Before the Independent Hearing Commissioner
In Wellington

Under	the Resource Management Act 1991 (the Act)
In the matter of	A Notice of Requirement by Wellington City Council to alter Designation 58 (Moa Point Drainage and Sewage Treatment) to provide for the construction, operation and maintenance of the proposed Sludge Minimisation Facility at Moa Point, Wellington

Statement of evidence of Christopher Andrew Frank French for Wellington City Council

Project need and overview

Dated 18 November 2022

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Statement of Evidence of Christopher Andrew Frank French

1 Introduction

1.1 My full name is Christopher Andrew Frank French.

1.2 I am contracted to Wellington City Council ('**WCC**') as Technical Director for the Sludge Minimisation Facility Project. I have been in this role since September 2021 and am responsible for providing WCC's oversight of the delivery of technical solutions proposed for the project.

1.3 I am Managing Director at Relier Project and Strategy Limited which I also founded.

1.4 This evidence focuses on the project need and overview arising from the Notice of Requirement ('**NOR**') lodged by Wellington City Council on 3 August 2022. The NOR is to alter Designation 58 (Moa Point Drainage and Sewage Treatment) in the Wellington City District Plan ('**WCDP**') to provide for the construction, operation and maintenance of the proposed Sludge Minimisation Facility ('**SMF'** or **'Project'**) at Moa Point, Wellington.

1.5 I am authorised to provide evidence on behalf of WCC.

1.6 I have been involved with the project since its inception in 2019, when I was the project manager for the options identification, options evaluation and concept design phases of the project. During this phase, I was an employee of Beca Limited, who were contracted to Wellington Water Limited as the primary delivery agent for the project. In September 2021, primary responsibility for delivery of the project transferred from Wellington Water Limited to WCC. Since this time, I have been the project Technical Director and am responsible for providing WCC's oversight of the delivery of technical solutions proposed for the project.

1.7 I contributed to the preparation of the SMF Business Case which is Appendix E to the Assessment of Environmental Effects ('**AEE**').

2 Qualifications and experience

2.1 My qualifications include Bachelor of Science (Physics and Energy Management, University of Otago), Post Graduate Diploma in Science (Energy Management, University of Otago) and Masters of Engineering (Chemical and Process

Engineering, University of Canterbury). I hold a membership to Water New Zealand and the Institute of Directors.

2.2 I have worked as a mechanical engineer, design manager, project manager and project director on municipal and industrial wastewater treatment, biosolids management and water resources projects over the last 21 in New Zealand, Fiji, North America and the United Kingdom. In the last ten years, I have predominantly specialised in the design and delivery management of sludge treatment and handling processes for industrial and municipal wastewater treatment facilities in New Zealand, and the reuse of biosolids resources.

3 Code of Conduct

3.1 While the NOR is not before the Environment Court, I have read and am familiar with the Code of Conduct for Expert Witnesses in the current Environment Court Practice Note (2014).

3.2 As a Wellington City Council contractor, I acknowledge I am not independent; however, I have sought to comply with the Code of Conduct (and will do so in giving evidence at the hearing). In particular, unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

4 Scope of evidence

4.1 My evidence addresses the following:

a Need for the Project;

b Description of the Project;

c Funding arrangements for the Project;

d Alternatives assessment process;

e Consultation with mana whenua;

f Consultation with adjacent businesses;

g Response to submissions; and

h Response to S42A Officer's Report.

4.2 I am familiar with the NOR AEE and associated documents.

5 Summary

5.1 Given the practicalities of the current approach to sludge disposal, and the community's expectations and councils' policy settings, WCC has determined that the current approach is not sustainable in the long-term. In order to address the current challenges, Wellington City requires a fundamental change in the management of sludge.

5.2 The change needs to enable the management of the sludge to be 'de-coupled' from the existing disposal to the Southern Landfill, and enable WCC to pursue other options for disposing of or otherwise using the sludge, and substantially improve the resilience of its sludge management.

5.3 The SMF site is proposed to be divided into several zones. The key zones include:

a Buildings which accommodate the sludge processing equipment (excluding the anaerobic digesters), energy generation / harvesting equipment, and electrical equipment and support systems. The AEE General Arrangement Plans (Appendix C to the AEE) show 2 main processing buildings.

b The anaerobic digesters, which are large enclosed tanks with auxiliary plant and equipment adjacent.

c The odour treatment system, which includes duct work, vessels for odour treatment and a stack.

5.4 The SMF treatment steps include:

a Raw sludge from Karori WWTP will be thickened to a slurry and then delivered to Moa Point WWTP by vehicle and combined with the raw Moa Point sludge.

b The sludge waste from the existing Moa Point WWTP and Karori WWTP will be subject to finer screening (strain press) at the WWTP, before being transferred by pipe to the adjacent SMF.

c The screened sludge waste will then be subject to dewatering (by centrifuge).

d The dewatered sludge will be fed into the thermal hydrolysis process. In this process, the sludge is held at elevated temperature (typically 140 – 165°C)

for a period of 20 – 30 minutes to “pressure cook” the sludge with steam within enclosed vessels.

e The hydrolysed sludge is cooled and enters the anaerobic digesters. Here, the sludge is held from between 8 – 20 days to biologically break down the sludge under anaerobic conditions.

f After digestion, the sludge is further dewatered. This produces a stabilised sludge “cake”.

g The final stage of the sludge treatment process is a thermal drying whereby water contained within the hydrolysed, digested cake is baked off to produce a dried biosolids product typically with less than 10% moisture (compared to approximately 75% in the existing situation).

h The dried biosolids is then transported away from the SMF by vehicle (at least initially this will be to the Southern Landfill, but other end uses will be considered longer term).

5.5 A four stage process was undertaken to select a preferred sludge treatment process and location:

a Identifying a long list: initial lists of process and site options were developed individually;

b Identifying a short list of process options: the initial list of process options was subjected to a fatal flaw analysis. The output of this stage of work was a short list of process options;

c Short list analysis: The process and site options were combined at this stage and a multi-criteria analysis of the short-listed options was undertaken involving a range of criteria which were set by iwi and key project stakeholders to identify a preferred option; and

d Economic assessment of options: The economic benefits of the best options from the MCA were assessed.

5.6 Based on the alternatives process described above, a Lysis-Digestion + Thermal Drying plant located at Moa Point was identified as the preferred option to take forward for the future of sludge management in Wellington.[1]

[1] AEE, Appendix E page 58.

5.7 Iwi were involved throughout the MCA process. To continue to address mana whenua concerns it is intended that iwi representatives remain involved in the project and the wider matter of sludge management in the following ways:

a To confirm that the construction of the plant remains in line with consent requirements, especially in regards to accidental discovery protocols, and to improve understanding about the historical significance of the Moa point area to Māori.

b To facilitate the project's broader outcomes, in particular to engage Māori businesses and to seek opportunities for employment in the construction and operation of the SMF.

c To co-develop and implement a biosolids re-use strategy to divert the treated biosolids from landfill after the SMF has been commissioned.

5.8 The design of a large, integrated sludge treatment facility of this type is complex and requires inputs from multiple international technology suppliers and technical specialists. Specific technology suppliers cannot be selected until project funding is secured, via the infrastructure Financing and Funding Act 2020, a condition of which is obtaining the relevant RMA approvals. Therefore, the design shown in the AEE is based on specimen, real world technology[2] and demonstrates a "maximum envelope" approach. There is opportunity to optimise this design and address matters raised by submitters in their submissions on this NoR, including reducing the bulk size of the buildings, reviewing their placement on the site to improve the visual aspects of the plant, and creating greater separation from the adjacent Cyclotek Industries pharmaceutical production facility. WCC will undertake further consultation to discuss these opportunities as the design progresses.

5.9 Both WIAL and Cyclotek have been involved in the design of the SMF and will continue to be involved throughout construction and operation, given their proximity and the sensitive nature of their activities.

[2] Examples of plant and equipment available at the size required for Wellington SMF that have been dropped into the design as placeholders until final plant and equipment selections have been made.

6 Project need

Existing situation

6.1 Most of Wellington's wastewater is treated at the Moa Point Wastewater Treatment Plant ('**WWTP**') and Western (Karori) WWTP.

6.2 Sludge, a residual by-product of the wastewater treatment process, is currently pumped from Moa Point WWTP via pipelines to Carey's Gully at Ōwhiro Bay, where it is dewatered and is then disposed of at the adjacent Southern Landfill. Sludge is dewatered at the Western WWTP and it is then transported by truck to Southern Landfill for direct disposal.

6.3 The existing dewatering process at Carey's Gully and Western WWTP is designed to remove water from the sludge. The product from this process is a wet soil-like material, that is approximately 75% water,[3] that can be mixed with solid waste at the Southern Landfill (as long as a suitable ratio of sludge to other solid waste is retained).

6.4 The current Greater Wellington Regional Council resource consent for the Southern Landfill (No. WGN070230 [26013]) requires every tonne of sludge to be mixed with four tonnes of solid waste. This ratio is a necessary landfill operational requirement to manage landfill structural stability and odour (due to the relatively untreated nature of the sludge).

Key drivers

6.5 There are three key drivers for the Project, being that:[4]

a Owing to the amount and untreated nature of the sludge, there is currently only one method for sludge management and disposal in Wellington City;

b Existing sludge management infrastructure has a low level of resilience; and

c WCC cannot pursue its waste reduction commitments at the Southern Landfill until the volume of sludge is reduced.

6.6 I expand on each of these drivers below.

[3] AEE, Appendix E, page 36.
[4] AEE, section 2.3.

A singular sludge disposal pathway

6.7 The Sludge is relatively un-treated (by national and global standards) so contains high levels of biodegradable solids (particles) which break down in the landfill.

6.8 The disposal of sludge in New Zealand is currently guided by the NZWWA/MfE Guidelines for the Safe Application of Biosolids to Land in New Zealand, 2003.

6.9 These guidelines grade biosolids against two factors, being the level of stabilisation (biological degradation potential) achieved (Grade 'A' or 'B') and the level of chemical contaminants (Grade 'a' or 'b').

6.10 The stabilisation and contaminant grades are combined to give four possible grades of biosolids: Aa, Ab, Ba and Bb. The Natural Resources Plan for the Wellington Region provides that Grade Aa products can be discharged to land as a permitted activity with no requirement for a resource consent.[5] All other biosolids grades require a resource consent to be discharged to land.[6]

6.11 The SMF will produce a product that achieves Grade 'A', in terms of stability.

6.12 Achieving Grade 'a', in terms of chemical contaminants, will be dictated by the contaminants that are discharged into the wastewater system (as opposed to something that can be treated within the SMF itself), and is therefore outside of the scope of this project.

