CITY OF AIRDRIE

ARTIFICIAL TURF SPORTSFIELD FEASIBILITY STUDY

JANUARY 2021


Ed's Perch
2014

EXECUTIVE SUMMARY

Overview

The City of Airdrie is exploring the development of an artificial turf sports field. The existing natural surface field at Ed Eggerer Athletic Park has been identified as the best candidate for a retrofit to an artificial turf surface due to the existing site amenities and synergies with Genesis Place (immediately adjacent to the sports field on the same site). The feasibility study contained herein was developed to provide greater clarity on the costs, benefits, and site options associated with the potential project and provide a point of reference that can inform future decision making.

Stakeholder Engagement – Key Findings

Input and perspective on the project was gathered from sports field user groups and stakeholders through a web based Sport and Recreation Organization Questionnaire as well as a handful of discussion sessions with representatives from key organizations. Identified as follows are notable findings from these engagements.

- There is overall support for the project and a belief that developing an artificial turf field would provide a number of benefits to the community. Commonly cited benefits of developing an artificial turf field in Airdrie were the ability to retain recreation and sports activities in the community, perceptions of increased safety, a longer playing season, mitigating weather as a scheduling issue, and economic benefits associated with hosting games and tournaments.
- Sport field organizations that participated in the engagement were generally acceptable of paying similar “market rates” to access an artificial turf field in Airdrie as they currently do elsewhere.
- Lighting was identified as a critical amenity that will be required to maximize the use and associated benefits of an artificial turf field in Airdrie.
- While as previously noted there was a strong degree of support for the project, there is also some belief that the football community is likely to benefit most significantly from the project. Indoor field space remains a challenge for some soccer groups (the notion of an air supported “bubble” was mentioned as potentially warranting consideration).
- The risk of an oversupply of artificial turf sports fields in the Calgary region was not a concern for stakeholders as they perceive most artificial turf fields in the region to be at or near prime time capacity.

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Research and Benefits Analysis – Key Findings

In addition to engaging with user groups and stakeholders, the project team also undertook research and analysis to explore potential demand indicators and further understand the potential benefits of investing in an artificial turf venue. Identified as follows are key findings from this research and analysis.

- Airdrie has a higher proportion of children and youth compared to provincial averages (nearly 30% of residents are between the ages of 0 and 19). While recreation participation trends and preferences are dynamic, it is reasonable to assume that this characteristic will result in a continued demand for children and youth sport programming and the infrastructure that supports these activities.
- There are currently 11 artificial turf fields (7 sites) in the Calgary region. Based on the high level of demand for these venues, the City of Calgary is currently studying the cost and benefit impacts of retrofitting more natural surface fields to artificial turf.
- A service level review looked at artificial turf sports field provision in urban Alberta communities with a population ranging from approximately 25,000 – 120,000.
  - » Currently, 10 of the 14 communities in this population range provide at least one artificial turf sports field (Airdrie was one of four without an artificial turf field).
- An artificial turf sports field could provide between 438 and 615 hours of additional "prime time" capacity per year. Most of this additional capacity would be accrued during "shoulder seasons" (spring and fall); capacity that a natural surface field is challenging to consistently provide.
- While the economic benefits of artificial turf can be hard to specifically ascertain, it is logical to assume that an artificial turf field would provide additional opportunities for event and tournament hosting. Extrapolating potential game and tournament use of the potential new artificial turf venue to the Government of Alberta's domestic tourism spending calculation (average spend per person, per overnight visit) indicates that $548,170 in annual non-local spending could be generated by the venue. However, this figure reflects an initial, high level analysis and further study may be required if economic impact is deemed as being a key rationale for the project moving ahead.
- Available research and quantitative evidence is mixed on the safety benefits of artificial turf sports fields. This is noted as the safety benefits of artificial turf is commonly identified, especially by high impact sport user groups (e.g. football).
- While field specific maintenance (e.g. line painting, irrigation, mowing, seasonal care) is practically eliminated at an artificial turf venue, other operational costs largely offset these savings (including: staff to coordinate higher volumes of use, shoulder season costs associated with snow clearing).
  - » The relatively short lifespan of an artificial turf field (10-12 years) also offsets a number of operational cost savings as funds need to be set aside to account for future replacement.

Site Analysis

A site analysis was undertaken to review the functionality of the site from a programmatic perspectives as well as the technical characteristics of the site that may impact construction timing and costs. The site analysis supports that the Ed Eggerer Athletic Park site is functionally well-suited for an artificial turf sports field given the existing amenities, site synergies with Genesis Place, and the overall location within Airdrie (accessibility via an arterial roadway, proximity to services, available parking, etc.). However, the site presents some technical challenges related to the soil conditions that will require remediation prior to installing an artificial turf surface.

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Recommended Site Program

The research and engagement was used to develop a recommended site program (components and amenities that should be part of the facility project). Advantageously, many of these components and amenities already exist on the site. The following chart summarizes the recommended site program.

Recommended Component / Amenity	Existing (No Action Needed)	Existing but Requires Enhancement	Requires New Development	Description
Artificial turf field			✔	Retrofit of the existing natural surface field to an artificial turf surface with official Canadian football and FIFA soccer dimensions.
Field lighting			✔	Addition of field lighting to allow for evening use during all operational seasons.
Spectator grandstand seating	✔			Existing grandstand is deemed sufficient for intended uses.
Press box / event operation centre		✔		Existing press box requires expansion to 4 independent rooms.
Athletics track		✔		Existing track is likely to require resurfacing as part of the project due to construction impact.
Concessions	✔			Full food services available at the adjacent Genesis Place.
Storage		✔	✔	Some storage currently exists at the site; additional storage may be required to accommodate regular user groups.
Change rooms	✔	✔		Change rooms at Genesis Place can be used; however an on-site field house may warrant consideration as part of a future phase.

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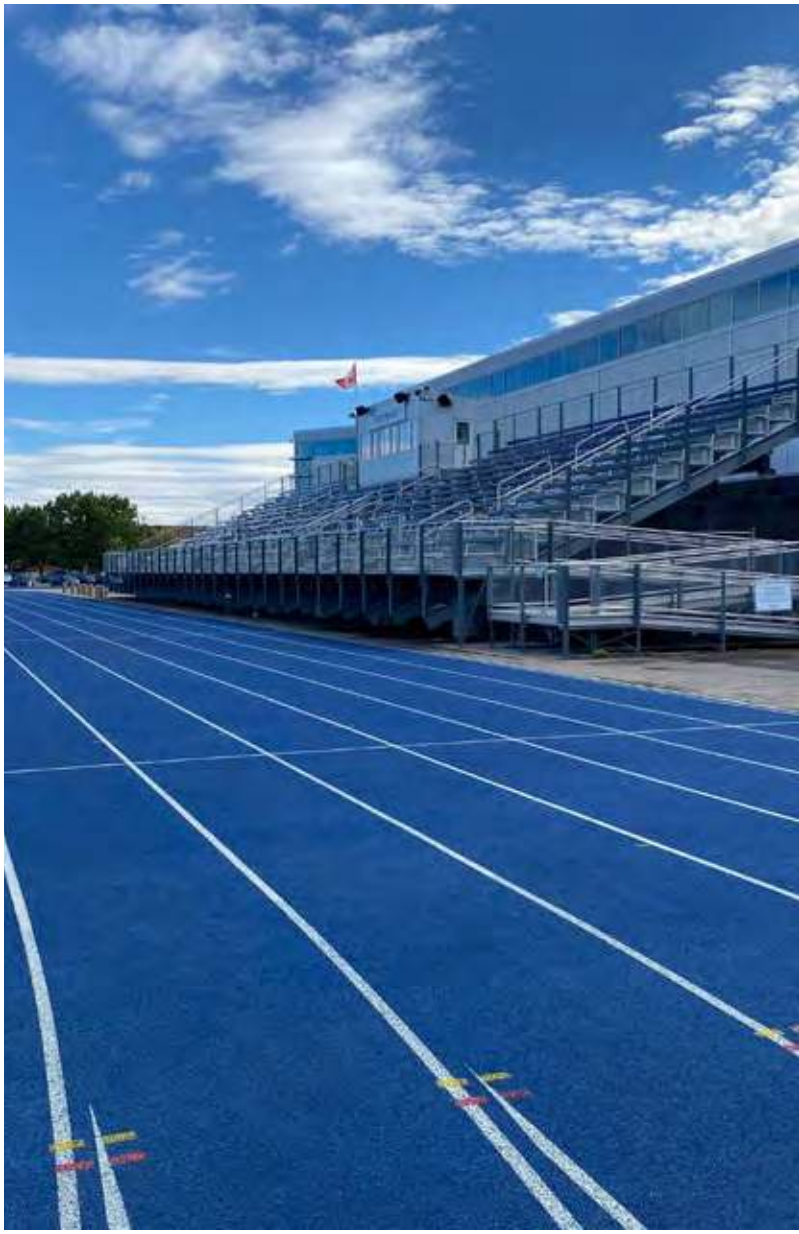
Estimated Capital Costs

As summarized by the following chart, the estimated capital cost of the project is $5,917,048. These figures reflect 2021 dollar values and should be considered +/- 20%. To account for fluctuations in the vendor and construction marketplace, it is suggested that a contingency of at least 5-10% be added to the estimated costs.

Summary of Capital Costs

Summary Including Contingencies and Soft Costs	$
Estimated Civil Works Costs	$4,569,760
Estimated Artificial Turf Costs (average of available options)*	$1,347,288
Total Estimated Project Cost	**$5,917,048**

**Optional and future phases costs are also estimated in Section 8 for an on-site field house building (additional change rooms and washrooms) and a seasonal air supported "bubble".*



EXECUTIVE SUMMARY

Estimated Operating Costs

Recognizing that a number of approaches could be used to manage and maintain the facility, two scenarios were developed. A base operating scenario (Scenario 1) includes the estimated additional staff required to operate the facility at an optimal service level based on expected usage. The second scenario (Scenario 2) uses the same revenue assumptions as Scenario 1, but without staffing expenditures (as it is assumed these functions would be undertaken using existing City staff levels and/or through a partnership arrangement with primary user groups). The impact of applying a lifecycle reserve contribution to annual operations is also shown in the chart for each scenario. It is important to note that the revenues associated with both scenarios are based on similar levels of use and fees as occurs in Calgary. If the project moves ahead, it will be important for the main users of the new artificial turf field to formally commit to a level of use and for the availability of the venue to be promoted broadly across the region.

Description		Revenues	Expenses	Annual Lifecycle Contribution	Net Operations
Scenarios with No Lifecycle Reserve Contribution					
Scenario 1 (Base Scenario)	Includes required incremental staff.	$101,024	$171,200	$0	($70,176)
Scenario 2	No incremental staff factored in (assumes these functions are fulfilled through volunteers or existing City staff).	$101,024	$65,000	$0	$36,024
Scenarios with Lifecycle Reserve Contribution					
Scenario 1 (Base Scenario)	Includes required incremental staff.	$101,024	$171,200	$104,167	($174,343)
Scenario 2	No incremental staff factored in (assumes these functions are fulfilled through volunteers or existing City staff).	$101,024	$65,000	$104,167	($68,143)

**Lifecycle reserve contribution figure of $104,167 is based on a $1,250,000 turf replacement cost and a 12 year lifespan before replacement is required.*

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While the estimated operating costs presented in the previous chart indicate that it is likely that an artificial turf field in Airdrie will require an annual subsidy, it is important to contextualize and consider the following factors.

- An artificial turf field provides shoulder season capacity in the spring and fall that may reduce the burden on other existing amenities in the city (e.g. indoor space at Genesis Place and use of natural surface fields during seasons in which field damage is likely).
- As per the chart below, the capacity (available hours) and operational cost (subsidy) of an artificial turf is generally equivalent to two natural surface fields.

	Annual Prime Time Capacity (Hours)	Estimated Annual Operating Subsidy Required (Incl. Contributions to a Lifecycle Reserve)
Artificial Turf Field (1 field)	1,176	($68,143) to ($174,343)
Natural Surface Field (2 fields)	1,076 - 1,428	($129,828)*

**Calculated using an average annual operating cost of $52,414 per field (as estimated for the 2019 Sportsfield Management Plan). A $250,000 replacement cost per natural surface field; and a 20 year lifespan assumption for a natural surface field.*

Next Steps

The feasibility study provides an initial point of reference to guide future decision making and partnerships discussions on the potential project. Outlined as follows are recommended next steps and key considerations for the project. Steps 1A and 1B should be considered as critical pre-requisites and undertaken prior to proceeding with Steps 2-5.

1A. As artificial turf surfaces have a limited lifespan of 10-12 years, the identification of lifecycle reserve funding strategy (and associated responsibilities of all main project partners) should be a focal point for future discussions and decision making.

   a) Increase the user fees identified in the feasibility study to a rate that adequately funds all or part of a lifecycle reserve.

   b) Fund a lifecycle reserve through contributions not tied to user fees (e.g. the City and key stakeholder agree to contribute a set amount annually to a lifecycle fund).

   c) Do not establish a lifecycle fund and address turf replacement costs at a later date.

1B. Using the feasibility study as a point of reference, get firm commitments from primary users groups on hours of use and the ability to pay market rates.

2. The City and key stakeholders (notably the Airdrie Turf Field Society) should collaboratively develop a community fundraising and sponsorship strategy.

3. Determine the preferred artificial turf typology and initiate vendor and construction procurement.

4. Develop an operational business plan that:

   a) Further refines and updates the operating assumptions outlined in the feasibility study.

   b) Identifies specific user fees in alignment with City fees and charges policy direction.

   c) Identifies allocation priority in alignment with City allocations planning and policy direction.

   d) Further specifies staffing roles and functions.

**Steps 4 and 5 could be reversed or occur simultaneously.*

TABLE OF CONTENTS

SECTION 1

INTRODUCTION

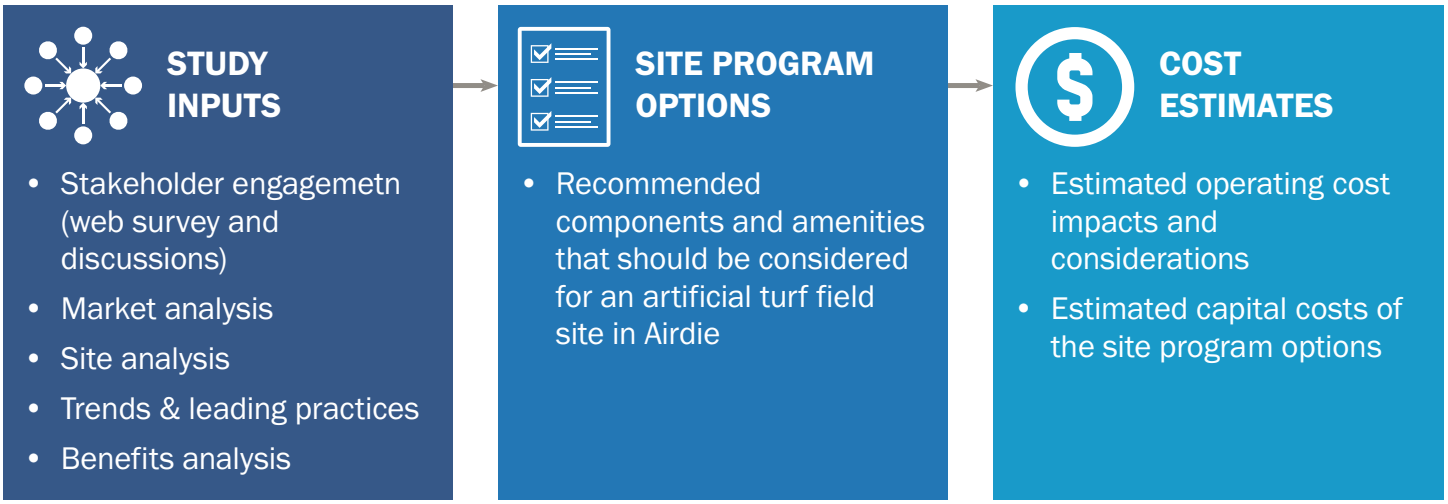
Included in this Section:

- Project background and context.
- Overview of the project process and desired outcomes.

This feasibility study document has been commissioned to explore the benefits, demand, potential options, and associated costs of developing an artificial turf in Airdrie. The notion of developing an artificial turf field in the community has been furthered in recent years by the formation of the Airdrie Field Turf Project Society. The group is comprised primarily of representatives and enthusiasts from the local and regional football community and, in partnership with the City, supported the development of this study to ensure all aspects of the potential project were clearly understood and measured.

