

# Chapter 17

Effects of the Environment on  
the Project

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## 17. Effects of the Environment on the Project

Any change to the Parallel Runway Project (PRP) that may be caused by the environment was considered an environmental effect. In accordance with the PRP Scoping Document, the effects of certain environmental conditions on the construction and operation phases of the PRP were assessed during the Comprehensive Study (CS). This included a summary of mitigation activities that will occur in the design, construction, and operation of the PRP in response to the relevant assessed conditions.

Effects of environmental conditions can range from minor delays in the project schedule to catastrophic failure. The primary mitigation tool in the construction and operation of the PRP is considered to be sound planning and adherence to best practice design and construction

### 17.1 Environmental Conditions to be Considered

The environmental conditions that have the potential to affect the PRP during construction and operation are as follows:

- Extreme weather;
- Climate Change;
- Wild Fire; and
- Seismic Events.

#### 17.1.1 Spatial and Temporal Boundaries

The spatial boundaries for the assessment of the effects of the environment on the PRP are those of the prairie ecozone of Alberta. This consists primarily of the southern areas of the province (Wiken 1986). The temporal boundary includes the construction roughly from 06/2011 to 06/2014 and operation phases of the PRP

#### 17.1.2 Risk Characterization

A significant effect of the environment on the PRP would be one that causes:

- A substantial delay in project work during construction;
- Long-term interruption in the provision of service during operation, such as re-routing aircraft services to alternate airports; and
- Sufficient damage to site infrastructure that public health and safety or the environment is at risk.

Minor effects of the environment on the PRP would be ones that result in short-term delays in construction schedules, frequent short-term disruptions in service, and increased operating or maintenance costs.

It is necessary to consider the level of risk that an environmental event or condition may have on the PRP. The level of risk of an event is the likelihood of occurrence multiplied by the severity of the potential effects of the event. In summary:

- A very low risk event is considered to be unlikely to occur and have minor effects on the PRP;
- A low-risk event is considered unlikely to occur but would have significant effects on the PRP;
- A moderate risk event is considered likely to occur with minor effects on the PRP; and
- A high-risk event is considered likely to occur and have significant effects on the PRP.

## 17.2 Environmental Effects Analysis and Mitigation

### 17.2.1 Extreme Weather

#### 17.2.1.1 Background

Alberta is subject to many forms of extreme weather events that may affect the construction or operation of the PRP. Extreme weather refers to those weather conditions that occur outside the average level of intensity for a location. Torrential rain, heavy snowfall, and ice storms can occur within the Calgary area, with historical data showing that as much as 95.3 mm of rain can fall in a single extreme weather event (WOC 2009). Heavy precipitation events such as this can lead to localised flooding. During winter historical data records heavy snowfalls of up to 48.4 cm in a day in 1981 (WOC 2009). Ice storms are less frequent than torrential rainfall or heavy snowfall but are considered to be more extreme. Ice storms or glaze events are caused by freezing rain. Freezing rain is defined by Environment Canada (EC) as rain that freezes upon impact and forms a layer of ice on the ground and the objects it strikes. A *freezing rain warning* is issued if more than four hours of continuous freezing rain, or seven hours of freezing drizzle, are expected (WOC 2009).

Other extreme weather events that can occur include prolonged drought, severe winds or dust storms, blizzards and tornados. Although drought is a natural occurrence within the prairies, prolonged drought that exceeds the intensity and duration of normal dry periods is considered to be an extreme weather event. There is no universally accepted definition of drought. It is generally associated with conditions of abnormally dry weather resulting in a serious water shortage, with consequences for crops, humans, and livestock. In Canada, drought primarily affects the prairies and is not unusual within the Calgary area (ICLR 2009). High winds and dust storms can also occur in Alberta, usually during times of drought. Dust storms generally involve high winds collecting particulate matter in the prairie and pushing the matter at the front of high winds. Dust storms can lead to reduced visibility, property damage, and, in severe cases, health concerns. Blizzards are perhaps the most destructive winter storms that occur in the RSA. Blizzards are characterized by intense cold, strong winds, snow and low visibility. Visibility during blizzards is typically reduced to less than 1 km due to blowing snow. Although the snowfall during a blizzard may be light, the fierce winds can endanger life and cripple transportation. Tornados are violently rotating funnel clouds which can have speeds up to 500 km/hr. They are extremely destructive and occur across the prairie provinces of Canada. On average, around 80 tornados touch down in Canada per year however only 28 have occurred in Calgary Municipality between 1976 and 2007 (EC 2009). Tornados generally occur during spring and summer in southern Alberta.