6.13 In terms of stability, the sludge currently being produced from the Carey's Gully Sludge Dewatering Plant cannot be graded because it is 'un-stabilised' and untreated.[7] Generally, this type of sludge is limited to being disposed of at landfills. Its un-stabilised nature means that it is difficult to transport long distances, such that it would not be feasible to transport the sludge to other landfills within the region as a long-term measure, because of the likely environmental, social and cultural effects (particularly odour and the nature of sewage sludge[8]) and risk from spillage during transportation.

6.14 Accordingly, without the Project the only viable option[9] for disposal of sludge in its current form from Moa Point and Western WWTPs is at Southern Landfill.

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[5] Rule R70.
[6] Rule R71.
[7] Biosolids are stabilized by treating them in a way that reduces or eliminates the potential for putrefaction and which, as a result, reduces pathogens, vector attraction and the potential for offensive odours, Guidelines for the Safe Application of Biosolids to Land in New Zealand, August 2003, Ministry for the Environment and New Zealand Water and Wastes Association, section 4.3.1.
[8] Due to the way that residual moisture is bound in the untreated dewatered sludge, when transported, water will leach from the sludge and pool within the truck carrying it. This creates the potential for liquid spillages during transportation and can mean that the landfill will not accept it.
[9] I respond to the suggestion from one submitter, that sludge should be disposed by long outfall to Cook Strait, in section **12** below.

Operational and seismic resilience

6.15 The pipelines that transfer sludge between Moa Point WWTP and the Carey's Gully Sludge Dewatering Plant commenced operation in 1998, and there have been two significant failures in the last ten years (in 2013 and 2020).

6.16 The most recent failure (due to burst pipes) affected both pipes and meant that, for a period of several months, over one million litres of sludge a day was transported using trucks on a 24-hour rotation to collect the 'soil-like' sludge from Moa Point WWTP and take it to the sludge dewatering facility at Carey's Gully. These pipelines also traverse multiple known seismic fault lines and includes almost 2km of pipework within a sewer tunnel beneath Mount Albert.

6.17 The existing Carey's Gully dewatering facility was constructed in the late 1990s and the mechanical equipment used at this facility is expected to reach its nominal end of life within the next five years. While routine maintenance and careful use may extend this life expectancy somewhat, it would be sensible not to rely heavily on this facility to service Wellington City in the medium to long term.

6.18 The Carey's Gully dewatering facility is located in an old gully on the top of a former, uncontrolled landfill site, which presents a significant geotechnical risk in the event of a major seismic event. If a significant and prolonged failure were to occur at the Sludge Dewatering Facility, this would cause a ripple effect through the wider sludge management system until alternative arrangements could be made for treatment and/or disposal.

6.19 Based on those factors, the way in which sewage sludge is currently managed presents several risks in terms of both operational and seismic resilience.

Waste minimisation and carbon reduction

6.20 The requirement to dispose of sludge into the Southern Landfill at a ratio of 1:4 parts of sludge to solid waste constrains WCC's ability to reduce the amount of solid waste going to the landfill over time. Ongoing waste minimisation efforts are reducing general/municipal waste volumes to landfill, so the amount of sludge that requires disposal is likely to be greater than is permitted by this ratio within the near future. Ongoing sludge disposal at the current volumes experienced will also prevent WCC from undertaking any further (general) waste minimisation initiatives (as that would make compliance with the mixing ratio more difficult).

6.21 The requirement to adhere to a fixed ratio will be further exacerbated by population growth which will result in greater overall volumes of sludge but not

necessarily greater solid waste as WCC seeks to undertake sold waste minimisation. Greater population will therefore further inhibit solid waste minimisation commitments as WCC must continue to satisfy the mixing ratio.

6.22 These factors limit WCC's waste minimisation aspirations, which are detailed in the following documents:

a Wellington Region Waste Management and Minimisation Plan (WMMP) 2017 – 2023 (2017) - this commits to reducing solid waste sent to landfills;

b Te Atakura – First to Zero, Wellington's Blueprint for a Zero Carbon Capital (June 2019) – this commits to exploring solutions and funding options for a sewage sludge processing solution at the Southern Landfill given 80% of Wellington City's carbon emissions can be attributed to the Southern Landfill;

c Te Atakura – First to Zero Implementation Plan (August 2020) – this strategy commits WCC to reducing landfill waste by 33% by 2026; and

d WCC's Long Term Plan 2021-2031 (June 2021) – one of the key projects within the Long Term Plan is to deliver a new sludge plant.

Other reasons for the Project

6.23 In addition to the three key drivers outlined above:

a The disposal of untreated sludge to landfill is also now inconsistent with good practice for the management of sludge from WWTPs of this scale.

b The disposal of sludge is dependent on the Southern Landfill obtaining consent for ongoing operation when its consents expire in 2026; and

c There are only three landfills in the Wellington region at which sludge can be disposed (being Southern, Spicer (Porirua), and Silverstream (Hutt/ Upper Hutt). Not sending sludge to the Southern Landfill would result in another landfill's operational life being reduced.[10]

Project objectives

6.24 WCC's specific RMA objectives for the SMF are to:

[10] Alternatively, we could send untreated to a commercial landfill far away, at significant cost and environmental, social and cultural impact. The nearest commercial landfill is Bonny Glen Landfill in Marton.

1. Significantly reduce the operational impact of sludge management at Southern Landfill.

2. Provide a sustainable and resilient long-term solution for sludge management from Wellington's WWTPs, that:

    a. Has appropriate capacity to provide for projected population growth, and aligns to associated infrastructure planning; and

    b. Can be integrated into the wastewater network in a cost-effective manner.

3. Reduce the environmental impact of sludge disposal, particularly in terms of:

    a. Carbon emissions; and

    b. Odour at the disposal site.

Determining the capacity of the sludge management solution

6.25 The desired capacity of the sludge management solution is a key driver of its design and also its effects on the environment.

6.26 The design horizon of the plant and equipment to be used in the sludge management solution was determined to be 50 years. A 50-year design life was chosen as it equates to the expected horizon at which Moa Point WWTP reaches its ultimate capacity based on current population projections. This also equates to approximately two lifecycles of main process and mechanical plant as well as providing the flexibility to reassess capacity of the solution at the end of the first plant lifecycle. It will also allow for incorporation of technological changes that are likely to enable the capacity of the solution be increased within the same footprint which would allow an even greater population to be served by the solution.[11]

6.27 In order to determine a sizing for plant and equipment (which determines capacity) within the new sludge management solution, assessments of the sludge production capacity of the Moa Point and Karori WWTPs were undertaken.

6.28 Moa Point WWTP currently serves a population of approximately 175,000 (as at 2020) and a major trade waste customer, Taylor Preston meat processors. Moa Point WWTP has been designed, following a capacity upgrade to be undertaken

[11] The basis of design, which includes the 50 year design horizon was agreed by Wellington Water and recorded in the Wellington Sludge Minimisation Facility Concept Design Report, May 2021, see Section 2.2 https://wellington.govt.nz/-/media/your-council/projects/files/moa-point-sludge-treatment/sludge-minimisation-facility-concept-design-report.pdf.

at some stage in the future, to ultimately serve a population of approximately 240,000.[12]

6.29 This would indicate that Moa Point WWTP can (if/when upgraded) accommodate an additional 65,000 people beyond those it serves now. Based on available population projections from WCC, this capacity would be reached in the Moa Point WWTP catchment in the next 30 to 50 years. Accordingly, this informed the capacity of the SMF which will effectively be co-sited with the WWTP.[13]

6.30 Karori WWTP will contribute a relatively minor amount (approximately 5%) of total sludge to the new sludge management solution. Karori WWTP does not generally have the same ultimate capacity constraints as Moa Point WWTP (relative to projected population growth in the catchment it serves, which will itself be constrained by capacity to accommodate more people). In 2021, the project team projected the increase in sludge contribution from Karori to SMF using WCC population projections for the 50-year design horizon.

6.31 A 75th percentile population projection was used[14], which indicates that the Karori catchment population will increase by 10,000 to 15,000 people over the next 30 to 50 years.

6.32 Accordingly, to account for population growth in both catchments, the SMF is designed to accommodate an additional population of (65,000 + 15,000) 80,000 people over the next 30 to 50 years.

6.33 A 50-year design life would equate to approximately two lifecycles of main process/mechanical plant[15] and provides the flexibility to reassess capacity at the end of the first plant lifecycle. It will also allow for incorporation of technological changes that are likely to enable the capacity of the SMF to be increased within the same footprint. This would potentially allow an even greater population to be served by the SMF.

7 Project description

7.1 The SMF is designed to achieve the project objectives by providing treatment to the sludge via three key mechanisms, as follows:

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[12] Wellington Sludge Minimisation Facility Concept Design Report, May 2021, see Table 2-1, https://wellington.govt.nz/-/media/your-council/projects/files/moa-point-sludge-treatment/sludge-minimisation-facility-concept-design-report.pdf.

[13] See the Process Basis of Design Report, Appendix A to the Concept Design Report, available at: https://wellington.govt.nz/-/media/your-council/projects/files/moa-point-sludge-treatment/sludge-minimisation-facility-concept-design-report.pdf

[14] Wellington Sludge Minimisation Facility Project – Preliminary Design Report, Beca Limited August 2022, Section 5.2.1.

[15] Processing equipment wears down over time and needs to be replaced or upgraded to maintain an appropriate level of process performance. This generally requires that the equipment within buildings, tank structures and the like is replaced. It does not usually require changes to structures.

a By reducing the vector[16] attraction potential of the sludge. In accordance with national guidelines[17], this will be achieved by stabilising the sludge using anaerobic digestion. The anaerobic digestion process is significantly enhanced by the thermal hydrolysis process. The stabilisation process reduces the potential for odour, the volume of sludge and its volatile content, which reduces the impact on operations at the landfill.

b By reducing the pathogen content in the sludge. In accordance with national guidelines[18], this will be achieved by subjecting the sludge to high temperatures for specified durations in the thermal hydrolysis and thermal drying processes. This creates the potential to reuse the treated biosolids so that it does not require disposal to landfill. This further reduces the impact on Southern Landfill.

c Removal of water. This is achieved by enhanced dewatering following the anaerobic digestion process, and then thermally drying the sludge. This create more resilience for WCC in its approach to sludge management as it opens more opportunities to dispose in different ways. The dewatered sludge can be transported longer distances, requires less stabilisation (i.e. does not require the same ratio to solid waste) at landfill, and/or can more readily be beneficially re-used

Steps in the treatment process

7.2 To achieve these forms of treatment, the SMF incorporates a sequence of treatment steps, as shown in **Figure 1** below. Refer to **Appendix A** for photos of other typical installations of the key treatment steps that are described below. These treatment steps include:

a Raw sludge from Karori WWTP will be thickened to a slurry and then delivered to Moa Point WWTP by vehicle (approximately five trucks per day) and combined with the raw Moa Point sludge.

b The sludge waste from the existing Moa Point WWTP and Karori WWTP will be subject to finer screening (strain press) at the WWTP, before being transferred by pipe to the adjacent SMF. The material collected from the strain press will be discharged into the existing screenings skips already located at Moa Point WWTP, which are disposed of at Southern Landfill.

