

EXECUTIVE COUNCIL

PUBLIC

Title: A Waste Management Strategy for the Falkland Islands

Paper Number: 30/18

Date: 28 May 2018

Responsible Director: Director of Policy and Economic Development

Report Author: Director of Policy and Economic Development
Director of Public Works
Environmental Officer and Policy advisor

Portfolio Holder: MLA Teslyn Barkman

Reason for paper: This paper is submitted to Executive Council:

For policy decision (including budgetary policy)
Requested by elected member of the Legislative Assembly

Publication: Yes, with redactions as highlighted

Not Recommended:

Under Executive Council Standing Order 23(2), Executive Council must have regard to the categories of exempt information in Schedule 3 to the Committees (Public Access) Ordinance when determining if information should be withheld

The categories which are potentially relevant to this paper are:

Paragraph 10: Information about relevant contracts and negotiations
223/11, 229/14, 143/16

Previous papers:

List of Documents: Waste Management Strategy for the Falkland Islands 2018.

1. Recommendations

Honourable Members are recommended to approve:

- (a) Adoption of the Waste Management Strategy, including phased-in, differential treatment of waste streams recommended as Option C and described in Section 5.4;

- (b) That DPW and DPED continue to work with MoD partners at Mount Pleasant Complex, and with other interested stakeholders and partners, to implement a public education and awareness campaign to encourage reduction in consumption of single use plastic;
- (c) That the Director of Public Works develop and submit a capital and operating budget proposal for each proposed waste handling element. This will include development of a detailed statement of requirements to identify potential private sector delivery partners;
- (d) That the Director of Policy and Economic Development begin preparation of a comprehensive Environmental Strategy, including appropriate and commensurate policy and legislative proposals to ensure effective environmental controls for the selected waste management systems.

2. Additional Budgetary Implications

- 2.1 2017/18 – None. The actions described above can be accomplished within existing budgets.
- 2.2 2018/19 and beyond – Implementation of fit-for-purpose waste management solutions will entail significant additional capital and operating costs. A detailed budget proposal will be developed for consideration by Members later in 2018, following completion of public consultations. Actions recommended for immediate implementation, such as the purchase and installation of a new glass crusher, are already included in the 2017/18 PWD budget.

3. Executive Summary

- 3.1 Existing waste management practices in the Falkland Islands are pragmatic and low cost, but do not meet current public expectations for sustainable, environmentally responsible, long term treatment and disposal of all the various wasted streams that are produced in a modern society.
- 3.2 Important issues include the current state of the Eliza Cove landfill site, where windblown plastic creates a significant eyesore and public concern. Other issues include open public access, resulting in unauthorised materials being dumped; the need for open burning to reduce volumes; and the expectation that the current landfill will reach capacity within 18 months.
- 3.3 Due to low volumes of waste, geographic isolation, high costs, limited availability of labour and expertise, and other logistical and practical barriers, modern waste management solutions such as recycling have previously been considered but not adopted.
- 3.4 The recommended comprehensive Waste Management Strategy (WMS) – Option 3, responds to public concerns about the existing situation and its desire to see the adoption of sustainable and environmentally friendly practices. It includes:
 - Recycling of materials that can either be reused in the Falkland Islands (glass) or which have a market value. New streams can be added if market conditions change.

- An energy-from-waste facility to handle all combustible materials that will not be recycled. It is proposed that investigations continue into alternative technologies and possible partnerships to identify the most cost-effective option; should Option 3 be approved, a detailed proposal will be brought to Honourable Members for consideration later in 2018.
- A new, engineered landfill to safely accommodate residual materials that cannot be treated or recycled.
- Development of policies and legislation that provide the appropriate guidance and regulatory framework to support a comprehensive waste management programme.
- A public awareness and education campaign to engage all Falkland Islanders in developing sustainable habits and practices.

3.5 An opportunity exists to partner with the Ministry of Defence at Mount Pleasant Complex (MoD) to implement a joined-up waste management solution. If successful, collaboration will reduce duplication of activities and investment between MPC and FIG, and provide the potential for improved economies of scale for recycling, including improved access to markets, and for the treatment of non-recyclable wastes. A collaborative approach could be more efficient and help to minimise costs associated with recycling, improved landfill and generating energy from waste.

4. Background

4.1 Waste management and reduction are stated priorities for Members of the Legislative Assembly and are reflected in the new 2018-22 Islands Plan.

4.1 In 2014, ExCo approved the creation of a 2-year Waste Management Coordinator role within the Environmental Planning Unit to “provide a basis for developing a longer term national waste strategy” (ExCo 229/14).

4.2 Drivers for the creation of a more environmentally sustainable approach included public sentiment, as well as the expectation that an anticipated increase in economic activity related to oil and other infrastructure construction, would generate significant new waste streams and volumes. In addition, Eliza Cove landfill is reaching capacity and an extension to the existing site, or a new landfill, will be required within the next 18 months.

4.3 Between 2014-2017, research was carried out to identify options for treating or disposing of recyclable, hazardous, organic and non-recyclable inorganic wastes generated in the Falkland Islands. Some attempts were made to quantify various waste streams. The options investigated included:

- Continuation of current practices;
- Recycling of specific waste products, including glass, tins, plastics and paper/cardboard;
- Engineered landfill;
- Incineration with energy recovery;
- Pyrolysis;
- Gasification
- In-vessel composting;
- Anaerobic digestion.

