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High Solids Anaerobic Digestion Facility (HSADF)
Digestate Screening & Mixing System
Business Case

Facility Planning & Design | Infrastructure Planning & Design

City of Edmonton

Capital Profile: CM-81-0005 for Planning & Design

Standalone profile to be created

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Project Sponsor: Shannon Fitzsimmons

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TABLE OF CONTENTS

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1. Executive Summary

1.1. HSADF Digestate Screening & Mixing System

The High Solids Anaerobic Digestion Facility (HSADF) at the Edmonton Waste Management Centre (EWMC) was fully commissioned in 2021, and was designed to process up to 40,000 tonnes of a combination of source separated organics (SSO) and the mechanically separated organic fraction of municipal solid waste (OFMSW). The HSADF uses microorganisms to degrade organic waste without oxygen in enclosed controlled fermentors (digesters), and produces biogas and a nutrient rich semi-solid digestate. This digestate is further processed in the HSADF aeration boxes and compost is produced as an end product.

During the design phase of the High Solids Digestion Facility (HSADF) many important process steps of the HSADF were shared with the ECF (Edmonton Composting Facility) in an effort to reduce the overall capital cost of the original HSADF design as compared to a completely stand-alone facility. The demise of the ECF has forced the investment of a number of projects in order to maintain the operability and regulatory compliance of the HSADF. The digestate screening and mixing system is one such project.

The digestate screening and mixing system consists of installing two screeners and two mixers (option 4) in the HSADF to remove nonorganic foreign materials (trash) and excess moisture in order to achieve a (more) marketable compost. This project will also eliminate the current problem of littering by nonorganic fraction (trash) at the compost cure site and neighbouring land. In addition, this project will also allow the reuse of two-thirds of the woodchips back into the process, and resulting in the reduction of usable material to landfill.

The majority of the planning and design work has been completed by the Infrastructure Planning and Design Branch in the IIS Department for the HSADF Digestate Screening and Mixing System project. The project is nearing Checkpoint #3 and the type of screening and mixing equipment needs to be finalized and ordered prior to moving into detailed design. For this, budget approval is needed to proceed.

It is recommended by the project team that this Business Case be approved and proceed to the Utility Committee for Capital Expenditure (Funding Approval) of $5.8 million within the 2023-2026 budget cycle. If the capital expenditure is approved, the project will proceed to the detailed design phase, followed by the build phase for completion in 2023/2024.

2. Profile Background

2.1. Problem / Opportunity and Current Situation

In the original design, the HSADF digestate was sent to the Edmonton Composting Facility (ECF) for composting and final screening in the finishing circuit. There is currently no digestate

screening after the deconstruction of the ECF. Presently, the HSADF digestate is sent directly to the EWMC Cure Site for compost curing. The plastic waste contained within the digestate causes littering issues around the EWMC Cure Site including neighbouring land. Photo 1 below shows the digestate from the HSADF as it arrives at the cure site.

Photo 1 - HSADF digestate at the cure site (Geoware Material Type 381)

The plastic waste also reduces the quality of the compost. As a result, the compost is currently only being used as alternative daily cover (ADC) for landfilling because it does not reach the quality level to have other uses. This compost usage results in a cost to Waste Services for disposal. Photo 2 below shows the cured digestate at the cure site screened to 1.5 inches which is the maximum permissible size for use as alternative daily cover.

Photo 2 - Cured digestate screened to 1½" at the cure site (Geoware Material Type 318)

Further, there is no opportunity for the separation of woodchips and plastic waste from the digestate at the HSADF. Currently most of the plastics and the woodchips are removed together at the cure site after final curing with no further opportunity for separation. The residuals or overs (woodchips & plastics) are sent to landfill at considerable cost and ideally, the woodchips can be reused, resulting in better diversion from landfill. As seen in Photo 3 below, the residual pile consisting of woodchips and plastic removed from the digestate is currently all sent to landfill.

Photo 3 - Residuals (wood & plastic) from the 1½" screen (Geoware Material Type 307)

As previously mentioned, the plastic in the digestate creates a litter problem on the EWMC Cure Site, and therefore outside the EWMC site when the wind blows and the piles are agitated. The spread of nuisance film plastic to neighbouring sites is an environmental concern, a regulatory compliance concern and a financial liability that will be addressed by implementing this project.

Photo 4 - EWMC Cure Site looking out to an adjacent wetland

Photo 4 is a June 2022 picture from inside the EWMC Cure Site, looking out through the fence to the neighbouring wetland. While some plastics are captured by the fencing, additional garbage in the wetland is present but obscured by the new, tall summer vegetation.

Photo 5 - EWMC Cure Site fenceline (upper portion) with wetlands in lower ⅔ portion

To further emphasize the need for the mixing and screening system within the HSADF, Photo 5 shows the litter issue outside of the EWMC Cure Site. Significant amounts of garbage can be seen south of the EWMC fenceline in the wetlands waterway in this April 2022 overhead drone picture.
In summary, this project proposes to reduce nuisance trash impacts at the EWMC and its neighbors, while simultaneously reducing the amount of woodchips sent to landfill.

