



BELLA BELLA – DENNY ISLAND EMERGENCY RESPONSE PLAN

ANNEX C: HAZARD RISK & VULNERABILITY ANALYSIS

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**Updated by:
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Bella Bella – Denny Island Hazard Risk & Vulnerability Analysis

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1 Introduction

The hazard potential for Bella Bella – Denny Island was assessed using Emergency Management BC’s web based Hazard, Risk and Vulnerability Analysis (HRVA) tool (V January, 2007) for each of the hazards having potential to cause emergencies of the scale necessary to invoke the Emergency Plan. Input data for the analysis was acquired from the previous emergency plan, from local residents, various studies and the author’s own experience living in the Central Coast. For each hazard, a risk index is generated based on the severity potential and estimated frequency. The input data for each hazard are provided in Appendix 1. The results of this analysis form the Hazard Profile for the Bella Bella – Denny Island communities.

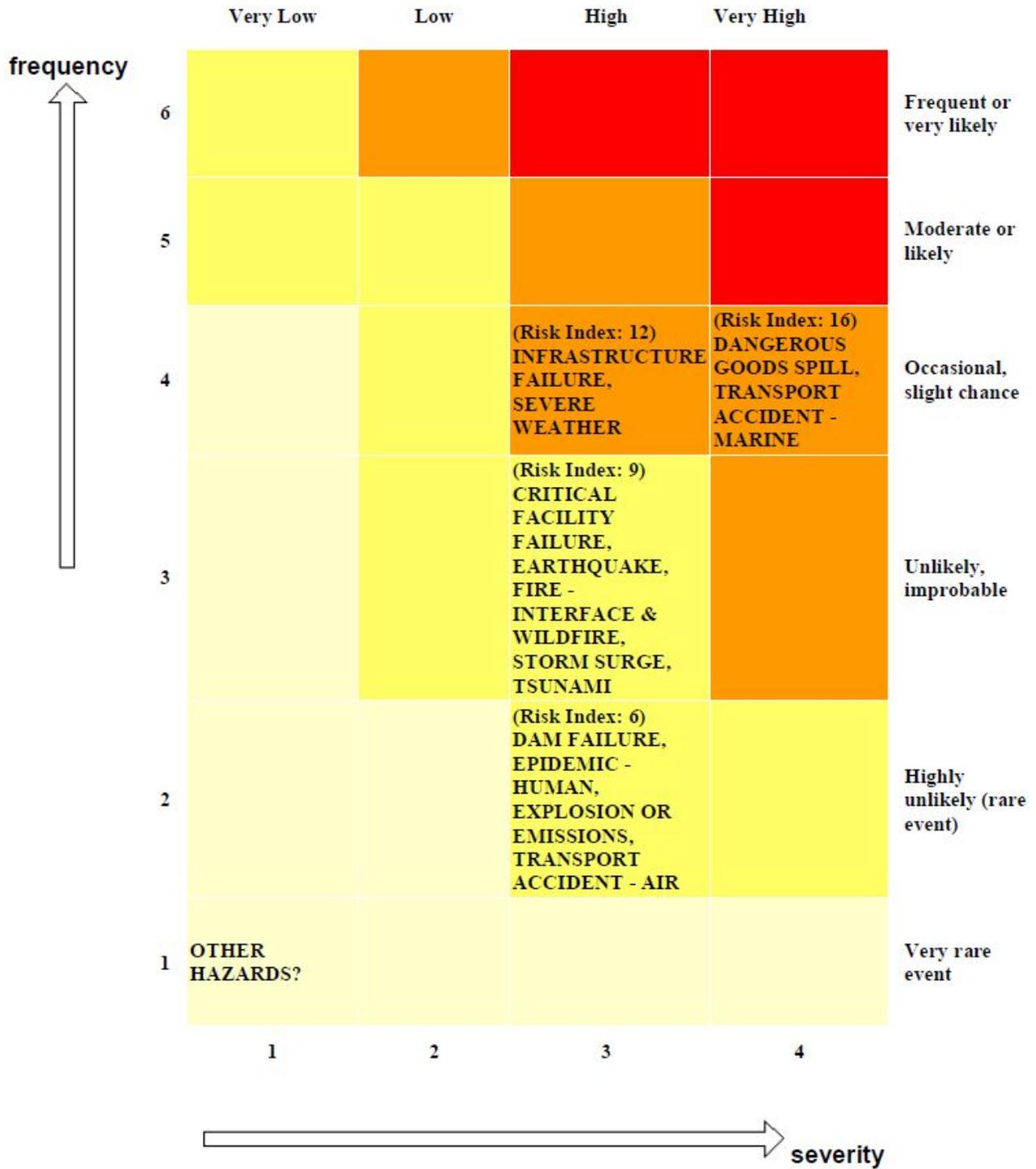
It should be noted that this hazard evaluation system is done using a Provincial scale and therefore a severity potential ranking of ‘low’ may be actually be very high at the local level on a relative basis.