- 4.4 Subsequent analysis has identified the most viable options for the Falkland Islands, given its geography, climate, labour force and waste volume constraints. These are presented in Section 5 and form the basis for the proposed WMS.
- 4.5 The WMS proposes a waste management approach that will allow long term, sustainable management of solid waste. It provides for phased-in, differential treatment of combustible, recyclable, and residual waste streams and emphasises reduction at source, capturing value wherever possible and minimising environmental impacts to air, water, soil and land. However, the WMS does not identify specific sites or describe the technological options – these will be developed in the design and implementation phase.
- 4.6 The proposed approach is scalable and allows for future acceptance of additional waste sources, such as from cruise ships and/or the oil industry to ensure safe, cost effective and appropriate waste handling that safeguards the Falkland Islands. These additional waste streams could generate revenue that would offset some operating costs.
- 4.7 Opportunities for collaboration with partners, including the MoD, private sector and grassroots groups have been identified and proposed wherever practical. A waste management working group has been set up with the MoD to ensure that all options for synergies, shared costs and shared facilities have been identified.
- 4.8 Some waste streams, including metals and hazardous materials such as batteries, will require additional analysis in order to identify an environmentally appropriate and cost-effective solution, as transportation of these materials off-Islands is restricted and few locations are willing to accept this waste. We will continue to work with partners to develop long term options.
- 4.9 Public participation in reducing consumption of plastics, separating recyclable materials for collection, and respecting rules for waste disposal to landfill will be critical for the success of any waste management strategy. Retailer collaboration to reduce packaging at source will also be required. Therefore, a comprehensive public education campaign is proposed, in collaboration with retailers and public advocacy groups. This campaign will support, and build upon, existing community-led initiatives.

5 Options and Reasons for Recommending Relevant Option

- 5.1 Three alternatives have been identified to improve current waste management practices. They range from implementing incremental improvements to respond to immediate public concerns about Eliza Cove landfill, to the development of a comprehensive solution that will deliver a sustainable, environmentally appropriate and collaborative waste management approach for the Falkland Islands.
- 5.2 Option 1 – Improvement to existing waste management practices
 - 5.2.1 Improvements to existing practices can be implemented largely within existing PWD budget allocation for waste management and include:
 - Improved landfill management practices at Eliza Cove, including increasing on-site supervision, improved fencing and limiting hours of operation;

- Enhancing the existing glass recycling programme by expanding the number of drop-off sites in Stanley and increasing handling capacity through the purchase of a new glass crusher;
- Support a public education campaign to encourage consumers to reduce purchase and consumption of single-use plastics. A campaign to raise awareness of appropriate waste disposal at Eliza Cove and Mary Hill will also be implemented.
- Work with retailers to phase out use and sale of plastic straws, cups and single-serve water bottles and to recognise and support their move to more environmentally sustainable packaging options.
- Provide chilled water dispensers in all FIG buildings to phase out availability of single-use bottles.
- Budget for this option is approximately £500,000 and is included in the Public Works budget for 2017-18. Unused budget is proposed to be carried over to 2018/19. Increases in staffing costs have been included in the 2018-19 budget proposal from PWD.

5.2.2 This is the lowest cost option and can be implemented immediately; some actions are already underway. Public concerns about visual pollution at Eliza Cove would be addressed.

5.2.3 Eliza Cove landfill will still require extension or replacement within the next 18 months. Capital costs to build this extension will depend on the scale and specifications of the new site and have not yet been estimated.

5.2.4 Biological waste will continue to be incinerated in an unregulated manner, potentially leading to air emissions concerns in the future.

5.2.5 This option is **NOT RECOMMENDED** as a stand-alone solution, as it delivers cosmetic improvements but does not meet Islands Plan objectives, nor does it address issues of long term environmental sustainability. Materials that could be recycled or used for feedstock will instead be buried. Disposal of hazardous biological and hospital waste will continue to be problematic, as current unregulated incineration practices are maintained. In addition, if FIG continues with its current practices, there will be few opportunities to develop a joint approach with partners such as the MoD and the oil industry, both of whom must adhere to a higher standard of waste management.

5.3 Option 2 – Develop a new, engineered landfill site to accept most waste

5.3.1 Replacing Eliza Cove landfill at the end of its useful life with a new, engineered landfill facility would be a more environmentally sustainable option. The new facility could be developed as an extension to the current site but engineered to meet modern specifications, or could be located at a new site, possibly situated closer to MPC to potentially enable joint waste management between FIG and MoD.

REDACTED. The project would take 2-3 years to complete.

5.3.2 A new landfill would include appropriate lining, leachate controls, venting and other appropriate technical features to ensure better environmental protection. Waste would be compacted in situ and covered with inert material, rather than open burned. Flyaway plastic and odours would be controlled.

5.3.3 All actions recommended under Option 1, paragraph 5.2.1, would still be implemented, creating an immediate improvement to existing practices and improving management of the existing landfill until the new site is operational.

5.3.3 This option is NOT RECOMMENDED as a stand-alone solution. Although it represents a significant improvement over current practices, it is only a partial solution to our wider waste management problem. It does not provide improvements for the disposal of medical/biological or other hazardous waste, and continues the practice of burying materials that could be recycled or used as feedstock for energy production. It is also not in line with international or UK best practices, nor with Falkland Islands public opinion on sustainable waste management.

