NOTICE OF PUBLIC HEARING
THE MUNICIPAL DISTRICT OF WILLOW CREEK NO. 26
IN THE PROVINCE OF ALBERTA

PROPOSED LAND USE BYLAW AMENDMENT
1:30 p.m., Wednesday, June 12, 2019
at
The Municipal District of Willow Creek No. 26, Council Chambers

PURSUANT to sections 230, 606, and 692 of the Municipal Government Act, Statutes of Alberta, Chapter M-26, 2000, as amended, the Council of the Municipal District of Willow Creek No. 26 in the Province of Alberta hereby gives notice of its intention to consider an application by Acestes Power ULD c/o Scott Land & Lease Ltd. (Registered Owner: Mayland Farms Ltd.) to amend Bylaw No. 1826, being the municipal Land Use Bylaw.

THE PURPOSE of the proposed land use bylaw amendment is to redesignate the following parcels of land:

- SE 15-14-27-W4M 78.89 acres of the 160.0 acre parcel

(as shown on the map in Schedule A), from 'Rural General – RG' to 'Rural Industrial – RI'. The redesignation will allow the submitted development permit applications to be processed – a request for 'grazing and ground mounted solar photovoltaic facility for electricity generation.'

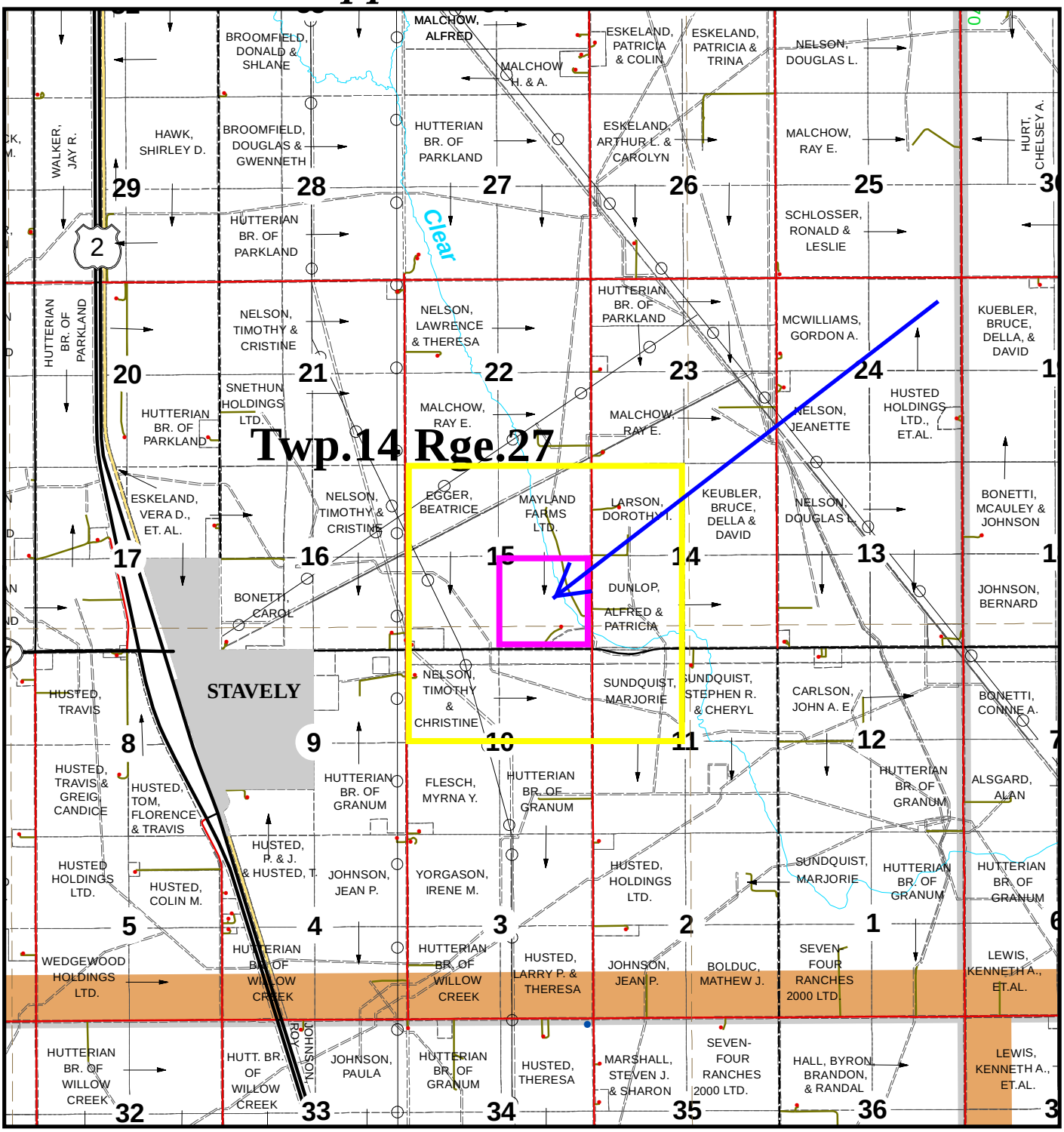
THEREFORE, TAKE NOTICE THAT a public hearing to contemplate the proposed land use bylaw amendment will be held in the Municipal District of Willow Creek No. 26 Council Chambers at **1:30 p.m., on the 12th day of June, 2019**.

AND FURTHER TAKE NOTICE THAT documents relating to this matter may be viewed on the Municipal District's website or inspected at the Municipal District Administration Office, 273129 Hwy 520 West, Claresholm, during normal business hours. Both written and/or verbal presentations may be given at the public hearing. Written submissions are to be forwarded to the Manager of Planning & Development Services at Box 550, Claresholm, Alberta, T0L 0T0 or via email at development@mdwillowcreek.com, **no later than 4:00 p.m. on the 11th day of June, 2019**. Any information submitted will become available to the public and is subject to the provisions of the Freedom of Information and Protection of Privacy Act (FOIP).

DATED at the Town of Claresholm in the Province of Alberta this 5th day of June, 2019.

Cindy Chisholm
Manager of Planning & Development
MD of Willow Creek No. 26

LAND USE BYLAW AMENDMENT
Application No. A-03-19



..... SCHEDULE 'A' .....

LAND USE BYLAW AMENDMENT FROM:
'RURAL GENERAL-RG' to 'RURAL INDUSTRIAL-RI'
78.89 ACRES of **160.0** ACRE PARCEL SE 15-14-27-W4M

N
W E
S

MD of Willow Creek

Date: MAY 3, 2019

THE MUNICIPAL DISTRICT OF WILLOW CREEK NO. 26
Box 550, Claresholm, AB T0L 0T0
Phone (403) 625-3351 Fax (403) 625-3886 www.mdwillowcreek.com

FOR OFFICE USE ONLY

Council Public Hearing

Application No. _____
Fees Submitted: $_____
Site Inspection: _____

APPLICATION FOR A LAND USE BYLAW AMENDMENT

IMPORTANT: ***This information may also be shared with appropriate government/other agencies (e.g. Alberta Agriculture, Food and Rural Development; Alberta Environment; the regional health authority), and may also be kept on file by those agencies. This information may also be used by and for any or all municipal programs and services. The application and related file contents will become available to the public and are subject to the provisions of the Freedom of Information and Protection of Privacy Act (FOIP). If you have any questions about the collection of this information, please contact The Municipal District of Willow Creek No. 26.***

Form I

APPLICANT: Acestes Power ULC c/o Scott Land & Lease Ltd. **Telephone:** _____

ADDRESS: _____ **Fax:** _____

_____ **Bus/Cell:** _____

REGISTERED OWNER: Mayland Farms Ltd. **Telephone:**

LEGAL DESCRIPTION: Lot(s) _____ Block _____ Plan _____

OR: Quarter SE Section 15 Township 14 Range 27 W4 M

PROPOSED AMENDMENT:

From: grazing and cultivation

To: grazing and ground mounted solar photovoltaic facilty for electricity generation

APPLICANT'S SUBMISSION: Please state your reasons for applying for this amendment and if applicable, supply details of future plans/development, complete with sketches that illustrate the proposal. Attaching separate sheets will be necessary.

Please refer to the attached submission package for details of the proposal.

REGISTERED OWNER OR PERSON ACTING ON BEHALF OF: I/we agree to the collection and sharing of this information contained in this application, and any other information that may be required to verify and evaluate this application as explained above. I have submitted particulars concerning the completion of the proposed development and agree to comply in all respects with any conditions that may be attached to any development permit that is issued and with any other bylaws that are applicable. I am aware that I may be required to pay for all local improvement costs, which include drainage, sidewalks, road construction, street lighting, water and sewer main extensions, utility connection fees and installation costs at the present established rate.

I have read and understand the terms noted above and hereby apply for that described above and/or on the attached plans and specifications. I further certify that the registered owner(s) of the land described above is aware of this application.

DATE: April 18, 2019 **SIGNED:** _____

See attached Letter

Applicant(s)

Stavely Solar Project
Land Use Amendment & Development Permit Application
Contents

1. Cover Letter to MD of Willow Creek
2. Application Fee

3a. Land Use Amendment Application

3b. Application for Development Permit SE 15-14-27 W4M

3c. Application for Development Permit NE 15-14-27 W4M

4. Letter from John Ellis, Acestes Power ULC

Attachment 1: Project Specific Information

Attachment 2: FortisAlberta Interconnection Letter

Attachment 3: Glare Analysis

Attachment 4: Environmental Effects Assessment

Attachment 5: Alberta Environment & Parks Referral Report

Attachment 6: Participant Involvement Program Report

Attachment 7: Haul Route Map

Attachment 8: Noise Impact Assessment

Attachment 9: Stormwater Management Plan

Attachment 10: Letter of Authorization

Attachment 11: Land Title Certificates (2)

Attachment 12: Site Plan

Attachment 13: Alberta Energy Regulator Abandoned Well Map

Attachment 14: Historical Resource Act Approval

Attachment 15: NAV Canada Approval

Attachment 16: Corporate Search

April 18, 2019

The Municipal District of Willow Creek No. 26
Box 550
Claresholm, AB T0L 0T0

Attention: Planning & Development

Re: Stavely Solar Project
Land Use Amendment Application & Development Permit Application

We are pleased to submit the enclosed application for a Land Use Amendment and Development Permit Application for the development of an 8.5 megawatt (MW) solar power project located on approximately 91 acres of privately-owned land a few kilometres northeast of the Town of Stavely.

The Land Use Amendment is an application to rezone the SE 15-14-27 W4M from Rural General to Rural Industrial. This is the quarter section that encompasses the permanent project site. Also included is an application for a Development Permit for these same lands.

In addition to these two applications, a Development Permit application is enclosed for the NE 15-14-27 W4M for temporary use as a lay down/construction area. This quarter section will not include any permanent project components.

Included in this package is the $2,000 Land Use Amendment fee. Should the application be approved, payment for the Development Permit fee will be sent via courier to the MD of Willow Creek address noted above.

Should you have any questions or concerns, or require any additional information, please do not hesitate to contact me at

Thank you,

Clyde Carr, President
Acestes Power ULC.

April 12, 2019

The Municipal District of Willow Creek No. 26
Box 550
Claresholm, AB T0L 0T0

Dear Cynthia Vizzutti, CAO:

Re: Background on Stavely Solar Project

As part of the Acestes Power ULC (Acestes) land use amendment and development permit application to the M.D. of Willow Creek, I would like to take this opportunity to introduce myself and our solar project, located on the E ½ 15-14-27 W4M to you and the M.D. of Willow Creek Council.

My grandfather, A. H. Mayland settled in Nanton in 1905 and then began acquiring farmland in the Nanton and Vulcan areas. Over the next fifty years he bought several sections that my family still owns. I have been managing the Mayland Farms property for my family since the 1990's. Although I don't live in the area, I have tried to participate in community events and be a good neighbour. I have attended Lions Club events in Vulcan and for many years I participated in the Stavely Elks Club Pheasant Derby.

Acestes began when I was approached by a wind energy developer about ten years ago. They wanted to secure an option to lease some of our land as part of a larger wind project east of Kirkcaldy. I became interested in the potential for renewable energy to add value to our existing farmland. I hired consultants and invested in more land east of Champion. After researching wind energy for several years, I changed my focus and began looking into solar energy projects.

A key to the economics of a rural power generation facility is to keep the cost of the interconnection to the electrical grid as low as possible. The best way to achieve this goal is to locate the project as close as possible to an existing electrical substation. I began looking for sites near substations in the area, and on the advice of a local farmer I approached the landowner of the E ½ 15-14-27 W4M, a property east of Stavely. I bought the property in 2016.

Since 2016 I have been renting the cultivated land to the farmer that introduced me to the property and renting the hay land and pasture to another farmer. The proposed solar project will occupy the 94 acre hay field in the southwest of the property and not impact the cultivated land. I will continue to rent out the pasture in the northeast and in the coulee.

As a landowner in the M.D. of Willow Creek, I have tried to be a good neighbor. Acestes will have the same respect for the community with the work they do. As a landowner I understand the importance of issues such as weed control, but I also understand how people in rural communities need to help each other. I am currently in discussions with members of the Stavely Elks Club to develop a scholarship program for Acestes to support local students.

I am eager to work through the permitting requirements of the M.D. of Willow Creek in order to create a project that will require very few services from the M.D., help diversify the local economy and provide valuable tax revenue.

Sincerely,

John Ellis, Owner
Acestes Power ULC

STAVELY SOLAR PROJECT
PROJECT SPECIFIC INFORMATION

Stavely Solar Project
Land Use Amendment Application
Project Specific Information

1. **Describe the current use of the land(s) (ie; agriculture productive land, wetlands, native grass, topography, etc.)**

The Project site is approximately 88 acres of land located approximately 2.5km northeast of the Town of Stavely at the intersection of Township Road 142 and Range Road 272. The permanent Project is entirely located on the SE 15-14-27 W4M, which is currently cultivated land. The location was chosen due its proximity to the Stavely substation.

2. **What is the primary purpose of the proposed development (ie: collection, inversion, storage, distribution of solar energy for electricity generation)**

The primary purpose of the proposed development is the distribution of solar energy for electricity generation which will be fed into the local distribution grid via the nearby FortisAlberta distribution line.

3. **Number of and size of solar panels (height and width)**

The Project will consist of approximately 37,800 solar modules, with a net (alternating current) generation capacity of approximately 8.5 megawatts (MW). As shown in the attached site layout, the maximum installed height of the panels is 14 feet. Each solar individual solar module will have dimensions of approximately 1.96m x 0.98m.

4. **Total energy being generated by project**

The solar plant will produce up to 8.5 MW of power onto the local electric distribution grid, enough to power up to 2,000 homes per year

5. **Indicate all structures that will be erected or constructed in relation to the project**

Photovoltaic panels are mounted on racking systems and tilted at an angle toward the sun to convert the sun's natural energy into direct current (DC) power. The rows are spaced apart from each other to avoid shadowing from the sun, and the spacing is maintained with vegetation. An electrical gathering system gathers (DC) power from the solar panels to inverters situated through-out the plant to convert from DC power to alternating current (AC) power and then takes the power to a transformer to increase the voltage to 25 kilovolt (kV) and deliver it into the local electric distribution grid.

6. **Land area being used**

Approximately 91 acres of SE 15-14-27 W4M. Approximately 88 acres will be used permanently, and 3 acres have been set aside for temporary use during construction.

7. **Indicate how power will be fed into grid (approval/confirmation from AESO or AltaLink that you will be able to tie into grid)**

The interconnection of the solar power plant is also located in the SE 15-14-27 W4M. FortisAlberta will handle the interconnection and letter confirming the allowance of this interconnection is included as Attachment 2.

8. **Indicate how the facility will be operated**

There will be an onsite Operations & Maintenance facility with an approximate footprint of 25 ft. by 30 ft. The generation facility will be monitored remotely and will not require operations personnel on-site. There will be a 24 hour contact available in the event of any facility issues.

9. **Describe the details of the proposed solar structures (ie: freestanding, materials, anti-reflective)**

The solar panels are mounted on fixed tilt aluminum or steel racking supported by driven or helical piles tilted at an angle toward the sun. The racking system upon which the modules are to be mounted is expected to be tilted between 30 - 35° from horizontal. The modules will be mounted in a landscape configuration with 4 rows of modules in each array row. The solar panels will have an anti-reflective coating.

10. **Estimated reflection produced from the solar panels**

Unlike concentrating solar power, which aims to reflect and concentrate as much of the incoming solar radiation as possible, the central function of a photovoltaic module is to absorb radiation. Any reflection of light is therefore an inefficiency, and module manufacturers strive to limit reflection. Standard modules have an anti-reflective coating on them. A copy of the glare assessment completed by Apricity Renewables is included as Attachment 3.

11. **Number of employees that will be onsite**

During the construction phase of the Project (approximately 6-9 months), over 100 jobs are expected to be created. During the operations phase, no operations personnel will be required on-site other than for periodic vegetation management and facility maintenance.

12. **Hours/days of operation while under construction**

Construction operations will take place Monday through Saturday from 7:00am to 9:00pm for the dates May 1st to August 31st (summer hours), and from 7:00am to 6:00pm for all the balance of the year.

13. **What standards will be used to address aesthetics and/or minimize environmental impacts**

The Project impacts are summarized as follows:

- All solar panels, access roads, collector lines and substations are located on cultivated land. No native prairie is present or affected.
- All collector lines will be located underground.
- All setbacks from wildlife features are being met.

- No known Sharp-tailed Grouse leks have been previously identified within the Project area, and no new leks or individual sightings were recorded.
- No burrowing owls were located during other surveys and the Project is located outside burrowing owl habitat ranges so burrowing owl surveys were not required.
- No nests are present within the Project boundaries or immediately adjacent to the Project lands in such a way as to affect the Project.
- There are 3 watercourses outside the boundaries of the Project. One watercourse runs through the Project and is intermittent drainage for surrounding cultivated land. All setbacks from watercourses within and adjacent to the Project are being met.
- There are no wetlands within the Project boundaries. Therefore, no wetland disturbance will be occurring as a result of the Project.
- Bird activity levels and movement patterns in spring and fall migration study periods did not reveal the presence of clearly identifiable migratory pathways. There are also no topographical features that appear to funnel or constrain bird movement.
- Due to the Project being located entirely on cultivated land there are limited affects to breeding birds and bird habitat.
- The Project is not situated in defined Critical Habitat[1] for any wildlife species.
- There are no unique or regionally or locally important habitats affected.

All lands within the Project area are cultivated. All surrounding ¼ sections are cultivated. Alberta Environment and Parks (AEP) recommends siting solar energy projects on cultivated or previously disturbed lands to reduce high quality habitat loss (2016). It is also recommended that siting avoid environmentally significant areas, key wildlife ranges, important water bodies, and valleys. Based on the general assessment of land use conditions in proximity to the Project site, it can be reasonably concluded that the Project site (as currently proposed) meets the expectations of AEP with respect to Project siting and avoidance of important wildlife habitat features.

The Project will result in loss of cultivation on approximately 37 hectares (91 acres) of land currently under active cultivation. A copy of the Environmental Effects Assessment completed for the Project is included as Attachment 4. The Project has been reviewed by AEP and a referral letter is included as Attachment 5.

Currently, no visual mitigation measures are proposed as there have been no concerns raised regarding aesthetics or solar glare. A copy of the Participant Involvement Program (PIP) report, including visual renders of the proposed Project, is included as Attachment 6.

14. Anticipated years of operational life

The Project is anticipated to have an operational life of 25 to 30 years, at which time the Project can either be decommissioned or the modules can be upgraded in order to extend the life of the Project.

15. A plan outlining how the site(s) will be decommissioned and reclaimed

General decommissioning activities include the following:

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[1] As defined by Canada's *Species at Risk Act*; **critical habitat** is the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species critical habitat in the recovery strategy or in an action plan for the species.

- De-energize facility
- Removal and recycling of above ground and below ground infrastructure
- Recontouring
- Reclamation of surface soils
- Re-seeding or re-planting
- Reclamation monitoring

Details of the reclamation plan are included in Section 9 of the Environmental Protection Plan, which can be found in Appendix II, Attachment 4: Environmental Effects Assessment.

16. Perimeter fencing details

The perimeter fence around the entire permanent Project site will be approximately 2.4m high chain link fence with barbed wire. The fence will be maintained by Acestes.

17. Proposed signage to be posted

Cautionary safety and no trespassing signs will be posted on the Project perimeter fence.

18. Haul routes to and from the proposed locations (for initial setup of equipment, structures, etc.)

Haul routes above subject to approval and permits issued by Alberta Transportation and the MD of Willow Creek. Acestes expected haul route can be found in Attachment 7: Haul Route Map.

19. A description of all potential impacts on public safety and health

During the construction phase (6-9 months), it is anticipated that there will be no significant impacts on public health and safety. The primary public health and safety impacts will arise from the traffic impacts. These will be managed using industry-standard mitigation measures.

The operations phase of the Project will have no significant impacts on public health and safety. Vehicle traffic on local roads will not be significantly above baseline, as a limited number of employees will be on site periodically. The operating solar Project will not have any harmful emissions to the public and nearby residents, and all potential hazards on-site will be mitigated according to a project-tailored health and safety protocol.

20. Access and any potential impact to public roads

Acestes is committed to ensuring that there is no damage to public roadways. As such, Acestes expects to complete a preconstruction and post-construction road condition assessment to prove the solar Project has not caused damage to public roadways. In the unlikely event that damage is caused to public roadways due to the solar project traffic, Acestes will work with the MD of Willow Creek to repair the roadway or provide compensation for the damages. Acestes will enter into a road agreement with the MD of Willow Creek, if required.

21. Management of weed control and erosion mitigation

Acestes recognizes that each operational region is unique and that weed management that is effective in one area, may not be effective in another. However, Acestes' policy to control

vegetation on private lands will be based upon the species identified, and discussions with landowners.

Acestes will take the following approach to vegetation management:
1. Identification
2. Prevention
3. Chain of Custody
4. Procedures for Vegetation Control
5. Monitoring

Additional details on weed management are included in Section 6 of Appendix II, Attachment 4: Environmental Effects Assessment.

Security, Emergency and Fire safety plans

Security
During the construction phase of the Project, security personnel will patrol the site during non-working hours at night, weekends, civic holiday or periods of shutdown. When the Project is operational, it will rely on the perimeter fencing and remote monitoring to provide security; a 24-hour contact will be available to respond to any issues on-site.

Health & Safety
The Project will meet the requirements of safety as required by Alberta Occupational Health and Safety. This will include the development of a safety program, including pre-job meetings, daily tailgate meetings, incident reporting and tracking and ensuring that all personnel on the project site meet required safety training.

Emergency Response
Prior to construction, Acestes will consult with the local fire department to discuss construction and operational fire prevention and to determine if specific requirements should be implemented during construction and safety to satisfy any recommendations or requirements of the local emergency response.

22. List the closest residential home(s)

A table of all nearby residences is included in the Noise Impact Assessment (Attachment 8). The closest residence is approximately 40m east of the proposed Project, which is a vacant residence owned by the landowner of the Project. The next closest residence is approximately 770m north east of the Project.

23. Name and brief history of Company undertaking project

The development is being proposed by Acestes Power ULC, a subsidiary of the Mayel Group, a family-owned group of businesses active in agriculture in southern Alberta for over 100 years.

24. Provide any supporting documentation from government agencies, other studies and reports to demonstrate site suitability and impact mitigation

Enclosed with this application please find:

- FortisAlberta Interconnection Letter
- Glare Analysis
- Environmental Effects Assessment
    - Environmental Protection Plan (Appendix II)
- AEP Referral Report
- PIP Report
- Haul Route Map
- Noise Impact Assessment
- Stormwater Management Plan
- Letters of Authorization (2)
- Land Title Certificate
- Site Plan
- Alberta Energy Regulator (AER) Abandoned Well Map
- Historical Resources Act Approval
- NAV Canada Approval
- Corporate Search

25. Date(s) an Open House was held for the landowners in the MD of Willow Creek

A community open house event was advertised in the Claresholm Local Press on November 8, 2017. Invitations to the open house event were also included in the notification packages sent to landowners and residents. The open house was held on November 14th, 2017 between 4pm and 8pm in the nearby town of Claresholm in the local Community Centre. During the open house event display boards were presented providing information and details of the proposed solar Project. Representatives from Action Land, Green Cat Renewables and Acestes attended the open house and were on-hand to present the Project information, answer questions and respond to any concerns raised. The Project notification letters as well as the AUC 'Public Involvement in a Proposed Utility Development' document were also made available to attendees. The table below refers to Sections 4.1, 4.1.1 and 4.1.2 of Attachment 6: PIP report, there were 10 attendees at the open house and the following questions were raised:

Questions/Concerns	Response/Mitigation
Aesthetics and visual impact of project	During the open house event True View Visualisation software was used to aid the discussions and to demonstrate how the development would appear in the landscape once built. See below sections 4.1, 4.1.1, 4.1.2
Weed control	Perennial grass/hay will be established between the panel rows to control weeds and spraying will also be done when necessary
Fire Hazard	Grass will be mowed and adequate room will be left for a fire truck to access the site

Additional details regarding the PIP undertaken by Acestes are included in Attachment 6.

26. Provide any detailed information that you feel may assist Council in making an informed decision

The proposed solar Project has many benefits to the local community and municipal district including:

Long-term tax revenue - The solar plant will provide ongoing tax revenue benefits to the Municipal District of Willow Creek over its life span, which in turn will feed into improvement of municipal services.

Local Employment Opportunities – Construction of the solar Project will require many skills and trades, and is expected to require over 100 workers. There will also be limited on-going job opportunities during the operational life of the plant.

Boosting Local Economy - Workers are expected to require accommodations and services while working on the Project in the construction phase, helping to boost local businesses in the hospitality sector.

Local supply of clean power – The solar plant will provide a local source of power that is clean and renewable. By connecting to the electric grid at the local distribution level, the plant will help reduce the future need for expensive upgrades to the large-scale transmission power grid, which over time could help to reduce everyone's electric utility bills.

27. Soil characteristics, environmental features and issues, Stormwater management, compatibility with surrounding land uses, potential impacts to agricultural land and irrigation operations, potential visual impacts, etc.)

A Stormwater Management Plan has been developed by Integrated Sustainability Consultants Ltd. and is enclosed as Attachment 9. Furthermore, the Environmental Effects Assessment and Environmental Protection Plan, which have been signed off by AEP are included as Attachment 4.

28. Environmental Assessment Report (prepared by a qualified professional)

The Environmental Effects Assessment and Environmental Protection Plan are included as Attachment 4.

29. Copy of landowner permission (required to have something in writing confirming that you have permission to make application)

A letter of authorization signed by the landowner is included as Attachment 10.

30. Any other relevant studies, reports, certificates and approvals from Federal/Provincial agencies

Please refer to Question #24.

31. Land title certificate for each of the parcels being proposed for development

A current land title certificate for SE 15-14-27 W4M is included as Attachment 11a.

32. Prescribed Land Use Bylaw Amendment application fee of $2,000.00 per application.

A cheque in the amount of $2,000 for the Land Use Amendment fee is enclosed.

33. Site Plan

The proposed site plan is included as Attachment 12.

34. AER Abandoned Well Information

An abandoned well map prepared using the AER's Abandoned Well Map Viewer is included as Attachment 13.

FORTIS ALBERTA INTERCONNECTION LETTER

STAVELY SOLAR PROJECT

FortisAlberta Inc.
320 – 17th Avenue SW
Calgary, Alberta, T2S 2V1
www.fortisalberta.com

September 25, 2018

Alberta Utilities Commission
Attention: Mr. Thomas Y. K. Chan
Eau Claire Tower
1400, 600 – 3rd Avenue SW
Calgary, Alberta T2P 0G5

Email

Dear Mr. Chan:

Re: Acestes Ventures Ltd.
SE15 14-27-W4, FortisAlberta reference CRM 660000143

FortisAlberta Inc. is in discussion and is prepared to allow the interconnection of the **Acestes Ventures Ltd. 8.5 MW** generating facility located at **SE15 14-27-W4** to our 25 kV distribution system, pending final execution of an Interconnection Agreement.

Please contact me at if further clarification is required.

Regards,

Jack Wojciechowski
Key Account Manager
FortisAlberta Inc.

Cc: Clyde Carr, Email,

SOLAR GLARE STUDY
STAVELY PROJECT

SOLAR GLARE STUDY – STAVELY PROJECT

Acestes Power ULC

APRICITY RENEWABLES INC.

Applying results oriented engineering to your next solar project.

Prepared by Brendan McCormick

May 9th, 2018

507 Cordach Cres.
Peterborough, ON
K9H3A4

www.apricityrenewables.com

Report Revision History

Project: Solar Glare Study – Stavely				
Date	Revision	Revision Description	Reviewed By	Released for
05/11/2018	R00	Issued for Review	RG	Acestes Power ULC

Attn:

Clyde Carr
President
Acestes Power ULC

Hello Clyde,

The purpose of the enclosed report is to assess the potential glare impact of the proposed Photovoltaic (PV) facility on a number of observation points in the vicinity of Acestes Power ULC's Stavely development.

In consultation with Acestes Power ULC, Apricity has identified a number of observation points including dwellings and intersections in the vicinity of the proposed project site which have been evaluated using the Forge Solar analysis software which leverages the Sandia National Labs Solar Glare Hazard Analysis Tool (SGHAT).

Details of the methodology, assumptions, and results are found in the enclosed report and we trust are satisfactory for your purposes.

Kind Regards,

Ross Green, P.Eng.

President and Principal Engineer

Apricity Renewables Inc.

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Disclaimer

Apricity Renewables Inc. (ARI) has provided an assessment of glare from a proposed PV Plant within the enclosed report. This assessment is based on the documentation and information provided to ARI by the Client and/or third parties. The enclosed information represents the results of a glare model created by ARI using such information which has been made presently available, along with a number of assumptions and estimates based on past experience, industry best practice, historical irradiance, climate, and weather information, and with the understanding the system will be operated in a manner consistent with industry best practice. The enclosed information does not constitute any warranties or guarantees and should not be construed as such in any way. Actual glare conditions may vary materially based on several factors including but not limited to final system design and installation, weather, and site conditions.

The enclosed report was prepared for the exclusive use of the person(s) to whom it is addressed and may not be disclosed to, or used by, any third party without the prior written consent of ARI. The Recipient agrees to indemnify and hold harmless ARI and its Affiliates from and against any losses, damages, costs or expenses incurred by any of them, and any claims made against any of them or liabilities suffered by any of them arising directly or indirectly from the use of this report by the Recipient or by any of its employees or agents. The benefit of such indemnity and limitations of liability shall extend to Apricity Renewables shareholders, directors, officers, partners, employees, and agents of all indemnified parties.

1 - Project Background

Acestes Power ULC is in the process of developing a 13.8MWdc solar PV system, to be located approximately 2.5km east of Stavely, Alberta.

The system will consist of a single array field, directly north of Township Rd. 142, and between Range Rd's 272 and 273. The array will utilize a fixed-tilt racking system and photovoltaic modules with an anti-reflective coating and a nameplate rating of at least 340W.

Figure 1: Detailed Site Layout

Figure 2: Site boundaries in relation to the surrounding area

The array field will have an azimuth of 180 degrees, meaning the modules will be oriented to face south. The racking system upon which the modules are to be mounted is expected to be tilted between 30 - 35° from horizontal. The modules will be mounted in a landscape configuration with 4 rows of modules in each array row.

Assuming an average module width of 1m, as well as a leading-edge height of 1m above grade, the expected highest point of each row will be 3 - 3.3m above grade.

Figure 3: Representative photo of module/row configuration for the Acestes Stavely Development. Final design may differ from this photo.

Apricity Renewables Inc. has been engaged by Acestes Power ULC to study the potential glare impacts on the surrounding area from the proposed solar PV development.

1.1 - Glare from Solar PV Systems

The Acestes Stavely development proposes the use of photovoltaic modules. Unlike concentrating solar power, which aims to reflect and concentrate as much of the incoming solar radiation as possible, the central function of a photovoltaic module is to absorb radiation. Any reflection of light is therefore an inefficiency, and module manufacturers strive to limit reflection.

The main source of reflection from a solar module results from solar radiation striking the protective glass cover at a high *angle of incidence*. The angle of incidence measures the angle at which incoming solar radiation is striking the surface of a PV module, with a 0° angle of incidence indicating solar radiation is striking the module directly perpendicular to its surface. An angle of incidence of 90° indicates the solar radiation is parallel to the surface of the PV module. Therefore, high incidence angles generally occur as the sun is rising and setting.

For the purposes of this report, reflection of solar radiation by the modules will be referred to as glare.

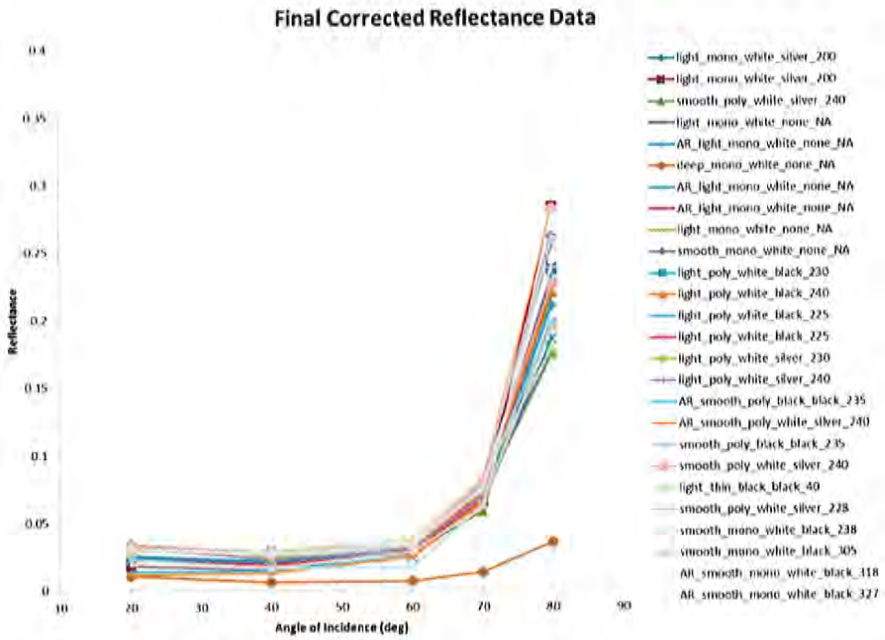


Figure 4: Reflection of solar radiation by several different PV modules, as a function of angle of incidence.

Because the reflectivity of glass increases with increasing angle of incidence, the most noticeable ground-level glare effect will be produced as the sun rises and sets, and typically in the spring and fall months when the sun is rising and setting in front of the plane of the array. These periods typically result in high incidence angles, where the PV modules will reflect the most sunlight.

The most likely observers to notice glare from a solar array field will therefore lie to the east and west of the array. Observers east of the array could experience glare in the early evening; observers west of the array could experience glare in the morning. Observers to the south could experience some glare, but it would likely be less than that experienced by east/west observers. Observers directly north of the array should experience no glare at all, as the modules face due south and they are therefore behind the plane of the array.

The hazard of glare from solar arrays has been investigated by the US Federal Aviation Administration (FAA) and Sandia National Labs. Several levels of glare and the hazard associated with each have been developed[1], and for the purposes of this study will be used as a general guideline for evaluating the severity of glare from a solar array:

- Green glare – poses no hazard
- Yellow Glare – has the potential to cause temporary after-image (a lingering image of the glare in the field of view) if the observer stares directly at the source of the glare. The size and impact of the afterimage (e.g. the effect after viewing a camera flash in a dim room, or the sun's reflection on water) depends on the retinal irradiance (brightness), and subtended source angle (size of glare source). Glare from PV arrays will typically have low retinal irradiance, but large subtended source angles.
- Red glare – has the potential to cause damage to the retina if exposure is prolonged

[1] US DOE, Sandia National Labs, SGHAT Technical Reference Manual, 2015

2 - Methodology & Assumptions

Apricity has used the Solar Glare Hazard Analysis Tool (SGHAT) developed by Sandia National Laboratory and licensed by Forge Solar to conduct a glare analysis for the proposed Acestes Stavely solar PV system.

The SGHAT tool employs an interactive Google map that allows users to locate and define an array field boundary and place glare observation points in relation to the array field. Latitude and longitude coordinates, as well as elevation, are automatically recorded for each point. The elevation of an observation point can be further adjusted to reflect the expected height above the ground a human observer or surface would be. Additional information is provided regarding azimuth and tilt of the panels, reflectance, array height, and ocular factors. A complete list these parameters and their values can be found in Appendix A.

The sun's position is then simulated in 1-minute time-steps for the entire year, and glare (as a function of the entered parameters) can be predicted for each observation point.

Apricity analyzed observations points within 1.5km of the proposed array field. The following points were identified for this glare analysis:

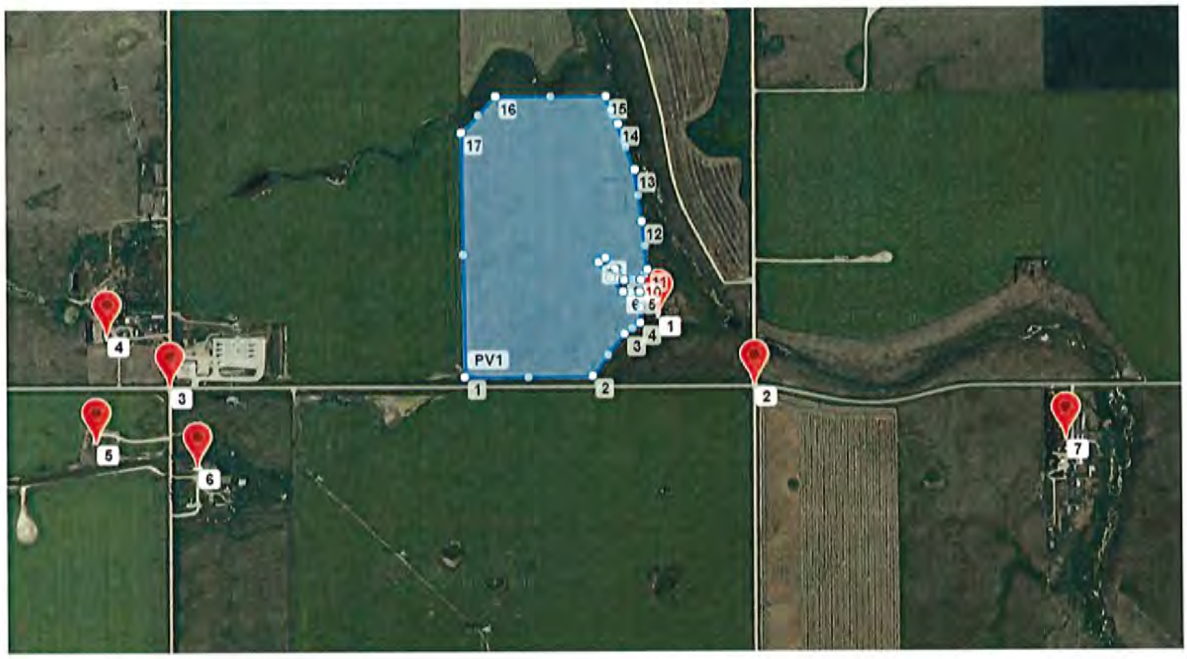


Figure 5: position of observation points relative to the proposed array field (blue)

Major assumptions of the glare analysis study include:

- SGHAT Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions. However, where appropriate, ARI has provided qualitative commentary on potential shading obstacles and their potential impact on observable glare.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- It is assumed that the modules procured will have an anti-reflective coating typical of commercial grade Tier 1 PV modules.
- No airports were identified within 3km of proposed solar array site, as a result no flight path analysis was conducted.
- This analysis does not consider the impact weather will have on the occurrence and duration of glare. All simulated days assume a clear-sky, with no impact from cloud cover, relative humidity, etc.
- Observation Points are oriented to face towards the source of glare at all times, i.e. viewing the glare directly. There is evidence to suggest that beyond a 50° viewing angle, glare produces no impediment to vision[2]. However, analyzing the potential orientations of observers is beyond the scope of this report.
- It is assumed the PV array is installed in a homogenous manner, without changes in grade, tilt angle, and azimuth (orientation) throughout the site.
- The study does not evaluate compounding effects of other sources of glare (eg. farm buildings, bodies of water)

[2] 2015, FAA – *Evaluation of Glare as a Hazard for General Aviation Pilots on Final Approach*

Required in the definition of the observation points is the elevation of the point above grade. A height of 2.7m was chosen for all observation points that are private residences, representing an approximation of an observer of average height on the 1st floor of a structure. A height of 2m was chosen to represent the height of an observer sitting in the driver's seat of a car at the two intersections studied.

Observation Point	Type of OP	Height above Grade (m)
1	Private Residence	2.7
2	Intersection	2
3	Intersection	2
4	Private Residence	2.7
5	Private Residence	2.7
6	Private Residence	2.7
7	Private Residence	2.7
8	Road/Intersection	2
9	Road/Intersection	2

Table 1: defined observation points, categories, and elevations

Apricity analyzed several design iterations of the Stavely system:

	Array Azimuth	Tilt Angle	Array Height above Grade
Analysis #1	180	30	1
Analysis #2	180	30	3
Analysis #3	180	35	1
Analysis #4	180	35	3.3

Table 2: Design iterations studied

As the final design may vary pending permitting and final engineering, the glare results presented in the following section represent the maximum duration of glare received by each observation point, across all iterations studied.

3 - Results of Glare Analysis

Using the approach described in the *Methodology & Assumptions* section above, Apricity has determined the following Observation Points will experience some amount of Yellow Glare (described in Section 1.1) as summarized in Table 3:

Observation Point	*Occurrence of Yellow Glare (Y/N)*	*Hours of Yellow Glare per Year*	*% of Year Yellow Glare may be Experienced*	*Glare, time-of-day*
1	Y	160	1.8	Evening
2	Y	56	0.6	Evening
3	Y	42	0.5	Morning
4	Y	34	0.4	Morning
5	Y	40	0.5	Morning
6	Y	31	0.4	Morning
7	Y	37	0.4	Evening
8	Y	44	0.5	Morning
9	Y	44	0.5	Evening

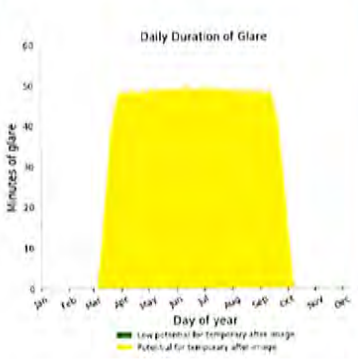
Table 3: Results of SGHAT analysis

Plots have been provided below for each Observation point where the analysis suggests Yellow Glare may be experienced. The plots summarize the months in which this glare could occur and the total estimated minutes of Yellow Glare experienced.

The level of Yellow Glare experienced at the observation points would be similar in magnitude to what might be observed from a smooth body of water. This conclusion is made based on the similar indices of refraction between smooth water, and glass with an anti-reflective coating (Shields, 2010).

An aerial image identifying the corresponding Observation Point has been included for reference. The aerial image provides context for the environment surrounding the observation point (i.e. tree-lines, buildings) that may impact glare results.

Observation Point 1



The results of the glare analysis for Observation Point 1 indicate that glare will be prominent due to the close proximity to the array section. The residence at OP1 is reported to be currently vacant, but could potentially be occupied in the future. The residence exists on property held by the same owner of the land upon which the solar system is situated, and it is assumed that the integrity of the shelterbelt could be maintained over the lifetime of the project.

Satellite and street imagery indicate the existence of a shelterbelt of bushes surrounding the residence. It is unclear from the images how thick and tall the shelterbelt is, but it is likely that the glare could be materially reduced for an observer at OP1 throughout the year. This conclusion is made based on the glare sources map created using the Forge software, which shows the vast majority of glare sources to be partially obstructed from view by the shelterbelt:

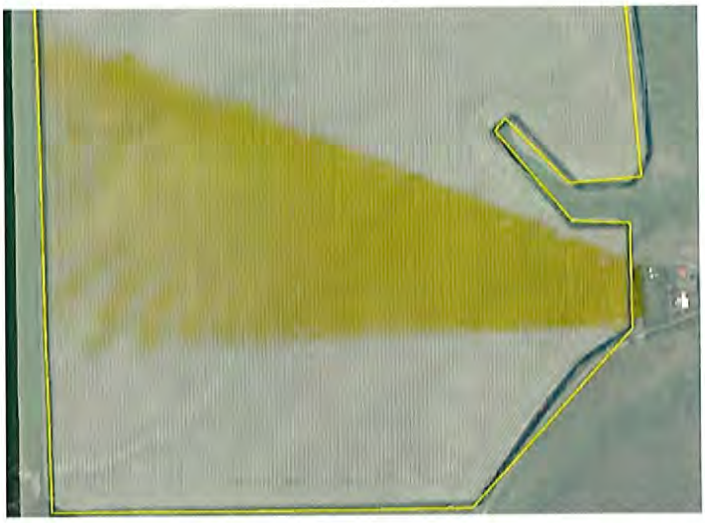
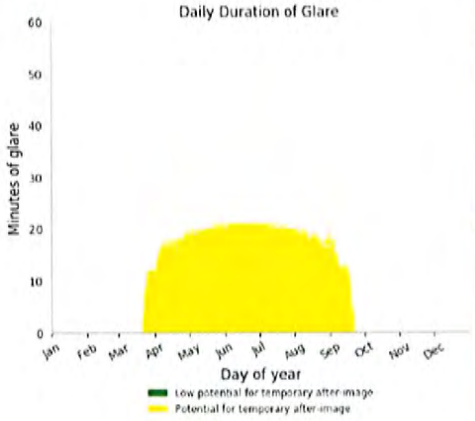


Figure 6: Map of locations of glare from the proposed solar array (yellow). Star indicates the position of OP1

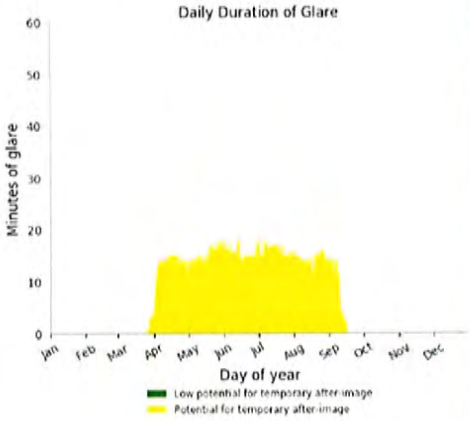
Based on a review of photos of the shelterbelt, ARI estimates that the amount of visable glare will be partially reduced, as the shelterbelt provides some barrier to the glare:

Figure 7: best view of shelterbelt of bushes surrounding OP1. Viewed from Twnshp Rd 142, looking NW. Glare will strike the OP on the opposite side.

