# Emergency Response Plan DRAFT

Eastervale Solar + Energy Storage Project

MD of Provost, Alberta

February 2024

WESTBRIDGE RENEWABLE ENERGY CORPORATION

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# 1 General Information

## 1.1 Introduction

This Emergency Response Plan ("ERP") has been established to ensure the proper planning, practices and procedures are in place to effectively respond to emergency situations should they occur, per Alberta Safety Code – Part 7: Emergency Preparedness and Response. This ERP will provide direction to all workers on a worksite and emergency response units in the event of medical aid, serious injury, fire, explosion, or other situation that may require an evacuation and/or emergency response.

## 1.2 ERP Development

The ERP was developed based on four main criteria: communication, prevention, mitigation, and preparedness and response. These criteria will be foundational to the evolution of the ERP through all Project phases. Eastervale considered the following resources during ERP development:

- Occupational Health and Safety Code, Part 7: Emergency Preparedness and Response; Regulation 87/2009
- CSA Standard CAN/CSA-Z731-03 (R2014), Emergency Preparedness and Response, 2014
- DNV-GL, Considerations for ESS Fire Safety, 2018
- DNV-GL, Quantitative Risk Analysis for Battery Energy Storage Sites, 2019
- NFPA 855, Standard for the Installation of Stationary Energy Storage Systems, 2020
- TESLA Lithium-ion Battery Emergency Response Guide; For Tesla Energy Products including Powerwall, Powerpack, and Megapack – TS-00004027 – REV2.1, 2020.

## 1.3 Project Description

Eastervale Solar Inc. ("Eastervale") is an Alberta-registered corporation owned by Westbridge Renewable Energy Corporation ("Westbridge"). Eastervale is proposing to construct and operate the Eastervale Solar + Energy Storage Project (the "Project" or "Eastervale Solar"), a 300 $MW_{AC}$ solar energy generation and 200MW / 400MWh battery energy storage project located in the Municipal District of Provost ("MD") approximately 16 kilometers southwest of Hughenden.

The Project includes portions of Sections 25, 35 and 36, Township 39, Range 08, W4M and Sections 2 and 11, Township 40, Range 08, W4M.

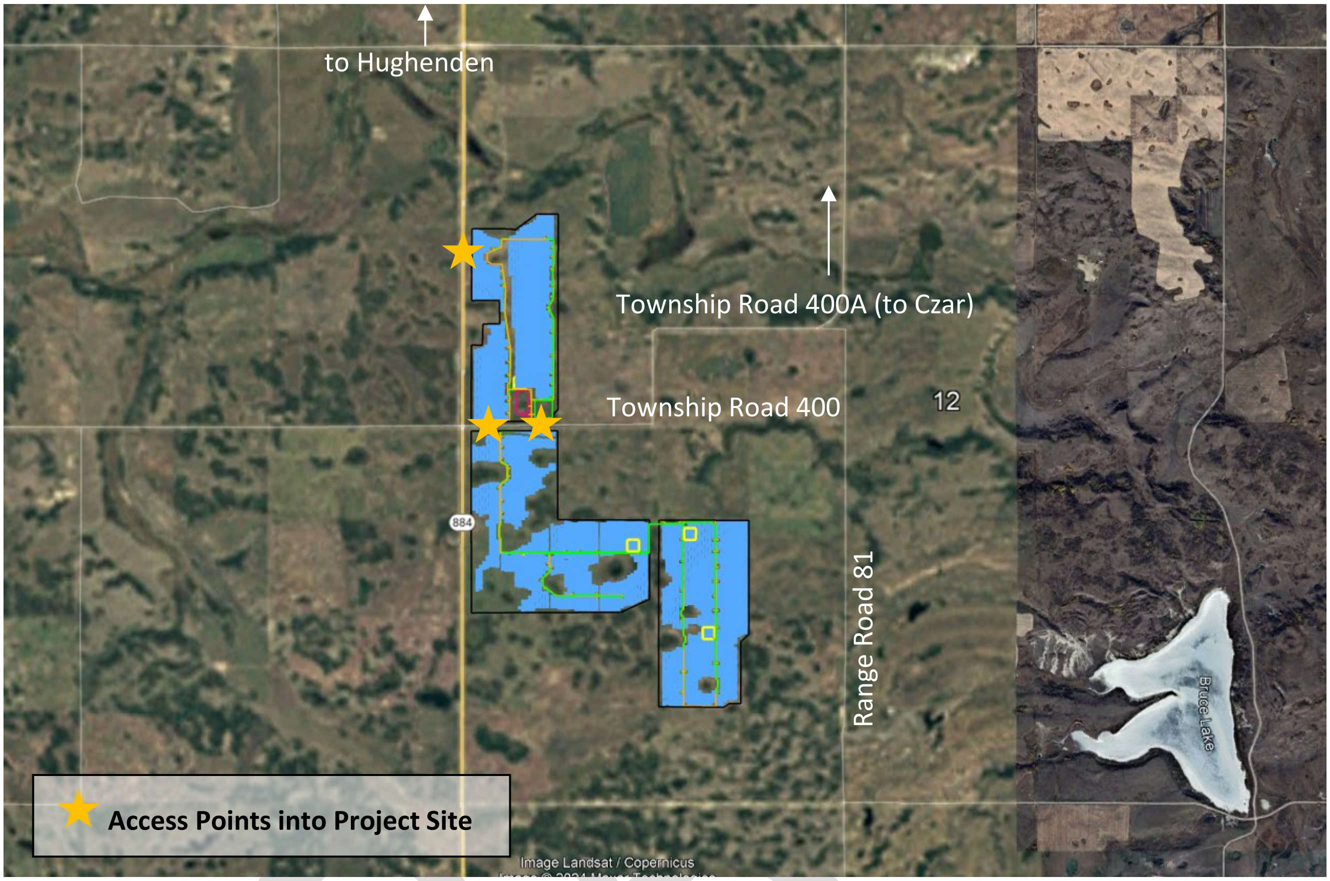



*Figure 1 - Project Map*

## 1.4 Site Access

The Project is located immediately adjacent to Highway 884. Routes for access to Eastervale can vary depending on the origination point of the emergency response agency. Access into the Project site is planned via one approach north and one approach south from Township Road 400, and one approach from Highway 884 as needed in emergencies as shown in Figure 1. Access to the Project location from Hughenden is shown in Figure 2.

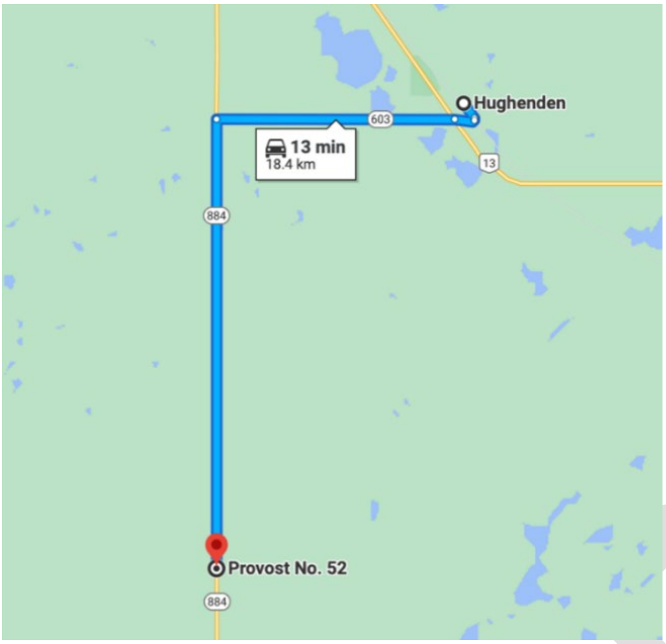



*Figure 2 - Site Access from Hughenden*

## 1.5 Emergency Response Jurisdictions

The Eastervale Project is within the jurisdictional boundary of the MD of Provost. Support from the West End Fire and Rescue Department will be dispatched accordingly when contacting 9-1-1. Other fire and emergency response may be dispatched from Provost. Below is a detailed list of non-emergency services contacts. If in a serious emergency always call 9-1-1 for immediate assistance.

## 1.6 MD of Provost Fire Response

The West End Fire and Rescue Department is the primary response agency in the Project area for a major event. The Fire Stations located in the villages of Amisk, Czar, and Hughenden are well equipped to respond to fire emergencies and has the following equipment available for fire response:

**Czar Fire Department -**

- 2019 Freightliner 114SD Pumper truck.
- 2012 Dodge 4500 Brush truck. Equipped with Honda gx 630 hight pressure pump system. 1m3 tank.

**Hughenden Fire Department –**

- 2008 International Dura star 4400 SBA 4X2 rescue truck.
- 2015 Freightliner 114SD Pumper Truck.
- 1995 GMC TopKick single axle pumper truck.
- 2019 367 Peterbilt tri-axle water tender. 3” Bowie pump.
- 2009 Ford F-150 Chiefs truck.
- 2016 Sundowner enclosed trailer 20’

- 2022Cam Am defender XT.

**Amisk Fire Department –**

- 2006 Freightliner. Business Class M2. single axle pumper truck
- 2013. Freightliner 114 SD. Single axle Pumper truck.

## 1.7 Local Emergency Services

*Table 1 - Emergency Response Agency Contacts*

| EMERGENCIES FIRST POINT OF CONTACT IS REACHED BY DIALING 9-1-1 | | | |
|---|---|---|---|
| EMS / FIRE / POLICE / NON-EMERGENCY CONTACT INFORMATION | | | |
| Facility | Contact Name | Telephone | Address |
| MD of Provost Director of Emergency Management | Tyler Lawrason | (780) 753-1918 | M.D. of Provost Administration Office<br>4504 53 Ave<br>Provost, AB |
| West Fire and Rescue Coordinator | Jeff Redekopp | Cell: (780) 753-0775 | N/A |
| Provost Fire Chief | Barry Johnstone | Station: (780) 753-1918<br>Cell: (780) 753-1454 | MD of Provost Fire Station<br>3911 53 Ave<br>Provost, AB |
| Amisk Fire Station<br>Amisk Fire Chief | Rick Damberger | Bus: (780) 753-6888<br>Cell: (780) 753-4171 | 5009 50 Street<br>Amisk, AB T0B 0B0 |
| Czar Fire Station<br>Czar Fire Chief | Orrin Ford | Cell: (780) 806-0432 | 4908 50 Street<br>Czar, AB T0B 0Z0 |
| Hughenden Fire Station<br>Hughenden Deputy Fire Chief | Cory Lefebvre | Station: (780) 856-2022<br>Res: (780) 856-2009 | 1 Simpson Ave,<br>Hughenden, AB<br>T0B 2E0 |
| Provost Fire Chief | Barry Johnstone | Station: (780) 753-1918<br>Cell: (780) 753-1454 | Provost Fire Department<br>3911 53 Ave<br>Provost, AB |
| RCMP Provost Detachment | | 780-753-2214<br>Non-Emergency | 5012 53rd Ave<br>Provost, AB, T0B 3S0 |
| Provost Health Center | | 780-753-2291<br>Switchboard | 5002 54 Avenue<br>Provost, Alberta<br>T0B 3S0 |
| Consort Hospital and Care Centre | | 403-577-3555<br>Switchboard | 5402 52 Avenue,<br>Consort, AB |
| Wainwright Health Centre | | 780-842-3324<br>Switchboard | 530 6 Avenue,<br>Wainwright, AB |

## 1.8 Site Contact Information

*The Primary Contact during the construction phase of the Project will be designated as a representative of the Engineering, Procurement, Construction ("EPC") contractor. During the operations phase, a Site Operations Manager will assume responsibility for emergency services and be known as the Primary Contact. The Project team will be determined in detail, as the project further develops.*

*Table 2 –* Construction Phase *Emergency Contacts*

| Construction Phase Contacts for Eastervale Solar Inc. | | | |
|---|---|---|---|
| Position | Name | Cell Phone | Email |
| EPC Project Manager | | | |
| Construction Superintendent | | | |
| Engineering Lead | | | |
| Environmental Coordinator | | | |
| Emergency POC | | | |
| Project Manager | | | |

*Table 3 - Operations and Maintenance* Phase Emergency Contacts

| Operations and Maintenance Phase Contacts for Eastervale Solar Inc. | | | |
|---|---|---|---|
| Site Operations Manager (Primary Contact) | TBD | Cell Phone: | Email: |
| BESS Subject Matter Expert | TBD | Cell Phone: | Email: |
| Safety Supervisor (Secondary Contact) | TBD | Cell Phone: | Email: |

The Primary Contacts (PC) listed above will be responsible for ensuring that all personnel receive the required safety and site-specific training and orientations. In addition, the PC duties will include compliance with this ERP and that all agencies and appropriate stakeholders (including but not limited to local residents, emergency response units, transmission utility, and project owner) are properly notified in the event notification is required, and that all required plans and reports are prepared and submitted in a timely manner.

The information gathered will be recorded in the appropriate EPC / General Contractor - Emergency Response Plans. This information will be communicated to all workers, including sub-contractors and visitors in the site- specific orientation. The ERP is to be posted in clear view for all to access if an event that requires emergency response occurs. The ERP will be updated as required to reflect changes in circumstances on the work site.

## 1.9 ERP Training, Orientation & Distribution

The contents and requirements of the ERP shall be communicated to all employees working on site and that could be affected by an emergency through training, staff meetings, All Hands Safety Meetings, and/or tailgate meetings.

A copy of the plan shall be provided to emergency responders in the local community, the occupational health treatment facilities, and the local Fire Response Team.

The Project's Primary Contact (Superintendent) and Secondary Contact will be responsible for overseeing emergency services compliance. They're duties will include ensuring that the measures in this plan are complied with, all agencies and appropriate stakeholders (including but not limited to emergency response units, transmission utility, and project owner) are properly notified in the event notification is required, and that all required plans and reports are prepared and submitted in a timely manner.

This is a working document and revisions will be made in consultation with the MD of Provost and applicable fire and emergency response agencies for the Project area.

## 1.10 Emergency Response Drill

At least one emergency response drill shall be completed within ninety (90) days of mobilizing to site that engages the local emergency service providers in the community.  Lessons learned shall be communicated Lessons learned shall be communicated across the project at Daily Hazard Assessment meetings, All Hands Safety Meetings, and Staff Meetings.  Needed improvement areas shall be incorporated into the next revision of the plan.

## 1.11 Emergency Medical Care / First Aid / CPR

Before each shift a supervisor will identify each member of their respective crews who are First-Aid/CPR trained. In the event of a major-medical emergency, on-site personnel who are professionally trained should immediately assess the patient in conjunction with immediate notification to 9-1-1 and/or local or onsite Emergency Medical Services.

Each jobsite must have a sign in sheet listing the current workers and visitors on the worksite. During an event where the site is evacuated to the muster point, the designated emergency supervisors will perform a roll call to ensure that everyone is at the meeting place. A complete report will be written, and all parties involved will contribute a witness statement. The report will be submitted and reviewed at the next Daily Hazard Assessment meeting, as well as the next weekly safety meeting. There will be discussions on how or what went well and what went wrong in this situation. Procedures will be reviewed, and decisions made on if changes need to be addressed.

## 1.12 Safety Equipment Requirements

The following equipment will be kept on-site (at a minimum) to support on-site care:

- First Aid Kits: standard kits containing supplies for care of minor injuries or ailments. One (1) kit per crew and one (1) kit in each jobsite office.
- Automated External Defibrillator (AED): portable device capable of restoring normal cardiac rhythm during cardiac arrest. One (1) in the jobsite office, One (1) in designed Site Safety Manager vehicle.
- Emergency use non-conductive rescue hook. One (1) in each jobsite office, One (1) in designed Site Safety Manager vehicle, One (1) at substation once energized.

All First Aid equipment should be stored in clean, dry area, accessible for regular inspection by crews and have documentation indicating equipment is in proper working order and supply is adequate. Replace any questionable, expired or exhausted supplies immediately.

# 2 Fire Prevention Plan (FPP) and Procedures

## 2.1 Purpose and Intent of the FPP

The intent of the FPP is to Identify hazards specific to site. With the goal of eliminating risks to prevent loss of life and property. Determining potential risks and/or causes of fires.