5.4 Option 3 – Implement a comprehensive waste management strategy - RECOMMENDED

5.4.1 The proposed WMS proposes a phased-in approach that includes immediate improvements to current practices and public education campaigns on reduction at source, as outlined in paragraph 5.2.1, along with differential handling, treatment and ultimate disposal of all waste streams. The WMS proposes the following components:

- Immediate improvements to Eliza Cove landfill;
- Immediate implementation of public education and engagement campaigns on waste reduction;
- Installation of water chillers in FIG buildings and phase-out of single-use water bottles
- Phased-in recycling as described in 5.4.3
- Incineration and heat recovery as described in 5.4.4
- New landfill for non-combustible or recyclable materials as described in 5.4.5
- Development of environmental policies and regulations to ensure safe operations and adherence to accepted standards and best practices.

5.4.2 Detailed capital and operating cost estimates will be developed should this option be selected for implementation, and will depend in part on partnerships with the MoD and/or the private sector, as well as technical specifications for each component. **REDACTED**. There may be opportunities for partial cost recovery through user fees or service agreements.

5.4.3 Recycling will be phased in as markets are identified; the phase-in may be accelerated when collaboration with the MoD is secured. Given current markets for recyclable materials, FIG has identified the following preliminary phase-in schedule:

Year 1-2: Glass

- Enhance glass recycling by establishing multiple ‘bring’ stations at major retailers and other locations;
- Install a new glass crusher for higher capacity and better pulverisation; the crushed glass will be used as fill in road construction;
- Institute public awareness campaigns to influence both householders and businesses to participate in the programme;
- Consider regulation if voluntary participation is limited.

Year 1-3: Tins and cans

- Implement recycling of tins and cans, with separation at source (householder);
- Materials would have to be cleaned before disposal and compacted prior to shipment off the islands;
- To maximise economies of scale when handling and selling recycled materials into secondary markets, collaboration with the MoD and joint use of their recycling plant is strongly preferred.

Year 3 – beyond: Other waste streams

- Investigate costs and feasibility of adding other waste streams, depending on markets, costs and potential for joint handling with MoD.

Disposal of batteries

- Will be investigated separately in conjunction with the MoD to identify the most viable options.

- 5.4.4 Incineration and waste heat recovery, engineered to modern emissions standards, is proposed for all non-recyclable, combustible waste streams including plastics, household waste and cardboard, along with biological/animal waste.

This is the most sustainable solution for most waste streams, given current waste volumes and would require minimal handling. Collaboration with the private sector, including FIMCO, and opportunities to capture waste heat and/or energy-from-waste will be emphasized.

Environmental impacts will be minimised with the appropriate, modern emissions controls. Legislation of appropriate air, water and ash emissions limits will be required.

Installation of appropriately regulated incineration facilities will provide additional opportunities to collaborate with the MoD. There is further potential to provide services to other industries including the oil and cruise ship sectors, which could contribute to partial cost recovery. Additional waste sources will also facilitate the achievement of better economies of scale and more consistent feedstock volumes.

- 5.4.5 Development of a new, shared landfill location outside of Stanley is proposed for all residual waste, including incinerator ash and some building/garden/construction waste. Preliminary discussions with MoD indicate opportunities for a shared site, if it is engineered and operated to acceptable standards. As recycling and incineration would greatly reduce volumes of waste to landfill, the urgency to add new capacity within the next 18 months will be reduced, and the new site can be developed within the next 3-5 years.

There is opportunity to reclaim the current Eliza Cove site over the next 10 years; a proposal for this work will be developed should Option 3 be approved and implemented.

- 5.5 A draft collaboration agreement between FIG and MoD is currently being developed, outlining principles for joint handling and treatment of waste streams.

- 5.6 Development of appropriate and commensurate environmental legislation and regulation is required to ensure that waste management facilities are appropriately developed and operated. These regulations would set emissions limits and clearly define how various waste streams are to be handled and treated to minimise the potential for harm to people and the environment.
- 5.7 Solutions for some handling of some Camp waste streams, in particular batteries and other hazardous waste, will be developed during the implementation of the WMS.

6 Resource Implications

- 6.1 Implementation of the first phase of the WMS, including development of technical specifications and budgets for each element, introduction of enhanced glass recycling and water chillers and delivery of public awareness campaigns can be accomplished with existing staff and capital resources, including the additional staff requested by PWD as part of Budget 2018/19.
- 6.2 Detailed phased budget proposals will be brought forward for consideration in 2018/19, including both capital and operating costs.
- 6.3 Development of legislation may require additional resources.

7 Legal Implications

- 7.1 Development of environmental legislation and regulations will be required if Option 3 is selected. Collaboration with MoD and opportunities for partnership with industry will be limited if FIG does not have appropriate legislation in place.
- 7.2 A decision to continue with landfill as the primary waste solution (Option 1 or 2) may also require some regulation to ensure appropriate disposal of waste.

8 Environmental & Sustainability Implications

- 8.1 The proposed waste management strategy for the Falkland Islands will improve current waste management practices and reduce impacts on the environment. It encourages environmentally sustainable consumer and business choices and will ultimately enhance the Falkland Islands reputation for sustainable environmental management.

9 Significant Risks

- 9.1 The risks of taking no action are largely reputational, both to FIG and to the Falkland Islands. Current practices are unsightly, potentially pose risks to the environment and are unaligned with our international tourism branding. Falkland Islanders are advocating for FIG to provide leadership in implementing environmentally appropriate waste management practices that incorporate the well-established principles of reduce, reuse and recycle, along with sustainable options for handling and treating residual waste.

