities
Landowner / Project Manager	Ensure the ASSMP is incorporated into project delivery and that responsibilities are assigned.
Principal Contractor	Implement work methods, segregation, stockpile, treatment and dewatering controls; maintain daily records.
Site Environmental Representative	Coordinate environmental controls, monitoring, incident response and release of water discharges.
Contaminated Land Specialist / SQEP	Provide ASS technical direction, review screening and laboratory results, determine treatment/placement requirements and release ASS hold points.
Earthworks Supervisor	Ensure operators understand ASS trigger conditions and stop-work requirements.
Laboratory	Undertake ASS analysis using appropriate accredited methods and report results for interpretation.



11.1 Training

Personnel working in areas where ASS may be encountered are to receive a toolbox briefing before relevant earthworks. The briefing should cover the field indicators in this plan, segregation requirements, water controls, unexpected discovery procedure and who must be contacted when a hold point is triggered.

12 Plan Review and Completion

This ASSMP is a living construction management document. It is to be reviewed when final cut/fill levels, pond/wetland excavations or dewatering methodologies are confirmed; when site-specific ASS analytical results become available; where significant changes to drainage or groundwater control are proposed; or following a material ASS-related non-conformance.

Any material change to the management approach is to be reviewed by the CLS before implementation.

13 Limitations

This plan has been prepared from the information available in the supplied Swiftsure investigations and project documents. Those investigations were undertaken primarily for contaminated land purposes and did not comprise a dedicated site-wide acid sulphate soil investigation. The extent, depth and acid-generating capacity of PASS/AASS across the development therefore remain to be confirmed where high-risk earthworks are proposed.

The plan provides a precautionary management framework and does not replace project-specific resource consent conditions, CEMP requirements, engineering design or specialist advice. Where any conflict occurs, the more stringent project or regulatory requirement is to apply.

Acid sulphate soil-specific sampling and laboratory analysis were not included in the contaminated land DSI scope. The controls in this plan are therefore precautionary and are intended to manage the risk until construction-specific screening or laboratory confirmation is available where required.



References

- Ahern, C.R., McElnea, A.E. & Sullivan, L.A. (2004). Acid Sulfate Soils Laboratory Methods Guidelines. Queensland Department of Natural Resources, Mines and Energy.
- Dear, S.E. et al. (2014). Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines. Queensland Government.
- Swiftsure Consultants Ltd (2026). Detailed Site Investigation: Southern Links Stage 1 - Residential.
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- Swiftsure Consultants Ltd (2026). Detailed Site Investigation: Southern Links FTA Industrial (Northern Block).
- Swiftsure Consultants Ltd (2026). Contaminated Soils Management and Remediation Plan: Southern Links FTA Industrial (Northern Block).
- Waikato Regional Council (2023/24). Waikato Region Acid Sulfate Soils Preliminary Risk Assessment.



Appendix A - ASS Field Checklist and Decision Record

Complete one sheet for each suspect ASS area or material batch. Attach photographs and laboratory results where applicable.

Field	Record
Date / time	
Work area / chainage / grid reference	
Excavation depth	
Material description	
Moisture / groundwater condition	
Odour	
Visible staining / mottling	
Field pH	
Peroxide screening result (if used)	
Approximate volume affected	
Temporary stockpile ID / location	
Laboratory samples collected	
Initial classification	A - low indication / B - suspect / C - confirmed / D - water impact
Management decision	
Treatment / reburial / disposal details	
Verification completed	
Hold point released by / date	

Decision Prompt

- Is the material saturated peat, organic silt, grey reduced soil or otherwise consistent with potentially sulfidic natural soil?
- Is there sulphurous odour, iron staining, unusual seepage or low field pH?
- Will the material be left exposed, placed in aerated fill, dewatered or removed off site?
- Does the management decision require a quantified treatment rate or long-term classification?
- Has the relevant hold point been released before the material or water leaves the controlled area?