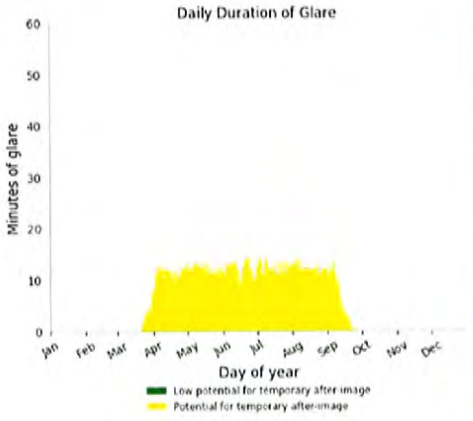
Observation Point 2



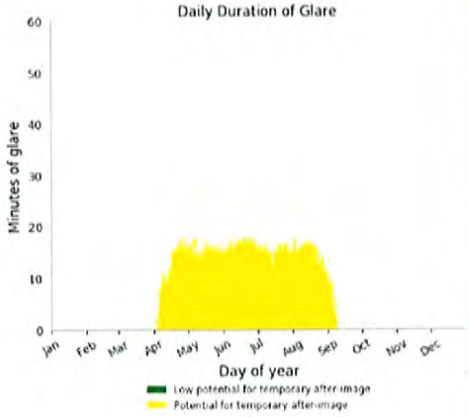
Observation Point 3



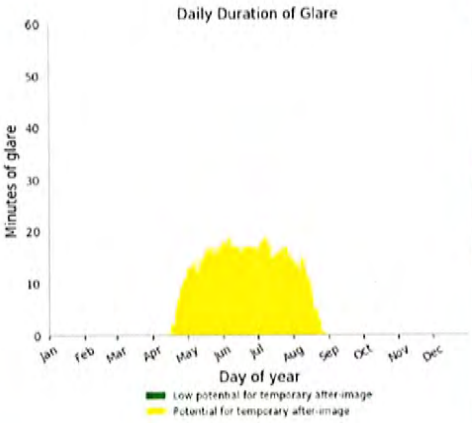
Observation Point 4



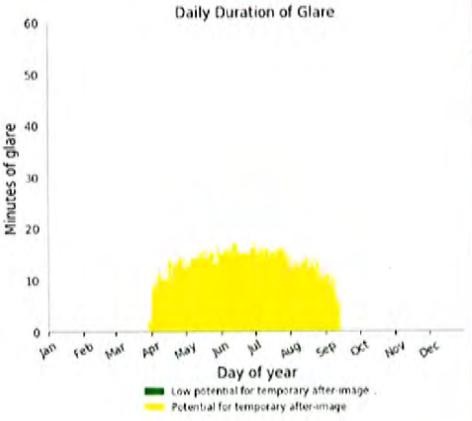
Observation Point 5



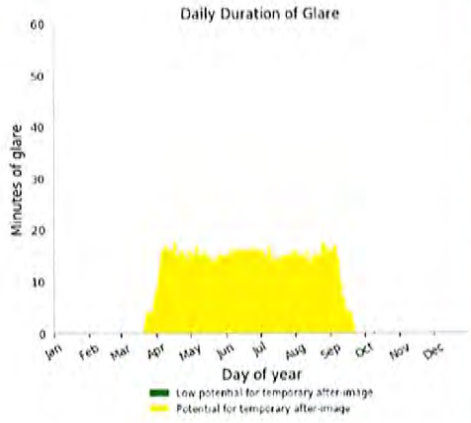
Observation Point 6



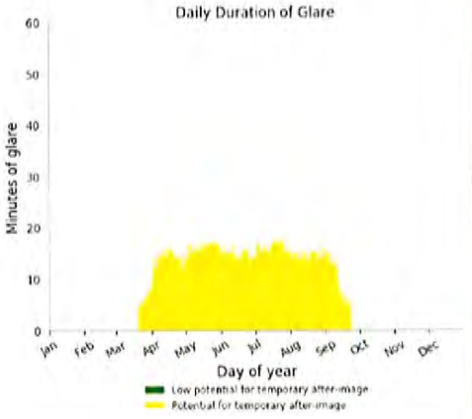
Observation Point 7



Observation Point 8



Observation Point 9



4 - Discussion of Results & Conclusions

Of the 9 observation points studied, all 9 could experience Yellow Glare during the year. The level of Yellow Glare experienced at the observation points would be similar in magnitude to what might be observed from a smooth body of water. This conclusion is made based on the similar indices of refraction between smooth water, and glass with an anti-reflective coating (Shields, 2010) and the large areas for which utility scale solar projects and bodies of water can span. Glare effects from these types of objects tend to be lower in intensity (retinal irradiance) but higher in subtended source angle due to their large area. No points studied were found to experience Red Glare at any point during the year.

On the days that Yellow Glare is predicted to occur:

- 7 sites could experience Yellow Glare for less than 20 minutes of the day (OP3-9)
- 1 will experience Yellow Glare for less than 25 minutes of the day (OP2)
- and 1 will experience Yellow Glare for less than 50 minutes (OP1)

Glare predicted by the SGHAT assumes the observer is staring directly at the source of glare. This assumption is appropriate for observers in a building, residence, or on private property as there is a full range of possible activities and likely orientations of their field of view. Observation points 2, 3, 8, and 9 all represent observers on paths travelled by surface vehicles (in this case vehicles, cyclists, or pedestrians), that are reasonably assumed to have predictable orientations of their field of view. It has been assumed that for such activities the observer's field of view is constrained to east facing and west facing orientations (parallel to their prevailing direction of travel). This assumption holds true for steady travel along Township Rd 142, but may break down as an observer approaches road features, such as intersections and driveways, which may require the orientation of their field of view to diverge from parallel to the prevailing direction of travel. The predicted glare experienced by such observers has been further analyzed during steady constant travel.

Apricity relies on results of a study on the impact solar PV glare has on the safe operation of aircraft (FAA, 2015) for this analysis. In the study conducted by the US Federal Aviation Administration and Sandia National Labs, pilots were exposed to glare during a series of flights in a flight simulator, and their perceived impairment was recorded. During the approach phase of each flight, glare was simulated from one of four possible angles (0, 25, 50, and 90° left of straight ahead) and for glare durations of either 0 (no glare control), 1, and 5 s. Subjective measures of impairment were recorded for each condition. This study concluded with recommendations to locate potential sources of glare such that they do not produce glare from angles less than 50° straight ahead.

Applying this parameter to glare experienced at Observation Points 8 and 9 indicates that glare sources would be within this 50° window when an observer is looking directly east or west along Township Rd 142:

Figure 8: Sources of glare (faint yellow circles), and their position relative to OP8. Glare sources can be seen to be within the 50° window

Figure 9: Sources of glare (faint yellow circles), and their position relative to OP9. Glare sources can be seen to be within the 50° window

In the Federal Aviation Administration's (FAA) study of a pilot's impairment due to solar glare, study participants reported slight to moderate impairment when a glare source was within 50° of their field of vision. The study concluded that while pilots reported this impairment, no statistically significant deviation was observed in their ability to execute the required simulated task (runway landing).

This level of reported impairment could deviate when considering a surface vehicle, cyclist or pedestrian, as the observer would not necessarily be classified as a trained professional (as was the case for the pilots participating in the FAA study) and would have a different set of navigational aids at their disposal. Furthermore, whereas the alignment of the observer's field of view with the prevailing direction of travel may be deemed reasonable for a pilot operating an aircraft, the same assumption may not necessarily be deemed reasonable in all cases for the operation of a surface vehicle (motor vehicle, cyclist, pedestrian). Note that the evaluation of the validity of this assumption is beyond the scope of this report.

Review of satellite imagery also indicates that there is no significant barrier to obstruct the sources of glare from the view of drivers on the highway.

While the intensity of the glare is relatively low, the subtended angle (size of the glare spot) is sufficiently large enough to possibly warrant the installation of a glare barrier (e.g. shelterbelt, hedge, fence) along the perimeter of the Stavely site. Such a barrier would be designed to significantly reduce or entirely mitigate the potential impacts of glare on observers travelling along Township Rd 142.

References

FAA. (2015). *Evaluation of Glare as a Hazard for General Avaiation Pilots on Final Approach.* Washington, DC: FAA.

Ho, C. K. (2015). *Solar Glare Hazard Analysis Tool (SGHAT) Technical Reference Manual* . US DOE, Sandia National Labs.

Ho, C. K. (2016). *Solar Glare Hazard Analysis Tool (SGHAT) User's Manual v. 3.0.* US DOE, Sandia National Labs.

Shields, M. (2010). *PV Systems: Low Levels of Glare and Reflectance vs. Surrounding Environment.* Sunpower.

Axis Tracking	Fixed (no rotation)
Panel Material	Smooth glass with anti-reflective coating
Vary reflectivity with sun position	Yes
Correlate slope error with surface type	Yes
Slope error	8.43 mrad
DNI Peak	1000.0 W/m^2
Timestep	1 min
Ocular transmission coefficient	0.5
Pupil diameter	0.002m
Eye focal length	0.017m
Sun subtended angle	9.3 mrad

Table 4: parameters used in Forge Solar SGHAT tool

ENVIRONMENTAL EFFECTS ASSESSMENT

STAVELY SOLAR PROJECT

ENVIRONMENTAL EFFECTS ASSESSMENT

For the
STAVELY SOLAR PROJECT
ALBERTA

To satisfy the requirements of
ALBERTA UTILITIES COMMISSION

RULE 007

Proponent

ACESTES POWER ULC

DOCUMENT COMPLETED BY

McCallum Environmental Ltd.

BearTracks Environmental Services

September 5, 2018 Update

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1 Executive Summary

Acestes Power ULC ('APULC') intends to develop a photovoltaic (PV) solar power electrical generation project and a substation on privately owned lands located 2.1 km east of the town of Stavely, Alberta. This solar power project is referred to herein as the Stavely Solar Project ('SSP'). The SSP includes approximately 37,832 solar panels with an approximate nameplate capacity of 8.5 MW AC (estimated at approximately14,100 MWh/year).

The SSP development will be located in the SE and NE quarter section of Section 15, Township 14, Range 27 west of the fourth Meridian (SE/NE-15-14-27W4M) in sourthwest Alberta. The SSP lands encompass approximately 37 hectares and the entire Project is on cultivated land.

The Project is located within the Mixedgrass Natural Subregion of Alberta, characterized by intensive cultivation, but with dispersed patches of native prairie (Alberta Parks, 2015). The Project is also within the Prairie Pothole Region (PPR), an ecologically significant area for wildlife containing abundant shallow wetlands throughout (Ducks Unlimited Canada, 2017), additionally, the Project lies within sensitive raptor and sharp-tailed grouse range (Alberta Environment & Parks, 2011).

A small coulee and associated drainage was documented running southwest through the Project area. Waterbodies in the vicinity of the Project include Clear Lake (13 km east of the Project area) and Pine Coulee Reservoir (9 km west of the Project area).

The SSP will include areas for solar panels mounted on fixed tilt racking supported by driven or helical piles, access roads, collector lines, a perimeter fence, inverters, step-up power transformers substation containing electrical gear and electrical control transformers, and an Operations & Maintenance (O&M) building.

This Environmental Effects Assessment (EEA) has been developed in response to the requirements outlined in the AUC Rule 007, dated February 1, 2016, and more specifically PP16 and PP17.

No approval, registration or notification requirements exist for solar power projects under the Alberta *Environmental Protection and Enhancement Act, Environmental Assessment (Mandatory and Exempted Activities) Regulation, Alberta Regulation 111/1993, with amendments up to and including Alberta Regulation 62/2008.* Therefore, no Alberta Provincial Environmental Assessment is required for this project. Project infrastructure (i.e. panels, roads) are setback from wetlands. In the event underground collection crosses a watercourse or wetland, notification under the *Water Act* will be required.

The document summarizes the SSP development activities and the results of wildlife monitoring surveys and habitat evaluations that have been conducted within and surrounding the proposed SSP. The development of the SSP, and the methodologies used for environmental assessment were, and continue to be based upon the requirements of Alberta Environment & Parks (AEP), and standard and acceptable practices for environmental assessments. The following lists the environmental assessment work that has been completed for the SSP in 2016 and 2017:

1. Fall Migration Surveys – September 1, 21; October 5, 25; November 17, 2016
2. Spring Migration Surveys – March 24, April 7, April 19, May 2, May 10, 2017.
3. Breeding Bird Surveys – June 7, June 20, 2017.
4. Bird Species Specific Surveys:
    a. Raptor Nest Survey – June 7, June 20, 2017
5. Amphibian Call Surveys – June 7, June 10, June 20, 2017
6. Wetland Surveys – completed in June and July 2017.

The SSP impacts are summarized as follows:

1. All solar panels, access roads, collector lines and substations are located on cultivated land. No native praire is present or affected.
2. All collector lines will be located underground.
3. All setbacks from wildlfe features are being met.
    a. No known Sharp-tailed Grouse leks have been previously identified within the SSP area, and no new leks or individual sightings were recorded.
    b. No burrowing owls were located during other surveys and the project is located outside burrowing owl habitat ranges so burrowing owl surveys were not required.
    c. No nests are present within the Project boundaries or immediately adjacent to the Project lands in such a way as to affect the Project.
4. There are 3 watercourses outside the boundaries of the Project. 1 watercourse runs through the Project and is intermittent drainage for surrounding cultivated land. All setbacks from watercourses within and adjacent to the Project are being met.
5. There are no wetlands within the Project boundaries. Therefore, no wetland disturbance will be occurring as a result of the SSP.
6. Bird activity levels and movement patterns in spring and fall migration study periods did not reveal the presence of clearly identifieable migratory pathways. There are also no topographical features that appear to funnel or constrain bird movement.
7. Due to the SSP being located entirely on cultivated land there is limited affects to breeding birds and bird habitat.
8. Due to the SSP being located entirely on cultivated land there is limited affects to wildlife habitat.

9. The SSP is not situated in defined *Critical Habitat*[1] for any wildlife species.
10. There are no unique or regionally or locally important habitats affected.
11. All lands within the Project area are cultivated. All surrounding ¼ sections are cultivated. AEP (2016) recommends siting solar energy projects on cultivated or previously disturbed lands to reduce high quality habitat loss. It is also recommended that siting avoid environmentally significant areas, key wildlife ranges, important water bodies, and valleys. Based on the general assessment of land use conditions in proximity to the Project site, it can be reasonably concluded that the Project site (as currently proposed) meets the expectations of AEP with respect to Project siting and avoidance of important wildlife habitat features.
12. The SSP will result in loss of cultivation on approximately 37 hectares (91 acres) of land currently under active cultivation. Under the *Alberta Agriculture & Forestry Conservation Cropping Protocols*[2], the 'carbon harvest' works out to approximately 0.057 tonnes/acre/year in the Dry Prairie areas for the no till seeding category of soil disturbance. Therefore, as the project will not result in soil disturbance during operations once construction is complete and lands are restored to perennial vegetation below the panels, over the lifetime of the SSP, in addition to the carbon offsets from solar production, expected carbon sequestration in the soils might be expected to amount to 5.1 tonnes of carbon per year. Over a 30-year project, this amounts to approximately 155 tonnes of carbon sequestered as a secondary benefit to solar energy production.
13. In a single year, the SSP will reduce overall provincial Greenhouse Gas Emissions ('GHG') as very small emissions are created by the SSP. Based on quantification protocols for renewable generation, the SSP could produce 0.59 tonnes CO_2e GHG offsets for every megawatt hour of electricity produced (Government of Alberta, 2015). Given the SSP produces measurable electricity, the GHG offsets are measurable. Using the total energy output of approximately 8.5 MW AC (estimated at 14,100 MWh/year) equates to approximately 8,319 tonnes[3] of CO_2e GHG offset in a single year.

The results of this environmental assessment suggest that there are no significant impacts on ECs that cannot be effectively mitigated during construction, operation and decommissioning of the SSP.

As with any energy project designed and implemented anywhere, there will always be some negative impacts when compared against the "do nothing" option. However, there will be material social benefits in air quality. There will also be material economic benefits in job creation,

[1] As defined by Canada's *Species at Risk Act*; **critical habitat** is the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species critical habitat in the recovery strategy or in an action plan for the species.
[2] http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/cl16220 accessed September 2017.
[3] = 14,100 MWh/Year x 0.59 tonnes CO_2e GHG Offsets/MWhr = 8,319 tonnes

payments to area landowners, payments to the MD, and economic opportunities for contractors and suppliers in the area.

The effects that this project has on physical, biological, and cultural components varies in magnitude and scale. For example, the reduction of GHG emissions has a large magnitude of effect on biological and cultural components at the local, regional, provincial, and international scale. Furthermore, the significant magnitude of positive effects from such reductions likely negates the less significant, negative effects, which tend to be confined to a small scale (i.e. the project area). The GHG reductions inherent in renewable energy projects potentially provide the single most important environmental and socially positive impact that is recognized by many governments and agencies in Alberta, Canada and the world. This example shows the importance of considering magnitude and scale of effects when determining their significance.

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2 List of Acronyms

AB	Alberta
AC	Alternating Current
AEP	Alberta Environment & Parks (formerly ESRD)
AESRD	Alberta Environment & Sustainable Resource Development*
ASRD	Alberta Sustainable Resource Development*
AUC	Alberta Utilities Commission
AUS	Avian Use Study
AWCS	Alberta Wetland Classification System
BBS	Breeding Bird Survey
BOP	Balance of Plant
BTES	Bear Tracks Environmental Services (2015) Ltd.
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
APULC	Acestes Power ULC
CWCS	Canadian Wetland Classification System
EC	Ecosystem Components
EEA	Environmental Effects Assessment
EPP	Environmental Protection Plan
ESA	Environmentally Significant Area
ESRD	Alberta Environment & Sustainable Resource Development*
FWMIS	Fisheries and Wildlife Management Information System
FWMIT	Fisheries and Wildlife Internet Mapping Tool
GHG	Greenhouse Gas
GIS	Geographic Information System
GOA	Government of Alberta
GPS	Global Positioning System
HSI	Habitat Suitability Index
IBA	Important Bird Area
km	Kilometers
kV	Kilovolt
m^3	meter cubed
MBCA	Migratory Birds Convention Act
MEL	McCallum Environmental Ltd.
MV	Medium Voltage
MW	Megawatt
MWh	Megawatt Hours
NAD83	North American Datum of 1983
PIP	Participant Involvement Program
PPR	Prairie Pothole Region

PV	Photovoltaic
SAR	Species at Risk
SARA	Species at Risk Act
SSP	Stavely Solar Project
USSE	Utility Scale Solar Energy
UTM	Universal Transverse Mercator

*These acronyms were changed by Alberta Environment & Sustainable Resource Development over time and are provided in this document as the acronym appeared in referenced material.

3 Project Information

Acestes Power ULC ('APULC') intends to develop a photovoltaic (PV) solar power electrical generation project and a substation on privately owned lands located 2.1 km east of the town of Stavely, Alberta. This solar power project is referred to herein as the Stavely Solar Project ('SSP'). The SSP includes approximately 37,832 solar panels. The total energy output will be approximately 8.5 MW AC (estimated at 14,100 MWh/year).

The SSP development will be located in the SE and NE quarter section of Section 15, Township 14, Range 27 west of the fourth Meridian (SE/NE-15-14-27W4M) in sourthwest Alberta (Figure 1 - below). The SSP lands encompass approximately 37 hectares and the entire Project is on cultivated land.

Table 1. Project Summary

Project Name	Stavely Solar Project (SSP)
Proponent Name	Acestes Power ULC (APULC) Attention: Clyde Carr
Solar Panels	Approximately 37,832
Nameplate Capacity	13.8 MW DC / 8.5 MW AC
SSP location	SE and NE-15-14-27W4M
SSP approximate boundary area	37 hectares
Landowner(s)	The SSP lands are private land. Refer to the AUC Participant Involvement Program PIP for further information.
Required Federal Environmental Permits & Authorizations	None
Municipality	MD of Willow Creek

Primary Environmental Consultant	Robert McCallum, P.Biol McCallum Environmental Ltd.
Environmental Studies completed by	McCallum Environmental Ltd. Bear Tracks Environmental Services Ltd.

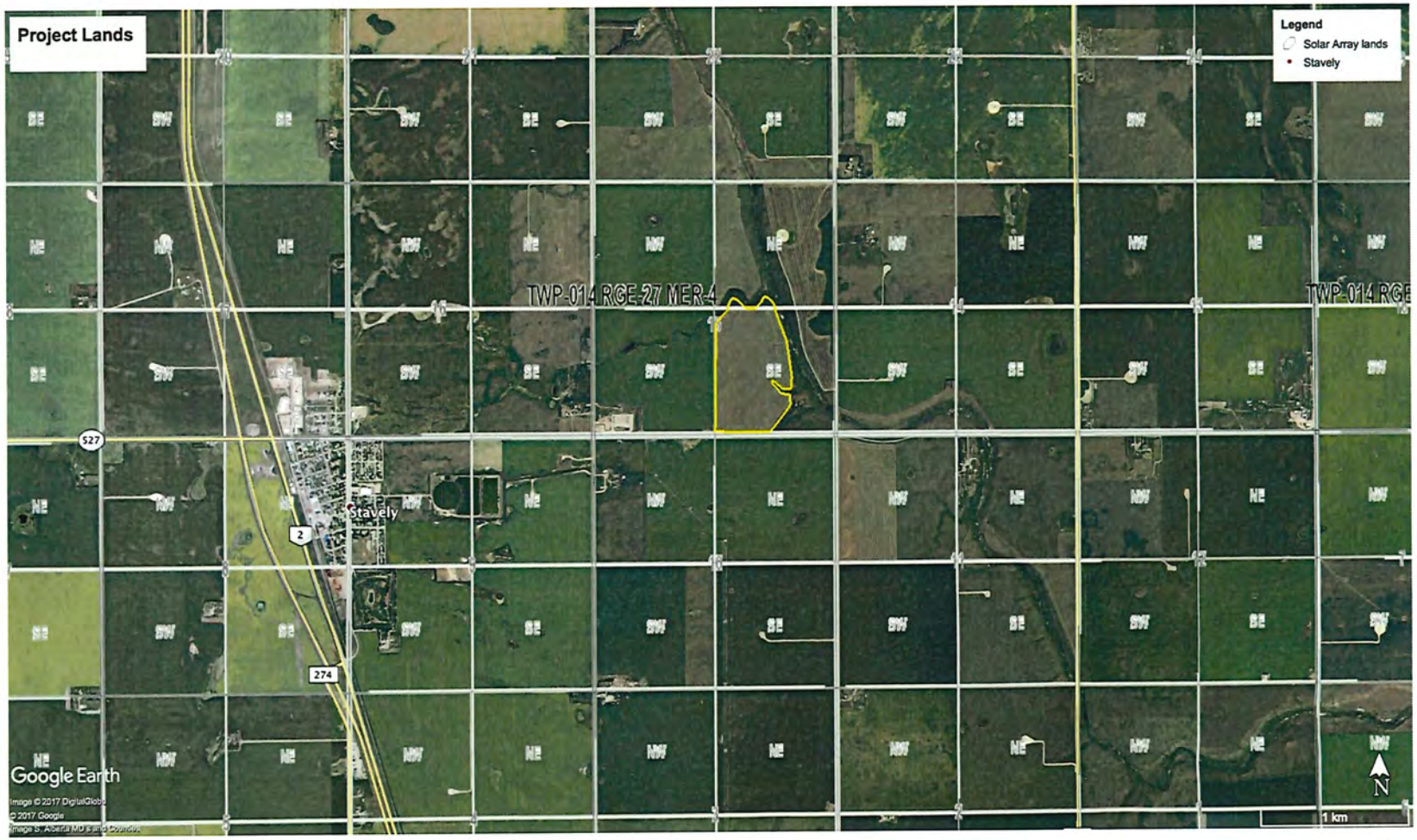

Figure 1. Project Location

3.1 Activity Phases

The following outlines general order of activities associated with a solar power project development.

Table 2. Activity Phases

Phase	Details
Pre-Construction	
	• Notification of residents/landowners of construction commencement • Survey access roads on SSP lands • Trucking & set up of temporary facilities – construction offices, workers trailers, temporary washroom facilities, etc. • Construction equipment delivery
Construction	
General	• Clearing of soils on construction/post construction roads; O&M building; substation • Construction of storage yards • Construction of temporary work space • Construction of perimeter security fence
Civil	• Stripping of surface soils along access roads, at solar panel locations, at substation, at other required work areas • Construction of access roads, water crossings • Construction of temporary work space(s) • Construction of solar panel locations • Installation of erosion and sediment control structures • Site grading on those areas stripped of soils only (see "General" above) • Excavation of foundations • Installation of helical piles for solar panels • Pouring of concrete for foundations as required • Backfilling of foundations with previously excavated soils • Reclamation of surplus soils • Grading of site
Solar panels	• Solar panel component and racking delivery • Pile driving and erection of racking • Install solar panel on racking

Phase	Details
DC Collection System	• Trenching for underground DC electrical collector system • Installation of underground DC collector lines
AC Collection System	• Trenching for underground Medium Voltage ('MV') electrical collector system • Installation of underground MV collector lines • Concrete pads for central inverter stations, MV power transformers and associated switch gear • Delivery and handling of MV electrical components
Switchgear Area	• Delivery of equipment • Installation of equipment foundations and station ground grid • Installation of equipment support structures • Installation of controls transformer, switch gear, protection and control systems, conduits, wiring, and terminations • System commissioning and testing • Installation of switchgear perimeter security fence
Operations & Maintenance	
	• Weed control • Re-seeding of disturbed soils • Grading of roads • Road maintenance • Culvert maintenance • Solar panel maintenance • Sub-station maintenance • Equipment repair and testing
Decommissioning	
	• De-energize facility • Removal and recycling of above ground and below ground infrastructure • Recontouring • Reclamation of surface soils • Re-seeding or re-planting • Reclamation monitoring

4 Constraints

A key aspect of planning the SSP was the determination of suitable lands for development.

This section details how the SSP lands and siting for the solar panels and infrastructure was rationalized:

A. Site Optimization: determination of the most appropriate location for the SSP to maximize power yields and to minimize overall impact on the landscape.

B. Constraints Analysis: analysis used to determine appropriate lands for the SSP.

4.1 Site Optimization

This section describes how multiple factors were considered in order to determine the area and footprint for the SSP. These factors include technical (i.e. solar resource), financial, construction, socio-economic, landowner, biophysical, as well as community and stakeholder feedback.

The determination of the most appropriate location for the SSP helps to minimize the overall impact on the landscape. Detailed planning and analysis was completed to determine available lands and to ensure that the solar panels can be placed within the area. Minimization of the SSP footprint allows APULC to reduce the impact on the environment and reduce construction and development costs.

The SSP was chosen for the following reasons:

1. Appropriate solar regime to make the SSP economically viable;
2. Presence of adequate land base for placement of solar panels and Balance of Plant;
3. Private v Public land: No solar panels are going to be placed on public lands;
4. Presence of cultivated land;
5. Relatively level topography and the characteristics to allow placement of solar panels as close together as practical to minimize land disturbance and SSP footprint;
6. Ability to place solar panels to meet regulatory setbacks;
7. Ability to place solar panels to meet municipal setbacks from residences; and,
8. Proximity to the existing Stavely substation in order to maximize grid interconnection capacity and achieve adequate economies of scale.

4.2 Environmental Setbacks for Final Layout

The following environmental setbacks were used[4] and the table provides a summary of setbacks from those features identified in, or expected around, the SSP.

Table 3. Setbacks for features identified at SSP

Environmental Feature[5]	Setback Definition	Setback (m)	Applied as setback?
Native Prairie	Avoid development on native prairie grasslands; no additional setback applied	Constraint on Feature	No native prairie present
Lek: Sharp-tailed Grouse	500 m	500	Not applicable - no relevant features in area
Nests of Species: Ferruginous Hawk	1000 m	1000	Not applicable - no relevant features in area
Nests of Species: Swainson's Hawk	100 m	100	Not applicable - no relevant features in area
Watercourse	No specific watercourse setback; using the setbacks and classification that are included in the Wetlands definitions below.	45	Yes
Wetland - Class 1[6]	Avoid development on Class 1 wetland; no additional setback applied	0	Not applicable - no relevant features in area

[4] All setbacks as outlined in the *Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural Regions of Alberta* (AEP, 2011) were used, in addition to those provided in *Wildlife Directive for Alberta Solar Energy Projects, October 4, 2017.* However, of the species listed in those documents, only the species in the table were identified within the SSP and constraints are summarized accordingly..

[5] During micro-siting, all setbacks as outlined in the *Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural Regions of Alberta* (AEP, 2011) were used. However, of the species listed in that document, only the species in the table were identified within the SSP and constraints are summarized accordingly.

[6] Classes as described in Stewart & Kantrud (1971) Classification System as AEP had recommended setbacks based on that classification. The author is aware this system is not in use (but referenced) in the new Alberta Wetland Policy (2016).

Environmental Feature[5]	Setback Definition	Setback (m)	Applied as setback?
Wetland - Class 2 (Temporary marsh)	Avoid development on Class 2 wetland; no additional setback applied	0	Not applicable - no relevant features in area
Wetland - Class 3, 4 & 5 (seasonal marsh, semi-permanent marsh, permanent shallow open water, or intermittent shallow open water)	100m from boundary	Solar panels: 100 Other infrastructure: 100	Not applicable - no relevant features in area

5 Assessments Completed

The assessments for wildlife were based upon the results of desktop reviews, FWMIS database search results, and habitat types present.

The following lists the environmental assessment work that has been completed on the SSP in 2016 and 2017:

1. Fall Migration Surveys – September 1, 21; October 5, 25; November 17, 2016.
2. Spring Migration Surveys – March 24, April 7, April 19, May 2, May 10, 2017.
3. Breeding Bird Surveys – June 7, June 20, 2017.
4. Bird Species Specific Surveys:
    a. Raptor Nest Survey – June 7, June 20, 2017
5. Amphibian Call Surveys – June 7, June 10, June 20, 2017
6. Wetland Surveys – completed in June and July 2017.

6 Environmental Assessment Methodologies

Assessment of wildlife, including vegetation and habitat, was completed based on the requirements outlined in the Government of Alberta, *Wildlife Guidelines for Alberta Solar Energy Projects*, 2016 and the Alberta Government *Sensitive Species Inventory Guidelines* 2013.

The purpose of the surveys was to document wildlife use and environmental characteristics within the SSP area to eliminate or minimize impacts to local wildlife from the proposed development, and to aid in the planning process for solar panel placement. Species specific surveys targeted sharp-tailed grouse and raptors.

6.1 Desktop Review

A desktop review was conducted to determine historic and potential wildlife species of concern occurrences in the SSP area. The Alberta Environment and Parks (AEP) Habitat Suitability Index (HSI) Model Search Tool (version 2.2) was used to identify wildlife species at risk with likelihood of occurrence in the SSP area. The HSI tool has habitat suitability indices generated for 11 sensitive species. Species predicted to have 'highly suitable' or 'suitable' habitat were identified as potential species of concern for the SSP. In addition, the Fish and Wildlife Internet Mapping Tool (FWIMT) was used to identify wildlife of concern that have been previously observed within 6 km radius of SSP centroid (ASRD, Fish and Wildlife Internet Mapping Tool (FWIMT), 2016a). Finally, a more detailed search of the Fish and Wildlife Management Information System (FWMIS) was conducted to determine actual locations of all fish and wildlife observed historically within the SSP townships (ASRD, Fish and Wildlife Management System (FWMIS), 2016b).

In addition to the above research, the following were reviewed prior to the wildlife assessment to determine potential sensitive species in the area and to develop proposed mitigation measures when warranted by the confirmed presence of species of management concern.

1. *Sensitive Species Inventory Guidelines* (Government of Alberta, 2013)
2. *Wildlife Guidelines for Alberta Solar Energy Projects*, 2016 (Alberta Environment and Parks, 2016)
3. *Master Schedule of Standards and Conditions* (Government of Alberta, 2017)
4. *Alberta Wild Species General Status Listing 2015* (Alberta Environment and Parks, 2015)
5. *Species at Risk Act (SARA)* (Government of Canada, 2002)
6. *Committee on the Status of Endangered Wildlife in Canada (COSEWIC)* (Government of Canada, 2017)
7. Provincial Wildlife Sensitive feature spatial data layers suitable for use in a Geographic Information System (GIS) (Alberta Environment & Parks, 2016)

The following sections outline the environmental assessment work that has been completed on the SSP to date.

6.2 Fall Migration Surveys - 2016

In accordance with the information requirements specified in the AEP *Wildlife Guidelines for Alberta Solar Energy Projects* (2016), the migration surveys were designed to assess fall avifauna

use within the various habitat types present within the Project area. Ms. Brandy Downey (Senior Species at Risk Biologist – AEP, Lethbridge) was consulted prior to the survey to review and approve the proposed survey methodology. The approved survey methods included:

1. Pre-determined survey locations were chosen throughout the Project. GPS locations were recorded in North American Datum (NAD) 83.
2. Each location was surveyed twice during each visit (once in early morning and once in mid-day) for a minimum of 20 minutes.
3. All observed avifauna within 800 m of pre-determined survey locations were documented.
4. The surveyor would stop periodically throughout the Project area and document flocks of migrating or staging birds, at which point a GPS location would be recorded. These locations were recorded as incidental sightings.
5. The surveyor would also stop at observed high value habitat areas (shrub rows, coulees, native pasture, etc.) to further investigate these areas for avian use.

Timing of migrations generally varies year to year and species to species, and can also be influenced by environmental conditions (i.e. warm and cold fronts) in summer habitats and along migration routes. Surveys were only suspended if poor visibility or audible perception was impeded. Based on discussion with AEP, five survey rounds were selected to provide greater accuracy in the data sets collected, as well as to better account for the seasonal variability of migrations.

Five rounds of surveys were conducted to ensure that migration data collected as part of the surveys was representative of the various stages of fall migration (i.e. early, mid, late). Surveys were conducted on:

1. September 1st;
2. September 21st;
3. October 5th;
4. October 25th; and
5. November 17th.

Analysis of lands and wildlife in the area were completed collectively – topography and any potential wetlands within the Project area were documented during the migration surveys. Four survey locations were selected in the Project area (Table 4). Plot locations were selected to provide appropriate survey coverage of the Project area, and to accurately represent dominant habitat types. Plots consisted of the area encompassing an 800 m radius (approximately 0.25 ha) of each survey point and the column of airspace above it. At each location, a minimum 20 minute survey was conducted and pertinent information with respect to migrating avifauna was recorded. The information collected included:

1. Avian species observed and direction/ distance of observation from plot center;
2. Direction of travel; and,
3. Number of individuals observed.

Incidental observations of flocks of staging or migrating birds were also recorded (those outside of the dedicated survey time, or greater than 800 m from plot center). The timing of the surveys (early morning and mid-day) allowed surveyors to capture both nocturnal migrants (e.g. songbirds) as well as afternoon migrants (e.g. raptors).

In the event that accurate counts of individual birds could not be conducted due to the presence of large groups of birds, a block counting method was utilized to estimate bird numbers in these instances. The block counting method involves counting individuals within a subset (block) of the group and then estimating the size of the flock by extrapolating the known number of individuals within the 'block' to the remainder of the group. This method is considered valid for estimating large groups of birds within an acceptable margin of error.

Table 4. Avian Use Study (AUS) plot descriptions.

Plot Number	GPS Location (NAD83 12U)		Habitat	Topography
	Easting	Northing		
SSM1	313092	5562240	75% cultivation, 25% grassland	Flat to gently rolling
SSM2	314409	5561008	50% cultivation, 50% grassland; small coulee	Gently rolling
SSM3	312995	5559424	100% cultivation	Flat to gently rolling
SSM4	315425	5559336	25% cultivation, 75% grassland	Gently rolling

Each AUS plot was surveyed in the morning and mid-day for a minimum of 20 minutes for the five rounds of surveys. This resulted in a total of 40 site visits, corresponding to approximately 13.3 hours of survey time logged.

6.2.1 Data Analysis

Data were summarized to include all birds observed in the Project area during the surveys to provide a representative sample of bird species present in the area during fall migration and to display changes in species richness and abundance over the course of survey rounds. This included

observations made at the survey plots during designated survey times, as well as incidental observations.

All bird observations made exclusively within survey plots during designated survey times were further summarized by species group to compare species group richness and abundance in the Project area. A temporal analysis of species use (presented as individuals per survey hour) in the Project area was calculated by dividing the total number of observed individuals from each respective species group by the total survey time.

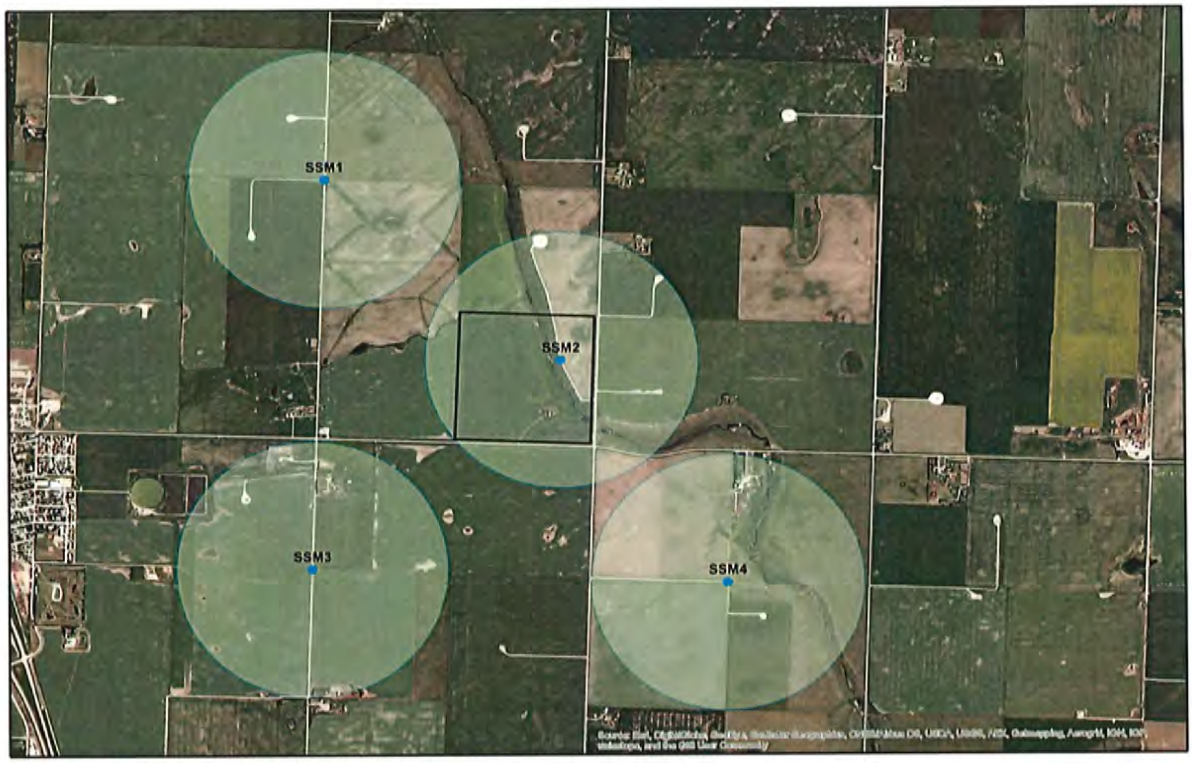

Figure 2. Spring and fall migration survey location

6.3 Spring Migration Surveys - 2017

In accordance with the information requirements specified in the AEP *Wildlife Guidelines for Alberta Solar Energy Projects* (2016), the migration surveys were designed to assess spring avifauna use within the various habitat types present within the Project area.
Ms. Brandy Downey (Senior Species at Risk Biologist – AEP, Lethbridge) was consulted prior to the survey to review and approve the proposed survey methodology. The approved survey methods included:

1. Pre-determined survey locations were chosen throughout the Project. GPS locations were recorded in NAD 83.
2. Each location was surveyed twice during each visit (once in early morning and once in mid-day) for a minimum of 20 minutes.
3. All observed avifauna within 800 m of pre-determined survey locations were documented.
4. The surveyor would stop periodically throughout the Project area and document flocks of migrating or staging birds, at which point a GPS location would be recorded. These locations were recorded as incidental sightings.
5. The surveyor would also stop at observed high value habitat areas (shrub rows, coulees, native pasture, etc.) to further investigate these areas for avian use.

Timing of migrations generally varies year to year and species to species, and can also be influenced by environmental conditions (i.e. warm and cold fronts) in summer habitats and along migration routes. Surveys were only suspended if poor visibility or audible perception was impeded. Based on discussion with AEP, five survey rounds were selected to provide greater accuracy in the data sets collected, as well as to better account for the seasonal variability of migrations.

Five rounds of surveys were conducted to ensure that migration data collected as part of the surveys was representative of the various stages of spring migration (i.e. early, mid, late). Surveys were conducted on:

6. March 24th;
7. April 7th;
8. April 19th;
9. May 2nd; and
10. May 10th.

Analysis of land use and wildlife in the area was completed concurrently – topography and suspected wetlands within the Project area were documented during the migration surveys. The

same four survey locations that were used in the Fall 2016, were used again in Spring 2017 (Table 4). Plot locations were selected to provide appropriate survey coverage of the Project area, and to accurately represent dominant habitat types. Plots consisted of the area encompassing an 800 m radius (approximately 200 ha) from each survey point and the column of airspace above it. At each location, a minimum 20-minute survey was conducted and pertinent information with respect to migrating avifauna was recorded. The information collected included:

1. Avian species observed and direction/ distance of observation from plot center;
2. Direction of travel; and,
3. Number of individuals observed.

Incidental observations of flocks of staging or migrating birds were also recorded (those outside of the dedicated survey time, or greater than 800 m from plot center). The timing of the surveys (early morning and mid-day) allowed surveyors to record both nocturnal migrants (e.g. songbirds) as well as afternoon migrants (e.g. raptors).

In the event that accurate counts of individual birds could not be conducted due to the presence of large groups of birds, a block counting method was utilized to estimate bird numbers in these instances. The block counting method involves counting individuals within a subset (block) of the group and then estimating the size of the flock by extrapolating the known number of individuals within the 'block' to the remainder of the group. This method is considered valid for estimating large groups of birds within an acceptable margin of error.

Each AUS plot was surveyed in the morning and mid-day for a minimum of 20 minutes for the five rounds of surveys. This resulted in a total of 40 site visits, corresponding to approximately 13.3 hours of survey time logged.

6.3.1 Data Analysis

Data collected during the surveys are intended to provide a representative sample of bird species present in the area during spring migration and to display changes in species richness and abundance over the course of survey rounds. Collected data included observations made at the survey plots during designated survey times as well as incidental observations.

All bird observations recorded exclusively within survey plots during designated survey times were further summarized by species group to compare species group richness and abundance in the Project area. A temporal analysis of species use (presented as individuals per survey hour) in the Project area was calculated by dividing the total number of observed individuals from each respective species group by the total survey time.

6.4 Breeding Bird Surveys – 2017

The wildlife surveys were designed to assess lands within 1000 m of proposed project disturbances for the presence of wildlife, and/or sensitive wildlife habitat features. The following reports and literature were reviewed prior to the wildlife surveys in order to determine sensitive species likely to occur in the project area, and to aid in determining mitigation measures that may be required for these species.

1. *Sensitive Species Inventory Guidelines* (Environment and Sustainable Resource Development (ESRD), 2013)
2. *Wildlife Guidelines for Alberta Solar Energy Projects* (Alberta Environment & Parks, 2016)
3. *Recommended Wildlife Land Use Guidelines* (ASRD, 2011)
4. *Alberta Wild Species General Status Listing-2015* (Alberta Environment and Parks, 2015)
5. Species at Risk Act (Government of Canada, 2002)
6. Committee on the Status of Endangered Wildlife in Canada (Government of Canada, 2017)
7. Fish and Wildlife Internet Mapping Tool (FWIMT) (ASRD, 2016a)

Field surveys for this project generally followed the survey protocols for breeding birds and sensitive species, as specified in the Alberta Environment and Sustainable Resource Development (ESRD*) Sensitive Species Inventory Guidelines* (Government of Alberta, 2013) and the AEP *Wildlife Guidelines for Alberta Solar Energy Projects* (Alberta Environment & Parks, 2016). Survey protocol was modified in times where adjacent lands were not accessible due to land ownership, or where adjacent land use was generally expected to preclude use by sensitive species (i.e. cultivated lands). In these situations, an assessment of land use to determine wildlife habitat suitability, as well as a thorough visual scan was used in the place of a ground search. Auditory amphibian surveys were completed as part of the field assessment, in addition to ground-truthing wetlands within proximity to the project for evidence of adult frogs or egg masses/tadpoles.

Breeding bird surveys were conducted at the site on June 7, 2017 and June 20, 2017 under survey appropriate weather conditions. Temperatures ranged from 16°C to 20°C and winds ranged from 5 to 15 km/hr during the surveys.

Five breeding bird survey points (SSBBS1 through SSBBS5) were established throughout the Project, spaced approximately 800 m apart, and surveyed following the ESRD *Sensitive Species Inventory Guidelines* (Government of Alberta, 2013). A five-minute point count was conducted

at each location, beginning at sunrise and ending before 9:00 am, during which all wildlife species occurrences (visual and auditory identification) within 200 m of the surveyors location were recorded. In addition to the breeding bird point count locations, a meander search was conducted on foot within the Project boundary, wherein wildlife species detected through visual or auditory cues were recorded. Observations of potential high-value wildlife habitat features, including dens, leks, wetlands, and nesting sites, were also documented. Adjacent properties were visually inspected (up to 1000 m from the Project boundary using binoculars or a spotting scope) for the presence of raptor stick nests or other sensitive wildlife habitat features. All GPS locations of wildlife features and concerns were recorded in NAD 83.

Figure 3. Breeding bird survey point locations.

6.5 Species Specific Surveys – 2017

6.5.1 Burrowing Owl Surveys

Burrowing owl surveys were not conducted as no suitable habitat is present and the Project is outside the known range for the species.

6.5.2 Sharp Tailed Grouse Surveys

Sharp Tailed Grouse Lek surveys were not conducted as no suitable habitat is present within or adjacent to the Project.

6.5.3 Raptor Nest Surveys

Raptor nest surveys (two rounds) – were conducted under survey appropriate weather conditions on June 7, 2017 and June 20, 2017. The raptor nest surveys included the inspection of habitat features (e.g. trees) considered suitable for raptor nesting activity within a 1000 m radius of the proposed project. Nest sites (typically stick nests) were identified using binoculars or a spotting scope and nesting activity was confirmed by observing raptors on the nest and/or by observing displays of defensive behaviour in direct proximity to a suspected nesting location. In instances where nesting activity could not be confirmed, the location was recorded as a 'probable' raptor nesting location.

6.5.4 Amphibian Surveys

Amphibian call surveys (two rounds) – conducted on the evenings of June 7, 2017 and June 10, 2017. Open water wetlands/waterbodies within the Project area were also visited during the breeding bird survey (June 7 and 20, 2017) to search for evidence of adult frogs or egg masses/tadpoles.

6.6 Wetlands

Desktop evaluation and field assessments completed by McCallum Environmental Ltd.

Under the Wetland and Delineation directive, the wetlands have been delineated according to Pathway 3 – simple desktop delineation and verification. "Pathway 3 is followed when the wetland boundary is obvious and simple to delineate AND imagery is available. In pathway 3, the desktop delineation is completed by a desktop assessment, but the wetland boundary is subsequently verified in the field at a representative number of points using a GPS unit."

Using the desktop results for wetlands, anticipated wetland locations were known. During the field assessment, GPS tracks were taken once the wetland boundaries were determined. Wetland boundary determination was based upon clear changes in surface vegetation or underlying soil structure if no surface vegetation was present. Wetland delineation was completed by Robert McCallum, P.Biol. Boundary determination was based on micro-topography, and observed surface hydrology and vegetation. If wetland boundaries were unclear, soil pits were taken to determine if mottling or gleying was evident and boundaries were then documented using a hand-held GPS unit to ensure that minimum setbacks, based on wetland type, were maintained.

The intent of the delineations was to determine wetland location and extent for avoidance of such features, therefore a functions assessments was not completed.

6.7 Vegetation/Rare Plant Surveys

The SSP area is wholly situated on cultivated land and therefore vegetation surveys were not completed.

6.8 Assumptions & Limitations in Methods and Reporting

6.8.1 Constraints Analysis

- On some maps, land use or land cover is defined everywhere to form a complete mosaic of polygons. On topographic maps land use/land cover is depicted only in certain areas. The source data in some cases may need to be conditioned to allow the second type of depiction if it is a mosaic, and certain constraints will operate differently in each case.
- Conflicts that might exist between objects in a database are typically of a logical nature, such as topological inconsistencies or duplicate identifiers. We attempted to ensure that our database has addressed any potential inconsistencies, however inconsistencies may still occur. In map generalization, the vast majority of conflicts are physical, spatial consequences of reducing map scale. The greater the degree of scale change, the more cluttered a map will be, and this signals the extents of potential conflicts in presentation of the data.

6.8.2 Limitations incurred at the time of the assessments

- There are a potentially infinite number of methods in which human activity can influence wildlife behaviors and populations and merely demonstrating that one factor is not operative does not negate the influence of the remainder of possible factors.

- The environmental assessment provides an inventory based on acceptable industry methodologies. A single assessment may not define the absolute status of site conditions and site conditions can and will change over time.
- Effects of impacts associated with oil and gas, electrical infrastructure, power generation, agriculture, and other power plant projects, separated in time and space that may affect the areas in question, have not been included in this assessment.
- The aerial photos used in the mapping may not represent actual on the ground conditions due to the age of the aerial photo and changes in land use.

6.8.3 General Limitations

- Classification and identification of soils, vegetation, wildlife, and general environmental characteristics have been based upon commonly accepted practices in environmental consulting. Classification and identification of these factors are judgmental and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may not identify all factors.
- Different assessors may in fact come to different results and conclusions and analysis based upon the collected information.
- All reasonable assessment programs will involve an inherent risk that some conditions will not be detected and all reports summarizing such investigations will be based on assumptions of what characteristics may exist between the sample points.

6.8.4 Discussion of Effects

The environmental assessment is being completed with specific SSP infrastructure, the analysis of effects is based upon the assessor's, the SSP developer's and the undersigned's experience with similar projects. That experience includes not only environmental assessment work, but completion of environmental permitting and compliance monitoring during construction for projects across Canada.