[16] Vectors are rodents, flies, mosquitoes and other organisms capable of transporting infectious agents.
[17] *Guidelines for the Safe Application of Biosolids to Land in New Zealand*, Ministry for the Environment, August 2003
[18] *Guidelines for the Safe Application of Biosolids to Land in New Zealand*, Ministry for the Environment, August 2003

This will typically add less than one skip of waste material per week, of a similar nature to the existing screenings.

c The screened sludge waste will then be subject to dewatering (by centrifuge).

d The dewatered sludge will be fed into the thermal hydrolysis process. In this process, the sludge is held at elevated temperature (typically 140 – 165°C) for a period of 20 – 30 minutes to “pressure cook” the sludge with steam within enclosed vessels. Upon release from the pressure vessels, the sludge is “flashed off”, which rapidly depressurises the sludge, causing the destruction of cellular material within it. This destruction process greatly aids the subsequent digestion process.

e The hydrolysed sludge is cooled and enters the anaerobic digesters. Here, the sludge is held from between 8 – 20 days to biologically breakdown the sludge under anaerobic conditions. As this occurs, methane rich biogas is produced which is captured. The biogas is treated and used in boilers and gas engines (CHP units) to generate steam, medium temperature heat and electricity, to fuel the sludge treatment process.

f After digestion, the sludge is further dewatered. This produces a stabilised sludge “cake”.

g The final stage of the sludge treatment process is thermal dryer, whereby water contained within the hydrolysed, digested cake is baked off to produce a dried biosolids product typically with less than 10% moisture (compared to approximately 75% in the existing situation).

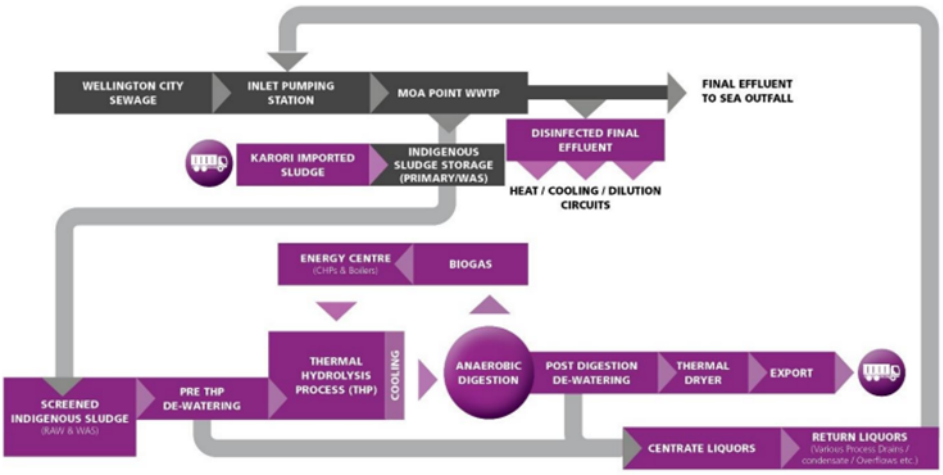

Figure 1: SMF sludge treatment process[19]

Use of the treatment processes in New Zealand and globally

7.3 All of the processes except thermal hydrolysis are established operations in New Zealand. Sludge dewatering using centrifuges is common, as is anaerobic digestion at New Zealand's larger wastewater treatment facilities, such as Invercargill, Christchurch, Hamilton, Tauranga, Mangere and North Shore). Thermal drying facilities are in operation at Christchurch WWTP, Seaview (Hutt Valley) WWTP, Paraparaumu WWTP, Whanganui WWTP and New Plymouth WWTP.

7.4 A thermal hydrolysis operation for municipal sludge treatment has not yet been established in New Zealand. However, there are over 120 systems either under construction or in operation globally[20]. I have visited four of these facilities in the United States of America as part of research to confirm the technical feasibility and sustainability of this operation in New Zealand.

7.5 Depending on the operating scenario of the SMF, there are three potential products that can be produced from the SMF. These are:

a Heat dried, stabilised (Class A[21]) biosolids, with a moisture content in the range of 5 – 12%. This is the product "normally" produced from the SMF when the entire plant is operating.

b Dewatered, stabilised (Class A[22]) biosolids, with a moisture content in the range of 67 – 75%. This will occur in instances (typically up to two weeks per year) when the thermal dryer is under maintenance.

c Dewatered, untreated sludge, which has not been through the thermal hydrolysis, anaerobic digestion or thermal drying processes. This is similar to the dewatered sludge product disposed of at Southern Landfill at present, will only occur under extreme / emergency conditions when the key SMF treatment processes are out of service for prolonged periods.

7.6 The SMF also includes a range of auxiliary systems, including:

[19] WAS – Waste Activated Sludge. CHP – Combined Heat and Power.
[20] Sludge Thermal Hydrolysis: Application and Potential, William Barber, 2020, IWA Publishing.
[21] In accordance with Table 4.1, *Guidelines for the Safe Application of Biosolids to Land in New Zealand*, Ministry for the Environment, August 2003.
[22] In accordance with Table 4.1, *Guidelines for the Safe Application of Biosolids to Land in New Zealand*, Ministry for the Environment, August 2003.

a A return liquors system, which collects wastewater from the sludge treatment processes and any contaminated stormwater. This water is returned to Moa Point WWTP for treatment.

b Water supply (including fire water) systems.

c Disinfected final effluent systems, which treat a portion of the treated wastewater from the Moa Point WWTP for use in the SMF process, so that reliance and demand on potable water is reduced (otherwise the potable water system would be being used).

d A two stage odour treatment system to collected odorous air from the treatment process and treat it before discharge via a stack on site.

Proposed site layout

7.7 The SMF site has three key components / areas to it, as follows:

a Buildings which accommodate the sludge processing equipment (excluding the anaerobic digesters), energy generation / harvesting equipment, and electrical equipment and support systems. The AEE General Arrangement Plans (Appendix C to the AEE) show 2 main processing buildings.

b The anaerobic digesters, which are large enclosed tanks with auxiliary plant and equipment adjacent.

c The odour treatment system, which includes duct work, vessels for odour treatment and a stack.

7.8 Modifications are proposed to the process equipment at Moa Point WWTP and Karori WWTP to enable the raw sludges to be transferred to the new SMF for treatment. These are predominantly internal to the plant.

Ongoing refinements to design

7.9 Since lodgement of the AEE, a designer and contractor have been selected to participate in an Early Contractor Involvement (ECI) process. The purpose of this process is to confirm the SMF cost and optimise the design (known as “value engineering”) so that the scheme meets funding requirements while maintaining the requirements set out in the AEE.

7.10 The design of a large, integrated sludge treatment facility of this type is complex and requires inputs from multiple international technology suppliers and technical

specialists. Specific technology suppliers cannot be selected until project funding is secured, via the infrastructure Financing and Funding Act, a condition of which is obtaining the relevant resource consent(s). I comment further on this funding mechanism in Section 8. Therefore, the design shown in the AEE is based on specimen, real world technology[23] and demonstrates a "maximum envelope" approach.

7.11 This means that the design of a facility of this type will naturally evolve or be refined as specific technology requirements are incorporated into the design through the ECI process. This process also provides opportunity to also address matters raised in submissions.

7.12 These opportunities include:

a Consolidation and reduction of the overall size of the building(s). This in turn, provides the opportunity to position the building(s) on the site to further improve the visual appeal of the SMF, particularly, when viewed from the north. It also provides the opportunity to create greater separation between core processes and the Cyclotek facility.

b Creating more space for vehicle deliveries to / from the Cyclotek facility and less intensive operations immediately adjacent to Cyclotek, so that interfaces with the Cyclotek operation are minimised.

c Improvement in the management of biogas which impacts the extent of hazardous areas.

7.13 The construction of the SMF will be undertaken in stages, as described in the evidence of **Mr Richard Galloway.** In terms of the commissioning stage, this will involve a series of sequential tests and plant runs, generally in the following stages:

i Pre-commissioning, which involves checks of control programmes for the plant, and "dry running" of plant and equipment to check it is installed and responds appropriately.

ii Introduction of water to the process plant to test how the plant responds to water before sludges are introduced. Owing to the nature of the plant, sludge will then need to be imported from other sites which have anaerobic digesters so that the digesters at the SMF can be "seeded"

[23] Examples of plant and equipment available at the size required for Wellington SMF that have been dropped into the design as placeholders until final plant and equipment selections have been made.

with the appropriate product, before Moa Point and Karori WWTP sludges are introduced. A series of commissioning stages will then be undertaken to bring the plant up to full operation. During these stages, temporary systems may be required to supplement the permanently installed equipment so that the plant can be tested under appropriate conditions to confirm that it operates as intended.

iii Trial operation, where the performance of the plant is proved.

Purchasing land

7.14 WCC plans to purchase an area which will be permanently added to Designation 58 as part of the NOR, from WIAL, shown in red cross-hatching in **Figure 2** below. WIAL and WCC are currently in the process of preparing a sale and purchase agreement. A document of key terms on which the purchase agreement is based have been developed and signed by both parties.