2 Hazard Profile for Bella Bella – Denny Island

Table 1 summarizes the main hazards facing Bella Bella – Denny Island and their relative risk priority using the HRVA tool.

PRIORITY	HAZARD & RISK INDEX
1	(Risk Index: 16) DANGEROUS GOOD SPILL, MARINE TRANSPORT ACCIDENT
2	(Risk Index: 12) INFRASTRUCTURE FAILURE, SEVERE WEATHER
3	(Risk Index: 9) CRITICAL FACILITY FAILURE, EARTHQUAKE, FIRE – INTERFACE AND WILDFIRE, STORM SURGE, TSUNAMI
4	(Risk Index: 6) DAM FAILURE, EPIDEMIC – HUMAN, EXPLOSION OR EMISSIONS, TRANSPORT ACCIDENT – AIR

Bella Bella – Denny Island Hazard Risk Profile



3 Dangerous Good Spill

Risk Index: 16

Severity Potential: Very High

Frequency: Occasional, slight chance (every 10 – 30 years).

The Bella Bella/Denny Island Communities are located along the inside passage marine transport corridor that is used by cargo vessels to move large quantities of products to the North Coast and Alaska. As the majority of the community's populations are situated near the waterline this creates a particular vulnerability to the impact of hazardous materials spills. Hazards from any spill will include contamination of the environment, toxic exposure to humans and animals, and explosion and fire. There may also be temporary disruption of travel, and interruption of phone and power lines. Containment of the hazard will be a priority, and evacuation may be necessary. Multiple injuries can overwhelm local health services.

3.1 Hazard Reduction Strategies

Hazard reduction strategies for harmful materials spills is primarily the responsibility of the vendor transporting and storing the material and associated agencies. Fuel oil distributors are required to maintain hazardous materials kits that contain emergency fuel spill control and clean up material (booms, soaker pads, etc). Vendors should be encouraged to advise local emergency representatives of any situation requiring the potential involvement of emergency personnel (eg exceptionally large fuel transfers or construction projects relating to fuel storage).

Community initiatives that will help reduce hazard are:

- Promotion of safe storage and handling practices
- Build capacity to handle spill control and clean up. Support efforts to establish a marine accident response center in this area.
- Establish system for vendors to notify local emergency representatives of the transport of hazardous material that are unusual for the area and particularly dangerous to population (ie chlorine gas).
- Encourage training opportunities through EMBC, The Justice Institute, ESS or other public or private education providers.
- Conduct table top response training sessions.
- Encourage the Denny Island Coast Guard Facility to advise local emergency personnel whenever any vessel transporting hazardous materials runs afoul or has the potential for accident within the region. This includes any situation that requires the shifting or re-distribution of hazardous cargo and any movement of hazard

4 Transport Accident – Marine

Risk Index: 16

Severity Potential: Very High

Frequency: Occasional, slight chance (every 10 – 30 years)

While Denny Island houses a Coast Guard Base, if a large vessel such as the Ferry or a cruise ship were to run into trouble in the region, local resources might be called on to help with rescue. There is limited facilities to handle a sudden influx of stranded passengers and crews in the two communities. If there are many injuries, this will also swamp local health services. Other more complicated scenarios are imaginable: for example, a large vessel (or fuel barge) might collide with the dock and start a fire. Storms may endanger fishing fleets or multiple recreational boaters thereby straining search and rescue resources.

4.1 Hazard Reduction Strategies

Hazard reduction strategies for accidents is primarily the responsibility of the various transportation service providers and associated agencies. However, community initiatives that will help reduce hazard are:

- Build capacity to handle marine accidents, transportation and care of multiple victims involved in accidents.
- Support efforts to establish a marine accident response center in this area.
- Training opportunities through EMBC, The Justice Institute, ESS or other public or private education providers.
- Conduct table top response training sessions.

