

Snow Melt and Material Handling Site Feasibility Study

January 19, 2024

Prepared for:



Prepared by:



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Letter of Transmittal

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January 19, 2024

File: 114-027

City of Fort Saskatchewan
10005 – 100 Avenue
Fort Saskatchewan, AB
T8L 2C5

Attention: Joey Farebrother
Sr. Engineering Coordinator

Re: Snow Melt and Material Handling Site Feasibility Study-Draft

We are pleased to submit our Final report of the **Snow Melt and Material Handling Site Feasibility Study**. We invite the opportunity to discuss the contents of the report with the City. If there are any questions or concerns with the document, please contact the undersigned.

Regards,
AI-Terra Engineering Ltd.



Fred Greenhough, P.Eng.

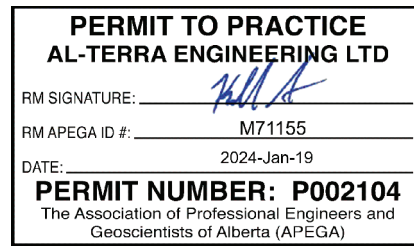
CORPORATE AUTHORIZATION

This report entitled **Snow Melt and Material Handling Site Feasibility Study** was prepared by Al-Terra Engineering Ltd., under authorization and exclusive use of the City of Fort Saskatchewan.

The designs and recommendations put forward reflect Al-Terra's best judgment with the information available. Any use of this information in a manner not intended or with the knowledge that situations have changed shall not be the responsibility of Al-Terra Engineering Ltd.



Prepared by:
Fred Greenhough P.Eng.



Corporate Permit

1.0 Introduction

The following study was completed to determine the feasibility of a combined snow melt and materials handling facility for the City of Fort Saskatchewan. The City of Fort Saskatchewan does not currently operate a snow melt facility. The City and private operators currently haul snow cleared from roadways and parking lots to snow melt facilities in Strathcona County and the City of Edmonton. The haul distances to the Edmonton Horse Hills facility is approximately 15km and approximately 24km to the Strathcona County Facility.

Historically, a site at 7951-109 St located near the Fort Saskatchewan Correctional Facility, was used to store cleared snow. This was an undeveloped site without a formal melt pad or stormwater control. The City discontinued the use of the site for snow storage in 2011 due to the site not meeting current environmental regulations, and its close proximity to residential areas. The site was continued to be used for material stockpiling and processing. Material stockpiled and processed at this location has generally been reclaimed asphalt and concrete generated from the neighbourhood and road rehabilitation programs. The site currently handles approximately 5000m³ of material.

Discussions were held with City staff to determine appropriate sizing of the facility. In the 2021/2022 snow season approximately 50,000m³ of snow was cleared by the City with additional snow cleared by private operators. Due to the long haul distances to the neighbouring facilities and the associated costs of the haul, less snow was cleared than would be anticipated with a City owned local facility. It was estimated that current demand would be for approximately 250,000m³ of storage. This size would be conservative and would be able to accommodate a significant snow season including a single clearing of all residential streets. To accommodate growth in the 50 year time horizon the design size was doubled to be able to accommodate 500,000m³ of snow.

The project objectives for the Fort Saskatchewan Snow Melt and Material Handling Site Feasibility Study was to provide a review of the following:

- Regulatory requirements
- Site selection criteria
- Specific site design considerations
- Concept design and estimated costs
- Operational and logistics costs for a snow melt facility

2.0 Regulatory Requirements

A high-level review of applicable regulations was completed. Generally, there is no specific provincial or federal legislation that explicitly regulates snow melt facilities within the province of Alberta. However, there are guidelines and legislation that have a cursory link to the construction and operation of snow melt facilities.

2.1 Federal Regulations

Canadian Environment and Protection Act – The primary purpose of the act is to contribute to sustainable development through pollution prevention. The primary impact of this regulation on snow melt facilities would be related to the management of contaminated sites. This act could apply to contaminants such as hydrocarbons and heavy metals that are present in snow melt, if present in high enough concentrations. Relevant concentrations are not expected to occur.

Fisheries Act – The Fisheries Act is the main legislation for the management of all fish, fish habitat and water quality. This could apply to the release of melt water to streams and waterbodies that are fish bearing or contain fish habitat. This act could also apply if the construction of the facility were to impact fish habitat.

Committee of the Status of Endangered Wildlife in Canada and Species at Risk Act – This act provides legal protection of wildlife and their habitats, and applies to migratory birds, aquatic species, and terrestrial species. This act would apply if the proposed site selected for the facility contains endangered or protected species or their habitat.

Migratory Bird Convention Act – This act prohibits the disturbance to nests or nesting birds during breeding or nesting periods. This act would typically apply to the construction of a facility and may limit the construction periods if nesting birds are present.