Educating employees to promote a safe environment. While bringing awareness and preparedness should a fire occur. Outlining a procedure to follow for the safety of the individuals on site at the time of a fire situation.

To establish proper procedures, training and rule out the responsible personnel for maintaining and servicing the equipment on site and systems in place to prevent and control a fire.

## 2.2 Responsibilities and Procedures

All employees are to be trained and should know how to prevent and respond to a fire emergency. All employees must:

- Complete an on-site training program identifying the fire risks for the project site.
- Know the protocol and follow emergency procedures should an event occur.
- Review and report potential fire hazards to the Onsite Primary Contact.

## 2.3 Site Specific Hazards Associated with Solar PV

Due to the unique nature of solar PV arrays standard fire suppression by means of water barrage are not always effective. Typical electrical or gas utility have a single point of disconnect. Photovoltaic (PV) solar arrays do not have a single point of disconnection, presenting a unique challenge for fire fighters. There are disconnects that will de-energize select parts of the system, if the PV panels are illuminated, the individual strings of PV panels are energized and capable of producing up to 1,500 volts. The following are possible hazards to consider when firefighting sites with photovoltaic solar arrays.

- No means of complete disconnection at one power source as there are multiple power sources.
- Outdoor rated electrical enclosures may not resist water intrusion from the high-pressure stream of a fire hose.
- Shock hazard due to the presence of water and PV power during suppression activities.
- PV panels and conductors damaged in the fire may not resist water intrusion.
- Shock hazard due to direct contact with energized components.

Other possible fire hazards and threats include grass fires due to lightning, failure of overhead lines, and construction-related accidents such as sparks from cutting operations and vehicular operations over dry vegetated areas, utility strikes, internal combustion engines, catalytic converters, and flammable/combustible liquids.

## 2.4 Large Fires

Do not attempt to extinguish a large fire or a soon to be large fire. Protect your safety.

- Persons discovering the fire should immediately contact the onsite supervisor and call 911 to report the fire.
- All personnel should be removed from the immediate danger area in anticipation of an evacuation.
- The Onsite Primary Contact will respond to the scene and ensure that the fire department has been dispatched. They will then determine evacuation needs, recruit/dispatch employees to assist with the evacuation and issue the following statement over the radio: "Attention, there is a fire emergency at (location name). Please evacuate (the affected area) and report to (designated meeting area)
- At this point, all employees in the affected area will stop work immediately, take steps to safely shut down equipment, exit the evacuation area, and report to the designated meeting area.
- In this scenario, fire extinguishers are to be used for escape purposes only.
- The Onsite Primary Contact will take the necessary steps to ensure that no employee re-enters the evacuated area until the Fire Department arrives and assumes command.
- No employee is required or permitted to place themselves in harm's way in order to facilitate extinguishment, evacuation, or rescue. All rescue operations will be performed by trained professionals upon their arrival.
- The Onsite Primary contact will provide notification to arriving MD of Provost Emergency Services that all employees are present and/or accounted for.
- The Onsite Primary Contact will issue an "All Clear" only when the Fire Department informs them that it is safe to do so.

## 2.5 Small Fires

Small fires that are in the early stage and can be controlled with a fire extinguisher. An example would be a small trash can fire. In the event of a small fire at the project:

Persons trained in the use of fire extinguishers are to attempt to put out fire.

- Call fire department if necessary.
- Fire extinguishers are located on all vehicles and motorized equipment.
- Do not allow the fire, heat, or smoke to come between you and your evacuation path.
- Select the appropriate type of fire extinguisher.
- Discharge the extinguisher within its effective range using the P.A.S.S. technique (pull, aim, squeeze, and sweep).
- Back away from an extinguished fire in case it flames up again.

- Exit the evacuation area, and report to the muster point or designated meeting area.
- No employees are permitted to re-enter the site until the incident commander deems it safe and will issue an "All Clear" when it is safe to do so.

## 2.6 Grass / Wildland Fire Procedures

The site should be free of combustible vegetation with only a ground cover of maintained vegetation adjacent and beneath the solar racking. Flying embers from off-site fire may inundate the area during fire events. The modified fuel areas and project features will resist ignition from ember showers. Ignition of the ground cover could result in a fast moving, but lower intensity fire that burn in a patchy manner on the site beneath the modules. This type of fire would be relatively short-duration as vegetative fuels are consumed rapidly. There would not be a sustained source of heat and or flame as there would be with surrounding wildfires. In the event of a vegetation fire under or near the modules or inverters:

- DO NOT attempt to extinguish the flames with water or other chemicals as an electric shock or arc could occur.
- If possible, safely attempt to shut down power at the inverter using the emergency shut off push button.
- Let the fire burn vegetation and self-extinguish.
- If flames continue away from modules or inverters, attempt to extinguish flames.

# 3 Controlling Fire Hazards & Prevention Practices

Identification and elimination of conditions that may cause fires is the best method for eliminating injury, loss of life, or loss of property due to fires. Fire prevention at the Project will be promoted by:

- Educating employees about risks and how to maintain a safe environment.
- Identification of risk factors (ignitions sources, fuel sources).
- Proper storage procedures.
- Housekeeping and site maintenance to eliminate fuel sources and identify fire risks.

All employees, contractors and sub-contractors need to be educated on fire hazards and what procedures to follow to prevent and control fire hazards. Employees need to know how to respond to the fires those hazards might cause.

## 3.2 Assessing Fire Danger

Fire Danger is a relative index of how easy it is to ignite vegetation, how difficult a fire may be to control, and how much damage a fire may do. Site Supervisors and/or the Project Safety Supervisor will continually assess the fire danger using the following resources:

- Alberta Fire Bans Map - https://www.albertafirebans.ca
- MD of Provost Fire Risk Notices - http://mdprovost.com

The fire danger index will be used to guide onsite activities and during high or extreme fire danger, hot work may be suspended or mitigated with water trucks.

## 3.3 Welding and Open Flame / Hot

Work Cutting, welding, and open flame work are naturally hazardous. Welding processes may use oxyacetylene gas, electrical current, electron beams, and heat from fuel gas. It is critical that the highest level of attention be given to these activities to prevent fires at a PV power plant.

- Cutting and welding are to be done by authorized personnel.
- Welders are to wear eye protection and protective clothing as appropriate.
- Oxygen-fuel gas systems are to be equipped with listed and or approved backflow valves and pressure-relief devices.
- Establish a fire watch when required.
- Maintain an on-site water source, such as a water truck or tank.

## 3.4 Class "A" Combustibles

These combustibles consist of common materials (wood, paper, cloth, rubber, and plastic) that can act as fuel and are found on most work sites. To handle Class A combustibles safely to prevent fires:

- Dispose of waste daily (i.e. cardboard, wood pallets, packing materials etc.)
- Use trash receptacles with covers.
- Keep work areas clean and free of combustible materials.
- Store materials in the proper storage containers.
- Do a periodic check of the job site to make sure combustibles are being handled correctly Water and multi-purpose dry chemical (ABC) are approved fire extinguishing agents for Class A Combustibles.

## 3.5 Class "B" Combustibles

These combustibles include flammable and combustible liquids (oil, grease, tar, oil-based paints and lacquers) flammable gases, and flammable aerosols. To handle Class B combustibles safely to prevent fires:

- Use only approved pumps (with suction from the top) to dispense liquids from tanks, drums, barrels, or similar containers (or use approved self-closing valves or faucets).
- Do not dispense Class B flammable liquids into a container unless the nozzle and container are electrically interconnected by contact or bonding wire. Either the tank or container must be grounded.
- Store, handle, and use Class B combustibles only in approved locations where vapors are prevented from reaching ignition sources such as heating or electric equipment, open flames, or

mechanical or electric sparks.

- Do not use a flammable liquid as a cleaning agent inside a building (the only exception is in a closed machine approved for cleaning with flammable liquids).
- Do not use, handle, or store Class B combustibles near exits, stairs, or any other areas normally used as exits.
- Do not weld, cut, grind, or use unsafe electrical appliances or equipment near Class B combustibles.
- Do not generate heat, allow an open flame, or smoke near Class B combustibles.
- Know the location of and how to use the nearest portable fire extinguisher rated for Class B fire.

### 3.6 Class "C" Combustibles

Class C fires are fires that involve energized electrical equipment. In the event of a Class C fire, ALWAYS de-energize the circuit(s) supplying the fire, and then use a non-conductive extinguishing agent such as carbon dioxide. A multi-purpose dry chemical (ABC) extinguisher can also be used on Class C fires. Do not use water, foam or other electrically conducive agents when fighting electrical fires. Once the electricity is shut down to the equipment involved, the fire generally becomes a standard combustible fire.

# 4 Hazards Associated with Battery Energy Storage Systems

In 2020, the American National Fire Protection Association published NFPA 855, *Standard for the Installation of Stationary Energy Storage Systems,* which addresses the dangers of toxic and flammable gases, stranded energy, and increase fire intensity associated with stationary energy storage systems. In general, the hazards inherent in BESS include fire and explosion, chemical, electrical, stranded or stored energy, and physical hazards. These hazards vary based on the technology used and the operating conditions.

The Project currently contemplates the use of lithium-ion (Li-ion) batteries. Hazards specific to Li-ion batteries under **normal** conditions include:

- Fire due to latent defects in the cells themselves or design issues related to the system controls
- Electrical hazards due to the risk of direct contact with high voltage equipment or high battery energy levels
- Stranded or stored energy hazards can exist if the batteries cannot be discharged or isolated for routine maintenance or replacement

Hazard considerations for Li-ion batteries under **abnormal/emergency** conditions include:

- Fire due to short circuiting and thermal runaway conditions if batteries are not maintained at appropriate operating parameters due to abnormal conditions
- Chemical hazards may be present via off-gassing or hazardous vapours
- Electrical hazards may exist if the BESS is at hazardous voltage and energy levels

- Stranded or stored energy under normal and abnormal conditions are similar. Damaged batteries may contain stored energy, which may pose a hazard during disposal.
- Physical hazards may exist due to overheating parts, damaged moving parts (e.g. fans)

## 4.1 Considerations for Emergency Responder Pre-incident Planning

The deployment and long-term operation of utility-scale BESS poses an additional challenge for rural first responders and fire fighters. NFPA 855, Annex C contains valuable information for first responders to safely and effectively respond to incidents that involve battery energy storage systems. Fire departments are encouraged to develop pre-incident plans for responding to fires, explosions, and other incidents associated with BESS installations and include:

- Awareness and understanding of procedures involved with the BESS facility operations and ERP
- Knowledge of technology (battery type) and the related hazards and methods for responding to the particular type of BESS
- Identifying the locations of all electrical disconnects
- Understanding that there may be stored or stranded electrical energy in the BESS that cannot be discharged or isolated
- Understanding procedures related to dealing with damaged BESS equipment
- Contacting the Eastervale Operations and Maintenance Manager or BESS subject matter expert to control or remove damaged equipment

## 4.2 Emergency Response Considerations

Immediate response would be from West End Fire and Emergency Services with a 15-minute response time to the Eastervale Project site. The West End Fire and Emergency Services includes 62 members who are trained at various levels and do include Fire Fighter Levels I and II and those certified in medical first response.

First response would primarily be focused on containing fire to the property, ensuring a safe site, and accessing only if there is a medical emergency or injury. Fire fighter entrance into the site would only occur with permission of the Eastervale PC once equipment is de-energized, contained, and with direction from the BESS SME.

## 4.3 Overheated Battery

If a fault occurs in the BESS and overheating of a battery cell(s) continues unchecked, damage may occur resulting in swelling, off-gassing, fire, or even explosion. Response to an overheated battery should include the following steps as outlined in NFPA 855, Annex C:

- Isolating area of all non-essential personnel
- Reviewing the status of the BESS buildings/containers, BESS alarm system, and facility with available system monitoring data

- Performing air monitoring of any connected spaces
- Identifying the location of overheated battery(s)
- Isolating the affected battery, string, or entire system based on the extent of damage by opening battery disconnect switched where possible
- Contacting the Eastervale Operations and Maintenance Manager or BESS subject matter expert
- Continue temperature monitoring to ensure mitigation or overheating condition

## 4.4 Understanding Thermal Runaway Conditions

Fires in electrochemical energy storage systems are often a result of thermal runaway, whereby the batteries create heat that cannot be dissipated, resulting in dynamic temperature increase. Fire responders should be prepared for toxic and potentially explosive gas release.

Toxic gases may be managed effectively through the appropriate personal protective equipment including a Self-Contained Breathing Apparatus (SCBA). The toxicity of gases released do not differ greatly from fires involving plastics; however, they should not be approached without SCBA, as concentrations of gases which cause Immediate Danger to Life and Health without PPE may be reached.

BESS thermal runaway prevention and response is outlined in the following sections.

## 4.5 BESS Design Considerations

The BESS will include a Battery Management System (BMS), an automated control and monitoring system, located on-site within a code compliant operating building or other suitable enclosure. The BMS will monitor sensors within and operating parameters of the BESS and, following programed logic and pre-determined ranges, thresholds, and triggers for monitored and operating parameters enact notifications, warnings, alarms, and protection modes without external intervention. Notifications, warnings, and alarms will be transmitted to remote operating personnel and manual interventions including protection modes and isolation may also be made by operational personnel remotely or onsite.

- The BMS will identify an abnormal operation and takes necessary measures to prevent thermal runaway, such as isolating a cell, a module or even emergency shutdown of the entire container
- The BESS includes a thermal management system with liquid-cooling (e.g., often an ethylene glycol/water mixture, air cooled heat exchangers, and heating, ventilating, and air conditioning systems) which dissipates the heat generated in battery cells and prevents overheating of the cells
- The BESS includes a detection system for gaseous hydrogen, smoke, and heat that identifies the pre-conditions and conditions of thermal anomaly or fire.
- The BESS enclosures are engineered to comply with the NFPA 69 (Standard on Explosion Prevention Systems rather than NFPA 68 Standard on Explosion Protection by Deflagration Venting) and includes fail safe passive ventilation panels that perform even in a power outage.

## 4.6 Project Site Design Considerations

- Based on manufacturer's recommendation, a minimum clearance from back-to-back and side-to-side of the BESS containers has been considered to avoid fire propagation
- There will be sufficient clearance in the layout between BESS containers with other equipment (inverters, transformers, substation, etc.) to avoid fire propagation to the rest of the project site
- The BESS site will be cleared of any vegetation to avoid grassfires entering the BESS site
- A clear access route around the perimeter of the BESS site has been included to allow full access for first responders to all sides of the BESS.

## 4.7 Emergency Response

Response to electrochemical BESS related fires should include the following steps:

- Ensure that all non-essential personnel are cleared of the vicinity and ensure safe egress for all such personnel.
- Notify the Site Supervisor (and the Emergency POC, as applicable).
- If there is an ongoing or risk of fire, call 9-1-1 to alert emergency services.
- If electrochemical BESS thermal runaway results in a fire, fire response should include system isolation and shutdown, hazard confinement and exposure protection, fire suppression, and ventilation.
- Shutdown, de-energize and isolate the affected and at-risk portions of the BESS (remotely as possible), and if necessary, on site, considering safe access requirements (fire, air quality etc.).
- Determine the air quality in all areas within the vicinity of the BESS, determine the wind speed and wind direction and notify all affected or potentially affected local stakeholders as required of potentially temporarily compromised air quality.
- Immediately engage 3rd party air quality monitoring if necessary (see air monitoring section below).
- As possible, evaluate the status of the BESS system via the system monitoring and control system (remotely) and monitor BESS stability and status via system monitoring data.
- Identify and isolate any overheating components via electrical disconnects.

## 4.8 Battery Energy Storage System Suppression Agents

For Li-ion battery fires, water is the preferred suppression agent due to its immediate cooling capacity, availability, and ease of onsite storage and transport. Fire fighting foams are not considered to be effective because they lack the ability to cool and can conduct electricity. Foams may also contribute to thermal runaway issues by insulating the burning materials and exacerbating heat rise. Dry chemical powders used in fire fighting may extinguish visible flame but, similar to foams, do not provide cooling to heated battery equipment. Thermal runaway inside the battery may continue potentially causing reignition.