The existing natural surface field at Ed Eggerer Athletic Park, located directly adjacent to Genesis Place, has been identified as the most likely candidate site for a retrofit from the current grass surface field to an artificial turf surface. This site is potentially advantageous as a number of existing indoor and outdoor amenities already exist which is likely to provide some cost efficiencies. As part of the study a more detailed analysis of the site condition and functionality was undertaken and is summarized in Section 3.

The following graphic illustrates the process that was used to develop the feasibility study. As reflected in the image, engagement and research inputs were used to identify program options (suggested components and amenities for the site). The cost impacts (capital and operating) of the program options were then further analyzed and identified.



The overall intent of this feasibility study is to provide the City with the necessary information and a point of reference that can inform future decision making and potential next steps. The study was developed by an independent consulting team consisting of RC Strategies and Binnie.

SECTION 2

MARKET CONTEXT

Included in this Section:

- Key population and demographics attributes and indicators.
- Current artificial turf provision in the catchment area.
- Service level comparison.

Population and Demographics[1]

The following chart summarizes relevant population and demographics attributes of Airdrie and considers how these attributes may impact future artificial turf field demand, utilization, and overall site needs.

Table 1

Population and Demographics Attribute / Characteristics	Potential Impact on Artificial Turf Demand and Site Considerations
The City's current population is 70,564 residents. This figure reflects growth of 3.63% from 2018. While the year to year growth rate has decreased in recent years, Airdrie remains one of Alberta's fastest growing urban communities having doubled in population since 2008.	• As further reflected later in this section, all communities in Alberta of a similar size to Airdrie provide artificial turf (potentially creating a resident and user group expectation for an artificial turf field as a base amenity). • As urban communities grow in population there are typically diversifying recreational and sport interests.
Nearly 30% of Airdrie residents are between 0 and 19 years of age. This proportion of children, youth, and young adults is higher than the provincial average of 25%.	• Given that children and youth comprise the majority of organized sport participation in a community, it is reasonable to assume that Airdrie will have higher than average organized sport participation numbers in coming years.
As would be expected in a community with a high proportion of under 19 residents, Airdrie also has a high proportion of young and middle aged adults (43% of residents are between the ages of 20 and 49).	• The majority of adult recreation and sport occurs during non-peak hours (e.g. later in the evening). As such, suitable infrastructure will be needed to support these activities. • Safety, convenience, and the existence of support amenities are often important considerations for adult sport participants.
85% of Airdrie residents that work within the community use their own vehicle as their main form of transportation. A large proportion of residents also commute to other areas in the Calgary Metropolitan area.	• Given the high prevalence of vehicle ownership it is reasonable to assume that most sport and recreation facilities are also accessed by participants (or their family) driving to these sites. While a societal shift to encouraging active transportation is likely to continue, an artificial turf field site in Airdrie will need to be accommodating to motorized vehicles.

1 *City of Airdrie Municipal Census, 2019*

Artificial Turf Field Provision in the Calgary Region

Artificial turf fields are generally destination facilities that draw from a relatively broad catchment area. The following map and charts (Tables 2-4) identify the location and characteristics of both existing and potential artificial turf fields in the Calgary metropolitan region. There are currently 11 existing artificial turf fields (6 sites) located in the Calgary region. Of note, the City of Calgary is currently undertaking a study to explore the benefits and cost impacts of retrofitting additional natural surface fields to artificial turf.

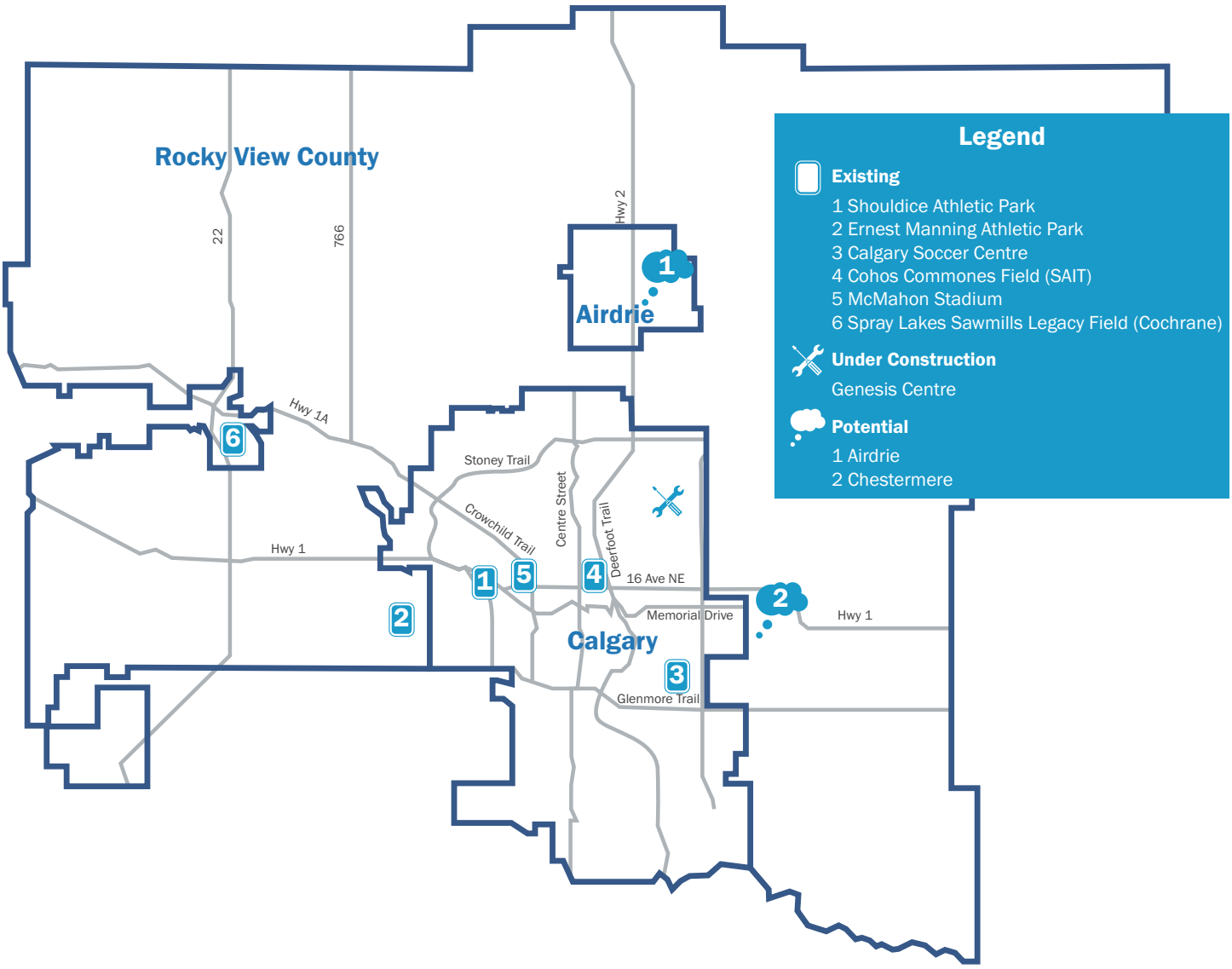


Table 2

Existing Artificial Turf Fields			
Artificial Turf Field Site	**Number of Artificial Turf Fields on the Site**	**Location**	**Notable Characteristics and Attributes**
Shouldice Athletic Park	3	1515 Home Road N.W	• All 3 artificial turf fields have lights, scoreboard, and PA system • Major athletic park site with 12 other sports field (mix of rectangular fields and ball diamonds)
Ernest Manning Athletic Park	1	20 Springborough Blvd S.W	• Field has lighting
Calgary Soccer Centre	3	7000 - 48 Street S.E.	• Adjacent to indoor soccer centre • 1 natural surface field also located on the site • Artificial turf fields are FIFA 2 star certified
Cohos Commones Field (SAIT)	1	Located on the SAIT Campus (1301 16 Ave N.W)	• Field does not have lighting
McMahon Stadium	1	1817 Crowchild Trail N.W	• Major spectator venue for the Calgary Stampeders and University of Calgary Athletics
Spray Lake Sawmills Legacy Field	1	Cochrane, AB	• Field has lighting • Initial phase 1 included the turf field and basic amenities; phase 2 ongoing to raise funding for additional change room and spectator amenities
Genesis Centre (expected completion in late 2021)	*1*	*7555 Falconridge Blvd N.E.*	• *Retrofit of an existing natural surface field* • *Field will have lighting* • *Minimal spectator seating and amenities proposed as part of the retrofit* • *Funding model includes a commitment of of $2 M from the City and $2 M from the North East Centre of Community Society ($6 M total project cost)*

Table 3

Potential (Not Confirmed Projects)			
Community	**Number of Artificial Turf Fields Proposed on the Site**	**Location**	**Notable Characteristics and Attributes**
Chestermere	1	Adjacent to the Recreation Centre	• The City of Chestermere is exploring the project with community stakeholders
Airdrie	1	Adjacent to Genesis Place	• Feasibility Study ongoing

Table 4

Summary of Existing and Potential Artificial		
	#	Provision Ratio (# of regional residents per artificial turf field)*
Existing Artificial Turf Fields	11	126,601
Existing + Potential Artificial Turf Fields	13	107,124

**Uses the Census Metropolitan Area population figure from Statistics Canada, 2016 Census of the Population*

User fees are another important consideration related to artificial turf field provision. Table 5 identifies the current user fees for artificial turf fields booked by the City of Calgary.

Table 5

Provider	Adult Fees (per hour)	Youth Fees (per hour)
City of Calgary (Athletic Parks and Soccer Centre)	$141.47	$111.47
City of Calgary (McMahon Stadium)	$155.62	$122.62

Service Level Analysis

While local need and demand should be primary drivers of recreation facility provision, a comparison with other jurisdictions can provide insight into:

- The competitive position of a community with regards to attracting tournaments and events;
- Resident expectations for a type of recreational facility (residents naturally contrast the infrastructure in their community to others they visit); and
- The types of recreation infrastructure that may be in-demand as a community grows.

Table 6 identifies artificial turf provision in small to mid-sized Alberta communities with a population range of approximately 25,000 – 120,000. As reflected in the table, 10 of the 14 Alberta communities in this population range provide artificial turf. With the exception of Airdrie, all of the communities with a population exceeding 40,000 residents provide artificial turf.

Table 6

Community	Population	Artificial Turf Fields (#)*
Fort Saskatchewan	23,895	1
Cochrane	25,853	1
Okotoks	28,881	0
Leduc	29,556	0
Lloydminster	34,583	0
Spruce Grove	36,135	2
Grande Prairie	63,166	1
St. Albert	65,589	1
Fort McMurray	66,573	1
Medicine Hat	76,522	1
Sherwood Park (Strathcona County)	98,044	1
Red Deer	100,418	1
Lethbridge	117,394	1
Airdrie	*61,082*	*0*

**Uses the Census Metropolitan Area population figure from Statistics Canada, 2016 Census of the Population*

It is also notable that in recent years a number of smaller Alberta communities have invested in artificial turf fields. Smaller Alberta communities with artificial turf fields include Cold Lake (14,961 residents), Lacombe (13,057 residents), Raymond (3,533 residents), and Bonnyville (5,081 residents). The majority of these projects have been community driven and included significant fundraising contributions from local sports organizations and/or not for profit organizations. Common rationale for these projects has included increased shoulder season capacity and perceived sports tourism opportunities.

SECTION 3

STAKEHOLDER ENGAGEMENT

Included in this Section:

- Key findings from the Sport and Recreation Organization Questionnaire.
- Themes and points of interest from the Stakeholder Discussions.

Engagement was undertaken with local and regional sports field user groups and stakeholders with the objective of further clarifying the benefits, potential levels of use, and important amenity considerations. The graphic below summarizes the methods used to undertake the stakeholder engagement.

Sport and Recreation Organization Questionnaire
6 Returned Questionnaires

Discussions with Key Stakeholder Groups
4 Discussions Convened

The key findings from the engagement are highlighted as follows in this section. ***Please refer to Appendix A for a list of organizations that participated in the engagement.***

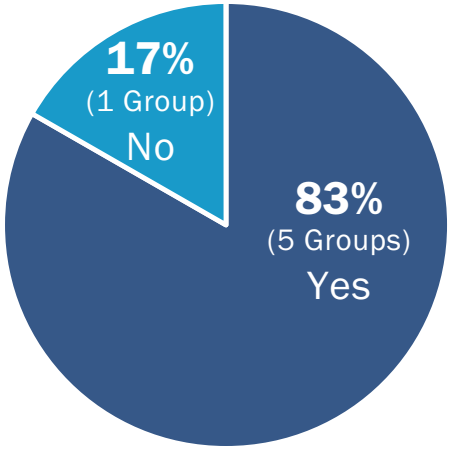
Sport and Recreation Organization Questionnaire – Key Findings

A questionnaire was distributed to sport field user groups that provide programming in Airdrie and/or across the Calgary region. The questionnaire was fielded for approximately 5 weeks (late July to the end of August) and responding groups had the options of completing either a web based or PDF version of the questionnaire.

Potential Use of an Artificial Turf Field in Airdrie

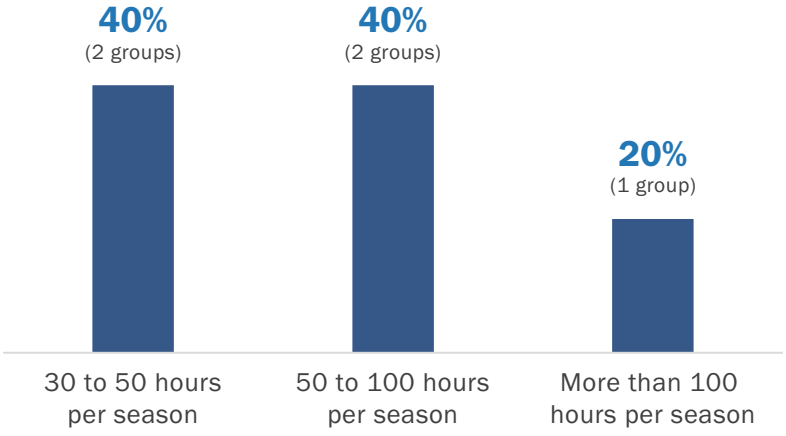
As illustrated by the adjacent graph, the majority of responding user groups (5 of 6) indicated that they would use an artificial turf field in Airdrie to varying degrees.

If an artificial turf field were to be developed in Airdrie, would your organization use it?



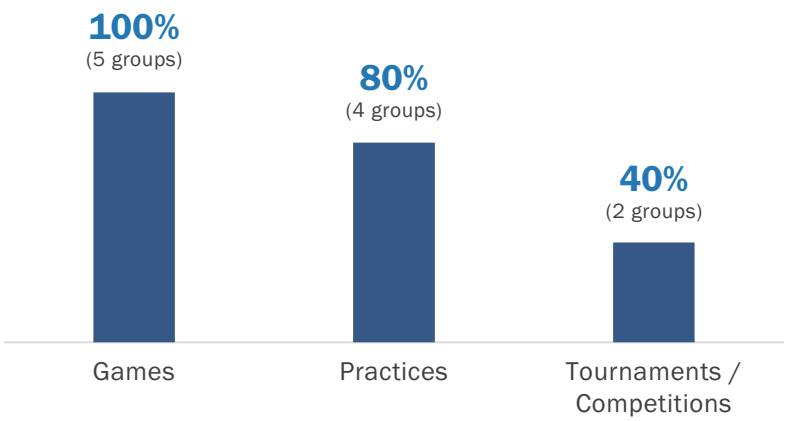
Four groups estimated their consumption of artificial field time in Airdrie to be >50 hours per season (two of these groups indicated that they would use > 100 hours per season).

Please estimate how many hours per season your organization would use at an artificial turf field in Airdrie.



When asked about their potential nature of use, games and practices were identified by the majority of responding groups.