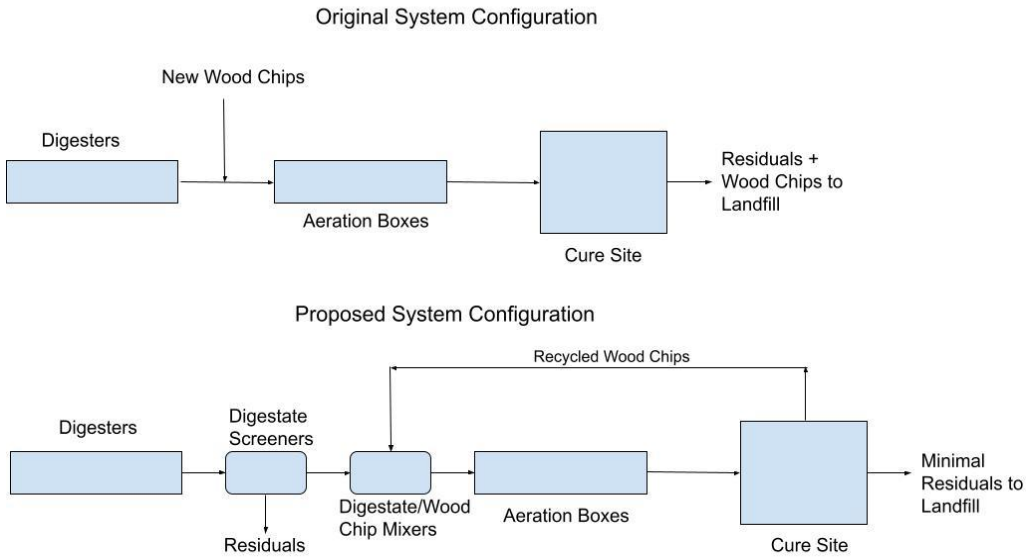
3. Profile/Initiative Description

3.1. Initiative Description

The project includes the procurement, design integration, installation and commissioning of the HSADF screening and mixing system. The screening and mixing system (option 4) will include two screeners, two mixers and auxiliary equipment such as conveyors. This new system will remove at least 95% of the plastic contamination in the digestate, as well as reduce moisture and improve digestate quality. As shown in Figure 1, the digestate will be screened and mixed through the new processing system prior to going into the aeration boxes. Woodchips screened at the cure site can then be recycled back into the process. The system should maintain or improve the current facility throughout and be handed over to operations "turn-key". As a result, integration of all new and modified equipment with existing systems and controls, identification and supply of spare parts after commissioning, as well as obtaining all necessary operation and maintenance turnover documents for the new equipment are all incorporated into this project's scope of work.

With the recommended option 4, the overall project completion is expected by the end of 2023 with a total capital cost of $5.8 million and operational costs of $3.2 million over its lifespan.

Figure 1: Original System vs. Proposed System Configuration



3.2. Initiative Justification

The Digestate Screening and Mixing System project will resolve the City's current plastic pollution liability at the EWMC Cure Site and help expand the City's organic waste processing capacity. Status quo or doing nothing is not a practical option as continued cure site littering is considered a significant environmental problem and a potential regulatory non-compliance that can't be ignored. Furthermore, regular and continuous manual litter cleanup from the EWMC Site and adjacent properties (including most notably the wetland directly south of the cure site) is not considered a viable option.

Screening and mixing the digestate at the HSADF will enable the City to:

- Maintain site environmental compliance by eliminating the litter issue at the cure site.
- Increase organics diversion from landfill, and contribute to the City's climate goals.
- Contribute to continuous improvement of the EWMC Site organic waste processing capacity.

3.3. Urgency of Need

Current Project Progressing Stage:
The concept design has been completed. In order to progress to detailed design (design development and working documents), the equipment supplier is required, therefore funding approval is needed.

Urgency of Need:
Checkpoint #3 readiness approval is dependent on the funding approval. The target project completion date is Q4 2023 assuming all project milestones are achieved on time.

3.4. Anticipated Outcomes

Primary outcomes and benefits of implementing this project include:

- Significantly reduce the amount of nuisance film plastic litter from being dispersed from the cure site, reducing City environmental and reputation risks.
- Reuse ⅔ of the woodchips rather than disposing after a single use, slightly increasing site diversion.
- Efficiently mix woodchips with HSADF digestate.

Secondary outcomes and benefits include:

- Reduce overall curing times, slightly increasing site capacity.
- Automate a currently manual process, avoiding 1.75 FTE growth.
- Improvement of compost quality.

3.5. Scope

The scope of the complete project, including the development and delivery phases is summarized as follows:

- System engineering and design.
- Supply and installation of digestate screening equipment, digestate and woodchip mixing equipment and related components.
- Required electrical and controls.
- Integration of the new equipment into the existing HSADF process and control system and full commissioning of the new equipment system within the existing facility.