#### 17.2.1.2 Effects and Mitigation

The primary effect of extreme weather on the PRP would be the delay of construction or operational activities. Torrential rain, heavy snowfall, and ice storms can cause disruption to utilities, transport infrastructure, and other services. These events may present a hazard to workers' safety or may make construction or operational tasks difficult to complete. In some cases, such as torrential rain, stockpiling of materials could be eroded and require remediation or amelioration prior to continuation of work. Preventive measures that can be implemented to reduce the effect of such events include guidelines that instruct workers to only complete tasks when it is reasonable to expect that no extreme weather events are likely to occur. In addition, all equipment should be sourced taking into consideration the climatic conditions and possible extreme weather events. The on-site supervisor will be responsible to ensure that this occurs.

Extreme snowfall events or ice storms that occur during the operation of the facility can delay operations through making the runway unsafe for use. The Authority has in place existing management strategies to remove snow or ice and maintain the runways in a working order. These strategies will be amended to support a parallel runway and will be incorporated into the management and operation of the PRP. Given the demonstrated success of these management strategies at present, it is accepted that they would continue to be effective for the PRP.

Catastrophic extreme weather events such as tornados or blizzards have the potential to substantially damage the PRP. In such circumstances, best practice environmental and workplace health and safety measures will be undertaken to reduce the immediate threat of worker injury and structure damage. Such events are difficult to predict and considered unlikely in the area. The Government of Alberta has in place the Emergency Public Warning System, which should be utilized by the Authority during the construction and operation of the PRP in case of extreme weather events that may threaten human safety.

The effect of environment on aircraft in flight is not considered. This is governed by Transport Canada (TC), which has a number of acts and regulations in place to ensure that safe flight procedures and practices are used when and where severe weather occurs.

### *17.2.1.3 Conclusion of Risk*

While there is the potential for extreme weather to adversely affect the construction and operation of the PRP, mitigation of these events is already considered in best practice construction management techniques and the existing operation procedures for the airport. On this basis, the majority of extreme weather events are considered to only have minor effects upon the construction and operation of the PRP. A tornado that would have the potential to have significant effects on the PRP is the exception. However, the likelihood of a tornado occurring at the airport is low. Therefore, the risk of extreme weather having adverse effects on the PRP is low.

## **17.2.2 Climate Change**

### *17.2.2.1 Background*

The Intergovernmental Panel on Climate Change (IPCC) has defined “climate change” as “the state of the climate that can be identified (e.g., using statistical tests) by changes in the mean and/or the variability of its properties, and that persist for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.” (IPCC 2001)

The average temperature in Alberta between 1961 and 1990 was 5.4°C. (Shen 2005). However, Barrow and Yu (2005) project it to increase by 3.8°C to an average temperature of 9.2°C by 2080. They also predict that precipitation will increase substantially by 2080. Francis & Hengeveld (1998) similarly predict that the frequency and severity of extreme weather events such as thunderstorms, strong winds, wildfire, and ice storms will also increase with continuation of climate change.

### *17.2.2.2 Effects and Mitigation*

The effects of climate change on the PRP are considered minor. The justification for this is based on the long duration over which changes in temperature and precipitation occur. This time frame means there will be no immediate effect upon the construction process of the PRP. Those effects that may occur on the operation of the airport as a result of an increase in frequency and severity of weather effects, or an

increase in temperature and precipitation, could be easily mitigated through the implementation of adaptive environmental management best practices. It is certain that the Authority would update environmental management procedures and practices on a regular basis. As such, the practices and procedures would be consistent with the requirements that any changes in climate may demand.

### *17.2.2.3 Conclusion of Risk*

Based on proxy evidence from the past, climate change is an inevitable phenomenon. It could have the potential to compromise the future operation of the PRP. However, the spatial context and the long timeframe in which to prepare for any effects of climate change on the PRP allow for the adjustment of practices and procedures that will be in place. This will ensure the effects are minor to the operation of the PRP. Thus, the risk of climate change having adverse effects on the PRP is low.

## 17.2.3 Wildfire

### *17.2.3.1 Background*

Wildfires refer to fires that occur either as the result of a lightning strike or a human action. Alberta Sustainable Resource Development records show that, on average, there are 1,382 wildfires in Alberta per year (based on 10-year averages) (ASRD 2009). However, as of 28 September 2009, only 224 of the 1,537 wildfires reported for that year occurred in the Calgary region, with those covering just 22.49 ha of a total 66,798 ha (ASRD 2009). This suggests that the likelihood of damaging wildfire in the Calgary area is low.

Weather conditions are important in the assessment of fire hazard and can be used as a gauge for the risk of wildfire occurring. Hot, dry, and windy conditions all influence the hazard rating and can dictate the appropriate management responses to reduce the risk of fire. Wildfires occur during the summer and fall months of the year.

### *17.2.3.2 Effects and Mitigation*

If a wildfire occurs in and around the airport, the effects could range from minor to substantial. Minor effects could include delayed construction works or an interruption in operation of the PRP. This could result from reduced visibility, personal risk for workers, or interference with utilities, services, or transit links. Significant effects may result from catastrophic damage to infrastructure, structures, materials, or vehicles.