5 Infrastructure Failure

Risk Index: 12

Severity Potential: High

Frequency: Occasional, slight chance (every 10 – 30 years)

The main power is supplied from Ocean Falls and the long, remote powerline is difficult to repair should there be a major break. However, a back-up power generator is located on Denny Island which can service the two communities if necessary. The hospital has back up power generation capacity and is able to function through periods of power outages. The main concern is major powerline breakdown in the vicinity of the communities through storms or fire as this would take time to mobilize crews to conduct the repairs. Should the underwater cable connecting Bella Bella to Denny Island break, then this would be a critical problem for Bella Bella. Winter is the main time for concern of prolonged power failure as furnaces, well pumps and sump pumps rely on electric power. Many homes have wood as primary or back up heat but there are a number of

dwellings that do not, particularly government and multi-family housing units. Food refrigeration would not necessarily be a problem in winter however, a prolonged power outage in summer could pose significant problems for food stores and many people who store their yearly supply of salmon and hunting meat in their freezers. Cooking could also pose a problem for many as electric stoves and ovens are the norm.

Telephone is connected to the outside world via microwave radio transmission and if this one point of contact goes down, then this would leave the communities with very limited opportunity to contact the outside world. There are still radio communication available through the RCMP, DFO and Coast Guard, but day to day business and services would be severely impacted without phone service. Internet is connected via satellite so there is opportunity to communicate via social media, skype and email.

5.1 Hazard Reduction Strategies

Hazard reduction from power outages is primarily through public education and promotion of safe home-based backup systems:

- Power supplies (small generators, batteries)
- Wood furnace
- Gas/propane cooking stoves (camping stoves)

Development of back-up phone system would address concerns of land line connections.

- Support development of cell service along coastal transport corridor.

6 Severe Weather

Risk Index: 12

Severity Potential: High

Frequency: Occasional, slight chance (every 10 - 30 years)

Storms can occur at any time of year although the more severe storms historically occurred in fall and winter every 5-10 years or so. However, in recent times severe storms seem to be more frequent and this is reflected in this version of the analysis. Hazards from extreme weather events include hurricane force winds, extreme rains, heavy wet snowfalls, ice build-up, and unusually cold temperatures. Although the region lacks the size of trees generally related to the knocking down of utility lines and blocking roads, the potential for wind-driven debris to cause such effects does exist. Falling trees and flying debris also pose a significant danger to people and structures. It may take days or more than a week to restore power to all parts of the community, so if this occurs in winter it may place many people in peril.

Storm related problems may include damage to water, power and telecommunications lines, watercraft and wharf infrastructure, interruption of road and air traffic, and possible

isolation of all or parts of the community. There may be loss of life for anyone caught out at sea, and hardship for people isolated in their homes without adequate food, heat, or water. Fortunately, people in the region tend to be self-reliant, and most have at least some wood backup for heat.

6.1 Hazard Reduction Strategies

Hazard reduction of weather storm effects is provided primarily through public preparedness and education. The fewer individuals who require assistance in such events means that emergency resources are available to help those who are seriously affected, such as the elderly, the disabled and the infirm. The following procedures can greatly reduce the seriousness of storm-related hazards:

- Identify in advance persons with extra needs and assign volunteer respondents to ensure they are cared for in times of distress.
- Promote personal preparedness that includes the stock-piling of basic household emergency kits including food, water and adequate clothing for adverse conditions.
- Promote safe alternate heating and cooking amenities and provide educational programs to ensure that they are used safely and correctly.
- Encourage battery-powered radios to be kept by residents.
- Encourage residents to have 1 telephone that does not require electricity to operate.
- Encourage educational opportunities through EMBC, the Justice Institute and other training providers.

7 Critical Facility Failure

Risk Index: 9

Severity Potential: High

Frequency: Unlikely, improbable (return period every 30 – 100 years)

The main critical facilities are the hospital, police and fire stations, schools, health centre, band office, ferry docks, marinas and airport. Of main concern is the hospital because if this facility becomes unusable, there are few options available in the short term. If the other facilities fail, then there would likely only be a temporary disruption of service as there are other buildings that can be called into use as a substitute.

7.1 Hazard Reduction Strategies

- Promote and ensure that all these facilities have good fire protection and meet earthquake standards.
- If not already in place, develop contingency plans in case of failure.

8 Tsunami

Risk Index: 9

Severity Potential: High

Frequency: Unlikely, improbable (every 30 - 100 years)

Tsunamis, or tidal waves, are unusually big waves generated from a disturbance in the ocean. Typically caused by an earthquake on the ocean floor, tsunamis can also be caused by near shore land slides or even meteorites from space. Bella Bella/Denny Island communities are specifically from ocean generated waves. By monitoring earthquake activity, EMBC is a participant in the WEST Coast and AlaskaTsunami Warning Centre for the coast of North America.

Depending on the type of initiating event, the alert time for a tsunami can range from a number of hours to no forewarning at all. Wave travel time from likely tsunami sources in the ocean is estimated at five – six hours. However, a near- shore subduction earthquake would provide virtually no time for evacuation alert. Therefore, if people experience a hard shaking earthquake for more than 15-20 seconds, they should immediately head for high ground at least 20 m elevation above sea level.