7 REGIONAL CHARACTERISTICS

7.1 Topography

The topography of the SSP area is generally level.

7.2 Ecoregion

The SSP is found in the Grassland Natural Region, within the Dry Mixedgrass Natural Sub-Region.

7.2.1 Mixedgrass Subregion[7]

The Mixedgrass Subregion is generally characterized by level to gently undulating semiarid prairie, broken in places by coulees, valleys, badlands and dune fields. The warm, dry climate supports grasses, shrubs and herbs that are adapted to summer droughts.

This subregion has the warmest summers, longest growing season and lowest precipitation of all the subregions in Alberta.

Soils in the subregion are dominated by Brown Chernozems.

Vegetation communities are typified by species that favour warmer and dry sites and species include blue grama and needle-and-thread grass, with sand grass and June grass on sand dunes. Extensive low shrublands with silver sagebrush, silverberry, buckbrush and prickly rose occupy low-lying areas and northerly or easterly aspects. Tall shrub and tree stands are found in coulee or valley bottoms or on sandy soils with perched water tables, where the moisture supply is sufficient to support growth during the summer drought period. Generally, the subregion is dominated by low-growing, drought tolerant communities.

7.3 Bird Areas

No Regionally Significant Bird Areas (BA) occur within 20 km of the SSP area.

7.4 Protected Areas / Natural Areas

No federal or provincially protected areas, provincially designated Natural areas, or provincial recreational areas are located within or adjacent to the SSP boundaries.

[7] Natural Regions and Subregions of Alberta, Natural Regions Committee. 2006.

7.5 Environmentally Significant Areas (ESA)

ESAs are (Government of Alberta, 2016):

- Important to the long-term maintenance of biological diversity, soil, water, or other natural processes, at multiple spatial scales.
- Areas that contain rare or unique elements or that include elements that may require special management consideration due to their conservation needs.

It is important to note that ESAs do not (Government of Alberta, 2016):

- Consider how these areas are being, or how they should be, managed or conserved.
- Represent natural resource policy, areas requiring specific management objectives, or comprehensive status reporting.
- Represent government policy, and do not necessarily require or confer legal protection.
- Replace other indicator-specific mapping and planning tools, such as wetland inventories, caribou range maps, and species at risk recovery plans.

ESAs are intended as an information tool – not as a regulatory tool. (Government of Alberta, 2016)

ESA mapped areas "are available for use by provincial and municipal land-use planners, industry, consultants, environmental organizations, academic institutions, and others, as an information tool to support municipal, regional, and provincial scale planning initiatives. The identification of significant areas does not consider how these areas are being, or how they should be, managed or conserved. As such, ESAs do not represent natural resource policy, areas requiring specific management objectives, or comprehensive status reporting. Further, ESAs do not represent government policy and do not necessarily require legal protection. They are intended to be an information tool that complements other information sources to inform land-use planning and policy at local, regional, and provincial scales." (FIERA Biological Consulting, 2014).

A comprehensive list of criteria, sub-criteria, and indicators were selected to identify ESAs in Alberta. Given that a single criteria is unlikely to be representative of all desired components of an ESA, multiple criteria, sub-criteria, and indicators were incorporated into the ESA framework (FIERA Biological Consulting, 2014).

Once final ESA values were calculated, and a continuous ESA value surface was produced the distribution of ESA scores was examined and a variety of methods were explored to objectively assign an ESA cut-off value, including Jenks and percentile ranks. Ultimately, professional judgement was used to determine a cutoff value of >0.189 for designating quarter sections as Environmentally Significant Areas in the province (FIERA Biological Consulting, 2014).

Results of the ESA mapping completed by Fiera Biological Consulting (2014) are provided in Figure 16. ESA

7.6 Sensitive Species Ranges[8]

Based off wildlife ranges from the FWIMT, the proposed Project area lies within the following ranges:

1. Sensitive raptor:
    a. Bald eagle (*Haliaeetus leucocephalus*),
    b. Ferruginous hawk (*Buteo regalis*),
    c. Golden eagle (*Aquila chrysaetos*),
    d. Prairie falcon (*Falco mexicanus*),
2. Sharp-tailed grouse (*Tympanuchus phasianellus*).

8 PROJECT AREA ECOSYSTEM COMPONENTS

Each Ecosystem Component (EC), including the baseline environmental work that has been completed to evaluate each EC, is described in the following sections. EC selection was based upon desktop findings, consultation with AEP, standard practices in environmental assessments in Alberta, and as per the guidelines and documents previously mentioned.

Each EC section provided below identifies the results of the baseline conditions, potential effects as a result of the SSP, mitigation measures to reduce potential effect, and identifies the significance of potential effects.

8.1 Habitat Types / Land Use

The SSP project lands are entirely cultivated. Highway 527 is located along the south boundary of the Project lands. All surrounding land use is cultivated. A small coulee and associated drainage flows southeast through the Project area.

Waterbodies in the vicinity of the Project include Clear Lake (13 km east of the Project area) and Pine Coulee Reservoir (9 km west of the Project area).

No Critical Habitat (as defined by Canada's *Species at Risk Act*; **critical habitat** is the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species critical habitat in the recovery strategy or in an action plan for the species), is present

[8] AEP Website. Wildlife Sensitivity Maps – May 11, 2017. http://aep.alberta.ca/forms-maps-services/maps/wildlife-sensitivity-maps/default.aspx

within or adjacent to the Project.

Photo 1. Facing west across coulee to Project lands. Project located in cultivated lands with hay bales. The solar project will come to the edge of the existing cultivated lands.

8.1.1 Effects of the SSP

The effects of the SSP on land use will be directly correlated to change of land use due to the presence of SSP infrastructure. This would include change in agricultural activity (i.e. due to the presence of a solar panel in a cultivated field there may be loss of commercial agricultural crop (i.e. canola), loss of use by residents, and/or loss of use by other industrial activities (i.e. oil and gas; gravel pit) due to setback requirements.

The SSP activities identified as having the greatest potential impact upon habitat would be associated with the construction phase and the final Balance of Plant (BOP) operational footprint. The construction phase typically results in a larger overall impact footprint, due to use of staging areas, work sites, borrow pits, or equipment storage. In contrast the permanent infrastructure (lasting the life of the SSP) such as road surfaces, solar panel and substation foundations results in a long-term habitat loss, but have a smaller footprint than the construction phase. There would be some expectation that small mammals and different ground dwelling bird species may continue to use the SSP lands.

SSP activities that have been identified as resulting in impacts on habitat include:

- Top soil stripping (which will be limited to roads, substation, and the O&M building)
- Construction of infrastructure including new access roads, crane pads, solar panel foundations and substation;
- Upgrade of existing roads;
- Installation of solar panels and electrical infrastructure;
- Installation of perimeter fence resulting in isolation of habitat; and,
- Transportation of crews and equipment.

During the operations phase, SSP activities will include the periodic transportation of work crews and equipment for routine infrastructure maintenance and operations.

Some of the original impacts resulting from the construction activities will be reduced during the operations phase through the localized regeneration of systems that were subject to temporary disturbances during the construction phase.

8.1.2 Mitigation

The use of existing roads and agricultural lands reduces the amount of fragmentation of wildlife habitat as a result of the SSP.

8.1.3 Significance

8.1.3.1 Magnitude

The potential effects of clearing on habitat are anticipated to be of insignificant magnitude due to use of cultivated lands as the primary SSP footprint.

The operation duration for the SSP will have a borderline neutral effect on agricultural land. The

lands will no longer be available for commercial agricultural production but perennial vegetation will be established. In addition, weed control and re-seeding of disturbed sites will have a positive impact on agricultural land.

The SSP would be expected to have a positive effect on soil conditions and health as annually cultivated lands will be converted to perennial vegetation. This vegetation would further increase carbon stores, support erosion control and loss of topsoil due to wind/water, and ultimately maintain long term soil health and characteristics.

8.2 Soils

The Agricultural Region of Alberta Soil Inventory Database was consulted to provide data on soils in the SSP (Alberta Agriculture & Rural Development, 2014). Soils identified in the database to exist at SSP are listed in Table 5.

Table 5. List of soil series found at SSP[9]

Unit Name	WNY14/U1h	Explanations
Landform	Undulating – high relief	Undulating with high slopes
LSRS Rating (spring grains)	3M(10)	**3**: Moderate suitability class **M** – Water holding capacity – crops adversely affected by lack of water due to inherent soil characteristics; (10) – proportion of area (i.e. 10 = 10%)
General Description	Orthic Dark Brown Chernozem on medium textured (L, SiCL, CL) materials over medium (L, CL) or fine (C) textured till (WNY). The polygon includes soils with Rego profiles (14). Undulating, high relief landform with a limiting slope of 4% (U1h).	
Horizon Depth (cm)	18	
Master Horizon	A	
% Sand	18	
% Silt	58	

[9] Alberta Soil Information Viewer; Revised July 30, 2015; https://soil.agric.gov.ab.ca/agrasidviewer/. Accessed August 2017.

% Clay	24	

8.2.1 Effects of the SSP

Site-specific soil surveys indicated that there are clear soil horizon layers throughout the cultivated lands impacted by development. In soil pits there were no B-horizons present but that is expected as a result of cultivation. Some admixing is already present however the soils represent no limitations to construction. None of the soils present at the SSP require special management practices during the implementation of the SSP.

The SSP activities identified as having the greatest potential impact upon soils are predominantly associated with the construction phase, where the permanent infrastructure (lasting the life of the SSP) such as road surfaces, solar panel and substation foundations results in a long-term use. SSP activities that have been identified as resulting in impacts on soils include:

- Stripping of surface soils along access roads, at solar panel locations, at substation, at other required work areas
- Upgrade of existing roads;
- Installation of solar panels and electrical infrastructure; and,
- Transportation of crews and equipment.

Four actions were identified, which may contribute to effects on soils. These actions are closely tied to those acting on vegetation. The 4 actions affecting soils may include:

1. Admixing – As soils are removed during construction soil layers will become mixed. This has the effect of reducing soil quality as organic matter layers are mixed with underlying clay horizons. This can result in limitations to vegetation growth in the mixed soils.

2. Wind erosion - Risk relates to the potential for the soil to be mobilized by wind, particularly when disturbed through construction activities or a high degree of traffic. Loss of (or reduced) vegetative cover during activity can increase the risk for wind erosion. The highest risk for wind erosion tends to occur in areas with coarse-textured soils and sparse vegetative cover.

3. Water erosion - Risk relates to the potential for the soil to be mobilized by water, particularly when disturbed through construction activities or a high degree of traffic. The highest risk for water erosion tends to be associated with long or steep slopes (particularly those that are channeled or dissected), higher clay content and low vegetative cover. A combination of these factors tends to produce an extreme risk for water erosion.

Compaction caused by excess traffic can increase overland flow, which can promote water erosion in channels or gullies.

4. Compaction along trails – caused by the continued use of equipment on designated minimal disturbance working areas. Although dry sandy soils have limited compaction characteristics, long term use will result in compaction. Compaction due to traffic will cause soil compaction on lease sites and along trails. Maintenance and operations traffic will contribute to this compaction over the life spans of the SSP. Unless traffic is eliminated, good timing of operations is the most effective way to preserve soil structural quality. There are a variety of methods available for compaction relief post operations which include aeration and subsoiling. Ultimately, reclamation and remediation following abandonment will minimize the long-term effects.

8.2.2 Mitigation

Soil stripping and leveling will be completed using a two-lift soil stripping method:

1. The first lift will remove the A-horizon to the colour change (B-horizon);
2. The second lift will remove the B-horizon. Both A and B-horizons will be stockpiled on the edges of the lease with a 1m separation. Care will be taken to avoid admixing while handling and stockpiling soils. The soils will be preserved and used for production and final reclamation. The remaining C-horizon will be used as cut and fill to level each lease to accommodate the necessary equipment.
    i. If new accesses require upgrading, they will be upgraded to medium grade roads and graveled to allow culvert installation as required, assistance to drying of the road bed, and safe travel conditions;
    ii. Gravel will be used on the accesses on an as-needed basis during the production life;
    iii. Hill cuts required will be contoured with a 3:1 slope for production access. In areas where a significant hill cut is made, an additional 5m may be required to properly back slope the hill cut, to avoid any erosion issues while maintaining a 3:1 slope;
    iv. Borrow areas may also be proposed in areas where there is insufficient material to construct an access road capable of hauling equipment to and from the sites;
    v. Culverts will be installed as required to maintain natural drainage; and,

vi. All final access road construction and design will be completed in accordance with both landowner and solar panel manufacturer requirements.

Some of the original impacts resulting from the construction activities will be reduced during the operations phase through the localized regeneration of systems that were subject to temporary disturbances during the construction phase.

Mitigation for soils has been further outlined in the Environmental Protection Plan ('EPP'). (Appendix II)

8.3 Wildlife

Wildlife surveys were limited to assessments for bird use and migration. Incidental sightings of mammals were noted but so infrequent as to not warrant discussion. This is due to the agricultural nature of the lands in question providing little to no habitat is larger species such as deer, coyote, or others.

8.3.1 Fall Migration – 2016

8.3.1.1 Total Number of Individuals Observed

During fall migration surveys, a total of 866 individuals were observed (20 avian species classifications, incidental species included). Observed individuals that could not be classified to unique species (n=185) are included in the species group summaries, but have been removed from the individual species calculations. Of the 866 individuals observed during fall migration, 833 were observed at the dedicated survey points (incidental observations removed).

8.3.1.2 Designated Species

Of the species observed during the 2016 fall migration surveys, four were identified as species of management concern under the *General Status of Alberta Wild Species* (Alberta Sustainable Resource Development, 2010). The following species are designated as 'Sensitive' in the Province of Alberta:

1. American Kestrel (*Falco sparverius*);
2. Northern Goshawk (*Accipiter gentilis*);
3. Northern Harrier (*Circus cyaneus*); and
4. Swainson's Hawk (*Buteo swainsoni*).

Six of the detected avian species (30%) are protected under the Federal *Migratory Birds Convention Act*, (MBCA) *1994* (excludes raptors, corvids, Galliformes (grouse, quail, pheasants, ptarmigan, cormorants, pelicans, and kingfishers) (Government of Canada, 1994). This Federal Act affords protection to a variety of native migrant bird species and their nests across Canada during nesting and migration periods.

Table 6. All species observed during fall migration surveys and their provincial and federal statuses.

Common Name	Latin Name	Number Observed	Species Status			
			AB General Status	AWA	COSEWIC	SARA
American Crow	*Corvus brachyrhynchos*	8	Secure	-	-	-
American Kestrel	***Falco sparverius***	**3**	**Sensitive**	-	-	-
American Tree Sparrow	*Spizella arborea*	2	Secure	-	-	-
Black-billed Magpie	*Pica hudsonia*	81	Secure	-	-	-
Canada Goose	*Branta canadensis*	284	Secure	-	-	-
Common Raven	*Corvus corax*	38	Secure	-	-	-
European Starling	*Sturnus vulgaris*	131	Exotic	-	-	-
Great Horned Owl	*Bubo virginianus*	1	Secure	-	-	-
Grey Partridge	*Perdix perdix*	8	Exotic	-	-	-
Horned Lark	*Eremophila alpestris*	5	Secure	-	-	-
Northern Goshawk	***Accipiter gentilis***	**1**	**Sensitive**	-	**Not at Risk**	-
Northern Harrier	***Circus cyaneus***	**4**	**Sensitive**	-	**Not at Risk**	-
Red-tailed Hawk	*Buteo jamaicensis*	6	Secure	-	-	-
Rock Dove	*Columba livia*	45	Exotic	-	-	-
Rough-legged Hawk	*Buteo lagopus*	2	Secure	-	Not at Risk	-
Savannah Sparrow	*Passerculus sandwichensis*	53				
Sharp-shinned Hawk	*Accipiter striatus*	1	Secure	-	Not at Risk	-
Swainson's Hawk	***Buteo swainsoni***	**3**	**Sensitive**	-	-	-
Vesper Sparrow	*Pooecetes gramineus*	1	Secure	-	-	-
Western Meadowlark	*Sturnella neglecta*	4	Secure	-	-	-

8.3.1.3 Wildlife Habitat/Staging Areas

The Project area consisted of cultivated lands, with select areas of native prairie grassland present – in particular on the slope running northwest to the southeast end of the Project, adjacent to the drainage. The drainage present within the Project area – meandering to the southeast and west – was observed to have retained some areas of standing water at the time of survey. A large dugout with water was recorded in the southeast of the Project adjacent to the drainage, while another dugout was recorded immediately adjacent to the east of the Project. Waterfowl were not observed on these waterbodies at the time of survey. No other waterbodies are present.

Treed habitats within 1000 m were primarily shelterbelts and tree stands around farmyards. No raptor stick nests were observed.

8.3.1.4 Species Abundance and Richness

Based on the fall migration results, the number of avian observations generally trended upwards, with the highest number of sightings observed later in the fall. Table 7 and Figure 4 below provide the overall number of species, the number of observations (recorded as distinct groups or individuals), and the total number of individuals observed during each survey round.

Table 7. Migration data summary for each survey round.

Survey Round	Number of Species	Number of Sightings	Number of Individuals*
Round 1	8	23	154
Round 2	11	33	112
Round 3	10	31	210
Round 4	5	16	22
Round 5	6	35	368
Total for All Rounds	**20**	**138**	**866**

*This includes the incidentals observed outside of the designated survey points/times.

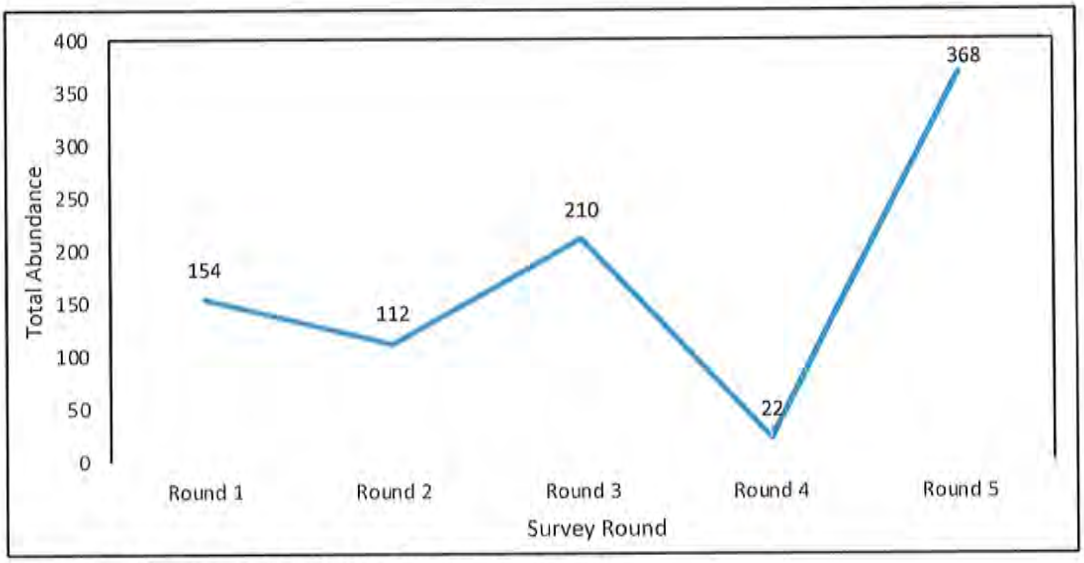

Figure 4. Number of individual birds by round.

The total abundance of birds observed during all five survey rounds is illustrated in **Error! Reference source not found.** (below). The greatest number of birds were observed at survey point SM4 (n=327) – this survey point had a value higher than the mean (n=208).

Species richness (number of observed species) generally decreased throughout the fall migration, from 8 species in the first survey round, to 6 in the last. Survey point SM3 was observed with the highest species richness with 13 distinct species observed within the survey area.

Table 8. Number of individuals documented at each survey point per round

Survey Point	Round 1	Round 2	Round 3	Round 4	Round 5	Number of Individuals* (Abundance)
SM1	59	6	123	4	8	200
SM2	62	20	3	3	26	114
SM3	18	33	54	9	78	192
SM4	13	53	30	6	225	327

*This does not include incidentals (those greater than 800 m from the survey point, outside the designated survey time).

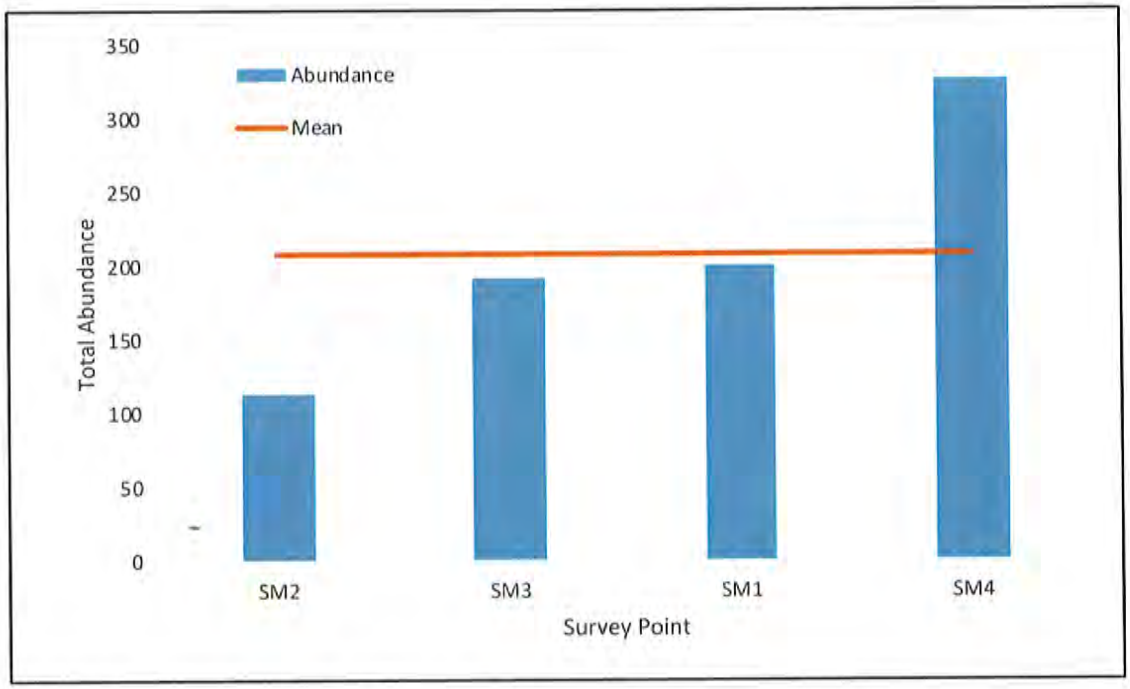

Figure 5. Abundance by survey point.

Overall abundance was observed to be highest southeast of the Project, however it should be noted that due to the small area and sample size, no major area use trends can be drawn from the abundance data.

Table 9 outlines the prevalence of each species group observed within the study area, as well as the total number of species within each group, the number of individuals identified to species group, and observations/hour for each group. Individuals not identified at the species group level, or

recorded as incidentals (i.e. greater than 800 m from the plot center, and/or outside of the dedicated survey time), were excluded from this abundance analysis.

Table 9. Abundance characteristics by species group

Species	Number of Species*	% of Total Species	Number of Individuals*	% of Total Individuals	Observations/hr**
Waterfowl	1	5.6	306	36.7	22.95
Passerines	6	33.3	339	40.7	25.43
Raptors	6	33.3	20	1.7	1.50
Corvids & Others	4	22.2	159	6.2	11.93
Shorebirds	0	0.0	1	0.1	0.08
Grouse and Allies	1	5.6	8	1.0	0.60
Combined total	**18**	**100**	**833**	**100**	**62.48**

*Does not include incidentals observed outside of the designated survey points/times.
**Observations/hr equals the number of individuals divided by the total survey time (13.33 hrs) at this project site.

The total abundance by species group shows that passerines account for approximately 41% of individuals observed.

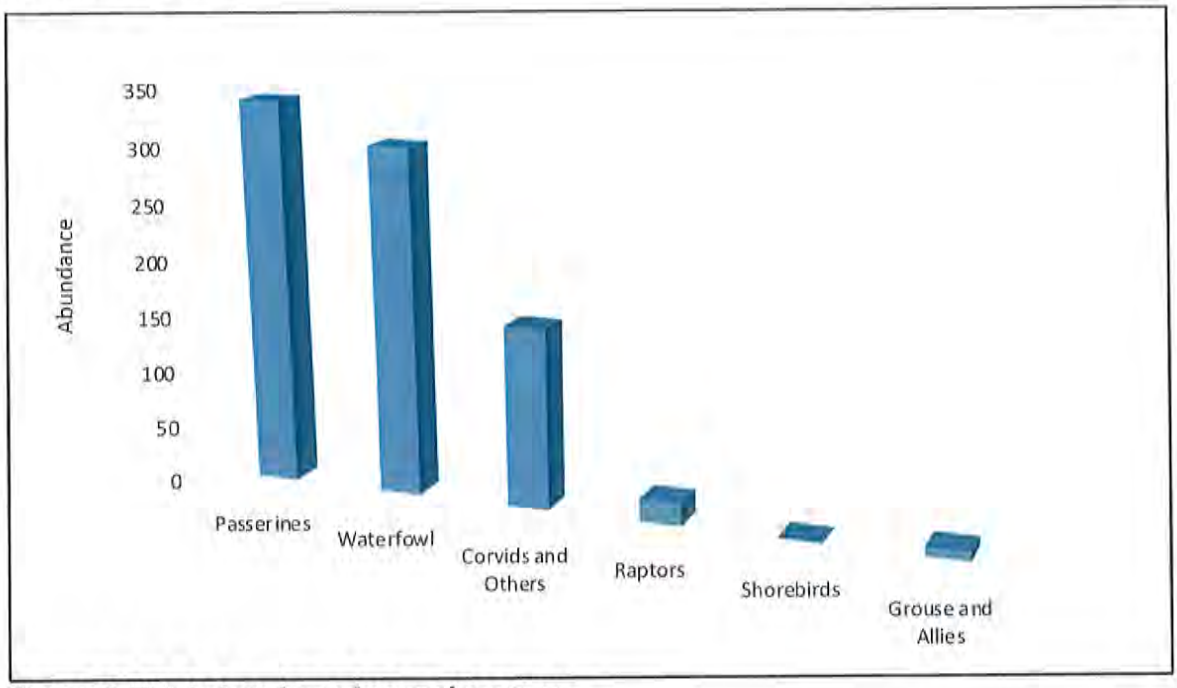

Figure 6. Total abundance by species group.
* No grouse and allies were detected

8.3.1.5 Waterfowl

Canada Goose was the only species of waterfowl identified within the Project study area during fall migration surveys. With 306 individuals documented, this accounted for approximately 37% of all individuals observed during dedicated surveys. An additional 37 individuals in this group were observed, but could not be identified to species. Waterfowl were observed at a rate of approximately 23 observations/hour during the fall migration survey.

The greatest number of waterfowl observations were recorded late November (Round 5). Approximately 85% of observations were recorded during this time period.

Survey points SSM3 and SSM4 had the greatest recorded number of individual waterfowl (n=81 and n=68, respectively); all recorded observations were of groups in-flight.

8.3.1.6 Passerines (songbirds)

A third (33%) of all species identified were passerines, with 339 individuals documented. Approximately 25 individuals per survey hour were recorded during the fall migration survey; the greatest observation rate for all species groups.

European Starling (*Sturnus vulgaris*) (n=131) were the most abundant songbird species observed during the fall migration surveys. Due to the difficulty of identifying individuals to species of this size at great distances or heights, 143 unknown passerines were recorded during fall migration surveys – these were included in the abundance analysis of species groups.

Passerine observations were greatest in early migration surveys (Round 1 to Round 3); 98% of passerines were observed during these rounds.

8.3.1.7 Raptors

A total of six raptor species (approximately 33% of total species observations) were detected during the migration surveys, totaling 20 individuals. Raptor observations were recorded at all survey points; generally, observations consisted of one or two individuals per sighting. Additionally, three incidental observations of raptors were recorded within the Project area.

Red-tailed Hawk's were the most frequently observed raptor species during the fall migration survey (n=6). A species list detailing raptor species observed during the survey, including associated provincial and federal statuses, can be referred to in Appendix A.

The greatest number of individuals recorded during the surveys was seven individuals in the first survey round. In total, raptors had an observation rate of approximately one individual per surveyed hour. No discernible trend with respect to spatial abundance of raptor observations was noted during the survey.

8.3.1.8 Corvids and Others

Four species (approximately 22% of total species observations) were detected for this species group during the migration surveys, totaling 159 individuals. The species most commonly observed were those in the corvid family [American Crow (*Corvus brachyrrhynchos*), Black-billed Magpie (*Pica hudsonia*), Common Raven (*Corvus corax*)]. Species richness as well as the number of individuals observed throughout the survey rounds remained relatively consistent, with no obvious trends in relation to seasonal abundance. Individuals in this species group were observed at a rate of approximately 12 individuals per surveyed hour, the third highest rate for all species groups.

8.3.1.9 Shorebirds

One unknown gull species was observed in-flight during fall migration surveys. No data trends can be drawn for this species group.

8.3.1.10 Grouse and Allies

Grey Partridge (*Perdix perdix*) was the only species recorded in this group during fall migration surveys, with eight individuals documented flushing from the ground near survey point SSM3. No data trends can be summarized for this species group.

8.3.2 Spring Migration Surveys – 2017

8.3.2.1 Total Number of Individuals Observed

During spring migration surveys, a total of 726 individuals were observed (30 avian species classifications, incidental species included). Observed individuals that could not be classified to unique species (n=213) are included in the species group summaries, but have been removed from the individual species calculations. Of the 726 individuals observed during spring migration, 716 were observed at the dedicated survey points (incidental observations removed).

8.3.2.2 Special Status Species

Of the species observed during the 2017 spring migration surveys, two were identified as a species of management concern under the *General Status of Alberta Wild Species* (Alberta Sustainable Resource Development, 2010). One species [ferruginous hawk (*Buteo regalis*)] is designated as 'At Risk' and one species [long-billed curlew (*Numenius americanus*)] is designated as 'Sensitive' in the Province of Alberta.

Sixteen of the detected avian species (53%) are protected under the Federal *Migratory Birds Convention Act*, (MBCA) *1994* (excludes raptors, corvids, Galliformes (grouse, quail, pheasants, ptarmigan), cormorants, pelicans, and kingfishers) (Government of Canada, 1994). This Federal Act affords protection to a variety of native migrant bird species across Canada during nesting and migration periods.

Table 10. Species observed and their provincial and federal statuses.

Common Name	Latin Name	# Observed	Species Status			
			AB General Status[1]	WA[2]	COSEWIC[3]	SARA[4]
American Crow	*Corvus brachyrhynchos*	33	Secure	-	-	-
American Robin	*Turdus migratorius*	7	Secure	-	-	-
Black-billed Magpie	*Pica hudsonia*	26	Secure	-	-	-
Brewer's Blackbird	*Euphagus cyanocephalus*	3	Secure	-	-	-
Blue-winged Teal	*Anas discors*	7	Secure	-	-	-
Canada Goose	*Branta canadensis*	21	Secure	-	-	-
Clay-colored Sparrow	*Spizella pallida*	3	Secure	-	-	-
Common Raven	*Corvus corax*	5	Secure	-	-	-
Common Snipe	*Gallinago delicata*	2	Secure	-	-	-
European Starling	*Sturnus vulgaris*	115	Exotic	-	-	-
Ferruginous Hawk	***Buteo regalis***	**1**	**At Risk**	**Endangered**	**Threatened**	**Threatened**
Gadwall	*Anas strepera*	4	Secure	-	-	-
Gray Partridge	*Perdix perdix*	5	Exotic	-	-	-
Horned Lark	*Eremophila alpestris*	40	Secure	-	-	-
Killdeer	*Charadrius vociferus*	10	Secure	-	Not at Risk	-
Long-billed Curlew	***Numenius americanus***	**1**	**Sensitive**	**Special Concern**	**Special Concern**	**Special Concern**
Lesser Yellowlegs	*Tringa flavipes*	3	Secure	-	-	-
Mallard	*Anas platyrhynchos*	21	Secure	-	-	-
Merlin	*Falco columbarius*	1	Secure	-	Not at Risk	-
Mourning Dove	*Zenaida macroura*	3	Secure	-	-	-
Northern Harrier	*Circus cyaneus*	3	Secure	-	-	-
Northern Pintail	*Anas acuta*	1	Secure	-	-	-

Common Name	Latin Name	# Observed	Species Status			
			AB General Status[1]	WA[2]	COSEWIC[3]	SARA[4]
Northern Shoveler	*Anas clypeata*	8	Secure	-	-	-
Rock Dove	*Columba livia*	42	Secure	-	-	-
Red-tailed Hawk	*Buteo jamaicensis*	9	Secure	-	Not at Risk	-
Red-winged Blackbird	*Agelaius phoeniceus*	39	Secure	-	-	-
Savannah Sparrow	*Passerculus sandwichensis*	23	Secure	-	-	-
Swainson's Hawk	*Buteo swainsoni*	8	Secure	-	-	-
Vesper Sparrow	*Pooecetes gramineus*	16	Secure	-	-	-
Western Meadowlark	*Sturnella neglecta*	53	Secure	-	-	-

1 - Government of Alberta. 2017. Alberta Wild Species General Status Listing - 2015. Available at: http://aep.alberta.ca/fish-wildlife/species-at-risk/albertas-species-at-risk-strategy/general-status-of-alberta-wild-species/documents/SAR-2015WildSpeciesGeneralStatusList-Mar2017.pdf

2 - Province of Alberta. 1997. *Wildlife Act*. Wildlife Regulation. Alberta Regulation 143/1997. Published by Alberta's Queen's Printer

3 - Government of Canada. 2017. Committee on the Status of Endangered Wildlife in Canada. Available at: http://www.cosewic.gc.ca/eng/sct5/index_e.cfm

4 - Government of Canada. 2002. *Species at Risk Act*. S.C. 2002., c. 29. Published by the Minister of Justice at: http://www.sararegistry.gc.ca/

8.3.2.3 Wildlife Habitat/Staging Areas

The Project area consisted of cultivated lands, with areas of grassland located adjacent to the drainage running northwest to the southeast within the Project. The drainage present within the Project area also contained some areas of standing water at the time of survey. A large dugout with water was recorded in the southeast of the Project adjacent to the drainage, while another dugout was recorded immediately adjacent to the east of the Project. Waterfowl were observed on these waterbodies during the surveys.

Treed habitats within 1000 m were primarily shelterbelts and tree stands around farmyards. One Swainson's hawk (*Buteo swainsoni*) nest was observed east of Range Road 272, outside the Project boundaries, at 12U 314694E 5561405N. No other raptor stick nests were observed.

8.3.2.4 Species Abundance and Richness

Based on the spring migration results, the number of avian observations generally trended downwards, with the highest number of sightings observed early in the spring.

Table 11 provides the overall number of species, sightings (the number of observations of distinct groups or individuals recorded), and the total number of individuals observed during each survey round.

Table 11. Migration data summary for each survey round.

Survey Round	Number of Species	Number of Sightings	Number of Individuals*
Round 1	8	34	176
Round 2	11	40	231
Round 3	14	38	106
Round 4	25	64	135
Round 5	20	64	78
Total for All Rounds	**30**	**240**	**726**

*Includes incidentals observed outside of the designated survey points/times.

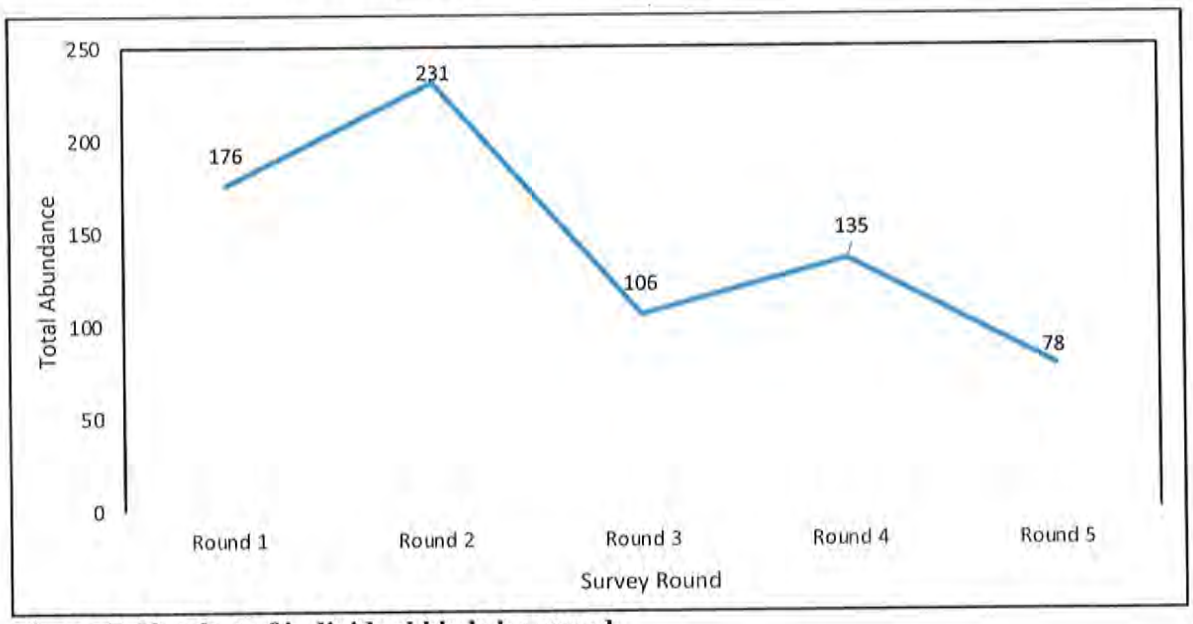

Figure 7. Number of individual birds by round.

The number of individuals (abundance) recorded at each survey point (incidentals removed) is provided in Table 12. It should be noted that surveys were designed to ensure repeatability by controlling factors that could influence results. To maintain repeatability, incidental observations were removed from the analysis.

Table 12. Number of individuals documented at each survey point per round.

Survey Point	Round 1	Round 2	Round 3	Round 4	Round 5	Number of Individuals* (Abundance)
SM1	55	49	12	39	11	166
SM2	87	34	41	40	38	240
SM3	15	123	32	30	14	214
SM4	19	25	13	25	14	96

*This does not include incidentals (those greater than 800 m from the survey point, outside the designated survey time).

The total abundance of birds observed during all five survey rounds is illustrated in Figure 8 (below). The greatest number of birds were observed at survey point SM2 (n=240) – this survey point had a value higher than the mean (n=179).

Species richness (number of observed species) generally increased throughout the fall migration, from 8 species in the first survey round, to 20 in the last. Survey point SM2 was observed with the highest species richness with 23 distinct species observed within the survey area.

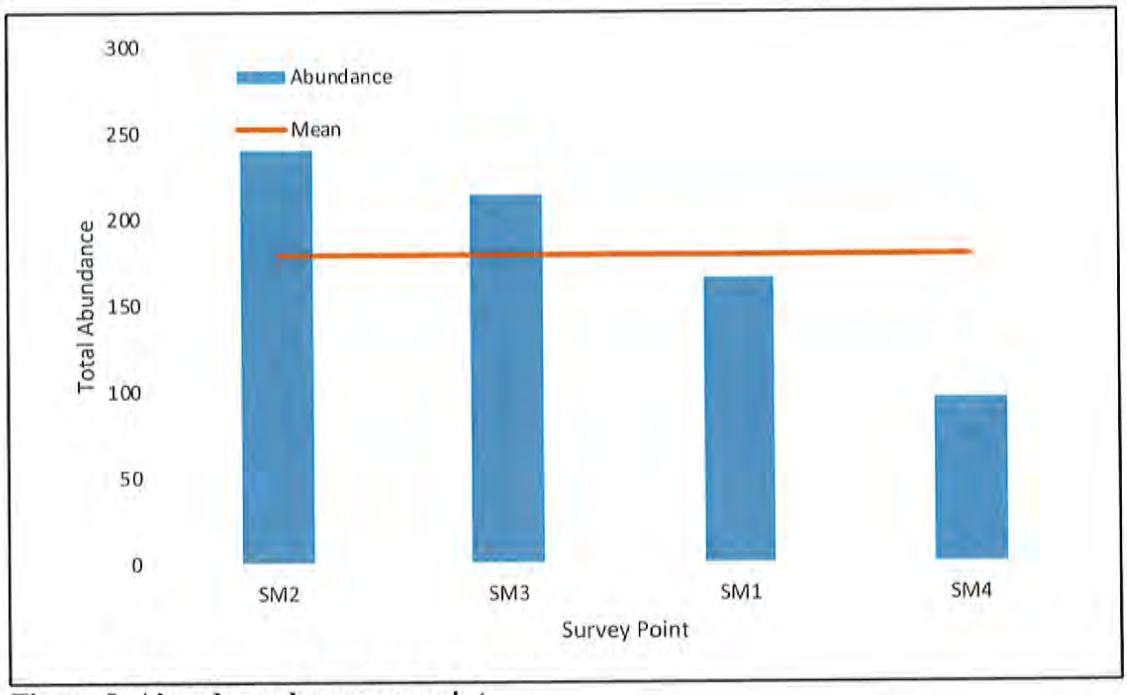

Figure 8. Abundance by survey point.

Overall abundance was observed to be highest within the boundaries of the Project (SM2), however it should be noted that due to the small area and sample size, no definitive trends with respect to avian use can be drawn from the abundance data.

Table 13 outlines the prevalence of each species group observed within the study area, as well as the total number of species within each group, the number of individuals identified to species group, and observations/hour for each group. Individuals not identified at the species group level, or recorded as incidentals (i.e. greater than 800 m from the plot center, and/or outside of the dedicated survey time), were excluded from this abundance analysis.

Table 13. Abundance characteristics by species group

Species	Number of Species*	% of Total Species	Number of Individuals*	% of Total Individuals	Observations/hr**
Waterfowl	6	20.7	216	30.2	16.20
Passerines	10	34.5	339	47.3	25.43
Corvids and Others	4	13.8	109	15.2	8.18
Raptors	4	13.8	31	4.3	2.33

Species	Number of Species*	% of Total Species	Number of Individuals*	% of Total Individuals	Observations/hr**
Shorebirds	4	13.8	16	2.2	1.20
Grouse and Allies	1	3.4	5	0.7	0.38
Combined Total	**29**	**100**	**716**	**100**	**53.70**

*Does not include incidentals observed outside of the designated survey points/times.
**Observations/hr equals the number of individuals divided by the total survey time (13.3 hrs) at this project site.

The total abundance by species group shows that passerines account for approximately 47% of individuals observed

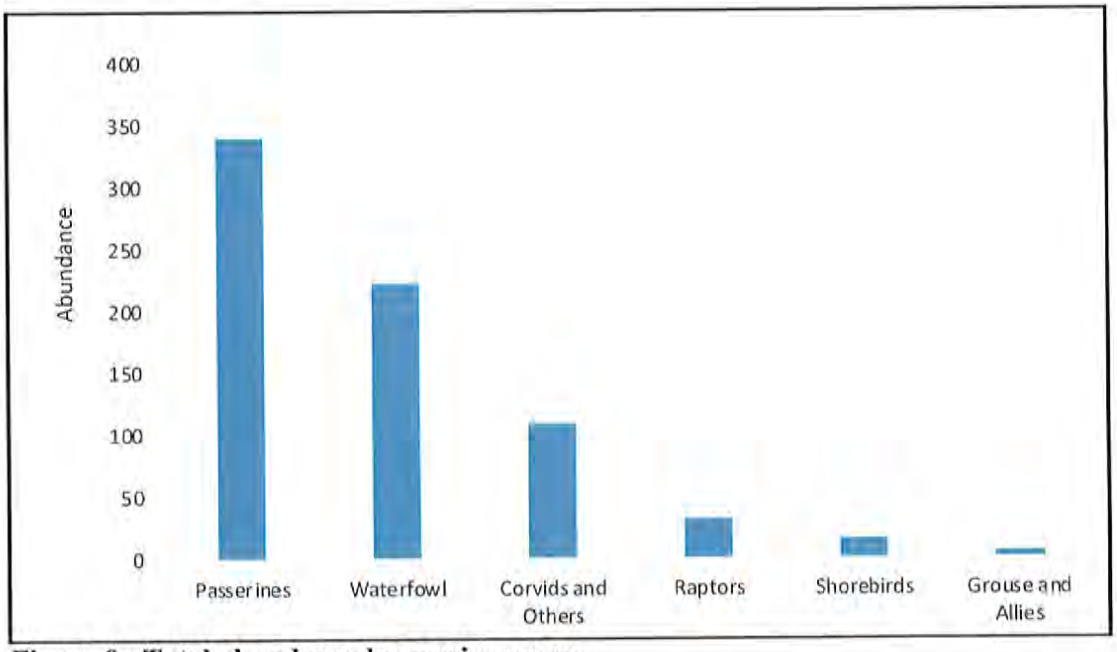

Figure 9. Total abundance by species group.

8.3.2.5 Waterfowl

A total of 216 waterfowl individuals were documented during dedicated surveys, which accounted for approximately 30% of all individuals observed. However, 162 individuals in this group could not be identified to species due to the difficulty of recognizing species at a distance. Six species (approximately 21% of total species observations) were detected for this species group during the migration surveys. The species most commonly observed were Canada goose (*Branta canadensis*)

and mallard (*Anas platyrhynchos*). Waterfowl were observed at a rate of approximately 16 observations/hour during the spring migration survey.

The greatest number of waterfowl observations were recorded in late March (Round 1) and early April (Round 2). Approximately 81% of observations were recorded during this time period. Survey points SSM2 and SSM3 had the greatest recorded number of individual waterfowl (n=78 and n=115, respectively).

8.3.2.6 Passerines (songbirds)

Over a third (34.5%) of all species identified were passerines, with 339 individuals documented. Approximately 25 individuals per survey hour were recorded during the spring migration survey; the greatest observation rate for all species groups.

European starling (*Sturnus vulgaris*) (n=115) was the most abundant songbird species observed during the spring migration surveys. As passerine species are generally more difficult to identify at a distance relative to other avian species groups, a higher proportion of unknowns is generally recorded during migration surveys. Forty unknown passerines were recorded during spring migration surveys – these were included in the abundance analysis of species groups.

The greatest number of passerine observations were recorded in early April (Round 2); 35% of passerines were observed during this round

8.3.2.7 Raptors

A total of four raptor species (approximately 14% of total species observations) were detected during the migration surveys, totaling 31 individuals. Raptor observations were recorded at all survey points; generally, observations consisted of one or two individuals per sighting. Additionally, two incidental observations of raptors were recorded within the Project area.

Red-tailed hawk (*Buteo jamaicensis*) and Swainson's hawk were the most frequently observed raptor species during the spring migration survey (n=9 and n=8, respectively). One ferruginous hawk was also observed in the project area. A species list detailing raptor species observed during the survey, including associated provincial and federal status designations, can be found in Appendix A.

The greatest number of raptors was recorded in early May (Round 4 and Round 5). Approximately 74% of observations were recorded during this time period. In total, raptors had an observation

rate of approximately two individuals per surveyed hour. No discernible trend with respect to spatial abundance of raptor observations was noted during the survey.

8.3.2.8 Corvids and Others

Four species (approximately 14% of total species observations) were detected for this species group during the migration surveys, totaling 109 individuals. The species most commonly observed were those in the corvid family [American crow (*Corvus brachyrrhynchos*), black-billed magpie (*Pica hudsonia*), and common raven (*Corvus corax*)]. Species richness as well as the number of individuals observed during the survey rounds remained relatively consistent, with no obvious trends in relation to seasonal abundance. Individuals in this species group were observed at a rate of approximately 8 individuals per surveyed hour, the third highest rate for all species groups.

8.3.2.9 Shorebirds

Four shorebird species were detected during spring migration surveys. Killdeer (*Charadrius vociferous*) were the most abundant shorebird species observed (n=10). Shorebird observations accounted for approximately 14% of the species observed during the spring migration surveys, with 16 individuals documented during designated survey times. This species group was observed at a rate of approximately one individual per surveyed hour. The highest abundance of shorebirds was recorded at SSM2 during spring migration, with the majority of individuals observed flying overhead.

8.3.2.10 Grouse and Allies

Gray partridge (*Perdix perdix*) was the only species recorded in this group during spring migration surveys, with five individuals documented at survey point SSM3. No obvious trends in relation to seasonal abundance were observed for this species group. Individuals in this species group were observed at a rate of less than one individual per surveyed hour.