Canadian Council of Ministers Environmental Quality Guidelines – These guidelines establish criteria, objectives, and standards for substances present in the environment and specially the *Canadian Water Quality Guidelines for the Protection of Aquatic Life*, *Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses*, *Recreational Water Quality Guidelines and Aesthetics*, *Canadian Sediment Quality Guidelines for the Protection of Aquatic life* and *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* could potentially apply. These guidelines establish limits for potential contaminants in soil and water. These guidelines would apply to discharged melt water and melt pad soils.

2.2 Provincial Regulations

Water Act – the Water Act focuses primarily on the planning and enforcement of water use. The primary impact of this legislation is in the discharge of water from the facility and the disturbance of wetlands for construction. If the facility discharges to the natural environment the act will govern the quantity and quality of the melt water and if there are any wetlands present in the property prior to construction, which may require compensation.

2.3 Municipal Regulations

Land Use Bylaw – The Fort Saskatchewan Land Use Bylaw establishes the rules and regulations for land developments as well as the process for making decisions for development permitting. The land use bylaw will impact where the facility will be able to be constructed.

Community Standards Bylaw – the Fort Saskatchewan Community Standards Bylaw regulates the generation of noise. This bylaw could have an impact on the siting of the facility as the facility will generate noise overnight during normal operation and may be considered a nuisance.

Sewer Bylaw – The Fort Saskatchewan Sewer Bylaw regulates the quality of effluent that can be released into the municipal sewer system. Melt water from the facility that is discharged into the municipal sewer system, including surface ditches will need to adhere to the criteria outlined in the bylaw.

2.4 Provincial Guidelines

The Province of Alberta has a document, Snow Disposal Guidelines for the Province of Alberta (February 1994) which provides some guidance for the construction and operation of snow melt facilities. Other documents that were reviewed and provide additional guidance within the Canadian context includes:

- Saskatchewan Snow Dump Management Guidelines (August 2012)
- Syntheses of Best Practices - Road Salt Management - Snow Storage and Disposal (Transportation Association of Canada April 2013)

Both documents listed above are more current than the Alberta Guidelines and provide better detailed information.

3.0 Site Selection Criteria

When selecting a site for a snow melt and material handling facility it is important to recognize that there will be social, economic, and environmental impacts that will have to be identified and mitigated. A summary of the siting criteria that should be evaluated when selecting a facility location includes:

- Environmental Criteria
 - Soil/geology
 - Surface water
 - Ground water
 - Noise
- Economic Criteria
 - Land costs
 - Operation costs
 - Impacts to existing infrastructure.
- Social Criteria
 - Aesthetics
 - Land use compatibility
 - Zoning

3.1 Environmental Criteria

The primary environmental implication of the operation of a snow melt facility is managing the quality of the discharged melt water. The two most prevalent contaminants in melt water are chlorides, from road salt, and suspended solids, from road sand and erosion within the facility. Studies have shown that most of the salt applied to roadways is not retained in the snow that is removed to snow melt facilities, however, a small percentage is collected. There is no practical or economical way of removing chlorides found in snow, but chloride levels can be managed with detention and dilution within the stormwater management system. Suspended solids can also be treated with detention within the settling pond system.

There are guidelines that limit the concentration of chlorides in water that is discharged to the natural environment that can be challenging to meet for snow melt facilities. Water testing at other facilities has shown that chloride levels are generally limited to the initial spring melt which coincides with the highest storm system and stream flows allowing for the highest levels of dilution. A best practice to limit these risks is to site the snow melt facility in a location which allows for melt water to be discharged to a municipal stormwater system to allow for dilution prior to discharge to a natural environment and to have a set-back of 200m from any waterbody. Depending on the specific site, off-site upgrades to provide storm servicing may be required. It is the recommendation of Alberta Environment and Parks that snow melt facilities discharge water to municipal stormwater systems rather than natural streams or water bodies.

Another consideration is the risk of chloride infiltration to groundwater. The snow melt facility should be sited in a location with low soil permeability and areas within the site that are exposed to snow and melt water should be lined with impervious or low permeability material. A hydrogeological study may be necessary to determine if the site is appropriate for a snow melt facility. The melt pad should have at a minimum a 0.6m thick compacted clay liner constructed with soil that has a maximum permeability of 1×10^{-7} cm/s. Both surface and ground water monitoring programs should be implemented to track water quality.



Snow melt and material handling facilities generate noise from both truck traffic to the site and from equipment operating within the site. The nature of snow removal generally requires that significant work is conducted during the night therefore noise becomes a significant consideration. To mitigate noise concerns snow melt and material handling facilities should be located a minimum of 350m from any residence and haul routes should avoid residential areas. If there are residences in the vicinity of the facility, a noise study should be considered to quantify noise levels prior to the construction of the facility and after operations have commenced. Other ways to mitigate noise would be to install policies limiting trucks from using engine retarder brakes, banning trucks from banging tailgates while dumping and limiting or controlling the use of backup alarms on heavy equipment.