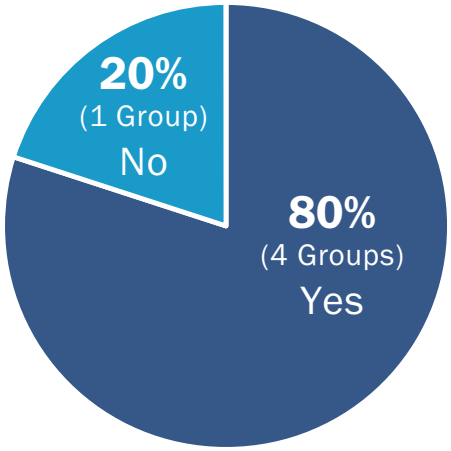
For what purposes and activities would your organization use an artificial turf field in Airdrie if one were developed?



User Fee Considerations

Responding groups were provided with a narrative that identified current artificial turf rates in Calgary and asked to indicate if their organization would be willing to pay market average rates to access and artificial turf field in Airdrie. As illustrated by the corresponding graph, 4 responding groups indicated that they were willing to pay similar rates.

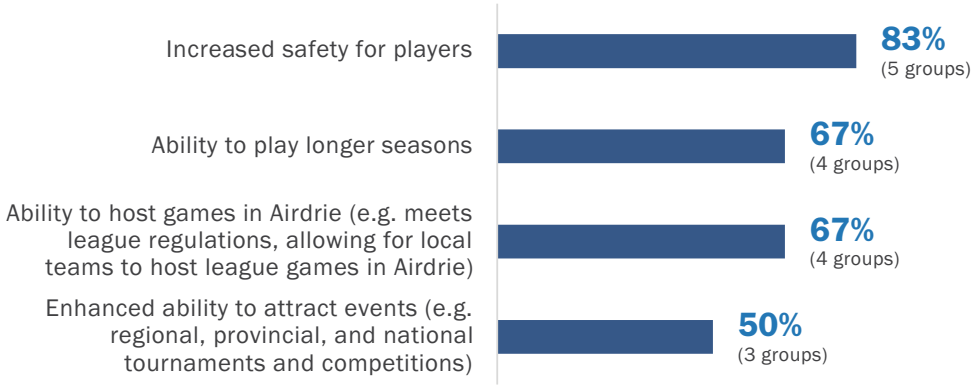
Is your organization willing to pay market average rates to access an artificial turf field in Airdrie?



Benefits and Impacts of Artificial Turf Development in Airdrie

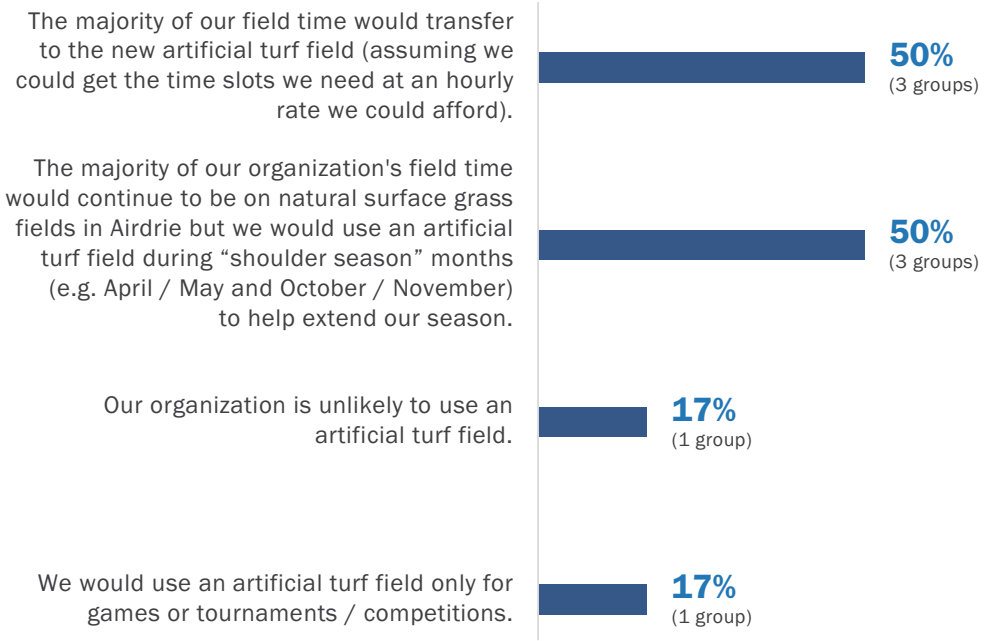
As illustrated by the adjacent graph, responding groups identified that the existence of an artificial turf field in Airdrie would bring about a variety of benefits, including increased safety, the ability to play longer seasons, the ability to host games locally, and the enhance ability of the community to attract events.

If an artificial turf field is developed in Airdrie, how would it benefit your organization?



When asked how their field use would change if an artificial turf field was developed in Airdrie, three (3) responding groups indicated that the majority of their field time would transfer to that surface.

Which of the following scenarios do you think would be likely occur if an artificial turf field is developed in Airdire?



Amenity Considerations

Responding groups were provided with a list of amenity types and asked to indicate the level of importance of each amenity as it would relate to their potential level of use and experience at an artificial turf field in Airdrie. As reflected in the following chart, lighting, permanent field lines, and on-site snow removal / sweeping equipment were identified as being "very important" by the majority of responding groups. On-site storage and upgraded dressing room areas were identified as being "very important" by half of the responding groups.

Amenity Consideration	Very Important	Somewhat Important	Not Important
Lighting	5 groups	1 group	0 groups
Permanent field lines for a variety of sports (football, soccer, rugby, field lacrosse, etc.)	5 groups	0 groups	0 groups
Upgraded dressing room areas	3 groups	2 groups	1 group
Portable goal posts and nets	1 group	4 groups	1 group
On-site storage	3 groups	2 groups	1 group
On-site snow removal / sweeping equipment	4 groups	1 group	1 group

Comments Provided in the Questionnaire

Space was provided throughout the questionnaire for responding groups to expand on their response and/or provide additional comments on the potential artificial turf field projects. The majority of comments provided reiterated support for the project and expressed the importance of ensuring that the facility is developed with quality and safety as paramount considerations (e.g. with sufficient support amenities, adequate buffer areas, etc.).

Discussions with Key Stakeholder Groups – Key Findings

Following up on the questionnaire, a handful of stakeholders were invited to participate in a discussion session with a member of the consulting team. These discussion sessions presented the opportunity to further explore key topics and considerations related to the project. Summarized as follows are notable themes and points of interest that emanated from the four discussions that were convened.

- Artificial turf fields in Calgary are perceived to be at capacity and difficult to book during "prime time" hours. A couple of the stakeholders believe that an artificial turf field in Airdrie would help address a need for artificial turf in northeast Calgary and newer communities located along Stony Trail.
- The following benefits of developing an artificial turf field were consistently expressed throughout the discussions by both soccer and football stakeholders:
  - » Eliminating (or vastly reducing) weather as a scheduling variable
  - » Opportunities for "shoulder season" use (early spring and late fall)
  - » Keeping participation in the community (reducing the need for Airdrie residents to travel to Calgary or other regional communities for games or tournaments)
- Football stakeholders expressed the safety benefits of artificial turf and the significant opportunity that artificial turf presents to further grow the sport in the community.
- The need for full sized, non-boarded indoor field space in Airdrie and more broadly across the Calgary region was expressed as being a significant regional need for soccer. While the notion of an artificial turf field in Airdrie was supported, it was suggested that covering the field during winter seasons (e.g. temporary air supported structure) could help maximize the benefits of the project and more broadly address soccer infrastructure needs.
- The majority of stakeholders believe that a new artificial turf field in Airdrie would be able to charge user rates consistent with those currently charged in Calgary.
- Lighting was strongly identified as a critical "must have" amenity.
- Football stakeholders also expressed the need to expand the current press box to make it suitable for hosting high school level games (it was indicated that a minimum of 4 independent rooms are needed in the press box).
- All of the stakeholders believe that the Genesis Place site (Ed Eggerer Athletic Park) is an optimal location for an artificial turf field in Airdrie. The existence of food services, indoor warm-up areas, and relative abundance of parking were noted as being attributes of the site that could also reduce project costs.
- Increased dressing room capacity was identified as being a potential future phase that could help further enhance the facility.

SECTION 4

TRENDS AND LEADING PRACTICES

Included in this Section:

- Notable artificial turf trends and leading practices.

Summarized in this section are notable trends and leading practices that are impacting artificial turf development and operations across Western Canada.

Diversity of artificial turf product options. Whereas 10-15 years ago only a handful of vendors and products existed, procurers of artificial turf have numerous turf typology, infill, and underlay products that each have their associated attributes. **A high level overview of these product options and considerations is provided in Appendix B.*

Retrofitting natural surface fields to leverage existing amenities and increase utilization. The majority of artificial turf field projects across Western Canada are retrofits of existing natural surface fields as opposed to completely new field developments. These projects are often rationalized based on the opportunity to utilize pre-existing amenity infrastructure (e.g. spectator seating, parking, adjacencies to indoor recreation infrastructure), lower operational expenditures, and expanded shoulder season capacity.

Maximizing community benefits and access to artificial turf fields. Traditionally, artificial turf fields have been viewed as sites of elite level sport in a community with restricted (or no) access for spontaneous or recreational uses. This mindset is slowly evolving and many communities are increasingly looking to ensure that artificial turf fields provide a broader public benefit. While the higher operational cost and maintenance realities of providing artificial turf fields can be a barrier to facilitating broader types of use, dedicated "drop-in" times (similar to a gymnasium), 1/3 and 1/2 field rental opportunities, and day-time (non-prime) use of artificial fields for fitness and youth programming are ways that many communities are expand the benefits of an artificial turf field.

Balancing levels of public access and physical barrier considerations. Related to the previous trend, many artificial turf operators struggle philosophically with fencing considerations and the level of public access that should be allowed onto an artificial turf field. On one hand, minimizing public access can extend the surface lifespan by maximizing cleanliness and reducing wear and tear. However, putting in place overly restrictive access measures can limit community benefit and create a sense of inaccessibility or even "elitism" of the venue. Although there is no 'one size fits all' answer to managing these accessibility considerations, a number of basic site design and management practices can help achieve an appropriate balance. Installing a fencing system that focuses on limiting ingress and egress from external areas with a higher risk of dirt contamination, signage, and site monitoring are methods that can help strike a balance.

Lifecycle Reserve Budgeting. Artificial turf fields typically have a lifespan ranging from 10-15 years which is influenced by a number of factors including levels of use, climate (e.g. amount of sun and precipitation), site factors, and maintenance practices. Given this relatively short surface lifespan relative to other recreational amenities, lifecycle budgeting is a critical aspect of sustainability and can help ensure funding is in place to replace artificial turf surfacing prior to significant safety issues or deterioration of the field base (e.g. shock pads and other underlay materials). A leading practice is to ensure user fees are set an amount that is sufficient to fund a lifecycle reserve and not simply ongoing operations and maintenance.

SECTION 5

BENEFITS ANALYSIS

Included in this Section:

- Capacity analysis (natural vs artificial turf surfaces).
- Economic benefits.
- Safety considerations.
- Operating and maintenance cost benefits.

The decision on whether to invest in providing artificial turf should ultimately be benefits based and consider the community, sport, and economic impacts of the potential project. As the project is being considered, it is also important to be realistic about the degree of benefit that can be accrued and have an understanding of how (or if) those benefits can be accurately measured. Provided is follows in this section is a high level analysis of potential benefits that have been cited as rationale for the artificial turf project.

Capacity of Natural vs Artificial Turf Surfaces

A common rationale for retrofitting a natural turf surface to artificial turf is the ability to provide increased capacity. Findings from the Sports Field Management Plan (finalized in 2019) do not suggest that overall rectangular field capacity is currently and issue in Airdrie. However, providing artificial turf would unquestionably provide increased capacity during "shoulder" seasons (early spring and late fall) and reduce the scheduling disruptions due to inclement weather, required rest and maintenance. As reflected in Table 8, an artificial turf field provides 2-3 months of additional use and between 438 and 615 of additional "prime time" hours of capacity per season in comparison to a natural surface field. The inclusion of lighting would also further expand this additional capacity opportunity.

Table 8

	Months of Use	Probable Weather, Rest Time, and Maintenance Adjustment	Prime Time Hours Available**
Artificial Turf Field	7	2%	1,152
Natural Surface Field - Typology Scenario 1*	4	20%	528
Natural Surface Field - Typology Scenario 2*	5	15%	714
Additional Capacity Provided by an Artificial Turf Field	**+2 – 3 months**	**-**	**+438 – 615 annual "prime time" hours per field**

**Two scenarios have been identified as natural surface sport field capacity is dependent on the condition characteristics of a field or site (e.g. existence of irrigation, drainage related factors, level of maintenance care, etc.)*

***Prime time for the purposes of this high level analysis is defined as 4 hours per weekday (e.g. 5 p.m. to 9 p.m.) and 10 hours per weekend day (e.g. 9 a.m. to 7 p.m.).*

Economic Benefits

The degree to which providing an artificial turf venue can drive economic value is challenging to accurately quantify given the variability of activities and users. However, there is some logical rationale to believe that developing an artificial turf field could positively position Airdrie to attract incremental non-local visitors to the community.

- **The football community's preference for artificial turf.** Entities that govern and direct competitive levels of football across the province have a clear preference for artificial turf and have demonstrated a preference to locating games accordingly. The Alberta Schools' Athletic Association Official Handbook dictates that all major provincial level games will occur on artificial turf. Given the season of play and injury considerations, most school sports zone administrators have also shown a preference for scheduling games on artificial turf where available. The growth of youth football jamborees and other multi-game tournament style events is also likely to influence the demand for artificial turf and create opportunities for sports tourism stays and spending in communities that provide desirable venues. These football specific dynamics supports the notion that providing artificial turf will retain local resident spending and recruit some level of non-local spending.
- **Soccer tournaments and games during shoulder seasons.** The degree to which artificial turf is advantageous in attracting incremental major soccer events and major competitions is less clear than with football for a couple reasons. The majority of significant regional, provincial, and national events tend to prefer (and in some instances dictate) having access to multi-field sites. Whiles attitudes towards artificial turf and clear FIFA artificial turf guidelines have positively shifted attitudes towards artificial turf as a playing surface, a preference for high quality natural surface fields also still does exist among some in the soccer community. However, it is likely that providing artificial turf will result in some incremental game and tournament hosting opportunities during shoulder seasons in the spring and fall when weather is most likely to be a factor.
- **Concerts, festivals and other community events.** Artificial turf fields can provide a well suited event hosting venue for concerts, festivals, and other gatherings given the durability and consistency of the surface (e.g. staging and other structures can be placed on the artificial surface without the risk of killing grass or creating ruts that would need to be rehabilitated).

It is important to recognize that the extent to which an artificial turf field can drive the economic benefits associated with the above noted activities will depend on the level of investment into event attraction, the financial risk tolerance of the City and stakeholders with regards to hosting events, and the City's overall strategic priority towards sports and event tourism.

Table 9 on the following page provides a high level calculation of the non-local spending that an artificial turf field could help generate through hosting sports games and tournaments. This analysis extrapolates the Government of Alberta's domestic tourism spending calculation (average spend per person, per overnight visit) to a potential scenario of non-local participants and spectators that would visit the site for major games and tournaments each year. **It is important to reiterate that this analysis is high level and the scenario assumptions may warrant further validation and/or refinement if the project moves forward. Should the economic benefits associated with the potential artificial turf facility become a major decision making factor, the City and its partners could benefit from conducting a detailed economic impact assessment. This exercise could further explore the potential economic activity that an artificial turf venue could generate by attracting visitations from within the region that are not likely to be overnight stays (e.g. Calgary residents coming to Airdrie to use the facility, tournaments with primarily local teams, etc.) as well as the value of retaining Airdrie residents in the community for sports and recreational activities.**

Table 9

	#	Assumption
Major Sports Games ("major sports games" are those with some level of spectator appeal; not including tournament play or recreation sport games)		
Major games per operational season	21	Average 3 per month (7 month operational season)
Average number of participants and coaches per game	40	Average of 20 per team
Average number of spectators per game	300	Estimate
Total participants, coaches, and spectators for major games during the operational season	7,140	Total participants, coaches, and spectators x 14 games
Non-local resident assumption (those individuals requiring an overnight stay)	10%	Estimate
Total non-local participants, coaches, and spectators	714	10% of the total number of participants, players, and coaches
Average spend per non local visitor, per day	$205	Source: Domestic Tourism in Alberta: A Summary of 2016 Domestic Visitor Numbers, Expenditures and Characteristics (July 2018)
Total Non-Local Spending Generated Annually by Major Sports Games	***$146,370***	
Major Tournament Hosting ("major tournament hosting" is defined as those that attract a significant number of out of town teams)		
Major tournaments per operational season	14	Average 2 per month (7 month operational season)
Average number of participants and coaches per tournament	160	Assumes an average of 20 participants and coaches x 8 teams
Number of non-participants (e.g. family, spectators, etc.) per tournament	120	Assumes an average of 15 per team (0.75 per participants)
Total participants, coaches, and non-participants for major tournaments held during the operational season	3,920	Total participants, coaches, and spectators x 10.5 tournaments
Non-local resident assumption (those individuals requiring an overnight stay)	50%	Estimate
Total non-local participants, coaches, and spectators	1,960	50% of the total number of participants, players, and coaches
Average spend per non local visitor, per day	$205	Source: Domestic Tourism in Alberta: A Summary of 2016 Domestic Visitor Numbers, Expenditures and Characteristics (July 2018)
Total Non-Local Spending Generated Annually by Major Tournaments	***$401,800***	
Total Estimated Non-Local Spending Generated by Major Games and Major Tournaments	**$548,170**	

Safety Considerations

Numerous studies have been undertaken over the past decade to try and better understand the injury and player safety impacts of artificial turf vs natural surface fields. Summarized below is a sampling key findings from a number of notable studies that reflect the differing and often contradictory evidence that exists with regards to the potential safety impacts of different field surface types.