8.3.3 Breeding Bird Surveys – 2017

The Project is located within the Mixedgrass Natural Subregion of Alberta, characterized by intensive cultivation, but with dispersed patches of native prairie (Alberta Parks, 2015). The Project is also within the Prairie Pothole Region (PPR), an ecologically important area for wildlife containing abundant shallow wetlands throughout (Ducks Unlimited Canada, 2017). The Project area consisted of cultivated lands, with scattered patches of native prairie and tame pasture. Treed habitats were primarily limited to shelterbelts and stands of trees around farmyards.

The proposed Project area lies within the range of several sensitive species, as per the data layers reviewed from the FWIMT, including: sensitive amphibian, sensitive raptor (bald eagle (*Haliaeetus leucocephalus*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), and prairie falcon (*Falco mexicanus*), burrowing owl (*Athene cunicularia*), and sharp-tailed grouse range (*Tympanuchus phasianellus*) (ASRD, 2016a).

A database search of the Fisheries and Wildlife Management Information System (FWMIS) indicates the historic presence of one wildlife species of management concern within the general area of the Project currently considered 'At Risk' in the province of Alberta - ferruginous hawk (*Buteo regalis).* It is also considered 'Threatened' nationally by COSEWIC and SARA. The results of the FWIMS database search, including applicable provincial and federal government status rankings for each species, are included in Table 14.

A total of 32 wildlife species were detected during the wildlife surveys within 1000 m of the proposed development (Table 14); species of conservation concern have bolded statuses. Two species detected at the time of survey are listed as 'Sensitive' in the province of Alberta: eastern kingbird (*Tyrannus tyrannus*), and long-billed curlew (*Numenius americanus*). Of these species, COSEWIC has designated the long-billed curlew as 'Special Concern'. The remaining species detected are considered 'Secure' in the province of Alberta.

Numerous bird species detected during the survey are associated with native grassland habitats, including the clay-colored sparrow, western meadowlark, and savannah sparrow. Many species were documented actively displaying and calling, indicating that they are breeding in the immediate area.

Several raptor species were observed during the wildlife surveys at, or in proximity to the Project, including: two rough-legged hawks (*Buteo lagopus*), three Swainson's hawks (*Buteo swainsoni*), and two northern harriers (*Circus cyaneus*). The FWMIS search results indicates several historic ferruginous hawk (*Buteo regalis*) sightings documented in proximity to the Project. However, no ferruginous hawks or nest sites were detected during the survey. One Swainson's hawk nest was observed east of Range Road 272, outside the Project boundaries, at 12U 314770E 5561411N. No other raptor stick nests were observed.

Figure 10. Raptor nest location

Table 14. Wildlife species observed and species status

Common Name	Latin Name	AB General Status[1]	AB Detailed Status[2]	*WA*[3]	COSEWIC[4]	*SARA*[5]
American Robin	*Turdus migratorius*	Secure	-	-	-	-
Black-billed Magpie	*Pica hudsonia*	Secure	-	-	-	-
Blue-winged Teal	*Anas discors*	Secure	-	-	-	-
Brown Thrasher	*Toxostoma rufum*	Secure	-	-	-	-
Brown-headed Cowbird	*Molothrus ater*	Secure	-	-	-	-
Clay-colored Sparrow	*Spizella pallida*	Secure	-	-	-	-
Cliff Swallow	*Petrochelidon pyrrhonota*	Secure	-	-	-	-
Eastern Kingbird	***Tyrannus tyrannus***	**Sensitive**	-	-	-	-
European Starling	*Sturnus vulgaris*	Exotic	-	-	-	-
Gadwall	*Anas strepera*	Secure	-	-	-	-
House Sparrow	*Passer domesticus*	Exotic	-	-	-	-
House Wren	*Troglodytes aedon*	Secure	-	-	-	-
Killdeer	*Charadrius vociferus*	Secure	-	-	-	-
Long-billed Curlew	***Numenius americanus***	**Sensitive**	**Special Concern**	-	**Special Concern**	**Special Concern**
Mallard	*Anas platyrhynchos*	Secure	-	-	-	-
Mourning Dove	*Zenaida macroura*	Secure	-	-	-	-
Nelson's Sparrow	*Ammodramus nelsoni*	Secure	-	-	Not at Risk	-
Northern Harrier	*Circus cyaneus*	Secure	-	-	Not at Risk	-
Northern Pintail	*Anas acuta*	Secure	-	-	-	-
Northern Shoveler	*Anas clypeata*	Secure	-	-	-	-
Red-tailed Hawk	*Buteo jamaicensis*	Secure	-	-	Not at Risk	-
Red-winged Blackbird	*Agelaius phoeniceus*	Secure	-	-	-	-
Rock Dove	*Columba livia*	Exotic	-	-	-	-
Savannah Sparrow	*Passerculus sandwichensis*	Secure	-	-	-	-
Swainson's Hawk	*Buteo swainsoni*	Secure	-	-	-	-
Vesper Sparrow	*Pooecetes gramineus*	Secure	-	-	-	-
Western Kingbird	*Tyrannus verticalis*	Secure	-	-	-	-
Western Meadowlark	*Sturnella neglecta*	Secure	-	-	-	-

Wilson's Phalarope	*Phalaropus tricolor*	Secure	-	-	-	-

1 - Government of Alberta. 2017. Alberta Wild Species General Status Listing - 2015. Available at: http://aep.alberta.ca/fish-wildlife/species-at-risk/albertas-species-at-risk-strategy/general-status-of-alberta-wild-species/documents/SAR-2015WildSpeciesGeneralStatusList-Mar2017.pdf

2 - Government of Alberta. 2014. Species Assessed by Alberta's Endangered Species Conservation Committee. Available at: http://aep.alberta.ca/fish-wildlife/species-at-risk/documents/SpeciesAssessedConservation-2014a.pdf

3 - Province of Alberta. 1997. *Wildlife Act*. Wildlife Regulation. Alberta Regulation 143/1997. Published by Alberta's Queen's Printer

4 - Government of Canada. 2017. Committee on the Status of Endangered Wildlife in Canada. Available at: http://www.cosewic.gc.ca/eng/sct5/index_e.cfm

5 - Government of Canada. 2002. *Species at Risk Act*. S.C. 2002., c. 29. Published by the Minister of Justice at: http://www.sararegistry.gc.ca/

8.3.4 Effects of the SSP

8.3.4.1 Habitat

The SSP is situated entirely within cultivation and cultivated lands contain the lowest species diversity and density in the SSP. This habitat type provides the least desirable avian habitat.

Some species of birds, and wildlife generally may avoid foraging, nesting, and roosting habitats near solar farms during construction activities and operation, thus effectively decreasing habitat quality beyond the immediate footprint of the infrastructure. The importance of this indirect effect has rarely been measured, but varies among species depending on their life history, behavior, and habitat requirements. In contrast, one would expect that smaller birds such as passerines would nest throughout the SSP lands, using infrastructure as nesting support and for cover.

Habitat fragmentation, degradation, and loss are recognized as leading threats to wildlife and biological diversity (Fahrig, 2003). Solar facility development has the potential to impact wildlife communities due to site abandonment, loss of movement corridors, loss of foraging, breeding, and brood rearing habitat, and direct fatality (Alberta Environment & Parks, 2016). Project related effects vary between solar development due to project size, location, and equipment and technology utilized.

The vast majority of the landscape within and surrounding the designated Project area was observed to be cultivated. AEP (2016) recommends siting solar energy projects on cultivated or previously disturbed lands to reduce high quality habitat loss. It is also recommended that siting avoid environmentally significant areas, key wildlife ranges, important water bodies, and valleys. Based on the general assessment of land use conditions in proximity to the Project site, it can be reasonably concluded that the Project site (as currently proposed) meets the expectations of AEP with respect to Project siting and avoidance of important wildlife habitat features.

One of the key challenges to developing alternative energy projects is balancing competition for land resources with other land users (Dahlin, et al., 2011). Siting solar developments on degraded lands (including agricultural lands) can help to balance land use requirements of alternative energy projects with other land uses related to energy, food, and fiber production (Dale, Efroymson, & Kline, 2011).

Due to avian mortality documented at a number of utility-scale solar facilities in North America, avian fatalities are considered a primary concern associated with solar developments. Death occurs primarily as a result of impact trauma, but also due to predation and starvation, when birds land within the project site and either sustain direct impact injuries and/or are stranded and unable to escape predators (Alberta Environment & Parks, 2016). Diving waterbirds (i.e. grebes, loons, diving ducks) make up the majority of mortalities at photovoltaic (PV) sites (Kagan et al., 2014), potentially mistaking the panels for water (Grippo et al., 2015); most succumbed to starvation or predation after impact. As many animals use polarized light for orientation and navigation, polarized light pollution can disrupt this innate tool when searching for waterbodies; Lovich and Ennen (2011) deem this "lake effect" linked to continuous rows of solar panels. Also, noted in their study was the concept of solar panels creating an "ecological trap", wherein the lake effect attracts insects, and in turn, avian species. Utility-scale solar energy (USSE) developments may also fragment habitat and create linear barriers to movement of wild species. Passerine fatalities are also common, as a recent study by the U.S. Department of Energy's Argonne National Laboratory (2015) found passerines to be the most frequently killed or injured taxonomic group at all six California solar energy facilities studied. Risk to waterfowl at these facilities was also high, due to the confusion of solar arrays with waterbodies.

8.3.4.2 Mortality

Mortality effects from the SSP are unknown. Due to avian mortality documented at a number of utility-scale solar facilities in North America, avian fatalities are becoming a primary concern associated with solar developments. Death occurs primarily as a result of impact trauma, but also due to predation and starvation, when birds land within the project site and either sustain direct impact injuries and/or are stranded and unable to escape predators (Alberta Environment & Parks, 2016). Diving waterbirds (i.e. grebes, loons, diving ducks) make up the majority of mortalities at PV sites (Kagan, Viner, Trail, & Espinoza, 2014), potentially mistaking the panels for water (Grippo, Hayse, & O'Connor, 2015); most succumbed to starvation or predation after impact. As many animals use polarized light for orientation and navigation, polarized light pollution can disrupt this innate tool when searching for waterbodies; Lovich and Ennen (2011) deem this "lake effect" linked to continuous rows of solar panels. Also, noted in their study was the concept of solar panels creating an "ecological trap", wherein the lake effect attracts insects, and in turn,

(Lovich & Ennen, 2011) avian species. Utility-scale solar energy (USSE) developments may also fragment habitat and create linear barriers to movement of wild species.

A 2014 study found no correlation between specific avian species groups and mortality hazards associated with solar facilities, except in instances where open water sources were present – such as wetlands or man-made evaporation pools (Kagan, Viner, Trail, & Espinoza, 2014). However, a recent study by the U.S. Department of Energy's Argonne National Laboratory (2015) found passerines to be the most frequently killed or injured taxonomic group at all six California solar energy facilities studied. Risk to waterfowl was also high, due to the confusion of solar arrays with waterbodies.

Mortality effects from the SSP are unknown. However, a study at the Genesis Solar Project in California an estimated 93 carcasses were found (and corrections included), resulting in a mortality of 0.37 birds/ MW for all components associated with both solar units (solar panels, power block, and along the perimeter fence, combined) (Western EcoSystems Technology Inc., 2016).

In a 2015 review of avian monitoring and mitigation information at existing utility-scale solar facilities, the U.S. Department of Energy identified the majority of birds found killed or injured at solar facilities in southern California were passerines. "The cause of death could not be determined for the majority of bird deaths, and many detections consisted only of feather spots. It has been hypothesized that feather spots found near perching/roosting structures may be incorrectly classified as fatalities when in fact they are the result of preening. Feather spots may also represent predation events and not reflect direct solar- related fatality. At sites where a large proportion of the fatalities detected are identified on the basis of feather spots, assigning fatalities to a known cause of death such as predation is difficult. Further work is needed to develop standardized protocols for evaluating feather spot detections and assigning carcasses to causes of death at solar energy facilities" (Walston, et al., 2015).

Water-dependent species (loons, grebes, rails, coots, shorebirds, waterbirds, and waterfowl) have been postulated to be vulnerable to fatality at PV facilities because of the potential for them to confuse arrays for bodies of water (the lake effect hypothesis). However, there was no consistent pattern of fatality by taxonomic groups among the solar energy facilities evaluated in this report to support or refute the lake effect hypothesis within the southern California region. Water-dependent species represented 11.3% of all recorded fatalities (as of December 2014), but there was high variability among PV facilities, with mortality ranging from 0.27% to 46.3%. Due to the limited and inconsistent dataset (i.e., six studies of incidental and systematic observations), it is too speculative to make any conclusions about the influence of the lake effect fatality of water-dependent birds. The activity and abundance of water-dependent species near solar facilities may

depend on other site-specific and regional factors (such as the surrounding landscape) that have not yet been investigated (Walston, et al., 2015).

Notwithstanding the above, direct impacts to avian mortality rates have been found to be low for USSE systems in comparison to other anthropogenic impacts on birds (McCrary, McKernan, Schreiber, Wagner, & Sciarrotta, 1986). While solar panels can cumulatively kill large numbers of birds, it is not known whether fatalities are high enough to cause population-level impacts (Grippo et al., 2015). It is recognized that regional and site-specific preconstruction surveys to estimate the number of resident and migratory birds are important to further characterize the significance of bird mortality related to solar developments (Grippo et al., 2015).

8.3.5 Mitigation

Although monitoring is not considered mitigation, it can frame future mitigation associated with the SSP. Therefore, a follow-up monitoring program will be implemented after construction and will be designed in accordance with AEP requirements. The purposes of the follow-up monitoring are:

- to determine rates of mortalities occurring and, if so, to identify any possible mitigation measures; and,
- to inform future decisions about any future development or placement of further solar panels for additional phases of the SSP.

If it appears that a high number of direct fatalities are occurring, attempts will be made to determine the nature of the fatalities, specific timing or seasonality, weather related effects at the time, so that mitigation may be designed.

8.3.6 Significance

8.3.6.1 Magnitude

The potential effect of the loss of breeding bird habitat from clearing for the SSP would be of insignificant magnitude. The potential effect of sensory disturbance from construction activities may result in nest abandonment however the effect would be short in duration.

The largest species group of birds identified were passerines. The potential effect on this bird group from clearing and operations for the SSP would therefore be expected to be moderate. Although the presence of solar panels and infrastructure will reduce habitat, upon restoration of vegetation, some passerine use will be expected. No guidelines or threshold values currently exist for bird use at a solar project so no exceedance of a guideline/threshold value will occur.

Waterfowl use may or may not change however 100 metre setbacks from marsh wetlands and dugouts is being maintained by infrastructure. This would be expected to mitigate effects on wildlife use and meets the AEP guideline for setbacks from a wetland.

8.4 Amphibian

A seasonal drainage present within the Project area – meandering to the southeast and west – was observed to have retained some areas of standing water at the time of survey. A large dugout with water was recorded in the southeast of the Project adjacent to the drainage, while another dugout was recorded immediately adjacent to the east of the Project. Boreal chorus frog (*Pseudacris maculata*) and tiger salamander (*Ambystoma mavortium*) were observed during the amphibian surveys (Table 15); however, no evidence (i.e. observations of adults or egg masses, calling) of sensitive amphibians was identified.

Table 15. Amphibian species observed and species status

Common Name	Latin Name					
		AB General Status[1]	AB Detailed Status[2]	*WA*[3]	COSEWIC[4]	*SARA*[5]
Boreal Chorus Frog	*Pseudacris maculata*	Secure	-	-	-	-
Tiger Salamander	*Ambystoma mavortium*	Secure	-	-	Special Concern	No Status

8.5 Watercourses

Clear Brook runs from the northwest to the southeast along the eastern boundary of the Project lands. Clear Brook is mapped on the on the *Code of Practice for Pipelines & Telecommunication Lines Crossing a Water Body/Watercourse Crossings Detailed Area Maps; Pincher Creek Management Area Map, November 2012*. According to the mapping, Clear Brook is a Class D water body class with no restricted activity period.

Two seasonal drainage watercourses (Class D) are located outside the Project lands and one intermittent drainage is located within the Project lands. (See Figure 11)

Watercourse 1: Seasonally intermittent watercourse drains west to east along the north boundary of the project, towards Clear Brook. This watercourse connects a dugout on lands to west of the Project with Clear Brook. This watercourse is intermittent and flows only during overflow events from the dugout. (See Figure 12)

Watercourse 2: Drains west to east through the Project lands, also draining into Clear Brook. This watercourse is also intermittent and seasonal and surface flows are dependent upon precipitation events as the primary input. This watercourse does not have defined bed or banks and is cultivated through. Surface water inputs into this watercourse occur from surrounding cultivated lands. During construction and operations, this watercourse will require crossing by a single access road, with culvert. (See Figure 13)

Watercourse 3: Intermittent and seasonal draining from west to east and is located on the southeast boundary of the Project, south of the existing house and driveway. (See Figure 13) This watercourse is visible as the drainage coming into the dugout in Photo 2 (below).

Alberta Environment will be notified of all applicable crossings in accordance with Alberta Environment requirements in *Guide to the Code of Practice for Watercourse Crossings, Including Guidelines for Complying with the Codes of Practice, Alberta Environment, April 2001.*

There are no fisheries concerns requiring Fisheries and Oceans Canada approvals. Furthermore, no navigable waters are encountered and no applications to the Coast Guard for crossing approvals are associated with the proposed SSP.

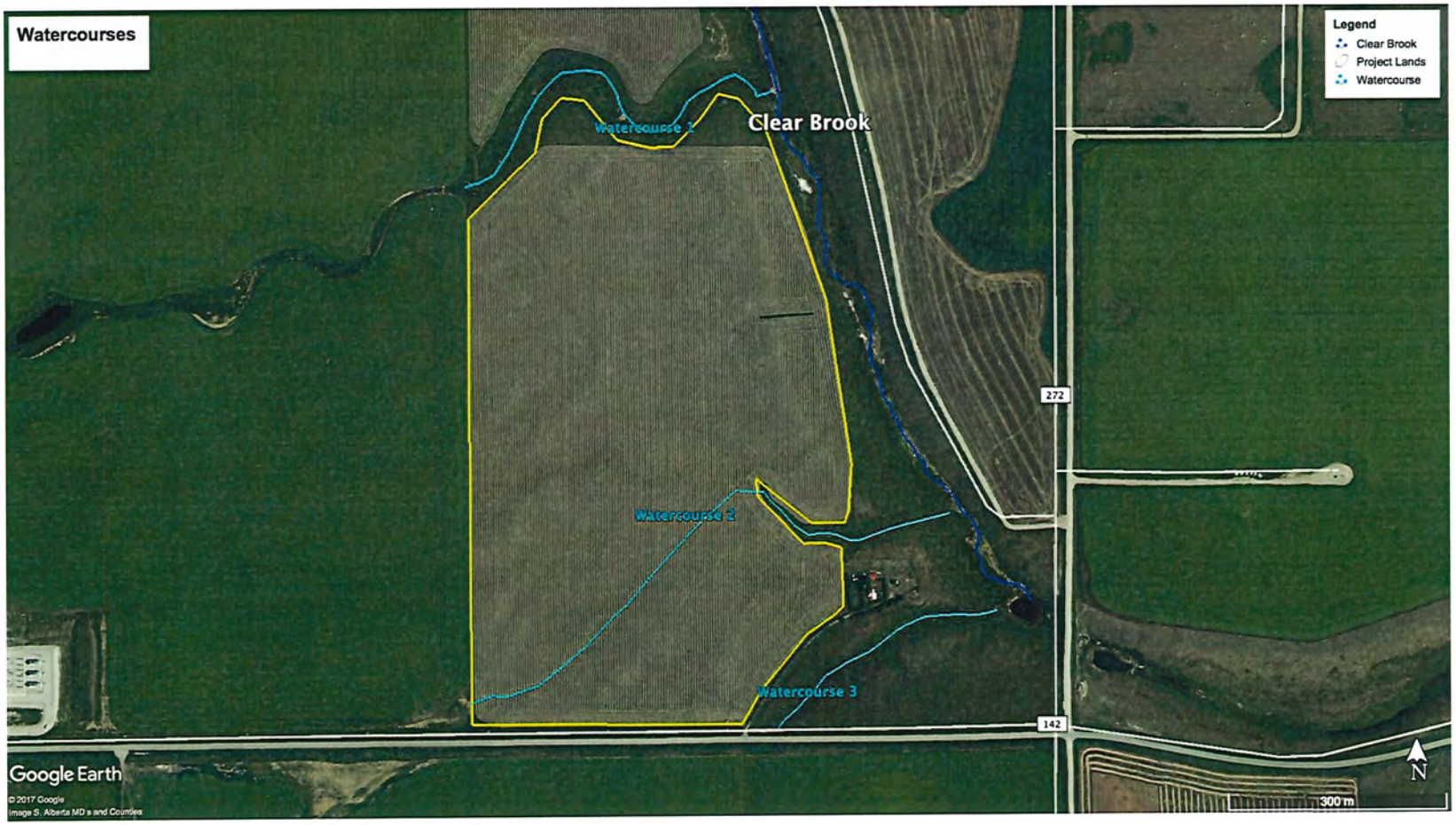

Figure 11. Watercourses in and around Project lands

Figure 12. Watercourse 1

Figure 13. Watercourse 2 and 3

Photo 2. Dugout in south-east corner of the Project with intermittent drainage visible along south side of house/trees in photo.

Photo 3. Clear Brook - dugout east of road outside Project boundary.

Photo 4. Facing south along Clear Brook coulee. Project on west side (right side) in this photo.

Photo 5. Clear Brook coulee facing South.

Photo 6. Water in Clear Brook drainage, facing south.

Photo 7. Clear Brook, facing south-east.

Photo 8. Clear Brook, facing north.

8.5.1 Effects of the SSP

As discussed, no infilling of the watercourses are expected as part of the SSP. Provided all standard watercourse alteration mitigation strategies are integrated into design, all the regulatory approvals are acquired, and crossing structures are sized accordingly, effects resulting from SSP development should be expected to be limited in duration and scope.

Clearing soils for the solar panel pads, roads and underground electrical collector network may potentially impact surface water flow by increasing the potential for surface erosion and runoff and changing drainage patterns, which may direct flows toward or away from natural drainage channels.

A measurable change in the rate of runoff into watercourses is not expected from the proposed SSP; therefore, no measurable increase in peak flows downstream is anticipated.

Photovoltaic energy systems have low rates of water consumption ($0.02m^3$/megawatt hours[MWh]), with consumption associated with panel washing and dust suppression where dust deposition is problematic (Hernandez, et al., 2013). However, washing panels with water is not the primary strategy for PV cleaning at SSP. Dry cleaning of the panels will occur. Dust suppression volumes are unknown and will be used on an as needed basis.

8.5.2 Mitigation

- All temporary watercourse crossing structures (if required) will be designed and installed to meet and be in accordance with the regulatory requirements;
- A stormwater management plan will be developed to adequately manage surface runoff associated with the project to ensure that existing drainage patterns within the project boundaries are not overwhelmed;
- Pre-construction drainage patterns will be matched post-construction wherever possible to reduce potential changes in downstream flows; and,
- Water used for dust suppression will be acquired from approved sources, including municipal water supplies and/or provincially approved water withdrawal locations under provincially approved licenses.

8.6 Wetlands

Desktop review provided a base layer used for constraints analysis for the SSP layout. No wetlands were identified in the base layer. Subsequent field assessments within the boundaries of the SSP also confirmed that no wetlands are present.

8.6.1 Effects of the SSP

At the time of this application, no wetland disturbance that requires application under the *Water Act* will be occurring. All solar panels, access roads and collector lines meet the setback requirements. Therefore, the SSP is not expected to have any measurable effects on wetlands.

8.6.2 Mitigation

The Stormwater Management Plan will manage stormwater flow into existing drainages and watercourses. As no wetlands are present, no mitigation is required.

9 CONSTRUCTION FOLLOW-UP COMMITMENTS

Post-construction wildlife monitoring and adaptive management will be incorporated into the Project. SSP ensures commitments have been included as part of this submission to align with the expectations cited in the recently released *Wildlife Directive for Alberta Solar Energy Projects*, AEP, October 4, 2017. These include bird mortality surveys for 3 years.

9.1 Post Construction Surveys

Surveys will:

1. Document wildlife mortalities within specific solar arrays
2. Determine carcass removal rates
3. Determine searcher efficiency
4. Monitor impact of the SSP on species at risk, sensitive species or other wildlife.

The seasonality and frequency of surveys will be as follows:

1. Seasonality: Between March 1st and November 15th
2. Frequency: Weekly during migratory periods (March 1st - May 15th and August 15th – November 15th) and once every 2 weeks during the summer

9.2 Annual Reporting

An annual report will be submitted to AEP outlining the results of the mortality surveys. Information will include raw data, results of mortality trials, fatality rates for birds, and mortalities found during the year being studied. Based on study findings, should it be deemed necessary by AEP, operational mitigation methods to reduce the risk of fatalities will be discussed.

The post-construction annual report will include the following:

1. a detailed description of the survey methods;
2. the raw data, using the appropriate FWMIS collected in and around the solar site
3. results of searcher efficiency trials and scavenger removal trials;
4. the uncorrected fatality rate for birds expressed as the number of mortalities/megawatt/year;
5. the corrected rates of mortalities/megawatt/year as per Huso (2011) or acceptable alternatives;
6. a summary of species affected;
7. a statement of compliance with the Directives and the signature of the lead biologist.

10 Effects

The scope, methodology and baseline environmental conditions for the SSP have been described in detail in this document. Each Ecosystem Component as identified and defined, has been described and baseline environmental work has been completed to evaluate each EC based on the site-specific conditions relating to the SSP.

Based on the environmental baseline work completed for each EC over the course of one year, and the expertise of the various members of the EA SSP Team, evaluation of each EC has been completed to determine which EC could have potential residual effects once planned mitigation has been completed. This evaluation is described in Table 16. A project EPP has been completed, and will support the mitigation strategies required for the SSP.

Table 16. Ecosystem Component Evaluation

Ecosystem Components (EC)	Sub-Component	Life Cycle Stage Effector	Description of Impacts	Mitigation	Magnitude of Effect	Likelihood of Effect	Risk	Residual Effects assuming Mitigation Effective
Habitat	**High quality habitat**	Construction Operations	Changes in land surface temperature and microclimates. Loss of use of lands due to infrastructure and perimeter fencing	• Avoidance of wetlands and watercourses. • Avoidance of unique habitats • Use of cultivated land	Insignificant	Unlikely	Low	Avoidance of cultivated lands by wildlife during operations.
Wildlife	**Large mammals**	Construction Operations	Barriers to movement within SSP lands due to fencing	• Location situated on agricultural land, thus reducing potential habitat fragmentation.	Insignificant	Unlikely	Low	Barriers to movement through the lands will remain for life of project for species unable to move through perimeter fencing (i.e. deer)
Soils	**All soil types**	Construction Operations	Impacts associated with construction include potential	Mitigation for soils has been outlined in the Environmental Protection Plan.	Insignificant	Likely	Medium	Following interim reclamation replacement

Ecosystem Components (EC)	Sub-Component	Life Cycle Stage Effector	Description of Impacts	Mitigation	Magnitude of Effect	Likelihood of Effect	Risk	Residual Effects assuming Mitigation Effective
			reduction in soil characteristics (quality and quantity) due to handling, admixing and losses due to erosion.					and revegetation of soils following construction (outside operational areas), residual effects are short term and not expected to extend beyond construction.
Vegetation	**Rare Plants**	Construction Operations	Impacts to rare plants not expected as none identified within footprint of solar panels, access roads, or collector lines during assessments and	Avoidance through use of cultivated land	None	None	None	None

Ecosystem Components (EC)	Sub-Component	Life Cycle Stage Effector	Description of Impacts	Mitigation	Magnitude of Effect	Likelihood of Effect	Risk	Residual Effects assuming Mitigation Effective
			all infrastructure on agricultural land.					
Watercourses	**Class D**	Construction Operations	No mapped watercourses within boundary. All watercourses intermittent and/or ephemeral and Class D.	Install culverts and crossings as per *Guide to the Code of Practice for Watercourse Crossings, Including Guidelines for Complying with the Codes of Practice, Alberta Environment, April 2001.* Refer to EPP for additional information.	Insignificant	Possible	Low	None
Water	**Use and Consumption**	Construction Operations	Use of localized water sources for dust suppression during construction. Water use for dust suppression during operations.	Use of water from approved water withdrawal locations, municipal water supplies, or under provincial permit.	Insignificant	Unlikely	Low	None

Ecosystem Components (EC)	Sub-Component	Life Cycle Stage Effector	Description of Impacts	Mitigation	Magnitude of Effect	Likelihood of Effect	Risk	Residual Effects assuming Mitigation Effective
Wetlands	**All Classes, All Types**	Construction Operations	None – no wetlands present	Not applicable to wetland systems.	None	None	None	None
Birds	**Waterfowl Passerines Raptors Corvids/Others Shorebirds Grouse/Allies**	Construction Operations Decommissioning	Potential concerns associated with birds include: • Displacement of nesting birds in pasture lands (limited) • Mortality resulting from direct collision with solar panels; • Habitat alteration; and, • Sensory disturbance.	Due to the potential residual effects of solar panels on birds once mitigation efforts are employed, this EC has been considered for further assessment in post construction/operations, using mortality monitoring, and potentially adaptive management, following consultation with AEP as required.	Moderate	Unlikely (population level)	Medium (population level)	Extent to be determined through post construction mortality monitoring.

Ecosystem Components (EC)	Sub-Component	Life Cycle Stage Effector	Description of Impacts	Mitigation	Magnitude of Effect	Likelihood of Effect	Risk	Residual Effects assuming Mitigation Effective
Amphibians	**Boreal Chorus Frog** **Tiger Salamander**	Construction Operations Decommissioning	Habitat loss and fragmentation from proposed activities such as clearing for roads, solar panel, the substation, could cause displacement of species from their habitats, degrade breeding habitats. Attractants may include the creation of ruts on roads, caused by equipment and vehicles, which may fill with water in the spring and attract breeding species of amphibians.	• Maintain setbacks from wetlands as per the layout and use existing disturbance and access as much as possible. This was incorporated into the layout. • Conduct regular road maintenance in the form of grading to prevent water pooling and to minimize deep ruts and/or water ponding; • Ensure erosion and sedimentation controls are in place to reduce soil erosion and water quality degradation; • Avoid impacts to ephemeral wetlands wherever possible; and.	Insignificant	Unlikely	Low	None

Ecosystem Components (EC)	Sub-Component	Life Cycle Stage Effector	Description of Impacts	Mitigation	Magnitude of Effect	Likelihood of Effect	Risk	Residual Effects assuming Mitigation Effective
			Since these ruts would likely dry up in the summer, this presents a potential risk to species that hatch and reproductive failure could occur. Creation of low spots following construction that may collect water may also result in attractants to species.	• Avoid wetlands and watercourses to the greatest extent possible and ensure stormwater management structures are constructed properly.				

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12 Environmental Assessment Project Team

Name	Designation	Years of Experience	Project Team Tasks
Robert McCallum	P.Biol	20	Project manager; Field assessments; Micro-siting; Wetlands; Reporting, Regulatory consultation.
Darryl Jarina	P.Biol	11	Project manager; Field assessments; Birding; Reporting; Regulatory consultation.
Mike Kelly	P.Biol (pending)	4	Field assessments; Birding; Vegetation; Wetlands; amphibians
Tara Evenson	B.Sc.	2	Field technician; Field assessments
Leah Kovatch	M.Sc., (P.Biol pending)	4	Field assessments; Reporting
Michele Fournier	B.Sc. (P.Biol pending)	4	Field assessments; Reporting

13 Certification

The undersigned has personally inspected the subject property and considered relevant factors and influences pertinent within the scope of the assessment.

The undersigned has no past, present, or contemplated interest in the assessed underlying property or investments in the proponent.

I have reviewed the information as submitted and completed this report in conformity with the Code of Ethics and the Duties of Professional Biologists.

Respectfully Submitted,

Robert McCallum, P.Biol
President
McCallum Environmental Ltd.

Darryl Jarina, B.Sc., P.Biol
President
Bear Tracks Environmental Services (2015) Ltd.

Appendix I – Figures

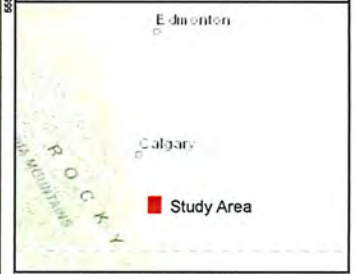
Figure 14. Project Lands
Figure 15. SSP Components
Figure 16. ESA

Prepared For:
Stavely Solar Project

Figure 14. Project Lands

Stavely, Alberta

Solar Array lands
Original Project Lands



Coordinate System: NAD 1983 10TM AEP Forest
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

0 90 180 360 m

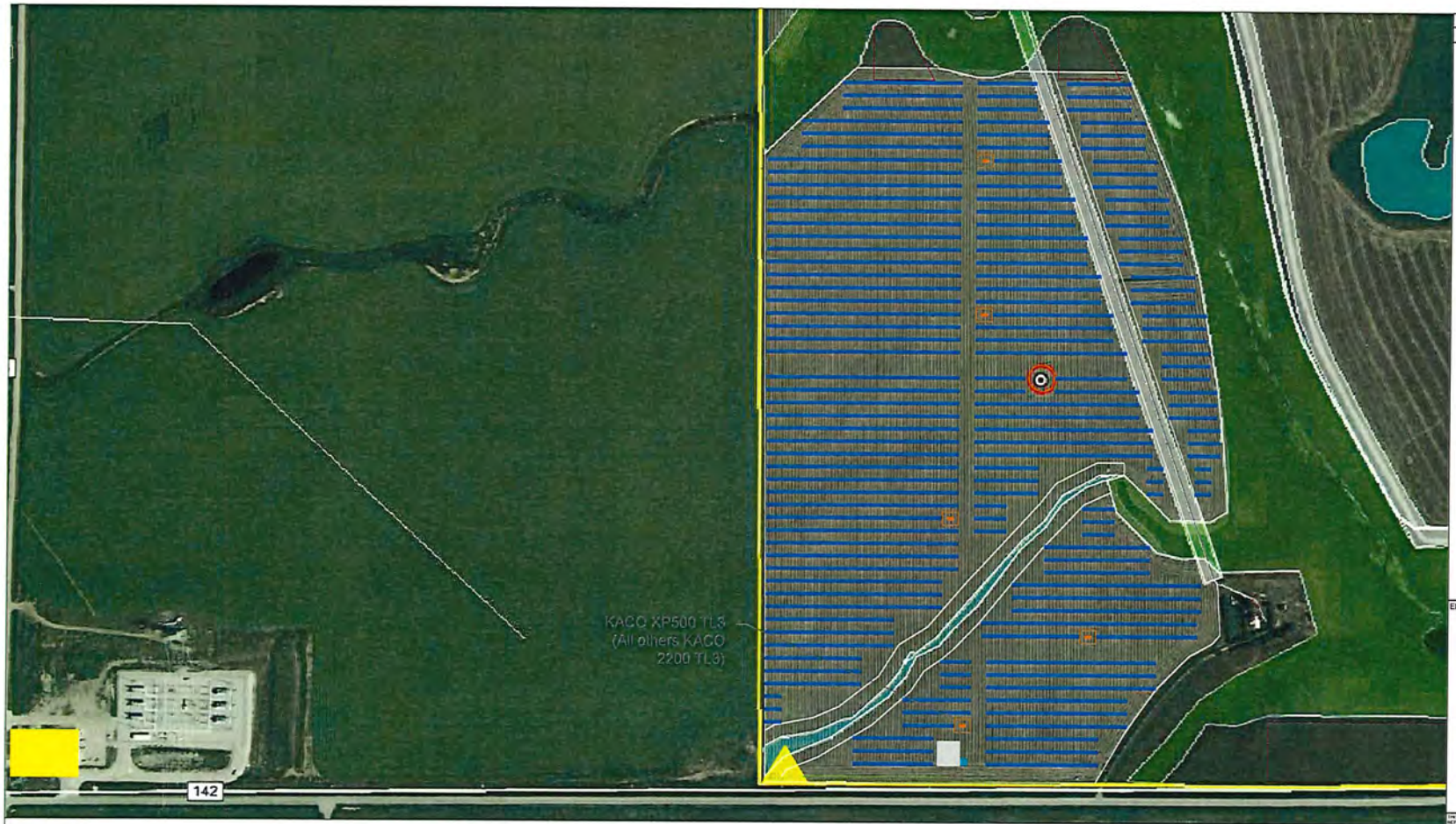
1:7,500 Scale when printed @ 11" x 17"

Drawn By: EP

Date: 2017-12-06

McCallum Environmental Ltd.

Document Name: 171206_Stavely_Project_Boundary



SHEET 1 OF 3

Notes and General Conditions

1. This is a preliminary drawing only and shall not be used for construction, detailed cost estimates, Bills of Material, or for any other such purpose than that described by Aprinity Renewables Inc. in the associated feasibility report.
2. PRELIMINARY LAYOUT SUMMARY DETAILS:

MODULES

ASSUMING 365W 72 Cell Modules

Overall Plant Size

37832 Modules

13.8 MW DC

8.5 MW AC

DC/AC Ratio 1.62

Minimum Setbacks

Roads: 125'

Property with dwellings: 33'

Pipelines: 33'

Adjacent Farm-land: 20'

Figure 15. Stavely Solar Array layout

ENGINEER'S SEAL:

Client:
Acestos Power

Project Address:
Township Rd 142 & Range Rd 272, Stavely, AB

Additional Details:
XXXXX

Drawing Title:
Site 3

Drawing No.:
1601501_Layout 3

REV.	DESCRIPTION	DATE	BY
03	FEASIBILITY - 11m RS, 1.62 OB	11/20/17	BM
02	FEASIBILITY - 9m RS, 1.7 OB	11/07/17	BM
01	FEASIBILITY - Rev. to AC interconnect size	10/26/17	BM

REVISIONS

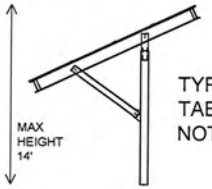
Designed By:	BM	Date:	01/10/16
Checked By:	NP	Date:	01/10/16

507 Cordeck Cres,
Peterborough, ON
T. 647-822-4313
www.aprinityrenewables.com

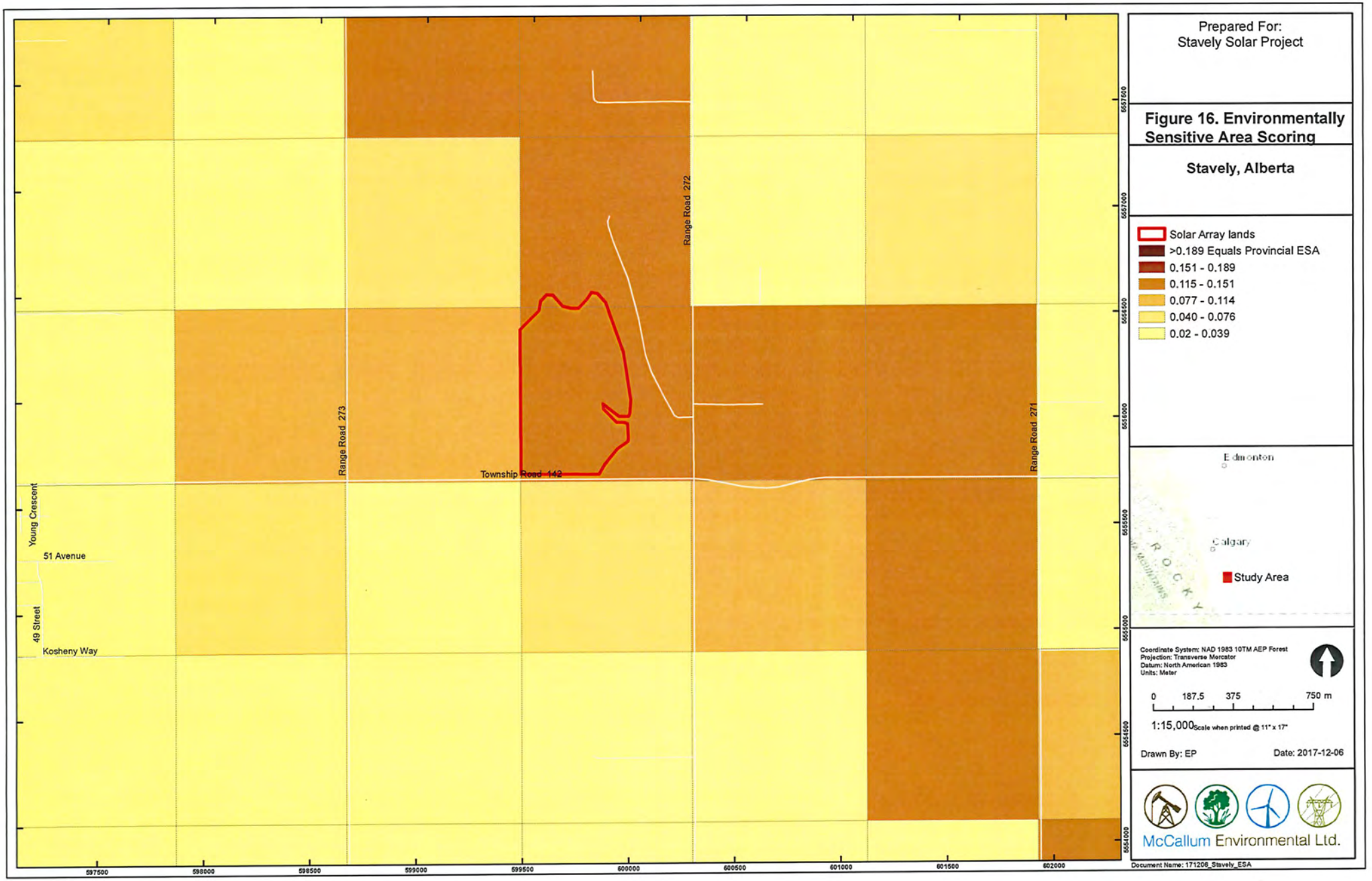
ARI

LEGEND

- INTERCONNECTION POINT
- PROPOSED FEEDER ROUTE
- PANELS
- INVERTERS and REQ. AREA
- SWITCHGEAR AREA
- STAGING AREA
- SITE BUILDING/SHED



TYPICAL MODULE
TABLE PROFILE VIEW
NOT-TO-SCALE



Prepared For:
Stavely Solar Project

Figure 16. Environmentally Sensitive Area Scoring

Stavely, Alberta

- Solar Array lands
- >0.189 Equals Provincial ESA
- 0.151 - 0.189
- 0.115 - 0.151
- 0.077 - 0.114
- 0.040 - 0.076
- 0.02 - 0.039

Coordinate System: NAD 1983 10TM AEP Forest
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter

0 187.5 375 750 m

1:15,000 Scale when printed @ 11" x 17"

Drawn By: EP

Date: 2017-12-06

McCallum Environmental Ltd.

Document Name: 171206_Stavely_ESA

Appendix II - Environmental Protection Plan

Stavely Solar Power Project

Environmental Protection Plan (EPP)

Operated by:
Acestes Power ULC

December 2017

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1 INTRODUCTION

The purpose of this Environmental Protection Plan (EPP) is to provide regulatory bodies with a commitment to reduce, mitigate, and where possible eliminate the environmental impacts of operations on the natural systems encountered. The EPP will serve as a field guide to ensure successful conservation and reclamation of valued ecosystem components in the area and ensure regulatory compliance.

The operating procedures contained in this document are intended as a guide in conducting operations with consideration for environmental protection. The procedures are partially based on regulatory requirements but are not intended to be used in substitution to regulations, nor are they intended to be an exhaustive review or interpretation of applicable legislation. When used in conjunction with other manuals, such as those which may be provided by EPC contractors or specific emergency response plans, the procedures contained herein are a valuable tool in guiding operations.

Environmental legislation is designed to protect the environment. All employees and contractors at the Stavely Solar Project (the 'Project') work site will comply with applicable regulatory requirements. These requirements include acts, regulations, policies, practices and procedures that are administered by governments and their agencies.

2 General Operational Guidelines

Acestes Power ULC ('Acestes') is committed to operating in the following manner:

- Ensure approvals are in place prior to beginning operations;
- Follow approval conditions;
- Conduct reporting as required by approval conditions;
- Practice good housekeeping at all times;
- Understand the emergency response plans in place;
- Conduct inspections as required;
- Clean up drips, leaks and spills;
- Maintain equipment;
- Report incidents;
- Participate in inspections whether internal, external or regulatory;
- Report spills;
- Be a good neighbour;
- Keep abreast of changing regulations;
- Manage waste appropriately;
- Maintain vegetative cover and control weeds;
- Prevent erosion;
- Control surface water releases;
- Conduct groundwater sampling if required by approvals;
- Communicate and share knowledge;
- Maintain records.

3 ACCOUNTABILITY

The Construction Foreman will be accountable for ensuring environmental compliance during the construction of the Project. All incidents that qualify as being in non-compliance of applicable laws, commitments made by Project and/or specific approval conditions by regulators, shall be reported to the Foreman and Environmental Monitors. The Foreman and Environmental Monitors shall take necessary steps to rectify the situation through appropriate notification of regulators, implementation of suitable mitigation measures and record keeping of the circumstances that resulted in the non-compliance, any remedial measures taken and any recommendations for future monitoring.

The Foreman and Environmental Monitors will monitor construction activities and, if applicable, will implement suitable measures to prevent non-compliance with laws, commitments and/or specific approval conditions by regulators.

4 CONSTRUCTION/OPERATIONS MANAGEMENT

To ensure that procedures are followed to reduce environmental impacts, reduce liability and promote compliance with applicable regulatory requirements, the following should be implemented:

4.1 Material Handling & Storage

The following material handling and storage procedures or other measures as authorized by the Construction Manager should be followed:

1. Potentially hazardous materials will be stored and handled at dedicated areas in accordance with all regulatory requirements;
2. All fuel storage and equipment-servicing areas will be located a minimum of 100 m away from any wetland/ waterbody;
3. All handling and storage of materials will conform to safety guidelines and regulatory requirements;
4. All hazardous materials will be labeled in accordance with applicable regulatory requirements;
5. Hazardous materials will be stored in appropriate containment in accordance with applicable regulations;
6. Inspect storage areas regularly; and,
7. Hazardous materials will be transported in accordance with the *Dangerous Goods Handling and Transportation Act.*

4.2 Spill Response

Acestes recognizes its responsibility for its operations and the effects that these operations have on employees, landowners, the public and the environment. Although facilities and operating procedures are designed to prevent upsets that could result in a spill, spills may occur.

To a large extent, effective spill response is dependent on the amount of planning that is undertaken before a spill occurs. Sound planning will help reduce the number of spills, improve the success of response activities, reduce environmental impact, decrease conflict with regulatory agencies and the

public, and lower spill response costs. Spill planning is a continuous process that requires commitment, cooperation and input. Components of planning include:

- Company policy;
- Spill prevention;
- Contingency plans (or specific ERPs);
- Equipment readiness (know local contractors); and,
- Training.

Acestes's policy in regard to spill planning and control operations involves:

- Authority to initiate emergency actions;
- Reporting structures for notification and approvals;
- Authority for expenditures related to spill activities;
- Authority to activate additional resources as needed;
- Authority to respond to public and media inquiries; and
- Authority to respond to unidentified spills.

If a spill occurs, a single authority will immediately assume overall responsibility for coordination of response actions. For small spills one individual can oversee the entire operation, especially if that individual can obtain advice and support from internal resources, spill specials, regulatory staff and others.

4.2.1 Basic Procedure

1. Assess for safety hazards.
2. Eliminate the spill source and contain if possible.
3. Notify the appropriate Acestes personnel.
4. Regulatory Agencies will be notified if required.
5. Recover any spill material.
6. Initiate waste management procedure if necessary.
7. File an incident report as per regulatory requirements.
8. Identify remediation options and requirements and implement as approved.
9. Waste materials that are generated from a spill will be minimized and managed so that there are no long-term problems with disposal.

4.2.2 Spill Containment

The successful containment of a spill on land or water depends upon ground cover and topography, hydrogeology, solubility of the material, viscosity of the liquid, water currents and flow rates, soil permeability and climatic conditions. A timely response to any spill will help maintain the integrity of the land and water and reduce costs associated with the cleanup and restoration.

The following general guidelines are necessary for containment of most materials:

- Overfill shut-off systems on production/storage tanks will be in good working order;
- An impervious tarp shall be in place during equipment servicing activities with the potential for accidental spills (e.g., oil changes, servicing of hydraulic systems, etc.).