A more detailed scope of work is highlighted in the goals below:

Goal 1: To design, procure, install, and commission two digestate screeners with capacity of approximately 40 tonnes/hour each, including:

- Digestate screeners to reliably remove plastic debris from fresh digestate.
- New screeners and all associated drives, electrical, controls, and instrumentation to

support the installation of the new screeners.
- Structural steel to support new screeners and/or concrete modifications to support the new equipment.
- New conveyors, piping, chutes, etc. required to support the screening system operations.
- Each screener to be capable of operating independently with capacity to process the full volume of digestate. The second screener is to act like a spare.
- Design consideration for reliable operation, ease of maintenance, and ease of operation

Goal 2: Design procure, install, and commission two digestate/woodchip mixers:
- Mixers capable of reliably mixing digestate and woodchips, each with capacity to keep up with screener output.
- New mixers and all associated drives, electrical, controls, and instrumentation to support the installation of the new mixers.
- Structural steel to support new mixers and/or concrete modifications to support the new equipment.
- New conveyors, piping, chutes, etc. required to install the mixers.
- Each mixer is capable of operating independently, with capacity to process the full volume of digestate with the second mixer acting like a spare.

Goal 3: Integration of the above equipment identified in Goal 1 and Goal 2 together as a system with integration into the existing control system.

3.6. Out of Scope

The scope of this project does not include the following:
- Any HSADF improvements or upgrades beyond the scope of work listed above.
- The HSADF site woodchip storage facilities.
- Any additional but necessary scope items that may be identified after the original scope is finalized.

3.7. Critical Success Factors

Critical success factors include:
- The ability to generate a higher quality compost, while meeting safety and environmental requirements.
- To provide a screening and mixing system that integrates into the current process and that is adjustable to account for potential changes/increases of the feedstock.
- Deliver the project on-time and on-budget to mitigate inflation and cost escalation risks.
- Approval of this capital profile from City Council.

The following list of deliverables will be achieved by the project along with any acceptance criteria that will be used to evaluate the success of the results achieved.

Deliverable	Acceptance Criteria
Checkpoint 1 - Readiness Criteria and Handover Package	Plan and Check Approval by Business Partner Lead, Direct Supervisor, IIS Project Manager & Direct Supervisor Approved by Project Sponsor **Outcome**: Deliverable accepted.
Project Scope	Reviewed by Project Team. Reviewed and approved by the Project Sponsor and Business Partners. **Outcome**: Deliverable accepted.
Consultant(s) Procurement Consultant(s) Evaluation / Award	Reviewed and approved according to procurement and IIS Standing Arrangement guidelines and requirements. **Outcome**: Consultant was procured and will continue with the project upon approval.
Project Schedule Development	Realistic and achievable schedules. **Outcome**: The schedule will continue to be reviewed and updated based on the long lead items.
Risk Register	Developed and reviewed by Project Team. **Outcome**: Project risks were analyzed and reviewed by Project Team, the Risk Register will keep being updated when new risks are identified.
Concept Design Package	Reviewed by Project Team and Business Partners. **Outcome**: Deliverable accepted and approved.
Project Class 4 Cost Estimate (by Consultant) for the Delivery Phase (Checkpoint #3-5)	Reviewed by Project Team and Business Partners. **Outcome**: Deliverable accepted in April 2022.
Approval by Alberta Environment and Parks	If required.
Checkpoint 2 - Readiness Criteria and Handover Package	Plan and Check Approval by Project Review Team, Lead Project Manager and Supervisor; Approve by Director **Outcome**: Deliverable accepted and approved.
Development Design Package Equipment Specifications	Reviewed by Project Team and Business Partners Comments are addressed to the City's satisfaction.

	Outcome: Deliverable accepted but will be updated upon project approval.
Checkpoint #3 - Readiness Criteria and Handover Package	Plan and Check is ready for Approval by Project Review Team, Project Managers and Supervisors and Directors both from Facility Planning and Design Section and Facility Delivery Section within IIS Department for the project Handover **Outcome**: Pending on project handover approval; Pending on Delivery Phase Budget approval by Utility Committee and City Council.
Detailed Design Package Issue for Tender (IFT) Drawing and Specification Packages	Review by Project Team, Business Partners, IIS Engineering Services team, Cost Estimate Consultant (if required). Comments are addressed to the City's satisfaction. **Outcome**: Pending on prerequisites.
Project Class 1 Cost Estimate (by Consultant)	Review by Project Team, Business Partners, and the Delivery Phase Lead Project Manager **Outcome**: Pending on prerequisites.
Checkpoint #4 - Readiness Criteria and Handover Package	Plan and Check Approval by Project Review Team, Project Manager, Supervisor and Director from Facility Infrastructure Delivery, IIS. **Outcome**: Pending on prerequisites.
Construction	Lead by Facility Infrastructure Delivery Project Manager. Delivery method yet to be determined. **Outcome:** Pending on prerequisites.
Final Product, training, O&M manual, As-Built drawings	Product meets Goals identified in this document including: *A digestate screening system consisting of two separate screeners and two digestate/woodchip mixers complete with all ancillary equipment, structural, electrical, and controls.*
Checkpoint #5 - Readiness Criteria and Handover Package	Plan and Check Approval by Project Review Team, Project Manager, Supervisor and Director Authorization for Project Closeout. **Outcome:** Pending on prerequisites.