- A study that tracked injury incidences in Major League Soccer from 2013-2016 found no discernable difference between natural and artificial turf surfaces.[1]
- A compressive study of NCAA athlete injuries from 2004 looked at 3,009,205 NCAA athlete exposures and 2,460 knee injury occurrences to identify turf related attributes. The study found no difference in the mechanisms of knee injuries on natural grass and artificial turf.[2]
- In 2015 the City of Toronto in partnership with Toronto Public Health conducted a *Health Impact Assessment of the Use of Artificial Turf*.[3] Notable conclusions from the study included:
  - » Available evidence indicates that under ordinary circumstances, adverse health effects among adults and children are unlikely to occur as a result of exposure to artificial turf infilled with crumb rubber in both outdoor and indoor settings.
  - » Adverse health effects among adults and children are unlikely to occur as a result of exposure to artificial turf infilled with crumb rubber in both outdoor and indoor settings.
  - » Research used by the study suggests that artificial turf increases the risk of ankle injuries, with mixed evidence regarding knee injuries and muscle strains.
  - » The study noted that there is insufficient evidence to clearly state that there is any different between natural and artificial turf surfaces with regards to the prevalence of contact injuries such as concussions and fractures.
- In contrast to the study in Toronto, a recent (2020) study published in the *British Association of Sport & Exercise Medicine Journal* did find an overall lower concussion and head injury rate occurring on artificial turf field surfaces for in competitive contact sports. However the study did note that further research was needed to investigate causality and the specific factors related to surface type that lead to head injuries.[4]

4 *O' Leary, F., Acampora, N., Hand, F., & O' Donovan, J. (2020). Association of artificial turf and concussion in competitive contact sports: A systematic review and meta-analysis. BMJ Open Sport & Exercise Medicine, 6(1), e000695. doi:10.1136/bmjsem-2019-000695*

Operating and Maintenance Cost Benefits

Analysis undertaken in 2019 as part of the Sportsfield Management Plan identified the following cost structures for existing natural surface rectangular sports fields in Airdrie (see Table 10 below). It is important to note that the maintenance expenditures identified in Table 10 do not account for contributions to a lifecycle reserve.

Table 10

Annual Maintenance Expenditures (all 36 fields)	$314,483
Average Maintenance Expenditure Per Field	$52,414
Maintenance Expenditure Per Acre	$3,674
Total Annual Revenues (all 36 fields)	$28,017
Average Revenue Generated Per Field	$778.25
Overall Cost Recovery (% of Expenditures Recovered Through Revenues)	9%

Reduced operating and maintenance costs and higher revenues are often cited as potential benefits of retrofitting natural surface sports field to artificial turf. However, available sports and recreation sector research on whether or not artificial turf fields provide a costs savings relative to natural surface fields is contradictory and dependent on the expenditures included in the cost accounting exercise as well as other contextual factors such as the method of provision (e.g. municipal vs community), climate, levels of use, and seasonal duration of use. Based on the consulting team's experience across Western Canada, identified below are a number of operating and maintenance cost assumptions that are reasonable to assume should an artificial turf field be developed in Airdrie.

- Maintenance costs at an artificial turf field will be reduced by as much as one-quarter as regular irrigation, mowing, lining, and natural turf management (top dressing, overseeding, turf rehabilitation etc.) will not be required.
- While maintenance costs are reduced at artificial turf, additional staff time will be required for functions such as scheduling and overall venue operations (e.g. snow clearing during shoulder seasons, switch-over between user groups, event set-up) given the increased volume of use relative to existing natural surface fields.
- The artificial turf field may generate gross revenues that exceed the total of all revenues generated by natural surface fields (dependent on the implementation timing of the fees strategy outlined in the Sportsfield Management Plan.
- The lifespan of an artificial turf field is typically between 10-15 years and the replacement of the artificial surface costs at least 4-5 time that of replacing a premium natural surface field. As such, ensuring that a lifecycle reserve is adequately funded is critical and should be factored into either ongoing operations (allocated from user fees) or the overall funding model for the facility (responsibilities pertaining to lifecycle replacement clearly outlined with stakeholders and partners before the project proceeds). It is the consultant's experience that these costs are not always factored into a comparison of artificial turf vs natural turf cost considerations.

A more comprehensive analysis of the estimated expenditures and revenues associated with the potential project are detailed in Section 8.

SECTION 6

SITE ANALYSIS

Included in this Section:

- Analysis of the proposed site functionality.
- Technical analysis of the proposed site.

The assessment of the Ed Eggerer Athletic Park site undertaken by the consulting team looked at both the functional suitability of the site from a user benefit and programmatic perspective as well as the technical conditions of the site. This analysis concluded that:

- From a functionality and programmatic standpoint, the site is well suited for the artificial turf retrofit project based on the existing on-site amenities and adjacencies to complementary services in the community; and
- There are technical challenges associated with the site that can be mitigated, but will result in the project incurring some site preparation costs above what is typically considered “normal”.

Site Functionality

Presented as follows is a summary of the site analysis. As reflected in the analysis, a 3 point scale was used to assess suitability and the proposed Ed Eggerer Athletic Park Site scored a possible 13 out of 15 points.

Table 11

Consideration	Scoring Metric	Score Assigned to the Ed Eggerer Athletic Park Site	Rationale for the Score Assigned
Existing Sports Field Amenities	3 pts: The field site has all of existing amenities associated with a performance sports field venue (small stadium), including: grandstand seating, a press box, scoreboard, concession, washrooms, lighting, and changeroom facilities. These amenities do not require any upgrade as part of the artificial turf installation project. 2 pts: The field site has the majority of existing amenities noted in the previous scoring categories. Some level of upgrade (or enhancement as part of a future phase) will be needed to be fully optimize the venue for the anticipated uses. 1 pt: The field site has some of the existing amenities noted in the first scoring category, but will require significant amenity development or enhancement as part of the artificial turf installation project in order to achieve at least a base level of functionality for the anticipated uses. 0 pts: The field site has no existing amenities.	2	The existing field site has a strong complement of amenities, however the addition of lighting and expansion of the press box would be required to optimize use. While changeroom facilities exist inside the adjacent Genesis Place facility, developing dedicated change room facilities immediately on the field site may be required to optimize the venue.
Existing Site Amenities	3 pts: The field site is co-located with other major community amenities that provides amenity efficiencies (e.g. shared concessions, shared event parking, warm-up spaces, indoor tournament and meeting rooms) and operational efficiencies (e.g. shared staff, shared equipment, etc.). 0 pts: The field site does not offer significant co-location opportunities.	3	The Eggerer Athletic Park site is located immediately adjacent to Genesis Place, the primary indoor recreation facility in Airdrie. The site has an abundance of parking and the Genesis Place facility includes a variety of recreation spaces, meeting rooms, and sports services (physiotherapy, training, etc.) The site is also located less than 350 metres from Bert Church High School. The adjacent East Lake Park site also has other recreational amenities including tennis courts and an outdoor rink.

Consideration	Scoring Metric	Score Assigned to the Ed Eggerer Athletic Park Site	Rationale for the Score Assigned
Site Access	3 pts: The site is accessible via a major arterial or collector road and within 0-2 km of a major freeway or highway. 2 pts: The site is accessible via a major arterial or collector road and within 2-5 km of a major freeway or highway. 0 pts: The site is either not accessible via a major arterial or collector road or 5 km of a major freeway or highway.	3	The site is immediately accessible via East Lake Boulevard, a designated arterial road in Airdrie and is located within approximately 1 km of QE Highway II.
Proximity to Services	3 pts: The field site has excellent access to accommodations and food service options (multiple options within a 10 minute drive). 1/2 pts: The field site has average to good access to accommodations and food service options (e.g. multiple options exist but may be located >10 minute drive). 0 pts: The field site has poor access to accommodations and food service options (options in the immediate vicinity are limited or non-existent and require a drive of >20 minutes).	3	The site is located within ~500 metres of flag hotel providers (Ramada and Super 8) and multiple food service options. In general, North Airdrie is well serviced by hotel and food service options given the proximity to the QE Highway II corridor and Calgary.
Proximity / Adjacency to Other Sports Fields	3 pts: The field site is part of a major regional sports field park (>8 rectangular sports fields with tournament amenities). 2 pts: The field site is part of a community sports field park (3 - 8 rectangular sports fields with some basic amenities). 1 pt: The field site has one or two adjacent sports fields that could be used for warm-up but that would not likely support any level of tournament hosting. 0 pts: The field site has no other adjacent fields.	2	The proposed artificial turf field site at Ed Eggerer Athletic Park is adjacent to a three other full sized rectangular fields (2 on the north shore of East Lake and a field located on the Bert Church High School site).

Technical Analysis of the Site

A geotechnical investigation was conducted on the site to further explore soil conditions and factors that may impact artificial turf installation. A summary of the geotechnical analysis is provided below. ***Please refer to Appendix C for the detailed geotechnical report.***

- 2 borehole locations were drilled and advanced to 6.55 mbgs (Meters below ground surface)
- The site has a 10 cm thick topsoil layer
- Silty clay soil fill was found up to depths of 2.15 and 1.50 mbgs (Meters below ground surface)
- Silty clay with some organic matter was found in one borehole from 1.50 to 3.05 mbgs (Meters below ground surface)
- The remainder of the material was found to be silty clay and sand

As per the above findings, the geotechnical conditions of the site are not optimal but development can proceed. It is recommended that any fill and organic soils be over-excavated to achieve a competent subgrade. Two options are recommended for fill below artificial turf structure:

1. Non-cohesive material – install turf as per manufacturer's specifications.
2. Cohesive material – additional frost protection and subsurface dewatering required.

The technical analysis of the site also looked at a couple of other factors that will have an impact on site development requirements and cost.

- The existing site infrastructure capacity is deemed excellent. The existing stormwater system and electrical (Phase III) can be utilized.
- One notable limitation of the site in its current configuration pertains to the dimensions of the field. Football configuration would need to be modified in the corner end zones to not impact the existing running track or adaptation of the running track will need to be undertaken to allow for fully dimensioned end zone areas.
- The preliminary assessment of roadway access and parking suggests that the existing site conditions are excellent for increase vehicular traffic that may occur as a result of artificial turf development.

SECTION 7

RECOMMENDED SITE PROGRAM & CONCEPTS

Included in this Section:

- Site program (main components and amenities).
- Conceptual rendering of the venue.

Site Program

A program was developed to reflect the types of components and amenities that are best suited for the site based on the expected level and types of uses. The following chart provides an overview of the recommended components and amenities that should be included as part of the project. As reflect in the chart, the site currently has a number of these identified components and amenities although some require an upgrade or enhancement.

Table 12

Recommended Component / Amenity	Existing (No Action Needed)	Existing but Requires Enhancement	Requires New Development	Description
Artificial turf field			✔	Retrofit of the existing natural surface field to an artificial turf surface with official Canadian football and FIFA soccer dimensions.
Field lighting			✔	Addition of field lighting to allow for evening use during all operational seasons.
Spectator grandstand seating	✔			Existing grandstand is deemed sufficient for intended uses.
Press box / event operation centre		✔		Existing press box requires expansion to 4 independent rooms.
Athletics track		✔		Existing track is likely to require resurfacing as part of the project due to construction impact.
Concessions	✔			Full food services available at the adjacent Genesis Place.
Storage		✔	✔	Some storage currently exists at the site; additional storage may be required to accommodate regular user groups.
Change rooms	✔	✔		Change rooms at Genesis Place can be used; however an on-site field house may warrant consideration as part of a future phase.

Site Concept

The following image illustrates the recommended site program (location of components and amenities) and spatial relationships to existing spaces and site conditions.

SECTION 8

FINANCIAL IMPACTS

Included in this Section:

- Capital cost estimates.
- Operating cost estimates and considerations.
- Fundraising Considerations.

Capital Cost Estimates

The following charts (Tables 13-15) outline the estimated capital cost of the project, broken into Civil Works (site work and enhancement of site amenities) and Artificial Turf (costs associated with the turf, infill, and site furniture). All capital cost figures identified in this document should be considered +/- 20% and reflect 2021 dollar values. It is also important to note that these figures do not include a contingency allocation which is strongly suggested given the variability of vendor and construction costs. ***For additional detail on the capital costs associated with the project elements please refer to Appendix D.***

Summary of Capital Costs (Table 13)

Summary Including Contingencies and Soft Costs	$
Estimated Civil Works Costs	$4,569,760
Estimated Artificial Turf Costs (average of available options)*	$1,347,288
Total Estimated Project Cost	**$5,917,048**

**Reflects the average of the four turf typology options (see Table 15 for cost per type)*

Overview of Civil Works Costs by Category (Table 14)

Item	Description	$
Site Demolition, Mobilization, and Demobilization	Estimated	$390,000
Site Earthwork	Includes construction fencing, mud mat and restoration, removal and disposal of topsoil and unsuitable fill, supply and install of new fill, excavation and grading, and site fencing and erosion control measures.	$1,114,700
Landscaping	Supply and install sod and 150mm of topsoil including fine grading.	$1,500
Site Servicing	Enhanced drainage and stormwater connections.	$174,500
Synthetic Turf - Aggregrate Base	Includes: • Supply and installation of perimeter concrete barrier curb per detail; and • Synthetic Turf Field Granular Base including but not limited to 500mm Granular with all associated items.	$736,500
Track Resurfacing	Resurfacing of the existing running track (assumes track will require resurfacing due to age and construction activity associated with artificial turf field construction).	$390,000
Lighting	Installation of sports field lighting (Musco Lighting; four poles).	$500,000
Enhancement to Exsiting Press Box	Expansion of press box to four rooms.	$100,000
Permanent Storage Facility	For snow clearing equipment, portable nets, football uprights, etc.	$4,500
Concrete Plaza	Base for storage container, event purposes, and potential future field house.	$103,500
	Sub-Total Civil Works	**$3,515,200**
	Civil Works Contingency (20%)	**$703,040**
	Civil Works Soft Costs (10%)	**$351,520**
	Estimated Total Civil Works Cost	**$4,569,760**

Overview of Artificial Turf Costs by Turf Typology (Table 15)

	SBR (Crumb Rubber) Pre-Engineered Pad	TPE (Thermoplastic Elastomer) Pre-Engineered Pad	SBR (Crumb Rubber) Elastic Layer	TPE (Thermoplastic Elastomer) Elastic Layer
Turf	$566,500	$566,500	$566,500	$566,500
Infill	$154,500	$257,500	$257,500	$257,500
Shock Pad	$154,500	$154,500	$154,500	$309,000
Site Furniture	$45,000	$45,000	$45,000	$45,000
Sub-Total	$920,500	$1,023,500	$1,023,500	$1,178,000
Contingency (20%)	$184,100	$204,700	$204,700	$235,600
Soft Costs (10%)	$92,050	$102,350	$102,350	$117,800
Total Estimated Artificial Turf Costs	**$1,196,650**	**$1,330,550**	**$1,330,550**	**$1,531,400**

**Please refer to Appendix B for additional detail on the turf typologies.*

Optional Components and Potential Future Phases

To further inform planning and potential future phases that could be considered for the site, the capital costs associated with a seasonal air supported structure ("bubble") and a field house structure are also provided. **These estimated costs do not include a contingency or soft costs and should be considered high level estimates pending future analysis.**

Table 16

Item	Potential Use, Benefits, and Other Considerations	Estimated Capital Cost
Air Supported "Bubble" Structure	May provide the potential to expand use and benefit of the artificial turf field throughout the winter months. *Annual set-up and take down costs and operational impacts of an air supported structure vary significantly and should be explored if this optional project component is considered*	$2,343,250
Field House Structure	Opportunity to provide additional on-site change room capacity that could benefit games and tournaments held at the site.	$727,500

Estimated Operating Costs

A key next step for the project will be to further refine potential operating models. To provide a basis for these discussions, the project team identified and modelled out a couple different approaches that could be used to operate the facility. The base operating scenario (Scenario 1) was developed using the following key assumptions:

- Incremental staff will be required for booking and allocations as well as ongoing venue operations. This incremental staffing equates to 2.0 FTE.
- Some additional site staff will be needed for special events, however these functions are assumed to be the financial responsibility of user groups and event organizers and are thus not accounted for in the Scenario 1 operating budget.
- Utilization of the facility will occur at similar levels to other artificial turf fields in Calgary (as per the consultant's market knowledge and analysis from other regional projects). Achieving this level of utilization will require the facility operator to aggressively market to regional user groups as well as continue to support local sport development among existing, emerging, and new user groups. **Future funding and partnership discussions should also include a commitment to a level of use among main user groups. If these commitments do not suggest that 70% of prime time utilization is realistic, the revenues and associated impacts should be revisited accordingly.*
- Average "Prime Time" hourly rates will be slightly less than the City of Calgary's and "Non-Prime Time" rates will be offered at a significant discount to generate utilization and revenues during expected non-peak hours of use.
- "Prime Time" is defined as 4 hours per weekday (e.g. 5 p.m. to 9 p.m.) and 10 hours per weekend day (e.g. 9 a.m. to 7 p.m.). "Non-Prime Time" is defined as 8 hours per weekday (e.g. 9 a.m. – 5 p.m.) and 2 hours per weekend day (e.g. 7 – 9 p.m.).
- Sponsorship revenues are assumed to the capital fundraising model for the first 10 years of operations.
- Revenues not factors into the estimates include concession and merchandise revenues, any increase in the value of lease spaces at Genesis Place, or parking.