## 4.9 Air Monitoring

Battery fires generally resemble plastic fires in terms of emission of toxic gases including CO, HCl, HF, HCN, Benzene, and Toluene. Li-ion battery fires will have short peaks of toxicity as individual cells randomly fail. However, battery fires, even once extinguished, continue to emit CO as long as the batteries remain hot.

Air monitoring during and after a BESS related emergency incident should be a priority for first responders. The BESS will contain a manufacturers air-monitoring system; however, it is recommended that fire responders use gas detection equipment to determine the presence and/or levels of toxic gases. Continued monitoring of CO from BESS fires, especially in enclosed spaces, and the continued use of personal protective equipment, including self-contained breathing apparatus, until CO levels are shown to be at normal levels. These practices may include monitoring for HCl, if applicable or possible.

## 4.10 Air Quality Dispersion Modelling Assessment

Eastervale retained Calvin Consulting Group Ltd. to complete an Air Quality Dispersion and Modelling Risk Assessment included as Appendix A to this ERP.

## 4.11 Hydrogen Buildup from Charging

Cycling Li-ion batteries can result in electrochemical reactions which release hydrogen gas. Without proper ventilation this hydrogen can build up in an enclosed space. The Lower Explosive Limit (LEL) for hydrogen is 4% concentration in air. Battery systems with this hazard are equipped with gas detection and alarm systems that would act to detect the generation of hydrogen and to shut down the system, as well, the enclosure venting would dissipate hydrogen generated into the atmosphere.

## 4.12 Vented Gas Combustion from Thermal Runaway

Lithium-ion batteries undergoing thermal runaway can vent their internal contents in the form of gas. Without proper ventilation, a combination of gasses can build up in an enclosed space. The LEL for this mixture can vary. Oxygen starvation fire suppression for lithium-ion battery systems is not recommended. Fire responders should be prepared for explosive gas release.

Safety measures include:

**Fire Resistant Construction:**

- Outdoor rated, non-walk-in battery enclosures made of high strength steel
- Fire resistant construction
- Ability to withstand potential mechanical forces during loading, transport, off-loading, installation and operation including seismic events

**Fire Suppression System:** smoke detector, temperature sensor, and a solid aerosol generator extinguisher are part of a standard fire suppression system.

**Fire and Explosion Safety System:** battery racks are typically monitored by a fire detection and suppression system. Very low gas concentration in case of thermal runaway.

### 4.13 Refrigerant and Coolant Leaks

HVAC systems designed to keep BESS within nominal operating temperature ranges have moving mechanical parts such as fan blades which, in the event of mechanical damage, may pose hazards to responders. Additionally, refrigerant or coolant lines or tanks may become mechanically damaged and leak refrigerant gas or coolant liquid. Each pose their own toxicological hazards. Responders should refer to equipment-specific safety data sheets (SDS) for further information.

# 5 Fire Reporting & Employee Training

## 5.1 Fire Incident Reporting

A fire report should be completed for all fires that occur on or in the vicinity of the site, including all small fires and ignitions, prescribed ecological burn fires and wildfires. If the incident is managed by Rocky View County Emergency Services, the fire reports from that agency / fire station will be obtained, reviewed and kept on record for monitoring and reporting purposes for the Project. Fire reporting should include details of the following:

- Fire name, ID and location.
- The person / agency responsible for responding to the fire.
- The command and control arrangements / incident team.
- A fire map, including a hand sketch or GIS map of the fire perimeter. Fire mapping should include known or suspected ignition point/s, fire perimeter, fire paths, asset damage, islands of unburnt areas, fire control lines, and other information specific to the fire.
- Fire management/control measures and strategies. This may include a list of equipment, personnel, vehicles utilised and their role (including agencies/equipment/personnel).
- Any unintended fire impacts to ecological values or other assets.
- Follow up action and additional reporting requirements, such as near-miss or injury, effectiveness of the burn, post-fire assessment requirements The annual monitoring for the Project will include a summary of all ecological burns and fire incidents. The fire reports and outcome will also be used to inform an adaptive management approach (e.x. improvements in fire mitigation procedures and/or response procedures) and incorporated as part of the document amendment procedure.

## 5.2 Fire Safety Training

Employees will be trained in and review any special hazards that might occur at the site, such as flammable materials, fuel storage, toxic chemicals, and water reactive substances. Fire safety training should occur during the site safety training. Every employee must take this training before starting work. Training to include:

- Employee roles and responsibilities.
- Recognition of potential fire hazards.

- Alarm system and evacuation routes.
- Location and operation of manually operated equipment (fire extinguishers).
- Emergency response procedures.
- Emergency shutdown procedures.
- Good fire-prevention housekeeping practices and equipment maintenance.

## 5.3 Site Maintenance & Housekeeping

All installed fire prevention or fire response equipment shall receive monthly inspections (with records) and regular maintenance in accordance with OSHA requirements. All personnel and subcontractors carrying fire extinguishers in their vehicles are responsible for conducting a monthly inspection of the extinguishers to ensure the equipment is in good working order and ready for use in a fire emergency.

- Combustible material should not be stored in mechanical rooms or electrical equipment rooms.
- Storage is not allowed in electrical equipment rooms, or near electrical panels.
- Electrical panel openings must be covered.
- Power bars must be plugged directly into an outlet and should be for temporary use only.
- Extension cords and flexible cords should not be substituted for permanent wiring.

## 5.4 Safety Data Sheets

**Location and Posting:**

Each subcontractor shall maintain a listing of all materials that they are using which may be flammable or hazardous to health. Therefore, refer to each subcontractor for the most comprehensive and up-to-date listing together with the Safety Data Sheets (SDSs) for each chemical.

The location of the SDSs maintained on site shall be posted on the project information board and a copy will be added to the WHMIS project binder located on site.

## 5.5 Fire Fighting Equipment Requirements

As per the *Alberta Prairie and Forest Protection Act and Regulation*, any person carrying on or overseeing an industrial or commercial operation in or within 1 kilometer of any public land shall keep at the site available for immediate use an adequate water supply for firefighting purposes plus at least the equipment listed in Table "3" in good working condition, according to the number of workers employed at the site.

*Table 4 - Fire Fighting Equipment Minimum*

| Minimum Requirements for 3 or More Personnel | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Equipment | Number of Personnel at the Worksite | | | | | | | |
| | 3 | 4 | 5 | 6-10 | 11-20 | 21-30 | 31-40 | 41+ |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Shovels | 2 | 2 | 3 | 5 | 10 | 15 | 20 | Contact the Director of Forestry to determine requirements |
| Backpack with Pump | 1 | 2 | 3 | 5 | 10 | 15 | 20 | |
| Axe or Pulaski | 1 | 1 | 2 | 5 | 10 | 15 | 20 | |
| Fire Pump | 0 | 0 | 0 | 0 | 0 | 1 | 1 | |
| Fire Hose | 0 | 0 | 0 | 0 | 0 | 450 m | 450 m | |
| Chainsaw | 0 | 0 | 0 | 0 | 0 | 1 | 1 | |

### 5.6 Fire Equipment Safety

The following are preventive measures to eliminate possible risks of fires.

- All internal combustion engines, both stationary and mobile, shall be equipped with spark arresters. Spark arresters shall be in good working order.
- Light trucks and cars with factory-installed (type) mufflers shall be used only on roads where the roadway is cleared of vegetation. These vehicle types shall maintain their factory-installed (type) mufflers and catalytic converter shields in good condition.
- Equipment parking areas and small stationary engine sites shall be cleared of all extraneous flammable materials.
- The project proponent shall make an effort to restrict the use of chainsaws, chippers, vegetation masticators, grinders, drill rigs, tractors, torches, and explosives to periods outside of the official fire season. When the above tools are used, water tanks equipped with hoses, fire rakes, and axes shall be easily accessible to personnel.
- Hot work permit. Activities using open flame heat sources shall be controlled and managed via an approved hot work permit process. A fire watch shall be maintained for one hour after activities that require a hot work permit cease.



## 6 Emergency Responses

### 6.1 Types of Emergencies and Responses

Some possible emergencies for the scopes of work undertaken by workers and subcontractors to consider include, but are not limited to, the following:

- Medical Emergency: worker injury or personal medical issue.
- Fire: wildland/grassfire or electrical fire.
- Severe Weather/Catastrophic Emergency: tornado, high wind event, blizzard, flood, lightning
- Fall from heights.
- Hazardous Material Emergency: chemical spills, equipment failures, environmental conditions dangerous to personnel.

- Electrocution: contact with AC or DC conductors or step and touch hazards.
- Vehicle: vehicle incident.

# 7 Emergency Procedures

## 7.1 Fire Emergency Notification Procedures

- All fires shall be immediately reported to the local emergency services (9-1-1) and the Project Primary Point of Contact.
- The POC shall coordinate the emergency response for the fire and ensure site evacuation procedures are followed.

## 7.2 Personnel Emergency Notification Procedure

- Assess the emergency and notify emergency services and site safety
- If there is a potentially life-threatening injury or scenario, the first step is to call 911 directly.
- Then contact the Project Supervisor and Subcontractor/Owner Safety Representative by radio or cell phone depending on available services at site.
- If the injury or scenario is not life threatening, contact the nearest Supervisor, as well as the Project Safety Supervisor and Subcontractor/Owner Safety Representative by radio or cell phone depending on available services at site.

**Describe the emergency scenario. Typically, the categories below can be used:**

- Incident type (e.x fall, crush, vehicular accident, fire, electrical shock)
- Potential Fatality
- Major illness (ex. Not breathing, heart attack, unconsciousness)
- Major injury (ex. broken bone, loss of limb, severe cuts/bleeding)
- Minor injury (ex. twisted ankle, foreign body in eyes, minor cuts)
- Bite/ Sting ( ex. Snake, wasp etc)
- Severe Weather (eg; Lighting strike, heat or cold stress, tornado)

**Identify Location**

- Provide the location of the emergency, by referring to the nearest structure or road junction.

**Determine Appropriate Response**

Unless the injury is a life-threatening injury, the Supervisor (PC), Project Safety Supervisor, and Subcontractor/Owner Safety Representative will determine the appropriate response, which may be:

- Arrange for a site First Aid Trained Employee to respond to the location of the injured.

- Arrange for transport of the injured to the site safety trailer for first aid administration, and further evaluation.
- Arrange for site transport to take the injured to a hospital or local medical clinic.
- Arrange for 911 services to respond directly to the injured employee.

**Coordinate**

- Send an employee to the nearest site access point to meet the emergency responders and escort them to the location of the location of the emergency.
- If offsite 911 responders are notified, the Project Safety Supervisor and Subcontractor /Owner Safety Representative will coordinate in directing the emergency services to the incident scene.

**Accompany**

- The First Aid Trained Employee, Supervisor, Project Safety Supervisor, and Subcontractor/Owner Safety Representative will continue to assist with the emergency scenario.
- If the decision is made to transport the employee directly to an offsite hospital or medical clinic (either by site transport or by 911 emergency responders), the employees' Supervisor, the Project Safety Supervisor (or designee), and the Subcontractor/Owner Safety Representative shall:
    - Accompany the injured employee to the hospital.
    - Stay with the injured employee until examination (including a drug and alcohol test) is complete, and the diagnosis is completed (in order for a full report including the extent of the potential injuries can be made.)
    - Supervisors shall make known to the treating medical practitioners the employee's typical work duties, the availability of oversight for the employee's return to duty, and alternate duties available to the employee.

**Notify Employer**

- The employee's Supervisor shall notify the employee's employer and emergency contact.
- Project Safety shall notify Corporate HSE as applicable and the Project Project Manager within established time frames.
- Subcontractor/Owner Safety Representative shall notify the Owner within established time frames.

**Media Response Plan**

- If an emergency draws the attention of the media and the public, certain procedures need to be in place. Cordon the area off with tape and barricades.
- Secure the area for the investigation that will occur. Have a media representative from the owner meet with the media when a release of information is allowed after discussions with the owner/client and the authorities.

## 7.3 Spill Response Procedure

Immediately report any releases of hazardous materials to your Supervisor and the Environmental

Supervisor (TBD)

The site Spill Prevention, Control and Countermeasure (SPCC) plan shall be followed when a spill occurs on site that involves any oil products. See SPCC plan for more details.

**In case of Spill to Land:**

- Stop all work in vicinity of spill.
- Identify the product - check container design, warning labels, markings, etc.
- Prevent personnel from approaching the site and keep them at a distance sufficiently removed that they will not be injured by, or cause, a fire or explosion.
- Install measures to contain the spill if it is safe to do so utilizing a spill kit as appropriate.
- A spill kit shall include: Poly containment pail, oil absorbent pads, oil absorbent socks, heavy duty disposal bags, nitrile gloves, all-purpose absorbent (such as sawdust or kitty litter), shovels, plugs and clamps (zip ties) to control a line break.
- Wait for further instructions from responding personnel.

**In case of spill to water:**

- Stop all work in vicinity of spill.
- Identify the product - check container design, warning labels, markings, etc.
- Prevent personnel from approaching the site and keep them at a distance.
- Install measures to contain the spill if it is safe to do so.
- Wait for further instructions from responding personnel.

## 7.4 Site Evacuation Procedure

Each jobsite must have a sign in sheet listing the current workers and visitors on the worksite. During an event where the site is evacuated to the muster point, the designated emergency supervisors will perform a roll call to ensure that everyone is at the meeting place. A complete report will be written, and all parties involved will contribute a witness statement. The report will be submitted and reviewed at the next *Daily Hazard Assessment* meeting, as well as the next weekly safety meeting. There will be discussions on how or what went well and what went wrong in this situation. Procedures will be reviewed, and decisions made on if changes need to be addressed.

An evacuation practice drill will be a part of the initial safety meeting held on site. Subsequent drills will be conducted at varying frequencies no less than two per calendar year depending on the duration and scope of work being undertaken at the site. These drills aid workers in understanding how to deal with an emergency correctly and efficiently and must be documented and records kept on site for audit purposes.

## 7.5 Designated Medical Facility

Eastervale will designate a Medicine facility/Urgent Care Clinic for nonemergency, occupational health related injuries and illnesses.

*Table 5 - Primary Non-Emergency*

| FACILITY NAME | ADDRESS | PHONE NUMBER |
|---|---|---|
| | | |

If the clinic is not available when needed during early, late, or weekend work hours, the hospital identified below will be utilized:

*Table 6 - Hospital*

| FACILITY NAME | ADDRESS | PHONE NUMBER |
|---|---|---|
| | | |

## 7.6 Damage Incident (No Injury)

In the event of a property, vehicle, road, equipment, and other damage related incident the below course of action will be followed:

- Notify Supervisor - contact the nearest Supervisor or employee, preferably the Safety Supervisor, by radio or cell phone depending on the services available at the site.
- Describe - the nature of the damage and the location of the of the damage incident, by referring to the nearest structure or road junction.
- Stop Work - stop all work in an area of damage until the Safety Supervisor arrives to investigate incident. Equipment and vehicle operators should stay near the vehicle.

## 7.7 Electrocution/contact with high voltage

All field personnel are first aid trained in how to deal with an electrocution. The Primary Contact or Safety Supervisor will be informed and will call STARS Emergency Link Centre with the site ID #

- Protect your own personal safety.
- Control the scene; stop work, shut down equipment and notify all workers in the area.
- Immediately report the incident/injury to your foreman/supervisor who will notify the designated client representative for the site. The Safety Supervisor (or designate if applicable) will, if required as per Section 18 of the *Alberta OH&S Act*, notify Workplace Health and Safety of the incident.
- Initiate the rescue plan to safely remove the casualty from close proximity of the electrical source.

- Administer first aid as needed and keep the individual warm.

## 7.8 Fall From Heights

- Field personnel are first aid trained in how to deal with falls from height and the related injuries. Primary Contact will be informed and will call STARS Emergency Link Centre with the site ID #.
- Protect your own personal safety.
- Control the scene; stop work, shut down equipment and notify all workers in the area.
- Immediately report the incident/injury to your foreman/supervisor who will notify the designated client representative for the site. The Safety Supervisor (or designate if applicable) will, if required as per Section 18 of the Alberta OH&S Act, notify Workplace Health and Safety of the incident.
- Initiate the rescue plan to safely lower the individual who has fallen or is suspended to a safe location.
- Administer first aid as needed and keep the individual warm.