10 Consultation

10.1 Consultations have been carried out previously with the public, MLAs, the Environment Committee, retailers, industry and the MoD. Further consultation on preferred recycling collection methods and willingness to pay for improved practices may be conducted as roll-out details are developed.

11 Communication

11.1 A detailed public education and awareness campaign is proposed, with specific messages dependent on the option chosen. FIG will collaborate with stakeholder groups, retailers and the MoD to develop consistent and effective messages.



Policy and Economic Development

Falkland Islands Government

ExCo 30-18 Appendix 1

Waste Management Strategy

May 2018

Policy and Economic Development Directorate
Environment Unit

1.0 Introduction:

This document proposes a waste management solution for the Falkland Islands to sustainably manage all municipal solid waste and identifies various options as to how waste on the islands can be managed. It does not identify locations for any waste handling, landfill or treatment sites nor does it identify specific technological solutions; instead, it provides an overview of the different options available, identifies an optimum approach and allows flexibility for implementation.

Any waste management solution for the Falkland Islands must deliver significant public benefit, including:

- Sustainable waste management, leading to a reduction in waste;
- Protection of public health and amenity;
- Protection of the natural environment;
- Enhancement of international reputation;
- Cost effective and appropriate waste handling infrastructure.

Improvements to waste management practices is a stated priority for Members of the Legislative Assembly and is included in the 2018-2022 Islands Plan.



2.0 Executive Summary

- 2.1 An overview of current waste management practices identified several issues that must be addressed to achieve long-term sustainability. There is no FIG-wide waste management strategy or long-term plan and although current practices are convenient to the public there is a growing public concern over the environmental unsustainability of practices.
- 2.2 At present, residential waste is collected weekly at kerbside for disposal at the Eliza Cove landfill site, where it is open-burned to reduce volume. Commercial and industrial waste disposal is the responsibility of the individual companies and most waste is delivered to the Eliza Cove landfill site.
- 2.3 Currently the only waste reduction initiatives are a retailer-led plastic bag reduction programme, and a grassroots campaign to reduce consumer purchase of single use plastics (the Wise Waste Group).
- 2.4 FIG currently operates a glass recycling programme, but its scale is limited and the glass crushing equipment is no longer fit-for-purpose.
- 2.5 Constraints on implementing environmentally sustainable waste management solutions have included higher costs and the perceived willingness of both FIG and the public to pay for treatment and/or recycling, as well as limited labour supply and expertise. The geographic remoteness of the islands, together with the small quantities of waste available for recycling or as feedstock for an energy-from-waste facility, limits waste treatment options.
- 2.6 Three options with respect to an overarching waste management strategy were identified including 1) making modest improvements to current waste management practices; 2) improving landfill facilities; and 3) adopting a differential waste handling and treatment strategy. The third option is recommended as it provides a comprehensive, long-term approach that will facilitate the treatment of various waste streams in an environmentally-appropriate manner that is proportionate to the context of the Falkland Islands.
- 2.7 Collaboration with the Ministry of Defence (MoD) at Mount Pleasant Complex is proposed as a preferred, cost-effective solution to make joint use of current and new waste management infrastructure wherever possible. While FIG can pursue all components of these options on its own, it would likely make recycling options less certain and energy-from-waste more costly.
- 2.8 Waste handling and treatment components include:
 - Phased-in recycling of some waste streams. Comprehensive recycling of reusable materials faces a number of challenges including the low volumes produced and the scarcity of suitable markets for these materials. Therefore, an incremental

approach is proposed, prioritising the recycling of materials with higher market value (tins/cans) or that which can be reused on-Islands (glass).

- Incineration is proposed for all combustible materials, as it represents the most economically and environmentally feasible approach. Appropriate technology, with robust emissions controls, will be specified. However, disposal of fly ash to landfill will still be required.
- There will be a requirement for a modern landfill site, engineered to standards that are an improvement over current practice. Landfill remains necessary to dispose of residual waste that cannot be incinerated or recycled, as well as by-product from incineration.

2.9 As summarised above, an integrated, phased-in approach is proposed to achieve immediate improvements, leverage collaboration across both private and public sectors and ensure that the Falkland Islands' waste management strategy provides flexible and scalable solutions that are fit for the long term. Figure 1 provides an overview of the differential approach.

As detailed in Section 5.0, specific components to be implemented over the next five years include:

- Public Education and Engagement in Waste Reduction
- Immediate improvements to current waste management as an interim measure
- Collaboration with the MoD, business community and oil industry
- Creation of appropriate policies and legislation for cost-recovery and to set environmental standards
- Phased-in and partial recycling of waste
- Incineration and heat recovery of combustible and non-recycled waste
- A new modern landfill to handle non-combustible residual waste