- Spent oils, lubricants and filters, etc., shall be collected and disposed of at an approved location.
- Where immobile equipment is required to operate within 100 meters of a water body:
    - containers, nozzles and hoses will be inspected to ensure they are free of leaks;
    - fuel nozzles are to be equipped with automatic shut-off;
    - No fuel, oil or hazardous material storage will be allowed within 100 meters of any water body or intermittent creek;
    - No equipment or machinery is to be washed within 100 meters of any water body or intermittent creek;
- The contractor shall ensure that during the course of operations, no fuel, lubricating fluids, hydraulic fluids, methanol, antifreeze, herbicides, biocides, or other chemicals are dumped on the ground;

Experience has shown that when prevention systems are in place, the next most significant contributor to contamination is accumulated releases/spills.

While often small in nature (less than the release volumes that require regulatory reporting), these releases/spills may occur for a variety of reasons, such as load line connection spills, tank overflows, truck overfilling and flange, valve and fitting leaks.

4.3 Waste Management

All domestic and construction waste will be disposed of at an approved landfill. All hazardous waste will be disposed of to an approved hazardous waste disposal facility.

5 SOILS HANDLING

As solar panels will be installed on screw piles, soil disturbance is expected to be limited to access roads, laydown areas, operations areas required for vehicle access or other as yet to be determined areas within the Project.

All soil stripping and leveling using a two-lift soil stripping method:

1. The first lift will remove the A-horizon to the color change (B-horizon);
2. The second lift will remove the B-horizon. Both A and B-horizons will be stockpiled on the edges of the lease with a 1m separation. Care will be taken to avoid admixing while handling and stockpiling soils. The soils will be preserved and used for production and final reclamation. The remaining C-horizon will be used as cut and fill to level each lease to accommodate the necessary equipment.
3. All stripped soils will be stored separately.
4. Erosion control for wind and water erosion will be implemented as required.

5.1.1 Time of Construction

Construction procedures which involve surface disturbance such as stripping, grading or travelling on un-stripped sod will be conducted during the dormant season under suitably dry and/or frozen ground conditions as much as possible.

Additionally, the completion of all stripping, grading and specific soil mitigation will occur at one time if possible and will be followed by the remaining associated civil construction which will reduce the chances of a shutdown being forced during construction.

5.2 General Soils Management

Activity / Concern	Mitigation
Wet/Thawed Conditions	1. Comply with municipal and provincial road bans. 2. Minimize use of heavy machinery in the event of wet or thawed soil conditions to reduce terrain disturbance and soil structure damage. 3. Initiate contingency measures once one of the following indicators occurs: • Excessive rutting; wheel slip, build-up of mud on tires and cleats, formation of puddles, and/or tracking of mud down the road as vehicles leave the site. 4. Employ the following contingency measures progressively or individually as warranted if the above indicators occur: • limit equipment traffic to the late afternoon or early morning when ground conditions are frozen or delay construction until soils dry out or refreeze; • prevent rubber-tired traffic from driving on the lands; • salvage excess snow from the right-of-way and spread, as well as pack, the snow on the travel lane to avoid premature thawing of the upper soils; • restrict construction vehicle traffic to equipment with low-ground-pressure tires or wide pad tracks.
Topsoil Handling Contingency Measures	Implement the Soil Handling Contingency Measures during topsoil salvage if any of the following are encountered: little or no topsoil; uneven boundary between topsoil and subsoil; poor colour separation between topsoil and subsoils; stony soils; wetlands; high winds; or requests for alternate topsoil handling methods by a landowner and/or occupant
Topsoil Salvage Schedule	• For construction scheduled to occur during frozen conditions, attempt to pre-strip topsoil prior to freeze-up, if feasible. Attempt to have all topsoil salvage completed prior to October 31. • Postpone topsoil salvage until after spring break-up when ground conditions are not excessively wet for construction scheduled to occur during non-frozen conditions.
Topsoil Salvage-Non-frozen Conditions	Full Topsoil Stripping Scenario • Salvage topsoil on all lands from the travel lane, assembly sites and all areas that will be subject to grading. • Acestes will monitor the condition of the site throughout construction and further assess whether topsoil is being subject to degradation that

Activity / Concern	Mitigation
	will eventually impact soil capability. If topsoil is being degraded, consider installing matting (or equivalent) to protect topsoil degradation.
Topsoil Salvage - Frozen Conditions	• Reduce the area of land subject to topsoil salvage during frozen conditions to areas that will be subject to grading. • Limit topsoil stripping activities to specialized equipment capable of accurately separating variable depths of topsoil from subsoil (*e.g.*, frozen topsoil cutter, if available). If a frozen topsoil cutter/mulcher is not available, rip frozen topsoil to the same depth as the salvage requirements. • Do not over rip and avoid overstripping. • Do not salvage topsoil from the travel lane during frozen conditions unless the right-of-way will be graded. Implement the Wet/Thawed Soils Contingency Plan if thawed conditions are encountered during winter construction.
Stripping Depth	Salvage all available topsoil in one lift as well as a second lift of better quality upper subsoils in areas where three-lift soils handling is required.
Wind Erosion of Topsoil Windrow	Droughty, erosion-prone soils require wind erosion protection. Tackify or apply water or pack the topsoil windrow with approved equipment. Application of a tackifier following topsoil removal is more cost effective than repeated watering of topsoil windrows and piles.
Grading	• Salvage topsoil from areas to be graded and store in a location that will not allow for mixing of topsoil with excavated subsoil and graded material. • The area stripped is to correspond to the area to be graded. • Reduce grading, especially at watercourses. • Limit the width of grading in order to reduce the potential for erosion and subsoil compaction. • Conduct grading adjacent to wetlands away from the wetland to reduce the risk of sediment and other material entering the wetland. Keep wetland soils separate from upland soils.
Spoil Storage	• During non-frozen conditions on cultivated lands place excavated spoil material on the stripped area adjacent to the excavation. Ensure enough workspace is available to allow for a sufficient distance to be left in place between the spoil and the excavation to reduce the risk of spoil material sloughing into the excavation. • If excavated spoil material is not to be used as backfill and disposed of offsite, load the excavated material directly into trucks for hauling and disposal at approved locations. Do not temporarily store spoil material if it is not to be used as backfill.
Dewatering	• Pump water onto stable and well-vegetated areas, tarpaulins or sheeting in a manner that does not cause erosion or any unfiltered or silted water to directly re-enter a watercourse.
Backfilling	• Ensure sources of imported backfill have been approved by landowners/occupants and/or applicable authorities prior to the removal of material from the site and hauling.

Activity / Concern	Mitigation
	• Backfill each lift in the correct sequence where three-lift soils handling was implemented to ensure saline lower subsoils do not contaminate upper subsoil horizons. • Avoid scalping sod and/or topsoil during backfilling. Use suitable equipment (*e.g.*, clean-up bucket on a backhoe) to reduce the potential for scalping. • Avoid mixing snow into backfill material. • Feather out excess spoil material across the area that has been stripped of topsoil. Avoid mixing topsoil and feathered subsoil material. Blend feathered material into the natural grade of the area so as to not change local surface drainage patterns.
Excess Spoil	Dispose of excess spoil material at locations approved by the landowner and/or occupant.

6 WEED MANAGEMENT

Acestes recognizes that each operational region is unique and that weed management that is effective in one area, may not be effective in another. However, Acestes's policy to control vegetation on private lands will be based upon the species identified, and discussions with landowners.

Acestes will take the following approach to vegetation management:

1. Identification
2. Prevention
3. Chain of Custody
4. Procedures for Vegetation Control
5. Monitoring

6.1 Identification

Species identified during site assessments were compared with those listed in the *Weed Act.*

6.2 Prevention

Prevention is paramount to an effective weed management program.

Acestes will attempt to minimize the potential for weed introduction/invasion by seeding all disturbed areas with landowner approved seed mixes unless the landowner/occupant chooses to.

6.3 Seeding

Use a certified native seed mix for perennial vegetation. Purchase only certified seed from a recognized member of the Canadian Seed Growers Association (CSGA). Obtain a certificate of analysis that identifies weeds found in samples of analyzed by a seed lab.

6.4 Chain of Custody

Acestes' Vegetation Management Policy guidelines will include:

- If landowners manage or implement a vegetation control program on surrounding lands, during the planning process Acestes will solicit their participation in a cooperative weed management program;
- Only licensed applicators or landowners may enter upon and treat vegetation on site.

6.5 Procedures for Vegetation Control

Acestes will use information collected in prior seasons to evaluate the infestation of noxious and invasive species over time and prepare a weed treatment plan for operations in the upcoming year.

As no one method of vegetation control may be effective, the following procedures will be implemented in a synergistic manner for all Acestes operations on Project lands:

- The most effective and least costly method of weed control is to prevent their establishment.
- Integrated weed management may combine chemical, mechanical and natural controls with each measure implemented as needed. Treatments should not be employed on a scheduled basis but used in response to a situation identified during past monitoring;
- Preventative control must be incorporated for all operations.

6.5.1 Chemical Controls

- Always notify adjacent landowners/occupants prior to the application of herbicides;
- If required permits will be obtained from regulatory bodies for the application of herbicides within 30 metres of an open water body. Pesticides must not be stored, mixed or equipment cleaned within 30 metres of an open body of water;
- Herbicide drift is a concern for ground application. Contractors are responsible for ensuring that any herbicide applications conducted are done so in a safe and responsible manner. The choice of chemical should be made with adjacent land uses in mind;
- During rainfall, herbicides are moved from land into waterbodies by runoff. The occurrence of herbicides in the waterbodies depends on the intensity and timing of the rainfall and location and timing of herbicide applications. Herbicide application requires extra care and caution to ensure water quality, and aquatic and riparian habitats will not be affected by the application. Natural vegetation should be left along natural water bodies to ensure bank stability and to provide a natural buffer and filter for chemicals;

6.5.2 Monitoring

- Monitoring of locations is required to alleviate problems as they occur or until weeds are controlled and vegetation established as appropriate;
- Information regarding the vegetation control program shall be documented for each site treated (see attached form);

7 SEDIMENT & EROSION CONTROL

Acestes will install temporary erosion controls immediately after a disturbance in an erosion prone area. Erosion controls must be properly maintained and reinstalled as necessary until replaced by permanent erosion controls or restoration is complete.

This is not limited to the duration of the Project, but to return to pre-disturbance conditions. The Construction Consultant/Environmental Monitor will consult with construction personnel on the appropriate measures to be taken. They may include:

Mulch application

- Mulch is intended to stabilize the soil surface. Mulch can consist of woodchips, straw, hay, erosion control fabric, or some functional equivalent;
- 2:1 slopes or steeper should be re-contoured with hand tools only (if possible) to at least a 3:1 ratio slope and a Straw/Coconut Blanket or High Velocity Wood Blanket be installed.
- 3:1 slopes or steeper - Wood or Straw Blanket with net on both sides;
- 4:1 slopes or flatter - Wood or Straw Mulch blanket with net on one side flat areas Straw Mulch with anchoring;
- Apply mulch in accordance with the specifications outlined in this section except, if mulching before seeding.

Mulch before seeding if:

- Final cleanup and installation of permanent erosion control measures, is not completed or activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions;
- Ensure that mulch is anchored to minimize loss by wind and water;
- When anchoring with liquid mulch binders, use rates recommended by the manufacturer.
- Do not use liquid mulch binders within 25m of wetlands or waterbodies;
- Install erosion control fabric, such as bonded fibre blankets, at a minimum, on waterbody banks at the time of final bank re-contouring. Anchor the erosion control fabric with staples or other appropriate devices;

Sediment Barriers Application

- Sediment barriers are intended to stop the flow of sediment. They may be constructed of materials such as silt fence, staked hay or straw bales, or sand bags;
- Install temporary sediment barriers at the base of slopes adjacent to road crossings until disturbed vegetation has been re-established;
- Install temporary sediment barriers at appropriate locations to prevent siltation into waterbodies or wetlands crossed by or near the construction work area;
- Inspect and maintain temporary slope breakers;
- Maintain all temporary sediment barriers in place until permanent re-vegetation measures are successful or the upland areas adjacent to wetlands, waterbodies, or roads are stabilized;
- Remove temporary sediment barriers from an area when that area is successfully restored.

The erosion and sediment control structures will be regularly inspected during the Project and each following growing season until they are removed or natural re-vegetation has taken place.

8 POST CONSTRUCTION FOLLOW-UP COMMITMENTS

Post-construction wildlife monitoring and adaptive management will be incorporated into the Project. Commitments have been included as part of this submission to align with the expectations cited in the recently released *Wildlife Directive for Alberta Solar Energy Projects*, AEP, October 4, 2017. These include mortality surveys for 3 years and will include the standards as outlined in *Section 100.4 – Standards* of the above referenced document.

8.1 Post Construction Surveys

Surveys will:

1. Document wildlife mortalities within specific solar arrays
2. Determine carcass removal rates
3. Determine searcher efficiency
4. Monitor impact of the SSP on species at risk, sensitive species or other wildlife.

The seasonality and frequency of surveys will be as follows:

1. Seasonality: Between March 1st and November 15th
2. Frequency: Weekly during migratory periods (March 1st - May 15th and August 15th – November 15th) and once every 2 weeks during the summer

8.2 Annual Reporting

An annual report will be submitted to Alberta Environment and Parks (AEP) outlining the results of the mortality surveys. Information will include raw data, results of mortality trials, fatality rates for birds, and mortalities found during the year being studied. Based on study findings, should it be deemed necessary by AEP, operational mitigation methods to reduce the risk of fatalities will be discussed.

The post-construction annual report will include the following:

1. a detailed description of the survey methods;
2. the raw data, using the appropriate FWMIS datasheet for each solar collector/reflector;
3. results of searcher efficiency trials and scavenger removal trials;
4. the uncorrected fatality rate for birds expressed as the number of mortalities/megawatt/year;
5. the corrected rates of mortalities/megawatt/year as per Huso (2011) or acceptable alternatives;
6. a summary of species affected;
7. results of the pre-construction wildlife surveys;
8. a comparison of the pre- and post-construction survey results if required; and,

9. a statement of compliance with the Directives and the signature of the lead biologist.

8.3 Adaptive Management

As per Standard 100.4.9, in the event that post-construction surveys reveal wildlife mortalities exceed acceptable levels (as determined by AEP), adaptive management may be implemented in consultation with AEP. Adaptive management may include, but may not be limited to:

1. Determination of reason for mortality (i.e. electrocution, impacts)
2. Once mortality is determined, where possible, mitigation may include:
    a. Installation of bird deterrents or markers;
    b. Addition of white edges to solar reflectors;
    c. Installation of nest spikes on areas to prevent raptor nesting;

8.4 Injured Wildlife

In the event that injured wildlife is found within the Project boundaries during operations, AEP will be notified and injured wildlife will be handled in accordance with regulatory direction and requirements.

9 RECLAMATION PLAN

The objective of the reclamation plan is to remove all garbage from site, control erosion as may be necessary, restore soil capability, and reclaim the Project areas and associated disturbed portions to a land capability which is equivalent to pre-disturbance characteristics.

Reclamation will take place once construction equipment has left the location or as soon as soil and weather conditions permit. The landowner will be notified prior to the initiation of the reclamation activities and again upon completion. Reclamation success is dependent good landowner communication and upon favourable conditions in the root zone for optimum crop growth. The key soil factors that determine root zone quality include the water holding capacity, organic content, structure and consistence, salinity, nutrient balance and soil regime.

9.1 Interim Reclamation

Acestes shall attempt to reclaim all disturbed land surfaces within 2 growing seasons. Interim reclamation, including site and debris clean-up, slope stabilization and re-contouring with subsoil, and spreading of topsoil shall be done progressively and concurrently with operations.

Revegetation using a perennial grass seed mixture approved by the landowner will occur.

9.2 Final Project Reclamation

Reclamation of the Project will be completed to typical reclamation practice at the time. As no reclamation standards for independent power are currently in place in Alberta, other provincial practices, guidelines, best industry practice, or regulations will be followed. The following would be considered a generic plan in line with current practice. In absence of specific reclamation criteria, the

Project will be reclaimed to the Alberta *2010 Reclamation Criteria for Wellsites and Associated Facilities,* or any updated versions thereof.

9.2.1 Typical Timing

Decommissioning	Activity	Timeline	Off Site Land Use Requirements
Infrastructure	Removal infrastructure	May – July	• Use provincial, municipal or private roads for access to water or soils; • May require temporary work space for equipment storage prior to removal from Project lands; • Use of water from local sources for reclamation purposes; • Reclamation of borrow pits at pre-approved locations; • Use of landfill or recycling activities for equipment/waste disposal.
	Removal of transformers	May – July	
	Partial excavation and removal of cement bases to approximate depth of 1.0 meters	June – July	
	Removal of gravel pads and gravel from access	July – August	
	Recontouring of pad and access roads	July – August	
	Reclamation of surface soils	August – September	
	Re-seeding	September - October	
Power Lines/ Transformer Station	Removal of above ground poles and lines or associated components	May – July	
	Below ground collector lines will remain in place if depth greater than 1 metre	N/A	
	Removal of transformer station and associated infrastructure	May – July	
	Removal of gravel pads	June – July	
	Removal of access roads	July – August	
	Recontouring of pad and access roads	August – September	
	Reclamation of surface soils	September - October	

9.3 Soils

- Upon abandonment of the location, all disturbed areas are to be re-contoured to pre-construction conditions. Loading of slopes with unconsolidated material will be avoided during slope re-contouring.
- All grades and drainages will be restored by removing any culverts and fills.
- Once sub-soil has been adequately reclaimed, topsoil will be replaced. Topsoil replacement should not be done until all subsoil levelling and cleanup has been completed, to prevent mixing by levelling after topsoil replacement.
- Topsoil depths will be replaced to 80% of control point depths.
- Soil quality should not drop in soil quality class.

- Surface diversion berms will be installed, as required. Run-off will be diverted to stable and vegetated off-right-of-way areas.
- Remove all foreign materials including geotextile.
- Fences and culverts are to be restored to meet or exceed pre-construction conditions.
- Rocks/stones exposed on the surface as a result of construction activity will be removed prior to and after topsoil/surface material replacement. The concentration of surface and profile rocks will be equivalent to, or better than the surrounding fields. Rocks/stones will be disposed of at a site approved by the landowner.
- Any areas with rutting or erosion gullies will be re-contoured and all strippings will be replaced evenly over all portions of disturbed areas. Replacement of soils during wet weather or high winds will be avoided. This will prevent damage to soil structure and reduce the potential for erosion of topsoil.
- Soil amendments (fertilizer/manure/compost) may be required on disturbed areas. The concentration of amendments required will be based upon nutrient levels in the undisturbed areas outside the boundaries of the Project areas and will be incorporated only if approval is obtained from the landowner.
- Erosion control may be necessary on slopes.
- Complete re-contouring and stabilization of disturbed areas. Smooth water channelling ruts and outside berms. Ensure that all erosion control and water management measures (e.g. water bars, drainage dips, culverts and ditches) are working.
- If grading or other earthwork is required to facilitate vehicle/equipment on areas, strip and salvage topsoil and organic material for replacement during clean-up procedures.
- Where soils have been disturbed, implement appropriate reclamation procedures (i.e. seeding, erosion blankets, slash rollback, straw crimping, etc.) to promote stability of the site, soil preservation, and plant re-establishment. Ensure the natural drainage is restored.

9.4 Vegetation

Vegetation recovery strategies may include a mixture of natural recovery, assisted natural recovery and/or the use of agronomic seed mixtures. A vegetation recovery strategy will be developed with the landowner prior to initiation of reclamation activities. The following outlines the various methods:

- Seeding rates and methods will be based upon characteristics of the area, weather conditions, erosion potential of slopes, and landowner recommendations.
- Fertilizer may be needed in some cases but will not be applied unless approved by landowners.
- If cattle may be frequently grazing through the area, reclaimed areas will require access restrictions (fencing) to ensure newly seeded/fertilized areas are not disturbed. Fencing may be electrical, temporary and/or permanent depending upon the requirements and grazing practices of applicable occupants. Temporary fencing will be adequate until vegetation becomes established, is able to support the stress placed upon it by grazing, and becomes less palatable.
- Locations should be monitored monthly during growing seasons. Typical monitoring should occur in June, July, and August or until a Memorandum of Surrender has been obtained. Monitoring will consist of visually inspecting the areas to ensure vegetation has been

established and is healthy, erosion has been mitigated, and landowner concerns have been adequately mitigated.

ALBERTA ENVIRONMENT AND PARKS – WILDLIFE MANAGEMENT

'RENEWABLE ENERGY REFERRAL REPORT'

STAVELY SOLAR PROJECT

Alberta Environment and Parks

Wildlife Management
Operations Division
530 8th Street South, 2nd Floor
Lethbridge, Alberta T1J 2J8

September 20, 2018

Clyde Carr, President
Acestes Power ULC

Transmitted via email

Dear Mr. Carr,

RE: Renewable Energy Referral Report for the Stavely Solar Project by Acestes Power ULC

This letter is to advise that Alberta Environment and Parks - Wildlife Management (AEP-WM) Staff have completed the review of the project proposed by Acestes Power ULC, called Stavely Solar Project. Attached is a copy of the AEP-WM Renewable Energy Referral Report, which reviews the potential impacts of the project on wildlife and wildlife habitat for inclusion with your application to other regulatory agencies. This review is only for the project as it has been presented by the proponent and any changes to the project (footprint, layout, mitigation measures, etc.), requires further review and written acknowledgement from AEP-WM to ensure wildlife and habitat are protected.

Sincerely,

K. Cline

Kristin Cline, M.Sc., P.Biol.
Wildlife Biologist, Renewable Energy Projects
Alberta Environment and Parks - Wildlife Management
Kristin.Cline@gov.ab.ca

cc:
Brandy Downey, AEP-WM,
Robert McCallum, McCallum Environmental Ltd.,

Alberta Environment and Parks

Alberta Environment and Parks - Wildlife Management - Renewable Energy Referral Report

A. Alberta Environment and Parks – Wildlife Management (AEP-WM) - Wildlife Review:
The Stavely Solar Project (the Project) proposed by Acestes Power ULC (the Proponent) was reviewed by the Alberta Environment and Parks – Wildlife Management (AEP-WM) regional wildlife contact for renewable energy projects. AEP-WM has reviewed the proposed location, construction mitigation strategies, including associated infrastructure and construction plans, and post-construction monitoring and mitigation program as presented by the Proponent in a submission dated December 14, 2017 and accepted by AEP-WM on December 18, 2017.

Documents reviewed by AEP-WM include:

- *Environmental Effects Assessment for the Stavely Solar Project Alberta*; 104 pages; dated December 15, 2017 (with an updated version on Sept 5, 2018 in which only sections 8.31, 8.3.2 and 8.3.3 were reviewed); hereafter referred to as *Environmental Effects Assessment*
- *AEP Initial Review Questions_Stavely Solar_Acestes Responses.xlsx* (excel spreadsheet); dated September 5, 2018; hereafter referred to as *Acestes Responses Spreadsheet*
- *Habitat Figure - Stavely Solar_Acestes*; 1 page; dated September 5, 2018
- *Photo log - Stavely Solar_Acestes*; 7 pages; dated September 5, 2018

The AEP-WM review of the Stavely Solar Project siting and pre-construction surveys was guided by the *Wildlife Guideline for Alberta Solar Energy Projects* (2016; hereafter called the *Guideline*). The review of the construction, operation, and post-construction monitoring and mitigation plans was guided by the *Wildlife Directive for Alberta Solar Projects* (October 2017; hereafter called the *Directive*). This follows the AEP-WM process outlined in the administrative procedure, *Solar Energy Review Process: Transition from old (2016) Wildlife Guideline for Alberta Solar Energy Projects to new (2017) Wildlife Directives for Alberta Solar Energy Projects* (October 2017), since pre-construction wildlife surveys were initiated prior to the release of the *Directive*, but Project submission to AEP-WM occurred after the release of the *Directive*. Therefore reference to both the *Guideline* and *Directive* will occur throughout this document.

This referral report summarizes the review undertaken by AEP-WM that was restricted to reviewing information provided in the submitted documents, completed by McCallum Environmental Ltd. and Bear Tracks Environmental Services Ltd., and applying the wildlife standards and best management practices for the siting, construction and operation of the solar facility. This office undertook no independent onsite assessment. This referral report is not intended to relieve any party from any liability if there are detrimental effects to wildlife or wildlife habitat during construction or operation that were not identified and mitigated for in the documents submitted. It is the responsibility of the Proponent to ensure compliance under all other policy and legislation, including, but not limited to, the *Alberta Wetland Policy*, *Water Act*, *Code of Practice for Watercourse Crossings* and the *Environmental Protection and Enhancement Act*. AEP-WM review does not eliminate the need for review by other branches of the Environment and Parks Department or other governing bodies. This referral report summarizes the potential risks to wildlife and wildlife habitat based on the information provided to AEP-WM.

Summary: This summary is a condensed version of the entire referral report. For details on specific topics, see the body of this report. The overall project risk ranking is provided in the last paragraph of this summary.

The Stavely Solar Project is sited entirely on cultivated land and avoids named lakes, permanent watercourses and valley breaks, which aligns with AEP-WM policy. The Project has been sited to avoid all wildlife features, including the house, nest, den and lek of species of management concern; therefore the risk to wildlife features is considered low. The Proponent has provided adequate alternative mitigation for the infringement on the required setbacks of four watercourses and one wetland, which aligns with AEP-WM policy. AEP-WM has determined the risk of wildlife entrapment due to the Project fence is low, based on the commitments made by the Proponent. AEP-WM has determined the risk of wildlife mortality is low based on avian use in the Project area.

AEP-WM has ranked the Stavely Solar Project proposed by Acestes Power ULC, a low risk based on Project siting, limited wildlife use in the area and commitments made by the Proponent to mitigate and monitor wildlife impacts. This AEP-WM Renewable Referral Report expires on September 20, 2023.

Primary AEP-WM Reviewer Signature:

Signature: K. Cline Date: September 20, 2018
Printed Name, Position, and Office: Kristin Cline, Wildlife Biologist, South Saskatchewan Region Operations Division, Grassland District, Lethbridge, Alberta

Secondary AEP-WM Reviewer Signature:

Signature: Date: September 20, 2018
Printed Name and Position: Brandy Downey, Senior Species at Risk Biologist, South Saskatchewan Region Operations Division, Grassland District, Lethbridge, Alberta

B. Project Details:

Project Name: Stavely Solar Project (also referred to as the Project)
Proponent Name: Acestes Power ULC (also referred to as the Proponent)
Project Location: SE and NE-15-14-27W4M
Facility Type: Photovoltaic (PV) solar facility
Project Area: 37 hectares (ha)
Nameplate Capacity (total megawatts): 8.5 megawatts (MW)

C. Wildlife Concerns Related to Solar Energy: *Impacts to wildlife identified for all solar energy projects in Alberta, which forms the basis for project specific review.*

Habitat Loss, Disturbance and Avoidance

Solar facilities result in the direct loss of habitat for wildlife. Negative effects may include, but are not limited to, habitat fragmentation, site abandonment, loss of movement corridors and loss of foraging/breeding/brood rearing habitat. AEP-WM identified the potential negative effects of siting solar facilities in areas of native grasslands on wildlife, especially species at risk. AEP-WM requires siting the solar facility and associated infrastructure (access roads, substation, etc.) on cultivated or other previously disturbed lands that do not contain sensitive features, such as wetlands, to significantly reduce most of the negative effects on wildlife habitat.

AEP-WM initially identified the Stavely Solar Project is in the following species ranges:

- Sharp-tailed grouse
- Sensitive raptors (including ferruginous hawk, bald eagle, golden eagle and prairie falcon)

Direct Wildlife Impacts

AEP-WM identified concerns over the potential negative effects on wildlife caused by solar facilities or related infrastructure including access roads, transformer/invertor stations and collection lines. AEP-WM requires that pre-assessment site specific wildlife surveys, following the survey protocols outlined in the *Sensitive Species Inventory Guidelines*, be conducted for the following species:

- Spring and fall migration surveys
- Breeding bird surveys
- Raptor nest surveys
- Field investigations to determine habitat types

Additional wildlife surveys are required if the Project is located within a Key Range or Wildlife Layer, including, but not limited to, burrowing owl range, sharp-tailed grouse range, or colonial nesting bird range. If a species of management concern is identified, AEP-WM requires that areas immediately adjacent to key wildlife habitats be avoided by appropriate setbacks as outlined in the *Directive* and *Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural Regions of Alberta* (found here: http://aep.alberta.ca/fish-wildlife/wildlife-land-use-guidelines/documents/WildlifeLandUse-SpeciesHabitatGrasslandParkland-Apr28-2011.pdf).

Wildlife Movement and Fencing

Fencing can create hazards and barriers for wildlife, such as mammals, reptiles and birds. Fences can block or hinder daily wildlife movements, seasonal migrations and access to forage or watering sites. Due to human safety concerns solar photovoltaic sites are fenced to exclude people; this exclusion also impacts wildlife. AEP-WM requires that solar projects are fenced in a manner to prevent harm or mortality to wildlife and to facilitate reasonable wildlife movement through or around the solar project.

Wildlife Mortality

Bird mortalities have been documented at a number of solar facilities in North America. Bird mortality related to PV facilities is caused by impact trauma, predation and starvation. The mechanism of mortality for birds appears to vary between the family groups. Passerines often fly at the height of solar panels and appear to be at a high risk of collision as shown by higher rates of mortality than expected at solar facilities in operation. One potential explanation for this mortality is that passerines are attracted to the solar facility because of nesting opportunities on the infrastructure or swarms of positive polarotactic insects (i.e. insects attracted by polarized light reflected off a surface) that congregate on the solar panels. Significant mortalities of waterbirds, such as grebes, loons and some ducks, have been detected at PV sites. Water obligate birds, such as grebes and loons, which fail to die on impact, become stranded because they require water to take flight and subsequently succumb to starvation or predation. AEP-WM requires siting solar facilities away from areas with large concentrations of waterbirds, such as lakes, rivers, 'Important Bird Areas' and 'Wetlands for Tomorrow' wetlands. AEP-WM requires that three years of post-construction monitoring are conducted at all solar facilities to determine risk of the facility to wildlife, as per AEP-WM policy at the time of the project commissioning. Additional years of post-construction monitoring may be required if mitigation is needed, as determined by AEP-WM. Post-construction monitoring will include carcass searches, searcher efficiency trials, and scavenger removal rate trials. Post-construction monitoring must meet the requirements outlined in the *Directive*.

D. Wildlife Monitoring Program: *Completion of predevelopment surveys and submission of information to the Fisheries and Wildlife Management Information System (FWMIS).*

Pre-assessment survey data completed within 2 years of submission to AEP-WM:
Pre-assessment survey methods and results were provided in the *Environmental Effects Assessment* with clarifications provided in the *Acestes Responses Spreadsheet*.

Wildlife surveys conducted include:

- Fall Migration Surveys: September 1, 21, October 5, 25, and November 17, 2016
- Spring Migration Bird Surveys: March 24, April 7, 19, May 2 and 10, 2017
- Breeding Bird Surveys: early survey June 7 and late survey June 20, 2017
- Raptor Nest Surveys: June 7 and 20, 2017
- Sharp-tailed Grouse Lek Surveys: not conducted as no suitable habitat is present
- Wetland Assessment Surveys: June and July 2017
- Amphibian Call Surveys : June 7 and 10, 2017

The Proponent has committed to keeping wildlife surveys current by completing additional site specific wildlife surveys (i.e., raptor nest searches) every two years until the Project is commissioned as per standard 100.2.4 of the *Directive*. All wildlife related surveys (pre- and post-construction) and analysis of data are required to be conducted by experienced wildlife biologists as defined by the *Directive*. Survey results are to be submitted to the AEP-WM Fish and Wildlife Management Information System (FWMIS). The Proponent has committed to implementing

additional mitigation measures if any new sensitivities or features are detected, as determined by AEP-WM.

If the Project has not constructed within 5 years of this AEP-WM Renewable Energy Referral Report (i.e. expiry date: September 20, 2023), wildlife surveys will need to be updated and a new Renewable Energy Referral Report will be required as per standard 100.2.5 of the *Directive*. Wildlife surveys that would be required include, but may not be limited to breeding bird surveys, bird migration surveys (spring and fall), sharp-tail grouse surveys, amphibian surveys and raptor nest surveys.

E. Solar Energy Facility - Avoidance and Mitigation of Wildlife Risks: *Review of the proposed wildlife avoidance and mitigation strategies identified in the submission, in comparison with the Guideline and Directive.*

Habitat Loss, Disturbance and Avoidance

Project infrastructure, including, but not limited to, solar arrays (mounted on fixed tilt racking supported by driven or helical piles), transformers, collection lines, access roads, a perimeter fence, and staging area, etc., has been sited to avoid native habitat because the Project is sited entirely on cultivated land. This Project siting reduces the risk to wildlife habitat and aligns with AEP-WM policy.

The Project siting has avoided named lakes, large permanent watercourses, old growth forest stands and valley/coulee breaks. The Project area is not sited within 20 km of Regionally Significant Bird Areas. The nearest waterbodies in the area include Clear Lake (13 km east of the Project area) and Pine Coulee Reservoir (9 km west of the Project area); this is consistent with the required avoidance and setbacks from wildlife habitat. Setbacks from wetlands and small watercourses are discussed in the below section titled, *Wetlands* and *Watercourses*.

Overall, the siting of the Project is consistent with AEP-WM policy (*Guidelines* and *Directive*).

Direct Wildlife Impacts

Breeding Birds: Results from the 2017 breeding bird surveys show 95 individual birds from 30 species were observed at the five survey points for an average of 1.9 individual birds identified per minute. Most of the bird species observed are currently listed as secure and the only sensitive species or species-at-risk observed during the surveys were the Eastern kingbird and the Long-billed Curlew.

Disturbance will be reduced by limiting initial construction (i.e. site preparation and vegetation removal) during the dormant season under dry and/or frozen conditions as much as possible, as per the *Environmental Effects Assessment*. Given the Project siting, wildlife usage in the area, and the proposed mitigations, the risk to breeding birds is assessed to be low; this is consistent with AEP-WM policy (*Guidelines* and *Directive*).

House, Nests, Dens or Leks: Details on each survey targeting various wildlife features (house, nest, den or lek) are as follows:

- **Raptor nests:** The Proponent identified treed habitat around farmyards and in shelterbelts. One Swainson's hawk nest was observed east of Range Road 272 (12U 314694E 5561405N), which is within the required 100m setback from the Project area, but the nearest infrastructure is sited approximately 600m from the nest. Therefore the Project siting abides by the setback requirements.
- **Sharp-tailed Grouse leks**: No sharp-tail grouse lek surveys were conducted because the land in the entire Project infrastructure boundary is cultivated and the land within 500m from the Project area is not suitable lekking habitat.

The Project related infrastructure and disturbance is sited to avoid the active raptor nest setback and there were no other nests, houses, dens or leks of species of management concern observed during the appropriate surveys, therefore the Project is in alignment with AEP-WM policy (*Guideline* and *Directive*).

Wetlands: The Proponent has identified a seasonal wetland (Class 3) in the southeast corner of the Project area, which is fed by Clear Brook. The wetland is impounded on two sides by roadways, but still has the potential to provide habitat for wildlife. AEP-WM requires a 100m setback from all seasonal marshes and higher class wetlands (i.e. Class 3+). The Proponent has sited all infrastructure 230 m from the wetland, but the staging area is sited only ~50m from the wetland, which infringes on the setback. The Proponent has proposed the alternative mitigation that if erosion protection is required during construction, silt fencing will be installed on disturbed lands to protect the wetland from sedimentation. Given the survey results and the habitat characteristics of the area, this wetland likely provides habitat for some amphibians and foraging opportunities for various wildlife, though it is unlikely to provide habitat for sensitive amphibians or nesting habitat for birds. With the alternative mitigations proposed, this plan adequately protects the wildlife using this wetland and therefore aligns with by AEP-WM policy.

Watercourses: The Proponent has identified four watercourses within and adjacent to the Project area that may provide habitat for wildlife and may also function as a wildlife corridor. AEP-WM requires a 45m setback from intermittent/small permanent watercourses. This requirement is to conserve both the wildlife in the immediate area and wildlife moving through the area since watercourses are often used as corridors enabling wildlife movement in the local landscape. The following setbacks have been identified for each of the below watercourses:

- Watercourse 1 (seasonally intermittent): The distance from the Project infrastructure boundary to the watercourse varies between 20m and 45m, due to the meandering nature of the watercourse and the Project siting that uses the greatest extent of cultivated land currently located adjacent to the watercourse. Therefore the setback is infringed.
- Watercourse 2 (seasonally intermittent): This watercourse does not have a defined channel and is currently cultivated through within the Project infrastructure boundary. The Proponent has sited infrastructure to avoid Watercourse 2 by a 15m setback, which infringes on the required setback. However, since there is no natural vegetation associated with this watercourse, the habitat quality is considered low.
- Watercourse 3 (seasonally intermittent): Project infrastructure is located 50m from watercourse 3, which abides by the setback. However, the Project staging area is sited approximately 35m from the watercourse, which infringes on the setback requirements.

- Clear Brook (intermittent watercourse): The distance from the Project infrastructure boundary to the watercourse varies between 15m and 45m, due to the meandering nature of the watercourse and the Project siting that uses the greatest extent of cultivated land currently located adjacent to the watercourse. Clear Brook connects into Clear Lake, 13km to the east, so the channel provides a wildlife corridor for local movements.

The Proponent has proposed to implement alternative mitigation to reduce the impacts of the setback infringements on the above four watercourses. If during construction, erosion protection is required, silt fencing will be installed on disturbed lands to protect the watercourse from sedimentation. Once vegetation is re-established following construction, silt fencing will be removed. To protect wildlife movement using Clear Brook, no fencing, infrastructure, or temporary disturbance will occur within 15m of Clear Brook. With the alternative mitigations proposed, this plan adequately protects the wildlife using these watercourses and therefore aligns with by AEP-WM policy.

Collection Lines: The Proponent has committed to installing all electrical transmission and collection lines and cables underground, which is consistent with the requirements of AEP-WM policy (*Directive*).

Wildlife Movement and Fencing

The Proponent has committed to installing the perimeter security fence using straight lines, squared corners and raising the fence several inches off the ground to prevent brood separation or wildlife entrapment. The exact fence placement has not been finalized, but to align with the above commitment the Proponent will construct the fence in a straight line on the east edge of the solar array lands across where Watercourse 2 exits the solar array. This will reduce the setback from the watercourse by a few meters, but it will reduce the potential for a predator trap to occur if the fence were to exactly follow the edge of the solar array lands. The above commitments will reduce the risk of wildlife entrapment caused by the fence and is consistent with the AEP-WM *Directive*.

Wildlife Mortality

The Stavely Solar Project is sited away from named lakes, large permanent watercourses, valley/coulee breaks and on previously disturbed land, which reduces the habitat quality for wildlife and results in lower mortality risk for the Project.

During the five rounds of fall 2016 migration surveys, a total of 833 birds from 20 different bird species were identified (~1.0 bird observations per minute; 33 individuals incidentally observed outside the survey time or survey distance of 800m). During the five rounds of spring 2017 migration surveys a total of 716 birds from 30 different species were identified (~0.9 bird observations per minute; 10 individuals incidentally observed outside the survey time or survey distance of 800m). The most commonly observed species were the Canada goose, European starling and western meadowlark, which are listed as secure (or exotic in the case of the starling) and are abundant in the Project area. There were six species of management concern observed during the surveys, including the ferruginous hawk, long-billed curlew, American kestrel, Northern Harrier, Northern Goshawk and Swainson's hawk. AEP-WM has conducted a bird risk assessment based on the migration and breeding bird data and it was determined that most species observed

are currently listed as secure and one species at risk were observed. AEP-WM expects that the mortality risk will be low because the Project is small and sited on previously disturbed land with limited wildlife use. If mortality is found to be high, the Proponent has committed to mitigating wildlife mortality as discussed in the below section titled, *Post-Construction Monitoring and Mitigation*.

Construction and Operation Mitigation

AEP-WM requires the construction and operation mitigation plan, which outlines construction techniques, mitigation and standard operating procedures, will meet the requirements outlined in Stage 3 of the *Directive*. This does not preclude any liability under the *Wildlife Act*, the *Species at Risk Act*, or other legislation. AEP-WM considers all injured or dead wildlife found in the Project area during construction and operation of the facility to be caused by the facility. In the event that injured wildlife is found, AEP-WM will be notified and the Proponent will act in accordance with regulatory direction and requirements. All wildlife mortalities must be reported to AEP-WM.

Post-Construction Monitoring and Mitigation

AEP-WM requires the post-construction monitoring and mitigation plan to meet the requirements outlined in Stage 4 of the *Directive*. Post-construction monitoring for the proposed Project will include the following minimum standards (note that all surveys and analysis must be conducted by an experienced wildlife biologist as defined in the *Directive*):

- Three years of post-construction monitoring.
- Weekly mortality searches during the migratory periods and once every two weeks during the summer (i.e. between the migratory periods). The migratory periods for the Stavely Solar Project area are from March 1st to May 15th and from August 15th to November 15th.
- Surveys will be conducted across the entire Project area (37ha) since the Project is less than 10MW, as per standard 100.4.4 of the *Directive*.
- Carcass removal rates and searcher efficiency trials will be conducted to provide corrected fatality rate estimates. Enough carcasses should be used to ensure reasonable accuracy and precision of the estimated rates for carcass persistence and searcher efficiency.
- Corrected mortality will be estimated using acceptable industry standard or current AEP-WM policy at the time, in consultation with AEP-WM.
- All notable wildlife observations as well as observed changes in wildlife behavior, species composition, or potential threats to wildlife during the post-construction monitoring period will be documented and reported.
- A detailed report of the post-construction monitoring will be provided to AEP-WM and the Alberta Utilities Commission (AUC) annually by the end of December each year, or acceptable alternative, following the mortality monitoring period, as per standard 100.4.7 of the *Directive*.

A Wildlife Research Permit and Collection Licence must be obtained from AEP-WM prior to conducting the post-construction monitoring surveys. Should carcass surveys, at any time, result in unusually high fatality numbers or fatalities of species at risk (provincially and/or federally listed, including species listed as 'sensitive' provincially) carcasses must be collected, frozen and submitted to AEP-WM. The Proponent must *immediately* notify AEP-WM and the AUC of the

mortality event and then discuss mitigation measures. The Proponent has committed to implementing the post-construction monitoring and mitigation in accordance with the *Directive*.

The Proponent has committed to operational adaptive management strategies related to avian impacts or other wildlife disturbances related to the operation of the Stavely Solar Project. Should adaptive management be required, specific strategies will be developed and implemented in agreement with AEP-WM. Potential mitigation measures for excessive wildlife fatalities may include, but are not limited to:

- the use of avian deterrents;
- white gridlines on solar panels;
- installation of bird deterrents;
- installation of nest deterrents to prevent nesting of raptors; and
- any mitigation that is deemed appropriate based upon the site specific circumstances following consultation and agreement by AEP-WM.

If post-construction mitigation is required, as determined by AEP-WM, at least two additional years of monitoring will be required to determine if the mitigation is successful at reducing the fatalities to acceptable levels, as per the *Directive*. The Proponent has committed to abiding by the *Directive*, as summarized above, by implementing the post-construction monitoring and mitigation plan; therefore the plan is consistent with AEP-WM policy.

PARTICIPANT INVOLVEMENT PROGRAM REPORT

STAVELY SOLAR PROJECT

LAND & ENVIRONMENTAL SERVICES LTD.

ACESTES VENTURES LTD.

STAVELY SOLAR PROJECT

Participant Involvement Program (PIP) Report

November 2018

Prepared By:

Action Land & Environmental Services Ltd

Green Cat Renewables Canada Corporation

Prepared For:

Acestes Ventures Ltd

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1. INTRODUCTION

The Stavely Solar development will produce up to 8.5MW of power for supply to the local electricity distribution network. The development will occupy approximately 88 acres of land on the E½ 15-14-27 W4M.

The proposed development is located north of Township Road 142 and west of Range Road 272, a few kilometres east of the town of Stavely.

2. PARTICIPANT INVOLVEMENT PROGRAM OVERVIEW

This report provides detail of the Participant Involvement Program (PIP) undertaken for the Stavely Solar development in accordance with AUC Rule 007 Appendix A1. The purpose of the PIP is to ensure effective communication with key stakeholders including the public, local authorities, agencies, industry and government such that any concerns with the proposed development may be raised, properly addressed and, where possible, resolved.

The Stavely Solar development falls under the category '*Power plants, one to ten megawatts - rural*' for which the requirement is to notify landowners, occupants, residents within 1500m of the edge of the proposed power plant site boundary. Personal consultation with landowners, occupants and residents within 800m and notification with landowners, occupants and residents within 2000m was completed. **Appendix A** shows the consultation and notification radius map for 800m and 2000m. **Appendix B** shows the residence map

The PIP was undertaken by Action Land and Environmental Ltd. ("Action Land") with assistance from Green Cat Renewables Canada Corporation ("Green Cat Renewables") on behalf of Acestes Ventures Ltd. ("Acestes"). The PIP commenced in November 2017 with personal consultation with landowners, occupants and residents within 800m. Notification packages were mailed on November 3, 2017 to the landowners, local authority and industry within 2000m. A copy of the notification package is included in **Appendix D**. An Open House event was held in the nearby town of Claresholm on November 14, 2017 between 4pm-8pm. Additional notification letters providing a project update were sent to the landowners, occupants, residents, local authority and industry within 2000m on September 21, 2018. A copy of this update letter is included in **Appendix D**.

The following sections provide a summary of the consultation undertaken with the various relevant stakeholders as well as providing discussion and responses to any concerns or questions raised during the consultation process.

3. STAKEHOLDER CONSULTATION AND NOTIFICATION

3.1. CONSULTATION WITH LANDOWNERS AND RESIDENTS

The landowner and resident consultation list was developed by conducting land title searches to identify the landowners within 2000m. Aerial maps and ground truthing within the 800m radius was completed to confirm any affected residents within this zone. Personal consultation was conducted with landowners and residents within 800m and notification via regular mail was sent to the remaining landowners, local authority and industry within 2000m to the address listed on title. **Appendix A** shows the consultation and notification radius map for 800m and 2000m. The complete consultation and notification line list including mailing and contact information and the corresponding legal land description is included in **Appendix C**.

Each notification package contained the following:

- Project information and details including a summary of the environmental assessments, community benefits and a location plan
- An overview of the participant involvement program and project schedule
- Details of the open house event and contact information for Action Land to invite feedback regarding the proposed project
- AUC Brochure – Public Involvement in a proposed utility development

The letter as issued to stakeholders is included in **Appendix D.** Consultations were conducted with the landowners and residents within the 800m radius. These were conducted by phone and in person. It was not possible to complete personal consultation with AltaLink Management Inc., landowner of Area B Plan 1313327 in SW¼ 15-14-27 W4M. Numerous attempts to contact via email and telephone were made and no response was received.

A community open house event was advertised in the Claresholm Local Press on November 8, 2017. This advertisement is included in **Appendix E**. Invitations to the open house event were also included in the notification packages sent to landowners and residents. The open house was held on November 14th, 2017 between 4pm and 8pm in the nearby town of Claresholm in the local Community Centre. During the open house event display boards were presented providing information and details of the proposed solar project, these are provided in **Appendix F**. Representatives from Action Land, Green Cat Renewables and Acestes attended the open house and were on-hand to present the project information, answer questions and respond to any concerns raised. The project notification letters as well as the AUC 'Public Involvement in a Proposed Utility Development' document were also made available to attendees. The open house attendee list is provided in **Appendix G**. During the open house event True View Visualisation software was used to aid the discussions and to demonstrate how the development would appear in the landscape once built. A landscape and visual summary including the visualisation images is provided in **Section 4.1** below.

Questions and concerns raised by landowners and residents during this consultation and the responses provided are included in **Section 4** of this report.

3.2. CONSULTATION WITH INDUSTRY STAKEHOLDERS, GOVERNMENT AGENCIES AND LOCAL AUTHORITIES

The stakeholder consultation list for industry, government agencies and local authorities was developed by conducting land title searches in order to identify any industry stakeholders within 2000m of the proposed project. Notification packages were sent via regular mail to each identified stakeholder. The complete notification line list including mailing and contact information is included in **Appendix C**.