## 7.9 Act of God/Extreme weather

In cases of tornado, flood, hurricane, lightning strike, meteor strike, earthquake, or solar flare; an emergency evacuation will be executed, and project management/EH&S will be notified.

- Protect your own personal safety.
- Control the scene; stop work, shut down equipment and notify all workers in the area.
- Immediately report the incident/injury to your foreman/supervisor who will notify the designated client representative for the site. The Safety Supervisor (or designate if applicable) will, if required as per Section 18 of the Alberta OH&S Act, notify Workplace Health and Safety of the incident.
- Devise a plan to move the casualty to an area that is out of the elements. This should only be done if the moving of the casualty will not cause further injury.

## 7.10 Wildlife Contact

- Protect your own personal safety - do not approach casualty until wildlife has been cleared away.
- Control the scene; stop work, shut down equipment and notify all workers in the area.
- Immediately report the incident/injury to your foreman/supervisor who will notify the designated client representative for the site.
- The Safety Supervisor (or other designate) will, if required as per Section 18 of the Alberta OH&S Act, notify Workplace Health and Safety of the incident.
- Devise a plan to move the casualty to an area that is out of the elements and away from the wildlife. This should only be done if the moving of the casualty will not cause further injury.

## 7.11 Snakebite

Personnel should be taken to the nearest major hospital as soon as possible where doctors will determine whether it is necessary to administer anti-venom. In case of a severe reaction (eg; loss of consciousness, not breathing, seizure, cardiac arrest), **call 911 immediately**. A bite victim should always be transported to hospital for assessment despite the fact that they may experience no effects from the bite.

**First Response:**

- Allow the bite to bleed freely for 15–30 seconds.
- Cleanse and rapidly disinfect the area with an iodine solution (if not allergic to iodine, fish, or shellfish), and remove clothing and jewelry from the body extremity where the bite occurred (pant legs, shirt sleeves, rings, etc.)
- If bite is on the hand, finger, foot, or toe - wrap the leg/arm rapidly with 3" to 6" of ACE or crepe bandage past the knee or elbow joint immobilizing it. Over-wrap bite marks. If possible, apply hard and direct pressure over the bite using a 4” x 4” gauze pad folded in half twice to 1” x 1”. Tape in place with adhesive tape. Soak gauze pad in Betadine™ solution if available and victim is not allergic to iodine, fish or shellfish.
- Strap gauze pad tightly in place with adhesive tape.
- Over-wrap dressing above, over, and below bite area with ACE or crepe bandage, but not too tight. Wrap ACE bandage as tight as one would for a sprain. Not too tight. Check for pulse above and below elastic wrap; if absent, the wrap is too tight. Unpin and loosen. If pulses are strong (normal), it may be too loose.
- Immobilize bitten extremity use splinting if available.
- If possible, try and keep bitten extremity at heart level or in a gravity-neutral position. Raising it above heart level can cause venom to travel into the body; below heart level can increase swelling.
- Evacuate to nearest hospital or medical facility as soon as possible.
- Do not delay medical care.

**What to Communicate at the Hospital:**

- Ask the staff to immediately contact their designated Poison Control Center.
- If required, more information can be found at Poison Control Information Services line (1-800-332-1414).
- Ask the hospital staff to use physician consultants available through the nationwide Poison Control Network if necessary.

**What NOT to do if bitten by a venomous snake.**

- Contrary to advice given elsewhere, do not permit removal of pressure dressings or ACE bandages until you are at the treatment facility and the physician is ready and able to administer anti-venom. When the dressings are released, the venom will spread causing the usual expected problems associated with a venomous snakebite.

- Do **NOT:**
  - eat or drink anything.
  - engage in strenuous physical activity.
  - apply oral/mouth suction to the bite.
  - cut into or incise bite marks with a blade.
  - drink any alcohol or use any medication.
  - apply hot or cold packs.
  - apply a narrow, constrictive tourniquet such as a belt, necktie, or cord.
  - use a stun gun or electric shock of any kind.
  - remove dressings/wraps until arrival at hospital and anti-venom is readily available.

# 8 STARS First Response

The STARS VIGILANT Emergency Communications Centre provides efficient activation of emergency response plans and monitors remote work sites, improving emergency preparedness for remote work sites. In the event of an emergency at a remote site, one call connects to a STARS VIGILANT emergency communications specialist who immediately begins to coordinate a medical response. Given the remote location of the Eastervale Project, the site will be registered with STARS VIGILANT to assist with major incident and trauma response.

The STARS Remote Site Landing Zone Card is included below for reference.

**STARS®**

# LANDING ZONE INFORMATION CARD.

## STEP 1

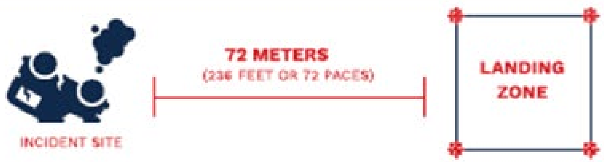
Advise your dispatch centre which channel you will be using to communicate with STARS.

## STEP 2

Select an area for the landing zone that is downwind from the incident site (unless hazardous materials or gases are present).


## STEP 3

Select an area for the landing zone that is a minimum of 72 metres (or 236 feet, or 72 paces) from the incident site.




## STEP 4

Select a flat, level surface for the landing zone; preferably pavement or concrete, if available.


## STEP 5

Ensure the landing zone area is clear of wires, poles, trees and debris.

## STEP 6

Mark out a 36 metre by 36 metre (120 feet x 120 feet, or 36 paces x 36 paces) square, and mark the corners with LED beacons, heavy pylons or any other bright conspicuous objects easily seen from the air.


## STEP 7

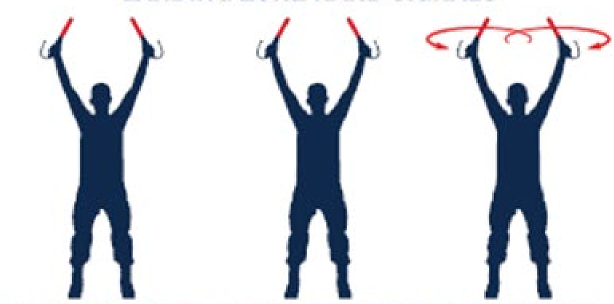
Brief STARS crew via radio or cell phone and stand at the middle of the upwind side of the landing zone with the wind at your back.

Monitor radio frequency to communicate with the STARS team.

As the helicopter approaches, go down on one knee and DO NOT MOVE from your position.

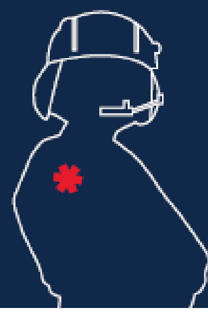
Do not approach the helicopter at any time unless escorted by the STARS crew.

### LANDING ZONE HAND SIGNALS



STARS®

# LANDING ZONE BRIEFING FOR STARS CREW.



**STEP 1**
Identify yourself and confirm the Landing Zone Officer is present with the landing zone secure.

**STEP 2**
Communicate the location of the landing zone using N/E/S/W to reference the accident scene or other landmarks.

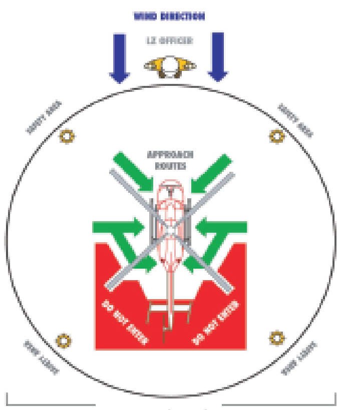
**STEP 3**
Identify the type of surface for the landing zone (field, road, other).

**STEP 4**
State what marking the corners of the landing zone: LED beacons, heavy pylons or any other bright conspicuous objects easily seen from the air.

**STEP 5**
Communicate the wind direction and approximate speed.

**STEP 6**
Identify the hazards in the area of the landing zone such as wires, poles, trees, or hazardous materials using N/E/S/W in reference to the landing zone.

---




## SPECIAL CONSIDERATION

Remove any loose debris and indicate if there is snow or dust in the landing zone. If dusty, water down the landing zone if possible prior to the helicopter's arrival. As marshaller, maintain your position at the middle of the upwind side of the landing zone, knees and **DO NOT MOVE** from your position as the helicopter lands.

If you have any questions or comments regarding this landing zone information card or would like to watch our landing zone video, please visit **www.stars.ca**

## INDUSTRY EMERGENCY LINE 1-888-888-4567

This number can also be used to provide a landing briefing to the STARS crew if radio communications are not available.

**WE ARE ALL STARS®**

*Figure 3 -STARS Remote Site Landing Zone Card*

## 9 Document Amendment and Distribution

This ERP will be reviewed:

- Annually.
- When there is a change of method and/or technology that may require this document to be reviewed and updated.
- Following an emergency drill, response, or significant event to which the ERP is relevant. All revision will be documented in Table 7. Revision Status.

*Table 7 - ERP Revision Status*

| Revision | Revision Date | Issued Date | Reason for Modification |
|---|---|---|---|
| 0 Internal | 2023-05-22 | | Initial Draft |
| 1 | 2023-09-19 | | Edits from MD of Provost |
| 2 | | February 2024 | |

The table below should be filled out following review by the MD of Provost and other municipal emergency service agencies.

*Table 8 - Emergency Service Review*

| | |
|---|---|
| **Reviewed by:** | **Signature:** |
| **Date:** | **SCO Number or Other Accreditation:** |

# Appendix A – Air Quality Modelling and Risk Assessment

*(to follow this page)*

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# AIR QUALITY
# DISPERSION MODELLING AND RISK ASSESSMENT
# FOR EASTERVALE SOLAR INC.
# EASTERVALE SOLAR+ ENERGY STORAGE PROJECT

***Prepared for:***
**Eastervale Solar Inc.**
**Bow Valley Square 3, Suite 490-5**
**255 - 5th Avenue S.W.**
**Calgary, Alberta T2P 3G6**

***Prepared by:***
**Calvin Consulting Group Ltd.**
**Suite 1A, 3850 - 19th Street N.E.**
**Calgary, Alberta T2E 6V2**

**J2024-043**

**February 8, 2024**

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**Emission Quantification**

Signature

Dr. Stephen Ramsay, P.Eng.
Name

Associate
Title

**Lead Modeller**

Signature

Mr. Barry Lough, EP, P.Phys., P.Met.
Name

CEO
Title

**Modeller**

Signature

Mr. Nick Gingerysty
Name

Intermediate Consultant
Title

**QA/QC**

Signature

Ms. Ann L. Jamieson, EP, P.Chem.
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February 8, 2024 J2024-043

ASCENT Energy Partners Ltd.

**SENT BY EMAIL:** jennifer@ascentpartners.ca

**Attention:** Ms. Jennifer Traichel, B.Sc., Partner

**Subject:** **Air Quality Dispersion Modelling and Risk Assessment for Eastervale Solar Inc. BESS Project**

As requested by ASCENT Energy Partners Ltd. (ASCENT), Calvin Consulting Group Ltd. (Calvin Consulting) has completed an Air Quality Dispersion Modelling and Risk Assessment (Assessment) for emissions emitted from a potential Battery Energy Storage System (BESS) fire. The BESS is part of the Eastervale Solar Inc. (Eastervale) Eastervale Solar+ Energy Storage Project (Project), which is proposed for development on Legal Subdivision (LSD) 03-02-040-08 W4M. The results of the Assessment are provided in this report.

If you require any additional information or have any comments or concerns pertaining to these results, please contact Ann Jamieson by email at ann.jamieson@calvinconsulting.ca or by phone at 403-560-7698. Thank you for the opportunity to work on this project.

Sincerely,
**Calvin Consulting Group Ltd.**

Barry Lough, EP, P.Phys., P.Met.
CEO

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## DISCLAIMER

Calvin Consulting Group Ltd. (Calvin Consulting) has prepared this report to provide Eastervale Solar Inc. (Eastervale) with predicted maximum concentrations of air contaminants that might occur in the vicinity of the Eastervale Solar+ Energy Storage Project (Project) in the unlikely event of a fire. These maximum concentrations are estimated based on, but not limited to, the following:

- Data provided by ASCENT, noting that in the absence of data for any emission source, estimated parameters were developed based on the professional expertise of Calvin Consulting personnel and our Associate, Dr. Stephen Ramsay, as outlined in Section 3.1 of this report

- Digital terrain data that are publicly available from the Government of Canada

- Historical meteorology data provided by the Alberta Government

- Estimates of land use percentages for land classes (e.g., vegetation cover, urban development, agricultural land, forest, etc.) within the selected modelling domain

- A computer modelling system developed by the United States Environmental Protection Agency (U.S. EPA)

Information, data, facts and the computer model provided by others and used in preparation of this report are assumed to be accurate without any verification or confirmation by Calvin Consulting.

As a result of the uncertainty and inherent variability in the preceding data and/or estimates, Calvin Consulting makes no representation or warranty with respect to this report or the information contained herein other than that Calvin Consulting has exercised reasonable skill, care and diligence in accordance with accepted practice and usual standards of thoroughness and competence for the Environmental Profession with respect to the collection, assessment and evaluation of the information used in the preparation of this report. Liability for the acceptance and implementation of the information and/or recommendations made in this report is limited to the actual dollar value of professional fees charged to Eastervale by Calvin Consulting for the scope of work as indicated in this report.

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## EXECUTIVE SUMMARY

At the request of ASCENT Energy Partners Ltd. (ASCENT), Calvin Consulting Group Ltd. (Calvin Consulting) and our Associate, Dr. Stephen Ramsay, have completed a literature review along with a Dispersion Modelling and Risk Assessment (Assessment) pertaining to a potential fire event at a Battery Energy Storage System (BESS) location proposed for construction and operation in Alberta. Literature pertaining to these types of fires was reviewed to assess the types of contaminants that are likely emitted during this type of fire and to obtain quantitative data related to estimated emission rates for each contaminant of concern, noting that Hydrogen Fluoride (HF) is stated in the literature as being the main contaminant of concern.

Source and emission data were derived based on the literature review, including reported laboratory test data. Air quality dispersion modelling was performed taking into account local wind data, groundcover, terrain influences, on-site building influences and the location of the closest residences. The modelling results were then compared to the Alberta Ambient Air Quality Objectives (AAAQOs), as well as the American Centers for Disease Control and Prevention (CDC) National Institute for Occupational Safety and Health (NIOSH) Immediately Dangerous to Life or Health (IDLH) values.

The following comments pertain to the conclusions from this Assessment:

- The winds in the area are predominantly from the west-northwest.
- Maximum predicted air quality concentrations close to the BESS fenceline, exceed the applicable AAAQOs. However, the maximum predicted concentrations at the closest residences comply with the AAAQOs.
- The IDLH will not be exceeded at or beyond the BESS site fenceline for the air contaminants of concern.
- The risk to the public and local residents is low.

# GLOSSARY

| | |
|---|---|
| AAAQO | Alberta Ambient Air Quality Objective |
| AEPA | Alberta Environment and Protected Areas |
| AQMG | Air Quality Model Guideline |
| BESS | Battery Energy Storage System |
| BPIP | Building Profile Input Program |
| CDC | American Centers for Disease Control and Prevention |
| CO | Carbon Monoxide |
| FSS | Fire Suppression System |
| HCl | Hydrogen Chloride |
| HCN | Hydrogen Cyanide |
| HF | Hydrogen Fluoride |
| IDLH | Immediately Dangerous to Life or Health |
| IR | Individual Risk |
| LFP | Lithium Iron Phosphate |
| $LiFePO_4$ | Lithium Iron Phosphate |
| Li-ion | Lithium-Ion |
| LSD | Legal Subdivision |
| NFPA | National Fire Protection Association |
| NIOSH | National Institute for Occupational Safety and Health |
| NMC | Nickel Manganese Cobalt |
| $POF_3$ | Phosphoryl Fluoride |
| PV | Photovoltaic |
| U.S. EPA | United States Environmental Protection Agency |
| WRF | Weather Research and Forecasting |

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# 1.0 INTRODUCTION

Eastervale Solar Inc. (Eastervale) proposes to install the Eastervale Solar+ Energy Storage Project (Project), which is expected to be 200 MW of nominal storage capacity and an energy capacity of up to 441.2 MW-h. The Battery Energy Storage System (BESS) is part of a 300 $MW_{AC}$ Solar Photovoltaic (PV) Project and is connected by alternating current. As indicated in Figure 1, the proposed location of the BESS is approximately 13 km south-southwest of Hughenden, Alberta on Legal Subdivision (LSD) 03-02-040-08 W4M. At the request of ASCENT Energy Partners Ltd. (ASCENT), Calvin Consulting Group Ltd. (Calvin Consulting) has completed an Air Quality Dispersion Modelling and Risk Assessment (Assessment) for potential emissions emitted from this BESS in the event of a fire.