4. Strategic Alignment

This initiative contributes to the overall City of Edmonton strategic direction and to corporate and departmental business plans, including Connect Edmonton: Vision 2050. This contribution is made by demonstrating leadership in waste management and processing standards, and by increasing the diversion of residential and non-residential waste from landfill. Below are strategies, business plans and policies that support this project:

City of Edmonton Environmental Policy C512	**POLICY STATEMENT:** The City of Edmonton, through its planning, decision-making processes, and leadership, will promote the development of an environmentally sustainable community that functions in harmony with the natural environment. The City of Edmonton will exercise environmental stewardship of its operations, products and services, based on its commitment to: (a) prevent pollution; (b) continually improve its environmental performance by setting and reviewing environmental objectives and targets; and (c) meet or exceed applicable environmental legal requirements and other requirements to which it subscribes.
Connect Edmonton: Vision 2050	This project aligns with the City's Vision 2050 strategic plan in that by ensuring that organic/food waste is collected, processed responsibly, and the amount landfilled is minimized, Edmonton will be a healthy city, urban places will be clean, regional prosperity is increased by building a circular economy, and a low carbon future is assured.
Waste Services Business Plan 2022-2025	The Business Plan outlines how Waste Services will continue to make transformational impacts through the 25-year Waste Strategy, provide essential service to Edmontonians while maintaining full cost recovery, and improve the employee and resident experience to support adaptation of new systems.

25 Year Waste Strategy	"The strategy adopts a broader lens to transform the system with new focus on efforts which will emphasize waste reduction in addition to affirming a commitment to 90 percent diversion of single unit residential waste from landfill." This project will help expand the City's organic waste processing capabilities and contribute to the 25 Year Waste Strategy's goal of diverting 90% of waste from landfill.
Waste Services Utility Fiscal Policy	"Customer rates will promote the efficient use of resources and be set to achieve broader social, economic, and environmental goals." This project will help to achieve broader social, economic, and environmental goals by providing a (more) marketable compost, eliminating the current problem of littering at the compost cure site, and allowing the reuse of woodchips back into the process.
Integrated Infrastructure Services (IIS) Vision and Mission Statements	"We inspire trust among citizens and Council in our commitment and ability to deliver quality infrastructure." We are in the business of: - bringing ideas to reality. - innovation and excellence. - assembling expertise. - building legacy infrastructure. - helping citizens have a better life in Edmonton. - Building a Great City.

5. Context Analysis

The ultimate goal of this project is to reduce or eliminate the plastic litter from being dispersed from the EWMC Cure Site when the digestate from the HSADF is screened outdoors.

The Canadian Biogas Association (CBA) has developed the *Canadian Anaerobic Digestion Guideline*: *Food and Organic Waste Processing Facilities,* which provides recommended planning, design, and operational practices for Anaerobic Digestion facilities that process food and organic waste materials. Litter (primarily plastics) is an environmental consideration that must be taken into account from an operations perspective to ensure a clean and safe facility. CBA

(2019), recommends that the following measures be considered on a site-by-site basis to reduce litter from a facility:

- Refuse to accept loads from uncovered vehicles;
- Receive and process feedstock in an enclosed area;
- Exercise care during processing and screening of organic waste, particularly during windy days if done outdoors;
- Collect on-site and off-site litter promptly, for example by conducting a daily manual pickup;
- Ensure that litter and other waste materials at the site are stored in proper closed containers and disposed of on a regular basis;

Furthermore, the Alberta Government's *Code of Practice for Compost Facilities, 2022* states that a compost facility (EWMC Cure Site) must:

- Prevent the escape of litter from the compost facility;
- Prevent litter from being washed, blown, or otherwise transported onto all properties adjacent to the compost facility, and
- Provide for the retrieval of litter that has been washed, blown, or otherwise transported onto all properties outside of the compost facility, with the consent of the property owner.

The HSADF does practice the above litter control measures as recommended by the CBA and at the cure site, the Code of Practice for compost facilities is followed as best as possible. A common litter control practice among other ADF and/or compost facilities is to utilize netting around the outside screening operations. While the option of netting was explored, the better practice is to have screening indoors, thus preventing the escape of litter from the compost cure site altogether.

6. Alternatives

The following alternatives had been considered to address the business need and attained desired outcomes:

- Option 1 - Status Quo
- Option 2 - EWMC Cure Site Netting with Trommel Screen
- Option 3 - One Screener and Two Mixers (netting still required)
- Option 4 - Two Screeners and Two Mixers
- Option 5 - Three Screeners and Two Mixers

As previously stated, status quo is not a practical option and after further consideration, the only options that were viable are option 2 and option 4. Option 3, with one screener and two mixers, this option still requires netting around the cure site, adding more capital costs. The throughput with one screener will not be able to keep up with the HSADF throughput. If the one screener is broken-down, the digestate will need to be screened at the cure site anyway. For option 5, three screeners and 2 mixers, the additional screener adds capital costs to the project for extra redundancy. Refer to Appendix A for further details on all alternatives that

were considered.