Each notification package contained the following information:

- Project information and details including a summary of the environmental assessments, community benefits and a location plan
- An overview of the participant involvement program and project schedule
- Details of the open house event and contact information for Action Land to invite feedback regarding the proposed project
- AUC Brochure – Public Involvement in a proposed utility development

Acestes met with the MD of Willow Creek development planning staff in November 2016 to introduce the project and to inquire about development permit requirements. They did not attend the open house in November 2017, but Acestes informed them on how it went (level of attendance and issues discussed). Throughout 2017 Acestes had various email exchanges and telephone calls with the MD of Willow Creek to seek clarifications on development permit requirements.

An application has been submitted to NAV Canada to ensure there are no glare issues. Given that the facility is not located within 6km of an aerodrome we do not anticipate any issues. Acestes will obtain NAV Canada approval prior to construction.

4. CONSULTATION AND NOTIFICATION RESPONSE

During the consultation and notification process a number of comments and queries were received from the landowners. The comments received are detailed in the below table:

Questions/Concerns	Response/Mitigation
Aesthetics and visual impact of project	During the open house event True View Visualisation software was used to aid the discussions and to demonstrate how the development would appear in the landscape once built. See below sections 4.1, 4.1.1, 4.1.2
Weed control	Perennial grass/hay will be established between the panel rows to control weeds and spraying will also be done when necessary
Fire Hazard	Grass will be mowed and adequate room will be left for a fire truck to access the site

4.1. LANDSCAPE AND VISUAL IMPACT

A site visit was undertaken by Green Cat Renewables to visually assess the baseline landscape conditions and to demonstrate at the open house what the project would look like.

4.1.1. Local Landscape

The local landscape is dominated by the large scale arable farming which defines the majority of the region. The site area is generally flat, becoming slightly more rolling to the east of the proposed site. There is a small drainage gully with a settlement pond next to range road 272 to the east of the proposed development site, with another drainage channel to the north of the site area.

4.1.2. Visual Impact

The visual impact of the proposed development is considered to be localised and at best those impacts will be minimal, given the relatively low lying overall height of the proposed development and the modest scale of the development. The main visual impacts will occur to the south, where the viewer will have a full view of the development. This is shown in **Figure 4.1**; the photo is taken from the side of Township Road 142 looking north.

Figure 4.1 – View of site, looking north from Township Road 142

Figure 4.2 - View of site, looking south-west from Range Road 272

Figure 4.3 - View of site, looking east from Range Road 273, near the substation.

APPENDIX A:

Consultation/Notification Radius Map

Stavely Solar Project

0 500 1,000 2,000 Metres

N W E S

- Project Area
- Staging Area
- 800m Consultation Radius
- 2000m Notification Radius

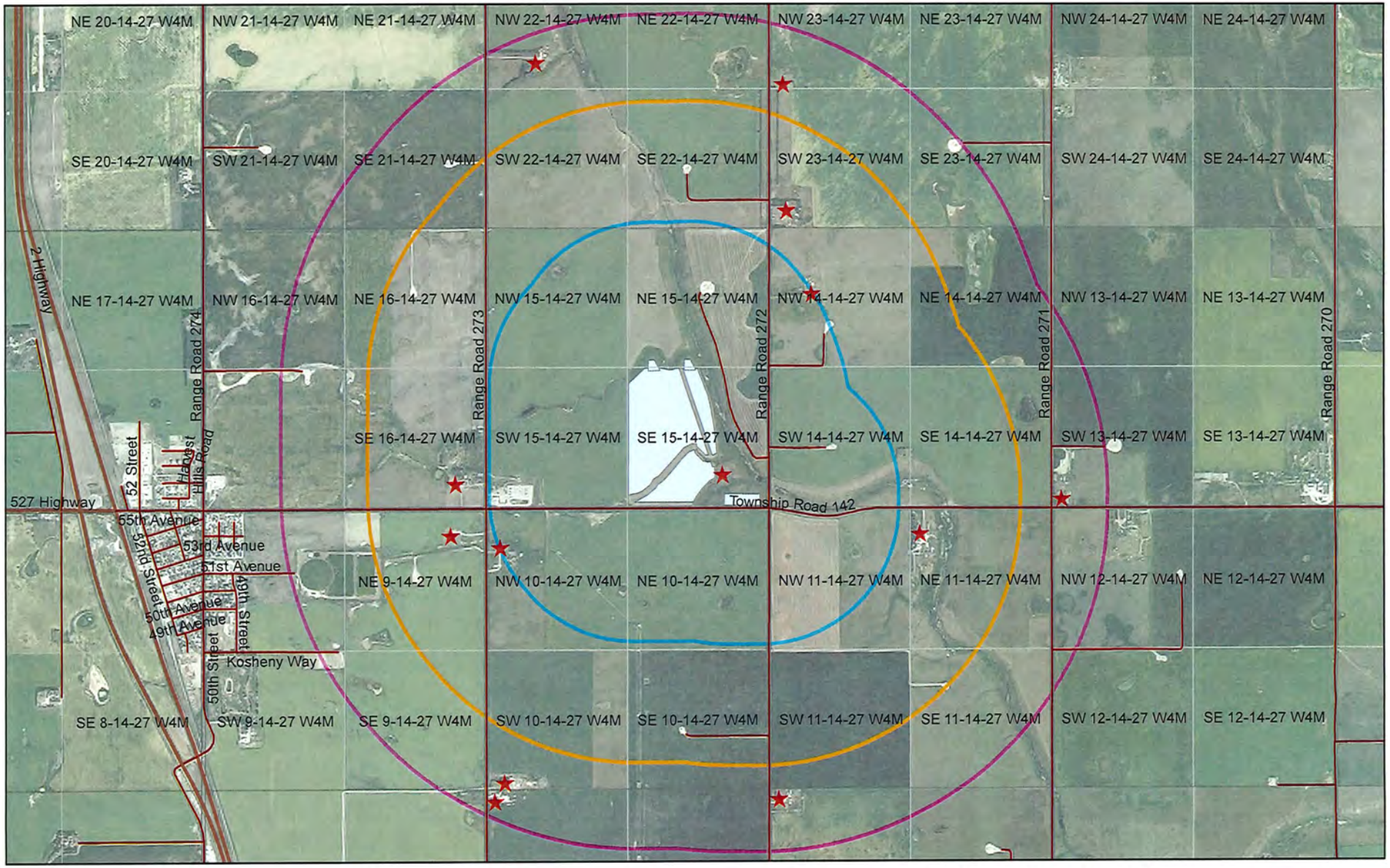
Prepared for: Acestes Ventures Ltd.
Date: August 30, 2018
Version: 1.1

ACESTES VENTURES

APPENDIX B:

Residence Map

Stavely Solar Project Residences



Metres
0 500 1,000 2,000

N W E S

Residences
Project Area
Consultation Radius (800 m)
Noise Buffer (1.5 km)
Notification Radius (2.0 km)

Prepared for: Acestes Ventures Ltd.
Date: August 30, 2018
Version: 1.2

ACESTES VENTURES

APPENDIX C:

Consultation/Notification Line List

Public Disclosure and Consultation Report
ACESTES VENTURES LTD.
STAVELY SOLAR PROJECT
Regulated Type: OTHER Regulated Category: OTHER

Producer Project: TBD | Producer Status: ACTIVE | Project Type: OTHER | AFE: TBD | Broker Project: 4600 | Broker Status: ACTIVE

Land Interest	Legal Descriptions	Stakeholder Details
CONSULTATION Landowner	Directly Affected Landowner: E½ 15-14-27 W4M	
CONSULTATION Landowner	Landowner within 0.8 km: NW¼ 11-14-27 W4M Landowner within 2.0km: SW¼ 11-14-27 W4M	
CONSULTATION Landowner	Landowner within 0.8 km: NW¼ 11-14-27 W4M Landowner within 2.0km: SW¼ 11-14-27 W4M	
CONSULTATION Landowner	Landowner within 0.8 km: N½ 10-14-27 W4M Landowner within 2.0 km: Portion of E¼ 16-14-27 W4M, Portion of NE¼ 21-14-27 W4M	
CONSULTATION Landowner	Landowner within 0.8 km: N½ 10-14-27 W4M Landowner within 2.0 km: Portion of E¼ 16-14-27 W4M, Portion of NE¼ 21-14-27 W4M	
CONSULTATION Landowners	Landowner within 0.8 km: S½ 14-14-27 W4M Landowner within 2.0 km: S½ 14-14-27 W4M	
CONSULTATION Landowner	Landowner within 0.8 km: S½ 14-14-27 W4M Landowner within 2.0 km: S½ 14-14-27 W4M	
CONSULTATION Landowner	Landowner within 0.8 km of: Portion of SW½ 15-14-27 W4M, Portion of NW¼ 15-14-27 W4M , Gas Line Right of Way (Plan GL49) in NW¼ 15-17-27 W4M	
CONSULTATION Landowner	Landowner within 0.8 km of: Area B Plan 1313327 in SW¼ 15-14-27 W4M	
CONSULTATION Landowner	Landowner within 0.8 km of: NW¼ 14-14-27 W4M Landowner within 2.0 km of: NE¼ 14-14-27 W4M	
NOTIFICATION Landowners	Landowner within 2.0 km: SE¼ 10-14-27 W4M, Portion of SE¼ 9-14-27 W4M, Portion of NE¼ 9-14-27 W4M, Portion of NE¼ 3-14-27 W4M	
NOTIFICATION Landowners	Landowner within 2.0 km: Portion of SW¼ 10-14-27 W4M	
NOTIFICATION Landowners	Landowner within 2.0 km: Lot 1 Block 2 Plan 9112039 in NE½ 9-14-27 W4M, Block 1 Plan 8610659 in N½ 9-14-27 W4M, Portion of SW¼ 9-14-27 W4M, Portion of NW¼ 9-14-27 W4M Industry Notification Local Authority	

Public Disclosure and Consultation Report
ACESTES VENTURES LTD.
STAVELY SOLAR PROJECT
Regulated Type: OTHER Regulated Category: OTHER

Producer Project: TBD | Producer Status: ACTIVE | Project Type: OTHER | AFE: TBD | Broker Project: 4600 | Broker Status: ACTIVE

Land Interest	Legal Descriptions	Stakeholder Details
NOTIFICATION Landowners	Landowner within 2.0 km: Lot 1 Block 3 Plan 1012948 in NE¼ 9-14-27 W4M	
NOTIFICATION Landowner Local Authority	Landowner within 2.0 km: Lot 1 Block 2 Plan 9112039 in NE¼ 9-14-27 W4M	
NOTIFICATION Landowners	Landowner within 2.0 km: Lot 1 Block 19 Plan 0815102 in NW¼ 9-14-27 W4M, Portion of NW¼ 9-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Portion of SW¼ 9-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0km: Portion of SW¼ 9-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: SW¼ 16-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: NW¼ 16-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: NW¼ 16-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: NW¼ 16-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: S½ 21-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: S½ 22-14-27 W4M, S¼ 23-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: N½ 22-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: N½ 22-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Lot 2 Block 1 Plan 0410645 in NW¼ 23-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Lot 2 Block 1 Plan 0410645 in NW¼ 23-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Lot 1 Block 1 Plan 0410644 in N½ 23-14-27 W4M, Portion of N½ 23-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Life Estate Owner - Portion of SW¼ 13-14-27 W4M, Portion of NW¼ 13-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Portion of SW¼ 13-14-27 W4M, Portion of NW¼ 13-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Portion of SW¼ 13-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: E½ 11-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: E½ 11-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Portion of NW¼ 12-14-27 W4M	

Public Disclosure and Consultation Report
ACESTES VENTURES LTD.
STAVELY SOLAR PROJECT
Regulated Type: OTHER Regulated Category: OTHER

Producer Project: TBD | Producer Status: ACTIVE | Project Type: OTHER | AFE: TBD | Broker Project: 4600 | Broker Status: ACTIVE

Land Interest	Legal Descriptions	Stakeholder Details
NOTIFICATION Landowner	Landowner within 2.0 km: Lot 1 Block 1 Plan 8911180 in NW¼ 12-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Lot 1 Plan 9112624 in NW¼ 2-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Portion of NW¼ 2-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: NW¼ 3-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Lot 1 Block 1 Plan 1410344 in SE¼ 9-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Block 1 Plan 9910498 in NE¼ 21-17-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0 km: Block 1 Plan 9910498 in NE¼ 21-14-27 W4M	
NOTIFICATION Landowner	Landowner within 2.0km: Lot 2 Block 19 Plan 0815102 in NW¼ 9-14-27 W4M	
NOTIFICATION Landowners	Landowner within 2.0 km of: Gas line right of way (Plan GL49) in Portion of E½ 16-14-27 W4M, Gas Line Right of Way (Plan GL49) in S½ 23-14 -27 W4M and SE¼ 22-14 -27 W4M Gas Line Right of Way (Plan GL24) in Portion of NW¼ 13-14-27 W4M Industry Notification	ATCO Gas, a division of ATCO Gas and Pipelines Ltd. Contact: Cheryl Smith 909 - 11 Avenue S.W. Calgary, Alberta Canada T2R 1L8 Phone: (403) 245-7864 Email: southlandadmin@atcogas.com
NOTIFICATION Other Interested Parties Industry Notification		FortisAlberta Inc. Contact: Jay Brar 15 Kingsview Road S.E. Airdrie, Alberta Canada T4A 0A8 Phone: (403) 514-4119 Fax: (403) 514-4411 Email: landserv@fortisalberta.com
NOTIFICATION Other Interested Parties Industry Notification		Canadian Natural Resources Limited Contact: Crossing Administrator 2500, 855 - 2 Street S.W. Calgary, Alberta Canada T2P 4J8 Phone: (403) 517-6700 Email: crossingadmin@cnrl.com
NOTIFICATION Other Interested Parties Industry Notification		AltaLink Management Ltd. Contact: Crossing/Proximity Administrator 2611 - 3 Avenue S.E. Calgary, Alberta Canada T2A 7W7 Phone: (403) 387-3561 Fax: (403) 267-3404 Email: 3rdpartyrequests@altalink.ca
NOTIFICATION Other Interested Parties Industry Notification		Telus Communications Inc. Contact: Administrator 715 - 41 Avenue N.E. Calgary, Alberta Canada T2E 3P8 Phone: (403) 530-4892 Fax: (403) 276-7202 Email: rightofwayab@telus.com
NOTIFICATION Other Interested Parties Industry Notification		ConocoPhillips Canada Resources Corp. Contact: Surface Land Department 1600, 401 - 9 Avenue S.W. Calgary, Alberta Canada T2P 2H7 Phone: (403) 233-4000 Fax: (403) 260-2166 Email: roaduse@conocophillips.com
NOTIFICATION Other Interested Parties Industry Notification		Long Term Asset Management Inc. Suite 100 - 250 - 2nd Street S Calgary, Alberta Canada T2P 0C1

Public Disclosure and Consultation Report
ACESTES VENTURES LTD.
STAVELY SOLAR PROJECT
Regulated Type: OTHER Regulated Category: OTHER

Producer Project: TBD | Producer Status: ACTIVE | Project Type: OTHER | AFE: TBD | Broker Project: 4600 | Broker Status: ACTIVE

Land Interest	Legal Descriptions	Stakeholder Details
NOTIFICATION Other Interested Parties Industry Notification		Oldman River Regional Services Commission 3105 - 16th Avenue North Lethbridge, Alberta Canada T1H 5E8 Phone: (403) 327-6847 Email: admin@orrsc.com
NOTIFICATION Other Interested Parties Industry Notification		AltaGas Services Inc. Contact: Administration 5509 - 45 Street Leduc, Alberta Canada T9E 6T7 Phone: (780) 986-5215 Fax: (780) 980-6769

APPENDIX D:

Project Specific Information Package

November 3, 2017

Dear Stakeholder:

RE: Proposed Solar Power Plant

On behalf of Acestes Ventures Ltd. ("Acestes") I am writing to inform you about a proposed solar power plant in your community. The plant will occupy approximately 88 acres on the SE 15-14-27W4M [and NE 15-14-27W4M] north of Township Road 142 and west of Range Road 272, a few kilometres east of the town of Stavely. Please see the enclosed map for details. We are providing you some basic information in this letter about the project and upcoming community open house. We encourage you to attend the open house, ask questions and provide your feedback. The meeting details are provided below.

Acestes is a subsidiary of the Mayel Group, a family-owned group of businesses active in agriculture in southern Alberta for over 100 years.

Project Description

The solar plant will produce up to 8.5 megawatts (MW) of power onto the local electric distribution grid, enough to power up to 2,000 homes per year. Photovoltaic panels are mounted on racking systems and tilted at an angle toward the sun to convert the sun's natural energy into direct current (DC) power. The rows are spaced apart from each other to avoid shadowing from the sun, and the spacing is maintained with vegetation, similar to this illustrative picture (right).

An electrical gathering system gathers (DC) power from the solar panels to inverters situated through-out the plant to convert from DC power to alternating current (AC) power and then takes the power to a transformer to increase the voltage to 25 kilovolt (kV) and deliver it onto the local electric distribution grid.

The project will adhere to all setbacks from roads, property lines, and right-of-way's required by the Municipal District of Willow Creek. In addition, a storm water management plan is being prepared to ensure that the solar plant will have no negative affects adjacent land usage.

Environmental and Noise Assessments

An environmental assessment has been completed which has found no negative environmental affects. The assessment is being submitted to Alberta Environment and Parks for review, and will be included as part of our permitting application to the Alberta Utilities Commission. Also, as required by the Alberta Utilities Commission, a noise impact assessment is being completed. Solar facilities are extremely quiet, and we expect the noise assessment to find that the plant will create little or no noticeable change to existing noise levels.

Community Benefits

There are a number of potential community benefits associated with the development of solar energy projects.

Long-term tax revenue - The solar plant will provide ongoing tax revenue benefits to the Municipal District of Willow Creek over its life span, which in turn will feed into improvement of municipal services.

Local Employment Opportunities – Construction of the solar project will require many skills and trades, and is expected to require over 100 workers. There will also be on-going job opportunities during the operational life of the plant.

Boosting Local Economy - Workers are expected to require accommodations and services while working on the project in the construction phase, helping to boost local businesses in the hospitality sector.

Local supply of clean power – The solar plant will provide a local source of power that is clean and renewable. By connecting to the electric grid at the local distribution level, the plant will help reduce the need for expensive upgrades to the large-scale transmission power grid in the area, which over time could help to reduce everyone's electric utility bills.

Next Steps

The project must receive several approvals, including Alberta Environment and Parks, the Alberta Utilities Commission (AUC) and a development permit from the Municipal District of Willow Creek. The proposed project schedule is as follows:

Activity	Timeframe
Notify Stakeholders	October 2017
Community Open House for Stakeholders	November 2017
Approval from Alberta Environment and Parks	December 2017
Submission of AUC Application	December 2017
Submission of Development Permit Application	Winter 2018
Start of Project Construction	Spring 2018
Project Becomes Operational	Fall 2018

Participant Involvement Program

With the assistance of Action Land & Environmental Services Ltd., Acestes is undertaking a Participant Involvement Program (PIP), as part of the AUC Rule 007 approval process. The process is intended to inform and engage landowners and residents near the proposed solar farm. The PIP includes this mailed notice to stakeholders within 2km of the project, personal communications with stakeholders within 800 metres of the project, and a community open house. Stakeholders with questions or concerns are encouraged to attend the community open house. Please see the enclosed document prepared by the AUC, called "Public Involvement in a Proposed Utility Development", for further information on the PIP.

Open House

Acestes will be holding a community open house to allow stakeholders to meet our company, learn more about the project, ask questions and discuss any concerns. Details for the open house are as follows:

November 14, 2017
From 4 – 8 p.m.
Claresholm Community Centre
5920 – 5928 59th Avenue W, Claresholm

Your feedback is important to us. To learn more about the project and provide your input, or to arrange a personal consultation, please contact Action Land & Environmental Services Ltd. by telephone, email or mail:

Box 20096, Kensington PO
Medicine Hat, Alberta T1A 8M4
Phone: (403) 528-2558
Email: info@actionland.ca

Kindest regards,

Jason Tweten
Action Land & Environmental Services Ltd.

Encl. Alberta Utilities Commission Public Involvement in a Proposed Utility Development


Information
ACESTES
Stavely Solar, Township Rd 142 &
Range Rd 272, Stavely, AB
Site Location Plan

ACESTES VENTURES

September 21, 2018

Dear Stakeholder:

RE: Proposed Solar Power Plant

On behalf of Acestes Ventures Ltd. ("Acestes") I am writing to update you about a proposed solar power plant in your community. The first project notification letter was mailed and/or hand delivered in November 2017, followed by a community Open House held at the Claresholm Community Centre on November 14, 2017. Since then we have been working on the project design, permitting activities, and preparing for the next steps.

Project Description

The plant will produce up to 8.5 megawatts (MW) of power onto the local electric distribution grid, enough to power up to 2,000 homes per year. It is planned to be located on SE 15-14-27W4M, north of Township Road 142 and west of Range Road 272. Please see the attached preliminary site layout.

Surface Water Management Plan

A storm water management plan has been prepared to ensure that the solar plant will have no negative effects on adjacent land usage. A copy of the storm water management plan will be included as part of our permitting application to the Alberta Utilities Commission.

Environmental Assessment

An environmental assessment has been completed by McCallum Environmental Ltd. which has found no negative environmental effects. The assessment was submitted to Alberta Environment and Parks (AEP) on December 14, 2017 for review and is progressing through the AEP process. A copy of the assessment will be included as part of our permitting application to the Alberta Utilities Commission.

Noise Assessment

As required by the Alberta Utilities Commission, a Noise Impact Assessment (NIA) has been completed by RWDI. This NIA has found that cumulative noise levels including the Project will comply with the day time and nighttime permissible sound levels as require by AUC Rule 012 and that there is low potential for low frequency noise to be generated by the Project. A copy of this assessment will be included as part of our power plant application to the Alberta Utilities Commission.

Glare Analysis:

A glare analysis was completed by Apricity Renewables Inc. and concluded that there would not be any hazard due to glare at any of the observation points evaluated, and that residents near the arrays will not be adversely affected by the installation of the Project. A copy of this assessment will be included as part of our power plant application to the Alberta Utilities Commission.

Revised Project Schedule

Below is our updated Project schedule which has been adjusted through our planning phase:

Activity	Timeframe
Notify Stakeholders	November 2017
Community Open House for Stakeholders	November 2017
Stakeholder Update Mailout	September 2018
Approval from Alberta Environment and Parks	Sep/Oct 2018
Submission of AUC Application	October 2018
Submission of Development Permit Application to MD of Willow Creek	Oct/Nov 2018
Start of Project Construction	Fall 2019
Project Becomes Operational	Summer/Fall 2020

Participant Involvement Program

With the assistance of Action Land & Environmental Services Ltd., Acestes is undertaking a Participant Involvement Program (PIP), as part of the AUC Rule 007 approval process. The process is intended to inform and engage landowners and residents near the proposed solar farm. The PIP includes this mailed notice to stakeholders within 2km of the project and personal communications with stakeholders within 800 metres of the project. Please see the enclosed document prepared by the AUC, called "Public Involvement in a Proposed Utility Development", for further information on the PIP.

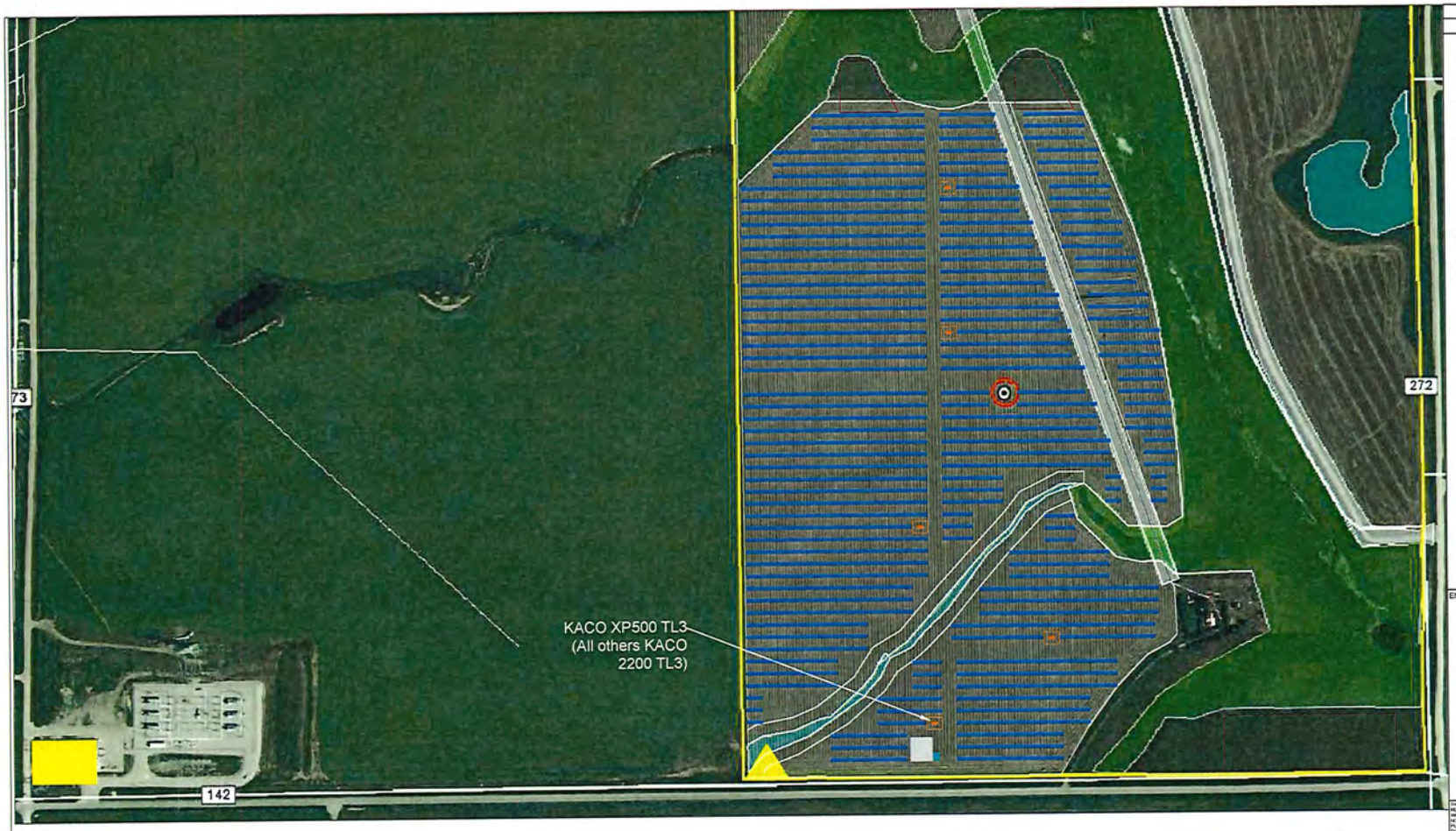
Your feedback continues to be important to us. To learn more about the project and provide your input, or to arrange a personal consultation, please contact Action Land & Environmental Services Ltd. by telephone, email or mail:

Box 20096, Kensington PO
Medicine Hat, Alberta T1A 8M4
Phone: (403) 528-2558
Email: info@actionland.ca

Kindest regards,

Jason Tweten
Action Land & Environmental Services Ltd.

Encl. Alberta Utilities Commission Public Involvement in a Proposed Utility Development



SHEET 1 OF 3

Notes and General Conditions

1. This is a preliminary drawing only and shall not be used for construction, detailed cost estimates, Bills of Material, or for any other such purpose than that described by Apricity Renewables Inc. in the associated feasibility report.
2. PRELIMINARY LAYOUT SUMMARY DETAILS:

MODULES
ASSUMING 365W 72 Cell Modules

Overall Plant Size
37832 Modules
13.8 MW DC
8.5 MW AC
DC/AC Ratio 1.62

Minimum Setbacks
Roads: 125'
Property with dwellings: 33'
Pipelines: 33'
Adjacent Farm-land: 20'

ENGINEER'S SEAL:

Client:
Acestes Power

Project Address:
Township Rd 142 & Range Rd 272, Stavely, AB

Additional Details:
XXXXX

Drawing Title:
Site 3

Drawing No.:
1601501_Layout 3

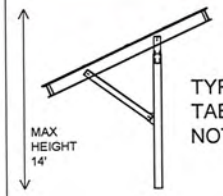
REV.	DESCRIPTION	DATE	BY
04	FEASIBILITY - Adjusted window zoom	09/20/17	BM
03	FEASIBILITY - 11m RS. 1.62.08	11/20/17	BM
02	FEASIBILITY - 9m RS. 17.08	11/07/17	BM
REVISIONS			
Designed By:	BM	Date:	01/10/16
Checked By:	NP	Date:	01/10/16

507 Confach Cres,
Peterborough, ON
T. 647-402-8313
www.apricityrenewables.com

ARI

LEGEND

- INTERCONNECTION POINT
- PROPOSED FEEDER ROUTE
- PANELS
- INVERTERS and REQ. AREA
- SWITCHGEAR AREA
- STAGING AREA
- SITE BUILDING/SHED
- SUBSTATION



TYPICAL MODULE
TABLE PROFILE VIEW
NOT-TO-SCALE

APPENDIX E:

Open House Advertisement

ARTISTS - The Livingstone Range School Division hosted their 11th annual Emerging Artists' Gala to recognize student artists of all grades throughout the division. Above at left is Stavely student Caden Keeley of Stavely Elementary School who won for his art work, entitled "Bucking Bull"; while at right is Shaelah Wicks of Willow Creek Composite High School who received two prizes with certificate and cash award. Photos by Lawrence Gleason

Student art work recognized at Emerging Artists' Gala

By Lawrence Gleason
Local Press Writer

It was a full house at the Livingstone Range School Division 11th Annual Emerging Artists Gala where 85 students from nine communities were recognized for art work, chosen as the best among their peers.

The event was held at the Livingstone Range School Division central office in Claresholm on Tuesday, Oct. 17.

"It was very hard do narrow down what you now see as the art pieces on the wall," said Trustee Lori Hodges. "The students at Livingstone Range do amazing work."

Art teacher Shannon Tynan said recognizing and celebrating student art work is not something done in every school division.

"I am so honoured to work in a school division that does this," Tynan said. "I don't know of any other school division that puts on an art gala for their students."

The artwork will stay up on the hallway walls of the school board office until spring.

Some of the artwork is for sale and if there is a for sale tag on it is available for purchase.

Purchased art work will stay on the school board walls until spring, when it will be sent to the purchaser. The school division also keeps the art frames for future student art work.

Each student received a certificate and a cash award. The event was catered with a mix-and-mingle for parents, school staff and students afterward.

The local winners were:

Stavely

- Caden Keeley, Grade 1, "Bucking Bull";
- Elena Reinhard, Grade 2, "Flowering Tree".

Claresholm West Meadow Elementary School

- Ruth Leishman, Grade 1, "Seasons Tree";
- Chase Skelliter, Grade 6, "Keith Haring Dance Movement".

Willow Creek Composite High School

- Bailey Gustman, Grade 9, "Self Portrait";
- Caitie Connor, Grade 10, "Weave";
- Shaelah Wicks, Grade 12, "Shine";
- Shaelah Wicks, Grade 12, "Tree".

Granum students get hands-on lessons on environment

By Lawrence Gleason
Local Press Writer

Granum School students had a visit from the Canadian Parks And Wilderness Society (CPAWS) recently, a conservation organization working to protect wilderness regions.

Jaclyn Angotti, the Southern Alberta education director for CPAWS, spoke to every student present at the school for four lectures, Kindergarten and Grade 1 students together, Grades 2 and 3 together, learning about species at risk, including the Swift Fox, Whooping Crane, Leopard Frogs, and Woodland Caribou, and Alberta ecosystems. Grade 5 and 6 students learned about wetlands, and Grades 7, 8 and 9 learned about grizzly bears.

"It was great. The students were having a lot of fun," said Angotti. "They seemed to be really happy we were there."

CPAWS gives interactive lectures, with games, dressing up, and activities.

A part of learning about how frogs are part of the wetlands ecosystem was to help students dress like frogs, with webbed feet – put on like snowshoes, goggles for the big frog eyes and a plastic bag pullover for frog skin.

"We also talk with students on what they can do to help take care of our ecosystem," said Angotti.

Two schools, including Granum School and a school north of Calgary, were chosen to be visited by CPAWS.

FROGGIE - Grade 6 student Merrik Whelan poses as a frog as part of the hands-on activities of the Canadian Parks And Wildlife Society, during its visit to Granum School on Oct. 18 and 19. Photo by Lawrence Gleason

APPENDIX F:

Open House Information Boards

INTRODUCTION

The Proposal

The proposal is for the installation of a solar power plant, comprising of Solar Photovoltaic (PV) panels, which will be located on approximately 88 acres on the SE 15-14-27W4M and NE 15-14-27W4M north of Township Road 142 and west of Range Road 272, a few kilometres east of the town of Stavely.

The development is being proposed by Acestes Ventures Ltd, a subsidiary of the Mayel Group, a family-owned group of businesses active in agriculture in southern Alberta for over 100 years.

Project Description

The solar plant will produce up to 8.5 megawatts (MW) of power onto the local electric distribution grid, enough to power up to 2,000 homes per year. Photovoltaic panels are mounted on racking systems and tilted at an angle toward the sun to convert the sun's natural energy into direct current (DC) power. The rows are spaced apart from each other to avoid shadowing from the sun, and the spacing is maintained with vegetation, similar to this illustrative picture (right).

An electrical gathering system gathers (DC) power from the solar panels to inverters situated through-out the plant to convert from DC power to alternating current (AC) power and then takes the power to a transformer to increase the voltage to 25 kilovolt (kV) and deliver it onto the local electric distribution grid.

The project will adhere to all setbacks from roads, property lines, and right-of-way's required by the Municipal District of Willow Creek. In addition, a storm water management plan is being prepared to ensure that the solar plant will have no negative affects adjacent land usage.

ACESTES VENTURES

Environmental and Noise Assessments

An environmental assessment has been completed which has found no negative environmental affects. The assessment is being submitted to Alberta Environment and Parks for review, and will be included as part of our permitting application to the Alberta Utilities Commission.

Also, as required by the Alberta Utilities Commission, a noise impact assessment is being completed. Solar facilities are extremely quiet, and we expect the noise assessment to find that the plant will create little or no noticeable change.

ACESTES VENTURES

COMMUNITY BENEFITS

There are a number of potential community benefits associated with the development of distribution scale solar energy projects.

Long-term Tax Revenue

The solar plant will provide ongoing tax revenue benefits to the Municipal District of Willow Creek over its life span, which in turn will feed into improvement of municipal services.

Local Employment Oportunity

Construction of the solar project will require many skills and trades, and is expected to require over 100 workers. There will also be on-going job opportunities during the operational life of the plant.

Boosting Local Economy

Workers are expected to require accommodations and services while working on the project in the construction phase, helping to boost local businesses in the hospitality sector.

Local Supply of Clean power

The solar plant will provide a local source of power that is clean and renewable. By connecting to the electric grid at the local distribution level, the plant will help reduce the need for expensive upgrades to the large-scale transmission power grid in the area, which over time could help to reduce everyone's electric utility bills.

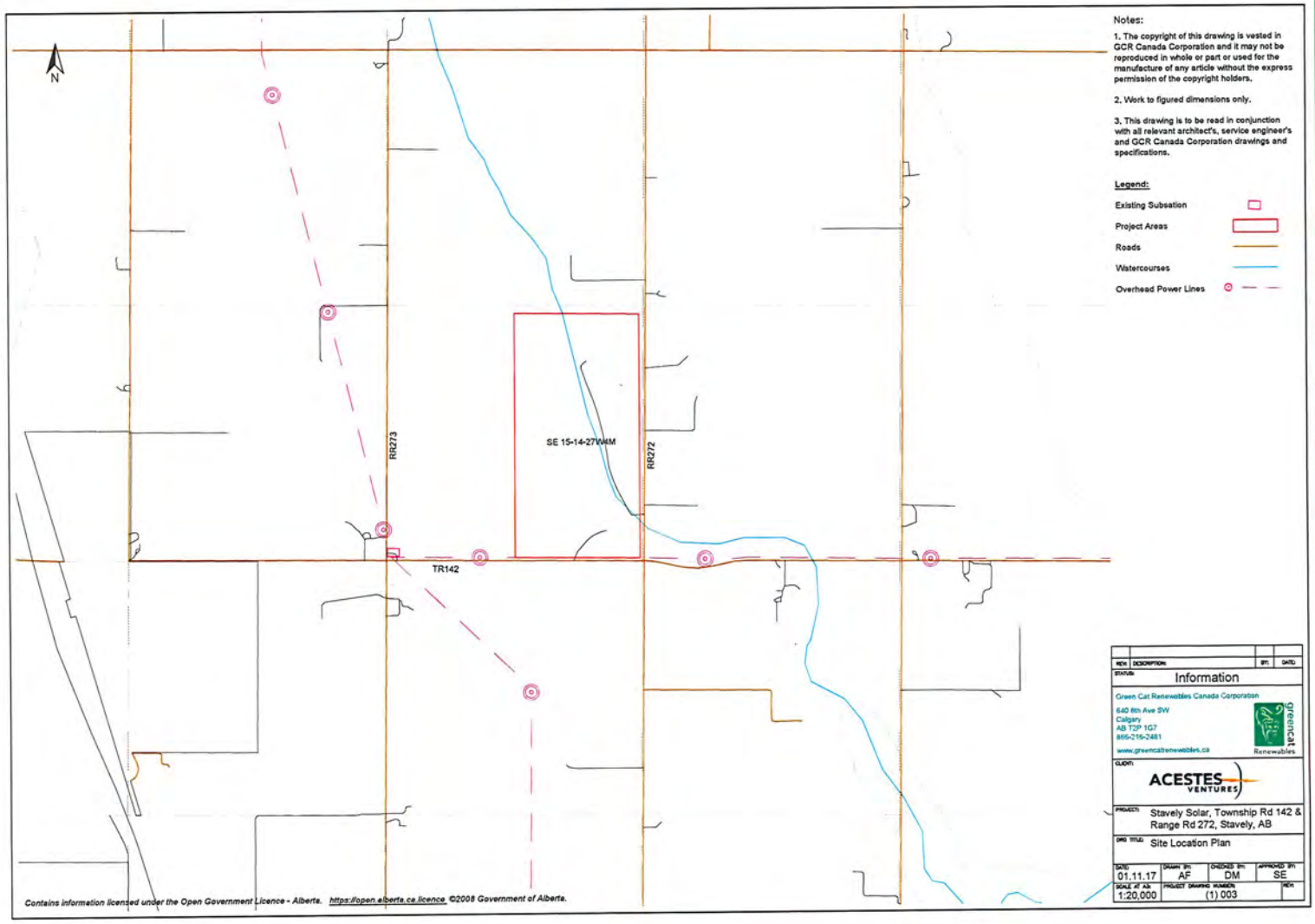
SITE PLAN

ACESTES VENTURES

The site plan shows the proposed location of the solar power plant.

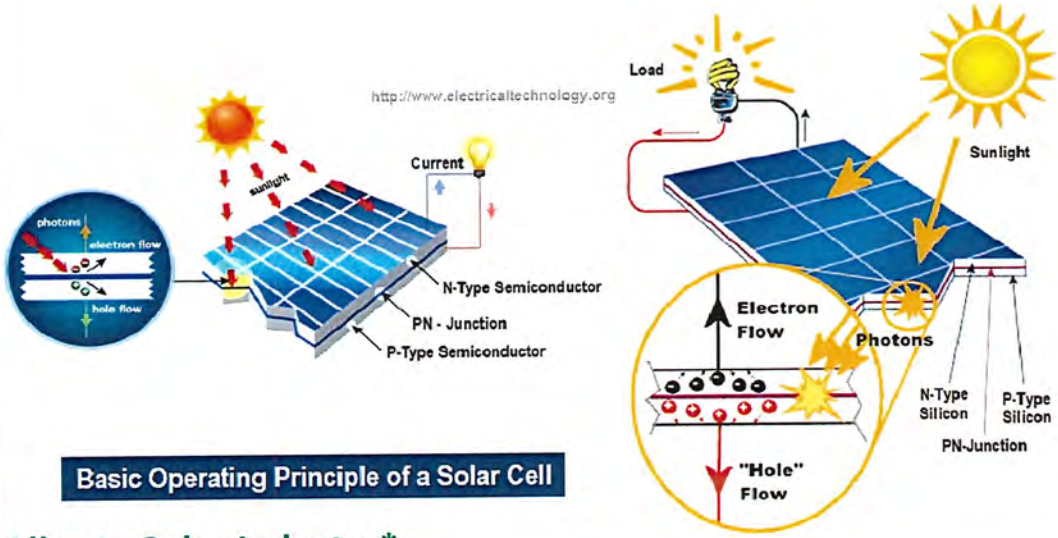
Covering approximately 88 acres north of Township Road 142 and west of Range Road 272, a few kilometres east of the town of Stavely.

The solar plant will produce up to 8.5 megawatts (MW) of power onto the local electric distribution grid.



TECHNOLOGY

ACESTES VENTURES



Basic Operating Principle of a Solar Cell

How Do Solar Panels Work

Put simply a solar cell works like this: Inside a solar cell you have two wafer-thin layers of silicon crystal, placed on top of each other to make a sort of silicon sandwich. The top layer has been specially treated so that its atoms are unstable — they have one too many electrons that they would really like to get rid of. The bottom layer has also been treated, but this time the atoms have a few empty spaces that could really do with an electron to fill them. So the top layer is desperate to lose a few electrons, the bottom layer is desperate to gain a few electrons, and the electrons themselves are itching to move from the top layer to the bottom. This setup puts everything in place for electricity to be produced.

There is just one problem: the electrons within silicon crystal can't move around freely — not until the solar panel is exposed to light.

Alberta Solar Industry*

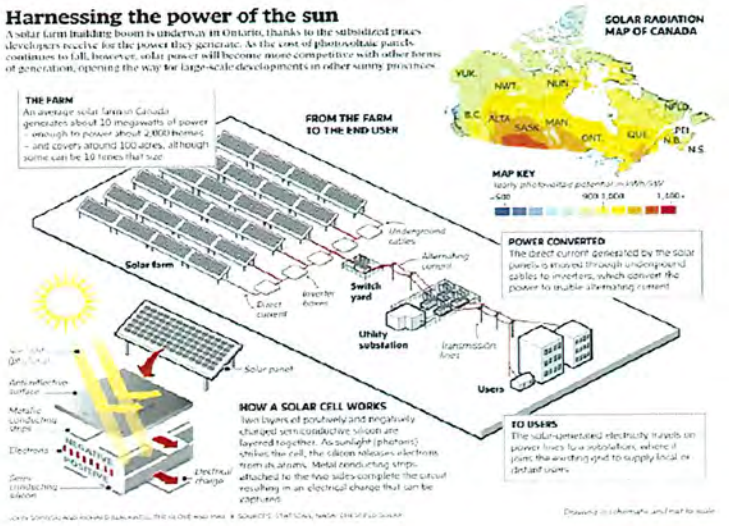
Energy Efficiency Alberta's $36-million Residential and Commercial Solar Program launched on June 21, 2017;

Alberta's new $36-million Residential and Small Commercial Solar program will support the installation of solar electricity generation on residential, multi-residential and small commercial roofs across the province with the goal of achieving 10,000 new rooftop solar installations;

Alberta's "Renewable Electricity Act" establishes a target for at least 30% of the electric energy produced in Alberta per year to be produced from renewable energy resources by the end of 2030 up from 10% in 2016;

Alberta's Renewable Electricity Program (REP) will support 5,000 MW of renewables through annual procurements starting with the first 400 MW round in 2017;

On May 9, 2017, the Government of Alberta launched a Negotiable Request for Proposals (NRFP) for the supply of 135,000 MWh of solar electricity to the Government of Alberta annually.



*Information provided by CanSIA (Canadian Solar Industries Association)

NEXT STEPS

The project must receive several approvals, including Alberta Environment and Parks, the Alberta Utilities Commission (AUC) and a development permit from the Municipal District of Willow Creek. The proposed project schedule is as follows:

Activity	Timeframe
Notify Stakeholders	October 2017
Community Open House for Stakeholders	November 2017
Approval from Alberta Environment and Parks	December 2017
Submission of AUC Application	December 2017
Submission of Development Permit Application	Winter 2018
Start of Project Construction	Spring 2018
Project Becomes Operational	Fall 2018

PARTICIPANT INVOLVEMENT PROGRAM

With the assistance of Action Land & Environmental Services Ltd., Acestes is undertaking a Participant Involvement Program (PIP), as part of the AUC Rule 007 approval process. The process is intended to inform and engage landowners and residents near the proposed solar farm.

The PIP includes this community open house, as well as mailed notice to stakeholders within 2km of the project and personal communications with stakeholders within 800 metres of the project.

Your feedback is important to us. Please discuss the proposal with one of the project team who are in attendance this evening. If you have any further questions following on from the open house this evening, please contact Action Land & Environmental Services Ltd. by telephone, email or mail:

Contact Info:

Box 20096, Kensington PO,Medicine Hat, Alberta T1A 8M4

Phone: (403) 528-2558

Email: info@actionland.ca

APPENDIX G:

Open House Sign-in Sheet

1967455 Alberta Ltd.

Leonard Emil Sundquist

Ca

Marjorie Rose Sundquist

Timothy David Nelson

Christine Elizabeth Nelson

Alfred Hugh Dunlop

Margaret Patricia Dunlop

Beatrice Catherine Egger

AltaLink Management Ltd.

Dorothy Irene Larson

Hutterite Brethren Church of Granum

Myrna Yvonne Bradley

The Town of Stavely

Cherise Colby Yorgason

The Municipal District of Willow Creek No. 26

Stavely & District Agricultural Society

James Andrew Watson

Leanne Olesen

Carol Bonetti

Vera Doris Eskeland

Charlene Fairclough

Vicki Campbell

Snethun Holdings Ltd.

Rav Edwin Malchow

Lawrence Edward Nelson

Theresa Gail Nelson

Timothy Cambridge

Lisa Cambridge

The Hutterite Brethren of Parkland

Jeanette Eleanor Nelson

Douglas Lloyd Nelson

Robert Glen Jones

Stephen Ross Sundquist

Cheryl Lynn Sundquist

John A E Carlson

Gaylene Carlson

Teresa Marie Husted

Husted Holdings Ltd.

Irene Margaret Yorgason

Daryl Nolan Yorgason

Gregory Victor Soetaert

Jade Elizabeth Soetaert

James Andrew Watson

ATCO Gas, a division of ATCO Gas and Pipelines Ltd.
Contact: Cheryl Smith

FortisAlberta Inc.

Canadian Natural Resources Limited

AltaLink Management Ltd.

Telus Communications Inc.

ConocoPhillips Canada Resources Corp.

Long Term Asset Management Inc.

Oldman River Regional Services Commission

AltaGas Services Inc.
Contact: Administration

PROPOSED HAUL ROUTE

STAVELY SOLAR PROJECT

Stavely Solar Project

Haul Route

ACESTES POWER

Project Area

Haul Route

N
W E
S

Meters

0 670 1,340

Scale: 1:20,000

Coordinate System: NAD 1983 UTM Zone 12N

Author: Dave Taylor
Contact: (403) 261-6529
Version: 1.0

AVT-0005

SCOTT LAND & LEASE LTD – 25+ YEARS –

NOISE IMPACT ASSESSMENT

STAVELY SOLAR PROJECT

FINAL REPORT

STAVELY SOLAR POWER PROJECT

STAVELY, ALBERTA

NOISE IMPACT ASSESSMENT

RWDI #1801783

April 15, 2019

SUBMITTED TO

Clyde Carr
Acestes Power

SUBMITTED BY

Teresa Drew, B.Sc., INCE.
Project Director
Teresa.drew@rwdi.com

Bryce Dawson, B.Sc., EPt
Project Manager
Bryce.dawson@rwdi.com

RWDI
#1000, 736-8th Avenue S.W.
Calgary, Alberta, Canada
T2P 1H4
T: 403.232.6771
F: 519.823.1316

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APPENDICES

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Appendix B: Environmental Descriptors
Appendix C: Kaco Manufacturer Specs.

1 INTRODUCTION

RWDI AIR Inc. (RWDI) was retained by Acestes Power to assess the environmental noise impact from the proposed Stavely Solar PV solar power plant (the Project) located in the SE corner of section 15-14-27 W4, approximately two kilometers east of Stavely, Alberta. The Project consists of solar arrays, inverters, and transformers that will produce 8.5 MW AC.

This assessment was prepared to demonstrate that the requirements of AUC Rule 012: Noise Control (AUC 2017) have been addressed based on site equipment and technologies.