3.2 Economic Criteria

Locating snow melt facilities requires balancing different economic factors. It is desirable to have snow melt facilities located close to the areas being cleared to minimize hauling costs. Hauling costs are a major factor in snow removal operations. However, finding a land parcel that fits established budgets with good proximity can be challenging. A cost benefit analysis can be completed when evaluating sites to determine the overall construction and operation costs of each location to calculate the life cycle cost of the facility.

Another economic impact to be considered is the impact on existing infrastructure from the increased truck traffic. Haul trucks will reduce the life expectancy and increase maintenance costs for the roads that are used. Depending on the specific site, off-site upgrades to access roads may be required.

3.3 Social Criteria

Snow melt and material handling facilities are not aesthetically pleasing infrastructure, and this can be a factor in selecting potential sites. These facilities will generate noise, dust and litter. There is a risk that neighboring property owners may not be accommodating. It is recommended that a public engagement program be implemented to gauge public acceptance and to provide accurate information about the facility. To limit the aesthetic impacts of the facility, landscaping of the site, including berms and trees, should be considered to limit the visibility of the site. Fencing should be considered around the perimeter of the site to reduce litter from leaving the property.

When selecting a site, current zoning will need to be a consideration. A snow melt and material handling facility will be considered an industrial land use; therefore any site will need to be compatible with zoning.

4.0 Specific Site Design Considerations

Snow melt facilities consist of several interconnected components including access roads, melt pad, collection ditches and settling pond. Each component of the system has unique design challenges and design criteria.

Site Access – Snow melt facilities can experience significant traffic during snow clearing events. The site access and internal roads should be constructed to accommodate two-way traffic and to simplify internal movements, separate entrance and exit points can be provided. Depending on the specific design of the site, truck queuing may occur, and should be accommodated on-site to limit impact on adjacent public roadways. A street lighting warrant analysis should be completed to determine if additional street lighting is required at the site access points as there can be significant traffic generated during the nighttime. A limited access gate and site fencing should be considered to limit unauthorized access and dumping.

All weather Internal access roads should be provided through the site and to central dump locations. If a compacted clay liner is selected, then there can be access issues during early and late season when the ground may not be frozen and driving on the liner may not be possible.

Melt pad – Melt pads generally consist of a gently graded pad which directs melt water towards collection ditches and then to a settling pond. There are different design options for the construction of melt pads:

- Roller Compacted Concrete (RCCP) - This is the preferred surfacing material. The benefits of roller compacted concrete is that it is very durable and can withstand the loading of the snow pile and heavy equipment and is not susceptible to erosion, however it has a very high cost. Typical maintenance would involve sealing cracks that occur. The service life would be greater than 20 years, depending on the structural design.
- Asphalt Concrete Pavement (ACP) – Asphalt concrete pavement has been used in other facilities with limited success. Asphalt concrete pavement is resistant to erosion but is generally not durable enough to withstand the loading of the snow pile or the loading of the trucks and heavy equipment and the durability is impacted by the presence of chlorides. Depending on the structural design a service life of less than 20 years would be expected.
- Recycled asphalt (RAP) and granular base course (GBC) - These liners limit erosion but are not durable and can rut, requiring significant yearly maintenance and generally have high maintenance demands. RAP and GBC liners would need to be graded yearly. Removal of sand from the melt pad is also difficult as it mixes with the surface aggregate. RAP and GBC liners will become contaminated with chlorides and heavy metals and will need to have the surface material removed and replaced. The service life would be typically less than 10 years.
- Compacted Clay Liner - The other alternative is to use a compacted clay liner. Compacted clay liners typically consist of 0.6m to 1.0m thick liner constructed in thin lifts with clay with a permeability coefficient of not greater than 1×10^{-7} cm/s. The compacted clay liners have the benefit of having a low construction cost, but they do experience significant erosion, requiring yearly maintenance to regrade and recompact the surface, and for cleaning of sediment from the settling pond. Over time, compacted clay liners will become contaminated with chlorides and heavy metals and will need to have the surface material removed and replaced. The surface material would generally need to be disposed of at a facility that accepts contaminated soil. Compacted clay liners can also experience

operational issues during warm periods when the ground is not frozen. The service life would be typically less than 10 years.

The melt pad should be designed with grades between 0.5% to 1% to accommodate equipment working on the site, limit erosion and still allow for positive drainage to the collection ditches. Melt pads should be sited such that when snow is dumped and piled, the push face of the pile is in a south or west direction to promote faster snow melt. By increasing the rate of snow melt it can allow for more time in the summer/fall to complete any necessary maintenance.