While the capital costs of the netting option 2 is significantly lower at $2.2 million compared to over $5.8 million for option 4, the operational costs of option 2 are significantly higher at $9.5 million versus $3.2 million for option 4. Overall option 4 has a better net present value and will be capable of achieving the project's outcomes and benefits.

Option Name	**Capital Costs**	**Operational Costs (over lifespan of equipment)**	**Time Frame**
Option 2 - EWMC Cure Site Netting with Trommel Screen	$2,174,617	$9,531,785	Completion Q4 2022
Option 4 - Screener Solution - Two Screens & Two Mixers	$5,822,820	$3,228,551	Completion Q4 2023

Option 2 - EWMC Cure Site Netting with Trommel Screen

- Less capital investment and quicker timeline to complete.
- Higher operational costs that includes the manual labour required to pick-up litter on- and off-site, trommel screen operations and maintenance costs, and annual woodchips costs and disposal of woodchips costs.
- Plastic film litter will still cause a litter problem within the EWMC Site, even if the netting prevents litter from spreading from the Site.
- Woodchips from HSADF process will have to be landfilled rather than digested (less landfill diversion opportunity).

Option 4 - Two Screeners and Two Mixers Solution

- Greater capital investment but overall slightly better net present value (NPV) as compared to option 2 due to significantly lower operating costs over the equipment lifespan. A better NPV may be further enforced with cleaner, marketable compost.
- Screening of waste as early in the process as possible is considered best practice as it reduces costs related to processing non-organic material, and can more efficiently screen out the material as compared to screening the waste further down the process line.
- Opportunity to reuse woodchips as the woodchips will not be mixed in with the plastic debris.
- A screening operation with two screening machines is able to keep up with normal HSADF facility throughput.

Refer to Appendix B and C for additional financial and revenue requirement comparisons.

7. Organizational Change Impact

7.1. Stakeholder Impact

The table below lists the key project stakeholders and the impacts this initiative has on these stakeholders.

Stakeholder	City Relationship	Type of Impact	Impact & Requirements
Waste Services	Internal	Direct	• Optimized City organics processing. • Capital resources for executing initiative. • Ongoing current budget resources for site operations and maintenance (O&M). • Expects the project to be completed on time and on budget while meeting all project goals and objectives.
Integrated Infrastructure Services (IIS)	Internal	Direct	• Expects project scope to be defined fully and accurately. • Adequate funding is approved to complete the project. • Project schedule is realistic and accurate.
Other City Departments	Internal	Indirect	• Incremental Corporate Services (Finance, HR, Law, CPSS) and Sustainable Development one time support for initiative execution and ongoing facility O&M. • Sufficient resourcing of above to provide support required.
Alberta Environment and Parks (AEP)	External	Direct	• Operation of the HSADF and compost cure site meets best practices.
HSADF Operating &	External	Direct	• Facility upgrades and modifications are easy to operate and maintain.

Maintenance Contractor			
General Public	External	Indirect	• Alignment with objectives articulated in Connect Edmonton: Vision 2050. • Compost produced meets safety requirements before it is used in public spaces.

7.2. Business and Operational Impact

The approval of this capital profile means dedicating Integrated Infrastructure Services (IIS) resources to this project, recognizing that this can have operational impacts to other capital City projects.

This development will not require the recruitment of additional operating personnel within the HSADF. Staff will have to be trained to operate and maintain the new equipment system.

8. Cost Benefits

8.1. Tangible Benefits

The following are key tangible benefits associated with the completion of this project:

Production of High(er) Quality Compost

- The screening and mixing of the digestate at the HSADF will reduce the litter in the final compost product which will allow the City to sell the compost rather than use it as an alternative daily cover on landfills.

Cost-Savings and Improved Services

- The screening and mixing system will automate a currently manual process, avoiding 1.75 FTE growth.
- The system will be able to handle the incoming multi-family organic waste, providing source-separated organic collection to more citizens.
- The project will also avoid alternative capital investments (example - cure site netting and manual litter control).

8.2. Intangible Benefits

Improved City Reputation

- Social approval in terms of the City's capacity to sustainably manage residential and

non-residential organic waste.
- Alignment with overall City Strategic Vision – *Connect Edmonton: Vision 2050* by ensuring that food waste is processed responsibly and the amount landfilled is minimized.

8.3. Costs

Capital Costs

Overall, the estimated capital cost for the current scope is $5.8M (excluding GST), financed within Waste Services 2023-2026 capital budgets. Among which, $100,000 is estimated spending for 2022 to obtain the equipment supplier(s), continue with detailed design and issue for tender documents. In 2023, the bulk of the costs will be seen for the completion of detailed design, equipment procurement, installation and commissioning.