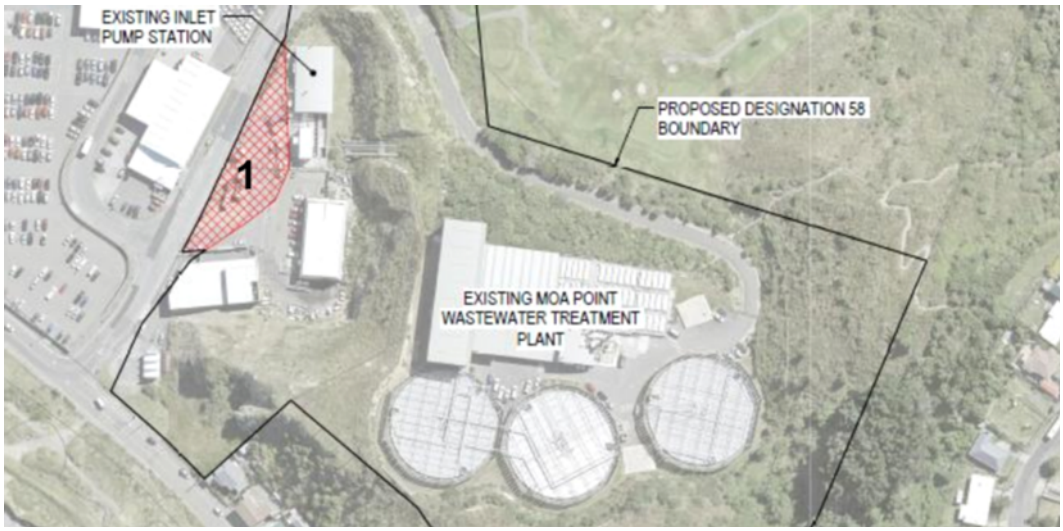

Figure 2: Area to be permanently added to Designation and purchased from WIAL by WCC

8 Funding

Funding options

8.1 The latest cost estimate for the SMF Project is $222m, which is being updated at present to reflect the current design and inflationary pressures. The updated estimate is expected to be submitted to Wellington City Council for approval between December 2022 and March 2023, upon which project funding arrangements will be finalised.

8.2 WCC consulted with the public through the long term plan process on two options to fund the SMF:

a Funding by WCC as part of its capital programme (i.e. directly financing the project from existing debt capacity, with that debt funded through rates);

b Funding and financing the project externally through use of funding raised pursuant to the Infrastructure Funding and Financing Act 2020 ('**IFF**').

8.3 Public feedback was split evenly between these options. After consideration, WCC decided to adopt its preferred option to pursue funding through the IFF.

Infrastructure Funding and Financing Act

8.4 The IFF was introduced by the government to provide an alternative funding option for infrastructure (outside of the debt constraints of a Local Authority) that supports urban development and housing supply. The IFF allows for a Crown Infrastructure Partners ('**CIP**') owned Special Purpose Vehicle ('**SPV'**) to levy infrastructure beneficiaries for up to 50 years.

8.5 The ultimate decision of whether to approve an IFF Levy and transaction sits with Government.

8.6 By using IFF, WCC will be able to progress critical infrastructure investment without compromising the existing composition of its balance sheet. It provides WCC the opportunity to deliver a greater number of projects than would be otherwise possible under its limited capital budgets.

8.7 A SPV will be established and is authorised by the Crown to charge a levy to beneficiaries of infrastructure funding using the IFF model. WCC will be collected by WCC and passed through to the SPV.

8.8 The levy itself will be collected by WCC at the same time as other rates (general / targeted etc) and uses the same collection and enforcement mechanisms as general rates.

9 Alternatives assessment process

9.1 Given that the SMF is a significant investment for Wellington City, the alternatives assessment was extensive. This section of my evidence summarises the

alternatives assessment process. More information can be found in the Business Case Report (Appendix to the AEE) and the Concept Design Report.[24]

9.2 A four stage process was undertaken to select a preferred sludge treatment process and location:

a Identifying a long list: initial lists of process and site options were developed individually;

b Identifying a short list of process options: the initial list of process options was subjected to a fatal flaw analysis. The output of this stage of work was a short list of process options;

c Short list analysis: The process and site options were combined at this stage and a multi-criteria analysis of the short-listed options was undertaken involving a range of criteria which were set by key project stakeholders to identify a preferred option; and

d Economic assessment of options: The economic benefits of the best options from the MCA were assessed.

9.3 These stages are discussed further below. I was involved in all of the stages and attended the various workshops.

Stage 1: Identifying a long list of process options and site options

9.4 During the early feasibility stages, a list of 25 potential technology options was developed by combining the range of technologies available into known process train options. This list of potential technology options is shown in Table 6.1 in the AEE.

9.5 A desktop study of Wellington's southern districts was undertaken to identify potential site options for a sludge treatment facility. Each option was assessed against a set of criteria which included size, vehicle access, noise and odour, utilities access, topography and land use and designation.

9.6 At the start of the alternatives process, when identifying sites, one of the parameters was capacity of the SMF, as discussed earlier.

9.7 Feasible site options were identified which generally fell into two groups:

[24] Sludge Minimisation Facility Concept Design Report, dated 4 May 2021, available at: https://wellington.govt.nz/-/media/your-council/projects/files/moa-point-sludge-treatment/sludge-minimisation-facility-concept-design-report.pdf

a Group A - sites located close to Moa Point WWTP; and

b Group B - sites located close to the Southern Landfill (Carey's Gully)

Stage 2: Identifying a short list of process options

9.8 To identify a short list of feasible combined process and site options, a fatal flaw analysis was undertaken by applying three critical success factors to the original list of 25 potential process options, and assessing whether each option meets the criteria, partially meets it, or does not meet it. The three critical success factors were:

a The maturity of the technology;

b Dry solid content of the end product; and

c Total plant area and footprint.

9.9 The process options considered to meet the fatal flaw criteria were (first group):

a Option 8: Mesophilic Anaerobic Digestion + Composting;

b Option 17: Mesophilic Anaerobic Digestion + Thermal Drying;

c Option 18: Thermal Drying; and

d Option 25: Incineration (Thermal Dryer optional).

9.10 The Options considered to 'almost' meet the criteria were also identified (Second group):

a Option 7: (Autothermal) Aerobic digestion + Thermal Dryer;

b Option 10: Lysis – Digestion + Thermal Dryer;[25]

c Option 12: Digestion – Lysis – Digestion + Thermal Dryer; and

d Option 19: Thermal Drying + Gasification; and

e Option 23: Wet Air Oxidation.

[25] This option (which is the proposal here) only 'marginally' met the 'maturity of technology' category as it is not applied in New Zealand currently. [Chris please explain why you don't think this being the first use in NZ will be a problem – presumably because it works overseas and we have looked there for guidance.

Stage 3: Identifying a short list of combined process and site options

9.11 The next step in the process was to overlay the short list of viable process options onto the site options to create a short list of combined process and site options which could be evaluated using a Multi-Criteria Assessment ('**MCA**').

9.12 However, two options were excluded, being:

a Mesophilic Anaerobic Digestion + Composting at the Moa Point site – due to limited available land; and

b Lysis – Digestion + Thermal Dryer at the Carey's Gully site. This is because it would have required the construction of additional pipelines between Moa Point WWTP and Carey's Gully to segregate sludges (primary and secondary) for treatment in this type of plant at Carey's Gully, which was thought unpragmatic

9.13 The resulting short list of 16 combined process and site options is shown in Table 6.4 in the AEE.

9.14 An MCA workshop was held in July 2020 with mana whenua (Taranaki Whānui and Ngāti Toa) and key stakeholders to identify a preferred option from the longlisted process and site options. The basis of the MCA was collaboratively developed by Connect Water, Veolia, Wellington Water Limited, and mana whenua based on the key investment objectives for the project.

9.15 The short list of 16 combined process and site options were scored against five criteria and 10 sub-criteria. These criteria and sub-criteria, including the associated weightings that were applied to each, were determined based on feedback received from the key stakeholders involved in the MCA workshop.

9.16 Table 2 provides a summary of the agreed assessment criteria and baseline weightings that were adopted.

Criterion	Sub-criterion	Baseline weighting (based on feedback from all stakeholders)	
Function	Sludge minimisation	12%	21%
	Biosolids re-use	9%	
Mana whenua values	Mana whenua values/principles	20%	20%
Complexity	Operation and technological complexity	21%	21%
Environmental	Carbon emissions	5%	17%
	Ecological effects	5%	
	Community impacts	3%	
	Consenting and planning	4%	
Cost	Whole of lift cost	11%	21%
	Staging to meet budget	10%	

Table 2: Summary of assessment criteria and baseline weightings

9.17 To test the outcomes of the MCA process, alternative weightings were then applied and incorporated into the final rankings of the short-listed options, to provide a sensitivity analysis of how outcomes of the assessment might change if criteria weightings are changed.

9.18 The Digestion-Lysis-Digestion + Thermal Drying (DLD+TD) option at Moa Point consistently scored the highest under the different weightings. The Thermal Drying + Gasification (TD + Gasification), Lysis-Digestion + Thermal Drying (LD + TD) and Mesophilic Anaerobic Digestion + Thermal Drying (MAD + TD) all at Moa Point, scored second, third, and fourth place consistently.

9.19 Following the MCA workshop it was concluded that the preferred option was a DLD + TD plant to be located at Moa Point given that it was the highest scoring option.[26] However, after the MCA workshop it was considered that a LD + TD plant located at Moa Point could also be an alternative preferred option to a DLD + TD plant, given the selection of a lysis-digestion (LD) plant versus a digestion-lysis-digestion (DLD) plant is typically based on scale.[27]

9.20 In terms of the differences between the LD + TD and DLD + TD options:

a The processes are comparable in terms of the end product, but the key difference is that LD does not include the first digestion step;[28]

[26] Sludge Minimisation Facility Concept Design Report, dated 4 May 2021, available at: https://wellington.govt.nz/-/media/your-council/projects/files/moa-point-sludge-treatment/sludge-minimisation-facility-concept-design-report.pdf at section 3.9.3. and table 3-12.
[27] Sludge Minimisation Facility Concept Design Report, dated 4 May 2021, available at: https://wellington.govt.nz/-/media/your-council/projects/files/moa-point-sludge-treatment/sludge-minimisation-facility-concept-design-report.pdf at section 3.10.1.
[28] The first digestion stage would typically be used at larger scale plants to break down the sludge before it goes through thermal hydrolysis. It would require two extra digester tanks.

b As such the choice of which option to use between these two would generally be based on scale (size of population served). It was noted by a technical specialist at the MCA that the size of the plant required for Wellington is close to the crossover point where the DLD + TD becomes financially viable and therefore either process option would be suitable;[29]

c I would not expect the two options to have any difference in terms of the on-site environmental effects, except that a LD-TD plant would typically be smaller so would have lesser visual/landscape effects.

9.21 Given the very significant investment represented by each of the short listed options to WCC, as well as the requirements of the IFF funding process, all four options were taken forward to assess the economic benefits of each. This occurred shortly after the project was transitioned from WWL to WCC.