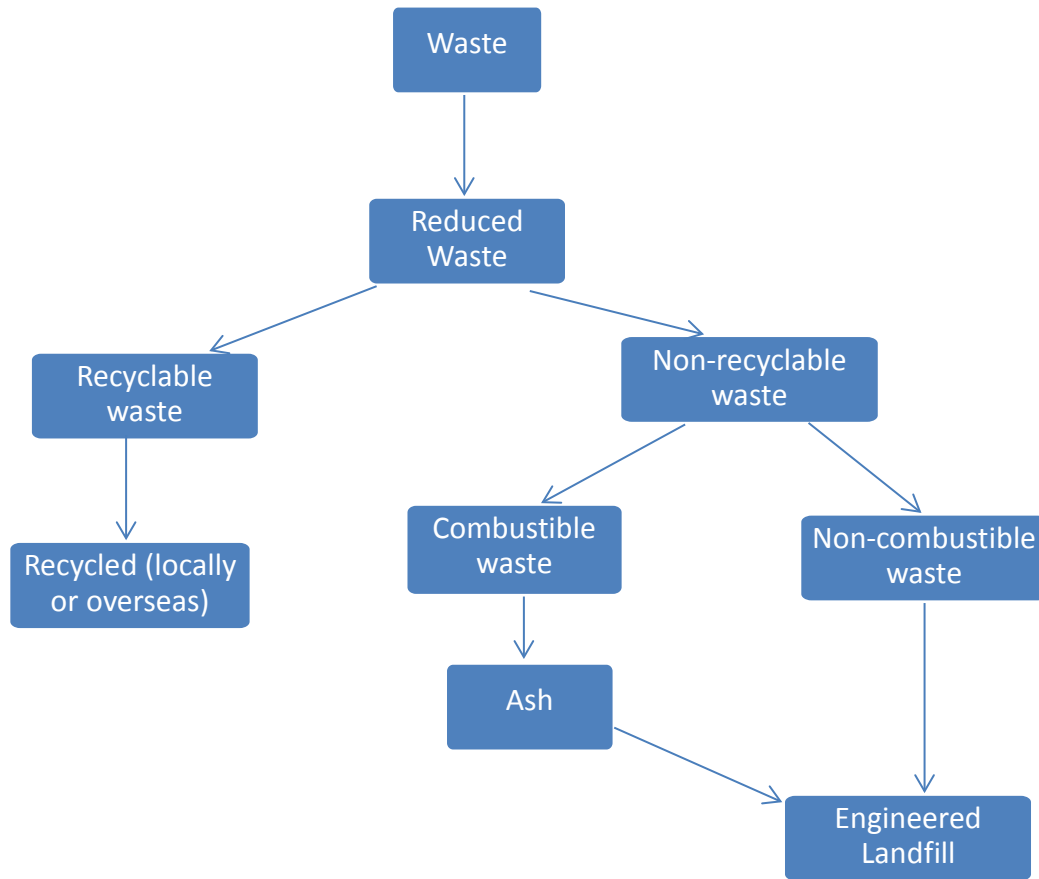


Figure 1: Summary of proposed differential waste handling approach

3.0 Background

Current Situation

- 3.1 Current waste management for Stanley is both basic and low cost. All plastics, tins and cans, food waste, construction and gardening waste are brought to the Eliza Cove landfill site, where it is bulldozed and open-burned to reduce overall volumes. Supervision of the site is minimal, with unrestricted public access and little control over materials entering the landfill. There is a separate storage site for batteries at Eliza Cove.

Unsegregated household waste is collected weekly at kerbside and brought to landfill. Small appliances, batteries, yard waste and household chemicals are often included, although in theory, householders are responsible for their separate disposal at alternative sites.

Collection and disposal of commercial, construction and industrial waste is the responsibility of the businesses; most waste is privately collected and deposited at Eliza Cove.

A limited glass recycling programme is operated by FIG's Public Works Department (PWD). There is a single collection point behind the Town Hall and glass is periodically fed into an imploder. Imploded glass is used for trench-fill and in construction, but the current equipment cannot handle increasing volumes and does not produce materials of appropriate size for the intended use.

At current disposal rates, it is expected that Eliza Cove landfill will require expansion within the next 18 months.

- 3.2 Metal (including vehicles) and inert waste are supposed to be brought by businesses and households to the Mary Hill Quarry landfill site. Spoil can also be dumped at Mary Hill, to the east of the quarry.
- 3.3 Waste oil is collected and stored at Mega Bid. Biological waste is currently handled through an incinerator located at FIMCO.
- 3.4 The British Forces military complex at Mount Pleasant (MPC) currently operates a separate and independent waste management programme, including an existing landfill that is nearing capacity.
- 3.5 In recent years, an industry-led initiative to reduce plastic bag consumption in the Falkland Islands through the imposition of a 5p charge has enjoyed widespread public support and resulted in a reduction in the number of new plastic bags provided by

retailers. Other industry-led initiatives include a recent programme by a few retailers to collect used plastic and styrofoam food containers, and the use of alternative packaging by some retailers and restaurants.

FIG and its partner Morrison Construction have recently implemented practices to separate wood and metal from construction waste to encourage reuse.

- 3.6 Existing practices are convenient and low cost, but have resulted in increasing public concerns about how waste is managed. Open burning and flyaway plastic at Eliza Cove have resulted in an unsightly appearance and the possibility that plastics can inadvertently enter the ocean. Lack of segregation and recycling has led to public concerns about sustainability and about the Falkland Islands' reputation as a strong environmental steward where "nature is in charge".

In addition, the Falkland Islands does not have adequate pollution control legislation to ensure safe operations of incineration and other waste treatment operations, nor to control potential environmental impacts.

- 3.7 Research conducted in 2015-16 by the FIG Waste Management Coordinator estimated that approximately 4500Mt of waste are produced each year and enter into the Falkland Islands waste stream. An additional 1600Mt per year is estimated to be produced at MPC.