The west coast of BC is overdue for a large earthquake, so the hazard likelihood has been upgraded for this analysis.

The most at-risk areas for damage from a tsunami are shoreline installations. In the Bella Bella/Denny Island Communities these include critical infrastructure facilities such as wharves, fuel storage facilities, the Denny Island Coast Guard Base and the RW Large General Hospital. In addition, a substantial number of residences are located within the danger zone.

When evacuating due to threat of tsunami, the general rule of thumb for coastal BC is to evacuate to locations at least 20 m above sea level.

8.1 *Tsunami Hazard Reduction*

- Up to date Emergency Response Plan.
- Public education.
- Coordinated Alerting and Evacuation Procedures.
- Post signs for evacuation routes to safe areas.
- Install and maintain tsunami siren alarms, test regularly.
- Training opportunities through EMBC, The Justice Institute, ESS or other public or private education providers.

9 Fire – Interface & Wildfire



Risk Index: 9

Severity Potential: High

Frequency: Unlikely, improbable (return period every 30-100 years)

Wildland and urban interface (homes and businesses built among trees) fire is a potential emergency threat that the Bella Bella/Denny Island communities face. Fires can start without warning and, under the right conditions, can spread very quickly to affect large areas. The Bella Bella/Denny Island region is not in a particularly high fire risk area although the small amount of fire fighting resources makes fire a definite concern. Accordingly, prevention is paramount and the implementation of a 'Firesmart' community program is recommended to help reduce the hazard.

Fire risk is highest in summer months from June through September although hot, dry weather conditions in April and October also give cause for alarm. Recently, a forest fire started along the power line from Ocean Falls in January, demonstrating that fires can be an issue during any drying trend. In this area of the coast, most forest fires are associated with logging slash or slash from land clearings. Human activities, like grass or slash burning, smoking, camp fires and garbage dump burning, pose the highest risk for initiating a fire, although lightning also poses a potential threat.

Power and telephone disruptions may be expected as power lines are suspended on wooden poles. Roads may become impassable due to fallen trees or intense smoke and heat. Evacuation may be required and homes and infrastructure may be lost. Restoration and clean up efforts can be sizeable and prolonged.

The Bella Bella town site has less tree cover than most other inhabited areas of the islands and therefore the risk is slightly lower. However, the potential for house-to-house fire is higher in these relatively dense areas. The prevailing summertime winds can increase the risk of multi-structure fires.

Local volunteer fire departments have some capacity to control structural fires before they spread to the forest. Resources in terms of equipment, expertise and labour from outside the region will be necessary in order to fight anything but the smallest interface fire.

9.1 *Community Wildfire Protection Plan*

A comprehensive Community Wildfire Protection Plan (CWPP) for the Bella Bella/Denny Island Communities was completed in August, 2006. The document forms an integral part of emergency planning for the region but should be updated to current conditions.

9.2 Hazard Reduction Strategies

There are a number of initiatives available to help the community prevent and prepare for wildland or interface fire:

- Firesmart Program (see EMBC and BC Wildfire websites)
- Public education.
- Implement Interface Fire Plan for community.
- Training opportunities through EMBC, The Justice Institute, ESS or other public or private education providers.
- Research funding opportunities to obtain more and better fire fighting equipment.
- Regularly review and update the Community Wildfire Protection Plan.

10 Earth Quake

Risk Index: 9

Severity Potential: High

Frequency: Unlikely, improbable (every 30 – 100 years)

The Queen Charlotte fault, located out in the Pacific Ocean, is the nearest active fault line posing the greatest threat to Bella Bella/Denny Island area.

Tremors from distant earthquakes have been felt in the region. Canada's largest earthquake (magnitude 8.1 Richter) took place in the Queen Charlotte Islands in 1949, and was felt widely over western North America. A magnitude 7.3 quake happened in Central Vancouver Island in 1946 and caused extensive damage along eastern Vancouver Island. An earthquake capable of structural damage (greater than 5 on the Richter scale) can be expected to strike somewhere in southwestern British Columbia once every ten years, and there are predictions that a very serious (8 to 9) earthquake is overdue for the Lower Mainland - Vancouver Island region. Such a quake would likely cause some problems in Bella Bella/Denny Island communities in terms of structural shake damage and disruption of power, communication and supply lines. Earthquakes can also trigger fires, likely the greatest threat of damage from an earthquake in the region.