## 1.1 Project Description

The proposed BESS consists of 176 Evloflex enclosures, arranged in pairs with one inverter and transformer skid for each pair. Each enclosure has six strings with 51 modules per string. The modules contain Lithium Iron Phosphate ($LiFePO_4$, also known as LFP) battery cells.

## 1.2 Safety Features

Numerous safety standards have been developed to reduce the risk of BESS fires. A BESS installation must meet local building codes, utility regulations and industry standards. It is not the purpose of this study to review or apply the BESS safety standards. These standards are cited only to substantiate the fire modelling assumptions that rely on the fire spread-limiting effect of these standards. The following industry safety standards were developed to minimize the hazards associated with BESSs:

- **National Fire Protection Association (NFPA) 855 - Standard for the Installation of Stationary Energy Storage.** This standard establishes the requirements for design, construction, installation, commissioning, operation, maintenance and decommissioning of stationary energy storage systems. This standard applies to battery installations greater than 70 kW-h.

- **UL 9540 - Standard for Safety Energy Storage Systems and Equipment.** This standard establishes that electrical, electro-chemical, mechanical and thermal energy storage systems operate at an optimal level of safety. It also establishes safety requirements for the integrated components of an energy storage system.

- **UL 9540A - Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems.** This standard establishes quantitative data to characterize potential battery storage fire events. The standard also establishes battery storage system fire testing on the cell level, module level, unit level and installation level.

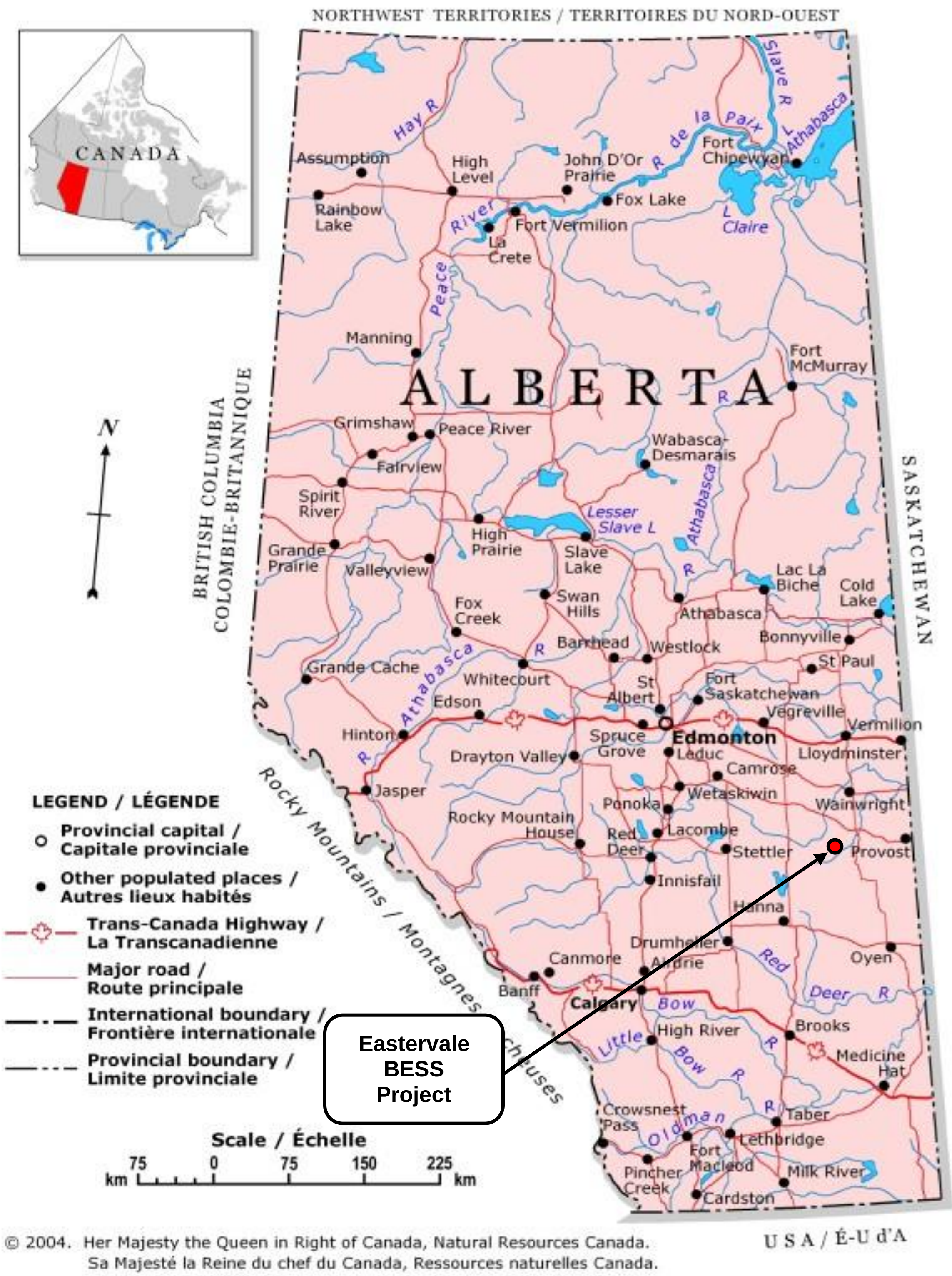


Figure 1 Proposed Project location.

Additionally, the project design will include numerous safety features to reduce the potential for fire and to suppress fire in the unlikely event that a fire was to occur in the electrical wiring, etc. Some of the safety features include the following:

- Fire-rated walls and doors in the containers
- Liquid cooling system for battery cells
- On-site control systems, including alarms, to continuously monitor and ensure operations remain within the design limits
- Gas and smoke detection and an internal Fire Suppression System (FSS)

It is also very important to note that there are several types of Lithium-Ion (Li-ion) batteries used worldwide. The materials in an LFP battery are less toxic than those in other types of Li-ion batteries, some of which contain cobalt and other hazardous substances. The sturdy iron phosphate crystal structure in LFP batteries will not break down during charging or discharging, and therefore, will not cause leakage. Additionally, since LFP is a thermally and structurally stable chemical compound, LFP batteries will not spontaneously combust and moreover, if LFP batteries do ignite, the fire will not spread easily from one module to another, even without the added safety feature of a FSS. While LFP batteries will burn if exposed to extreme heat, these batteries are very difficult to ignite and will burn much more slowly than other types of Li-ion batteries, such as Lithium Nickel Manganese Cobalt (NMC) batteries that are used at other BESS projects and that have been widely reported in the media in relation to fires. As such, fire runaway events are highly unlikely.

## 1.3 Site Description

As indicated in the plot plan presented in Figure 2, the BESS site fenceline follows a rectangle that is 184 m long on the north perimeter fenceline and 100 m wide on the west perimeter fenceline. The site is located approximately 13 km south-southwest of Hughenden, Alberta, 17 km west-southwest of Czar, Alberta and 18 km south of Amisk, Alberta. The BESS site is situated within the fenceline of the Solar PV Facility, as shown in Figure 3. For modelling purposes, it was assumed, as a worst-case scenario, that a fire would occur in the container that is located closest to the nearest residence, which is located approximately 700 m north-northwest of the assumed fire location and emission source.

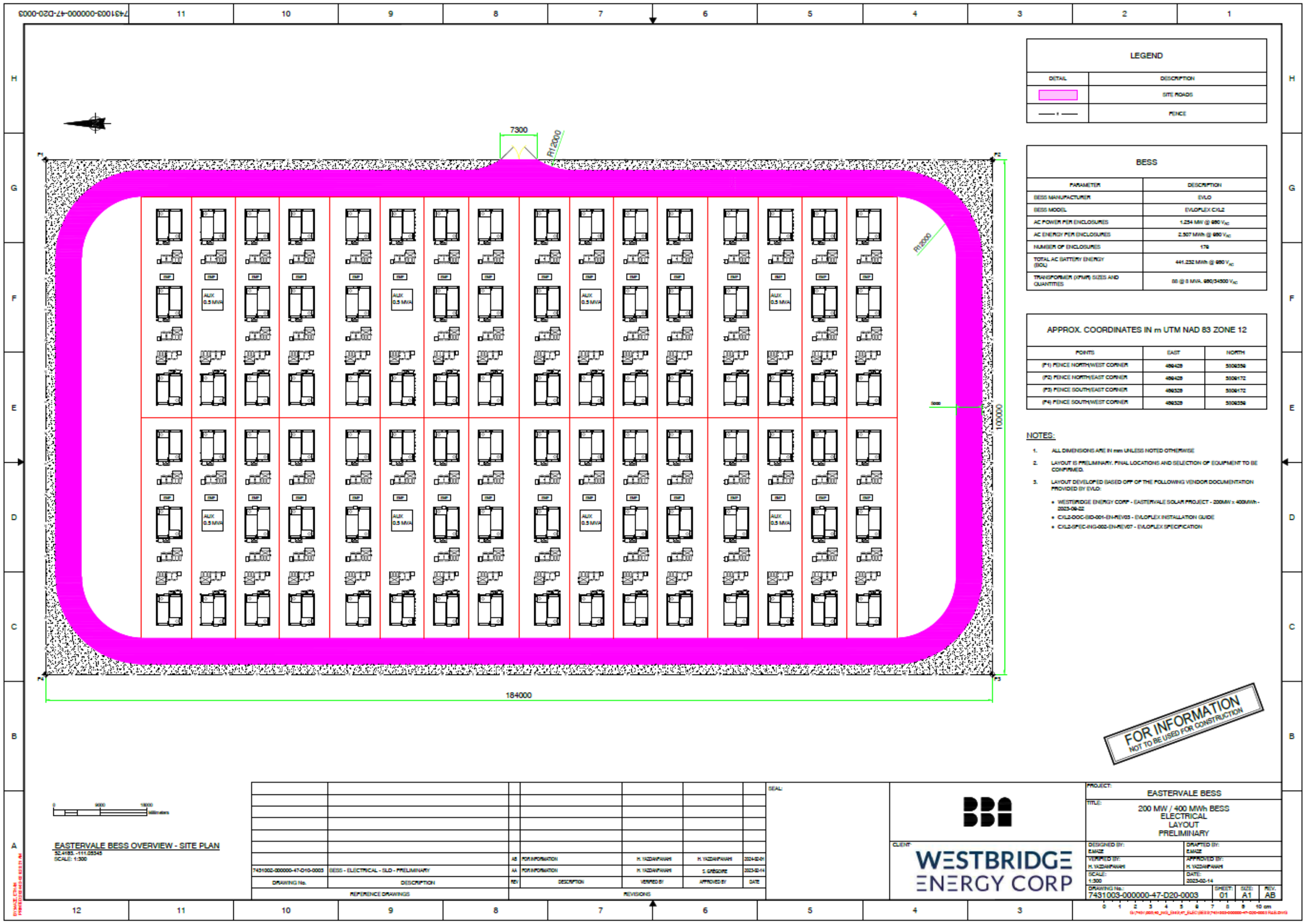


Figure 2 Project plot plan indicating proposed equipment and Eastervale BESS fenceline.

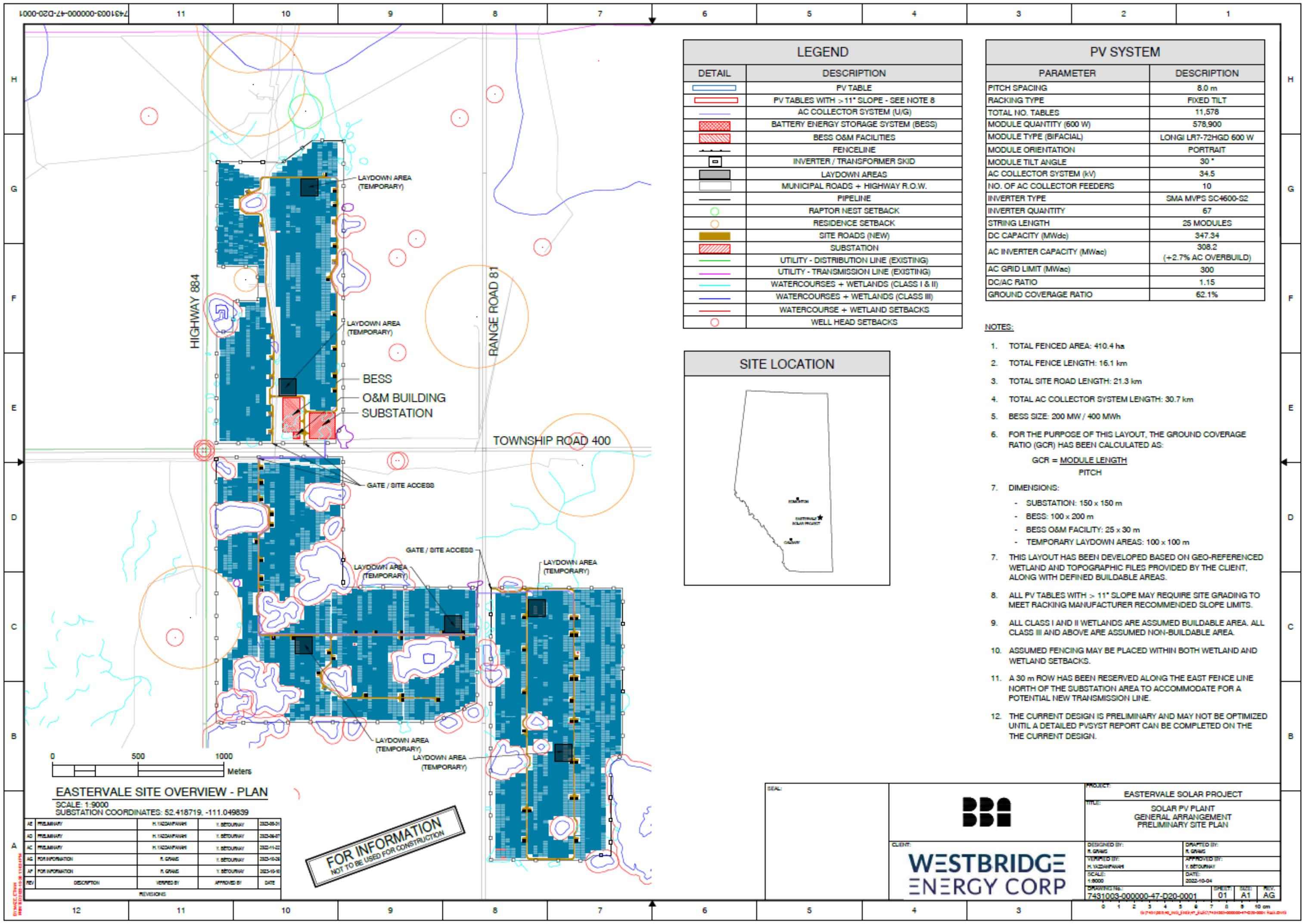


Figure 3 Project plot plan indicating proposed preliminary equipment and site survey.

# 2.0 LITERATURE REVIEW

Unless constantly kept within specific environmental conditions and electrical parameters, some types of Li-ion cells can fail. This can lead to spontaneous combustion and a process known as thermal runaway. Thermal runaway is an exothermic reaction that causes the internal temperature of the battery to rise and may eventually ignite the electrolyte. As such, thermal runaway events can escalate into fires and a single failing cell can quickly overheat the surrounding cells, causing them to go into thermal runaway in turn.