Snow is typically dumped on the pad by haul trucks and dozers push the snow into the pile to maximize height. The pile can have up to 1:1 slope on the spill side and 5:1 slope on the push side. During melting operations, dozers are utilized to rip the surface of the snow pile to facilitate faster melting as sand and debris can form a crust which insulates the snow pile. Typically, the snow pile will last into late summer or early fall.

Collection Ditches – Collection ditches are used to collect the melt water and direct the melt water to the settling pond. Collection ditches experience near continuous flow during the melt season which prevents vegetation from establishing and therefore require armoring to limit erosion. During the peak melt periods significant water volumes are generated. Options for lining the ditches include HDPE liners, heavy rock rip rap and concrete. Ditches should be sized to simultaneously handle both melt water and storm events.

Settling Pond – Settling ponds are constructed to collect the melt water and stormwater generated by the site and improve the water quality prior to discharging off site. A settling pond should contain a forebay to allow for coarse material to settle prior to entering the primary pond. The primary pond should be sized to allow for 24 hours of detention and to handle a 25-year storm event. Baffles may be required to increase the detention time to allow for more sediment to be removed. Settling ponds should have the floor lined with roller compacted concrete to allow for the removal of sediment, especially in facilities with compacted clay liner melt pads as significant sediment can collect. An access road, paved with roller compacted concrete, should be provided to the base of the pond to allow equipment to access the floor. The sides of the pond should be lined with an HDPE geomembrane to limit exfiltration to the surrounding soils.

The outlet from the settling pond typically consists of a control weir and/or orifice. The control structure should be designed with a shut off gate to allow the settling pond to be isolated in the event there is a contaminant spill on site. An oil/Grit separator should be installed downstream of the control structure to provide final polishing of the discharged water.

The settling pond should ideally be discharged to a municipal storm sewer system. The melt water will have elevated chloride levels during the early melt season which may not meet federal or provincial guidelines. If melt water is discharged to a municipal sewer system, then it would need to meet the discharge criteria as outlined in the Sewer Bylaw. Within the sewer system the melt water would experience dilution prior to being discharged.

Material Handling – Material handling sites will generally consist of a graveled area that will allow for the all-weather movement of trucks, loaders and operation of a crusher. Area requirements will be specific to the crushing equipment that is used. Sufficient area will also need to be provided for raw material and processed material stockpiles. The truck traffic and crushing operation generates noise, therefore it should be located to minimize impacts to adjacent properties. The material handling site should be surfaced with gravel or asphalt millings (RAP) to reduce contaminating the stockpiles with clay and dirt and allow all-weather operation.



5.0 Concept Design and Cost Estimate

An example concept layout and construction cost estimates are provided for both a combined snow melt and material handling facility and a standalone material handling facility. The design concepts were based on requirements provided through discussions with City staff. For the snow melt facility, staff identified that there would be an estimated demand for approximately 250,000m³ of snow storage today if there was a city facility. To accommodate growth in the 50year time horizon the design size was doubled to be able to accommodate 500,000m³ of snow. The material handling site was based on the requirement for four aggregate piles containing up to 5000 t and sufficient space to operate an aggregate crusher. Additional requirements included a hydrovac dump pad and an additional 5ha for future expansion.

There is value to the City in locating both facilities on the same parcel of land due to similar transportation needs, siting requirements (noise, dust, etc.), shared security, and reduced space requirements as some areas can be shared in off seasons. However, due to land availability, it may not be possible to obtain a parcel meeting the combined requirements. The requirement for the snow melt facility to have sufficient stormwater capacity, and the need for a larger combined site may make finding an acceptable parcel difficult. If the sites are split between locations, additional land would be required to meet the design criteria due to the expected efficiencies realized by having a shared site.

The design concept shows a possible layout of the proposed facility and provides a general size to provide guidance for acquiring an acceptable property. Once a site is selected a site-specific design and layout will be required. The concept design and cost estimate were based on the following parameters:

- Melt pad capable of storing 500,000 m³ of snow.
- Lined collection ditches.
- Settling pond with roller compacted concrete floor and HDPE lined walls, outlet structure and oil/grit separator.
- Hydrovac Dump pad lined with roller compacted concrete.
- General equipment storage yard surfaced with gravel.
- Stockpile area capable of storing 4 aggregate piles of 5000t.
- Material handling/staging area for the dumping and crushing of aggregate material surfaced with gravel.
- Additional space for future expansion

The cost estimate is based on 2023 pricing but due to the nature of the material specified, such as roller compacted concrete, there can be significant price fluctuations. The cost estimates are shown in **Table 1 – Combined Site Cost Estimate** and **Table 2 – Material Handling Site Cost Estimate**. Assumptions used for the cost estimate include:

- In-situ material will be acceptable for the compacted clay liner and no offsite fill material will be required. All grading material will remain on site.
- Melt water will be able to be discharged at the property boundary and additional storm piping will not be required.
- No offsite cost allowances were included, such as road upgrades.
- Aggregate stockpiles were sized to be piled with dozers or loaders.