Earthquakes are unpredictable. They provide no warning and their effects are immediate. An earthquake lasts from 30 seconds to 2 minutes, and there may be aftershocks intermittently for days. Possible effects include damage to buildings, roads and runways, power and telephone lines, fuel lines, water lines and sewage systems; diversion of stream channels, and blockage of streams with subsequent flooding. Damage may be minor or nearly total, local or regional. Debris removal and cleanup will be a concern after the event.

10.1 Hazard Reduction Strategies

Hazard reduction from earthquakes is primarily addressed through tsunami hazard reduction strategies.

- Check status of schools/hospital in terms of earthquake proof buildings by agencies responsible.
- Training opportunities through PEP, The Justice Institute, ESS or other public or private education providers.

11 Storm Surge

Risk Index: 9

Severity Potential: High

Frequency: Unlikely, improbable (every 30 -100 years)

Storm surges are unusually high ocean water levels associated with storms combined with high tides. They affect low lying areas near the ocean shoreline. There will also be large swells and cresting waves that will pound shoreline installations. Marinas, ferry terminals and buildings near the shoreline can easily be damaged. Given modern weather forecasting, warnings of storm surges should allow for evacuation of potentially affected areas and storm proofing. Emergency response is similar as for tsunami, except that there should be more time to prepare ahead of the event.

11.1 Hazard Reduction Strategy

- Public education.
- Coordinated Alerting and Evacuation Procedures.
- Post signs for evacuation routes to safe areas.
- Training opportunities through EMBC, The Justice Institute, ESS or other public or private education providers.

12 Dam Failure

Risk Index: 6

Severity Potential: High

Frequency: Highly unlikely, rare event (every 100 – 200 years)

The water supply for Bella Bella is from a reservoir that is held up by a small dam. Should this dam fail, the run off will likely not affect properties or infrastructure, except possibly road to the airport. However, with the loss of the dam, water supply to the community may drain away leaving the community without water. Given the wet climate in this area, there are other water sources on the island, however, given the swampy condition, the water is not good quality. So, water would need to be brought in or water treatments would need to be set up for alternate sources.

12.1 Hazard Reduction Strategy

- Regular inspection of the dam to ensure integrity
- Develop contingency plans for alternate water sources
- Review water treatment options for alternate water source.

13 Epidemic – Human

Risk Index: 6

Severity Potential: High

Frequency: Highly unlikely, rare event (every 100 – 200 years)

The World Health Organization and the US Centre for Disease Control both state that the threat of impending global pandemic is very real. Currently, these organizations are tracking the mutations of H5N1, the avian flu virus that has been shown to cause a staggering 75% mortality rate in affected humans. As this strain originates in South-east Asia, the west coast of British Columbia is recognized as being vulnerable to the spread of the disease due to the large volumes of travellers that make the populated areas of the province their destination.

Bella Bella/Denny Island's isolation has both positive and negative benefits in relation to disease and epidemics. Because it is not a heavily populated area with large numbers of people traveling through it, the community is not as exposed to disease originating from distant shores. On the other hand, because it is a close knit community, infectious disease can spread very quickly to affect a significant number of residents, thus potentially disabling the community's ability to provide essential services. The community's isolation and limited points of entry may provide some defence against a pandemic threat affecting British Columbia, but if this was to occur, the communities would have to limit outside access and provide much of its food and other supply needs locally. House quarantine or other forms of confinement may be a requirement in severe cases. In the event of a pandemic, the communities should not expect much help from the outside as larger populations at risk would receive priority with regards to medical, or other, assistance.

13.1 Hazard Reduction Strategies

Local health services are responsible for addressing disease issues through their emergency plans.

- The Bella Bella Emergency Program must work closely with the local health authority and provide support wherever it is required.
- A pandemic outbreak would require the community to be self reliant for an extended period of time and this would require stocking up of non-perishable foods and rationing of essential supplies.

- All residents of the community must be encouraged to obtain flu vaccinations each year and the health authority must be supported in its efforts to receive sufficient vaccine supply.
- All residents must also be encouraged to practise good hygiene and to remain isolated when they are unwell.

It is essential that the community's emergency plan contain provisions to protect essential services providers at the outset of an epidemic/pandemic emergency.

14 Explosions or Emissions

Risk Index: 6

Severity Potential: High

Frequency: Highly unlikely, rare event (every 100 – 200 years).

The Bella Bella/Denny Island region is not heavily industrialized, so the risk of a serious explosion occurring is low. Use of explosives is limited and primarily related to road construction and occasional major works projects like site preparation. Vendors using explosives are required to follow strict rules for storage, record keeping and magazine facility standards. The potential for other explosions are primarily related to fuel transport or storage facilities like oil tank farms at the harbour or gas stations. A propane explosion is also a possibility as there are a number of homes that rely on propane for heat and the hospital maintains a large propane inventory. Except for an explosion at the harbour or on the Bella Bella town site or the Shearwater Marine facility on Denny Island, an explosion would likely not affect more than one or two structures.