Stage 4: Final economic assessment of options

9.22 The final stage of the process was to assess the economic benefits of the four consistently highest-scoring options from the MCA and option 1 (the Base Case) from the original long list of potential options. A Cost Benefit Analysis ('**CBA**') and a Qualitative Assessment ('**QA**') were used to undertake this economic assessment.

9.23 The options assessed in the final stage were:

a Option 1 – Base Case – dewater sludge and dispose at Southern Landfill until 2026,[30] and thereafter, Bonny Glen Landfill;

b Option 2: Lysis-Digestion + Thermal Drying, located at Moa Point;

c Option 3: Digestion-Lysis-Digestion + Thermal Drying, located at Moa Point;

d Option 4: Mesophilic Anaerobic Digestion + Thermal Drying, located at Moa Point; and

e Option 5: Thermal Drying + Gasification, located at Moa Point.

9.24 Six Critical Success Factors ('**CSFs**') were chosen to form the basis of the framework required for the QA. These CSFs were used to determine which

[29] Sludge Minimisation Facility Concept Design Report, dated 4 May 2021, available at: https://wellington.govt.nz/-/media/your-council/projects/files/moa-point-sludge-treatment/sludge-minimisation-facility-concept-design-report.pdf at section 3.10.1.
[30] As part of developing this, there was some consideration of an outflall option where sludge is discharged into the Cook Strait. However, it was concluded that this wasn't a viable option because it would be 'not acceptable' in terms environmental impact/ consentability and mana whenua values and principles (even as a hypothetical base case), see AEE, Appendix E page 50, Table 9.

investment option best delivers the essential elements required to ensure the success of the project. While this stage of the process focussed on economic considerations, it is my view that the options were relatively comparable in terms of their environmental effects and any difference in adverse effects could be mitigated at the design stage. The CSFs and their weightings were:

a Achieving strategic fit – 20%;

b Meeting community and business needs – 20%;

c Value for money – 15%;

d Achievability – 10%;

e Affordability – 15%; and

f Mana whenua values – 15%.

Scoring

9.25 The base case and investment options were assessed qualitatively against the CSFs.

9.26 In summary, the LD + TD and DLD + TD options were ranked first equal, followed by MAD + TD, TD + Gasification, and the Base Case respectively. Each investment option was given a scoring of +2 (exceeds) for mana whenua values.

9.27 The CBA indicated that the Base Case is the best economic outcome, with LD + TD being the best performing investment option, followed closely by DLD + TD.

9.28 The base case performed very poorly against the CSFs, being the only option to deliver a negative weighted average outcome. The qualitative analysis of the Base Case indicated some very significant issues around delivering against desired strategic and community outcomes, and was the only option assessed that fails to meet mana whenua values.

Determining the preferred option

9.29 A choice needed to be made between the LD + TD and DLD + TD options, as they were consistently the best scoring options. They are similar in that they require similar types of plant items, but they are configured in different ways, to achieve similar treated biosolids outputs. Neither provides any material environmental benefits over the other.

9.30 There are far fewer examples of DLD + TD globally, and this process is more economically viable for larger municipalities. At the scale of Wellington's sludge volumes, LD + TD provides similar benefits with a lower plant / infrastructure investment utilising similar unit processes in an altered configuration, where the first stage of digestion before thermal hydrolysis is not required. This means both options are technically feasible.

9.31 However, when considering the relative merits of the two options side by side:

a DLD + TD would require more investment in infrastructure (essentially more plant) and the tight constraints on the Moa Point site are likely to increase costs further because squeezing more plant on a tight site creates engineering complexity;

b DLD + TD would add more operational complexity, and as it is employed less globally, it would be harder for WCC to access the technical expertise to design and operate the plant; and

c DLD + TD would produce slightly less end product that requires disposal.

9.32 DLD + TD would also involve additional complexity, capital investment, and engineering design development, all of which contribute to higher cost of this option.

9.33 Therefore, based on the above analysis, a LD + TD located at Moa Point was identified as the preferred option to take forward for the future of sludge management in Wellington.[31] This was unanimously approved by Wellington City Councillors at their meeting on 30 June 2022.[32]

10 Consultation with mana whenua

Involvement in the MCA process

10.1 Ngāti Toa and Taranaki Whānui were both engaged as mana whenua during the options process to assist in determining a preferred process and site option.

10.2 Mana whenua were consulted to assist in the short listing of process options to understand cultural concerns with sludge management that might influence

[31] AEE, Appendix E page 58.
[32] Ordinary meeting of Wellington City Council minutes, 30 June 2022, available at: https://wellington.govt.nz/-/media/your-council/meetings/council/2022/2022-06-30-minutes-council.pdf; section 2.2.

process selection. The short list of sites and process options was then considered as part of the MCA.

10.3 The MCA criteria were collaboratively developed with iwi and key stakeholders based on the project objectives, and iwi representatives led the assessment of options against those criteria at the MCA workshop.

10.4 “Mana whenua values” formed a single criterion, with a weighting of 20% which was comparable to the weighting given to the other key criteria for evaluating each process and site option.

10.5 The LD + TD selected site and process option was scored 8 out of 10 when ranked against mana whenua values.[33]

Key concerns raised by mana whenua

10.6 Through WCC’s iwi liaison personnel, WCC have approached Ngāti Toa to seek involvement in the project via the Taika Here partnership in the areas noted in paragraph 10.10. Ngāti Toa have not sought to engage in this project owing to other priorities.

10.7 However, Ngāti Toa have provided a written statement relating to the proposed excavation of the “hillock” immediately north of the SMF site, which is subject a separate resource consent application. This statement has been reviewed by WCC and the essence of it considered in this project, including accidental discovery protocol requirements and understanding of the use of the area by Māori. WCC will continue to offer opportunities for engagement in the Project should Ngāti Toa’s position on project involvement change.

10.8 Wikaira Consulting were engaged by Taranaki Whānui in early 2022 to assess the options process for alignment to Tikanga Māori. Wikaira Consulting prepared a memorandum on the SMF which was provided to the Project team in April 2022 (**Appendix B**). The memorandum covered issues relating to mana whenua involvement and consultation, mauri and mana of the coastal marine area to the south-east of the site, and the processes if an archaeological site is discovered.

[33] DLD + TD scored 9/10 against mana whenua values which was due to the marginally higher biogas yield from this option. Harvesting more energy from the sludge is an important consideration from mana whenua.

Re-use of sludge

10.9 The principal issue for mana whenua, raised during the development of the MCA criteria as noted above, relates to how the stabilised biosolids, arising from the SMF process, are to be disposed or re-used for other purposes.

10.10 I understand from my discussions that a key mana whenua principle relates to the ability to harness and use the resources available from the sludge to give them another life (such as the recovery of energy or nutrients). The existing sludge treatment methodology does not recover energy or nutrients from the sludge.

10.11 Whilst the SMF process enables beneficial re-use of stabilised biosolids, it is not within the scope of the project to confirm how this is to occur in the long term. WCC is therefore seeking to engage with both Taranaki Whānui and Ngāti Toa to work collaboratively on developing a 'Biosolids Reuse and Management Plan'.

10.12 This will form part of a broader Takai Here Partnership Agreement with each iwi, which will detail how all parties will engage on key issues moving forward on both the SMF project and wider long term waste management and minimisation initiatives for the city.

Concerns with the existing situation

10.13 Consultation with Ngāti Toa and Taranaki Whānui also identified the following issues with the current method of sludge disposal:

a The existing sludge treatment and disposal method of disposing raw sludge to landfill is not aligned with key mana whenua principles;

b The potential impact to the environment in the event of future failure of the sludge pipelines;

c Odour release from the existing sludge disposal; and

d The potential for sludge disposal to affect local waterways.

10.14 A cultural impact assessment has not yet been prepared for the SMF Project by iwi.

Addressing mana whenua concerns and working together

10.15 In response to the issues noted above, it is intended that iwi representatives remain involved in the project and the wider matter of sludge management in the following ways:

a To confirm that the construction of the plant remains in line with consent requirements, especially in regard to accidental discovery protocols, and to improve understanding about the historical significance of the Moa point area to Māori.

b To facilitate the project's broader outcomes, in particular to engage Māori businesses and to seek opportunities for employment in the construction and operation of the SMF.

c To co-develop and implement a biosolids re-use strategy to divert the treated biosolids from landfill after the SMF has been commissioned.

11 Consultation with adjacent businesses

Wellington International Airport Limited

Engagement

11.1 Since 2020, Wellington Water and subsequently WCC have liaised frequently with WIAL via meetings and written correspondence on a range of matters, including:

a The proposed location of the SMF, including evaluating options around Moa Point WWTP;

b The sale and purchase of WIAL land on which part of the SMF will be placed, as was described in paragraph 7.147.14;

c Relocation of the existing WIAL tenant on this property, Aviation Ground Services (AGS);

d Use of areas adjacent to the SMF site for construction laydown;

e Upgrades to utilities;

f Traffic management;

g Co-ordination of SMF and WIAL concurrent construction activities;

h Co-ordination of liaison with stakeholders and neighbours;

i Mitigation of the effects of SMF construction and operation activities on landside and airside / aeronautical activities.

WIAL's submission

11.2 WIAL expresses a view that it is important that the SMF does not impact airport operations. WIAL seeks a condition which requires WCC to engage with WIAL where there is potential for the operation of the SMF to adversely affect operation.

My response to WIAL's submission

11.3 I have worked with WIAL to ensure the SMF will not impact airport operations. These matters have been recorded in a register by both parties, which is provided in **Appendix C**. The Project has been adapted in the following key ways to ensure minimal impact on WIAL's operations:

a Use of materials and lighting systems that prevent or reduce glare on approaching / departing aircraft;

b Preventing electrical interference with aeronautical communication and monitoring systems;

c Construction below the obstacle limiting surfaces;

d Co-ordination of access for heavy vehicles and sharing of access routes by heavy vehicles during operation;

e Maintaining access to the southern side of the airport for (at least) commercial traffic during construction.

11.4 I support the inclusion of a condition which requires WCC to engage with WIAL when there is potential for the operation of the SMF to adversely affect airport activities. I understand that an equivalent condition is also now proposed for the construction phase of the project, as further discussed in Mr Galloway's and Mr McGimpsey's evidence.

11.5 During the future detailed design and construction stages of the SMF project, the following consultation with WIAL is proposed:

a Prepare a detailed aeronautical study for WIAL's review (in conjunction with AirwaysNZ and Civil Aviation Authority reviews) to confirm that reasonable provisions have been made to prevent interference with WIAL operations;

b Design / review workshops to co-ordinate the placement and configuration of utilities;

c Construction planning workshops to confirm construction interfaces and mitigations;

d The establishment of liaison meetings during construction to discuss matters arising.