The project costs include:

Year	Total Profile Budget
2022	$100,000
2023	$5,700,000
Total	**$5.8 million**

Operating Costs

The HSADF has an existing operating and maintenance contractor, therefore, the operating and maintenance costs, estimated to be $80,000 will cover the maintenance of the new equipment including parts within the existing contract. Other operating costs include the purchase of woodchips every 3 years and additional utility costs at the HSADF to handle the new equipment.

8.4. Cost Assumptions

Following are a list of assumptions made during the formation of this Business Case that may have an impact on the success of the project.
- Funding will be adequate to achieve the objectives outlined.
- Consultants will complete the Detailed Design, Construction support and Post Construction support successfully.
- All necessary background information will be available to the team.
- All consultants and contractors will be able to meet deadlines.
- The contractor(s) will have the capacity to complete the project on schedule and are qualified and experienced in this type of work.
- Permits/licenses, regulatory agreement, and approvals will be granted.
- All affected civic departments approve and support the deliverables.
- Scope will not increase over the Checkpoint #3-5 of the project.
- All stakeholders understand impact relationships between project scope,

budget, schedule, and quality and may require compromise on some parameters.
- Project resource requirements as identified in the Resourcing Section are available.

9. Resourcing

Following the Project Development and Delivery Model (PDDM), the project is being led through Development and Delivery phases by Facility Planning and Design (FPD) and Facility Infrastructure Delivery (FID) sections within IIS Department. Project Managers have been assigned for the Development and Delivery sections. Program Managers and Supervisors from both sections are overseeing the project and involved as necessary. Project Managers provide reporting through the Project Management Information System (e-Builder system) and regular meetings during the design and construction periods.

Through each phase, the Strategy Business Partner (Waste Services, Technical Services) and the Operating Business Partner (Waste Services, Sustainable Waste Processing) have had/will have representatives that are part of the project team and the Design Technical Review Team. Other members of the project team may include other IIS or Waste Services representatives (including the maintenance contractor), or other stakeholders as necessary.

The design Consultant is responsible for the design from concept development through commissioning. The screening and mixing equipment will be specified by the Consultant based on throughput and performance requirements. The procured Equipment Vendor(s) will provide engineering information in order for the Consultant to complete the detailed design. The Consultant and the Equipment Vendor(s) will be involved in the project through construction, commissioning, performance testing and the warranty period. The Delivery method for this project will be determined upon approval of this business case.

Special Resources
The following special resources are available to the project:

Engineering Services, IIS:
Resources available to review engineering design associated with facility scope.

Technical Services, Waste Services:
Waste Services Technical Services in-house engineering review is available for: process, electrical, and mechanical disciplines.

Technical Services, Waste Services:
Waste Services Technical Services Environmental Compliance and Landfill management team will support the project team's communication with Alberta Environment and Parks (AEP) for authorization to proceed on the project if required.

HSADF Operation and Maintenance Contractor Services:

Provide field level expertise and input throughout the project.

10. Key Risk(s) and Mitigation Strategy

A risk management plan is in place, which follows the steps for risk control, risk register, and assumptions/constraints as outlined in the City's Project Management procedures. The plan outlines the processes used for risk identification, quantitative and qualitative risk analysis. A robust risk register is here and mitigation strategy has been developed and is monitored regularly through project team meetings to ensure risks are managed effectively. Some key risks are identified below.

Key Risks

- Equipment supply chain problems from COVID-19 may result in schedule delays.
- Inflation and currency risk especially for US or Europe supplied equipment.
- New equipment will be installed in a functioning facility. Careful project management will be required to avoid conflicts.

11. Conclusion and Recommendations

11.1. Conclusion

While the capital cost of option 4 (two screeners and 2 mixers) is higher than the netting option 2, the NPV of both options are similar, with option 4 being slightly less expensive overall in the long run. Option 4 will eliminate the need for an aesthetically and environmentally unpleasant netting around the cure site area and this option provides more opportunity for landfill diversion. It also provides lower environmental and regulatory risk. Option 3 (single screener option) does not provide capacity to meet normal facility throughput. The three screener option 5 meets normal facility throughput with additional redundancy, however, this option is more expensive. Due to cost constraints, and due to its adequate capacity, Option 4 is recommended.

11.2. Recommendations

It is recommended by the project team that this Business Case be approved and authorized for Capital Expenditure (Funding Approval) of $5.8 million within the 2023-2026 budget cycle. A stand-alone profile will be created for this project project, in accordance with the requirement that stand-alone profiles for growth projects funded from composites be created for projects over the $2 million threshold.

11.3. Composite Profiles

The project was funded from profile CM-81-0005 for the Planning & Design phase. The two million threshold for growth projects requires this project to become a stand-alone profile.

11.4. Project Responsibility and Accountability

The project sponsor for the Develop Phase was the Director of Facility Planning and Design (Shannon Fitzsimmons), the project sponsor will transition to the Director of Facility Infrastructure Delivery (Jesse Banford) for the Delivery Phase. A project team with a lead and support Project Manager is established and a stakeholder register in place to support the project.