For the combined site cost estimate, three options were provided with differing melt pad liners, and collection ditch liners. The options provided were:

- Melt pad with compacted clay liner, and HDPE lined ditches.
- Melt pad with a hybrid liner, 50% compacted clay and 50% roller compacted concrete and concrete lined ditches.
- Melt pad with roller compacted concrete and concrete lined ditches.

An additional option that could be considered includes staging the melt pad such that only a small portion is lined with a hard surface at initial construction. This would allow for snow to be piled in this area in most years and would allow for costs of a larger melt pad being deferred.



6.0 Operational Costs

To estimate the operational costs of a clay lined snow melt facility, Strathcona County was contacted as their facility would be a similar configuration to what the City would require. The Strathcona County facility is designed for 1,000,000 m³ of storage. The County does not track all costs as some work is performed by their own forces, but the costs presented below indicate the order of magnitude of the costs. The approximate operational costs include:

- \$300,000 per year to stack snow (dozers). This number has varied from \$150,000 - \$600,000 depending on the amount of snow hauled to the site.
- \$150,000/year for site maintenance. This includes cleaning of the storm pond by pumping the water out and removing built up sediment, maintenance of the oil/grit separator and general repairs.
- \$50,000/year for melt pad maintenance. This includes removal of debris left over from the snow pile and regrading pad to remove ruts.

Overall, Strathcona County spends approximately \$500,000 per year operating their facility. This cost does not include major capital improvements such as reconstruction of the melt pad liner. As a further comparison, the City of Edmonton operates 4 large sites and had costs of \$3.2 million in 2021, which works out to \$800,000 per year per site in operating costs. The proposed facility for the City would be very similar, though smaller, than the Strathcona County facility. Based on the above example, it is estimated that operational costs will be approximately \$300,000 per year. Major capital improvements would be in addition to this amount.

Currently, the city of Fort Saskatchewan hauls snow predominantly to the Strathcona County facility and if that facility is unavailable, to the City of Edmonton Horse Hills facility. The City has an agreement with Strathcona County that is based on 2000 loads per year at a cost of \$12 per load for a total of \$24,000/year, although this volume does vary from year to year as dump fees were approximately \$50,000 for the 2021/22 winter season.

While there are going to be increased capital and operating costs to having a city owned snow melt facility there will also be cost and operational benefits as well.

A cost that is significantly impacted by the location of the snow melt facility is trucking. The amount of snow clearing can vary significantly by year. In the 2022-23 snow clearing season, the city hauled from both residential and commercial areas. From residential areas the City hauled for 21 days for a cost of \$397,824, which consisted of \$148 per hour for trucking, 16 trucks, 8 hours per day and 21 days of hauling. From the downtown commercial area, the City hauled for 10 days for a cost of \$71,040, which consisted of \$148 per hour for trucking, 6 trucks, 8 hours per day, 10 days of hauling. The total cost of snow hauling in 2022-23 was \$468,864.

There would be a reduction in trucking costs with a city owned facility, which will vary with the specific location. In the snow clearing operation trucks spend time at the loading location, driving, and at the unloading location. The return trip from the center of Fort Saskatchewan to the Strathcona County facility is approximately 48km. A city owned facility would likely reduce the return trip haul distance to approximately 15km. Assuming an average speed of 80km/h to the Strathcona County facility due to mostly 4-lane highway routes and 50km/h for a city owned facility, due mostly to local road routes, there would have been a saving of approximately 18 min per truck load which results in a saving of \$44 per load. If a typical year is 4000 loads that would result in a total savings of approximately \$176,000 per year on trucking costs.

Reducing the trucking distance has the benefit of lower costs as well as reduced traffic and reduced risk with having less trucks on the road. The costs will be reduced for private operators as well, which will result in lower costs to remove snow for private commercial and residential taxpayers.

Another potential cost benefit will be having the facility open to dumping from other municipalities and private users. While other municipalities such as the City of Edmonton, do not charge private companies to dump snow, they are considering the possibility. Depending on the rates they use there may be demand to haul snow to a city owned facility if the rates are competitive.

An operational benefit of a city owned facility would be that the City would have control of the facility and of haul routes to and from the site. This would remove the risk of other jurisdictions restricting use of their facilities to the City of Fort Saskatchewan or altering/restricting truck haul routes.

Another operational benefit is that snow clearing could be increased due to the reduced per load cost. This could result in more roads being cleared, reducing the amount of snow that is stockpiled in the boulevard. This would have the benefits of increasing the aesthetics of the community as unsightly snow piles could be removed as well as safety benefits as sightlines would be improved for both motorists and pedestrians.