Thermal runaway events are highly unlikely for LFP battery cells, which are the type of cells that will be installed at this Project. Studies have shown that the internal temperature of an LFP battery must exceed 400°C before these batteries will ignite (e.g., in the presence of a forest fire or some other major ignition event). Research also indicates that since LFP batteries are not easily ignited, the fire would spread much more slowly than a runaway event might for other types of Li-ion batteries, such as NMC batteries.

It is not the purpose of this study to conduct an extensive independent review of Li-ion battery fires. Several authoritative studies detail the fire dynamics and resulting emissions from Li-ion battery cells. While extensive data are available for fires associated with NMC type batteries, which again are widely reported in the media in association with fires, less data are available for LFP batteries since these are not generally a concern from a fire perspective (i.e., LFP batteries do not easily ignite and if ignited, do not burn well). The studies reviewed for this Assessment are summarized in Table 1 and are studies that provide quantitative data that could be used as a basis for developing the source and emission parameters required for air quality dispersion modelling purposes.

In addition to the studies referenced in Table 1, the online BESS Failure Event Database was reviewed and information pertaining to battery cell fire dynamics was obtained from various recent and authoritative sources in the public domain including, but not limited to, the following:

- Fei Gao, Maosong Fan, Congjie Wang, Wei Liu and Yanli Zhu. 2021. *Study on Temperature Change of $LiFePO_4$/C Battery Thermal Runaway Under Overcharge Condition*. IOP Conference Series, Earth and Environmental Science, 631 012114.

- Andrey W. Golubkov, David Fuchs, Julian Wagner, Helmar Wiltsche, Christoph Stangl, Gisela Fauler, Gernot Voitic, Alexander Thaler and Viktor Hacker. 2014. *Thermal-runaway experiments on consumer Li-ion batteries with metal-oxide and olivin-type cathodes*. RSC Advances, 4, pg. 3633 to 3642.

Table 1 Studies on emissions from battery malfunctions.

| Study | Description | Results |
|---|---|---|
| Anderson *et al.* 2013 | Provides detailed assessment of fire emissions from LFP batteries. Exposure of battery to heat source, off gases tested. | Hydrogen Fluoride (HF): 30 to 50 ppm peak<br>Phosphoryl Fluoride ($POF_3$): 1 to 2 ppm peak<br>HF Rate: 0.01 g/s |
| Blum & Long, 2016 | Detailed assessment of Li-ion battery fire hazards, with specific reference to Tesla configurations. Modules tested with heat exposure until thermal runaway. 100 kW-h by Tesla. | HF: 100 ppm peak for NMC batteries |
| CATL, 2018 | UL 9540A testing for NMC batteries (proprietary) | Composition of off gassing: Primary gaseous contaminants only<br>Up to 153.5 L off gas per cell |
| Larsson *et al.* 2017 | External heat source used to heat batteries. Measured toxic gases. Focuses on HF emissions from Li-ion battery fires. | For LFP batteries:<br>HF: up to 148 ppm peak<br>HF rate: 48 mg/s peak<br>$POF_3$ rate: not detected |
| LG Chem | Proprietary data on LFP and NMC battery types. | |
| DNVGL, 2017 | Measurement of a wide range of battery types and failures. | Release rates per kg battery weight: $1.7e^{-7}$ kg/s-kg |
| DNVGL, 2019 | Measured characteristics of a Tesla powerpack thermal runaway scenario for NMC batteries (proprietary). | Hydrogen Chloride (HCl): 538 ppm<br>HF: 183 ppm<br>Hydrogen Cyanide (HCN): 67 ppm |
| MRS Environmental, 2019 | Provides a detailed assessment of fire hazards focusing specifically on Tesla 2XL-Megapacks. | |
| Quintiere *et al.* 2016 | Provides detailed assessment of fire hazards focusing on NMC Li-ion battery cells. | |
| Tesla | Proprietary studies for NMC batteries. | HF: 500 ppm<br>HCl: 1000 ppm<br>HCN: 1600 ppm<br>Methanol: 32 ppm<br>Styrene: 1 ppm<br>Toluene: 3500 ppm |

# 3.0 MODELLING ASSUMPTIONS

Under normal operating conditions, there will be no gaseous emissions from the Project. However, in the unlikely event of a fire that causes ignition of the LFP batteries, gases could be emitted to the atmosphere. For the purpose of this Assessment, the analysis is limited to an assumed worst-case event, which is defined as the ignition of one module, noting that because of the safety features included in the BESS design, it is highly unlikely that an entire module or groups of modules would burn simultaneously.

Analysis of recent events, including the Victoria BESS incident and the Victoria Moss Landing incident indicates that the percentage of cells involved at any one time in a fire ranged from 0.5 to 2%. The lower limit is associated with LFP cell fire dynamics, while the higher limit is associated with conventional NMC fire dynamics. For the purpose of this current BESS Assessment, it has very conservatively been assumed that 10% of the LFP batteries in any one module would burn simultaneously until such time as all modules in a container have burned.

It should also be noted that for the case of the NMC cells, the fire dynamics indicate a cell combustion phase duration of approximately 1500 seconds and a peak temperature in excess of 800°C. For the LFP cells, the combustion phase duration is approximately 1200 seconds, with a peak temperature of approximately 400°C. The lower LFP peak temperature affects the heat transfer process and combustion progress through the battery cells.

Figure 4 illustrates the overall fire progress through a BESS unit. As indicated in the figure, the emissions start at 0, rise to a maximum duration of the fire and then decrease to 0. However, for the purpose of modelling, it has been assumed that the maximum emission rate occurs as a continuous release, with worst-case parameters. The fire is assumed to be limited to one container, progressing through the cells (i.e., 10% of which would burn simultaneously, igniting more cells over time), until such time that all batteries in all modules within the container have burned.

## 3.1 Emission Parameters

The two compounds of potential concern associated with an LFP fire include HF and Carbon Monoxide (CO). Emission rates for these two air contaminants are indicated in Table 2. Both of these contaminants are regulated by the Alberta Ambient Air Quality Objectives (AAAQOs). Table 2 also presents a summary of the other source parameters that are required for modelling, noting the following:

- **Height.** The height of the containers, as stated in the vendor design specifications, was used as the height of the release.
- **Diameter.** The diameter of the release was assumed to be equivalent to the approximate diameter of the ventilation vent on the roof of the containers.
- **Exit Temperature and Exit Velocity.** The values used in the modelling were selected to represent worst-case emission conditions.

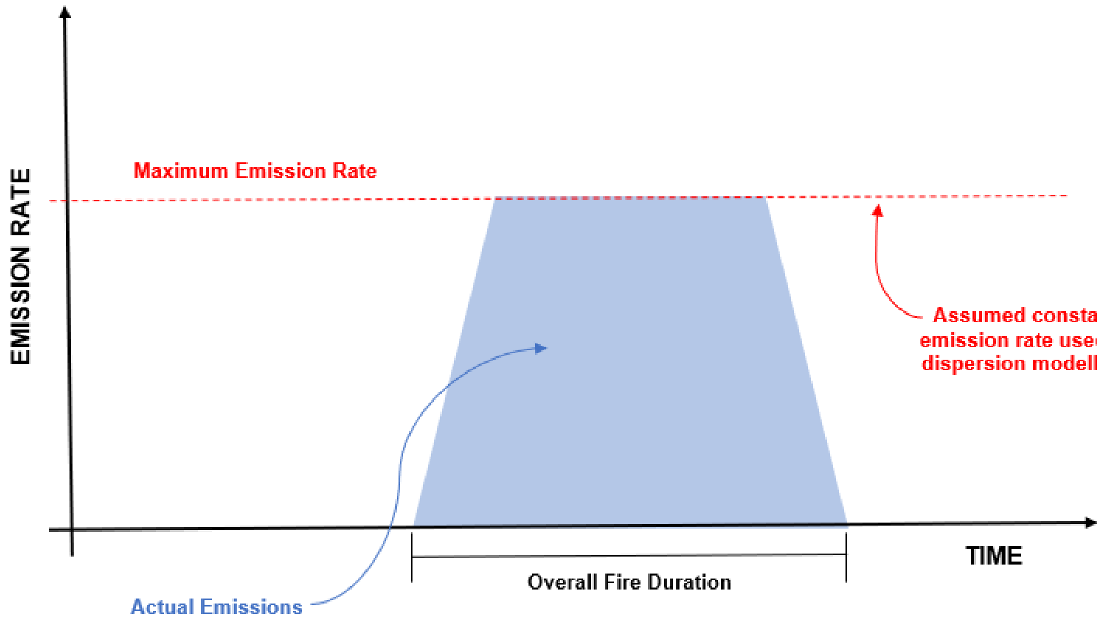


Figure 4 Illustration of actual emission rate versus emission rate used for modelling.

Table 2 Source parameters used for modelling a potential fire at the Project.

| Parameter | | Value |
|---|---|---|
| Height | (m) | 2.9 |
| Pseudo Diameter | (m) | 0.3 |
| Exit Temperature | (K) | 323 |
| Exit Velocity | (m/s) | 0.035 |
| HF Emission Rate[a] | (g/s) | 0.00093 |
| CO Emission Rate | (g/s) | 0.88 |

[a] Assumes no internal fire suppression system

# 4.0 MODELLING APPROACH

The dispersion modelling was performed using the United States Environmental Protection Agency (U.S. EPA) AERMOD v.23132 dispersion model, meteorological data, terrain data and building downwash as required in Alberta for this type of assessment and as described in the following sections.

## 4.1 Meteorological Data

Meteorological data, including but not limited to wind data, were obtained from the Alberta Environment and Protected Areas (AEPA) Weather Research and Forecasting (WRF) Meteorological Data Repository as required by the 2021 Alberta Air Quality Model Guideline (AQMG). The data cover the period from 01-Jan-2015 to 31-Dec-2019, and are centred on the geographical point at 52.407°N and 111.054°W. As required in Alberta, five years of the data were processed in AERMET v.23132 to produce meteorological files suitable for use in AERMOD. These files include atmospheric stability and inversions, and take into account the effects of topography and ground cover.

Figure 5 provides a wind direction and wind speed frequency diagram (i.e., windrose) for the area based on the hourly-average WRF data. As indicated in the windrose, the hourly-average winds are predominantly from the west-northwest.

## 4.2 Terrain Data

Terrain data were obtained from the Government of Canada, Department of Natural Resources Geobase online portal, which provides public access to a base of quality geospatial data for all of Canada. The domain used for this Assessment incorporates topographic data from map tiles identified as 073D02, 073D03, 073D06, 073D07, 073D10 and 073D11.

## 4.3 Modelling Receptors

As indicated in Figure 6, the following receptor grids were used this Assessment:

- **Grid 1.** Every 20 m out to 500 m.
- **Grid 2.** Every 50 m out to 2000 m.
- **Grid 3.** Every 500 m out to 5000 m.
- **BESS Site Fenceline.** Modelling was completed at receptors placed every 10 m along the BESS fenceline.
- **Discrete Receptors.** The modelling was also completed at 100, 250, 400, 700 and 1000 m downwind distances from the assumed fire location.
- **Sensitive Receptors.** Modelling was completed at the eleven nearest residences within 5 km of the BESS site.

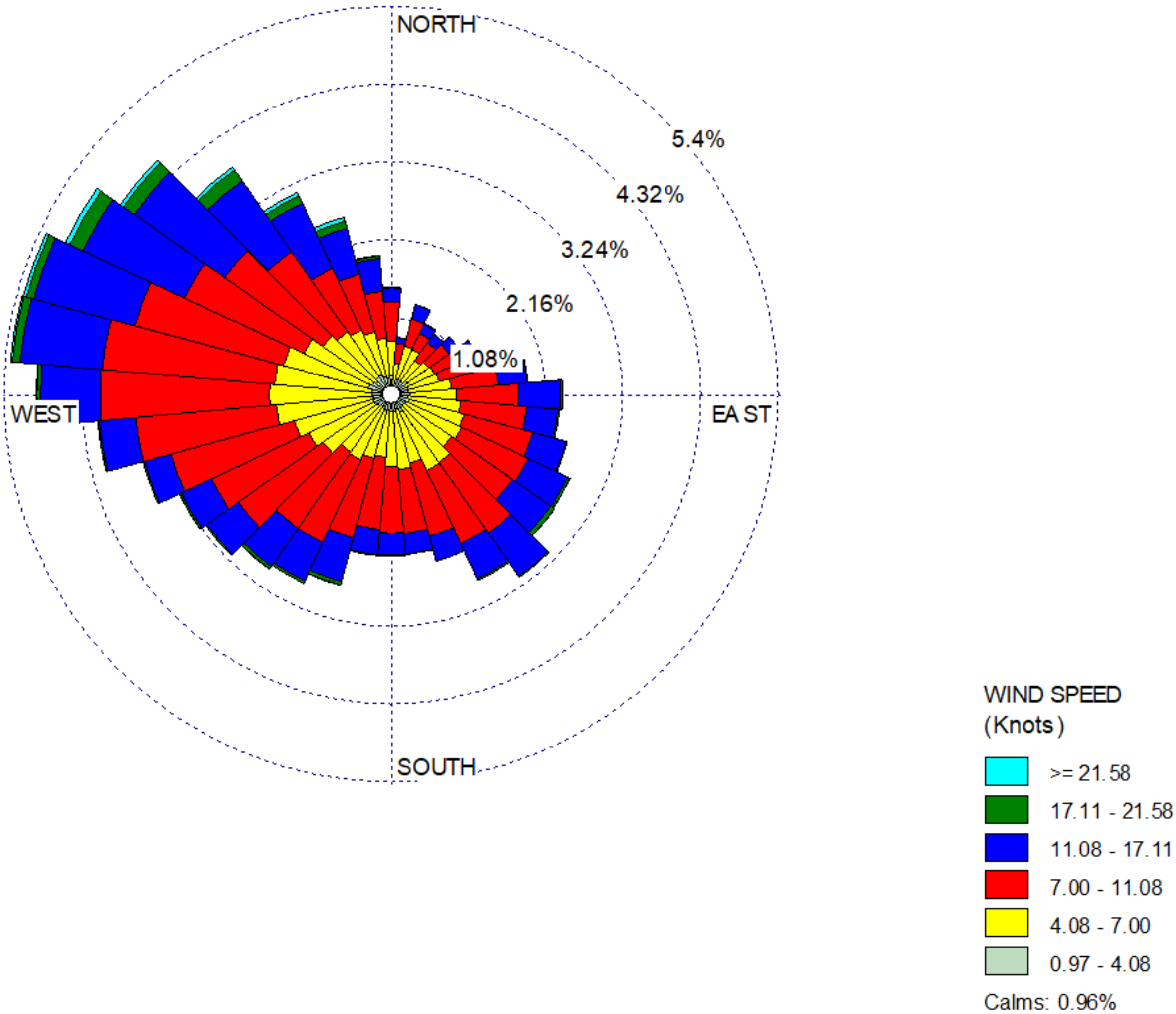


Figure 5 Windrose indicating the frequency of wind direction and wind speeds in the area.