14.1 Hazard Reduction Strategies

Reduction of explosion hazard is primarily the responsibility of the user, service provider and associated agencies. Community initiatives that will help reduce hazard are:

- Promotion of safe storage and handling practices.
- Build capacity to handle explosion response.
- Establish system for vendors to notify emergency management personnel of the transport and storage of explosives.

15 Transport Accident – Air

Risk Index: 6

Severity Potential: High

Frequency: Highly unlikely, rare event (every 100 – 200 years)

The effects of an air-crash may vary tremendously, depending on the size of the aircraft and where it comes down. Problems may include severe injury or death for passengers

and/or persons on the ground, and destruction of property, by impact or by subsequent fire. Difficult search and rescue may be required, and multiple casualties will strain the local health care system. As Bella Bella relies heavily on air transportation, a particular problem would exist if an air disaster were to cause the closure of the Bella Bella airport. Outside helicopter assistance would likely be required to transport seriously injured persons should the air-ambulance be unable to use the existing airstrip.

At present, small plane air traffic in the Bella Bella/Denny Island region is fairly busy. Pacific Coastal Airlines and Wilderness Seaplanes are the main service providers but there are also many charter companies and private planes that visit the area.

15.1 Hazard Reduction Strategies

Hazard reduction strategies for accidents is primarily the responsibility of the various transportation service providers and associated agencies. However, community initiatives that will help reduce hazard are:

- Build capacity to handle transportation and care of multiple victims involved in accidents.
- Training opportunities through EMBC, The Justice Institute, ESS or other public or private education providers.

APPENDIX 1 – HAZARD RISK VULNERABILITY ANALYSIS DATA

Appendix 1 - Hazard Risk and Vulnerability Analysis - Web tool data

CCRD Emergency Management Planning

Bella Bella - Denny Island

January, 2018

HAZARD		CONSEQUENCE			LIKELIHOOD		RISK PRIORITY	
Description	Vulnerability & Impact	Description	Assessment	Rank	Rating	Description		
Dam Failure	Water reservoir	Vulnerable populations	Elderly, children, handicapped	Yes	High	Highly unlikely, rare event	Every 100-200 years	4
		Vulnerable areas close to hazard	Infrastructure, buildings	Yes				
		Inadequate alert or evac plans	Check with Boralex	Yes				
		Limited capability to respond or recover	Equipment availability?	Yes				
		Dated risk analysis, response recovery plans	Check with Boralex	Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	0-4	Very low				
		Potential extent of injury	0-4	Very low				
		Potential extend of damage or loss to critical infrastructure	Road to airport may be cut off	Very low				
		Potential extend of damage or loss to lifelilnes	Permanent power loss	Very low				
		Potential extend of property damage or loss	Localized & severe	Low				
		Potential extend of damage or loss to environment	Localized damage	Very low				
Potential extend of economic or social impact	Water supply shortage, extended and widespread	High						
Flood	No large watersheds in vicinity	Vulnerable populations	Elderly, children & poor people exposed		N/A			0
		Vulnerable areas close to hazard	Infrastructure exposed					
		Inadequate alert or evac plans	10 years old, inadequate personnel to alert					
		Limited capability to respond or recover						
		Dated risk analysis, response recovery plans	Over 10 years old					
		Inadequate hazard specific contingency plans	Need updated flood mapping					
		Potential extent of deaths	0-4					
		Potential extent of injury	4-50					
		Potential extend of damage or loss to critical infrastructure						
		Potential extend of damage or loss to lifelilnes						
		Potential extend of property damage or loss						
		Potential extend of damage or loss to environment						
Potential extend of economic or social impact								
Critical Facility Failure	Hospital, police, fire, shelters, schools, gov admin, closure due to fire.	Vulnerable populations	Elderly, children & poor people exposed	Yes				
		Vulnerable areas close to hazard	Infrastructure exposed	No				
		Inadequate alert or evac plans	Each organization has own plan	No				

HAZARD		CONSEQUENCE				LIKELIHOOD		RISK PRIORITY
	Description	Vulnerability & Impact	Description	Assessment	Rank	Rating	Description	
	collapse	Limited capability to respond or recover		Yes	High	Unlikely, improbable	Every 30 - 100 years	3
		Dated risk analysis, response recovery plans	> 10 years old	Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	0-4	Very low				
		Potential extent of injury	0-4	Very low				
		Potential extend of damage or loss to critical infrastructure		High				
		Potential extend of damage or loss to lifelines		High				
		Potential extend of property damage or loss		Low				
		Potential extend of damage or loss to environment		Very low				
		Potential extend of economic or social impact		Very low				