If the City of Fort Saskatchewan were to construct a city owned snow melt facility the estimated costs will be:

- ◆ \$4,000,000 for land.
- ◆ \$5,700,000 to construct facility
- ◆ \$300,000 per year for operational costs

The benefits would be:

- ◆ \$50,000 per year in savings from dump fees at the Strathcona County Facility
- ◆ \$176,000 per year in savings from reduced trucking costs
- ◆ Reduced number of trucks on roadways due to shorter haul distance

6.1 Material Handling Facility

The estimated operational costs of the new material handling facility will be similar to the costs incurred at the current location. These costs are included in the current operating budget and therefore there would be minimal change. The only additional cost that may be incurred would be power for lighting if the new site is illuminated.



Construction Cost Estimate

Project: Fort Saskatchewan Snow Melt Facility Concept
 Client: City of Fort Saskatchewan

Date: December 21, 2023
 Job No.: 114-027

Option A - Clay Liner					Option B - RCC Liner					Option C - Hybrid Liner (50% RCC/50% CCL)				
Item	Rate	Unit	Quantity	Total	Item	Rate	Unit	Quantity	Total	Item	Rate	Unit	Quantity	Total
Construction														
Topsoil Stripping	\$5.00	m3	75000	\$ 375,000	Topsoil Stripping	\$5.00	m3	75000	\$ 375,000	Topsoil Stripping	\$5.00	m3	75000	\$ 375,000
Grading	\$7.00	m3	150000	\$ 1,050,000	Grading	\$7.00	m3	150000	\$ 1,050,000	Grading	\$7.00	m3	150000	\$ 1,050,000
Pond Liner Bottom (RCC)	\$230.00	m2	3000	\$ 690,000	Pond Liner Bottom (RCC)	\$230.00	m2	3000	\$ 690,000	Pond Liner Bottom (RCC)	\$230.00	m2	3000	\$ 690,000
Pond Liner Sides (Membrane)	\$17.00	m2	10000	\$ 170,000	Pond Liner Sides (Membrane)	\$17.00	m2	10000	\$ 170,000	Pond Liner Sides (Membrane)	\$17.00	m2	10000	\$ 170,000
Pond Liner Curb	\$150.00	m	250	\$ 37,500	Pond Liner Curb	\$150.00	m	250	\$ 37,500	Pond Liner Curb	\$150.00	m	250	\$ 37,500
Pond Outfall Structure	\$360,000.00	ls	1	\$ 360,000	Pond Outfall Structure	\$360,000.00	ls	1	\$ 360,000	Pond Outfall Structure	\$360,000.00	ls	1	\$ 360,000
Gravel Surfacing	\$32.00	m2	30000	\$ 960,000	Gravel Surfacing	\$32.00	m2	30000	\$ 960,000	Gravel Surfacing	\$32.00	m2	30000	\$ 960,000
Misc Erosion Control	\$50,000.00	LS	1	\$ 50,000	Misc Erosion Control	\$50,000.00	LS	1	\$ 50,000	Misc Erosion Control	\$50,000.00	LS	1	\$ 50,000
Misc Landscaping	\$100,000.00	LS	1	\$ 100,000	Misc Landscaping	\$100,000.00	LS	1	\$ 100,000	Misc Landscaping	\$100,000.00	LS	1	\$ 100,000
Ditch Liner - HDPE	\$300.00	m	300	\$ 90,000	Ditch Liner - RCC	\$400.00	m	300	\$ 120,000	Ditch Liner - HDPE	\$300.00	m	300	\$ 90,000
Melt Pad - Compacted Clay	\$2.50	m2	45000	\$ 112,500	Melt Pad - RCC	\$200.00	m2	45000	\$ 9,000,000	Melt Pad - 50% RCC	\$200.00	m2	22500	\$ 4,500,000
Fencing/Gates	\$20.00	m	1650	\$ 33,000	Fencing/Gates	\$20.00	m	1650	\$ 33,000	Melt Pad - 50% Compacted Clay	\$2.50	m2	22500	\$ 56,250
Site Building	\$30,000.00	LS	1	\$ 30,000	Site Building	\$30,000.00	LS	1	\$ 30,000	Fencing/Gates	\$20.00	m	1650	\$ 33,000
				\$ -					\$ -	Site Building	\$30,000.00	LS	1	\$ 30,000
Sub-Total				\$ 4,058,000					\$ 12,945,500					\$ 8,507,750
Engineering (@10%)				\$ 405,800					\$ 1,294,550					\$ 850,175
Contingency (@30%)				\$ 1,217,400					\$ 3,883,650					\$ 2,550,525
Sub-Total				\$ 1,623,200					\$ 5,178,200					\$ 3,400,700
Total				\$ 5,681,200	OPTION A			OPTION B	\$ 18,123,700				OPTION C	\$ 11,902,450