Scenario 1 (No Lifecycle Reserve Contribution)

Scenario 1 indicates that the facility would operate at a net loss position of $70,176 annually, not including a contribution to a lifecycle reserve fund.

Table 17

Revenues	Assumption	$
Prime Time Field Rentals	70% utilization of available **prime time** capacity (1,152 annual hours) @ an average hourly rate of $110 per hour.	$88,704
Non-Prime Time Field Rentals	20% utilization of available **non-prime time** capacity (1,232 annual hours) @ an average hourly rate of $50 per hour.	$12,320
Sponsorships	Assumed to capital fundraising over the first 10 years of operation.	$0
	Total Revenues	**$101,024**
Expenditures	**Assumption**	**$**
Incremental Staffing	0.5 FTE scheduling and allocations @ $60,000 (required to manage the additional bookings required for the venue) 1.0 FTE field operations coordinator @ $60,000 (required for game and practice set-up / switch-over between uses, snow clearing during shoulder seasons, etc.)	$90,000
Benefits and Training	18% of wages	$16,200
General Maintenance Costs	Estimated for turf repair, special event lining, equipment costs (e.g. fuel and maintenance), etc.	$15,000
Utilities	Estimated for lighting and press box electricity.	$50,000
	Total Expenditures	**$171,200**
	Net Operating Position	**($70,176)**

Scenario 2 (No Lifecycle Reserve Contribution)

Scenario 2 uses the same revenue assumptions as Scenario 1 but has no expenditures for staffing. The premise of this assumption is that these required functions would be fulfilled by existing City staff levels or user groups. Scenario 2 would generate positive revenues of $36,024 annually, not including a contribution to a lifecycle reserve fund.

Table 18

Revenues	Assumption	$
Prime Time Field Rentals	70% utilization of available **prime time** capacity (1,152 annual hours) @ an average hourly rate of $110 per hour.	$88,704
Non-Prime Time Field Rentals	20% utilization of available **non-prime time** capacity (1,232 annual hours) @ an average hourly rate of $50 per hour.	$12,320
Sponsorships	Assumed to capital fundraising over the first 10 years of operation.	$0
	Total Revenues	**$101,024**
Expenditures	**Assumption**	**$**
General Maintenance Costs	Estimated for turf repair, special event lining, equipment costs (e.g. fuel and maintenance), etc.	$15,000
Utilities	Estimated for lighting and press box electricity.	$50,000
	Total Expenditures	**$65,000**
	Net Operating Position	**$36,024**

Lifecycle Reserve Contribution Analysis and Adjustment of the Scenarios

Adequately contributing to a lifecycle reserve is a critical aspect of sustaining an artificial turf field at a standard that is both safe and appealing for user groups. As reflected in Table 17, an annual contribution of $104,167 would be required to fully fund a capital reserve of $1,250,000 within a 12 year period (a reasonable lifespan assumption for an artificial turf field).

Table 19

Turf Lifecycle Replacement Cost	$1,250,000
Turf Lifecycle Assumption (years)	12
Annual Lifecycle Contribution Required to Fund Lifecycle Reserve	$104,167

Table 20 reflects the impact of applying the lifecycle reserve to Scenarios 1 and 2 based on the assumptions identified in Table 19.

Table 20

Description		Revenues	Expenses	Annual Lifecycle Contribution	Net Operations
Scenarios with No Lifecycle Reserve Contribution					
Scenario 1 (Base Scenario)	Includes required incremental staff.	$101,024	$171,200	$0	($70,176)
Scenario 2	No incremental staff factored in (assumes these functions are fulfilled through volunteers or existing City staff).	$101,024	$65,000	$0	$36,024
Scenarios with Lifecycle Reserve Contribution					
Scenario 1 (Base Scenario)	Includes required incremental staff.	$101,024	$171,200	$104,167	($174,343)
Scenario 2	No incremental staff factored in (assumes these functions are fulfilled through volunteers or existing City staff).	$101,024	$65,000	$104,167	($68,143)

While factoring in lifecycle reserve contributions indicates that the facility will require an annual subsidy amount of $68,143 - $174,343; it is important to reiterate that the City's current cost to provide a natural surface field is estimated at $52,414 annually. This figure also does not include a lifecycle contribution and represents an average per field cost across the entire inventory (the cost to provide a higher quality natural surface field is likely much higher relative to the overall average). As previously reflected in Section 5, an artificial turf field can also provide capacity that is comparable to two natural surface fields thus potentially reducing future field development or replacement needs. Table 19 presents a comparison of the operating cost of natural surface vs artificial turf surface fields using these assumptions. A reflected in Table 19 the annual cost impact is relatively similar between the two field types.

Table 21

	Annual Prime Time Capacity (Hours)	Estimated Annual Operating Subsidy Required (Incl. Contributions to a Capital Reserve)
Artificial Turf Field (1 field)	1,176	($68,143) to ($174,343)
Natural Surface Field (2 fields)	1,076 - 1,428	($129,828)*

**Calculated using an average annual operating cost of $52,414 per field; a $250,000 replacement cost per fields; and a 20 year lifespan assumption for a natural surface field.*

Fundraising Considerations

Capital funding for the project is likely to require contributions from municipal government sources and fundraising. Grant funding opportunities from senior levels of government are competitive and the success level is hard to predict, but could also factor into the funding formula for the project. Provided as follows is a brief overview of potential funding considerations and opportunities.

Major Grant Programs

The federal government's Investing in Canada Infrastructure Program has committed funding through to 2028 with funding applications administered by the provincial government and funds up to 40% of municipal or not for profit projects. The provincial government has recently (September 2020) stated that future funding received through the program will be directed to the COVID-19 Resilience stream which can be used for "capital maintenance and renewal improvements to public infrastructure as part of Alberta's Recovery Plan to build, diversify, and create tens of thousands of jobs in our Province."[1]

The provincial governments Community Facility Enhancement Program (CFEP) remains another potential source of capital funds. The funding outcomes of the CFEP program are to:

- Enhance the lifespan and support the creation of public-use community facilities
- Stimulate economic activity across the province

The large funding stream of the program is for eligible projects requesting over $125,001 and up to $1 million.[2]

Capital Sponsorships

The success of capital sponsorship campaigns for sport and recreation facilities varies greatly and is typically dependent upon the following key factors:

- Level of organization, capacity, and energy of a local fundraising group or entity
- Public and stakeholder support for the project (and perceived benefit of the project)
- State of the local and regional economy

The following chart identifies the potential value of key sponsorship assets that may be available at a new artificial turf venue. This preliminary estimation of sponsorship value is based on other recent artificial turf field and recreation facility sponsorship campaigns in Alberta over the past 5 years and should be further validated by a local fundraising committee and/or sponsorship expert. In general, it is reasonable to assume that 5-10% of the project cost can be generated through sponsorships.

Table 22

Sponsorship Asset	Estimated Annual Asset Value (Preliminary)	Probable Sponsorship Term Required
Venue Naming Rights	$20,000 - $40,000 per year	10 years
Scoreclock	$4,000 - $8,000 per year	5 years
End Zone Banners	$1,000 - $2,000 per year, per banner (~ 4-8 banners)	2 years
*Field House**	*$5,000 - $10,000 per year*	*10 years*

**Potentially included as a future phase*

SECTION 9

RECOMMENDED NEXT STEPS

Included in this Section:

- Recommended next steps for the project.

The findings and analysis contained in this feasibility study generally support that the potential artificial turf retrofit of Ed Eggerer Athletic Park will provide a number of user group and community benefits. However, before the project proceeds to the development stage the following five next steps are recommended. Following these steps will help further validate the long viability and sustainability of the potential venue and ensure risk is adequately mitigated to all key stakeholders.

1A. As artificial turf surfaces have a limited lifespan of 10-12 years, the identification of lifecycle reserve funding strategy (and associated responsibilities of all main project partners) should be a focal point for future discussions and decision making.

   a) Increase the user fees identified in the feasibility study to a rate that adequately funds all or part of a lifecycle reserve.

   b) Fund a lifecycle reserve through contributions not tied to user fees (e.g. the City and key stakeholder agree to contribute a set amount annually to a lifecycle fund).

   c) Do not establish a lifecycle fund and address turf replacement costs at a later date.

1B. Using the feasibility study as a point of reference, get firm commitments from primary users groups on hours of use and the ability to pay market rates.

2. The City and key stakeholders (notably the Airdrie Turf Field Society) should collaboratively develop a community fundraising and sponsorship strategy.

3. Determine the preferred artificial turf typology and initiate vendor and construction procurement.

4. Develop an operational business plan that:

   a) Further refines and updates the operating assumptions outlined in the feasibility study.

   b) Identifies specific user fees in alignment with City fees and charges policy direction.

   c) Identifies allocation priority in alignment with City allocations planning and policy direction.

   d) Further specifies staffing roles and functions.

**Steps 4 and 5 could be reversed or occur simultaneously.*

APPENDICES

Appendix A: Stakeholder Engagement Participating Organizations

Sport and Recreation Organization Questionnaire – Participating Organizations

Calgary Bantam Football Association

Airdrie Bantam Raiders Football

AFS Flag Football

George McDougall Mustangs High School Football

Airdrie Raiders Spring Football

Calgary United Soccer Association

Stakeholder Discussions – Participating Organizations

Airdrie and District Minor Soccer Association

Airdrie Turf Field Society

Rocky View Schools (Sports Leagues)

Calgary United Soccer Association

Appendix B: Artificial Turf Product Options Overview & Considerations

Artificial Turf Typology

Artificial Turf System

Artificial turf materials are manufactured in rolls that are usually 15 ft (4.5 m) wide. Each roll should be attached to the next with a seam to form the fabric of the field. The seams are adhered with a supplemental backing material and sewn with high strength sewing thread. The bonding and fastening of all system material components should provide a permanent, tight, secure, and hazard-free athletic playing surface. Seam gaps should be uniform. For tufted infill systems, the gap between the fibres should not exceed the gauge of the tufting.

Fibre

Fibre used in artificial turf is textured and/or non-textured polypropylene, polyethylene, nylon, or other suitable performing hybrid or copolymer in tape form or monofilament. Minimum fibre sizes are 50 microns for polypropylene or polyester, 100 microns for tape form (slit film) polyethylene, 140-300 form monofilament polyethylene (shape dependent).

Backing Materials

Backing material is on back of the turf, as opposed to the turf or face. There is an adhesive backing used as a part of the system which is either urethane or latex coating. Turf backing refers to the stabilizing fabrics that are used to secure the fibre tufts.

Slit Film

Slit film is fiber has been around the longest in infilled systems and has proven to be the most durable. Also known as fibrillated or monotape, it is a single tape made and then cut into slits from top to bottom to divide it into several tapes. It has an interlaced structure, where each of the fibres looks much like a honeycomb. Slit film is very durable, and its structure reduces infill flyout.

Monofilament

Monofilament is a single strand of Artificial fibre bundled together to achieve a more grass-like appearance. A monofilament fibre results in a more controlled ball roll. Monofilament also has less glare than a slit film resulting in a more natural aesthetic.

Hybrid

Hybrid fibre systems combine slit film and monofilament fibres into one complete system. Hybrid systems look like natural grass and allow for better ball roll. These systems tend to be durable and promote infill control. They typically feature two-ends-per-needle manufacturing process.

Thatch Layer

Thatch is a textured yarn that is situated below the face yarn to enhance grass-pile recovery. It is added to systems to create a matrix of protection that minimizes infill movement and reduces migration to other areas of the field.

Infill Products

Infill Function

Infilled Artificial turf consists of relatively widely spaced Artificial grass fibres tufted into a backing material to which ground infill is deposited through brushing after the turf is installed. There are a variety of different infill materials available, however, the most common type is crumb rubber (over 90% of fields utilize crumb rubber). The turf and infill are then installed over a shock pad.

The infill material usually (but not always) contributes towards shock attenuation (for safety and injury reduction), acts as ballast and a stabilizer for the Artificial turf fibers and plays an important role in the playability of the field (ball roll, ball bounce, surface speed, footing, etc.).