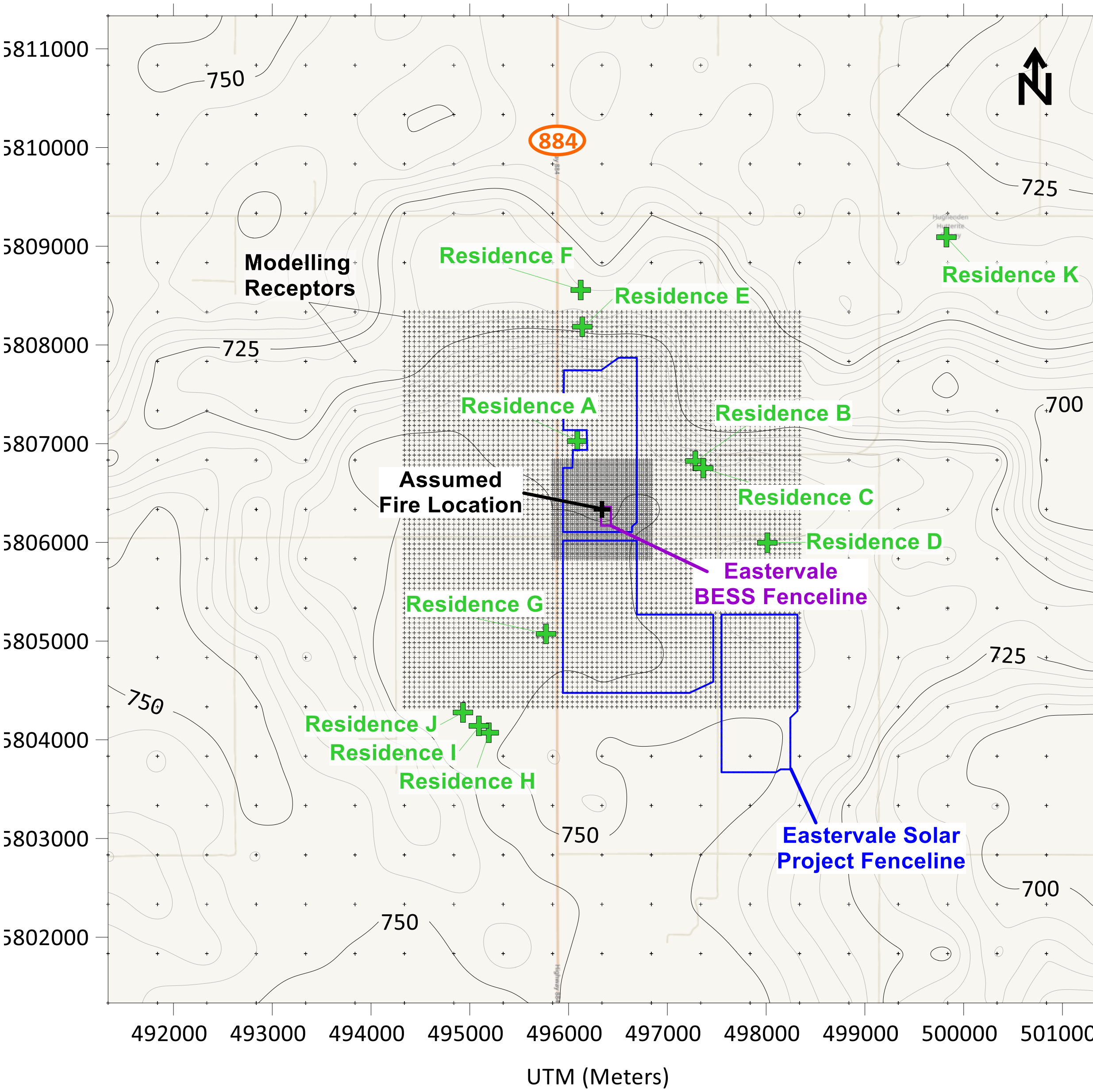


Figure 6 Location of dispersion modelling receptors, ground-level elevations (m) and nearest residences to the assumed fire location at the proposed site.

## 4.4 Building Downwash

Building downwash effects were taken into account for this Assessment. The U.S. EPA Building Profile Input Program (BPIP) was used to determine the effects of building downwash on dispersion of emissions from the modelled fire.

# 5.0 MODELLING RESULTS

## 5.1 Modelling Cases

The following were modelled for the Project:

- **Ambient Air Quality Modelling.** The emissions from a potential fire were modelled for comparison to the hourly-average AAAQOs, which are designed to protect the most sensitive of species, noting that in some cases, humans are less sensitive than plants or other animals.

- **Health & Safety Modelling.** From a health and safety perspective, the overall maximum predicted hourly-average concentrations were modelled. These were then converted to 10-minute average concentrations using the methodology indicated in the 2021 Alberta AQMG. The resulting 10-minute average concentrations were compared to the American Centers for Disease Control and Prevention (CDC) National Institute for Occupational Safety and Health (NIOSH) Immediately Dangerous to Life or Health (IDLH) values for HF and CO.

## 5.2 Ambient Air Quality Modelling Results

### *5.2.1 Regional Air Quality*

The maximum predicted off-site one-hour average ground-level HF concentration is presented in Table 3. As indicated in the table, the maximum concentration is predicted to exceed the applicable AAAQO. Figures 7 and 8 present the maximum predicted hourly-average concentrations for HF within 2 km and 5 km of the Project, respectively. As indicated in the figures, the maximum predicted off-site HF concentration occurs on the Eastervale BESS fenceline and exceeds out to ~85 m beyond the BESS fenceline. However, the maximum predicted concentrations do not exceed outside of the Solar PV property line.

The maximum predicted off-site one-hour average ground-level CO concentration is also presented in Table 3 and is also predicted to exceed the applicable AAAQO. Figures 9 and 10 present the maximum predicted hourly-average concentrations for CO within 2 km and 5 km of the Project, respectively. As indicated in the figures, the maximum predicted off-site CO concentration also occurs on the BESS fenceline and exceeds out to ~15 m beyond the BESS fenceline. However, as indicated for HF, the maximum predicted CO concentrations also do not exceed outside of the Solar PV property line.

Table 3 Predicted maximum off-site hourly-average ground-level concentrations.

| Contaminant | Maximum Predicted Concentration (µg/m$^3$) | AAAQO (µg/m$^3$) |
|---|---|---|
| HF | 23.5 | **4.9** |
| CO | 22196.8 | **15000** |

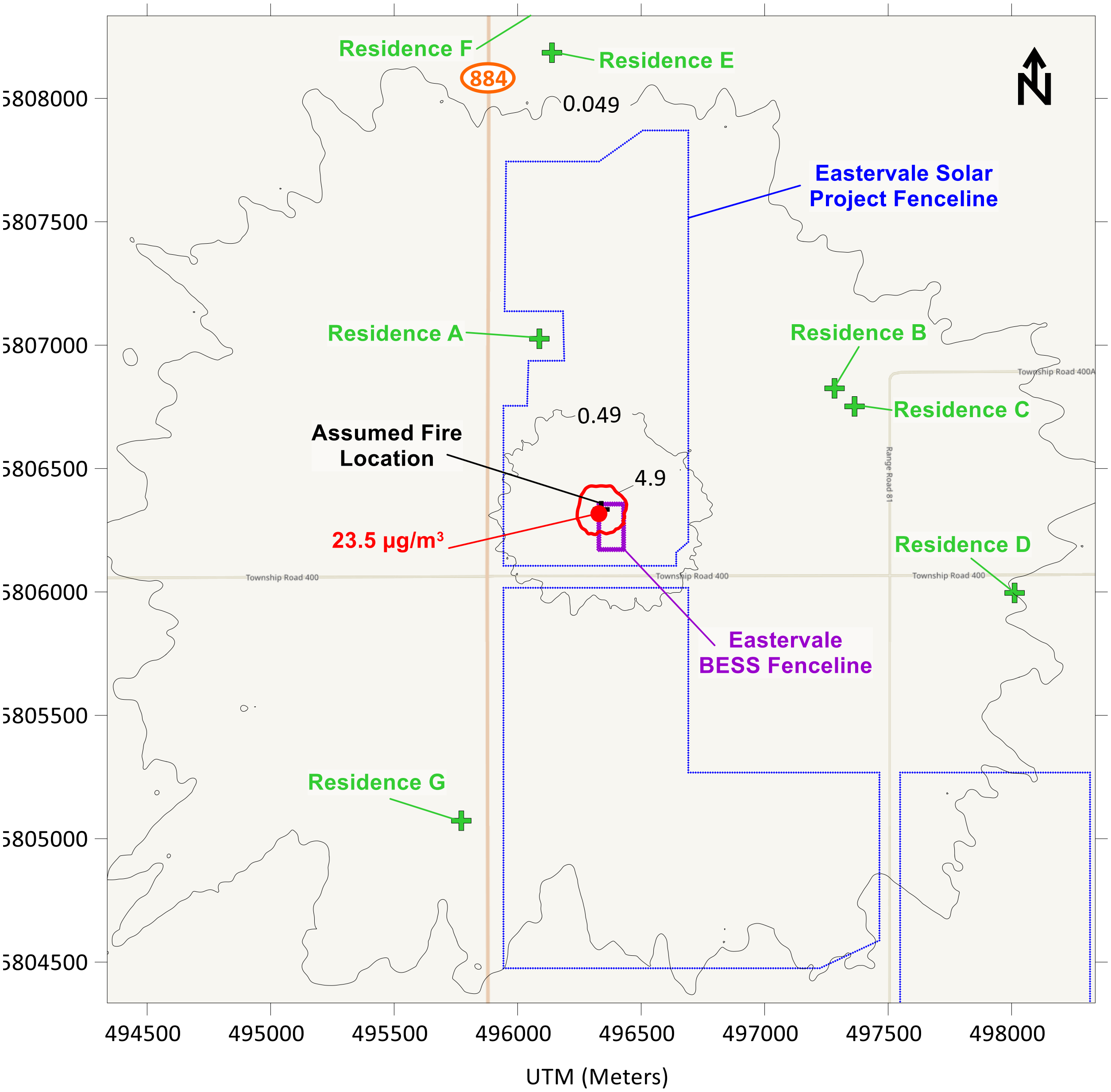


Figure 7 Maximum predicted hourly-average ground-level HF concentrations associated with a potential fire. Isopleths shown include 0.049, 0.49 and 4.9 µg/m³.

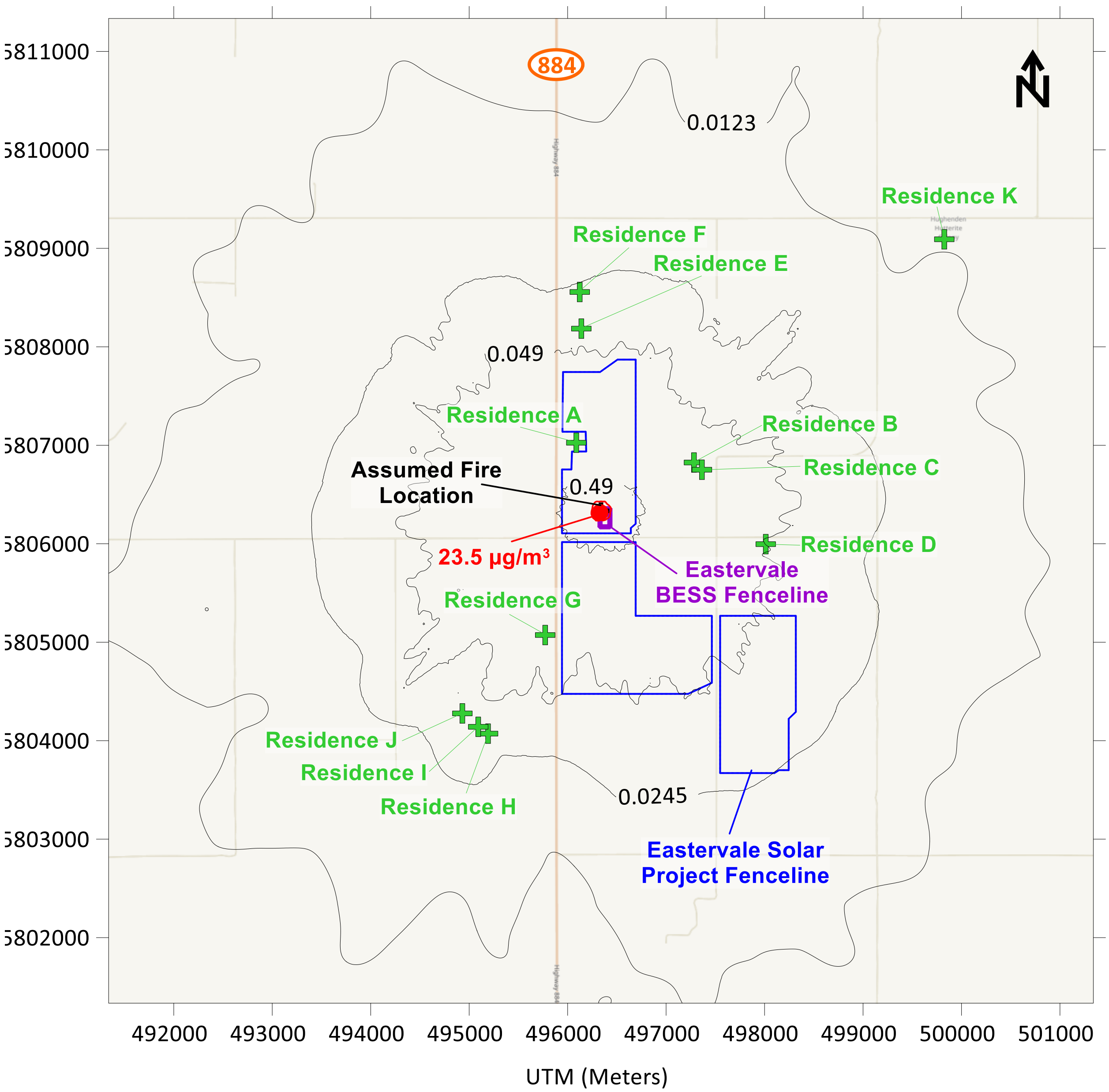


Figure 8 Maximum predicted hourly-average ground-level HF concentrations associated with a potential fire. Isopleths shown include 0.0123, 0.0245, 0.049 and 0.49 µg/m$^3$.

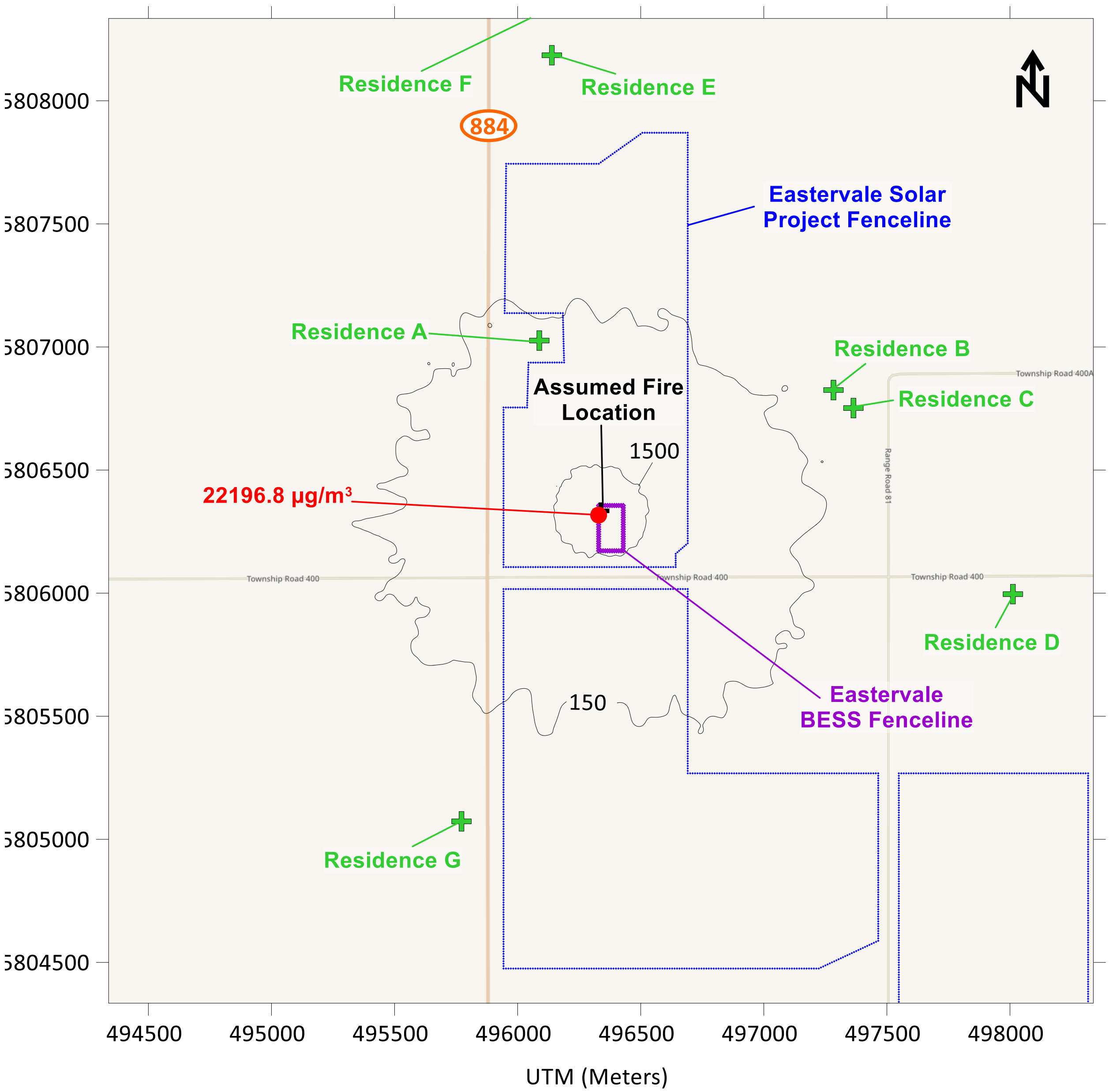


Figure 9 Maximum predicted hourly-average ground-level CO concentrations associated with a potential fire. Isopleths shown include 150 and 1500 µg/m³.