Notes:

- Estimated quantities for a 500,000m3 storage facility
- Potential off-site costs are not included
- Roller Compacted Concrete (RCC) price includes gravel base and subgrade prep

Table 1 - Combined Site Cost Estimate

Project: Fort Saskatchewan Material Handling Facility
 Client: City of Fort Saskatchewan

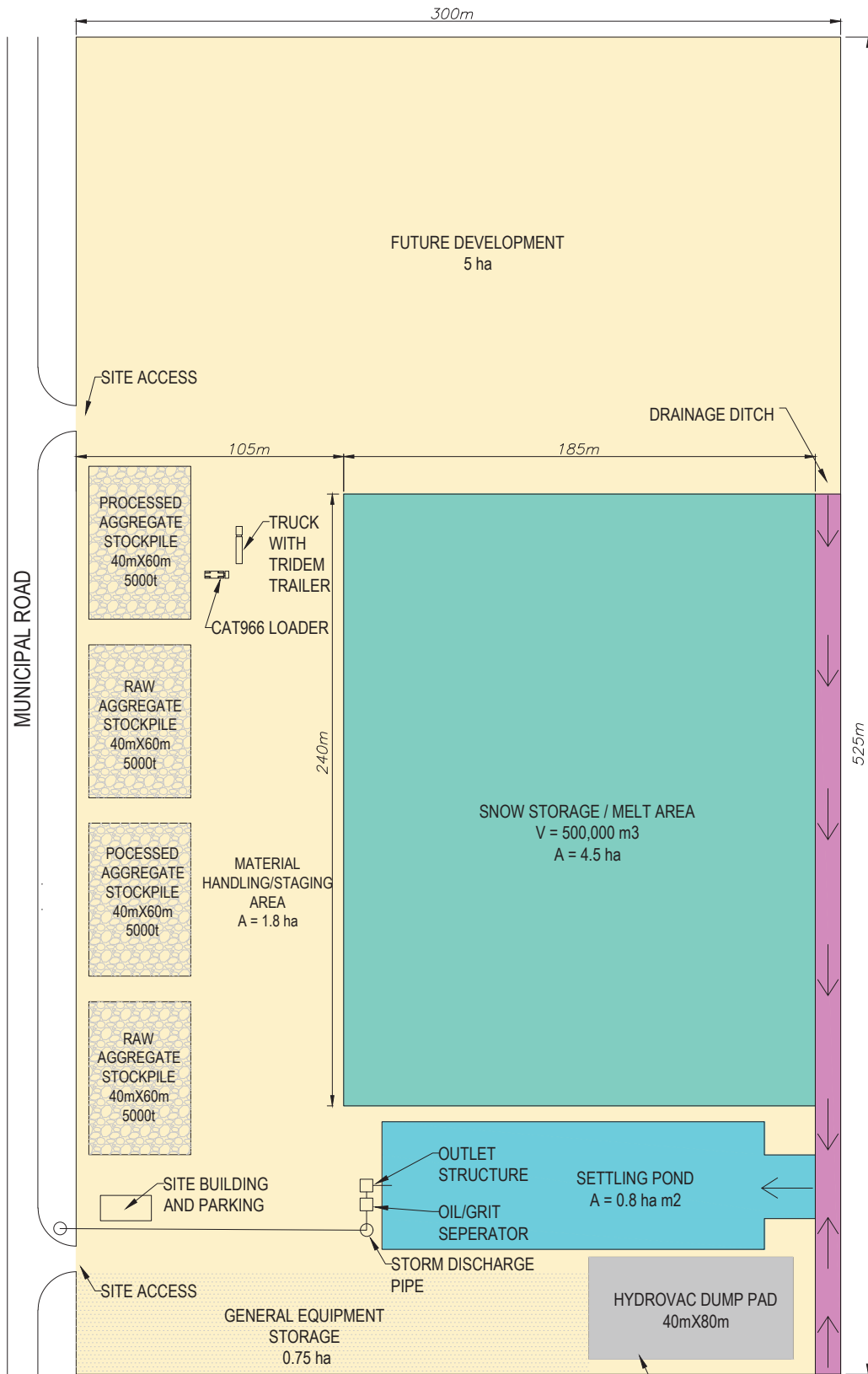
Date: Dec 21, 2023
 Job No.: 114-027

Item	Rate	Unit	Quantity	Total
Construction				
Topsoil Stripping	\$5.00	m3	10000	\$ 50,000.00
Grading	\$7.00	m3	10000	\$ 70,000.00
Gravel Surfacing	\$32.00	m2	25000	\$ 800,000.00
Fencing/Gate	\$20.00	m	800	\$ 16,000.00
Illumination	\$50,000.00	LS	1	\$ 50,000.00
				\$ -
Sub-Total				\$ 986,000.00
Engineering (@10%)				\$ 98,600.00
Contingency (@30%)				\$ 295,800.00
Sub-Total				\$ 295,800.00
Total				\$ 1,281,800.00