Recycled Rubber

Crumb Rubber (SBR or CRI)	
Product Description	Crumb Rubber (SBR/CRI) is produced by grinding or shredding used passenger vehicle and truck tires and removing approximately 99% of the steel and fabric belting material. The CRI is then installed within the synthetic turf grass blades, blended with silica sand, or occasionally without sand. Approximately 50% of crumb rubber from recycled tires is utilized in sports surfaces and playgrounds. The remaining uses include rubberized asphalt pavement, extruded rubber products, and automotive parts.
Advantages	• Highly resilient–Excellent shock absorption • Widely used in Synthetic Turf Field in approx. 90% of fields • Low cost compared to other infill materials • Post-consumer recycled product removes tires from waste stream • Optional light colour selections absorbs less visible light to reduce surface temperature • Athletic Performance (excellent elasticity and durability) • High UV resistance
Disadvantages	• Post-consumer recycled product—material source variable • Public perception of potential health impact • Due to its black colour, more heat is absorbed resulting in higher surface temperatures than some of the alternative infills • CRI can omit a somewhat unpleasant 'off-gassing' odor when first installed, particularly during very hot weather • Negative Perception of rubber
Additional Information	• The infill material is either reused in the replacement field or reclaimed – the end use is dependent on infill type. • Aesthetic (Black color)

Crumb Rubber Coated	
Product Description	Crumb Rubber Coated is similar to SBR/CRI which is ground-up car and truck tires which has been encapsulated with a cross linkable UV resistant coating. Coated rubber provides additional aesthetic appeal, reduction of dust byproducts during the manufacturing process, and complete encapsulation of the rubber particle.
Advantages	• Highly resilient–Excellent shock absorption • Low cost • Post-consumer recycled product removes tires from waste stream • Optional light colour selections absorbs less visible light to reduce surface temperature • Reduction in fine particles
Disadvantages	• Post-consumer recycled product—material source variable • Public perception of potential health impact • Different coating qualities existing on the market • Premature wear of the coating according to the quality
Additional Information	• The infill material is either reused in the replacement field or reclaimed – the end use is dependent on infill type. • Aesthetics (Color) – Various colour available

Virgin Rubber

Thermoplastic Elastomer or Olefin (TPE or TPO)	
Product Description	Thermoplastic Elastomer or Olefin (TPE or TPO) is made from raw materials for use as infill. It is not a recycled product. It is a ground crumb, formed particle or shredded material, about the same size as SBR/CRI. It is commonly green in colour but can be manufactured in a variety of colours. TPE is installed within the synthetic turf grass blades, blended with silica sand, or occasionally without sand. TPE is food-safe and is also used to manufacture food storage containers and water bottles.
Advantages	• Can have high resiliency– good shock absorption, minimal 'spray' • Virgin material–raw materials can be controlled – contains no cancer-causing PAH's or heavy metals • Can be melted so they can be recycled after use • Potential reduction in turf surface temperature • Athletic Performance (elasticity) • Good particle size distribution due to its angular shape • Limited fine particles
Disadvantages	• High cost; limited availability results in high transportation costs • Extruded particles • All particles are the same size–do not settle together • Round particles can create slipping problems on sidewalks or tracks • Improper formulation can lead to premature aging issues • Medium UV Resistance • Different qualities (various origin/recycling): A low polymer content can lead to premature ageing problems and agglomeration • As a manufactured, non-local material, TPE has a higher carbon footprint • Limited supply and manufactures
Additional Information	• The infill material is either reused in the replacement field or reclaimed – the end use is dependent on infill type • Aesthetics (Color) – Various colours available • TPE has a lower melting point than SBR/CRI therefore TPE should be sourced only from manufacturers with sound quality control practices

Ethylene Propylene Diene Monomer (EPDM)	
Product Description	Ethylene Propylene Diene Monomer (EPDM) is a synthetic rubber material that is purpose made from raw materials for use as infill. It is not a recycled product. It is a ground crumb, formed particle, or shredded material, about the same size as CRI. It is commonly green, black, or brown in colour, but can be manufactured in a variety of colours. EPDM is installed within the synthetic turf grass blades, blended with silica sand, or occasionally without sand. EPDM is not a food-safe material. It is also used as the coloured top coat layer in running tracks and playground surfacing.
Advantages	• Virgin material–control of raw materials • High to medium resiliency depending on filler level • Crumb form–settles like crumb rubber • Athletic Performance (elasticity) • Odorless • Limited fine particles • Can be recycled
Disadvantages	• High cost • Limited availability results in high transportation costs • High filler level results in chalking, degradation of materials • Improper crosslinking can lead to premature aging • Generic Material - Must use Proven - Proprietary formulations for quality • Medium UV Resistance • Different qualities (low polymer content = > Ageing, agglomeration problems) • As a manufactured, non-local material, EPDM has a higher carbon footprint • Limited supply and manufactures
Additional Information	• The infill material is either reused in the replacement field or reclaimed – the end use is dependent on infill type. • Aesthetics (Color) – Various colours available

Mineral

Rounded Silica Sand	
Product Description	Rounded Silica Sand is one of the original infilling materials utilized in synthetic turf. This product is a natural infill that is non-toxic, chemically stable, and fracture resistant. Silica sand infills are typically tan, off-tan, or white in color and – depending upon plant location – may be round or sub-round in particle shape. As a natural product there is no possibility of heavy metals, and the dust/turbidity rating is less than 100. It can be used in conjunction with many other infills on the market to provide a safe and more realistic playing surface. Typically, sand product is blended with recycled rubber, virgin rubber and organic, not use a sole for infill material unless for specific sport field application (lawn bowling, field hockey).
Advantages	• Relatively low cost (per lbs) • Inorganic material–can be cleaned to have low impurities
Disadvantages	• No resiliency–low shock absorption • Requires a pad • High transportation costs due to weight • High number of pounds required to infill the system (high cost)
Additional Information	• The infill material is either reused in the replacement field or reclaimed – the end use is dependent on infill type. • Product can be given a colour

Coated Sand	
Product Description	Coated Sand infill consists of coated, high-purity silica sand with either a soft or rigid coating specifically engineered for synthetic turf. These coatings are either elastomeric or acrylic in nature (non-toxic) and form a bond with the sand grain sealing it from bacteria to provide superior performance and durability over the life of a field. Coated sand is available in various sizes to meet the application's needs. Typically, sand product is blended with recycled rubber, virgin rubber, and organics. They do not use a sole for infill material unless for specific sport field application (lawn bowling, field hockey).
Advantages	• Good sport performance • Good footing • Low maintenance • Good permeability • Aesthetics
Disadvantages	• Slightly more abrasive • Not a resilient material • Abrasiveness (Users and fibers--> coating degradation) • Hardness • Cost (combined with an underlayer) • Pollution (clogging) • Variable coating quality: fiber pollution and filling
Additional Information	• The infill material is either reused in the replacement field or reclaimed – the end use is dependent on infill type.

Environment

Migration Concerns

There are ongoing concerns within Europe and North America regarding the migration of infill product and broken turf fibre off the field and into watercourses which contribute to pollution. The following possible options and can be used for any synthetic turf field development:

- Different infill products have different migration rates. Infill product migration is partially managed at the source through the choice of infill product.
- Turf fibers migrate significantly less in quantity than infill. The turf fibers are stitched rather than glued to the backing material providing a durable mechanical means of anchorage. Fiber migration increases when the turf has been severely damaged and not repaired or over worn. Turf wear is monitored by the extent of splitting of the fiber ends. Once splitting reaches a certain point the turf losses its playable characteristics and is replaced, before it is over worn.
- To contain infill and turf fiber migration for any future proposed field:
  - » Select an infill product with a low migration characteristic and stitched turf fiber system;
  - » Implement a raised perimeter edge to contain migration;
  - » Install boot brushes and educational signage at all access and egress gates; and
  - » Implement a site overland drainage system that directs all drainage to sump style catch basins possessing an inverted weir and filter.
  - » Additional water quality measures can be included within overall stormwater management plan by adding a stormceptor (Oil Grit Separator) to outlet of catchment area for the synthetic tur field area.
- Collectively these efforts will prevent migratory elements entering the municipal storm water system and ultimately the natural environment and allow for recovery and reuse of migrated infill products.

Recycling

Recycling of the synthetic turf and infill materials has been ongoing question within overall synthetic turf industry in North America. At the end of its useful lifespan, current industry practice is to remove the infill and ship the turf to a recycling facility in Asia. The facility is certified by the Geneva, Switzerland based International Organisation for Standardization (ISO), and meets the US Environmental Protection Act's Resource Conservation and Recovery Act with regard to waste. At the facility the turf fibers are separated from the backing materials and are processed into small pellets or beads and incorporated into other manufactured products including plastic lumber, irrigation pipe, various household products and other materials. A third-party certification is provided at the conclusion of this process.

A new turf recycling facility is scheduled to open in California in 2020, thus eliminating the need to ship overseas. The infill material is either reused in the replacement field or reclaimed – the end use is dependent on infill type.

RECOMMENDED PADDING / UNDERLAY

Shock Pads

Shock attenuation pads offer an added level of protection and consistent playability to the playing surface and are designed to contribute to a safe g-max level throughout an Artificial turf field's life. Roll out or panel systems are relatively economical and offer ease of installation. Pads can be permeable or impermeable. Some can replace all or portions of the stone base and provide both shock attenuation and drainage, while others are used in combination with a traditional stone and drainage base. Pads can be placed directly over asphalt or cement stabilized surfaces. Provided care is taken in the turf install/removal process, some last more than one turf life cycle. Some pads are made from recycled materials, while others are made from virgin materials and may be recyclable.

These are type of shock pad types available on the marketplace currently:

- Pre-engineered
  - » The product is either thermal bonded (closed-cell) cross-linked polyethene foam (XPE or PEX) or nonwoven Geotextile shock & drainage pad. The system is assembled through an interlocking panel system. The typical lifespan can range from 8 to 20 years (two turf replacements), based on the original installation.
- Elastic Layer (Pour in Place)
  - » Elastic layer offering superior quality and construction. The product can be installed from range 10mm to 35mm based on proposed Artificial Turf System. Elastc Layer is constructed from rubber crumb material with binder (glue). Elastic layer does offers increased field stability, longevity and performance. Its specialized design is resistant to weather fluctuations, severe heat, frozen climates, thawing, rot and field use. The typical lifespan can range from 20 to 30 years (four turf replacements), based on the original installation.

Field Signage – Artificial Turf

Signage provides rules for users to follow when on an artificial turf field, which helps prevent damage and keeps the field clean. Information that could be listed on signage includes:

- No food or drink or glass containers on the field. Plastic water bottles permitted.
- No spitting
- No alcohol
- No smoking
- No chewing tobacco
- No pets (animals) on the field
- Avoid tracking infill material off the field. Before leaving the field, shake off any visible infill and use the boot brush area.
- Clean and disinfect wounds and cover them as soon as possible.
- No footwear with metal spikes or metal cleats.
- Clean footwear on boot brushes before entering field
- No scooters, skateboards, in-line skates, roller blades or motorized vehicles (e.g. ATVs or battery-operated scooters) on the field. This is to protect the artificial turf surface from wheel damage.

Artificial Turf Fields – Regular and Special Uses

The owner should keep track of field usage hours, as an artificial turf field can be used max. 3000 hours per year (based on industry warranty standards). Shift use from over-utilized fields to under-utilized where possible. Be knowledgeable of the high-wear areas on the field itself. Encourage field users to rotate their warm-up drills to areas that are not highly worn, so that wear is more evenly distributed.

Artificial turf surfaces can be used for non-standard activities (i.e. festivals and community events), but it is important to protect the surface during these activities.

Based on standard industry practices, artificial turf warranties cover the following activities:

- Soccer
- Football
- Lacrosse
- Ultimate (Frisbee)
- Field Hockey
- Marching band
- Rugby
- Physical exercises
- Baseball
- Physical education activities
- Softball
- Military/Police marching drills
- Field cover for special events and concerts
- Pedestrian traffic and other similar uses
- Pneumatic rubber-tired maintenance and service vehicles
- Other miscellaneous sport and recreation activities

All alternate activities should take into consideration the warranty and exemptions that are listed within warranty clauses. The following activities should not be performed on the field:

- Fireworks
- All activities that may melt the artificial turf fibers
- Parking vehicles for long periods of time, especially when the field is wet.
- Loading/storing heavy items on the field.
- Idling of maintenance vehicles, as the exhaust pollutes the field and the heat may melt the fibers

Appendix C: Geotechnical Investigation

WATT CALGARY
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R.F. Binnie & Associates Ltd.
#930, 150 - 9th Avenue SW
Calgary, Alberta T2P 3H9

2020-05-19
Our File No: 3757.G01

Attention: Mr. Ben Tymchyshyn, Senior Project Manager

Dear Ben:

Re: Geotechnical Assessment – Artificial Turf Sportsfield Feasibility Study, 800 East Lake Boulevard NE, Airdrie, Alberta

1. Introduction

Watt Consulting Group (WATT) was retained by R.F. Binnie & Associates Ltd. (Binnie) on behalf of The City of Airdrie (The City) to provide geotechnical support for an Artificial Turf Sportsfield Feasibility Study. The objective of the study was to provide recommendations for the design and construction of an artificial turf Sportsfield, to be located at the current Ed Eggerer Athletic Park, 800 East Lake Blvd NE in Airdrie, Alberta.

A geotechnical investigation was completed by Watt to assess the subsurface ground and groundwater conditions, and to provide geotechnical project input. The investigation comprised of a review of available geotechnical data and a field and laboratory test program. This letter report summarizes the results of the desk top study and geotechnical field and laboratory test program, and provides comments and recommendations pertinent to the proposed artificial turf sports field design and construction.

2. Project Background

The project site is located at 800 East Lake Blvd NE in Airdrie, Alberta. It is bounded by Genesis Place recreation center to the southwest, East lake to the northeast, and parking lots to the northwest and southeast. It is currently used as natural grass athletic Sportsfield and surrounded by a running track.

It is understood that the natural grass athletic field may be replaced by an artificial turf surface. This study will assist The City to determine the feasibility of the proposed development, along with a preliminary cost estimate for budgeting purposes.

3. Desk Top Study

A desk top study was completed to assess the geological site condition, based on published data and past information gathered at the project site. The following information was reviewed during the study:

- Geotechnical Investigation, Proposed Relocation of Tennis Courts, 800 East Lake Blvd, Airdrie, Alberta, prepared by Sabatini Earth Technologies Inc., File No. 0710-6393 dated December 2007;
- Geotechnical Investigation, Genesis Place Twin Arena Addition, 800 East Lake Blvd, Airdrie, Alberta, prepared by Levelton Consultants Ltd., File AB11-0369-00 dated March 4, 2011;
- Genesis Place Arena – Track Expansion, Recommendations for Track Construction, prepared by Levelton Consultants Ltd., File AB12-0876 dated July 19, 2013; and
- Genesis Place – Track Expansion, Lateral Earth Pressures for Temporary Shoring; prepared by Levelton Consultants Ltd., File AB12-0876-00 dated July 30, 2013.

Based on the data presented in the above listed reports, the subsurface ground conditions at the project site were expected to comprise of fill soil in form of silty clay mixed with organic matter, overlying silty clay till, followed by siltstone bedrock. In the 2007 report, the fill was encountered to a depth of approximately 3.5 m. The underlying soil was described as silt with slight to some plasticity; however, based on the laboratory test results presented in the report this material has similar properties as the soil described as silty clay till in later reports. The 2011 report identified fill material to depths ranging from approximately 1.0 to 2.2 m, followed by silty clay till to depths ranging from 2.8 to 5.0 m. Weathered siltstone bedrock was encountered underlying silty clay till to the termination depths of the boreholes drilled, ranging from 3.0 to 6.0 m below ground surface (mbgs). The 2013 reports do not include geotechnical borehole records. The subsurface ground conditions were assessed based on a review of existing information, and described as fill soil of up to 2.0m thickness, with underlying material comprising of clay till overlying bedrock.

Stabilized groundwater levels presented in the reports varied from 2.66, 2.79 and 2.74 mbgs in 2007, 2.40, 1.94 and 3.0 mbgs in 2011, and 1.45 mbgs in 2013. It is noted that the groundwater level presented may be impacted by the proximity of the boreholes to East Lake, i.e. measurements closer to the lake may be higher than those taken further away. Groundwater level readings may have also been impacted by seasonal and annual fluctuations.

4. Geotechnical Investigation

4.1. Investigation Methodology

On April 15, 2020, WATT geotechnical staff oversaw the drilling of two geotechnical boreholes at the approximate locations shown on Figure 1 – Borehole Location Plan, attached to this letter report. It is noted that the borehole locations shown on Figure 1 were based on handheld GPS readings in the field that have typically low accuracy. Drilling was carried out by All Service Drilling of Airdrie, Alberta, using a track mounted solid stem auger drill rig. The boreholes were advanced to depths of 6.55 mbgs each. Standard penetration Tests (SPTs) were completed at select intervals, and soil samples were taken from the split spoon sampler.

The subsurface ground and groundwater conditions were logged in the field by WATT geotechnical staff as drilling proceeded. The subsurface stratigraphy encountered is shown on the Borehole Records attached to this letter report. 25 mm diameter standpipe piezometers were installed in both boreholes. Installation details are shown on the Borehole Records.

Soil samples obtained during drilling were submitted to Wood Environment & Infrastructure Solutions in Calgary, Alberta. The following soil index tests were completed on select soil samples:

- Moisture content determination (ASTM D2216) - 8 tests;
- Atterberg limits (ASTM D4318) – 2 tests; and
- Organic content – 1 test.

The soils laboratory test results are shown on the Borehole Records, are attached to this report, and are discussed in Section 2.

4.2. Subsurface Ground Conditions

The subsurface stratigraphy encountered at the discrete borehole locations generally comprised topsoil, underlain by fill, followed by silty lay till with fine to medium sand layers. Siltstone bedrock was encountered at the bottom of borehole BH20-02.

The Borehole Records attached to this letter report present WATT's interpretation of the materials encountered. Soil classification shown on the Borehole Records is based on ASTM D2488[1]. It is noted that the subsurface stratigraphy may be variable between borehole locations. A description of the subsurface soil strata encountered is provided in the following sections.

[1] Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)

4.2.1. Topsoil

A 10 cm thick topsoil layer was encountered at the top of both boreholes. The topsoil was black in color and frozen at time of drilling.