Dangerous Good Spill	Primary dangerous goods is large fuel tanks and transport of variety of chemicals by barge and ships.	Vulnerable populations	Elderly, children & poor people exposed	Yes	Very High	Occasional, slight chance	Every 10 - 30 years	1
		Vulnerable areas close to hazard	Infrastructure exposed	Yes				
		Inadequate alert or evac plans		Yes				
		Limited capability to respond or recover		Yes				
		Dated risk analysis, response recovery plans		Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	0-4	Very low				
		Potential extent of injury	4-50	Low				
		Potential extend of damage or loss to critical infrastructure		Very low				
		Potential extend of damage or loss to lifelines		Very low				
		Potential extend of property damage or loss		High				
		Potential extend of damage or loss to environment	Wide spread and severe	Very high				
		Potential extend of economic or social impact	Extended and widespread	High				

Earthquake	No records of large earthquake in this area. Fault lines are further out in ocean.	Vulnerable populations	Elderly, children & poor people exposed	Yes	High	Unlikely, improbable	Every 30 - 100 years	3
		Vulnerable areas close to hazard	Infrastructure exposed	Yes				
		Inadequate alert or evac plans		Yes				
		Limited capability to respond or recover		Yes				
		Dated risk analysis, response recovery plans		Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	4-10	Low				
		Potential extent of injury	4-50	Low				
		Potential extend of damage or loss to critical infrastructure		High				
		Potential extend of damage or loss to lifelines		High				
		Potential extend of property damage or loss		High				
		Potential extend of damage or loss to environment		Low				
		Potential extend of economic or social impact		High				

HAZARD		CONSEQUENCE			LIKELIHOOD		RISK PRIORITY	
Description	Vulnerability & Impact	Description	Assessment	Rank	Rating	Description		
Fire - Interface & Wildfire	Evidence of historical forest fires visible throughout valley.	Vulnerable populations	Elderly, children & poor people exposed	Yes	High	Unlikely, improbable	Every 30 -100 years	3
		Vulnerable areas close to hazard	Infrastructure exposed	Yes				
		Inadequate alert or evac plans		Yes				
		Limited capability to respond or recover		Yes				
		Dated risk analysis, response recovery plans		Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	0-4	Very low				
		Potential extent of injury	4-50	Low				
		Potential extend of damage or loss to critical infrastructure		Low				
		Potential extend of damage or loss to lifelines		High				
		Potential extend of property damage or loss		High				
Potential extend of damage or loss to environment		High						
Potential extend of economic or social impact		Low						
Epidemic - Human	Isolated community provides opportunity to control outside access in event of epidemic in outside world and also for quarantying.	Vulnerable populations	Elderly, children & poor people exposed	Yes	High	Highly unlikely, rare event	Every 100 - 200 years	4
		Vulnerable areas close to hazard	Infrastructure exposed	Yes				
		Inadequate alert or evac plans		No				
		Limited capability to respond or recover		Yes				
		Dated risk analysis, response recovery plans		Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	4-10	Low				
		Potential extent of injury	50 - 2000	High				
		Potential extend of damage or loss to critical infrastructure		High				
		Potential extend of damage or loss to lifelines		Very low				
		Potential extend of property damage or loss		Very low				
Potential extend of damage or loss to environment		Very low						
Potential extend of economic or social impact		High						
Explosion or Emissions	Fuel tanks	Vulnerable populations	Elderly, children & poor people exposed	Yes	High	Highly unlikely, rare event	Every 100 - 200 years	4
		Vulnerable areas close to hazard	Infrastructure exposed	Yes				
		Inadequate alert or evac plans		Yes				
		Limited capability to respond or recover		Yes				
		Dated risk analysis, response recovery plans		Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	0-4	Very low				
		Potential extent of injury	4-50	Low				

HAZARD		CONSEQUENCE				LIKELYHOOD		RISK PRIORITY
	Description	Vulnerability & Impact	Description	Assessment	Rank	Rating	Description	
		Potential extend of damage or loss to critical infrastructure		Very low				
		Potential extend of damage or loss to lifelines		High				
		Potential extend of property damage or loss		Low				
		Potential extend of amage or loss to environment		Low				
		Potential extend of economic or social impact		Very low				