Constraints

- 3.9 Costs associated with enhanced waste management practices, including additional waste handling, recycling and/or treatment, are expected to exceed any potential revenues from the sale of recycled materials or reductions in heating/electricity costs achieved from energy-from-waste options. Increased costs could be partially or wholly offset by increased residential service charges, landfill tipping fees and/or government subsidisation.
- 3.10 There is only a limited labour force available in the domestic economy for enhanced waste handling, with a population of 3,136 and less than 1% unemployment. Suitable technical expertise to design, install, maintain and operate facilities is also limited.
- 3.11 Proposed solutions must consider the geographic remoteness of the islands, which limits potential markets for recycled materials. Climatic conditions also limit the feasibility of some options such as composting or aerobic digestion.
- 3.12 Quantities of waste produced across all streams are small and limit opportunities to achieve economies of scale from recycling or energy-from-waste solutions. Growing

international reluctance to accept recyclable waste materials from other countries also limits market options.

- 3.13 For any integrated waste management solution to work within the Falkland Islands, public willingness to change consumption and disposal behaviours will be required, as will be willingness to accept higher costs.

4.0 Waste management alternatives

- 4.1 Following research by the Waste Management Coordinator and analysis of options for feasibility, applicability and affordability, three alternative approaches were identified to address the Falkland Islands' waste management issues. These strategies focus on delivering waste management solutions for Stanley; integration of some Camp waste streams will be considered in the future. Options for the safe disposal of hazardous materials, such as batteries, will need to consider both Stanley and Camp, and will be developed in later phases of the Waste Management Strategy.

Alternatives A and B represent lower cost options that are appropriate for the Falkland Islands but do not address underlying issues of environmental stewardship and long term sustainability. Alternative C is comprehensive, incorporating actions from both A and B, as well as recycling, incineration and regulation, to provide an environmentally sound approach.

- A. Improvements to existing waste management practices
- B. New, engineered landfill site
- C. Comprehensive and differential waste management

A. Improvements to existing waste management practices

- 4.2 At the most pragmatic level, changes can be made to current landfill management practices at Eliza Cove and Mary Hill. These would include allowing only supervised public access during defined opening hours, instituting practices to reduce visible plastic and trash and immediately commencing planning to expand the existing site. However, this solution does not address issues of environmental sustainability, nor will it encourage responsible consumer behaviour to lead to reduction of waste at source.
- 4.3 These improvements can be made alongside existing FIG plans to incrementally improve environmental practices in Stanley:
- Planned installation of new glass crushing capacity and increase in the number of glass recycling locations ('bring' sites).
 - Planned installation of water chillers in FIG buildings and low/no cost distribution of refillable bottles at schools and other locations.

- Support for public awareness campaigns to reduce the purchase and use of single-use plastics, and for retailer-led initiatives.

4.4 Notwithstanding these actions, expansion of the existing Eliza Cove site will be required within the next 18 months.

B. Development of a new, engineered landfill site to accept most waste

4.5 In addition to the actions proposed above, this alternative recognises that the imminent need to expand existing landfill provides an opportunity to improve waste disposal practices to international standards.

4.6 A new, modern engineered landfill facility would improve waste management practices and reduce environmental impacts. A facility designed with appropriate lining, leachate control and venting, with enhanced operations including compacting of waste and controlled public access, would be capable of receiving most waste streams generated by the Falkland Islands.

Opportunities to collaborate on design, construction, operation and/or use of the facility with other major waste producers such as the Ministry of Defence (MoD) at Mount Pleasant Complex (MPC) could help to improve cost effectiveness and reduce duplication of infrastructure. However, solutions would still be required for hazardous and biological waste and responsible consumer behaviour would not be encouraged.

An engineered landfill solution will be costly and will require ongoing operating costs. If it is located outside of Stanley, additional transportation costs will be incurred. Landfilling of most waste will result in limited combustible waste available as feedstock for incineration, which may increase the costs of handling biological waste and limit opportunities for waste heat recovery.

C. Implementation of a differential waste handling and management strategy

4.7 Differential waste handling includes the identification and segregation of waste streams at source, for diversion to appropriate treatment streams. This approach allows for the implementation of different solutions that are appropriate to the characteristics of each category of waste material, as well as market and cost factors. In the case of the Falkland Islands, it is proposed that the differential solution will include reduction at source, recycling of some waste streams, incineration of most combustible material and landfilling for residual waste where no other option exists.

The actions outlined in Alternative A would also be implemented.

5.0 Recommendations – Implementation of differential waste management

1. Public Engagement: Sustainable waste management rests first and foremost on a partnership between consumers, businesses and government to reduce waste – whether from over-packaging, single-use products or other sources. Re-use is the next most sustainable solution, and it is one in which many Falkland Islanders are actively engaged. Recycling of materials that can no longer be reused in their original form is the third pillar, with responsible disposal of residual materials the fourth. Both recycling and changed disposal methods will require both government leadership and the changing of individual habits and behaviours.

As a first component to the WMS, FIG would launch a public education campaign to increase public engagement in waste reduction and responsible waste disposal. This government-led waste reduction initiative would be conducted with citizen groups and retail partners to raise public awareness and encourage individuals and businesses to make smart consumption choices.