This assessment predicts the cumulative impact of noise generating equipment from the Project and the existing and approved energy related facilities that can potentially affect receptors. Predicted noise levels were evaluated against permissible sound levels (PSLs) established within Rule 012 for the nearest receptors. All work was completed by technical staff experienced in acoustic assessment, as detailed in Appendix A.

2 ASSESSMENT APPROACH

Noise from the proposed Project has been estimated using predictive modelling to determine the impact at the nearest receptors. The assessment was completed by:

- Identifying receptors and respective PSLs per Rule 012;
- Determining existing ambient conditions per Rule 012;
- Estimating sound emissions from existing or approved nearby facilities;
- Estimating sound emissions from the proposed Project;
- Modelling the sound emissions to predict noise levels at receptors; and,
- Comparing the predictions to the Rule 012 PSLs.

This report describes methods of the noise assessment, as well as general noise mitigation recommendations for the Project required to meet the PSLs.

2.1 Environmental Noise Descriptors

As environmental noise varies over time, a single number descriptor known as the Energy Equivalent Sound Level or L_{EQ} is used to quantify noise. The L_{EQ} value, expressed in dBA, is the energy-averaged A-weighted sound level. It is defined as the steady continuous sound level, over a specified time period, that has the same acoustic energy

as the actual varying sound levels occurring over the same time period. The L_{EQ} values are reported as A-weighted sound levels expressed in units of dBA (A-weighted decibels). The A-weightings are assigned to account for the frequency response of the human ear, which is most sensitive to mid-frequency sounds. The L_{EQ} in dBA is the primary sound level criteria addressed by AUC criteria.

Rule 012 has different allowable sound levels for daytime, which it defines as 07:00 to 22:00 hours, and nighttime, which it defines as 22:00 to 07:00 hours. The L_{EQ} during daytime periods is the 15-hour A-weighted energy equivalent sound level and is denoted as the L_{EQ} Day. Similarly, the L_{EQ} during nighttime periods is a 9-hour A-weighted energy equivalent sound level and is denoted as the L_{EQ} Night.

In addition to assessing A-weighted L_{EQ} sound levels, Rule 012 recommends that low frequency noise (LFN) be assessed at the NIA stage where data is available. LFN is measured using C-weighted L_{EQ} sound levels, expressed in dBC, which represent a nearly flat frequency response. The C-weighted levels are considered because A-weighted levels may not indicate the potential for disturbance caused by high levels of LFN. Rule 012 assesses the potential for LFN complaints based on the difference between the dBC and dBA levels, and whether there is tonality of the sound within the LFN frequencies.

A detailed glossary of terms is provided in Appendix B to aid the non-technical reader.

2.2 Permissible Sound Levels

The requirements of Rule 012 limit the amount of sound contribution at a receptor location that may be generated by facilities. The sound level limits for a receptor are set by calculating permissible sound levels (PSLs) according to the procedures in Rule 012. Where dwellings or receptors are present, the PSL is determined using a Basic Sound Level (BSL) plus any allowed adjustments. Where no special conditions exist, the PSL is determined as follows:

Permissible Sound Level	=	Basic Sound Level (Table 1 in Rule 012)	+	Daytime Adjustment (If applicable)

The BSL is determined based on dwelling density and proximity to heavily travelled roadways for each receptor. Other than the daytime adjustment, no other special adjustments (e.g., temporary activities or ambient conditions) are considered in this assessment.

For remote rural areas where no permanent or seasonally-occupied human dwelling exists within a distance of 1.5 km from the Project, Rule 012 requires that the cumulative sound level at 1.5 km from the Project "fenceline" not exceed 40 dBA L_{EQ} during nighttime hours.

Regarding LFN, Rule 012 states that a complaint condition may exist where the difference between the Project only time weighted average dBA and dBC levels is equal to or greater than 20 dB, and where a clear tonal component exists at a frequency below 250 Hz.

3 STUDY AREA AND RECEPTORS

Rule 012 defines a noise-sensitive receptor as any permanent or seasonally occupied dwelling within 1.5 km of a facility. In areas where there are no nearby residents, Rule 012 sets a limit on the sound levels at a distance of 1.5 km from the Project fenceline, referred to here as the 1.5 km Criteria Boundary. To be consistent with other applications to the AUC, the "Project boundary line", as supplied in site drawings, has been defined as the Project fenceline.

Table 1 shows the geographic coordinates, distance and direction of the noise-sensitive receptors within 1.5 km from the Project. Figure 1 shows the location of the Project, identified receptors, and the 1.5 km Criteria Boundary.

Table 1: Location of Receptors and Spatial Locations from Project

Receptor ID	UTM Coordinates (NAD 83, Zone 11)		Distance from Project (m)	Direction from Project
	Easting (m)	Northing (m)		
R1	314798	5561923	1000	NE
R2	314911	5561401	770	NE
R3	312885	5560401	900	W
R4	312831	5560096	1050	SW
R5	313072	5559997	770	SW
R6	315494	5560007	1200	SE
R7	314366	5560391	40	E

3.1 Applicable Sound Level Limits

The AUC defines the sound limits at receptors by calculating the PSLs starting with Table 1 in Rule 012. A Basic Sound Level (BSL) is assigned to a receptor based on the proximity to transportation and the population density for the quarter section. Based on the calculated BSL, the assumed night ambient and permissible sound level for the location can be calculated, with the PSL equaling the BSL and the assumed ambient as 5 dBA less than the

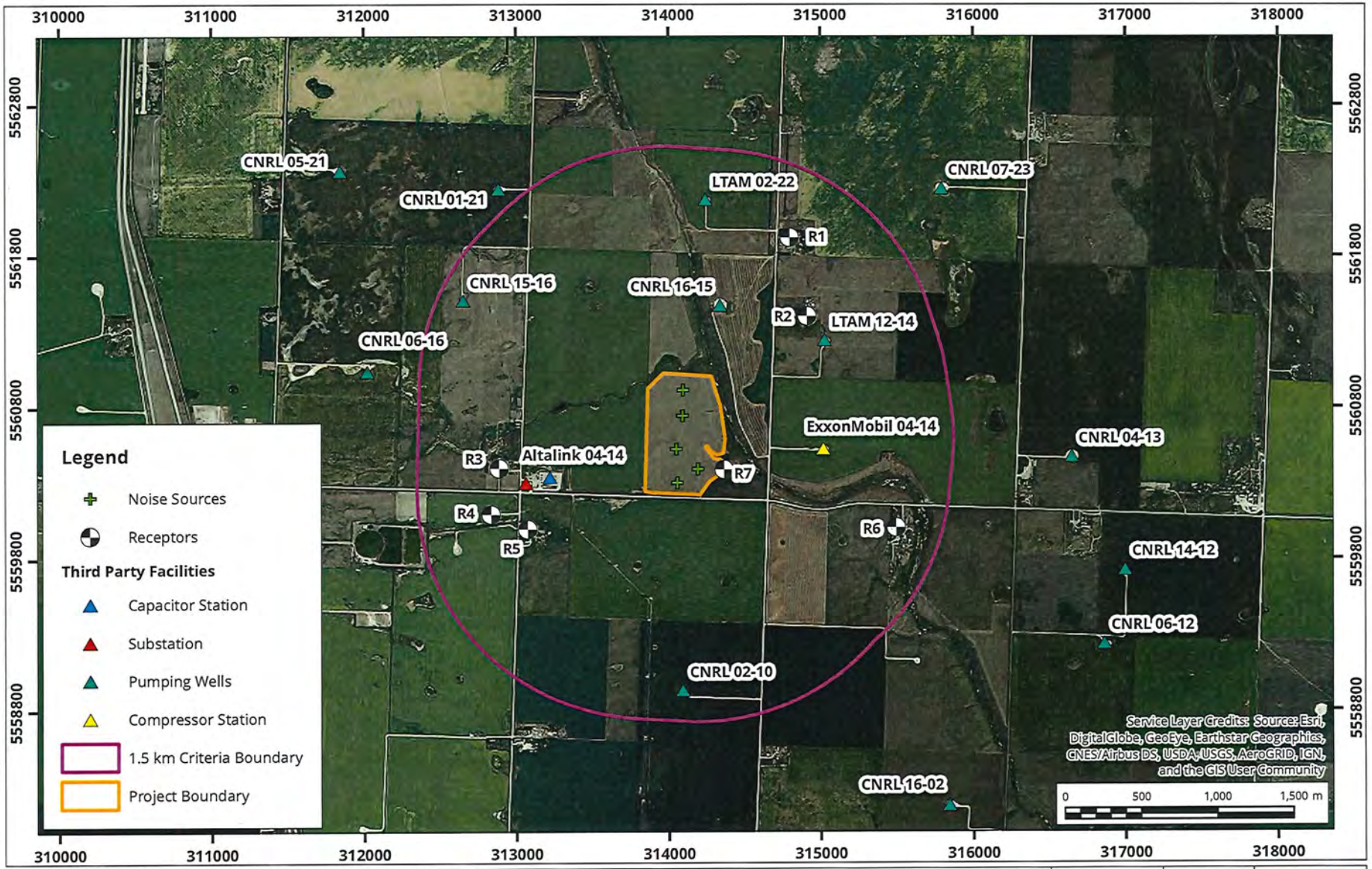
BSL. A +10 dBA daytime adjustment can be added to these values to arrive at the equivalent daytime PSL and assumed ambient.

Table 2 shows the permissible sound levels for the Project. Figure 1 shows the Project boundary, noise-sensitive receptors, and the 1.5 km boundary.

Table 2: Nighttime and Daytime Permissible Sound Levels

Receptor ID[1]	BSL[2] (dBA)	Assumed Nighttime Ambient Level[3] (dBA)	Nighttime PSL[4] (22:00 - 07:00) (dBA)	Assumed Daytime Ambient Level[5] (dBA)	Daytime PSL[6] (07:00 - 22:00) (dBA)
R1	40	35	40	45	50
R2	40	35	40	45	50
R3	40	35	40	45	50
R4	40	35	40	45	50
R5	40	35	40	45	50
R6	40	35	40	45	50
R7	40	35	40	45	50

Notes:
1 - Receptors as identified by client.
2 - Basic sound level as identified per Table 1 of AUC Rule 012.
3 - Assumed nighttime ambient sound level is five dBA less then BSL.
4 - Nighttime PSL is equal to the BSL as there are no A,B, or C adjustments.
5 - Assumed daytime ambient sound level is the assumed nighttime ambient plus the 10 dBA daytime adjustment.
6 - Daytime PSL is equal to the BSL plus the 10 dBA daytime adjustment, as there are no A,B, or C adjustments.



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Acestes Power Stavely Solar Power Project

Detailed Project Location, Receptors, 1.5 km Criteria Boundary, and Third Party Facilities

Map Projection: NAD 1983 UTM Zone 12N

Stavely, Alberta

True North

Project #: 1801783

Drawn by: ABU	Figure: 1
Approx. Scale:	1:35,000
Date Revised:	Apr 15, 2019

4 NOISE PROPAGATION MODELLING

4.1 Computer Modelling

Modelling for this assessment was conducted using Cadna/A (Version 2017 MR – b159-4707) sound level prediction software set to use the environmental sound propagation calculation methods prescribed by the ISO Standard 9613 (ISO 1993, 1996). The ISO 9613 sound propagation method predicts sound levels under moderately developed temperature inversion and downwind conditions, which enhance sound propagation to the receptor. The evaluation is based on typical summertime weather conditions, as outlined in Rule 012. Table 3 describes the configuration of the calculation parameters used to complete the noise modelling.

Table 3: Model Configuration Parameters

Parameter	Model Settings	Description/Notes
Calculation Standard	ISO 9613 only	All sources and attenuators are treated as required by the cited standard.
Source Directivity	Vertical sources applied to larger structures	Directivity of the source emission and the barrier effect of the unit itself were included.
Ground Absorption	0.7 (index value 0 to 1)	Values used for soft ground located beyond the fence line of the Project.
	0.4	Value used for hard ground within the Project.
Temperature and Humidity	10°C/70% Relative Humidity	Average summer conditions for area.
Wind Conditions	Default ISO 9613	The propagation conditions in the ISO (1996) standard are valid for wind speeds between 4 and 18 km/h; all points are considered downwind.
	ISO 1996 – moderate inversion condition	
Terrain	Terrain applied	Terrain in the area is modelled at 2 m contours in the vertical direction to account for any natural barriers within the noise study area
Reflections	1	One reflection is taken into account for reflections from on-site structures.

The sound emissions for all sources considered in the Cadna/A modelling were established by reviewing proposed equipment lists, site layouts and activity descriptions. Sound emissions were identified for each type of equipment using, in order of preference: manufacturer data, measured data from similar equipment, public literature or theoretical calculation.

5 EXISTING CONDITIONS

Rule 012 requires existing sound levels be established for use in a cumulative assessment. The cumulative existing sound level includes the noise contributions from existing adjacent facilities, and the ambient sound level considered typical of remote rural areas, as mandated. The ambient sound level is defined in Rule 012 as 5 dBA less than the assigned PSL.

The Project is located in a rural area in southern Alberta. Satellite imagery indicates the presence of well pads and energy related facilities near the Project. Review of the AER ST37 (AUC 2017) well database and the AER ST102 (AER 2017) facility list show nearby oil and gas facilities that could potentially contribute to the cumulative sound level.

Table 4 lists the adjacent facilities that have the potential to have an influence on the Project, and which were included in the assessment. Facility fencelines are also shown in Figure 1.

Table 4: Adjacent Facilities Considered for the Assessment

Facility Name[1]	Site Description	Operator	Approximate Distance from Project (m)	Direction from Project	Surface LSD (All Sites W4M)
CNRL 16-15	Single Well	Canadian Natural Resources Limited	470	NE	16-15-14-27
CNRL 6-12	Single Well	Canadian Natural Resources Limited	2740	SE	6-12-14-27
CNRL 14-12	Single Well	Canadian Natural Resources Limited	2780	SE	14-12-14-27
CNRL 15-16	Single Well	Canadian Natural Resources Limited	1357	NW	15-16-14-27
CNRL 1-21	Single Well	Canadian Natural Resources Limited	1660	NW	01-21-14-27
CNRL 5-21	Single Well	Canadian Natural Resources Limited	2463	NW	05-21-14-27
CNRL 7-23	Single Well	Canadian Natural Resources Limited	1956	NE	07-23-14-27
CNRL 02-10	Gas Single-Well Battery	Canadian Natural Resources Limited	1260	S	02-10-014-27
LTAM 12-14	Gas Single-Well Battery	Long Term Asset Management Inc.	780	NE	12-14-014-27
LTAM 02-22	Gas Single-Well	Long Term Asset	1125	N	02-22-014-27

Facility Name[1]	Site Description	Operator	Approximate Distance from Project (m)	Direction from Project	Surface LSD (All Sites W4M)
	Battery	Management Inc.			
CNRL 06-02	Gas Single-Well Battery	Canadian Natural Resources Limited	3000	SE	06-02-014-27
CNRL 16-02	Gas Single-Well Battery	Canadian Natural Resources Limited	2620	SE	16-02-014-27
LTAM 05-03	Gas Single-Well Battery	Long Term Asset Management Inc.	2850	SW	05-03-014-27
ExxonMobil 04-14 CS	Compressor Station	ExxonMobil Canada Energy	650	E	04-14-014-27
CNRL 04-13	Gas Multiwell Group Battery	Canadian Natural Resources Limited	2235	E	04-13-014-27
CNRL 06-16	Crude Oil Single-Well Battery	Canadian Natural Resources Limited	1883	W	06-16-014-27
Altalink 04-14 Substation	Substation	Altalink	740	W	04-15-014-27
Altalink 04-14 Capacitor Bank	Capacitor Bank (6)	Altalink	556	W	04-15-014-27

Notes: 1. Facilities identified on Figure 1.

Detailed equipment information or NIAs for the facilities were not readily available. A conservative approach was assumed to account for the absence of detailed information. Emissions for compressor stations, multiwell batteries and single wells are based on a RWDI AIR Inc. internal library for similar Alberta facilities which are measured sources. The operational equipment on the sites were determined based on the use of satellite imagery and the facility type documented in the AER ST37 (AUC 2017) and AER ST102 (AER 2016b) databases. Attempts to gather further information by contacting operators were not successful.

A listing of the estimated sound emissions for the noted facilities that were modelled are presented in Table 5. The facilities were modelled as running constantly 24 hours a day 7 days a week.

Table 5: Estimated Sound Emissions for Nearby Facilities

Item	Type[1]	Qty	Levels at Octave Band Center Frequencies (dB)									Overall Sound Power		Source
			31.5	63	125	250	500	1,000	2,000	4,000	8,000	(dBA)	(dB)	
CNRL 16-15 PJ	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
CNRL 06-12 PJ	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
CNRL 14-12 PJ	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
CNRL 15-16 PJ	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
CNRL 01-21 PJ	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
CNRL 05-21 PJ	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
CNRL 07-23 PJ	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
CNRL 02-10 Gas Single-Well Battery	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
LTAM 12-14 Gas Single-Well Battery	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
LTAM 02-22 Gas Single-Well Battery	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
CNRL 06-02 Gas Single-Well Battery	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
CNRL 16-02 Gas Single-Well Battery	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
LTAM 05-03 Gas Single-Well Battery	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
ExxonMobil 04-14 CS	P	1	112.3	110.8	107.8	100.6	98.1	94.1	90.2	86.5	79.7	100.4	115.7	(2)
CNRL 04-13 Multiwell Group Battery	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
CNRL 06-16 Single-Well Battery	P	1	104.9	98.2	95.3	93.6	95.2	87.6	86.0	85.8	80.1	95.6	106.8	(2)
Altalink 04-14 Substation	P	1	86.3	92.3	94.3	89.3	89.3	83.3	78.3	73.3	66.3	89.7	98.3	(3)
Altalink 04-14 Capacitor	P	1	93.5	88.8	98.8	82.2	89.8	91.5	80.7	65.9	64.6	93.5	101.2	(2)

Notes: 1 - Represents the following source types: P - Point Source, L - Line Source, A - Area Source, and V - Vertical Area Source.
2 - Based on an RWDI internal library of similar equipment.
3 - Derived using theoretical calculations based on power ratings, dimensions, and capacities provided by the client. Crocker, Section 82.2.4, p 1005

A cumulative existing sound level was generated using the logarithmic summation of the mandated ambient sound level and the estimated adjacent site sound levels. Table 6 and Table 7 summarizes the existing cumulative sound level results for the nighttime and daytime, respectively.

Table 6: Existing Nighttime Sound Levels for the Project

Receptor	Mandated Ambient Sound Level[1] (dBA)	Estimated Adjacent Facility Sound Level[2] (dBA)	Cumulative Ambient Sound Level[3] (dBA)
Nighttime (22:00- 07:00)			
R1	35	31	36
R2	35	38	40
R3	35	35	38
R4	35	31	36
R5	35	33	37
R6	35	31	36
R7	35	31	36

Notes: 1 - Ambient sound level as outlined by AER Directive 038.
2 - Estimate sound level at receptor due to all adjacent facilities as noted in Table 5.
3 - The cumulative sound level is the logarithmic sum of AER mandated ambient and the adjacent facility contribution.

Table 7: Existing Daytime Sound Levels for the Project

Receptor	Mandated Ambient Sound Level[1] (dBA)	Estimated Adjacent Facility Sound Level[2] (dBA)	Cumulative Ambient Sound Level[3] (dBA)
Daytime (07:00 – 22:00)			
R1	45	31	45
R2	45	38	46
R3	45	35	45
R4	45	31	45
R5	45	33	45
R6	45	31	45
R7	45	31	45

Notes: 1 - Ambient sound level as outlined by AER Directive 038.
2 - Estimate sound level at receptor due to all adjacent facilities as noted in Table 5.
3 - The cumulative sound level is the logarithmic sum of AER mandated ambient and the adjacent facility contribution.

6 RESULTS

6.1 Project Noise Sources

The project consists of solar arrays connected to five solar inverter/transformer units that will connect to external utilities. The inverters and the transformers are the dominant noise sources located within the Project. The inverters which convert the DC voltage from the solar arrays to AC voltage will in general only be operational during daytime hours or when there is adequate sunlight for power generation. Given the proximity of homes the most conservative approach of calculating 100% of nighttime operations was not practical. Since during summer there may be up to 2.5 hours of operation during the AUC nighttime hours of 22:00 hrs to 07:00 hrs, a realistic worst case of 2.5 hours nighttime operation (based on the summer solstice) was used. As a result, the inverters have been modelled as running continuously during the daytime hours and 2.5 hours during the nighttime hours.

The transformers will be fully active throughout the day when the inverters are operational. As the transformers, could potentially remain energized on the high voltage side throughout the nighttime hours, they were conservatively modeled as operating 24 hours a day.

A listing of the proposed sources that were modelled are presented in Table 8. Available manufacturer data is provided in Appendix C. No other sound generating equipment has been identified on the site.

Table 8: Proposed Project Noise Sources

Item	Type[1]	Qty	Levels at Octave Band Center Frequencies (dB)									Overall Sound Power		Source
			31.5	63	125	250	500	1,000	2,000	4,000	8,000	(dBA)	(dB)	
KACO 2200 TL3 Inverter	P	4	93.0	92.9	91.7	96.9	94.3	91.9	91.7	86.8	82.8	98.0	102.2	(2)
KACO 500 TL3 Inverter	P	1	93.0	92.9	91.7	96.9	94.3	91.9	91.7	86.8	82.8	98.0	102.2	(2)
2.5MVA Transformer	P	4	61.4	73.4	79.4	78.4	78.4	70.4	63.4	55.4	43.4	77.7	84.2	(3)
0.5MVA Transformer	P	1	52.9	64.9	70.9	69.9	69.9	61.9	54.9	46.9	34.9	69.2	75.7	(3)

Notes: 1 - Represents the following source types: P - Point Source, L - Line Source, A - Area Source, and V - Vertical Area Source.
2 - Based on Kaco manufacturer specifications (see Appendix C), and RWDI internal library of similar equipment.
3 - Derived using theoretical calculations based on power ratings, dimensions, and capacities provided by the client. Crocker, Section 82.2.4, p 1005)

6.2 Operation Results

The cumulative ASL, predicted Project sound level contributions, and the calculated cumulative sound levels at the receptors are presented in Table 9 and Table 10, for nighttime and daytime, respectively. The results indicate the Project will comply with Rule 012 PSLs at all receptors. Figure 2 and Figure 3 show the predicted noise levels due to the Project and adjacent facilities listed in Table 4 for nighttime and daytime hours, respectively. The figures do not include the ASL.

Table 9: Assessment of Compliance with Nighttime PSL

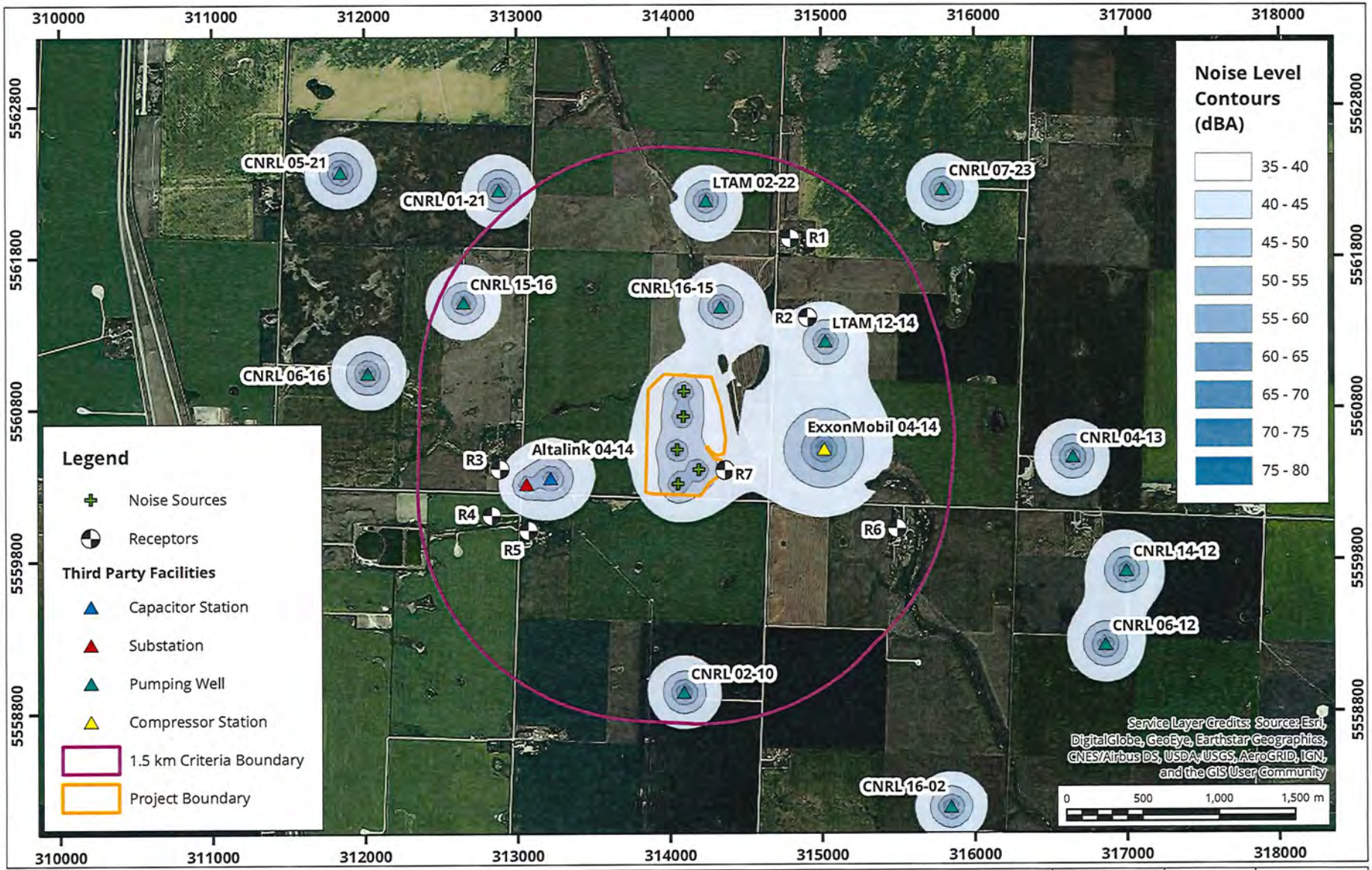
Receptor	Cumulative Ambient Sound Level[1] (dBA)	Proposed Project Contribution (dBA)	Cumulative Sound Level[2] (dBA)	PSL[3] (dBA)	Meet PSL? (Y/N)
Nighttime (22:00 – 07:00)					
R1	36.3	17.9	36	40	Yes
R2	39.4	21.4	40	40	Yes
R3	37.8	19.8	38	40	Yes
R4	36.6	18.2	37	40	Yes
R5	36.9	20.3	37	40	Yes
R6	36.4	17.5	36	40	Yes
R7	36.5	36.8	40	40	Yes

Notes: 1 - As determined previously in Table 6.
2 - Logarithmic addition of AUC mandated ambient, third party facilities, and Project contributions.
3 - As determined previously in Table 2.

Table 10: Assessment of Compliance with Daytime PSL

Receptor	Cumulative Ambient Sound Level[1] (dBA)	Proposed Project Contribution (dBA)	Cumulative Sound Level[2] (dBA)	PSL[3] (dBA)	Meet PSL? (Y/N)
Daytime (07:00 – 22:00)					
R1	45.2	23.3	45	50	Yes
R2	45.7	26.8	46	50	Yes
R3	45.4	25.2	45	50	Yes
R4	45.2	23.7	45	50	Yes
R5	45.2	25.7	45	50	Yes
R6	45.2	23.0	45	50	Yes
R7	45.2	42.4	47	50	Yes

Notes: 1 - As determined previously in Table 7.
2 - Logarithmic addition of AUC mandated ambient, third party facilities, and Project contributions.
3 - As determined previously in Table 2.



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Acestes Power Stavely Solar Power Project

Nighttime Predicted Noise Contours - Project and Third Party Facilities

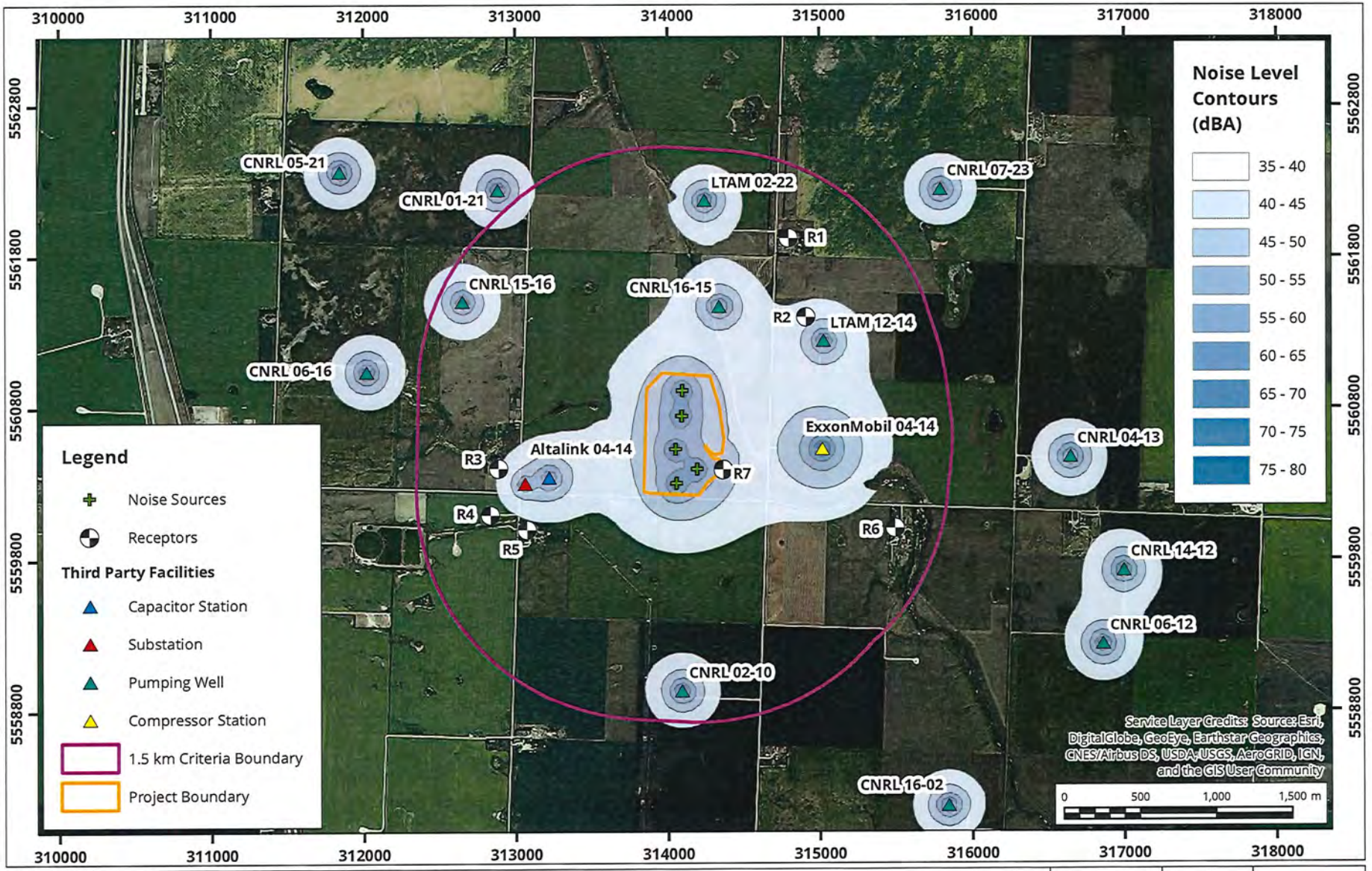
Map Projection: NAD 1983 UTM Zone 12N

Stavely, Alberta

True North

Project #: 1801783

Drawn by: ABU	Figure: 2
Approx. Scale:	1:35,000
Date Revised:	Apr 15, 2019



Acestes Power Stavely Solar Power Project

Daytime Predicted Noise Contours - Project and Third Party Facilities

Map Projection: NAD 1983 UTM Zone 12N

Stavely, Alberta

True North

Project #: 1801783

Drawn by: ABU	Figure: 3
Approx. Scale:	1:35,000
Date Revised:	Apr 15, 2019

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6.3 Low Frequency Noise

The C-Weighted sound level (dBC) results have been reviewed to determine if there is potential for LFN at the receptors. Table 11 shows potential low frequency noise conditions from the Project do not exist.

Table 11: Low Frequency Noise Assessment

Receptor ID	C-Weighted Sound Level (dBC)	A-Weighted Sound Level (dBA)	dBC-dBA	Potential LFN Condition? (YES/NO)
Daytime (07:00 - 22:00)				
R1	33.4	23.3	10.1	No
R2	35.8	26.8	9.0	No
R3	34.5	25.2	9.3	No
R4	33.2	23.7	9.5	No
R5	34.7	25.7	9.0	No
R6	33.2	23.0	10.2	No
R7	47.7	42.4	5.3	No
Nighttime (22:00 - 07:00)				
R1	27.9	17.9	10.0	No
R2	30.3	21.4	8.9	No
R3	29.1	19.8	9.3	No
R4	27.8	18.2	9.6	No
R5	29.2	20.3	8.9	No
R6	27.7	17.5	10.2	No
R7	42.2	36.8	5.4	No

7 SUMMARY

This NIA has found that cumulative noise levels including the Project will comply with the daytime and nighttime PSLs calculated according to Table 1 of AUC Rule 012 and that there is low potential for LFN to be generated by the Project. The Project is expected to be in operation primarily throughout the daytime hours but has been modelled conservatively as running continuously during the day and for 2.5 hours at night, to account for the seasonal shift in daylight. The model considered Project design data, including but not limited to, equipment lists, building lists, plot plans, and available equipment specifications provided by Acestes Power.

.

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APPENDIX A

APPENDIX A: PRACTITIONER BIOGRAPHIES

Teresa Drew, B.Sc., INCE. Technical Director

Teresa joined RWDI in 2011 as a Senior Consultant/Technical Director for the Noise group in the Calgary office. Teresa is an accomplished professional with over 25 years of consulting experience, focused on the acoustic environment. She has extensive experience in project management, acoustic & environmental consulting, environmental impact assessments and industrial permit applications. The skills Teresa has acquired in the acoustics field have allowed her to play a prominent role in both domestic and international projects for multiple industries.

Her experience in the wind power industry includes applications, noise predictions, and compliance monitoring and policy development. She has lead the technical studies for provincial (Alberta and British Columbia) power project approvals as well as provided expert testimony at federal, provincial and municipal level hearings.

Daniel Kremer, M.Sc., E.I.T. Intermediate Scientist/Engineer.

Daniel joined RWDI in 2013 as a Noise & Vibration Scientist specializing in environmental noise. He has completed many environmental noise studies for regulatory compliance in Alberta and British Colombia. His work has focused on long-term monitoring programs, sound source measurements and predictive modelling for noise and acoustics to support regulatory requirements (AUC Rule 012, AER Directive 038).

His experience is focused on environmental noise related to energy, oil & gas, and mining applications in Western Canada and includes oil sands mining, in-situ oil sands projects, conventional oil and gas extraction, and wind turbine projects. His expertise has been to model and develop noise strategies for large scale projects for future developments at the provincial and federal levels.

Daniel has experience in the planning and post construction stages of wind power development, and in providing analysis and reporting to meet regulatory requirements (AUC Rule 012). He has provided detailed analysis on the relationships between meteorological conditions and turbine operating parameters, and the effects at receptors, including conducting comprehensive post-construction sound level surveys for wind turbines.

APPENDIX B

APPENDIX B: ENVIRONMENTAL NOISE DESCRIPTORS AND TERMINOLOGY

Abnormal noise events

Noises that are sufficiently infrequent as to be uncharacteristic of an area or that occur so close to the microphone as to dominate the measurements in an unrealistic manner. Consideration must be given to deleting occurrences of abnormal noise from the measurements to obtain a reasonably accurate representation of the sound environment. Examples of abnormal noises include a dog barking close to the microphone, a vehicle passing nearby, people talking in the vicinity of the microphone in a quiet environment, or a passing road grader.

Airborne Sound

Sound that reaches the point of interest by propagation through air.

Ambient noise or sound

All noises that exist in an area and are not related to a facility under study. Ambient noise may include sound from other existing industrial facilities, transportation sources, animals, and nature. Context for ambient noise should be defined for each project.

Attenuation

The reduction of sound intensity by various means (e.g., air, humidity, porous materials, etc.)

A-weighted sound level

The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear.

A-weighting shows that the measured sound pressure levels have been filtered using a frequency weighting network that mimics the response of the human ear.

The resultant sound pressure level with the associated unit "dBA" is therefore a representative of the subjective response of the human ear. The weightings are assigned in a way to reflect the higher sensitivity of human ear to sound in the mid and high frequency band as shown in the curve labelled A-weighting in Figure B-1.

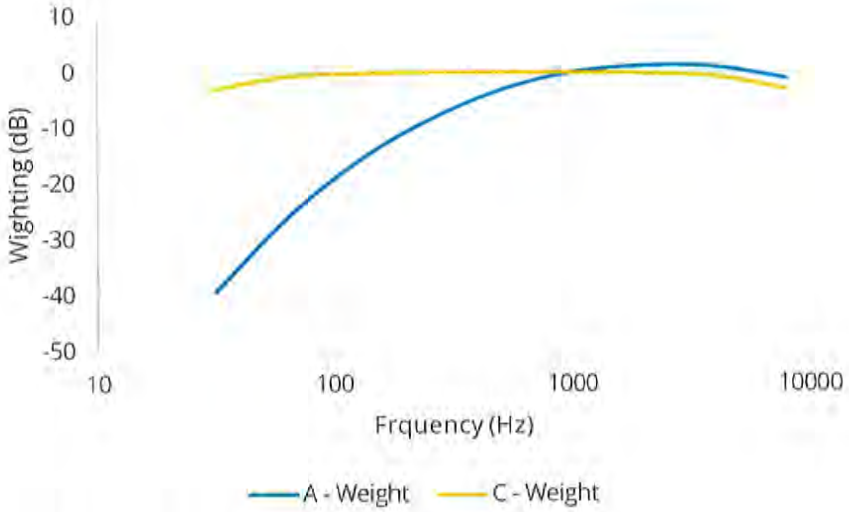


Figure B-1 Sound Weighting Network

Calibration

The procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Calibration must take place before and after the sound level measurements.

C-Weighted Sound Level

The sound level as measured on a sound level meter using a setting that emphasizes the low and middle frequency components. The weightings are assigned as shown in the curve labelled C-weighting in Figure B-1. The resultant sound pressure level is reported with the associated unit "dBC"

Daytime

Defined as the hours from 07:00 to 22:00.

dB (decibel)

A unit of measure of sound pressure that compresses a large range of numbers into a more meaningful scale. Hearing tests indicate that the lowest audible pressure is approximately 2 x 10-5 Pa (0 dB), while the sensation of pain is approximately 2 x 102 Pa (120 dB). Generally, an increase of 10 dB is perceived as twice as loud.

dBA

The decibel (dB) sound pressure level filtered through the A filtering network to approximate human hearing response at low frequencies.

dBC

The decibel (dB) sound pressure level filtered through the C filtering network to highlight low and middle frequencies.

Dwelling

Any permanently or seasonally occupied residence with the exception of an employee or worker residence, dormitory, or construction camp located within an industrial plant boundary. Trailer parks and campgrounds may qualify as a dwelling unit if it can be demonstrated that they are in regular and consistent use during the applicable season.

Energy equivalent sound level (Leq)

The Leq is the average A-weighted sound level over a specified period of time. It is a single-number representation of the cumulative acoustical energy measured over a time interval. If a sound level is constant over the measurement period, the Leq will equal the constant sound level where f is the fraction of time the constant level L is present.

Standardized Wind Speed at 10 m

The standardized wind speed at a height of 10 m is calculated in accordance with IEC 614000-11 (2012) and is given below. In the case of calculating the standardized wind speed for turbines in Alberta, a roughness length of 0.05 m is used, which is representative of farmland with vegetation.

$$V_H = V_{10}\left[\frac{\ln\left(\frac{H}{z_{0ref}}\right)}{\ln\left(\frac{10}{z_{0ref}}\right)}\right]$$

Where:

V_H is the wind speed at hub height z (m), determined from the power curve;

V_{10} is the standardized wind speed at 10m;

z_{0ref} is the reference roughness length of 0.05 m; and

H is the rotor centre height (m).

Far Field

Describes a region in free space where the sound pressure level from a source obeys the inverse-square law (the sound pressure level decreases 6 dB with each doubling of distance from the source). Also, in this region the sound particle velocity is in phase with the sound pressure. Closer to the source where these two conditions do not hold constitutes the "near field" region.

Frequency

The number of times per second that the sine wave of sound or of a vibrating object repeats itself. The unit is expressed in hertz (Hz), formerly in cycles per second (cps).

Human Perception of Sound

The human perception of noise impact is an important consideration in qualifying the noise effects caused by projects. The following table presents a general guideline.

Table B-1 Human Perception of Sound

Increase in Noise Level (dBA)	Perception
1 to 3	Imperceptible to possibly perceptible
4 to 5	just-noticeable difference
6 to 9	marginally significant
10 or more	significant, perceived as a doubling of sound level

Impulsive Noise

Single or multiple sound pressure peak(s) (with either a rise time less than 200 milliseconds or total duration less than 200 milliseconds) spaced at least by 500 millisecond pauses. A sharp sound pressure peak occurring in a short interval of time.

L_{EQ}

See Energy equivalent sound level.

Nighttime

Defined as the hours from 22:00 to 07:00.

Noise

Generally defined as the unwanted portion of sound.

Noise Level

This is the same as sound level except that it is applied to unwanted sounds, general the sound level at a point of reception.

Sound

A dynamic (fluctuating) pressure.

Sound level meter (SLM)

An instrument designed and calibrated to respond to sound and to give objective, reproducible measurements of sound pressure level. It normally has several features that would enable its frequency response and averaging times to be changed to make it suitable to simulate the response of the human ear.

Sound Pressure Level (SPL)

The logarithmic ratio of the RMS sound pressure to the sound pressure at the threshold of hearing. The sound pressure level is defined by equation (1) where P is the RMS pressure due to a sound and P0 is the reference pressure. P0 is usually taken as 2.0 × 10-5 Pascals.

(1) SPL (dB) = 20 log(PRMS/P0)

Sound Power Level (PWL)

The logarithmic ratio of the instantaneous sound power (energy) of a noise source to that of an international standard reference power. The sound power level is defined by equation (2) where W is the sound power of the source in watts, and W0 is the reference power of 10-12 watts.

(2) PWL (dB) = 10 log(W/W0)

Interrelationships between sound pressure level (SPL) and sound power level (PWL) depend on the location and type of source.

Spectrum

The description of a sound wave's resolution into its components of frequency and amplitude.

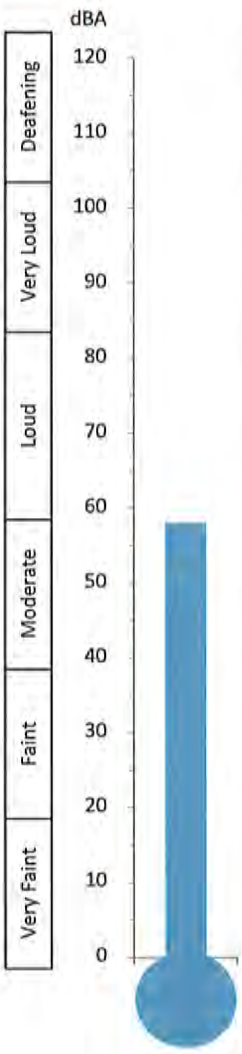
Speed of Sound in Air

344 m/s at 70°F (21°C) in air at sea level.

Tonal Components

Some industrial facilities typically exhibit a tonal component. Examples of tonal components are transformer hum, sirens, and piping noise. The test for the presence of tonal components consists of two parts. The first part must demonstrate that the sound pressure level of any one of the slow-response, A-weighted, 1/3-octave bands between 20 and 16000Hz is 10 dBA or more than the sound pressure level of at least one of the adjacent bands within two 1/3-octave bandwidths. In addition, there must be a minimum of a 5 dBA drop from the band containing the tone within 2 bandwidths on the opposite side. The second part is that the tonal component must be a pronounced peak clearly obvious within the spectrum.

RELATIONSHIPS BETWEEN EVERYDAY SOUNDS



Sources of Noise

- threshold of feeling / pain
- accelerating motorcycle a few feet distance
- loud auto horn 3 m (10 ft) away
- aance club / maximum human vocal output
- jack hammer at 15 m (50 ft) distance
- indoors in a noisy factory
- heavy truck pass-by at 15 m (50 ft) distance
- noisy bar or school cafeteria
- near the edge of a major highway / inside an automobile travelling at 60 km/h
- noisy restaurant
- normal human speech (unraised voice) at 1 m (3 ft) distance
- typical background noise in large department store
- inside average urban home/moderate rainfall/quiet street
- typical sound in a library
- average background sound level in remote Alberta (Per AER/AUC)
- bedroom of a country Home
- average whisper
- deep woods on a very calm day
- threshold of hearing

APPENDIX C

KACO new energy.

Data sheet
blueplanet
2200 TL3 outdoor

Big is powerful.

The central inverter blueplanet 2200 TL3 outdoor.

The new blueplanet 2200 TL3 outdoor has been designed with the economic development of utility-scale PV installations in mind.

The central inverter features the protection class NEMA 3R for outdoor installation. It is also available as part of an Integrated Power Station (IPS). It caters for the growing need for fast and efficient execution of large-scale solar farms. Inverters, medium voltage transformer and balance of system equipment are mounted together on a single base plate, to create a ready-to-use, functional unit. Plus, the skid offers extra space for additional equipment such as monitoring accessories, weather stations, or tracker control units.

The blueplanet 2200 TL3 outdoor provides unique user-friendliness – irrespective of whether you operate it locally or by means of remote access over the Internet. The inverter is equipped with fully digital control and communicates via Sunspec Modbus TCP and RTU protocol, among others. The user interface consists of a large, graphical color LCD with touch panel. Your advantages are:

- easy operation, quick maintenance
- multiple options for monitoring, control and communication
- activation of country-specific settings at the push of a button.

This adds up to smooth, cost-effective installation and commissioning of the blueplanet 2200 TL3 outdoor. Once in operation, your investment security has top priority: The efficiency reaches outstanding 98.3%. In addition, the inverter delivers its full rated power in a ambient temperature range of -20 to +50 °C, making it suitable for use in desert-like as well as cold climates.

blueplanet 2200 TL3 outdoor

- 98.3% maximum efficiency for highest yields
- NEMA 3R enclosure for outdoor use
- Three power stacks for high availability
- Continuous full output power at ambient temperatures up to +50 °C
- Continuous, remote monitoring
- 7" color TFT LCD with touch panel for convenient operation
- Sunspec Modbus TCP and RTU for flexible monitoring and control
- Turnkey solution available with inverters, disconnection units, transformer, and accessories

www.kaco-newenergy.com

Electrical data	2200 TL3 OD
DC input	
MPP range	550 V ... 830 V
Operating range	550 V ... 1000 V
No-load voltage	1000 V
Max. input current	3818 A
Number of DC inputs	24 (250 A DC fuse) 18 (400 A DC fuse)
AC output	
Max. output power / rated power	2200 kVA / 2000 kW [1]
Voltage to external transformer	3 x 370 V (+/-10 %)
Max. output current	3468 A
Rated frequency	50 Hz / 60 Hz
cos phi	0 inductive ... 0 capacitive (adjustable)
General electrical data	
Max. efficiency	98.3 %
CEC efficiency	98.0 %
Internal consumption operation	< 1% of rated power (2000 W)
Internal consumption standby	< 150 W
Mechanical data	
Interfaces	Color TFT LCD with touchpanel 1 x RS485 / Ethernet / USB 1 user digital input / output
Protocol	Modbus TCP/RTU (with Sunspec), SOAP (Simple Object Access Protocol), KACO RS485 protocol
Ambient temperature	-20°C ... +50°C full rated power, no derating
Max. altitude above mean sea level	2000 m [2]
Cooling	forced fan
Audible noise	< 70 db(A) [3]
Protection class	NEMA 3R
H x W x D	2150 x 3400 x 1400 mm
Weight	5000 kg
Extras	
Ground fault detection	yes
Emergency stop	yes
Overvoltage protection	DC side type 2 / self-supply type 2 / Ethernet AC side optional
Certifications	
EMC	FCC Part 15 Class A
Grid compliance	UL1741-2010 IEEE1547, IEEE1547.1 CSA C22.2 No. 107.1

Conforms to the country-specific standards and regulations according to the country version that has been set.
[1] 2200 kVA@AC voltage ≥ 370 V, PV input ≥ 630 [2] Power derating above MSL 2000 m up to MSL 5000 m
[3] Measured in 10 m distance.