12. Implementation Strategy

The approval of the project will support the continuation of the project at the detailed design phase which will lead into the project transition to Facility Infrastructure Delivery as lead to complete the delivery phase of the project. Funding and resourcing for internal and external resources to complete the design and construction have been incorporated into the cost estimate.

13. Review and Approval Process

This Business Case is drafted by the Lead Project Manager in the Facility Planning and Design Section with input from Waste Services project representatives (Engineering economic analysis, Business Integration team, Finance team etc.).

This Business Case will be:

- Reviewed by key project team members;
- Circulated for Directors review and approval; and
- Submitted for Waste Services' Branch Manager review and approval.

A City Council Report will be:

- Presented to the Utility Committee for recommendation to the City Council for approval.

13.1. Business Case Sign Off

The Utility Committee and the City Council's approval is the authorization for Capital Expenditure (Funding Approval) of $5.8 million within the 2023-2026 budget cycle. The approval of this Business Case will enter the project to the detailed design phase, followed by the build phase for completion in 2023.

14. References

Alberta Government. (2022). Code of practice for compost facilities. https://www.qp.alberta.ca/570.cfm?frm_isbn=9780779828579&search_by=link

Canadian Biogas Association (CBA). (2019). *Canadian anaerobic digestion guideline: food and organic waste processing facilities.* https://biogasassociation.ca/resources/canadian_anaerobic_digestion_guideline

Appendix A: Summary of Options

Option Name	Capital Costs	Time Frame
Option 1 - Status quo	N/A	N/A
Option 2 - EWMC Cure Site Netting & Trommel Screen	$2.2 million	Completion Q4 2022
Option 3 - Screener Solution - One Screener & Two Mixers plus Cure Site Netting	$7 million	Completion Q4 2023
Option 4 - Screener Solution - Two Screens & Two Mixers	$5.8 million	Completion Q4 2023
Option 5 - Screener Solution - Three Screens & Two Mixers	$6.8 million	Completion Q4 2023

Option 1 - Status Quo

- Status quo or doing nothing is not a practical option as continued cure site littering is considered a significant environmental problem that can't be ignored.
- Regular and continuous manual litter cleanup from the EWMC Site and adjacent properties (including most notably the wetland directly south of the cure site) is not considered a viable option.

Option 2 - EWMC Cure Site Netting and Trommel Screen

- Less capital investment and quicker timeline to complete.
- Higher operational costs that includes the manual labour required to pick-up litter on- and off-site, trommel screen operations and maintenance costs, and annual woodchips costs and disposal of woodchips costs.
- Plastic film litter will still cause a litter problem within the EWMC Site, even if the netting prevents litter from spreading from the Site.
- Woodchips from HSADF process will have to be landfilled rather than digested (less landfill diversion opportunity).

Option 3 - Screener Solution - One Screener & Two Mixers plus Cure Site Netting

- Greater capital investment and worse net present value (NPV) as compared to option 2.
- Screening of waste as early in the process as possible is considered best practice as it reduces costs related to processing non-organic material, and can more efficiently screen out the material as compared to screening the waste further down the process line.

- Opportunity to reuse woodchips as the woodchips will not be mixed in with the plastic debris.
- A screening operation with a single screening machine is not able to keep up with normal facility throughput.
- Cure site netting is still required unless intended HSADF throughput is adjusted downward.

Option 4 - Screener Solution - Two Screens & Two Mixers

- Greater capital investment but overall slightly better net present value (NPV) as compared to option 2 due to significantly lower operating costs over the equipment lifespan. A better NPV may be further enforced with cleaner, marketable compost.
- Screening of waste as early in the process as possible is considered best practice as it reduces costs related to processing non-organic material, and can more efficiently screen out the material as compared to screening the waste further down the process line.
- Opportunity to reuse woodchips as the woodchips will not be mixed in with the plastic debris.
- A screening operation with two screening machines is able to keep up with normal HSADF facility throughput.

Option 5 - Screener Solution - Three Screeners & Two Mixers

- Greater capital investment and a slightly worse net present value (NPV) as compared to option 2.
- Screening of waste as early in the process as possible is considered best practice as it reduces costs related to processing non-organic material, and can more efficiently screen out the material as compared to screening the waste further down the process line.
- Opportunity to reuse woodchips as the woodchips will not be mixed in with the plastic debris.
- A screening operation with three screening machines is able to keep up with normal facility throughput with some redundant capacity in the event of screener failure.