Cyclotek Industries

Engagement

11.6 SMF project team personnel have met with Cyclotek Industries on three occasions, supplemented by written and phone correspondence, and meetings on specific topics, to discuss the following key matters:

a To familiarise the SMF project team with the Cyclotek operation and their specific operational needs in relation to potential effects from the SMF construction and operation activities;

b To develop solutions for proposed changes to the Cyclotek building facility that are designed to reduce the risk of dust and/or pathogen entry into the facility;

c To discuss the matters presented in an operational risk register prepared by Cyclotek (and included in their submission on this NoR).

11.7 During the future detailed design and construction stages of the SMF project, the following consultation with Cyclotek Industries is proposed:

a Co-development of design solutions for modifications to the Cyclotek facility, and co-ordination to execute the proposed works;

b Design / review workshops to confirm with Cyclotek Industries how matters raised in their NoR submission have been addressed (for example , stormwater management);

c Construction planning workshops to confirm construction interfaces and mitigations;

d The establishment of liaison meetings during construction to discuss upcoming works, lessons from recently completed works, and other matters arising.

Cyclotek's submission

11.8 Cyclotek Industries Limited's ('**Cyclotek**') submission raises concerns that their operations could be affected by:

a Potential contaminants of surface water;

b Stormwater being re-directed away from the airport and towards Cyclotek; and

c Dust.

My response to Cyclotek's submission

11.9 In response to the particular matters raised by Cyclotek, I note/consider all of their concerns can be adequately mitigated through conditions, design changes and ongoing consultation throughout both construction and operation. In particular, I can confirm that temporary flood protection measures will be installed to ensure stormwater runoff is directed away from Cyclotek.

11.10 WCC have engaged Beca to prepare options for modifications to the Cyclotek facility to further improve air filtration and manage egress via the maintenance / delivery accesses into the facility. We expect to present options for their consideration, and include them in the scope of the project, in December 2022.

12 Response to submissions

12.1 I have reviewed the submissions that comment on matters relevant to my evidence. I respond to the key matters raised below. I have addressed the submissions of WIAL and Cyclotek above in my evidence.

Andrew Page

12.2 Mr Andrew Page expresses a view that the SMF Project should proceed without delay. Mr Page acknowledges the risks associated with the current approach of piping sludge to the Landfill.

12.3 I have commented on these matters in general terms in my evidence above at section 6, and agree that piping the sludge to Landfill carries risks and is a key reason for the SMF Project.

12.4 Mr Page considers that practical maintenance aspects of the SMF Project should be considered early in the design phase.

12.5 I have commented on these matters in general terms in my evidence above at section 7. I agree that maintenance aspects should be implemented into the early stages of the design phase. The design phase of the SMF Project has incorporated maintenance aspects through Safety in Design reviews with experienced operators and designers. Further Safety in Design reviews involving specialist operators and maintainers will be conducted through the detailed design phase.

Elise Webster

12.6 Ms Elise Webster raises concerns with the removal of the hillock. I note that separate resource consent is being sought to remove to hillock for airport purposes.

12.7 The hillock site will serve as a construction laydown area for both the Logistics Hub to be constructed by WIAL and the SMF Project. The AGS building will also be moved to the hillock site, as the SMF Project will be using the land it currently occupies. WIAL has recently had a designation confirmed in the District Plan which contemplates the hillock site being removed and used for airport purposes in the long term.[34] **Mr Galloway's** evidence describes why the hillock site is intended for use as a construction laydown for the SMF Project.

Mr Savage

12.8 Mr Carl Savage expresses a view that the Carey's Gully sludge dewatering facility should be closed down as soon as possible as it is rarely operated as it was intended to in terms of containing odours.

12.9 In response to the particular matters raised by Mr Savage, I consider that the operator of the SMF will be able to effectively operate the plant because the design will allow it to contain odours effectively.

Greater Brooklyn Residents Association Incorporated

12.10 The Greater Brooklyn Residents Association Incorporated ('**Brooklyn Residents**') expresses a view that the Carey's Gully sludge dewatering facility should be closed down as soon as possible. The submission suggests that it is rarely operated as it was intended to in terms of containing odours.

[34] Wellington City District Plan, Designation G5, Appendix AF, Conditions 2, 19.

12.11 I consider that the operator of the SMF will be able to effectively operate the plant because the design will allow it to contain odours effectively.

12.12 The Brooklyn Residents also raise concerns that WCC has a history of not keeping spending under budget.

12.13 In response to the particular matters raised by the Brooklyn Residents, I consider that the cost of the SMF has been calculated utilising a structured process as the project evolves, and with the involvement of parallel, independent estimators. All cost estimates are developed in accordance with international cost management standards[35] in a robust way, with the appropriate allocation of contingencies to manage risks and design evolution.

Fiona Hoang

12.14 Ms Fiona Hoang raises concerns that an 'outfall option' should have been considered further due to its excellent operational and cost advantages. By the 'outfall option', I assume Ms Hoang means the option whereby liquid sludge would be piped from the Moa Point Waste Water Treatment Plant and discharged into the Cook Strait. In any case the submission suggests that this option would significantly reduce the cost of the Project

12.15 I have described the alternatives assessment process in general terms in my evidence above at section 9 of my evidence. An 'outfall' option was considered in the Economic Business Case (Appendix E to the AEE) as one of the options for what the "base case" for sludge management in Wellington should be in the absence of the SMF. An outfall option was considered 'not acceptable' when assessed against mana whenua values and principles, and environmental impact. It was also noted that the likelihood of getting consent, and iwi acceptance of it, was "very low to impossible".[36]

[35] American Association of Cost Estimators (AACE) Recommended Practice Notes 18R-97 and 56R-08.
[36] AEE, Appendix E, page 50. The 'outfall' option was described as Outfall – sludge is discharged with treated effluent from Moa Point WWTP via the long sea outfall into Cook Strait. This would mean that the sludge would not require any further treatment.

Guardians of the Bay

12.16 Guardians of the Bay ('**GOTB**') express a view that the building form, textures and full pallet of colours should be reconsidered in the conditions to better mitigate adverse visual effects.

12.17 I can confirm that the changes can be achieved through the detailed design to satisfy GOTB's concerns.

13 Response to s42A officer's report

13.1 The Section 42A Report raises a concern that 'the hillock is integral to the construction phase' of the SMF despite not being part of the designation proposal.[37] I generally address this above in response to Ms Webster's submission and it is further discussed by Mr McGimpsey and Mr Town.

14 Conclusions

14.1 Wellington City requires a fundamental change in the management of sludge. The change needs to enable the management of the sludge to be 'de-coupled' from the existing disposal to the Southern Landfill and enable WCC to pursue other options for disposing of, or otherwise using the sludge, and substantially improve the resilience of its sludge management.

14.2 The sludge will go through the process as described in the diagram below.

[37] Section 42A Report, section 2.0, page 2.

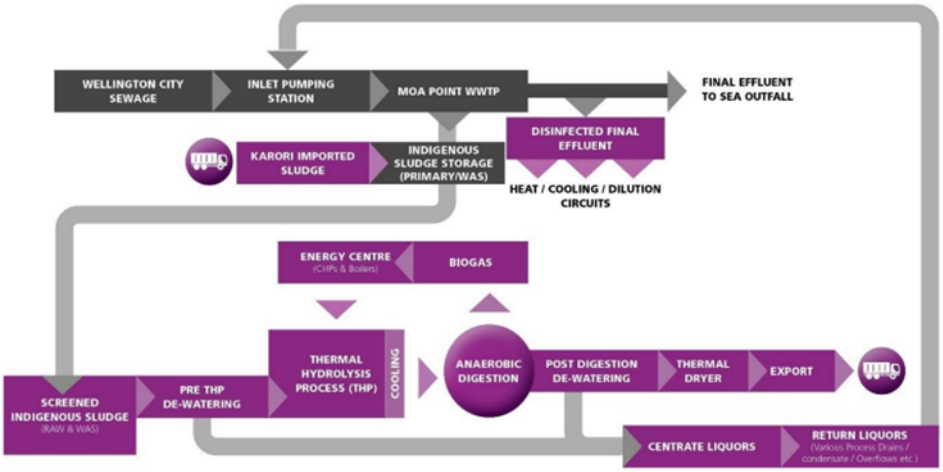

Figure 3: SMF sludge treatment process[38]

14.3 WIAL and Cyclotek have been actively involved and engaged with in designing the SMF, given their proximity and sensitive nature of their activities.

14.4 To address mana whenua concerns it is intended that iwi representatives remain involved in the project and the wider matter of sludge management.

Christopher Andrew Frank French
18 November 2022

[38] WAS – Waste Activated Sludge. CHP – Combined Heat and Power

Appendix A Photos of Typical Process Installations

Sludge screens / strain presses, as will be installed at Moa Point and Karori WWTP to screen the sludge before treatment at the SMF.

Dewatering centrifuges. These are required before the thermal hydrolysis plant and after the anaerobic stage to remove free water from the sludge.

The thermal hydrolysis plant, housed indoors.

Anaerobic digesters. The ones shown are constructed from steel with the biogas holder (the dome) on top of the digester. The Wellington SMF anaerobic digesters will be constructed from concrete or steel and the biogas holder domes will be made of recessive colours.

Thermal dryer. The one shown here is a belt type dryer, which is an enclosed dryer housed within a building, similar to that proposed for the Wellington SMF.

Boiler room, used for the generation of steam and hot water from the biogas.

Appendix B Memorandum from Wikaira Consulting

Development of a New SMF: Retrospective Options Assessment

Date	5 April 2022
From	Wikaira Consulting Limited
To	Wellington City Council
Project	The current Resource Consent for disposal of sludge to Southern Landfill expires in 2026 with alternative pathways for sludge disposal expected thereafter. Following a comprehensive options analysis, a preferred solution has been proposed, being a substantial upgrade to the Moa Point Wastewater Treatment Plant. The Council Infrastructure Committee unanimously voted in favour of this project (the SMF).

Purpose

The purpose of this memo is to assess the options considered and the process for shortlisting the development of a new Council Sludge Minimisation Facility (SMF) for alignment to Tikanga Māori, as well as the identification of possible opportunities to improve alignment to Tikanga Māori.