Infrastructure Failure	Hydro power plant, power lines, telephone	Vulnerable populations	Elderly, children & poor people exposed	Yes	High	Occasional, slight chance	Every 10 -30 years	2
		Vulnerable areas close to hazard	Infrastructure exposed	No				
		Inadequate alert or evac plans		Yes				
		Limited capability toe respond or recover		Yes				
		Dated risk analysis, response recovery plans		Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	0-4	Very low				
		Potential extent of injury	0-4	Very low				
		Potential extend of damage or loss to critical infrastructure		Low				
		Potential extend of damage or loss to lifelines		High				
		Potential extend of property damage or loss		Low				
		Potential extend of amage or loss to environment		Very low				
		Potential extend of economic or social impact		Low				

Severe Weather		Vulnerable populations	Elderly, children & poor people exposed	Yes	High	Occasional, slight chance	Every 10 - 30 years	2
		Vulnerable areas close to hazard	Infrastructure exposed	Yes				
		Inadequate alert or evac plans		Yes				
		Limited capability toe respond or recover		Yes				
		Dated risk analysis, response recovery plans		Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	0-4	Very low				
		Potential extent of injury	4-50	Low				
		Potential extend of damage or loss to critical infrastructure		Low				
		Potential extend of damage or loss to lifelines		High				
		Potential extend of property damage or loss		High				
		Potential extend of amage or loss to environment		Low				
		Potential extend of economic or social impact		Low				

Transport Accident - Air		Vulnerable populations	Elderly, children & poor people exposed	Yes				
		Vulnerable areas close to hazard	Infrastructure exposed	Yes				
		Inadequate alert or evac plans		Yes				

HAZARD		CONSEQUENCE				LIKELYHOOD		RISK PRIORITY
Description	Vulnerability & Impact	Description	Assessment	Rank	Rating	Description		
		Limited capability to respond or recover		Yes	High	Highly unlikely, rare event	Every 100 - 200 years	4
		Dated risk analysis, response recovery plans		Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	4-10	Low				
		Potential extent of injury	4-50	Low				
		Potential extent of damage or loss to critical infrastructure		Low				
		Potential extent of damage or loss to lifelines		Low				
		Potential extent of property damage or loss		High				
		Potential extent of damage or loss to environment		Very low				
		Potential extent of economic or social impact		Very low				

Storm surge	High water with damaging waves	Vulnerable populations	Elderly, children & poor people exposed	Yes	High	Unlikely, improbable	Every 30 -100 years	3
		Vulnerable areas close to hazard	Infrastructure exposed	Yes				
		Inadequate alert or evac plans		Yes				
		Limited capability to respond or recover		Yes				
		Dated risk analysis, response recovery plans		Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	0-4	Very low				
		Potential extent of injury	0-4	Very low				
		Potential extent of damage or loss to critical infrastructure		Very low				
		Potential extent of damage or loss to lifelines		Low				
		Potential extent of property damage or loss		High				
Potential extent of damage or loss to environment		Very low						
Potential extent of economic or social impact		Very low						

Transport Accident - Marine		Vulnerable populations	Elderly, children & poor people exposed	Yes	Very high	Occasional, slight chance	Every 10 - 30 years	1
		Vulnerable areas close to hazard	Infrastructure exposed	Yes				
		Inadequate alert or evac plans		Yes				
		Limited capability to respond or recover		Yes				
		Dated risk analysis, response recovery plans		Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	0-4	Very low				
		Potential extent of injury	4-50	Low				
		Potential extent of damage or loss to critical infrastructure		Very low				
		Potential extent of damage or loss to lifelines		Very low				
		Potential extent of property damage or loss		Very low				
Potential extent of damage or loss to environment		Very high						
Potential extent of economic or social impact		Low						

HAZARD		CONSEQUENCE				LIKELYHOOD		RISK PRIORITY
	Description	Vulnerability & Impact	Description	Assessment	Rank	Rating	Description	
Tsunami	Hospital close to hazard zone, fuel tanks, homes	Vulnerable populations	Elderly, children & poor people exposed	Yes	High	Unlikely, improbable	Every 30 - 100 years	3
		Vulnerable areas close to hazard	Infrastructure exposed	Yes				
		Inadequate alert or evac plans		Yes				
		Limited capability to respond or recover		Yes				
		Dated risk analysis, response recovery plans		Yes				
		Inadequate hazard specific contingency plans		Yes				
		Potential extent of deaths	4-10	Low				
		Potential extent of injury	4-50	Low				
		Potential extend of damage or loss to critical infrastructure		High				
		Potential extend of damage or loss to lifelines		High				
		Potential extend of property damage or loss		High				
		Potential extend of damage or loss to environment		Low				
Potential extend of economic or social impact		High						