Appendix B: Costs- Financial Analysis Summary

Project Title: HSADF Digestate Screening & Mixing System	Option 4 - Screener Solution - Two Screens & Two Mixers	Option 2 - Cure Site Netting with Trommel Screen	Option 2 Net Change from Option 4
Total Capital Cost	($5,822,820)	($2,174,617)	$3,648,203
Total Revenues	$606,880	$0	-$606,880
Total Operating and Maintenance Costs	($3,228,551)	($9,531,785)	-$6,303,234
Total Lease Costs	$0	$0	$0
Project Net Inflows (Outflows)	($8,444,491)	($11,706,402)	-$3,261,912
WACC Discount Rate	6.28%	6.28%	0.00%
Net Present Value	($6,719,824)	($7,478,742)	-$758,918
IRR	N/A	N/A	N/A

Appendix C: Revenue Requirement

	Alternatives	
Reference	Option 4 - Screener Solution - Two Screens & Two Mixers	Option 2 - Cure Site Netting with Trommel Screen
Base Year	2022	2022
In-Service Year	2023	2022
Cumulative Revenue Requirement (from base year)	Option 4 - Screener Solution - Two Screens & Two Mixers	Option 2 - Cure Site Netting with Trommel Screen
CPV @ Yr 5	2,982,514	3,144,386
CPV @ Yr 10	5,146,270	5,710,524
CPV @ Yr 15	6,563,899	7,746,178
CPV @ Yr 20	6,637,173	7,752,402
CPV @ Yr 25	6,637,173	7,752,402
CPV @ Yr 30	6,637,173	7,752,402
CPV @ Yr 35	0	0
Capital Cost Summary (Base Year Dollars)	Option 4 - Screener Solution - Two Screens & Two Mixers	Option 2 - Cure Site Netting with Trommel Screen
Equipment	5,640,000	1,928,983
Building	0	0
Other (engineering/PM/etc)	0	0
Total base costs	**5,640,000**	**1,928,983**
Add: contingency, inflation		
Contingency (12%)[1]	0	231,478
Inflation[2]	182,820	14,156
Total Capital	**5,822,820**	**2,174,617**

Economic Assumptions

1. Contingency is built into the Capital costs for Option 4 at 12%.
2. Inflation is compounded yearly at 3.30%.
3. Analysis is based on 15 years to capture the full life cycle costs of the assets.

Revenue Requirement Summary (Annual Costs)

		Alternatives	
Year	Calendar Year	Option 4 - Screener Solution - Two Screens & Two Mixers	Option 2 - Cure Site Netting with Trommel Screen
0	2022	$3,731	$118,681
1	2023	$645,385	$549,032
2	2024	$739,168	$757,186
3	2025	$639,550	$769,112
4	2026	$832,351	$781,349
5	2027	$721,127	$793,904
6	2028	$610,630	$806,783
7	2029	$822,435	$819,991
8	2030	$699,070	$833,534
9	2031	$576,468	$847,418
10	2032	$809,096	$861,649
11	2033	$672,222	$876,232
12	2034	$536,140	$891,173
13	2035	$791,579	$906,475
14	2036	$639,663	$922,146
15	2037	$458,253	$882,189
16	2038	$194,094	$16,487
17	2039	$0	$0
18	2040	$0	$0
19	2041	$0	$0
20	2042	$0	$0
21	2043	$0	$0
22	2044	$0	$0
23	2045	$0	$0
24	2046	$0	$0
25	2047	$0	$0
26	2048	$0	$0
27	2049	$0	$0
28	2050	$0	$0
29	2051	$0	$0
30	2052	$0	$0

Revenue Requirement Summary (CUMULATIVE PRESENT VALUE to use for graph)

		Alternatives	
Year	Calendar Year	Option 4 - Screener Solution - Two Screens & Two Mixers	Option 2 - Cure Site Netting with Trommel Screen
0	2022	$3,731	$118,681
1	2023	$610,995	$635,283
2	2024	$1,265,421	$1,305,661
3	2025	$1,798,204	$1,946,377
4	2026	$2,450,645	$2,558,840
5	2027	$2,982,514	$3,144,386
6	2028	$3,406,285	$3,704,284
7	2029	$3,943,331	$4,239,735
8	2030	$4,372,858	$4,751,879
9	2031	$4,706,134	$5,241,800
10	2032	$5,146,270	$5,710,524
11	2033	$5,490,348	$6,159,026
12	2034	$5,748,564	$6,588,233
13	2035	$6,107,285	$6,999,021
14	2036	$6,380,040	$7,392,228
15	2037	$6,563,899	$7,746,178
16	2038	$6,637,173	$7,752,402
17	2039	$6,637,173	$7,752,402
18	2040	$6,637,173	$7,752,402
19	2041	$6,637,173	$7,752,402
20	2042	$6,637,173	$7,752,402
21	2043	$6,637,173	$7,752,402
22	2044	$6,637,173	$7,752,402
23	2045	$6,637,173	$7,752,402
24	2046	$6,637,173	$7,752,402
25	2047	$6,637,173	$7,752,402
26	2048	$6,637,173	$7,752,402
27	2049	$6,637,173	$7,752,402
28	2050	$6,637,173	$7,752,402
29	2051	$6,637,173	$7,752,402
30	2052	$6,637,173	$7,752,402

Cost Impact of Alternatives

Cumulative Present Value of Revenue Requirement