EN 5001052-03-170622

Your retailer

KACO new energy.

Data sheet

Powador XP500-HV TL outdoor XP550-HV TL outdoor

High output. High reliability. High protection.

The central inverters Powador XP500-HV TL outdoor and XP550-HV TL outdoor.

The Powador XP500-HV TL outdoor and the Powador XP550-HV TL outdoor have been especially conceived for outdoor use. With the protection class IP54 they do not require a separate enclosed room for installation. This means that both units offer an alternative to central inverter stations depending on the project requirements. The latest signal-processing technology offers maximum performance, efficiency and reliability. The fully digital controller makes operation and maintenance user-friendly and offers a multitude of options for monitoring and communications.

Our unique power electronics control increases the switching efficiency of the power transistors: Depending on the input power currently present, one of several pulse-width modulation methods is used. This means higher levels of efficiency and better yields. The Powador XP series also offers maximum reliability: the internal power supply of the controller is designed redundantly and an extremely powerful cooling system protects sensitive components. The speed of the cooling fan is variably controlled depending on the load and ambient temperature.

The Powador XP500-HV TL outdoor and XP550-HV TL outdoor feature a powerful Human Machine Interface (HMI). It provides for local data logging via SD card as well as remote control and online monitoring via RS485 generic or Modbus TCP/IP protocol. The operation of all critical components is continuously monitored and potential faults are reported immediately.

The Powador XP is an inverter for the world: country-specific settings can be activated at the press of a button.

Technical data

Powador XP500-HV TL outdoor | Powador XP550-HV TL outdoor

Electrical data	XP500-HV TL OD	XP550-HV TL OD
DC input		
MPP range	550 V ... 830 V	550 V ... 830 V
Operating range	550 V ... 1000 V	550 V ... 1000 V
No-load voltage	1100 V [1]	1100 V [1]
Max. input current	1091 A	1200 A
Number of DC inputs	6	6
AC output		
Rated output	500 kVA	550 kVA
Voltage to external transformer	3 x 370 V (+/- 10 %)	3 x 370 V (+/- 10 %)
Rated frequency	50 Hz / 60 Hz	50 Hz / 60 Hz
Rated current	780 A	858 A
cos phi	0 inductive ... 0 capacitive (adjustable)	0 inductive ... 0 capacitive (adjustable)
General electrical data		
Max. efficiency	98.7 %	98.7 %
European efficiency	98.3 %	98.3 %
Consumption	<1650 W	<1650 W
Standby consumption	<110 W	<110 W
Mechanical data		
Interfaces	2 x RS485 / Ethernet / Wi-Fi 1 x digital input / -output SD card	22 x RS485 / Ethernet / Wi-Fi 1 x digital input / -output SD card
Ambient temperature	-20 °C ... +50 °C full rated power, no derating	-20 °C ... +50 °C full rated power, no derating
Cooling	fan (max. 6940 m³/h)	fan (max. 6940 m³/h)
Protection class	IP54	IP54
Noise emission	< 70 dB(A) [2]	< 70 dB(A) [2]
H x W x D	2125 x 2600 x 860 mm	2125 x 2600 x 860 mm
Weight	2200 kg	2200 kg
Extras		
Ground fault detection	yes	yes
Protection against moisture	integrated hygrostat and heating combination	
Emergency stop	yes	yes
Overvoltage protection DC/AC/Ethernet	yes	yes
Certifications		
Safety	IEC 62109-1/IEC 62109-2/EN 61000-6-2/EN 61000-6-4/ EN 61000-3-3/EN 61000-3-12	
Grid compliance	BDEW, ... for more see homepage/download area	

Conform to the country-specific standards and regulations according to what country version has been set.
[1] To protect the hardware, the inverter starts up only at voltages < 1000 V. [2] Measured at a 10 m distance.

Powador
XP500-HV TL outdoor
XP550-HV TL outdoor

- Highest efficiency
- Maximum power density
- Maximum flexibility due to transformerless design
- Load-adaptive pulse-width modulation
- Continuous, remote monitoring
- Designed for outdoor use

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Your retailer

EN 5000416-11-160603

SURFACE WATER MANAGEMENT PLAN

STAVELY SOLAR PROJECT

Stavely Solar Farm

Surface Water Management Plan

Prepared for
Acestes Ventures Ltd.

Integrated Sustainability Consultants Ltd. **15 December 2017**

INTEGRATED SUSTAINABILITY

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WATER | WASTE | ENERGY

CONSULTING & ENGINEERING

INTEGRATED SUSTAINABILITY

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Any questions concerning the information or its interpretation should be directed to Patrick Leslie.

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INTEGRATED SUSTAINABILITY

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INTEGRATED SUSTAINABILITY

1 INTRODUCTION

Integrated Sustainability Consultants Ltd. (Integrated Sustainability) was retained by Acestes Ventures Ltd. (Acestes) to complete a conceptual Surface Water Management Plan (SWMP) for Acestes proposed solar farm in the Town of Stavely, Alberta. This SWMP is for the proposed Stavely site located within the southeast ¼ of Section 15, in Township 14, and Range 27, west of the 4th meridian (SE-15-14-27-W4) at the intersection of Township Road 142 (TR142) and Range Road 272 (RR272) (the Site) as shown on the conceptual layout which is provided in Appendix 1.

The development of the Site from the original conditions to the proposed industrial use, has the potential to cause changes in surface water flow patterns, run-off rates, and intensities. This SWMP presents the potential impact of the proposed development and provides recommendations for the management of surface water on the Site to mitigate these effects.

1.1 Objectives

This report has been prepared in support of a development permit application to the Alberta Utilities Commission (AUC). The following work was undertaken to develop the SMWP:

- Assessment of pre-development hydrologic conditions and run-off
- Assessment of post-development hydrologic conditions to determine potential impacts to peak flows
- Recommendation for Erosion and Sediment Control (ESC) practices during and post construction

The SWMP utilizes existing surface water drainage patterns and features around the area to minimize downstream impacts.

1.2 Proposed Development

The proposed solar array for the Stavely site has a name plate size of 13.8 MW-DC (8.5 MW-AC) and consists of the following:

- 37,832 solar modules
- Fix tilt racking
- 5 central inverters
- Interconnecting cables in trenches
- Two staging areas
- One 25 kV switch gear
- Compacted gravel access right-of-ways
- An operation/equipment shed

The conceptual layout drawing is included in Appendix 1.

The Site utilizes the existing drainage system consisting of culverts, ditches, and immediate watercourses (small unnamed creeks) downstream of the Site. Existing drainage patterns, grades, as well as final discharge points will be maintained, where possible.

Temporary ESC measures will be implemented during the construction of the Site. In general, light duty silt fences will be implemented along the perimeter of the Site and any waterways within the Site. Straw bales will be placed around the catchment areas and culverts located within the Site. Mud mats will be utilized for entrance ways that are directed to local paved roadways. The temporary measures will be removed once construction has been completed.

2 SITE CONDITIONS

The Site and the surrounding area are comprised of agricultural lands with prairie vegetation and an established drainage system including drainage ditches along the roadways and along the perimeter of the farm lands/blocks. The general topography of the area drains towards east, as shown in Appendix 2, Figure 1.

2.1 Pre-Development Site Conditions

The Site is approximately 36.9 hectares (ha) located on agricultural lands. The Site is bounded by an existing access road to the south (TR142), Clearbrook Creek to the west, and an unnamed creek to the north. The adjacent area south and west of the Site is farmlands on the headwater of an unnamed tributary to Clearbrook Creek. The external drainage area between TR142 and Unnamed Creek tributary to Clearbrook Creek of approximately 42 ha drains through the Site. The combined surface drainage from the external drainage area (42 ha) and the Site (36.9 ha) is approximately 78.9 ha and will continue flowing to the east into Clearbrook Creek, as shown in Appendix 2, Figure 1.

Based on the pre-development topography and drainage areas shown in Appendix 2, Figure 1, the Site slopes down from the west toward Clearbrook Creek east of the Site. The average slope from the high point on the west to the low point at east border is approximately 1.4% (including the external drainage area). The average elevation of the Site is about 1,021 m. There is currently no geotechnical information for the Site. It is assumed that the subsurface conditions are similar across the Site, and consist of a thin layer of topsoil underlain with clay, sand, and gravel based on the publicly available surficial geology data (Agriculture Canada 1980).

2.2 Post-Development Site Conditions

The solar panel will occupy approximately 29.5 ha of the Site. The rows of solar panels are comprised of solar panel modules attached to metal racking systems, and anchored into the ground. While designs for the racking have not been finalized, the anchors are expected to be comprised of helical piles less then 2 m in depth and less than 15.3 cm (<6 inches) in diameter, and advanced through the existing groundcover. The piles will

have a minimal impact on the imperviousness of the surface as it is expected to impact less than 0.05% of the surface area of the Site[1]. In certain cases, the geotechnical investigation may reveal sections of the property requiring piles up to 30.5 cm (12 inch) in diameter and 4 m in depth. While this will increase the impacted area, it is not expected to affect the imperviousness of the Site.

Electrical cables connecting the panels to the central inverters and the central inverters to the switch gear will be installed in shallow trenches (<1.5 m) with widths varying between 1 m and 4 m, depending on the number of cables within each trench. The trenches are expected to impact less then 1.4% of the Site, and will be backfilled with native material and graded to maintain the original grade.

Although the solar panel surface is impervious, the resulting localized erosion from the water falling beneath each panel is not expected to impact the imperviousness of the Site once the vegetation on the Site has been re-established. The development will include seeding the previously cultivated soil with a hardy perennial grass mixture that will be used to support groundcover development.

For normal operation, the solar panels are unlikely to generate water pollution, and surface water generated on the Site is expected to be free of contaminants and will not require water quality treatment.

Solar panels do not increase the impervious area of the land surface; therefore, the development is anticipated to have minimal changes to the quantity and quality of the surface water run-off.

The Site can be accessed from TR142. No roads are being added to the Site other than access ways from the existing road. The compacted gravel access ways are expected to be 8 m wide and have a total sum length of 1.44 km occupying approximately 3.1% of the Site. Development of the Site will not result in further clearing and grubbing of the area.

The Site design accepts run-on from the up-gradient external contributing area, and controls drainage within the Site's extents. Run-off from the west is expected to sheet flow off the Site and discharge through an existing swale at the Site and directly to Clearbrook Creek.

3 HYDROLOGY ASSESSMENT

3.1 Overview

Development of the Site will not remove natural vegetation as the land has been previously cultivated, and will have minimal impacts to the topographic characteristics. However, the drainage patterns and peak run-off flow rates are expected to change due to the surface characteristics of the solar panels.

[1] Pile area estimate uses 304 piles per Mega Watt (MW) based on similar projects. Actual number will vary depending on geotechnical study results.

In developing a SWMP, it is important to consider site-specific conditions. The Site has the following characteristics that may influence the adopted modelling approach and design of the SWMP:

- The Site is situated on a flat agricultural surface with the existing drainage system consisting of culverts and ditches around the area.
- There are existing swale and unnamed creek tributary to Clearbrook Creek and upper reach of Clearbrook creek immediately downstream of the Site.
- External drainage area and the Site consist of pasture, grassland, or agricultural.

Based on the publicly available surficial geology information (Agriculture Canada 1980), the soil characteristics of the Site are expected to be clayey silty sand underlain by clayey silt and clay (typical for the prairie region) and considered to be Hydrologic Soil Group C.

The Rational Method was utilized to model and compare the pre-development and post-development peak run-off flow rates.

3.2 Rational Method

The Rational Method is an empirical formula relating the peak run-off flow rate to the run-off coefficient, the rainfall intensity, and the drainage area. This formula model is most applicable to drainage areas less than 100 ha in size (Government of Alberta 2011).

This formula was chosen as the most practical run-off formula model for the Site due to its applicability to small drainage areas with rural characteristics. Additionally, the Site fits the two key criteria for selecting the Rational Method:

- The entire catchment contributes to run-off
- Rainfall is uniform over the entire catchment area

The Rational Method equation provided by Alberta Transportation (Government of Alberta 2011) is:

$$Q = 0.00278 \times C \times i \times A$$

Where:

- Q is the peak run-off flow rate (m^3/s)
- The dimensionless constant, *0.00278*, accounts for unit conversion
- C is the run-off coefficient
- i is the rainfall intensity (mm/hr)
- A is the effective area of the drainage basin (ha)

3.2.1 Run-off Coefficients

Run-off coefficients represent the ratio in which precipitation translates to run-off and are based on:

- Ground cover
- Soil characteristics
- Slope
- Depression storage
- Antecedent rainfall conditions
- Rainfall intensity
- Rainfall duration

Estimation of run-off coefficients is a subjective process aided by published tables that can be found in the *Erosion and Sediment Control Manual* (Government of Alberta 2011).

Various run-off coefficients were used for pre-development and post-development conditions based on land use type, design gradients and soil material. Table A indicates the selected run-off coefficient ranges for analysis of both pre-development and post-development conditions (Government of Alberta 2011).

Table A. Selected Government of Alberta (Transportation) Run-off Coefficient Ranges

Land Use	Range	Applicability
Pasture - Heavy Soil	0.15 - 0.45	Applicable for areas with brush/re-growth on pre-development conditions.
Barren Packed Soil - Smooth	0.30 - 0.60	Applicable to the trafficable surfaces on post-development conditions (lower end due to flat gradients and gravel surfaces).
Roofs	0.75 - 0.95	Applicable for the structure/small building for onsite operations staff and storage area.

3.2.2 Rainfall Intensity

The Environment Canada climate monitoring station Lethbridge A 3033880 is the nearest station in distance and elevation to the Site, which provides short duration rainfall intensity-duration-frequency (IDF) data. It is approximately 82.5 km southeast of the area and is approximately 99 m lower in elevation. The Lethbridge A 3033880 IDF curve is provided in Appendix 3 (Environmental Canada 2014).

Based on recommendations from *The Stormwater Management Guidelines* (Alberta Environmental Protection 1999) and the lifespan of the Site (approximately 20 years), a 1 in 10 year, 1 in 25 year, and 1 in 100 year storm event (Design Storm) was used to determine the expected peak run-off flow rates from the Site. The longest time of concentration was calculated for each of the pre-development and post-development drainage areas to determine the rainfall intensity for the Site. It was found that an 80-

minute duration storm encompassed the calculated time of concentration for the drainage areas. A rainfall intensity of 48.4 mm/hr, which corresponds to the 1 in 100 year, 80-minute storm event, was therefore selected to compare the pre-development and post-development drainage conditions for the Site.

3.2.3 Pre-Development Drainage Area

As discussed in Section 2.1, the total drainage area is approximately 78.9 ha. The pre-development drainage areas consist of the following:

- External drainage area is approximately 39.5 ha. C of 0.45 (pasture – heavy soil type).
- External facility area of approximately 2.5 ha. C of 0.85 (roofs).
- The Site area of approximately 36.9 ha. C of 0.45 (pasture – heavy soil type).

3.2.4 Post-Development Drainage Area

The post-development drainage area consists of an effective drainage area from the Site that consists of four land types. This consists of the following:

- Solar panel area of approximately 29.5 ha. C of 0.45 (pasture – heavy soil type).
- An operation/equipment shed of approximately 0.006 ha. C of 0.95 (roofs).
- Solar block access road of approximately 1.15 ha. C of 0.30 (barren packed soil).
- External facility area of approximately 2.5 ha. C of 0.85 (roofs).
- Remaining undeveloped area within the Site and external drainage area of approximately 45.72 ha. C of 0.45 (pasture – heavy soil type).

4 RESULTS

Design calculation sheets demonstrating the results of the calculations used to determine the pre-development and post-development peak run-off flows from the Site (i.e. rainfall captured within the Site) are included in Appendix 4.

With respect to surface water management, the Site is a small area with resulting low run-off volumes. The allowable peak run-off flow rates from the Site is expected to be slightly lower than the pre-development conditions due to changes in the land use. Changes in the peak run-off flow rates from pre-development to post-development were found to be minimal with less than 0.5% decrease in peak flows. Results of calculated peak run-off flow rates for the 1 in 100 year storm event are shown in Table B. Detailed assumptions and calculation are presented in Appendix 4.

Table B. Summary of 1 in 100 year Peak Run-off Flow for the Site (Pre-Development and Post-Development)

Drainage Area	Equivalent Run-off Coefficient (C)	1:100 Year Rainfall Intensity (mm/hr)	Effective Area (ha)	Peak Run-off Flow (m^3/s)
Pre-Development	0.463	48.4	78.9	4.92
Post-Development	0.461	48.4	78.9	4.89

Overall impacts related to stormwater run-off generated from the Site will be minimal as post-development run-off rates and volume is less than pre-development.

No major stormwater infrastructure such as pond is proposed for the development other than typical roadside ditch and culverts along the north south access way. These drainage features will be sized properly during the detailed design stage, to maintain drainage path to Clearbrook Creek and to avoid impoundment along the access road within the Site.

5 EROSION AND SEDIMENT CONTROL

In general, the ESC plan will consist of silt fencing around the Site boundary. It will also utilize straw bales or geotextile line check dams in culverts and ditches.

During construction, site grading activities may occur, but are expected to be minimal as the development on the Site will not require further clearing and grubbing.

The following Best Management Practices (BMP) are recommended to prevent erosion and reduce movement of sediment on the Site during and immediately following construction activities, if necessary:

- Introduce continuous perimeter control structures that may include: silt fences, or straw bale barriers.
- Vegetated filter strips.
- Rip rap at culverts along the access road within the Site (as the road may impede run-off to Clearbrook Creek)
- Continually inspect and maintain erosion controls (Government of Alberta 2011).

6 CONCLUSION

The findings of this SWMP suggest that post-development changes to the Site's surface water run-off will have minimal impacts to the surrounding area as the peak run-off flow will decrease by less than 0.5% of the pre-development conditions. The drainage pattern during post-development conditions will be the same as the pre-development conditions. Run-off from the Site and the external drainage west of the Site will continue flowing to the east into Clearbrook Creek. Because the peak run-off flow decreases, it is not

expected to cause erosion to land/properties or to watercourses/waterbodies immediately downstream of the Site.

While long-term erosion and sedimentation is not considered to be a risk due to low anticipated peak run-off flows and natural attenuation, ESC practices should be implemented during and immediately following construction activities to limit impacts to infrastructure and prevent offsite discharges of sediment, if necessary. This includes maintaining run-off and drainage path.

To maintain run-off and drainage path, typical drainage features such as roadside ditches and culverts will be installed along the access road within the Site, as this road may impede run-off from the external drainage area and the Site to Clearbrook Creek.

INTEGRATED SUSTAINABILITY

7 CLOSURE

Integrated Sustainability would like to thank Acestes Ventures Ltd. for the opportunity to support the Stavely Solar Farm project. We trust that this report meets your needs and expectations. If you have any question, please contact the undersigned at any time.

Sincerely,

Integrated Sustainability Consultants Ltd.

Eri Ratnawati, M. Sc., P.Eng.
Senior Water Resources Engineer

Patrick Leslie, B. A., P.Eng.
Director of Technology and Innovation

APEGA Permit Number: P11259

INTEGRATED SUSTAINABILITY

8 REFERENCES

Agriculture Canada. 1980. Soils of the Lethbridge Area (82H) Map. 1980

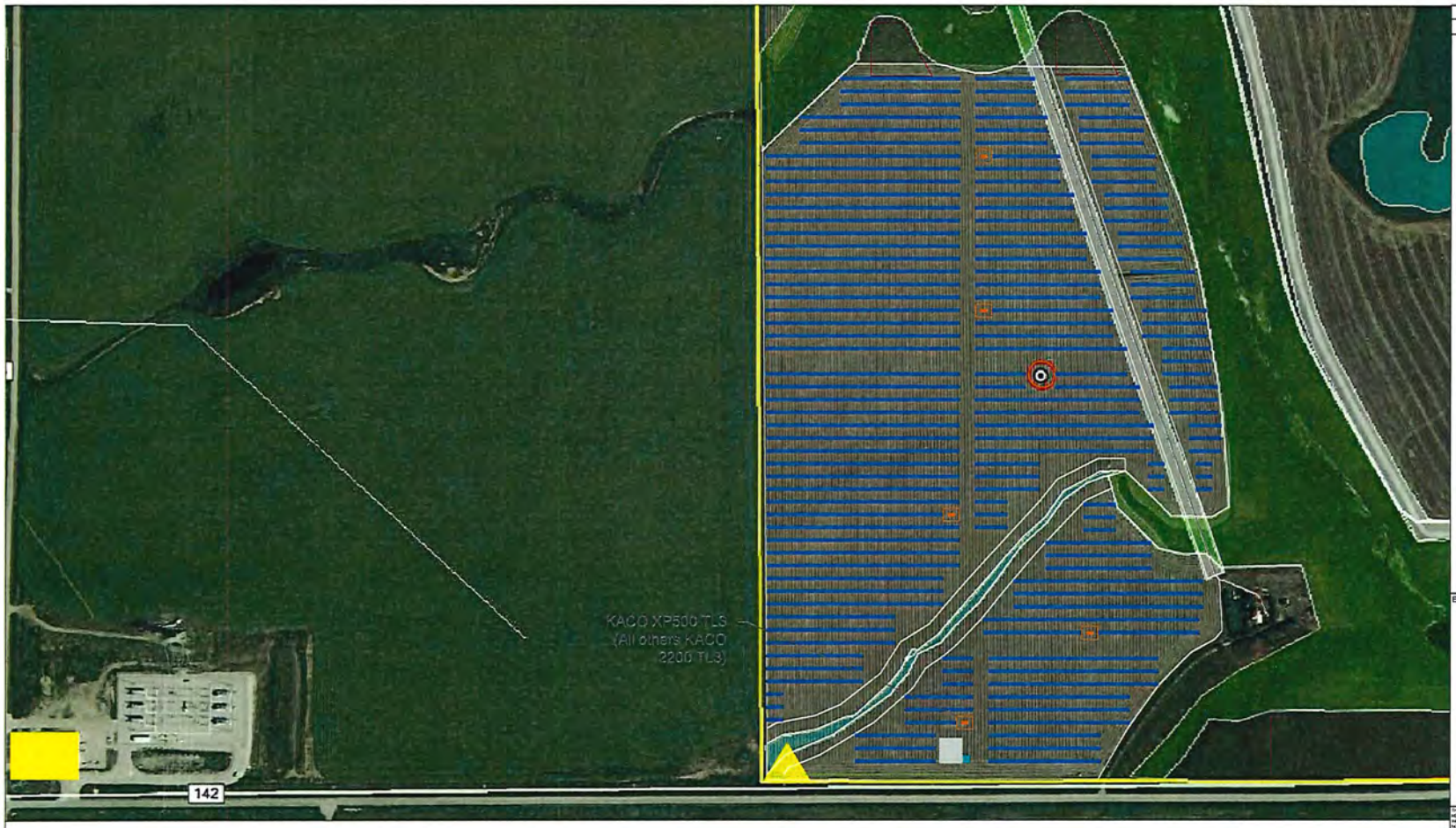
Alberta Environmental Protection. 1999. Stormwater Management Guidelines for the Province of Alberta, Alberta. 1999.

Environment Canada. 2014. Short Duration Rainfall Intensity-Duration-Frequency Data Lethbridge A, AB. 21 December 2014.

Government of Alberta. 2011. Erosion and Sediment Control Manual. 2011.

INTEGRATED SUSTAINABILITY

Appendix 1 – Stavely Solar Farm Conceptual Design Layout



SHEET 1 OF 3

Notes and General Conditions

1. This is a preliminary drawing only and shall not be used for construction, detailed cost estimates, Bills of Material, or for any other such purpose than that described by Apricity Renewables Inc. in the associated feasibility report.
2. PRELIMINARY LAYOUT SUMMARY DETAILS:

MODULES

ASSUMING 365W 72 Cell Modules

Overall Plant Size

37632 Modules

13.8 MW DC

8.5 MW AC

DC/AC Ratio 1.62

Minimum Setbacks

Roads: 125'

Property with dwellings: 33'

Pipelines: 33'

Adjacent Farm-land: 20'

ENGINEER'S SEAL:

Client:
Acestos Power

Project Address:
Township Rd 142 & Range Rd 272, Stavely, AB

Additional Details:
XXXXX

Drawing Title:
Site 3

Drawing No.:
1601501_Layout 3

REV.	DESCRIPTION	DATE	BY
03	FEASIBILITY - 11m RS, 1.62 OS	11/20/17	BM
02	FEASIBILITY - 9m RS, 1.7 OS	11/07/17	BM
01	FEASIBILITY - Rev. to AC interconnect size	10/26/17	BM

REVISIONS

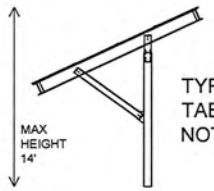
Designed By:	BM	Date:	01/10/16
Checked By:	NP	Date:	01/10/16

507 Cordeah Cres,
Peterborough, ON
T: 647-420-6313
www.apricityrenewables.com

ARI APRICITY RENEWABLES INC.

LEGEND

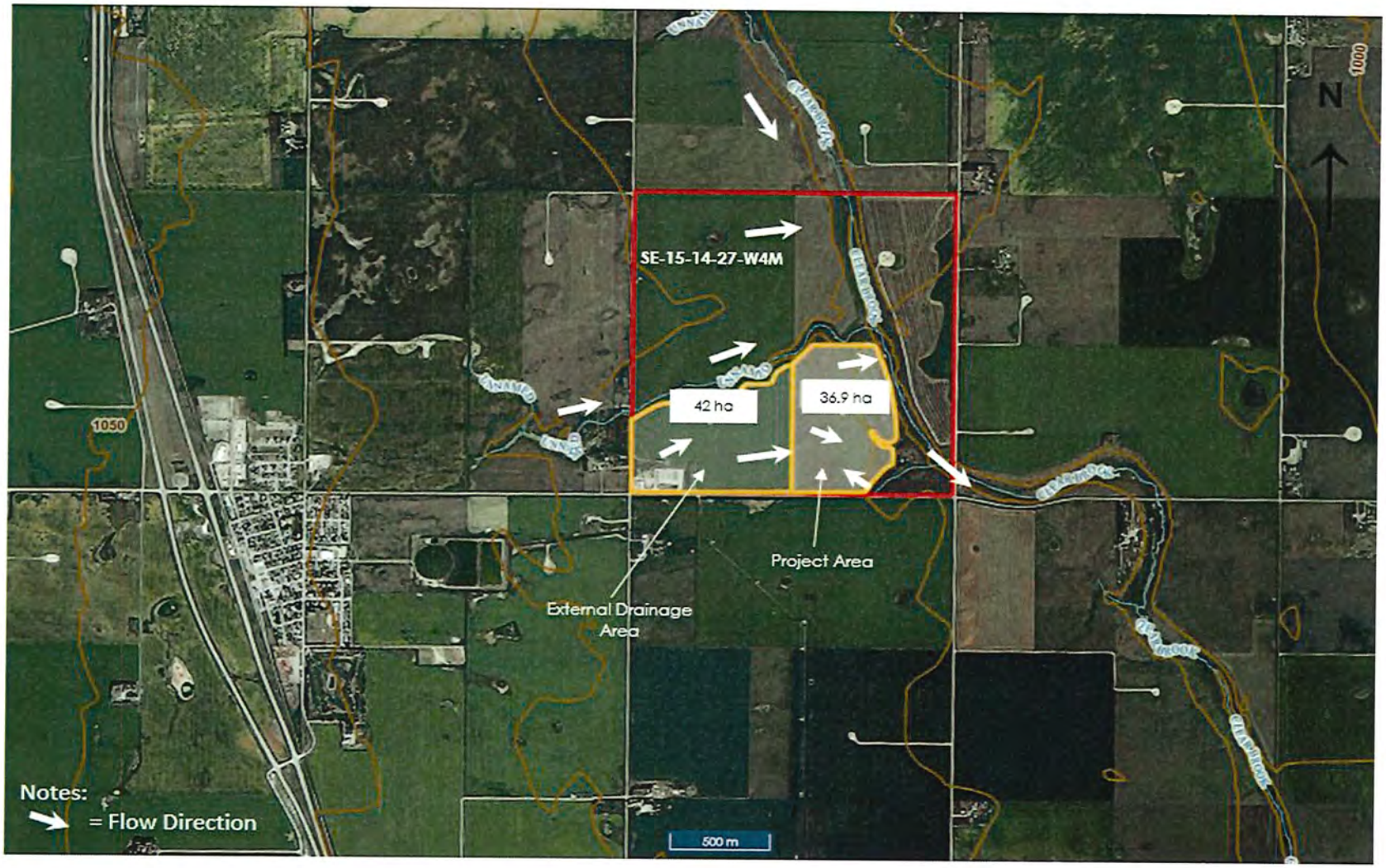
- INTERCONNECTION POINT
- PROPOSED FEEDER ROUTE
- PANELS
- INVERTERS and REQ. AREA
- SWITCHGEAR AREA
- STAGING AREA
- SITE BUILDING/SHED



TYPICAL MODULE
TABLE PROFILE VIEW
NOT-TO-SCALE

INTEGRATED SUSTAINABILITY

Appendix 2 – Site Flow Direction



PREPARED BY: INTEGRATED SUSTAINABILITY	STAVELY SOLAR FARM SURFACE WATER MANAGEMENT PLAN SITE LOCATION AND FLOW DIRECTION				
CLIENT: ACESTES POWER	DRAWN BY: E. RATNAWATI	CHECKED BY: A. SPERSKE	APPROVED BY: P. LESLIE	DATE: December 15, 2017	
	SCALE: NTS	PROJECT NO.: VP17-ACP-01-00	FIGURE NO.: FIGURE 1		REVISION: A

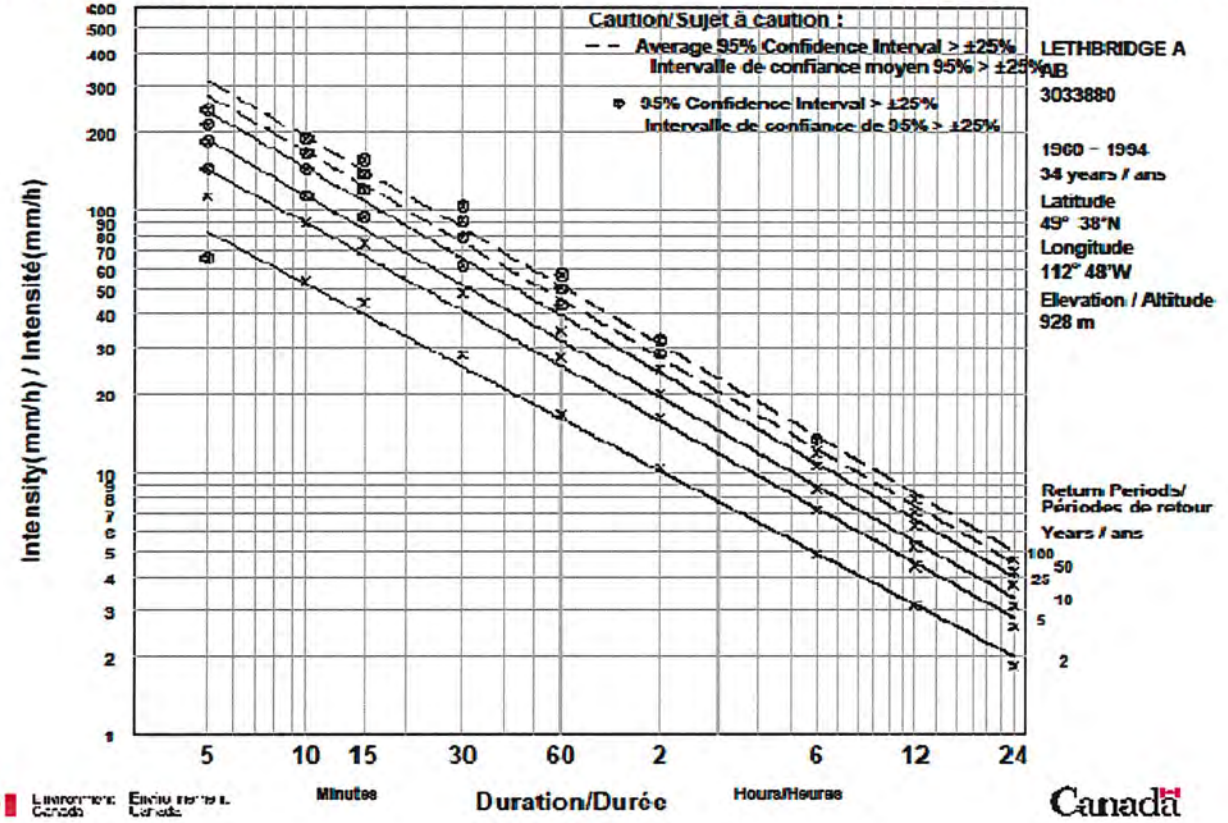
INTEGRATED SUSTAINABILITY

Appendix 3 – IDF Curve for Lethbridge

Short Duration Rainfall Intensity–Duration–Frequency Data

2014/12/21

Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée



Environment Canada / Environnement Canada

Canada

INTEGRATED SUSTAINABILITY

Appendix 4 – SWMP Calculation Sheets

INTEGRATED SUSTAINABILITY

VP17-ACP-01-00 Calculation Record

Project Name: Stavely Solar Farm - Surface Water Management
Client Name: Acestes Power
Project Manager: Patrick Leslie
Technical Lead: Eri Ratnawati
Calculation Originator: Eri Ratnawati

Project Number: VP17-ACP-01-00
Calculation Title/Number: Stormwater Management
Client Project Manager: Clyde Carr
Date: December 14, 2017

Rev.	Description		Date	By	Chkd	Date
0	Issued for Approval		22-Nov-17	E. Ratnawati	A. Sperske	14-Dec-17

Purpose of Calculation

The purposes of these calculations are to compare the pre-development and post-development surface water runoff, and to calculate the post-development run-off from the solar farm area.

Assumptions

Design Storm: 1:100 year event

Runoff rates were calculated using the Rational Method.

Based on site layout conveyance channels will not be required for Drainage Areas

For post-development runoff, the Rainfall Intensity is based on the largest Time of Concentration generated from the contributing area(s).

References

Runoff Coefficients and Manning's n values were obtained from:
Alberta Transportation, 2011. Erosion and Sediment Control Guide. Appendix F. Web accessed on April 11, 2017. http://www.transportation.alberta.ca/4626.htm

Intensity Duration Frequency Rainfall Rate from
Environment Canada, 2014. Short Duration Rainfall Intensity-Duration-Frequency Data for Lethbridge, Alberta.

Coefficients associated with the Kerby and Kirpich formulas were obtained from:
Texas Department of Transportation, 2015. Hydraulic Design Manual. Web accessed on April 11, 2017. http://onlinemanuals.txdot.gov/txdotmanuals/hyd/time_of_concentration.htm

Discussion of Calculation Findings

Design Storm Peak Runoff Flow Rates for the Site.

Drainage Areas	Equivalent Runoff Coefficient (C)	Time of Concentration (min)	Selected Return Period (min)	Design Storm	Rainfall Intensity (mm/hr)	Effective Area (ha)	Peak Flow (m^3/s)
Pre-Development (Site)	0.463	77	80	1:10 year	29.7	78.90	**3.01**
	0.463			1:25 year	37.2		**3.78**
	0.463			1:100 year	48.4		**4.92**
Post-Development Conditions	0.461	77	80	1:10 year	29.7	78.90	**3.00**
	0.461			1:25 year	37.2		**3.76**
	0.461			1:100 year	48.4		**4.89**

Recommendations

Changes in runoff between pre and post development are negligible for the used storm 1 in 10, 1 in 25 year, and 1 in 100 year storm events evaluated. No infrastructure (stormwater pond) is proposed to control surface water on the Site othe than roadside ditch and several of culverts along the north south access way to maintain drainage path to downstream site (i.e. Clearbrook Creek).

INTEGRATED SUSTAINABILITY

Pre-Development Runoff - Calculation Record

Project Name: Stavely Solar Farm Surfacae Water Management Plan
Client Name: Acestes Power
Project Manager: Patrick Leslie
Technical Lead: Eri Ratnawati
Calculation Originator: Eri Ratnawati

Project Number: VP17-ACP-01-00
Calculation Title/Number: Pre-Development Runoff
Client Project Manager: Clyde Carr
Date: December 14, 2017

Pre-Development Runoff Flow Rate

Input Data
Constants/Calcs
Output Data

Method Used:	Rational Method

Rainfall Data:		
Design Storm:	1:10	
	1:25	
	1:100	

Comments:

1. Used Rainfall data for Lethbridge, Alberta.
2. Runoff coefficient was taken from Appendix E of the From Erosion and Sediment Control Guide, produced by Alberta Transportation

Calculation of the Runoff Coefficients:

	Drainage Area				Runoff Coefficients
Project Area (Pasture - Heavy Soil)	369,000	m^2	36.90	ha	0.45
External Drainage Area Facility (Street - Drive and Walk, Roof)	25,000	m^2	2.50	ha	0.85
External Drainage Area (Pasture - Heavy Soil)	395,000	m^2	39.50	ha	0.45
Total Area	789,000	m^2	78.90	ha	

Composite Runoff Coefficient, C:	0.463

Calculation of the Runoff Flow Rate (Q):

Design Overland Travel Length, L	1365	m	**The Kerby Method** For small watersheds where overland flow is an important component of overall travel time, the Kerby method can be used. The Kerby equation is $t_{ov} = K(L \times N)^{0.467} S^{-0.235}$
Design Channel Travel Length, L	0	m	
High Point Elevation (Overland)	1027.00	m	
Overland Low Point Elevation	1010.00	m	
Channel Low Point Elevation	0.00	m	
Design Overland Elevation Diff	17.00	m	
Design Channel Elevation Diff	0.00	m	**The Kirpich Method** For channel-flow component of runoff, the Kirpich equation is: $t_{ch} = KL^{0.770} S^{-0.385}$
Average Overland Slope, So	0.0125	m/m	
Average Channel Slope, Sc	0	m/m	
K Value	1.44		
N Value	0.4		Pasture - average grass
Time of Concentration, Tov	77	min	
K Value	0.0195		
Time of Concentration, Tch	0	min	
Time of Concentration, Ttotal	77	min	Minimum 10 min
Intensity (Design Storm) 1:10 year storm	29.7	mm/hr	From the IDF for a duration of Ttotal
Intensity (Design Storm) 1:25 year storm	37.2	mm/hr	
Intensity (Design Storm) 1:100 year storm	48.4	mm/hr	
Calculated Pre-Development Peak Runoff Flow - **Design Storm 1 in 10 year**	3.01	m^3/s	Q = 0.00278CiA (m3/s)
Calculated Pre-Development Peak Runoff Flow - **Design Storm 1 in 25 year**	3.78	m^3/s	
Calculated Pre-Development Peak Runoff Flow - **Design Storm 1 in 100 year**	4.92	m^3/s	

INTEGRATED SUSTAINABILITY

Post-Development Runoff - Calculation Record

Project Name: Stavely Solar Farm Surfacae Water Management Plan
Client Name: Acestes Power
Project Manager: Patrick Leslie
Technical Lead: Eri Ratnawati
Calculation Originator: Eri Ratnawati

Project Number: VP17-ACP-01-00
Calculation Title/Number: Post-Development Runoff
Client Project Manager: Clyde Carr
Date: December 11, 2017

Post-Development Runoff Flow Rate

Input Data
Constants/Calcs
Output Data

Method Used:	Rational Method

Rainfall Data:		
Design Storm:	1:10	
	1:25	
	1:100	

Comments:

1. Used Rainfall data for Lethbridge, Alberta.
2. Runoff coefficient was taken from Appendix E of the From Erosion and Sediment Control Guide, produced by Alberta Transportation

Calculation of the Runoff Coefficients:

	Drainage Area				Runoff Coefficients	
Solar panel area	295,200	m^2	29.5	ha	0.45	*Pasture - Heavy Soil*
An operation/equipment shed (structure footprint)	60	m^2	0.006	ha	0.95	*Roof*
Solar block access way	11,520		1.15	ha	0.30	*Barren Packed Soil - Smooth (lower end)*
External Drainage Area Facility (Street - Drive and Walk, Roof)	25,000	m^2	2.50	ha	0.85	*Roof*
Remaining area (including external drainage area)	457,220	m^2	45.72	ha	0.45	*Pasture - Heavy Soil*
Total Area	789,000	m^2	78.90	ha		

Composite Runoff Coefficient, C:	0.461

Calculation of the Runoff Flow Rate (Q):

Design Overland Travel Length, L	1365	m	**The Kerby Method** For small watersheds where overland flow is an important component of overall travel time, the Kerby method can be used. The Kerby equation is $t_{ov} = K(L \times N)^{0.467} S^{-0.235}$
Design Channel Travel Length, L	0	m	
High Point Elevation (Overland)	1027.00	m	
Overland Low Point Elevation	1010.00	m	
Channel Low Point Elevation	0.00	m	
Design Overland Elevation Diff	17.00	m	
Design Channel Elevation Diff	0.00	m	**The Kirpich Method** For channel-flow component of runoff, the Kirpich equation is: $t_{ch} = KL^{0.770} S^{-0.385}$
Average Overland Slope, So	0.0125	m/m	
Average Channel Slope, Sc	0	m/m	
K Value	1.44		
N Value	0.4		Pasture - average grass
Time of Concentration, Tov	77	min	
K Value	0.0195		
Time of Concentration, Tch	0	min	
Time of Concentration, Ttotal	77	min	Minimum 10 min
Intensity (Design Storm) 1:10year storm	29.7		From the IDF for a duration of Ttotal
Intensity (Design Storm) 1:25 year storm	37.2		
Intensity (Design Storm) 1:100 year storm	48.4	mm/hr	
Calculated Pre-Development Peak Runoff Flow - **Design Storm 1 in 10 year**	**3.00**	m^3/s	Q = 0.00278CiA (m3/s)
Calculated Pre-Development Peak Runoff Flow - **Design Storm 1 in 25 year**	**3.76**	m^3/s	
Calculated Pre-Development Peak Runoff Flow - **Design Storm 1 in 100 year**	**4.89**	m^3/s	

AUTHORIZATION LETTER (LANDOWNER)
AND
LAND TITLE CERTIFICATES

STAVELY SOLAR PROJECT

AUTHORIZATION LETTER

April 15, 2019

FROM: Mayland Farms Ltd.

TO WHOM IT MAY CONCERN

Re: SE 15-14-27 W4M & NE 15-14-27 W4M
Site: Stavely Solar Project

We/I, Mayland Farms Ltd., the owner of the above mentioned properties, hereby give Acestes Power ULC.and its agents permission to act as our agent to acquire the necessary permits and information from the municipality or other authorities concerned, needed to approve the construction of the Stavely Solar Project. Permission is granted to Acestes Power ULC and its agents to apply for any Land Use Amendments, Development Permits, Building Permits and any other municipal or provincial permits required to gain approval to construct the Stavely Solar Project on the lands indicated above.

Sincerely,
Mayland Farms Ltd.,

_____

Per: John Ellis

SITE PLAN

STAVELY SOLAR PROJECT

SHEET 1 OF 3

Notes and General Conditions

1. This is a preliminary drawing only and shall not be used for construction, detailed cost estimates, Bills of Material, or for any other such purpose than that described by Apricity Renewables Inc. in the associated feasibility report.
2. PRELIMINARY LAYOUT SUMMARY DETAILS:

MODULES

ASSUMING 365W 72 Cell Modules

Overall Plant Size

37832 Modules

13.8 MW DC

8.5 MW AC

DC/AC Ratio 1.62

Minimum Setbacks

Roads: 125'

Property with dwellings: 33'

Pipelines: 33'

Adjacent Farm-land: 20'

ENGINEER'S SEAL:

Client: Acestes Power

Project Address: Township Rd 142 & Range Rd 272, Stavely, AB

Additional Details: XXXXX

Drawing Title: Site 3

Drawing No.: 1601501_Layout 3

REV.	DESCRIPTION	DATE	BY
04.1	FEASIBILITY - Addition of roads	4/12/2019	BM
04	FEASIBILITY - Adjusted window zoom	09/29/17	BM
03	FEASIBILITY - 11m RD, 1.62 DR	11/09/17	BM

REVISIONS

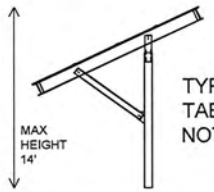
Designed By:	BM	Date:	01/10/16
Checked By:	NP	Date:	01/10/16

507 Cordeath Cres,
Peterborough, ON
T.647-622-4313
www.apricityrenewables.com

ARI

LEGEND

- INTERCONNECTION POINT
- PROPOSED FEEDER ROUTE
- PANELS
- INVERTERS and REQ. AREA
- SWITCHGEAR AREA
- STAGING AREA
- SITE BUILDING/SHED
- SUBSTATION



TYPICAL MODULE
TABLE PROFILE VIEW
NOT-TO-SCALE

ALBERTA ENERGY REGULATOR
ABANDONED WELL MAP

STAVELY SOLAR PROJECT

Abandoned Well Map

Base Data provided by: Government of Alberta

Author XXX

Printing Date: 4/8/2019

Date Date (if applicable)

Legend

- Abandoned Well (Large Scale)
- Revised Well Location (Large Scale)
- Revised Location Pointer
- Road Paved
- Road Gravel
- Road Other
  - Unimproved Road
  - Winter Road; Truck Trail
- Rail Line
  - Rail Line
  - Abandoned Rail Line

Scale: 18,055.95

0.28 Kilometers 0

Projection and Datum:

WGS84 Web Mercator Auxiliary Sphere

Alberta Energy Regulator

HISTORICAL RESOURCE ACT APPROVAL

STAVELY SOLAR PROJECT

Alberta Culture and Tourism

HRA Number: 4941-18-0003-001
May 01, 2018

Historical Resources Act Approval

Proponent: Ascestes Power ULC
210B, 9705 Horton Road SW, Calgary, AB T2V 2X5
Contact: Clyde Carr

Agent: Arrow Archaeology Limited
Contact: Neil Mirau

Project Name: **Acestes Stavely Solar Project**

Project Components: Solar Power

Application Purpose: Requesting HRA Approval / Requirements

Historical Resources Act approval is granted for the activities described in this application and its attached plan(s)/sketch(es) subject to Section 31, "a person who discovers an historic resource in the course of making an excavation for a purpose other than for the purpose of seeking historic resources shall forthwith notify the Minister of the discovery." The chance discovery of historical resources is to be reported to the contacts identified within Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources.

Rebecca Traquair
Regulatory Approvals Coordinator

Lands Affected: All New Lands

Proposed Development Area:

MER	RGE	TWP	SEC	LSD List
4	27	14	15	1,2,7-10,15,16

Documents Attached:

Document Name	Document Type
project area map	Illustrative Material

NAV CANADA APPROVAL

STAVELY SOLAR PROJECT

NAV CANADA

Serving a world in motion
navcanada.ca

January 11, 2019

Your file
Stavely Solar - SE 15-14-27 W4M
Our file
18-4481

Clyde Carr
Acestes Ventures Ltd

RE: Other Permanent Structure(s): Solar Panels - Stavely, AB
(N50° 9' 54.62" W113° 35' 59.66" / 16' AGL / 3372' AMSL)

Carr,

NAV CANADA has evaluated the captioned proposal and has no objection to the project as submitted.

NAV CANADA does not require notification of construction; however, if you should decide not to proceed with this project, please advise us accordingly so that we may formally close the file. If you have any questions, contact the Land Use Department by telephone at 1-866-577-0247 or e-mail at landuse@navcanada.ca.

NAV CANADA's land use evaluation is valid for a period of 12 months. Our assessment is limited to the impact of the proposed physical structure on the air navigation system and installations; it neither constitutes nor replaces any approvals or permits required by Transport Canada, other Federal Government departments, Provincial or Municipal land use authorities or any other agency from which approval is required. Innovation, Science and Economic Development Canada addresses any spectrum management issues that may arise from your proposal and consults with NAV CANADA Engineering as deemed necessary.

Yours truly,

Olivier Meier | NAV CANADA
Manager - Land Use and NOTAM Office

cc NOPR - Northern and Prairie Region, Transport Canada
blamb@scottland.ca