To reduce the risk of wildfire causing adverse effects on the PRP, a number of best practice fire management strategies will be included in the construction and operation of the site. These are outlined within the Airport's Environmental Management System in place. A fire response plan and an emergency response plan will be prepared to govern activities during the construction of the site, which minimizes the risk fire would have on hindering the process. The existing airport has a fire plan and emergency response plan in place. These plans would be extended to support the parallel runway. Given the demonstrated success of the existing emergency response plan for the site, this response is considered adequate to effectively mitigate the risk associated with wildfire. The responsibility of controlling wildfire is that of the Calgary Fire Service, given the location of the airport outside the Forest Protection Area of Alberta. The Government of Alberta has in place the Emergency Public Warning System, which would be utilized by the Authority during the construction and operation of the PRP in the case of extreme wildfire events that may threaten human safety.

### *17.2.3.3 Conclusion of Risk*

Wildfires present a low likelihood of occurrence in the Calgary area. There are a variety of mitigation actions that are proposed for construction and presently exist in the operation of the airport that reduce the risk of fire on the premises. With these strategies in mind, and the effective record of fire control by the municipality, it is likely that the occurrence of fire within the region would have only minor effects on the PRP. Thus, the risk of wildfire having adverse effects on the PRP is very low.

## **17.2.4 Seismic Events**

### *17.2.4.1 Background*

Alberta is located in what is considered a stable part of the North American Plate system. According to the Alberta Geological Survey (AGS 2009), Alberta experiences approximately 200 micro-earthquakes each decade a micro-earthquake being a seismic activity of magnitude 3.0 or less. Most of them are considered as induced seismicity.

### *17.2.4.2 Effects and Mitigation*

It is likely that any seismic activity that occurs within Calgary during the construction and operation of the PRP would have only minor effects. This is based on the historical evidence demonstrating that most seismic activity in Alberta and particularly around Calgary is magnitude 3.0 or less. Nevertheless, all buildings and infrastructure to be constructed as part of the PRP will adhere to the National Building Code Standards, which provide guidelines for construction procedures and structure design that are relevant to the level of seismic risk in an area. The Government of Alberta has in place the Emergency Public Warning System, which should be utilized by the Authority during the construction and operation of the PRP in case of any seismic activity that may threaten human safety.

### *17.2.4.3 Conclusion of Risk*

In consideration of the background information and the mitigation strategies available to the design, construction, and operation of the PRP, it is considered that there is a low likelihood of high-magnitude seismic activity, and any effects that may occur would be minor. Thus, the risk of seismic events having adverse effects on the PRP is very low.

**Table 17-1 Summary of Effects of the Environment on the Project**

Environmental Condition	Risk Level	Effect on Project	Mitigation/Corrective Action
<b>Construction Phase</b>			
Extreme Weather	Low	Construction delays. Damage to infrastructure, utilities, transport routes etc. Potential for flooding of site, increased erosion, contamination of adjacent wetlands or waterways.	Construction Environmental Management Plan will govern best practice methods for erosion and sediment control practices, workplace health and safety procedures, and emergency response plans.
Wildfire	Low	Construction delays. Damage to infrastructure, utilities, transport routes etc. Risk to the health and safety of workers.	Emergency response plan outlining actions to take place should wildfire occur within the region of construction.
Seismic Events	Very Low	Construction delays. Damage to infrastructure, utilities, transport routes etc.	Emergency response plan outlining actions to take place should a seismic event occur within the region of construction.
<b>Operation Phase</b>			
Extreme Weather	Low	Delays to operations resulting from high winds, impaired visibility (fog or dust), damaging snow or ice, etc. Potential damage to infrastructure, utilities, and transport routes in cases of tornados.	Existing guidelines and procedures will be amended and, where necessary, extended to accommodate the parallel runway.
Climate Change	Low	Increased frequency and severity of extreme weather. Increase in mean temperatures and precipitation Possible change in wind patterns.	As the effects of climate change become clearer, the Environmental Management System in place for the airport will be adapted and improved to allow for an increase in mean temperature and precipitation. On the occurrence of an increase in frequency and severity of extreme weather events, emergency response plans will be adapted and, where necessary, improved to mitigate any impacts.
Wildfire	Very Low	Delays to operations resulting from impaired visibility (smoke). Damage to infrastructure, utilities, and transport routes. Potential risk to health and safety of workers.	Upgrade or duplication, if deemed necessary by the Authority, of fire response facility to accommodate parallel runway. Fire Response Plan extended to accommodate parallel runway. Emergency Response Plan extended to accommodate parallel runway.
Seismic Events	Very Low	Delays to operations. Damage to infrastructure, utilities, and transport routes. Potential risk to health and safety of workers.	Existing guidelines and procedures will be amended and where necessary modified to accommodate the parallel runway.