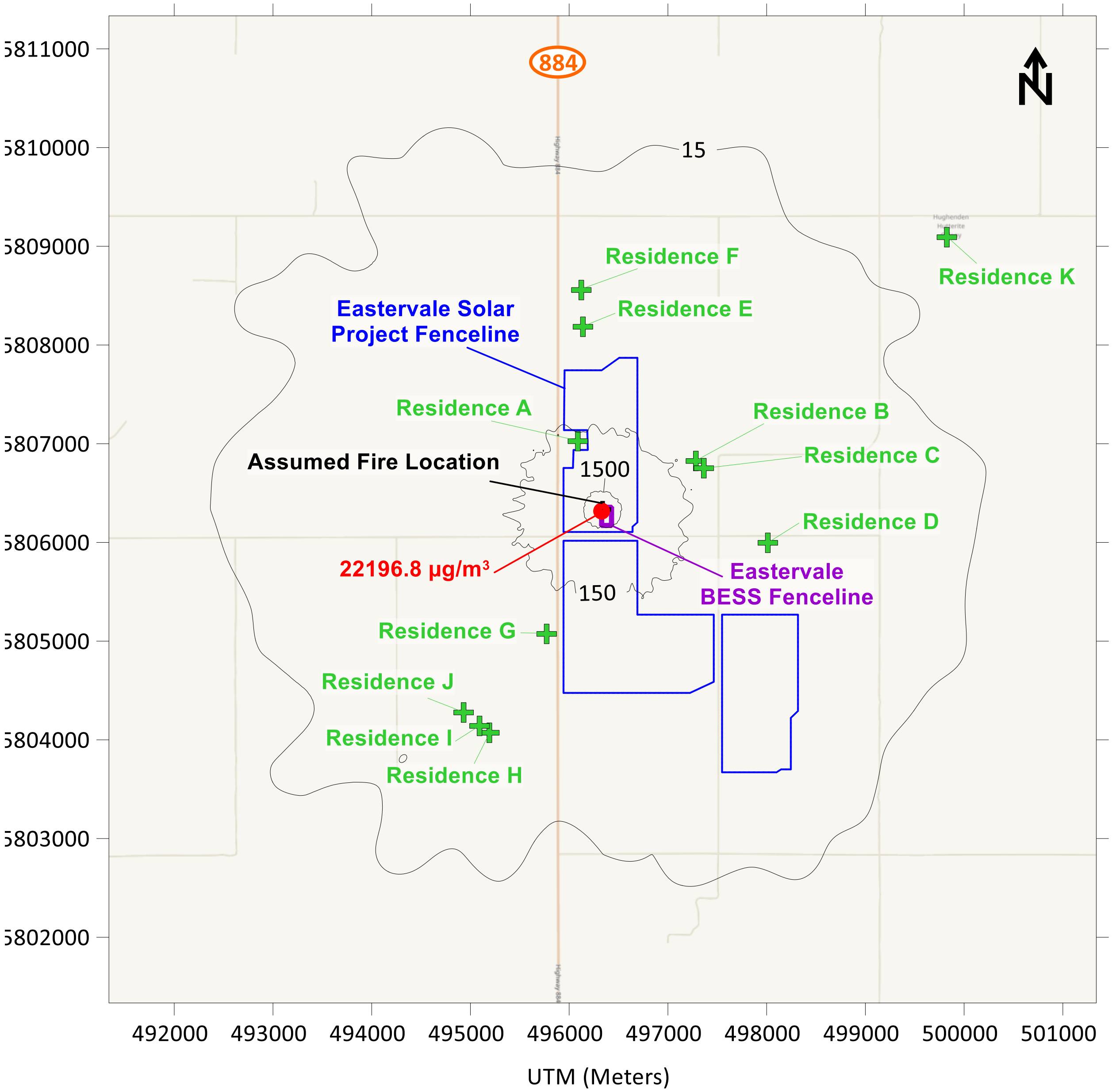


Figure 10 Maximum predicted hourly-average ground-level CO concentrations associated with a potential fire. Isopleths shown include 15, 150 and 1500 µg/m³.

### *5.2.2 Sensitive Receptors*

Table 4 presents the maximum predicted concentrations at the nearest residences. As indicated in Table 4, all predicted concentrations are well within the applicable AAAQOs at these locations.

Table 4 Predicted maximum hourly-average ground-level concentrations at residences within 5 km of the assumed fire location.

| Residence | Location (UTM) | | Predicted Concentration (µg/m³) | | AAAQO (µg/m³) | |
|---|---|---|---|---|---|---|
| | Easting | Northing | HF | CO | HF | CO |
| Residence A | 496088 | 5807026 | 0.1833 | 173.4 | **4.9** | **15000** |
| Residence B | 497283 | 5806825 | 0.1022 | 96.7 | | |
| Residence C | 497364 | 5806752 | 0.1127 | 106.7 | | |
| Residence D | 498012 | 5805996 | 0.0483 | 45.7 | | |
| Residence E | 496139 | 5808185 | 0.0313 | 29.7 | | |
| Residence F | 496123 | 5808557 | 0.0259 | 24.5 | | |
| Residence G | 495772 | 5805073 | 0.0707 | 66.9 | | |
| Residence H | 495192 | 5804072 | 0.0342 | 32.3 | | |
| Residence I | 495092 | 5804141 | 0.0372 | 35.2 | | |
| Residence J | 494931 | 5804277 | 0.0379 | 35.9 | | |
| Residence K | 499825 | 5809092 | 0.0103 | 9.7 | | |

### *5.2.3 Discrete Receptors*

Modelling was completed at varying distances (i.e., 100, 250, 400, 700 and 1000 m) downwind from the assumed fire location. The results from this modelling indicate the following, noting that the peaks shown in the diagrams in the north, northeast, south and west-northwest are a result of the battery enclosures resulting in building downwash effects, which pull the plume closer to the ground in the immediate vicinity of the assumed ignition location (i.e., within 100 m), but beyond 100 m from the modelled fire the downwash effects are resolved and do not lead to a significant peak:

- **HF.** As indicated in Figure 11, concentrations at 100 m downwind of the modelled fire are predicted to exceed the HF hourly-average AAAQO, and as previously indicated, all predicted concentrations at and beyond 85 m of the BESS fenceline and all concentrations beyond the Solar PV property line are predicted to comply with the HF hourly-average AAAQO of 4.9 µg/m³.

- **CO.** As indicated in Figure 12, all concentrations at or beyond 100 m downwind of the assumed fire location are predicted to comply with the hourly-average AAAQO of 15000 µg/m³ for CO. In fact, as previously indicated, all predicted concentrations at and beyond 15 m of the BESS fenceline and all concentrations beyond the Solar PV property line are predicted to comply with the CO hourly-average AAAQO of 15000 µg/m³.

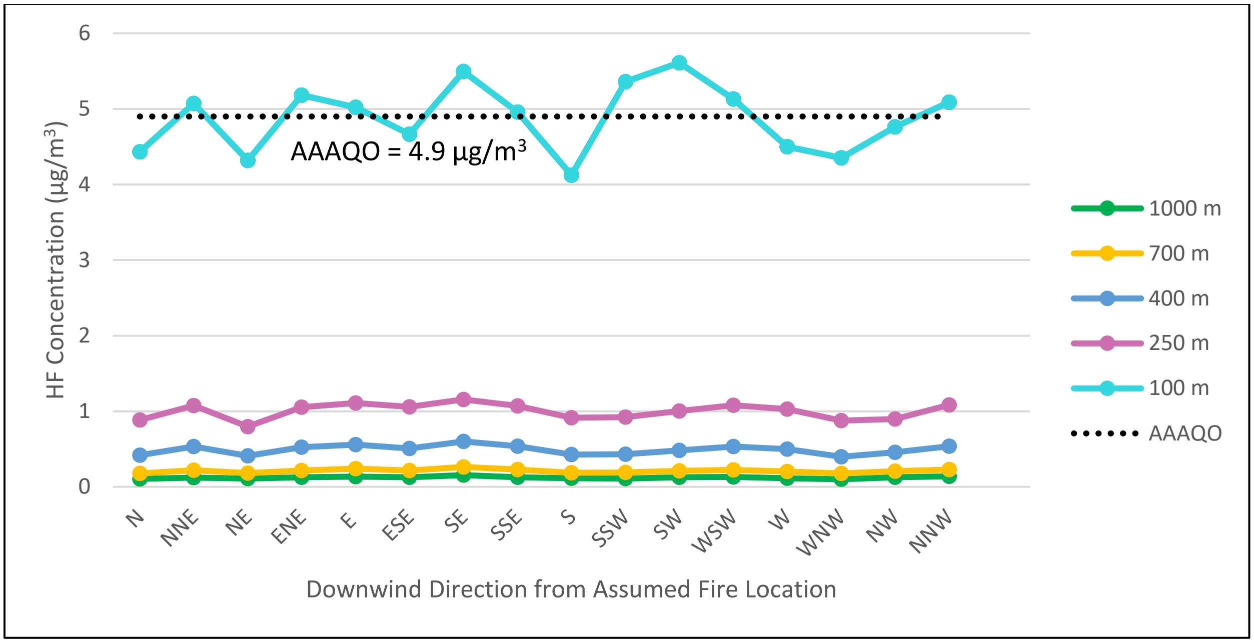


Figure 11 Predicted one-hour average HF concentrations (µg/m$^3$) associated with the project at 100, 250, 400, 700 and 1000 m downwind of the assumed fire location.

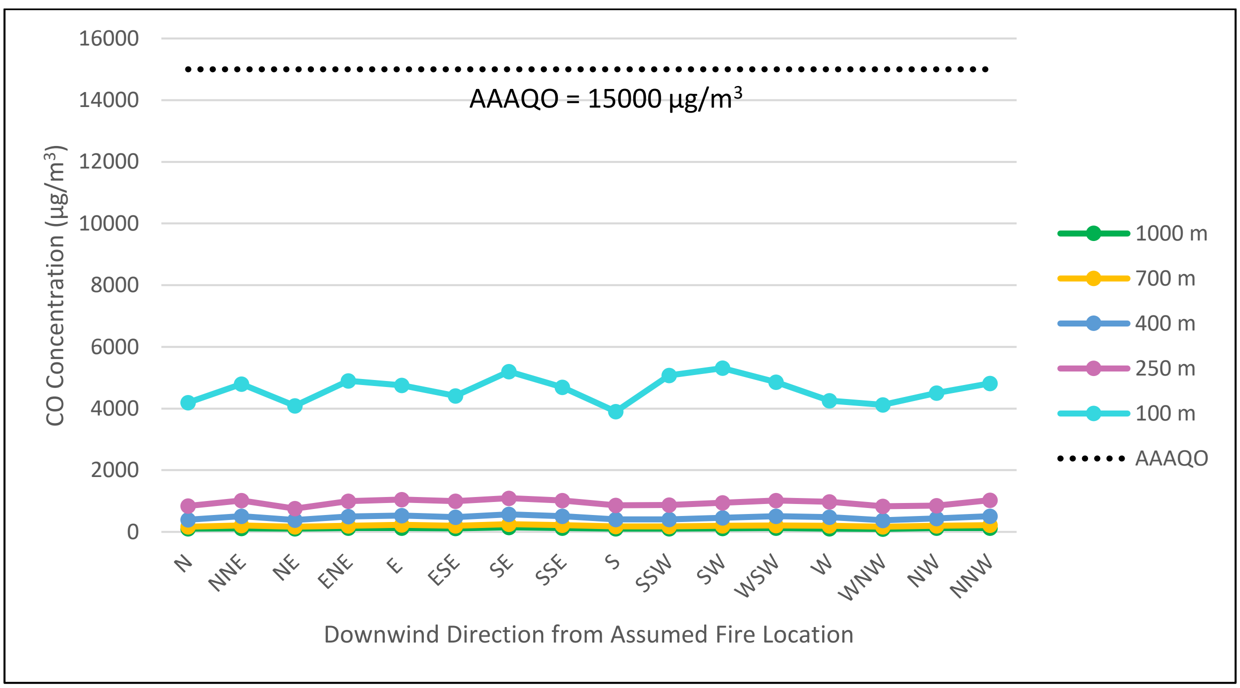


Figure 12 Predicted one-hour average CO concentrations (µg/m$^3$) associated with the Project at 100, 250, 400, 700 and 1000 m downwind of the assumed fire location.

## 5.3 Health and Safety Modelling Results

### *5.3.1 Regional Modelling*

Table 5 presents a summary of the maximum predicted 10-minute average concentrations within the modelling domain. These values are compared to the IDLH values. As indicated in Table 5, all maximum predicted 10-minute average concentrations are well within the IDLH limits at all off-site locations.

Table 5 Maximum predicted 10-minute average concentrations within the modelling domain.

| **Contaminant** | **10-Minute Average Maximum Predicted Concentration (ppm)** | **IDLH (ppm)** |
|---|---|---|
| HF | 0.0562 | **30** |
| CO | 37.9 | **1200** |

### *5.3.2 Discrete Receptors*

The modelling results for the discrete receptors are presented in Table 6. As indicated in Table 6, at distances beyond the Eastervale BESS fenceline, all predicted contaminant concentrations are well within the corresponding IDLH limits.

Table 6 Maximum predicted 10-minute average concentrations at varying downwind distances from the assumed fire location.

| **Contaminant** | **10-Minute Average Maximum Predicted Concentration (ppm)** | | | | | **IDLH (ppm)** |
|---|---|---|---|---|---|---|
| | **Downwind Distance** | | | | | |
| | **100 m** | **250 m** | **400 m** | **700 m** | **1000 m** | |
| HF | 0.0151 | 0.0030 | 0.0016 | 0.0007 | 0.0004 | **30** |
| CO | 10.2 | 2.0 | 1.1 | 0.5 | 0.3 | **1200** |

# 6.0 CONCLUSIONS

## 6.1 Ambient Air Quality

In the unlikely event of a BESS fire, maximum concentrations for HF are predicted to exceed the AAAQO in close proximity to the BESS site, as would be expected during a fire. However, HF and CO concentrations are predicted to comply with the applicable AAAQOs beyond ~85 m and ~15 m, respectively, from the BESS fenceline, and all concentrations beyond the Solar PV property line also comply.

## 6.2 Health and Safety

From a health and safety perspective, all maximum 10-minute average concentrations are predicted to comply with applicable IDLH limits within the modelling domain. As such, the modelling performed in this Assessment does not predict any significant health or safety impact associated with emissions in the event of a fire.

## 6.3 Risk Assessment

Fire risks, including emissions, from various types of Li-ion batteries, including LFP, have been studied extensively. LFP batteries are generally accepted as having lower risk of fire and decreased emissions as compared to other commonly used battery types. To ensure conservative estimates of emissions from an LFP battery fire, this Assessment considered worst-case conditions.

Risk is estimated according to the following:

Risk = Probability of Occurrence x Consequences

Given the safety features of the BESS being considered for this project and the low probability of a BESS fire from LFP batteries, coupled with the off-site maximum predicted air quality and IDLH concentrations, the risk to the public and area residents in association with this Project is deemed to be low. Specifically, risk assessment typically assigns a de minimis Individual Risk (IR) of $10^{-6}$/year as the level of risk below which there is no concern. This is approximately the same risk as being electrocuted in your own home. For comparison, the risk of being in a car accident is $10^{-4}$/year and has been deemed an allowable risk for workers driving to and from work.

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