Notes:

- Estimated quantities for a 2.5 ha facility
- Potential off-site costs are not included

Table 2 - Material Handling Site Cost Estimate

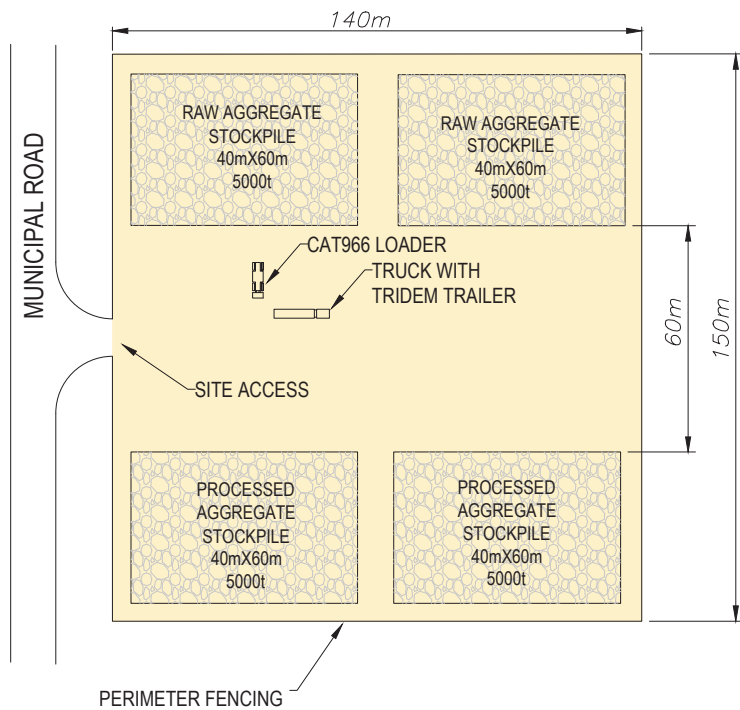


OVERALL SITE AREA
16 ha (40 Acres)

SNOW DUMP & MATERIAL HANDLING SITE

DRAWN BY: JRP	CHECKED BY: FDG	CONCEPTUAL PLAN
JANUARY 2024		
		Plan No. 1 of 1





OVERALL SITE AREA
2.1ha (5.2 Acres)



MATERIAL HANDLING SITE		
DRAWN BY: JRP	CHECKED BY: FDG	CONCEPTUAL PLAN
JANUARY 2024		Plan No. 1 of 1

7.0 Recommendations

Based on discussions with the City of the Fort Saskatchewan and provided information, the City requires a facility that will be able stockpile and manage snow removed from city streets and properties for a 50-year design life, store and process recycled construction materials, provide a hydrovac dump pad, have an equipment laydown area and allow for future expansion. To meet these requirements the facility should meet the following criteria:

- A combined facility be approximately 16 ha in size.
- A standalone material handling facility be approximately 2.5ha in size.
- The working face of the snow storage pile should face south to maximize melting potential.
- The site should be located close to existing truck access roads and a minimum of 350m from residences.
- The site should have access to the municipal storm water system with sufficient available capacity.
- Geotechnical conditions need to be able to accommodate the melt pad and settling pond.
- The site should be able to operate 24h a day.
- The site should not have any noise restrictions.
- The site should be flat to minimize grading costs.
- Zoning of site to allow for this type of facility.

Based on the operational costs that the City of Fort Saskatchewan currently spends to haul snow to facilities operated by Strathcona County and the City of Edmonton, it will not be cost effective to own and operate a city owned facility at this time. The upfront capital costs will be approximately \$4,000,000 for land, \$5,700,000 for the construction of the facility, and approximately \$300,000 per year to operate. The yearly costs to maintain the current arrangement with Strathcona County are approximately \$25,000 - \$50,000 and additional trucking costs of approximately \$176,000. If dump fees increase, or access is restricted, a city owned and operated facility could be further investigated.

Replacement of the existing material handling site should be pursued. The existing site is poor as it is located close to residential areas, was not formally designed or graded, located close to Ross Creek and is not large enough to handle the amount of material that is required. A new facility should be located in an industrial zoned location and could provide additional space for storage of City equipment.

The City could consider a parcel that is large enough to construct a snow melt facility in future. Having the two sites co-located would have operational benefits and there is value in securing land today if it is available. The size and uniqueness of the site's requirements could prove difficult to acquire in the future, therefore if an acceptable parcel is available today it should be considered.