4.2.2. Fill

Fill soil was observed in both boreholes to depths of 2.15 mbgs in borehole BH20-01 and 1.50 mbgs in borehole BH20-02. The fill comprised of silty clay soil with some sand and some gravel. The color of the fill material varied between grey-brown, brown and dark brown. It was frozen to depths of 1.2 and 0.9 mbgs in boreholes BH20-01 and -02, respectively, and was moist and stiff and dry to damp and stiff underneath the frost penetration depths. Based on field identification procedures, the fill had medium plasticity.

4.2.3. Organic Clay

Silty Clay with some sand and some organic matter was encountered in borehole BH20-01 from 1.50 to 3.05 mbgs. The soil was black in color, moist and stiff. One SPT completed in this stratum resulted in an N-value of 13, indicating stiff consistency. An Atterberg limits test resulted in a liquid limit of 37, a plastic limit of 22 and a plasticity index of 15, indicating medium plasticity. The sample tested had a moisture content of 24.8% and an organic content of 6.9%.

4.2.4. Silty Clay

Silty clay was encountered in both boreholes, underlying either organic clay (BH20-01) or fill (BH20-02). The silty clay contained some sand and trace to some gravel. It was grey to grey-brown in color, moist, and low plastic. The consistency varied from stiff to hard.

Six SPTs completed within the silty clay stratum resulted in N-values ranging from 9 to 35, indicating stiff to hard consistency. Six moisture content tests resulted in values ranging from 15.3% to 21.6% An Atterberg limits test completed on sample SPT 2 of borehole BH20-02 resulted in in a liquid limit of 19, a plastic limit of 16 and a plasticity index of 3, indicating low plasticity.

4.2.5. Fine to Medium Sand

A fine to medium sand layer was encountered in both boreholes, interlayered with the silty clay till. The sand layer was observed from 3.65 to 4.90 mbgs in borehole BH20-01 and from 4.90 to 5.50 mbgs in borehole BH20-02. The sand was beige in color, saturated, loose to compact and poorly graded.

It is noted that more, thinner sand layers may be present within the silty clay stratum. However, observations of thinner strata were difficult due to the presence of groundwater in the borehole, impacting the soil observations on the auger flights.

4.2.6. Siltstone Bedrock

Siltstone bedrock was observed in the tip of SPT 4 in borehole BH20-02, from approximately 6.40 to 6.55 mbgs. The siltstone bedrock was grey in color, highly weathered and extremely weak.

4.3. Subsurface Groundwater Conditions

Water seepage was observed during drilling at depths of 3.65 and 3.35 mbgs in boreholes BH20-01 and -02, respectively. 25 mm diameter standpipe piezometers were installed in both boreholes. Installation details are shown on the borehole records attached in Appendix A. The following Table 1 shows the groundwater levels below ground surface measured in the standpipes at the end of drilling and on April 24, 2019.

Table 1: Groundwater Level Measurements

Borehole No.	Groundwater Level – April 15, 2020 (mbgs)	Groundwater Level – April 24, 2020 (mbgs)
BH20-01	4.05	2.59
BH20-02	Dry	2.78

It should be recognized that groundwater levels vary from season to season and year to year, and are dependent on many factors including surface drainage, precipitation and the hydrology of the area. April typically represents a month with seasonally low water levels, and seasonal fluctuations of ±1.0 meters under normal conditions should be expected.

5. General Geotechnical Commentary

Design and construction recommendations pertaining to the geotechnical aspects of the proposed development are provided in this report section based on the results of the geotechnical evaluation fieldwork, the laboratory testing carried out, and WATT's understanding of the proposed development at time of report preparation. These recommendations are intended to provide support for various project concepts and specifications as well as insight to determine the most appropriate site-specific construction methodologies. As well, WATT should be retained to review the applicable geotechnical aspects of the final design (drawings and specifications) and provide all necessary field reviews.

Based on the results of the desk top study and field and laboratory testing, the subsurface conditions present at the project site comprise of fill underlain by silty clay, followed by bedrock. An organic silty clay layer was observed in borehole BH20-02 to approximately 3.05 m depth. Fill with organic matter was also reported in existing geotechnical reports.

The subsurface ground conditions at the project site are considered challenging for the proposed development. Fill and organic soil may cause long-term settlement of the ground surface, which in turn may negatively impact an artificial turf Sportsfield surface. As recommended in previous reports, fill and organic soil should be over excavated and replaced with clean, mineral fill.

Detailed comments and recommendations for the artificial turf Sportsfield feasibility assessment are provided in the following Sections.

5.1. Site Preparation

All deleterious material such as fill and organic soils should be over excavated to competent native subgrade material. Over excavation should be extended laterally beyond the perimeter of the proposed development equal to the vertical depth of over excavation required.

Upon over excavation, the exposed subgrade should be proof-rolled using heavy equipment such as a loaded tandem dump truck. All loose or soft areas must be further over excavated to competent material and replaced with approved engineered fill. Further recommendations for backfill materials and compaction requirements are provided in Section 5.2. The final subgrade surface should be carefully graded to prevent surface water ponding.

If construction is carried out during winter conditions, the subgrade should be protected from freezing. In addition, the subgrade should be protected from wetting or drying, both before and after the placement of engineered fill. Subgrade surfaces that are allowed to dry or become wet should be scarified, moisture conditioned, and re-compacted.

5.2. Recommendations for Fill Selection, Placement and Compaction

Either clean non-cohesive or cohesive material may be used to replace unsuitable soils such as fill and soils containing organic matter. Each option has its own advantages and disadvantages, which should be considered for preliminary cost-benefit analyses.

Option 1: Soil Replacement with Non-Cohesive Material

Non-cohesive material such as free draining, well graded sand and gravel would provide a free-draining and non-frost-susceptible base for the artificial turf surface, and reduce the need for additional protection measures such as frost protection (insulation) or subsurface drainage. Due to the relatively high groundwater level this material would likely be saturated for most of the year, which could lead to a softening of the underlying native cohesive subgrade soils. Softening of the subgrade soils, in combination with a variable depth of soil over excavation and replacement, may induce differential ground surface settlement, unless a minimum over excavation depth will be specified to mitigate frost and groundwater impact. The minimum over excavation depth may be taken as 2.1 m (i.e. depth of frost protection, as specified in previous reports).

Granular material may be placed in lift thickness of approximately 300 mm (loose measure) and compacted to minimum 98% of its Standard Proctor maximum dry density (SPMDD) at a moisture content of within ±3% of its optimum moisture content for compaction purposes (OMC). A non-woven geotextile should be placed between native cohesive soils and granular fill to prevent migration of coarse particles into the cohesive subgrade.

Option 2: Soil Replacement with Cohesive Material

Clean cohesive material such as low to medium plastic clay would provide a backfilled area that is similar to the surrounding, native soils. The high frost susceptibility and low permeability of cohesive soils would require consideration during artificial turf Sportsfield design in form of frost protection and subsurface drainage (see Section 5.3).

Cohesive fill may be placed on the clean, native subgrade soil with the need to specify a minimum over excavation depth. It may be placed in lift thickness of approximately 200 mm (loose measure) and compacted to minimum 98% of its Standard Proctor maximum dry density (SPMDD) at a moisture content of within 0 to +2% of its optimum moisture content for compaction purposes (OMC). Placement of a non-woven geotextile between native and fill soils is not required.

5.3. Recommendations for Artificial Turf Sportsfield Installation

When replacing unsuitable on-site soils with non-cohesive fill (Option 1), the artificial turf surface may be installed as per manufacturer's specifications, typically requiring a bedding layer between the turf surface and granular fill. No additional insulation or drainage measures are deemed necessary.

When replacing unsuitable soils with cohesive fill (Option 2), additional frost protection using rigid insulation and subsurface dewatering using a perimeter drainage system will be required. The following measures should be considered in addition to the manufacturer's specifications:

In addition to the manufacturer specified bedding layer, minimum 500 mm of freely draining, 25 mm minus gravel should be placed, followed by minimum 100 mm thick rigid insulation. Additional waterproofing measures to protect the subgrade, like a PVC membrane, may be needed if the rigid insulation material does not provide adequate waterproofing. The rigid insulation should be placed on approved competent subgrade, which is crowned from the center line to the perimeter drainage pipes at 1% slopes. The slopes should run in transverse direction in a roof-profile shape, sloping into longitudinal direction does not appear to be required. Design of perimeter drainage pipes and adequate dewatering should be designed by a civil engineering firm, based on the stormwater conditions at the project site.

5.4. Review, Testing and Field Inspection

WATT should be given the opportunity to review details of the design and specifications related to geotechnical aspects of this project prior to construction. The recommendations provided in this report should be supported by an adequate scope of field review during construction. All construction should be undertaken by an experienced contractor for the foundation and earthworks construction. As a minimum, an adequate scope of field review is as follows:

- Review of subgrade conditions upon over excavation, including review of proof-roll tests; and
- Engineered Fill Placement → Full-time monitoring and compaction testing during fill placement.

All geotechnical field reviews must be carried out by a qualified geotechnical engineer or technician independent of the contractor. Failure to provide an adequate level of field review for construction of the foundations may be in contradiction of the Alberta Building Code requirements.

6. Limitations

The recommendations provided in this geotechnical evaluation report are based on the interpreted findings encountered within two (2) geotechnical boreholes drilled across the project site. The subsurface soil, bedrock and groundwater conditions observed during borehole drilling are anticipated to be reasonably representative of the project site; however, it should be noted that innate variable conditions may be encountered at the time of various construction aspects. WATT should be notified and given the opportunity to re-evaluate current information, if required, should geotechnical conditions other than those reported herein be identified at any stage of development.

This report has been prepared with accepted geotechnical soil and foundation engineering practices/principles for the project details specified within this report. The recommendations presented herein are subject to an adequate level of inspection during construction and any relevant Alberta Building Code requirements, or their validity may be jeopardized. No other warranty is expressed or implied.

7. Closure

We trust that the information contained in this report meets your present requirements. Please do not hesitate to contact the undersigned with any questions, or should you require further geotechnical input on this project.

Sincerely,
WATT Consulting Group

Jens Hornbruch, *P.Eng.*
Senior Geotechnical Engineer

T 587-433-5218
E jhornbruch@wattconsultinggroup.com

#WEAREWATT

Figure 1 – Borehole Location Plan

WATT CONSULTING GROUP #310, 3016-5 Avenue NE Calgary, Alberta T2A 6K4	TITLE:	Borehole Location Plan			DESIGN: JH / DATE: 2020-05-15
	PROJECT:	Artificial Sports Field Study 800 East Lake Boulevard, Airdrie AB			DRAWN: JH / SCALE: NTS
	CLIENT:	The City of Airdrie			CHECKED: JH / PROJECT NO.: 3757.G01
			1	2020-05-15	FIGURE NO. **Figure 1**
			REV.	DESCRIPTION / DATE	

WATT CONSULTING GROUP
To: Mr. Ben Tymchyshyn, Senior Project Manager
RE: Geotechnical Assessment – Artificial Turf Sportsfield Feasibility Study, 800 East Lake Boulevard NE, Airdrie, Alberta

2020-05-19
Our File No: 3757.G01

Borehole Records

WATT Consulting Group
#310, 3016 - 5 Avenue NE
Calgary, AB T2A 6K4
Telephone: 403-273-9001

BORING NUMBER BH20-01

CLIENT The City of Airdrie
PROJECT NAME Artificial Sports Field Feasibility Study
PROJECT NUMBER 3757
PROJECT LOCATION 800 East Lake Boulevard, Airdrie, Alberta
DATE STARTED 20-4-15 **COMPLETED** 20-4-15
GROUND ELEVATION **HOLE SIZE** 150
DRILLING CONTRACTOR All Service Drilling Ltd.
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger
AT TIME OF DRILLING 3.65 m
LOGGED BY JH **CHECKED BY** JH
AT END OF DRILLING 4.05 m
NOTES
AFTER DRILLING 2.59 m

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
				0.10 **TOPSOIL**, black, frozen	Bentonite seal
1				**FILL**: SILTY CLAY, some sand, brown, frozen, medium plastic	
				0.60 **FILL**: SILTY CLAY, sandy, some gravel, dark brown, frozen, medium plastic	
				- from 1.20m: moist, stiff	
				1.50	
2	SPT 1	4-5-8 (13)		**SILTY CLAY**, some sand, some organics, black, moist, stiff, medium plastic - LL=37, PL=22, PI=15, MC=24.8% - Organic content=6.9%	Soil cuttings
3				3.05	
	SPT 2	2-3-6 (9)		**SILTY CLAY**, some sand, grey, moist, stiff, low plastic - MC=20.7%	
				3.65 **FINE to MEDIUM SAND**, beige, saturated, loose to compact, poorly graded	
4					Filter sand Slotted pipe
5	SPT 3	2-4-10 (14)		4.90 **SILTY CLAY**, some sand, brown-grey, moist, very stiff, low plastic	
6					
	SPT 4	11-11-11 (22)		- MC=21.6%	
				6.55 End of borehole at 6.55m. Slough to 5.50m. 25mm diameter standpipe piezometer installed. Groundwater at 4.05m upon standpipe installation.	

JH BOREHOLE 3757.G01 AIRDIRE SPORTS FIELD STUDY.GPJ GINT STD CANADA.GDT 20-5-13

WATT Consulting Group
#310, 3016 - 5 Avenue NE
Calgary, AB T2A 6K4
Telephone: 403-273-9001

BORING NUMBER BH20-02

CLIENT The City of Airdrie
PROJECT NAME Artificial Sports Field Feasibility Study
PROJECT NUMBER 3757
PROJECT LOCATION 800 East Lake Boulevard, Airdrie, Alberta
DATE STARTED 20-4-15 **COMPLETED** 20-4-15
GROUND ELEVATION _____ **HOLE SIZE** 150
DRILLING CONTRACTOR All Service Drilling Ltd.
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger
AT TIME OF DRILLING 3.35 m
LOGGED BY JH **CHECKED BY** JH
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING 2.78 m

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
				0.10 **TOPSOIL**, black, frozen	Bentonite cap
1				**FILL**: SILTY CLAY, some sand, some gravel, grey-brown, frozen, medium plastic	
				- from 0.9m: dry to damp, stiff	
2	SPT 1	4-5-4 (9)		- MC=18.4%	Soil cuttings
				2.15 **SILTY CLAY**, some sand, some gravel, grey, moist, stiff, medium plastic	
				2.45 **SILTY CLAY**, some sand, trace gravel, grey-brown, moist, very stiff, low plastic	
3	SPT 2	5-9-10 (19)		- LL=19, PL=16, PI=3, MC=19.9%	
4				- from 4.30m: hard	Filter sand Slotted pipe
5	SPT 3	10-15-20 (35)		- MC=19.4%	
				4.90 **FINE to MEDIUM SAND**, beige, saturated, loose to compact, poorly graded	
				5.50 **SILTY CLAY**, some sand, trace gravel, grey-brown, moist, hard, low plastic	
6	SPT 4	12-13-18 (31)		- MC=15.3%	
				6.40 6.55 **MUDSTONE BEDROCK**, grey, highly weathered, extremely weak	
				End of borehole at 6.55 m. Slough to 5.50m. 25mm diameter standpipe piezometer installed. Standpipe dry upon installation.	