Documents Reviewed

Wikaira Consulting has reviewed the following documents, sent by Chris French on 26 March 2022:

Document Title	# of pages	Brief Summary
1 SMF Business Case – Introduction – Strategic Case – Economic Case – 230322.docx		This document describes the process by which WCC has initiated a project to develop, assess and present options for alternative technologies for the processing of wastewater and by extension new pathways for the disposal of sewage sludge.
2 Sludge Minimisation Site and Process Options Report – 2020.08.18.pdf	136	This report presents the site and process plant options for the proposed Wellington Sludge Minimisation Facility, and the process used to reach a preferred option. It summarises the long list and short listing of site and process options considered, and the multi-criteria assessment (MCA) framework used to assess the shortlist, to arrive at the preferred site and process option to be taken forward for concept design development.

Document Title	# of pages	Brief Summary
3 Sludge Minimisation Facility Consenting Strategy – Draft – 2021.06.16.pdf	81	This document is the consenting strategy (framework) for pursuing the approvals required under the Resource Management Act 1991 (RMA) for the construction, operation and maintenance of a new Sludge Minimisation Facility (SMF) at Moa Point.
4 220325 Wellington Sludge Minimisation – hui with TW.pptx	15 (slides)	This PowerPoint is an introduction to the Wellington Sludge Minimisation Project that outlines the project's key activities and output, priority objectives, selection of the preferred option, the currently proposed solution, and next steps.
5A Briefing Report for Meeting Next Week.msg	1	This document is an email sent from Chris French at Connect Water on the 19th of April, to several people from Beca, KPDC and Wellington Water, about the briefing report for the following week's meeting, and includes the briefing report as an attachment.
5B Wellington Sludge Project – Presentation 14-04-20.pdf	31	This document is a memorandum providing the background information in advance of the multi-criteria assessment (MCA) workshop to select a preferred process and site option for the Wellington Sludge Minimisation Project.
6 SMURF Iwi Meeting Minutes – 2020.05.26	7	This document is the minutes from an iwi consultation meeting held on the 26th of May 2020 between members of Taranaki Whānui, Ngāti Toa, WWL, Connect Water and Latitude. The purpose of the meeting was to provide an update of the project, discuss Maori values / principles associated with sludge management, and present previous sludge management projects undertaken and discuss how to apply learnings from past projects to develop a scheme that naturally embodies kaitiakitanga.
7 (Email) Please Respond by Thursday 25 June – Criteria for Sludge Minimisation MCA Workshop	1	This document is an email sent on the 21st of June 2020 from Chris French with the attachment 'Criteria for Evaluation of Options for Wellington Sludge Minimization Project'.
8 Background Information for Sludge Minimisation MCA Workshop.pdf	37	This document provides summary background information in advance of the multi-criteria assessment (MCA) workshop to select a preferred process and site option for the Wellington Sludge Minimisation Project.
9A MCA Minutes.docx – Multi-Criteria Assessment (MCA) Evaluation Workshop (Thursday 2 July 2020)	14	This document provides notes from the workshop, where 18 attendees included Kara Puketapu-Dentice and Maiora Puketapu-Dentice (Wellington Water) from Taranaki Whanui, and Sharli-jo Solomon and Turi Hippolite from Ngati Toa Rangatira.
9B MCA Minutes Attachment 1 – MCA Briefing Paper.pdf	37	This document is a memorandum providing summary background information in advance of the multi-criteria

Document Title	# of pages	Brief Summary
		assessment (MCA) workshop to select a preferred process and site option for the Wellington Sludge Minimisation Project.
9C MBA Minutes Attachment 2 – MCA Presentation Slides.pdf	41	

Key Findings

General Comments

Wikaira Consulting make the following comments, based off their review of the documents received:

<u>Overview of Mana Whenua Involvement</u>

- We note that throughout the project lifespan there has been discrete times of input and feedback from Mana Whenua. These appear to primarily be at the development of the MCA criteria and ranking of shortlisting sites stage (where mana whenua values were condensed into one criteria), and feedback after the ranking of short-listed options had been completed (where there appears to be support for the Moa Point site). We note that the proposed site and process appear to reflect the comments provided by mana whenua to date.
- In noting the above, we also note that there appears to have been several key project actions that did not directly include mana whenua, or appear to have lacked appropriate consideration of iwi and cultural values:
    - Development of the long-list of processes and sites;
    - Development of the fatal flaw criteria;
    - Detailed and clearly evidenced consideration of Sites and Areas of Significance to Māori throughout the documents;
    - Detailed and clearly evidenced inclusion and response to feedback from mana whenua throughout the documents
- It is difficult then to predict whether mana whenua involvement at these keys stages of the project would have influenced the outcomes differently. As Treaty partners their input is of great importance, especially in the early stages of project development. Going forward, the Applicant should seek early and effective engagement on all areas that concern Mana Whenua.

<u>Consideration of Mana Whenua</u>

- Mana Whenua principles are one of the identified benefits of the SMF, according to the business case. However, Mana Whenua were not consulted on the project until the MCA – establishing the short-list.

- Mana Whenua do not appear to have been involved in identifying the long list of technologies or the establishing of the fatal flaw criteria.
- There does not appear to have been any Mana Whenua consultation for the sludge transfer pipeline selection. A heritage area is noted in Option 2 and 3 but there have been no considerations for Sites and Areas of Significance to Māori (SASMs).
- Mana Whenua do not appear to have been involved in the initial workshop held with key Connect Water personnel in February 2020 to identify potential sites using available spatial data. However, one of the criteria contains a 'fatal flaw description" mentioning "land ownership". It is important that Mana Whenua as Treaty partners are involved in decision-making processes.
- In the MCA briefing paper, there is no evidence of Mana Whenua input.
- None of the project objectives relate to Mana Whenua or anything cultural.
- Mana Whenua values have not been included/reflected in the key criteria considered in identifying the long-list of potential sites for the proposed SMF. A Mana Whenua values criterion should be added. Furthermore, the table considers land use and land ownership, in which Mana Whenua will be pivotal in advising on historic land use and ownership.
- In the Sludge Minimisation Consenting Strategy, Mana Whenua do not appear to be included as 'affected parties' under 3.3.3.3 Scope of Notice of Requirement.
- There is no consideration of Mana Whenua values when assessing the site options short list, and none one of the considerations made in the technical investigation of the shortlisted options are cultural.

<u>Wāhi Taonga and Sites of Significance</u>

- Will the mouri and mana of the coastal marine area to the south-east of the site (identified as tāonga) be protected from all works relating to the project? How can the Applicant and Mana Whenua work together to ensure the tāonga is protected? (e.g. CIA to identify cultural values, concerns, opportunities).
- According to the Sludge Minimisation Consenting Strategy *"there are no mapped sites of significance within the area of works. However, it is noted that the New Zealand Archaeological Association GIS maps show there are a number of mapped wāhi taonga or archaeological sites in the wider area surrounding the proposed site . . ." and ". . . GWRC have also classified the entire area as within an area with a 'very high' likelihood of uncovering an archaeological site."* (p.19) However, what about sites of significance not made public by Mana Whenua. The Applicant should consult with Mana Whenua to ensure there are no other sites in the area, they've chosen not to reveal.
- What is the Applicant's strategy for ensuring the wāhi taonga and other archaeological sites in the wider area are protected from any works relating to the project?

- What is the process the Applicant is planning to follow if an archaeological site is uncovered?

Next Steps

- The Applicant should hire a Mātauranga Māori expert participate in the risk assessment, following the DSI, and ensure Mana Whenua values, concerns, etc. are addressed.

Questions

- Mana Whenua values were given a weighting of 20% in the MCA process. However, Mana Whenua values were given a weighting of 15% in the CSF of the Qualitative Assessment. Why has the 20% MCA weighting for Mana Whenua values become a 15% weighting for the CSF?
- Was consultation with Mana Whenua conducted in the investigations undertaken to identify any constraints with the proposed "Group A" and "Group B" sites?
- Were Mana Whenua present at the workshop to confirm the definition and scoring basis of each assessment criterion, to confirm/establish the definition of Mana Whenua values? Who was the technical expert that initially scored the Mana Whenua values sub-criterion? Were Mana Whenua involved in the establishment of the Mana Whenua values sub-criterion?
- As part of 'Next Steps' in the Wellington Sludge Minimisation PowerPoint use for the hui with Mana Whenua, there is '*analysis of options and process proposed for alignment to Tikanga Māori' (slide 15).* How does the Applicant plan to analyse the options for alignment with Tikanga Māori? This must done in close partnership with Mana Whenua.

Recommendations

It is critical to establish clear and mutual understanding of the current project and processes with mana whenua. We understand that a business case is currently being progressed for sludge minimisation options, recommending the expansion of the Moa Point WWTP site as the preferred option. At the same time, we understand that the required Resource Management Act approvals and land acquisition are being progressed. We suggest this is worked through further with iwi so that Taranaki Whānui can effectively prioritise where they focus their limited resources.

Wikaira Consulting makes the following recommendations to the Applicant in moving forward with their New Sludge Minimisation Facility in a way that imbeds Mana Whenua and their values in the project:

1. WCC actively involve Taranaki Whānui as Treaty partners, in the project going forward through the following:
    - As a priority, WCC engage and facilitate Taranaki Whānui involvement in the Moa Point extension project (preliminary design, consenting and conditions, delivery and operation, training, and employment)

- Should they desire, invite and enable Taranaki Whānui to revisit the sludge minimisation process and site optioneering and assessments to provide additional confidence in the process
- Establish which protocols they plan to follow if an archaeological site is uncovered
- Establishing a forward work programme that outlines supporting and additional work packages and the ways in which Taranaki Whānui involvement will be facilitated.
- Ensure the coastal marine area to the south-east of the site (identified as tāonga), as well as wāhi taonga and other significant sites in the wider area, are protected from project works. WCC will need to engage Taranaki Whānui to develop a Cultural Impact Assessment (CIA), that would help them articulate their relevant values, interests, opportunities and concerns. It could also include site visits to determine the nearest sites of significance, mahinga kai areas, vital resources, etc. that could be affected by the given project, and how best to protect them and maintain the mouri and mana of the area.

The above is likely best achieved through maintained engagement, several hui and / or wānanga to discuss the various projects and any related concerns or opportunities / aspirations on behalf of Mana Whenua.