Government would lead by example and would aim to provide tools that empower people to be part of the solution. We would work together with the private sector to provide information to consumers on what is already being done to reduce over-packaging and move to biodegradable options.

In collaboration with stakeholders, we propose to set targets for phasing-out or reduction of specific products such as single-use beverage containers, plastic straws, plastic cotton buds and Styrofoam. Reusable alternatives, such as providing water chillers and refillable bottles in FIG buildings will be identified and implemented.

2. Collaboration: with the Ministry of Defence at Mount Pleasant, business community and the oil industry to identify all possible areas of joint waste handling and disposal to create economies of scale wherever possible and avoid duplication of infrastructure and services. Energy recovery from incineration is made more viable with larger feedstock (waste) volumes. Cost recovery through fee-for-service may be possible.

It may also be possible to implement reciprocal agreements with the MoD, such that FIG would develop some waste management infrastructure and MoD would develop other components, to achieve an integrated solution.

Opportunities to encourage private sector development or operation of waste management infrastructure should be explored – either through contract or public-private partnerships.

3. Appropriate policies and regulation: to ensure that waste management is accomplished in an environmentally sustainable manner that is proportionate to the unique circumstances of the Falkland Islands. In particular, improved landfill and energy-from-waste technologies require air, water and ash emissions standards to ensure no harmful residual emissions.

Global best practices also suggest that implementing some form of user-pay policy is effective in encouraging both households and businesses to practice sustainable consumption and waste disposal. Policy options will be investigated to ensure that proposals are fair and do not cause undue financial harm.

4. Phased-in and partial recycling. A phased-in approach will allow the development of infrastructure and operations, as well as identification of eventual export markets where appropriate. Materials that do not currently have viable markets will be incinerated, but these waste streams could be added to recycling at a later date should this become economic. Details are outlined in Section 6.
5. Incineration and heat recovery or energy-from-waste: of all combustible and non-recycled materials. Most waste streams can be incinerated including plastics, household waste and cardboard. Incineration has a high potential for waste heat capture which could allow energy-from-waste options to be explored.

Incineration is currently the most sustainable solution given the limited waste volumes generated in the Falkland Islands and would require minimal waste handling. With appropriate, modern emissions control technology, the environmental impact is minimal provided that the incinerator is properly sized, specified, engineered and maintained. Appropriate legislation and monitoring will maintain both environmental and public health standards.

6. New landfill site for residual waste and ash. There will always be residual waste which cannot be recycled or incinerated. Options exist to site a new landfill at adjacent to the current Eliza Cove site or at a new location outside Stanley. Ideally, the comprehensive waste management strategy would relocate the landfill away from Stanley Common, allowing for the reclamation of the current site. Regardless of location, a new landfill would incorporate modern features such as lining, compacting and covering.

6.0 Differential waste handling and management – waste streams

6.1 Proposed treatment for each waste stream is outlined below:

Material	Immediate Actions proposed (2018-19)	Expected longer term solution (2019-2023)
Glass	<ul style="list-style-type: none"> - Increased collection sites - New glass crusher - Reuse materials for road construction - Public education campaign 	<ul style="list-style-type: none"> - No change
Tins and cans	<ul style="list-style-type: none"> - Develop collaboration protocols with MoD for recycled materials handling - Identify and secure export markets for recycled materials 	<ul style="list-style-type: none"> - Public education campaign to clean and segregate tins and cans Set up for segregation at source (separate recycling for householder and commercial users) - Compacting and warehousing of compacted tins and cans - Joint disposal programme with MoD

Material	Immediate Actions proposed (2018-19)	Expected longer term solution (2019-2023)
Plastics	<ul style="list-style-type: none"> - Improved landfill and waste management practices at Eliza Cove - Public education to reduce consumption at source - Campaign with commercial/ construction companies to responsibly dispose of packaging materials - Collaboration with retailers to reduce packaging or implement non-plastic options - Installation of water chillers in FIG facilities - Collaboration with retailers to phase out single use plastics such as straws, cups, water bottles and cotton buds. 	<ul style="list-style-type: none"> - Incineration of all plastic waste with appropriate regulation - Should market prices recover and export options become available, plastics can be recycled in the future.
Paper/cardboard	<ul style="list-style-type: none"> - Improved landfill and waste management practices at Eliza Cove - Campaign with commercial users and FIG to segregate for use in existing incinerator 	<ul style="list-style-type: none"> - Incineration of all paper/cardboard waste with appropriate regulation
Organic household waste (ie food)	<ul style="list-style-type: none"> - Improved landfill and waste management practices at Eliza Cove 	<ul style="list-style-type: none"> - Incineration with appropriate regulation
Biological hazardous waste	<ul style="list-style-type: none"> - Continue as current 	<ul style="list-style-type: none"> - Incineration with appropriate regulation
Waste oil	<ul style="list-style-type: none"> - Continue as current 	<ul style="list-style-type: none"> - Use as fuel for incineration
Yard/garden waste	<ul style="list-style-type: none"> - Continue as current 	<ul style="list-style-type: none"> - New, engineered landfill
Building/construction waste	<ul style="list-style-type: none"> - Continue as current 	<ul style="list-style-type: none"> - High temperature incineration waste with appropriate regulation
Metals	<ul style="list-style-type: none"> - Continue as current with Mary Hill site 	<ul style="list-style-type: none"> - Investigate disposal options to transport out of Islands where appropriate - New, engineered landfill
Batteries	<ul style="list-style-type: none"> - Disposal as current - Collection from Camp locations as required 	<ul style="list-style-type: none"> - Investigate long term solutions for transportation off-Islands or other options
Ash from incineration	<ul style="list-style-type: none"> - n/a 	<ul style="list-style-type: none"> - New, engineered landfill