JH BOREHOLE 3757.G01 AIRDIRE SPORTS FIELD STUDY.GPJ GINT STD CANADA.GDT 20-5-13

WATT CONSULTING GROUP
To: Mr. Ben Tymchyshyn, Senior Project Manager
RE: Geotechnical Assessment – Artificial Turf Sportsfield Feasibility Study, 800 East Lake Boulevard NE, Airdrie, Alberta

2020-05-19
Our File No: 3757.G01

Laboratory Test Results

Moisture Content Determination (ASTM D2216 - Method B)

Wood Environment & Infrastructure Solutions

a Division of Wood Canada Limited

Client: Watt Consulting
Project: Airdrie Artificial Turf Sport Field Study
Date: April 17, 2020

Request Number:
Project Manager: Hamdan Marwasi
Project Number: CA18683
Reviewed By: HM

Test Hole Number	BH20-01	BH20-01	BH20-01	BH20-01				
Depth (ft)	5.0-6.0	10-11.5	15-16.5	20-20.5				
Sample Number	SS1	SS2	SS3	SS4				
Tare No:	ADA1	ADA2	ADA3	ADA4				
Wt. Sample Wet + Tare	431.1	612.7	517.7	387.6				
Wt. Sample Dry + Tare	348.9	510.7	424.8	321.9				
Wt. Water	82.2	102.0	92.9	65.7				
Wt. Tare	17.3	17.2	17.1	17.3				
Wt. Dry Sample	331.6	493.5	407.7	304.6				
Moisture Content (%)	24.8	20.7	22.8	21.6				
Test Hole Number	BH20-02	BH20-02	BH20-02	BH20-02				
Depth (ft)	5-6'8"	10-11.5	15-16.5	20-21.5				
Sample Number	SS1	SS2	SS3	SS4				
Tare No:	AS1	AS2	AS3	AS4				
Wt. Sample Wet + Tare	408.9	468.1	325.1	287.8				
Wt. Sample Dry + Tare	347.9	393.3	275.1	251.8				
Wt. Water	61.0	74.8	50.0	36.0				
Wt. Tare	17.2	17.3	17.1	17.0				
Wt. Dry Sample	330.7	376.0	258.0	234.8				
Moisture Content (%)	18.4	19.9	19.4	15.3				
Test Hole Number								
Depth (ft)								
Sample Number								
Tare No:								
Wt. Sample Wet + Tare								
Wt. Sample Dry + Tare								
Wt. Water								
Wt. Tare								
Wt. Dry Sample								
Moisture Content (%)								
Test Hole Number								
Depth (ft)								
Sample Number								
Tare No:								
Wt. Sample Wet + Tare								
Wt. Sample Dry + Tare								
Wt. Water								
Wt. Tare								
Wt. Dry Sample								
Moisture Content (%)								

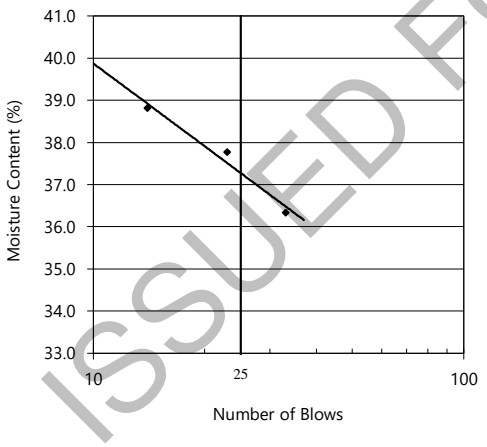
Atterberg Limits Test (ASTM D4318 - dry method)

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

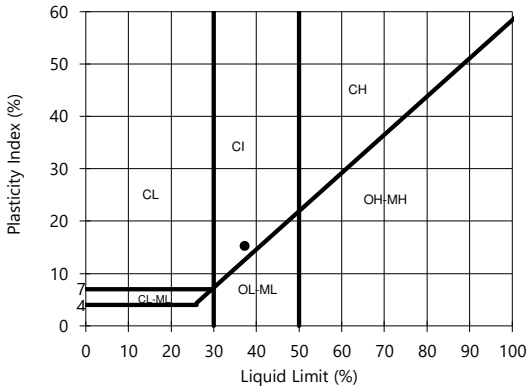
Client: Watt Consulting
Project No: CA18683
Project: Airdrie Artificial Turf Sports Field Study
Sample ID: BH20-01 SS1 @ 5.0 - 6.0 ft
Date: 22-Apr-20
Technician: JCS

Liquid Limit Test				Plastic Limit Test		
# of Blows	14	23	33			
Tare #	1	2	3	Tare #	4	5
Wet Wt + Tare	35.81	32.44	36.06	Wet Wt + Tare	15.38	17.04
Dry Wt + Tare	28.18	25.88	28.72	Dry Wt + Tare	14.15	15.48
Wt of Tare	8.52	8.51	8.52	Wt of Tare	8.52	8.43
% Moisture	38.8	37.8	36.3	% Moisture	21.8	22.1

Liquid Limit Test



Plasticity chart for soil passing 425 um sieve



Liquid Limit : 37.3 **Plastic Limit :** 22.0 **Plasticity Index :** 15.3

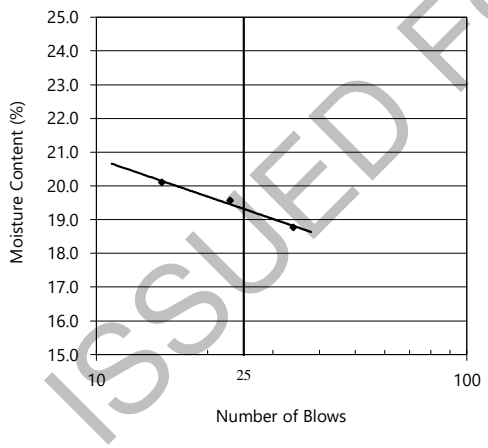
Classification : CI **Reviewed By :** HM

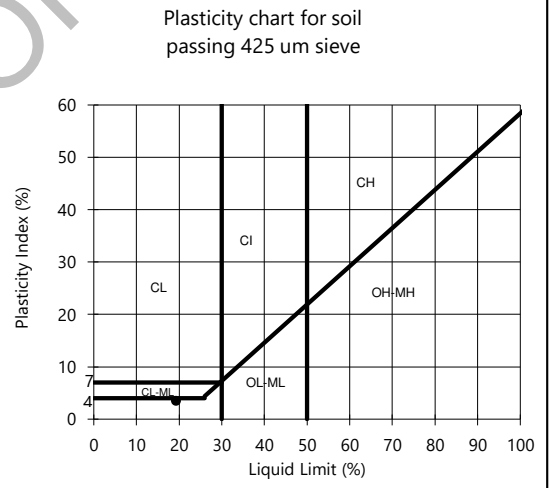
Atterberg Limits Test (ASTM D4318 - dry method)

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Client: Watt Consulting
Project No: CA18683
Project: Airdrie Artificial Turf Sports Field Study
Sample ID: BH20-02 SS2 @ 10.0-11.5 ft
Date: 22-Apr-20
Technician: JCS

Liquid Limit Test				Plastic Limit Test		
# of Blows	34	23	15			
Tare #	1	2	3	Tare #	4	5
Wet Wt + Tare	35.86	36.92	35.26	Wet Wt + Tare	15.86	17.03
Dry Wt + Tare	31.54	32.27	30.77	Dry Wt + Tare	14.85	15.87
Wt of Tare	8.51	8.50	8.43	Wt of Tare	8.50	8.55
% Moisture	18.8	19.6	20.1	% Moisture	15.9	15.8





Liquid Limit : 19.3 **Plastic Limit :** 15.9 **Plasticity Index :** 3.4

Classification : NON-PLASTIC **Reviewed By :** HM

Organic Content (ASTM D2974 - Method C)

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Client: WATT Consulting Ltd.
Airdrie Artificial Turf Sports
Project: Field Study
Project No: CA18683

Project Manager: Hamdan Marwasi
Date Tested: April 21, 2020
Technologist: JCS

Sample ID: BH20-01 SS1 @ 5.0 - 6.0 ft

Crucible No. :	4	11
Mass of Crucible & Sample :	90.46	98.28
Mass of Crucible :	44.09	56.94
Mass of Sample **[B]** :	46.37	41.34
After Heating		
Mass of Crucible & Sample :	87.28	95.44
Mass of Crucible :	44.09	56.94
Mass of Sample (Ash) **[C]** :	43.19	38.5
Calculations		
Ash Content (%) **[D]** =	93.14	93.13
Organic Content (%) =	6.86	6.87

AVERAGE ORGANIC CONTENT (%)= 6.86

Comments:

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Reviewed By: HM

Wood Environmental and Infrastructure Solutions
a Division of Wood Canada Limited
1003 – 53rd Street N.E.
Calgary, Alberta
CANADA T2E 6X9
Tel: +1 (403) 248-4331

Appendix D: Detailed Capital Cost Information

Detailed Civil Works Capital Costs

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Subtotal	COMMENT
1.0	**SITE DEMOLITION, MOBILIZATION & DEMOBILIZATION**					
1.1	Allowance for Site Demolition, Mobilization & Demobolization (5% of the total budget cost)	1	ls	$190,000.00	$190,000.00	Use 5% of the total cost
				TOTAL SECTION	**$190,000.00**	
2.0	**SITE EARTHWORK - NON-COHESIVE FILL**					
2.1	Supply and install Construction fencing, Galvanized, chain link mesh. 1.8m high by " Fast Fence Inc" or approved equal.	550	lm	$27.00	$14,850.00	Measured off estimated site limits on DWG. Cost copied from 19-0780
2.2	Mud mat per detail and Associated restoration works after construction	1	ls	$50,000.00	$50,000.00	Copied from 19-0780
2.3	Removal and Disposal of Existing topsoil and unsuitable fill material onsite as directed by consultant.	22,660	m3	$25.00	$566,500.00	Measured from total area inside the track area (10,300) (assumes 2.1m depth)
2.4	Supply and install fill material as directed by consultant.	17,510	m3	$25.00	$437,750.00	
2.5	All excavation, rough and fine grading required in areas of new construction per drawings and specifications.	10,300	sq.m	$4.00	$41,200.00	
2.6	Silt fence and erosion control measure	550	lm	$8.00	$4,400.00	
				TOTAL SECTION	**$1,114,700.00**	
3.0	**LANDSCAPING**					
3.1	Supply and install Sod and 150mm of Topsoil including fine grading	100	sq.m	$15.00	$1,500.00	Measured green are outside of track within estimated site limits
				TOTAL SECTION	**$1,500.00**	
4.0	**SITE SERVICING**					
4.1	Supply and install Slotted or Perforated PVC pipe 300mm diameter include all connections to manholes and sewers per City of Airdrie Standards.	400	lm	$300.00	$120,000.00	Length measured from DWG
4.2	Ads-Drain Inlet with 150mm Light Duty Grate per detail	6	each	$750.00	$4,500.00	
4.3	Misc. Stormwater Service Connections	1	Allowance	$50,000.00	$50,000.00	
				TOTAL SECTION	**$174,500.00**	

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Subtotal	COMMENT
5.0	**SYNTHETIC TURF - AGGREGATE BASE**					
5.1	Supply and install perimeter concrete barrier curb per detail.	395	lm	$300.00	$118,500.00	
5.2	Synthetic Turf Field Granular Base including but not limited to 500mm Granular with all associated items.	10300	sq.m	$60.00	$618,000.00	
				TOTAL SECTION	**$736,500.00**	
6.0	**TRACK**					
6.1	Re-surfacing the existing synthetic running track (blue)	6000	sq. m	$65.00	$390,000.00	https://www.competitionathleticsurfaces.com/blog/55-time-to-fix-your-running-
				TOTAL SECTION	**$390,000.00**	$6 sq ft or $65 sq. m from Centaur Products
7.0	**SPORTS FIELD LIGHTING**					
7.1	Supply and install Sport Field Lighting as Musco Lighting (Four Pole)	1	ls	$500,000.00	$500,000.00	
				TOTAL SECTION	**$500,000.00**	
8.0	**MISCELLANEOUS**					
8.1	Permanent Storage Structure (for snow clearing equipment, portable nets, football uprights, etc.)	1	ls	$4,500.00	$4,500.00	Price from C Can Store Sales Calgary
8.2	Enhance existing press box - 4 rooms (1 room for each team, scorekeeping room, and media room)	1	ls	$100,000.00	$100,000.00	
	Subgrade Preparation	25	sq.m	$20.00	$500.00	
	75mm - Asphalt	25	sq.m	$30.00	$750.00	tonne = area * 0.1 depth * 2.2
8.5	Concrete plaza	345	sq.m	$300.00	$103,500.00	
				TOTAL SECTION	**$209,250.00**	
CONSTRUCTION COST TOTALS						
				Subtotal Construction Costs:	**$3,316,450.00**	
				Contingency Allowance (20%) :	**$663,290.00**	
				Soft Costs (Design, Study, Reports) 10%	**$331,645.00**	
				Total Estimated Construction Cost:	**$4,311,385.00**	
OPTIONAL WORK						
01	Air Supported Structure	1		$2,343,250.00	$2,343,250.00	
02	Field House Building (35' x 40' Pre-Engineered Fieldhouse Building (changeroom/storage) including electrical, sanitary and water service)	1		$727,500.00	$727,500.00	
03	2m Wide Asphalt Pathway from Fieldhouse Building	1				

SBR Pre-Engineered Pad

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Subtotal
A	**SYNTHETIC TURF**				
A1	Artificial Turf without infill but including soccer lines per specifications	10300	sq.m	$55.00	$566,500.00
A2	Infill - Synthetic Turf Field (SBR)	10300	sq.m	$15.00	$154,500.00
A3	Supply and install Engineered Shock Pad	10300	sq.m	$15.00	$154,500.00
				TOTAL SECTION	**$875,500.00**
B	**SITE FURNITURE**				
B1	Supply and install Movable Soccer Goals	1	set	$15,000.00	$15,000.00
B2	Supply and install Football Uprights (Goose Neck)	1	set	$20,000.00	$20,000.00
B3	Supply and install Player's Benches per detail and specifications	4	EA	$2,500.00	$10,000.00
				TOTAL SECTION	**$45,000.00**
				SUBTOTAL	**$920,500.00**
				Contigency 20%	**$184,100.00**
				Soft Costs 10%	**$92,050.00**
				GRAND TOTAL	**$1,196,650.00**

TPE Pre-Engineered Pad

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Subtotal
A	**SYNTHETIC TURF**				
A1	Artificial Turf without infill but including soccer lines per specifications	10300	sq.m	$55.00	$566,500.00
A2	Infill - Synthetic Turf Field (TPE/EPDM)	10300	sq.m	$25.00	$257,500.00
A3	Supply and install Pre-Engineered Shock Pad	10300	sq.m	$15.00	$154,500.00
				TOTAL SECTION	**$978,500.00**
B	**SITE FURNITURE**				
B1	Supply and install Movable Soccer Goals	1	set	$15,000.00	$15,000.00
B2	Supply and install Football Uprights (Goose Neck)	1	set	$20,000.00	$20,000.00
B3	Supply and install Player's Benches per detail and specifications	4	EA	$2,500.00	$10,000.00
				TOTAL SECTION	**$45,000.00**
				SUBTOTAL	**$1,023,500.00**
				Contigency 20%	**$204,700.00**
				Soft Costs 10%	**$102,350.00**
				GRAND TOTAL	**$1,330,550.00**

SBR Elastic Layer

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Subtotal
A	**SYNTHETIC TURF**				
A1	Artificial Turf without infill but including soccer lines per specifications	10300	sq.m	$55.00	$566,500.00
A2	Infill - Synthetic Turf Field (TPE/EPDM)	10300	sq.m	$25.00	$257,500.00
A3	Supply and install Pre-Engineered Shock Pad	10300	sq.m	$15.00	$154,500.00
				TOTAL SECTION	**$978,500.00**
B	**SITE FURNITURE**				
B1	Supply and install Movable Soccer Goals	1	set	$15,000.00	$15,000.00
B2	Supply and install Football Uprights (Goose Neck)	1	set	$20,000.00	$20,000.00
B3	Supply and install Player's Benches per detail and specifications	4	EA	$2,500.00	$10,000.00
				TOTAL SECTION	**$45,000.00**
				SUBTOTAL	**$1,023,500.00**
				Contigency 20%	**$204,700.00**
				Soft Costs 10%	**$102,350.00**
				GRAND TOTAL	**$1,330,550.00**

TPE Elastic Layer

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Subtotal
A	**SYNTHETIC TURF**				
A1	Artificial Turf without infill but including soccer lines per specifications	10300	sq.m	$55.00	$566,500.00
A2	Infill - Synthetic Turf Field (TPE/EPDM)	10300	sq.m	$25.00	$257,500.00
A3	Supply and install Elastic Layer	10300	sq.m	$30.00	$309,000.00
				TOTAL SECTION	**$1,133,000.00**
B	**SITE FURNITURE**				
B1	Supply and install Movable Soccer Goals	1	set	$15,000.00	$15,000.00
B2	Supply and install Football Uprights (Goose Neck)	1	set	$20,000.00	$20,000.00
B3	Supply and install Player's Benches per detail and specifications	4	EA	$2,500.00	$10,000.00
				TOTAL SECTION	**$45,000.00**
				SUBTOTAL	**$1,178,000.00**
				Contigency 20%	**$235,600.00**
				Soft Costs 10%	**$117,800.00**
				GRAND TOTAL	**$1,531,400.00**

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