Appendix C Aeronautical Risk Register

DRAFT Ver 2 - Sludge Minimisation Facility (SMF) - Risk Register for Risks to WIA Airport Operations

Ref	Risk	Situation	Existing Control Measures	Initial Qualitative Risk Analysis								NOTES and DRAFT Risk Reduction Measures (In addition to existing controls)	Residual Qualitative Risk Analysis (Assuming Risk Reduction Measures implemented)							
				How likely is the event?	How severe is the consequence?	What are the consequences of the event?	Risk Evaluation		Risk Score	Risk Priority	Threat Rank		How likely is the event?	How severe is the consequence?	What are the consequences of the event?	Risk Evaluation		Risk Score	Risk Priority	Threat Rank
							Likelihood Rating	Severity Rating								Likelihood Rating	Severity Rating			
1	**Design Phase - Review risk register at completion of concept design phase**																			
1.1	New Service Connections to existing	Are there any new service connections to Wellington Airport Infrastructure to be construcuted through existing airside areas? (Gas, water, power, sewerage).	None	Unlikely	Minor	Disruption to airport operations	2	10	20	Low Threat	15	Review design to understand exents and possible impacts of airport operations. Install services in locations that minimise the impacts during both the construction phase and the operational life of the services. 11 KV/substation in construction site, relocating will needs to be managed. Work on Stuart Duff Drive needs to consider future proofing of infrastrucuture services in the road alignment.	Very Unlikely	Minor		1	10	10	Low Threat	14
1.2	New Service Connections through future expansion areas	Are there any new service connections through future expansion areas that are part of WIAL's Masterplan	None	Likely	Minor	Impact on the the future design of the expansion	4	10	40	Moderate Threat	11	Review design with respect the proposed future expansion (Masterplan and Mastergrading) and place new services in a location that future proofs them (ie. that they will not be required to be relocated as a result of the future expansion design).	Occasional	Minor		3	10	30	Moderate Threat	9
1.3	Obstacle Limitation Surface protrusion	Is the buiilding below the 280/150m strip Obstacle Limitation Surface (OLS)	None	Unlikely	Medium	Increase in approch minima - reduced operational efficiency	2	40	80	High Threat	8	Building sits below 150 and 280m strip OLS models	Very Unlikely	Negligible		1	1	1	Negligible Threat	15
1.4	Lighting and façade design	Are there any risks to glare for pilots from lighting or façade design of the building	None	Very Unlikely	Extreme	Distract to pilot resulting in Aircraft incident or accident	1	100	100	High Threat	7	Review the design and remove any possible causes of glare to pilots within the building design and lighting - Want low-level glazing for public to view guts of plant. - Export Silos – mild steel painted – digestor steel or concrete; nothing too shiny. Roof dark grey - Operational task lighting, 24/7 manned site (Personnel-	Unlikely	Minor		2	10	20	Low Threat	11

												activated lights where possible – i.e., access stairways to top of digesters, etc.). Minimise lighting on continuously outside of buildings.								
1.5	Turbulance to aircraft	Possible turbulance/wind shear created by new building	None	Unlikely	Medium	Aircraft Incident or accident	2	40	80	High Threat	8	Some modelling will be done by WSP - more consideration of wind tunnel effect on Stuart Duff Drive Plant sitting in lee of hill, cross wind component likley low	Unlikely	Medium		2	40	80	High Threat	4
1.6	Distraction to ATC monitoring airside Operations	Lighting of plant, glare from roof etc distracts ATC Tower view across Runway/Taxiway	None	Occasional	Extreme	Aircraft Incident or accident	3	100	300	Very High Threat	2	Downlighting used in design. Glare is a concern of ATC, reflection from roofs. Prepare a sight line view from tower? New freight building max 13m high below OLS, wont shield SMF	Unlikely	Medium		2	40	80	High Threat	4
1.7	Potential Interference of Buildings with ILS	Building mass and cladding interfernce with ILS performance	None	Occasional	Major	May impact availability/performance of ILS	3	70	210	Very High Threat	3	LT to provide ILS sensative area plan. Beca to advise Airways/ seek sign off	Unlikely	Medium		2	40	80	High Threat	4
2	**Construction Phase**																			
2.1	Crane infringement on OLS	Potential infringement by cranes of the Obstacle Limitation Surface (OLS) during construction phase – 300m and 150m runway strip OLS	None	Likely	Extreme	Aircraft Collsion with Crane	4	100	400	Extreme Threat	1	Confirm penetrations before considering mitigation measures Tower crane will be used on the site. This is likely to penetrate the 300m, not 150m runway strip. 35m high crane, boom same elevation base of existing WWTP (OLS) Main building is 22m in height. The crane would be 30-35m high. Ground at RL 6m. Digester 16m high. Any temporary penetration to be notified to CAA - in accordance with Rule Part 77 - Objects and Activities Affecting Navigable Airspace Beca to liase with WIAL to coordinate Part 77 submission	Occasional	Minor		3	10	30	Moderate Threat	6

2.2	Cranes interfere with Instrument Landing Surface (ILS)	Potential for cranes to interfere with Instrument Landing System e.g, Moa Pt. Tower Crane was assessed prior to construction by Airways. Long metal wire was erected on site to simulate crane. System can be "tuned" to allow for interference.	None	Unlikely	Medium	May impact availability of ILS	2	40	80	High Threat	8	Check potential issue of ILS interference with Airways Crane below Moa Point , metal flared roof may mitigate this issue. Check protection zone and include in discussion with Airways. LT to provide ILS sensative area plan. Beca to advise Airways/ seek sign off	Unlikely	Minor		2	10	20	Low Threat	7
2.3	Requirement to deliver large equipment to site	Is there the potential to require transport via airside taxiway? Has this been done before in the instance of house movers?	None	Occasional	Minor	Disruption to airport operations	3	10	30	Moderate Threat	12	Conduct good planning well inadvance of delivery of any large equipment to minimise disruption. - Possibility for delivery of oversized Silos that won't fit through underpass. - Most equipment should be containerized. - Silos manufactured in Petone or further afield (?) - May need to request "airside access." - Oversized equipment can be programmed to be delivered during airport curfew	Unlikely	Major		2	70	140	High Threat	1
2.4	General Site Control During Construction, Noise and dust impact on sensative local community	Dust and Noise day and night, lighting, heavy vehicle traffic, access to set dwon and construction site, etc.	None	Very Likely	Medium	Disruption to airport operations	5	40	200	Very High Threat	4	Prepare and execute a robust Construction Health and Safety Site and Environemental Management Plan - 90,000 + 12,000 cu. m for material to be removed by the airport company. Logistics hub to be constructed at the same time. - Dust mitigation necessary. - Our areas: Site office, ablutions, portacoms, small scale fabrication, equipment laydown areas. Get WIAL requirements from Nick Petkov - perception will be that it is a WIAL project not a council project. Joint approach with concurrent projects	Unlikely	Minor		2	10	20	Low Threat	7

2.5	Communication between WIAL and Contractor	Communication between WIAL and Contractor falls down	None	Unlikely	Major	Disruption to airport operations	2	70	140	High Threat	6	Set up robust communication system between Project Manager / Contractor and WIAL for forward planning and any issues that may arise. ECI contractor to be appointed .Contract has allowances for interfaces with WIAL. WCC to appoint a constuction interface manager - for liason with WIAL/local residents (w/lead contactor just after easter)	Unlikely	Medium		2	40	80	High Threat	4
2.6	Excessive traffic congestion and associated noise on Stuart Duff Drive	Mulitple construction projects at southern end of the airport causing disruption and poor interaction with residents and pax/meeters-greeters etc	None	Likely	Medium	General road access disruption, noise complaints	4	40	160	Very High Threat	5	?? Close public access from the south on Stuart Duff Drive Traffic mangement plan coordinated with WIAL and other constuction projects. Delivery of materials outside of peak airport operatoinal hours								
3	**Operational Phase**																			
3.1	Facility emergency flare and exhaust stacks	Emergency Flare flare emits gases, exhaust stacks will emit gases during plant operations	None	Occasional	Minor	Gas emisions effect surrounding airport staff and visitors -	3	10	30	Moderate Threat	12	Need to identify when would it be used, how frequent, vertical velocity of escape gases, proximity to runway centerline? Any other gases ejected from plant during ongoing operations – steam? - Emergency Flare: Plan is to use all of gas produced. Only for emergency situation – i.e., excess of gas produced. Not exposed but will be a heat plume. - Boiler and gas engine stack: Does run continuously and will produce a steam and thermal plume, but it is too early to know velocity or volume. - Similar type of plume issue in Kapiti. Similar plant Christchurch – worth a visit if required.	Unlikely	Major		2	70	140	High Threat	1

3.2	Hazardous gases	Plant emits hazardous gases	None	Unlikely	Minor	Gas emisions effect surrounding airport staff and visitors -	2	10	20	Low Threat	15	Need to idendify what will be stored or produced on site and understand what risk this poses. Have in place and follow appropriate Helath and Safety standards for the production and storgae of Hazardous materials - Natural gas from the street supply for backup power. - Diesel generator set - in ground storage tanks. - Nitrogen tank for fire suppression for thermal dryer. - General lubricants. - Will produce biogas stored in ground level "gas bag" – 12-15 cu.m 1200-1500m3 capacity at very low-pressure supplies gas to boiler system - Polymer used for thickening sludge (1 tonne bags) Not flammable or combustible but is a skin irritant.	Very Unlikely	Major		1	70	70	High Threat	5
3.3	Hazardous material / gases handling	Hazardous material / gases to and from the site	None	Occasional	Minor		3	10	30	Moderate Threat	12	Have in place appropriate health and safety measures inclusing informing fire service of material and shipment programme - Polymers - General lubricants - Diesel for genny - Boiler water treatment chemicals: There are usually 3-4 different hazardous liquid form chemicals – scale inhibitors, oxygen scavengers, amines, and alkalinity builders – each in 1000ltr IBCs. - I am pushing for a solid state 5kg cartridge state system which will virtually remove the hazard; however, I would rather keep it worse case at this point as per consenting report. - Odour control chemicals: Hazardous yes, not sure on quantities yet.	Very Unlikely	Extreme		1	100	100	High Threat	3
3.4	Odor?											No descernable/objectionable at the boundary Air within the facility								

													will be odor treated before being discharged.								

Prepared by: SiD review workshop (TBC) attendees: TBC

Counts:

Extreme Threat	**1**		**Extreme Opportunity**
Very High Threat	**2**		**Very High Opportunity**
High Threat	**2**		**High Opportunity**
Moderate Threat	**3**		**Moderate Opportunity**
Low Threat	**1**		**Low Opportunity**
Negligible Threat			**Negligible Opportunity**
Total	**9**		**Total**

Counts:

Extreme Threat			**Risk Status**	**Risk Status**	
Very High Threat			Emerging	Emerging	
High Threat	**5**		Live	Live	
Moderate Threat	**1**		Parked	Parked	
Low Threat	**2**		Closed	Closed	
Negligible Threat					
Total	**8**				