7.0 Differential Waste Handling and Management – Component Analysis

7.1 Component 1 - Recycling

- 7.1.1 Several options for a successful recycling initiative were considered. Currently, glass can be recycled, crushed and used in road construction. However, no recycling facilities for other materials exist in the Falkland Islands, nor have export markets been identified. While collaboration with MPC is the preferred option to achieve some economies of scale and better access to markets, recycling can be implemented by FIG acting alone if necessary.
- 7.1.2 In addition to glass, potential recyclable material includes tins, aluminium cans, paper, cardboard and some plastics. While markets currently exist for higher value materials such as tins and cans, prices for other materials do not currently support recovery and some recyclables (such as plastics) have increasingly limited markets. The cleanliness of the recycled materials and the volumes available from the Falkland Islands will influence both their value and buyer interest.
- 7.1.3 Segregated collection of recycling streams can be accomplished through kerbside collection or at dedicated recycling sites. Households and businesses can be asked to separate and clean their recyclables before disposal, or separation and cleaning can occur at a dedicated recycling plant at FIG expense.
- 7.1.4 In order to achieve best prices for some materials, it is required that they be cleaned to particular standards. This is difficult to achieve if left to individual consumers and businesses. However, the shortage of both skilled and general labour in the Falkland Islands would suggest that operating a dedicated recycling plant to separate and clean waste materials would be costly.
- 7.1.5 Kerbside collection adds additional costs, as recycling requires collection separate from general waste – possibly requiring two pickups per week; collection of multiple segregated waste materials may require compartmentalised refuse lorries. Requiring consumers to bring recycled materials to dedicated recycling sites is more cost effective to FIG, however, voluntary compliance is more inconvenient and unlikely to result in sufficient diversion of waste.
- 7.1.6 Regardless of where separation, cleaning and collection occurs, a compacting and storage facility will be needed. There is an opportunity to share infrastructure with the MoD, but this will require that materials arriving from Stanley are to the same cleanliness, contamination and segregation standards. Materials will have to be transported from Stanley, which is an additional expense.
- 7.1.7 Successful recycling in the Falkland Islands will face singular challenges due to geographic isolation and the small volumes generated for each waste stream. Markets for some materials are limited and transportation costs could be prohibitive even if a market is found. Transportation itself is not environmentally neutral and will increase our carbon footprint.

- 7.1.8 It is proposed, therefore, to implement a limited recycling programme, beginning with glass, with the possibility of adding additional materials in the future should market conditions change.
- 7.1.9 A comprehensive glass recycling initiative can be implemented in the short term, as this material can be crushed and reused in the Falklands, making its segregation and recycling cost effective. Increasing the number of recycling locations to improve convenience and implementing a sustained public education campaign to encourage recycling of glass will support the success of this initiative and encourage public participation.
- 7.1.10 Recycling of tins and cans would be implemented as a next step in the programme, as global markets for these products exist and prices are relatively robust. However, challenges related to volumes and transportation must be overcome. Collaboration with the MoD to consolidate recycled materials, identify and secure markets and transport product out of the Falklands will be important to improve the viability of recycling.

7.2 Component 2 – Incineration

- 7.2.1 Given the composition and volumes of waste in the Falkland Islands, an appropriately regulated and specified incineration facility, with or without energy recovery, is identified as a feasible and sustainable waste management solution. Incineration will reduce the need for landfill and will provide a more comprehensive solution for all combustible waste streams including, with appropriate emissions controls, plastics and biological materials from FIMCO and the hospital.
- 7.2.2 It is recommended that waste heat recovery be incorporated into the incinerator design, with the energy generated used to provide electricity or heat for stand-alone operations such as FIMCO or a new greenhouse facility. The feasibility of this approach will depend, in part, on consistency of feedstock, both in volume and caloric value, and it is likely that additional fuel will be needed to maintain incinerator operation. Feasibility will also depend on opportunities to partner with other major waste producers such as the MoD and a future oil industry.
- 7.2.3 Ash is a by-product of incineration and will have to be transported to landfill.
- 7.2.4 Successful implementation of incineration will require appropriate environmental regulation and pollution control standards for emissions to air, water and soil. Monitoring protocols may also be required.
- 7.2.5 Incineration and energy recovery could be developed in partnership with the private sector.

7.3 Component 3 - Landfill

- 7.3.1 Some landfill will be required under in any waste disposal strategy, as there are some residual waste streams that cannot be recycled, reused or combusted. Successful diversion strategies will influence both the size of landfill required and how long it can be expected to last. Modern landfill design will incorporate compacting and

covering of this residual waste, as well as access control, reducing negative impacts experienced at the current site.

7.3.2 The new landfill could be located at a site outside of the Stanley Common, particularly if used jointly for waste from Stanley and MPC. This would be the eventual restoration of the current landfill site at Eliza Cove.

7.3.3 As noted, development of a new engineered landfill site to accept all waste can also be considered as a stand-alone solution to better waste management for the Falkland Islands. While this would represent a significant improvement over current practices, some public concerns about environmental stewardship and sustainability would likely remain.